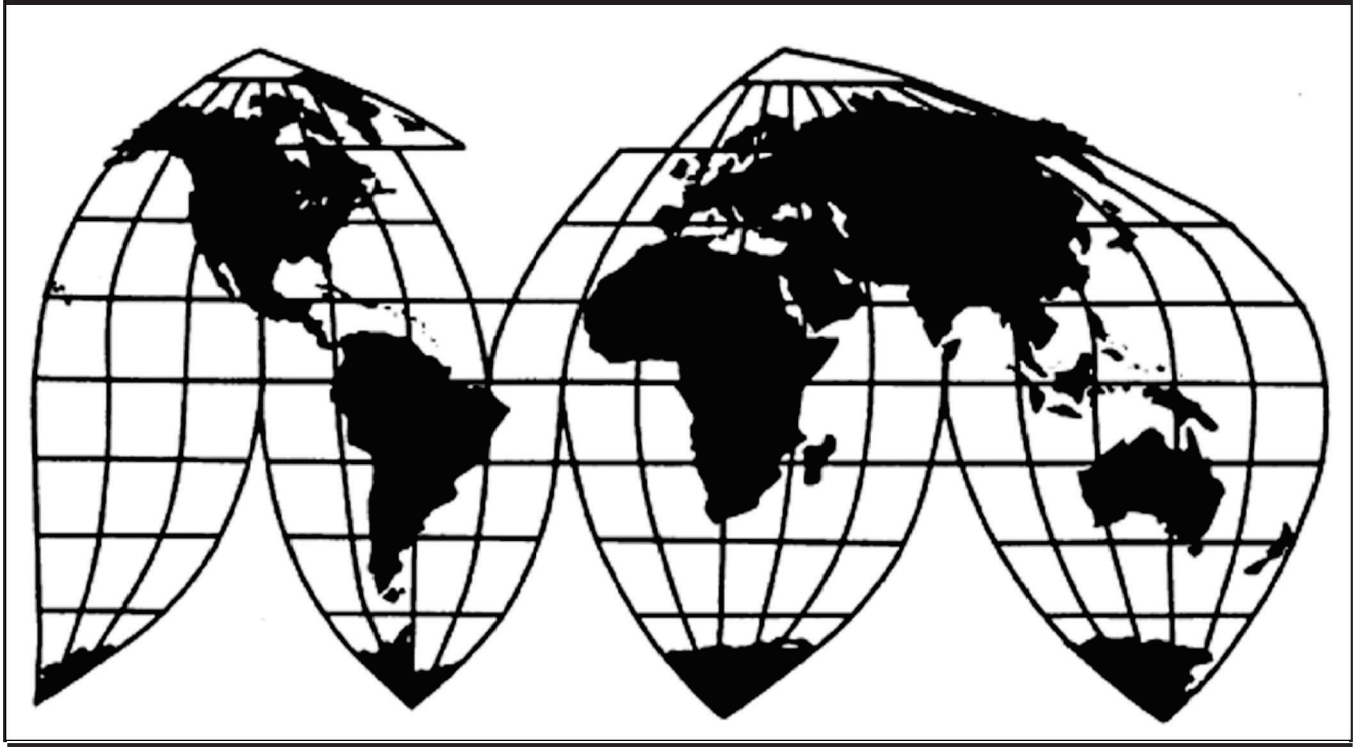
In the Matter of

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

337-TA-1100

Publication 5077 **June 2020**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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Washington, DC 20436

U.S. International Trade Commission

Washington, DC 20436
www.usitc.gov

In the Matter of

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-1100**

NOTICE OF THE COMMISSION'S FINAL DETERMINATION FINDING A VIOLATION OF SECTION 337; ISSUANCE OF A LIMITED EXCLUSION ORDER AND CEASE AND DESIST ORDER; AND TERMINATION OF THE INVESTIGATION.

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined that there is a violation of 19 U.S.C. 1337, as amended ("section 337"), in the above-captioned investigation. The Commission has further determined to issue a limited exclusion order and cease and desist order and to set a bond rate on the entered value of covered products imported during the period of Presidential review.

FOR FURTHER INFORMATION CONTACT: Benjamin S. Richards, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street SW, Washington, DC 20436, telephone (202) 708-5453. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street SW, Washington, DC 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at *https://www.usitc.gov*. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *https://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: On February 21, 2018, the Commission instituted this investigation based on a complaint filed by 10X Genomics, Inc. of Pleasanton, CA. 83 Fed. Reg. 7491 (Feb. 21, 2018). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of one or more claims of U.S. Patent Nos. 9,644,204 ("the '204 patent"); 9,689,024 ("the '024 patent"); 9,695,468 ("the '468 patent"); and 9,856,530 ("the '530 patent"). *Id.* The Commission's

notice of investigation named as the sole respondent Bio-Rad Laboratories, Inc. of Hercules, CA. *Id.* The Office of Unfair Import Investigations ("OUII") is participating in this investigation. *Id.*

On July 12, 2019, the administrative law judge ("ALJ") issued the final initial determination ("ID"). The ID found a violation of section 337 by virtue of Bio-Rad's indirect infringement of the '024, the '468, and the '530 patents. The ID found that 10X had not established a violation with respect to the '204 patent. The ID also found that Bio-Rad failed to establish invalidity of any of the asserted claims of any patent. The ID further found that the domestic industry requirement was satisfied for each of the asserted patents. Finally, the ID found that Bio-Rad had not carried its burden with respect to various additional affirmative defenses, including improper inventorship and ownership.

On July 25, 2019, the ALJ issued her recommended determination on remedy and bonding. The ALJ recommended, upon a finding of violation, that the Commission issue a limited exclusion order, issue a cease and desist order, and impose a bond in the amount of twenty-five percent of the entered value of any covered products imported during the period of Presidential review.

On July 29, 2019, 10X, Bio-Rad, and OUII submitted petitions seeking review of the ID. On August 6, 2019, 10X, Bio-Rad, and OUII submitted responses to the others' petitions. On August 26, 2019, 10X and Bio-Rad submitted comments on the public interest pursuant to Commission Rule 210.50(a)(4).

On October 17, 2019, the Commission issued a notice indicating its determination to review the ID with respect to (1) all findings related to a violation based on the '024 patent; (2) all findings related to a violation based on the '468 patent; (3) noninfringement of the '204 patent; (4) all findings related to a violation based on the '530 patent; (5) Bio-Rad's inventorship and ownership defenses; and (6) a typographical error on page 91. The same notice also requested briefing from the parties on certain of those issues, and on remedy, bonding, and the public interest. The notice also included an extension of the target date to December 19, 2019.

The parties filed their initial responses to the Commission's questions on October 31, 2019, and their replies on November 7, 2019.

Upon review of the parties' submissions, the ID, RD, and evidence of record, the Commission has determined that Bio-Rad violated section 337 by reason of infringement of asserted claims 1, 5, 17, 19, and 22 of the '024 patent, claims 1, 6, 7, 9, and 21 of the '468 patent, and claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent. The Commission found no violation with respect to the '240 patent. The Commission has further determined to issue a limited exclusion order prohibiting further importation of Bio-Rad's infringing microfluidic systems and a cease and desist order against Bio-Rad. The Commission will set a bond of twenty-five percent of entered value on Bio-Rad's infringing microfluidic systems imported during the period of Presidential review.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), and in part 210 of the Commission's Rules of Practice and Procedure (19 CFR 210).

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: February 12, 2020

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.,** and the following parties as indicated, on **February 12, 2020.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants 10X Genomics, Inc.:

Paul T. Ehrlich
TENSEGRITY LAW GROUP LLP
555 Twin Dolphin Dr., Suite 650
Redwood Shores, CA 94061

☐ Via Hand Delivery
☒ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

On Behalf of Respondents Bio-Rad Laboratories, Inc.:

S. Alex Lasher
QUINN EMANUEL URQUHART & SULLIVAN, LLP
1300 I Street NW, Suite 900
Washington, DC 20005

☐ Via Hand Delivery
☒ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-1100**

LIMITED EXCLUSION ORDER

The Commission has determined that there is a violation of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), in the unlawful importation, sale for importation, and/or sale within the United States after importation by Bio-Rad Laboratories, Inc. of Hercules, California ("Bio-Rad" or "Respondent") of certain microfluidic systems and components thereof and products containing same that infringe one or more of claims 1, 5, 17, 19, and 22 of U.S. Patent No. 9,689,024 ("the '024 patent"); claims 1, 6, 7, 9, and 21 of U.S. Patent No. 9,695,468 ("the '468 patent"); and claims 1, 4, 11, 14, 19, 26, and 28 of U.S. Patent No. 9,856,530 ("the '530 patent").

Having reviewed the record of this investigation, including the written submissions of the parties, the Commission has made its determination on the issues of remedy, the public interest, and bonding. The Commission has determined that the appropriate form of relief includes a limited exclusion order prohibiting the unlicensed entry of covered microfluidic systems and components thereof and products containing same manufactured by or on behalf of, or imported by or on behalf of, Respondent or any of its affiliated companies, parents, subsidiaries, or other

related business entities, or its successors or assigns. This Exclusion Order does not apply to microfluidic consumables[1] imported into the United States for use by researchers who are using such consumables in the United States as of the date of issuance of this Order, and who have a documented need to continue receiving the consumables for a specific current ongoing research project for which that need cannot be met by any alternative product.

The Commission has also determined that the public interest factors enumerated in 19 U.S.C. § 1337(d)(1) do not preclude the issuance of this limited exclusion order. Finally, the Commission has determined that the bond during the Presidential review period shall be in the amount of twenty-five (25) percent of the entered value for all covered products.

Accordingly, the Commission hereby **ORDERS** that:

1. Microfluidic systems and components thereof and products containing same that infringe one or more of claims 1, 5, 17, 19, and 22 of the '024 patent; claims 1, 6, 7, 9, and 21 of the '468 patent; and claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent, and that are manufactured by or on behalf of, or imported by or on behalf of, Respondent or any of its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns ("covered products"), are excluded from entry for consumption into the United States, entry for consumption from a foreign trade zone, or withdrawal from a warehouse for consumption, for the remaining terms of the patents, except under license of the patent owner or as provided by law.

[1] "Consumable" means any otherwise covered Bio-Rad part or material that is purchased for use with Bio-Rad's droplet generation instruments and which is consumed during the use of those instruments. For example, Bio-Rad's microfluidic chips are consumables.

2. The provisions of this Order shall not apply to covered consumables imported into the United States for use by researchers who are using such consumables in the United States as of the date of issuance of this Order, and who have a documented need[2] to continue receiving the consumables for a specific current ongoing research project for which that need cannot be met by any alternative product. The provisions of this Order shall also not apply to service or repair articles imported for use in servicing or repairing microfluidic systems that were imported as of the date of this Order and are under a warranty that existed as of the date of this Order, if such servicing or repairing is provided for in terms of the warranty.

3. Notwithstanding paragraph 1 of this Order, the covered products are entitled to entry into the United States for consumption, entry for consumption from a foreign-trade zone, or withdrawal from a warehouse for consumption under bond in the amount of twenty-five (25) percent of the entered value of such articles pursuant to subsection (j) of Section 337 (19 U.S.C. § 1337(j)) and the Presidential Memorandum for the United States Trade Representative of July 21, 2005 (70 Fed. Reg. 43,251), from the day after this Order is received by the United States Trade Representative until such time as the United States Trade Representative notifies the Commission that this Order is approved or disapproved but, in any event, not later than sixty (60) days after the date of receipt of this Order. All entries of covered products made pursuant to this paragraph are to be reported to U.S. Customs and Border Protection ("CBP"), in

[2] This "documented need" is to be satisfied by the questionnaire attached to this Order, as discussed at pages 84–86 of the Commission Opinion issued in this investigation on the date of this Order. Bio-Rad is not required to maintain the individual researchers' records supporting the questionnaire. Commission Opinion, at 85–86.

advance of the date of the entry, pursuant to procedures CBP establishes.

4. At the discretion of CBP and pursuant to procedures that it establishes, persons seeking to import microfluidic systems and components thereof and products containing same that are potentially subject to this Order may be required to certify that they are familiar with the terms of this Order, that they have made appropriate inquiry, and thereupon state that, to the best of their knowledge and belief, the products being imported are not excluded from entry under paragraph 1 of this Order. At its discretion, CBP may require persons who have provided the certification described in this paragraph to furnish such records or analyses as are necessary to substantiate the certification.
5. In accordance with 19 U.S.C. § 1337(1), the provisions of this Order shall not apply to covered products that are imported by and for the use of the United States, or imported for, and to be used for, the United States with the authorization or consent of the Government.
6. The Commission may modify this Order in accordance with the procedures described in Rule 210.76 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.76).
7. The Secretary shall serve copies of this Order upon each party of record in this

Investigation and upon CBP.

8. Notice of this Order shall be published in the *Federal Register*.

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: February 12, 2020

ATTACHMENT

Name: _____

Institution: _____

If you were conducting research using Bio-Rad's ddSEQ consumables as of February 12, 2020, in the United States and you need to continue to receive the ddSEQ consumables for that research, answer the following questions:

1. What is the subject matter of your research that uses Bio-Rad's ddSEQ system and consumables?

2. On what date (mm/dd/yyyy) did your research using these Bio-Rad systems begin?

3. What is the expected completion date (mm/dd/yyyy) of your research that uses these Bio-Rad systems?

4. What other competing products did you consider for your research, and why did you reject these products?

I certify that all information provided as part of this questionnaire is accurate and complete to the best of my knowledge. I am aware that U.S. law (including, but not limited to, 18 U.S.C. § 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government.

I acknowledge that I am to maintain records supporting the above declarations and am not to provide those supporting records to Bio-Rad. If the facts change concerning my research, which began on or before February 12, 2020, I understand that I am to provide an updated questionnaire response to Bio-Rad.

Date: _____ Signature: _____

Additional Bio-Rad comments [to be completed by Bio-Rad]:

I certify that all information provided as part of this questionnaire is accurate and complete to the best of my knowledge. I am aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government.

Date: _____ Signature: _____

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION ORDER** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.,** and the following parties as indicated, on **February 12, 2020.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants 10X Genomics, Inc.:

Paul T. Ehrlich
TENSEGRITY LAW GROUP LLP
555 Twin Dolphin Dr., Suite 650
Redwood Shores, CA 94061

☐ Via Hand Delivery
☒ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

On Behalf of Respondents Bio-Rad Laboratories, Inc.:

S. Alex Lasher
QUINN EMANUEL URQUHART & SULLIVAN, LLP
1300 I Street NW, Suite 900
Washington, DC 20005

☐ Via Hand Delivery
☒ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-1100**

CEASE AND DESIST ORDER

IT IS HEREBY ORDERED THAT Bio-Rad Laboratories, Inc. of Hercules, California cease and desist from conducting any of the following activities in the United States: importing, selling, marketing, advertising, distributing, transferring (except for exportation), and soliciting U.S. agents or distributors for, or aiding and abetting other entities in the importation, sale for importation, sale after importation, transfer (except for exportation), or distribution of microfluidic systems and components thereof and products containing same covered by one or more of claims 1, 5, 17, 19, and 22 of U.S. Patent No. 9,689,024 ("the '024 patent"); claims 1, 6, 7, 9, and 21 of U.S. Patent No. 9,695,468 ("the '468 patent"); and claims 1, 4, 11, 14, 19, 26, and 28 of U.S. Patent No. 9,856,530 ("the '530 patent") in violation of Section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337).

I.
Definitions

As used in this order:

(A) "Commission" shall mean the United States International Trade Commission.

(B) "Complainant" shall mean 10X Genomics, Inc. of Pleasanton, California.

(C) "Respondent" shall mean Bio-Rad Laboratories, Inc., of Hercules, California.

(D) "Person" shall mean an individual, or any non-governmental partnership, firm, association, corporation, or other legal or business entity other than Respondent or its majority owned or controlled subsidiaries, successors, or assigns.

(E) "United States" shall mean the fifty States, the District of Columbia, and Puerto Rico.

(F) The terms "import" and "importation" refer to importation for entry for consumption under the Customs laws of the United States.

(G) The term "covered products" shall mean microfluidic systems and components thereof and products containing same that infringe one or more of claims 1, 5, 17, 19, and 22 of the '024 patent; claims 1, 6, 7, 9, and 21 of the '468 patent; and claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent.[1] "Covered products" shall not include articles for which a provision of law or license avoids liability for infringement of all asserted claims of the Asserted Patents.

(H) The term "consumable" means any otherwise covered Bio-Rad part or material that is purchased for use with Bio-Rad's droplet generation instruments and which is consumed during the use of those instruments. For example, Bio-Rad's microfluidic chips are consumables.

II.
Applicability

The provisions of this Cease and Desist Order shall apply to Respondent and to any of its principals, stockholders, officers, directors, employees, agents, distributors, controlled (whether

[1] For purposes of this Order, "covered products" includes products for which associated conduct and/or inventory is permitted based on a documented need.

by stock ownership or otherwise) and majority-owned business entities, successors, and assigns, and to each of them, insofar as they are engaging in conduct prohibited by section III, *infra*, for, with, or otherwise on behalf of, Respondent.

III.
Conduct Prohibited

The following conduct of Respondent in the United States is prohibited by this Order. For the remaining term of one of the '024, '468, and '530 patents, Respondent shall not:

(A) import, sell for importation into the United States, or sell after importation covered products;

(B) market, distribute, offer to sell, or otherwise transfer (except for exportation) in the United States imported covered products;

(C) advertise imported covered products;

(D) solicit U.S. agents or distributors for imported covered products; or

(E) aid or abet other entities in the importation, sale for importation, sale after importation, transfer, or distribution of imported covered products.

IV.
Conduct Permitted

Notwithstanding any other provision of this Order, specific conduct otherwise prohibited by the terms of this order shall be permitted if: (1) in a written instrument, the owner of the '024, '468, and '530 patents licenses or authorizes such specific conduct; (2) the conduct is limited to service or repair articles imported for use in servicing or repairing microfluidic systems that were imported as of the date of this Order and are under a warranty that existed as of the date of this Order, if such servicing or repairing is provided for in terms of the warranty; or (3) such specific conduct is related to the importation or sale of covered products by or for the United States. This Order does not prohibit the importation or sale of covered microfluidic consumables for use by

researchers who are using such consumables in the United States as of the date of the issuance of this Order, and who have a documented need[2] to continue receiving the consumables for a specific current ongoing research project for which that need cannot be met by any alternative product.

V.
Reporting

For purposes of this requirement, the reporting periods shall commence on the first day of each calendar month and shall end on the last day of each calendar month. The first report required under this section shall cover the period from the date of issuance of this order through the last day of that calendar month.

Within five (5) days of the last day of each month's reporting period, Respondent shall report to the Commission: (a) the quantity in units and the value in dollars of covered products that it has (i) imported and/or (ii) sold in the United States after importation during the reporting period, (b) the quantity in units and the value in dollars of covered products imported and/or sold for use in each research project for which there is a documented need pursuant to Section IV and the identity of each such purchaser, (c) questionnaires[3] from each such purchaser supporting the documented need pursuant to Section IV, and (d) the quantity in units and value in dollars of reported covered products that remain in inventory in the United States at the end of the reporting period.

When filing written submissions, Respondent must file the original document

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[2] This "documented need" is to be satisfied by the questionnaire attached to this Order, as discussed at pages 84–86 of the Commission Opinion issued in this investigation on the date of this Order. Bio-Rad is not required to maintain the individual researchers' records supporting the questionnaire. Commission Opinion, at 85–86.

[3] *See* Footnote 2.

electronically on or before the deadlines stated above and submit eight (8) true paper copies to the Office of the Secretary by noon the next day pursuant to section 210.4(f) of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-1100") in a prominent place on the cover pages and/or the first page. (*See* Handbook for Electronic Filing Procedures, *https://www.usitc.gov/documents/handbook_on_filing_procedures.pdf*). Persons with questions regarding filing should contact the Office of the Secretary (202-205-2000). If Respondent desires to submit a document to the Commission in confidence, it must file the original and a public version of the original with the Office of the Secretary and must serve a copy of the confidential version on Complainant's counsel.[4]

Any failure to make the required report or the filing of any false or inaccurate report shall constitute a violation of this Order, and the submission of a false or inaccurate report may be referred to the U.S. Department of Justice as a possible criminal violation of 18 U.S.C. § 1001.

VI.
Recordkeeping and Inspection

(A) For the purpose of securing compliance with this Order, Respondent shall retain any and all records relating to the sale, offer for sale, marketing, or distribution in the United States of covered products, made and received in the usual and ordinary course of business (including documents related to the documented need to continue receiving consumables for a specific current ongoing research project provided in Section IV), whether in detail or in summary form, for a period of three (3) years

[4] Complainant must file a letter with the Secretary identifying the attorney to receive reports associated with this order. The designated attorney must be on the protective order entered in the investigation.

from the close of the fiscal year to which they pertain.

(B) For the purposes of determining or securing compliance with this Order and for no other purpose, subject to any privilege recognized by the federal courts of the United States, and upon reasonable written notice by the Commission or its staff, duly authorized representatives of the Commission shall be permitted access and the right to inspect and copy, in Respondent's principal office during office hours, and in the presence of counsel or other representatives if Respondent so chooses, all books, ledgers, accounts, correspondence, memoranda, and other records and documents, in detail and in summary form, that must be retained under subparagraph VI(A) of this Order.

VII.
Service of Cease and Desist Order

Respondent is ordered and directed to:

(A) Serve, within fifteen days after the effective date of this Order, a copy of this Order upon each of its respective officers, directors, managing agents, agents, and employees who have any responsibility for the importation, marketing, distribution, sale of imported covered products in the United States;

(B) Serve, within fifteen days after the succession of any persons referred to in subparagraph VII(A) of this order, a copy of the order upon each successor; and

(C) Maintain such records as will show the name, title, and address of each person upon whom the order has been served, as described in subparagraphs VII(A) and VII(B) of this order, together with the date on which service was made.

The obligations set forth in subparagraphs VII(B) and VII(C) shall remain in effect until the expiration dates of the '024, '468, and '530 patents.

VIII.
Confidentiality

Any request for confidential treatment of information obtained by the Commission pursuant to section V–VI of this order should be made in accordance with section 201.6 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 201.6). For all reports for which confidential treatment is sought, Respondent must provide a public version of such report with confidential information redacted.

IX.
Enforcement

Violation of this order may result in any of the actions specified in section 210.75 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.75), including an action for civil penalties under section 337(f) of the Tariff Act of 1930 (19 U.S.C. § 1337(f)), as well as any other action that the Commission deems appropriate. In determining whether Respondent is in violation of this order, the Commission may infer facts adverse to Respondent if it fails to provide adequate or timely information.

X.
Modification

The Commission may amend this order on its own motion or in accordance with the procedure described in section 210.76 of the Commission's Rules of Practice and Procedure (19 C.F.R. § 210.76).

XI.
Bonding

The conduct prohibited by Section III of this Order may be continued during the sixty-day period in which this Order is under review by the United States Trade Representative, as delegated by the President (70 Fed. Reg. 43,251 (Jul. 21, 2005)) subject to the Respondent's posting of a bond in the amount of twenty-five (25) percent of the entered value of the covered

products. This bond provision does not apply to conduct that is otherwise permitted by section IV of this order. Covered products imported on or after the date of issuance of this order are subject to the entry bond set forth in the exclusion order issued by the Commission, and are not subject to this bond provision.

The bond is to be posted in accordance with the procedures established by the Commission for the posting of bonds by complainants in connection with the issuance of temporary exclusion orders. *See* 19 C.F.R. § 210.68. The bond and any accompanying documentation are to be provided to and approved by the Commission prior to the commencement of conduct that is otherwise prohibited by section III of this Order. Upon the Secretary's acceptance of the bond, (a) the Secretary will serve an acceptance letter on all parties, and (b) Respondent must serve a copy of the bond and any accompanying documentation on Complainant's counsel.[5]

The bond is to be forfeited in the event that the United States Trade Representative approves this Order (or does not disapprove it within the review period), unless the U.S. Court of Appeals for the Federal Circuit, in a final judgment, reverses any Commission final determination and order as to Respondent on appeal, or unless Respondent exports or destroys the products subject to this bond and provides certification to that effect that is satisfactory to the Commission.

[5] *See* Footnote 4.

The bond is to be released in the event the United States Trade Representative disapproves this order and no subsequent order is issued by the Commission and approved (or not disapproved) by the United States Trade Representative, upon service on Respondent of an order issued by the Commission based upon application therefore made by Respondent to the Commission.

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: February 12, 2020

ATTACHMENT

Name: _____

Institution: _____

If you were conducting research using Bio-Rad's ddSEQ consumables as of February 12, 2020, in the United States and you need to continue to receive the ddSEQ consumables for that research, answer the following questions:

1. What is the subject matter of your research that uses Bio-Rad's ddSEQ system and consumables?

2. On what date (mm/dd/yyyy) did your research using these Bio-Rad systems begin?

3. What is the expected completion date (mm/dd/yyyy) of your research that uses these Bio-Rad systems?

4. What other competing products did you consider for your research, and why did you reject these products?

I certify that all information provided as part of this questionnaire is accurate and complete to the best of my knowledge. I am aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government.

I acknowledge that I am to maintain records supporting the above declarations and am not to provide those supporting records to Bio-Rad. If the facts change concerning my research, which began on or before February 12, 2020, I understand that I am to provide an updated questionnaire response to Bio-Rad.

Date: _____ Signature: _____

Additional Bio-Rad comments [to be completed by Bio-Rad]:

I certify that all information provided as part of this questionnaire is accurate and complete to the best of my knowledge. I am aware that U.S. law (including, but not limited to, 18 U.S.C. 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government.

Date: _____ Signature: _____

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION ORDER** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.,** and the following parties as indicated, on **February 12, 2020.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants 10X Genomics, Inc.:

Paul T. Ehrlich
TENSEGRITY LAW GROUP LLP
555 Twin Dolphin Dr., Suite 650
Redwood Shores, CA 94061

☐ Via Hand Delivery
☒ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

On Behalf of Respondents Bio-Rad Laboratories, Inc.:

S. Alex Lasher
QUINN EMANUEL URQUHART & SULLIVAN, LLP
1300 I Street NW, Suite 900
Washington, DC 20005

☐ Via Hand Delivery
☒ Via Express Delivery
☐ Via First Class Mail
☐ Other:_____

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-1100**

COMMISSION OPINION

I. INTRODUCTION

On October 17, 2019, the Commission determined to review portions of the Administrative Law Judge's ("ALJ") final initial determination, which issued on July 12, 2019. 84 Fed. Reg. 56835 (Oct. 23, 2019). On review, the Commission has determined that respondent Bio-Rad Laboratories, Inc. of Hercules, CA ("Bio-Rad" or "Respondent") violated section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337, as amended ("Section 337"), by way of infringement of certain claims of U.S. Patent No. 9,689,024 ("the '024 patent"), U.S. Patent No. 9,695,468 ("the '468 patent"), and U.S. Patent No. 9,856,530 ("the '530 patent"). The Commission has also determined that there is no violation with respect to U.S. Patent No. 9,644,204 ("the '204 patent"). The Commission has determined to issue a limited exclusion order ("LEO") and a cease and desist order ("CDO") against Bio-Rad. The Commission has further determined that during the period of Presidential review, a bond in the amount of twenty-five (25) percent of entered value shall be applied to Bio-Rad's covered products.

II. BACKGROUND

A. Procedural History

On February 21, 2018, the Commission instituted this investigation based on a complaint filed by 10X Genomics, Inc. of Pleasanton, California ("10X" or "Complainant"). 83 Fed. Reg. 7491 (Feb. 21, 2018). The complaint, as supplemented, alleges violations of Section 337, in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of one or more claims of the '204 patent; the '024 patent; the '468 patent; and the '530 patent. *Id.* The Commission's notice of investigation named Bio-Rad as the sole respondent. *Id.* The Office of Unfair Import Investigations ("OUII") participated in this investigation. *Id.*

The ALJ granted 10X's unopposed motion for summary determination that it has satisfied the economic prong of the domestic industry requirement. Order No. 19 at 5 (Oct. 5, 2018), *unreviewed*, Notice (Nov. 6, 2018). The ALJ also terminated the investigation with respect to several patent claims. Order No. 26 at 2 (Nov. 30, 2018), *unreviewed*, Notice (Dec. 20, 2018); Order No. 27 at 2 (Dec. 10, 2018), *unreviewed*, Notice (Dec. 21, 2018).

From March 25 to 29, 2019, an evidentiary hearing was held in this investigation. At the hearing, 10X asserted the following claims against Bio-Rad:

Patent	**Asserted Claims**
'024 Patent	Claims 1, 5, 17, 19, 22
'204 Patent	Claims 27, 29, 31, 33
'468 Patent	Claims 1, 6, 7, 9, 21
'530 Patent	Claims 1, 4, 11, 14, 19, 26, 28

See ID at 16–17, 58, 70, 89; *see also* 10X Posthearing Br. at 4.

On July 12, 2019, the ALJ issued her final initial determination ("ID") on violation. The ID found that Bio-Rad imported into the United States, sold for importation, or sold within the United States after importation "the accused microfluidic systems and components thereof and products containing same." ID at 154. The ID found that Bio-Rad indirectly infringed all of the remaining asserted claims of the '024, '468, and '530 patents, but that 10X had not established that Bio-Rad infringed any asserted claims of the '204 patent. *Id.* The ID found that Bio-Rad failed to establish invalidity of any of the asserted claims of any patent. *Id.* The ID found that the domestic industry requirement was satisfied for each of the asserted patents. *Id.* at 154–55. Finally, the ID found that Bio-Rad had not carried its burden with respect to various additional affirmative defenses, including improper inventorship and ownership. *Id.* at 155. Thus, the ID concluded that Bio-Rad violated Section 337 with respect to the '024, '468, and '530 patents, but not with respect to the '204 patent. *Id.* at 154.

On July 25, 2019, the ALJ issued her recommended determination on remedy and bonding ("RD"). The RD recommended issuance of a limited exclusion order upon a finding of violation, without a certification provision. RD at 1–2. The RD further recommended issuance of a cease and desist order. *Id.* at 2–3. The RD also recommended imposition of a bond of twenty-five (25) percent of the entered value of any covered products during the Presidential review period. *Id.* at 3–5. On July 29, 2019, 10X, Bio-Rad, and OUII submitted petitions seeking review of the ID.[1] On August 6, 2019, 10X, Bio-Rad, and OUII submitted responses to the others' petitions.[2]

On October 17, 2019, the Commission issued a notice of its determination to review the ID in part. Particularly, the Commission determined to review the ID with respect to:

> (1) all findings related to a violation based on the '024 patent; (2) all findings related to a violation based on the '468 patent; (3) noninfringement of the '204 patent; (4) all findings related to a violation based on the '530 patent; (5) Bio-Rad's inventorship and ownership defenses; and (6) a typographical error on page 91.

84 Fed. Reg. 56835. The Commission also requested briefing on multiple issues. *Id.*

[1] Complainant 10X Genomics, Inc.'s Petition for Review of the Initial Determination (July 29, 2019) ("10X Pet."); Respondent Bio-Rad Laboratories, Inc.'s Petition for Review of the Initial Determination on Violation of Section 337 (July 30, 2019) ("Bio-Rad Pet."); Petition of the Office of Unfair Import Investigations for Review of the Initial Determination on Violation of Section 337 (July 29, 2019) ("OUII Pet.").

[2] Complainant 10X Genomics, Inc.'s Response to Respondent Bio-Rad Laboratories, Inc.'s Petition for Review of the Initial Determination on Violation of Section 337 (Aug. 6, 2019) ("10X Resp. to Bio-Rad Pet."); Complainant 10X Genomics, Inc.'s Response to Petition of the Office of Unfair Import Investigations Petition for Review of the Initial Determination on Violation of Section 337 (Aug. 6, 2019) ("10X Resp. to OUII Pet."); Respondent Bio-Rad Laboratories, Inc.'s Combined Response to 10X's and the Office of Unfair Import Investigations' Petitions for Review of the Initial Determination (Aug. 6, 2019) ("Bio-Rad Resp. to Pets."); The Office of Unfair Import Investigations' Combined Response to Petitions for Review of the Initial Determination on Violation of Section 337 (Aug. 6, 2019) ("OUII Resp. to Pets.").

On October 31, 2019, the parties filed their respective responses to the Commission's questions on review.[3] On November 7, 2019, the parties filed their respective replies.[4]

B. Overview of the Technology

The technology at issue in this investigation relates to methods of preparing deoxyribonucleic acid ("DNA") and ribonucleic acid ("RNA") samples for genetic sequencing and analysis. Particularly, the technology seeks to preserve certain information about nucleic acid segments that would otherwise be lost during sequencing, *e.g.*, whether two nucleic acid segments originated from the same source. This is accomplished by tagging nucleic acid segments, prior to sequencing, with oligonucleotide "barcodes."[5] These barcodes allow researchers to later identify nucleic acid segments that originated from a common sample. The barcoding process involves partitioning nucleic acids from a sample into droplets along with single gel beads to which oligonucleotide barcodes are attached. The barcodes are released from the gel beads and combined with the nucleic acids. At that point, the nucleic acids in each droplet bear a unique barcode. Those nucleic acids can then be pooled and sequenced, and it will still be possible to associate nucleic acid segments from a common droplet. The partitioning of nucleic acids and gel beads

[3] Complainant 10X Genomics, Inc.'s Opening Written Submission Regarding the Commission's October 17, 2019 Notice (Oct. 31, 2019) ("10X Resp. to Qs."); Respondent Bio-Rad Laboratories, Inc.'s Opening Submission Responding to the Commission's Notice Dated October 17, 2019 (Oct. 31, 2019) ("Bio-Rad Resp. to Qs."); The Office of Unfair Import Investigations' Responses to the Commission's October 17, 2019 Questions (Oct. 31, 2019) ("OUII Resp. to Qs.").

[4] Complainant 10X Genomics, Inc.'s Reply Written Submission Regarding the Commission's October 17, 2019 Notice (Nov. 7, 2019) ("10X Reply"); Respondent Bio-Rad Laboratories, Inc.'s Combined Reply to 10X's and the Office of Unfair Import Investigations' Response to the Commission Notice Dated October 17, 2019 (Nov. 7, 2019) ("Bio-Rad Reply"); The Office of Unfair Import Investigations' Reply to the Private Parties' Responses to the Commission's October 17, 2019 Questions (Nov. 7, 2019) ("OUII Reply").

[5] A "barcode" is a short DNA sequence of 3–12 DNA bases. *See* Bio-Rad Prehearing Br. at 8.

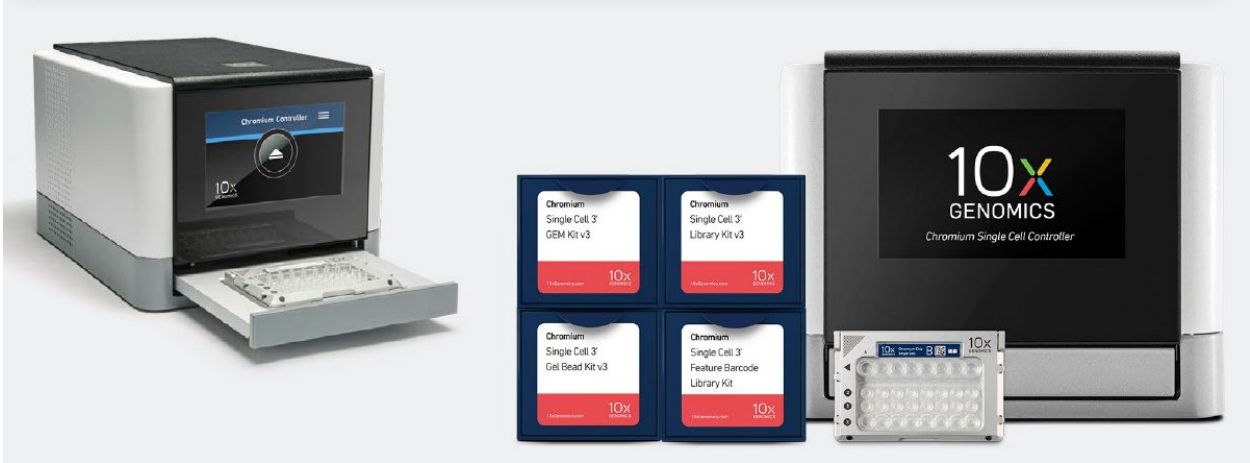
into droplets is accomplished with microfluidic systems that rely on small channels to combine streams of nucleic acids and gel beads into droplets. The asserted claims that remain in this investigation are directed to various aspects of this barcoding process.

C. Products at Issue

The accused products are components and assays of Bio-Rad's ddSEQ system, which includes ddSEQ version 1 and version 2. ID at 3. The ID explained that the ddSEQ v1 products include Bio-Rad's ddSEQ v1 Cartridge, ddSEQ v1 Single-Cell Isolator, ddSEQ Cartridge Holder, and consumables and assays used with and/or as part of Bio-Rad's ddSEQ v1 system, including the SureCell WTA 3' v1 assay. *Id.* (citing CX-0004C (Butte DWS) at Q/A 54; RX-0665C (Metzker RWS) at Q/A 29). The ddSEQ v2 products include [redacted], scATACseq, [redacted]. *Id.* 10X provided the following image of the ddSEQ v1 Single-Cell Isolator and WTA 3' library prep kit products:

See CX-1485C (product launch announcement); CDX-2 at 22 (reproducing CX-1485C).

The domestic industry products are 10X's GemCode™ and Chromium™ product lines. *Id.* at 3. The ID explained that these products were developed by 10X based on its GEM ("Gel bead in Emulsion") architecture, and the first GemCode™ product was sold in 2015. *Id.* (citing CX-0003C at Q/A 47-52). The domestic industry products include both single-cell and linked-read applications, including the Chromium™ Single Cell 3' Solution, Chromium™ Single Cell V(D)J Solution, and GemCode™ Single Cell platform, and the Chromium™ Genome Solution, Chromium™ Exome Solution, Chromium™ de nova Assembly Solution, and GemCode™ Long Read platform. *Id.* 10X provided the following image of its domestic industry products:



See CDX-2 at 80 (reproducing images from 10X's website).

III. THE '024 PATENT

The Commission determined to review all of the ID's findings related to the '024 patent. 84 Fed. Reg. 56835. On review, the Commission has determined to affirm with modified reasoning the ID's finding that Bio-Rad has violated section 337 based on infringement of the '024 patent. Specifically, the Commission finds that Bio-Rad failed to raise the location of amplification as a basis for noninfringement in its petition for review and has therefore abandoned that argument. The Commission further finds that the '024 patent is infringed regardless of whether the claim term "amplification" encompasses reverse transcription, and therefore the Commission need not resolve that dispute as it will not have a material effect on the outcome of this investigation. Concerning invalidity, the Commission affirms the ID's finding that Bio-Rad has not established that any of the asserted claims are invalid under modified reasoning. The Commission adopts the remainder of the ID's findings with respect to the '024 patent to the extent they are not inconsistent with this opinion.

For reference, claim 1 of the ’024 patent follows:

1. A method for sample preparation, comprising:

    a) providing a droplet comprising ***a porous gel bead*** and a target nucleic acid analyte, wherein said porous gel bead comprises at least 1,000,000 oligonucleotide molecules comprising barcode sequences, wherein said oligonucleotide molecules are releasably attached to said porous gel bead, wherein said barcode sequences are the same sequence for said oligonucleotide molecules;

    b) applying a stimulus to said porous gel bead to release said oligonucleotide molecules from said porous gel bead into said droplet, wherein upon release from said porous gel bead, a given oligonucleotide molecule from said oligonucleotide molecules attaches to said target nucleic acid analyte; and

    c) subjecting said given oligonucleotide molecule attached to said target nucleic acid analyte to nucleic acid ***amplification*** to yield a barcoded target nucleic acid analyte.

’024 patent at cl. 1 (emphasis added on contested terms).

A. Construction of “Amplification” and the Effect on Infringement

OUII petitioned for review of the ALJ’s construction of the term “nucleic acid amplification,” which appears in asserted claim 1 of the ’024 patent and asserted claim 21 of the ’468 patent. *See* OUII Pet. at 18–26. Specifically, OUII asserted that the *Markman* order erred by construing “nucleic acid amplification” such that “creation of a single complementary copy through reverse transcription constitutes ‘amplification.’” *Id.* at 20. However, OUII also acknowledged that whether “amplification” should be construed to encompass reverse transcription may be immaterial to the ID’s ultimate conclusion that Bio-Rad violated section 337 based on infringement of the ’024 patent. *See id.* at 19 (“[T]his issue may not be material since, under the proper construction, the ID’s ultimate violation holdings on [the ’024 and ’468] patents are correct.”). OUII elaborated that “10X provided evidence of infringement and the technical prong under both the broader construction adopted by the Court, as well as the narrower

construction supported by OUII," and noted that "the ID appeared to rely on 10X's evidence under both constructions, although the ID focused at times on reverse transcription." *Id.* at 25.

10X disagreed with OUII's assertion that the *Markman* order misconstrued "nucleic acid amplification," 10X Resp. to OUII Pet. at 7–13, but agreed that "under either the ALJ's or Staff's proposed construction of 'amplification,' the findings of violation for the ['']024 and ['']468 Patents are correct and should stand." *Id.* at 13. Particularly, 10X asserted that because no party challenged the ID's infringement findings based on the construction of "amplification," "[OUII]'s challenge to one aspect of the claim construction will have no material effect and any error would be harmless." *Id.*

Bio-Rad did not petition for review of the *Markman* order's construction of "nucleic acid amplification." *See generally* Bio-Rad Pet. Bio-Rad did petition for review of the ID's finding that the asserted claims of the '024 and '468 patents were infringed, but the arguments Bio-Rad advanced in support of that aspect of its petition were based on entirely different limitations in the claims. *See* Bio-Rad Pet. at 6–9, 27–33, 66–73. In its response to OUII's petition, however, Bio-Rad agreed with OUII that the *Markman* order misconstrued "amplification" to encompass reverse transcription. *See* Bio-Rad Resp. to Pets. at 35–38.

Notwithstanding the fact that Bio-Rad did not petition for review of the construction of "nucleic acid amplification," it argued for the first time in its response to OUII's petition that its products do not infringe the '024 patent "under the correct construction of the 'amplification' terms." Bio-Rad Resp. to Pets. at 38. The noninfringement argument Bio-Rad laid out in support of that assertion did not relate to whether "nucleic acid amplification" encompassed reverse transcription, however. *See id.* at 38–40 (no discussion of reverse transcription). Rather, Bio-Rad argued that "claim 1 of the '024 Patent requires that amplification occur in the droplet," and that

the evidence does not show that amplification occurs in a droplet in Bio-Rad's products. *Id.* at 39. In making that argument, Bio-Rad revived a dispute decided in the *Markman* order — whether amplification must occur in a droplet — for which no party sought review. *See* Order No. 22 at 44–45 (rejecting the same Bio-Rad argument and finding that "[t]he requirement that the 'said given oligonucleotide molecule attached to said target nucleic acid analyte' be created in a droplet in the second step does not mean that it has to remain in the droplet for all subsequent steps").

Given the disagreement over the materiality of the construction of "amplification" as set forth in OUII's petition for review, and the apparent disconnect between Bio-Rad's noninfringement argument and the question of whether "amplification" encompasses reverse transcription, the Commission sought briefing from the parties addressing those issues. 84 Fed. Reg. 56836. 10X and OUII both responded that modifying the construction of "amplification" to exclude reverse transcription would have no effect on the ID's infringement findings because the evidence of record shows other multiple types of amplification in the accused products, including polymerase chain reaction ("PCR"), which would meet the definition of "amplification" even if that term did not encompass reverse transcription. 10X Resp. to Qs. at 21–23; OUII Resp. to Qs. at 13. Further, both 10X and OUII responded that whether "amplification" must occur in a droplet and whether "amplification" encompasses reverse transcription are distinct issues and therefore modifying the ID's construction of "amplification" to exclude reverse transcription would not give rise to a noninfringement finding based on the location where amplification occurs. *See* 10X Resp. to Qs. at 23–24; OUII Resp. to Qs. at 14. Accordingly, both 10X and OUII responded that Bio-Rad waived its noninfringement argument based on whether amplification must occur in a droplet. 10X Resp. to Qs. at 26–27; OUII Resp. to Qs. at 14–15.

Bio-Rad responded that "[i]f amplification does not include reverse transcription, than [sic] all but Bio-Rad's scATACseq products do not infringe Claim 1 of the '024 Patent or Claim 21 of the '468 Patent," because reverse transcription is the only amplification reaction that occurs in a droplet in Bio-Rad's products. *See* Bio-Rad Resp. to Qs. at 28. We note that, by taking this position, Bio-Rad expanded its previous noninfringement argument, which was limited to the '024 patent. *See* Bio-Rad Resp. to Pets. at 38. Bio-Rad's briefing in support of its position also included a new argument not previously made in its petition or in response to the other parties' petitions. Particularly, Bio-Rad argued that the "said target nucleic acid analyte" in claim 1 of the '024 patent and claim 21 of the '468 patent must be messenger RNA ("mRNA"), but that in proving infringement 10X relied on complementary DNA ("cDNA") to establish amplification of nucleic acids outside a droplet. *See* Bio-Rad Resp. to Qs. at 29–31.

Concerning waiver, Bio-Rad responded that OUII's petition preserved its noninfringement argument. The crux of Bio-Rad's position in this regard appears to be that by challenging one aspect of the *Markman* order's construction of "amplification" — whether "amplification" encompasses reverse transcription — OUII's petition opened the door for Bio-Rad (or 10X) to challenge other aspects of that construction in its response to OUII's petition. *See id.* at 31–33. Bio-Rad also argued that the ID only relied on reverse transcription as the basis for its infringement finding, and therefore, Bio-Rad was not required to specifically petition for review of whether its products are infringing based on amplification outside the droplet. *See id.* at 33–34. Bio-Rad then submitted that "[i]f the Commission determines that 'amplification' can occur outside of the droplet, the Commission should remand to the ALJ to make specific findings on infringement under that construction." *Id.* at 34. Notably, notwithstanding the Commission's request for "citations to where this [amplification location] issue was raised in Bio-Rad's prehearing brief,

posthearing brief, and petition for review," 84 Fed. Reg. 56836, Bio-Rad provides none in its response to the Commission's waiver question. *See* Bio-Rad Resp. to Qs. at 31–34.

The dispute regarding whether the term "nucleic acid amplification" encompasses reverse transcription is immaterial to any issue in the investigation, and thus the Commission need not resolve that dispute. As the Federal Circuit has explained, "only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). The Commission need not resolve issues of claim construction that are not material to any issue in this investigation. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need not construe the claim preambles here where the construction is not material to the [obviousness] dispute." (alteration in original) (internal quotation marks omitted)); *EmeraChem Holdings, LLC v. Volkswagen Grp. of Am., Inc.*, 714 F. App'x 995, 997 (Fed. Cir. 2017) (unpublished) (declining to decide claim construction dispute "because the prior art would anticipate the '558 patent claims regardless of which construction we apply.").

The dispute over whether "amplification" should encompass reverse transcription is immaterial because, as noted in the ID, 10X pointed to four different reactions in the accused products to satisfy the "amplification" limitation of claim 1 of the '024 patent. *See* ID at 25–26 ("[Dr. Butte] further explains that barcoded cDNA strands are generated from the oligonucleotide molecules through several different processes, which 10X identifies in its brief as four types of amplification."). One of the processes identified is PCR, which is explicitly listed as an amplification reaction in the '024 patent. *See* '024 patent at 25:25–28 ("[O]ligonucleotide primers containing bar code sequences may be used in amplification reactions (e.g., PCR, qPCR, reverse-transcriptase PCR, digital PCR, etc.) of the DNA template analytes, thereby producing tagged

analytes."). Even Bio-Rad has acknowledged that PCR is a type of amplification reaction. *See* Bio-Rad Initial Claim Construction Br. at 16 (listing evidence where PCR is described as an amplification reaction). While 10X argued in its pre- and post-hearing briefs that PCR in the accused products satisfied the "amplification" limitation in claim 1 of the '024 patent, Bio-Rad did not address whether the PCR relied on by 10X satisfied the "nucleic acid amplification" limitation. *Compare* 10X Prehearing Br. at 33–35; 10X Initial Posthearing Br. at 24–26 *with* Bio-Rad Posthearing Br. at 62–63 (disputing infringement of "amplification" limitation without addressing PCR) *and* Bio-Rad Posthearing Reply at 12 (same). Instead, Bio-Rad limited itself to arguing that "the oligonucleotide molecule containing the barcode that attaches to the target nucleic acid analyte (mRNA) acts as a primer during the reverse transcription reaction," and because "this portion of the oligonucleotide molecule is not amplified in reverse transcription," 10X could not show that the accused products satisfy the "amplification" limitation. Bio-Rad Posthearing Br. at 62–63; *see also* Bio-Rad Posthearing Reply Br. at 12; Bio-Rad Prehearing Br. at 65–68. Bio-Rad never challenged 10X's assertion that the "amplification" limitation is satisfied by PCR. *See generally* 10X Initial Posthearing Br. at 24–26.

Given Bio-Rad's failure to present evidence or argument disputing 10X's evidence and argument that the "amplification" limitation is satisfied by PCR in the accused products, the Commission affirms the ID's finding that the accused products practice the "amplification" limitation. A preponderance of the evidence supports that finding under the broad construction applied in the ID, as well as under a narrow construction that excludes reverse transcription from the definition of "amplification." Accordingly, whether "amplification" should be construed to encompass reverse transcription is not material to any issue in this investigation; the Commission

need not resolve that question and takes no position on it. The Commission affirms the remainder of the ID's infringement findings with respect to the '024 patent.[6]

With respect to the argument regarding whether amplification must occur in a droplet, which Bio-Rad raised as a basis for noninfringement in its response to OUII's petition, Bio-Rad abandoned that argument and waived it by failing to raise it in its petition for review. Commission Rule 210.43(b)(2) states that "[a]ny issue not raised in a petition for review will be deemed to have been abandoned by the petitioning party and may be disregarded by the Commission in reviewing the initial determination . . . and any argument not relied on in a petition for review will be deemed to have been abandoned and may be disregarded by the Commission." 19 C.F.R. § 210.43(b)(2). Further, the ALJ's Ground Rule 8.2 states that "[a]ny contentions not set forth in detail as required herein shall be deemed abandoned or withdrawn, except for contentions of which a party is not aware and could not be aware in the exercise of reasonable diligence at the time of filing the pre-trial brief," while Ground Rule 11.1 states that issues not raised in post-trial briefs "shall be deemed waived." *See* Order No. 2 (Ground Rules). During the *Markman* process, the ALJ resolved three distinct disputes with respect to the meaning of "amplification" in the asserted patents. *See* Order No. 22 at 31–45. Whether "amplification" encompassed reverse transcription was one dispute; whether amplification must occur in a droplet was another. *Compare id.* at 31–41 *with id.* at 42–

[6] The Commission notes that Bio-Rad did not assert in response to OUII's petition that the ID's domestic industry findings would be affected by construing "amplification" to exclude reverse transcription. *See* Bio-Rad Resp. to Pets. at 34–40. To avoid confusion, however, the Commission finds that the ID's determination that 10X satisfies the domestic industry requirement is supported by a preponderance of the evidence regardless of whether "amplification" encompasses reverse transcription. This is because, as with the accused products, 10X presented unrebutted evidence that PCR in the domestic industry products satisfies the "amplification" limitation of claim 1 of the '024 patent. *See* 10X Posthearing Br. at 39 (citing CX-0004C at Q/A 278-279; CX-0481 at 11; CX-0542 at 1; CX-0579 at 1–2; CX-0578 at 15, 53). Accordingly, the Commission also affirms the ID's finding that 10X satisfied the domestic industry requirement with respect to the '024 patent.

45. The *Markman* order resolved both disputes — "amplification" is broad enough to include reverse transcription and "amplification" need not occur only in a droplet. *See* Order 22 at 32–41, 44–45.

OUII petitioned for review of the *Markman* order's conclusion on the reverse transcription issue, *see* OUII Pet. at 18–26, but no party petitioned for review of the *Markman* order's conclusion on the location of amplification issue. Bio-Rad contends that it was entitled to raise the issue in its response to OUII's petition because OUII's petition put the construction of "amplification" at issue. *See* Bio-Rad Resp. to Qs. at 31–33. That line of reasoning, if accepted, necessarily implies that by petitioning for review of one of the three issues regarding the construction of "amplification," OUII opened the door to review the other two issues as well, even though *no party petitioned for review of those issues*. Commission Rule 210.43(b)(2) provides that "[a]ny issue not raised" and "any argument not relied on" in a petition for review will be deemed abandoned. Such is the case with Bio-Rad's belated challenge to the *Markman* order's resolution of whether "amplification" must occur in a droplet. By withholding that argument until its response to OUII's petition, Bio-Rad precluded 10X and OUII from responding to that argument in their own petition responses. There would be obvious prejudice to both if the Commission declined to enforce Rule 210.43(b)(2).

Finally, the Commission notes that the noninfringement argument Bio-Rad advances in its response to the Commission's questions bears little resemblance to the argument it raised in its response to OUII's petition. Indeed, the new argument raised in Bio-Rad's response to the Commission's questions strongly suggests that even Bio-Rad understands that the noninfringement argument it raised in its response to OUII's petition is unrelated to the reverse transcription issue. For example, Bio-Rad's argument in its response to OUII's petition relied on

evidence from the *Markman* phase of this investigation to ultimately argue that "[t]he structure of claim 1 of the '024 Patent requires that amplification occur in the droplet. But 10X has presented no evidence that amplification in the Bio-Rad Accused Products (*i.e.*, PCR) occurs in the droplet and, in fact, there is evidence that this step takes place after the droplets are broken." Bio-Rad Resp. to Pets. at 39–40. The success of that argument is contingent on a claim construction that requires amplification to occur in a droplet such that the PCR in Bio-Rad's products will not read on the "amplification" limitation. As noted, Bio-Rad abandoned this argument by failing to include it in its petition for review.

By contrast, in its responses to the Commission's questions, Bio-Rad shifted its focus away from claim construction. Instead, Bio-Rad argued that the subject of the "nucleic acid amplification" limitation — "said given oligonucleotide molecule attached to said target nucleic acid analyte" — "only exists in the droplet," in Bio-Rad's products. Bio-Rad Resp. to Qs. at 29 (internal quotations omitted). That argument relies on the assumption that the target nucleic acid analyte is mRNA. *See id.* at 29–30. The argument fails to address, however, the fact that 10X did not rely solely on amplification of mRNA to satisfy the "amplification" limitation. In two of the four types of amplification 10X relied on, cDNA is the target nucleic acid analyte in both steps (b) and (c) of claim 1 of the '024 patent. *See* 10X Posthearing Br. at 24–25. As previously noted, Bio-Rad's posthearing briefing and evidence only addressed 10X's infringement allegations that relied on reverse transcription as the amplification reaction. Bio-Rad did not present evidence or argument to counter 10X's evidence and arguments that the amplification reaction is satisfied by PCR. Accordingly, the Commission finds that Bio-Rad's most recent noninfringement argument does not change the fact that a preponderance of the evidence shows that the amplification step of claim 1 of the '024 patent is satisfied regardless of whether "amplification" encompasses reverse

transcription. Moreover, because Bio-Rad raised this argument for the first time before the Commission, it is also waived. *See* 19 C.F.R. § 210.43(b)(2).

The Commission notes that Bio-Rad's response to OUII's petition for review did not argue that modifying the construction of "amplification" to exclude reverse transcription would alter the ID's conclusion that 10X satisfied the domestic industry requirement for any asserted patent, or the ID's conclusion that the '468 patent is infringed. *See* BioRad Resp. to Pets. at 39–40. Moreover, as OUII noted in its petition, 10X presented, and the ID identified, similar evidence showing amplification through PCR in the context of the domestic industry products and infringement of the '468 patent. *See* OUII Pet. at 25–26; ID at 32, 63, 66. Accordingly, the Commission also finds that whether "amplification" encompasses reverse transcription is immaterial to those issues as well.

B. Validity: Disclosure of "Porous Gel Beads" in the Prior Art

Bio-Rad petitioned for review of the ID's finding that the asserted claims of the '024 patent were not invalid as anticipated or obvious. Bio-Rad Pet. at 10–26. Like the ID, Bio-Rad's petition focused on two limitations in the asserted claims: (1) porous gel beads and (2) releasable attachment of barcodes to those gel beads. *See id.* In Bio-Rad's view, those limitations are anticipated or rendered obvious by U.S. Patent No. 9,347,059 (JX-0031, "the '059 patent") and/or U.S. Patent No. 9,902,950 (RX-0462, "the Church patent"). *See id.* On review, the Commission has determined to affirm the ID's finding that the asserted claims of the '024 patent are not invalid as anticipated or obvious with supplemented reasoning concerning the disclosure of "porous gel beads" in the prior art.

First, Bio-Rad asserted that the ID erred by relying on (1) the '059 patent's description of certain beads as "coated" and (2) the testimony of the inventor of the '059 patent that he believed he disclosed solid beads in the '059 patent to conclude that the beads were solid as opposed to

porous. *See* Bio-Rad Pet. at 10–11. However, even if those assertions of error are true, they would not provide a basis to find an affirmative disclosure of porous gel beads in the '059 patent. Bio-Rad's arguments are limited to criticizing evidence the ID relied on to support the conclusion that the antibody-linked beads are solid, *i.e.*, not porous. At best, Bio-Rad's arguments may lead to the conclusion that the composition of the antibody-linked beads is not disclosed in the '059 patent. However, Bio-Rad's arguments do not show, by clear and convincing evidence, that the antibody-linked beads of the '059 patent are disclosed as being porous.

Second, with respect to Bio-Rad's reliance on the Roche 454 sequencing technique listed in the specification of the '059 patent as disclosing the "porous gel bead" limitation, the Commission notes that neither the '059 patent itself, nor the publication by Margulies, *et al.*, cited in the '059 patent in connection with the Roche 454 sequencing technique, disclose the use of Sepharose beads with the technique. Both the '059 patent and the Margulies paper are in evidence, but neither mentions Sepharose beads. *See* JX-0031 ('059 patent); CX-1940 (Margulies, *et al.*). Rather than acknowledge this lack of disclosure, Bio-Rad represented in its petition that "[t]he undisputed testimony from 10X's expert Dr. Dear is that Margulies describes the 454 beads as being Sepharose." Bio-Rad Pet. at 11 (citing Tr. at 869:21–870:4; JX-31 at 26:52–54). However, the evidence Bio-Rad cites does not support its representation. The cited portion of Dr. Dear's evidentiary hearing testimony follows:

> Q. Now the 454, beads, those are Sepharose beads; correct?
>
> A. You mean the 454 sequencing beads?
>
> Q. That's correct.
>
> A. Yes, I believe — *at the time 454 was published, I believe they used Sepharose beads*. That's the Margulies paper. Whether they did since in their commercial instruments, I don't know. But in the Margulies paper, I believe they are Sepharose — Sepharose beads.

Tr. at 869:21–870:4 (emphasis added). Dr. Dear did not testify that the Margulies paper describes the 454 beads as being Sepharose beads. *See id.* He testified that he believed Sepharose beads were used with the technique at the time Margulies was published. *See id.* The fact that one of the expert witnesses in this investigation had a belief as to the particular type of bead used with the Roche 454 sequencing technique by the authors of the Margulies paper does not lead to the conclusion that the paper discloses the composition of those beads. Indeed, one need only review the Margulies paper, which is in evidence, to see that Margulies does not discuss Sepharose beads. *See generally* CX-1940. Moreover, Dr. Dear's testimony falls short of establishing that persons of ordinary skill in the art would understand Margulies to disclose the use of Sepharose beads. *Cf. Akamai Techs., Inc. v. Cable & Wireless Internet Servs., Inc.*, 344 F.3d 1186, 1192 (Fed. Cir. 2003) ("[T]he dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from the prior art reference's teaching that every claim [limitation] was disclosed in that single reference."); *Rosco v. Mirror Lite,* 304 F.3d 1373, 1380 (Fed. Cir. 2002) ("[I]f an element is not expressly disclosed in a prior art reference, the reference will still be deemed to anticipate a subsequent claim if the missing element is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." (internal quotation marks omitted)). In addition, his testimony does not indicate that Sepharose beads must necessarily or inevitably be used with the Roche 454 technique, which would be required to show inherent disclosure. *See Akamai Techs., Inc.*, 344 F.3d at 1192 ("A claim limitation is inherent in the prior art if it is necessarily present in the prior art, not merely probably or possibly present.").

The portion of the '059 patent on which Bio-Rad relies is also inapposite to its position. The cited portion of that patent merely provides that "[i]n some embodiments, the next generation

sequencing technique is 454 sequencing (Roche) (see e.g., Margulies, M et al. (2005) *Nature* 437: 376-380)." JX-31 at 26:52–54. That statement does not support the conclusion that the Margulies publication discloses the use of Sepharose beads with the Roche 454 sequencing technique. *See id.*

Finally, the Commission notes, as did OUII, that the Roche 454 technique is a sequencing technique as opposed to the sample preparation technique that is the subject of the asserted claims. *See* OUII Resp. to Pets. at 7 (citing CX-1827C at Q/A 108–109). The ID makes that point explicitly in its discussion of the releasable attachment limitation, *see* ID at 37 (citing CX-1827C at Q/A 87, 108), but the Commission reiterates it here because it is equally applicable to the "porous gel bead" limitation. Thus, nothing in the '059 patent or the Margulies paper discloses the porous gel beads of the asserted claims. Accordingly, neither reference anticipates the asserted claims of the '024 patent, all of which include limitations drawn to porous gel beads. Similarly, neither reference can supply that limitation as part of a combination of prior art references to show that the asserted claims are obvious.

Consistent with the supplemented reasoning above, the Commission affirms the ID's finding that the porous gel bead limitation is not disclosed in the prior art. The Commission further affirms the remainder of the ID's findings with respect to the validity of the '024 patent to the extent they are not inconsistent with the reasoning herein. Those findings include that the prior art, including the Church patent, does not disclose porous gel beads with "releasably attached" oligonucleotide molecules, and that the asserted claims are not rendered obvious by a combination of prior art. Accordingly, the Commission affirms the ID's finding that no asserted claim of the '024 patent is invalid.

IV. THE '468 PATENT

The Commission determined to review all of the ID's findings related to a violation of section 337 based on the '468 patent. 84 Fed. Reg. 56835. On review, the Commission has determined to affirm with modified reasoning the ID's finding that Bio-Rad has violated section 337 based on infringement of the '468 patent. The Commission also affirms with modified reasoning the ID's findings that 10X satisfies the domestic industry requirement with respect to the '468 patent and that no asserted claim of the '468 patent is invalid. The Commission adopts the remainder of the ID's findings with respect to the '468 patent to the extent they are not inconsistent with this opinion.

For reference, claims 1 and 21 of the '468 patent follow:

> 1. A method for droplet generation, comprising:
>
> (a) providing at least 1,000,000 oligonucleotide molecules comprising barcode sequences, wherein said barcode sequences are the same sequence for said at least 1,000,000 oligonucleotide molecules, wherein said at least 1,000,000 oligonucleotide molecules are ***releasably attached*** to a bead, wherein said bead is porous;
>
> (b) ***combining said at least 1,000,000 oligonucleotide molecules and a sample comprising a nucleic acid analyte each in an aqueous phase at a first junction of two or more channels of a microfluidic device to form an aqueous mixture comprising said at least 1,000,000 oligonucleotide molecules attached to said bead and said sample***; and
>
> (c) ***generating a droplet comprising said at least 1,000,000 oligonucleotide molecules attached to said bead and said sample comprising said nucleic acid analyte by contacting said aqueous mixture with an immiscible continuous phase at a second junction of two or more channels of said microfluidic device***.
>
> * * *
>
> 21. The method of claim **1,** wherein subsequent to generating said droplet in (c), a given oligonucleotide molecule of said at least 1,000,000 oligonucleotide molecules attaches to said nucleic acid analyte, and wherein said given oligonucleotide molecule attached to said given nucleic acid analyte is subjected to ***nucleic acid amplification*** to yield a barcoded nucleic acid analyte.

'468 patent at cls. 1, 21 (emphasis added on contested limitations).

A. Construction of "Amplification" and the Effect on Infringement and Domestic Industry

As noted in the context of the '024 patent, the Commission has determined to take no position on whether "amplification" encompasses reverse transcription. As with the '024 patent, that issue is immaterial to the issue of whether Bio-Rad infringes the '468 patent and 10X satisfies the domestic industry requirement for the '468 Patent because a preponderance of the evidence shows that that "amplification" limitation is satisfied by PCR in the accused and domestic industry products even under a narrower construction of "amplification" than the one employed by the ID. *See* discussion *supra* Section III.A. Accordingly, the Commission affirms the ID's findings that the '468 patent is infringed and that 10X satisfies the domestic industry requirement for the '468 patent. *See* ID at 58–66. A preponderance of the evidence supports this finding under the construction the ID applied, as well as under a narrower construction that would exclude reverse transcription from the definition of "amplification."

B. Validity

Bio-Rad petitioned for review of the ID's finding that none of the asserted claims of the '468 patent are invalid as anticipated or obvious based on the '059 patent. *See* Bio-Rad Pet. at 33–38 The ID's finding is based on three principal findings: (1) that the "releasably attached" limitation of the asserted claims is not disclosed in the prior art; (2) that the "combining" step of the asserted claims is not disclosed in the prior art; and (3) that the "generating a droplet" limitation of the asserted claims is not disclosed in the prior art. *See* ID at 66–70. The ID also found that secondary considerations weighed against finding any of the asserted claims obvious. *See id.* at 70.

On review, the Commission has determined to affirm the ID's finding that the asserted claims of the '468 patent are not invalid, but under modified reasoning. Particularly, the Commission affirms the ID's finding that the "releasably attached" limitation in (1) above is not disclosed in the prior art and the ID's finding that secondary considerations weigh against finding the asserted claims obvious and adopts those findings in whole. *See* ID at 66, 70. Those findings, including particularly the absence of the "releasably attached" limitation from the prior art, are sufficient to support the ID's finding that the asserted claims are not invalid as anticipated or obvious by the prior art. The Commission has determined to take no position on whether the "combining" and "generating a droplet" limitations in (2) and (3) above are disclosed by the '059 patent.

V. THE '204 PATENT

The ID found that 10X failed to establish that Bio-Rad's accused products infringe any asserted claim of the '204 patent. *See* ID at 77. The ID's noninfringement finding follows from two subsidiary findings: (1) the ID found that Bio-Rad's accused products do not meet a Markush group limitation that defines the type of stimulus used to cause a capsule to release its contents; and (2) the ID found that 10X could not rely on the doctrine of equivalents to satisfy the Markush group limitation. 10X petitioned for review of the ID's noninfringement finding by challenging both findings. *See* 10X Pet. at 9–18. The Commission has determined to affirm with supplemented reasoning the ID's finding that none of the asserted claims of the '204 patent are infringed. The Commission adopts the ID's findings to the extent they are not inconsistent with this opinion.

For reference, claims 1 and 27 of the '204 patent follow:

> 1. A composition comprising a plurality of capsules, said capsules situated within droplets in an emulsion, wherein said capsules are configured to release their contents into said droplets upon the application of a stimulus to provide said contents in said droplets in said emulsion, wherein said stimulus ***is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof.***
>
> * * *
>
> 27. The composition of claim 1, wherein said contents comprise at least 10,000 barcoded oligonucleotides releasably attached to each of said capsules.

'204 patent at cls. 1, 27 (emphasis added on contested Markush group).

A. Literal Infringement

The salient issue addressed in 10X's petition is the ID's determination that Bio-Rad's products "do not literally infringe the asserted claims because they do not have a stimulus 'selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof.'" ID at 73. The crux of the ID's decision with respect to this limitation is that the stimulus that causes barcode molecules to be released in Bio-Rad's products are [redacted]. *See id.* at 74. [redacted] are not listed among the stimulus choices in the Markush group (a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof) and, therefore, Bio-Rad's products do not practice this limitation, which is incorporated into every asserted claim of the '204 patent. *See id.*

In concluding that Bio-Rad's products do not satisfy the Markush group limitation, the ID rejected several arguments from 10X. First, the ID rejected 10X's reliance on an [redacted] as the stimulus responsible for causing barcode molecules to be released from the gel beads in Bio-Rad's products. *See id.* at 74–78. The ID explained that the evidence of record did not show that an [redacted] alone would cause the release of barcode

molecules from gel beads. *See id.* at 75 ("[T]here is no evidence that the [redacted] by themselves would have any effect on the attached barcode molecules or the gel bead."). Rather, at best, 10X's evidence showed that barcode release is caused by [redacted] *See id.* ("Thus, as understood by [10X's expert,] Dr. Butte, the stimulus that causes the release of the barcode molecules from the gel bead in the accused products is the [redacted]"). Relying on the closed transition phrase "consisting of" in the Markush group, however, the ID interpreted the group to exclude additional unrecited elements, in this case, the [redacted]. *See id.* at 75–77. Thus, the ID determined that the stimulus limitation of the asserted claims could not be satisfied by the combination of an [redacted] and provision of [redacted] in Bio-Rad's products. *See id.* at 78.

The ID also rejected reliance on the [redacted] alone as the claimed stimulus. *See* ID at 77. Further to that finding, the ID noted that "there is no evidence that changing the [redacted] without the [redacted] will cause the release of barcode molecules from the gel beads." *Id.* The ID also pointed to a portion of 10X's posthearing brief that acknowledges the role of [redacted] in releasing the barcode molecules. *See id.* (citing 10X Posthearing Br. at 181–182). Regarding 10X's assertion that only the [redacted] is the claimed stimulus, the ID characterized that assertion as "unsupported attorney argument that is contradicted by the testimony of [10X's] own expert." *Id.* at 78 (citing Tr. (Butte) at 474:18-21). For these reasons, the ID found that "the accused products do not literally infringe the asserted claims." *Id.*

10X's primary argument is that an [redacted] is the claimed stimulus, and that the actions of [redacted] is the mechanism through which release is effectuated. *See* 10X

Pet. at 9–10 [redacted] is the start of a chain reaction: the [redacted]; and the contents of the capsule are released as a result. This [redacted] is applied as the trigger of a series of events leading to the release of the contents of the capsule and meets the claimed stimulus within the Markush group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof."). Relying on this premise, 10X attacks the ID from several directions, including arguing that the ID erroneously construed the claim such that the stimulus must "effectuate by itself the release of the contents without any facilitating or intermediate steps," 10X Pet. at 10, and that the ID erred by failing to give due weight to the fact that 10X stated in its various infringement contentions that only the [redacted] is the claimed stimulus, *id.* at 12–14.

None of 10X's arguments show that the ID erred in finding no literal infringement by Bio-Rad's products. First, as the ID noted, there is a pronounced lack of evidence supporting 10X's argument. For example, 10X's own expert *never* testified that an [redacted] alone was the stimulus recited in the asserted claims. Rather, Dr. Butte consistently testified that the stimulus was the [redacted]. For example, Dr. Butte testified as follows:

> Q: Sure. You're not claiming that the [redacted] is one of the claimed stimuli that's mentioned in claim 1 of the '204 patent; correct?
>
> A: It's [redacted]
>
> * * *
>
> Q: Right. But it's not the [redacted] itself; right?

A: It's not the [redacted] itself. It's the combination with the [redacted] specifically.

* * *

Q: Now, it's your view that the stimulus in the accused products is the [redacted] correct?

A: That is correct.

Tr. 371:14–18, 371:19–23, 432:13–16. Moreover, while 10X argues that the [redacted], *see* 10X Pet. at 9, its primary support for that contention is a section of equivocal corporate deposition testimony from a Bio-Rad witness who testified repeatedly that he was unsure of the purpose of [redacted] in Bio-Rad's process. *See, e.g.*, CX-0009C at 425:7–22 ("There are – there is [redacted] in that reaction. But it's required for a lot of DNA modifying enzymes. So I don't – I don't know. It's – it's not uncommon for an enzyme to bind a cofactor and – and not require additional – addition of a cofactor to – to be active. So I don't know if that – I don't know if the [redacted] that we add is – is necessary for the [redacted]."). Further still, Bio-Rad and OUII point to evidence suggesting that the [redacted] in Bio-Rad's products is unrelated to the action of the [redacted], which would directly refute 10X's argument that the [redacted]. *See* OUII Resp. to Pets. at 22; Bio-Rad Resp. to Pets. at 9–15; *see also* Tr. at 376:19–377:7, 377:11–379:4, 381:5–382:9, 383:18–384:16, 533:12–19, 564:15–565:9; JX-0050C at 56; JX-0132 at 65; RX-503C at Q/A 60–64; RX-537 at 5, RX-665C at Q/A 52, 59–65 (evidence relied on by OUII and Bio-Rad).

Second, 10X's argument that the ALJ misinterpreted its contentions about the accused stimulus is largely immaterial. *See* 10X Pet. at 12–14. Regardless of whether 10X asserted in its

briefs that only [redacted] is the claimed stimulus, the fact remains that there is little, if any, evidence to support that contention. That is, 10X's infringement argument did not fail because the ID misunderstood its contentions; it failed because those contentions do not show infringement by a preponderance of the evidence.

Finally, 10X's reliance on the word "comprising" in the preamble of the claims to argue that the presence of [redacted] in the accused products does not defeat infringement is at odds with the most analogous cases addressing the issue. Here, each of the independent claims begins with a preamble such as, "A composition comprising . . . ," '024 patent at cl. 1, "A device comprising . . . ," *id.* at cl. 23, or "A method comprising . . . ," *id.* at cl. 25. 10X relies on the word "comprising" in each to argue that the claims are open to additional unrecited elements. 10X Pet. at 11 (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 811 (Fed. Cir. 1999); *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 945 (Fed. Cir. 1990)). Based on that uncontroversial legal principle, 10X argues that "[redacted] is no different than any other *unaccused* component of the buffer that plays a role in creating the right operating environment such that the [redacted] results in release of contents." 10X Pet. at 11 (emphasis in original).

10X's argument misapprehends the ID's reasoning and fails to acknowledge the rest of the claim language. First, the ID did not find that the mere presence of [redacted] in the accused products defeated infringement. The ID found that 10X's own expert admitted that [redacted] alone did not stimulate the release of barcodes as required by the claims, but rather the [redacted] were an essential component of the stimulus. *See* ID at 75. Second, each claim uses the phrase "said stimulus is selected from the group *consisting of* . . ." in the limitation at issue. '204 patent at cls. 1, 23, 25 (emphasis added). The transitional phrase "consisting of" indicates a closed

group of elements, including only "a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." *Id.* Because the evidence shows that [redacted] are all or part of the stimulus that caused the release of barcodes, this limitation is not met. The presence of the word "comprising" in the preamble of each claim does not negate the closed nature of the Markush group defining the set of stimuli that will read on the claim. Indeed, the cases the ID relied on to support its interpretation of the Markush group as a closed set of options dealt with exactly such claims — introduced by an open preamble with "comprising," but including a closed Markush group signaled with "consisting of." *See Multilayer Stretch Cling Film Holdings, Inc. v Berry Plastics Corp.,* 831 F.3d 1350, 1358 (Fed. Cir. 2016) (analyzing claims with "comprising" in the preamble followed by an element reciting, "selected from the group consisting of"); *Abbott Labs. v. Baxter Pharm. Prod., Inc.*, 334 F.3d 1274, 1276 (Fed. Cir. 2003) (same); *see also* ID at 74 (citing *Multilayer* and *Abbott*).

Under 10X's interpretation of the claim, the Markush group limitation would effectively become an open limitation, allowing any number of additional unrecited stimuli as long as one of the recited stimuli also had some connection to causing the capsules to release their contents. 10X cites no precedent interpreting a Markush group that introduces its elements with the signal "consisting of" in that way. To the contrary, precedent uniformly treats Markush groups using the signal "consisting of" as closed, excluding other unrecited elements absent explicit language in the claim permitting as much. *See Multilayer,* 831 F.3d at 1358; *Abbott Labs.*, 334 F.3d at 1276. Given the Federal Circuit's binding precedent, the Commission affirms the ID's reasoning that the Bio-Rad products do not infringe because the [redacted] are part of the stimulus that releases barcodes in the accused products, but the Markush group recited in the asserted claims does not encompass the [redacted]. We adopt those findings.

The Commission notes that the ID reached its conclusion without resolving the disputed issue of whether an [redacted] in the accused products. In response to the Commission's request for briefing, 10X argued that the [redacted] *See* 10X Resp. to Qs. at 28–35. In support of that argument, 10X argued that (1) [redacted]. *See id.* at 33–35. This facet of 10X's argument relied on a publication by Melamede, *et al.*, listed on the face of the [redacted] product insert.[7] *See* JX-0050C at 56; CX-1965. Particularly, 10X asserted that "Figure 6C of Melamede plots the activity of Endo VIII [redacted]. *Id.* at 34; *see also id.* at 35.

[7] The [redacted] product insert lists five articles and one U.S. Patent on its face. JX-0050C at 56. 10X relies on one of those references — Melamede, R.J., Hatahet, Z., Kow, Y.W., Ide, H. and Wallace, S.S. (1994) *Biochemistry* 33, 1255–1264 (hereinafter "Melamede") (CX-1965) — to support its argument that an [redacted] activity. Bio-Rad relies on the U.S. Patent — U.S. Patent No. 7,435,572, "Methods and Compositions for DNA Manipulation," issued to Jurate Bitinaite on October 14, 2008 (hereinafter "the '572 patent") (JX-0132) — and one of the articles — Lindhal, T., Ljungquist, S., Siegert, W., Nyberg, B. and Sperens, B. (1977) *J. Biol. Chem.* 252, 3286–3294 (hereinafter "Lindhal") (RX-0537) — to support its counter-argument that an [redacted].

10X also relies on the testimony of a Bio-Rad employee, Dr. Agresti, who provided corporate deposition testimony on behalf of Bio-Rad, and also testified at the evidentiary hearing. *See id.* at 36. Specifically, 10X notes that "Dr. Agresti provided corporate deposition testimony that [redacted], but that he did not recall which of the [redacted] required it." *Id.* In 10X's view, Dr. Agresti's deposition testimony supports its argument that "the activity [of] [sic] [redacted]." *Id.* 10X further noted that Dr. Agresti testified at the evidentiary hearing that he did not believe [redacted], but 10X characterizes that testimony as contradictory to his deposition testimony. 10X also argued that the bases of Dr. Agresti's hearing testimony — a publication by Lindhal, RX-0537, and U.S. Patent No. 7,435,572, JX-0132, both of which appear on the [redacted] product insert — were cherry-picked for him by Bio-Rad's counsel, and that neither are reliable because they concern [redacted] activity under conditions that are materially different from those found in the accused products. *See id.* at 36–40. Based on these arguments, 10X submits that a "preponderance of evidence therefore shows that an [redacted], meeting the relevant language of Claim 1 of the 204 Patent." *Id.* at 41.

Bio-Rad argued in its response that any [redacted] in the workflow of its products does not [redacted]. *See* Bio-Rad Resp. to Qs. at 34–35. Bio-Rad does not appear to dispute that [redacted] to the ddSEQ system, but submits that the purpose of that addition is to [redacted]). *See id.* at 37 ("On the contrary, the evidence shows that Bio-Rad [redacted],

[redacted].”). Bio-Rad argued that the [redacted] is already 100% active without any [redacted]. *See id.* at 35–37.

The strongest part of Bio-Rad’s counter-argument is that 10X’s cited evidence purporting to show a relationship between [redacted] is inapposite because of material differences in the conditions surrounding the experiments in the cited article and the conditions present in Bio-Rad’s products. *See id.* at 41–43. For example, Bio-Rad points out that while 10X relies heavily on Melamede, that article “tested the activity of Endonuclease VIII ***on DNA containing thymine glycols***.” Bio-Rad Resp. to Qs. at 42 (emphasis in original). Moreover, Bio-Rad submits that “Melamede expressly states that Endonuclease VIII [redacted]” *Id.* (citing CX-1965.00008). Thus, Bio-Rad argues that 10X is relying on information about [redacted] activity that is insufficiently related to the behavior of the [redacted] in the accused products. *See id.* at 41–43 (“10X does not even attempt to demonstrate that the context of Melamede has any relevance to the context of the Bio-Rad Accused Products”).

Bio-Rad also argued that 10X’s calculations of the amount of [redacted] to Bio-Rad’s products are unsupported attorney argument, and are also contradicted by witness testimony in the record. Bio-Rad Resp. to Qs. at 43–44 (citing Greiner Tr. 539:16-541:15). The point of that argument, presumably, is to further undermine any reliance on Melamede by arguing that the concentrations of [redacted] investigated in Melamede are not similar to the concentrations present in Bio-Rad’s products.

Finally, Bio-Rad pointed to the Lindhal article and the ’572 patent referenced on the [redacted] product insert as evidence that the [redacted] are either unaffected or inhibited by the [redacted]. *See id.* at 44–46; s*ee also* Bio-Rad Resp. to Pets. at 12–15.

Particularly, Bio-Rad argued that "according to Lindahl, UDG, [redacted]," Bio-Rad Resp. to Qs. at 44, and that "the '572 Patent describes the [redacted] and confirms that [redacted]," *id.* at 44–45.

OUII's response was in substantial alignment with Bio-Rad's. OUII Resp. to Qs. at 15–19. OUII reiterated the evidence it pointed to in its petition for review to show that the [redacted] used in the Bio-Rad products are active without any [redacted], that the [redacted], and that the purpose of the [redacted] present in the Bio-Rad products is to [redacted]. *See id.* at 15–18. With respect to the Melamede article, OUII takes the position that the experiments reported therein are insufficiently related to the accused products to conclude that an [redacted]. *See id.* at 18. OUII was also critical of the absence of expert testimony supporting 10X's interpretation of Melamede. *Id.*

There is no dispute that Bio-Rad's processes involve an [redacted]. There is, however, a lack of reliable evidence as to the effect, if any, that [redacted]. This is because the parties failed to show that the articles and references upon which they rely analyzed [redacted] activity in conditions that are the same or similar to those in the accused products. 10X has the burden of proving infringement by a preponderance of the evidence; the evidence does not establish that Melamede's reported relationship between [redacted] and Endo VIII's activity in nicking thymine glycols is probative of the relationship between [redacted]

[redacted] in the accused products to release barcodes. *See* Bio-Rad Reply at 35–37 (discussing evidence supporting the distinction between [redacted] in the accused products and Endonuclease VIII nicking thymine glycol). Dr. Agresti's deposition testimony is hardly persuasive on the effect of [redacted] in the accused products. When viewed in whole, the relevant portion of Dr. Agresti's deposition transcript demonstrates that Dr. Agresti did not know at the time whether the [redacted] was necessary for the [redacted] to work. *See* CX-0009C at 422:20–429:15.

Even if 10X's argument is accepted as true, it would not show that an [redacted] is the "trigger of a series of events leading to the release of" barcodes from the beads in the accused products. *Cf.* 10X Pet. at 10 (arguing that an [redacted]). According to 10X, prior to any [redacted] in the accused products, *see* 10X Pet. at 35 ("According to Melamede, that [redacted] Thus, even under 10X's theory, an [redacted] does not "trigger" the release of barcodes from beads in the accused products. The [redacted] is already active, and the presence of [redacted] only improves its activity. 10X fails to explain how that [redacted] reads onto the '204 patent's claim language requiring capsules "configured to release their contents . . . upon the application of a stimulus." *See, e.g.*, '204 patent at cl. 1. Under 10X's theory, the [redacted] will stimulate the capsules in Bio-Rad's products to release barcodes regardless of whether [redacted] is added, albeit possibly at a slower rate. Accordingly, even under its own theory of how [redacted] in the accused products, 10X

has not shown that an [redacted] is the stimulus that causes the capsules in Bio-Rad's products to release their barcodes.

In conclusion, the Commission affirms the ID's finding that 10X failed to show that the asserted claims of the '204 patent are literally infringed by the accused products.

B. Doctrine of Equivalents

Before the ALJ, 10X argued in the alternative that the Markush group limitation was satisfied by the [redacted] in the presence of a change in [redacted] ion concentration as an equivalent to the recited "reduction in disulfide bonds" element. *See* ID at 78. The ID rejected this argument, finding that 10X was estopped from relying on the doctrine of equivalents ("DOE") to satisfy this limitation. The ID's finding in that regard has two facets: (1) there is a presumption that 10X is estopped from relying on DOE based on its amendments during prosecution, *see id.* at 82; and (2) 10X had not established that its narrowing amendment was tangential to the alleged equivalent (which would overcome the presumption against DOE), *see id.* at 85.

10X petitioned for review of the ID's finding that it is estopped from relying on DOE to satisfy this element of the asserted claims. 10X does not dispute the ID's finding that a presumption of estoppel is proper, but rather faults the ID for misunderstanding what evidence was in the record.[8] 10X Pet. at 16. Particularly, 10X faults the ID's statement that "the record **is devoid of any evidence concerning Trnovsky's teachings**." *Id.* (quoting ID at 84 (emphasis 10X's)).

[8] 10X spends several pages of its petition reciting the "procedural history of Staff's [prosecution history estoppel] argument" to show "the improper burden the ID imposes on 10X." 10X, however, does not explain how the procedural history of the issue supports modifying or reversing the ID, and we find such argument meritless in any event. 10X's chief complaint appears to be that Bio-Rad raised but abandoned a similar argument, while OUII raised the argument for the first time in its prehearing brief. Presumably, 10X's implication is that it did not receive a fair opportunity to prepare evidence in response to OUII's argument. If that is the case, 10X's recourse was to seek relief from the ALJ.

10X argues this statement is clear error because Trnovsky itself is in the record, as is testimony from 10X's expert, Dr. Butte. *Id.* at 16–17.

As explained in the ID, "[d]uring the prosecution of the '204 patent, application claims 1, 78, and 110 matured into issued claims 1, 23, and 25, respectively." ID at 79 (citing JX-0009 at 13630). As originally filed, application claims 1 and 78 required a capsule(s) "configured to release their contents . . . upon the application of a stimulus," but did not require that the stimulus be selected from a particular group of stimuli. *Id.* (quoting JX-0009 at 80 (application claim 1); JX-0009 at 85 (application claim 78) (requiring a capsule "configured to release its contents into said droplets upon the application of a stimulus"). Similarly, application claim 110 required a step of "providing a stimulus to cause said capsules to release their contents into said droplets," without requiring the stimulus be selected from a group of stimuli. *Id.* (citing JX-0009 at 87).

The ID further explains that while "application claim 1 did not limit the stimulus to a group of stimuli, two of its dependent claims [(application claims 19 and 21)] did." ID at 80. Application claim 19 required the stimulus to be "selected from the group consisting of a chemical stimulus, a bulk stimulus, a biological stimulus, a light stimulus, a thermal stimulus, a magnetic stimulus, and combinations thereof," while application claim 21 required the stimulus to be "selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." JX-0009 at 81.

A brief description of the prosecution history is helpful before addressing 10X's argument. In an office action issued on January 29, 2016, the examiner rejected all of the pending claims as anticipated in view of several prior art references. *Id.* at 9770–9781. Application claim 1 was found to be anticipated by seven references: (1) U.S. Patent Publication No. 2005/007951 to Berka et al. ("Berka"), (2) U.S. Patent Publication No. 2015/0079510 to Church et al. ("Church"), (3)

U.S. Patent Publication No. 2014.0227706 to Kato et al. ("Kato"), (4) U.S. Patent Publication No. 2003/0207260 to Trnovsky et al. ("Trnovsky"), (5) U.S. Patent Publication No. 2013/0189700 to So et al. ("So"); (6) U.S. Patent Publication No. 2004/0258701 to Dominowski et al. ("Dominowski"); and (7) U.S. Patent Publication No. 2009/0025277 to Takanashi ("Takanashi"). *Id.* at 9777–9780. Application claim 19 was rejected as anticipated by five references: (1) Berka, (2) Trnovsky, (3) So, (4) Dominowski, and (5) Takanashi. *Id.* Application claims 78 and 110 were rejected as being anticipated by Berka. *Id.* Application claim 21 was rejected as being anticipated by Kato. *Id.*

On April 28, 2016, the applicants responded to the rejections by, *inter alia*, cancelling application claims 19 and 21 and amending application claims 1, 78, and 110. As amended, application claims 1, 78, and 110 incorporated application claim 21's limitation requiring that the stimulus be "selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." *Id*. at 10009; *see also id.* at 10000, 10002, 10003. With this amendment, the applicants argued that the amended application claims were allowable over the cited prior art with the exception of Kato. *Id*. at 10009 ("Initially, as Claim 21 was rejected only over Kato, Applicant understands that the Office acknowledges that none of Berka, Church, Trnovsky, So, Dominowski and Takanashi teach or disclose 'wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof,' as recited in claims 1, 31, 78, 89, 110 and 118."). With regard to Kato, the applicants argued that "Kato does not teach or disclose, 'wherein said capsules are configured to release their contents into said droplets upon the application of a stimulus,' as recited in Claim l." *Id.* at 10010. The applicants also argued that Kato did not qualify as prior art. *Id.*

On August 5, 2016, the examiner rejected the amended claims in view of a new set of prior art references and noted that the previous rejections had been rendered moot in view of the new grounds of rejection. *Id*. at 10074. The examiner also "noted that the 102(b) rejection of Claims 1 and 21 over Kato has been withdrawn in light of the applicant's persuasive arguments." *Id.* In response to the new rejections, the applicants further amended application claims 1, 78, and 110 to require that the capsule or capsules "provide said contents in said droplets in said emulsion" upon the application of a stimulus. *Id.* at 10118, 10120–21. The application claims as amended were allowed. *Id.* at 13617.

The Commission finds that 10X is correct that Trnovsky is in the record, and thus the ID was wrong to state that there is no record evidence of Trnovsky's teachings. Trnovsky is exhibit JX-0030, and was admitted on March 25, 2019. Tr. at 480. The ID apparently interpreted the statement in 10X's posthearing reply brief that "Staff [] did not introduce the underlying references, and the evidence of record is that they do *not* disclose [redacted] with a change in ion concentration," to mean that the Trnovsky was not introduced at all, when apparently 10X only meant that OUII did not introduce Trnovsky as an exhibit. CRB at 85; *see also* ID at 84 (citing same). Because the ID's statement concerning Trnovsky's admission is incorrect, the Commission reverses that limited portion of the ID's reasoning. However, notwithstanding that correction, 10X still has not shown why it is entitled to rely on DOE based on correction of this error.

The crux of 10X's tangential relationship argument is that Trnovsky did not disclose the combination of an enzyme with a change in ion concentration as the stimulus to cause a capsule to release its contents. 10X Pet. at 17 (quoting CX-0004C (Butte WS) at Q/A 331). Rather, the reference only disclosed the use of a specific enzyme (agarase) on its own. *See id.* Thus, 10X

argued that the amendment to overcome Trnovsky only surrendered the use of enzymes that did not work in combination with a change in pH, a change in ion concentration, or a reduction of disulfide bonds. *See id.* Thus, according to 10X, the combination of an enzyme *with* a change in pH, a change in ion concentration, or a reduction of disulfide bonds continued to be covered by the claims. *See id.*

The Commission finds that the legal support for 10X's tangential relation argument is lacking. Particularly, 10X's argument implicitly relies on the premise that the tangential relation exception to prosecution history estoppel applies if the prior art does not contain the asserted equivalents. This is incorrect. As explained by the Federal Circuit, while "[a]n amendment made to avoid prior art that contains the equivalent is not tangential," ***"[i]t does not follow [] that equivalents not within the prior art must be tangential to the amendment***." *Integrated Tech. Corp. v. Rudolph Techs., Inc.*, 734 F.3d 1352, 1358 (Fed. Cir. 2013) (emphasis added) (internal citations and quotation marks omitted). Indeed, an applicant may surrender by amendment more than what was required to overcome the prior art, and yet, the applicant cannot reclaim that excess via the DOE. *See Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1581 (Fed. Cir. 1995) ("[T]he limits imposed by prosecution history estoppel on the permissible range of equivalents can be broader than those imposed by the prior art.").

What 10X must show to rely on the tangential relation exception to prosecution history estoppel is that the reason for the applicant's "narrowing amendment was peripheral, or not directly relevant, to the alleged equivalent." *Integrated Tech. Corp. v. Rudolph Techs., Inc.*, 734 F.3d 1352, 1358 (Fed. Cir. 2013) (quoting *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.,* 344 F.3d 1359, 1369 (Fed. Cir. 2003) (en banc)). In other words, 10X must show that the reason the applicant amended the Markush group limitation to recite a change in pH, a change in ion

concentration, or a reduction of disulfide bonds was peripheral, or not directly relevant, to its alleged equivalent, *i.e.*, the action of [redacted]. That showing should "focus[] on the patentee's objectively apparent reason for the narrowing amendment, which should be discernible from the prosecution history record." *Integrated Tech. Corp.*, 734 F.3d at 1358 (internal quotation marks omitted) (quoting *Festo*, 344 F.3d at 1369).

Here, 10X has not made the required showing. Rather, 10X relies on the following testimony from its expert, Dr. Butte:

> Trnovsky did not describe [redacted] generally, but digestion with a specific enzyme: agarase (which Bio-Rad incorrectly quoted as agarose). JX-0030.00010 ([0009]). Trnovsky was overcome by the amendment because Trnovsky has no description, either in paragraph 9 or 102, which were cited by the examiner, see JX-0009.09778, of the use of agarase with a change in a change in pH, a change in ion concentration, or a reduction of disulfide bonds. One of ordinary skill in the art would understand that the amended claims no longer covered enzymes such as agarase that did not work with a change in a change in pH, a change in ion concentration, or a reduction of disulfide bonds. *However, one of ordinary skill would also understand that the claims continue to cover the use of enzymes with change in a change in pH, a change in ion concentration, or a reduction of disulfide bonds.*

10X Pet. at 17 (quoting CX-0004C at Q/A 331) (emphasis added). Even assuming that this testimony is uncontested, as 10X claims it is, it does not show that the tangential relation exception applies. Here, Dr. Butte merely testifies that the reference "Trnovsky has no description, either in paragraph 9 or 102, which were cited by the examiner, see JX-0009.09778, of the use of agarase with a change in a change in pH, a change in ion concentration, or a reduction of disulfide bonds." *Id.* But, as explained above, "[i]t does not follow [] that equivalents not within the prior art must be tangential to the amendment." *Integrated Tech. Corp. v. Rudolph Techs., Inc.*, 734 F.3d 1352, 1358 (Fed. Cir. 2013) (internal citations and quotation marks omitted).

The applicant's amendment drastically reduced the universe of stimuli covered by the Markush group to overcome an anticipation rejection based on references, such as Trnovsky, that

disclosed stimuli covered by the applicant's original, broader claims. That reason is neither peripheral nor irrelevant to 10X's alleged equivalent, which would replace a reduction in disulfide bonds with the action of [redacted] in the presence of an [redacted] ions. The action of [redacted] would have been included within the scope of the applicant's original claims, but also would have been anticipated by the disclosure of Trnovsky concerning agarase, both [redacted] and agarase enzymes being within the original Markush group consisting of a chemical stimulus, a bulk stimulus, and a biological stimulus. The applicant's amendment surrendered both enzymes by narrowing the universe of claimed stimuli drastically. Though 10X now tries to create space between the amendment's rationale and its claimed equivalent by relying on [redacted] in combination with an [redacted], it points to nothing "objectively apparent" in the prosecution history to show that the rationale for its amendment was irrelevant to enzymes in combination with an increase in ion concentrations. Particularly, Dr. Butte's testimony to that effect is wholly conclusory, and not part of the prosecution history. *See Integrated Tech. Corp.*, 734 F.3d at 1358 ("The tangential relation inquiry 'focuses on the patentee's objectively apparent reason for the narrowing amendment,' which 'should be discernible from the prosecution history record.'" (quoting *Festo*, 344 F.3d at 1369)).

At bottom, 10X's tangential relation argument against prosecution history estoppel lacks legal and evidentiary support. The ID was correct to discount it. However, the ID erroneously stated that Trnovsky is not in evidence, and that the record is devoid of evidence concerning its teachings. Accordingly, the Commission affirms the ID's finding that 10X is estopped from relying on the doctrine of equivalents to show infringement, *see* ID at 78 (finding that 10X "is precluded from relying on the DOE to satisfy the Markush group limitation."), but with the

correction that Trnovsky is in evidence and with the additional reasoning laid out above. *See* discussion *supra* pp. 35–41.

VI. THE '530 PATENT

The Commission previously determined to review all of the ID's findings related to a violation of section 337 based on the '530 patent. 84 Fed. Reg. 56835. On review, the Commission has determined to affirm with modified reasoning the ID's finding that Bio-Rad has violated section 337 based on infringement of the '530 patent. The Commission also affirms with modified reasoning the ID's finding that 10X satisfies the domestic industry requirement with respect to the '530 patent. The Commission has determined to take no position on whether Bio-Rad contributorily infringes the '530 patent. The Commission also finds that Bio-Rad abandoned the indefiniteness argument raised for the first time in its petition for review of the ID, but that even if not abandoned, the argument would fail. The Commission adopts the remainder of the ID's findings with respect to the '530 patent to the extent they are not inconsistent with this opinion.

A. Background

Of the asserted claims — claims 1, 4, 11, 14, 19, 26, 28 — claim 1 is the sole independent claim, and the bulk of the disputes with respect to the '530 patent involve the limitations recited in claim 1. All of the other asserted claims depend, both directly and indirectly, from independent claim 1. Claim 1 reads as follows:

> 1. A method for nucleic acid preparation or analysis, comprising:
>
> (a) providing:
>
> (i) at least 1,000 gel beads;
>
> (ii) releasably attached to each of said at least 1,000 gel beads, at least 1,000 barcode molecules comprising identical barcode sequences that are distinct from barcode sequences of at least 1,000 barcode molecules releasably attached to any other gel bead of said at least 1,000 gel beads; and

(iii) a plurality of cells each comprising a plurality of polynucleotide molecules;

(b) generating a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each comprise:

(i) a single gel bead from said at least 1,000 gel beads; and

(ii) a single cell from said plurality of cells; and

(c) in each of said at least 1,000 droplets, using said plurality of polynucleotide molecules from said single cell and barcode molecules of said at least 1,000 barcode molecules from said single gel bead to generate a plurality of barcoded polynucleotide molecules,

wherein said barcode molecules become detached from said gel bead.

'530 patent at cl. 1 (emphasis added on contested limitations; indentation from "wherein said barcode molecules become detached from said gel bead" paragraph maintained from admitted joint exhibit, JX-7).

In construing claim 1, the *Markman* order rejected proposed constructions from OUII and Bio-Rad that would limit the claim by requiring that the 1,000 droplets be provided in a single experiment (Bio-Rad's proposal) or by requiring that the plurality of cells come from a common sample (OUII's proposal). *See* Order No. 22 at 46 (*Markman* Order) at 46–48. The *Markman* order also rejected 10X's argument that multiple runs of the method could be combined to reach the 1,000-droplet threshold in step (b). *See id.* at 50–51. Ultimately, the *Markman* order concluded that "claim 1 requires that the step of generating 'at least 1,000 droplets' be completed before the third step of forming a 'plurality of barcoded polynucleotide molecules' is performed in any of the droplets." *Id.* at 51.

Thereafter, on March 5, 2019, the ALJ issued Order No. 35, which denied Bio-Rad's motion for summary determination of non-infringement with respect to the '530 patent, among others things. In its motion, Bio-Rad had argued that its products did not infringe because, in them, barcoding began before all of the at least 1,000 droplets were formed. *See* Order No. 35 at 4–5.

Order No. 35 rejected Bio-Rad's argument on the basis that the *Markman* order did not interpret claim 1 such that "all 1,000 droplets form before any barcoding begins." *Id.* at 6 (internal quotation marks omitted). Rather, "[t]he claim language merely requires that any accused step of generating a plurality of barcoded molecules occurs after the at least 1,000 droplets are generated." *Id.* Order No. 35 then further explained that even if Bio-Rad's assertion were true that some barcoded molecules were formed at room temperature before the at least 1,000 droplets were generated, that would "not preclude a finding of infringement based on a subsequent step of generating barcoded molecules in a thermal cycler." *Id.* The crux of Order No. 35's reasoning is that some barcoding may occur during the droplet generation claimed in step (b) without precluding the possibility that after 1,000 droplets are generated in step (b) additional barcoding may occur that will satisfy step (c) of claim 1. *See id.* (citing *Kaneka Corp. v. Xiamen Kingdomway Group Co.*, 790 F.3d 1298, 1306, (Fed. Cir. 2015)).

The final ID reiterated and applied the claim constructions for the '530 patent from Order Nos. 22 and 35, discussed above. ID at 91.

B. "wherein said barcode molecules become detached from said gel bead."

Bio-Rad petitioned for review of the ID's findings of infringement and domestic industry with respect to the '530 patent. Among the arguments raised in Bio-Rad's petition is that neither the accused products nor the domestic industry products practice the final clause of step (c) of claim 1, which reads: ". . . wherein said barcode molecules become detached from said gel bead." '530 patent at cl. 1. Bio-Rad's arguments rely on the premise that this "wherein" clause is part of step (c), and thus subject to the ID's requirement that step (c) occur after at least 1,000 droplets are generated in step (b). In other words, barcode detachment must occur after at least 1,000 droplets are generated. There is no question that barcode detachment occurs in the accused and

domestic industry products; thus, the salient dispute raised by Bio-Rad's petition is the timing of barcode detachment.

Step (c) of claim 1, as it appears in the '530 patent, sets off the "wherein" clause with separate indentation from the other limitations of step (c). *See* '530 patent at cl. 1.[9] At the same time, the wherein clause is separated from the other clauses of step (c) with only a comma, where elsewhere in the claim separate steps are set off with semi-colons. Because the unusual indentation of the "wherein" clause raises some ambiguity as to whether that clause is part of step (c) — and thus subject to the timing requirement at the heart of Bio-Rad's argument — the Commission sought briefing from the parties on whether the "wherein" clause is included within step (c). The parties all agreed in response that the "wherein" clause is part of step (c) of the method claimed in claim 1. The Commission agrees, and therefore affirms the ID's finding that the third step of the

[9] Images from the '530 patent follow:

What is claimed is:

1. A method for nucleic acid preparation or analysis, comprising:

(a) providing:

(i) at least 1,000 gel beads;

(ii) releasably attached to each of said at least 1,000 gel beads, at least 1,000 barcode molecules comprising identical barcode sequences that are distinct from barcode sequences of at least 1,000 barcode molecules releasably attached to any other gel bead of said at least 1,000 gel beads; and

(iii) a plurality of cells each comprising a plurality of polynucleotide molecules;

(b) generating a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each comprise:

(i) a single gel bead from said at least 1,000 gel beads; and

(ii) a single cell from said plurality of cells; and

(c) in each of said at least 1,000 droplets, using said plurality of polynucleotide molecules from said single cell and barcode molecules of said at least 1,000

* * *

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barcode molecules from said single gel bead to generate a plurality of barcoded polynucleotide molecules, wherein said barcode molecules become detached from said gel bead.

2. The method of claim **1**, wherein, prior to (c), said

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15. The method of claim **1**, wherein, in (a), said at least 1,000 gel beads are a subset of a plurality of gel beads.

16. The method of claim **15**, wherein said plurality of gel beads comprises at least 10,000 gel beads.

17. The method of claim **1**, wherein said at least 1,000

'530 patent at cl. 1 (highlighting added on disputed clause).

claimed process "requires that the 'barcode molecules become detached from said gel bead.'" ID at 98. Accordingly, because the "wherein" clause is part of step (c), the barcode detachment required by that clause must occur after at least 1,000 droplets have been generated in step (b). The parties dispute whether the accused and domestic industry products practice the "wherein" clause so construed.

10X argued that a "preponderance of evidence shows that Bio-Rad's accused products and 10X's domestic industry products practice step (c) of Claim 1 of the ']530 Patent if the Commission finds that the barcode molecules must become detached from the gel bead during that step." 10X Resp. to Qs. at 46. Concerning the accused Bio-Rad products, 10X pointed to evidence showing that [redacted], *i.e.*, the barcodes are released during step (c). *See id.* at 46–48.

Concerning its own domestic industry products, 10X argued that "[o]n the thermal cycler in 10X's single-cell products, barcode detachment occurs and those barcodes are used to form barcoded cDNAs." *Id.* at 49. 10X further argued that "[t]he entire droplet formation process takes only several minutes, whereas 10X's technical fact witness explained upon cross-examination that the gel bead with attached barcodes persists after droplet formation." *Id.* at 50 (citing Schnall-Levin, Tr. at 224:18-23). In making that point, 10X implicitly argues that barcode release does not happen instantaneously in its products such that at least 1,000 droplets can be formed and transferred to a thermal cycler before the barcodes are released in those droplets.

By contrast, Bio-Rad argued that neither the accused nor domestic industry products satisfy the "wherein said barcode molecules become detached from said gel bead" limitation of claim 1 because in both sets of the products the barcodes become detached before a collection of at least 1,000 droplets can be generated. *See* Bio-Rad Resp. to Qs. at 54. With respect to the domestic

industry products, Bio-Rad pointed to evidence showing that [redacted] dissolves the gel beads and thus releases the barcodes immediately after droplet formation and prior to incubation on the thermal cycler. *See id.* at 58–64. Because the barcodes are released immediately after barcode formation, Bio-Rad argued that the domestic industry products do not release barcodes after at least 1,000 droplets have been formed, as required by step (b) of claim 1. Thus, Bio-Rad argued that the domestic industry products do not practice the "wherein" clause during step (c), because there is never a collection of at least 1,000 droplets in which gel beads release their barcodes. Bio-Rad also pointed out that the evidence cited in the ID to support the conclusion that barcodes are detached during incubation (and thus as part of step (c)), does not actually support that conclusion. *See id.* at 59–60. Bio-Rad further pointed to portions of the user manual cited by the ID that actually tend to show that barcodes are released prior to incubation on the thermal cycler. *Id.* at 60 (citing CX-0481 at 11).

With respect to its accused products, the crux of Bio-Rad's argument is that the [redacted]. *See id.* at 65–66. Bio-Rad disputed the ID's finding that the purpose of heating the droplets in the accused products on a thermal cycler[10] — a process that occurs after droplet formation — is to activate the [redacted]. *See id.* at 66. Bio-Rad argued that the ID incorrectly described the product label for [redacted] as describing a reaction temperature and time when the label only actually specifies a temperature. *See id.* Bio-Rad also disputed that many of its own documents cited by

[10] A thermal cycler, also known as a thermocycler, is a laboratory instrument that can be used to raise and lower the temperature of a sample in discrete, pre-programmed steps. *See* CX-0481 at 26 (10X Chromium™ Single Cell 3' Reagent Kits v2 User Guide describing three-step incubation procedure on a thermal cycler); *see also id.* at 9 (listing recommended thermal cyclers).

the ID show that [redacted]. *See id.* at 66–67. Bio-Rad also argued that the ID erred in concluding that even if the [redacted]. *See id.* at 67–68. Finally, Bio-Rad argued that the weight of expert and fact witness testimony presented supported the conclusion that the [redacted]. *See id.* at 68–70.

OUII argued, like 10X, that the ID's finding that the accused products infringe should stand under its position on the relationship between the "wherein" clause and step (c) of claim 1. OUII Resp. to Qs. at 22. OUII pointed to evidence showing that the purpose of incubating the accused products on a thermal cycler at 37°C is to [redacted]. *Id.* at 22–24. OUII thus concluded that a preponderance of the evidence shows that the accused products practice step (c) of the claimed method, including the [redacted].

OUII agreed with Bio-Rad, however, that a preponderance of the evidence does not support the conclusion that the domestic industry products practice step (c) of claim 1. Like Bio-Rad, OUII pointed to documentation produced by 10X that indicates that the gel beads in the droplets dissolve "immediately" upon droplet generation, thus releasing barcode molecules, before droplets are placed on the thermal cycler. *See id.* at 24–25 (citing CX-423C at 15; CX-0004C at Q/A 242, 260; CX-540 at 5:48–6:08).

On review, the Commission has determined to affirm, with modified reasoning, the ID's conclusion that the accused products infringe the asserted claims of the '530 patent, and affirm, with modified reasoning, the ID's conclusion that the domestic industry products practice claim 1.

1. Accused Products

With respect to the accused products, there is ample evidence to show that barcode cleavage happens on the thermal cycler when the samples are heated at 37°C for 30 minutes. This evidence comes in the form of (1) a declaration submitted by a Bio-Rad scientist during prosecution of a Bio-Rad patent, *see* JX-0171 at 328–29 (Declaration from Bio-Rad scientist Andrew Kohlway) ("The data was generated using the protocol from the Illumina-Biorad SureCell WTA 3' Library Prep kit . . . *Droplets were incubated at 37º for 30 minutes to allow the cleaving agent to cleave the dT oligonucleotides off the bead*. Next droplets were incubated at 50ºC for 1 hour to allow cellular RNA to be reverse transcribed using dT oligonucleotide primers.") (emphasis added), and (2) Bio-Rad's own expert's testimony, *see* RX-665C at Q/A 41 ("Then another step is carried out to make sure that the [redacted] and reverse transcription reactions, which took place [redacted]. In this step, the tube with the emulsion is placed into a thermocycler that is programmed to operate at two temperatures, [redacted]. First, the thermocycler operates at 37°C (basically our body temperature) for 30 minutes [redacted].

Bio-Rad's counter arguments are unpersuasive. Bio-Rad simply lacks evidentiary support for its position that "the barcode molecules [redacted]" Bio-Rad Resp. to Qs. at 65. Bio-Rad relies heavily on the testimony of its own expert, Dr. Michael Metzker, and one of its own employees, Dr. Douglas Greiner, who testify not only that [redacted]. *See* RX-665C at Q/A 97, 102, 107; RX-507C at Q/A 65; RX-727C at Q/A 8–11, 17–20. However, as noted in the ID, Dr. Metzker's testimony stands only for the

proposition that [redacted]. *See* RX-665C at Q/A 97, 102, 107; ID at 101. That testimony does not contradict the ID's ultimate finding that the [redacted].

Dr. Greiner's initial testimony is similar, establishing only that [redacted]. *See* RX-507C at Q/A 65. Dr. Greiner's rebuttal testimony goes further and, if accepted, would establish that both [redacted]. *See* RX-727C at Q/A 8–11, 17–20. Even this rebuttal testimony, however, stops short of establishing error in the ID's finding that the [redacted]. The claimed process does not include a negative limitation precluding any [redacted] or barcoding from occurring immediately upon droplet formation. The process requires only that [redacted] and barcoding occur in at least 1,000 droplets after those droplets are generated. *See* '503 patent at cl. 1.

Moreover, Dr. Greiner's rebuttal testimony relies on the assumption that the [redacted] is active at room temperature, which is contradicted by the [redacted]. *Compare* RX-727C at Q/A 11 ("Based on my own experience, I know that enzymes generally are active at room temperature, 25°C. Also, the scientific literature shows that the [redacted]") *with* JX-0050C at 56 ("[redacted] (emphasis added)). Similarly, Dr. Greiner's testimony that [redacted] is contradicted by Bio-Rad's own reference guide, which explains that reverse transcription occurs on the thermal cycler. *Compare* RX-727C at Q/A 18 ("[redacted]

[redacted].") *with* JX-0034 at 25 ("This step reverse transcribes samples on a thermal cycler.").

Order No. 35 specifically rejected Bio-Rad's interpretation of claim 1 wherein all droplet formation must be complete before *any* barcode release and barcoding began. *See* Order 35 at 6. Under such a construction, Bio-Rad might have a stronger argument that some limited amount of barcode release and barcoding occurs before 1,000 droplets have been generated. Thus, Bio-Rad's arguments are most persuasive when viewed through the lens of a claim construction that was never adopted. While Bio-Rad now tries to adjust its argument to fit the ID's claim construction — which *does not* require *all* droplet generation to be complete before any barcodes are released — the two are an imperfect match, which leads to Bio-Rad's failure on this issue.

At bottom, the dispute here is a factual one about the operation of Bio-Rad's products. The ID considered this dispute, including the testimonial evidence from Bio-Rad's expert, and concluded that "10X has shown by the preponderance of the evidence that at least the bulk of the following processes occur while the droplets are being heated on the thermal cycler: (1) the [redacted] release the barcode molecules from the gel bead and (2) the reverse transcription of barcoded cDNA from mRNA and barcode molecules." ID at 102. The Commission has determined to affirm that ultimate finding under the modified reasoning given above.[11]

[11] The ID misstates a piece of evidence on which it relies to reach that conclusion. Particularly, the ID describes exhibit JX-0050C at 56, which is a picture of the [redacted] product label, as "[redacted]" ID at 100. However, the label reproduced on the exhibit does not state that incubation should occur for 30 minutes. Instead, it states as follows: "[redacted]" JX-0050C at 56.

Bio-Rad pointed out this discrepancy in its petition for review, *see* Bio-Rad Pet. at 61, and neither OUII nor 10X disputed the point. To the contrary, 10X's response to Bio-Rad's petition is carefully worded to avoid misrepresenting the [redacted] product label. *See* 10X Resp. to Bio-Rad Pet. at 65 ("The ALJ relied upon Bio-Rad's documentation that shows the RT program at the thermal cycler contains a step of incubating the droplets at 37°C for 30 minutes, which

2. Domestic Industry Products

Turning to the domestic industry products, although the ID found that "[w]hile the droplets are being heated on the thermal cycler, the barcode molecules are released from the gel bead through the application of [redacted], which dissolves the disulfide bonds holding the barcode molecules to the gel beads," the exhibits that were cited to support that statement do not, on their face, support it. ID at 115 (citing CX-0481.0 at 11; CX-0004C (Butte DWS) at Q/A 481). Page 11 of CX-0481 (10X's Single Cell 3' Reagent Kits v2 User Guide) says nothing about barcode molecules being released from a gel bead during incubation on a thermal cycler. CX-0481 at 11. Rather, that exhibit describes incubation as occurring *after* dissolution of the gel bead delivering the barcodes. *See id.* That evidence does not address whether barcodes are released in the domestic industry products after at least 1,000 droplets have been generated as required by step (b) of the asserted claims.

Further, Q/A 481 of CX-0004C, Dr. Butte's witness statement, relates to infringement by Bio-Rad's accused products, not 10X's domestic industry products. CX-0004C at Q/A 481. Though no party petitioned for correction, this citation in the ID appears to be an inadvertent error. However, even assuming that the citation is an oversight, the portions of Dr. Butte's witness statement that *are* directed to domestic industry still do not support the conclusion that barcodes are released on the thermal cycler. *See id.* at Q/A 580–81.[12]

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matches the reaction *temperature* for [redacted] as shown in [redacted] product label." (emphasis added)). Accordingly, the Commission has determined to modify the sentence starting on the seventh line of page 100 of the ID to read [redacted] Notwithstanding this modification, the Commission nonetheless agrees with and affirms the ID's conclusion that the accused products practice step (c) of claim 1.

[12] The parties addressed waiver at length in their responses to the Commission's request for briefing on whether the domestic industry products practice the "wherein" clause limitation of step

Nevertheless, the Commission has determined that, more likely than not, barcodes are still being released in the domestic industry products after at least 1,000 droplets have been generated, thus satisfying step (c) in combination with the ID's finding that barcoding of the polynucleotide molecules occurs on the thermal cycler in the domestic industry products. *See* ID at 115–16; *see also* CX-0481 at 11; CX-0004C at Q/A 576–78. Particularly, while evidence identified by Bio-Rad and OUII does establish that some of 10X's promotional materials explain that the gel bead dissolves "immediately" after droplet generation, *see* CX-423C at 15; CX-540 at 5:48–6:08; RX-665C at Q/A 116, counter-evidence identified by 10X shows that while the process may begin immediately, gel bead dissolution is not instantaneous, and that when at least the last 1,000 droplets are formed in the domestic industry products, dissolution of the gel beads in those droplets will not yet have occurred, but will occur shortly thereafter. *See* CX-0076C at 36; CX-0116C at 27; *see also* 10X Reply at 50–53 (citing same).

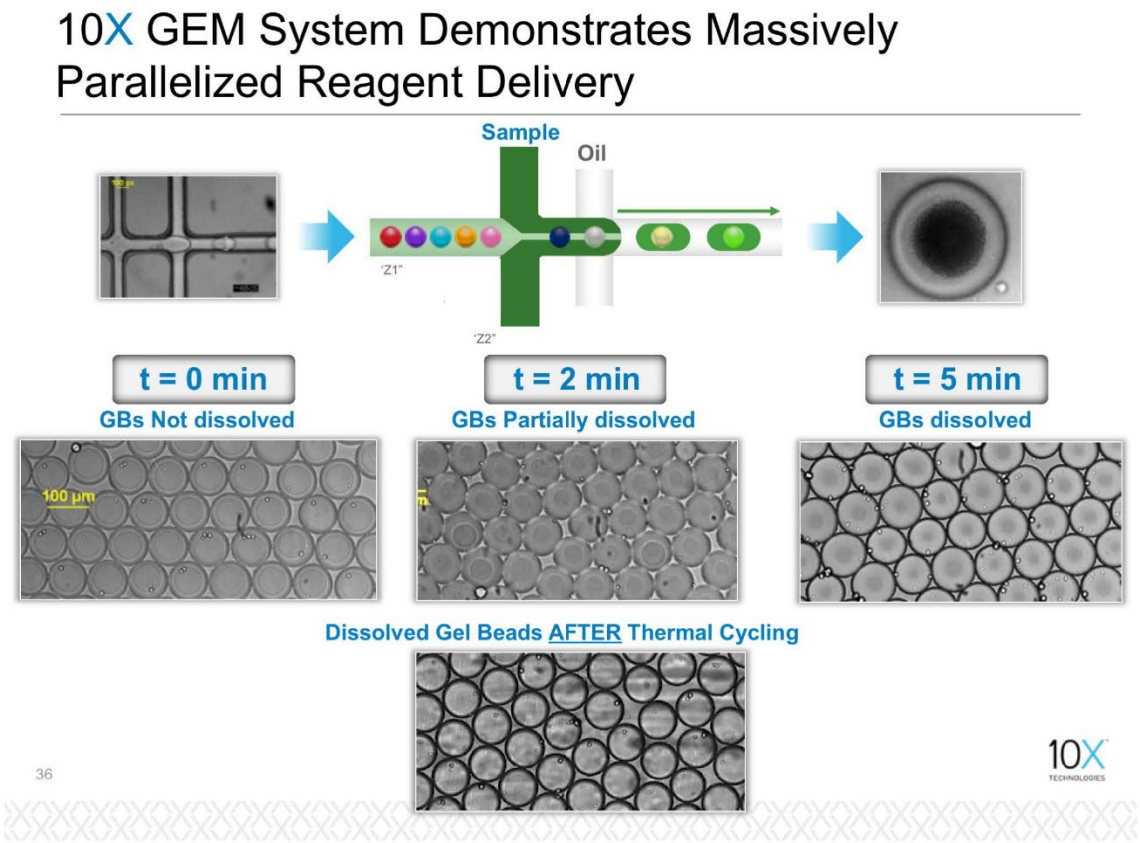
10X's counter-evidence establishes two main points in support of its position. First, it establishes that, if used according to 10X's recommendations, 17,000 cells are loaded into each of eight reaction lanes on a 10X chip, which results in recovery of about 8,000 droplets each with one gel bead and one cell. *See* CX-0004C at Q/A 570; CX-0481 at 15; *see also* 10X Reply at 50 (citing same). Because a typical run of droplet formation lasts approximately 6.5 minutes, more than 1,000 droplets are generated just in the last minute of the droplet formation process. *See* CX-0481 at 13, 23 (describing ~6.5 minute run time); 10X Reply at 51–52 ("Taking the example described above of loading a small number of cells per channel to generate 8,000 good droplets over a six

(c). *See* 10X Reply at 39; OUII Resp. to Qs. at 24, 24 n.12; OUII Reply at 19 n.14; Bio-Rad Resp. to Qs. at 54 n.9; Bio-Rad Reply at 48–50. The parties fail to acknowledge that the Commission enjoys *sua sponte* authority to review any aspect of an ID. *See* 19 C.F.R. § 210.44. Here, where the evidence cited by the ID does not support the ID's finding, such *sua sponte* review is appropriate.

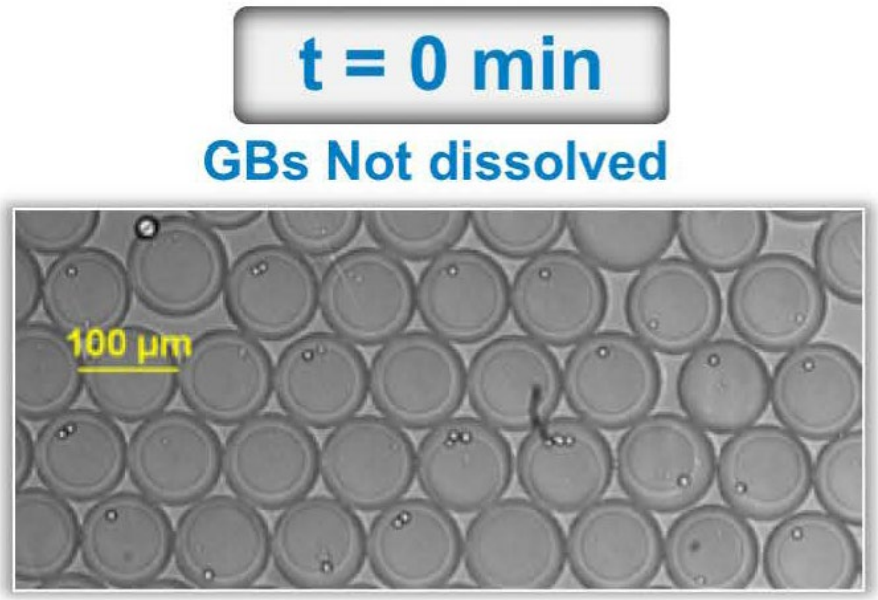
minute run (*see* CX-0477.00002) means that at least 1,000 good droplets are generated in the last minute alone of droplet formation." (footnote omitted)). The crucial question then is whether those droplets generated in the last minute still contain gel beads with attached barcodes. If they do, then the release of those barcodes will satisfy the "wherein" clause of step (c) of the claimed method. If, however, the gel beads dissolve instantaneously as each droplet is formed, the "wherein" clause of step (c) would not be satisfied because, per the construction of this claim, step (c) must occur after at least 1,000 droplets have been generated in step (b).[13]

The second point established by 10X's counter-evidence addresses that crucial question. The evidence shows that the gel beads in 10X's domestic industry products are only partially dissolved two (2) minutes after droplet formation. *See* CX-0076C at 36; CX-0116C at 27; *see also* 10X Reply at 52 (citing same). The following slide, which appears in two of 10X's investment presentations admitted into evidence, is illustrative:

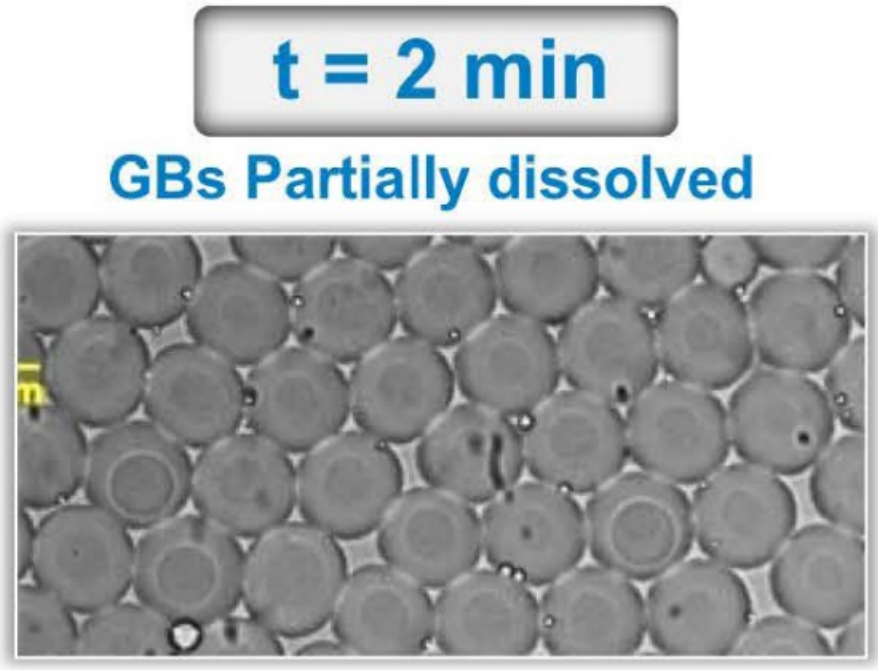
[13] The claim requires that a generated droplet must contain within it both a single gel bead with barcodes attached and a single cell made up of polynucleotide molecules. *See* '530 patent at cl. 1 (steps (a) and (b)). Inside the droplet, barcodes are released from the gel bead and then combine with the polynucleotide molecules to form barcoded polynucleotide molecules. *See id.* (step (c)). There is no dispute that all of this occurs in each droplet generated in the domestic industry products. *See, e.g.*, Bio-Rad Pet. at 63 (acknowledging formation of barcoded polynucleotide molecules in droplets in the domestic industry products). The dispute between the parties is over the timing of this process. *See, e.g.*, *id.* at 63–65.



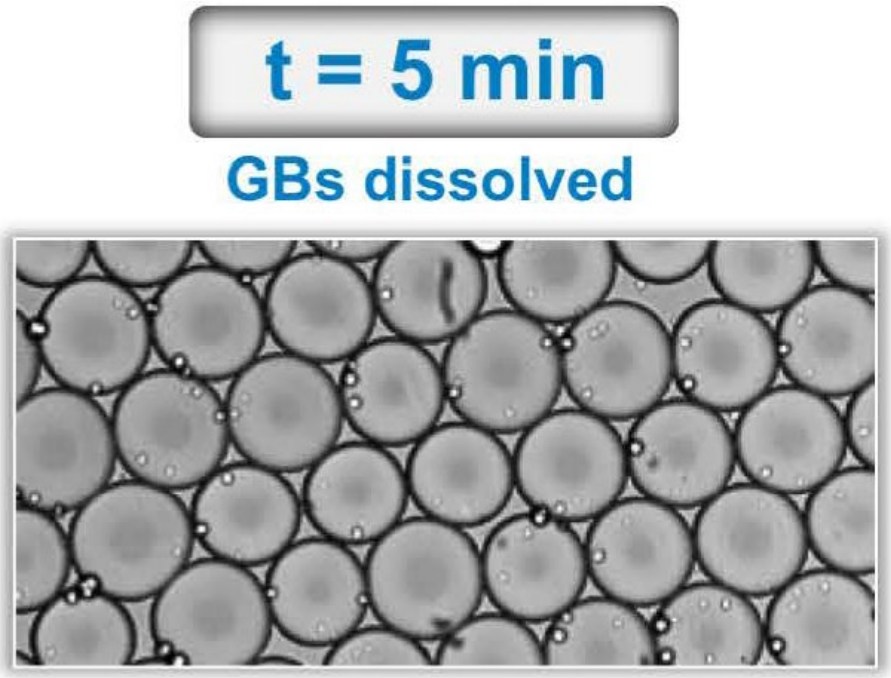
CX-0076C at 36; *see also* CX-0116C at 27 (same image in black and white). The image on the left of the middle row shows that immediately after droplet formation (t=0 min), the gel beads inside the droplet have a defined, circular boundary:



Id.; *see also id.* at 23 (illustrating components of droplet containing a gel bead). At two (2) minutes after droplet formation (t=2 min), the image in the center of the middle row shows gel beads with a blurred boundary, which are described as "partially dissolved":



See CX-0076C at 36. And, at five (5) minutes after droplet formation (t=5 min), the image on the right of the middle row shows droplets with no visible boundary around a gel bead, which are described as "dissolved":



See id. Accordingly, the Commission agrees that "whatever 'immediately' means in 10X's promotional literature, it does not mean that [redacted] dissolves the gel beads so fast that fewer than 1,000 of them still have barcodes attached after the completion of droplet formation." 10X Reply at 52.

The Commission also agrees that this evidence adequately addresses OUII's and Bio-Rad's argument that the use of the word "immediately" in 10X's promotional material means that all barcodes were released instantaneously after droplet formation. 10X's evidence is also consistent with the testimony of Dr. Schnall-Levin, who testified on cross-examination that the gel bead does not disappear instantaneously after droplet formation:

Q. When you take the first droplet, the cell and bead disappear immediately; right?

A. No, I don't think so.

Tr. at 224:18–23. Accordingly, the Commission has determined to affirm under modified reasoning the ID's finding that 10X satisfied the domestic industry requirement with respect to the '530 patent.

C. Infringement of Dependent Claim 26

Dependent claim 26 requires that the gel beads have at least 1,000,000 barcode molecules. '530 patent at cl. 26 ("26. The method of claim 1, wherein said at least 1,000 barcode molecules are at least 1,000,000 barcode molecules."). The ID found that "the WTA 3' v1, [redacted] and scATAC-seq assays infringe claim 26." ID at 105.

10X and OUII both petitioned for review of the ID's finding that dependent claim 26 of the '530 patent is infringed by the accused products. *See* 10X Pet. at 19; OUII Pet. at 17. Particularly, both argued that the ID inadvertently omitted the [redacted] from the list of infringing assays for claim 26. *See* 10X Pet. at 19; OUII Pet. at 17. Bio-Rad did not dispute 10X and OUII's position in its response to their petitions for review. *See generally* Bio-Rad Resp. to Pets.

Upon review of the ID, we agree with 10X and OUII that the omission of the [redacted] in the portion of the ID listing the assays that infringe dependent claim 26 of the '530 patent is the result of a clerical error and should be corrected. *Cf.* ID at 105. Where the ID excluded an assay from its infringement findings, it did so explicitly and with an explanation, as in the case of claim 4. *See id.* at 103. However, in the ID's analysis of claim 26, there is no discussion of the [redacted] specifically. *See id.* at 105. Moreover, the record shows that 10X timely submitted evidence to establish infringement of claim 26 with respect to all four assays. CX-

0004C at Q/A 554–556. Accordingly, the Commission has determined to modify the ID's findings to include the [redacted] among the assays that infringe claim 26.

D. Contributory Infringement

OUII petitioned for review of the ID's finding that "10X has failed to show that using the scATAC-seq assay with isolated nuclei is not a substantial non-infringing use of the ddSEQ vl products," ID at 112, which defeated 10X's allegations of contributory infringement with respect to the '530 patent. *See* OUII Pet. at 17–18. In OUII's view, the finding should be reversed because "as of the time of the hearing, the record evidence showed a lack of substantial, non-infringing uses for the ddSEQ v1 products under the '530 patent." *Id.* at 18. OUII noted, however, that even if the ID's finding was reversed, the ID's ultimate finding of violation would not be affected because the ID found that Bio-Rad induced infringement of the '530 patent. 10X summarily joined OUII on this issue in its response to OUII's petition for review. *See* 10X Resp. to OUII Pet. at 7. Bio-Rad did not respond to OUII's petition on this issue. *See generally* Bio-Rad Resp. to Pets.

The Commission has determined to take no position on whether 10X has established contributory infringement with respect to the '530 patent. The Commission affirms the remainder of the ID's findings with respect to indirect infringement of the '530 patent, including specifically its finding that Bio-Rad induced infringement of the '530 patent.

E. Indefiniteness

The Commission asked the parties to brief whether "any party argue[d] in its pre- or post-hearing briefing that the ALJ's construction of claim 1 of the '530 patent, as laid out in orders 22 and 35, was indefinite." Notice at 4. No party contended in response that indefiniteness was briefed in either pre- or post-hearing briefing. Bio-Rad and OUII, nonetheless, argued that Bio-Rad's indefiniteness argument is not waived. Notably, Bio-Rad and OUII adopted different rationales for why waiver does not apply.

OUII pointed back to Bio-Rad's briefing during the *Markman* stage of the hearing, where Bio-Rad argued that claim 1 of the '530 patent was indefinite. *See* OUII Resp. to Qs. at 26. The *Markman* order rejected that indefiniteness argument on the basis that Bio-Rad had conflated breadth with indefiniteness. *See* Order No. No. 22 at 46. OUII submitted that because the "*Markman* Order rejected Bio-Rad's indefiniteness arguments in view of the 'clear and readily understood' meaning of the disputed terms," it also "implicitly h[eld] that the Order's own construction did not render the claim indefinite." *Id.* OUII further submitted that an instruction in the *Markman* order directing the parties' subsequent briefing to apply the *Markman* order's constructions "presumably limit[ed] the parties to challenging the ordered constructions in petitions for review." *Id.* (citing Order No. 22 at 52 ("Hereafter, discovery and briefing in this Investigation shall be governed by the construction of the claim terms in this Order.").

Bio-Rad did not point to its *Markman* stage indefiniteness argument to avoid waiver. Instead, Bio-Rad argued it was precluded from raising its indefiniteness argument by the timing of Order Nos. 22 and 35. Bio-Rad Resp. to Qs. at 70–71. Expanding on that idea, Bio-Rad explained that it "believed that, as a result of the limitations imposed on the claimed method in the *Markman* Order, in particular, the requirement that step (b) of the method be completed in all 1,000 droplets before step (c) was performed on any of the droplets, a requirement the judge identified in finding the claim definite, it no longer had a basis to argue indefiniteness in its Prehearing Brief, as it had previously argued during claim construction." *Id.* at 71. Bio-Rad appears to have argued though that Order No. 35, which clarified the construction of claim 1 given in the *Markman* Order, either gave rise to a new basis for arguing indefiniteness or revived its prior basis. *See id.* at 72. Bio-Rad's briefing also suggested that the language of the *Markman* Order directing the parties to

apply the constructions therein precluded it from raising its indefiniteness arguments. Bio-Rad Reply at 53.

On review, the Commission has determined that the indefiniteness challenge raised by Bio-Rad in its petition for review is new, could have been presented before the ALJ, was not presented before the ALJ, and therefore is waived. *See* Ground Rule 11.1.

If OUII were correct that Bio-Rad's indefiniteness arguments before the ALJ during the *Markman* phase of the investigation preserved the indefiniteness arguments in its petition, Bio-Rad would, presumably, be limited to challenging the *Markman* Order's resolution of Bio-Rad's indefiniteness argument. Bio-Rad's petition is, however, silent on the reasoning given in the *Markman* Order rejecting Bio-Rad's indefiniteness argument at the time. *See* Bio-Rad Pet. at 48–55. The *Markman* order explained that:

> Bio-Rad asserts that the terms "providing," "plurality of cells," and "at least 1,000 droplets" render the claim indefinite because the claim "calls for the generation of 1,000 droplets containing specific material but does not describe how or under what circumstances those droplets are formed." RRB at 23. In making this argument, Bio-Rad confuses breadth with indefiniteness. Breadth does not render a claim indefinite. *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1367 (Fed. Cir. 2017 ("[B]readth is not indefiniteness.") (quoting *SmithKline Beecham Corp. v. Apotex Corp.*, 403 F.3d 1331, 1341 (Fed. Cir. 2005)) (internal quotation marks omitted); Manual of Patent Examining Procedure § 2173.02 ("A broad claim is not indefinite merely because it encompasses a wide scope of subject matter provided the scope is clearly defined"). Standing alone and in the context of the claim, the claim terms identified by Bio-Rad are clear and readily understood "even to lay judges." *Phillips*, 415 F.3d at 1314. Based on the foregoing, I find that Bio-Rad has not shown that claim 1 is indefinite.

Order No. 22 at 46. Bio-Rad's petition did not address the *Markman* Order's conclusion that Bio-Rad mistook breadth for indefiniteness. Instead, Bio-Rad's petition argued that "[t]he ID construction renders the claim indefinite both because it permits aggregation of multiple runs and because it eliminates the requirement that the method steps be performed in a specific order." Bio-Rad Pet. at 48. Moreover, Bio-Rad's petition made clear that the indefiniteness argument raised

therein is based on the construction applied in the ID, which, in Bio-Rad's view, is consistent with the clarified construction of Order No. 35, but not with the construction in the *Markman* Order. *See* Bio-Rad Pet. at 48 ("*The ID construction renders the claim indefinite* both because it permits aggregation of multiple runs and because it eliminates the requirement that the method steps be performed in a specific order." (emphasis added)). Bio-Rad's focus on the clarified construction of Order No. 35 suggests that Bio-Rad itself does not view its *Markman* indefiniteness argument and its petition indefiniteness argument as one and the same. Moreover, Bio-Rad's focus on the timing of Order No. 35, *i.e.*, that it was issued after Bio-Rad submitted its prehearing brief, as a reason it could not raise its indefiniteness argument at the hearing or in post-hearing briefing further supports the conclusion that the indefiniteness argument in the petition is distinct from the one raised before the ALJ. If not, the timing of Order No. 35 would be irrelevant, as Bio-Rad would have already had the opportunity to raise its indefiniteness argument during the *Markman* proceeding. Put differently, by arguing unfairness in the timing of Order No. 35 to support raising indefiniteness on review, Bio-Rad effectively undercut any argument that its petition's indefiniteness argument was preserved by its *Markman* indefiniteness argument.

Moreover, the indefiniteness argument in Bio-Rad's petition included new arguments that it did not raise in its *Markman* briefing. During the *Markman* process, Bio-Rad relied exclusively on the fact that the claims did not specify whether the droplets had to be generated in a single experiment or in multiple experiments. Bio-Rad Opening Markman Br. at 31 ("Nothing in the intrinsic evidence clarifies how or when the claimed 1,000 droplets each containing a gel bead and a cell should be generated. For example, the droplets could be generated in one experiment or in multiple experiments."). By contrast, the indefiniteness argument in Bio-Rad's petition is based on the theories that "numerical limitations in method claims must be met in each run of the method,

and cannot be met through aggregation of multiple runs," Bio-Rad Pet. at 48, and "[i]f the '530 Patent encompasses a continuous process, the '530 Patent is indefinite because the plain language of the claims does not inform a person of skill in the art with reasonable certainty about the scope of the claimed method." *Id.* at 54–55. Even assuming that the multiple experiment argument of the *Markman* brief and the aggregation argument of the petition are the same — an assumption which is not clearly justified — the continuous-process argument is still a new theory of indefiniteness that was never presented to the ALJ.

In a similar vein, the indefiniteness argument in Bio-Rad's petition relies on new evidence that was never presented to the ALJ in connection with indefiniteness. Particularly, Bio-Rad relies on deposition testimony from one of the inventors of the '530 patent and a 10X executive (Dr. Michael Schnall-Levin) to support its petition's indefiniteness argument. *See* Bio-Rad Pet. at 52. Bio-Rad did not rely on testimony from Dr. Schnall-Levin in its *Markman* briefing.

At bottom, the indefiniteness argument raised in Bio-Rad's petition is a new argument that was never raised before the ALJ. The Commission does not agree with OUII that the instruction in Order No. 22 requiring the parties to apply the constructions therein precluded the parties from asserting the indefiniteness of those claims as construed. A more reasonable reading of that statement is that the parties should not present multiple analyses based on different claim constructions going forward in the case.

Bio-Rad's argument that it has not waived its petition's indefiniteness arguments because the timing of Order No. 35 prevented it from raising the argument at the hearing or in its briefing is not persuasive. First, the argument is premised on Bio-Rad's belief that Order No. 35 reversed the construction of claim 1 given in Order No. 22. The Commission does not agree, however, that the two orders are inconsistent with each other. Rather, Bio-Rad interpreted Order No. 22 in a

way that was not correct — it interpreted the order such that any barcoding that occurred prior to the completion of droplet formation would defeat infringement — and Order No. 35 pointed out as much in denying Bio-Rad's motion for summary determination of no infringement. Bio-Rad's misinterpretation of Order No. 22 cannot be a reason to excuse its failure to argue indefiniteness before the ALJ.

However, even if Order No. 35 *had* materially altered the construction of claim 1 of the '530 patent, Bio-Rad's late indefiniteness argument would still be waived. This is because Bio-Rad could have sought relief from the ALJ, but did not. For example, Bio-Rad could have asked the ALJ for leave to amend its prehearing filings on the basis that Order No. 35 provided a new construction that it could not possibly have addressed in those filings. But Bio-Rad did not seek such leave. Instead, it waited until after the ID issued to argue that the clarification given in Order No. 35 rendered claim 1 indefinite. That course of action prevented 10X and OUII from developing testimony or introducing evidence to rebut that argument, and prevented the ALJ from considering the argument. While Bio-Rad argues repeatedly that it was "denied the opportunity" to argue that the ALJ's construction of claim 1 was indefinite, there is no support for that statement. Bio-Rad Reply at 53. Particularly, it is not clear why Order No. 22's statement that "[h]ereafter, discovery and briefing in this Investigation shall be governed by the construction of the claim terms in this Order," would preclude Bio-Rad from arguing that claim 1 was indefinite. If Bio-Rad had sought leave to raise its indefiniteness argument at the hearing after receiving Order No. 35, and if the ALJ denied that request, Bio-Rad would be on much stronger ground to argue that it was not permitted to make its indefiniteness argument. That is not what happened though. Bio-Rad simply did not argue that claim 1 as construed was indefinite until after the ID issued. That is waiver.

In the alternative, even if there were no waiver, Bio-Rad has not shown by clear and convincing evidence that claim 1 of the '530 patent is indefinite. *See BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1365 (Fed. Cir. 2017) (explaining that the defendant has "the burden of proving indefiniteness by clear and convincing evidence."). Concerning the argument it made at the *Markman* phase of the investigation, the Commission agrees with the ALJ's reasoning in Order No. 22 that Bio-Rad's arguments conflated broad claims with indefinite ones. The fact that the claim does not limit droplet generation to one particular mode, *i.e.*, in a single experiment, or from a single sample, or in one run, etc., simply means the claim is broad and all of those modes are covered. Bio-Rad cannot manufacture uncertainty in the claim by arguing that only one mode can be claimed and then arguing that the claims fail to specify the particular mode.

Bio-Rad's petition-stage indefiniteness argument fails for multiple reasons. First, the argument is based on Bio-Rad's continued misinterpretation of the ID's construction of the claim. Bio-Rad argued that the ID's construction of claim 1 allows aggregation of multiple runs to meet the numerical limitations therein. Explaining that assertion, Bio-Rad argued that because its chips each have four lanes, processing droplets on one chip is actually four different experimental runs. Because the ID found that a chip generates approximately 1,200 droplets, Bio-Rad argued that the ID relied on the aggregation of four different runs that each generate about 300 droplets to find infringement. *See* Bio-Rad Pet. at 49. Bio-Rad relies on *Applera Corp. v. Illumina, Inc*., 375 Fed. App'x. 12, 20-21 (Fed. Cir. 2010), and *In re Varma*, 816 F.3d 1352, 1362–64 (Fed. Cir. 2016), for the proposition that aggregation is not permitted.

The Commission disagrees with Bio-Rad's aggregation argument because nothing in the claim indicates that the method must be confined to a single lane on a chip. *See* '530 patent at cl. 1. To the contrary, the specification clearly contemplates that different machinery used together

can practice the invention. *See* '530 patent at 10:1–18 (describing use of a device with microwell chambers to practice the method). Further, the concerns animating *In re Varma* and *Applera* are not present here. The portion of *In re Varma* relied on by Bio-Rad simply stands for the proposition that where a claim recites an object that performs two functions, the claim is not practiced by two objects that each perform one of the functions. *In re Varma*, 816 F.3d at 1363 ("For a dog owner to have 'a dog that rolls over and fetches sticks,' it does not suffice that he have two dogs, each able to perform just one of the tasks."). That issue is not present here where the claims do not include a requirement that a single lane on the chip generate at least 1,000 droplets.

Applera is no more on point. There, the claim at issue, in simple terms, covered a three-step process where the third step was to repeat the first two. *Applera*, 375 Fed. App'x at 20. The patentee advanced a construction that would allow one to skip the second step of the process for some repetitions of the process. The Federal Circuit agreed with the district court that such a construction was incorrect because it abrogated the second step of the process. *Id.* at 20–21. Thus, neither *Applera* nor *In re Varma* stand for a broad prohibition on aggregation as Bio-Rad contends. The Commission further notes that neither of those cases addresses indefiniteness based on aggregation.

Separate from *Applera* and *In re Varma*, Bio-Rad argued that if aggregation is permitted, claim 1 is indefinite because "there is no starting point and no endpoint that defines any particular method cycle" and "[a]ny number of droplets containing a single bead and a single cell, with reagents for barcoding, can be generated at any time over the course of any number of runs, on any number of independent droplet generators." Bio-Rad Pet. at 50. Bio-Rad then argued that "[a]s long as, at some point, it is determined that at least 1,000 productive droplets were generated where barcoding occurred, the limitations of the claim are met," and submits that such a claim is

in conflict with *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014). Bio-Rad relied on *Dow Chemical Co. v. Nova Chemicals Corp*., 803 F.3d 620 (Fed. Cir. 2015), and *Icon Health & Fitness, Inc. v. Polar Electric Oy*, 656 Fed. Appx. 1008 (Fed. Cir. 2016), as analogous situations where indefiniteness was found. Bio-Rad at 50. Bio-Rad also argued that deposition testimony from 10X's expert and an inventor of the '530 patent indicates that claim 1 has no objective boundaries. Bio-Rad Pet. at 51.

First, Bio-Rad's assertions that claim 1 has no starting point or end point under the ID's constructions are baseless. Claim 1 has three steps: (a) a "providing" step in which raw materials are provided; (b) a "generating" step in which those raw materials are used to generate droplets; and (c) a barcoding step where barcoded polynucleotides are generated in at least 1,000 droplets. '530 patent at claim 1. The claimed method starts at the providing step and ends after barcoding has occurred in at least 1,000 droplets. *Id.* Bio-Rad's argument attempts to manufacture uncertainty in an otherwise straightforward three-step claim by focusing on limitations that are not present in the claim — for example, that droplets must be generated in a single "run," or that they must be generated only in a single droplet generator, or only in droplet generators that are not independent. *Cf.* Bio-Rad Pet. 50. Bio-Rad's indefiniteness argument is not directed at claim 1 of the '530 patent; it is directed at a claim of its own making, *i.e.*, a strawman.

The cases Bio-Rad relies on bear little resemblance to the facts in this investigation and are of little relevance. *Dow* dealt with the claim phrase "slope of strain hardening coefficient greater than or equal to 1.3," which the facts in that case showed could be calculated four different ways — each with different results. *Dow Chemical Co.*, 803 F.3d at 631–634. This investigation does not present that scenario, nor even an analogous scenario. *Icon Fitness* found a claim indefinite where the evidence of record showed that the terms "in-band" and "out-of-band" were relative

terms that only have meaning in the context of a defined reference. *Icon Health & Fitness, Inc.*, 656 Fed. App'x at 1016. Here again, that scenario is not presented in this investigation. And, with respect to *Nautilus*, a case that dealt with the meaning of the phrase "spaced relationship" in exercise equipment, *see Nautilus*, 572 U.S. at 903–906, but which is legally significant for striking down the Federal Circuit's prior formulations of the test for indefiniteness, *see id.* at 901, Bio-Rad relies on the case for broad assertions unrelated to the facts of *Nautilus*. This includes the assertion that "the fact that the ALJ issued and applied two conflicting constructions over the course of the investigation supports the indefiniteness of the '530 Patent claims," Bio-Rad Pet. at 38–39 (citing *Nautilus*), and that open ended claims "violate[] the strictures of *Nautilus*," *id.* at 50. Yet, Bio-Rad's reliance on *Nautilus* is little more than a collection of unsupported assertions that the ID's construction of claim 1 somehow conflicts with the reasonable certainty standard for indefiniteness laid out in *Nautilus.* Merely identifying the case that lays out the standard for indefiniteness and then asserting that the standard is met, or not met, is not clear and convincing evidence of invalidity, which is what is required.

The expert testimony Bio-Rad relies on does not meet its burden either. *See* Bio-Rad Pet. at 51. The citations from the transcript of Dr. Butte's deposition show the attorney and Dr. Butte having a lengthy discussion about what is and is not a "common process," with Dr. Butte giving, admittedly, widely varying answers. *See* JX-157 at 123:13–137:3. Bio-Rad relied on this testimony to argue that whether aggregation is permitted depends on the vagaries of a person's opinion, thus rendering claim 1 indefinite. *See* Bio-Rad Pet. at 51–52. This entire line of reasoning is tainted however by the fact that, again, there is no limitation in the claim requiring droplet generation to occur on a single machine, in a single experiment, as part of a single "run," from a single "sample," or as part of a "common process." *See generally* '530 patent at cl. 1. An expert's

extrinsic testimony on a limitation that is not present in the claims is not probative evidence of indefiniteness. For that reason, we also find Bio-Rad's reliance on *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014), which found the term "unobtrusive manner" depended on a person's subjective opinion and therefore rendered the claim in which it appeared indefinite, to be inapposite. *See* Bio-Rad Pet. at 51–52. *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1345 (Fed. Cir. 2015), which Bio-Rad also relies on in connection with Dr. Butte's testimony, is also unhelpful as the indefiniteness issue in *Teva* is essentially identical to the one in *Dow*. *See* Bio-Rad Pet. at 52.

Bio-Rad's reliance on Dr. Schnall-Levin's deposition testimony is no more probative. *See id.* (citing RX-413C at 285:19–24). Bio-Rad asked Dr. Schnall-Levin if the patent provided directions of how many cells to run per chip in claim 1, and Dr. Schnall-Levin answered that there were no instructions on cells per chip. *See id.* This testimony does not show that a person of ordinary skill in the art would not understand the boundaries of the three-step process laid out in claim 1 of the '530 patent. It simply shows that Bio-Rad can concoct a limitation that is not present in the claim, ask if the patent describes that limitation, and then get an answer in the negative. This is manufactured uncertainty — not indefiniteness.

As to Bio-Rad's continuous-process indefiniteness argument, Bio-Rad Pet. at 53–55, the argument fails because it is based on a faulty premise: that the ID's construction does not require the steps to be performed in order. *Id.* at 54. That is not the case. The ID, as well as Order Nos. 35 and 22, all require step (b) to be completed before step (c). Thus, the ID does not permit an assembly-line style process where step (c) is completed on a droplet as soon as it is generated in step (b). Bio-Rad, however, appears to mean something different when it refers to performing the steps of the claim in order. In Bio-Rad's view, no barcoding can occur in any droplet before at

least 1,000 droplets are generated in step (b). This is something more than simply requiring the steps be performed in order. What Bio-Rad seeks is to include a new negative limitation in claim 1 that excludes any barcoding from occurring before at least 1,000 droplets have been generated. This was the issue that was clarified in Order No. 35, and the basis of Bio-Rad's unsuccessful motion for summary determination of noninfringement.

Claim 1, however, is an open-ended claim, and thus other non-recited activity may occur that will not defeat infringement. Here, as 1,000 droplets are generated in step (b), there may be some barcoding happening as soon as each droplet is generated. This will not preclude the process from reading on step (c) though if, after 1,000 droplets are generated, barcodes are released in those droplets and a plurality of polynucleotides are barcoded. The fact that barcoding of other polynucleotides also happened before 1,000 droplets were generated is irrelevant. Bio-Rad incorrectly characterizes the ALJ's observation to that effect as permitting a continuous process. The ALJ correctly determined that extraneous unrecited activity will not defeat infringement of a claim drafted in open language.

Finally, we note that Bio-Rad offers no real reasoning why construing claim 1 to encompass a continuous process would render it indefinite. Bio-Rad simply parrots the reasonable certainty language of *Nautilus*. Bio-Rad Pet. at 54–55.

For all these reasons, the Commission finds that Bio-Rad waived the indefiniteness arguments raised in its petition for review, but even if not waived, those arguments and the evidence presented therein would fail to establish that claim 1 is indefinite by clear and convincing evidence.

VII. INVENTORSHIP

The Commission determined to review the ID's findings with respect to Bio-Rad's inventorship defense. *See* Notice at 2. On review, the Commission has determined to take no

position on whether Dr. Heredia should have been named as a joint inventor of the '204 patent. The Commission affirms the ID's findings with respect to Bio-Rad's inventorship defense for the other three patents. Because the Commission has affirmed the ID's finding of noninfringement with respect to the '204 patent, the Commission's determination to take no position on Bio-Rad's inventorship defense with respect to the '204 patent does not affect the ID's ultimate finding of no violation with respect to the '204 patent.

VIII. OWNERSHIP

The ID rejected Bio-Rad's claim that it had an ownership interest in each of the asserted patents based on work done by Drs. Hindson and Saxonov during their time at QuantaLife/Bio-Rad. *See* ID at 136–152. The ID began by explaining that inventorship and ownership are distinct issues, and that while federal patent law governs inventorship, ownership is a question of state contract law. *Id.* at 136–141. The ID noted with disapproval that the parties conflated the two issues in their briefing. *See id.* at 141. The ID went on to explain that the crux of the dispute with respect to Bio-Rad's ownership defense involves defining the "inventive concept" in the asserted patents. *See id.* The ID rejected Bio-Rad's approach to that issue, explaining that Bio-Rad "briefed the matter as if it owned a share of the patents because it could trace some elements of the asserted patents to work done at Quanta/Life and Bio-Rad." *Id.* The ID explained that while Bio-Rad "owns many ideas conceived by Drs. Hindson and Saxonov, [] it does not own the idea for the specific arrangement of elements claimed in the asserted patents . . . because there is insufficient evidence that that idea was conceived-during the period of employment." *Id.* at 142.

Concerning the pertinent contract language, the ID noted that "[n]o provision of any of the applicable contracts governs future inventions that are based on or developed from work done during employment." *Id.* at 144. Based on this observation, the ID found Bio-Rad's interpretation of the contract to be unreasonable because it "read out the plain meaning of the durational

limitation in the pertinent contracts, and in its place suggest[ed] an interpretation of the contracts in which inventions developed by the employee after his employment belong to the company if they are related to ideas conceived during employment." *Id.* at 145. The ID went on to reject Bio-Rad's theory that it is entitled to a pro-rata undivided co-ownership interest in the asserted patents based on Drs. Hindson and Saxonov's discovery of ideas that are related to the invention in the asserted patents, as opposed to their actual discovery of the invention. *See id.*

The ID next considered whether Bio-Rad had presented evidence showing that the inventive idea embodied in the asserted patents was conceived at QuantaLife/Bio-Rad. The ID concluded that Bio-Rad presented no direct evidence of such conception. *See id.* As for circumstantial evidence, the ID determined that the relatively short time between when Drs. Hindson and Saxonov left Bio-Rad and when they filed their first provisional patent application did not, on its own, establish conception by Drs. Hindson and Saxonov at Bio-Rad. *Id.* at 146.[14] The ID also rejected several challenges to Dr. Hindson's credibility. *Id.* at 147–48.

Next, the ID rejected Bio-Rad's argument that certain concepts disclosed by Drs. Hindson and Saxonov at Bio-Rad can be traced to the asserted patents such that conception at Bio-Rad should be implied. *Id.* at 149. In rejecting this argument, the ID credited testimony from Dr. Saxonov that the ideas formed at Bio-Rad were only directions for further research, as opposed to ideas that would work. *See id.* at 149–150. The ID also rejected a similar argument based on the '059 patent's disclosure of certain numerical ranges, *see id.* at 150, and based on lab notebooks offered by 10X. *See id.* at 150–51. The ID concluded as follows: "In sum, the evidence before me is insufficient to permit the conclusion that, more likely than not, the work Drs. Hindson and

[14] The ID noted that Drs. Hindson and Saxonov left Bio-Rad in April 2012 and founded 10X several months later. ID at 146. In August 2012, Drs. Hindson and Saxonov filed their first provisional patent application at 10X. *Id.*

Saxonov did at QuantaLife and Bio-Rad led them to conceive the idea described in the 10X patents while they were still under contract." *Id.* at 151. Accordingly, the ID found that Bio-Rad "failed to establish ownership of the asserted patents." *Id.*

The ownership dispute in this investigation revolves around Drs. Hindson and Saxonov's employment contracts with QuantaLife and Bio-Rad. The relevant portions of the QuantaLife contracts contain identical language, as follows:

[redacted]

RX-0623C (Hindson-QuantaLife contract) at ¶ 2; RX-0624C (Saxonov-QuantaLife contract) at ¶ 2; *see also* ID at 143–44 (quoting same). The relevant portions of the Bio-Rad contracts also contain identical language, as follows:

[redacted]

[redacted]

RX-0619C (Hindson-Bio-Rad employment agreement) at ¶¶ 3, 6; RX-0620C (Saxonov-Bio-Rad employment agreement) at ¶¶ 3, 6; *see also* ID at 144 (quoting same).

The Commission finds that Bio-Rad has failed to show that the "ideas" developed by Drs. Hindson and Saxonov at QuantaLife/Bio-Rad would entitle them to an ownership interest in the asserted patents. This follows for several reasons. First, in its response to the Commission's questions, Bio-Rad only attempted to map the ideas developed at QuantaLife/Bio-Rad onto a single claim: claim 1 of the '468 patent. *See* Bio-Rad Resp. to Qs. at 4–12. Bio-Rad summarily asserted that the "'468 Patent is representative of the claims of the four 10X Patents," *id.* at 5, but did not attempt to show a direct correspondence between the "ideas" developed at QuantaLife/Bio-Rad and the particular limitations of any claim of the '024, '204, and '530 patents.[15] Instead, Bio-Rad argued that all four asserted patents have the same "fundamental architecture," and thus its mapping of ideas onto the limitations of claim 1 of the '468 patent should entitle it to an ownership interest in the other asserted patents as well. *See id.* at 12–14. Thus, at best, Bio-Rad's showing of ownership under its theory would be limited to the '468 patent.

Second, Bio-Rad was only able to map the "ideas" it relies on to claim 1 of the '468 patent because it substituted generic descriptions in place of the specific limitations of that claim. For example, Bio-Rad argued that Dr. Hindson "came up with ideas at QuantaLife about [redacted]

[15] Among other "ideas," Bio-Rad argued that Drs. Hindson and Saxonov conceived of the idea to use porous gel beads as a reagent delivery system while at QuantaLife. *See* Bio-Rad Resp. to Qs. at 10. However, Order No. 43 precluded Bio-Rad from arguing that the idea for porous gel beads was conceived at QuantaLife/Bio-Rad. Bio-Rad did not petition for review of that order, nor has the Commission determined to review that order *sua sponte*. Accordingly, Bio-Rad may not now argue that it is entitled to an ownership interest in the asserted patents because the idea of using porous gel beads was developed at QuantaLife.

[redacted] and that "[t]he use of droplets to partition sample (and achieve a single cell per partition) is fundamental to claim 1 of the '468 Patent." Bio-Rad Resp. to Qs. at 5. But claim 1 of the '468 patent recites a method for droplet generation with three steps, each of which has a number of specific internal limitations; it does not broadly claim the use of droplets to partition a sample. *See* '468 patent at cl. 1. That disconnect undercuts Bio-Rad's theory of ownership based on Drs. Hindson and Saxonov's prior "ideas."

In the same vein, the Commission also notes that the "ideas" Bio-Rad identified relate to different architectures and applications than those central to the asserted patents. *See* CX-0001C (Hindson WS) at Q/A 79–107 (discussing 10X's development of its GEMs and their attributes); *see also* ID at 142 ("the inventive idea is a specific arrangement of elements which, when combined, works to achieve a desired goal."). This follows from the fact that the "ideas" relied on by Bio-Rad were developed in connection with the droplet-in-droplet architecture described in the '059 patent. *See, e.g.*, Bio-Rad Pet. at 84, 87 (citing lab notebook (RX-127C at 95, 97) and [redacted], to support ownership claim based on "ideas" developed at QuantaLife). The asserted patents, however, do not use a droplet-in-droplet approach, as the '059 patent did (Dr. Saxonov is the named inventor of the '059 patent, and he assigned the patent to Bio-Rad). *See* Tr. (Metzker) at 656–657; CX-1829C (Saxonov WS) at Q/A 28–32 (discussing the droplet-in-droplet concept for barcoding before sequencing and its disclosure in the '059 patent); CX-1827C (Dear WS) at Q/A 40. Rather, the asserted patents, in contrast, require features such as the release of the barcodes from the bead into the droplet in the '024 patent, a particular microfluidic arrangement for generating droplets with the beads in the '468 patent, and a large diversity of beads for use in

generating droplets with single cells in the '530 patent. *See* CX-1827C (Dear WS) at Q/A 40; *see also* ID at 33–40 (finding that the '024 patent was novel and not obvious vis-à-vis the '059 patent and Church (RX-0462)). As such, the asserted patents are based on a different architecture involving beads or capsules that release key reactants. *See* CX-1828C (Hindson WS) at Q/A 24–34 (describing how 10X invented its GEM architecture "from scratch . . . because there was no such architecture at QuantaLife."). Thus, the inventions claimed in the asserted patents are fundamentally different from the prior work conducted at QuantaLife/Bio-Rad.

Third, even under Bio-Rad's theory that it owns a share of the patents based on joint inventorship principles, *see, e.g.*, Bio-Rad Pet. at 77–80, Bio-Rad has not shown that the "ideas" it relies on to build its joint inventorship argument are distinct from the prior art. Indeed, many of these "ideas" are embodied in the '059 patent — a patent naming Dr. Saxonov as an inventor that *was* assigned to Bio-Rad because the underlying invention was developed during his employment at Bio-Rad — which make those ideas part of the prior art. *See* '059 patent (JX-0031) at 1:26–55. But merely explaining the prior art is not sufficient to render someone a joint inventor. *See Fina Oil & Chem. Co. v. Ewen*, 123 F.3d 1466, 1473 (Fed. Cir. 1997) ("[A] person will not be a co-inventor if he or she does no more than explain to the real inventors concepts that are well known and the current state of the art."). No part of Drs. Hindson and Saxonov's employment agreements preclude them from building on ideas in the prior art. Moreover, the existence of the '059 patent demonstrates that Bio-Rad received the benefit of its bargain with respect to the employment agreements. For the ideas that were conceived at QuantaLife or Bio-Rad, Dr. Saxonov did assign his rights. *See* '059 patent (JX-0031) at Cover ("Assignee: Bio-Rad Laboratories, Inc."). Bio-Rad overreaches insomuch as it now attempts to extend its rights to inventions conceived outside the term of Drs. Hindson and Saxonov's employment agreements. *Cf. Israel Bio-Eng'g Project v.*

Amgen, Inc., 475 F.3d 1256, 1267 (Fed. Cir. 2007) (in a case involving an Israeli contract, the Federal Circuit concluded that the plaintiff "was not entitled to further assignments of any other newly developed inventions, even when these inventions built on proprietary information developed during the [contractual] R & D process," which concluded in December 1987); *see also* ID at 148–49 n.29 (reasoning that if Hindson and Saxonov's prior, generic work [redacted] were sufficient to trigger ownership rights, "the contracts' [redacted] would be nullities."); *Dawson v. Dawson*, 710 F.3d 1347, 1353–56 (Fed. Cir. 2013) (concluding that, along with other evidence, a preliminary statement about a potential use was insufficient to establish that an inventor conceived the claimed invention while employed by his former employer). Accordingly, for the reasons provided above, the Commission finds that Bio-Rad has failed to show that the "ideas" Bio-Rad relies on entitle it to an ownership interest in the asserted patent.

Concerning the ID's use of the phrase "inventive concept," the Commission notes that the phrase has some history in patent law and its use in the ID may invite confusion, as evidenced by Bio-Rad's brief. *See, e.g.,* Bio-Rad Ans. at 16 ("The ALJ's analysis was incorrect because it treated the ownership question as requiring proof of a singular eureka moment at a specific point in time when everything was finalized and established to work."). Particularly, "inventive concept" may imply similarity to the pre-1952 patent law's requirement for a "flash of genius," *compare Cuno Eng'g Corp. v. Automatic Devices Corp.*, 314 U.S. 84, 91 (1941) (requiring an invention to "reveal the flash of creative genius not merely the skill of the calling.") *with* Pub. L. 82-593, § 103, July 19, 1952, 66 Stat. 798 (Patent Act of 1952) ("Patentability shall not be negatived by the manner in which the invention was made."), or it may suggest the search for an "inventive concept" in step 2 of an *Alice* patent-eligibility analysis. *See Alice Corp. Pty. v. CLS*

Bank Int'l, 573 U.S. 208, 217 (2014) ("We have described step two of this analysis as a search for an 'inventive concept.'").

Upon review of the ID, the Commission has determined to clarify that the ID's use of the phrase "inventive concept" is synonymous with "the specific arrangement of elements claimed in the asserted patents." ID at 142; *see also id.* ("[T]he invention claimed in the asserted patents is complex and consists of many elements. CX-0001C (Hindson WS) at Q/A 88. The inventive idea, which emerged from many other ideas (some of which clearly were in the prior art), is to combine these elements in a process resulting in what 10X calls the GEM ('gel bead in emulsion') architecture. As confirmed by both parties, **the inventive idea is a specific arrangement of elements which, when combined, works to achieve a desired goal**."). Bio-Rad's position that the use of the phrase "inventive concept" in the ID is indicative of a search for a singular eureka moment conflicts with the ID's explanation that the inventive concept is the combination and specific arrangement of elements laid out in the claims of the asserted patents. The Commission finds no error in the ID's focus on the inventions as laid out in the claims in its analysis of Bio-Rad's ownership defense.

Consistent with the reasoning above, the Commission affirms with supplemented reasoning the ID's finding that Bio-Rad has not shown that it is entitled to an ownership interest in any of the asserted patents.

IX. CLERICAL ERROR

10X's petition for review included a request to correct two clerical errors in the ID. *See* 10X Pet. at 18–19. One of the errors appears on page 91 of the ID, and the other on page 105. *See id.* at 19. The error on page 105 relates to the same absence of an accused assay in the ID's infringement findings for dependent claim 26 of the '530, which has already been addressed *supra* in this opinion. Concerning the error on page 91, 10X explained that "[t]he ID states on page 91

that '[i]n Order No. 35, this claim construction was further clarified so that it does preclude the generation of some barcoded molecules before the start of the claimed third step,' which should have stated 'so that it does *not* preclude the generation of some barcoded molecules before the start of the claimed third step.'" *Id.* OUII agreed that the omission of the word "not" was an oversight. *See* OUII Resp. to Pets. at 44–45. Bio-Rad did not directly respond to 10X's assertion that the omission of the word "not" was a clerical error. *See generally* Bio-Rad Resp. to Pets. Instead, through its own petition, Bio-Rad pointed to the absence of the word "not" as evidence of "contradictory statements" by the ALJ for the purpose of bolstering its argument that the ALJ adopted two contradictory claim constructions for the '530 patent in Order No. 22 and Order No. 35. *See* Bio-Rad Pet. at 46, n.7.

Upon review of Order No. 35, the Commission agrees with 10X and OUII that the omission of the word "not" on page 91 of the ID is a simple clerical error. *Cf.* Order No. 35 ("Bio-Rad reads the claims to require 'that all 1,000 droplets form before any barcoding begins,' Reply at 8, but no such limitation was contemplated in the *Markman* order. The claim language merely requires that any accused step of generating a plurality of barcoded molecules occurs after the at least 1,000 droplets are generated."). Bio-Rad's attempt to frame that error as evidence of contradictory statements by the ALJ is not persuasive. Accordingly, the last sentence of the first full paragraph on page 91 of the ID is modified to read: "In Order No. 35, this claim construction was further clarified so that it does *not* preclude the generation of some barcoded molecules before the start of the claimed third step."

X. REMEDY

The RD recommended that the Commission issue an LEO and CDO directed to Bio-Rad. There was no dispute among the parties that an LEO would be the appropriate remedy. *See* RD at 1. The RD also explained that while Bio-Rad "suggest[ed]" that the LEO should include a

certification provision, "there is no evidence in the record that a certification provision will be necessary to distinguish between infringing and non-infringing products," and on that basis declined to recommend the inclusion of a certification provision. *Id.* at 2.

With respect to the CDO, the RD found that Bio-Rad maintains a commercially significant domestic inventory of ddSEQ products and on that basis recommended that the Commission issue a CDO directed to Bio-Rad.[16] *See id.* at 2–3. Specifically, the RD found that Bio-Rad had inventory of ddSEQ Single-Cell Isolators and ddSEQ-M cartridges in California. *See id.* at 2. The RD found these inventories to be significant because the number of units in inventory exceeded the number of such units Bio-Rad actually sold between 2017 and 2018. *See id.* While there was a dispute regarding whether some number of the cartridges should be discounted because they were for testing purposes, the RD agreed with 10X's expert, Dr. Vander Veen, that the inventory of cartridges would be significant even if the test cartridges were not considered. *See id.* at 2–3.

A. Limited Exclusion Order

Section 337(d)(1) provides that "[i]f the Commission determines, as a result of an investigation under this section, that there is a violation of this section, it shall direct that the articles concerned, imported by any person violating the provision of this section, be excluded from entry into the United States, unless, after considering the [public interest], it finds that such articles should not be excluded from entry." 19 U.S.C. § 1337(d)(1). The Commission has "broad discretion in selecting the form, scope, and extent of the remedy." *Viscofan, S.A. v. US. Int'l*

[16] As explained in *Certain Road Construction Machines and Components Thereof*, "[t]he Commission generally issues cease and desist orders with respect to the imported infringing products when 'respondents maintain commercially significant inventories in the United States or have significant domestic operations that could undercut the remedy provided by an exclusion order.'" Inv. No. 337-TA-1088, Comm'n Op. at 51 (June 27, 2019) (quoting *Certain Table Saws Incorporating Active Injury Mitigation Technology and Components Thereof*, Inv. No. 337-TA-965, Comm'n Op. at 4 (Jan. 27, 2017)).

Trade Comm'n, 787 F.2d 544, 548 (Fed. Cir. 1986). Thus, the Commission may issue an LEO excluding the goods of the person(s) found in violation.

Here, all parties agree that an LEO is appropriate in this investigation should the Commission affirm the ID's finding of a violation, and we agree that an LEO is appropriate here. There are, however, questions about the scope of that LEO and the exemptions it should contain. The questions concern: (1) whether the LEO should include an exemption for all ddSEQ v2 products ("v2 product exemption"); (2) whether the LEO should include exemptions for any product used for warranty, repair, or service purposes, and/or for consumables for existing deployments of Bio-Rad's ddSEQ v1 products ("existing use exemptions"); (3) whether the LEO should include an exemption for internal research and development testing by Bio-Rad ("internal research and development exemption"); and (4) whether a certification of noninfringement provision should be included in the LEO ("certification provision").[17] The parties disagree on questions (1), (3) and (4) but agree that the LEO should include existing use exemptions.

1. v2 Product Exemption

The most significant disagreement between the parties is whether the LEO should explicitly exempt the ddSEQ v2 products because the ID found that 10X did not establish indirect infringement of those products. Bio-Rad seeks an exemption for its ddSEQ v2 products on the

[17] 10X also includes a section explaining that Bio-Rad has admitted "that the scATAC-seq assay is now commercially available and has been used by its customers in the United States," and therefore "Bio-Rad now also contributorily infringes 10X's Asserted Patents through sales of the scATAC-seq assay and induces infringement of others' uses of its scATAC-seq assay." 10X Resp. to Qs. at 55–56. The purpose of 10X's briefing on this point is far from clear, but it appears that 10X is asking the Commission to expand the indirect infringement findings in the ID to include the scATAC-seq assay, though it fails to explicitly make that request. To the extent 10X intends to request a Commission ruling as to whether the scATAC-seq assay indirectly infringes, the Commission's Rules provide procedures for obtaining such as ruling through a request for an advisory opinion or a petition for modification of the remedial orders. *See* 19 C.F.R §§ 210.76, 210.79.

basis that the ID found no indirect infringement due to the fact that the products were not available for commercial sale and had not yet been used in the United States, which necessarily precluded a finding of indirect infringement due to an underlying lack of direct infringement. *See* Bio-Rad Resp. to Qs. at 72–73. 10X counters that the ID nonetheless found the v2 products to be infringing, just like the v1 products, and that the Commission's longstanding practice has been to direct its exclusion orders broadly to articles that infringe, whether those articles currently exist or if they are manufactured and imported in the future. *See* 10X Reply at 58–59. OUII's position is that the v2 products should not be exempted because the ID did not foreclose the possibility that the importation of the v2 products would constitute a violation of section 337 if the requirements for indirect infringement are later met. *See* OUII Reply at 22. OUII does, however, recommend including a certification provision in the LEO allowing Bio-Rad to certify that either the v1 or v2 products are imported for use in a noninfringing manner. *See id.* at 22–23.

The ID uses a two-step approach to its infringement analysis. First, for each asserted patent, the ID determines whether the accused products practice the limitations of the asserted claims of that patent. Those determinations revolve around an analysis of how the microfluidic chips and instruments operate when used with the assays specific to those chips, *i.e.*, the v1 chips with the WTA 3' v1 assay, and the v2 chips with the [redacted], scATAC-seq,[18] [redacted] *See* ID at 3 (listing assays for the v1 and v2 ddSEQ systems). For the '024 and '468 patents, the ID found that the v1 and v2 systems/processes infringe all of the claims asserted from those patents. *See id.* at 27, 62–63. For the '530 patent, only the WTA 3' v1 [redacted] scATAC-seq, and [redacted] assays were accused. *See id.* at 91. The ID found that all of those

[18] The ID also includes a finding that shows that the scATAC-seq assay can be used with a v1 cartridge. *See* ID at 96 ("If the scATAC-seq assay is performed using the ddSEQ vl cartridge, each lane is capable of generating 500 droplets with a cell and gel bead.").

accused products infringe independent claim 1 of the '530 patent. *See id.* at 102–103. For the dependent claims of the '530 patent, the ID found infringement with respect to all of the asserted dependent claims and all of the accused products except in two instances. The ID explicitly found that the scATAC-seq assay does not infringe claim 4, and the ID omitted [redacted] from the list of assays that infringe claim 26. *See id.* at 103, 104. As explained above, the omission of the [redacted] assay from the claim 26 findings is an inadvertent error that the Commission has corrected on review. Accordingly, for the '530 patent, there is a single accused assay — scATAC-seq — that does not infringe one particular asserted dependent claim: dependent claim 4.

The second step in the ID's analysis was the determination of whether Bio-Rad induced or contributed to the infringement of any of the asserted claims. Of particular importance here, for each of the '024, '468, and '530 patents, the ID first considered whether there was an underlying act of direct infringement that could support a finding of indirect infringement. For each of the '024, '468, and '530 patents, the ID found that an act of direct infringement had occurred with respect to the v1 products but not the v2 products. The failure as to the v2 products was based on the fact that 10X could not show actual use of the v2 products in the United States by entities other than Bio-Rad at the time of the hearing. *See* ID at 28–29, 64, 105–108. Because the ID found no act of direct infringement with respect to the v2 products, it did not make findings about whether Bio-Rad induced infringement with the v2 products, or if the v2 products have a substantial noninfringing use.

Upon review of the parties' submissions, the Commission has determined not to adopt an exemption for the v2 products. The Commission's established practice is to direct its remedial orders to articles that infringe, as opposed to specific product model numbers. *See Certain Hardware Logic Emulation Systems and Components Thereof*, Inv. No. 337-TA-383, USTIC Pub.

3089 (Mar. 1998), Comm'n Op. on Remedy, the Public Interest, and Bonding at 16 ("The limited exclusion order is not limited to the specific models of emulation system found by the Commission to infringe, as urged by respondents. As the ALJ noted, the Commission's long-standing practice is to direct its remedial orders to all products covered by the patent claims as to which a violation has been found, rather than limiting its orders to only those specific models selected for the infringement analysis. As the IAs noted, while individual models may be evaluated to determine importation and infringement, the Commission's jurisdiction extends to all models of infringing products that are imported at the time of the Commission's determination and to all such products that will be imported during the life of the remedial orders.").

2. Existing Use Exemptions

There is broad agreement among the parties that certain exemptions to the LEO *are* appropriate. These consist of an exemption for customers who currently have access to ddSEQ equipment to continue to purchase repair parts and warranty replacements as well as consumables. *See* 10X Resp. to Qs. at 59–60; Bio-Rad Resp. to Qs. at 73–74; OUII Reply at 23. These exemptions will allow the work of researchers already using Bio-Rad's products to continue. Consistent with the existing use exemption adopted in the LEO and CDO issued in *Certain Microfluidic Devices*, Inv. No. 337-TA-1068 ("the 1068 investigation"),[19] researchers seeking to

[19] In the 1068 investigation, Bio-Rad was the complainant and 10X was the respondent. *See* 82 Fed. Reg. 42115 (Sep. 6, 2017). The Commission found that 10X had violated section 337 through the importation of microfluidic devices that infringed Bio-Rad's patents. *Certain Microfluidic Devices*, Inv. No. 337-TA-1068, Comm'n Op. at 1 (Jan. 10, 2020) (public version). Due to substantial public interest concerns and supporting record evidence, particularly with respect to the public health and welfare, the Commission tailored its remedial orders in the 1068 investigation to exempt otherwise covered microfluidic devices, provided that scientists and medical researchers using those devices established that they had a documented need to continue receiving the devices to continue ongoing research and that no alternative product could be substituted for the covered microfluidic device. *See id.* at 46.

receive ddSEQ consumables under that provision must provide Bio-Rad with a documented need to continue receiving those consumables for an identified current ongoing research project for which that need cannot be met by any alternative product. With respect to warranty and repair parts, the orders also exempt service or repair articles imported for use in servicing or repairing microfluidic systems that were imported as of the date of this Order and are under a warranty that existed as of the date of this Order, if such servicing or repairing is provided for in terms of the warranty.

The Commission's remedial orders include as attachments questionnaires that Bio-Rad is to provide to its customers for purposes of obtaining infringing ddSEQ consumables after the effective date of the Commission's orders. Bio-Rad may provide a modified version of that questionnaire to its customers, but whatever documentation it uses must request from its customers at least the information requested in the attached questionnaires using the verbiage as it appears in the questionnaires. A completed questionnaire (or its modified equivalent) establishes a "documented need" to qualify for the exemption, as that phrase is used in this opinion. The questionnaires request, *inter alia*, a researcher to identify the date the research for which he or she is using the ddSEQ system began and to state whether other products could meet his or her research needs. The questionnaires also require both Bio-Rad and its customers to certify their statements and to acknowledge that U.S. law (including, but not limited to, 18 U.S.C. § 1001) imposes criminal sanctions on individuals who knowingly and willfully make material false statements to the U.S. Government. To qualify for the exemption, the researcher must attest in the questionnaire that the research using the ddSEQ system began prior to the date of issuance of these remedial orders, and also attest that other products cannot meet his or her research needs. In addition, researchers who avail themselves of this exemption are required to maintain records to support

their declarations in case an audit is carried out or such records are required for any future enforcement proceeding. These accompanying records are not to be provided to Bio-Rad.

United States Customs and Border Protection ("CBP") may choose to require Bio-Rad to furnish the relevant completed questionnaires for each entry that is claimed to be exempted. *See* LEO, at ¶¶ 2–3. CBP may require that the questionnaires be submitted in advance of the date of entry of the ddSEQ consumables and pursuant to procedures that CBP establishes. The recordkeeping provision of the CDO requires Bio-Rad to retain such questionnaires, and the reporting provision requires Bio-Rad to report such records. *See* CDO, at §§ V, VI.

Consistent with the 1068 investigation, the CDO in this investigation requires Bio-Rad to provide a detailed accounting showing that the consumables imported and/or sold in the United States after importation (including sales of any infringing domestic inventory existing at the time of the Commission's decision) are being sent to only those identified customers and that consumables are not being stockpiled, sent to unauthorized customers, or used for research projects other than those identified. *See* CDO at § V. That accounting must be supported by documentation (including the questionnaires) referencing all relevant information, including the number of consumables imported and/or sold and the identity of the customers, their exempted research project(s), and the projected completion date of such projects. The reporting provision requires monthly, rather than the Commission's standard annual, reports.

3. Internal Research and Development Exemption

Bio-Rad also seeks an exemption for its internal research and development testing by Bio-Rad; 10X has not acquiesced to that exemption. *See* Bio-Rad Resp. to Qs. at 74; 10X Reply at 57. Bio-Rad makes two arguments in favor of such an exemption. The first is that the Commission has incorporated such exemptions before. *Id.* (citing *Certain Devices for Connecting Computers*

via Tel. Lines, Inv. No. 337-TA-360, Comm'n Op. at 7–10 (Nov. 18, 1994) ("A complainant that seeks exclusion of other types of entry [other than for consumption] should present evidence that activities by respondents involving other types of entry either are adversely affecting it or are likely to do so."); *Certain Magnetic Data Storage Tapes and Cartridges Containing the Same*, Inv. No. 337-TA-1012, Comm'n Op. at 128–133 (Apr. 2, 2018) ("*Magnetic Storage Tapes*") (exempting infringing products used for U.S.-based compliance testing that was necessary for foreign sales)). The second argument is that because the asserted claims for which a violation was found are method claims, Bio-Rad's own use of its products cannot be a violation of Section 337. *See* Bio-Rad Reply at 55 (citing *Electronic Devices with Image Processing Systems, Components Thereof, and Associated Software*, Inv. No. 337-TA-724, Comm'n Op at 18-20 (Dec. 1, 2011)). 10X opposes this exemption on the basis that Bio-Rad waived it by failing to ask for it in briefing before the ALJ, and that the cases relied on by Bio-Rad are factually distinguishable from this investigation. *See* 10X Reply at 57–58. OUII also opposes an exemption for internal development and testing purposes. *See* OUII Reply at 23.

The Commission has determined not to include an exemption for internal development and testing. Neither of the cases Bio-Rad cited in its initial response to the Commission's questions stand for the proposition that an "entry for consumption" excludes research and development uses. Further, Bio-Rad has not established an evidentiary basis to support a need for this exemption in contrast to the respondent in *Magnetic Storage Tapes.* *See* Comm'n Op. at 132 (finding that denial of an exemption for compliance verification testing would amount to a "world-wide" prohibition against Sony's products, since verification testing in the United States appears to be necessary even for foreign sales of Sony's LTO-7 products). Bio-Rad's request that it be allowed to continue importing infringing products for research and development purposes finds no precedent as a matter of patent law or section 337. As the Federal Circuit has recognized, there "is no fair use or

research and development exception for infringement of normal commercial processes." *Soitec, S.A. v. Silicon Genesis Corp.*, 81 F. App'x 734, 737 (Fed. Cir. 2003) (citing *Madey v. Duke Univ.*, 307 F.3d 1351, 1362 (Fed. Cir. 2002) (stating that "the experimental use defense is . . . limited to actions performed 'for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry.'") (citation omitted)). Likewise, Bio-Rad points to no Commission investigation where a respondent was allowed to continue importing its own products, which had been found in violation, for such internal testing purposes that would continue to infringe the patents.

4. Certification Provision

Finally, the parties dispute whether a certification of noninfringement provision should be included with the exclusion order. 10X argues that no certification provision is appropriate because here, unlike in the 1068 investigation, there is no evidence that the determination of whether a Bio-Rad product is infringing will be technically difficult. *See* 10X Resp. to Qs at 57–58. OUII supports including a certification provision "because it is possible that certain accused 'v2 products' will not infringe if imported, and because it is possible that the accused products could be used in non-infringing ways." OUII Resp. to Qs at 28. Bio-Rad joins OUII's reasoning and also argues that a certification provision will facilitate enforcing the exemptions on which the parties agree. Bio-Rad Reply at 56.

Upon consideration of the parties' submissions, the Commission has determined to include a standard certification provision in the LEO to facilitate CBP's enforcement of the order. *See Certain Composite Aerogel Insulation Materials and Methods for Manufacturing the Same*, Inv. No. 337-TA-1003, Comm'n Op. at 62 (Feb. 22, 2018) ("[T]he Commission's standard practice for the past several years [has been] to include certification provisions in exclusion orders to aid CBP."). This provision does not, however, provide Bio-Rad with the ability to self-certify that its

products are noninfringing. That determination must be made by the Commission or CBP. *See id.* ("CBP only accepts a certification that the goods have been previously determined by CBP or the Commission not to violate the exclusion order."). The standard certification can be used to facilitate entry of products adjudicated to be non-infringing as well as for products imported for warranty and repair service pursuant to the express terms of Bio-Rad's warranty provisions. In addition to the standard provision, the LEO provides a separate procedure by which Bio-Rad may certify that the microfluidic devices are being imported for use by researchers who have been using such devices in the United States as of the date of the issuance of the LEO, and who have provided Bio-Rad a documented need to continue receiving the devices for an identified current ongoing research project for which that need cannot be met by any alternative product.

B. Cease and Desist Order

Section 337(f)(1) provides that in addition to, or in lieu of, the issuance of an exclusion order, the Commission may issue a CDO as a remedy for violation of section 337. *See* 19 U.S.C. § 1337(f)(1). CDOs are generally issued when, with respect to the imported infringing products, respondents maintain commercially significant inventories in the United States or have significant domestic operations that could undercut the remedy provided by an exclusion order.[20] *See, e.g.*, *Certain Table Saws Incorporating Active Injury Mitigation Technology & Components Thereof* ("*Table Saws*"), Inv. No. 337-TA-965, Comm'n Op. at 4-6 (Feb. 1, 2017); *Certain Protective Cases & Components Thereof*, Inv. No. 337-TA-780, USITC Pub. No. 4405, Comm'n Op. at 28

[20] When the presence of infringing domestic inventory or domestic operations is asserted as the basis for a CDO under section 337(f)(1), Commissioner Schmidtlein does not adopt the view that the inventory or domestic operations needs to be "commercially significant" in order to issue the CDO. *See, e.g.*, *Certain Magnetic Tape Cartridges and Components Thereof*, Inv. No. 337-TA-1058, Comm'n Op. at 65, n.24 (Mar. 25, 2019); *Table Saws*, Comm'n Op. at at 6-7, n.2 (Feb. 1, 2017). In Commissioner Schmidtlein's view, the presence of some infringing domestic inventory or domestic operations, regardless of its commercial significance, provides a basis to issue a CDO. *Id.*

(Nov. 19, 2012) (citing *Certain Laser Bar Code Scanners & Scan Engines, Components Thereof & Prods. Containing Same*, Inv. No. 337-TA-551, Comm'n Op. at 22 (June 24, 2007)). Complainants bear the burden on this issue. "A complainant seeking a cease and desist order must demonstrate, based on the record, that this remedy is necessary to address the violation found in the investigation so as to not undercut the relief provided by the exclusion order." *Table Saws*, Comm'n Op. at 5 (citing *Certain Integrated Repeaters, Switches, Transceivers, & Prods. Containing Same*, Inv. No. 337-TA-435, USITC Pub. No. 3547 (Oct. 2002), Comm'n Op. at 27 (Aug. 16, 2002); *see also* H.R. REP. No. 100-40, at 160 (1987)).

The RD recommended issuing a cease and desist order based on its finding that Bio-Rad maintains a commercially significant inventory of ddSEQ products in the United States. RD at 2–3. Both 10X and OUII supported the RD's recommendation. *See* 10X Resp. to Qs. at 58–59; OUII Resp. to Qs. at 29. Bio-Rad opposed the recommendation and argued that 10X's expert incorrectly included noninfringing test chips in his analysis of Bio-Rad's inventory. *See* Bio-Rad Reply at 56–57.

The Commission has determined to adopt the RD's recommendation and issue a cease and desist order to Bio-Rad. The RD considered the argument Bio-Rad raised, and determined that even if the test chips were discounted, the inventory of ddSEQ chips in the United States would still be commercially significant. RD at 2–3 ("I agree with 10X and Dr. Vander Veen that regardless of whether the 'test' cartridges are counted, Bio-Rad's inventory of ddSEQ products is commercially significant."). Bio-Rad has shown no error in that finding, which is supported by record evidence. *See* CX-0005C at Q/A 39.

Like the LEO discussed above, the CDO exempts from its scope the importation of certain microfluidic consumables for use by researchers who have been using such consumables in the

United States as of the date of the issuance of the CDO, and who have provided Bio-Rad a documented need to continue receiving the consumables for an identified current ongoing research project for which that need cannot be met by any alternative product. The CDO also exempts from its scope service or repair articles imported for use in servicing or repairing microfluidic systems that were imported as of the date of the issuance of the CDO and are under a warranty that existed as of the date of this Order, if such servicing or repairing is provided for in terms of the warranty

XI. BOND

If the Commission enters an exclusion order or a cease and desist order, a respondent may continue to import and sell its products during the 60-day period of Presidential review under a bond in an amount determined by the Commission to be "sufficient to protect the complainant from any injury." 19 U.S.C. § 1337(j)(3); *see also* 19 C.F.R. § 210.50(a)(3). When reliable price information is available in the record, the Commission has often set the bond in an amount that would eliminate the price differential between the domestic product and the imported, infringing product. *See Certain Microsphere Adhesives, Processes for Making Same, & Prods. Containing Same, Including Self-stick Repositionable Notes*, Inv. No. 337-TA-366, USITC Pub. No. 2949, Comm'n Op. at 24 (Jan. 16, 1996). The Commission also has used a reasonable royalty rate to set the bond amount where a reasonable royalty rate could be ascertained from the evidence in the record. *See, e.g.*, *Certain Audio Digital-to-Analog Converters & Prods. Containing Same*, Inv. No. 337-TA-499, Comm'n Op. at 25 (Mar. 3, 2005). Where the record establishes that the calculation of a price differential is impractical or there is insufficient evidence in the record to determine a reasonable royalty, the Commission has imposed a 100 percent bond. *See, e.g.*, *Certain Liquid Crystal Display Modules, Prods. Containing Same, & Methods Using the Same*, Inv. No. 337-TA-634, Comm'n Op. at 6-7 (Nov. 24, 2009). The complainant, however, bears the burden of establishing the need for a bond. *Certain Rubber Antidegradants, Components Thereof*

& Prods. Containing Same, Inv. No. 337-TA-533, USITC Pub. No. 3975, Comm'n Op. at 40 (July 21, 2006).

The RD recommended that the Commission impose a bond of 25 percent of the entered value of infringing products imported by Bio-Rad during the presidential review period. In reaching that recommendation, the RD rejected an argument from Bio-Rad that 10X had failed to show that it was injured by the importation of Bio-Rad's products. *See* RD at 4. While the RD acknowledged some contrary evidence, it ultimately credited the testimony and analysis of 10X's expert, Dr. Vander Veen, that 10X was forced to lower its prices in response to Bio-Rad's presence in the market. *See id.*

On the amount of bond, the RD reached the 25 percent figure based on a comparison of the average selling prices of Bio-Rad's ddSEQ Single-Cell Isolator and 10X's Chromium Single Cell Controller, *i.e.*, the parties' single cell instruments. *See id.* at 5. That comparison was one of two offered by Bio-Rad's expert, Mr. Herrington. *See id.* at 4–5. The RD declined to compare the cost of the parties' consumables because experts on both sides agreed that such a comparison was impractical. *See id.* The RD also rejected 10X's request for a 100 percent bond rate, which was based on 10X's assertion that no reliable price comparison could be performed at all. *See id.* at 5. The RD explained that while "Mr. Herrington's comparison between the average selling prices of the parties' single cell instruments is not perfect, [] absent any other price comparison offered by 10X, the 25 percent price differential is the most reliable evidence in the record for an appropriate bond amount." *Id.*

The Commission has determined to adopt the recommendation of the RD and impose a bond in the amount of 25 percent of the entered value of the subject articles. OUII supports that approach. *See* OUII Resp. to Qs. at 30–33. 10X and Bio-Rad do not support the RD's

recommendation, but their positions merely rehash the arguments addressed in the RD, or advance unendorsed methodologies. Particularly, 10X first argues that a price differential is not possible, and therefore a 100 percent bond is appropriate. *See* 10X Resp. to Qs. at 68–71. In support of that first argument, 10X makes three points: (1) 10X argues that the parties' [redacted] undercuts any price differential's ability to protect 10X from harm; (2) 10X argues that importation of Bio-Rad's ddSEQ system may affect 10X's Chromium product line in addition to its single-cell instrument sales, and the absence of analysis on those products precludes a reliable price comparison; and (3) 10X criticizes an alternative "price per cell" calculation Bio-Rad offered but that the RD did not adopt. *Id.* at 68–70.

As to the first point, 10X fails to explain why [redacted] precludes a price differential calculation. If 10X's position is that it is entitled to a price differential based on higher sales prices for its own products, it had months of discovery and then an evidentiary hearing to produce evidence of those higher [redacted] prices. Moreover, such evidence about 10X's own sales prices, and reasoning therefore, was in 10X's control. On the second point, 10X's argument is supported only by a handful of conclusory statements from its economic expert. This testimony does not provide sufficient justification to abandon any attempt at calculating a price differential, which is what 10X has done. *See* 10X Resp. to Qs. at 69 (citing CX-0005C at Q/A 46–51). As to 10X's third point, the RD did not rely on a price per cell calculation, and the Commission has determined not to adopt such an approach. Accordingly, the Commission declines to impose a 100 percent bond on the basis that a price comparison is impractical.

10X makes a backup argument that if a price differential can be calculated based on instrument sales, then the correct calculation yields a bond of [redacted]. *See* 10X

Resp. to Qs. at 71–73. 10X reaches these percentages by taking the difference of either the average sales or lists prices of the parties' single cell instruments and then dividing that difference by the entered value of the Bio-Rad instruments, [redacted]. *See id.* at 72. 10X asserts that this calculation is supported by *Certain Reclosable Plastic Bags and Tubing*, Inv. No. 337-TA-266, USITC Pub. 2058, Comm'n Op. at 6 (Dec. 1, 1987) ("*Reclosable Plastic Bags*"). This approach appears to be endorsed by 10X's expert, Dr. Thomas Vander Veen, as well. *See* CX-0005C at Q/A 48.

10X's calculation is without support in Commission precedent. *Reclosable Plastic Bags* stated only that CBP preferred bonds to be calculated as a percentage of entered values, so the Commission issues a bond as a percentage of entered value and not as a dollar amount per product. *Id.* at Comm'n Op. at 6. The typical method for calculating a price differential is to subtract the price of the respondent's product from the price of the complainant's product, divide the difference by the price of the respondent's product, and then multiply by 100 to reach a percentage value. *See Certain Two-Handle Centerset Faucets and Eschutcheons, and Components Thereof*, Inv. No. 337-TA-422, USITC Pub. No. 3332, Comm'n Op. on Remedy, the Public Interest, and Bonding, 2000 WL 1159298, at *10 n.13 (July 2000) (stating that "[t]he amount of the bond was derived by dividing the remainder of the ***average price*** of the Moen faucet minus the ***average price*** of the infringing Foremost/Chung Cheng faucets by the ***average price*** of the Foremost/Chung Cheng faucets, and then multiplying the result by 100"). Indeed, this appears to be the method used in *Certain Protective Cases and Components Thereof,* Inv. No. 337-TA-780, USITC Pub. 4405, Initial Determination at 121–22, (July 10, 2012), upon which 10X relies in its brief. *See* 10X Resp. to Qs. at 73 n.12. Accordingly, the Commission declines to adopt 10X's proposed calculation, which departs from the Commission's established method of calculating price differentials.

With respect to Bio-Rad, it merely argued that 10X failed to establish injury warranting a bond. Particularly, pointing to its price per cell metric, it argued that [redacted], and thus no bond at all is appropriate. Bio-Rad Resp. to Qs. at 75. As noted above though, the RD declined to adopt Bio-Rad's price per cell metric, and Bio-Rad has not shown why the Commission should adopt it. *See* RD at 5.

For the reasons provided above, the Commission has determined to impose a bond of twenty-five percent (25%) of entered value of infringing articles imported during the period of Presidential review.

XII. PUBLIC INTEREST

Section 337 requires the Commission, upon finding a violation of section 337, to issue an LEO "unless, after considering the effect of such exclusion upon the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers, it finds that such articles should not be excluded from entry." 19 U.S.C. § 1337(d)(l). Similarly, the Commission must consider these public interest factors before issuing a CDO. 19 U.S.C. § 1337(f)(1).

Under appropriate facts and circumstances, the Commission may determine that no remedy should issue because of the adverse impacts on the public interest. *See, e.g.*, *Certain Fluidized Supporting Apparatus & Components Thereof*, Inv. Nos. 337-TA-182/188, USITC Pub. 1667, Comm'n Op. at 1–2, 23–25 (Oct. 1984) (finding that the public interest warranted denying complainant's requested relief). Moreover, when the circumstances of a particular investigation require, the Commission has tailored its relief in light of the statutory public interest factors. For example, the Commission has allowed continued importation for ongoing medical research, exempted service parts, grandfathered certain infringing products, and delayed the imposition of remedies to allow affected third party consumers to transition to non-infringing products. *E.g.*,

Certain Microfluidic Devices, Inv. No. 337-TA-1068 Comm'n Op. at 1, 22–48, 53–54 (analyzing the public interest, discussing applicable precedent, and ultimately issuing a tailored LEO and a tailored CDO); *Certain Road Milling Machines & Components Thereof*, Inv. No. 337-TA-1067, Comm'n Op. at 32–33 (July 18, 2019) (exempting service parts); *Certain Baseband Processor Chips & Chipsets, Transmitter, & Receiver (Radio) Chips, Power Control Chips, & Prods. Containing Same, Including Cellular Tel. Handsets*, 337-TA-543, USITC Pub. No. 4258, Comm'n Op. at 150–51 (Oct. 2011) (grandfathering certain products); *Certain Personal Data & Mobile Comm'n Devices & Related Software*, 337-TA-710, USITC Pub. No. 4331, Comm'n Op., at 72–73, 80–81 (June 2012) (delaying imposition of remedy).

The statute requires the Commission to consider and make findings on the public interest in every case in which a violation is found regardless of the quality or quantity of public interest information supplied by the parties. 19 U.S.C. § 1337(d)(l), (f)(l). Thus, the Commission publishes a notice inviting the parties as well as interested members of the public and interested government agencies to gather and present evidence on the public interest at multiple junctures in the proceeding. 19 U.S.C. § 1337(d)(l) & (f)(l).

On July 25, 2019, the Commission issued a notice soliciting comments on public interest issues raised by the relief recommended in the RD. Notice at 1 (July 25, 2019). No comments from the public were received in response to that notice. On August 26, 2019, pursuant to Commission Rule 210.50(a)(4), 10X and Bio-Rad each submitted briefs addressing the effect the RD's proposed remedies would have on the public interest.[21] The parties also submitted additional public interest arguments with their responses to the Commission's notice of review, and their

[21] Complainant 10X Genomics, Inc.'s Submission on the Public Interest (Aug. 26, 2019) ("10X BPI"); Bio-Rad's Statement on Public Interest (Aug. 26, 2019) ("Bio-Rad BPI").

replies to those responses. The parties' arguments with respect to each of the public interest factors are summarized below.[22]

A. Public Health and Welfare

Concerning the public health and welfare, 10X submitted that "[t]here are no public health, safety, or welfare concerns relating to the requested remedial orders." 10X BPI at 1. 10X also argued that Bio-Rad should not be permitted to argue that remedial orders would adversely affect the public health and welfare in this investigation because it argued that remedial orders in the 1068 investigation would not cause such adverse effects. *See* 10X BPI at 1–2. Further, 10X asserted that [redacted]. *See id.* at 2. 10X substantially reiterated these arguments in its brief responding to the Commission's notice of review. *See* 10X Resp. to Qs. at 60–61.

For its part, Bio-Rad confined itself to arguing that if 10X's public health and welfare arguments in the 1068 investigation justify a modification of the remedy in that investigation then the same arguments should justify a modification in this investigation. *See* Bio-Rad BPI at 3.

On the record of this investigation, the Commission has determined that the public health and welfare will not be adversely affected by issuance of a tailored LEO and a similarly tailored CDO. Of note, the LEO and CDO issued today include exemptions to allow researchers who have been using Bio-Rad's ddSEQ systems in the United States as of the date of the issuance of those orders, and who have provided Bio-Rad a documented need to continue procuring consumables for those systems for an identified current ongoing research project for which that need cannot be

[22] The Commission did not delegate responsibility to the ALJ for taking evidence and making findings concerning the effect of a remedy on the public interest in this investigation.

met by any alternative product, to continue to procure and use such consumables. Bio-Rad's ddSEQ system is used by medical researchers "to study the ways in which individual cells from a tumor differ from each other." Bio-Rad BPI at 1; *see also id.* at 2, n.2 (listing published research that used Bio-Rad's technology). In the 1068 investigation, the Commission considered a large volume of evidence about the adverse effects attendant to disrupting important medical research by forcing researchers to switch instruments mid-study, which Bio-Rad contested. *See* Inv. No. 337-1068, Comm'n Op. at 45–46. On the record of the 1068 investigation, the Commission determined that disruption of such research would adversely affect the public health and welfare to such a degree that the remedial orders in that investigation should include exemptions to allow ongoing research to continue without disruption. *See id.*

The record on the public interest in this investigation is not nearly as robust as the one in the 1068 investigation. As noted, in addressing the public health and welfare, Bio-Rad has merely argued that whatever argument prevails in the 1068 investigation should prevail here as well. *See* Bio-Rad BPI at 3. Bio-Rad's argument suggests that its ddSEQ systems are so comparable to the accused products in the 1068 investigation that any adverse effects attendant to the exclusion of those products must attend the exclusion of its products as well. Bio-Rad has not, however, presented evidence sufficient for the Commission to draw that conclusion, and the Commission does not agree with Bio-Rad's underlying premise that the remedies in the 1068 investigation and this one must be reciprocal because the underlying products have similar uses. Nonetheless, here, unlike Bio-Rad's position in the 1068 investigation, 10X affirmatively proposed an exemption to the remedial orders to allow the use of Bio-Rad's ddSEQ systems in ongoing research to continue. *See* 10X BPI at 1 ("[T]o address any potential public interest concern, 10X does not oppose a limited carveout for sales of consumables imported for sale to customers who have access to

existing instruments in the United States as of the Target Date so that Bio-Rad's current customers with access to existing instruments may continue to perform their research, as well as for warranty support, service, repair, and replacement of existing instruments if such warranty is currently offered and covers such activities.").[23]

Accordingly, as stated above, the Commission has determined to issue an LEO and CDO in this investigation that incorporate 10X's proposed exemptions because the parties have agreed to this remedy.

B. Competitive Conditions in the United States Economy

With respect to competitive conditions, 10X argued that exclusion of Bio-Rad's accused products would have no material impact on competitive conditions in the United States because [redacted], 10X's own products provide similar functionality to Bio-Rad's, and 10X's own products are superior to Bio-Rad's. *See* 10X BPI at 2–3. 10X disputed any suggestion that competitive conditions would be harmed due to the removal of a large supplier from the market because, in 10X's view, [redacted]. *See id.* at 3. 10X further submitted that the introduction of its next generation products will also blunt any detrimental effects to competition that may result from exclusion of its older products in other litigation. *See id.* at 3–4. Finally, 10X asserted that Bio-Rad's assertion in the 1068 investigation that numerous alternatives exist to both 10X and Bio-Rad's products should preclude it from arguing in this investigation no suitable alternatives exist. *See id.* at 4. Here again, 10X substantially reiterated these arguments in its brief responding to the Commission's notice of review. *See* 10X Resp. to Qs. at 61–63, 64–65.

[23] Bio-Rad's arguments regarding availability of 10X's products, and alleged flaws in those products, are addressed below in section XII.C.

Bio-Rad did not specifically identify any adverse effects on competitive conditions in the United States economy that would flow from issuance of remedial orders in this investigation. *See generally* Bio-Rad BPI; Bio-Rad Resp. to Qs. at § XI.C; Bio-Rad Reply at § XI.D.

On the record of this investigation, the Commission has determined that competitive conditions in the United States economy will not be adversely affected by the issuance of the remedial orders in this investigation. Bio-Rad has not rebutted 10X's assertions that [redacted]. Moreover, evidence submitted by 10X shows that Bio-Rad's ddSEQ products appear in only a small number of research publications, which tends to reinforce the conclusion that adoption of Bio-Rad's ddSEQ products has been modest. *See* 10X Resp. to Qs., Ex. I (search results for "ddSEQ" in medical publication database). [redacted], the Commission finds that exclusion of those products will not adversely affect competitive conditions in the United States.

C. Production of Like or Directly Competitive Articles in the United States

10X submitted that "[t]he production of 'like or directly competitive' articles in the United States will not be harmed and may be helped by the recommended orders," because Bio-Rad [redacted] while 10X manufactures consumables and assembles instruments in the United States. 10X BPI at 4. In 10X's view, "[s]ubstituting 10X's products for Bio-Rad's will not harm domestic production and will, if anything, increase it." *Id.*

Bio-Rad disputed 10X's position based on the fact that "10X has been enjoined from selling any of the products it used to establish the domestic industry in this case to new customers." Bio-Rad BPI at 4 (citing *Bio-Rad et al. v. 10X*, No. 1:15-cv-00152-RGA, Dkt. 576 (D. Del. Aug. 12, 2019)). Bio-Rad also pointed to the possibility of an exclusion order in the 1068

investigation.[24] *See id.* Concerning 10X's next generation Next GEM product, Bio-Rad pointed to an SEC filing from 10X calling into question whether the Next GEM chip will be a viable replacement for the GEM chip. *See id.* (citing https://www.sec.gov/Archives/edgar/data/1770787/000119312519224368/d737378ds1.htm at 7). Additionally, Bio-Rad suggested that the Commission should not rely on 10X's own products as possible replacements for Bio-Rad's because 10X's financial stability is uncertain. *See* Bio-Rad BPI at 4–5. Bio-Rad drew support for that suggestion from an SEC filing by 10X discussing the various risks its business currently faces. *See* Bio-Rad BPI at 4–5 (citing https://www.sec.gov/Archives/edgar/data/1770787/000119312519224368/d737378ds1.htm at 15). Finally, Bio-Rad argued that 10X's own arguments in the 1068 investigation regarding the infeasibility of switching its customers to other instruments should apply equally in this investigation to Bio-Rad's customers and instruments. *See id.* at 5.

In response to Bio-Rad's arguments, 10X first argued that neither the district court injunction nor any exclusion order in the 1068 investigation will prevent it from filling the demand created by excluding Bio-Rad's products because 10X's next generation products, which were launched in May 2019, are not subject to either order. *See* 10X Resp. to Qs. at 62. 10X also disputed Bio-Rad's characterization of its next generation products as "unproven." *See id.* at 63. Further, 10X asserted that its transition to its next generation products will not prevent it from being able to meet any demand resulting from exclusion of Bio-Rad's products. *See id.*

Next, 10X disputed Bio-Rad's suggestion that its financial stability would hamper its ability to meet demand for microfluidic systems and components. *See id.* at 64. Particularly, 10X

[24] Since the parties submitted their briefs, an exclusion order and a cease and desist order have issued in connection with the 1068 investigation. *See* 84 Fed. Reg. 70999 (Dec. 26, 2019).

pointed to its initial public offering and its revenue numbers for the first half of 2019 as evidence of its financial stability. *See id.* And finally, cornering the litigation mentioned in its prospectus, 10X acknowledged that there is ongoing litigation related to its next generation products, but submitted that speculation about the outcome of that litigation at some point in the future should not preclude issuance of an exclusion order where a violation has already been proven. *See id.*

In its own response to the Commission's notice of review, Bio-Rad argued that a recently published study demonstrates flaws in 10X's Chromium scATAC-seq assay. *See* Bio-Rad Reply at 58–59. Bio-Rad asserted that the flaws identified in this study are present throughout all of 10X's products, including its next generation product line. *See id.* The thrust of Bio-Rad's point is that 10X's products are not superior to Bio-Rad's, and that the public interest will be harmed if researches are forced to utilize inferior equipment. *See id.* at 59.

The Commission finds Bio-Rad's assertion that 10X will be unable to fill demand created by the exclusion of its ddSEQ products to be speculative. While 10X's domestic industry products may be subject to an exclusion order and an injunction, its next generation products are not. As noted above, an exemption for existing use of ddSEQ products in this investigation, in combination with the similar exemption for 10X's products in the 1068 investigation, will protect the public interest with respect to extant use of those products where switching to a new product would be unworkable. For new uses, the public is free to use 10X's next generation products. Bio-Rad cites no evidence to support its assertions that 10X's next generation products are "unproven" or have "no track record," and therefore the Commission does not credit those assertions. By contrast, 10X produced two white papers supporting its assertion that its next generation products provide comparable performance to its earlier products. *See* 10X Resp. to Qs., Ex. J at 1, 8; Ex. K at 1, 4. While 10X's SEC filings do acknowledge the risks and inherent uncertainty involved in launching

a new product, the statements therein primarily concern 10X's ability to replace its own prior products with its next generation products. *See id.*, Ex. H at 6–7. The filing does not suggest that 10X will be unable to manufacture its next generation products in volumes sufficient to replace [redacted] Bio-Rad's ddSEQ products in use. *See id.*

Bio-Rad points out that 10X's SEC filings acknowledge that one of the risks potential investors should consider is the fact that, as of June 30, 2019, it had accumulated a deficit of $245.6 million. *See* https://www.sec.gov/Archives/edgar/data/1770787/000119312519224368/d737378ds1.htm at 15. However, 10X has since completed its initial public offering with a market capitalization near $5 billion. *See* 10X Resp. to Qs., Ex. L at 1. Thus, while the record evidence indicates that investors in 10X may be subject to some risk based on 10X's revenue and deficits, the Commission finds that it would be speculative at this point to determine that 10X's financial health will hinder it from offering its next generation products to the public. The Commission also finds that the discussion of litigation risk in the SEC filings is similarly speculative. Bio-Rad has identified no litigation currently precluding 10X from offering its next generation products domestically, and the Commission declines to speculate on the outcome of ongoing litigation.

Finally, with respect to Bio-Rad's argument that all of 10X's products are tainted by common flaws, Bio-Rad relied on a publication titled "Inference and effects of barcode multiplets in droplet-based single-cell assays" by Lareau *et al.* and a declaration by Dr. Lior Pachter, a Bio-Rad expert witness from the 1068 investigation. *See* Bio-Rad Reply, Ex. A & Pachter Decl. While the Lareau publication does report flaws associated with 10X's scATAC-seq assay, Bio-Rad Reply, Ex. A at 2, which Dr. Pachter asserts are equally applicable across 10X's entire line of products, *see* Pachter Decl. at ¶ 7, Dr. Pachter also acknowledges in his declaration that 10X is aware of the issue reported in the Lareau publication and that it has published a statement on its

website indicating that the issue in its scATAC product can be corrected with software processing, *see id.* at ¶ 10. Dr. Pachter's declaration reproduces a portion of that statement in which 10X acknowledges the issue identified in the Lareau publication, but omits the portion of the statement in which 10X explains the actions it has or will take to address the issue. *Compare id. with* https://www.10xgenomics.com/blog/letter-from-10x-genomics. Based on the publication and Dr. Pachter's declaration, Bio-Rad concluded that if its products "are excluded and [Bio-Rad's] future potential customers are forced to use 10X systems, their medical research efforts — research which 10X characterizes as very important to public health — will be hampered by 10X's faulty data output." Bio-Rad Reply at 15.

Bio-Rad's conclusion overreaches with respect to what the evidence shows. The underlying publication shows a flaw attendant to 10X's scATAC-seq assay. *See* Bio-Rad Reply, Ex. A at 2. Dr. Pachter's declaration, if accepted as true, supports the conclusion that the underlying flaw is present across all of 10X's single cell product line. *See* Pachter Decl. at ¶¶ 7, 12. However, Dr. Pachter's declaration also supports the conclusion that 10X is aware of the Lareau publication and the issue reported therein, and has devised a method of correcting the issue through computational means. *See id.* at ¶ 10. Though Dr. Pachter stated that "10X Genomics has not released any data or validation demonstrating that their computational solution to eliminating barcode multiplets removes all multiplets, and does not erroneously filter out single barcode cells," *see id.* at 15, that fact is not surprising given the short time between when the publication was published on October 30, 2019, and November 7, 2019, when Dr. Pachter signed his declaration.

The Commission declines to presume that 10X's entire product line is flawed beyond correction based on a publication that does not go so far, and testimony from a declarant who only implies, without support, that the computational correction proposed by 10X will not be effective.

Accordingly, on the record of this investigation, the Commission finds that the issuance of remedial orders in this investigation will not adversely affect the production of like or directly competitive articles in the United States.

D. United States Consumers

10X argued that the proposed remedial orders would have a minimal impact on U.S. consumers due to [redacted] and the fact that, as discussed above, 10X does not oppose exempting existing users of Bio-Rad's ddSEQ instruments from such orders. *See* 10X BPI at 5. As with the other public interest factors, 10X also argued that Bio-Rad's statements in the 1068 investigation to the effect that United States consumers would not be harmed by an exclusion order in that investigation should preclude Bio-Rad from arguing that the proposed remedial orders in this investigation would harm consumers. *See id.* 10X's assertions in its responses to the Commission's notice of review regarding the effect of remedial orders United States consumers are substantially aligned with its arguments in its public interest briefing. *See* 10X Resp. to Qs. at 65–66.

Bio-Rad argued only that "[b]ecause 10X's prior products are subject to an injunction and its new products are unproven, an exclusion order against Bio-Rad's products could force consumers to use noncommercial and unproven technologies to pursue their research objectives." Bio-Rad BPI at 5.

The arguments presented addressing the effect of a remedy on United States consumers are substantially coextensive with the arguments advanced in the context of the other public interest factors. 10X relies on the [redacted] for ddSEQ products to argue that any impact on consumers from their exclusion will be minimal, while Bio-Rad again asserts that 10X's products are already subject to exclusion, or if not are unproven. For reasons similar to those given above, the Commission finds that the evidence in this investigation does not establish that United States

consumers will be harmed by the issuance of a tailored LEO and similarly tailored CDO in this investigation.

E. Commission Determination on Public Interest

Upon consideration of the parties' submissions, and after considering the effect that remedial orders would have on the public interest, the Commission has determined to issue a tailored LEO and a similarly tailored CDO. The exemptions to the LEO and CDO proposed by 10X will allow the work of researchers already using Bio-Rad's products to continue.

XIII. CONCLUSION

For the reasons discussed above, the Commission has determined that Bio-Rad violated Section 337 by importing into the United States, selling for importation, or selling in the United States after importation certain microfluidic systems and components thereof and products containing same by reason of infringement of certain claims of the '024,'468, and '530 patents. The Commission finds no violation with respect to the asserted claims of the '204 patent. The Commission has determined to issue a limited exclusion order and a cease and desist order against Bio-Rad. The Commission finds that the public interest factors do not weigh against issuing these remedial orders. The Commission has further determined that during the Period of Presidential review, a bond in the amount of twenty-five (25) percent of entered value shall be applied to covered Bio-Rad products.

By order of the Commission.

Lisa R. Barton
Secretary to the Commission

Issued: March 24, 2020

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME **Inv. No. 337-TA-1100**

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **COMMISSION OPINION** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.,** and the following parties as indicated, on **March 25, 2020.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

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☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability for Download

On Behalf of Respondents Bio-Rad Laboratories, Inc.:

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☐ Via Express Delivery
☐ Via First Class Mail
☒ Other: Email Notification of Availability for Download

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-1100**

NOTICE OF A COMMISSION DETERMINATION TO REVIEW IN PART A FINAL INITIAL DETERMINATION FINDING A VIOLATION OF SECTION 337 AND TO EXTEND THE TARGET DATE; SCHEDULE FOR FILING WRITTEN SUBMISSIONS

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined to review in part the Administrative Law Judge's ("ALJ") final initial determination ("ID"), issued on July 12, 2019, finding a violation of section 337 in the above-referenced investigation and to extend the target date for completion of the above-referenced investigation to December 19, 2019. The Commission requests briefing from the parties on certain issues under review, as indicated in this notice.

FOR FURTHER INFORMATION CONTACT: Benjamin S. Richards, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street SW, Washington, DC 20436, telephone (202) 708-5453. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street SW, Washington, DC 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at *https://www.usitc.gov*. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *https://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 205-1810.

SUPPLEMENTARY INFORMATION: On February 21, 2018, the Commission instituted this investigation based on a complaint filed by 10X Genomics, Inc. of Pleasanton, CA. 83 FR 7491 (Feb. 21, 2018). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of one or more claims of U.S. Patent Nos. 9,644,204 ("the '204 patent"); 9,689,024 ("the '024 patent");

9,695,468 ("the '468 patent"); and 9,856,530 ("the '530 patent"). *Id.* The Commission's notice of investigation named as the sole respondent Bio-Rad Laboratories, Inc. of Hercules, CA. *Id.* The Office of Unfair Import Investigations ("OUII") is participating in this investigation. *Id.*

On July 12, 2019, the ALJ issued the final ID. The ID found a violation of section 337 by virtue of Bio-Rad's indirect infringement of the '024, the '468, and the '530 patents. The ID found that 10X had not established a violation with respect to the '204 patent. The ID also found that Bio-Rad failed to establish invalidity of any of the asserted claims of any patent. The ID further found that the domestic industry requirement was satisfied for each of the asserted patents. Finally, the ID found that Bio-Rad had not carried its burden with respect to various additional affirmative defenses, including improper inventorship and ownership.

On July 25, 2019, the ALJ issued her recommended determination on remedy and bonding. The ALJ recommended, upon a finding of violation, that the Commission issue a limited exclusion order, issue a cease and desist order, and impose a bond in the amount of twenty-five percent of the entered value of any covered products imported during the period of Presidential review.

On July 29, 2019, 10X, Bio-Rad, and OUII submitted petitions seeking review of the ID. On August 6, 2019, 10X, Bio-Rad, and OUII submitted responses to the others' petitions. On August 26, 2019, 10X and Bio-Rad submitted comments on the public interest pursuant to Commission Rule 210.50(a)(4).

Having examined the record of this investigation, including the ID, the petitions for review, and the responses thereto, the Commission has determined to review the ID with respect to (1) all findings related to a violation based on the '024 patent; (2) all findings related to a violation based on the '468 patent; (3) noninfringement of the '204 patent; (4) all findings related to a violation based on the '530 patent; (5) Bio-Rad's inventorship and ownership defenses; and (6) a typographical error on page 91. The Commission has determined not to review the remainder of the ID.

The Commission has further determined to extend the target date in this investigation to December 19, 2019.

The parties are requested to brief their positions on only the following issues under review with reference to the applicable law and the evidentiary record:

1. With respect to Bio-Rad's ownership defense, would Drs. Hindson and Saxanov be considered inventors of the asserted patents based only on the "ideas" they developed at QuantaLife/Bio-Rad? Your response should address how, if at all, those "ideas" correspond to the particular inventions claimed in the asserted patents.

2. Was the ALJ correct to focus on the "inventive concept" of the asserted patents in determining whether Bio-Rad has ownership rights in the asserted patents? If not, what is the correct focus?

3. The ID construed the term "amplification" in the '024 and '468 patent claims to mean "increasing the number of copies of the target sequence to be detected, including by reverse transcription." Explain whether the ID's construction is supported by the Application No. PCT/US 99/01705 ("the '705 application"), U.S. Patent Application Publication No. 2011/0053798 ("the '798 application"), or the specifications of the '024 and '468 patents. Please cite and explain each section that supports or detracts from this construction as well as any expert testimony that interprets those sections.

4. If the Commission determined to construe "amplification" to exclude reverse transcription, consistent with OUII's petition, what effect, if any, would that have on the ID's finding of infringement of the asserted claims of the '024 and '468 patents?

5. In its response to OUII's petition on the construction of "amplification," Bio-Rad argues that, if the ID's construction of "amplification" is modified to exclude reverse transcription, then the ID's infringement findings with respect to the '024 patent should be reversed. Bio-Rad's argument focuses particularly on whether amplification occurs in a droplet. Explain how, if at all, modifying the ID's construction of "amplification" to exclude reverse transcription could give rise to a noninfringement finding based on the location where amplification occurs.

6. Has Bio-Rad waived its noninfringement argument for the '024 patent based on the location where amplification occurs, as described in question 5, by failing to raise the argument in its petition for review? If you contend that the argument is not waived, provide citations to where this issue was raised in Bio-Rad's prehearing brief, posthearing brief, and petition for review.

7. Does the evidence of record support the conclusion that [[ ]] in the context of the products accused of infringing the '204 patent?

8. Claim 1 of the '530 patent includes the clause "wherein said barcode molecules become detached from said gel bead." Is this clause part of step (c) of the claimed method such that barcode molecules must become detached from the gel bead during that step, or does the clause modify the entire method such that the barcode molecules may become detached during any step of the method? Address the significance of the separate indentation of the "wherein" clause and the punctuation setting it off from the rest of the claim.

9. If claim 1 of the '530 patent is construed such that the barcode molecules must become detached from the gel bead during step (c) of the claimed method, does a preponderance of the evidence show that Bio-Rad's accused products and/or 10X's domestic industry products practice step (c) of claim 1? Please identify all evidence supporting your position.

10. Did any party argue in its pre- or post-hearing briefing that the ALJ's construction of claim 1 of the '530 patent, as laid out in orders 22 and 35, was indefinite? If they did, identify where in the briefing those arguments were made.

The parties are not to brief other issues on review, which are adequately presented in the parties' existing filings.

In connection with the final disposition of this investigation, the Commission may issue: (1) an exclusion order that could result in the exclusion of the subject articles from entry into the United States, and/or (2) a cease-and-desist order that could result in the respondent being required to cease and desist from engaging in unfair acts in the importation and sale of such articles. Accordingly, the Commission is interested in receiving written submissions that address the form of remedy, if any, that should be ordered. If a party seeks exclusion of an article from entry into the United States for purposes other than entry for consumption, the party should so indicate and provide information establishing that activities involving other types of entry either are adversely affecting it or likely to do so. For background, *see Certain Devices for Connecting Computers via Telephone Lines*, Inv. No. 337-TA-360, USITC Pub. No. 2843, Comm'n Op. at 7-10 (Dec. 1994).

If the Commission contemplates some form of remedy, it must consider the effects of that remedy upon the public interest. The factors the Commission will consider include the effect that an exclusion order and/or cease and desist orders would have on (1) the public health and welfare, (2) competitive conditions in the U.S. economy, (3) U.S. production of articles that are like or directly competitive with those that are subject to investigation, and (4) U.S. consumers. The Commission is therefore interested in receiving written submissions that address the aforementioned public interest factors in the context of this investigation.

If the Commission orders some form of remedy, the U.S. Trade Representative, as delegated by the President, has 60 days to approve or disapprove the Commission's action. *See* Presidential Memorandum of July 21, 2005, 70 FR 43251 (July 26, 2005). During this period, the subject articles would be entitled to enter the United States under bond, in an amount determined by the Commission and prescribed by the Secretary of the Treasury. The Commission is therefore interested in receiving submissions concerning the amount of the bond that should be imposed if a remedy is ordered.

WRITTEN SUBMISSIONS: The parties to this investigation are requested to file written submissions on the issues identified in this Notice and on the issues of remedy, the public interest, and bonding. Complainant and OUII are requested to submit proposed remedial orders

for the Commission's consideration. Complainant is also requested to state the date that the patents expire and the HTSUS numbers under which the accused products are imported. Complainant is further requested to supply the names of known importers of the Respondent's products at issue in this investigation.

The parties' written submissions and proposed remedial orders must be filed no later than the close of business on October 31, 2019. Reply submissions must be filed no later than the close of business on November 7, 2019. Opening submissions are limited to 75 pages. Reply submissions are limited to 60 pages. Such submissions should address the ALJ's recommended determination on remedy and bonding. Interested government agencies and any other interested parties are also encouraged to file written submissions on the issues of remedy, the public interest, and bonding. Third-party submissions should be filed no later than the close of business on October 31, 2019, 2019. No further submissions on any of these issues will be permitted unless otherwise ordered by the Commission.

Persons filing written submissions must file the original document electronically on or before the deadlines stated above and submit eight true paper copies to the Office of the Secretary pursuant to Section 210.4(f) of the Commission's Rules of Practice and Procedure (19 CFR 210.4(f)). Submissions should refer to the investigation number ("Inv. No. 337-TA-1100") in a prominent place on the cover page and/or the first page. (*See* Handbook on Filing Procedures, *https://www.usitc.gov/documents/handbook_on_filing_procedures.pdf*). Persons with questions regarding filing should contact the Secretary at (202) 205-2000.

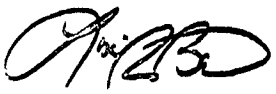
Any person desiring to submit a document to the Commission in confidence must request confidential treatment unless the information has already been granted such treatment during the proceedings. All such requests should be directed to the Secretary of the Commission and must include a full statement of the reasons why the Commission should grant such treatment. *See* 19 CFR 210.6. Documents for which confidential treatment by the Commission is sought will be treated accordingly. A redacted non-confidential version of the document must also be filed simultaneously with any confidential filing. All information, including confidential business information and documents for which confidential treatment is properly sought, submitted to the Commission for purposes of this Investigation may be disclosed to and used: (i) by the Commission, its employees and Offices, and contract personnel (a) for developing or maintaining the records of this or a related proceeding, or (b) in internal investigations, audits, reviews, and evaluations relating to the programs, personnel, and operations of the Commission including under 5 U.S.C. Appendix 3; or (ii) by U.S. government employees and contract personnel[1], solely for cybersecurity purposes. All non-confidential written submissions will be available for public inspection at the Office of the Secretary and on EDIS

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), and in part 210 of the Commission's Rules of

[1] All contract personnel will sign appropriate nondisclosure agreements.

Practice and Procedure (19 CFR 210).

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: October 17, 2019

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.,** and the following parties as indicated, on **October 18, 2019.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
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☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

On Behalf of Respondents Bio-Rad Laboratories, Inc.:

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☐ Via Hand Delivery
☐ Via Express Delivery
☒ Via First Class Mail
☐ Other:_____

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Inv. No. 337-TA-1100**

INITIAL DETERMINATION ON VIOLATION OF SECTION 337

Administrative Law Judge Dee Lord

(July 12, 2019)

Appearances:

For Complainant 10X Genomics, Inc.:

Matthew D. Powers, Esq., Paul T. Ehrlich, Esq., Azra M. Hadzimehmedovic, Esq., Aaron M. Nathan, Esq., and Stefani C. Smith, Esq. of Tensegrity Law Group, LLP of Redwood Shores, CA.

For Respondent Bio-Rad Laboratories, Inc.:

Kevin P.B. Johnson, Esq., Brian Cannon, Esq., and Victoria Maroulis, Esq. of Quinn, Emanuel, Urquhart & Sullivan, LLP of Redwood Shores, CA; S. Alex Lasher, Esq. and Sean Gloth, Esq. of Quinn, Emanuel, Urquhart & Sullivan, LLP of Washington, DC; and David Bilsker, Esq. of Quinn, Emanuel, Urquhart & Sullivan, LLP of San Francisco, CA.

For the Commission Investigative Staff:

Monica Bhattacharyya, Esq. and Anne Goalwin, Esq. of the Office of Unfair Import Investigations.

Pursuant to the Notice of Investigation (Dec. 13, 2017) and Commission Rule 210.42, this is the administrative law judge's final initial determination in the matter of *Certain Microfluidic Systems and Components Thereof and Products Containing Same*, Commission Investigation No. 337-TA-1100. 19 C.F.R. § 210.42(a)(1)(i).[1]

For the reasons discussed herein, it is my final initial determination that there is a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of certain claims of U.S. Patent No. 9,689,024 ("the '024 Patent"), U.S. Patent No. 9,695,468 ("the '468 Patent"), and U.S. Patent No. 9,856,530 ("the '530 Patent"). There is no violation with respect to U.S. Patent No. 9,644,204 ("the '204 Patent").

[1] Pursuant to Commission Rule 210.42(a)(1)(ii), a recommended determination on remedy and bonding shall issue within 14 days of this initial determination. 19 C.F.R. § 210.42(a)(1)(ii).

TABLE OF CONTENTS

The following abbreviations may be used in this Initial Determination:

Tr.	Transcript
WS	Witness Statement
DWS	Direct Witness Statement
RWS	Rebuttal Witness Statement
JX	Joint Exhibit
CX	Complainant's exhibit
CPX	Complainant's physical exhibit
CDX	Complainant's demonstrative exhibit
RX	Respondent's exhibit
RPX	Respondent's physical exhibit
RDX	Respondent's demonstrative exhibit
CPHB	Complainant's pre-hearing brief
CIB	Complainant's initial post-hearing brief
CRB	Complainant's reply post-hearing brief
RPHB	Respondent's pre-hearing brief
RIB	Respondent's initial post-hearing brief
RRB	Respondent's reply post-hearing brief
SPHB	Staff's pre-hearing brief
SIB	Staff's initial post-hearing brief
SRB	Staff's reply post-hearing brief

I. BACKGROUND

A. Procedural History

The Commission instituted this investigation in response to a complaint filed by 10X Genomics, Inc. ("10X") alleging violations of section 337 of the Tariff Act of 1930, as amended, by reason of infringement of certain claims of U.S. Patent No. 9,644,204 ("the '204 Patent"), U.S. Patent No. 9,689,024 ("the '024 Patent"), U.S. Patent No. 9,695,468 ("the '468 Patent"), and U.S. Patent No. 9,856,530 ("the '530 Patent") by Respondent Bio-Rad Laboratories, Inc. ("Bio-Rad"). The Commission ordered that an investigation be instituted to determine:

> whether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of one or more of claims 1-4, 6-9, 17, 20, 21, 23, 25, 27, 29, 31, and 33 of the '204 Patent; claims 1, 2, 5, 8, 10, 11, 13, 15-17, 19, 21, and 22 of the '024 Patent; claims 1-4, 6-9, 11, 12, 21, and 22 of the '468 Patent; and claims 1-6, 8-11, 14-20, and 24-30 of the '530 Patent; and whether an industry in the United States exists as required by subsection (a)(2) of section 337;

Notice of Investigation at 2. The investigation was instituted upon publication of the notice of investigation in the *Federal Register* on Wednesday, February 21, 2018. 83 Fed. Reg. 7491-92 (2018); *see* 19 C.F.R. § 210.10(b). Bio-Rad filed a response to the complaint and notice of investigation on March 6, 2018.

A *Markman* hearing was held in this investigation on July 25, 2018, and a *Markman* order, issued on October 31, 2018. Order No. 22.

On October 5, 2018, 10X's motion for summary determination was granted pursuant to a stipulation between 10X and Bio-Rad that 10X has satisfied the economic prong of the domestic industry requirement. Order No. 19 (Oct. 5, 2018), *not reviewed by* Comm'n Notice (Nov. 6, 2018).

10X withdrew its allegations of infringement with respect to claims 2, 8, 10, 11, 13, 15, 16, and 21 of the '024 patent, claims 1, 2, 3, 4, 6, 7, 8, 9, 17, 20, 21, 23, and 25 of the '204 patent, claims 2, 3, 4, 8, 11, 12, and 22 of the '468 patent, and claims 2, 3, 5, 6, 8, 9, 10, 15, 16, 17, 18, 20, 24, 25, 27, 29, and 30 of the '530 patent. Order No. 26 (Nov. 30, 2018); Order No. 27 (Dec. 10, 2018); Comm'n Notice (Dec. 21, 2018). Part of Bio-Rad's inventorship defense was terminated pursuant to Order No. 34 (Feb. 21, 2019), *not reviewed by* Comm'n Notice (Mar. 13, 2019). The evidentiary hearing proceeded on March 25-29, 2019, and the target date was extended to November 12, 2019, pursuant to Order No. 45 (May 29, 2019), *not reviewed by* Comm'n Notice (Jun. 13, 2019).

B. The Private Parties

1. Complainant

The complainant is 10X Genomics, Inc. ("10X"). Notice of Investigation at 2. 10X was founded in 2012 in Pleasanton, California, where it maintains its headquarters and a manufacturing facility. Complaint ¶ 6 (Jan. 9, 2018); Order No. 19 at 3-4 (Oct. 5, 2018).

2. Respondents

The respondent is Bio-Rad Laboratories, Inc. ("Bio-Rad"). Notice of Investigation at 2. Bio-Rad is a Delaware corporation with its principal place of business in Hercules, California. Response to Complaint ¶ 22 (Mar. 6, 2018).

C. Products at Issue

The products at issue are microfluidic cartridges, droplet generation instruments, and assays used in single-cell sequencing.

1. Domestic Industry

The domestic industry products ("DI products") are 10X's GemCode™ and Chromium™ product lines. Order No. 19 at 3. These products were developed by 10X based on its GEM ("Gel bead in Emulsion") architecture, and the first GemCode™ product was sold in 2015. CX-0003C (Schnall-Levin DWS) at Q/A 47-52. The DI products include both single-cell and linked-read applications, including the Chromium™ Single Cell 3' Solution, Chromium™ Single Cell V(D)J Solution, and GemCode™ Single Cell platform (collectively, "10X's single-cell applications), and the Chromium™ Genome Solution, Chromium™ Exome Solution, Chromium™ *de novo* Assembly Solution, and GemCode™ Long Read platform (collectively, "10X's linked-read applications"). Order No. 19 at 3. Pursuant to Order No. 19, 10X has satisfied the economic prong of the domestic industry requirement with respect to these products. *See* Comm'n Notice (Nov. 6, 2018).

2. Accused Products

The accused products are components and assays of Bio-Rad's ddSEQ system, which includes ddSEQ [redacted]. CIB at 4-5; RIB at 11-12. The ddSEQ v1 products include Bio-Rad's ddSEQ v1 Cartridge, ddSEQ v1 Single-Cell Isolator, ddSEQ Cartridge Holder, and consumables and assays used with and/or as part of Bio-Rad's ddSEQ v1 system including the SureCell WTA 3' v1 assay. *Id.*; CX-0004C (Butte DWS) at Q/A 54; RX-0665C (Metzger RWS) at Q/A 29. The ddSEQ [redacted]. *Id.* Bio-Rad has admitted that each of the ddSEQ v1 instruments and the v1 [redacted]. CX-0041C at Interrogatory Nos. 4 and 5; *see* RPHB at 53.

D. Background of Asserted Patents

1. The '024 and '468 Patents

Through application 13/966,150 ("the '150 application"), which was filed on August 13, 2013, the '468 and '024 patents claim priority to six provisional applications filed between August 14, 2012 and July 10, 2013. '024 patent (JX-0003), cover; '468 patent (JX-0005), cover. The '024 patent was filed as a divisional of the '150 application and the '468 patent was filed as a continuation of the '150 application. '024 patent, cover; '468 patent, cover. Because of their ancestry, the '024 and '468 patents share a common specification. The patents identify Benjamin Hindson, Serge Saxonov, and Michael Schnall-Levin as inventors. '024 patent, cover; '468 patent, cover.

Analysis of biological materials, such as sequencing nucleic acids, requires proper sample preparation. '024 patent, col. 1:28-30. "Sample preparation may . . . involve fragmenting molecules, isolating molecules, and/or attaching unique identifiers to particular fragments of molecules . . . ." *Id.* at col. 1:34-37. A microwell partition capsule array can be used in sample preparation operations. *Id.*, col. 4:28-29. Such a device consists of "an assembly of partitions (*e.g.*, microwells, droplets) that are loaded with microcapsules." *Id.*, col. 4:24-27. The array divides the sample "such that a portion of the sample is present in each partition." *Id.*, col. 4:29-32. Each partition "may include one or more capsules that contain one or more reagents (*e.g.*, enzymes, unique identifiers (*e.g.*, bar codes), antibodies, *etc.*)." *Id.*, col. 4:41-44. A "trigger" can be used to cause the microcapsules to release the reagents into the partitions, so that the reagents come into contact with the subdivided sample. *Id.*, col. 4:44-48.

Microcapsules are used (1) to "provide for the controlled and/or timed release of reagents for sample preparation of an analyte," (2) to control the release and transport of reagents, (3) to

deliver reagents in discrete and definable amounts, (4) to "prevent premature mixing of reagents with the sample," and (5) to ease handling of and limit contact with reagents. *Id.*, col. 6:62-col. 7:13. Microcapsules can be formed using gel beads. *Id.*, col. 9:28-35. Analytes and/or reagents can "be coupled/ immobilized to the interior surface of a gel bead (*e.g.*, the interior accessible via diffusion of an oligonucleotide barcode and/or materials used to generate an oligonucleotide barcode) and/or the outer surface of a gel bead." *Id.*, col. 9:36-42. Release of the analytes or reagents from the microcapsule may be the result of applying a trigger. *Id.*, col. 22:4-6. Various types of stimuli can be used as a trigger, including chemical stimuli, enzymes, light, heat, and magnetic fields. *Id.*, col. 19:43-48, col. 22:4-21.

One sample preparation reagent that can be delivered by a microcapsule is a "molecular barcode." *Id.*, col. 12:9-14. For most applications, such as in the case of the nucleic acid sequencing, analyzing multiple samples simultaneously "substantially decreases the cost of analysis as well as increases through-put of the process." *Id.*, col. 12:33-36. To analyze multiple samples, different samples are pooled together. *Id.*, col. 12:36-39. Before the samples are pooled together, the analytes from each sample are tagged with a unique identifier, known in the art as a "molecular barcode," so that analytes from different samples can be identified and tracked in the pooled sample. *Id.*, col. 12:11-13, col. 12:36-39. Molecular barcodes "may comprise a variety of different forms such as oligonucleotide bar codes, antibodies or antibody fragments, fluorophores, nanoparticles, and other elements or combinations thereof." *Id.*, col. 12:14-17. In nucleic acid sequencing, oligonucleotide barcodes are particularly useful. *Id.*, col. 12:43-44.

2. The '204 Patent

The '204 patent issued on May 9, 2017 from an application filed on February 7, 2014. '204 patent (JX-0001), cover. The '204 patent claims priority to four provisional applications filed between February 8, 2013 and July 10, 2013. The provisional applications to which the '204 patent claims priority are also relied on for priority by the '024 and '468 patents. The patent names Benjamin Hindson, Serge Saxonov, Kevin Ness, Paul Hardenbol, Christopher Hindson, Donald Masquelier, Mirna Jarosz, and Michael Schnall-Levin as inventors. Three of the named inventors—Dr. Hindson, Dr. Saxonov, and Dr. Schnall-Levin—are also the named inventors of the '024 and '468 patents.

The disclosed subject matter of the '204 patent is similar to that of the '024 and '468 patents. As with those patents, the '204 patent is directed to sample preparation methods and discloses "compositions comprising a plurality of capsules, the capsules situated within droplets in an emulsion, wherein the capsules are configured to release their contents into the droplets upon the application of a stimulus." *Id.*, col. 1:42-46. The capsules may contain reagents and/or analytes. *Id.*, col. 1:47-48.

3. The '530 Patent

The '530 patent issued on January 2, 2018 from an application filed on May 5, 2017. '530 patent (JX-0007), cover. Through intervening applications, the '530 patent is a continuation in part of an application filed on February 7, 2014. *Id.* The '530 patent also claims priority to five provisional applications filed between December 14, 2012 and July 10, 2013. *Id.* Four of the provisional applications to which the '204 patent claims priority are also relied on for priority by the '024, '468, and '204 patents. The patent names Benjamin Hindson, Serge Saxonov, Kevin Ness, Paul Hardenbol, Mirna Jarosz, and Michael Schnall-Levin as inventors.

These same individuals are named inventors of the '204 patent and three of them—Dr. Hindson, Dr. Saxonov, and Dr. Schnall-Levin—are also named inventors of the '024 and '468 patents.

The claimed subject matter of the '530 patent is similar to the subject matter disclosed in the '024, '468, and '204 patents. As with those patents, the '530 patent discloses sample preparation methods that use microcapsules and beads to provide reagents and analytes in response to stimuli. '530 patent, col. 23:60-col. 24:13.

E. Level of Ordinary Skill in the Art

In the *Markman* order, I adopted Bio-Rad's proposed definition for the level of ordinary skill in the art: either a Ph.D. in molecular biology, molecular genetics, chemistry, engineering, or equivalent disciplines with two years of experience or [B.S.] in such fields with five years of experience, with such experience including library preparation methods, microfluidic technology, and/or bead attachment chemistries. Order No. 22 at 2-3.

F. Witness Testimony

I received testimonial evidence in this investigation in the form of witness statements, live testimony, and deposition designations.

1. Fact Witnesses

10X began the hearing with the testimony of Benjamin Hindson, co-founder of 10X and co-inventor of the asserted patents. CX-0001C; CX-1828C; Tr. 132-187. The next witness was Michael Schnall-Levin, a vice president at 10X and another co-inventor of the asserted patents. CX-0003C; CX-1830C; Tr. 189-231. 10X also called Serge Saxonov, its CEO and also a co-founder of 10X and co-inventor of the asserted patents. CX-1829C; Tr. 768-820.

Bio-Rad presented the testimony of Annette Tumolo, the president of its Life Sciences Group. RX-0502C; Tr. 509-511. Bio-Rad also presented the testimony of Douglas Greiner, a

senior manager in its product development group. RX-0507C; RX-0727C; Tr. 511-565. Bio-Rad also called another of its employees, Nicholas Heredia, who is an alleged co-inventor of the asserted patents. RX-0504C; Tr. 565-604. In addition, Bio-Rad presented the testimony of one of its former employees, Kelly Kaihara (RX-0506C), and she was examined as an adverse witness by 10X. Tr. 234-282. Bio-Rad also presented the testimony of its employee Jeremy Agresti (RX-0503C), who was further examined as an adverse witness by 10X. Tr. 283-348.

2. Expert Witnesses

10X's expert on infringement is Atul Butte, whose testimony was qualified as that of an expert in the field of genomic sequencing solutions. CX-0004C; Tr. 351-474 (expert qualification at 364:9-17). 10X's expert on invalidity is Paul Dear, whose testimony was qualified as that of an expert in the field of genomic sequencing solutions. CX-1827C; Tr. 822-934 (expert qualification at 828:20-829:1).

Bio-Rad's technical expert is Michael Metzker, whose testimony was qualified as that of an expert in next generation sequencing, including sample preparation technologies, microfluidics, enzyme chemistry, high throughput assays, bead properties and attachment chemistries. RX-0664C; RX-0665C; Tr. 608-767 (expert qualification at 613:22-614:14), 935-961.

The parties also stipulated to the admission of witness statements from Thomas Vander Veen (CX-0005C) and Ryan Herrington (RX-0666C), and their designated deposition transcripts (JX-0162C and JX-0170C), discussing the issues of remedy and bond. Tr. 24-25.

3. Deposition Designations

10X submitted designated deposition transcripts for several witnesses: Jeremy Agresti (CX-0009C), Mark DiPanfilo (CX-0010C), Lucas Frenz (CX-0011C), Jodi Goodrich (CX-

0012C), Nicholas Heredia (CX-0014C and CX-0015C), Kelly Kaihara (CX-0016C), Ronald Lebofsky (CX-0018C), Dan Norton (CX-0019C), Carolyn Reifsnyder (CX-0020C), Annette Tumolo (CX-0022C), and Svilen Tzonev (CX-0023C). Tr. 23.

Bio-Rad also submitted designated deposition transcripts for several witnesses: Paul Hardenbol (RX-0396C), Benjamin Hindson (RX-0399C), Christopher Hindson (RX-0400C), Mirna Jarosz (RX-0401C), Donald Masquelier (RX-0405C), Kevin Ness (RX-0408C), Serge Saxonov (RX-0412C), and Michael Schnall-Levin (RX-0413C). Tr. 23-24.

II. JURISDICTION

In order to have the power to decide a case, a court or agency must have both subject matter jurisdiction and jurisdiction over either the parties or the property involved. 19 U.S.C. § 1337; *Certain Steel Rod Treating Apparatus and Components Thereof*, Inv. No. 337-TA-97, Commission Memorandum Opinion, 215 U.S.P.Q. 229, 231 (1981).

A. Subject Matter Jurisdiction

Section 337 confers subject matter jurisdiction on the Commission to investigate, and if appropriate, to provide a remedy for, unfair acts and unfair methods of competition in the importation, the sale for importation, or the sale after importation of articles into the United States. *See* 19 U.S.C. §§ 1337(a)(1)(B) and (a)(2). The Commission has subject matter jurisdiction over this investigation based on 10X's allegation that Bio-Rad has imported the accused products. *Amgen Inc. v. Int'l Trade Comm'n*, 902 F.2d 1532, 1536 (Fed. Cir. 1990). Bio-Rad does not contest the Commission's subject matter jurisdiction in this investigation. RPHB at 53.

B. Personal Jurisdiction

Bio-Rad does not contest the Commission's *in personam* jurisdiction in this investigation. RPHB at 49. Bio-Rad has submitted to the personal jurisdiction of the Commission by answering the Complaint and Notice of Investigation, participating in discovery, appearing at hearings, and filing motions and briefs. *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, USITC Pub. No. 1948, Initial Determination at 4, 1986 WL 379287, *1 (Oct. 15, 1986), *not reviewed in relevant part by* Comm'n Action and Order, 1987 WL 450871 (Jan. 15, 1987).

C. *In Rem* Jurisdiction

The Commission has *in rem* jurisdiction over the accused products by virtue of their importation into the United States. *See Sealed Air Corp. v. U.S. Int'l Trade Comm'n*, 645 F.2d 976, 985-86 (C.C.P.A. 1981) (holding that the ITC's jurisdiction over imported articles is sufficient to exclude such articles). Bio-Rad does not contest that it has imported, sold for importation, and/or sold after importation certain ddSEQ products. RPHB at 53.

III. LEGAL STANDARDS

A. Infringement

Section 337(a)(1)(B)(i) prohibits "the importation into the United States, the sale for importation, or the sale within the United States after importation by the owner, importer, or consignee, of articles that – (i) infringe a valid and enforceable United States patent or a valid and enforceable United States copyright registered under title 17." 19 U.S.C. §1337(a)(1)(B)(i). The Commission has held that the word "infringe" in Section 337(a)(1)(B)(i) "derives its legal meaning from 35 U.S.C. § 271, the section of the Patent Act that defines patent infringement." *Certain Electronic Devices with Image Processing Systems, Components Thereof, and Associated Software*, Inv. No. 337-TA-724, Comm'n Op. at 13-14 (December 21, 2011). Under 35 U.S.C. § 271(a), direct infringement of a patent consists of making, using, offering to sell, or

selling the patented invention without consent of the patent owner.

In addition to direct infringement, a respondent may be liable for indirect infringement, including induced infringement, which is defined in section 271(b) of the Patent Act: "Whoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b). *See DSU Med. Corp. v. JMS Co., Ltd.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (*en banc*) ("To establish liability under section 271(b), a patent holder must prove that once the defendants knew of the patent, they actively and knowingly aided and abetted another's direct infringement.") (citations omitted). "The mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven." *Id.* (citations omitted). The Federal Circuit has held that induced infringement "requires knowledge that the induced acts constitute . . . infringement." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 766 (2011). In *Suprema, Inc. v. Int'l Trade Comm'n*, the Federal Circuit upheld the Commission's interpretation of the section 337 language "articles that infringe" in the context of induced infringement, holding that the statute "covers goods that were used by an importer to directly infringe post-importation as a result of the seller's inducement." 796 F.3d 1338, 1352-53 (Fed. Cir. 2015).

Another form of indirect infringement is contributory infringement, defined in section 271(c) of the Patent Act: "Whoever offers to sell . . . or imports into the United States a component of a patented machine, . . . or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer." 35 U.S.C. § 271(c). The intent requirement for contributory

infringement requires that respondent knows "that the combination for which [the] component was especially designed was both patented and infringing." *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. at 763. A violation of section 337 based on contributory infringement requires that "the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement." *Spansion, Inc. v. Int'l Trade Comm'n*, 629 F.3d 1331, 1353 (Fed. Cir. 2010).

"An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996) (citation omitted). Infringement must be proven by a preponderance of the evidence. *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988). A preponderance of the evidence standard "requires proving that infringement was more likely than not to have occurred." *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

A complainant must prove either literal infringement or infringement under the doctrine of equivalents. Literal infringement requires the patentee to prove that the accused device contains each and every limitation of the asserted claim(s). *Frank's Casing Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1378 (Fed. Cir. 2004). "If even one limitation is missing or not met as claimed, there is no literal infringement." *Elkay Mfg. Co. v. EBCO Mfg. Co.*, 192 F.3d 973, 980 (Fed. Cir. 1999). Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008).

B. Invalidity

It is the respondents' burden to prove invalidity, and the burden of proof never shifts to the patentee to prove validity. *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1380 (Fed. Cir. 2008). "Under the patent statutes, a patent enjoys a presumption of validity, *see* 35 U.S.C. § 282, which can be overcome only through facts supported by clear and convincing evidence . . . ." *SRAM Corp. v. AD-II Eng'g, Inc.*, 465 F.3d 1351, 1357 (Fed. Cir. 2006); *see also Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 100-114 (2011) (upholding the "clear and convincing" standard for invalidity).

The clear and convincing evidence standard placed on the party asserting an invalidity defense requires a level of proof beyond the preponderance of the evidence. Although not susceptible to precise definition, "clear and convincing" evidence has been described as evidence that produces in the mind of the trier of fact "an abiding conviction that the truth of a factual contention is 'highly probable.'" *Price v. Symsek*, 988 F.2d 1187, 1191 (Fed. Cir. 1993) (quoting *Buildex, Inc. v. Kason Indus., Inc.*, 849 F.2d 1461, 1463 (Fed. Cir. 1988)).

1. Anticipation

Pursuant to 35 U.S.C. § 102, a patent claim is invalid as anticipated if:

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant;
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States;
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent;
>
> (g)(2) before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it.

35 U.S.C. § 102 (2000).[2] "A patent is invalid for anticipation if a single prior art reference discloses each and every limitation of the claimed invention. Moreover, a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference." *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citations omitted).

2. Obviousness

Section 103 of the Patent Act states:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 103(a) (2000).[3]

"Obviousness is a question of law based on underlying questions of fact." *Scanner Techs.*, 528 F.3d at 1379. The underlying factual determinations include: "(1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) objective indicia of non-obviousness." *Id.* (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)). These factual determinations are often referred to as the "*Graham* factors."

The critical inquiry in determining the differences between the claimed invention and the prior art is whether there is a reason to combine the prior art references. *KSR Int'l Co. v. Teleflex*

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[2] As explained in the revision notes and legislative reports in 35 U.S.C.A. § 100 (May 13, 2015), the language of 35 U.S.C. § 102 that was effective prior to the America Invents Act controls in this investigation.

[3] *See supra*, n.2.

Inc., 550 U.S. 398, 418-21 (2007). In *KSR*, the Supreme Court rejected the Federal Circuit's rigid application of the teaching-suggestion-motivation test. While the Court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," it described a more flexible analysis:

> Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue . . . . As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

Id. at 418. Applying *KSR*, the Federal Circuit has held that, where a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, "the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device . . . and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007).

In addition to demonstrating that a reason exists to combine prior art references, the challenger must demonstrate that the combination of prior art references discloses all of the limitations of the claims. *Hearing Components, Inc. v. Shure Inc.*, 600 F.3d 1357, 1373-1374 (Fed. Cir. 2010), *abrogated on other grounds by Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014) (upholding finding of non-obviousness based on substantial evidence that the asserted combination of references failed to disclose a claim limitation); *Velander v. Garner*, 348

F.3d 1359, 1363 (Fed. Cir. 2003) (explaining that a requirement for a finding of obviousness is that "all the elements of an invention are found in a combination of prior art references").

C. Domestic Industry

In patent-based proceedings under section 337, a complainant must establish that an industry "relating to the articles protected by the patent . . . exists or is in the process of being established" in the United States. 19 U.S.C. § 1337(a)(2). Under Commission precedent, the domestic industry requirement of section 337 consists of an "economic prong" and a "technical prong." *See, e.g., Alloc, Inc. v. Intl Trade Comm'n,* 342 F.3d 1361, 1375 (Fed. Cir. 2003). To meet the technical prong, the complainant must establish that it practices at least one claim of the asserted patent. *Certain Point of Sale Terminals and Components Thereof,* Inv. No. 337-TA-524, Order No. 40 at 17-18 (Apr. 11, 2005). "The test for satisfying the 'technical prong' of the industry requirement is essentially [the] same as that for infringement, *i.e.*, a comparison of domestic products to the asserted claims." *Alloc*, 342 F.3d at 1375.

With respect to the "economic prong," subsection (3) of Section 337(a) provides:

> For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned –
>
> (A) significant investment in plant and equipment;
>
> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.

19 U.S.C. § 1337(a)(3).

IV. THE '024 PATENT

A. Asserted Claims

10X is asserting claims 1, 5, 17, 19, and 22 of the '024 patent. Claim 1 is independent and the remaining claims depend directly or indirectly from claim 1. Claim 1 recites:

> A method for sample preparation, comprising:
>
> a) providing a droplet comprising a porous gel bead and a target nucleic acid analyte, wherein said porous gel bead comprises at least 1,000,000 oligonucleotide molecules comprising barcode sequences, wherein said oligonucleotide molecules are releasably attached to said porous gel bead, wherein said barcode sequences are the same sequence for said oligonucleotide molecules;
>
> b) applying a stimulus to said porous gel bead to release said oligonucleotide molecules from said porous gel bead into said droplet, wherein upon release from said porous gel bead, a given oligonucleotide molecule from said oligonucleotide molecules attaches to said target nucleic acid analyte; and
>
> c) subjecting said given oligonucleotide molecule attached to said target nucleic acid analyte to nucleic acid amplification to yield a barcoded target nucleic acid analyte.

'024 patent (JX-0003), col. 33:56-col. 34:7.

Claims 5 and 19 depend directly from claim 1. Claim 5 requires that the stimulus applied to the gel bead be "selected from the group consisting of a biological stimulus, a chemical stimulus, a thermal stimulus, an electrical stimulus, a magnetic stimulus, and a photo stimulus." *Id.*, col. 34:15-19. Claim 19 requires that the oligonucleotide molecules attach to the target nucleic acid analytes by hybridization. *Id.*, col. 34:.65-67. Claim 17 depends on claim 16, which requires that the droplet "comprise[] a plurality of target nucleic acid analytes, which plurality of target nucleic acid analytes comprises said target nucleic acid analyte." *Id.*, col. 34:54-56. Claim 17 requires that each of the plurality of target nucleic acid analytes attach to one of the oligonucleotide molecules. *Id.*, col. 34:58-61. Claim 22 depends on claim 21, which requires that the gel bead be formed from polymer gel. *Id.*, col. 35:4-5. Claim 22 requires that the polymer gel be a polyacrylamide. *Id.*, col. 35:6-7.

B. Claim Construction

The parties agreed to construe "barcode" to mean a "label that may be attached to an analyte to convey identifying information about the analyte." Order No. 22 at 2. They agreed to construe "applying a stimulus to said porous gel bead to release said oligonucleotide molecules from said porous gel bead into said droplet" to have its plain and ordinary meaning. *Id.* In the *Markman* order, "1,000,000 oligonucleotides comprising barcode sequences" was construed to mean "1,000,000 oligonucleotide molecules that include, but are not necessarily limited to, barcode sequences." *Id.* at 17-22. The term "releasably attached" was construed to mean "attached in a manner that allows the attached object to be released." *Id.* at 22-30. The terms "amplify" and "amplification" were construed to mean "increasing the number of copies of the target sequence to be detected," including by reverse transcription and without requiring amplification to be performed in a droplet. *Id.* at 31-45.

C. Infringement

10X accuses Bio-Rad's ddSEQ system (v1 [redacted]) of infringing claims 1, 5, 17, 19, and 22 of the '024 patent.

1. Claim 1

There is no dispute that the ddSEQ system includes a method of sample preparation, as recited in the preamble of claim 1, and 10X relies on Dr. Butte's testimony to identify steps corresponding to each limitation. CX-0004C at Q/A 109-226.

a. "providing a droplet . . ."

There is no dispute with respect to a majority of the elements in the first limitation of claim 1, which requires "providing a droplet comprising a porous gel bead and a target nucleic acid analyte," wherein the porous gel bead has certain characteristics. CIB at 8-19; SIB 24-29.

Dr. Butte identifies [redacted] gel beads used by the ddSEQ system, which are "porous because each bead has a three-dimensional network of pores [redacted] CX-0004C at Q/A 116. He identifies the steps of making droplets in the ddSEQ v1 workflow, *Id.* at Q/A 61-66, and the [redacted]. *Id.* at Q/A 73-80. He further identifies a targeted nucleic acid analyte: mRNA from a cell or a genomic DNA fragment. *Id.* at Q/A 116-17, 120-23. Bio-Rad does not dispute 10X's allegations with respect to the "porous gel bead" or "nucleic acid analyte."

The claim limitation further requires that the porous gel bed "comprises at least 1,000,000 oligonucleotide molecules comprising barcode sequences," and Dr. Butte cites Bio-Rad documents for the ddSEQ v1 process describing a concentration of oligonucleotides in a droplet with a volume consistent with [redacted]. CX-0004C at Q/A 128 (citing JX-0050C). This is consistent with Dr. Agresti's deposition testimony, where he was asked, "How many oligo molecules are attached to each gel bead in ddSEQ?" CX-0009C at 434. He answered: [redacted] *Id.* [redacted] CX-0004C at Q/A 133 (citing JX-0090C; CX-1529C). Dr. Agresti confirmed that the number of oligonucleotides in the scATAC-seq is [redacted] CX-0009C at 436-37. Bio-Rad disputed this limitation in its pre-hearing brief, RPHB at 57, but does not raise this argument it its post-hearing briefs. *See* RIB at 50-68; RRB at 5-14.

The next element of this limitation requires that "said oligonucleotide molecules are releasably attached to said porous gel bed." As discussed above, "releasably attached" was construed to mean "attached in a manner that allows the attached object to be released." *Id.* at

22-30. There is no dispute that the oligonucleotide molecules in Bio-Rad's ddSEQ system are attached to the gel bead. *See* RRB at 5-6. 10X relies on Dr. Butte's opinion that the oligonucleotide molecules are "releasably attached" to the gel bead through a "linker" that is [redacted] CX-0004C at Q/A 143-45 (citing JX-0050C.00026). Bio-Rad's expert, Dr. Metzker, explains that the [redacted] in the oligonucleotides of the accused products, [redacted]:

[redacted]

RX-0665C at Q/A 78-79 (citing JX-0087.00005).

10X contends that [redacted] in the accused ddSEQ system shows that the oligonucleotide molecules are "releasably attached." CIB at 12-15. There is no dispute that an oligonucleotide molecule containing barcode sequences is released after [redacted] Staff agrees that this process shows that the accused products meet the "releasably attached" limitation. SIB at 26-29.

Bio-Rad argues that its products do not meet the "releasably attached" limitation because [redacted] are part of a long oligonucleotide molecule that contains the barcode sequences and is attached to the gel bead. RIB at 54-59. When [redacted] are removed by [redacted] part of the long oligonucleotide molecule is thus destroyed, and Bio-Rad argues that destroying part of an oligonucleotide molecule is inconsistent with the claim language requiring

that the "oligonucleotide molecules are releasably attached." RIB at 54-59.

In reply, 10X explains that the accused "oligonucleotide molecule" is the molecule that is released [redacted], and no portion of this molecule is destroyed when it is released. CRB at 2. Relying on the opinions of Dr. Butte, 10X divides the Bio-Rad's long oligonucleotide into an accused "oligonucleotide molecule" and a separate "linker."

CRB at 2; CX-0004C (Butte DWS) at Q/A 143-45. Bio-Rad argues that there is no basis for dividing the oligonucleotide in this way, RRB at 5-8, but there are examples of linkers described in the specification. '024 patent, col. 9:57-58 (identifying "chemical linkers"); *see* SIB at 28. Moreover, there is nothing that precludes the claimed "oligonucleotide molecule" from being part of a larger oligonucleotide molecule—as recognized in the *Markman* order, the claim's "recital of 'oligonucleotide molecules' without a qualifier encompasses both larger and smaller oligonucleotide molecules." Order No. 22 at 19. Bio-Rad fails to identify any intrinsic or extrinsic evidence that precludes 10X from identifying the accused portion of Bio-Rad's oligonucleotide as the claimed "oligonucleotide molecule." The claim only requires that the accused "oligonucleotide molecule" include the claimed barcode sequences and that it be released—the molecule identified by 10X meets these limitations.

Bio-Rad further argues that the construction of "releasably attached" requires a reversible process, citing a discussion of the prosecution history in the *Markman* order. RIB at 54-57; RRB at 8. The portion of the *Markman* order cited by Bio-Rad does not support the

imposing a "reversible" limitation on the claims, however. At the *Markman* hearing, Bio-Rad had proposed a construction for "releasably attached" that required the gel bead to be configured or designed to release the attached molecules. Order No. 22 at 22-23. The *Markman* order rejected Bio-Rad's proposed construction for several reasons, including a discussion of the prosecution history where the applicants identified "reversible immobilization" as an example of releasable attachment. *Id.* at 26-27, 29. The discussion of reversible immobilization was cited an example to show that the claims "encompass[] situations wherein a barcode molecule is released from a bead by severing a portion of the barcode molecule," *Id.* at 29, and nothing in the *Markman* order requires that every releasable attachment be reversible. Moreover, limiting "releasably attached" to reversible immobilization would be inconsistent with the claims of the '024 patent, because dependent claim 15 adds "reversibly immobilized" as a limitation. *See Phillips*, 415 F.3d at 1315 ("[T]he presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim."). Bio-Rad's proposed "reversible" limitation is not consistent with the claims, specification, or prosecution history of the '024 patent.

There is no dispute with respect to the final element of the gel bead limitation, requiring that "said barcode sequences are the same sequence for said oligonucleotide molecules." Dr. Butte identifies documentation for ddSEQ v1 describing the same barcodes for each oligonucleotide in a bead. CX-0004C at Q/A 177-79. In particular, [redacted] CX-0149C.00019. Dr. Butte explains that for Bio-Rad's products to perform their intended purpose, "the barcode sequence should be the same for all the oligonucleotide molecules on a gel bead." CX-0004C at Q/A 180. [redacted]

[redacted]

JX-0091C.0009, .00011. In addition, Bio-Rad employee Dr. Lebofsky confirmed at his deposition that in the scATAC-seq assay, a single bead will have the same barcode on all of the single-stranded DNA fragments on it. CX-0018C at 208:11-15.

Accordingly, the accused ddSEQ v1 [redacted] processes infringe the "providing a droplet . . ." limitation of claim 1 of the '024 patent.

b. "applying a stimulus . . ."

The second limitation of claim 1 of the '024 patent requires "applying a stimulus to said porous gel bead to release said oligonucleotide molecules from said porous gel bead into said droplet." Dr. Butte identifies the [redacted] as the claimed stimulus, which causes the release of the oligonucleotide molecules from the porous gel bead. CX-0004C at Q/A 181-83.

Bio-Rad argues that the accused products do not infringe this limitation because the [redacted] acts on the oligonucleotides, not the gel bead. RIB at 59-62. There is no dispute that the [redacted] acts on the oligonucleotide, but 10X and Staff argue that this is a distinction without a difference, because the oligonucleotide is part of the gel bead. CIB at 19-22; SIB at 29-31. For the reasons discussed below, I agree with 10X and Staff that a preponderance of the evidence shows that the [redacted] is applied to the gel bead in the accused products, and a stimulus that acts on the oligonucleotides attached to the gel bead is consistent with infringement of the "applying a stimulus" limitation.

Dr. Butte explains that the [redacted] is part of an aqueous solution that is applied to the gel bead in the accused products. CX-0004C at Q/A 184. One of Bio-Rad's witness, Dr. Agresti, admitted at his deposition that "in ddSEQ, [] the [redacted] enters the entire volume of the bead." CX-0009C at 343:12-13. As discussed above, the [redacted]

[redacted], releasing the oligonucleotide molecule. *Id.* There is no dispute that the [redacted] thus acts as the stimulus that releases the oligonucleotide molecule from the gel bead into the droplet.

Bio-Rad argues that the [redacted] is applied to the oligonucleotide, not the gel bead; but in the accused products, the oligonucleotides are part of the gel bead. Any stimulus applied to the oligonucleotide is therefore also applied to the gel bead. As Dr. Agresti admitted at the hearing, the oligonucleotides are "[i]nside the volume" of the beads. Tr. 289. *See also* CX-00011C (Frenz Dep. Tr.) at 59-60 (describing oligos "in the volume of the . . . bead."). Bio-Rad cites the language of the '024 patent to argue that the oligonucleotide molecules and gel beads are separately claimed structures, but the claim language explicitly describes the oligonucleotide molecules as a part of the gel beads: "said porous gel bead comprises at least about 1,000,000 oligonucleotide molecules." *See* SIB at 30; SRB at 8. As stated in the *Markman* Order, "[t]he plain and ordinary meaning of 'comprise' is 'to include esp. with a particular scope,' 'to be made up of,' 'compose,' or 'constitute.'" Order No. 22 at 17-18. Recognizing that the oligonucleotides are part of the gel beads is consistent with structure of the accused products and with the language of the asserted claims.

There is no dispute with respect to the remaining elements of this limitation. Dr. Butte identifies a target nucleic acid analyte in the ddSEQ v1 [redacted] "wherein upon release from said porous gel bead, a given oligonucleotide molecule from said oligonucleotide molecules attaches to said target nucleic acid analyte." CX-0004C at Q/A 198 (ddSEQ v1: describing hybridization between the poly-T sequence of the oligonucleotide molecule and the

poly-A tail of the mRNA), Q/A 199 ([redacted]), Q/A 200 (scATAC-seq and [redacted]: Nextera adaptor binding sequence).

c. ". . . nucleic acid amplification"

The third and final limitation of claim 1 of the '024 patent requires "subjecting said given oligonucleotide molecule attached to said target nucleic acid analyte to nucleic acid amplification to yield a barcoded target nucleic acid analyte." As discussed above, the term "amplification" was construed to mean "increasing the number of copies of the target sequence to be detected," including by reverse transcription. Order No. 22 at 31-45.

10X relies on Dr. Butte's analysis of reverse transcription in the accused products to show infringement of this limitation. CIB at 24-28. In the ddSEQ v1 products, Dr. Butte explains that an oligonucleotide molecule attached to mRNA is "subjected to reverse transcription, second strand synthesis, and further PCR, to yield a barcoded cDNA strand." CX-0004C at Q/A 203. He further explains that barcoded cDNA strands are generated from the oligonucleotide molecules through several different processes, which 10X identifies in its brief as four types of amplification. CIB at 24-26 (citing CX-0004C at Q/A 205). In "Type A" the oligonucleotide-mRNA hybrids are subjected to reverse transcription to generate barcoded first cDNA strands. *Id.* In "Type B" the hybrids are subjected to second strand synthesis and further PCR to generate additional barcoded cDNA strands outside the droplet. *Id.* In "Type C" the oligonucleotide molecule attaches to the mRNA through reverse transcription to form the first barcoded cDNA strand, and this cDNA strand is subjected to second strand synthesis outside the droplet to create a second strand of cDNA. *Id.* In "Type D" the first cDNA strand is subjected

to PCR to generate additional double-stranded cDNA outside the droplet. *Id.* In Dr. Butte's opinion, any of these processes would meet the "amplification" limitation of the '024 patent.

Bio-Rad argues that the oligonucleotide molecule only acts as a primer during the reverse transcription reaction, and that this limitation is not infringed because the oligonucleotide molecule itself is not subjected to amplification. RIB at 62-63 (citing RX-0665C (Metzker RWS) at Q/A 87). This interpretation of the claim language was rejected in the *Markman* order, however, which recognized that persons of ordinary skill in the art would understand "amplification" to include reverse transcription. Order No. 22 at 32-41. Notably, the construction of "amplification" does not require exact copies of the oligonucleotide barcodes—the product of amplification can be complementary copies, which are the result of reverse transcription. *Id.* at 35-41. Moreover, dependent claims of the '024 patent explicitly discuss the usage of the oligonucleotide molecule as a primer during amplification. See '024 patent, claim 8 ("The method of claim 1, wherein said given oligonucleotide molecule of said oligonucleotide molecules comprises a region which functions as a primer during said nucleic acid amplification in c)."), claim 10 ("The method of claim 8, wherein said primer is configured to amplify said target nucleic acid analyte."). Bio-Rad's non-infringement argument is not consistent with the claim language of the '024 patent, as construed in this investigation.

Accordingly, the accused ddSEQ v1 [redacted] systems infringe all of the limitations of claim 1 of the '024 patent.

2. Dependent Claims

There is no dispute with respect to the infringement of any the limitations added by dependent claims 5, 17, 19, and 22 of the '024 patent.

Claim 5 requires that the stimulus that is applied to release the oligonucleotides "is

selected from the group consisting of a biological stimulus, a chemical stimulus, a thermal stimulus, an electrical stimulus, a magnetic stimulus, and a photo stimulus." As discussed above, the [redacted] is the claimed stimulus in the accused products, and Dr. Butte explains that "[t]he [redacted] is both a biological stimulus and a chemical stimulus." CX-0004C at Q/A 215.

Claim 17 requires that the claimed droplet "comprises a plurality of target nucleic acid analytes" and that "each of said plurality of target nucleic acid analytes attaches to an individual oligonucleotide molecule." As discussed above, the ddSEQ v1, [redacted] comprise a plurality of mRNAs, which attach to individual oligonucleotide molecules through hybridization and reverse transcription. *See* CX-0004C (Butte DWS) at Q/A 219-20. The droplets in the scATAC-seq [redacted] comprise a plurality of genomic DNA fragments, which attach to individual oligonucleotide molecules through hybdridization involving the Nextera Adaptor binding sequence. *Id.*

These processes also infringe the limitations of claim 19, which requires that "said given oligonucleotide molecule from said oligonucleotide molecules attaches to said target nucleic acid analyte by hybridization." *See* CX-0004C (Butte DWS) at Q/A 223.

There is no dispute that the ddSEQ system infringes the limitations of claim 22, which requires that the "porous gel bead comprises a polymer gel" and "said polymer gel is a polyacrylamide." *See* CX-0004C (Butte DWS) at Q/A 224-26.

Accordingly, the accused ddSEQ v1 [redacted] infringe dependent claims 5, 17, 19, and 22 of the '024 patent.

3. Indirect Infringement

The asserted claims of the '024 patent are method claims, and 10X contends that there is

a violation of section 337 by Bio-Rad based on theories of contributory and induced infringement. CIB at 30-37.

a. Underlying Direct Infringement

Indirect infringement requires evidence of an underlying direct infringement. As discussed above, ordinary use of the ddSEQ products would be direct infringement of the asserted claims of the '024 patent by Bio-Rad's customers. *See* CIB at 31-32. There is no dispute that Bio-Rad's customers have used and continue to use the ddSEQ v1 products in the United States. *Id.*; SIB at 36. In particular, 10X cites evidence that by early 2017, Bio-Rad had engaged with [redacted] of ddSEQ v1 products. CX-0004C (Butte DWS) at Q/A 599; CX-1494C; CX-1584C. Dr. Kaihara testified at her deposition that she has helped many Bio-Rad customers use the ddSEQ v1 system, including several in the United States. CX-0016C at 48-49; *see* Tr. 270. Bio-Rad's corporate representatives confirmed that Bio-Rad had sold [redacted] to its customers. CX-0019C (Reifsnyder Dep. Tr.) at 70-71; CX-0020C (Norton Dep. Tr.) at 32-33. This evidence is sufficient to show direct infringement of the '024 patent by Bio-Rad's customers.

[redacted] 10X contends that

[redacted]

Dr. Kaihara's testimony is sufficient to show direct infringement by [redacted]

b. Induced Infringement

Bio-Rad admits that it had knowledge of the application for the '024 patent [redacted], CX-0050C at 8, and the complaint in this investigation explicitly accused Bio-Rad of induced infringement. Complaint ¶ 72; *see Certain Television Sets, Television Receivers, Television Tuners, and Components Thereof*, Inv. No. 337-TA-910, Comm'n Op. at 39-43 (Oct. 14, 2015) (holding that service of the complaint on a respondent is sufficient to establish knowledge for indirect infringement). 10X identifies Bio-Rad's promotional materials and instruction manuals as evidence that Bio-Rad has induced infringement of the asserted claims. CIB at 36-37. This includes advertising materials, instructional manuals, and materials describing Bio-Rad's customer support and services for installation, repair, and troubleshooting of ddSEQ products. *See* CX-0004C (Butte DWS) at Q/A 629-37. Bio-Rad does not dispute this evidence of inducement, and Staff agrees with 10X that the dissemination of these materials is sufficient to show that Bio-Rad has induced infringement of the asserted claims of the '024 patent by the ddSEQ v1 products. SIB at 39-40.

Accordingly, 10X has shown that Bio-Rad has induced infringement of claims 1, 5, 17, 19, and 22 of the '024 patent by the ddSEQ v1 products.

c. Contributory Infringement

As discussed above, Bio-Rad had knowledge of its contributory infringement upon service of the complaint in this investigation. *See* Complaint ¶ 73 (alleging contributory infringement). Dr. Butte explained how the accused components of Bio-Rad's ddSEQ system are especially adapted for use in practicing the infringing methods. CX-0004C at Q/A 602-609. With respect to the ddSEQ v1 products, Dr. Butte identifies specific components, including the ddSEQ cartridges, ddSEQ single-cell isolator, ddSEQ cartridge holder, and consumables and assays used with the ddSEQ v1 process, including the SureCell WTA 3' v1 assay, which are designed and adapted for performing the infringing ddSEQ v1 workflow. *Id.* at Q/A 604. These components and their use in the ddSEQ v1 system are described in Bio-Rad product literature, including a [redacted] presentation (JX-0088C), and numerous instruction manuals and training materials. *See, e.g.,* CX-1405C; CX-1406C; CX-1435C; CX-1436C; CX-1460C; CX-1437C; CX-1451C; CX-1452C; CX-1454C; CX-1461C; CX-1473C; CX-1488C. Dr. Butte also identifies [redacted]. *Id.* at Q/A 605-609.

Bio-Rad disputes 10X's allegations of contributory infringement by arguing that the ddSEQ v1 system has a substantial non-infringing use. RIB at 66-68. Specifically, Dr. Metzker describes the Drop-seq protocol, where the barcode molecules are not releasably attached to the gel bead and are not released, as required by the claims of the '024 patent. RX-0665C at Q/A 138-143. During the course of this investigation, Bio-Rad developed a Drop-seq protocol for its ddSEQ system, releasing the protocol to the public in late 2018. *Id.* at Q/A 144-147; JX-0131C; JX-0130; *see* Tr. (Kaihara) at 239.

10X does not dispute that Drop-seq would be a non-infringing use of the ddSEQ system, but 10X and Staff argue that it is not a "substantial non-infringing use," because there is no evidence that any ddSEQ user has actually used the Drop-seq protocol. CIB at 34-35; SIB at 37-38. The Bio-Rad employee who was responsible for updating the Drop-seq protocol admitted at the hearing that she was not aware of any customer using Drop-seq on any Bio-Rad ddSEQ device. Tr. (Kaihara) at 240-41. Bio-Rad did not publish the Drop-seq protocol for ddSEQ until after the close of discovery in this investigation. *Id.* at 239. Dr. Butte considered the evidence regarding Bio-Rad's Drop-seq protocol and offered his opinion that it would not be a substantial use of the ddSEQ products because it would require additional reagents not included in the ddSEQ products, and it would not use several of the accused ddSEQ components, including Bio-Rad's SureCell kits and certain assays. CX-0004C at Q/A 611-616. Based on this evidence, I agree with 10X and Staff that the Drop-seq protocol is not a substantial non-infringing use of the ddSEQ system, and accordingly, 10X has carried its burden to show contributory infringement with respect to the accused ddSEQ v1 products. *See Certain Beverage Brewing Capsules, Components Thereof, and Products Containing the Same*, Inv. No. 337-TA-929, Comm'n Op. at 22-24 (Apr. 5, 2016) (finding contributory infringement based on a lack of substantial non-infringing uses).

Accordingly, 10X has shown that Bio-Rad contributorily infringed of claims 1, 5, 17, 19, and 22 of the '024 patent by importing and selling components of the ddSEQ v1 system.

D. Domestic Industry

There is no dispute that 10X's DI products practice claims 1, 5, 17, 19, and 22 of the '024 patent. CIB at 37-40; SIB at 40-41. 10X relies on the testimony of Dr. Butte to show that the DI products practice the asserted claims. CX-0004C at Q/A 227-287.

1. Claim 1

10X's DI products are part of a method of sample preparation of gDNA or mRNA for sequencing applications. CX-0004C (Butte DWS) at Q/A 256-58. The steps in the method meet each of the limitations of claim 1 of the '024 patent. *Id.* at Q/A 259-79. In particular, 10X's DI products provide a droplet that contains a porous gel bead formed of polyacrylamide. *Id.* at Q/A 260-61. 10X's single cell applications contain an mRNA as a target nucleic acid analyte, while the linked read solutions contain a gDNA fragment. *Id.* In each of the DI products, there are at least 1,000,000 oligonucleotide molecules that include barcode sequences. *Id.* at Q/A 263-64. These barcode sequences are the same for the oligonucleotide molecules on each gel bead. *Id.* at Q/A 269-70. The oligonucleotide molecules are releasably attached to the gel bead through a [redacted] that can be broken upon application of [redacted]. *Id.* at Q/A 265-68. [redacted] is applied to the gel bead as part of "Additive A," which cleaves the [redacted] to release the barcodes and also dissolves the gel bead. *Id.* at Q/A 272-73. Upon release, the barcodes attach through hybridization to the mRNA or gDNA fragment. *Id.* at Q/A 274-76. In the single-cell applications, a reverse transcription process then generates barcoded cDNA strands, which undergo further PCR outside the droplet to create barcoded double-stranded cDNAs. *Id.* at Q/A 278. In the linked-read applications, an isothermal amplification in the droplet creates a DNA amplicon, which undergoes further amplification outside the droplet. *Id.* at Q/A 279.

Accordingly, the DI products meet the technical prong of the domestic industry requirement with respect to claim 1 of the '024 patent.

2. Dependent Claims

The additional limitations of the asserted dependent claims are also practiced by the DI products. With respect to claim 5, [redacted]. CX-0004C (Butte DWS) at Q/A

281. With respect to claim 17, the mRNA of the single-cell applications and the gDNA of the linked-read applications are the target nucleic acid analytes, and they attach to individual oligonucleotide molecules in each of the DI products. *Id.* at Q/A 283. With respect to claim 19, the oligonucleotides attach to the mRNA or gDNA fragment through hybridization. *See Id.* at Q/A 274-76. With respect to claim 22, the porous gel beads of the DI products are comprised of polyacrylamide. *Id.* at Q/A 287.

Accordingly, the DI products meet the technical prong of the domestic industry requirement with respect to dependent claims 5, 17, 19, and 22 of the '024 patent.

E. Invalidity

Bio-Rad contends that the asserted claims of the '024 patent are invalid as anticipated or rendered obvious by U.S. Patent No. 9,347,059 (JX-0031, "the '059 patent") and/or U.S. Patent No. 9,902,950 (RX-0462, "Church"), alone or in combination with additional prior art. RIB at 68-111.

1. The '059 patent

The '059 patent issued from a patent application filed by Bio-Rad in April 2012, based on a provisional application that was filed in April 2011 by Dr. Saxonov, around the time that QuantaLife was acquired by Bio-Rad. CX-1829C (Saxonov RWS) at Q/A 25-27; JX-0031. Dr. Saxonov is the sole named inventor on the '059 patent, and Bio-Rad is the assignee. JX-0031. There is no dispute that the '059 patent is prior art to the '024 patent and all of the other asserted patents—it is listed as a cited reference on each of the asserted patents. *See* SIB at 41.

The '059 patent discloses methods for barcoding mRNA and DNA in droplets. The specification of the '059 patent explains the benefits of barcoding, allowing separately prepared samples to be pooled and sequenced, while "each sample can have its own unique barcode."

'059 patent, col. 3:53-62. The specification further describes "adaptors" with barcodes that "can be bundled within a partition, e.g., an aqueous phase of an emulsion, e.g. a droplet." *Id.*, col. 4:4-5. Also, "[t]he adaptor-filled droplets can be burst (e.g., through a temperature adjustment) to release reaction components . . . ." *Id.*, col. 4:34-37. The specification also describes "end modifications" that "can be attached to a nucleic acid strand through a linker." *Id.*, col. 12:30-36. Moreover, the specification describes "an amplification reaction" that "comprises a polymerase chain reaction." *Id.*, col. 2:41-46. The specification further provides that "[a] barcode can be attached to a polynucleotide by amplification with a primer comprising a barcode." *Id.* at col. 9:63-65.

There is no dispute that many of the limitations of the asserted claims of the '024 patent are disclosed in the '059 patent. In particular, the '059 patent discloses a method for sample preparation using a droplet containing barcoded oligonucleotide molecules and that the oligonucleotide molecules are subject to amplification. The parties dispute whether the '059 patent discloses several specific claim limitations, however, including the limitations regarding porous gel beads, and the limitations requiring releasable attachment to those beads.

a. Porous gel beads

10X and Staff argue that the '059 patent fails to disclose the porous gel beads claimed in the '024 patent. CIB at 62-75; SIB at 42-44. Bio-Rad concedes that there is no explicit disclosure of porous gel beads in the '059 patent specification. RRB at 20-21. Bio-Rad points to an embodiment described in the '059 patent where barcodes attach to a bead: "In some embodiments, antibodies can be linked to beads coated with short DNA fragments with a unique barcode." '059 patent, col. 36:59-60. Although the '059 patent does not describe the type of bead used with these antibodies, the use of the term "coated" suggests that the barcodes are

attached to the surface of a solid bead, rather than the interior of a porous bead. *See* CX-1872C (Dear RWS) at Q/A 108 ("Not only are the antibody-linked beads not being described as gel or porous, they are described as being 'coated' with short DNA fragments. Thus, the beads are not permeated with oligonucleotide molecules, and instead their surface is "coated." This further confirms that the beads are not porous gel beads, and are instead rigid, non-porous beads."); CX-1829C (Saxonov RWS) at Q/A 16 ("I was assuming that the beads were solid throughout or that only the exterior solid surface was going to be used."). Bio-Rad identifies an alleged reference to gel beads in another embodiment in the '059 patent specification describing a "next generation sequencing technique" called Roche 454 sequencing. '059 patent, col. 26:43-66. Dr. Metzker explains that the Roche 454 system used Sepharose beads, which he describes as porous gel beads. RX-0664C at Q/A 162-63, 166-68.

10X disputes Bio-Rad's assertion that the Roche 454 beads are porous gel beads as required by the claims of the '024 patent. CIB at 64-75. Although Dr. Metzker identifies the Roche 454 beads as Sepharose, there is no direct evidence in the record of the composition of these beads.[5] The only evidence that Bio-Rad cites is cross-examination testimony of 10X's expert, Dr. Dear, who identified a publication by Marcel Margulies *et al.* (CX-1940) describing the use of Sepharose beads in the context of Roche 454 sequencing: "Yes, I believe—at the time 454 published, I believe they used sepharose beads. That's the Margulies paper. Whether they did since in their commercial instruments, I don't know." Tr. 869-70.

10X also challenges Bio-Rad's assertion that Sepharose is a porous gel, relying on the opinion of Dr. Dear that Sepharose beads are rigid and lack the deformability that characterizes

[5] Certain evidence regarding Sepharose beads was excluded from Dr. Metzker's witness statement pursuant to a motion *in limine*. Order No. 38 at 8-9 (Mar. 12, 2019).

the gel beads described in the asserted patents. CIB at 64-75 (citing CX-1827C (Dear RWS) at Q/A 110-15). Bio-Rad supports its contention that Sepharose is a porous gel with testimony from Dr. Agresti, who describes Sepharose as "a crosslinked agarose, which is a material that I would consider to be a hydrogel," citing a document listing Sepharose as a "gel filtration media." RX-0503C (Agresti DWS) at Q/A 69; RX-0692. During cross-examination, however, Dr. Agresti admitted that gel filtration is different from microfluidics. Tr. 336. In addition, Dr. Agresti had previously testified at his deposition that he was not sure whether prior art using Sepharose would disclose a hydrogel bead. *Id.* at Q/A 66-68; Tr. 334.[6] Bio-Rad also offers testimony from Dr. Grenier describing Sepharose as a porous gel bead based on his work in graduate school in the mid-1990s. RX-0507C at Q/A 47-50.

Although I agree with Bio-Rad that Dr. Dear's strict requirements for rigidity and deformability may not be necessary to satisfy the "porous gel bead" limitation, Bio-Rad bears the burden on invalidity, and the conflicting evidence regarding Sepharose is neither clear nor convincing. Even if Bio-Rad had shown that Sepharose beads existed in the prior art that were porous gel beads, the record is far from clear that such beads were used in the Roche 454 sequencing process described in the '059 patent. Bio-Rad does not identify any disclosure in the '059 patent or the Margulies paper describing the composition or the characteristics of the Roche 454 beads, and Bio-Rad's witness testimony does not convincingly show that these beads described in the '059 patent are porous gel beads. Accordingly, Bio-Rad has failed to carry its

[6] Dr. Agresti equivocated on this issue when he was presented with a document filed at the USPTO by Bio-Rad's counsel when prosecuting a different patent application, which is discussed in more detail, *infra*, in the context of the Church patent. JX-0171.0027.

burden to show that the porous gel bead limitation of the '024 patent is anticipated by disclosures in the '059 patent.

b. Releasable attachment

Even if Bio-Rad had presented sufficient evidence at the hearing to show that the '059 patent disclosed porous gel beads, the beads identified by Dr. Metzker cannot anticipate the limitation of claim 1 of the '024 patent requiring that "said oligonucleotide molecules are releasably attached to said porous gel bead." 10X's expert, Dr. Dear, notes that the '059 patent describes the Roche 454 beads as "capture beads," and these beads are only discussed in the context of sequencing, which is a separate process in a separate embodiment from any discussion of releasing barcodes. CX-1827C at Q/A 87, 108. The '059 patent only references the Roche 454 beads as a substrate for sequencing, and Dr. Dear explains that "nucleic acids to be sequenced must remain attached to the substrate for their sequences to be determined." *Id.* at Q/A 108. Bio-Rad fails to connect the '059 patent's disclosure of Roche 454 beads to any discussion of releasable attachment, and the '059 patent's separate disclosure of these beads cannot form the basis for a finding of anticipation of this limitation. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008) (holding that the district court was "wrong to combine parts of the separate protocols shown in the iKP reference in concluding that claim 23 was anticipated").

Bio-Rad argues in the alternative that it would have been obvious to use porous gel beads for releasable attachment of the oligonucleotides described in the '059 patent. *See* RRB at 20-21. Dr. Metzker identifies the '059 patent's disclosure of antibody-linked beads and droplets as a disclosure of releasable attachment. RX-0664C at Q/A 181-85. In particular, the '059 patent specification describes an embodiment where "antibodies can be linked to beads coated with

short DNA fragments with a unique barcode," and further suggests that "[t]he antibodies could also be linked to droplets containing DNA fragments—which can be burst as appropriate." JX-0031, col. 36:59-64. Based on this disclosure, Dr. Metzker suggests that the '059 patent "teaches three interchangeable ways to deliver barcodes—droplets, capsules, and beads." RX-0664C at Q/A 181.

10X argues that Bio-Rad improperly mixes and matches different embodiments of the '059 patent. CIB at 53-64. The portion of the '059 specification that describes the release of "barcode adaptors" is limited to droplets, disclosing that "[t]he adaptor-filled droplets can be burst (e.g., through a temperature adjustment) to release reaction components (e.g., PCR or ligation components) that can be used for library preparation." JX-0031, col. 4:34-37. The antibody-linked beads are described in a separate embodiment, and the DNA fragments attached to these beads are not the barcodes described in the '059 patent's droplet embodiment. *See* CX-1827C (Dear RWS) at Q/A 40, 87. Moreover, although the '059 patent describes the droplets being "burst" to release barcode adaptors, there is no description of any mechanism for releasing the attached DNA fragments from beads. *Id.* at Q/A 155-56. Dr. Metzker concedes that the antibody-linked embodiment does not disclose the claimed barcodes but submits that "one of ordinary skill in the art would have immediately envisioned from the bead antibody disclosure in Saxonov that it could also apply to barcoding the cellular material." RX-0664C at Q/A 183. Dr. Metzker's suggestion that the antibody-linked DNA fragments could be replaced with barcodes is plausible, but this would only result in barcodes attached to beads, with no teaching regarding release.

To meet the releasable attachment limitation, Dr. Metzker further suggests that "[t]he only way for the barcodes in the inner droplet to function is by having them released from the

inner droplet," and "[o]ne of ordinary skill in the art would have therefore recognized that the barcodes on beads would be functioning in the same way, they would be released from the bead." *Id.* at Q/A 184. There is no disclosure in the '059 patent indicating how the beads could function to release barcodes in the same way as the burstable droplets, however, and Bio-Rad fails to offer a convincing argument for how one of ordinary skill in the art would use prior art teachings to replace the burstable droplets with beads. As Dr. Dear explains, the '059 patent specification shows that "although Saxonov specifically had the idea of releasing adaptors from a droplet," he "did not have the idea of releasing short DNA fragments from a bead." CX-1827C at Q/A 161.

Dr. Metzker attempts to supply a mechanism for releasably attaching barcodes to beads by suggesting that one of ordinary skill in the art would recognize that certain parts of the barcodes disclosed in the '059 patent "would be susceptible to cleavage and could remove the barcode adaptor molecule at the point of contact with the bead." RX-0664C at Q/A 186. This conclusory expert opinion cannot meet Bio-Rad's burden on invalidity, however. *See K/S Himpp v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365-66 (Fed. Cir. 2014) (affirming a finding of non-obviousness where the USPTO properly rejected "a conclusory assertion from a third party about general knowledge in the art without evidence on the record," noting that the limitation "an important structural limitation that is not evidently and indisputably within the common knowledge of those skilled in the art!"). Dr. Metzker's suggestion for barcode cleavage is not based in any prior art disclosure but on hindsight, using the limitations of the '024 patent to selectively modify the prior art. *See Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008) ("In other words, Mylan's expert, Dr. Anderson, simply retraced the path of the inventor with hindsight, discounted the number and complexity of the alternatives,

and concluded that the invention [] was obvious. Of course, this reasoning is always inappropriate for an obviousness test . . . .").

Accordingly, I agree with 10X and Staff that Bio-Rad has failed to show that releasably attaching oligonucleotide molecules to a bead would be obvious in view of the '059 patent.

c. Combinations with other references

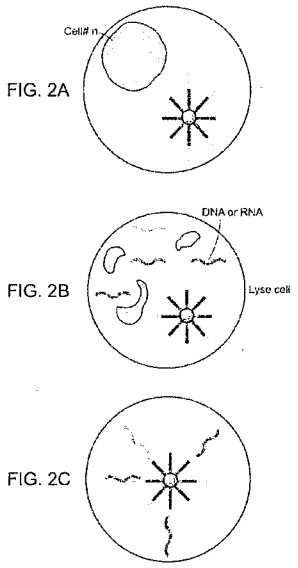
Bio-Rad further contends that the claimed porous gel beads are disclosed in other prior art references that would have been obvious to combine with the '059 patent. RIB at 77-80. These references include the Church patent (RX-0462), an article by Dr. Adam Abate, *Beating Poisson Encapsulation Statistics Using Close-Packed Ordering* (RX-0102, "Abate"), and U.S. Patent Application Pub. No. 2010/0304982, naming inventors Wolfgang Hinz *et al.* (RX-0461, "Hinz"). These references each disclose beads that appear to meet the "porous gel bead" limitations of the asserted claims of the '024 patent, but Bio-Rad fails to offer any credible motivation for combining the gel beads disclosed in these references with the droplet-based barcoding system disclosed in the '059 patent. As discussed above, Dr. Metzker's proposal for replacing the '059 patent's burstable droplets with beads having releasably attached barcodes is conclusory and relies on hindsight. Bio-Rad has identified no credible motivation for one of ordinary skill in the art to look to the gel beads disclosed in Church, Abate, or Hinz for releasable attachment of the barcodes contained in droplets in the '059 patent. Accordingly, Bio-Rad has failed to show that any asserted claim of the '024 patent is rendered obvious by the '059 patent in combination with these additional references.

2. The Church patent

The Church patent issued from a patent application filed in October 2011 and is assigned to Harvard College. RX-0462. There is no dispute that the Church patent is prior art to the '024

patent and all of the other asserted patents—the published patent application for the Church patent is listed as a cited reference on each of the asserted patents. *See* SIB at 50-51.

Church describes a process for producing beads coated with barcoded oligonucleotides. RX-0462, col. 2:28-34. The specification explicitly discloses "a variety of materials" for its beads, including "paramagnetic materials, ceramic, plastic, glass, polystyrene, methylstyrene, acrylic polymers, titanium, latex, sepharose, cellulose, nylon and the like." *Id.*, col. 12:38-42. Figure 2 of Church depicts a process where a single cell and barcoded bead are captured in an emulsion (Fig. 2A), nucleic acid sequences are released into the emulsion upon cell lysis (Fig. 2B), and the nucleic acid target is annealed to the barcoded bead (Fig. 2C).



Id. at Fig. 2, col. 3:49-53, col 5:50-6:10. The barcoded beads are then further processed, with cDNA synthesis for RNA, followed by PCR amplification. *Id.*, col. 6:18-24.

There is no dispute that the Church patent discloses a method for sample preparation using a barcoded bead with oligonucleotides attached that are subject to amplification. The parties dispute whether Church discloses several limitations of the asserted claims of the '024

patent, however, including whether the bead is a porous gel bead and whether the barcoded oligonucleotides are releasably attached.

a. Porous gel beads

Bio-Rad primarily relies on the Church patent's disclosure of Sepharose beads to anticipate the porous gel bead limitation of the '024 patent. RIB at 95-96. As discussed above in the context of the '059 patent, Bio-Rad relies on the testimony of Dr. Metzker and certain other evidence that Sepharose beads are porous gel beads. RX-0664C (Metzker DWS) at Q/A 213; *see also* RX-0503C (Agresti DWS) at Q/A 66-69; RX-0507C (Grenier DWS) at Q/A 47-50. 10X's expert, Dr. Dear, disagrees with Dr. Metzker's opinion, contending that Sepharose beads are rigid and lack the deformability to meet the gel bead limitation. CX-1827C (Dear RWS) at Q/A 110-115. Moreover, Bio-Rad's counsel represented to the USPTO in August 2017 that "Church does not teach or suggest particles that are hydrogels nor cleaving the oligonucleotides from the particles as recited in the claims." JX-0171.0027, Applicant's Response to Final Office Action at 8 (Aug. 21, 2017).[7] On this record, Bio-Rad has failed to carry its clear and convincing burden to show that Church's disclosure of Sepharose as a bead material anticipates the claim limitation requiring a porous gel bead.

Bio-Rad further contends that Church's disclosure of cellulose and polystyrene as bead materials anticipates the porous gel bead limitation. RIB at 95-96. Bio-Rad offers little evidence to support these assertions, however. With respect to cellulose, Bio-Rad cites cross-examination testimony from Dr. Dear, where he was presented with a catalog describing cellulose as having

[7] Bio-Rad later filed a correction with USPTO withdrawing this statement, conforming their prosecution filings to their arguments here that "Sepharose is a cross-linked agarose with a porous structure and is a hydrogel." RX-0660 at 9.

porosity, but Dr. Dear testifies that "I'm familiar with cellulose in the ordinary sense of the word, and as I know it, it's – as I have encountered it, it's nonporous and rigid." Tr. 890-91. For polystyrene, Bio-Rad cites testimony from Dr. Metzker that "[p]olystyrene can be cross-linked" and that "there are only two choices . . . of going with either a nonporous or a porous polystyrene bead." Tr. 676-77. This expert testimony, without additional evidentiary support, is insufficient to meet Bio-Rad's clear and convincing burden, particularly when considered in the context of Bio-Rad's prior representation to the USPTO that "Church does not teach or suggest particles that are hydrogels." JX-0171.0027.

Accordingly, the porous gel bead limitations of the '024 patent are not anticipated by the Church patent.

b. Releasable attachment

With respect to the releasable attachment limitations of the '024 patent, Bio-Rad points to a paragraph in the Church patent's specification describing "functional groups attached to [a bead] surface, which can be used to bind one or more reagents described herein to the bead." RX-0462, col. 12:43-53. Church further states: "One or more reagents can be attached to a support (e.g., a bead) by hybridization, covalent attachment, magnetic attachment, affinity attachment and the like." *Id.* Church then references "a variety of attachments" that "are commercially available" and states that beads "may also be functionalized using, for example, solid-phase chemistries known in the art," citing another patent, U.S. Patent No. 5,919,523 to Sundberg, *et al.* (RX-0466, "Sundberg"). *Id.*

According to Dr. Metzker, Sundberg "teaches the attachment of oligonucleotides to porous gel bead surfaces for the synthesis of oligonucleotides using spacer molecules." RX-0664C at Q/A 222. Sundberg provides that "[i]n some embodiments, the spacer may provide for

a cleavable function by way of, for example, exposure to acid or base." RX-0466, col. 8:57-59. In addition, "[a]ccording to other embodiments, small beads may be provided on the surface, and compounds synthesized thereon may be released upon completion of the synthesis. *Id.*, col. 6:14-16. Based on these disclosures, Bio-Rad argues that the releasable attachment limitation of the '024 patent is rendered obvious by Church, incorporating Sundberg by reference. RIB at 100-102; RRB at 30-34.[8]

10X and Staff disagree with Bio-Rad's contention, arguing that Sundberg is only cited by Church in the context of attaching functional groups to bind reagents to beads, without any discussion of releasing barcodes. CIB at 95-96; SRB at 19-20; *see* CX-1927C (Dear RWS) at Q/A 286. Moreover, the disclosures in Sundberg relied upon by Dr. Metzker are found under the heading "Pin-Based Methods," which is separate from "Bead Based Methods." *See* RX-0466, col. 8:23-59, 8:60-13:49. As Dr. Dear explains, the pin-based methods in Sundberg are methods of synthesis where "[e]ach tray is filled with a particular reagent for coupling in a particular chemical reaction on an individual pin." CX-1827C at Q/A 289 (quoting RX-0466, col. 8:33-34). According to Dr. Dear, the "cleavable function" cited by Dr. Metzker relates to the removal of a substance synthesized on a pin, not the release of barcodes attached to a bead. *Id.* Dr. Dear also notes that where Sundberg references release in the context of beads, it describes release "upon completion of the synthesis," which is not a release of barcodes into a droplet, as claimed

[8] It is unclear from Bio-Rad's post-hearing briefs whether it contends that this limitation is anticipated by the Church patent. Bio-Rad's initial post-hearing brief contains a section heading stating that "Church anticipates or renders obvious the claims of the '024 Patent." RIB at 94; *see also id.* at 106. Nevertheless, Bio-Rad does not appear to make an explicit contention that Church anticipates the "releasably attached" limitation of the '024 patent, *see* RIB at 100-102, and in Bio-Rad's post-hearing reply brief, Bio-Rad only contends that Church renders the asserted claims obvious. RRB at 30-34.

in the '024 patent. *Id.* Moreover, there is nothing in Church to suggest that one of ordinary skill would look to Sundberg for methods of releasing barcodes, because Church only describes a process where the barcodes remain attached to the bead. *Id.* These are significant gaps in Dr. Metzker's analysis that undercut Bio-Rad's obviousness contentions.

Bio-Rad's contentions are further contradicted by the representation of its attorneys to the USPTO that "Church does not teach or suggest particles that are hydrogels nor cleaving the oligonucleotides from the particles as recited in the claims." JX-0171.0027, Applicant's Response to Final Office Action at 8 (Aug. 21, 2017).[9] On this record, I agree with 10X and Staff that Bio-Rad has failed to show that the "releaseably attached" limitation is obvious in view of Church and Sundberg.

c. Combination with other references

Bio-Rad further contends that the asserted claims of the '024 patent are obvious in view of Church in combination with several additional references. RIB at 94-111; RRB at 30-34.

I agree with Bio-Rad that the use of a porous gel bead would have been obvious in view of Church in combination with Sundberg or Hinz (RX-0461). The list of bead materials in Church is non-exhaustive. RX-0462, col. 12:38-42 ("Beads may comprise a variety of materials including, but not limited to paramagnetic materials, ceramic, plastic, glass, polystyrene, methylstyrene, acrylic polymers, titanium, latex, sepharose, cellulose, nylon and the like."). Sundberg explicitly describes "polymer-coated supports" including "polyacrylamides." RX-0466, col. 5:32-38. Hinz teaches using polyacrylamide gel beads for nucleic acid analysis,

[9] Although Bio-Rad later retracted its argument regarding hydrogels, *see* n.7, *supra*, there has been no retraction of its statement reading cleaving the oligonucleotides. Bio-Rad submits that it amended the pending claims, however, to remove a limitation regarding cleaving the oligonucleotides. RRB at 33 (citing RX-0660.0005).

noting that these porous gel beads "allow polynucleotides to be attached throughout their volumes for higher loading capacities than those achievable solely with surface attachment." RX-0461, Abstract. Polyacrylamide is explicitly identified in the '024 patent specification and claims as a polymer gel that can be used for a porous gel bead. '024 patent, col. 1:51-53, 2:28-31. In addition, Dr. Dear agreed that Hinz discusses porous gel beads. Tr. 895-96. Accordingly, I agree with Bio-Rad that one of ordinary skill in the art, reading the statement in Church identifying a variety of bead materials, would have pursued other known materials available in the prior art, including the polyacrylamide beads described in Sundberg and Hinz. As recognized by Dr. Metzker, one of ordinary skill in the art would have been motivated to use these porous gel beads because of their increased loading capacities, consistent with the Church patent's stated goals of generating millions of barcoded beads for high-throughput sequencing. *See* RX-0664C at Q/A 216; RX-0462, col. 2:30-34, 2:51-3:6.

Bio-Rad has failed to make its case for obviousness with respect to the "releasably attached" limitation, however. Bio-Rad contends that it would have been obvious to use releasable attachments to the beads in Church when viewed in combination with the '059 patent, Sundberg, and the knowledge of one of ordinary skill in the art. RIB at 100-102; RRB at 30-34. Bio-Rad identifies no motivation for adding releasability of barcodes to the process disclosed in Church, however. As discussed above, Bio-Rad's attorneys argued to the USPTO that "Church does not teach or suggest . . . cleaving the oligonucleotides from the particles as recited in the claims." JX-0171.0027. Bio-Rad fails to identify any evidence in Church to contradict this prior representation.

Bio-Rad argues that the releasably attached limitation is obvious because there are only two options for the barcodes attached to the beads in Church: either the barcode remains attached

to the bead or it is detached. RRB at 32-33. Bio-Rad's argument relies on a misreading of *KSR*, however, which describes a case for obviousness where there is "a design need or market pressure to solve a problem," and one of ordinary skill would have "good reason to pursue the known options within his or her technical grasp." 550 U.S. at 421. Whether or not to release barcodes attached to bead does not present a choice of two solutions to a known problem, however—these are two methods for addressing different problems in the prior art. In Church, the problem is attaching barcodes to a bead, and these barcodes remain attached to the bead for synthesis and amplification. RX-0462, col. 6:18-24. In the '059 patent, droplets are burst to release reaction components with the barcodes. JX-0031, col. 4:34-36. Bio-Rad's framing of the issue as two known options has been constructed in hindsight, and it does not prove that this limitation is obvious. *See* CRB at 37-38.[10]

Accordingly, Bio-Rad has failed to show that any asserted claim of the '024 patent is rendered obvious by Church in combination with any of these additional references.

3. Secondary considerations of non-obviousness

In *Graham v. John Deere Co. of Kansas City*, the Supreme Court held that in determining obviousness "[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, *etc.*, might be utilized" as "*indicia* of obviousness or nonobviousness," 383 U.S. 1, 17-18 (1966). Indeed, "evidence of secondary considerations may often be the most probative and cogent evidence in the record." *In re Cyclobenzaprine Hydrochloride Extended-*

[10] At the hearing, Dr. Dear testified: "No, there's not only two options as to what you do. If you say do—I mean, there are many things you can do in droplets. If you simply say do we cleave it off the bead or do we not cleave it off the bead, the point I'm making is that that doesn't constitute a conception. It's just saying those are two options for that particular feature." Tr. 912:3-13.

Release Capsule Patent Litigation, 676 F.3d 1063, 1075-76 (Fed. Cir. 2012) (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538–39 (Fed. Cir. 1983)) (internal quotation marks omitted). Accordingly, such evidence "must always when present be considered *en route* to a determination of obviousness." *Id.* (quoting *Stratoflex,* 713 F.2d at 1538–39) (internal quotation marks omitted). Secondary considerations of non-obviousness "include: commercial success enjoyed by devices practicing the patented invention, industry praise for the patented invention, copying by others, and the existence of a long-felt but unsatisfied need for the invention." *Apple Inc. v. Samsung Electronics Co.*, 839 F.3d 1034, 1052 (Fed. Cir. 2016).

10X identifies five secondary considerations that it alleges weigh against a finding of obviousness. Four of these considerations—(1) solving a long-felt need, (2) industry praise, (3) commercial success, and (4) failure of others—relate to the success of 10X's domestic industry products and the failure of a competitor to develop a competing product. With regard to these secondary considerations, Bio-Rad argues that 10X has not shown a nexus between the asserted claims and the domestic industry products. RRB at 94-95. With respect to the fifth secondary consideration identified by 10X—copying by another, *viz.,* Bio-Rad—Bio-Rad contests 10X's allegations of copying.

a. The success of the domestic industry products weighs against obviousness.

i. 10X has established the required nexus.

There must be a "nexus between the merits of the claimed invention and evidence of secondary considerations . . . in order for the evidence to be given substantial weight in an obviousness decision." *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 668 (Fed. Cir. 2000)); *see also Ormco Corp v. Align Tech., Inc.*, 463 F.3d 1299, 1311-12 (Fed. Cir. 2006) ("Evidence of commercial success, or other secondary considerations, is only significant if there is a nexus

between the claimed invention and the commercial success."). As discussed herein, the domestic industry single-cell products practice all of the asserted patents, while the domestic industry linked-read products practice the asserted claims of the '024, '468, and '204 patents. Citing *WBIP, LLC v. Kohler Co.*, both 10X and Staff argue that the domestic industry products' practice of the asserted claims triggers a presumption that there is a nexus between the claims and the "asserted objective evidence" tied to the domestic industry products. 829 F.3d 1317, 1329 (Fed. Cir. 2016) (internal citations and quotation marks omitted). Such a presumption is only applicable, however, if a product is coextensive with the claimed invention. *Polaris Indus., Inc. v. Artic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018) ("[W]hen the thing that is commercially successful is not coextensive with the patented invention—for example, if the patented invention is only a component of a commercially successful machine or process—the patentee must show prima facie a legally sufficient relationship between that which is patented and that which is sold.") (internal citation and quotation marks omitted). Neither 10X nor Staff provide analysis regarding whether the domestic industry products are coextensive with the claimed invention.

At least in some instances, the claimed invention is only a component of the domestic industry products. For example, the asserted claims of the '204 patent are directed to droplets containing capsules, wherein the capsules contain barcode molecules. *See, e.g.,* '204 patent, col. 44:42-49 (unasserted claim 1), col. 46:24-27 (claim 27). Although the domestic industry products have such capsules in the form of a gel beads, they also include unclaimed components, such as "microfluidic chips, chip holders, droplet generating instruments, . . . and various other reagents." CIB at 5. Accordingly, I find that the domestic industry products' practice of the asserted claims does not trigger the presumption of a nexus.

Although the presumption of a nexus does not apply, 10X has shown that the evidence relating to the success of its products is sufficiently related to the claimed invention to provide the necessary nexus. All of the asserted claims require a droplet containing a capsule that is capable of releasing barcode molecules. *See, e.g.,* CX-1827C (Dear RWS) at Q/A 966. This claimed invention is employed in the domestic industry products in the form of "GemCode" or "GEM technology," wherein gel beads capable of releasing barcode molecules are encapsulated in droplets. *Id.* at Q/A 966. Using GEM technology, the domestic industry products are able to achieve "high-throughput profiling of large numbers of single cells or molecules in a single procedure." *Id.* As discussed below, the ability to achieve a high-throughput was the key to the domestic products' success. Conversely, the failure of a competitor with a commanding position in the market to develop a high-throughput solution led to the competitor abandoning the market.

Bio-Rad counters that high throughput "is not a patented feature of the commercial product." RIB at 219. The domestic industry products, however, are only able to achieve a high throughput by using the claimed invention, *viz.*, by encapsulating gel beads with attached barcode molecules into droplets. CX-1827C (Dear RWS) at Q/A 967. This relationship between the domestic industry product's high throughput and the claimed invention provides the necessary nexus. *See Rambus Inc. v Rea,* 731 F.3d 1248, 1256-57 (Fed. Cir. 2013) (finding a nexus between evidence relating to the unclaimed high speed achieved by a memory system and the challenged claims, because the high speed was enabled by the claimed functionality).

ii. The success of the domestic industry products and the failure of a competitor to develop a competing product weigh against obviousness.

Bio-Rad does not dispute that the domestic industry products (1) solved a long-felt need, (2) received industry praise, (3) were a commercial success, and (4) that others failed in

developing a high-throughput system. With regard to long-felt need, at the time of the invention, it was widely recognized that it would be beneficial for both single-cell analysis and linked-read analysis to increase the single-run throughput of the single cells or molecules being analyzed. For instance, in the context of single-cell analysis, [redacted] *Id.*

At the time of the presentation, the industry leader in the field of sample preparation systems for SCG was Fluidigm. *Id.* at .00011; CX-0016C (Kaihara Dep. Tr.) at 25:19-26:3. In 2012, Fluidigm released its "C_1 Single-Cell AutoPrep System for cell isolation, sample prep, and analysis." CX-1946C.00011 (bold-face type removed), *see also, id.* at .00003 ("2012: Introduction of Fluidigm's SC automated cell prep instrument"). The Fluidigm system had throughput of "up to 96 cells per run." *Id.* at .00013. This, however, was inadequate, as it was necessary to analyze "many more single cells . . . within a single experiment" in order "to address biological and stoichiometric noise or at least to achieve a better understanding of cell-to-cell variation within tissue[.]" CX-1269.00005 (quoting Jokim Lundeberg, KTH Royal Institute of Technology (Sweden)) (internal quotation marks omitted). This left an [redacted]. In the 2014 timeframe, such a need was even acknowledged by Fluidigm's CEO: "As the science of single-cell analysis unfolds, it's clear to us the field is evolving in several important ways.

[There is] an increasing need for higher throughput to enable large volume studies." CX-1946C.00012 (quoting Fluidigm CEO, Gajus Worthington) (internal quotation marks omitted and alterations in original). In the context of linked-read technology, high throughput was also a "long-felt but unresolved need in accessing long range DNA sequence information." CX-1827C (Dear RWS) at Q/A 997.

Upon its introduction, 10X's GEM technology received industry praise and recognition. In particular, Dr. Hindson presented 10X's GEM technology at the Advances in Genome Biology Technology conference ("AGBT"). CX-0001C (Hindson WS) at Q/A 143-48. After Dr. Hindson described the data that was obtained through the technology, the audience applauded. *Id.* at 149-50. Dr. Agresti, who attended the conference on behalf of Bio-Rad, congratulated Dr. Hindson on "10X's achievements and said something to the effect that he's real amazed and it's awesome what we've done with the technology." *Id.* at Q/A 152-53. As acknowledged by Dr. Tzonev, another Bio-Rad witness, 10X's presentation at the AGBT [redacted] CX-0023C (Tzonev Dep. Tr.) at 127:19-25.

The domestic industry products have been a commercial success. Between the second quarter of 2015 and the second quarter of 2018, the domestic industry products generated $159 million in revenues. CX-1827C (Dear RWS) at Q/A 1073; JX-0043C. 10X has sold the domestic industry products to over 550 customers, including the National Institutes of Health, University of California, Harvard University, Cornell University, California Institute of Technology, Dartmouth College, Duke University, Georgetown University, John Hopkins University, and the University of Georgia. CX-1827C (Dear RWS) at Q/A 1071-72; CX-1265C.

The success of 10X's domestic industry products stands in marked contrast to Fluidigm's failure to develop a competing high throughput product. Although it was "the sole player in the single cell market in 2009" and recognized by at least 2014 that there was "an increasing need for higher throughput to enable large volume studies," Fluidigm was ultimately unable to develop a high throughput solution. CX-1827C (Dear RWS) at Q/A 1078-1083; CX-1691C.00024; CX-1946C.00012 (quoting Fluidigm CEO, Gajus Worthington). In a May 4, 2017 earnings call, Fluidigm acknowledged that its "single-cell genomics business," which was "overwhelmingly [Fluidigm's] C1 product line, was down in the quarter by over 70% year-on-year." CX-1273.00003. One of the reasons for the decline, according to Fluidigm, was "the announcement of new competition." *Id.* As a result of the decline, Fluidigm announced that it would continue "to shift [its] primary business focus" away from the single cell market. *Id.*

In view of the foregoing, I find that the domestic industry products solved a long-felt, but unmet need, received industry praise, were commercially successful, and that another tried but failed to develop a solution to satisfy the unmet need. I further find that this evidence weighs against obviousness.

b. 10X has not established that Bio-Rad copied the claimed invention.

10X argues that Bio-Rad's copying of the claimed invention shows that the invention is not obvious. 10X's argument that Bio-Rad copied its invention, however, is unpersuasive. 10X publicly disclosed its GEM technology for the first time at the February 2015 AGBT conference, which was attended by Dr. Agresti and two other Bio-Rad employees. CX-0001C (Hindson WS) at Q/A 143; 151-53. [redacted]. Prior to joining Bio-Rad, Dr. Agresti worked at

Amyris, where he [redacted]. By at least 2009, as shown in a paper that he co-authored, Dr. Agresti was aware that a gel beads could be used to deliver DNA molecules to droplets. RX-0102.00001 ("[T]he gel particles can be functionalized with a variety of compounds, including fluorophores, DNA fragments, antibodies, and enzymes."); RX-0503C (Agresti DWS) at Q/A 40. The paper notes that gel particles "are useful substrates for chemical and biological applications" and "[t]he compliance of the particles prevents clogging of the channels" of microfluidic devices. RX-0102.00001.

[redacted]

[redacted] The presentation attached to the email is JX-0065C; JX-0067C is a higher quality copy of the presentation. *Id.* at Q/A 49.

[redacted]. JX-0067C.00014; RX-0503C (Agresti DWS) at Q/A 54.

Accordingly, there is clear documentary evidence, as well as Dr. Agresti's testimony, showing that, [redacted]

In support of its argument that Bio-Rad copied the claimed invention, 10X points to Dr. Agresti's trial testimony and an [redacted]

[redacted]—is an advantage discussed in the 2009 paper he co-authored, entitled "Beating Poisson encapsulation statistics using close-packed ordering." RX-0102.0001. ("We use compliant gel particles in these experiments. The compliance of the particles prevents clogging of the channels.") (footnotes omitted).

[redacted]. 10X's argument is unpersuasive.

[redacted]

Based on the foregoing, I find that 10X has not shown that Bio-Rad copied the claimed invention.

V. THE '468 PATENT

A. Asserted Claims

10X is asserting claims 1, 6, 7, 9, and 21 of the '468 patent. Claim 1 is independent and the remaining claims depend directly or indirectly from claim 1. Claim 1 recites:

> A method for droplet generation, comprising:
>
> (a) providing at least 1,000,000 oligonucleotide molecules comprising barcode sequences, wherein said barcode sequences are the same sequence for said at least 1,000,000 oligonucleotide molecules, wherein said at least 1,000,000 oligonucleotide molecules are releasably attached to a bead, wherein said bead is porous;
>
> (b) combining said at least 1,000,000 oligonucleotide molecules and a sample comprising a nucleic acid analyte each in an aqueous phase at a first junction of two or more channels of a microfluidic device to form an aqueous mixture comprising said at least 1,000,000 oligonucleotide molecules attached to said bead and said sample; and

(c) generating a droplet comprising said at least 1,000,000 oligonucleotide molecules attached to said bead and said sample comprising said nucleic acid analyte by contacting said aqueous mixture with an immiscible continuous phase at a second junction of two or more channels of said microfluidic device.

'468 patent (JX-0005), col. 33:56-col. 34:9.

Claims 6, 7, 9, and 21 depend directly from claim 1. Claim 6 requires that the bead be formed from a polyacrylamide. *Id.*, col. 34:25-26. Claim 7 requires that the bead be a gel bead. *Id.*, col. 34:27. Claim 9 requires that the "at least 1,000,000 oligonucleotide molecules" have a region that functions as a primer. *Id.*, col. 34:30-32. Claim 21 requires that after the generation of a droplet "a given oligonucleotide molecule of said at least 1,000,000 oligonucleotide molecules attaches to said nucleic acid analyte," before being "subjected to nucleic acid amplification to yield a barcoded nucleic acid analyte." *Id.*, col. 35:3-9.

B. Claim Construction

The parties agreed to construe "barcode" to mean a "label that may be attached to an analyte to convey identifying information about the analyte." Order No. 22 at 2. In the *Markman* order, "1,000,000 oligonucleotides comprising barcode sequences" was construed to mean "1,000,000 oligonucleotide molecules that include, but are not necessarily limited to, barcode sequences." *Id.* at 17-22. The term "releasably attached" was construed to mean "attached in a manner that allows the attached object to be released." *Id.* at 22-30. The term "amplification" was construed to mean "increasing the number of copies of the target sequence to be detected," including by reverse transcription. *Id.* at 31-45.

C. Infringement

10X accuses Bio-Rad of infringing claims 1, 6, 7, 9, and 21 of the '468 patent.

1. Claim 1

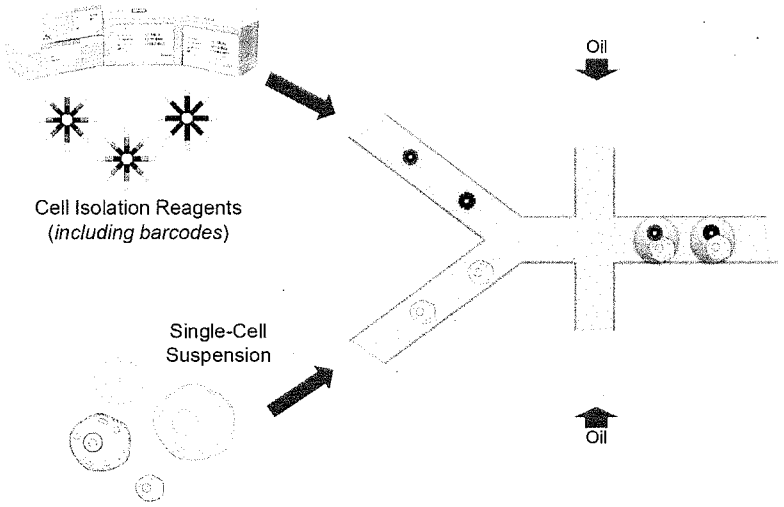
There is no dispute that Bio-Rad's ddSEQ system includes a method for droplet generation, and 10X relies on Dr. Butte's analysis to show infringement of the limitations of claim 1 of the '468 patent. CX-0004C at Q/A 418-437.

a. "providing at least 1,000,000 oligonucleotide molecules . . ."

There is no dispute with respect to a majority of the elements in the first limitation of claim 1 of the '468 patent, which includes limitations that are substantively identical to those discussed above for claim 1 of the '024 patent. Dr. Butte refers back to his analysis for the '024 patent for these limitations, which require "providing at least 1,000,000 oligonucleotide molecules," that the "barcode sequences are the same," that the molecules are "releasably attached to a bead," and "said bead is porous." CX-0004C at Q/A 422-424. As discussed above, Bio-Rad disputes infringement of the "releasably attached" limitation, but its non-infringement arguments are not consistent with the claim construction adopted in this investigation. Accordingly, the accused ddSEQ products infringe the "providing . . ." limitation of claim 1 of the '468 patent.

b. "combining said at least 1,000,000 oligonucleotide molecules and a sample comprising a nucleic acid analyte each in an aqueous phase . . ."

Dr. Butte identifies Bio-Rad documentation describing the mixing of two input aqueous solutions in the ddSEQ v1 process: one solution contains the oligonucleotide molecules and the other solution contains a sample of single cells comprising the mRNA nucleic acid analyte. CX-0004C at Q/A 427-28. Dr. Butte testifies that these two solutions are combined at a first junction of two channels of the ddSEQ v1 cartridge, citing a Bio-Rad document showing the mixing of the aqueous solutions. *Id.* at Q/A 429.



JX-0035.00009. He further cites the testimony of Bio-Rad employee Lucas Frenz, describing the junction where the two solutions are combined. CX-0011C (Frenz Dep. Tr.) at 229-30.

[redacted]

Bio-Rad contends that Dr. Butte's testimony fails to carry 10X's burden to show infringement of this limitation. RIB at 165-66.[12] In particular, Bio-Rad cites Dr. Butte's testimony on cross-examination where he agrees that [redacted] Tr. 408:6-13. Dr. Butte further testifies that "it would be a big mess" if the two solutions mixed "without forming a droplet." *Id.* at 409:12-21. As Dr. Butte further explains his testimony,

[12] Pursuant to Order No. 39 (Mar. 12, 2019), Bio-Rad was precluded from offering affirmative evidence of non-infringement regarding this limitation.

however, these statements do not contradict his infringement opinions. *See* SRB at 43-44. Dr. Butte explains that the two solutions [redacted] *Id.* And although he concedes that "lysis might start, it takes time to complete." *Id.* at 408:20-498:2. When Dr. Butte's cross-examination testimony is considered in the context of his infringement opinions and the evidence from Bio-Rad's documents and testimony, there is a preponderance of evidence that the ddSEQ system infringes the "combining" limitation.

c. "generating a droplet . . ."

There is no dispute with respect to the elements of the final limitation of claim 1. Dr. Butte identifies evidence that a droplet is formed when the mRNA or genomic DNA fragment contacts the aqueous mixture at a second junction. CX-0004C at Q/A 436-37. This droplet generation is depicted in Bio-Rad documents.

[redacted]

JX-0088C.00013. Dr. Butte explains how the limitation is met for both the ddSEQ v1 [redacted] products. CX-0004C at Q/A 436-37. Dr. Frenz confirmed the location of the junction in the ddSEQ v1 [redacted] cartridges. CX-0011C at 231-32; CX-0056C; CX-1458C.

Accordingly, both the ddSEQ v1 [redacted] processes infringe the method of claim 1 of the '468 patent.

2. Dependent Claims

There is no dispute with respect to the ddSEQ system's infringement of the limitations in dependent claims 6, 7, 9, and 21 of the '468 patent. CIB at 197-98; SIB at 92.

As discussed in the context of the '024 patent, there is no dispute that the ddSEQ system uses a gel bead comprised of [redacted], as required by claims 6 and 7 of the '468 patent. *See* CX-0004C (Butte DWS) at Q/A 224-26, 438-43.

Claim 9 of the '468 patent requires that the oligonucleotide molecule "comprises a region which functions as a primer." Dr. Butte explains that in the WTA 3' v1 [redacted]. CX-0004C at Q/A 446. In the scATAC-seq [redacted] assays, the Nextera Adaptor binding sequence attaches to the Nextera Adaptor and functions as a primer during PCR in the droplet. *Id.*

Claim 21 of the '468 patent requires that the "nucleic acid analyte is subjected to nucleic acid amplification to yield a barcoded nucleic acid analyte." The limitations of this claim are similar to those recited in limitation (c) of claim 1 of the '024 patent, and the ddSEQ system infringes claim 21 for the same reasons discussed above. *See* CX-0004C (Butte DWS) at Q/A 449.

Accordingly, [redacted] the ddSEQ v1 [redacted] processes infringe claims 6, 7, 9, and 21 of the '468 patent.

3. Indirect Infringement

10X accuses Bio-Rad of indirect infringement of the method claims of the '468 patent based on the same evidence cited for the '024 patent. CIB at 198. Staff and Bio-Rad raise the same indirect infringement arguments for the '468 patent that were addressed in the context of the '024 patent. RIB at 166; SIB at 92-93.

As discussed above, 10X has shown that the ddSEQ v1 system has been used in the United States, [redacted]. For the same reasons discussed above in the context of the '024 patent, 10X has thus shown that Bio-Rad has induced infringement and contributorily infringed claims 1, 6, 7, 9, and 21 of the '468 patent by importing and selling components of the ddSEQ v1 system.

D. Domestic Industry

10X contends that its DI products practice claims 1, 6, 7, 9, and 21 of the '468 patent, relying on the testimony of Dr. Butte. CIB at 198-201; CX-0004C at Q/A 450-77.

1. Claim 1

There is no dispute that the DI products include a method for droplet generation, and 10X relies on Dr. Butte's analysis to show infringement of the limitations of claim 1 of the '468 patent. CX-0004C at Q/A 453-66.

There is no dispute with respect to the first limitation of claim 1 of the '468 patent, which includes limitations that are substantively identical to those discussed above for claim 1 of the '024 patent. Dr. Butte refers back to his analysis for the '024 patent for these limitations, which require "providing at least 1,000,000 oligonucleotide molecules," that the "barcode sequences are the same," that the molecules are "releasably attached to a bead," and "said bead is porous." CX-0004C at Q/A 455-56.

With respect to the second limitation of claim 1 of the '468 patent requiring forming an aqueous mixture, Dr. Butte identifies two aqueous input solutions for 10X's single-cell products: one solution comprising an mRNA nucleic acid analyte and a second solution including gel beads with oligonucleotide molecules attached. CX-0004C at Q/A 458-59. He further identifies a junction of channels on the Chromium Single Cell 3' microfluidic chip where the two solutions

are combined. *Id.* at Q/A 460. With respect to 10X's linked-read products, Dr. Butte identifies a Sample Master Mix with denatured genomic DNAs and a second solution containing gel beads. *Id.* at Q/A 462. He further identifies the junction on the Chromium Genome microfluidic chip where the two solutions are combined. *Id.* at Q/A 463. Bio-Rad argues that 10X has failed to carry its burden with respect to the "aqueous solution" limitation, raising arguments similar to those discussed above in the context of infringement. RIB at 166-67. As discussed above, however, Dr. Butte's testimony on cross-examination does not contradict his affirmative opinions with respect to this limitation.

There is no dispute with respect to the third limitation of claim 1 of the '468 patent, which requires generating a droplet. Dr. Butte identifies images of the claimed second junction in the 10X single-cell and linked-read applications and documents showing the portioning oil loaded on the Genome microfluidic chip. CX-0004C at Q/A 465-66; CX-0581C; CX-0622C; CX-0481; CX-0578.

Accordingly, the DI products practice claim 1 of the '468 patent.

2. Dependent Claims

There are no disputes with respect to the limitations recited in dependent claims 6, 7, 9, 10, 17, and 21 of the '468 patent. CIB at 200-01; SIB at 94.

With respect to claims 6 and 7, Dr. Butte refers back to his opinions with respect to the '024 patent, and there is no dispute that the DI products use a polyacrylamide gel bead. CX-0004C at Q/A 467-70.

With respect to claims 9 and 10, Dr. Butte explains that the DI products use the 10X Barcoded Primer—in the single-cell applications, the poly-T sequence attaches to the mRNA and functions as a primer during reverse transcription, and in the linked-read applications, a 6

nucleotide random primer is used in isothermal amplification. CX-0004C at Q/A 472; CX-0579; CX-0578.

With respect to claim 17, Dr. Butte explains that the gel bead is dissolved upon application of [redacted]. CX-0004C at Q/A 476.

With respect to claim 21, Dr. Butte refers to his testimony regarding the '024 patent, explaining how the DI products undergo amplification. CX-0004C at Q/A 478.

Accordingly, the DI products practice claims 1, 6, 7, 9, 10, 17, and 21 of the '468 patent.

E. Invalidity

Bio-Rad contends that the asserted claims of the '468 patent are invalid as anticipated or rendered obvious by the '059 patent (JX-0031), alone or in combination with additional prior art, including Hinz (RX-0461), PCT Pub. No. WO 2010/036352 A1 naming inventors Billy W. Colston, Jr. and Benjamin J. Hindson, *et al.* (RX-0473, "Colston"), and U.S. Patent App. Pub. No. US 2012/0220494 A1 naming inventor Michael Samuels *et al.* (RX-0474, "Samuels"). RIB at 168-85.

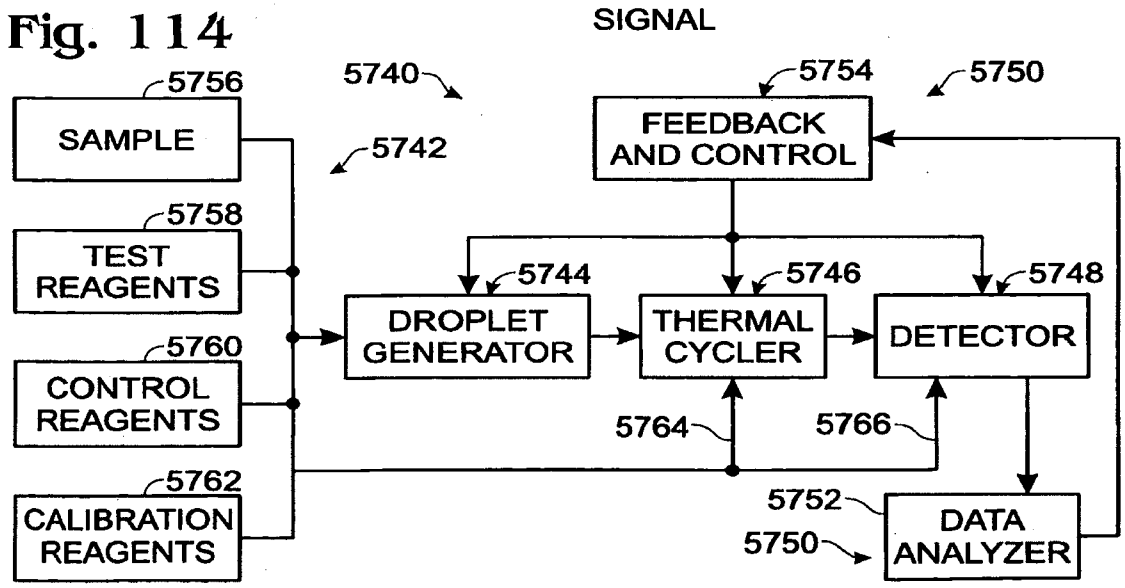
1. "at least 1,000,000 oligonucleotide molecules . . . releasably attached to a bead"

As discussed above in the context of the '024 patent, Bio-Rad has failed to show that the '059 patent anticipates or renders obvious, alone or in combination with other references, the claim limitation requiring that oligonucleotide molecules be releasably attached to a bead. For this reason alone, Bio-Rad has not shown that the asserted claims of the '468 patent are invalid.

2. "combining said at least 1,000,000 oligonucleotide molecules and a sample comprising a nucleic acid analyte each in an aqueous phase at a first junction"

Bio-Rad contends that the "combining" step of claim 1 of the '468 patent is anticipated or rendered obvious by the '059 patent through the incorporation by reference of Colston. RIB at

170-79. In the '059 patent's discussion of droplet generation, the specification states that droplets may be generated by devices described in Colston. JX-0031, col. 13:8-14. Colston is a patent application published in April 2010 that is assigned to QuantaLife, naming Dr. Hindson as one of the co-inventors. RX-0473. Colston teaches that "samples and/or reagents may be . . . mixed selectably before they are supplied to a downstream region of the system," identifying a "droplet generator" as one such region. *Id.* at 243. Figure 114 of Colston is a schematic showing the mixing of a sample and reagents prior to a droplet generator.



RX-0473.000340, Fig. 114. Based on these disclosures, Dr. Metzker submits that the '059 patent discloses the combination of a nucleic acid analyte sample and oligonucleotide molecules at a first junction to form an aqueous mixture. RX-0664C at Q/A 264.

10X contends that Bio-Rad's anticipation argument fails because the '059 patent only references Colston in the context of droplet generation, with no discussion of mixing polynucleotides and barcode adaptors. CIB at 201-02. Dr. Dear notes that the '059 patent describes the step of combining adaptors with polynucleotides as "merging," rather than droplet

formation. CX-1827C at Q/A 401 (citing JX-0031, col. 1:40-51). On this record, I agree with 10X that the "combining" limitation is not anticipated the '059 patent's incorporation of Colston by reference.

Bio-Rad further contends that it would have been obvious to combine the '059 patent's polynucleotides and barcode adaptors with the microfluidics disclosed in Colston. RIB at 170-72. Dr. Metzker suggests that one of ordinary skill "would have been motivated . . . to keep assay reagents separate from the nucleic acid or cellular analyte solutions" and "would have been motivated to see what methods others have used in droplet formation devices to improve the efficiency of her system." RX-0664C at Q/A 265. 10X disagrees with these obviousness contentions, arguing that Colston's disclosures are too vague to render obvious the "first junction" limitation of the '468 patent. CIB at 201-02. As explained by Dr. Dear, Colston does "not disclose how reagents and samples are combined, beads with barcodes, a junction of two channels to form an aqueous mixture of beads with barcodes and sample, and generation of droplets with beads and sample at a second junction." CX-1827C at Q/A 403. Dr. Dear further criticizes Dr. Metzker's reliance on Figure 114, because it is a "schematic" rather than a "microfluidic layout." *Id.* at Q/A 404. In reply, Bio-Rad argues that the '468 patent itself has no figures illustrating the claimed junctions and cites cross-examination testimony from Dr. Dear admitting that Colston shows mixing of the sample and reagents in an aqueous phase. RRB at 85; Tr. (Dear) at 902.

Although I agree with Bio-Rad that the disclosures in Colston are sufficient to show the mixing of a sample and reagents in an aqueous phase, Bio-Rad has failed to offer clear and convincing evidence that it would have been obvious to apply this mixing to the polynucleotides and barcode adaptors in the '059 patent. Dr. Metzker only offers conclusory opinions regarding

the motivations of one of ordinary skill in the art to implement a microfluidics system meeting the limitations of the '468 patent. RX-0664C at Q/A 265. Bio-Rad fails to cite any evidence from the '059 patent or other contemporaneous references indicating a need or desire to implement a particular microfluidic mixing process for the '059 patent's polynucleotides and barcode adaptors. Accordingly, Bio-Rad has failed to carry its burden to show that this limitation is obvious in view of the '059 patent, alone or in combination with Colston.

Bio-Rad's proposed combinations of the '059 patent with other references fail for the same reason, because Dr. Metzker only offers conclusory opinions regarding the obviousness of combining these references. *See* RX-0664C at Q/A 268. Although Samuels (RX-0474), Song (RX-0475), and Abate (RX-0102) teach microfluidic systems that meet at least some of the claim limitations of the '468 patent, Bio-Rad fails to identify a credible reason for implementing these processes to mix the polynucleotides and barcode adaptors of the '059 patent. There is no evidence that these references solve a known problem for the process described in the '059 patent, and there is no evidence that the particular microfluidic systems identified by Bio-Rad are among a finite number of identified, predictable solutions. Accordingly, Accordingly, Bio-Rad has failed to carry its burden on obviousness with respect to this limitation.

3. "generating a droplet . . . by contacting said aqueous mixture with an immiscible continuous phase at a second junction"

Bio-Rad contends that the "generating a droplet" step of claim 1 of the '468 patent is anticipated or rendered obvious by the '059 patent alone or in combination with Colston and Samuels. RIB at 179-83. In particular, Bio-Rad cites a disclosure in the '059 patent that "[m]icrofluidic methods of producing emulsion droplets using microchannel cross-flow focusing on physical agitation can produce either monodisperse or polydisperse emlusions." JX-0031, col. 14:6-8. Dr. Metzker submits that "[o]ne of ordinary skill in the art would have understood

that the 'cross-flow focusing' as taught by Saxonov involves the concept of flow-focusing using a cross junction with two or more input channels, one being oil and one being an aqueous channel." RX-0664C at Q/A 276.

The '059 patent's reference to "cross-flow focusing" is not sufficient to anticipate the "generating a droplet" limitation of the '468 patent. As Dr. Dear explains, the '059 patent's discussion of droplet generation is separate from any discussion of mixing polynucleotides and barcode adaptors. CX-1827C at Q/A 427. Accordingly, Bio-Rad's anticipation argument fails for the same reasons discussed above for the "combining" limitation.

Bio-Rad's obviousness arguments for the "generating a droplet" limitation rely on the same combinations discussed above for the "combining" limitation. RIB at 180-83. Again, Bio-Rad fails to offer credible evidence for using the microfluidic systems disclosed in Colston, Samuels, Song, or Abate with the polynucleotides and barcode adaptors of the '059 patent. Accordingly, Bio-Rad's obviousness arguments fail to the same reasons discussed above for the "combining" limitation.

4. Secondary considerations of non-obviousness

For the same reasons discussed above in the context of the '024 patent, the success of 10X's domestic industry products further weigh against a finding of obviousness.

VI. THE '204 PATENT

A. Asserted Claims

10X is asserting claims 27, 29, 31, and 33 of the '204 patent. The asserted claims depend from unasserted independent claims 1, 23, and 25. Unasserted claim 1 recites:

> A composition comprising a plurality of capsules, said capsules situated within droplets in an emulsion, wherein said capsules are configured to release their contents into said droplets upon the application of a stimulus to provide said contents in said droplets in said emulsion,

> wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof.

Id., col. 44:42-48. Asserted claims 27 and 33 depend directly from claim 1. Claim 27 requires that the contents of each capsule "comprise at least 10,000 barcoded oligonucleotides releasably attached" to the capsule. *Id.*, col. 46:24-26. Claim 33 limits the claimed capsules to gel capsules. *Id.*, col. 46:42-43.

Unasserted claim 23 recites:

> A device comprising a plurality of partitions, wherein at least one partition of said plurality of partitions comprises a capsule, wherein said capsule is situated within a droplet in an emulsion, wherein said capsule is configured to release its contents into said droplet upon the application of a stimulus to provide said contents in said droplet in said emulsion, wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof.

Id., col. 45:51-58. Claim 29 depends directly from claim 23 and requires that the contents of the claimed capsule "comprise at least 10,000 barcoded oligonucleotides releasably attached" to the capsule. *Id.*, col. 46:30-32.

Unasserted claim 25 recites:

> A method comprising:
>
> a. providing a plurality of inner capsules, said inner capsules situated within outer capsules in an emulsion, wherein said inner capsules are configured to release their contents into said outer capsules upon the application of a stimulus, wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof; and
>
> b. providing a stimulus to cause said inner capsules to release their contents into said outer capsules in said emulsion.

Id., col. 46:3-12. Claim 27 requires that the contents of each capsule "comprise at least 10,000 barcoded oligonucleotides releasably attached" to the capsule. *Id.*, col. 46:36-38.

For the technical prong of the domestic industry requirement, in addition to the asserted claims, 10X relies on claim 10 of the '204 patent. Claim 10 depends from claim 1 through claims 2, 7, and 8. Claim 1 is recited above. Claim 2 requires that the capsules of claim 1 include "at least one of said capsules and said droplets comprise a species selected from the group consisting of a reagent and an analyte." *Id.*, col. 44:50-52. Claim 7 requires that the analyte of claim 2 be selected "from the group consisting of a cell, a polynucleotide, a chromosome, a protein, a peptide, a polysaccharide, a sugar, a lipid, a small molecule, and combinations thereof." *Id.*, col. 44:66-col. 45:2. Claim 8 requires the analyte of claim 7 to be a polynucleotide. *Id.*, col. 45:3-4. Claim 10 requires that the amount of polynucleotide in the composition of claim 8 be "sufficient to provide about 100-200X sequence coverage." *Id.*, col. 45:8-10.

B. Claim Construction

The parties agreed to construe "barcode" to mean a "label that may be attached to an analyte to convey identifying information about the analyte." Order No. 22 at 2. They agreed to construe "wherein said capsules are [capsule is] configured to release their [its] contents into said droplets [droplet] upon the application of a stimulus" to have its plain and ordinary meaning. *Id.*

C. Infringement

10X asserts that Bio-Rad's ddSEQ v1 [redacted] products infringe claims 27, 29, 31, and 33 of the '204 patent. With the exception of claim 33, the asserted claims of the '204 patent require a "capsule" or "capsules," wherein the contents of each capsule include barcode molecules that are "releasably attached" to the capsule. '204 patent, col. 44:42-49 (claim 1), col.

46:24-26 (claim 27), col. 46:30-32 (claim 29), col. 46:36-38 (claim 31). Bio-Rad's infringement argument relating to the "releasably attached" limitation are addressed above in the context of the '024 and '468 patents and are rejected for the same reasons in the context of the '204 patent. All of the asserted claims require a "capsule" or "capsules" that are "configured to release their contents into said droplets upon the application of a stimulus." *Id.*, col. 44:44-46 (claim 1), col. 46:5-7 (claim 25); *see also id.*, col. 45:53-56 (claim 23) ("wherein said capsule is configured to release its contents into said droplet upon the application of a stimulus to provide said contents in said droplet in said emulsion"). The parties agreed that the term "wherein said capsules are [capsule is] configured to release their [its] contents into said droplets [droplet] upon the application of a stimulus" did not need to be construed and should be given its "plain and ordinary meaning." Order No. 22 (Oct. 31, 2018) at 2. The claims further require that the stimulus be "selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." *Id.*, col. 44:46-49 (claim 1), col. 45:56-58 (claim 23), col. 46:7-10 (claim 25).

For the reasons set forth below, the accused products do not literally infringe the asserted claims because they do not have a stimulus "selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." In addition, 10X is estopped from relying on the doctrine of equivalents to show infringement.

1. Literal Infringement

The claims require that the capsules release their contents in response to a stimulus that is "selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." '204 patent, col. 44:44-46 (claim 1), col. 45:44-58 (claim 23), col. 46:5-10 (claim 25). The recited stimuli form a "Markush group." In Markush

claims, alternative species or elements that can be selected as part of the claimed invention are listed as a group, called a Markush group. *Multilayer Stretch Cling Film Holdings, Inc. v Berry Plastics Corp.*, 831 F.3d 1350, 1357 (Fed. Cir. 2016) (citing *Abbott Labs. v. Baxter Pharm. Prods., Inc.*, 334 F.3d 1274, 1280 (Fed. Cir. 2003)). The term "group of" is traditionally used by patent drafters to signal a Markush group. *Id.* (citing *Gillette Co. v. Energizer Holdings, Inc.*, 405 F.3d 1367, 1372 (Fed. Cir. 2005)). Typically, Markush groups take the following form: "a member selected from the group consisting of A, B, and C." *Id.* (quoting *Gillette*, 405 F.3d at 1372) (internal quotation marks omitted). Each member of a Markush group is "alternatively usable for the puposes of the invention." *Id.* at 1357-58 (quoting *In re Driscoll*, 562 F.2d 1245, 1249 (CCPA 1977)) (internal quotation marks omitted).

In the accused products, 10X argues that the barcode molecules are linked to the gel bead by "chemical bonds susceptible to [redacted] so that the barcode molecules are released when the [redacted]. CIB at 173. It is undisputed that the [redacted] are not one of the recited stimuli. *See, e.g.*, Tr. (Butte) at 371:24-372:17 (testifying that [redacted] by themselves are not a change in pH or ion concentration and do not reduce disulfide bonds). 10X, however, points to evidence showing that [redacted] *See, e.g.*, CX-0004C (Butte DWS) at Q/A 317-319. Relying on this evidence, 10X identifies the combination of the [redacted] as the claimed stimulus. CIB at 173. While Bio-Rad and Staff dispute 10X's contention that the presence of [redacted] the accused products still would not literally infringe the asserted claims.

While there is no dispute that the addition of [redacted] constitutes a "change in the ion concentration," which is a recited element of the Markush group, there is no evidence that the [redacted] would have any effect on the attached barcode molecules or the gel bead. *See, e.g.*, Tr. (Butte) at 474:18-21 ("Q: And you did not provide an opinion in your witness statement that [redacted] A: That's correct."). Rather, according to 10X's expert, Dr. Butte, [redacted] sever the barcode molecules from the gel bead. *See, e.g.*, CX-0004C (Butte DWS) at Q/A 318. Thus, as understood by Dr. Butte, the stimulus that causes the release of the barcode molecules from the gel bead in the accused products is the [redacted].

Dr. Butte's identification of the [redacted] in combination with a change in magnesium ion concentration for the claimed stimulus is legally flawed. By its express language—"wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof"—the Markush group at issue is limited to (1) one of the recited stimuli or (2) a combination of the recited stimuli; it does not encompass a combination of a recited stimulus and an unrecited

stimulus. In particular, the asserted claims define the Markush group as "consisting of" the recited stimuli and combinations thereof, as opposed to being "comprised" of the recited stimuli. "'Consisting of' is a term of patent convention meaning that the claimed invention contains only what is expressly set forth in the claim." *Multilayer,* 831 F.3d at 1358 (quoting *Norian Corp. v. Stryker Corp.,* 363 F.3d 1321, 1331 (Fed. Cir. 2004)) (internal quotation marks omitted). While the term "comprising" would have indicated that the group was open to additional, unrecited stimuli, the term "consisting of" indicates that unrecited stimuli are excluded from the group. *Id.* at 1358.

As explained by the Federal Circuit, "[t]he presumption that a claim term set off by the transitional phrase 'consisting of' is closed to unrecited elements is at least a century old and has been reaffirmed many times by our court and other courts." *Id.* While "the exceptionally strong presumption that a claim term set off with 'consisting of' is closed to unrecited elements" may be overcome if a patentee acts as his own lexicographer and "give[s] 'consisting of' an alternative, less restrictive meaning," the specification and prosecution history must "unmistakably manifest [such] an alternative meaning." *Id.* 10X does not contend that the patentees acted as their own lexicographers and re-defined "consisting of."

As shown in *Multilayer*, the closed nature of the claim language at issue excludes a combination of a recited stimulus (change in ion concentration) and an unrecited stimulus (enzymes). In *Multilayer,* the asserted claims were directed to a thermoplastic stretch wrap film having two outer layers and five inner layers. *Id.* at 1353. The claims further required that "five identifiable inner layers" be formed from materials selected from a Markush group "consisting of" various resins. *Id.* At issue was whether an inner layer composed of a combination of a recited resin and an unrecited resin fell outside the scope of the claimed Markush group. *Id.* at

1358. Answering the question in the affirmative, the Federal Circuit held that "constru[ing] the claims to cover any plastic film with five compositionally different inner layers, each of which contains any amount of one of the four recited resins," would "render the '055 patent's Markush language—each layer being selected from the group consisting of'—equivalent to the phrase 'each layer comprising one or more of.'" *Id.* at 1358.

10X has not pointed to any basis for distinguishing the closed Markush group at issue in *Multilayer* that would allow interpreting the Markush group at issue in this investigation to encompass a combination of a recited stimulus and an unrecited stimulus. 10X's only response to the argument that such a combination falls outside the scope of the claims, is to argue that the accused stimulus does not include the [redacted].

Relying on the [redacted] as the claimed stimulus has no legal basis and makes no logical sense. The claims require that the capsules release their contents in response to the claimed stimulus. *See* CIB at 181 ("The claimed function of applying a stimulus is to allow the release of the contents of a capsule into the droplet."). 10X does not argue and there is no evidence that [redacted] will cause the release of barcode molecules from the gel beads. [redacted].

10X's attempt to limit the accused stimulus to the [redacted]

Based on the foregoing, I find that the accused products do not literally infringe the asserted claims.

2. Doctrine of Equivalents

10X argues that the accused products satisfy the stimulus under the doctrine of equivalents ("DOE"). CIB at 181-84. In the accused products, the barcode molecules are released from the gel bead when the [redacted]. 10X, however, is precluded from relying on the DOE to satisfy the Markush group limitation.

Under the DOE, "a product or process that does not literally infringe upon the express terms of a patent claim may nonetheless be found to infringe if there is 'equivalence' between the elements of the accused product or process and the claimed elements of the patented invention." *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 21 (1997).

Although the DOE allows a "patentee to claim those insubstantial alterations that were not captured in drafting the original patent claim but which could be created through trivial changes," under prosecution history estoppel a patentee cannot use the DOE to recapture subject matter surrendered during prosecution. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabuskiki Co.*, 535 U.S. 722, 733-34 (2002) ("*Festo VIII*"). Such surrender occurs "[w]here the original application once embraced the purported equivalent but the patentee narrowed his claims to obtain the patent or to protect its validity." *Id.*

Making a narrowing amendment to secure a claim's issuance creates a presumption that prosecution history estoppel applies. *Id.* at 740-41. The presumption, however, is rebuttable as there may be some instances "where the amendment cannot reasonably be viewed as surrendering a particular equivalent." *Id.* Such situations include where the equivalent was unforeseeable at the time of the application or where the rationale underlying the amendment bears no more than a tangential relation to the equivalent in question. *Id.* at 741.

During the prosecution of the '204 patent, application claims 1, 78, and 110 matured into issued claims 1, 23, and 25, respectively. JX-0009.13630. In their original form, application claims 1 and 78 required a capsule (application claim 1) or capsules (application claim 78) "configured to release their contents . . . upon the application of a stimulus," but did not require that the stimulus be selected from a particular group of stimuli. *Id.* at .00080 (application claim 1); *see also id.* at .00085 (application claim 78) (requiring a capsule "configured to release its contents into said droplets upon the application of a stimulus"). Similarly, application claim 110 required a step of "providing a stimulus to cause said capsules to release their contents into said droplets," without requiring the stimulus be selected from a group of stimuli. *Id.* at .00087.

Although application claim 1 did not limit the stimulus to a group of stimuli, two of its dependent claims did. Application claims 19 and 21 depended directly from application claim 1. Application claim 19 required the stimulus to be "selected from the group consisting of a chemical stimulus, a bulk stimulus, a biological stimulus, a light stimulus, a thermal stimulus, a magnetic stimulus, and combinations thereof." *Id.* at .00081. Application claim 21 required the stimulus to be "selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." *Id.* at .00081.

In an office action issued on January 29, 2016, the examiner rejected all of the pending claims as being anticipated in view of several prior art references. *Id.* at .09770-09781. Application claim 1 was found to be anticipated by seven references: (1) U.S. Patent Publication No. 2005/007951 to Berka *et al.* ("Berka"), (2) U.S. Patent Publication No. 2015/0079510 to Church *et al.* ("Church"), (3) U.S. Patent Publication No. 2014.0227706 to Kato et al. ("Kato"), (4) U.S. Patent Publication No. 2003/0207260 to Trnovsky et al. ("Trnovsky"), (5) U.S. Patent Publication No. 2013/0189700 to So *et al.* ("So"); (6) U.S. Patent Publication No. 2004/0258701 to Dominowski *et al.* ("Dominowski"); and (7) U.S. Patent Publication No. 2009/0025277 to Takanashi ("Takanashi") *Id.* at .09777-.099780. *Id.* at .09774-.099780. Application claim 19 was rejected as anticipated by five references: (1) Berka, (2) Trnovsky, (3) So, (4) Dominowski, and (5) Takanashi. *Id.* Application claims 78 and 110 were rejected as being anticipated by Berka. *Id.* Application claim 21 was rejected as being anticipated by Kato. *Id.*

On April 28, 2016, the applicants responded to the rejections by, *inter ilia*, cancelling application claims 19 and 21 and amending application claims 1, 78, and 110. As amended, application claims 1, 78, and 110 incorporated application claim 21's limitation requiring that the stimulus be "selected from the group consisting of a change in pH, a change in ion concentration,

reduction of disulfide bonds, and combinations thereof." *Id.* at .10009 ("[C]laims 1, 31, 78, 89, 110 and 118 have been amended to recite 'wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof,' thus incorporating the elements of Claim 21."); *see also id.* at .10000, .10002, .10003. With this amendment, the applicants argued that the amended application claims were allowable over the cited prior art with the exception of Kato. *Id.* at .10009 ("Initially, as Claim 21 was rejected only over Kato, Applicant understands that the Office acknowledges that none of Berka, Church, Trnovsky, So, Dominowski and Takanashi teach or disclose 'wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof,' as recited in claims 1, 31, 78, 89, 110 and 118."). With regard to Kato, the applicants argued that "Kato does not teach or disclose, 'wherein said capsules are configured to release their contents **into said droplets** upon the application of a stimulus,' as recited in Claim 1." *Id.* at .10010. The applicants also argued that Kato did not qualify as prior art. *Id.*

On August 5, 2016, the examiner rejected the amended claims in view of a new set of prior art references and noted that the previous rejections had been rendered moot in view of the new grounds of rejection. *Id.* at .10074. The examiner also "noted that the 102(b) rejection of Claims 1 and 21 over Kato has been withdrawn in light of the applicant's persuasive arguments." *Id.* In response to the new rejections, the applicants further amended application claims 1, 78, and 110 to require that the capsule or capsules "provide said contents in said droplets in said emulsion" upon the application of a stimulus. *Id.* at .10118, .10120-.10121. The application claims as amended were allowed. *Id.* at .13617.

10X argues that "[i]nfringement under the doctrine of equivalents is not barred here by the prosecution history estoppel because there was no disclaimer during prosecution of all chemical, bulk, or biological stimuli." CIB at 182. 10X's argument, however, is unpersuasive. A narrowing amendment made in order to gain issuance triggers the presumption that a patentee is estopped from relying on the DOE to show infringement. *Festo VIII,* 535 U.S. at 740-41. It is indisputable that the April 28, 2016 amendments to application claims 1, 78, and 110 narrowed the scope of the claims. As originally drafted, the application claims did not require the claimed stimulus to be selected from any group of stimuli, much less from the "group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof." It is also indisputable that the narrowing amendment was made to overcome prior art as the applicants expressly cited the amendment to overcome several prior art references relied upon by the examiner: "[A]s Claim 21 was rejected only over Kato, Applicant understands that the Office acknowledges that none of Berka, Church, Trnovsky, So, Dominowski and Takanashi teach or disclose 'wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof,' as recited in claims 1, 31, 78, 89, 110 and 118." JX-0009 at .10009

Thus, the applicants' narrowing amendment triggers the presumption that 10X is estopped from relying on the DOE to show that accused products satisfy the stimulus limitation. *See Festo VIII,* 535 U.S. at 740-41. 10X attempts to rebut the presumption by arguing that the narrowing amendment was tangential to the alleged equivalent, which 10X identifies as [redacted]

different Markush element, [redacted] The only basis that 10X has put forth in support of its contention that the amendment was tangential to the alleged equivalent is that the alleged equivalent was not disclosed in the prior art references relied upon by the examiner to reject the pending claims. This argument, however, fails on examination.

"[A]n amendment made to avoid prior art that contains the equivalent in question is not tangential; it is central to allowance of the claim." *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabuskiki Co., Ltd.*, 344 F.3d 1359, 1369-70 (Fed. Cir. 2003) ("*Festo IX*").[14] It is 10X's burden to show that the reason for the amendment is tangential to the alleged equivalent. *Id.* at 1369. Moreover, the reason for the amendment must be "objectively apparent" from the prosecution history "without the introduction of additional evidence, except, when necessary, testimony from those skilled in the art as to the interpretation of that record." *Id.; see also Integrated Tech. Corp. v. Rudolph Techs., Inc.*, 734 F.3d 1352, 1358. This is a burden that 10X has not met.

At the hearing, 10X's own expert Dr. Butte confirmed that one of the references in question, Trnovsky, discloses the use of the enzyme agarase as a stimulus. Tr. 431:14-16. Describing Trnovsky as a "complicated paper," Dr. Butte further testified that he was unable to "tell one way or the other whether" Trnovsky disclosed the use of ion cofactors with agarase. *Id.* at 431:17-25. Dr. Butte, however, acknowledged that Trnovsky discloses "buffers used with

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[13] In its initial post-hearing brief, 10X also argued in the alternative that [redacted]. In its reply brief, however, 10X appears to have abandoned this argument. *See* CRB at 84-85.

[14] The converse is not necessarily true. *Integrated Tech. Corp. v. Rudolph Techs. Inc.*, 734 F.3d 1352, 1358 (Fed. Cir. 2013) ("It does not follow . . . that equivalents not within the prior art must be tangential to the amendment.") (quoting *Chimie v. PPG Indus. Inc.*, 402 F.3d 1371, 1383 (Fed. Cir. 2005)) (internal quotation marks omitted).

agarase which may provide a cofactor and that there may be an ion cofactor." *Id.* at 432:1-5. This testimony by its own expert is fatal to 10X's argument that the reason for the narrowing amendment is tangential to the alleged equivalent.

10X's only response to its expert's testimony is to characterize it as "hypothetical testimony" and argue that surrender of the alleged equivalent must be shown through "the actual prior art disclosure and amendment in prosecution." CRB at 85 n. 36.[15] It is 10X's burden, however, to show that the narrowing amendment is tangential to the alleged equivalent, not Staff's and Bio-Rad's burden to show the converse. *Festo IX*, 344 F.3d at 1369-70. 10X would be unable to meet its burden, even if its expert's testimony on the issue was discounted in its entirety as "hypothetical testimony." This is because the record is devoid of any evidence concerning Trnovsky's teachings. As 10X acknowledges, Trnovsky and the other references relied upon by the examiner are not in evidence. CRB at 85. Nor does the prosecution history describe Trnovsky's disclosure in sufficient detail to determine whether the narrowing amendments are tangential to the alleged equivalent. In rejecting application claims 1 and 19 in view of Trnovsky, the examiner did not describe the reference's teachings, but cited particular portions of Trnovsky. For example, with respect to application claim 19, the examiner's rejection reads as follows:

> **Claim 19** is drawn, in part, to an embodiment of the composition of Claim 1 wherein said stimulus is selected from a defined group consisting of a chemical stimulus, a bulk stimulus and a biological stimulus.

[15] The Federal Circuit has held that it is appropriate to rely on "testimony from those skilled in the art as to the interpretation of" the prosecution history "when necessary." *Festo IX,* 344 F.3d at 1369-70. Such testimony is appropriate for a "complicated paper," such as Trnovsky. Tr. (Butte) at 431:17-25.

Trnovsky *et al.* teach these limitations, see ¶s 9 and 102.

JX-0009 at .09778; *see also id.* at .09777 ("Trnovsky et al. teach a composition comprising all of the limitations of **Claims 1-2, 4-5, 7-10, 13 and 28-30** see at least the abstract, as well as, ¶s 32, 84, 88, 99 and 102). Nor does the applicants' response provide any information about Trnovsky's disclosure other than Trnovsky does not disclose the recited stimuli. JX-0009 at .10009 ("[A]s Claim 21 was rejected only over Kato, Applicant understands that the Office acknowledges that none of Berka, Church, Trnovsky, So, Dominowski and Takanashi teach or disclose 'wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof,' as recited in claims 1, 31, 78, 89, 110 and 118.").

Based on the foregoing, I find that 10X has not shown that the reason for the narrowing amendment is tangential to the alleged equivalent. Accordingly, 10X is estopped from relying on the DOE to show that the stimulus limitation is satisfied by the accused products.

D. Domestic Industry

10X asserts that each of its domestic industry products practice claims 10, 27, 29, 31, and 33 of the '204 patent. CIB at 187-188. 10X's contentions regarding the practice of the '204 patent by its domestic industry products are undisputed by both Bio-Rad and Staff. SIB at 86 (arguing that the DI products practice the claims at issue); RIB at 136-64 (not addressing the technical prong with respect to the '204 patent). As set forth below, I find that 10X's linked-read DI products practice claims 10, 27, 29, 31, and 33 of the '204 patent and 10X's single cell DI products practice claims 27, 29, 31, and 33 of the '204 patent.

1. Claim 10

Claim 10 depends from claim 1 through claims 2, 7, and 8. Claim 1 consists of a preamble and three limitations. To the extent that the preamble is limiting, 10X's DI products provide a "composition." CX-0004C (Butte DWS) at Q/A 369-370. As required by first limitation of claim 1, the DI products provide a plurality of capsules in the form of gel beads. *Id.* at Q/A 372. In accordance with the second limitation of claim 1, the gel beads are situated within droplets in an emulsion. *Id.* at Q/A 374; CX-0538.00002 ("A GEM is a '**G**el bead in **EM**ulsion' droplet that encapsulates each tiny micro-reaction within the Chromium System. Here we show a Single Cell GEM with a single T-cell, reagents and barcoded gel bead all partitioned within a single oil droplet."). As required by third limitation, the gel beads are configured to release their contents (barcoded primers) into the droplets upon application of [redacted], which [redacted] connecting the barcoded primers to the gel beads. CX-0004C (Butte DWS) at Q/A 376, 378.

As required by claims 2, 7, and 8, in 10X's single-cell DI products, droplets encapsulating a cell containing a plurality of mRNA (a claimed analyte and a polynucleotide) are formed. *Id.* at Q/A 381, 384, and 387. In 10X's linked-read DI products, droplets containing gDNA molecules (a claimed analyte and a polynucleotide) are formed. *Id.*

As required by claim 10, the amount of gDNA provided by 10X's linked-read DI products is sufficient to provide about 100-200X sequence coverage. *Id.* at Q/A 390. 10X, however, does not address how the single-cell DI products satisfy the limitation of claim 10.

Based on the foregoing, I find that 10X's linked-read DI products practice claim 10, but that 10X has failed to show that its single-cell DI products practice claim 10.

2. Claims 27 and 33.

Claims 27 and 33 depend from claim 1, which is discussed above with respect to claim 10. As required by claim 27, each gel bead in 10X's domestic industry products contains millions of barcoded primers that are releasably attached to the bead. *Id.* at Q/A 392. As required by claim 33, the capsules (gel beads) in the domestic industry products are made of a gel. *Id.* at Q/A 370, 372, 374, 376, and 378.

Based on the foregoing, I find that 10X's linked-read DI products and single cell DI products practice claims 27 and 33.

3. Claim 29

Claim 29 depends from claim 23. Claim 23 is consists of a preamble and three limitations. To the extent the preamble is limiting, 10X's DI products provide a "composition." CX-0004C (Butte DWS) at Q/A 395. As required by first limitation of claim 1, the DI products provide a plurality of partitions in the form of gel beads. *Id.* at Q/A 372, 397. As further required by the first limitation, each gel bead is a capsule. *Id.* In accordance with the second limitation, each gel bead is situated within a droplet in an emulsion. *Id.* at Q/A 374, 399; CX-0538.00002 ("A GEM is a '**G**el bead in **EM**ulsion' droplet that encapsulates each tiny micro-reaction within the Chromium System. Here we show a Single Cell GEM with a single T-cell, reagents and barcoded gel bead all partitioned within a single oil droplet."). As required by the third limitation, the gel beads are configured to release their contents in the form of barcoded primers into the droplets upon application of [redacted], which [redacted] connecting the barcoded primers to the gel beads. CX-0004C (Butte DWS) at Q/A 376, 378, 400. As required by claim 29, each gel bead in 10X's domestic industry products contains millions of barcoded primers that are releasably attached to the bead. *Id.* at Q/A 392, 402.

Based on the foregoing, I find that 10X's linked-read DI products and single cell DI products practice claim 29.

4. Claim 31

Claim 31 depends from claim 25. Claim 25 is a method claim consisting of a preamble and two steps. To the extent the preamble is limiting, 10X's DI products perform a method. CX-0004C (Butte DWS) at Q/A 405. As required by first step of claim 25, the DI products provide a plurality of capsules in the form of gel beads. *Id.* at Q/A 372, 407. Each gel bead is situated within a droplet in an emulsion. *Id.* at Q/A 374, 407; CX-0538.00002 ("A GEM is a '**Ge**l bead in **EM**ulsion' droplet that encapsulates each tiny micro-reaction within the Chromium System. Here we show a Single Cell GEM with a single T-cell, reagents and barcoded gel bead all partitioned within a single oil droplet."). The gel beads are configured to release their contents (barcoded primers) into the droplets upon application of [redacted], which [redacted] connecting the barcoded primers to the gel beads. CX-0004C (Butte DWS) at Q/A 376, 378, 407. As required by the second step, 10X's domestic industry products apply a stimulus to the gel beads provided in the first step, resulting in the gel beads releasing their contents, the barcode primers. *Id.* at Q/A 376, 378, 409. As required by claim 31, each gel bead contains millions of barcoded primers that are releasably attached to the bead. *Id.* at Q/A 392, 411.

Based on the foregoing, I find that 10X's linked-read DI products and single cell DI products practice claim 31.

E. Invalidity

Bio-Rad contends that the asserted claims of the '204 patent are invalid as anticipated or rendered obvious by the '059 patent and/or the Church patent, alone or in combination with

additional prior art. RIB at 145-56. The asserted claims of the '204 patent require either barcode molecules that are releasably attached to a capsule (claims 27, 29, and 31) or a gel bead that is "configured to release" its contents (claim 33). Accordingly, the parties' arguments regarding invalidity for the '204 patent are substantially identical to those addressed above in the context of the "releasable attachment" limitation of the '024 patent. *See* SRB at 38-39. For the same reasons discussed above, Bio-Rad has failed to show that any asserted claim of the '204 patent is anticipated and/or rendered obvious by the '059 patent and/or the Church patent because these references do not disclose the "releasably attached" or "configured to release" limitations. Moreover, the success of 10X's domestic industry products further weigh against a finding of obviousness.

VII. THE '530 PATENT

The '530 patent issued on January 2, 2018, naming inventors Benjamin Hindson, Serge Saxonov, Kevin Ness, Paul Hardenbol, Mirna Jarosz, and Michael Schnall-Levin. JX-0007.

A. Asserted Claims

10X is asserting claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent. Claim 1 is independent and the remaining claims depend directly or indirectly from claim 1. Claim 1 recites:

> A method for nucleic acid preparation or analysis, comprising:
>
> (a) providing:
>
> (i) at least 1,000 gel beads;
>
> (ii) releasably attached to each of said at least 1,000 gel beads, at least 1,000 barcode molecules comprising identical barcode sequences that are distinct from barcode sequences of at least 1,000 barcode molecules releasably attached to any other gel bead of said at least 1,000 gel beads; and

(iii) a plurality of cells each comprising a plurality of polynucleotide molecules;

(b) generating a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each comprise:

(i) a single gel bead from said at least 1,000 gel beads; and

(ii) a single cell from said plurality of cells; and

(c) in each of said at least 1,000 droplets, using said plurality of polynucleotide molecules from said single cell and barcode molecules of said at least 1,000 barcode molecules from said single gel bead to generate a plurality of barcoded polynucleotide molecules,

wherein said barcode molecules become detached from said gel bead.

Id., col. 47:58-67, col. 48:57-col. 49:4.

Claim 4 depends from claim 1 through unasserted claim 3. Claim 3 requires that the polynucleotide molecules be mRNA. *Id.*, col. 49:8-10. Claim 4 further requires that the barcoded polynucleotide molecules be generated by reverse transcribing the mRNA in the presence of the barcode molecules. *Id.*, col. 49:11-14. Claim 19 depends from claim 1 through unasserted claim 17. Claim 17 requires that the barcode molecules "comprise combinatorial assemblies of sequences from sequence modules." *Id.*, col. 50:5-7. Claim 19 further requires that each of the combinatorial assemblies comprise a first sequence, a second sequence, and a third sequence. *Id.*, col. 50:13-15.

Claims 11, 14, 26, and 28 depend directly from claim 1. Claim 11 requires that the barcode molecules in each of the droplets be released from a single gel bead. *Id.*, col. 49:34-36. Claim 14 requires that each gel bead have "disposed within" it at least 1,000 barcode molecules. *Id.*, col. 49:44-45. Claim 26 requires that each gel bead contain at least 1,000,000 barcode

molecules. *Id.*, col. 50:30-31. Claim 28 requires that the barcode molecules become detached before the generation of the barcoded polynucleotide molecules. *Id.*, col. 50:35-37.

B. Claim Construction

The parties agreed to construe "barcode" to mean a "label that may be attached to an analyte to convey identifying information about the analyte." Order No. 22 at 2. They agreed that the term "wherein said barcode molecules become detached from said gel bead" has its lpain and ordinary meaning. *Id.* In the *Markman* order, the term "amplifying" was construed to mean "increasing the number of copies of the target sequence to be detected," including by reverse transcription. *Id.* at 31-45. The terms "providing," "said at least 1,000 droplets," and "a plurality of cells" were given their plain and ordinary meaning, with a requirement that all of the "at least 1,000 droplets" in the second step be generated before the third step of the claim is performed on any of "said at least 1,000 droplets." *Id.* at 45-51. In Order No. 35, this claim construction was further clarified so that it does preclude the generation of some barcoded molecules before the start of the claimed third step. Order No. 35 at 4-6 (Mar. 5, 2019).

C. Infringement

10X is asserting claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent against Bio-Rad's "ddSEQ Cartridges (v1 [redacted]), ddSEQ Single-Cell Isolator (v1 [redacted]), ddSEQ Cartridge Holder, and consumables and assays used with and/or as part of Bio-Rad's ddSEQ v1 [redacted]2 products including SureCell WTA 3′ (also referred to as WTA 3′ v1), [redacted]

[redacted]

1. Claim 1

As discussed in the *Markman* order, claim 1 is directed to a three-step method. Order No. 22 (Oct. 31, 2018) at 44. The first step requires "providing" at least 1,000 gel beads with

"releasably attached" barcode molecules and "a plurality of cells" containing polynucleotides. '530 patent, col. 47:60-67 & col. 48:58-64. The second step requires generating "a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each" have "a single gel bead from said plurality of cells" and "a single cell from said plurality of cells." *Id.*, col. 48:60-64. The third step requires using the polynucleotide molecules and barcode molecules to form "a plurality of barcoded polynucleotide molecules" "in each of said 1,000 droplets." *Id.*, col. 48:65-col. 49:4. As found in the *Markman* Order, the second step of generating "at least 1,000 droplets" must be completed before the third step of generating a "plurality of barcoded polynucleotide molecules" is performed in any of the droplets. Order No. 22 (Oct. 22, 2018) at 51.

a. Preamble

To the extent that the preamble is limiting, there is no dispute that the accused products are methods of nucleic acid preparation and analysis or are used in such methods. '530 patent, col. 47:58-59. Specifically, Bio-Rad's ddSEQ v1 products are used with the WTA 3'v1 assay to prepare the mRNA of a single cell for single cell whole transcriptome analysis. *See* CX-0004C (Butte DWS) at Q/A 68 (describing the release and barcoding of mRNA from cell in the WTA 3' v1 assay's workflow). [redacted] *See* CX-0004C (Butte DWS) at Q/A 68 (describing the release and barcoding of mRNA from cell in the WTA 3' v1 assay's workflow), 84 [redacted]

performs the same work flow as the WTA 3′ v1 assay to partition and barcode the mRNA transcripts of individual cells."), 93 (In the scATAC-seq assay, "[t]he oligonucleotide barcodes are released from the gel bead [redacted] and attach to the genomic DNA fragments for amplification through PCR in the droplet"), 100 ([redacted]; JX-0091C.00006-.00007 (describing the workflow of the scATAC-seq assay); CX-1491C.00013-.00016 (describing the WTA 3′ v1 assay); JX-0105C.00024 ([redacted])

b. Step 1: "providing" a plurality of cells and at least 1,000 gel beads

The first step of claim 1 requires "providing" at least 1,000 gel beads and a plurality of cells. '530 patent, col. 47:60-67 & col. 48:57-58. Each gel bead must have "releasably attached" to it "at least 1,000 barcode molecules comprising identical barcode sequences." *Id.* at col. 47:62-67. The barcode sequences of barcode molecules attached to each bead must be distinct from the barcode sequences of the barcode molecules attached to any other bead. *Id.* Each cell must "compris[e] a plurality of polynucleotide molecules." *Id.* at col. 48:57-58.

There is no dispute that the accused products can be used to provide at least 1,000 gel beads and a plurality of cells. The accused products use gel beads. CX-0004C at Q/A 489 ("[T]he ddSEQ v1 products provide gel beads composed of polyacrylamide and users provide these gel beads in performing the claimed method."), 491 ([redacted]). The accused products have the ability to provide at least 1,000 gel beads

and a corresponding number of cells. CX-0004C (Butte DWS) at Q/A 490 (testifying that Bio-Rad's ddSEQ v1 products provide at least 1,000 beads and an equal number of cells); 492 [redacted], 493 (testifying that Bio-Rad's scATAC-seq assay using the v1 cartridge provide at least 1,000 beads and an equal number of cells); JX-0036.00002-00003 (data sheet showing that 1,384 single cells were barcoded in one WTA 3′ v1 assay); CX-1573C (18,000 cells processed in WTA 3′ v1 assays); CX-1529C.00037 [redacted].

The cells provided by the accused products contain a plurality of polynucleotide molecules. CX-0004C (Butte DWS) at 502 (testifying that the cells provided by the ddSEQ v1 products comprise a plurality of mRNA molecules), 504 ([redacted]

Although Bio-Rad disputes whether the barcode molecules are releasably attached to the gel beads, here is no dispute that each of the gel beads has at least 1,000 barcode molecules attached to it. CX-0004C (Butte DWS) at 496; JX-0036.00004 (showing at least 3,000 genes are detected per cell and thus confirming at least 3,000 barcode molecules per bead). The barcode molecules have barcode sequences in the form of oligonucleotide molecules. CX-0004C (Butte DWS) at Q/A 127 (testifying that "oligonucleotide molecules released from the gel beads in Bio-Rad's ddSEQ v1 products each include a Cell Barcode sequence") ('024 patent, claim 1),

130 ([redacted]), 131 (testifying that "[t]he claimed oligonucleotide molecules in the ATAC-seq assay" include a barcode sequence). The barcode molecules attached to each gel bead have barcode sequences that are distinct from the sequences of barcode molecules attached to other gel beads. CX-0004C (Butte DWS) at Q/A 497. In particular, for the ddSEQ v1 products, there are almost [redacted] pools of barcode molecules and each pool of barcode molecules has a unique barcode sequence. *Id.*; JX-0050C.00026; CX-0018C (Lebofsky Depo. Tr.) at 115:13-116:4. [redacted]. CX-0004C (Butte DWS) at Q/A 497; CX-0009C (Agresti Dep. Tr.) at 437:1-7.

The barcode molecules are releasably attached to the gel bead through a [redacted] CX-0004C (Butte DWS) at Q/A 143 (ddSEQ v1 products), 160 ([redacted]); JX-0036.00001 ("Comprehensive Single-Cell RNA Sequencing Workflow"). Bio-Rad disputes that its products satisfy the "releasably attached" requirement for the same reasons that it contested that the requirement was satisfied with respect to the asserted claims of the '024 and '468 patents. Bio-Rad's argument is rejected for the same reasons that it was rejected with respect to the '024 and '468 patents.

For the foregoing reasons, I find that the accused products satisfy the first step of claim 1.

c. Step 2: "generating a plurality of droplets"

The second step of claim 1 requires generating a plurality of droplets, wherein at least 1,000 of the droplets comprise a "single gel bead" and a "single cell." '530 patent, col. 48 59-64. The accused products are capable of producing a plurality of droplets. CX-0004C (Butte DWS)

at Q/A 508-509; CX-1357C.00018; JX-0050C.00014 (ddSEQ v1 products provide between 50,000-75,000 droplets for each sample, and about 260,000 droplets per chip); CX-1529C.00037; JX-0110C.00006 ([redacted]); CX-0018C at 197:24-198:5.

The accused systems can be used to generate at least 1,000 droplets with a cell and gel bead. When all four lanes are primed with a Cell Suspension Mixture, the ddSEQ v1 cartridge can generate approximately 1,200 droplets having a cell and a gel bead. CX-0004C (Butte DWS) at Q/A 512; JX-0035.00011 (requirement of 40,000 input cells for 1,200 processed cells); CX-0016C (Kaihara Depo. Tr.) at 166:21-167:17 (testifying that most users have [redacted] to input into a ddSEQ v1 cartridge); JX-0036.00002–03 (1,384 droplets containing a single cell and a gel bead generated using one ddSEQ v1cartridge); CX-1494C.00016 ([redacted]). If the scATAC-seq assay is performed using the ddSEQ v1 cartridge, each lane is capable of generating 500 droplets with a cell and gel bead. CX-0016C (Kaihara Depo. Tr.) at 155:15-158:25; CX-0004C (Butte DWS) at Q/A 515-516. [redacted]. CX-0004C (Butte DWS) at Q/A 513; CX-1529C.00037.

Bio-Rad does not dispute that the accused products are capable of generating at least 1,000 droplets containing a cell and gel bead. Instead, Bio-Rad argues that the accused products do not satisfy the second step of claim 1 because they do not generate a "collection" of at least 1,000 of such droplets. RIB at 194-95. Bio-Rad argues that droplets are formed one-by-one in each chamber of the ddSEQ v1 [redacted] cartridge and, after each droplet is formed, the cell in the droplet is "destroyed almost immediately." RX-0665C (Metzker RWS) at Q/A 100 ("Think of it

this way, as droplet number one forms with a cell and a gel bead in it, the cell is destroyed almost immediately because the cell lysis reagent acts on the cell membrane. So, you never form a collection of 1,000 droplets containing a single cell and a single gel bead before any barcoding begins."). As a result, Bio-Rad argues, that there is never an instant of time where there is at least 1,000 droplets with a cell and gel bead. Bio-Rad's non-infringement argument reads a limitation into the claim that is not present, *viz.*, that a collection of at least 1,000 droplets with a cell and gel bead must exist in some instant of time.

Neither the claim language nor the *Markman* order require amassing such a "collection." The claim language and *Markman* order only require that all of the droplets be generated prior to proceeding to the third step. '530 patent, col. 48:59-64 ("generating a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each comprise" a single gel bead and a single cell); Order No. 22 (Oct. 31, 2019) at 48 ("The second step of claim 1's three-step method requires the generation of 'at least 1,000 droplets' . . . ."). Although the step of generating droplets with a cell and gel bead must be completed before the start of the third step, the third step does not require at least 1,000 droplets having a cell and a gel bead. The third step requires at least 1,000 droplets containing (1) a plurality of polynucleotide molecules from a single cell and (2) the barcode molecules from a single bead. '530 patent, col. 48:65-col. 49:2. Therefore, even if the cells are lysed almost immediately after droplet formation so that there is never more than a handful of droplets with a cell and gel bead at any single point in time, the claim language is still satisfied so long as at least 1,000 of such droplets had been generated before the start of the third step.

Based on the foregoing, I find that the accused products satisfy the second step of claim 1.

d. Step 3: generating a plurality of "barcoded polynucleotide molecules"

The third step requires that, in each of said at least 1,000 droplets, a plurality of barcoded polynucleotide molecules be generated using the polynucleotide molecules from the cell and the barcode molecules from the gel bead. '530 patent, col. 48:65-col. 49:2. The step further requires that the "barcode molecules become detached from said gel bead." *Id.* at col. 49:3-4.

There does not appear to be a dispute that in each droplet containing a single cell and single gel bead the following processes occur: (1) the cell lyses and releases polynucleotide molecules in the form of mRNA or gDNA into the droplet; (2) [redacted] the barcode molecules from the gel bead; (3) the released barcode molecules bind with either mRNA (WTA 3′ v1, [redacted]) or tagmented gDNA fragments (scATAC-seq assay); and (4) the barcode molecules and polynucleotide molecules are used as templates to generate either barcoded cDNA (WTA 3′ v1, [redacted]) or barcoded gDNA (scATAC-seq assay).

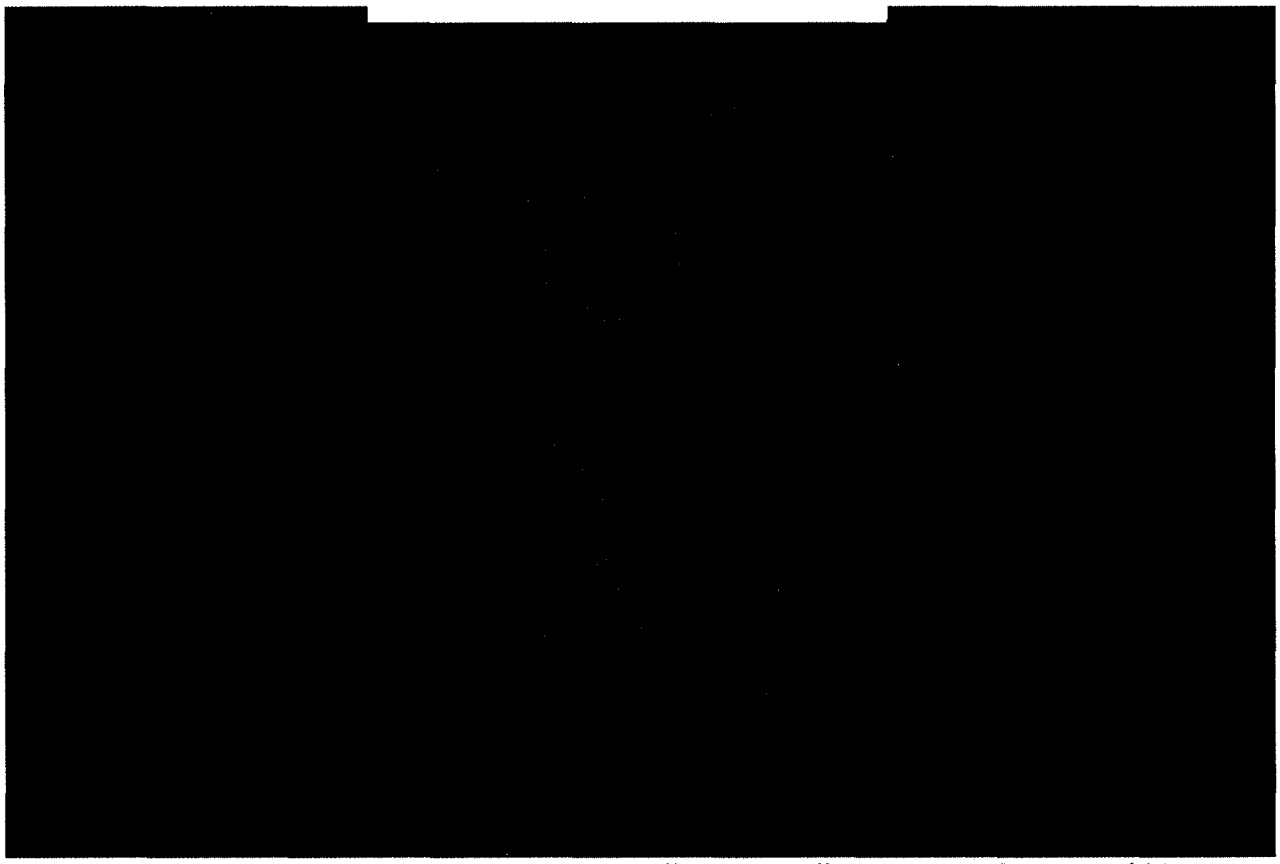
[redacted]

JX-0075C.00018 (describing the WTA 3′ v1 assay); *see also* JX-0074C.00009 (describing the WTA 3′ v1 assay); JX-0088C.00015 (describing the WTA 3′ v1 assay); JX-0091C.00020

(describing the scATAC-seq assay); CX-1491C.00018 (describing the scATAC-seq assay); JX-0034.00027, 00031, 00037 CX-0004C (Butte DWS) at Q/A 198-200, 204-209, 519, 523; CX-0018C (Lebofsky Depo. Tr.) at 154:7-157:22, 160:8-161:18; CX-0019C (Norton Depo. Tr.) at 194:24-195:13.

According to 10X, the third step occurs when the droplets are heated on a thermal cycler. Bio-Rad argues that 10X has not shown that a plurality of polynucleotide molecules are barcoded in each of at least 1,000 droplets while the droplets are being incubated on the thermal cycler. RIB at 196. According to Bio-Rad, the enzymes in the droplets "are active and start reacting to form barcoded molecules immediately upon droplet formation" and suggests—but does not state—that all of the barcoding is completed in a subset of the droplets prior to incubation, so that barcoded polynucleotides are generated in less than 1,000 droplets during the incubation step. *Id.*

With regard to the WTA 3′ v1, [redacted], Bio-Rad's documentation indicates that barcoded cDNA is generated when the droplets are incubated in accordance to the thermal cycler's "Reverse Transcription (RT) program."



JX-0088C.00015; *see also* JX-0034.00043 (SureCell WTA 3' Library Prep Reference Guide) ("Cell lysis and cell barcoding of mRNA transcripts takes place in each droplet during reverse transcription."), 00025 ("**Reverse Transcribe Samples** This step reverse transcribes samples on a thermal cycler,"), .00026 ("Save the following Reverse Transcription (RT) program on a thermal cycler . . . .").

The thermal cycler's reverse transcription program heats the droplets at 37°C for 30 minutes and then heats the droplets at 50°C for 60 minutes. JX0034.00026. [redacted]. This evidence supports 10X's position that the following processes occur in the thermal cycler: (1) the release of the barcode molecules from the gel bead and (2) the generation of barcoded polynucleotides through reverse transcription.

With regard to the scATAC-seq assay, Dr. Ronald Lebofsky—who holds the position R& D Manager II at Bio-Rad and [redacted]—confirmed that barcoded polynucleotides are generated during the first heating cycle of the thermal cycler. CX-0018C (Lebofsky Depo. Tr.) at 157:8-16, 159:24-160:9.

Bio-Rad dismisses the statements in its own documents as "general statements," but does not point to any persuasive evidence countering those statements. RIB at 109. Bio-Rad primarily relies on the testimony of its expert Dr. Metzger, who testifies that [redacted] RX-0665C (Metzker RWS) at Q/A 97-98. Dr. Metzer also testifies that [redacted] the barcode molecules from the gel bead soon after the droplet is formed. *Id.* Dr. Metzker, however, does not state that these processes are completed before the droplets are incubated on the thermal cycler, only that the processes start before incubation. *Id.* at Q/A 97-108. In support of its argument, Bio-Rad also points to the hearing testimony of 10X's expert, who testified that the reverse transcriptase used in the accused products may exhibit a "small element" of activity at room temperature. Tr. (Butte) at 397:7-12. As discussed above, however, Bio-Rad's own documents clearly show that [redacted] primarily occur during incubation.

Assuming *arguendo* that Dr. Metzker is correct and [redacted] and reverse transcriptase are active as soon as droplets are formed in the single-cell isolator, the enzymes would be active only for a relatively short period of time at a suboptimal temperature. The single-cell isolator operates at room temperature (~20°C) and completes a run within five

minutes. CX-0004C (Butte DWS) at Q/A 526; JX-0075C.00016; JX-0034 ("Single-cell isolation begins automatically after the ddSEQ Single-Cell Isolator door is closed and takes approximately 5 minutes."). In that period of time, for Bio-Rad's argument to hold true, the [redacted] and reverse transcriptase must not only be active, but they must reach a point where all the barcoded molecules have been cleaved from the gel bead and/or the reverse transcriptase has finished forming barcoded cDNA in a sufficient number of droplets so that these processes occur in less than 1,000 droplets during incubation. As shown by their product labels, however, room temperature is a suboptimal temperature for both the [redacted] and the reverse transcriptase used in the accused products. The reaction temperature of the [redacted] (37°C) is significantly higher than room temperature (20°C) and the optimal reaction temperature of the reverse transcriptase is higher still (50-55°C). JX-0050C.00056. Moreover, the period of time that droplets are being generated in the single-cell isolator is short relative to the periods of time that the droplets are being incubated. Specifically, the droplets are incubated at 37°C (the [redacted] reaction temperature) for 30 minutes and then heated at 50°C (the reverse transcriptase's optimal reaction temperature) for another 60 minutes. JX-0034C.00026. There is no evidence suggesting that the single-cell isolator'sgive-minute run-time provides the enzymes sufficient time to finish catalyzing their reactions within the droplets, especially at a suboptimal temperature.

On the basis of this evidence, I find that 10X has shown by the preponderance of the evidence that at least the bulk of the following processes occur while the droplets are being heated on the thermal cycler: (1) the [redacted] release the barcode molecules from the gel bead and (2) the reverse transcription of barcoded cDNA from mRNA and barcode molecules. Accordingly, I find that the accused products satisfy the third step of claim 1 and infringe

claim 1.

2. Claims 4, 11, 14, 19, 26, and 28

Claim 4, 11, 14, 19, 26, and 28 depend either directly or indirectly from claim 1.

a. Claim 4

Claim 4 depends from claim 1 through unasserted claim 3. Claim 3 requires that the polynucleotide molecules be mRNA. '530 patent, col. 49:8-10. Claim 4 further requires that the third step of claim 1 comprise reverse transcribing "said plurality of mRNA molecules in presence of said barcode molecules to generate said plurality of barcoded polynucleotide molecules." '530 patent, col. 49:11-14. As discussed above, the WTA 3′ v1, WTA 3′ v2, and CITE-seq assays generate barcoded cDNA by reverse transcribing mRNA in the presence of barcode molecules. *See, e.g.,* JX-0075C.00018 (describing the WTA 3′ v1 assay); JX-0074C.00009 (describing the WTA 3′ v1 assay); JX-0088C.00015; JX-0034.00027, 00031, 00037; CX-0004C (Butte DWS) at Q/A 198-200, 204-209, 519, 523; CX-0018C (Lebofsky Depo. Tr.) at 154:7-157:22, 160:8-161:18; CX-0019C (Norton Depo. Tr.) at 194:24-195:13. With regard to the scATAC-seq assay, however, gDNA fragments, not mRNA, are barcoded and the assay does not form barcoded polynucleotides through reverse transcription. *See, e.g.,* JX-0091C.00020; CX-1491C.00018.

For the foregoing reasons, I find that WTA 3′ v1, [redacted] infringe claim 4. I further find that the scATAC-seq assay does not infringe claim 4.

b. Claim 11

Claim 11 depends directly from claim 1 and requires that the barcode molecules be released from the gel bead. '530 patent, col. 49:34-36. As discussed above, in the WTA 3′ v1, [redacted] and scATAC-seq assays, [redacted] the barcode molecules

from the gel bead. *See supra.* Accordingly, I find that the accused assays infringe claim 11.

c. Claim 14

Claim 14 requires that there be at least 1,000 barcode molecules "disposed within" each gel bead. '530 patent, col. 49:44-45. The gel beads used in the accused products are formed from polyacrylamide, which is a polymer hydrogel formed by polymerization of acrylamide monomers, acrydite oligos and crosslinker methylene-bis-acrylamide in water. CX-0004C (Butte DWS) at Q/A 116-17, 122-23; JX-0101C.00006. Each gel bead is porous having a three-dimensional network of pores. *Id.* The gel beads are created by combining the acrylamide pre-mix and barcode molecules, which results in barcode molecules bonded throughout each gel bead. CX-1548C.00006. Each resulting bead has at least 1,000,000 barcode molecules disposed within the bead. CX-0004C (Butte DWS) at Q/A 128-31, 133, 546-47; JX-0101C.00006 ("Entire volume is accessible."). Accordingly, I find that the WTA 3′ v1, [redacted], and scATAC-seq assays infringe claim 14.

d. Claim 19

Claim 19 depends from claim 1 through unasserted claim 17. Claim 17 requires that the barcode molecules "comprise combinatorial assemblies of sequences from sequence modules." *Id.*, col. 50:5-7. Claim 19 further requires that the combinatorial assemblies have a first sequence, a second sequence, and a third sequence. *Id.*, col. 50:13-15. The barcode molecules in the accused products comprise [redacted]. JX-0105C.00021; JX-0075C.00018; CX-0004C (Butte DWS) at Q/A 550-51; JX-0101C.0007-.00008. Accordingly, I find that the WTA 3′ v1, [redacted], and scATAC-seq assays infringe claim 19.

e. Claim 26

Claim 26 depends directly from claim 1 and requires that the gel beads have at least 1,000,000 barcode molecules. '530 patent, col. 50:30-31. The gel beads in the accused assays have over 1,000,000 barcode molecules. CX-0004C (Butte DWS) at Q/A 128-29; JX-0050C.00026; JX-0105C.00020-.00022. Accordingly, I find that the WTA 3′ v1, [redacted], and scATAC-seq assays infringe claim 26.

f. Claim 28

Claim 28 depends directly from claim 1 and requires that the barcode molecules be released from the gel bead before the formation of the barcoded polynucleotide molecules. '530 patent, col. 50:35-37. In the accused assays, the [redacted] severs the barcode molecules from the gel bead before the generation of barcoded cDNA strands and barcoded gDNA fragments. CX-0004C (Butte DWS) at Q/A 557-559; *see, e.g.*, JX-0075C.00018. Accordingly, I find that the WTA 3′ v1, [redacted], and scATAC-seq assays infringe claim 28.

3. Indirect Infringement

10X alleges that Bio-Rad indirectly infringed the asserted claims by inducing infringement or through contributory infringement.

a. Underlying Acts of Direct Infringement

Both induced infringement and contributory infringement require an act of direct infringement. *Carborundum Co. v. Molten Metal Equip. Innovations, Inc.*, 72 F.3d 872, 876 n.4 (Fed. Cir. 1995) ("Absent direct infringement of the claims of a patent, there can be neither contributory infringement nor inducement of infringement.") (quoting *Met–Coil Sys. Corp. v. Korners Unlimited, Inc.*, 803 F.2d 684, 687 (Fed. Cir. 1986)) (internal quotation marks omitted). Moreover, the act of direct infringement must be by an entity other than Bio-Rad. *AIDS*

Healthcare Found., Inc. v. Gilead Sci., Inc., 890 F.3d 986, 992-93 (Fed. Cir. 2018) ("Liability for induced infringement requires that some other entity is directly infringing the patent."); *Spansion, Inc. v. Int'l Trade Com'n,* 629 F.3d 1331, 1352 (Fed. Cir. 2010) ("[T]o prevail on contributory infringement in a Section 337 case, the complainant must show: . . . the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement.").

With Bio-Rad's assistance, Berkeley researchers performed SureCell 3' WTA assays, using 12 ddSEQ v1 cartridges. CX-1573.00001. The researchers were able to obtain barcoded cDNA from a total of 18,000 cells resulting in an average of 1500 cells being barcoded per cartridge. *Id.* at .00002-.00003. In addition, [redacted]. CX-1494C.00016. A Bio-Rad document describes another experiment in which a SureCell 3' WTA assay was conducted using a single ddSEQ v1 cartridge. JX-0036.00002-.00003. The experiment resulted in 1,384 cells being barcoded. *Id.* at .00003. 10X, however, has not pointed to any evidence showing that the SureCell 3' WTA assay was used with [redacted]. Accordingly, I find that the SureCell 3' WTA assay has been used with the ddSEQ v1 products to infringe the asserted claims. I further find that 10X has not shown that the SureCell 3' WTA assay has been used with [redacted] to infringe the asserted claims.

Although there is testimony indicating that the [redacted], the testimony does not provide sufficient details that would allow for a determination of whether this was an infringing use. It is possible to use the ddSEQ v1 cartridge in a non-infringing manner by using only a subset of

cartridge's four chambers to conduct an assay. Using only a subset of the chambers will fall outside the scope of the claims because the cartridge will not produce at least 1,000 droplets containing a cell and gel bead. *See, e.g.,* JX-0034.00005 (teaching that, if primed with input cells, each chamber will produce approximately 300 droplets with one cell and one gel bead), .00017 (providing instructions on how to use cartridge without priming all of the chambers with cells). At least one or two of Bio-Rad's customers have so used the ddSEQ v1 cartridge. CX-0016C (Kaihara Depo. Tr.) at 167:18-168:3. There is no evidence regarding the methodology employed with running the [redacted]

With regard to the scATAC-seq assay, in September 19, 2018, Bio-Rad made the scATAC-seq assay available to its "Early Access Customers" for use with the ddSEQ v1 system. CX-1739C; *see also,* CX-0004 (Butte DWS) at Q/A 95. There is, however, no evidence of any of the "Early Access Customers" purchasing, much less using, the scATAC-seq assay for use with the ddSEQ v1 system. As discussed above, although the scATAC-seq [redacted]. Tr. (Kaihara) at 275:2-6; CX-0016C (Kaihara Depo. Tr.) at 148:13-19. Accordingly, I find that 10X has not shown that the scATAC-seq assay has been used with [redacted] the ddSEQ

v1 system [redacted] system to infringe the asserted claims of the '530 patent.[16]

[redacted]

Based on the foregoing, the only acts of direct infringement by entities other than Bio-Rad involve the 3' WTA v1 assay used with the ddSEQ v1 system.

b. Induced Infringement

For induced infringement, 10X must show that Bio-Rad acted to induce infringement of the asserted claims and that it was aware "that the induced acts constitute[d] patent infringement." *Global-Tech,* 563 U.S. at 760-66. As confirmed by the testimony of Bio-Rad witnesses, Bio-Rad actively induced end-users to infringe the asserted claims by using the 3' WTA v1 assay with the ddSEQ v1 system. *See, e.g.,* CX-0019C (Norton Depo. Tr.) at 32:6-11 (testifying that Bio-Rad will "generally train the customer after they purchase the system"), 32:15-33:4 (testifying that Bio-Rad demonstrated the ddSEQ v1 system to each of its customers and that the demonstrations taught the customers "each step of the workflow to use the ddSEQ system"). Bio-Rad provides customers with specific instructions on how to perform the 3' WTA v1 by priming all four chambers of the ddSEQ v1 cartridge with cells. JX-0034.00017 ("To load the same cell sample across all 4 chambers, make a Cell Suspension Mix using the volumes listed for 1 cartridge."). As discussed above, if all four chambers are primed with cells, the

16 [redacted]. Bio-Rad's own acts of direct infringement, however, cannot be relied upon to support a finding of indirect infringement. *AIDS Healthcare,* 890 F.3d at 992-93; *Spansion,* 629 F.3d at 1352.

cartridge will generate approximately 1,200 droplets containing a cell and gel bead.

With regard to Bio-Rad's knowledge that the induced acts constituted patent infringement, Bio-Rad was aware of the 10X's infringement allegations and "the '530 Patent as of at least January 15, 2018, when 10X served its summons and complaint in *10X Genomics, Inc. v. Bio-Rad Labs., Inc.*, Case No. 3:18-cv-00209 (N.D. Cal. Jan. 9, 2018)." Bio-Rad's Response to the Complaint (Mar. 6, 2018), ¶ 86. With regard to whether Bio-Rad knew that the acts that induced were intended to cause a third party to infringe the '530 patent, there is no evidence that Bio-Rad sought and obtained a non-infringement opinion. Bio-Rad's failure to do so is circumstantial evidence that it was aware that the acts brought about by its conduct would infringe the '530 patent. *See, e.g., Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 699 (Fed. Cir. 2008) (failure to procure a non-infringement opinion is "circumstantial evidence of intent to infringe").

Based on the foregoing, I find that Bio-Rad induced infringement of the asserted claims of the '530 patent by inducing others to use the 3' WTA v1 assay with the ddSEQ v1 system.

c. Contributory Infringement

"[T]o prevail on contributory infringement in a Section 337 case, the complainant must show *inter alia*: (1) there is an act of direct infringement in violation of Section 337; (2) the accused device has no substantial non-infringing uses; and (3) the accused infringer imported, sold for importation, or sold after importation within the United States, the accused components that contributed to another's direct infringement." *Spansion,* 629 F.3d at 1353. With regard to the first and third elements, as discussed above, Bio-Rad "imported, sold for importation, or sold after importation within the United States" the 3' WTA v1 assay and the ddSEQ v1 products, which were used by others to infringe the asserted claims of the '530 patent.

With regard to the second element identified by the *Spansion* court, it is 10X's burden to show "that there are no substantial non-infringing uses" of the accused system. *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1362 (Fed. Cir. 2012) (citing 35 U.S.C. § 271(c)). Pointing to three uses for the accused product that it contends are substantial and non-infringing, Bio-Rad argues that 10X has not met its burden.[17] "[N]on-infringing uses are substantial when they are not unusual, far-fetched, illusory, impractical, occasional, aberrant, or experimental." *Id.* (quoting *Vita–Mix Corp. v. Basic Holding, Inc.*, 581 F.3d 1317, 1327 (Fed. Cir. 2009) (internal quotation marks omitted). "In assessing whether a use is substantial, the fact-finder may consider 'the use's frequency, . . . the use's practicality, the invention's intended purpose, and the intended market.'" *Id.* (quoting *i4i Ltd. P'ship v. Microsoft Corp.*, 598 F.3d 831, 851 (Fed. Cir. 2010)) (omission in original).

The first use that Bio-Rad contends is substantial and non-infringing is the DROP-seq assay. This assay and Bio-Rad's contentions are addressed above. I find that the DROP-seq assay is not a substantial, non-infringing use of the accused ddSEQ v1 products with respect to the asserted claims of the '530 patent for the same reasons that it does not constitute such a use with the respect to the '024 patent.

The second alleged substantial non-infringing use is processing samples using less than all four chambers of the ddSEQ v1 cartridge. The asserted claims require the generation of at least 1,000 droplets containing a single cell and a single gel bead. '530 patent, col. 48:65-col.

[17] Staff—but not Bio-Rad—identifies a fourth alleged non-infringing use: [redacted]

49:2 (claim 1). The ddSEQ v1 cartridge has four chambers and each chamber is capable of producing an average of 300 droplets containing a cell and gel bead. JX-0034.0005. Accordingly, if less than four of the chambers are used, the ddSEQ v1 cartridge will generate less than 1,000 droplets containing a cell and a gel bead. RX-0665 (Metzker DWS) at Q/A 148. Bio-Rad provides instructions on how to use the cartridge without using all four chambers to process samples:

> All 4 sample chambers must be loaded with Cell Suspension Mix. If you choose not to bad any cells into a chamber, prepare and load the Cell Suspension Mix, substituting an equivalent volume 1X PBS +0.1% BSA in place of Filtered Cells.

JX-0034.00017.

Although it is possible to use the ddSEQ v1 cartridge without using all four chambers, the evidence indicates that such usage would be an uncommon practice at best. In order to generate 1,200 droplets containing a cell and gel bead, Bio-Rad teaches that each of the four chambers should be loaded with between 10,125-12,375 cells. JX-0034.00012. It is Bio-Rad's expectation that its customers will use all four chambers and it counsels potential customers with less than 40,000 cells that the ddSEQ v1 "system is not right for them." JX-0016C (Kaihara Depo. Tr.) at 167:5-17. [redacted] *Id.* at 167:18-22. [redacted] Accordingly, I find that using less than all four chambers of the ddSEQ v1 cartridge for an assay is not a substantial use of the ddSEQ v1 cartridge.

The third alleged substantial non-infringing use is performing the scATAC-seq assay using purified nuclei, instead of cells. While the scATAC-seq assay can be used to generate droplets containing a cell and gel bead, it can also be used to generate droplets containing purified nuclei and a gel bead. CX-0004C (Butte DWS) at Q/A 92 ("The scATAC-seq assay can

partition either whole cells or purified nuclei for analysis."). Using the assay to encapsulate nuclei instead of cells is a non-infringing use because the claims require the generation of droplets containing a cell and gel bead. '530 patent, col. 48:59-63.

10X does not dispute that using the assay to encapsulate purified nuclei is a non-infringing use, but takes the position that "[t]here is no substantial use of scATAC-seq with isolated nuclei." CIB at 233. In support of its position, 10X argues that "using isolated nuclei rather than single cells is merely an option for scATAC-seq" and that "all use of scATAC-seq is at most [redacted]." *Id.* 10X's argument is unpersuasive. Although Bio-Rad has not fully released the scATAC-seq assay, on September 19, 2018 Bio-Rad started to offer the assay to "Early Access Customers" for use with the ddSEQ v1 system. CX-1739C; CX-0004 (Butte DWS) at Q/A 95. Although using the assay with nuclei instead of cells may only be an "option," it is an option customers will likely select in particular situations. Bio-Rad developed alternate protocols for the scATAC-seq assay—one using cells and one using nuclei—because for certain types of cells "one would work better than the other." CX-0018C (Lebofsky Depo. Tr.) at 157:24-158:16. End users would be expected to use nuclei with the scATAC-seq assay in those instances where using nuclei "would work better" than using intact cells and *vice versa*.

Based on the foregoing, I find that 10X has failed to show that using the scATAC-seq assay with isolated nuclei is not a substantial non-infringing use of the ddSEQ v1 products.[18]

[18] Pointing to the hearing testimony of Dr. Kaihara, Staff argues that using the scATAC assay with nuclei is not a substantial non-infringing use of the ddSEQ v1 products because "[t]he evidence shows that ATAC-seq on the v1 products, [redacted] SIB at 105. Although Staff correctly characterizes Dr. Kaihara's testimony, it ignores that Bio-Rad offered the scATAC assay to its customers for use with the ddSEQ v1 products. CX-1739C; CX-0004 (Butte DWS) at Q/A 95.

D. Domestic Industry

10X asserts that its single-cell domestic industry products practice claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent.

1. Claim 1

a. Preamble

To the extent that the preamble is limiting, there is no dispute that the domestic industry products either are methods of nucleic acid preparation and analysis or are used in such methods. '530 patent, col. 47:58-59. Specifically, 10X's single cell applications are used to prepare cell samples for transcriptome analysis. CX-0004C (Butte DWS) at Q/A 564.

b. Step 1: "providing" a plurality of cells and at least 1,000 gel beads

There is no dispute that the domestic industry products provide at least 1,000 gel beads and a plurality of cells. *See, e.g.,* CX-0477.00001 ("Within each microfluidic channel, ~100,000 GEMs are formed per ~6-min run, encapsulating thousands of cells in GEMs."), .00002 ("The core of the technology is a Gel bead in EMulsion (GEM). GEM generation takes place in an 8-channel microfluidic chip that encapsulates single gel beads at ~80% fill rate . . . ."); CX-0004C (Butte DWS) at Q/A 566. Each cell contains a plurality of polynucleotides in the form of mRNA. CX-0004C (Butte DWS) at Q/A 260, 570; CX-0481.00015; CX-0477.00004. Each gel bead has millions of barcode molecules attached to it. CX-0447.00002 ("Each gel bead is functionalized with barcoded oligonucleotides that consists of: (i) sequencing adapters and primers, (ii) a 14 bp barcode drawn from ~750,000 designed sequences to index GEMs, (iii) a 10 bp randomer to index molecules (unique molecular identifier, UMI) and (iv) an anchored 30 bp oligo-dT to prime polyadenylated RNA transcripts . . . ."); CX-0004C (Butte DWS) at Q/A 263. The barcode molecules comprise identical barcode sequences that are distinct from the barcode

sequences of the barcode molecules attached to any other gel bead. *Id.* The barcode molecules are releasably attached to the gel beads through a [redacted] that can be broken through the application of [redacted]. CX-0477.00002 ("Gel beads dissolve and release their oligonucleotides for reverse transcription of polyadenylated RNAs."); CX-0004C (Butte DWS) at Q/A 266.

Based on the foregoing, I find that the single-cell domestic industry products satisfy the first step of claim 1.

c. Step 2: "generating a plurality of droplets"

As required by the second step of claim 1, the domestic industry products generate a plurality of droplets, wherein at least 1,000 of the droplets comprise a "single gel bead" and a "single cell." *See, e.g.,* CX-0477.00001 ("Within each microfluidic channel, ~100,000 GEMs are formed per ~6-min run, encapsulating thousands of cells in GEMs."), .00002 ("The core of the technology is a Gel bead in EMulsion (GEM). GEM generation takes place in an 8-channel microfluidic chip that encapsulates single gel beads at ~80% fill rate . . . ."); CX-0004C (Butte DWS) at Q/A 566.

Bio-Rad argues that the domestic industry products do not satisfy the second step of claim 1 because the products do not "generate a collection of 'at least 1,000 droplets' each having a 'single gel bead' and 'single cell.'" RIB at 198. This is the same argument that Bio-Rad made with respect to the accused products: Because the cells start to lyse almost immediately after droplet formation, at any instant of time there are less than 1,000 droplets with a cell and gel bead. *Id.* As discussed above in the context of infringement, claim 1 only requires the generation of at least 1,000 droplets containing a cell and gel bead before the third step, not that a "collection" of such droplets exist before the start of the third step.

Based on the foregoing, I find that the accused products satisfy the second step of claim 1.

d. Step 3: generating a plurality of "barcoded polynucleotide molecules"

The domestic industry products perform the third step of claim 1 when the droplets are heated on the thermal cycler. After the droplets are generated, they are transferred to a thermal cycler and heated at 53°C for 45 minutes and then heated at 85°C for 5 minutes. CX-0481.00013. While the droplets are being heated on the thermal cycler, the barcode molecules are released from the gel bead through the application of [redacted], which dissolves [redacted] holding the barcode molecules to the gel beads. CX-0481.00011; CX-0004C (Butte DWS) at Q/A 481. In each of at least 1,000 droplets, two or more barcoded polynucleotide molecules are generated using the mRNA from the cell and the barcode molecules from the bead. CX-0481.00011 ("Incubation of the GEMs then produces barcoded, full-length cDNA from poly-adenylated mRNA."); CX-0004C (Butte DWS) at Q/A 576-78.

Bio-Rad argues that 10X has "not provided any evidence showing that a plurality of barcoded polynucleotides are formed in each droplet on 10X's thermocycler." RIB at 199. Bio-Rad's argument is the same as the one it made with respect to accused products: Because cell lysis begins as soon as the droplets are formed, the generation of barcoded polynucleotides begins before the droplets are incubated. This argument fails for the same reasons that it failed in the context of infringement.

According to 10X documents, barcoded polynucleotides are generated when the droplets are being heated on the thermal cycler. CX-0481.00011 ("Incubation of the GEMs then produces barcoded, full-length cDNA from poly-adenylated mRNA."); *see also* CX-0004C (Butte DWS) at Q/A 576-78. To counter this evidence, Bio-Rad points to the testimony of its

expert Dr. Metzker, who testifies that the generation of barcoded mRNA starts in each droplet almost as soon as the droplet is formed. RX-0665C (Metzker RWS) at Q/A 117. Dr. Metzker, however, does not testify that barcoding is completed in any or all of the droplets before they are incubated. Even if barcoded polynucleotides start to form immediately after the droplet is formed, there is no evidence that the generation of barcoded polynucleotides would be completed in any of the droplets before they are transferred to the thermal cycler.

The droplets in the domestic industry product are heated at temperatures and durations similar to those used in the accused products to stimulate the release of the barcode molecules from the gel beads and the generation of the barcoded molecules. In the domestic industry products, droplets are generated at room temperature (~20°C) in 6.5 minutes. CX-0481.00013 ("GEM Generation – 6.5 minutes"), .00018 ("Equilibrate to room temperature before use . . . ."). In the ddSEQ v1 products, the droplets are generated at room temperature in five minutes. JX-0034.00005. In the domestic industry products, the droplets are heated on the thermal cycler at 53°C for 45 minutes and then at 85°C for 5 minutes. CX-0481.00026. In the ddSEQ v1 products, the droplets are heated ion the thermal cycler at 37°C for 30 minutes and then at 50°C for 60 minutes. JX0034.00026. Similar to 10X's documentation for the domestic industry products, Bio-Rad's documentation describes barcoded cDNA being generated through reverse transcription while the droplets are being heated on the thermal cycler. *See, e.g.,* JX-0088C.00015; JX-0034.00043; JX-0034C.00025, .00026.

Based on the foregoing, I find that the domestic industry products practice claim 1.

2. Claims 4, 11, 14, 19, 26, and 28

Claim 4, 11, 14, 19, 26, and 28 depend either directly or indirectly from claim 1. There is no dispute that the single-cell domestic industry products satisfy the additional limitations of these dependent claims.

a. Claim 4

The cells provided by the domestic industry products have mRNA. CX-0004C (Butte DWS) at Q/A 260, 570; CX-0481.00015; CX-0477.00004. As further required by claim 4, barcoded polynucleotides are generated by reverse transcribing the mRNA in the presence of the barcode molecules. CX-0481.00011; CX-0004C (Butte DWS) at Q/A 576-78. Accordingly, I find that the domestic industry products practice claim 4.

b. Claim 11

As required by claim 11, in each droplet, the barcode molecules are released from the gel bead. CX-0481.00011; CX-0004C (Butte DWS) at Q/A 481. Accordingly, I find that the domestic industry products practice claim 11.

c. Claim 14

In accordance with claim 14, there at least 1,000 barcode molecules "disposed within" each gel bead. Specifically, the beads are porous polyacrylamide gel beads. CX-0004C (Butte DWS) at Q/A 587. Each gel bead has over 1,000 barcode molecules disposed throughout its entire volume. *Id.*; CX-0479C.00010; CX-0542.00001 ("Each Gel Bead contains millions of oligo primers . . . ."). Accordingly, I find that the domestic industry products practice claim 14.

d. Claim 19

The barcode molecules of the domestic industry products include combinatorial assemblies of sequences formed from sequence modules. CX-0004C (Butte DWS) at Q/A 589; CX-0425C.00016; JX-0037C.00036-.00042. As required by claim 19, each of the combinatorial

assemblies has a first sequence [redacted] a second sequence [redacted] and a third sequence [redacted] *Id.* Accordingly, I find that the domestic industry products practice claim 19.

e. Claim 26

As required by claim 26, the gel beads have at least 1,000,000 barcode molecules. CX-0481.00061 ("Gel Beads are the foundation of 10x Genomics®' technology, and are beads functionalized with millions of copies of a 10x Barcoded primer."); CX-0004C (Butte DWS) at Q/A 263, 592. Accordingly, I find that the domestic industry products practice claim 26.

f. Claim 28

As required by claim 28, the barcode molecules of the domestic industry products become detached from the gel beads before the barcoded polynucleotide molecules are generated. CX-0004C (Butte DWS) at Q/A 275, 594; CX-0542.00001 ("Once partitioned, the Gel Bead dissolves and its oligo primers are released into the aqueous environment of the GEM. The cell captured in the GEM is also lysed. The contents of the GEM (oligos, lysed cell components and Master Mix) are incubated in an RT reaction to generate full-length, barcoded cDNA from the poly A-tailed mRNA transcripts."). Accordingly, I find that the domestic industry products practice claim 28.

E. Invalidity

Bio-Rad contends that the asserted claims of the '530 patent are invalid as anticipated or rendered obvious by the '059 patent and/or the Church patent, alone or in combination with additional prior art. RIB at 199-215. All of the recited claims require barcode molecules that are "releasably attached" to a gel bead, and the parties' arguments regarding invalidity for the '530 patent are substantially identical to those addressed above in the context of the "releasable

attachment" limitation of the '024 patent. *See* SRB at 107. For the same reasons discussed above, Bio-Rad has failed to show that any asserted claim of the '530 patent is anticipated and/or rendered obvious by the '059 patent and/or the Church patent because these references do not disclose the "releasably attached" limitation.[19] In addition, the success of 10X's domestic industry products further weigh against a finding of obviousness.

VIII. ADDITIONAL DEFENSES

A. Inventorship

1. Pertinent Factual Background

In 2008, Dr. Benjamin Hindson and others founded QuantaLife to develop a droplet digital PCR system. Tr. (Hindson) 137:20-22; CX-0001C (Hindson WS) at Q/A 22-25. Dr. Hindson was Chief Scientific Officer. Tr. (Hindson) at 137:23-25; CX-0001C (Hindson WS) at Q/A 25. Dr. Nicholas Heredia joined QuantaLife in May 2009 as a Senior Molecular Biologist. RX-504C (Heredia WS) at Q/A 8. Dr. Serge Saxonov joined QuantaLife in 2010. Tr. (Saxonov) at 771:13-15. Dr. Saxonov was Vice President of Application Development for QuantaLife's droplet digital PCR system. *Id.* at 771:16-21.

In 2011, Bio-Rad purchased QuantaLife. CX-0001C (Hindson WS) at Q/A 31. Drs. Hindson, Saxonov, and Heredia became Bio-Rad employees. Tr. (Saxonov) at 771:9-12); CX-

[19] 10X further contends that the '059 patent and the Church patent fail to disclose the step of "generating" droplets, CIB at 241-42, arguing for a distinction between the term "merging" and the term "generating," which is supported by Dr. Dear's citation to deposition testimony from Dr. Agresti. *See* CX-1827C (Dear RWS) at Q/A 604-09, 719-22. 10X cites no evidence from the intrinsic record that the claim language of the '530 patent makes a distinction between "merging" and "generating" droplets, however. The '059 patent includes several paragraphs under the heading "Droplet Generation," which includes discussions of emulsions and the coalescence of smaller droplets with larger droplets. JX-0031, col. 13:5-37. In addition, Dr. Metzker has identified specific disclosures in the '059 patent and in Church that meet this limitation. RX-0664C at Q/A 349, 382.

0001C (Hindson WS) at Q/A 33; RX-0504C (Heredia WS) at Q/A 6. Dr. Hindson's role at Bio-Rad [redacted] CX-0001C (Hindson WS) at Q/A34. In April 2012, Drs. Hindson and Saxonov resigned their positions at Bio-Rad on the same day. Tr. (Hindson) at 163:6-14. Dr. Heredia remained at Bio-Rad, where he still works. RX-0504C (Heredia WS) at Q/A 3, 6. Three months later, after taking a break from work, Drs. Hindson and Saxonov founded 10X. Tr. (Hindson) at 163:22-24; CX-0001C (Hindson WS) at Q/A 38-40. The first provisional patent applications for the asserted patents were filed in August 2012. *See, e.g.,* JX-0003 ('024 patent, cover), JX-0005 ('468 patent, cover).

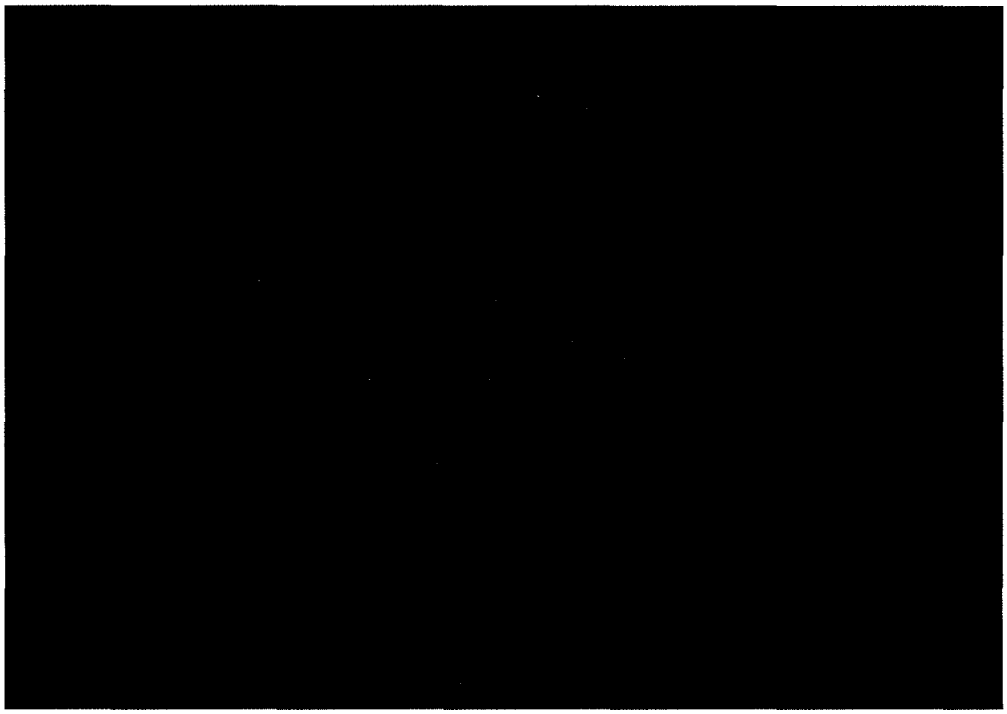
Bio-Rad and Dr. Heredia claim that Dr. Heredia was improperly omitted as a co-inventor on the asserted patents, and that the patents are therefore invalid. *Pannu v. Iolab Corp.,* 155 F.3d 1344, 1349 (Fed. Cir. 1998) ("[I]f nonjoinder of an actual inventor is proved by clear and convincing evidence . . . a patent is rendered invalid."). Bio-Rad contends that Drs. Hindson and Saxonov, while they were at QuantaLife, "built off of" the "fundamental solution that Hindson and Heredia had come up with [redacted]." Tr. (Opening Statement) at 95:8-10. 10X counters that the technology described in the asserted patents is distinct from anything that was described by Dr. Heredia or worked on by him or any others at QuantaLife.

2. Alleged inventorship

Dr. Heredia claims to be an inventor on all four of the patents in suit. RX-0504C (Heredia WS) at Q/A 20 [redacted]

[redacted]

In terms of his claim of co-inventorship, however, he points only to his work with Dr. Hindson. *Id.* at Q/A 11. Dr. Heredia alludes to [redacted]

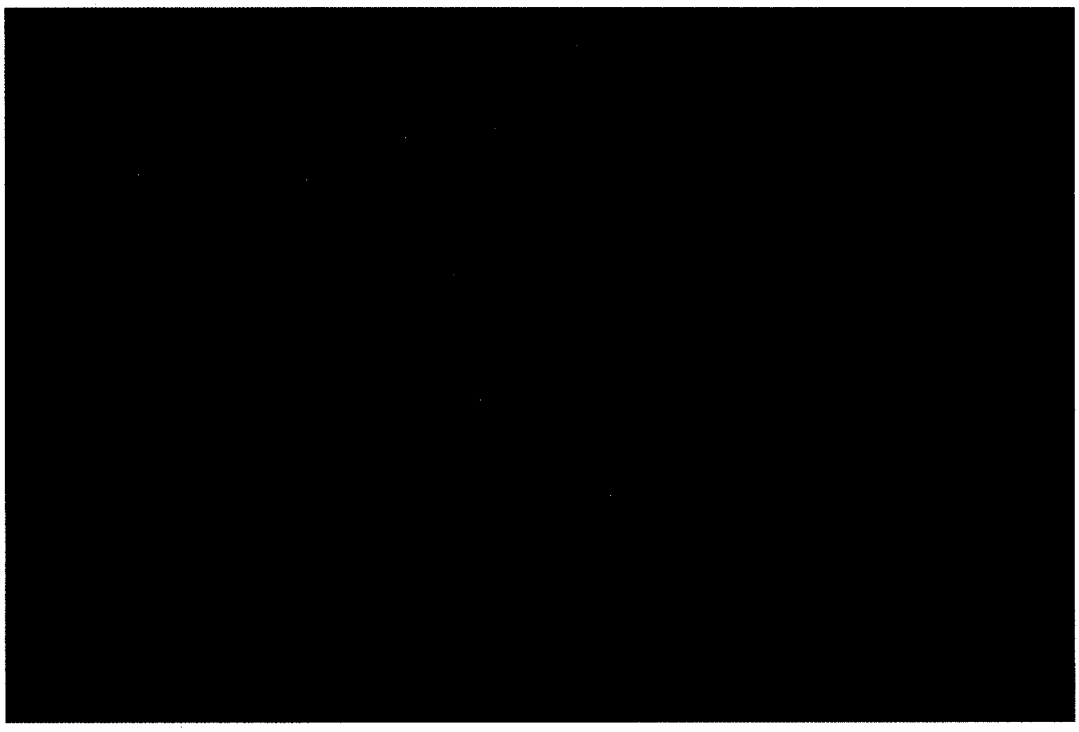


JX-0057C.00018 .

[redacted]

[redacted]

20 [redacted]



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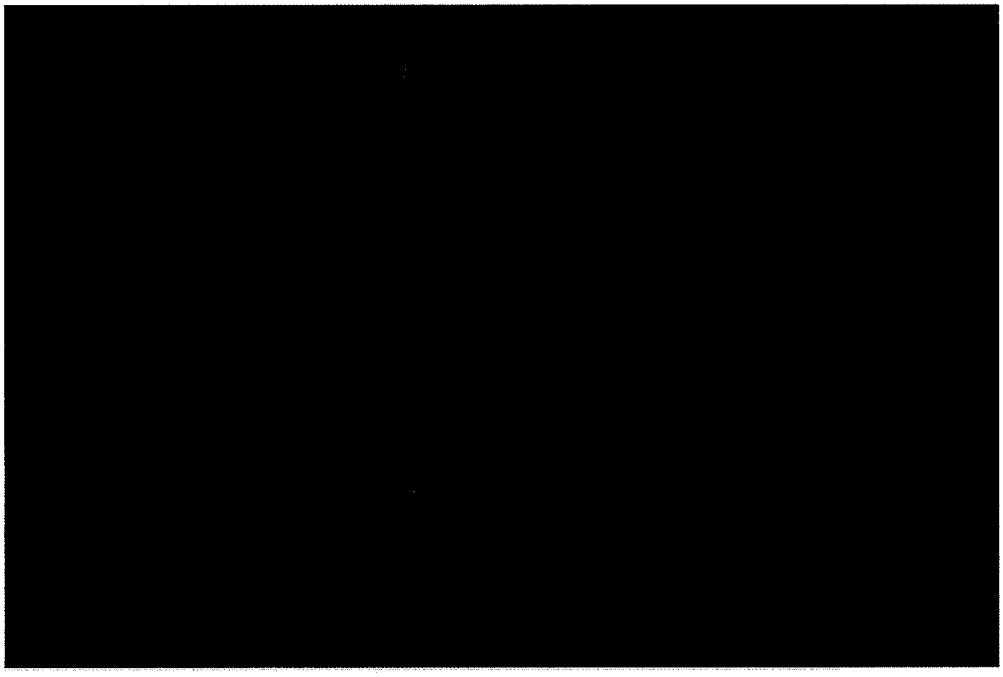

JX-120C.00008; and

JX-0120C.00009

[redacted]

3. Discussion

a. Legal Standards

The statutory requirements regarding joint inventorship state, in pertinent part:

> When an invention is made by two or more persons jointly, they shall apply for patent jointly and each make the required oath, except as otherwise provided in this title. Inventors may apply for a patent jointly even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent.

35 U.S.C. § 116 (a).

A joint invention is "the product of collaboration," and requires that "each of the inventors work on the same subject matter and make some contribution to the inventive thought and to the final result.'" *Vanderbilt Univ. v. ICOS Corp.*, 601 F.3d 1297, 1302 (Fed. Cir. 2010) (quoting *Monsanto Co. v. Kamp,* 269 F. Supp. 818, 824 (D.D.C. 1967)) (internal quotation marks omitted). "[T]he critical question for joint conception is who conceived, as that term is used in the patent law, the subject matter of the claims at issue." *Ethicon, Inc. v. U.S. Surgical Corp.,* 135 F.3d 1456, 1460 (Fed. Cir. 1998). "Conception is the touchstone of inventorship" and "[i]t is 'the formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice.'" *Burroughs Wellcome Co. v.*

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[21] In several instances, Dr. Heredia's testimony at hearing had evolved significantly from the testimony he gave at his deposition. For example, with respect to the issue discussed above, whether [redacted] CX-0014C at 211:14-21. This was the pattern of Dr. Heredia's testimony throughout the hearing. *See infra.* His credibility suffers as a result.

Barr Labs. Inc., 40 F.3d 1223, 1227-28 (Fed. Cir. 1994) (quoting *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376 (Fed. Cir. 1986)).

"It is not necessary that the entire invention concept should occur to each of the joint inventors . . . ." *Vanderbilt,* 601 F.3d at 1302 (quoting *Monsanto,* 269 F. Supp. at 824). "'[E]ach contributor need not have their own contemporaneous picture of the final claimed invention in order to qualify as joint inventors.'" *Id.* at 1303 (citing *Fina Oil & Chem. Co. v. Ewen,* 123 F.3d 1466, 1473 (Fed. Cir. 1997)). However, "'[o]ne who simply provides the inventor with well-known principles or explains the state of the art without ever having a firm and definite idea of the claimed combination as a whole does not qualify as a joint inventor.'" *Nartron Corp. v. Schukra U.S.A. Inc.,* 558 F.3d 1352, 1356 (Fed. Cir. 2009) (quoting *Ethicon,* 135 F.3d at 1460). "'[T]he qualitative contribution of each collaborator is the key—each inventor must contribute to the joint arrival at a definite and permanent idea of the invention as it will be used in practice.'" *Vanderbilt,* 601 F.3d at 1303 (quoting *Burroughs,* 40 F.3d at 1229).

In general, "'[t]he inventors as named in an issued patent are presumed to be correct.'" *Nartron,* 558 F.3d at 1356 (quoting *Hess v. Advanced Cardiovascular Sys., Inc.,* 106 F.3d 976, 980 (Fed. Cir. 1997). Proof of joint inventorship requires clear and convincing evidence. *Vanderbilt,* 601 F.3d at 1305.

b. Insufficient evidence of collaboration

"A primary focus of section 116 has [] always been on collaboration and joint behavior." *Vanderbilt,* 601 F.3d at 1303. "The interplay between conception and collaboration requires that each co-inventor engage with the other co-inventors to contribute to a joint conception." *Id.*

Dr. Hindson testifies that he did not collaborate with Dr. Heredia on the [redacted]. He explains that Dr. Heredia was a new employee at QuantaLife in May 2009 and that his role

was limited to "assisting in validation and testing." CX-1828C (Hindson RWS) at Q/A 6; *see* Tr. at 181:19-23 [redacted] He recalls discussing Dr. Heredia's [redacted] for five or 10 minutes, but he states that [redacted] CX-1828C (Hindson RWS) at Q/A 11; Tr. at 181:24-182:16. Dr. Hindson says he commented to Dr. Heredia that he had done well to put his idea down on paper only because he did not want to discourage him. CX-1828C at Q/A 11. Dr. Hindson testifies that he did not know of any follow-up work on Dr. Heredia's [redacted], that no research plan was developed based on the idea, that no experiments were conducted, and that the idea did not inform any work Dr. Hindson performed at QuantaLife or Bio-Rad. *Id.* at Q/A 21-22.

Dr. Heredia does not specifically dispute Dr. Hindson's recollection that there was no significant collaboration between him and Dr. Hindson based on the [redacted]. *See, e.g.,* CX-0015C (Heredia Dep.) at 335:21-336:2 ([redacted]). He maintains, however, that [redacted] show "an inventive contribution," Tr. (Heredia) at 602:7-13, and collaboration, and that [redacted], JX-0120C, shows follow-up. RX-0504C at Q/A 16 [redacted] He recalls no subsequent development or any additional conversations with Dr. Hindson or others at QuantaLife concerning [redacted], however. *E.g.,* Tr. (Heredia) at 584:15-19 (". . . I can't recall . . . . But I have a vague sense that Dr. Hindson talked about, you know, [redacted]

[redacted] 594:12-18 ([redacted]. Dr. Heredia also testifies that he recalls no conversations with Dr. Saxonov about the [redacted]. *Id.* at 594:7-11.

In sum, apart from Dr. Heredia's somewhat vague and uncertain testimony, his [redacted], which do not clearly demonstrate a collaborative effort to develop Dr. Heredia's idea, Bio-Rad points to no evidence to show that Dr. Heredia collaborated with other scientists at QuantaLife or Bio-Rad on any project concerning the [redacted]. Dr. Hindson denies that such a collaboration occurred, and Dr. Heredia cannot recall any specific collaborative activities concerning development of his [redacted], beyond the alleged brainstorming discussion with Dr. Hindson, the details of which are disputed by Dr. Hindson. On this record, I find insufficient evidence to establish that Dr. Heredia collaborated with others to develop the technology in the asserted patents.

c. Insufficient evidence of conception

The "core idea" of the "gel bead-in-emulsion" or "GEM" architecture claimed in the asserted patents

> is about partitioning nucleic acids, DNA or RNA, in droplets together with gel beads that are used to deliver the barcodes into the droplet. The gel beads contain oligonucleotide barcodes. In each gel bead there are a large number of oligonucleotide molecules that include barcode sequences . . . Those oligonucleatide barcodes are released from the gel beads using a stimulus. They attach to the nucleic acids in the droplet. An amplification reaction is used to create barcoded nucleic acids, and those can be used for downstream processing.

CX-0003C (Schnall-Levin WS) at Q/A 27 (discussing the '024 patent).

Dr. Heredia's [redacted] *Id.* at .00004. [redacted] *Id.* at .00005.

Bio-Rad's argument is that Dr. Heredia's [redacted] address the same problem of "sample preparation for analysis of biological materials such as nucleic acids," that ultimately is addressed in the asserted patents. Tr. at 86: 22-23. Bio-Rad maintains that Dr. Heredia's solution to the problem can be reduced to four parts that track the invention described in the asserted patents: First, Bio Rad identifies "partitioning the sample into droplets." *Id.* at 86:25-87:1. Second is "creating a reagent delivery system." *Id.* at 87:1-2. Third is "combining the sample and reagent delivery system with droplets using microfluidics." *Id.* at 87:2-3. Fourth is tracking "the sample reagent reaction

complex with a barcode mechanism." *Id.* at 87:4-5. Bio-Rad's counsel use this construct to maintain that all of the elements ultimately found in the patents-in-issue were conceptualized by Dr. Heredia in 2009.

The evidence fails to persuade clearly and convincingly that Dr. Heredia in 2009 had in mind anything like the architecture of the GEM, however, as described by Dr. Schnall-Levin, above. This is true for several reasons.

Fundamentally, nothing in Dr. Heredia's materials indicates how his idea would work. Dr. Heredia's [redacted] does not explain even on a basic level how his [redacted] functions. CX-1827C (Dear RWS) at Q/A 1145 ("The description in [redacted] is a bare sketch of at best a partially formed idea that does not show any way to deal with even the basic issues that would confront someone trying to make such a thing work."); *see* CX-1828C (Hindson RWS) at Q/A 16-19. One who "merely suggests an idea of a result to be accomplished, rather than means of accomplishing it, is not a joint inventor." *Nartron,* 558 F.3d at 1359 (quoting *Garrett Corp. v. United States,* 422 F.2d 874, 881 (1970)).

More specifically, Bio-Rad's efforts, through Dr. Metzker, to isolate various aspects of the patented technology to claim that they were conceived by Dr. Heredia in 2009 fail due to lack of evidentiary support. For example, Dr. Metzker indicates that Dr. Heredia's inventive contribution was "a reagent delivery system." Tr. (Metzker) at 717:5-22; 716:19-21 ("thinking about it as a reagent delivery system within an aqueous droplet"). Dr. Heredia, however, appears to have had no idea of the reagent delivery system described in the asserted patents. Tr. (Heredia) at 589:6-11 ([redacted]);

Tr. (Heredia) at 590:9-22 ([redacted]).

Bio-Rad seeks to draw an equivalence between the [redacted] described by Dr. Heredia and the porous gel bead described in the asserted patents and used in 10X's GEM technology. The effort fails. First, Dr. Metzker concedes that Dr. Heredia's idea entailed the use of a [redacted] that was "already in the art." Tr. at 718:7-8. He testifies that Dr. Heredia's [redacted] are [redacted] Tr. at 712:19-21. Luminex beads were "extremely well understood at the time of Dr. Heredia's lab notebook entry," Dr. Metzker says. Tr. 716:3-5. Dr. Metzker concedes that "the idea of a capsule in a droplet that can release its contents into the droplet also "might very well be" something known in the state of the art at the time. Tr. at 722:22-723:12. Putting an analyte within an aqueous droplet was "certainly known state of the art by 2009," Dr. Metzker testifies. *Id.* at 724:12-22. The case law is clear that merely describing prior art is not an inventive idea. *Nartron,* 558 F.3d at 1356.

In addition, Dr. Heredia's idea of a [redacted] does not encompass the functionality of a gel bead. Dr. Metzker opines that Dr. Heredia's [redacted] RX-0664C (Metzker DWS at Q/A 480). These assertions are unconvincing. As explained by 10X's expert, Dr. Dear, Dr. Heredia's [redacted] which is not the same as a bead, a distinction that would have been understood in the art at the time. CX-1827C (Dear RWS) at Q/A 1148. [redacted] *Id.* at Q/A 1149. *See* Tr. (Hindson) at

172:6-7 (describing Luminex as "a capture bead, a solid bead that's used to capture analytes from solution for subsequent detection"); *see also* CX-1828C (Hindson RWS) at Q/A 10.

Dr. Heredia not only did not describe the functionality of the patented gel beads in his 2009 materials, he did not conceive of that functionality. As noted by Dr. Dear, Dr. Heredia at deposition and at trial "struggled to articulate an understanding of what the relationship between [redacted] and any of the claimed inventions was." *Id.* at Q/A 1172. In fact, Dr. Heredia apparently struggled at his deposition to understand what a porous gel bead (as disclosed in the asserted patents), actually is. *See, e.g.,* CX-0014C (Heredia Dep.) at 42:2-11 ("Q. [] Are porous gel beads and [redacted] the same thing? A. Well, gels are just an extremely viscous liquid, in my understanding. So they're very related."). Dr. Metzker, Bio-Rad's expert, implicitly contradicts Dr. Heredia's testimony, agreeing that "a gel is not a viscous liquid," *id.* at 713:5, and rejects the notion that Dr. Heredia's [redacted] is a gel. Tr. (Metzker) at 712:23-25, 713:5-8. Although Dr. Metzker testifies that Dr. Heredia's [redacted] Tr. at 712:14-22, he admits that nothing in Dr. Heredia's depiction of his [redacted] indicates that it was either porous or a gel. Tr. 714:10-2. Dr. Heredia himself cannot say whether in 2009 he knew what a porous gel bead was. Tr. 581:18-22.

Dr. Metzker opines that "Dr. Heredia specifically conceived and contributed [redacted] RX-0664C (Metzker DWS) at Q/A 480. Dr. Metzker opines that Dr. Heredia's idea as set forth in [redacted] *Id.* Dr. Metzker says Dr. Heredia's idea [redacted]

[redacted] *Id.* at 481. Dr. Heredia's materials, however, depict no mechanism for achieving this result. As noted above, Dr. Heredia himself testifies that he cannot recall having "the idea of applying a stimulus to a bead to release oligonucleotide molecules from it." Tr. (Heredia) at 590:9-22. Dr. Dear confirms that Dr. Heredia's [redacted] does not depict oligonucleotide barcodes or barcodes releasably attached to anything; it does not show any attachment that is releasable upon the application of a stimulus. CX-1827C (Dear RWS) at Q/A 1142. Dr. Heredia himself concedes that the oligonucleotides he envisioned were "not going to be released into the interior." CX-0014C (Heredia Dep.) at 172:21-173:4; *see also* Tr. at 589:6-11. Again, Dr. Metzker's efforts to extrapolate elements of the GEM architecture from Dr. Heredia's depictions of his liquid [redacted] are unpersuasive.

Even if one were to accept the proposition that Dr. Heredia's [redacted] could be considered a porous gel bead, Dr. Heredia's notebook does not disclose barcoding nucleic acids or any microfluidic system; it does not disclose a barcode that can function as a unique label; and it does not disclose what the numbers of droplets would be. CX-1827C (Dear RWS) at Q/A 1142. "In short," Dr. Dear testifies, "this [redacted]ntry does not come close to showing conception of any claim in any 10X Asserted Patent." *Id.* at Q/A 1146-1147. *See* CX-1828C (Hindson RWS) at Q/A 16-19.

Specifically with respect to the draft provisional application, Dr. Dear notes that Dr. Heredia discusses [redacted] as disclosed in the 10X inventions. CX-1827C (Dear RWS) at Q/A 1156. Dr. Dear notes further that [redacted]

[redacted]. *Id.* at Q/A 1158. Dr. Heredia's [redacted] does not depict how [redacted] in other words, Dr. Heredia's idea "would not work without something not actually depicted." *Id.* at Q/A 1165. In sum, Dr. Dear demonstrates persuasively that Dr. Heredia's 2009 idea lacks the elements which, combined, interact to effectuate the patented invention.

Bio-Rad argues that an inventor need only contribute one individual feature to an invention. But the evidence, as discussed, does not support the contention that Dr. Heredia contributed even one element. Dr. Heredia himself does not point to anything his idea for a liquid bead contributed to the invention patented by 10X. *See, e.g.,* Ex. CX-0014C (Heredia Dep.) at 114:10-12 [redacted]

Bio-Rad lays great stress on case law that says each contributor need not have "their own contemporaneous picture" of the final claimed invention to qualify as a joint inventor. RIB at 13 (quoting *Vanderbilt,* 601 F.3d at 1302). Bio-Rad relies on case law holding that a contribution to individual features of a patented invention, "even at different times," may qualify for joint inventorship. *Id.* at 14. The evidence here does not establish clearly and convincingly that Dr. Heredia's work contributed to the patented technology at any time. Dr. Heredia did not conceive of anything at all that worked at the time he thought of it or that contributed to technology that was developed later. These facts distinguish this case from the cases Bio-Rad

cites in support of its arguments. "[O]ne who is 'too far removed from the real-world realization of an invention' is not a co-inventor." *Nartron,* 558 F.3d at 1359 (quoting *Eli Lilly & Co. v. Aradigm Corp.,* 376 F.3d 1352, 1359 (Fed. Cir. 2004)).

Bio-Rad argues that Dr. Heredia's disclosures share the "context" of the patented inventions. This is true only at a level of generality so high that it would render the concept of inventorship meaningless. As 10X asserts, "Dr. Heredia's [redacted] was a goal with no operative means to achieve it." CIB at 160. While Dr. Heredia's idea may have related generally to sample preparation and the "same sample preparation context," RRB at 61-62, he made no contribution toward meeting the goals of the invention in the way described in the patents. I cannot find clear and convincing evidence that Dr. Heredia's conception contributed at all, much less in a qualitative way, to the invention claimed in the asserted patents.

d. Insufficient evidence of significance

"'A joint inventor must contribute in some significant manner to the conception or reduction to practice of the invention [and] make a contribution to the claimed invention that is not insignificant in quality, when that contribution is measured against the dimension of the full invention.'" *Nartron,* 558 F.3d at 1356-57 (quoting *Pannu,* 155 F.3d at 1351).

Even Dr. Metzker admits that Dr. Heredia's idea "in isolation" is not a "significant contribution." *Id.* at Tr. 726:3-9. Dr. Heredia's idea, according to Dr. Metzker, is significant only if it [redacted] *Id.* at 728:14-22. In this respect, 10X and Bio-Rad seem to agree. *See* Tr. (Schnall-Levin) at 230:15-24 ("[T]his invention is not like a bag

of words, like barcodes, gel beads. It's actually how they're all put together, which is really important for driving the performance of the system."). Because there is no evidence that Dr. Heredia had an idea of how the elements that he allegedly conceived of would be put together to achieve the desired result, he made no significant contribution.

Absent evidence that Dr. Heredia's liquid bead contributed anything of significance to the patented technology (or any technology), Bio-Rad cannot demonstrate clearly and convincingly that Dr. Heredia is a joint inventor.

B. Ownership

As an affirmative defense to 10X's allegations of infringement, Bio-Rad claims ownership of each of the asserted patents in this investigation. 10X disputes Bio-Rad's claims of ownership, and Staff agrees with 10X. Although, in briefing the matter, the parties have lost their way in arguments concerning the law of inventorship, this is a contract dispute that boils down to a simple question: is there evidence that the idea embodied in the asserted patents was conceived by Drs. Hindson and Saxonov during the period in which they were employed by Quanta/Life and Bio-Rad? If the answer is yes, then as a matter of contract law, the asserted patents belong to Bio-Rad. If the answer is no, the asserted patents belong to 10X.

1. Legal Standards

"It is elementary that inventorship and ownership are separate issues." *Beech Aircraft Corp. v. EDO Corp.,* 990 F.3d 1237, 1248 (Fed. Cir. 1993). *Accord, Israel Bio-Eng'g Project v. Amgen, Inc.,* 475 F.3d 1256, 1263 (Fed. Cir. 2007) ("[I]ssues of patent ownership are distinct from questions of inventorship."). Ownership "is a question of who owns legal title to the subject matter in a patent," while "inventorship is a question of who actually invented the subject matter claimed in a patent." *Beech,* 990 F.2d at 1248. Bio-Rad confuses the issue by attempting

to use the legal analysis that applies to joint inventorship to resolve its ownership dispute with 10X. The distinction is illustrated in this case: the question whether Dr. Heredia should be treated as a co-inventor is one of inventorship; but there is no question that Drs. Hindson and Saxonov are inventors on the asserted patents. The question with respect to them is one of ownership, *i.e.,* do their contractual agreements with Bio-Rad and QuantaLife require that the asserted patents be assigned to Bio-Rad? *See FilmTec Corp. v. Hydranautics*, 982 F.2d 1546, 1550 (Fed. Cir. 1992) (stating that in a case that "turns on" "ownership", the court only needs "to decide whether the invention . . . was made or conceived" during the period of employment).[22]

Bio-Rad's ownership claims arise solely as the result of the contract terms governing the employment of Drs. Hindson and Saxonov, who are among the named inventors of the asserted patents. In general, contract terms must be construed under state law. *Board of Trustees of Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc.,* 583 F.3d 832, 841 (citing *Jim Arnold Corp. v. Hydrotech Sys.,* 109 F.3d 1567, 1572 (Fed. Cir. 1997)). The exception to this

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[22] Bio-Rad asserts that I adopted joint inventorship as a "guide" to ownership. RIB at 20 (citing Order No. 34). To the contrary, on reconsideration, Order. No. 41 clarified that "Order No. 34 did not conclusively establish the legal framework for deciding Bio-Rad's ownership claim." Order No. 41 at 2. In affirming denial of 10X's motion for summary determination on the ownership issue, Order No. 41 recognized that the "legal standard for addressing the ownership issue" continued to be disputed, and that "the parties' dispute would be better resolved after the conclusion of the evidentiary hearing, with the benefit of a complete evidentiary record regarding the contractual relationships between the parties and the contributions of the inventors." *Id.* As stated in Order No. 41, doubt concerning the facts and the law precluded a ruling on summary determination, including on the applicable legal standards. *See also Gen'l Elec. Co. v. Wilkins,* No. CV F 10-0674 LJO JLT, 2012 WL 3778865(E.D. Cal. 2012) at *19 note 3 ("[T]his Court is not bound by its interlocutory orders, which are not final, and may reconsider or modify them at any time.") (quoting *Marconi Wireless Telegraph Co. v. United States,* 320 U.S. 1, 63 (1943); *City of Los Angeles, Harbor Div. v. Santa Monica Baykeeper,* 254 F.3d 882(9th Cir. 2001)).

rule covers matters that are "intimately bound up with the question of standing in patent cases," such as "whether contractual language effects a present assignment of patent rights, or an agreement to assign rights in the future." *Id.* No such question is presented here.[23] This is important because the standard for determining joint ownership is a matter of patent law determined by federal courts, while the federal courts defer to state law on questions of contract. "[Q]uestions of contract law are matters of state law, questions related to patent law are interpreted according to federal law." *General Elec. Co. v. Wilkins,* No. CV F 10-0674 LJO JLT, 2012 WL 3778865 (E.D.Cal. 2012).

Confusing the two issues leads to error, as described by the federal court in *STMicroelectronics, Inc. v. Harari*, Case No. C 05-4691 JF, 2006 WL 2032580 (N.D. Cal. 2006).[24] In that case, the court addressed a dispute similar to the facts here: a company sued its former employee alleging that certain inventions were subject to a contract in which the employee agreed to assign inventions made during the term of his employment. *Id.* at *1-2. The district court initially found federal jurisdiction based on a substantial question of federal patent law. *Id.* at *2. The court reversed its decision on reconsideration, holding that "[o]wnership and inventorship issues are completely separate issues," and that the resolution of the ownership dispute depended entirely on the terms of the employment contract and the question of when "the

[23] Obviously, if Bio-Rad owns the patents, 10X lacks standing to assert them. But this is not a case in which there is a dispute concerning a present vs. a future assignment of rights, or how the actual assignment of patent rights among multiple parties affects standing. Interpretation of the contractual provisions, not application of the law of standing, determines the outcome in this instance.

[24] *Harari* is an unpublished decision. It is cited here not as precedent but as an instance in which a court mistakenly applied patent law inventorship principles to the issue of ownership, and thereafter recognized and corrected its mistake.

inventions described in the subject patents were 'made or conceived.'" *Id.* at *10-11. This "presen[ted] a factual question that does not implicate a substantial question of patent law," the court ruled, sending the case back to state court. *Id.* at *12-14.

The *Harari* court explicitly rejected the idea that determining the "inventive contribution" made by the employee mattered at all in deciding whether the company owned the inventions made by him. "It is unclear," the court lamented, "how Defendants, and subsequently the Court, came to inject the phrase 'inventive contribution' into the discussion of Harari's contractual disclosure and assignment obligations. The phrase does not appear in the Inventions Agreement . . . ." *Id.* at *8. Because the employment agreements required disclosure and assignment of all inventions and rights to inventions made during the term of employment, "there was no need to inquire into Harari's precise inventive contribution." *Id.* at *11.

Harari relies on *AT&T v. Integrated Network Corp.*, 972 F.2d 1321 (Fed. Cir. 1992), a precedential Federal Circuit decision involving similar facts, in which the Federal Circuit reversed a district court decision asserting jurisdiction and remanded with instructions to send the case to a state court. *Id.* at 1325. In *AT&T*, four employees left AT&T to join another firm, INC, "as a team." *Id.* at 1323. The employees were subject to agreements giving AT&T assignment rights in inventions made or conceived, either solely or jointly with others, during the course of their employment. *Id.*

The patent in question was filed about a year and a half later, naming the four former AT&T employees as inventors, and disclosing that the application for the patent was assigned to INC. *Id.* AT&T sued alleging that the invention in question had been disclosed in a proprietary [AT&T] memorandum prepared by one of the four employees during the period of employment. *Id.* AT&T alleged contract and tort claims. INC removed the case to federal district court, but

AT&T moved the district court to remand the case back to state court, arguing that it would seek to prove that the invention was conceived during the period of employment by AT&T, and that this did not present "a substantial question of federal patent law." *Id. Accord, e.g., ReCor Med. Inc. v. Warnking,* C.A. No. 7387-VCN, 2013 Del. Ch. LEXIS 142 at *34 (Del. Ch. Ct. May 31, 2013) ("[T]he Court can see no reason why patent law should displace contract law here." (citing *AT&T*).)

The district court kept the case but on appeal, the Federal Circuit held that it should be remanded to the state court for decision. *Id.* at 1324. The Circuit explained that "conception of inventions, as used in the employment agreement, is [not] solely a technical question of patent law." *Id.* Specifically, the Circuit opined that the moment "when an invention was conceived may be more a question of common sense than of patent law." *Id.* The Circuit said the state court was "free to look for guidance to the law on the conception of inventions as we may have explained it, but in light of the different facets of the word conceive, indeed of inventions, this may well not be determinative of the outcome . . . ." *Id.* at 1325 (quoting *Ingersoll-Rand Co. v. Ciavatta,* 542 A.2d 879 (1988). *Accord, e.g., Motorola, Inc. v. Lemko Corp.,* No. 08 C 5427, 2012 WL 74319, at *4-5 (N.D. Ill. Jan. 10, 2012) ("the parties did not necessarily use terms in their agreements in the same way in which they are defined in patent law").

While the jurisdictional question addressed in *AT&T* does not arise in a case brought pursuant to section 337, the principle is the same: where an action sounding in contract is brought, the resolution of the contract dispute should be decided based on state law, even in a patent case.[25] A state court may look to federal law for "guidance" on questions of inventorship

[25] *Ingersoll-Rand* states that it is the employer's burden to establish that conception occurred during the period of the employment contract. 542 A.2d at 894. *Accord, e.g., ReCor,* 2013 Del.

where that is appropriate, but an action for breach of contract remains a question of state law and does not arise under federal patent law. *AT&T, supra.* In the case before me, as in *AT&T*, the contract requires determination of when the idea that gave rise to the patents-in-issue was conceived. The time of conception, as the Circuit noted in *AT&T*, is not a patent law issue.

The parties in this case fall into the same trap bemoaned by the court in *Harari* to the extent that they argue about whether the concept of "complete inventorship" applies to Drs. Hindson and Saxonov. The notion of "complete inventorship" has no application with respect to ownership under the pertinent contracts. These contracts, like the contracts in *Harari*, are silent as to any inventive contribution, complete or incomplete, made by an employee. Under the unambiguous contract provisions, *see infra*, the only fact that matters is the actual time when the inventors conceived of the inventive idea embodied in the asserted patents. *See also Motorola,* 2012 WL 74319 at *5 ("[T]he terms 'developed or conceived . . . during the term of my employment' are not ambiguous. Their meaning is sufficiently clear that a jury could simply examine evidence of when the inventions or ideas embodied in the Lemko patents first came into existence in order to determine whether Pan and Labun's actions were within the scope of the contractual term.").

2. Discussion

The real dispute involves defining the inventive concept in the asserted patents. Bio-Rad has the burden to identify the idea of which it claims ownership. It has not done so. Instead, it has briefed the matter as if it owned a share of the patents because it could trace some elements of the asserted patents to work done at Quanta/Life and Bio-Rad. This is inconsistent with the

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Ch. LEXIS 142 at *32 (employer "must show by a preponderance of the evidence that it is entitled to the relief it requested").

contracts: [redacted] [redacted] Bio-Rad, as 10X freely concedes, owns many ideas conceived by Drs. Hindson and Saxonov, but it does not own the idea for the specific arrangement of elements claimed in the asserted patents, as discussed herein, because there is insufficient evidence that that idea was conceived during the period of employment.

As described by Dr. Hindson, the invention claimed in the asserted patents is complex and consists of many elements. CX-0001C (Hindson WS) at Q/A 88. The inventive idea, which emerged from many other ideas (some of which clearly were in the prior art), is to combine these elements in a process resulting in what 10X calls the GEM ("gel bead in emulsion") architecture. As confirmed by both parties, the inventive idea is a specific arrangement of elements which, when combined, works to achieve a desired goal. *See* Tr. (Metzker) at 728:14-22 ("[I]t has to work within the architecture of a droplet, so partitioning the analyte from other analytes, having a reagent delivery system that adds the reagents that we can then combine, barcode, analyze and then track back to the different droplets, to what is the makeup of that analyte. All of that, all of that together is important."). *See also* Tr. (Schnall-Levin) at 230:15-24 ("[T]his invention is not like a bag of words, like barcodes, gel beads. It's actually how they're all put together, which is really important for driving the performance of the system."). The asserted patents each claim particular steps in the GEM architecture, and for purposes of ownership, the employment contracts at issue require determination of who conceived of this architecture and when. *See ReCor*, 2013 Del. Ch. Ct. LEXIS at *29, 42 (examining the record to determine when the "aha" or "eureka" moment occurred). Bio-Rad does not address squarely the critical contractual question of when the inventive concept in the asserted patents was conceived. Instead, Bio-Rad clouds the real issue with misplaced arguments about inventive contributions.

Consistent with the Federal Circuit's holding in *AT&T*, California law governs the pertinent employment agreements between Bio-Rad and Drs. Hindson and Saxonov. RX-0624C at ¶ 11; RX-0623C at ¶ 11; RX-0619C at ¶ 11; RX-0620C at ¶ 11. "Under California law, the interpretation of a written contract is a matter of law for the court even though questions of fact are involved." *Southland Corp. v. Emerald Oil Co.,* 789 F.2d 1441, 1443 (9th Cir.1986). Contract language that is plain and unambiguous requires no construction. "'In interpreting an unambiguous contractual provision we are bound to give effect to the plain and ordinary meaning of the language used by the parties.'" *Lockyer v. R.J. Reynolds Tobacco Co.,* 107 Cal. App. 4th 516, 517 (2003) (quoting *Coast Plaza Doctors Hospital v. Blue Cross of California,* 83 Cal. App. 4th 677, 684 (2000)). Where "'contract language is clear and explicit and does not lead to absurd results, we ascertain intent from the written terms and go no further.'" *Shaw v. Regents of Univ. of California,* 58 Cal. App. 4th 44, 53, 67 (1997). *See* Cal. Civ. Code § 1639 ("When a contract is reduced to writing, the intention of the parties is to be ascertained from the writing alone, if possible.").

The contracts in this case state, in pertinent part, with respect to QuantaLife:

[redacted]

And with respect to Bio-Rad:

[redacted]

RX-0619C at ¶¶ 3, 6; RX-0620C at ¶¶ 3, 6.

As set forth above, the QuantaLife contracts [redacted] RX-0623C at ¶2(a). The Bio-Rad contracts [redacted] RX-0619C at ¶¶3, 6. [redacted] *Id.* at ¶3.

No provision of any of the applicable contracts governs future inventions that are based on or developed from work done during employment. To the contrary, the plain, unambiguous contract language pertains only to ideas actually conceived during the employment period. Bio-

Rad's arguments improperly read out the plain meaning of the durational limitation in the pertinent contracts, and in its place suggest an interpretation of the contracts in which inventions developed by the employee after his employment belong to the company if they are related to ideas conceived during employment. "'When a dispute arises over the meaning of contract language, the first question to be decided is whether the language is 'reasonably susceptible' to the interpretation urged by the party. If it is not, the case is over.'" *Lockyer,* 107 Cal. App. 4th at 524. Bio-Rad's (implicit) construction is not reasonable.[26]

Bio-Rad's contention that "[b]ecause Hindson and Saxonov made contributions to the inventions that are now claimed in the Asserted Patents [redacted] . . . Bio-Rad has a pro rata undivided co-ownership interest in the Asserted Patents based on those contributions," RRB at 40, therefore is unavailing. Bio-Rad owns no interest in any of the patents unless it can demonstrate, in conformity with the contractual requirements, that Drs. Hindson and Saxonov actually conceived the inventive idea embodied in the asserted patents during the employment period. Bio-Rad does not cite to any provision of the employment contracts to support its contentions that an idea that is related to the invention embodied in the asserted patents, but is not the actual inventive idea in the asserted patents, confers ownership on Bio-Rad.

On review of this record, Bio-Rad has failed to present any direct evidence that the actual inventive idea embodied in the asserted patents was first conceived at Quanta/Life or Bio-Rad, as required by the contracts. Since it has presented no direct evidence of conception, Bio-Rad necessarily falls back on circumstantial evidence, asking me to infer that conception likely

[26] Bio-Rad has not actually offered any alternative construction of the contract terms.

occurred during the period of employment. Bio-Rad's argument is grounded mainly on the temporal proximity of Drs. Hindson and Saxonov's departure from Bio-Rad and the inventions developed thereafter by 10X.

These facts are basically undisputed: In October 2011, Bio-Rad acquired QuantaLife [redacted] RIB at 44 (citing RX-0502C (Tumolo DWS) at Q/A 32). Drs. Hindson and Saxonov worked at Bio-Rad for six months thereafter, leaving in what was a "coordinated event" in April 2012. *Id.* at 44-45 (citing Tr. (Hindson) at 162:3-9, 163:6-14; Tr. (Saxonov) at 797:4-21, 798:3-9). After taking off several months, Drs. Hindson and Saxonov formed 10X. Tr. (Hindson) at 163:3-164:3; CX-0001C (Hindson WS) at Q/A 38-40. Within four months of leaving Bio-Rad and less than a month after founding 10X, they filed their first provisional patent application at 10X on August 14, 2012, Provisional App. No. 61/683,192 (the "'192 application"). RX-0299.

This chronology alone does not establish circumstantially that the inventions at issue were conceived during Drs. Hindson and Saxonov's employment with QuantaLife and Bio-Rad. The circumstances of their departure make it likely that Drs. Hindson and Saxonov left Bio-Rad with the intention of pursuing opportunities to invent and market new technologies—they were free to do so. But these circumstances in themselves do not support a finding that Drs. Hindson and Saxonov conceived of the idea embodied in the asserted patents before they left Bio-Rad's employ.[27]

[27] The record indicates that Drs. Hindson and Saxonov left Bio-Rad because [redacted] Tr. (Saxonov) at 798:14-24. [redacted] *Id.* at 797:15-21.

Bio-Rad challenges Dr. Hindson's credibility, asking me to infer that he is lying about the time frame in which the inventive idea in the asserted patents was conceived. Bio-Rad maintains that the '192 provisional application, submitted in August 2012, refers to gel beads, and that that disclosure is inconsistent with Dr. Hindson's testimony that conception of the claimed porous gel beads did not occur until the [redacted]. *Id.* at 45 (citing CX-0001C (Hindson WS) at Q/A 85). In context, however, Dr. Hindson's testimony that [redacted] is not inconsistent with the '192 provisional. Dr. Hindson recalls [redacted] CX-0001C (Hindson WS) at Q/A 86. "Around that time or shortly thereafter, [redacted] *Id.* Bio-Rad has not pointed to any portion of the '192 provisional patent application showing that the idea to use porous gel beads to deliver barcodes was conceived [redacted] before the events described in detail by Dr. Hindson. [28]

Bio-Rad also points to a paper published in 2009 by inventors at Harvard, referred to as the "Beating Poisson" article. RIB at 47. The significance of the "Beating Poisson" article is that it discusses using microfluidics to deliver deformable gel beads to droplets that can be

[28] The '192 application states in pertinent part: "The microcapsules may also comprise a polymer within the interior of the capsule. In some instances this polymer may be a porous polymer bead that may entrap reagents or combinations of reagents. In other instances, this polymer may be a bead that has been previously swollen to create a gel." RX-0299 at ¶0050. This provision refers to a porous polymer bead that may entrap reagents but not to such a bead with barcodes or other reagents releasably attached, as in the asserted patents. As Staff notes, Bio-Rad's expert, Dr. Metzker, does not opine that the asserted claims were conceived in August 2012. SRB at 28 (citing Tr. (Metzker) at 705:2-22.)

functionalized with DNA. *Id.* *See* RX-0102. Dr. Hindson testifies in his direct witness statement he came across the "Beating Poisson" paper only in late 2012, while at 10X. CX-0001C (Hindson WS) at Q/A 132. On cross-examination, he concedes that he had encountered the paper in April 2011, while still at QuantaLife, but he claims not to have read it at that time. Tr. at 169:5-22, 172:8-18.

Bio-Rad maintains that Dr. Hindson's denial is implausible given the importance of the "Beating Poisson" article, pointing in particular to [redacted] RIB at 48; Tr. (Hindson) at 169:18-171:23). Bio-Rad maintains that Dr. Hindson's recollection also is undermined by [redacted] *Id.* (citing JX-0145C; Tr. (Saxonov) at 793:8-794:5.

I am not persuaded that this evidence undermines Dr. Hindson's credibility. I find it at least plausible that Dr. Hindson did not remember seeing the "Beating Poisson" article or [redacted]. The record does not indicate that Dr. Hindson attached particular significance to the article at that time, or that [redacted] indicated the conception of the idea for the inventions claimed in the asserted patents.[29] If Dr. Hindson did

[29] [redacted] JX-0145C. [redacted] does not indicate that Drs. Hindson and Saxonov at that time conceived the idea asserted in the patents. On the contrary, it indicates that they had not conceived the idea embodied in the patents at that time, because there is no mention of using porous gel beads or releasably attached oligonucleotides. The record shows that Drs. Hindson and Saxonov [redacted]

not realize in 2011 the significance of porous gel beads in the eventual development of the GEM architecture at 10X, it would be easy to forget [redacted] I conclude that Dr. Hindson's alleged lack of credibility is a slim reed for Bio-Rad to stand on.[30]

In addition to challenging Dr. Hindson's credibility, Bio-Rad points to evidence that certain concepts disclosed in Drs. Hindson and Saxonov's earlier work prefigured the patented invention. Presumably, Bio-Rad would contend (if Bio-Rad were attempting to establish conception under the correct legal theory) that because certain discoveries made by Drs. Hindson and Saxonov during the period of their employment included elements that also are found in the asserted patents, the particular arrangement of those elements, set forth in the asserted patents, must have occurred to them. For example, Bio-Rad discusses the concepts [redacted] RIB at 40-44. Dr. Saxonov testifies, however, that [redacted] CX-1829C

[redacted]. If that in itself were sufficient to trigger ownership of inventions patented after they left Bio-Rad, the contracts' [redacted] would be nullities.

[30] I agree with Bio-Rad that Dr. Hindson on several occasions was not forthcoming in his representations to Bio-Rad's representative about the work that was being conducted at 10X, but Dr. Hindson testifies credibly that he felt threatened by Bio-Rad; people are known to react defensively when they perceive they are under attack, even when they have done nothing wrong. *See* CX-1828C (Hindson RWS) at Q/A 55 ("It was very clear to me based on our conversations what she was asking me was 'are you using Quantalife droplets,' essentially fishing for whether we were competing with our old Quantalife products, and the answer to that was clearly 'no,' because we were using GEMs.")

(Saxonov RWS) at Q/A 22 ("We had not thought through these issues or come up with solutions that would have made it work.").

Bio-Rad also points out that certain number ranges of "cells, droplets, beads, and barcodes" were disclosed in the '059 patent, JX-0031, and that the numbers discussed in the claims of the asserted patents, as Dr. Saxonov concedes, could be derived easily based on those ranges. RRB at 55 (quoting RX-0412C (Saxonov Dep. Tr.) at 148:15-149:12). These facts do not demonstrate, even circumstantially, that the idea for the inventions claimed in the asserted patents had already been conceived at the time the '059 application was filed.[31]

Bio-Rad also contends that the entries in notebooks offered into evidence by 10X to support conception by the 10X inventors is "much more consistent with the theory that Dr. Hindson and others founded 10X to commercialize the ideas they had at QuantaLife and Bio-Rad." RRB at 57. Bio-Rad cites testimony from Dr. Schnall-Levin and Dr. Dear that allegedly corroborates Bio-Rad's argument that 10X's lab notebooks do not evidence the conception of the inventions claimed in the asserted patents. RIB at 130-131. Even assuming Bio-Rad's argument about the nature of 10X's notebooks is correct (and this is disputed), it would not necessarily

[31] 10X responds persuasively to each of the many circumstances alleged by Bio-Rad concerning the work done by Drs. Hindson and Saxonov during their period of employment, maintaining that their work was conducted in a variety of technological contexts distinct from the particular GEM architecture described in the asserted patents. *See* CIB at 139-151. It is not necessary or useful to try to resolve every one of the parties' disputes. These disputes are largely beside the point because, as discussed above, they are not probative on the issue of when the particular arrangement that constitutes the inventive concept of the asserted patents actually was conceived by Drs. Hindson and Saxonov.

lead to the conclusion that the claimed inventions were conceived at QuantaLife or Bio-Rad. Several months elapsed between the time Drs. Hindson and Saxonov left Bio-Rad and the founding of 10X. The actual idea could have been conceived at any time after Dr. Hindson and Saxonov left Bio-Rad's employ; the record does not indicate more likely than not that conception of the inventive idea in the asserted patents occurred before their departure.[32]

In sum, the evidence before me is insufficient to permit the conclusion that, more likely than not, the work Drs. Hindson and Saxonov did at QuantaLife and Bio-Rad led them to conceive the idea described in the 10X patents while they were still under contract. *Compare Agilent Techs., Inc. v. Kirkland,* C.A. No. 3512-VCS, 2010 WL 610725 at *15 (Del. Ch. Ct. Feb. 18, 2010) (finding employees conceived of technology at issue "based upon insights they formed and recorded at Agilent from observing the empirical results of experiments they conducted at Agilent"). Bio-Rad presents no pertinent records showing insights or experiments that support the argument that the inventive idea in the asserted patents was conceived before these employees left Bio-Rad. Given that Bio-Rad bears the burden of proof on this issue, Bio-Rad has failed to establish ownership of the asserted patents. *See* CX-1827C (Dear RWS) at Q/A 1129 ("Nothing [Dr. Metzker] cites shows whether there was a partial experiment involving some but not all of these elements. Nothing shows how the experiments would work. Nothing he cites shows any experimental observation. Dr. Metzker does not rely upon anything in his

[32] 10X's interrogatory responses detail with some specificity the timeline regarding development of the patented technology. *See* RX-0643C. In these responses, 10X seeks to show that the claims of the patents were conceived in [redacted]. *Id.* at 63-65. *See also* CX-1827C (Dear RWS) at Q/A 1269-1279. Dr. Metzker, Bio-Rad's witness, reviewed 10X's timeline regarding conception and declined to offer an opinion disagreeing with 10X's alleged [redacted] conception dates. Tr. (Metzker) at 704:7-705:22.

testimony offering a reasonable basis to conclude that any such experiments occurred nor, importantly, what happened in them.").

C. Other Affirmative Defenses

Bio-Rad raises several additional affirmative defenses. None has any merit.

Bio-Rad's equitable estoppel defense has two prongs. Bio-Rad contends that the employment agreements signed by Drs. Hindson and Saxonov [redacted] RIB at 132. First, the agreements cited by Bio-Rad give no such "explicit contractual assurances." Second, the evidence does not show that the inventions in the asserted 10X patents were made at QuantaLife and/or Bio-Rad.

Bio-Rad also contends that 10X is equitably estopped from bringing this action because Bio-Rad had no notice of infringement until this litigation was instituted, and Bio-Rad allegedly relied on 10X's "silence and inaction" in developing its product line "with the reasonable belief that it would not be subject to an infringement action." *Id.* at 133. Bio-Rad points to no evidence to support the contention that it relied on any lack of notice of infringement from 10X. *See id.* Bio-Rad's equitable estoppel defense fails for lack of proof.

Bio-Rad also claims to have an express license to practice each of the asserted patents, based on Drs. Hindson and Saxonov's [redacted] *Id.* at 133. Since Bio-Rad has not shown that the invention embodied in the 10X patents was made during the course of the employment agreement, this defense also fails.

Bio-Rad claims an implied license, wavier, and acquiescence based on "'circumstances [that] plainly indicate that the grant of a license should be inferred.'" *Id.* (quoting *Bandag, Inc. v. Al Bolser's Tire Stores, Inc.,* 750 F.2d 903, 925 (Fed. Cir. 1984)). This defense is based on the same contractual provisions asserted by Bio-Rad "with respect to Bio-Rad's affirmative defenses of acquiescence and equitable estoppel," and is rejected for the same reasons stated above. *See Id.* at 133. Bio-Rad has not demonstrated that Drs. Hindson and Saxonov were under any obligation to Bio-Rad with respect to the asserted 10X patents.

The "shop rights" defense similarly is predicated on the assertion that Drs. Hindson and Saxonov "'conceived' of the claimed inventions of the Asserted Patents while employed by and under contract at QuantaLife and/or Bio-Rad—or at the very least significantly and extensively contributed to the conception, development or making of the claimed inventions of the Asserted Patents – and did so using their employer's resources and personnel." *Id.* at 134-135.[33] As discussed above, the evidence does not show that Drs. Hindson and Saxonov conceived of the claimed inventions while under contract to QuantaLife and/or Bio-Rad, and the contracts that determine Bio-Rad's rights do not cover "contributions" made by employees during the course of their employment to inventions conceived after the employment ends. Accordingly, the shop rights doctrine affords Bio-Rad no defense.

[33] "The doctrine of shop rights has its origins in equity. A shop right is an employer's nonexclusive right to use an employee's patented process or invention that was developed during the employee's hours of employment. The right is based on the employer's presumed contribution to the invention through materials, time, and equipment." *California Eastern Labs., Inc. v. Gould,* 896 F.2d 400, 402 (9th Cir. 1990) (citing *U.S. v. Dubilier Condenser Corp.,* 239 U.S. 178 (1933)).

IX. CONCLUSIONS OF LAW

Based on the foregoing, and the record as a whole, it is my final initial determination that there is a violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, in the importation into the United States, the sale for importation, and/or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of certain claims of U.S. Patent No. 9,689,024 ("the '024 Patent"), U.S. Patent No. 9,695,468 ("the '468 Patent"), and U.S. Patent No. 9,856,530 ("the '530 Patent"). There is no violation with respect to U.S. Patent No. 9,644,204 ("the '204 Patent").

This determination is based on the following conclusions of law:

1. The Commission has subject matter jurisdiction over this investigation, *in personam* jurisdiction over Bio-Rad, and *in rem* jurisdiction over the accused microfluidic systems and components thereof and products containing same.

2. There has been an importation into the United States, sale for importation, or sale within the United States after importation of the accused microfluidic systems and components thereof and products containing same by Bio-Rad.

3. Bio-Rad has indirectly infringed claims 1, 5, 17, 19, and 22 of the '024 patent with respect to its ddSEQ v1 products.

4. Bio-Rad has indirectly infringed claims 1, 6, 7, 9, and 21 of the '468 patent with respect to its ddSEQ v1 products.

5. 10X has not shown that any claims of the '204 patent are infringed by Bio-Rad.

6. Bio-Rad has indirectly infringed claims 1, 4, 11, 14, 19, 26, and 28 of the '530 patent with respect to its ddSEQ v1 products.

7. No claims of the '024 patent have been shown to be invalid.

8. No claims of the '468 patent have been shown to be invalid.

9. No claims of the '204 patent have been shown to be invalid.

10. No claims of the '530 patent have been shown to be invalid.

11. The domestic industry requirement is satisfied with respect to claims of the '024

patent.

12. The domestic industry requirement is satisfied with respect to claims of the '468 patent.

13. The domestic industry requirement is satisfied with respect to claims of the '204 patent.

14. The domestic industry requirement is satisfied with respect to claims of the '530 patent.

15. Bio-Rad has failed to carry its burden with respect to its allegations of improper inventorship, ownership, and other affirmative defenses.

I hereby certify the record in this investigation to the Commission with my final initial determination. Pursuant to Commission Rule 210.38, the record further comprises the Complaint and exhibits thereto filed with the Secretary, the *Markman* order, and the exhibits attached to the parties' summary determination motions and the responses thereto. 19 C.F.R. § 210.38(a).

Pursuant to Commission Rule 210.42(c), this initial determination shall become the determination of the Commission 45 days after the service thereof, unless a party files a petition for review pursuant to Commission Rule 210.43(a), the Commission orders its own review pursuant to Commission Rule 210.44, or the Commission changes the effective date of the initial determination. 19 C.F.R. § 210.42(h)(6).

This initial determination is being issued with a confidential designation pursuant to Commission Rule 210.5 and the protective order in this investigation. Within ten (10) days of the date of this initial determination, each party shall submit to the Administrative Law Judge a statement as to whether or not it seeks to have any portion of this document deleted from the public version. *See* 19 C.F.R. § 210.5(f). A party seeking to have a portion of this document deleted from the public version thereof must attach to its submission a copy of the document with red brackets indicating the portion(s) asserted to contain confidential business

information.[34] The parties' submissions under this subsection shall not be filed with the Commission Secretary but shall be submitted by paper copy to the Administrative Law Judge and by e-mail to the Administrative Law Judge's attorney advisor.

SO ORDERED.

Dee Lord
Administrative Law Judge

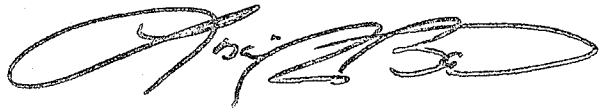
[34] To avoid depriving the public of the basis for understanding the result and reasoning underlying the decision, redactions should be limited. Parties who submit excessive redactions may be required to provide an additional written statement, supported by declarations from individuals with personal knowledge, justifying each proposed redaction and specifically explaining why the information sought to be redacted meets the definition for confidential business information set forth in Commission Rule 201.6(a). 19 C.F.R. § 201.6(a).

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **INITIAL DETERMINATION** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.**, and the following parties as indicated, on **August 12, 2019.**



Lisa R. Barton, Secretary
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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Inv. No. 337-TA-1100**

RECOMMENDED DETERMINATION ON REMEDY AND BONDING

(July 25, 2019)

Pursuant to Commission Rule 210.42(a)(1)(ii), this is the Administrative Law Judge's recommended determination on remedy and bonding. 19 C.F.R. § 210.42(a)(1)(ii).[1]

A. Limited Exclusion Order

Complainant 10X Genomics, Inc. ("10X") seeks a limited exclusion order ("LEO") for the infringing products. CIB at 243-44. The Commission Investigative Staff ("Staff") agrees with 10X that a limited exclusion should issue, and Respondent Bio-Rad Laboratories, Inc. ("Bio-Rad") does not dispute that a limited exclusion order should issue upon a finding of violation. SIB at 109; RPHB at 367. Pursuant to 19 U.S.C. §1337(d)(1), "If the Commission determines, as a result of an investigation under this section, that there is a violation of this section, it shall direct that the articles concerned . . . be excluded from entry into the United States," unless the Commission determines that such exclusion would be contrary to the public interest.[2] Accordingly, I recommend that a limited exclusion order issue in this investigation.

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[1] The final initial determination in this investigation issued on July 12, 2019.

[2] Consideration of the public interest factors articulated in section 337(d)(1) has not been delegated to the ALJ in this investigation. *See* Notice of Investigation (Feb. 12, 2018).

Bio-Rad suggests that any remedial order should include a certification provision, but there is no evidence in the record that a certification provision will be necessary to distinguish between infringing and non-infringing products. *See* CRB at 96-97.

B. Cease and Desist Order

10X seeks a cease and desist order ("CDO") pursuant to 19 U.S.C. §1337(f)(1). CIB at 244-45. The Commission has issued a CDO where a respondent "maintains a commercially significant inventory and/or has significant domestic operations that could undercut the remedy provided by an exclusion order." *Certain Road Construction Machines and Components Thereof*, Inv. No. 337-TA-1088, Comm'n Op. at 51-53 (Jun. 27, 2019).

10X relies on a review of Bio-Rad's inventory conducted by Dr. Thomas Vander Veen. CX-0005C (Vander Veen DWS) at Q/A 29-39. In particular, Dr. Vander Veen identifies [redacted] ddSEQ Single-Cell Isolators in Bio-Rad's California inventory in the first quarter of 2018. *Id.* at Q/A 29-31; CDX-0007.0004 (citing CX-0067C). Dr. Vander Veen offers his opinion that this amount is significant by comparing this inventory to Bio-Rad's domestic sales of ddSEQ Single-Cell Isolators over a full year from 2017 to 2018. *Id.* at Q/A 32-35; CDX-0007.0005. Bio-Rad only sold [redacted] these products in that time, and Dr. Vander Veen thus considers the [redacted] products in inventory to be a commercially significant amount. *Id.* at Q/A 30. Dr. Vander Veen further identifies ddSEQ-M cartridges in Bio-Rad's California inventory, including [redacted] ddSEQ-M cartridges and [redacted] ddSEQ-M "test" cartridges. *Id.* at Q/A 36-37. Dr. Vander Veen identifies yearly sales of [redacted] ddSEQ-M cartridges, offering his opinion that the number of cartridges in inventory is commercially significant because it exceeds Bio-Rad's yearly sales. *Id.* at Q/A 38. Bio-Rad argues that Dr. Vander Veen improperly counted the "test" cartridges that are manufactured domestically, RIB at 228-29, but Dr. Vander Veen explains that excluding the

"test" cartridges would not change his conclusion regarding the significance of the inventory. CX-0005C at Q/A 39.

I agree with 10X and Dr. Vander Veen that regardless of whether the "test" cartridges are counted, Bio-Rad's inventory of ddSEQ products is commercially significant. *See* CRB at 97; *see also* SIB at 110 (agreeing that inventory is significant). Accordingly, I recommend that a cease and desist order issue with respect to products that have been found to infringe.

C. Bond

Commission Rule 210.50(a)(3) specifies that the amount of a bond must be "sufficient to protect the complainant from any injury." 19 C.F.R. § 210.50(a)(3); *see* 19 U.S.C. § 1337(j). ("[A]rticles directed to be excluded from entry under subsection (d) of this section or subject to a cease and desist order under subsection (f) of this section shall, until such determination becomes final, be entitled to entry under bond prescribed by the Secretary in an amount determined by the Commission to be sufficient to protect the complainant from any injury."). The Commission has set bond amounts based on the price difference between the infringing imports and the domestic industry products or on a reasonable royalty the respondent would otherwise pay to the complainant. *See Certain Inject Ink Supplies And Components Thereof*, Inv. No. 337-TA-691, Comm'n Op. at 15-18 (Nov. 1, 2011). Where the calculation of a price differential is impractical and there is insufficient evidence in the record to determine a reasonable royalty, the Commission has set a bond in the amount of 100% of the entered value of the infringing products. *Certain Marine Sonar Imaging Devices, Including Downscan and Sidescan Devices, Products Containing the Same, and Components Thereof*, Inv. No. 337-TA-921, Comm'n Op. at 83-89 (Jan. 6, 2016). The complainant bears the burden of establishing the need for a bond.

Certain Rubber Antidegradants, Components Thereof, and Products Containing Same, Inv. No. 337-TA-533, Comm'n Op. at 40 (July 21, 2006).

As an initial matter, Bio-Rad disputes whether 10X has carried its burden to show injury based on the importation of accused products. RIB at 231-34. 10X relies on Dr. Vander Veen's analysis of the competition between Bio-Rad and 10X, where he finds evidence of "[redacted]." CX-0005C at Q/A 41. In particular, Dr. Vander Veen cites internal presentations and communications at 10X and Bio-Rad [redacted]. *Id.* at Q/A 42-45 (citing JX-0026C, CX-1708C, RX-0557C). Bio-Rad cites certain contrary evidence, including Dr. Vander Veen's testimony that the Bio-Rad and 10X products are "imperfectly substitutable" and the absence of "any study or data" that shows "how Bio-Rad's pricing below all of the affects 10X's profitability on each." *Id.* at Q/A 47. In addition, when asked at her deposition whether Bio-Rad took market share from 10X in single cell genomics, 10X's vice-president of finance, Jamie Osborn, testified: "[redacted]." JX-044C at 134:8-10. Staff submits that a bond is appropriate in an amount that will protect 10X from injury due to lost instrument sales. SIB at 110-14. Based on Dr. Vander Veen's supporting analysis, I agree with 10X that there is sufficient evidence of injury to support the imposition of a bond.

The parties also dispute whether and how a bond amount can be computed for the infringing products. 10X contends that a 100% bond is appropriate because the prices for components of the Bio-Rad's ddSEQ system cannot be meaningfully compared with the prices for components of 10X's domestic industry products. *See* CX-0005C (Vander Veen DWS) at Q/A 47. Bio-Rad's expert, Ryan Herrington, agrees that a price comparison of the parties'

consumable products is not practicable, RX-0666C at Q/A 33-36, but Bio-Rad identifies two other comparisons based on the prices of the parties' single cell instruments and the "price per cell" metric. RIB at 234-238. With respect to the single cell instruments, Mr. Herrington compares the average selling prices of Bio-Rad's ddSEQ Single-Cell Isolator and 10X's Chromium Single Cell Controller, finding a [redacted] price differential. RX-0666C at Q/A 33-36. Mr. Herrington also compares the cost of preparing cells for sequencing using a "price per cell" metric, [redacted]. *Id.* at Q/A 44-45. 10X identifies certain discrepancies in Mr. Herrington's analysis, CIB at 245-49, but I agree with Bio-Rad that his testimony is sufficient to rebut 10X's contention that there can be no meaningful comparison between the parties' products.

Mr. Herrington's comparison between the average selling prices of the parties' single cell instruments is not perfect, but absent any other price comparison offered by 10X, the [redacted] price differential is the most reliable evidence in the record for an appropriate bond amount. The Commission has previously imposed bond amounts based on comparisons of average selling prices. *See, e.g., Certain Robotic Vacuum Cleaning Devices and Components Thereof Such As Spare Parts*, Inv. No. 337-TA-1057, Comm'n Op. at 68-72 (Feb. 1, 2019). Accordingly, I recommend that a bond of [redacted] of entered value be imposed on infringing products imported during the Presidential review period.

This determination is being issued with a confidential designation, and pursuant to Ground Rule 1.10, each party shall submit to the Administrative Law Judge a statement as to whether or not it seeks to have any portion of this order deleted from the public version within seven (7) days. *See* 19 C.F.R. § 210.5(f). A party seeking to have a portion of the order deleted from the public version thereof must attach to its submission a copy of the order with red

brackets indicating the portion(s) asserted to contain confidential business information.[3] The parties' submissions under this subsection need not be filed with the Commission Secretary but shall be submitted by paper copy to the Administrative Law Judge and by e-mail to the Administrative Law Judge's attorney advisor.

SO ORDERED.

Dee Lord
Administrative Law Judge

[3] Redactions should be limited to avoid depriving the public of the basis for understanding the result and reasoning underlying the decision. Parties who submit excessive redactions may be required to provide an additional written statement, supported by declarations from individuals with personal knowledge, justifying each proposed redaction and specifically explaining why the information sought to be redacted meets the definition for confidential business information set forth in Commission Rule 201.6(a). 19 C.F.R. § 201.6(a).

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **RECOMMENDED DETERMINATION** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.**, and the following parties as indicated, on **August 12, 2019.**

Lisa R. Barton, Secretary
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UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of	
CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME	**Inv. No. 337-TA-1100**

ORDER NO. 22: *MARKMAN* ORDER

(October 31, 2018)

A *Markman* hearing was held in this investigation on July 25, 2018. Counsel for Complainant 10X Genomics, Inc. ("10X"), counsel for Respondent Bio-Rad Laboratories, Inc. ("Bio-Rad"), and counsel for the Office of Unfair Import Investigations ("Staff") appeared at the hearing. In advance of the hearing, 10X, Bio-Rad, and Staff filed initial and rebuttal *Markman* briefs.[1]

[1] 10X's initial and rebuttal briefs are referenced herein as "CIB" and "CRB," respectively; Bio-Rad's initial and rebuttal briefs are referenced herein as "RIB" and "RRB," respectively; Staff's initial and rebuttal briefs are referenced herein as "SIB" and "SRB," respectively.

Table of Contents

I. PROCEDURAL HISTORY

This investigation was instituted to determine whether there is a violation of section 337 of the Tariff Act of 1930, as amended, in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of U.S. Patent No. 9,644,204 (''the '204 patent''); U.S. Patent No. (''the '024 patent''); U.S. Patent No. 9,695,468 (''the '468 patent''); and U.S. Patent No. 9,856,530 (''the '530 patent''). Notice of Investigation at 2 (Feb. 14, 2018); 83 Fed. Reg. 7491-92 (Feb. 21, 2018). 10X asserts that Bio-Rad infringes the following claims: claims 1-4, 6-9, 17, 20, 21, 23, 25, 27, 29, 31, and 33 of the '204 patent; claims 1, 2, 5, 8, 10, 11, 13, 15-17, 19, 21, and 22 of the '024 patent; claims 1-4, 6-9, 11, 12, 21, and 22 of the '468 patent; and claims 1-6, 8-11, 14-20, and 24-30 of the '530 patent. Notice of Investigation at 2; 83 Fed. Reg. at 7492.

The parties have agreed on constructions for the following terms:

Term	Patent	Agreed-Upon Constructions
"barcode"	'204 patent, claims 3, 6, 27, 29, 31 '024 patent, claim 1 '468 patent, claim 1 '530 patent, claims 1, 4, 11, 14, 17, 24, 25, 26, 28, 29, 30	"label that may be attached to an analyte to convey identifying information about the analyte"
"wherein said capsules are [capsule is] configured to release their [its] contents into said droplets [droplet] upon the application of a stimulus"	'204 patent, claims 1, 23, 25	plain and ordinary meaning; no construction required
"applying a stimulus to said porous gel" bead to release said oligonucleotide molecules from said porous gel bead into said droplet"	'024 patent, claim 1	plain and ordinary meaning; no construction required
"wherein said barcode molecules become detached from said gel bead"	'530 patent, claims 1, 28, 29, 30	plain and ordinary meaning and above agreed-to construction for "barcode;" no construction required

CIB, App. B.

II. LEVEL OF ORDINARY SKILL IN THE ART

Bio-Rad contends that the level of ordinary skill in the art for the asserted patents is either a Ph.D. "in molecular biology, molecular genetics, chemistry, engineering, or equivalent disciplines with two years of experience or [B.S.] in such fields with five years of experience, with such experience including library preparation methods, microfluidic technology, and/or bead attachment chemistries." RIB at 5. Staff does not address the relevant level of ordinary skill in the art. Although 10X does not address the relevant level of ordinary skill in the art in its briefs, its expert does so in a declaration submitted in support of 10X's initial brief ("Butte Initial Declaration"). In that declaration, Dr. Atul J. Butte opines that a person of ordinary skill in the

art "would have a master's degree in bio-engineering, genetics, biochemistry or a related discipline, with two to three years of academic, research, or industry experience in the field of genomic sequencing solutions." Butte Initial Declaration at ¶ 22. In his declaration submitted in support of 10X's rebuttal brief ("Butte Rebuttal Declaration"), Dr. Butte states that the differences between the parties' proposed definitions of the level of ordinary skill in the art are immaterial to the claim construction disputes. Butte Rebuttal Declaration at ¶ 7.

Accordingly, for the purposes of this order, I adopt Bio-Rad's proposed definition of the level of ordinary skill.

III. LEGAL STANDARDS

"The construction of claims is simply a way of elaborating the normally terse claim language[] in order to understand and explain, but not to change, the scope of the claims." *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1347 (Fed. Cir. 2000) (alterations in original) (quoting *Scripps Clinic v. Genentech, Inc.*, 927 F.2d 1565, 1580 (Fed. Cir. 1991)). "[O]nly those [claim] terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy." *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Claim construction focuses mainly on the intrinsic evidence, which consists of the claims themselves, the specification, and the prosecution history. *See generally Phillips v. AWH Corp.*, 415 F.3d 1303, 1313-17 (Fed. Cir. 2005) (*en banc*). The words of a claim "'are generally given their ordinary and customary meaning,'" which is "the meaning that the term would have to a person of ordinary skill in art" as of the date that the patent application was filed. *Id.* at 1312-13 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)) (citations omitted). A person of ordinary skill in the art "is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire

patent, including the specification." *Id.* In some cases, "the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges." *Id.* at 1314. Often, however, "determining the ordinary and customary meaning of the claim requires examination of terms that have a particular meaning in a field of art." *Id.* "[T]he court looks to 'those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean.'" *Id.* (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)). Those sources include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Id.*

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Id.* at 1312 (quoting *Innova*, 381 F.3d. at 1115)). "Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claim terms." *Id.* at 1314. For example, "the context in which a term is used in the asserted claim can be highly instructive," and "[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term." *Id.*

"[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" *Id.* at 1315 (quoting *Vitronics*, 90 F.3d at 1582). "The longstanding difficulty is the contrasting nature of the axioms that (a) a claim must be read in view of the specification and (b) a court may not read a limitation into a claim from the specification." *Innova*, 381 F.3d at 1117.

In addition to the claims and the specification, the prosecution history should be

examined if in evidence. "The prosecution history . . . consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent. Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent." *Phillips*, 415 F.3d at 1317. "[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Id.*

If the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence may be considered. Extrinsic evidence "consists of all evidence external to the patent and the prosecution history, including inventor and expert testimony, dictionaries, and learned treatises." *Id.* at 1317. Extrinsic evidence is generally viewed "as less reliable than the patent and its prosecution history in determining how to read claim terms." *Id.* at 1318. "The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence." *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

Although "[c]laim terms are generally given their plain and ordinary meanings to one of skill in the art when read in the context of the specification and prosecution history," there are two instances in which a court will depart from the plain and ordinary meaning. *Hill-Rom Service, Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). The first is when a patentee acts as its own lexicographer. *Id.* "To act as its own lexicographer, a patentee must 'clearly set forth a definition of the disputed claim term.'" *Thorner v. Sony Comput. Entm't Am.*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (quoting *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366

(Fed. Cir. 2002)). The second is when the patentee disavows the full scope of the claim term. *Id.* Disavowal can be effectuated by language in the specification or the prosecution history. *See Phillips*, 415 F.3d at 1316-17. "In either case, the standard for disavowal is exacting, requiring clear and unequivocal evidence that the claimed invention includes or does not include a particular feature." *Poly-America, L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2017).

IV. THE ASSERTED PATENTS

A. The '024 and '468 Patents

Through application 13/966,150 ("the '150 application"), which was filed on August 13, 2013, the '468 and '024 patents claim priority to six provisional applications filed between August 14, 2012 and July 10, 2013. '024 patent, cover; '468 patent, cover.[2] The '024 patent was filed as a divisional of the '150 application and the '468 patent was filed as a continuation of the '150 application. '024 patent, cover; '468 patent, cover. Because of their ancestry, the '024 and '468 patents share a common specification. The patents identify Benjamin Hindson, Serge Saxonov, and Michael Schnall-Levin as inventors. '024 patent, cover; '468 patent, cover.

1. The Specification

Analysis of biological materials, such as sequencing nucleic acids, requires proper sample preparation. '024 patent, col. 1:28-30. "Sample preparation may . . . involve fragmenting molecules, isolating molecules, and/or attaching unique identifiers to particular fragments of molecules . . . ." *Id.* at col. 1:34-37. A microwell partition capsule array can be used in sample preparation operations. *Id.*, col. 4:28-29. Such a device consists of "an assembly of partitions (*e.g.*, microwells, droplets) that are loaded with microcapsules." *Id.*, col. 4:24-27.

[2] The '024 and '468 patents are attached to 10X's initial brief as Exhibits 1 and 3, respectively.

The array divides the sample "such that a portion of the sample is present in each partition." *Id.*, col. 4:29-32. Each partition "may include one or more capsules that contain one or more reagents (*e.g.*, enzymes, unique identifiers (*e.g.*, bar codes), antibodies, *etc.*)." *Id.*, col. 4:41-44. A "trigger" can be used to cause the microcapsules to release the reagents into the partitions, so that the reagents come into contact with the subdivided sample. *Id.*, col. 4:44-48.

Microcapsules are used (1) to "provide for the controlled and/or timed release of reagents for sample preparation of an analyte," (2) to control the release and transport of reagents, (3) to deliver reagents in discrete and definable amounts, (4) to "prevent premature mixing of reagents with the sample," and (5) to ease handling of and limit contact with reagents. *Id.*, col. 6:62-col. 7:13. Microcapsules can be formed using gel beads. *Id.*, col. 9:28-35. Analytes and/or reagents can "be coupled/ immobilized to the interior surface of a gel bead (*e.g.*, the interior accessible via diffusion of an oligonucleotide barcode and/or materials used to generate an oligonucleotide barcode) and/or the outer surface of a gel bead." *Id.*, col. 9:36-42. Release of the analytes or reagents from the microcapsule may be the result of applying a trigger. *Id.*, col. 22:4-6. Various types of stimuli can be used as a trigger, including chemical stimuli, enzymes, light, heat, and magnetic fields. *Id.*, col. 19:43-48, col. 22:4-21.

One sample preparation reagent that can be delivered by a microcapsule is a "molecular barcode." *Id.*, col. 12:9-14. For most applications, such as in the case of the nucleic acid sequencing, analyzing multiple samples simultaneously "substantially decreases the cost of analysis as well as increases through-put of the process." *Id.*, col. 12:33-36. To analyze multiple samples, different samples are pooled together. *Id.*, col. 12:36-39. Before the samples are pooled together, the analytes from each sample are tagged with a unique identifier, known in the art as a "molecular barcode," so that analytes from different samples can be identified and

tracked in the pooled sample. *Id.*, col. 12:11-13, col. 12:36-39. Molecular barcodes "may comprise a variety of different forms such as oligonucleotide bar codes, antibodies or antibody fragments, fluorophores, nanoparticles, and other elements or combinations thereof." *Id.*, col. 12:14-17. In nucleic acid sequencing, oligonucleotide barcodes are particularly useful. *Id.*, col. 12:43-44.

2. Asserted Claims

10X is asserting claims 1, 2, 5, 8, 10, 11, 13, 15-17, 19, 21, and 22 of the '024 patent and claims 1-4, 6-9, 11, 12, 21, and 22 of the '468 patent.

a. The Asserted Claims of the '024 Patent

Of the asserted claims of the '024 patent, claim 1 is independent and the remaining claims depend directly or indirectly from claim 1. Claim 1 recites:

> A method for sample preparation, comprising:
>
> a) providing a droplet comprising a porous gel bead and a target nucleic acid analyte, wherein said porous gel bead comprises at least 1,000,000 oligonucleotide molecules comprising barcode sequences, wherein said oligonucleotide molecules are releasably attached to said porous gel bead, wherein said barcode sequences are the same sequence for said oligonucleotide molecules;
>
> b) applying a stimulus to said porous gel bead to release said oligonucleotide molecules from said porous gel bead into said droplet, wherein upon release from said porous gel bead, a given oligonucleotide molecule from said oligonucleotide molecules attaches to said target nucleic acid analyte; and
>
> c) subjecting said given oligonucleotide molecule attached to said target nucleic acid analyte to nucleic acid amplification to yield a barcoded target nucleic acid analyte.

Id., col. 33:56-col. 34:7.

Claims 2, 5, 8, 11, 13, 15, 16, 19, and 21 depend directly from claim 1. Claim 2 requires that the droplet be "an aqueous droplet in a continuous oil phase." *Id.*, col. 34:8-9. Claim 5 requires that the stimulus applied to the gel bead be "selected from the group consisting of a biological stimulus, a chemical stimulus, a thermal stimulus, an electrical stimulus, a magnetic stimulus, and a photo stimulus." *Id.*, col. 34:15-19. Claim 8 requires that the oligonucleotide molecule attached to the analyte have "a region which functions as a primer during said nucleic acid amplification." *Id.*, col. 34:25-28. Claim 11 requires that the "droplet further comprise[] a polymerase." *Id.*, col. 34:34-35. Claim 13 requires the nucleic acid analyte to be selected from a particular group. *Id.*, col. 34:39-47. Claim 15 requires that the oligonucleotide molecules be reversibly immobilized to the porous gel bead. *Id.*, col. 34:51-53. Claim 16 requires that the droplet "comprise[] a plurality of target nucleic acid analytes, which plurality of target nucleic acid analytes comprises said target nucleic acid analyte." *Id.*, col. 34:54-56. Claim 19 requires that the oligonucleotide molecules attach to the target nucleic acid analytes by hybridization. *Id.*, col. 34:.65-67. Claim 21 requires that the gel bead be formed from polymer gel. *Id.*, col. 35:4-5.

Claim 10 requires that the primer of claim 8 be "configured to amplify said target nucleic acid analyte" so that a barcoded target nucleic acid analyte is produced. *Id.*, col. 34:31-33. Claim 17 requires that each of the plurality of target nucleic acid analytes of claim 16 attach to one of the oligonucleotide molecules. *Id.*, col. 34:58-61. Claim 22 requires that the polymer gel of claim 21 be a polyacrylamide. *Id.*, col. 35:6-7.

b. The Asserted Claims of the '468 Patent

Of the asserted claims of the '468 patent, claim 1 is independent and the remaining claims depend directly or indirectly from claim 1. Claim 1 recites:

A method for droplet generation, comprising:

(a) providing at least 1,000,000 oligonucleotide molecules comprising barcode sequences, wherein said barcode sequences are the same sequence for said at least 1,000,000 oligonucleotide molecules, wherein said at least 1,000,000 oligonucleotide molecules are releasably attached to a bead, wherein said bead is porous;

(b) combining said at least 1,000,000 oligonucleotide molecules and a sample comprising a nucleic acid analyte each in an aqueous phase at a first junction of two or more channels of a microfluidic device to form an aqueous mixture comprising said at least 1,000,000 oligonucleotide molecules attached to said bead and said sample; and

(c) generating a droplet comprising said at least 1,000,000 oligonucleotide molecules attached to said bead and said sample comprising said nucleic acid analyte by contacting said aqueous mixture with an immiscible continuous phase at a second junction of two or more channels of said microfluidic device.

Id., col. 33:56-col. 34:9.

Claims 2, 6-9, 12, 21, and 22 depend directly from claim 1. Claim 2 requires that the aqueous fluid formed at the first junction include a reagent necessary for amplification of the nucleic acid analyte. *Id.*, col. 34:10-18. Claim 6 requires that the bead be formed from a polyacrylamide. *Id.*, col. 34:25-26. Claim 7 requires that the bead be a gel bead. *Id.*, col. 34:27. Claim 8 requires that the "at least 1,000,000 oligonucleotide molecules" include uracil. *Id.*, col. 34:28-29. Claim 9 requires that the "at least 1,000,000 oligonucleotide molecules" have a region that functions as a primer. *Id.*, col. 34:30-32. Claim 12 requires that the nucleic acid analyte be selected from a particular group. *Id.*, col. 34:37-46. Claim 21 requires that after the generation of a droplet "a given oligonucleotide molecule of said at least 1,000,000 oligonucleotide molecules attaches to said nucleic acid analyte," before being "subjected to nucleic acid amplification to yield a barcoded nucleic acid analyte." *Id.*, col. 35:3-9. Claim 22 requires the bead to have a chemical cross-linker. *Id.*, col. 35:12-13.

Claim 3 requires that the reagents of claim 2 be situated in the droplet. *Id.*, col. 34:19-20. Claim 4 requires that the reagents of claim 3 include polymerase. *Id.*, col. 34:23-24. Claim 11 requires that the primer of claim 9 be used to amplify the nucleic acid analyte. *Id.*, col. 34:35-36.

B. The '204 Patent

The '204 patent issued on May 9, 2017 from an application filed on February 7, 2014. '204 patent, cover.[3] The '204 patent claims priority to four provisional applications filed between February 8, 2013 and July 10, 2013. The provisional applications to which the '204 patent claims priority are also relied on for priority by the '024 and '468 patents. The patent names Benjamin Hindson, Serge Saxonov, Kevin Ness, Paul Hardenbol, Christopher Hindson, Donald Masquelier, Mirna Jarosz, and Michael Schnall-Levin as inventors. Three of the named inventors—Benjamin Hindson, Mr. Saxonov, and Mr. Schnall-Levin—are also the named inventors of the '024 and '468 patents.

1. The Specification

The disclosed subject matter of the '204 patent is similar to that of the '024 and '468 patents. As with those patents, the '204 patent is directed to sample preparation methods and discloses "compositions comprising a plurality of capsules, the capsules situated within droplets in an emulsion, wherein the capsules are configured to release their contents into the droplets upon the application of a stimulus." *Id.*, col. 1:42-46. The capsules may contain reagents and/or analytes. *Id.*, col. 1:47-48.

[3] The '204 patent is attached to 10X's initial brief as Exhibit 5.

2. Asserted Claims

10X is asserting claims 1-4, 6-9, 17, 20, 21, 23, 25, 27, 29, 31, and 33 of the '204 patent. Claims 1, 23, and 25 are independent and the remaining claims depend directly or indirectly from these claims. Claim 1 recites:

> A composition comprising a plurality of capsules, said capsules situated within droplets in an emulsion, wherein said capsules are configured to release their contents into said droplets upon the application of a stimulus to provide said contents in said droplets in said emulsion, wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof.

Id., col. 44:42-48.

Claims 2, 17, 20, 21, 27, and 33 depend directly from claim 1. Claim 2 requires that "at least one of [the] capsules and [the] droplets comprise a species selected from the group consisting of a reagent and an analyte." *Id.*, col. 44:50-52. Claim 17 requires that the "droplets comprise a fluid that is of a lesser density than the density of [the] capsules." *Id.*, col. 45:27-29. Claim 20 requires that the stimulus be applied to the capsules. *Id.*, col. 45:37-38. Claim 21 requires that the stimulus be applied to the droplets. *Id.*, col. 45:39-40. Claim 27 requires that the capsules' "contents comprise at least 10,000 barcoded oligonucleotides releasably attached to each of [the] capsules." *Id.*, col. 46:24-26. Claim 33 requires that the capsules be gels. *Id.*, col. 46:42-43.

Claims 3, 4, and 6-9 depend indirectly from claim 1. Claim 3 depends from claim 2 and requires that the reagent be selected from a group of reagents. *Id.*, col. 44:53-57. Claim 4 depends from claim 3 and requires that the reagent be selected from a group of enzymes. *Id.*, col. 44:58-61. Claim 6 depends from claim 3 and requires that the barcode be an oligonucleotide barcode. *Id.*, col. 44:64-65. Claim 7 depends from claim 2 and requires that the analyte be

selected from a group of analytes. *Id.*, col. 44:66-col. 45:2. Claim 8 depends from claim 7 and requires that the analyte be a polynucleotide. *Id.*, col. 45:3-4. Claim 9 depends from claim 8 and requires that the polynucleotide be selected from a group of polynucleotides. *Id.*, col. 45:5-7.

Claim 23 recites:

> A device comprising a plurality of partitions, wherein at least one partition of said plurality of partitions comprises a capsule, wherein said capsule is situated within a droplet in an emulsion, wherein said capsule is configured to release its contents into said droplet upon the application of a stimulus to provide said contents in said droplet in said emulsion, wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof.

Id., col. 45:51-58. Claim 29 depends from claim 23 and requires that the capsules' "contents comprise at least 10,000 barcoded oligonucleotides releasably attached to each of [the] capsules." *Id.*, col. 46:30-32.

Claim 25 recites:

> A method comprising:
>
> a. providing a plurality of inner capsules, said inner capsules situated within outer capsules in an emulsion, wherein said inner capsules are configured to release their contents into said outer capsules upon the application of a stimulus, wherein said stimulus is selected from the group consisting of a change in pH, a change in ion concentration, reduction of disulfide bonds, and combinations thereof; and
>
> b. providing a stimulus to cause said inner capsules to release their contents into said outer capsules in said emulsion.

Id., col. 46:3-12. Claim 31 depends from claim 25 and requires that the capsules' "contents comprise at least 10,000 barcoded oligonucleotides releasably attached to each of [the] capsules." *Id.*, col. 46:36-38.

C. The '530 Patent

The '530 patent issued on January 2, 2018 from an application filed on May 5, 2017. '530 patent, cover.[4] Through intervening applications, the '530 patent is a continuation in part of an application filed on February 7, 2014. *Id.* The '530 patent also claims priority to five provisional applications filed between December 14, 2012 and July 10, 2013. *Id.* Four of the provisional applications to which the '204 patent claims priority are also relied on for priority by the '024, '468, and '204 patents. The patent names Benjamin Hindson, Serge Saxonov, Kevin Ness, Paul Hardenbol, Mirna Jarosz, and Michael Schnall-Levin as inventors. These same individuals are named inventors of the '203 patent and three of them—Mr. Hindson, Mr. Saxonov, and Mr. Schnall-Levin—are named inventors of the '024 and '468 patents.

1. The Specification

The claimed subject matter of the '530 patent is similar to the subject matter disclosed in the '024, '468, and '204 patents. As with those patents, the '530 patent discloses sample preparation methods that use microcapsules and beads to provide reagents and analytes in response to stimuli. '530 patent, col. 23:60-col. 24:13.

2. Asserted Claims

10X is asserting claims 1-6, 8-11, 14-20, and 24-30 of the '530 patent. Claim 1 is independent and the remaining claims depend directly or indirectly from claim 1. Claim 1 recites:

> A method for nucleic acid preparation or analysis, comprising:
>
> (a) providing:
>
> (i) at least 1,000 gel beads;

[4] The '530 patent is attached to 10X's initial brief as Exhibit 7.

(ii) releasably attached to each of said at least 1,000 gel beads, at least 1,000 barcode molecules comprising identical barcode sequences that are distinct from barcode sequences of at least 1,000 barcode molecules releasably attached to any other gel bead of said at least 1,000 gel beads; and

(iii) a plurality of cells each comprising a plurality of polynucleotide molecules;

(b) generating a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each comprise:

(i) a single gel bead from said at least 1,000 gel beads; and

(ii) a single cell from said plurality of cells; and

(c) in each of said at least 1,000 droplets, using said plurality of polynucleotide molecules from said single cell and barcode molecules of said at least 1,000 barcode molecules from said single gel bead to generate a plurality of barcoded polynucleotide molecules,

wherein said barcode molecules become detached from said gel bead.

Id., col. 47:58-67, col. 48:57-col. 49:4.

Claims 2, 3, 5, 8-11, 14, 15, 17, 20, and 24-30 depend directly from claim 1. Claim 2 requires that the plurality of polynucleotide molecules be released in each of the at least 1,000 droplets before step (c) of claim 1. *Id.*, col. 49:7-10. Claim 3 requires that the polynucleotide molecules be messenger ribonucleic acid ("mRNA") molecules. *Id.*, col. 49:8-10. Claim 5 requires that the barcoded polynucleotide molecules be released from the droplets. *Id.*, col. 49:15-17. Claim 8 requires that the barcoded polynucleotide molecules or a "derivative thereof" be sequenced. *Id.*, col. 49:27-29. Claim 9 requires that a subset of the droplets not contain a cell. *Id.*, col. 49:30-31. Claim 10 requires that a subset of the droplets not contain a gel bead. *Id.*, col. 49:32-33. Claim 11 requires that the barcode molecules in each of the droplets be released by a single gel bead. *Id.*, col. 49:34-36. Claim 14 requires that each gel bead have at

least 1,000 barcode molecules. *Id.*, col. 49:44-45. Claim 15 requires that the gel beads recited in step (a) constitute a subset of the gel beads. *Id.*, col. 50:1-2. Claim 17 requires that the barcode molecules "comprise combinatorial assemblies of sequences from sequence modules." *Id.*, col. 50:5-7. Claim 20 requires that the plurality of droplets be at least 10,000. *Id.*, col. 50:15-16. Claim 24 requires that the gel beads contain at least 10,000 barcode molecules. *Id.*, col. 50:26-27. Claim 25 requires that the gel beads contain at least 100,000 barcode molecules. *Id.*, col. 50:28-29. Claim 26 requires that the gel beads contain at least 1,000,000 barcode molecules. *Id.*, col. 50:30-31. Claim 27 requires that the number of polynucleotide molecules range from 10,000-100,000 molecules. *Id.*, col. 50:31-32. Claim 28 requires that the barcode molecules become detached before the formation of the barcoded polynucleotide molecules. *Id.*, col. 50:35-37. Claim 29 requires that the barcode molecules become detached after the barcoded polynucleotide molecules are generated. *Id.*, col. 50:39-41. Claim 30 requires that the barcode molecules detach while the barcoded polynucleotide molecules are being generated. *Id.*, col. 50:42-44.

Claim 4 depends from claim 3 and requires that barcoded polynucleotide molecules be generated by reverse transcribing the mRNA molecules in the presence of the barcode molecules. *Id.*, col. 49:11-14. Claim 6 depends from claim 5 and requires that the barcoded polynucleotide molecules be amplified by nucleic acid amplification after the barcoded polynucleotide molecules are released from the droplets. *Id.*, col. 49:18-22. Claim 18 depends from claim 17 and requires that each of the combinatorial assemblies comprise a first sequence and a second sequence. *Id.*, col. 50:8-10. Claim 18 depends from claim 17 and requires that each of the combinatorial assemblies comprise a first sequence, a second sequence, and a third sequence. *Id.*, col. 50:11-14.

V. CLAIM CONSTRUCTION

Because the asserted patents are directed to similar subject matter, share common inventors, and stem from common priority documents, the claim construction disputes cut across patents. The disputed terms can be placed into five categories, which are addressed below.

A. "1,000,000 oligonucleotides comprising barcode sequences"

"1,000,000 oligonucleotide molecules comprising barcode sequences" ('024 patent, claim 1; '468 patent claim 1)	
Party	**Construction**
10X	Plain meaning and proposed construction for "barcode sequence"
Bio-Rad	"1,000,000 oligonucleotide molecules, part of which are barcode sequences"
Staff	"1,000,000 oligonucleotide molecules that include, but are not necessarily limited to, barcode sequences"

Claim 1 of the '024 patent and claim 1 of the '468 patent require "at least 1,000,000 oligonucleotide molecules comprising barcode sequences" that are "releasably attached" to a porous bead. '024 patent, col. 33:57-60; '468 patent, col. 33:57-63. The parties agree that the recited oligonucleotide molecules encompass molecules that have a barcode sequence and components in addition to the barcode sequence, but disagree on whether the claims encompass molecules consisting solely of a barcode sequence. Bio-Rad contends that the oligonucleotide molecules consisting solely of a barcode sequence fall outside of the scope of the claims, whereas 10X and Staff argue that the claims capture such molecules.

The plain language of the claims is consistent with 10X's and Staff's position. The plain and ordinary meaning of "comprise" is "to include esp. with a particular scope," "to be made up of," "compose," or "constitute." Webster's Ninth Collegiate Dictionary (1984) at 270-71.[5] All

[5] When used as a transitional phrase to join the preamble of a claim with the claim's body, the term "comprising" is open-ended and allows for, but does not require, additional elements. *Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc.*, 212 F.3d 1377, 1382-83 (Fed. Cir. 2000) ("The

of the definitions of "comprise" are consistent with 10X's and Staff's position that the claimed molecules encompass oligonucleotide molecules consisting solely of a barcode sequence. None of the definitions are consistent with Bio-Rad's position that the oligonucleotide molecule must have elements in addition to the barcode sequence.

The specification further supports 10X's and Staff's position. Describing the use of "oligonucleotide barcodes" to tag analytes, the specification describes the oligonucleotide barcodes as "compris[ing] a unique sequence (*e.g.*, a barcode sequence) that gives the oligonucleotide barcode its identifying functionality." '468 patent, col. 12:44-47. The specification notes that "an oligonucleotide barcode may consist solely of a unique barcode sequence or may be included as part of an oligonucleotide of longer sequence length." *Id.*, col. 12:58-60. Thus, the specification expressly contemplates that an oligonucleotide molecule used to tag analytes can either consist solely of a barcode sequence or include additional elements.

Bio-Rad counters that the specification supports its proposed construction. In particular, Bio-Rad points to a portion of the specification in which the term "oligonucleotide barcode" is used to refer to oligonucleotide barcodes consisting solely of a barcode sequence and the term "larger oligonucleotide" in used to refer oligonucleotide barcodes having elements in addition to the barcode sequence. *Id.*, col. 13:6-10. Bio-Rad argues that the specification's use of the term "a larger oligonucleotide comprising an oligonucleotide barcode" to describe oligonucleotide

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phrase 'consisting of' is a term of art in patent law signifying restriction and exclusion, while, in contrast, the term 'comprising' indicates an open-ended construction. . . . A drafter uses the term 'comprising' to mean 'I claim at least what follows and potentially more.'") (internal citation omitted). In the instant case, however, the term "comprising" is not being used as a transitional phrase. Accordingly, the term "should be interpreted according to the normal rules of claim interpretation." *Moleculon Research Corp. v. CBS Inc.*, 793 F.2d 1261, 1272 n. 8 (Fed. Cir. 1986), *abrogated on other grounds*, *Egyptian Goddess, Inc. v. Swisa, Inc.*, 543 F.3d 665 (Fed. Cir. 2008).

molecules having elements in addition to a barcode sequence supports its interpretation of the claim language. Tr. at 7:11-8:4. The specification can only limit claim scope through lexicography or disavowal. *Hill-Rom*, 755 F.3d at 1371.

The specification's use of the term "a larger oligonucleotide comprising an oligonucleotide barcode" to describe molecules containing elements in addition to a barcode sequence is not a clear statement defining "oligonucleotide molecules" and is not a clear statement disavowing claim scope. *See, e.g., Thorner*, 669 F.3d at 1365 ("To act as its own lexicographer, a patentee must 'clearly set forth a definition of the disputed claim term.'") (quoting *CCS Fitness*, 288 F.3d at 1366); *Poly-America*, 839 F.3d at 1136 ("[T]he standard for disavowal is exacting, requiring clear and unequivocal evidence that the claimed invention includes or does not include a particular feature."). The specification's use of the qualifier "larger" to describe oligonucleotide molecules that have elements in addition to barcode sequences suggests that "smaller" oligonucleotide molecules do not have elements in addition to barcode sequences. Claim 1's recital of "oligonucleotide molecules" without a qualifier encompasses both larger and smaller oligonucleotide molecules.

Bio-Rad also argues that interpreting the claims to encompass oligonucleotide molecules comprised solely of a barcode sequence captures subject matter surrendered during prosecution of the '024 patent. RIB at 9-10. The premise underlying Bio-Rad's argument is that, during the prosecution of the '024 patent, the applicants "changed 'oligonucleotide barcode' to 'oligonucleotide molecules comprising barcode sequences' to overcome" the examiner's anticipation and obviousness rejections. *Id.* at 9 (underlining in original). Bio-Rad's interpretation of the prosecution history is incorrect.

As originally drafted, application claim 78, which would mature into claim 1, was directed to a method of sample preparation wherein an "oligonucleotide barcode" and an analyte are released from a microcapsule in response to a stimulus. '024 Patent File History, Amendment (Feb. 17, 2017) at 3.[6] The examiner rejected application claim 78 as anticipated and obvious in view of several prior art references. *See, generally*, '024 Patent File History, Office Action (June 24, 2016). The applicants filed two responses to the office action. In the first response, the applicants extensively amended application claim 78. '024 Patent File History, Response (Dec. 21, 2016) at 2. As amended, the application claim required a "droplet comprising a porous gel bead and a target nucleic acid analyte, wherein said porous gel bead comprises at least 1,000,000 oligonucleotide barcodes" and required the barcoded analyte to undergo an amplification step. *Id.*

The applicants argued that the amended application claim was allowable over the cited prior art, because the prior art did not disclose one or more of the following elements: (1) "providing a droplet comprising a porous gel bead . . . wherein said porous gel bead comprises at least 1,000,000 oligonucleotide barcodes that are releasably attached to said porous gel bead," (2) "applying a stimulus to said porous gel bead to release said oligonucleotide barcodes from said porous gel bead, wherein upon release from said gel bead, a given oligonucleotide barcode from said oligonucleotide from said oligonucleotide barcodes attaches to said target nucleic acid analyte," and (3) "subjecting said given oligonucleotide barcode attached to said target nucleic acid analyte to nucleic acid amplification to yield a barcoded target nucleic acid analyte." *Id.* at 8-14. Notably, none of the bases cited by the applicants to distinguish the pending claims from the prior art relate to the composition of the "barcode molecules."

[6] A certified copy of the file history of the '024 patent was filed as Appendix B to the complaint.

Three months after submitting their initial response, the applicants submitted a supplementary response, amending the application claim 78 to replace the term "oligonucleotide barcodes" with the term "oligonucleotides comprising barcode sequences." '024 Patent File History, Response (Mar. 28, 2016) at 3. Bio-Rad argues that the applicants made this amendment in order to further distinguish the pending claims from the cited prior art. The prosecution history clearly indicates, however, that the amendment in the supplementary response was not made in order to distinguish prior art.

The supplementary response was filed after the examiner conducted an interview with the applicants. '024 Prosecution History, Examiner Initiated Interview Summary (Apr. 25, 2017). In that interview, the examiner informed the applicants that application claim 78 would be allowable if it was further amended "to specify that the barcode sequence of oligonucleotides are the same," not to overcome an obviousness or anticipation rejection, but to overcome a "potential rejection under 35 USC 112 second paragraph." '024 Prosecution History, Examiner Initiated Interview Summary (Apr. 25, 2017). The supplementary response was submitted eight days after the interview. Thus, amending the claims to recite "oligonucleotides comprising barcode sequences" rather than "oligonucleotide barcodes" was made "to specify that the barcode sequence of oligonucleotides are the same," not to disclaim oligonucleotide molecules that consist solely of a barcode sequence. *See Core Licensing S.A.R.L. v. LG Electronics, Inc.*, 880 F.3d 1356, 1367 (Fed. Cir. 2018) ("The patentee's statements during prosecution do not amount to a clear and unmistakable disclaimer restricting the meaning of 'un-launched state' only to those applications that are not running any processes.").

In view of the foregoing, I reject Bio-Rad's argument that the oligonucleotide molecules do not encompass molecules that consist solely of a barcode sequence. I find that the term

"1,000,000 oligonucleotides comprising barcode sequences" means "1,000,000 oligonucleotide molecules that include, but are not necessarily limited to, barcode sequences."

B. "releasably attached"

"releasably attached" ('024 patent, claim 1; '468 patent, claim 1)	
Party	**Construction**
10X	"attached, directly or through chemical moieties or chemical linkers, and releasable upon application of a stimulus"
Bio-Rad	"**wherein said oligonucleotide molecules are releasably attached to said porous gel bead "wherein said porous gel bead is configured to release said oligonucleotide molecules"** ('024 patent, claim 1) means "wherein said porous gel bead is configured to release said oligonucleotide molecules" "**wherein said at least 1,000,000 oligonucleotide molecules are releasably attached to a bead**" ('468 patent, claim 1) means "wherein said bead is configured to release said at least 1,000,000 oligonucleotide molecules" "**10,000 barcoded oligonucleotides releasably attached to [each of said capsules] [said capsule] [each of said capsule]**" ('204 patent, claim 27, 29, 31) means "10,000 barcoded oligonucleotides attached to [each of said capsules] [said capsule] [each of said capsule], which is [are] configured to release them" "**1,000 barcode molecules releasably attached to any other gel bead**" ('530 patent, claim 1) means "any other gel bead is configured to release said at least 1,000 barcode molecules" "**releasably attached to each of said at least 1,000 gel beads, at least 1,000 barcode molecules**" ('530 patent, claim 1) means "said at least 1,000 gel beads are configured to release said at least 1,000 barcode molecules"
Staff	Same as 10X's

The asserted claims of the '024, '468, and '530 patents require a gel bead comprising barcode molecules, wherein the barcode molecules are "releasably attached" to the gel bead. '024 patent, col. 33:60-62 (claim 1); '468 patent, col. 33:60-63 (claim 1); '530 patent, col. 47:62-67 (claim 1). The asserted claims of the '204 patent require a "capsule," the contents of which include barcode molecules that are "releasably attached" to the capsule. '204 patent, col. 44:42-49 (claim 1), col. 46:25-27 (claim 27), col. 46:30-32 (claim 29), col. 46:36-38 (claim 31). The asserted claims of the '024 patent require that the barcode molecules be released from the gel

bead in response to a stimulus applied to the gel bead. '024 patent, col. 33:65-col.34:1 (claim 1). The asserted claims of the '530 patent require the barcodes to "become detached" or be "released" from a gel bead without specifying how they become detached or released. '530 patent, col. 49:3-4 (claim 1) ("become detached"), col. 49:34-36 (claim 11) ("released"), col. 50:35-38 (claim 28) ("become detached"), col. 50:38-41 (claim 29) ("become detached"), col. 50:42-44 (claim 30) ("become detached"). The asserted claims of the '468 patent do not require the barcode molecules to become detached or released from the bead. '468 patent, col. 33:57-col. 34:9 (claim 1). The parties agree that the term "releasably attached" should be construed consistently across the patents. RRB at 2; CIB at 25; SIB at 30.

According to Bio-Rad, the term "releasably attached" requires that the bead or capsule be configured or designed to release the barcode molecules. RIB at 12. 10X and Staff counter that the term only requires that the barcode molecules be attached and releasable upon application of a stimulus. SIB at 16; CIB at 12-13. The term "releasably attached" is not a term of art and its meaning is apparent to even a lay judge: the barcode molecules are attached to the bead or capsule in a way that allows them be released. *Phillips*, 415 F.3d at 1314 ("In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words."). There is no support in the claim language, the specifications, and prosecution histories of the asserted patents for Bio-Rad's proposed construction. 10X's and Staff's proposed construction is also flawed because it imports limitations from the specification into the claims.

1. Bio-Rad's proposed construction is inconsistent with the claim language of the asserted claims.

Although Bio-Rad argues that the language of the asserted claims supports its proposed construction of "releasably attached," the claim language is actually inconsistent with Bio-Rad's proposed claim construction. Bio-Rad places particular emphasis on the claim language of the '204 and '024 patents. RRB at 2-4. Independent claim 1 of the '204 patent is directed to "capsules" that "are configured to release their contents . . . upon the application of a stimulus." '204 patent, col. 44:42-49 (claim 1). Dependent claims 27, 29, and 31 require that each capsule's contents include barcode molecules "releasably attached" to the capsule. *Id.*, col. 46:25-27 (claim 27), col. 46:30-32 (claim 29), col. 46:36-38 (claim 31). The asserted claims of the '024 patents require the barcode molecules to be released in response to a stimulus applied to the gel bead. '024 patent, col. 33:65-col.34:1 (claim 1). To the extent that the claims of the '204 and '024 patents may be interpreted to require a capsule or bead configured to release the barcode molecules, such an interpretation—as acknowledged by Bio-Rad—would be based on claim language other than "releasably attached:"[7]

> **Claim 1.** A composition comprising a plurality of capsules, said capsules situated within droplets in an emulsion, wherein said ***capsules are configured to release their contents*** into said droplets upon the application of a stimulus . . . .

RRB at 3 (quoting '204 Patent, col. 44:42-49 (claim 1)) (emphasis added by Bio-Rad).

> (b) applying a ***stimulus to said porous gel bead to release said oligonucleotide molecules from said porous gel bead*** into said droplet . . . .

[7] This order is limited to addressing whether the term "releasably attached" requires a capsule or bead configured to release the barcode molecules and makes no finding on whether other claim language so requires.

Id. at 4 (quoting '024 patent, col. 33:65-col.34:1 (claim 1)) (emphasis added by Bio-Rad).

The claim language relied on by Bio-Rad with respect to the '204 and '024 patents is not present in the asserted claims of the '468 and '530 patents. Bio-Rad does not even make the argument that the claim language of the '468 patent supports its proposed construction. While requiring barcode molecules that are "releasably attached" to a gel bead, the asserted claims of the '468 patent do not require the barcode molecules to be released from the gel bead, much less be released in response to a stimulus applied to the gel bead. '468 patent, col. 33:57-col. 34:9 (claim 1). Although Bio-Rad argues that the claims of the '530 patent support its proposed construction of "releasably attached," its argument is unpersuasive. RRB at 5-6.

Independent claim 1 of the '530 patent requires barcode molecules that are "releasably attached" to the gel bead to "become detached," while certain dependent claims (*e.g.*, claim 11) require the barcode molecules to be "released." *Compare* '530 patent, col. 49:3-4 (claim 1) ("become detached") *with id.*, col. 49:34-36 (claim 11) ("released"). According to Bio-Rad, "[l]ogically, 'released' must be narrower than 'detached' or Claim 11 would not be limiting Claim 1 in any way." RRB at 5 (citing *Hutchins v. Zoll Medical Corp.*, 492 F.3d 1377, 1382 (Fed. Cir. 2007). Whether "released" has a narrower scope than "detached" is irrelevant to the construction of "releasably attached." Claim 1 describes the "releasably attached" barcode molecules as "becom[ing] detached," not being "released." '530 patent, col. 47:62-66, col. 49:3-4. Accordingly, "releasably attached" barcode molecules encompasses barcode molecules that can be "detached."

2. The specifications of the asserted patents are inconsistent with Bio-Rad's proposed construction.

Bio-Rad's proposed construction is also inconsistent with the specifications of the asserted patents. The specification of the '024 and '468 patents teaches that "oligonucleotide

barcodes . . . may be coupled/immobilized to the interior surface of a gel bead (*e.g.*, the interior accessible via diffusion of an oligonucleotide barcode and/or materials used to generate an oligonucleotide barcode) and/or the outer surface of a gel bead or any other microcapsule." '024 patent, col. 9:36-42. The "[c]oupling/immobilization may be via any form of chemical bonding (e.g., covalent bond, ionic bond) or physical phenomena (*e.g.*, Van der Waals forces, dipole-dipole interactions, *etc.*)" and in certain circumstances may be reversible. *Id.*, col. 9:42-49. Bio-Rad argues that this description is inapplicable because it addresses barcode molecules that are "reversibly immobilized" on a bead or capsule, not barcode molecules that are "releasably attached" to a bead or capsule. RRB at 12-13. Bio-Rad's argument ignores that reversible immobilization is a species of releasable attachment.

The relationship between the claim term "releasably attached" and the specifications' discussion of reversible immobilization is confirmed by the '468 patent's prosecution history.[8] During the prosecution of that patent, the examiner questioned whether application "claim 99 requiring the limitation of 'said at least 1,000,000 oligonucleotide molecules are attached to said bead via a covalent bond' . . . further limit[ed] the limitation of amended claim 78, requiring 'oligonucleotide molecules [that] are releasably attached to a bead.'" '468 Patent Prosecution History, Email from B. Narayan to A. Alemozafar (Apr. 20, 2017). In response, the applicants argued that "the 'oligonucleotide molecule' of Claim 78 may be 'releasably attached to a bead' via covalent bonds or ionic bonds, to provide a few examples." '468 Patent Prosecution History, Email from A. Alemozafar to B. Narayan (Apr. 20, 2017). In support of their position, the applicants pointed to the specification's discussion of reversible immobilization and quoted the following sentences:

[8] A certified copy of the file history of the '468 patent was filed as Appendix C to the complaint.

> Coupling/immobilization may be via any form of chemical bonding (e.g., covalent bond, ionic bond) or physical phenomena (e.g., Van der Waals forces, dipole-dipole interactions, etc.). In some cases, coupling/immobilization of a reagent to a gel bead or any other microcapsule described herein may be reversible, such as, for example, via a labile moiety (e.g., via a chemical cross-linker, including chemical cross-linkers described herein). Upon application of a stimulus, the labile moiety may be cleaved and the immobilized reagent set free.

Id. (quoting '024 patent, col. 9:42-52) (internal citations omitted). The examiner agreed that the cited paragraph described how barcode molecules can be "releasably attached" using covalent bonds and ionic bonds, and allowed application claim 99. Notice of Allowability (Apr. 28, 2017) at 2-3 ("[A]n agreement was reached that the limitation of claim 99 still further limits the limitations of claim 78 because 'oligonucleotide molecules' of claim 78 may be 'releasably attached to a bead' via covalent bonds or ionic bonds, as discussed in the instant published specification paragraph 0056.").[9]

Bio-Rad further argues the specifications of the asserted patents support its proposed construction because they "describe the bead or capsule as configured to release the oligonucleotide molecules." RIB at 12-13. The patents, however, also disclose embodiments in which the barcode molecules are released by severing a portion of the barcode molecule. The '024 patent specifically discusses the use of "a labile moiety" to "coupl[e]/immobiliz[e]" a barcode molecule to a gel bead. '024 patent, col 9:45-49. In order to free the immobilized barcode, the labile moiety is cleaved "upon application of a stimulus." *Id.*, col. 9:49-51.

[9] Both the applicants in their email to the examiner and the examiner in the interview summary refer to paragraph 56 of the application of the '024 patent. Although the "reversible immobilization" discussion occurs in paragraph 54, not paragraph 56, it is clear from the sentences quoted in the applicants' email that the applicants and examiner are referring to paragraph 54.

Importantly, the specification teaches that the labile moiety may be part of the barcode molecule itself. *Id.*, col. 9:56-59.

The specification of the '024 and '468 patents further undercuts Bio-Rad's proposed construction. The specification explains that the release of the barcode molecule can be effectuated by "[v]arious different stimuli." *Id.*, col. 19:36-38. Such a stimulus can trigger the release of barcode molecules by causing "disruption or degradation of any chemical bonds that immobilize a reagent to the microcapsule," as opposed to causing "disruption or degradation of the shell or membrane enveloping the microcapsule" or "disruption or degradation of the interior of a microcapsule." *Id.*, col. 19:39-43. This description does not limit the "chemical bonds that immobilize a reagent to the microcapsule" to chemical bonds on the bead or capsule, but encompasses chemical bonds that are part of the barcode molecules.

Despite the clarity of the specification's description, Bio-Rad argues that this portion of the specification supports its construction because

> The phrase "any chemical bonds" only concerns bonds that can be broken when a stimulus is applied to the microcapsule. It is not stating that "any chemical bonds" disrupted in any manner is within the scope of release.

RRB at 13. In the description at issue, however, the specification does not state that the "stimulus is applied to the microcapsule." *Id.* Bio-Rad's only apparent support for so interpreting the specification is the specification's statement that stimuli can be used to "'trigger release of reagents ***from the microcapsules***.'" RRB at 13 (quoting '024 patent, col. 19:36-43) (emphasis added by Bio-Rad). That a stimulus causes the barcode molecules to be released "from the microcapsules" does not necessarily mean that the stimulus acts upon the microcapsules.

3. The prosecution history of the '024 patent is inconsistent with Bio-Rad's proposed construction.

The prosecution history of the '024 patent further undercuts Bio-Rad's proposed construction. During prosecution, the examiner rejected application claims 102 and 103 as being anticipated by U.S. Patent Application 2012/0316074 ("'074 application"). '024 Patent Prosecution History, Office Action (June 24, 2016) at 4-5. Application claims 102 and 103 depended from application claim 78, which required a "microcapsule [that] is degradable upon the application of a stimulus to said microcapsule," so that an oligonucleotide barcode is released upon the application of the "stimulus to said microcapsule." '024 Patent Prosecution History, Preliminary Amendment (February 17, 2015) at 3. Application claim 103 further required the oligonucleotide barcode to be "reversibly immobilized" to the microcapsule. *Id.* at 5. The examiner found that the "reversible immobilization" limitation was satisfied by the '074 application's disclosure of an "oligonucleotide barcode . . . , which can be cut and ligated." '024 Patent Prosecution History, Office Action (June 24, 2016) at 5. In their response to the office action, the applicants did not dispute the examiner's determination that the '074 application disclosed the "reversibly immobilized" limitation. '024 Patent File History, Response (Dec. 12, 2016) at 9-10. Thus, both the examiner and the applicants understood that "reversible immobilization"—a form of releasable attachment—encompasses situations wherein a barcode molecule is released from a bead by severing a portion of the barcode molecule.

4. 10X's and Staff's proposed construction imports limitations from the specification.

10X and Staff argue that "releasably attached" should be construed to mean "attached, directly or through chemical moieties or chemical linkers, and releasable upon application of a stimulus." This proposed construction imports limitations from the specification by requiring the barcode molecule to be releasable "upon application of a stimulus" and requiring any indirect

attachment be "through chemical moieties or chemical linkers." In support of these limitations, 10X and Staff point to the specifications of the asserted patents, not the claim language. It is axiomatic that limitations from the specification should not be imported into the claims. *Phillips*, 415 F.3d at 1319-20.

Based on the foregoing, I find that "releasably attached" means "attached in a manner that allows the attached object to be released."

C. "reversibly immobilized"

"reversibly immobilized" ('024 patent, claim 15)	
Party	**Construction**
10X	"bound by a chemical bond or physical phenomenon that can be undone"
Bio-Rad	"**reversibly immobilized to said porous gel bead**" means "releasable by reversing the process of attachment to said porous gel bead"
Staff	"immobilized through any form of chemical bonding or physical phenomena that can be specifically disrupted or degraded"

Claim 15 of the '024 patent requires the barcode molecules of claim 1 to be "reversibly immobilized" to the gel bead. '024 patent, col. 34:51-53. As noted by Staff, "it is unclear what—if any—substantive dispute exists among the parties." RRB at 7. Although 10X argued at the hearing that there is some potential ambiguity that could arise from Bio-Rad's proposed construction, the cause of 10X's concern is not Bio-Rad's proposed construction of "reversibly immobilized," but Bio-Rad's proposed construction of "releasably attached." Tr. at 45 (". . . Bio-Rad's construction leaves ambiguity as to what they think it means to have the 'bead releasing the barcode.'").

Because there is no dispute regarding the interpretation of the term "reversibly immobilized," its construction is not addressed in this order. U.S. *Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) ("Claim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims.").

D. Amplification terms

"amplification"('024 patent, claims 1, 8; '468 patent, claims 2, 21)/"amplify" ('024 patent, claim 10)/"amplifying" ('468 patent, claim 11; '530 patent, claim 6)	
Party	**Construction**
10X	***"amplification"***: "polymerization of" ***"amplify"***: "polymerize" ***"amplifying"***: "polymerizing one or more additional nucleic acid sequences based on a template nucleic acid sequence"
Bio-Rad	***"amplification"***: "creation of multiple copies of" ***"amplify"***: "create multiple copies of" ***"amplifying"***: "creating multiple copies of"
Staff	***"amplification"***: "replication" ***"amplify"***: "replicate" ***"amplifying"***: "replicating"

The asserted claims of the '024 patent require that the barcode molecule attached to a nucleic acid analyte be subjected "to nucleic acid amplification to yield a barcoded target nucleic acid analyte." '024 patent, col. 34:4-7 (claim 1). Claim 6 of the '530 patent requires a step of "amplifying" barcoded polynucleotide molecules "by nucleic acid amplification." '530 patent, col. 34:25-28. Claim 2 of the '468 patent requires forming an aqueous solution by combining the nucleic acid analyte and gel bead of claim 1 with "one or more reagents necessary for amplification." '468 patent, col. 34:10-18. Claim 11 of the '468 patent requires "amplifying" a nucleic acid analyte. *Id.*, col. 34:35-36. The parties raise two disputes concerning the construction of "amplification" and its variants. The first issue is whether amplification encompasses synthesizing complementary copies of mRNA strands through reverse transcription. The second issue is whether amplification requires the creation of multiple copies of the nucleic acid being amplified. With regard to the asserted claims of the '024 patent, the parties raise a third dispute regarding whether the amplification step must be performed within a droplet.

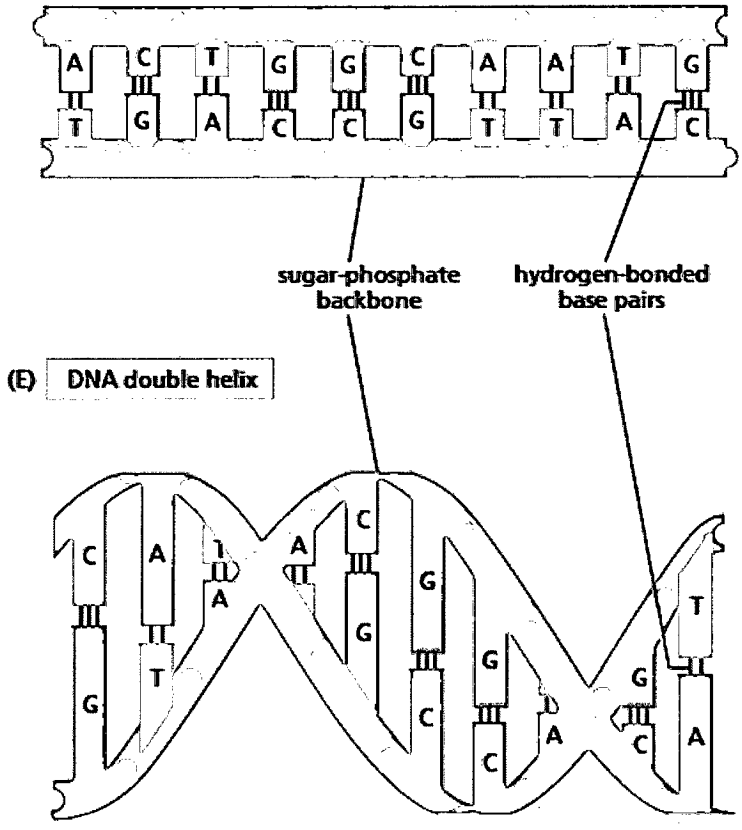
1. Amplification encompasses reverse transcription.

10X's proposed constructions of the "amplification" terms encompass reverse transcription of RNA (ribonucleic acid) into DNA (deoxyribonucleic acid). Both Bio-Rad and Staff argue that reverse transcription is not a form of amplification. For the reasons set forth below, I find that reverse transcription can be used as a method of amplification.

a. Nucleic Acid Replication and Reverse Transcription

By way of background, DNA and RNA are comprised of sequences of nucleotides. Butte Initial Declaration at ¶ 37. DNA strands are comprised of four nucleotides: adenine (A), guanine (G), cytosine (C), and thymine (T). *Id.* RNA strands are also composed of four nucleotides. With the exception of thymine, the nucleotides in an RNA strand are the same as those in a DNA strand. *Id.* Instead of thymine, RNA strands have the nucleotide uracil (U). *Id.*

DNA molecules typically occur as double-stranded molecules, known as DNA double helices. *Id.* at ¶ 39. A DNA double helix is comprised of two DNA strands oriented antiparallel to each other. *Id.* The nucleotides in one strand of a double helix are complementary to those in the other strand and bonds will form between the complementary nucleotides. *Id.* Adenine pairs with thymine and cytosine pairs with guanine. *Id.*



Alberts, Molecular Biology of the Cell (5th Ed.) ("Alberts"), Fig. 1-2 (excerpt); Butte Initial Declaration at ¶ 39.[10] In DNA replication, an enzyme called DNA polymerase binds to each strand and forms a new strand that is complementary to the template strand. Butte Initial Declaration at ¶ 40.

In a process called "transcription," a DNA strand serves as a template to create a strand of messenger RNA ("mRNA"). *Id.* at ¶ 41. In this process, an enzyme called RNA polymerase uses one DNA strand as a template to form an mRNA strand that is composed of nucleotides complementary to those on the DNA strand. *Id.* To form the mRNA strand, adenine, thymine, cytosine and guanine in the DNA strand are transcribed into uracil, adenine, guanine, and

[10] Excerpts from Alberts are attached as Exhibit 13 to 10X's initial brief and as Exhibit SMX-0010 to Staff's rebuttal brief.

cytosine, respectively. *Id.* The mRNA strand is then used to create proteins in a process known as "translation." *Id.*

Because of the complementary relationship between the nucleotide sequences comprising the DNA strand and the mRNA strand, in a process called "reverse transcription," the mRNA strand can be used as a template to form a strand of complementary DNA ("cDNA"). *Id.* at ¶ 42. To form a cDNA strand, adenine, uracil, cytosine and guanine in the mRNA strand are reverse transcribed into thymine, adenine, guanine, and cytosine, respectively. *Id.*

b. Amplification is increasing the copy number of the target sequence to be detected.

The '530 patent teaches that "[a]mplification may be used to increase the quantity of a target polynucleotide." '530 patent, col. 19:5-6. To provide a general description of "polynucleotide amplification," the '530 patent cites Application No. PCT/US 99/01705 ("'705 application").[11] '530 patent, col. 18:28-34 (teaching that "target polynucleotides" can be obtained through a variety of ways including "polynucleotide amplification (as generally described in PCT/US/99/01705)"). In addition, the '530 patent expressly incorporates the '705 application by reference. *Id.* col. 5:5-22 ("All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent, or patent application was specifically and individually indicated to be incorporated by reference.").

The '705 application teaches that "[t]arget amplification involves the amplification (replication) of the target sequence to be detected, such that the number of copies of the target sequence is increased." '705 application, p. 20; *see also id.* at 2 ("Target amplification involves

[11] The '705 application is attached as Exhibit SMX-0004 to Staff's initial brief.

the amplification (*i.e.* replication) of the target sequence to be detected, resulting in a significant increase in the number of target molecules."). Accordingly, "amplification" as used in the '530 patent is a process that "increases the number of copies of the target sequence to be detected." '705 application, p. 20; *see also* '530 patent, col. 19:5-6 ("Amplification may be used to increase the quantity of a target polynucleotide.").

With regard to the '024 and '468 patents, there is no indication that "amplification" is being used differently in these patents. The '024, '468, and '530 patents share common inventors and stem from common priority documents; accordingly the term "amplification" and its variants should be construed consistently across the patents. *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005), *abrogated on other grounds as recognized in IRIS Corp. v. Japan Airlines Corp.*, 769 F.3d 1359, 1361 n. 1 (Fed. Cir. 2014) ("Because NTP's patents all derive from the same parent application and share many common terms, we must interpret the claims consistently across all asserted patents.").

Based on the foregoing, I find that the amplification terms recited in the claims of the '530, '024 and '468 patents refers to increasing "the number of copies of the target sequence to be detected."

c. The "target sequence to be detected" includes complementary copies.

Pointing to the '705 application's equation of "amplification" to "replication," Staff argues that "amplification" requires the creation of exact copies—not complementary copies—of the target sequence. In support of this argument, Staff points to technical dictionaries defining "replication" as "the process of duplicating or reproducing, as replication of an exact copy of a polynucleotide strand of DNA or RNA." *Miller-Keane Encyclopedia and Dictionary of Medicine*, Nursing, Allied Health at 1530 (7th Ed. 2003) ("*Miller-Keane*"); *see also Oxford Dictionary of Biochemistry and Molecular Biology* at 565 (Oxford Univ. Press 1997) ("*Oxford*

Dictionary").[12] 10X, however, cites references that show that "replication" can be used more broadly to refer to the creation of complementary copies through reverse transcription. V. Potapov, *et al.*, *Base Modifications Affecting RNA Polymerase and Reverse Transcriptase Fidelity*, Nucleic Acids Research, Vol. 46, Iss. 11, June 20, 2018 ("Potapov"), at 5753, 5756 ("RNA is replicated by a reverse transcriptase to produce cDNA, then the first strand is replicated by the same reverse transcriptase to produce double-stranded DNA, which is then prepared for sequencing by ligating SMRTbell adaptors."); U.S. Patent No. 7,153,672 ("'672 patent") at 2:18-20 ("Eukaryotic genomes in particular are filled with mobile elements, retrotransposons, that use reverse transcriptase for replication.").[13]

Consistent with the references cited by 10X, the '705 application uses "amplification" (and, by extension, "replication") broadly to encompass the creation of complementary copies, as well as exact copies, of a target sequence to be detected. In particular, the '705 application discusses "strand displacement amplification" ("SDA"), as one method of target amplification. '705 application at 20-21. In SDA, a "single stranded target nucleic acid, usually a DNA target sequence, is contacted with an SDA primer." *Id.* at 20. The SDA primer hybridizes with the target sequence and is extended by an SDA polymerase to form a "newly synthesized strand." *Id.* at 20-21. The newly synthesized strand is complementary to the original strand. *Id.* at 21-22. The '705 application considers the formation of the complementary strand to be an amplification reaction noting that a "second amplification reaction can be done using the complementary target

[12] Excerpts from *Miller-Keane* and *Oxford Dictionary* are attached as Exhibits SMX-0006 and SMX-0005, respectively, to Staff's initial brief.

[13] Popatov and the '627 patent are attached as Exhibits 16 and 17, respectively, to 10X's initial brief.

sequence, resulting in a substantial increase in amplification during a set period of time." *Id.* at 22.

d. Reverse transcription can be used increase the copy number of the target sequence to be detected.

In support of its construction of "amplification," Bio-Rad places significant emphasis on the fact that reverse transcription produces a cDNA copy, not an RNA copy, of an mRNA strand. RIB at 17 ("mRNA and cDNA are not the same molecule."); Tr. at 82:13-84:12. If the cDNA copy is the "target sequence to be detected," however, reverse transcription increases the copy number of target molecules to be detected and is therefore an amplification reaction. This is shown in the '705 application's discussion of nucleic acid sequence based amplification ("NASBA"), which the '705 application teaches can be used for target amplification. '705 application at 2. In NASBA, "[a] single stranded target nucleic acid, usually an RNA target sequence," is used as a first template. *Id.* at 23. A cDNA copy of the first template is synthesized through reverse transcription. *Id.* This cDNA copy is the second template. *Id.* A strand of DNA complementary to the second template is synthesized resulting in a double-stranded cDNA copy. *Id.* at 23-24. The double-stranded copy is referred to as the third template. *Id.* Each strand of the third template is used to generate multiple RNA strands that are "essentially the same as the first template." *Id.* at 24. The method can be repeated using the newly synthesized RNA strands as the first template for the new cycle. *Id.*; *see also* U.S. Patent No. 5,409,818 ("'818 patent"), col. 5:54-56 ("Each newly synthesized first template can be converted to further copies of the second template and the third template by repeating the cycle.").[14]

[14] The '705 application incorporates by reference the '818 patent in its entirety and cites it as providing a general description of NASBA. '705 application at p. 22.

Although the RNA sequence that serves as the first template is described as an "RNA target sequence," it is not the "target sequence to be detected." In a NASBA reaction, the target sequence to be detected is typically the cDNA copy of the RNA. As the '705 application notes, it "will be appreciated by those in the art, [that] it is preferable to detect DNA strands during NASBA since the presence of the ribonuclease makes the RNA strands potentially labile." '705 application at p. 24. In the NASBA process, a substantial portion of the cDNA copies are produced through reverse transcription reactions. *Id.* ("[NASBA] result[s] in a single starting RNA template generating a single DNA duplex; however, since this DNA duplex results in the creation of multiple RNA strands, which can then be used to initiate the reaction again, amplification proceeds rapidly."). Accordingly, if the cDNA sequence is the target sequence to be detected, reverse transcription is an amplification reaction because it increases the copy number of cDNA strands. On the other hand, if the RNA sequence is the target sequence to be detected, reverse transcription would not be an amplification reaction because it does not increase the copy number of RNA strands.

Staff and Bio-Rad argue that the asserted patents distinguish amplification from reverse transcription. In particular, they point out that in identifying examples of various reactions that can be used to amplify polynucleotide analytes, the asserted patents omit reverse transcription. '204 patent, col. 31:29-40 ("An [*sic*] suitable amplification method may be utilized, including polymerase chain reaction ('PCR'), ligase chain reaction ('LCR'), helicase-dependent amplification, linear after the exponential PCR ('LATE-PCR') asymmetric amplification, digital PCR, degenerate oligonucleotide primer PCR ('DOP-PCR'), primer extension pre-amplification PCR ('PEP-PCR') and ligation mediated PCR, rolling circle amplification, multiple displacement amplification ('MDA'), and single primer isothermal linear amplification."); '530

patent, col. 18:40-43 ("Amplification may include PCR amplification, multiple displacement amplification (MDA), rolling circle amplification and other amplification methods."); '024 patent, col. 25:24-28 ("amplification reactions (e.g., PCR, qPCR, reverse-transcriptase PCR, digital PCR, etc.)"). The lists of amplification reactions provided in the patents are non-exhaustive, as indicated by the use of the words "including," "may include," "other amplification methods," "*e.g.*," and "*etc.*" Accordingly, the omission of "reverse transcription" from the list of exemplary amplification reactions is not a basis for finding that reverse for transcription cannot be used for amplification. *Intervet Inc. v. Merial Ltd.*, 617 F.3d 1282, 1287 (Fed. Cir. 2010) ("[T]he five deposited strains and listed sequences are 'representative of' a 'type of porcine circovirus,' and thus do not constitute the entire scope of the invention.").

Bio-Rad makes two additional arguments in support of its position that the patents distinguish between amplification and reverse transcription. First, Bio-Rad argues that the '530 patent discusses reverse transcription and amplification as separate and distinct processes. Specifically, the second full paragraph of column 18 of the '530 patent discusses various amplification methods that can be used to isolate genomic DNA, before discussing the use of reverse transcription to create cDNA copies of mRNA. *Compare* '530 patent, col. 18:39-43 (discussing various methods of amplification) *with id.*, col. 18:51-54 (discussing reverse transcription). There is no inconsistency between the '530 patent's separate discussions of reverse transcription and amplification in column 18 and finding that reverse transcription can be used for amplification. In column 18, the '530 patent is not discussing amplification in general but amplification of genomic DNA. *Id.*, col. 18:37-43 ("For example, genomic DNA may be isolated with or without amplification. Amplification may include PCR amplification, multiple displacement amplification (MDA), rolling circle amplification and other amplification

methods."). Reverse transcription cannot be used to increase the number of genomic DNA copies, but—as acknowledged in the same paragraph—is used to increase the number of cDNA copies. *Id.*, 18:51-54 ("If the isolated polynucleotide is an mRNA, it may be reverse transcribed into cDNA . . . ."). Thus, the '530 patent's separate treatment of reverse transcription and amplification of genomic DNA does not indicate that reverse transcription cannot be used for amplification of cDNA strands.

Second, Bio-Rad argues that the '530 patent claims reverse transcription and amplification separately. Specifically, claim 4 depends from claim 1 through claim 3 and requires the generation of barcoded polynucleotide molecules using reverse transcription. '530 patent, col. 49:11-14. Claim 7 depends directly from claim 1 and requires the barcoded polynucleotide molecules generated in step (c) of claim 1 to be amplified. *Id.*, col. 49:23-26. Claims 4 and 7 are sister claims that depend from a common claim, but do not refer back to or limit each other. Construing amplification to embrace reverse transcription creates no inconsistency between the two claims. Dependent claim 4 is narrowly drawn to embrace a particular form of amplification (reverse transcription), while dependent claim 7 is broader and embraces all forms of amplification.

In addition to their arguments concerning the disclosures of the asserted patents, Staff and Bio-Rad also cite prior art references discussing reverse-transcription PCR ("RT-PCR"). Of these references, U.S. Patent Application No. 2011/0053798 ("'798 application") is typical.[15] As described in the application, RT-PCR is a two-step process. '798 application, ¶ 0054. The first step is "forming complementary DNA copies of RNA" through reverse transcription. *Id.* The second step is "PCR amplification using the complementary DNA as a template." *Id.* According

[15] The '798 application is attached to Bio-Rad's initial brief as Exhibit RXM-0013.

to Staff and Bio-Rad, because these references describe amplification as occurring in the second step and not the first step, reverse transcription is not amplification. This argument is unpersuasive. The descriptions do not state that "amplification" occurs in the second step, but that "PCR amplification" occurs in the second step. Amplification using polymerase chain reaction ("PCR") techniques is routinely referred to as "PCR amplification." For example, the '530 patent teaches that "[a]mplification may include PCR amplification," as well as "multiple displacement amplification (MDA), rolling circle amplification and other amplification methods." '530 patent, col. 18:40-43; *see also id.*, col 18:29-34 (stating that polynucleotides may be obtained through "polymerase chain reaction (PCR) amplification," as well as "recombinant cloning, polynucleotide amplification (as generally described in PCT/US99/01705) . . . purification methods (such as purification of genomic DNA or RNA), and synthesis reactions"); '024 patent, col. 22:45-47 ("[I]f PCR amplification is desired . . . ."). Thus, the '798 application's reference to "PCR amplification" in describing the second step of the RT-PCR method indicates only that a specific amplification method is performed in the second step. The reverse transcription reaction performed in the first step may not be "PCR amplification," but this does not mean that reverse transcription is not an amplification reaction.

Moreover, in contrast to the descriptions cited by Staff and Bio-Rad, at least one description of RT-PCR expressly acknowledges that amplification occurs in the reverse transcription step of RT-PCR, as well as the PCR step. U.S. Patent Application No. 2015/0315629 ("'629 application") describes RT-PCR as a two-step reaction in which "the first amplification reaction is reverse transcription," and "[t]he single stranded cDNA produced by reverse transcription is then used for subsequent PCR." '629 application, ¶ 0073.[16]

[16] The '629 application is attached to 10X's initial brief as Exhibit 13.

2. Amplification only requires the creation of one or more copies.

Bio-Rad argues that amplification requires the creation of multiple copies and that the creation of a single copy is not amplification. Such a construction is inconsistent with the claims of the '024 patent. Claim 1 of the '024 patent is directed to a droplet with "a target nucleic acid analyte" and a gel bead with "at least 1,000,000 oligonucleotide molecules comprising barcode sequences." '024 patent, col. 33:57-60. After the oligonucleotide molecules are released from the gel bead, "a given oligonucleotide molecule from said oligonucleotide molecules attaches to said target nucleic acid analyte." *Id.*, col. 33:65-col. 34:3. The "said given oligonucleotide molecule attached to said target nucleic acid analyte" is subjected to nucleic acid amplification to yield "a barcoded target nucleic acid analyte." *Id.*, col. 33:4-7. Thus, claim 1 of the '024 patent uses amplification to refer to the creation of a single copy of a single target nucleic acid.

Although Bio-Rad cites a number of statements in the specifications of the asserted patents in support of its position, these statements indicate only that amplification can be used to create multiple copies of a sequence, not that amplification requires the creation of multiple copies. For instance, while the '204 patent states that amplification can be used for various purposes "including but not limited to generating multiple copies of polynucleotide sequences," it specifically notes that amplification can be used to add "adaptor sequences or barcodes to polynucleotides." '204 patent at col. 31:23-25. As shown with respect to claim 1 of the '024 patent, using amplification to add a barcode sequence to a polynucleotide does not require the creation of multiple copies. Bio-Rad also notes that the specification of the '204 patent teaches that "amplification may be used to increase the quantity of a polynucleotide." '204 patent, col. 24:23-25. The creation of a single copy, however, will increase the quantity of the target polynucleotide.

In a similar vein, Bio-Rad points to the '798 application and argues that the application "describes the amplification as a process to 'form multiple copies of a template.'" RIB at 16 (quoting '798 application, ¶ 0052). Bio-Rad's argument is not supported by the full quotation: "Amplification—a process in which a copy number increases. Amplification may be a process in which replication occurs repeatedly over time to form multiple copies of a template." '798 application, ¶ 0052. Thus, according to the '798 application, the creation of multiple copies of the template is an option, not a requirement, of amplification. *Id.*

Bio-Rad further notes that the methods identified in the patents as examples of amplification methods are used to create multiple copies of a target sequence. RIB at 16. The methods identified in the patents, however, are only examples of amplification reactions and the patents explicitly indicate that "amplification" is not limited to such methods. '530 patent, col. 18:40-43 ("Amplification may include PCR amplification, multiple displacement amplification (MDA), rolling circle amplification and other amplification methods."); '024 patent, col. 25:24-28 ("amplification reactions (*e.g.*, PCR, qPCR, reverse-transcriptase PCR, digital PCR, *etc.*)"); '204 patent, col 31:29-40 ("An suitable amplification method may be utilized, including . . . ."). Even if the patents were interpreted as teaching that the identified methods are the preferred amplification methods, the claims would not be limited to such embodiments. *See Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380-82 (Fed. Cir. 2009) ("Although the patent contemplates that certain animals are '[p]referred animals from which to produce a food product,' that statement does not disavow human animals because it relates to preferred embodiments only; it does not state that all animals covered by the claims must produce a food product.").

3. Claim 1 of the '024 patent does not require amplification to be performed in a droplet.

Although it is not explicitly required by its proposed construction, Bio-Rad contends that the amplification step of claim 1 of the '024 patent must be performed in a droplet. Claim 1 of the '024 patent is directed to a three-step method. The first step requires "providing a droplet" with "a target nucleic acid analyte" and a gel bead with "at least 1,000,000 oligonucleotide molecules comprising barcode sequences." '024 patent, col. 33:57-64. The second step requires the "said oligonucleotide molecules" to be released into "said droplet" and "a given oligonucleotide molecule from said oligonucleotide molecules attach[] to said target nucleic acid analyte." *Id.*, col. 33:65-col. 34:3. In the third step, the "said given oligonucleotide molecule attached to said target nucleic acid analyte" is subjected to nucleic acid amplification to yield "a barcoded target nucleic acid analyte." *Id.*, col. 33:4-7. Bio-Rad argues that all three steps must be performed in a droplet. There is no dispute that the first two steps must be performed in a droplet, but 10X and Staff argue that the third step, an amplification step, can be—but does not have to be—performed in a droplet.

The third step, unlike the first and second steps, makes no reference to the droplet. Bio-Rad argues that because "said given oligonucleotide molecule attached to said target nucleic acid analyte" refers to antecedents in the second step, the third step must also occur in the droplet of the second step. Bio-Rad's argument lacks merit. The requirement that the "said given oligonucleotide molecule attached to said target nucleic acid analyte" be created in a droplet in the second step does not mean that it has to remain in the droplet for all subsequent steps. The use of "comprising" in the preamble of claim 1 indicates that there could be additional steps between the second step and the third step. *Vehicular Techs. Corp. v. Titan Wheel Int'l, Inc.*, 212 F.3d 1377, 1382-83 (Fed. Cir. 2000) ("The phrase 'consisting of' is a term of art in patent law

signifying restriction and exclusion, while, in contrast, the term 'comprising' indicates an open-ended construction. . . . A drafter uses the term 'comprising' to mean 'I claim at least what follows and potentially more.'") (internal citation omitted). Thus the claim would cover a four-step method that included a step wherein the droplet was broken after the second step, but before the third step, so long as all three recited steps are performed. *See id.*

E. "providing"/"said at least 1,000 droplets"/"a plurality of cells"

"providing" ('530 patent, claim 1)	
Party	**Construction**
10X	Plain meaning
Bio-Rad	Indefinite; or, in the alternative, "in one experiment"
Staff	"providing as inputs for a droplet generation process"
"said at least 1,000 droplets" ('530 patent, claim 1)	
Party	**Construction**
10X	"1,000 or more droplets"
Bio-Rad	"said at least 1,000 droplets from one experiment"
Staff	Plain and ordinary meaning
"a plurality of cells" ('530 patent, claim 1)	
Party	**Construction**
10X	"two or more cells"
Bio-Rad	Indefinite; or, in the alternative, "a plurality of cell from the same sample"
Staff	"two or more cells from a common sample (which may be a pooled sample)"

Claim 1 of the '530 patent is directed to a three-step method. The first step requires "providing" at least 1,000 gel beads and "a plurality of cells." '530 patent, col. 47:60-67 & col. 48:58-64. Barcode molecules are attached to each of the gel beads and each of the cells contains polynucleotides. *Id.* The second step requires generating "a plurality of droplets, wherein at least 1,000 droplets of said plurality of droplets each" have "a single gel bead from said plurality of cells" and "a single cell from said plurality of cells." *Id.*, col. 48:60-64. The third step requires using the polynucleotide molecules and barcode molecules to form "a plurality of barcoded polynucleotide molecules" "in each of said 1,000 droplets." *Id.*, col. 48:65-col. 49:4.

Bio-Rad asserts that the terms "providing," "plurality of cells," and "at least 1,000 droplets" render the claim indefinite because the claim "calls for the generation of 1,000 droplets containing specific material but does not describe how or under what circumstances those droplets are formed." RRB at 23. In making this argument, Bio-Rad confuses breadth with indefiniteness. Breadth does not render a claim indefinite. *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1367 (Fed. Cir. 2017 ("[B]readth is not indefiniteness.") (quoting *SmithKline Beecham Corp. v. Apotex Corp.*, 403 F.3d 1331, 1341 (Fed. Cir. 2005)) (internal quotation marks omitted); Manual of Patent Examining Procedure § 2173.02 ("A broad claim is not indefinite merely because it encompasses a wide scope of subject matter provided the scope is clearly defined."). Standing alone and in the context of the claim, the claim terms identified by Bio-Rad are clear and readily understood "even to lay judges." *Phillips*, 415 F.3d at 1314. Based on the foregoing, I find that Bio-Rad has not shown that claim 1 is indefinite.

Through their proposed constructions, both Staff and Bio-Rad seek to narrow the scope of the claims of the '530 patent. As discussed above, a claim term is to be given its plain and ordinary meaning unless the patentee alters the scope of the term through lexicography or disavowal. *Hill-Rom*, 755 F.3d at 1371. Bio-Rad's proposed constructions of the terms "providing" and "said at least 1,000 droplets" require the claimed method to be performed in "one experiment."[17] According to Bio-Rad, this "construction is most consistent with the plain language of the claim," because "a person of ordinary skill would normally think of the steps in a

[17] Staff has proposed that "providing" be construed to mean "providing as inputs for a droplet generation process." While 10X does not dispute the substance of Staff's proposed construction, it argues that the Staff's proposed construction is unnecessary in view of other claim limitations. CIB at 35-36. "Providing" is not a term of art, but rather an ordinary word that is readily understood by a lay judge. *Phillips*, 415 F.3d at 1314. Accordingly, I agree with 10X that Staff's proposed construction is unnecessary.

method" as being performed in a single experiment. RIB at 32. Thus, Bio-Rad's proposed constructions of the terms "providing" and "at least 1,000 drops" attempt to construe "method" as a single "experiment." As used in the claim, the term "method" is not a term of art, but a legal term. *Nassau Precision Casting Co. v. Acushnet Co.*, 566 Fed. Appx. 933 (Fed. Cir. 2014) (non-precedential). A "method" is a "process" and both "'method' and 'process' have a clear and settled meaning: 'a set of actions, necessarily taken over time.'" *Id.*; *see also Bilski v. Kappos*, 561 U.S. 593, 607 (2010) (relying on definition of "method" as "way or manner of doing anything"); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972) (defining "a process" as "an act, or a series of acts"); *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1316 (Fed. Cir. 2005) (defining "a process" as "a series of acts.") (quoting *Minton v. Nat'l Ass'n of Sec. Dealers, Inc.*, 336 F.3d 1373, 1378 (Fed. Cir. 2003)) (internal quotation marks omitted); *In re Kollar*, 286 F.3d 1326, 1332 (Fed. Cir. 2002) (defining "a process" as "a series of acts or steps"); MPEP § 2106 ("Process—an act, or a series of acts or steps."). In contrast, as 10X and Staff note, the contours of what would constitute a "single experiment" is not well-defined. CIB at 37-38; SRB at 22 n. 12. Thus, defining "method" as a "single experiment" would only create ambiguity by replacing a term that has clear and well-established meaning with one that does not. *See E-Pass Tech., Inc. v. 3Com Corp.*, 473 F.3d 1213, 1220 (Fed. Cir. 2007) ("[T]he terms courts use to enunciate the proper construction of a claim are not themselves limitations that require interpretation").

Bio-Rad's and Staff's proposed constructions also seek to limit the claimed "plurality of cells," by requiring that the cells be obtained from "the same sample" (Bio-Rad) or "a common sample (which may be a pooled sample)" (Staff). Bio-Rad's proposed construction of "plurality of cells" stems from its proposed constructions of "providing" and "at least 1,000 droplets." RIB at 33-34 ("Just as a person of ordinary skill in the art attempting to determine the boundaries of

the claim would focus on the number 1,000 to indicate components of a single experiment, the person of ordinary skill would limit the undefined term 'plurality of cells' to mean cells from one sample used in that single experiment. That is the way a researcher would think about carrying out a single experiment according to the steps identified."). As discussed above, there is no basis for construing "method" to be a "single experiment." Accordingly, Bio-Rad's proposed construction of "plurality of cells" is rejected.

Staff argues that its proposed construction of "plurality of cells" is necessary in order to give life to the claim's numerical limitations requiring at least 1,000 cells, "at least 1,000 gel beads" and "at least 1,000 droplets." CIB at 37-38.[18] According to Staff, absent a requirement that the plurality of cells be drawn from a common sample, the claim's "numerical requirements would not make sense, as the claim could be infringed simply by 5 unrelated repetitions of a droplet generation process using at least 200 gel beads and least 200 cells, or 10 unrelated repetitions of the process using at least 100 gel beads and 100 cells, or 20 unrelated repetitions of the process using at least 50 gel beads and at least 50 cells, *etc.*" *Id.* Staff's concern about preserving the vitality of claim 1's numerical limitations is ungrounded. As drafted, claim 1 is not satisfied by repeating a process that uses less than required number of cells and gel beads or generates less than the required number of droplets.

The second step of claim 1's three-step method requires the generation of "at least 1,000 droplets," while the third step requires generation of barcoded polynucleotide molecules in each

[18] Both 10X and Staff have proposed constructions of "plurality of cells" which would encompass as few as two cells. While such an interpretation is consistent with plain and ordinary meaning of "plurality," it is not consistent with a later claim limitation requiring the generation of at least 1,000 droplets, wherein each droplet has "a single cell from said plurality of cells." '530 patent, col. 48:59-64. Thus, within the context of claim 1, the claimed "plurality of cells" must comprise at least 1,000 cells.

of the "said at least 1,000 droplets." '530 patent, col. 47:60-67 & col. 48:58-64. This language requires that all of the "at least 1,000 droplets" be generated before the third step of claim is performed on any of "said at least 1,000 droplets." If less than 1,000 droplets are generated in the second step, then there is no "said at least 1,000 droplets" for the third step. *E-Pass*, 473 F.3d at 1222 ("[B]ecause the language of most of the steps of its method claim refer to the completed results of the prior step, E-Pass must show that all of those steps were performed in order."). Claim 2, which depends directly from claim 1, supports this interpretation. Claim 2 requires that "prior to (c) [the third step of claim 1], said plurality of polynucleotide molecules are released from said single cell in each of said at least 1,000 droplets." '530 patent, col. 2:5-7. The added step of claim 2 can only be satisfied if all of the "at least 1000 droplets" are generated before any of the droplets are subjected to the third step. *See Gillette Co. v. Energizer Holdings, Inc.*, 405 F.3d 1367, 1373 (Fed. Cir. 2005) (relying on dependent claim's use of the term "a span" to construe independent claim as covering razors with more than one span between razor blades). Interpreting claim 1 otherwise would—as Staff correctly notes—negate the claim's numerical limitations. Such a result is strongly disfavored. *Wasica Finance GmbH v. Cont'l Automotive Sys., Inc.*, 853 F.3d 1272, 1288 n. 10 (Fed. Cir. 2017) ("Construing 'bit sequence' to allow for an empty, zero-bit sequence would effectively remove the 'first bit sequence,' 'second, or third bit sequence,' and 'fourth and final bit sequence' limitations from the claim, as it would make them optional or potentially nonexistent. It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.") (internal citations omitted); *Bicon Inc. v. Straumann, Co.*, 441 F.3d 945, 950-51 (Fed. Cir. 2006) ("[C]laims are interpreted with an eye toward giving effect to all terms in the claim."). Accordingly, a method that generates less than a 1,000 droplets will not infringe claim 1 irrespective of how many times that method is

performed. *See In re Varma*, 816 F.3d 1352, 1362-64 (Fed. Cir. 2016) (finding that the claim requiring "a statistical analysis request corresponding to two or more selected investments" did not encompass two single-investment analyses conducted *seriatim*, but required two investments to be analyzed at the same time).

10X's arguments to the contrary are unpersuasive. While conceding that "unrelated repetitions of non-infringing processes" would not "constitute a single infringing process," 10X contends that the 1,000-droplet threshold can be met though "multiple runs" so long as the runs "are all done as part of the same process." CRB at 21, 40. As discussed above, such an interpretation is contrary to the language of claims 1 and 2. In support of its positon, 10X points to portions of the specification of the '530 patent, which 10X argues teach that the claimed method can be repeated. *See, e.g.*, '530 patent, col. col. 36:49-50 ("With continued reference to FIG. 2, the methods described above are then repeated . . . ."). 10X's reliance on these portions of the specification is misplaced. First, the cited portions of the specification relate to methods for the "[g]eneration of [n]on-[o]verlapping DNA [f]ragments for [s]equencing," not the claimed method, which is a "method for nucleic acid preparation or analysis." *Compare id.*, col. 36:6-7 *with id.*, col. 47:58-59. Second, while the specification states that the "methods" can be repeated, there is no suggestion that the number of partitions (droplets) used in each repetition can be aggregated. Third, even if the specification disclosed aggregating the number of partitions used in multiple runs of the same method, such a disclosure cannot expand the scope of claim 1. *See Scheonhaus v. Genesco, Inc.*, 440 F.3d 1354, 1359 (Fed. Cir. 2006) ("[W]here a patent specification includes a description lacking a feature, but the claim recites that feature, the language of the claim controls."). As discussed above, the claim language of claim 1 requires

that all of the "at least 1,000 droplets" be formed before the third step is performed on any of the droplets.

Based on the foregoing, I find that claim 1 requires that the step of generating "at least 1,000 droplets" be completed before the third step of forming a "plurality of barcoded polynucleotide molecules" is performed in any of the droplets. With that clarification, I find that the terms "providing," "said at least 1,000 droplets," and "a plurality of cells" recited in claim 1 of the '530 patent should be given their plain and ordinary meaning.

VI. CONCLUSION

For the reasons discussed above, I construe the disputed terms from the asserted patents as follows:

The term "1,000,000 oligonucleotides comprising barcode sequences" recited in claim 1 of the '024 patent and claim 1 of the '468 patent means "1,000,000 oligonucleotide molecules that include, but are not necessarily limited to, barcode sequences."

The term "releasably attached" recited in claim 1 of the '024 patent and claim 1 of the '468 patent means "attached in a manner that allows the attached object to be released."

No construction is necessary for the term "reversibly immobilized" recited in claim 15 of the '024 patent.

The term "amplification" recited in claims 1 and 8 of the '024 patent and claims 2 and 21 of the '468 patent; the term "amplifying" recited in claim 11 of the '468 patent and claim 6 of the '530 patent; and the term "amplify" recited in claim 10 of the '024 patent means "increasing the number of copies of the target sequence to be detected." The copies can be exact copies or complementary copies. Reverse transcription is a form of amplification if a cDNA sequence is the target sequence to be detected. Amplification only requires the creation of one or more copies of a template.

The amplification step of claim 1 of the '024 patent can be—but does not have to be—performed in a droplet.

The terms "providing," "said at least 1,000 droplets," and "a plurality of cells" recited in claim 1 of the '530 patent should be given their plain and ordinary meaning. As a point of clarification, the step of generating "at least 1,000 droplets" must be completed before "a plurality of barcoded polynucleotide molecules" is formed in any of the "said at least 1,000 droplets."

Hereafter, discovery and briefing in this Investigation shall be governed by the construction of the claim terms in this Order.

SO ORDERED.

Dee Lord
Administrative Law Judge

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **ORDER** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.**, and the following parties as indicated, on **October 31, 2018.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Investigation No. 337-TA-1100**

NOTICE OF COMMISSION DETERMINATION NOT TO REVIEW AN INITIAL DETERMINATION GRANTING A SUMMARY DETERMINATION THAT THE COMPLAINANT HAS SATISFIED THE ECONOMIC PRONG OF THE DOMESTIC INDUSTRY REQUIREMENT

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission ("Commission") has determined not to review an initial determination (Order No. 19) ("ID") granting a summary determination that the complainant has satisfied the economic prong of the domestic industry requirement in this investigation.

FOR FURTHER INFORMATION, CONTACT: Ron Traud, Office of the General Counsel, U.S. International Trade Commission, 500 E Street SW., Washington, DC 20436, telephone 202-205-3427. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street SW., Washington, DC 20436, telephone 202-205-2000. General information concerning the Commission may also be obtained by accessing its Internet server at *https://www.usitc.gov*. The public record for this investigation may be viewed on the Commission's electronic docket ("EDIS") at *https://edis.usitc.gov*. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal, telephone 202-205-1810.

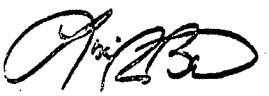
SUPPLEMENTARY INFORMATION: On February 21, 2018, the Commission instituted this investigation based on a complaint filed by 10X Genomics, Inc. of Pleasanton, CA ("10X"). 83 FR 7491 (Feb. 21, 2018). The complaint alleges violations of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, based upon the importation into the United States, the sale for importation, and the sale within the United States after importation of certain microfluidic systems and components thereof and products containing same by reason of infringement of one or more of claims 1-4, 6-9, 17, 20, 21, 23, 25, 27, 29, 31, and 33 of U.S. Patent No. 9,644,204; claims 1, 2, 5, 8, 10, 11, 13, 15-17, 19, 21, and 22 of U.S. Patent No. 9,689,024; claims 1-4, 6-9, 11, 12, 21, and 22 of U.S. Patent No. 9,695,468; and claims 1-6, 8-11, 14-20, and 24-30 of U.S.

Patent No. 9,856,530. *Id.* The Commission's Notice of Investigation named as the sole respondent Bio-Rad Laboratories, Inc. of Hercules, CA. *Id.* The Office of Unfair Import Investigations is participating in this investigation. *Id.*

On October 5, 2018, the ALJ issued the subject ID (Order No. 19), which grants 10X's unopposed motion for a summary determination that it has satisfied the economic prong of the domestic industry requirement. No petitions for review of the subject ID were filed. The Commission has determined not to review the ID.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), and in part 210 of the Commission's Rules of Practice and Procedure (19 CFR part 210).

By order of the Commission.



Lisa R. Barton
Secretary to the Commission

Issued: November 6, 2018

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **NOTICE** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.,** and the following parties as indicated, on **November 6, 2018.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants 10X Genomics, Inc.:

Paul T. Ehrlich
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On Behalf of Respondents Bio-Rad Laboratories, Inc.:

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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of **CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME**	**Inv. No. 337-TA-1100**

ORDER NO. 19: INITIAL DETERMINATION GRANTING SUMMARY DETERMINATION THAT COMPLAINANT HAS SATISFIED THE ECONOMIC PRONG OF THE DOMESTIC INDUSTRY REQUIREMENT

(October 5, 2018)

On August 15, 2018, Complainant 10X Genomics, Inc. ("10X") moved for summary determination that 10X's investments in the United States in the products that 10X alleges practice the claims of the asserted patents (the "domestic industry" or "DI" products) satisfy the economic prong of the domestic industry requirement under each subsection of 19 U.S.C. § 1337(a)(3)(A)-(C). Motion Docket No. 1100-010 (the "motion"). The motion is unopposed. Further, 10X and Respondent Bio-Rad Laboratories, Inc. ("Bio-Rad") have stipulated that 10X satisfies the economic prong of the domestic industry requirement by making significant and substantial investments in the DI products in the United States under each subsection of section 337(a)(3). Motion, Exhibit A (the "Stipulation").

Federal Rule of Civil Procedure 56(a) provides a party may seek summary judgment upon "all or part" of a claim. Fed.R.Civ.P. 56(a).[1] Under section 337, summary determination

[1] Commission Rule 210.18 is analogous to a motion for summary judgment under Rule 56. *Certain Carbon and Alloy Steel Products,* Inv. No. 337-TA-1002, Initial Determination, 2017 WL 5167413 at *11, *not reviewed* by Commission Notice, 2017 WL 6434923 (Nov. 1, 2017).

can be granted as to the economic prong even where disputes remain concerning the technical prong. *E.g.*, *Certain Composite Aerogel Insulation Materials and Methods for Manufacturing the Same,* Inv. No. 337-TA-1003, Order No. 19 at 2-3 (Nov. 15, 2016), *unreviewed in pertinent part by* Comm'n Notice (Dec. 2, 2016) at 1-2; *Certain Graphics Processing Chips, Systems on a Chip, and Products Containing the Same,* Inv. No. 337-TA-941, Order No. 12 (July 16, 2015).

I have reviewed 10X's statement of undisputed material facts and the parties' stipulation. I conclude that the undisputed facts stated therein satisfy the Commission's requirements under the economic prong of section 337(a)(3)(A), (B), and (C), as a matter of law. The facts stated in the parties' Stipulation are adopted and incorporated into this initial determination by reference.[2]

As stated by the Commission in Investigation No. 337-TA-1097:

> In patent proceedings under section 337, a complainant must establish that an industry "relating to the articles protected by the patent . . . exists or is in the process of being established" in the United States. 19 U.S.C. § 1337(a)(2). Under Commission precedent, the domestic industry requirement of section 337 consists of an "economic prong" and a "technical prong." *See, e.g., Alloc, Inc. v. Int'l Trade Comm'n,* 342 F.3d 1361, 1375 (Fed. Cir. 2003).
>
> The "economic prong" of the domestic industry requirement is satisfied when it is determined that the economic activities and investments set forth in subsections (A), (B), and/or (C) of section 337(a)(3) have taken place or are taking place. *Certain Variable Speed Wind Turbines & Components Thereof* Inv. No. 337-TA-376, USITC Pub. No. 3003, Comm'n Op. at 21 (Nov. 1996) *("Wind Turbines").* With respect to the "economic prong," 19 U.S.C. § 1337(a)(3) provides that:
>
> [A]n industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned—
>
> (A) significant investment in plant and equipment;

[2] Bio-Rad stipulates only that the economic prong of the domestic industry requirement, not the technical prong, has been satisfied. Bio-Rad disputes that 10X's products practice any of the asserted patents. This decision makes no findings concerning the technical prong, or any issue in this investigation, other than satisfaction of the economic prong.

> (B) significant employment of labor or capital; or
>
> (C) substantial investment in its exploitation, including engineering, research and development, or licensing.
>
> Given that these criteria are listed in the disjunctive, satisfaction of any one of them will be sufficient to meet the domestic industry requirement. *Wind Turbines,* Inv. No. 337-TA-376, Comm'n Op. at 15.
>
> The statutory text of section 337 does not limit sections 337(a)(3)(A) and (B) to investments related to manufacturing or any other type of industry. It only requires that the domestic investments in plant and equipment, and employment of labor or capital be "with respect to the articles protected by the patent." 19 U.S.C. § 1337(a)(3). Moreover, even though subsection (C) expressly identifies "engineering" and "research and development" as exemplary investments in the "exploitation" of the patent, that language does not unambiguously narrow subsections (A) and (B) to exclude those same types of investments. 19 U.S.C. § 1337(a)(3)(C).

Comm'n Op. at 7-8.

There is no dispute that 10X has provided sufficient evidence to satisfy the economic prong under subsection (A), (B) and (C) of section 337 with respect to the DI products, which are 10X's GemCode™ and Chromium™ product lines for single-cell and linked-read applications, including with respect to each of Chromium™ Genome Solution, Chromium™ Exome Solution, Chromium™ *de novo* Assembly Solution, and GemCode™ Long Read platform (collectively, "10X's linked-read applications"), and Chromium™ Single Cell 3' Solution, Chromium™ Single Cell V(D)J Solution, and GemCode™ Single Cell platform (collectively, "10X's single-cell applications). Stipulation at ¶ 1-2. A summary of the expenditures related to the DI products follows, as stipulated to by the parties.

The parties agree that 10X has made significant investments in plant and equipment related to each of the DI Products. 19 U.S.C. § 1337(a)(3)(A). Specifically, 10X maintains its headquarters, including its manufacturing facility, in Pleasanton, California. [redacted]

[redacted]

[redacted]

The parties also agree that 10X has made significant investments in the United States in labor and capital related to each of the DI products. 19 U.S.C. §1337(a)(3)(B). [redacted] 10X's entire labor force is substantially dedicated to manufacturing, developing, selling, promoting and supporting 10X's DI products. [redacted]

[redacted]

Further, 10X has made substantial investments in the U.S. in the exploitation of the asserted patents through the engineering, research and development of each of the DI products. 19 U.S.C. §1337(a)(3)(C). [redacted]

The parties agree, moreover, that 10X's investments are significant and substantial both qualitatively and quantitatively. *Id.* at ¶ 7. The parties stipulate that activities involving 10X's DI Products account for substantially all of 10X's operations. *Id.* at ¶ 77.

Accordingly, Motion Docket No. 1100-010 is GRANTED.

Pursuant to Commission Rule 210.42(h), this initial determination shall become the determination of the Commission unless a party files a petition for review of the initial determination pursuant to Commission Rule 210.43(a), or the Commission, pursuant to Commission Rule 210.44, orders, on its own motion, a review of the initial determination or certain issues contained herein. 19 C.F.R. § 210.42(d).

This order is being issued with a confidential designation, and pursuant to Ground Rule 1.10, each party shall submit to the Administrative Law Judge a statement as to whether or not it seeks to have any portion of this order deleted from the public version within seven (7) days. *See* 19 C.F.R. § 210.5(f). A party seeking to have a portion of the order deleted from the public version thereof must attach to its submission a copy of the order with red brackets indicating the portion(s) asserted to contain confidential business information.[3] The parties' submissions under this subsection need not be filed with the Commission Secretary but shall be submitted by paper copy to the Administrative Law Judge and by e-mail to the Administrative Law Judge's attorney advisor.

SO ORDERED.

Dee Lord

Dee Lord
Administrative Law Judge

[3] Redactions should be limited to avoid depriving the public of the basis for understanding the result and reasoning underlying the decision. Parties who submit excessive redactions may be required to provide an additional written statement, supported by declarations from individuals with personal knowledge, justifying each proposed redaction and specifically explaining why the information sought to be redacted meets the definition for confidential business information set forth in Commission Rule 201.6(a). 19 C.F.R. § 201.6(a).

CERTAIN MICROFLUIDIC SYSTEMS AND COMPONENTS THEREOF AND PRODUCTS CONTAINING SAME

Inv. No. 337-TA-1100

PUBLIC CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the attached **ORDER** has been served by hand upon the Commission Investigative Attorney, **Monica Bhattacharyya, Esq.**, and the following parties as indicated, on **October 31, 2018.**

Lisa R. Barton, Secretary
U.S. International Trade Commission
500 E Street, SW, Room 112
Washington, DC 20436

On Behalf of Complainants 10X Genomics, Inc.:

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- ☐ Via Hand Delivery
- ☑ Via Express Delivery
- ☐ Via First Class Mail
- ☐ Other:_____

On Behalf of Respondents Bio-Rad Laboratories, Inc.:

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