UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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LENOVO (UNITED STATES) INC. and
MOTOROLA MOBILITY LLC
Petitioners

v.

THETA IP, LLC
Patent Owner

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Patent No. 7,010,330 B1

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**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 7,010,330 B1**

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| Exhibit 1002 | Declaration of R. Jacob Baker, P.E., Ph.D. |
| Exhibit 1003 | Prosecution History of U.S. Patent No. 7,010,330 B1 |
| Exhibit 1004 | European Patent Application Publication No. 0 999 649 A2 to *Rauhala* published on May 10, 2000 |
| Exhibit 1005 | United States Patent No. 6,278,864 B1 to *Cummins et al.*, published on September 14, 1999 |
| Exhibit 1006 | United States Patent No. 5,953,640 to *Meador et al.*, published on September 14, 1999 |
| Exhibit 1007 | United States Patent No. 5,086,508 to *Furuno*, published on February 4, 1992 |
| Exhibit 1008 | U.S. Patent No. 5,513,387 B2 to *Saito et al.*, published on April 30, 1996 |
| Exhibit 1009 | Claim Construction Order dated January 7, 2021, from *Theta IP, LLC v. Samsung Electronics Co. Ltd., et al.*, 6:20-cv-00160-ADA (W.D. Tx.) |

[1] Citations to Exs. 1001, 1005-1008, 1018, and 1020 are to column:line number of the patents. Citations to Exs. 1003, 1009-1017, 1019, 1021, and 1022 are to the page numbers of the exhibit. Citations to Exs. 1002 and 1004 are to paragraph numbers.

| | |
|---|---|
| Exhibit 1010 | Memorandum and Order on Claim Construction dated June 6, 2017 from *Theta IP, LLC v. Samsung Electronics Co. Ltd., et al*., 2:16-cv-527 (E.D. Tx.) |
| Exhibit 1011 | Rudolf F. Graf, Modern Dictionary of Electronics, Seventh Edition, 1999 |
| Exhibit 1012 | Behzad Razavi, RF Microelectronics, Prentice Hall PTR, 1998 |
| Exhibit 1013 | Patent Owner's Claim Construction Brief, *Theta IP, LLC v. Samsung Electronics Co.,* No. 2:16-CV-527-JRG-RSP (E.D. Tex. April 11, 2017), ECF No. 63 |
| Exhibit 1014 | Patent Owner's Claim Construction Reply Brief, *Theta IP, LLC v. Samsung Electronics Co.*, No. W-20-CV-00160-ADA (W.D. Tex. Dec. 16, 2020), ECF No. 45 |
| Exhibit 1015 | Phillip A. Laplante, Electrical Engineering Dictionary, 2000 |
| Exhibit 1016 | A. Kestenbaum et al., Design Concepts for Process Control, Ind. Eng. Chem., Process Des. Dev., Vol. 15, No. 1, (1976) |
| Exhibit 1017 | Lijun Qian, Optimal Power Control in Cellular Wireless Systems, Ph.D. diss., Rutgers The State University of New Jersey, School of Graduate Studies (2001) |
| Exhibit 1018 | United States Patent No. 3,880,104 to *Saye*, published on April 29, 1975 |
| Exhibit 1019 | Scheduling Order, *Theta IP, LLC v. Motorola Mobility LLC*, No. 1:22−cv−03441 (N.D. Ill. Sep. 29, 2022), ECF No. 26 |
| Exhibit 1020 | United States Patent No. 6,236,365 to *LeBlanc* et al., issued on May 22, 2001 |
| Exhibit 1021 | David A. Johns & Ken Martin, Analog Integrated Circuit Design, 1997 |
| Exhibit 1022 | Mahmood Nahvi, Ph.D. & Joseph A. Edminister, Schaum's Outline of Theory and Problems of Electric Circuits ($4^{th}$ ed. 2003) |

# I. INTRODUCTION

Lenovo (United States) Inc. and Motorola Mobility LLC (collectively, "Petitioners") request *inter partes* review of claims 1, 23, 29, and 30 ("the challenged claims") of U.S. Patent No. 7,010,330 B1 ("the '330 patent") (Ex. 1001), assigned to Theta IP, LLC ("Patent Owner"). As explained below, the challenged claims should be found unpatentable and cancelled.

# II. MANDATORY NOTICES

**Real Party-in-Interest**: The real parties-in-interest for this Petition are Lenovo (United States) Inc. ("Lenovo US"); Motorola Mobility LLC ("Motorola"); and Lenovo Group Ltd ("LGL").[2]

**Related Matters**: Patent Owner has asserted the '330 patent against Lenovo US, Motorola, and LGL in *Theta IP, LLC v. Motorola Mobility LLC, et al*., 1:22-cv-03441 (N.D. Ill.) ("co-pending litigation").

The '330 patent issued from U.S. Application No. 10/784,613, which claims the benefit of priority to U.S. Application No. 60/451,229 ("the '229 application")

[2] Petitioners identify LGL out of an abundance of caution because it is a named party in the co-pending litigation, but maintain that LGL is not a proper party to the co-pending litigation.

and U.S. Application No. 60/451,230 ("the '230 application"), both of which are expired provisional applications.

Petitioner has filed a petition for IPR challenging claims 3, 4, and 8 of U.S. Patent No. 10,129,825 ("the '825 patent"), which is also assigned to Patent Owner and issued from a progeny of the '421 application. Petitioner has filed a petition for IPR challenging claims 7-11, 13, and 19-21 of U.S. Patent No. 10,524,202 ("the '202 patent"), which is also assigned to Patent Owner and issued from a progeny of the '421 application.

**Counsel and Service Information**: Lead counsel is Dinesh N. Melwani (Reg. No. 60,670), and Backup counsel is Jameson Q. Ma (Reg. No. 68,343). Service information is: Bookoff McAndrews, PLLC, 2020 K Street, NW, Suite 400, Washington, DC 20006; Tel.: 202.808.3497; Fax.: 202.450.5538; email: docketing@bomcip.com, dmelwani@bomcip.com, and jma@bomcip.com. Petitioner consents to electronic service.

## III. PAYMENT OF FEES

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 50-5906.

## IV. GROUNDS FOR STANDING

Petitioner certifies that the '330 patent is available for review and Petitioner is not barred/estopped from requesting review on these grounds. § 42.104(a).

## V. PRECISE RELIEF REQUESTED AND GROUNDS

### A. Identification of Challenge

Petitioner requests IPR and cancellation of the challenged claims. For the purposes of this IPR, Petitioner assumes the priority date of the challenged claims is March 1, 2003.

The challenged claims should be cancelled as unpatentable based on:

**Ground 1:** Claims 1 and 23 are unpatentable under 35 U.S.C. § 103(a) as obvious over *Cummins* in view of *Rauhala*. [3]

**Ground 2:** Claim 29 is unpatentable under 35 U.S.C. § 103(a) as obvious over *Rauhala* in view of *Meador*.

**Ground 3:** Claim 30 is unpatentable under 35 U.S.C. § 103(a) as obvious over *Rauhala* in view of *Meador*, and further in view of *Furuno*.

**Ground 4:** Claims 1 and 23 are unpatentable under 35 U.S.C. § 103(a) as obvious over *Cummins* in view of *Rauhala*, and further in view of *Saito*.

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[3] For each Ground, Petitioner does not rely on any reference other than those listed here. Other references are discussed to show the state of the art at the time of the invention. *See Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1365 (Fed. Cir. 2015).

**Ground 5:** Claim 29 is unpatentable under 35 U.S.C. § 103(a) as obvious over *Rauhala* in view of *Meador*, and further in view of *Saito*.

**Ground 6:** Claim 30 is unpatentable under 35 U.S.C. § 103(a) as obvious over *Rauhala* in view of *Meador*, and further in view of *Saito* and *Furuno*.

The application of the ’330 patent was filed on February 23, 2004, and claims the benefit of priority to the ’229 application and the ’230 application, both of which were filed on March 1, 2003. Ex. 1001 at pages 1-2. For the purposes of this proceeding only, Petitioner assumes the priority date of the ’330 patent is March 1, 2003.

*Rauhala*, *Cummins*, *Meador*, *Furuno*, and *Saito*, were each published more than a year before March 1, 2003, and each is prior art under 35 U.S.C. § 102(b).

## VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (“POSITA”) as of the claimed priority date of the ’330 patent would have had a bachelor’s degree in electrical engineering, computer engineering, or the equivalent, and three or more years of experience with wireless communications devices. Ex. 1002 at ¶¶ 27-31. More practical experience could qualify one not having the aforementioned education as a POSITA, while a higher level of education could offset lesser experience. *Id.*

## VII. THE ’330 PATENT AND PRIOR ART

### A. The ’330 patent

The ’330 patent describes methods for reducing power dissipation in wireless transceivers. Ex. 1001 at 1:16-18; Ex. 1002 at ¶37.

When the receiver is active, received signals include a desired signal and interfering signals. Ex. 1001 at 5:17-21; Ex. 1002 at ¶38. During operation, the qualities of the desired signal and the interfering signals can vary. Ex. 1001 at 5:28-41; Ex. 1002 at ¶38. For example, the desired signal may be weak and the interfering signals may be strong, which the ’330 patent refers to as a “worst-case input signal.” Ex. 1001 at 5:51-53, 6:3-7; Ex. 1002 at ¶38-41. On the other hand, the ’330 patent refers to when the desired signal is strong and the interfering signals are weak as the “best-case input signal.” Ex. 1001 at 6:11-13; Ex. 1002 at ¶38-41.

In order for the receiver to function properly in the “worst-case” condition, the receiver must dissipate large amounts of power and battery life is drained rapidly. Ex. 1001 at 1:26-37. Power dissipation can be reduced in the “best-case” operating condition by adjusting parameters of the receiver’s circuits. Ex. 1001 at 6:11-20; Ex. 1002 at ¶39. The adjusted parameters can include impedances and bias currents. Ex. 1001 at 6:17-20; Ex. 1002 at ¶39.

Figures 9B/9C of the ’330 patent below, illustrate how impedance of a receiver circuit can be adjusted for a better-than-worst-case operating condition.

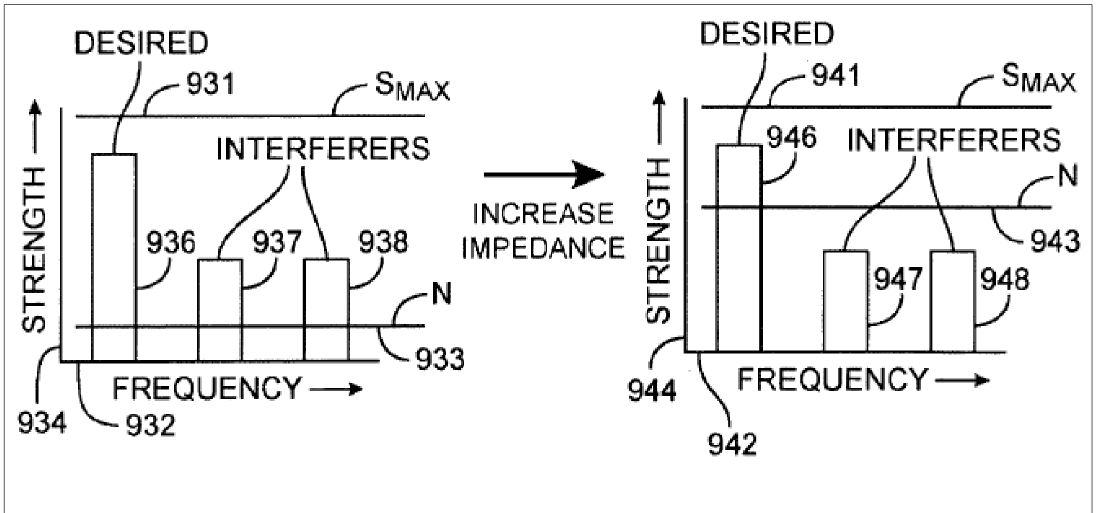



FIG. 9B FIG. 9C

The noise floor can be increased as shown in FIG. 9C by increasing an impedance of a circuit in the receiver. Ex. 1001 at 9:50-53; Ex. 1002 at ¶51. The increased impedance results in decreased drive current through the circuit and lower power dissipation. Ex. 1001 at 9:53-55; Ex. 1002 at ¶51. Despite the reduced power dissipation, the desired signal 946 remains within the receivable signal band of the receiver. Ex. 1001 at FIG. 9C; Ex. 1002 at ¶51.

Other power saving adjustments to receiver circuits can be made depending on desired signal strength and interferer signal strength. *See* Ex. 1001 at FIGS. 8A-12; Ex. 1002 at ¶¶47-55.

| | RECEIVED SIGNAL (1210) | | RESPONSE TO RECEIVED SIGNAL (1220) | | |
|---|---|---|---|---|---|
| | SIGNAL STRENGTH | INTERFERER STRENGTH | DECREASE SMAX | INCREASE IMPEDANCE NOT GAIN | INCREASE IMPEDANCE AND GAIN |
| 1230 | SMALL | SMALL | YES | NO | YES |
| 1240 | LARGE | SMALL | NO | YES | NO |
| 1250 | LARGE | LARGE | NO | YES | NO |
| 1260 | SMALL | LARGE | NO | NO | NO |

FIG. 12

For example, in row 1230, the desired signal and interferer signal strengths are both weak or small. Ex. 1001 at 10:65-66; Ex. 1002 at ¶¶55. In response, the ’330 patent calls for an increase in impedance of a circuit and an increase in a gain of a circuit. Ex. 1001 at 10:66-11:9; Ex. 1002 at ¶¶55. In row 1240, the desired signal strength is strong or large, while the interfering signals are small. Ex. 1001 at 11:10-11; Ex. 1002 at ¶¶55. Similar to the example of Figures 9B and 9C, the ’330 patent calls for an increase of a circuit impedances. Ex. 1001 at 11:11-14; Ex. 1002 at ¶¶55. In row 1250, both the desired signals and interfering signal strengths are large. Ex. 1001 at 11:15-16; Ex. 1002 at ¶¶55. In response, the ’330 patent calls for an increase of a circuit impedance. Ex. 1001 at 11:16-18; Ex. 1002 at ¶39. In row 1260, the received desired signal strength is weak or small, while the interfering signals are large. Ex. 1001 at 11:20-21; Ex. 1002 at ¶55. As this is the worst-case operating condition, the ’330 patent calls for no adjustment of impedance or gain and power dissipation is not reduced. Ex. 1001 at 11:21-26; Ex. 1002 at ¶55.

The ’330 patent contends that by making the foregoing adjustments to receiver circuit parameters, power can be saved over time. Ex. 1001 at 11:36-45; Ex. 1002 at ¶¶56, 62. Figure 13, below, depicts a graphical representation of the purported power savings. Ex. 1001 at 11:36-39; Ex. 1002 at ¶63.

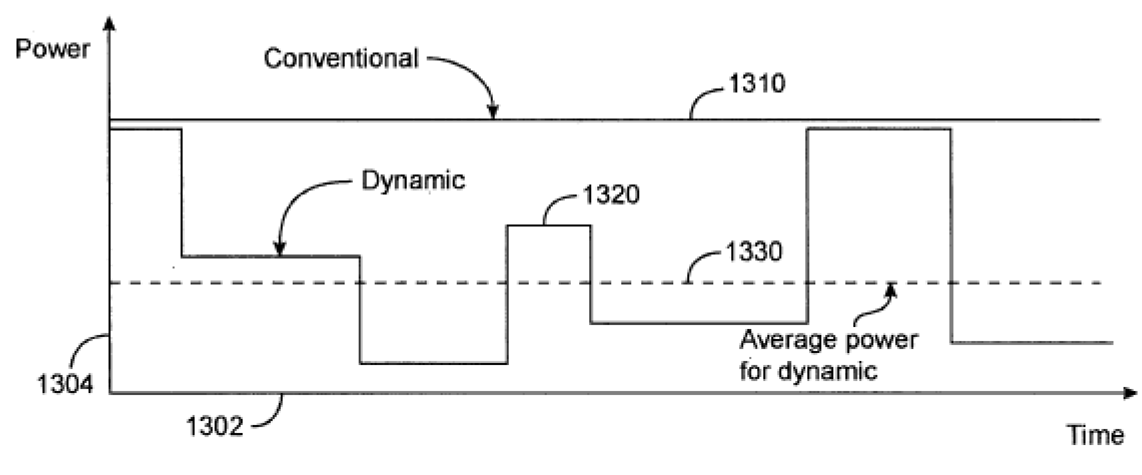



FIG 13

### B. Prosecution Summary of the ’330 patent

The grounds asserted herein rely on prior art references which were not before the examiner during prosecution of the ’330 patent.

The ’330 patent was filed as Application No. 10/784,613 (“the ’613 application”) on February 23, 2004.

Claim 1 was amended on July 5, 2005, to further define “<u>reducing a switching current in the signal path by</u> dynamically changing an impedance of a component in the signal path based on the first signal strength.” Ex. 1003 at 157 (emphasis in original).

Claim 23 also was amended on July 5, 2005, to further define that “an impedance in the signal path is configured to be dynamically adjusted <u>to reduce a switching current</u> in response to the first signal strength.” *Id.* at 160 (emphasis in original).

In the response, the patentee argued that:

> A bias current is not the same as a switching current. One skilled the art understands that a bias current is a DC or quiescent current, while a switching current is a dynamic or transient current that occurs during voltage transitions. (See for example, the pending application, Figure 6 and related discussion.) Accordingly, the cited references do not show or suggest reducing a switching current in the signal path by dynamically changing an impedance of a component in the signal path as required by the claim.

*Id.* at 163.

### C. The Prior Art

The claimed features of the ’330 patent were well-known at the time of the alleged invention.

#### 1. *Rauhala*

*Rauhala* discloses "a method and an arrangement for linearizing a radio receiver," to be "applied in the reception circuit of mobile stations." Ex. 1004 at [0001]; Ex. 1002 at ¶68. *Rauhala* discloses techniques for minimizing certain disadvantages in prior art, namely power dissipation resulting from requiring "a relatively large supply of energy" or "a relatively large continuous current" even when signal conditions at a particular time do not warrant such a large energy supply. Ex. 1004 at [0003]-[0004]; Ex. 1002 at ¶68. *Rauhala* discloses the concept of varying the currents supplied to appropriate circuit components based on the condition of the detected signals, which include a signal in a receive channel and a signal in a neighboring channel. Ex. 1004 at [0006]; Ex. 1002 at ¶68. For instance, *Rauhala* discloses that "[i]n normal conditions, i.e., when the signal strength if satisfactory on the receive channel and ordinary on the neighboring channels, the supply currents of the receiver's front-end amplifiers and at least the first mixer are kept relatively low" and "[i]f the signal strength goes below a certain value on the receive channel or exceeds a certain value on a neighboring channel, said supply currents are increased." Ex. 1004 at [0006]; Ex. 1002 at ¶68.

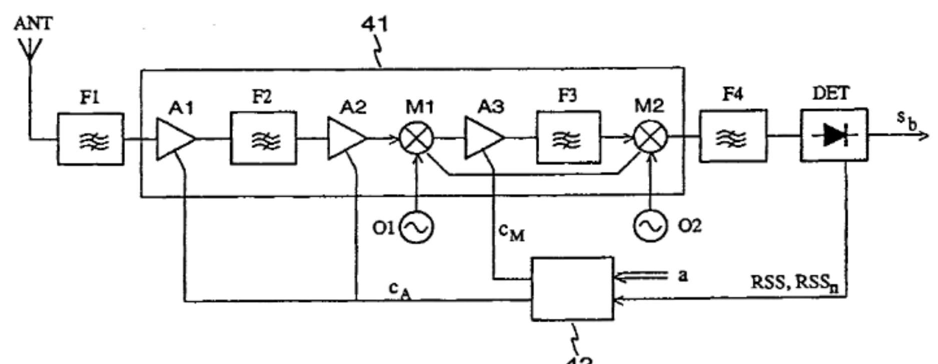


Fig. 4

With reference to FIG. 4 above, *Rauhala* discloses "a simplified example of a radio receiver" that includes "linear units." Ex. 1004 at [0012] and [0017]; Ex. 1002 at ¶69. The linear units are the amplifiers and mixers in the receiver. In FIG. 4, the amplifiers are designated as A1, A2, and A3 and the mixers are designated as M1 and M2. Ex. 1004 at 2:58 through 3:1; Ex. 1002 at ¶69.

Particularly, with reference to FIG. 4, *Rauhala* discloses an example of how the currents supplied to the linear units are controlled. Ex. 1004 at [0017]; Ex. 1002 at ¶70. First, "[a] control unit 42 receives from detect[or] DET an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band." Ex. 1004 at [0013], [0017]; Ex. 1002 at ¶70. The receive channel signal strength is designated as "RSS" and the neighboring channel signal strength is designated as "RSSn." Ex. 1004 at [0013], [0017]; Ex. 1002 at ¶70. Each signal condition represented by the values of RSS and RSSn dictates the levels (e.g., high and low) of the currents supplied to the linear units in the receiver. Ex. 1004 at [0017]-[0018]; Ex. 1002 at ¶70.

| | $RSS_n$ | RSS | $I_A$ | $I_M$ |
|---|---|---|---|---|
| Row 1 → | <Sn | >S4 | $I_{Al}$ | $I_{Ml}$ |
| Row 2 → | <Sn | ≤S4 | $I_{Ah}$ | $I_{Ml}$ |
| Row 3 → | ≥Sn | >S4 | $I_{Ah}$ | $I_{Ml}$ |
| Row 4 → | ≥Sn | ≤S4 | $I_{Ah}$ | $I_{Mh}$ |

Ex. 1004 at [0017]; Ex. 1002 at ¶70.

Specifically, with reference to the annotated table above, *Rauhala* discloses different signal conditions and the levels of the currents supplied to the linear units under each of the different signal conditions. Ex. 1004 at [0017]; Ex. 1002 at ¶71. In the table, Sn is a "threshold value … which corresponds to a relatively high signal strength on the [neighboring] channel," and S4 is a "threshold value … which corresponds to a relatively low receive signal strength." Ex. 1004 at [0017]; Ex. 1002 at ¶71. Further, the subindex A refers to "linear units A1 and A2," meaning $I_A$ is a current supplied to linear units A1 and A2, and the subindex M refers to "linear units M1, A3, and M2," meaning $I_M$ is a current supplied to linear units M1, A3, and M2. Ex. 1004 at [0017]; Ex. 1002 at ¶71. Furthermore, the subindex 1 refers to a "lower supply current of the linear unit" and the subindex "h" refers to a "higher supply current." Ex. 1004 at [0017]; Ex. 1002 at ¶71. Thus, as an example, "$I_{M1}$ means that the control current in mixers M1 and M2 and in amplifier A3 is set to the lower value." Ex. 1004 at [0017]; Ex. 1002 at ¶71.

With reference to the table above, *Rauhala* discloses "[w]hen the signal strength on the receive channel is normal or relatively high, and on the neighboring channels normal or relatively low," which represents the best case signal condition corresponding to Row 1 in the table, "all linear unit supply current are set to the lower values." Ex. 1004 at [0018]; Ex. 1002 at ¶72. *Rauhala* further discloses "[w]hen the signal strength on the receive channel drops relatively low and on a neighboring channel relatively high," which represents the worst case signal condition corresponding to Row 4 in the table, "the supply currents of all linear units are set to the higher values." Ex. 1004 at [0018]; Ex. 1002 at ¶72.

However, in other signal conditions that are neither best case nor worst base, the current levels supplied may vary between the linear units in the receiver. In other words, a current level supplied to one or more linear units may be different from a current level supplied to one or more other linear units. Ex. 1004 at [0018]; Ex. 1002 at ¶73.

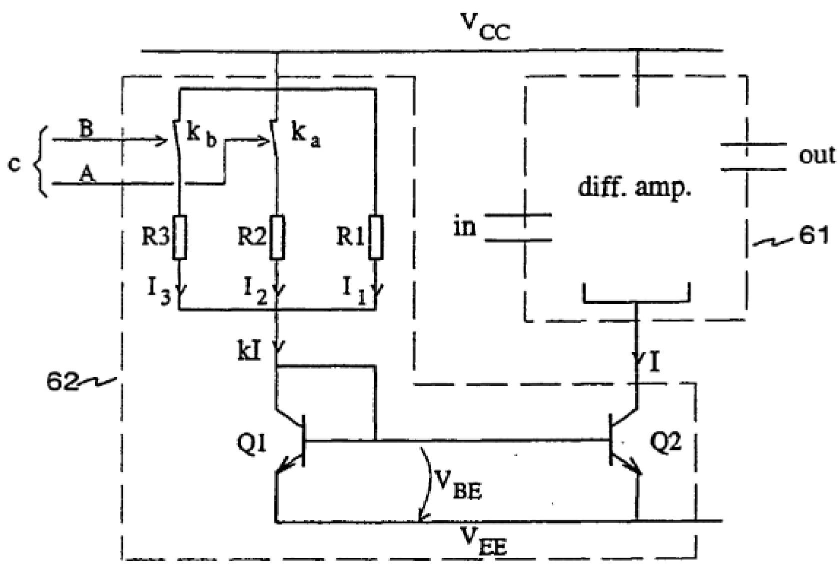



Fig. 6

With reference to FIG. 6 above, *Rauhala* discloses an example of "a linear unit's supply current control." Ex. 1004 at [0021]; Ex. 1002 at ¶75. The supply current control 62 is configured to vary the current supplied to the linear unit 61, by varying the impedance within the enclosed circuit. *I* Ex. 1004 at [0021]; Ex. 1002 at ¶75. Specifically, "[t]he supply current control circuit 62 comprises transistors Q1 and Q2, resistors R1, R2 and R3," as well as switch $k_a$ "in series with resistor R2" and switch $k_b$ "in series with resistor R3." Ex. 1004 at [0021]; Ex. 1002 at ¶75. These "series connections are coupled in parallel with resistor R1," forming a three-branch parallel connection. Ex. 1004 at [0021]; Ex. 1002 at ¶75.

In the three-branch parallel connection, "the current of resistor R1 is $I_1$, the current of resistor R2 is $I_2$ and the current of resistor R3 is $I_3$." Ex. 1004 at [0021]; Ex. 1002 at ¶76. Accordingly, "the current kI of transistor Q1 is the sum $I_1$+$I_2$+$I_3$."

Ex. 1004 at [0021]; Ex. 1002 at ¶76. The switches $k_a$ and $k_b$ are controlled based on the bits A and B, respectively, which are received from the control unit 42. Ex. 1004 at [0021]; Ex. 1002 at ¶76. For example, when a bit (e.g., A or B) is 0, the corresponding switch (e.g., $k_a$ or $k_b$) is open, and when the bit is 1, the corresponding switch is closed. Ex. 1004 at [0021]; Ex. 1002 at ¶76.

| B | A | kI | $kI/I_1$ |
|---|---|---|---|
| 0 | 0 | $I_1$ | 1 |
| 0 | 1 | $I_1+I_2$ | 2 if R1=R2 |
| 1 | 0 | $I_1+I_3$ | 3 if R1=2·R3 |
| 1 | 1 | $I_1+I_2+I_3$ | 4 if R1=R2=2·R3 |

Ex. 1004 at [0021]; Ex. 1002 at ¶76.

With reference to the table above, *Rauhala* discloses different two-bit digital signals (e.g., A and B) received at the supply current control 62 and the corresponding current kI of transistor Q1 generated based on each of the received signals. Ex. 1004 at [0021]; Ex. 1002 at ¶77. The current I that is supplied to the linear unit 61 will be the same as kI by way of the "current mirror" configuration implemented in the supply current control 62. Ex. 1004 at [0021]; Ex. 1002 at ¶77. *Rauhala* also discloses another example of a supply current control circuit in FIG. 7, which has a slightly different configuration compared to that of the supply current control circuit in FIG. 6 but follows a similar principle of varying the supply current by varying the impedance. Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶77.

### 2. *Cummins*

*Cummins* discloses "a radio frequency (RF) transceiver for data communication." Ex 1005 at 5:33-37; Ex. 1002 at ¶85. *Cummins* discloses that a transceiver 150 is on an integrated circuit as it "is disposed within a PCMCIA format package described above, with an antenna, RF and digital circuitry integrated on a single printed circuit board (PCB) disposed within the PCMCIA package." Ex 1005 at 5:33-37; Ex. 1002 at ¶85.

*Cummins* shows a "low noise amplifier (LNA) 214 for amplification before being applied to [a] mixing section 215." *Id. Cummins* also shows low pass filters 221i and 221q are coupled to an output of mixers 215i and 215q. Ex. 1005 at 7:19-23; Ex. 1002 at ¶¶86-88.

*Cummins* discloses:

> [p]ower consumption is also another major concern in portable transceivers. Most commercially available portable radio transceivers, such as cellular phones, transmit in the 1-3 watt ranges. As such, it is not possible to run such transceivers for an extended period (days) using a small battery, for example, a disposable 9 volt battery or a small number of AAA batteries, commonly used to power the newer generations of palm top PCs. Instead, most conventional portable transceivers require larger Ni-Cad batteries which typically operate for at most 8 hours before requiring a recharge. As such, most conventional RF transceiver designs are unsuitable for incorporation in low power portable computers such as a lap-top or palm-top personal computer (PC).

. . .

> There is a need for a compact, low cost and low power RF transceiver having an efficient contention resolution capability that fits into a housing sized within a compact form factor, for use with PCs and/or peripherals. Ex. 1005 at 2:31-44 and 3:1-4; Ex. 1002 at ¶89.

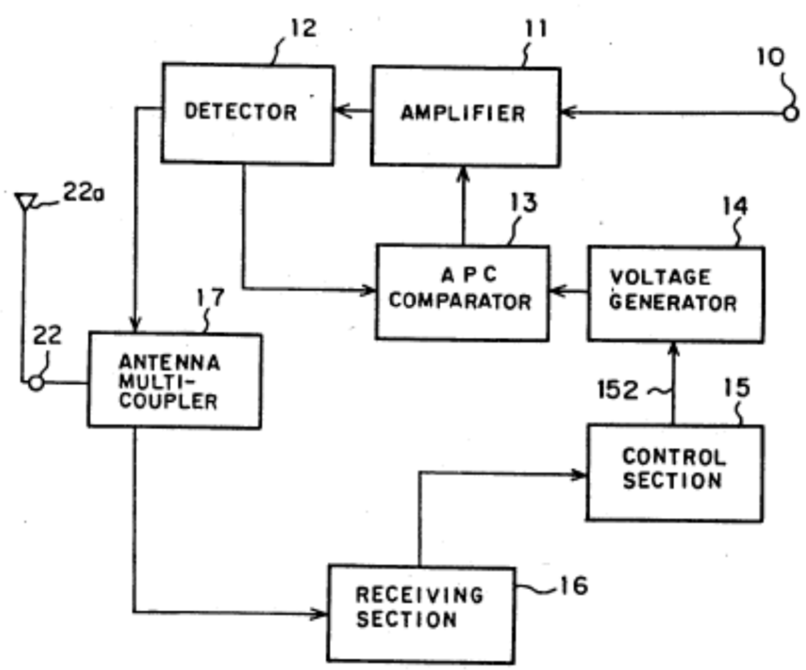
### 3. *Meador*

*Meador* is directed "in general to radio transceivers, and more particularly, to integrated circuit devices that implement transceiver functions." Ex. 1006 at 1:5-7. Ex. 1002 at ¶91. *Meador* discloses that "[t]here has been a desire to integrate as many functions as feasible on a single integrated circuit when implementing a radio transceiver," and that "[a]n entire transceiver system integrated on a common substrate would tend to reduce cost and increase reliability." Ex. 1006 at 1:27-32. Ex. 1002 at ¶91-92.

### 4. *Furuno*

*Furuno* discloses a transmitting output control for a conventional automobile telephone. Element 10 is a transmitting signal input terminal at which a transmitting signal is to be received. Ex. 1007 at 1:16-35 and FIG. 1 (below); Ex. 1002 at ¶93. Element 11 is an amplifier for amplifying the transmitting signal. Ex. 1007 at 1:16-35; Ex. 1002 at ¶93. Element 12 is a detector which detects the level of an output signal of the amplifier 11. Ex. 1007 at 1:16-35; Ex. 1002 at ¶93. Element 13 is an automatic power control (APC) comparator which constitutes a transmitting power control means in which a DC voltage output by the detector 12 and an output of a voltage generator 14. Ex. 1007 at 1:16-35; Ex. 1002 at ¶93. The APC comparator 13 compares the DC voltage and the specified voltage and adjusts the amplification factor (gain) of the amplifier 11 so that both voltages are in balance. Ex. 1007 at 1:16-35; Ex. 1002 at ¶93.

FIG. 1 (PRIOR ART)




### 5. *Saito*

*Saito* discloses automatic gain control (AGC) circuitry for use in receivers of mobile devices. Ex. 1008 at 1:34-40; Ex. 1002 at ¶94. The AGC circuitry is aimed at "reducing reception disturbance resulting from intermodulation distortion for input levels of a broad range from the reception of a small input signal to the reception of a large input signal in receivers." Ex. 1008 at 1:34-40; Ex. 1002 at ¶94. The AGC circuitry includes "reception field level detection means" which "outputs a gain control signal in accordance with the reception field level." Ex. 1008 at 1:41-47; Ex. 1002 at ¶94. *Saito* further explains that the gain of radio frequency gain control units is controlled by "an automatic gain control unit comprising one or a plurality of continuous feedback systems." Ex. 1008 at 1:47-53; Ex. 1002 at ¶94.

*Saito* teaches that "variable attenuators 20, 21, can continuously vary the damping quantity by the gain control signal outputted from the reception field level detection means 22, which constitute the continuous feedback system." Ex. 1008 at 6:17-27; Ex. 1002 at ¶95. *Saito* explains that the "continuous feedback system . . . operate[s] to keep the input level of the received signal processing circuit always constant." Ex. 1008 at 6:20-27; Ex. 1002 at ¶96. *Saito* contends that such gain control "eliminat[es] the intermodulation distortion in a wide range of reception field levels ranging from the input of the very fine signal to the input of the large signal." Ex. 1008 at 7:51-62; Ex. 1002 at ¶96.

## VIII. CLAIM CONSTRUCTION

The claims of the '330 patent should be construed under the Phillips standard. 37 C.F.R. § 42.100(b); *see generally Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Under *Phillips*, claim terms are typically given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention, having taken into consideration the language of the claims, the specification, and the prosecution history. *Phillips*, 415 F.3d at 1313; *see also Id.* at 1312–16. The Board, however, construes only the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Sys., Inc*., IPR2015-00633, Paper No. 11 at 16 (Aug. 14, 2015). Except for the terms identified below, Petitioner believes that no express constructions are necessary to assess whether the prior art reads on the challenged claims.[4]

### A. "dynamically changing" and "dynamically adjust[ed]"

The proper construction of this term "dynamically changing" in claim 1 and of "dynamically adjusted" or "dynamically adjust" in claims 23, 29, and 30 is "adjusting during operation based, at least in part, on information gained during operation." This construction is consistent with the specification of the '330 patent, the claims, and Patent Owner's own representations of the meaning of this term in

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[4] Petitioner reserves all rights to raise claim construction and other arguments in district court. For example, Petitioner has not raised all challenges to the '330 patent in this petition, including validity under 35 U.S.C. § 112, and a comparison of the claims to any accused products in litigation may raise controversies needing resolution through claim constructions not presented here.

prior litigations.[5] The Board should reject any attempt by Patent Owner to further limit this term.

The ’330 patent uses the phrase “dynamically adjusted” interchangeably with “dynamically changing,” and uses these terms to describe instances in which a second parameter (e.g., an impedance, a bias current, a gain, etc.) is adjusted/changed “based on” or “in response to” a first parameter (e.g., signal strength). *See* Ex. 1001 at 2:11-15, 22-25, 33-37, 46-48, 57-59 and 2:66 to 3:3; Ex. 1002 at ¶¶58.

For example, the ’330 patent states:

> The method itself includes **determining** a first signal strength at a first node in the signal path in the integrated circuit and **dynamically changing** an impedance of a component in the signal path **based on** the first signal strength.

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[5] The progeny ’202 patent was asserted by Patent Owner, and the term “dynamically adjusting” was construed by the court, in *Theta IP, LLC v. Samsung Electronics Company*, No. W-20-CV-00160-ADA (W.D. Tex.) (“*Theta II*”). Ex. 1009. The ’330 patent was asserted by Patent Owner in an earlier litigation titled *Theta IP, LLC v. Samsung Electronics Company*, No. 2:16-CV-527-JRG-RSP (E.D. Tex.) (“*Theta I*”). Ex. 1010 at 3. The term “dynamically adjust[ed]” was construed by that court. *Id.* at 7-15.

> …
> The method itself includes **determining** a first signal strength at a first node in the signal path in the integrated circuit and **dynamically changing** a bias current in the signal path **based on** the first signal strength.
> …
> The method further includes **dynamically changing** a gain of the first circuit **based on** the first signal strength and **dynamically changing** an impedance of a component in the second circuit **based on** the first signal strength.
> …
> An impedance in the signal path is configured to be **dynamically adjusted in response to** the first signal strength.
> …
> A bias current in the signal path is configured to be dynam**ically adjusted in response to** the first signal strength.
> …
> A gain of the first circuit is configured to be **dynamically adjusted in response to** the first signal strength, and an impedance in the second circuit is configured to be **dynamically adjusted in response to** the first signal strength.

Ex. 1001 at 2:11-15, 22-25, 33-37, 46-48, 57-59 and 2:66 to 3:3 (emphasis added)

The signal strength is determined during operation of the system. Ex. 1002 at ¶61. It follows that the responsive adjustment likewise occurs during operation of the system. Ex. 1002 at ¶61.

In Figure 13 (below), the ’330 patent illustrates an example of dynamic adjustment of circuit parameters allegedly resulting in “dynamic power dissipation.” Ex. 1001 at 11:35-39; Ex. 1002 at ¶62. Power is shown on the Y axis of Figure 13, while time is shown on the X axis. Ex. 1002 at ¶62.

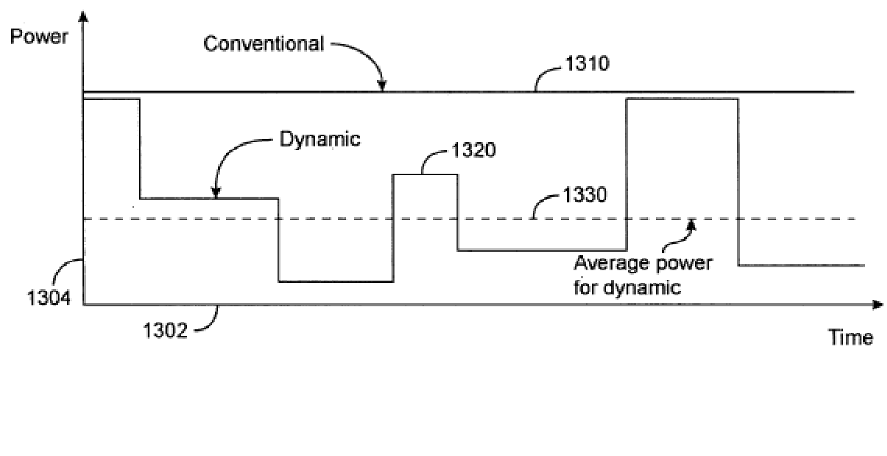



FIG 13

According to the ’330 patent, “control of variable gains, impedances, biasing, or combination thereof, allows for a lower average power” dissipation. Ex. 1001 at 11:35-39. Figure 13 shows that “dynamic power dissipation” occurs in discrete steps, as opposed to along a continuous curve, and in contrast with “conventional” power dissipation, which is depicted as a straight line (*i.e.* static). Ex. 1002 at ¶63. A POSITA would have understood from Figure 13 and the accompanying description in the specification that “***dynamic*** power dissipation” is simply power dissipation that varies over time. Ex. 1002 at ¶63.

The claims of the ’330 patent use the term “dynamically adjusted” consistently with the specification. For example, claim 1 recites:

> **determining** a first signal strength at a first node in the signal path in the integrated circuit; and
>
> reducing a switching current in the signal path by **dynamically changing** an impedance of a component in the signal path **based on** the first signal strength.

Ex. 1001 at 12:63-67 (emphases added).

Claim 23 recites:

> a first signal strength indicator circuit coupled to the signal path, and configured to **determine a first signal strength**;
>
> wherein an impedance in the signal path is configured to be **dynamically adjusted** to reduce a switching current **in response to** the first signal strength

Ex. 1001 at 14:23-28 (emphases added).

Claim 29 recites:

> a first signal strength indicator circuit coupled to the signal path, and configured to **determine a first signal strength**;
>
> wherein a gain of the first circuit is configured to be **dynamically adjusted in response to** the first signal strength, and
>
> wherein an impedance in the second circuit is configured to be **dynamically adjusted in response to** the first signal strength.

Ex. 1001 at 16:4-12 (emphases added).

Read in the context of the claims, a POSITA would have understood "dynamically adjusting" to mean adjusting during operation (while receiving a wireless signal) based, at least in part, on information (signal strengths and/or comparisons thereof) gained during operation. Ex. 1002 at ¶66.

Patent Owner has itself argued during litigation that the term "dynamically adjusting" should be no more limited than Petitioner proposes here. Ex. 1013 at 8. In *Theta I*, in which Patent Owner asserted the '330 patent, Patent Owner argued that "dynamically adjust[ed]" should be construed according to its plain and ordinary meaning, or alternatively to mean simply "changing during operation," an interpretation even broader than proposed by Petitioner here. Ex. 1013 at 8. Patent Owner specifically argued that interpreting "dynamically adjust[ed]" to mean "adjust[ed] in a continuous manner, as opposed to discrete steps," is "unduly limiting." *Id*. at 9. The *Theta I* court agreed with Patent Owner that "dynamically adjust[ed]" is not so limited. Ex. 1010 at 15.

In *Theta II*, in which Patent Owner asserted the progeny '202 patent, Patent Owner unequivocally argued that "[n]o negative limitation should be included in the 'dynamically adjusting' claims at issue here." Ex. 1014 at 12. In particular, Patent Owner took the position that "dynamically adjusting" <u>does not</u> preclude "reliance on a signal strength threshold." *Id.* at 13. Rather than distinguish the art cited during prosecution by limiting the phrase "dynamically adjusting" in this way, Patent Owner asserted that it "made distinctions over [the cited art] based on the limitations of the claims," and that "the limitations are clear on their face." *Id*. The *Theta II* court agreed and construed "dynamically adjusting" precisely as Petitioner proposes here. Ex. 1009 at 2.

Whether the Board construes the terms "dynamically changing" in claim 1 and of "dynamically adjusted" or "dynamically adjust" in claims 23, 29, and 30 as Petitioner proposes does not impact the ultimate conclusion that the challenged claims are unpatentable. Ex. 1002 at ¶67. Even under a narrower construction, the cited references would still render the challenged claims unpatentable.

# IX. DETAILED EXPLANATION OF GROUNDS

## A. Ground 1: *Cummins* in view of *Rauhala* Renders Claims 1 and 23 Unpatentable

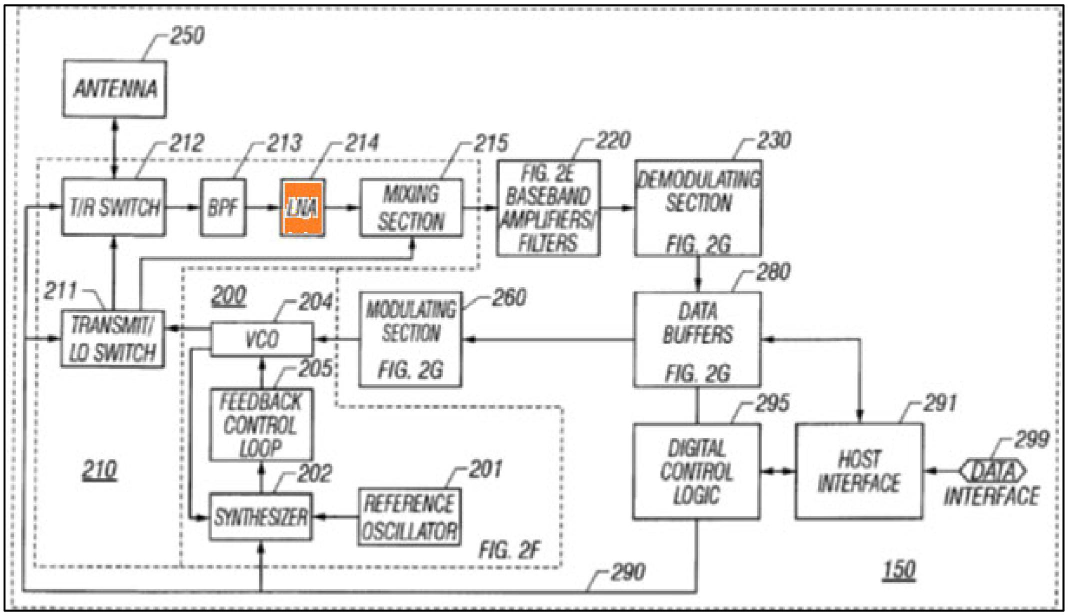
### 1. Claim 1

#### i. "A method of receiving a signal using an integrated circuit"

*Cummins* discloses "a radio frequency (RF) transceiver for data communication." Ex 1005 at 5:33-37; Ex. 1002 at ¶100. *Cummins* discloses that a transceiver 150 is on an integrated circuit as it "is disposed within a PCMCIA format package described above, with an antenna, RF and digital circuitry integrated on a single printed circuit board (PCB) disposed within the PCMCIA package." *Id. Cummins* discloses that its transceiver has a "receive mode." *Cummins* also discloses that "[i]n a receive mode, switch 212 routes the signal received via antenna 250." Ex. 1005 at 3:28-29; Ex. 1002 at ¶100. *Cummins* discloses that "[a] pair of switches, T/R switch 212 and transmit/LO switch 211, provide a means for selectively coupling antenna 250 to either the **receiver portion** or the transmitter portion **of transceiver 150**." Ex. 1005 at 6: 12-15 (emphasis added); Ex. 1002 at ¶100. Transceiver 150 is disposed on an integrated circuit because *Cummins* discloses that transceiver 150, an antenna, RF, and digital circuitry are integrated on a single printed circuit board. Ex. 1002 at ¶100. An integrated circuit is defined as "[m]ultiple, interconnected circuit elements, contained on or in a **common substrate** that function as a unit and not separately." Ex. 1011 at 9; Ex. 1002 at ¶100. *Cummins* thus discloses that transceiver 150 is on an integrated circuit because it is disclosed on a common substrate (the printed circuit board) with an antenna, RF, and digital circuitry are integrated on a single printed circuit board consistent with the definition of an integrated circuit. Ex. 1002 at ¶¶100-102. Therefore, *Cummins* discloses receiving a signal using (a transceiver that is on) an integrated circuit. Ex. 1002 at ¶¶100-102.

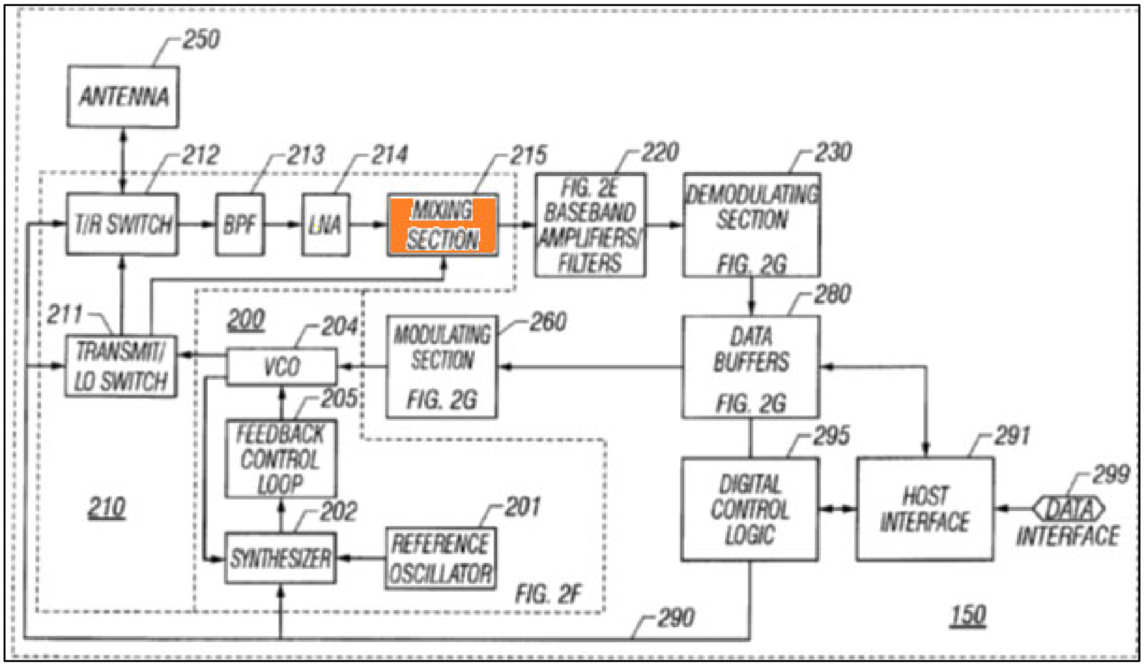
#### ii. "the integrated circuit comprising a signal path including a low-noise amplifier configured to receive the signal"

*Cummins* "shows a simplified block diagram of transceiver 150." Ex. 1005 at 5:33-37; Ex. 1002 at ¶103. Transceiver 150, which is disposed on an integrated circuit, *see supra* Section IX(A)(1)(i), includes a "low noise amplifier (LNA) 214 for amplification before being applied to [a] mixing section 215". Ex. 1005 at 6:1-2 and FIG. 2F (annotated below); Ex. 1002 at ¶103. *Cummins* discloses that, "[i]n a receive mode, switch 212 routes the signal received via antenna 250 through a broad band filter 213 to the input of low noise amplifier (LNA) 213." Ex. 1005 at 5:55 to 6:2; Ex. 1002 at ¶103. FIG. 2F is a block diagram that "serves to indicate the various data and control signal paths between functional units of the system hardware." Ex. 1011 at 7 (emphasis added); Ex. 1002 at ¶104. The functional units of *Cummins*, e.g., LNA 214, are disposed within a signal path represented by the units and arrows of FIG. 2F. Ex. 1005 at FIG. 2F; Ex. 1002 at ¶104.




#### iii. "a mixer having an input coupled to an output of the low-noise amplifier"

*Cummins* discloses "I and Q mixers 215 i and 215 q, respectively, of mixing section 215 combine LO signal from switch 211 and the output signal of LNA 214 as amplified by amplifier 215 b". Ex. 1005 at 7:1-12; FIGS. 2D and 2F (annotated below); Ex. 1002 at ¶105. The block diagram of FIG. 2F shows an arrow drawn from low-noise amplifier 214 to mixing section 215 (which includes mixers 215 i and 215 q), and thus the mixers 215 i and 215 q are coupled to the output of the low-noise amplifier 214. Ex. 1005 at 7:1-12; FIGS. 2D and 2F; Ex. 1002 at ¶105.



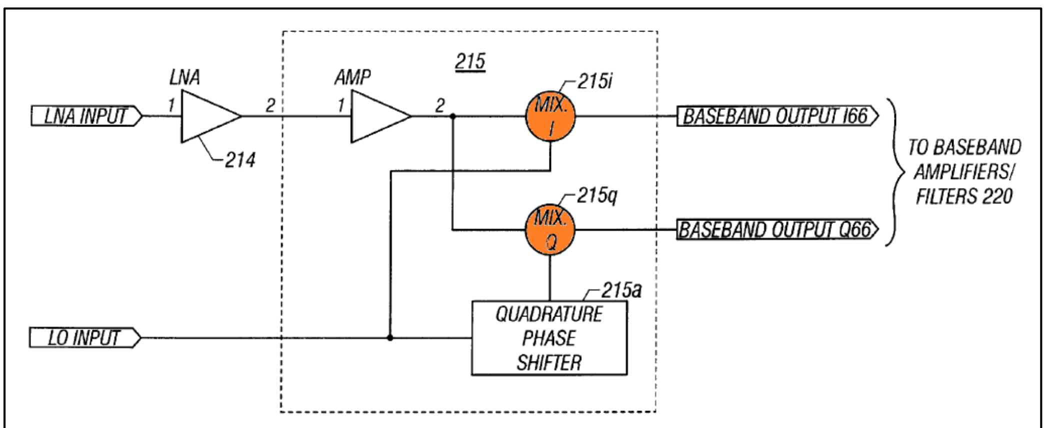
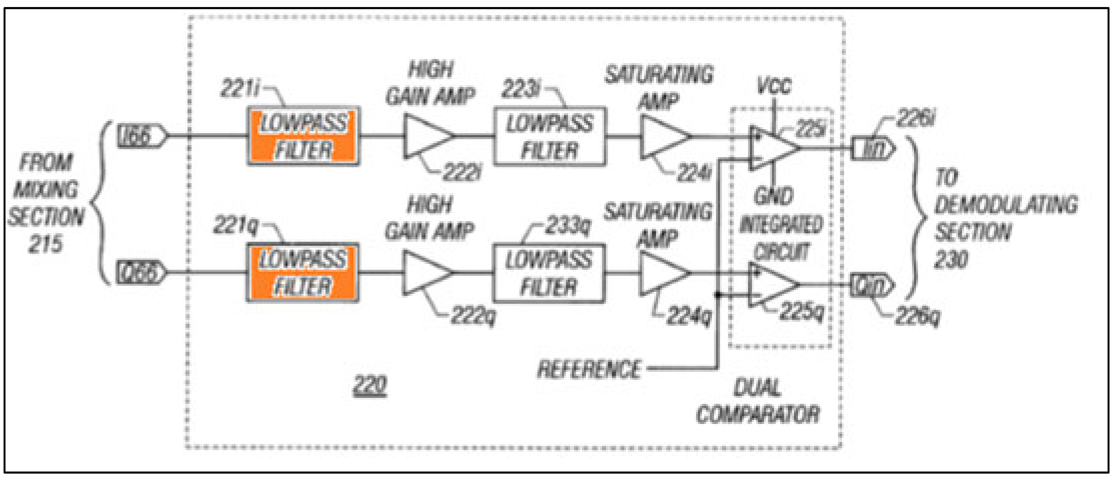
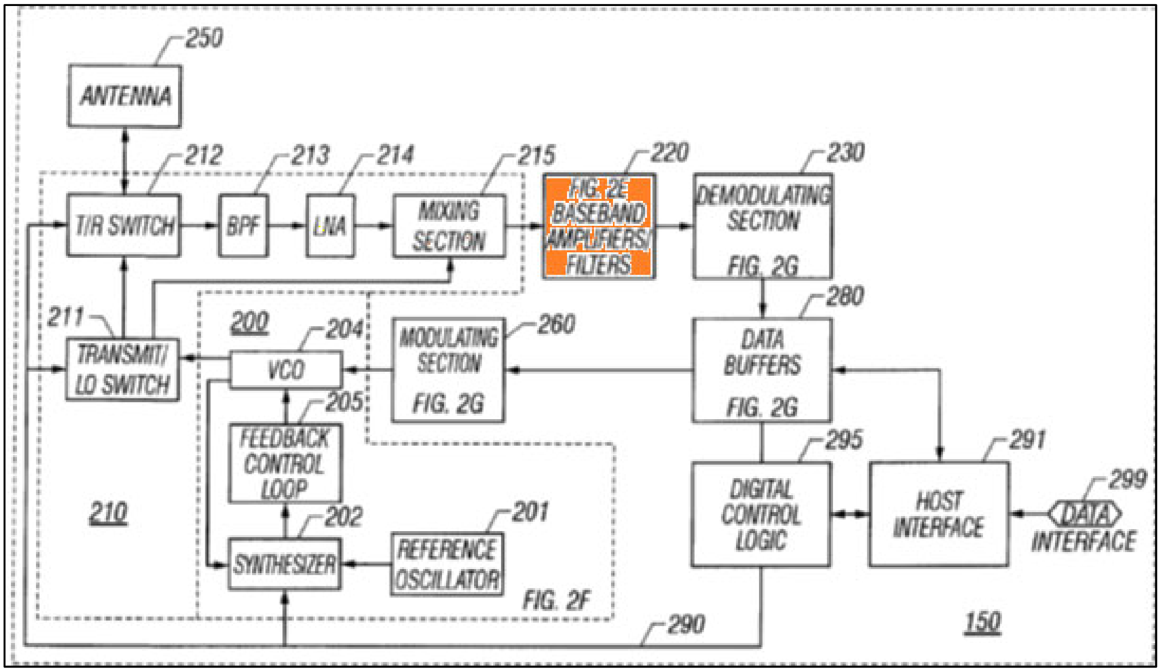




FIG. 2D

### iv. "a low-pass filter having an input coupled to an output of the mixer"

*Cummins* discloses "the output signals of mixers 215 i and 215 q, i.e. Ibb and Qbb, are processed separately by baseband amplifiers/filters section 220. First signals Ibb and Qbb are filtered by low pass filters 221 i and 221 q." Ex. 1005 at 7:19-23 and FIGS. 2E and 2F (annotated below); Ex. 1002 at 105. The block diagram of FIGS. 2F shows an arrow indicating a signal path directly coupling mixing section 215 to “FIG. 2E BASEBAND AMPLIFERS/FILTERS.” *See* Ex. 1005 at FIG. 2F. FIG. 2E shows “[f]irst signals Ibb and Qbb are filtered by low pass filters 221 i and 221 q,” and as shown in FIG. 2E, low pass filters 221 I and 221 q are the first components within functional block 220 to receive the signals Ibb and Qbb from mixing section 215. Ex. 1005 at 7:21-22 and FIGS. 2E and 2F; Ex. 1002 at ¶105.






**v. "determining a first signal strength at a first node in the signal path in the integrated circuit"**

*Cummins* does not explicitly disclose determining a first signal strength at a first node in the signal path in the integrated circuit. *Rauhala* teaches such limitations in a device that aims to solve the same technical problems as *Cummins*. Ex. 1002 at ¶86; Ex. 1002 at ¶106.

*Rauhala* describes methods "for linearizing a radio receiver" in which "the energy consumption of the receiver can be reduced without degrading the signal quality." Ex. 1004 at [0001], [0007]; Ex. 1002 at ¶109. *Rauhala* states that such techniques are "appli[cable] in the reception circuits of mobile stations," such as mobile phones, which are transceivers. Ex. 1004 at [0001], [0012]; Ex. 1002 at ¶109.

*Rauhala* discloses that a signal path includes a detector DET coupled to an output of a filter. Ex. 1004 at [0012] and FIG. 2 (annotated below). *Rauhala* further teaches that "[d]etector DET provides information about the signal strength (RSS) on the channel to which the receiver is tuned." Ex. 1004 at [0013]; Ex. 1002 at ¶110. Thus, *Rauhala* discloses determining a first signal strength in the signal path. Ex. 1002 at ¶112. FIG. 2 of *Rauhala* is a block diagram showing a signal path comprising functional units (as blocks) and control signal paths (as lines and arrows between the blocks). Ex. 1004 at FIG. 2; Ex. 1002 at ¶112. Detector DET is shown as a functional block in the block diagram and signal path of FIG. 2 (between filter F4 and control unit 22). Ex. 1004 at FIG 2; Ex. 1002 at ¶113. A node is a "physical connection between two electrical components in a circuit." Ex. 1015 at 3; Ex. 1002 at ¶113. The detector DET is therefore determining signal strength of RSS at a node between two electrical components of the *Rauhala* circuit - e.g., 1) filter F4 and 2) control unit 22). Ex. 1004 at FIG 2; Ex. 1002 at ¶113. Therefore, *Rauhala* is determining a first signal strength at a node in the signal path. Ex. 1002 at ¶113.

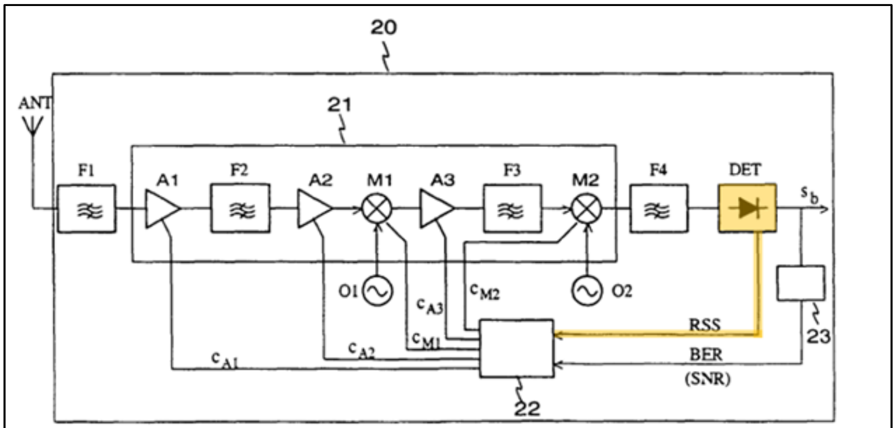



Fig. 2

*Rauhala* discloses that in "normal conditions, i.e., when the signal strength is satisfactory on the receive channel and ordinary on the neighboring channels, the supply currents of the receiver's front-end amplifiers and at least the first mixer are kept relatively low. If the signal strength goes below a certain value on the receive channel or exceeds a certain value on a neighboring channel, said supply currents are increased." Ex. 1004 at [0006]; Ex. 1002 at ¶111.

*Rauhala* and *Cummins* are analogous. Both references are directed to wireless transceivers, and in particular, with improving the battery life and reducing battery size in such device. Ex. 1002 at ¶¶115-117.

For example, *Rauhala* relates to "a method and an arrangement for linearizing a radio receiver," whose technical advantage is that "the energy consumption of the receiver can be reduced without degrading the signal quality," leading to "longer life for the battery or [. . .] a smaller battery can be used." Ex. 1004 at [0007]; Ex. 1002 at ¶114.

Similarly, *Cummins* discloses that

> [p]ower consumption is also another major concern in portable transceivers. Most commercially available portable radio transceivers, such as cellular phones, transmit in the 1-3 watt ranges. As such, it is not possible to run such transceivers for an extended period (days) using a small battery, for example, a disposable 9 volt battery or a small number of AAA batteries, commonly used to power the newer generations of palm top PCs. Instead, most conventional portable transceivers require larger Ni-Cad batteries which typically operate for at most 8 hours before requiring a recharge. As such, most conventional RF transceiver designs are unsuitable for incorporation in low power portable computers such as a lap-top or palm-top personal computer (PC).

Ex. 1005 at 2:31-44; Ex. 1002 at ¶107.

*Cummins* also discloses that

> there is a need for a compact, low cost and low power RF transceiver having an efficient contention resolution capability that fits into a housing sized within a compact form factor, for use with PCs and/or peripherals.

Ex. 1005 at 3:1-4; Ex. 1002 at ¶108.

A POSITA would be motivated to modify *Cummins* with *Rauhala*, because such a modification would reduce the energy consumption of the *Cummins* transceiver without reducing its signal quality, leading to longer battery life or a smaller battery. Ex. 1002 at ¶¶115-117. Indeed, reducing battery size is the primary objective of *Cummins* and is a stated benefit of *Rauhala*. Ex. 1005 at 2:31-44; Ex. 1004 at [0007]; Ex. 1002 at ¶¶114-117.

It would have been obvious to a POSITA to modify *Cummins* to incorporate a detector for detecting signal strength and using the detected signal strength to control supply currents to the *Cummins* amplifiers and mixers, as taught by *Rauhala*, since *Cummins* and Rauhala are analogous and since a POSITA would be motivated to combine their teachings as set forth above. Ex. 1002 at ¶¶114-117. The modification of *Cummins* with Rauhala would have been the use of a known technique (*Rauhala's* supply current control in mixers/amplifiers of a radio receiver) to improve a similar device (reducing power consumption in the *Cummins* transceiver, via supply current control in the *Cummins* mixers/amplifiers). Ex. 1002 at ¶116. Thus, the modification would have amounted to nothing more than the use of a known technique to improve a similar device, and the results of the modification would have been predictable. *See KSR Int'l. Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007). Ex. 1002 at ¶117. At the time of the invention, a POSITA would have had the requisite skill level to readily modify the device disclosed by *Cummins* to implement the teachings of *Rauhala* without any problem. Ex. 1002 at ¶117.

**vi. "reducing a switching current in the signal path"**

*Rauhala* discloses a collector current I/2, which, as set forth below is a "switching current." Ex. 1002 at ¶118.

The '330 specification does not define "switching current." However, the Patent Owner did define "switching current" to be "a dynamic or transient current that occurs during voltage transitions," during prosecution of the '330 patent. In particular, in the response, the Patent Owner argued that:

> A bias current is not the same as a switching current. One skilled the art understands that a bias current is a DC or quiescent current, while a switching current is a dynamic or transient current that occurs during voltage transitions. (See for example, the pending application, Figure 6 and related discussion.) Accordingly, the cited references do not show or suggest reducing a switching current in the signal path by dynamically changing an impedance of a component in the signal path as required by the claim.

Ex. 1003 at 163; Ex. 1002 at ¶119.

FIG. 7 of *Rauhala* shows a double-balanced mixer with two switching pairs of transistors. Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶¶120-125. The switching pairs are driven by a local oscillator. Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶¶120-125. A first switching pair includes a first transistor (annotated 1A) and a second transistor (annotated 1B). Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶¶120-125. The signal from the local oscillator would switch first transistor 1A and second transistor 1B in a complementary manner. Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶¶120-125.

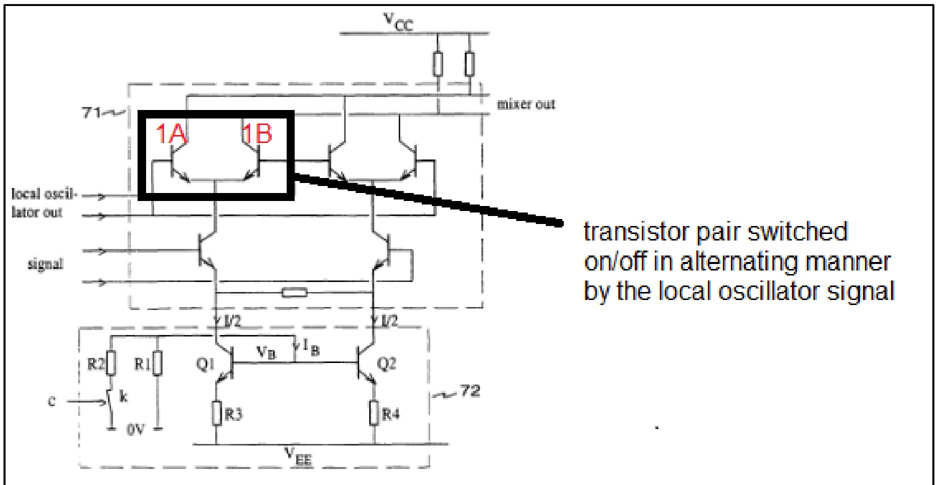


Fig. 7

Annotated FIG. 7 of *Rauhala* below shows how current I/2 is directed to one of transistor 1A or transistor 1B at a time. Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶¶120-125.

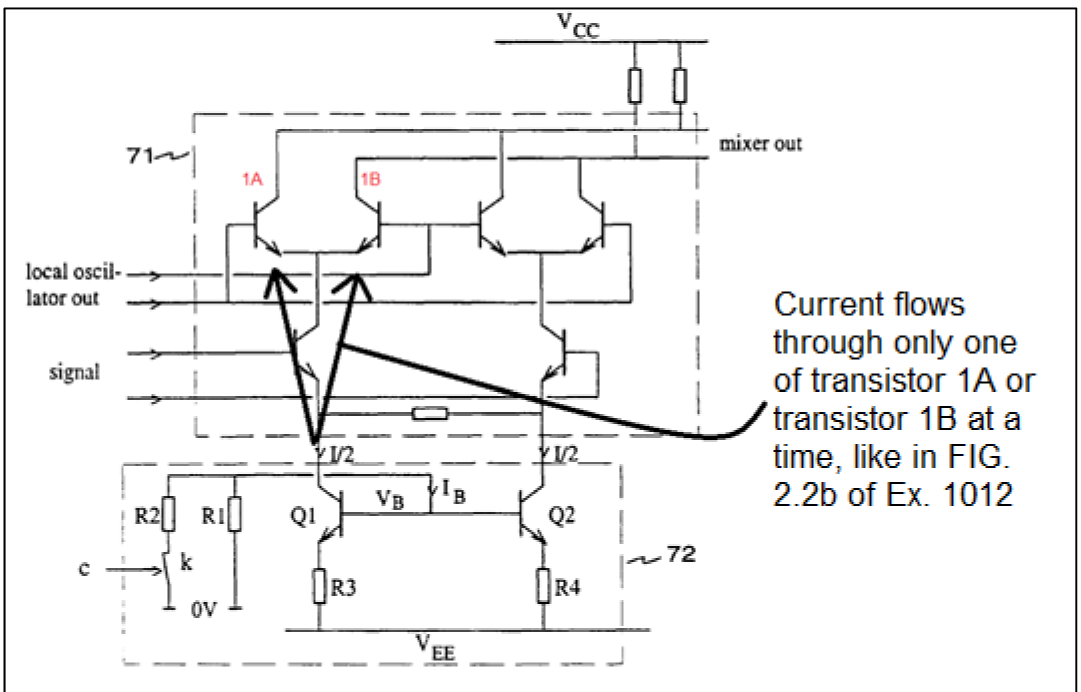


Fig. 7

The current I/2 directed to transistors 1A and 1B is a "switching current" as defined by the patentee because it is "a dynamic or transient current that occurs during voltage transitions." Ex. 1002 at ¶¶120-125. Each on-off switching event at transistors 1A/1B of *Rauhala* is a voltage transition. Ex. 1002 at ¶¶120-125. Each current I/2 is transient and dynamic, as it is constantly switched from first transistor 1A or second transistor 1B. Ex. 1002 at ¶¶120-125.

*Rauhala* discloses that the supply current I can be controlled between higher values and lower values, meaning supply current can be increased or decreased.

> When the signal strength RSS is not more than S31, signal c is 0 and the linear unit **supply currents are at their higher values**. The relatively large supply currents help reduce the effects of possible interference from outside the receive channel. When the signal strength RSS is between S31 and S32, signal c is 1 and the **supply currents are at their lower values**. The relatively small supply currents help reduce energy consumption.
>
> Thus, the control current $I_B$ increases, **causing the supply current I to increase** as well.

Ex. 1004 at [0016] and [0023] (emphasis added); Ex. 1002 at ¶81. The switching current (collector current I/2) necessarily changes based on the value of the supply current I. Ex. 1004 at [0016] and [0023]; Ex. 1002 at ¶133. Thus, *Rauhala* discloses reducing a switching current (the collector current I/2) in situations when *Rauhala*'s supply currents I are moved from their higher to lower values. Ex. 1004 at [0016] and [0023]; Ex. 1002 at ¶¶81, 133.

### vii. "[reducing a switching current in the signal path] by dynamically changing an impedance of a component in the signal path based on the first signal strength"

*Rauhala* discloses a mechanism for controlling the supply current to a mixer, with a control signal c using a control circuit 72, in FIG. 7. Ex. 1004 at [0023]; Ex. 1002 at ¶¶126-130. As stated below, the value of control signal c depends on the detected signal strength RSS. Ex. 1004 at [0015]; Ex. 1002 at ¶¶126-130.

*Rauhala* shows two resistors R1 and R2 that are in parallel to one another. Ex. 1004 at [0023] and FIG. 7; Ex. 1002 at ¶126.

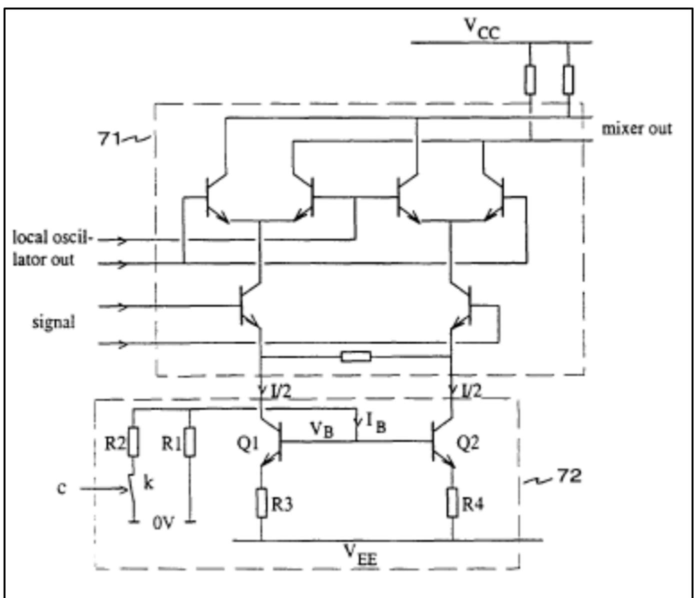



Fig. 7

Therefore, the resistance of the parallel circuit shown in FIG. 7 can be switched between two different resistance configurations. Ex. 1004 at [0023]; Ex. 1002 at ¶127. The first (low) resistance configuration is when the switch k is closed such that resistor R2 is placed in parallel with R1. Ex. 1004 at [0023]; Ex. 1002 at ¶127. The second (high resistance) configuration is when the switch k is open such that the resistance of the circuit is equal to R1. Ex. 1004 at [0023]; Ex. 1002 at ¶127.

*Rauhala* discloses that the control current $I_B$ when switch k is open is equal to a low value VB/R1. Ex. 1004 at [0023]; Ex. 1002 at ¶128.

The impedance (high or low), and the control current (low or high), based on the state of switch k is summarized in the table below. Ex. 1004 at [0023]; Ex. 1002 at ¶129.

| **Switch k** | **Impedance** | **Control Current $I_B$** |
|---|---|---|
| Closed | Low | High (VB/R1 + VB/R2) |
| Open | High | Low (VB/R1) |

In the example of FIG. 7, the state of switch k depends on the control signal c. Ex. 1004 at [0023]; Ex. 1002 at ¶130. When signal c is 0, switch k is open. Ex. 1004 at [0023]; Ex. 1002 at ¶130. When signal c is 1, switch k is closed. Ex. 1004 at [0023]; Ex. 1002 at ¶130.

| **Control signal c (dependent on signal strength)** | **k** | **Impedance** | **Control Current $I_B$** |
|---|---|---|---|
| 1 | Closed | Low | High (VB/R1 + |

| | | | |
|---|---|---|---|
| | | | VB/R2) |
| 0 | Open | High | Low (VB/R1) |

*Rauhala* discloses that as the control current $I_B$ increases, the supply current I increases. Ex. 1004 at [0023]; Ex. 1002 at ¶131. As control current $I_B$ decreases, the current flowing in Q1 and Q2 decreases, since the current in Q1 and Q2 is controlled by $I_B$, and thus the supply current I, that provides current to Q1 and Q2 (and thus the rest of the circuit) also would decrease. Ex. 1002 at ¶131.

*Rauhala* further discloses that in FIG. 7, the resistances of resistors R3 and R4 are identical and transistors Q1 and Q2 are identical, and thus the collector currents (I/2) of the transistors are also identical. Ex. 1004 at [0023]; Ex. 1002 at ¶132.

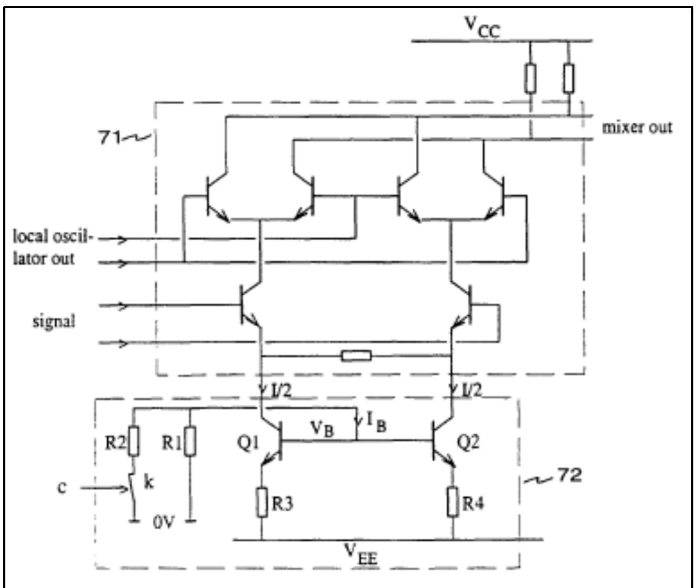



Fig. 7

Since the control current $I_B$ is reduced when the impedance of control circuit 72 is increased, and supply current (I) is reduced when the control current is reduced, the collector current I/2 is reduced when the impedance of the control circuit 72 is increased. Ex. 1004 at [0023]; Ex. 1002 at ¶133. These relationships are summarized in the table below.

| **Control signal c (dependent on signal strength)** | **k** | **Impedance** | **Control Current $I_B$** | **Supply Current I** | **Collector Current I/2** |
|---|---|---|---|---|---|
| 1 | Closed | Low | High (VB/R1 + VB/R2) | High | High |
| 0 | Open | High | Low (VB/R1) | Low | Low |

Thus, *Rauhala* discloses reducing the collector current (I/2), by increasing (i.e., changing) the impedance of control circuit 72. As set forth above, collector current I/2 corresponds to the claimed "switching current." Ex. 1004 at [0023]; Ex. 1002 at ¶133; *See supra* Section IX(A)(1)(vi).

**viii. "[dynamically changing an impedance of a component in the signal path] based on the first signal strength"**

*Rauhala* discloses controlling the impedance and supply current of linear units, such as amplifiers and mixers, based on a detected signal strength. Ex. 1002 at ¶¶135-140. Based on the detected signal strength, impedance can be 1) reduced (increasing supply current) to improve performance at the expense of energy consumption, or 2) increased (decreasing supply current) to improve energy consumption in situations where supply current can be reduced without sacrificing performance. Ex. 1002 at ¶¶135-140.

In particular, *Rauhala* discloses that the detected signal strength RSS is directed to a control unit 22. Ex. 1004 at [0013] and FIG. 2; Ex. 1002 at ¶135. Control unit 22 outputs control signals to the linear units (e.g., the amplifiers and mixers). *Id.;* Ex. 1002 at ¶135. For example, control signal cM1 sets the supply current of mixer M1 and signal cM2 sets the supply current of mixer M2. *Id.;* Ex. 1002 at ¶135.

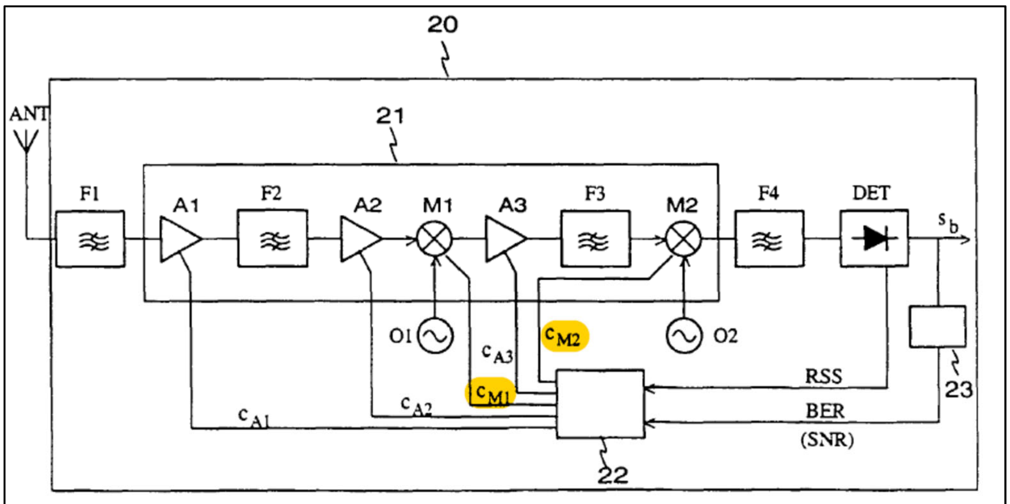


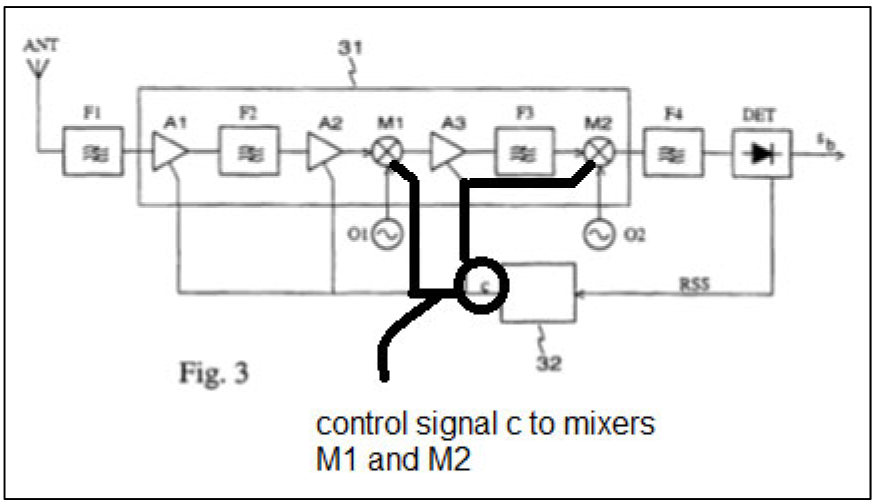
Fig. 2

*Rauhala*'s FIG. 3 is one example of supply current control for the linear units. Ex. 1004 at [0015]; Ex. 1002 at ¶136. A control unit 32 receives only the receive signal strength RSS information which has threshold values S31 and S32. Ex. 1004 at [0015]; Ex. 1002 at ¶136. The control unit 32 produces one one-bit control signal c, which is taken to all linear units A1, A2, M1, A3 and M2. Ex. 1004 at [0015]; Ex. 1002 at ¶136. The supply current of a given linear unit has two values. Supply currents are controlled with signal c according to the annotated table below. Ex. 1004 at [0015]; Ex. 1002 at ¶136.

| RSS | c | $I_i$ | |
|---|---|---|---|
| ≤S31 | 0 | $I_h$ | high current condition |
| ≥S31, <S32 | 1 | $I_l$ | low current condition |
| ≥S32 | 0 | $I_h$ | high current condition |

Ex. 1004 at [0015]; Ex. 1002 at ¶136.

The control signal c is taken to all linear units, including each of the mixers M1 and M2. Ex. 1004 at [0015] and FIG. 3 (annotated below); Ex. 1002 at ¶137.




The value of control signal c depends upon the detected signal strength RSS. Ex. 1004 at [0015]; Ex. 1002 at ¶138. When the measured current is below threshold S31, signal c is 0 and the linear unit (e.g., mixer and amplifier) supply currents are at their higher values. Ex. 1004 at [0015]; Ex. 1002 at ¶138.

*Rauhala* shows "dynamically changing an impedance of a component in the signal path based on the first signal strength." Ex. 1004 at [0023]; Ex. 1002 at ¶¶138-140. The impedance of control circuit 72 depends on the control signal c, which itself depends on the determined signal strength RSS. Ex. 1002 at ¶¶138-140. The signal strength is dynamic because it depends on factors like the distance between the mobile station and the base station, terrain undulations, atmospheric conditions. Since the signal strength itself is dynamic and changing, the impedance is dynamically changed because it is based on the dynamic determined signal strength RSS. Ex. 1002 at ¶¶138-140.

This relationship between the signal strength and control signal c with impedance, supply current, and collector (switching) current are summarized in the table below.

| **Control signal c (dependent on signal strength)** | **k** | **Impedance** | **Control Current $I_B$** | **Supply Current I** | **Collector Current I/2** |
|---|---|---|---|---|---|
| 1 | Closed | Low | High (VB/R1 + VB/R2) | High | High |
| 0 | Open | High | Low (VB/R1) | Low | Low |

As the impedance is increased, the collector (switching current) directed to the switching transistors 1A or 1B would be decreased. Ex. 1002 at ¶¶118-140.

Therefore, *Cummins* and *Rauhala* disclose "reducing a switching current in the signal path by dynamically changing an impedance of a component in the signal path based on the first signal strength." Ex. 1002 at ¶¶118-140.

**2. Claim 23**

**i. "A wireless transceiver integrated circuit comprising: a receiver comprising a signal path"**

*Cummins* teaches this element. *See supra* Section IX(A)(1)(i); Ex. 1002 at ¶¶142-144.

**ii. "a low-noise amplifier"**

*Cummins* teaches this element. *See supra* Section IX(A)(1)(ii); Ex. 1002 at ¶145.

**iii. "a mixer having an input coupled to an output of the low-noise amplifier"**

*Cummins* teaches this element. *See supra* Section IX(A)(1)(iii); Ex. 1002 at ¶146.

**iv. "a low-pass filter having an input coupled to an output of the mixer"**

*Cummins* teaches this element. *See supra* Section IX(A)(1)(iv); Ex. 1002 at ¶147.

#### v. "a first signal strength indicator circuit coupled to the signal path, and configured to determine a first signal strength"

*Cummins in view of Rauhala* teaches this element. *See supra* Section IX(A)(1)(v); Ex. 1002 at ¶¶148-160.

#### vi. "wherein an impedance in the signal path is configured to be dynamically adjusted to reduce a switching current in response to the first signal strength."

*Cummins in view of Rauhala* teaches this element. *See supra* Section IX(A)(1)(vi) to IX(A)(1)(viii); Ex. 1002 at ¶¶161-184.

## B. Ground 2: *Rauhala* in view of *Meador* renders claim 29 unpatentable

### 1. Claim 29

#### i. "A wireless transceiver integrated circuit comprising"

*Rauhala* describes methods "for linearizing a radio receiver" in which "the energy consumption of the receiver can be reduced without degrading the signal quality." Ex. 1004 at [0001], [0007]; Ex. 1002 at ¶187. *Rauhala* states that such techniques are "appli[cable] in the reception circuits of mobile stations," such as mobile phones, which are transceivers. Ex. 1004 at [0001], [0012]; Ex. 1002 at ¶187.

To the extent that the Patent Owner argues that *Rauhala* does not explicitly disclose that its transceiver circuity is disposed on an integrated circuit, *Meador* teaches that it is well known to incorporate such components onto an integrated circuit. Ex. 1002 at ¶¶188-190.

*Meador* is directed "in general to radio transceivers, and more particularly, to integrated circuit devices that implement transceiver functions." Ex. 1006 at 1:5-7. Ex. 1002 at ¶¶188-190. *Meador* discloses that "[t]here has been a desire to integrate as many functions as feasible on a single integrated circuit when implementing a radio transceiver," and that "[a]n entire transceiver system integrated on a common substrate would tend to reduce cost and increase reliability." Ex. 1006 at 1:27-32. Ex. 1002 at ¶¶188-190. *Meador* discloses that "a configurable single-chip radio transceiver is needed." Ex. 1006 at 1:36-37; Ex. 1002 at ¶¶188-190.

*Meador* discloses a "configurable single-chip transceiver integrated circuit (IC) architecture." Ex. 1006 at 1:66-67; Ex. 1002 at ¶¶188-190. The "single-chip transceiver IC has multiple on-chip circuits that implement receiver functions, transmitter functions, and audio processing functions, among others." Ex. 1006 at 2:1-2:3; Ex. 1002 at ¶¶188-190.

*Meador* discloses that the "resultant integrated transceiver system allows for flexibility in improving performance and functionality." Ex. 1006 at 7:63-65; Ex. 1002 at ¶¶188-190.

*Rauhala* and *Meador* are analogous. Both references are directed to wireless transceivers. Ex. 1002 at ¶191.

For example, *Rauhala* relates to "a method and an arrangement for linearizing a radio receiver." Ex. 1004 at [0007]; Ex. 1002 at ¶187. *Meador* is directed "in general to radio transceivers." Ex. 1006 at 1:5-7. Ex. 1002 at ¶188.

A POSITA would have been motivated to modify *Rauhala* with *Meador*, because such a modification would have reduced cost and increased reliability as explicitly disclosed by *Meador*. Ex. 1002 at ¶¶191-193. *Meador* discloses that the reduced cost and increased reliability would have been achieved by integration of as many functions as feasible on a single integrated circuit when implementing a radio transceiver. Ex. 1006 at 1:27-32. Ex. 1002 at ¶188-190.

It would have been obvious to a POSITA to modify *Rauhala* to incorporate its transceiver circuitry, including receiver and transmitter circuitry, into an integrated circuit, as taught by *Meador*. Ex. 1002 at ¶¶191-193. *Rauhala* and *Meador* are analogous and the motivation for combining is set forth above.

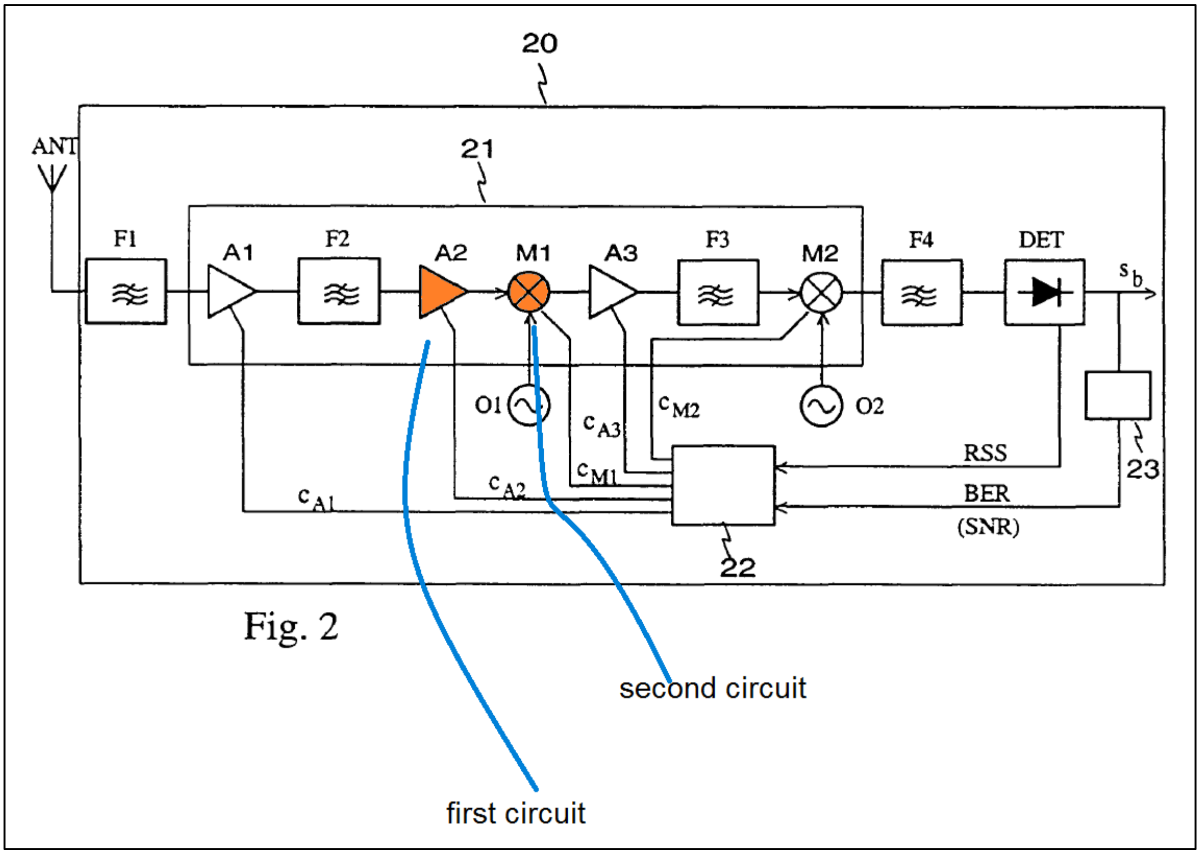
The modification of *Rauhala* with *Meador* would have amounted to the use of a known technique (*Meador's* integration of a transceiver onto an integrated circuit) to improve a similar device (*Rauhala's* mobile phone transceiver). Ex. 1002 at ¶¶191-193.

Thus, the modification would have amounted to nothing more than the use of a known technique to improve a similar device, and the results of the modification would have been predictable. *See KSR Int'l. Co. v. Teleflex, Inc.*, 550

U.S. 398, 417 (2007). At the time of the invention, a POSITA would have had the requisite skill level to readily modify the device disclosed by *Rauhala* to implement the teachings of *Meador* without any problem. Ex. 1002 at ¶¶191-193.

**ii. "a receiver comprising a signal path, the signal path comprising: a first circuit; and a second circuit having an input coupled to an output of the first circuit"**

*Rauhala* teaches a receiver signal path comprising at least an amplifier, a mixer and a filter. Ex. 1004 at [0012], [0013], and FIG. 2 (below); Ex. 1002 at ¶194. *Rauhala*'s amplifier A2 is a first circuit, and that *Rauhala*'s mixer M1 is a second circuit coupled to an output of the first circuit (the amplifier A2). Ex. 1002 at ¶¶195-199.




**iii. "a first signal strength indicator circuit coupled to the signal path, and configured to determine a first signal strength"**

*Rauhala* discloses that a signal path includes a detector DET coupled to an output of a filter. Ex. 1004 at [0012] and FIG. 2 (annotated below); Ex. 1002 at ¶200. *Rauhala* further teaches that "[d]etector DET provides information about the signal strength (RSS) on the channel to which the receiver is tuned." Ex. 1004 at [0013]; Ex. 1002 at ¶200. Detector DET is a signal strength indicator circuit coupled to a signal path, and detector DET is configured to determine a signal strength. Ex. 1002 at ¶¶201-203.

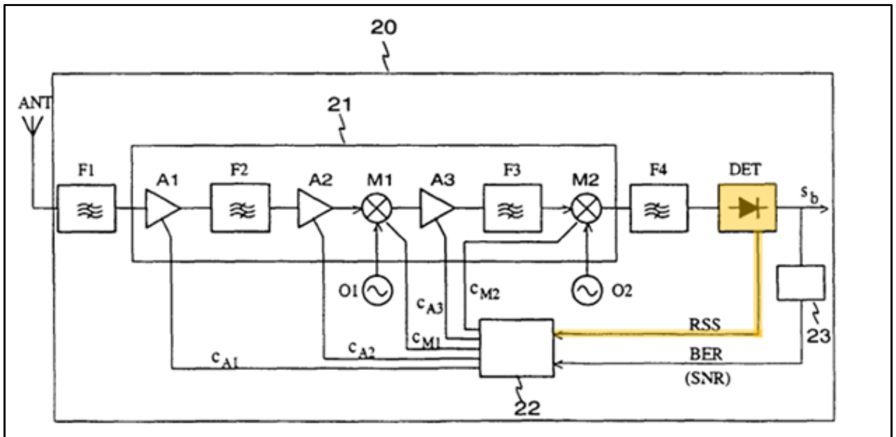


Fig. 2

### iv. "wherein a gain of the first circuit is configured to be dynamically adjusted in response to the first signal strength"

The amplifiers of *Rauhala* correspond to the claimed first circuit. *See supra* Section IX(B)(1)(ii); Ex. 1002 at ¶¶195-199. The supply current control of the *Rauhala* amplifiers corresponds to adjustment of the gain of the first circuit, and this is elaborated further below. Ex. 1002 at ¶¶204-215.

*Rauhala* discloses that the detected signal strength RSS is directed to a control unit 22. Ex. 1004 at [0013]; Ex. 1002 at ¶204. Control unit 22 outputs control signals to the linear units (e.g., the amplifiers and mixers). Ex. 1004 at [0013]; Ex. 1002 at ¶204. For example, control signal cA1 sets the supply current of amplifier A1. Ex. 1004 at [0013]; Ex. 1002 at ¶204. Similarly, signal cA2 sets the supply current of amplifier A2, signal cM1 that of mixer M1, signal cA3 that of amplifier A3, and signal cM2 that of mixer M2. Ex. 1004 at [0013]; Ex. 1002 at ¶204.

*Rauhala*'s FIG. 3 is one example of supply current control for the linear units. Ex. 1004 at [0015]; Ex. 1002 at ¶205. A control unit 32 receives only the receive signal strength RSS information which has threshold values S31 and S32. Ex. 1004 at [0015]; Ex. 1002 at ¶205. The control unit 32 produces one one-bit control signal c, which is taken to all linear units A1, A2, M1, A3 and M2. Ex. 1004 at [0015]; Ex. 1002 at ¶205. The supply current of a given linear unit has two values. Supply currents are controlled with signal c according to the annotated table below. Ex. 1004 at [0015]; Ex. 1002 at ¶205.

| RSS | c | $I_i$ | |
|---|---|---|---|
| ≤S31 | 0 | $I_{ih}$ | high current condition |
| >S31, <S32 | 1 | $I_{il}$ | low current condition |
| ≥S32 | 0 | $I_{ih}$ | high current condition |

The control signal c is taken to all linear units, including each of the amplifiers A1, A2, and A3. Ex. 1004 at [0015]; Ex. 1002 at ¶206.

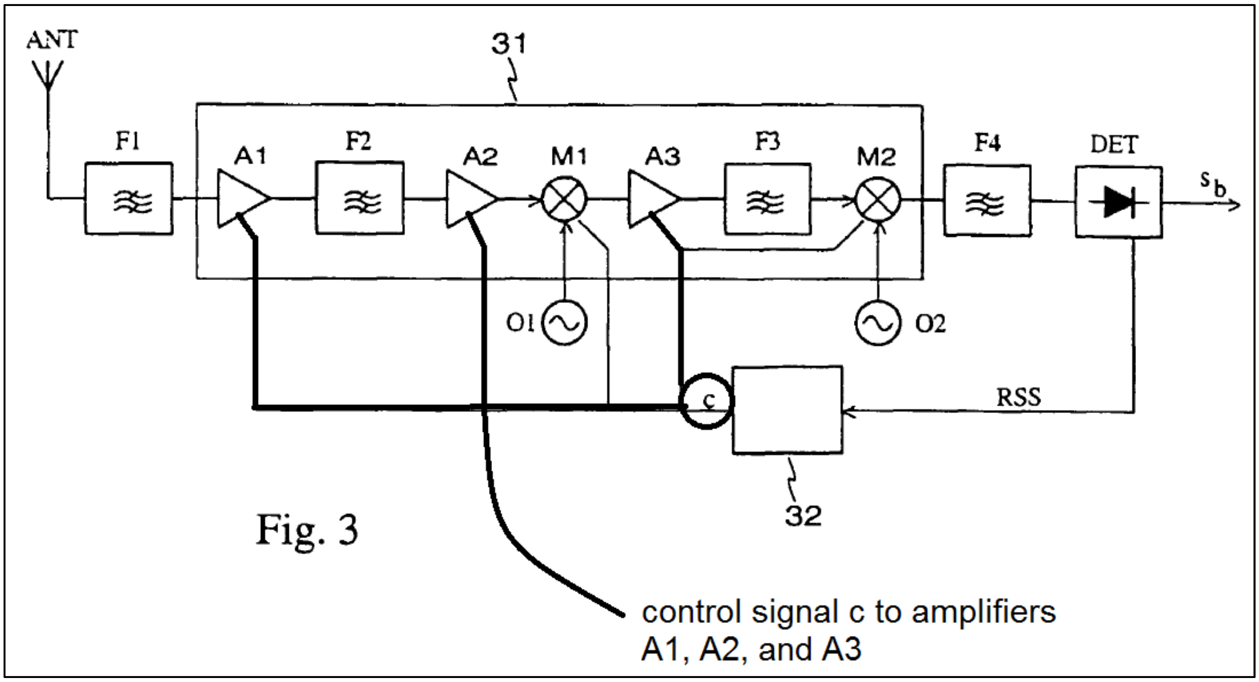


Fig. 3

The value of control signal c depends upon the detected signal strength RSS. Ex. 1004 at [0015]; Ex. 1002 at ¶¶207-210.

Fig. 6 of *Rauhala* in particular shows an example of supply current control for an amplifier 61. Ex. 1004 at [0021]; Ex. 1002 at ¶211. In this example the amplifier 61 is a differential amplifier, a "diff. amp." that is biased, as in Fig. 7, using transistors Q1 and Q2. Ex. 1004 at [0021]; Ex. 1002 at ¶211.

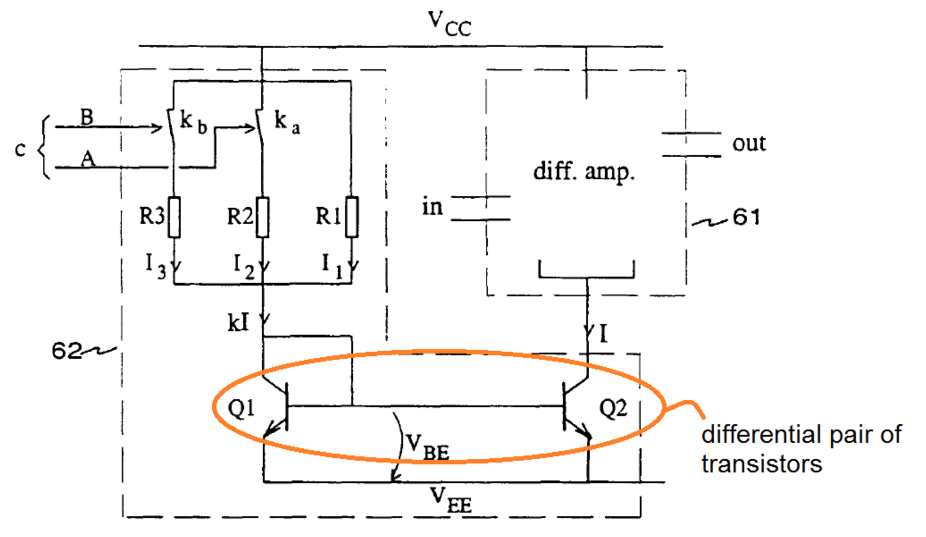


Fig. 6

The supply current for the amplifier is controlled by changing the impedance of control circuit 62, using control signals A and B, which form a two bit control signal c (where c = AB). Ex. 1004 at [0021]; Ex. 1002 at ¶212. The control signal c is based on the determined signal strength RSS. Ex. 1004 at [0013]-[0021]; Ex. 1002 at ¶212. The control for current kI and the current I is described in the table below. Ex. 1004 at [0013]-[0021]; Ex. 1002 at ¶212. Therefore, the impedance of the control circuit 62 and the total supply current kI + I is based on the determined signal strength RSS. Ex. 1004 at [0021]; Ex. 1002 at ¶212.

| B | A | kI | $kI/I_1$ |
|---|---|---|---|
| 0 | 0 | $I_1$ | 1 |
| 0 | 1 | $I_1+I_2$ | 2 if R1=R2 |
| 1 | 0 | $I_1+I_3$ | 3 if R1=2·R3 |
| 1 | 1 | $I_1+I_2+I_3$ | 4 if R1=R2=2·R3 |

Therefore, a POSITA would have understood that *Rauhala* teaches a dynamic adjustment of gain of the claimed first circuit. Ex. 1002 at ¶204-215. The gain adjustment is dynamic because it depends on the determined signal strength RSS, which a POSITA would have understood changes depending on factors affecting signal strength known to a POSITA. Ex. 1002 at ¶¶209-210.

#### v. "wherein an impedance in the second circuit is configured to be dynamically adjusted in response to the first signal strength"

*Rauhala*'s mixer corresponds to the claimed "second circuit." *See supra* Section IX(B)(1)(ii).

The impedance of control circuit 72 depends on the control signal c, which itself depends on the determined signal strength RSS. *See supra* Section IX(A)(1)(viii).

Therefore, *Cummins* in view of *Rauhala* discloses that "an impedance in the second circuit is configured to be dynamically adjusted in response to the first signal strength." Ex. 1002 at ¶¶216-227.

### C. Ground 3: *Rauhala* in view of *Meador* and *Furuno* renders claim 30 unpatentable

#### i. "The wireless transceiver of claim 29 further comprising a transmitter comprising"

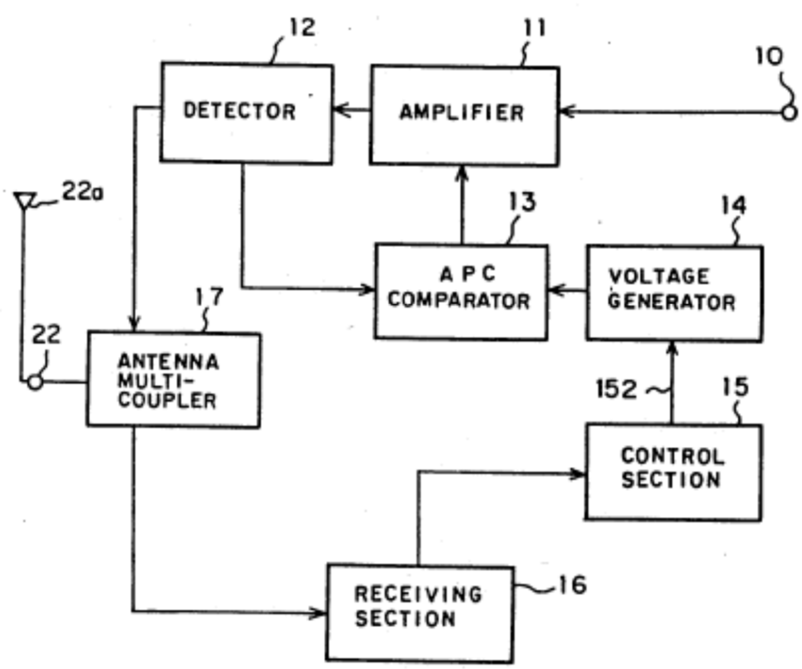
*Rauhala* states that its techniques are "appli[cable] in the reception circuits of mobile stations," such as mobile phones, which is a transceiver having a transmitter. Ex. 1004 at [0001], [0012]; Ex. 1002 at ¶228. A mobile phone, used to conduct phone calls that transmit signals and receive signals, is a transceiver, which would have a transmitter. Ex. 1002 at ¶¶100, 228. A transceiver is "combination of radio transmitting and **receiving equipment** . . . for portable or mobile use and employing some common circuit components for both transmitting and receiving." Ex. 1011 at 12 (emphasis added), and a mobile phone is a transceiver because it must transmit and receive signals to conduct phone calls. Ex. 1002 at ¶100.

*Rauhala's* invention is specifically dedicated to the receiver side of the mobile phone, and does not explicitly disclose the precise structural details of its transmitter side. Ex. 1002 at ¶¶229-232.

*Furuno* is an exemplary disclosure that teaches such features are well-known in mobile phones. Ex. 1007 at 1:16-35; Ex. 1002 at ¶¶229-232.

*Furuno* discloses a transmitting output control section for an automobile telephone set of a conventional type. In the figure, 10 is a transmitting signal input terminal at which a transmitting signal is to be received. Ex. 1007 at 1:16-35 and FIG. 1 (below); Ex. 1002 at ¶229. In the figure, 11 is an amplifier for amplifying the transmitting signal. Ex. 1007 at 1:16-35; Ex. 1002 at ¶229. *Furuno* teaches that element 12 is a detector which detects the level of an output signal of the amplifier 11. Ex. 1007 at 1:16-35; Ex. 1002 at ¶234. *Furuno* teaches element 13 is an automatic power control comparator (hereinafter referred to as APC comparator) which constitutes a transmitting power control means in which a DC voltage output by the detector 12 and an output of a voltage generator 14. Ex. 1007 at 1:16-35; Ex. 1002 at ¶234. The APC comparator 13 compares the DC voltage and the specified voltage and adjusts the amplification factor (gain) of the amplifier 11 so that both voltages are in balance. Ex. 1007 at 1:16-35; Ex. 1002 at ¶234.

FIG. 1 (PRIOR ART)




*Rauhala*, *Meador*, and *Furuno* are analogous as they all relate to mobile phones. Ex. 1002 at ¶¶188, 230

A POSITA would have been motivated to combine *Rauhala* in view of *Meador*, and *Furuno* to the extent that the express details of how to implement the details of a transmitter were needed for the transmitting side of *Rauhala's* transceiver. Ex. 1002 at ¶¶230-232. For example, *Furuno* teaches how to implement a transmitter for transmitting the signal, an amplifier for amplifying the signal, and how to ensure that the amplification factor of the amplifier is set appropriately. Ex. 1007 at 1:16-35; Ex. 1002 at ¶¶230-232.

Accordingly, it would have been obvious to the POSITA to include a transmitter (and any other conventional components) in the mobile phone of *Rauhala*. Ex. 1002 at ¶¶230-232. *Rauhala*, *Meador*, and *Furuno* are analogous and the motivation to combine the references are set forth above.

The modification of *Rauhala* in view *Meador*, with *Furuno* would have amounted to the use of a known technique (*Furuno's* transmitter components for a mobile phone, including transmitter, amplifier, detector, and APC comparator) to improve a similar device (*Rauhala's* mobile phone transceiver). Ex. 1002 at ¶¶230-232.

Such a modification would have amounted to nothing more than the use of a known technique to improve a similar device, and the results of the modification would have been predictable. See KSR, 550 U.S. at 417. At the time of the invention, a POSITA would have had the requisite skill level to readily modify the device disclosed by *Rauhala* and *Meador* to implement the teachings of Furuno without any problem. Ex. 1002 at ¶¶230-232.

#### ii. "a power amplifier"

*Furuno* discloses a transmitting output control section for an automobile telephone set of a conventional type. In the figure, 11 is an amplifier for amplifying the transmitting signal. Ex. 1007 at 1:16-35; Ex. 1002 at ¶233.

#### iii. "an output-level-sensing circuit coupled to an output of the power amplifier wherein the output-level-sensing circuit is configured to dynamically adjust a gain of the power amplifier"

*Furuno* teaches that element 12 is a detector which detects the level of an output signal of the amplifier 11. Ex. 1007 at 1:16-35; Ex. 1002 at ¶234. *Furuno* teaches element 13 is an automatic power control comparator (hereinafter referred to as APC comparator) which constitutes a transmitting power control means in which a DC voltage output by the detector 12 and an output of a voltage generator 14. Ex. 1007 at 1:16-35; Ex. 1002 at ¶234. The APC comparator 13 compares the DC voltage and the specified voltage and adjusts the amplification factor (gain) of the amplifier 11 so that both voltages are in balance. Ex. 1007 at 1:16-35; Ex. 1002 at ¶234. Detector 12 and APC comparator 13 form an output-level-sensing circuit coupled to the output of a power amplifier because together they are configured to adjust a gain of the power amplifier 11. Ex. 1002 at ¶234. The gain adjustment is dynamic because it depends on the DC voltage output from detector 12 and on the output of voltage generator 14, neither of which are constant. Ex. 1002 at ¶234.

### D. Ground 4: *Cummins* in view of *Rauhala* and *Saito* Renders Claims 1 and 23 Unpatentable

#### 1. Claim 1

##### i. "A method of receiving a signal using an integrated circuit"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(i); Ex. 1002 at ¶¶100-102, 236.

##### ii. "the integrated circuit comprising a signal path including a low-noise amplifier configured to receive the signal"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(ii); Ex. 1002 at ¶¶103-104, 236.

##### iii. "a mixer having an input coupled to an output of the low-noise amplifier"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(iii); Ex. 1002 at ¶¶105, 236.

##### iv. "a low-pass filter having an input coupled to an output of the mixer"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(iv); Ex. 1002 at ¶¶105, 236.

##### v. "determining a first signal strength at a first node in the signal path in the integrated circuit"

*Cummins in view of Rauhala* teaches this element. *See supra* Section IX(A)(1)(v); Ex. 1002 at ¶¶106-117, 236.

**vi. "reducing a switching current in the signal path by dynamically changing an impedance of a component in the signal path based on the first signal strength"**

*Cummins in view of Rauhala* teaches this element. *See supra* Sections IX(A)(1)(vi) to IX(A)(1)(viii); Ex. 1002 at ¶¶118-140, 236.

However, to the extent that the term "dynamically changing" is interpreted to require adjustment without reliance upon a signal strength threshold, which Petitioner does not concede, it would have been obvious to a POSITA to modify *Cummins* in view of *Rauhala* with the teachings of *Saito*. Ex. 1002 at ¶¶237-249.

*Saito* discloses automatic gain control circuitry for use in receivers of mobile devices. Ex. 1008 at 1:34-40; Ex. 1002 at ¶237. *Saito* states that the automatic gain control circuitry is aimed at "reducing reception disturbance resulting from intermodulation distortion for input levels of a broad range from the reception of a small input signal to the reception of a large input signal in receivers." Ex. 1008 at 1:34-40; Ex. 1002 at ¶237. *Saito* explains that the automatic gain control circuitry includes "reception field level detection means" which "outputs a gain control signal in accordance with the reception field level." Ex. 1008 at 1:41-47; Ex. 1002 at ¶237. The "reception field level" referred to by *Saito* is analogous to signal strength. Ex. 1002 at ¶237. *Saito* further explains that the gain of radio frequency gain control units is controlled by "an automatic gain control unit comprising one or a plurality of continuous feedback systems." Ex. 1008 at 1:47-53; Ex. 1002 at ¶237.

In an embodiment, *Saito* teaches that "variable attenuators 20, 21, can continuously vary the damping quantity by the gain control signal outputted from the reception field level detection means 22, which constitute the continuous feedback system." Ex. 1008 at 6:17-27; Ex. 1002 at ¶238. *Saito* explains that the "continuous feedback system . . . operate[s] to keep the input level of the received signal processing circuit always constant." Ex. 1008 at 6:20-27; Ex. 1002 at ¶238. *Saito* contends that such gain control "eliminat[es] the intermodulation distortion in a wide range of reception field levels ranging from the input of the very fine signal to the input of the large signal." Ex. 1008 at 7:51-62; Ex. 1002 at ¶238. In other words, the use of continuous feedback in *Saito* allowed for the desired control outcome – "eliminat[ing] the intermodulation distortion" and "keep[ing] the input level of the received signal processing circuit always constant" – over a broad range of conditions – "in a wide range of reception field levels ranging from the input of the very fine signal to the input of the large signal." Ex. 1008 at 6:20-27; 7:51-62; Ex. 1002 at ¶238.

It was well known in the art that "continuous feedback" controllers, such as the one disclosed in *Saito* operate using "proportional control." Ex. 1002 at ¶¶239-246; Ex. 1016 at 1-3, 12 (discussing that proportional-integral-derivative (PID), proportional-integral (PI), and proportional controllers are forms of a "continuous feedback controller"); Ex. 1017 at 6-7, 25, 27, 29, 31 at (using proportional control, e.g., PID controller, to optimize mobile terminal transmission power and signal-to-interference error); Ex. 1018 at 1:26-29 (stating "the system effects proportional control, i.e., therfe is continuous feedback to the device so that the course correction is proportional to the deviation or error").

Proportional control is "[a] control system in which corrective action is always proportionate to any variation of the controlled process from its desired value. For example, instead of snapping directly open-closed in the manner of two-position control, a proportional valve will be always positioned at some point between open and closed, depending on the flow requirement of the system at any given moment." Ex. 1011 at 11; Ex. 1002 at ¶245. Proportional controllers, like the continuous feedback controller of *Saito*, do not rely on thresholds because their "corrective action is always proportionate to any variation of the controlled process from its desired value." Ex. 1011 at 11; Ex. 1002 at ¶246.

*Cummins*, *Rauhala*, and *Saito* are analogous as they all relate to wireless receivers. Ex. 1002 at ¶247.

A POSITA would have been motivated to modify the threshold-based current controls of *Rauhala* (in the *Cummins*/*Rauhala* combination) to continuously adjust the supply currents using a continuous feedback system, as described by *Saito*, because doing so would have allowed for the desired outcome (supply current level) to be achieved over a broad signal strength range as in *Saito*. Ex. 1002 at ¶¶248-249.

In view of *Saito*, it would have been obvious to a POSITA to modify *Cummins* in view of *Rauhala* with the teachings of *Saito* to apply a continuous feedback mechanism for continuous adjustment of the supply currents. Ex. 1002 at ¶¶248-249. *Cummins*, *Rauhala*, and *Saito* are analogous and the motivation to combine the references are set forth above.

The modification of *Cummins* in view *Rauhala*, with *Saito* would have amounted to the use of a known technique (*Saito's* continuous feedback control) to improve a similar device (*Rauhala's* threshold-based control). Ex. 1002 at ¶¶248-249.

Such a modification would have amounted to nothing more than the use of a known technique to improve a similar device, and the results of the modification would have been predictable. *See KSR Int'l. Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007). At the time of the invention, a POSITA would have had the requisite skill level to readily modify the device disclosed by *Cummins* in view of *Rauhala* to implement the teachings of *Saito* without any problem. Ex. 1002 at ¶¶248-249. Moreover, such modifications of *Cummins* in view of *Rauhala* would have been routine for the POSITA as they unite old elements with no change in their respective functions. *See KSR*, 550 U.S. at 417; Ex. 1002 at ¶¶248-249.

### 2. Claim 23

#### i. "A wireless transceiver integrated circuit comprising: a receiver comprising a signal path"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(i); Ex. 1002 at ¶¶142-144, 236.

#### ii. "a low-noise amplifier"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(ii); Ex. 1002 at ¶¶145, 236.

#### iii. "a mixer having an input coupled to an output of the low-noise amplifier"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(iii); Ex. 1002 at ¶¶146, 236.

#### iv. "a low-pass filter having an input coupled to an output of the mixer"

*Cummins* teaches this element. *See supra* Section IX(A)(1)(iv); Ex. 1002 at ¶¶147, 236.

#### v. "a first signal strength indicator circuit coupled to the signal path, and configured to determine a first signal strength"

*Cummins in view of Rauhala* teaches this element. *See supra* Section IX(A)(1)(v); Ex. 1002 at ¶¶148-160, 236.

vi. **"wherein an impedance in the signal path is configured to be dynamically adjusted to reduce a switching current in response to the first signal strength."**

*Cummins in view of Rauhala and Saito* teaches this element. *See supra* Section IX(D)(1)(vi); Ex. 1002 at ¶¶161-184, 236.

### E. Ground 5: *Rauhala* in view of *Meador* and *Saito* renders claim 29 unpatentable

i. **"A wireless transceiver integrated circuit comprising,"**

*Rauhala in view of Meador* teaches this element. *See supra* Section IX(B)(1)(i); Ex. 1002 at ¶¶187-193, 250.

ii. **"a receiver comprising a signal path, the signal path comprising: a first circuit; and a second circuit having an input coupled to an output of the first circuit"**

*Rauhala in view of Meador* teaches this element. *See supra* Section IX(B)(1)(ii); Ex. 1002 at ¶¶194-199, 250.

iii. **"a first signal strength indicator circuit coupled to the signal path, and configured to determine a first signal strength"**

*Rauhala in view of Meador* teaches this element. *See supra* Section IX(B)(1)(iii); Ex. 1002 at ¶¶200-203, 250.

iv. **"wherein a gain of the first circuit is configured to be dynamically adjusted in response to the first signal strength"**

*Rauhala in view of Meador* teaches this element. *See supra* Section

IX(B)(1)(iv); Ex. 1002 at ¶¶195-215, 250.

However, to the extent that the term "dynamically adjusted" in interpreted to require adjustment without reliance upon a signal strength threshold, which Petitioner does not concede, it would have been obvious to a POSITA to modify *Rauhala* in view of *Meador* with the teachings of *Saito*. Ex. 1002 at ¶¶250-262. Specifically, it would have been obvious to modify the threshold-based current controls of *Rauhala* to continuously adjust the supply currents using a continuous feedback. Ex. 1002 at ¶¶250-262.

*Saito* is discussed previously. *See supra* Section IX(D)(1)(vi).

In view of *Saito*, it would have been obvious to a POSITA to modify *Rauhala* in view of *Meador* with the teachings of *Saito* to apply a continuous feedback mechanism for continuous adjustment of the supply currents. Ex. 1002 at ¶¶250-262. Indeed, a POSITA would have been motivated to make such a modification of *Rauhala* in view of *Meador* at least to maintain a constant quality of a received signal and avoid abrupt changes in quality caused by changing circuit parameters near thresholds. Ex. 1002 at ¶¶250-262. Moreover, modification of *Rauhala* in view of *Meador* with the teachings of *Saito* would have amounted to nothing more than the use of a known technique to improve a similar device, and the results of the modification would have been predictable. *See KSR Int'l. Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007). This is because at the time of the invention, a POSITA would have had the requisite skill level to readily modify the device disclosed by *Rauhala* in view of *Meador* to implement the teachings of *Saito* without any problem. Ex. 1002 at ¶¶250-262. Moreover, such modifications of *Rauhala* in view of *Meador* would have been routine for the POSITA as they unite old elements with no change in their respective functions. *See KSR*, 550 U.S. at 417; Ex. 1002 at ¶¶250-262.

**v. "wherein an impedance in the second circuit is configured to be dynamically adjusted in response to the first signal strength"**

*Rauhala in view of Meador* teaches this element. *See supra* Section IX(B)(1)(v); Ex. 1002 at ¶¶250-262.

However, to the extent that the term "dynamically adjusted" in interpreted to require adjustment without reliance upon a signal strength threshold, which Petitioner does not concede, it would have been obvious to a POSITA to modify *Rauhala* in view of *Meador* with the teachings of *Saito*. Ex. 1002 at ¶¶250-262. Specifically, it would have been obvious to modify the threshold-based current controls of *Rauhala* to continuously adjust the supply currents using a continuous feedback

*Saito* is discussed previously. *See supra* Section IX(D)(1)(vi).

In view of *Saito*, it would have been obvious to a POSITA to modify *Rauhala* in view of *Meador* with the teachings of *Saito* to apply a continuous feedback mechanism for continuous adjustment of the supply currents. Ex. 1002 at ¶¶250-262. Indeed, a POSITA would have been motivated to make such a modification of *Rauhala* in view of *Meador* at least to maintain a constant quality of a received signal and avoid abrupt changes in quality caused by changing circuit parameters near thresholds. Ex. 1002 at ¶¶250-262. Moreover, modification of *Rauhala* in view of *Meador* with the teachings of *Saito* would have amounted to nothing more than the use of a known technique to improve a similar device, and the results of the modification would have been predictable. *See KSR Int'l. Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007). This is because at the time of the invention, a POSITA would have had the requisite skill level to readily modify the device disclosed by *Rauhala* in view of *Meador* to implement the teachings of *Saito* without any problem. Ex. 1002 at ¶¶250-262. Moreover, such modifications of *Rauhala* in view of *Meador* would have been routine for the POSITA as they unite old elements with no change in their respective functions. *See KSR*, 550 U.S. at 417; Ex. 1002 at ¶¶250-262.

### F. Ground 6: *Rauhala* in view of *Meador, Saito, and Furuno* renders claim 30 unpatentable

#### i. "The wireless transceiver of claim 29 further comprising a transmitter comprising:"

*Rauhala in view of Meador and Furuno* teaches this element. *See supra* Section IX(C)(i); Ex. 1002 at ¶¶100, 228-234. The addition of *Saito* in the alternative ground 4 does not affect the teaching of this claim feature by the combination of *Rauhala* in view of *Meador* and *Furuno*. The modification of *Rauhala* in view *Meador* and *Saito*, with *Furuno* would have amounted to the use of a known technique (*Furuno's* transmitter components for a mobile phone) to improve a similar device (*Rauhala's* mobile phone transceiver). Ex. 1002 at ¶¶100, 228-234.

#### ii. "a power amplifier;"

*Rauhala in view of Meador and Furuno* teaches this element. *See supra* Section IX(C)(ii); Ex. 1002 at ¶233.

#### iii. "an output-level-sensing circuit coupled to an output of the power amplifier wherein the output-level-sensing circuit is configured to dynamically adjust a gain of the power amplifier"

*Rauhala in view of Meador and Furuno* teaches this element. *See supra* Section IX(C)(iii); Ex. 1002 at ¶234.

## X. ARGUMENTS FOR DISCRETIONARY DENIAL SHOULD BE REJECTED

### A. Section 325(d) Is Inapplicable Because the Asserted Art Was Never Evaluated During Examination.

The Board should not deny institution under §325(d) because the art asserted here was not before the Examiner and is not cumulative of art that was. As set forth below, the Examiner either (1) was not presented with the same or substantially the same art or arguments as Petitioner's, or (2) materially erred in allowing the challenged claims. *Advanced Bionics, LLC v. Med-El Elektromedizinische Gerate GmbH*, IPR2019-01469, Paper 6 at 8 (P.T.A.B. Feb. 13, 2020) (citing *Becton, Dickinson, & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (P.T.A.B. Dec. 15, 2017)).

***Becton, Dickinson* Factors (a), (b), and (d).** Neither "the same [nor] substantially the same" art or arguments were previously presented to the Office during prosecution of the challenged claims. *Rauhala*, *Cummins*, *Meador*, *Furuno*, and *Saito* were never cited during prosecution of the '202 patent, let alone considered by the Examiner or made the subject of a rejection. *See generally* Ex. 1003. These references are also not substantially the same or cumulative of references considered during examination. During Examination, the pending claims were rejected under sections 102 and 103 over combinations of U.S. Patent No. 5,001,776 ("Clark"), U.S. Patent No. 5,001,776 ("Okanobu"), U.S. Patent No. 6,714,557 ("Smith"), and U.S. Patent No. 5,995,853 ("Park"). Ex. 1003 at 171-177.

***Becton, Dickinson* Factors (c), (e), and (f).** As explained above, the answer to the first inquiry of *Advanced Bionics*—whether the same or substantially the same art or arguments were previously presented to the Office—is a definitive "no." Accordingly, analysis of Examiner error is unnecessary. Nevertheless, to the extent the Board disagrees and determines *Becton, Dickinson* factors (a), (b), and

(d) do not favor institution, discretionary denial still is not warranted because the Examiner must have necessarily overlooked anticipatory disclosures of the art that was examined, constituting material error. *Advanced Bionics*, IPR2019-01469, Paper 6, 10 (listing silence as evidence of error). As stated above in detail, *Rauhala* alone teaches every element of the challenged claims. To the extent any reference that was Examined could be considered cumulative of *Rauhala*, *Cummins*, *Meador*, *Furuno*, and *Saito*, the Examiner should have rejected the challenged claims under section 102, or at least under section 103, and maintained the rejection(s).

### B. Institution is Proper Under Section 314(a) and *Fintiv*.

The merits of this Petition are strong, which alone warrants institution. On June 21, 2022, Director Vidal issued an interim procedure regarding application of the *Fintiv* factors clarifying that "the PTAB will not deny institution [] under *Fintiv* (i) when a petition presents compelling evidence of unpatentability." Director Vidal, Memorandum, "Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation," 9 (June 21, 2022). Here, each ground in the Petition presents compelling evidence of unpatentability. For example, Ground I is an anticipation ground explaining how *Rauhala* discloses each and every limitation of the challenged claims. This evidence, "if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable," (*id.* at 4) and the Board must decline to exercise its discretion under §314(a). *Id.; PopSockets LLC v. Flygrip, Inc.,* IPR2022-00938, Paper 8 (P.T.A.B. Nov. 1, 2022).

The *Fintiv* factors also weigh in favor of institution. First, the District Court has not yet scheduled a trial date. Ex. 1019. Second*,* the District Court will not hold a claim construction hearing until January 19, 2024, so the district court has not yet invested significant resources in this dispute. *See, e.g., Hulu LLC v. SITO Mobile R&D IP, LLC,* IPR2021-00298, Paper 11 at 13 (P.T.A.B. May 19, 2021). Third*,* "there is a reasonable likelihood that the Board will address the overlapping validity issues prior to the district court reaching them at trial [. . .] thereby providing the possibility of simplifying issues for trial." *Juniper Networks, Inc. v. Packet Intelligence LLC,* IPR2020-00339, Paper 21 at 18 (P.T.A.B. Sept. 10, 2020).

## XI. CONCLUSION

For the reasons above, Petitioner requests institution of IPR of the challenged claims based on all grounds.

Respectfully submitted,

Dated: March 7, 2023

______________________

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## CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 7,010,330 contains, as measured by the word-processing system used to prepare this paper, 13,776 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Dated: March 7, 2023

Respectfully submitted,

By: ________________________
Dinesh N. Melwani (Reg. No.60,670)
Counsel for Petitioner

## CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e) and 37 C.F.R. § 42.105(a), I hereby certify that on March 7, 2023, I caused a true and correct copy of the foregoing "PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 7,010,330" and supporting exhibits to be served via Federal Express on the Patent Owner at the following correspondence address of record as listed on PAIR:

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