

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

THETA IP, LLC,
Patent Owner.

IPR2024-00819
Patent 11,564,164 B2

Before KARA L. SZPONDOWSKI, AARON W. MOORE, and
RUSSELL E. CASS, *Administrative Patent Judges*.

CASS, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Apple Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–20 (the “challenged claims”) of U.S. Patent No. 11,564,164 B2 (Ex. 1001, “the ’164 patent”). Paper 1 (“Pet.”). Theta IP, LLC (“Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). With our permission, Petitioner filed a Preliminary Reply (Paper 10, “Prelim. Reply”), and Patent Owner filed a Preliminary Sur-reply (Paper 11, “Prelim. Sur-reply”).

We have authority to determine whether to institute an *inter partes* review, under 35 U.S.C. § 314 and 37 C.F.R. § 42.4. An *inter partes* review may not be instituted unless it is determined that “the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314 (2018); *see also* 37 C.F.R. § 42.4(a) (2020) (“The Board institutes the trial on behalf of the Director.”). The reasonable likelihood standard is “a higher standard than mere notice pleading,” but “lower than the ‘preponderance’ standard to prevail in a final written decision.” *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

For the reasons provided below and based on the record before us, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the challenged claims. Accordingly, we institute an *inter partes* review on all grounds set forth in the Petition.

B. Real Parties in Interest

Petitioner identifies itself as the real party-in-interest. Pet. 77. Patent Owner identifies “Theta IP, LLC as the real party in interest.” Paper 3, 2.

C. Related Proceedings

The parties identify the following district court case involving the ’164 patent: *Theta IP, LLC v. Apple Inc.*, No. 6:23-cv-00314 (W.D. Tex.). Pet. 77; Paper 3, 2.

D. The ’164 Patent (Ex. 1001)

The ’164 patent is titled “Power Dissipation Reduction in Wireless Transceivers” and is generally directed to “[m]ethods and circuits for reducing power dissipation in wireless transceivers and other electronic circuits and systems.” Ex. 1001, codes (54), (57). The ’164 patent states that in wireless networking, connectivity to the Internet can result in a corresponding drain on battery life in portable devices, such as notebooks and handheld computers. *Id.* at 1:27–38. The problem is further described as follows:

One reason why this power drain is high is that electronic circuits are typically designed to function properly under worst-case operating conditions. For a wireless transceiver, the worst case condition is when a desired signal reception strength is low, while other transceivers or nearby electronic equipment generate interfering signals and other spurious noise.

But a wireless transceiver does not always operate in these worst-case conditions. For example, a base station, router or access point may be nearby such that the received signal is strong. Also, there may be no interfering signals, or they may be relatively weak. In these situations, receiver circuit currents can be reduced below what is necessary for the worst case condition. If this is done, power dissipation is reduced, and battery life is increased.

Ex. 1001, 1:39–53.

The '164 patent describes embodiments that “use bias current reduction, impedance scaling, and gain changes either separately or in combination to reduce power dissipation.” Ex. 1001, code (57). It goes on to explain that, for example, “bias currents are reduced in response to a need for reduced signal handling capability, impedances are scaled thus reducing required drive and other bias currents in response to a strong received signal, or gain is increased and impedances are scaled in response to a low received signal in the presence of no or weak interfering signals.” *Id.*

Figures 2A and 2B, reproduced below, “illustrate examples of desired and interfering signals and noise that may be received by a circuit in a wireless receiver.” Ex. 1001, 3:22–24.

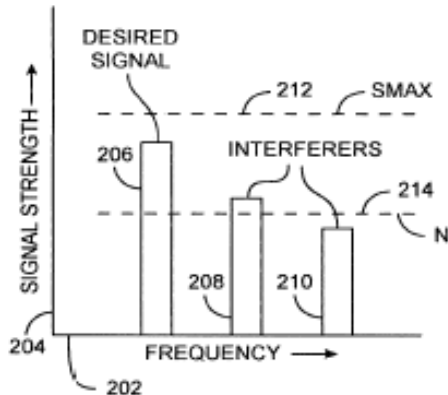


FIG. 2A

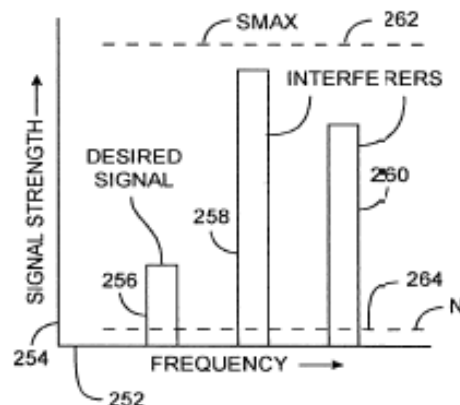


FIG. 2B

Figures 2A and 2B depict examples of desired signals. *Id.* at 5:36. Figure 2A shows received desired signal 206 is large in comparison to interfering signals 208 and 210, and is considered the best-case input signal. *Id.* at 5:41–42, 6:19–20. Figure 2B shows desired signal 256 is relatively weak

compared to large interferers 258 and 260, and is considered the worst-case input signal. *Id.* at 5:59–61, 6:11–12.

Figure 6, reproduced below, “is an example of how a circuit’s impedances may be scaled to reduce drive currents, and, depending on the circuit configuration used, to reduce associated bias currents as well.”

Ex. 1001, 7:52–54.

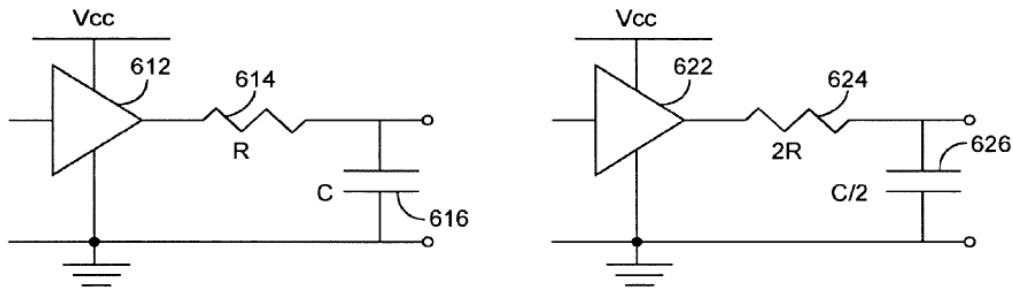


FIG. 6

On the left, Figure 6 shows driver 612 with load R 614 and C 616. *Id.* at 7:55. On the right, Figure 6 shows driver 622 driving an impedance of 2R 624 and C/2 626. *Id.* at 7:55–57. The frequency response of the circuits are the same, “[b]ut the impedance of the load seen by driver 622 is double that seen by 612, thus the output current required by the driver 622 is reduced by one-half.” *Id.* at 7:57–60.

Figure 8A, reproduced below, “is a block diagram of a functional block 820 and optional gain element 810 in accordance with an embodiment of the present invention.” Ex. 1001, 8:28–30.

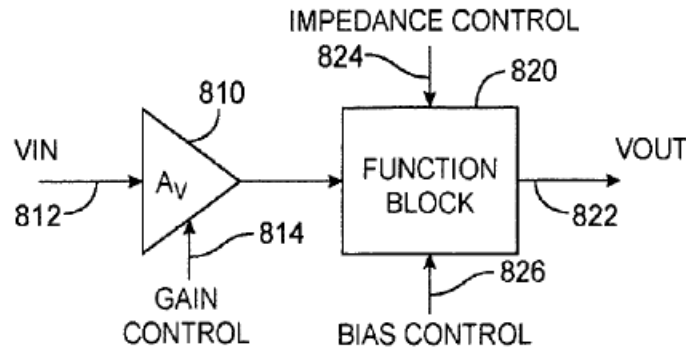


FIG. 8A

Figure 8A shows functional block 820 with bias control lines 826 and impedance control lines 824, and optional gain block 810 with gain control lines 814. Functional block 820 “may be a filter, mixer, amplifier, or other circuit or circuits in a wireless transceiver or other electronic circuits or system.” *Id.* at 8:31–33.

E. Illustrative Claims

Of the challenged claims, claims 1, 5, 10, 15, and 20 are independent.

Claim 1 is illustrative, and is reproduced below.

[1(Pre)]: “1. A system for power dissipation reduction in a battery powered portable wireless communication device, the system comprising:”

[1(a)]: “a battery powered portable wireless communication device, the wireless communication device comprising: a battery configured to supply power for the battery powered portable wireless communication device;”

[1(b)]: “a wireless receiver configured to receive a wireless signal, wherein the wireless signal has a desired signal and an interferer signal,”

[1(c)]: “the wireless receiver having a plurality of circuits that includes circuits in a receiver signal path,”

[1(d)]: “the plurality of circuits designed to operate under a worst-case operating condition where the corresponding

power drain from the battery is a maximum, thereby consuming maximum power from the battery; and”

[1(e)]: “a monitoring circuit associated with the battery powered portable communication wireless device configured to monitor the signal strength of the interferer signal,”

[1(f)]: “wherein a power dissipation control circuit in the wireless receiver causes a bias current to be dynamically adjusted in one or more of the circuits in the receiver signal path as the monitored signal strength of the interferer signal varies during operation when the operating condition is better than the worst-case operating condition, enabling a power dissipation reduction in the wireless receiver, providing a corresponding reduction in a power consumption from the battery of the battery powered portable wireless communication device.”

Ex. 1001, 13:2–33 (bracketed paragraph identifiers added).

F. Applied References

Petitioner relies upon the following references:

Behbahani et al., *Adaptive Analog IF Signal Processor for a Wide-Band CMOS Wireless Receiver*, 36 IEEE Journal of Solid-State Circuits 1205 (Aug. 2001) (Ex. 1004, “Behbahani”);

Behbahani et al., *A 2.4-GHz Low-IF Receiver for Wideband WLAN in 0.6 μm CMOS—Architecture and Front-End*, 35 IEEE Journal of Solid-State Circuits 1908 (Dec. 2000) (Ex. 1005, “Leete”); and

Behbahani et al., *A Broad-Band Tunable CMOS Channel-Select Filter for a Low-IF Wireless Receiver*, 35 IEEE Journal of Solid-State Circuits 476 (Apr. 2000) (Ex. 1006, “Tan”).

Pet. 11, 79.

Petitioner submits the Declaration of Dr. Asad Abidi (Ex. 1003).

Patent Owner submits the Declaration of Dr. Lawrence E. Larson (Ex. 2005).

G. Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–20 of the '164 patent based on the following grounds:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–20	103(a) ¹	Behbahani, Leete, Tan

Pet. 11.

II. DISCUSSION

A. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention would have had “a master’s degree in electrical engineering or the equivalent, and two or more years of experience with wireless communication devices.” Pet. 10 (citing Ex. 1003 ¶¶ 27–29). Petitioner further states that “[a]dditional education or experience might substitute for the above requirements.” *Id.*

Relying on Dr. Larson, Patent Owner argues that a person of ordinary skill “would have at least a Bachelor’s Degree in Electrical or Electronics Engineering, along with ‘approximately five years of relevant experience in the design of transceiver architecture, RF systems and components, and analog and mixed signal circuits, as well as experience in control algorithms for such systems and familiarity with wireless standards.’ Prelim. Resp. 27–28 (citing Ex. 2005 ¶ 50). Patent Owner further states that “[a]dditional education could substitute for experience and vice versa.” *Id.*

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. § 103 that became effective after the filing of the application that led to the '164 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

Petitioner thus proposes a Master's degree with two years of experience, while Patent Owner proposes a Bachelor's degree with five years of experience. Given that both parties also indicate that more education could substitute for less experience and vice versa, we do not see a material difference in the proposals, and thus adopt Patent Owner's version for the purposes of this Decision. If the parties believe that the choice of one proposal over the other would make a difference in the patentability analysis, they may address that during trial.

B. Claim Construction

A claim "shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b)." 37 C.F.R. § 42.100(b) (2020).

The parties discuss a number of terms of the challenged claims that have been construed during district court litigation concerning the '164 patent. Petitioner submits the following chart showing the parties' proposed constructions of "impedance," "worst-case," and "best-case" in the district court litigation. Pet. 8–9.

Claim Term	Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
“impedance”	Plain and ordinary meaning, but if construed, should be construed as “opposition to the flow of alternating current”	Plain and ordinary meaning
“worst-case”	Plain and ordinary meaning	“desired signal strength is low and interferer signal strength is high”
“best-case”	Plain and ordinary meaning	“desired signal strength is high and interferer signal is low”

Petitioner asserts that its proposed ground satisfies either party’s proposed construction of these claim terms. Pet. 8. Based on the present record, we determine that we need not expressly construe these terms for purposes of this Decision.

Petitioner also states that it argued in the related district court litigation that the term “signal path” excludes the “digital signal processing” block, and that Patent Owner argued that “no such exclusion is proper.” Pet. 9 (citing Ex. 1009, 1–3). The district court preliminarily agreed with Patent Owner that “signal path” should be given its “plain and ordinary meaning” and should not be limited to analog components. Prelim. Resp. 30, 32; Ex. 2015. Petitioner requests that we adopt Patent Owner’s (and thus, the district court’s) interpretation of “signal path” from the related district court litigation for purposes of this proceeding. *Id.* at 9-10 (citing *Western Digital Corporation v. SPEX Technologies, Inc.*, IPR2018-00084,

Paper 14 at 11 (PTAB Apr. 25, 2018); *General Electric v. Vestas*, IPR2018-00928, Paper 9 at 16–17 (PTAB Nov. 5, 2018); *10x Genomics, Inc. v. Bio-Rad Laboratories, Inc.*, IPR2020-00086, Paper 8 at 19 (PTAB Apr. 27, 2020)). Patent Owner “agrees, consistent with [Patent Owner’s] prior assertions and the district court’s preliminary ruling, that ‘signal path’ should be given its plain meaning, and is not properly limited to only ‘analog’ signals.” Prelim. Resp. 29.

For purposes of this Decision, we will give the term “signal path” its “plain and ordinary meaning” and not limit it only to analog components, as the district court found and the parties agree. However, based on the parties’ application of the prior art to the claims, it appears that there may be some further disagreement concerning the meaning of “signal path” in this proceeding. *See* Pet. 8–10, 52–57; Prelim. Resp. 29, 35–37, 42–44. We will discuss the term “signal path” further below in the context of the parties’ arguments applying this term to the asserted prior art. *See* § III.F.4.f, *infra*. The parties may further address the meaning of the term “signal path” during the trial.

The parties also discuss the meaning of the term “dynamically adjusting” in claims 1, 10, 15, and 20 and the term “dynamically varying” in claim 5, which Petitioner refers to as the “dynamic limitation.” Pet. 9–10; Prelim. Resp. 29. Patent Owner argues that, in Patent Owner’s litigation against Samsung in district court, the district court found that the dynamic limitation in patents related to the ’164 patent should be given its “[p]lain-and-ordinary meaning, wherein the plain-and-ordinary meaning is ‘adjusting during operation based—at least in part—on information gained during operation.’” Prelim. Resp. 30 (citing Ex. 2014, 2). Patent Owner further asserts that it advanced this construction to the district court in Patent

Owner’s litigation against Petitioner, and that the district court in that case preliminarily determined that the dynamic limitation should be given its “[p]lain and ordinary meaning.” *Id.* (citing Ex. 2015, 2–3). Patent Owner contends that “if the Board finds that it must interpret the claim terms, ‘adjusting during operation based, at least in part, on information gained during operation’ reflects the plain meaning to one of ordinary skill, and is a proper way to read” the dynamic limitation. *Id.*

Petitioner argues that, “for purposes of this proceeding, Petitioner proposes this Board adopt Patent Owner’s interpretation” of “the dynamic limitations.” Pet. 9. Thus, for purposes of this proceeding, the parties appear to agree with the construction of the dynamic limitation adopted by the district court in Patent Owner’s case against Samsung, namely that the term should be given its plain and ordinary meaning which is “adjusting during operation based, at least in part, on information gathered during operation.” Because this construction is agreed upon by the parties in this proceeding, and is consistent with the construction adopted by the district court, we will apply that construction for purposes of this Decision.

Patent Owner also argues that we should dismiss the Petition because Petitioner is relying on a construction that it disagreed with in district court, citing the Board’s non-precedential decisions in *Samsung Elecs. Am., Inc. v. Cobblestone Wireless LLC*, IPR2024-00319, Paper 16 at 13–23 (PTAB Jun. 24, 2024) and *Hologic, Inc. v. Enzo Life Sciences, Inc.*, IPR2018-00019, Paper 21 at 5–7 (PTAB Nov. 28, 2018). Prelim. Resp. 31–33. Patent Owner, however, relies on a flawed understanding of the *Samsung* case. In *Samsung*, the Board determined that Petitioner had failed to establish a reasonable likelihood of success because it offered and relied on a claim construction that it failed to support, disagreed with, and disparaged, and

that this claim construction was not agreed upon by the patent owner or adopted by a district court. *Samsung*, Paper 21 at 13–23. Specifically, as the Board pointed out in *Samsung*, the petitioner argued and submitted testimony from its expert that its proffered construction was “expressly excluded” by the specification of the challenged patent and was “contrary to [the term’s] plain and ordinary meaning.” *Id.* at 14–15, 19–20. In reaching its decision in *Samsung*, the Board expressly “distinguish[ed] this case from situations where a petitioner relies on the ordinary meaning of a claim term, offers alternative constructions of a claim term, or relies on a construction agreed upon by the parties in the proceeding at issue.” *Id.* at 21. Here, unlike in *Samsung*, Petitioner relies on the plain and ordinary meaning of the dynamic limitation, which is agreed to by the parties in this proceeding and has been adopted by district courts in parallel litigation. We similarly find the facts in *Hologic* distinguishable from those presented here. *See Hologic* at 4 (stating, for example, that “[n]early every time [p]etitioner discusses its use in the [p]etition of [p]atent [o]wner’s proposed construction, [p]etitioner affirmatively disagrees with the construction it adopts.”). Therefore, we reject Patent Owner’s argument that *Samsung* and *Hologic* support dismissal of the Petition here.

Other than the terms discussed above, we determine that it is not necessary to provide an express interpretation of any other claim terms for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

C. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, objective evidence of non-obviousness.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result has weight in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b) (2020). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

² At this stage of the proceeding, Patent Owner has not presented objective evidence of non-obviousness.

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

D. Discretion to Deny Institution Under § 35 U.S.C. 314

Patent Owner contends that we should exercise our discretion to deny institution under 35 U.S.C. § 314(a). Prelim. Resp. 51–55. Specifically, Patent Owner argues that patents related to the '164 patent have been challenged in IPR2023-00694, IPR2023-00697, and IPR2023-00698 by Lenovo and in district court by Samsung. *Id.* at 51, 53. According to Patent Owner, this Petition “is a follow-on to [these] prior invalidity challenges—and [Petitioner] admittedly uses those prior efforts as a roadmap.” *Id.* at 53. (citing IPR2024-00816, Paper 1 at 36).

The issue raised by Patent Owner implicates the factors set forth in *General Plastic Indus. Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (PTAB Sept. 6, 2017) (precedential Section II.B.4.i), which involved multiple petitions serially filed by the same petitioner against the same patent. *General Plastic*, Paper 19 at 6–8. The *General Plastic* factors are as follows:

1. Whether the same petitioner previously filed a petition directed to the same claims of the same patent;
2. Whether at the time of filing of the first petition the petitioner knew of the prior art asserted in the second petition or should have known of it;
3. Whether at the time of filing of the second petition the petitioner already received the patent owner’s preliminary response to the first petition or received the Board’s decision on whether to institute review in the first petition;

4. The length of time that elapsed between the time the petitioner learned of the prior art asserted in the second petition and the filing of the second petition;

5. Whether the petitioner provides adequate explanation for the time elapsed between the filings of multiple petitions directed to the same claims of the same patent;

6. The finite resources of the Board; and

7. The requirement under 35 U.S.C. § 316(a)(11) to issue a final determination not later than 1 year after the date on which the Director notices institution of review.

Id. at 9–10. In *Valve Corp. v. Elec. Scripting Prods., Inc.*, IPR2019-00062, -00063, -00084, Paper 11 (PTAB Apr. 2, 2019) (designated precedential May 7, 2019) (“*Valve*”), the Board extended application of *General Plastic* factors to the situation where multiple petitions for review of the same patent are filed by different petitioners. *Valve*, Paper 11 at 2 (“when different petitioners challenge the same patent, we consider any relationship between those petitioners when weighing the *General Plastic* factors.”). In *Valve*, the Board considered the relationship between the parties, and whether there was a “significant relationship . . . with respect to [the challenged patent],” such that the second petitioner should be regarded as the same petitioner under the first *General Plastic* factor. *Id.* at 2, 10–11. The two petitioners in *Valve* were co-defendants in district court litigation, were accused of infringement based on the same product, and had a licensing relationship concerning that accused product. *Id.* at 9–10.

Director Vidal has instructed the Board that *General Plastic* factor 1 should not be expanded beyond *Valve* to apply to parties that do not have a significant relationship. See *Videndum Production Solutions, Inc. v.*

Rotolight Limited, IPR2023-01218, Paper 12 at 6 (Director Vidal, April 19, 2024) (“The majority’s Decision in this proceeding improperly expanded the discretionary principles set forth in *General Plastic* and *Valve* to apply to petitioners that are not the same and do not have a ‘significant relationship.’”). Moreover, Director Vidal has instructed that where “the first and second petitioners are neither the same party, nor possess a significant relationship under *Valve*, *General Plastic* factor one necessarily outweighs the other *General Plastic* factors.” *Id.*

We determine that the first *General Plastic* factor does not favor exercising discretion to deny institution of *inter partes* review. This is Petitioner’s first petition challenging the ’164 patent. There is no evidence in the record that Petitioner has any significant relationship with Lenovo or Samsung—for example, that Petitioner is a co-defendant with either of them or was accused of infringing the ’164 patent or any related patents based on the same product. *See Valve* at 9–10. That Petitioner apparently may have reviewed and considered strategies undertaken by prior petitioners on similar issues does not, in and of itself, create a significant relationship with any of the prior petitioners.

For these reasons, we decline to exercise our discretion to deny institution under 35 U.S.C. § 314.

E. Discretion to Deny Institution Under § 35 U.S.C. 325(d)

Patent Owner contends that the Board should deny institution under 35 U.S.C. § 325(d). Prelim. Resp. 55–61. Specifically, Patent Owner argues that we should deny institution in deference to the original examination because Patent Owner “submitted Behbahani, Tan, and Professor Tsividis’ 2003 article to the Examiner . . . , they were reviewed and considered . . . , and the claims were allowed over the cited prior art.”

Id. at 56 (citing Ex. 1002, 12–13, 118–120, 158–159). Petitioner opposes. Pet. 73–75.

For the reasons provided below, we do not exercise our discretion to deny institution under Section 325(d).

1. Applicable Framework

35 U.S.C. § 325(d) provides that, in determining whether to institute an *inter partes* review, “the Director may take into account whether, and reject the petition or request because, the same or substantially the same prior art or arguments previously were presented to the Office.” The Board uses a two-part framework when determining whether to exercise its discretion under 35 U.S.C. § 325(d), specifically: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if so, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential) (“*Advanced Bionics*”).

In applying the two-part framework, we consider a number of non-exclusive factors in evaluating whether to exercise its discretion under § 325(d). *See Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first para.) (“*Becton, Dickinson*”); *see also Advanced Bionics* at 9–11. The factors set forth in *Becton, Dickinson* are as follows:

- (a) the similarities and material differences between the asserted art and the prior art involved during examination;

- (b) the cumulative nature of the asserted art and the prior art evaluated during examination;
- (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;
- (d) the extent of the overlap between the arguments made during examination and the manner in which petitioner relies on the prior art or patent owner distinguishes the prior art;
- (e) whether Petitioner has pointed out sufficiently how the examiner erred in its evaluation of the asserted prior art; and
- (f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or arguments.

Becton, Dickinson, Paper 8 at 17–18. *Becton, Dickinson* factors (a), (b), and (d) relate to whether the art or arguments presented in the Petition are the same or substantially the same as those previously presented to the Office.

Advanced Bionics, Paper 6 at 10. The art or arguments presented in the Petition are not “substantially the same” as those previously presented to the Office when there are differences between them that are material to the Office’s prior consideration of the art and arguments. *Wolfspeed, Inc. v. Trs. of Purdue Univ.*, IPR2022-00761, Paper 13 at 7–8 (Vidal Mar. 30, 2023).

Factors (c), (e), and (f) “relate to whether the petitioner has demonstrated a material error by the Office” in its prior consideration of that art or arguments. *Advanced Bionics*, Paper 6 at 10. Only if the same or substantially the same art or arguments were previously presented to the Office do we consider whether petitioner has demonstrated a material error by the Office. *Id.* “At bottom, this framework reflects a commitment to defer to previous Office evaluations of the evidence of record unless material error is shown.” *Id.* at 9.

2. *Whether the Same or Substantially the Same Art or Arguments Were Previously Presented to the Office*

There is no dispute that the Behbahani and Tan were cited on the face of the '164 patent, in an IDS initialed by the examiner. Pet. 74; Prelim. Resp. 56–57. However, Petitioner argues that neither reference was discussed by the Examiner or applied in a rejection, which weighs against denial under § 325(d), whereas Patent Owner argues that these references were “reviewed and considered.” Pet. 74; Prelim. Resp. 56. The parties also appear to agree that Leete was not previously presented to the Office, but Patent Owner argues that because Petitioner contends that “*Leete* was referenced in, and intended to be used ‘conjunctively’ with *Behbahani*” as part of its obviousness arguments, that Petitioner “does not argue that *Leete* is not ‘the same or substantially the same art.’” Pet. 74; Prelim. Resp. 56–57.

That Behbahani and Tan appeared in an initialed IDS is sufficient to satisfy the first *Advanced Bionics* prong. *See Advanced Bionics*, Paper 6 at 7–8 (“Previously presented art includes art made of record by the Examiner, and art provided to the Office by an applicant, such as on an Information Disclosure Statement (IDS), in the prosecution history of the challenged patent”). Leete was not previously presented to the Office, but we need not decide whether the reference to Leete in Behbahani (*see* Section II.F.1 below) or Petitioner’s obviousness arguments concerning Behbahani and Leete suffice to satisfy the first *Advanced Bionics* prong for purposes of this Decision. As discussed below, even if we assume that the first part of the *Advanced Bionics* framework is satisfied, Petitioner has demonstrated that the Office erred in a manner material to the patentability of the challenged claims in the second part of the framework.

3. *Whether Petitioner has Demonstrated that the Office Erred in a Manner Material to the Patentability of the Challenged Claims*

Petitioner argues that “[a]s highlighted by the strength of the Proposed Grounds, it is evident that the Examiner did not appreciate Behbahani’s disclosures and how this reference in combination with Tan and Leete (not previously before the Office) render the Challenged Claims obvious.”

Pet. 74. Petitioner further argues that, when a reference was not substantively discussed by the Examiner, ““a petitioner’s showing that the challenged claims are unpatentable over the asserted prior art may itself be evidence of material error by the Office during prosecution.” *Id.* at 74–75 (quoting *Quasar Science LLC v. Colt International Clothing, Inc. d/b/a Colt LED*, IPR2023-00611, Paper 10 at 14 (PTAB Oct. 10, 2023)).

Patent Owner argues that “[Petitioner] must do more than simply disagree with the Examiner” and that “[i]nstitution should be denied when, as here, [a] [p]etitioner fails to sufficiently explain how the Office erred in a manner material to patentability.” Prelim. Resp. 58–59.

We find that *Becton, Dickinson* factor (c)—the extent to which the asserted art was evaluated during examination—does not favor denying the Petition under Section 325(d) because the Examiner did not cite Behbahani or Tan in any rejection and did not specifically address either reference in any correspondence, other than initialing them in an IDS. Nor did the Examiner address Leete.

For factors (e) and (f), we find that Petitioner has explained sufficiently how the Examiner allegedly erred in evaluating Behbahani and Tan, by pointing to the proposed grounds, which detail how the challenged claims read on these references over the combination of Behbahani, Leete, and Tan. *See* Pet. 18–73. We find this sufficient to identify the “specific

teachings” that were overlooked, as contemplated in *Advanced Bionics*, and we agree with Petitioner that the facts and discussion of Behbahani, Leete, and Tan presented in the Petition warrant reconsideration of the challenged claims in view of those references. We thus find that Petitioner has satisfied the second part of the *Advanced Bionics* framework by demonstrating that the Examiner may have erred by not appreciating that Behbahani, Leete, and Tan teach or suggest the features of the claimed invention.

For these reasons, we decline to exercise our discretion to deny institution under 35 U.S.C. § 325(d).

F. Ground 1: Obviousness of Claims 1–20 Over Behbahani in View of Leete and Tan

Petitioner contends that claims 1–20 would have been obvious over Behbahani in view of Leete and Tan. Pet. 11, 18–73; Prelim. Reply. Patent Owner disagrees. Prelim. Resp. 33–51; Prelim. Sur-reply.

1. Overview of Behbahani (Ex. 1004)

Behbahani is titled “Adaptive Analog IF Signal Processor for a Wide-Band CMOS Wireless Receiver” and generally describes a receiver that implements adaptive dynamic range (“DR”) in the IF section. Ex. 1004, 1205. Behbahani explains that:

Most wireless systems are designed for the worst case; that is, the dynamic range is specified for the desired signal at a minimum detectable level, accompanied by the largest anticipated interferers. In practice, the receiver only infrequently needs this high instant DR. DR is obtained at the expense of a disproportionate rise in power consumption: doubling the power consumed by a circuit lowers its noise floor by 3 dB with constant IP₃, thus raising its spurious-free dynamic range (SFDR) by only 2 dB. An important idea here, which has also been noted elsewhere [4], is that providing no

more than the required DR at any given time lowers the *average* power consumption.

Id.

Figure 2, reproduced below, shows a block diagram of the receiver.

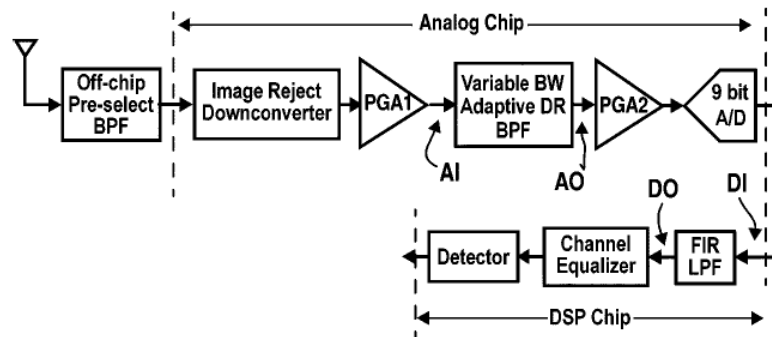


Fig. 2. Block diagram of complete WLAN receiver.

Ex. 1004, 1205. Figure 2 depicts a “Block diagram of [a] complete WLAN receiver,” and focuses on the IF section of the receiver, which follows image rejection, and includes a prefilter programmable gain amplifier (“PGA1”), Variable BW Adaptive DR Bandpass Filter (“BPF”), post-filter PGA (“PGA2”), and a continuously variable gain amplifier (“VGA”). *Id.* at 1205. Behbahani states that Figure 2 “is taken from [Tan]” and “[t]he front-end and image-reject downconversion sections of the RX are described in [Leete].” *Id.* Behbahani also states that “[t]he details of the BPF design are presented elsewhere,” and cites to Tan. *Id.* at 1210.

Figure 3 of Behbahani, which depicts three different scenarios for received signals, is reproduced below.

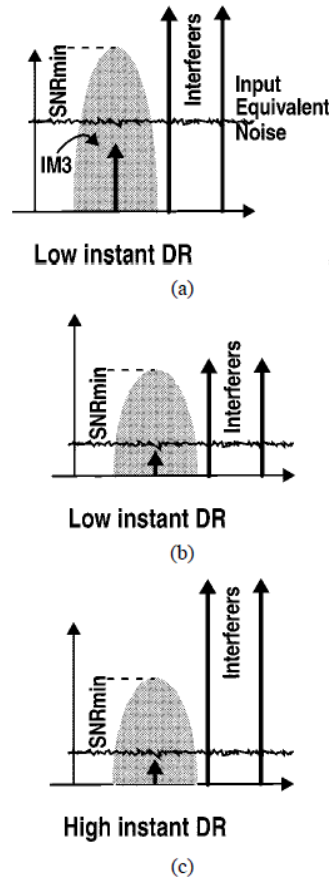


Fig. 3. Three different scenarios for received signals. (a) Strong desired signal. High noise can be tolerated. (b) Weak desired signal and weak interferers. Low linearity can be tolerated. (c) Weak desired signal and large interferers. Low noise and high linearity is required.

Ex. 1004, 1206. Figure 3 depicts three scenarios for received signals. *Id.* Figure 3(a) depicts a strong desired signal where high noise can be tolerated. *Id.* Figure 3(b) depicts a weak desired signal and weak interferers, where low linearity can be tolerated. *Id.* Figure 3(c) depicts a weak desired signal and large interferers where low noise and high linearity is required, and is the “worst-case.” *Id.*

Behbahani describes two types of adaptive DR, sliding and step, and states that the circuits comprising the receiver shown in Figure 2 use both types. Ex. 1004, 1206. “In sliding DR, the *instant* DR of the RX is constant but slides to best accommodate the input signal,” whereas in step DR, “the

DR may be *stepped up* by substituting a scaled version of a nominal circuit.”
Id.

Figure 4 of Behbahani, reproduced below, depicts an illustration of how to achieve slide and step DR.

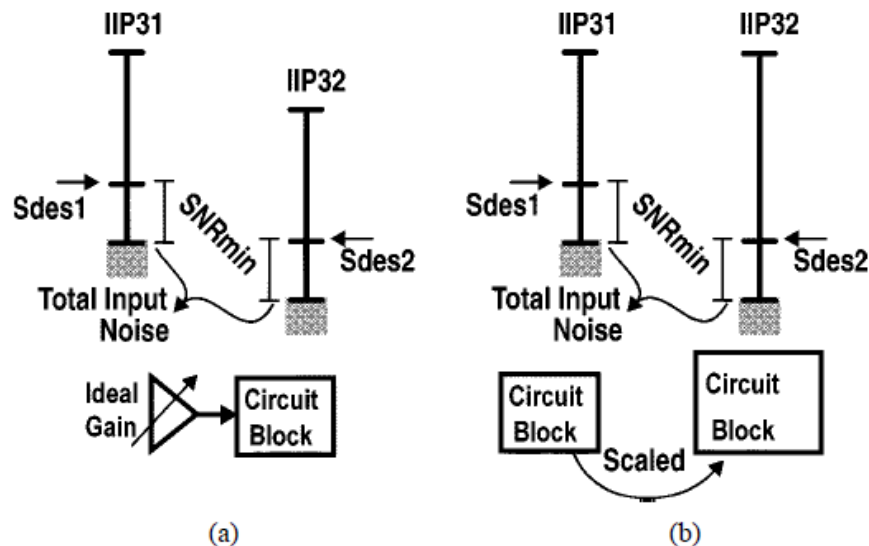


Fig. 4. An illustration of how to achieve: (a) slide DR with preamplification and (b) step DR by substitution of a scaled circuit block.

Ex. 1004, 1206. “Figure 4(a) shows how, by adding a gain stage in front of a noisy and nonlinear circuit block, input referred noise and IIP3 drop by the gain of the amplifier” which “slides down the entire DR and enables detection of a weaker signal accompanied by weak interferers.” *Id.* Figure 4(b) shows scaling up all the transistors in a circuit and scaling down all resistors by the same factor, i.e., substituting a scaled version of a nominal circuit. *Id.* Behbahani states that Figure 4(b) results in lowering input mean square noise and raising bias current proportional to the scale factor, while IIP3 remains unchanged, allowing the scaled circuit to pass a weak desired signal accompanied by strong interferers. *Id.*

Behbahani explains that “[t]he on-chip filter is usually the bottleneck to achievable DR in a fully integrated RX.” Ex. 1004, 1207. In the scenario

shown in Figure 4(b), “[t]wo filters are implemented with the same topology, but one, scaled up to consume 10x more power, offers 10x lower mean square noise but the same linearity.” *Id.* An algorithm, described below, senses which conditions are present and in the first two instances (shown in Figures 3(a) and 3(b)), employs a BPF dissipating low power. *Id.* In the instance shown in Figure 3(b), i.e., the worst-case scenario, “a high-power scaled filter is switched in raising total DR.” *Id.* In the algorithm, “[s]ignal power is sensed at four points along the IF strip (Fig. 2): input and output of the analog BPF and input and output of the digital channel select filter.” *Id.* “These measured signal levels indicate how much of the received signal is being rejected, respectively, by the analog filter and the digital filter.” *Id.* This process is further described as follows;

The signal at the output of the digital filter (point in Fig. 2) is only the desired channel, with possibly some possible IM3 from adjacent interferers. By comparing the signal level at the output of the analog BPF (A_O) and at the input of the A/D (D_I), the postfilter gain is measured. Then, by comparing the signal level at the input and the output of the digital filter (D_I and D_O), the relative strength of the out-of-channel signal that passes through the analog filter is calculated. The signal level at A_I and A_O is a measure of the out-of-band interferers being rejected by the analog BPF. If the *desired* signal at the output of the analog BPF is strong, as measured by $\text{Power}_{\text{Do}} - \text{Gain}_{\text{Post-analog-filter}}$, the scenario is as shown in Fig. 3(a). If the total signal power is comparable at A_I and A_O , and at D_I and D_O , the condition is like Fig. 3(a) or (b). In both cases, the required instant DR is low. If the signal levels are significantly different at either of the above pairs of nodes (A_I and A_O and D_I and D_O) and there is a weak signal at D_O , the condition must be the one shown in Fig. 3(c).

Id.

2. Overview of Leete (Ex. 1005)

Leete is titled “A 2.4-GHz Low IF Receiver for Wideband WLAN in 0.6 μ m CMOS – Architecture and Front-End,” and generally describes the “2.4-GHz front-end and the first downconversion section of a fully integrated low-IF receiver.” Ex. 1005, 1908.

Figure 1, reproduced below, shows a block diagram of the dual-conversion low-IF receiver.

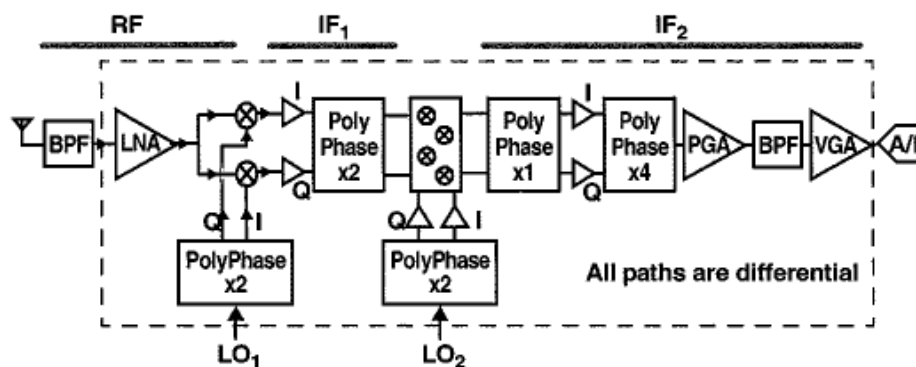


Fig. 1. Receiver block diagram.

Ex. 1005, 1909. Figure 1 shows a receiver block diagram with RF front-end comprising a low noise amplifier (LNA) and an RF quadrature mixer, which downconverts the RF signal to the first IF (IF1). *Id.* at 1908–1909.

3. Overview of Tan (Ex. 1006)

Tan is titled “A Broad-Band Tunable CMOS Channel-Select Filter for a Low-IF Wireless Receiver,” and generally describes “a broad-band bandpass filter (BPF) designed as a channel-select filter for wireless applications” that “is implemented as a low-pass filter (LPF) in series with a high-pass filter (HPF) for lower power consumption compared to true BPF.” Ex. 1006, 476. Tan’s Figure 1, which shows a block diagram of a receiver, is similar to Behbahani’s Figure 2, reproduced above. *Id.* at 477. Tan describes the “Variable BW BPF” block. *Id.* at 476–488.

Figure 16, reproduced below, depicts a chip microphotograph of variable-gain BPF.

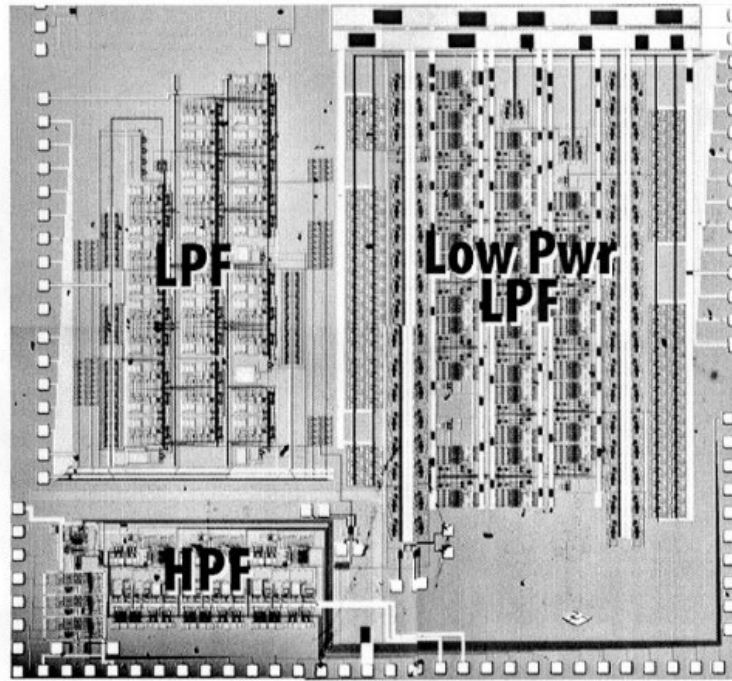


Fig. 16. Chip microphotograph.

Ex. 1006, 486. Figure 16 depicts a chip microphotograph of variable-gain BPF, including LPF, HPF, and Low Pwr LPF. *Id.*

4. *Analysis of Independent Claim 1*

- a) [1(Pre)]: “1. A system for power dissipation reduction in a battery powered portable wireless communication device, the system comprising:”

Petitioner argues that, to the extent the preamble is limiting, the Behbahani discloses it. Pet. 18. Petitioner asserts that “Behbahani’s focus is saving power in a wireless device, teaching that its wireless receiver implements an ‘adaptive dynamic range’ method to save power by decreasing the dynamic range when conditions are better than worst case.” *Id.* at 19 (citing Ex. 1004, 1205). According to Petitioner, one of ordinary

skill “would have understood that the reference fairly conveys a wireless transceiver intended for a battery-operated wireless communication device and would have been motivated to implement the described receiver in such a device.” *Id.* (citing Ex. 1003 ¶¶ 49–59). Petitioner further contends that one of ordinary skill “would have understood that Behbahani’s method for lowering the average power consumption in the receiver results in power dissipation reduction, and a corresponding reduction in a drain on battery life of the battery powered portable wireless device.” *Id.* (citing 1003 ¶ 59).

At this stage of the proceeding, Patent Owner does not present arguments addressing Petitioner’s showing as to the preamble. *See* Prelim. Resp. 33–51.

Based on the current record, and for purposes of this Decision, Petitioner has sufficiently demonstrated that Behbahani teaches the preamble of claim 1.³

b) [1(a)]: “*a battery powered portable wireless communication device, the wireless communication device comprising: a battery configured to supply power for the battery powered portable wireless communication device;*”

Petitioner argues that, as discussed above with respect to the preamble, one of ordinary skill “would have understood that Behbahani’s receiver fairly conveys a wireless receiver intended for a battery-operated transceiver (i.e., wireless communication device), and would have been motivated to implement the described receiver in such a device.” Pet. 22 (citing Ex. 1003 ¶ 61). “Further,” Petitioner contends, one of ordinary skill

³ Neither party takes a position at this stage as to whether the preamble is limiting. Because Petitioner sufficiently shows that the prior art teaches the subject matter of the preamble, we need not determine whether the preamble is limiting.

“would have understood and found obvious that ‘a battery configured to supply power’ would be required for such a battery-operated transceiver-equipped portable wireless communication device.” *Id.*

At this stage of the proceeding, Patent Owner does not present arguments addressing Petitioner’s showing as to limitation [1(a)]. *See* Prelim. Resp. 33–51.

Based on the current record, and for purposes of this Decision, we are persuaded Petitioner has sufficiently demonstrated that Behbahani teaches limitation [1(a)].

- c) [1(b)]: “*a wireless receiver configured to receive a wireless signal, wherein the wireless signal has a desired signal and an interferer signal,*”

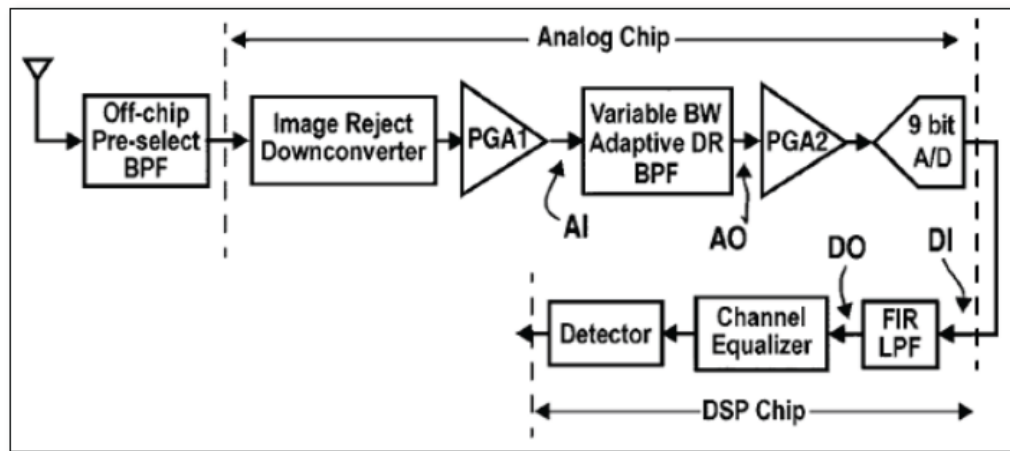
Petitioner argues that “Behbahani’s wireless receiver receives a wireless signal, as claimed.” Pet. 23 (citing Ex. 1004, 1207). “Indeed,” Petitioner asserts, “the whole point of an RF *receiver* is to receive RF signals.” *Id.* (citing Ex. 1003 ¶ 62). “Further,” according to Petitioner, “Behbahani teaches that this received signal includes a desired signal component and interferer signals,” and “Behbahani’s adjustable dynamic range concepts turn critically on the absolute and relative strengths of received desired and interferer signals.” *Id.* (citing Ex. 1004, 1205). Additionally, Petitioner contends that Figures 3(a) and 3(b) of Behbahani “depict better than worst-case conditions in which ‘receiver dynamic range may be modest’ and the gain-based sliding DR approach is sufficient,” and Behbahani’s Figure 3(c) “depicts worst-case conditions (i.e., low desired signal and high interferers), requiring the system to expand the dynamic range by switching in the high-power filter.” *Id.* at 23–24 (citing Ex. 1004, 1206, Figs. 3(a)–3(c)).

At this stage of the proceeding, Patent Owner does not present arguments addressing Petitioner’s showing as to limitation [1(b)]. *See* Prelim. Resp. 33–51.

Based on the current record, and for purposes of this Decision, we are persuaded Petitioner has sufficiently demonstrated that Behbahani teaches limitation [1(b)].

d) [1(c)]: “the wireless receiver having a plurality of circuits that includes circuits in a receiver signal path”

Petitioner argues that “Behbahani in view of Leete teaches a wireless receiver comprising a plurality of circuits on the receiver signal path, including an amplifier, filter, and mixer.” Pet. 24. Petitioner points to Behbahani’s Figure 2, reproduced below, as describing the “complete WLAN receiver” circuitry.



Behbahani’s Figure 2 showing the “complete WLAN receiver” circuitry. Pet. 25 (citing Ex. 1004, 1206).

Petitioner argues that Behbahani cites Leete for the details of the Image Reject Downconverter in Figure 2, including a low noise amplifier (LNA) and RF quadrature mixer. *Id.* at 25–26 (citing Ex. 1004, 1205; Ex. 1005, 1908, Fig. 1). According to Petitioner, one of ordinary skill would have

been motivated to combine Behbahani and Leete because Behbahani specifically cites Leete as describing “[t]he front-end and image-reject downconversion sections of the [receiver].” *Id.* at 25 (citing Ex. 1004, 1205). Thus, Petitioner contends, the Behbahani-Leete combination produces a receiver circuit with an “LNA->mixer->filter topology.” *Id.* at 27–28 (citing Ex. 1003 ¶¶ 74–75). Petitioner further argues that Behbahani’s bandpass filter (BPF) is a low-pass filter. Pet. 31 (citing Ex. 1004, 1210, 1216).

At this stage of the proceeding, Patent Owner does not present arguments addressing Petitioner’s showing as to limitation [1(c)]. *See* Prelim. Resp. 33–51.

Based on the current record, and for purposes of this Decision, we are persuaded Petitioner has sufficiently demonstrated that Behbahani teaches limitation [1(c)].

- e) [1(d)]: “*the plurality of circuits designed to operate under a worst-case operating condition where the corresponding power drain from the battery is a maximum, thereby consuming maximum power from the battery; and*”

Petitioner argues that “Behbahani teaches a wireless receiver circuitry that is designed to function under a range of operating conditions—from a worst-case operating condition to a best-case operating condition, as well as conditions that fall in between.” Pet. 32. More specifically, Petitioner asserts that “Behbahani teaches a wireless receiver that implements an ‘adaptive dynamic range’ method to save power by decreasing the dynamic range when conditions are better than worst case.” *Id.* (citing Ex. 1004, 1205).

Petitioner argues that “[t]wo separate adaptive techniques are combined to accomplish Behbahani’s goals—(1) step-based DR and (2)

sliding DR.” Pet. 33 (citing Ex. 1004, 1206-07). “For Behbahani’s step-based adaptive DR,” Petitioner asserts, “the receiver switches/steps between two scaled filters,” such that “[a] ‘high-power filter’ is used during a range of worst-case conditions, and a separate ‘low-power filter’ is used when conditions improve sufficiently above worst-case.” *Id.* According to Petitioner, “[w]hen the low-power filter is utilized during better than worst-case conditions, Behbahani’s sliding DR technique uses a gain stage in advance of the low-power filter to slide a smaller DR up or down based on strengths of the received signals.” *Id.*

Petitioner argues that “Behbahani explains that the signal conditions in Fig. 3(c), depicting worst-case conditions (i.e., low desired signal and high interferers), require the system to expand the dynamic range by switching in the high-power filter at the expense of high-power consumption,” and that one of ordinary skill “would have understood that *Behbahani*’s receiver operates with a maximum power dissipation while using this high-power filter.” Pet. 34–35 (citing Ex. 1004, 1205-1206; Ex. 1003 ¶¶ 92–97). “Moreover,” Petitioner asserts, “Behbahani explains that under the signal conditions in Figs. 3(a) and Fig. (b), depicting better than worst-case conditions, the ‘receiver dynamic range may be modest’ and the gain-based sliding DR approach is sufficient to save power.” *Id.* at 35 (citing Ex. 1004, 1206). “Accordingly,” Petitioner contends, “when the system transitions from worst-case conditions (e.g., Fig. 3(c)) to a strong desired signal (e.g., Fig. 3(a)), it saves power by switching from the high-power filter to low-power filter.” *Id.* (citing Ex. 1003 ¶¶ 98–102). Petitioner further argues that, “[w]hen Behbahani’s low-power filter is in use, sliding DR is used to adjust the relatively smaller dynamic range up or down to reflect current signal conditions.” *Id.* (citing Ex. 1004, 1206).

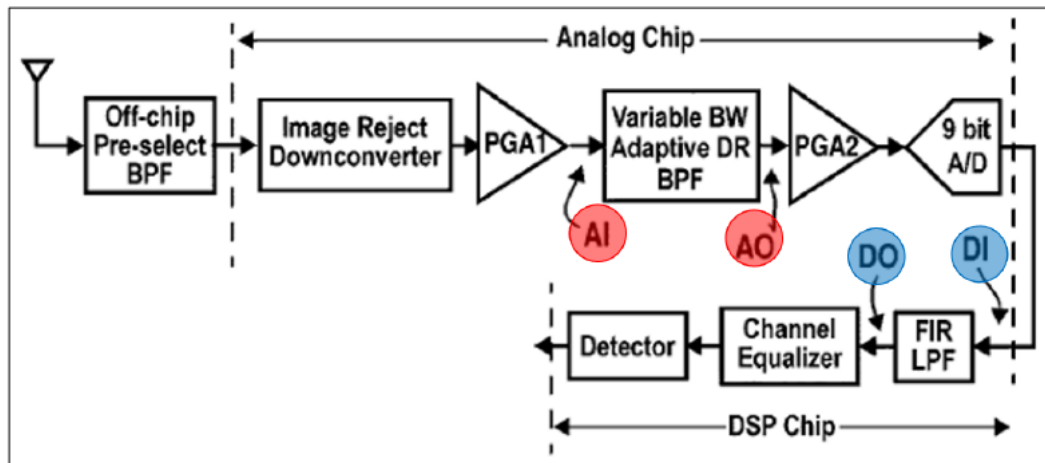
“Accordingly,” Petitioner contends, one of ordinary skill “would have understood that Behbahani’s *receiver* operates under at least a worst-case operating condition where the corresponding power drain from the battery is a maximum, consuming maximum power from the battery, as claimed.” Pet. 36 (citing Ex. 1003 ¶ 97).

At this stage of the proceeding, Patent Owner does not present arguments addressing Petitioner’s showing as to limitation [1(d)]. See Prelim. Resp. 33–51.

Based on the current record, and for purposes of this Decision, we are persuaded Petitioner has sufficiently demonstrated that Behbahani teaches limitation [1(d)].

f) [1(e)]: “a monitoring circuit associated with the battery powered portable communication wireless device configured to monitor the signal strength of the interferer signal,”

Petitioner argues that “Behbahani teaches monitoring circuits for determining not only interferer signal strengths but also desired signal strengths, by taking signal strength measurements at two nodes on the analog signal path—A_I and A_O—and at two nodes on the digital signal path—D_I and D_O,” as shown in Petitioner’s annotated version of Behbahani’s Figure 2, reproduced below.



Petitioner’s annotated version of Behbahani’s Figure 2 showing signal strength measurements taken at nodes A_I and A_O on the analog signal path and nodes D_I and D_O on the digital signal path. Pet. 37 (citing Ex. 1004, Fig. 2)

Petitioner argues that “Behbahani teaches that the difference between signal levels measured at nodes ‘ A_I and A_O is a measure of the out-of-band *interferers* being rejected by the analog [filter].” Pet. 40 (citing Ex. 1004, 1207). Petitioner asserts that “[t]he interferer signal power that remains after the *analog* filter is then calculated by comparing the difference between signal levels into and out of the *digital* filter.” *Id.* “From these two sets of measurements,” Petitioner explains, “Behbahani can determine the total interferer signal strength received on the signal path.” *Id.* (citing Ex. 1003 ¶ 107). And, according to Petitioner, “Behbahani teaches that the difference between the signal strength measured at nodes A_I and A_O and the difference between the signal strength measured at nodes D_I and D_O are used in its adaptive DR process.” *Id.* at 41 (citing Ex. 1004, 1206, 1207).

Petitioner further argues that, “[a]lthough Behbahani does not expressly teach calculating an absolute interferer signal strength, it does calculate an absolute desired signal strength, and a [person of ordinary skill in the art] would have been motivated to similarly calculate an absolute

value of the interferers.” Pet. 42 (citing Ex. 1003 ¶ 109). “Indeed,” Petitioner asserts, “the sliding DR process adjusts the PGA1 gain ‘to best accommodate the input signal conditions.’” *Id.* (citing Ex. 1004, 1206). According to Petitioner, “[a] precise calculation of the interferer signal strength would benefit the sliding DR process, allowing the system to more accurately adjust the smaller DR to best accommodate input signal conditions.” *Id.*

Additionally, Petitioner argues, “Behbahani uses these same analog and digital signal strength measurements to determine the absolute signal strength of a *desired signal*.” Pet. 42. “First,” Petitioner asserts, post-analog filter gain is calculated by comparing the signal strengths measured at nodes A_O and D_I.” *Id.* (citing Ex. 1004, 1207). “Next,” according to Petitioner, “by subtracting this gain from the signal strength at D_O, Behbahani determines the absolute strength of the desired signal. *Id.* (citing Ex. 1004, 1207; Ex. 1003 ¶ 110). Finally, Petitioner contends, Behbahani “teaches using this absolute desired signal strength in its adaptive DR process.” *Id.* (citing Ex. 1004, 1207).

Petitioner acknowledges that “Behbahani does not provide details about the specific circuit used to measure signal strength,” but argues that Tan provides this disclosure. Pet. 43. Petitioner argues that Tan is “expressly referenced by Behbahani and intended to be used in conjunction with Behbahani” and “provides an example of circuitry used to detect signals at various points in the low-pass filter signal path as a means of implementing a prefilter automatic gain control (AGC).” *Id.* (citing Ex. 1006, 481). “In this example,” according to Petitioner, “signal peaks are detected by current summing circuitry that is designed to ‘lower the input signal’ via gain control when peak values exceed a predefined limit.” *Id.*

Petitioner contends that one of ordinary skill “would have been motivated to utilize Tan’s signal strength measurement circuitry to measure nodes A₁ and A₀ in Behbahani for a number of reasons,” including that: (1) “Behbahani and Tan describe different aspects of the same circuit,” (2) “using Tan’s signal strength measurement circuit in Behbahani” uses “a known technique to improve a similar device in the same way,” and (3) “signal strength measurement circuitry was well understood at the time” and one of ordinary skill “would have expected success in combining these teachings.” *Id.* at 43–44 (citing Ex. 1003 ¶¶ 112–115).

At this stage of the proceeding, Patent Owner does not present arguments addressing Petitioner’s showing as to limitation [1(e)]. *See* Prelim. Resp. 33–51.

Based on the current record, and for purposes of this Decision, we are persuaded Petitioner has sufficiently demonstrated that Behbahani teaches limitation [1(e)].

- g) [1(f)]: “*wherein a power dissipation control circuit in the wireless receiver causes a bias current to be dynamically adjusted in one or more of the circuits in the receiver signal path as the monitored signal strength of the interferer signal varies during operation when the operating condition is better than the worst-case operating condition, enabling a power dissipation reduction in the wireless receiver, providing a corresponding reduction in a power consumption from the battery of the battery powered portable wireless communication device.*”

The parties dispute whether the asserted prior art satisfies this limitation. Pet. 45–62; Prelim. Resp. 33–51; Prelim. Reply; Prelim. Sur-reply.

Petitioner argues that, “when Behbahani’s adaptive DR receiver (i.e., power dissipation control system) switches from its high-power filter to its

low-power filter, it increases the ‘opposition to the flow of alternating current’ (i.e., impedance) in the analog signal path and results in a reduced current that carries the AC signal through a load (i.e., through the filter load).” Pet. 45. “This switch to a low-power filter,” Petitioner asserts, “reduces the DC bias current applied to the filter stage.” *Id.* at 45–46. Thus, according to Petitioner, “this dynamic adjustment occurs (1) ‘when the operating condition is better than the worst-case operating condition’ and (2) ‘as the monitored signal strength of the interferer signal varies during operation[.]’” *Id.* at 46. “For example,” Petitioner contends, “when the system detects that the strength of the interferer signal has decreased, resulting in conditions sufficiently better than the worst-case, Behbahani switches from its high-power to low-power filter.” *Id.*

More specifically, Petitioner argues that “Behbahani teaches a wireless receiver that implements an ‘adaptive dynamic range’ method to save power by decreasing the dynamic range when conditions are better than worst-case.” Pet. 52 (citing Ex. 1004, 1205). In Behbahani’s receiver, Petitioner asserts, “[a] step-based DR technique switches between two scaled filters, using ‘high-power filter’ only during worst-case conditions and a separate ‘low-power filter’ for conditions that are better than worst-case.” *Id.* (citing Ex. 1004, 1207–07). Petitioner points to Behbahani’s Figure 4(b), reproduced below, to illustrate switching from the low-power filter to the high-power filter to expand the dynamic range when worst-case conditions occur.

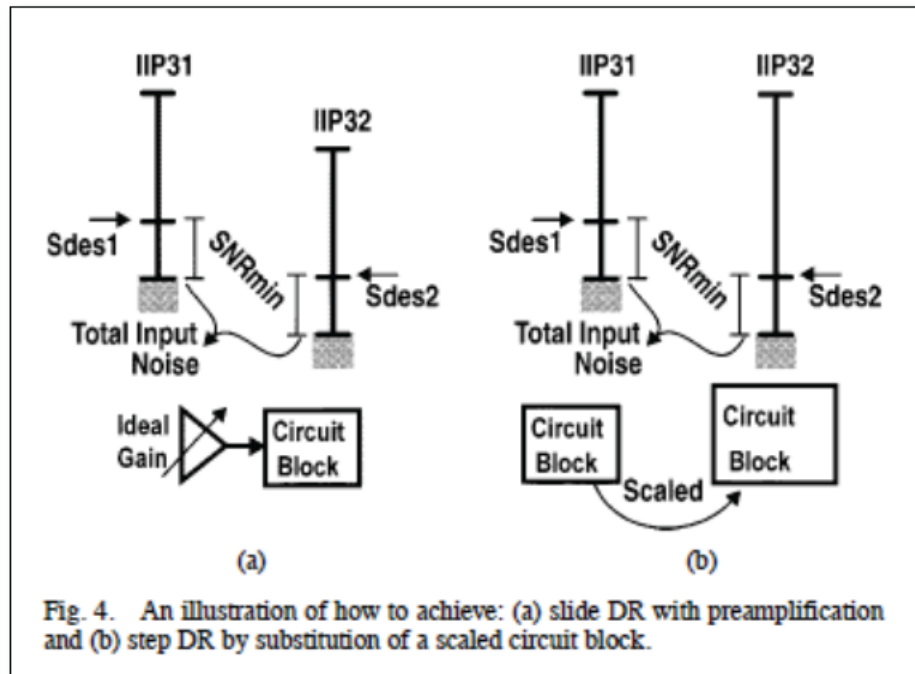


Figure 4 of Behbahani illustrating switching from a low-pass filter to the high-power filter to expand dynamic range. Pet. 52–53 (citing Ex. 1004, 1206).

According to Petitioner, one of ordinary skill “would understand that switching back—from the high-power filter to the low-power filter—when conditions improve is one means through which Behbahani’s system saves power during periods of better than worst-case conditions.” *Id.* at 40 (citing Ex. 1003 ¶¶ 131–134). “Indeed,” Petitioner contends, “Behbahani expressly teaches that the high-power filter is used *only* during the infrequent periods of worst-case conditions.” *Id.* (citing Ex. 1004, 1205, 1207; Ex. 1003 ¶¶ 131–134).

Petitioner further argues that Behbahani’s high-power filter “[s]cale[s] up all the transistors[,]’ while ‘scaling down all resistors by the same factor[,]’ which ‘raises bias current proportional to the scale factor[.]’” Pet. 54 (citing Ex. 1004, 1206) (emphasis omitted). Petitioner cites Tan to “provide additional details about the scaled filters discussed in Behbahani,”

which “confirm that transitioning from the high-power to low-power filter increases signal path impedance, reducing drive AC drive current and DC bias current.” *Id.* at 54. According to Petitioner, one of ordinary skill would have been motivated to combine Behbahani and Tan because these references “describe different aspects of the same circuit,” and Behbahani specifically cites Tan to provide additional “details of the [filter] design.” *Id.* (citing Ex. 1004, 1210, 1216; Ex. 1003 ¶ 140). Thus, Petitioner asserts, “Behbahani’s low-power filter has higher resistance (accompanying a lower transconductance), lower capacitance, and lower bias current than its high-power filter,” and one of ordinary skill would have understood that “switching from Behbahani’s high-power filter to its low-power filter changes (increases) an impedance, and changes (reduces) . . . the bias current of a component (*i.e.*, the filter) in the signal path.” *Id.* at 56–57 (citing Ex. 1003 ¶ 149).

Additionally, Petitioner argues that this understanding of Behbahani is confirmed by a January 2003 article published by Dr. Tsividis, the inventor of the ’164 patent, titled “Internally Varying Analog Circuits Minimize Power Dissipation.” Pet. 49 (citing Ex. 1011 (the “Tsividis article”), 70). According to Petitioner, the Tsividis article “concludes its discussion by pointing to Behbahani’s switched filter process as an exemplary means by which dynamic impedance scaling can be implemented.” *Id.* Specifically, Petitioner contends, the Tsividis article discloses that “‘impedance scaling’ by ‘lowering capacitances and transconductances allows one also to lower [the bias current], and thus the total power dissipation can be made small.’” *Id.* at 50 (citing Ex. 1011, 70). Petitioner further points to the Tsividis article’s statement that “[o]ne way to achieve the above scenario would be to use two filters, designed with different capacitance values, and place on or

the other in services as required by [34], turning the other filter off,” and notes that reference [34] is the Behbahani reference relied on in the Petition. *Id.* at 51 (citing Ex. 1011, 70, 72).

Finally, Petitioner argues that Behbahani’s switches from a high-power filter to a low-power filter “based on a signal strength measurement comparison.” Pet. 57–60.

Patent Owner responds that Behbahani does not disclose dynamically adjusting a bias current (or impedance) in the signal path because Behbahani’s “filter swap” merely “takes one fixed filter out of operation, and puts another fixed filter into operation.” Prelim. Resp. 35 (citing Pet. 52; Ex. 1004, 1207). According to Patent Owner, the “plain language” of the claim “requires adjusting the bias, in or of a circuit—rather than switching out one circuit for another without changing the bias (or impedance) of either.” *Id.* at 38–39 (citing Ex. 1001, 13:24–26).

Patent Owner argues that its reading of the claim language is supported by the ’164 patent Specification because Figure 8A, reproduced below, depicts impedance variation “as an adjustment within a single ‘Function Block.’”

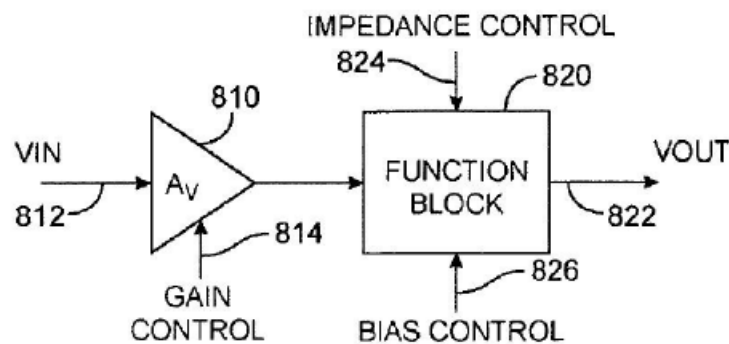


FIG. 8A

Figure 8A of the ’164 patent showing Function Block 820 subject to impedance control 824 and bias control 826. Pet. 39–40 (citing Ex. 1001, Fig. 8A, 8:28–33).

Patent Owner argues that additional support is provided by Column 8 of the '164 patent, which explains that “[o]ne or more impedances are under control of signals on impedance control lines 824” and “one or more bias currents *in the function block* are under control of one or more signals on bias control lines 826,” as well as by Column 9’s disclosure that “one or more impedance *in the function block* 920 may be increased.” Pet. 40 (citing Ex. 1001, 8:44–47, 9:44–67). Additionally, Patent Owner argues that Figure 6 of the '164 patent “*does not* depict a circuit swap like Behbahani’s, but rather a single RC circuit before and after its impedance is dynamically scaled.” *Id.* at 41 (citing Ex. 1001, 7:52–54, Fig. 6).

Patent Owner then argues that the claim language is not met by Behbahani’s “filter swap” because “[t]he parameters—including bias current and impedance—of each filter are static, in that they do not change before and after the switch.” Prelim. Resp. 35 (citing Ex. 1004, 1207; Ex. 1006, 488). Additionally, according to Patent Owner, “[s]witching from one filter to another” changes “the signal path” and “causes discontinuity and bit errors.” *Id.* (citing Ex. 1004, 1208; Ex. 2005 ¶ 67) (emphasis omitted). Thus, Patent Owner asserts, “[e]ach low pass filter ‘LPF’ in the Behbahani device sits idle while the signal path is re-routed such that the other LPF is put in operation,” and “[n]either is changed by being switched on or off.” *Id.* at 36 (citing Ex. 2005 ¶¶ 67–68). Patent Owner further contends that “[s]witching operation from one static filter to another,” as in Behbahani, “is a different, and inferior, approach—versus dynamically changing the components or structure of a single filter block in operation.” *Id.* at 68 (citing Ex. 2005 ¶¶ 63, 65, 66, 69, 70). And, Patent Owner argues, Behbahani’s “filter swap” does not dynamically adjust a bias current of or in at least one circuit “*within* the signal path,” as the claims require, but instead

“*changes the signal path*” itself. *Id.* at 43 (citing Pet. 52; Ex. 1004, 1208; Ex. 2005 ¶¶ 67) (emphasis in original).

Patent Owner further argues that Petitioner misconstrues the Tsivdis article because that article “notes problems with Behbahani’s approach” and “teaches improvements on Behbahani’s approach—specifically dynamic scaling of a single filter’s structure via individual elements.” Pet. 37 (citing Ex. 1004, 1208; Ex. 1011, 8, 9; Ex. 2005 ¶¶ 61–62) (emphasis omitted). According to Patent Owner, the Tsivdis article “refers to *dynamic* impedance scaling only with reference to its own Figure 12—which shows a single RC circuit, adjusted via individual switching elements.” *Id.* (citing Ex. 1011, 9, Fig. 12). Thus, Patent Owner contends, the Tsivdis article “teaches *away* from Behbahani’s error-prone approach, and towards ‘vary[ing] structure dynamically’ in a single filter and using ‘individual filter elements rather than entire filters.’” *Id.* at 38 (citing Ex. 1011, 8, 9, Fig. 12; Ex. 2005 ¶¶ 62–64).

Based on the present record, Petitioner has made a sufficient showing as to this limitation for purposes of institution.⁴ Petitioner has sufficiently

⁴ We disagree with Patent Owner’s arguments in the Preliminary Sur-reply that Petitioner raised a new theory in the Preliminary Reply. *See* Prelim. Sur-reply 1–3. Rather, Petitioner clearly relied upon Behbahani’s Variable BW Adaptive DR BPF to teach a filter, and on Behbahani’s switching from the high-power filter to the low-power filter. *E.g.*, Pet. 31, 45–46, 52–57. On this record, we do not view Petitioner’s use of the word “branch” in the Preliminary Reply to result in a new theory of unpatentability, as Patent Owner argues. Nor, on this record, are we persuaded by Patent Owner’s arguments that the Petition lacks evidentiary support inasmuch as it relies on the Declaration of Dr. Abidi. *See* Prelim. Resp. 61–67. The Petition cites to Dr. Abidi’s Declaration as evidence to support contentions in the Petition. Any similarity would appear to result from the Petition citing Dr. Abidi’s Declaration without deviation from the matters to which Dr. Abidi testifies.

shown, and Patent Owner does not appear to dispute, that Behbahani switches from its high-power filter to its low-power filter in response to signal strength measurements, and that this “filter swap” increases the impedance in the receiver. The only disputed issues appear to be:

(1) whether the claim language excludes Behbahani’s filter swap as a method of dynamically increasing impedance; and (2) whether the increase in impedance caused by Behbahani’s filter swap is “in the signal path,” as the claim requires.

As to the first issue, we preliminarily agree with Petitioner that the language of limitation [1(f)] encompasses Behbahani’s filter swap. Limitation [1(f)] merely requires that “a bias current” is “dynamically adjusted in one or more of the circuits in the receiver signal path” without specifying any particular structure for these “one or more circuits.” We see no reason why the two filters that are switched in Behbahani’s “filter swap” cannot be considered “one or more of the circuits in the signal path,” as the claim language requires. Thus, swapping out a higher impedance filter for a lower impedance filter dynamically adjusts the bias current in “one or more circuits” the device. We also do not agree with Patent Owner’s argument that Behbahani’s filter swap does not meet limitation [1(f)] because the parameters of each of the filters involved are static and do not change before and after the switch, because nothing in the claim language requires a change in the parameters of the individual filters as long as the bias current

Dr. Abidi supports his testimony by citing to evidence in the record. If declaration testimony is sufficiently supported and supports contentions in the Petition, we do not give it little to no weight simply because it is repeated in the Petition.

in the “one or more circuits” is dynamically adjusted, which is the case in Behbahani’s system. *See* Prelim. Resp. 35.

We also disagree with Patent Owner’s argument that the depiction of a single Function Block 820 in Figure 8A of the ’164 patent means that a filter swap (as in Behbahani) cannot satisfy limitation [1(f)]. *See* Prelim. Resp. 39–40. The ’164 patent explains that Figure 8A is merely “an **embodiment** of the present invention” that describes a “**possible** power saving technique[],” and we do not see a basis to read this particular embodiment into the claim. Ex. 1001, 3:38–40, 8:28–30 (emphasis added). Moreover, the ’164 patent describes Function Block 820 broadly, explaining that it “may be a filter, mixer, amplifier, **or other circuit or circuits** in a wireless transceiver or other electronic circuits or system.” *Id.* at 8:30–33 (emphasis added). Based on this disclosure, we see no reason why Function Block 820 could not include multiple filters, such as the ones used in Behbahani’s filter swap. Similarly, we are not persuaded by Patent Owner’s reliance on Figure 6, which the ’164 patent describes as merely “**an example** of how a circuit’s impedances may be scaled to reduce drive currents.” *Id.* at 3:32–35, 7:52–54 (emphasis added).

We now turn to the second disputed issue. We preliminarily agree with Petitioner that Behbahani’s filter swap dynamically adjusts a bias current “in the signal path,” as limitation [1(f)] requires. Claim 1 broadly recites that “the signal path” of the receiver includes “circuits.” Ex. 1001, 13:11–13. We do not see any reason why these “circuits” cannot include multiple filters that are swapped in response to signal strength measurements (as in Behbahani). On the present record, we do not agree with Patent Owner’s argument that “[s]witching from one filter to another” changes “the signal path,” because that argument appears to presuppose that the claims

require that there be only one possible path for the flow of electrons in the receiver, which does not appear to be required by the claim language. *See* Prelim. Resp. 35. We also are not persuaded by Patent Owner’s argument that Behbahani’s filter swap “causes discontinuity and bit errors,” because the claims include no limitations concerning discontinuity or bit errors, and Patent Owner does not sufficiently explain how Behbahani would teach away from the approach it proposes. *Id.* The parties may further address the meaning of the term “signal path” during the trial.

h) Summary for Claim 1

For the foregoing reasons, we are persuaded that Petitioner’s cited evidence and reasoning demonstrates a reasonable likelihood that Petitioner would prevail in its contentions regarding claim 1.

G. Remaining Claims

At this stage, Patent Owner does not provide separate arguments for claims 2–20. *See generally* Prelim. Resp. Because we preliminarily determine above that Petitioner has demonstrated a reasonable likelihood of prevailing in its challenge to at least one claim of the ’164 patent, we institute *inter partes* review on all claims and grounds. *See* 37 C.F.R. § 42.108(a) (“When instituting . . . review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

III. CONCLUSION

After considering the evidence and arguments presented in the current record, we determine that Petitioner has demonstrated a reasonable likelihood of success in proving that at least one of the challenged claims of the ’164 patent is unpatentable. We therefore institute trial on all challenged

claims and grounds raised in the Petition. *See PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (indicating that a decision whether to institute an *inter partes* review “require[s] a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”).

At this stage of the proceeding, we have not made a final determination as to the patentability of any challenged claim or as to the construction of any claim term.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–20 of the ’164 patent is instituted with respect to all 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 ’164 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

IPR2024-00819
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