

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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TEXAS INSTRUMENTS INCORPORATED,  
Petitioner,

v.

PARKERVISION, INC.,  
Patent Owner.

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IPR2024-00934  
Patent 7,496,342 B2

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Before MICHAEL R. ZECHER, BART A. GERSTENBLITH, and  
IFTIKHAR AHMED, *Administrative Patent Judges*.

ZECHER, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining All Challenged Claims Unpatentable

35 U.S.C. § 318(a)

Dismissing in part and Denying in part Patent Owner's Motion to Exclude

Dismissing Petitioner's Motion to Exclude

37 C.F.R. § 42.64(c)

## I. INTRODUCTION

Petitioner, Texas Instruments Incorporated (“TI”), filed a Petition requesting an *inter partes* review (“IPR”) of claims 18–23 of U.S. Patent No. 7,496,342 B2 (Ex. 1001, “the ’342 patent”). Paper 2 (“Pet.”). Patent Owner, ParkerVision, Inc. (“ParkerVision”) filed a Preliminary Response (Paper 6 (“Prelim. Resp.”)), along with a statutory disclaimer pursuant to 35 U.S.C. § 253(a) and 37 C.F.R. § 1.321(a) that disclaims claims 18, 22, and 23 of the ’342 patent (Ex. 2006). Consequently, only claims 19–21 of the ’342 patent remain for our consideration. *See* 37 C.F.R. § 42.107(e) (“No [IPR] will be instituted based on disclaimed claims.”); Prelim. Resp. 1. Taking into account the arguments presented in ParkerVision’s Preliminary Response, we determined that the information presented in the Petition established that there was a reasonable likelihood that TI would prevail with respect to challenging at least one of claims 19–21 of the ’342 patent. Pursuant to 35 U.S.C. § 314, we instituted this IPR on November 26, 2024, only as to claims 19–21 of the ’342 patent and based on all grounds raised in the Petition challenging these claims. Paper 10 (“Dec. on Inst.”).

During trial, ParkerVision filed a Patent Owner Response (Paper 24, “PO Resp.”), TI filed a Reply to the Patent Owner Response (Paper 30, “Pet. Reply”), and ParkerVision filed a Sur-reply to the Reply (Paper 38, “PO Sur-reply”). ParkerVision filed a Motion to Exclude that seeks to exclude Exhibits 1042, 1043, 1046, 1060, and 2039 (Ex. 1)<sup>1</sup> (Paper 39, “PO Mot. to Exclude”), TI filed an Opposition to the Motion to Exclude (Paper 42, “Pet.

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<sup>1</sup> “Ex. 1” refers to Exhibit 1 used in the deposition of TI’s declarant, Ian Galton, Ph.D., which was transcribed and filed as Exhibit 2039.

Opp. to PO Mot. to Exclude”), and ParkerVision filed a Reply to the Opposition to the Motion to Exclude (Paper 43, “PO Reply to Pet. Opp. to PO Mot. to Exclude”). TI also filed a Motion to Exclude that seeks to exclude certain paragraphs and an appendix in Exhibit 2021 (Paper 40, “Pet. Mot. to Exclude”), ParkerVision filed an Opposition to TI’s Motion to Exclude (Paper 41), and TI filed a Reply to the Opposition to the Motion to Exclude (Paper 44). In addition, an oral argument was held on September 9, 2025, and a transcript of the hearing is included in the record. Paper 53 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a) only as to the patentability of claims 19–21 of the ’342 patent. For the reasons we identify below, we hold that TI has demonstrated by a preponderance of the evidence that these claims are unpatentable. We *dismiss in part* and *deny in part* ParkerVision’s Motion to Exclude, and we *dismiss* TI’s Motion to Exclude as moot.

*A. Real Party in Interest (“RPI”)*

TI identifies itself as an RPI. Pet. 80. ParkerVision identifies itself as an RPI. Paper 7 (ParkerVision’s Updated Mandatory Notices), 1.

*B. Related Matters*

The parties indicate that the ’342 patent is the subject of the following two district court cases: (1) *ParkerVision, Inc. v. Texas Instruments Inc.*, No. 6:23-cv-00384 (W.D. Tex. filed May 18, 2023); and (2) *ParkerVision, Inc. v. Qualcomm Inc.*, No. 3:11-cv-00719 (M.D. Fla. filed July 20, 2011). Pet. 81; Paper 7, 1. TI identifies a decision from the U.S. Court of Appeals for the Federal Circuit that, among other things, reversed the U.S. District Court for the Middle District of Florida’s denial of Qualcomm’s motion for

judgment as a matter of law (“JMOL”) relating to the invalidity<sup>2</sup> of claim 18 of the ’342 patent. Pet. 11–13 (citing Ex. 1031<sup>3</sup>). In case before the Middle District of Florida, Qualcomm asserted that claim 18 was anticipated by DeMaw, which is one of the asserted prior art references in this proceeding. *Id.* We also note a previous Board decision denying a petition filed by Dr. Michael Farmwald and RPX Corporation challenging claims 18–21 and 23 of the ’342 patent. *Farmwald v. ParkerVision, Inc.*, IPR2014-01107, Paper 7 (PTAB Jan. 8, 2015) (Decision Denying Institution) (Ex. 1030<sup>4</sup>).

### *C. The ’342 Patent*

The ’342 patent, titled “Down-Converting Electromagnetic Signals, Including Controlled Discharge of Capacitors,” issued from U.S. Patent Application No. 10/972/133, filed on October 25, 2004. Ex. 1001, codes (54), (21), (22). The ’342 patent has an extensive priority chain of applications that ultimately results in a claim of priority to U.S. Patent

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<sup>2</sup> According to the Federal Circuit, “[a]t the conclusion of the validity and infringement phase [of the trial], the jury returned a verdict rejecting Qualcomm’s validity claims and finding that Qualcomm directly or indirectly infringed . . . claim 18 of the ’342 patent.” Ex. 1031, 5. “Following trial, Qualcomm filed motions for judgment as a matter of law (‘JMOL’) and for a new trial on both invalidity and infringement. The [Middle District of Florida] granted Qualcomm’s motion for JMOL of non-infringement but denied Qualcomm’s motions relating to invalidity.” *Id.* at 6.

<sup>3</sup> All references to the Federal Circuit’s decision reversing the Middle District of Florida’s denial of Qualcomm’s motion for JMOL relating to invalidity of claim 18 of the ’342 patent refer to the page numbers inserted by TI in the bottom, middle portion of each page in Exhibit 1031.

<sup>4</sup> ParkerVision filed a second copy of the Decision Denying Institution for IPR2014-01107 as Exhibit 2049.

Application No. 09/550,644, which was filed on April 14, 2000. *Id.* at code (60).

The '342 patent generally relates to the down-conversion and up-conversion of an electromagnetic ("EM") signal using a universal frequency translation ("UFT") module. Ex. 1001, 1:43–45, 6:25–29. A UFT module, such as UFT 102 illustrated in Figure 1A of the '342 patent, operates to generate an output signal from an input signal, whereby the frequency of the output signal differs from the frequency of the input signal. *Id.* at 6:37–41. Stated differently, the UFT module operates to generate the output signal from the input signal by translating the frequency of the input signal to the frequency of the output signal. *Id.* at 6:41–46.

Figure 16H of the '342 patent, reproduced below, illustrates a receiver with two switching devices according to one embodiment. Ex. 1001, 3:51–52, 20:33–34.

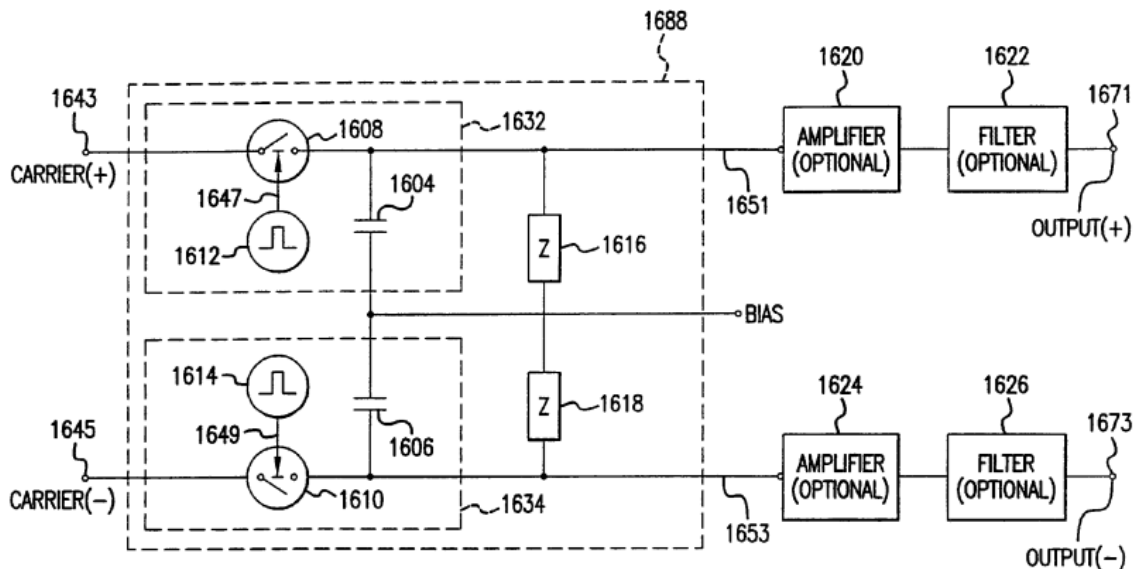


FIG. 16H

Figure 16H illustrates universal frequency down-conversion (“UFD”) module 1688 that includes two aliasing modules 1632 and 1634 and two impedance devices 1616 and 1618. Ex. 1001, 18:13–15. Aliasing module 1632 further includes capacitor 1604 and switching device 1608 controlled by aperture generator 1612. *Id.* at 18:34–36. Aliasing module 1634 further includes capacitor 1606 and switching device 1610 controlled by aperture generator 1614. *Id.* at 18:51–53. According to the ’342 patent, UFD module 1688 illustrated in Figure 16H operates similarly to UFD module 1638 illustrated in Figure 16A (not shown above), “except that the carrier signal is removed from the down converted signal by capacitors 1604 and 1606 during down conversion.” *Id.* at 20:36–39.

In some embodiments, the ’342 patent discloses that “one or more capacitors are sized to discharge between about six percent to about fifty percent of the total charge stored therein during a period of time that a switching device is open (i.e., between apertures).” Ex. 1001, 38:11–15. The ’342 patent, however, states that “this range is provided for illustrative purposes. Other embodiments of the invention exhibit other discharge percentages.” *Id.* at 38:15–18.

#### *D. Challenged Claims*

Claims 19–21 directly depend from independent claim 18. Ex. 1001, 52:58–54:2. Dependent claim 19 is illustrative of the challenged claims and is reproduced below. For convenience, independent claim 18 also is reproduced below because, by virtue of dependency, claim 19 includes all the limitations of independent claim 18.

18. A method for down-converting an electromagnetic signal, comprising the steps of:

- (1) receiving an information signal;
  - (2) inverting the information signal to generate an inverted information signal;
  - (3) electrically coupling the information signal to a first capacitor and the inverted information signal to a second capacitor;
  - (4) controlling a charging and discharging cycle of the first and second capacitors with first and second switching devices electrically coupled to the first and second capacitors, respectively; and
  - (5) performing a plurality of charging and discharging cycles of the first and second capacitors to generate first and second down-converted information signals across first and second impedance devices, respectively;
- wherein the information signal is used to store a charge on the first capacitor when the first switching device is closed and the inverted information signal is used to store a charge on the second capacitor when the second switching device is closed.

*Id.* at 52:37–57.

19. The method of claim 18, wherein the first capacitor discharges between six percent to fifty percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between six percent to fifty percent of the total charge stored therein during a period of time that the second switching device is open.

*Id.* at 52:58–64.

*E. Asserted Prior Art References*

TI relies on the prior art references set forth in the tables below.

| <b>Name</b>           | <b>Reference</b> | <b>Dates</b>                                     | <b>Exhibit No.</b> |
|-----------------------|------------------|--------------------------------------------------|--------------------|
| Tayloe                | US 6,230,000 B1  | issued May 8, 2001;<br>filed Oct. 15, 1998       | 1004               |
| Macnally <sup>5</sup> | WO 00/16492      | published Mar. 23, 2000;<br>filed Sept. 10, 1999 | 1023               |

| <b>Printed Publication</b>                                                                    | <b>Exhibit No.</b> |
|-----------------------------------------------------------------------------------------------|--------------------|
| Doug DeMaw, “ <i>Practical RF Design Manual</i> ” (Prentice-Hall 1982) <sup>6</sup> (“DeMaw”) | 1016               |

*F. Asserted Grounds of Unpatentability*

As we note above, due to the statutory disclaimer filed by ParkerVision, the only claims remaining for our consideration are claims 19–21 of the ’342 patent. Ex. 2006. For simplicity, the table set forth below only lists the asserted grounds of unpatentability raised by TI in the Petition that challenge these remaining claims. Pet. 1, 13–38, 50–77.

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<sup>5</sup> For clarity and ease of reference, we only list the first named inventor.

<sup>6</sup> To support its argument that DeMaw was indexed and made available publicly by the Penn State University library at least as of November 1982, TI introduces a Declaration of June Ann Munford, a librarian professional, who testifies that the version of DeMaw filed in this proceeding is “a true and correct copy” that was acquired by the Penn State University library on November 9, 1982, and it became publicly available shortly after its initial acquisition. Ex. 1014 ¶¶ 14–17.

| Claim(s) Challenged | 35 U.S.C. §         | Reference(s)/Basis |
|---------------------|---------------------|--------------------|
| 19–21               | 103(a) <sup>7</sup> | DeMaw              |
| 19–21               | 103(a)              | Macnally           |

## II. ANALYSIS

### *A. Claim Construction*

In this IPR, claim terms are construed using the same claim construction standard as in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b). That is, claim terms generally are construed in accordance with their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art, in view of the specification and the prosecution history pertaining to the patent at issue. *See id.* The ordinary and customary meaning of a claim term “is its meaning to the ordinary artisan after reading the entire patent,” and “as of the effective filing date of the patent application.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc).

In its Petition, TI identifies the following two claim terms at issue in the co-pending district court case between the parties and its proposed constructions for those claim terms: (1) “controlling a charging and discharging cycle” should be construed as “controlling a cycle of charging and then discharging”; and (2) “switching device” should be accorded its plain and ordinary meaning, but if a construction is necessary, this claim term should be construed as “an electronic device which opens and closes to

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<sup>7</sup> The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the application that issued as the ’342 patent was filed before this date, the pre-AIA version of § 103 applies. Ex. 1001, codes (21), (22).

break or complete an electrical path in a circuit.” Pet. 3–5. TI also identifies the following two additional claim terms that the Board previously construed in connection with another proceeding involving the ’342 patent:

(1) “electrically coupling” was construed as “indirectly or directly connecting such that an electrical signal can flow between”; and  
(2) “impedance device” was construed as “a device that exhibits an impedance.” *Id.* at 6. Even though TI identifies four claim terms in total in the Petition, TI argues that the asserted prior art renders the challenged claims unpatentable under any reasonable construction of those claim terms. *See, e.g., id.* at 4 (arguing that the “prior art analyzed here renders the claims unpatentable under either [party’s] constructions” proposed in the co-pending district court case between the parties), 6 (arguing that the “prior art renders the Challenged Claims unpatentable under . . . the [Board’s] constructions”).

In its Patent Owner Response, ParkerVision identifies the following three claims terms: (1) “switching device” should be construed the same as a “switch,” which was construed previously by the Board to mean “an electronic device for opening and closing a circuit”; (2) “electrically coupling” was construed previously by the Board to mean “indirectly or directly connecting such that an electric signal can flow between”; and (3) “controlling a charging and discharging cycle” should be accorded its plain and ordinary meaning, which, according to ParkerVision, does not require synchronization between the first and second capacitors required by dependent claims 19–21. PO Resp. 25–28. Based on the complete record, the parties appear to agree on the construction of the claim term “electrically coupling” because they propose the same construction for this claim term,

but they appear to disagree on the constructions of the claim terms “switching device” and “controlling a charging and discharging cycle.” We address the claim terms “switching device” and “controlling a charging and discharging cycle” below. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that “we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

*I. “switching device”*

ParkerVision’s proposed construction for the claim term “switching device” as “an electronic device for opening and closing a circuit” is based on a previous construction from another Board panel construing the claim term “switch” in another patent owned by ParkerVision.<sup>8</sup> PO Resp. 25 (citing *Intel Corp. v. ParkerVision, Inc.*, IPR2021-00346, Paper 33 at 25–26 (PTAB June 30, 2022) (Final Written Decision)). We see no reason why the Board’s previous construction of the claim term “switch” should not apply equally to the claim term “switching device.” The Board’s Final Written Decision in IPR2021-00346 provided a thorough explanation of both the intrinsic and extrinsic record before arriving at its final claim construction for the claim term “switch.” *See Intel*, IPR2021-00346, Paper 33 at 15–26. The Federal Circuit summarily affirmed the Board’s Final Written Decision in IPR2021-00346. *See ParkerVision, Inc. v. Vidal*, No. 2022-2173, 2024

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<sup>8</sup> The Special Master in the co-pending district court case also construed the claim terms “switching device/switch” as “an electronic device for opening and closing a circuit.” Ex. 2052, 24. The presiding Judge in the co-pending district court case between the parties adopted this construction. Ex. 2053.

WL 2207312 (Fed. Cir. May 16, 2024); *see also* Pet. 3 n.2 (acknowledging that “[t]he Federal Circuit recently affirmed the [Board’s] finding of invalidity of U.S. [Patent No.] 8190108 to ParkerVision”). Although we recognize that the Federal Circuit’s affirmance of the Board’s Final Written Decision in IPR2021-00346 is not necessarily an endorsement of the Board’s previous construction of the claim term “switch,” it at least serves as persuasive authority that the Board’s construction in that regard was correct.

Moreover, neither party in this proceeding directs us to disclosures in the specification of the ’342 patent to support their proposed constructions of the claim term “switching device.” *Compare* Pet. 2–6, with PO Resp. 25. Absent specific arguments and evidence directed to claim term “switching device” that are tethered to the specification of the ’342 patent, we are not inclined to deviate from the Board’s previous construction of the claim term “switch.” This is because, in our view, the claim terms “switch” and “switching device” generally should be construed consistently across the same family of patents, especially those that share many common terms like the ’342 patent at issue in this proceeding and U.S. Patent No. 8,190,108 B2 at issue in IPR2021-00346. *Cf. SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1316 (Fed. Cir. 2015) (explaining that, “[w]here multiple patents ‘derive from the same parent application and share many common terms, we must interpret the claims consistently across all asserted patents’” (quoting *NTP, Inc. v. Rsch. In Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005))).

In summary, for the reasons set forth above, we adopt ParkerVision’s proposed construction of the claim term “switching device” as “an electronic device for opening and closing a circuit.” We clarify that the specification of the ’342 patent provides examples of what constitutes a switching device,

such as transistors, field-effect transistors (“FETs”), junction field-effect transistors (“JFETs”), and metal-oxide-semiconductor field-effect transistors (“MOSFETs”). *See, e.g.*, Ex. 1001, 51:56–63 (dependent claims 7–10).

2. *“controlling a charging and discharging cycle”*

The parties’ proposed constructions of the claim term “controlling a charging and discharging cycle” differ in only one material respect. ParkerVision contends “[TI] . . . seeks to incorporate a specific timing of charging and discharging by improperly inserting the word ‘then’ into” its proposed construction for this claim term. PO Resp. 26 (citing Pet. 5). TI responds to this argument from ParkerVision by asserting that “[t]he Petition does not impose a timing requirement on the charging/discharging cycle, so [ParkerVision’s] argument on this issue is irrelevant.” Pet. Reply 4 (citing PO Resp. 26).

Based on the complete record, the parties’ arguments regarding the proper scope and meaning of the claim term “controlling a charging and discharging cycle” has two layers of complexity. First, we find that there are no temporal requirements associated with this claim term. Independent claim 18 recites, in relevant part, “controlling a charging and discharging cycle of the first and second capacitors with first and second switching devices electrically coupled to the first and second capacitors, respectively.” Ex. 1001, 52:45–48. This relevant language of independent claim 18 merely requires controlling a cycle of charging and discharging the first capacitor using the first switch, and controlling a cycle of charging and discharging the second capacitor using the second switch, without imposing a sequential order of events. This is consistent with the claim construction position ParkerVision took in the related district court case between the parties,

arguing that the claim term “controlling a charging and discharging cycle” “does *not* impose a sequential order of events where a charging portion of the cycle must *precede* a discharging portion.” Ex. 1010, 6.<sup>9</sup>

Second, the parties appear to agree that the relevant language of independent claim 18 also does not require control of a cycle to include both charging and discharging of the first and second capacitors. *Compare* Pet. 4–5, *with* PO Resp. 26–28. The specification of the ’342 patent supports this reading. As one example, when discussing the embodiment illustrated in Figures 16H and 62, the specification discloses the following:

when switching device 1608 is closed, the RF signal coupled to capacitor 1604 causes a charge to be stored on capacitor 1604 . . . . During a period of time that switching device 1608 is open (i.e., between the apertures of control signal 1646), a percentage of the total charge stored on capacitor 1604 is discharged . . . . In a similar manner, switching device [1610]<sup>10</sup> is used to control the charging and discharging of capacitor 1606 . . . during a period of time that switching device 1610 is open.

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<sup>9</sup> Exhibit 1010 is ParkerVision’s Responsive Claim Construction Brief filed in the related district court case between the parties. Exhibit 1010 includes two different page numbers located at the middle, bottom portion of each page. For citation purposes, we rely on the native pagination that begins with “i” and ends with the page number “30.”

<sup>10</sup> The specification of the ’342 patent appears to incorrectly label the second switching device as switching device “1614.” Ex. 1001, 50:21–25. When reviewing Figures 16A and 16H and their corresponding descriptions in other portions of the specification, the second switching device is labeled using “1610,” whereas aperture generator is labeled using “1614.” *See* Ex. 1001, 18:51–53, 49:58–62 (identifying 1614 as aperture generator).

Ex. 1001, 49:67–50:25, Figs. 16H, 62. This cited disclosure reinforces that the closing and opening of switching devices 1608 and 1610 control the charging and discharging of capacitors 1604 and 1606, respectively.

In summary, we decline to incorporate a temporal requirement into the construction of the claim term “controlling a charging and discharging cycle.” Instead, we construe this claim term in accordance with its plain and ordinary meaning, which, in our view, is controlling a cycle of charging and discharging. As one example, this claim term encompasses controlling a cycle of discharging the first capacitor by opening the first switch, and controlling a cycle of discharging the second capacitor by opening the second switch. *See, e.g.*, Ex. 1001, 52:58–54:2 (dependent claims 19–21).

*B. Obviousness over DeMaw*

TI contends that claims 19–21 of the ’342 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over DeMaw. Pet. 13–37. TI contends that the teachings of DeMaw account for the subject matter of each challenged claim. *Id.* TI submits the first, second, and third Declarations of Ian Galton, Ph.D. to support its positions. *See* Ex. 1003, 1042,<sup>11</sup> 1060.

ParkerVision contends that DeMaw does not teach the three discharge ranges required by dependent claims 19–21. *See* PO Resp. 79–89; PO Sur-reply 13–26. ParkerVision also argues the Dr. Galton’s simulations on a model of DeMaw’s circuit diagram illustrated in Figure 6.7 include material errors and, therefore, they have little, if any, evidentiary value. *See* PO

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<sup>11</sup> ParkerVision also filed a verbatim copy of Dr. Galton’s second Declaration with the transcript of his deposition taken on April 14, 2025. Ex. 2039 (Ex. 1). Unless otherwise noted, we refer to Dr. Galton’s second Declaration that is Exhibit 1042.

Resp. 38–65; PO Sur-reply 6–13. ParkerVision submits the Declaration of Dr. David Ricketts to support its positions. *See* Ex. 2021.

Based on the complete record, we determine that TI has shown by a preponderance of the evidence that claims 19–21 of the ’342 patent are unpatentable as obvious over the teachings of DeMaw. We begin our analysis with the principles of law that generally apply to an asserted ground based on obviousness, we then assess the level of skill in the art, next we provide an overview of DeMaw, and then we turn to the parties’ contentions with respect to dependent claims 19–21.

### *1. Principles of Law*

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, “would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of obviousness or non-obviousness (i.e., secondary considerations, such as commercial success, long-felt but unsolved need, failure of others, etc.).<sup>12</sup> *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). We analyze the asserted grounds based on obviousness with the principles we identify above in mind.

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<sup>12</sup> During trial, ParkerVision does not present arguments or evidence of secondary considerations. *See* PO Resp.

## 2. *Level of Skill in the Art*

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. “The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). The “person having ordinary skill in the art” is a hypothetical construct, from whose vantage point obviousness is assessed. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998).

Factors pertinent to a determination of the level of ordinary skill in the art include “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Env’t Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). “Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case.” *Id.* at 696–97.

Relying on the testimony of Dr. Galton, TI argues the following:

[a] person of ordinary skill in the art . . . as of the ’342 [p]atent’s priority date (April 14, 2000) would have had a least a bachelor’s degree in electrical engineering or a related subject and two or more years of experience in the field of EM circuit design. Less work experience may be compensated by a higher level of education, such as a master’s degree.

Pet. 6 (citing Ex. 1003 ¶¶ 28–30). ParkerVision offers two alternative assessments, the first one being essentially the same assessment of the level of skill in the art as TI, arguing the following:

a [person of ordinary skill in the art] would have (a) a [Bachelor of Science] degree in electrical or computer engineering (or a related academic field), and at least two (2) additional years of work experience in the design and development of radio frequency circuits and/or systems, or (b) at least five (5) years of working experience and training in the design and development of radio frequency circuits and/or systems.

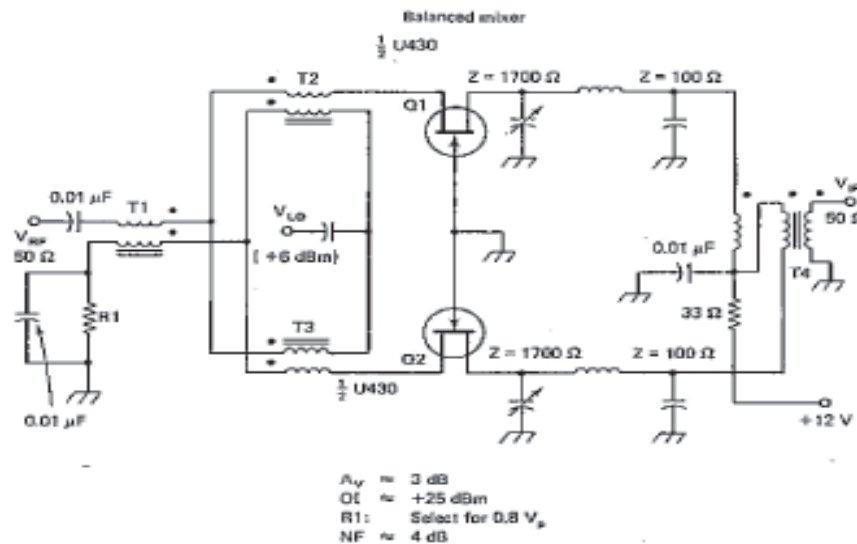
PO Resp. 2; Ex. 2021 ¶ 25.

We do not discern a material difference between the assessment of the level of skill in the art advanced by TI and the first of the two alternative assessments of the level of skill in the art advanced by ParkerVision. We adopt TI’s assessment of the level of skill in the art, except we delete the qualifier “at least” to eliminate vagueness as to the appropriate level of education. The qualifier expands the range of education without an upper bound (i.e., encompassing a Ph.D. degree and beyond), and does not indicate meaningfully the level of skill in the art. TI’s assessment—without the qualifier—is consistent with the ’342 patent and the asserted prior art, and it is supported by the testimony of Dr. Galton. We note, however, that our obviousness analysis would be the same under the first of ParkerVision’s two alternative assessments.

### 3. Overview of DeMaw

Chapter 6 of DeMaw is titled “Mixers, Balanced Modulators and Detectors.” Ex. 1016, 187.<sup>13</sup> DeMaw discloses that “[t]here is little difference between the functions of mixers, balanced modulators, and detectors in standard communication circuits” because “[a]ll three operate on the principle of combining two frequencies to produce a third [frequency].” *Id.* DeMaw discloses that “any one of the three circuits perform with high dynamic range, minimum distortion, and good suppression or isolation between the various ports of the circuit device.” *Id.*

One example of a circuit diagram is illustrated in Figure 6.7 of DeMaw, reproduced below.



Ex. 1016, 197. Figure 6.7 illustrates “[a]n example of [a] properly designed JFET singly balanced mixer.” *Id.* at 196. DeMaw discloses that “[d]ynamic

<sup>13</sup> All references to the page numbers in DeMaw refer to the native pagination in Exhibit 1016.

balance is assured through the use of a U430 dual-FET unit,” and “[s]ymmetrical feed is used at the mixer input by means of  $T1$ ,  $T2$ , and  $T3$ , providing a  $180^\circ$  phase differential between the sources of  $Q1$  and  $Q2$ .” *Id.* at 196–97.

#### 4. Claims 19–21

At the outset, we briefly address independent claim 18 because, by virtue of dependency, claims 19–21 include all the limitations of independent claim 18. *See* Pet. 18–34. In its Petition, TI presents an annotated version of Figure 6.7 of DeMaw.

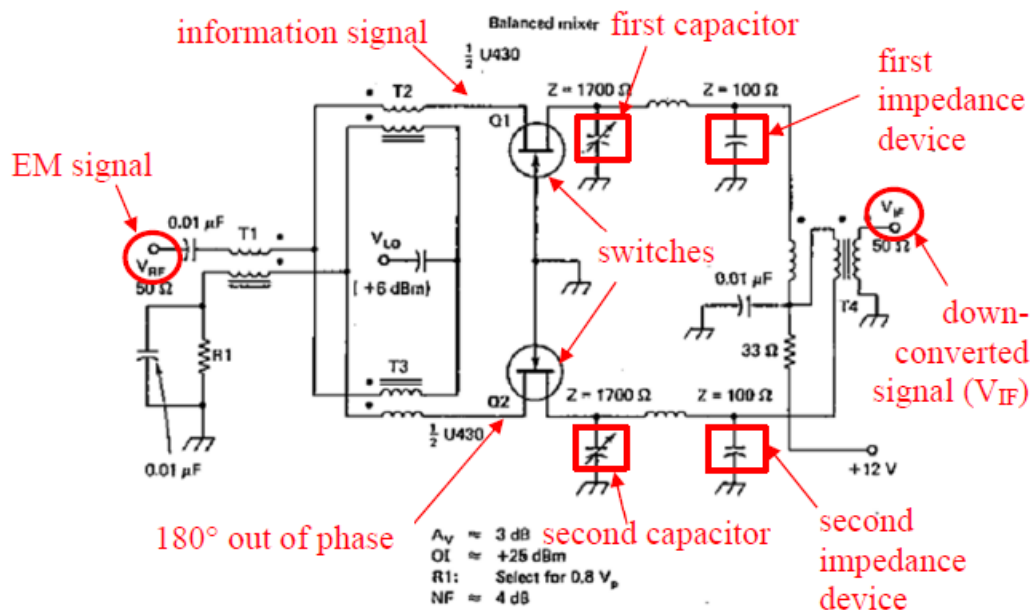


Figure 6.7 Dual FET balanced mixer using a Siliconix U430 device.

DeMaw, FIG. 6.7 (annotated)

*Id.* at 14. This version of Figure 6.7 illustrates a circuit diagram with annotations (in red) that explain how TI alleges that DeMaw teaches all the limitations of independent claim 18. *See, e.g., id.* at 18 (arguing that “[t]he

method steps [of independent claim 18] are described below using the FIG. 6.7 circuit provided in DeMaw”).

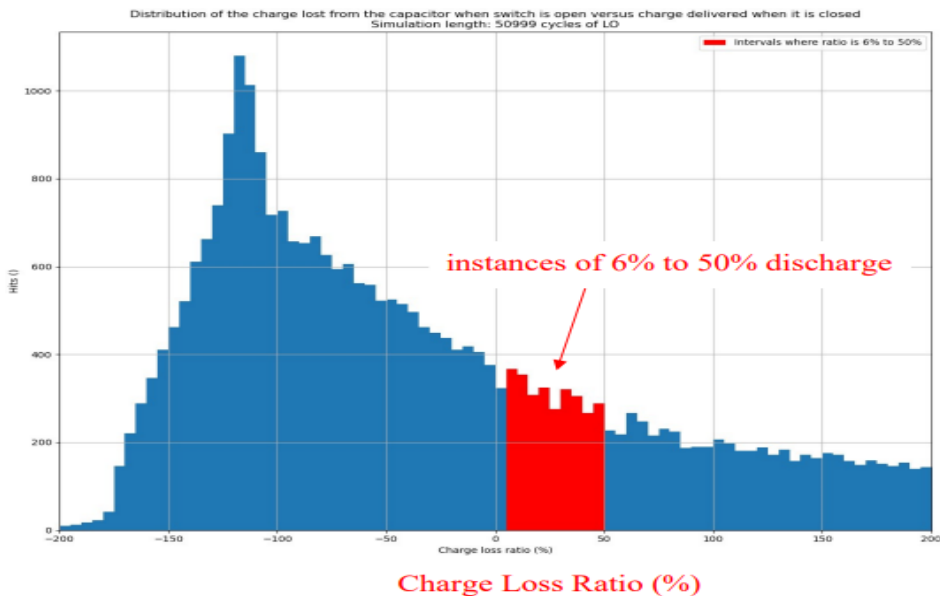
Consistent with the Federal Circuit’s decision that DeMaw’s circuit illustrated in Figure 6.7 explicitly or implicitly discloses all the limitations of independent claim 18, TI argues that DeMaw’s information signal teaches the claimed “information signal,” the creation of a different information signal with a 180° offset teaches the claimed “inverted information signal,” the first and second capacitors shown immediately next to the outputs of transistors Q1 and Q2 teach the claimed “first and second capacitors,” transistors Q1 and Q2 teach the claimed “first and second switches,” and the two additional capacitors shown to the right of the first and second capacitors teach the claimed “first and second impedance devices.”

*Compare* Ex. 1031, 26, *with* Pet. 18–30, 34. Based on the simulations performed by Dr. Galton on a model of DeMaw’s circuit diagram illustrated in Figure 6.7, TI argues that DeMaw teaches “performing a plurality of charging and discharging cycles of the first and second capacitors to generate first and second down-converted information signals across first and second impedance devices, respectively.” Pet. 30–34. According to TI, the simulations performed by Dr. Galton demonstrate that DeMaw’s first and second capacitors, shown immediately next to the outputs of transistors Q1 and Q2, engage in “charging and discharging” cycles to generate first and second down-converted information signals across the two additional capacitors, which, in turn, teach the first and second impedance devices, respectively. *See id.*

Claim 19 directly depends from independent claim 18 and further recites the following:

wherein the first capacitor discharges between six percent to fifty percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between six percent to fifty percent of the total charge stored therein during a period of time that the second switching device is open.

Ex. 1001, 52:58–64. TI contends that DeMaw teaches this limitation because, by “using the transition edges of the [local oscillator (‘LO’)] signal, and the knowledge that the switch opening and closing is dictated by the LO signal amplitude,” the 6%–50% discharging range required by dependent claim 19 “can be computed on a cycle-by-cycle basis using a python post-processing script applied to the raw simulation waveforms.” Pet. 35. According to TI, the discharging rate “was collected for 50,999 simulation cycles and plotted as a histogram,” as evidenced by DEMAW-SIM-FIG. 7, which is reproduced below. *Id.* (citing Ex. 1003 ¶ 114).



DEMAW-SIM-FIG. 7 (annotated)

*Id.* at 36. DEMAW-SIM-FIG 7 illustrates “[d]istribution of the charge lost from the capacitor when the switch is open versus charge delivered when it

is closed.” *Id.* Relying on DEMA-W-SIM-FIG. 7, TI asserts “that the DeMaw circuit generates a continuum of these ratios, densely spanning the 6% to 50% range” marked in red that is required by dependent claim 19. *Id.*

Claim 20 directly depends from independent claim 18 and further recites the following:

wherein the first capacitor discharges between ten percent to twenty-five percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between ten percent to twenty-five percent of the total charge stored therein during a period of time that the second switching device is open.

Ex. 1001, 52:65–53:4. TI contends that, based on simulation DEMA-W-SIM-FIG. 7, “the histogram shows a continuum of occurrences of discharging ratio that includes the . . . 10–25% discharging rate” marked in red that is required by dependent claim 20. Pet. 37 (citing Ex. 1003 ¶¶ 114–115).

Claim 21 directly depends from independent claim 18 and further recites the following:

wherein the first capacitor discharges between fifteen percent to thirty percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between fifteen percent to thirty percent of the total charge stored therein during a period of time that the second switching device is open.

Ex. 1001, 53:5–54:2. TI contends that, based on simulation DEMA-W-SIM-FIG. 7, “the histogram shows a continuum of occurrences of discharging ratio that includes the . . . 15–30% discharging rate” marked in red that is required by dependent claim 21. Pet. 37 (citing Ex. 1003 ¶¶ 114, 116).

After institution of trial, a dispute arose between the parties regarding new, updated simulations performed by Dr. Galton on a model of DeMaw's circuit diagram illustrated in Figure 6.7 (i.e., a second set of simulations). *See* Paper 18. After a conference call with the panel, the parties agreed to resolve their dispute without further intervention by the Board. Ex. 1052. More specifically, TI agreed to provide ParkerVision with Dr. Galton's second set of simulations, TI agreed to make Dr. Galton available for a second deposition, and TI agreed to a one-month extension for DUE DATE 1 in the Scheduling Order, which is the deadline for filing a Patent Owner Response, so that ParkerVision would have sufficient time to present and develop its arguments and evidence. *Id.*; *see also* Paper 20 (Joint Stipulation to Modify Trial DUE DATES 1–3, 5, and 6); PO Resp. 37–40 (acknowledging receipt of Dr. Galton's second set of simulations). We address Dr. Galton's second set of simulations in more detail below. *See infra* Section II.B.4.c.

During trial, ParkerVision contends that DeMaw does not teach the three discharge percentages required by dependent claims 19–21. *See* PO Resp. 79–89; PO Sur-reply 13–26. ParkerVision also argues that Dr. Galton's first and second sets of simulations of DeMaw's circuit include material errors and, therefore, they are entitled to little to no evidentiary value. *See* PO Resp. 38–65; PO Sur-reply 6–13.

We begin our analysis by discussing the scope of independent claim 18 and dependent claims 19–21 as it pertains to the prima facie case of obviousness, next we address whether ParkerVision presents sufficient rebuttal evidence demonstrating that the three discharging ranges required by dependent claims 19–21 can be deemed critical ranges sufficient to

overcome the prima facie case of obviousness, then we discuss Dr. Galton's second set of simulations, and, finally, we address ParkerVision's due process arguments, as well as its arguments addressing Dr. Galton's first and second sets of simulations.

*a. Scope of independent claim 18 and dependent claims 19-21*

As we explain above, the Federal Circuit found that DeMaw's circuit illustrated in Figure 6.7 explicitly or implicitly discloses all the limitations of independent claim 18. *See* Ex. 1031, 25–29. With two exceptions, dependent claims 19–21 share common features with independent claim 18—namely, the “first capacitor,” “first switching device,” “second capacitor,” and “second switching device.” *Compare* Ex. 1001, 52:37–57, *with id.* at 52:58–54:2. The two material differences between independent claim 18 and dependent claims 19–21 include the following: (1) the specific discharging ranges of “the total charge stored” on the first and second capacitors (2) during a period of time when the first and second switches are “open.” *Id.* at 52:58–54:2.

The Federal Circuit's finding that independent claim 18 is anticipated by DeMaw credited the testimony from Qualcomm's expert, Dr. Behzad Razavi, that “‘charging and discharging the first and second capacitors’ occurs when the first and second switches (Q1 and Q2) ‘are turned on and off at a certain rate.’” Ex. 1031, 27. The Federal Circuit's crediting of this testimony from Dr. Razavi implies that the court appreciated that DeMaw's first and second switches (Q1 and Q2) are capable of turning on and off at a certain rate by opening and closing. ParkerVision's declarant, Dr. Ricketts, corroborates our understanding of the Federal Circuit's crediting of this particular testimony from Dr. Razavi. Notably, when providing a

description of the general background in the art, Dr. Ricketts testifies that the “same exact FET [that] receives a high-amplitude, rapidly changing input signal (e.g., [a] square wave or a pulse train) . . . operates as a switch.” Ex. 2021 ¶ 128. He further testifies that, when the FET operates as a switch, “the FET alternates between an ‘on’ state (allowing current to flow) and ‘off’ state (blocking current flow), effectively opening and closing the circuit at defined intervals.” We credit Dr. Ricketts’s testimony in this regard because it appears to be consistent with the Federal Circuit’s reliance on Dr. Razavi’s testimony that explains the functionality of DeMaw’s first and second switches (Q1 and Q2). *See* Ex. 1031, 27.

With this in mind, the record before us includes sufficient evidence to support a finding that a person of ordinary skill in the art would have recognized that, when viewing the teachings of DeMaw through the perspective of a person of ordinary skill in the art as provided by Dr. Razavi’s testimony, and considering Dr. Ricketts’s testimony regarding the general background knowledge in the art, DeMaw’s first and second switches (Q1 and Q2) turn off and on at a certain rate by opening and closing. In our view, this would satisfy one of the limitations noted above that is recited in dependent claims 19–21, but not recited in independent claim 18—namely, DeMaw’s first and second switches (Q1 and Q) are open during a period of time. Consequently, the only remaining difference between independent claim 18 and dependent claims 19–21 is the specific discharging ranges of “the total charge stored” on the first and second capacitors during the period of time when the first and second switches (Q1 and Q) are open. This leads directly to our next inquiry—whether ParkerVision presents sufficient rebuttal evidence demonstrating that the

three discharging ranges required by dependent claims 19–21 can be deemed critical ranges sufficient to overcome the prima facie case of obviousness. As we explain in more detail below, ParkerVision does not present sufficient rebuttal evidence demonstrating that any of the three discharging ranges required by dependent claims 19–21 produce new and unexpected results and, therefore, they are not critical to the operability of the claimed invention.

*b. The record is devoid of evidence demonstrating that each of the discharging ranges required by dependent claims 19–21 can be deemed critical*

In the Institution Decision, we explained that “‘where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.’” Dec. on Inst. 22–23 (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (citing *E.I. DuPont De Nemours & Co. v. Synviana C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018)); *see also id.* at 34 (providing the same explanation with respect to Macnally). We further explained that, taking into account Dr. Galton’s simulations of DeMaw’s circuit in his Declaration accompanying the Petition, “TI has shown that the general conditions of dependent claims 19–21 are disclosed in DeMaw.” *Id.* at 23. We then explained that the burden of production shifts to ParkerVision to show that the three discharging ranges required by dependent claims 19–21 demonstrate new and unexpected results such that each of these claimed ranges can be deemed “a ‘critical’ range,” and we invited ParkerVision to present rebuttal evidence in a timely response to the Petition. *Id.* (quoting *E.I. DuPont*, 904 F.3d at 1006).

Despite our invitation to present rebuttal evidence with its Patent Owner Response, ParkerVision did not direct us to, nor can we find, evidence in the complete record indicating that any of the three discharging ranges required by dependent claims 19–21 demonstrate new and unexpected results, such that they could be deemed critical ranges. *See* Tr. 13:11–17 (arguing that ParkerVision does not contend or present evidence “that there’s criticality or any unexpected results on the ranges that are recited in [dependent claims] 19 to 21”). Instead of rebutting the presumption of obviousness triggered by *DuPont*, ParkerVision presented several arguments that Dr. Galton’s simulations of DeMaw’s circuit include material errors, each of which we address separately below. *See infra* Sections II.B.4.e and II.B.4.f.

We take this opportunity to note that, based on our review of the specification of the ’342 patent, the only discharged range explicitly disclosed in the specification outside the claims is the 6%–50% discharging range required by dependent claim 19. *See, e.g.*, Ex. 1001, 19:31–33 (“In an embodiment, capacitors 1604 and 1606 are selected so they discharge at a rate of between six percent to fifty percent between apertures of the control signals.”), 22:37–39 (“Capacitors 1804 and 1806 are selected so that they discharge at a rate of between six percent to fifty percent between apertures of the switching (control) signal.”), 24:54–57 (“Capacitor 2004 is selected so that it discharges at a rate of between six percent to fifty percent between apertures of switching (control) signal 2046.”), 38:11–15 (“In embodiments of the invention such as, for example, aliasing module 300, one or more capacitors are sized to discharge between about six percent to about fifty percent of the total charge stored therein during a period of time that a

switching device is open (i.e., between apertures).”), 50:15–21 (“[C]apacitor 1604 is sized in accordance with embodiments of the invention to discharge between about six percent to about fifty percent of the total charge stored therein during a period of time that switching device 1608 is open.”), 50:21–25 (“In a similar manner, switching device [1610] is used to control the charging and discharging of capacitor 1606 so that between about six percent to about fifty percent of the total charge stored therein is discharged during a period of time that switching device 1610 is open.”). The 10%–25% and 15%–30% discharging ranges required by dependent claims 20 and 21 are not disclosed in the specification outside of the claims. *See id.*

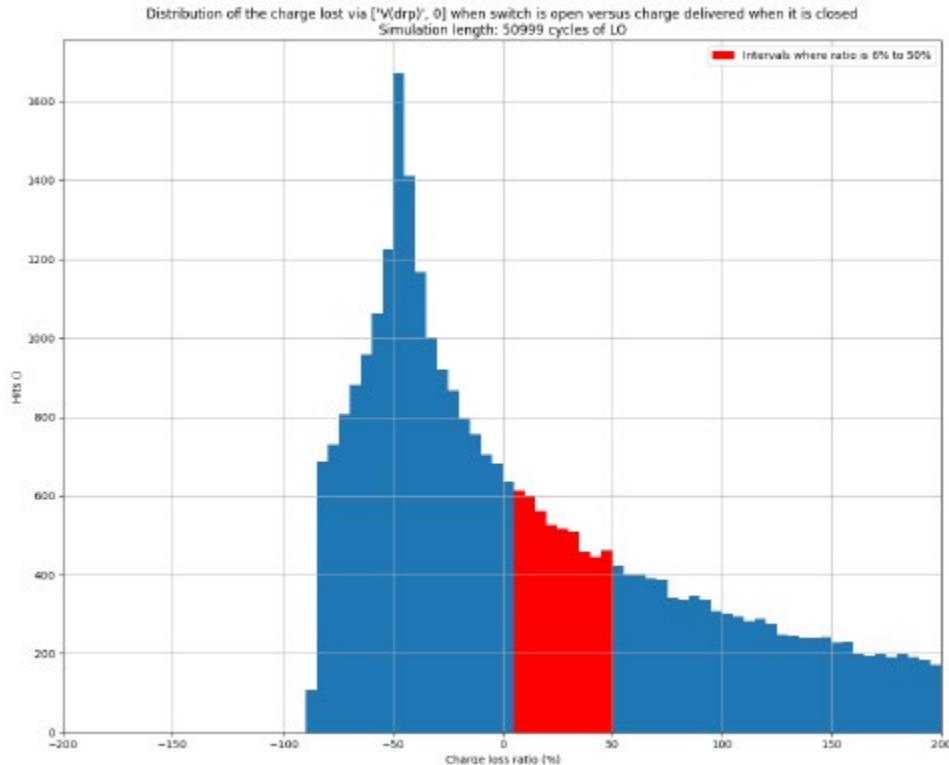
The specification, however, clearly states that the 6%–50% discharging range “*is provided for illustrative purposes.*” Ex. 1001, 38:15–16 (emphasis added). ParkerVision does not explain how a range that “is provided for illustrative purposes” produces new and unexpected results and, therefore, is critical to the operability of the claimed invention. Put simply, the intrinsic record is devoid of evidence indicating that the optimization of the three discharging ranges required by dependent claims 19–21 is anything other than the exercise of ordinary skill in the art.

*c. Dr. Galton’s second set of simulations*

As we explain above, in its claim mapping of dependent claims 19–21 set forth in the Petition, TI relies on a first set of simulations performed by Dr. Galton on a model of DeMaw’s circuit diagram illustrated in Figure 6.7 to demonstrate the discovery of optimal or working ranges under general conditions disclosed in DeMaw. Pet. 35–37 (citing Ex. 1003 ¶¶ 114–116). After institution, Dr. Galton performed a second set of simulations on a model of DeMaw’s circuit diagram illustrated in Figure 6.7 that goes

“beyond those described in [his] original Declaration ([Ex.] 1003) in support of the . . . [P]etition.” Ex. 1042 ¶ 1. According to Dr. Galton, the first set of simulations described in his first Declaration were performed using “default, generic LTspice JFET models” instead of the “Siliconix U430 JFET models” identified in DeMaw. *Id.* ¶ 3; *see also* Ex. 1016, 197 (labeling DeMaw’s Figure 6.7 as “Dual FET balanced mixer using a Siliconix U430 device”). Dr. Galton ran the second set of simulations using “the same version of the DeMaw circuit, the same input, and the same local oscillator (LO) signals” as those used in the first set of simulations, “except with the Siliconix U420 JFET models.” *Id.*

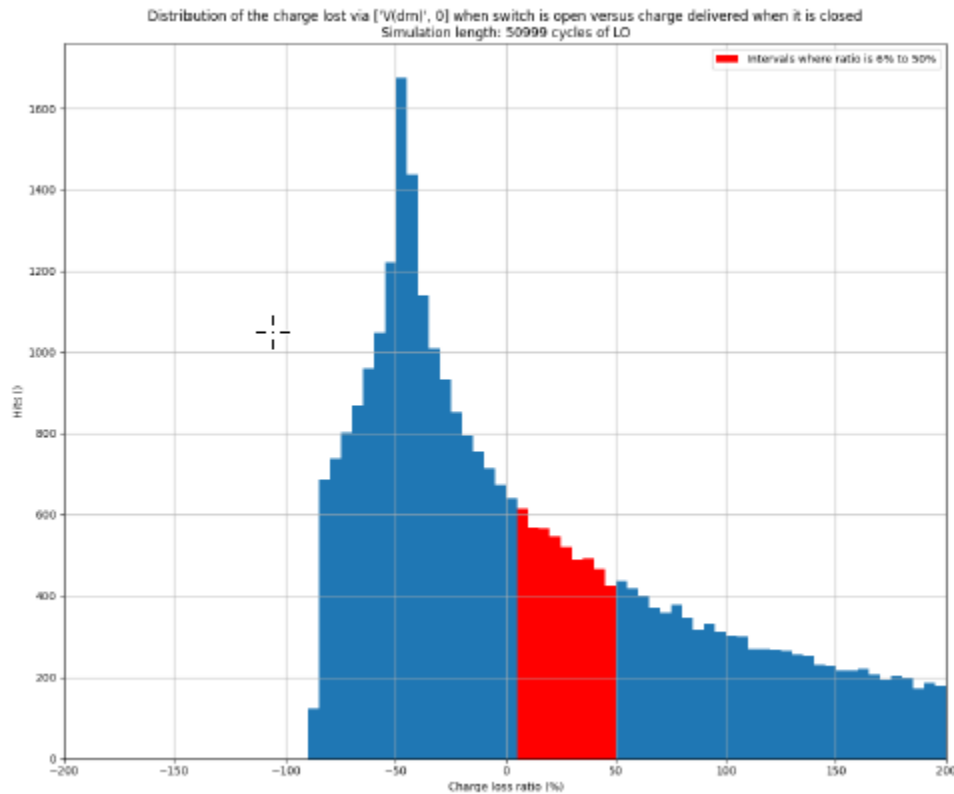
Dr. Galton testifies that, in contrast to the first set of simulations where he “provided one histogram of the charge loss ratio percentage that was representative of capacitors C4 and C5 (DEMAW-SIM-FIG. 7),” the second set of simulations resulted in him generating two new histograms—“one for each capacitor DEMAW-SIM-FIG. 7A and 7B.” Ex. 1042 ¶ 10. DEMAW-SIM-FIG. 7A, reproduced below, is a histogram that represents the charge loss ratio percentages for the first capacitor C4 of DeMaw’s circuit (i.e., DEMAW-SIM-FIG. 1) collected for 50,999 simulation cycles.



*Id.* DEMA-W-SIM-FIG. 7A illustrates “[d]istribution of the charge lost. . . when [the first] switch is open versus charge delivered when it is closed.”

*Id.* The charge loss ratio spanning the 6% to 50% range marked in red teaches the discharging range for the first capacitor required by dependent claim 19. *See id.*

DEMA-W-SIM-FIG. 7B, reproduced below, is a histogram that represents the charge loss ratio percentages for the second capacitor C5 of DeMaw’s circuit (i.e., DEMA-W-SIM-FIG. 1) collected for 50,999 simulation cycles. Ex. 1042 ¶ 11.



*Id.* Similar to DEMA W-SIM-FIG. 7A, DEMA W-SIM-FIG. 7B illustrates “[d]istribution of the charge lost. . . when [the second] switch is open versus charge delivered when it is closed.” *Id.* The charge loss ratio spanning the 6% to 50% range marked in red teaches the discharging range for the second capacitor required by dependent claim 19. *See id.*

We understand TI to take the position that DEMA W-SIM-FIG. 7A and DEMW-SIM-FIG. 7B further demonstrate how the charge loss ratios spanning the 6% to 50% range marked in red encompasses the 10% to 25% discharging range for the first and second capacitors required by dependent claim 20, as well as the 15% to 30% range for the first and second capacitors required by dependent claim 21. *See, e.g.,* Pet. Reply 14 (arguing that, [w]hen [DeMaw’s switching devices are] open, the capacitors discharge the claimed percentages” (citing Ex. 1042 ¶ 11)).

*d. ParkerVision's due process arguments*

In its Patent Owner Response, ParkerVision contends that we should disregard Dr. Galton's second set of simulations because Dr. Galton could have included these simulations in his first Declaration accompanying the Petition. *See* PO Resp. 37–40 (citing Ex. 1003; Ex. 2039 (Exs. 1 and 2)); Ex. 2040; Ex. 2041). In its Sur-reply, ParkerVision argues that it first learned of Dr. Galton's second set of simulations during Dr. Galton's deposition related to his first Declaration. Ex. 2036. ParkerVision asserts that “[it] had no real choice but to take” Dr. Galton's second set of simulations “before filing its [Patent Owner Response].” PO Sur-reply 3. ParkerVision argues that Dr. Galton's second set of simulations are belated and that “[a] petitioner is not entitled to revise its case after-the-fact” to address a mistake or flaw in the Petition. *Id.* at 4. ParkerVision, therefore, asserts that “[TI] should not be entitled to rely on any simulations . . . that were not included with the Petition.” *Id.* In the same vein, ParkerVision argues that TI's theories of unpatentability are a moving target and that TI should not be permitted to “fundamentally alter/replace its original theories with new ones.” *Id.* at 4–5.

In its Reply, TI contends that Dr. Galton “stands by his [first set of] simulations, which prove that DeMaw renders claims 18–21 unpatentable.” Pet. Reply 6. TI, however, acknowledges that Dr. Galton's first set of simulations “inadvertently” used a generic JFET model instead of the U430

JFET identified by DeMaw,<sup>14</sup> but “[TI] offered and [ParkerVision] accepted a second declaration [from Dr. Galton] with revised simulations using the U430 [JFETs].” Pet. Reply 5–6 (citing Ex. 1042; PO Resp. 38; Ex. 2036, 43:2–5). After providing ParkerVision with Dr. Galton’s second set of simulations, “[TI] agreed to extend the [Patent Owner Response] deadline to accommodate an additional deposition of Dr. Galton to allow [ParkerVision] time to respond.” *Id.* at 6. TI asserts that, prior to filing its Patent Owner Response, “[ParkerVision] had ample opportunity to respond to Dr. Galton’s updated simulations employing the U430 JFET[s].” *Id.*

As an initial matter, we note that this proceeding presents a unique circumstance. TI provided two sets of simulations performed by Dr. Galton on a model of DeMaw’s circuit diagram illustrated in Figure 6.7 to demonstrate the discovery of optimal or working ranges under general conditions disclosed in DeMaw—one accompanying the Petition and one provided by agreement between the parties reached after institution of trial. *See* Pet. 35–37 (citing Ex. 1003 ¶¶ 114–116); Ex. 1042. ParkerVision, however, had the opportunity to address both sets of simulations in its substantive briefing during trial, as well as through two depositions of Dr. Galton. *See* PO Resp.; PO Sur-reply; Ex. 2036 (transcript of Dr. Galton’s deposition taken on February 28, 2025); Ex. 2039 (transcript of Dr. Galton’s deposition taken on April 14, 2025).

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<sup>14</sup> TI asserts that Dr. Galton’s inadvertent use of a generic JFET model was actually “a typo” caused by LTspice (i.e., a signal data simulation software) because it did not recognize the requested JFET, but rather defaulted to a generic JFET. Pet. Reply 6 n.2 (quoting Ex. 2036, 44:6–8); *see also* Pet. 16–17 (explaining LTspice).

We do not agree with ParkerVision's arguments that we should disregard the second set of simulations performed by Dr. Galton on DeMaw's circuit that were provided to ParkerVision based on an agreement between the parties reached after institution of trial. *See* PO Resp. 37–40; PO Sur-reply 2–4. As we note above, without intervention by the Board, TI agreed with ParkerVision's proposal to provide ParkerVision with Dr. Galton's second set of simulations, TI agreed to make Dr. Galton available for a second deposition, and TI agreed to stipulate to a one-month extension of time for ParkerVision to file its Patent Owner Response. ParkerVision then filed its Patent Owner Response, in which it presented and developed arguments and evidence directed to Dr. Galton's second set of simulations. *See* PO Resp. 48–65. In response, TI filed a Reply that included arguments clarifying how both the first and second sets of simulations performed by Dr. Galton on DeMaw's circuit demonstrate the discovery of optimal or working ranges under general conditions disclosed in DeMaw. *See* Pet. Reply 5–19.

We recognize that TI acknowledges in its Reply that Dr. Galton's first and second sets of simulations on DeMaw's circuit involved selecting different JFET types, but at no point did TI deviate from its initial position that simulations of this kind sufficiently demonstrate the discovery of optimal or working ranges under general conditions disclosed in DeMaw. Instead, TI merely used the Reply as a vehicle to respond to the arguments raised by ParkerVision in the Patent Owner Response, which, according to the rules governing an IPR, is permissible. *See* 37 C.F.R. § 42.23(b) (“A reply may only respond to arguments raised in the corresponding opposition, patent owner preliminary response, patent owner response, or decision on

institution.”). Moreover, there is no apparent due process violation under this unique circumstance because ParkerVision also was afforded the opportunity to file a Sur-reply responding to TI’s arguments presented and developed in the Reply. *See* PO Sur-reply 7–21.<sup>15</sup>

*e. ParkerVision’s arguments addressing Dr. Galton’s first set of simulations*

In its Patent Owner Response, ParkerVision contends that Dr. Galton’s first set of simulations deviated significantly from DeMaw and those deviations render Dr. Galton’s first set of simulations “inaccurate and unreliable.” PO Resp. 40-41 (citing Ex. 2021 ¶¶ 228, 229). Primarily relying on the testimony of its declarant, Dr. Ricketts, ParkerVision argues that Dr. Galton’s first set of simulations are inaccurate and unreliable for the following reasons: (1) Dr. Galton uses default, generic JFETs provided by LTspice instead of the Siliconix U430 JFET models identified in DeMaw; (2) Dr. Galton models the LO signal<sup>16</sup> as a square wave, whereas DeMaw provides no basis for using a square wave, but instead DeMaw appears to suggest using a sinusoidal signal; (3) Dr. Galton changes the bias configuration, which has a material impact on the JFETs; and (4) Dr. Galton uses operating frequencies that exceed the range of operating frequencies specified by DeMaw, thereby distorting the intended operation of DeMaw’s circuit. *Id.* at 41–48 (citing Ex. 1003 ¶¶ 69, 74, 103, DEMAW-SIM-FIG. 1

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<sup>15</sup> ParkerVision argues that “[t]he Board . . . could not guarantee that a Sur-reply declaration would be permitted” with the filing of its Sur-reply. PO Sur-reply 3. ParkerVision, however, could have requested leave to submit new evidence with its Sur-reply, but never made such a request.

<sup>16</sup> LO signal refers to a local oscillator signal. *See* Pet. 28.

(DeMaw balanced Mixer); Ex. 2021 ¶¶ 230–255, 257–267; Ex. 2034, 44:6–20, 24:21–25:2).

In its Reply, TI contends that Dr. Galton’s selection of JFETs in his first set of simulations is immaterial because claims 18–21 do not require a specific type of JFET, and there is no dispute that the use of LTspice’s generic JFET performs “down-converting” to achieve the claimed discharge ranges. Pet. Reply 5–6. TI also takes the position that Dr. Galton’s first set of simulations reflect that a person of ordinary skill in the art “implementing DeMaw would have performed routine optimization to select the JFET type for the circuit’s desired performance,” and “Dr. Galton’s inadvertent use of the generic JFET model is consistent with this routine optimization.” *Id.* at 7 (citing Ex. 1060 ¶¶ 11–16). TI further argues that, because DeMaw does not specify the LO signal used by its circuit, Dr. Galton’s use of a squared-up LO signal is consistent with those used in “most modern practical mixer circuits.” *Id.* at 9 (citing Ex. 1003 ¶¶ 37, 38, 69, 74, 139, 140; Ex. 2036, 41:1–12; Ex. 1060 ¶¶ 34–36). Lastly, TI argues that operating values and biasing used by Dr. Galton in his first set of simulations are consistent with DeMaw. *Id.* at 9–10 (citing Ex. 1016, 196–197; Ex. 1060 ¶¶ 39–42, 66).

In its Sur-reply, ParkerVision contends that TI should be limited to Dr. Galton’s first set of simulations that accompanied the Petition and reiterates that those simulations remain inaccurate and unreliable. PO Sur-reply 2–4. According to ParkerVision, Dr. Galton’s first set of simulations remain inaccurate and unreliable for the following reasons: (1) Dr. Galton’s calculation of the charge added to a capacitor during a single charging cycle fails to account for the “total charge stored” over multiple charging cycles; (2) Dr. Galton’s histograms serve as the sole basis for asserting that DeMaw

satisfies the claimed discharging ranges, but those histograms just show results/conclusions of an undisclosed process; (3) DeMaw's JFETs are configured not to turn off; and (4) Dr. Galton's reliance on a JFET other than the one disclosed in DeMaw would significantly alter the behavior of DeMaw's circuit. *Id.* at 4–11 (citing Ex. 1060 ¶¶ 56–58; Ex. 1001, 42:52–54, Fig. 16J; Ex. 2047, 14:2–16; PO Resp. 89–90), 13–15 (citing Ex. 1016, Fig. 6.7; Ex. 2021 ¶¶ 136, 199, 201, 202; PO Resp. 30), 24 (citing Ex. 2021 ¶¶ 135–139).

Based on the complete record, we agree with TI that Dr. Galton's first set of simulations on DeMaw's circuit evidence that DeMaw discloses the general conditions of dependent claims 19–21 (i.e., the three discharging ranges), which, as we explain, ParkerVision has not demonstrated produce new and unexpected results and, therefore, they are not critical to the operability of the claimed invention. *See* Pet. 35–37 (citing Ex. 1003 ¶¶ 114–116). There is nothing inherently unreliable or suspect about TI using Dr. Galton's first set of simulations accompanying the Petition as evidence to demonstrate that DeMaw discloses the general conditions of dependent claims 19–21. *See Novartis Corp. v. Ben Venue Labs.*, 271 F.3d 1043, 1054 (Fed. Circ. 2001) (“There is nothing inherently unreliable or suspect about computer simulations as evidence.”); *WiTricity Corp. v. Inductev Inc.*, No. 2023-1916, 2025 WL 1147578, at \*3 (Fed. Cir. Apr. 16, 2025) (explaining “that ordinarily skill artisans commonly use simulations to predict real circuit behavior”). We are mindful that Dr. Galton's first set of simulations need not be perfect replicas of DeMaw's circuit diagram illustrated in Figure 6.7, but the simulations must be based on reliable scientific methodology and TI must have offered Dr. Galton for cross-

examination to provide ParkerVision an opportunity to develop further arguments and evidence. *Cf. Liquid Dynamics Corp. v. Vaughan Co., Inc.*, 449 F.3d 1209, 1220–21 (Fed. Cir. 2006) (explaining that, in the context of a district court case, a party’s reliance on computer simulations to teach limitations at issue was permissible as long as “they were based on reliable scientific methodology and subject to cross examination and the proffering of further scientific analysis by [the opposing party]”). This is exactly what occurred here.

In Dr. Galton’s first Declaration accompanying the Petition, he testifies that he performed his first set of simulations on a model of DeMaw’s circuit diagram illustrated in Figure 6.7 using certain parameters identified in DeMaw. Ex. 1003 ¶¶ 72–74. Dr. Galton, however, testifies that he engaged in routine experimentation to make minor adjustments to other parameters not identified in DeMaw. *See id.* According to Dr. Galton, this routine optimization occurred over 50,999 simulation cycles and it was plotted in histograms that evidence the three discharge ranges required by dependent claims 19–21. *Id.* ¶¶ 114–116. Dr. Galton was subject to cross-examination regarding his first set of simulations during a deposition held on February 28, 2025. *See* Ex. 2036. We credit Dr. Galton’s testimony that his first set of simulations performed on DeMaw’s circuit account for the general conditions of dependent claims 19–21 because, in the field of circuit design, it was standard practice to use simulations such as this to predict DeMaw’s circuit behavior. *See, e.g.,* Ex. 2021 ¶¶ 257, 276, 279 (Dr. Ricketts’s testimony that he ran simulations of his own to predict DeMaw’s circuit behavior).

We do not agree with ParkerVision’s arguments that Dr. Galton’s first set of simulations are inaccurate and unreliable for two reasons. First, ParkerVision’s arguments in this regard impose requirements on Dr. Galton’s first set of simulations that are divorced from the requirements of independent claim 18 and dependent claims 19–21. For instance, ParkerVision faults Dr. Galton for not using a specific JFET model, signal, bias configuration, and operating frequency. *See* PO Resp. 41–48; PO Sur-reply 24. Claims 18–21, however, do not require the use of a specific signal or JFET model. *See, e.g.*, Ex. 1001, 51:56–63 (dependent claims 7–10 provide examples of what constitutes a switching device, such as transistors, FETs, JFETs, and MOSFETs). Nor do these claims require a bias configuration or operation frequency. Put simply, we decline to impose requirements on Dr. Galton’s first set of simulations that are not otherwise required by independent claim 18 and dependent claims 19–21.

Second, given that the record is devoid of evidence indicating that the routine optimization of the three discharging ranges required by dependent claims 19–21 is anything other than the exercise of ordinary skill in the art, we credit Dr. Galton’s selection of certain operational parameters to perform his first set of simulations. In our view, Dr. Galton’s selection of certain operational parameters is nothing more than using routine experimentation to predict DeMaw’s circuit behavior. As one example, Dr. Galton testifies—and we agree—that a person of ordinary skill in the art “implementing DeMaw’s circuit would have started with an initial [circuit] design (such as the [circuit] design shown in DeMaw FIG. 6.7), but would likely have improved upon it through routine optimization, including trying different JFETs.” Ex. 1060 ¶ 12. This type of routine optimization that

starts with modeling DeMaw's circuit diagram illustrated in Figure 6.7, but includes, among other things, trying different JFETs, finds support in the evidence of record. *See, e.g.*, Ex. 1044, 6–33 (“How to Select the Proper FET”).<sup>17</sup>

We do not agree with ParkerVision's argument that Dr. Galton fails to perform the necessary discharge calculations using “total charge stored” over multiple charging cycles. *See* PO Sur-reply 7–11. According to ParkerVision, Dr. Galton's approach is flawed because he only accounts for charge accumulated on a capacitor over a single charging cycle—not multiple charging cycles. *Id.* at 10 (citing Ex. 2047, 14:2–16). This argument, however, mischaracterizes Dr. Galton's approach.

During the third deposition of Dr. Galton, the following exchange occurred between counsel for ParkerVision and Dr. Galton:

Q With regards to the DeMaw in your original declaration, when you calculated the discharge percentages you did so by looking at what came into the capacitor in one charging cycle and what was discharged by the capacitor in the subsequent discharging cycle, correct?

A Yes. That is what I did in my original declaration.

Ex. 2047, 14:2–16. ParkerVision appears to view Dr. Galton's cross-examination testimony in this regard as implicating a single charging cycle. Yet, in Dr. Galton's first Declaration, he testifies that his first set of simulations involved performing discharge calculations “on a cycle-by-cycle basis . . . collected for 50,999 simulation cycles.” Ex. 1003 ¶ 114; *see also* Pet. Reply 22 (arguing that “Dr. Galton provided 400µs and 50,999 cycles”

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<sup>17</sup> All references to the page numbers in Exhibit 1044 (“Oxner”) refer to the native pagination in the exhibit.

(citing Ex. 1003 ¶ 114)). Contrary to ParkerVision's argument, we do not view Dr. Galton's cross-examination testimony as limiting his first set of simulations to a single charging cycle. Instead, we view Dr. Galton's cross-examination testimony as being consistent with the testimony provided in his first Declaration because, even though he may calculate the discharge percentage of a capacitor in a cycle-by-cycle basis, he collects these calculations for 50,999 simulation cycles.

We also do not agree with ParkerVision's argument that Dr. Galton's histograms serve as the sole basis for asserting that DeMaw satisfies the claimed discharging ranges. *See* PO Sur-reply 6–7. ParkerVision fails to appreciate that Dr. Galton's histograms are merely graphical representations of collected data that display the discharging ranges of DeMaw's first and second capacitors that result from Dr. Galton performing a first set of simulations on DeMaw's circuit. In our view, using histograms in this way helps to visualize the discharging ranges of DeMaw's first and second capacitors. *See, e.g.,* Ex. 1042 ¶¶ 10, 149 (Dr. Galton testifying how he generates histograms to represent certain aspects of DeMaw's and Macnally's circuit simulations).

Finally, we do not agree with ParkerVision's arguments that DeMaw's JFETs are configured not to turn off, nor do we agree with ParkerVision's argument that Dr. Galton's reliance on a JFET other than the one identified in DeMaw would significantly alter the behavior of DeMaw's circuit. *See* PO Sur-reply 13–15, 24. As we explain above when discussing the scope of independent claim 18 and dependent claims 19–21 (*see supra* Section II.B.4.a), the Federal Circuit's finding that DeMaw anticipates independent claim 18 credited the testimony from Qualcomm's invalidity

expert, Dr. Razavi, that “charging and discharging the first and second capacitors’ occurs when the first and second switches (Q1 and Q2) ‘are turned on and off at a certain rate.’” Ex. 1031, 27. The Federal Circuit’s crediting of this testimony from Dr. Razavi implies that the court appreciated that DeMaw’s first and second switches (Q1 and Q2) are capable of turning on and off at a certain rate by opening and closing. ParkerVision’s argument that DeMaw’s JFETs are configured not to turn off fails to appreciate this guidance from the Federal Circuit. *See Intergraph Corp. v. Intel Corp.*, 253 F.3d 695, 697 (Fed. Cir. 2001) (“The doctrine of law of the case generally bars retrial of issues that were previously resolved.”).

ParkerVision’s argument that a JFET other than the one identified in DeMaw would significantly alter the behavior of DeMaw’s circuit relies exclusively on the testimony of its declarant, Dr. Ricketts. *See* PO Sur-reply 24 (citing Ex. 2021 ¶¶ 135–139). Dr. Ricketts’s testimony on this particular issue does not explain why the LTspice JFET model used by Dr. Galton in his first set of simulations would significantly alter the behavior of DeMaw’s circuit. *See* Ex. 2021 ¶¶ 135–139. To the contrary, Dr. Ricketts’s testimony acknowledges “FETs have many modes of operation depending on circuit topology and signals,” and “FETs are used in different ways in different circuit/systems depending on the needs of the circuit/system.” *Id.* ¶ 139. This testimony appears to support TI’s position that Dr. Galton’s selection of the LTspice JFET model is nothing more than the routine optimization that would be expected by a person of ordinary skill in the art when attempting to predict DeMaw’s circuit behavior. *See* Pet. Reply 7.

*f. ParkerVision's arguments addressing Dr. Galton's  
second set of simulations*

In its Patent Owner Response, ParkerVision contends that, even though Dr. Galton's second set of simulations replaces the generic JFETs with the Siliconix U430 JFET models, his second set of simulations remain inaccurate and unreliable because he still uses "other incorrect parameters." PO Resp. 48 (citing Ex. 2021 ¶¶ 268–270). Relying primarily on the testimony of its declarant, Dr. Ricketts, ParkerVision argues that Dr. Galton's second set of simulations are inaccurate and unreliable for the following reasons: (1) Dr. Galton's use of the Siliconix U430 JFET models identified in DeMaw results in a state of continuous bidirectional conduction such that the circuit never turns off; (2) the switching behavior, impedance response, and waveform profiles materially differ from Dr. Galton's first set of simulations; and (3) Dr. Galton's introduction of a completely new reference—Oxner—is procedurally improper. *Id.* at 48–65 (citing Ex. 1003 ¶ 62; Ex. 2021 ¶¶ 272–311, 315–320, 323–337, 340–345; Ex. 2039 (Ex. 1) ¶¶ 3, 8, 12, 18, 51, 57, 63, 65, 83, 84, 90, 96, 102, 108)).

In its Reply, TI contends that Dr. Galton's second set of simulations demonstrate that ParkerVision's complaints regarding the use of incorrect parameters do not impact materially the operation of the model of DeMaw's circuit diagram illustrated in Figure 6.7. Pet. Reply 12 (citing Ex. 1060 ¶¶ 67–77). According to TI, Dr. Galton's second set of simulations are accurate and reliable for the following reasons: (1) Dr. Galton's use of the Siliconix U430 JFET models identified in DeMaw does not materially alter the performance of DeMaw's circuit; (2) even under ParkerVision's restrictive view of DeMaw, the circuit illustrated in Figure 6.7 still teaches

the method of independent claim 18 and dependent claims 19–21;  
(3) Dr. Galton’s use of a sinusoidal LO instead of a square wave does not materially impact the operation of DeMaw’s circuit; and (4) even under the narrow interpretation of dependent claims 19–21 provided by ParkerVision’s declarant, Dr. Ricketts, DeMaw still shows instances of the three discharged ranges required by these claims. *Id.* at 12–22 (citing Ex. 1001, 19:1–8, 19:29–40, 20:1–11, 23:60–67, 45:24–27, 38:4–15, 50:26–34, claim 18, Figs. 16A, 16D, 16H, 16O; Ex. 1003 ¶ 114; Ex. 1042 ¶¶ 4, 11, 14, 17, 18, 19, 48, 49, 81, 82, DEMA-SIM-FIG. 5.11; Ex. 1060 ¶¶ 24, 25, 34–36, 49–59, 64, 74–77 117; Ex. 2021 ¶¶ 201 285, 426; Ex. 2042 ¶ 84).

In its Sur-reply, ParkerVision contends that Dr. Galton’s second set of simulations are flawed for the following reasons: (1) Dr. Galton’s new calculations do not take into account that the challenged claims require including a 12V bias voltage as part of the “total charge stored” on each capacitor; (2) DeMaw’s JFETs are configured not to turn off; (3) TI’s introduction of a new “between apertures” theory is belied by Dr. Galton and the ’342 patent, but even if we were to accept this theory, Dr. Galton has not shown that DeMaw’s JFETs are open for the entire period “between apertures”; and (4) Dr. Galton’s reliance on Oxner should be disregarded. PO Sur-reply 11–15 (citing Ex. 1001, 23:60–67, 45:24–27; Ex. 1016, Fig. 6.7; Ex. 1060 ¶ 61; Ex. 2021 ¶¶ 136, 199, 201, 202; Ex. 2047, 21:21–22:11, 25:16–22; PO Resp. 30; Pet. Reply 20–21), 20–21 (citing Ex. 1001, 20:1–11, 38:4–15; Ex. 1060 ¶ 38), 25–26 (citing Ex. 1060 ¶¶ 8–13, 19, 26 n.1, 27, 42, 57, 58, 72, 75–77; Ex. 2047, 33:10–19; Pet. 9–10; Pet. Reply 7).

Based on the complete record, we agree with TI that Dr. Galton’s second set of simulations on DeMaw’s circuit evidence that DeMaw

discloses the general conditions of dependent claims 19–21 (i.e., the three discharging ranges), which, as we explain, ParkerVision has not demonstrated produces new and unexpected results and, therefore, they are not critical to the operability of the claimed invention. *See* Pet. Reply 12–22 (citing Ex. 1042 ¶¶ 4, 11, 14, 17, 18, 19, 48, 49, 81, 82, DEMA-SIM-FIG. 5.11; Ex. 1060 ¶¶ 24, 25, 34–36, 49–59, 64, 74–77, 117). As we explain above, there is nothing inherently unreliable or suspect about TI using Dr. Galton’s second set of simulations filed with the Patent Owner Response (and accompanying the Reply) as evidence to demonstrate that DeMaw discloses the general conditions of dependent claims 19–21. *See Novartis*, 271 F.3d at 1054; *WiTricity*, 2025 WL 1147578, at \*3. We are mindful that Dr. Galton’s second set of simulations need not be perfect replicas of DeMaw’s circuit, but the simulations must be based on reliable scientific methodology and TI must have offered Dr. Galton for cross-examination to provide ParkerVision an opportunity to develop further arguments and evidence. *Cf. Liquid*, 449 F.3d at 1220–21. Once again, this is exactly what occurred here.

In Dr. Galton’s second Declaration accompanying the Reply, which also was filed by ParkerVision with the transcript of his deposition held on April 14, 2025, Dr. Galton testifies that he performed his second set of simulations on DeMaw’s circuit using, where possible, the parameters identified in DeMaw. Ex. 1042 ¶¶ 5–11; Ex. 2039 (Ex. 1). Dr. Galton testifies that his second set of simulations are “structurally the same” as his first set of simulations, except that he replaces the generic LTspice JFETs with the Siliconix U430 JFET models identified in DeMaw. Ex. 1042 ¶ 6; *see also id.* ¶ 4 (testifying to the same). Similar to his first set of simulations

Dr. Galton testifies that he engages in routine experimentation to make minor adjustments to other parameters not identified in DeMaw. *See id.* ¶¶ 7–9. According to Dr. Galton, this routine optimization occurred over 50,999 simulation cycles and it was plotted in histograms that evidence the three discharge ranges required by dependent claims 19–21. *Id.* ¶¶ 10, 11. Dr. Galton was subject to cross-examination regarding his second set of simulations during a deposition held on April 14, 2025. *See* Ex. 2039. Once again, we credit Dr. Galton’s testimony that his second set of simulations on DeMaw’s circuit account for the general conditions of dependent claims 19–21 because, in the field of circuit design, it was standard practice to use simulations such as this to predict DeMaw’s circuit behavior. *See, e.g.,* Ex. 2021 ¶¶ 257, 276, 279 (Dr. Ricketts’s testimony that he ran simulations of his own to predict DeMaw’s circuit behavior).

We do not agree with ParkerVision’s arguments that Dr. Galton’s first set of simulations are inaccurate and unreliable for two reasons. First, ParkerVision’s arguments in this regard impose requirements on Dr. Galton’s first set of simulations that are divorced from the requirements of independent claim 18 and dependent claims 19–21. For instance, ParkerVision faults Dr. Galton for using switching behavior, impedance response, and waveform profiles that materially differ from Dr. Galton’s first set of simulations. *See* PO Resp. 53–57. Claims 18–21, however, do not require a particular switching behavior, impedance response, or waveform profile. Put simply, we decline to impose requirements on Dr. Galton’s second set of simulations that are not otherwise required by independent claim 18 and dependent claims 19–21.

Second, given that the record is devoid of evidence indicating that the routine optimization of the three discharging ranges required by dependent claims 19–21 is anything other than the exercise of ordinary skill in the art, we credit Dr. Galton’s selection of certain operational parameters to perform his second set of simulations. In our view, Dr. Galton’s selection of certain operational parameters is nothing more than using routine experimentation to predict DeMaw’s circuit behavior. Similar to our analysis of Dr. Galton’s first set of simulations, we agree with Dr. Galton’s testimony that a person of ordinary skill in the art modeling DeMaw’s circuit diagram illustrated in Figure 6.7 would have engaged in routine optimization that includes, among other things, “trying different JFETs.” Ex. 1060 ¶ 12. This type of routine optimization finds support in the evidence of record. *See, e.g.*, Ex. 1044, 6–33 (“How to Select the Proper FET”).

We do not agree with ParkerVision’s argument that Dr. Galton’s use of the Siliconix U430 JFET models identified in DeMaw results in a state of continuous bidirectional conduction such that the JFETs never turn off. *See* PO Resp. 48–52. Nor do we agree with ParkerVision’s arguments that DeMaw’s JFETs are configured not to turn off. *See* PO Sur-reply 13–15. These are puzzling arguments because, on the one hand, ParkerVision faults Dr. Galton for not using the Siliconix U430 JFET models identified in DeMaw in his first set of simulations, but on the other hand, ParkerVision appears to assert that Dr. Galton cannot use the Siliconix U430 JFET models identified in DeMaw in his second set of simulations because they never turn off. This is illogical and renders ParkerVision’s arguments regarding the use of the Siliconix U430 JFET models internally inconsistent.

Moreover, as we explain above when discussing the scope of independent claim 18 and dependent claims 19–21, the Federal Circuit’s finding that independent claim 18 is anticipated by DeMaw credited the testimony from Qualcomm’s invalidity expert, Dr. Razavi, that “‘charging and discharging the first and second capacitors’ occurs when the first and second switches (Q1 and Q2) ‘are turned on and off at a certain rate.’” Ex. 1031, 27. The Federal Circuit’s crediting of this testimony from Dr. Razavi implies that the court appreciated that DeMaw’s Siliconix U430 JFET model is capable of turning on and off at a certain rate by opening and closing. In addition, Dr. Ricketts testifies, when a FET “operates as a switch,” “the FET alternates between an ‘on’ state (allowing current to flow) and ‘off’ state (blocking current flow), effectively opening and closing the circuit at defined intervals.” Ex. 2021 ¶ 128. ParkerVision’s argument that DeMaw’s JFETs are configured not to turn off fails to appreciate the Federal Circuit’s crediting of Dr. Razavi’s testimony, as well as the testimony from its own declarant, Dr. Ricketts, both of whom seem to appreciate that DeMaw’s JFETs turn on and off at a certain rate by opening and closing.

We also do not agree with ParkerVision that Dr. Galton’s reliance on Oxner is improper. *See* PO Resp. 59–62; PO Sur-reply 25. We understand TI to rely on Oxner as general background knowledge in the art because DeMaw states that its circuit “is similar to a circuit suggested by E. Oxner of Siliconix in *Application Note AN72-1*.” Ex. 1016, 196. It is well-settled that TI may rely on prior art such as Oxner to demonstrate the general background knowledge possessed by a person of ordinary skill in the art, especially because DeMaw states that Oxner discloses a similar circuit to DeMaw’s circuit. *See Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d

1359, 1365 (Fed. Cir. 2015) (“Art can legitimately serve to document the knowledge that skilled artisans would bring to bear in reading the prior art identified as producing obviousness.” (citing *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362–63 (Fed. Cir. 2013))).

Finally, we do not agree with ParkerVision’s argument that Dr. Galton’s new calculations do not take into account that the challenged claims require including a 12V bias voltage as part of the “total charge stored” on each capacitor. *See* PO Sur-reply 11–13. ParkerVision’s argument is predicated on the notion that dependent claims 19–21 require a 12V bias voltage as part of the “total charged stored” on each capacitor. This is not commensurate in scope with dependent claims 19–21 because these claims do not require a specific bias voltage, much less a 12V bias voltage. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) (explaining that limitations not appearing in the claims cannot be relied upon for patentability).

*g. Summary*

In summary, TI has demonstrated by a preponderance of the evidence that the three discharging ranges required by dependent claims 19–21 would have been obvious over the teachings of DeMaw.

*C. Obviousness over Macnally*

TI contends that claims 19–21 of the ’342 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Macnally. Pet. 50–73.

TI contends that the teachings of Macnally account for the subject matter of each challenged claim. *Id.* TI submits the first, second, and third Declarations of Dr. Galton to support its positions. *See* Ex. 1003, 1042, 1060.

ParkerVision contends that Macnally does not teach the following limitations: (1) the “electrically coupling” required by independent claim 18; (2) the first and second “switching devices” required by independent claim 18 and dependent claims 19–21; and (3) the three discharging ranges required by dependent claims 19–21. *See* PO Resp. 90–102; PO Sur-reply 26–41. ParkerVision also argues that Dr. Galton’s simulations on a model of Macnally’s circuit diagram illustrated in Figure 3 include material errors and, therefore, they have little, if any, evidentiary value. *See* PO Resp. 65–78. ParkerVision submits the Declaration of Dr. David Ricketts to support its positions. *See* Ex. 2021.

Based on the complete record, we determine that TI has shown by a preponderance of the evidence that claims 19–21 of the ’342 patent are unpatentable as obvious over the teachings of Macnally. We begin our analysis with an overview of Macnally, and then we turn to the parties’ contentions with respect to independent claim 18 and dependent claims 19–21.

### *1. Overview of Macnally*

Macnally generally relates to “[a] single-chip [complementary metal-oxide semiconductor (‘CMOS’)] direct conversion transceiver [that] includes an [radio frequency (‘RF’)] circuit, a transmitter having a synthesizer, a receiver having a baseband filter, and a demodulator.” Ex. 1023, code (57). Figure 1 of Macnally, reproduced below, illustrates a

block diagram of the single-chip CMOS transceiver according to one embodiment. *Id.* at 3:11–12.<sup>18</sup>

FIG. 1

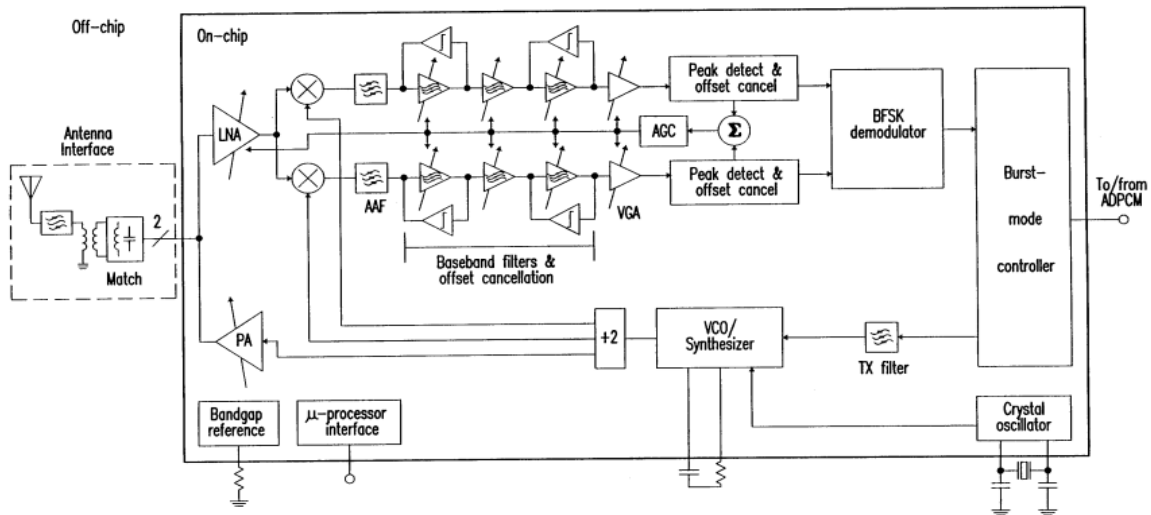


Figure 1 illustrates a fully integrated transceiver 100 that includes, among other things, RF circuits 102 and 104, synthesizer 106, baseband filters 108, demodulator 110, and digital signal processing. *Id.* at 8:21–24.

Figure 3 of Macnally, reproduced below, illustrates a circuit diagram of the mixer and antialias filter according to one embodiment. Ex. 1023, 3:14–15.

<sup>18</sup> All references to the page numbers in Macnally refer to the native page numbers located in the top, middle portion of each page in Exhibit 1023.

FIG. 3

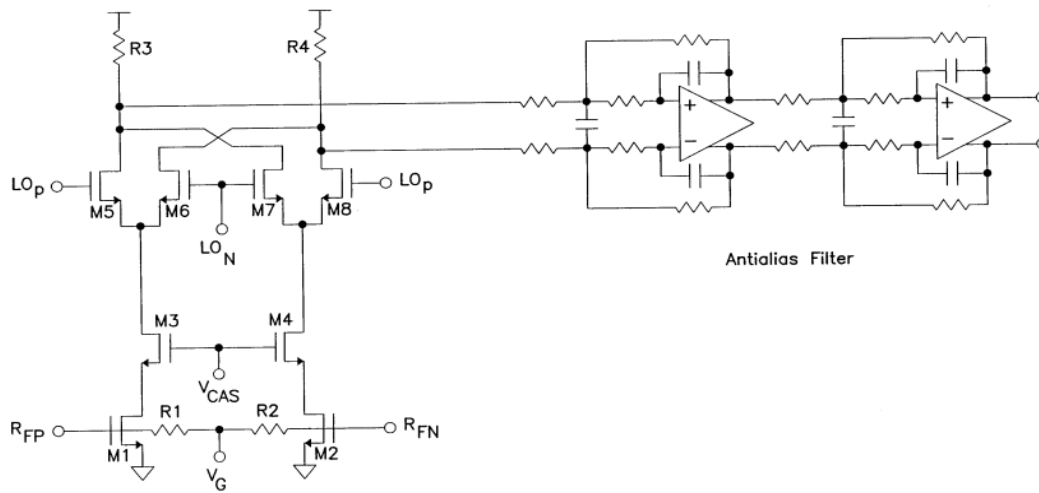


Figure 3 illustrates mixer 142 and antialias filter 144. *Id.* at 12:15. Macnally discloses that “[t]he output of the mixer 142 is fed to a four-pole Butterworth antialias filter 144” formed by “[t]wo biquad stages.” *Id.* at 12:20–24.

## 2. Claims 19–21

At the outset, we briefly address independent claim 18 because, by virtue of dependency, claims 19–21 include all the limitations of independent claim 18. *See* Pet. 55–71. TI relies, at least in part, on partial, annotated versions of Macnally’s Figures 1 and 3 to explain how Macnally teaches all the limitations of independent claim 18. *See, e.g., id.* at 56 (presenting an annotated version of Macnally’s Figure 1), 59 (presenting a partial, annotated version of Macnally’s Figure 3), 61–62 (presenting two other partial, annotated versions of Macnally’s Figure 3).

TI argues that Macnally’s direct-conversion transceiver that receives an RF signal at the antenna interface (illustrated in Figure 1) teaches the claimed “information signal,” the creation of a fully differential signal by inverting the RF signal received at the antenna interface (also illustrated in

Figure 1) teaches the claimed “inverted information signal,” the first and second capacitors C1 and C2 located in the first biquad stage of the antialias filter (illustrated in Figure 3) that receive the  $RF_P$  information signal and the  $RF_N$  inverted information signal, respectively, teach the claimed “first and second capacitors,” switching devices M1/M3/M5 and M2/M4/M8 located in the mixer (illustrated in Figure 3) collectively teach the claimed “first and second switches,” and resistors R18 and R19 (illustrated in simulation MACNALLY-SIM-FIG. 1) teach the claimed “first and second impedance devices.” Pet. 55–66, 69–71. Based on circuit simulations performed by Dr. Galton on a model of Macnally’s circuit diagram illustrated in Figure 3, TI argues that Macnally teaches “performing a plurality of charging and discharging cycles of the first and second capacitors to generate first and second down-converted information signals across first and second impedance devices, respectively.” *Id.* at 66–69. According to TI, the circuit simulations performed by Dr. Galton demonstrate that Macnally’s first and second capacitors C1 and C2 located in the first biquad stage of the antialias filter (illustrated in Figure 3) engage in “charging and discharging” cycles to generate first and second down-converted information signals across resistors R18 and R19, which, in turn, teach the first and second impedance devices, respectively. *See id.*

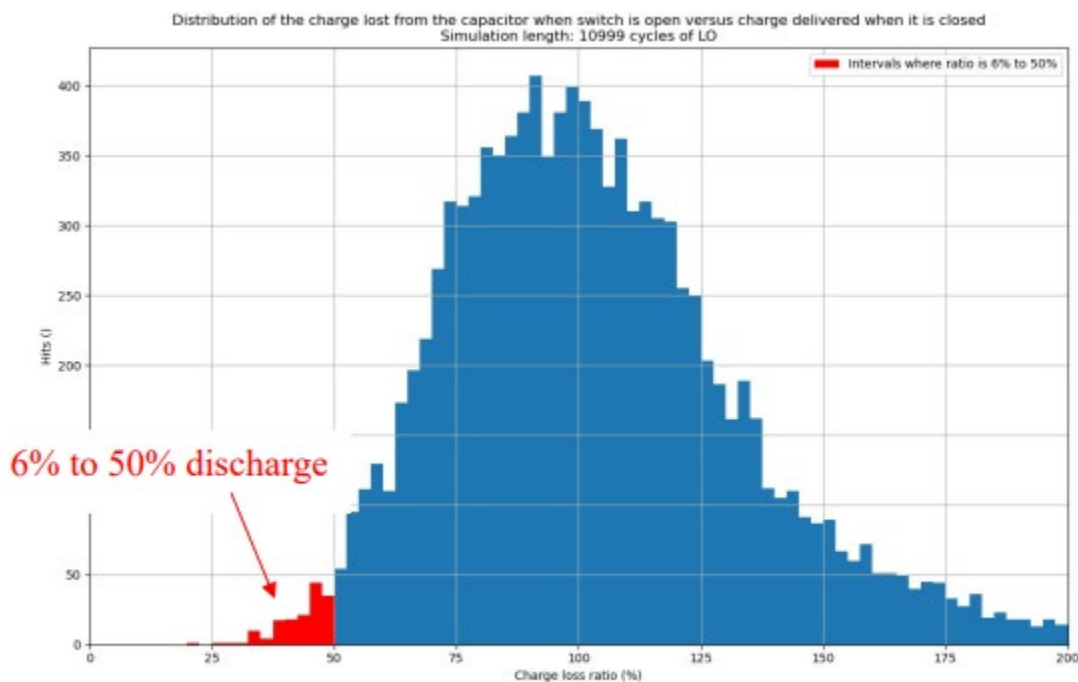
Claim 19 directly depends from independent claim 18 and further recites the following:

wherein the first capacitor discharges between six percent to fifty percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between six percent to fifty percent of the

total charge stored therein during a period of time that the second switching device is open.

Ex. 1001, 52:58–64. TI contends that Macnally teaches this limitation because “the mixer switches are driven by the full-swing LO clock signal,” thereby making it “possible to compute the intervals of time when the switches are open versus closed.” Pet. 72 (citing Ex. 1003 ¶ 149).

According to TI, “[t]he identical post-processing script [that] was used to generate [simulation] DEMAW-SIM-FIG. 7 [was also] used to generate [simulation] MACNALLY-SIM-FIG. 4,” which is reproduced below. *Id.*



MACNALLY-SIM-FIG. 4 (annotated)

*Id.* MACNALLY-SIM-FIG. 4 illustrates “[d]istribution of the charge lost from the capacitor when switch is open versus charge delivered when it is closed.” *Id.* Relying on simulation MACNALLY-SIM-FIG. 4, TI asserts

that “[a] region of occurrences within the 6% to 50% range marked in red” teaches the discharging range required by dependent claim 19. *Id.*

Claim 20 directly depends from independent claim 18 and further recites the following:

wherein the first capacitor discharges between ten percent to twenty-five percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between ten percent to twenty-five percent of the total charge stored therein during a period of time that the second switching device is open.

Ex. 1001, 52:65–53:4. TI contends that, based on simulation MACNALLY-SIM-FIG. 4, “[t]here are cycles where the charge loss ratio is 25%, which satisfies the claimed range of 10% to 25%” required by dependent claim 20. Pet. 73 (citing Ex. 1003 ¶¶ 149, 150).

Claim 21 directly depends from independent claim 18 and further recites the following:

wherein the first capacitor discharges between fifteen percent to thirty percent of the total charge stored therein during a period of time that the first switching device is open, and wherein the second capacitor discharges between fifteen percent to thirty percent of the total charge stored therein during a period of time that the second switching device is open.

Ex. 1001, 53:5–54:2. TI contends that, based on simulation MACNALLY-SIM-FIG. 4, “[t]here are cycles where the charge loss ratio is 25%, which satisfies the claimed range of 15% to 30%” required by dependent claim 21. Pet. 73 (citing Ex. 1003 ¶¶ 149, 151).

After institution of trial, similar to Dr. Galton’s approach taken with a model of DeMaw’s circuit diagram illustrated in Figure 6.7, Dr. Galton performed new, updated simulations on a model of Macnally’s circuit

diagram illustrated in Figure 3 (i.e., a second set of simulations). *See* Ex. 1042; Ex. 2039 (Ex. 1). According to TI, Dr. Galton performed these additional simulations to rebut accusations from ParkerVision that Dr. Galton choose component values and circuit configurations to get the results needed to demonstrate that Macnally teaches the three discharging ranges required by dependent claims 19–21. Pet. Reply 35–36. We address Dr. Galton’s second set of simulations in more detail below. *See infra* Section II.C.2.a.

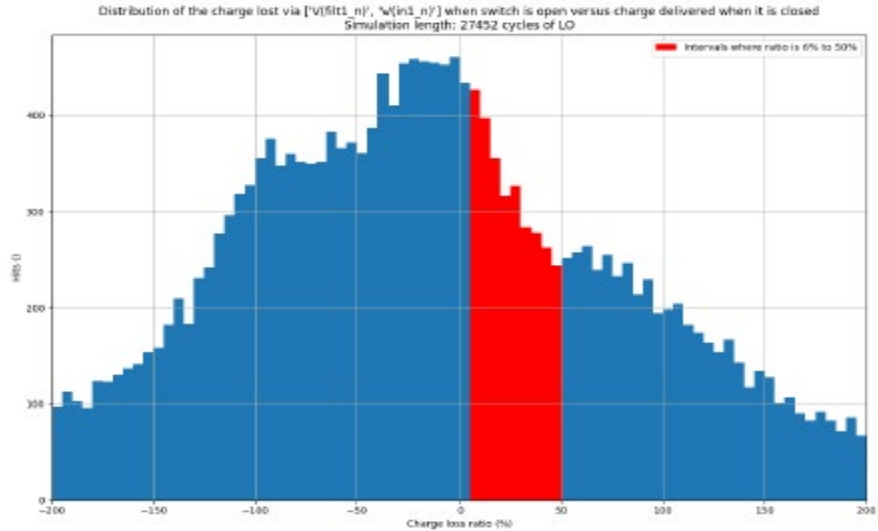
During trial, ParkerVision contends that Macnally does not teach the following limitations: (1) the “electrically coupling” required by independent claim 18 and dependent claims 19–21; (2) the first and second “switching devices” required by independent claim 18 and dependent claims 19–21; and (3) the three discharging ranges required by dependent claims 19–21. *See* PO Resp. 90–102; PO Sur-reply 26–41. ParkerVision also argues that Dr. Galton’s simulations on a model of Macnally’s circuit diagram illustrated in Figure 3 include material errors and, therefore, they have little, if any, evidentiary value. *See* PO Resp. 65–78. We address ParkerVision’s arguments in turn. *See infra* Sections II.C.b–f.

*a. Dr. Galton’s second set of simulations*

As we explain above, in its claim mapping of dependent claims 19–21 set forth in the Petition, TI relies on a first set of simulations performed by Dr. Galton on a model of Macnally’s circuit diagram illustrated in Figure 3 to demonstrate the discovery of optimal or working ranges under general conditions disclosed in Macnally. Pet. 71–73 (citing Ex. 1003 ¶¶ 149–151). After institution, and in response to criticism leveled by ParkerVision during the preliminary phase of this proceeding, Dr. Galton performed a second set

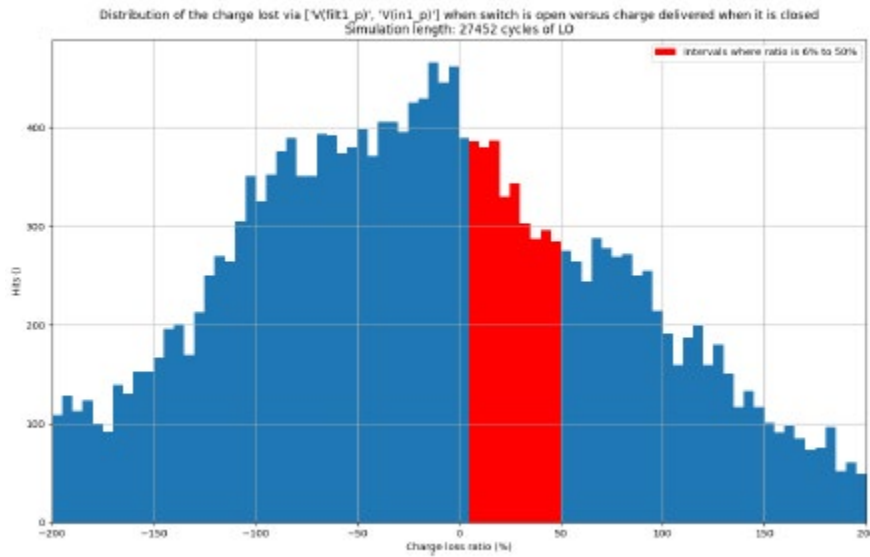
of simulations on a model of Macnally's circuit diagram illustrated in Figure 3 that aligns "with component values and an input signal that match[] the information presented in Macnally . . . as closely as possible." Ex. 1042 ¶ 145. Dr. Galton then provides testimony regarding the changes he made to a model of Macnally's circuit diagram illustrated in Figure 3 for purposes of his second set of simulations, including, among other things, using actual resistors to implement resistors R3 and R4, increasing the mixer gain by changing the size and bias voltages of transistors M1 and M2, and changing the RF input signal to have Binary Frequency Shift Keying ("BFSK") modulation and a center frequency of 915 megahertz ("MHz"). *Id.* In addition, Dr. Galton testifies that the "use of 300 nm gate length" for Macnally's transistors M8–M11 in his first set of simulations "was indeed inadvertent," but after correcting this inadvertent mistake by changing the gate length to 60 nm, it "did not lead to a different conclusion" for his second set of simulations. Ex. 1060 ¶ 119; *see also id.* ¶ 118 (discussing Dr. Rickett's criticism of Dr. Galton's first set of simulations).

Dr. Galton testifies that, in contrast to the first set of simulations where he "provided one histogram of the charge loss ratio percentage that was representative of capacitors C6 and C7 (MACNALLY-SIM-FIG. 4)," the second set of simulations resulted in him generating two new histograms—"one for each capacitor MACNALLY-SIM-FIG. [4.1A and 4.1B]." Ex. 1042 ¶ 149. MACNALLY-SIM-FIG. 4.1A, reproduced below, is a histogram that represents the charge loss ratio percentages for the first capacitor C6 of Macnally's circuit (i.e., MACNALLY-SIM-FIG. 101) collected for 27,452 simulation cycles.



*Id.* MACNALLY-SIM-FIG. 4.1A illustrates “[d]istribution of the charge lost... when [the first] switch is open versus charge delivered when it is closed.” *Id.* The charge loss ratio spanning the 6% to 50% range marked in red teaches the discharging range for the first capacitor required by dependent claim 19. *See id.*

MACNALLY-SIM-FIG. 4.1B, reproduced below, is a histogram that represents the charge loss ratio percentages for the second capacitor C7 of Macnally’s circuit (i.e., MACNALLY-SIM-FIG. 1.1) collected for 27,452 simulation cycles. Ex. 1042 ¶ 150.



*Id.* MACNALLY-SIM-FIG. 4.1B illustrates “[d]istribution of the charge lost . . . when [the second] switch is open versus charge delivered when it is closed.” *Id.* The charge loss ratio spanning the 6% to 50% range marked in red teaches the discharging range for the second capacitor required by dependent claim 19. *See id.*

We understand TI to take the position that MACNALLY-SIM-FIG. 4.1A and MACNALLY-SIM-FIG. 4.1B further demonstrate how the charge loss ratios spanning the 6% to 50% range marked in red encompass the 10% to 25% discharging range for the first and second capacitors required by dependent claim 20, as well as the 15% to 30% range for the first and second capacitors required by dependent claim 21. *See, e.g.,* Pet. Reply 39 (arguing that “[a]ll histograms show, regardless of operational parameters, Macnally produces the claimed discharge percentages”).

*b. “electrically coupling”*

In its Patent Owner Response, ParkerVision contends that Macnally’s RF signal received at the antenna interface (i.e., RF<sub>P</sub> input) and the fully

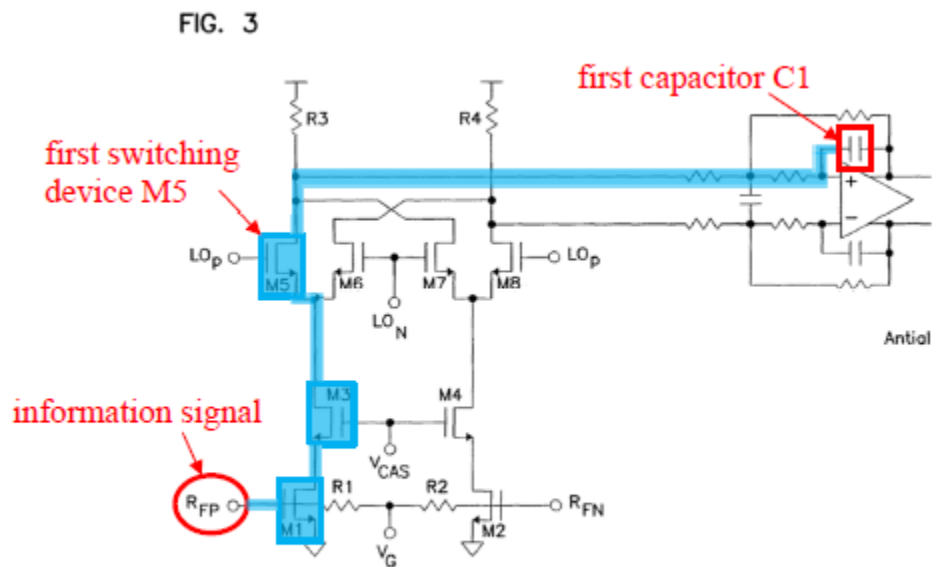
differential signal created by inverting the RF signal received at the antenna interface (i.e.,  $RF_N$  input) are not “electrically coupled” to capacitors C1 and C2 because these two input signals do not flow to capacitors C1 and C2. PO Resp. 97 (citing Ex. 2021 ¶458). According to ParkerVision, current in Macnally only flows downward from power source to ground. *Id.* at 93–97 (citing Ex. 2021 ¶¶ 449–452, 454–457). ParkerVision asserts that the only current or signals that flow to Macnally’s capacitors C1 and C2 comes from the power source connected to resistors R3 and R4. *Id.* at 94 (citing Ex. 2021 ¶ 453; Ex. 1023, Fig. 3 (with annotations provided by ParkerVision)).

In its Reply, TI contends that Macnally’s  $RF_P$  input is transformed and amplified as it flows up through switching device M5 into capacitor C1 and, similarly, the  $RF_N$  input is transformed and amplified as it flows up through switching device M8 into capacitor C2. Pet. Reply 23–25 (citing Ex. 1001, 11:3–12, 11:38–42; Ex. 1023, 8:18–25, 10:20–25; Ex. 1060 ¶¶ 84–90; Ex. 2021 ¶ 202). According to TI, this results in Macnally “transfer[ring] non-negligible amounts of energy from the information signal to capacitors.” *Id.* at 25 (citing Ex. 1060 ¶¶ 86–90). TI argues that Macnally’s circuit operations are consistent with the ’342 patent, both of which allow an information signal to pass through a low-noise amplifier that outputs the same information signal, but on different charge carriers. *Id.* at 25–26 (citing Ex. 1001, 49:29–46; Ex. 1023, 2:22–23, 6:57–64, Fig. 2; Ex. 1060 ¶¶ 90–96). TI argues that ParkerVision’s argument that “current flows downward in Macnally is misleading” because ParkerVision applies conventional current, whereas Macnally allows electrons to flow upward “from ground through transistors M1–M8 and resistors R3 and R4, and

capacitors C1 and C2.” *Id.* at 27–28 (citing PO Resp. 93–97; Ex. 1023, Fig. 3 (with annotations provided by TI); Ex. 1060 ¶¶ 97, 98, 133–135; Ex. 2021 ¶¶ 39, 41).

In its Sur-reply, ParkerVision contends that TI does not dispute that “electrically coupling” Macnally’s RF<sub>P</sub> input and RF<sub>N</sub> input to capacitors C1 and C2 requires these two signals to flow to capacitors C1 and C2. PO Sur-reply 26–27. ParkerVision, however, maintains that “the only current that flows to Macnally’s capacitors [C1 and C2] comes from the power supply”—not from the RF<sub>P</sub> input and RF<sub>N</sub> input. *Id.* at 27–28 (citing Ex. 1023, Fig. 3 (with annotations provided by ParkerVision); Ex. 2021 ¶¶ 452, 453). ParkerVision acknowledges that Macnally’s RF<sub>P</sub> input and RF<sub>N</sub> input “*affect* the flow of current from the power source,” ParkerVision nonetheless argues that “it is current from the power source, *not* [RF<sub>P</sub> input and RF<sub>N</sub> input] themselves, that flows to the capacitors” C1 and C2. *Id.* at 28. Relying on Figure 16O of the ’342 patent, ParkerVision asserts that an information signal is “electrically coupled” to a capacitor because “the signal itself reaches the capacitor.” *Id.* at 29–30 (citing Ex. 1001, 49:43–46; Fig. 16O). In contrast, ParkerVision asserts that the current flowing to Macnally’s capacitors C1 and C2 originates from the power source—not from transistors M1 and M2 to which RF<sub>P</sub> and RF<sub>N</sub> provide input. *Id.* at 30–31. Finally, ParkerVision argues that, even under TI’s electron flow theory, Macnally’s RF<sub>P</sub> input and RF<sub>N</sub> input are not “electronically coupled” to capacitors C1 and C2 because the electrons flow towards the power supply terminal through resistors R3 and R4—not to capacitors C1 and C2. *Id.* at 32–34 (citing Pet. Reply 27–28, Ex. 1060 ¶¶ 134, 135).

Based on the complete record, we agree with TI that Macnally teaches “electronically coupling”  $RF_P$  input and  $RF_N$  input to capacitors C1 and C2 in the manner required by independent claim 18. *See* Pet. 59–65; Pet. Reply 23–28. As we note in our claim construction analysis above, the parties agree that the construction of the claim term “electrically coupling” is “indirectly or directly connecting such that an electrical signal can flow between.” *Compare* Pet. 6, with PO Resp. 25–26. With this construction in mind, TI provides a partial, annotated version of Macnally’s Figure 3, reproduced below, to demonstrate how Macnally’s mixer and anti-aliasing circuit includes an information signal electrically coupled to a first capacitor. Pet. 60 (citing Ex. 1023, 12:19–20; Ex. 1003 ¶ 133).

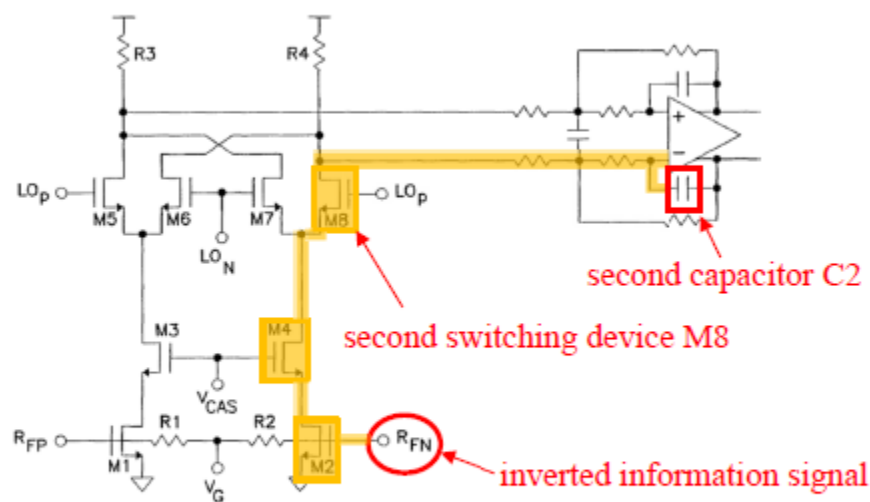


TI-1023, FIG. 3 (partial, annotated)

*Id.* at 61. The partial, annotated version of Macnally’s Figure 3 illustrates how the  $RF_P$  input indirectly connects to capacitor C1 through switch device M5 such that the information signal can flow between.

Similarly, TI provides a partial, annotated version of Macnally's Figure 3, reproduced below, to demonstrate how Macnally's mixer and anti-aliasing circuit includes an inverted information signal electrically coupled to a second capacitor. Pet. 62.

FIG. 3



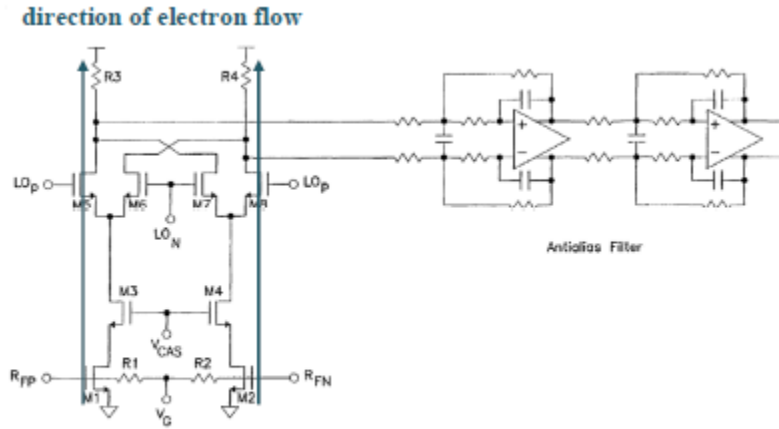
TI-1023, FIG. 3 (partial, annotated)

*Id.* The partial, annotated version of Macnally's Figure 3 illustrates how the RF<sub>N</sub> input indirectly connects to capacitor C2 through switch device M8 such that the inverted information signal can flow between. Consistent with the parties' agreed upon construction of the claim term "electrically coupling," we find that these two partial, annotated versions of Macnally's Figure 3 demonstrate how RF<sub>P</sub> input and RF<sub>N</sub> input indirectly connect to capacitors C1 and C2 such that electrical signals can flow between.

We do not agree with ParkerVision's argument that the only signals that can flow to Macnally's capacitors C1 and C2 come from the power source R3 and R4—not from RF<sub>P</sub> input and RF<sub>N</sub> input. *See* PO Resp. 94;

PO Sur-reply 27–31. ParkerVision’s argument in this regard is predicated on the notion that current does not flow upward in Macnally’s circuit illustrated in Figure 3. *See* PO Resp. 93–97. But neither ParkerVision nor its declarant, Dr. Ricketts, provide any evidentiary support for limiting Macnally’s current flow in this way. *See* Ex. 2021 ¶¶ 222–225, 449–457. Macnally discloses that “[t]he output of the mixer 142 is fed to a four-pole Butterworth antialias filter 144” formed by “[t]wo biquad stages.” Ex. 1023, 12:20–24. In our view, this cited disclosure fairly suggest that the  $RF_P$  input and  $RF_N$  input flow upward through Macnally’s mixer so the corresponding output is fed to capacitors C1 and C2 contained within Macnally’s antialias filter.

In addition, TI’s declarant, Dr. Galton, testifies that, because “[e]lectrons are negatively charged, . . . they flow toward the positive supply voltage, not toward ground.” Ex. 1060 ¶ 134. In the context of Macnally’s Figure 3, Dr. Galton testifies that “electrons actually flow upward through transistors M1–M8 and resistors R3 and R4 towards the positive power supply terminal.” *Id.* Dr. Galton provides a partial, annotated version of Macnally’s Figure 3, reproduced below, that demonstrates his electron flow theory.



Macnally, FIG. 3 (annotated)

*Id.* This partial, annotated version of Macnally’s Figure 3 illustrates the direction of electron flow upward is representative of how  $RF_P$  input and  $RF_N$  input flow upward through switches M5 and M8 to power source R3 and R4. We credit Dr. Galton’s testimony on this particular issue as emblematic of current flow in Macnally’s Figure 3 because it takes into account the reasonable inferences a person of ordinary skill in the art would draw to explain why current flows along a channel from source (i.e., Macnally’s  $RF_P$  input and  $RF_N$  input) to drain (i.e., Macnally’s switching devices M5–M8). *See KSR*, 550 U.S. at 418 (An obviousness evaluation “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”); *see also* Ex. 2025, 199 (“The drain current  $I_D$  consists of electrons drifting from the source to drain along the channel.”).

c. first and second “switching devices”

In its Patent Owner Response, ParkerVision contends that the claim term “switching device” should have the same meaning as a “switch,”

which, according to ParkerVision, another Board panel previously construed as “an electronic component opening and closing a circuit.” PO Resp. 97. ParkerVision argues that TI identifies Macnally’s transistors M5 and M8 as teaching the first and second “switching devices,” but because these transistors don’t open a circuit, they cannot be considered switching devices. *Id.* at 97 (citing Ex. 2021 ¶ 460). According to ParkerVision, “transistors M5 and M8 are not ‘opening’ a circuit” “because the current supply is always flowing through [Macnally’s] circuit from the power supply down to [transistors] M1 and M2.” *Id.* at 99 (citing Ex. 2021 ¶ 465). That is, ParkerVision argues that Macnally’s transistors M5 and M8 cannot perform the function of “opening a circuit” as required by its proposed construction for the first and second “switching devices” because the current supply in Macnally’s circuit is “uninterrupted.” *Id.* at 101–102 (citing Ex. 2021 ¶ 468).

In its Reply, TI contends that Macnally’s transistors M5 and M8 disclose the switching behavior required by the first and second “switching devices.” *See* Pet. Reply 28. TI argues that Macnally states that “[t]he LO input transistors [M5, M6, M7, M8] *operate as switches*.” *Id.* (second alteration in original) (quoting Ex. 1023, 12:19–20<sup>19</sup>) (citing Ex. 1060 ¶¶ 78, 136–138). TI argues that, when Macnally’s transistors M5 and M8 are closed, they cause the capacitors C1 and C2 to store energy from the information signal and, conversely, when transistors M5 and M8 are open,

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<sup>19</sup> When quoting the disclosure in Macnally, TI inadvertently cites to page 7, lines 12–14. Pet. Reply 28. This quoted disclosure clearly appears in Macnally on page 12, lines 19–20.

they cause capacitors C1 and C2 to discharge the energy. *Id.* at 28–29 (citing Ex. 1060 ¶¶ 99, 100; Ex. 2021 ¶ 216). TI also argues that, when transistors M5 and M8 are open, they isolate the information signal from the capacitors.” *Id.* at 29 (citing Ex. 1060 ¶¶ 99, 100).

In its Sur-reply, ParkerVision contends that TI does not demonstrate that Macnally’s transistors M5 and M8 satisfy its proposed construction of the claim term “switching device” because merely pointing out the Macnally uses the word “switch,” and asserting that transistors M5 and M8 open and close, does not address why transistors M5 and M8 “open and close *a circuit*.” PO Sur-reply 36 (citing Pet. 28–29). ParkerVision maintains that transistors M5 and M8 cannot open Macnally’s circuit because “there is always a continuous flow of current to the capacitors” C1 and C2. *Id.* ParkerVision, therefore, asserts that Macnally’s “circuit is continuously conducting, now switching.” *Id.* at 36–37 (citing PO Resp. 98–99; Ex. 2021 ¶ 462).

Based on the complete record, we agree with TI that Macnally’s transistors M5 and M8 teach the first and second “switching devices.” *See* Pet. 59–66; Pet. Reply 28–31. As we note in our claim construction analysis above, we adopt ParkerVision’s proposed construction of the claim term “switching device” as “an electronic device for opening and closing a circuit.” *See supra* Section II.A.1. We also clarified that the specification of the ’342 patent provides examples of what constitutes a switching device, such as a transistor, FET, JFET, MOSFET. *See, e.g.*, Ex. 1001, 51:56–63 (dependent claims 7–10). When describing the mixer and antialias filter illustrated in Figure 3, Macnally states “[t]he LO input transistors *operate as switches* that steer a process and temperature independent current.”

Ex. 1023, 12:19–20 (emphasis added). TI asserts—and ParkerVision does not dispute—that the LO input transistors identified in this quoted sentence from Macnally refer to transistors M5–M8 illustrated in Figure 3 because these four transistors receive the LO<sub>P</sub> input or the LO<sub>N</sub> input. *Id.* at Fig. 3. Based on these disclosures in Macnally, we find that Macnally’s transistors M5 and M8 operate as switches (i.e., “electronic device[s] for opening and closing a circuit”).

Moreover, Dr. Galton testifies that “a [person of ordinary skill in the art] would understand from Macnally, FIG. 3 that each of transistors M5, M6, M7, and M8, turn off and on for nearly half of each local (LO) period.” Ex. 1060 ¶ 138. We credit Dr. Galton’s testimony on this particular issue because it is consistent with Macnally’s disclosure that transistors M5–M8 operate as switches. Ex. 1023, 12:19–20. Based on the aforementioned disclosure in Macnally, together with Dr. Galton’s supporting testimony, we find that transistors M5 and M8 disclose “switching device[s]” because these transistors operate as switches that effectively open and close Macnally’s circuit (i.e., opening or closing transistors M5 and M8 completes or breaks the flow of current through the circuit), thereby satisfying the construction proposed by ParkerVision that we adopt above.

We do not agree with ParkerVision’s arguments that Macnally’s transistors M5 and M8 cannot operate as the first and second “switching devices” because the current supply in Macnally’s circuit is continuous or uninterrupted, such that current always flows through the circuit down from the power source through resistors R3 and R4 and transistors M1 and M2. *See* PO Resp. 97–102; PO Sur-reply 36–38. These arguments strain credulity. ParkerVision’s declarant, Dr. Ricketts, testifies that “a [person of

ordinary skill in the art] understands that Macnally uses a 50% duty cycle.” Ex. 2021 ¶ 216. As we note above, TI’s declarant, Dr. Galton, testifies that “transistors M5, M6, M7, and M8, turn off and on for nearly half of each local (LO) period.” Ex. 1060 ¶ 138. When considering the teachings of Macnally through the perspective of both Dr. Ricketts and Dr. Galton, transistors M5–M8 would be open 50% of the time and closed 50% of the time. In essence, this means that Macnally’s transistors M5 and M8 exhibit the switching behavior required by the first and second “switching devices.”

*d. ParkerVision’s argument addressing Dr. Galton’s first set of simulations*

In its Patent Owner Response, ParkerVision contend that its declarant, Dr. Ricketts, identifies several deviations between Dr. Galton’s simulations of a model of Macnally’s circuit diagram illustrated in Figure 3 and the actual teachings of Macnally, and Dr. Ricketts identifies several deficiencies with Dr. Galton’s simulation setup. PO Resp. 66 (citing Ex. 1003 ¶ 92; Ex. 2021 ¶¶ 359–364), 68 (citing Ex. 2021 ¶¶ 369–376). According to ParkerVision, Dr. Galton’s attempt to simulate the behavior of Macnally’s circuit is inaccurate and unreliable for the following reasons: (1) Dr. Galton uses a full-swing LO clock signal that is not disclosed in Macnally; (2) Dr. Galton models active load transistors M12 and M13 using LTspice default devices that are not disclosed in Macnally; (3) Dr. Galton applied inconsistent gate length to Macnally’s transistors and this alleged inconsistency materially impacts parasitic capacitance, gain, and switching behavior; (4) Dr. Galton omitted parameter values for the operational amplifier component, thereby rendering the op-amp behavior undefined and the simulation results unreliable; and (5) Dr. Galton omits device parasitic

capacitances in its entirety, and a person of ordinary skill in the art would not consider omission of these parasitic capacitances reliable for evaluating performance. *Id.* at 67–69 (citing Ex. 1003 ¶¶ 92, 94, 149; Ex. 1023, Fig. 3).

In its Reply, TI contends that Dr. Galton’s first set of simulations accurately represent the behavior of Macnally’s circuit. Pet. Reply 31 (citing Ex. 1060 ¶¶ 102, 110, 111). TI argues that Dr. Galton provides ample explanation and support for how and why a person of ordinary skill in the art would have selected the parameters he chose for his first set of simulations. *Id.* at 32 (citing Ex. 1003 ¶¶ 92–94; Ex. 1042 ¶¶ 145–152; Ex. 1060 ¶¶ 78–131). TI responds to the arguments leveled by ParkerVision by asserting that Dr. Galton’s first set of simulations are reliable and accurate for the following reasons: (1) Dr. Galton models Macnally’s power supply and resistors R3 and R4 using a constant current source, which is common practice because of Macnally’s high mixer gain; (2) Dr. Galton’s use of a full-swing LO clock signal is the most straight-forward way to implement Macnally consistent with its intent; (3) Dr. Galton uses LTspice default devices for active load transistors M12 and M13 because a person of ordinary skill in the art would have expected Macnally’s power supply and resistors R3 and R4 to have current sources; (4) Dr. Galton provides specified parameter values for the operational amplifier; and (5) Dr. Galton includes parasitic capacitances. *Id.* at 32–35 (citing Ex. 1060 ¶¶ 67, 79, 82, 83, 115, 116, 121–124, 128–131; Ex. 1049 ¶ 763).

Based on the complete record, we agree with TI that Dr. Galton’s first set of simulations on Macnally’s circuit evidence that Macnally discloses the general conditions of dependent claims 19–21 (i.e., the three discharging ranges), which, as we explain, ParkerVision has not demonstrated produce

new and unexpected results and, therefore, they are not critical to the operability of the claimed invention. *See* Pet. 71–73 (citing Ex. 1003 ¶¶ 149–151). There is nothing inherently unreliable or suspect about TI using Dr. Galton’s first set of simulations accompanying the Petition as evidence to demonstrate that Macnally discloses the general conditions of dependent claims 19–21. *See Novartis*, 271 F.3d at 1054; *WiTricity*, 2025 WL 1147578, at \*3. We are mindful that Dr. Galton’s first set of simulations need not be perfect replicas of Macnally’s circuit diagram illustrated in Figure 3, but the simulations must be based on reliable scientific methodology and TI must have offered Dr. Galton for cross-examination to provide ParkerVision an opportunity to develop further arguments and evidence. *Cf. Liquid*, 449 F.3d at 1220–21. This is exactly what occurred here.

In Dr. Galton’s first Declaration accompanying the Petition, he testifies that he performed his first set of simulations on a model of Macnally’s circuit diagram illustrated in Figure 3 using the limited descriptive text available in Macnally. Ex. 1003 ¶¶ 92–94. Dr. Galton, however, testifies that he engages in routine experimentation to make reasonable choices not identified in Macnally. *See id.* According to Dr. Galton, this routine optimization occurred over 10,999 simulation cycles and it was plotted in histograms that evidence the three discharge ranges required by dependent claims 19–21. *Id.* ¶¶ 149–151. Dr. Galton was subject to cross-examination regarding his first set of simulations during a deposition held on February 28, 2025. *See* Ex. 2036. We credit Dr. Galton’s testimony that his first set of simulations on a model of Macnally’s circuit diagram illustrated in Figure 3 account for the general

conditions of dependent claims 19–21 because, in the field of circuit design, it was standard practice to use simulations such as this to predict Macnally’s circuit behavior. *See, e.g.*, Ex. 2021 ¶¶ 359, 369, 393 (Dr. Ricketts’s testimony that he ran simulations of his own to predict Macnally’s circuit behavior).

We do not agree with ParkerVision’s arguments that Dr. Galton’s first set of simulations are inaccurate and unreliable for two reasons. First, ParkerVision’s arguments in this regard impose requirements on Dr. Galton’s first set of simulations that are divorced from the requirements of independent claim 18 and dependent claims 19–21. For instance, ParkerVision faults Dr. Galton for modeling Macnally’s resistors R3 and R4 using constant current source, using a full-swing LO clock signal, not providing parameter values for an operational amplifier component, and omitting device parasitic capacitances. *See* PO Resp. 66–69. Claims 18–21, however, do not require a current source, an LO clock signal, an operational amplifier component, or device parasitic capacitance. Put simply, we decline to impose requirements on Dr. Galton’s first set of simulations that are not otherwise required by independent claim 18 and dependent claims 19–21.

Second, given that the record is devoid of evidence indicating that the routine optimization of the three discharging ranges required by dependent claims 19–21 is anything other than the exercise of ordinary skill in the art, we credit Dr. Galton’s selection of certain operational parameters to perform his first set of simulations. In our view, Dr. Galton’s selection of certain operational parameters is nothing more than using routine experimentation to predict Macnally’s circuit behavior. As one example, when addressing

Dr. Ricketts's criticism of using a full-swing LO clock signal, Dr. Galton testifies that Macnally "states that the 'LO input transistors operate as switches,' which implies that the LO signal approximates a square wave." Ex. 1060 ¶ 79. This type of routine optimization that starts with modeling Macnally's circuit diagram illustrated in Figure 3, but includes, among other things, using a full-swing LO clock signal, is consistent with Macnally's disclosure. *See* Ex. 1023, 12:19–20.

*e. ParkerVision's arguments addressing Dr. Galton's second set of simulations*

In its Patent Owner Response, ParkerVision contends that a person of ordinary skill in the art would have recognized that Dr. Galton's second set of simulations differs materially from his first set of simulations. PO Resp. 70 (citing Ex. 2021 ¶ 279). ParkerVision argues that Dr. Galton made the following material changes in his second set of simulations:

(1) replacing the current source/resistor combinations used to implement R3 and R4 in his first set of simulations with actual resistors; (2) adjusting the mixer gain by modifying the sizes and bias voltages of Macnally's transistors M1 and M2; (3) modifying the RF input signal to incorporate BFSK modulation centered at 915 MHz; (4) changing the gate length for Macnally's transistors M8–M11 from 300 nm to 600 nm; (5) using single-ended op-amps in lieu of differential macro-model operational amplifiers; and (6) redesigning all the transistors in Macnally's circuit with new dimensions, except those in the LO inverter. *Id.* at 70–72 (citing Ex. 1003 ¶ 92; Ex. 2021 ¶ 380–387; Ex. 2039 (Ex. 1 ¶ 145)). According to ParkerVision, these modifications to Dr. Galton's second set of simulations "reflect a fundamentally different simulation than the one presented in

Dr. Galton’s [first] Declaration” accompanying the Petition because the newly revised Macnally circuit “uses new component values, altered geometries, changed op-amp topologies, and a different modulation format.” *Id.* at 72–73 (citing Ex. 2021 ¶ 388); *see also id.* at 74–75 (arguing that Dr. Galton’s second set of simulations amounts to “a new/materially different theory”).

In its Reply, TI contends that, although Dr. Galton stands by his first set of simulations, he performed a second set of simulations on a model of Macnally’s circuit diagram illustrated in Figure 3 to rebut ParkerVision’s accusations that he had “chosen component values and circuit configurations to ‘get the results [that TI] needed.’” Pet. Reply 35–36 (quoting Prelim. Resp. 11) (citing Ex. 1042 ¶ 145). TI argues that Dr. Galton’s second set of simulations “are not a new theory of unpatentability,” but rather demonstrates that “taking different approaches modeling Macnally[’s]” circuit still teaches the three discharging ranges required by dependent claims 19–21. *Id.* at 36. TI responds to the arguments leveled by ParkerVision by asserting that Dr. Galton’s second set of simulations are reliable and accurate for the following reasons: (1) TI’s complaint that Dr. Galton uses an input signal that was AM-modulated is immaterial because the challenged claims do not require a specific information signal modulation; (2) although Dr. Galton’s first and second simulations use transistors with different gate lengths (i.e., 300 nm v. 600 nm), this inconsistency does not materially impact the switching behavior of the transistors; (3) Dr. Galton changes transistors to account for changes in transconductance resulting from other modifications; and (4) Dr. Galton’s reliance on cross-conducting finds sufficient evidentiary support in

Macnally. *Id.* at 36–37 (citing Ex. 1060 ¶¶ 80, 81, 102–106, 125–127, 118, 120; Ex. 1050, Table 13.7.1; PO Resp. 25, 67, 71).

Based on the complete record, we agree with TI that Dr. Galton’s second set of simulations of Macnally’s circuit evidence that Macnally discloses the general conditions of dependent claims 19–21 (i.e., the three discharging ranges), which, as we explain above, ParkerVision has not demonstrated produce new and unexpected results and, therefore, they are not critical to the operability of the claimed invention. *See* Pet. Reply 35–39; Ex. 1042 ¶¶ 145–152. There is nothing inherently unreliable or suspect about TI using Dr. Galton’s second set of simulations filed with the Patent Owner Response (and accompanying the Reply) as evidence to demonstrate that Macnally discloses the general conditions of dependent claims 19–21. *See Novartis*, 271 F.3d at 1054; *WiTricity*, 2025 WL 1147578, at \*3. We are mindful that Dr. Galton’s second set of simulations need not be perfect replicas of Macnally’s circuit diagram illustrated in Figure 3, but the simulations must be based on reliable scientific methodology and TI must have offered Dr. Galton for cross-examination to provide ParkerVision an opportunity to develop further arguments and evidence. *Cf. Liquid*, 449 F.3d at 1220–21. Once again, this is exactly what occurred here.

In Dr. Galton’s second Declaration accompanying the Reply, which also was filed by ParkerVision with the transcript of his deposition held on April 14, 2025, Dr. Galton testifies that he performed his second set of simulations on Macnally’s circuit in response to allegations leveled by ParkerVision during the preliminary phase of this proceeding that he was simply “get[ting] the results [that TI] needed. Ex. 1042 ¶ 145 (quoting Prelim. Resp. 11). As we explain above, Dr. Galton testifies that his second

set of simulations attempt to align the “component values and an input signal that match[] the information presented in Macnally . . . as closely as possible.” *Id.* Dr. Galton then identifies the changes he made to a model of Macnally’s circuit diagram illustrated in Figure 3 in his second set of simulations, including, among other things, implementing resistors R3 and R4 using actual resistors, increasing the mixer gain by changing the size and bias voltages of transistors M1 and M2, and changing the RF input signal to have BFSK modulation and a center frequency of 915 MHz. *Id.*

Similar to his first set of simulations, Dr. Galton testifies that he makes adjustments to a model of Macnally’s circuit diagram illustrated in Figure 3 for his second set of simulations. Ex. 1042 ¶ 146. According to Dr. Galton, this routine optimization occurred over 27,452 simulation cycles and it was plotted in histograms that evidence the three discharge ranges required by dependent claims 19–21. *Id.* ¶¶ 149, 150. Dr. Galton was subject to cross-examination regarding his second set of simulations during a deposition held on April 14, 2025. *See* Ex. 2039.<sup>20</sup> Once again, we credit Dr. Galton’s testimony that his second set of simulations on a model of Macnally’s circuit diagram illustrated in Figure 3 account for the general conditions of dependent claims 19–21 because, in the field of circuit design, it was standard practice to use simulations such as this to predict Macnally’s circuit behavior. *See, e.g.,* Ex. 2021 ¶¶ 359, 369, 393 (Dr. Ricketts’s

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<sup>20</sup> During this deposition of Dr. Galton held on April 14, 2025, counsel for ParkerVision only asked one question that implicated Macnally’s circuit. *See* Ex. 2039, 37:16–38:2.

testimony that he ran simulations of his own to predict Macnally's circuit behavior).

We do not agree with ParkerVision's arguments that Dr. Galton's second set of simulations are inaccurate and unreliable for two reasons. First, ParkerVision's arguments in this regard impose requirements on Dr. Galton's second set of simulations that are divorced from the requirements of independent claim 18 and dependent claims 19–21. For instance, ParkerVision faults Dr. Galton for implementing Macnally's resistors R3 and R4 using actual resistors, adjusting the mixer gain by modifying the sizes and bias voltages of Macnally's transistors M1 and M2, modifying the RF input signal to incorporate BFSK modulation centered at 915 MHz, changing the gate length for Macnally's transistors M8–M11 from 300 nm to 600 nm, using single-ended op-amps in lieu of differential macro-model operational amplifiers, and redesigning all the transistors in Macnally's circuit with new dimensions, except those in the LO inverter. *See* PO Resp. 70–72. Claims 18–21, however, do not require resistors, mixer gain, a specific input signal, specific gate lengths or dimensions for the transistors, or amplifiers. Put simply, we decline to impose requirements on Dr. Galton's second set of simulations that are not otherwise required by independent claim 18 and dependent claims 19–21.

Second, given that the record is devoid of evidence indicating that the routine optimization of the three discharging ranges required by dependent claims 19–21 is anything other than the exercise of ordinary skill in the art, we credit Dr. Galton's selection of certain operational parameters to perform his second set of simulations. In our view, Dr. Galton's selection of certain operational parameters is nothing more than using routine experimentation

to predict Macnally's circuit behavior. Similar to our analysis of Dr. Galton's first set of simulations, we agree with Dr. Galton that a person of ordinary skill in the art modeling Macnally's circuit diagram illustrated in Figure 3 would have engaged in routine optimization that includes, among other things, implementing R3 and R4 as resistors, increasing the mixer gain by changing the size and bias voltages of transistors M1 and M2, and changing the RF input signal, because engaging in this type of routine optimization is common practice in the field of circuit design.

*f. Dr. Galton's histograms*

In its Sur-reply, ParkerVision contends that TI "*solely*" relies on Dr. Galton's histograms to demonstrate that Macnally teaches the three discharge ranges required by dependent claims 19–21. PO Sur-reply 38. ParkerVision, however, argues that TI provides no explanation as to why these histograms teach the three discharge ranges only when transistors M5 and M8 are open. *Id.* ParkerVision asserts that TI cannot satisfy its burden of proof by simply pointing to bars in a histogram, without any explanation. *Id.* at 41.

As an initial matter, ParkerVision's argument criticizing Dr. Galton's use of histograms to demonstrate how Macnally's circuit satisfies the three discharge ranges required by dependent claims 19–21 only when transistors M5 and M8 are open is an improper new argument raised for the first time in the Sur-reply. In the Scheduling Order, we cautioned ParkerVision "that any arguments not raised in the [Patent Owner Response] may be deemed waived." Paper 11, 9; *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner's failure to proffer argument at trial as instructed in the scheduling order constitutes waiver). The Board

routinely holds patent owners to this standard. *See, e.g., Werner Co. v. Louisville Ladder, Inc., IPR2019-00336*, Paper 34 at 39 (PTAB Aug. 24, 2020) (Final Written Decision) explaining that a patent owner's arguments made for the first time in a Sur-reply are waived because they were not made in the Patent Owner Response, and the petitioner relied on their absence to its detriment and was deprived of the chance to present arguments and evidence in its Reply to rebut the patent owner's assertions). We see no reason to deviate from this position in this proceeding, especially because ParkerVision does not attempt to explain why we should consider its belated arguments. *See* PO Sur-reply 38–42.

In any event, even if ParkerVision did not waive its argument criticizing Dr. Galton's reliance on histograms to demonstrate how his first and second simulations of Macnally's circuit satisfy the three discharge ranges required by dependent claims 19–21, this argument is unavailing. ParkerVision fails to appreciate that Dr. Galton's histograms are merely graphical representations of collected data that display the discharging ranges of Macnally's first and second capacitors C1 and C2 that result from Dr. Galton performing first and second sets of simulations on Macnally's circuit. In our view, using histograms in this way helps to visualize the discharging ranges of Macnally's first and second capacitors C1 and C2. *See, e.g.,* Ex. 1042 ¶¶ 10, 149 (Dr. Galton testifying how he generates histograms to represent certain aspects of DeMaw's and Macnally's circuit simulations).

*e. Summary*

In summary, TI has demonstrated by a preponderance of the evidence that the three discharging ranges required by dependent claims 19–21 would have been obvious over the teachings of Macnally.

*D. Remaining Arguments*

ParkerVision contends that “[TI’s] Reply improperly attempts to circumvent the word limit[] by incorporating arguments by reference from [Dr. Galton’s] declarations, in violation of 37 C.F.R. § 42.6(a)(3).” PO Sur-reply 1. ParkerVision also argues that “[TI’s] Reply fails to cite to [Dr. Galton’s] declarations with the specificity required under [37] C.F.R. § 42.22(a)(2).” *Id.* More specifically, ParkerVision asserts that the excessive length of Dr. Galton’s second and third Declarations, together with short, conclusory arguments in TI’s Reply followed by vague and expansive citations to paragraphs in these two Declarations, force both ParkerVision and the Board “to piece together the bases of [TI’s] allegations.” *Id.* at 1–2 (citing Pet. Reply 2, 4–11, 20, 27, 32, 40; Ex. 1042; Ex. 1060). ParkerVision, therefore, asserts that we should decline to consider Dr. Galton’s declaration testimony and any supporting exhibits that are not discussed specifically in the Reply itself. *Id.* at 2.

Apart from two citations to Dr. Galton’s second Declaration that each span over fifty paragraphs (*see* Pet. Reply 2 (citing Ex. 1042 ¶¶ 16–144); Pet. Reply 11 (citing Ex. 1042 ¶¶ 18–76)), we do not agree that TI improperly incorporates by reference Dr. Galton’s testimony from his second and third Declarations in the Reply. The circumstances presented in this case are distinguishable from previous Board decisions that determined there was improper incorporation by reference. *See, e.g., Cisco Sys., Inc. v.*

*C-Cation Techs., LLC*, IPR20214-00454, Paper 12 at 7–10 (PTAB Aug. 29, 2014) (Decision Denying Institution) (informative) (explaining how footnotes and claim charts that include an incomprehensible web of citations to paragraphs in a declaration amount to improper incorporation by reference). With the exception of the two instances we identify above, this is not a case where the sheer number of paragraphs in Dr. Galton’s second and third Declarations cited in the Reply are excessive, nor is this a case where the cited paragraphs include nested string citations to other paragraphs in Dr. Galton’s second and third Declarations that amount to an incomprehensible web of citations. Instead, in most instances, we are satisfied that TI’s citations to specific paragraphs from Dr. Galton’s second and third Declarations to support its obviousness grounds based on DeMaw or Macnally fall within the purview of evidence that is permissible under 37 C.F.R. § 42.104(b)(5).

*E. ParkerVision’s Motion to Exclude*

ParkerVision filed a Motion to Exclude that seeks to exclude Exhibits 1042, 1043, 1046, 1060, and 2039 (Ex. 1). PO Mot. Exclude 1. TI filed an Opposition to ParkerVision’s Motion to Exclude (*see* Pet. Opp. to PO Mot. to Exclude), and ParkerVision filed a Reply to the Opposition to ParkerVision’s Motion to Exclude (*see* PO Reply to Pet. Opp. to PO Mot. to Exclude). We address the parties’ arguments in turn.

*1. Exhibits 1042 and 2039 (Ex. 1)*

Exhibit 1042 is a second Declaration of Dr. Galton filed with TI’s Reply. Exhibit 2039 (Ex. 1) is a verbatim copy of Dr. Galton’s second Declaration filed with ParkerVision’s Patent Owner Response. Relying on 37 C.F.R. §§ 42.23(b) and 42.123, ParkerVision contends that Dr. Galton’s

second Declaration should be excluded in its entirety because it is evidence that should have been presented earlier with the Petition as part of TI's *prima facie* case of unpatentability. PO Mot. to Exclude 1–2. ParkerVision also argues that paragraphs 5–10, 12, 13, 15, 153–171, 173, and 174 of Dr. Galton's second Declaration should be excluded under Federal Rules of Evidence ("FRE") 401 and 402 because they are not relied upon by TI in this proceeding. *Id.* at 3–4.

In its Opposition, TI contends that Exhibits 1042 and 2039 (Ex. 1) are admissible because Dr. Galton's second Declaration was requested by ParkerVision, ParkerVision had a full and fair opportunity to depose Dr. Galton regarding the testimony presented in his second Declaration, and ParkerVision was able to address that testimony in its Patent Owner Response. Pet. Opp. to PO Mot. to Exclude 1–6. TI further argues that Dr. Galton's second Declaration was responsive to arguments presented by ParkerVision in its Preliminary Response that Dr. Galton selected values and waveforms for his circuit simulations that achieve a desired result, Dr. Galton's second Declaration does not present new legal theories regarding the operations of DeMaw's and Macnally's circuits, and Dr. Galton's second Declaration is not required as evidence to establish that the challenged claims are obvious over the teachings of DeMaw or Macnally. *Id.* at 6–11. TI also argues that paragraphs 5–10, 12, 13, 15, 153–171, 173, and 174 of Dr. Galton's second Declaration are admissible under FRE 401 and 402 because they provide context for his simulations of DeMaw's circuit using the U430 JFET models, they provide a general discussion of how DeMaw performs the method of independent claim 18 and dependent claims 19–21 under various operational parameters, and they

provide context to Dr. Galton's verification of the modeling and post-processing for obtaining histogram data. *Id.* at 12.

In its Reply, ParkerVision contends that Dr. Galton's second Declaration is inadmissible because ParkerVision did not consent to the introduction of this second Declaration into the record of this proceeding, Dr. Galton's second Declaration is beyond the scope of permissible reply evidence, and Dr. Galton's second Declaration should have been introduced earlier because it amounts to critical evidence supporting the obviousness grounds presented and developed in the Petition. PO Reply to Pet. Opp. to PO Mot. to Exclude 1–3.

The party moving to exclude evidence bears the burden of proof to establish that it is entitled to the relief requested—namely, that the material sought to be excluded is inadmissible under the FRE. *See* 37 C.F.R. §§ 42.20(c), 42.62(a). As a general matter, the Board routinely encourages parties in an IPR to resolve discovery disputes on their own. *See, e.g.*, Paper 11 (“The Board encourages parties to resolve disputes relating to discovery on their own.”), Paper 18 (“We concluded the [conference] call with an understanding that the parties will continue to work together to resolve this [discovery] dispute. The parties may reach out to us for further guidance, if needed.”). As we explain above, the parties resolved the dispute surrounding Dr. Galton's second Declaration on their own.

As a quick refresher, after institution of trial, a dispute arose between the parties regarding new, updated simulations performed by Dr. Galton on a model of DeMaw's circuit diagram illustrated in Figure 6.7 (i.e., a second set of simulations). *See* Paper 18. After a conference call with the panel, the parties agreed to resolve their dispute without further intervention by the

Board. Ex. 1052. More specifically, TI agreed to provide ParkerVision with Dr. Galton's second set of simulations presented in his second Declaration, TI agreed to make Dr. Galton available for a second deposition, and TI agreed to a one-month extension of time for filing a Patent Owner Response so that ParkerVision would have sufficient time to present and develop its arguments and evidence. *Id.*; *see also* PO Resp. 37–40 (acknowledging receipt of Dr. Galton's second set of simulations).

We are not persuaded by ParkerVision's arguments that Dr. Galton's second Declaration is inadmissible because it should have been presented with the Petition. *See* PO Mot. to Exclude 1–2; PO Reply to Pet. Opp. to PO Mot. to Exclude 2–3. ParkerVision directs us to 37 C.F.R. §§ 42.23(b) and 42.123 as purportedly supporting its arguments seeking to exclude Dr. Galton's second Declaration. We do not view § 42.23(b) as providing a sufficient basis to exclude Dr. Galton's second Declaration because this rule is directed to arguments properly raised in a reply. Here, ParkerVision was in possession of Dr. Galton's second Declaration prior to filing its Patent Owner Response and, indeed, presented arguments directed to Dr. Galton's second Declaration in its Patent Owner Response. *See* PO Resp. 48–65, 70–78. Pursuant to § 42.23(b), TI was permitted to respond to these arguments from ParkerVision in its Reply. *See* Pet. Reply 12–22, 35–39.

We also do not view 37 C.F.R. § 42.123 as providing a sufficient basis to exclude Dr. Galton's second Declaration because this rule is directed to supplemental information. TI did not file Dr. Galton's second Declaration as supplemental information pursuant to § 42.123. Instead, based on an agreement reached by the parties, without further intervention by the Board, TI provided Dr. Galton's second Declaration to ParkerVision

prior to the filing of the Patent Owner Response. When filing its Patent Owner Response, ParkerVision filed Dr. Galton's second Declaration as a separate exhibit together with the deposition transcript of Dr. Galton held on April 14, 2025. Ex. 2039 (Ex. 1). TI then filed a verbatim copy of Dr. Galton's second Declaration as an exhibit accompanying its Reply. Ex. 1042.

Finally, we do not agree with ParkerVision's arguments that paragraphs 5–10, 12, 13, 15, 153–171, 173, and 174 of Dr. Galton's second Declaration should be excluded under FRE 401 and 402 for at least two reasons. *See* PO Mot. to Exclude 3–4. First, apart from asserting that TI does not rely on these cited paragraphs in this proceeding, ParkerVision does not provide an adequate explanation as to why Dr. Galton's testimony in those paragraphs is irrelevant or has little, if any, probative value. FRE 401 provides that evidence is relevant if it “has any tendency to make a fact more or less probable than it would be without the evidence” and “the fact is of consequence in determining the action.” Fed. R. Evid. 401; Fed. R. Evid. 402 (“Relevant evidence is admissible.”). Courts routinely characterize the relevance threshold as being “very low.” *See United States v. White*, 692 F.3d 235, 246 (2nd Cir. 2012) (quoting *United States v. Al-Moayad*, 545 F.3d 139, 176 (2nd Cir. 2008)). Under this standard, we find that Dr. Galton's testimony set forth in paragraphs 5–10, 12, 13, 15, 153–171, 173, and 174 of his second Declaration satisfies this low relevance threshold. Second, the policy considerations for excluding expert testimony are less compelling in a bench proceeding, such as an IPR, than in jury trials because, unlike a lay jury, the Board by statutory definition has competent scientific ability (35 U.S.C. § 6) and has significant experience in evaluating

such testimony. *See, e.g., Donnelly Garment Co. v. NLRB*, 123 F.2d 215, 224 (8th Cir. 1941) (“One who is capable of ruling accurately upon the admissibility of evidence is equally capable of sifting it accurately after it has been received.”).

In summary, ParkerVision has not met its burden of demonstrating that Dr. Galton’s second Declaration constitutes inadmissible evidence.

## *2. Exhibits 1043 and 1046*

Exhibit 1043 is an article titled “A 900-MHz CMOS Direct Conversion Receiver,” authored by Dr. Behzad Razavi. ParkerVision contends that Exhibit 1043 is inadmissible under FRE 401 and 402 because TI does not cite to, nor rely upon, Exhibit 1043 in this proceeding. PO Mot. to Exclude 4. Exhibit 1046 is an article titled “Understanding Phase Error and Jitter: Definitions, Implications, Simulations, and Measurement,” co-authored by Dr. Galton and Colin Weltin-Wu. ParkerVision argues that Exhibit 1046 is inadmissible under FRE 401 and 402 because Exhibit 1046 does not qualify as prior art to the ’342 patent. *Id.*

We do not rely on Exhibits 1043 and 1046 in reaching our decision that dependent claims 19–21 of the ’342 patent are unpatentable as obvious over the teachings of DeMaw. Nor do we rely on Exhibits 1043 and 1046 in reaching our decision that dependent claims 19–21 of the ’342 patent are unpatentable as obvious over the teachings of Macnally. Accordingly, we *dismiss* ParkerVision’s Motion to Exclude Exhibits 1043 and 1046 as moot.

## *3. Exhibit 1060*

Exhibit 1060 is the third Declaration of Dr. Galton. ParkerVision contends that paragraphs 57, 58, 114, and 115 of Dr. Galton’s third Declaration are inadmissible under FRE 702 and 703 because Dr. Galton’s

testimony as to how he generated the histograms presented in those paragraphs is incomplete and deficient. PO Mot. to Exclude 5.

ParkerVision also argues that paragraphs 32, 139, 140, 145, and 146 of Dr. Galton's third Declaration are inadmissible under FRE 401 and 402 because TI does not cite to, nor rely on, those paragraphs in this proceeding. *Id.* at 6.

In its Opposition, TI contends that paragraphs 57 and 58 of Dr. Galton's third Declaration are admissible because they demonstrate how Dr. Galton changed the existing Python code to address ParkerVision's declarant, Dr. Ricketts's, testimony. Pet. Opp. to PO Mot. to Exclude 14–15. TI argues that paragraphs 114 and 115 of Dr. Galton's third Declaration are admissible because they describe how the same Python code was used for his simulations of Macnally's circuit. *Id.* at 15. In addition, TI argues that paragraphs 32, 139, 140, 145, and 146 of Dr. Galton's third Declaration are admissible because they provide contextual and rebuttal evidence as to the conductance behavior of JFETs, they address Dr. Ricketts's misunderstanding of sampling in the context of the '342 patent, and they are relevant for Dr. Galton's conclusions/attestations. *Id.*

In its Reply, ParkerVision maintains that paragraphs 57, 58, 114, and 115 of Dr. Galton's third Declaration are inadmissible because Dr. Galton does not explain the modifications he made to the existing Python code, nor does he explain how he generates the histograms disclosed therein. PO Reply to Pet. Opp. to PO Mot. to Exclude 4–5. ParkerVision also argues that paragraphs 32, 139, and 140 of Dr. Galton's third Declaration are inadmissible because TI does not cite to, nor rely on, those paragraphs in this proceeding. *Id.* at 5.

We do not agree with ParkerVision's arguments that paragraphs 57, 58, 114, and 115 of Dr. Galton's third Declaration should be excluded under FRE 702 and 703. *See* PO Mot. to Exclude 5; PO Reply to Pet. Opp. to PO Mot. to Exclude 4–5. FRE 702 provides the following:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) the testimony is based on sufficient facts or data;

(c) the testimony is the product of reliable principles and methods; and

(d) the expert has reliably applied the principles and methods to the facts of the case.

Fed. R. Evid. 702; Fed. R. Evid. 703 (“If experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject, they need not be admissible for the opinion to be admitted.”). ParkerVision's arguments for excluding Dr. Galton's testimony in paragraphs 57, 58, 114, and 115 appear to be based on his purported lack of explanation regarding modifications he made to the existing Python code and how he generates the histograms disclosed therein. ParkerVision, however, does not dispute that Dr. Galton possesses the necessary qualifications to testify under FRE 702. In our view, ParkerVision's arguments go more towards the weight that we should accord Dr. Galton's relevant testimony and, as a result, ParkerVision does not make a convincing case for exclusion.

To the extent ParkerVision's arguments turn on the admissibility of Python code and histograms as the basis of Dr. Galton's testimony in

paragraphs 57, 58, 114, and 115, this also would not warrant exclusion. ParkerVision's declarant, Dr. Ricketts, appears to accept that a person of ordinary skill in the art in circuit design would reasonably rely on Python code to perform circuit simulations. *See, e.g.*, Ex. 2021 ¶¶ 268 (“[Dr. Galton's] new simulations were accompanied by native Python scripts and text files to facilitate easier replication of his results.”), 277 (“[Dr. Galton's] new simulations . . . were accompanied by native Python scripts and text files to facilitate replication of his results.”). Moreover, ParkerVision does not direct us to, nor can we find, evidence in the record suggesting that a person of ordinary skill in the art of circuit design would not view using histograms as an acceptable way to illustrate how circuit simulations generate particular discharging ranges. Pursuant to FRE 703, if ordinarily skilled artisans in the art of circuit design would reasonably rely on Python codes and histograms in forming their opinion, then the Python codes and histograms themselves need not be admissible for Dr. Galton's relevant testimony to be admissible.

We also do not agree with ParkerVision's arguments that paragraphs 32, 139, 140, 145, and 146 of Dr. Galton's third Declaration should be excluded under FRE 401 and 402. *See* PO Mot. to Exclude 6; PO Reply to Pet. Opp. to PO Mot. to Exclude 5. Similar to our analysis of Exhibits 1042 and 2039 (Ex. 1) above, paragraphs 32, 139, 140, 145, and 146 of Dr. Galton's third Declaration should not be excluded for the following two reasons: (1) they satisfy the low relevance threshold of FRE 401 and 402; and (2) the policy considerations for excluding Dr. Galton's testimony at issue in these paragraphs are less compelling in a bench proceeding, such as an IPR, than in jury trials because, unlike a lay

jury, the Board by statutory definition has competent scientific ability and has significant experience in evaluating such testimony.

In summary, ParkerVision has not met its burden of demonstrating that paragraphs 32, 57, 58, 114, 115, 139, 140, 145, and 146 of Dr. Galton's third Declaration constitute inadmissible evidence.

*F. TI's Motion to Exclude*

Exhibit 2021 is the Declaration of Dr. Ricketts. TI filed a Motion to Exclude that seeks to exclude paragraphs 318, 329, 342, 352, 418, 419, 421, 424, and Appendix B of Dr. Ricketts's Declaration for the following two reasons: (1) these paragraphs are inadmissible under FRE 702 because they rely on intentionally incomplete and insufficient data; and (2) these paragraphs are inadmissible under FRE 403 because they rely on data collected for a statistically insignificant amount of time, they lack probative value, and they are confusing and prejudicial. Pet. Mot. to Exclude 1–2.

We do not rely on paragraphs 318, 329, 342, 352, 418, 419, 421, 424, and Appendix B of Dr. Ricketts's Declaration in reaching our decision that dependent claims 19–21 of the '342 patent are unpatentable as obvious over the teachings of DeMaw. Nor do we rely on these paragraphs and appendix in reaching our decision that dependent claims 19–21 of the '342 patent are unpatentable as obvious over the teachings of Macnally. Accordingly, we *dismiss* TI's Motion to Exclude paragraphs 318, 329, 342, 352, 418, 419, 421, 424, and Appendix B of Dr. Ricketts's Declaration as moot.

III. CONCLUSIONS

Based on the complete trial record, TI has demonstrated by a preponderance of the evidence that claims 19–21 of the '342 patent are unpatentable. A summary of our conclusions is set forth in the table below.

| Claims                     | 35 U.S.C.<br>§ | Reference(s)/<br>Basis | Claims Shown<br>Unpatentable | Claims Not<br>Shown<br>Unpatentable |
|----------------------------|----------------|------------------------|------------------------------|-------------------------------------|
| 19–21                      | 103(a)         | DeMaw                  | 19–21                        |                                     |
| 19–21                      | 103(a)         | Macnally               | 19–21                        |                                     |
| <b>Overall<br/>Outcome</b> |                |                        | 19–21                        |                                     |

#### IV. ORDER

Accordingly, it is

ORDERED that claims 19–21 of the ’342 patent have been shown to be unpatentable;

FURTHER ORDERED that we *dismiss in part* and *deny in part* ParkerVision’s Motion to Exclude;

FURTHER ORDERED that we *dismiss* TI’s Motion to Exclude as moot; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. ¶ 90.2.

IPR2024-00934  
Patent 7,496,342 B2

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