

UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of

**CERTAIN ELECTRONIC DEVICES AND
SEMICONDUCTOR DEVICES HAVING
WIRELESS COMMUNICATION
CAPABILITIES AND COMPONENTS
THEREOF**

Inv. No. 337-TA-1367

ORDER NO. 29: CONSTRUING CERTAIN CLAIM TERMS

(January 23, 2024)

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I. INTRODUCTION

This Investigation was instituted by the Commission on July 21, 2023, to determine whether the importation, sale for importation, or sale within the United States after importation of certain electronic devices and semiconductor devices having wireless communication capabilities and components thereof violates section 337 of the Tariff Act of 1930, as amended, due to infringement of certain claims of U.S. Patent Nos. 7,564,914 (“the ’914 patent”), RE48,629 (“the ’629 patent”), and 8,416,862 (“the ’862 patent”). *See* 88 Fed. Reg. 48,493 (July 27, 2023) (hereinafter, “Notice of Investigation”). Bell Northern Research, LLC (“Complainant” or “BNR”) is the complainant. *Id.* at 48,494. NXP Semiconductors, N.V., NXP USA, Inc. (collectively, “NXP”), Laird Connectivity, LLC (“Laird”), MediaTek Inc., MediaTek USA Inc. (collectively, “MediaTek”), ASUSTek Computer Inc., and ASUS Computer International (collectively, “ASUS” and, as a whole, “Respondents”) are the named respondents.¹ 88 Fed. Reg. 48,493, at 48,494. The Commission Investigative Staff is a party to this Investigation. *Id.*

A *Markman* hearing was held on December 7, 2023.² Prior to the hearing, the parties submitted briefing and a Joint Claim Construction Chart.³

¹ The complaint was withdrawn as to named respondent Qualcomm Technologies, Inc. Order No. 12 (Sept. 1, 2023), *unreviewed*, Comm’n Notice, EDIS Doc. ID 804708 (Sept. 22, 2023).

² The transcript of the *Markman* hearing is available on EDIS as Doc. ID 810102 and is cited as “Markman Tr.” in this order.

³ For convenience, the briefs and chart submitted by the parties are referred to hereafter as:

CMIB	Complainant’s Opening Claim Construction Brief (EDIS Doc. ID 806483)
CMRB	Complainant’s Rebuttal Claim Construction Brief (EDIS Doc. ID 808248)
CSMIB	Complainant’s Supplemental Claim Construction Brief on Indefiniteness (EDIS Doc. ID 809143)
CSMRB	Complainant’s Responsive Claim Construction Brief on Indefiniteness (EDIS Doc. ID 809657)
RMIB	Respondents’ Opening Claim Construction Brief (EDIS Doc. ID 806473, 806698 (corrected Ex. 1))

II. IN GENERAL

The claim terms construed in this Order are done so for the purposes of this section 337 Investigation. Those terms not in dispute need not be construed. *See Vanderlande Indus. Nederland BV v. Int'l Trade Comm'n*, 366 F.3d 1311, 1323 (Fed. Cir. 2004) (noting that the administrative law judge need only construe disputed claim terms).

III. RELEVANT LAW

“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*) (cleaned up), *aff'd*, 517 U.S. 370 (1996). Claim construction is a “matter of law exclusively for the court.” *Id.* at 970-71. “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).

Claim construction focuses on the intrinsic evidence, which consists of the claims themselves, the specification, and the prosecution history. *See Phillips v. AWH Corp.*, 415 F.3d

RMRB	Respondents' Reply Claim Construction Brief (EDIS Doc. ID 808254)
RSMIB	Respondents' Opening Supplemental Claim Construction Brief Regarding Indefiniteness (EDIS Doc. ID 809131)
RSMRB	Respondents' Rebuttal Supplemental Claim Construction Brief Regarding Indefiniteness (EDIS Doc. ID 809654)
SMIB	Commission Investigative Staff's Initial Markman Brief (EDIS Doc. ID 806476)
SMRB	Commission Investigative Staff's Rebuttal Markman Brief (EDIS Doc. ID 808255)
SSMIB	Commission Investigative Staff's Opening Supplemental Markman Brief (EDIS Doc. ID 809120)
SSMRB	Commission Investigative Staff's Rebuttal Supplemental Markman Brief (EDIS Doc. ID 809647)
JC	Joint Proposed Claim Construction Chart (EDIS Doc. ID 809823)

1303, 1314 (Fed. Cir. 2005) (*en banc*); *see also Markman*, 52 F.3d at 979. As the Federal Circuit in *Phillips* explained, courts must analyze each of these components to determine the “ordinary and customary meaning of a claim term” as understood by a person of ordinary skill in the art at the time of the invention. 415 F.3d at 1313. “Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language.” *Bell Atl. Network Servs., Inc. v. Covad Commc’ns Grp., Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001).

“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.’” *Phillips*, 415 F.3d at 1312 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). “Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claims terms.” *Id.* at 1314; *see also Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001) (“In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to particularly point out and distinctly claim the subject matter which the patentee regards as his invention.”) (cleaned up). The context in which a term is used in an asserted claim can be “highly instructive.” *Phillips*, 415 F.3d at 1314. Additionally, other claims in the same patent, asserted or unasserted, may also provide guidance as to the meaning of a claim term. *Id.*

The 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 Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). “[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Id.* at 1316. “In

other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor.” *Id.* As a general rule, however, the particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. *Id.* at 1323. In the end, “[t]he construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be . . . the correct construction.” *Id.* at 1316 (quoting *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)).

In addition to the claims and the specification, the prosecution history should be examined, if in evidence. *Id.* at 1317; *see also Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004). The 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.” *Phillips*, 415 F.3d at 1317; *see also Chimie v. PPG Indus. Inc.*, 402 F.3d 1371, 1384 (Fed. Cir. 2005) (“The purpose of consulting the prosecution history in construing a claim is to exclude any interpretation that was disclaimed during prosecution.”) (cleaned up).

When the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence (*i.e.*, all evidence external to the patent and the prosecution history, including dictionaries, inventor testimony, expert testimony, and learned treatises) may be considered. *Phillips*, 415 F.3d at 1317. Extrinsic evidence is generally viewed as less reliable than the patent itself and its prosecution history in determining how to define claim terms. *Id.* at 1317. “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).

If, after a review of the intrinsic and extrinsic evidence, a claim term remains ambiguous, the claim should be construed so as to maintain its validity. *Phillips*, 415 F.3d at 1327. Claims, however, cannot be judicially rewritten in order to fulfill the axiom of preserving their validity. *See Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999). Thus, “if the only claim construction that is consistent with the claim’s language and the written description renders the claim invalid, then the axiom does not apply and the claim is simply invalid.” *Id.*

A claim must also be definite. Pursuant to 35 U.S.C. § 112, second paragraph: “The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, ¶ 2. In *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014), the Supreme Court held that § 112, ¶ 2 requires “that a patent’s claims, viewed in light of the specification and prosecution history inform those skilled in the art about the scope of the invention with reasonable certainty.” *Id.* at 2129. A claim is required to “provide objective boundaries for those of skill in the art,” and a claim term is indefinite if it “might mean several different things and no informed and confident choice is among the contending definitions.” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). A patent claim that is indefinite is invalid. 35 U.S.C. § 282(b)(3)(A). Proving indefiniteness requires clear and convincing evidence. *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1365 (Fed. Cir. 2017).

IV. THE ASSERTED PATENTS⁴

A. The '914 Patent

The '914 patent is entitled “Method and System for Frame Formats for MIMO Channel Measurement Exchange” and lists Christopher J. Hansen, Carlos H. Aldana, and Joonsuk Kim as inventors. Compl. Ex. 1 (EDIS Doc. ID 799056, Att. 2012052) (hereinafter, “'914 patent”) at cover. The '914 patent was issued on July 21, 2009. *Id.* BNR asserts that it owns the '914 patent by assignment. Compl. ¶ 33. The '914 patent generally relates to a system and method for MIMO (Multiple Input Multiple Output) channel measurement exchange. '914 patent at 5:59–61.

The '914 patent has 36 claims. Claims 13, 14, 17, 21, and 22 are asserted in this Investigation. Notice of Investigation at 48,493. These claims read as follows (with the first instance of the agreed-upon term in *italics* and the first instance of the disputed terms highlighted in **bold**):

13. A method for communicating information in a communication system, the method comprising:

receiving data via a plurality of RF channels utilizing a plurality of receiving antennas;

transmitting feedback information via at least one of said plurality of RF channels;

requesting modification of a transmission mode for **subsequent received data in transmitted response messages comprising said feedback information**;

transmitting said feedback information comprising **channel estimates** based on transmission characteristics of said received data *via at least one of said plurality of receiving antennas*; and

deriving said feedback information from mathematical matrix decomposition of said channel estimates.

⁴ The parties do not seek to construe any terms from the '862 patent. This order therefore does not address the '862 patent.

14. The method according to claim 13, comprising receiving requests for said feedback information utilizing at least one of said plurality of receiving antennas via said at least one of said plurality of RF channels.
17. A method for communicating information in a communication system, the method comprising:
- receiving data via a plurality of RF channels utilizing a plurality of receiving antennas;
- transmitting feedback information via at least one of said plurality of RF channels;
- requesting modification of a transmission mode for subsequent received data in transmitted response messages comprising said feedback information;
- transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data via at least one of said plurality of receiving antennas; and
- deriving said feedback information from mathematical averaging of a result of mathematical matrix decomposition of said channel estimates.
21. A method for communicating information in a communication system, the method comprising:
- receiving data via a plurality of RF channels utilizing a plurality of receiving antennas;
- transmitting feedback information via at least one of said plurality of RF channels;
- requesting modification of a transmission mode for subsequent received data in transmitted response messages comprising said feedback information;
- transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data via at least one of said plurality of receiving antennas; and
- deriving said feedback information from calibration of said channel estimates for communication in at least one direction via said at least one of said plurality of RF channels.
22. The method according to claim 21, comprising receiving requests for said feedback information utilizing at least one of said plurality of receiving antennas via said at least one of said plurality of RF channels.

B. The '629 Patent

The '629 patent is entitled “Backward-Compatible Long Training Sequences for Wireless Communication Networks” and lists Jason Alexander Trachewsky and Rajendra T. Moorti as inventors. Compl. Ex. 2 (EDIS Doc. ID 799056, Att. 2012051) (hereinafter, “'629 patent”) at cover. The '629 patent was issued on July 6, 2021. *Id.* The '629 patent is a reissue of U.S. Patent No. 7,990,842 (“the '842 patent”), which issued on August 2, 2011. *Id.* BNR asserts that it owns the '629 patent by assignment. Compl. ¶ 35. The '629 patent generally relates to a network device for generating an expanded long training sequence with a minimal peak-to-average ratio. '629 patent at 2:56–58.

The '629 patent has 30 claims, including claims 2, 3, 5, 6, and 7 which were cancelled during reissue proceedings. Claims 1, 8-11, 13, 14, 19, 20, and 27 are asserted in this Investigation. Notice of Investigation at 48,493. These claims read as follows (with the first instance of the agreed-upon term in *italics* and the first instance of the disputed terms highlighted in **bold**):

1. A wireless communications device, comprising:
 - a signal generator that generates an extended long training sequence; and
 - an *Inverse Fourier Transformer* operatively coupled to the signal generator,wherein the Inverse Fourier Transformer processes the extended long training sequence from the signal generator and provides **an optimal extended long training sequence with a minimal peak-to-average ratio**, and
- wherein at least the optimal extended long training sequence is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme,
- wherein the optimal extended long training sequence is carried by exactly 56 active sub-carriers, and
- wherein the optimal extended long training sequence is represented by encodings for indexed sub-carriers –28 to +28, excluding indexed sub-carrier 0 which is set to zero, as follows:

<i>Sub-carrier</i>	-28	-27	-26	-25	-24	-23	-22
<i>Encoding</i>	+1	+1	+1	+1	-1	-1	+1
<i>Sub-carrier</i>	-14	-13	-12	-11	-10	-9	-8
<i>Encoding</i>	+1	+1	+1	-1	-1	+1	+1
<i>Sub-carrier</i>	1	2	3	4	5	6	7
<i>Encoding</i>	+1	-1	-1	+1	+1	-1	+1
<i>Sub-carrier</i>	15	16	17	18	19	20	21
<i>Encoding</i>	+1	+1	-1	-1	+1	-1	+1
<i>Sub-carrier</i>	-21	-20	-19	-18	-17	-16	-15
<i>Encoding</i>	+1	-1	+1	-1	+1	+1	+1
<i>Sub-carrier</i>	-7	-6	-5	-4	-3	-2	-1
<i>Encoding</i>	-1	+1	-1	+1	+1	+1	+1
<i>Sub-carrier</i>	8	9	10	11	12	13	14
<i>Encoding</i>	-1	+1	-1	-1	-1	-1	-1
<i>Sub-carrier</i>	22	23	24	25	26	27	28
<i>Encoding</i>	-1	+1	+1	+1	+1	-1	-1

8. The wireless communications device according to claim 1, wherein a binary phase shift key encoding is used for each sub-carrier above the +26 indexed sub-carrier and below the -26 indexed sub-carrier.
9. The wireless communications device according to claim 1, wherein the Inverse Fourier Transformer comprises an Inverse Fast Fourier Transformer or an Inverse Discrete Fourier Transformer.
10. The wireless communications device according to claim 1, wherein the wireless communications device comprises one or more of the following: a personal digital assistant, a laptop computer, a personal computer, a processor, and a cellular phone.
11. The wireless communications device according to claim 1, wherein the wireless communications device comprises a wireless mobile communications device.
13. The wireless communications device according to claim 1, wherein the wireless communications device is backwards compatible with legacy wireless local area network devices.
14. The wireless communications device according to claim 1, wherein the optimal extended long training sequence is longer than a long training sequence used by a legacy wireless local area network device in accordance with a legacy wireless networking protocol standard.
19. The wireless communications device according to claim 1, wherein the extended long training sequence or the optimal extended long training sequence is encoded using binary phase shift key encoding on each of the 56 active subcarriers.

20. The wireless communications device according to claim 1, comprising:
a symbol mapper operatively coupled to the signal generator, wherein the symbol mapper receives coded bits and generates symbols for each of 64 subcarriers of an Orthogonal Frequency Division Multiplexing sequence.
27. The wireless communications device according to claim 1, wherein an output of the Inverse Fourier Transformer is operatively coupled to a time-domain windower.

V. LEVEL OF ORDINARY SKILL IN THE ART

In their briefing, the parties argue that the same level of ordinary skill in the art applies for the '914 and '629 patents.

BNR argues that “[a] person of ordinary skill in the art for the Asserted Patents would have a bachelor’s degree in electrical engineering or a related field and two or more years of relevant industry experience in the design of semiconductor devices. Graduate studies in electrical engineering or a related field may substitute for work experience and, likewise, additional work experience may substitute for relevant formal education.” CIMB at 1.

Respondents argue that “[a] [person of ordinary skill in the art] at the time of the alleged invention would have had a Bachelor’s degree in Electrical Engineering, Computer Engineering, Computer Science, or a related field, and at least 2-4 years of experience in the field of wireless communication. Equivalent education, work, or experience in this field could substitute for the foregoing qualifications.” RIMB at 4; *see also* RSIMB at 2.

Staff argues that either of the proposals would be appropriate based on the current record. SIMB at 2-3.

The differences between the proposed levels of skill in the art are minor, and no party disputes that any claim construction dispute is dependent upon the level of ordinary skill in the art. To the extent a finding is required at this stage, I adopt Respondents’ proposed level of ordinary skill in the art for purposes of this Order. *Cf. Genzyme Therapeutic Prods. Ltd. P’ship v. Biomarin*

Pharm. Inc., 825 F.3d 1360, 1372 (Fed. Cir. 2016) (failure to make a specific finding about the required level of skill in the art is not reversible error where the record did not show any meaningful differences in proposed definitions or that the outcome of the case would have been different based on which definition was selected). If a dispute arises which is dependent upon the level of ordinary skill in the art, the parties should be prepared to address this issue again later in the investigation.

VI. CLAIM CONSTRUCTION

A. The Agreed Terms

In the Joint Claim Construction Chart, the parties identified the following agreed constructions:

TERM	AGREED CONSTRUCTION
“via at least one of said plurality of receiving antennas” '914 patent claims 13, 17, and 21	“modifies the verb ‘transmitting’ in the greater term: ‘transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data via at least one of said plurality of receiving antennas’”
“Inverse Fourier Transformer” '629 patent claim 1	“hardware and/or software within the wireless communications device that converts a frequency-domain signal into a time-domain signal using an inverse Fourier transform”

JC at 2, 3.

B. “channel estimates”

The term “channel estimates” appears in claim 13, 17, and 21 of the '914 patent. The parties disagree on the claim construction of this term and have proposed the following construction:

BNR	RESPONDENTS	STAFF
“information that quantifies characteristics of the wireless path between the transmitter and the receiver”	“estimates of the values of H”	Plain and ordinary meaning ⁵

JC at 2. The term “channel estimates” first appears in the following limitation of claim 13, and identical limitations of claims 17 and 21:

transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data via at least one of said plurality of receiving antennas; and

’914 patent at claims 13, 17, 21.

BNR devotes several pages to discussing channel estimation, arguing that it “involves the estimation of various channel characteristics to understand how the wireless channel . . . affects the transmitted signal.” CIMB at 4; *see also id.* at 4-6. It argues that channel estimation is used to “estimate several characteristics [*sic*] of the wireless channel” such as “channel attenuation (magnitude), phase shift, delay spread, Doppler shift, frequency response, noise and interference levels, channel coefficients, channel correlation, channel impulse response, channel state information (CSI), and others.” *Id.* at 4. BNR acknowledges that in MIMO systems, the channel transfer function (or channel impulse response) “is a matrix or sequence of matrices.” *Id.* at 5. It argues that the specification teaches deriving feedback information from the channel estimates. *Id.* at 6. It states that “the ‘channel estimates’ comprise information used to derive channel estimate matrices and other matrices[]” but then argues that in the context of the patent, “channel estimates” means “information that quantifies characteristics of the RF channel[.]” *Id.* at 6.

⁵ Staff’s position has changed since its initial Markman brief, in which it agreed with BNR’s proposed construction. SIMB at 7.

BNR argues that it would be improper to limit the term “channel estimates” to “estimates of the values of H .” CIMB at 6. BNR argues that the patentee did not serve as a lexicographer because the patentee used the term “may” which BNR contends does not rise to the level of “a clear and unmistakable definition” or a “clear[] and unmistakabl[e] disavow[al] [of] other factors that the ‘channel estimates’ may constitute.” *Id.* at 6-7. BNR argues that even if “channel estimates” is meant to refer to estimates of the values of the channel transfer function, “Respondents’ proposal is unworkably vague to the extent it refers to neither time nor frequency.” *Id.* at 7. BNR argues that the transfer function can also be a function of frequency, not just time. *Id.* It argues that “simply dropping ‘(t)’” would result in a more vague term because “[a] POSITA faced with Respondents’ proposed definition would be left to guess whether ‘estimates of the values of H ’ refers to $H(t)$, $H(f)$, H_{est} , or a different ‘ H ’ altogether.” *Id.* at 8 (citing *id.*, Cooklev Decl. ¶ 55). BNR also argues that “Respondents are wrong to limit the transfer function to ‘ $H[]$ ’” because “the transfer function could just as accurately be represented by ‘ G ,’ ‘ C ,’ or any other label.” *Id.* (citing *id.*, Cooklev Decl. ¶¶ 41-42).

In reply, BNR argues that a proposed alternative from Respondents, “an estimate of the ‘true’ values of $H(t)[,]$ ” is “even more problematic” because it eliminates frequency-varying characteristics and the word “true” is allegedly vague. CRMB at 6. BNR also argues Respondents’ proposed construction is vague because Respondents “fail to address any of the nuances of what ‘values’ could mean[,]” such as whether it is real, imaginary, complex, or has a magnitude and phase. *Id.* at 7. BNR also argues that its prior positions in district court are distinguishable because a different patent with different claims were at issue. *Id.* at 9-10. Finally, Respondents argue that the specification does not exclude information such as “noise,” “matrices,” “number of antennas,

bandwidth, or modulation type” from being a characteristic that can qualify as a channel estimate. *Id.* at 11-12.

Respondents argue that the intrinsic evidence clearly supports its position, including what they contend is a clear definition in the specification. RIMB at 5. Respondents argue that this “constitutes lexicography.” *Id.* Respondents argue that the ’914 patent “repeatedly and exclusively treats ‘channel estimates’ as referring to estimates of the values of H.” *Id.* at 6 (citing evidence). Respondents argue that the use of estimates of H as a “channel estimate” “contrasts with other types of information that the specification explicitly distinguishes” from a channel estimate, such as other matrices V, S, U, R, D, and L. *Id.* at 6-7. They also argue that the ’914 patent distinguishes certain characteristics that are allegedly not a channel estimate, including number of spatial streams, number of transmit antennas, bandwidth, code rate, error correcting code type, and type of modulation. *Id.* at 7.

Respondents argue that BNR’s prior proposals and prior constructions of a related patent, U.S. Patent No. 7,957,450, also support their proposal. *Id.* at 7-8. They contend that in prior litigation in the Southern District of California and Eastern District of Texas, BNR either argued or agreed to a construction of “channel estimate matrix” that included “estimates of the values of H(t)” or similar language. *Id.* at 8. Respondents argue that “channel estimates” should be construed consistently with these prior constructions. *Id.* at 8-9.

Respondents further argue that its construction is the plain and ordinary meaning of the term “channel estimates.” *Id.* at 9. They argue that “channel estimate” is a known term and is “almost always represented by H.” *Id.* Respondents finally argue that BNR’s argument is overbroad because it includes characteristics that the ’914 patent distinguishes from the claimed channel estimates, including noise, matrices disclosed as derived from a channel estimate, and

information that is part of the mode request/response embodiment, such as number of antennas, bandwidth, or modulation type. *Id.* at 10-11.

In reply, Respondents argue that certain criticisms, such as the one about the removal of “true” and “(t)” are criticism of attempts by Respondents to reach agreement during meet-and-confer. RRMB at 5-7. Respondents argue that if these “departures” cause concern, then the verbatim definition should be adopted. *Id.* at 7. Respondents also argue that BNR’s concerns about use of “H” as opposed to “G” or “C” are theoretical. *Id.* at 7-8. Respondents also reiterate their argument that BNR’s proposal is overly broad, because it includes information that is not a “channel estimate.” *Id.* at 8-10. Respondents argue that the file history provides no insight into the definition of “channel estimates.” *Id.* at 13-14.

Although Staff initially agreed with BNR’s construction, it explains that Dr. Cooklev’s deposition raised a “concern[] that its proposed construction may be *too* broad.” SRMB at 2. Staff explained that at his deposition, Dr. Cooklev took a position that information that was broader than Staff’s understanding of what was a channel estimate, such as number of antennas. *Id.* at 2. Staff’s new position in reply therefore was that plain and ordinary meaning would be a proper construction at this stage. *Id.*

As an initial matter, I reject Staff’s argument to simply construe the term as plain and ordinary meaning. The parties’ briefs show a clear dispute about the meaning and scope of the claim term “channel estimates[.]” The dispute about the meaning of “channel estimates” is also material to an indefiniteness dispute. *See* § VI.E, *infra*. As the Federal Circuit explained, “[w]hen the parties present a fundamental dispute regarding the scope of a claim term, it is the court’s duty to resolve it.” *O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co., Ltd.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008). “A determination that a claim term ‘needs no construction’ or has the ‘plain and

ordinary meaning’ may be inadequate when a term has more than one ‘ordinary’ meaning or when reliance on a term’s ‘ordinary’ meaning does not resolve the parties’ dispute.” *Id.* at 1361. Adopting plain and ordinary meaning would not resolve this dispute because it would not resolve BNR and Respondents’ dispute about the meaning of “channel estimates.” I will therefore resolve this dispute as a matter of claim construction.

The evidence shows that the patentee served as its own lexicographer and defined “channel estimates.” The Federal Circuit has identified two strong indications that a patentee is serving as its own lexicographer: 1) setting off the term by quotation marks and 2) using the term “is” or “are” with the term. *Sinorgchem Co., Shandong v. Int’l Trade Comm’n*, 511 F.3d 1132, 1136 (Fed. Cir. 2007); *see also Netscape Commc’ns Corp. v. ValueClick, Inc.*, 684 F. Supp. 2d 687, 688 (E.D. Va. 2009) (“Significantly, the patentee’s intention to act as lexicographer is evidenced by two recognized indicators: (i) the use of quotation marks around the claim term and (ii) the patentee’s use of the word ‘are.’”). “Known as” has been recognized as an indication of lexicography. *Lambeth Magnetic Structures, LLC v. Seagate Tech. (US) Holdings, Inc.*, Civil Action No. 16-538, 2017 WL 4681328, at *6 (W.D. Pa. Oct. 18, 2017).

The ’914 patent uses both strong indicators of lexicography for “channel estimates.” The first mention in the specification of the ’914 patent of “channel estimates” is shown below:

In MIMO systems which communicate according to specifications in IEEE resolution 802.11, the receiving mobile terminal may compute $H(t)$ each time a frame of information is received from a transmitting mobile terminal based upon the contents of a preamble field in each frame. **The computations which are performed at the receiving mobile terminal may constitute an estimate of the “true” values of $H(t)$ and may be known as “channel estimates”.** For a frequency selective channel there may be a set of $H(t)$ coefficients for each tone that is transmitted via the RF channel. To the extent that $H(t)$, which may be referred to as the “channel estimate matrix”, changes with time and to the extent that the transmitting mobile terminal fails to adapt to those changes, information loss between the transmitting mobile terminal and the receiving mobile terminal may result.

'914 patent at 4:15-29 (emphasis added). The specification sets off the term “channel estimates” with quotation marks and uses definitional language, “may be known as[.]” *Id.*; *see also Sinorgchem*, 511 F.3d at 1146. The specification also provides definitions for terms provided in this definition. The specification explains that $H(t)$ is the representation of the transfer system function. '914 patent at 3:58-62. It explains that “[t]he relationship between a time varying transmitted signal, $x(t)$, a time varying received signal, $y(t)$, and the systems function may be represented as” an equation “ $y(t)=H \times x(t)+n(t)$ ” where $n(t)$ represents noise. *Id.* at 3:58-4:3. It explains that “[i]n the case of fast fading, the transfer function, H , may itself become time varying and may thus also become a function of time, $H(t)$. Therefore, individual coefficients, $h_{ij}(t)$, in the transfer function $H(t)$ may become time varying in nature.” *Id.* at 4:10-14.

The specification’s use of the term “channel estimate” is consistent with this definition of “channel estimates” as estimates of the transfer system function. For example, it describes to a “reverse channel estimate matrix, H_{up} , for the channel defined in an uplink direction from the receiving mobile terminal to the transmitting mobile terminal.” *Id.* at 5:4-7. And it describes a “forward channel estimate matrix, H_{down} , for the channel defined in a downlink direction from the transmitting mobile terminal to the receiving mobile terminal.” *Id.* at 5:7-12. The specification explains that in one embodiment, the transmitting mobile terminal may compute the full forward channel estimate matrix, H_{down} . *Id.* at 10:27-32. It also describes a “full channel estimate matrix which is computed by a receiving mobile terminal, $H_{est}[\cdot]$ ” which is represented by equation [2] “ $H_{est}=USV^H[\cdot]$ ” *Id.* at 8:57-60. Each of these various forms of H are channel estimates.

The specification’s use of the term “channel estimates” also distinguishes it from information derived from, or which can be used to derive, channel estimates. For instance, in equation [2], $H_{est}=USV^H$, “ H_{est} may be a complex matrix[.]” “ U may be an orthonormal complex

matrix[,] “S may be a diagonal real matrix[,]” and “V may be an orthonormal complex matrix . . . with V^H being the Hermitian transform of the matrix V.” *Id.* at 8:62-9:2. The ’914 patent explains that “the channel estimate matrix H_{est} from the SVD in equation[2] may be reconstructed by a transmitting mobile terminal from feedback information” containing only certain information. *Id.* at 9:27-30. In one embodiment, H can be calculated from the matrices U, S, and V. *Id.* at 8:57-9:9. In another embodiment, the transmitting mobile terminal can compute H_{down} , send it to the receiving terminal, and the receiving terminal can perform mathematical operations to derive matrices S_{down} and V_{down}^H based on a setting of U_{down} . *Id.* at 10:27-37. Another embodiment also discusses using the channel estimate matrix to derive V and S. *Id.* at 16:7-9. Thus, while matrices U, S, and V can be either derived from a channel estimate or used to derive a channel estimate, the specification does not call any of them “channel estimates.” Likewise, although the number of receiving and transmitting antenna determine the number of rows and columns of the channel estimate matrix, *id.* at 8:62-65, they are not called a channel estimate.

The intrinsic evidence thus shows that the patentee intended to serve as its own lexicographer to define “channel estimates” as the estimate of the values of the transfer system function.⁶ I am unpersuaded by BNR and Staff’s arguments that the use of “may” undermines this intent. To serve as its own lexicographer, the patentee “clearly set forth a definition of the disputed claim term” and “clearly express an intent to redefine the term.” *See Thorner v. Sony Comp. Ent’t Am LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (cleaned up).⁷ The Federal Circuit has found that

⁶ I note that this is also consistent with BNR’s positions in prior litigation over U.S. Patent No. 7,957,450 (“the ’450 patent”) relating to the terms “channel estimate matrices” and “matrix based on the plurality of channel estimates.” RIMB Ex. 10 at 7-8, Ex. 11 at 18, Ex. 13 at 20.

⁷ Although BNR argues that this definition must rise to the level of a clear and unmistakable disclaimer, *see* CIMB at 7, that is not the test for lexicography. *See Thorner*, 669 F.3d at 1365-66.

a patentee served as its own lexicographer where it defined the term using the phrase “sometimes referred to” when the patentee also used the term consistently with that definition in the specification. *Kyocera Senco Indus. Tools Inc. v. Int’l Trade Comm’n*, 22 F.4th 1369, 1378-79 (Fed. Cir. 2022). I therefore find that in view of the intrinsic evidence, use of the word “may” does not undermine the other clear expressions of intent by the patentee to serve as its own lexicographer.

Even if the patentee had not served as its own lexicographer, the evidence also shows that Respondents’ proposed construction is the plain and ordinary meaning of “channel estimates” in the context of the ’914 patent. As I explained above, Respondents’ proposed construction is supported by the intrinsic evidence consistently referring to “channel estimates” as estimates of the values of the channel transfer function. Although I do not need to reach the extrinsic evidence, I note that I find the testimony of Respondents’ expert, Dr. Buehrer, persuasive because it is in accordance with the specification. Dr. Buehrer explained that a channel estimate in a multiple-input multiple-output communication system is commonly referred to as H and is understood to be an estimate of the complex channel gains in the relationship between transmitted and received signals. RIMB Ex. 1 ¶ 27. Dr. Buehrer cited several publications and patent applications which refer to channel estimates as H in the field of wireless MIMO communications. *Id.* ¶¶ 28-35 (citing evidence). He explained that a channel estimate is well-understood in this field to be an estimate of the channel transfer function, and H is typically used in the field. *Id.* ¶ 35. Dr. Buehrer’s declaration thus persuasively explains that the ’914 patent’s definition is the plain and ordinary meaning of “channel estimates[.]” *Id.* ¶¶ 36-39.

By contrast, BNR’s proposed construction contradicts the specification. BNR and its expert argue that the ’914 teaches “deriving ‘feedback information’ from mathematical matrix

decomposition . . . of the channel estimates.” CIMB at 6; *id.* Cooklev Decl. ¶ 48 (both citing ’914 patent at 6:15-16; 6:48-55; 7:11-13; 8:49-60; 9:25-55; 10:27-40). But when the ’914 patent specification discusses feedback information “derived from” channel estimates, it distinguishes that from a scenario in which the feedback information comprises channel estimates. For instance, the specification explains that an SVD reduction may be performed to “reduce the quantity of channel feedback information which is transmitted[.]” ’914 patent at 8:49-57. The specification also describes use of calibration to derive certain information which may be sent and used to reconstruct the channel estimate. *Id.* at 10:27-54. These scenarios are clearly set forth as alternatives to sending the complete channel estimate matrix. The ’914 patent thus makes clear that channel estimates are distinct from matrices or information which are derived from channel estimates.

I find Dr. Cooklev unpersuasive because his opinion is not supported by the intrinsic evidence. In his declaration, Dr. Cooklev opined that “‘channel estimates’ comprise information used to derive channel estimate matrices and other matrices.” CIMB, Cooklev Decl. ¶ 49. And in his deposition, he testified that information such the number of antennas and the matrices U , S , V , and V^H could be channel estimates. SRMB, Ex. A at 39:7-20, 45:6-22. But as I discussed above, the specification distinguishes the other matrices derived from or used to derive channel estimates, such as U , S , V , and V^H , from channel estimates. But as I discussed above, the specification clearly distinguishes these matrices and this information from “channel estimates.” BNR’s construction is not the plain and ordinary meaning of “channel estimates” and is unsupported by the specification, therefore it is incorrect.

For these reasons, I construe “channel estimates” to mean “an estimate of the values of the transfer system function.”⁸

C. “subsequent received data in transmitted response messages comprising said feedback information”

The term “subsequent received data in transmitted response messages comprising said feedback information” appears in claims 13, 17, and 21 of the ’914 patent. The parties disagree on the claim construction of this term and have proposed the following construction:

BNR	RESPONDENTS	STAFF
Claim term is taken out of context. The correct context is: <u>“requesting modification of a transmission mode for subsequent received data</u> in transmitted response messages comprising said feedback information” A POSITA would understand this to mean that the receiving mobile terminal requests modification of a transmission mode for subsequent data to be received from a transmitting terminal; and it does so in transmitted response messages comprising said feedback information.	Indefinite	Plain and ordinary meaning

JC at 2.

Respondents argue that this limitation renders claims 13, 17, and 21 of the ’914 patent indefinite “because the limitation’s excessive use of prepositional phrases makes it unclear

⁸ I use “transfer system function” instead of “H” to prevent any potential confusion that could arise from the use of labels other than “H” for the transfer system function. *Cf.* CIMB, Cooklev Decl. ¶ 57 (asserting that “G” or “C” could be used as a label for the transfer system function); Markman Tr. at 33:4-10 (BNR arguing that “a plain and ordinary meaning of the term as understood by a POSITA should at least encompass the phrase ‘transfer function.’”).

whether the subsequent received data must appear in the transmitted response messages.” RSIMB at 11. Respondents argue that it could be read “to require the ‘subsequent received data’ be included within the response messages or be the object of the modification request.” *Id.* Respondents argue that the alleged ambiguity cannot be resolved by the specification because neither alternative is supported by the specification. *Id.* at 11-12. Respondents argue that the specification never discusses feedback information from the mode request/response embodiment (Figure 7) associated with this limitation being combined with response messages from the channel request/response embodiment (Figure 8) that are associated with the subsequent limitations. RSRMB at 3.

BNR argues that “when read as a whole, the phrase ‘subsequent received data’ qualifies ‘transmission mode,’ not ‘transmitted response messages.’” CSIMB at 2-3. As BNR argues, “[t]hese ‘response messages’ serve to request ‘modification of a transmission mode’ for subsequent data transmitted by the transmitting terminal to the receiving terminal.” *Id.* at 3 (citing *id.*, Cooklev Decl. ¶ 34). BNR argues that Figure 7 describes these steps, and that step 710 in Figure 7 corresponds with this limitation. *Id.* at 4-5. BNR argues that a person of ordinary skill in the art would recognize that “subsequent received data” refers to data subsequently received from the transmitting terminal rather than the “transmitted response messages.” *Id.* at 5 (citing *id.*, Cooklev Decl. ¶ 38).

Staff argues that “the claim language is clear on its face.” SSIMB at 3. Staff agrees with BNR’s interpretation that “in transmitted response messages, the receiving mobile terminal requests modification of the transmission mode.” *Id.* Staff explains that its understanding is “that Respondents contend that this claim limitation is indefinite in view of invalidity concerns.” *Id.* at 3. Staff contends that invalidity concerns do not justify departure from the plain and ordinary

meaning of this term. *Id.* at 3-4. In reply, Staff argues that the claim language is clear on its face, and the alleged ambiguity identified by Respondents is from the specification. SSRMB at 2. Staff contends that “this is an issue of written description, and not indefiniteness.” *Id.* at 3.

I find that Respondents have failed to prove this limitation renders claims 13, 17, and 21 indefinite by clear and convincing evidence. This limitation recites “requesting modification of a transmission mode for subsequent received data in transmitted response messages comprising said feedback information[.]” ’914 patent at claims 13, 17, 21. When the limitation is read in its entirety, it is clear on its face: the receiving terminal requests modification of a transmission mode in transmitted response messages, and that transmission mode is modified “for subsequent received data[.]” the data later received by the receiving terminal from a transmitting terminal. I therefore disagree with Respondents that there is any ambiguity in the claim. To the extent that I need to refer to extrinsic evidence, the only expert testimony about this term agrees with the plain language of the claim. CSIMB, Cooklev Decl. ¶ 34, 38. As Staff noted, SSRMB at 2, Respondents appear to be raising written description concerns to find the claims indefinite. But the claim is clear on its face, and potential written description concerns do not justify adopting an unreasonable interpretation of the limitation. Any written description defenses, if Respondents have them, can be raised at a later stage of the Investigation.

For these reasons, I construe the limitation “requesting modification of a transmission mode for subsequent received data in transmitted response messages comprising said feedback information” to have its plain and ordinary meaning.

D. “transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data”

The term “transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data” appears in claims 13, 17, and 21 of the ’914

patent. The parties disagree on the claim construction of this term and have proposed the following construction:

BNR	RESPONDENTS	STAFF
A POSITA would understand this to mean that the receiving mobile terminal computes channel estimates based on transmission characteristics of data received from a transmitting terminal, derives feedback information from mathematical matrix decomposition of the computed channel estimates, and transmits the derived feedback information to the transmitting terminal.	Indefinite	“said received data” refers to “receiving data”

JC at 2-3.

Respondents argue that this limitation renders claims 13, 17, and 21 indefinite because “‘said received data’ lacks a clear antecedent basis.” RSIMB at 9. Respondents argue that the claims refer to “receiving data” and “subsequent received data,” and it is unclear which instance is being referred to by “said received data.” *Id.* at 10. Respondents argue that the lack of clear antecedent basis renders these claims indefinite. *Id.* at 10-11.

BNR argues that this term is not indefinite because a POSITA would understand that “said received data” refers to the “receiving data” step rather than the “subsequent received data” step. CSIMB at 6 (citing *id.* Cooklev Decl. ¶ 41). BNR argues that the specification’s description confirms that “said received data” refers to the “receiving data.” *Id.* at 7-9. BNR also argues that Respondents’ argument is incorrect because is illogical that “subsequent received data” could be used to determine channel estimates even though the terminal has not yet received the data when the terminal determines channel estimates. CSRMB at 5.

Staff argues that although the claim does not explicitly refer to the “receiving data” step, the claim is sufficiently definite and refers to that step. SSIMB at 5. Staff argues that the claim distinguishes between received data and data to be received, and there is a “clear” temporal difference in the claim. *Id.* at 5-6. Staff argues that unasserted claims 15, 16, 23, and 24 show that the inventors knew how to refer to subsequently received data as opposed to the data received in the “receiving” step. *Id.* at 6. Staff argue that the specification also supports its interpretation. *Id.* at 7 (citing ’914 patent at 6:44-48).

I am unpersuaded by Respondents’ arguments that this limitation renders claims 13, 17, and 21 indefinite. The Federal Circuit has explained that lack of antecedent basis does not necessarily render a claim indefinite. *Microprocessor Enhancement Corp. v. Tex. Instruments Inc.*, 520 F.3d 1367, 1376 (Fed. Cir. 2008). In these claims, the antecedent basis can be determined with reasonable certainty because the claim’s plain language indicates that “said received data” refers to data received in the “receiving” step. I agree with BNR that a person of ordinary skill in the art would understand with reasonable certainty that “said received data” refers to the data received in the “receiving data” step. Although claims 13, 17, and 21 discuss “subsequent received data,” there is only one step that recites “receiving data,” which strongly suggests that “said received data” refers to this step. That understanding is bolstered by unasserted claims 15, 16, 23, and 24, which recite “said subsequently received data[.]” SSIMB at 6; *see Phillips*, 415 F.3d at 1314 (“Other 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.”). The patentee clearly knew how to refer to data received subsequently and did so in claims 15, 16, 23, and 24. The only expert opinion on this term, Dr. Cooklev’s, supports BNR and Staff’s interpretation. RSIMB, Cooklev Decl. ¶ 41. Respondents’ indefiniteness argument relies on a strained and illogical interpretation of the claims

that is not supported by the claim language itself. Respondents have not met their burden of proving indefiniteness by clear and convincing evidence.

However, I reject BNR's statement on plain and ordinary meaning because it goes beyond what is necessary to interpret the claim. The statement provides its interpretation of the claim as a whole, not just this limitation. *See CSIMB at 7-9.* Many of its arguments relate to other terms being construed in this order. But for purposes of construing this limitation, it is sufficient to construe "said received data" as referring to the "receiving data" step. The remainder of BNR's interpretation is addressed elsewhere in this order, if appropriate, with reference to specific limitations.

For these reasons, I find that Respondents have failed to prove by clear and convincing evidence that "transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data" in claims 13, 17, and 21 is indefinite. I construe "said received data" to refer to the data received in the "receiving data" step of claims 13, 17, and 21.

E. "deriving said feedback information from . . . decomposition of said channel estimates" / "deriving said feedback information from calibration of said channel estimates"

The terms "deriving said feedback information from . . . decomposition of said channel estimates" and "deriving said feedback information from calibration of said channel estimates" appear in claims 13, 17, and 21 of the '914 patent. The parties disagree on the claim construction of these terms and have proposed the following construction:

BNR	RESPONDENTS	STAFF
A POSITA would understand this to mean that the receiving mobile terminal computes channel estimates based on transmission characteristics of data received from a transmitting terminal, and derives said feedback information from [mathematical matrix decomposition]/[calibration] of the computed channel estimates.	Indefinite	Indefinite

JC at 3. These limitations appear in claims 13, 17, and 21. Claim 13 is reproduced below:

13. A method for communicating information in a communication system, the method comprising:

receiving data via a plurality of RF channels utilizing a plurality of receiving antennas;

transmitting feedback information via at least one of said plurality of RF channels;

requesting modification of a transmission mode for subsequent received data in transmitted response messages comprising said feedback information;

transmitting said feedback information comprising channel estimates based on transmission characteristics of said received data via at least one of said plurality of receiving antennas; and

deriving said feedback information from mathematical matrix decomposition of said channel estimates.

'914 patent at claim 13. The first four steps are identical in claims 17 and 21, but the "deriving" step varies in these two claims. In claims 17 and 21, this step reads:

[17] deriving said feedback information from mathematical averaging of a result of mathematical matrix decomposition of said channel estimates.

[21] deriving said feedback information from calibration of said channel estimates for communication in at least one direction via said at least one of said plurality of RF channels.

Id. at claims 17, 21. Respondents argue that the final limitation of each of these claims, the “deriving” step, renders each claim indefinite. RSIMB at 2-3. The parties address all three terms together, and do not identify any differences between the claims. I therefore address them all together.

Respondents argue that these limitations “create[] a logical impossibility—the same feedback information cannot both comprise channel estimates (as required by the previous ‘transmitting’ limitation) and be derived from those same channel estimates.” RSIMB at 3-4. Respondents argue that it would be incorrect if BNR were to argue that “feedback information” could comprise both channel estimates and information derived from channel estimates, because “said feedback information” must refer to the same feedback information in every limitation. *Id.* at 4-5.

Respondents argue that claims 13, 17, and 21 conflate two alternative types of feedback information that the ’914 patent distinguishes from each other. *Id.* at 5. They explain that in the channel request/response embodiment in Figures 5, 6, and 8, a receiving mobile terminal may provide one of three alternative responses: a null response with no feedback (box 808), a channel estimate (box 812), or information derived from the channel estimate (boxes 814, 816, 818). *Id.* at 5-6. Respondents argue that the asserted claims “improperly conflate the two alternative paths[.]” *Id.* at 6-7. Respondents argue that this conflict with the specification confirm that they are indefinite. *Id.* at 7. Respondents argue that BNR’s interpretation is incorrect because it “improperly rewrites the claims[.]” *Id.* They argue that BNR’s interpretation would “replace [the] requirement of ‘transmitting said feedback information comprising channel estimates’ with ‘transmits the derived feedback information[.]’” *Id.* at 8 (emphasis in original).

In reply, Respondents argue that BNR's opening brief raises four arguments which are incorrect. RSRMB at 5. Respondents argue that BNR's argument to read the claims in context is an attempt to rewrite the claims. *Id.* at 9. Respondents also argue that the specification cannot support BNR's construction. *Id.* Respondents further argue that their argument does not depend on adoption of their proposed construction of "channel estimates." *Id.* at 7-8. And Respondents finally argue that "impossible" claims are indefinite under the *Nautilus* standard. *Id.* at 8.

Staff agrees with Respondents that this limitation renders claims 13, 17, and 21 indefinite. SSIMB at 8. Staff argues that the claim is "impossible[]" because "'said feedback information must somehow comprise both (i) 'channel estimates,' and (ii) the 'mathematical matrix decomposition of said channel estimates.'" *Id.* at 8-9. Staff argues that even if the deriving step were performed before the transmitting step, the claim would be internally inconsistent and thus indefinite. *Id.* at 9.

In reply, Staff argues that to save the claims at issue multiple claim saving steps must be taken. SSRMB at 6. These include, as Staff claims, reversing the order of steps, broadening "channel estimates" beyond the matrix H, arguing that feedback information can comprise both channel estimates and information derived from them, and arguing that it is possible for the transmitting step to transmit both channel estimates and information derived from them. *Id.* Staff argues that the internal inconsistency of claims 13, 17, and 21 "appears to be the result of the inventors attempting to draft one method claim that covers two different method scenarios disclosed in the specification." *Id.* at 7 (emphasis in original). Staff explains that the "transmitting" step corresponds to box 812 of Figure 8, while the "deriving" step corresponds to box 816 of Figure 8. *Id.* at 7-8. Staff argues that BNR is incorrectly arguing that "transmitting" corresponds with both

boxes 812 and 818 to reconcile this mixing. *Id.* at 8. Staff argues that the specification does not support this “stretching” of the claims. *Id.*

BNR argue that these limitations are not indefinite because they are “neither ‘circular’ nor mutually exclusive[.]” CSIMB at 10. BNR argues that the “deriving” step “merely narrows the [transmitting] step and provides greater detail on how the feedback information is derived.” *Id.* (internal quotation marks and alteration in original omitted). BNR argues that the claimed feedback information is derived from the same channel estimates recited in the transmitting step, and that “[t]he feedback information need not comprise all of the channel estimates and the mathematical matrix decomposition is not based on all of the channel estimates.” *Id.* at 10-11.

BNR argues that the ’914 patent specification is consistent with its argument. It argues that Figure 6b and box 812 show a response that comprises a complete channel estimate matrix. *Id.* at 11. It argues that in Figure 6c and box 816, a matrix decomposition of the complete channel estimate matrix (which include the right singular vector matrix and diagonal matrix of singular values derived from the channel estimate) are transmitted. *Id.* BNR argues that Respondents’ argument is based on an incorrect assumption that “channel estimates” cannot be transmitted simultaneously as “information derived from ‘said channel estimates.’” *Id.* at 11-12

BNR argues that Respondents’ argument “relies on both” adoption of Respondents’ construction of “channel estimates” and “a finding that such ‘estimates of the values of H’ are coextensive with the ‘complete channel estimate matrix’ referenced in Fig. 6b.” *Id.* at 12. BNR argues that “a [person of ordinary skill in the art] would recognize that the ‘feedback information’ can **both** ‘compris[e] channel estimates’ and be ‘deriv[ed] . . . from mathematical matrix decomposition of said channel estimates.’” *Id.* at 12. BNR argues that a person of ordinary skill in the art “would understand that . . . it is possible to transmit information that both ‘compris[es]

channel estimates’ and is ‘derived from mathematical matrix decomposition of [] channel estimates.’” *Id.* at 13.

In reply, BNR argues that Respondents and Staff’s positions “overlook a key aspect of the term at issue, namely, that neither ‘channel estimates’ nor ‘feedback information’ is a singular, indivisible data type.” CSRMB at 6. BNR asserts that both “channel estimates” and “feedback information” can encompass several types of data. *Id.* BNR asserts, for example, that “feedback information” includes data, some of which may comprise “channel estimates” but some of which may not. *Id.* at 6. BNR argues that Respondents and Staff’s arguments rely on an “unduly narrow” reading of the specification, and “mischaracterize the actual disclosures” in Figures 5, 6, and 8. *Id.* at 7. BNR also disputes Respondents’ argument that it is attempting to rewrite the claims. *Id.* at 9-10.

I find that claims 13, 17, and 21 require an impossibility, and therefore are indefinite. The Federal Circuit has explained that claims may be found indefinite where they are “nonsensical and require an impossibility[.]” *Synchronoss Techs., Inc. v. Dropbox, Inc.*, 987 F.3d 1358, 1366-67 (Fed. Cir. 2021); *see also Trustees of Columbia Univ. in City of N.Y. v. Symantec Corp.*, 811 F.3d 1359, 1366-67 (Fed. Cir. 2016). If the claims are nonsensical, it is improper for a court to adopt an unreasonable interpretation that would essentially rewrite the claims to avoid a finding of indefiniteness. *Synchronoss*, 987 F.3d at 1367; *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1349 (Fed. Cir. 2002) (declining to construe “perpendicular” to mean “parallel” and explaining “[i]t is not our function to rewrite claims to preserve their validity.”).

I agree with Respondents and Staff that the plain language of the claims is impossible. The plain language requires both that “said feedback information compris[e] channel estimates” and that “said feedback information” be “deriv[ed] . . . from” mathematical matrix decomposition or

calibration of the channel estimates in at least one direction. '914 patent at claims 14, 17, 21. This is a mathematical impossibility because the same feedback information cannot both comprise channel estimates and be derived from channel estimates. *See* RSIMB at 3-4; SSIMB at 8-9. The “deriving step” requires that “said feedback information” is derived from channel estimates, not “a portion of” that feedback information. The feedback information referred to in the “deriving” step must be the same as the feedback information in every preceding step, because the claims consistently refer to “said feedback information.” *See Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1343 (Fed. Cir. 2008) (“In grammatical terms, the instances of ‘said fabric roll’ in the claim are anaphoric phrases, referring to the initial antecedent phrase.”). But, as discussed above, channel estimates do not include information derived from channel estimates. The claims therefore require an impossibility: the same information must both be channel estimates and derived from it. That impossibility renders the claims indefinite. *Synchronoss*, 987 F.3d at 1367.

The specification of the '914 patent confirms that the asserted claims are claiming an impossibility by seeking to claim two mutually exclusive options in a single claim. Figure 8 of the '914 patent is “an exemplary flowchart illustrating steps in the exchange of RX/TX feedback information utilizing MIMO channel request and MIMO channel response frames in accordance with an embodiment of the invention.” '914 patent at 17:39-42.

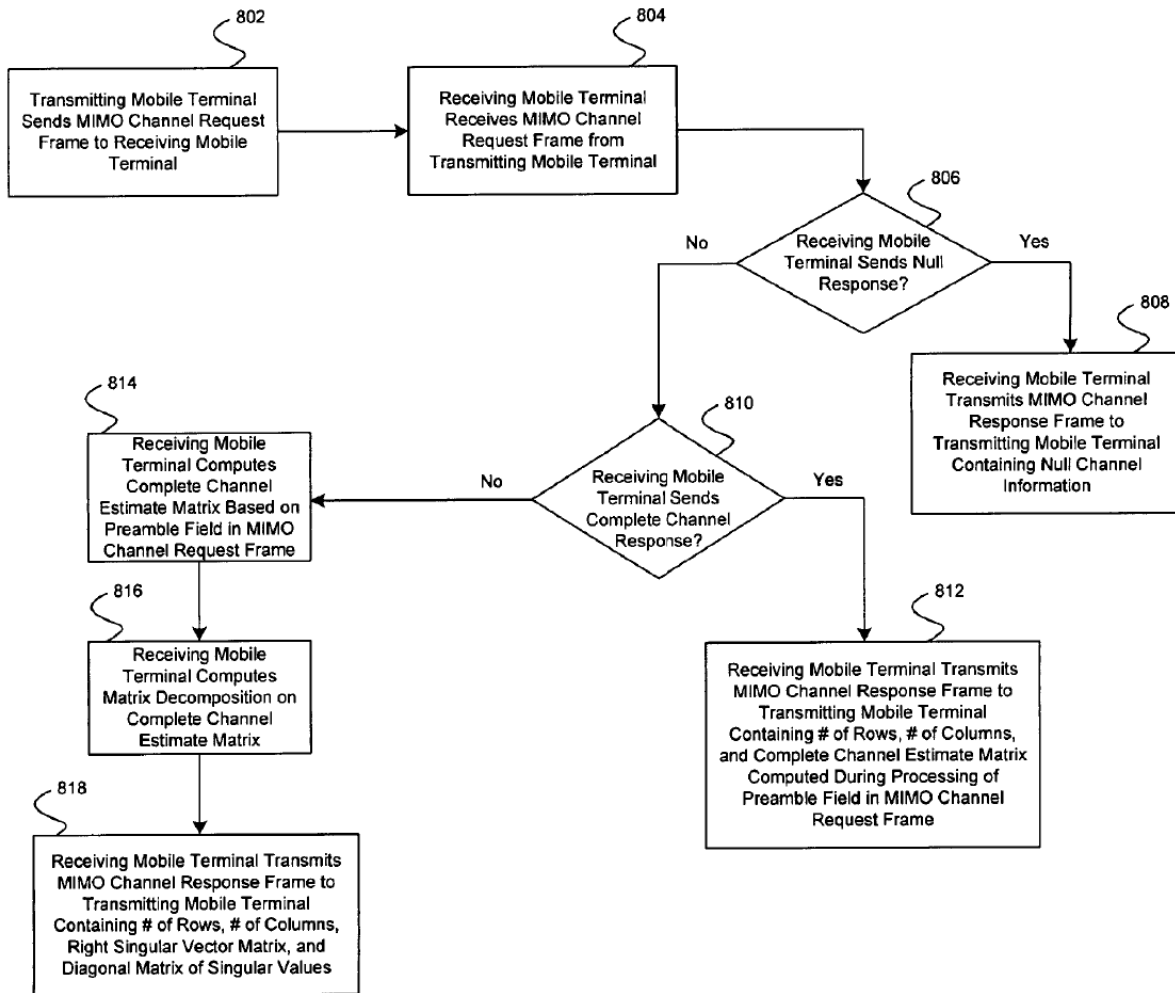


FIG. 8

'914 patent at Fig. 8. It describes how different responses may be transmitted depending on whether the receiving terminal sends a complete channel response. *Id.* at 17:54-56. If a complete channel response is sent, the receiving terminal will send a response containing “a complete channel estimate matrix computed during the processing of the preamble field in the preceding MIMO channel request frame.” *Id.* at 17:56-62. This response corresponds with the response shown in Figure 6b:

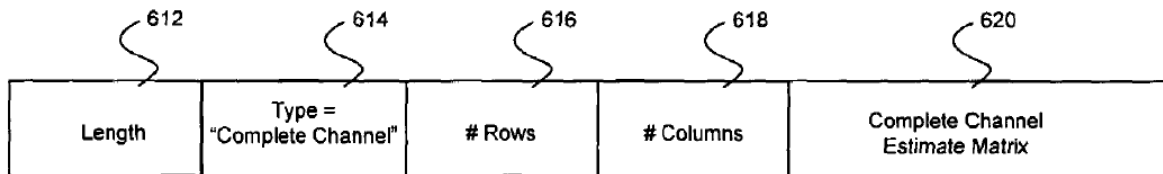


FIG. 6b

Id. at Fig. 6b; *see also id.* at 15:15-44. If a complete channel response is not sent, then the receiving terminal may compute a complete channel estimate matrix, then perform matrix decomposition and send the right singular vector matrix and diagonal matrix of singular values. *Id.* at 17:63-18:11. This response corresponds with the response shown in Figure 6c:

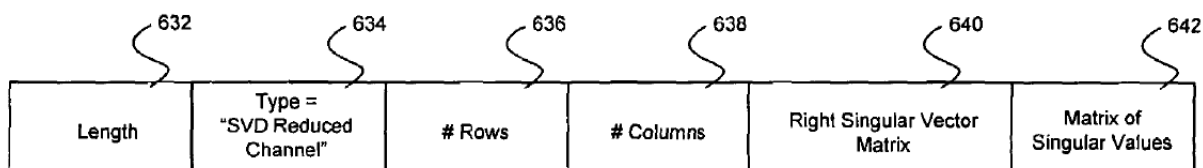


FIG. 6c

Id. at Fig. 6c; *see also id.* at 15:45-16:9. The specification thus treats these two options as mutually exclusive: either the response comprises a complete channel estimate matrix or it comprises the decomposition of the channel estimate matrix. Calibration is also described as a mathematical calculation which is derived from channel estimates, but distinct from those estimates, when calibration information is sent. *See generally id.* at 10:27-54, 16:40-48. The specification is thus further evidence that the claims are seeking to claim an impossibility.

BNR's primary arguments are not persuasive because they rely on unreasonable interpretations of the claim. BNR argues that "[t]he feedback information need not comprise all of the channel estimates and the mathematical matrix decomposition is not based on all of the channel estimates." CSIMB at 10-11; *see also* CSRMB at 6-7. BNR argues that an embodiment in which

the right singular vector matrix and diagonal matrix of singular values are transmitted includes transmission of both a channel estimate and information derived from that channel estimate. CSIMB at 11-12; *see also* CSRMB at 6 (arguing that “[s]imply because certain feedback information may comprise channel estimates does not preclude other feedback information from being derived from (the same or different) channel estimates.”). But as I explained above, these matrices are not within the scope of “channel estimates.” *See* § VI.B, *supra*. Dr. Cooklev’s declaration relies on this same incorrect and overbroad interpretation of channel estimates, and therefore is unpersuasive. *See* CSIMB Cooklev Decl. ¶¶ 53-54. BNR’s argument that the feedback information can contain both channel estimates and information derived from those channel estimates is also based on an unreasonable interpretation of the claim. Its interpretation would interpret “said feedback information” in the deriving step to refer to only a portion of the feedback information from the earlier steps. But the patentee repeatedly referred to “said feedback information,” indicating that it is the same information being referred to in every step.

BNR’s fallback argument under Respondents’ construction of “channel estimates” is also unpersuasive. BNR argued that “a POSITA would understand that the receiving mobile terminal computes channel estimates based on transmission characteristics of data received from a transmitting terminal, performs mathematical matrix decomposition of the computed channel estimates, and transmits the derived feedback information.” CSIMB at 13 (citing *id.* Cooklev Decl. ¶ 56). It is not clear how, in this interpretation, the feedback information “compris[es] channel estimates” as required by the claims. This interpretation therefore is not persuasive.

Finally, I reject BNR’s argument that I should construe the claims to preserve their validity. *See* CSIMB at 13. That canon of construction is applied only if a claim is ambiguous after applying all other tools of construction. *Ruckus Wireless, Inc. v. Innovative Wireless Sols., LLC*, 824 F.3d

999, 1004 (Fed. Cir. 2016) (citing *Phillips*, 415 F.3d at 1327). These claims are not ambiguous: they plainly recite an impossibility. It is not proper to adopt an unreasonable construction that would essentially rewrite the claims to preserve their validity. *Synchronoss*, 987 F.3d at 1367; *Allen Eng'g*, 299 F.3d at 1349.

For these reasons, I find the terms “deriving said feedback information from . . . decomposition of said channel estimates” and “deriving said feedback information from calibration of said channel estimates” render claims 13, 17, and 21 indefinite.⁹

F. “an optimal extended long training sequence with a minimal peak-to-average ratio”

The term “an optimal extended long training sequence with a minimal peak-to-average ratio” appears in claim 1 of the '629 patent. The parties disagree on the claim construction of this term and have proposed the following construction:

BNR	RESPONDENTS	STAFF
An extended long training sequence that is optimal because its peak-to-average ratio is approximately equal to the peak-to-average ratio of the long training sequence utilized by the 802.11a and 802.11g standards	Indefinite	Defined by the claim

JC at 3.

Respondents argue that claim 1 of the '629 patent is indefinite “because the term ‘optimal’ contradicts the remainder of the claim.” RSIMB at 14. Respondents argue that a person of ordinary skill in the art would understand optimal to mean “the best or most favorable point[.]” *Id.* at 15

⁹ The parties are encouraged to take any steps they deem appropriate such as filing a motion for summary determination. Such a motion would not count toward the limit on motions for summary determination under Ground Rule 5.4.2.1.

(citing RSIMB Ex. 1 ¶ 31). It argues that BNR took the position that “optimal” meant the lowest peak-to-average ratio power ratio (“PAPR”) in prior litigation involving the ’842 patent from which the ’629 patent reissued. *Id.* at 15 (citing RSIMB Ex. 4 at 8). It argues that the encoding scheme cited in the ’629 patent has the fourth lowest PAPR of the potential sixteen sequences. *Id.* at 15 (citing RSIMB Ex. 1 ¶¶ 37-40, 50-51); *see also id.* at 15-17. Respondents argue that this is a logical inconsistency that renders the claims nonsensical and impossible, and therefore that they are indefinite. *Id.* at 18. Respondents also argue that “[t]he patent does not provide any explanation for why the fourth best solution is supposedly ‘optimal,’ nor does it explain whether or how a POSITA could distinguish other solutions with other PAPR’s from being ‘optimal.’” *Id.* at 18. Respondents argue that the recitation of “a minimal peak-to-average ratio” adds to confusion. *Id.* at 18-19. Respondents argue that BNR’s proposed construction lacks any support in the specification. *Id.* at 19-21. And Respondents argue that Staff’s proposed construction would be an improper broadening of the claim, which results in the invalidity of the ’629 patent. *Id.* at 21-23.

BNR argues that the term “an optimal extended long training sequence with a minimal peak-to-average ratio” is not indefinite when read in the context of the claim and view of the specification. CSIMB at 14. BNR argues that the claim’s recitation of the encodings provides a person of ordinary skill in the art of objective boundaries for determining the scope of the claims. *Id.* at 14-15. BNR argues that a person of ordinary skill in the art that the sequences in Figure 4 (included in claim 1) and Figure 5 (unclaimed) would be “optimal” with reasonable certainty. *Id.* at 16. BNR argues that “minimal peak-to-average ratio” does not require the “lowest” but instead broadly includes values other than the lowest. *Id.* at 16-17. BNR argues that the goal is backwards compatibility with the 802.11 standards, and that a factor in doing so is maintaining approximately

the same PAPR as the long training sequence in those standards, and thus the differences between the claimed scheme and the absolute lowest are insignificant. *Id.* at 16-18.

Staff argues that the term “optimal” does not affect the scope of the claim, but rather reflects the inventors’ characterization of the claimed sequence. SSIMB at 11. Staff argues that the use of the term does not change the scope of the invention because the claimed extended long training sequence is represented by the specifically recited encodings. *Id.* Staff argues that the claim as a whole defines the optimal extended long training sequence, and that it does not require an optimal PAPR. SSRMB at 11-12. Staff argues that there is no support in the specification for BNR’s proposed construction, and notes that BNR’s expert agreed with Staff that the optimal extended long training sequence is defined by the claimed encoding sequence. *Id.* at 12. Finally, it argues that even if its construction would result in an impermissible broadening, that is not relevant to the issue of indefiniteness. *Id.* at 13.

I am unpersuaded by Respondents’ argument that this term renders claim 1 of the ’629 patent indefinite. The test for whether claims are indefinite is whether “[the] claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus*, 572 U.S. at 901. The scope of the claim can be ascertained with reasonable certainty because the claim explicitly recites the encodings for the claimed “optimal extended long training sequence.”

The plain language of claim 1 of the ’629 patent describes the claimed “optimal extended long training sequence” with reasonable certainty. Claim 1 states the sequence has “a minimal peak-to-average ratio[.]” ’629 patent at 5:61-62. It further states that the sequence “is carried by a greater number of subcarriers than a standard wireless networking configuration for an Orthogonal Frequency Division Multiplexing scheme[.]” *Id.* at 5:63-67. It also states that the sequence “is

carried by exactly 56 active sub-carriers[.]” *Id.* at 6:1-2. And it finally identifies the specific encodings for each of the 56 active sub-carriers. *Id.* at 6:4-22. I agree with Staff that the encodings for each of the 56 sub-carriers provide objective boundaries for the claim scope. *See* SSIMB at 11-12; Markman Tr. at 109:19-20 (“But here the inventors provide the objectivity by telling us which encodings.”). BNR’s expert, Dr. Cooklev agrees with Staff that these encodings provide objective boundaries. CSIMB, Cooklev Decl. ¶¶ 85-86, 89.

Respondents have not presented clear and convincing evidence of indefiniteness. Dr. Buehrer opined that his alleged “confusion” about the claim arises because, in his opinion, the encoding sequence for the 56 subcarriers is not “optimal” as he understands it. RSIMB Ex. 1 ¶ 44. But he admitted that “there would be no confusion” if the claim did not use the word “optimal” because “[a] person of ordinary skill in the art would understand that infringement of the claim requires use of the recited encoding scheme for the 56 subcarriers of the long training sequence[.]” *Id.* ¶ 46. I am not persuaded that the claim “sends mixed messages” or that “the claims seem to be attempting to cover two different encoding schemes[.]” *Id.* ¶¶ 47-48; *cf.* Markman Tr. at 111:10-11 (Staff arguing that “mixed messages does not sound like clear and convincing evidence.”). As Dr. Buehrer admits, the recited encoding scheme provides clear boundaries for the claimed invention. *See* RSIMB Ex. 1 ¶ 46. The patentee’s use of the word optimal cannot reasonably be read to implicitly claim a different, unrecited encoding sequence. Even if the claimed sequence only has the fourth lowest PAPR, that does not render the claims indefinite.

Respondents’ argument about whether this construction would result in an impermissible reissue is not relevant to claim construction. *See* RSIMB at 22-23. The purpose of claim construction is to properly construe the meaning of the claim terms. Respondents will have ample opportunity to argue later that this claim is an impermissible reissue under the proper construction.

I also reject BNR's "statement on the plain and ordinary meaning" because it is not supported by the intrinsic evidence.¹⁰ Neither the claims nor the specification support for BNR's proposal that the claimed sequence "is optimal because its peak-to-average ratio is approximately equal to the peak-to-average ratio of the long training sequence utilized by the 802.11a and 802.11g standards[.]" See SSRMB at 12-13. The specification never describes the sequence as "optimal" with reference to the 802.11a or 802.11g standards. And neither BNR nor its expert, Mr. Cooklev, cite any portion of the specification to support this interpretation of "optimal." See CSIMB at 15-16, Cooklev Decl. ¶ 87. And although Mr. Cooklev identifies numerous considerations which he contends would render a specific sequence "optimal," most of these considerations are not in the specification. *Id.*, Cooklev Decl. ¶¶ 93-99. It is unclear whether "optimal" requires construction in view of the claim language itself, but even if it did, BNR's interpretation of that term is unsupported by the record.

For these reasons, I find that Respondents have failed to prove by clear and convincing evidence that the asserted claims are indefinite. I further find that the term "an optimal extended long training sequence with a minimal peak-to-average ratio" does not need to be construed because it is adequately defined by the claim itself.

SO ORDERED.


Bryan F. Moore
Administrative Law Judge

¹⁰ During the Markman hearing, BNR appeared to contend that this was not its proposed interpretation, but rather only one potential interpretation. Markman Tr. at 105:21-106:8. But this elaboration on the plain and ordinary meaning is the only interpretation it offered, and therefore I consider it as a proposed construction.

CERTIFICATE OF SERVICE

I, Lisa R. Barton, hereby certify that the parties listed have entered an appearance in the above captioned investigation, and a copy of the PUBLIC CERTIFICATE OF SERVICE was served upon the following parties via first class mail and air mail where necessary.

Document	Security	Document Type	Official Rec'd Date	Title
812426	Public	Order	01/23/2024 11:32 AM	Construing Certain Claim Terms

Service Date: January 23, 2024

/s/

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