

IN THE
Supreme Court of the United States

PARKERVISION, INC.,

Petitioner,

v.

TCL INDUSTRIES HOLDINGS CO., *et al.*,

Respondents.

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED
STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

PETITION FOR A WRIT OF CERTIORARI

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QUESTION PRESENTED

Section 144 of the Patent Act directs the Federal Circuit to decide appeals from the Patent Trial and Appeal Board (PTAB) by issuing “opinion[s].” 35 U.S.C. § 144. The word *opinion* is a legal term of art. It has long meant a court’s statement of reasons for a decision, and it is distinct from a *judgment*. Congress had also required the Federal Circuit’s predecessor to issue opinions in patent agency appeals. And it made sense for Congress to retain that reasoning-giving directive when it created the Federal Circuit: the court’s mandate was to clarify the legal standards for invention patents. Uncertainty stifles innovation. The Federal Circuit’s first Chief Judge, the Honorable Howard T. Markey, thus said: “In our Court there will be an opinion explaining enough to tell you what the law is in every case.” He added: “We do not just render a one-worded decision and go away.” In recent years, though, the Federal Circuit has routinely issued one-word “judgment[s] of affirmance without opinion” under Federal Circuit Rule 36(a), saying only “AFFIRMED” rather than issuing an opinion. That happened here. The PTAB invalidated claims in ParkerVision’s already issued patents through inter partes review, a peculiar process that flouts due-process principles; and the Federal Circuit summarily affirmed. So, ParkerVision has been deprived of vested property rights, yet no court has ever explained why, despite § 144’s text.

The question presented is: Whether 35 U.S.C. § 144, which requires the Federal Circuit to issue “opinion[s]” in PTAB appeals, is a reason-giving directive that prohibits the Federal Circuit’s practice, under Federal Circuit Rule 36(a), of summarily affirming PTAB decisions without issuing opinions.

PARTIES TO THE PROCEEDINGS

Petitioner

- ParkerVision, Inc.

Respondents

- TCL Industries Holdings Co., (TCL)
- LG Electronics Inc. (LGE)

RULE 29.6 STATEMENT

ParkerVision has no parent corporation and no publicly held corporation owns 10% or more of its stock.

LIST OF PROCEEDINGS

U.S. Court of Appeals for the Federal Circuit

No. 2023-1415

*ParkerVision, Inc. v. TCL Indus. Holdings Co. and
LG Electronics Inc.*

Date of Final Judgment: June 5, 2024

U.S. Court of Appeals for the Federal Circuit

No. 2023-1417

*ParkerVision, Inc. v. TCL Indus. Holdings Co. and
LG Electronics Inc.*

Date of Final Judgment: June 5, 2024

Patent Trial and Appeal Board

No. IPR2021-00985

*TCL Indus. Holdings Co. and LG Electronics Inc. v.
ParkerVision, Inc.*

Date of Final Decision: November 17, 2022

Patent Trial and Appeal Board

No. IPR2021-00990

*TCL Indus. Holdings Co. and LG Electronics Inc. v.
ParkerVision, Inc.*

Date of Final Decision: November 21, 2022

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BLACK’S LAW DICTIONARY (5th ed. 1979).....	11
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Daniel F. Klodowski et al., <i>Federal Circuit PTAB Appeal Statistics for June 2024</i> , Finnegan PTAB Blog (Aug. 22, 2024), https://www.finnegan.com/en/ insights/blogs/at-the-ptab-blog/federal- circuit-ptab-appeal-statistics-for-june- 2024.html	32
Gary S. Lawson, <i>Appointments and Illegal Adjudication: The America Invents Act Through A Constitutional Lens</i> , 26 GEO. MASON L. REV. 26 (2018)	24
Harold Leventhal, <i>Appellate Procedures: Design, Patchwork, and Managed Flexibility</i> , 23 UCLA L. Rev. 432 (1976)	20
Rebecca A. Lindhorst, Comment, <i>Because I Said So: The Federal Circuit, the PTAB, and the Problem with Rule 36 Affirmances</i> , 69 Case W. RES. L. REV. 247 (2018)	33

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Charles Macedo et al., <i>Justice Is Not Silent: The Case Against One-Word Affirmances in the Federal Circuit</i> , Patently-O (Sept. 22, 2024), <a href="https://patentlyo.com/patent/2024/09/
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Eileen McDermott, <i>Chief Judge Paul Michel: Patent Reform Progress Is Likely, But We Must Stay Focused on the Big Picture</i> , IPWatchDog.com (Sept. 15, 2019), <a href="https://
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William P. McLauchlan, <i>The Oxford Companion to the Supreme Court of the United States</i> (Kermit L. Hall ed., 2d ed. 2005)	12
Pharm. Researchers & Mfrs. of Am., <i>Comments on Trial Proceedings Under the America Invents Act</i> (Oct. 16, 2014), <a href="https://www.uspto.gov/sites/default/files/
ip/boards/bpai/phrma_20141016.pdf">https://www.uspto.gov/sites/default/files/ ip/boards/bpai/phrma_20141016.pdf	26
Alvin B. Rubin, <i>Book Review of The Ways of a Judge by Frank M. Coffin</i> , 130 U. PA. L. REV. 220 (1981)	21

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Larry Sandell, <i>What 18 Months of IPR Stats Teach Us About Winning Appeals</i> , Law360 (July 20, 2020), https://www.law360.com/articles/ 1293373/what-18-months-of-ipr-stats- teach-us-about-winning-appeals	33
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Joseph W. Singer, <i>Normative Methods for Lawyers</i> , 56 UCLA L. REV. 899 (2009)	20
Patricia M. Wald, <i>The Problem with the Courts: Black- Robed Bureaucracy or Collegiality Under Challenge?</i> , 42 MD. L. REV. 766 (1983)	21, 22
Karl M. ZoBell, <i>Division of Opinion in the Supreme Court A History of Judicial Disintegration</i> , 44 CORNELL L. REV. 186 (1959).....	12



PETITION FOR A WRIT OF CERTIORARI

ParkerVision respectfully requests a writ of certiorari to review the judgment of the U.S. Court of Appeals for the Federal Circuit.



DECISIONS BELOW

The Federal Circuit's judgments are unreported but available at *ParkerVision, Inc. v. TCL Indus. Holdings Co.*, No. 2023-1415, 2024 WL 2842282 (Fed. Cir. June 5, 2024), and No. 2023-1417, 2024 WL 2842279 (Fed. Cir. June 5, 2024). They are reprinted in the Appendix to the Petition (App.) at 1a-2a, 111a-112a. The final written decisions of the PTAB are unreported but reprinted at App.3a-86a, 113a-233a.



JURISDICTION

The Federal Circuit entered its judgments on June 5, 2024. On August 28, 2024, the Chief Justice granted ParkerVision's applications to extend the time to file this petition until November 2, 2024. This petition is thus timely filed under Sup. Ct. R. 13. This Court has jurisdiction under 28 U.S.C. § 1254(1).



STATUTORY PROVISION INVOLVED

35 U.S.C. § 144 provides:

The United States Court of Appeals for the Federal Circuit shall review the decision from which an appeal is taken on the record before the Patent and Trademark Office. Upon its determination the court shall issue to the Director its mandate and opinion, which shall be entered of record in the Patent and Trademark Office and shall govern the further proceedings in the case.



INTRODUCTION

Under § 144 of the Patent Act, the Federal Circuit “shall issue” an “opinion” in an appeal from a final decision by the Patent Trial and Appeal Board (PTAB), an administrative body of the U.S. Patent and Trademark Office (PTO). 35 U.S.C. § 144. The word *opinion* has deep roots in American law. It is a legal term of art. Since the founding, it has meant—and it still means—a court’s statement of reasons for its decision. It is distinct from the *judgment*, which is the final determination of the parties’ rights.

Congress understood—or must be presumed to have understood—that by requiring the Federal Circuit to issue an *opinion* in a PTAB appeal, it was requiring the Federal Circuit to give reasons for its decision. When Congress employed *opinion*, Congress swept in the word’s old soil: a rich history and tradition, in

American legal culture, of calling a court’s statement of reasons an *opinion*. Indeed, reason-giving is at the heart of the cluster of ideas constituting the term.

Here, however, the Federal Circuit summarily affirmed the PTAB’s patent-invalidation decisions under Federal Circuit Rule 36—without issuing opinions and saying only “AFFIRMED.” The Federal Circuit therefore violated § 144—just as it has done in 58 other PTAB appeals so far in 2024. (See *infra* at 32.) As a result of the Federal Circuit’s statutory violations, no court has ever explained to ParkerVision and numerous other technology companies why claims in their already issued patents were invalidated, and why their vested property rights were canceled.

Congress had good reason to require the Federal Circuit to give reasons. From 1929 to 1982, the Federal Circuit’s predecessor, the Court of Customs and Patent Appeals (CCPA), was statutorily required to issue “opinion[s]” in appeals from the PTO’s predecessor, the Patent Office. 28 U.S.C. § 216 (repealed 1982). After Congress replaced the CCPA with the Federal Circuit in 1982, Congress promptly revived the statutory opinion-writing requirement. By requiring the Federal Circuit to give reasons for its decisions in patent agency appeals, Congress promoted the very point of the Federal Circuit: to bring uniformity, stability, and coherence to the legal standards for invention patents. So in 1984, Congress amended 35 U.S.C. § 144 to its current form. The Federal Circuit’s first Chief Judge, the Honorable Howard T. Markey, declared: “In our Court there will be an opinion explaining enough to tell you what the law is in every case.” *The First Annual Judicial Conference of the United States Court of*

Appeals for the Federal Circuit, 100 F.R.D. 499, 511 (1983) (“We do not just render a one-worded decision and go away.”).

Interpreting § 144 as a reason-giving requirement also makes sense, and cannot be an absurd literalism, given that reason-giving serves multiple adjudicative goals: accountability, transparency, perceived legitimacy, accuracy, and dignity, to name a few. As Professor Mary Ann Glendon put it, the “[d]iscipline of writing out the reasons for a decision and responding to the main arguments of the losing side has proved to be one of the most effective curbs on arbitrary judicial power ever devised.” *A Nation Under Lawyers: How the Crisis in the Legal Profession is Transforming American Society* 147-48 (1994).

Resisting an atextual interpretation of § 144 avoids serious constitutional problems, as well. Here, the PTAB invalidated claims in ParkerVision’s patents through inter partes review, a highly idiosyncratic administrative process where a panel of PTAB members reassesses the validity of already issued patents. The PTO Director, a political appointee, decides which PTAB members will serve on a particular panel, and how many, and determines their salary. They receive bonuses based on their productivity and commitment to the PTO’s mission. They decide both (i) whether to institute an inter partes review (based on a petition, brought by anyone who does not own the patent, challenging the patent), and (ii) whether to invalidate the patent (based on the petitioner’s and the patent-holder’s papers). Additional petitioners may join the inter partes review midstream, and if all the petitioners drop out, the PTAB panel may proceed. Given inter partes review’s deviations from the principles of judi-

cial independence and justiciability that underlie our Article III courts, due process may very well demand that if a patent holder challenges, in the Federal Circuit, an inter partes review that invalidated an already issued patent, the Federal Circuit must give reasons for its decision.

Critically, construing § 144 as a reason-giving directive will not deluge the Federal Circuit with additional work. An opinion can be pithy. In ParkerVision's view, the Federal Circuit would satisfy § 144 by issuing a one-paragraph document identifying the grounds for reversal or vacatur that the appellant has raised and stating why they fail. This construction of § 144 would have required the Federal Circuit to have written sixty more paragraphs so far this year. Even if this Court disagrees with ParkerVision's position, it should grant the petition to draw the correct line, or to explain why a one-word affirmance suffices.

The question presented is important and recurring, and this case is an ideal vehicle to resolve it. Inventors, technology companies, parties before the PTAB and the Federal Circuit, the patent bar, judges (including former Federal Circuit judges), and scholars have been protesting the Federal Circuit's use of Rule 36 for several years. The chorus of criticism is only growing louder. The petition for certiorari should be granted.



STATEMENT OF THE CASE

A. ParkerVision's Patents

ParkerVision—the petitioner here, the appellant in the Federal Circuit, and the patent owner in the PTAB proceedings—develops advanced wireless solutions for communications networks. TCL and LGE—the respondents here, the appellees in the Federal Circuit, and the petitioners in the PTAB proceedings—produce electronic devices.

In the mid-1990s, inventor Jeffrey L. Parker set his sights on breaking an engineering logjam in the field of wireless communications. The fundamental architecture of the technology for wireless signal generation and reception was severely outdated—decades old in mobile phones, and a century old in receivers. Wireless products were running on super-heterodyne, a power-hungry technology that required large circuitry and numerous components. As a result, mobile phones would die quickly and process data slowly. Undeterred by the wireless industry's path dependency, and dissatisfied with the status quo, Parker formed ParkerVision. By the late 1990s, the company had a breakthrough: lead inventor David Sorrells conceived energy transfer sampling. This paradigm shift ushered in smaller, more efficient, and higher performing wireless products. Today, countless smartphones, WiFi devices, and satellite communications employ ParkerVision's energy transfer sampling technology, which enables them to accommodate lower-cost computer chips that use less power, to work over worldwide bands of radio frequencies and multiple

standards, and to process data at higher rates. App.62a-63a.

ParkerVision sought intellectual-property protection for its ground-breaking inventions, and the PTO granted its applications, issuing the '444 patent in 2006 and the '835 patent in 2007. Fed. Cir. No. 2023-1415, J.A. 143; Fed. Cir. No. 2023-1417, J.A. 101.

In broad strokes: When Person A speaks into a mobile phone during a call with Person B, Person A's phone up-converts Person A's voice—which is a low-frequency, baseband signal—into a high-frequency, carrier signal. Unlike the human voice, the carrier signal can be transmitted a long distance through the air to Person B's phone. Once the carrier signal gets there, Person B's phone down-converts the carrier signal back into a baseband signal, and Person B hears Person A's voice. Fed. Cir. No. 2023-1415, Appellant Br. (C.A.Br.) 1-5.

The ParkerVision patents at issue revolved around its revolutionary down-conversion system: energy transfer sampling. A different down-conversion system under consideration in the wireless-technology community was *voltage* sampling, which measured only a carrier signal's voltage. *Energy* transfer sampling, in contrast, transferred the carrier signal's energy so as to use the transferred energy to form a baseband signal, resulting in far greater performance. C.A.Br. 14.¹

¹ Energy transfer sampling accomplishes that feat by (i) transferring non-negligible amounts of energy during a carrier-signal sample period directly to a low-impedance load and simultaneously to a capacitor (“storage element”), and (ii) discharging, between sample periods, the stored energy to the load. The sampling performs down-conversion to a baseband signal; the

B. PTAB Proceedings

The Leahy-Smith America Invents Act (AIA) authorizes the PTAB to administer various patent-related proceedings, including inter partes review. Pub. L. No. 112-29, § 6, 125 Stat. 284, 299-313 (2011). Under this process, “a person who is not the owner of a patent” may file a petition with the PTAB seeking reconsideration and cancellation of any claim in an already issued patent on the ground that it was anticipated or obvious. 35 U.S.C. § 311; *see also id.* § 102 (novelty); *id.* § 103 (non-obviousness).

In May 2021, TCL filed a petition for inter partes review seeking to invalidate certain claims of the ’444 patent, and a second petition seeking to invalidate certain claims of the ’835 patent. The PTAB instituted the reviews. LGE then filed two petitions challenging the same patent claims on the same grounds, which the PTAB instituted and joined with the corresponding TCL inter partes reviews. App.4a, 114a-115a.

The petitions argued that certain claims in ParkerVision’s patents were obvious in light of the

continuous energy flow at the load forms a baseband signal during and between samples. Voltage sampling, however, does not transfer the carrier signal’s energy. Rather, its capacitor (“holding element”) merely holds a negligible amount of energy so as to provide an accurate voltage per sample, which is then measured to represent the baseband. Whereas a voltage sampling circuit discards energy from the sampled carrier signal without using the energy in the down-converted signal and thereby wastes energy and limits performance, an energy transfer sampling circuit uses non-negligible energy from the carrier signal to a low impedance load so that the down-converted energy itself forms the down-converted signal. An energy transfer system thus results in a higher-quality baseband signal and allows for smaller, less costly, and more efficient wireless devices. C.A.Br. 6-15.

prior art, *see* 35 U.S.C. § 103. App.7a-8a, 117a-119a. In response, ParkerVision demonstrated that the proffered prior-art references were inapposite, as they described a *voltage* sampling system that merely held energy without storing it for down-conversion—not an *energy* sampling system. C.A.Br. 62-63.

Notably absent from the petitions and the supporting declarations was any argument that capacitors in the prior art stored non-negligible amounts of energy. App.97a, 235a-236a. In fact, the petitions and supporting declarations made no mention of the terms “non-negligible,” “negligible,” or “energy.” App.92a-93a, 236a-237a; C.A.Br. 64.

In their replies, TCL and LGE argued—for the first time—that capacitors in the prior art stored non-negligible amounts of energy. App.91a-93a, 235a-236a; C.A.Br. 64-65.

In November 2022, the PTAB issued its final written decisions, which adopted TCL and LGE’s arguments and determined that the challenged patent claims in both petitions were obvious and thus invalid under 35 U.S.C. § 103. App.3a-86a, 113a-233a.

C. Federal Circuit Proceedings

Section 141 of the Patent Act authorizes a party “dissatisfied with” a final decision by the PTAB to appeal that decision to the Federal Circuit. 35 U.S.C. § 141. Sections 142 to 144 enumerate the requirements for the notice of appeal, the Federal Circuit proceedings, and the Federal Circuit’s decision. *Id.* §§ 142-44.

ParkerVision timely appealed the PTAB’s final written decisions to the Federal Circuit. Among other arguments, ParkerVision argued that the prior art

references were inapposite, and that the PTAB had improperly based its cancellation decision on forfeited arguments. C.A.Br. 62-78.

In each appeal, the Federal Circuit summarily affirmed the PTAB's decision, without opinion, under Federal Circuit Rule 36(a). App.1a-2a, 111a-112a.

This petition followed.



REASONS FOR GRANTING THE PETITION

I. THE FEDERAL CIRCUIT'S RULE 36 PRACTICE OF SUMMARILY AFFIRMING PTAB DECISIONS WITHOUT ISSUING OPINIONS VIOLATES THE PATENT ACT'S REASON-GIVING REQUIREMENT.

A. Section 144 of the Patent Act Requires the Federal Circuit to Issue an *Opinion*, a Legal Term of Art Meaning a Statement of Reasons.

Under § 144 of the Patent Act—titled “Decision on Appeal”—the Federal Circuit “shall review the decision from which an appeal is taken on the record before the [PTO],” and “[u]pon its determination, the court shall issue to the Director [of the PTO] its mandate *and opinion*, which shall be entered of record in the [PTO] and shall govern the further proceedings in the case.” 35 U.S.C. § 144 (emphasis added); *see also id.* § 141 (showing that § 144 applies to PTAB appeals).

When Congress amended § 144 of the Patent Act in 1984² to require the Federal Circuit to issue an

² See Act of Nov. 8, 1984, Pub. L. No. 98-620, title IV, § 414(a),

“opinion” in an appeal from the PTAB, Congress knew—or it must be presumed to have known—that it was requiring the Federal Circuit to issue a statement of reasons for its decision. An *opinion* is a legal term of art with a settled meaning: a court’s “expression of the reasons why a certain decision (the judgment) was reached in a case.” See BLACK’S LAW DICTIONARY 985 (5th ed. 1979). An *opinion* is distinct from a *judgment*, which is the “final decision of the court resolving the dispute and determining the rights and obligations of the parties.” *Id.* at 755. A *mandate*, meanwhile, is an appellate court’s order “directing action to be taken, or disposition to be made of case,” by the “inferior” adjudicative body, *id.* at 867; see also *Comm’r v. Bedford’s Est.*, 325 U.S. 283, 287 (1945) (distinguishing “Opinion” from “Order for Mandate”); *Rogers v. Hill*, 289 U.S. 582, 587 (1933) (“The court’s decision of a case is its judgment thereon. Its opinion is a statement of the reasons on which the judgment rests.”).

What is more, “[w]here Congress borrows terms of art in which are accumulated the legal tradition and meaning of centuries of practice, it presumably knows and adopts the cluster of ideas that were attached to each borrowed word in the body of learning from which it was taken and the meaning its use will convey to the judicial mind unless otherwise instructed.” *Molzof v. United States*, 502 U.S. 301, 307 (1992) (discussing *punitive damages*) (quoting *Morissette v. United States*, 342 U.S. 246, 263 (1952)). Put differently, “[w]hen a statutory term is obviously transplanted from another legal source, it brings the old soil with

98 Stat. 3363 (1984).

it.” *Taggart v. Lorenzen*, 587 U.S. 554, 560 (2019) (punctuation omitted).

An *opinion* is a legal term of art with a rich history and tradition, and its meaning has never wavered. As Thomas Jefferson recounted: “From the earliest ages of English law, from the date of the year-books, at least, to the end of the II^d George, the judges of England in all but self-evident cases, delivered their opinions seriatim, with the reasons and authorities which governed their decisions.” Karl M. ZoBell, *Division of Opinion in the Supreme Court A History of Judicial Disintegration*, 44 CORNELL L. REV. 186, 190 (1959) (quoting Paul L. Ford, *The Writings of Thomas Jefferson* 223-25 (1899) (quoting Letter to Justice William Johnson (1822))). The premise of Jefferson’s preference for seriatim opinion delivery was that *opinions give reasons*—in a seriatim system, no judge can hide. *Id.* at 194. As a fledgling institution, this Court adopted the tradition of the King’s Bench and delivered “opinions” seriatim, which resulted in the Court’s speaking “with multiple voices”—precisely because, again, *opinions give reasons*. William P. McLauchlan, “Opinions, Assignment and Writing Of,” in *The Oxford Companion to the Supreme Court of the United States* 705 (Kermit L. Hall, ed., 2d ed. 2005). Chief Justice Marshall stopped the seriatim custom, and during his stewardship, this Court started rendering a univocal “opinion of the Court”—a reason-giving document. *Id.*

Today, of course, “[o]pinions announce the decision(s) reached by the Supreme Court and explain the reasons for those results.” *Id.* This Court also issues concurring and dissenting opinions, which offer alternative reasons, or what to the author should

have been the reasons. *See id.* And beyond this Court, the understanding of *opinion* as a reason-giving document has remained a fixture of American legal culture more generally. *See* GARNER'S DICTIONARY OF LEGAL USAGE 636 (3d ed. 2011). The old soil therefore resolves the statutory-interpretation question presented: when Congress, in § 144, directed the Federal Circuit to issue an “opinion,” Congress was imposing a reason-giving obligation on the court.

Here, however, the Federal Circuit summarily affirmed the PTAB under Federal Circuit Rule 36. That rule provides: “The court may enter a judgment of affirmance without opinion, citing this rule, when it determines” (i) that “an opinion would have no precedential value” and (as relevant here) (ii) that either “the decision of an administrative agency warrants affirmance under the standard of review in the statute authorizing the petition for review,” or “a judgment or decision has been entered without an error of law.” Fed. Cir. R. 36(a).³

In summarily affirming the PTAB under Rule 36 without issuing an opinion, the Federal Circuit violated § 144's plain text. There is no sense in which a Rule 36 summary affirmance is an *opinion*. Rather than stating reasons, the document states “AFFIRMED.” Rule 36(a) itself says that the document it authorizes is a “judgment of affirmance” that the court may enter “without opinion.” Fed. Cir. R. 36(a). And the Federal Circuit recognizes that a Rule 36

³ The Federal Circuit promulgated its Rule 36 in 1989, five years after § 144 took its current form. *The Seventh Annual Judicial Conference of the United States Court of Appeals for the Federal Circuit*, 128 F.R.D. 409, 420 (1989).

summary affirmance (i) “simply confirms” that the adjudicative body below “entered the correct judgment” and (ii) “does not endorse or reject any specific part” of the “reasoning” under review. *Phil-Insul Corp. v. Airlite Plastics Co.*, 854 F.3d 1344, 1354-55 (Fed. Cir. 2017) (citation and punctuation omitted).

Nor may the Federal Circuit seek refuge in 28 U.S.C. § 2071(a). That statute authorizes courts to “prescribe rules for the conduct of their business,” but it proceeds to state: “Such rules shall be consistent with Acts of Congress.” *Id.* Rule 36 is inconsistent with § 144.

B. The Context Confirms That § 144 Is a Reasoning-Giving Directive.

Even if there were reason to look beyond the text, § 144’s surrounding context reinforces the conclusion that the statute means what it says.

1. Statutory history is relevant when, as here, it is an “important part” of the context. *See United States v. Hansen*, 599 U.S. 762, 775 (2023). In 1929, Congress created the Court of Customs and Patent Appeals (CCPA), the Federal Circuit’s predecessor, and directed that “[t]he opinion of the Court . . . in every case on appeal from decision of the Patent Office shall be rendered in writing, and shall be filed in such case as part of the record thereof, and a certified copy of said opinion shall be sent to the Commissioner of Patents and shall be entered of record in the Patent Office.” Act of Mar. 2, 1929, ch. 488, § 3, 45 Sta. 1475, 1476 (1929).

In 1948, that requirement was codified at 28 U.S.C. § 216. *See* Act of June 25, 1948, ch. 646, 62

Stat. 899 (1948) (codifying 28 U.S.C. § 216 (“The Court of Customs and Patent Appeals, on each appeal from a Patent Office decision, shall file a written opinion as part of the record and send a certified copy to the Commissioner of Patents who shall record it in the Patent Office.”)). That provision remained on the books until 1982, when Congress scrapped the CCPA, repealed the statutory chapter governing it, and created the Federal Circuit—which, unlike the CCPA, would have exclusive jurisdiction over patent appeals, including from district courts, and which was accordingly positioned to unify patent law. *See* Pub. L. No. 97-164, 96 Stat. 28 (1982); 28 U.S.C. § 216 (repealed 1982).

Then, in 1984, § 144 of the 1952 Patent Act was amended from (i) its prior form, which operated alongside 28 U.S.C. § 216 and required the CCPA to return “to the Commissioner a certificate of its proceedings and decision, which shall be entered of record in the Patent Office and govern the further proceedings in the case,” *see* Act of July 19, 1952, Pub. L. No. 593, § 144, 66 Stat. 792, 802 (1952), to (ii) its current form, which requires the Federal Circuit to issue to the PTO Director its “mandate and opinion,” *see* Act of Nov. 8, 1984, Pub. L. No. 98-620, title IV, § 414(a), 98 Stat. 3363 (1984).

In other words, Congress imposed on the Federal Circuit the same opinion-writing requirement that for decades had constrained the court’s predecessor, the CCPA. That requirement had become the norm. The Federal Circuit’s first Chief Judge, the Honorable Howard T. Markey, made the following assurance about the new court in 1983: “In our Court there will be an opinion explaining enough to tell you what the

law is in every case.” 100 F.R.D. at 511. He explained that this patent-appeal “tradition”—“We do not issue fiats. We do not just render a one-worded decision and go away”—reflected a foundational principle of “the American judicial system”: courts ordinarily should “explain [their] decisions.” *Id.* After all, “you would never know what the law is otherwise.” *Id.*

One year later, Congress erased any doubt that the Federal Circuit would not issue one-word decisions in patent agency appeals by reviving the opinion-writing requirement that had previously constrained the CCPA and by imposing it on the court’s new iteration. *See* Dennis Crouch, *Wrongly Affirmed Without Opinion*, 52 WAKE FOREST L. REV. 561, 565 (2017).

2. Interpreting § 144 as a reason-giving requirement promotes Congress’s objectives in creating the Federal Circuit: to “provide nationwide uniformity in patent law,” and to “make the rules applied in patent litigation more predictable.” H.R. Rep. No. 97-312, at 20 (1981); *see also* S. Rep. No. 97-275, at 2 (1981) (“to improve the administration of the patent law by centralizing appeal in patent cases”). Section 144’s reason-giving requirement advances those purposes by facilitating the Federal Circuit’s articulation, development, and clarification of the legal standards applicable to invention patents. The Federal Circuit’s explication of legal standards, through a steady stream of opinions, ensures that all patent-law adjudicators—the Federal Circuit itself, district courts, and PTAB judges—apply a uniform and predictable set of rules. A set of coherent rules, in turn, simplifies patent litigation and preempts unnecessary legal battles. Still more, a shared comprehension of what is, and what is not, patentable enables inventors to

focus their research-and-development efforts on productive pursuits, allows for effective business planning, encourages investment in new technologies, reduces barriers to entry, and supports a fair competitive environment. See *Hunter Douglas, Inc. v. Harmonic Design, Inc.*, 153 F.3d 1318, 1331 (Fed. Cir. 1998) (listing uniformity’s benefits); Paul R. Gugliuzza & Mark A. Lemley, *Can a Court Case Change the Law by Saying Nothing?*, 71 VAND. L. REV. 765, 792 (2018) (arguing that Rule 36 distorts the public perception of patent-law trends).

Through its Rule 36 practice, however, the Federal Circuit is defying Congress’s reason-giving mandate, thereby creating the precise uncertainty that Congress sought to avoid. An appellant-inventor challenging the PTAB’s invalidation of an already issued patent—along with other inventors, the patent bar, and the public—is left in the dark about what specific aspects of the PTAB’s final written decision the Federal Circuit agreed with: one aspect; some aspects; or the decision in its entirety. The Federal Circuit might even have largely disagreed with the PTAB’s decision but nonetheless affirmed because the PTAB committed no *reversible* error.

The interaction between PTAB invalidity proceedings and district court patent-infringement proceedings further exposes the uncertainty that Rule 36 has injected into patent law. A patent challenger quite often seeks an inter partes review after the patent holder has brought a patent-infringement action in district court. The challenger will then often move for, and secure, a stay of the district-court action pending the inter partes review. If the Federal Circuit affirms the PTAB’s invalidity decision in an inter

partes review, that “*affirmance* of [the] invalidity finding . . . has a collateral estoppel effect on all pending or co-pending actions.” *United Therapeutics Corp. v. Liquidia Techs., Inc.*, 74 F.4th 1360, 1372 (Fed. Cir. 2023) (emphasis added) (citation omitted). Collateral estoppel precludes re-litigation of issues “actually litigated and determined.” *Laguna Hermosa Corp. v. United States*, 671 F.3d 1284, 1288 (Fed. Cir. 2012). So, if the Federal Circuit issues a Rule 36 affirmance, the patent holder, the accused infringer, and the district court may have divergent interpretations of collateral estoppel’s scope, because what was “actually determined” is unclear. And the same PTAB decision may end up having inconsistent collateral-estoppel effect in different pending actions. All this further undermines the coherence that creating the Federal Circuit was supposed to engender.

2. In other statutes, Congress has shown that it knows how to avoid imposing reason-giving responsibilities on courts. The Copyright Act provides: “Within one month after any final order or judgment is issued in the [copyright infringement] case, the clerk of the court shall notify the Register [of Copyrights] of it, sending with the notification a copy of the order or judgment together with the written opinion, *if any*, of the court.” 17 U.S.C. § 508(b) (emphasis added). Because Congress has shown that it knows how to use language to render an opinion optional (*e.g., if any*), Congress’s decision not to use any such qualifying language in § 144 of the Patent Act should be treated as a deliberate drafting choice.

3. Reason-giving requirements are not foreign to our federal system. In *United States v. Nugent*, the Sixth Circuit held that the district court had violated

a statutory provision (since repealed) requiring courts to issue “written opinion[s]” in Tucker Act actions. 100 F.2d 215, 216 (6th Cir. 1938) (applying 28 U.S.C. § 764 (repealed 1948)). Federal Rule of Civil Procedure 52(a) requires district courts to make findings of fact and draw conclusions of law in bench trials and when adjudicating interlocutory injunctions, and Federal Rule of Civil Procedure 59 requires district courts to state reasons when they sua sponte grant new trials.

Taylor is not to the contrary. There, the Fifth Circuit summarily reversed, without issuing an opinion. *Taylor v. McKeithen*, 407 U.S. 191, 192 (1972). The appellees sought review in this Court, which granted the petition, vacated, and remanded “[b]ecause this record does not fully inform us of the precise nature of the litigation and because we have not had the benefit of the insight of the Court of Appeals.” *Id.* at 194. This Court added that, despite its direction to the Fifth Circuit, “the courts of appeals should have wide latitude in their decisions of whether or how to write opinions. That is especially true with respect to summary affirmances.” *Id.* at 194 n.4.

ParkerVision’s position comports with *Taylor*’s cautionary footnote. Nothing in the Constitution, and no statute generally applicable to the appellate courts, precludes them from issuing summary affirmances. But § 144 is a specific statute aimed at a particular court, thus disabling that background presumption in this case. As then-Justice Rehnquist noted in dissent, no “existing statute or rule of procedure” barred the Fifth Circuit from deciding the *Taylor* appeal without issuing an opinion, which to him established that the Fifth Circuit was well within its rights to withhold an opinion. *Id.* at 195-96 (Rehnquist, J., dissenting).

Section 144 is what Justice Rehnquist had in mind: it expressly and specifically obligates a particular court, the Federal Circuit, to issue an “opinion.”

4. More fundamentally, interpreting § 144 as a reason-giving requirement harmonizes with bedrock principles of our democracy. Justice Brennan observed that when a court “explain[s] *why* and *how* a given rule has come to be,” such reason-giving “serves a function within the judicial process similar to that served by the electoral process with regard to the political branches of government”: “[i]t restrains judges and keeps them accountable to the law and to the principles that are the source of judicial authority.” William J. Brennan, Jr., *In Defense of Dissents*, 37 HASTINGS L.J. 427, 435 (1986). As Judge Leventhal put the point, “there is accountability in the giving of reasons,” and “[g]rave questions are raised when a court uses ‘judgments’ and ‘orders’ to dispense with any indication of reasons”—as here. Harold Leventhal, *Appellate Procedures: Design, Patchwork, and Managed Flexibility*, 23 UCLA L. REV. 432, 438 (1976). Those grave questions concern nothing less than our government’s structure of separated and limited powers. According to Professor Glendon, *supra*, at 147-48, the “[d]iscipline of writing out the reasons for a decision and responding to the main arguments of the losing side has proved to be one of the most effective curbs on arbitrary judicial power ever devised.” Yet “[t]hose important safeguards are lost when, as is increasingly the case, decisions are rendered without written opinions.” *Id.*; accord Joseph W. Singer, *Normative Methods for Lawyers*, 56 UCLA L. REV. 899, 489-49 (2009) (“the biggest check on the use of judicial power is the duty to give public reasons for decisions, justifying choices by writing judicial

opinions”). Professor Schauer similarly noted that when an institutional designer seeks to rein in a decision-maker, a reason-giving mandate is a reasonable design choice. Frederick Schauer, *Giving Reasons*, 47 STAN. L. REV. 633, 657-58 (1995). The relevant institutional designer here—Congress—reasonably obligated the Federal Circuit, through § 144, to show its work in PTAB appeals.

Giving reasons also serves the adjudicative goal of accuracy. As Chief Judge Wald recognized, “the discipline of writing even a few sentences or paragraphs explaining the basis for the judgment insures a level of thought and scrutiny by the court that a bare signal of affirmance, dismissal, or reversal does not.” Patricia M. Wald, *The Problem with the Courts: Black-Robed Bureaucracy or Collegiality Under Challenge?*, 42 MD. L. REV. 766, 782 (1983). Judge Rubin, too, recognized that “the discipline of opinion writing does affect the result,” an empirical reality reflected in the oft-recounted judicial experience of sitting down to “prepare an opinion stating the decision and its rationale,” only to find that “it won’t write.” Alvin B. Rubin, *Book Review of The Ways of a Judge by Frank M. Coffin*, 130 U. PA. L. REV. 220, 227 (1981).

In addition, reason-giving generates a body of coherent, predictable law around which public and private actors can orient their decision-making. See Benjamin N. Cardozo, *Nature of the Judicial Process* 30 (1921). Reason-giving requirements safeguard parties’ dignity, as well. See Rachel Bayefsky, *Dignity and Judicial Authority* 118 (2024).

5. In light of the above, there is no basis to suggest that interpreting § 144 as a reason-giving directive is an absurd literalism. See *Pub. Citizen v. U.S. Dep’t*

of *Just.*, 491 U.S. 440, 470-71 (1989) (Kennedy, J., concurring in the judgment) (absurdity doctrine should be limited to the genuinely absurd).

As for the anticipated objection that interpreting § 144 as a reason-giving directive is absurd because the additional work will overwhelm the Federal Circuit, that fear is unfounded. Not even former Chief Judge Michel shares that concern: he has urged the court to cease its Rule 36 practice because it is a “dereliction of duty.”⁴ “A minimum opinion need not be unduly time consuming to write.” Wald, *supra*, at 782.

ParkerVision submits that the Federal Circuit would satisfy § 144 by issuing a one-paragraph document identifying the grounds for reversal or vacatur that the appellant has raised and stating why they fail. That document would qualify as an “opinion” under § 144, and preparing it would not add significantly to the time that the panel already would have spent analyzing the case. See *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1556 (Fed. Cir. 1997) (“Appeals whose judgments are entered under Rule 36 receive the full consideration of the court, and are no less carefully decided than the cases in which we issue full opinions.”). Under this construction of § 144, the Federal Circuit would have been obligated to write sixty more paragraphs than it has written so far this year. (See *infra* at 32.)

⁴ Eileen McDermott, *Chief Judge Paul Michel: Patent Reform Progress Is Likely, But We Must Stay Focused on the Big Picture*, IPWatchDog.com (Sept. 15, 2019), <https://ipwatchdog.com/2019/09/15/chief-judge-paul-michel-patent-reform-progress-likely-must-stay-focused-big-picture/id=113326/>.

In any event, even if Congress’s § 144 reason-giving directive to the Federal Circuit were an unwise policy choice, “[t]he wisdom of Congress’s judgment on this matter is not [this Court’s] concern.” See *Burwell v. Hobby Lobby Stores, Inc.*, 573 U.S. 682, 736 (2014).

Equally unavailing is the anticipated objection that construing § 144 as a reason-giving directive presents a line-drawing predicament. If an opinion is too concise, a party can raise the issue whether the document qualifies as an “opinion” with the en banc Federal Circuit, which can administer the line. Appellate courts regularly determine whether district courts have rendered adequate findings of fact and conclusions of law under Fed. R. Civ. P. 52(a).

C. The Constitutional-Doubt Canon and Elemental Principles Further Counsel for Interpreting § 144 as a Reason-Giving Directive.

1. The canon of constitutional doubt is another reason to reject an atextual reading of § 144. Even if the “statutory language” were “susceptible of multiple interpretations,” “a court may shun an interpretation that raises serious constitutional doubts and instead may adopt an alternative that avoids those problems.” See *Jennings v. Rodriguez*, 583 U.S. 281, 286 (2018). Of particular relevance here, this Court has recognized that “there are occasions when an explanation of the reasons for a decision may be required by the demands of due process.” *Harris v. Rivera*, 454 U.S. 339, 344 (1981). Due process may very well demand that when a patent holder has been deprived of its vested property rights through a strange agency proceeding

that stacks the deck for the challenger, the holder is entitled to at least some judicial explanation for the property deprivation. Adopting a textual reading of § 144 would avoid this constitutional problem.

Inter partes review may *itself* violate the Fifth Amendment’s Due Process Clause. In *Oil States*, this Court emphasized the “narrowness of [its] holding” that inter partes review comports with Article III and the Seventh Amendment, and it clarified that the Due Process Clause was not at issue. *Oil States Energy Servs., LLC v. Greene’s Energy Grp., LLC*, 584 U.S. 325, 344 (2018) (“our decision should not be misconstrued as suggesting that patents are not property for purposes of the Due Process Clause”). The question is therefore open under this Court’s precedents, and the procedure may indeed fall short.

First, inter partes review empowers an executive agency “to cancel a vested property right in an already-issued patent”—a “feat that, under the Constitution, can be performed only by a judicial actor in accordance with governing law.” See Gary S. Lawson, *Appointments and Illegal Adjudication: The America Invents Act Through A Constitutional Lens*, 26 GEO. MASON L. REV. 26, 28 (2018); see also *id.* at 50 (“It requires judicial process. That is what the idea of due process of law has been about at least since Magna Carta in the thirteenth century.”).

Second, inter partes review reflects a “retreat from the promise of judicial independence.” *Oil States*, 584 U.S. at 347 (Gorsuch, J., dissenting). The Patent Office Director—a political appointee who serves at the President’s pleasure—supervises the PTAB members who hear inter partes reviews and selects which members, and how many, will hear any particular

challenge. 35 U.S.C. §§ 1(a), 6(c). If the PTAB panel reaches a result that the Director disagrees with, the Director may add members or order a rehearing. *Id.* §§ 6(a), (c). The Director also determines the PTAB members' base salary. *Id.* § 3(b)(6). Worse still, PTAB members are eligible for annual bonuses, which are based on “quality, production, support for the mission of the Board/leadership, and stakeholder interactions.” *Mobility Workx, LLC v. Unified Pats., LLC*, 15 F.4th 1146, 1155 (Fed. Cir. 2021).

Third, the same PTAB panel decides whether to institute inter partes review and proceeds to adjudicate that very case. Inter partes review thus contravenes the ancient maxim that “[n]o man is allowed to be a judge in his own cause,” see THE FEDERALIST NO. 10, p. 59 (J. Cooke ed. 1961) (J. Madison). The principle of *nemo iudex in causa sua*—an unassailable premise of any “free society,” see *In re Murchison*, 349 U.S. 133, 137 (1955)—is woven into the fabric of the Due Process Clause, see *Williams v. Pennsylvania*, 579 U.S. 1, 9 (2016). Although Congress in the AIA had assigned the institution decision to the Director, thereby lodging the investigative and adjudicative functions in different executive actors, see 35 U.S.C. § 314(a), the Director has delegated the institution power to the PTAB, see 37 C.F.R. § 42.4(a). The consequent commingling of functions casts doubt on the PTAB's objectivity. Even the most well-intentioned bureaucratic body will, upon removing the investigator's cap and donning the adjudicator's cap, experience a degree of cognitive lock-in.⁵

⁵ See Pharm. Researchers & Mfrs. of Am., *Comments on Trial Proceedings Under the America Invents Act* 14 (Oct. 16, 2014) (warning that combining functions would threaten “patent owners’

Another anomaly is that additional patent challengers who were not initially part of the petition may join the inter partes review midstream; and even if all the patent challengers drop out, the PTAB panel may continue reviewing the patent on its own. 35 U.S.C. §§ 315(c), 317(a). That power collides with the principles of standing, mootness, and party presentation that, in our Article III system, ensure that the judge is focused on resolving an actual, concrete dispute and is not stepping outside the judicial role and into matters of self-interest. *See Baker v. Carr*, 369 U.S. 186, 204 (1962).

Several other features of inter partes review may not raise due-process issues on their own but nonetheless contribute to the process's overall inadequacy. For example, the PTAB employs a preponderance-of-the-evidence standard, meaning that for a petitioner to prevail and invalidate a patent holder's already issued patent, the petitioner need only show that it is more likely than not that a patent claim is unpatentable. In district court, though, because a patent is presumed valid, *see* 35 U.S.C. § 282, a defendant in a patent-infringement action arguing patent invalidity as a defense must satisfy a higher standard of "clear and convincing evidence" to prove invalidity, *see Microsoft Corp. v. I4I Ltd. P'ship*, 564 U.S. 91, 95 (2011).

Discovery in PTAB proceedings is also "limited to (A) the deposition of witnesses submitting affidavits or declarations; and (B) what is otherwise necessary in the interest of justice." 35 U.S.C. § 316(a)(5); *see also* 37 C.F.R. § 42.51(b) ("A party is not entitled to

due process protections"), https://www.uspto.gov/sites/default/files/ip/boards/bpai/phrma_20141016.pdf.

discovery” except initial disclosures and limited items constituting “routine discovery”). By contrast, the scope of discovery in district court litigation is broad, enabling patent holders to gather comprehensive evidence and information through depositions, interrogatories, requests for production, and other mechanisms—and thereby to mount a robust defense of their vested property rights. *See Fed. R. Civ. P.* 26.

Additionally, inter partes review is decided solely on a paper record. Expert and fact-witness testimony “must be submitted in the form of an affidavit,” except for the rare circumstance when the PTAB panel authorizes live testimony. 37 C.F.R. § 42.53(a). But in deciding between battling experts who offer competing narratives, the ability to observe them in real time, and thereby to assess their credibility, can be critical. *See Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 843 F.3d 1315, 1341 (Fed. Cir. 2016) (crediting jury’s credibility assessments of competing experts testifying on patent validity).

Although ParkerVision is not challenging, in this petition, inter partes review on due-process grounds, the point remains that the procedural infirmities of inter partes review could necessitate a single, minimal explanation why the patent holder’s already issued patent was invalidated, rendered by an independent court sitting above the fray. Congress, through § 144, has already selected the court to perform that function: the Federal Circuit. Granted, a patent holder whose already issued patent is invalidated through an inter partes review will receive a written decision from the PTAB. *See* 35 U.S.C. § 318(a). But a decision that is the product of a deficient process could not cure that process’s inadequacy. One instance of *judicial* reason-

giving—and its corresponding adjudicative benefits, such as accountability, accuracy, and dignity—could be necessary to compensate for inter partes review’s severe departures from established rules of court procedure that are designed to safeguard rights.

In *Oil States*, this Court observed that “because the Patent Act provides for judicial review by the Federal Circuit, *see* 35 U.S.C. § 319, we need not consider whether inter partes review would be constitutional without any sort of intervention by a court at any stage of the proceedings.” 584 U.S. at 344 (other citation and punctuation omitted). As mentioned, this Court noted that the Due Process Clause was not at issue there. *Id.* For due-process purposes, it may be that a Rule 36 summary affirmance is an inadequate level of “intervention” to resolve inter partes review’s due-process shortcomings. For due-process purposes, that is, more could be needed: an opinion setting forth reasons, the writing of which will obligate the Federal Circuit to carefully and thoroughly review the proceeding below.

In this vein, then-Judge Wald observed that an appellate court’s summary affirmance of an agency decision is “quite a different matter” from an appellate court’s summary affirmance of a district court opinion: “In the latter case, the parties have had the benefit of an independent judicial decision whereas in the former the parties are seeking judicial review of the agency decision in the first instance in this court.” *Nat’l Classification Comm. v. United States*, 765 F.2d 164, 174 (D.C. Cir. 1985) (Wald, J., separately stating). For that reason, continued Judge Wald, when an appellate court is reviewing an appeal from an agency decision, the court “should at least give the parties a

statement of reasons in the court’s own words, if for no other reason than to indicate that the court in fact thoughtfully reviewed the agency’s determination.” *Id.* That point is doubly true for inter partes review, a rare breed of administrative process. A plain-language reading of § 144, however, avoids the foregoing host of constitutional concerns.

2. Yet another consideration militating against an atextual reading of § 144 is the “elemental proposition,” which this Court recently addressed in *Loper Bright*, that “courts decide legal questions by applying their own judgment.” *Loper Bright Enters. v. Raimondo*, 144 S.Ct. 2244, 2261 (2024). As the framers envisioned, the “judicial function” of courts—the very purpose of them—would be to “exercise independent judgment” in determining “questions of law” and “the meaning of statutory provisions.” *Id.* at 2262; *see also* THE FEDERALIST NO. 78, p. 525 (J. Cooke ed. 1961) (A. Hamilton) (“The interpretation of the laws is the proper and peculiar province of the courts.”). This Court embraced that view in *Marbury v. Madison*, where Chief Justice Marshall pronounced: “It is emphatically the province and duty of the judicial department to say what the law is.” 1 Cranch 137, 177 (1803) (emphasis added); *see also Decatur v. Paulding*, 14 Pet. 497, 515 (1840) (holding that the judicial role is to “interpret the act of Congress, in order to ascertain the rights of the parties”). That traditional conception of the judicial function—that is, the conception that “courts must exercise independent legal judgment”—has held true from the founding era to present day. *Loper Bright*, 144 S.Ct. at 2262, 2265.

When the Federal Circuit issues a summary affirmance of a PTAB decision in an inter partes

review under Rule 36, however, it becomes impossible to determine whether the Federal Circuit has satisfied its longstanding duty to exercise independent legal judgment. In the appeals here, for example, Parker-Vision raised multiple legal issues, including whether the PTAB erred in basing its unpatentability determinations on an argument that the petitioners had forfeited by excluding it from the petitions and raising it for the first time on reply. (See *supra* at 9.) Under 32 U.S.C. § 312(a)(3), the petition must “identif[y], in writing and with particularity, each claim challenged, the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge to each claim.” This Court, further, has held that the petition must “guide the life of the litigation,” and that the “petitioner is the master of its complaint.” *SAS Inst., Inc. v. Iancu*, 584 U.S. 357, 363, 366 (2018). And the Federal Circuit, for its part, has held that “[a]ny marked departure from the grounds identified with particularity in the petition would impose unfair surprise on the patent owner and, consequently, violate the IPR statute.” *Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1002 (Fed. Cir. 2023) (citation and punctuation omitted).

Despite this settled law, the PTAB’s plain violation of it, and the plainly unfair surprise of the reply, the Federal Circuit summarily affirmed the PTAB under Rule 36. Consequently, it is impossible to assess whether the Federal Circuit independently applied 32 U.S.C. § 312(a)(3) and the surrounding case law. Its independent analysis of this legal issue is essential because courts possess the institutional competence to analyze legal technicalities such as

forfeiture. Legal analysis is what “[c]ourts do.” *Loper Bright*, 144 S.Ct. at 2266.

If the Federal Circuit did not exercise its independent legal judgment, the absence of an opinion denies ParkerVision the ability to challenge the Federal Circuit’s breach of its judicial role in the en banc Federal Circuit or in this Court. Because there is no record of the Federal Circuit’s breach, there is no basis for further review. *See* Fed. Cir. R. 54 Practice Notes (“A petition for rehearing en banc is rarely appropriate if the appeal was the subject of a nonprecedential opinion by the panel of judges that heard it.”). And if the Federal Circuit did exercise its independent legal judgment, the absence of an opinion causes ParkerVision the indignity of not knowing why, or how, the Federal Circuit sidestepped the weight of authority.

In this way, the Federal Circuit’s Rule 36 practice stands in tension with the elemental principle that courts must exercise independent legal judgment. But Congress has already resolved this fundamental problem: through § 144, Congress imposed a reasoning requirement on the Federal Circuit, thereby enabling parties on appeal to discern whether the Federal Circuit has fulfilled its judicial role.

II. THIS CASE IS AN IDEAL VEHICLE TO RESOLVE THE IMPORTANT AND RECURRING QUESTION PRESENTED.

This case presents no vehicle problem that would preclude this Court’s review of the question presented. The PTAB invalidated claims in ParkerVision’s already issued patents through inter partes review. ParkerVision timely appealed, and the Federal Circuit

summarily affirmed the PTAB’s decision under Rule 36, without issuing an opinion—despite § 144.

The statutory violation that occurred here is not an isolated incident. It is part of a disconcerting pattern. Since the AIA’s enactment in 2011, and as of August 22, 2024, the Federal Circuit has issued a Rule 36 summary affirmance in 43.01% of its PTAB appeals from inter partes review, post-grant review, and covered-business-method proceedings—*i.e.*, 569 out of 1,323 appeals.⁶ In addition, according to the Federal Circuit’s online database, the court so far in 2024 has issued sixty Rule 36 summary affirmances and 75 opinions in PTAB appeals, which amounts to a relative-Rule-36 frequency of 44.44%.⁷

As a consequence of the Federal Circuit’s heavy reliance on Rule 36, patent holders rarely receive a judicial explanation why their already issued patents have been invalidated. A study of 300 Federal Circuit inter-partes-review decisions from 2019 to the first half of 2020 found that “patent owner-appellants seldom succeeded at the Federal Circuit, with PTAB unpatentability determinations being affirmed 85% of the time.”⁸ Further, “[w]ith approximately 60% of

⁶ See Daniel F. Klodowski et al., *Federal Circuit PTAB Appeal Statistics for June 2024*, Finnegan PTAB Blog (Aug. 22, 2024), <https://www.finnegan.com/en/insights/blogs/at-the-ptab-blog/federal-circuit-ptab-appeal-statistics-for-june-2024.html>.

⁷ See Fed. Cir. Website, *Opinions & Orders*, <https://cafc.uscourts.gov/home/case-information/opinions-orders/> (visited Oct. 31, 2024). Counsel selected “PTO” from the webpage’s dropdown menu, restricted the date range to this year, and excluded trademark appeals.

⁸ See Larry Sandell, *What 18 Months of IPR Stats Teach Us About Winning Appeals*, Law360 (July 20, 2020), <https://www.>

such affirmances being made under Rule 36, approximately half of all patent owner IPR appeals were rejected without a substantive appellate opinion.” *Id.*

These staggering figures have prompted numerous practice-oriented and academic comments⁹ arguing that the Federal Circuit’s use of Rule 36 is unlawful. To stakeholders in the patent system, the Federal Circuit’s Rule 36 practice has become a lightning rod. It is a constant topic of conversation and, quite often, consternation.

As this Court knows, among the courts of appeals, only the Federal Circuit deploys a one-word affirmance with any meaningful degree of frequency. The First, Second, Third, Fourth, Sixth, Seventh, Ninth, Eleventh, and D.C. Circuits have no local rule authorizing one-word affirmances. The Fifth, Eighth, and Tenth Circuits have such a rule—*see* 5th Cir. R. 47.6, 8th Cir. R. 47B, and 10th Cir. R. 36.1—but in the past year, it appears that only the Fifth Circuit has applied it, and only twice.¹⁰ Yet the Federal Circuit, which is statutorily required to issue an “opinion” in PTAB

law360.com/articles/1293373/what-18-months-of-ipr-stats-teach-us-about-winning-appeals.

⁹ *See, e.g.*, Charles Macedo et al., *Justice Is Not Silent: The Case Against One-Word Affirmances in the Federal Circuit*, Patently-O (Sept. 22, 2024), <https://patentlyo.com/patent/2024/09/appellate-decision-reasoning.html>; Crouch, *supra*, at 570; Rebecca A. Lindhorst, Comment, *Because I Said So: The Federal Circuit, the PTAB, and the Problem with Rule 36 Affirmances*, 69 Case W. RES. L. REV. 247, 260-61 (2018).

¹⁰ *Merkle v. Thomas*, No. 23-50692, Doc. 65-1 (5th Cir. July 12, 2024); *Am. Longshore v. Aries Marine*, No. 23-30564, Doc. 63-1 (5th Cir. Apr. 4, 2024).

appeals, issues one-word summary affirmances at a rate that dwarfs other circuits' rates.

There is a pressing need for this Court's intervention because "[i]n the area of patents, it is especially important that the law remain stable and clear." *Bilski v. Kappos*, 561 U.S. 593, 613 (2010) (Stevens, J., concurring). The Federal Circuit's Rule 36 practice shrouds the legal principles that govern patentability, and makes it difficult for inventors to predict whether their inventions will receive and retain patent protection. (See *supra* at 16-17.) The practice thus disincentivizes inventors from investing the time and energy to invent, and undermines the purpose of patents as laid down in the Constitution: "[t]o promote the Progress of Science and useful Arts." U.S. Const. art. I, § 8, cl. 8. At bottom, "[r]eliable application of legal principles underlies the economic incentive purpose of patent law, in turn implementing the benefits to the public of technology-based advances, and the benefits to the nation of industrial activity, employment, and economic growth." *CLS Bank Int'l v. Alice Corp. Pty.*, 717 F.3d 1269, 1321 (Fed. Cir. 2013) (en banc) (Newman, J., concurring in part and dissenting in part), *aff'd*, 573 U.S. 208 (2014).

To be sure, there are plenty of circumstances where it makes perfect sense for a court not to give reasons for a decision. But here, the Federal Circuit must give reasons in PTAB appeals because—and only because—the statutory text and context demand it. And although our Article III courts *are* overburdened, the sixty or so additional opinions that the Federal Circuit would need to prepare per year need not be tomes. An opinion can be concise.

This Court should therefore intervene to stop the Federal Circuit's practice of issuing Rule 36 affirmances, without opinions, in contravention of the plain statutory text. Our nation's elected representatives chose to impose a reason-giving requirement on the Federal Circuit, and their choice, which embodies the people's will, should not be so easily and frequently brushed aside.

Even if this Court disagrees that § 144 is a reason-giving directive, there would be significant value in granting certiorari to consider the question on a fully developed record and in publicly explaining why a one-word affirmance suffices. This Court's reason-giving would—fittingly—advance the dignity of appellants who have been Rule 36-ed, including patent holders who have been deprived of their vested property rights. *See Bayefsky, supra*, at 118. They and other critics of Rule 36 would finally come to understand why the rule is compatible with the statute. An explanation would thus alleviate public apprehensions and restore public trust. Alternatively, if this Court believes that something more than a one-word affirmance is needed, but that Parker-Vision's one-paragraph proposal goes too far (see *supra* at 22), this Court could draw the line as it deems fit. This Court could also hold that reason-giving is required in only a subset of PTAB appeals, such as appeals from inter partes review, a peculiar process that diverges from foundational due-process norms.



CONCLUSION

The petition for a writ of certiorari should be granted.

Respectfully submitted,

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November 4, 2024

APPENDIX

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**R. 36 JUDGMENT, U.S. COURT OF APPEALS
FOR THE FEDERAL CIRCUIT,
ON THE '444 PATENT
(JUNE 5, 2024)**

NOTE: This disposition is nonprecedential

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

PARKERVISION, INC.,

Appellant,

v.

TCL INDUSTRIES HOLDINGS CO., LTD.,
LG ELECTRONICS INC.,

Appellees.

No. 2023-1415

Appeal from the United States Patent and
Trademark Office, Patent Trial and Appeal Board
in Nos. IPR2021-00990, IPR2022-00245.

Before: PROST, TARANTO, and CHEN,
Circuit Judges.

JUDGMENT

JASON SCOTT CHARKOW, Daignault Iyer LLP,
Vienna, VA, argued for appellant. Also represented by
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KRISTOPHER L. REED, Kilpatrick Townsend & Stockton LLP, Dallas, TX, argued for appellees. TCL Industries Holdings Co., Ltd. also represented by EDWARD JOHN MAYLE, Denver, CO.

DAVID S. CHUN, Ropes & Gray LLP, East Palo Alto, CA, for LG Electronics Inc. Also represented by STEVEN PEPE, MATTHEW R. SHAPIRO, New York, NY; SCOTT S. TAYLOR, Boston, MA.

THIS CAUSE having been heard and considered,
it is

ORDERED and ADJUDGED:

PER CURIAM (Prost, Taranto, and Chen, *Circuit Judges*).

AFFIRMED. See Fed. Cir. R. 36.

Entered by Order of the Court

/s/ Jarrett B. Perlow

Clerk of Court

[SEAL]

Date June 5, 2024

**FINAL WRITTEN DECISION,
U.S. PATENT AND TRADEMARK OFFICE,
ON THE '444 PATENT
(NOVEMBER 21, 2022)**

UNITED STATES PATENT AND
TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND
APPEAL BOARD

TCL INDUSTRIES HOLDINGS CO., LTD.
and LG ELECTRONICS INC.,

*Petitioners,*¹

v.

PARKERVISION, INC.,

Patent Owner.

No. IPR2021-00990²
Patent 7,110,444 B1

¹ The caption is updated to remove Petitioner Hisense Co., Ltd. (“Hisense”) because Hisense is no longer a party to this proceeding. *See* Paper 38 (Termination due to Settlement After Institution of Trial Only as to Hisense Co., Ltd.). The parties shall use this caption (without this footnote) going forward.

² LG Electronics Inc., who filed a petition in IPR2022-00245, is joined as petitioner in this proceeding.

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

GERSTENBLITH, Administrative Patent Judge.

JUDGMENT
Final Written Decision
Determining All Challenged
Claims Unpatentable
35 U.S.C. § 318(a)

I. Introduction

A. Background

TCL Industries Holdings Co., Ltd. (“TCL”) and Hisense filed a Petition (Paper 1, “Pet.”) requesting institution of *inter partes* review (“IPR”) of claims 2–4 (“the Challenged Claims”) of U.S. Patent No. 7,110,444 B1 (Ex. 1001, “the ’444 patent”). ParkerVision, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 8). Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review as to all claims and grounds set forth in the Petition. Paper 9 (“Inst. Dec.”).

After institution, LG Electronics Inc. (“LG”) filed a petition in IPR2022-00245 (challenging the same claims of the ’444 patent on the same grounds), and a motion for joinder (seeking to join this proceeding as a petitioner). *LG Elecs. Inc. v. ParkerVision, Inc.*, IPR2022-00245 (PTAB Dec. 12, 2021), Papers 3 (petition), 4 (motion for joinder). We granted institution in IPR2022-00245 and granted LG’s motion for joinder. *Id.* at Paper 9 (PTAB Apr. 12, 2022); IPR2021-00990,

Paper 16. Recently, Hisense and Patent Owner reached a settlement and this proceeding was terminated only as to Hisense. Paper 38. Accordingly, we refer to TCL and LG, collectively, as “Petitioners.”

Also following institution, Patent Owner filed a Patent Owner Response (Paper 12, “PO Resp.”), Petitioners filed a Reply to Patent Owner’s Response (Paper 20, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 26, “PO Sur-reply”). Additionally, we granted Petitioners’ Motion for Routine and/or Additional Discovery (Paper 13), ordering the production of Patent Owner’s Final Infringement Contentions. Paper 18 (Order), 8. And, we denied Patent Owner’s Motion to Strike portions of Petitioners’ Reply (Paper 21), finding that the “Reply does not raise new issues, is not accompanied by belatedly presented evidence, and does not otherwise exceed the proper scope of [a] reply brief as set forth in 37 C.F.R. § 42.23(b).” Paper 25 (Order), 13. An oral hearing was held on September 8, 2022, and the transcript is of record. Paper 34 (“Tr.”).³

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the Challenged Claims. Petitioners bear the burden of proving unpatentability of the Challenged Claims. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioners must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37

³ Because of a substantial overlap in issues presented, the transcript includes oral argument from related case IPR2021-00985, although this proceeding and IPR2021-00985 are not consolidated or joined.

C.F.R. § 42.1(d) (2020). Having reviewed the arguments and the supporting evidence, we determine that Petitioners have shown, by a preponderance of the evidence, that claims 2–4 of the '444 patent are unpatentable.

B. Related Proceedings

The parties identify the following as related matters: *ParkerVision, Inc. v. Intel Corporation*, 6:20-cv-00108 (W.D. Tex.); *ParkerVision, Inc. v. TCL Industries Holdings Co., Ltd. et al.*, No. 6:20-cv-00945 (W.D. Tex.); *ParkerVision, Inc. v. Hisense Co., Ltd. et al.*, No. 6:20-cv-00870 (W.D. Tex.); *ParkerVision, Inc. v. ZyXEL Communications Corp.*, No. 6:20-cv-01010 (W.D. Tex.)⁴; *ParkerVision, Inc. v. LG Electronics Inc.*, No. 6:21-cv-00520 (W.D. Tex.); and *Intel Corporation v. ParkerVision, Inc.*, IPR2020-01265 (“the Intel IPR”). Pet. 4–5; Paper 5 (Petitioners’ Updated Mandatory Notice), 1; Paper 7 (Patent Owner’s Mandatory Notices), 1. Petitioners also identify *ParkerVision, Inc. v. Buffalo Inc.*, No. 6:20-cv-01009 (W.D. Tex.), as a related matter involving the '444 patent. Pet. 5. Additionally, Petitioners challenge several claims of U.S. Patent No. 7,292,835 B2 (“the ‘835 patent”), owned by Patent Owner, in IPR2021-00985. Pet. 5; Paper 7, 1.⁵

⁴ After the parties’ briefing, the district court granted a joint motion to dismiss with prejudice and the case is now closed. *See* Ex. 3001 (Docket Entry 25, Order dated Sept. 27, 2001).

⁵ Patent Owner identifies the instant proceeding—IPR2021-00990—as a related matter, but we understand Patent Owner to refer to IPR2021-00985. *See* Paper 7, 1.

C. Real Parties in Interest

Petitioners identify TCL; TCL Electronics Holdings Ltd.; Shenzhen TCL New Technology Co., Ltd.; TCL King Electrical Appliances (Huizhou) Co., Ltd.; TCL Moka Int'l Ltd.; TCL Moka Manufacturing S.A. DE C.V.; TCL Technology Group Corp.; TTE Technology, Inc.; LG; and LG Electronics U.S.A., Inc. as real parties in interest. Pet. 4; *LG*, IPR2022-00245, Paper 3 at 5. Patent Owner identifies ParkerVision, Inc. as the sole real party in interest. Paper 7, 1.

D. The Asserted Grounds of Unpatentability and Declaration Evidence

Petitioners challenge the patentability of claims 2–4 of the '444 patent on the following grounds:

Claim(s) Challenged	35 U.S.C. § ⁶	Reference(s)/Basis
2, 3	103(a)	Tayloe, ⁷ TI Datasheet ⁸

⁶ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the '444 patent has an effective filing date before March 16, 2013, we apply the pre-AIA version of the statutory basis for unpatentability.

⁷ U.S. Patent No. 6,230,000 B1, issued May 8, 2001 (Ex. 1004, “Tayloe”).

⁸ SN74CBT3253 Dual 1-of-4 FET Multiplexer/Demultiplexer (rev. ed. May 1998) (Ex. 1005, “TI Datasheet”).

2–4	103(a)	Lam, ⁹ Enz, ¹⁰ Tayloe
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Pet. 7.

Additionally, Petitioners support their challenge with a Declaration of Matthew B. Shoemake, Ph.D. (Ex. 1002) and a Declaration of Maureen M. Honeycutt (Ex. 1009). Patent Owner supports its arguments with a Declaration of Dr. Michael Steer (Ex. 2038). Petitioners cross-examined Dr. Steer and a transcript of that deposition is of record. Ex. 1021.

E. The '444 Patent

The '444 patent is directed to “a wireless local area network (WLAN) that includes one or more WLAN devices (also called stations, terminals, access points, client devices, or infrastructure devices) for effecting wireless communications over the WLAN.” Ex. 1001, 2:10–14. The '444 patent explains that “[t]he WLAN device includes at least an antenna, a receiver, and a transmitter. . . . The WLAN receiver includes at least one universal frequency translation module that frequency down-converts a received electromagnetic (EM) signal.” *Id.* at 2:14–22.

⁹ U.S. Patent No. 5,937,013, issued Aug. 10, 1999 (Ex. 1006, “Lam”).

¹⁰ Circuit Techniques for Reducing the Effects of Op-Amp Imperfections: Autozeroing, Correlated Double Sampling, and Chopper Stabilization, *Proceedings of the IEEE*, Vol. 84, No. 11, Nov. 1996 (Ex. 1007, “Enz”).

Figure 70A is reproduced below:

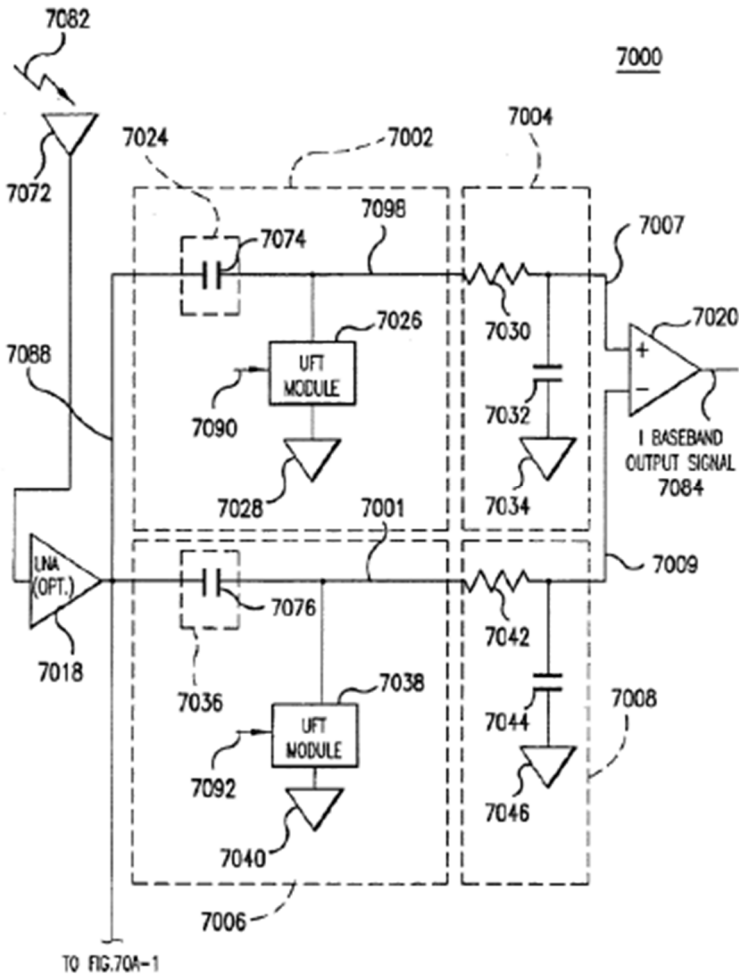


FIG. 70A

Figure 70A of the '444 patent “illustrates an IQ [in-phase quadrature] receiver having shunt UFT [universal frequency translation] modules.” Ex. 1001, 5:34–35. The '444 patent explains that “I/Q modulation receiver 7000 receives, down converts, and demodulates

a[n] I/Q modulated RF [radio frequency] input signal 7082 to an I baseband output signal 7084, and a Q baseband output signal 7086.” *Id.* at 35:51–54; *see id.* at 35:60–62 (Antenna 7072 receives and outputs I/Q modulated RF input signal 7082.). The ’444 patent states that, “[w]hen present, LNA 7018 amplifies I/Q modulated RF input signal 7082, and outputs amplified I/Q signal 7088.” *Id.* at 35:63–64. Thereafter, “[f]irst UFD [universal frequency down-conversion] module 7002 receives amplified I/Q signal 7088 . . . [,] down-converts the I-phase portion of the amplified input I/Q signal 7088 according to an I control signal 7090 . . . [, and] outputs an I output signal 7098.” *Id.* at 35:65–36:2. Similarly, UFD module 7006 “receives amplified I/Q signal 7088[,]” “down-converts the inverted I-phase signal portion of amplified input I/Q signal 7088 according to an inverted I control signal 7092[,]” and “outputs an inverted I output signal 7001.” *Id.* at 36:33– 37. Thereafter, “[f]irst differential amplifier 7020 receives filtered I output signal 7007 . . . subtracts filtered inverted I output signal 7007 from filtered I output signal 7001, amplifies the result, and outputs I baseband output signal 7084.” *Id.* at 37:3–8.

The ’444 patent’s first and second UFD modules in Figure 70A include capacitors 7074 and 7076, respectively, and UFT modules 7026 and 7038, respectively. Ex. 1001, 36:3–5 (first UFD module 7002 comprises first storage module 7024 and first UFT module 7026), 36:14–15 (first storage module 7024 comprises first capacitor 7074), 36:38–40 (second UFD module 7006 comprises second storage module 7036 and second UFT module 7038), 36:50–51 (second storage module 7036 comprises second capacitor 7076).

Figure 1B is reproduced below:

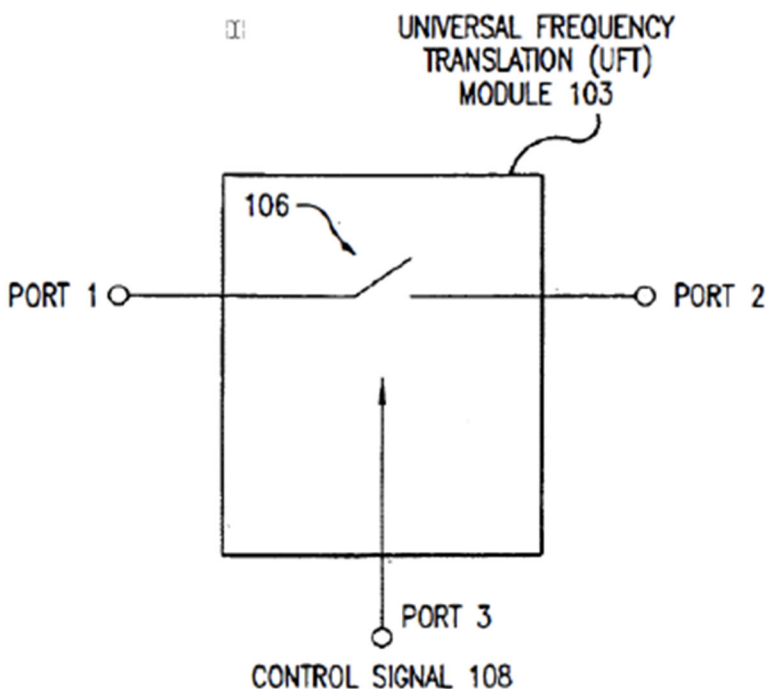


FIG.1B

Figure 1B of the '444 patent "is a more detailed diagram of a universal frequency translation (UFT) module." Ex. 1001, 2:56-58. The '444 patent explains that, "[g]enerally, the UFT module 103 includes a switch 106 controlled by a control circuit 108." *Id.* at 8:62-64 (noting that switch 106 is referred to as a controlled switch); *see id.* at 36:5-7 (first UFT module, shown in Figure 70A, contains a switch that opens and closes as a function of I control signal 7090), 36:40-42 (second UFT module, also shown in Figure 70A, contains a switch that opens and closes as a function of inverted I control signal 7092).

App.12a

The '444 patent includes two alternative configurations of switches and capacitors in UFD modules (Ex. 1001, 9:43-57), as shown in

Figures 20A and 20A-1 reproduced below:

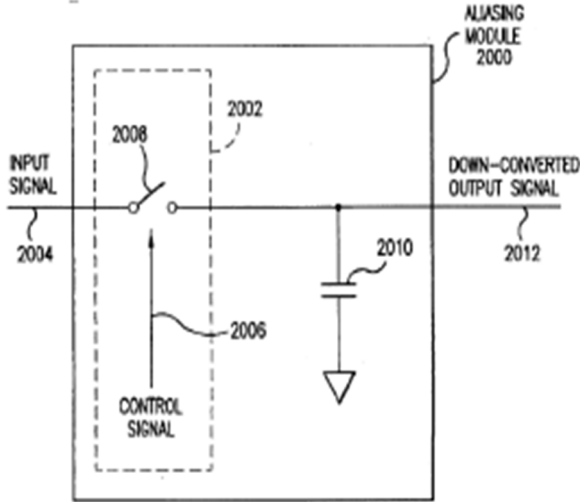


FIG.20A

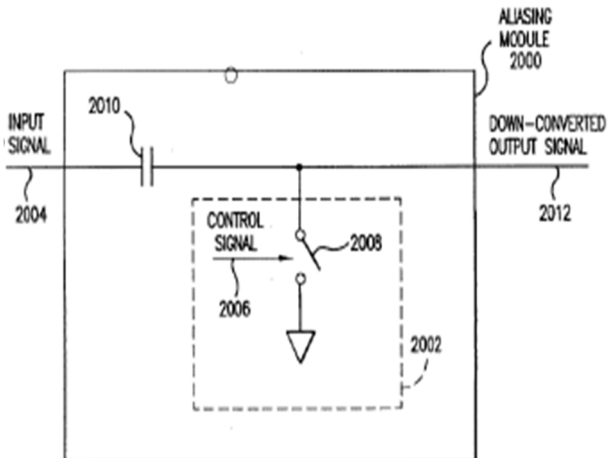


FIG.20A-1

Figures 20A and 20A-1 of the '444 patent “are example aliasing modules.” Ex. 1001, 3:50–51. The '444 patent explains that, in Figure 20A, switch 2008 is in series with input signal 2004 and capacitor 2010 is shunted to ground; in Figure 20A-1, however, capacitor 2010 is in series with input signal 2004 and switch 2008 is shunted to ground. *Id.* at 9:48–57 (also noting that “[t]he electronic alignment of the circuit components is flexible”).

The '444 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, 9:32–38; *see id.* at 34:54–58 (“Down-conversion utilizing a UFD module (also called an aliasing module) is further described in . . . [the '551 patent].”).¹¹

F. Illustrative Claims

Claims 2 and 3, the independent claims challenged in this proceeding, are illustrative of the claimed subject matter and are reproduced below with Petitioners' bracketing added for reference:

2. [2-pre] A wireless modem apparatus, comprising:
 - [2A] a receiver for frequency down-converting an input signal including,
 - [2B] a first frequency down-conversion module to down-convert the input signal, wherein said first frequency down-conversion module down-converts said

¹¹ The '551 patent is Exhibit 2029 in this proceeding.

input signal according to a first control signal and outputs a first down-converted signal;

[2C] a second frequency down-conversion module to down-convert said input signal, wherein said second frequency down-conversion module down-converts said input signal according to a second control signal and outputs a second down-converted signal; and

[2D] a subtractor module that subtracts said second down-converted signal from said first down-converted signal and outputs a down-converted signal;

[2E] wherein said first frequency down-conversion module under-samples said input signal according to said first control signal, and [2F] said second frequency down-conversion module under-samples said input signal according to said second control signal.

3. [3-pre] A wireless modem apparatus, comprising:

[3A] a receiver for frequency down-converting an input signal including,

[3b] a first frequency down-conversion module to down-convert the input signal, wherein said first frequency down-conversion module down-converts said input signal according to a first control signal and outputs a first down-converted signal;

- [3C] a second frequency down-conversion module to down-convert said input signal, wherein said second frequency down-conversion module down-converts said input signal according to a second control signal and outputs a second down-converted signal; and
- [3D] a subtractor module that subtracts said second down-converted signal from said first down-converted signal and outputs a down-converted signal;
- [3E] wherein said first and said second frequency down-conversion modules each comprise a switch and a storage element.

Ex. 1001, 60:47–67, 61:1–18.

G. Level of Ordinary Skill in the Art

Petitioners, supported by Dr. Shoemake’s testimony, propose that a person of ordinary skill in the art at the time of the invention would have had “at least an undergraduate degree in electrical engineering or a related subject and two or more years of experience in the fields of communication systems, signal processing and/or RF circuit design.” Pet. 35 (citing Ex. 1002 ¶¶ 31–36). Petitioners explain that “[l]ess work experience may be compensated by a higher level of education, such as a master’s degree.” *Id.* (citing Ex. 1002 ¶¶ 31–36).

In the Institution Decision, we noted that Patent Owner had not expressed a position on the level of ordinary skill in the art in the Preliminary Response, and, based on the preliminary record, we adopted Petitioners’ unopposed position, finding it consistent

with the level of ordinary skill in the art reflected by the '444 patent and the prior art of record. Inst. Dec. 10 (citing *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)).

In the Patent Owner Response, Patent Owner, supported by Dr. Steer's testimony, proposes that a person of ordinary skill in the art at the time of the invention would have had

- (a) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two (2) additional years of work experience in the design and development of radio frequency circuits and/or systems, or
- (b) at least five (5) years of work experience and training in the design and development of radio frequency circuits and/or systems.

PO Resp. 4 (citing Ex. 2038 ¶ 24). Neither Patent Owner nor Dr. Steer explain why their proposal materially differs from that proposed by Petitioners.

Patent Owner's option (a) is substantially the same as Petitioners' proposal—both require a bachelor's degree in the same or a related subject and two additional years of related work experience. Patent Owner's option (b) adds an additional option based on work experience in lieu of a formal degree.

Neither party contends that the difference in their proposals affects the outcome of this proceeding and we do not find that it does. Nonetheless, on the full record before us, we find that our identification of the level of ordinary skill in art in the Institution Deci-

sion as well as Patent Owner's option (b) are supported by the prior art of record, the '444 patent, and the opinion of Dr. Steer. Accordingly, we modify our preliminary finding to include option (b) from Patent Owner's proposal. Thus, we find that one of ordinary skill in the art 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. We also find that less work experience may be compensated by a higher level of education, such as a master's degree.

II. 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 *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

A. “storage element”

In the Institution Decision, we did not construe any claim terms expressly because none of the terms were in dispute. Inst. Dec. 11. In the briefing following institution, Patent Owner proposed a construction for the term “storage element,” see, e.g., PO Resp. 36–38, and it became clear that the parties dispute the meaning of the term. Additionally, because many of Patent Owner’s arguments hinge on the meaning of this term, its proper construction is important to address the issues presented in this proceeding. Further, the parties’ arguments rely, almost exclusively, on disclosures in the ’551 patent, incorporated by reference into the ’444 patent.

In the final written decision in IPR2020-01265 (Ex. 2016), we construed the term “storage element,” relying on its use in the ’551 patent. In IPR2020-01265, after considering the parties’ extensive arguments as well as prior constructions in related district court litigation, we construed “storage element” to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.” Ex. 2016, 41. Critical to that determination was the finding that the patentees acted as their own lexicographers by defining the systems to which “storage modules” *refer to*. Specifically, we explained that the ’551 patent expressly states “[s]torage modules and storage capacitances, on the other hand, *refer to* systems that store non-negligible amounts of energy from an input EM signal.”¹² *Id.* at 36 (emphasis added) (citing ’551 patent,¹³ 66:59–67). Additionally, we also explained that in a prior proceeding challenging claims of the ’551 patent before the Board—IPR2014-00948—Patent Owner represented that the ’551 patent “*provides an explicit definition*” and “*explicitly defines a storage module.*” *Id.* at 39 (citing Ex. 1032,¹⁴ 21). We found that “Patent Owner’s acknowledgement that the ’551 patent provides an explicit definition of ‘storage

¹² It is undisputed that “storage element” (recited in the ’444 patent) and “storage module” (recited in the ’551 patent) are synonymous. *See* PO Resp. 37–38 (referring to storage module); Pet. Reply 4 (consenting to the adoption of the Board’s construction of “storage element” from IPR2020-01265, which relied on the use of “storage module” in the ’551 patent).

¹³ In IPR2020-01265, the ’551 patent was Exhibit 2007.

¹⁴ Exhibit 1032 from IPR2020-01265 is Patent Owner’s Preliminary Response (Paper 7) from IPR2014-00948, which was not filed as an exhibit in this proceeding.

module’ directly supports our determination that the patentees acted as lexicographers.” *Id.* at 40.

In this proceeding, in addition to raising substantially the same arguments addressed in IPR2020-01265, Patent Owner submitted a Claim Construction Order and Memorandum in Support Thereof from *ParkerVision, Inc. v. LG Electronics, Inc.*, No. 6:21-cv-00520-ADA (W.D. Tex. June 21, 2022) (Doc. 55) (Ex. 2040), and a Special Master’s Report and Recommendation Regarding Claim Construction from *ParkerVision, Inc. v. Hisense Co.*, No. 6:20-cv-00870-ADA (W.D. Tex. Aug. 29, 2022) (Doc. 72) (Ex. 2043).¹⁵ Each of these claim construction decisions construes “storage module” to mean “a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal.” Ex. 2043, 33; *see* Ex. 2040, 16 (district court declining to modify its previous construction of “storage module,” which was limited to an “energy transfer system”). In so determining, each of the district court’s decisions finds that the patentees did not act as their own lexicographers. *See* Ex. 2040, 19; Ex. 2043, 32. Patent Owner advocates that we adopt the same construction here. PO Resp. 36–38.

Petitioners assert that “[u]nder any reasonable construction, a capacitor constitutes a ‘storage element.’” Pet. Reply 2 (citing Pet. 59; Ex. 1002 ¶ 169). Petitioners rely on the ‘441 patent’s statement that a storage module is a capacitor. *Id.* at 2–3 (citing Pet. 59; Ex. 1002 ¶ 169; Ex. 1001, 34:22–23 (“The storage

¹⁵ Patent Owner also submitted the same Special Master’s Report and Recommendation Regarding Claim Construction from *ParkerVision, Inc. v. TCL Industries Holdings Co.*, No. 6:20-cv-00945-ADA (W.D. Tex. Aug. 29, 2022) (Doc. 68) (Ex. 2042).

module 6704A is a capacitor 6706A.”), 36:14–15 (“In an embodiment, first storage module 7024 comprises a first capacitor 7404.”)). Petitioners contend that “[t]his is consistent with [Patent Owner’s] position on infringement, where [Patent Owner] alleges repeatedly across multiple related patents that a ‘storage element’ in the accused products is simply ‘one or more capacitors.’” *Id.* at 3 (citing Ex. 1022 ¶¶ 127–131, 138–140, 150; Ex. 1023 ¶¶ 75, 92, 98). Nonetheless, “Petitioners do not object to adoption of the Board’s construction for ‘storage element’ from IPR2020-01265.” *Id.* at 4.

We have reviewed and considered the district court’s construction (which limits “storage element” to an “energy transfer system”), but we are not persuaded that our construction from IPR2020-01265 should be altered. We expressly adopt and incorporate by reference our analysis from IPR2020-01265 and do not repeat it in full here. We do, however, take this opportunity to provide additional reasoning in support of our prior determination based on the arguments and evidence presented in this proceeding.

The ’551 patent provides the following, which formed the focal point of Patent Owner’s argument in IPR2014-00948 and which we found provides a lexicographic definition of “storage module”/“storage element” in IPR2020-01265:

The terms storage module and storage capacitance, *as used herein*, are distinguishable from the terms holding module and holding capacitance, respectively. Holding modules and holding capacitances, as used above, identify systems that store negligible amounts of energy from an under-sampled

input EM signal with the intent of “holding” a voltage value. Storage modules and storage capacitances, on the other hand, *refer to* systems that store non-negligible amounts of energy from an input EM signal.

Ex. 2029, 66:59–67 (emphases added); *see* Ex. 2016, 39–40 (discussing Patent Owner’s prior arguments to construe “storage module” in IPR2014-00948). When defining certain terms in a section titled “General Terminology,” the ’551 patent repeatedly uses the phrase “when used herein” in combination with the phrase “refer(s) to.” *See, e.g.*, Ex. 2029, 13:56–15:27 (mentioning a term followed by “when used herein,” followed by “refers to,” followed by a definition). For example, the ’551 patent states, “[t]he term digital signal, when used herein, refers to a signal that changes between discrete states, as contrasted to a signal that is continuous.” *Id.* at 15:7–9. As shown, the ’551 patent defines “digital signal” by stating “when used herein” followed by “refers to.” And, the same sentence also provides a comparison between “digital signal” and a signal that is continuous. Even though the passage describing “storage module” is not listed under the “General Terminology” section of the ’551 patent, the passage provides the same indications that the patentees clearly and unambiguously intended to define the term “storage module” by stating “as used herein” and “refer to”—hallmarks that the patentees were providing a lexicographic definition of the term. *Vasudevan Software, Inc. v. MicroStrategy, Inc.*, 782 F.3d 671, 679 (Fed. Cir. 2015) (“An applicant’s use of the phrase ‘refers to’ generally indicates an intention to define a term.”) (citing *In re Imes*, 778 F.3d 1250, 1252–53 (Fed. Cir. 2015); *Microsoft Corp. v. Int’l*

Trade Comm'n, 731 F.3d 1354, 1360 (Fed. Cir. 2013); *Linear Tech. Corp. v. Int'l Trade Comm'n*, 566 F.3d 1049, 1054 (Fed. Cir. 2009)). Additionally, as with the term “digital signal,” the above-passage provides a comparison between “storage module” and “holding module” and uses the definitions of the terms to compare and contrast them.

“To act as its own lexicographer, a patentee must ‘clearly set forth a definition of the disputed claim term’ other than its plain and ordinary meaning.” *Thorner*, 669 F.3d at 1366 (citing *CCS Fitness*, 288 F.3d at 1366). “It is not enough for a patentee to simply disclose a single embodiment or use a word in the same manner in all embodiments, the patentee must ‘clearly express an intent’ to redefine the term.” *Id.* (citing *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1381 (Fed. Cir. 2008); *Kara Tech. Inc. v. Stamps.com*, 582 F.3d 1341, 1347–48 (Fed. Cir. 2009)). That is precisely what the patentees did in the above-passage. Specifically, we find that they clearly set forth a definition that is different than the plain and ordinary meaning and, in so doing, clearly expressed an intent to redefine the term. That the patentees intended to redefine the term “storage module” is clearly expressed by the use of “as used herein”¹⁶ and “refers to” in the above-passage and is consistent with the patentees’ use of these same phrases when defining other terminology in the ’551 patent, as discussed above.

We also do not agree with Patent Owner’s argument that this passage in the ’551 patent does not pro-

¹⁶ There is no substantive difference between the phrase “when used herein” and “as used herein.”

vide a lexicographic definition for at least two reasons. First, in related case IPR2021-00985, Patent Owner argues that the patent-at-issue in that proceeding (the ‘835 patent) provides a definition of the term “cable modem” and points to the following from the ‘835 patent specification: “Cable Modems *refer to* modems that communicate across ordinary cable TV [television] network cables” (IPR2021-00985, Ex. 1001, 36:19–20 (emphasis added)). During the oral argument, Patent Owner stated that “we just used *the same definition that was in the spec.* . . . We just took *the same exact definition from the spec*” (Tr. 83:16–20 (emphases added)). In other words, Patent Owner’s acknowledgement that the ‘835 patent provides a definition of the term “cable modem” undermines Patent Owner’s argument that the patentees did not define “storage module” even though the patentees used *the same phrase* “refer(s) to.”

Second, Patent Owner has absolutely no (even remotely) colorable explanation as to why it repeatedly argued, in IPR2014-00948, that the ‘551 patent “*provides an explicit definition*” and “*explicitly defines a storage module.*” See Ex. 2016, 39–40 (discussing Patent Owner’s prior arguments to construe “storage module” in IPR2014-00948). The only plausible explanation is that Patent Owner has simply changed positions to suit its current litigation strategy. But that is not how claim construction works. There either *is* a lexicographic definition or there *is not*, regardless of the claim construction standard applied (*i.e.*, broadest reasonable interpretation v. the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b)). In IPR2014-00948, Patent Owner argued

that there was a lexicographic definition and emphasized the same exact statements in the above-passage from the '551 patent. That passage has not changed and provides definitive confirmation of the patentees' intent to provide a lexicographic definition of "storage module" for the reasons discussed above.¹⁷

In its Sur-reply, Patent Owner argues that the above-passage from the '551 patent "is comparative, *not* definitional." PO Sur-reply 4. We agree that it is comparative, but it is *also definitional*. These are not mutually exclusive concepts. And, the above-discussion reflects that the '551 patent defines other terms by providing a definition *and* comparing that definition to definitions of other terms.

Accordingly, for the reasons explained in detail in the Board's final written decision in IPR2020-01265 and as further explained above, we find that the patentees clearly and unmistakably set forth a definition of "storage module" in the incorporated '551 patent, and, therefore, we construe "storage element" to mean "an element of a system that stores non-negligible amounts of energy from an input EM signal."

B. "wireless modem apparatus"

The preambles of claims 2 and 3 recite "[a] wireless modem apparatus." Ex. 1001, 60:47 (claim 2), 61:1 (claim 3). Patent Owner contends that each preamble is limiting "because it provides an essential structure or necessary meaning for the claim." PO

¹⁷ None of the district court claim construction decisions address Patent Owner's representations, in IPR2014-00948, that the '551 patent explicitly defines "storage module." *See generally* Exs. 2040, 2043.

Resp. 38 (citing *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305–06 (Fed. Cir. 1999)). Patent Owner asserts that “the claims recite ‘an input signal’” and “[t]he use of ‘wireless modem’ in the preamble clarifies that the ‘input signal’ is not just any signal, but a wireless (RF) signal to a modem.” *Id.* at 39 (citing Ex. 1014,¹⁸ 1:52–57). Additionally, Patent Owner argues that, “as the name suggests, a ‘modem’ is a device that performs *both modulation and demodulation* of analog carrier signals. . . . The claims and specification disclose a configuration of a receiver that can operate along with a transmitter.” *Id.* (citing Ex. 2038 ¶¶ 228–229).

Petitioners raise several arguments in response. First, Petitioners contend that Patent Owner is collaterally estopped from arguing that the preamble is limiting because Patent Owner did not assert that position in IPR2020-01265. Pet. Reply 10 (noting that claim 3 was at issue in IPR2020-01265 and that claims 2 and 3 each recite the same preamble). Thus, Petitioners assert that Patent Owner “should not be heard now to argue that the preamble is limiting.” *Id.*

Second, Petitioners contend that, in related litigation, Patent Owner never argued that the preamble is limiting because it “is non-essential and does not give meaning to the structurally-complete bodies of claims 2 and 3.” Pet. Reply 11. Petitioners contend the preamble (1) does not provide antecedent basis for any

¹⁸ Patent Owner contends that “[t]he disclosure regarding wireless modems in U.S. Patent No. 5,764,693 (‘the ’693 patent’) is incorporated into the ’444 patent. Thus, a [person of ordinary skill in the art] would consider the ’693 patent.” PO Resp. 39 n.10 (citing Ex. 2038 ¶ 228 n.13).

later term; (2) does not represent “essential structure”; and (3) merely states an intended use, which is confirmed by the specification. *Id.* at 11–12. In particular, Petitioners assert that a “wireless modem” “is just one of the many exemplary applications of the apparatuses disclosed in the specification.” *Id.* at 12. And, Petitioners point to the ’444 patent’s statement that “[t]hese applications and embodiments are *not intended to limit the invention.*” *Id.* (alteration in original) (citing Ex. 1001, 30:56–67, 60:7–10). Petitioners argue that “the body of the claim defines a structurally complete invention and the term ‘wireless modem apparatus’ does not give life, meaning, and vitality to the claim”; in other words, Petitioners contend that, “if ‘wireless modem apparatus’ was deleted from the preamble or replaced with a generic term like device, the body of each claim would still define a structurally complete device that down-converts an input signal by using frequency down-conversion modules, as shown in Figure 70A of the ’444 patent.” *Id.* (citing *TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1323 (Fed. Cir. 2015); Pet. 10).

Patent Owner does not address whether “wireless modem apparatus” is limiting nor does Patent Owner address its proposed construction in the Sur-reply. *See generally* PO Sur-reply.

“Generally . . . the preamble does not limit the claims.” *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d 1354, 1358 (Fed. Cir. 2010). A term in the preamble is a limitation only if it “recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *TomTom*, 790 F.3d at 1323.

We agree with Petitioners that “wireless modem apparatus,” as recited in the preambles of claims 2

and 3, is not limiting. In particular, “wireless modem apparatus” does not provide antecedent basis for any term subsequently recited in claims 2–4; it does not provide any essential structure because the body of the claim recites a structurally complete invention; and it is not necessary to give life, meaning, and vitality to the claim. Further, Patent Owner’s argument that the preamble is limiting because it makes clear that the input signal is input to a wireless modem apparatus is unavailing because the body of claims 2 and 3 expressly recite, as the first element, “a receiver for frequency down-converting an input signal.” *See* Ex. 1001, 60:48–49 (claim 2), 61:2–3 (claim 3). And, Patent Owner’s arguments make clear that its attempt to read “wireless modem apparatus” as limiting is solely for the purpose of arguing that claims 2–4 require a transmitter, which is a structural element that is not recited in the claims. *See, e.g.*, PO Resp. 72 (arguing that Tayloe does not disclose a transmitter), 79 (raising the same arguments directed to Lam). When the patentees intended to limit a claim to a transmitter, they expressly recited a transmitter in the body of the claim. *See, e.g.*, Ex. 1001, 61:25–57 (Claim 6 recites “[a] wireless modem apparatus, comprising,” and expressly recites “a receiver” and “a transmitter” in the body of the claim.).

Accordingly, for each of these reasons, we find that “wireless modem apparatus” recited in the preambles of claims 2 and 3 is not limiting.

C. Additional Terms

Petitioners propose that we construe the following three terms: “frequency down-conversion module,” “subtractor module,” and “under-samples.” Pet. 15–

18. Patent Owner responds to Petitioners' constructions for "frequency down-conversion module" and "subtractor module." PO Resp. 39–41.

On the full record before us, none of the parties' arguments nor the outcome of this proceeding hinge on the construction of these additional terms. Accordingly, we need not construe them expressly to resolve the present disputes between the parties. *See Nidec Motor Corp.*, 868 F.3d at 1017.

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.”)).

“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. Obviousness over Tayloe and TI Data-sheet

Petitioners assert the combination of Tayloe and TI Datasheet would have rendered the subject matter of claims 2 and 3 obvious to one of ordinary skill in the

art at the time of the invention. Pet. 30–32 (discussing motivation to combine Tayloe and TI Datasheet), 35–59 (discussing the application of the art to the claims).

1. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is set forth above. *See supra* § I.G.

2. Scope and Content of the Prior Art

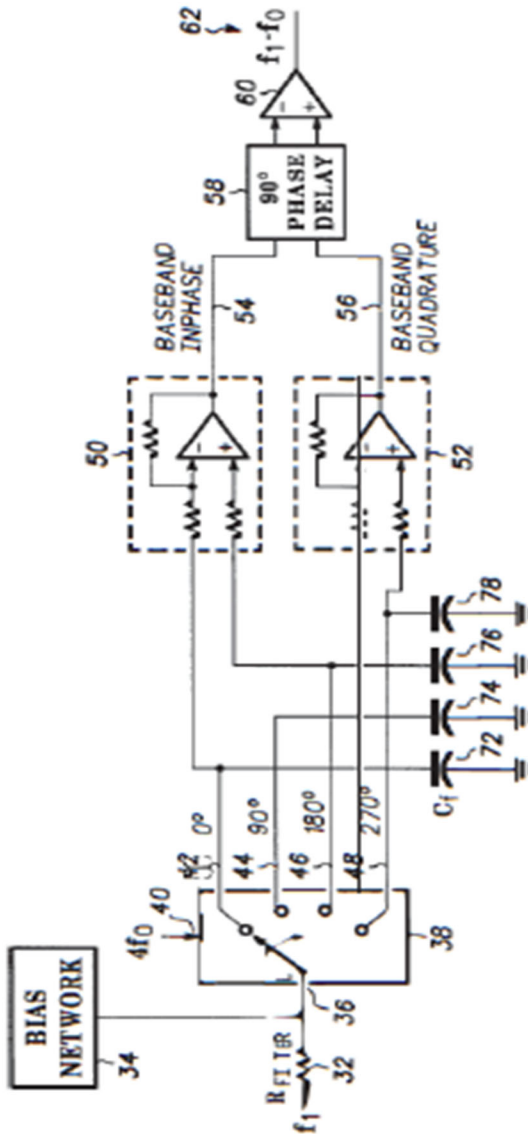
a. Tayloe

Tayloe is directed to a direct conversion receiver (also referred to as a “product detector”) “for converting a signal to baseband.” Ex. 1004, code (57); *see id.* at 1:51–52 (describing Figure 3). Tayloe explains that its direct conversion receiver

includes a commutating switch which serves to sample an RF waveform four times per period at the RF frequency. The samples are integrated over time to produce an average voltage at 0 degrees, 90 degrees, 180 degrees and 270 degrees. The average voltage at 0 degrees is the baseband in-phase signal. . . .

Id. at code (57). Tayloe teaches that, “[a]lternatively, to increase gain, the 0 degree average can be differentially summed with the 180 degree average to form the baseband in-phase signal. . . .” *Id.* Tayloe states that “[d]irect conversion receivers are desirable in part because they convert signals of interest directly to baseband (or near zero hertz) from a radio frequency (RF) or an intermediate frequency (IF).” *Id.* at 1:10–13.

Taylor's Figure 3 is reproduced below:



Taylor's Figure 3 "shows a direct conversion receiver."
 Ex. 1004, 1:51-52.

Taylor discloses the following regarding the operation of the direct conversion receiver shown in the Figure 3:

[A]n RF or IR signal f_1 is received at resistor 32. . . . After passing through resistor 32, the input signal is received by commutating switch 38 at input 36. Commutating switch 38 switches input 36 to outputs 42, 44, 46, and 48. The rate at which commutating switch 38 operates is controlled by a signal present at control input 40. In the preferred embodiment as shown in FIG. 3, the control signal input to control input 40 is substantially equal to four times the local oscillator frequency that would exist in a simple direct conversion receiver. As a result, input 36 is switched to each of the four outputs substantially once during each period of the input signal f_1 .

In the preferred embodiment, commutating switch 38 remains closed at each of the four outputs for substantially 90 degrees at the frequency of the input signal. In alternate embodiments, commutating switch 38 remains closed at each of the four outputs for less than 90 degrees.

During the time that commutating switch 38 connects input 36 to output 42, charge builds up on capacitor 72. Likewise, during the time commutating switch 38 connects input 36 to output 44, charge builds up on capacitor 74. The same principle holds true for capacitors 76 and 78 when commutating switch 38 connects input 36 to outputs 46 and 48

respectively. As commutating switch 38 cycles through the four outputs, capacitors 72–78 charge to voltage values substantially equal to the average value of the input signal during their respective quadrants. . . .

Output 42 represents the average value of the input signal during the first quarter wave of the period, and is termed the 0 degree output. Output 44 represents the average value of the input signal during the second quarter wave of the period, and is termed the 90 degree output. Output 46 represents the average value of the input signal during the third quarter wave of the period, and is termed the 180 degree output. Output 48 represents the average value of the input signal during the fourth quarter wave of the period, and is termed the 270 degree output.

Id. at 2:13–55.

Taylor describes the following regarding summing amplifiers 50 and 52:

The outputs of commutating switch 38 are input to summing amplifiers 50 and 52. Summing amplifier 50 differentially sums the 0 degree output [42] and the 180 degree output [46], thereby producing baseband in-phase signal 54. Summing amplifier 52 differentially sums the 90 degree output and the 270 degree output, thereby producing baseband quadrature signal 56. Baseband in-phase signal 54 and baseband quadrature signal 56 are input to phase delay 58 which shifts the

phase of baseband quadrature signal 56 by 90 degrees relative to baseband in-phase signal 54. The resulting signals are then summed by summing amplifier 60 to produce the signal of interest 62.

Ex. 1004, 2:56–67. Summing amplifiers 50, 52, and 60 show “+” and “-” input ports. *Id.* at Fig. 3.

Taylor’s Figure 4 is reproduced below:

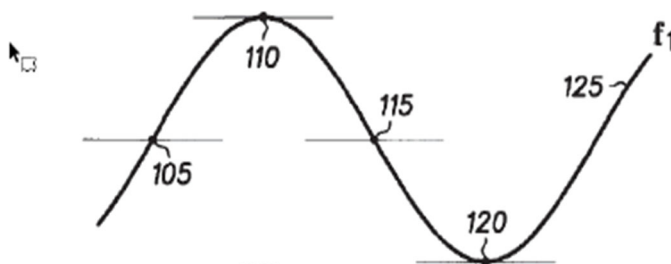


FIG. 4 100

Taylor’s Figure 4 “shows a waveform.” Ex. 1004, 1:53–54.

Tayloe explains the following regarding Figure 4:

Waveform 100 includes signal 125 which corresponds to the input signal f1. Superimposed on signal 125 are points 105, 110, 115, and 120. Point 105 represents the voltage to which capacitor 72 (FIG. 3) charges. Likewise, point 110 represents the voltage to which capacitor 74 charges, point 115 represents the voltage to which capacitor 76 charges, and point 120 represents the voltage to which capacitor 78 charges.

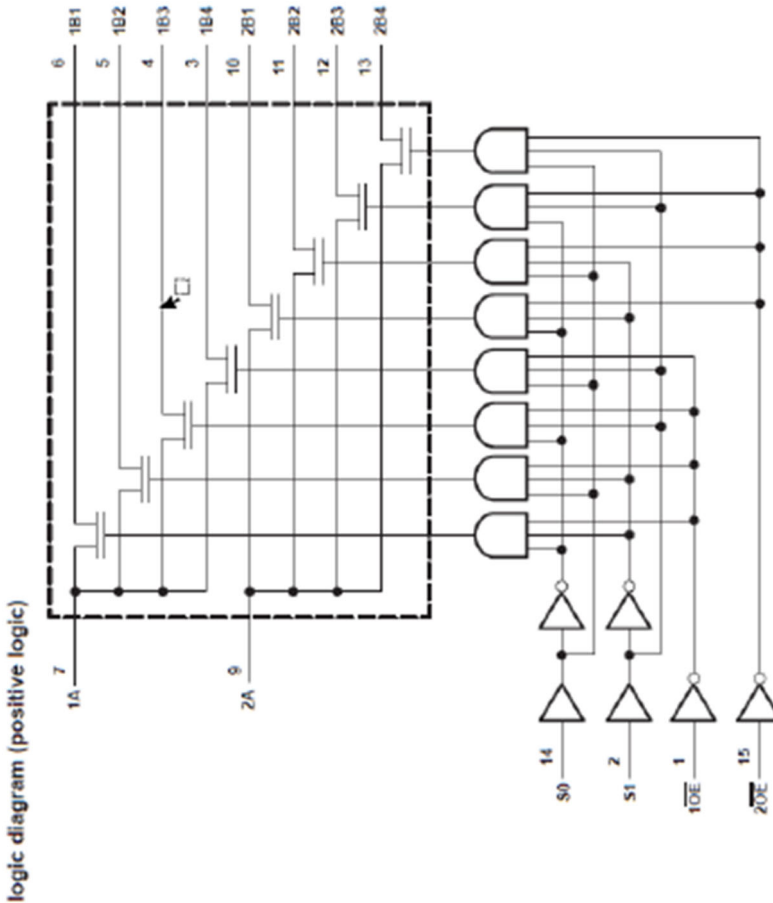
Id. at 3:40–48.

Tayloe further discloses the equipment used to achieve its stated experimental results, explaining: “A direct conversion receiver which utilizes a Tayloe Product Detector has been built. The receiver design is the same as direct conversion receiver 30 (FIG. 3) utilizing an analog multiplexer and a digital counter as shown in FIG. 7. The analog multiplexer is a Texas Instruments SN74BCT3253D.” Ex. 1004, 5:32–37.

b. TI Datasheet

TI Datasheet is directed to SN74CBT3253, a “dual 1-of-4 high-speed [transistor-transistor logic]-compatible [field-effect transistor] multiplexer/demultiplexer.” Ex. 1005, 1. TI Datasheet states “[t]he low on-state resistance of the switch allows connections to be made with minimal propagation delay.” *Id.*

TI Datasheet includes the following figure:



Logic Diagram (Positive Logic)

The above figure illustrates a logic diagram (positive logic). Ex. 1005, 2. TI Datasheet explains “1OE, 2OE, S0, and S1 select the appropriate output for the A-input data.” *Id.* at 1.

3. Differences Between the Prior Art and the Claims; *Motivation to Modify*

Petitioners set forth a detailed analysis showing how the combined teachings of Tayloe and TI Datasheet

meet the limitations of claims 2 and 3. Pet. 35–59. In particular, Petitioners rely on Tayloe as disclosing most of the elements of the claims, but rely on TI Datasheet for details of how to implement Tayloe’s multiplexer/demultiplexer. *See, e.g., id.* at 42 (discussing TI Datasheet’s logic diagram of the TI SN74CBT3253D multiplexer/demultiplexer and its use of four switches to selectively supply an input signal to one of four outputs according to four control signals); 42–43 (discussing switches shown in TI Datasheet that Petitioners contend “show the implementation details of Tayloe’s switch 38 (Figure 3) or its multiplexer 202 (Figure 7)”). Petitioners contend Tayloe “specifically discloses a direct conversion receiver that includes a[n] SN74-CBT3253 multiplexer/demultiplexer, and TI Datasheet describes the implementation details of the demultiplexer.” *Id.* at 30 (citations omitted).

Additionally, Petitioners assert “Tayloe’s express reference to the SN74CBT3253 provides sufficient motivation to combine Tayloe with the TI Datasheet describing that device.” Pet. 30 (citing Ex. 1004, 5:33–37; Ex. 1005). Petitioners contend “combining Tayloe with TI Datasheet . . . would have yielded expected, predictable results.” *Id.* at 32. Petitioners assert

[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 demultiplexer in the context of Tayloe; (2) a simple substitution of one known element (the SN74CBT3253 demultiplexer in TI Datasheet) for another (the demultiplexer in Tayloe) to obtain predictable results; and (3)

obvious to try—a choice of one type of demultiplexer from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Id. (citing *KSR*, 550 U.S. at 421; *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007); Ex. 1002 ¶ 116).

a. Claim 2

Patent Owner’s sole argument directed to claim 2 is that Tayloe “does not disclose/teach/suggest” a “wireless modem apparatus.” PO Resp. 72; *see id.* at 72–74. As discussed above, we determine that “wireless modem apparatus,” which is recited in the preamble of claim 2, is not limiting. Thus, Patent Owner’s argument directed to claim 2 does not detract from Petitioners’ challenge.

We find Petitioners’ arguments persuasive to demonstrate how the combination of Tayloe and TI Datasheet teaches the subject matter of claim 2 and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that the combination of Tayloe and TI Datasheet teaches the subject matter of claim 2 and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

b. Claim 3

Regarding claim 3, Patent Owner’s arguments, aside from its contentions regarding “wireless modem

apparatus,”¹⁹ are (1) that Tayloe fails to teach a “storage element” (recited in element [3E]), PO Resp. 59–72²⁰; (2) it would not have been obvious to replace the voltage sampling configuration of Tayloe with an energy sampling configuration, *id.* at 72; and (3) objective evidence of nonobviousness weigh in favor of Patent Owner (*id.* at 17–19, 72). We first focus on Patent Owner’s argument directed to “storage element” (recited in element [3E]) and then address Patent Owner’s additional arguments. For the other elements of claim 3 that are not challenged by Patent Owner, however, on the complete record, we find that Petitioners’ argument and evidence establishes that the combination of Tayloe and TI Datasheet teaches each element and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

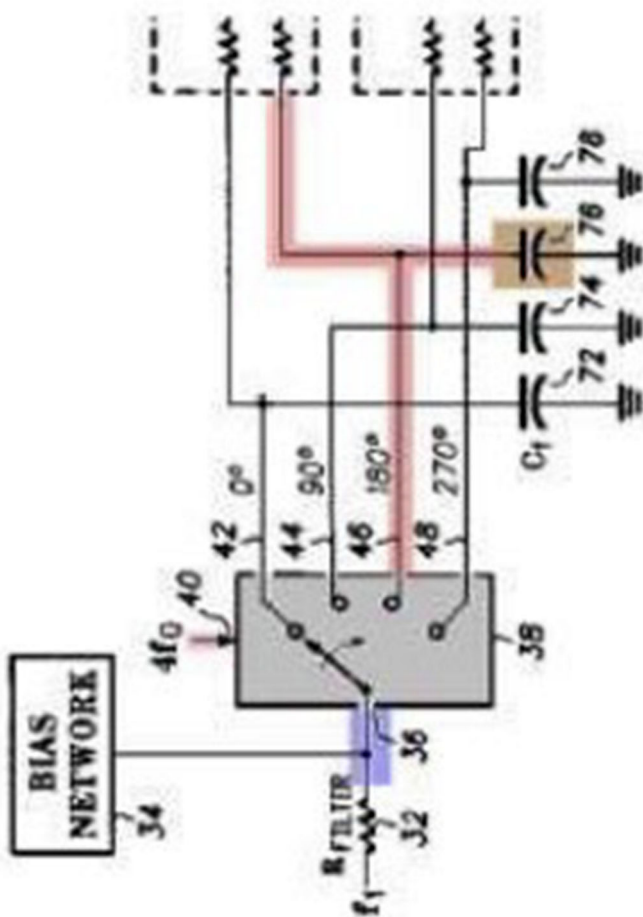
Element [3E] recites “wherein said first and said second frequency down-conversion modules each comprise a switch and a storage element.” Ex. 1001, 61:16–18. Petitioners contend that, “[a]s explained

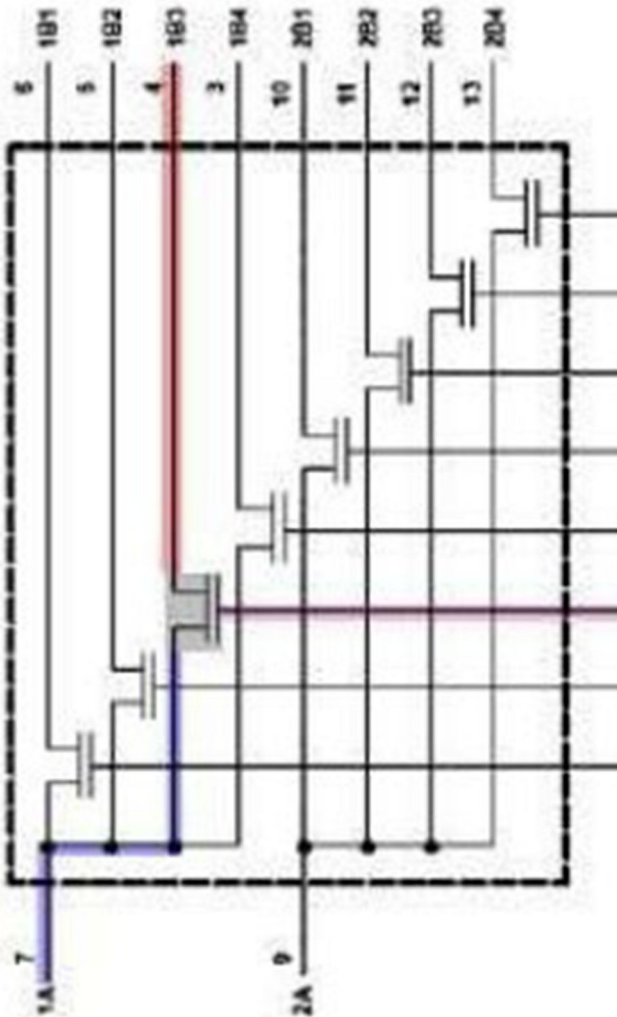
¹⁹ Patent Owner’s argument regarding “wireless modem apparatus” also applies to claim 3 (*see* PO Resp. 72), but, for the same reasons discussed above in the context of claim 2, does not detract from Petitioners’ challenge to claim 3.

²⁰ Under its heading “GROUND 1: Tayloe in View of the TI Datasheet,” Patent Owner notes that “[c]laims 3 and 4 recite a ‘storage element.’” PO Resp. 59. Although Patent Owner is correct that claim 4 recites “storage elements,” Petitioners do not challenge claim 4 under the combination of Tayloe and TI Datasheet; rather, Petitioners challenge claim 4 based on the combination of Lam, Enz, and Tayloe. *See* Pet. 7 (identifying the grounds for challenge).

App.41a

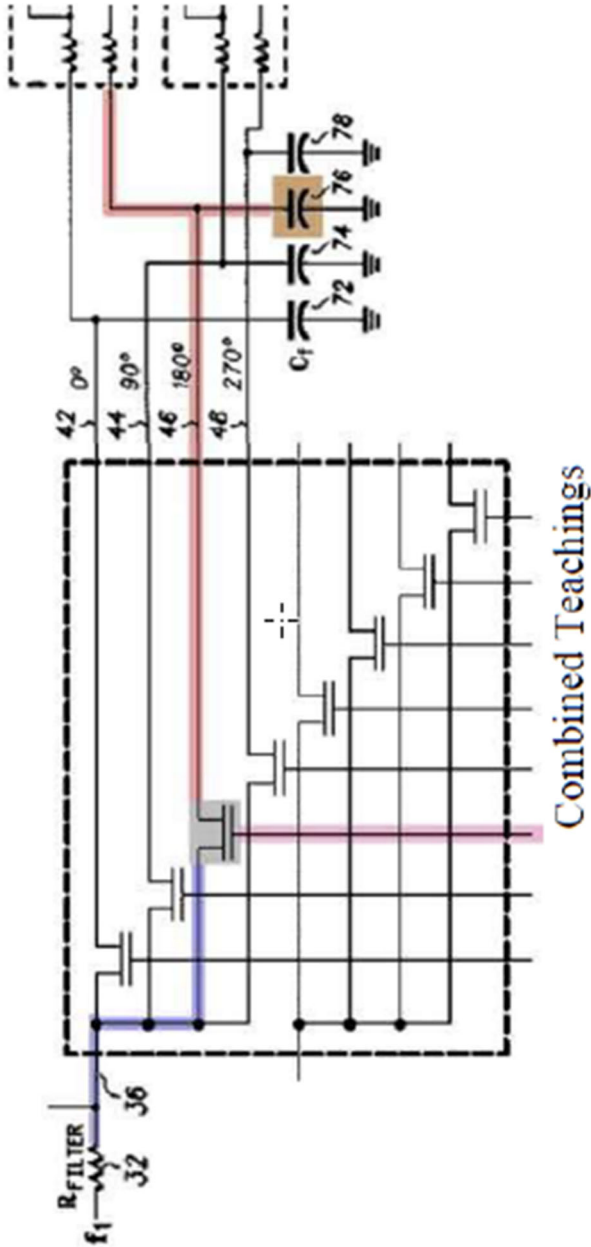
for Elements [2B]-[2C], the combination of Tayloe and TI datasheet teaches a first frequency down-conversion module (for Tayloe's 180° output 46 (red)) comprising a first switch (TI Datasheet's transistor (gray)) and a first capacitor (Tayloe's capacitor 76 (brown)).” Pet. 58 (citing Ex. 1002 ¶ 167; Ex. 1004, Fig. 3; Ex. 1005, 2). Petitioners rely on the annotated versions of Tayloe's Figure 3 (left) and TI Datasheet's logic diagram (right), reproduced below.





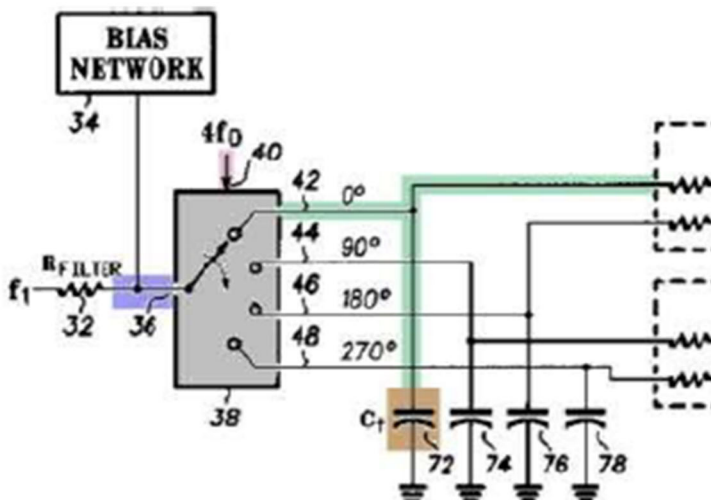
Id. Petitioners annotated Tayloe’s Figure 3 (left) to highlight RF input signal f1 36 in purple, 180° output 46 in red, and capacitor 76 in brown, and annotated TI Datasheet’s logic diagram (right) to highlight input signal 1A in purple, a transistor in gray, and output 4 in red. *Id.* Petitioners also provide the following figure

showing the combined teachings of Tayloe and TI Datasheet.



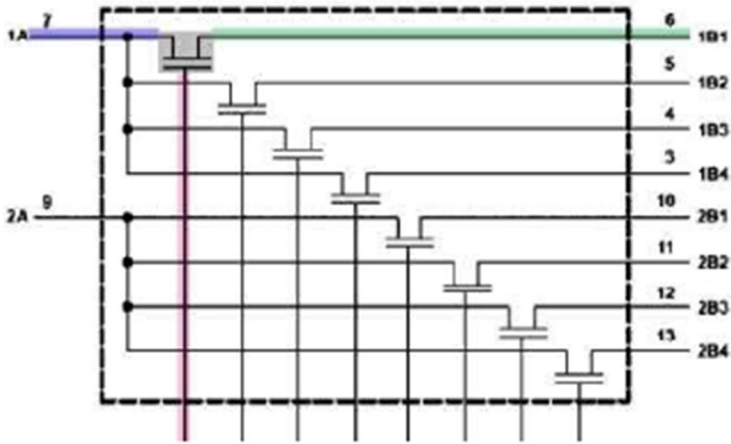
Id. Petitioners' figure of the combined teachings of Tayloe and TI Datasheet shows an annotated version of TI Datasheet's logic diagram (left), with the same highlighting described above, and an annotated version of Tayloe's Figure 3 (right), highlighted to show capacitor 76 in brown and 180° output 46 in red.

Additionally, Petitioners assert that, “[s]imilarly . . . , the combination teaches a second frequency down-conversion module (for Tayloe’s 0° output 42 (green) comprising a second switch (TI Datasheet’s transistor (gray)) and a second capacitor (Tayloe’s capacitor 72 (brown)).” Pet. 59. Petitioners rely on the annotated versions of Tayloe’s Figure 3 (left) and TI Datasheet’s logic diagram (right), reproduced below.



Ex.1004-Tayloe

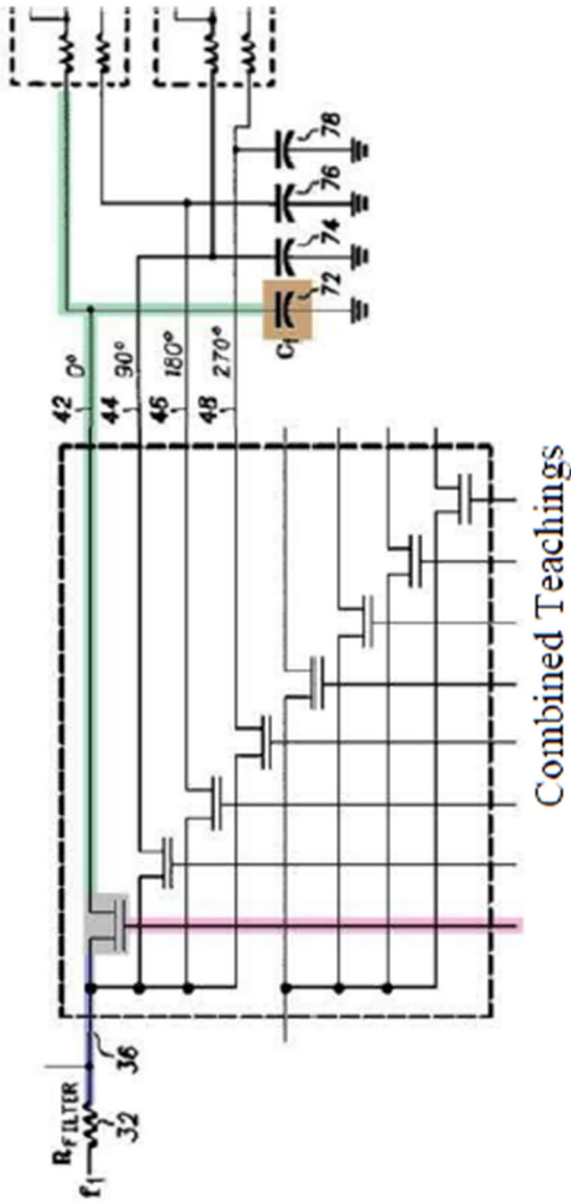
Fig. 3



Ex.1005-TI

Datasheet, 2

Id. Petitioners annotated Tayloe’s Figure 3 (left) to highlight RF input signal f1 36 in purple, 0° output 42 in green, and capacitor 72 in brown, and annotated TI Datasheet’s logic diagram (right) to highlight input signal 1A in purple, a transistor in gray, and output 6 in green. *Id.* Petitioners also provide the following figure showing the combined teachings of Tayloe and TI Datasheet.



Id. Petitioners' figure of the combined teachings of Tayloe and TI Datasheet shows an annotated version

of TI Datasheet's logic diagram (left), with the same highlighting described above, and an annotated version of Tayloe's Figure 3 (right), highlighted to show capacitor 72 in brown and 0° output 42 in green.

Further, Petitioners contend that “[a] capacitor is a well-known storage element, and the ’444 patent embodiment discloses a capacitor as the storage element.” Pet. 59 (citing Ex. 1001, 34:22–23, 36:14–15; Ex. 1002 ¶ 169).

Patent Owner contends that Tayloe's capacitor 30 is not a “storage element.” PO Resp. 59. Patent Owner asserts that “[t]he Petition fails to set forth any argument/theory that any capacitor in Tayloe ‘stores *non-negligible* amounts of energy from an input electromagnetic signal,’ and, thus, the Petition fails.” *Id.*

Patent Owner raises three primary arguments directed to element [3E]. First, Patent Owner argues that Tayloe's capacitor is not a “storage element” because it does not store *non-negligible* amounts of energy; rather, according to Patent Owner, Tayloe's capacitors hold *negligible* amounts of energy. PO Resp. 59 (referring to Patent Owner's Response §§ VII, VIII.B.1, VIII.B.2). Relying on Dr. Steer's declaration testimony, Patent Owner contends that “one way to determine energy storage is to perform calculations based on a time constant. Using a time constant together with a capacitance value provides the proportion of available energy that is transferred during a sampling aperture.” *Id.* at 60 (citing Ex. 2038 ¶ 307). Patent Owner walks through three steps of calculations, spanning four pages of its Patent Owner Response, and, relying on those calculations, asserts that “[o]nly 0.193% of the energy available is held on

a Tayloe capacitor.” *Id.* at 61–65 (citing Ex. 2038 ¶¶ 309, 315–335). Patent Owner asserts that “the size of Tayloe’s capacitors has nothing to do with energy storage.” *Id.* at 61 (providing reasons why Tayloe’s uses a higher capacitance (citing Ex. 1003, 2:14–15, 3:21–22; Ex. 2038 ¶¶ 310–314)). Patent Owner also calculates an amount of energy from Figure 82B of the ’551 patent, which Patent Owner identifies as showing an exemplary energy transfer system. *Id.* at 61, 65–67 (citing Ex. 2038 ¶¶ 309, 336–342).

Second, Patent Owner asserts that Tayloe’s capacitors are not elements of an energy transfer system, a limitation Patent Owner contends “should be incorporated into the construction” of “storage element.” PO Resp. 68, *see id.* at 68–71. Rather, Patent Owner contends that Tayloe is a voltage sampling system. *Id.* at 68. As an alleged voltage sampling system, Patent Owner contends that Tayloe’s capacitors are *holding* elements, not *storage* elements. *Id.* Patent Owner asserts that “[t]he type of load used in Tayloe further demonstrates that Tayloe is a *voltage* sampling system.” *Id.*; *see id.* at 68–71 (asserting that Tayloe uses a high impedance load). Based on a series of calculations, Patent Owner argues that a very small fraction of the energy (0.0000001378%) is delivered to the load relative to the available energy. *Id.* at 70–71 (citing Ex. 2038 ¶¶ 351–352). As Patent Owner acknowledges, this argument primarily is based on Patent Owner’s claim construction of “storage element,” which seeks to limit this term to “energy transfer systems.” *See id.* at 68.

Third, and related to Patent Owner’s argument that energy transfer system should be incorporated into the construction of “storage element,” Patent

Owner asserts that “it would not have been obvious to a [person of ordinary skill in the art] to replace the voltage sampling configuration of Tayloe with an energy sampling configuration.” PO Resp. 72. Patent Owner contends that “[t]here is no teaching/suggestion/motivation to do so; voltage and energy sampling are *fundamentally different and competing* technologies.”²¹ *Id.* And, Patent Owner argues that “secondary considerations of non-obviousness demonstrate that, at the time of the invention, (1) such a dramatic modification of Tayloe was not envisioned by a [person of ordinary skill in the art], and (2) the challenged claims are not obvious in view of Tayloe.”²² *Id.* (citing PO Resp. § VII.D). Patent Owner also argues that “[o]ne would have to use hindsight to modify Tayloe to use a *low* impedance load and *energy* sampling to get to the claimed invention.” *Id.* (citing Ex. 2038 ¶¶ 353–354).

In their Reply, Petitioners first contend that “[t]he Board previously found that Tayloe discloses a first storage element (*i.e.*, capacitor 76) and a second storage element (*i.e.*, capacitor 72).” Pet. Reply 13 (citing Ex. 2016, 57–58; Pet. 58–59; Ex. 1004, Fig. 3; Ex. 1002 ¶¶ 167–169). Petitioners assert that collateral estoppel applies and the Board’s Final Written Decision in IPR2020-01265 resolves this dispute in favor of Petitioners. *Id.* at 14. Petitioners argue that, “even if the Board’s previous decision does not trigger collateral

²¹ Patent Owner’s argument is inapposite as Petitioners do not propose modifying Tayloe to perform energy sampling as Patent Owner contends.

²² We address Patent Owner’s argument as to objective indicia of nonobviousness below. See *infra* § III.B.4.

estoppel, it should be given persuasive effect in these proceedings.” *Id.*

Second, Petitioners contend that, “[t]o the extent that the Board elects to revisit this issue, it should reach the same conclusion.” Pet. Reply 15. In particular, Petitioners assert that Tayloe uses switch 38 and capacitors 72 and 76 to down-convert an input signal to baseband. *Id.* at 15–16 (citing Ex. 1004, 2:13–67; Ex. 1002 ¶¶ 88–89; Ex. 2016, 44–70; Ex. 1021, 39:17–42:6). Petitioners argue that, “[g]iven that Tayloe’s capacitors perform down-conversion, ‘*that is proof*’ under the ’444 [patent’s] lead inventor’s own testimony that the capacitors store non-negligible energy.” *Id.* at 16 (citing *ParkerVision, Inc. v. Qualcomm Inc.*, 621 F. App’x 1009, 1019 (Fed. Cir. 2015)). Petitioners contend that Patent Owner’s “argument that Tayloe does not disclose storage elements . . . , fails to apply the Board’s construction, and further contradicts the sworn testimony from its own lead inventor.” *Id.* at 16–17 (citing PO Resp. 59–72; Pet. Reply § II.A).

In particular, Petitioners challenge Patent Owner’s “attempts to further construe ‘non-negligible’ from the construction of ‘storage [element]’ to require that the amount of energy on a capacitor must be shown ‘mathematically’ in a complex, three-step calculation that compares the ‘total available energy’ to the ‘energy in a capacitor.’” Pet. Reply 5. Petitioners assert that Patent Owner and Dr. Steer “offer no legitimate reason for requiring a comparison of the capacitor’s energy to the ‘total available energy’ in the context of down-converting an input EM signal.” *Id.* at 5–6. Petitioners point to prior testimony regarding the meaning of a “non-negligible” amount of energy by named-inventor David Sorrells from litigation between

Patent Owner and Qualcomm, Inc. (“Qualcomm”). *Id.* at 6 (citing, *inter alia*, *ParkerVision*, 621 F. App’x at 1018).

Specifically, Petitioners contend that

Mr. Sorrells “explained at trial that transferring a non-negligible amount of energy into the storage capacitor means ‘that you have to transfer enough energy *to overcome the noise in the system* to be able to meet your specifications.’” 621 F. App’x at 1019 (emphasis added). Mr. Sorrells thus concluded that when a product functions according to its specifications, this “is *proof that a ‘non-negligible’ amount of energy is transferred to the storage element* in those products.” 621 F. App’x at 1019 (emphasis added). As viewed by the Federal Circuit, “Mr. Sorrells’ testimony thus establishes that to determine whether or not energy in amounts distinguishable from noise has been transferred from the carrier signal, one may look to whether the down-converting circuit functions in practice. If a circuit successfully down-converts, *that is proof that enough energy has been transferred to overcome the noise in the system.*” *Id.* (emphasis added).

Pet. Reply 6–7. Petitioners assert that, “if the Board deems it necessary to construe the word “non-negligible” from its construction of ‘storage [element],’ it should hold that when a device employs a capacitor in order to ‘successfully down-convert’ a signal, then ‘that is proof’ that the capacitor stores non-negligible

energy.” *Id.* at 7 (citing *ParkerVision*, 621 F. App’x at 1019).²³

Additionally, Petitioners argue that, “even if a mathematical calculation of negligible and non-negligible energy was somehow required (which it is not), the energy stored in each of Tayloe’s capacitors is ‘non-negligible’ even under Dr. Steer’s own calculations,” which resulted in 0.193% of the available energy, because dependent claim 42 of the ’551 patent “teaches that ‘one tenth of one percent of the energy’ is ‘non-negligible.’” Pet. Reply 17 (citing Ex. 2029, claims 41, 42; Ex. 1021, 51:3–52:11).

In its Sur-reply, Patent Owner challenges Petitioners’ reliance on Mr. Sorrells’ testimony, contending that “instead of providing expert rebuttal, Petitioners chose to rely on out-of-context testimony by one inventor of the ’444 patent and *attorney* interpretation of the cited references in view of that testimony.” PO Sur-reply 1. Patent Owner asserts that it is not seeking to *require* a complex, three-step mathematical calculation to define non-negligible. *Id.* at 8. Rather, according to Patent Owner “whether mathematical calculations are used depends on the prior art’s disclosure and, even then, does not require a specific calculation.” *Id.* at 7 n.8. Patent Owner points to its arguments in the Patent Owner Response that the calculations show “*one way*” to determine

²³ Petitioners also assert that Dr. Steer “failed to consider crucial materials in arriving at his opinion here, as he did not review Mr. Sorrell[s]’ prior testimony regarding the meaning of ‘non-negligible,’ nor did he consider the Federal Circuit and District Court opinions relying on that testimony.” Pet. Reply 7 n.6 (citing Ex. 1016, 55:25–56:14, 60:5–67:20, 72:11–74:5).

energy storage. *Id.* In other words, Patent Owner suggests that there may be *other* ways to demonstrate non-negligible energy storage.²⁴ *See id.* But, Patent Owner asserts that “[n]on-negligible’ is a relative term and must be demonstrated in some manner,” which Petitioners fail to do. *Id.* at 8.

Patent Owner contends that Petitioners’ argument based on Mr. Sorrells’ prior testimony is flawed because (1) it “is a concept and just attorney argument”; (2) the concept is solely based on extrinsic evidence— testimony by one inventor years after the ’444 patent issued; and (3) Petitioners ignore key portions of Mr. Sorrells’ testimony. PO Sur-reply 7–8. Patent Owner walks through Mr. Sorrells’ testimony, contending that Petitioners’ argument fails to accurately reflect both his actual testimony and how the testimony was applied by the Federal Circuit in its prior decision. *Id.* at 10–15. Patent Owner asserts that the “two key take-aways” from the Federal Circuit’s decision are “(1) Mr. Sorrells’s position is *one way* (not the only way) of determining non-negligible amounts of energy, and (2) whether a circuit ‘successfully’ down-converts depends on whether it meets cellular/wireless specifications.” *Id.* at 12.

Patent Owner’s primary argument in response to Petitioners’ reliance on Mr. Sorrells’ testimony is that Petitioners do not address whether the prior art references meet cellular/wireless specifications.²⁵ PO Sur-

²⁴ Patent Owner notes that its “energy storage analysis” of the Lam/Enz capacitors, in response to Petitioners’ challenge based on those references, “does not include mathematical calculations.” PO Sur-reply 8 n.8 (citing PO Resp. 74–75).

²⁵ Patent Owner also contends that Mr. Sorrells’ testimony is di-

reply 13–15. Patent Owner contends that, “if Petitioners are going to follow the Federal Circuit’s decision, simply showing the prior art down-converts a signal is not enough. Petitioners must show that the prior art ‘successfully’ down-converts a signal. To do so, Petitioners must identify cellular/wireless specifications and demonstrate that the prior art meet those specifications.” *Id.* at 13–14. Patent Owner asserts that Petitioners “ignore the requirement of ‘successfully’ down-converting because they cannot prove it.” *Id.* at 14. Specifically, Patent Owner argues that “there is no concept of cellular/wireless specifications to be met in those references, there is no evidence that such specifications were met, and there is no expert testimony otherwise. There is simply no evidence for Petitioners to meet their burden.” *Id.* By not relying on a reply declaration, Patent Owner contends that Petitioners are left only with attorney argument and that Tayloe performs down-conversion. *Id.* But, according to Patent Owner, performing down-conversion alone, “says nothing about how [Tayloe’s] system[] work[s] and does not meet Mr. Sorrells’s standard.” *Id.* Further, Patent Owner argues that Petitioners’ position is “illogical” because voltage sampling systems also perform down-conversion, but they use capacitors that hold negligible amounts of energy. Thus, it cannot follow that merely because down-conversion

rected to “transferring” energy to a capacitor whereas the claims here pertain to “storing” energy in a capacitor. PO Sur-reply 13. Nonetheless, Patent Owner does not argue that this difference results in any distinction in terms of our consideration of the primary question before us—whether the prior art teaches a “storage element.”

occurs, that means Tayloe's capacitors store a non-negligible amount of energy. *Id.* at 14–15.

As reflected above, element [3E] recites “a storage element.” Ex. 1001, 61:17–18. As also reflected above, the parties dispute the proper construction of “storage element” and also dispute the meaning of the construction. In other words, there are multiple levels of complexity regarding the dispute between the parties pertaining to this limitation. For the reasons discussed above, we construe “storage element” to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.” *See supra* § II.A. That determination resolves the first level of the parties' dispute because we do not construe “storage element” as limited to an energy transfer system.

The second level of the parties' dispute, to which the discussion above is primarily directed, is the meaning of “non-negligible amounts of energy.” On this point, although Patent Owner presents a multi-step series of calculations, Patent Owner expressly states that determining whether an amount of energy is a non-negligible amount of energy “does not require a specific calculation” (PO Sur-reply 8 n.8) and that its calculations are but “*one way*” to approach the question (*id.*). Additionally, Patent Owner acknowledges that Mr. Sorrells' testimony also provides “*one way*” of determining a non-negligible amount of energy. *Id.* at 12. Yet, as discussed in several instances at the oral hearing, Patent Owner cannot or would not identify any specific amount that indicates when a negligible amount of energy becomes a non-negligible amount of energy. *See, e.g.*, Tr. 73:15–18, 77:18–79:11. Patent Owner's arguments give the impression that a non-

negligible amount of energy is a moving target because Patent Owner is the only party that can tell when an amount is negligible or non-negligible, a non-negligible amount is relative, and it depends on the circuit in question at any given time.

Fortunately, the Federal Circuit already has addressed essentially the same question. In *Parker Vision, Inc. v. Qualcomm Inc.*, the Federal Circuit addressed claims of several patents, including the '551 patent—the precise patent on which the parties rely to explain the meaning and application of “storage element.” *ParkerVision*, 621 F. App'x at 1011 (identifying four patents at issue). Claim 23 of the '551 patent, which the Federal Circuit identified as a representative claim, is directed to an apparatus for down-converting a carrier signal to a lower frequency signal, comprising, *inter alia*, “a storage module” and recites “wherein said storage module receives non-negligible amounts of energy transferred from a carrier signal.” *Id.* As part of its cross-appeal, Qualcomm argued that claim 23, and others, should have been held invalid by the district court. *See id.* at 1017–18. One of the arguments raised by Patent Owner, similar to the one here, was that the prior art at issue did not disclose transferring non-negligible amounts of energy from a carrier signal to a storage capacitor. *See id.* at 1018 (“First, Weisskopf²⁶ does not disclose transferring ‘non-negligible amounts of energy’ from the carrier signal to the storage capacitor.”).

²⁶ P.A. Weisskopf, “Subharmonic Sampling of Signal Processing Requirements,” *Microwave Journal*, May 1992, 239–47. The same article is Exhibit 1023 in IPR2014-00948.

In addressing that argument by Patent Owner, the Federal Circuit explained, “[t]he asserted claims all require transferring ‘non-negligible amounts of energy’ from the carrier signal to a store device, such as the storage capacitor in *Weisskopf*.” *ParkerVision*, 621 F. App’x at 1018. The Federal Circuit explained that “[t]he district court construed ‘non-negligible amounts of energy’ to mean ‘energy in amounts that are distinguishable from noise.’” *Id.* And, the Federal Circuit noted that the “construction is not disputed on appeal.” *Id.* Here, neither party has provided any sufficient reason why we should construe “non-negligible amounts of energy” differently than the Federal Circuit in *ParkerVision*. Accordingly, because this specific issue of what amounts to “non-negligible amounts of energy” was already decided by the Federal Circuit, we construe this term to mean “energy in amounts that are distinguishable from noise.”²⁷

The next logical question the Federal Circuit faced in *ParkerVision* was how to determine if energy in amounts that are distinguishable from noise is

²⁷ The intrinsic record does not define “non-negligible amounts of energy,” but the ’551 patent does state, when referring to an energy transfer signal, that it includes “a train of pulses having non-negligible apertures *that tend away from zero*.” Ex. 2029, 66:36–39 (emphasis added); *see also* Ex. 1001, 13:15–17 (“In another embodiment, the pulses of control signal 2006 have non-negligible apertures that tend away from zero.”). Even if we applied a meaning of non-negligible as tending away from zero, that construction would not assist in resolving the parties’ dispute because neither party can explain where to draw the line between negligible and non-negligible amounts of energy simply based on that meaning. Thus, the Federal Circuit’s decision provides a better basis from which to understand the meaning of non-negligible in this context.

transferred from the carrier signal to the storage device. *ParkerVision*, 621 F. App'x at 1018–19. The Federal Circuit relied on Mr. Sorrells' testimony to answer this specific question. The Federal Circuit stated:

Mr. Sorrells explained at trial that transferring a non-negligible amount of energy into the storage capacitor means “that you have to transfer enough energy to overcome the noise in the system to be able to meet your specifications.” He further testified that the fact that the accused Qualcomm products meet “all of the cellular/cellphone specifications” is proof that a “non-negligible” amount of energy is transferred to the storage element in those products.

Mr. Sorrells' testimony thus establishes that to determine whether or not energy in amounts distinguishable from noise has been transferred from the carrier signal, one may look to whether the down-converting circuit functions in practice. If a circuit successfully down-converts, that is proof that enough energy has been transferred to overcome the noise in the system.

Id. at 1019.²⁸

Having decided how to determine whether energy in amounts distinguishable from noise has been

²⁸ Mr. Sorrells' testimony was directed to the issue of infringement (hence the discussion of “the accused Qualcomm products”). *Parker Vision*, 621 Fed. App'x at 1012 (“To prove infringement, Parker Vision called . . . David Sorrells, one of the inventors.”).

transferred to a storage module, the Federal Circuit turned to testimony provided by Qualcomm’s expert, who the Federal Circuit found “testified, without contradiction, that the Weisskopf system is designed to maximize the amount of energy transferred from the carrier signal.” *ParkerVision*, 621 F. App’x at 1019. The Federal Circuit concluded that “[t]he fact that Weisskopf transfers as much energy as possible from the carrier signal, resulting in a commercially viable down-converting system is proof that the system successfully distinguishes the transferred energy from noise.” *Id.*

Applying the discussion above, we first recognize that, although claim 3 does not expressly recite transferring energy from the carrier signal to the storage device, the construction we adopt for “storage element” is “an element of a system that stores non-negligible amounts of energy from an input EM signal.” Thus, the language we consider is substantially similar to the language at issue in *ParkerVision*. In both circumstances, energy *from* a signal is stored at a storage element/device. And, neither party raises any specific reason why the Federal Circuit’s analysis would not apply equally here.²⁹ Accordingly, Patent Owner’s argument that the Federal Circuit “refers to *transferring* energy to a capacitor to *overcome noise* whereas Petitioners refer to *storing* energy in a capacitor” is a distinction without a difference. *See* PO Sur-reply 13.

Second, we disagree with Patent Owner’s strained reading of the Federal Circuit’s decision and with

²⁹ In fact, Patent Owner acknowledges that “Mr. Sorrells’s position is *one way* (not the only way) of determining non-negligible amounts of energy.” PO Sur-reply 12.

Patent Owner's argument that places far too much emphasis on what Patent Owner contends the Federal Circuit meant by "successfully" down-converting. Patent Owner asserts that to show Tayloe successfully down-converts, in accordance with the Federal Circuit's decision, Petitioners were required to "identify cellular/wireless specifications and demonstrate that the prior art meet[s] those specifications." PO Sur-reply 14. We disagree because the Federal Circuit's decision fails to support Patent Owner's argument. In particular, when considering whether Weisskopf satisfied this aspect of the claims at issue in that case, the Federal Circuit did not identify or rely on evidence regarding cellular or wireless specifications.³⁰ Rather, the Federal Circuit noted that Weisskopf transfers as much energy as possible resulting in a "commercially viable down-converting system" and that was "proof that the system successfully distinguishes the transferred energy from noise." *ParkerVision*, 621 F. App'x at 1019. The Federal Circuit's discussion does not identify how the court determined that Weisskopf's system was commercially viable. But, Weisskopf is an article, not an issued patent, such as Tayloe.³¹ Tayloe

³⁰ Patent Owner focuses primarily on the Federal Circuit's discussion of Mr. Sorrells' testimony regarding Qualcomm's accused products as opposed to considering how the Federal Circuit specifically *applies that testimony* to determining whether Weisskopf (an anticipatory reference) satisfies the test for infringement set forth by Mr. Sorrells. We also note that, in *ParkerVision*, despite Mr. Sorrells' testimony, Patent Owner contended that Weisskopf failed to disclose transferring non-negligible amounts of energy, a position the Federal Circuit found "[n]o reasonable jury could have concluded. . . ." See *ParkerVision*, 621 F. App'x at 1019.

³¹ As an issued patent, Tayloe is presumed to be enabled. See,

expressly states that it “relates in general to radio receivers” and describes that a specific product (“[a] direct conversion receiver which utilizes a Tayloe Product Detector”) has been built and that it successfully down-converts an input EM signal. Ex. 1004, 1:5–6, 5:32–60; *see also* Tr. 125:21–126:10 (addressing Tayloe’s performance of down-conversion). Accordingly, because Tayloe is a patent that is presumed to be enabled such that it operates in a manner that successfully down-converts and does so in a viable system that has been used in radio receivers, we find that constitutes sufficient evidence that Tayloe’s capacitors 72 and 76 are “storage elements” as that term is used in the context of the ’444 patent. In other words, Tayloe’s capacitors are “element[s] of a system that store[] non-negligible amounts of energy [*i.e.*, energy in amounts that are distinguishable from noise] from an input EM signal.”³² Thus, we find that Petitioners have shown that Tayloe teaches element [3E].

c. Summary as to Claims 2 and 3

For the reasons discussed above, we find that Petitioners have established on the complete record before us that the combination of Tayloe and TI Datasheet teaches the subject matter of claims 2 and 3 and that one of ordinary skill in the art would have been motivated to combine the teachings of these two

e.g., *Cephalon v. Watson Pharms., Inc.*, 707 F.3d 1330, 1337 (Fed. Cir. 2013) (recognizing that an issued patent is presumed to be enabled).

³² In light of our determination, we need not also address the parties’ arguments regarding dependent claim 42 of the ’551 patent and whether 0.1% is a non-negligible amount of energy.

references as proposed by Petitioners with a reasonable expectation of success.

4. Objective Indicia of Nonobviousness

Patent Owner contends that, “[i]n the late 1990s through March 2000, there was a long-felt need for a solution for direct down-conversion.” PO Resp. 17. Patent Owner asserts that “[t]he industry was looking to voltage sampling and mixing using nonlinear or time-varying elements to solve the direct down-conversion problem. But these solutions had their own problems (*e.g.*, too much noise) and were never widely implemented commercially (if at all).” *Id.* at 18 (citing Ex. 2038 ¶¶ 234–235).

Patent Owner contends that “[u]sing energy sampling at the time was counter-intuitive and against the thinking of the industry, which was looking to replicate the voltage of the RF signal and use that voltage to derive a baseband signal. Energy sampling did not accurately replicate the voltage of an RF signal.” PO Resp. 18 (citing Ex. 2038 ¶¶ 237–238). Patent Owner asserts that

[e]nergy sampling had a number of unexpected results: an energy sampling downconverter (1) enables selection of just one channel from a band, (2) uses enough of the available RF energy so that the desired baseband signal stands out from the noise which, in turn, improves RF receiver performance, lowers power consumption, allows for reduction/elimination of expensive/bulky external components, and (3) is surprisingly linear (at the time of the invention, the common understanding was that competing

mixing technologies were nonlinear).

Id. (citing Ex. 2038 ¶¶ 239–242). Patent Owner argues that “[u]nknown at this time by industry and academia was that, by using an energy transfer system, RF receivers could be built smaller, cheaper and with improved performance.” *Id.* Patent Owner contends that Qualcomm recognized the significance of Patent Owner’s energy transfer system “as set forth in [the] challenged claims” and subsequently Qualcomm and others in the industry “transitioned away from superheterodyne receivers and mixer technology and began to use the energy transfer system set forth in the challenged claims.” *Id.* at 18–19 (citing Ex. 2038 ¶¶ 243–245).

As set forth above, in its discussion of Tayloe, Patent Owner contends that it would not have been obvious to one of ordinary skill in the art “to replace the voltage sampling configuration of Tayloe with an energy sampling configuration.” PO Resp. 72. And, Patent Owner contends that “secondary considerations of non-obviousness demonstrate that, at the time of the invention, (1) such a dramatic modification of Tayloe was not envisioned by a [person of ordinary skill in the art], and (2) the challenged claims are not obvious in view of Tayloe.” *Id.* Patent Owner contends that “[o]ne would have to use hindsight to modify Tayloe to use a *low* impedance load and *energy* sampling to get to the claimed invention.” *Id.* (citing Ex. 2038 ¶¶ 353–354).

Objective indicia of nonobviousness are “only relevant to the obviousness inquiry ‘if there is a nexus between the claimed invention and the [objective indicia of nonobviousness].’” *In re Affinity Labs of Tex., LLC*, 856 F.3d 883, 901 (Fed. Cir. 2017) (quoting *Ormco*

Corp. v. Align Tech., Inc., 463 F.3d 1299, 1312 (Fed. Cir. 2006)). For objective indicia of nonobviousness to be accorded substantial weight, their proponent must establish a nexus between the evidence and the merits of the claimed invention. *ClassCo, Inc., v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016). “[T]here is no nexus unless the evidence presented is ‘reasonably commensurate with the scope of the claims.’” *Id.* (quoting *Rambus Inc. v. Rea*, 731 F.3d 1248, 1257 (Fed. Cir. 2013)).

A patentee is entitled to a presumption of nexus “when the patentee shows that the asserted objective evidence is tied to a specific product and that product ‘embodies the claimed features, and is coextensive with them.’” *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018) (quoting *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000))); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33, 32 (PTAB Jan. 24, 2020) (precedential, designated Apr. 14, 2020). On the other hand, a patentee is not entitled to a presumption of nexus if the patented invention is only a component of a commercially successful machine or process. *Fox Factory*, 944 F.3d at 1373 (reaffirming the importance of the “coextensiveness” requirement).

“[T]he purpose of the coextensiveness requirement is to ensure that nexus is only presumed when the product tied to the evidence of secondary considerations ‘is the invention disclosed and claimed.’” *Fox Factory*, 944 F.3d at 1374 (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). “[T]he degree of correspondence between

a product and a patent claim falls along a spectrum. At one end of the spectrum lies perfect or near perfect correspondence. At the other end lies no or very little correspondence.” *Id.* “A patent claim is not coextensive with a product that includes a ‘critical’ unclaimed feature that is claimed by a different patent and that materially impacts the product’s functionality.” *Id.* at 1375.

However, “[a] finding that a presumption of nexus is inappropriate does not end the inquiry into secondary considerations.” *Fox Factory*, 944 F.3d at 1375. “To the contrary, the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the ‘direct result of the unique characteristics of the claimed invention.’” *Id.* at 1373–74 (quoting *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)). “Where the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, there is no nexus to the merits of the claimed invention,” meaning that “there must be a nexus to some aspect of the claim not already in the prior art.” *In re Kao*, 639 F.3d 1057, 1068–69 (Fed. Cir. 2011). On the other hand, there is no requirement that “objective evidence must be tied exclusively to claim elements that are not disclosed in a particular prior art reference in order for that evidence to carry substantial weight.” *WBIP*, 829 F.3d at 1331. A patent owner may show, for example, “that it is the claimed combination as a whole that serves as a nexus for the objective evidence; proof of nexus is not limited to only when objective evidence is tied to the supposedly ‘new’ feature(s).” *Id.* at 1330.

Ultimately, the fact finder must weigh the objective indicia evidence presented in the context of whether the claimed invention, as a whole, would have been obvious to a skilled artisan. *WBIP*, 829 F.3d at 1331–32. Once the patentee has presented a prima facie case of nexus, the burden of coming forward with evidence in rebuttal shifts to the challenger “to adduce evidence to show that the commercial success was due to extraneous factors other than the patented invention.” *Demaco*, 851 F.2d at 1393.

Here, we first note that Patent Owner’s arguments as to objective indicia appear to be responding to a position not asserted by Petitioners—to replace the voltage sampling configuration of Tayloe with an energy sampling configuration. *See* PO Resp. 72. As discussed above, Petitioners do not propose to modify Tayloe as Patent Owner contends. And, as also discussed above, we decline to construe “storage element” as limited to an “energy transfer system.” *See supra* § II.A. Thus, in large part, Patent Owner’s arguments as to nonobviousness do not respond to Petitioners’ arguments and evidence discussed above.

Nonetheless, even assuming that all or some of Patent Owner’s arguments and Dr. Steer’s testimony are directed to the combination proposed by Petitioners, Patent Owner’s evidence of nonobviousness remains insufficient to “be accorded substantial weight” because Patent Owner fails to “establish a nexus between the evidence and the merits of the claimed invention.” *ClassCo*, 838 F.3d at 1220. In particular, neither Patent Owner nor Dr. Steer makes any attempt to establish nexus with the elements recited in any specific challenged claim based on a presumption of co-extensiveness or otherwise. Rather, Patent Owner

and Dr. Steer only tie the discussion to energy transfer systems or energy sampling *in general*, which is based on Patent Owner’s proposed claim construction that we do not adopt, and make no attempt to tie their discussion to the specific language of any of the Challenged Claims. *See* Ex. 2038 ¶¶ 234–245 (referring generally to “energy sampling” or “energy transfer” systems as set forth in “claims 2-4 of the ’444 patent”). Moreover, Patent Owner does not contend that claim 2 of the ’444 patent is limited to energy transfer systems. *See* PO Resp. 59–72 (arguing, *inter alia*, that claims 3 and 4³³ (not claim 2, which does not recite a “storage element”) are directed to energy transfer systems). This disconnect further reflects that Patent Owner’s arguments as to objective indicia of nonobviousness are not tied to specific claims. Thus, for each of these reasons, we find that Patent Owner fails to establish that a presumption of nexus is warranted and similarly fails to establish nexus absent the presumption. Accordingly, for the reasons above, Patent Owner has not satisfied its burden to establish nexus. *See WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999) (patent owner “bears the burden of showing that a nexus exists”).

Nonetheless, in spite of the above failures, we consider Patent Owner’s weak evidence of nonobviousness in our weighing of the *Graham* factors below.

³³ As noted above, Petitioners do not challenge the patentability of claim 4 based on the combination of Tayloe and TI Datasheet; rather, Petitioners challenge claim 4 based on the combination of Lam, Enz, and Tayloe. *See* Pet. 7 (grounds for challenge).

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.” *Arctic Cat*, 876 F.3d at 1361. On balance, considering the complete record before us and for the reasons explained above, the evidence of obviousness is very strong and the evidence of nonobviousness, which includes Patent Owner’s objective evidence of nonobviousness, is very weak. As a result of that balancing, we determine that Petitioners have established by a preponderance of the evidence that the combination of Tayloe and TI Datasheet would have rendered the subject matter of claims 2 and 3 obvious to one of ordinary skill in the art at the time of the invention.

C. Obviousness over Lam, Enz, and Tayloe

Petitioners assert the combination of Lam, Enz, and Tayloe would have rendered the subject matter of claims 2–4 obvious to one of ordinary skill in the art at the time of the invention. Pet. 32–35 (discussing motivation to combine Lam, Enz, and Tayloe), 60–78 (discussing the application of the art to the claims).

1. Level of Ordinary Skill in the Art

The level of ordinary skill in the art at the time of the invention is discussed above. *See supra* § I.G.

2. Scope and Content of the Prior Art

a. Lam

Lam is directed to a “quadrature demodulation receiver for narrow-band communication systems comprising means for directly sampling an incoming signal which is modulated on a radio-frequency carrier at a sampling frequency which can be substantially lower than the carrier frequency to demodulate said signal into its in-phase and quadrature components.” Ex. 1006, 4:3–9. Figure 3 is reproduced below:

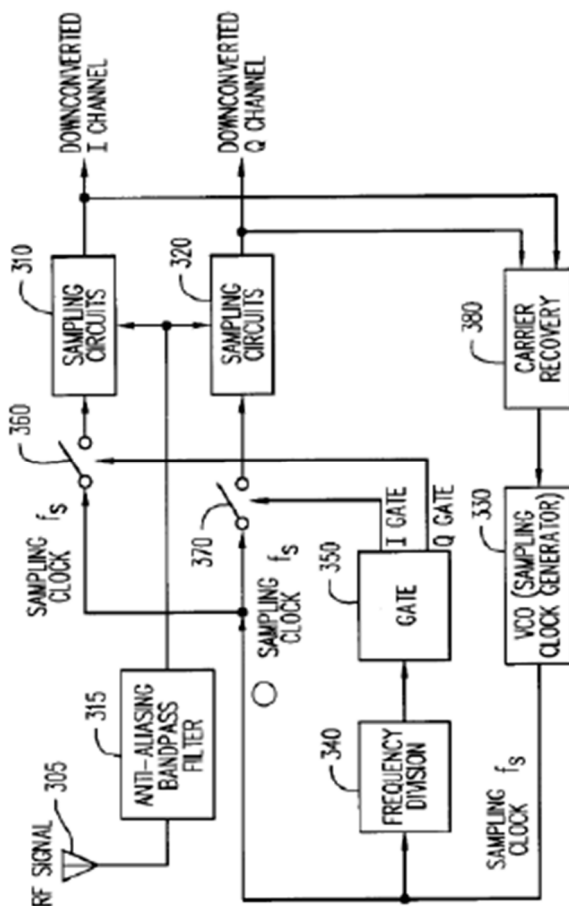


FIG.3

Lam's Figure 3 is a schematic block diagram showing an example of a circuit arrangement suitable for the disclosed receiver. *Id.* at 5:41–44.

With respect to Figure 3, Lam states that the receiver

down-converts the incoming RF signal 305 into its base-band in-phase (I) and quadrature (Q) components by means of in-phase and quadrature sampling circuits 310 and 320 respectively which sample the incoming RF waveform directly at a considerably lower sampling frequency than the carrier frequency. The signal sampling may for example be performed by conventional sampling circuits which comprise simple CMOS [(complementary metal-oxide-semiconductor)] switches and sample-and-hold capacitors and integrated with low-frequency differential amplifiers to drive IF circuits.

Ex. 1006, 5:50–60. Lam explains that the sampling circuits take “four sub-samples which represent the in-phase (I), the quadrature (Q), negative of the in-phase (-I) and negative of the quadrature (-Q) components.” *Id.* at 4:21– 24. After down-conversion by the sampling circuits 310 and 320, “the-I and-Q components can be inverted and combined with the I and Q components respectively,” resulting in a down-converted in-phase (I) baseband signal being output from the sampling circuits 310 and a down-converted quadrature (Q) baseband signal being output from the sampling circuits 320. *See id.* at 5:50–60, 10:20–23, Fig. 3.

b. Enz

Enz describes a number of “circuit techniques” employing an “operational amplifier (op-amp), whose main function in the circuit is to create a virtual ground, *i.e.*, a node with a zero (or constant) voltage at its input terminal without sinking any current.” Ex. 1007, 3. Enz describes the techniques as “applicable to such important building blocks as . . . sample-and-hold (S/H) circuits.” *Id.*

Enz’s Figure 29 is reproduced below:

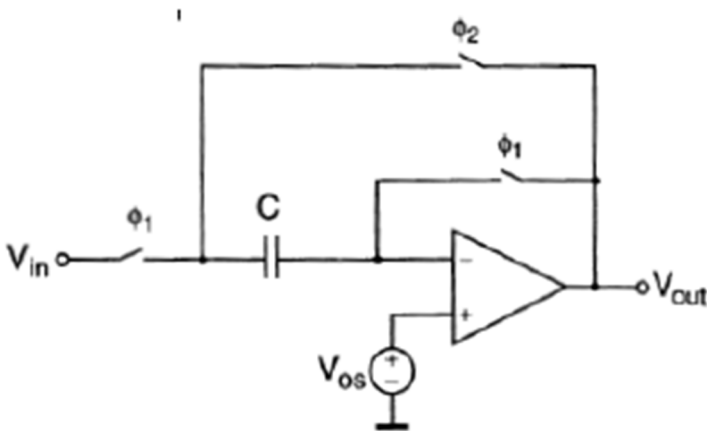


Fig. 29. A SC S/H stage.

Ex. 1007, 19. Figure 29 shows a circuit that “can be used as a simple S/H circuit.” *Id.* at 22. Enz discloses that this circuit uses a capacitor (C), which charges “during $\phi_1 = 1$ [sampling] period” and “utilizes [correlated double sampling] to reduce dc offset effects.” *Id.*

c. Tayloe

The scope and content of Tayloe is described above. *See supra* § III.B.2.a.

3. Differences Between the Prior Art and the Claims; Motivation to Modify

Petitioners set forth a detailed analysis showing how the combined teachings of the references meet the elements of claims 2–4 of the '444 patent. Pet. 32–35, 60–78. In particular, Petitioners rely on Lam as disclosing most of the elements of the claims, but asserts that one of ordinary skill in the art would have been motivated to “look to the teachings of Enz and Tayloe to implement Lam’s ‘sampling circuits,’ and would have understood the benefits of doing so.” *Id.* at 32. Petitioners assert that “each of the components—the sample-and-hold switched-capacitor of Enz, and the differential amplifier of Tayloe—all are disclosed in the prior art as being used for the exact purposes called for by Lam” and, therefore, it would have been obvious for one of ordinary skill in the art to “look to such components to implement the ‘conventional sampling circuits which comprise simple CMOS switches and sample-and-hold capacitors and integrated with low-frequency differential amplifiers’ taught in Lam for down-converting an RF input signal.” *Id.* at 34 (citing Ex. 1002 ¶ 120).

Further, Petitioners contend that “using the specific components from Enz and Tayloe to implement Lam’s ‘conventional sampling circuits’ would have yielded only expected, predictable results” because

[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 “sampling circuits” using such conventional components in the context of Lam; and (2)

obvious to try—a choice of one type of demultiplexer, switched capacitor, and differential amplifier from a finite number of identified, predictable solutions, with a reasonable expectation of success.

Pet. 34 (citing *KSR*, 550 U.S. at 416–17, 421; *Leapfrog*, 485 F.3d at 1162; Ex. 1002 ¶ 121).

a. Claim 2

As with Patent Owner’s response to Petitioners’ first challenge of claim 2 (based on Tayloe and TI Datasheet), Patent Owner’s sole argument directed to claim 2 is that Lam “does not disclose/teach/suggest” a “wireless modem apparatus.” PO Resp. 79. Patent Owner contends that “[t]he same arguments regarding this element in connection to Tayloe (above) apply equally to Lam.” *Id.* (citing PO Resp. § XI.A.3). As discussed above, we determine that “wireless modem apparatus,” which is recited in the preamble of claim 2, is not limiting. *See supra* § II.B. Thus, Patent Owner’s argument directed to claim 2 does not detract from Petitioners’ challenge.

We find Petitioners’ arguments persuasive to demonstrate how the combination of Lam, Enz, and Tayloe teaches the subject matter of claim 2 and supported sufficiently on the complete record before us and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that the combination of Lam, Enz, and Tayloe teaches the subject matter of claim 2 and that one of ordinary skill in the art would have been motivated to combine the teachings of these references as proposed by Petitioners with a reasonable expectation of success.

b. Claim 3

Regarding claim 3, Patent Owner's arguments, aside from its contentions regarding "wireless modem apparatus,"³⁴ are (1) that "[a] capacitor in Lam/Enz only *holds negligible* amounts of energy" (PO Resp. 74–75); (2) Lam and Enz are voltage sampling systems, not energy transfer systems (*id.* at 76–77); (3) Enz does not disclose a circuit that down-converts an input signal (*id.* at 77–78); (4) one of ordinary skill in the art would not "use Enz's sample-and-hold circuit as the sampling circuits in Lam because the Enz circuit is incompatible with Lam's sampling circuits" (*id.* at 78); and (5) there is no motivation to combine Lam and Enz (*id.* at 80–81).

In their Reply, Petitioners contend that Lam's capacitors perform down-conversion, and thus that is proof that the capacitors store non-negligible energy. Pet. Reply 17–19 (citing *ParkerVision*, 621 F. App'x at 1019).

Petitioners also address an alternative argument, raised in the Petition, that relies on the combination of Lam and Enz, contending that the combination also "discloses or renders obvious a 'storage element.'" Pet. Reply 20 (citing Pet. 74–78). Petitioners explain that "Enz describes a number of conventional 'circuit techniques' employing an operational amplifier 'whose main function in the circuit is to create a virtual ground, *i.e.*, a node with a zero (or constant) voltage at its input terminal without sinking any current.'" *Id.*

³⁴ Patent Owner's argument regarding "wireless modem apparatus" also applies to claim 3 (*see* PO Resp. 79), but, for the same reasons discussed above in the context of claim 2, does not detract from Petitioners' challenge to claim 3.

(quoting Ex. 1007, 3). And, Petitioners assert that “[t]he techniques are described as ‘applicable to such important building blocks as . . . sample-and-hold (S/H) circuits.’” *Id.* (citing Ex. 1007, 3) (also noting that Enz’s Figure 29 shows “a circuit ‘that can be used as a simple S/H circuit,’” which includes capacitor C (citing Ex. 1007, 22)).

Petitioners also address the other arguments raised by Patent Owner as follows. First, Petitioners explain that whether Enz itself down-converts is largely irrelevant because Petitioners do not rely on Enz for that element of claim 3; rather, Petitioners rely on Lam. Pet. Reply 22–24. Additionally, Petitioners assert that “whether Enz expressly discloses the sampling rate of [its] switches . . . is not critical, as Petitioner[s] [are] not relying on Enz for that disclosure.” *Id.* at 23–24 (citing *In re Merck & Co., Inc.* 800 F.2d 1091, 1097 (Fed. Cir. 1986) (“Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.”))).

In its Sur-reply, Patent Owner contends that Petitioners “rely on the configuration of the switched-capacitor ‘sample-and-hold’ circuit in Figure 29 of Enz as the structure of the sampling circuit disclosed in Lam,” yet “Lam provides no details regarding the circuitry contained within a ‘sampling circuit.’” PO Sur-reply 23. Patent Owner asserts that “[s]witches/capacitors operate as different devices depending on their configuration. Unlike Lam’s ‘simple CMOS switches and sample-and-hold capacitors,’ which operate as a down-converter, the switched-capacitor circuit of Enz is configured to operate as a completely different device—a voltage buffer.” *Id.* Thus, Patent

Owner argues that, “[s]ince the switched-capacitor circuit of Enz operates as a completely different device than the ‘conventional sampling’ circuit of Lam, there is no motivation to combine Lam and Enz.” *Id.* at 24.

Patent Owner’s argument does not detract from Petitioners’ argument and evidence that one of ordinary skill in the art would have been motivated to combine Lam and Enz as proposed and with a reasonable expectation of success. The above-discussion, and evidence of record, reflects that these references teach similar circuit components that can be used to perform both similar and different functions. In light of the record before us, even accepting Patent Owner’s argument that one circuit performs a different function than another, that does not mean that one of ordinary skill in the art would not have been motivated to modify one reference in light of the other, especially when, as here, the components “all are disclosed . . . as being used for the exact purposes called for by Lam.” *See* Pet. 34 (discussing the reasons to combine) (citing Ex. 1002 ¶ 120).

Second, Petitioners respond to Patent Owner’s argument that Enz’s input may be at a constant voltage by explaining that the challenge under this ground is based on a combination of teachings, “not Enz in isolation.” Pet. Reply 24. And, Petitioners assert that “[i]t would have been obvious to combine the sample and hold circuitry of Lam—which indisputably uses a switched capacitor to down-convert an RF signal—with the similar sample and hold feedback capacitor arrangement of Enz’s Figure 29.” *Id.*

In its Sur-reply, Patent Owner asserts that the voltage of Enz’s input is relevant because “it causes Enz’s circuit to operate as a voltage buffer.” PO Sur-

reply 24. And, Patent Owner contends that one of ordinary skill in the art “will not use Enz’s voltage buffer in place of Lam’s down-converter to alter the ‘sampling circuit’ of Lam.” *Id.* at 24–25.

Again, Patent Owner’s arguments do not detract from Petitioners’ argument and evidence on this point for the same reasons discussed above; namely, Petitioners rely on the combined teachings of the references whereas Patent Owner’s arguments attack the references in isolation. *See, e.g., In re Keller*, 642 F.2d 413, 426 (CCPA 1981) (“non-obviousness [cannot be established] by attacking references individually” when the asserted ground of obviousness is based upon combined teachings); *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991) (the test is what the combined teachings of the references would have taught or suggested to one of ordinary skill in the art at the time of the invention).

Further, Petitioners respond to each of Patent Owner’s additional arguments regarding motivation to combine and compatibility of Lam and Enz. *See* PO Resp. 77–78, 80–81; PO Sur-reply 23–26, 27; Pet. Reply 22– 26, 26–27. We’ve addressed several of those arguments above. For the additional positions taken, we also do not agree with Patent Owner that one of ordinary skill in the art would not have been motivated to combine the teachings of these references as proposed by Petitioners. *See, e.g.,* PO Resp. 80–81 (asserting that Lam and Enz are incompatible). In particular, we find each of Petitioners’ arguments persuasive on the complete record before us and adopt

Petitioners' arguments and evidence as our own findings.³⁵

In addition, as with Petitioners' challenge based on Tayloe and TI Datasheet, Patent Owner's arguments based on the construction of "storage element" and attempts to limit the meaning of the term to energy transfer systems does not undermine Petitioners' position because they are not commensurate in scope with our construction of the term. And, our discussion above regarding Mr. Sorrells' testimony applies equally here. Specifically, we find that Petitioners have established that Lam functions in practice and successfully down-converts. *See* Pet. Reply 17–19. In particular, Lam is directed, *inter alia*, to "high-speed receivers for narrow-band communication systems" and describes use of receivers in "mobile hand-held communication systems." Ex. 1006, 1:6–7, 1:19–25. Accordingly, because Lam is a patent that is presumed to be enabled such that it operates in a manner that successfully down-converts and does so in a system that can be used for mobile hand-held communication systems, we find that constitutes sufficient evidence that Lam teaches a "storage element" as that term is used in the context of the '444 patent.

c. Claim 4

Claim 4 depends from claim 3 and recites "wherein said storage elements comprise a capacitor that reduces a DC offset voltage in said first down-converted signal and said second down-converted signal." Ex. 1001, 61:19–22.

³⁵ We address the parties' arguments as to claim 4 below.

Petitioners contend that “Lam alone, or in combination with Enz and Tayloe, renders claim 4 obvious.” Pet. 76. Petitioners rely on their discussion of claim 3 and further assert that “it would have been obvious to a [person of ordinary skill in the art] to use the switched-capacitor ‘sample-and-hold circuit’ of Figure 29 of Enz for each of the two down-conversion modules in Lam’s in-phase sampling circuits 310.” *Id.* at 76–77. Petitioners argue that, “[a]s taught in Enz, the switched capacitor arrangement of Figure 29 serves to ‘reduce dc offset effects’ in the RF input signal from reaching the output node, thereby reducing (or entirely eliminating) a DC offset voltage in the resulting down-converted signal.” *Id.* at 77 (citing Ex. 1002 ¶¶ 202–203). And, Petitioners point to Figure 70A of the ’444 patent, asserting that “[t]his is the same principle by which the capacitor reduces the ‘DC offset voltage’ . . . in the ’444 specification.” *Id.* (citing Ex. 1001, Fig. 70A, 36:14–18).

Patent Owner asserts that Enz does not disclose the subject matter of claim 4. PO Resp. 79–80. Patent Owner contends that “[t]he reduction in DC offset described in Enz relates to the DC offset resulting from the internal circuitry of the op-amp and is not the reduction of ‘DC offset voltage’ in a ‘down-converted signal’ as required by claim 4.” *Id.* at 79 (citing Ex. 2038 ¶ 385). Specifically, Patent Owner asserts the following:

the ’444 specification identifies the DC offset voltage as including “a DC offset voltage resulting from charge injection. . . .” Ex. 1001, 36:16-17). A [person of ordinary skill in the art] would understand that DC offset voltage resulting from charge injection is due to the

sampling clock at the control input of the *switch*, e.g., CMOS transistor. If a capacitor follows the switch, an offset voltage $V_{\text{OFFSET}} = \Delta Q/C$ will appear on the capacitor and, over time, this becomes a DC offset voltage. The '444 specification states that a 'storage module . . . reduces or prevents a DC offset voltage resulting from charge injection from appearing on . . . [the] output signal" See, e.g., *id.*, 36:16-18.

The only DC offset that Enz addresses is the effective DC offset due to circuitry internal to an operational amplifier. The circuit in Figure 29 does not address DC offset voltage resulting from charge injection.

The technique of Enz is specific to a switched-capacitor circuit used as "an on-chip reference buffer." Ex-1008, 5. The voltage reference is a steady (DC) voltage and not an RF input signal. The technique taught by Enz removes DC offset due to internal imperfections in the operational amplifier which otherwise provides linear gain. The op-amp is not involved in the down-conversion process. Ex.-2038 ¶ 388.

PO Resp. 79–80 (alterations in original).

In their Reply, Petitioners assert that claim 4 "requires 'a capacitor that reduces a DC offset voltage'—it does not require that the DC offset voltage 'result' from charge injection." Pet. Reply 26. Petitioners argue that "[t]he specification portion [of the '444 patent] upon which [Patent Owner] relies for this argument merely describes 'an embodiment.'" *Id.* (citing

Ex. 1001, 36:14–18); *see id.* at 26–27 (also noting that the '444 patent states that the embodiments are “presented by way of example only, and not limitation” (citing Ex. 1001, 60:17–24)). Petitioners contend that “Enz discloses that its circuit is used ‘to reduce dc offset effects,’ which is all that claim 4 requires when properly interpreted.” *Id.* at 27 (citing Ex. 1007, 22; Pet. 76–77; Ex. 1002 ¶¶ 201–203).

In its Sur-reply, Patent Owner responds in two places. First, Patent Owner contends that, “unlike claim 4 which requires the reduction of DC offset *in a down-converted signal*, the only DC offset that Enz addresses has nothing to do with a down-converted signal.” PO Sur-reply 25. Rather, Patent Owner asserts that “the DC offset that Enz refers to is the effective DC offset due to circuitry internal to an operational amplifier in Enz.” *Id.* (citing PO Resp. 79, 80; Ex. 2038 ¶ 385). Additionally, Patent Owner asserts that Petitioners “gloss over that reduction of DC offset relates to a ‘down-converted signal’” and that Patent Owner relies on the specification of the '444 patent “to explain how the capacitor in a down-converter reduces DC offset, and identifies the DC offset voltage as including ‘a DC offset voltage resulting from charge injection.’” *Id.* at 26–27 (citing PO Resp. 79).

As noted above, claim 4 recites that the storage elements comprise “a capacitor that reduces a DC offset voltage in said first down-converted signal and said second down-converted signal.” Ex. 1001, 61:19–22. As the language of claim 4 states, the reduction in DC offset voltage is *in* the first and second down-converted signals. Claim 4 is not limited to charge injection, although, as the parties contend, that is an

example provided in the specification of the '444 patent. *See id.* at 36:14–18 (“In an embodiment, first storage module 7024 comprises a first capacitor 7074. In addition to storing I output signal 7098, first capacitor 7074 reduces or prevents a DC offset voltage resulting from charge injection from appearing on I output signal 7098.”). What Patent Owner’s arguments fail to appreciate is that Petitioners rely on *the combination* of Lam and Enz. Patent Owner challenges Petitioners’ argument primarily because Enz does not disclose down-conversion. But, Petitioners do *not* rely on Enz for down-conversion. So, Patent Owner’s argument that Enz does not disclose reducing a DC offset voltage *in* the down-converted signals does not respond to Petitioners’ challenge because it focuses on Enz in isolation instead of considering the *combination* proposed by Petitioners. In the *combination*, Petitioners rely on using the switched-capacitor circuit shown in Enz’s Figure 29 “for each of the two down-conversion modules in Lam’s in-phase sampling circuits 310.” Pet. 76–77. In that *combination*, Petitioners have shown persuasively that the elements of claim 4 would be met. Patent Owner’s arguments to the contrary either fail to appreciate the combination or focus on an embodiment disclosed in the specification of the '444 patent as though the language descriptive thereof was recited in the claim, which it is not.

i. Summary as to Claims 2–4

For the reasons discussed above, we find that Petitioners have established on the complete record before us that the combination of Lam, Enz, and Tayloe teaches the subject matter of claims 2–4 and that one of ordinary skill in the art would have been

motivated to combine the teachings of these references as proposed by Petitioners with a reasonable expectation of success in so doing.

4. Objective Indicia of Nonobviousness

Patent Owner relies on the same arguments and evidence regarding objective indicia of nonobviousness that we addressed above, in the context of considering Petitioners' obviousness ground based on Tayloe and TI Datasheet. *See* PO Resp. 17–19 (addressing objective indicia generally), 77 (addressing the combination of Lam, Enz, and Tayloe). Our discussion, analysis, and findings from the obviousness ground based on Tayloe and TI Datasheet apply equally here. *See supra* § III.B.4 (finding that Patent Owner fails to establish that a presumption of nexus is warranted and similarly fails to establish nexus absent the presumption). As in the obviousness ground based on Tayloe and TI Datasheet, we consider Patent Owner's weak evidence of nonobviousness in our weighing of the *Graham* factors below.

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.” *Arctic Cat*, 876 F.3d at 1361. On balance, considering the complete record before us and for the reasons explained above, the evidence of obviousness is very strong and the evidence of nonobviousness, which includes Patent Owner's objective evidence of nonobviousness, is very weak. As a result of that balancing we determine that Petition-

ers have established by a preponderance of the evidence that the combination of Lam, Enz, and Tayloe would have rendered the subject matter of claims 2–4 obvious to one of ordinary skill in the art at the time of the invention.

IV. Summary³⁶

For the reasons discussed above, Petitioners have demonstrated, by a preponderance of the evidence, that claims 2–4 of the '444 patent are unpatentable.

Our conclusions regarding the Challenged Claims are summarized below:

Claims Challenged	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable
2, 3	103(a)	Tayloe, TI Datasheet	2,3
2-4	103(a)	Lam, Enz, Tayloe	2-4
Overall Outcome			2-4

³⁶ Should Patent Owner wish to pursue amendment of claims 2–4 in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

V. Order

In consideration of the foregoing, it is hereby:

ORDERED that claims 2–4 of U.S. Patent No. 7,110,444 B1 are determined to be unpatentable; and

FURTHER ORDERED that, because this a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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**TRANSCRIPT OF ORAL ARGUMENT,
U.S. COURT OF APPEALS FOR THE FEDERAL
CIRCUIT, ON THE '444 PATENT
(JUNE 3, 2024)**

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

PARKERVISION, INC.,

Appellant,

v.

TCL INDUSTRIES HOLDINGS CO., LTD.,
LG ELECTRONICS INC.,

Appellees.

No. 23-1415

Before: PROST, TARANTO, and
CHEN, Circuit Judges.

[June 3, 2024, Transcript, p.2]

(Recording begins)

JUDGE PROST: Next case for argument is 23-1415, ParkerVision v. TCL. Please proceed.

MR. CHARKOW: Good morning, Your Honor. My name is Jason Charkow, and I represent ParkerVision. So why are we here today? Well, the PTAB decided that it's heard the argument, and no evidence is sufficient on a key—

JUDGE CHEN: Can we first figure out what things are now barred from this appeal?

MR. CHARKOW: Sure.

JUDGE CHEN: You're not going to argue claim construction anymore. Is that right?

MR. CHARKOW: Today I'm not going to argue claim construction. I'm going to focus on Claim 4 of the patent, which nobody disputes, there's no issue with—in terms of any sort of issues.

JUDGE CHEN: Right. Because Claim 3 is gone.

MR. CHARKOW: Well, we believe there's a different record, and there's—

JUDGE CHEN: But Claim 3 was deemed to be unpatentable, and we affirmed that in an earlier litigation, right?

MR. CHARKOW: Correct. It was deemed—

JUDGE CHEN: So it's gone.

MR. CHARKOW: We believe there's a different record under the Supreme Court's decision in—

JUDGE PROST: They're talking about preclusion again?

MR. CHARKOW: Yes. I'm going to make it quick because it seems like he got that out early on today.

So after *Parklane Hosiery Co. v. Shore*, 439 U.S. 322 at 330 to 331, that's a Supreme Court case that talks about this particular situation as both offensive collateral estoppel if we were to be barred by that.

And the Supreme Court said we—Courts should be very wary of that in situations just like this where a party like TCL could have joined up in the case, in the petition. It only had happened a couple of months after TCL entered with suit.

And they didn't, and the Supreme Court said you have to be wary of that because it's ripe for problems which happen just like we're in—at right now.

We're—through no fault of our own, we're in a very weird position which, quite frankly, is messed up where, basically, you have a situation where we told the Board it should be combined, the two—the earlier case and this case. The Board said no.

All—and different records developed. We came to this court. We said it should be stayed. The first case should be stayed and everything should be consolidated. The Federal Circuit said no. Different records.

So I believe that the—this is the type of case that the Supreme Court was talking about that this is ripe for issues. And, therefore, we believe because there's a different record, it should be heard. But I think Claim 4 avoids that whole issues, so I would like to just—

JUDGE TARANTO: Do you happen to know where the PTO has taken the canceling step that—

MR. CHARKOW: I don't know that, Your Honor.

JUDGE TARANTO: Okay.

MR. CHARKOW: Okay. So the—sorry, Your Honor. If I may.

JUDGE CHEN: So we're just going to focus on Claim 4 and whether, I guess, Lam teaches—

MR. CHARKOW: Yeah. Enz and—Lam and Enz. Yes. That's what I would like to do today.

JUDGE PROST: And preamble issues going to—

MR. CHARKOW: We're not going to address that today.

JUDGE PROST: Okay.

MR. CHARKOW: Okay.

JUDGE PROST: Thank you.

MR. CHARKOW: So the reason why we're here today is—I'm sorry. I forget where I left off. But the PTAB decided that attorney argument and no evidence on a key issue—and the issue is storing non-negligible amounts of energy—that that was sufficient to invalidate a patent.

And that's just, in our view, not right. It turns the process on its head, and we think that's an issue the Court should address. And I'll go through this. So we'll talk about Claim 4. So our view is Claim 4 should be reversed.

The decision and validity. We believe there was Administrative Procedure Act violation, number one. Number two, we don't only think that there was no substantial evidence regarding the storage element limitation and the requirement of non-negligible amounts of energy, but we believe there was no evidence, and we believe the Board

had a backfill to deal with the fact that that there was no evidence put forward by the petitioner.

So quickly on the Administration Procedures Acts violation: During the proceeding—

JUDGE TARANTO: Can I just ask you—

MR. CHARKOW: Sure.

JUDGE TARANTO: Did our December 2023 decision address one or the other or both of the two points that you're now making?

MR. CHARKOW: No. Lam—that was a reference called Tayloe.

JUDGE TARANTO: No, but on the—isn't the argument about, you know, material submitted in reply having come too late? I thought that was part—

MR. CHARKOW: It's a different issue.

JUDGE TARANTO: Different issue.

MR. CHARKOW: It's a different issue here. Yeah.

JUDGE PROST: It is?

MR. CHARKOW: It's a different issue here.

JUDGE PROST: Okay.

MR. CHARKOW: Yes. We are—there was an issue similar to that, but it's different facts. There's different issues here that had nothing to do with that case. So, if I may, I could explain.

JUDGE PROST: Yeah.

MR. CHARKOW: Okay. So in that—in this case that we're currently in, what occurred is the following: TCL, when they—so, basically, TCL raised a new argument for the first time in their reply brief.

We moved to strike. That was denied. We're saying that—we're saying that was an abuse of discretion.

So what happened exactly? So when TCL filed their original brief, their petition, what they attached to the petition was the district court's decision, which held that a storage element, at least the relevant part, stored non-negligible amounts of energy.

That was in the district court's decision on claim construction, and they—an earlier decision from another case. They attached that to their petition. They then went ahead to talk about other of the district court's decision in their petition, and was Exhibit 1013 of—which was the Markman order from the district court case, and that, you can find in appendix 4540.

JUDGE CHEN: What is the new argument they raised in their reply?

MR. CHARKOW: So they—for the first time, they raised statements that were made by the inventor, Mr. Short, one of the inventors, in the ParkerVision case from 2015, from years before this whole issue. Never heard about it before.

So they had the opportunity when filed their petition to address the issue of non-negligible amounts of energy. They said nothing, even though they knew about it, the Markman ruling from a prior case about storage element and non-negligible amounts of energy. It was attached to their petition. They ignored it, yet—and—yeah.

JUDGE CHEN: Let me see—let me tell you what I'm—

MR. CHARKOW: Sure.

JUDGE CHEN:—understanding of this case. They didn't make this particular argument about negligible non-negligible amounts of energy in their petition for the meaning of storage element. In the patent owner response, you had a very particular understanding of the term "storage element," and it would mean something about energy transfer systems.

MR. CHARKOW: Right. And non-negligible amounts of energy.

JUDGE CHEN: And then they came back and said, No. You don't have to have an energy transfer system inside of the claim—inside of storage element.

MR. CHARKOW: And non-negligible amounts of energy. That was—so put the energy transfer argument aside.

JUDGE CHEN: Right.

MR. CHARKOW: We're all addressing these non-negligible amounts of energy. It was an issue that they could have and should have discussed. They had the Fed Circuit decision.

They knew about the Markman decision, talked about non-negligible amounts of energy. That's how you define storage element, the uncontested part. And so they didn't address—they—

JUDGE PROST: Do we have any cases—I mean, we've got cases on the other side that say, no, it was okay as long as you had a chance to respond to it. I mean, you're talking about they should have

raised it in the petition because there were other related cases or whatever going on.

MR. CHARKOW: Right.

JUDGE PROST: So they knew about it. They didn't know you—what you were going to raise with—in response to their petition.

MR. CHARKOW: But now they're saying that's lexicography. So they knew about the definition. They're saying it's now lexicography that includes this non-negligible amounts of energy, and they decided not to address it.

Now, we did get to respond on the sur-reply, but we couldn't use our expert to specifically address the issue that they knew about, they could have and should have raised, and they never did.

JUDGE CHEN: How is this different from our December 2023 opinion where we said it was more than fine for them to raise their argument about having a counterclaim construction in their petition or reply?

MR. CHARKOW: Because in that case, they did not have a Markman ruling. They did not—there was no Markman ruling attached to their petition that they knew about, that they talked about, and they just avoided this one issue in that Markman ruling.

That was not in the prior case. They did not—there was no issue that they had some knowledge ahead of time. In that case, they said, Well, we were just responding to what ParkerVision said.

In this case, they knew ahead of time. They had a claim construction ruling. They knew it. They ignored it. They talked about other portions of the claim construction ruling in their petition, but they ignored that part of it.

JUDGE PROST: So your argument is, because of this other stuff going on, they should have known what you were going to offer in response, and they should have included that in the petition.

MR. CHARKOW: It's not that they should have known what—

JUDGE PROST: What you were going to—

MR. CHARKOW:—we were going to say. It's that they had a claim construction, and they relied on the claim construction of the court for other things. And they knew about it. It was attached to their petition. So there's no reason why they shouldn't have addressed this non-negligible amounts of energy.

So the only thing they said their petition, the only thing they said, Capacitors are storage elements. That's it. Their expert didn't say anything about non-negligible amounts of energy. Where did that leave them?

Then when they—we responded, they replied. They put new information in that we never heard of before. Our expert couldn't address those particular issues that they raised.

JUDGE PROST: Is there a—my recollection of other cases is that, yes, while you're not allowed to introduce an expert report, you can file a request to do that, move to be able to—

MR. CHARKOW: I'm not aware that that happens. I'm not aware of the procedure. I know it's definitely not allowed as, like, a right or anything. I don't know if there's a procedure to allow an expert to, you know, go ahead and file something later and how often that's even a thing, if it's even possible. So the bottom line is we weren't able to address the issue. So—

JUDGE CHEN: But didn't you have an expert running all sorts of calculations?

MR. CHARKOW: That—but not in response to the specific issue where they talked about this commercial viable system, which was that new issue that first came about when TCL filed their reply brief. We didn't know about these issues.

So we didn't know about the issues. We couldn't anticipate what they were going to say. They should have addressed these issues in their opening petition. They did not do so. And so we were left in a situation where we had nothing to respond to. So we—

JUDGE CHEN: It seems to boil down to what is the correct understanding of this Court's ParkerVision v. Qualcomm opinion, right?

MR. CHARKOW: It's partly correct. And I'm—that's the next issue I'm going to get down to. So we—so I think we've talked about this issue, but they could have addressed it. They didn't address it.

We had no ability to do a sur-reply and have our expert address head-on the issues that they raised for the first time in their reply, and we think that's abuse of discretion.

Now going back, if I could, to the point that I think you want to get to, which is the heart of the matter. So our position is that there was—references Lam and Enz. That's what was used to invalidate the claim, Claim 4.

And our view is that there was no substantial evidence—there was no evidence at all that the capacitors of Lam and Enz are storage elements that store non-negligible amounts of energy.

Dr. Steer, ParkerVision's expert, was the only one that provided any testimony whatsoever on non-negligible amounts of energy. Their expert provided zero.

They had an opportunity for their expert to provide in a reply to address this non-negligible amounts of energy, which was this new theory that they put. They could not even get an expert to opine, to counter what Dr. Steer was saying on non-negligible amounts of energy. So there's no—

JUDGE CHEN: Is that required as a matter of law?

MR. CHARKOW: It's not required as a matter of law, but I'm going to get to the point—I'm going to get to the point in a minute.

So what happened? They didn't—our view is they didn't meet their burden of proof. The—so what did the PTAB do? They had no evidence, so they went into the ParkerVision/Qualcomm case from 2015.

They said, Okay. What's non-negligible amounts of energy? Well, the Fed Circuit tells us that it's energy distinguishable from noise. That's what the PTAB said. Then they say, Okay. What's energy

distinguishable from noise? How do you figure that out?

They went back to the Fed Circuit decision In the Qualcomm/ParkerVision case, and they said— Fed Circuit said transferring as much energy as possible to have a commercially viable system is proof that energy is distinguishable from noise.

So now this—now the issue became commercially viable. So now the PTAB says, Well, what's commercially viable? But there is, again, no evidence. So TCL knew about this commercial viability issue. They did not have their expert opine on it at all.

It's telling. They have an expert, probably spends hundreds of dollars an hour, and they could not get an expert to just say that it was a commercially viable system. They—and to say that what was in Lam and Enz was a commercially viable system.

They couldn't get an expert to do that. They had an opportunity, and they didn't do it, which is telling. And so all that was on the record was what Dr. Steer said about non-negligible amounts of energy. What Dr. Steer said was un rebutted. What he said was—they didn't question his credibility; they just ignored it.

So how did they get to a result? What they did is they backfilled. They said, Okay. Well, Lam and Enz—in particular, Lam—talks about a mobile handheld device. So it's enabled, right? So they have it backfilled. There's no evidence.

There's no evidence from the other side to say it's a commercially viable system. So they're like,

Okay. We're going to backfill. So how do we get to the result? What do we say? It's enabled. It—Lam is enabled.

And it talks in the background section, mind you, which the Board did not say—Lam talks about how the background of the invention is in the mobile space, right?

And then Lam talks—so it's aspirational. This is where the—our invention kind of lives. And they said just merely because of that, because the background section talked about a mobile device, that—and patents are presumed to be enabled, all of a sudden, now the patents are presumed to be enabled, that equals to commercially viable.

And there's no case law that I'm aware of ever that says that something is abled means it—equals that means it's a commercially viable system. They should have had evidence on it. TCL should have presented evidence on it, and they didn't present evidence.

And they had all the opportunity in the world, and the Board had nothing to rely on. So what did the Board do? They came up with, Well, patents are presumed enabled, and therefore, we're going to backfill it and—with this enablement argument.

And there's no case law that says you could—just because it says a mobile device in the background section—enablement just means it can down-convert, that Lam and Enz can down-convert.

But it doesn't mean that all of a sudden it's this commercially viable system. Lam and Enz could

be a test system. Like, there's no evidence like it's a test system, it's a real system. It's enabled from the point of view of down-conversion.

JUDGE PROST: Okay.

MR. CHARKOW: I'll reserve my time. Thank you.

JUDGE PROST: Thank you.

Mr. (indiscernible), please proceed.

MR. REED: Good morning, Your Honors. Kristopher Reed on behalf of the appellee petitioners. May it please the Court. Let me just touch on one thing briefly. Claim 3 is canceled. There's a final decision by this Court that Claim 3 has been canceled.

There was no sur-petition, nothing filed to keep that Claim 3 alive, so I don't fully understand Counsel's argument as to why Claim 3 somehow could be still viable, but for our purposes, Claim 3 is canceled. And the arguments regarding Claim 3—

JUDGE CHEN: I realize this—I mean, this is not where the action in the case—I thought—I don't have the statute in front of me—in 318 or 319 that cancellation is a separate, ministerial act of the director that takes place sometime after proceedings are complete where the proceedings result in a determination of unpatentability.

That's what I meant by cancellation, that ministerial act that erases the claim from the books. Is that what you were referring to? And I thought—I mean, my general understanding, not based on much, is that, you know, the director does that, I don't know, twice a year or

something, collects everything that needs to be canceled and cancels it.

MR. REED: I was using the term “cancel” in terms of the Board’s decision finding.

JUDGE CHEN: Oh, okay. Okay.

MR. REED: So I—no, to briefly answer your question.

Turning to claim construction, as Counsel said, they’re arguing claim construction. Needs to be re-argued here. So I’ll turn to the—first to the alleged APA violation with respect to the reply brief.

And as—Judge Chen, as you suggested, the ParkerVision v. Vidal case addressed the same situation. You know, any attempted distinctions are just not material. And in particular, like in the ParkerVision v. Vidal case, our reply arguments responded to a construction that was first offered in this proceeding in their patent owner responses.

JUDGE CHEN: I guess patent owner is raising a potentially interesting question, which is, if there’s something foreseeable that the petitioner could see that it needs to address in the petition but then doesn’t, then have they given up the right to make that argument at a later point in time in the proceeding?

And here, what I’m being told is the fact that there was some kind of Markman order in a district court proceeding, that gave a very particular claim construction, the very claim construction that the patent owner proposed in its patent owner response.

And if—and there’s no argument that you were not aware of that Markman order. In fact, you for other reasons cited and relied on that Markman order in your own petition.

So then the question becomes: Is that a situation where it was entirely foreseeable that you needed to address that adverse claim construction in your petition but you didn’t?

MR. REED: To answer that question, the Board actually looked at this question in denying their motion to strike our reply arguments, and the Board found that it was not foreseeable and not a reasonable expectation for us to guess which of the myriad of positions that ParkerVision had asserted previously was going to be asserted in this particular IPR proceeding.

And in particular, this claim construction order we’re referring to was not from the underlying litigation behind this IPR. It was from the Intel case. It was not from our case.

And in our case, in the complaints—this was acknowledged by the Board. In the complaint, they did not assert that that was a preferable way of reading “storage element.” The complaint simply said, “Storage element, *e.g.*, a capacitor.”

And that is the approach we used in filing our petition. We used the implicit definition that they have provided in the complaint in this matter. And the Board acknowledged that this is that—

JUDGE CHEN: Right. But you were aware of the Markman order that was in a different litigation, right?

MR. REED: We were aware.

JUDGE CHEN: At the time of your petition.

MR. REED: That's correct.

JUDGE CHEN: And, in fact, you were using pieces of it in your petition.

MR. REED: It is referenced in the petition. That's right. Not on this issue, but yes.

JUDGE CHEN: All right. So then the question is, well, why didn't you address the pieces of the Markman order that were unfavorable to you in your petition?

MR. REED: We didn't address because, based on what we had at the time, that was not the position they were taking in the litigation that preceded this particular IPR proceeding. Again, and that's what the Board held in denying their motion to strike.

They said that the—this is found at Appendix 5012. They said that our position on the term in the petition, that storage elements can simply be capacitors is, quote, “substantially the same as ParkerVision's assertion as to storage elements in the underlying district court complaint.”

So for that reason, the Board said it wasn't incumbent on us to guess that they were going to assert a different position other than what's in their complaint in our petition.

JUDGE CHEN: What if it was in the same litigation? What if the Markman was in the underlying litigation against you? Would you—do you feel like

you would have needed to address it in your petition?

MR. REED: It would have been a more compelling case to address it in our petition. Now, to be clear, the construction that we use in our reply brief is not the same construction that they assert in their patent owner response.

So we disagree with the construction in their patent owner response, and we disagree with the construction by the district court. So at no point have we ever said that was the correct construction, what—and this Court and the Board disagree with that construction in the *Parker Vision v. Vidal* case.

So that is not the proper construction. We responded to the construction they raised in their patent owner response, just like in the Intel matter, and we said it's wrong. We said the Board got it right in its decision in the Intel case, which had already issued at that point, and then we applied that construction in our responsive arguments.

And that is akin to what was described in both *Axonics* and this—and the *ParkerVision v. Vidal* case, that we were simply responding to arguments raised in the patent owner response. And, for that reason, the Board denied their motion to compel and did not abuse its discretion in doing so.

Turning to the second argument made by Counsel that there is no evidence in this case to support a finding of—that the *Lam v.*—the *Lam* or *Lam plus Enz* discloses the claim of storage element.

His argument today assumes something that's not correct with respect to what was required in the ParkerVision v. Qualcomm case. As Your Honor indicated, we relied, yes, on Mr. Sorrell's position in the ParkerVision v. Qualcomm case which made its way into the holding that to determine whether there's non-negligible energy, you look to whether the system, the receiver, successfully down-converts.

And we relied on that definition. Well, what he has read into in his argument today is he has added into that approach this idea of commercial viability. And that's exactly what they did below.

Instead of taking the holding of Qualcomm v.—excuse me—of ParkerVision v. Qualcomm on its face, what it says, they instead interpreted it or tried to reinterpret it to say that “successfully down-converts” actually means—and I quote here from the blue brief at 69.

“Successfully down-converts actually means it must meet certain specifications and telecommunication standards so that the system is commercially viable.” And that's exactly what we heard argued here today, and that is not—there's no reason for the Court to rewrite the Qualcomm holding in this way.

“Successfully down-converts” means exactly that: The receiver successfully down-converts to recover the baseband signal from the carrier signal.

JUDGE TARANTO: And so putting aside this commercially viable business, what was your evidence that there was success in down-converting?

MR. REED: First is found by the Board at Appendix 64. “The disclosure of Lam itself provides evidence that the identified capacitors constitute claimed storage elements.”

And in particular, the Board noted that “Lam discloses receivers that are high-speed receivers from narrow-band communication systems that are used in mobile, handheld communication systems.” That’s at Appendix 64, and it’s citing Appendix 2144, the Lam patent at column 1, lines 6 and 7 and 19 through 25.

Further, Lam discloses at Appendix 2146—this is column 5, lines 50 through 60—that, quote, “The receiver illustrated in Figure 3 in accordance with the present invention down-converts the incoming RF signal into baseband components.” That’s exactly what’s called for in the ParkerVision v. Qualcomm decision.

JUDGE TARANTO: What page in the appendix am I—

MR. REED: This is Appendix 2146.

JUDGE TARANTO: Is this something the Board found, or you’re just looking at the underlying source?

MR. REED: The Board did include that in describing the parties’ arguments, yes. And with respect to the—again, this is column 5, lines 50 to 60. This is almost verbatim in saying what Qualcomm says is required for showing non-negligibility.

That the receiver, in accordance with the present invention, the present invention of an enabled U.S. patent, down-converts the incoming RF signal

into baseband components.” That is successful down-conversion.

That demonstrates that there’s non-negligible energy being transferred, and that shows—so there is evidence in the record, substantial evidence, of that being disclosed in Lam.

Second, the Board at Appendix 58 and 59 and indirectly at Appendix 64 relied on Dr. Shoemake’s expert testimony that Lam teaches sampling circuits using sample hold capacitors that, both alone and in combination, would then result in down-conversion of the I and Q baseband signals.”

And in particular, the Board directly cited to Paragraphs 120 and 121 of Dr. Shoemake’s testimony that—regarding the capacitors taught in Lam for down-converting an RF input signal. And that’s at Appendix 58 through 59 again.

Further, the Board indirectly cites Dr. Shoemake’s testimony via citations to the petition and the reply brief, which, of course, then in turn cite Dr. Shoemake’s testimony.

For example, in the Board’s order at Appendix 64, it cites Pages 17 through 19 of the reply brief below for the proposition that, quote, “Lam functions in practice and successfully down-converts.”

Now, those pages of our reply are found at Appendix 4529, and they expressly rely on Paragraphs 102 through 104 of Dr. Shoemake’s testimony in support of the same proposition.

So given this presumption of enablement and given the disclosure of Lam and given the reference to

expert testimony, there is substantial evidence in the record that Lam discloses the storage elements in view of the discussion of ParkerVision v. Qualcomm.

Now, unless the Court has further questions, I'll conclude my argument.

JUDGE PROST: Thank you.

MR. REED: Thank you.

JUDGE PROST: We'll restore two minutes of rebuttal because you ran through your rebuttal time.

MR. CHARKOW: I'm sorry. Say that again.

JUDGE PROST: I will restore two minutes of rebuttal.

MR. CHARKOW: Oh. Thank you very much.

Okay. If I may. Okay. So I'll work backwards from what he said. He just pointed you to a whole bunch of things in the record. None of them talks about non-negligible amounts of energy, not one of them.

So he was—you asked where—is this evidence? There is no evidence. That's what the Court had to back—that's why the Board had to backfill and use this—you know, this concept of enablement, which, by the way, is inherency, and they haven't met the—and we put that in our brief too. They haven't met the elements of inherency.

JUDGE CHEN: That was in your gray brief, right?

MR. CHARKOW: In our gray brief, I believe. Yeah.

JUDGE CHEN: Not your blue brief.

MR. CHARKOW: I don't think it was in the blue brief.

JUDGE CHEN: Okay.

MR. CHARKOW: I don't recall. But the one thing I want to point to in term—so he didn't address any of your question. He just pointed to a whole bunch of other stuff that had nothing to do with that.

In terms of—going back to Judge Chen, your issue about foreseeability, they knew. It was stapled to their—it was stapled to their petition, and they knew that this construction was relevant. It was foreseeable.

It's a common thread through all ParkerVision cases. Every ParkerVision cases, we talk about non-negligible amounts of energy. That's always what we talk about. That's, like, part of the—that's, like, part of the crux of the invention.

And so they completely knew about it. And when they—once they knew about it, they had the burden at the onset to address that issue and address this non-negligible amounts of energy issue, and they failed to do so. They failed to do so.

And when—even when they had the opportunity to do so in the reply brief, they couldn't get a paid expert to contradict what Dr. Steer said. They couldn't get anybody to say, Yes, you know, we're correct and Dr. Steer's wrong.

And, by the way, it's commercially viable. It's a commercially viable system, Lam and Enz. And, by the way, it discloses non-negligible amounts of energy, and Steer got it wrong. They couldn't even do that.

And in terms of the timing, their petition was filed, I believe, nine days after we first introduced in the earlier case the concept of all our calculations, which ultimately were struck. But—so there was a nine-day period in there.

And if you go to Page 26 of our gray brief, I believe it is, 26 of our gray brief discloses the timing of when they had—when they should have known, when they had knowledge of things.

So, Judge Chen, as you said, completely foreseeable. They should have addressed it. This is nothing like what was going on in the previous case. They didn't address it. And there's no evidence whatsoever—anything he just talked about, there is no evidence in that about non-negligible amounts of energy.

And that's why the Court—the Board, when they were making their decision, they had to backfill. They had to come up with something else to get to the result they wanted, which was ultimately invalidity.

They couldn't point to anything in the record because there wasn't—it was only Dr. Steer, unrebutted testimony, completely unrebutted, credibility not questioned. And they had the burden, and they failed to meet that burden.

JUDGE PROST: Okay.

MR. CHARKOW: That's all. Thank you.

JUDGE PROST: Thank you. Case is submitted.

(Recording ends)

**R. 36 JUDGMENT, U.S. COURT OF APPEALS
FOR THE FEDERAL CIRCUIT,
ON THE '835 PATENT
(JUNE 5, 2024)**

NOTE: This disposition is nonprecedential

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

PARKERVISION, INC.,

Appellant,

v.

TCL INDUSTRIES HOLDINGS CO., LTD.,
LG ELECTRONICS INC.,

Appellees.

No. 2023-1417

Appeal from the United States Patent and
Trademark Office, Patent Trial and Appeal Board
in Nos. IPR2021-00985, IPR2022-00246.

Before: PROST, TARANTO, and CHEN,
Circuit Judges.

JUDGMENT

JASON SCOTT CHARKOW, Daignault Iyer LLP,
Vienna, VA, argued for appellant. Also represented by
RONALD M. DAIGNAULT, CHANDRAN IYER.

KRISTOPHER L. REED, Kilpatrick Townsend & Stockton LLP, Dallas, TX, argued for appellees. TCL Industries Holdings Co., Ltd. also represented by EDWARD JOHN MAYLE, Denver, CO.

DAVID S. CHUN, Ropes & Gray LLP, East Palo Alto, CA, for LG Electronics Inc. Also represented by STEVEN PEPE, MATTHEW R. SHAPIRO, New York, NY; SCOTT S. TAYLOR, Boston, MA.

THIS CAUSE having been heard and considered,
it is

ORDERED and ADJUDGED:

PER CURIAM (Prost, Taranto, and Chen, *Circuit Judges*).

AFFIRMED. See Fed. Cir. R. 36.

Entered by Order of the Court

/s/ Jarrett B. Perlow

Clerk of Court

[SEAL]

Date June 5, 2024

**FINAL WRITTEN DECISION,
U.S. PATENT AND TRADEMARK OFFICE,
ON THE '835 PATENT
(NOVEMBER 17, 2022)**

UNITED STATES PATENT AND
TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND
APPEAL BOARD

TCL INDUSTRIES HOLDINGS CO., LTD.
and LG ELECTRONICS INC.,

*Petitioners,*¹

v.

PARKERVISION, INC.,

Patent Owner.

No. IPR2021-00985²
Patent 7,292,835 B2

¹ The caption is updated to remove Petitioner Hisense Co., Ltd. (“Hisense”) because Hisense is no longer a party to this proceeding. *See* Paper 43 (Termination due to Settlement After Institution of Trial Only as to Hisense Co., Ltd.). The parties shall use this caption (without this footnote) going forward.

² LG Electronics Inc., who filed a petition in IPR2022-00246, is joined as petitioner in this proceeding.

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

GERSTENBLITH, Administrative Patent Judge.

JUDGMENT
Final Written Decision
Determining All Challenged
Claims Unpatentable
35 U.S.C. § 318(a)

I. Introduction

A. Background

TCL Industries Holdings Co., Ltd. (“TCL”); Hisense; and ZyXEL Communications Corp. (“ZyXEL”) filed a Petition (Paper 1, “Pet.”) requesting institution of inter partes review of claims 1, 12–15, and 17–20 (“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 9). ZyXEL and Patent Owner reached a settlement and this proceeding was terminated only as to ZyXEL. Paper 13. TCL and Hisense remained as petitioners in the proceeding. Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an inter partes review as to all claims and grounds set forth in the Petition. Paper 14 (“Inst. Dec.”).

After institution, LG Electronics Inc. (“LG”) filed a petition in IPR2022-00246 (challenging the same claims of the ’835 patent on the same grounds), and a motion for joinder (seeking to join this proceeding as a petitioner). *LG Elecs. Inc. v. ParkerVision, Inc.*, IPR

2022-00246 (PTAB Dec. 17, 2021), Papers 2 (petition), 3 (motion for joinder). We granted institution in IPR2022-00246 and granted LG's motion for joinder. *Id.* at Paper 10 (PTAB Apr. 12, 2022); IPR2021-00985, Paper 21. Recently, Hisense and Patent Owner reached a settlement and this proceeding was terminated only as to Hisense. Paper 43. Accordingly, we refer to TCL and LG, collectively, as "Petitioners."

Also following institution, Patent Owner filed a Patent Owner Response (Paper 17, "PO Resp."), Petitioners filed a Reply to Patent Owner's Response (Paper 25, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 31, "PO Sur-reply"). Additionally, we granted Petitioners' Motion for Routine and/or Additional Discovery (Paper 18), ordering the production of Patent Owner's Final Infringement Contentions. Paper 23 (Order), 8. And, we denied Patent Owner's Motion to Strike portions of Petitioners' Reply (Paper 26), finding that the "Reply does not raise new issues, is not accompanied by belatedly presented evidence, and does not otherwise exceed the proper scope of [a] reply brief as set forth in 37 C.F.R. § 42.23(b)." Paper 30 (Order), 13. An oral hearing was held on September 8, 2022, and the transcript is of record. Paper 39 ("Tr.").³

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the Challenged Claims. Petitioners bear the

³ Because of a substantial overlap in issues presented, the transcript includes oral argument from related case IPR2021-00990, although this proceeding and IPR2021-00990 are not consolidated or joined.

burden of proving unpatentability of the Challenged Claims. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioners must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2020). Having reviewed the arguments and the supporting evidence, we determine that Petitioners have shown, by a preponderance of the evidence, that claims 1, 12–15, and 17–20 of the '835 patent are unpatentable.

B. Related Proceedings

The parties identify the following as related matters: *ParkerVision, Inc. v. TCL Industries Holdings Co., Ltd. et al.*, No. 6:20-cv-00945 (W.D. Tex.); *ParkerVision, Inc. v. Hisense Co., Ltd. et al.*, No. 6:20-cv-00870 (W.D. Tex.); *ParkerVision, Inc. v. ZyXEL Communications Corp.*, No. 6:20-cv-01010 (W.D. Tex.)⁴; and *ParkerVision, Inc. v. LG Electronics Inc.*, No. 6:21-cv-00520 (W.D. Tex.). Pet. 13–14; Paper 6 (Petitioner's Updated Mandatory Notice), 1; Paper 8 (Patent Owner's Mandatory Notices), 1. Petitioners also identify *ParkerVision, Inc. v. Buffalo Inc.*, No. 6:20-cv-01009 (W.D. Tex.), as a related matter involving the '835 patent. Pet. 14. In joined case IPR2022-00246, Petitioner LG also identifies *ParkerVision, Inc. v. TCL Technology Group Corp.*, No. 5:20-cv-01030 (C.D. Cal.). *LG Elecs.*, IPR2022-00246, Paper 2 at 13. Additionally, Petitioners challenge several claims of U.S.

⁴ After the parties' briefing, the district court granted a joint motion to dismiss with prejudice and the case is now closed. *See* Ex. 3001 (Docket Entry 25, Order dated Sept. 27, 2001).

Patent No. 7,110,444 B1, owned by Patent Owner, in IPR2021-00990. Pet. 14; Paper 8, 1.⁵

C. Real Parties in Interest

Petitioners identify TCL;TCL Electronics Holdings Ltd.; Shenzhen TCL New Technology Co., Ltd.; TCL King Electrical Appliances (Huizhou) Co., Ltd.; TCL Moka Int'l Ltd.; TCL Moka Manufacturing S.A. DE C.V.; TCL Technology Group Corp.; TTE Technology, Inc.; LG; and LG Electronics U.S.A., Inc. as real parties in interest. Pet. 13; LG, IPR2022-00246, Paper 2 at 12. Patent Owner identifies ParkerVision, Inc. as the sole real party in interest. Paper 8, 1; LG, IPR2022-00246, Paper 8 (Patent Owner's Mandatory Notices), 1.

D. The Asserted Grounds of Unpatentability and Declaration Evidence

Petitioners challenge the patentability of claims 1, 12–15, and 17–20 of the '835 patent on the following grounds:

⁵ Patent Owner identifies the instant proceeding—IPR2021-00985—as a related matter, but we understand Patent Owner to refer to IPR2021-00990. *See* Paper 8, 1.

App.118a

Claim(s) Challenged	35 U.S.C. § ⁶	Reference(s)/Basis
1, 12, 15, 17	103(a)	Hulkko, ⁷ Gibson ⁸
1, 12, 15, 17	103(a)	Hulkko, Gibson, Goldberg, ⁹ Thacker, ¹⁰ ITU-T J.83b, ¹¹ AAPA ¹²
1, 12–15, 17–20	103(a)	Gibson, Schiltz ¹³

⁶ 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, we apply the pre-AIA version of the statutory basis for unpatentability.

⁷ U.S. Patent No. 5,734,683, issued Mar. 31, 1998 (Ex. 1004, “Hulkko”).

⁸ U.S. Patent No. 4,682,117, issued July 21, 1987 (Ex. 1005, “Gibson”).

⁹ 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 (Ex. 1007, “Goldberg”).

¹⁰ U.S. Patent No. 6,011,548, issued Jan. 4, 2000 (Ex. 1008, “Thacker”).

¹¹ ITU-T J.83 Recommendation (Apr. 1997) (Ex. 1009, “ITU-T J.83b”). Petitioners include the letter “b” in references to this exhibit although the title does not include the letter “b.” *See, e.g.*, Pet. 17, 42. For consistency, we refer to the exhibit in the same manner as Petitioners by including the letter “b.”

¹² 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. 11. “A

1, 12–15, 17–20	103(a)	Gibson, Schiltz, Goldberg, Thacker, ITU-T J.83b, AAPA
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Pet. 17. In the Petition, Petitioners first set forth the grounds as though there are two: Hulkko and Gibson, and Gibson and Schiltz. *Id.* Petitioners, however, explain that “if the Board finds that the preamble of claim 1 is limiting—and thus requires a ‘cable modem’—then Petitioners submit that the [C]hallenged [C]laims are obvious for the reasons above and further in view of publications (e.g., Goldberg and Thacker) describing the then-existing cable modem standards (ITU-T J.83b and DOCSIS) and/or AAPA.” *Id.* Accordingly, the chart above includes the alternative grounds set forth in the Petition. Inst. Dec. 4.

Additionally, Petitioners support their challenge with a Declaration of Matthew B. Shoemake, Ph.D. (Ex. 1002) and a Declaration of Brenda Ray (Ex. 1010). Patent Owner supports its arguments with a Declaration of Dr. Michael Steer. (Ex. 2038). Petitioners cross-examined Dr. Steer and a transcript of that deposition is of record. Ex. 1016.

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 . . . or the effective filing date of the claimed invention. . . .” USPTO Memorandum, Updated Guidance on the Treatment of Statements of the Applicant in the Challenged Patent in Inter Partes Reviews Under § 311 (issued June 9, 2022), at 4, available at <https://go.usa.gov/xSbGF>.

¹³ U.S. Patent No. 5,339,459, issued Aug. 16, 1994 (Ex. 1006, “Schiltz”).

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:

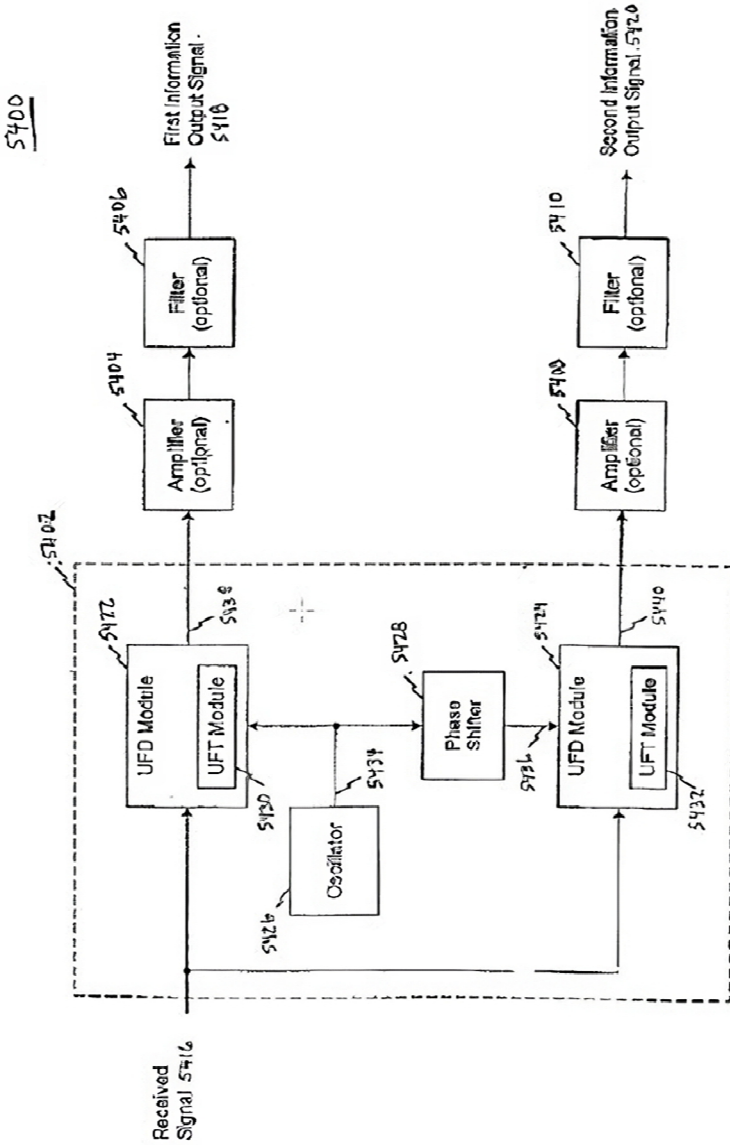


Fig 54B

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).

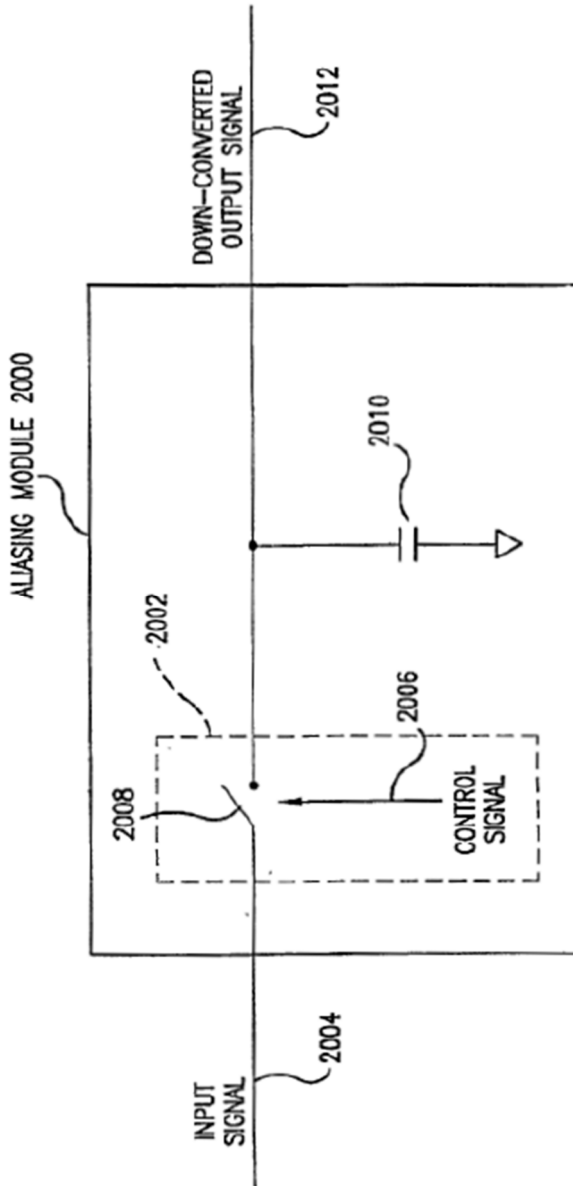
Down-converted “I” signal 5438 is optionally amplified by first optional amplifier 5404 and optionally filtered by first optional filter 5406, and a first information output signal 5418 is output.

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:



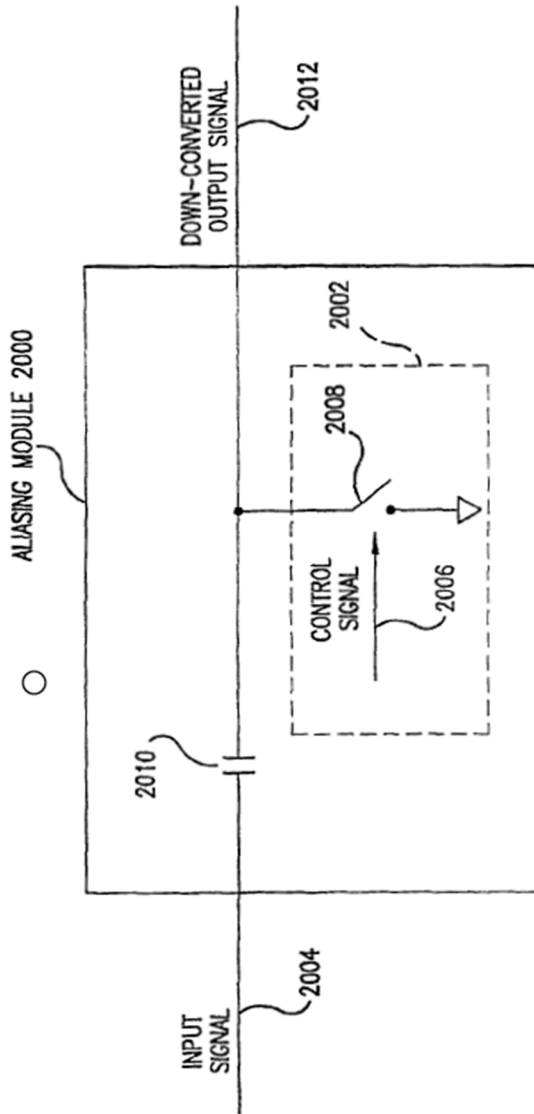


Fig 20A-1

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.¹⁴ *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 Petitioners’ 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] 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;
 - [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

¹⁴ The ’551 patent is Exhibit 2027 in this proceeding.

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.

G. Level of Ordinary Skill in the Art

Petitioners, supported by Dr. Shoemake’s testimony, propose 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 communication system design, signal processing and/or analog and RF circuit design.” Pet. 50 (citing Ex. 1002 ¶¶ 31–36). Petitioners explain that “[l]ess work experience may be compensated by a higher level of education, such as a master’s degree.” *Id.* (citing Ex. 1002 ¶¶ 31–36).

In the Institution Decision, we noted that Patent Owner had not expressed a position on the level of ordinary skill in the art in the Preliminary Response, and, based on the preliminary record, we adopted Petitioners’ unopposed position, finding it consistent with the level of ordinary skill in the art reflected by the ’835 patent and the prior art of record. Inst. Dec.

10–11 (citing *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)).

In the Patent Owner Response, Patent Owner, supported by Dr. Steer’s testimony, proposes that a person of ordinary skill in the art at the time of the invention would have had

(a) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two (2) additional years of work experience in the design and development of radio frequency circuits and/or systems, or (b) at least five (5) years of work experience and training in the design and development of radio frequency circuits and/or systems.

PO Resp. 4 (citing Ex. 2038 ¶ 24). Neither Patent Owner nor Dr. Steer explains why their proposal materially differs from that proposed by Petitioners.

Patent Owner’s option (a) is substantially the same as Petitioners’ proposal—both require a bachelor’s degree in the same or a related subject and two additional years of related work experience. Patent Owner’s option (b) adds an additional option based on work experience in lieu of a formal degree.

Neither party contends that the difference in their proposals affects the outcome of this proceeding and we do not find that it does. Nonetheless, on the full record before us, we find that our identification of the level of ordinary skill in art in the Institution Decision as well as Patent Owner’s option (b) are supported by the prior art of record, the ’835 patent, and

the opinion of Dr. Steer. Accordingly, we modify our preliminary finding to include option (b) from Patent Owner's proposal. Thus, we find that one of ordinary skill in the art 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. We also find that less work experience may be compensated by a higher level of education, such as a master's degree.

II. 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 Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an inter partes review).

A. “storage module”

In the Institution Decision, we did not construe any claim terms expressly because none of the terms were in dispute. Inst. Dec. 10 (citation omitted). In the briefing following institution, Patent Owner proposed a construction for the term “storage module,” *See, e.g.*, PO Resp. 46–50, and it became clear that the parties dispute the meaning of the term. Additionally, because many of Patent Owner’s arguments hinge on the meaning of this term, its proper construction is important to address the issues presented in this proceeding. Further, the parties’ arguments rely, almost exclusively, on disclosures in the ’551 patent, incorporated by reference into the ’835 patent. *Id.* at 49–50; Pet. Reply 7–9.

In the final written decision in IPR2020-01265 (Ex. 2037), we construed the term “storage element,”

relying on its use in the '551 patent. Because “storage module” is synonymous with “storage element,” our prior construction of “storage element” is relevant to our consideration of “storage module.” In IPR2020-01265, after considering the parties’ extensive arguments as well as prior constructions in related district court litigation, we construed “storage element” to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.” Ex. 2037, 41. Critical to that determination was the finding that the patentees acted as their own lexicographers by defining the systems to which “storage modules” refer to. Specifically, we explained that the '551 patent expressly states “[s]torage modules and storage capacitances, on the other hand, refer to systems that store non-negligible amounts of energy from an input EM signal.” *Id.* at 36 (emphasis added) (citing '551 patent,¹⁵ 66:59–67). Additionally, we also explained that in a prior proceeding challenging claims of the '551 patent before the Board—IPR2014-00948—Patent Owner represented that the '551 patent “provides an explicit definition” and “explicitly defines a storage module.” *Id.* at 39 (citing Ex. 1032¹⁶, 21). We found that “Patent Owner’s acknowledgement that the '551 patent provides an explicit definition of ‘storage module’ directly supports our determination that the patentees acted as lexicographers.” *Id.* at 40.

In this proceeding, in addition to raising substantially the same arguments addressed in IPR2020-

¹⁵ In IPR2020-01265, the '551 patent was Exhibit 2007.

¹⁶ Exhibit 1032 from IPR2020-01265 is Patent Owner’s Preliminary Response (Paper 7) from IPR2014-00948, which was not filed as an exhibit in this proceeding.

01265, Patent Owner submitted a Claim Construction Order and Memorandum in Support Thereof from *ParkerVision, Inc. v. LG Electronics, Inc.*, No. 6:21-cv-00520-ADA (W.D. Tex. June 21, 2022) (Doc. 55) (Ex. 2039), and a Special Master’s Report and Recommendation Regarding Claim Construction from *ParkerVision, Inc. v. Hisense Co.*, No. 6:20-cv-00870-ADA (W.D. Tex. Aug. 29, 2022) (Doc. 72) (Ex. 2042).¹⁷ Each of these claim construction decisions construes “storage module” to mean “a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal.” Ex. 2042, 33; *See* Ex. 2039, 16 (district court declining to modify its previous construction of “storage module,” which was limited to an “energy transfer system”). In so determining, each of the district court’s decisions finds that the patentees did not act as their own lexicographers. *See* Ex. 2039, 19; Ex. 2042, 32. Patent Owner advocates that we adopt the same construction here. PO Resp. 47–50.

Petitioners assert that “[u]nder any reasonable construction of the term, a capacitor constitutes a ‘storage module.’” Pet. Reply 6 (citing Ex. 1002 ¶¶ 118–119). Petitioners rely on claim 4 of the ’835 patent, which depends indirectly from claim 1 and recites that “said first storage [module]¹⁸ is a first capacitor.” *Id.*

¹⁷ Patent Owner also submitted the same Special Master’s Report and Recommendation Regarding Claim Construction from *ParkerVision, Inc. v. TCL Industries Holdings Co.*, No. 6:20-cv-00945-ADA (W.D. Tex. Aug. 29, 2022) (Doc. 68) (Ex. 2041).

¹⁸ Although claim 1 recites a “first storage module” and a “second storage module,” dependent claim 3 refers to “said first storage device” and “said second storage device,” thus resulting in claim 4 referring to “said storage device” instead of “said storage

at 6 n.2. Nonetheless, “Petitioners do not object to adoption of the Board’s construction for ‘storage module’ from IPR2020-01265 here.” *Id.* at 7.

We have reviewed and considered the district court’s construction (which limits “storage module” to an “energy transfer system”), but we are not persuaded that our construction from IPR2020-01265 should be altered. We expressly adopt and incorporate by reference our analysis from IPR2020-01265 and do not repeat it in full here. We do, however, take this opportunity to provide additional reasoning in support of our prior determination based on the arguments and evidence presented in this proceeding.

The ’551 patent provides the following, which formed the focal point of Patent Owner’s argument in IPR2014-00948 and which we found provides a lexicographic definition of “storage module”/“storage element” in IPR2020-01265:

The terms storage module and storage capacitance, as used herein, are distinguishable from the terms holding module and holding capacitance, respectively. Holding modules and holding capacitances, as used above, identify systems that store negligible amounts of energy from an under-sampled input EM signal with the intent of “holding” a voltage value. Storage modules and storage capacitances, on the other hand, refer to systems that store non-negligible amounts of

module.” Ex. 1001, claims 1, 3, 4. Because “storage device” is not recited in claim 1 (or claim 3), we understand that claim 4 refers to the first and second storage modules recited in claim 1.

energy from an input EM signal.

Ex. 2027, 66:59–67 (emphases added); *See* Ex. 2037, 39–40 (discussing Patent Owner’s prior arguments to construe “storage module” in IPR2014-00948). When defining certain terms in a section titled “General Terminology,” the ’551 patent repeatedly uses the phrase “when used herein” in combination with the phrase “refer(s) to.” *See, e.g., Id.* at 13:56–15:27 (mentioning a term followed by “when used herein,” followed by “refers to,” followed by a definition). For example, the ’551 patent states, “[t]he term digital signal, when used herein, refers to a signal that changes between discrete states, as contrasted to a signal that is continuous.” *Id.* at 15:7–9. As shown, the ’551 patent defines “digital signal” by stating “when used herein” followed by “refers to.” And, the same sentence also provides a comparison between “digital signal” and a signal that is continuous. Even though the passage describing “storage module” is not listed under the “General Terminology” section of the ’551 patent, the passage provides the same indications that the patentees clearly and unambiguously intended to define the term “storage module” by stating “as used herein” and “refer to”—hallmarks that the patentees were providing a lexicographic definition of the term. *Vasudevan Software, Inc. v. MicroStrategy, Inc.*, 782 F.3d 671, 679 (Fed. Cir. 2015) (“An applicant’s use of the phrase ‘refers to’ generally indicates an intention to define a term.”) (citing *In re Imes*, 778 F.3d 1250, 1252–53 (Fed. Cir. 2015); *Microsoft Corp. v. Int’l Trade Comm’n*, 731 F.3d 1354, 1360 (Fed. Cir. 2013); *Linear Tech. Corp. v. Int’l Trade Comm’n*, 566 F.3d 1049, 1054 (Fed. Cir. 2009)). Additionally, as with the term “digital signal,” the above-passage provides a

comparison between “storage module” and “holding module” and uses the definitions of the terms to compare and contrast them.

“To act as its own lexicographer, a patentee must ‘clearly set forth a definition of the disputed claim term’ other than its plain and ordinary meaning.” *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). “It is not enough for a patentee to simply disclose a single embodiment or use a word in the same manner in all embodiments, the patentee must ‘clearly express an intent’ to redefine the term.” *Id.* (citing *Helmsderfer v. Bobrick Wasroom Equip., Inc.*, 527 F.3d 1379, 1381 (Fed. Cir. 2008); *Kara Tech. Inc. v. Stamps.com*, 582 F.3d 1341, 1347–48 (Fed. Cir. 2009)). That is precisely what the patentees did in the above-passage. Specifically, we find that they clearly set forth a definition that is different than the plain and ordinary meaning and, in so doing, clearly expressed an intent to redefine the term. That the patentees intended to redefine the term “storage module” is clearly expressed by the use of “as used herein”¹⁹ and “refers to” in the above-passage and is consistent with the patentees’ use of these same phrases when defining other terminology in the ’551 patent, as discussed above.

We also do not agree with Patent Owner’s argument that this passage in the ’551 patent does not provide a lexicographic definition for at least two reasons. First, in arguing the construction of “cable modem,”

¹⁹ There is no substantive difference between the phrase “when used herein” and “as used herein.”

discussed further below, Patent Owner points to the following from the '835 patent specification: "Cable Modems refer to modems that communicate across ordinary cable TV [television] network cables" (Ex. 1001, 36:19–20 (emphasis added)); and Patent Owner argues that "we just used the same definition that was in the spec. . . . We just took the same exact definition from the spec" (Tr. 83:16–20 (emphases added)). In other words, Patent Owner's acknowledgement that the '835 patent provides a definition of the term "cable modem" undermines Patent Owner's argument that the patentees did not define "storage module" even though the patentees used the same phrase "refer(s) to."

Second, Patent Owner has absolutely no (even remotely) colorable explanation as to why it repeatedly argued, in IPR2014-00948, that the '551 patent "provides an explicit definition" and "explicitly defines a storage module." See Ex. 2037, 39–40 (discussing Patent Owner's prior arguments to construe "storage module" in IPR2014-00948). The only plausible explanation is that Patent Owner has simply changed positions to suit its current litigation strategy. But, that is not how claim construction works. There either is a lexicographic definition or there is not, regardless of the claim construction standard applied (i.e., whether applying the broadest reasonable interpretation or the same claim construction standard for construing claims in a civil action under 35 U.S.C. § 282(b)). In IPR2014-00948, Patent Owner argued that there was a lexicographic definition and emphasized the same exact statements in the above-passage from the '551 patent. That passage has not changed and provides definitive confirmation of the

patentees' intent to provide a lexicographic definition of "storage module" for the reasons discussed above.²⁰

In its Sur-reply, Patent Owner argues that the above-passage from the '551 patent "is comparative, not definitional." PO Sur-reply 4. We agree that it is comparative, but it is also definitional. These are not mutually exclusive concepts. And, the above-discussion reflects that the '551 patent defines other terms by providing a definition and comparing that definition to definitions of other terms.

Accordingly, for the reasons explained in detail in the Board's final written decision in IPR2020-01265 and as further explained above, we find that the patentees clearly and unmistakably set forth a definition of "storage module" in the incorporated '551 patent, and, therefore, we construe "storage module" to mean "a module of a system that stores non-negligible amounts of energy from an input EM signal."

B. "cable modem"

Petitioners identify "cable modem," as recited in the preamble of claim 1, as a term for potential construction. Pet. 31–32. Petitioners contend,

if the preamble is limiting and if the Board finds it necessary to construe "cable modem" to resolve this IPR, the Board should find that any modem that can be used to down-convert modulated signals from a TV network

²⁰ None of the district court claim construction decisions address Patent Owner's representations, in IPR2014-00948, that the '551 patent explicitly defines "storage module." See generally Exs. 2039, 2042.

is a “cable modem,” regardless of whether the modem is wired or wireless, and regardless of whether it complies with any cable data standard.

Id. (citing Ex. 1002 ¶ 113).

Patent Owner contends that the “specification specifically states that a ‘cable modem’ ‘refers to [a] modem[] that communicate[s] across ordinary cable TV network cables.’” PO Resp. 51 (alterations by Patent Owner) (quoting Ex. 1001, 36:19–20). Patent Owner asserts that “[t]he specification distinguishes a cable modem from a data modem, which communicates across telephone lines.” *Id.* (citing Ex. 1001, Figs. 45A, 45B, 36:20–25, 36:61–63). Thus, Patent Owner argues that “what makes a modem a ‘cable’ modem relates to the type of physical transmission line/cabling over which data is ultimately transmitted.” *Id.* Patent Owner contends that Petitioners’ construction “focuses on the type of network (TV network) over which data is transmitted,” which “is inconsistent with the specification.” *Id.* (citing Pet. 32). Nonetheless, despite “cable modem” appearing in the preamble of claim 1, Patent Owner does not provide any argument or analysis of whether the preamble is, in fact, limiting. *See generally* PO Resp.; *See also* PO Sur-reply.

In their Reply, Petitioners contend that “cable modem” is not limiting because it “is non-essential and does not give life or meaning to the structurally complete body of claim 1.” Pet. Reply 14. Petitioners assert that, in related litigation, Patent Owner did not contend that the term was limiting and took the litigation position that certain WiFi chips in TVs are “cable modems” “even though Wi-Fi chips obviously

have no physical transmission line or cabling.” *Id.* (citing Ex. 2002 ¶ 112; Ex. 2001 ¶ 90).

Petitioners assert the following:

The portion of the preamble that includes the phrase “[a] cable modem” does not provide antecedent basis for any later term in claim 1. Nor does cable modem provide any “essential structure,” as the remainder of the claim recites a structurally complete invention, and the term “cable modem” does not give life, meaning, and vitality to the claim. . . . More specifically, if “cable modem” was deleted from the preamble or replaced with a generic word like “device,” the body of the claims would still define a structurally complete apparatus that down-converts by using an oscillator, a phase shifter, a first frequency down-conversion module, and a second frequency down-conversion module. . . . Indeed, the ’835 specification describes the combination of these components as a stand-alone device (“Receiver 5400”), which is “applicable to any of the applications described in any of the sections” in the specification. Ex. 1001 at 48:11-20, 42:43-43:57, Figures 52, 54B; Pet. at 26.

Pet. Reply 15. Additionally, Petitioners contend that “cable modem” states an intended use because it is “just one of the many ‘exemplary applications’ that can use the purported invention.” *Id.* at 16 (citing Ex. 1001, 5:11–59, 21:55–22:7, 23:20–24:2, 48:11–20, 48:34–39, 49:6–12, 49:38–42, 50:1–5, 50:13–23). And, the ’835 patent states that “[t]hese applications and embodiments are not intended to limit the invention.”

Id. (alteration by Petitioners) (quoting Ex. 1001, 50:14–15) (citing Ex. 1001, 23:55–24:2, 50:13–25). Petitioners further note that the district court, in the litigation between Patent Owner and LG, found that “cable modem” recited in the preamble of claim 1 was not limiting. *Id.* (citing Ex. 1021 (Court’s Preliminary Constructions)²¹).

Petitioners argue that, “[i]f the Board finds that ‘cable modem’ is limiting, a cable modem in the limited context of the ’835 patent can be used to communicate with a cable TV network using a cable or wirelessly.” Pet. Reply 16 (citing Ex. 1001, 36:19–25, 36:50–56, 37:24–30, Fig. 45B). Petitioners note that “the invention ‘is not limited to’ the DOCSIS standard, as it can be used with ‘additional standards’ (e.g., ITU-T J.83b) and can also be used in ‘non-standard configurations.’” *Id.* at 16–17 (citing Ex. 1001, 38:28–34). Thus, Petitioners assert that, if the preamble is limiting, we should find that “any device that can be used to down-convert modulated signals from a TV network is a ‘cable modem’ in the context of the ’835 patent whether the device has a cable or is wireless, and regardless of whether it complies with any standard.” *Id.* at 17 (citing Ex. 1002 ¶ 113).

Patent Owner does not address whether “cable modem” is limiting or its construction in the Sur-reply. See generally PO Sur-reply.

“Generally . . . the preamble does not limit the claims.” *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d

²¹ The district court’s final claim construction was filed after Petitioners’ Reply, but maintains the court’s preliminary finding that “cable modem” is not limiting. Ex. 2039 (Claim Construction Order and Memorandum in Support Thereof) (Doc. 55), 24.

1354, 1358 (Fed. Cir. 2010). A term in the preamble is a limitation only if it “recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *TomTom, Inc. v. Adolph*, 790 F.3d 1315, 1323 (Fed. Cir. 2015).

We agree with Petitioners that “cable modem,” as recited in the preamble of claim 1, is not limiting. In particular, “cable modem” does not provide antecedent basis for any term subsequently recited in claim 1, it does not provide any essential structure because the body of the claim recites a structurally complete invention, and “cable modem” is not necessary to give life, meaning, and vitality to the claim. Further, Patent Owner fails to raise any arguments on these issues to the contrary. Accordingly, for each of these reasons, we find that “cable modem” is not limiting.

Because “cable modem” is not limiting, we need not construe it expressly to resolve the present dispute between the parties.²² *See Nidec Motor Corp.*, 868 F.3d at 1017 (recognizing that only those terms in controversy need be construed and only to the extent necessary to resolve the controversy).

²² During oral argument, Patent Owner raised a new argument, not previously raised in its briefing, that because dependent claim 17 recites “cable modem” in the body of the claim, the construction of the term was still relevant and necessary to resolve Petitioners’ challenges to that claim. *See* Tr. 79:21–80:15. As explained further herein, we find that Patent Owner waived any argument specifically directed to dependent claim 17 and its recitation of “cable modem” by not raising that argument in its Patent Owner Response. *See* Paper 15 (Scheduling Order), 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”).

C. “frequency translation module”

Petitioners present “frequency translation module” for construction, but it appears that Petitioners do so because of the possibility that 35 U.S.C. § 112, ¶ 6 may apply. *See* Pet. 32 (“To the extent it is argued or determined that 35 U.S.C. § 112(6) applies. . . .”); *See* 37 C.F.R. § 42.104(b)(3) (“Where the claim to be construed contains a means-plus-function or step-plus-function limitation . . . , the construction of the claim must identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function.”).

Patent Owner contends that 35 U.S.C. § 112, ¶ 6 does not apply. PO Resp. 51–52. Petitioners do not address the construction of “frequency translation module” in their Reply (see generally Pet. Reply) and Patent Owner does not address the issue in its Sur-reply (see generally PO Sur-reply).

On the full record, it is not clear whether the parties actually dispute the construction of “frequency translation module,” but that is inapposite because none of the parties’ arguments nor the outcome of this proceeding hinge on the construction of this term. Accordingly, we need not construe it expressly to resolve the present dispute between the parties. *See Nidec Motor Corp.*, 868 F.3d at 1017.

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.”)).

“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. Obviousness over Hulkko and Gibson, and Alternatively Hulkko, Gibson, Goldberg, Thacker, ITU-T J.83b, and/or AAPA

Petitioners assert the combination of Hulkko and Gibson, and alternatively the combination of Hulkko, Gibson, Goldberg, Thacker, ITU-T J.83b, and/or AAPA, would have rendered the subject matter of claims 1, 12, 15, and 17 obvious to one of ordinary skill in the art at the time of the invention.²³ Pet. 43–46 (discussing motivation to combine Hulkko and Gibson), 47–50 (discussing motivation to “use the modem[] of Hulkko modified with Gibson” as “cable modems” in view of Goldberg, Thacker, ITU-T J.83b,

²³ Petitioners refer to Goldberg and Thacker together as “the DOCSIS References.” Pet. 52.

and/or AAPA), 50–67 (discussing the application of the art to the claims).²⁴

1. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is set forth above. *See supra* § I.G.

2. Scope and Content of the Prior Art

a. Hulkko

Hulkko is directed to demodulation of an intermediate frequency signal by a sigma-delta converter. Ex. 1004, code (54). More particularly, Hulkko teaches “a receiver for receiving a modulated carrier signal comprising, a sigma-delta signal converter having at least one adder included in a feedback loop, characteri[z]ed in that the arrangement comprises a time discrete sampling means for down converting the modulated carrier signal prior to the feedback loop.” *Id.* at 2:31–37. Figure 2 is reproduced below:

²⁴ As discussed *infra* (*see* § III.B.3.a.i), we do not address Petitioners’ alternative challenge based on Hulkko, Gibson, Goldberg, Thacker, ITU-T J.83b, and/or AAPA because we do not find that the recitation of “cable modem” in the preamble of claim 1 is limiting. *See* Pet. 17 (presenting this alternative ground “if the Board finds that the preamble of claim 1 is limiting—and thus requires a ‘cable modem’”); *See also SAS Inst. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (nonprecedential) (stating that the “Board need not address issues that are not necessary to the resolution of the proceeding,” such as “alternative arguments with respect to claims [the Board] found unpatentable on other grounds”).

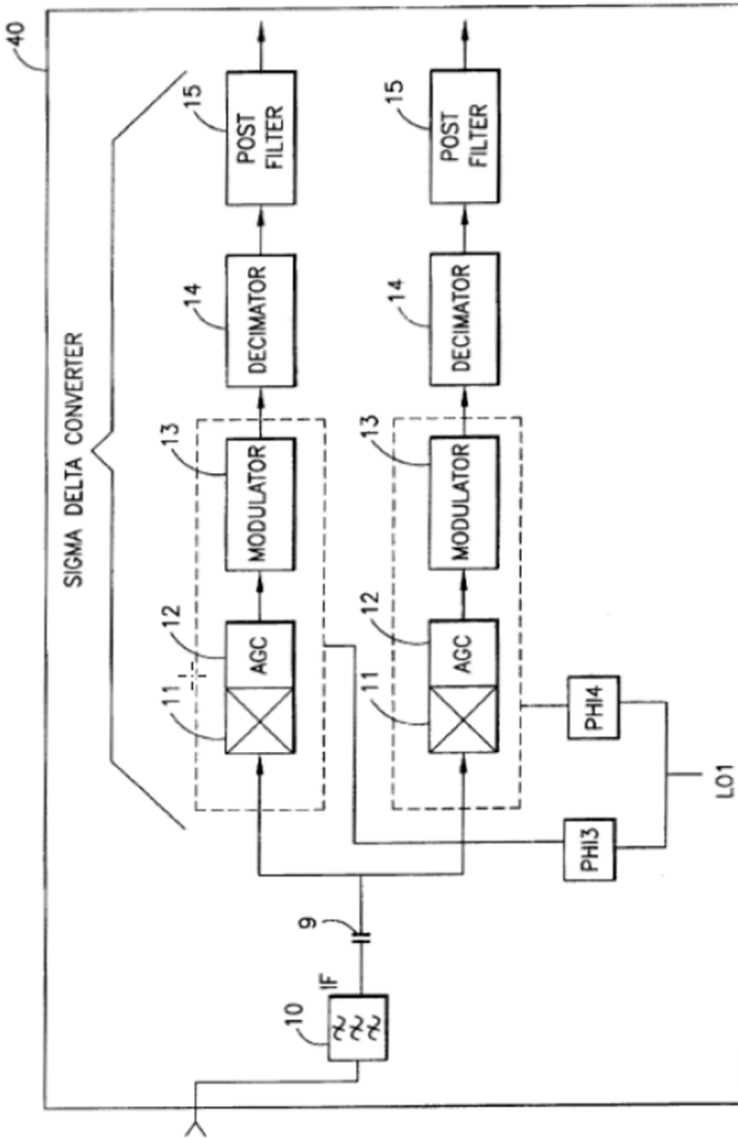


Fig 2

Figure 2 is a block diagram of a sigma-delta converter included in a receive arrangement. Ex. 1004, 3:33-35.

Hulkko explains the following regarding Figure 2:

The receive arrangement of an embodiment of the invention is illustrated in FIG. 2 using a sigma-delta analog-digital converter with a large dynamic input range in which a mixer 11 is implemented using switched capacitor switching elements 30–39 illustrated in FIG. 4. The receive arrangement of this embodiment receives radio signals for a radio telephone 40. The switched capacitor switching elements providing the mixing function of the mixer 11 are driven by a square wave local oscillator signal (LO1) at (or near) the frequency of the [intermediate frequency (“IF”)] signal. Both the mixer and the local oscillator signal are digital. Switched capacitor switching elements are also provided to implement an automatic gain controller (AGC) 12 providing an automatic gain control function for the circuit. The receive arrangement includes a bandpass filter 10, and each branch further includes a modulator 13 that converts signals from analog signals to digital signals, a decimator 14 and a post filter 15 which perform the same functions as the correspondingly named portions of the prior art receive arrangement illustrated in FIG. 1. The prefiltering of the signal (after modulation) can be designed to freely correspond to the design demands of the respective circuit and the dc-deviation of the sigma-delta converter can be corrected using the internal, digital correction of deviations.

The phase and frequency details for the local oscillator signals provided to the respective branches are as follows:

$$\text{PHI3}=+45^\circ$$

$$\text{PHI4}=-45^\circ$$

$$\text{LO1}=\text{IF}$$

A base-frequency output signal is obtained from the modulator after the decimator and the low-pass filter which can be processed to retrieve the modulating information. Because the signal entering the sigma-delta converter arrangement is an IF signal, only a short time-constant capacitor 9 is necessary for preventing dc signals from transferring to the sigma-delta converter. This means that the device can be powered up and down more quickly and as less power is required to power up, short term power downs are practical making the arrangement more power efficient than conventional receive arrangements.

Ex. 1004, 3:48–4:20.

Further referring to Figure 2, Hulkko states that

the inventive idea is realized in the circuit arrangement of this embodiment of the invention in accordance with which switched capacitor switching elements present in the input stage of a sigma-delta converter are used to implement the mixer 11 which directly demodulates the IF-signal into a base-frequency signal; in other words, the

IF-signal and its multiples are folded on the base frequency.

Id. at 5:39–46.

Hulkko's Figure 4 is reproduced below:

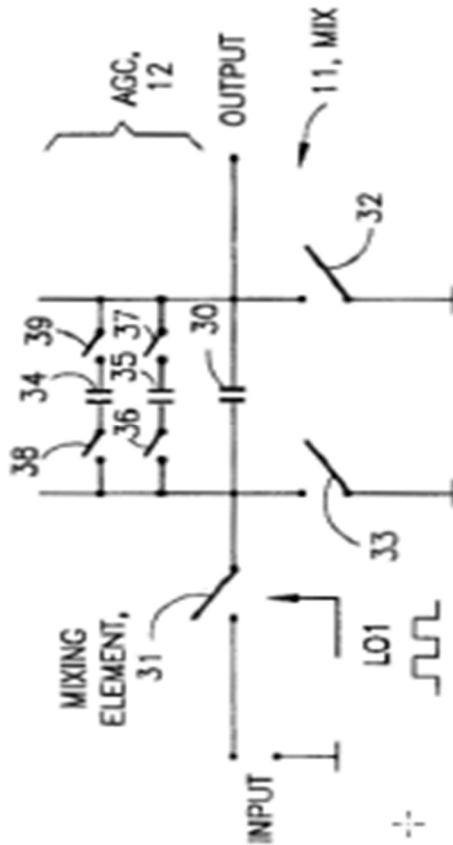


Fig 4

Figure 4 is a schematic representation of a switched capacitor switching element suitable for implementing the mixing and automatic gain control functions of the sigma-delta converter of Figure 2. Ex. 1004, 3:41–44.

Hulkko explains that Figure 4 “shows the input stage of the receive arrangement . . . of FIG. 2 showing switched capacitor switching elements of the mixer 11 and the AGC 12 in greater detail.” Ex. 1004, 4:61–64. Hulkko discloses that

[a] first capacitor 30 is used to sample end [sic] hold the incoming signal. First switches 31, 32 are closed to provide a sample to the first capacitor 30. Once the input signal has been sampled, a third switch 33 is closed to transfer the charge on the first capacitor 30 to the output. Second and third (and possibly further) capacitors 34, 35 are provided in parallel with the first capacitor 30. These are each controllably connected to the input and output through a pair of switches 36, 37; 38, 39. By closing the appropriate switches and adding parallel capacitance from one or more of the second and third capacitors 34, 35 the signal transfer ratio can be changed. The switches are under the control of an external cpu and can be used to replace automatic gain control steps of the circuit as a whole. In this way amplification steps can be included in the sigma-delta modulator by altering the ratios of the input capacitances.

Id. at 4:64–5:12. Hulkko further explains that “mixer 11 can be considered as a sample and a hold circuit that samples the input signal in synchronization with the oscillator and directs the samples to the output as a signal which remains constant for the period of the sampling interval.” *Id.* at 5:13–17.

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. 1005, 2:56–3:2.

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.83b

The International Telecommunication Union, Telecommunication Standardization Sector, describes the J.83b standard for “[d]igital multiprogramme systems for television, sound and data services for cable distribution,” including QAM television. *See* Ex. 1009, 1, 5 (indicating that Annex B describes the 64-and 256-QAM specifications).

f. AAPA

As AAPA, Petitioners rely on a portion of the '835 patent that describes several well-known devices for implementing the cable modem receivers, transmitters, and transceivers. In particular, Petitioners rely upon 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.

3. Differences Between the Prior Art and the Claims; Motivation to Modify

a. Claim 1

i. Element [1pre]

Element [1pre] recites “[a] cable modem for down-converting an electromagnetic signal having complex modulations, comprising.” Ex. 1001, 51:5–6. Petitioners assert that “Hulkko discloses a modem for down-converting an electromagnetic signal having complex modulations.” Pet. 51 (citing Ex. 1004, Fig. 2, 2:38–40). Petitioners contend that,

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

Id. at 51–52 (citing Ex. 1001, 2:1–3, 6:35–45; Ex. 1002 ¶¶ 146–149). Additionally, Petitioners argue that, “to the extent that ‘cable modem’ is limiting, it would have been obvious to use the modem of Hulkko (as modified by Gibson, discussed below) as a cable modem, in view of the DOCSIS References (Thacker, Goldberg), ITU-T J.83b, and AAPA.” *Id.* (citing Pet. § VIII.G.3; Ex. 1002 ¶ 150).

Patent Owner’s argument directed to element [1pre] focuses on the recitation of “a cable modem” in the preamble of claim 1. PO Resp. 69–71. In particular, Patent Owner asserts that Hulkko, as modified by

Gibson, does not “disclose/teach/suggest ‘a cable modem.’” *Id.* at 69–70. Additionally, Patent Owner asserts that it would not have been obvious to use the modem of Hulkko, modified by Gibson, as a cable modem even considering the additional references provided by Petitioners. *Id.* at 70–71.

First, because we determine that the term “cable modem” recited in the preamble of claim 1 is not limiting, *See supra* § II.B, we need not address Patent Owner’s arguments directed to that term. Second, Patent Owner does not assert that the other language recited in the preamble of claim 1 is limiting or that Hulkko fails to teach the additional recitations (i.e., “down-converting an electromagnetic signal having complex modulations”). We need not determine whether the other language in the preamble of claim 1 is limiting because we agree with Petitioners that Hulkko teaches “down-converting an electromagnetic signal having complex modulations” for the reasons argued by Petitioners, which are uncontested and which we adopt as our own findings.

Additionally, we need not address Petitioners’ alternative challenge based on Hulkko, Gibson, Goldberg, Thacker, ITU-T J.83b, and/or AAPA because we do not find that the recitation of “cable modem” in the preamble of claim 1 is limiting. *See* Pet. 17 (presenting this alternative ground “if the Board finds that the preamble of claim 1 is limiting—and thus requires a ‘cable modem’”); *See also* SAS, 138 S. Ct. at 1359 (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed*, 809 F. App’x at 990 (stating that the “Board need not address issues that are not necessary to the resolution of the proceeding,”

such as “alternative arguments with respect to claims [the Board] found unpatentable on other grounds”).

ii. Element [1A]

Element [1A] recites “an oscillator to generate an in-phase oscillating signal.” Ex. 1001, 51:7. Petitioners contend that “Hulkko discloses an oscillator (Fig. 2, ‘LO1’) to generate an in-phase signal.” Pet. 52 (citing Ex. 1002 ¶ 151; Ex. 1004, Fig. 2, 3:54–57). Petitioners provide the following annotated version of Hulkko’s Figure 2:

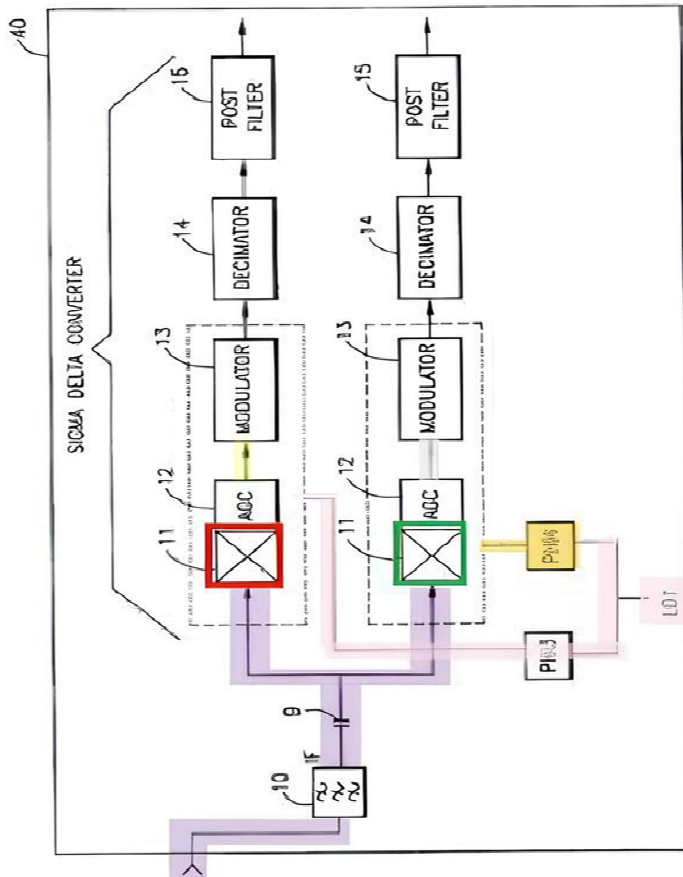


Fig.2

Pet. 53. Petitioners annotated Hulkko's Figure 2, "a block diagram of a sigma-delta converter included in a receive arrangement" (Ex. 1004, 3:33–35), to highlight the electromagnetic signal purple, one mixer 11 red, the other mixer 11 green, the in-phase oscillating signal (output of PHI3) pink, the quadrature-phase oscillating signal (travelling through PHI4) orange, a first sampled signal yellow, and a second sampled signal gray. *Id.* at 52. Petitioners contend that the in-phase oscillating signal "has a phase that is 90 degrees offset from the quadrature-phase oscillating signal." *Id.*

Patent Owner does not challenge Petitioners' analysis of element [1A]. *See generally* PO Resp.

We find Petitioners' arguments persuasive as to element [1A] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1A].

iii. 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 Hulkko's Figure 2 reproduced above, Petitioners contend that Hulkko teaches a "phase shifter ('PHI4') to receive said in-phase oscillating signal (pink) and to create a quadrature-phase oscillating signal (orange signal output from 'PHI4')." Pet. 53. Petitioners assert that "[t]he quadrature-phase oscillating signal is 90 degrees out of phase with the in-phase oscillating signal" (*id.* at 54 (citing Ex. 1004, 3:48–4:9)), and that "the in-phase signal (through PHI3) and the quadrature-phase signal (through PHI4) can be used for demodulating

an I/Q modulated signal” (*id.* (citing Ex. 1004, 6:35–45; Ex. 1002 ¶¶ 152–153)).

Petitioners also present an alternative position as to element [1B]:

To the extent it is argued or determined that Hulkko fails to disclose Element [1B], it would have been obvious to modify the arrangement of Hulkko’s PHI3 and PHI4 by eliminating PHI3 and replacing PHI4 with a 90 degree phase-shifter, such that the first mixer 11 (red) uses the signal from the local oscillator directly as the in-phase oscillating signal, and the 90 degree phase-shifter outputs a quadrature-phase oscillating signal to the second mixer 11 (green) as taught by Gibson.

Pet. 55. Petitioners provide the following annotated version of Gibson’s Figure 1:

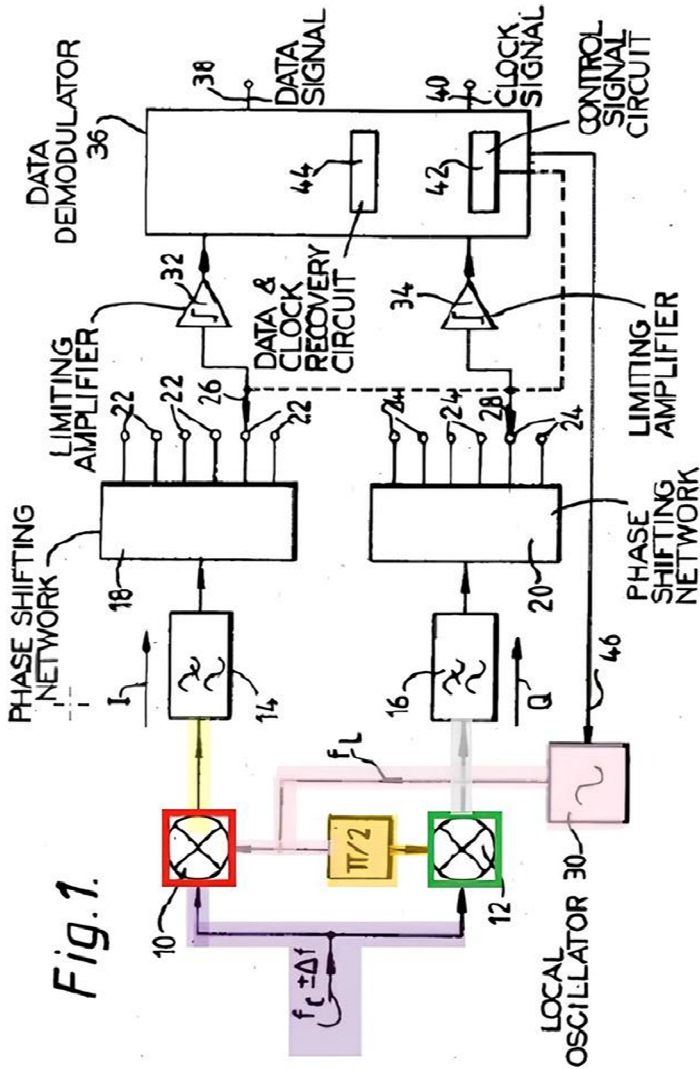


Fig. 1.

Id. Petitioners annotated Gibson's Figure 1, a block schematic circuit of a data receiver (Ex. 1005, 2:44-46), *inter alia*, to show a first mixer in a red box, a second mixer in a green box, an in-phase oscillating signal (pink), a phase shifter (orange), and a quadra-

ture-phase oscillating signal (orange signal from phase shifter $\pi/2$ output to green mixer 12). *Id.* (citing Ex. 1002 ¶¶ 154–155).

Petitioners assert that, although Hulkko “discloses that the oscillating signal supplied to first mixer 11 (through ‘PHI3’) is 90 degrees out of phase with the oscillating signal supplied to second mixer 12 (through ‘PHI4’). . . . [.] Hulkko does not describe the mechanism used to shift these signals 90 degrees out of phase from each other.” Pet. 44 (citations omitted). Petitioners contend that “Gibson shows that . . . it was conventional at the time of Hulkko to use a phase shifter to supply a quadrature-phase oscillating signal.” *Id.* And, Petitioners assert that Hulkko and Gibson “show that a [person of ordinary skill in the art] would have recognized the benefits of using a phase shifter as taught by Gibson, in that the receiver could be used to demodulate an I/Q modulated signal such as a QAM modulated signal.” *Id.*

Additionally, Petitioners contend that “combining Hulkko with Gibson would have yielded only expected, predictable results.” Pet. 45. In particular, Petitioners assert,

[j]ust as Hulkko teaches forming two control signals that are 90 degrees out of phase with each other by shifting a local oscillator signal by +45 degrees (Ex. 1004 at Fig. 2 “PHI3”) and –45 degrees (Fig. 2 “PHI4”), respectively (see *Id.* at 4:5–9), Gibson teaches forming two control signal[s] that are 90 degrees out of phase with each other by using a simpler structure—i.e., a single, 90 degree phase shifter (Ex. 1005 at Fig. 1 “ $\pi/2$ ”).

Pet. 45. Petitioners argue that the combination proposed would have been “a combination of prior art elements according to known methods to yield predictable results” because one of ordinary skill in the art “would have understood how to implement a phase shifter (as taught by Gibson) in the context of Hulkko” and the combination would have been “obvious to try—a choice of one type of phase shifting device from a finite number of identified, predictable solutions, with a reasonable expectation of success.” *Id.* (citing Ex. 1002 ¶ 136; KSR, 550 U.S. at 416–17; *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 458 F.3d 1157, 1162 (Fed. Cir. 2007)).

Patent Owner’s Response does not challenge Petitioners’ first alternative relying on Hulkko alone as teaching element [1B]. *See generally* PO Resp. We find Petitioners’ arguments that Hulkko alone teaches element [1B] persuasive and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko alone teaches element [1B].

We address Petitioners’ second alternative based on Hulkko and Gibson primarily because Petitioners rely on the combined teachings of these references when addressing at least dependent claim 15 (see Pet. 65–66 (relying on Gibson)), thus requiring a determination as to whether one of ordinary skill in the art would have been motivated to combine the teachings of Hulkko and Gibson. As to this alternative, Patent Owner contests whether one of ordinary skill in the art would have been motivated to combine Gibson with Hulkko. PO Resp. 81–82. Specifically, Patent Owner asserts that one of ordinary skill in the art

“would not be motivated to combine Gibson with Hulkko . . . because they are directed to fundamentally different and competing technologies; Gibson discloses a quadrature (non-sampling) mixer, whereas Hulkko . . . disclose[s] down-conversion by sampling.” *Id.* at 81 (citing Ex. 2038 ¶ 381). Patent Owner contends, “[s]ince Gibson/Hulkko disclose different types of systems, a [person of ordinary skill in the art] would not look to Gibson for components to use in Hulkko.” *Id.* at 82 (citing Ex. 2038 ¶¶ 387–388).²⁵

In their Reply, Petitioners contend (1) the circuits of Hulkko and Gibson are nearly identical and both are nearly identical to Figure 54B of the ’835 patent (Pet. Reply 27 (citing Pet. 1–7, 35–39)); (2) “Hulkko expressly encourages use of its switched capacitors as a mixer to perform down-conversion—the exact same function of the mixers disclosed in Gibson” (*id.* (citing Ex. 1004, 5:39–49)); and (3) the Petition sets forth several reasons for combining Hulkko with Gibson providing ample evidence supporting Petitioners’ argument that one of ordinary skill in the art would have been motivated to combine Hulkko with Gibson as proposed by Petitioners (*id.* at 27–28 (citing Pet. 43–46)).

In its Sur-reply, Patent Owner contends that Gibson discloses a non-sampling mixer, not a sampling system and that one of ordinary skill in the art “would not substitute a circuit that is specifically configured

²⁵ Patent Owner’s argument regarding motivation to combine is primarily directed to Petitioners’ challenge based on the combination of Gibson and Schiltz. *See* PO Resp. 81–82 (five paragraphs directed to Gibson and Schiltz as compared to one paragraph (particularly, one sentence) directed to Hulkko and Gibson, excluding the introduction and conclusion paragraphs).

to operate in one way (sampling) (Hulkko) with a circuit that is configured to operate in a completely different manner (non-sampling mixing) (Gibson).” PO Sur-reply 17–18.²⁶

Based on the full record, we find Petitioners’ motivation to combine argument regarding the second alternative persuasive. In particular, the distinction Patent Owner seeks to draw between Hulkko and Gibson generally, does not undermine Petitioners’ argument and evidence that the particular structures proposed for combination are substantially similar, operate in a similar manner, and would have been expected, by one of ordinary skill in the art, to function predictably and with a reasonable expectation of success, once combined. Notably, we find particularly persuasive Hulkko’s teaching to use its switched capacitors as a mixer to perform down-conversion, which is the same function as Gibson’s mixers. *See* Ex. 1004, 5:39–49 (“switched capacitor switching elements . . . are used to implement the mixer 11 which directly demodulates the IF-signal into a base-frequency signal”). Accordingly, we find that the combination of Hulkko and Gibson teaches element [1B] and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

iv. Element [1C]

Element [1C] recites “a first frequency down-conversion module to receive the electromagnetic

²⁶ Patent Owner’s other arguments are directed to Petitioners’ challenge based on Gibson and Schiltz.

signal and said in-phase oscillating signal.” Ex. 1001, 51:10–12. Relying on the same annotated version of Hulkko’s Figure 2, reproduced above in our discussion of element [1A], Petitioners contend that “Hulkko discloses a first frequency down-conversion module (red mixer 11) to receive the electromagnetic signal (purple) and said in-phase oscillating signal (pink).” Pet. 56. In particular, Petitioners assert that “[m]ixer 11 down-converts the received electromagnetic signal to baseband or an intermediate frequency.” *Id.* (citing Ex. 1004, 5:12–6:34, claim 1; Ex. 1002 ¶¶ 156–157).

Patent Owner does not challenge Petitioners’ analysis of element [1C]. *See generally* PO Resp.

We find Petitioners’ arguments persuasive as to element [1C] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1C].

v. Element [1D]

Element [1D] recites “a second frequency down-conversion module to receive the electromagnetic signal and said quadrature-phase oscillating signal.” Ex. 1001, 51:14–16. Relying on the same annotated version of Hulkko’s Figure 2, reproduced above in our discussion of element [1A], Petitioners contend that “Hulkko discloses a second frequency down-conversion module (green mixer 11) to receive the electromagnetic signal (purple) and said quadrature-phase oscillating signal (orange).” Pet. 57. Petitioners explain that

[t]he second frequency down-conversion module of Hulkko (green mixer 11) is

structurally identical to its first frequency down-conversion module (red mixer 11) discussed above with respect to Element [1C], the only difference being that the first down-conversion module receives the in-phase oscillating signal (pink) while the second down-conversion module receives the quadrature-phase oscillating signal (orange).

Id. at 57–58. Petitioners assert that, “[l]ike the first down-conversion module, the second down-conversion module (green mixer 11) down-converts the received electromagnetic signal to baseband or an intermediate frequency.” *Id.* (citing Ex. 1004, 5:12–6:34, 5:34–37, claim 1; Ex. 1002 ¶¶ 158–159).

Patent Owner does not challenge Petitioners’ analysis of element [1D]. *See generally* PO Resp.

We find Petitioners’ arguments persuasive as to element [1D] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1D].

vi. Element [1E]

Element [1E] recites “wherein said first frequency down-conversion module further comprises a first frequency translation module.” Ex. 1001, 51:17–18. Relying on an annotated version of Hulkko’s Figure 4, reproduced below, Petitioners contend that “Hulkko discloses that the first frequency down-conversion module (red mixer 11) comprises a first frequency translation module (blue switch 31).” Pet. 58.

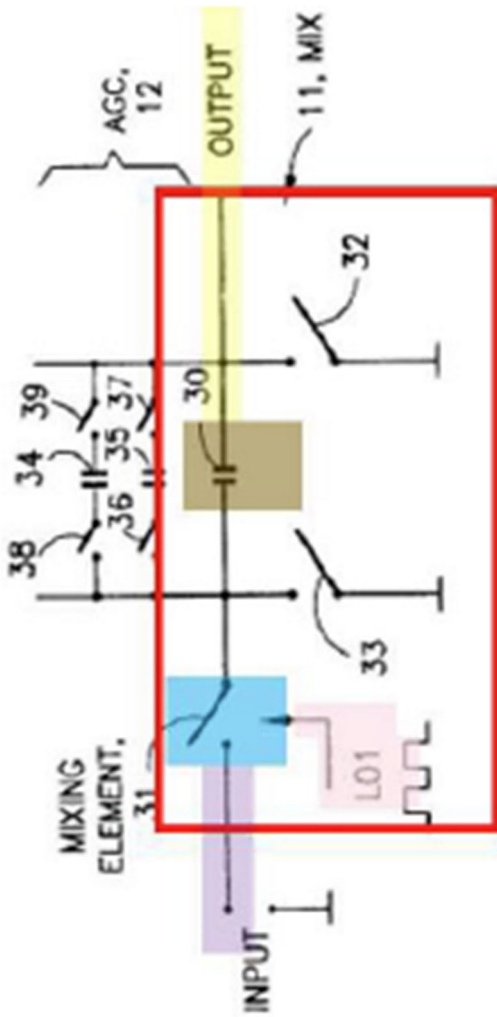


FIG.4

Id. at 59. Petitioners annotated Hulkko’s Figure 4, “a schematic representation of a switched capacitor switching element suitable for implementing the mixing and automatic gain control functions” of the sigma-delta converter of Figure 2 (Ex. 1004, 3:41–44),

to include a red box identifying mixer 11 and to highlight the input electromagnetic signal purple, switch 31 blue, in-phase oscillating signal pink, capacitor 30 brown, and a first sampled signal yellow. Petitioners provide the following quotation from Hulkko:

It is preferable to use the first switch 31 of the switched capacitor switching element as the mixing element. In this case, signal bands around the multiples of the frequency of the local oscillator signal LO1 are folded onto the base frequency. The local oscillator base frequency or its subharmonics can therefore be used to down convert the carrier signal to the base-band or a frequency approaching the base-band.

Pet. 59 (quoting Ex. 1004, 5:30–37) (citing Ex. 1004, 4:61–6:34, claims 2, 3; Ex. 1002 ¶¶ 160–161).

Patent Owner does not challenge Petitioners' analysis of element [1E]. *See generally* PO Resp.

We find Petitioners' arguments persuasive as to element [1E] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1E].

vii. Element [1F]

Element [1F] recites “and a first storage module.” Ex. 1001, 51:18– 19. Petitioners contend “the '835 patent at Figs. 20A and 20A-1 provide two examples of frequency down-conversion modules wherein a capacitor is used as the constituent storage module.” Pet. 60. Relying on the annotated version of Hulkko's

Figure 4 reproduced above in our discussion of element [1E], Petitioners assert that Hulkko “likewise uses a capacitor (brown capacitor 30) as the storage module of the claimed frequency down-conversion module.” *Id.* (citing Ex. 1004, 4:64–65, claim 3; Ex. 1002 ¶¶ 162–163).

Patent Owner contends that Hulkko’s capacitor 30 is not a “storage module.” PO Resp. 60. Patent Owner asserts that “[t]he Board and District Court agree that a ‘storage’ element/module ‘stores non-negligible amounts from an input electromagnetic signal.’ The Petition fails to set forth any argument/theory that the capacitor in Hulkko does so and, thus, the Petition fails.” *Id.* at 61.

Patent Owner raises at least two related arguments directed to element [1F]. First, Patent Owner asserts that Hulkko’s capacitor 30 is a sample-and-hold capacitor and thus Hulkko is “a sample-and-hold (voltage sampling) system.” PO Resp. 61. As an alleged voltage sampling system, Patent Owner contends that capacitor 30 is a holding element, not a storage element. *Id.*; *See Id.* at 62 (alleging that Hulkko’s system “seeks to (1) accurately represent the voltage of the input signal, and (2) take readings of voltage in a capacitor in order to recreate a baseband signal” and that “to accurately read voltage, the Hulkko capacitor only *holds negligible* amounts of energy (near zero)” by using a high impedance load); *See Id.* at 67–68 (arguing that “storage module” should be limited to an energy transfer system). This argument primarily is based on Patent Owner’s claim construction of “storage module,” which seeks to limit the term to “energy transfer systems.”

Second, Patent Owner argues that Hulkko’s capacitor 30 is not a “storage module” because it does not store non-negligible amounts of energy; rather, according to Patent Owner, capacitor 30 holds negligible amounts of energy. PO Resp. 62 (citing Ex. 2038 ¶ 313). Relying on Dr. Steer’s declaration testimony, Patent Owner contends that “one way to determine energy storage is to perform calculations based on a time constant.” *Id.* at 63 (citing Ex. 2038 ¶ 313). Patent Owner walks through three steps of calculations, spanning five pages of its Patent Owner Response (see *Id.* at 63–67), and, relying on those calculations, asserts that “[o]nly 0.5% of the energy available is held on a Hulkko capacitor” and that one of ordinary skill in the art would “understand that 0.5% is a *negligible* (nearly zero) amount of energy” *Id.* at 67 (citing Ex. 2038 ¶¶ 329–330).

In their Reply, Petitioners respond to both of Patent Owner’s arguments. First, Petitioners assert that the Board should reject Patent Owner’s attempt to read “energy transfer system” into the construction of “storage module.” Pet. Reply 1. For the reasons explained above, we do not agree with Patent Owner’s attempt to limit “storage module” to “energy transfer systems.” See *supra* § II.A. Rather, we determine that “storage module” means “a module of a system that stores non-negligible amounts of energy from an input EM signal.” See *Id.*

Second, Petitioners assert that Patent Owner “offers no principled reason for imposing” its mathematically “complex, three-step calculation that compares the ‘total available energy’ to the ‘energy in a capacitor.’” Pet. Reply 2 (citing PO Resp. 62–67). Petitioners contend that Patent Owner’s “newfound

‘mathematical’ construction-of-a-construction . . . contradicts its prior positions.” *Id.* Petitioners point to prior testimony regarding the meaning of a “non-negligible” amount of energy by named-inventor David Sorrells from litigation between Patent Owner and Qualcomm, Inc. (“Qualcomm”). *Id.* (citing, *inter alia*, *ParkerVision, Inc. v. Qualcomm Inc.*, 621 F. App’x 1009, 1018 (Fed. Cir. 2015)).

In particular, Petitioners contend that

Mr. Sorrells “explained at trial that transferring a non-negligible amount of energy into the storage capacitor means ‘that you have to transfer enough energy to overcome the noise in the system to be able to meet your specifications.’” 621 F. App’x at 1019 (emphasis added). Mr. Sorrells also testified that when a product functions according to its specifications, this “is proof that a ‘non-negligible’ amount of energy is transferred to the storage element in those products.” 621 F. App’x at 1019. “Mr. Sorrells’ testimony thus establishes that to determine whether or not energy in amounts distinguishable from noise has been transferred from the carrier signal, one may look to whether the down-converting circuit functions in practice. If a circuit successfully down-converts, that is proof that enough energy has been transferred to overcome the noise in the system.” *Id.* (emphasis added).

Pet. Reply 2–3. Petitioners assert that, “[h]ere, [Hulkko] indisputably discloses a capacitor within a circuit that ‘successfully down-converts’ a signal, and ‘that is proof’ that the capacitor stores non-negligible energy

under [Patent Owner's] original position.” *Id.* at 3 (citing *ParkerVision*, 621 F. App'x at 1019). Petitioners argue that “as its original construction was adopted by the courts, [Patent Owner] is collaterally estopped from advancing an entirely new ‘mathematical’ construction to try and create patentability.” *Id.* And, Petitioners assert that, “if the Board deems it necessary to provide a substituent construction of ‘non-negligible’ from its construction of ‘storage module,’ it should hold that when a device employs a capacitor in order to ‘successfully down-convert’ a signal, then ‘that is proof’ that the capacitor stores non-negligible energy.” *Id.* at 11 (citing *ParkerVision*, 621 F. App'x at 1019).²⁷

Turning to the relevant disclosures in *Hulkko*, Petitioners contend that *Hulkko*'s frequency translation modules “perform down conversion by sampling the input signal using a switched capacitor—which accumulates (i.e., integrates) charge (hence, energy)—exactly like the alleged invention of the '835 patent.” Pet. Reply 20. Petitioners contend that

“mixer 11 can be considered as a sample and a hold circuit that samples the input signal in synchronization with the oscillator and directs the samples to the output as a signal which remains constant for the period of the sampling interval.” Ex. 1004 at 5:13-17. A

²⁷ Petitioners also assert that Dr. Steer “failed to consider crucial materials in arriving at his opinion here, as he did not review Mr. Sorrell[s'] prior testimony regarding the meaning of ‘non-negligible,’ nor did he consider the Federal Circuit and District Court opinions relying on that testimony.” Pet. Reply 11 n.6 (citing Ex. 1016, 55:25–56:14, 60:5–67:20, 72:11–74:5).

“first capacitor 30 is used to sample [a]nd **hold** the incoming signal. . . . Once the input signal has been sampled, a third switch 33 is closed to **transfer the charge on the first capacitor 30** to the output.” *Id.* at 4:61-5:12 (emphasis added). Thus, the first capacitor 30 in Hulkko serves to store or “hold” non-negligible energy that has been sampled from the input EM signal, and then transfers that energy or “charge on the first capacitor” when the third switch is closed.

Pet. Reply 20–21. Petitioners assert that “[t]he **‘switched capacitor switching elements . . . are used to implement the mixer 11 which directly demodulates the IF-signal into a base-frequency signal.’**” *Id.* at 21 (emphasis by Petitioners) (citing Ex. 1004, 5:39–48; Ex. 1002 ¶¶ 120–123; Pet. 5–7, 35–37, 60). Thus, according to Petitioners, “because Hulkko’s capacitors successfully demodulate the signal ‘into a base-frequency signal’ (i.e., successfully perform down-conversion), **‘that is proof** that the capacitors store non-negligible energy under [Patent Owner’s] prior litigation position.” *Id.* (emphasis by Petitioners) (citing ParkerVision, 621 F. App’x at 1019).

Additionally, Petitioners argue that, “even under [Patent Owner’s] and Dr. Steer’s flawed mathematical construction of ‘non-negligible,’ the capacitors in Hulkko constitute ‘storage modules.’” Pet. Reply 21. Petitioners point to dependent claim 42 of the ’551 patent, arguing that the claim “instructs that ‘one tenth of one percent of the energy’ is ‘non-negligible,’” which means that “even under Dr. Steer’s spurious mathematical construction[,] the capacitors in Hulkko constitute ‘storage modules’” because 0.5% of the

energy is greater than 0.1% of the energy. *Id.* (citing Ex. 2027, claims 41, 42; Ex. 1016, 137:3–138:21).

In its Sur-reply, Patent Owner challenges Petitioners' reliance on Mr. Sorrells' testimony, contending that "instead of providing expert rebuttal, Petitioners chose to rely on out-of-context testimony by one inventor of the '835 patent and *attorney* interpretation of the cited references in view of that testimony." PO Sur-reply 1. Patent Owner asserts that it is not seeking to require a complex, three-step mathematical calculation to define non-negligible. *Id.* at 7. Rather, according to Patent Owner "whether mathematical calculations are used depends on the prior art's disclosure and, even then, does not require a specific calculation." *Id.* at 7 n.8. Patent Owner points to its arguments in the Patent Owner Response that the calculations show "one way" to determine energy storage. *Id.* In other words, Patent Owner suggests that there may be other ways to demonstrate non-negligible energy storage. *See Id.* But, Patent Owner asserts that "[n]on-negligible' is a relative term and must be demonstrated in some manner," which Petitioners fail to do. *Id.* at 7–8.

Patent Owner contends that Petitioners' argument based on Mr. Sorrells' prior testimony is flawed because (1) "it is a concept and just attorney argument"; (2) the concept is solely based on extrinsic evidence—testimony by one inventor years after the '835 patent issued; and (3) Petitioners ignore key portions of Mr. Sorrells' testimony. PO Sur-reply 8. Patent Owner walks through Mr. Sorrells' testimony, contending that Petitioners' argument fails to accurately reflect both his actual testimony and how the testimony was applied by the Federal Circuit in its prior decision. *Id.*

at 9–14. Patent Owner asserts that the “two key take-aways” from the Federal Circuit’s decision are “(1) Mr. Sorrells’s position is one way (not the only way) of determining non-negligible amounts of energy, and (2) whether a circuit ‘successfully’ down-converts depends on whether it meets cellular/wireless specifications.” *Id.* at 12.

Patent Owner’s primary argument in response to Petitioners’ reliance on Mr. Sorrells’ testimony is that Petitioners do not address whether the prior art references meet cellular/wireless specifications.²⁸ PO Sur-reply 13–14. Patent Owner contends that, “if Petitioners are going to follow the Federal Circuit’s decision, simply showing the prior art down-converts a signal is not enough. Petitioners must show that the prior art ‘successfully’ down-converts a signal. To do so, Petitioners must identify cellular/wireless specifications and demonstrate that the prior art meet those specifications.” *Id.* at 13. Patent Owner asserts that Petitioners “ignore the requirement of ‘successfully’ down-converting because they cannot prove it.” *Id.* Specifically, Patent Owner argues that “there is no concept of cellular/wireless specifications to be met in those references, there is no evidence that such specifications were met, and there is no expert testimony otherwise. There is simply no evidence for Petitioners to meet their burden.” *Id.* at 13–14. By not relying on

²⁸ Patent Owner also contends that Mr. Sorrells’ testimony is directed to “transferring” energy to a capacitor whereas the claims here pertain to “storing” energy in a capacitor. PO Sur-reply 13. Nonetheless, Patent Owner does not argue that this difference results in any distinction in terms of our consideration of the primary question before us—whether the prior art teaches a “storage module.”

a reply declaration, Patent Owner contends that Petitioners are left only with attorney argument and that Hulkko and Schiltz perform down-conversion. *Id.* at 14. But, according to Patent Owner, performing down-conversion alone, “says nothing about how [Hulkko’s and Schiltz’s] systems work and does not meet Mr. Sorrells’s standard.” *Id.* Further, Patent Owner argues that Petitioners’ position is “illogical” because voltage sampling systems also perform down-conversion, but they use capacitors that hold negligible amounts of energy. Thus, it cannot follow that merely because down-conversion occurs, that means Hulkko’s and Schiltz’s capacitors store a non-negligible amount of energy. *Id.*

As reflected above, element [1F] recites “a first storage module.” Ex. 1001, 51:18–19. As also reflected above, the parties dispute the proper construction of “storage module” and also dispute the meaning of the construction. In other words, there are multiple levels of complexity regarding the dispute between the parties pertaining to this limitation. For the reasons discussed above, we construe “storage module” to mean “a module of a system that stores non-negligible amounts of energy from an input EM signal.” See *supra* § II.A. That determination resolves the first level of the parties’ dispute because we do not construe “storage module” as limited to an energy transfer system.

The second level of the parties’ dispute, to which the discussion above is primarily directed, is the meaning of “non-negligible amounts of energy.” On this point, although Patent Owner presents a multi-step series of calculations, Patent Owner expressly states that determining whether an amount of energy

is a non-negligible amount of energy “does not require a specific calculation” (PO Sur-reply 7 n.8) and that its calculations are but “one way” to approach the question (*id.*). Additionally, Patent Owner acknowledges that Mr. Sorrells’ testimony also provides “one way” of determining a non-negligible amount of energy. *Id.* at 12. Yet, as discussed in several instances at the oral hearing, Patent Owner cannot or would not identify any specific amount that indicates when a negligible amount of energy becomes a non-negligible amount of energy. *See, e.g.*, Tr. 73:15–18, 77:18–79:11. Patent Owner’s arguments give the impression that a non-negligible amount of energy is a moving target because Patent Owner is the only party that can tell when an amount is negligible or non-negligible, a non-negligible amount is relative, and it depends on the circuit in question at any given time.

Fortunately, the Federal Circuit already has addressed essentially the same question. In *ParkerVision, Inc. v. Qualcomm Inc.*, the Federal Circuit addressed claims of several patents, including the ’551 patent—the precise patent on which the parties rely to explain the meaning and application of “storage module.” *ParkerVision*, 621 F. Appx. at 1011 (identifying four patents at issue). Claim 23 of the ’551 patent, which the Federal Circuit identified as a representative claim, is directed to an apparatus for down-converting a carrier signal to a lower frequency signal, comprising, *inter alia*, “a storage module” and recites “wherein said storage module receives non-negligible amounts of energy transferred from a carrier signal.” *Id.* As part of its cross-appeal, Qualcomm argued that claim 23, and others, should have been held invalid by the district court. *See Id.* at 1017–18.

One of the arguments raised by Patent Owner, similar to the one here, was that the prior art at issue did not disclose transferring non-negligible amounts of energy from a carrier signal to a storage capacitor. *See Id.* at 1018 (“First, Weisskopf²⁹ does not disclose transferring ‘non-negligible amounts of energy’ from the carrier signal to the storage capacitor.”).

In addressing that argument by Patent Owner, the Federal Circuit explained, “[t]he asserted claims all require transferring ‘non-negligible amounts of energy’ from the carrier signal to a store device, such as the storage capacitor in Weisskopf.” *ParkerVision*, 621 F. Appx. at 1018. The Federal Circuit explained that “[t]he district court construed ‘non-negligible amounts of energy’ to mean ‘energy in amounts that are distinguishable from noise.’” *Id.* And, the Federal Circuit noted that the “construction is not disputed on appeal.” *Id.* Here, neither party has provided any sufficient reason why we should construe “non-negligible amounts of energy” differently than the Federal Circuit in *ParkerVision*. Accordingly, because this specific issue of what amounts to “non-negligible amounts of energy” was already decided by the Federal Circuit, we construe this term to mean “energy in amounts that are distinguishable from noise.”³⁰

²⁹ P.A. Weisskopf, “Subharmonic Sampling of Signal Processing Requirements,” *Microwave Journal*, May 1992, 239–47. The same article is Exhibit 1023 in IPR2014-00948.

³⁰ The intrinsic record does not define “non-negligible amounts of energy,” but the ’551 patent does state, when referring to an energy transfer signal, that it includes “a train of pulses having non-negligible apertures that tend away from zero.” Ex. 2027, 66:36–39 (emphasis added); *See also* Ex. 1001, 10:31–32 (“In another embodiment, the pulses of control signal 2006 have non-

The next logical question the Federal Circuit faced in *ParkerVision* was how to determine if energy in amounts that are distinguishable from noise is transferred from the carrier signal to the storage device. *ParkerVision*, 621 F. Appx. 1018–19. The Federal Circuit relied on Mr. Sorrells’ testimony to answer this specific question. The Federal Circuit stated:

Mr. Sorrells explained at trial that transferring a non-negligible amount of energy into the storage capacitor means “that you have to transfer enough energy to overcome the noise in the system to be able to meet your specifications.” He further testified that the fact that the accused Qualcomm products meet “all of the cellular/cellphone specifications” is proof that a “non-negligible” amount of energy is transferred to the storage element in those products.

Mr. Sorrells’ testimony thus establishes that to determine whether or not energy in amounts distinguishable from noise has been transferred from the carrier signal, one may look to whether the down-converting circuit functions in practice. If a circuit successfully down-converts, that is proof that enough energy has been transferred to overcome the

negligible apertures that tend away from zero.”). Even if we applied a meaning of non-negligible as tending away from zero, that construction would not assist in resolving the parties’ dispute because neither party can explain where to draw the line between negligible and non-negligible amounts of energy simply based on that meaning. Thus, the Federal Circuit’s decision provides a better basis from which to understand the meaning of non-negligible in this context.

noise in the system.

Id. at 1019.³¹

Having decided how to determine whether energy in amounts distinguishable from noise has been transferred to a storage module, the Federal Circuit turned to testimony provided by Qualcomm’s expert, who the Federal Circuit found “testified, without contradiction, that the Weisskopf system is designed to maximize the amount of energy transferred from the carrier signal.” *ParkerVision*, 621 F. Appx. at 1019. The Federal Circuit concluded that “[t]he fact that Weisskopf transfers as much energy as possible from the carrier signal, resulting in a commercially viable down-converting system is proof that the system successfully distinguishes the transferred energy from noise.” *Id.*

Applying the discussion above, we first recognize that, although claim 1 does not expressly recite transferring energy from the carrier signal to the storage device, the construction we adopt for “storage module” is “a module of a system that stores non-negligible amounts of energy from an input EM signal.” Thus, the language we consider is substantially similar to the language at issue in *ParkerVision*. In both circumstances, energy from a signal is stored at a storage module/device. And, neither party raises any specific reason why the Federal Circuit’s analysis would not apply equally here.³² Accordingly, Patent

³¹ Mr. Sorrells’ testimony was directed to the issue of infringement (hence the discussion of “the accused Qualcomm products”). *ParkerVision*, 621 Fed. Appx. at 1012 (“To prove infringement, *ParkerVision* called . . . David Sorrells, one of the inventors.”).

³² In fact, Patent Owner acknowledges that “Mr. Sorrells’s position

Owner’s argument that the Federal Circuit “refers to transferring energy to a capacitor to overcome noise whereas Petitioners refer to storing energy in a capacitor” is a distinction without a difference. *See* PO Sur-reply 13.

Second, we disagree with Patent Owner’s strained reading of the Federal Circuit’s decision and with Patent Owner’s argument that places far too much emphasis on what Patent Owner contends the Federal Circuit meant by “successfully” down-converting. Patent Owner asserts that to show Hulkko successfully down-converts, in accordance with the Federal Circuit’s decision, Petitioners were required to “identify cellular/wireless specifications and demonstrate that the prior art meet[s] those specifications.” PO Sur-reply 13. We disagree because the Federal Circuit’s decision fails to support Patent Owner’s argument. In particular, when considering whether Weisskopf satisfied this aspect of the claims at issue in that case, the Federal Circuit did not identify or rely on evidence regarding cellular or wireless specifications.³³ Rather, the Federal Circuit noted that Weisskopf transfers as

is one way (not the only way) of determining non-negligible amounts of energy.” PO Sur-reply 12.

³³ Patent Owner focuses primarily on the Federal Circuit’s discussion of Mr. Sorrells’ testimony regarding Qualcomm’s accused products as opposed to considering how the Federal Circuit specifically *applies that testimony* to determining whether Weisskopf (an anticipatory reference) satisfies the test for infringement set forth by Mr. Sorrells. We also note that, in *ParkerVision*, despite Mr. Sorrells’ testimony, Patent Owner contended that Weisskopf failed to disclose transferring non-negligible amounts of energy, a position the Federal Circuit found “[n]o reasonable jury could have concluded. . . .” *See ParkerVision*, 621 F. Appx. at 1019.

much energy as possible resulting in a “commercially viable down-converting system” and that was “proof that the system successfully distinguishes the transferred energy from noise.” *ParkerVision*, 621 F. Appx. at 1019. The Federal Circuit’s discussion does not identify how the court determined that Weisskopf’s system was commercially viable. But, Weisskopf is an article, not an issued patent, such as *Hulkko*.³⁴ And, *Hulkko* expressly states that “[e]mbodiments of the invention can be utilized advantageously in, for example, radio telephones.” Ex. 1004, 3:23–34; *See Id.* at 4:21–24 (discussing radio telephone 40), 6:46–52 (discussing use of a circuit arrangement as “especially significant for radio telephones”); *See also* Tr. 101:2–8 (addressing *Hulkko*’s identification of commercial uses). Accordingly, because *Hulkko* is a patent that is presumed to be enabled such that it operates in a manner that successfully down-converts and does so in a commercially viable system that can be used for radio telephones, we find that constitutes sufficient evidence that *Hulkko*’s capacitor 30 is a “storage module” as that term is used in the context of the ’835 patent. In other words, *Hulkko*’s capacitor 30 is “a module of a system that stores non-negligible amounts of energy [i.e., energy in amounts that are distinguishable from noise] from an input EM signal.”³⁵ Thus, we find

³⁴ As an issued patent, *Hulkko* is presumed to be enabled. *See, e.g., Cephalon v. Watson Pharms., Inc.*, 707 F.3d 1330, 1337 (Fed. Cir. 2013) (recognizing that an issued patent is presumed to be enabled).

³⁵ In light of our determination, we need not also address the parties’ arguments regarding dependent claim 42 of the ’551 patent and whether 0.1% is a non-negligible amount of energy.

that Petitioners have shown that Hulkko teaches element [1F].

viii. 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 Hulkko’s Figure 2, reproduced above in our discussion of element [1A], Petitioners contend that

Hulkko discloses that the first frequency down-conversion module (red mixer 11 in Figure 2, comprising blue switch 31 and brown capacitor 30 as shown in [Petitioners’ annotated version of Hulkko’s] Figure 4[, reproduced above in our discussion of element [1E]]) samples the electromagnetic signal (purple) at a rate that is a function of said in-phase oscillating signal (pink), thereby creating a first sampled signal (yellow, labelled “output” in Figure 4).

Pet. 61. To further support its argument, Petitioners provide the following quotation from Hulkko:

It is preferable to use the first switch 31 of the switched capacitor switching element as the mixing element. In this case, signal bands around the multiples of the frequency of the local oscillator signal LO1 are folded onto the base frequency. The local oscillator base frequency or its subharmonics can therefore be used to down convert the carrier signal to the base-band or a frequency approaching

the base-band.

Id. at 62 (quoting Ex. 1004, 5:30–37) (citing Ex. 1004, 4:61–6:34, claims 2, 3; Ex. 1002 ¶¶ 164–165).

Patent Owner does not challenge Petitioners’ analysis of element [1G]. *See* generally PO Resp.

We find Petitioners’ arguments persuasive as to element [1G] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1G].

ix. Element [1H]

Element [1H] recites “said second frequency down-conversion module further comprises a second frequency translation module.” Ex. 1001, 51:23–24. Referring to their arguments directed to element [1E], Petitioners reiterate that “Hulkko discloses using a first frequency translation module comprising a switch 31 that is controlled by a control signal.” Pet. 63. Referring to the previously reproduced annotated versions of Hulkko’s Figures 2 and 4, Petitioners contend that “[t]he second frequency down-conversion module is in lower mixer 11 (green) in Hulkko’s Figure 2 and is structurally identical to the first frequency down-conversion module (shown in Figure 4) discussed above.” *Id.* Petitioners explain that “the control signal that controls switch 31 in the second[] frequency down[-]conversion module (lower mixer 11, green in Figure 2) is the quadrature-phase oscillating signal coming from PHI4 in Figure 2 (orange).” *Id.* (citing Ex. 1002 ¶¶ 166–167).

Patent Owner does not challenge Petitioners' analysis of element [1H]. *See generally* PO Resp.

We find Petitioners' arguments persuasive as to element [1H] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1H].

x. Element [1I]

Element [1I] recites “and a second storage module.” Ex. 1001, 51:24– 25. Relying on the same annotated figures of Hulkko, Petitioners contend that “[t]he second storage module (in lower mixer 11 in Figure 2) is the same as the first storage module (in upper mixer 11) discussed above with respect to Element [1F], each comprising a respective capacitor 30, as shown in Figure 4.” Pet. 63 (citing Ex. 1002 ¶ 168).

We have addressed Patent Owner's arguments directed to whether Hulkko discloses a “storage module” in the context of our consideration of element [1F] (“a first storage module”) and that same discussion and analysis apply equally here. Accordingly, for the same reasons explained in the context of our consideration of element [1F], we find that Petitioners have shown that Hulkko teaches element [1I].

xi. 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 figures of Hulkko, Petitioners assert that

Hulkko discloses that the second frequency down-conversion module (green mixer 11 in Figure 2, comprising switch 31 and capacitor 30 as shown in Figure 4) samples the electromagnetic signal (purple) at a rate that is a function of said quadrature-phase oscillating signal (orange signal from “PHI4”), thereby creating a second sampled signal (gray in Figure 2 . . . , labelled “output” in Figure 4).

Pet. 64 (citing Ex. 1004, 5:30–37, 4:61–6:34, claims 2, 3; Ex. 1002 ¶¶ 169–170).

Patent Owner does not challenge Petitioners’ analysis of element [1J]. *See generally* PO Resp.

We find Petitioners’ arguments persuasive as to element [1J] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Hulkko teaches element [1J].

xii. Summary as to Claim 1

For the reasons discussed above, we find that Petitioners have established on the complete record before us that the combination of Hulkko and Gibson teaches the subject matter 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 Petitioners with a reasonable expectation of success in so doing.

b. Dependent Claims 12, 15, and 17

Claims 12, 15, and 17 depend, directly or indirectly, from claim 1. Petitioners set forth argument with supporting evidence as to how the combination of Hulkko and Gibson teaches each element of claims 12, 15, and 17. Pet. 65–67. Patent Owner does not challenge Petitioners’ analysis of claims 12, 15, and 17 in the Patent Owner Response.³⁶ *See generally* PO Resp.

We find Petitioners’ arguments supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that the combination of Hulkko and Gibson teaches the subject matter of claims 12, 15, and 17 and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

4. Objective Indicia of Nonobviousness

Patent Owner contends that, “[i]n the late 1990s through March 2000, there was a long-felt need for a solution for direct down-conversion.” PO Resp. 21. Patent Owner asserts that “[t]he industry was looking to voltage sampling and mixing using nonlinear or time-varying elements to solve the direct down-conversion problem. But these solutions had their own

³⁶ As noted above, Patent Owner raised a new argument, directed to dependent claim 17’s recitation of “cable modem,” during the oral argument, which we find waived because it was not raised in the Patent Owner Response. *See* Paper 15 (Scheduling Order), 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”).

problems (e.g., too much noise) and were never widely implemented commercially (if at all).” *Id.* (citing Ex. 2038 ¶¶ 277–280).

Patent Owner contends that “[u]sing energy sampling at the time was counter-intuitive and against the thinking of the industry, which was looking to replicate the voltage of the RF signal and use that voltage to derive a baseband signal. Energy sampling did not accurately replicate the voltage of an RF signal.” PO Resp. 21. Patent Owner asserts that

[e]nergy sampling had a number of unexpected results: an energy sampling downconverter (1) enables selection of just one channel from a band, (2) uses enough of the available RF energy so that the desired baseband signal stands out from the noise which, in turn, improves RF receiver performance, lowers power consumption, allows for reduction/elimination of expensive/bulky external components, and (3) is surprisingly linear (at the time of the invention, the common understanding was that competing mixing technologies were nonlinear).

Id. at 22 (citing Ex. 2038 ¶¶ 282–286). Patent Owner argues that “[u]nknown at this time by industry and academia was that, by using an energy transfer system, RF receivers could be built smaller, cheaper and with improved performance.” *Id.* Patent Owner contends that Qualcomm recognized the significance of Patent Owner’s energy transfer system “as set forth in the challenged claims” and subsequently Qualcomm and others in the industry “transitioned away from superheterodyne receivers and mixer technology and began to use the energy transfer

system set forth in the challenged claims.” *Id.* (citing Ex. 2038 ¶ 287).

In its discussion of Hulkko, Patent Owner contends that it would not have been obvious to one of ordinary skill in the art “to replace the voltage sampling configuration of Hulkko with an energy sampling configuration.” PO Resp. 68. And, Patent Owner contends that “secondary considerations of non-obviousness demonstrate that, at the time of the invention, (1) such a dramatic modification of Hulkko was not envisioned by a [person of ordinary skill in the art] and (2) the challenged claims are not obvious in view of Hulkko.” *Id.* Patent Owner contends that “[o]ne would have to use hindsight to modify Hulkko to use a low impedance load and energy sampling to get to the claimed invention.” *Id.* (citing Ex. 2038 ¶ 334).

Objective indicia of nonobviousness are “only relevant to the obviousness inquiry ‘if there is a nexus between the claimed invention and the [objective indicia of nonobviousness].” *In re Affinity Labs of Tex., LLC*, 856 F.3d 883, 901 (Fed. Cir. 2017) (quoting *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1312 (Fed. Cir. 2006)). For objective indicia of nonobviousness to be accorded substantial weight, their proponent must establish a nexus between the evidence and the merits of the claimed invention. *ClassCo, Inc., v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016). “[T]here is no nexus unless the evidence presented is ‘reasonably commensurate with the scope of the claims.’” *Id.* (quoting *Rambus Inc. v. Rea*, 731 F.3d 1248, 1257 (Fed. Cir. 2013)).

A patentee is entitled to a presumption of nexus “when the patentee shows that the asserted objective

evidence is tied to a specific product and that product ‘embodies the claimed features, and is coextensive with them.’” *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018) (quoting *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000))); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33, 32 (PTAB Jan. 24, 2020) (precedential, designated Apr. 14, 2020). On the other hand, a patentee is not entitled to a presumption of nexus if the patented invention is only a component of a commercially successful machine or process. *Fox Factory*, 944 F.3d at 1373 (reaffirming the importance of the “coextensiveness” requirement).

“[T]he purpose of the coextensiveness requirement is to ensure that nexus is only presumed when the product tied to the evidence of secondary considerations ‘is the invention disclosed and claimed.’” *Fox Factory*, 944 F.3d at 1374 (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). “[T]he degree of correspondence between a product and a patent claim falls along a spectrum. At one end of the spectrum lies perfect or near perfect correspondence. At the other end lies no or very little correspondence.” *Id.* “A patent claim is not coextensive with a product that includes a ‘critical’ unclaimed feature that is claimed by a different patent and that materially impacts the product’s functionality.” *Id.* at 1375.

However, “[a] finding that a presumption of nexus is inappropriate does not end the inquiry into secondary considerations.” *Fox Factory*, 944 F.3d at 1375. “To the contrary, the patent owner is still

afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the ‘direct result of the unique characteristics of the claimed invention.’” *Id.* at 1373–74 (quoting *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)). “Where the offered secondary consideration actually results from something other than what is both claimed and novel in the claim, there is no nexus to the merits of the claimed invention,” meaning that “there must be a nexus to some aspect of the claim not already in the prior art.” *In re Kao*, 639 F.3d 1057, 1068–69 (Fed. Cir. 2011) (emphasis in original). On the other hand, there is no requirement that “objective evidence must be tied exclusively to claim elements that are not disclosed in a particular prior art reference in order for that evidence to carry substantial weight.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1331 (Fed. Cir. 2016). A patent owner may show, for example, “that it is the claimed combination as a whole that serves as a nexus for the objective evidence; proof of nexus is not limited to only when objective evidence is tied to the supposedly ‘new’ feature(s).” *Id.* at 1330.

Ultimately, the fact finder must weigh the objective indicia evidence presented in the context of whether the claimed invention, as a whole, would have been obvious to a skilled artisan. *WBIP*, 829 F.3d at 1331–32. Once the patentee has presented a prima facie case of nexus, the burden of coming forward with evidence in rebuttal shifts to the challenger “to adduce evidence to show that the commercial success was due to extraneous factors other than the patented invention.” *Demaco*, 851 F.2d at 1393.

Here, we first note that Patent Owner’s arguments as to objective indicia appear to be responding to a

position not asserted by Petitioners—to replace the voltage sampling configuration of Hulkko with an energy sampling configuration. *See* PO Resp. 68. Petitioners do not propose to modify Hulkko as Patent Owner contends. *See, e.g.*, Pet. 43–46. And, as discussed above, we decline to construe “storage module” as limited to an “energy transfer system.” *See supra* § II.A. Thus, in large part, Patent Owner’s arguments as to nonobviousness do not respond to Petitioners’ arguments and evidence discussed above.

Nonetheless, even assuming that all or some of Patent Owner’s arguments and Dr. Steer’s testimony are directed to the combination proposed by Petitioners, Patent Owner’s evidence of nonobviousness remains insufficient to “be accorded substantial weight” because Patent Owner fails to “establish a nexus between the evidence and the merits of the claimed invention.” *ClassCo*, 838 F.3d at 1220. In particular, neither Patent Owner nor Dr. Steer makes any attempt to establish nexus with the elements recited in any specific challenged claim based on a presumption of co-extensiveness or otherwise. Rather, Patent Owner and Dr. Steer only tie the discussion to energy transfer systems or energy sampling *in general*, which is based on Patent Owner’s proposed claim construction that we do not adopt, and make no attempt to tie their discussion to the specific language of any of the Challenged Claims. *See* Ex. 2038 ¶¶ 277–288 (referring generally to “energy sampling as set forth in the challenged claims”). Thus, we find that Patent Owner fails to establish that a presumption of nexus is warranted and similarly fails to establish nexus absent the presumption. Accordingly, for the reasons above, Patent Owner has not satisfied its burden to

establish nexus. See *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999) (patent owner “bears the burden of showing that a nexus exists”).

Nonetheless, in spite of the above failures, we consider Patent Owner’s weak evidence of nonobviousness in our weighing of the Graham factors below.

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.” *Arctic Cat*, 876 F.3d at 1361. On balance, considering the complete record before us and for the reasons explained above, the evidence of obviousness is very strong and the evidence of nonobviousness, which includes Patent Owner’s objective evidence of nonobviousness, is very weak. As a result of that balancing, we determine that Petitioners have established by a preponderance of the evidence that the combination of Hulkko and Gibson would have rendered the subject matter of claims 1, 12, 15, and 17 obvious to one of ordinary skill in the art at the time of the invention.

C. Obviousness over Gibson and Schiltz, and Alternatively Gibson, Schiltz, Goldberg, Thacker, ITU-T J.83b, and/or AAPA

Petitioners assert the combination of Gibson and Schiltz, and alternatively the combination of Goldberg, Thacker, ITU-T J.83b, and/or AAPA, would have rendered the subject matter of claims 1, 12–15, and 17– 20 obvious to one of ordinary skill in the art at the

time of the invention.³⁷ Pet. 46–47 (discussing motivation to combine Gibson and Schiltz), 47–50 (discussing motivation to “use the modem[] of . . . Gibson modified with Schiltz” as a “cable modem[]” in view of Goldberg, Thacker, ITU-T J.83b, and/or AAPA), 67–85 (discussing the application of the art to the claims).³⁸

1. Level of Ordinary Skill in the Art

The level of ordinary skill in the art at the time of the invention is discussed above. *See supra* § I.G.

³⁷ Although the heading on page 67 of the Petition omits dependent claim 17 (see Pet. 67 (listing claims 1, 12–15, and 18–20)), Petitioners’ argument under these challenges include claim 17 (*see Id.* at 83 (discussing claim 17)) and claim 17 is listed in Petitioners’ identification of the obviousness ground based on the combination of Gibson and Schiltz under the section titled “Grounds for Challenge” (*see Id.* at 17).

³⁸ As discussed *infra* (see § III.C.3.a.i), we do not address Petitioners’ alternative challenge based on Gibson, Schiltz, Goldberg, Thacker, ITU-T J.83b, and/or AAPA because we do not find that the recitation of “cable modem” in the preamble is limiting. *See* Pet. 17 (presenting this alternative ground “if the Board finds that the preamble of claim 1 is limiting—and thus requires a ‘cable modem’”); *See also* SAS, 138 S. Ct. at 1359 (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed*, 809 F. App’x at 990 (stating that the “Board need not address issues that are not necessary to the resolution of the proceeding,” such as “alternative arguments with respect to claims [the Board] found unpatentable on other grounds”).

2. Scope and Content of the Prior Art

a. Gibson, Goldberg, Thacker, ITU-T J.83b, and AAPA

The scope and content of Gibson, Goldberg, Thacker, ITU-T J.83b, and AAPA are described above. *See supra* §§ III.B.2.b–f.

b. Schiltz

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. 1006, 1:7–10. Figure 1 is reproduced below:

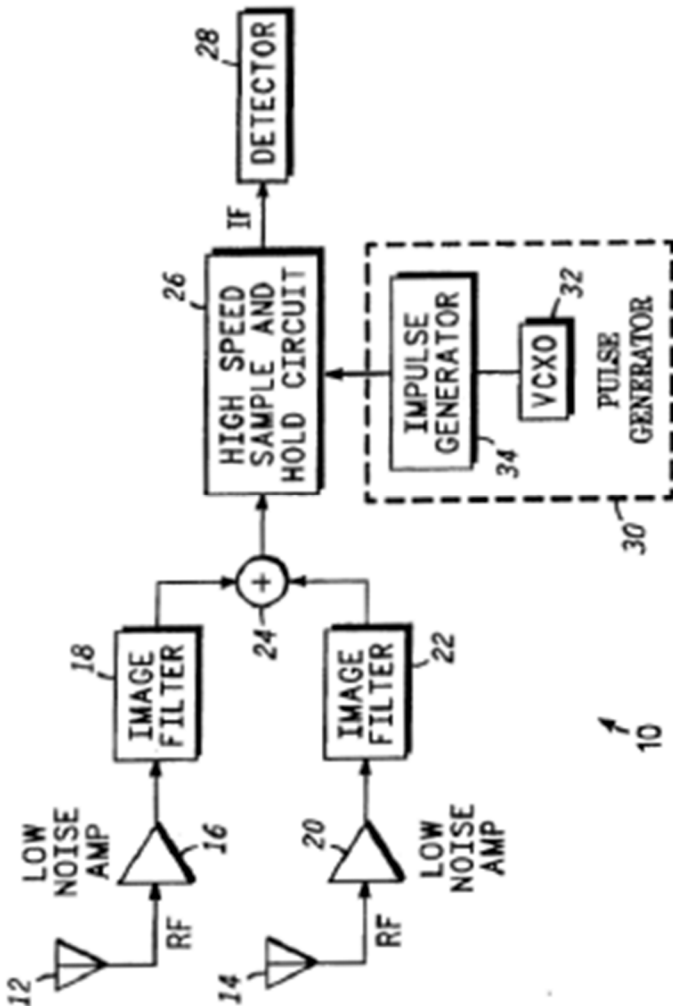


FIG. 1

Figure 1 shows a block diagram of radio 10. Ex. 1006, 3:4, 2:56-58.

Schiltz explains that radio 10 converts one or more RF signals into an IF signal and then into a baseband signal. *Id.* at 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:

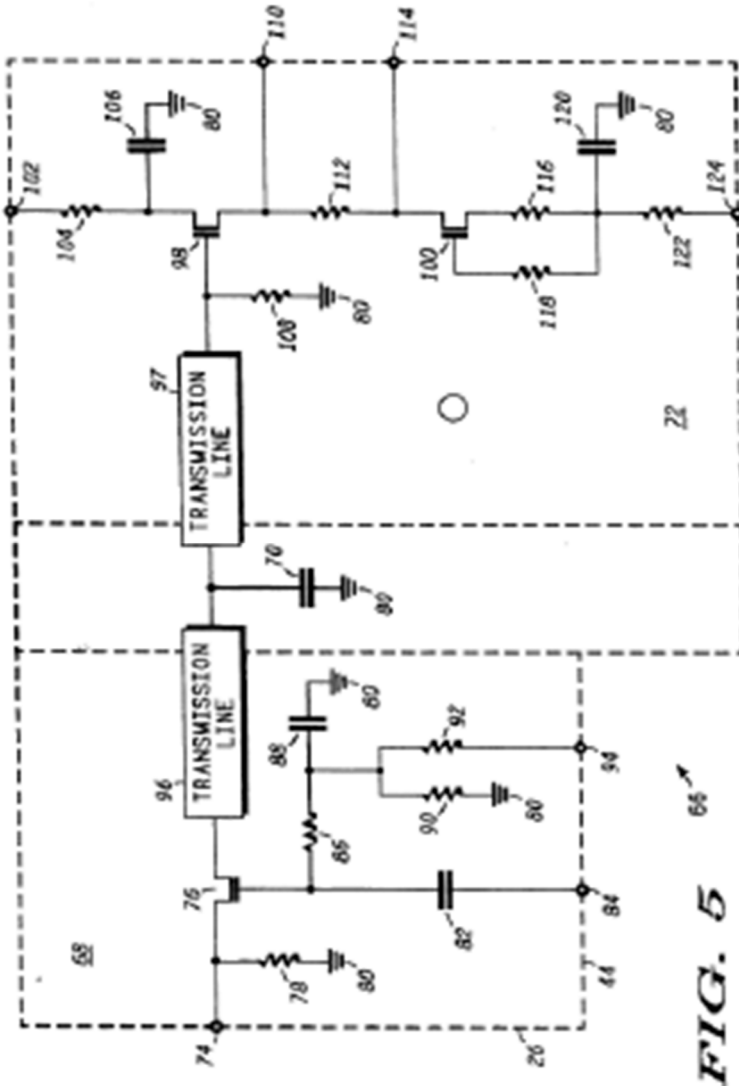


FIG. 5

Figure 5 shows a schematic diagram of a sample and hold circuit. Ex. 1006, 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.” *Id.* at 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. 1006, 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.

3. Differences Between the Prior Art and the Claims; Motivation to Modify

a. Claim 1

i. Element [1pre]

Element [1pre] recites “[a] cable modem for down-converting an electromagnetic signal having complex modulations, comprising.” Ex. 1001, 51:5–6. Petitioners assert that “Gibson discloses a modem for down-converting an electromagnetic signal having complex modulations.” Pet. 67 (citing Ex. 1005, Fig. 1). Petitioners’ annotated version of Gibson’s Figure 1 is reproduced below.

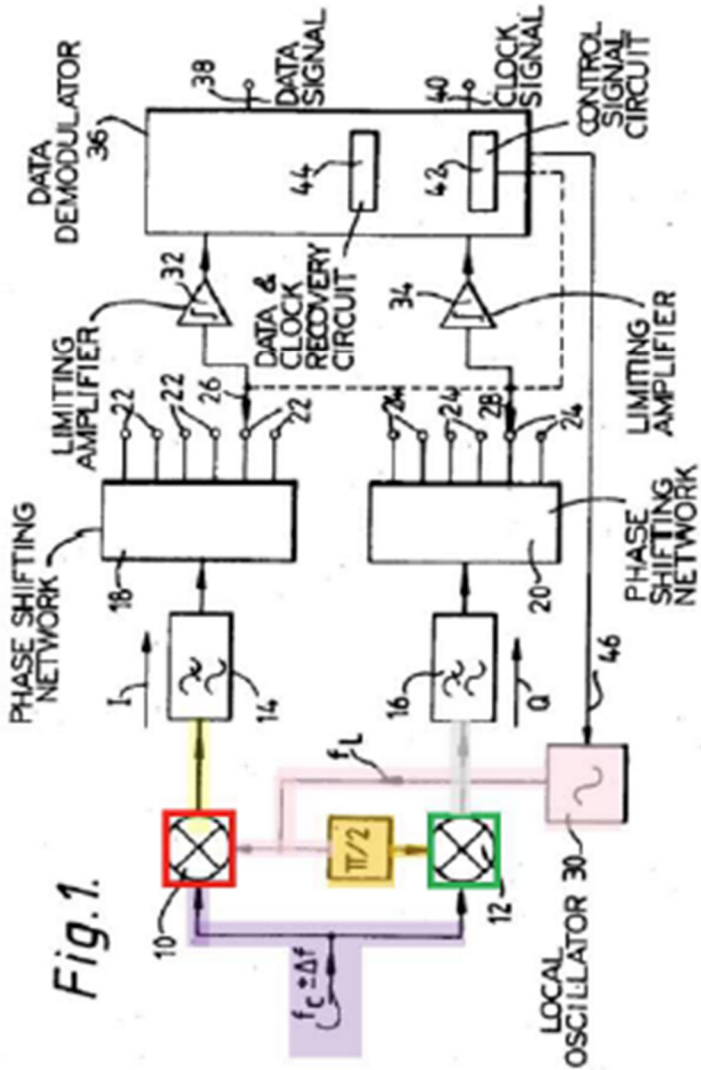


Fig.1.

Id. at 68. Petitioners 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.* Petitioners assert that Gibson’s “modem down-converts the modulated carrier signal, for example from a 900 MHz signal to a 4 kHz signal. *Id.* (citing Ex. 1005, 2:55–3:21).

Petitioners contend 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. 68 (citing Ex. 1005,³⁹ Fig. 1, 2:55–3:21; Ex. 1002 ¶¶ 178–182). Additionally, Petitioners argue 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 of Thacker, Goldberg, ITU-T J.83b, and/or AAPA.” *Id.* (citing Pet. § VIII.G.3).

Patent Owner’s argument directed to element [1pre] focuses on the recitation of “a cable modem” in the preamble of claim 1. PO Resp. 79. Patent Owner relies on the same arguments it raised regarding the obviousness ground based on the combination of Hulkko and Gibson. *Id.* (“The same arguments regarding this element in connection to Hulkko (as modified by Gibson) apply equally to Gibson (as modified by Schiltz).”). In the context of that obviousness ground, Patent Owner asserts that Hulkko, as modified by

³⁹ Petitioners cite to Exhibit 1001, but we understand the citation was intended for Gibson, which is Exhibit 1005.

Gibson, does not “disclose/teach/suggest ‘a cable modem.’” *Id.* at 69–70. Additionally, Patent Owner asserts that it would not have been obvious to use the modem of Hulkko, modified by Gibson, as a cable modem even considering the additional references provided by Petitioners.⁴⁰ *Id.* at 70–71.

First, because we determine that the term “cable modem” recited in the preamble of claim 1 is not limiting, *See supra* § II.B, we need not address Patent Owner’s arguments directed to that term. Second, Patent Owner does not assert that the other language recited in the preamble of claim 1 is limiting or that Gibson fails to teach the additional recitations (i.e., “down-converting an electromagnetic signal having complex modulations”). We need not determine whether the other language of the preamble of claim 1 is limiting because we agree with Petitioners that Gibson teaches “down-converting an electromagnetic signal having complex modulations” for the reasons argued by Petitioners, which are uncontested and which we adopt as our own findings.

Additionally, we need not address Petitioners’ alternative challenge based on Gibson, Schiltz, Goldberg, Thacker, ITU-T J.83b, and/or AAPA because we do not find that the recitation of “cable modem” in the preamble of claim 1 is limiting. *See* Pet. 17 (presenting this alternative ground “if the Board finds that the preamble of claim 1 is limiting—and thus requires a ‘cable modem’”); *See also* SAS, 138 S. Ct. at 1359 (holding that a petitioner “is entitled to a final

⁴⁰ As applied to this obviousness ground, we understand Patent Owner’s argument to be that it would not have been obvious to use Gibson, as modified by Schiltz, as a cable modem.

written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed*, 809 F. App’x at 990 (stating that the “Board need not address issues that are not necessary to the resolution of the proceeding,” such as “alternative arguments with respect to claims [the Board] found unpatentable on other grounds”).

ii. Element [1A]

Element [1A] recites “an oscillator to generate an in-phase oscillating signal.” Ex. 1001, 51:7. Petitioners contend that “Gibson discloses an oscillator (30) to generate an in-phase oscillating signal (fL),” which Petitioners identify in the annotated version of Gibson’s Figure 1 (reproduced above) in pink. Pet. 69 (citing Ex. 1005, Fig. 1, 2:56–3:2; Ex. 1002 ¶¶ 183–184).

Patent Owner does not challenge Petitioners’ analysis of element [1A]. *See generally* PO Resp.

We find Petitioners’ arguments persuasive as to element [1A] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Gibson teaches element [1A].

iii. 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, Petitioners contend that “Gibson discloses a phase shifter ($\pi/2$) to receive said in phase oscillating signal (pink, fL) and to create a quadrature-phase oscillating signal (orange signal

output from ‘ $\pi/2$ ’ to green mixer 12).” Pet. 69–70 (citing Ex. 1005, Fig. 1, 2:56–3:2; Ex. 1002 ¶¶ 185–186).

Patent Owner does not challenge Petitioners’ analysis of element [1B]. *See generally* PO Resp.

We find Petitioners’ arguments persuasive as to element [1B] and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Gibson teaches element [1B].

iv. 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, Petitioners contend 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. 70–71 (citing Ex. 1005, Fig. 1).

Petitioners also present an alternative argument “[t]o the extent it is argued or determined that Gibson does not disclose Element [1C].” Pet. 71. In particular, Petitioners assert that “Schiltz discloses a frequency down-conversion module, specifically, a ‘high speed sample and hold circuit’ used ‘as a mixer.’” *Id.* (citing Ex. 1006, 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, Petitioners contend that “Schiltz’s sample and hold circuit (26) shown in Figure 5 (. . . [which] includes the ‘impulse generator’ of Figure 1) discloses a mixer having a sampling switch 68

(comprising a field effect transistor 76, blue) and a 'hold capacitor' 70 (brown)." *Id.* at 71-72 (footnote omitted) (citing Ex. 1006, Fig. 5).

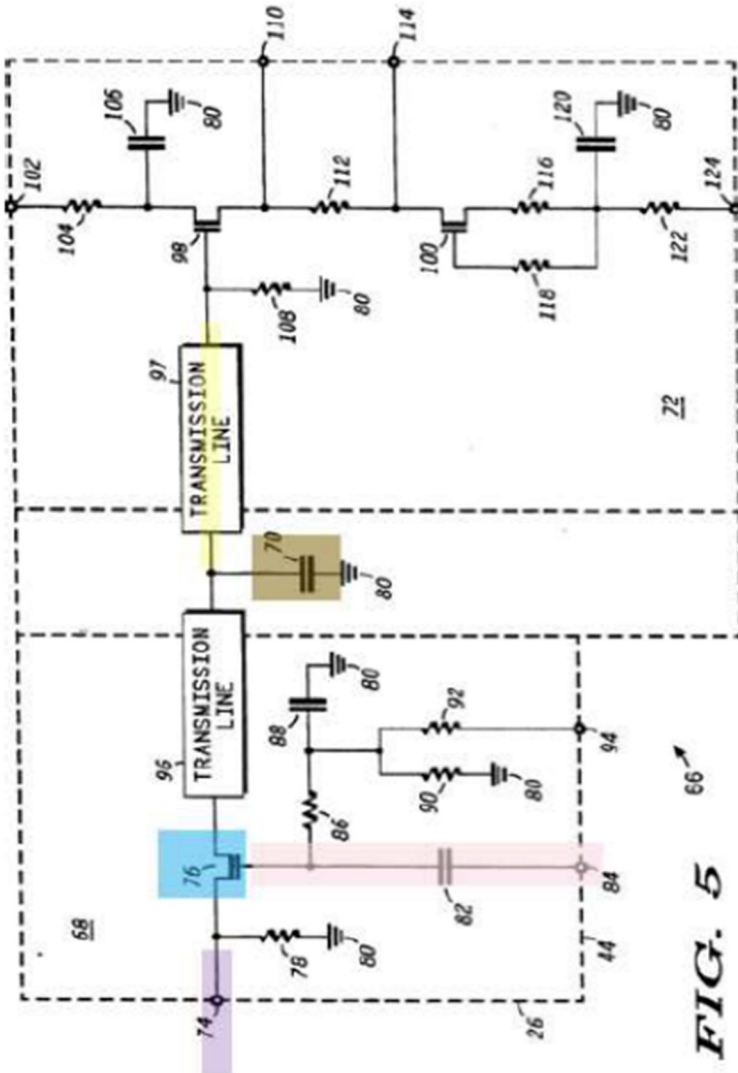


FIG. 5

Id. at 72. Petitioners annotated Schiltz’s Figure 5 to color input electromagnetic signal purple, field effect transistor 76 blue, control oscillating signal pink, hold capacitor 70 brown, and sampled signal yellow. *Id.* Petitioners assert 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.* (citing Ex. 1006, 7:58–8:48). Petitioners contend 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.* (citing Ex. 1006, Fig. 1, 4:8–13). Petitioners assert that “[f]ield effect transistor 76 operates as a switch and samples the incoming signal.” *Id.* at 73 (citing Ex. 1006, 7:58–8:48). Petitioners further contend 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. 1006, 7:58–8:48; Ex. 1002 ¶¶ 187–190).

Petitioners refer to their 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. 73 (“Motivations to combine the references are set forth above in [Petition] Section VIII.G.2.”)), which we discuss here because this is the first element of claim 1 that relies on the combined teachings of the references. In particular, Petitioners assert that one of ordinary skill in the art would have been motivated to use “Schiltz’s sample and hold circuit (Ex. 1006, Figs. 1 and 5 at circuit 26) as the mixer in each of the two branches of Gibson’s receiver (Ex. 1005, Fig. 2 at mixers 10 and 12).” *Id.* at 46. Petitioners explain that Gibson discloses using two mixers, but “does not

describe the precise inner workings of its mixers.” *Id.* Schiltz, according to Petitioners, “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. 1006, 1:5–10, 10:15–22; Ex. 1002 ¶¶ 137–138). Petitioners contend 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.” *Id.* at 47 (citing Ex. 1006, 10:15–48; Ex. 1002 ¶ 139).

Further, Petitioners contend that “combining Gibson with Schiltz would have yielded only expected, predictable results.” Pet. 47. In particular, Petitioners explain 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, 485 F.3d at 1162; Ex. 1002 ¶ 140).

Patent Owner does not challenge Petitioners' first alternative argument relying on Gibson alone as teaching element [1C]. *See generally* PO Resp. We find Petitioners' first alternative argument persuasive and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Gibson teaches element [1C].

Regarding Petitioners' second alternative argument relying on the combination of Gibson and Schiltz, Patent Owner challenges Petitioners' argument that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners. PO Resp. 81–82. Similar to its arguments in response to Petitioners' combination of Hulkko and Gibson, Patent Owner contends that one of ordinary skill in the art “would not be motivated to combine Gibson with . . . Schiltz because they are directed to *fundamentally different* and competing technologies; Gibson discloses a quadrature (non-sampling) mixer, whereas . . . Schiltz disclose[s] down-conversion by sampling.” *Id.* at 81 (citing Ex. 2038 ¶ 381). Patent Owner asserts that “Schiltz discloses a *sample-and-hold (voltage sampling) circuit*” and that its operation “is fundamentally different than the operation of a *non-sampling mixer/mixing system*.” *Id.* In particular, Patent Owner contends that “[w]hereas a mixer forms a down-converted signal by mixing two signals (e.g., an RF signal and an LO sinusoid) together, a voltage sampling system uses a switch to sample the input signal and recover a down-converted signal.” *Id.* (citing Ex. 2038 ¶ 383).

Patent Owner argues that, “[b]ecause the systems described in Gibson, on the one hand, and Schiltz, on

the other hand, are incompatible, a [person of ordinary skill in the art] would not look to the teachings of Schiltz to alter the circuit of Gibson and vice versa.” PO Resp. 82. Rather, Patent Owner contends that “[s]uch modifications would require considerable research/development/experimentation that would not yield expected/predictable results.” *Id.* (citing Ex. 2038 ¶ 385). And, Patent Owner argues that one of ordinary skill in the art “would understand that replacing the quadrature mixer in Gibson with the sample-and-hold circuit of Schiltz would fundamentally change the intent and design of Gibson.” *Id.* (citing Ex. 2038 ¶ 386).

In their Reply, Petitioners assert that “Schiltz expressly encourages use of its ‘sample and hold circuit *as a mixer*’ for down-conversion—the same function as the mixers disclosed in Gibson.” Pet. Reply 28 (citing Ex. 1006, 1:5–10, 10:15–22). Petitioners contend that “Schiltz encourages the use of its sampling mixer because it ‘may be accurately operated at high frequencies’ and ‘may be applied virtually to any frequency RF and IF signals.’” *Id.* (citing Ex. 1006, 10:15–48; Pet. 46–47).

In its Sur-reply, Patent Owner contends that its argument “go[es] to the incompatibility of different types of mixers,” whereas Petitioners focus on the function performed (i.e., down-conversion). PO Sur-reply 18 (citing Pet. Reply 28). Patent Owner contends

Schiltz discloses a sample-and-hold (voltage sampling) circuit. The operation of a sample and hold/voltage sampling system is fundamentally different than the operation of a non-sampling mixer/mixing system. Whereas a mixer forms a downconverted signal by

mixing two signal (e.g., an RF signal and an LO sinusoid) together, a voltage sampling system uses a switch to sample the input signal and recover a down-converted signal.

Id. at 18–19 (citing Ex. 2038 ¶ 383). Patent Owner, thus, asserts that one of ordinary skill in the art “would understand that replacing the quadrature mixer in Gibson with the sample-and-hold circuit of Schiltz would fundamentally change the intent and design of Gibson.” *Id.* at 19 (citing Ex. 2038 ¶ 386).

Based on the full record, we find Petitioners’ motivation to combine argument persuasive. In particular, the distinction Patent Owner seeks to draw between Gibson and Schiltz, does not undermine Petitioners’ argument and evidence that the particular structures proposed for combination are substantially similar, operate in a similar manner, and would have been expected, by one of ordinary skill in the art, to function predictably and with a reasonable expectation of success once combined. Notably, we find particularly persuasive Schiltz’s express disclosure encouraging the use of its circuit as a mixer. Ex. 1006, 1:7–10 (“The present invention relates generally to high speed electronic circuits. More specifically, the present invention relates to a high speed sample and hold circuit and to radios *which use such a circuit as a mixer.*” (emphasis added)); *See Id.* at 10:15–18 (“[T]he present invention provides an improved radio *which uses a sample and hold circuit in various mixing applications, such as down conversion and oscillation signal generation circuits.*” (emphasis added)); *See also Id.* at 10:40–43 (“For example, 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. In addition, those skilled in the art will understand that *the present invention may be applied to virtually any frequency RF and IF signals.*” (emphases added)). Patent Owner’s arguments to the contrary appear akin to arguing bodily incorporation, which is not the proper standard by which to determine whether one of ordinary skill in the art would have been motivated to modify Gibson in light of Schiltz. *See, e.g., In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“it is not necessary that a device shown in one reference can be physically inserted into the device shown in the other”).

Accordingly, we find that the combination of Gibson and Schiltz teaches element [1C] and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

v. Element [1D]

Element [1D] recites “a second frequency down-conversion module to receive the electromagnetic signal and said quadrature-phase oscillating signal.” Ex. 1001, 51:14–16. Relying on the same annotated version of Gibson’s Figure 1, reproduced above in our discussion of element [1pre], Petitioners contend 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. 73.

Alternatively, Petitioners assert 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. 74 (citing Ex. 1002 ¶¶ 191–192).

Patent Owner does not challenge Petitioners' first alternative argument relying on Gibson alone as teaching element [1D]. *See generally* PO Resp. We find Petitioners' arguments persuasive and supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that Gibson teaches element [1D].

Patent Owner's arguments directed to Petitioners' second alternative argument, relying on the combination of Gibson and Schiltz, are directed to whether one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners and are addressed above in our discussion of the combination in element [1C]. For the same reasons explained in our discussion of element [1C] and based on Petitioners' argument and evidence directed to element [1D], we find that the combination of Gibson and Schiltz teaches element [1D] and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

vi. Element [1E]

Element [1E] recites “wherein said first frequency down-conversion module further comprises a first frequency translation module.” Ex. 1001, 51:17–18. Petitioners contend the “Gibson discloses a first mixer 10 but does not expressly disclose that it has a switch (if a ‘frequency translation module’ requires one).” Pet. 74. Relying on the same annotated version of Schiltz’s Figure 5 reproduced above, Petitioners assert 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 74–75. Petitioners contend “[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 75 (citing Ex. 1002 ¶¶ 193–194).

Patent Owner’s arguments directed to element [1E] are based on whether one of ordinary skill in the art would have been motivated to combine the teachings of Gibson and Schiltz as proposed by Petitioners and are addressed above in our discussion of the combination in element [1C].⁴¹ For the same reasons explained in our discussion of element [1C] and based on Petitioners’ argument and evidence directed to element [1E], we find that the combination of Gibson and Schiltz teaches element [1E] and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as

⁴¹ Patent Owner does not assert that claim 1 requires a “switch,” but does contest Petitioners’ arguments regarding a switch in the context of dependent claim 18 (*see* PO Resp. 81), which we address below. *See infra* § III.C.3.c (addressing claims 18–20).

proposed by Petitioners with a reasonable expectation of success.

vii. Element [1F]

Element [1F] recites “and a first storage module.” Ex. 1001, 51:18–19. Petitioners contend that “Gibson does not expressly disclose that first mixer 10 has a storage module (e.g., capacitor).” Pet. 75. Petitioners assert 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 a mixer in the modem of Gibson for the reasons discussed above with respect to Elements [1C] and [1D].” *Id.* (citing Ex. 1002 ¶ 195).

Patent Owner contends that Schiltz’s sample-and-hold capacitor 70 is not a “storage module.” PO Resp. 71–79. Patent Owner raises three arguments in support of its position. First, Patent Owner asserts that “Schiltz discloses using the smallest capacitor possible. In particular, Schiltz states that the capacitance of the capacitor 70 ‘needs to be *as small as possible* so that acquisition time may be as fast as possible and bandwidth extended as far as possible.’” *Id.* at 72 (quoting Ex. 1006, 8:31–34).

Second, Patent Owner contends that Schiltz is a sample-and-hold system and not an energy transfer system. PO Resp. 73 (citing Ex. 1006, 9:13–17; Ex. 2038 ¶¶ 356–357); *See Id.* at 77–78 (arguing that Schiltz is a voltage sampling system and noting that Schiltz uses sample and hold terminology). Patent Owner asserts that, “[a]s a sample-and-hold system, a [person of ordinary skill in the art] understands that Schiltz seeks to (1) accurately represent the voltage of the input signal, and (2) take readings of voltage in a

capacitor in order to recreate a baseband signal.” *Id.* at 73. And, Patent Owner argues that Schiltz holds the voltage on the capacitor using a high impedance load (e.g., around 1,000,000 ohms). *Id.*

Third, Patent Owner contends that it can demonstrate mathematically that Schiltz’s capacitor only holds negligible amounts of energy from an input electromagnetic signal. PO Resp. 73–76. Patent Owner asserts that, “given Schiltz’s configuration as well as Schiltz’s component values and voltage source information, one way to determine energy storage is to perform calculations based on [a] ratio of available RF input power to IF output power.” *Id.* at 74. Patent Owner provides several pages of calculations, which result in Patent Owner’s contention that “[t]he maximum energy held on the hold capacitor 70 in Fig. 5 is 0.002% of the energy available in an RF cycle.” *Id.* at 76. Thus, Patent Owner contends one of ordinary skill in the art “understands that the capacitor 70 in Schiltz only stores a negligible amount of energy.” *Id.* (citing Ex. 2059⁴² ¶¶ 358–366).

Relying on Schiltz, Petitioners contend in their Reply that

[f]ield effect transistor 76 operates as a switch and samples the incoming signal. . . . The drain of field effect transistor 76 is coupled to “hold capacitor 70,” resulting in sufficient non-negligible energy being transferred from the input EM signal and stored on the capacitor

⁴² Although Patent Owner cites Exhibit 2059, we understand Patent Owner to have intended to cite to Exhibit 2038 (Dr. Steer’s Declaration) as there is no Exhibit 2059 in the record.

70 in order to “hold” the sampled signal.

Pet. Reply 23 (citing Ex. 1006, 7:58–8:48; Ex. 1002 ¶¶ 127–128, Pet. 10–11, 39–41, 75). Additionally, relying on Mr. Sorrells’ testimony (discussed in detail above with respect to the obviousness ground based on the combination of Hulkko and Gibson), Petitioners assert that “capacitor 70— which accumulates (i.e., integrates) charge/energy—successfully performs down-conversion. . . . [and] [t]his constitutes additional ‘proof’ . . . that the capacitor stores non-negligible energy and represents a ‘storage module’ within the meaning of the claims.” *Id.* (citing ParkerVision, 621 F. App’x at 1019). Petitioners also contend that Schiltz’s capacitor 70 “has a capacitance ‘significantly larger’ than the ‘parasitic capacitance.’” *Id.* at 24 n.9.

Patent Owner’s Sur-reply presents essentially the same arguments that Patent Owner raised in response to the obviousness ground based on the combination of Hulkko and Gibson. PO Sur-reply 2–17. In particular, Patent Owner (1) construes “storage module” as limited to an energy transfer system (PO Sur-reply 2–7), (2) contends that Petitioners have not shown that Schiltz’s capacitor stores non-negligible amounts of energy (*id.* at 7–9), (3) characterizes Mr. Sorrells’ testimony as requiring that a product meet cellular/wireless specifications in order to be considered to “successfully” down-convert (*id.* at 9–13), (4) argues that Petitioners have not shown that Schiltz’s system successfully down-converts because “there is no evidence that such specifications were met, and there is no expert testimony otherwise” (*id.* at 13–14), and (5) asserts that Dr. Steer’s un rebutted testimony and mathematical calculations do not contradict Mr. Sorrells’ testimony because there may be more than

one way in which to determine whether there is non-negligible amounts of energy (*id.* at 14–17).

In our discussion of element [1F] in the obviousness ground based on the combination of Hulkko and Gibson, we address the same arguments by Patent Owner, which discussion we refer to and incorporate here because it is equally applicable to both grounds. In terms of considering Schiltz, which, like Hulkko, is an issued patent,⁴³ we find that Petitioners have established that Schiltz functions in practice and successfully down-converts. In particular, Schiltz is directed, *inter alia*, to radios that use a high speed sample and hold circuit as a mixer. Ex. 1006, 1:7–10; *See Id.* at 2:24–27 (“The above and other advantages of the present invention are carried out in one form by an improved radio having a receiver capable of receiving a wideband RF signal.”), 4:29–30 (“Sample and hold circuit 26 operates as a downconverter in radio 10.”); *See also* Tr. 101:9–11 (addressing Schiltz’s commercial use). Accordingly, because Schiltz is a patent that is presumed to be enabled such that it operates in a manner that successfully down-converts and does so in a commercially viable system that can be used for radios, we find that constitutes sufficient evidence that Schiltz’s capacitor 70 is a “storage module” as that term is used in the context of the ’835 patent. In other words, Schiltz’s capacitor 70 is “a module of a system that stores non-negligible amounts of energy [i.e., energy in amounts that are distinguishable from noise] from an input EM signal.”

⁴³ As an issued patent, Schiltz is presumed to be enabled. *See, e.g.,* Cephalon, 707 F.3d at 1337 (recognizing that an issued patent is presumed to be enabled).

Thus, we find that Petitioners have shown that Schiltz teaches element [1F].

viii. 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 element [1pre], Petitioners contend 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. 76. Petitioners assert 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.* Relying on Figure 1 of Schiltz and the same annotated version of Schiltz’s Figure 5 reproduced above, Petitioners argue 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 76–77 (footnote and emphasis omitted). Petitioners assert 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 Section VIII.F.2” of the Petition. *Id.* at 77 (citing Ex. 1002 ¶¶ 196–198).

Patent Owner argues that “Gibson does not perform sampling” and “discloses a *fundamentally different and competing* technology to . . . sampling.” PO Resp. 79–80 (citing Ex. 2038 ¶ 377).

Based on the full record, we do not agree with Patent Owner’s argument because it amounts to an individual attack on Gibson. It is well-settled that “non-obviousness [cannot be established] by attacking references individually,” when, as here, the asserted ground of obviousness is based upon the combined teachings of Gibson and Schiltz. *In re Keller*, 642 F.2d 413, 426 (CCPA 1981). Instead, the test is what the combined teachings of these references would have taught or suggested to one of ordinary skill in the art. *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991). As discussed above, Petitioners do not rely on Gibson for sampling. Rather, Petitioners rely on the combination of Gibson and Schiltz. *See, e.g.*, Pet. 76–77. Thus, Patent Owner’s contention—that Gibson does not perform sampling—does not respond to Petitioners’ proposed combination.

Additionally, Patent Owner’s arguments directed to whether one of ordinary skill in the art would have been motivated to combine the teachings of Gibson and Schiltz as proposed by Petitioners and are addressed above in our discussion of the combination in element [1C]. For the same reasons explained in our discussion of element [1C], we disagree with Patent Owner’s arguments that one of ordinary skill in the art would not have been motivated to combine the teachings of Gibson and Schiltz as proposed by Petitioners. On the complete record before us, we find that Petitioners have established that the combination of Gibson and Schiltz teaches element [1G] and that

one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

ix. Element [1H]

Element [1H] recites “said second frequency down-conversion module further comprises a second frequency translation module.” Ex. 1001, 51:23–24. Petitioners assert 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. 78. Relying on the same annotated version of Schiltz’s Figure 5, Petitioners contend that “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.* (citing Ex. 1002 ¶ 199).

Patent Owner’s arguments directed to element [1H] are based on whether one of ordinary skill in the art would have been motivated to combine the teachings of Gibson and Schiltz as proposed by Petitioners⁴⁴ and are addressed above in our discussion of the combination in element [1C]. Patent Owner does not contest, however, that the combination of Gibson

⁴⁴ As addressed in our discussion of element [1E], Patent Owner does not assert that claim 1 requires a “switch,” but does contest Petitioners’ arguments regarding a switch in the context of dependent claim 18 (see PO Resp. 81), which we address below. *See infra* § III.C.3.c (addressing claims 18–20).

and Schiltz teaches element [1H]. For the same reasons explained in our discussion of element [1C], we find that one of ordinary skill in the art would have been motivated to combine the teachings of Gibson and Schiltz as proposed by Petitioners with a reasonable expectation of success, and based on the arguments and evidence provided by Petitioners, we find that this combination teaches element [1H].

x. Element [1I]

Element [1I] recites “and a second storage module.” Ex. 1001, 51:24–25. Petitioners contend that, “[a]s discussed above, the mixer of Schiltz includes a storage module (capacitor 70).” Pet. 79 (citing Ex. 1002 ¶ 200).

We have addressed Patent Owner’s arguments directed to whether Schiltz discloses a “storage module” in the context of our consideration of element [1F] (“a first storage module”) and that discussion and analysis apply equally here. Accordingly, for the same reasons explained in the context of our consideration of element [1F], we find that Petitioners have shown that Schiltz teaches element [1I].

xi. 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, Petitioners contend 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. 79. Petitioners assert 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.* Petitioners rely on the following annotated version of Schiltz’s Figure 5.

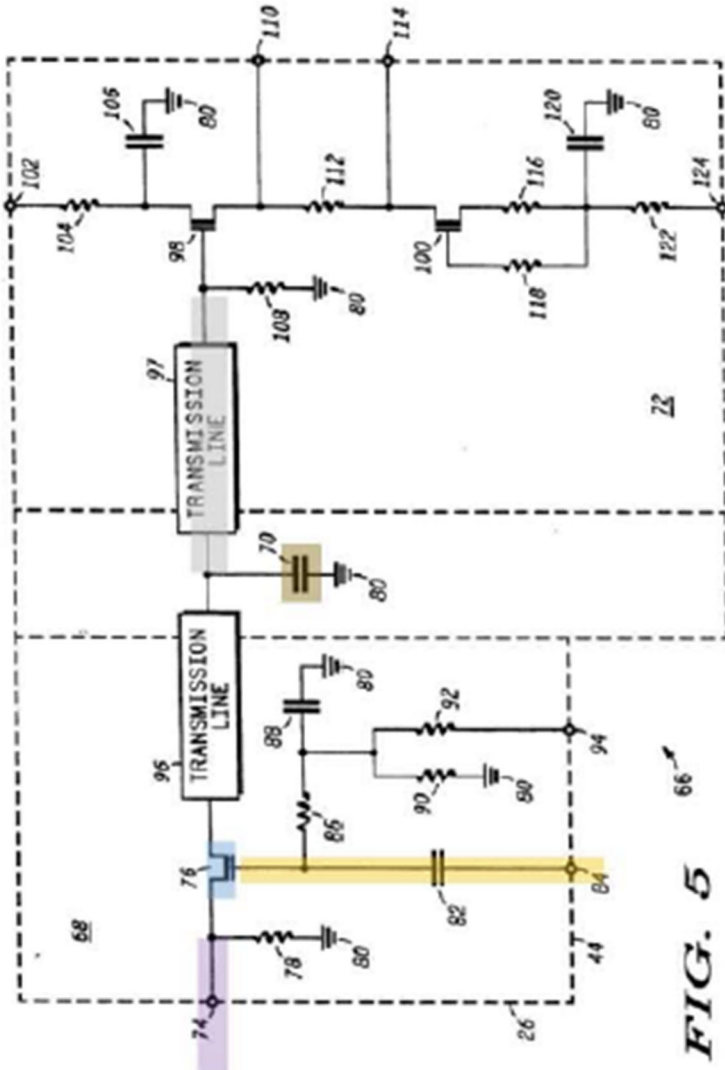


FIG. 5

Id. at 80. Petitioners annotated Schiltz’s Figure 5 to highlight input electromagnetic signal purple, input for a control oscillating signal orange, FET 76 blue, hold capacitor 70 brown, and sampled signal gray. *Id.* Petitioners contend 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).” *Id.* at 79–80 (emphasis omitted). Petitioners argue 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 Section VIII.G.2” of the Petition. *Id.* at 80 (citing Ex. 1002 ¶¶ 201–203).

To the extent Patent Owner’s arguments are directed to element [1J], for example, whether one of ordinary skill in the art would have been motivated to combine the teachings of Gibson and Schiltz, they are addressed above in our discussion of element [1C]. For the same reasons explained above, and based on the arguments and evidence presented by Petitioners, we find that the combination of Gibson and Schiltz teaches element [1J] and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

xii. Summary as to Claim 1

For the reasons discussed above, we find that Petitioners have established on the complete record before us 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 Petitioners with a reasonable expectation of success in so doing.

b. Dependent Claims 12–15 and 17

Claims 12–15 and 17 depend, directly or indirectly, from claim 1. Ex. 1001, 51:60–52:19. Petitioners set forth argument with supporting evidence as to how the combination of Gibson and Schiltz teaches each element of these claims. Pet. 80–83. Patent Owner does not challenge Petitioners’ analysis of claims 12–15 and 17. *See generally* PO Resp.

We find Petitioners’ arguments supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners, we find that the combination of Gibson and Schiltz teaches the elements of claims 12–15 and 17 and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed by Petitioners with a reasonable expectation of success.

c. Dependent Claims 18–20⁴⁵

Claim 18 depends from claim 1 and claims 19 and 20 depend, directly or indirectly, from claim 18. Ex. 1001, 51:20–51. Claim 18 recites:

18. The cable modem of claim 1, wherein said

⁴⁵ We group these claims together because Patent Owner raises a separate argument directed to dependent claim 18 that applies to claims 19 and 20 because of their dependency from claim 18.

first frequency translation module comprises a first switch coupled to said first storage module, and said second frequency translation module comprises a second switch coupled to said second storage module, and

wherein said first frequency down-conversion module further comprises a first control signal generator coupled to said first switch and coupled to receive said in-phase oscillating signal, and said second frequency down-conversion module further comprises a second control signal generator coupled to said second switch and coupled to receive said quadrature-phase oscillating signal.

Ex. 1001, 52:20–33 (emphases added).

Petitioners rely on their discussion of claim 1 for most of the elements of claim 18. *See* Pet. 83 (“As to the first modules, *See* Elements [1C], [1E], [1F], and [1G], *supra*. As to the second modules, *See* Elements [1D], [1H], [1I], and [1J], *supra*.”). Petitioners assert that

[a]s discussed above, the first and second frequency down-conversion modules in Gibson are structurally identical, the only difference being that the in-phase oscillating signal *i*[s] used to generate the sampling pulses that control the switch in the first module, while the quadrature-phase oscillating signal is used to generate the sampling pulses that control the second switch.

Id. at 84 (citing Ex. 1004, Fig. 1, 2:56–67). Petitioners contend “Schiltz discloses using a control signal generator (Fig. 1, ‘impulse generator’ 34 coupled

through node 84 in Fig. 5) that is coupled to the respective switch (FET 76) and coupled to receive the respective oscillating control signal.” *Id.* at 84–85 (referring to Petitioners’ discussion of Element [1C]) (internal footnote omitted) (citing Ex. 1006, 4:8–13; Ex. 1002 ¶¶ 211–212).

In a section with the heading “Gibson does not disclose ‘sampling’ or a ‘switch’ (claim 1, 18)” (PO Resp. 79 (bold omitted)), Patent Owner first argues that Gibson does not disclose sampling. *Id.* at 79–80. We addressed this argument above, explaining that Petitioners rely on Schiltz for sampling, not Gibson. *See supra* § III.C.3.a.viii (element [1G]); *See also* Pet. 76 (relying on Schiltz for sampling as part of element [1G]), 79 (relying on Schiltz for sampling as part of element [1J]).

Second, Patent Owner contends that dependent “[c]laim 18 recites a first and second ‘switch.’ As discussed in Section VIII, non-sampling mixers use FETs as time-varying resistors, not as switches.” PO Resp. 81 (citing Ex. 2038 ¶ 380). In Section VIII of the Patent Owner Response, Patent Owner asserts that “[a] FET is a type of transistor that can amplify, oscillate, *or* switch the flow of current between two terminals by varying the current or voltage at a third terminal. In other words, a FET can behave and be used in *different ways*.” *Id.* at 23 (citing Ex. 2038 ¶ 195); *See also Id.* at 23–27 (discussing different uses of FETs). Even assuming Patent Owner is correct, the argument does not detract from Petitioners’ position because Petitioners rely on the operation of FET 76 from Schiltz as teaching the recited switch (*see, e.g.*, Pet. 79–80 (referring to Schiltz’s FET 76)), and Patent Owner does not contend that Schiltz is a non-sampling

mixer (instead, Patent Owner contends that Gibson is a non-sampling mixer).

We find Petitioners' arguments supported sufficiently on the complete record before us, and, therefore, we adopt them as our own findings. Accordingly, for the reasons explained by Petitioners and as explained further above, we find that the combination of Gibson and Schiltz teaches the subject matter of claims 18–20 and that one of ordinary skill in the art would have been motivated to combine the teachings of these two references as proposed Petitioners with a reasonable expectation of success.

4. Objective Indicia of Nonobviousness

Patent Owner relies on the same arguments and evidence regarding objective indicia of nonobviousness that we addressed above, in the context of considering the obviousness ground based on the combination of Hulkko and Gibson. *See* PO Resp. 21–22 (addressing objective indicia generally), 78 (addressing the combination of Gibson and Schiltz). Our discussion, analysis, and findings from the obviousness ground based on the combination of Hulkko and Gibson apply equally here. *See supra* § III.B.4 (finding that Patent Owner fails to establish that a presumption of nexus is warranted and similarly fails to establish nexus absent the presumption). As stated above, we consider Patent Owner's weak evidence of nonobviousness in our weighing of the Graham factors below.

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.” *Arctic Cat*, 876 F.3d at 1361. On balance, considering the complete record before us and for the reasons explained above, the evidence of obviousness is very strong and the evidence of nonobviousness, which includes Patent Owner’s objective evidence of nonobviousness, is very weak. As a result of that balancing, we determine that Petitioners have established by a preponderance of the evidence that the combination of Gibson and Schiltz would have rendered the subject matter of claims 1, 12–15, and 17–20 obvious to one of ordinary skill in the art at the time of the invention.

IV. Summary⁴⁶

For the reasons discussed above, Petitioners have demonstrated, by a preponderance of the evidence, that claims 1, 12–15, and 17–20 of the ’835 patent are unpatentable.

Our conclusions regarding the Challenged Claims are summarized below:

⁴⁶ Should Patent Owner wish to pursue amendment of claim 3 in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

App.231a

Claims Challenged	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable
1, 12, 15, 17	103(a)	Hulkko, Gibson	1, 12, 15, 17
1, 12, 15, 17	103(a) ⁴⁷	Hulkko, Gibson, Goldberg, Thacker, ITU-T J.83b, AAPA	
1, 12-15, 17-20	103(a)	Gibson, Schiltz	1, 12-15, 17-20

⁴⁷ For the reasons explained above, we do not reach this alternative ground because we do not find that “cable modem” (recited in the preamble of claim 1) is limiting. *See supra* § III.B.3.a.i (element [1pre]).

Claims Challenged	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable
1, 12-15, 17-20	103(a) ⁴⁸	Gibson, Schiltz Goldberg, Thacker, ITU-T J.83b, AAPA	1, 12-15, 17-20
Overall Outcome			1, 12-15, 17-20

V. Order

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 12–15, and 17–20 of U.S. Patent No. 7,292,835 B2 are determined to be unpatentable; and

FURTHER ORDERED that, because this a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER TCL Industries Holdings Co., Ltd.:

Kristopher L. Reed
Edward J. Mayle
Matias Ferrario

⁴⁸ For the reasons explained above, we do not reach this alternative ground because we do not find that “cable modem” (recited in the preamble of claim 1) is limiting. *See supra* § III.C.3.a.i (element [1pre]).

App.233a

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**TRANSCRIPT OF ORAL ARGUMENT,
U.S. COURT OF APPEALS FOR THE FEDERAL
CIRCUIT, ON THE '835 PATENT
(JUNE 3, 2024)**

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

PARKERVISION, INC.,

Appellant,

v.

TCL INDUSTRIES HOLDINGS CO., LTD.,
LG ELECTRONICS INC.,

Appellees.

No. 23-1417

Before: PROST, TARANTO, and
CHEN, Circuit Judges.

[June 3, 2024, Transcript, p.2]

(Recording begins)

JUDGE PROST: Next case is 23-1417, ParkerVision v. TLC. You're up again.

MR. CHARKOW: (Indiscernible), but I'm up again. And I apologize about that if there's repetition, but new record. Good morning again.

So again, let's talk about why we're here today. Why we're here today, again, is the PTAB decided that in this case, it's a little different. It's attorney argument, plus no evidence, plus bare-

JUDGE PROST: What do we got in this case?

MR. CHARKOW: Oh, I'm sorry. So this case is the 835 patent. And the 835 patent, the particular references are Hulkko and Schiltz and Gibson. So it's a different set of patents. And this patent's directed to a cable modem.

And so what happened? In this case, the PTAB decided that attorney argument, no evidence, and in this case, bare expert assertions can invalidate a patent. And again, we don't believe that's correct. We believe that it turns process on its head, and I'll explain why. And we believe that the-that this court should address this issue and that the invalidity claim-the invalidity determination of the PTAB should be reversed.

Again, two issues. Issue number one is the-there was an Administrative Procedures Act violation. Issue number two is that there was no substantial evidence that Gibson, Hulkko, and Schiltz disclosed a storage element that stores non-negligible amounts of energy.

So going to the Administrative Procedures Act, what do we have here? In-first time in the reply brief, TCL, the petitioner, raised the issue of this federal circuit case for the first time. We moved to strike and said that they knew about this issue; they should have raised it before. And the Board said, nope, too bad; we're going to move forward. And they did not strike this new evidence or new

position. And we believe that's an abuse of discretion.

So with regards to what happened, when the petitioner submitted their petition, they attached an exhibit. In this case, it's Exhibit 1011, which was the court-the district court's prior Markman decision, which specifically talked about a storage element storing-at least uncontested parts, storing non-negligible amounts of energy, which TCL now says open lexicography. And so-and I don't know if I said this, and that Exhibit 1011, I think it's in Appendix 3--or it is, in Appendix 370. You can see where they cited to it. And that's the court order from the district court attached to the petition.

Didn't address-at that point, it was their burden to address the issue in their petition. They should have addressed it. They didn't. And so they just left non-negligible amounts of energy alone. Didn't say anything. We came along. We talked about non-negligible amounts of energy.

Then in response, for the first time, they brought up the Qualcomm-ParkerVision case from 2015. And in that case, the federal circuit talked about what the inventor talked about, but we never heard the argument before.

Now we're at the point of a surreply. Our expert has no ability-our expert has talked about non-negligible amounts of energy. Our expert has explained why it's relevant. And the one thing I want to point out, because I do think it's important, is that our expert, they say, well, you know-and Dr. Steer, specifically during his depo-

sition, and this is Appendix 2242 to 2243, Line-Page 62, Column 23, to 63, 25, he specifically was faced with this federal circuit decision. And the only thing he could say was that I don't find what I did calculating non-negligible amounts of energy to be inconsistent with what Mr. Sorrells talked about in the Fed Circuit and what the Fed Circuit talked about.

And so what do we have here? So we have a situation where, on a surreply, we had no, as of right, the ability to have our expert opine and specifically address head on commercial viability and-sorry, give me one second-yeah, so address commercial viability and that it's-it successfully down-converts, which according to Mr. Sorrells, which TCL ignores and the PTAB ignores, Mr. Sorrells specifically stated successful down-conversion means you meet standards. Not just anything that down-converts meets standards. And they just want to ignore that. And the PTAB just wants to ignore that because it's inconvenient.

And so at the end, we believe that there was a Administrative Procedure Act violation. It was foreseeable. They knew about it. They had the burden. They should have addressed it. They didn't. And then we're put in the position-and we can't guess what they're going to argue. And so we-just like they can't guess, we can't guess. But in this case, they knew. They knew.

And if you look in our-again, if you look in our reply brief, we address the timing, when they knew about the timing. They filed the petition four months after the district court ruled on what a storage element was. And I believe in this case,

I think nine days after we first showed our view of what non-negligible amounts of energy and all those calculations in the first case, that's when they filed their petition in this case. So it was certainly foreseeable that they knew.

So in terms of storage elements storing non-negligible amounts of energy, again, here, there's no substantial evidence that the capacitors of Hulkko and Schiltz is a storage element that stores non-negligible amounts of energy. Again, Dr. Steer is the only one that provided a declaration to talk about what non-negligible amounts of energy means. He wasn't rebutted. His credibility wasn't questioned. He was just ignored, ignored.

And so the petitioner had the burden. They had the opportunity on a reply to put in an expert declaration. They pay experts however much they pay experts. And they could not find their expert. Dr. Shoemaker [sic], whatever his name is, was unwilling, or they didn't apparently, put in a declaration. All he had to say was, yes, Hulkko and Schiltz is commercially viable, it's-it meets the standards, or whatever they wanted to say. They could have done it, and they didn't do it. And that is telling. The fact that they didn't have their expert, on a reply, support their position, and they just went with, you know, this is what Qualcomm said, you know, that is extremely telling.

And so again, what did the PTAB do? So the logic of the PTAB was first, they said, okay, we have non-negligible amounts of energy. What does that mean? Well, fortunately, we have the Federal Circuit and Qualcomm case that tells us. And so

they said, that means it's energy distinguishable (indiscernible).

JUDGE CHEN: The Board basically did a carbon copy of what it did in the 1415 appeal, right?

MR. CHARKOW: Correct.

JUDGE CHEN: Okay.

MR. CHARKOW: Okay.

JUDGE CHEN: We know what the Board did.

MR. CHARKOW: Right. So again, the only thing that the-the only thing there was, just like in the other case that we just discussed, in the 1415 case, all there was attorney argument. That's it. There was no supporting declaration of their experts to support what they were saying. All attorney argument. And again, there-so what was the Board left with? Nothing. There were-Dr. Steer, who they didn't criticize, or they didn't say anything about and say, oh, he's not credible, they just kind of ignored it. And they said, well, again, in this case, Hulkko and Schiltz just talk about radio applications generally. And because they talk about radio applications and because things are-patents are viewed to be enabled, somehow enablement magically becomes it's commercially viable and it meets specifications. And there's no case, again, that I am aware of where enablement of a patent, you presume that it's commercially viable and you can presume that it meets standards. That case law doesn't exist.

And so again, they had-the Board was faced to backfill. They had to backfill. So that-they had to

come up with this new argument about enablement. And again, this inherency argument that we raised in our gray brief, they haven't met that standard of inherency.

And so the other issue with regards to this is that Dr. Steer also talked about, you know, there's no dispute that Hulkko and Schiltz are sample and hold systems and they have sample and hold capacitors. The-TCL doesn't say that it's not the case, and the Board doesn't say that's not the case. And Dr. Steer explains that in this case-and I don't believe it was rebutted-that those capacitors only hold negligible amounts of energy. And that's Steer Appendix 2013 to 2017 at Paragraphs 357 to 366.

JUDGE PROST: If inherency is a large part of your argument, weren't you required to preserve it in blue? Because I (indiscernible) Judge Chen.

MR. CHARKOW: Okay. I'll move on then. I'll move on.

JUDGE PROST: Okay.

MR. CHARKOW: And then so if you don't believe Dr. Steer-okay, I'm sorry. The other part of his-the appendix for Dr. Steer is Appendix 1999 to 2004, Paragraphs 310 to 333. And so Dr. Steer explained that when you have a sample and hold system, which nobody debates that Hulkko and Schiltz are sample and hold systems, that means that it stores negligible amounts of energy. And if you don't believe Dr. Steer, our patent specifically says that.

So in Appendix 1715-this is the 551 patent, which is incorporated by reference into the 835-sorry, on

Column 66, Lines 62 to 65, that patent says, again, incorporated by reference, holding modules and holding capacitance, as used above, identify systems that store negligible amounts of energy.

So don't take Dr. Steer's words for it. Look at our own patent. And when we talk about what a holding system is, and, you know, a holding system is a sample and hold system. And so you don't have to take Dr. Word's [sic] words for it. You could look at what was said in our patent early on, before any litigation happened, in terms of what negligible amounts of energy is and that sample and hold systems store-hold negligible amounts of energy.

They didn't rebut that. They didn't address it. They didn't talk about it, meaning their experts, TCL's experts. And so the Board had nothing to rely upon.

Then the last point I want to raise, so I can reserve some time, is a combination of Gibson and Schiltz. So petitioners state that both Gibson and Schiltz disclose mixers. And so this goes to my point about their expert assertions, that they-when they were doing their-when TCL, the petitioner, was putting their combinations together, what their experts said is that, listen, Schiltz and Gibson both talk about mixers, and they both down-convert. That was pretty much the extent of it. Then what happened is that-and they said, oh, that's a bare pronouncement. I view it as a bare pronouncement. And they said, listen, because it's-they both talk about mixers and because they

both down-convert, all of a sudden that means you can just swap one for the other, no problem.

No, not so fast. So Gibson is a non-sampling mixer, or not-called a heterodyne mixer, which is always on. Schiltz works differently. It's a sampling mixer. It turns on and off. You can't just swap one for the other. And Steer addresses this as Appendix 1993 to 1994, Paragraph 294 to 296, with regards to Gibson; with regards to Schiltz, Appendix 1995 to 1998, Paragraph 298 to 306. And he says you don't combine them in Paragraph-in Appendix 2018 to 2022 in Paragraphs 381 to 388.

So what happens? Dr. Steer explains this. Do they put anything to counter that in the reply? No. Again, in the reply brief, they couldn't get an expert to provide evidence to counter what Dr. Steer said. In reply to what Dr. Steer said, they had the opportunity, and tellingly, they-TCL, the petitioner, did nothing. They didn't-nobody responded to Dr. Steer. It was unrebutted to respond to what Dr. Steer said.

And just to be clear, basically what they're saying is you have two liquids, and they can be swapped. Because they said there's mixers, and they both down-convert. In this case, they're basically saying, because you have two liquids, you can just swap them. So if I have a car with a gas tank that I can put gas in, their position is that because both gas and water are liquids, you could put water in place of the gas. These systems don't work together, as Dr. Steer said. They're inconsistent. You have to-once you swap the mixers of Schiltz for Gibson, it changes the system. It's completely different. It's like putting water-because they're

both liquid-because gas and water are both liquids, it's like putting water in a car in a gas tank. And that just doesn't work, and that's the same issue here.

JUDGE PROST: And you're into your rebuttal time.

MR. CHARKOW: Yeah, going to-I'm wrapping up right now.

And then, so this court has specifically said you cannot-combining systems that change the basic principle under which the prior art was designed to operate or that rendered the prior art inoperable, or for its intended purposes may fail to support a conclusion of obviousness. That's exactly what happened here.

That's *Plas-Pak Industries v. Sulzer*. That's 600 F.Appx 755, 757-758.

And with that, I'll conclude and reserve my time. Thank you.

JUDGE PROST: Good morning.

MR. MAYLE: May it please the court. Ted Mayle for the appellees. I'm going to respond just briefly on a few things.

One was Judge Chen's question about whether ParkerVision could have submitted a expert declaration. And that was actually addressed in the Vidal case. It's on page 981.

I quote, "If ParkerVision believed Intel's reply raised an issue that was inappropriate for a reply brief or that ParkerVision needed a greater opportunity to respond beyond that provided by the rules, *e.g.* to include new argument and evi-

dence in its surreply, it was incumbent upon ParkerVision to contact the Board and request authorization for an exception to the rules.” And that would be authorized under 37 C.F.R. Section 42.5(b).

In the final written decision in our case, this case, the 1417 case, at Appendix 2511 to 2512, which is the order denying the motion to strike, the Board made the points that ParkerVision never explained why it would need new expert testimony and that it didn’t move for new expert testimony and it could have. And instead, they used the limited time in the proceeding to file a procedural motion to strike our reply.

I would also note that in the surreply below, ParkerVision expressly conceded-this is at Page 2531, and it’s also in the final written decision at Page 53-they conceded that the showing of down-conversion as proof for non-negligible energy is, quote, “one way.” It’s one way to show non-negligible energy. Well, we only need one way. We don’t need to do calculations.

ParkerVision did not talk about the claim-they had an argument about cable modem be limiting. They made a few arguments, and they didn’t talk about it, but I just want to clear the record on their main argument in their opening brief at Page 79 was that cable modem is limiting because it provides antecedent basis for some dependent claims. But the Board at Appendix 25 and 022 held that that argument was waived and not preserved because they brought it up for the first time at oral argument.

JUDGE PROST: I think you're better off addressing what your friend addressed this morning.

MR. MAYLE: Okay? That's all I was going to say about that.

Everything else in the case is substantial evidence. We had evidence and arguments for what the storage modules were, what the motivation to combine was. They had their counter evidence. The Board weighed them and determined in our favor. And there's nothing that they've put forth on appeal to show that there was not substantial evidence.

JUDGE CHEN: Gasoline and water.

MR. MAYLE: Right.

JUDGE CHEN: What about their argument about gasoline and water? You can't just swap one mixer for another because the mixers operate very differently, just as gasoline and water do.

MR. MAYLE: There's--there was two grounds. On ground--I'll go to that. That's the motivation to combine. On ground one, which was Hulkko with Gibson--

JUDGE CHEN: Well, let's just stick to Gibson and Schiltz since that's the one that covers all the claims.

MR. MAYLE: If you look to Appendix--aside from everything that it down-converts, it does so in radios, which is in the record, Schiltz provided--and aside from Schiltz expressly stating to use the down--the switch capacitor as a mixer, which is on Appendix 76 to 78, Schiltz provided two express

reasons for why you would want to use a switch capacitor as a mixer. This is at Appendix 78. The Board also referred to this at Appendix 80 to 82.

The first reason I will quote from the record. Quote, "The sample and hold circuit may be accurately operated at high frequencies," unquote. Two, quote, "may be applied to virtually any RF and IF signals," unquote. That is a motivation to use a specific mixer.

Gibson also has a mixer, but it doesn't disclose what type of mixer it is. It just has the symbol for a mixer, which is a circle with an X in it. And so there's two-there's at least three reasons to use it. They both use mixers, and Schiltz provides multiple reasons for why. And when the Board relied on this evidence, it didn't just say, like we heard earlier in a different appeal today, common sense. The Board-and I can quote from Appendix 81 to the point about the mixers. The Board rejected that argument and said, that argument-that specific argument, quote, "does not undermine petitioner's argument and evidence that the particular structures proposed for combination, one, are substantially similar; two, operate in a similar manner; and three, function predictably; and four, with a reasonable expectation of success once combined." That's substantial evidence.

The ground one combination, which was not really addressed, did not even rely on the mixers from the secondary reference. Hulkko, the main reference, taught the mixer, and there was no combination. So the argument about the mixers being incompatible is simply irrelevant.

If I could quickly talk about storage modules, again, ParkerVision says that there was no evidence. That's not correct. For the first round, Hulkko was the storage module at Appendix 49 to 50. Hulkko is a sample and hold circuit. Hulkko-after it samples the incoming signal, the patent teaches that another switch is open, quote, "to transfer the charge on the first capacitor," that's the holding capacitor, "to the output." If that was negligible, why would they talk about that?

And three, that the mixer directly demodulates the input signal, just like the Qualcomm case. And that was all supported by our expert,

Dr. Shoemake, for example, at Appendix 494 to 496, which is cited at Appendix 50. So that's substantial evidence. That's ground one.

Ground two, the Schiltz. This is at Appendix 85 to 88 on the Board's decision. There's substantial evidence that Schiltz is a storage module. For example, it's also a hold capacitor. Schiltz discloses a, quote, "high-speed sample and hold circuit," unquote, comprising a switch capacitor. And it, quote, "provides an improved radio, which uses a sample and hold circuit in various mixing applications, including down-conversion," unquote. And this is by Dr. Shoemake in Appendix 498 to 500, our expert. Schiltz also discloses, quote, "Radios that use a high-speed sample and hold circuit as a mixer"-this is Appendix 88-that the mixer, quote, "operates as a down-converter in radio 10." This is Appendix 88. It also has commercial uses, not that it's required, but, quote, "an improved

radio having a receiver capable of receiving a wideband RF signal,” unquote, Appendix 88.

So that’s ground two. That’s substantial evidence. I’ll stop here unless the court has questions.

JUDGE CHEN: The other side says that if you look at their incorporated 551 patent, that they define that sample and hold capacitors hold negligible amounts of energy. Therefore, the fact that your reference that you’re relying on is a holding capacitor means that it’s storing only negligible amounts of energy. What do you have to say about that?

MR. MAYLE: I think that’s primarily an end run around the claim construction. That verbiage comes from that paragraph that you all dealt with in the Vidal case and the Board dealt with here, where it has multiple sentences that talk about holding modules and storage modules. But the lexicography was that the storage module just has to have non-negligible energy. It doesn’t say—there’s nothing in the construction that says, if you hold the energy, it can’t be non-negligible. I don’t think that’s even logical or a matter of engineering. And also, their patent, whatever it says about their invention doesn’t define the prior art conventions, which have non-negligible energy.

JUDGE PROST: Thank you.

MR. MAYLE: Thank you.

MR. CHARKOW: All right, I’m up again. All right.

JUDGE TARANTO: Smaller device.

MR. CHARKOW: What was that?

JUDGE TARANTO: The smaller device.

MR. CHARKOW: Smaller device, yes. I'll try to make it quick.

Okay. So let me address a couple of issues. So Dr. Steer, don't-again, don't believe our patent in terms of what holding elements are. Dr. Steer addressed that, number one.

They have no expert that talked about holding elements and this, that, or the other thing and what they do. So it's-Dr. Steer's unrebutted testimony further supports what the patent says about holding, and that's a negligible amount of energy.

The counsel raised a number of arguments. They're attorney arguments. He didn't identify anywhere where his expert-he was going through it and trying to cobble together stuff. He said, well, because it's releasing energy, therefore it must be non-negligible. Where is that in the expert report? Where-that's his statement. That's not his expert statement. There is no testimony from their expert that rebuts what Dr. Steer says, that says what he says is wrong. Again, they had the reply brief. They couldn't do it. They couldn't get their expert, apparently, to come up with these positions. That's telling. If you have an expert that's-you have an expert, why not use them? Possibly because the expert wouldn't take the positions because they're fundamentally flawed.

That's not how the technology works. The technology does not work the way they're saying. And for him-they also said that-he pointed to the patent office saying, well, the-for Gibson and Schiltz, that the technology is similar. It's similar

in the sense that they both down-convert, sure, but it's not similar in any other sense. It's water and gasoline. They're both liquids, but they do very different things, and you can't put water, as we know, in your gas tank, and your car's gonna work. It's not gonna work very well.

They try to excuse that they didn't address the issue. So going back to the issue of the untimeliness of when they raised their issue on the Qualcomm case. They tried to excuse that with, well, you could have asked the Board for a surreply-which, by the way, it's not as a right. That's-maybe they would allow it, but that doesn't excuse. They had the burden. They knew about it. It was foreseeable. They had the burden to address the non-negotiable amounts of energy, and they didn't do it. They chose not to do it. And when they had another opportunity to do it on reply, they couldn't get an expert to say it because it's not true. It's inconsistent. He wouldn't-their expert would not have been able to support the position to talk about these systems being commercially viable, to being meeting standards, and so that's it.

I'm out of time. I think you got it.

Thank you very much.

JUDGE PROST: Thank both sides. The case is submitted.

(Recording ends)