

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

PARKERVISION, INC.,
Patent Owner.

IPR2020-01265
Patent 7,110,444 B1

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

GERSTENBLITH, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining Non-Disclaimed Challenged Claim Unpatentable
Granting Petitioner's Request to Exclude Improper Arguments
Raised in Patent Owner's Sur-reply
Granting Petitioner's Motion to Exclude
Denying Petitioner's Motion to Seal
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background*

Intel Corporation (“Petitioner”) filed a Petition (Paper 3, “Pet.”) requesting institution of *inter partes* review of claims 1, 3, and 5 of U.S. Patent No. 7,110,444 B1 (Ex. 1001, “the ’444 patent”). ParkerVision, Inc. (“Patent Owner”) filed an Amended Preliminary Response (Paper 9).¹ 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 10 (“Inst. Dec.”).

After institution, Patent Owner filed a Patent Owner Response (Paper 18, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 21, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 26, “PO Sur-reply”). Additionally, Petitioner filed a Motion to Exclude Exhibit 2022 (Paper 34, “Mot. Exc.”), Patent Owner filed an Opposition to Petitioner’s Motion to Exclude (Paper 36, “Opp.”), and Petitioner filed a Reply in Support of its Motion to Exclude (Paper 37, “Mot. Reply”). With our prior

¹ Patent Owner filed a timely Preliminary Response on November 23, 2020 (Paper 8), and, a day later, filed the Amended Preliminary Response. The Notice of Filing Date Accorded to Petition and Time for Filing Patent Owner Preliminary Response (Paper 4) was entered August 21, 2020. A preliminary response was thus due by November 23, 2020 (November 21st and 22nd fell on a weekend). Patent Owner should have requested authorization from the Board prior to filing its Amended Preliminary Response. Nonetheless, despite Patent Owner’s failure to request authorization, we exercised our discretion under 37 C.F.R. § 42.5(b) to waive, by one day, the timing requirement under 37 C.F.R. § 42.107(b) because (1) Petitioner has not asserted that the additional day resulted in any prejudice to Petitioner and (2) the Amended Preliminary Response appears to be nearly identical to the timely filed Preliminary Response. Paper 10 (“Inst. Dec.”), 2 n.1.

authorization (Paper 31, “Order”), Petitioner filed an Identification of Improper New Evidence and Arguments in [Patent Owner’s] Sur-Reply (Paper 32, “Petitioner’s Identification”) and Patent Owner filed a Response to Petitioner’s Identification (Paper 35, “Patent Owner’s Response to Identification”). Petitioner also filed an unopposed Motion to Seal Exhibit 1029, which is the deposition transcript of Michael Steer, Ph.D. (Paper 22, “Mot. Seal”).

Additionally, Patent Owner filed a Notice of Statutory Disclaimer (Paper 40, “Patent Owner’s Disclaimer Notice”) to which Patent Owner attached a copy of its disclaimer under 37 C.F.R. § 1.321(a), wherein Patent Owner disclaimed claims 1 and 5 of the ’444 patent (Paper 40, Ex. A). Patent Owner’s disclaimer effectively eliminated claims 1 and 5 from the ’444 patent, leaving the patent as if those claims never existed. *See Sanofi-Aventis U.S., LLC v. Dr. Reddy’s Labs., Inc.*, 933 F.3d 1367, 1373 (Fed. Cir. 2019) (noting that disclaiming claims effectively eliminates those claims from the patent as though the disclaimed claims had never existed (internal quotations and citations omitted)); *see also Asetek Danmark A/S v. CoolIT Sys., Inc.*, IPR2020-00747, Paper 42 at 6 (PTAB Sept. 30, 2021) (determining that a statutory disclaimer removed a disclaimed claim from an *inter partes* review proceeding). Thus, claims 1 and 5 are no longer part of this proceeding.

At Petitioner’s request, we held a pre-hearing conference on October 26, 2021, during which we addressed, *inter alia*, Petitioner’s Motion to Exclude and related briefing, Petitioner’s Identification and Patent Owner’s Response to Identification, and Petitioner’s Motion to Seal. Each is addressed in more detail below. An oral hearing was held on November 1,

2021, and a copy of the transcript was entered in the record. Paper 42 (“Tr.”).

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 claim 3, the sole claim remaining in the trial. Petitioner bears the burden of proving unpatentability of the challenged claim.

Dynamic Drinkware, LLC v. Nat’l Graphics, Inc., 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must prove unpatentability by a preponderance of the evidence. See 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). Having reviewed the arguments and the supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 3 of the ’444 patent is unpatentable.

B. Related Proceedings

Petitioner and Patent Owner identify the following related matter: *ParkerVision, Inc. v. Intel Corp.*, No. 6:20-cv-108-ADA (W.D. Tex.) (“the related litigation”). Pet. 7; Paper 5 (Patent Owner’s Mandatory Notices), 2. Patent Owner also states that the ’444 patent is asserted in *ParkerVision, Inc. v. TCL Technology Group Corp.*, No. 5:20–cv-01030-GW-SHK (C.D. Cal.). Paper 5, 2. In addition, Petitioner filed a petition challenging several claims of U.S. Patent No. 7,539,474 B2, which is related to the ’444 patent, in IPR2020-01302.

C. Real Parties in Interest

Petitioner identifies Intel Corporation as the real party in interest. Pet. 7. Patent Owner identifies ParkerVision, Inc. as the real party in interest. Paper 5, 2.

D. The Asserted Grounds of Unpatentability and Declaration Evidence

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged²	35 U.S.C. §³	Reference(s)/Basis
3	103(a)	Tayloe, ⁴ TI Datasheet ⁵
3	103(a)	Tayloe, Kawada ⁶

Pet. 10. Petitioner supports its challenge with two declarations by Vivek Subramanian, Ph.D., one submitted with the Petition (Ex. 1002 (Declaration of Vivek Subramanian, Ph.D.)) and the other submitted with Petitioner's Reply (Ex. 1030 (Reply Declaration of Vivek Subramanian, Ph.D.)), and a Declaration of Maureen M. Honeycutt (Ex. 1019). Patent Owner supports its arguments with a Declaration of Michael Steer, Ph.D. (Ex. 2021).

² Claim 3 is the sole challenged claim remaining in the case following Patent Owner's disclaimer of claims 1 and 5.

³ 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 versions of the statutory bases for unpatentability.

⁴ U.S. Patent No. 6,230,000 B1, issued May 8, 2001 (Ex. 1004, "Tayloe").

⁵ SN74CBT3253 Dual 1-of-4 FET Multiplexer/Demultiplexer (rev. ed. May 1998) (Ex. 1005, "TI Datasheet"). Petitioner refers to this exhibit, in at least one instance, as "SN74CBT3253D." Pet. 9. The exhibit itself, however, does not include the letter "D" in the product number. Ex. 1005. Petitioner explains that "the 'D' in the product number refers simply to a packaging option" (Pet. 38 n.5), which is confirmed by the description on the first page stating "Package Options Include Plastic Small-Outline (D)." Ex. 1005, 1. Neither party asserts that the packaging option results in a difference of any significance to the issues before us.

⁶ U.S. Patent No. 4,985,647, issued January 15, 1991 (Ex. 1008, "Kawada").

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.

Figure 70A is reproduced below:

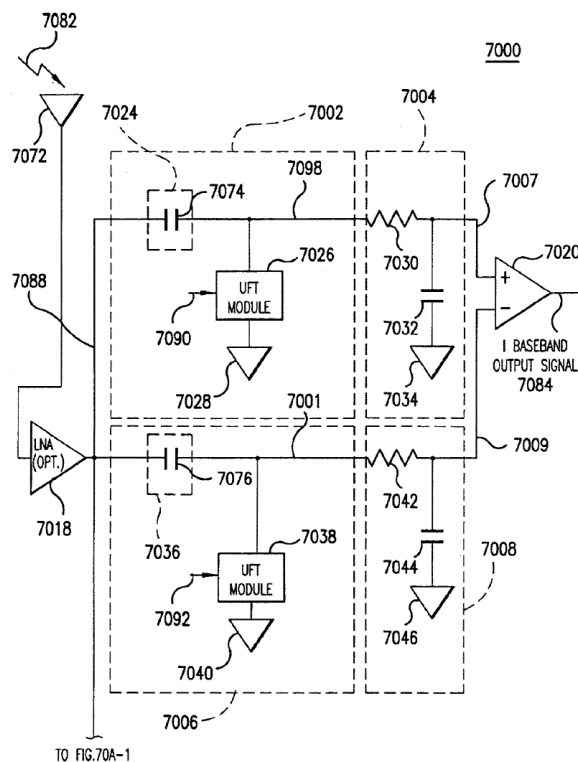


FIG.70A

Figure 70A of the '444 patent “illustrates an IQ 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 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 35:62–64. Thereafter, “[f]irst UFD [universal frequency down-conversion] module 7002, receives amplified I/Q signal 7088. . . . [,] down-converts the I-phase signal portion of 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 7009 from filtered I output signal 7007, 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. *See* 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:

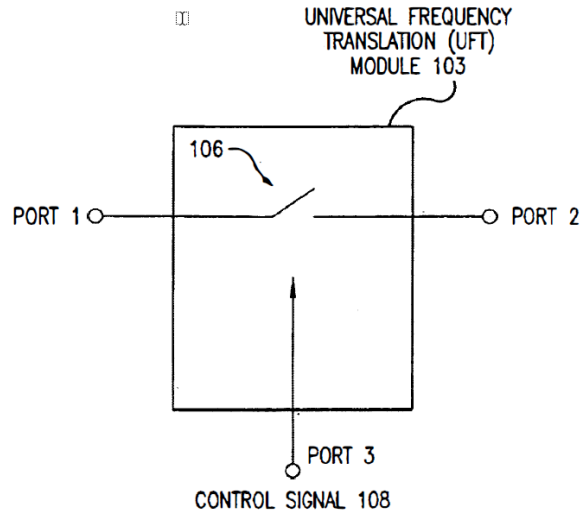
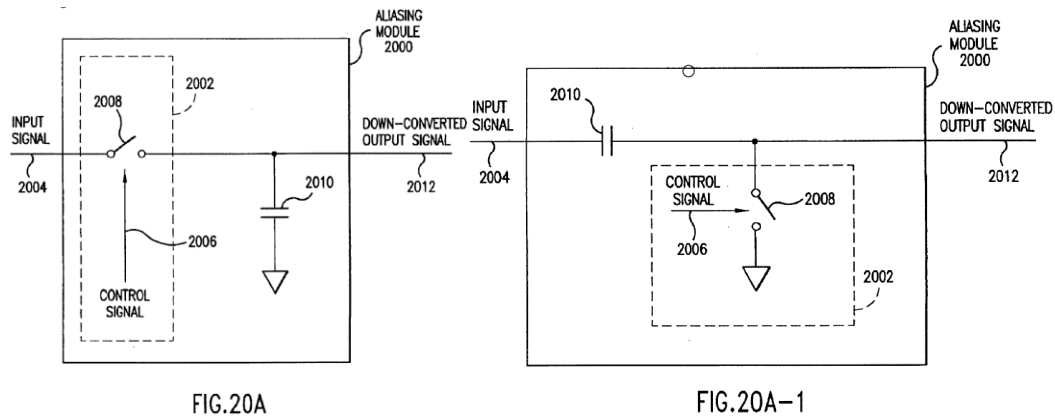


FIG. 1B

Figure 1B of the '444 patent “is a more detailed diagram of a universal frequency translation (UFT) module.” *Id.* at 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).

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:



Figures 20A and 20A-1 of the '444 patent “are example aliasing modules.” *Id.* at 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. Patent No. 6,061,551 (“the '551 patent”), “the full disclosure of which is incorporated herein by reference.” Ex. 1001, 9:32–38. And, the '444 patent further states that “[d]own-conversion utilizing a UFD module (also called an aliasing module) is further described in the” '551 patent. *Id.* at 34:54–58.

F. Illustrative Claim

Claim 3, the sole claim remaining in this proceeding, is illustrative of the claimed subject matter and reproduced below with Petitioner's bracketing added for reference:

3. [3 preamble] 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, 61:1–18.

G. Level of Ordinary Skill in the Art

Petitioner, supported by Dr. Subramanian's testimony, proposes that a person of ordinary skill in the art at the time of the invention would have had "at least a bachelor's degree in electrical engineering or a related subject and two or more years of experience in the field of RF circuit design." Pet. 47 (citing Ex. 1002 ¶ 25). Petitioner explains that "[l]ess work experience may

be compensated by a higher level of education, such as a master's degree.”
Id. (citing Ex. 1002 ¶ 25).

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, on the preliminary record, we adopted Petitioner's 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. 9 (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

- (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. 2021 ¶ 24). Neither Patent Owner nor Dr. Steer explains why their proposal materially differs from that proposed by Petitioner.

Patent Owner's option (a) is substantially the same as Petitioner's 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. Patent Owner's option (b), however, is consistent with

Dr. Subramanian’s testimony, which states “[l]ess work experience may be compensated by a higher level of education, such as a master’s degree, *and vice versa*.” Ex. 1002 ¶ 25 (emphasis added). It is not clear why Petitioner’s proposal, as set forth in the Petition, did not include the additional option of providing greater work experience in compensation for a lower level of education.

Neither party contends that the differences in proposals affect the outcome of this proceeding and we do not find that they do. 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 ’444 patent, and the opinions of Drs. Subramanian and Steer (which, as discussed above, recognize that additional work experience can compensate for the lack of a formal degree). 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 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) (2019). The claim construction standard includes construing claims in accordance with

the ordinary and customary meaning of such claims as 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*”⁷

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 element,” *see, e.g.*, PO Resp. 2–4, 45–59, 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. Accordingly, we address the parties’ arguments and proposed constructions.

1. *The Parties’ Arguments*

In the Petition, Petitioner does not propose a construction for “storage element,” but does assert that each “storage element” is taught by Tayloe’s capacitors, illustrated in Tayloe’s Figure 3. Pet. 75–78 (citations omitted). Petitioner contends that “[a] capacitor is a well-known storage element, and in fact, the ’444 patent embodiment discloses a capacitor as the storage element.” *Id.* at 77 (citations omitted).

In the Patent Owner Response, Patent Owner notes that the district court construed “storage element” in the related litigation as “an element of

⁷ The parties agree that the terms “storage element” and “storage module” are synonymous. *See* PO Resp. 27 (noting that “storage module” is “another name for ‘storage element’”); Pet. Reply 10 n.2 (“The ’551 patent uses the term ‘storage **module**,’ whereas challenged claim 3 uses ‘storage **element**.’ As [Patent Owner] appears to admit (*e.g.*, [PO Resp.] 46), ‘storage module’ and ‘storage element’ are synonymous.”).

an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal.” PO Resp. 45; *see also id.* at 3–4 (citing Ex. 2012 (Document 75, Claim Construction Order), 5). Patent Owner contends that the district court previously considered the construction of “storage element” proposed by Petitioner in that forum—“an element that stores a non-negligible amount of energy from an input electromagnetic (EM) signal.” *Id.* at 46. Patent Owner asserts that the district court included the phrase “of an energy transfer system” from Patent Owner’s proposed construction “to distinguish a ‘storage element’ (an element of an *energy transfer* system) from a ‘holding element’ (an element of a sample and hold system – the type of element used in [Petitioner’s] primary prior art reference, Tayloe).” *Id.*

Patent Owner contends that the ’444 patent (based on the incorporated ’551 patent disclosure) teaches two different systems: (1) a “sample-and-hold” or “voltage sampling” system and (2) an “energy transfer” or “energy sampling” system. PO Resp. 19, 21; *see also id.* at 31 (citing Ex. 2021 ¶ 196). Patent Owner asserts that a sample-and-hold system includes (1) a switch, (2) a *holding* element, and (3) a *high* impedance load. *Id.* at 20. Patent Owner contends,

The ’444 patent specifically *reserves* the term “*holding*” module/element to refer to an element (e.g., capacitor) used in a sample-and-hold (voltage sampling) system because . . . the use of a *high* impedance load causes the capacitor to *hold* energy (i.e., *prevent* energy in the capacitor from being discharged to form the down-converted signal – the discharged energy itself does not become part of the down-converted signal).

Id. (citing Ex. 2021 ¶ 146). In contrast, Patent Owner contends that an energy transfer system includes (1) a switch, (2) a *storage* element, and (3) a *low* impedance load. *Id.* at 21. Patent Owner asserts,

The '444 patent specifically reserves the term “*storage*” module/element to refer to an element (e.g., capacitor) used in an energy sampling system because . . . the use of a *low* impedance load enables the capacitor to *store* energy and subsequently *discharge* the energy to form the baseband signal (i.e., the discharged energy itself becomes part of the baseband signal).

Id. at 22 (citing Ex. 2021 ¶ 160).

Patent Owner contends that “[w]hat is critical to understand is that while both energy sampling and voltage sampling use similar components (e.g., switches, capacitors and loads), these components are used in different ways in a circuit to create a desired result.” PO Resp. 22 (citing Ex. 2021 ¶ 173). Patent Owner asserts that “the way in which the components are used is significant and make these systems *fundamentally different and competing* systems.” *Id.* In particular, Patent Owner contends that “[w]hereas a voltage sampling circuit discards energy without using the energy in the down-converted signal (thereby wasting energy), an energy sampling circuit discharges energy into a load so that the energy itself becomes part of the down-converted signal.” *Id.* (citing Ex. 2021 ¶ 173). Patent Owner argues that “[t]hese differences . . . [are] why claim 3 of the '444 patent specifically recites ‘*storage* element’ (an element of an *energy* transfer (*energy* sampling) system) instead of ‘*holding* element’ (an element of a sample-and-hold (*voltage* sampling) system).” *Id.*; see *id.* at 31 (“Challenged claim 3 of the '444 patent is directed to *energy* transfer because it uses a term that the patentees *reserved* specifically to connote

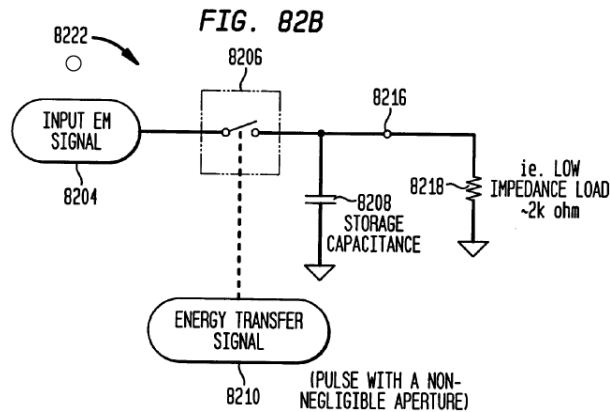
energy transfer – ‘*storage* element.’”) (citing Ex. 2021 ¶ 196). Patent Owner asserts that “[t]he different terms distinguish between the *different* function/operation of the capacitors and *different* type of loads used with the capacitors.” *Id.* Patent Owner further explains, “[i]n other words, whether a capacitor is a ‘storage’ module/element depends on the way in which the capacitor is being used. Just because a capacitor is being used does not mean that the capacitor is a ‘storage’ module/element.” *Id.* at 29.

Patent Owner includes the following table that it contends “identifies key features that distinguish energy transfer (i.e., energy sampling) from sample-and-hold (i.e., voltage sampling)” systems:

Energy Transfer (<i>Energy</i> Sampling)	Sample and Hold (<i>Voltage</i> Sampling)
Non-negligible sampling aperture	Negligible sampling aperture
“ <i>Storage</i> ” module	“ <i>Holding</i> ” module
<i>Low</i> impedance load	<i>High</i> impedance load
Down-converted signal includes the <i>energy</i> transferred from the RF signal to the load (i.e., energy sent to the load makes up the down-converted signal)	Down-converted signal is based on discrete <i>voltage</i> measurements of the RF signal

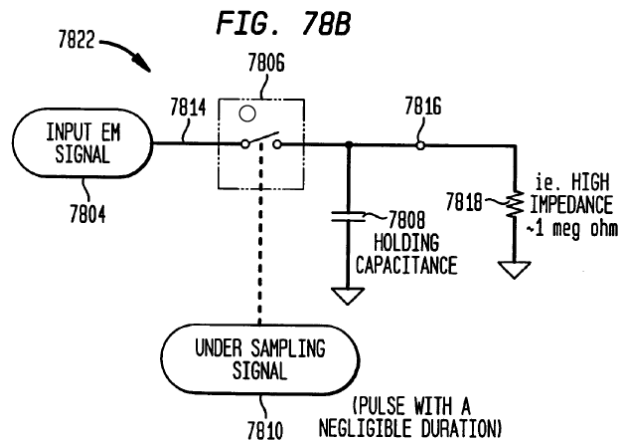
PO Resp. 32 (footnote omitted).

Relying on Figure 82B of the ’551 patent, reproduced below, Patent Owner explains the operation of an energy transfer (energy sampling) system.



Ex. 2007, Fig. 82B; see PO Resp. 33. Figure 82B of the '551 patent illustrates an exemplary energy transfer system. Ex. 2007, 7:47–48. According to Patent Owner, “an energy transfer system uses (1) a control signal having a pulse with a *non-negligible* aperture/duration, and (2) a ‘storage’ capacitor for storing *and discharging non-negligible* amounts of energy for driving a *low* impedance load.” PO Resp. 33–34. Patent Owner asserts that, “[i]f the impedance were high, the ‘storage’ capacitor could *not* discharge sufficient energy for the system to perform energy transfer (energy sampling) and form a down-converted signal from energy transferred to the low impedance load.” *Id.* at 34 (citing Ex. 2021 ¶ 200). Patent Owner provides further explanation as to how it contends an energy transfer system functions, based on the teachings of the '551 patent, to produce the baseband signal sent from a transmitting device. *Id.* at 33–38 (citations omitted).

In comparison, Patent Owner relies on Figure 78B of the '551 patent, reproduced below, to explain the operation of a sample-and-hold system.



Ex. 2007, Fig. 78B; *see* PO Resp. 39. Figure 78B of the '551 patent illustrates an exemplary embodiment of an under-sampling system.

Ex. 2007, 7:36–37. According to Patent Owner, “a sample and hold system uses (1) a control signal having a pulse with a *negligible* aperture/duration, (2) a ‘holding’ capacitor for *holding* a constant voltage across the capacitor and (3) a *high* impedance load.” PO Resp. 39. Patent Owner asserts that the capacitor is referred to as a “holding” capacitor “because, unlike the ‘storage’ capacitor in an energy transfer system, a ‘holding’ capacitor does not discharge any significant energy to the load.” *Id.* Patent Owner contends that “the *high* impedance load is specifically included to *prevent* the holding capacitor from discharging energy, which would degrade the discrete voltage measurements and adversely affect the system performing sample and hold (voltage sampling).” *Id.* (citing Ex. 2021 ¶ 209). Patent Owner provides further explanation as to how it contends a sample and hold system functions, based on the teachings of the '551 patent, to produce the baseband signal sent from a transmitting device. *Id.* at 38–42 (citations omitted).

Patent Owner contends that “[a] ‘*storage* element’ (or ‘storage module’) is a term reserved exclusively for a component of an energy

transfer (*energy* sampling) system” whereas “a ‘holding’ module/element is a term reserved exclusively for a component of a sample-and-hold (*voltage* sampling) system.” PO Resp. 46. Therefore, Patent Owner asserts that “an energy ‘storage’ module/element must be construed in a way that distinguishes it from a ‘holding’ module/element.” *Id.* (citations omitted).

Patent Owner argues that the specification of the ’551 patent “is clear that the term ‘storage’ module/element is specific to an ‘energy transfer system’ and a ‘holding’ module/element, as the name implies, is specific to a sample-and-*hold* (voltage sampling) system.” PO Resp. 47. In particular, Patent Owner relies on the following paragraph of the ’551 patent:

FIG. 82A illustrates an exemplary energy transfer system 8202 for down-converting an input EM signal 8204. The energy transfer system 8202 includes a switching module 8206 and a storage module illustrated as a storage capacitance 8208. 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. 2007, 66:55–67, *quoted in* PO Resp. 47. Patent Owner also relies on the ’551 patent’s use of “storage” in Figures 68G and 82B compared to the use of “holding” in Figures 29G and 78B. PO Resp. 48–49 (comparing “*STORAGE* MODULE” and “*CAPACITIVE STORAGE* MODULE” in Figure 68G and “*STORAGE* CAPACITANCE” in Figure 82B to “*HOLDING* MODULE” and “*CAPACITIVE HOLDING* MODULE” in

Figure 29G and “*HOLDING CAPACITANCE*” in Figure 78B (emphases added)).

Patent Owner contends that “[a] storage element is synonymous with a *low* impedance load. Indeed, a *low* impedance load is what makes a module a ‘storage’ module/element as opposed to a ‘holding’ module/element.” PO Resp. 49. Patent Owner asserts that “a *low* impedance load provides little resistance to electrical current and, thus, energy can be transferred/discharged from a ‘storage’ module/element. This unique feature of an energy transfer system is what enables the ‘storage’ module/element to drive a low impedance load.” *Id.* In contrast, Patent Owner argues that, if “a load is *high* impedance, there would be high resistance to current and the module would ‘hold’ a voltage. In other words, with a *high* impedance load, the module would be a ‘holding’ module/element, *not* a ‘storage’ module/element.” *Id.* As further support for its argument, Patent Owner points to the following statement in the ’551 patent, which notes that a benefit of energy transfer system 8202 is driving a low impedance load:

Another benefit of the energy transfer system 8202 is that the non-negligible amounts of transferred energy permit the energy transfer system 8202 to effectively drive loads that would otherwise be classified as low impedance loads in under-sampling systems and conventional sampling systems. In other words, the nonnegligible amounts of transferred energy ensure that, even for lower impedance loads, the storage capacitance 8208 accepts and maintains sufficient energy or charge to drive the load 8202.

Ex. 2007, 67:37–46, *quoted in* PO Resp. 49–50. Patent Owner asserts that “[w]ithout a ‘storage’ module/element driving a *low* impedance load, sufficient energy could not be transferred/discharged from the ‘storage’

module/element in order to recover a down-converted signal from an input EM signal. In such a case, the module/element would be a ‘holding’ module/element.” PO Resp. 50.

Petitioner contests Patent Owner’s characterization of the ’444 and ’551 patents as well as Patent Owner’s construction of “storage element.” See, e.g., Pet. Reply 4–16. We discuss both patents, as we did with respect to Patent Owner’s argument, because the distinction informs as to how the parties understand these two patents and, specifically, claim 3 of the ’444 patent. With respect to the characterization of the patents, Petitioner relies on a portion of the Summary of the Invention of the ’551 patent, which states:

Briefly stated, the present invention is directed to methods, systems, and apparatuses *for down-converting an electromagnetic (EM) signal by aliasing the EM signal*, and applications thereof. Generally, the invention operates by receiving an EM signal. The invention also receives an aliasing signal having an aliasing rate. The invention aliases the EM signal according to the aliasing signal to down-convert the EM signal. *The term aliasing, as used herein and as covered by the invention refers to both down-converting an EM signal by under-sampling the EM signal at an aliasing rate, and down-converting an EM signal by transferring energy from the EM signal at the aliasing rate.*

Ex. 2007, 2:53–65 (emphases added), *quoted in* Pet. Reply 5–6.

Relying on the above-disclosure from the ’551 patent, Petitioner explains that “aliasing” refers to down-converting an EM signal by (1) under-sampling the EM signal at an aliasing rate and (2) transferring energy from the EM signal at the aliasing rate. Pet. Reply 6 (citing Ex. 2007, 2:60–65, 20:7–11, 21:4–7). Additionally, Petitioner points to the Table of Contents in the ’551 patent and, specifically, the Overview of the

Invention section that organizes its discussion around these two concepts as well as Figure 45A, which shows a Venn diagram in which “UNDERSAMPLING” and “TRANSFERRING ENERGY” are shown as subsets of “ALIASING.” *Id.* at 6–8 (citing Ex. 2007, 9:1–21, 20:63–21:2, Fig. 45A). Further, Petitioner points to an express statement by Patent Owner in a previous *inter partes* review (IPR2014-00948), where Patent Owner stated that the ’551 patent describes “**two sampling mechanisms: (1) under-sampling; and (2) energy transfer.**” *Id.* at 8 (citing Ex. 1031 (Patent Owner’s Response to Petition in IPR2014-00948, Paper 25), 17).⁸

Petitioner contends that neither patent (the ’444 patent or the ’551 patent) refers to “energy sampling” or “voltage sampling,” and neither refers to “any sample of ‘energy’” measured in units of energy, such as joules. Pet. Reply 8–9. Rather, Petitioner asserts that “the down-converted waveforms for all embodiments—including those that [Patent Owner] identifies as ‘energy transfer’ embodiments—show samples measured in units of voltage (‘millivolts’ or ‘mV’).” *Id.* (citing Ex. 2007, Figs. 83E–83F). Thus, Petitioner argues that Patent Owner’s characterization is incorrect because the distinction in the ’551 patent is not between “energy sampling” and “voltage sampling”; rather, the distinction is between “under-sampling” and “energy transfer.” *See, e.g., id.* at 4–5 (citations omitted).

⁸ The patent-at-issue in IPR2014-00948 also incorporates the ’551 patent by reference, and, thus, the argument there also was based on the ’551 patent. *See, e.g.,* Ex. 1031, 3 n.1 (noting incorporation of the ’551 patent by reference).

With respect to the construction of “storage element,” Petitioner proposes that it be construed to mean “an element that stores a nonnegligible amount of energy from an input electromagnetic (EM) signal.” Pet. Reply 10. Petitioner contends that its proposed construction expressly tracks the definition provided in the ’551 patent for “storage element,” which the parties agree is synonymous with “storage module.” *Id.*; see *id.* at 10 n.2. In particular, Petitioner asserts that the ’551 patent states: “**Storage modules . . . refer to systems that store non-negligible amounts of energy from an input EM signal.**” *Id.* (quoting Ex. 2007, 66:65–67). Petitioner notes that the ’551 patent also states that “the ‘goal of the storage modules’ is ‘to **store non-negligible amounts of energy** transferred from the EM signal’” and that the patent “specifically distinguishes **storage** elements from **holding** elements on this basis.” *Id.* at 10–11 (quoting Ex. 2007, 66:59–67 (“**Holding modules . . . 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 . . . on the other hand, refer to systems that store non-negligible amounts of energy** from an input EM signal.”)). Thus, Petitioner contends “‘storage element’ should be construed accordingly.” *Id.* at 11 (citation omitted).

Additionally, Petitioner points to IPR2014-00948, where Petitioner asserts that Patent Owner argued “a storage module” should be construed to mean “an apparatus that stores non-negligible amounts of energy from the carrier signal.” Pet. Reply 11 (citing Ex. 1032 (Patent Owner’s Preliminary Response in IPR2014-00948, Paper 7), 37). Petitioner also notes that Patent Owner argued that the ’551 patent “**explicitly defines a storage module.**” *Id.* (citing Ex. 1032, 21). And, Petitioner further argues that the Board relied

upon Patent Owner’s statement in the institution decision in that proceeding. *Id.* at 11–12 (citing Ex. 1033 (Decision, Institution of *Inter Partes* Review, Paper 8), 10).

Addressing Patent Owner’s proposed construction in this proceeding, Petitioner asserts that Patent Owner seeks to modify the definition provided in the ’551 patent by including a requirement that the “storage element” be part of “an **energy transfer system**.” Pet. Reply 12 (citing PO Resp. 45). Petitioner notes that Patent Owner “then interprets this proposed construction as requiring a further limitation—the system must have a low-impedance load.” *Id.* (citing PO Resp. 32, 46–50).

Petitioner responds with three primary points. First, Petitioner points to Patent Owner’s express statement, from IPR2014-00948, that the ’551 patent “explicitly defines” this term, but Petitioner notes that “of an energy transfer system” does not appear in the definition. Pet. Reply 12 (citing Ex. 1032, 21). Petitioner contends that Patent Owner’s proposal “should be rejected for this reason alone.” *Id.* (citation omitted). Second, Petitioner asserts that Patent Owner’s “rationale for its construction—the supposed distinction between ‘energy sampling’ and ‘voltage sampling’—is not grounded in the patent.” *Id.* And, third, that the ’551 patent does not define a storage module as part of an energy transfer system; rather, it “merely discloses an embodiment of ‘an exemplary energy transfer system.’” *Id.* at 12–13 (citing Ex. 2007, 66:55–67). And, “the rest of the passage directly supports [Petitioner’s] proposed construction” by reciting that storage modules “refer to systems that store non-negligible amounts of

energy from an input EM signal.” *Id.* at 13 (internal quotation and emphasis omitted).⁹

In its Sur-reply, Patent Owner responds to Petitioner’s discussion of the characterization of the ’444 and ’551 patents as well as the construction of “storage element.” PO Sur-reply 8–14. With respect to the characterization of these two patents, Patent Owner contends that “[u]nlike [Patent Owner], who focuses on how the technology actually works, [Petitioner] relies on a *naming convention* used in the patent to push a *flawed* narrative – one that has *twice* been rejected by the” same district court. PO Sur-reply 8 (citing Pet. Reply 2–3, 6–8). Patent Owner asserts that “[t]he fact that the patent does not use the terms ‘voltage sampling’ and ‘energy sampling’ verbatim is beside the point.”¹⁰ *Id.* at 9. Patent Owner argues that the ’444 patent “relates to the use of *sampling* to down-convert a signal and teaches *only two* things that can be sampled to down-convert a signal: (1) voltage and (2) flow of energy over time.” *Id.* Voltage, Patent Owner asserts, “is sampled by taking and holding input voltage values (using a ‘holding’ element),” whereas “energy is sampled by transferring non-negligible amounts of energy from an input signal.” *Id.* (citing Ex. 2007,

⁹ Petitioner also notes that, although Figures 68G and 82B “show a ‘storage module’ or ‘storage capacitance’ in an ‘energy transfer’ embodiment, . . . neither figure **defines** a storage module as an element of an ‘energy transfer system’—any more than they suggest that a switch or resistor (also shown) should be defined as such an element.” Pet. Reply 13 n.3.

¹⁰ Patent Owner contends that “[e]nergy cannot be measured directly. Instead a measurement (voltage or its inverse, current) needs to be taken from which energy can be derived.” PO Sur-reply 9 n.6. Thus, Patent Owner argues that Petitioner’s identification of Figures 83E–F of the ’551 patent, which plot measurements of voltage over time, “is of no moment.” *Id.*

62:27–30). Patent Owner explains that this is the reason it refers to the two systems as voltage sampling and energy sampling. *Id.* at 10.

With respect to the construction of “storage element,” Patent Owner contends that the ’551 patent “states that the ‘energy transfer’ system uses ‘a storage module’ that ‘stores non-negligible amounts of energy,’ whereas the ‘under-sampling (i.e., sample-and-hold) system utilizes a ‘holding module’ that ‘stores negligible amounts of energy.’” PO Sur-reply 10–11 (quoting Ex. 2007, 66:55–67). Thus, Patent Owner asserts that “there should be no dispute that ‘energy transfer system’ should be included in the construction as [Patent Owner] proposes.” *Id.* at 11.

Patent Owner contends that Petitioner fails to provide any “substantive technical arguments based on the intrinsic evidence as to why including ‘an element of an energy transfer system’ is technically incorrect. Instead, [Petitioner] points to a single sentence from the specification . . . and asserts that this passage is enough to define the ‘storage’ element.” PO Sur-reply 11. Discussing the same paragraph quoted above from Petitioner’s Reply, Patent Owner contends that the paragraph “is describing a ‘storage’ module/element in the context of an energy transfer system . . . , which is the only type of system that has a ‘storage’ module/element. Indeed, this passage is found in the section entitled ‘0.1.2 Introduction to *Energy Transfer*.’” *Id.* at 12 (quoting Ex. 2007, 66:33) (citing Ex. 2007, 66:55–37). Thus, Patent Owner asserts there is no basis to argue against including “energy transfer system” in the meaning of “storage element.” *Id.*

Patent Owner argues that inclusion of “energy transfer system” in the meaning of “storage element” is appropriate because (1) Petitioner admits there are only two systems disclosed—energy transfer and under-sampling

(PO Sur-reply 12 (citing Pet. Reply 6)), and (2) the '444 patent (via incorporation of the '551 patent) states that a “storage” element is only used in an energy transfer system (*id.* (citing Ex. 2007, 66:55–59)). Patent Owner contends, “[l]ogically, if there are only two systems and a ‘storage’ element is only used in an energy transfer system, then a ‘storage’ module/element must necessarily be an element of an energy transfer system.” *Id.* Patent Owner argues that “the specification makes it clear that ‘storage’ modules/elements are inseparably intertwined with energy transfer systems.” *Id.* (citing PO Resp. 46–50).

Additionally, Patent Owner asserts that its arguments in IPR2014-00948 were based on the broadest reasonable interpretation standard used by the Board at that time, not the standard currently employed by the Board, which matches the standard used in federal courts under 35 U.S.C. § 282(b). PO Sur-reply 12–13. In particular, Patent Owner contends that it focused on the single-sentence highlighted by Petitioner because of the claim construction standard at that time, whereas the current claim construction standard, “requires considering more than just the” one sentence, which Patent Owner asserts its proposed construction now does. *Id.* at 13.

Further, Patent Owner asserts that “a ‘low impedance load’ goes to the heart of what makes an element, a ‘storage’ element (used in energy sampling) as opposed to a ‘holding’ element (used in voltage sampling/sample-and-hold).” PO Sur-reply 13. Patent Owner contends that “[u]nlike a low impedance load, a high impedance load causes an element to ‘hold’ energy, making it a ‘holding’ element, not a ‘storage’ element.” *Id.* Patent Owner asserts that “[t]his is the reason the specification specially makes a point to say that a ‘holding’ modules/elements hold ‘negligible

amounts of energy . . . *with the intent of ‘holding’ a voltage value.*” *Id.* (quoting Ex. 2007, 66:63–65). Patent Owner argues that “the way in which ‘holding’ modules/elements ‘hold’ a voltage value is by using a high impedance load.” *Id.* at 14 (citing Ex. 2021 ¶ 148). Patent Owner asserts that loads can either be high or low—“it is a binary choice”—and “because a ‘storage’ module/element is not using a high impedance load, it must necessarily be using a low impedance load.” *Id.* (citing Ex. 2007, 67:32–33). Patent Owner also remarks that “the specification states that in energy transfer systems driving a low impedance load *is* a benefit” meaning “it *necessarily* occurs.” *Id.* (citing Ex. 2007, 67:37–42).

2. Analysis

We begin with a discussion of the timing of the parties’ proposed constructions and interplay between this proceeding and the related litigation because the parties include aspects of both in their briefing here. Petitioner’s Reply, in particular, sets forth an accurate timeline, which we repeat here along with additional details.

- July 2020 – Petitioner files the instant Petition, but does not propose an express construction for “storage element” (see Paper 4 (Notice of Filing Date Accorded to Petition and Time for Filing Patent Owner Preliminary Response), 1);
- September 2020 – the parties identify terms for construction in the related litigation, but neither party includes “storage element” (see Ex. 1034 (Patent Owner’s Identification of Proposed Claim Terms for Construction); Ex. 1035 (Petitioner’s Proposed Claim Terms));
- Late September 2020 – the parties modify their identification of terms for construction in the related litigation and Petitioner

includes “storage element” as recited in the ’444 patent (Ex. 1036 (Petitioner’s Proposed Claim Constructions));

- October 2020 – the parties exchange proposed constructions for the terms identified in the related litigation (Pet. Reply 14);
- January 2021 – the district court issues a claim construction order construing “storage element” as “an element of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal” (see Paper 12 (Petitioner’s Supplemental Notice Regarding Claim Construction), Ex. 2012 (Claim Construction Order in the related litigation), 5);
- May 2021 – Patent Owner files its Patent Owner Response and proposes an express construction for “storage element”;
- July 2021 – the district court issues a claim construction order in a different case (Case No. W-20-CV-00562-ADA) construing “storage module” in a related patent as “a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal *for driving a low impedance load*” (Ex. 1038 (Claim Construction Order in Case No. W-20-CV-00562-ADA), 2 (emphasis added));
- August 2021 – Petitioner files its Reply;
- September 2021 – Patent Owner files its Sur-reply;
- October 2021 – the district court issues an amended construction of “storage module” in Case No. W-20-CV-00562-ADA, deleting the recitation of “for driving a low impedance load” from its previous construction and, thus, harmonizing its constructions (see Paper 39

(Petitioner’s Supplemental Notice Regarding Claim Construction), 2–3); and

- October 2021 – a district court-appointed Special Master recommends, in other litigation involving claim 3 of the ’444 patent, construing “storage element” consistent with the district court’s construction of “an element of an energy transfer system that stores nonnegligible amounts of energy from an input electromagnetic signal” (see Paper 41 (Patent Owner’s Supplemental Notice Regarding Claim Construction), 2)).

As the above-sequence reflects, the most-current construction of “storage element” by the district court is “an element of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal.” See Paper 12; Ex. 2012, 5. As set forth in 37 C.F.R. § 42.100(b), we consider “[a]ny prior claim construction determination concerning a term of the claim in a civil action . . . that is timely made of record.” We have done so to the extent possible on the record before us. In particular, the district court’s claim construction is set forth in a chart format without providing the benefit of the district court’s informed analysis as to how that construction was determined. The lack of explanation is particularly of note here because the district court did not adopt either party’s proposed construction in full; rather, the court accepted parts of each party’s proposal. As reflected in the chart below, the district court accepted that “storage element” is limited to “an energy transfer system” by including that phrase in the court’s final construction, but did not accept Patent Owner’s inclusion of the phrase “for driving a low impedance load.”

Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction	District Court's Final Construction
“storage element”	“an element <i>of an energy transfer system</i> that stores non-negligible amounts of energy from an input electromagnetic signal <i>for driving a low impedance load</i> ”	“an element that stores a nonnegligible amount of energy from an input electromagnetic (EM) signal”	“an element <i>of an energy transfer system</i> that stores non-negligible amounts of energy from an input electromagnetic signal”

See Ex. 1026, 5 (emphases added). We consider the district court’s construction as we analyze the meaning of “storage element” based on the complete record before us.

As reflected in the arguments above, Patent Owner’s proposed construction in this proceeding matches the district court’s final construction in the related litigation. Petitioner, however, presents the same construction here that it proposed in the related litigation. The parties’ proposed constructions in this proceeding are reflected in the chart below.

Term	Patent Owner's Proposed Construction	Petitioner's Proposed Construction
“storage element”	“an element <i>of an energy transfer system</i> that stores non-negligible amounts of energy from an input electromagnetic signal”	“an element that stores a nonnegligible amount of energy from an input electromagnetic (EM) signal”

See, e.g., PO Resp. 4 (emphasis altered); Pet. Reply 10 (emphasis added).

We begin with the plain language of claim 3. Claim 3, as reproduced above, is directed to “[a] wireless modem apparatus, comprising a receiver for frequency down-converting an input signal.” Ex. 1001, 61:1–3. Claim 3 recites several structural requirements of the claimed receiver including “a

first frequency down-conversion module,” “a second frequency down-conversion module,” and “a subtractor module.” *Id.* at 61:4–15. Claim 3 further recites two structural requirements of the first and second frequency down-conversion modules—“a switch and a storage element.” *Id.* at 61:16–18. Neither party contends that the claim language itself informs as to the meaning of “storage element” beyond the words “storage” and “element.” The term “energy transfer” is not recited in claim 3 and neither party points to *other* language in claim 3 (aside from “storage element”) to argue that the claim must be understood to require an energy transfer system.

Turning to the Specification of the ’444 patent, the parties agree that it has little significance apart from its incorporation of the ’551 patent by reference. *See, e.g.*, Ex. 1001, 9:30–38. Aside from incorporating the ’551 patent, the parties do not rely on the Specification of the ’444 patent to inform as to the meaning of “storage element.” Thus, our focus is on the specification of the ’551 patent.

Despite their differences, the parties’ discussions of the ’551 patent (as reflected above) are similar. For example, it is undisputed that the ’551 patent teaches “down-converting an electromagnetic (EM) signal by aliasing the EM signal” and that “[t]he term aliasing, as used [therein], refers to both down-converting an EM signal by under-sampling the EM signal at an aliasing rate, and down-converting an EM signal by transferring energy from the EM signal at the aliasing rate.” Ex. 2007, code (57). Despite Patent Owner’s use of the phrases “voltage sampling” and “energy sampling,” the parties agree (as do we) that the ’551 patent expressly describes these two methods as “under-sampling” and “energy transfer.”

It is clear from the '551 patent's "Table of Contents" that the specification is structured to provide an overview of the invention and then include different sections addressing "Under-Sampling" and "Energy Transfer." See, e.g., Ex. 2007, cols. 9–13 (Table of Contents). It is in section "0.1.2 Introduction to Energy Transfer" where the parties primarily focus their arguments. We find this section particularly noteworthy and informative. This section begins by comparing an energy transfer system to an under-sampling system. In making the comparison, the '551 patent specifically focuses on what it refers to as "an energy transfer signal" compared to "an under-sampling signal": "In an embodiment, the present invention transfers energy from an EM signal *by utilizing an energy transfer signal instead of an under-sampling signal.*" *Id.* at 66:34–36. The '551 patent continues to describe the comparison: "Unlike under-sampling signals that have negligible aperture pulses, the energy transfer signal includes a train of pulses having non-negligible apertures that tend away from zero." *Id.* at 66:36–39. The '551 patent explains that "this"—the train of pulses having non-negligible apertures that tend away from zero—"provides more time to transfer energy from an EM input signal." *Id.* at 66:39–40. By these statements, the '551 patent provides a direct link between (a) using of a train of pulses having non-negligible apertures that tend away from zero and (b) the result of providing more time to transfer energy.

The '551 patent also lists several benefits flowing from using a train of pulses having non-negligible apertures that tend away from zero, including (1) "that the input impedance of the system is reduced so that practical impedance matching circuits can be implemented to further

improve energy transfer and thus overall efficiency,” (2) “[t]he non-negligible transferred energy significantly improves the signal to noise ratio and sensitivity to very small signals, as well as permitting the down-converted signal to drive lower impedance loads unassisted,” (3) “[s]ignals that especially benefit include low power ones typified by RF signals,” and (4) “[o]ne benefit of a non-negligible aperture is that phase noise within the energy transfer signal does not have as drastic of an effect on the down-converted output signal as under-sampling signal phase noise or conventional sampling signal phase noise does on their respective outputs.” Ex. 2007, 66:40–54.

Turning to what we consider a critical paragraph and disclosure of the ’551 patent (Ex. 2007, 66:55–67), the patent precisely explains the use of the term “storage module,” which, as noted above, the parties agree is synonymous with “storage element.” The first sentence states that Figure 82A, reproduced below, “illustrates an exemplary energy transfer system 8202 for down-converting an input EM signal.” Ex. 2007, 66:55–56.

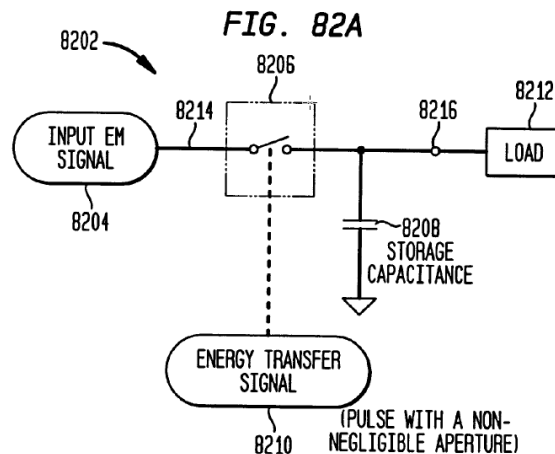


Figure 82A illustrates an exemplary energy transfer system. *Id.* at 7:47–48. The ’551 patent explains that “[t]he energy transfer system 8202 includes a

switching module 8206 and a storage module illustrated as a storage capacitance 8208.” *Id.* at 66:56–59. Critically, the ’551 patent states:

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.*

Id. at 66:59–67 (emphasis added).

This portion of the ’551 patent specification provides a lexicographic definition of the systems to which the terms refer. In particular, “holding modules” “identify systems that store negligible amounts of energy from an under-sampled input EM signal with the intent of ‘holding’ a voltage value” whereas “storage modules” “*refer to systems that store non-negligible amounts of energy from an input EM signal.*” *Id.* (emphasis added). Because the parties agree that “storage element” and “storage module” are synonymous, we determine that the patentees acted as their own lexicographers and deliberately defined the systems to which “storage element” refers as “systems that store non-negligible amounts of energy from an input EM signal.” *Id.* As reflected in the parties’ proposed constructions above, the parties also agree that the meaning of “storage element” includes the term “element.” Thus, applying the lexicographic definition of the systems to which “storage element” refers, we determine that one of ordinary skill in the art would have understood “storage element” to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.”

We do not agree with Patent Owner that “system” should be limited to “energy transfer system.” Critically, if the patentees wanted to limit the term “storage element” beyond the express definition of the systems to which the term refers, it was incumbent upon the patentees to do so; *and they did not*. The aspect chosen by the patentees to provide the critical distinction between “storage element” and “holding element”¹¹ is not whether one refers to “an energy transfer system”; rather, it is the clause that follows the word “system” and there are two choices provided by the patentees—(1) “systems that store negligible amounts of energy from an under-sampled input EM signal with the intent of ‘holding’ a voltage value,” and (2) “systems that store non-negligible amounts of energy from an input EM signal.” That is how the patentees specifically set forth the distinction between the terms and that is the distinction we express in the construction of “storage element.”

We recognize that the parties vigorously dispute the construction of “storage element” and that the patentees’ definition in the ’551 patent is different than the district court’s construction. We also recognize that the parties agree that only two methods of down-converting an EM signal are disclosed in the ’551 patent—(1) under-sampling and (2) energy transfer. The above-quoted paragraph of the ’551 patent expressly links “holding module” to an under-sampling method, by expressly including the phrase “from an under-sampled input EM signal.” But, the ’551 patent does not include the phrase “energy transfer system” in its definition of the systems to

¹¹ The patentees specifically refer to “storage module” and “holding module,” which as we indicate above are synonymous with “storage element” and “holding element.”

which “storage element” refers. Rather, the ’551 patent, as explained above, expressly defines “storage elements” as referring to “systems that store non-negligible amounts of energy from an input EM signal.” Thus, to the extent a system stores non-negligible amounts of energy from an input EM signal, it would be within the scope of the express lexicographic meaning of “storage module” whether or not it is *also* an energy transfer system. The “naming convention” that Patent Owner complains of is the patentees’ own lexicographic definition. It is not appropriate to re-write a definition expressly set forth in the patent simply because an assignee complains that the definition does not focus on “how the technology actually works.” *Contra* PO Sur-reply 8 (citations omitted). As the United States Court of Appeals for the Federal Circuit has repeatedly stated, “the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316 (citation omitted).¹²

¹² Patent Owner’s attempt to read “energy transfer” into the meaning of “storage element” is not insignificant. In particular, Patent Owner asserts that four “key features” distinguish energy transfer systems and the implication of Patent Owner’s argument is that, if “energy transfer” were read into the meaning of “storage element,” then all four “key features” would also be read into the meaning of the claim term—(1) non-negligible sampling aperture; (2) storage module; (3) low impedance load; and (4) down-converted signal includes the energy transferred from the RF signal to the load (i.e., energy sent to the load makes up the down-converted signal). See PO Resp. 32 (chart listing “key features” of energy transfer systems). We need not decide whether “energy transfer” requires any of the four alleged “key features” because we do not limit the patentees’ lexicographic definition to “energy transfer” systems.

Additionally, we note that Patent Owner proposed a construction for “storage module” in IPR2014-00948 that did not include the phrase “energy transfer system.” In particular, relying on the same disclosures of the ’551 patent, Patent Owner proposed that “storage module” (in a related patent claim) “be construed to mean ‘an apparatus that stores non-negligible amounts of energy from the carrier signal.’” Ex. 1032, 21–22. Patent Owner now argues that its proposed construction of “storage module” in IPR2014-00948 is inconsequential because, at that time, the Board applied the broadest reasonable interpretation standard in claim construction and Patent Owner’s proposed construction was, therefore, broader than what it now proposes. PO Sur-reply 12–13. We do not agree with Patent Owner’s attempt to distinguish its prior argument from IPR2014-00948 on the basis that it applied a different claim construction standard because Patent Owner clearly stated that “[t]he Specification *provides an explicit definition* that supports this construction” and that “[t]he incorporated ’551 Specification *explicitly defines a storage module and draws the distinction between storage modules and holding modules.*” Ex. 1032, 21 (emphases added). These statements by Patent Owner confirm that Patent Owner understood *its own ’551 patent* to (a) provide *an explicit definition* of “storage module” and (b) draw a distinction between storage modules and holding modules. The steps of claim construction, whether applying the broadest reasonable interpretation standard or the standard used in federal courts under 35 U.S.C. § 282(b), include “look[ing] to the specification to see if it provides a definition for claim terms.” *In re ICON Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) (applying the broadest reasonable interpretation standard); see *Phillips*, 415 F.3d at 1316 (applying the standard used in

federal courts and stating that “the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.”) (citation omitted). Thus, 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, which the case law confirms controls.

Neither party relies upon the prosecution history of the ’444 patent or any related patent. And, we do not find the prosecution history informative as to the disputed aspect of the meaning of “storage element” (i.e., whether “energy transfer” should be read into the claim). *See generally* Ex. 1003 (prosecution history of the ’444 patent).

Turning to extrinsic evidence,¹³ Patent Owner, as reflected above, argues that Dr. Steer agreed with its proposed construction, whereas Dr. Subramanian did not offer an express opinion on the meaning of “storage element.” Although we have considered Dr. Steer’s testimony, we find it “less significant than the intrinsic record in determining the legally operative meaning of” “storage element.” *Phillips*, 415 F.3d at 1317 (internal quotations and citations omitted). In particular, we are cognizant of the Federal Circuit’s guidance that we “should discount any expert

¹³ Although, in the Petition, Petitioner initially relied on two dictionary definitions of a “capacitor” in support of its analysis that Tayloe’s capacitor teaches the recited “storage element” (see Pet. 77 (citing Ex. 1014 (Microsoft Press Computer Dictionary (2d ed. 1994)) (defining “capacitor”); Ex. 1015 (IBM Dictionary of Computing (10th ed. 1994)) (defining “capacitor”))), neither party relies upon a dictionary definition in support of their proposed constructions of “storage element.”

testimony that is clearly at odds with the claim construction mandated by . . . the written description.” *Id.* at 1318 (internal quotation and citation omitted). In this instance, we find that Dr. Steer’s testimony is clearly at odds with the lexicographic definition provided in the ’551 patent because the definition does not include “energy transfer” in the meaning of “storage element.” In particular, Dr. Steer (and Patent Owner) seek to read an additional limitation of “energy transfer” into the definition of “storage element” provided by the specification. Therefore, although we appreciate and recognize Dr. Steer’s discussion of the “background on the technology at issue” and “how [the] invention works,” we do not find that his testimony trumps the express definition provided in the specification. *See id.* (“extrinsic evidence in the form of expert testimony can be useful to a court for a variety of purposes,” including, *inter alia*, “to provide background on the technology at issue” or “to explain how an invention works”) (citations omitted).

Based on our review of the complete record before us, including the intrinsic and extrinsic evidence, we determine that one of ordinary skill in the art would understand “storage element” to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.”

B. Other Claim Terms

Petitioner presents two other claim terms recited in claim 3 for construction—“frequency down-conversion module” and “subtractor module.” Pet. 28–31. And, Patent Owner presents an additional term for construction in its Patent Owner Response—“switch.” PO Resp. 45. In its Reply, Petitioner notes that Patent Owner does not argue that the combinations of prior art asserted by Petitioner lack any of these elements,

and, therefore, there is no need for us to construe the terms. Pet. Reply 16–18. Patent Owner does not appear to address these terms in its Sur-reply. *See generally* PO Sur-reply.

We decline to construe these additional terms because their constructions are not necessary to resolve the present controversy between the parties. *See Vivid Techs.*, 200 F.3d at 803 (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.*, 868 F.3d at 1017 (citing *Vivid Techs.* in the context of an *inter partes* review).

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 Datasheet

Petitioner asserts the combination of Tayloe and TI Datasheet would have rendered the subject matter of claim 3 obvious to one of ordinary skill in the art at the time of the invention. Pet. 43–47 (discussing motivation to combine), 47–78 (discussing the application of the art to claim 3).

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 discloses 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.

Tayloe’s Figure 3 is reproduced below:

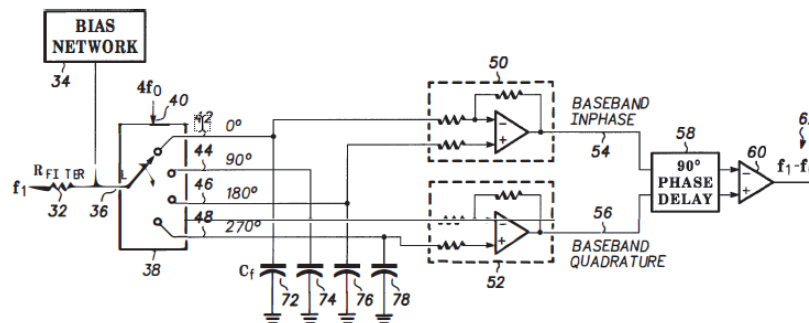


FIG. 3

Tayloe’s Figure 3 “shows a direct conversion receiver.” Ex. 1004, 1:51–52. Tayloe 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.

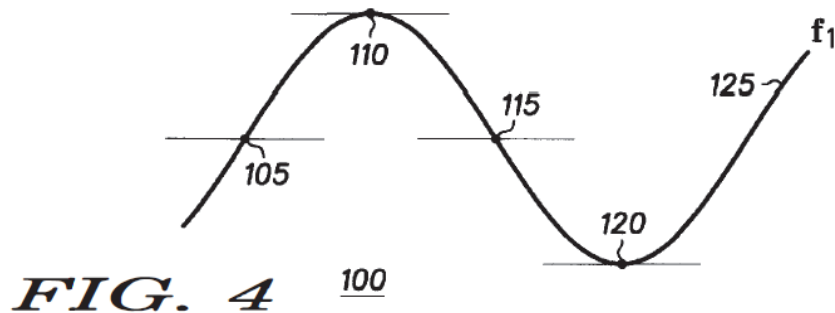
Id. at 2:13–55.

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:



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

Waveform 100 includes signal 125 which corresponds to the input signal f_1 . 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.

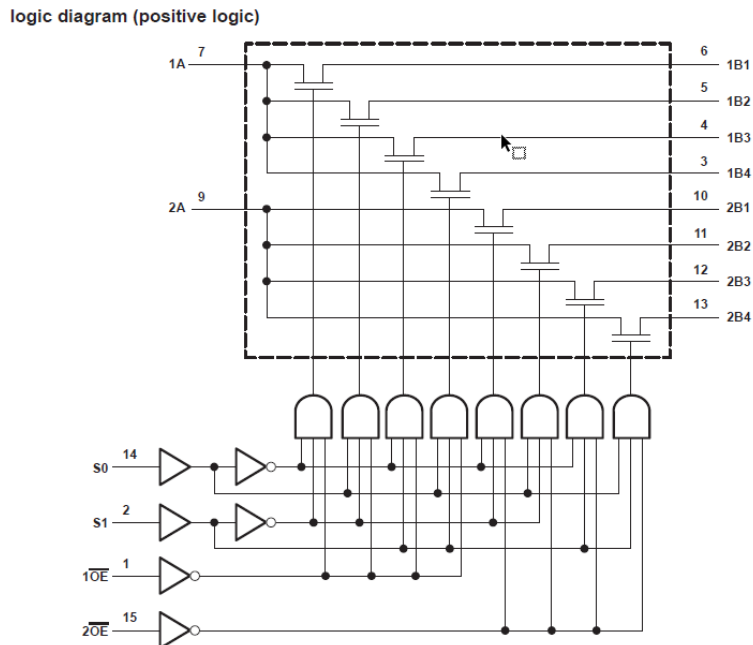
Id. at 3:40–48.

Taylor further discloses the equipment used to achieve its stated experimental results, explaining: “A direct conversion receiver which utilizes a Taylor 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:



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

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

a. *Uncontested Elements of Claim 3*

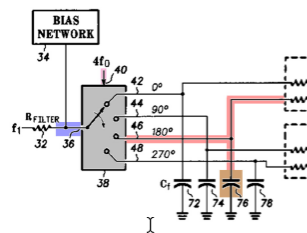
For elements [3preamble] and [3A]–[3D], Petitioner relies upon its arguments and evidence presented with respect to its challenge to claim 1. Pet. 74–75 (referring to elements of claim 1) (citing Ex. 1002 ¶¶ 148–149). In the Patent Owner Response, Patent Owner does not contest Petitioner’s showing with respect to these elements; rather, Patent Owner’s argument is focused entirely on whether the combination of Tayloe and TI Datasheet teaches or suggests the “storage element” recited in element [3E]. *See, e.g.*, PO Resp. 53–70 (contending that Tayloe discloses capacitors that are “holding” elements and not “storage” elements because Tayloe teaches (1) a voltage sampling system and (2) a high impedance load), 72–74 (contending that Tayloe does not teach “storage elements” because “the capacitors of Tayloe are not elements of ‘an energy transfer system’” and there is “no teaching, suggestion, or motivation in Tayloe to use *energy* sampling to down-convert a signal”).

We have reviewed Petitioner’s arguments and evidence in support thereof as to how the combination of Tayloe and TI Datasheet teaches or suggests elements [3preamble] and [3A]–[3D]. *See* Pet. 74–75 (addressing claim 3), 43–47 (addressing motivation to combine Tayloe and TI Datasheet as well as reasonable expectation of success), 47–69 (addressing claim elements [1preamble] and [1A]–[1D]). We find Petitioner’s 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 Petitioner, we find that the combination of Tayloe and TI Datasheet teaches or suggests elements [3preamble] and 3[A]–3[D].

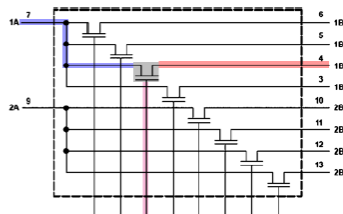
b. Element [3E]

i. The Parties' Arguments

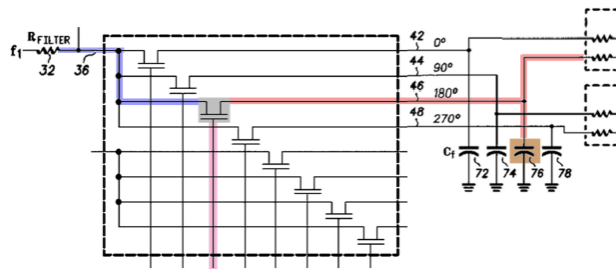
Element [3E] recites “wherein said first and said second frequency down-conversion modules each comprise a switch and a storage element.” Ex. 1001, 61:16–18.¹⁴ Petitioner contends that “Tayloe in view of TI Datasheet discloses this limitation.” Pet. 75. In particular, and with reference to several annotated figures reproduced below, Petitioner asserts that “the combination of Tayloe and TI [D]atasheet 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)).” *Id.* at 75–76 (citing Ex. 1002 ¶ 150).



Ex. 1004-Tayloe
Fig. 3



Ex. 1005-TI
Datasheet, 2



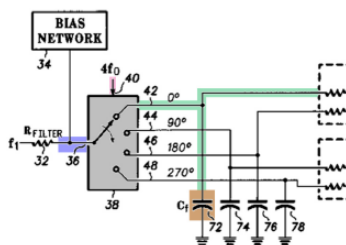
Combined Teachings

Id. at 76. Petitioner’s annotated figures, shown above, include (1) Tayloe’s Figure 3, (2) a portion of TI Datasheet’s “logic diagram (positive logic),”

¹⁴ Even though some of the discussion below refers to a “storage element,” we recognize that element [3E] recites that the first and second frequency down-conversion modules *each* comprise a storage element.

and (3) a figure prepared by Petitioner showing the “Combined Teachings.” *Id.* Petitioner added several colors to highlight various aspects of the figures, shown above. *Id.*

Similar to its analysis of the recited “first frequency down-conversion module” and, again, with reference to several annotated figures reproduced below, Petitioner contends that the combination of Tayloe and TI Datasheet also “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. 76–77 (citing Ex. 1002 ¶ 151).



Id. Petitioner added several colors to highlight various aspects of the figures, shown above. *Id.*

Additionally, Petitioner asserts that “[a] capacitor is a well-known storage element, and in fact, the ’444 patent embodiment discloses a capacitor as the storage element.” Pet. 77 (citing Ex. 1001, 34:22–23, 36:14–15; Ex. 1014; Ex. 1015; Ex. 1002 ¶ 152).

In the Patent Owner Response, Patent Owner asserts that the capacitors in Tayloe “are not ‘*storage*’ elements’ because the capacitors of Tayloe are not elements of ‘an *energy* transfer system.’” PO Resp. 73. In contrast, Patent Owner asserts that “Tayloe is a *voltage* sampling system – a *fundamentally different and competing* technology to energy transfer (energy sampling). As such, the capacitors in Tayloe are ‘*holding* elements’ (a term reserved by the ’444 patent for elements of a sample-and-hold (voltage sampling) system.” *Id.*

Additionally, Patent Owner contends that “there is no teaching, suggestion, or motivation in Tayloe to use *energy* sampling to down-convert a signal.” PO Resp. 73 (citing Ex. 2021 ¶ 283). Rather, according to Patent Owner, “the opposite is true. All teaching, suggestion, and motivation in Tayloe demonstrates that Tayloe only relates to a *sample-and-hold* (voltage sampling) system.” *Id.* (citing Ex. 2021 ¶ 283; PO Resp. § VIII.A); *see id.* (noting that “Tayloe consistently refers to voltage and voltage sampling concepts for down-conversion”) (citing Ex. 2021 ¶ 242). Patent Owner contends that “the term ‘energy’ does not appear anywhere in Tayloe[,] nor would a [person of ordinary skill in the art] understand Tayloe as teaching or suggesting use of energy sampling for down-conversion.” *Id.* (citing Ex. 2021 ¶ 242).

Patent Owner asserts that “whether a capacitor is a ‘*storage* element’ depends on the way in which the capacitor is being used in a circuit.” PO Resp. 74 (citing Ex. 2021 ¶ 193). Patent Owner argues that Petitioner “ignores that capacitors are used in different ways in Tayloe and claim 3 of the ’444 patent.” *Id.* (citing Ex. 2021 ¶ 172). Patent Owner explains as follows:

Whereas the high impedance load in a sample-and-hold (voltage sampling) system (as in Tayloe) causes a capacitor to *hold* energy (i.e., *prevent* energy in the capacitor from being discharged to form the down-converted signal), the *low* impedance load in an energy transfer (energy sampling) system (as in claim 3) has the opposite effect. Ex. 2021 ¶168. A low impedance load enables a capacitor to *store* energy and then *discharge* the stored energy in between samples to form the down-converted signal (i.e., the discharged energy itself becomes part of the down-converted signal). Ex. 2021 ¶¶168, 173. The way in which capacitors are used in energy transfer (energy sampling) systems results in such systems having significant benefits that were not recognized by a [person of ordinary skill in the art] at the time of the invention of the ’444 patent. Ex. 2021 ¶169.

PO Resp. 74.

Further, Patent Owner contends 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. 74 (citing Ex. 2021 ¶ 288). Patent Owner asserts, “[t]here are numerous secondary considerations of non-obviousness demonstrating that such a dramatic modification of Tayloe was not envisioned by a [person of ordinary skill in the art] at the time of the invention of the ’444 patent.”¹⁵ *Id.*

¹⁵ Patent Owner’s assertions of secondary considerations of non-obviousness are addressed below. *See infra* § III.B.4.

at 74–75 (citing Ex. 2021 ¶¶ 228–239). Patent Owner argues that “to get the invention of the ’444 patent using Tayloe, one would have to *ignore* all of the disclosure in Tayloe, *abandon* all of the teachings and suggestions of Tayloe, and *ignore* the state-of-the-art for direct down-conversion at the time of the invention of the ’444 patent.” *Id.* at 75 (citing Ex. 2021 ¶ 289). Patent Owner asserts that “one would have to use hindsight (knowledge of the ’444 patent) to modify Tayloe to use a *low* impedance load and *energy* sampling to get to the invention of claim 3 of the ’444 patent.” *Id.* (citing Ex. 2021 ¶ 289). And, Patent Owner contends “secondary considerations demonstrate that the invention of claim 3 of the ’444 patent was not obvious in view of Tayloe.” *Id.* (citing Ex. 2021 ¶¶ 228–239, 289).

With respect to TI Datasheet, Patent Owner asserts that it “merely describes a possible switch configuration for use with Tayloe. But the TI [D]atasheet does not change the fundamental nature of Tayloe as a *voltage* sampling system using ‘holding’ modules/elements. As such, the TI Datasheet does not cure the deficiencies of Tayloe.” PO Resp. 75 (citing Ex. 2021 ¶ 291).

In its Reply, Petitioner contends that Patent Owner’s “sole validity argument for claim 3 is that Tayloe does not disclose a ‘storage element’ under [Patent Owner’s] proposed construction of the term. There is no dispute that under [Petitioner’s] (proper) construction, Tayloe discloses the ‘storage element.’”¹⁶ Pet. Reply 18.

¹⁶ Petitioner also asserts that “even under [Patent Owner’s] proposed construction, Tayloe discloses a ‘storage element.’” Pet. Reply 18; *see id.* at 20–27. We need not reach these arguments because we do not adopt Patent Owner’s proposed construction of “storage element.”

Petitioner contends that “Taylor clearly discloses that its capacitors 72–78 store non-negligible amounts of energy from the input signal.” Pet. Reply 19. Petitioner asserts that Taylor’s capacitors are “**tens of thousands of times** larger than the capacitors in the energy transfer embodiments of the ’551 patent.” *Id.* (comparing Ex. 1004, 5:50–52 (Taylor’s capacitors at 0.3 microfarads (or 300,000 picofarads (pF))), with Ex. 2007, 67:22–25 (disclosing storage capacitance 8208 at 18pF)). Petitioner explains that Taylor teaches (1) its capacitors charge to the average level of the input signal (*id.* (citing Pet. 32–33; Ex. 1004, 2:33–45, 4:28–45)), and (2) its capacitors integrate the input signal, which Petitioner asserts “indicates an accumulation of energy and matches the ’551 patent’s description of a storage module’s operation” (*id.* at 19–20 (citing Ex. 1004, 4:46–47, 2:42–44; Ex. 2007, claims 198–202)). Thus, Petitioner asserts that “[t]he quantity of energy stored on Taylor’s capacitors is plainly non-negligible.” *Id.* at 20 (citing Ex. 1030 ¶¶ 6–14).

From a high level, Patent Owner’s Sur-reply raises the following arguments: (1) Taylor’s capacitors only hold a negligible amount of energy from an input EM signal (PO Sur-reply 1), (2) “storage element” should be construed such that it is limited to an “energy transfer system” (*id.* at 2), (3) an “energy transfer system” should be limited to driving a low impedance load (*id.* at 2–3), and (4) Taylor discloses a high impedance load, not a low impedance load (*id.* at 3).

ii. Discussion

To begin, we agree with Petitioner that the arguments asserted in Patent Owner’s Response, and Dr. Steer’s testimony in support thereof, are entirely dependent upon Patent Owner’s proposed construction of “storage

element,” which we do not adopt. Therefore, our focus below is on the arguments raised in Patent Owner’s Sur-reply, which either respond to Petitioner’s arguments or raise new arguments that we have excluded (as explained below).

Addressing Patent Owner’s Sur-reply arguments slightly out of order, the second, third, and fourth arguments are each directed to Patent Owner’s proposed construction of “storage element,” which we do not adopt. In particular, as noted above, those arguments focus on various aspects that Patent Owner contends are required by an “energy transfer system,” including whether “storage element” should be limited thereto, whether a low impedance load is required, and whether Tayloe discloses a low impedance load. *See, e.g.*, PO Sur-reply 2–3. Those arguments do not address Petitioner’s challenge when “storage element” is construed as we have here, in accordance with the lexicographic definition provided in the ’551 patent.¹⁷ Thus, we focus below on Patent Owner’s arguments in response to Petitioner’s assertion that Tayloe teaches a “storage element,” as we construe the term.

Turning back to Patent Owner’s first argument (whether Tayloe’s capacitors hold a negligible or non-negligible amount of energy from an input EM signal), that argument includes positions that were first raised in the Sur-reply, which, as discussed further below, we determined are

¹⁷ Patent Owner’s argument also includes its contention that Dr. Subramanian allegedly admitted that Tayloe’s operational amplifiers are high impedance loads. *See* PO Sur-reply 3–6 (addressing whether Tayloe teaches high or low impedance loads). That argument by Patent Owner also is directed to Patent Owner’s claim construction position, which we do not adopt.

impermissible under our Rules and, therefore, excluded from consideration in this proceeding. *See infra* § III.D; *see also* Tr. 6:24–7:23 (reiterating the ruling made during the pre-hearing conference). Also, as discussed below, our exclusion includes Exhibit 2022 because it was filed in violation of 37 C.F.R. § 42.23(b) and in support of Patent Owner’s improperly asserted sure-reply arguments. In light of that ruling, we limit our discussion of Patent Owner’s first argument to the arguments that are not excluded.¹⁸

Patent Owner contends that the “[t]he capacitors of Tayloe . . . only hold a *negligible* . . . amount of energy from an input EM signal.” PO Sur-reply 1. Patent Owner asserts that “[h]ow much energy is stored depends on the specific components/configuration of a system.”¹⁹ *Id.* Although somewhat intertwined with its claim construction argument, Patent Owner also contends that, “[s]ince Tayloe is simply capturing a voltage measurement, a Tayloe capacitor only holds *negligible* amounts of energy” *Id.* at 7. Further, Patent Owner argues that, “for the first time in its Reply, [Petitioner] focuses on the size of Tayloe’s capacitor and that Tayloe’s capacitors accumulate energy over time.” *Id.* at 17 (citing Pet. Reply 19). Patent Owner asserts that “this superficial analysis provides no

¹⁸ As discussed herein, not all of Patent Owner’s arguments as to whether Tayloe discloses capacitors that hold a non-negligible amount of energy from an input EM signal were excluded. That specific delineation is discussed *infra* and also is set forth clearly in Petitioner’s Identification.

¹⁹ This argument by Patent Owner also responds to Petitioner’s alternative position that Tayloe teaches an “energy transfer system” (under Patent Owner’s proposed construction of “storage element”) because Tayloe discloses a control signal with non-negligible aperture widths. *See* PO Sur-reply 1.

insight into whether a Tayloe capacitor stores non-negligible amounts of energy.”²⁰ *Id.*

Based on the full record before us, we find Petitioner’s argument and evidence persuasive to show that Tayloe’s capacitors 72–78 teach the recited “storage element” because Petitioner establishes sufficiently that Tayloe’s capacitors are “element[s] of a system that store[] non-negligible amounts of energy from an input EM signal.” In particular, we find Dr. Subramanian’s testimony persuasive to show that “the amount of energy stored in one of Tayloe’s capacitors 72-78 is . . . 0.6 μ J (microjoules)” and that one of ordinary skill in the art “would [have understood] that this quantity is a significant amount of energy in the context of a down-conversion system such as that disclosed in Tayloe.” Ex. 1030 ¶ 12 (citing Ex. 1004, 5:38–41, 5:49–52); see *id.* ¶ 13 (“the energy transferred is distinguishable from noise” and “is also not minor or inconsequential but rather is important for the formation of the down-converted signal in Tayloe”).

Additionally, Dr. Subramanian’s testimony and Tayloe’s disclosure supports Petitioner’s arguments that (a) Tayloe’s capacitors are “***tens of thousands of times*** larger than the capacitors in the energy transfer embodiments of the ’551 patent” (Pet. Reply 19 (*comparing* Ex. 1004, 5:50–52 (Tayloe’s capacitors at 0.3 microfarads (or 300,000 picofarads (pF))), with Ex. 2007, 67:22–25 (disclosing *storage* capacitance 8208 at 18pF)); (b) Tayloe’s capacitors charge to the average level of the input signal (*id.* (citing Pet. 32–33; Ex. 1004, 2:33–45, 4:28–45)); and (c) Tayloe’s capacitors integrate the input signal, which “indicates an accumulation of

²⁰ The remainder of Patent Owner’s Sur-reply arguments are either directed to its incorrect claim construction position or are excluded.

energy and matches the '551 patent's description of a storage module's operation" (*id.* at 19–20 (citing Ex. 1004, 4:46–47, 2:42–44; Ex. 2007, claims 198–202)).

Patent Owner's arguments that remain for our consideration, as noted above, do not detract from Petitioner's arguments and evidence (particularly Dr. Subramanian's testimony in support thereof) because Patent Owner does not identify any deficiencies therein that would lead us to find otherwise. In particular, Petitioner's analysis considers "the specific components/configuration of [Taylor's] system" (as Patent Owner asserts a proper analysis should), and we do not agree that Petitioner's analysis is "superficial" and "provides no insight into whether a Taylor capacitor stores non-negligible amounts of energy" (as Patent Owner contends), for the reasons explained above.

Further, Petitioner sets forth a reason with rational underpinning as to why one of ordinary skill in the art would have been motivated to combine Taylor and TI Datasheet with a reasonable expectation of success. *See, e.g.*, Pet. 43–47. Although we address Patent Owner's arguments of alleged objective indicia of nonobviousness below, Patent Owner does not challenge, specifically, Petitioner's argument and evidence with respect to motivation to combine the teachings of Taylor and TI Datasheet or reasonable expectation of success in so doing.²¹ We find Petitioner's analysis persuasive and adopt it as our own findings. *See id.*

²¹ As discussed below, Patent Owner asserts that it would not have been obvious to replace the voltage sampling configuration of Taylor with an energy sampling configuration; Patent Owner, however, does not argue that one of ordinary skill in the art would not have combined Taylor and TI Datasheet. *See, e.g.*, PO Resp. 74–75 (citations omitted).

Accordingly, we find that the combination of Tayloe and TI Datasheet teaches or suggests element 3[E] and that one of ordinary skill in the art would have had a reason with rational underpinning to combine the teachings as proposed with a reasonable expectation of success.

4. *Objective Indicia of Nonobviousness*

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. 74 (citing Ex. 2021 ¶ 288). Patent Owner contends that “[t]here are numerous secondary considerations of non-obviousness demonstrating that such a dramatic modification of Tayloe was not envisioned by a [person of ordinary skill in the art] at the time of the invention of the ’444 patent.” *Id.* at 74–75 (citing Ex. 2021 ¶¶ 228–239); *see id.* at 75 (“In addition, secondary considerations demonstrate that the invention of claim 3 of the ’444 patent was not obvious in view of Tayloe.”).

Petitioner raises several arguments in its Reply responding to Patent Owner, including: (1) that Patent Owner improperly incorporates Dr. Steer’s testimony by reference without discussing any substance of the cited paragraphs in the Patent Owner Response in violation of 37 C.F.R. § 42.6(a)(3), which prohibits incorporation by reference (Pet. Reply 28); and (2) that, even if considered, Dr. Steer’s testimony is “conclusory and factually unsupported” because he “cites no evidence other than his unsupported, subjective opinions,” “fails to name a single commercial product practicing the purported invention,” asserts “various alleged unexpected results from energy transfer systems . . . but cites no evidence to support his assertion that energy transfer systems yield **any** of these results”

and “does not tie any alleged secondary consideration to claim 3’s purported invention,” thus failing to “establish a nexus between the alleged secondary considerations and the claimed invention” (*id.* at 29–30 (citations omitted)).

Although not required, we note that Patent Owner does not address objective indicia of nonobviousness in its Sur-reply.

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 based on modifying Tayloe to replace what Patent Owner refers to as “the voltage sampling configuration of Tayloe” with “an energy sampling configuration.” PO Resp. 74. That modification, however, is not proposed by Petitioner and does not form the basis for our findings herein. Rather, as we discuss above, we decline to construe “storage element” as limited to an “energy transfer system.” *See supra* § II.A.2. Thus, in large part, Patent Owner’s arguments as to nonobviousness do not respond to Petitioner’s arguments and evidence discussed above. Nor does Patent Owner specifically contest Petitioner’s arguments and evidence that one of ordinary skill in the art would have had a reason with rational underpinning to combine Tayloe and TI Datasheet with a reasonable expectation of success in so doing, as we discussed above.

Nonetheless, even assuming that all or some of Patent Owner’s arguments and Dr. Steer’s testimony are directed to the combination of Tayloe and TI Datasheet proposed by Petitioner, Patent Owner’s arguments and evidence fail for each of the reasons identified by Petitioner. In particular, Patent Owner’s argument consists of two sentences that do no more than assert the phrase “secondary considerations” without providing any explanation or reason in support. *See* PO Resp. 74–75 (quoted in our discussion above). Instead, Patent Owner cites to twelve paragraphs of Dr. Steer’s Declaration. *See id.* at 75 (citing Ex. 2021 ¶¶ 228–239). This is precisely the type of incorporation by reference that is prohibited by 37 C.F.R. § 42.6(a)(3), which states “[a]rguments must not be incorporated by reference from one document into another document.” *See* Consolidated Trial Practice Guide November 2019, 35–36 (“CTPG”) (*available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated>) (“Thus, *parties that incorporate expert testimony by reference* in their petitions, motions, or replies without providing explanation of such testimony risk having the testimony not considered by the Board.” (emphasis added) (citing *Cisco Sys., Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 (PTAB Aug. 29, 2014) (informative))). Thus, Patent Owner’s failure—to provide any explanation or reason in support of its bare assertion of objective indicia—is a basis, in and of itself, for us not to consider Patent Owner’s evidence of nonobviousness. *See* 37 C.F.R. § 42.6(a)(3); CTPG 35–36.

Nonetheless, even if we were to overlook Patent Owner’s failure and assume that the entire twelve paragraphs of Dr. Steer’s testimony were included in the Patent Owner Response, the 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 claim 3 based on a presumption of co-extensiveness or otherwise. Each instance in which Dr. Steer mentions claim 3, he only ties 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. *See, e.g.*, Ex. 1022 ¶¶ 229 (“energy transfer (energy sampling) system – of claim 3”), 230 (“energy sampling as set forth in claim 3”), 233 (“[u]sing energy sampling . . . as set forth in claim 3”), 234 (“energy sampling as set forth in claim 3”), 235 (same), 236 (same), 237 (“using the energy transfer (energy sampling) system of claim 3”), 238 (same), 239 (“energy sampling system as set forth in claim 3”). 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 Petitioner has established by a preponderance of the evidence that the combination of Tayloe and TI Datasheet would have rendered the subject matter of claim 3 obvious to one of ordinary skill in the art at the time of the invention.

C. Obviousness over Tayloe and Kawada

Petitioner also contends the combined teachings of Tayloe and Kawada would have rendered the subject matter of claim 3 of the ’444 patent obvious to one of ordinary skill in the art at the time of the invention. Pet. 43–47 (discussing motivation to combine), 78–81 (discussing the application of the art to claim 3). Because Petitioner’s challenge based on the combination of Tayloe and TI Datasheet is dispositive as to claim 3, we need not reach this additional asserted ground. *See 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”); *cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming a ground based on anticipation); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (An administrative agency is at liberty to reach

a decision based on a dispositive issue because doing so “can not only save the parties, the [agency], and [the reviewing] court unnecessary cost and effort,” but “can greatly ease the burden on [an agency] commonly faced with a . . . proceeding involving numerous complex issues and required by statute to reach its conclusion within rigid time limits.”); *SK Hynix Inc. v. Netlist, Inc.*, IPR2017-00692, Paper 25 at 40 (PTAB July 5, 2018) (determining all challenged claims to be unpatentable and not addressing additional grounds).

D. Petitioner’s Identification of Arguments Improperly Raised in a Sur-Reply

As noted above, we held a conference call to discuss Petitioner’s request to file a motion to strike Exhibit 2022 as well as portions of Patent Owner’s Sur-reply. *See* Order. As set forth in our Order, we authorized (1) Petitioner to address the propriety of Patent Owner filing Exhibit 2022 with its Sur-reply and (2) in lieu of a motion to strike, Petitioner to file a chart including the page and line numbers for each portion of Patent Owner’s Sur-reply that Petitioner contends exceeds the proper scope for a sur-reply and for Patent Owner to file a corresponding chart in response. *See id.* at 2–5. Thereafter, Petitioner filed Petitioner’s Identification (Paper 32) and Patent Owner filed Patent Owner’s Response to Identification (Paper 35).²²

At Petitioner’s request, we held a pre-hearing conference to discuss, *inter alia*, Petitioner’s Identification and Patent Owner’s Response to Identification. In particular, Petitioner explained that Patent Owner did not assert, in the Patent Owner Response, that Tayloe’s capacitors did not store a

²² Petitioner also filed a Motion to Exclude Exhibit 2022. *See infra* § III.E.

non-negligible amount of energy; rather, Patent Owner’s arguments as to whether Tayloe discloses a “storage element” were directed to other aspects of Patent Owner’s proposed construction of “storage element,” including whether Tayloe discloses an “energy transfer system” and a low impedance load. In contrast, Petitioner asserted that Patent Owner’s arguments—that “‘non-negligible’ is *relative to* the available power (i.e., amount of energy available from the input EM signal)” (PO Sur-reply 15), and which segues to most of the portions of the Sur-reply identified in Petitioner’s Identification—were not raised in Patent Owner’s Response and are raised, improperly, for the first time in the Sur-reply.

Patent Owner responded by arguing, *inter alia*, that its Sur-reply arguments were properly raised to respond to Petitioner’s arguments, first raised in the Reply, in which Petitioner argued that Tayloe’s capacitors stored a non-negligible amount of energy. Additionally, Patent Owner asserted that it had previously raised the argument—that “non-negligible” is relative to available power—in its Patent Owner Response. *See, e.g.*, Paper 35, 3 (citing “Paper 18 (Response) at . . . 47:40–48:2 . . .”).²³

The moving party “has the burden of proof to establish that it is entitled to the requested relief.” 37 C.F.R. § 42.20(c). “A sur-reply may only respond to arguments raised in the corresponding reply and may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness.” 37 C.F.R. § 42.23(b); *see* Consolidated TPG at 74 (“‘Respond,’ in the context of 37 C.F.R. § 42.23(b), does not mean proceed in a new direction with a new approach as compared to the

²³ We reviewed each citation provided by Patent Owner, but particularly call out 47:40–48:2 for reasons discussed below.

positions taken in a prior filing.” (emphasis added)). The portions of Patent Owner’s Sur-reply identified in Petitioner’s Identification proceed in a new direction with a new approach as compared to the positions taken in Patent Owner’s Response, and, therefore, are impermissible for a sur-reply.

First, we agree with Petitioner that Patent Owner did not assert, in its Patent Owner Response, that Tayloe’s capacitors did not teach a “storage element” because they did not store a non-negligible amount of energy. In no instance is that assertion raised in Patent Owner’s Response. *See generally* PO Resp. None of Patent Owner’s citations in its Response to Petitioner’s Identification reflect any argument even remotely raising this issue.

Second and relatedly, it also is clear that Patent Owner did not assert in its Patent Owner Response that to determine whether an element stores “non-negligible” amounts of energy, the available power must be determined and compared. *See* PO Sur-reply 15. Patent Owner’s Response to Petitioner’s Identification cites, *inter alia*, to page 48, line 2, of the Patent Owner Response. Paper 35, 3. During the pre-hearing conference, Patent Owner emphasized this citation as evidencing that Patent Owner had previously asserted this argument in its Patent Owner Response. In the Patent Owner Response, this citation follows a block quote of the paragraph of the ’551 patent that is the centerpiece of the claim construction arguments regarding the meaning of “storage element” (and is reproduced in our claim construction discussion above). *See* PO Resp. 47–48. Patent Owner quotes the paragraph in the context of its arguments distinguishing energy transfer systems and sample-and-hold systems. *See id.* The citation following the block quote reads as follows: “Ex. 2007 at 66:56-67; *see also id.* at 54:20-

59:19 (discussing sample and hold systems); 66:35-68:15, 97:39-101:32 (discussing energy transfer systems).” PO Resp. 48. Patent Owner identified the most relevant portion of this citation as column 68, lines 1 through 15. Nothing from this portion (or any other portion) of the Patent Owner Response expressly or impliedly states the argument raised in the Sur-reply. Additionally, even if the citation *could have* supported the argument raised in Patent Owner’s Sur-reply, that argument would have had to be raised in Patent Owner’s Response, which it was not.²⁴ The citations on line 2 of page 48 of Patent Owner’s Response, which span six columns of text of the ’551 patent, fail to sufficiently raise the specific argument asserted in the Sur-reply.

Third, the discussion that follows this critical segue in Patent Owner’s Sur-reply continues this line of argument and includes pages of arguments and calculations not asserted previously in the Patent Owner Response, and clearly proceeds in a new direction with a new approach as compared to the positions actually asserted in the Patent Owner Response. Our discussion of Exhibit 2022 (in the context of Petitioner’s Motion to Exclude, below) is similarly reflective of this new argument as that exhibit, which constitutes new evidence, was filed with Patent Owner’s Sur-reply in violation of 37 C.F.R. § 42.23(b).

Fourth, one of the reasons that a sur-reply may not raise arguments that proceed in a new direction with a new approach is because Petitioner does not have an opportunity to respond thereto. Patent Owner asserts that it

²⁴ We need not and do not decide whether the citation supports Patent Owner’s Sur-reply argument because the argument was raised, improperly, in the Sur-reply in the first instance.

was merely responding to Petitioner’s Reply. But, it was Patent Owner’s Response that first asserted the meaning of “storage element” that included the phrase “non-negligible amount of energy,” and Patent Owner *could have* asserted that Tayloe was distinguishable on this basis, *but did not do so*.

Additionally, if Patent Owner believed Petitioner’s Reply raised an issue that was inappropriate for a reply brief or that Patent Owner needed a greater opportunity to respond beyond that provided by our Rules (e.g., to include new argument and evidence in its Sur-reply), it was incumbent upon Patent Owner to contact us and request authorization for an exception to the Rules. *Patent Owner did not do so*. Patent Owner did not request that its Sur-reply be permitted to include arguments and evidence that would otherwise be impermissible in a sur-reply.

As noted above, the parties’ arguments and our ruling thereon were made during the pre-hearing conference and our ruling was reiterated at the start of the oral hearing. Here, we include the positions expressed by the parties and our basis for finding that Petitioner satisfied its burden to show that it is entitled to the relief requested so that the record is complete. For each of these reasons,²⁵ we granted Petitioner’s request to exclude the portions of Patent Owner’s Sur-reply identified in Petitioner’s Identification

²⁵ We also find that Patent Owner waived these arguments by not raising them in the Patent Owner Response. See Paper 11 (Scheduling Order), 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”); see also *In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (determining that an argument not raised in a patent owner response was waived).

and we do not consider those portions of the Sur-reply in reaching this Final Written Decision.²⁶

E. Petitioner’s Motion to Exclude

Following a timely objection (*see* Paper 27), Petitioner moves to exclude Exhibit 2022 pursuant to 37 C.F.R. § 42.64(c) because the exhibit (1) is “untimely and improper pursuant to 37 C.F.R. § 42.23(b)” and the Consolidated TPG and (2) is unfairly prejudicial under Federal Rule of Evidence 403. Mot. Exc. 1.

First, Petitioner contends the exhibit is untimely and procedurally improper because it was first introduced and filed with Patent Owner’s Sur-reply, in violation of our Rules. Mot. Exc. 2 (citing 37 C.F.R. § 42.23(b); Consolidated TPG at 73). Petitioner asserts that Exhibit 2022 raises “complicated calculations . . . at a point when Petitioner cannot fully respond—after the time when Petitioner could respond with expert testimony or a written response. Forcing Petitioner to address these calculations during an oral hearing without the benefit of briefing or expert testimony will significantly prejudice Petitioner.” *Id.* at 2–3.

Second, Petitioner contends that Exhibit 2022 should be excluded under Federal Rule of Evidence 403 because it is an attorney-prepared document, contains unsupported assumptions and calculation errors, is not supported by expert testimony, lacks the necessary factual foundation to

²⁶ Patent Owner’s Demonstrative Exhibits (Ex. 2029) include discussion of the arguments we exclude from the Sur-reply. Even though demonstrative exhibits are not evidence, we have not considered the excluded arguments referenced therein.

make it relevant, and thus “any purported relevance . . . is substantially outweighed by the unfair prejudice and confusion it creates.” Mot. Exc. 3.

In its Opposition, Patent Owner asserts that “Exhibit 2022 is timely, compliant with PTAB procedure, and poses no undue prejudice.” Opp. 2. First, regarding timeliness, Patent Owner asserts that it introduced Exhibit 2022 “[t]o address Dr. Subramanian’s (and [Petitioner’s]) additional theories” through the cross-examination of Dr. Subramanian and the use of the exhibit, which Patent Owner contends includes “well-known calculations and mathematical equations.” *Id.* at 5. Thus, Patent Owner argues that “Exhibit 2022 was not belatedly introduced, but is simply used as deposition testimony submitted in rebuttal of issues raised by [Petitioner/Petitioner’s] expert in its Reply.” *Id.* at 6.

Second, Patent Owner contends that Petitioner is not prejudiced by the inclusion of Exhibit 2022. Opp. 6. Patent Owner asserts that Petitioner’s “prejudice argument rests on the false notion that [Patent Owner’s] Exhibit 2022 is improper.” *Id.* Patent Owner argues that in any given case, “one party submits the final brief” and the other party is not prejudiced just because that party is not the one that gets the final word. *Id.* Additionally, Patent Owner asserts that Dr. Subramanian first addressed the application of the construction of “storage element” to Tayloe in his Reply Declaration, and, therefore, Patent Owner was “entitled to impeach Dr. Subramanian’s analysis” during his deposition. *Id.* at 6–7. Further, Patent Owner asserts that the filing of Exhibit 2022 does not violate 37 C.F.R. § 42.23(b) because the exhibit is cited “in conjunction with Dr. Subramanian’s deposition testimony, which [Patent Owner] elicited in accordance with [the] Trial Practice Guide.” *Id.* at 8; *see id.* at 8–9 (also asserting that Patent Owner

argued that Tayloe’s capacitors do not store non-negligible amounts of energy in the Patent Owner Response).

Third, Patent Owner asserts that Exhibit 2022 should not be excluded pursuant to Federal Rule of Evidence 403 because the probative value clearly outweighs any risk of unfair prejudice. Opp. 10. To the contrary, Patent Owner contends that “excluding Exhibit 2022 prejudices [Patent Owner] and unfairly deprives it of proper rebuttal evidence.” *Id.*

In its Reply in Support of Its Motion to Exclude, Petitioner responds to Patent Owner’s arguments, contending (1) that “Exhibit 2022 is improper ‘new evidence’ that would take the trial ‘in a new direction with a new approach’” because Patent Owner did not assert the positions for which it relies on Exhibit 2022 in its Patent Owner Response (Mot. Reply 1–4); (2) Patent Owner could have, but did not, question Dr. Subramanian about the calculations set forth in his Reply Declaration (*id.* at 4–5); and (3) that Exhibit 2022 contains multiple errors and unsupported assumptions that support Petitioner’s argument of exclusion because of unfair prejudice pursuant to Federal Rule of Evidence 403 (*id.* at 5).

Petitioner, as the “moving party,” “has the burden of proof to establish that it is entitled to the requested relief.” 37 C.F.R. § 42.20. As set forth above, 37 C.F.R. § 42.23(b) specifies, in relevant part, that “[a] sur-reply may only respond to arguments raised in the corresponding reply and *may not be accompanied by new evidence* other than deposition transcripts of the cross-examination of any reply witness.” 37 C.F.R. § 42.23(b) (emphasis added). The Consolidated TPG repeats the above-quoted language of the rule and also explains that

[s]ur-replies should only respond to arguments made in reply briefs, comment on reply declaration testimony, or point to cross-examination testimony. As noted above, a sur-reply may address the institution decision if necessary to respond to the petitioner's reply. This sur-reply practice essentially replaces the previous practice of filing observations on cross-examination testimony.

Consolidated TPG at 73–74. Accordingly, Rule 42.23(b) provides a blanket prohibition on a patentee filing new exhibits (other than deposition transcripts of the cross-examination of any reply witness) with a sur-reply, as Patent Owner has done here.

Additionally, Exhibit 2022 is used by Patent Owner to raise new arguments in the Sur-reply that we exclude above. As our discussion above reflects, the new arguments based on this exhibit are improper under our Rules. Petitioner would undoubtedly be prejudiced by the admission of Exhibit 2022 for precisely the reasons explained by Petitioner (and reiterated above). In particular, the Rules prohibit new evidence (other than deposition transcripts of the cross-examination of any reply witness) with a sur-reply for this exact reason—because Petitioner lacks an opportunity to respond to new evidence submitted with a sur-reply.²⁷

Patent Owner's complaints that it would be prejudiced by the exclusion of the exhibit are (1) unfounded because Patent Owner had the opportunity to cross-examine Dr. Subramanian as to the opinions set forth in his Reply Declaration and (2) only the result of Patent Owner's own actions or inaction. Specifically, at no point (even belatedly) did Patent Owner seek

²⁷ Contrary to Patent Owner's argument, this is not a question of who gets the last word; rather, this is a question of whether a party can submit *new evidence* with its last word, which Rule 42.23(b) specifically prohibits.

authorization to file new evidence (such as Exhibit 2022) with its Sur-reply. Had Patent Owner requested to do so in a timely manner, we could have considered Patent Owner's arguments of potential prejudice and determined whether Patent Owner should have been permitted to file the exhibit along with providing an opportunity for Petitioner to respond. But, Patent Owner *did not so request* and, thus, we do not agree with Patent Owner's assertions of unfair prejudice.

Further, even though not expressly argued by Patent Owner, we similarly do not find it in the interests of justice to maintain this exhibit in the case file. Even though Exhibit 2022 was used during Dr. Subramanian's deposition, each of Patent Owner's arguments thereon is excluded as improper sur-reply argument. Thus, there is no basis upon which inclusion of the exhibit is warranted.

Accordingly, we grant Petitioner's Motion to Exclude pursuant to 37 C.F.R. § 42.23(b).^{28,29}

F. Petitioner's Motion to Seal

Petitioner filed an unopposed Motion to Seal Exhibit 1029, the deposition transcript of Dr. Steer. Mot. Seal. Petitioner explains that it "seeks to seal Dr. Steer's deposition transcript because, during the deposition, Patent Owner . . . designated the [t]ranscript as 'confidential' under the terms of the PTAB's default Protective Order." *Id.* at 1. Petitioner

²⁸ In light of our determination, we need not also decide whether Federal Rule of Evidence 403 provides an independent basis for exclusion.

²⁹ Patent Owner's Demonstrative Exhibits (Ex. 2029) include discussion of excluded Exhibit 2022. Even though demonstrative exhibits are not evidence, we have not considered the portions of the demonstratives referencing that exhibit.

explains that Patent Owner sought to seal the deposition transcript because of Dr. Steer's "testimony revealing alleged confidential information about his work for [Patent Owner]." *Id.* Petitioner also states that Patent Owner asserts good cause exists to seal the deposition transcript, although Petitioner expressly "takes no position as to the propriety of this designation . . . and reserves the right to challenge such designation." *Id.*

Petitioner's Motion to Seal was discussed during the pre-hearing conference. Without elaborating on the details of the discussion, we indicated that, as presented, the Motion is insufficient to justify sealing the entirety of the deposition transcript. Additionally, we explained that we intended to deny the Motion, but we provided Patent Owner an opportunity to file a new motion to seal with a protective order (which was not filed with Petitioner's Motion to Seal) if Patent Owner maintained its desire to seal a portion of the deposition transcript.³⁰ On November 18, 2021, Patent Owner emailed the Board to report that Patent Owner "does not intend to designate any portions of Dr. Michael Steer's deposition transcript as confidential, and therefore will not file" a new motion to seal. Ex. 3002 (Email from S. Mandir, dated Nov. 18, 2021). Patent Owner indicates, "[a]ccordingly, . . . Dr. Steer's deposition transcript (filed as Exhibit 1029 in IPR2020-01265 . . .) can be unsealed." *Id.*

In light of our discussion at the pre-hearing conference and Patent Owner's representation that it no longer intends to designate any portion of Dr. Steer's deposition transcript as confidential, we deny Petitioner's Motion to Seal and unseal Exhibit 1029.

³⁰ There was no basis provided to seal the entirety of the deposition transcript.

IV. SUMMARY³¹

For the reasons discussed above, Petitioner has demonstrated, by a preponderance of the evidence, that claim 3 of the '444 patent is unpatentable. Additionally, we exclude from consideration the portions of Patent Owner's Sur-reply identified in Petitioner's Identification (Paper 32), we grant Petitioner's Motion to Exclude (Paper 34) and exclude Exhibit 2022, and we deny Petitioner's Motion to Seal (Paper 22) and unseal Exhibit 1029.

Our conclusions regarding claim 3 are summarized below:

Claims Challenged	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
3	103(a)	Tayloe, TI Datasheet	3	
3	103(a) ³²	Tayloe, Kawada		
Overall Outcome			3	

³¹ 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).

³² As explained above, because Petitioner's challenge based on the combination of Tayloe and TI Datasheet is dispositive as to claim 3, we do not reach this asserted ground. See *supra* § III.C.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claim 3 of U.S. Patent No. 7,110,444 B1 is determined to be unpatentable;

FURTHER ORDERED that the portions of Patent Owner's Sur-reply (Paper 26) identified in Petitioner's Identification (Paper 32) are excluded;

FURTHER ORDERED that Petitioner's Motion to Exclude (Paper 34) is *granted* and Exhibit 2022 is excluded;

FURTHER ORDERED that Petitioner's Motion to Seal (Paper 22) is *denied* and Exhibit 1029 is unsealed; 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.

IPR2020-01265
Patent 7,110,444 B1

For PETITIONER:

Grant K. Rowan
Haixia Lin
Brian Lambson
Michael J. Summersgill
Todd C. Zubler
WILMER CUTLER PICKERING HALE AND DORR LLP
grant.rowan@wilmerhale.com
haixia.lin@wilmerhale.com
brian.lambson@wilmerhale.com
Michael.summersgill@wilmerhale.com
todd.zubler@wilmerhale.com
WH-ParkerVision-IPRs@wilmerhale.com

For PATENT OWNER:

Jason S. Charkow
Chandran B. Iyer
Stephanie R. Mandir
Richard Juang
Kevin H. Sprenger
DAIGNAULT IYER LLP
jcharkow@daignaultiyer.com
cbiyer@daignaultiyer.com
smandir@daignaultiyer.com
rjuang@daignaultiyer.com
ksprenger@daignaultiyer.com