

# Theta IP, LLC

## July 24, 2024 Hearing Demonstratives

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***Lenovo (United States) Inc. et al. v. Theta IP, LLC***

***U.S. Patent No. 10,129,825*** **IPR2023-00697**

***U.S. Patent No. 10,524,202*** **IPR2023-00698**

# determining

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('825 PATENT & '202 PATENT)

# '825 Patent, claim 3

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3. A method for power dissipation reduction in a receiver of a wireless transceiver of a battery powered portable wireless device, and a corresponding increase in battery life of the battery powered portable wireless device, the method comprising:

...

**receiving a wireless signal having a desired signal and an interferer signal**, by the wireless transceiver of the battery powered portable wireless device,

...

the wireless transceiver having a receiver signal path comprising a plurality of circuits, wherein the plurality of circuits includes an amplifier, a filter, and a mixer, and wherein the wireless transceiver comprises **a circuit for determining a signal strength of the interferer signal** and **a circuit for determining a signal strength of the desired signal**;

...

-00697 EX1001 ('825 Patent) at claim 3; see *also id.* at claims 1, 8

# “a desired signal and an interferer signal”

*Desired and interferer signals are components of same received signal spectrum.*

## '825 claim 3:

... receiving **a wireless signal having a desired signal and an interferer signal**

... determining a signal strength of the interferer signal

... determining a signal strength of the desired signal

## '825 Patent at 5:20-33:

“When a receiver is actively receiving a desired signal, each block in the signal path **has at its input the desired signal as well as** noise and possibly **interfering signals.**”

-00697 Response at 35; Sur-Reply at 9-10, 13-14; EX2015 ¶¶70-72

# '202 Patent, claim 7

7. A method for power dissipation control in a receiver of a wireless transceiver of a battery-powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer, wherein the receiver is configured to **receive a wireless signal having a desired signal and an interferer signal**, wherein the plurality of circuits are designed to function between a worst-case condition when a strength of the desired signal is low and a strength of the interferer signal is high, and a best-case condition when the strength of the desired signal is high and the strength of the interferer signal is low, the method comprising:

...

**receiving the wireless signal having the desired signal and the interferer signal** by the receiver;

...

**determining the strength of the desired signal;**

**determining the strength of the interferer signal;**

comparing the strength of the desired signal relative to the strength of the interferer signal; and

...

-00698 EX1001 ('202 Patent) at claim 7; see *also id.* at claims 11, 13, 19

# “the desired signal and the interferer signal”

*Desired and interferer signals are components of same received signal spectrum.*

## '202 claim 7:

... receiving **the wireless signal having the desired signal and the interferer signal** by the receiver;

...

**determining the strength of the desired signal;**

**determining the strength of the interferer signal;**

## '202 Patent at 5:22-32:

“When a receiver is actively receiving a desired signal, each block in the signal path **has at its input the desired signal as well as noise and possibly interfering signals.**”

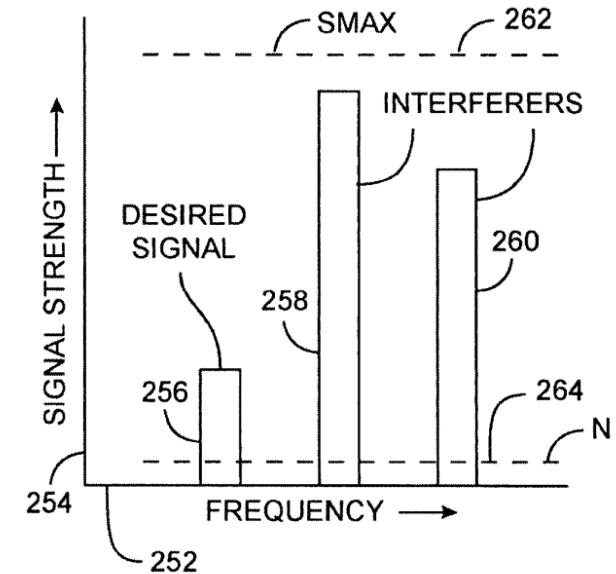
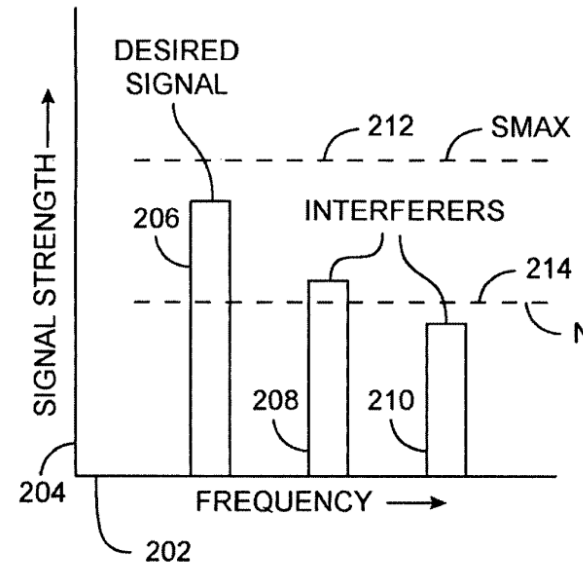
-00698 Response at 37; Sur-Reply at 9-10, 13-15; EX2015 ¶¶70-72

# “a desired signal and an interferer signal”

“When a receiver is actively receiving a desired signal, each block in the signal path **has at its input the desired signal as well as noise and possibly interfering signals.**”

'825 Patent at 5:20-33

'202 Patent at 5:22-35

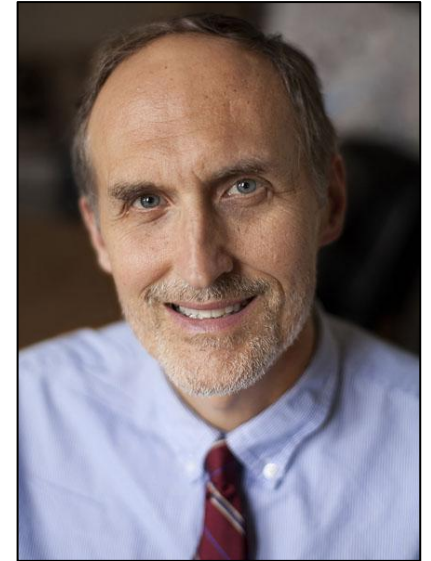


-00697 Response at 10, 35; Sur-Reply at 9-10, 13-14; EX2015 ¶¶70-72

-00698 Response at 11-12, 35; Sur-Reply at 9-10, 13-15; EX2015 ¶¶70-72

# Petition's determining: not received interferer

70. ... Re-tuning the receiver changes what is being measured. This means that **Rauhala's system cannot determine a desired signal strength "and" an interferer signal strength within the same received spectrum.** In a dynamic system, this is a significant impractical handicap, as signal strengths could change while the detector was being re-tasked. **The total signal power in a band around a neighboring channel when tuned to that channel is not a direct measurement of interference received when the receiver is tuned to a first channel.**



Professor Larson

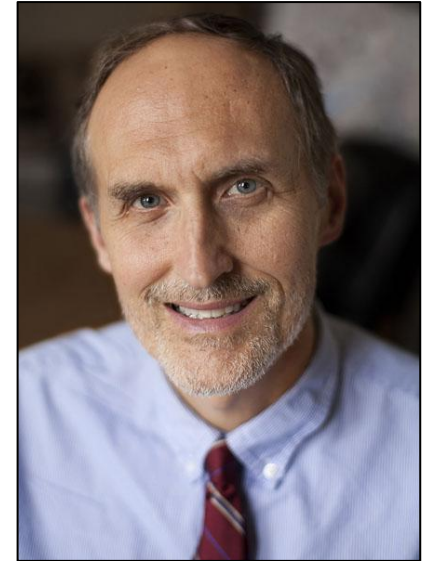
-00697 Response at 3, 37-38, 40; Sur-Reply at 9-10; EX2015 ¶¶70-72

-00698 Response at 3, 37-40; Sur-Reply at 9-10, 15; EX2015 ¶¶70-72

# Petition's determining: not received interferer

72. ... Because of *Rauhala*'s retuning requirement, a person of skill in the art would not understand its single detector to be able to act as both determining circuits of these claims.

**The alleged second measurement, taken only after tuning to center the receiver on a new channel, would not be a measurement of the original received interferer signal**—just as the static received while tuned to a particular FM radio station is not measured by tuning to and checking the signal strength of a different radio station....

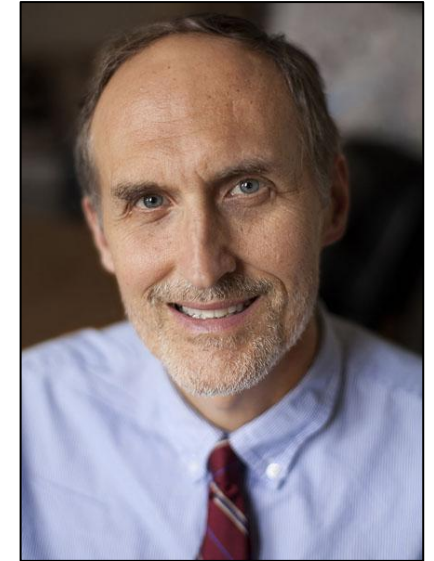
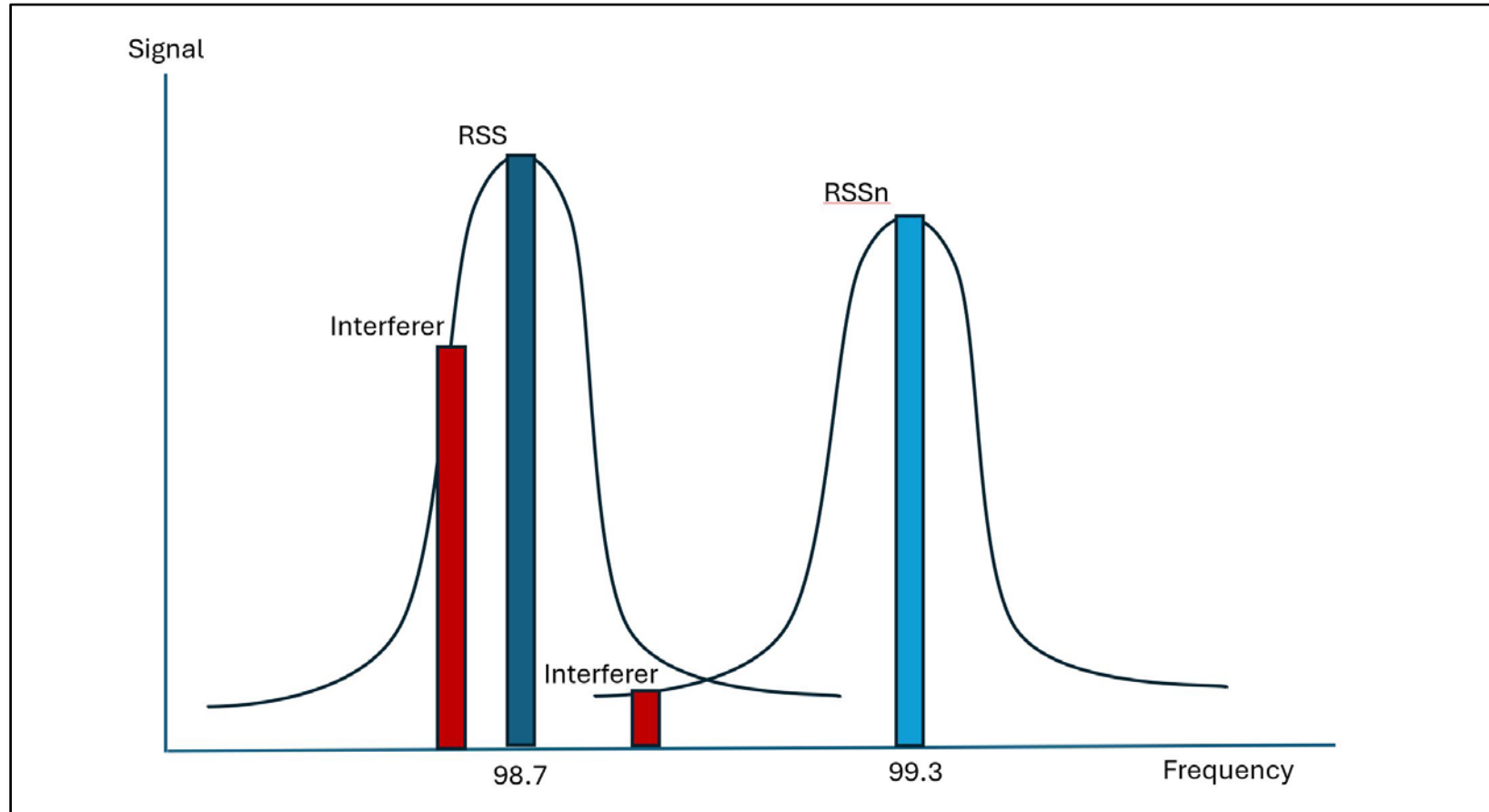


Professor Larson

-00697 Response at 3, 37-38, 40; Sur-Reply at 9-10, 11-13; EX2015 ¶¶70-72

-00698 Response at 3, 39-41, 43; Sur-Reply at 9-10, 15; EX2015 ¶¶70-72

# Petition's determining: not received interferer



Professor Larson

-00697 Sur-Reply at 9-10; EX2015 ¶¶70-72

-00698 Sur-Reply at 6-8; EX2015 ¶¶70-72

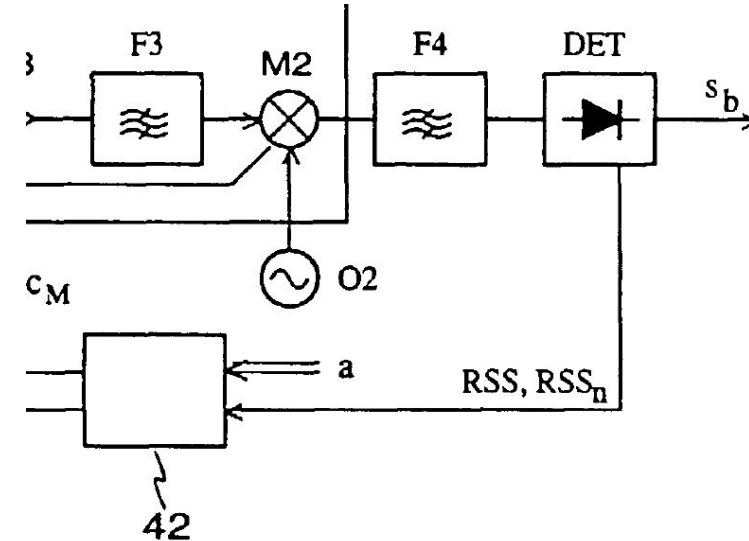
# Rauhala's sparse disclosure

**EX1004, [0013]:**

“Detector DET provides information about the signal strength (RSS) on the channel to which the receiver is tuned.”

**EX1004, [0017]:**

“receives from detector DET an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band. Signal a from the receiver's tuner control indicates the channel.”



**RSS<sub>n</sub> is total signal strength of neighboring channel.  
RSS<sub>n</sub> is not an interferer signal strength measure.**

-00697 Response at 35-36; Sur-Reply at 11; EX2015 ¶¶ 69-72  
-00698 Response at 37-37; Sur-Reply at 8-9; EX2015 ¶¶ 69-72

# Rauhala does not anticipate the claims

***Experts agree that the way Rauhala discloses operation does not accomplish claimed purpose or effect .***

**Professor Larson, EX2015 ¶70:**

“Re-tuning the receiver changes what is being measured. This means that *Rauhala*’s system cannot determine a desired signal strength “and” an interferer signal strength within the same received spectrum. In a dynamic system, this is a **significant impractical handicap**, as signal strengths could change while the detector was being re-tasked. The total signal power in a band around a neighboring channel when tuned to that channel is not a direct measurement of interference received when the receiver is tuned to a first channel.”

**Professor Baker, EX1019 ¶48:**

“For instance, if we were to measure the receive channel signal strength in one instance, and measure the neighboring channel signal strength in another instance, . . . the comparison of these signal strengths to the respective threshold values **would be meaningless**, as the conditions under which these signals propagate can change instantly as well as constantly over time.”

-00697 Sur-Reply at 12; EX2015 ¶70; EX1019 ¶48

-00698 Sur-Reply at 9-10; EX2015 ¶70; EX1019 ¶48

# comparing

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('202 PATENT)

# '202 Patent, claim 7

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7. A method for power dissipation control in a receiver of a wireless transceiver of a battery-powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer, wherein the receiver is configured to **receive a wireless signal having a desired signal and an interferer signal**, wherein the plurality of circuits are designed to function between a worst-case condition when a strength of the desired signal is low and a strength of the interferer signal is high, and a best-case condition when the strength of the desired signal is high and the strength of the interferer signal is low, the method comprising:

...

**receiving the wireless signal having the desired signal and the interferer signal** by the receiver;

...

**determining the strength of the desired signal;**

**determining the strength of the interferer signal;**

**comparing the strength of the desired signal relative to the strength of the interferer signal; and**

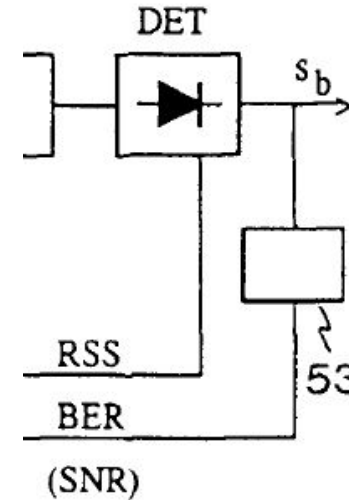
...

-00698 EX1001 ('202 Patent) at claim 7; see *also id.* at claims 11, 13, 19

# Rauhala's sparse disclosure

**EX1004, [0014]:**

“Alternatively, the quality of the detected signal can be determined by calculating its signal-to-noise ratio. In that case, unit 23 provides signal SNR (signal-to-noise ratio).”

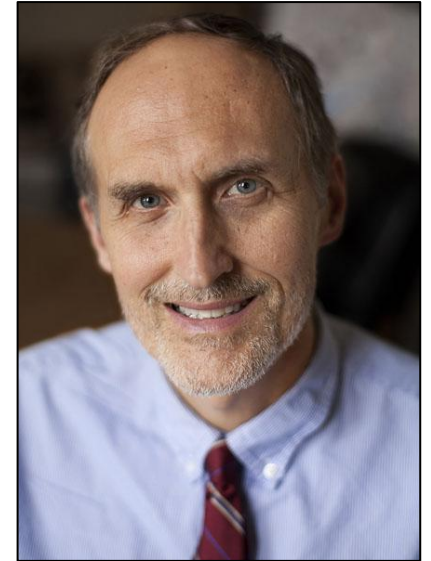


-00698 Response at 48-50; Sur-Reply at 11-12; EX2015 ¶¶ 74-75

# Rauhala has no “comparing” disclosure

74. *Rauhala* does not disclose any particular method for “calculating its signal-to-noise ratio.” EX1004, [0014], Fig. 2.

76. A person of ordinary skill in the art would understand that there are multiple ways to calculate SNR, including those that derive from bit-error-rate or other error estimates (e.g., block error rate, frame error rate). These error rate measures are known to correlate to, and could be used to estimate, SNR—but **without comparing signal strengths**.

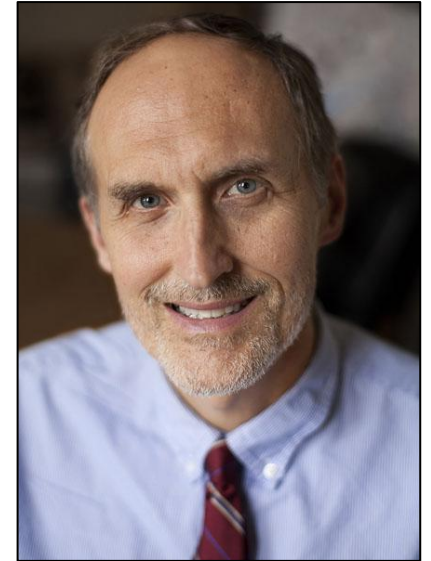


Professor Larson

-00698 Response at 48-51; Sur-Reply at 11-12; EX2015 ¶¶73-80

# Rauhala has no “comparing” disclosure

78. Without more, *Rauhala*’s simple instruction to calculate SNR **does not explicitly disclose comparing a desired signal strength to an interferer signal strength.** Because it is not clear what *Rauhala* is referring to by “N” (for noise), it is not explicitly or necessarily using “an interferer signal strength” to calculate “SNR.” Also, because the SNR could be calculated in ways other than what Dr. Baker describes, including with various bit or block error determinations that do not involve a signal strength comparison step, **his assumed calculation method is not inherently disclosed either.**

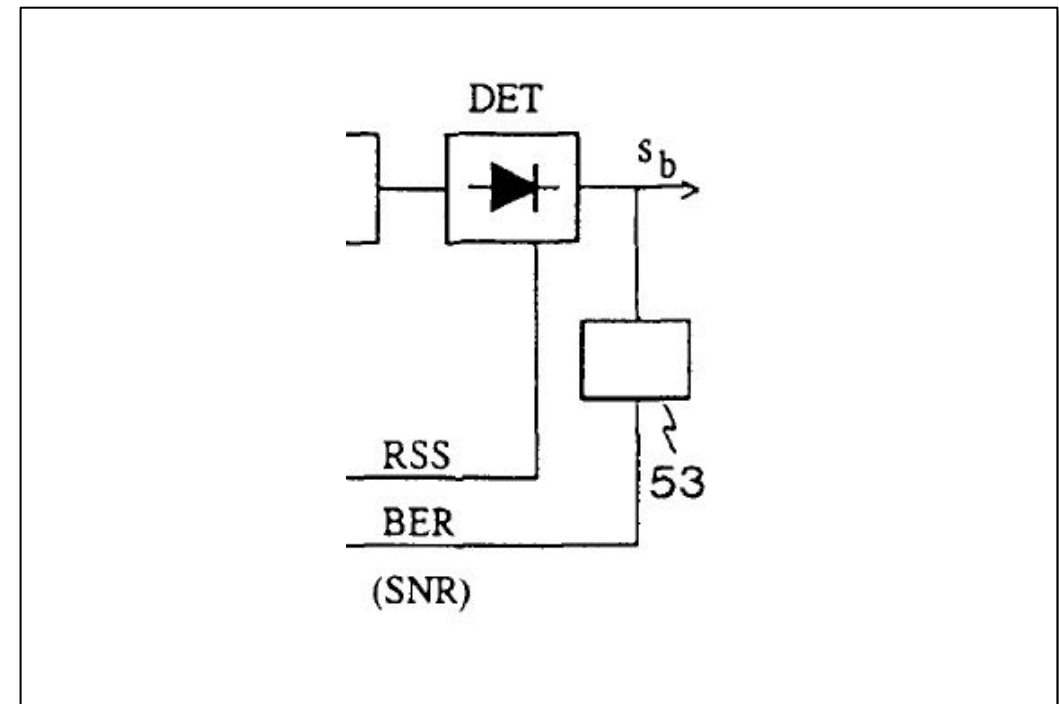
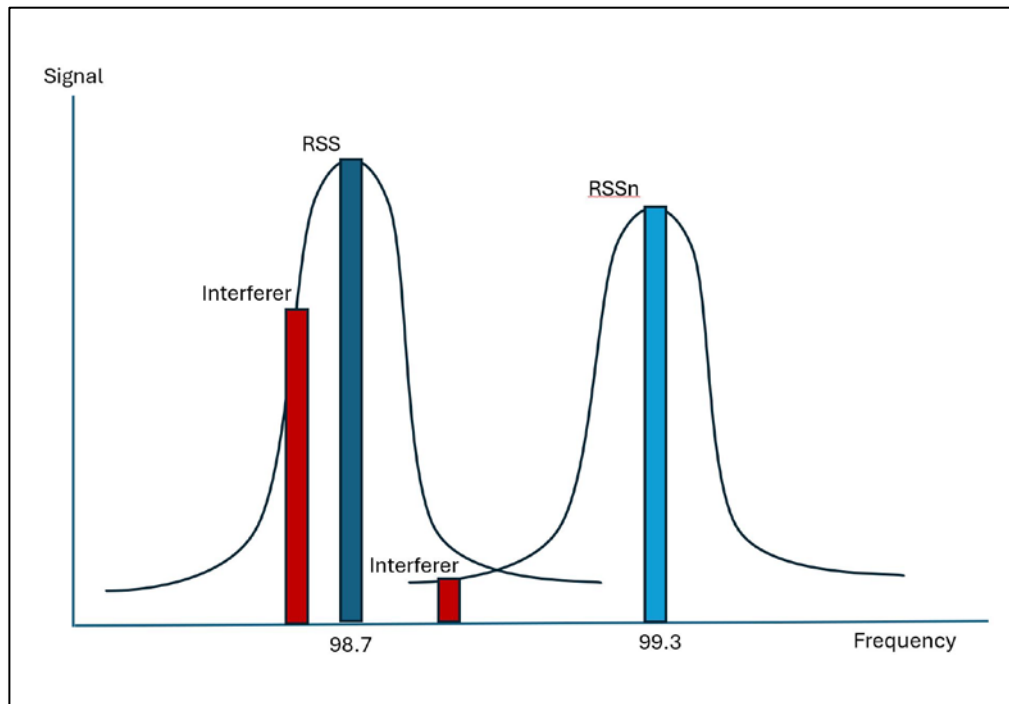


Professor Larson

-00698 Response at 50-51; Sur-Reply at 13-14; EX2015 ¶¶73-80

# Rauhala has no “comparing” disclosure

**Rauhala’s black box does not even have access to Received Signal Strength, or to any measure of an interferer signal.**



-00698 Response at 48-50; Sur-Reply at 11-12, 14-15; EX2015 ¶¶ 74-75

# varying an impedance

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('825 PATENT & '202 PATENT)

# '825 Patent, claim 8

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8. A method for power dissipation reduction in a receiver of a wireless transceiver of a battery powered portable wireless device, and a corresponding reduction in power dissipation and an increase in battery life of the battery powered portable wireless device, the method comprising:

...

wherein the power dissipation reduction in the receiver is achieved by causing a bias current and **an impedance to vary** in one or more of the plurality of circuits **in the receiver signal path** of the wireless transceiver,

...

an impedance of the one or more of the plurality of circuits in the receiver signal path of the wireless transceiver to be increased, thereby causing **a drive current** of the one or more of the plurality of circuits to be decreased;

...

-00697 EX1001 ('825 Patent) at claim 8

# a bias current and an impedance vary

**Claim 8 . . . causing a bias current and an impedance to vary in one or more of the plurality of circuits in the receiver signal path**

## **'825 Patent at 8:20-22:**

“These variables, or degrees of freedom, specifically reducing bias currents, increasing impedances, and increasing gain may be used as in the following examples.”

## **'825 Patent at fig. 9A**

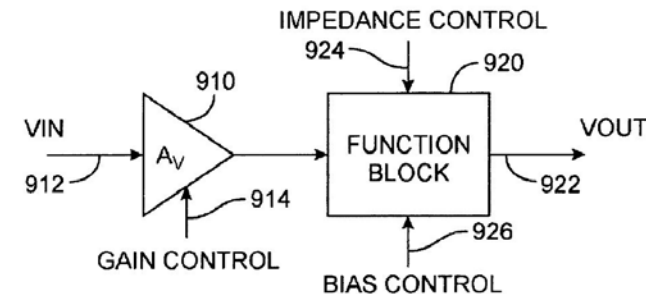


FIG. 9A

***Varying an impedance is a separate control from changing a bias current.***

-00697 Response at 29-30; Sur-Reply at 14-15, 17-18; EX2015 ¶¶43-45

# '202 Patent, claim 7

7. A method for power dissipation control in a receiver of a wireless transceiver of a battery-powered portable wireless device, the receiver having a signal path comprising a plurality of circuits including at least an amplifier, a filter, and a mixer, wherein the receiver is configured to receive a wireless signal having a desired signal and an interferer signal, wherein the plurality of circuits are designed to function between a worst-case condition when a strength of the desired signal is low and a strength of the interferer signal is high, and a best-case condition when the strength of the desired signal is high and the strength of the interferer signal is low, the method comprising:

...

based on the comparison, when the plurality of circuits are functioning at better than the worst-case condition, **dynamically adjusting** one or more of **an impedance, a bias or a gain** of one or more of the plurality of circuits **in the signal path**, thereby controlling power dissipation.

-00698 EX1001 ('202 Patent) at claim 7; id. at claims 8, 19

# adjusting an impedance and/or a bias current

Claim 7 . . . dynamically adjusting one or more of an impedance, a bias or a gain of one or more of the plurality of circuits in the signal path

## '202 Patent at 8:22-24:

“These variables, or degrees of freedom, specifically reducing bias currents, increasing impedances, and increasing gain may be used as in the following examples.”

## '202 Patent at fig. 9A

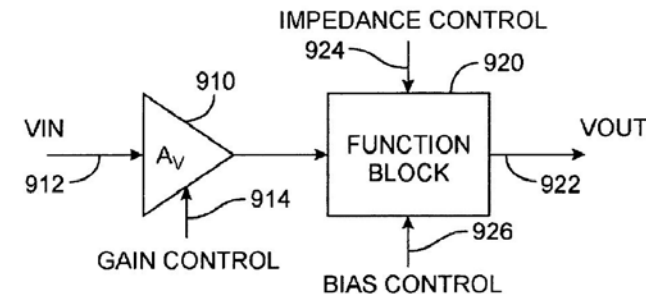


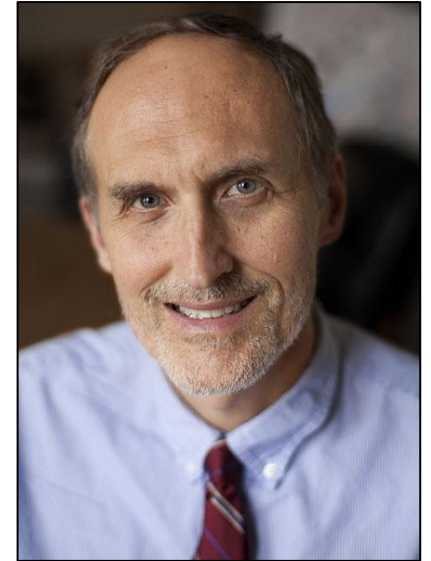
FIG. 9A

***Varying an impedance is a separate control from changing a bias current.***

-00698 Response at 32-33; Sur-Reply at 16-20; EX2015 ¶¶43-45

# a bias current and an impedance vary

45. ... Information about the desired signal and interferer signal is used to adjust the operating characteristics of the components in the receiver's signal path—for example, the amplifier(s), mixer(s), and/or filter(s)—relative to a worst-case condition. The patents describe **multiple separate adjustments, dynamically changing operating parameters, including bias current, impedance, and gain**, either separately or in combination, to reduce power dissipation in better-than-worst case conditions.



Professor Larson

-00697 Response at 29-30; Sur-Reply at 14-15, 17-18; EX2015 ¶¶43-45

-00698 Response at 32-33; Sur-Reply at 16-20; EX2015 ¶¶43-45

# impedance is an AC parameter

*No real dispute that impedance is an AC circuit parameter.*

**Professor Baker, EX1002, ¶149:**

“The definition of the term “impedance” had been well known in the field of electric fields well before the effective filing date of the ’825 patent. For instance, Graf, which is an engineering dictionary published in 1999, defines the term ‘impedance’ as ‘[t]he total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency.’”

**Professor Larson, EX2015, ¶54:**

“A person of ordinary skill would understand that impedance refers to the opposition of a circuit or circuit component to alternating current. Impedance includes both resistance (from resistors) and reactance (from inductors or capacitors) to alternating current. Impedance is often symbolized with  $Z$ , and is given by the formula  $Z = \sqrt{R^2 + (X_L + X_C)^2}$ , where  $R$  is resistance,  $X_L$  is inductive reactance, and  $X_C$  is capacitive reactance”

-00697 Response at 25-32; Sur-Reply at 14-15; EX2015 ¶¶53-58; EX1002 ¶149; Petition at 53

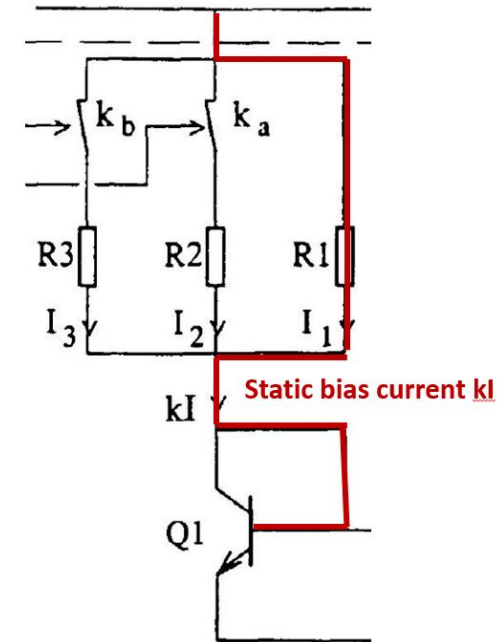
-00698 Response at 29-35; Sur-Reply at 16-17; EX2015 ¶¶53-58; EX1002 ¶149; Petition at 41

# Rauhala's R1, R2 are not “an impedance”

**Professor Larson, EX2015 ¶65:**

“But a person of ordinary skill would understand that **there are no AC currents, or frequency components, in the circuit** for setting DC bias current  $I_B$  in *Rauhala's* Figure 7, or the circuit for setting DC bias current  $k_I$  in *Rauhala's* Figure 6.”

**Petitioners failed to meaningfully dispute this.**



**EX1004, fig. 6**

**R1, R2, R3  
control DC bias current.**

-00697 Response at 31, 45-51; Sur-Reply at 14-15; EX2015 ¶¶ 64-65

-00698 Response at 34, 54-63; Sur-Reply at 16-19; EX2015 ¶¶ 64-65

# Petitioners' new theory ignores elements

Petitioners' Replies changed their entire theory for this element.

The Board should reject this unfair and improper tactic.

But Petitioner's new theory still fails, as it ignores claim elements.

Petitioners now claim that changing a bias current via resistors (R1, R2, etc.) also ***indirectly*** causes output impedances of unshown transistors within *Rauhala*'s "amplifier 61" to change.

**But these are separate controls and separate claim elements.**

-00697 Sur-Reply at 17-20

-00698 Sur-Reply at 18-22

# Petitioners' new theory ignores elements

Changing bias current and changing impedance are **separate controls** and **separate claim elements**.

## '825 claim 8:

8. ... is achieved by causing **a bias current** and **an impedance** to vary in one or more of the plurality of circuits in the receiver signal path...

- (i) **the bias current** of the one or more of the plurality of circuits in the receiver signal path of the wireless transceiver to be decreased; and
- (ii) **an impedance** of the one or more of the plurality of circuits in the receiver signal path of the wireless transceiver to be increased

## '825 Patent, fig. 8A:

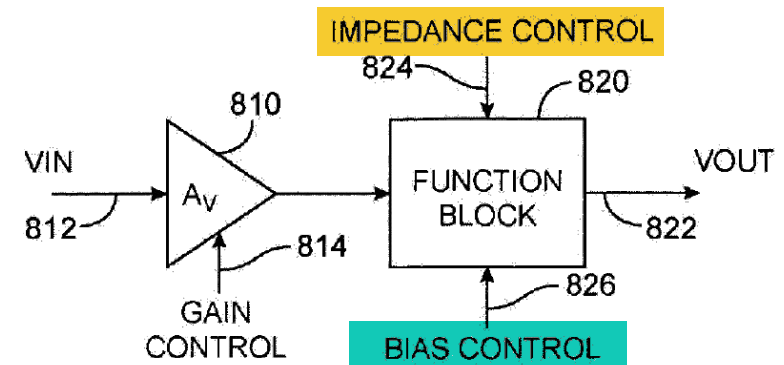


FIG. 8A

-00697 Sur-Reply at 17-20

# Petitioners' new theory ignores elements

Changing bias current and changing impedance are **separate controls** and **separate claim elements**.

## '202 claim 7:

7. ... based on the comparison ... dynamically adjusting one or more of **an impedance**, **a bias** or **a gain** of one or more of the plurality of circuits in the signal path, thereby controlling power dissipation

## '202 Patent, fig. 8A:

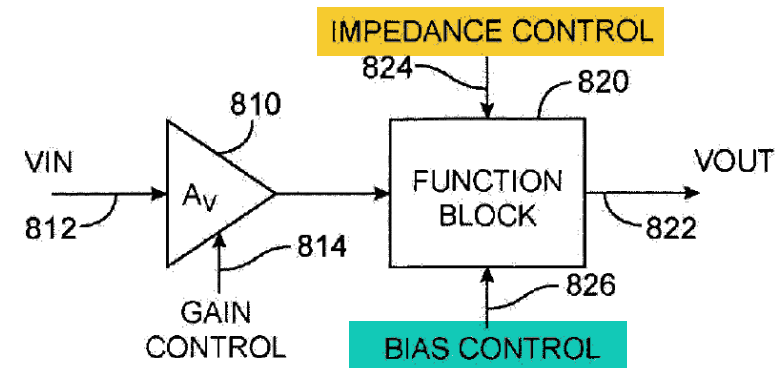


FIG. 8A

-00698 Sur-Reply at 18-22

# in the receiver signal path

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('825 PATENT & '202 PATENT)

# alleged impedances are not “in signal path”

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## **Institution Decision (-00697), Paper 10 at 35-36:**

“Patent Owner also relies on Dr. Larson’s declaration testimony that the circuits to control supply current to differential amplifier 61 are ‘not in the signal path, which proceeds from ‘in’ to ‘out’ of amplifier 61 in Figure 6.’ ... Dr. Larson’s testimony relies on, and is consistent with, Rauhala’s Figure 6.

We also agree with Patent Owner that Petitioner does not discuss with particularity how *Rauhala* discloses causing the impedance to vary *in a circuit in the receiver signal path of the wireless transceiver ...*”

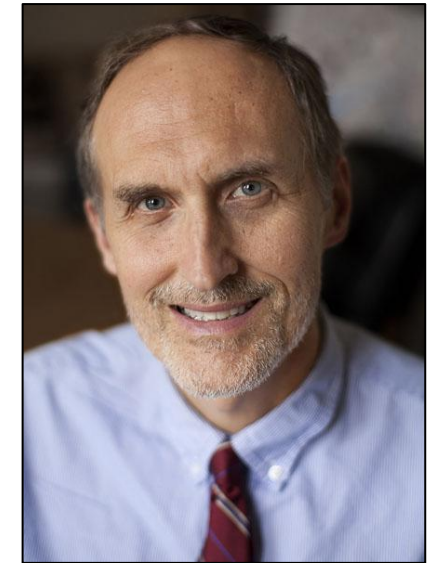
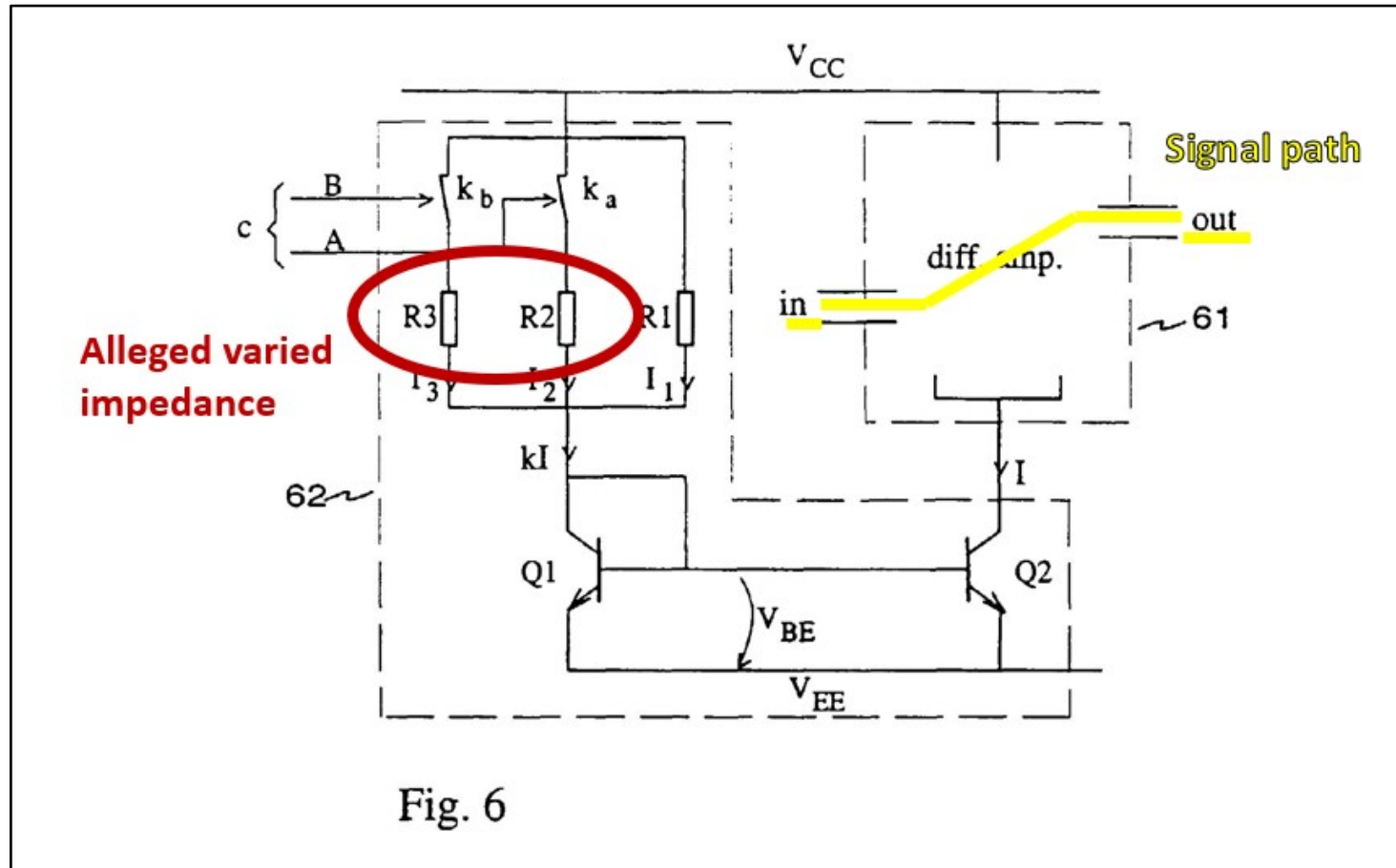
## **Decision on Rehearing, IPR2023-00694, Paper 14 at 14-14:**

“[F]or those claims that, like the claims before us here, require changing an *impedance* of circuits in the signal path (see claim 8 in IPR2023-00697 and claims 7 and 19 in IPR2023-00698), we concluded, as here and in our Decision, that Petitioner’s challenge based on Rauhala fails to meet the test for institution.”

-00697 Response at 51-54; Sur-Reply at 21-24; EX2015 ¶¶62-63, 66

-00698 Response at 54-57; Sur-Reply at 23-26; EX2015 ¶¶62-63, 66; see *also* Institution Decision at 25-26

# alleged impedances are not “in signal path”

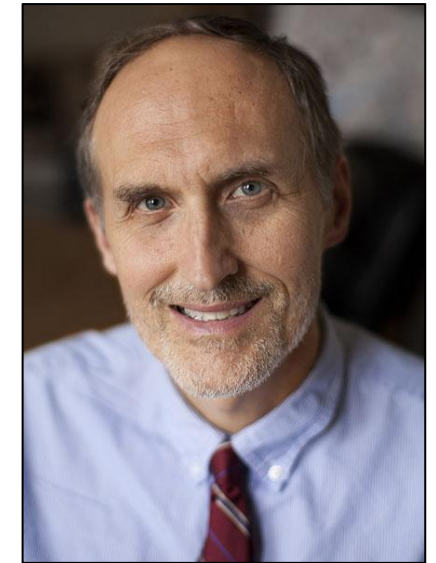
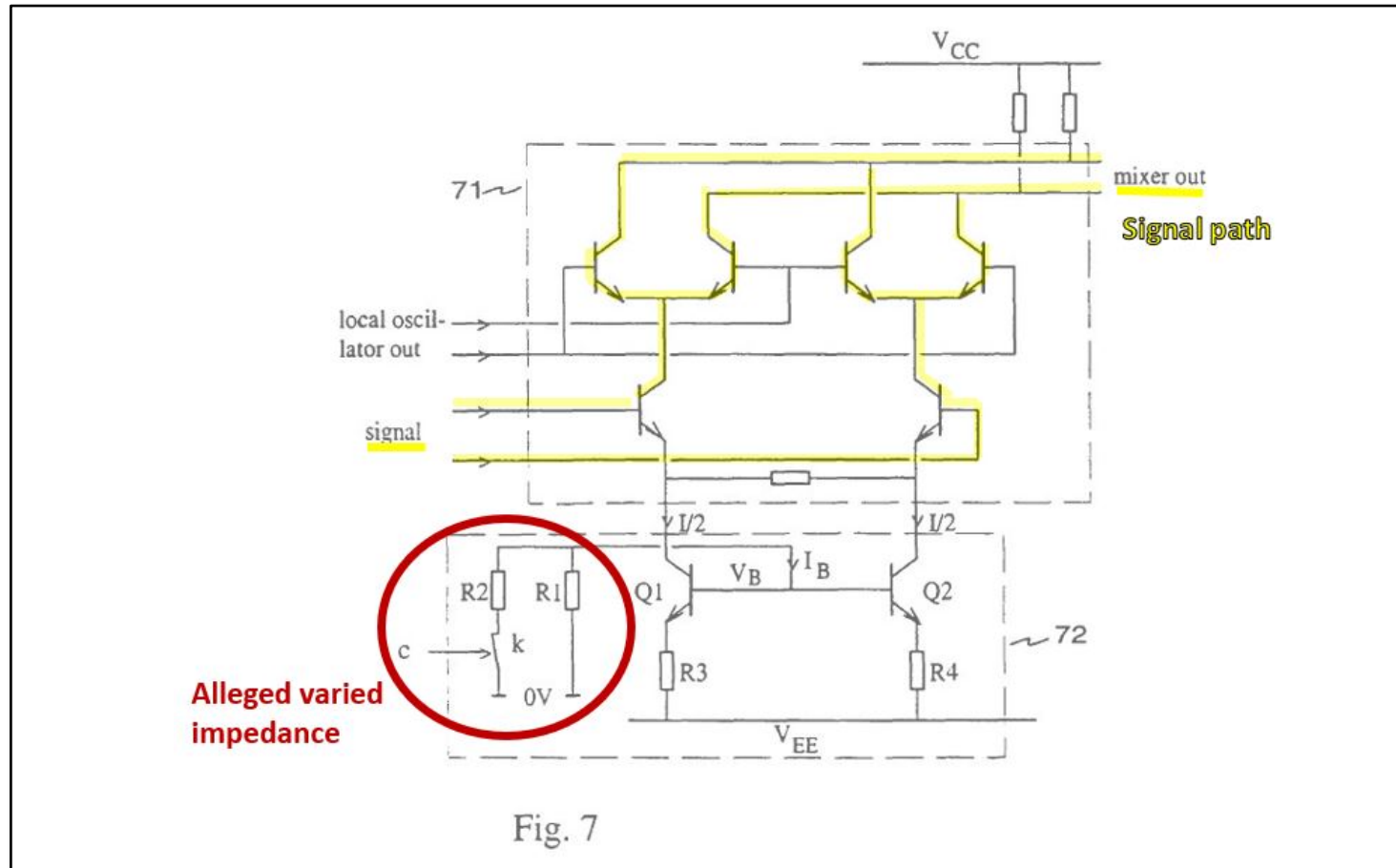


Professor Larson

-00697 Response at 52-54; Sur-Reply at 22-23; EX2015 ¶¶62-63, 66

-00698 Response at 54-57; Sur-Reply at 23-26; EX2015 ¶¶62-63, 66

# alleged impedances are not “in signal path”



Professor Larson

-00697 Response at 52-54; Sur-Reply at 22-23; EX2015 ¶¶62-63, 66

-00698 Response at 54-57; Sur-Reply at 23-26; EX2015 ¶¶62-63, 66

# alleged impedances are not “in signal path”

**The signal path is not  
the entirety of Rauhala’s Fig. 7 mixer or Fig. 6 amplifier.**

**Decision on Rehearing, IPR2023-00694, Paper 14 at 8-11:**

“We do not agree [with Petitioner] and find Dr. Larson’s testimony credible [and] supported by the record. Dr. Larson’s testimony is supported by Rauhala’s Figures 1 and 2, *supra*, as well as Figures 6 and 7. Larson Decl. ¶¶ 62–63”

“First, it is contrary to Rauhala’s depiction of mixer 72, a linear unit that is part of the signal path, as separate from control unit 71 that supplies bias current I. The boxes drawn around those units and their descriptions by Rauhala confirm that they are separate.”

-00697 Sur-Reply at 22-23; EX2015 ¶¶62-63, 66

-00698 Sur-Reply at 24-25; EX2015 ¶¶62-63, 66

# alleged impedances are not “in signal path”

**Bias current is necessary to, but not part of, Rauhala’s mixer or amplifier.**

Just as a wall outlet and current are necessary to operate a floor lamp, they are not deemed part of the lamp.

Even if a current supply circuit were deemed part of a mixer or amplifier, that still does not make it logically part of the “receiver signal path” through that mixer or amplifier.

-00697 Sur-Reply at 23-23

-00698 Sur-Reply at 25-26

# a drive current

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('825 PATENT)

# bias current is not “a drive current”

**Reducing drive current via an impedance increase  
is different adjustment than reducing bias current.**

“In this way one or more of the driving currents in the function block 920 may be reduced. Similarly, **since the drive current is reduced, one or more bias current may *also* be reduced** depending on the exact circuit configuration.”

EX1001, 6:10-13, Figs. 11B, 11C, & 11D, 9:56-60 (Response at 56-57)

**Theta distinguished between bias and  
switching/drive current in prosecution:**

“A bias current is not the same as a switching current. ... (See for example ... Figure 6 and related discussion.)”

See EX2012 at 163

**Patent distinguishes between  
bias and drive currents:**

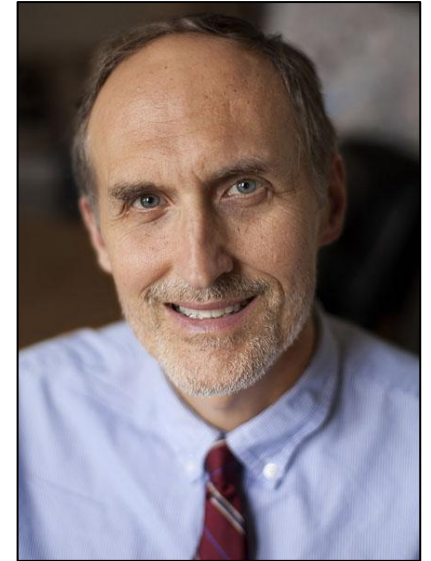
“This reduces the required drive current, and may also allow for a reduction in bias currents.”

EX1001 at 5:50-62, Fig. 6, 6:20-23, 10:19-21

-00697 Response at 55-58; Sur-Reply at 25-26

# bias current is not “a drive current”

67. **Bias currents  $I_B$  of *Rauhala*’s Figure 7 and  $I_I$  of *Rauhala*’s Figure 6 would not be understood by a person of ordinary skill in the art to be or relate to a “switching current” as the applicant used that term during prosecution of the ’330 Patent, or a signal “drive” current as described in the discussion of Figure 6 of the Tsividis Patents. See, e.g., IPR2023-00694, EX1001 (’330 Patent), 3:24-27, 7:44-59 (“FIG. 6 is an example of how a circuit’s impedances may be scaled to reduce drive currents”).**



Professor Larson

-00697 Response at 55-58; Sur-Reply at 25; EX2015 ¶167

# thank you

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