

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TEXAS INSTRUMENTS INC.,
Petitioner,

v.

PARKERVISION, INC.
Patent Owner.

IPR2024-00936
Patent 9,118,528 B2

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

GERSTENBLITH, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Texas Instruments Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting institution of *inter partes* review of claims 1–5, 8, 9, 11–23, 26, 27, and 29–36¹ (“the Challenged Claims”) of U.S. Patent No. 9,118,528 B2 (Ex. 1001, “the ’528 patent”). ParkerVision, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

An *inter partes* review may be instituted only if “the information presented in the petition . . . and any [preliminary] response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect

¹ From the context of the analysis and discussion in the Petition, we understand Petitioner to challenge claim 29 and not claim 28 even though, in several places, the Petition either incorrectly includes claim 28 or omits claim 29. We identify several of those instances here in the order presented in the Petition. First, in the chart identifying Petitioner’s grounds, Petitioner includes claim 28 but does not include claim 29 in Ground 2A. Pet. 1; *see id.* at 62 (identifying Ground 2A as applying to claim 28 and not claim 29). Additionally, in Petitioner’s discussion of Ground 1A, Petitioner includes a heading—“Claims 28, 30, 31, 32” (*id.* at 55 (emphasis omitted))—that identifies claim 28 while excluding claim 29. And, the discussion under that heading refers to “claim 18” (which was previously discussed at pages 46–47 of the Petition under Ground 1A), but attributes claim language to claim 18 (“two (2) percent or greater”) that actually is recited in claim 29. *Id.* at 56. To be clear, neither claim 18 nor claim 28 recite that phrase; rather, the phrase is recited in claim 29. *Compare* Ex. 1001, 194:1–7 (claim 18), *with id.* at 195:10–24 (claims 28 and 29). And, in the heading and discussion on page 89 of the Petition (Ground 2A), Petitioner incorrectly identifies claim 28 and ties it to the same (“two (2) percent or greater”) language of claim 29. Pet. 89. Because the discussion in the Petition makes clear that claim 29 is challenged as opposed to claims 18 or 28 in those instances, we have modified the discussion in this Decision accordingly, including in the table listing Petitioner’s grounds below.

to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2018). For the reasons given below, on this record, Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at one of the Challenged Claims. Accordingly, we institute an *inter partes* review of the Challenged Claims on all grounds raised in the Petition.

B. Related Proceedings

Petitioner identifies the following litigation involving the ’528 patent: *ParkerVision, Inc. v. Texas Instruments Inc.*, No. 6:23-cv-00384 (W.D. Tex.) (“Western District of Texas Litigation”); *ParkerVision, Inc. v. NXP Semiconductors NV*, No. 6:23-cv-00389 (W.D. Tex.); *ParkerVision, Inc. v. Realtek Semiconductor Corp.*, 6:23-cv-00374 (W.D. Tex.); *ParkerVision, Inc. v. MediaTek, Inc.*, No. 6:23-cv-00375 (W.D. Tex.); *ParkerVision, Inc. v. LG Electronics, Inc.*, 6:21-cv-00520 (W.D. Tex.); *ParkerVision, Inc. v. Buffalo Inc.*, 6:20-cv-01009 (W.D. Tex.); *ParkerVision, Inc. v. ZyXEL Communications Corp.*, 6:20-cv-01010 (W.D. Tex.); *ParkerVision, Inc. v. TCL Industries Holdings Co.*, 6:20-cv-00945 (W.D. Tex.); *ParkerVision, Inc. v. Hisense Co.*, 6:20-cv-00870 (W.D. Tex.); *ParkerVision, Inc. v. TCL Technology Group Corp.*, 5:20-cv-01030 (C.D. Cal.); *ParkerVision, Inc. v. Intel Corp.*, 6:20-cv-00108 (W.D. Tex.); *ParkerVision, Inc. v. LG Electronics, Inc.*, 2:17-cv-05359 (D.N.J.); *RF Capable Integrated Circuits and Products Containing the Same*, 337-TA-982 (USITC); and *ParkerVision, Inc. v. Apple Inc.*, 3:15-cv-01477 (M.D. Fla.). Pet. 97. Patent Owner identifies the first four cases listed above as being “current[.]” Paper 7 (Patent Owner’s Updated Mandatory Notices), 2.

C. Real Parties in Interest

Petitioner identifies Texas Instruments Inc. as a real party in interest.
Pet. 96. Patent Owner identifies ParkerVision, Inc. as a real party in interest.
Paper 7, 1.

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

Petitioner challenges the patentability of claims 1–5, 8, 9, 11–23, 26, 27, and 29–36 of the ’528 patent on the following four grounds:

Claim(s) Challenged	35 U.S.C. § ²	Reference(s)/Basis
1, 5, 8, 9, 11–19, 23, 26, 27, 29–36	103(a)	Tayloe, ³ TI Datasheet, ⁴ Macnally ⁵

² The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Although Petitioner contests whether the ’528 patent is entitled to its full priority claim (*see* Pet. 1–2 (noting that the priority claim includes continuation-in-part applications)), Petitioner assumes the ’528 patent is entitled to its full priority claim for purposes of determining whether the asserted references qualify as prior art. Because Petitioner does not present its challenge to the ’528 patent’s priority for our consideration, we assume for purposes of this Decision that the ’528 patent is entitled to its full priority claim and, therefore, we apply the pre-AIA version of the statutory basis for unpatentability. *See* Ex. 1001, code (60) (claiming priority to October 21, 1998).

³ U.S. Patent No. 6,230,000 B1, issued May 8, 2001 (Ex. 1004, “Tayloe”).

⁴ Texas Instruments, *SN74CBT3253 Dual 1-of-4 FET Multiplexer/Demultiplexer*, 1–23 (2004) (Ex. 1005, “TI Datasheet”).

⁵ U.S. Patent No. 7,065,327 B1, issued June 20, 2006 (Ex. 1021, “Macnally”). Petitioner contends that “Macnally is entitled to its provisional filing date, because Macnally and the Macnally-Provisional [Ex. 1022] share virtually identical figures and similar descriptions of those figures.” Pet. 21. Petitioner asserts that, although the Macnally-Provisional omits some of disclosure of Macnally—the priority paragraph, summary of the claims, some overview paragraphs, the abstract, and the claims—“columns 5–8, the

Claim(s) Challenged	35 U.S.C. § ²	Reference(s)/Basis
2–4, 20–22	103(a)	Tayloe, TI Datasheet, Macnally Cahn ⁶
1, 5, 8, 9, 11–19, 23, 26, 27, 29–36 ⁷	103(a)	Razavi, ⁸ Macnally
2–4, 20–22	103(a)	Razavi, Macnally, Cahn

Pet. 1.

Additionally, Petitioner supports its challenge with a Declaration of Ian Galton, Ph.D. (Ex. 1003), a Declaration of June Ann Munford (Ex. 1014), a Declaration of Rickea McLeod (Ex. 1015), and a Declaration of Maureen Honeycutt (Ex. 1018).

E. The '528 Patent

The '528 patent is directed to “methods, systems, and apparatuses, and combinations and sub-combinations thereof, for down-converting an electromagnetic (EM) signal.” Ex. 1001, code (57). More particularly, the '528 patent “relates to down-conversion of EM signals to intermediate

core of [Macnally’s] description, is nearly identical to the provisional.” *Id.* Thus, Petitioner contends “[t]he corresponding disclosures in the Macnally-Provisional support[] at least one claim of Macnally (the patent).” *Id.* at 21–22 (citing Ex. 1003 ¶¶ 112). Patent Owner does not contest Petitioner’s assertions regarding the effective filing date of Macnally.

⁶ C. Cahn, *Combined Digital Phase and Amplitude Modulation Communication Systems*, 1960 IEEE/IRE Transactions on Communications Systems, Vol. 8, Issue 3 (Sept.), 150–55 (Ex. 1007, “Cahn”).

⁷ For the reasons discussed above, we identify claim 29 and not claim 28 in this ground.

⁸ B. Razavi, *A 900-MHz CMOS Direct Conversion Receiver*, 1997 Symposium on VLSI Circuits Digest of Technical Papers, 113–14 (Ex. 1017, “Razavi”).

frequency signals, to direct down-conversion of EM modulated carrier signals to demodulated baseband signals, and to conversion of [frequency modulation ('FM')] signals to non-FM signals.” *Id.* at 1:65–2:2. And, the ’528 patent teaches under-sampling and transferring energy at aliasing rates. *Id.* at 2:2–4.

As pertains to the Challenged Claims, the ’528 patent describes “I/Q modulation receiver 19700 [that] receives, down-converts, and demodulates a I/Q modulated [radio frequency ('RF')] input signal 19782 to an I baseband output signal 19784, and a Q baseband output signal 19786.”

Ex. 1001, 176:47–51. The ’528 patent explains that

I/Q modulation receiver 19700 comprises a first Processing module 19702, a first optional filter 19704, a second Processing module 19706, a second optional filter 19708, a third Processing module 19710, a third optional filter 19712, a forth Processing module 19714, a fourth filter 19716, an optional [low noise amplifier] 19718, a first differential amplifier 19720, a second differential amplifier 19722, and an antenna 19772.

Id. at 176:40–46.

Figure 197 is reproduced below.

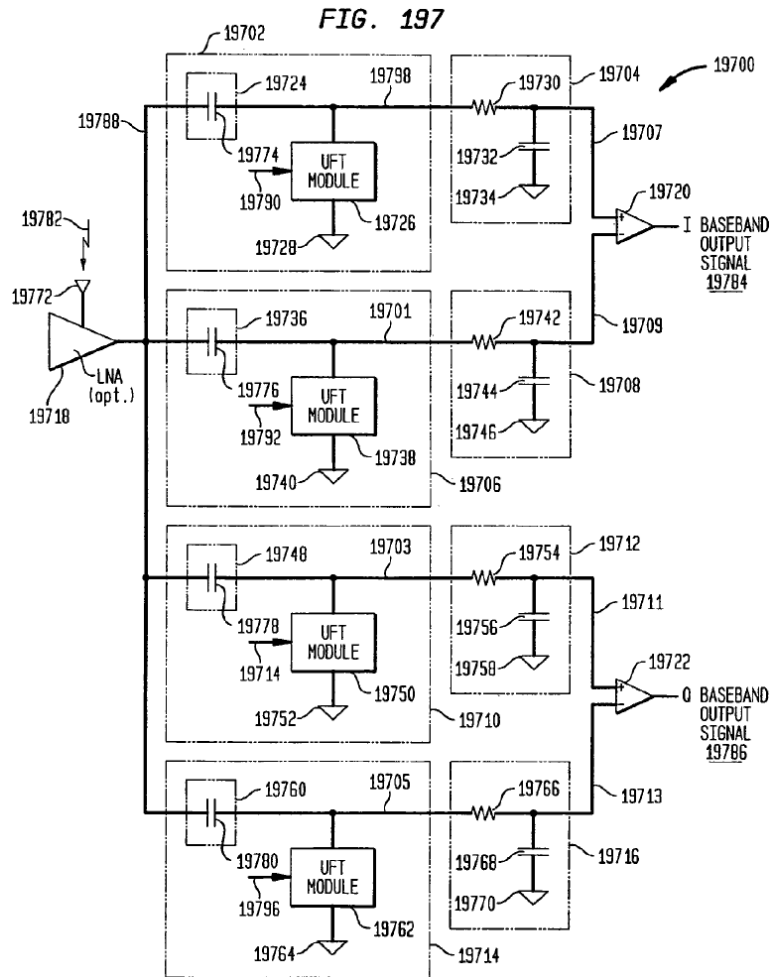


Figure 197 “illustrates an exemplary I/Q modulation receiver.” Ex. 1001, 12:24–25.

The ’528 patent explains that “First Processing module 19702 down-converts the I-phase signal portion of amplified input I/Q signal 19788 according to an I control signal 19790.” *Id.* at 176:62–64. “[F]irst Processing module 19702 comprises a first storage module 19724, a first [universal frequency translator (‘UFT’)] module 19726” and “a switch contained within first UFT module 19726 [that] opens and closes as a function of I control signal 19790.” *Id.* at 176:66–177:3. The ’528 patent teaches that, “[a]s a result of the opening and closing of this switch . . . a

down-converted signal, referred to as I output signal 19798, results.” *Id.* at 177:3–7.

According to the ’528 patent, “[s]econd Processing module 19706 down-converts the inverted I-phase signal portion of amplified input I/Q signal 19788 according to an inverted I control signal 19792.” Ex. 1001, 177:32–36. I output signal 19798 is filtered and first filter 19704 outputs filtered I output signal 19707. *Id.* at 177:16–30. Inverted I output signal 19701 is filtered and second filter 19708 outputs filtered inverted I output signal 19709. *Id.* at 177:55–178:2.

Continuing to describe Figure 197, the ’528 patent explains that “[f]irst differential amplifier 19720 receives filtered I output signal 19707 . . . and receives filtered inverted I output signal 19709” to “output[] I baseband output signal 19784.” Ex. 1001, 178:3–8. Similarly, third processing module 19710 and fourth processing module 19714 also operate on amplified input I/Q signal 19788 and produce, respectively, Q output signal 19703 and inverted Q output signal 19705, which are filtered and provided to “[s]econd differential amplifier 19722.” *Id.* at 178:26–179:22, 179:34–40.

Figure 110A is reproduced below.

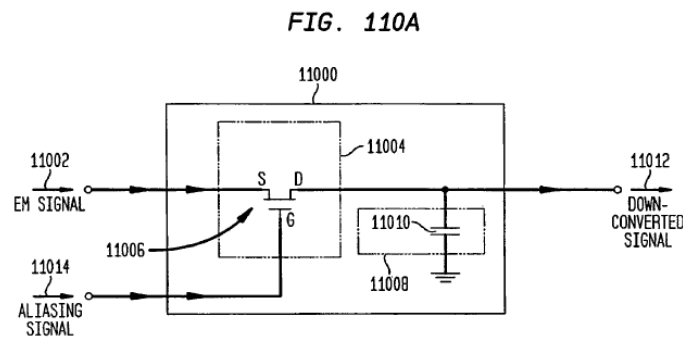


Figure 110A illustrates “aliasing module 11000 [as] a single [field effect transistor (‘FET’)] configuration.” Ex. 1001, 9:43–44. In one embodiment,

the '528 patent teaches that UFT module 11004 is implemented as a n-channel FET 11006, and storage module 11008 is implemented as a capacitor 11010.” *Id.* at 108:30–33.

F. Illustrative Claim

Claim 1, the sole independent claim challenged in this proceeding, is reproduced below with Petitioner’s bracketing added for reference:

1. 1[a] A system for frequency down-converting a modulated carrier signal to a baseband signal, comprising:
 - 1[b] a first switch coupled to a first control signal which comprises a sampling aperture with a specified frequency, wherein the first switch is on and a portion of energy that is distinguishable from noise is transferred from the modulated carrier signal as an output of said first switch during the sampling aperture of the first control signal;
 - 1[c] a first energy storage element that stores the transferred energy from the modulated carrier signal and outputs a down-converted in-phase baseband signal portion of said modulated carrier signal;
 - 1[d] a second switch coupled to a second control signal which comprises a sampling aperture with a specified frequency, wherein the second switch is on and a portion of energy that is distinguishable from noise is transferred from the modulated carrier signal as an output of said second switch during the sampling aperture of the second control signal;
 - 1[e] a second energy storage element that stores the transferred energy from the modulated carrier signal and outputs a down-converted inverted in-phase baseband signal portion of said modulated carrier signal;
 - 1[f] wherein the portions of transferred energy from each of the first and second switch are integrated over time to accumulate said portions of transferred energy from which said down-converted in-phase baseband signal portion and said down-converted inverted in-phase baseband signal portion are derived; and

1[g] a first differential amplifier circuit that combines said down-converted in-phase baseband signal portion with said down-converted inverted in-phase baseband signal portion and outputs a first channel down-converted differential in-phase baseband signal.

Ex. 1001, 192:32–65; *see* Pet. v (indicating Petitioner’s bracketing).

II. DISCRETIONARY DENIAL

Patent Owner contends we should exercise our discretion under 35 U.S.C. § 314(a) to deny institution “because of the advanced state of parallel litigation pending in the [U.S. District Court for the] Western District of Texas.” Prelim. Resp. 2. Patent Owner asserts that, “[g]iven the current posture and schedule of the underlying Texas case, the factors set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) [(Order Authorizing Supplemental Briefing on Discretionary Denial)] (precedential), . . . weigh in favor of *denying* institution of an [*inter partes* review (‘IPR’)].” *Id.*; *see id.* at 17–27 (discussing the *Fintiv* factors).

Petitioner filed Exhibit 1041, with the Petition, in which Petitioner stipulates that, if the Patent Trial and Appeal Board [PTAB] institutes IPR for the ’528 patent based on the soon to be filed IPR petition by [Petitioner], and only while any IPR from this petition is pending, [Petitioner] will not advance against the ’528 patent in [the Western District of Texas Litigation]: (1) the same grounds of invalidity advanced in the instituted IPR, or (2) any grounds of invalidity that reasonably could have [been] raised during the inter partes review.

Ex. 1041 (e-mail from R. Magee to J. Charkow, dated May 17, 2024).

As set forth in the Director’s Memorandum, Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (dated June 21, 2022), at 7, *available at*

https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf,

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

Petitioner's stipulation (Ex. 1041) satisfies the language from the Director's Memorandum quoted above. Therefore, we need not analyze each *Fintiv* factor to reach the determination that we will not exercise our discretion to deny institution in view of the parallel Western District of Texas Litigation.

III. ANALYSIS

A. Legal Standards – Obviousness

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

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

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

[o]ften, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an

apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit.

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

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

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

B. Level of Ordinary Skill in the Art

Petitioner, supported by Dr. Galton’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 EM circuit design.” Pet. 6 (citing Ex. 1003 ¶¶ 68–71). Petitioner further proposes that “[l]ess work experience may be compensated by a higher level of education, such as a master’s degree.” *Id.*

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

On the present record at this stage of the proceeding, we adopt Petitioner’s uncontested, proposed level of ordinary skill in the art, which we find consistent with the level of ordinary skill in the art reflected by the ’528 patent and the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

C. Claim Construction

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

If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316 (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Another exception to the general rule that claims are given their ordinary and customary meaning is “when the patentee disavows the full scope of a claim term either in the specification or during

prosecution.” *Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1313 (Fed. Cir. 2013) (quoting *Thorner v. Sony Computer Entm’t Am., LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)).

Additionally, only terms that are in controversy need to be construed, and these need be construed only to the extent necessary to resolve the controversy. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner contends that the claims should be construed according to their plain and ordinary meaning, with one exception. Pet. 3. Specifically, Petitioner asserts “storage element” or “energy storage element” are recited “interchangeably” in the claims and should each be construed to mean “***an element of a system that stores non-negligible amounts of energy from an input EM signal,***” which Petitioner notes was “determined by the Board and affirmed by the [U.S. Court of Appeals for the] Federal Circuit.” *Id.* (citing *ParkerVision, Inc. v. Vidal*, 88 F.4th 969, 976 (Fed. Cir. 2023) (holding “ParkerVision acted as its own lexicographer to define the term ‘storage element’” and “the Board’s construction of ‘storage element’ [(quoted above)] correctly tracks the lexicography provided by [ParkerVision]”) (citing U.S. Patent No. 6,061,551 (“the ’551 patent”), 66:55–67)). Petitioner contends that, like U.S. Patent No. 7,110,444 that was at issue in *ParkerVision v. Vidal*, the ’528 patent also incorporates the ’551 patent by reference. Pet. 4 (citing Ex. 1001, 1:30–34). And Petitioner notes that the ’528 patent “includes an identical disclosure to that deemed dispositive from

the incorporated by reference '551 patent.” *Id.* (citing Ex. 1001, 73:9–22 (which Petitioner contends defines “storage module”)). Further, Petitioner asserts “[n]o intrinsic evidence demands a different construction” because, even though claim 1 recites “system,” “energy,” and “transfer,” it does so “in isolation” and “does not recite ‘energy transfer system,’ let alone restrict the claimed ‘storage element’ to any energy transfer system.” *Id.* at 5 (also contending the file history of the '528 patent does not support a different construction). Petitioner also contends “the proposed combinations teach the claimed ‘storage element’ or ‘energy storage element,’ even including the alleged condition of ‘low impedance load’ that purportedly ‘goes to the heart of what makes an element, a “storage” element.’” *Id.*

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

On the present record at this stage of the proceeding, we agree with Petitioner, for the reasons discussed above, that “storage element” and “energy storage element” are used interchangeably in the claims and should be construed consistently with our prior construction of “storage element,” which, as noted above, was affirmed by the Federal Circuit, to mean “an element of a system that stores non-negligible amounts of energy from an input EM signal.” We need not construe any other claim terms expressly because there is no present controversy as to the meaning of any other claim terms in this proceeding. *Realtime Data*, 912 F.3d at 1375.

D. Ground 1A: Obviousness over Tayloe, TI Datasheet, and Macnally
Petitioner asserts that the combination of Tayloe, TI Datasheet, and Macnally would have rendered the subject matter of claims 1, 5, 8, 9, 11–19, 23, 26, 27, and 29–36 obvious to one of ordinary skill in the art at the time

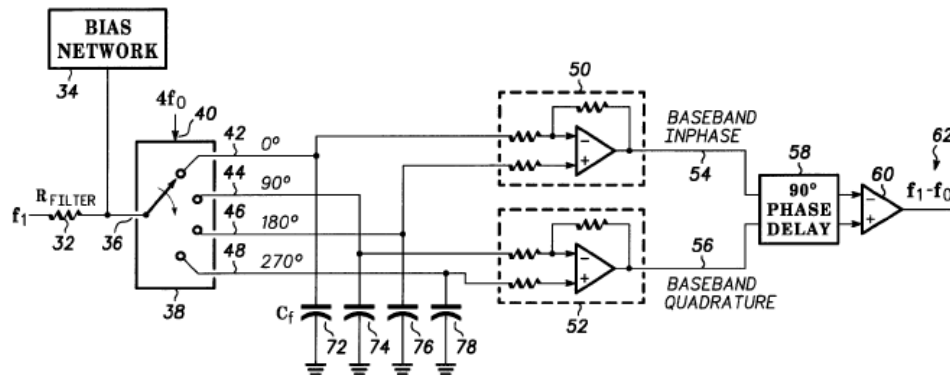
of the invention. Pet. 10–60. Petitioner first discusses the scope and content of the prior art, then asserts one of ordinary skill in the art would have been motivated to combine the teachings of the references with a reasonable expectation of success, and lastly contends that the combined teachings of the references meet each element of the claims. *See id.* at 10–22 (discussing the scope and content of the prior art), 22–30 (discussing motivation to combine Tayloe, TI Datasheet, and Macnally and reasonable expectation of success), 30–60 (discussing the application of the prior art to the claims).

As discussed further below, Patent Owner does not challenge, in its Preliminary Response, Petitioner’s application of the prior art to the claims, instead focusing its argument on whether Petitioner has sufficiently established that one of ordinary skill in the art would have been motivated to combine the references as proposed with a reasonable expectation of success. Prelim. Resp. 3–11. We address Patent Owner’s arguments in our discussion of Petitioner’s contentions.

1. Scope and Content of the Prior Art

a. Tayloe (Ex. 1004)

Tayloe is directed to “a direct conversion receiver” and its method of “convert[ing] signal of interest directly to baseband (or near zero hertz) from a radio frequency (RF) or intermediate frequency (IF).” Ex. 1004, 1:10–13. Figure 3 is reproduced below:



30 **FIG. 3**

Figure 3 is a block schematic circuit of a direct conversion receiver. *Id.* at 1:51–52.

Regarding Figure 3, Tayloe explains that

an RF or IF signal f_1 is received at resistor 32. Resistor 32, as is more fully discussed below, forms a filter when taken in combination with capacitors 72-78. 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 a 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. Each of the capacitors functions as a separate integrator, each integrating a separate quarter wave of the input signal. . . .

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.

The outputs of commutating switch 38 are input to summing amplifiers 50 and 52. Summing amplifier 50 differentially sums the 0 degree output and the 180 degree output, 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, 2:13–67.

Tayloe explains that commutating switch 38 is “controlled by a signal present at control input 40,” which causes the switch to couple the RF input

signal f_1 to one of four outputs 42, 44, 46, and 48 so that the RF input signal f_1 is sampled four times during a full cycle, as shown in Figure 4, reproduced below. Ex. 1004, 2:17–20, 3:40–48.

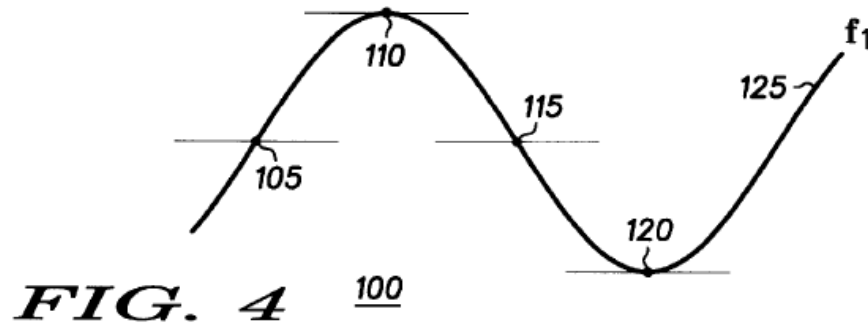


Figure 4 “shows a waveform” in accordance with a preferred embodiment of Tayloe. *Id.* at 1:53–54. Tayloe indicates that “[p]oint 105 represents the voltage to which capacitor 72 (FIG. 3) charges,” “point 110 represents the voltage to which capacitor 74 charges, point 115 represents the voltage to which capacitor 76 charges, and point 120 represents the voltage to which capacitor 78 charges.” *Id.* at 3:41–48.

As shown in Figure 6, reproduced below, Tayloe also discloses “an alternate embodiment in which each integrating capacitor has its own resistor.” Ex. 1004, 4:48–49.

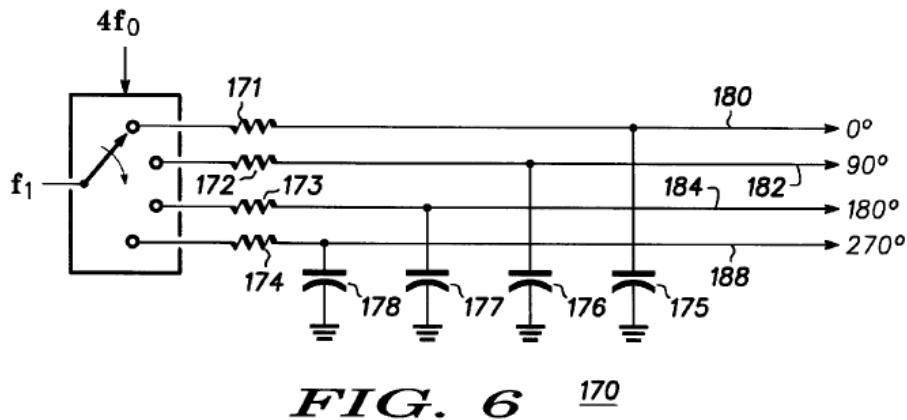


Figure 6 “shows a product detector in accordance with an alternate embodiment” of Tayloe. *Id.* at 1:58–59. Tayloe explains that “0 degree

output 180 has a voltage controlled by the combination of capacitor 175 and resistor 171” and “180 degree output 184 has a voltage controlled by the combination of capacitor 177 and resistor 173.” *Id.* at 4:49–57 (similarly describing 90 degree output 182 and 270 degree output 188 in relation to the combination of their capacitors and resistors).

Taylor teaches implementing “direct conversion receiver 30 (FIG. 3) utilizing an analog multiplexer and a digital counter as shown in FIG. 7,” reproduced below. Ex. 1004, 5:33–37.

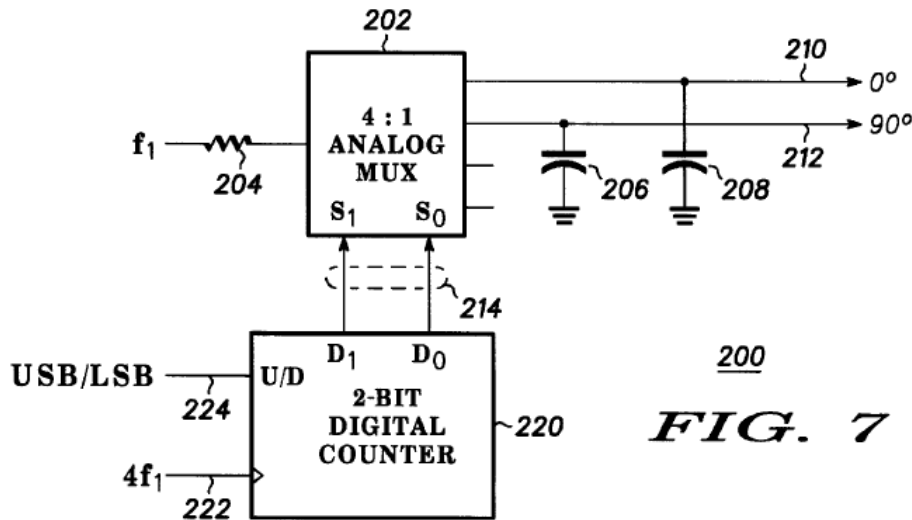


Figure 7 “shows a product detector” in accordance with one of Taylor’s embodiments. *Id.* at 1:60–61. Taylor discloses that “[t]he analog multiplexer is a Texas Instruments SN74BCT3253D.”⁹ *Id.* at 5:36–37.

⁹ Petitioner explains that the “BCT” in Taylor’s reference to the TI Datasheet is a typographical error and should instead be read as “CBT.” Pet. 17 n.5. Patent Owner does not contest Petitioner’s characterization at this stage of the proceeding. *See generally* Prelim. Resp.

b. TI Datasheet (Ex. 1005)

TI Datasheet describes the SN74CBT3253 multiplexer/demultiplexer, “a dual 1-of-4 high-speed TTL-compatible FET multiplexer/demultiplexer.” Ex. 1005, 1. A demultiplexer may be used to receive one input signal and route it to several output lines. Ex. 1003 ¶ 105.

c. Macnally (Ex. 1021)

Macnally generally relates to “[a] single-chip CMOS [complementary metal-oxide semiconductor] direct conversion transceiver [that] includes an RF circuit, a transmitter having a synthesizer, a receiver having a baseband filter, and a demodulator.” Ex. 1021, code (57). Figure 1 of Macnally, reproduced below, illustrates a block diagram of the single-chip CMOS transceiver according to one embodiment. *Id.* at 2:20–21.

FIG. 1

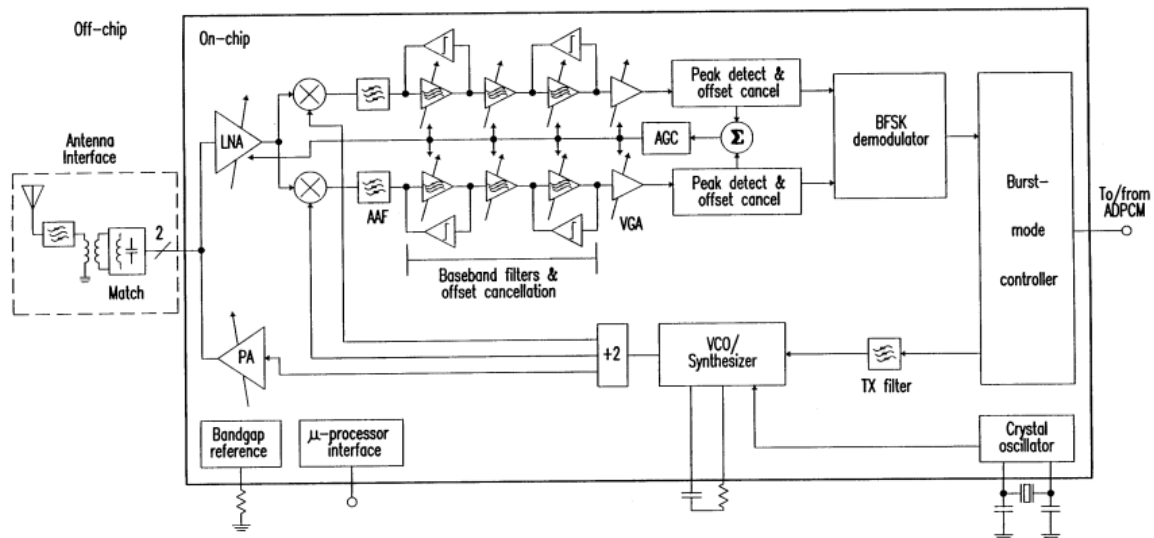


Figure 1 illustrates a fully-integrated transceiver 100 that includes, among other things, RF circuits 102 and 104, synthesizer 106, baseband filters 108, demodulator 110, and digital signal processing. *Id.* at 5:7–11.

Figure 3 of Macnally, reproduced below, illustrates a circuit diagram of the mixer and antialias filter according to one embodiment. Ex. 1021, 2:24–25.

FIG. 3

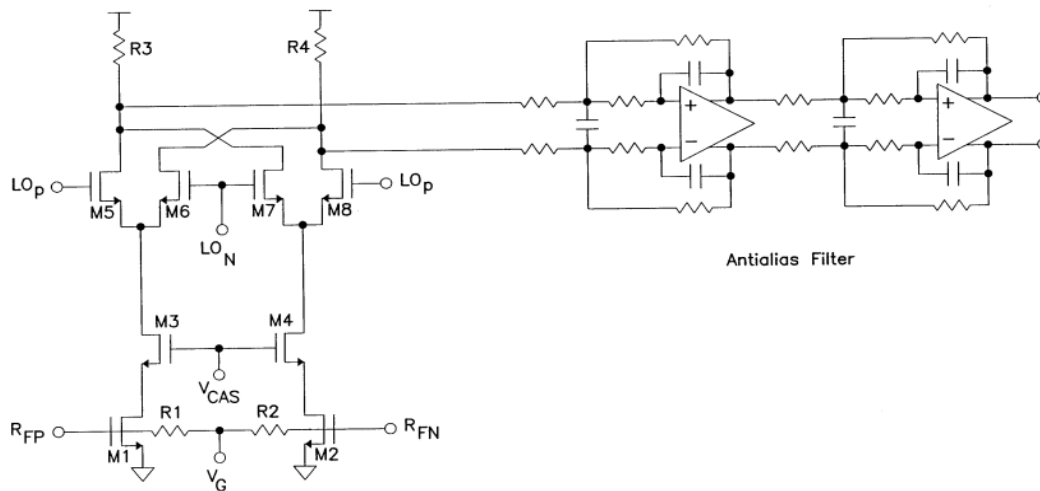


Figure 3 illustrates mixer 142 and antialias filter 144. *Id.* at 7:7–8.

Macnally discloses that “[t]he output of the mixer 142 is fed to a four-pole Butterworth antialias filter 144” formed by “[t]wo biquad stages.” *Id.* at 7:14–17.

2. *The Combination: Motivation to Combine and Reasonable Expectation of Success*

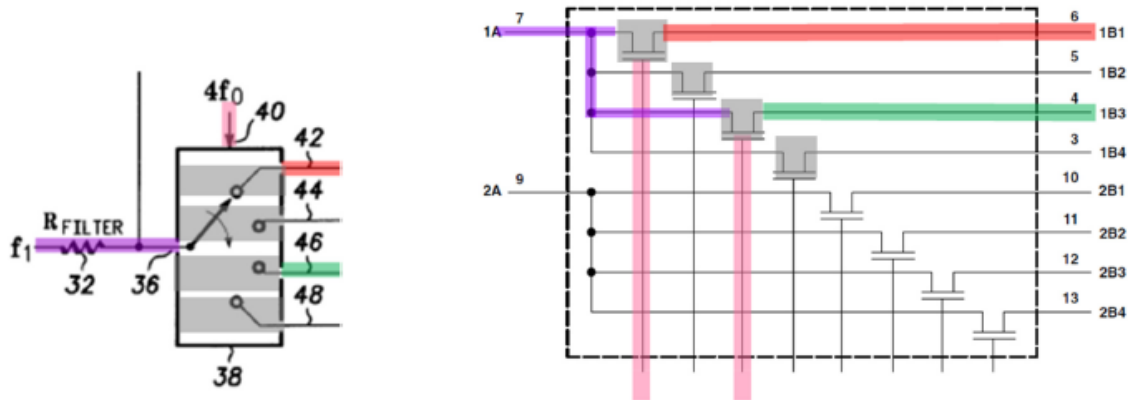
Petitioner asserts Tayloe discloses “a direct conversion receiver using a commutating switch to ‘sample an RF waveform four times per period at the RF frequency’ in which ‘[t]he samples are integrated over time to produce an average voltage of 0 degrees, 90 degrees, 180 degrees and 270 degrees’ across the 360-degree full cycle.” Pet. 22 (alteration in original) (quoting Ex. 1004, code (57)) (citing Ex. 1004, 2:13–67 (referring to “one embodiment using separate capacitors 72, 74, 76, and 78), Figs. 3, 4). Petitioner contends Tayloe “discloses ‘an alternative embodiment in

which each integrating capacitor has its own resistor.” *Id.* (quoting Ex. 1004, 4:48–57) (citing Ex. 1004, Fig. 6). Petitioner further asserts Tayloe discloses implementing commutating switch 38 using the multiplexer/demultiplexer disclosed by TI Datasheet. *Id.* (citing Ex. 1004, 5:33–37, 5:1–16, Fig. 7). Additionally, Petitioner contends “Macnally discloses examples of using antialiasing filters in an integrated transceiver device.” *Id.* at 23 (citing Ex. 1021, Fig. 3, 1:44–46, 7:7–29; Ex. 1022, Figs. 3, 6, 8).

Petitioner proposes several modifications based on combining the teachings of Tayloe, TI Datasheet, and Macnally, and asserts that one of ordinary skill in the art would have been prompted to combine the teachings as proposed with a reasonable expectation of success. Pet. 22–30. As described below, Petitioner first proposes combining Tayloe with TI Datasheet, then describes modifying Tayloe according to one of the alternate embodiments disclosed therein, and then describes modifying the Tayloe/TI Datasheet combination in light of Macnally. *Id.* Patent Owner asserts that Petitioner, “[a]t best, . . . demonstrates that a skilled artisan, once presented with the three references, would have understood that they *could* be combined,” but “does not adequately explain *why* a [person of ordinary skill in the art] would have been motivated or would have had a reason to combine these teachings, and no such motivation exists.” Prelim. Resp. 3–4. At this stage, however, Patent Owner does not challenge Petitioner’s arguments regarding combining Tayloe and TI Datasheet or Tayloe’s alternate embodiment; rather, Patent Owner’s arguments are directed to Petitioner’s proposed modifications of the Tayloe/TI Datasheet combination in light of Macnally and whether one of ordinary skill in the art would have

been prompted to do so with a reasonable expectation of success. *Id.* at 3–11. We address each of Patent Owner’s arguments below as we discuss Petitioner’s proposed combination.

First, Petitioner contends that one of ordinary skill in the art would have been motivated “to combine Tayloe and the TI Datasheet, using any four of the multiplexer switches (gray) from the multiplexer to implement Tayloe’s commutating switch 38.” Pet. 23. Petitioner annotates Tayloe’s Figure 3 and the multiplexer/demultiplexer of TI Datasheet, as shown below.



TI-1004, Fig 3 (switch 38)

TI-1005, 1 (multiplexer/demultiplexer)

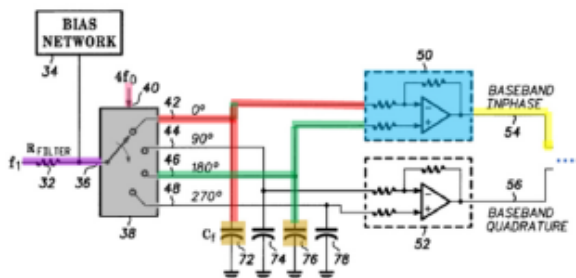
Pet. 24. Petitioner highlights Tayloe’s switch 38 as shown in Figure 3 (left) and the multiplexer/demultiplexer of TI Datasheet (right) using the same colors to indicate the correspondence between switch 38 and the multiplexer/demultiplexer, and explains how using the multiplexer/demultiplexer instead of Tayloe’s switch 38 would have been a “simple substitution of one known element for another.” Pet. 24–25 (citing *KSR*, 550 U.S. at 401); *see id.* at 24 (asserting one of ordinary skill in the art would have been “motivated to use the multiplexer of the TI Datasheet to implement Tayloe’s commutating switch 38 at least because Tayloe expressly teaches using an analog multiplexer, and the multiplexer of TI’s

Datasheet is a suitable analog multiplexer capable of performing the needed switching with the requisite number of channels” (citing Ex. 1003 ¶ 134)).

Petitioner contends one of ordinary skill in the art “would have a reasonable expectation of success at combining Tayloe with TI Datasheet because the combination would have yielded predictable results (e.g., ‘low on-state resistance of the switch [which] allows connections to be made with minimal propagation delay’).” Pet. 25 (alteration in original) (citing Ex. 1005, 1; Ex. 1003 ¶ 136).

As noted above, at this stage Patent Owner does not challenge Petitioner's argument and evidence pertaining to the combination of Tayloe and TI Datasheet. *See generally* Prelim. Resp.

Second, Petitioner contends one of ordinary skill in the art “would have found it obvious to apply the separate integrator example” from Figure 6 of Tayloe to the receiver depicted in Tayloe’s Figure 3, as shown below. Pet. 25.



30 *FIG. 3*

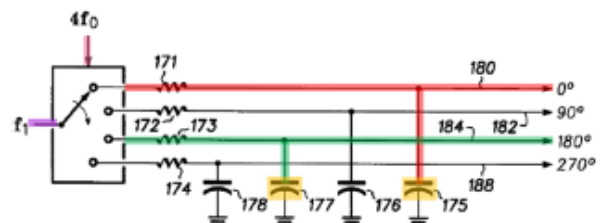


FIG. 6 170

TI-1004, Fig. 3

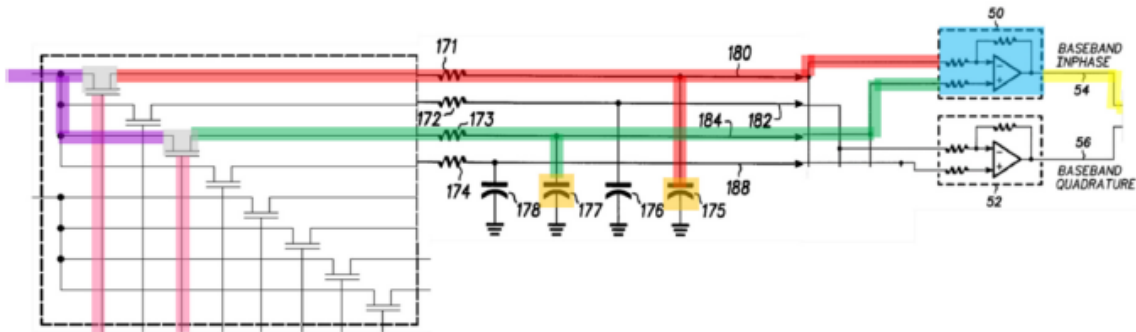
TI-1004, Fig. 6

Pet. 25. Tayloe’s Figure 3 “shows a direct conversion receiver” and Tayloe’s Figure 6 “shows a product detector.” Ex. 1004, 1:51, 1:58. Petitioner annotates with highlighting the similar components of Tayloe’s

Figures 3 and 6. *Id.* Petitioner provides the following figures showing how it proposes to combine (1) Figures 3 and 6 of Tayloe and (2) Figures 3 and 6 of Tayloe with TI Datasheet. *Id.* at 26.



Combined Teachings of TI-1004



Combination System (using switch of TI-1005)

Pet. 26. The first figure shown above includes Tayloe's Figure 6 in place of a portion of Tayloe's Figure 3, specifically where each integrating capacitor has its own resistor. *Id.* The second figure shown above substitutes TI Datasheet's multiplexer switches for Tayloe's switch 38. *Id.* Each figure includes highlighting to identify the corresponding portions of each figure. *Id.*

Petitioner contends that one of ordinary skill in the art "would have been motivated to combine Figure 6 with Figure 3 of Tayloe at least because Tayloe specifically describes Figure 6 as 'an alternate embodiment in which

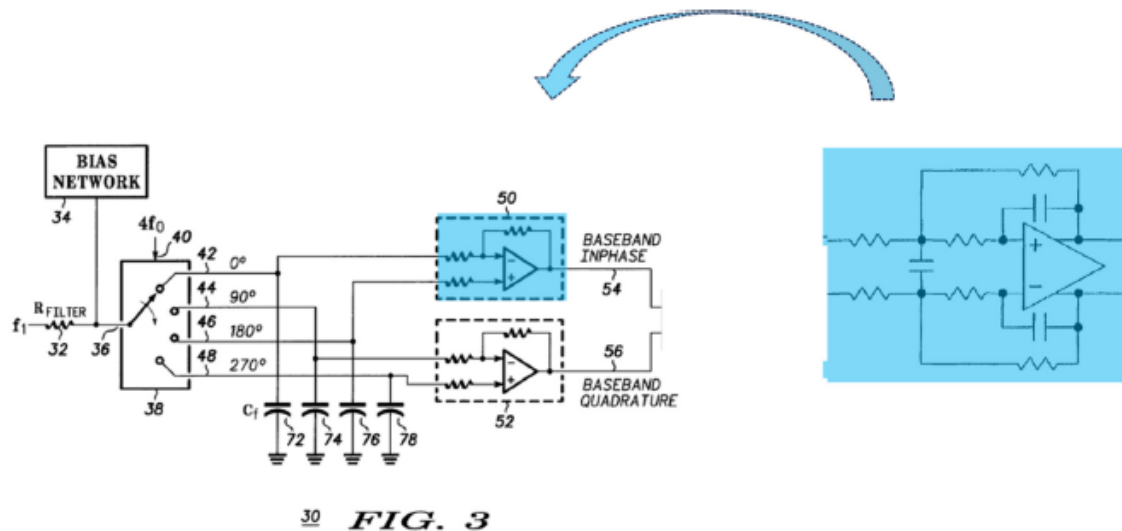
each integrating capacitor has its own resistor.” Pet. 26 (quoting Ex. 1004, 4:46–49). Petitioner asserts, “[a]s ‘an alternate embodiment’ relative to the embodiment where capacitors 72–78 share a resistor 32, i.e., Figure 3, a [person of ordinary skill in the art] would have understood the ‘alternate embodiment’ as replacing a portion of Figure 3.” *Id.* In further explanation of Petitioner’s proposed combination of Figures 3 and 6 in Tayloe, Petitioner asserts “[w]hile the ‘alternate embodiment’ performs a similar function of the portion of Figure 3, it alone does not produce a baseband signal.” *Id.* Therefore, Petitioner contends one of ordinary skill in the art “seeking to generate a baseband signal with the ‘alternate embodiment’ would have found it obvious to replace the existing arrangement of capacitors in Figure 3 using the alternate arrangement where ‘each integrating capacitor has its own resistor,’ as depicted in Figure 6.” *Id.* at 26–27.

Petitioner contends one of ordinary skill in the art “would have a reasonable expectation of success because the replacement is no more than ‘a simple substitution of one known element for another’ to obtain predictable results (i.e., ‘each integrating capacitor has its own resist[or]’).” Pet. 27 (citing Ex. 1003 ¶¶ 135–139).

As noted above, at this stage Patent Owner does not challenge Petitioner’s argument and evidence pertaining to the modification based on Tayloe’s alternate embodiment. *See generally* Prelim. Resp.

Third, Petitioner contends it would have been obvious to one of ordinary skill in the art “to implement each of Tayloe’s differential amplifier circuits (light blue) ([Ex.] 1004, Fig. 3) as a fully differential operational amplifier configuration (light blue), as taught in Macnally ([Ex.] 1021/1022,

Fig. 3).” Pet. 27. To illustrate Petitioner’s combination, Petitioner provides the annotated figures reproduced below.



TI-1004, Fig. 3 (left)

TI-1021/TI-1022, Fig. 3 (right)

Pet. 27. To demonstrate this combination, Petitioner reverts back to unmodified Figure 3 of Tayloe (left) to show where Macnally’s differential operational amplifier configuration (right) would be substituted into Tayloe. *Id.* Petitioner illustrates this substitution by coloring the respective portions of the figures in light blue and adding a light blue arrow showing the substitution. *Id.*

Petitioner contends one of ordinary skill in the art would have been motivated “to adapt Tayloe’s system as a single-chip (i.e., integrated circuit known as IC) to meet relentless market demand for improved product size/performance, and decreased unit cost.” Pet. 28 (citing Ex. 1003 ¶¶ 140–142 (citing Ex. 1021, 5:5–7; Ex. 1022, 5)). Petitioner asserts one of ordinary skill in the art would have been “inspired by several known advantages of using fully differential amplifiers and Macnally’s topology for baseband processing on an IC.” *Id.*

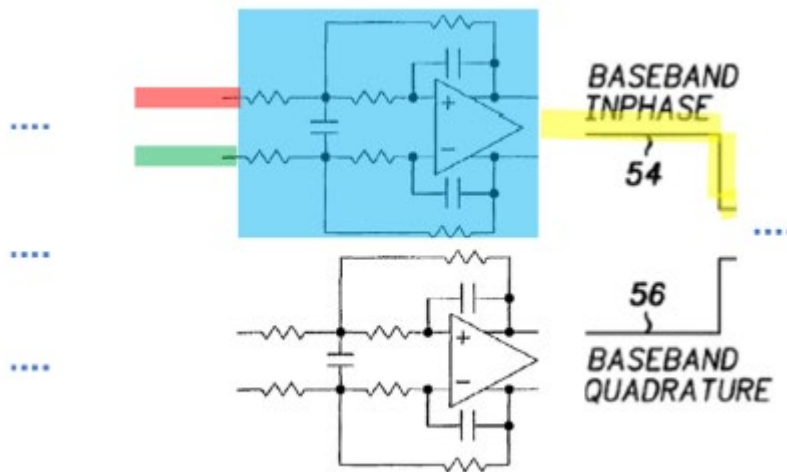
First, Petitioner asserts “fully differential amplifiers operate on complementary signal components such that interference which equally corrupts both complementary signal components can be cancelled by taking the difference between the two complementary signal components.” Pet. 28. Petitioner asserts “[t]his known feature can minimize even order harmonic distortion, thus improving the linearity of amplifier output.” *Id.* (citing Ex. 1003 ¶ 141).

Second, Petitioner contends “each fully differential amplifier is laid out symmetrically on an integrated circuit (IC) to provide ‘a fully differential analog signal path [that] minimizes supply and substrate noise coupling [e.g., interference coupling from the substrate, power supply lines, and ground lines].” Pet. 28 (alterations in original) (citing Ex. 1021, 5:64–65¹⁰; Ex. 1022, 9; Ex. 1003 ¶ 141 (citing Ex. 1027, 1389)).

Third, Petitioner asserts that, “among available design options for fully differential amplifiers, Macnally’s configuration employs the Rauch biquad topology that can achieve a given power output with lower power input and reduced noise and distortion.” Pet. 28 (citing Ex. 1003 ¶ 141 (citing Ex. 1027, 1388, Fig. 12)).

Petitioner provides the following figure, which shows part of the combined system focused on the circuits from Macnally.

¹⁰ Petitioner cites column 6, lines 64–65, of Macnally, but we understand Petitioner to have intended to cite column 5 as opposed to column 6 given the discussion in Macnally in those columns, at those lines.



Pet. 29. Petitioner’s figure shows the combination with Macnally’s differential operational amplifier configuration substituted into Tayloe’s Figure 3, using the same color highlighting from the previous iterations of Petitioner’s combined figures reproduced above. *Id.*

Relying on Dr. Galton’s testimony, Petitioner asserts that “the differential output of Macnally’s configuration is characteristic of on-chip baseband signals for subsequent on-chip processing, also in differential format.” Pet. 29 (citing Ex. 1003 ¶ 142). Petitioner contends that one of ordinary skill in the art would have understood “the subsequent on-chip components would likewise be differential as in Macnally, *e.g.*, differential inputs/outputs for I and for Q in any subsequent circuit paths, phase shifters, amplifiers, and other components, eventually summing each differential pair with a summing amplifier, like Tayloe’s amplifier 60.” *Id.* (citing Ex. 1003 ¶ 142). And Petitioner asserts “the implementation would have been a simple substitution of one known element (fully differential amplifier circuit of Macnally) for another (summing amplifier circuit of Tayloe) to obtain predictable results (*e.g.*, improved linearity and reduced power consumption

for on-chip performance), and hence would have had a reasonable expectation of success.” *Id.* at 29–30 (citing Ex. 1003 ¶¶ 141–143).

Patent Owner initially challenges Petitioner’s stated motivation for modifying the Tayloe/TI Datasheet combo in light of Macnally. First, Patent Owner asserts that Tayloe “already explicitly describes its invention as ‘a *simple and inexpensive* product detector,’ with performance benefits such as ‘low conversion loss’ and ‘substantial receiver performance gains.’” Prelim. Resp. 5 (quoting Ex. 1004, 1:65, 3:5–6, 3:9–11). Thus, Patent Owner contends “these features already address the issues that [Petitioner] alleges a [person of ordinary skill in the art] would seek to solve by combining Tayloe with Macnally. *Id.*

We recognize that Tayloe touts these advantages of its product detector, but that does not necessarily mean that the benefits asserted by Petitioner would not have led one of ordinary skill in the art to make the modifications proposed. For example, just because Tayloe has a simple and inexpensive product with performance benefits does not mean that one of ordinary skill in the art would not seek to continue to improve Tayloe further by reducing product size, increasing performance, and reducing unit cost. These factors are relative in nature and it is against this relative comparison that one of ordinary skill in the art would have considered whether to modify Tayloe/TI Datasheet in light of Macnally. But, in order to adequately weigh the relative scale of potential benefits that may result from Petitioner’s proposed modification, the record needs to be further developed during trial to better understand the baseline from which Tayloe begins its description and the potential benefits—even if related to the same characteristics of size, performance, and cost—of modifying Tayloe in light of Macnally.

Additionally, Petitioner's argument is supported by the testimony of Dr. Galton (Ex. 1003 ¶¶ 140–143), who Patent Owner will have the opportunity to cross-examine.

Second, Patent Owner contends that Petitioner's "reliance on the supposed 'advantages' of Macnally's fully differential topology for baseband processing on an IC is similarly misguided." Prelim. Resp. 5. In particular, Patent Owner asserts that "Taylor's summing amplifiers already employ differential inputs, and this means they too operate on complementary signal components, and address the same functional goal as Macnally's amplifier." *Id.* at 5–6. Thus, Patent Owner contends one of ordinary skill in the art "would have no logical reason to seek out an alternative amplifier configuration (Macnally's amplifier) that performs the same function as Taylor's existing summing amplifiers." *Id.* at 6.

Even assuming Patent Owner is correct that Taylor's and Macnally's amplifiers are, in fact, structured similarly and perform similarly, that does not detract from (and may support) Petitioner's argument that the combination would have been "a simple substitution of one known element (fully differential amplifier circuit of Macnally) for another (summing amplifier circuit of Taylor) to obtain predictable results (e.g., improved linearity and reduced power consumption for on-chip performance)." Pet. 29–30 (citing Ex. 1003 ¶¶ 141–143).

Third, Patent Owner asserts Petitioner also misinterprets Macnally to suggest that the symmetrical layout of each fully differential amplifier on an IC inherently provides "a fully differential analog signal path [that] minimizes supply and substrate noise coupling [e.g., interference coupling from the substrate, power supply lines, and ground lines.]" Prelim. Resp. 6

(alterations in original) (quoting Pet. 28). Patent Owner contends that Petitioner's assertion is "misleading" because the identified advantage "pertains specifically to a fully differential signal path, not merely the use of a fully differential amplifier." *Id.* Patent Owner asserts that, "[i]n reality, Macnally clearly refers to the [noise minimization] advantage of a fully differential signal path as a whole, not just the amplifier." *Id.* (citing Ex. 1021, 5:64–65). Patent Owner argues that the language Petitioner adds before quoting Macnally changes Macnally's meaning and is "critical" because Petitioner's "argument attempts to retrofit Macnally's statement to support its position, which is not substantiated by Macnally's actual language." *Id.* at 6–7.

We recognize that Patent Owner correctly quotes Macnally's disclosure, but we also recognize that Petitioner's statement is not inaccurate in that Macnally's fully differential analog signal path includes a fully differential amplifier laid out symmetrically on an IC. *See* Pet. 28; Ex. 1021, 5:64–65; Ex. 1022, 9; Ex. 1003 ¶ 141.

Fourth, Patent Owner contends that Petitioner's "proposed combination would increase the number of opamps in Tayloe's circuitry, contradicting the very advantage" identified by Petitioner of "achiev[ing] a given power output with lower power input and reduced noise distortion." Prelim. Resp. 7.

Patent Owner appears to identify a weakness in Petitioner's motivation that may offset some of the benefits identified by Petitioner as to why one of ordinary skill in the art would have been motivated to modify Tayloe/TI Datasheet with Macnally. But, at this stage of the proceeding,

Petitioner has identified other sufficient reasoning with rational underpinning supporting its proposed motivation as discussed above.

Lastly, Patent Owner contends that “TI Datasheet pertains to a standalone chip,” which “by definition, is not part of a single-chip IC; instead, it exists as its own discrete component.” Prelim. Resp. 8. Patent Owner asserts that Petitioner’s reliance on TI Datasheet “contradicts the very motivation [Petitioner] asserts” because “under [Petitioner’s] alleged motivation to implement Macnally’s fully differential amplifier (i.e., single-chip IC implementation), a [person of ordinary skill in the art] would not logically also consider the teachings of the TI Datasheet (a standalone chip).” *Id.* Patent Owner contends “[t]his internal inconsistency undermines [Petitioner’s] proposed motivation.” *Id.*

Patent Owner’s argument raises an interesting point, but it is not clear that Petitioner’s proposed combination employs the teachings of TI Datasheet as a standalone chip as opposed to being implemented in Tayloe as a single-chip IC. This issue, like several raised above by Patent Owner is better left for trial where the record can be more fully developed in light of the various factual issues raised at this stage of the proceeding on the limited record before us.

Patent Owner also challenges Petitioner’s contentions that one of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Macnally with those of Tayloe/TI Datasheet. Prelim. Resp. 8–11. In contrast to Petitioner’s argument that the modification would have been a simple substitution of one known element for another to obtain predictable results, Patent Owner asserts Tayloe’s and Macnally’s amplifiers have “significant structural and functional

differences” that Petitioner overlooks. *Id.* at 9. In particular, Patent Owner contends that “[i]mplementing Macnally’s fully differential amplifier into Tayloe’s circuit would require a fundamental redesign to accommodate Macnally’s differential output configuration.” *Id.*; *see also id.* at 10 (“replacing Tayloe’s summing amplifier with Macnally’s fully differential amplifier configuration would alter the fundamental operation of Tayloe’s circuit”). And, Patent Owner contends Petitioner does not “even consider[] the principle of operation of Tayloe in its analysis,” which, according to Patent Owner, would be changed if combined with Macnally. *Id.* at 10–11.

We acknowledge Patent Owner’s position and recognize that Petitioner proposes, as discussed above, that the subsequent on-chip components would likewise be differential as in Macnally. At this stage in the proceeding, Petitioner’s argument is supported by the testimony of Dr. Galton. Specifically, Dr. Galton provides unrebutted testimony that one of ordinary skill in the art “would have recognized that the lowpass filtering function of the Macnally differential amplifiers is beneficial in the [sic] Tayloe’s circuits as lowpass filtering of the baseband signals in direct conversion receives is beneficial.” Ex. 1003 ¶ 143 (referring to Ex. 1003 § VI). Additionally, Dr. Galton testifies, “[i]ndeed, success stories for building integrated direct down-conversion receivers had been reported, for example, in [Figure 1], by Macnally.” *Id.* (citing Ex. 1021, Fig. 1; Ex. 1022, Fig. 1).

Accordingly, on the present record at this stage of the proceeding and for the reasons discussed above, we find that Petitioner has shown a reasonable likelihood of establishing that one of ordinary skill in the art would have been motivated to combine the teachings of Tayloe,

TI Datasheet, and Macnally with a reasonable expectation of success. Patent Owner is invited to elaborate further on its positions in future briefing with potential expert support.

3. *Claims 1, 5, 8, 9, 11–19, 23, 26, 27, 29–36*

Petitioner sets forth a detailed analysis and discussion of claims 1, 5, 8, 9, 11–19, 23, 26, 27, and 29–36 with citations to supporting evidence showing how the combination of Tayloe, TI Datasheet, and Macnally teaches the subject matter of the claims. Pet. 30–60.

At this stage of the proceeding, Patent Owner does not challenge Petitioner’s contentions that the claimed subject matter is met by the proposed combination. *See generally* Prelim. Resp.

We have reviewed Petitioner’s arguments and evidence cited in support thereof. We find, on the present record at this stage of the proceeding, that Petitioner has shown that the combination of Tayloe, TI Datasheet, and Macnally teaches the subject matter of the claims for the reasons set forth by Petitioner. *See* Pet. 30–60.

4. *Objective Indicia of Nonobviousness*

In the record presently before us, neither Petitioner nor Patent Owner has presented any evidence of objective indicia of nonobviousness.

5. *Weighing the Graham Factors*

“Once all relevant facts are found, the ultimate legal determination [of obviousness] involves the weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan.” *Arctic Cat*, 876 F.3d at 1361. On balance, considering the record presently before us, Petitioner has established a reasonable likelihood that it would prevail in showing that the combination of Tayloe, TI Datasheet, and

Macnally would have rendered the subject matter of claims 1, 5, 8, 9, 11–19, 23, 26, 27, and 29–36 of the '528 patent obvious to one of ordinary skill in the art at the time of the invention.

E. Ground 1B: Obviousness over Tayloe, TI Datasheet, Macnally, and Cahn

Ground 2A: Obviousness over Razavi and Macnally

Ground 2B: Obviousness over Razavi, Macnally, and Cahn

Petitioner contends that the combination of Tayloe, TI Datasheet, Macnally, and Cahn would have rendered the subject matter of claims 2–4 and 20–22 obvious to one of ordinary skill in the art at the time of the invention. Pet. 60–61. Petitioner also contends that the combination of Razavi and Macnally would have rendered the subject matter of claims 1, 5, 8, 9, 11–19, 23, 26, 27, and 29–36 obvious to one of ordinary skill in the art at the time of the invention. *Id.* at 62–94. And, Petitioner contends that the combination of Razavi, Macnally, and Cahn would have rendered the subject matter of claims 2–4 and 20–22 obvious to one of ordinary skill in the art at the time of the invention. *Id.* at 94–95.

Patent Owner raises several arguments in response to Petitioner's challenges based on Razavi, including that (a) Razavi teaches away from the proposed combination (Prelim. Resp. 12–15), (b) Petitioner fails to provide sufficient reasonable expectation of success in combining Razavi and Macnally (*id.* at 15–16), and (c) Petitioner has not shown motivation to combine Razavi, Macnally, and Cahn (*id.* at 16–17).

Because we have determined above that, on the present record at this stage of the proceeding, the information presented in the Petition shows that there is a reasonable likelihood that Petitioner will prevail with respect to its

challenge based on the combination of Tayloe, TI Datasheet, and Macnally (Ground 1A), we need not address, in this Decision, Petitioner’s additional challenges (Grounds 1B, 2A, and 2B). *See* 35 U.S.C. § 314(a); *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) (“Section 314(a) does not require the Director to evaluate every claim individually. Instead, it simply requires him to decide whether the petitioner is likely to succeed on ‘at least 1’ claim. Once that single claim threshold is satisfied, it doesn’t matter whether the petitioner is likely to prevail on any additional claims; the Director need not even consider any other claim before instituting review.”); 37 C.F.R. § 42.108(a).

IV. CONCLUSION

For the reasons discussed above, we do not exercise our discretion to deny institution. Additionally, Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that at least one claim of the ’528 patent is unpatentable. Our analysis is based on the preliminary record developed thus far and may change after the record is developed fully, during trial.

V. ORDER

Accordingly, it is:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review is instituted as to claims 1–5, 8, 9, 11–23, 26, 27, and 29–36 of the ’528 patent on each of the grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the ’528 patent shall commence

IPR2024-00936
Patent 9,118,528 B2

on the entry date of this Decision, and notice is hereby given of the institution of a trial.

IPR2024-00936
Patent 9,118,528 B2

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