

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

THETA IP, LLC,
Patent Owner.

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

**THETA IP, LLC'S
PATENT OWNER RESPONSE**

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Patent Owner's Exhibit List	
EX2001	Declaration of Corey Johanningmeier in Support of Motion for <i>Pro Hac Vice</i> Admission
EX2002	"Yannis Tsividis, Path-Breaking Researcher and Educator," IEEE Solid State Circuits Magazine, Fall 2014
EX2003	Y. Tsividis <i>et al.</i> , "Internally Varying Analog Circuits Minimize Power Dissipation," IEEE Circuits & Devices Magazine, Jan. 2003
EX2004	Y. Tsividis, "Signal-to-Noise Ratio, Dynamic Range, and Power Dissipation," IEEE Solid State Circuits Magazine, Fall 2018
EX2015	Declaration of Professor Lawrence Larson, Ph.D. under 37 C.F.R. § 1.68 in support of Patent Owner's Preliminary Response in IPR2023-00694, -00697, and -00698.
EX2006	<i>Curriculum Vitae</i> of Professor Larson
EX2007	U.S. Patent No. 5,001,776 (<i>Clark</i>)
EX2008	Scheduling Order, <i>Theta IP, LLC v. Motorola Mobility LLC, et al.</i> , No. 1:22-cv-03441 (N.D. Ill. July 6, 2023), ECF No. 60
EX2009	Excerpts of Rudolf F. Graf, <i>Modern Dictionary of Electronics</i> , Seventh Edition, 1999
EX2010	Excerpts of Phillip A. Laplante, <i>Electrical Engineering Dictionary</i> , 2000
EX2011	Excerpts of Mahmood Nahvi, Ph.D. & Joseph A. Edminister, <i>Schaum's Outline of Theory and Problems of Electric Circuits</i> (4th ed. 2003)
EX2012	Prosecution History of U.S. Patent No. 7,010,330 B1 – Filed by Petitioners in IPR2023-00694 as EX1003
EX2013	Memorandum and Order on Claim Construction dated June 6, 2017 from <i>Theta IP, LLC v. Samsung Electronics Co. Ltd., et al.</i> , 2:16-cv-527 (E.D. Tx.) – Filed by Petitioners in IPR2023-00694 as EX1010
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	<i>Theta IP, LLC v. Samsung Electronics Co. Ltd., et al.</i> , 6:20-cv-00160-ADA (W.D. Tx.) – Filed by Petitioners in IPR2023-00694 as EX1009
EX2015 (New)	Declaration of Professor Lawrence Larson, Ph.D. in support of Patent Owner's Preliminary Response in IPR2023-00697 and -00698
EX2016 (New)	Deposition Transcript of R. Jacob Baker, P.E., Ph.D
EX2017 (New)	Exhibit 5 from the Deposition of R. Jacob Baker, P.E., Ph.D – Lax Machina export of “31 PTAB trials”
EX2018 (New)	Exhibit 6 from the Deposition of R. Jacob Baker, P.E., Ph.D – Lex Machina export of “12 PTAB trials”
EX2019 (New)	Exhibit 7 from the Deposition of R. Jacob Baker, P.E., Ph.D – Baker, CMOS, Circuit Design, Layout, and Simulation (3rd Ed.)
EX2020 (New)	Wikipedia, “Envelope detector,” <i>available at</i> https://en.wikipedia.org/w/index.php?title=Envelope_detector

Patent Owner Theta IP, LLC (“Theta”) respectfully submits this Response to Lenovo (United States) Inc.’s and Motorola Mobility LLC’s (“Lenovo” or “Petitioners”) above-captioned Petition for *Inter Partes* Review of United States Patent No. 10,129,825 (“the ’825 Patent”).

I. Introduction

Rauhala does not anticipate the independent claims of the ’825 Patent. Because the Petition relies only on anticipation for all independent claims, and fails to show anticipation, each challenged claim must be upheld. The Board has already found that the Petition failed to raise a reasonable likelihood of success concerning claim 8—crediting the argument and testimony repeated below. In addition, for each of the independent challenged claims 1, 3, and 8, *Rauhala* discloses a ***single detector of undisclosed operation***—one that cannot measure two components of a received signal spectrum because it indisputably has to be re-tuned to receive a different signal spectrum in order to detect on a neighboring channel. *Rauhala* does not disclose the claimed operations.

With respect to independent claim 8, *Rauhala*, the only reference alleged to do so, fails to disclose, suggest, or otherwise render obvious the elements requiring varying “an impedance.” This is both because the alleged changed parameter in *Rauhala* is not an impedance as a POSITA would understand Professor Tsividis’ ordinary use of that term in the patent, and ***because the alleged changed impedance***

is not “of” a circuit “in the receiver signal path” as required. The Board already found that Lenovo’s Petition failed its burden to “discuss with particularity” the signal path aspects here—and agreed with Theta that the record does not show “changing an impedance of a component ‘in the receiver signal path’ as required” by claim 8. Inst. Dec., Paper 10, 35-36.

Lenovo cannot cure its initial failure of proof on Reply—both because of the prohibition on offering new argument to gap-fill holes in its Petition, and because *Rauhala* indeed lacks any disclosure of the elements. While the Board instituted on claim 8, because it must institute on all challenged claims when instituting on any (*id.* at 34), ***claim 8 is valid and must be upheld.***

In addition, *Rauhala*, the only reference alleged to do so, fails to disclose the elements requiring “a circuit for determining a signal strength of the interferer signal ***and*** a circuit for determining a signal strength of the desired signal”—elements which appear in each of the challenged claims of the ’825 Patent.¹ See, *e.g.*, EX1001, 13:4-7 (claim 1), 13:49-52 (claim 3 and its dependent claim 4), 16:21-24 (claim 8).

Lenovo attempts to argue disclosure of both required determining circuits by the same single diode detector of *Rauhala*—a single detector of total received signal

¹ All ***bold italic*** emphasis herein added unless otherwise noted.

strength, that ***must be re-tuned*** to subsequently detect total signal strength on a different neighboring channel. Petition, 33-34; EX1004, [0017], Fig. 4. The challenged claims require receiving a single spectrum with multiple components—“a wireless signal having a desired signal and an interferer signal”—and determining two of those received components. *See, e.g.*, EX1001, 13:43-52 (claim 3), 9:45-52 (example embodiment measuring before and after a filter).

Rauhala’s spare discussion of a single diode detector, that requires the receiver to be re-tuned in order to measure a new signal channel, does not disclose these claimed elements. *Rauhala* nowhere discloses or suggests “determining” “the interferer signal” component of a received signal spectrum. Measuring the total signal strength when tuned to channel B is not the same as measuring the interference contribution of channel B on channel A when tuned to channel A.

If someone wanted to measure the amount of interfering static heard on their favorite radio station, they would not and could not do so by re-tuning the radio to a different station. *See* EX2015, ¶¶70, 72. Even if that new station were the source of the interference in the original reception, re-tuning the receiver changes the signal spectrum being received. *Id.* Re-tuning the receiver—in order to reuse the same detector circuit to measure—does not teach measuring the strength of the interferer component received *at the original tuning*. Neither the Petition, nor the Board’s Institution Decision, discuss this difference in the *Rauhala* approach.

Each of Lenovo’s grounds fail to meet Petitioners’ evidentiary burden to show anticipatory disclosure of the claimed elements in *Rauhala*. Lenovo has the burden of proof here. 35 U.S.C. § 316(e):

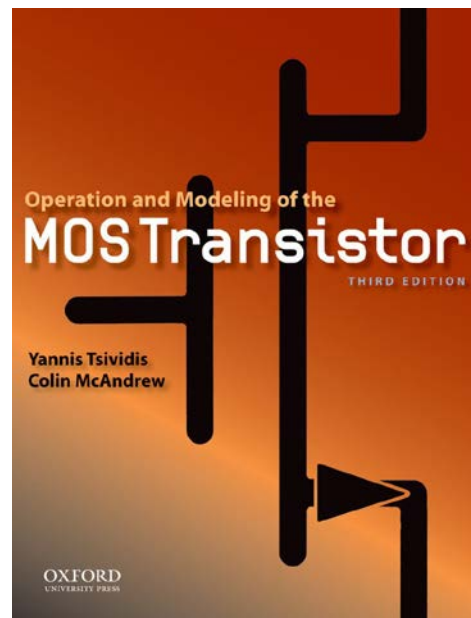
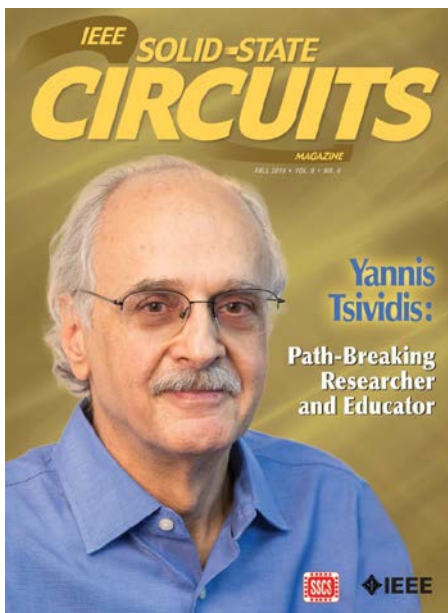
In an inter partes review . . . , the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence.

Harmonic Inc. v. Avid Tech., Inc., 815 F.3d 1356, 1363 (Fed. Cir. 2016) (“the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable”) (*citing* 35 U.S.C. §312(a)(3) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). If Lenovo fails its burden to provide evidence that proves invalidity, it loses the instituted trial, even if Theta were to offer no response beyond identifying that failure. *Apple Inc. v. Zipit Wireless, Inc.*, IPR2021-01124 *et al.*, 2022 WL 18108215, Paper 14, Decision on Director Review, (PTAB Dec. 21, 2022) (designated precedential: Jan. 4, 2023).

As shown below, Lenovo’s Grounds—both relying on alleged anticipation by *Rauhala*, exclusively (anticipation Ground 1) or for all elements disputed here (obviousness Ground 2)—each fail to properly interpret, or to show any disclosure of, key elements common to all four challenged claims. All challenged claims are valid.

II. Overview, History, and Construction of the '825 Patent

The inventor of the '825 Patent, Yannis Tsividis, is the Edwin Howard Armstrong Professor of Electrical Engineering at Columbia University in New York City. He has taught circuits and devices for over 45 years, is beloved by his students, and has written or edited multiple widely-used textbooks on devices and circuits. Not only is Dr. Tsividis a prolific inventor and life fellow of the IEEE, but in 2014, the IEEE publication Solid State Circuits devoted an entire Special Edition of its magazine to him. EX2002.



The '825 Patent is part of a series of patents that teach and claim foundational inventions for controlling high-power analog circuits in radio frequency (RF)

transceivers used in every cell phone. The patents' chief purpose and benefit is power savings, enabling the longer battery life that smartphone consumers demand.

Intelligent circuit design for power conservation was and remains a vital issue in the mobile communications industry—about which Professor Tsividis has published and taught many times throughout his distinguished career, and throughout the life of the patents. *See, e.g.,* EX2003; EX2004 (Tsividis, Y., “Signal-to-Noise Ratio, Dynamic Range, and Power Dissipation,” IEEE Solid State Circuits Magazine, Fall 2018):

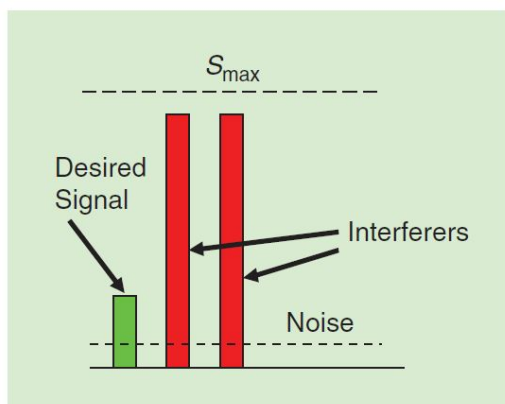


FIGURE 18: The worst-case scenario: minimum desired signal with maximum interference.

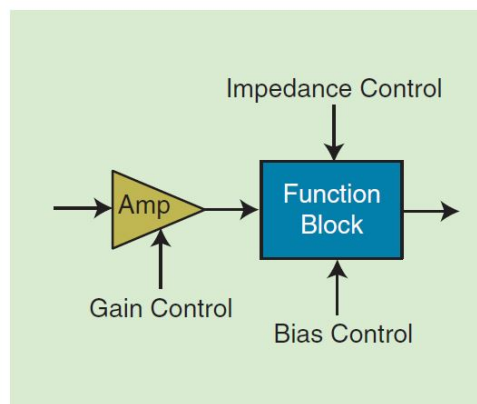


FIGURE 11: The three adaptive power strategies: adaptive gain, adaptive bias, and adaptive impedance.

The '825 Patent parent application first taught and claimed these power-saving circuit design techniques more than twenty years ago—demonstrating multiple ways that circuits could adapt to desired signal and interferer signal conditions to save power. For example, and relevant to the challenged claims of

the '825 Patent, circuit designers could use bias current reductions and/or impedance variation to dynamically vary drive currents in an RF receiver system. EX1001, 7:27-46, Fig. 5, 7:47-8:3, Fig. 6. The specification also discusses—and other claims address—separate dynamic controls for gain of amplifier circuits (*id.*, 8:4-19, Fig. 7). *See also id.*, Figs. 2B, 8A:

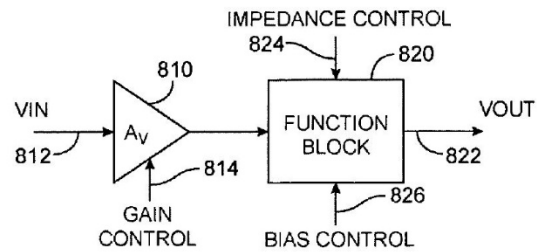
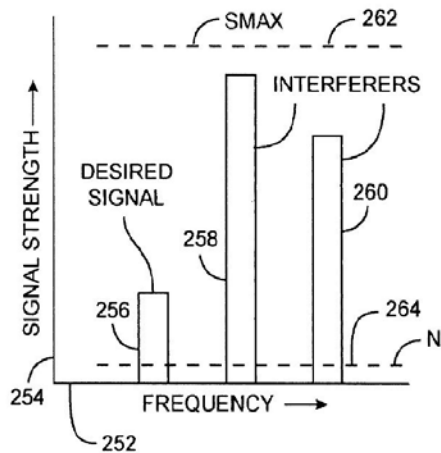


FIG. 8A

The '825 Patent taught that by dynamically adjusting one or more of these variables in response to determined signal conditions, circuit designers can “reduce power dissipation in response to better-than-worst case conditions.” *Id.*, 1:58-61. And it taught many specific approaches to doing so, based on variations in possible signal conditions. *See, e.g., id.*, 9:45-62, Figs. 9B & 9C (demonstrating a signal spectrum where impedance varying to raise the noise floor N can save power):

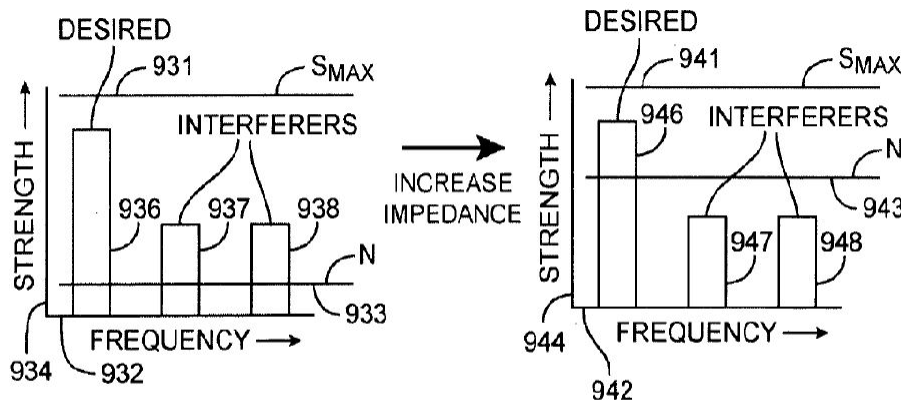


FIG. 9B

FIG. 9C

The application and specification that led to issuance of the parent of the '825 Patent also led to six (so far) additional patents. Moreover, the Tsividis Patents in this family have been widely cited by the industry and by Examiners during the prosecution of other patents, including those of Qualcomm, Samsung, Intel, Marvell, Ericsson, Matsushita, and others. For example, Qualcomm, itself a pioneer in RF circuits for wireless, has been forced by patent Examiners in the USPTO and Europe to cite to and even quote Professor Tsividis' foundational '330 Patent (parent to the '825 Patent) in its own applications. *See, e.g.*, EP2151924B1 at [0004]; EP2018705B1 at [0005]; U.S. Patent No. 8,781,426.

Patents in this family were the subject of two district court litigations against Samsung, leading to a courthouse-steps settlement within hours of the start of a jury trial. Notably, Samsung—the most prolific filer of IPRs since the proceeding was

created—never filed IPRs against the Tsividis patents.² As both industry participants and litigants have acknowledged, the '825 Patent and its family made important, valuable contributions to the public knowledge—just as Professor Tsividis has always been known for doing in his distinguished teaching and professional career.

In short, Professor Tsividis' foundational teaching patents here are nothing like the proverbial “bad patents” for which Congress created the *Inter Partes* Review procedure. There are no flaws in the Tsividis patents' lengthy and continued prosecution by Office Examiners, and nothing wrong with their claim scope. The inventions therein are novel, were not obvious to persons of ordinary skill—and offer valuable contributions not previously disclosed in the art.

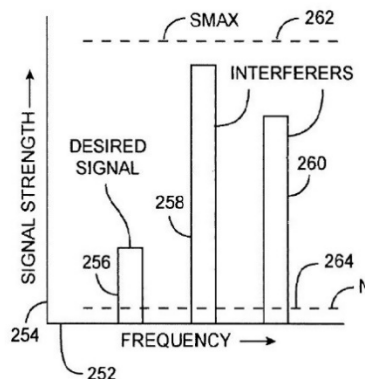
A. The '825 Patent

As described above, the '825 Patent is part of a series of patents that disclose and claim Professor Tsividis' inventive systems and techniques for optimizing mobile wireless device power consumption—and thus battery life. *See, e.g.*, EX1001 (“'825 Patent”), Abstract, 1:55-61. In the early days of mobile

² According to the Lex Machina database as queried on January 28, 2024, Samsung and related entities are a Petitioner on at least 962 (or 6.2%) of the 15,505 *Inter Partes* Review petitions ever filed.

communications, receivers were designed to operate in the worst-case conditions to ensure that connectivity was available to the greatest extent possible. This meant that devices operated at a high power level all of the time, draining the battery quickly. *Id.*, 1:34-40.

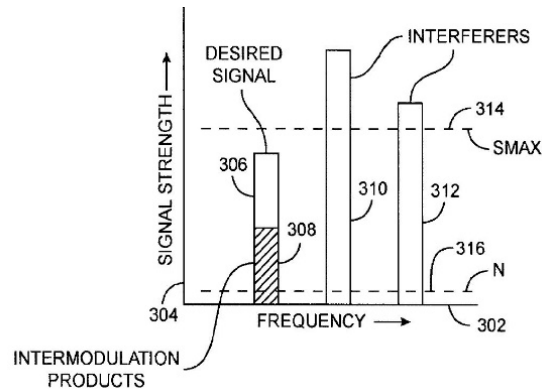
Professor Tsividis invented systems and methods that optimized battery life by making various adjustments to components in a receiver based on determining signal strength—or the relationships between the strength of desired signal (such as the signal carrying voice data) and the strength of interferer signals (originating from other wireless devices or electronic equipment, for example)—to achieve power savings. *Id.*, 5:20-30, 5:54-56, Figs. 2A & 2B (showing example desired signal and interferer signal spectrum):



B. The '825 Patent Specification

The '825 Patent specification explained and showed examples of when to employ the various power saving circuit techniques, based on different signal spectra being determined to be better than a worst-case condition. *Id.*, 1:58-67,

8:49-10:60. A worst-case condition occurs when a low desired signal is accompanied by high interferer signals—and can result in unacceptable levels of distortion, *e.g.*, intermodulation products, if the maximum signal handling capability is not kept sufficiently high. *See, e.g., id.*, 6:31-49, Fig 3:



The '825 Patent describes three different adjustments, or “degrees of freedom” that can be dynamically optimized to reduce power in response to the various ways signal conditions can improve over a worst case. Specifically, the patent discusses dynamic changes to bias currents, circuit impedances, and gain. *See, e.g., id.*, Abstract (“Embodiments of the present invention use bias current reduction, impedance scaling, and gain changes either separately or in combination to reduce power dissipation.”), 1:58-67, Fig. 9A:

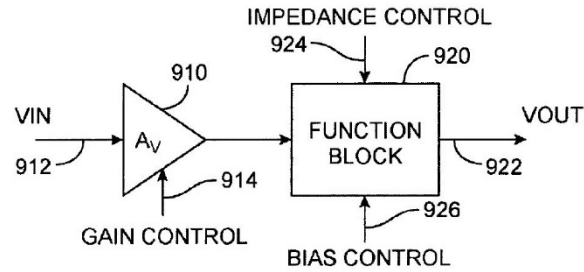
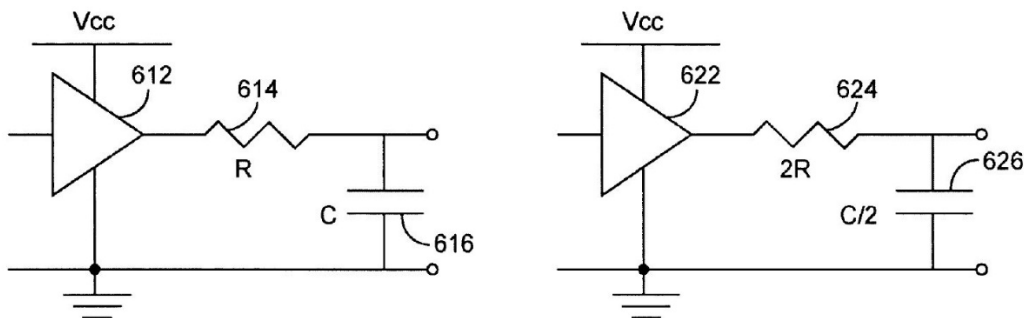


FIG. 9A

For example, the specification discusses circumstances calling for changes to bias currents, and techniques for doing so. *Id.*, 7:27-46, Fig. 5. For example, a bias current might be changed by increasing a resistance “by opening switches across portions of the resistance.” *Id.*, 7:39-44.

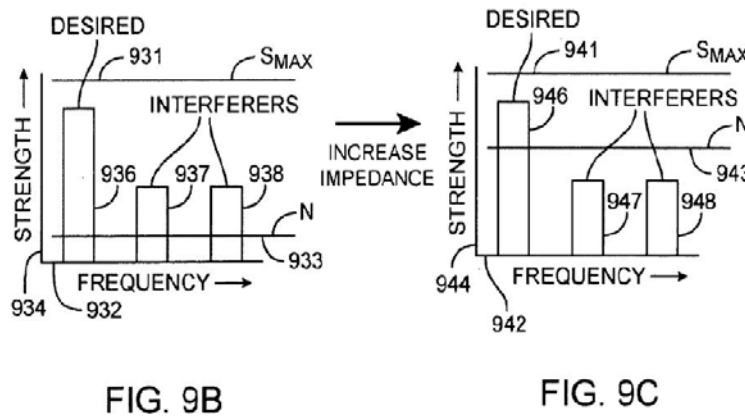
Alternatively, and in contrast, “a circuit’s impedances may be scaled to reduce drive currents” or even associated bias currents. *Id.*, 7:47-62, Fig 6. A basic example of this, with a common RC impedance load on a driver, is shown in Figure 6:



In this figure, the driver load impedance from R and C is replaced by impedance from $2R$ and $C/2$, such that: “the impedance of the load seen by driver 622 is double

that seen by 612, thus the output current required by the driver 622 is reduced by one-half. *Id.*, 7:50-55.

The '825 Patent also discusses and gives examples of gain adjustment. See, *e.g.*, *id.*, 8:4-19, Fig. 7. It then goes on to discuss that: “These variables, or degrees of freedom, specifically reducing bias currents, increasing impedances, and increasing gain may be used as in the following examples.” *Id.*, 8:20-22. A lengthy discussion follows, providing particular examples of signal spectra and corresponding adjustments that can advantageously be made. See *id.*, Figs. 8A & 8B, 9A & 9B, 10A & 10B, 11A & 11B, 12, and corresponding text discussions:



See also *id.*, 3:34-50 (“FIGS. 9A-9C illustrate one of the possible power saving techniques that may be used when a received desired signal is strong while all interfering signals are at a low power level.”), Fig. 9A, 9:45-52:

Accordingly, one or more impedance[s] in the function block 920 may be increased, such that the noise floor 943 rises as shown in FIG. 9C.

In this way one or more [of] the driving currents in the function block 920 may be reduced.

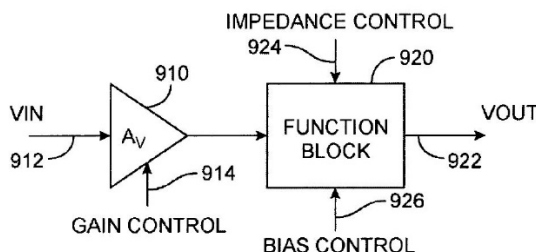


FIG. 9A

Again, the adjustments made to circuits in the claimed inventions are dynamic, based on monitoring the interferer signal levels and desired signal levels to optimize the changes in gain, bias, and impedance of the circuit components. The '825 Patent also teaches specific examples and techniques for locations within receiver circuits at which the beneficial power-saving dynamic adjustments can be performed. *See, e.g., id.*, 11:64-67 (low noise amplifier (LNA) adjustments), 12:1-5 (mixer), 12:6-18 (voltage controlled oscillator (VCO) adjustments).

In keeping with Professor Tsividis' long teaching career, the specification of the '825 Patent explains the embodiments of the disclosed and claimed inventions in clear detail and with examples much like those in his textbooks, magazine articles, and teaching slides. *See, e.g.,* EX2003, EX2004, Figs. 11, 18. As described above, the industry has shown continued interest in these techniques even decades after their invention by Professor Tsividis. For example, in Fall of 2018,

he provided an article to the IEEE Solid-State Circuits magazine teaching many of these power-saving techniques. EX2004. In Figure 18 of that article, for example, there is an example showing a combination of both impedance scaling (multiplying RC impedance by n via nR_x combined with C/n), and also bias current scaling (dividing I_{bias} by n):

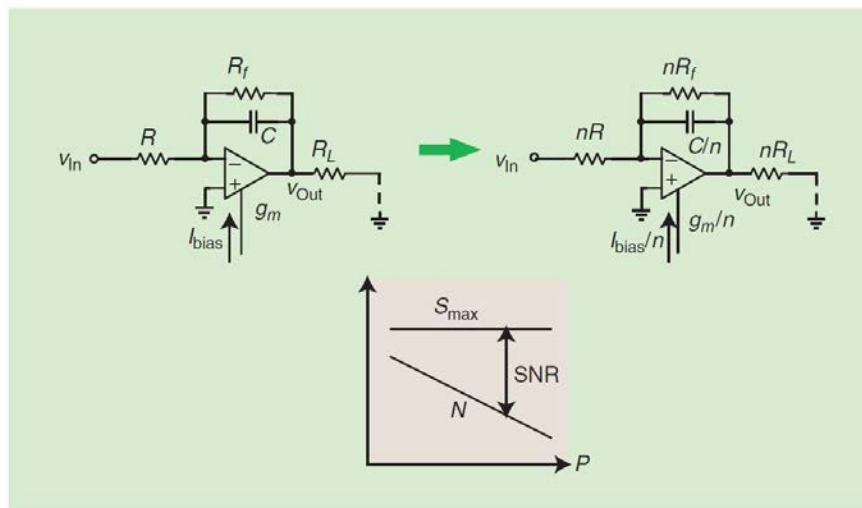


FIGURE 16: Bias-impedance scaling for an active RC circuit.

See also *id.*, Figure 23 (showing effect of a combination of bias and impedance adjustments—lowering maximum signal handling capability and raising the noise floor, respectively, with creation of some intermodulation products):

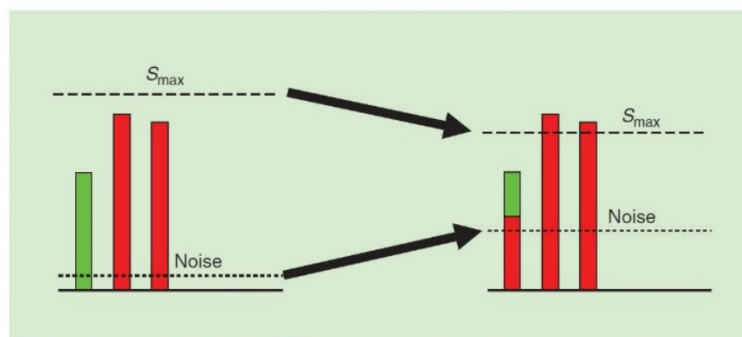
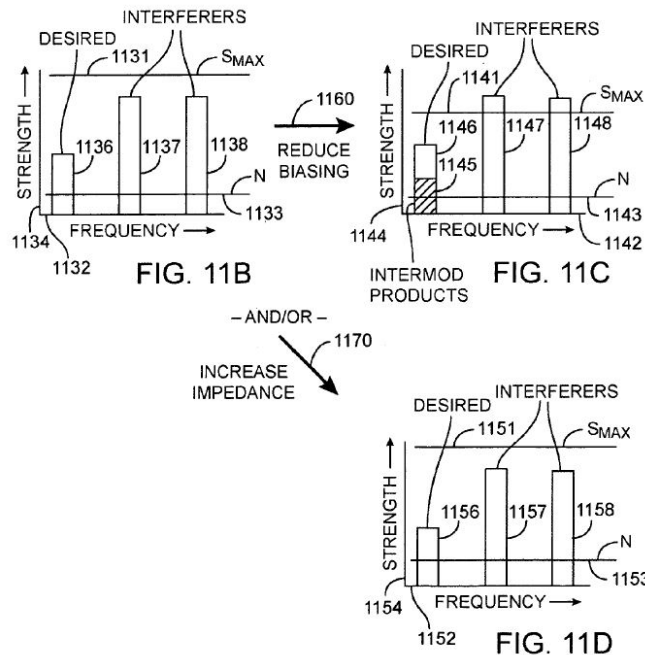


FIGURE 23: Power adaptation in the case of a medium desired signal and large interference.

The same combination of dynamic adjustments to impedance and to bias current as in Figure 23 above was also discussed by Professor Tsividis more than fifteen years prior, in the specification that became the '825 Patent. EX1001, 10:30-59, Figs. 11B, 11C, & 11D:



The '825 Patent discloses that decreases in bias current can be used to lower the maximum signal handling capability. *See, e.g., id.*, 9:8-10. The '825 Patent also discloses that the noise floor can be “increased by increasing impedances in the function block,” which also “reduces the required drive current.” *See, e.g., id.*, 10:18-21.

The fact that the IEEE remained interested in publishing Professor Tsividis’ innovative approaches for dynamic circuit adjustments for power savings, even in

the Fall of 2018, is one of the many indicators of the non-obviousness of the inventions also taught and claimed in the '825 Patent. Others are mentioned above. The '825 Patent was groundbreaking and foundational, and the inventions taught and claimed therein are still used throughout the mobile communications industry.

C. The '825 Patent (and parent '330 Patent) Prosecution History

The application that issued as the '825 Patent was filed on March 24, 2016 and claims priority to two provisional applications filed on March 1, 2003 (App. Nos. 60/451,229 and 60/451,230). The '825 Patent is a continuation that has the '330 Patent, filed on February 23, 2004, as its ultimate parent.

As acknowledged in the Petition, the claims in their present form were added—replacing cancelled claims that had been rejected, including in view of the *Clark* reference—on March 6, 2018. Petition 11-12; EX1003, 159-161 (rejection), 140 (new claims). After this, the Examiner did not renew the earlier rejections, instead making only a double patenting assertion, followed by entry of a terminal disclaimer, and then notice of allowance. EX1003, 103 (Notice of Allowability).

In the earlier prosecution of the parent '330 Patent, the pending claims were also initially rejected as obvious over a combination that included the *Clark* reference (U.S. Patent No. 5,001,776). EX2012, 171.³ The Examiner found that

³ The file history for the '330 Patent was filed by Petitioners as EX1003 to their

Clark did not explicitly or inherently disclose “dynamically changing an impedance” of a “component in the signal path.” *Id.*, 171-172. Instead, the Examiner asserted obviousness based on disclosure of varying an injection voltage and “the current consumption of the mixer 110.” *Id.*, 171 (*citing Clark*, 2:34-4:66); EX2007 (*Clark*), 3:62-4:3.

Applicant responded to this rejection by arguing that the identified disclosures of *Clark* only taught changing a “bias current,” which was understood to be different than a switching or drive current. EX2012, 163:

A bias current is not the same as a switching current. One skilled [in] 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.)

See also EX1001, 7:47-62 (“In this way, an impedance can be scaled in order to decrease a circuit’s required drive current.”), Fig. 6.

The Examiner then reversed the prior obviousness rejection and allowed the ’330 Patent claims based on Applicant’s amendments and arguments. EX2012, 133-134. In allowing these two claim sets after rejections in view of *Clark*, the

parallel Petition in IPR2023-00694, and is re-filed here as Exhibit EX2012.

Examiner necessarily recognized that modifying a DC or quiescent current, as in *Clark*, did not disclose elements involving “dynamically changing an impedance.” *Id.*, 134. Accordingly, claim 8 here—requiring “an impedance to vary” in a circuit “in the receiver signal path”—cannot be invalidated here based on *Rauhala*’s similar disclosure of modifying a DC or quiescent current.

D. The ’825 Patent Challenged Claims

Lenovo challenges four claims of the ’825 Patent here. Each of the three challenged independent claims contains elements requiring “a circuit for determining a signal strength of the interferer signal *and* a circuit for determining a signal strength of the desired signal”—elements which appear in the body or by dependency in each of the challenged claims of the ’825 Patent. *See, e.g.*, EX1001, 13:4-7 (claim 1), 13:49-52 (claim 3), 16:21-24 (claim 8), 14:5 (claim 4, depending from claim 3).

For example, challenged claim 3 recites:

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;***

wherein a worst-case power dissipation condition from the battery results when the signal strength of the desired signal is low and the signal strength of the interferer signal is high; and

wherein the power dissipation reduction in the receiver is achieved by causing a bias current to vary in one or more of the plurality of circuits in the receiver signal path of the wireless transceiver as the signal strength of the interferer signal and the signal strength of the desired signal vary, according to the following:

when the signal strength of the interferer signal is high and the signal strength of the desired signal is low, and the desired signal has a signal strength that is larger than in the worst-case power dissipation conditions, causing 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 compared to the worst-case power dissipation condition, causing a reduction in power dissipation.

EX1001, 13:38-14:4 (claim 3).

Like challenged independent claims 3 and 8, challenged independent claim 1 also requires “a circuit for determining a signal strength of the interferer signal and a circuit for determining a signal strength of the desired signal” in response to a signal strength determination. *Id.*, 12:60-13:31 (claim 1).

As discussed below, *Rauhala*—the only reference alleged to do so—does not disclose the “a circuit for determining a signal strength of the interferer signal and a circuit for determining a signal strength of the desired signal” elements, which are included directly or by dependency in every challenged claim. Lenovo’s Petition relies on *Rauhala*’s brief reference to a single detector, that is only disclosed to indicate a threshold crossing, and only for the one signal channel and spectrum that it is tuned for at a time.

Challenged independent claim 8 recites elements similar to claim 3, but adds elements requiring “causing an impedance to vary” in a circuit “in the receiver signal path”:

8. ...

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 as the signal strength of the interferer signal and the signal strength of the desired signal vary, according to the following:

...

(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**, thereby causing a drive current of the one or more of the plurality of circuits to be decreased.

EX1001, 16:10-48 (claim 8).

As also discussed below, *Rauhala*—the only reference alleged to do so—does not even arguably disclose or suggest the claimed impedance variation elements. Lenovo’s Petition relies on *Rauhala*’s disclosure of changing resistors controlling a static DC bias current. That is **not** changing an impedance, and *Rauhala*’s k_I or I_B bias control circuits are **not** in the receiver signal path.

The Petition fails to show anticipatory disclosure of all elements of any challenged independent claim, and all challenged claims should be upheld.

Challenged claim 4 depends from claim 3, and the Petition fails to prove invalidity for the same reasons discussed herein for claim 3. EX1001, 14:9-11 (claim 4); *see also* Petition, 50-56 (Ground 2). Nothing is added in Ground 2 for claim 4—or from the alleged combination reference *Masaaki*—to the deficient showing concerning independent claim 3 in Ground 1. *Id.* Indeed, Ground 2 simply refers back to the alleged anticipatory disclosure argued in Ground 1, for all of the elements inherited from claim 3 by dependency in claim 4. *Id.*, 50 (“As discussed above for independent claim 3, Rauhala anticipates each limitation of that claim”).

In addition, the brief discussion in the Petition of the proposed prior art combination for dependent claim 4 fails to identify anything in *Rauhala* providing the required motivation to combine. *See* Petition, 53-54. Instead, Lenovo simply offers an improper invitation to engage in result-based hindsight reasoning, which does not support obviousness. *See, e.g., Apple Inc. v. Contentguard Holdings, Inc.*, IPR2015-00442, 2015 WL 4467397, Paper 9 at 11-12, 17 (P.T.A.B. July 13, 2015) (“analysis infected with impermissible hindsight cannot form the basis of an obviousness finding”); *see also, e.g., Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966). That invitation is contrary to law: saying “no more than that a skilled artisan, once presented with the two references, would have understood that they could be combined. And that is not enough: it does not imply a motivation to pick

out those two references and combine them to arrive at the claimed invention.”

Pers. Web Techs., LLC v. Apple, Inc., 848 F.3d 987, 993-94 (Fed. Cir. 2017).

Lenovo’s Petition fails completely on proof with respect to key elements of all independent challenged claims and should be dismissed, with all of the challenged claims upheld.

E. Claim Construction

For purposes of *inter partes* review, disputed claim terms are construed to give them “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *See* 83 Fed. Reg. 51341 (Oct. 11, 2018 (adopting the standard of *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005)). The proper construction is considered in the context of, and must be consistent with, the specification—and the claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art. *See, e.g., Phillips*, 415 F.3d at 1313.

A person of ordinary skill in the art with respect to the ’825 Patent would have at least a Bachelor’s Degree in Electrical or Electronics Engineering, along with approximately five years of relevant experience in the design of transceiver architecture, RF systems and components, and analog and mixed signal circuits, as well as experience in control algorithms for such system and familiarity with

wireless standards—with additional education substituting for experience and vice versa. EX2015, ¶48.

As Lenovo acknowledged in a parallel proceeding, claims of the '825 Patent and related patents have been twice construed by district courts. See EX2013; EX2014. The claims will be construed again in two other district court litigations.⁴ This heightens the importance of guidance that the Board should not construe terms beyond what is necessary to make its determinations. See, e.g., *Sandoz Inc. v. Abbvie Biotechnology Ltd.*, No. IPR2017-01987, 2018 WL 1230583, at *5 (P.T.A.B. Mar. 9, 2018) (“[B]ecause neither of those phrases requires construction for us to resolve the instant dispute, we decline to construe them. See *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (‘only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy’).”).

Lenovo asserts that no constructions are necessary. Petition, 19. But because Lenovo attempts to implicitly redefine “an impedance” via the non-impedance

⁴ The district court will hold a *Markman* hearing in Theta’s litigation against Petitioners sometime after March of 2025. A *Markman* hearing date of February 5, 2024 is set in *Theta IP LLC v. Apple Inc.*, No. 6:23-cv-00314-ADA (W.D. Tex.). “Impedance” is one of the terms to be discussed at the WDTX hearing.

disclosure it identifies, Theta offers the section below on the proper interpretation of impedance.

Challenged independent claim 8 here has specific elements requiring changes to “an impedance,” that is in the “receiver signal path.” See EX1001, 16:29-35, 16:44-48 (claim 8). Lenovo failed to show these elements are disclosed in *Rauhala* as alleged. Other than adopting the plain meaning—and prior consistent construction—of “impedance” as referring to the opposition to AC signals, construction by the Board is not needed to see why these elements are not present or suggested in the cited art.

1. “changing” or adjusting “an impedance”

In this Petition, Lenovo, and its declarant Dr. Baker, admit that impedance has a well-known meaning, and that it is an AC circuit parameter. Petition, 53; EX1002, ¶149 (“[t]he total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency”). A person of ordinary skill in the art would not find changing an impedance obvious from *Rauhala*’s disclosure of adding a simple resistor in series with a DC supply current—because impedance is well-known to mean the total opposition of a circuit to an alternating current. *Id.* As described below, Professor Tsividis uses the term consistently with this understanding in the ’825 Patent, and refers instead to “resistance” when discussing DC bias currents.

Impedance is undisputedly an alternating current parameter: “The total opposition (*i.e.*, resistance and reactance) a circuit offers to the flow of alternating current at a given frequency.” Graf, *Modern Dictionary of Electronics*, Seventh Edition, EX2009, 6:

impedance — 1. The total opposition (*i.e.*, resistance and reactance) a circuit offers to the flow of alternating current at a given frequency; the ratio of the potential difference across a circuit or element of a circuit to the current through the circuit or element. It is measured in ohms, and its reciprocal is called admittance. Symbol: Z . 2. The combination of resistance and reactance 3. Combined opposition to current resulting from resistance, capacitance, and inductance. 4. The sinusoidal terminal voltage of a circuit divided by the current through it. 5. A speaker's resistance to an alternating current, which varies with frequency. A speaker's rated impedance is usually the value measured at 400 Hz. 6. The opposition to alternating current in a circuit, generally categorized as either high or low, and measured in ohms. 7. The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. It is a combination of resistance, R , and reactance, X , measured in ohms.

see also EX1006, 9; Laplante, *Electrical Engineering Dictionary*, 2000, EX2010, 3 (“electrical property of a network that measures its ability to conduct electrical AC current for a given AC voltage”); Nahvi, *et al.*, *Electric Circuits*, Fourth Ed., EX2011, 9 (“sinusoidal voltage or current” and “When impedance is written in Cartesian form the real part is the resistance R and the imaginary part is the reactance X ”), 11 (“impedance in the frequency domain”); EX1010, 7, 8; Wikipedia, Electrical Impedance, at https://en.wikipedia.org/wiki/Electrical_impedance (“In electrical engineering, impedance is the opposition to alternating current presented by the combined effect

of resistance and reactance in a circuit”). Impedance is a well-known term of art with a well-known definition to a POSITA reading the ’825 Patent. EX2015, ¶¶54-56.

This definition is not in dispute. Lenovo agrees with it and relies on both the Graf dictionary and the Nahvi textbook. EX1006; EX1010; *see also* Petition, 53; EX2002, ¶149:

An “impedance” is an extremely well-known concept in the field of electric circuits. It generally means a “[t]otal opposition that a circuit offers to the flow of alternating current or any other varying current ... [comprising] a combination of resistance, R, and reactance, X” ...

In Theta’s first litigation against Samsung, the parties agreed, and Judge Gilstrap construed the term “impedance” to mean: “opposition to the flow of alternating current.” EX2013, 15. In Theta’s second litigation against Samsung, the parties each proposed variations of this definition, and Judge Albright declined to further elaborate on the plain and ordinary meaning of impedance. EX2014, 5.

The ’825 Patent specification uses the term consistently with its ordinary definition of total opposition to the flow of alternating current. For example, in Figure 6 and related discussions of “impedance scaling,” the impedance of the load seen by the driver is the total AC opposition including both resistive and capacitive (reactance) components. EX1001, 7:47-55, Fig. 6. The discussion of “frequency

response” is also consistent with the ordinary understanding of a POSITA that impedance is an alternating current, frequency domain circuit analysis parameter. *Id.*; see also EX2015, ¶¶54-56; EX1002, ¶149 (“...combination of resistance, R, and reactance, X,’ where the reactance X means ‘[t]he opposition offered an alternating flow by a capacitance or inductance related to the frequency of the alternating current.’”).

Because impedance is indisputably an AC circuit parameter, persons of skill in the art do not ordinarily refer to a resistance to a DC current as an impedance. EX2015, ¶56. More importantly, the ’825 Patent does not do so—using the term “resistance” when discussing DC circuits, such as those for setting bias currents. *See, e.g.*, EX1001, 7:38-44 (describing changing a DC bias current through “a resistance” by “opening switches across portions of the resistance”), 8:15-17 (“increasing a load resistance using switches”). In contrast, when the circuit load includes reactance (*e.g.*, capacitors) and an AC signal current is being driven, the specification uses the term “impedance.” *Id.*, 7:47-62. This is in keeping with ordinary usage of the terms. EX2015, ¶¶57-58.

As described above, the ’825 Patent teaches control of bias currents, and control of impedances, as separate concepts. *See, e.g.*, 1:58-60 (“bias current reduction, impedance scaling, gain, and other dynamic changes either separately or in combination”), 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”), Fig 9A:

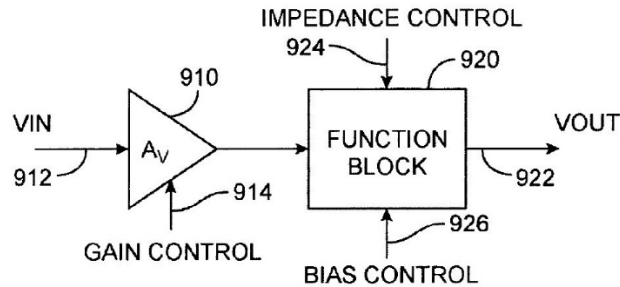
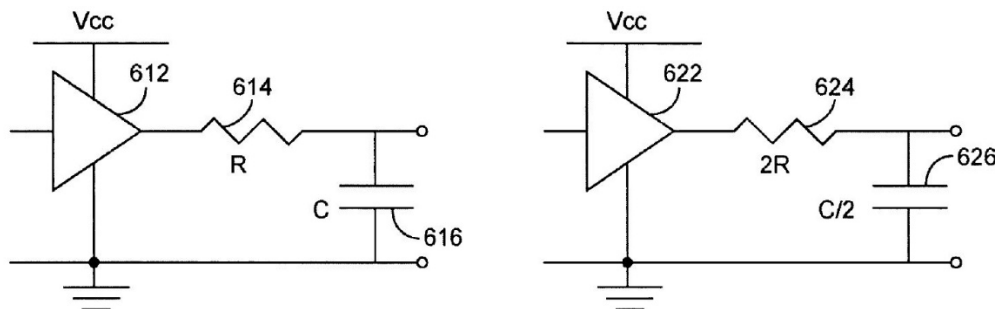


FIG. 9A

This teaching of separate and distinct control variables would make no sense if switching portions of “resistance” in or out to control a DC bias current (as in the example given with Figure 5) were also interpreted as an impedance control. *Id.*, 7:39-44 (“resistance”), Fig. 5. The patent discusses “impedance” changes separately, in context that makes clear it is referring to an alternating current, frequency domain signal—in an example circuit that happens to include resistive and reactive (*e.g.*, capacitive) circuit elements. *Id.*, 7:47-62 (“impedance”), Fig. 6:



This ordinary understanding of impedance as used in the '825 Patent is also consistent with the prosecution history. In prosecution of the parent '330 Patent, Applicant distinguished changes in a DC current, allegedly shown in prior art, from the claimed impedance change affecting an AC switching current. EX2012, 163 (“a bias current is a DC or quiescent current, while a switching current is a dynamic or transient current”).

The Petition relies only on a resistor(s) controlling a DC supply current—for alleged disclosure of the key elements of dynamically changing an impedance. Petition, 45-46 (“including or excluding resistors R2 and/or R3 from the circuit”). That is wrong. A person of ordinary skill in the art wouldn’t call this changing an impedance. Indeed, Dr. Baker testified he would call a resistor a resistor. EX2016, 77:7-78:7.

Switching a resistance in series to a DC current isn’t changing an impedance in the context of the '825 Patent—as impedance is indisputably defined as the opposition to the flow of AC current. A person of ordinary skill wouldn’t understand or describe *Rauhala*’s supply current switch as dynamically adjusting an impedance as claimed—just as the Examiner didn’t when allowing the claims over the “DC or quiescent current” change disclosed in *Clark*. EX2015, ¶¶62, 64-65; IPR2023-00694, EX1003, 163, 134.

The Board may construe “impedance” as “opposition to the flow of

alternating current,” as determined in the Eastern District of Texas (EX2013, 15); or may simply agree with the Western District of Texas (EX2014, 5), Lenovo, and Theta that impedance has this “well-known” meaning in the art. Either way, Lenovo’s implicit redefinition of the term—to allegedly apply to quiescent supply currents controlled through a resistor network—must be rejected. That redefinition is inconsistent with the proper and agreed meaning of impedance as an alternating current parameter. *See, e.g.*, Petition, 53 (The definition of the term “impedance” is “[t]he total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency”); EX1002, ¶149.

2. “determining” elements

In its Institution Decision, the Board undertook claim construction analysis of the determining circuit elements—“a circuit for determining a signal strength of the interferer signal and a circuit for determining a signal strength of the desired signal”—ultimately concluding that on the preliminary record, the claims neither required nor prohibited two separate circuits. Inst. Dec., Paper 10, 11-17.

The main point of Theta’s preliminary argument, hopefully stated with more clarity herein, was not to suggest that the claims are limited to a particular number of circuits or exact timing of their use. Indeed, Theta’s claims are not so limited. Rather, the issue is with *Rauhala*, because the single, specific received signal detector disclosed therein is ***not capable*** of determining both a desired signal and

an interferer signal received as part of the same signal spectrum. As in *Robertson*, discussed in the Institution Decision, here there is a relationship between the determinations. *Id.* at 12-13. Separate, distinct, or not, the circuits must determine two components of one received spectrum—“a wireless signal having a desired signal and an interferer signal.” *See, e.g.*, EX1001, 13:43-52 (claim 3). As discussed further herein, *Rauhala*’s single diode detector that required re-tuning cannot meet, and therefore does not anticipate, this requirement of the claims.

III. Petitioners failed to prove that the challenged claims are disclosed by *Rauhala*

Rauhala, the only reference cited to or relied on for alleged anticipatory disclosure of all elements of each independent challenged claim (*see* Petition, 3), does not disclose key elements as claimed. Lenovo has not proven, and cannot prove, otherwise.

For all challenged claims, the Petition does not show disclosure of “a circuit for determining a signal strength of the interferer signal **and** a circuit for determining a signal strength of the desired signal.” *Rauhala* undisputedly does not disclose two determining circuits. The single received signal strength detector as it is described in *Rauhala* cannot be used to perform and thus does not disclose the two claimed determinations. *See, e.g., In re Robertson*, 169 F.3d 743, 744-45 (Fed. Cir. 1999) (reversing determination that reuse of one fastener could disclose

multiple claimed fasteners that performed different functions).

The claim language requires measurement of two different components of one received signal spectrum. EX1001, 13:43-52 (claim 3: “receiving a wireless signal having a desired signal and an interferer signal”). Neither the Petition, nor the Board’s analysis, considered that *Rauhala*’s re-tuning—required in order to use a single detector circuit to also obtain a neighboring channel signal strength—would also change the “signal” spectrum being measured at “detector DET.” Because of this re-tuning, *Rauhala*’s subsequent neighboring channel signal strength measurement is not of an “interferer signal” of the original received spectrum.

With respect to claim 8, the Petition does not properly interpret, or show disclosure in *Rauhala* of “an impedance” as claimed. And the Petition completely ignores the requirements—not disclosed or suggested in *Rauhala*—of changing an impedance in the “receiver signal path.” *Rauhala*’s discussion of bias current also does not disclose the required reducing of a “drive current.”

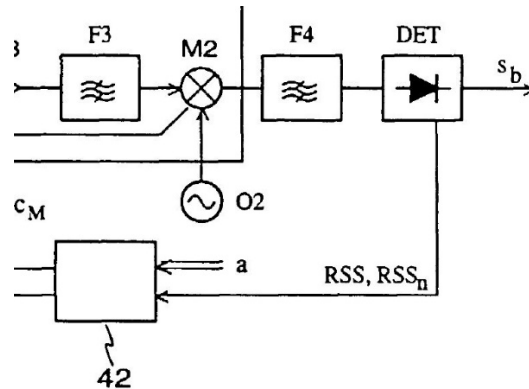
Each of these gaps in Lenovo’s required proof is fatal to the Petition; the challenged claims should be upheld.

A. Petitioners failed to show that *Rauhala* discloses “a circuit for determining a signal strength of the interferer signal and a circuit for determining a signal strength of the desired signal” according to the challenged claims

Lenovo failed to show that *Rauhala* discloses to a person of ordinary skill in the art elements of every challenged claim requiring both “a circuit for determining a signal strength of the interferer signal **and** a circuit for determining a signal strength of the desired signal.” See, e.g., 13:4-7 (claim 1), 13:49-52 (claim 3), 16:21-24 (claim 8). The ’825 Patent teaches that the desired signal and the interferer signal are part of the same received signal input spectrum—in other words, they are received together. *Id.*, 5:20-30 (“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.”). Lenovo’s expert agreed—that in order for an interferer signal to interfere, it must be received along with the desired signal. EX2016, 64:10-22, 65:7-17.

But Lenovo points to only a single structure as allegedly disclosing both “a circuit for determining a signal strength of the interferer signal and a circuit for determining a signal strength of the desired signal”—a single “detector (DET)” shown in *Rauhala*. See, e.g., Petition, 23. There is no dispute that there is only one disclosed detector, or that it can only give one indication at a time. *Id.* (“**a** ‘detector DET’ configured to provide ‘an indication about **either** the receive channel signal

strength RSS **or** the strength of [another channel]”); EX1004, [0017] (“receives from detector DET an indication about either ... or ...”), Fig. 4 (showing a single detector with a single output that can be either RSS or RSS_n, depending on “a”);



See also EX2015, ¶¶60, 69-70 (“a single detector “DET,” which can generate “an indication about either the receive channel signal strength RSS or the signal strength of a neighboring channel RSS_n”).

Rauhala does not describe how the detector works, only that it can give “an indication” whether the signal strength crossed a threshold. *Id.*; EX1004, [0017] (“Signal RSS has one threshold value S4”); EX2015, ¶71. The diode symbol used in *Rauhala*’s Figures for the detector suggests that it is a “diode detector”—which is a simple envelop detector often used in RF circuits to measure total received signal strength around a particular frequency. EX2015, ¶60; EX1004, Fig. 4.

It is also apparent from *Rauhala* that the detector must be re-tuned to another channel in order to provide a second indication from it. See, e.g., EX1004, [0017] (“Signal a from the receiver’s tuner control indicates the channel”); EX2015, ¶61.

Indeed, *Rauhala* directly states that: “[d]etector DET provides information about the signal strength (RSS) ***on the channel to which the receiver is tuned.***” EX1004, [0013]. This is consistent with the operation of a diode detector being used to measure RSS—because such a detector needs an input that is band-pass filtered around a desired signal, and would require that receiver input filter to be re-tuned in order to measure another signal. EX2015, ¶60; EX2020, 2.

Rauhala does not disclose how the threshold indications from the channels may be combined, but it is clear from the circuit diagram of Fig. 4 that the threshold indications for “S4” and “Sn” shown in the table in [0017] must come from at least two distinct uses of the ***single*** disclosed detector. EX1004, [0017] (“receives from detector DET an indication about either ... RSS or ... RSS_n”), [0013] (“the channel to which the receiver is tuned”), Fig. 4; EX2015, ¶70.

Lenovo agrees that the single detector can at most give one indication: “an indication about either the receive channel signal strength RSS or ... [RSS_n].” Petition, 13. Lenovo’s single-paragraph discussion of this claim element does not explain how one single-indication detector—requiring an intervening re-tuning of the receiver—could disclose the two determining functions in the claims. It can’t, and Lenovo’s Petition fails on this point—both as a matter of fact and of law. *See also* EX2015, ¶¶70-72. Petitioners cannot show anticipatory disclosure of both a desired signal determination and an interferer signal determination within a

received signal spectrum, from one circuit alleged to be capable of each but only one at a time, and only after re-tuning. *See, e.g., In re Robertson*, 169 F.3d at 744-45 (discussed further below).

Instead of explaining how a single detector might meet an element requiring two determinations, Lenovo chooses to just assert that it does. Petition, 23 (“a circuit (e.g., a ‘detector DET’) ..., which corresponds to the recited ‘a circuit for determining a signal strength of the interferer signal and a circuit for determining a signal strength of the desired signal’”). But it doesn’t, for all the reasons given herein. Most pointedly, *Rauhala*’s detector cannot perform both determinations of the challenged claims because after re-tuning, the detector’s second determination is instead of total received signal strength ***of a different signal spectrum***—it is not a determination of an interferer signal received before the re-tuning. EX2015, ¶72.

In other words, *Rauhala* fails to disclose the claim elements, not as a matter of claim construction as the Board analyzed—but because the claim requires two distinct functions that cannot both be met by the particular structure disclosed in *Rauhala*.

The Federal Circuit has held, in directly analogous circumstances, that a single structure can’t be used to show anticipatory disclosure of elements requiring multiple structures with two functions—even if the single structure were capable of doing both functions. In *Robertson*, 169 F.3d at 744-45, a claim required

fasteners (for holding a diaper in place) and another fastener (for holding the diaper closed for disposal). The patent challenger pointed to a reference disclosing only fasteners for securing the diaper, but suggested that they could be re-tasked for disposal. *Id.*

The Federal Circuit reversed the Board’s finding of anticipation, stating that the required fastener for disposal was neither expressly nor inherently disclosed by the suggestion to reuse the disclosed fasteners for disposal. *Id.* at 745. This is precisely the situation presented by Lenovo’s faulty allegations here. A claim element, requiring two different functions, is not anticipated by a reference containing one circuit alleged to be capable of doing either one or the other function. *See, e.g., id.* This is particularly true when there is a required relationship between the elements, such that separate reuse does not fully meet the claim requirements. *See* Inst. Dec., Paper 10, 13 (noting the *Robertson* third fastening means must be “mechanically engageable” with the first); EX1001, 13:43-52 (requiring a received signal “having a desired signal and an interferer signal,” and determining the strength of both signal components from that received signal spectrum).

Numerous other cases also refute Lenovo’s argument here. *See, e.g., Ex parte Miller*, Appeal No. 2020-004369, 2021 WL 4492109, at *3 (P.T.A.B. Sept. 29, 2021) (“When a claim requires two separate elements, one element construed

as having two separate functions does not meet the claim’s terms,”); *Ex parte Wiedeman*, Appeal No. 2008-003454, 2009 WL 211777, at *3 (B.P.A.I. Jan. 27, 2009) (same structure could not be both claimed “seat bottom” and “center support”); *Ex parte Koutsky*, Appeal No. 2008-000557, 2008 WL 4359775, at *2 (B.P.A.I. Sept. 23, 2008) (“when a claim requires two separate elements using one element construed as performing two separate functions will not suffice to meet the terms of the claim”).

As discussed above, the receiver re-tuning indisputably required by *Rauhala* is like changing the radio station, and any subsequent measurement of total signal strength on the new station is not a determination of the interferer signal (*e.g.*, static) being received on the originally tuned station. EX2015, ¶¶70, 72. *Rauhala*’s single diode detector cannot perform, and the sparse details given about it fail to disclose, determining both signal measurement functions of the challenged claims. *Id.*

Dr. Baker’s declaration adds no evidence or insight here—both because ***he never actually states that the single detector “corresponds to” both determining circuits appearing together in the claim element*** (compare Petition, 23, with EX1002, ¶83), and because the only testimony actually presented is nothing more than a near-verbatim copy of the Petition attorney argument, signed by Dr. Baker. See below (verbatim text highlighted):

Petition, pg. 23	Declaration ¶83
As discussed above, <i>Rauhala</i> discloses that the receiver “monitors the signal strength on the receive channel and neighboring channels.” See <i>supra</i> Section IX.A.1.b.; Ex. 1004 at ¶ [0006]; Ex. 1002 at ¶ 83. Further, <i>Rauhala</i> discloses a “detector DET” configured to provide “an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band,” which may include “RSSn [that] stands for the signal strength of the neighboring channel.” Ex. 1004 at ¶ [0017]; Ex. 1002 at ¶ 83. It is thus evident that the receiver in <i>Rauhala</i> includes a circuit (e.g., a “detector DET”) for determining a signal strength of the neighboring channel signal as well as the receive channel signal, ... Ex. 1002 at ¶ 83.	83. <i>Rauhala</i> discloses that the “receiver monitors the signal strength on the receive channel and neighboring channels.” (<i>Id.</i> at ¶ [0006].) <i>Rauhala</i> further discloses a “detector DET” that provides “an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band,” such as “RSSn [which] stands for the signal strength of the neighboring channel.” (<i>Id.</i> at ¶ [0017].) Accordingly, <i>Rauhala</i> discloses that the receiver has a circuit, namely a “detector DET,” that determines the receive channel signal strength denoted RSS and the neighboring channel signal strength denoted RSSn.
Petition, pg. 33-34	Declaration ¶109
As discussed above, <i>Rauhala</i> discloses that the receiver “monitors the signal strength on the receive channel and neighboring channels.” See <i>supra</i> Section IX.A.2.b.; Ex. 1004 at ¶ [0006]; Ex. 1002 at ¶ 109. Further, <i>Rauhala</i> discloses a “detector DET” configured to provide “an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band,” which may	109. <i>Rauhala</i> discloses that the “receiver monitors the signal strength on the receive channel and neighboring channels.” (<i>Id.</i> at ¶ [0006].) <i>Rauhala</i> further discloses a “detector DET” that provides “an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band,” such as “RSSn [which] stands for the signal strength of the neighboring channel.” (<i>Id.</i> at ¶

include “RSSn [that] stands for the signal strength of the neighboring channel.” Ex. 1004 at ¶ [0017]; Ex. 1002 at ¶ 109. It is thus evident that the receiver in <i>Rauhala</i> includes a circuit (e.g., a “detector DET”) for determining a signal strength of the neighboring channel signal as well as the receive channel signal, ... Ex. 1002 at ¶ 109.	[0017].) Accordingly, <i>Rauhala</i> discloses that the receiver has a circuit, namely a “detector DET,” that determines the receive channel signal strength denoted RSS and the neighboring channel signal strength denoted RSSn.
Petition, pg. 42	Declaration ¶125
<i>Rauhala</i> discloses that the receiver “monitors the signal strength on the receive channel and neighboring channels.” Ex. 1004 at ¶ [0006]; Ex. 1002 at ¶ 125. Further, <i>Rauhala</i> discloses a “detector DET” configured to provide “an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band,” which may include “RSSn [that] stands for the signal strength of the neighboring channel.” Ex. 1004 at ¶ [0017]; Ex. 1002 at ¶ 125. Therefore, the receiver in <i>Rauhala</i> includes a circuit (e.g., a “detector DET”) for determining a signal strength of the neighboring channel signal as well as the receive channel signal, ... Ex. 1002 at ¶ 125.	125. <i>Rauhala</i> discloses that the “receiver monitors the signal strength on the receive channel and neighboring channels.” (<i>Id.</i> at ¶ [0006].) <i>Rauhala</i> further discloses a “detector DET” that provides “an indication about either the receive channel signal strength RSS or the strength of any signal on the reception band,” such as “RSSn [which] stands for the signal strength of the neighboring channel.” (<i>Id.</i> at ¶ [0017].) Accordingly, <i>Rauhala</i> discloses that the receiver has a circuit, namely a “detector DET,” that determines the receive channel signal strength denoted RSS and the neighboring channel signal strength denoted RSSn.

This single paragraph, substantively identical to the Petition’s and repeated three times, is the extent of the Petition’s argument, and Dr. Baker’s testimony, allegedly

relating *Rauhala* to these claim elements.⁵ Again, Dr. Baker’s declaration on this point adds nothing to the attorney argument of the Petition and can be disregarded.

Dr. Baker’s signature—endorsing attorney argument—is not evidence, and declarations like his are frequently and properly ignored. *See, e.g., Samsung Elecs. Co., Ltd. v. Rightquestion, LLC*, No. IPR2022-00251, 2022 WL 2124913, at *9, Paper 17 at 25 (P.T.A.B. June 9, 2022) (declining to credit testimony where “declarant makes these same statements verbatim, without more, and with no additional citations to evidence”). The Board gives such conclusory, unsupported expert assertions little or no weight. *Id.*; *see also In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”); *Rohm and Haas Co. v. Brotech Corp.*, 127 F.3d 1089, 1092 (Fed. Cir. 1997) (noting that a fact finder is

⁵ Dr. Baker testified that he has declared in support of invalidity in about 200 IPRs, including at least 31 since Lenovo’s Petitions here were filed, and 12 in the month that Lenovo’s Petitions here were filed. EX2016, 9:15-10:2, 14:18-15:17; EX2017; EX2018. In the last year alone, he has declared about: “thermostats, display optics, wireless charging, flash memory, IC packaging, and RF wireless circuits. EX2016, 20:4-14; EX2017. The Board needn’t credit his testimony or alleged expertise here.

not required to “credit the unsupported assertions of an expert witness”); 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

Lenovo’s cursory attorney argument—consisting of one paragraph stating, without support, that disclosure of one detector can meet a claim element requiring a circuit determining one thing **and** a circuit determining another thing—does not meet Lenovo’s burden. Petition, 23. “Attorney argument is not evidence.” *Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017) (reversing Board for relying on argument); MPEP §2145 (“arguments of counsel cannot take the place of factually supported objective evidence”). And because it is not evidence, unsupported attorney argument does not meet Lenovo’s burden of proof—particularly when that attorney argument is legally and factually incorrect.

In sum, Petitioners’ *Rauhala* arguments are facially deficient as a matter of law and fact, and it would be reversible error to credit them and find anticipatory disclosure in *Rauhala*’s single re-tuned diode detector. There is simply no teaching or suggestion in *Rauhala* of the elements requiring both “a circuit for determining a signal strength of the interferer signal **and** a circuit for determining a signal strength of the desired signal,” which are included directly or by dependency in every challenged claim. Petitioners’ Grounds, each of which cite to and rely only on *Rauhala* for alleged anticipatory disclosure of these elements, must fail. *See*,

e.g., *In re Smith Int'l, Inc.*, 871 F.3d 1375, 1381 (Fed. Cir. 2017) (all claim elements must be shown); *Robertson*, 169 F.3d at 745 (“Anticipation ... requires that ‘each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.’”). *Rauhala* does not disclose every element of any claim and cannot anticipate. All challenged claims should be upheld.

B. Petitioners failed to show that *Rauhala* discloses varying “an impedance” according to challenged claim 8

Lenovo failed to show that *Rauhala* discloses to a person of ordinary skill in the art varying “***an impedance***” as disclosed and claimed in the ’825 Patent. *See, e.g.*, EX1001, 16:10-48 (claim 8) (“causing ... an impedance to vary in one or more of the plurality of circuits in the receiver signal path” and “causing: ... an impedance of the one or more of the plurality of circuits in the receiver signal path ... to be increased”).

As discussed above in Section II.E, the proper definition of “impedance”—as would be understood by a person of ordinary skill at the time reading the ’825 Patent—indisputably refers to the opposition of a circuit to ***AC current***. This is how the term has been construed before, and what Lenovo and its declarant agree it means. *Petition*, 53; EX2012, 15. But here Lenovo has instead pointed to a change to resistors that are in series with a ***DC supply current***. *See* *Petition*, 44-45.

That does not disclose a change to an impedance as taught and claimed in the '825 Patent.

The sole identified disclosures of *Rauhala* for these elements do not meet the “well-known” definition of impedance—admitted to by Lenovo—that is used in and understood from the '825 patent. See Section II.E above. The identified disclosure of *Rauhala* does not disclose or render obvious changing the total “opposition to the flow of alternating current”—including because it relates instead ***only to DC or quiescent supply current.***

Specifically, the Petition cites only *Rauhala*'s supply current “control circuit 62” as allegedly disclosing the impedance-varying elements. Petition, 44-46. The Petition relies on resistor R1 in series with a supply, which can be supplemented by adding in parallel resistor R2 and/or R3, to change direct current kI from one static value to another. *Id.*, 45-46; EX1004, Fig. 6:

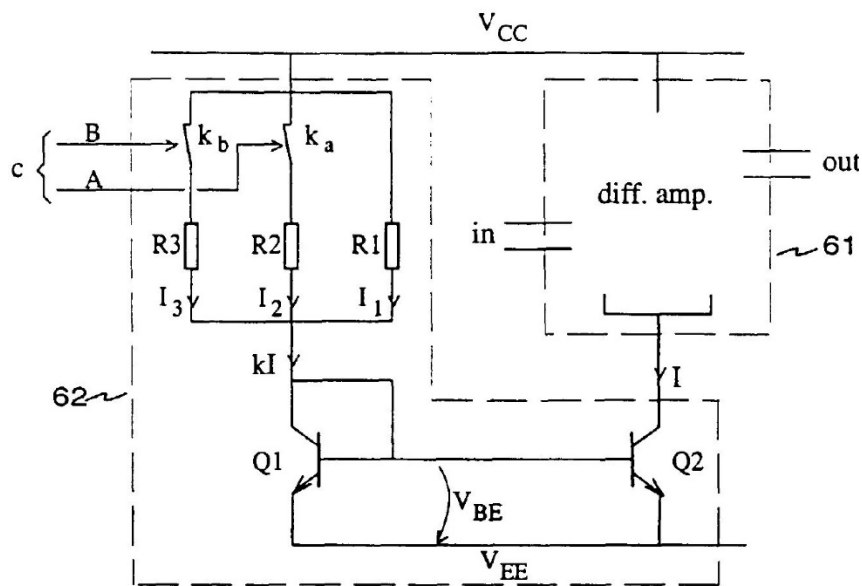
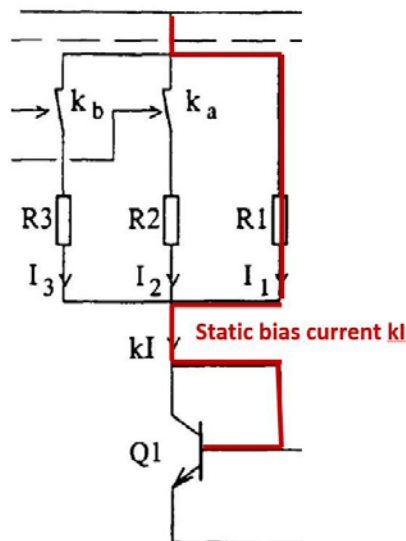


Fig. 6

The alleged impedance change is entirely resistive, and critically, ***applies only to a static DC bias current kI*** . This is not disputed, or disputable, by Lenovo. Petition, 45-46 (“including or excluding resistors R2 and/or R3 from the circuit ... affects the current kI ”), 44 (“bias current”). There are no alternating currents in this circuit for setting kI . EX2015, ¶65. By design, control current kI keeps a constant, quiescent value for the duration of time that one of R1 or R1 + R2 and/or R3 is selected. EX1004, [0023], Fig. 6 (annotated detail below):



In the bias control circuit portion of *Rauhala's* Fig. 6, reproduced above, current kI is used to bias the mirrored supply current transistors $Q1$ and $Q2$ in control circuit 62, and the current kI keeps a **constant DC value** based on one the configurations of resistors $R1$, $R2$, and $R3$. *Lenovo* and *Dr. Baker* agree, stating the current kI takes one of three constant values depending on whether $R2$ and/or $R3$ is included in parallel with $R1$. *Petition*, 44-45; *EX1002*, ¶¶132, 139 (“including more resistors ($R2$, $R3$) via the corresponding switches”). There is no dispute about how *Rauhala's* control circuit 62 operates.

And as described above, there is no dispute about what “an impedance” means to a person of ordinary skill in the art: that it measures the total opposition of a circuit to **alternating current**. But there is no alternating current in the circuit for which resistance components $R1$, $R2$, and $R3$ are variously included, or in the I_B bias current circuit in Fig. 7. *EX2015*, ¶¶62, 64-65. *Lenovo* and *Dr. Baker* do

not say that there is. Instead, Lenovo improperly ignores the agreed definition and ordinary usage of impedance in trying to relate **direct current** through a resistance to changing an impedance. Its attempt to do so fails.

Dr. Baker's declaration agrees with and quotes sources establishing that the ordinary definition of impedance is: "the total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency," or "[t]he total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency." EX1002, ¶134.

But Dr. Baker completely fails to apply this definition, identifying no alternating current, no frequency component, and no reactance in the cited circuits. *Id.*, ¶¶134-135, 139-141. He simply declares that the "resistance ... is at least **a portion of** the impedance." *Id.*, ¶134. The Petition also never applies the agreed definition of impedance, simply declaring—incorrectly—that resistors carrying a DC current are an impedance. Petition, 44-45 ("By including or excluding resistors ... the impedance of the circuit is varied..."), 49 ("R2 and/or R3 constituting the impedance"). But the '825 Patent does not use "impedance" in this way.

As discussed above, resistors carrying a DC current are a resistance in the '825 Patent. *See, e.g.*, EX1001, 7:38-44 (describing changing a DC bias current through "a resistance" by "by opening switches across portions of the resistance"),

8:15-17 (“increasing a load resistance using switches”). Impedance is used in the ’825 Patent, as in the agreed ordinary definition, as an AC circuit parameter.

Disclosing a DC current running through one or more resistors is not disclosure of impedance as used in the ’825 Patent. Dr. Baker’s “a portion of the impedance” hedging suggests he knows this. *See also* EX2016, 74:17-78:7 (“I mean, if it’s a resistor, they would refer to it as a resistance”). For all of the reasons given in Section II.E and above, *Rauhala* does not disclose varying an impedance—with cited circuits that only include resistance, without the alternating current and reactance in the agreed definition of impedance. A person of skill in the art would not understand *Rauhala*’s DC bias circuits for generating kI (Fig. 6) or I_B (Fig. 7) to disclose “an impedance” as that well-known term is used in the context of the teaching and claims of the ’825 Patent, for all the reasons given above. Indeed, ***Rauhala never uses the word “impedance,”*** including when referring to the resistors R1, R2 and R3 of Figure 6, and R1 and R2 of Figure 7, only as ***resistance***. EX1004, [0021], [0023].

The Petition cites to and relies only on *Rauhala* for alleged disclosure of these “impedance” varying claim elements. *See, e.g.*, Petition at 44-46, 48-49 (Ground 1, claim 8), 49 (Ground 2, claim 4: “As discussed above for independent claim 3, *Rauhala* anticipates each limitation of that claim”). And the Petition only argues explicit anticipatory ***disclosure, not obviousness***, for these elements. *Id.*

But *Rauhala* simply does not disclose them. The Board need go no further to find a complete failure of proof and uphold the challenged claim.

In sum, Petitioners' *Rauhala* arguments are facially deficient, and do not meet Lenovo's burden to show that *Rauhala* discloses challenged claim 8. There is simply no teaching or suggestion in *Rauhala* of the claimed changing of "an impedance." Petitioners' Grounds, each of which cite to and rely only on *Rauhala* for these elements, must fail.

C. Petitioners failed to show that *Rauhala* discloses varying an impedance "in the receiver signal path" according to challenged claim 8

Challenged independent claim 8 also requires changing an impedance *in the receiver signal path*. EX1001, 16:29-35 ("an impedance to vary in one or more of the plurality of circuits in the receiver signal path"), 16:41-43 ("an impedance of the one or more of the plurality of circuits in the receiver signal path"). The Board already found that Lenovo had no reasonable likelihood of success on showing anticipation of this element. Inst. Dec., Paper 10 at 35-36 (agreeing with Theta that the alleged varied circuit components are not in the signal path).

As the Board noted (*id.*, 36), Lenovo ignores and never discusses this "in the receiver signal path" aspect of the impedance claim elements. *See, e.g.*, Petition, 44-46, 48-49. To do so would expose Lenovo's failure of proof. The resistances controlling a bias current that are (incorrectly) alleged to be the changed

impedance—R1, R2, and R3 of supply control circuit 62, see Petition at 45, 48—**are not in the receiver signal path.** EX2015, ¶¶63, 66. This is plain from the relied upon figure, which shows the signal path from differential signal input “in” to differential signal output “out,” in differential amplifier “61”—which is separate and apart from “control circuit 62” for the supply current and its bias current kI . EX1004, [0021], Fig. 6:

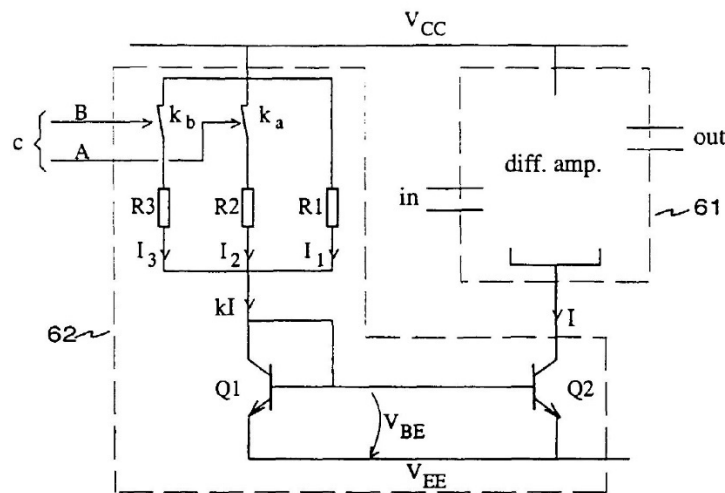


Fig. 6

See also EX2015, ¶63 (“not in the signal path”); EX1004, [0023], Fig. 7 (showing bias current I_B of “control circuit 72” that is clearly not in the signal path from “signal” to “mixer out” of mixer 71). These bias current setting circuits are not in the signal path because they indisputably do not carry alternating signal currents with any signal frequency component. EX2015, ¶¶65-66.

Even if changing *Rauhala*’s DC bias current kI by “including or excluding resistors R2 and/or R3” were changing an impedance as claimed—and it is not, for

the reasons detailed in the section above—*that would still not be changing an impedance of a component “in the receiver signal path”* as required by the language of challenged claim 8. Lenovo’s annotations to Figure 6 of *Rauhala* actually illustrate this fact, by showing the alleged impedance change on the opposite side of the current mirror from the signal-carrying amplifier. See Petition, 45 (citing *Rauhala* Fig. 6, further annotated below):

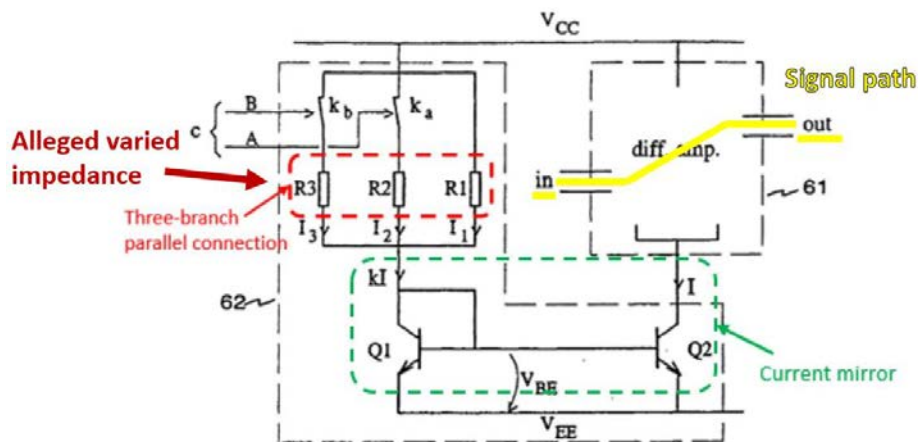


Fig. 6

The alleged varied impedance (via components R1, R2, and R3) of *Rauhala's* Fig. 6 is **not** in the receiver signal path through differential amplifier 61. EX1004, Fig. 6 (annotated above); EX2015, ¶63 (“not in the signal path”). Lenovo does not, and cannot, argue otherwise—again, never mentioning this “receiver signal path” aspect of the elements beyond quoting the claim in headings. Petition, 44-46, 48-49.

Lenovo cannot cure the deficiency in its Petition here because no amount of

additional argument will move the circuit it identifies into the signal path. A person of ordinary skill would understand the identified amplifier or mixer components to have circuits that carry received RF signals, and circuits that provide DC bias or supply current, or perform other functions. *See, e.g.*, EX2015, ¶¶62-63.

As was the case for Lenovo’s identification of the alleged varied impedance, discussed in the section above, here the Petition cites to and relies only on *Rauhala* for alleged disclosure of these claim elements. *See, e.g.*, Petition at 44-46, 48-49 (Ground 1, claim 8), 49 (Ground 2, claim 4: “As discussed above for independent claim 3, *Rauhala* anticipates each limitation of that claim”). And again, the Petition only argues explicit disclosure, not obviousness, for these elements. *Id.* But *Rauhala* simply does not disclose them. The Board need go no further to find a complete failure of proof and uphold the challenged claim.

In sum, Petitioners’ *Rauhala* arguments are facially deficient, and do not meet Lenovo’s burden to show that *Rauhala* discloses challenged claim 8. There is simply no teaching or suggestion in *Rauhala* of the claimed varying of “an impedance” that is in the “receiver signal path.” Petitioners’ challenge, which cites to and relies only on *Rauhala* for these elements, must fail.

D. Petitioners failed to show that *Rauhala* discloses increasing an impedance to decrease a “drive current” according to claim 8

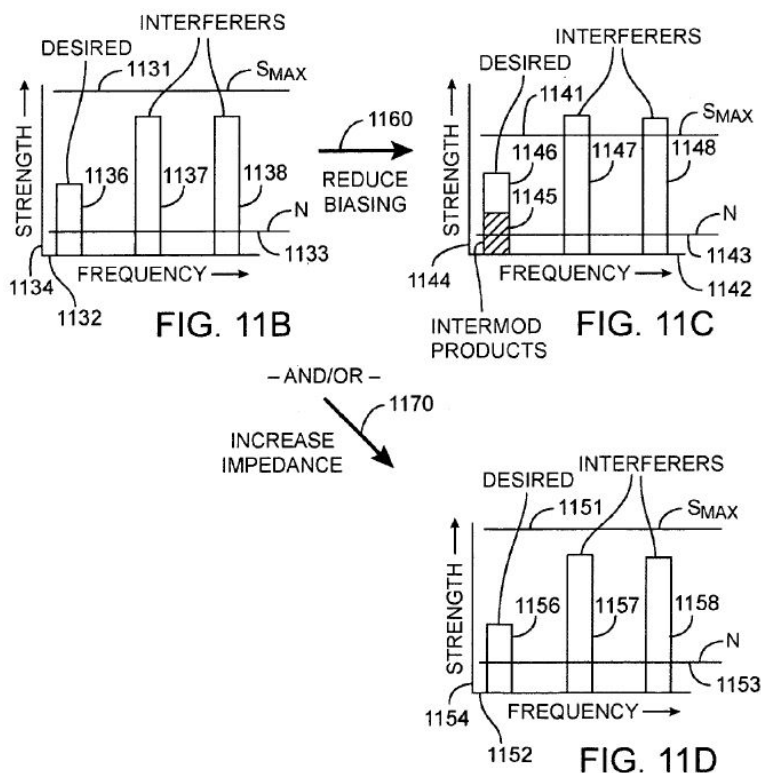
Lenovo also fails to raise any argument showing disclosure in *Rauhala* of a third element—namely decreasing a “drive current” by increasing an impedance in the receiver signal path. EX1001, 16:44-48 (“...thereby causing a drive current of the one or more of the plurality of circuits to be decreased.”). Here, Lenovo discusses supply current *kI*, then simply declares without any support that it “corresponds to the recited ‘drive current’”). Petition, 49. Dr. Baker also makes this bare, unsupported assertion. EX1002, ¶140 (“current *kI*, which corresponds to the drive current”). But it doesn’t correspond to a drive current. Notably, Lenovo also argues, for bias current elements, that supply current “corresponds to the recited ‘bias current.’” See, e.g., Petition, 36, 44-45. It can’t be both when the ’825 Patent teaches them as being different things.

As discussed above in Section II.C, during prosecution of the parent ’330 Patent, supply bias currents were distinguished from switching drive currents. EX2012, 163 (“A bias current is not the same as a switching current. ... (See for example, the pending application, Figure 6 and related discussion.)”). The ’825 Patent uses “drive current” to refer to currents that drive switching signal loads. See, e.g., EX1001, 5:50-62, Fig. 6. The ’825 Patent repeatedly distinguishes between drive and bias currents. See, e.g., *id.*, 6:20-23, 10:19-21 (“This reduces

the required drive current, and may also allow for a reduction in bias currents.”). Lenovo’s conflation of a supply bias current with the “drive current” of claim 8 conflicts with the usage of “drive current” in the ’825 Patent as it would be understood by a person of skill. *Rauhala*’s supply bias current kI is not, and does not disclose, a drive current according to claim 8. EX2015, ¶¶67-68.

In other words, and as discussed herein, changing a resistance to alter a DC bias current does not disclose or suggest the claim elements, for at least three reasons: 1) impedance is instead an AC circuit parameter, see Section III.B above; 2) the components and DC bias current here are not in the signal path, see Section III.C above; and 3) the identified bias current isn’t a “drive current.” EX2015, ¶68.

The ’825 Patent teaches that reducing a drive current via an impedance increase in the signal path is a different adjustment than reducing a bias current. EX1001, 6:10-13 (“Circuit impedances and currents are set such that the noise floor 264 is sufficiently low for an acceptable bit-error rate, while bias currents are set sufficiently high for the required S_{max} 262”), Figs. 11B, 11C, & 11D:



As the '825 Patent teaches, increasing an impedance in the signal path of the circuit causes the noise floor to rise, and causes “driving currents in the function block” to decrease. *Id.*, 9:56-60, 10:18-20, Fig. 11D. Reducing a bias current is a separate adjustment that causes the maximum signal handling capability to drop, and also reduces current and saves power across the circuit. *Id.*, 1:62-63; 10:48-55 (“power may be reduced in this way”), Fig. 11C.

A person of ordinary skill would not find the claimed reducing of a drive current, by an impedance adjustment in the signal path, to be disclosed by *Rauhala*’s discussion of a DC bias current adjustment in Figure 6 or Figure 7. As discussed above, a person of skill would further understand that the bias current is

not a switching “drive current” according to claim 8. EX1001, 16:44-48 (claim 8); IPR2023-00694, EX1003, 163 (“A bias current is not the same as a switching current”).

Again here, the Petition cites to and relies only on *Rauhala* for alleged disclosure of this claim element. *See, e.g.*, Petition at 48-49. And again, the Petition only argues explicit disclosure, not obviousness, for the element. *Id.* (“*Rauhala* discloses ...”). But *Rauhala* simply does not disclose it, for all the reasons given herein.

Lenovo cannot meet its burden of proof with only a conclusory assertion of a correspondence—one that conflicts with the ’825 Patent’s disclosures and related prosecution history. *Id.* (“corresponds to the recited ‘drive current’”). “Attorney argument is not evidence.” *Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017) (reversing Board for relying on argument); MPEP §2145 (“arguments of counsel cannot take the place of factually supported objective evidence”).

And attorney argument does not become evidence by being copied into an expert’s declaration. *See, e.g., Kinetic Techs., Inc. v. Skyworks Solutions, Inc.*, No. IPR2014-00529, 2014 WL 4787238, Paper 8 at 15 (P.T.A.B. Sept. 23, 2014) (“merely repeating an argument from the Petition in the declaration of a proposed expert does not give that argument enhanced probative value”); *Infobionic, Inc. v.*

Braemer Mfg., LLC, No. IPR2015-01704, 2016 WL 1081571, Paper 11 at 6 (P.T.A.B. Feb. 16, 2016). Dr. Baker’s repeating of the alleged correspondence, repeating the unsupported argument as opinion without offering further support, adds nothing. EX1002, ¶140 (“corresponds to the drive current”). Because Lenovo has failed to support its Petition attorney argument with any meaningful expert testimony, Lenovo has further failed to meet its burden here.

Lenovo has failed to show disclosure of multiple elements of challenged independent claim 8—which should be upheld for these reasons as well as those detailed in Sections III.A through C above.

IV. Conclusion

As detailed above, with the ’825 Patent, Professor Tsividis made foundational inventive and teaching contributions to the field. The techniques taught and claimed in his patents have been recognized for their importance and cited across the industry, and have remained interesting and worthy of publication to this day. EX2004.

Lenovo failed its burden to come forward with specific evidence here. 35 U.S.C. §316(e); *Harmonic*, 815 F.3d at 1363 (“the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable”). Lenovo failed to do show any disclosure—of elements that appear in every challenged claim—and thus cannot show anticipation of any claim.

The single detector of the *Rauhala* reference—which must be re-tuned to detect on a different channel—cannot anticipate claim elements requiring two circuits that determine different signal strengths in the same received spectrum. And Lenovo’s arguments about elements relating to an “impedance” fail under the proper and agreed definition of that term—failing to show disclosure of multiple aspects of the claim in *Rauhala*’s bias current controls.

For all of the reasons detailed above, the challenged claims should be upheld.

Dated: January 30, 2024

Respectfully submitted,

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37 C.F.R. §42.24(d) CERTIFICATION

The undersigned hereby certifies that this submission, excluding the tables of contents, certificate of word count, exhibit list, and certificate of service, contains 11,979 words, as determined using the standard word counting feature of the Microsoft Word program.

Dated: January 30, 2024

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CERTIFICATE OF SERVICE

Petitioners have consented to e-mail service in this proceeding. Pursuant to 37 C.F.R. §42.6, the undersigned certifies that on January 30, 2024, a copy of the foregoing document was served by email upon the following counsel at the below email addresses:

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