

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Intel Corporation,  
Petitioner,

v.

Qualcomm Incorporated,  
Patent Owner

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Case IPR2018-01153  
U.S. Patent No. 8,698,558

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**PATENT OWNER'S NOTICE OF APPEAL**

Pursuant to 37 C.F.R § 90.2(a), Patent Owner, Qualcomm, Inc., (“Qualcomm” or “Patent Owner”), hereby appeals to the United States Court of Appeals for the Federal Circuit the Patent Trial and Appeal Board’s Final Written Decision in IPR2018-01153, entered on January 15, 2020 (Paper No. 28) and from all underlying orders, decisions, rulings and opinions that are adverse to Qualcomm, including, without limitation, those within the Decision on Institution of *Inter Partes* Review, entered January 16, 2019 (Paper No. 9).

In accordance with 37 C.F.R § 90.2(a)(3)(ii), Patent Owner further indicates that the issues on appeal include, but are not limited to, constitutionality of the appointment of the Administrative Patent Judges who presided over this *inter partes* review; determination of unpatentability of claims 1-9 and 13 of U.S. Patent No. 8,698,558; any finding or determination supporting or related to those issues; as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings, and opinions.

Simultaneous with this submission, a copy of this Notice of Appeal is being filed with the United States Patent and Trademark Office by way of hand delivery to the Office of General Counsel to:

Office of the General Counsel  
United States Patent and Trademark Office  
Madison Building East, Room 10B20  
600 Dulany Street  
Alexandria, Virginia 22314

In addition, this Notice of Appeal, along with a copy of the Final Written Decision, is being filed electronically with the United States Court of Appeals for the Federal Circuit along with the required docketing fees, and one paper copy of the Notice of Appeal is being provided to the Clerk's Office:

Clerk of Court  
United States Court of Appeals for the Federal Circuit  
717 Madison Place, NW, Room 401  
Washington, DC 20439

Respectfully submitted,

Date: March 13, 2020

/ Joshua R. Nightingale /  
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*Counsel for Patent Owner*

## CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on March 13, 2020, a complete and entire copy of this **PATENT OWNER'S NOTICE OF APPEAL** has been served in its entirety by e-mail on the following counsel of record for petitioner:

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INTEL CORPORATION,  
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Before TREVOR M. JEFFERSON, DANIEL N. FISHMAN, and  
SCOTT B. HOWARD, *Administrative Patent Judges*.

JEFFERSON, *Administrative Patent Judge*.

JUDGMENT  
Final Written Decision  
Determining All Challenged Claims Unpatentable  
*35 U.S.C. § 318(a)*

## I. INTRODUCTION

In the *inter partes* reviews in IPR2018-01152 and IPR2018-01153, Intel Corporation (“Petitioner”) challenges claims 1–9 and 12–14 of U.S. Patent No. 8,698,558 B2 (IPR2018-00152, Ex. 1001; IPR2018-01153, Ex. 1101; “the ’558 patent”), which is assigned to Qualcomm Incorporated (“Patent Owner”).

As explained in detail below, the references applied against the challenged claims are identical in each of the cases. A joint hearing was held for these cases. The parties rely on the same declarants submitting substantially similar declarations in each case for testimonial evidence. Under these circumstances, we determine that a combined Final Decision will promote a just, speedy, and inexpensive resolution of these proceedings.

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in these *inter partes* reviews. For the reasons discussed below, we determine that Petitioner has proven by a preponderance of the evidence that claim 12–14 of the ’558 patent are unpatentable in IPR2018-01152 and claims 1–9 of the ’558 patent are unpatentable in IPR2018-01153. *See* 35 U.S.C. § 316(e).

### A. Procedural History

In IPR2018-01152, Petitioner filed a Petition (Paper 2, “1152 Pet.”) challenging claims 12–14 of the ’558 patent. Patent Owner filed a Preliminary Response (Paper 8).<sup>1</sup> We instituted trial on all grounds of

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<sup>1</sup> Similar papers and exhibits were filed in each case with related numbering. References to papers and exhibits in this Final Written Decision refer to

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unpatentability. Paper 9 (“1152 Dec. on Inst.”), 22–23. During trial, Patent Owner filed a Response (Paper 16, “1152 PO Resp.”), Petitioner filed a Reply (Paper 20, “1152 Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 23, “1152 PO Sur-reply”).

In IPR2018-01153, Petitioner filed a Petition (Paper 3, “1153 Pet.”) challenging claims 1–9 of the ’558 patent. Patent Owner filed a Preliminary Response (Paper 8). We instituted trial on all grounds of unpatentability. Paper 9 (“1153 Dec. on Inst.”), 22–23. During the trial, Patent Owner filed a Response (Paper 16, “1153 PO Resp.”), Petitioner filed a Reply (Paper 19, “1153 Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 22, “1153 PO Sur-reply”).

A combined oral hearing for these *inter partes* reviews was held on October 28, 2019, a transcript of which appears in the record in each case. Paper 29 (“Tr.”) (IPR2018-01152); Paper 27 (IPR2018-01153).

*B. Instituted Grounds of Unpatentability*

*1. IPR2018-01152 Grounds*

We instituted *inter partes* review of claims 12–14 of the ’558 patent in IPR2018-01152 on the following grounds:

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filings in IPR2018-01152 unless otherwise specified by “1152” or “1153” preceding the citation.

Claim(s) Challenged	35 U.S.C. §	References
12, 14	102(b) <sup>2</sup>	Chu <sup>3</sup>
14	103(a)	Chu, Blanken <sup>4</sup>
13	103(a)	Chu, Choi 2010 <sup>5</sup>
13	103(a)	Chu, Choi 2010, Myers <sup>6</sup>

1152 Dec. on Inst. 22–23; 1152 Pet. 39–40, 72.

In support of these grounds, Petitioner relies on the Declaration of Dr. Alyssa Apsel (Ex. 1003), the Reply Declaration of Dr. Alyssa B. Apsel (Ex. 1027), and the Deposition of Dr. Arthur Kelley (Ex. 1028) in support the Petition. Patent Owner relies on the Declaration of Dr. Arthur Kelley (Ex. 2005) and Depositions of Dr. Alyssa Apsel (Ex. 2006; Ex. 2008).

## 2. IPR2018-01153 Grounds

We instituted *inter partes* review of claims 1–9 of the '558 patent in IPR2018-01153 on the following grounds.

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<sup>2</sup> The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the '558 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability.

<sup>3</sup> Wing-Yee Chu, et al., *A 10 MHz Bandwidth, 2 mV Ripple PA Regulator for CDMA Transmitters*, IEEE JOURNAL OF SOLID-STATE CIRCUITS 2809–2819 (2008) (Ex. 1004, “Chu”).

<sup>4</sup> P.G. Blanken, et al., *A 50MHz Bandwidth Multi-Mode PA Supply Modulator for GSM, EDGE and UMTS Application*, 2008 RADIO FREQUENCY INTEGRATED CIRCUITS SYMPOSIUM (IEEE) 401–404 (2008) (Ex. 1010, “Blanken”).

<sup>5</sup> Jinsung Choi, et al., *Envelope Tracking Power Amplifier Robust to Battery Depletion*,” Microwave Symposium Digest (MTT), 2010 IEEE MTT-S INTERNATIONAL 1074–1077 (2010) (Ex. 1007, “Choi 2010”).

<sup>6</sup> Myers, et al., U.S. Patent No. 5,929,702 (Ex. 1012, “Myers”).



Claims Challenged	35 U.S.C. §	References
6, 8	103(a)	Chu, Choi 2010
1–9	103(a)	Chu, Choi 2010, Myers

1153 Dec. on Inst. 24–25; 1153 Pet. 39–40.

Petitioner relies on the Declaration of Dr. Alyssa Apsel (1153 Ex. 1103), the Reply Declaration of Dr. Alyssa B. Apsel (1153 Ex. 1127), and the Deposition of Dr. Arthur Kelley (1153 Ex. 1128) in support of the 1153 Petition. Patent Owner relies on the Declaration of Dr. Arthur Kelley (Ex. 2005) and Depositions of Dr. Alyssa Apsel (Ex. 2006, Ex. 2008).

### *C. Related Proceedings*

Apple Inc. is identified as an additional real party-in-interest. 1152 Pet. 2. The parties inform us that the '558 patent was asserted against Petitioner in the litigation *Qualcomm Inc. v. Apple Inc.*, Case No. 3:17-cv-01375-DMS-MDD (S.D. Cal.) and against Apple in a proceeding before the International Trade Commission (“ITC”) captioned *In the Matter of Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof*, Inv. No. 337-TA-1065. 1152 Pet. 2; 1152 Paper 6, 2.

### *D. The '558 Patent and Illustrative Claims*

The '558 patent is titled “Low-Voltage Power-Efficient Envelope Tracker” and discloses “[t]echniques for efficiently generating a power supply for a power amplifier” used in communication system transmitters. Ex. 1001, 1:30–31, code (54). The '558 patent discloses that a

transmitter typically includes a power amplifier (PA) to provide high transmit power for the output RF signal. The power amplifier should be able to provide high output power and have high power-added efficiency (PAE). Furthermore, the power amplifier may be required to have good performance and high PAE even with a low battery voltage.

*Id.* at 1:21–26. The '558 patent also discloses that the power amplifier apparatus may include: (1) in one embodiment, an envelope amplifier and a boost converter; (2) in a second embodiment a switcher, an envelope amplifier, and a power amplifier; or (3) in a third embodiment, a switcher that may sense an input current and generate a switching signal to charge and discharge an inductor providing a supply current. *Id.* at 1:31–34, 1:51–52, 1:66–2:2.

Figure 3, below, shows an exemplary switcher and envelope amplifier. Ex. 1001, 4:39–42.

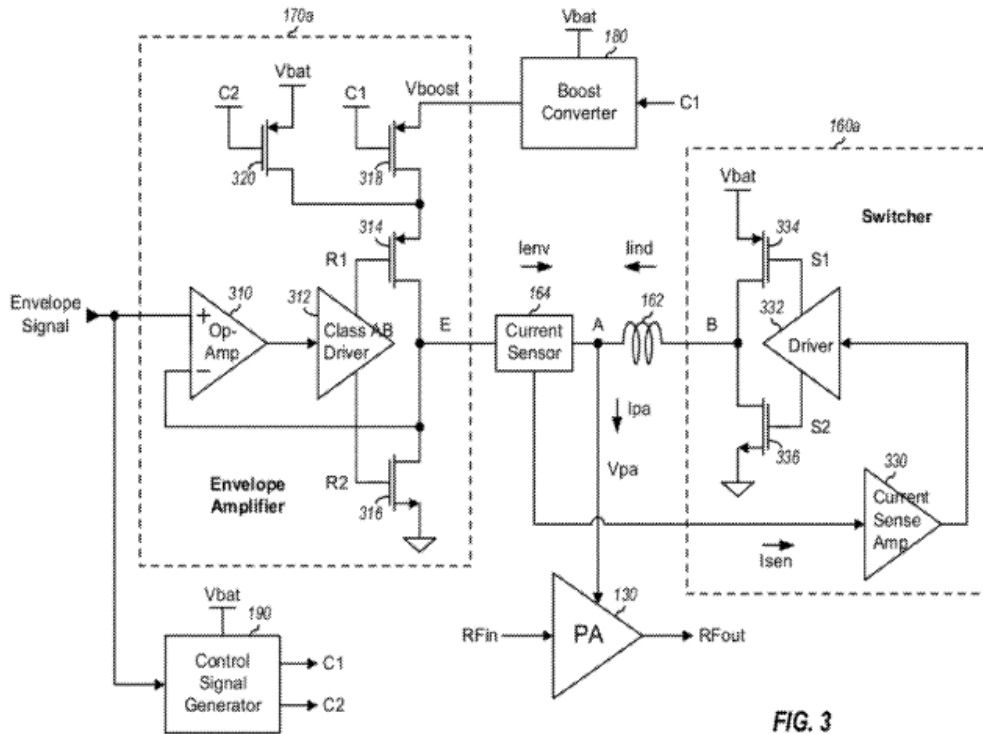


FIG. 3

Figure 3 shows switcher 160a and envelope amplifier 170a, which, in turn, includes operational amplifier (op-amp) 310 that receives the envelope signal. *Id.* at 4:41–63. Driver 312 has output (R1) coupled to the gate of P-channel metal oxide semiconductor (PMOS) transistor 314 and a second output (R2) coupled N-channel MOS (NMOS) transistor 316. *Id.* PMOS

transistor 318 in envelope amplifier 170a is connected to receive C1 control signal via Vboost voltage from Boost Converter 180. *Id.* PMOS transistor 320 in envelope amplifier 170 receives a C2 control signal and Vbat voltage. *Id.*

Within switcher 160a, current sense amplifier 330 has its input coupled to current sensor 164 and its output coupled to an input of switcher driver 332. Ex. 1001, 4:64–66. Vbat voltage of switcher 160a provides current to power amplifier 130 via inductor 162 when the switcher is ON, and inductor 120 provides stored energy to power amplifier 130 during the OFF state of the switcher circuit. *Id.* at 5:14–30. In the ON state, the switcher is joined with the current from the envelope amplifier 170a ( $I_{env}$ ) to provide a combined current ( $I_{pa}$ ) to PA 130. *See id.* at 3:21–27.

The '558 patent also discloses another embodiment for the switcher circuit of Figure 3—specifically a switcher that uses offset current to lower the  $I_{sen}$  current from the current sensor, keeping the switcher in the ON state for a longer time and producing a larger  $I_{ind}$  current provided to power amplifier 130. *Id.* at 1:5–48, Fig. 5.

Claims 1, 6, 8, and 12 are independent. Claims 6, 7, 12, and 13 are illustrative and reproduced below (Ex. 1001, 11:42–11:67, 12:51–13:14).

6. An apparatus for wireless communication, comprising:
  - a power amplifier operative to receive and amplify an input radio frequency (RF) signal and provide an output RF signal; and
  - a supply generator operative to receive an envelope signal and a first supply voltage, to generate a boosted supply voltage having a higher voltage than the first supply voltage, and to generate a second supply voltage for the power amplifier based on the envelope signal and the boosted supply voltage, wherein

the supply generator incorporates an operational amplifier (op-amp) operative to receive the envelope signal and provide an amplified signal, a driver operative to receive the amplified signal and provide a first control signal and a second control signal, a P-channel metal oxide semiconductor (PMOS) transistor having a gate receiving a first control signal, a source receiving the boosted supply voltage or the first supply voltage, and a drain providing the second supply voltage, and an N-channel metal oxide semiconductor (NMOS) transistor having a gate receiving the second control signal, a drain providing the second supply voltage, and a source coupled to circuit ground.

7. The apparatus of claim 6, wherein the supply generator is operative to generate the second supply voltage based on the envelope signal and either the boosted supply voltage or the first supply voltage.

12. An apparatus comprising:

a switcher operative to receive a first supply voltage and provide a first supply current;

an envelope amplifier operative to receive an envelope signal and provide a second supply current based on the envelope signal; and

a power amplifier operative to receive an envelope signal and provide a second supply current based on the envelope signal; and

a power amplifier operative to receive a total supply current comprising the first supply current and the second supply current, wherein the switcher comprises

a current sense amplifier operative to sense the first supply current, or the second supply current, or the total supply current and provide a sensed signal,

a driver operative to receive the sensed signal and provide a first control signal and a second control signal,

a P-channel metal oxide semiconductor (PMOS) transistor having a gate receiving the first control signal, a source receiving

the first supply voltage, and a drain providing a switching signal for an inductor providing the first supply current, and

an N-channel metal oxide semiconductor (NMOS) transistor having a gate receiving the second control signal, a drain providing the switching signal, and a source coupled to circuit ground.

13. The apparatus of claim 12, further comprising:

a boost converter operative to receive the first supply voltage and provide a boosted supply voltage having a higher voltage than the first supply voltage, wherein the envelope amplifier operates based on the first supply voltage or the boosted supply voltage.

## II. ANALYSIS

### A. *Level of Ordinary Skill in the Art*

The parties do not materially dispute the level of ordinary skill in the art. *See* 1152 PO Resp. 9–10; 1152 Pet. 38–39. Petitioner argues a person of ordinary skill in the art related to the '558 patent at the time of filing would have a Master's degree in electrical engineering, computer engineering, or computer science and would also have at least two years of relevant experience or a Bachelor's degree in one of those fields and four years of relevant experience, where relevant experience "refers to experience with mobile device architecture as well as transmission and power circuitry for radio frequency devices." 1152 Pet. 38–39 (citing Ex. 1001, code (57), 1:7–9, 1:30–31; Ex. 1003 ¶¶ 84–85).

We are persuaded by Petitioner's definition of the level of ordinary skill in the art and we find the work experience is commensurate with the level of ordinary skill in the art as reflected in the prior art. *See In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Here, as Petitioner has asserted,

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we discern the prior art, as well as the '558 patent, requires a degree of knowledge that is specific to mobile device architecture as well as transmission and power circuitry for radio frequency devices. *See* 1152 Pet. 38–39; Ex. 1001, code (57), 1:7–9, 1:30–31.

*B. Claim Interpretation*

In an *inter partes* review for a petition filed before November 13, 2018, a claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears. 37 C.F.R. § 42.100(b) (2017); *see* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b); effective November 13, 2018). The Petition was accorded a filing date of June 28, 2018, and therefore, the broadest reasonable interpretation standard for claim interpretation applies. *See* Paper 5 (Notice of Filing Date Accorded to Petition).

In applying a broadest reasonable interpretation, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). This presumption may be rebutted when a patentee, acting as a lexicographer, sets forth an alternate definition of a term in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Furthermore, only terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013,

1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

1. “*current sense amplifier*” (claim 12)

Petitioner offers a claim construction for “current sense amplifier” (claim 12) to mean an “amplifier that produces a voltage from a current,” which is based on the ALJ’s construction in the parallel ITC proceeding. 1152 Pet. 37–38 (citing Ex. 1023, 11–12). Petitioner argues that the ITC construction is consistent with the ’558 patent specification and the knowledge of a person of ordinary skill in the art. 1152 Pet. 37–38. Patent Owner argues that this term does not require construction, but does not contest Petitioner’s contention or our adoption of this construction in the Institution Decision. 1152 PO Resp. 9.

Based on the full record and for the reasons given by the ALJ in the ITC proceeding (Ex. 1023, 11–12), we adopt the construction of “current sense amplifier” to mean an “amplifier that produces a voltage from a current.”

2. “*envelope signal*” (claims 1, 6–8, and 12)

Petitioner offers a claim construction for “envelope signal” (claim 12) to mean a “signal indicative of the upper bound of the output RF signal,” which is the ALJ’s construction in the ITC proceeding. 1152 Pet. 38; Ex. 1023, 13–14. Patent Owner argues that this term does not require construction, but does not contest Petitioner’s contention or our adoption of this construction in the Institution Decision. 1152 PO Resp. 9.

Based on the full record and for the reasons given by the ALJ (Ex. 1023, 13–14), we adopt the ITC construction for “envelope signal” to mean a “signal indicative of the upper bound of the output RF signal.”

3. “a P-channel metal oxide semiconductor (PMOS) transistor [having] . . . a source [receiving/that receives] the boosted supply voltage or the first supply voltage” (claims 6 and 8) and “wherein the envelope amplifier operates based on the first supply voltage or the boosted supply voltage” (claim 13)

Claims 6 and 8 recite in pertinent part “a P-channel metal oxide semiconductor (PMOS) transistor [having] . . . a source [receiving/that receives] the boosted supply voltage or the first supply voltage.” Claim 13 recites a similar limitation. At issue for claims 6, 8, and 13 is the interpretation of whether the PMOS transistor source or the envelope amplifier is required to receive (operate) on both the first supply voltage and the boosted supply voltage or whether one of these voltages would suffice to satisfy the limitation of claims 6, 8, and 13.

Patent Owner argues that “[t]he only reasonable interpretation of this claim element, properly read within the context of the claim as a whole, is that the source of the PMOS transistor must be able to receive, *selectively*, *either* the boosted supply voltage or the first supply voltage (referred to herein as a ‘*selective boost*’).” 1153 PO Resp. 19 (emphasis added) (citing 1153 Ex. 2005 ¶¶ 47–61); *see* 1152 PO Resp. 9 (stating same selective boost required for claim 13 between the first supply voltage and the boosted supply voltage) (citing 1152 Ex. 2005 ¶¶ 48–56).

With respect to claim 6 in IPR2018-001153, Patent Owner argues that the text of claim 6 requires a supply generator that generates two supply voltages. 1153 PO Resp. 21–22 (citing Ex. 1001, 11:42–63). Thus, the claim 6 limitations directed to the transistor source receiving said supply voltages from the generator refers to *selectively* receiving the first supply



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voltage or boosted supply voltage. *Id.* Thus, this selective boost is required for claim 6 and the related limitation in claim 8.

Patent Owner asserts that to interpret it otherwise would render portions of the claims meaningless or superfluous and cannot be correct. 1153 PO Resp. 20–21 (citing *Digital-Vending Servs. Int’l, LLC v. Univ. of Phoenix, Inc.*, 672 F.3d 1270, 1275 (Fed. Cir. 2012); *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1288 n.10 (Fed. Cir. 2017)). Patent Owner argues that to adopt Petitioner’s construction and allow the transistor to receive either one of the voltages alone would render the other supply voltage an optional signal that need not be present throughout the claim. 1153 PO Resp. 22.

Claim 7, which depends from independent claim 6, recites “wherein the supply generator is operative to generate the second supply voltage based on the envelope signal *and either* the boosted supply voltage *or* the first supply voltage” (emphasis added). Relying on Petitioner’s concession that claim 7 requires a selective boost (*see e.g.*, 1153 Pet. 80–81), Patent Owner argues that claim 6, which generates two voltages applied to the PMOS transistor source, indicates that the transistor source must be capable of receiving either one of two boosted voltages (selectively) as recited in claim 7. 1153 PO Resp. 23. Thus, “despite [claim 6’s] inclusion of the conjunction ‘or,’ the ‘boosted supply voltage’ and the ‘first supply voltage’ [of claim 6] are not alternative options—the claimed PMOS source must be capable of receiving both. No other interpretation makes sense in the context of [claims 6 and 8].” 1153 PO Resp. 24.

Claim 13, which depends from claim 12, also requires the “selective boost” discussed above for claims 6 and 7, as it recites “wherein the

envelope amplifier operates based on the first supply voltage or the boosted supply voltage.” (Ex. 1001, 1:42–50, 8:55–62). The limitation in claim 13 mirrors the limitation in claim 6 and requires the amplifier (recited as a transistor in claim 6) to receive or operate on a first voltage or a boosted voltage. Patent Owner contends that read in context of the claims:

The claim 13 limitation “a boost converter operative to receive the first supply voltage and provide a boosted supply voltage having a higher voltage than the first supply voltage” serves no purpose whatsoever [under Petitioner’s construction]. The only reasonable interpretation is that the envelope amplifier must be able to receive both voltage inputs, and *selectively choose* which one to use. That is, the envelope amplifier operates based on one or the other supply voltage, but it must receive both and *selectively choose* which one to use.

1152 PO Resp. 24 (emphasis added).

Patent Owner argues that the ’558 patent specification also supports this conclusion as it refers to an amplifier receiving “the boosted supply voltage or the first supply voltage” and “the first supply voltage or the boosted supply voltage,” but always does so in the context of an example employing a selective boost. Ex. 1001, 1:42–50, 8:55–62; *see* 1152 PO Resp. 20; 1153 PO Resp. 24–25. In the remaining instances where the first supply voltage or boosted supply voltages are referenced without an example of a selective boost (Ex. 1001, 8:62–9:17; 9:21–36; 10:19–29), the passages refer to Figures 3 or 5 of the ’558 patent, and both figures show an amplifier operating on *either* a first supply voltage or a boosted supply voltage. 1152 PO Resp. 21–22 (citing Figures 3 and 5); *see* 1153 PO Resp. 26–27 (discussing same). Patent Owner’s annotated Figures 3 and 5 from the ’558 patent are provided below.

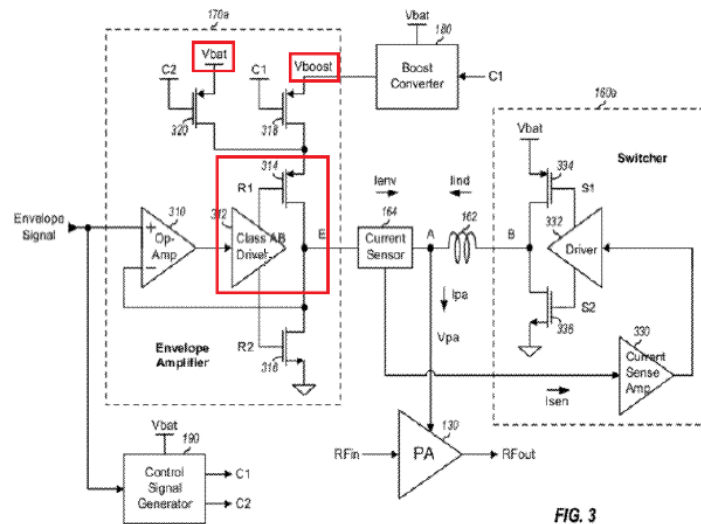


FIG. 3

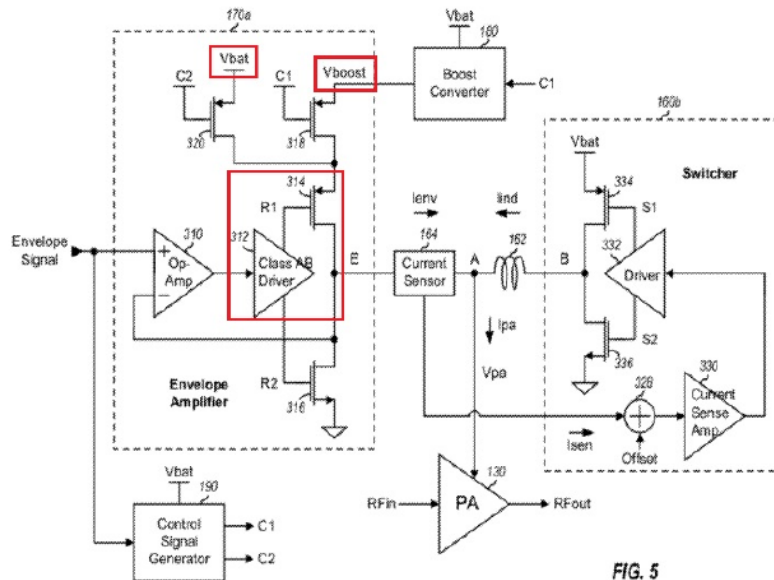


FIG. 5

1152 PO Resp. 21–22. Patent Owner’s annotated Figures 3 and 5 from the ‘558 patent both show Vbat (first supply voltage) and Vboost (boosted supply voltage) connected as inputs into the source of PMOS transistor 314. *Id.* at 22–23 (citing Ex. 1001, 5:31–49). Patent Owner avers that under Petitioner’s proposed construction, a system that was capable of receiving only Vbat would render the features and limitations directed to a boosted voltage meaningless. 1152 PO Resp. 27–28

Patent Owner asserts that Petitioner's reliance on the text of the claim recitation of "or" in claims 6, 8, and 13 as merely providing alternatives that would operate on only one voltage is mistaken because it is inconsistent with the language of the specification and would render aspects of claims 6, 8, and 13 meaningless. *See* 1152 PO Resp. 23–24 (citing *Wasica Fin.*, 853 F.3d at 1288 n.10; *In re Gaubert*, 524 F.2d 1222 (CCPA 1975)); 1153 PO Resp. 20, 29 (noting same). Patent Owner also contends that textual reading of the claim limitations for claims 6, 8, and 13 in a conjunctive manner that allows only one supply voltage to be present would be contrary to the disclosed embodiments and inconsistent with the claim language as a whole. 1152 PO Resp. 25; 1153 PO Resp. 29.

Finally, Patent Owner argues that Dr. Apsel, Petitioner's declarant, admitted that "based on" as recited in claim 6 requires that both of the claimed voltages must be available. 1152 PO Resp. 24 (citing Ex. 2004, 42:19–43:9); *see* 1153 PO Resp. 24 (citing same).

Petitioner responds that the plain language of claims 6 and 13 recites an "envelope amplifier" that "operates based on the first supply voltage *or* the boosted supply voltage." 1152 Pet. Reply 3 (emphasis added); Ex. 1001, 13:13–15; 1153 Pet. Reply 3. Furthermore, Patent Owner's declarant agrees that the conjunctive use of "or" identifies, in plain English, the recitation of two alternatives. 1152 Pet. Reply 3 (citing Ex. 1028, 130:10–18, 130:19–131:2); 1153 Pet. Reply 3–4. Petitioner relies heavily on the plain meaning of the claims, which recite the conjunctive "or" in reference to the source receiving the boosted supply voltage or the first supply voltage.

We are not persuaded by Petitioner's evidence and argument. First, Petitioner's reliance on the text of the claims fails to construe the claims in

light of the intrinsic record. *See In re Translogic Tech.*, 504 F.3d at 1257. Petitioner does not address the '558 patent specification and the repeated references in context that inform the dual supply voltages and their operation at the source of the amplifier. *See* Ex. 1001, 1:42–50, 8:55–62, 8:62–9:17, 9:21–36, 10:19–29, Figs. 3 and 5; *see* 1152 PO Resp. 20; 1153 PO Resp. 24–25. Although we agree that use of the conjunctive “or” in claims 6, 8, and 13 is an acceptable mechanism for claiming alternatives such that only one of the limitations need be found in the prior art (*see In re Gaubert*, 524 F.2d 1222 (CCPA 1975)), claim limitations under the broadest reasonable interpretation must also be interpreted in light of the intrinsic record (*see In re Translogic Tech.*, 504 F.3d at 1257). In the present case, the context of the claim limitations and '558 patent specification inform the scope of the claims.

Petitioner's arguments assert both that Patent Owner improperly limits the construction to one disclosed embodiment (1152 Pet. Reply 7; 1153 Pet. Reply 7) and that the Patent Owner's construction improperly excludes a disclosed embodiment (1153 Pet Reply 6–7; Ex. 1001, 8:24–26). We are not persuaded by Petitioner's argument that Patent Owner's construction should be rejected because it excludes an embodiment. 1152 Pet. Reply 7 (citing *EPOS Techs. Ltd. v. Pegasus Techs. Ltd.*, 766 F.3d 1338, 1347 (Fed. Cir. 2014); *Anchor Wall Sys., Inc. v. Rockwood Retaining Walls, Inc.*, 340 F.3d 1298, 1308 (Fed. Cir. 2003); *Dow Chem. Co. v. Sumitomo Chem. Co.*, 257 F.3d 1364, 1378 (Fed. Cir. 2001)). The cases Petitioner cites refer to constructions that read out *preferred* embodiments. *See EPOS Techs.*, 766 F.3d at 1347; *Dow Chem. Co.*, 257 F.3d, at 1378; *Anchor Wall Sys.*, 340 F.3d at 1308. Petitioner provides no persuasive evidence that the

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embodiment they identify as being excluded is the preferred embodiment of the '558 patent. Further, Petitioner cites no support that claims 6, 8 and 13 must be construed to cover all embodiments. *See Baran v. Med. Device Techs., Inc.*, 616 F.3d 1309, 1316 (Fed. Cir. 2010); 1152 PO Sur-reply 6.

The Federal Circuit has stated that the broadest reasonable construction is not required to cover the most embodiments in a patent specification, but “must be *reasonable* in light of the claims and specification. The fact that one construction may cover more embodiments than another does not categorically render that construction reasonable.” *PPC Broadband, Inc. v. Corning Optical Commc’ns RF, LLC*, 815 F.3d 747, 755 (Fed. Cir. 2016); *see* 1152 PO Sur-reply 6 (citing same). We are not persuaded by Petitioner’s argument that exclusion of a single embodiment renders Patent Owner’s claim construction improper.

We are also not persuaded by Petitioner’s contention that in related proceedings before the United States District Court for the Southern District of California, the court issued a claim construction for a related term in claim 7 of the '558 patent that construed “or” in similar manner as Petitioner proposes here. 1153 Pet. Reply 5–6 (citing Ex. 1026, 5–6); 1152 Pet. Reply 4–6 (citing same). The district court was faced with assessing whether “based on” in claim 7 of the '558 patent was indefinite or should be construed according to its plain meaning. Ex. 1026, 5. The court found that because dependent claim 7 acted to expand the scope of a dependent claim to include another possible combination not claimed in the claim from which it depended, the term “based on” in claim 7 was indefinite. *Id.* at 6. The court’s discussion of indefiniteness does not construe the term “or” as recited in claims 6, 8, or 13. We do not agree with Petitioner that the court

addressed the scope of claim 6 or even construed the word “or” in claim 6 by implication. *Id.* at 5–6; 1153 Pet. Reply 5–6. Petitioner’s reliance on the district court’s discussion is unpersuasive here.

Turning to the claims, Petitioner agrees that dependent claim 7 recites a selective boost requirement, but notes that similar language is missing from claims 6, 8, and 13, which use the conjunctive “or” without additional terms and indicate that a skilled artisan need only use one of either a boosted or first supply voltage. 1153 Pet. Reply 5–6; 1152 Pet. Reply 5–6. Petitioner contends that if claim 6 included a selective boost, claim 7, which adds limitations that “the supply generator is operative to generate the second supply voltage based on the envelope signal and either the boosted supply voltage or the first supply voltage,” would add nothing. *Id.* We disagree. Claim 7 modifies the “second supply voltage” from the supply generator of claim 6 and introduces two alternate options for the second supply voltage. *See* 1153 PO Sur-reply 4. Claim 7 does not alter the first supply voltage recited in claim 6, which along with the boosted voltage make up the two voltages that are available for the source of the PMOS transistor. *See* 1153 PO Resp. 23–24, *see also* 1152 PO Resp. 21–22 (citing Figures 3 and 5); 1153 PO Resp. 26–27 (discussing same).

Finally, we are not persuaded by the extrinsic cross-examination testimony. Neither Petitioner nor Patent Owner cites compelling testimony regarding the interpretation of claims 6, 8, and 13. *See* 1153 Pet. Reply 4–5 (citing Ex. 1028, 147:10–151), 7 (citing Ex. 1028, 134:12-18), 8–9; 1153 PO Resp. 24 (citing Ex. 2006, 42:19–43:9); 1153 PO Sur-reply 7–8. The cross-examination testimony cited by both parties does not place the terms in

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context of the specification or claims and, on this record, is not persuasive or determinative regarding the interpretation of claim 6, 8, and 10.

The broadest reasonable interpretation is what would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See Translogic*, 504 F.3d at 1257. Applicable here is that the '558 specification and the context of claims 6, 8, and 13 and their related claims support that the amplifier (PMOS transistor) must be able to receive both the boosted supply voltage and the first supply voltage as recited in the claims.

Ex. 1001, 1:42–50, 8:55–62, 8:62–9:17, 9:21–36, 10:19–29, Figs. 3 and 5; *see* 1152 PO Resp. 20; 1153 PO Resp. 24–25. Most importantly, Petitioner acknowledges that dependent claim 7 requires a selective boost by adding limitations to the supply generator of claim 6. 1153 Pet. Reply 5–6 (noting that claim 7 adds the “second supply voltage based on the envelope signal *and either* the boosted supply voltage *or* the first supply voltage” (emphasis added) to claim 6 creating a selective boost). Yet, Petitioner contends inconsistently that the PMOS source of claim 6 (that receives the supply generator of claim 7) need only receives the first supply voltage or the boosted supply voltage when interpreting claims 6 and 8. *See* 1153 Pet. Reply 5–6, 1153 PO Resp. 23; Ex. 2005 ¶ 60. We determine that a construction consistent with the specification and dependent claim 7 requires that both generated voltages of claim 6 (the boosted supply *or* the first supply voltage) be available to the PMOS source of claim 6 (Claim 7: “wherein the supply generator is operative to generate the second supply voltage based on the envelope signal and either the boosted supply voltage or the first supply voltage”). The related claim language in claims 8 and 13 requires similar interpretation. We also credit and find persuasive Patent



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Owner's evidence that the '558 specification refers to the capability of receiving or operating on both voltages at the source (envelope amplifier). *See* 1152 PO Resp. 20–22; 1153 PO Resp. 24–27.

Based on the full record, we are persuaded by Patent Owner's arguments that the specification and context of the claims support the broadest reasonable interpretation that claims 6, 8, and 13 require that both a first supply voltage and second supply voltage be available at the amplifier (claim 13) and PMOS transistor source (claims 6 and 8).

We apply this interpretation in our analysis of the teachings of the prior art below.

### *C. Principles of Law*

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008). Although the elements must be arranged or combined in the same way as in the claim, "the reference need not satisfy an *ipsissimis verbis* test," i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009) (citing *In re Bond*, 910 F.2d 831, 832–33 (Fed. Cir. 1990)).

A patent claim is unpatentable under 35 U.S.C. § 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 ordinary skill in the art; and (4) any secondary considerations, if in evidence.<sup>7</sup> *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

*D. Grounds based on Chu and Blanken (IPR2018-01152)  
(Claims 12 and 14)*

Petitioner asserts that claim 12 and 14 are anticipated by Chu, and claim 14 would have been rendered obvious by Chu and Blanken. 1152 Pet. 40–59, 59–63 (citing 1153 Ex. 1003 ¶¶ 87–118). “Patent Owner does not contest these grounds and agrees to cancel claims 12 and 14.” 1152 PO Resp. 1. We deem Patent Owner’s statement regarding claims 12 and 14 to be an admission that Chu anticipates claims 12 and that claim 14 would have been rendered obvious by Chu and Blanken.

Having considered the full record developed during trial, Petitioner has demonstrated by a preponderance of the evidence that claims 12 and 14 of the ’558 patent are anticipated by Chu, and that claim 14 of the ’558 patent would have been unpatentable under 35 U.S.C. § 103(a) in view of Chu and Blanken.

*E. Grounds based on Chu, Choi 2010, and Myers (IPR2018-01152)  
(Claim 13)*

*1. Chu*

Chu is a 2008 paper titled “A 10 MHz Bandwidth, 2 mV Ripple PA Regulator for CDMA Transmitters” that discloses a power amplifier that contains a master-slave linear and switch-mode supply modulator with fast dynamic transient response. Ex. 1004, 2809. Chu discloses “[a] combined

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<sup>7</sup> Patent Owner does not present any objective evidence of nonobviousness (i.e., secondary considerations) as to any of the challenged claims.

class-AB [linear amplifier] and switch-mode regulator based supply modulator with a master-slave architecture achieving wide bandwidth and low ripple.” *Id.* Figure 4 of Chu, below, shows the block diagram of the master-slave linear and switch-mode combined supply modulator loaded with a PA. *Id.* at 2810.

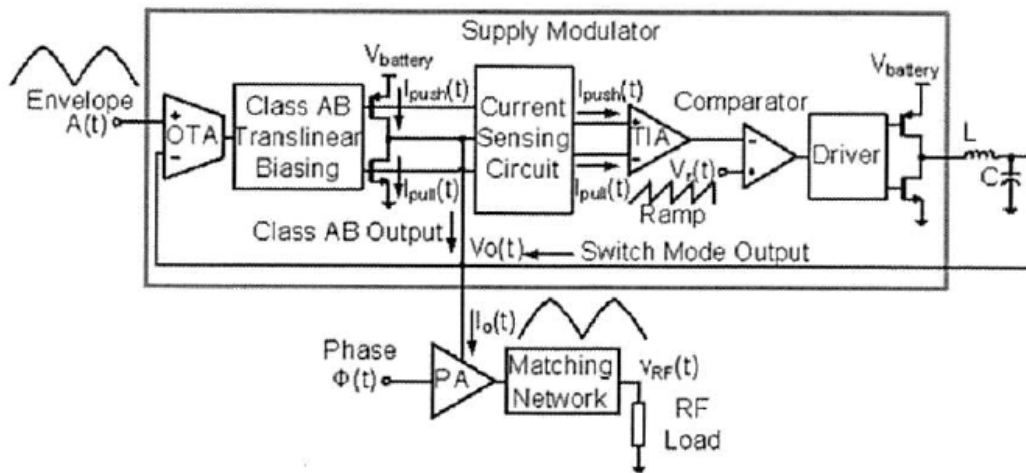


Figure 4 depicts the proposed master-slave linear and switch-mode PA regulator block diagram. Figure 4 shows a current sensing circuit, high gain transimpedance amplifier, and switch-mode regulator that form a feedback control loop that suppresses the current output from the linear amplifier within the switch-mode regulator bandwidth. *Id.* at 2810.

## 2. Choi 2010

Choi 2010 is a paper titled “Envelope Tracking Power Amplifier Robust to Battery Depletion” that describes “[a] wideband envelope tracking power amplifier” with an integrated boost converter to keep a stable operation of the power amp supply modulator. Ex. 1007, 1074.

## 3. Myers

Myers is a United States patent that discloses “[a] method and apparatus for efficient power amplification of a high dynamic range signal”

using an envelope detector, multi range modulator, and power amplifier. Ex. 1012, code (57). Myers discloses that “multi-range modulator (270) efficiently amplifies the envelope of the input signal by selecting a power source as a function of the amplitude of the input signal.” *Id.* “When the amplitude of the input signal rises above a reference, the duty cycle and the amplitude are modified so as to keep the multi-range modulator in an operating region of high efficiency.” *Id.*

4. *Claim 13 Analysis*

a) *Chu and Choi 2010*

Petitioner contends that claim 13, which depends from claim 12, would have been obvious in view of Chu and Choi 2010. 1152 Pet. 64–72. Petitioner’s arguments for Chu and Choi 2010 assert that the combination teaches the claim 13 limitation (wherein the envelope amplifier operates based on the first supply voltage or the boosted supply voltage; Ex. 1001, cl. 13) because claim 13 does not require selectivity. 1152 Pet. 72. Petitioner concedes that the combination does not teach selectivity between two supply voltages. *Id.* Because we determined above (*see* Section II.B.3) that claim 13 requires the two supply voltages to be selectively available, Petitioner has failed to show by a preponderance of the evidence that claim 13 would have been rendered obvious over Chu and Choi 2010.

b) *Chu, Choi, and Myers*

Petitioner asserts that claim 13, which depends from claim 12, would have been obvious in view of Chu, Choi 2010, and Myers. 1152 Pet. 72–79; *see* 1152 Pet. 64–72; Ex. 1003 ¶¶ 119–130, 131–140. Because Patent Owner concedes the unpatentability of claim 12 over Chu (1152 PO Resp. 1), the issue is whether Chu, Choi 2010, and Myers teach the limitation of

dependent claim 13. 1152 Pet. 72–79; Ex. 1003 ¶¶ 132–140. The pertinent part of claim 13 recites “wherein the envelope amplifier operates based on the first supply voltage or the boosted supply voltage.” Petitioner argues:

When combined with Myers, the Chu envelope amplifier would . . . be able to operate selectively by choosing a power source—either the boosted voltage generated by the boost converter provided by Choi 2010 or the battery supply voltage (the “first supply voltage”) already disclosed in Chu—and generate the second supply voltage based on either the first supply voltage (battery voltage) or the boosted supply voltage, as circumstances warrant.

1152 Pet. 72–73 (citing Ex. 1003 ¶¶ 132, 141). Petitioner cites Figure 7 of Myers, which shows a method that selects one voltage supply from a plurality of power sources for the input signal of an amplifier. 1152 Pet. 73–74; *see* Ex. 1012, 9:8–12, 9:22–41, Figs. 7, 8.

Patent Owner does not dispute Petitioner’s arguments mapping the limitations of claims 12 and 13 to Chu, Choi 2010, and Myers. 1152 PO Resp. 1, 25–44. Patent Owner argues that Petitioner has failed to demonstrate a sufficient motivation to combine Chu with Choi 2010, and Myers with Chu and Choi 2010. *Id.* at 25–36, 36–44.

Petitioner offers a motivation to combine Chu with Choi 2010, and Myers with Chu and Choi 2010. 1152 Pet. 67–71 (motivations to combine Chu and Choi 2010), 75–79 (motivation to combine Chu, Choi 2010, and Myers); Ex. 1003 ¶¶ 127–129, 138–140. Petitioner provides testimony and citations to Choi 2010 to establish that it would have been obvious to modify Chu’s supply modulator to incorporate the boost converter of Choi 2010 to prevent distortion as the battery voltage falls, based on teachings within Choi 2010. 1152 Pet. 66–68 (citing Exs. 1007, 1074, 1077); Ex. 1003 ¶ 126.

In addition, Petitioner cites contemporary references in the art regarding preventing distortion of the amplified signal. 1152 Pet. 68–70 (citing Ex. 1018, Abstract; Ex. 1015, 8); Ex. 1003 ¶ 127.

With respect to Myers, Petitioner argues that adding the power selection functions of Myers would have promoted efficiency in operation and battery life as evidenced directly from Myers. 1152 Pet. 75–78 (citing Ex. 1012, 1:19–23, 3:47–59, 9:18–21); Ex. 1003 ¶¶ 136–139.

Patent Owner asserts that Petitioner’s arguments are based on hindsight reconstruction as the references address different problems with different solutions that are at tension with each other. 1152 PO Resp. 25, 26. Patent Owner does not contest that efficiency, output distortion, or robustness problems Petitioner identifies were generally known in the art, but argues that in a person of ordinary skill in the art “looking to maximize efficiency and minimize output power degradation in a cellular receiver had to make a trade-off: either maximize efficiency at the cost of output power degradation (like in Chu), or minimize the output power degradation at the cost of reducing efficiency (like in Choi 2010). *Id.* at 26–27. Patent Owner also contends that Petitioner ignores the problem of how to solve both problems and fails to advance how these solutions will be applied in the combination of Chu and Choi 2010. *Id.* at 27–29. Patent Owner also discounts the related references Petitioner cites (Ex. 1018, Ex. 1015) because their technology is not relevant to the linear amplifier used in the applications of Chu and Choi 2010 and contains material differences in how the amplifier designs function. 1152 PO Resp. 28–30; Ex. 2005 ¶¶ 85–91.

Patent Owner’s arguments regarding motivation to combine are not persuasive. We credit Petitioner’s argument and evidence regarding the Chu

and Choi 2010 concerns with power degradation and efficiency, which Patent Owner's declarant testified were common concerns known before the '558 patent. 1152 Pet. Reply 11–12 (citing Ex. 1028, 13:12–20, 13:21–14:2, 259:7–18); Ex. 1027 ¶ 18. We find that Petitioner presents persuasive evidence and argument that the issues of power degradation and efficiency were known in the art and within the knowledge and skill of a person of ordinary skill in the art. *See id.*; *see also* 1152 PO Resp. 26 (noting that Patent Owner does not contest that efficiency and output distortion/robustness problems were generally known in the art.”).

We also find that Petitioner identifies persuasive motivations to combine from the references themselves, identifying specific teachings in Choi 2010 in reference to boost converter systems like those in Chu. 1152 Pet. 67–68 (citing Ex. 1007, 1074, 1077). Indeed, Patent Owner's declarant, Dr. Kelley, agreed that Choi 2010 teaches the use of boost converters to address battery degradation. Ex. 1028, 105:20–106:4, 156:3–6. Finally, Petitioner provides evidence that degrading battery performance affecting operation further motivates the combination of Chu and Choi 2010. Ex. 1028, 165:17–22; 1152 Pet. 67–71.

We are also persuaded by Petitioner's citation to secondary references of examples that use a boost converter to prevent distortion provides further support that a person of ordinary skill in the art would have been motivated to combine Chu and Choi 2010. *See* 1152 Pet. 68–70 (citing Ex. 1018, code (57); Ex. 1015, 8); Ex. 1003 ¶ 127. Patent Owner's arguments regarding the secondary references attempts to bodily incorporate the teachings from these references into Chu and Choi 2010. Patent Owner also fails to address persuasively the support for the teachings these secondary references

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provide for modifying Chu's supply modulator to incorporate a boost converter as disclosed in Choi 2010. 1152 Pet. 68–70 (citing Ex. 1018, code (57); Ex. 1015, 8); Ex. 1003 ¶ 127. Indeed, Patent Owner's declarant agrees extending battery life, which is discussed in Exhibit 1015 and cited by Petitioner as a motivation to combine Chu and Choi 2010 (1152 Pet. 69–70), would be achieved by the combination of Chu and Choi 2010 and was within the ordinary skill of an artisan. Ex. 1028, 281:6–282:2, 284:6–12.

We also disagree with Patent Owner that the Petition fails to show how to combine the references to solve the conflicting problems that Petitioner alleges as motivation—efficiency and degradation. 1152 PO Resp. 28–29. First, we credit Dr. Kelley's testimony that the result of the combination was within the knowledge and skill of an artisan. Ex. 1028, 105:20–106:4, 156:3–6, 281:6–282:2, 284:6–12. Second, we find that the evidence and argument in the Petition explain sufficiently how Chu would have been modified to incorporate the boost supply voltage of Choi 2010. *See* 1152 Pet. 64–66; Ex. 1027 ¶ 25.

With respect to combining the selective power supply of Myers with Chu and Choi 2010, Patent Owner argues that Choi 2010 teaches away from selective boost and that the 1997 technology of Myers is very different from the 2008-2010 technology of Chu and Choi 2010. 1152 PO Resp. 32–34, 39–40; Ex. 2005 ¶¶ 104, 105. In particular, Patent Owner argues “Choi 2010's boost is a constant boost applied to the linear amplifier, and thus teaches away from a selective boost.” 1152 PO Resp. 33. Patent Owner further argues combining Myers' selective boost with Choi 2010's constant boost would destroy the purpose and benefits of Choi 2010's design. *Id.* at 37.



We do not find that Choi 2010's use of a constant boost teaches away from selective boost in Myers. Patent Owner's evidence and argument do not persuade us that Choi 2010's teachings of boost exclude or discourage the use of selective boost. The portion of Choi 2010 Patent Owner cites does not criticize or discourage the use of selective boost, but applies boost generally to achieve its goals. *See* Ex. 1006, 1333–1334. We do not find that the teachings in Choi 2010 discourage a person of ordinary skill in the art from working with boosted voltage to achieve battery efficiencies. *See Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 738 (Fed. Cir. 2013). Choi 2010 does not discredit or criticize selective boost to improve efficiency.

Patent Owner contends that Chu and Choi 2010 in combination with Myers is impermissible hindsight that culls components to fit the parameters of the challenged claims. 1152 PO Resp. 38–39. Further, Patent Owner asserts that Myers is limited to its disclosure of older technology for switching power supply but operates in a context that differs materially from Chu and Choi 2010. *Id.*

Patent Owner also argues that the ALJ in the related ITC investigation rejected the rationales offered to combine the envelope trackers of Chu and Choi 2010—which had no disclosure of average power tracking—with the average power tracking device of Myers. 1152 PO Resp. 40–42; Ex. 2007, 36–37; Ex. 2005 ¶¶ 107. Patent Owner further notes that Chu describes technology that has moved past the envelope tracking of Myers. Ex. 2005 ¶ 108; Ex. 1004, 2809.

Unlike the combination of Chu, Choi 2010, and Myers advanced in the ITC investigation (*see* Ex. 2007, 36–37), Petitioner does not assert the

direct incorporation of Myers technology into the combination of Chu and Choi 2010. Instead, Petitioner asserts that Myers teaches a method of choosing a power source to improve operation efficiency. 1152 Pet. Reply 22; Pet. 76–77; Ex. 1012, 9:18–21, 1:19–23. Furthermore, Patent Owner’s declarant, Dr. Kelley, acknowledges this teaching. Ex. 1028, 270:13–271:5. Petitioner’s arguments and evidence differ materially from those cited in the ITC investigation (Ex. 2007, 36–37).

In the case before us, Petitioner does not directly incorporate Myers hardware into Chu or Choi 2010, but asserts that Myers—particularly Figure 7 that discloses the technique of switching between two different power sources—teaches a technique that would have been within the level of skill of an artisan at the time of patenting. 1152 Pet. Reply 23; *see* 1152 Pet. 72–74; Ex. 1028, 283:16–284:1; *see also* Ex. 1028, 152:21–153:4 (agreeing that a person of ordinary skill would have known how to select between two power sources). Contrary to the combination of the envelope elimination and restoration (EER) circuits of Myers into the linear amplifiers of Chu and Choi 2010 argued at the ITC, Petitioner has provided testimony and citations to the record that Myers’ selection functionality is applicable to the combination of Chu and Choi 2010. We credit Petitioner’s argument and evidence that a person of ordinary skill in the art would have been motivated to combine Chu and Choi 2010 with the technique from Myers and would have had a reasonable expectation of success in doing so. 1152 Pet. 77–78 (providing supporting argument and testimony regarding battery and boosted voltage efficiency as taught by Myers). We find that Petitioner’s argument and evidence provide sufficient rationales with articulated reasoning to support the application of the Myers selection technique with the amplifiers

of Chu and Choi 2010 to achieve battery efficiency during described operating modes. Pet. 75–79. Indeed, Dr. Kelley’s testimony supports the applicability of the techniques in Myers. *See* Ex. 1028, 270:13–271:5, 281:6–282:2, 284:6–12; Ex. 1027 ¶ 34; Ex. 1012, 9:18–21 (discussing Myers’ teaching of choosing power source for operation efficiency).

Based on our review of the full record, Petitioner demonstrates by a preponderance of the evidence an articulated rationale with articulated reasons to combine Chu, Choi 2010, and Myers. In addition, Petitioner demonstrated by a preponderance of the evidence that Chu, Choi 2010, and Myers teach the limitations of dependent claim 13.

*c) Conclusion on Unpatentability of Claim 13*

For the reasons discussed above, we find Chu, Choi 2010, and Myers teach all of the limitations of claim 13. We also find that Patent Owner concedes that Chu anticipates claim 12. Having considered the full record developed during trial, Petitioner has demonstrated by a preponderance of the evidence that claim 13 of the ’558 patent would have been unpatentable under 35 U.S.C. § 103(a) in view of Chu, Choi 2010, and Myers.

*F. Obviousness over Chu and Choi 2010 (IPR2018-01152)  
(Claims 6 and 8)*

Petitioner argues that claims 6 and 8 would have been obvious over Chu and Choi 2010. 1153 Pet. 38–62 (citing 1153 Ex. 1103 ¶¶ 83–116). Petitioner’s contentions are based on the argument that claims 6 and 8 do not require selective boost voltages input into the source of the PMOS transistor. 1153 Pet. 53–54 n.4; 1153 PO Resp. 19. As discussed above in Section II.B.3., we determined claims 6 and 8 require selective boost to teach the PMOS transistor source capable of receiving the boosted supply voltage or

the first supply voltage. Accordingly, Petitioner has failed to demonstrate by a preponderance of the evidence that Chu and Choi 2010 teach the limitations of claims 6 and 8 that recite “a P-channel metal oxide semiconductor (PMOS) transistor [having] . . . a source [receiving/that receives] the boosted supply voltage or the first supply voltage.”

Having considered the full record developed during trial, we determine that Petitioner has not proven by a preponderance of the evidence that claims 6 and 8 of the '558 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over the combined teachings of Chu and Choi 2010.

*G. Obviousness over Chu, Choi 2010, and Meyer (IPR2018-01153)  
(Claims 1–9)*

Petitioner contends that claims 1–9 would have been obvious in view of Chu, Choi 2010, and Myers. 1153 Pet. 62–81; 1153 Ex. 1103 ¶¶ 119–158. Petitioner provides citations to the evidence and testimony that Chu, Choi 2010, and Myers teach the limitations of claims 1–9.

*1. Claims 1–9 Limitations*

Petitioner provides evidence and citations mapping the limitations of claim 1 to the teachings of Choi 2010 and Chu. 1153 Pet. 62–75. Specifically, Petitioner asserts that Chu discloses “master–slave linear and switch-mode combined supply modulator loaded with a PA” (apparatus) (1153 Ex. 1104, 2810) that in combination with the hybrid supply generator/modulator containing a boost converter of Choi 2010 (1153 Ex. 1107, 1014) teaches the boost converter limitations of claim 1. 1153 Pet. 62–64. Petitioner asserts that it would have been obvious to modify Chu such that output of the supply voltage is generated based on the envelope signal and a boosted supply voltage. *Id.* at 66. Petitioner provides a

rationale to combine Chu and Choi 2010 (*id.* at 44–48) and a rationale to combine Chu with Choi 2010 and Myers (*id.* at 70–74).

In addition, Petitioner provides evidence and argument demonstrating that Chu in combination with Choi 2010 and Myers discloses the envelope amplifier operative to receive the first supply voltage and generate the second supply voltage based selectively on either the first supply voltage or the boosted supply voltage. *Id.* at 66–69. For the same reasons discussed above in Section II.E.4.b with respect to claim 13 in IPR2018-01152, Petitioner asserts:

When combined with Myers, the Chu envelope amplifier would also be able to operate selectively by choosing a power source—either the boosted voltage generated by the boost converter provided by Choi 2010 or the battery supply voltage already disclosed in Chu—and generate the second supply voltage based on either the first supply voltage (battery voltage) or the boosted supply voltage, as circumstances warrant. Myers discloses a power supply modulator for a PA that “efficiently amplifies the envelope of the input signal” by selecting among different power sources based on operating conditions. Ex. 1112 at Abstract.

1153 Pet. 67–68. Petitioner relies on Figure 7 of Myers to disclose a method for selecting one of a plurality of power sources for use in an amplifier. *Id.* at 69; 1153 Ex. 1112, 9:8–21, Figs. 7 and 8; 1153 Ex. 1103 ¶¶ 127–128.

Petitioner maps the operational amplifier, driver, PMOS transistor, and NMOS transistor limitations of claim 1 to the teachings of Chu in combination with Choi 2010 and Myers. 1153 Pet. 74–75. For claims 2–5, 7, and 9, Petitioner provides sufficient and persuasive evidence and argument that Chu in combination with Choi 2010 and Myers teaches the limitations of the claims. 1153 Pet. 75–79, 79–80.

For independent claim 6 and dependent claim 8, Petitioner relies on the arguments presented with respect to Chu and Choi 2010 (1153 Pet. 38–62) and asserts that Myers in combination with Chu and Choi 2010 discloses the ability to selectively choose among power sources, in accordance with the teachings of Myers regarding selectable power generators. 1153 Pet. 79–80 (citing 1153 Ex. 1103 ¶¶ 151, 158). Thus, the limitations of claims 6 and 8, which require selective boost are taught by Chu, Choi 2010, and Myers.

Patent Owner does not challenge Petitioner’s arguments or evidence mapping claims 1, 2, and 4–9 to the teachings of Chu in combination with Choi 2010 and Myers. 1153 PO Resp. 29–47. On the full record, we find Petitioner’s has demonstrated by a preponderance of the evidence that Chu in combination with Choi 2010 and Myers teaches or suggests the additional limitations of dependent claim 1, 2, and 4–9.

## 2. *Claim 3*

With respect to claim 3, which depends from independent claim 1, Patent Owner argues that Petitioner’s argument and testimony are conclusory and unsupported. 1153 PO Resp. 48–49. We do not agree. Petitioner asserts that claim 3, which limits the envelope amplifier of claim 1 to an arrangement of PMOS transistors comprises a simple multiplexer that selects between the boosted and first supply voltage (the battery). 1153 Pet. 77. Petitioner argues and provides testimony that it would have been within the knowledge of a person of ordinary skill in the art to implement the Myers voltage selection feature as a multiplexer. *Id.* (citing 1103 ¶¶ 142–144, 158). In addition to the testimony that such features would have been known to skilled artisans, Petitioner explains the operation and structure of multiplexers and their use to select between power supplies and provides

sources for that knowledge. 1153 Pet. 17–19 (discussing prior art Multiplexers and their operation); 1153 Ex. 1103 ¶¶ 49–52.

Accordingly, we do not find Petitioner’s arguments and evidence with respect to claim 3 to be unsupported and conclusory. *See* 1153 Pet. Reply 24–25. Having reviewed the full record, we find Petitioner’s has demonstrated by a preponderance of the evidence that Chu in combination with Choi 2010 and Myers teaches or suggests the additional limitations of dependent claim 3.

3. *Motivation to Combine Chu, Choi 2010, and Myers*

Patent Owner’s contentions mirror and repeat arguments regarding the motivations to combine the asserted references presented in IPR2018-01152 with respect to claim 13. *Compare* 1153 PO Resp. 29–48, *with* 1152 PO Resp. 25–36, 36–44. For the motivation to combine Chu with Choi 2010 and Myers to reach claims 1–9 (1153 Pet. 44–48, 70–74), Petitioner asserts the same arguments and rationales for combining Chu, Choi 2010, and Myers presented for claim 13 (1152 Pet. 67–71, 75–79) in IPR2018-01152.

For the same reasons discussed above in Section II.E.4.b, we find that Petitioner sets forth persuasive arguments and evidence to demonstrate that a skilled artisan would have been motivated to combine Chu, Choi 2010, and Myers. Thus, we do not agree with Patent Owner’s arguments that Petitioner has failed to demonstrate a motivation to combine Chu and Choi 2010 (1153 PO Resp. 29–36), that Choi 2010 teaches away from selectively boosting the supply voltage (*id.* at 36–40), or that Myers is technically disparate from Chu and Choi 2010 and only impermissible hindsight allows the combination of Myers with Chu and Choi 2010 (*id.* at 40–48). Instead, we find based on our review of the full record, Petitioner demonstrates by a

preponderance of the evidence an articulated rationale with articulated reasons to combine Chu, Choi 2010 and Myers.

4. *Conclusion for Claims 1–9*

For the reasons discussed above, we find Chu, Choi 2010, and Myers teaches all of the limitations of claims 1–9. Having considered the full record developed during trial, Petitioner has demonstrated by a preponderance of the evidence that claims 1–9 of the '558 patent would have been unpatentable under 35 U.S.C. § 103(a) in view of Chu, Choi 2010, and Myers.

III. CONCLUSION<sup>8</sup>

For the reasons discussed above, we determine Petitioner has proven, by a preponderance of the evidence, that the challenged claims in IPR2018-01152 and IPR2018-01153 are unpatentable, as summarized in the following table:

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<sup>8</sup> Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2) (2019).



<b>Claim(s)</b>	<b>35 U.S.C. §</b>	<b>Reference(s)</b>	<b>Claims Shown Unpatentable</b>	<b>Claims Not Shown Unpatentable</b>
12, 14	102(b)	Chu	12, 14	
14	103(a)	Chu, Blanken	12	
13	103(a)	Chu, Choi 2010		13
13	103(a)	Chu, Choi 2010, Myers	13	
6, 8	103(a)	Chu, Choi 2010		6, 8
1–9	103(a)	Chu, Choi 2010, Myers	1–9	
<b>Overall Outcome</b>			1–9, 12–14	

#### IV. ORDER

In consideration of the foregoing, it is:

ORDERED that claims 1–9 (in IPR2018-01153) and claims 12–14 (in IPR2018-01152) of the '558 patent have been shown to be unpatentable; and

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

IPR2018-01152  
IPR2018-01153  
Patent 8,698,558 B2

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