

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner

v.

THETA IP, LLC,
Patent Owner

Case No. IPR2024-00818
Patent No. 10,524,202

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,524,202**

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I. INTRODUCTION

Apple Inc., (“Petitioner”) respectfully requests *inter partes* review (“IPR”) of Claims 1-2, 4-23 (“Challenged Claims”) of U.S. Patent No. 10, 524, 202 (“’202 Patent”).

II. THE ’202 PATENT

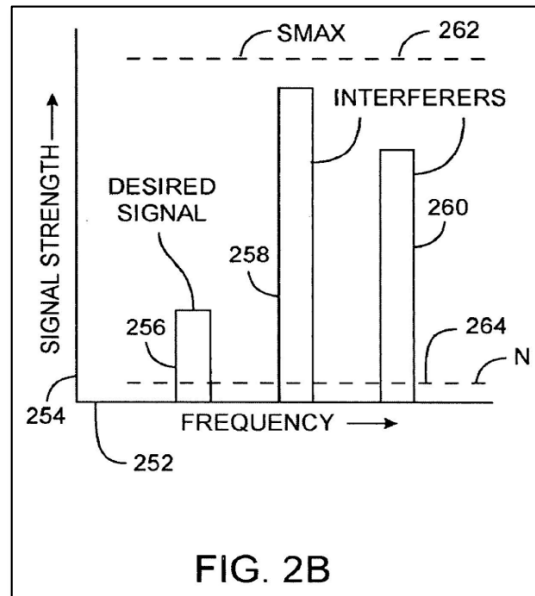
A. The ’202 Patent’s Alleged Invention

The ’202 Patent describes methods for reducing power dissipation in wireless transceivers, targeting the problem of battery drain in portable devices such as laptops and handheld devices. ’202 Patent (Ex. 1001), 1:21-35. The patent explains that prior art transceivers were designed to function properly under “worst-case operating conditions”—when the strength of a desired signal is low and the strength of interfering signals is high. *Id.*, 1:31-42. When better than worst case conditions exist (e.g., high desired signal and/or low interferers), the alleged invention ***reduces “receiver circuit currents”***¹ . . . below what is necessary for the worst case condition[,]” ***reducing power dissipation*** and increasing battery life. *Id.*, 1:47-53.

The ’202 Patent connects the concept of power dissipation to the “dynamic range” of the receiver. *Id.*, 5:33-67. The dynamic range is defined on the upper end by the maximum signal strength that can be recovered—referred to as *S*_{max}—and on the lower end by the noise floor (*N*)—the level approaching which desired signals

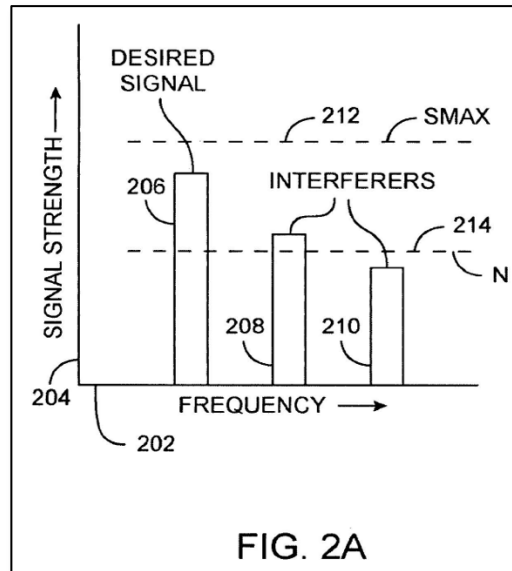
¹ All emphases added unless otherwise noted.

may be misinterpreted, causing bit-errors. *Id.*, 6:6-25. Fig. 2B below illustrates the dynamic range required under worst-case conditions. Here, (1) the desired signal strength is low, requiring a low noise floor (N), and (2) the interferers are strong, requiring a large S_{max}^2 :



Id., Fig. 2B, 5:56-67 (describing the same). Fig. 2A below illustrates the dynamic range required under better than worst-case conditions. Here, (1) the desired signal strength is high, allowing for an increased noise floor (N), and (2) the interferers are relatively weak, allowing S_{max} to be lowered without risking corruption from intermodulation distortion:

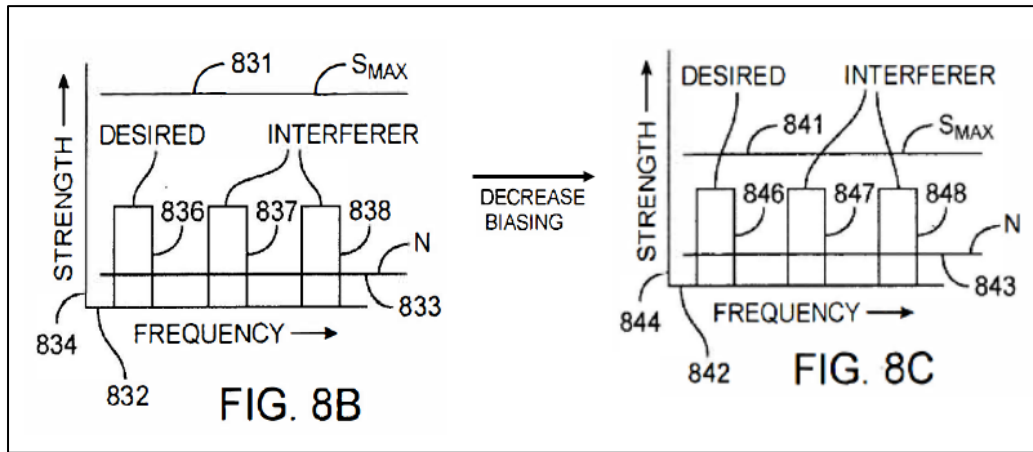
² If S_{max} falls below the strength of interferer signals, intermodulation distortion may corrupt reception of the desired signal. '202 Patent, 6:33-52, Fig. 3.



Id., Fig. 2A, 5:35-52 (describing the same).

The '202 Patent identifies three variables used to adjust the dynamic range, saving power when better than worst-case conditions are experienced: DC bias current, signal path impedance, and gain.

First, a DC bias current may be used to lower S_{max} , saving power when conditions permit accommodating a lower maximum signal strength. *Id.*, 6:23-25, 9:10-17. Figs. 8B and 8C illustrate saving power by decreasing bias current, which lowers S_{max} , when the desired signal strength and interferer signal strengths permit a lower S_{max} :

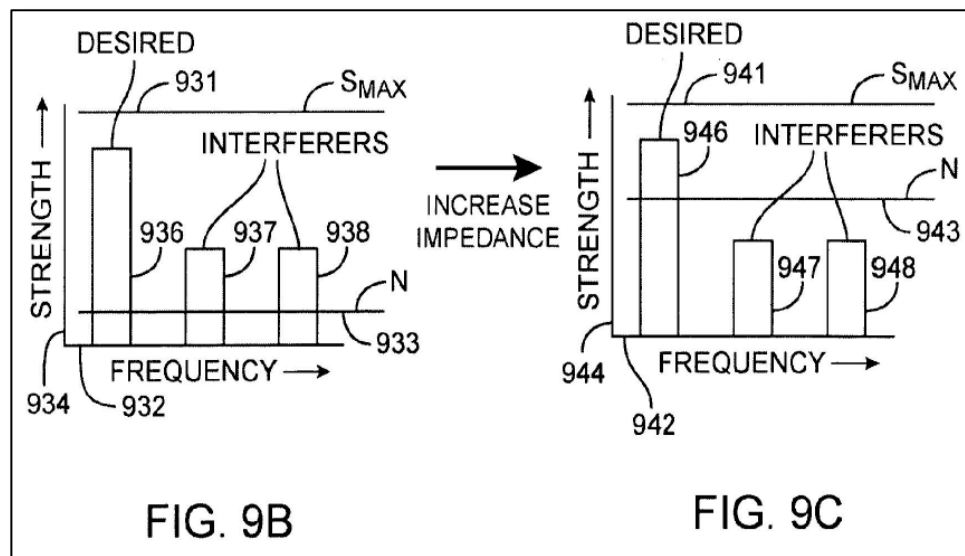


Id., Figs. 8B-8C.

Second, increasing the signal path impedance permits a lower AC drive current to be used in the RF signal path, saving power. *Id.*, 6:22-23, 7:49-65. In one example, illustrated in Fig. 6, an RC filter circuit is “scaled,” doubling the signal path impedance, which allows the “circuit’s required drive current” to be cut in half. *Id.*, 7:49-64. Although the patent does not explain *why* increasing the signal path impedance also increases the noise floor (N),³ the patent repeatedly notes that the signal path impedance can be increased to save power by lowering drive/switching current only if conditions permit increasing the noise floor (N). *Id.*, 6:12-13 (“Circuit impedances and currents are set such that the noise floor 264 is sufficiently low for

³ A POSITA would recognize that resistor thermal noise is often a dominant source of noise in an RC filter, so increasing the impedance by increasing the signal path resistance as taught by the ‘202 Patent (‘202 Patent, 7:49-57) would indeed increase the noise introduced by the filter. *Dec.* (Ex. 1003), ¶34.

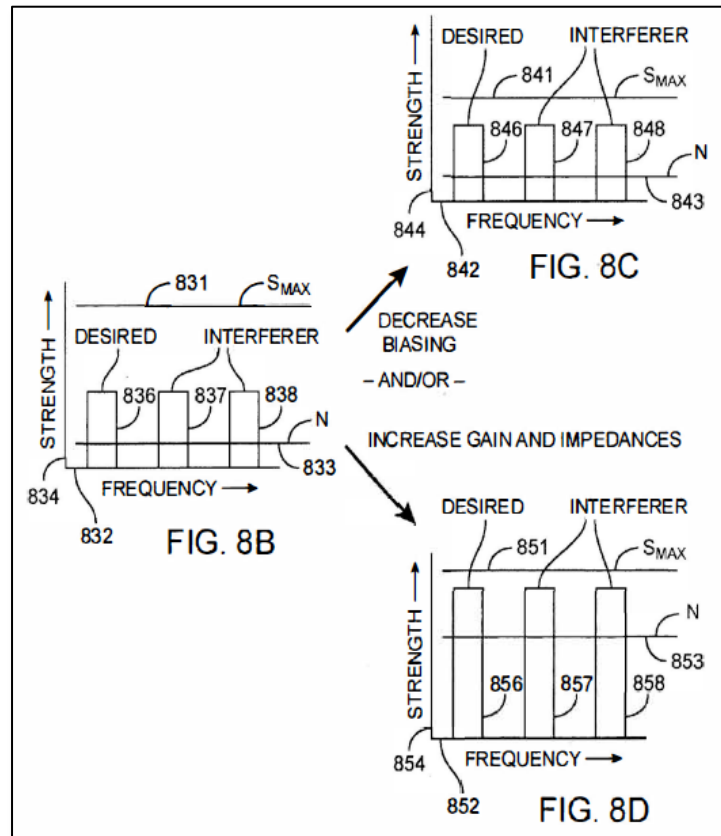
an acceptable bit-error rate.”), 8:13-14 (“[I]mpedances are increased, which raise the noise floor.”), 9:21-25 (teaching that the noise floor is increased “by increasing one or more impedance in function block 810, such that drive currents inside that block are reduced.”). Figs. 9B and 9C illustrate saving power by increasing impedance, which increases noise floor (N), when the desired signal strength and interferer signal strengths permit such a noise floor increase:



Id., Figs. 9B-9C.

The third variable used to adjust a circuit’s dynamic range is gain. While gain does not directly correspond to power savings, it does provide a mechanism by which all signals—desired and interferers—can be increased, creating room for power savings to be realized by increasing impedance. As illustrated in Figs. 8B-8D below, when the desired signal and interferer signals are all low, power savings can be realized by (1) lowering the bias current, which lowers S_{max} , as shown in Fig.

8C, (2) increasing gain and increasing impedance, which increases noise floor (N), as shown in Fig. 8D, or (3) all three—lowering the bias current, increasing gain, and increasing impedance:



Id., Figs. 8B-8D, Fig. 12, 10:62-11:9 (explaining that a combination of all three adjustments may be used when the desired signal and interferer signals are all low).

In sum, the '202 Patent teaches saving power when signal conditions are better than worst-case by decreasing the dynamic range via (1) decreasing the DC bias current, (2) increasing signal path impedance, and/or (3) increasing gain.

B. The '202 Patent's Prosecution

The '202 patent was filed as Application No. 15/824,841 ("841 application") on November 28, 2017 and is related, through a chain of continuations, to U.S. Patent No. 7,010,330 ("the '330 Patent"). The '330 Patent was filed on February 23, 2004, claiming priority to Provisional Application Nos. 60/451,229 and 60/451,230, both filed March 1, 2003. For this proceeding, Petitioner applies March 1, 2003, as the priority date for the Challenged Claims.

The original submitted claims were subject to multiple office actions and significant amendments. *See, e.g.*, Ex. 1002, 88-128 (first office action rejecting all claims under obviousness and double patenting grounds and some claims for being indefinite), 150-63 (amendments and arguments responsive to first office action), 169-71 (filing of terminal disclaimer), 179-98 (final office action rejecting all claims), 214-237 (amendments and arguments responsive to final office action, adding entirely new Claims 40-51).

Accompanying amendments responsive to the office actions, applicant repeatedly distinguished the cited prior art from the pending claims on the basis that the claims required dynamically adjusting the receiver operation in response to determining the *relative strengths* of desired and interferer signals. *Id.* at 160-62 (arguing that U.S. Patent No. 5,001,776 to Clark controls power consumption based on comparing a received signal to thresholds, distinguishing this from the claimed

requirement that the receiver is adjusted “based on the relative comparison of the desired signal strength to the interferer signal strength”), 266-29 (arguing that “no . . . comparison of the strength of the desired signal and the strength of the interference signal is disclosed in [U.S. Patent No. 6,311,048 to] Loke”).

A notice of allowance was subsequently issued on November 13, 2019, with no further actions. *Id.* at 251-52.

C. Claim Construction

In this proceeding, claims are interpreted under the same standard applied by Article III courts (i.e., the *Phillips* standard). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 197 (Oct. 11, 2018); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (*en banc*). Petitioner applies the plain and ordinary meaning of all claim terms as understood by a POSITA for all terms not expressly construed below. Petitioner does not waive any argument in any litigation that claim terms in the ‘202 Patent are indefinite or that additional terms might need construction in a different proceeding.

The parties are disputing the correct construction of a number of terms in parallel litigation. As explained in the detailed mapping below, the Proposed Grounds satisfy either party’s proposal for the disputes in the below chart:⁴

⁴ *Joint Markman Statement* (Ex. 1008). Although alternative positions have been exchanged in the parallel litigation for various terms, this chart captures the current state of parties’ primary positions. Further, although the Court has yet to issue a

Claim Term	Theta’s Constructions	Apple’s Constructions
“impedance”	Plain and ordinary meaning, but if construed, should be construed as “opposition to the flow of alternating current” ⁵	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 strength is low”

The parties also dispute the meaning of “signal path” and “dynamically changing/adjust[ing]” (the “dynamic limitation”).

Regarding “signal path,” Apple argued that signal path excludes the “digital signal processing” block, and Theta argued that no such exclusion is proper. *See Theta Sur-Reply* (Ex. 1009), 1-3 (arguing that the signal path “can be both analog or

Markman order, in advance of the *Markman* hearing, the Court preliminarily concluded all disputed claim language should be accorded its plain and ordinary meaning.

⁵ Petitioner applies Theta’s proposed construction of “impedance” for dependent claims 4 and 8.

digital at different points in the signal path,” and as such, “is not limited to only analog components”).

For the dynamic limitation, Apple argued it should exclude “reliance on a signal strength threshold,” and Theta argued that no such exclusion is proper. *Theta Markman Br.*, 14-16 (arguing the terms only “require varying ‘during operation based—at least in part—on information gained during operation.’”).

For purposes of this proceeding, Petitioner proposes this Board adopt Patent Owner’s interpretation of the signal path. *See Western Digital Corporation v. SPEX Technologies, Inc.*, IPR2018-00084, Paper 14, *11 (PTAB Apr. 25, 2018); *see also General Electric v. Vestas*, IPR2018-00928, Paper 9, *16-17 (PTAB Nov. 5, 2018); *10x Genomics, Inc. v. Bio-Rad Laboratories, Inc.*, IPR2020-00086, Paper 8, *19 (PTAB Apr. 27, 2020) (finding “judicial efficiency will be enhanced by allowing Petitioner to rely upon a claim construction that Patent Owner is relying upon in the related district court litigation to assert infringement of the challenged patent”).

D. A Person of Ordinary Skill in the Art

As of March 1, 2003, a person of ordinary skill in the art (POSITA) would have had a master’s degree in electrical engineering or the equivalent, and two or more years of experience with wireless communications devices. *Dec.*, ¶¶39-41. Additional education or experience might substitute for the above requirements. *Id.*

III. REQUIREMENTS UNDER 37 C.F.R. § 42.104

A. Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies the '202 Patent is eligible for IPR and Petitioner is not barred or estopped from requesting IPR challenging the claims of the '202 Patent. Petitioner is not the owner of the '202 Patent, has not filed civil action challenging the validity of any claim of the '202 Patent, and this Petition is filed less than one year after Petitioner was served with a complaint alleging infringement of the '202 Patent.

B. Identification of Challenge Under 37 C.F.R. § 42.104(b)

Petitioner requests the Challenged Claims be found unpatentable on the following grounds:

Proposed Ground of Unpatentability	Exhibits
Ground 1: Claims 1, 2, 4-23 are obvious ⁶ under §103(a) over “Adaptive Analog IF Signal Processor for a Wide-Band CMOS Wireless Receiver” by Behbahani et al. (“ <i>Behbahani</i> ”) in view of “A 2.4-GHz Low-IF Receiver for Wideband WLAN in 0.6μm	Ex. 1004 Ex. 1005 Ex. 1006

⁶ In the parallel litigation, Theta contends it has evidence of secondary indicia of nonobviousness and stated that it intends to supplement the record beyond the minimal responses provided to date. Petitioner does not address those partial contentions herein, but reserves its right to fully respond to any evidence or arguments advanced in this proceeding.

Proposed Ground of Unpatentability	Exhibits
CMOS – Architecture and Front-End” by Leete et al. (“ <i>Leete</i> ”) and in further view of “A Broad-Band Tunable CMOS Channel-Select Filter for a Low-IF Wireless Receiver” by Tan et al. (“ <i>Tan</i> ”).	

IV. OVERVIEW OF THE PRIOR ART

A. Behbahani

Behbahani published in August 2001. *Behbahani* (Ex. 1004). Petitioner’s declarant, Dr. Asad A. Abidi, is listed as a co-author on *Behbahani* and was the supervising faculty member overseeing the research underlying *Behbahani*. Dec., ¶46. Dr. Abidi explains that, as indicated on the face of the article, it was made publicly available in the August 2001 IEEE Journal of Solid-State Circuits, and therefore qualifies as prior art under 35 U.S.C. §102(b) (pre-AIA). *Id.*; see also *Munford Dec.*, (Ex. 1010), ¶¶6-9.

Behbahani was cited on the face of the ’202 Patent, but was not discussed by the Examiner during prosecution. As set forth below in Section VI, a discretionary denial under § 325(d) is not warranted on this record.

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:

This receiver implements *adaptive dynamic range* in the IF [Intermediate Frequency] section. *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 [(dynamic range)]. DR is obtained at the expense of a disproportionate rise in power consumption* 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.*

Behbahani, 1205.

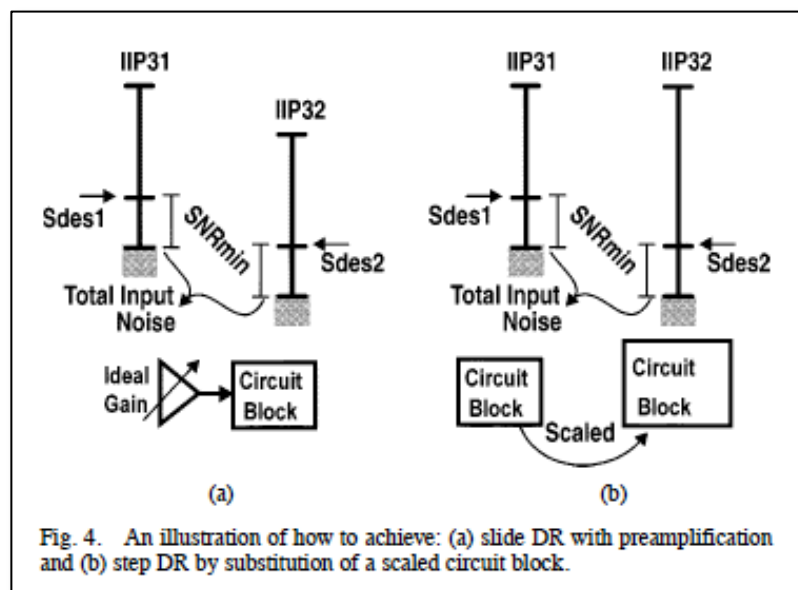
Two separate adaptive techniques are combined to accomplish *Behbahani's* goals—(1) step-based DR and (2) sliding DR. *Id.*, 1206-07. For *Behbahani's* step-based adaptive DR, the receiver switches/steps between two scaled filters. *Id.* A “high-power filter” is used during the range⁷ of worst-case signal conditions, and a separate “low-power filter” is used for the range of conditions that are better than worst-case. *Id.* (“Since the worst-case scenario is infrequent, the low-power filter determines the average RX power consumption.”). As set forth in the proposed grounds below, switching from the high-power filter to the low-power filter satisfies

⁷ Petitioner’s declarant, Dr. Abidi, explains that worst-case conditions exist when the desired signal is very low and the interferers are very high, but notes that these “worst-case” conditions do capture a range of scenarios in which low-desired and high-interferer signals are received, rather than a single discrete “worst-case” condition. *Dec.*, ¶48.

both power saving mechanisms described and claimed in the Challenged Patent, (1) lowering the bias current and (2) increasing the signal path impedance, lowering the drive current.

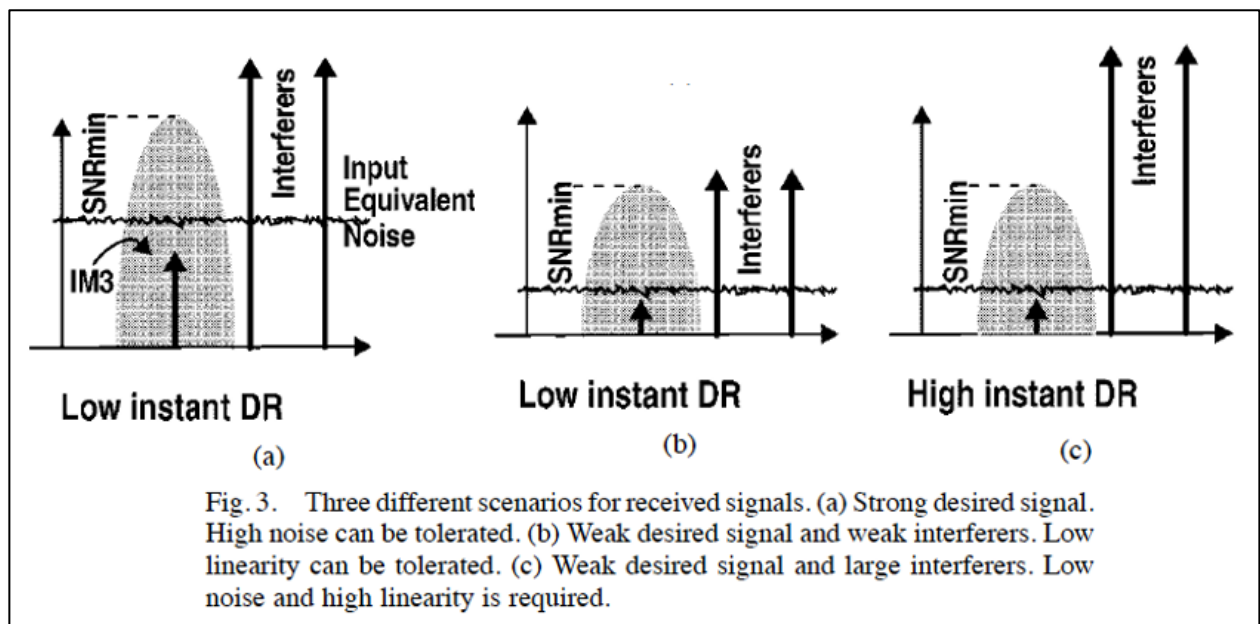
When the low-power filter is utilized during better than worst-case conditions, *Behbahani's* sliding DR technique uses a gain stage in advance of the low-power filter to slide a smaller DR up or down based on strengths of the received signals. *Id.*, 1206-07.

Below, Fig. 4(a) illustrates a gain stage used to slide a small DR (that results from using the low-power filter) to accommodate specific signal strength conditions, and Fig. 4(b) illustrates switching from the low-power filter to high-power filter to expand the DR when worst-case conditions are encountered:



Id., 1206.

Behbahani describes three different desired and interferer signal scenarios below in Figure 3. Figs. 3(a) and Fig. (b) depict better than worst-case conditions in which “receiver dynamic range may be modest” and the gain-based sliding DR approach is sufficient. *Id.*, 1206. Fig. 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.*



Id., Fig. 3 (rearranged).

Behbahani, like the ‘202 Patent, discloses a wireless receiver architecture and design intended to achieve reduced power dissipation. *Compare* ‘202 Patent, Abstract, 1:21-23, 2:43-64, 6:6-32, with *Behbahani*, Abstract, 1205. Thus, *Behbahani* is in the same field of endeavor as the ‘202 Patent. *Dec.*, ¶¶46-53.

Behbahani is also reasonably pertinent to certain problems addressed by the '202 Patent such as accommodating different signal conditions by dynamically adjusting dynamic range. *Compare* '202 Patent, 5:33-67, 6:6-32, with *Behbahani*, Abstract 1205, Fig. 3; *Dec.*, ¶¶46-53. Therefore, *Behbahani* is analogous art to the '202 Patent.

B. Leete

Leete was published in December 2000. Petitioner's declarant, Dr. Asad A. Abidi, is listed as a co-author on *Leete* and was the supervising faculty member overseeing the research underlying *Leete*. *Dec.*, ¶54. Dr. Abidi explains that, as indicated on the face of the article, it was made publicly available in the December 2000 IEEE Journal of Solid-State Circuits, and therefore qualifies as prior art under 35 U.S.C. §102(b) (pre-AIA). *Id.*; see also *Munford Dec.*, ¶¶14-17. *Leete* was not cited or considered during prosecution of the '202 patent.

Leete is intended to be used on conjunction with *Behbahani*. Specifically, *Leete* provides details about the RF circuitry not described in *Behbahani* itself. *Behbahani*, 1205. In one example, *Leete* describes the RF front-end, including a low noise amplifier (LNA) and an RF downconverter (including mixers) that converts the RF signal to an intermediate frequency (IF). *Leete*, 1908. As discussed in the Proposed Grounds below, *Behbahani* focuses on the IF and digital portions of the receiver, effectively picking up where *Leete* leaves off. *Dec.*, ¶55.

Like the '202 Patent, *Leete* teaches a wireless receiver architecture and design intended to achieve reduced power dissipation. *Compare* '202 patent, Abstract, 1:21-23, 2:43-64, 6:6-32, *with Leete*, Introduction, 1908, Fig. 1. Thus, *Leete* is in the same field of endeavor as the '202 Patent. *Dec.*, ¶¶54-56.

Leete is also reasonably pertinent to certain problems addressed by the '202 Patent, such as accommodating a wide dynamic range, low power consumption, and minimizing noise in the components of the wireless receiver architecture. *Compare* '202 Patent, 5:33-67, 6:6-32, *with Leete*, 1908, 1910; *Dec.*, ¶¶54-56. Therefore, *Leete* is analogous art to the '202 Patent.

C. Tan

Tan published in April 2000. Petitioner's declarant, Dr. Asad A. Abidi, is listed as a co-author on *Tan* and was the supervising faculty member overseeing the research underlying *Tan*. *Dec.*, ¶57. Dr. Abidi explains that, as indicated on the face of the article, it was made publicly available in the April 2000 IEEE Journal of Solid-State Circuits, and therefore qualifies as prior art under 35 U.S.C. §102(b) (pre-AIA). *Id.*; *see also Munford Dec.*, ¶¶10-13.

Tan was cited on the face of the '202 Patent, but was not discussed by the Examiner during prosecution. As set forth below in Section VI, a discretionary denial under § 325(d) is not warranted on this record.

Behbahani cites *Tan* to describe the details of the bandpass filter used in *Behbahani*: “The details of the BPF design are presented elsewhere [7].” *Behbahani*, 1210. The citation [7] in *Behbahani* is to *Tan*. The Proposed Grounds rely upon certain details in *Tan* to explain the operation of the low-power and high-power filters in *Behbahani*.

Like the ’202 Patent, *Tan* teaches a wireless receiver architecture and design intended to achieve reduced power dissipation. *Compare* ’202 patent, Abstract, 1:21-23, 2:43-64, 6:6-32, *with Tan*, Introduction, 476. Thus, *Tan* is in the same field of endeavor as the ’202 Patent. *Dec.*, ¶¶57-60.

Tan is also reasonably pertinent to certain problems addressed by the ’202 Patent, such as accommodating a wide dynamic range, low power consumption, and minimizing noise in the components of the wireless receiver architecture. *Compare* ’202 Patent, 5:33-67, 6:6-32, *with Tan*, 476; *Dec.*, ¶¶57-60. Therefore, *Tan* is analogous art to the ’202 Patent.

V. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: *Behbahani* in view of *Leete* in further view of *Tan*

1. Claim 1

Claim 1 (Pre)(a): “A method of reducing the power consumption of a receiver of a battery operated transceiver having a plurality of circuits, wherein the plurality of circuits comprise a receiver signal path comprising at least an amplifier, a mixer and a filter,”

To the extent the preamble is limiting, *Behbahani* discloses a method of reducing power consumption of a receiver of a battery-operated transceiver having a plurality of circuits. Moreover, *Behbahani* in view of *Leete* disclose a plurality of circuits having a receiver signal path comprising at least an amplifier, a mixer and a filter.

***Behbahani* discloses a method of reducing power consumption of a receiver of a battery-operated transceiver having a plurality of circuits**

Behbahani's focus is saving power in a wireless device, teaching that its wireless⁸ receiver implements an “adaptive dynamic range” method to save power by decreasing the dynamic range when conditions are better than worst case:

This receiver implements *adaptive dynamic range* in the IF section. *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 [dynamic range]. DR is obtained at the expense of a disproportionate*

⁸ Similar to Claim 1's language, “receiver of a battery-operated transceiver,” other Claims require a “receiver in a battery operated mobile device” (Claim 6), a “wireless transceiver of a battery-powered portable wireless device,” (Claims 7, 11, 12, 13, 14, 16, 18), and a “receiver of wireless transceiver of a wireless communication device” (Claims 19, 22). As established in the Claim 1 mapping, a POSITA would have understood that *Behbahani* satisfies each of these different ways to describe the claimed receiver. *Dec.*, ¶73.

rise in power consumption 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.*

Behbahani, 1205.

Although *Behbahani* does not expressly state that its wireless receiver is intended for a battery-operated wireless transceiver, for a number of reasons, a POSITA would have understood that the reference fairly conveys a wireless receiver intended for a battery-operated transceiver and would have been motivated to implement the described receiver in such a device. *Dec.*, ¶¶64-73. *Behbahani*'s receiver is designed for the 2.4 GHz WLAN communications. *Behbahani*, 1205 (discussing the “2.4-GHz ISM band”), 1206 (referring to the receiver as a “WLAN receiver”); *Dec.*, ¶¶66-67 (explaining that the receiver described is in fact designed for 2.4GHz WLAN (Wireless Local Area Network) communications). Confirming this focus on 2.4 GHz WLAN communications, *Behbahani* references two other papers ([1] and [5]) that describe different aspects of the same receiver research. *Behbahani*, 1205 (noting that the image rejection issues associated with the research are “addressed in detail elsewhere [1]” and that the” basic RX architecture has been described in detail elsewhere [5]”). References [1] and [5] largely overlap in authorship with *Behbahani* and do in fact describe difference aspects of the same research. *Dec.*, ¶68. Each of these references also indicate in their titles that the research targets 2.4 GHz WLAN communications. *Behbahani*, 1216. At the time of

Behbahani, and today, the most common form of 2.4Ghz WLAN communications is Wi-Fi. *Dec.*, ¶¶68 (explaining that Wi-Fi communications most commonly used the 2.4 GHz radio band). Although Wi-Fi receivers were not used exclusively in battery operated transceivers/mobile devices, it was a dominant means of wireless communication in such devices at the time. *Dec.*, ¶¶69-70 (noting that Wi-Fi was the dominant form of high bandwidth, wireless connectivity for battery powered mobile devices such as laptops and PDAs). Confirming that *Behbahani* was in fact contemplating such mobile use for its Wi-Fi receiver, the Introduction notes that the described receiver solves problems associated with “mobile systems.” *Behbahani*, 1205; *Dec.*, ¶¶70-71. Further, a POSITA would have understood from *Behbahani*’s focus on power savings that battery powered transceivers/mobile devices were the primary target of the disclosed receiver technology and would have been motivated to use the technology to reduce the power consumption in such devices. *Id.* (noting that power savings is a key consideration for battery-powered wireless devices and confirming that the research described in *Behbahani* did in fact target preserving power consumption in battery operated transceivers/mobile devices).

Finally, a POSITA would have understood that *Behbahani*’s receiver circuitry is in fact part of a wireless transceiver, i.e., is in a device that includes both transmission and reception functionality. *Dec.*, ¶¶62-63. Although *Behbahani* focuses on the details of receiver circuitry, *Behbahani* expressly notes that the

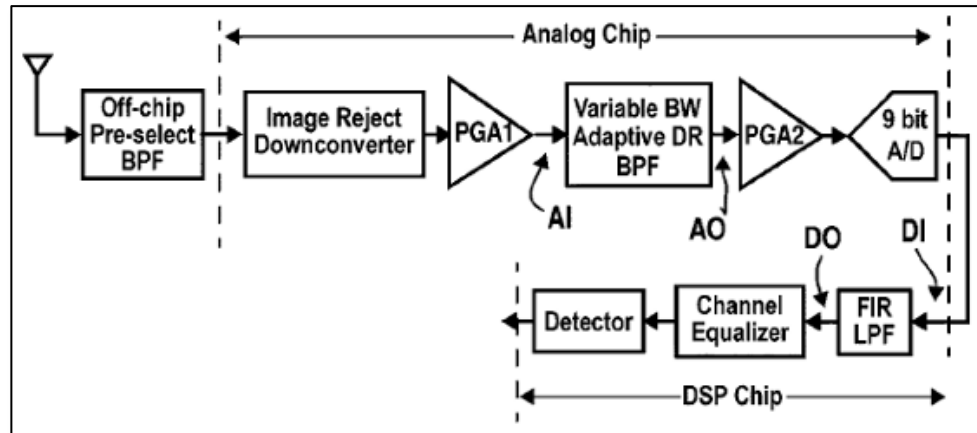
receiver is part of a transceiver. *Behbahani*, 1207 (“This frequency-hopping *transceiver* uses many adaptive algorithms at each hop[.]”), 1208 (noting “a maximum speed of 2 m/s for the indoor mobile *transceiver*”). Accordingly, a POSITA would have understood that, although the paper focuses on the receiver circuitry, *Behbahani* does in fact teach that its receiver circuitry is intended to be used in a mobile device with a complete transceiver. *Dec.*, ¶¶62-63.

***Behbahani* in view of *Leete* disclose a plurality of circuits having a receiver signal path comprising an amplifier, a mixer and a filter.**

Behbahani in view of *Leete* discloses a method of receiving an RF signal by a wireless transceiver having a signal path comprising an amplifier, a filter, and a mixer.

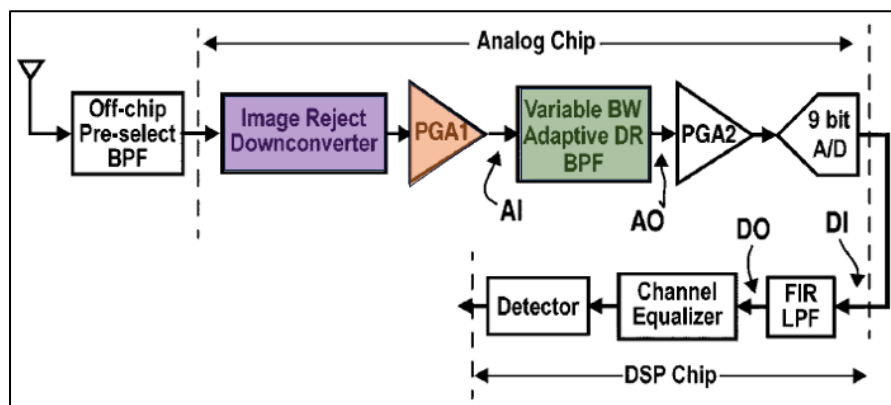
***Behbahani* and *Leete* describe different aspects of the same circuit—a POSITA would have been motivated to combine their teachings.**

As an initial matter, the two references describe the same research, focusing on different aspects of the same receiver circuit, and were intended to be used in conjunction. *Dec.*, ¶75. Fig. 2 from *Behbahani* describes the “complete WLAN receiver” circuitry:



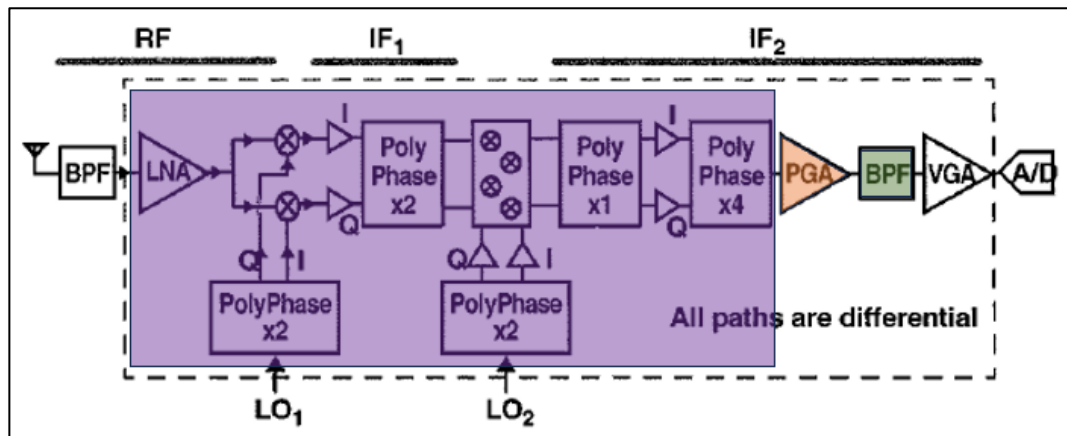
Behbahani, 1206. *Behbahani* explains that “the IF section is the main focus of this paper” and notes that “[t]he front-end and image-reject downconversion sections of the [receiver] are described in [5].” *Id.*,1205. The citation “[5]” in *Behbahani* is the *Leete* article. *Leete* does in fact describe a “2.4-GHz front-end and the first downconversion section of a fully integrated low-IF receiver.” *Leete*, Abstract.

On the “analog chip” and in advance of **PGA1 (prefilter programmable gain amplifier)** and the **variable filter**, *Behbahani* represents the receiver circuitry with a single box labeled “**Image Reject Downconverter**”:



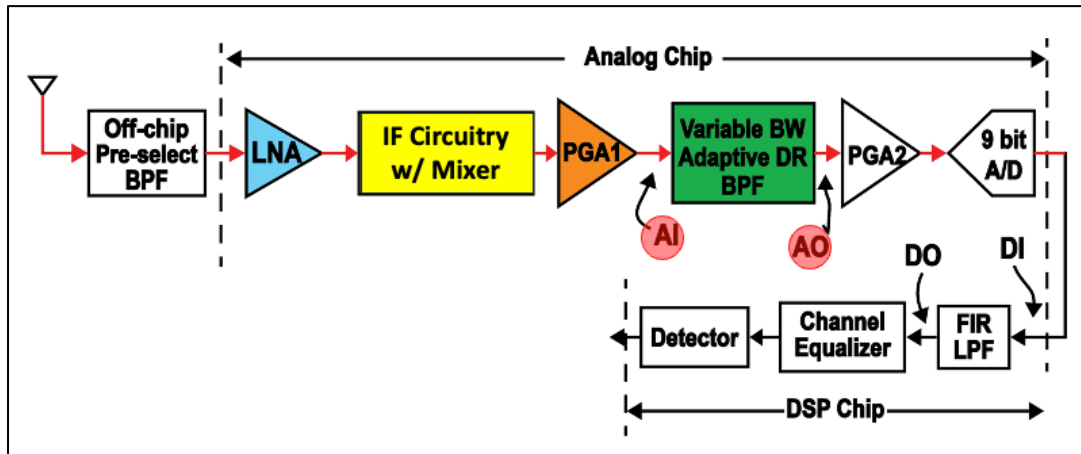
Behbahani, Fig. 2 (annotated).

As *Behbahani* notes, *Leete* provides the details of this downconverter circuitry. *Leete* teaches that the “RF front-end comprises a **low noise amplifier (LNA)** and an **RF quadrature mixer**, which downconverts the RF signal to the first IF (IF1).” *Leete*, 1908 (further noting an additional “IF mixer downconverts the *desired* signal at IF1 to a low IF2”). This detailed circuitry is depicted in Fig. 1 below:



Id. at Fig. 1 (annotated).

Consistent with *Behbahani*'s express intent to use the two references conjunctively, the “**Image Reject Downconverter**” box from *Behbahani*'s Fig. 2 has been replaced with an LNA and the other IF circuitry, including the mixer stage:



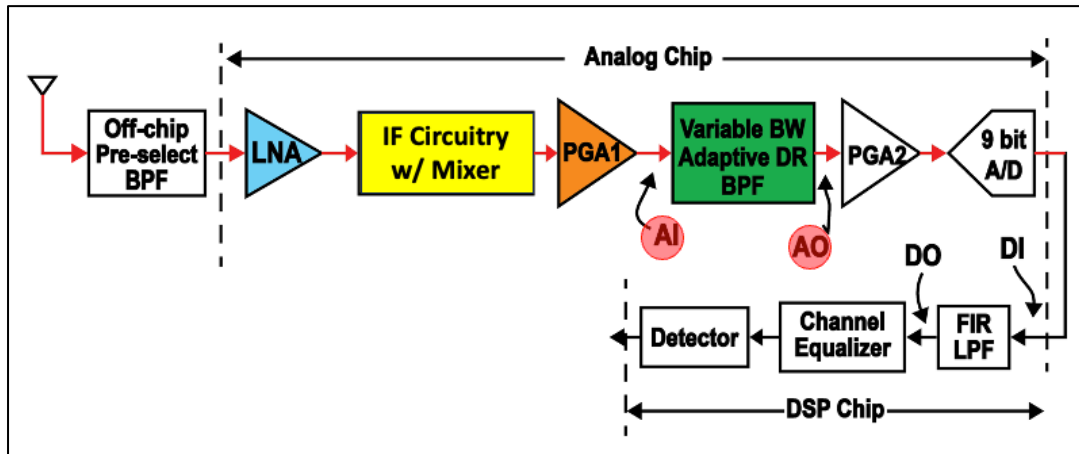
Behbahani modified by *Leete*, Figure 2 (annotated).

A POSITA would have been motivated to combine *Behbahani* and *Leete* as depicted above at least because *Behbahani* expressly motivates the combination, teaching that *Leete* provides the receiver details preceding PGA1. *Dec.*, ¶¶75-87; *Norian Corp. v. Stryker Corp.*, 363 F.3d 1321, 1328 (Fed. Cir. 2004) (finding a sufficient motivation to combine references where one explicitly cites the other). Further, a POSITA would have understood that the LNA->mixer->filter topology is commonplace, further motivating the proposed combination of *Behbahani* and *Leete*. *Dec.*, ¶¶84-87 (discussing extensive use of this topology in the field of wireless transceivers). Finally, a POSITA would have understood that placing *Leete*'s LNA in *Behbahani*'s circuit as proposed uses a known technique to improve a similar device in the same way. *Id.*, ¶¶75-87 (explaining that, not only does *Leete*'s circuitry improve *Behbahani*'s receiver, it completes *Behbahani*'s receiver, providing implementation detail not covered by *Behbahani*). As set forth above, both

circuits are similar. In fact, they are describing different portions of the same receiver circuit. *Id.* (discussing a 2000 IEEE paper by the same research team that published before *Behbahani* and *Leete*, that included the same LNA-equipped figure as *Leete*, and that described both the IF stages (*Leete*'s focus) and *Behbahani*'s step-based and sliding DR concepts). A POSITA would have understood that benefits of an LNA in a wireless receiver include the ability to introduce gain without significant noise, improving the receiver's ability to recover a desired signal. *Id.* A POSITA would further have understood that such a benefit applies equally to *Behbahani*'s Fig. 2 as it does to the more detailed version of the same receiver circuit as depicted in *Leete*'s Fig. 1 and would have expected success in treating their teachings conjunctively, as the authors intended. *Id.*

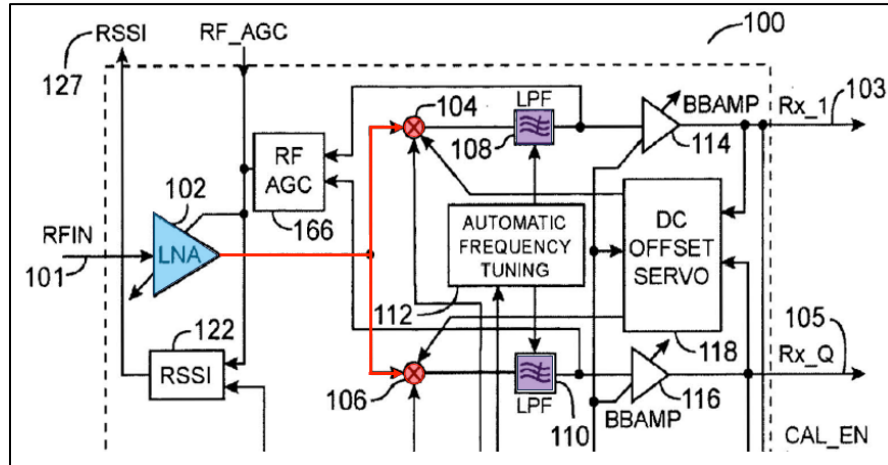
The receiver described by Behbahani and Leete includes an amplifier, mixer, and filter

Starting with the claimed amplifier, there are three distinct amplifiers, any of which satisfies this element—low-noise amplifier (LNA), programmable gain amplifier (PGA1), or PGA2. *Dec.*, ¶88 (discussing the three different amplifiers in the described receiver). Each of these amplifiers is depicted below:

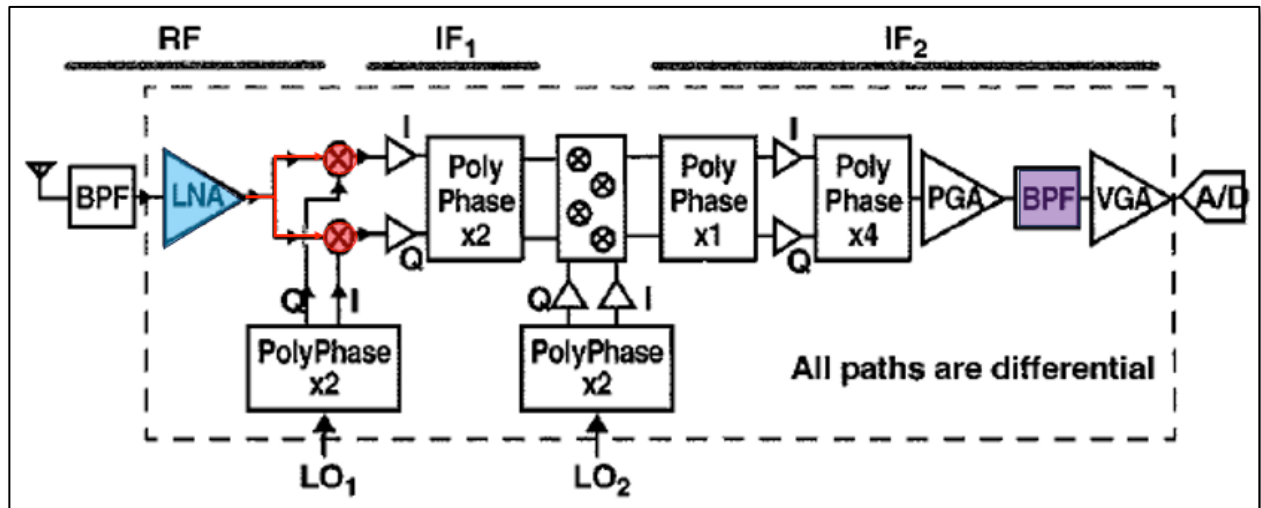


Behbahani modified by *Leete*, Figure 2 (annotated).

Leete’s quadrature RF mixer—with its separate I and Q paths—satisfies the claimed “mixer.” Although the Challenged Claims generically refer to a “mixer,” the ’202 Patent’s detailed description describes the same two-signal path quadrature mixer arrangement as *Leete*. ’202 Patent, 4:19-21 (“The receiver includes a signal path formed by low-noise amplifier 102, *I and Q mixers 104 and 106*, low pass filters 108 and 110[.]”), 4:39-43 (teaching that “quadrature mixers 104 and 106 . . . down-convert the received signal”). As shown below, both *Leete* and the ’202 Patent place the **quadrature mixer** (with separate I and Q paths) between an **amplifier** and **filter**:

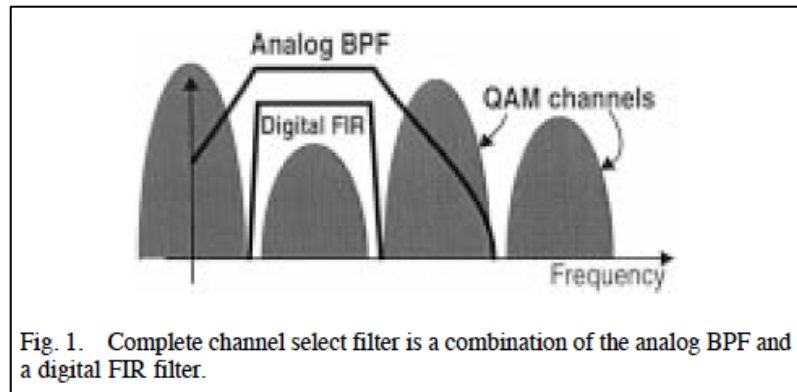


'202 Patent, Fig. 1 (annotated).



Leete, Fig. 1 (annotated). Based on the similar disclosures in the '202 Patent and in *Leete* and based on the prevalence of quadrature mixers in receivers at the time, a POSITA would have understood that *Leete*'s quadrature mixer stage satisfies the claimed "mixer." *Dec.*, ¶¶89-92.

Finally, *Behbahani's* Variable BW Adaptive DR BPF satisfies the claimed “filter.” *Dec.*, ¶93. Depicted in Fig. 1 below, *Behbahani* teaches an analog bandpass filter (BPF) that “attenuates near-by channels and rejects far-away channels.”



Behbahani, Fig. 1, 1205. *Behbahani* explains that its “BPF realized by a LPF [low-pass filter] in series with HPF [high-pass filter] lowers power consumption.” *Behbahani*, 1216; see also *id.*, 1210 (describing the BPF as “[a] high-order LPF... cascaded with a low-order HPF”).

Claim 1(Pre)(b): “wherein the plurality of circuits are designed to function between a worst-case operating condition and a best case operating condition, wherein the worst-case operating condition is when a desired signal strength is low and an interferer signal strength is high and the receiver operates with a maximum power dissipation and the best-case operating condition is when the desired signal strength is high and the interferer signal strength is low and the receiver operates with a minimum power dissipation, the method comprising:”

Behbahani teaches 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.

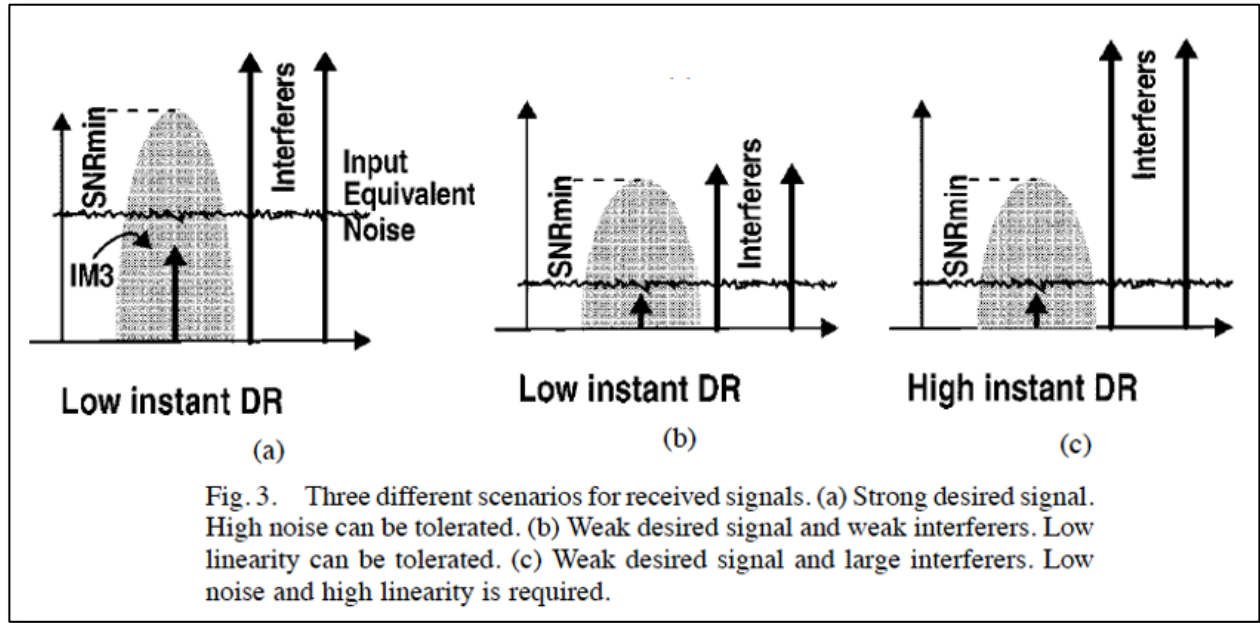
Behbahani teaches a wireless receiver that implements an “adaptive dynamic range” method to save power by decreasing the dynamic range when conditions are better than worst case:

This receiver implements *adaptive dynamic range* in the IF [Intermediate Frequency] section. *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 [dynamic range]. DR is obtained at the expense of a disproportionate rise in power consumption* 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.*

Behbahani, 1205.

Two separate adaptive techniques are combined to accomplish *Behbahani*’s goals—(1) step-based DR and (2) sliding DR. *Id.*, 1206-07. For *Behbahani*’s step-based adaptive DR, the receiver switches/steps between two scaled filters. *Id.* A “high-power filter” is used only during worst-case conditions, and a separate “low-power filter” is used for conditions that are sufficiently better than worst-case. *Id.* When 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.*, 1206-07.

Behbahani describes three different desired and interferer signal scenarios below in Figure 3. Figs. 3(a) and Fig. (b) depict better than worst-case and Fig. 3(c) depicts worst-case conditions. *Id.*, 1206.



Id., Fig. 3 (rearranged). Fig. 3(c)'s worst-case conditions exist when the desired signal is very weak and the interferers are very strong. *Id.*, 1206; *Dec.*, ¶¶97. Fig. 3(a) depicts better than worst-case conditions in which the desired signal is strong and the interferers are also strong, and Fig. 3(b) depicts better than worst-case conditions in which the desired signal is weak and the interferers are also weak. *Behbahani*, 1206; *Dec.*, ¶¶97.

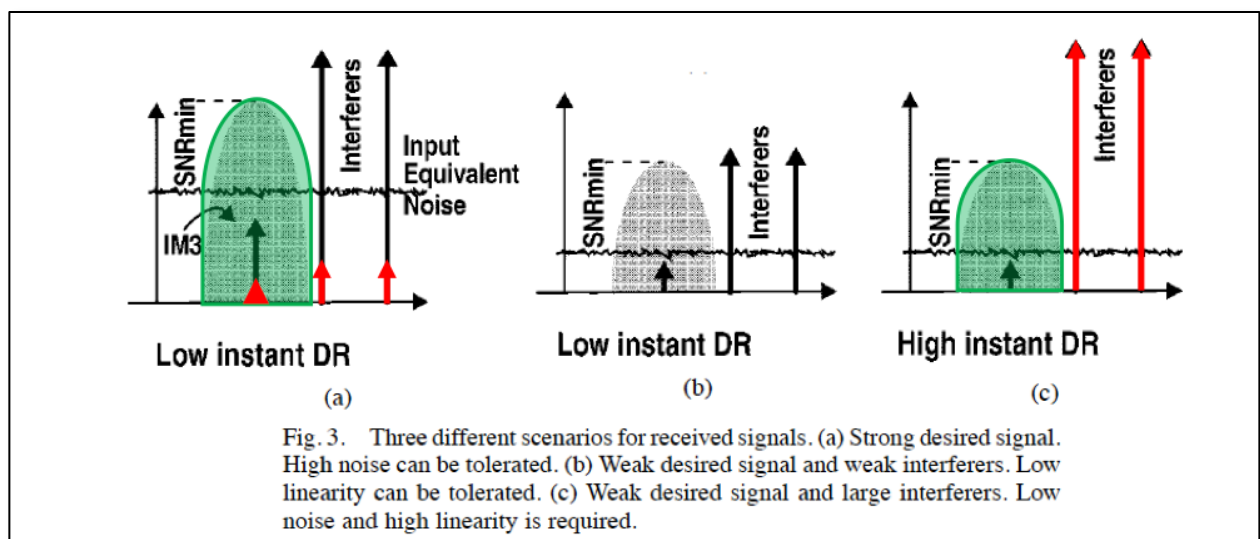
Behbahani explains that the signal conditions in Fig. 3(c), depicting worst-case conditions (i.e., low desired signal and high interferers), require the system to expand the dynamic range by switching in the high-power filter at the expense of

high-power consumption. *Behbahani*, 1205-1206. A POSITA would have understood that *Behbahani*'s receiver operates with a maximum power dissipation while using this high-power filter. *Dec.*, ¶¶103-105; *Behbahani*, 1207 (“[t]wo filters are implemented with the same topology, but one [high-power filter], scaled up to consume 10x more power, offers 10x lower mean square noise but the same linearity.”).

Moreover, *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. *Behbahani*, 1206. Accordingly, per *Behbahani*'s express teachings, 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. *Dec.*, ¶¶101-07. When *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. *Behbahani*, 1206. *Behbahani* teaches adjusting the pre-filter gain (at PGA1) to slide the smaller dynamic range up and down. *Id.*; *Dec.*, ¶108. When a large desired signal is received (e.g., Fig. 3(a)), the gain at PGA1 is decreased, which slides the dynamic range up and increases the noise floor. *Behbahani*, 1206-07 (“When the gain of PGA1 is lowered, $IIP3_{IF}$ [the max signal that can be handled] is higher. On the other hand, NF_{IF} [noise floor] also rises due to

the dominant noise of the BPF. Thus, lowering gain in PGA1 slides up the DR.”); *see also id.*, Fig. 3 (noting that “[h]igh noise can be tolerated” when a “[s]trong desired signal” is received). Conversely, when the gain at PGA1 is increased, “input referred noise and IIP3 drop by the gain of the amplifier. This slides down the entire DR and enables detection of a weaker signal.” *Id.*, 1206.

Annotated Fig. 3 below illustrates a range of signal operating conditions delineated by worst-case conditions (e.g., Fig. 3(c)) and best-case operating conditions (e.g., Fig 3(a) annotated):



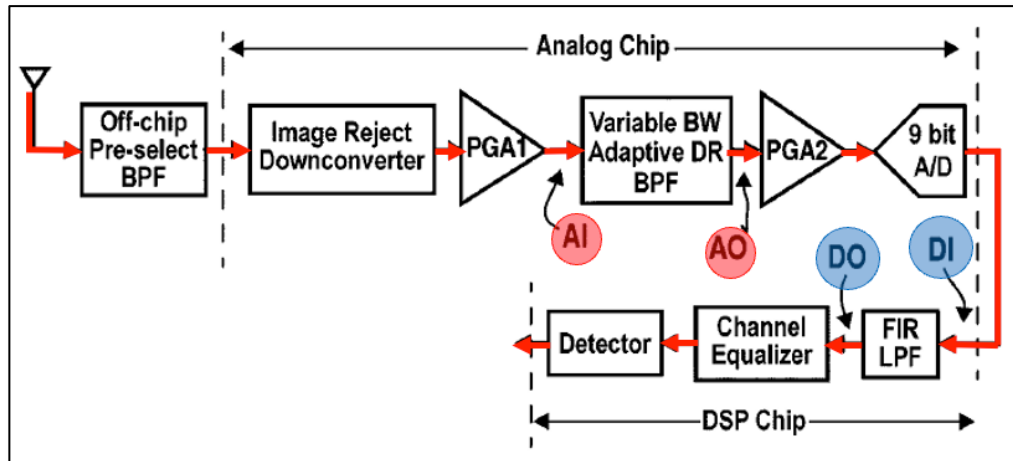
Id., Fig. 3(a) (annotated to depict hypothetical best-case in which interferers are weaker than in Fig. 3(a)), (c) (annotated to show expressly described worst-case); *Dec.*, ¶98 (explaining the same). The claimed best case operating condition (i.e., high desired signal strength and low interferer signal strength) is akin to *Behbahani's* Fig. 3(a) but assumes lower interferers. *Dec.*, ¶99. A POSITA would have

understood that under a best-case operating condition *Behbahani*'s receiver operates with a minimum power dissipation (i.e., using the low powered filter and decreasing the gain at PGA1, which slides the dynamic range up and increases the noise floor). *Id.*, 1206-07; *Dec.*, ¶100.

In sum, a POSITA would have understood that *Behbahani* teaches (1) a plurality of circuits that function between a worst-case operating condition (i.e. low desired signal and high interferer), and a best-case operating condition (i.e., high desired signal and low interferer), and (2) that *Behbahani*'s receiver operates with a maximum power dissipation under worse case conditions and with a minimum power dissipation under best case conditions, as claimed. *Dec.*, ¶¶94-112.

Claim 1(a): “receiving a signal comprising a desired signal and an interferer signal; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal to the strength of the interferer signal; and”

Behbahani teaches circuits for determining desired and interferer signal strengths, including 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**.



Behbahani, Figure 2 (annotated); *Dec.*, ¶113. As set forth below, *Behbahani* expressly measures an absolute desired signal strength, renders obvious measuring an absolute interferer signal strength, and expressly teaches comparing the strengths of the desired and interferer signals. *Id.*

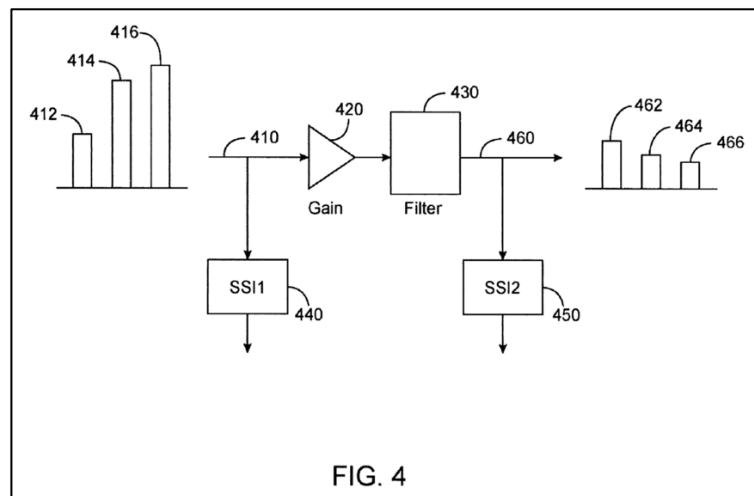
***Behbahani's* receiver receives a wireless signal having a desired signal and an interferer signal**

Behbahani's wireless receiver receives a wireless signal, as claimed. *Behbahani*, 1207 (describing “measured signal levels [that] indicate how much of the **received signal** is being rejected, respectively, by the analog filter and the digital filter”). Indeed, the whole point of an RF *receiver* is to receive RF signals. *Dec.*, ¶95. Further, *Behbahani* teaches that this received signal includes a desired signal component and interferer signals. *Behbahani*, 1205 (“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*⁹.”); Dec., ¶96.

***Behbahani* determines the strengths of the desired and interferer signals**

As an initial matter, the '202 patent teaches determining the *relative* strengths of a desired signal and interferer signals, rather than absolute strengths of these signals. It does so by comparing a cumulative signal strength at a first node to a cumulative signal strength at a second node. Figure 4 below illustrates this concept.



'202 Patent, Figure 4. SSI1 is the “sum of desired signal 412 and interfering signals 414 and 416,” and SSI2 is the “sum of desired signal 462 and interfering signals 464 and 466.” *Id.*, 6:64-7:2. The patent explains that the combination of optional gain

⁹ *Behbahani* teaches that major interferer signals originate from external devices. *Behbahani*, 1205 (“Microwave ovens emitting in the middle of the [2.4-GHz] band are often the largest interferer[.]”).

element 420 and filter 430 produce a gain of one for the desired signal, meaning the strength of the desired signal is identical in the SSI1 and SSI2 measurements. *Id.*, 7:2-5. It also explains that the interfering signal levels are reduced by filter 430. *Id.*, 7:6-10 Accordingly, if SSI2 is significantly smaller than SSI1, large interferer signals have been reduced by filter 430. *Id.* (explaining that comparing these values indicates how much of the combined signal has been filtered). From this information, the system determines what combination of “bias, impedance, and gain . . . may be optimized to reduce power dissipation.” *Id.*, 7:10-13.

Behbahani teaches a nearly identical process for determining *relative* signal strengths and using that information to employ its adaptive sliding DR and adaptive step DR techniques. Importantly, however, *Behbahani* teaches additional measurement nodes that allow the system to determine *absolute* signal strengths in addition to relative signal strengths. As set forth below, regardless of whether this language is interpreted to require measuring only relative signal strengths as described by the '202 Patent or more narrowly to require measuring absolute signal strengths, *Behbahani* renders obvious the limitation.

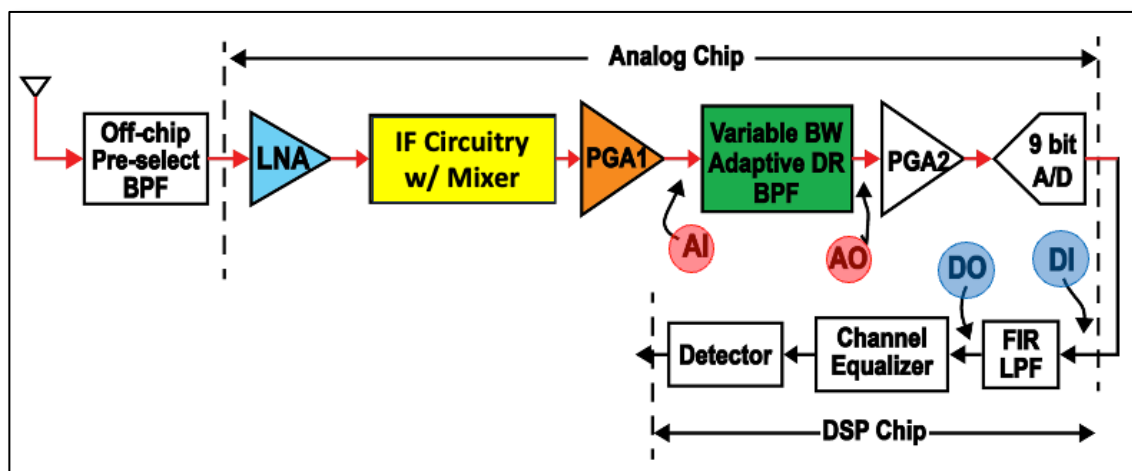
Behbahani emphasizes the importance of measuring signal strength to its adaptive DR techniques, and notes that, like the '202 Patent, signal power is sensed at the input and output of filters to indicate how much of the received signal is being rejected:

The algorithm to sense the input signal and determine instant DR is key.

Signal 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**. These measured signal levels indicate how much of the received signal is being rejected, respectively, by the analog filter and the digital filter.

Behbahani, 1207.

Behbahani teaches determining desired and interferer 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 .



Behbahani modified by *Leete*, Figure 2 (annotated).

***Behbahani* (1) expressly teaches comparing the desired and interferer signal strengths and (2) renders obvious calculating an absolute interferer signal strength**

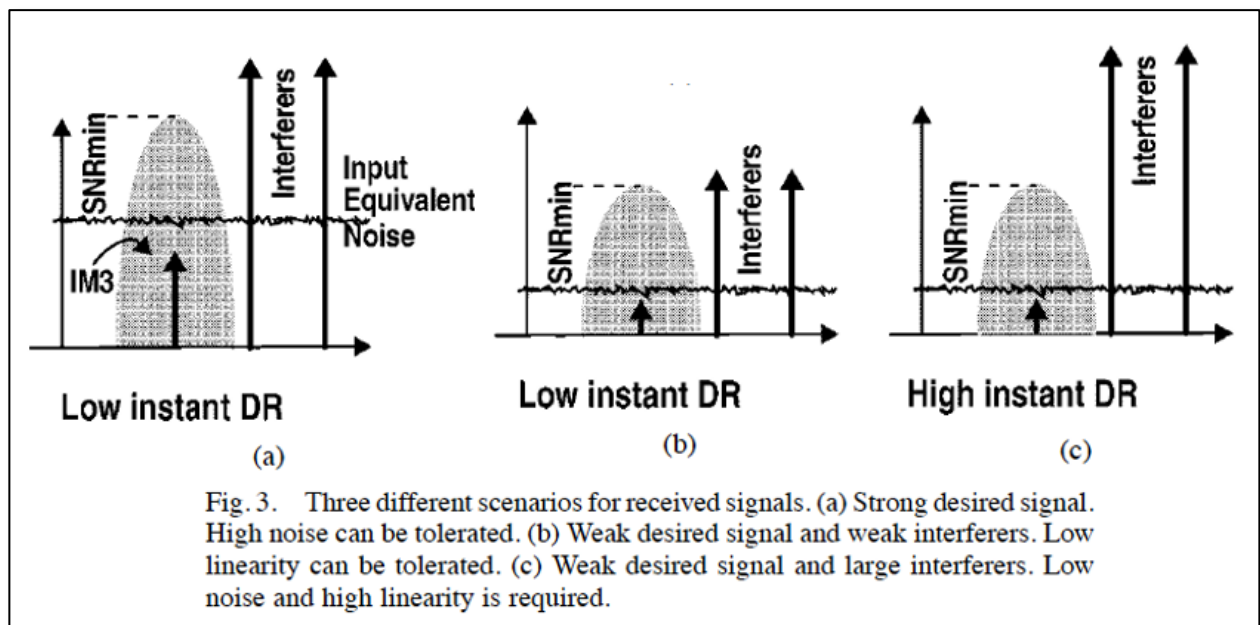
Like the '202 Patent, *Behbahani* teaches that the difference between signal levels measured at nodes “ A_I and A_O is a measure of the out-of-band *interferers*

being rejected by the analog [filter].” *Behbahani*, 1207. The 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.* (“[B]y 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.”). From these two sets of measurements, *Behbahani* can determine the total interferer signal strength received on the signal path. *Dec.*, ¶117 (explaining that the difference between A_I and A_O combined with the difference between D_I and D_O , accounting for gain introduced by any of the amplifiers, represents the total signal strength of the interferer signals). *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:

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).

Behbahani, 1207; see also *id.*, 1206 (explaining that the scenarios depicted in Fig. 3(a-c) determine how the sliding and step-based adaptive DR processes are implemented).

Fig. 3 below describes three different desired and interferer signal scenarios, each of which turns on determining the relative desired and interferer signal strengths. *Dec.*, ¶118. Figs. 3(a) and Fig. (b) depict better than worst-case conditions in which “receiver dynamic range may be modest” and the gain-based sliding DR approach is sufficient. *Behbahani*, 1206. Fig. 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.*



Id., Fig. 3 (rearranged).

Although *Behbahani* does not expressly teach calculating an absolute interferer signal strength, it does calculate an absolute desired signal strength, and a POSITA would have been motivated to similarly calculate an absolute value of the interferers. *Dec.*, ¶119. Indeed, the sliding DR process adjusts the PGA1 gain “to

best accommodate the input signal conditions. *Behbahani*, 1206. 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.*

***Behbahani* expressly teaches calculating an absolute desired signal strength**

Behbahani uses these same analog and digital signal strength measurements to determine the absolute signal strength of a ***desired signal***. First, post-analog filter gain is calculated by comparing the signal strengths measured at nodes A_O and D_I. *Behbahani*, 1207. Next, by subtracting this gain from the signal strength at D_O, *Behbahani* determines the absolute strength of the desired signal. *Id.* (noting “the desired signal . . . [i]s measured by $\text{Power}_{D_O} - \text{Gain}_{\text{Post-analog-filter}}$ ”), *Dec.*, ¶120 (explaining that D_O represents the desired signal in isolation, having had all or nearly all interferers removed by the two filters). *Behbahani* also teaches using this absolute desired signal strength in its adaptive DR process. *Behbahani*, 1207 (teaching that significant interferer signal strength coupled with “a weak signal at D_O” indicates a situation as shown in Fig. 3(c)).

Claim 1(b): “dynamically adjusting at least one of an impedance, a bias or a gain of at least one of the amplifier, filter or mixer in the receiver signal path, responsive to the comparing.”

As discussed in Section II.C, the parties have advanced competing constructions in the parallel litigation for a number of terms. The Proposed Grounds

satisfy both parties' proposals for most of these disputes, so the Board need not resolve them. For example, Patent Owner proposed that "impedance" is "opposition to the flow of alternating current," and Petitioner advocated a plain and ordinary meaning for that term. Further, as discussed in Section II.C, Petitioner proposes the Board adopt Patent Owner's construction of signal path, requiring the signal path to include analog and digital portion of the receiver, and Patent Owner's construction of the dynamic limitation, requiring only that an adjustment is made during operation based on information gained during operation.

As set forth below, when *Behbahani's* 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 in a reduced current that carries the AC signal through a load (i.e., through the filter load). This switch to a low-power filter also reduces the DC bias current applied to the filter stage.

Although Claim 1 permits dynamically adjusting any of an impedance, a bias or a gain, other Challenged Claims specifically require dynamically adjusting impedance or DC bias current. All proposed grounds rely on *Behbahani's* dynamic DR process, which satisfies all the limitations requiring dynamically adjusting a signal path impedance, a DC bias current, or any combination thereof. To avoid repetition, Petitioner sets forth the full theory here.

A. The '202 Patent's Sole Inventor Admitted That *Behbahani's* Scaled Filter Approach Adjusts Signal Path Impedance Consistent With The Alleged Invention

Patent Owner cannot dispute that *Behbahani* teaches the claimed concept of adjusting signal path impedance to save power. The Challenged Patent's sole inventor has previously pointed to *Behbahani's* scaled filter approach as an example of how one might dynamically adjust impedance, and the related bias current, in the signal path to respond to changing signal strengths. Inventor Tsividis, in a January 2003 article titled, "Internally Varying Analog Circuit Minimize Power Dissipation," described a "Dynamic Impedance Scaling" approach to save power when experiencing better than worst-case conditions. Ex. 1011, 70; *Munford Dec.*, ¶¶18-21 (attesting to the public availability of this article). Dr. Tsividis' January 2003 article concludes its discussion by pointing to *Behbahani's* switched filter process as an exemplary means by which dynamic impedance scaling can be implemented. Ex. 1011, 70. Accordingly, the Proposed Grounds here rely on *Behbahani's* scaled filter approach—an approach that Challenged Patent's inventor expressly identified as an example of how one could dynamically adjust impedance to save power.

A brief discussion of the January 2003 article connects its subject matter to the Challenged Claims and highlights that Dr. Tsividis did in fact point to *Behbahani* when discussing the concept in the dynamic impedance limitations. The article

explains that systems are often designed “to handle very small signals in the worst case,” providing large Usable Dynamic Ranges (UDR), which require filters with large capacitance values. *Id.* It noted that, “when the desired signal happens to be strong and no strong blocker is present,” “the very low noise floor of this system is unnecessary and can be allowed to increase by scaling [the capacitance] down.” In addition to decreasing capacitance, the article explained that “the conductances of the filter will have to be scaled together with [the capacitance] in order to leave the frequency response unchanged.” *Id.* The article explains that the concepts of changing a bias current and changing impedance are related as “**impedance scaling**” by “lowering capacitances and transconductances allows one to also **lower I_{BIAS}** , and thus the total power dissipation can be made small.” *Id.*; *see also id.*, 71 (“not[ing] that dynamic biasing is also encountered in the course of applying [] dynamic impedance scaling[.]”).

Increasing the resistance and decreasing capacitance in a filter circuit is the only specific example of adjusting signal path impedance discussed in the '202 Patent. '202 Patent, 7:49-57 (discussing Fig. 6 and its corresponding disclosure). Accordingly, a POSITA would understand that inventor Tsvidis' description of dynamic impedance scaling in his January 2003 article aligns precisely with his disclosure of the concept of adjusting impedance, and related bias current, described and claimed in the '202 Patent. *Dec.*, ¶¶124-28. Both proposed **increasing signal**

path impedance by (1) decreasing transconductance (and increasing resistance)¹⁰ and (2) decreasing capacitance of a filter, ***allowing lower DC bias current*** and ***lower AC drive current*** to save power.

Dr. Tsividis' January 2003 article concludes its discussion by pointing to *Behbahani's* switched filter process, which results in a change in bias current, as an exemplary means by which dynamic impedance scaling can be implemented. Ex. 1011, 70 (“One way to achieve the above scenario would be to use two filters, designed with different capacitance values, and place one or the other in service as required [34], turning the other filter off.”). Reference [34] is the same *Behbahani* reference that forms the basis of all Proposed Grounds herein. *Id.*, 72; *Dec.*, ¶128.

Accordingly, the Proposed Grounds here rely on *Behbahani's* scaled filter approach—an approach that Challenged Patent's inventor expressly identified as an example of how one could adjust impedance to save power. “[A] patentee's admissions about the scope and content of the prior art provide a factual foundation

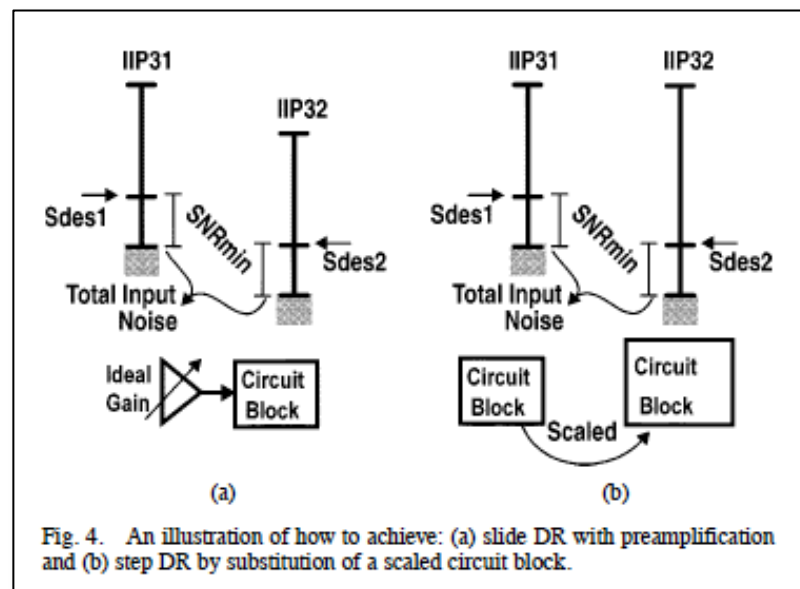
¹⁰ As discussed in more detail with reference to the *Tan* paper, a POSITA would have understood that decreasing transconductance in filters was generally accompanied by an increased resistance. *Dec.*, ¶¶124-28. Accordingly, a POSITA would have understood that the January 2003 article's dynamic filter that maintains the same frequency response by ***decreasing transconductance*** and decreasing capacitance is analogous to the '202 Patent's dynamic filter that maintains the same frequency response by ***increasing resistance*** and decreasing capacitance. *Id.*

as to what a skilled artisan would have known at the time of invention[.]” *Qualcomm Inc. v. Apple Inc.*, 24 F.4th 1367, 1376 (Fed. Cir. 2022).

B. Switching From *Behbahani*’s High-Power Filter to Low-Power Filter Increases Signal Path Impedance and Reduces DC Bias Current.

As explained above, *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. *Behbahani*, 1205. 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.*, 1206-07.

Fig. 4(b) below illustrates switching from the low-power filter to high-power filter to expand the DR when worst-case conditions are encountered:



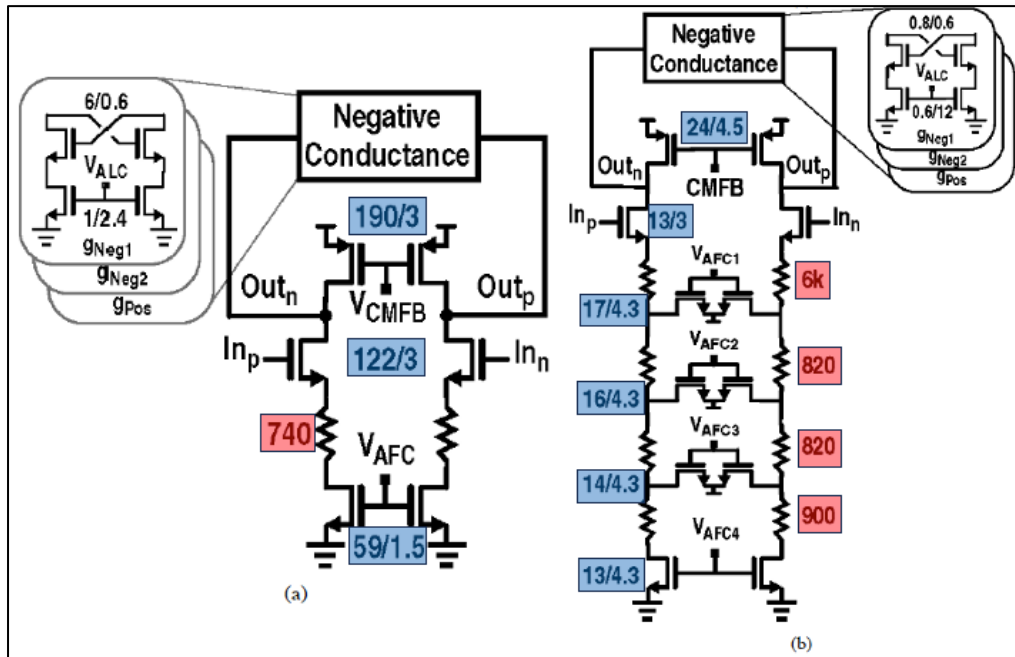
Id. at 1206. A POSITA would understand that switching back—from the high-power filter to the low-power filter—when conditions improve is one means through which *Behbahani*'s system saves power during periods of better than worst-case conditions. *Dec.*, ¶¶129-132. Indeed, *Behbahani* expressly teaches that the high-power filter is used *only* during the infrequent periods of worst-case conditions. *Behbahani*, 1205 (“An important idea here . . . is that providing no more than the required DR at any given time lowers the average power consumption.”), 1207 (“[A] BPF dissipating low power is employed for nominal RX DR. However, in the worst-case scenario, the high-power scaled filter is switched in raising total DR. Since the worst-case scenario is infrequent, the low-power filter determines the average RX power consumption.”); *Dec.*, ¶¶129-132 (discussing the same).

Scaling circuits was a well-known technique at the time. *Dec.*, ¶¶133-136 (discussing state of the art). As *Behbahani* explains, “[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.” *Behbahani*, 1207. *Behbahani* provides some detail about the scaled filters, including that its high-power filter “[s]cale[s] up all transistors[,]” while “scaling down all resistors by the same factor,” which “**raises bias current** proportional to the scale factor.” *Id.*, 1206. *Behbahani* also explains that the filter input capacitance scales proportionately, noting the “filter

input capacitance [] is, respectively, 0.4 and 4 pF for the low-power and the high-power versions.” *Id.*, 1208.

Tan provides additional details about the scaled filters discussed in *Behbahani*, and these additional details confirm that transitioning from the high-power to low-power filter increases signal path impedance and reduces bias current. As with the *Leete* reference, *Behbahani* and *Tan* describe different aspects of the same circuit, and a POSITA would have been motivated to combine their teachings. *Dec.*, ¶138 (explaining that the authors intended *Behbahani*’s and *Tan*’s teachings to be used conjunctively and concluding that a POSITA would have expected success in doing so, as the authors intended). *Behbahani* notes that additional “details of the [filter] design are presented elsewhere [7].” *Behbahani*, 1210. [7] is a reference to *Tan*. *Id.*, 1216.

As suggested, *Tan* does in fact provide more detail on the scaled filter design used by the *Behbahani* receiver. For example, *Tan* proposes scaled G_m - C filters. *Tan*, 477. *Tan* notes that the “electrical characteristics of the G_m - C filter strongly depend on the G_m circuit.” *Id.* Examining the G_m circuit that important defines the overall filter characteristics reveals that the proposed low-power filter does in fact have lower transconductance, higher resistance, lower capacitance, and a lower bias current. *Dec.*, ¶¶139-147. Figs. 6(a) and 6(b) below illustrate how the transconductances and resistances vary together in the proposed scaled filters:



Tan, Figs. 6(a)-(b) (annotated). Annotated blue above, the transistor Width/Length ratio is directly related to transconductance, with a higher W/L ratio resulting in a higher transconductance. Dec., ¶¶139-147. In the above example, we see W/L ratios ranging between 40-60 for the low-noise (high-power) filter stage depicted in Fig. 6(a) and much smaller W/L ratios ranging between 3-5.3 for the low-power filter stage depicted in Fig. 6(b). *Id.* (identifying a more than ten times increase in transconductance with the high-power stage). Annotated red above, resistance has an inverse relationship to transconductance. For example, Fig. 6(a)'s higher transconductance is accompanied by a relatively small 740 Ohms in one leg of the circuit, while Fig. 6(b)'s lower transconductance is accompanied by a much higher 8,540 Ohms in one leg of its circuit. *Id.* A POSITA would have understood that the inverse relationship between transconductance and resistance was well known at the

time. *Id.* (explaining that higher current capability of high transconductance transistors is typically paired with the low resistance to that higher current in the form of smaller resistors).

Consistent with *Behbahani's* own teachings, *Tan* describes a low-power filter that exhibits “the same frequency response and linearity” as the high-power filter, but that scales all “transconductances and capacitors in th[e] filter . . . by a factor of 10” and “consumes 10x lower power.” *Tan*, 480. *Tan* also confirms that the high-power filter utilizes a higher transconductance G_m (accompanied by lower resistance), higher capacitance, and higher bias current. *Id.* at 481; *Dec.*, ¶¶139-147 (explaining how *Tan's* teachings confirm that the signal path impedance changes when switching between scaled filters).

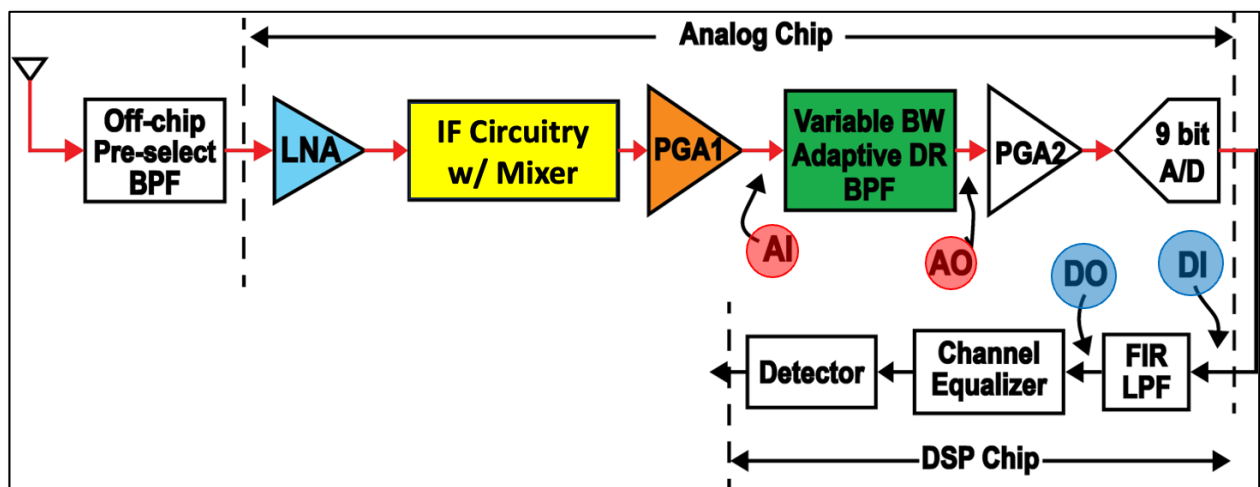
In sum, *Behbahani's* low-power filter has higher resistance (accompanying a lower transconductance), lower capacitance, and lower bias current than its high-power filter. *Dec.*, ¶147. This is precisely the arrangement disclosed in the '202 Patent and Dr. Tsividis' January 2003 paper. *Compare* '202 Patent, Fig. 6, 7:49-8:5 (describing a filter with increased resistance and decreased capacitance, which allows lower bias and drive currents), *with* Ex. 1011, 70 (describing a filter with lower capacitance and transconductances (accompanying higher resistance) that “allows one to lower I_{BIAS} ”). A POSITA would have understood that, consistent with the '202 Patent and its inventors own publications, 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.

Dec., ¶147.

C. *Behbahani* Switches From a High-Power Filter to a Low-Power Filter Responsive to the Signal Strength Measurement Comparison

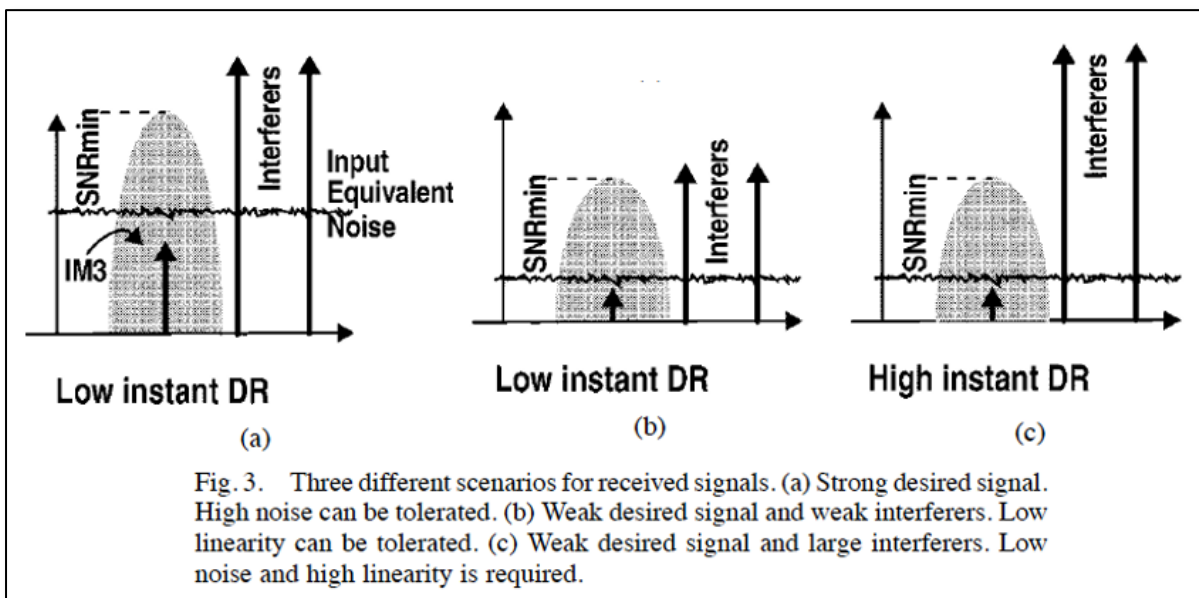
As described above with reference to limitation [1(b)], *Behbahani* takes multiple signal strength measurements to ascertain desired and interferer signal conditions, including at a signal strength measured at node A_I (annotated in red) located in the signal path before the analog filter and a signal strength measured at node A_O (annotated in red) located in the signal path after the analog filter:



Behbahani modified by *Leete*, Figure 2 (annotated). Like the '202 Patent, *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]." *Behbahani*, 1207. *Behbahani* also measures the output of the digital filter (D_O ,

annotated blue), which indicates the absolute signal strength of a received desired signal. *Id.*

Behbahani explains that a weak desired signal (i.e., a low D_0) and significantly different levels at nodes A_I and A_O indicates worst case conditions as depicted in Fig. 3(c) below. *Id.* (“If the signal levels are significantly different at . . . the above pairs of nodes (A_I and A_O . . .) and there is a weak signal at D_0 , the condition must be the one shown in Fig. 3(c).”).



Id., Fig. 3 (rearranged).

When such worst-case conditions are experienced, *Behbahani's* switched DR process uses the high-power filter to expand the DR and accommodate a low desired signal and high interferers. *Id.*, 1206. And, when signal strength measurements indicate better than worst-case conditions, *Behbahani's* system switches in the low-power filter, saving power, and implements the sliding DR process to track the

desired signal strength. *Id.*; see also *Dec.*, ¶¶153-57 (confirming *Behbahani*'s use of signal strength measurements to implement sliding DR and switched DR.).

Accordingly, a POSITA would have understood that switching from the high-power filter to low-power filter is based on signal strength measurements of the desired and interferer signal strengths taken at multiple points in the receiver signal path of the wireless transceiver. *Dec.*, ¶¶157-58.

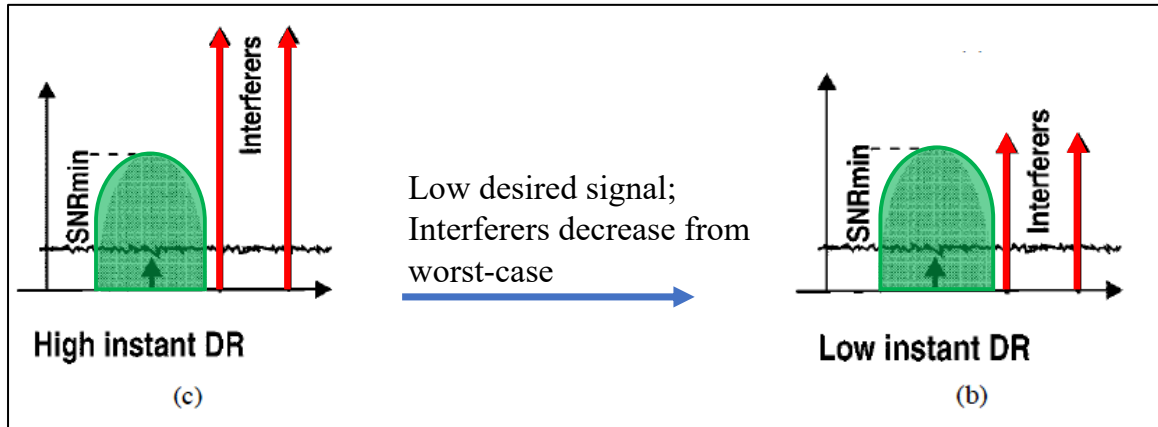
2. Claim 2

Claim 2: “The method of claim 1, wherein when the strength of the interferer signal decreases over time, and the strength of the desired signal is low, dynamically decreasing the bias of at least one of the plurality of circuits in the receiver signal path.”

As explained above with reference to limitations [1(Pre)(a)] through [1(b)] *Behbahani* teaches an “adaptive dynamic range” method of saving power by switching from a high-power to a low-power filter when signal conditions sufficiently improve from worst-case. This switch dynamically (1) increases signal path impedance and (2) decreases DC bias current in the filter.

Claim 2 captures a scenario in which the system starts out experiencing worst-case conditions (i.e., low desired and high interferers), but improves over time as the strength of the interferers weaken. *Behbahani* expressly contemplates this precise scenario. Namely, as shown in annotated Fig. 3 below, the transition from worst-case conditions (e.g., Fig. 3(c)) to the improved conditions depicted in Fig. 3(b)

retains a low desired signal strength and the improvement is realized by interferer signal strength weakening over time:



Behbahani, Fig. 3(b), (c) (annotated); *Dec.*, ¶160 (explaining the same). Assuming a starting point of worst case (Fig. 3(c)), when interferer signal strength decreases sufficiently above a worst case (even absent any change in the desired signal strength), *Behbahani*'s system switches from the high-power filter to the low-power filter, decreasing DC bias current and saving power. *Dec.*, ¶160.

3. Claim 4

Claim 4: “The method of claim 1 wherein when the strength of the interferer signal is low and the strength of the desired signal increases over time, dynamically increasing the impedance of one or more of the plurality of circuits in the receiver signal path.”

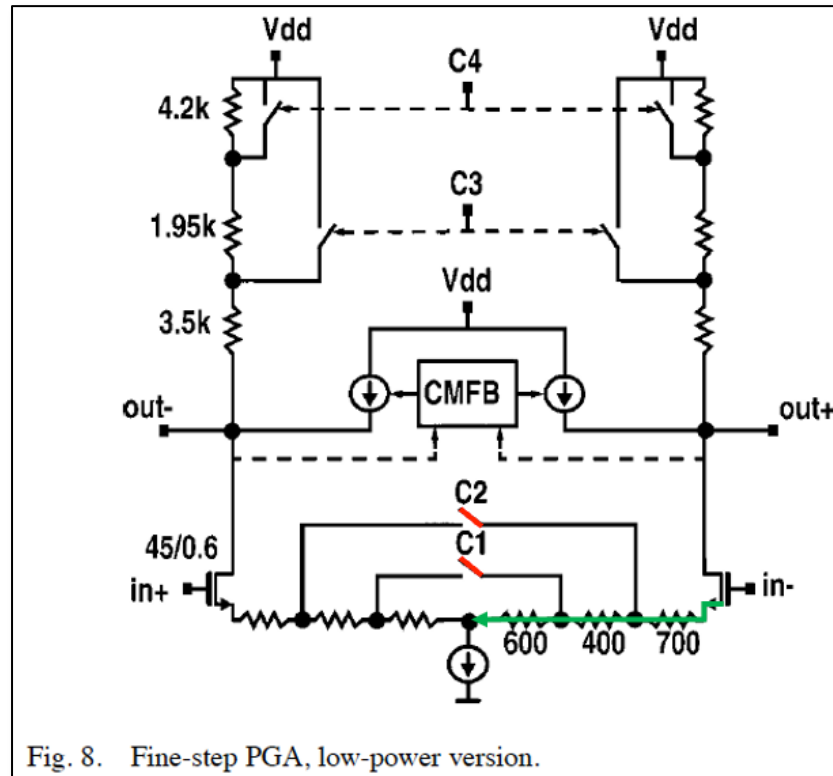
As explained above with reference to Claim 1(b), *Behbahani* explains that the high-power filter is used for a range of worst-case conditions (e.g., Fig. 3(c)) and the low-power filter is used when conditions have sufficiently improved. *Behbahani* 1206; *Dec.*, ¶161. Claims 4, 5, and 8 address specific signal conditions in which the

low-power filter is in use and the system dynamically adjusts either DC bias or signal path impedance to reflect the desired signal strength changing over time. As set forth above with reference to Claim 1(Pre)(b), when 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. *Behbahani*, 1206-07. *Behbahani* teaches (1) increasing gain at PGA1 to slide the smaller dynamic range up when a “[s]trong desired signal” is received and (2) decreasing the gain, “enabl[ing] detection of a weaker signal.” *Id.*, 1206. *Leete* similarly teaches that “[t]he gain of the RF mixer and IF amplifier is switchable to slide the available dynamic range of the following stages based on the conditions of the input signal.” *Leete*, 1908 (Abstract); *see also id.*, 1912 (explaining that “Table II shows the characteristics of the IF1 amplifier with two gain settings” used to “slide dynamic range”).

As set forth above with reference to Claim 1(Pre)(a), a POSITA would have been motivated to treat the teachings of *Behbahani* and *Leete* conjunctively, as the authors intended. Those arguments apply equally here and support concluding that a POSITA would have implemented the gain-based sliding DR teachings from *Leete* in *Behbahani's* receiver and would have expected success in doing so. *Dec.*, ¶164 (reiterating that the references are in fact describing different aspects of the same receiver). A POSITA would have understood that implementing gain adjustments at

different points along the signal path in the receiver provides the benefit of optimizing dynamic range under prevailing conditions. *Id.* (concluding that *Behbahani*'s sliding DR was intended to be implemented via gain adjustments at the IF1 amplifier and RF mixer, as described by *Leete*, and at PGA1, as described by *Behbahani*).

Claim 4 recites a better than worst-case condition where the desired signal strength increases over time. Per *Behbahani*'s sliding DR teachings, gain is decreased to reflect increasing desired signal strength. *Behbahani*, 1206; *Dec.*, ¶165. As discussed in Section III.C, Theta proposed "impedance" means "opposition to the flow of alternating current." For purposes of mapping Claims 4 and 8, Petitioner asks the Board to adopt Theta's interpretation of this term. Under this interpretation, when gain is decreased at PGA1 to reflect an increasing desired signal, the signal path opposition to the flow of alternating current is increased, as claimed. Namely, *Behbahani* explains that Fig. 8 depicts PGA1 in which gain is varied in 3dB steps. *Behbahani*, 1208 (noting the PGA is a degenerated differential pair with resistive load). As set forth in Fig. 8 below, switches C1 and C2 are used to adjust the level of degeneration and switches C3 and C4 are used to adjust the load resistance:



Id., Fig. 8 (annotated); *Dec.*, ¶¶165-166 (explaining the same). *Behbahani* explains that switches C1 and C2 are **open** at the lowest gain setting, which results in the highest degeneration resistance—all **three resistors in series** between the MOSFET source and current source. *Behbahani*, 1208 (noting the low gain setting results in “maximum degeneration”). This setting is annotated in the above Fig. 8. A POSITA would have understood that these series resistors do in fact oppose the AC signal current developed by the MOSFET transistors in PGA1. *Dec.*, ¶¶167-168 (explaining the well-understood concept of degeneration in this context and concluding that increased degeneration resistance, resulting from lowering the gain of PGA1, would in fact have increased “impedance” as Theta has proposed

interpreting the term in parallel litigation). Accordingly, when *Behbahani's* receiver is operating in better than worst-case conditions, using the low-power filter, and the desired signal increases, gain at PGA1 is lowered, sliding the smaller DR up and increasing the opposition to alternative current within PGA1. *Id.*, ¶169.

4. Claim 5

Claim 5: “The method of claim 1, wherein when the interferer signal is weak and the desired signal is low and the strength of the desired signal increases over time, dynamically decreasing the bias of one or more of the plurality of circuits in the receiver signal path.”

As explained above with reference to Claim 4, per *Behbahani's* sliding DR teachings, gain is decreased to reflect increasing desired signal strength, and a POSITA would have been motivated to implement *Behbahani's* sliding DR via gain adjustments at the IF1 amplifier and RF mixer, as described by *Leete*, and at PGA1, as described by *Behbahani*.

Satisfying Claim 5's decreased DC bias requirement, decreasing gain in the IF1 amplifier does in fact lower its DC bias current. *Dec.*, ¶171. Indeed, Table II below expressly discloses that the **lower gain setting** in the IF1 amplifier has a lower DC bias current than the **higher gain setting**:

TABLE II
SIMULATION RESULTS OF THE IF1 AMPLIFIER AND BUFFER

W_{eff} (μm)	I_{bias} (mA)	Gain (dB)	V_n diff (nV/ $\sqrt{\text{Hz}}$)	IIP3 (dBm)
40	6.2	6	4.6	15
70	8.5	10	3.5	10.5

Leete, Table II (annotated), 1912; *Dec.*, ¶171 (describing the same).

5. Claim 6

*Claim 6 (Pre)*¹¹

See limitation [1(Pre)(a)]. Claim 6 uses slightly different language than Claim 1 to describe its claimed receiver. Namely, Claim 6 recites “a receiver in a battery operated *mobile device*,” and Claim 1 recites “a receiver of a battery operated *transceiver*.” A POSITA would understand that these are immaterially different ways to describe the same concept. *Dec.*, ¶172. Further, as explained in the preamble discussion above, a POSITA would have understood *Behbahani*’s receiver circuitry is intended to be used in a mobile device with a complete transceiver or at least would have been motivated to implement *Behbahani*’s receiver circuitry in a mobile device with a complete transceiver. *Id.*

¹¹ All claim language is provided in a claim appendix below.

Claim 6 (a)

See limitation [1(a)]. Claim 6 (a) uses slightly different language than Claim 1 to describe its claimed received signal. Namely, Claim 6 recites “receiving a *wireless* signal...*at the receiver*” and Claim 1 recites “receiving a signal.” A POSITA would have understood and found obvious that *Behbahani*’s claimed wireless receiver would satisfy receiving a wireless signal at the receiver and that the Claim 1 mapping also satisfies limitation [6(a)]. *Dec.*, ¶173.

Claim 6(b)

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used when conditions have sufficiently improved beyond worst-case conditions. *Behbahani* 1206; *Dec.*, ¶174. Limitation [6(b)] recites a better than worst-case condition where the interferers are weak and desired signal strength is greater than the interferer signal. Per *Behbahani*’s adaptive DR teachings, such a scenario would save power above worst-case conditions by switching from the high-power filter to the low-power filter, dynamically increasing an impedance of the filter in the signal path. *Dec.*, ¶174.

6. Claim 7

Claim 7 (Pre)(a)

See limitation [1(Pre)(a)]. Claim 7 uses slightly different language than Claim 1 to describe its claimed method for power dissipation. Namely, limitation [7(Pre)(a)] recites “a method for power dissipation control in a receiver,” and Claim 1 recites “a method of reducing the power consumption of a receiver.” A POSITA would have understood that this are immaterially different ways to describe a method for power dissipation by reducing power usage in a receiver and that the Claim 1 mapping satisfies limitation [7(Pre)(a)]. *Dec.*, ¶¶175-176. Further, limitation [7(Pre)(a)] recites “a receiver of a *wireless* transceiver of a battery-powered portable wireless device,” and Claim 1 recites “a receiver of a battery operated transceiver.” A POSITA would have understood and found obvious that *Behbahani’s* wireless receiver would satisfy both types of receivers and that the Claim 1 mapping also satisfies limitation [7(Pre)(a)]. *Dec.*, ¶176.

Claim 7(Pre)(b)

See limitation [1(a)].

Claim 7(Pre)(c)

See limitation [1(Pre)(b)].

Claim 7 (a)

See limitation [6(a)].

Claim 7 (b)

See limitation [1(b)]. As discussed above, based on a comparison of desired and interferer signal strength, *Behbahani* dynamically increases impedance of the filter responsive to detecting that the circuits are functioning at better than the worst-case condition.

7. Claim 8

Claim 8

See Claim 4. As set forth in the Claim 4 mapping above, PGA1 gain is decreased to reflect increasing desired signal strength, producing an increased “impedance” under Theta’s proposed interpretation of this term. And, as set forth in the Claim 5 mapping above, gain would also be decreased in the IF1 amplifier, decreasing DC bias current in that circuit. A POSITA would have understood that the lower bias current and lower gain would have reduced power dissipation in *Behbahani*’s receiver. *Dec.*, ¶¶182-184 (discussing *Behbahani*’s overall power saving mechanisms and concluding that sliding a smaller DR by decreasing gain to reflect improved desired signal strength decreases average power dissipation).

8. Claim 9

Claim 9

Claim 9 recites a scenario in which the desired signal is low and the interferers are high, but the overall conditions are not the absolute worst-case. From this near-worst-case state, the interferer signal strength reduces and the system responds by

reducing DC bias current to save power. As set forth in Section VI.A and with reference to Claim 1(b), *Behbahani*'s "high-power filter" is used during the range of worst-case signal conditions, and a separate "low-power filter" is used when conditions have sufficiently improved. A POSITA would have understood that *Behbahani*'s range of worst-case conditions captures the scenario recited in Claim 9—where the conditions are bad, but not the absolute worst-case. *Dec.*, ¶186. Per *Behbahani*'s adaptive DR teachings, when the interferers reduce from this bad state, as Claim 9 requires, the high-power filter is replaced with a low-power filter, decreasing the DR and saving power. *Id.*, ¶187 (discussing Dr. Tsividis' literature regarding the power savings that result from lowering DC bias current and concluding that at least the average current usage is reduce, reducing power dissipation); *see also* Claim 2.

9. Claim 10

Claim 10

See limitation [1(b)]. A POSITA would have understood that *Behbahani*'s method for lowering the average power consumption in the receiver results in power dissipation reduction, and in a corresponding reduction in a drain on battery life of the battery powered portable wireless device. *Dec.*, ¶188. Indeed, the whole point of saving power pursuant to *Behbahani*'s teachings is to decrease the drain on battery life of the wireless device within which the receiver is installed. *Id.*

10. Claim 11

Claim 11 (Pre)(a)

See limitation [7(Pre)(a)].

Claim 11(Pre)(b)

See limitation [1(Pre)(b)]. Claim 11 uses slightly different language than Claim 1 to describe its claimed method for power dissipation. Namely, limitation [11(Pre)(b)] recites “the plurality of circuits designed to function *under at least a worst case condition*[,]” and Claim 1 recites “the plurality of circuits are designed to function *between a worst-case operating condition and a best case operating condition*[.]” A POSITA would have understood and found obvious that *Behbahani’s* plurality of circuits are designed to function under a range of signal conditions including a worst-case condition, a best-case condition, and in between. *Dec.*, ¶191.

Claim 11(a)

See limitation [6(a)].

Claim 11(b)

See Claim 1(b) (establishing that low desired and low interferers are better than worst-case and that bias current is dynamically decreased when transitioning from the high-power filter to low-power filter (e.g., when conditions improve sufficiently from worst-case), saving power.

11. Claim 12

Claim 12 (Pre)

See limitation [7(Pre)(a)]; Claim 11(Pre)(b).

Claim 12 (a)

See limitation [6(a)].

Claim 12(b)

As explained above with reference to limitations [1(b)], *Behbahani* explains that the high-power filter is used for a range of worst-case conditions (e.g., Fig. 3(c)) and the low-power filter is used when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶196. Limitation [12(b)] recites dynamically increasing impedance from worst-case conditions (i.e., the impedance of the high-power filter) *when* the system detects a best-case condition where the desired signal is strong, and the interferers are weak. Per *Behbahani*'s adaptive DR teachings, such a scenario would save power above worst-case conditions by switching from the high-power filter to the low-power filter, increasing an impedance of the filter in the signal path. *Dec.*, ¶¶196-197; *see also* Claim 4.

12. Claim 13

Claim 13 (Pre)

See limitation [7(Pre)(a)].

Claim 13 (a)

See limitation [6(a)].

Claim 13 (b)

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used for all other conditions, i.e., when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶200. Limitation [13(b)] recites a worst-case condition where the desired signal is low, and the interferer is high. Per *Behbahani*'s adaptive DR teachings, such a scenario would control power dissipation of the receiver by using the high-power filter, dynamically increasing a DC bias current. *Dec.*, ¶200.

13. Claim 14

Claim 14 (Pre)(a)

See limitation [7(Pre)(a)]; limitation [1(b)].

Claim 14 (Pre)(b)

See limitation [1(Pre)(b)] through limitation [1(b)].

Claim 14 (a)

See limitation [6(a)].

Claim 14 (b)

See limitations [1(b)], [12(b)]; *see also* Claims 4, 5.

14. Claim 15

Claim 15

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used for all other conditions, i.e., when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶205. Claim 15 recites two better than worst case signal condition scenarios: (1) where the desired signal is low, and the interferers are weaker than in worst case conditions, and (2) where the interferers are high and the desired signal is higher than in worst case conditions. Per *Behbahani*'s adaptive DR teachings, both scenarios would save power above worst-case conditions by switching from the high-power filter to the low-power filter, dynamically reducing a DC bias current and increasing an impedance in the signal path. *Dec.*, ¶205; *see* limitation [1(b)].

15. Claim 16

Claim 16 (Pre)(a)

See limitation [7(Pre)(a)]. Claim 16 uses slightly different language than limitation [7(Pre)(a)] to describe its claimed method for power dissipation. Namely, Claim 16 recites a “method for power dissipation *optimization* in a receiver,” and limitation [7(Pre)(a)] recites an a “method for power dissipation *control* in a

receiver.” A POSITA would understand that these are immaterially different ways to describe the same concept. *Dec.*, ¶206.

Claim 16 (Pre)(b)

See limitation [1(Pre)(b)].

Claim 16 (a)

See limitation [6(a)].

Claim 16 (b)

See limitation [7(b)].

16. Claim 17

Claim 17

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶210. Claim 17 recites two signal condition scenarios: (1) where the desired signal is low, and the interferers signal is increasing—requiring dynamically *increasing* a bias current in the signal path, and (2) where the desired signal is low and the interferers are decreasing—requiring dynamically *decreasing* a bias current in the signal path. A POSITA would have understood and found obvious that the first scenario recites a worst-case condition where per *Behbahani*’s adaptive DR teachings such a scenario would optimize

power dissipation by using its high-power filter—dynamically increasing a DC bias current. *Dec.*, ¶¶210-13. And the second scenario recites better than worse case conditions, where *Behbahani*'s system would optimize power dissipation by switching from high power filter to the low power filter—dynamically increasing a DC bias current, thereby satisfying Claim 17. *Id.*, ¶¶210-14

17. Claim 18

Claim 18 (Pre)(a)

See limitation [7(Pre)(a)].

Claim 18 (Pre)(b)

See limitation [1(Pre)(b)].

Claim 18 (a)

See limitation [6(a)].

Claim 18 (b)

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used for all other conditions, i.e., when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶218. Limitation [18(b)] recites a better than worst case scenario where the interferer signal is low, and the desired signal is higher than the worst-case operating signal condition. Per *Behbahani*'s adaptive DR teachings, such a scenario would save power above worst-

case conditions by switching from the high-power filter to the low-power filter. *Dec.*, ¶218.

18. Claim 19

Claim 19 (Pre)(a)

See limitations [16(Pre)(a)-(b)]; [1(b)]. Claim 19 uses slightly different language than Claim 16 to describe its claimed method for power dissipation. Namely, Claim 19 recites “a plurality of circuits designed to function under operating signal conditions that vary based on relative signal strengths of an interferer signal and a desired signal” and Claim 16 recites a “plurality of circuits are designed to function between a worst-case operating condition and a best case operating condition.” A POSITA would understand that these are immaterially different ways to describe the same concept. *Dec.*, ¶219.

Claim 19 (Pre)(b)

See limitation [16(Pre)(b)]

Claim 19 (a)

See limitation [6(a)].

Claim 19 (b)

See limitation [16(b)].

19. Claim 20

Claim 20

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used for all other conditions, i.e., when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶223. Claim 20 recites a better than worst case scenario where the desired signal is low, but the operating signal condition is still better than the worst-case. Per *Behbahani's* adaptive DR teachings, such a scenario would save power above worst-case conditions by switching from the high-power filter to the low-power filter, reducing DC bias current in the signal path. *Dec.*, ¶¶223-224.

20. Claim 21

Claim 21

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used for all other conditions, i.e., when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶225. Claim 21 recites a better than worst case scenario where the interferer signal decreases over time. Per *Behbahani's* adaptive DR teachings, such a scenario would save power above worst-case conditions by switching from the high-power filter to the low-power filter, reducing DC bias current in the signal path. *Dec.*, ¶225.

21. Claim 22

Claim 22 (Pre)(a)

See limitation [19 (Pre)(a)]

Claim 22 (Pre)(b)

See limitation [19(Pre)(b)].

Claim 22 (a)

See limitation [6(a)]

Claim 22 (b)

As explained above with reference to limitation [1(b)], *Behbahani* explains that the high-power filter is used for worst-case conditions (Fig. 3(c)) and the low-power filter is used for all other conditions, i.e., when conditions have sufficiently improved beyond worst-case conditions. *Behbahani*, 1206; *Dec.*, ¶229. Limitation [22(b)] recites a scenario where the interferer signal is high, but the signal conditions are still better than worst case conditions. Per *Behbahani*'s adaptive DR teachings, such a scenario would save power above worst-case conditions by switching from the high-power filter to the low-power filter, dynamically increasing an impedance in the signal path. *Dec.*, ¶229.

22. Claim 23

Claim 23

See limitation [1(b)]., Claim 4. *Dec.*, ¶¶230-32.

VI. DISCRETION UNDER 35 U.S.C. §325(d)

The Board uses a two-part framework for evaluating arguments under § 325(d):

- (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 either condition of first part of the framework is satisfied, 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*”).

The Proposed Grounds rely on *Behbahani* and *Tan*, which were cited on the face of the '202 Patent, but were not discussed by the Examiner during prosecution. The fact that neither reference was applied in a rejection weighs strongly against denying institution under § 325(d). See *CrowdStrike, Inc. v. Webroot Inc.*, IPR2023-00126, Paper 9 at 14 (PTAB May 5, 2023) (“[the Board] cannot determine the extent to which [cited reference] was evaluated during the examination because it was never used in a rejection” and because “[cited reference] was not the basis of a rejection, there is no overlap of arguments.”); *Scientific Design Co. Inc. v. Shell Oil Co.*, IPR2022-00158, Paper 7 at 24-26 (PTAB Apr. 4, 2022) (declining to exercise discretion under § 325(d) based on “credit[ing] Petitioner’s argument that although

the references ‘were cited in an IDS, together with 111 references, none of them was used in any rejections, or otherwise addressed by the examiner’”); *Bowtech, Inc. v. MCP IP, LLC*, IPR2019-00379, Paper 14 at 18 (PTAB Jul. 3, 2019) (“[the Board has] consistently held that a reference that was neither applied against the claims nor discussed by the Examiner does not weigh in favor of exercising our discretion under § 325(d).”).

As 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. When a reference was never “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.” *Quasar Science LLC v. Colt International Clothing, Inc. d/b/a Colt LED*, IPR2023-00611, Paper 10 at 14 (PTAB Oct. 10, 2023) (“Quasar”).

Therefore, denial under 35 U.S.C. § 325(d) is not warranted.

VII. DISCRETIONARY DENIAL IS NOT WARRANTED

A. The *General Plastic* Factors Favor Institution

The Board set forth seven factors it considers in determining whether to exercise discretion to deny a petition under § 314(a). *General Plastic Industrial Co.*,

Ltd. v. Canon Kabushiki Kaisha, IPR2016-01357, Paper 19 at 15-19 (PTAB Sept. 6, 2017) (precedential). Here, these factors weigh heavily in favor of institution.

There is one prior PTAB challenge to the '202 Patent—*Lenovo et al., v. Theta IP, LLC*, IPR2023-00698. With respect to the first five *General Plastic* factors, it weighs against a discretionary denial that Apple is not a party to any prior IPR, that this is Apple's first IPR challenge to the '202 Patent, and that Apple did not coordinate with *Lenovo et al.*, in any way. *See Unified Patents, Inc. v. Certified Measurement, LLC*, IPR2018-00548, Paper 7 at 7-8 (PTAB Sept. 5, 2018); *see also Foursquare Labs, Inc. v. Mimzi LLC*, IPR2019-01287, Paper 11 (PTAB Jan. 14, 2020) (petitioners individually sued with no evidence of coordination weighed against denying institution); *see Alcatel-Lucent USA Inc. v. Oyster Optics, LLC*, Case IPR2017-02146, slip op. at 12 (PTAB Feb. 28, 2018) (Paper 12) ("Once resolution of factor 1 indicates that Petitioner had not previously filed a petition against the same patent, factors 2– 5 bear little relevance.").

Relevant to factor (3), Apple is not using the earlier proceedings as a "roadmap" here. Apple employs entirely different art, different arguments and a different expert. Apple makes no use of the art, argument, responses, or holdings in the *Lenovo* IPR to "refine" failed arguments there. *See Toshiba Am. Info. Sys., Inc. v. Walletex Microelectronics Ltd.*, IPR2018-01538, Paper 11 at 20-21 (PTAB Mar. 5, 2019) ("apply[ing] different prior art ... based on different arguments, made by different a

petitioner,” does not amount to “a roadmap in a manner unfair to Patent Owner.”); *see Google LLC v. Realtime Adaptive Streaming, LLC*, IPR2019-01036, Paper 9 at 10-12 (PTAB Nov. 13, 2019) (finding Factor Three is “neutral or slightly favors institution” when prior IPR was instituted, there was no “readily apparent ‘unfair benefit’ obtained through use of [the] Institution Decision” from the prior IPR).

As to the sixth factor, the instant petition respects the finite resources of the Board. The Petition presents non-cumulative Grounds with new art. In IPR2023-00698, *Lenovo et al.*, challenged the patentability of the ’202 patent under 35 U.S.C. §102(b) and § 103(a). *Lenovo* relied on *Rauhala* and a combination of *Rauhala* and *Saito*. None of the references used by *Lenovo* are relied upon in this instant challenge. Petitioner presents one ground of unpatentability of the Challenged Claims in view of new art: *Behbahani* in view of *Leete* and *Tan*. Petitioner’s combination is fundamentally different than the grounds raised in IPR2023-00698 and therefore presents non-cumulative art with fundamentally different disclosures.

Regarding the seventh factor, there is no readily identifiable roadblock for the Board to issue a final determination within the statutory one-year limit.

Accordingly, the Board should reach the merits of this petition, and institute review of all Challenged Claims.

B. The *Fintiv* Factors Favor Institution

Per the Interim *Fintiv* Guidance (“*Fintiv Memo*”),¹² “the PTAB will not discretionarily deny institution of an IPR . . . where a petitioner” proffers a *Sotera* stipulation. *Fintiv Memo*, 7. Petitioner stipulates that, if the instant IPR is instituted, it will not pursue invalidity grounds against the Challenged Claims in the parallel district court proceeding that were brought in the petition or that could have reasonably been raised in the petition. Accordingly, the Board should not discretionarily deny institution under *Fintiv*.

VIII. CONCLUSION

For the forgoing reasons, Petitioner respectfully requests *inter partes* review of the Challenged Claims.

Respectfully submitted,

By: /s/ Paul R. Hart

Paul R. Hart, Reg. No. 59,646

COUNSEL FOR PETITIONER

¹²https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

IX. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1)

Petitioner is the real party-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The '202 Patent is presently the subject of a patent infringement lawsuit filed against Petitioner in the United States District Court for the Western District of Texas, *Theta IP, LLC v. Apple Inc.*, Case No. 6:23-cv-00314. Petitioner understands the '202 Patent has also been asserted in the following matters:

- *Lenovo et al., v. Theta IP, LLC*, IPR2023-00698, instituted.
- *Theta IP, LLC v. Motorola Mobility LLC et al.*, in the United States District Court for the Northern District of Illinois, Case No. 1:22-cv-3441.
- *Theta IP, LLC v. Samsung Electronics Co. LTD., et al.*, in the United States District Court for the Western District of Texas, Case No. 6:20-cv-00160, dismissed.

Family members of the '202 Patent have also been challenged in the following PTAB proceedings:

- U.S. Patent No. 10,129,825 challenged in *Lenovo et al., v. Theta IP, LLC*, IPR2023-00697, instituted.
- U.S. Patent No. 7,010,330 challenged in *Lenovo et al., v. Theta IP, LLC*, IPR2023-00694, denied institution.

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation and service information for lead and back-up counsel. 37 C.F.R. § 42.8(b)(3) and (b)(4).

Lead Counsel	Back-Up Counsel
Paul R. Hart, (Reg. No. 59,646) Paul.Hart@eriseip.com <u>Postal and Hand-Delivery Address:</u> ERISE IP, P.A. 717 17 th St., Suite 1400 Denver, Colorado 80202 Telephone: (913) 777-5600 Fax: (913) 777-5601	Adam P. Seitz (Reg. No. 52,206) Adam.Seitz@eriseip.com <u>Postal and Hand-Delivery Address:</u> ERISE IP, P.A. 7015 College Blvd., Suite 700 Overland Park, Kansas 66211 Telephone: (913) 777-5600 Fax: (913) 777-5601

APPENDIX OF EXHIBITS

Exhibit 1001	U.S. Patent No. 10,524,202 (the “’202 Patent”)
Exhibit 1002	File History for U.S. Patent 10,524,202 (the “’202 <i>File History</i> ”)
Exhibit 1003	Asad Abidi Declaration (“ <i>Dec.</i> ”)
Exhibit 1004	Farbod Behbahani et al., <i>Adaptive Analog IF Signal Processor for a Wide-Band CMOS Wireless Receiver</i> , 36 IEEE Journal of Solid-State Circuits 1205, (Aug. 2001) (“ <i>Behbahani</i> ”)
Exhibit 1005	Farbod Behbahani et al., <i>A 2.4-GHz Low-IF Receiver for Wideband WLAN in 0.6μm CMOS – Architecture and Front-End</i> , 35 IEEE Journal of Solid-State Circuits 1908, (Dec. 2000) (“ <i>Leete</i> ”)
Exhibit 1006	Farbod Behbahani et al., <i>A Broad-Band Tunable CMOS Channel-Select Filter for a Low-IF Wireless Receiver</i> , 35 IEEE Journal of Solid-State Circuits 476, (April 2000) (“ <i>Tan</i> ”)
Exhibit 1007	Theta IP, LLC’s Response Claim Construction Br., Dec. 08, 2023 (<i>Theta Markman Br.</i>)
Exhibit 1008	Joint Claim Construction Statement, Jan. 18, 2024 (<i>Joint Markman Statement</i>)
Exhibit 1009	Theta IP, LLC’s Sur-Reply Claim Construction Br., Jan. 16, 2024 (<i>Theta Markman Br. Sur-Reply</i>)
Exhibit 1010	<i>June A. Munford Declaration</i> (“ <i>Munford Dec.</i> ”)
Exhibit 1011	Y. Tsividis et al., <i>Internally Varying Analog Circuit Minimize Power Dissipation</i> , IEEE Circuits & Devices Magazine, Jan. 2003.
Exhibit 1012	Mihai Banu & Yannis Tsividis, <i>Fully Integrated Active RC Filters in Technology</i> , 18 IEEE Journal of Solid-State Circuits 644, (Dec. 1983) (“ <i>Fully Integrated</i> ”)
Exhibit 1013	Farbod Behbahani et. al, <i>An Adaptive 2.4GHz Low-IF Receiver in 0.6μm CMOS for Wideband Wireless LAN</i> , IEEE International Solid-State Circuits Conference, 2000 (“ <i>Kishigami</i> ”).
Exhibit 1014	U.S. Patent No. 6,335,952 to Lee et al. (“ <i>Lee</i> ”)
Exhibit 1015	Reinhold Ludwig, et. al, <i>RF Circuit Design</i> , 2000, (“ <i>Ludwig</i> ”)
Exhibit 1016	“AN-844 Integrated LNA and Mixer Basics” by Texas Instruments (April 1993) (“ <i>Texas</i> ”)
Exhibit 1017	U.S. Patent No. 6,498,927 to Kang et al. (“ <i>Kang</i> ”)
Exhibit 1018	<i>Intentionally left blank</i>
Exhibit 1019	Rex Miller & Mark R. Miller, <i>Barron’s Electronics The Easy Way</i> (4 th ed.) (2002) (“ <i>Barron</i> ”)
Exhibit 1020	<i>Intentionally left blank</i>

Exhibit 1021	Thomas Byunghak Cho & Paul R. Gray, <i>A 10 b, 20 Msample/s, 35 mW Pipeline A/D Converter</i> , IEEE Journal Of Solid-State Circuits Conference 166 (Mar. 1995) (“Cho”)
Exhibit 1022	<i>Intentionally left blank</i>
Exhibit 1023	Roubik Gregorian & Gabor C. Temes, <i>Analog MOS Integrated Circuits for Signal Processing</i> (Robert A. Johnson & George Szentirmai eds., 1986) (“Gregorian”)
Exhibit 1024	John Pritiskutch & Brett Hanson, <i>UNDERSTANDING LDMOS DEVICE FUNDAMENTALS</i> , AN1226 App. Note (July 2000) (“STMicroelectronics”)
Exhibit 1025	<i>Intentionally left blank</i>
Exhibit 1026	John G. Proakis & Masoud Salehi, <i>Communications Systems Engineering</i> , (1994) (“Proakis”)
Exhibit 1027	<i>Intentionally left blank</i>
Exhibit 1028	The Evolution of Wi-Fi Technology, IEEE Standards Association, (May 16, 2023) (“IEEE”)
Exhibit 1029	Kevin Werbach, <i>The New Wireless Paradigm</i> , Open Spectrum (October 2002) (“Werbach”)
Exhibit 1030	Robert G. Fichman et. al, <i>Information-Rich Commerce At A Crossroads: Business and Technology Adoption Requirements</i> , (July 2002) (“Fichman”)
Exhibit 1031	U.S. Patent No. 6,480,700 to Groe et al. (“Groe”)
Exhibit 1032	<i>Intentionally left blank</i>
Exhibit 1033	<i>The American Heritage Dictionary</i> (4 th ed., 2001) (“Heritage”)
Exhibit 1034	Rudolf F. Graf, <i>Modern Dictionary of Electronics</i> (7 th ed., 1999) (“Graf”)
Exhibit 1035	Arthur D. Spaulding et al, <i>Optimum Reception in an Impulsive Interference Environment-Part I: Coherent Detection</i> , COM-25 IEEE Transactions on Communications 910 (Sept. 1997) (<i>Spaulding</i> ”)
Exhibit 1036	<i>Intentionally left blank</i>
Exhibit 1037	<i>Intentionally left blank</i>
Exhibit 1038	<i>Intentionally left blank</i>
Exhibit 1039	<i>Intentionally left blank</i>
Exhibit 1040	Paul R. Gray & Robert G. Meyer, <i>Analysis and Design of Analog Integrated Circuits</i> , pp. 147-148, John Wiley & Sons, (1997) (“Gray”)

CLAIM LISTING APPENDIX
U.S. Patent No. 10,524,202 for Claims 1-23

Claim Designation	Claim Language
Claim 1[P](a)	A method of reducing the power consumption of a receiver of a battery operated transceiver having a plurality of circuits, wherein the plurality of circuits comprise a receiver signal path comprising at least an amplifier, a mixer and a filter,
Claim 1[P](b)	wherein the plurality of circuits are designed to function between a worst-case operating condition and a best case operating condition, wherein the worst-case operating condition is when a desired signal strength is low and an interferer signal strength is high and the receiver operates with a maximum power dissipation and the best-case operating condition is when the desired signal strength is high and the interferer signal strength is low and the receiver operates with a minimum power dissipation, the method comprising:
Claim 1(a)	receiving a signal comprising a desired signal and an interferer signal; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal to the strength of the interfere signal; and
Claim 1(b)	dynamically adjusting at least one of an impedance, a bias or a gain of at least one of the amplifier, filter or mixer in the receiver signal path, responsive to the comparing.
Claim 2	The method of claim 1, wherein when the strength of the interferer signal decreases over time, and the strength of the desired signal is low, dynamically decreasing the bias of at least one of the plurality of circuits in the receiver signal path.
Claim 3	The method of claim 1, wherein when the strength of the interferer signal is low, and the strength of the desired signal decreases over time, dynamically increasing a gain of at least one of a plurality of circuits in the receiver signal path and dynamically increasing the impedance of at least one of the plurality of circuits in the receiver signal path.

Claim Designation	Claim Language
Claim 4	The method of claim 1 wherein when the strength of the interferer signal is low and the strength of the desired signal increases over time, dynamically increasing the impedance of one or more of the plurality of circuits in the receiver signal path.
Claim 5	The method of claim 1, wherein when the interferer signal is weak and the desired signal is low and the strength of the desired signal increases over time, dynamically decreasing the bias of one or more of the plurality of circuits in the receiver signal path.
Claim 6[P]	A method for reducing power consumption in a receiver in a battery operated mobile device, wherein the receiver comprises a plurality of circuits, and wherein the plurality of circuits comprise a signal path including at least an amplifier, a mixer and a filter, the method comprising:
Claim 6(a)	receiving a wireless signal comprising a desired signal and an interferer signal at the receiver; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal to the strength of the interferer signal; and
Claim 6(b)	when the strength of the interferer signal is low and the relative strength of the desired signal is greater than the strength of the interferer signal, dynamically increasing an impedance of at least one of the amplifier, filter or mixer in the signal path of the receiver, thereby reducing power dissipation in the receiver.
Claim 7[P](a)	A method for power dissipation control in a receiver of a wireless transceiver of a battery-powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer,
Claim 7[P](b)	wherein the receiver is configured to receive a wireless signal having a desired signal and an interferer signal,

Claim Designation	Claim Language
Claim 7[P](c)	wherein the plurality of circuits are designed to function between a worst-case condition when a strength of the desired signal is low and a strength of the interferer signal is high, and a best-case condition when the strength of the desired signal is high and the strength of the interferer signal is low, the method comprising:
Claim 7(a)	receiving the wireless signal having the desired signal and the interferer signal by the receiver; determining the strength of the desired signal; determining the strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal; and
Claim 7(b)	based on the comparison, when the plurality of circuits are functioning at better than the worst-case condition, dynamically adjusting one or more of an impedance, a bias or a gain of one or more of the plurality of circuits in the signal path, thereby controlling power dissipation.
Claim 8	The method of claim 7, wherein when the strength of the interferer signal is low and the relative strength of the desired signal with respect to the interferer signal increases, dynamically increasing the impedance of one or more of the plurality of circuits in the signal path to reduce the power dissipation and thereby save power.
Claim 9	The method of claim 7, wherein when the strength of the desired signal is low but the relative strength of the desired signal with respect to the interferer signal is better than the worst-case condition and the interferer signal reduces in strength, dynamically reducing the bias of one or more of the plurality of circuits in the signal path, thereby reducing power dissipation and saving power.
Claim 10	The method of claim 9, wherein reducing power dissipation reduces a power drain from a battery in the battery-powered portable wireless device.
Claim 11[P](a)	A method for power dissipation reduction in a receiver of a wireless transceiver of a battery powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer,

Claim Designation	Claim Language
Claim 11[P](b)	the plurality of circuits designed to function under at least a worst case condition when a strength of a received desired signal is low and a strength of a received interferer signal is high, the method comprising:
Claim 11(a)	receiving a wireless signal having a desired signal and an interferer signal by the receiver; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal;
Claim 11(b)	based on the comparing, determining a functioning condition of the plurality of circuits; and when the plurality of circuits are determined to function at a better than the worst case condition in which the strength of the interferer signal is low and the strength of the desired signal is low, causing a bias current of one or more of the plurality of circuits in the receiver signal path of the wireless transceiver to be dynamically decreased relative to the worst-case condition, thereby saving power.
Claim 12[P]	A method for power dissipation reduction in a receiver of a wireless transceiver of a battery powered portable wireless device, the receiver configured to function under at least a worst case condition when a received desired signal strength is low and a received interferer signal strength is high, the receiver having a signal path comprising at least an amplifier, a filter, and a mixer, the method comprising:
Claim 12(a)	receiving a wireless signal having a desired signal and an interferer signal by the receiver; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal;

Claim Designation	Claim Language
Claim 12(b)	based on the comparing, determining a functioning condition of the plurality of circuits; and when the plurality of circuits are determined to function at a better than the worst case condition in which the strength of the interferer signal is low and the strength of the desired signal is high, causing an impedance of one or more of amplifier, filter or the mixer in the receiver signal path of the wireless transceiver to be increased relative to the worst-case condition, thereby saving power.
Claim 13[P]	A method for power dissipation control in a receiver of a wireless transceiver of a battery powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer, the method comprising:
Claim 13(a)	receiving a wireless signal having a desired signal and an interferer signal by the receiver; determining the strength of the desired signal; determining the strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal; and
Claim 13(b)	when the interferer signal is high and the desired signal is low, causing a bias current of one or more of the plurality of circuits in the receiver signal path of the wireless transceiver to be dynamically increased, controlling the power dissipation of the receiver
Claim 14[P](a)	A method for power dissipation reduction in a receiver of a wireless transceiver of a battery powered portable wireless device based on its operating signal conditions, wherein the receiver has a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer,

Claim Designation	Claim Language
Claim 14[P](b)	the plurality of circuits designed to function under operating signal conditions that vary based on relative signal strengths of an interferer signal and a desired signal, wherein the operating signal conditions vary between a worst-case operating condition and a best-case operating condition, wherein the worst-case operating condition occurs when a desired signal strength is low and an interferer signal is high and the receiver operates with a maximum power dissipation, wherein the best-case operating condition occurs when the desired signal is high and the interferer signal strength is low and the receiver operates with a minimum power dissipation, the method comprising:
Claim 14(a)	receiving a wireless signal having a desired signal and an interferer signal by the receiver; determining the strength of the desired signal; determining the strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal strength;
Claim 14(b)	based on the comparing, when the plurality of circuits are determined to be functioning at better than the worst-case operating signal condition, dynamically adjusting at least one of an impedance, a bias current or a gain of one or more of the amplifier, filter or mixer in the signal path of the receiver, thereby reducing power consumption to save power.
Claim 15	The method of claim 14, wherein when the desired signal strength is low and the receiver is operating at better than the worst-case operating signal condition by having the interferer strength lower than that in the worst case operating signal condition, dynamically reducing the bias of one or more of the plurality of circuits in the signal path of the receiver, thereby reducing power dissipation and saving power; and wherein when the interferer signal strength is high and the receiver is operating at better than the worst-case operating signal condition by having the desired signal higher than that in the worst case operating signal condition, dynamically increasing the impedance of one or more of the plurality of circuits in the signal path of the receiver, thereby reducing power dissipation and saving power.

Claim Designation	Claim Language
Claim 16[P](a)	A method for power dissipation optimization in a receiver of a wireless transceiver of a battery powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer,
Claim 16[P](b)	wherein the plurality of circuits are designed to function between a worst-case operating condition and a best case operating condition, wherein the worst-case operating condition is when a desired signal strength is low and an interferer signal strength is high and the receiver operates with a maximum power dissipation and the best-case operating condition is when the desired signal strength is high and the interferer signal strength is low and the receiver operates with a minimum power dissipation, the method comprising:
Claim 16(a)	receiving a wireless signal having a desired signal and an interferer signal by the receiver; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal; and
Claim 16(b)	based on the comparing, when the plurality of circuits are determined to be functioning at better than the worst-case operating condition, dynamically adjusting at least one of an impedance, a bias current or a gain of one or more of the amplifier, filter or mixer in the signal path of the receiver to optimize power dissipation and save power.

Claim Designation	Claim Language
Claim 17	The method of claim 16, wherein when the desired signal strength is low and the operating signal condition of the receiver is better than the worst-case operating signal condition and the interferer signal strength is increasing, dynamically increasing a bias current of at least one of the plurality of circuits in the receiver signal path of the wireless transceiver, optimizing the power dissipation; wherein when the desired signal strength is low and the operating signal condition of the receiver is better than the worst-case operating condition and the interferer signal strength reduces over time, dynamically decreasing a bias current of at least one of the plurality of circuits in the receiver signal path of the wireless transceiver, optimizing the power dissipation, and wherein optimizing the power dissipation under better than the worst-case operating signal condition saves power with respect to the maximum power dissipation of the worst-case operating signal condition.
Claim 18[P](a)	A method for controlling power dissipation in a receiver of a wireless transceiver of a battery powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer,
Claim 18[P](b)	wherein the plurality of circuits are designed to function between a worst-case operating condition and a best case operating condition, wherein the worst-case operating condition is when a desired signal strength is low and an interferer signal strength is high and the receiver operates with a maximum power dissipation and the best-case operating condition is when the desired signal strength is high and the interferer signal strength is low and the receiver operates with a minimum power dissipation, the method comprising:
Claim 18(a)	receiving a wireless signal having a desired signal strength and an interferer signal by the receiver; determining a strength of the desired signal; determining a strength of the interferer signal; comparing the strength of the desired signal relative to the strength of the interferer signal; and

Claim Designation	Claim Language
Claim 18(b)	wherein when the strength of the interferer signal is low and when the strength of the received desired signal is higher than the desired signal of the worst-case operating signal condition, dynamically adjusting an impedance of at least one of the plurality of circuits in the signal path to reduce power dissipation.
Claim 19[P](a)	A method of power dissipation optimization in a receiver of a wireless transceiver of a wireless communication device based on its operating signal conditions, wherein the transceiver has a signal path comprising a plurality of circuits designed to function under operating signal conditions that vary based on relative signal strengths of an interferer signal and a desired signal in a received wireless signal,
Claim 19[P](b)	wherein operating conditions vary between a worst-case operating signal condition, wherein the receiver operates with a maximum power dissipation when a desired signal strength is low and an interferer signal strength is high and a best-case operating signal condition, wherein the receiver operates with minimum power dissipation when the desired signal strength is high and the interferer signal strength is low, the method comprising:
Claim 19(a)	receiving the wireless signal having the desired signal and the interferer signal by the receiver; determining the desired signal strength; determining the interferer signal strength; comparing the desired signal strength to the interferer signal strength to determine an operating signal condition of the receiver;
Claim 19(b)	based on the comparing, when the receiver operating signal condition is better than the worst case operating signal condition, dynamically adjusting one or more of an impedance, a bias, or a gain of one or more of the plurality of circuits in the receiver signal path, thereby optimizing power consumption to save power.
Claim 20	The method of claim 19, wherein power saving occurs when the desired signal strength is low and the operating signal condition is better than the worst-case operating signal condition, by dynamically reducing the bias current of one or more of the plurality of circuits in the signal path of the receiver, thereby reducing power dissipation.

Claim Designation	Claim Language
Claim 21	The method of claim 20, wherein power saving occurs when the operating signal condition improves when the strength of the interferer signal decreases over time, and the bias current is reduced by dynamically adjusting the bias current of one or more of the plurality of circuits in the signal path of the receiver.
Claim 22[P](a)	A method of power dissipation optimization in a receiver of a wireless transceiver of a wireless communication device based on its operating signal conditions, wherein the transceiver has a signal path comprising a plurality of circuits designed to function under operating signal conditions that vary based on relative signal strengths of an interferer signal and a desired signal in a received wireless signal received,
Claim 22[P](b)	wherein the operating signal conditions vary between a worst-case operating signal condition and a best-case operating signal condition, wherein in the worst-case operating signal condition the receiver operates with a maximum power dissipation when a desired signal strength is low and an interferer signal strength is high, and wherein in the best-case operating signal condition the receiver operates with minimum power dissipation when the desired signal strength is high and the interferer signal strength is low, the method comprising:
Claim 22(a)	receiving the wireless signal having the desired signal and the interferer signal by the receiver; determining the desired signal strength; determining the interferer signal strength; comparing the desired signal strength to the interferer signal strength;
Claim 22(b)	determining an operating signal condition of the receiver between the best and worst-case operating signal conditions based on the comparing; when the interferer signal strength is high and the operating signal condition is better than the worst-case operating signal condition, dynamically increasing an impedance of one or more of the plurality of circuits in the signal path of the receiver, thereby reducing power dissipation.
Claim 23	The method of claim 22, wherein when the desired signal strength increases over time resulting in an improvement in the operating condition, dynamically adjusting the impedance of one or more of the plurality of circuits in the signal path of the receiver results in power saving.

CERTIFICATION OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. §42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. §42.8, certificates of service or word count, or appendix of exhibits, contains 13,967 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: May 1, 2024

Respectfully submitted,

By: /s/ Paul R. Hart
Paul R. Hart, Reg. No. 59,646

COUNSEL FOR PETITIONER

CERTIFICATE OF SERVICE ON PATENT OWNER
UNDER 37 C.F.R. § 42.105(a)

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b), the undersigned certifies that on May 1, 2024, a complete and entire copy of this Petition for *Inter Partes* Review and Exhibits were provided via Priority Mail Express to the Patent Owner by serving the correspondence address of record for the '202 patent:

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A complete and entire copy of this Petition for *Inter Partes* Review and Exhibits were also emailed to counsel of record in the parallel litigation:

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Respectfully submitted,

By: /s/ Paul R. Hart
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