

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIATEK INC.,
Petitioner,

v.

PARKERVISION, INC.
Patent Owner.

IPR2024-00150
Patent 7,292,835 B2

Before MICHAEL R. ZECHER, BART A. GERSTENBLITH, and
IFTIKHAR AHMED, *Administrative Patent Judges*.

GERSTENBLITH, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background

MediaTek Inc. (“Petitioner”) filed a Corrected Petition¹ (Paper 7, “Pet.”) requesting institution of *inter partes* review of claims 1–5 (“the Challenged Claims”) of U.S. Patent No. 7,292,835 B2 (Ex. 1001, “the ’835 patent”). ParkerVision, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 8, “Prelim. Resp.”).

An *inter partes* review may be instituted only if “the information presented in the petition . . . and any [preliminary] response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2018). For the reasons given below, on this record, Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the Challenged Claims. Accordingly, we institute an *inter partes* review of the Challenged Claims on all grounds raised in the Petition.

¹ Initially, Petitioner filed an exhibit (Exhibit 1015), which was referenced in a first-filed petition (Paper 1), and a motion to seal that exhibit (Paper 3). After meeting and conferring, the parties contacted the Board via email and jointly requested that Paper 3 and Exhibit 1015 be expunged, a corrected petition be filed (the corrected petition removing one sentence and a citation to Exhibit 1015), and the corrected petition be accorded the same filing date (November 15, 2023) as the first-filed petition. We granted the parties’ joint request. See Ex. 3001 (email exchange that includes the parties’ joint request and Board’s response). Paper 3 and Exhibit 1015 were expunged from the record and Petitioner filed the Corrected Petition, which we refer to herein as the Petition.

B. Related Proceedings

The parties identify the following related proceedings before the Board involving the '835 patent: *TCL Industries Holdings Co. v. ParkerVision, Inc.*, IPR2021-00985, and *LG Electronics, Inc. v. ParkerVision, Inc.*, IPR2022-00246 (joined to IPR2021-00985) (collectively, “the TCL IPR”). Pet. 3; Paper 5 (Patent Owner’s Mandatory Notices), 2. In the final written decision in the TCL IPR, we found that claims 1, 12–15, and 17–20 of the '835 patent were shown to be unpatentable under 35 U.S.C. § 103(a) based on the combination of Hulkko² and Gibson³ as well as the combination of Gibson and Schiltz⁴ (one of the grounds raised by Petitioner in this proceeding, as discussed further below). The final written decision in the TCL IPR is currently on appeal before the U.S. Court of Appeals for the Federal Circuit in *ParkerVision, Inc. v. TCL Industries Holdings Co.*, No. 2023-1417 (Fed. Cir.). Pet. 3; see Paper 5, 2 (also identifying the pending appeal).

The parties also identify the following pending related litigation involving the '835 patent: *ParkerVision, Inc. v. MediaTek, Inc.*, No. 6:22-cv-01163 (W.D. Tex.) (“Western District of Texas Litigation”); *ParkerVision, Inc. v. TCL Industries Holdings Co.*, No. 6:20-cv-00945 (W.D. Tex.); *ParkerVision, Inc. v. Realtek Semiconductor Corp.*, 6:22-cv-01162 (W.D. Tex.); and *ParkerVision, Inc. v. LG Electronics, Inc.*, No. 6:21-cv-00520 (W.D. Tex.). Pet. 3; Paper 5, 1–2. Petitioner additionally identifies the following three related litigations that are now terminated: *ParkerVision,*

² U.S. Patent No. 5,734,683, issued Mar. 31, 1998 (“Hulkko”). Hulkko is Exhibit 1004 in IPR2021-00985.

³ U.S. Patent No. 4,682,117, issued July 21, 1987 (Ex. 1004, “Gibson”).

⁴ U.S. Patent No. 5,339,459, issued Aug. 16, 1994 (Ex. 1005, “Schiltz”).

Inc. v. Hisense Co., No. 6:20-cv-00870 (W.D. Tex.)⁵; *ParkerVision, Inc. v. ZyXEL Communications Corp.*, No. 6:20-cv-01010 (W.D. Tex.)⁶; and *ParkerVision, Inc. v. Buffalo Inc.*, No. 6:20-cv-01009 (W.D. Tex.)⁷

To the above list, we add *ParkerVision, Inc. v. Vidal*, 88 F.4th 969 (Fed. Cir. 2023) (“*ParkerVision*”). In *ParkerVision*, the Federal Circuit, *inter alia*, affirmed our construction of “storage element,” a term that is synonymous with “storage module” (a claim term presented for construction in this proceeding). *Id.* at 978 (“We hold that the Board correctly adopted the construction that a ‘storage element’ is ‘an element of a system that stores non-negligible amounts of energy from an input EM signal.’”); *see id.* at 976 n.6 (“The parties agree that the term ‘storage module’ . . . is synonymous with ‘storage element.’”).

C. Real Parties in Interest

Petitioner identifies MediaTek Inc., MediaTek USA Inc., MTK Wireless Limited (UK), Gaintech Co. Limited, and MediaTek Investment Singapore Pte. Ltd. as real parties in interest. Pet. 3. Patent Owner identifies ParkerVision, Inc. as a real party in interest. Paper 5, 1.

⁵ This case was terminated following the grant of a joint stipulation of dismissal with prejudice. *See* Ex. 3002 (Docket Entry 81, Stipulation dated Nov. 30, 2022).

⁶ This case was terminated following the grant of a joint motion to dismiss with prejudice. *See* Ex. 3003 (Docket Entry 25, Order dated Sept. 27, 2021).

⁷ This case was terminated following the grant of a joint motion to dismiss with prejudice. *See* Ex. 3004 (Docket Entry 16, Order dated Sept. 13, 2021).

*D. The Asserted Grounds of Unpatentability and Declaration
Evidence*

Petitioner challenges the patentability of claims 1–5 of the ’835 patent on the following four grounds:

Claims Challenged	35 U.S.C. § ⁸	Reference(s)/Basis
1–5	103(a)	Gibson, Schiltz
1–5	103(a)	Crols ⁹
1–5	103(a)	Gibson, Schiltz, Goldberg, ¹⁰ Thacker, ¹¹ ITU-T J.83, ¹² and/or AAPA ¹³

⁸ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the ’835 patent has an effective filing date before March 16, 2013 (*see, e.g.*, Ex. 1001, code (22)), we apply the pre-AIA version of the statutory basis for unpatentability.

⁹ J. Crols, *A Single-Chip 900 MHz CMOS Receiver Front-End with a High Performance Low-IF Topology*, 30 IEEE Journal of Solid-State Circuits 1483–92 (Dec. 1995) (Ex. 1006, “Crols”).

¹⁰ L. Goldberg, “MCNS/DOCSIS MAC Clears a Path for the Cable-Modem Invasion,” *Electronic Design*; Dec. 1, 1997; 45, 27; Materials Science & Engineering Collection pg. 69–79 (Ex. 1007, “Goldberg”).

¹¹ U.S. Patent No. 6,011,548, issued Jan. 4, 2000 (Ex. 1008, “Thacker”).

¹² ITU-T J.83 Recommendation (Apr. 1997) (Ex. 1009, “ITU-T J.83”).

¹³ Applicant admitted prior art (“AAPA”) refers to the ’835 patent, at column 40, lines 17–35, which states, *inter alia*, that “[t]he cable modem receivers, transmitters, and transceivers of the present invention may be implemented using a variety of well[-]known devices” and lists several examples. *See* Pet. 31. “A patentee’s admissions regarding the scope and content of the prior art under § 103 can be used, for example, to: (1) supply missing claim limitations that were generally known in the art prior to the invention” USPTO Memorandum, Updated Guidance on the Treatment of Statements of the Applicant in the Challenged Patent in Inter Partes Reviews Under § 311 (June 9, 2022), at 4, *available at* <https://go.usa.gov/xSbGF>; *see Qualcomm Inc. v. Apple Inc.*, 24 F.4th 1367, 1377 (Fed. Cir. 2022) (“it is . . . impermissible for a petition to challenge a

Claims Challenged	35 U.S.C. § ⁸	Reference(s)/Basis
1–5	103(a)	Crols, Goldberg, Thacker, ITU-T J.83, and/or AAPA

Pet. 6–7. In the Petition, Petitioner first sets forth its grounds as though there are two: Gibson and Schiltz (Ground 1), and Crols (Ground 2). *Id.* at 6. Petitioner, however, explains that

[a]s to both Grounds, if the Board finds that the preamble of claim 1 is limiting—and thus requires a “cable modem”—then Petitioner submits that the challenged claims are unpatentable as obvious over the combinations above and further in view of publications (*e.g.*, Goldberg and Thacker) describing the then-existing cable modem standards (ITU-T J.83 and DOCSIS [Data Over Cable Service Interface Specification¹⁴]) and/or AAPA.

Id. at 6–7. Accordingly, the chart above includes the two alternative grounds set forth in the Petition to reflect that there are four grounds asserted.

Additionally, Petitioner supports its challenge with a Declaration of Dr. Lawrence E. Larson (Ex. 1003), a Declaration and Affirmation of Brenda Ray (Ex. 1010), and a Declaration of June Ann Munford (Ex. 1011).

Patent Owner’s Preliminary Response raises two issues for our consideration—(1) whether we should exercise our discretion to deny institution pursuant to 35 U.S.C. § 314(a) and (2) whether the Petition should be denied because of a lack of particularity. Prelim. Resp. 1–2. We address Patent Owner’s second issue here because it challenges the clarity of

patent relying on solely AAPA without also relying on a prior art patent or printed publication”).

¹⁴ See Ex. 1001, 38:28–29.

Petitioner's grounds. Specifically, Patent Owner contends the Petition should be denied because "Petitioner fails to articulate obviousness theories with particularity." *Id.* at 13 (capitalization and emphasis of heading altered). Patent Owner asserts, "Petitioner relies on numerous 'cable modem' references to teach limitations missing in Gibson, Schiltz, and Crols" and "essentially argues obviousness over Gibson and Schiltz or Crols in some combination with one or more of the four 'cable modem' references, without specifying which specific combination is asserted with respect to each challenged claim." *Id.* Patent Owner contends that "[s]uch use of prior art without including them in the proposed ground is improper because it makes it impossible to determine the exact basis of Petitioner's challenge" and, therefore, "does not provide Patent Owner a fair opportunity to address the proposed grounds." *Id.* at 13–14.

We disagree. The Petition is clear that it presents alternative challenges where Goldberg, Thacker, ITU-T J.83, and/or AAPA are added to the combination of Gibson and Schiltz or are added to Crols, if the term "cable modem," recited in the preamble of claim 1, is determined to be limiting. Pet. 6–7. In the context presented here, "and/or" clearly means one or more of the four additional references. And Petitioner's reliance on one or more of the additional references is clear in the context of the issues before us based on Petitioner's analysis of the preamble of claim 1, where Petitioner clearly states, "[a]nd to the extent that the preamble is limiting and requires a 'cable modem,' it would have been obvious to use the modem of Gibson (as modified by Schiltz, discussed below) as a cable modem, in view of Thacker, Goldberg, ITU-T J.83, and/or AAPA." Pet. 42 (Ground 1); *see id.* at 66–67 (similarly asserting, in the context of Ground 2, that, "[t]o the

extent that the preamble is limiting and requires a ‘cable modem,’ it would have been obvious to use the modem of Crols as a cable modem, in view of Thacker, Goldberg, ITU-T J.83, and/or AAPA”). Petitioner also includes a discussion as to why one of ordinary skill in the art would have been motivated to “use the modems of Gibson modified with Schiltz (Ground 1), and Crols (Ground 2), as ‘cable modems,’ in view of the DOCSIS References (Thacker and Goldberg), ITU-T J.83, and AAPA,” and would have had a reasonable expectation of success in so doing. *Id.* at 37–40. Thus, we do not agree with Patent Owner that the Petition lacks particularity and we find that the Petition clearly sets forth the alternative combinations discussed above such that Patent Owner has a fair opportunity to respond.

E. The '835 Patent

The '835 patent is directed to frequency translation and applications thereof, including cable modem applications. Ex. 1001, code (57). The applications include, but are not limited to, “frequency down-conversion, frequency up-conversion, enhanced signal reception, unified down-conversion and filtering, and combinations” thereof. *Id.*

In particular, with respect to the Challenged Claims, the '835 patent teaches a “[Quadrature Amplitude Modulation (“QAM”)] modulation mode receiver” that “down-convert[s] and demodulates an input signal that is modulated according to QAM . . . modulation techniques.” *See* Ex. 1001, 42:43–49. Figure 54B is reproduced below:

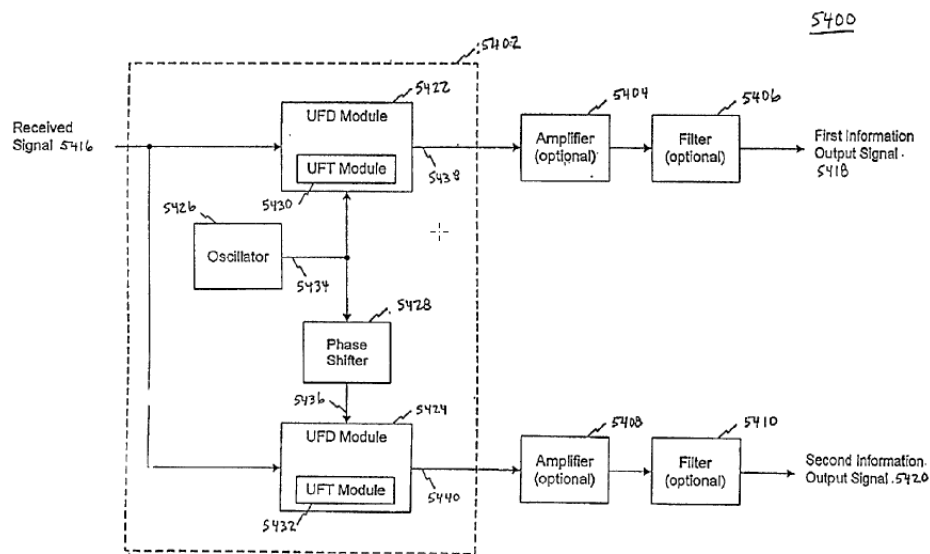


FIG. 54B

Figure 54B is an exemplary block diagram of QAM modulation receiver 5402. *Id.* at 4:42–44, 42:45–47.

The '835 patent explains that QAM modulation mode receiver 5402 “may be used to directly down-convert and demodulate a received [radio frequency (“RF”)] input signal to two baseband information signals, or may down-convert and demodulate a received signal that is at an intermediate frequency to two baseband information signals.” Ex. 1001, 42:49–54. QAM modulation mode receiver 5402 comprises oscillator 5426, first universal frequency down-conversion (“UFD”) module 5422, second UFD module 5454, first universal frequency translation (“UFT”) module 5430, second UFT module 5432, and phase shifter 5428. *Id.* at 42:63–67.

The '835 patent further explains that

[o]scillator 5426 provides an oscillating signal used by both first UFD module 5422 and second UFD module 5424 via phase shifter 5428. Oscillator 5426 generates an “I” oscillating signal 5434.

“I” oscillating signal 5434 is input to first UFD module 5422. First UFD module 5422 comprises at least one UFT module 5430. In an embodiment, first UFD module 5422 is structured similarly to UFD module 5300 of FIG. 53, with oscillator 5426 substituting for oscillator 5304, and “I” oscillating signal 5434 substituting for oscillating signal 5316. First UFD module 5422 receives received signal 5416. Received signal 5416 comprises two information signals modulated with an RF carrier signal according to either QAM or QPSK modulation techniques. First UFD module 5422 frequency down-converts and demodulates received signal 5416 to down-converted “I” signal 5438 according to “I” oscillating signal 5434. Down-converted “I” signal 5438 may be an information signal with two possible states or voltage levels (QPSK), or with more than two possible states or voltage levels (QAM).

Phase shifter 5428 receives “I” oscillating signal 5434, and outputs “Q” oscillating signal 5436, which is a replica of “I” oscillating signal 5434 shifted preferably by 90°. Second UFD module 5424 inputs “Q” oscillating signal 5436. Second UFD module 5424 comprises at least one UFT module 5432. In an embodiment, second UFD module 5424 is structured similarly to UFD module 5300 of FIG. 53, with “Q” oscillating signal 5436 substituting for oscillating signal 5316. Second UFD module 5424 frequency down-converts and demodulates received signal 5416 to down-converted “Q” signal 5440 according to “Q” oscillating signal 5436. Down-converted “Q” signal 5440 may be an information signal with two possible states or voltage levels (QPSK), or with more than two possible states or voltage levels (QAM).

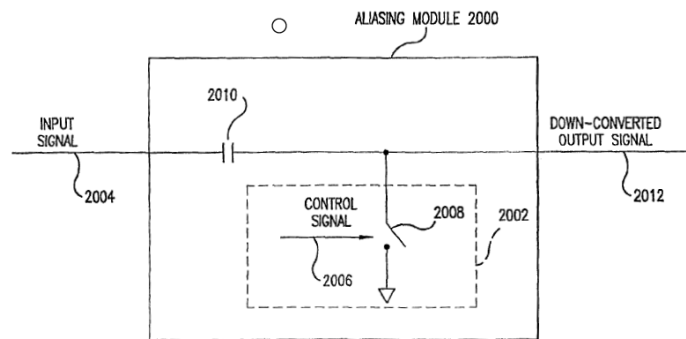
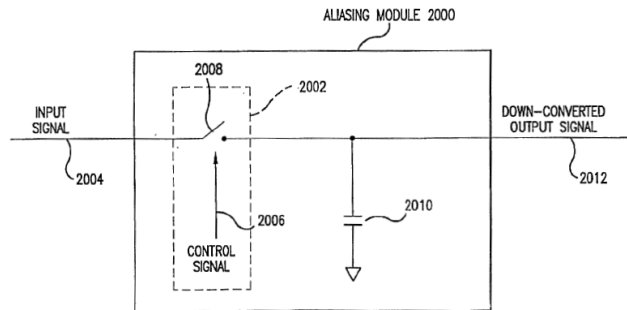
Down-converted “I” signal 5438 is optionally amplified by first optional amplifier 5404 and optionally filtered by first optional filter 5406, and a first information output signal 5418 is output.

Down-converted “Q” signal 5440 is optionally amplified by second optional amplifier 5408 and optionally filtered by

second optional filter 5410, and a second information output signal 5420 is output.

Ex. 1001, 43:1–42.

Figures 20A and 20A-1 are reproduced below:



Figures 20A and 20A-1 are exemplary aliasing modules. Ex. 1001, 3:21–22.

The '835 patent explains that Figures 20A and 20A-1 illustrate “aliasing module 2000 for down-conversion using a [UFT] module 2002 which down-converts an [electromagnetic (“EM”)] input signal 2004.”

Ex. 1001, 6:66–7:2. The '835 patent further provides that

[i]n particular embodiments, aliasing module 2000 includes a switch 2008 and a capacitor 2010. The electronic alignment of the circuit components is flexible. That is, in one implementation, switch 2008 is in series with input signal 2004 and capacitor 2010 is shunted to ground (although it may be

other than ground in configurations such as differential mode). In a second implementation (see FIG. 20A-1), capacitor 2010 is in series with input signal 2004 and switch 2008 is shunted to ground (although it may be other than ground in configurations such as differential mode). Aliasing module 2000 with UFT module 2002 can be easily tailored to down-convert a wide variety of electromagnetic signals using aliasing frequencies that are well below the frequencies of EM input signal 2004.

Id. at 7:2–14.

The '835 patent states that “[t]he down-conversion of an EM signal by aliasing the EM signal at an aliasing rate is fully described in . . . U.S. Pat[ent] No. 6,061,551 [(‘the ’551 patent’)], the full disclosure of which is incorporated herein by reference.” Ex. 1001, 6:56–61. And, the '835 patent further states that “[a]dditional details pertaining to UFD module 5300 are contained in” the '551 patent.¹⁵ *Id.* at 42:37–42.

F. Illustrative Claim

Claim 1, the sole independent claim challenged in this proceeding, is illustrative of the claimed subject matter and is reproduced below with Petitioner’s bracketing added for reference:

1. [1pre] A cable modem for down-converting an electromagnetic signal having complex modulations, comprising:
 - [1A] an oscillator to generate an in-phase oscillating signal;
 - [1B] a phase shifter to receive said in-phase oscillating signal and to create a quadrature-phase oscillating signal;
 - [1C] a first frequency down-conversion module to receive the electromagnetic signal and said in-phase oscillating signal;

¹⁵ The '551 patent is Exhibit 2027 in IPR2021-00985.

[1D] a second frequency down-conversion module to receive the electromagnetic signal and said quadrature-phase oscillating signal; wherein

[1E] said first frequency down-conversion module further comprises a first frequency translation module [1F] and a first storage module, [1G] wherein said first frequency translation module samples the electromagnetic signal at a rate that is a function of said in-phase oscillating signal, thereby creating a first sampled signal; and

[1H] said second frequency down-conversion module further comprises a second frequency translation module [1I] and a second storage module, [1J] wherein said second frequency translation module samples the electromagnetic signal at a rate that is a function of said quadrature-phase oscillating signal, thereby creating a second sampled signal.

Ex. 1001, 51:5–29; *see* Pet. 41–54 (indicating Petitioner’s bracketing).

II. DISCRETIONARY DENIAL

Patent Owner contends we should exercise our discretion under 35 U.S.C. § 314(a) to deny institution “because of the advanced state of parallel litigation pending in the [U.S. District Court for the] Western District of Texas.” Prelim. Resp. 1. Patent Owner asserts that, “[g]iven the current posture and schedule of the underlying Texas case, the factors set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential)[,] weigh in favor of *denying* institution of an [*inter partes* review].” *Id.*; *see id.* at 2–13 (discussing the *Fintiv* factors).

Petitioner contacted the Board seeking authorization to file a preliminary reply to respond to Patent Owner’s arguments regarding *Fintiv*. Ex. 3005 (email from J. Kaiser, dated Mar. 12, 2024). Patent Owner opposed Petitioner’s request. *Id.* We responded to Petitioner’s email by authorizing either (1) Petitioner to file a stipulation in accordance with

Sotera Wireless, Inc. v. Masimo Corp., IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential as to § II.A), or (2) Petitioner to file a preliminary reply followed by Patent Owner filing a preliminary sur-reply, each limited to addressing the *Fintiv* factors. *See id.* In response, Petitioner filed Exhibit 1025, in which Petitioner

stipulate[s] and agree[s] that, if the [Patent Trial and Appeal Board] institutes an inter partes review proceeding (“IPR”) for [the ’835 patent] on the grounds presented in [Petitioner’s] petition, [Petitioner] will not pursue an invalidity defense in [the Western District of Texas Litigation] that the patent claims subject to the instituted IPR are invalid based on the same grounds as in the petition or any grounds that could have reasonably been raised in the petition.

Ex. 1025 (letter from M. Bernstein to J. Charkow, dated Mar. 14, 2024).

As set forth in the Director’s Memorandum, Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (dated June 21, 2022), at 7, *available at* https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf,

the PTAB will not discretionarily deny institution of an IPR . . . in view of parallel district court litigation where a petitioner stipulates not to pursue in a parallel district court proceeding the same grounds as in the petition or any grounds that could have reasonably been raised in the petition.

Petitioner’s stipulation (Ex. 1025) satisfies the language from the Director’s Memorandum quoted above. Therefore, we need not analyze each *Fintiv* factor to reach the determination that we will not exercise our discretion to deny institution in view of the parallel Western District of Texas Litigation.

III. ANALYSIS

A. Legal Standards – Obviousness

The U.S. Supreme Court set forth the framework for applying the statutory language of 35 U.S.C. § 103 in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966):

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

The Supreme Court explained in *KSR International Co. v. Teleflex Inc.* that

[o]ften, 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. To facilitate review, this analysis should be made explicit.

550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” (alteration in original))).

“Whether an ordinarily skilled artisan would have been motivated to modify the teachings of a reference is a question of fact.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1327 (Fed. Cir. 2016) (citations omitted).

“[W]here a party argues a skilled artisan would have been motivated to combine references, it must show the artisan ‘would have had a reasonable expectation of success from doing so.’” *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360–61 (Fed. Cir. 2017) (quoting *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1068–69 (Fed. Cir. 2012)).

B. Level of Ordinary Skill in the Art

Petitioner, supported by Dr. Larson’s testimony, proposes that a person of ordinary skill in the art at the time of the invention would have had “at least a bachelor’s degree in electrical engineering or a related subject and two or more years of experience in the field of RF circuit design, or at least five years of work experience and training in the design and development of RF circuits and/or systems.” Pet. 40 (citing Ex. 1003 ¶¶ 24–27). Petitioner further proposes that “[l]ess work experience may be compensated by a higher level of education, such as a master’s degree.” *Id.*

Patent Owner does not take a position on the level of ordinary skill in the art in the Preliminary Response. *See generally* Prelim. Resp.

Petitioner’s proposed level of ordinary skill in the art is identical to the level of skill that we found applicable in the final written decision in the TCL IPR. *See* IPR2021-00985, Paper 44 at 13. We see no reason to deviate from our previous finding, which is now further supported by Dr. Larson’s testimony. *See* Ex. 1003 ¶ 26. Accordingly, at this stage of the proceeding and on the present record, we adopt Petitioner’s proposed level of ordinary skill in the art, which we find consistent with the level of ordinary skill in the art reflected by the ’835 patent and the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57

F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

C. Claim Construction

In this *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2020). The claim construction standard includes construing claims in accordance with the ordinary and customary meaning of such claims as would have been understood by one of ordinary skill in the art at the time of the invention. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc). In construing claims in accordance with their ordinary and customary meaning, we take into account the specification and prosecution history. *Phillips*, 415 F.3d at 1315–17.

If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316 (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Another exception to the general rule that claims are given their ordinary and customary meaning is “when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1313 (Fed. Cir. 2013) (quoting *Thorner v. Sony Computer Entm’t Am., LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)).

Additionally, only terms that are in controversy need to be construed, and these need be construed only to the extent necessary to resolve the controversy. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375

(Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner presents two claim terms for construction—“cable modem” and “storage module.” Pet. 21–23. We address each.

1. “cable modem”

The term “cable modem” is recited in the preamble of claim 1 (“[a] cable modem for down-converting an electromagnetic signal having complex modulations”). Ex. 1001, 51:5–6. In the final written decision in the TCL IPR, based on the record presented there, we determined that “a cable modem” is non-limiting and therefore we did not construe it expressly to resolve the dispute between the parties. IPR2021-00985, Paper 44 at 21–25. Petitioner identifies our prior determination and also posits that, if “cable modem” is determined to be limiting, we should “find that any modem that can be used to down-convert modulated signals from a TV network is a ‘cable modem,’ regardless of whether the modem is wired or wireless, and regardless of whether it complies with any cable data standard.” Pet. 21 (citing Ex. 1003 ¶¶ 57–63).

Patent Owner does not take a position on claim construction in the Preliminary Response. *See generally* Prelim. Resp.

We recognize that the ’835 patent states “[c]able [m]odems refer to modems that communicate across ordinary cable TV network cables.” Ex. 1001, 36:19–20. Although this statement in the ’835 patent refers to “communicat[ing] across . . . cables,” the ’835 patent refers to both “wired cable modem environment[s]” and “wireless cable modem environment[s].”

See id. at 36:52–53 (“FIG. 45A illustrates an exemplary wired cable modem environment 4500.”), 37:24–25 (“FIG. 45B illustrates a wireless cable modem environment 4520.”). The ’835 patent also makes clear that “[t]hese embodiments are described herein for purposes of illustration, and not limitation.” *Id.* at 36:42–43.

At this stage of the proceeding and on the present record, however, we see no reason to disturb our determination from the TCL IPR that “cable modem” is non-limiting and we adopt our discussion and analysis as set forth in the final written decision in that proceeding as though it were set forth in full here. *See* IPR2021-00985, Paper 44 at 21–25.

2. “storage module”

Claim 1 recites a “first storage module” and a “second storage module.”¹⁶ Ex. 1001, 51:19, 25. Petitioner asserts that we should adopt the same construction of “storage module” that we adopted in the TCL IPR. Pet. 22. In the final written decision in the TCL IPR, we construed “storage module” to have the same meaning as “storage element,” which we construed in IPR2020-01265, because the parties in those proceedings agreed that the terms are synonymous. IPR2021-00985, Paper 44 at 15–21. As discussed above, the Federal Circuit also noted the parties’ agreement

¹⁶ Petitioner contends that dependent claim 3, which recites “wherein said first storage device,” and dependent claim 4, which recites “wherein said second storage device,” would have been understood by one of ordinary skill in the art as referring to the first and second “storage module[s].” Pet. 57 n.7 (citing Ex. 1003 ¶ 155), 60 n.8 (citing Ex. 1003 ¶ 166). Patent Owner does not take a position on this issue in the Preliminary Response. Although Petitioner’s position seems reasonable, we need not decide this issue at the present time because there is no controversy on this specific point. *See Realtime Data*, 912 F.3d at 1375.

that “storage module” is synonymous with “storage element” and affirmed our construction of “storage element” in the appeal of the final written decision in IPR2020-01265. *ParkerVision*, 88 F.4th at 976 n.6 (“The parties agree that the term ‘storage module’ used in the critical paragraph is synonymous with ‘storage element.’”), 978 (“We hold the Board correctly adopted the construction that a ‘storage element’ is ‘an element of a system that stores non-negligible amounts of energy from an input EM signal.’”).¹⁷

On the present record, there is no reason to deviate from our prior construction. Accordingly, we construe “storage module” to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.”

Additionally, in the TCL IPR, the parties disputed the meaning of “non-negligible amounts of energy,” which we construed to mean “energy in amounts that are distinguishable from noise,” based on the Federal Circuit’s decision in *ParkerVision, Inc. v. Qualcomm Inc.*, 621 F. App’x 1009, 1018 (Fed. Cir. 2015), which applied the same construction. *See* IPR2021-00985, Paper 44 at 54–55 (discussing the construction of “non-negligible amounts of energy” accepted by the Federal Circuit). On the present record, there is no reason to deviate from our prior construction. Accordingly, for the same reasons explained in the final written decision in the TCL IPR (*id.*), we construe “non-negligible amounts of energy” to mean “energy in amounts that are distinguishable from noise.”

¹⁷ The Federal Circuit’s decision on appeal issued after the Petition was filed in this proceeding.

D. Ground 1: Obviousness over Gibson and Schiltz

*Ground 3: Obviousness over Gibson, Schiltz, Thacker,
Goldberg, ITU-T J.83 and/or AAPA*

Petitioner asserts that the combination of Gibson and Schiltz would have rendered the subject matter of claims 1–5 obvious to one of ordinary skill in the art at the time of the invention and that, “[i]f the preamble of claim 1 is limiting, and therefore requires a ‘cable modem,’ then these claims are unpatentable as obvious over Gibson in view of Schiltz, and further in view of Thacker, Goldberg, ITU-T J.83, and/or AAPA.” Pet. 41; *see id.* at 32–34 (discussing motivation to combine Gibson and Schiltz and reasonable expectation of success), 37–40 (discussing motivation to combine Gibson and Schiltz with Thacker, Goldberg, ITU-T J.83, and AAPA), 41–65 (discussing the application of the prior art to the claims).

As noted above, Patent Owner contends the Petition should be denied because “Petitioner fails to articulate obviousness theories with particularity,” Prelim. Resp. 13 (capitalization and emphasis of heading altered), an issue we addressed above. Patent Owner’s Preliminary Response does not raise any other substantive argument directed to Petitioner’s obviousness grounds. *See generally* Prelim. Resp.

1. Scope and Content of the Prior Art

a. Gibson (Ex. 1004)

Gibson is directed to “a data receiver including quadrature mixers having outputs coupled by signal paths to a coherent data de-modulator, wherein correction of carrier phase errors is effected after the outputs from the mixers have been pass filtered.” Ex. 1004, 1:35–40. Figure 1 is reproduced below:

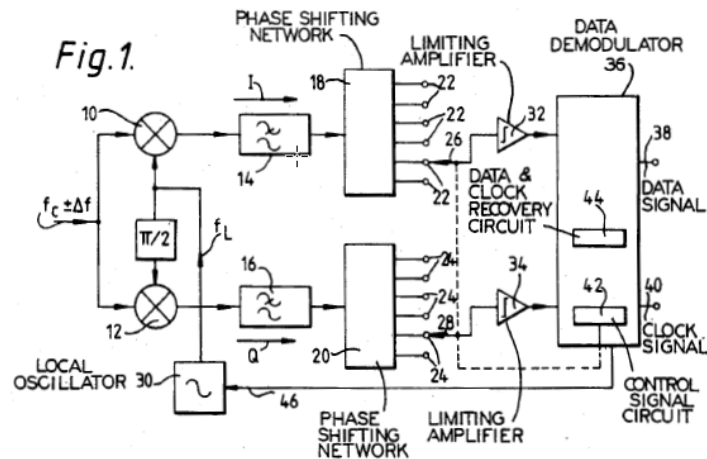


Figure 1 is a block schematic circuit of a data receiver. Ex. 1004, 2:44–46.

Regarding Figure 1, Gibson explains that

a signal, which may be a frequency modulated, differentially encoded input signal $f_c \pm \Delta f$ is applied to quadrature mixers 10, 12 to which a frequency f_L , substantially equal to carrier frequency f_c , is applied from a local oscillator 30. The outputs of the mixers 10, 12 are filtered in low pass filters 14, 16 which will pass the modulation frequency Δf . In an alternative arrangement, not shown, the low pass filters 14, 16 may be omitted and the low pass filtering is done in the mixers 10, 12. Thus in the in-phase channel I the signal is $+\Delta f$ or $-\Delta f$ and in the quadrature channel Q the signal is $+\Delta f - \pi/2$ or $-\Delta f - \pi/2$. By the way of example, f_c may be 900 MHz and the deviation frequency Δf would be a quarter of the bit rate, e.g. for a bit rate of 16 Kb/s Δf is 4 kHz.

Ex. 1004, 2:56–3:2.

b. Schiltz (Ex. 1005)

Schiltz is directed to high-speed electronic circuits and, more specifically, “to a high speed sample and hold circuit and to radios which use such a circuit as a mixer.” Ex. 1005, 1:7–10. Figure 1 is reproduced below:

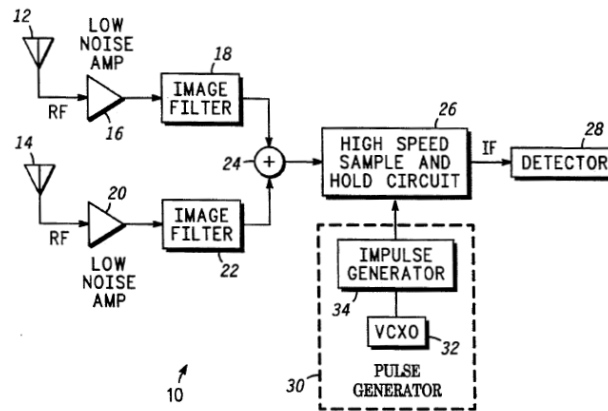


FIG. 1

Figure 1 shows a block diagram of radio 10. Ex. 1005, 2:56–58, 3:4.

Schiltz explains that radio 10 converts one or more RF signals into an IF signal and then into a baseband signal. Ex. 1005, 3:4–6. “Sample and hold circuit 26 operates as a downconverter in radio 10,” by “convert[ing] a high frequency RF signal into an IF signal in a single operation.” *Id.* at 4:29–32. Schiltz discloses that sample and hold circuit 26 “samples the RF signal while the pulses supplied by pulse generator 30 (see FIG. 1) are active and holds the samples while the pulses are inactive.” *Id.* at 6:3–6.

Figure 5 is reproduced below:

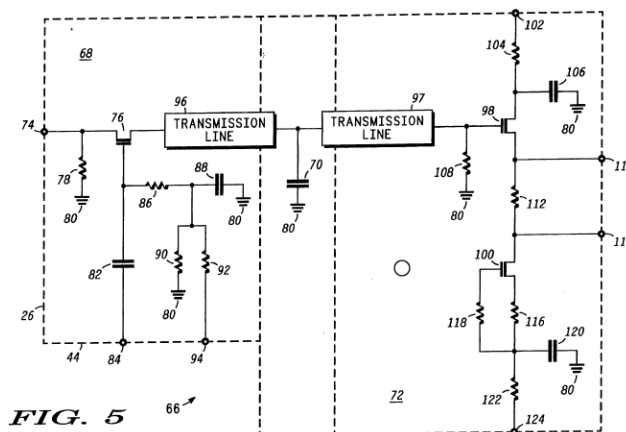


FIG. 5

Figure 5 shows a schematic diagram of a sample and hold circuit. Ex. 1005, 2:67–68.

Schiltz explains that Figure 5 “shows a schematic diagram of one embodiment of sample and hold circuit 26 that achieves a wide bandwidth and is suitable for use in radio 10.” Ex. 1005, 7:39–42. Schiltz states that, “[i]n order to achieve a wide bandwidth, sample and hold circuit 26 is preferably implemented as an integrated circuit,” meaning “substantially all components needed by sample and hold circuit 26 reside within a single integrated circuit (IC) 66.” *Id.* at 7:46–50. Schiltz further provides that IC 66

includes a sampling switch 68, a hold capacitor 70, and a buffer amplifier 72. Sampling switch 68 includes a contact 74 of IC 66, which serves as the sampling input. In other words, an RF signal is applied to sample and hold circuit 26 at contact 74. Contact 74 couples to a source of a field effect transistor (FET) 76. FET 76 performs the above-discussed sampling of the RF signal. A matching resistor 78, preferably around fifty ohms, couples between contact 74 and a ground terminal 80, which is adapted to receive a common potential. Matching resistor 78 provides for the termination of fifty ohm transmission lines, which are commonly used to transmit high frequency RF signals.

A gate of FET 76 couples through a DC blocking capacitor 82 to a contact 84 of IC 66. Contact 84 serves as the control input for sample and hold circuit 26. In other words, the stream of sampling pulses is applied to sample and hold circuit 26 at contact 84. The gate of FET 76 also couples to a first node of a matching resistor 86, which preferably exhibits around fifty ohms for termination of fifty ohm transmission lines. An AC shorting capacitor 88 and a biasing resistor 90 each couple between a second node of matching resistor 86 and ground terminal 80. A biasing resistor 92 couples between the second node of matching resistor 86 and a contact 94 of IC 66. When a negative potential, around – 4 Vdc for example, is applied at contact 94 biasing resistors 90 and 92, bias the gate

of FET 76 through matching resistor 86. Capacitor 88 provides an AC ground to the second node of matching resistor 86.

A drain of FET 76 serves as the output of sample switch 68. The schematic diagram of FIG. 5 shows a transmission line 96, which couples sample switch 68 to a first node of hold capacitor 70. The schematic diagram of FIG. 5 also shows a transmission line 97, which couples the first node of hold capacitor 70 and sample switch 68 to an input of buffer amplifier 72. A second node of hold capacitor 70 couples to ground terminal 80.

Id. at 7:58–8:29.

Schiltz states that it provides “an improved radio which uses a sample and hold circuit in various mixing applications, such as down conversion and oscillation signal generation circuits.” Ex. 1005, 10:15–18. Schiltz explains that “[d]ue to the accurate high frequency operation, a high bandwidth results when the sample and hold circuit is used as a mixer.” *Id.* at 10:29–31. Schiltz further states that “those skilled in the art will appreciate that radio and other architectures other than those described herein may utilize a sample and hold circuit as a mixer.” *Id.* at 10:40–43.

c. Goldberg

Goldberg is an article directed to the introduction of “the BCM3220 multimedia cable networking systems/Data-Over-Cable-Service Interface Specification (MCNS/DOCSIS) compliant media-access controller (MAC) chip.” Ex. 1007, 4. Goldberg describes the DOCSIS, explaining that it “is designed to employ one or more unused video channels within the 54-to-860-MHz cable broadcast spectrum to transmit IP-based data across hybrid fiber coaxial networks.” *Id.* at 4–5. Goldberg states that, “[d]epending on the bit rate selected by the operator, the shared downstream

channel uses either 64- or 256-point quadrature-amplitude modulation (QAM).” *Id.* at 5. Figures 1 and 2 of Goldberg, although not reproduced herein, show Broadcom’s BCM3220 MAC chip and illustrate use of Broadcom’s BCM3116 QAM receiver and the BCM3037 QPSK/16-QAM modulator. *Id.* Goldberg predicts that “Broadcom’s first silicon implementation of the DOCSIS standard will surely give rise to a first generation of low-cost, interoperable cable modems.” *Id.* at 8.

d. Thacker

Thacker is directed to “broadband multimedia data distribution systems, and more particularly, to [an] apparatus for integrating satellite broadband data distributed over a cable TV network with legacy corporate local area networks.” Ex. 1008, 1:7–11. Thacker explains that “the Institute of Electronic and Electrical Engineering’s (IEEE) 802.14 Cable TV Media Access Control and Physical Protocol Working Group” developed the IEEE 802.14 standard, which “supports the International Telecommunications Union’s (ITU) J.83 Annex A, B and C standards for 64/256 QAM modulation.” *Id.* at 1:22–24, 1:52–54.

e. ITU-T J.83

The International Telecommunication Union, Telecommunication Standardization Sector, describes the J.83 standard for “[d]igital multi-programme systems for television, sound and data services for cable distribution,” including QAM television. *See* Ex. 1009, 1 (heading format altered); *see id.* at 4 (indicating that Annex B describes the 64- and 256-QAM specifications).¹⁸

¹⁸ Citations are to the native page numbers of the underlying document.

f. AAPA

As AAPA, Petitioner relies on a portion of the '835 patent that describes several well-known devices for implementing the cable modem receivers, transmitters, and transceivers. In particular, Petitioner relies on the following disclosure:

The cable modem receivers, transmitters, and transceivers of the present invention may be implemented using a variety of well[-]known devices. In embodiments, these receivers, transmitters, and/or transceivers may be implemented by a BCM3415 CMOS Digital Cable Tuner, a BCM3125 QAM-Link™ Universal Set-Top Box Transmission Solution, a BCM3120-Set-Top Box Transceiver, a BCM3116-QAMLink™ 64/256-QAM ITU-B Receiver, a BCM3118B-QAMLink™ 64/256-QAM DVB/DAVIC Receiver, a BCM3115-QAMLink™ 64/256-QAM Dual-Channel Receiver, a BCM3037-QAMLink™ QPSK/16-QAM Burst Modulator, a BCM3033-QAMLink™ Universal Modulator, a BCM3137-QAMLink™ QPSK/16-QAM Burst Demodulator, a BCM3360 QAMLink™ Single-Chip MCNS/DOCSIS Cable Modem, a BCM93310 DOCSIS External Cable Modem, a BCM93310i DOCSIS Internal PCI Cable Modem, and/or a BCM3300-QAMLink™ Single-Chip MCNS/DOCSIS Cable Modem, manufactured by Broadcom™ Corporation.

Ex. 1001, 40:17–35.

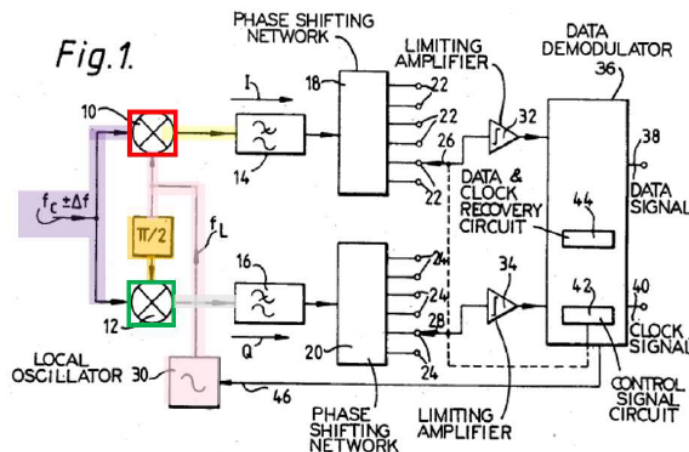
2. Claim 1

a. [1pre]

[1pre] recites “[a] cable modem for down-converting an electromagnetic signal having complex modulations, comprising.”

Ex. 1001, 51:5–6. Petitioner asserts that “Gibson discloses a modem for down-converting an electromagnetic signal having complex modulations.”

Pet. 41 (citing Ex. 1004, Fig. 1). Petitioner’s annotated version of Gibson’s Figure 1 is reproduced below.



Id. at 41. Petitioner annotated Gibson’s Figure 1 to highlight the input electromagnetic signal purple, mixer 10 red, mixer 12 green, the in-phase oscillating signal pink, the quadrature-phase oscillating signal orange, the signal following mixer 10 yellow, and the signal following mixer 12 gray. *Id.* Petitioner asserts that Gibson’s “modem down-converts the modulated carrier signal, for example from a 900 MHz signal to a 4 kHz signal.” *Id.* at 42 (citing Ex. 1004, 2:55–3:21).

Petitioner contends that,

[t]o the extent that the preamble is limiting and the electromagnetic signal must have “complex modulations,” Gibson discloses that the invention works with I/Q modulation, which were complex modulation formats within the general knowledge of a [person of ordinary skill in the art] at the time.

Pet. 42 (citing Ex. 1004,¹⁹ Fig. 1, 2:55–3:21; Ex. 1003 ¶ 124). Additionally, Petitioner asserts that, “to the extent that the preamble is limiting and requires a ‘cable modem,’ it would have been obvious to use the modem of Gibson (as modified by Schiltz, discussed below) as a cable modem, in view

¹⁹ Petitioner cites to Exhibit 1001, but we understand the citation was intended for Gibson, which is Exhibit 1004.

of Thacker, Goldberg, ITU-T J.83, and/or AAPA.” *Id.* (citing Pet. § VII.G.3).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding the preamble of claim 1 aside from the general assertion of an alleged lack of particularity (Prelim. Resp. 13–15), which we addressed above.

We find, at this stage of the proceeding and on the present record, that Petitioner has shown the combination of Gibson and Schiltz satisfies the preamble of claim 1. Additionally, although we determine that “cable modem” is non-limiting, were we to consider that term limiting, we find that Petitioner has shown that its alternative combination of Gibson and Schiltz with Goldberg, Thacker, ITU-T J.83, and/or AAPA satisfies the preamble of claim 1 because one of ordinary skill in the art would have been motivated to use the receiver of Gibson modified with Schiltz as a cable modem in view of Thacker, Goldberg, ITU-T J.83, and/or AAPA for the reasons provided by Petitioner, and would have had a reasonable expectation of success in so doing. *See* Pet. 37–40 (discussing motivation to combine and reasonable expectation of success for Petitioner’s alternative combination).

b. Element [1A]

Element [1A] recites “an oscillator to generate an in-phase oscillating signal.” Ex. 1001, 51:7. Petitioner contends that “Gibson discloses an oscillator (30) to generate an in-phase oscillating signal (f_L),” which Petitioner identifies in pink in the annotated version of Gibson’s Figure 1 (reproduced above). Pet. 43 (citing Ex. 1004, Fig. 1, 2:56–3:2; Ex. 1003 ¶ 126).

In the Preliminary Response, Patent Owner does not challenge Petitioner's contentions regarding element [1A]. *See generally* Prelim. Resp.

We find Petitioner's arguments persuasive as to element [1A] and supported on the record before us for the reasons explained by Petitioner.

c. Element [1B]

Element [1B] recites “a phase shifter to receive said in-phase oscillating signal and to create a quadrature-phase oscillating signal.” Ex. 1001, 51:8–9. Relying on the same annotated version of Gibson's Figure 1 reproduced above, Petitioner contends that “Gibson discloses a phase shifter ($\pi/2$) to receive said in phase oscillating signal (pink, f_L) and to create a quadrature-phase oscillating signal (orange signal output from ‘ $\pi/2$ ’ to green mixer 12).” Pet. 43–44 (citing Ex. 1004, Fig. 1, 2:56–3:2; Ex. 1003 ¶ 127).

In the Preliminary Response, Patent Owner does not challenge Petitioner's contentions regarding element [1B]. *See generally* Prelim. Resp.

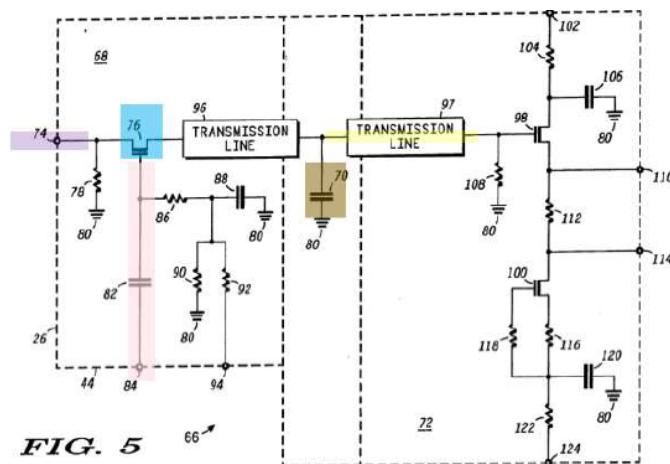
We find Petitioner's arguments persuasive as to element [1B] and supported on the record before us for the reasons explained by Petitioner.

d. Element [1C]

Element [1C] recites “a first frequency down-conversion module to receive the electromagnetic signal and said in-phase oscillating signal.” Ex. 1001, 51:10–12. Relying on the same annotated version of Gibson's Figure 1, reproduced above, Petitioner contends that “Gibson discloses a first frequency down-conversion module (mixer 10, red) to receive the

electromagnetic signal (purple ' $f_c \pm \Delta f$ ') and said in-phase oscillating signal (pink, f_L).” Pet. 44–45 (citing Ex. 1004, Fig. 1).

Petitioner also presents an alternative argument “[t]o the extent it is argued or determined that Gibson does not disclose Element [1C].” Pet. 45. In particular, Petitioner asserts that “Schiltz discloses a frequency down-conversion module, specifically, a ‘high speed sample and hold circuit’ used ‘as a mixer.’” *Id.* (citing Ex. 1005, 1:5–10, 3:45–65, 4:29–32, 6:3–10, 7:58–60). Relying on an annotated version of Schiltz’s Figure 5, reproduced below, Petitioner contends that “Schiltz’s sample and hold circuit (26) shown in Figure 5 discloses a mixer having a sampling switch 68 (comprising a field effect transistor 76, blue) and a ‘hold capacitor’ 70 (brown).” *Id.* at 46 (footnote omitted) (citing Ex. 1005, Fig. 5).



Id. Petitioner annotated Schiltz’s Figure 5 to color the input electromagnetic signal purple, field effect transistor 76 blue, the control oscillating signal pink, hold capacitor 70 brown, and the sampled signal yellow. *Id.* Petitioner asserts that “[t]he input electromagnetic signal (purple) enters at contact 74, which serves as the sampling input and couples to a source of field effect transistor 76 (blue).” *Id.* at 46–47 (citing Ex. 1005, 7:58–8:48). Petitioner contends that “[c]ontact 84 serves as the input for a control oscillating signal

(pink) for the sample and hold circuit 26, and couples to a gate of field effect transistor 76.” *Id.* at 47 (citing Ex. 1005, Fig. 1, 4:8–13). Petitioner asserts that “[f]ield effect transistor 76 operates as a switch and samples the incoming signal.” *Id.* (citing Ex. 1006, 7:58–8:48). Petitioner further contends that “[a] drain of FET 76 is coupled to ‘a first node of hold capacitor 70’ and serves as the output of the sample and hold switch 68, which outputs a sampled signal (yellow).” *Id.* (citing Ex. 1005, 7:58–8:48; Ex. 1003 ¶¶ 127–132).

Petitioner refers to its argument as to why one of ordinary skill in the art would have been motivated to combine the teachings of Gibson and Schiltz (*see* Pet. 47 (“Motivations to combine the references are set forth above in [Petition] Section VII.G.1.”)), which we discuss here because this is the first element of claim 1 that relies on the combined teachings of these two references. In particular, Petitioner asserts that one of ordinary skill in the art would have been motivated to use “Schiltz’s sample and hold circuit ([Ex. 1005], Figs. 1 and 5 at circuit 26) as the mixer in each of the two branches of Gibson’s receiver ([Ex. 1004], Fig. 2 at mixers 10 and 12).” *Id.* at 32. Petitioner contends “Gibson as modified by Schiltz would use one instance of Schiltz’s sample and hold circuit as the mixer 10 in Gibson’s in-phase path, and another instance of Schiltz’s sample and hold circuit as the mixer 12 in Gibson’s quadrature-phase path.” *Id.* at 32–33.

First, Petitioner explains that Gibson discloses using two mixers, but “does not describe the inner workings of its mixers.” Pet. 33. Schiltz, according to Petitioner, “expressly teaches one of ordinary skill to use its ‘sample and hold circuit *as a mixer*’ for down-conversion (like the mixers in Gibson).” *Id.* (citing Ex. 1005, 1:5–10, 10:15–22; Ex. 1003 ¶¶ 113–114).

Second, Petitioner contends that one of ordinary skill in the art “would have recognized the benefits of using the sample and hold circuit as taught in Schiltz for each of the mixers disclosed by Gibson,” in part, because “Schiltz encourages the use of a sample and hold circuit” by stating that “‘the sample and hold circuit may be accurately operated at high frequencies’ and ‘may be applied to virtually any frequency RF and IF signals.’” Pet. 33–34 (citing Ex. 1005, 10:15–48; Ex. 1003 ¶ 115).

Further, Petitioner contends that “combining Gibson with Schiltz would have yielded only expected, predictable results.” Pet. 34. In particular, Petitioner asserts that

[e]ach combination would have been (1) a combination of prior art elements according to known methods to yield predictable results, since a [person of ordinary skill in the art] would have understood how to implement a sample and hold mixer (as taught by Schiltz) in the context of Gibson; and (2) obvious to try—a choice of one type of mixer from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Id. (citing *KSR*, 550 U.S. at 416–17, 421; *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007); Ex. 1003 ¶ 116).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1C]. *See generally* Prelim. Resp.

We find each of Petitioner’s alternative arguments persuasive as to element [1C] and supported on the record before us for the reasons explained by Petitioner.

e. Element [1D]

Element [1D] recites “a second frequency down-conversion module to receive the electromagnetic signal and said quadrature-phase oscillating signal; wherein.” Ex. 1001, 51:14–16. Relying on the same annotated version of Gibson’s Figure 1, reproduced above in our discussion of [1pre], Petitioner contends that “Gibson discloses a second frequency down-conversion module (mixer 12, green) to receive the electromagnetic signal (purple) and said quadrature-phase oscillating signal (orange).” Pet. 47–48.

Alternatively, Petitioner asserts that

[t]o the extent it is argued or determined that Gibson does not disclose Element [1D], it would have been obvious to use the frequency down-conversion module of Schiltz in place of the second mixer of Gibson in the same manner and for the same reasons as discussed previously for Gibson’s first mixer with respect to Element [1C].

Pet. 48 (citing Ex. 1003 ¶¶ 133–134).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1D]. *See generally* Prelim. Resp.

We find each of Petitioner’s alternative arguments persuasive as to element [1D] and supported on the record before us for the reasons explained by Petitioner.

f. Element [1E]

Element [1E] recites “said first frequency down-conversion module further comprises a first frequency translation module.” Ex. 1001, 51:17–18. Petitioner contends “Gibson discloses a first mixer 10 but does not expressly disclose that it has a switch (if a ‘frequency translation module’ requires one).” Pet. 48. Relying on the same annotated version of Schiltz’s

Figure 5 reproduced above, Petitioner asserts that, “[a]s discussed above with respect to Elements [1C] and [1D], Schiltz discloses a mixer comprising a switch (FET 76, blue) coupled to a storage module (capacitor 70, brown).” *Id.* at 48–49. Petitioner contends “[i]t would have been obvious to use the mixer of Schiltz for each of the mixers (10, 12) in Gibson for the reasons discussed above with respect to Elements [1C] and [1D].” *Id.* at 49 (citing Ex. 1003 ¶¶ 135–136).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1E]. *See generally* Prelim. Resp.

We find Petitioner’s arguments persuasive as to element [1E] and supported on the record before us for the reasons explained by Petitioner.

g. Element [1F]

Element [1F] recites “and a first storage module.” Ex. 1001, 51:18–19. Petitioner contends that “Gibson does not expressly disclose that first mixer 10 has a storage module (*e.g.*, capacitor).” Pet. 49. Petitioner asserts that, “[a]s discussed above with respect to Elements [1C], [1D], and [1E], Schiltz discloses a mixer comprising a switched capacitor, and it would have been obvious to use such a mixer in the modem of Gibson for the reasons discussed above with respect to Elements [1C] and [1D].” *Id.* at 49–50 (citing Ex. 1003 ¶¶ 137–138).

Petitioner additionally points to the final written decision in the TCL IPR, in which we found that Schiltz’s switched capacitor 70 satisfies “a first storage module” as recited in element [1F]. Pet. 50 (citing IPR2021-00985, Paper 44 at 85–88).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1F]. *See generally* Prelim. Resp.

We find Petitioner’s arguments persuasive as to element [1F] and supported on the record before us for the reasons explained by Petitioner.

h. Element [1G]

Element [1G] recites “wherein said first frequency translation module samples the electromagnetic signal at a rate that is a function of said in-phase oscillating signal, thereby creating a first sampled signal.”

Ex. 1001, 51:19–22. Relying on the same annotated version of Gibson’s Figure 1, reproduced above in our discussion of [1pre], Petitioner contends that “Gibson discloses that the first frequency down-conversion module (mixer 10) mixes the electromagnetic signal (purple) with the in-phase oscillating signal (pink),” but “does not expressly disclose sampling.” Pet. 50–51. Petitioner asserts that, “[a]s discussed above with respect to Elements [1C], [1D], [1E], and [1F], Schiltz discloses a mixer module comprising a pulse generator and a switched capacitor acting as a ‘sample and hold circuit.’” *Id.* at 51. Relying on the same annotated versions of Figures 1 and 5 of Schiltz reproduced above, Petitioner argues that

mixer module uses an input oscillating signal (pink, such as the one shown as an input to mixer 10 in Figure 1 of Gibson) to generate a stream of oscillating sampling pulses in order to control FET switch 76 which, in conjunction with “hold capacitor 70,” samples the incoming RF signal (purple) to create a first sampled signal (yellow).

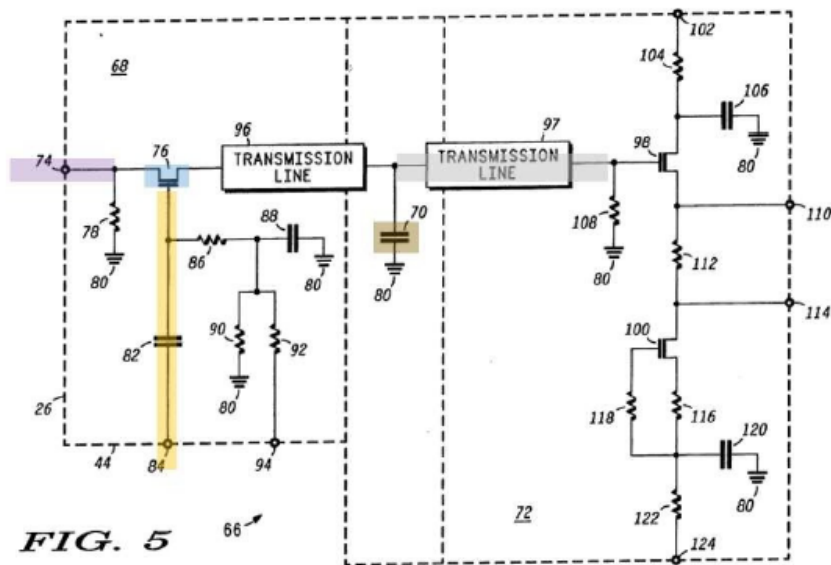
Id. at 51–52 (footnote and emphasis omitted). Petitioner asserts that “[i]t would have been obvious to use the sampling mixer of Schiltz in place of the mixers (10, 12) in Gibson, for the reasons discussed previously” in element [1C]. *Id.* at 52 (citing Ex. 1003 ¶¶ 139–141) (referring to Pet. § VII.G.1).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1G]. *See generally* Prelim. Resp.

We find Petitioner’s arguments persuasive as to element [1G] and supported on the record before us for the reasons explained by Petitioner.

i. Element [1H]

Element [1H] recites “said second frequency down-conversion module further comprises a second frequency translation module.” Ex. 1001, 51:23–24. Petitioner asserts that “[t]he first and second mixers of Gibson (10, 12) are structurally identical, and it would have been obvious to use the sample and hold mixer of Schiltz as a mixer in Gibson for the reasons discussed previously in Element [1E].” Pet. 52. As shown below, Petitioner relies on Schiltz’s Figure 5 with slightly different annotations as compared to the version above, contending “the mixer of Schiltz has a frequency translation module, *i.e.*, a switch (FET 76, blue), that is in turn coupled to a capacitor (70, brown), which down-converts the incoming RF signal (purple) to create a second sampled signal (gray).” *Id.* at 52–53 (citing Ex. 1003 ¶¶ 142–145).



Id. at 53. Petitioner annotated Schiltz’s Figure 5 to color the input electromagnetic signal purple, field effect transistor 76 blue, the control oscillating signal yellow, hold capacitor 70 brown, and the second sampled signal gray. *Id.*

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1H]. *See generally* Prelim. Resp.

We find Petitioner’s arguments persuasive as to element [1H] and supported on the record before us for the reasons explained by Petitioner.

j. Element [1I]

Element [1I] recites “and a second storage module.” Ex. 1001, 51:24–25. Petitioner contends that, “[a]s discussed above, the mixer of Schiltz includes a storage module (capacitor 70).” Pet. 53 (citing Ex. 1003 ¶ 145). Petitioner also points to the final written decision in the TCL IPR, in which we found that Schiltz’s switched capacitor 70 satisfies “a second storage module” as recited in element [1I]. *Id.* (citing IPR2021-00985, Paper 44 at 91–92).

In the Preliminary Response, Patent Owner does not challenge Petitioner's contentions regarding element [1I]. *See generally* Prelim. Resp.

We find Petitioner's arguments persuasive as to element [1I] and supported on the record before us for the reasons explained by Petitioner.

k. Element [1J]

Element [1J] recites “wherein said second frequency translation module samples the electromagnetic signal at a rate that is a function of said quadrature-phase oscillating signal, thereby creating a second sampled signal.” Ex. 1001, 51:25–29. Relying on the same annotated version of Gibson's Figure 1 reproduced above in the discussion of [1pre], Petitioner contends that “Gibson discloses that the second frequency down-conversion module (mixer 12) samples the electromagnetic signal (purple) at a rate that is a function of the quadrature-phase oscillating signal (orange).” Pet. 54. Petitioner asserts that, “[a]s discussed with respect to Element [1G], Schiltz discloses a mixer comprising a switched capacitor acting as a ‘sample and hold circuit.’” *Id.*

Relying on the same annotated version of Schiltz's Figure 5 reproduced above in the discussion of element [1H], Petitioner contends that,

[a]s seen in Figure 5 of Schiltz, that mixer uses an oscillating signal (orange, such as the quadrature-phase one shown as an input to mixer 12 in Figure 1 of Gibson) in order to control FET switch 76 which, in conjunction with “hold capacitor 70,” samples the incoming RF signal (purple) to create a sampled signal (gray).

Pet. 54 (emphasis omitted). Petitioner argues that “[i]t would have been obvious to use the sampling mixer of Schiltz in place of the mixers (10, 12)

in Gibson, for the reasons discussed previously” in element [1C]. *Id.* at 55 (citing Ex. 1003 ¶¶ 146–148) (referring to Pet. § VII.G.1).

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding element [1J]. *See generally* Prelim. Resp.

We find Petitioner’s arguments persuasive as to element [1J] and supported on the record before us for the reasons explained by Petitioner.

1. Summary as to Claim 1

For the reasons discussed above, on the present record we find that Petitioner has established that the combination of Gibson and Schiltz teaches each of the elements of claim 1 and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioner with a reasonable expectation of success in so doing.

Additionally, although we determine that “cable modem” is non-limiting, were we to consider that term limiting, on the present record we find that Petitioner has established that the alternative combination of Gibson and Schiltz with Goldberg, Thacker, ITU-T J.83, and/or AAPA teaches each of the elements of claim 1 and that one of ordinary skill in the art would have been motivated to combine the teachings of these references as proposed by Petitioner with a reasonable expectation of success in so doing.

3. Claims 2–5

Claims 2–5 depend from claim 1. Petitioner provides a detailed analysis with argument supported on the present record showing how the

combination of Gibson and Schiltz²⁰ would have rendered the subject matter of claims 2–5 obvious to one of ordinary skill in the art at the time of the invention. Pet. 55–65.

In the Preliminary Response, Patent Owner does not challenge Petitioner’s contentions regarding claims 2–5. *See generally* Prelim. Resp.

We have reviewed Petitioner’s detailed arguments and evidence, and we find Petitioner’s arguments persuasive as to claims 2–5 and supported on the record before us for the reasons explained by Petitioner. Pet. 55–65.

4. *Objective Indicia of Nonobviousness*

Petitioner notes that in the final written decision in the TCL IPR, we found that Patent Owner’s evidence of objective indicia of nonobviousness was “weak” as compared to the obviousness evidence presented. Pet. 90 (citing IPR2021-00985, Paper 44 at 63–68). Petitioner contends that it “is not presently aware of any other evidence of objective indicia of non-obviousness that is relevant to this proceeding.” *Id.*

In the record presently before us, Patent Owner has not presented any evidence of objective indicia of nonobviousness.

5. *Weighing the Graham Factors*

“Once all relevant facts are found, the ultimate legal determination [of obviousness] involves the weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan.”

²⁰ Petitioner relies only on Gibson and Schiltz to teach the elements expressly recited in claims 2–5. *See* Pet. 55–65 (addressing claims 2–5). But, because claims 2–5 depend from claim 1, Petitioner’s alternative ground directed to claim 1 (based on the combination of Gibson and Schiltz with Thacker, Goldberg, ITU-T J.83, and/or AAPA) also applies to claims 2–5.

Arctic Cat, 876 F.3d at 1361. On balance, considering the record presently before us, Petitioner has established a reasonable likelihood that it would prevail in showing that the combination of Gibson and Schiltz and, alternatively, the combination of Gibson and Schiltz with Goldberg, Thacker, ITU-T J.83, and/or AAPA would have rendered the subject matter of claims 1–5 of the '835 patent obvious to one of ordinary skill in the art at the time of the invention.

E. Ground 2: Obviousness over Crols

Ground 4: Obviousness over Crols, Thacker, Goldberg, ITU-T J.83, and/or AAPA

Petitioner asserts that Crols would have rendered the subject matter of claims 1–5 obvious to one of ordinary skill in the art at the time of the invention and that, “[i]f the preamble of claim 1 is limiting, and therefore requires a ‘cable modem,’ then these claims are unpatentable as obvious over Crols, and further in view of Thacker, Goldberg, ITU-T J.83, and/or AAPA.” Pet. 65; *see id.* at 34–37 (discussing motivation to combine two embodiments of Crols and reasonable expectation of success), 37–40 (discussing motivation to combine Crols with Thacker, Goldberg, ITU-T J.83, and AAPA), 65–90 (discussing the application of the prior art to the claims).

As noted above, Patent Owner contends the Petition should be denied because “Petitioner fails to articulate obviousness theories with particularity,” Prelim. Resp. 13 (capitalization and emphasis of heading altered), which we addressed above. Patent Owner’s Preliminary Response does not raise any other substantive argument directed to Petitioner’s obviousness grounds. *See generally id.*

Because we have determined above that, at this stage of the proceeding and on the present record, the information presented in the Petition shows that there is a reasonable likelihood that Petitioner will prevail with respect to its challenge based on Gibson and Schiltz (Ground 1), we need not address, in this Decision, Petitioner's additional challenges. *See* 35 U.S.C. § 314(a); *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) (“Section 314(a) does not require the Director to evaluate every claim individually. Instead, it simply requires him to decide whether the petitioner is likely to succeed on ‘at least 1’ claim. Once that single claim threshold is satisfied, it doesn’t matter whether the petitioner is likely to prevail on any additional claims; the Director need not even consider any other claim before instituting review.”).

IV. CONCLUSION

For the reasons discussed above, we do not exercise our discretion to deny institution. Additionally, Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that at least one claim of the ’835 patent is unpatentable. Our analysis is based on the preliminary record developed thus far and may change after the record is developed fully, during trial.

V. ORDER

Accordingly, it is:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review is instituted as to claims 1–5 of the ’835 patent on each of the four grounds set forth in the Petition—(1) Gibson and Schiltz; (2) Crols; (3) Gibson and

Schiltz with Thacker, Goldberg, ITU-T J.83, and/or AAPA; and (4) Crols with Thacker, Goldberg, ITU-T J.83, and/or AAPA; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '835 patent shall commence on the entry date of this Decision, and notice is hereby given of the institution of a trial.

IPR2024-00150
Patent 7,292,835 B2

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