

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUALCOMM INCORPORATED,
Petitioner,

v.

COBBLESTONE WIRELESS, LLC,
Patent Owner.

IPR2024-01336
Patent 7,924,802 B2

Before KARL D. EASTHOM, NORMAN H. BEAMER, and
RUSSELL E. CASS, *Administrative Patent Judges*.

CASS, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

In this *inter partes* review, Qualcomm Incorporated (“Petitioner”) challenges the patentability of claims 1–4, 6–10, 13, 14, 17, and 21–25 of U.S. Patent No. 7,924,802 (“the ’802 patent”), which is assigned to Cobblestone Wireless, LLC (“Patent Owner”).

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 this *inter partes* review. For the reasons discussed below, Petitioner has proven by a preponderance of the evidence that claims 1–4, 6–9, 24, and 25 of the ’802 patent are unpatentable. Petitioner has not proven by a preponderance of the evidence that any of claims 10, 13, 14, 17, and 21–23 of the ’802 patent are unpatentable.

B. Procedural History

In the Petition, Petitioner challenges claims 1–4, 6–10, 13, 14, 17, and 21–25 of the ’802 patent. Paper 4 (“Pet.”) 1. Petitioner also filed a motion to join an earlier *inter partes* review proceeding filed by Samsung Electronics America, Inc. and Samsung Electronics Co., Ltd, IPR2024-00606 (the “Samsung IPR”). Paper 3. Patent Owner filed a Preliminary Response opposing Petitioner’s joinder motion as well as requesting that we discretionarily deny the Petition based on *General Plastic Indus. Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (PTAB Sept. 6, 2017) (precedential). Paper 11. With our permission, Petitioner filed a Preliminary Reply and Patent Owner filed a Preliminary Sur-reply addressing the *General Plastic* issues raised in the Preliminary Response. Papers 12, 13. We declined to exercise discretion to deny institution,

instituted trial on all challenged claims, and denied Petitioner's motion for joinder. Paper 15 ("Inst. Dec.").

Following institution, Patent Owner filed a Response (Paper 22, "PO Resp."), Petitioner filed a Reply (Paper 23, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 27, "PO Sur-reply").

Petitioner submitted a Declaration of Kevin C. Almeroth, PhD, with its Petition (Ex. 1003, "Almeroth Decl.") and another Declaration from Dr. Almeroth in opposition to the Patent Owner Response (Ex. 1030, "Supp. Almeroth Decl."). Patent Owner submitted a Declaration of Todor V. Cooklev, PhD, with its Patent Owner Response (Ex. 2013, "Cooklev Decl."). An oral hearing was held on December 16, 2025, a transcript of which appears in the record. Paper 34, "Tr."

C. Applied References

Petitioner relies upon the following references:

Rick et al., U.S. Patent No. 8,693,525 B2, issued Apr. 8, 2014 (Ex. 1021, "Rick");

Suzuki et al., US 2006/0276146 A1, published Dec. 7, 2006 (Ex. 1004, "Suzuki");

Fernandez, US 2009/0052556 A1, published Feb. 26, 2009 (Ex. 1005, "Fernandez");

Montejo et al., US 2005/0135312 A1, published June 23, 2005 (Ex. 1006, "Montejo");

Jalali et al., U.S. Patent No. 6,952,454, published Oct. 4, 2005 (Ex. 1008, "Jalai");

Chen et al., U.S. Patent No. 6,359,868, issued Mar. 19, 2002 (Ex. 1009, "Chen");

Etemad, U.S. Patent No. 8,036,702 B2, issued Oct. 11, 2011 (Ex. 1014, "Etemad").

Pet. 4.

D. Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–4, 6–10, 13, 14, 17, and 21–25 of the '802 patent based on the following grounds:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1	103(a) ¹	Rick
1–4, 6–8, 10, 13, 17, 21–22	103(a)	Suzuki
7–9, 22, 23	103(a)	Suzuki, Jalai
14, 24, 25	103(a)	Suzuki, Chen
6, 13, 21	103(a)	Suzuki, Etemad
1–4, 6–8, 10, 13, 17, 21, 22	103(a)	Fernandez, Montojo
7–9, 22, 23	103(a)	Fernandez, Montojo, Jalai
14, 24, 25	103(a)	Fernandez, Montojo, Chen
6, 13, 21	103(a)	Fernandez, Montojo, Etemad

Pet. 4.

E. Real Parties in Interest

Petitioner identifies Qualcomm Incorporated and Qualcomm Technologies, Inc. as the real parties in interest. Pet. 105. Petitioner states that it is filing this Petition because “Cobblestone has sued at least one of Qualcomm’s customers for infringing the '802 Patent” and states that, “[f]or completeness” it “also identifies its customer Cisco Systems, Inc., which has been named as a defendant in a pending litigation involving the '802 Patent, as an additional real party in interest.” *Id.* Patent Owner identifies Cobblestone Wireless, LLC, as the real party in interest. Paper 6, 1.

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. § 103 that became effective after the filing of the application that led to the '802 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

F. Related Proceedings

The parties identify the following proceedings involving the '802 patent: *Cobblestone Wireless, LLC v. Samsung Electronics Co., Ltd.*, No. 2:23-cv-00285 (E.D. Tex.); *Cobblestone Wireless, LLC v. T-Mobile USA, Inc.*, No. 2:23-cv-00381 (E.D. Tex.); *Cobblestone Wireless, LLC v. Cellco Partnership d/b/a Verizon Wireless*, Case No. 2:23-cv-00382 (E.D. Tex.); *Cobblestone Wireless, LLC v. AT&T Services Inc.* No. 2:23-cv-00380 (E.D. Tex.); *Cobblestone Wireless, LLC v. Hewlett Packard Enterprise Company, et al.*, Case No. 2:23-cv-00457 (E.D. Tex.); *Cobblestone Wireless, LLC v. CommScope Holding Company, Inc.*, No. 2:23-cv-00455 (E.D. Tex.); *Cobblestone Wireless, LLC v. Cisco Systems, Inc.*, No. 2:23-cv-00454 (E.D. Tex.); *Cobblestone Wireless, LLC v. Apple Inc.*, No. 7:24-cv-00232 (W.D. Tex.); *Cobblestone Wireless, LLC v. Motorola Mobility LLC*, No. 1:24 cv-08726 (N.D. Ill.); *Wireless Communication Systems and Methods*, Re-Examination Appl. No. 90/019,458; *Samsung Elecs. Am., Inc. v. Cobblestone Wireless, LLC*, IPR2024-00606 (PTAB, filed Feb. 26, 2024); *Hewlett Packard Enterprise Co. v. Cobblestone Wireless, LLC*, IPR2024-00707 (PTAB, filed Mar. 19, 2024); *Cellco Partnership d/b/a Verizon Wireless v. Cobblestone Wireless LLC*, IPR2024-00946 (PTAB, filed Jun. 28, 2024). Pet. 105–106; Paper 6, 1–2; Paper 21, 1–3.

G. The '802 Patent (Ex. 1001)

The '802 patent is directed to a wireless communication system and method that transmits signals simultaneously over a communication channel at different RF center frequencies. Ex. 1001, code (54), code (57). The Background of the '802 patent explains that “[c]ommunication systems generally contain one or more transmission channels to transmit data from

the transmitter to the receiver.” *Id.* at 1:12–14. The Background describes a transmitter in such a system that “is limited to up-converting a signal to one center frequency (or modulation frequency), which is the LO [(local oscillator)] frequency.” *Id.* at 1:30–32. “Typically,” the Background explains, “the amount of information transmitted around the center frequency is limited by the bandwidth of the transmitter around the center frequency,” which “limits the amount of data that can be transmitted.” *Id.* at 1:32–35. Thus, “[t]ypical prior art approaches to improving the information capacity in a wireless communication system involve maximizing the bandwidth around the center frequency to increase the amount of information that may be modulated onto the carrier frequency.” *Id.* at 1:35–40.

To overcome this issue, the ’802 patent proposes “a method of transmitting information in a wireless communication channel” that includes “transmitting first information across a first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency, and simultaneously transmitting second information across a second frequency range using the same wireless transmitter,” where the second frequency range has “a second center frequency greater than the first center frequency, a second highest frequency, and a second lowest frequency.” Ex. 1001, 1:62–2:5.

Figure 2 of the ’802 patent, reproduced below, “illustrates a wireless communication system according to one embodiment of the present invention.” Ex. 1001, 5:53–54.

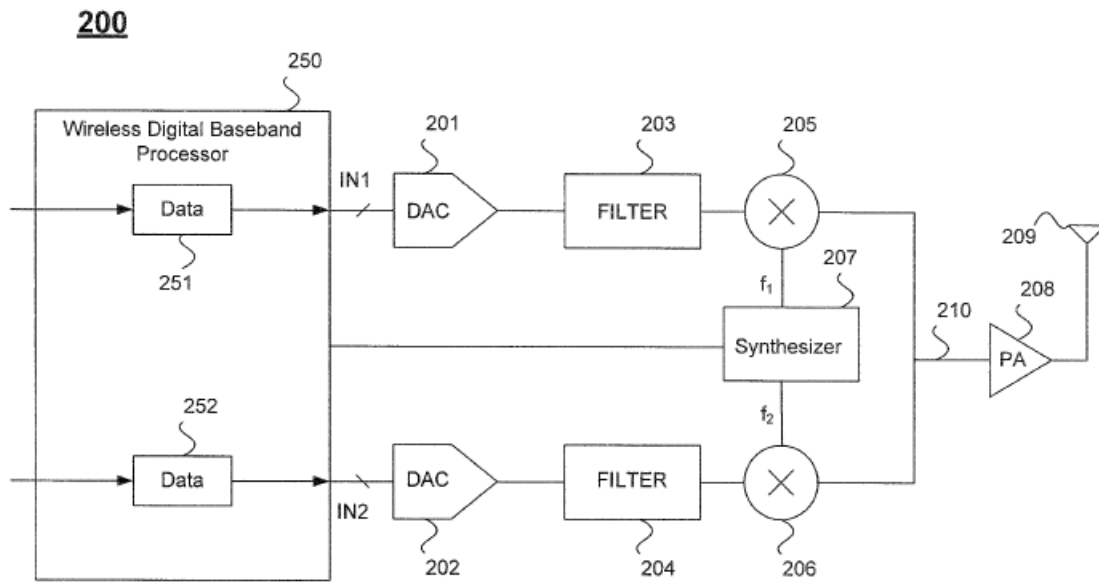


Fig. 2

Figure 2 of the '802 patent illustrates a wireless communication system according to an embodiment of the invention. Ex. 1001, 5:53–54, Fig. 2.

As shown in Figure 2, baseband digital system 250 provides a first digital signal comprising first digital data 251, which is provided as IN1, and a second digital signal comprising second digital data 252, provided as IN2. *Id.* at 5:62–66. The first digital data 251 and second digital data 252 may be unrelated data streams or data from the same data stream. *Id.* at 6:7–9. Each of the first and second digital signals is transmitted to a digital to analog converter (DAC 201 and 202), a filter (203 and 204), and an up-converter (205 and 206). *Id.* at 6:10–26. The up-converters 205 and 206 each receive a first modulation signal having an RF center frequency (f_1 and f_2 , respectively) from synthesizer 207 and generate first and second up-converted signals that are combined at the input to amplifier 208. *Id.* at 6:22–44, 6:57–60, 7:4–7. Amplifier 208 outputs an amplified up-converted

signal comprising the first and second up-converted analog signals, and transmits this signal over antenna 209. *Id.* at 7:7–11.

Figure 3 of the '802 patent, reproduced below, illustrates an example of the frequency content of the signal transmitted from the system disclosed in Figure 2.

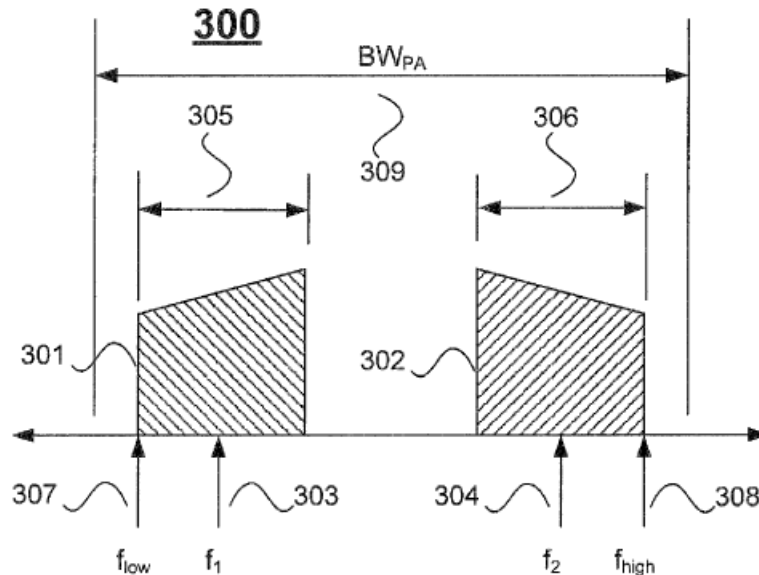


Fig. 3

Figure 3 of the '802 patent illustrates an example of the frequency content of the signal transmitted by the system of Figure 2. Ex. 1001, 5:58–60, Fig. 3.

Figure 3 shows first up-converted analog signal 301 generated by up-converter 205, which has center frequency f_1 and frequency range 305, and second up-converted analog signal 302 generated by up-converter 206, which has center frequency f_2 and frequency range 306. *Id.* at 6:26–44. The frequency difference between f_1 and f_2 is greater than the sum of one-half of the first frequency range and one-half of the second frequency range, so that the up-converted signals do not overlap and cause distortion. *Id.* at 6:48–53. The first and second up-converted analog signals 301 and 302 may be transmitted by the antenna over bandwidth BW_{PA} 309. *Id.* at 7:9–14.

H. Illustrative Claims

Of the challenged claims, claims 1, 10, 17, and 24 are independent.

Claim 1 is illustrative and is reproduced below.

1. [pre] A method of transmitting information in a wireless communication channel comprising:

[1a] transmitting first information across a first frequency range using a wireless transmitter, the first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency; and

[1b] simultaneously transmitting second information across a second frequency range using the same wireless transmitter, the second frequency range having a second center frequency, a second highest frequency, and a second lowest frequency.

Ex. 1001, 13:59–14:3 (bracketed paragraph identifiers added).

II. DISCUSSION

A. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented 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) where in evidence, objective evidence of non-obviousness.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

² At this stage of the proceeding, Patent Owner has not presented objective evidence of non-obviousness.

When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result has weight in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b) (2020). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention would have had “at least a bachelor’s in EE/CE/CS, physics, or equivalent, and two years of experience with cellular telecommunications, radio-access network architectures, protocols and signal propagation in wireless networks.” Pet. 4 (citing Ex. 1003 ¶¶ 50–51). Petitioner further states that “[m]ore education can supplement practical experience and vice versa.” *Id.* Patent Owner states that, for purposes of this proceeding, it does not dispute Petitioner’s definition of a person of ordinary skill in the art. PO Resp. 1.

For purposes of this proceeding, we adopt Petitioner’s assessment of the level of skill in the art, which is consistent with the ’802 patent and the asserted prior art of record.

C. Claim Construction

We construe claims using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b) (2025).

In the Petition, Petitioner states that, “[u]nless otherwise indicated, and for this proceeding only, the claim terms should be given their plain and ordinary meaning.” Pet. 9 (citing Ex. 1003 ¶¶ 68–69). Patent Owner similarly states that, “[u]nless otherwise indicated, and for purposes of this proceeding only, the claim terms should be given their plain and ordinary meaning.” PO Resp. 1.

Nonetheless, in the Patent Owner Response, Patent Owner applies a definition of “first information” and “second information” in claim 1 requiring that “[t]hese are not random signals or disparate transmissions, but rather information that is transmitted in an organized way, involving a first and second part that is transmitted simultaneously from the same transmitter.” PO Resp. 2 (citing Ex. 2013 ¶ 37). To support this construction, Patent Owner argues that the claimed first and second information are part of the “information” transmitted over the wireless channel recited in the preamble, and that “the preamble’s ‘information’ provides the antecedent basis for ‘first’ information’ and ‘second

information,’ establishing that both are parts of a unified whole transmitted together.” PO Resp. 3 (citing Ex. 2013 ¶ 37); PO Sur-reply 2 (citing Ex. 2013 ¶ 37). Patent Owner also argues that the ’802 patent Specification “provides multiple examples emphasizing this relationship,” including: (1) an embodiment which transmits a plurality of OFDM symbols, with a first symbol corresponding to the “first information” and a second symbol corresponding to the “second information”; and (2) an embodiment that transmits wireless protocols, in which a first wireless protocol is the “first information” and a second wireless protocol is the “second information.” *Id.* (citing Ex. 1001, 2:16–20, 2:36–38; Ex. 2013 ¶ 38). Dr. Cooklev cites to two additional embodiments including one where “the information is the same data at two different frequencies” and another where “the first and second information are produced from the same data stream using coding or data mapping.” Ex. 2013 ¶ 38 (citing Ex. 1001, 2:39–44); PO Sur-reply 2–3 (citing Ex. 2013 ¶ 38). “In each embodiment,” Patent Owner contends, “the first and second information are related to one another and part of a greater information package that is transmitted.” PO Resp. at 3–4 (citing Ex. 1001, 2:39–44; Ex. 2013 ¶ 38).

Petitioner responds that Patent Owner is trying to “backdoor its own constructions into the claims without undergoing proper claim construction analysis.” Pet. Reply 2. Petitioner argues that Patent Owner’s construction is “exceedingly narrow” and “relies on an interpretation of ‘information’ that departs from its plain and ordinary meaning without adequate justification.” *Id.* Petitioner also asserts that the portions of the ’802 patent Specification upon which Patent Owner relies are merely embodiments of the invention, and that it would be improper to read those embodiments into the claims. *Id.*

at 3. Additionally, Petitioner contends that the '802 Specification explicitly defines “information” as “data” by using the phrase “information (i.e. data),” and expressly states that the first and second data may be “unrelated.” *Id.* at 4 (citing Ex. 1001, 5:60–62, 6:7–9, 9:15–16, 11:30–32). Instead of the construction offered by Patent Owner, Petitioner argues that one of ordinary skill “would understand that the term ‘information’ simply means data.” Pet. Reply 3 (citing Ex. 1030 ¶ 10).

After reviewing the arguments and evidence, we find that the term “information” should be given its plain and ordinary meaning as “data,” and that Patent Owner’s narrower construction of “first information” and “second information” lacks sufficient support in the intrinsic record. We agree with Petitioner that the '802 patent Specification defines “information” as data when it uses the phrase “information (i.e., data).” *See* Ex. 1001, 5:60–62 (“**Information (i.e., data)** to be transmitted may be received in a baseband digital system 250, such as a wireless digital baseband processor.” (emphasis added)), 11:30–32 (“In this example, the signals 911 and 912 carry **the same information (data)**.” (emphasis added)). As the Federal Circuit has explained, a “specification’s use of ‘i.e.’ signals an intent to define the word to which it refers.” *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1334 (Fed. Cir. 2009).

We disagree with Patent Owner’s argument that the preamble and claim language support its proposed construction. The preamble of claim 1 merely recites “[a] method of transmitting information in a wireless communication channel,” and the claim body goes on to recite “transmitting first information” and “transmitting second information.” Ex. 1001, claim 1. We do not see anything in this claim language that states or suggests that the

“first information” and “second information” must be “parts of a unified whole” as Patent Owner contends. We also see no reason why a “method of transmitting information” cannot include transmitting first and second information that are unrelated and not parts of a unified whole.

We also find no support for Patent Owner’s proposed construction in the passages of the ’802 patent Specification upon which Patent Owner relies, because each of these passages merely describes an embodiment of the invention. Patent Owner’s first example of transmitting first and second OFDM symbols is prefaced by the phrase “[i]n one embodiment.” Ex. 1001, 2:16–20. The same is true of Patent Owner’s second embodiment involving first and second wireless protocols (*id.* at 2:36–38), the third embodiment involving the same data transmitted across two different frequencies (*id.* at 2:39–41), and the fourth embodiment involving information produced from the same data stream using coding or data mapping (*id.* at 2:42–44). PO Resp. 3; Cooklev Decl. ¶ 38. As the Federal Circuit has explained, “although the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005)

Indeed, the ’802 patent Specification suggests the opposite of Patent Owner’s position by indicating that the invention encompasses embodiments where the “first information” and “second information” are unrelated. For example, the Specification states that “[t]he data of the first digital signal and the data of the second digital [signal] may be **unrelated** data streams or may be data from the same data stream, for example.” Ex. 1001, 6:7–9 (emphasis added). In another example, the Specification states that “[i]n one

embodiment, the first data may be *unrelated* to the second data.” *Id.* at 9:15–16 (emphasis added). Although, as Patent Owner points out, the same paragraph also states that “the original information data may be passed through an encoder” and “split into two streams,” this is described as yet “another example,” and does not override the fact that the Specification discloses embodiments in which the first and second data are unrelated. *See* PO Sur-reply 3; Ex. 1001, 6:1–7. Thus, the Specification is consistent with the ordinary meaning of the claim language, which would encompass both first and second data that is related and first and second data that is unrelated.

Consequently, we find that “information” in “first information” and “second information” should be given its ordinary meaning of “data.” We decline to adopt Patent Owner’s narrower definition of the first and second information as “not random signals or disparate transmissions, but rather information that is transmitted in an organized way, involving a first and second part that is transmitted simultaneously from the same transmitter.” *See* PO Resp. 2.

D. Ground 1: Obviousness of Claim 1 Over Rick

1. Overview of Rick (Ex. 1021)

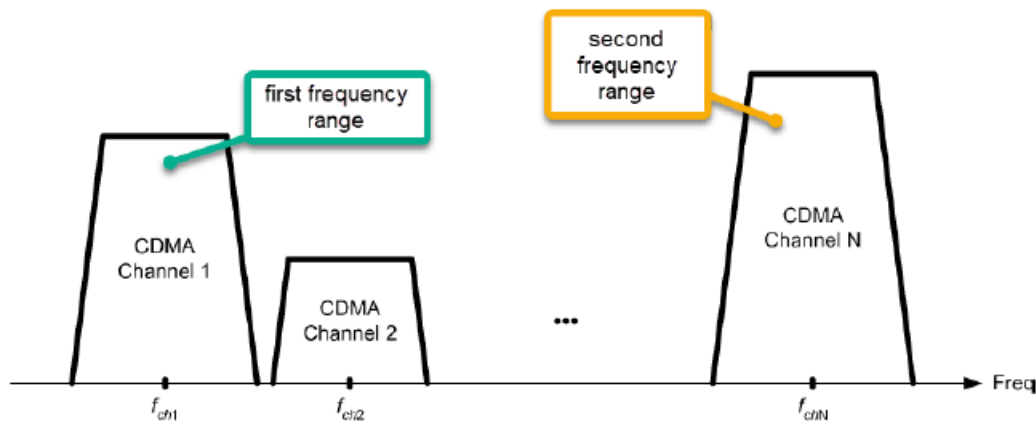
Rick discloses a “multi-carrier transmitter capable of transmitting on one or multiple frequency channels simultaneously.” Ex. 1021, code (57). The multi-carrier transmitter includes “at least one processor and a single radio frequency (RF) transmit chain.” *Id.* The processor(s) “may generate output chips for each of multiple frequency channels, digitally filter and upsample the output chips for each frequency channel to obtain filtered samples, and digitally upconvert the filtered samples for each frequency

channel to a different frequency to obtain upconverted samples.” *Id.* The processor(s) “may then combine the upconverted samples for the multiple frequency channels to obtain composite samples, perform pre-distortion on the composite samples for I/Q [(in-phase and quadrature signal)] mismatch compensation, and upsample the pre-distorted samples to obtain output samples,” which “may be converted to an analog signal with a wideband DAC [(digital to analog converter)].” *Id.* The RF transmit chain may then “process the analog signal to generate an RF output signal.” *Id.*

2. Independent Claim 1

Petitioner provides a limitation-by-limitation analysis of claim 1, supported by argument and evidence, including testimony from Dr. Almeroth. Pet. 12–16. In this Ground, Patent Owner raises only one argument in response, namely that Petitioner fails to identify “‘first information’ and ‘second information’ as those terms are used in claim 1 of the ’802 patent.” PO Resp. 3–4.

Petitioner argues that Rick discloses “transmission of N CDMA signals,” each of which “may carry any type of data for any service.” Pet. 13 (citing Ex. 1021, 3:19, 3:35–36). Petitioner asserts that the data for one of these CDMA signals is a “first information” transmitted over a first frequency range, and the data for another one of these signals is a “second information” transmitted over a second frequency range, as shown in Petitioner’s annotated version of Rick’s Figure 1, reproduced below.



Petitioner’s annotated version of Rick’s Figure 1 showing transmitted “first information” with a “first frequency range” (green) and “second information” with a “second frequency range” (yellow). Pet. 13, 15.

Patent Owner responds that Petitioner fails to identify “‘first information’ and ‘second information’ as those terms are used in claim 1 of the ’802 patent.” PO Resp. 3–4. Patent Owner’s argument is predicated on its construction of “first information” and “second information” as “not random signals or disparate transmissions, but rather information that is transmitted in an organized way, involving a first and second part that is transmitted simultaneously from the same transmitter.” *Id.* Because we reject Patent Owner’s construction, we also reject Patent Owner’s argument that Rick fails to teach the relevant claim limitations under that rejected construction. Patent Owner does not present argument that Rick fails to disclose the simultaneous transmission of first and second information under the ordinary meaning of those terms, where “information” merely means “data” and no particular relationship between the first and second information is required, and we find that Petitioner has made a sufficient showing on this point. PO Resp. 3–4; Pet. 13, 15.

After reviewing the arguments and evidence of record, we find that Petitioner has demonstrated, by a preponderance of the evidence, that Rick discloses the limitations of claim 1. *See* Pet. 12–16.

E. Grounds 2–5: Suzuki-Based Grounds

1. Overview of Suzuki (Ex. 1004)

Suzuki discloses “a predistorter that compensates for a distortion of a power amplifier for amplifying power of high frequency signals that changes in a plurality of frequency bands.” Ex. 1004 ¶ 1. The predistorter compensates for this distortion by looking up predistortion components in a lookup table, and adding these predistortion to the signal in order to cancel out distortion components produced by a power amplifier. *Id.* ¶ 13. The predistorter can include N (an integer greater than two) output side variable band signal extractors for extracting output signals in N frequency bands from output signals from a power amplifier. *Id.* ¶ 14. It can also include N difference detectors for detecting differences between transmitting signals in N frequency bands and N output signals from the N output side variable band signal extractors. *Id.* ¶ 15. A frequency band controller can control frequency bands of the N output side variable band signal extractors. *Id.* ¶ 19.

In Suzuki, N lookup tables can read distortion compensation data of corresponding N frequency bands by using differences of the N frequency bands as reference signals. Ex. 1004 ¶ 16. N adders can then add the distortion compensation data from the lookup tables to the transmitting signals in the corresponding N frequency bands. *Id.* ¶ 17. A combiner can combine the outputs from the adders and output a signal for transmission with the predistortion. *Id.* at 18. As a result, the predistorter “can easily

execute distortion compensation on a plurality of frequency bands.” *Id.*

¶ 12.

2. Overview of Jalali (Ex. 1008)

Jalali is directed to transmitter and receiver units for use in an OFDM communications system that can support multiple types of services.

Ex. 1008, code (57). The transmitter includes one or more encoders, a symbol mapping element, and a modulator. *Id.* Each encoder receives and codes a respective channel data stream to generate a corresponding coded data stream. *Id.* The symbol mapping element receives and maps data from the coded data streams to generate modulation symbol vectors, each of which includes a set of data values used to modulate a set of tones to generate an OFDM symbol. *Id.* The modulator modulates the modulation symbol vectors to provide a modulated signal suitable for transmission. *Id.* The data from each coded data stream is mapped to a respective set of one or more circuits, each of which can include tones from a number of OFDM symbols, tones from a single OFDM symbol, all tones from one or more OFDM symbols, or some other combination of tones. *Id.* Different circuits can be used for full rate data, such as active speech, and low-rate data, such as silence periods. *Id.* Jalali further explains that “the overall transmission channel is essentially divided into a number of (L) parallel sub-channels that are used to transmit the same or different data.” *Id.* at 8:50–53; *see id.* at 9:1–4 (“same data transmitted on both sub-channels”).

3. Overview of Chen (Ex. 1009)

Chen discloses, in pertinent part, a receiver that provides for reduced hardware requirements for receiving signals. Ex. 1009, 3:7–10. An embodiment of this receiver is shown in Figure 6, reproduced below.

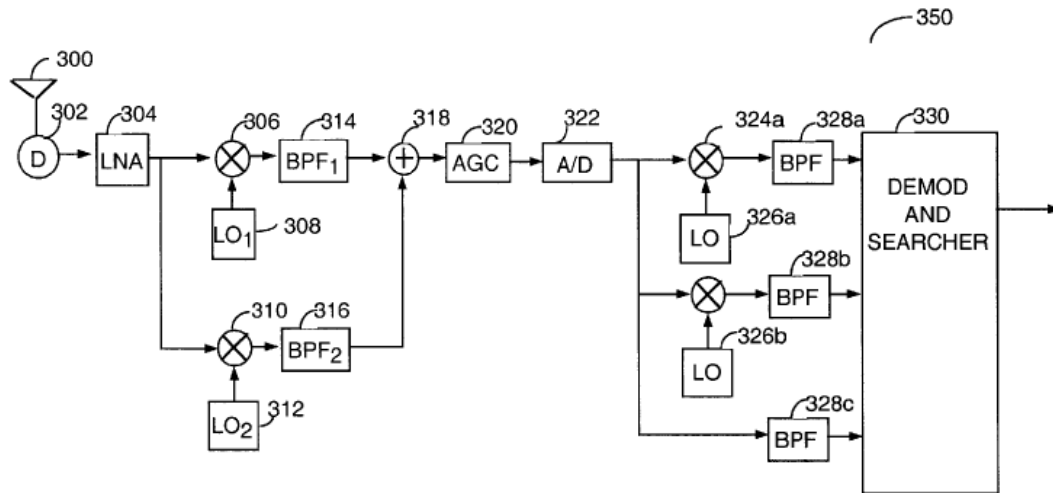


FIG. 6

Chen's Figure 6 is a block diagram of a receiver structure which provides for reduced hardware requirements for receiving signals transmitted in accordance with the invention. Ex. 1009, Fig. 6, 3:7–10.

As shown in Figure 6, signals are received at antenna 300 and provided through duplexer 302 to low noise amplifier (LNA) 304. *Id.* at 13:60–62. The amplified signal is provided to mixer 306 and downconverter 310, which downconverts the signals. *Id.* at 13:63–14:3. After low-pass filtering by filters 314 and 316, the signals are summed, amplified by automatic gain control (AGC) 320, and converted to digital by A/D converter 322. *Id.* at 14:7–11. The digital signals are then provided to downconverters 324a and 324b, and to bandpass filter (BPF) 328c. *Id.* at 14:11–26. These signals are then fed to demodulator and searcher 330. *Id.* at 26–27.

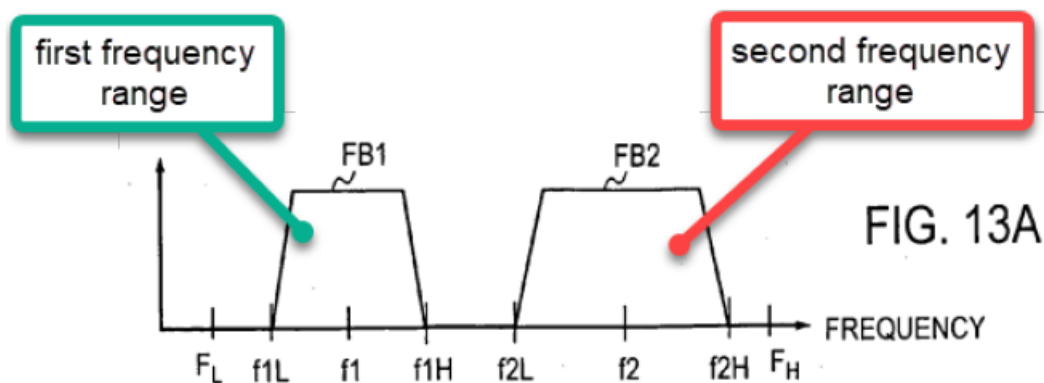
4. Independent Claim 1 (Ground 2)

Under this Ground, Petitioner provides a limitation-by-limitation analysis of claim 1, supported by argument and evidence, including testimony from Dr. Almeroth. Pet. 19–24. Patent Owner raises two issues in response: (1) whether Suzuki discloses the claimed “first information”

and “second information” (PO Resp. 4–5); and (2) whether Suzuki’s predistortion signals are “information” to be “transmitted” (*id.* at 5–6). As discussed further below, we find that Petitioner has made a sufficient showing on both of these issues.

a) Whether Suzuki Discloses the Claimed “First Information” and “Second Information”

Petitioner argues that Suzuki discloses transmission of “first information” FB1 across a first frequency range and “second information” FB2 across a second frequency range, as shown in Petitioner’s annotated version of Suzuki’s Figure 13A, reproduced below.



Petitioner’s annotated version of Suzuki’s Figure 13A showing transmitted “first information” with a “first frequency range” (green) and “second information” with a “second frequency range” (red). Pet. 19–20, 21–22.

Similar to Ground 1, Patent Owner responds that Suzuki fails to disclose the claimed “first information” and “second information” in claim 1 because it “do[es] not address the claimed relationship between the first and second information.” PO Resp. 4 (citing Ex. 2013 ¶ 42). Relying on its proposed construction of “first information” and “second information,” Patent Owner argues that Suzuki merely discloses transmitting from “two different wireless systems that send two completely different and unrelated data streams,” and that this is different from the claimed method of

transmitting first and second information that are first and second parts of the same “information” transmitted in an organized way. PO Resp. 4–5.

However, as discussed previously, we have rejected Patent Owner’s construction requiring the “first information” and “second information” to be related parts of the same transmitted “information.” *See* § II.C, *supra*.

Therefore, we disagree with Patent Owner’s argument here, which is predicated on that rejected claim construction. Patent Owner does not present argument that Suzuki fails to disclose the simultaneous transmission of first and second information under the ordinary meaning of those terms, where “information” merely means “data” and no particular relationship between the first and second information is required, and we find that Petitioner has made a sufficient showing on this point. PO Resp. at 4–5; Pet. 19–20, 21–22.

Consequently, we find that Petitioner has demonstrated, by a preponderance of the evidence, that Suzuki teaches this limitation of claim 1. *See* Pet. 19–24.

b) Whether Suzuki’s Predistorted Signals Are “Information” to be “Transmitted”

Petitioner argues that Suzuki’s predistorted signals are “information” to be “transmitted” Pet. 19–20, 21–22. Petitioner identifies these signals as predistorted signals from adders 13-1 and 13-2 in Suzuki’s Figure 6, reproduced below.

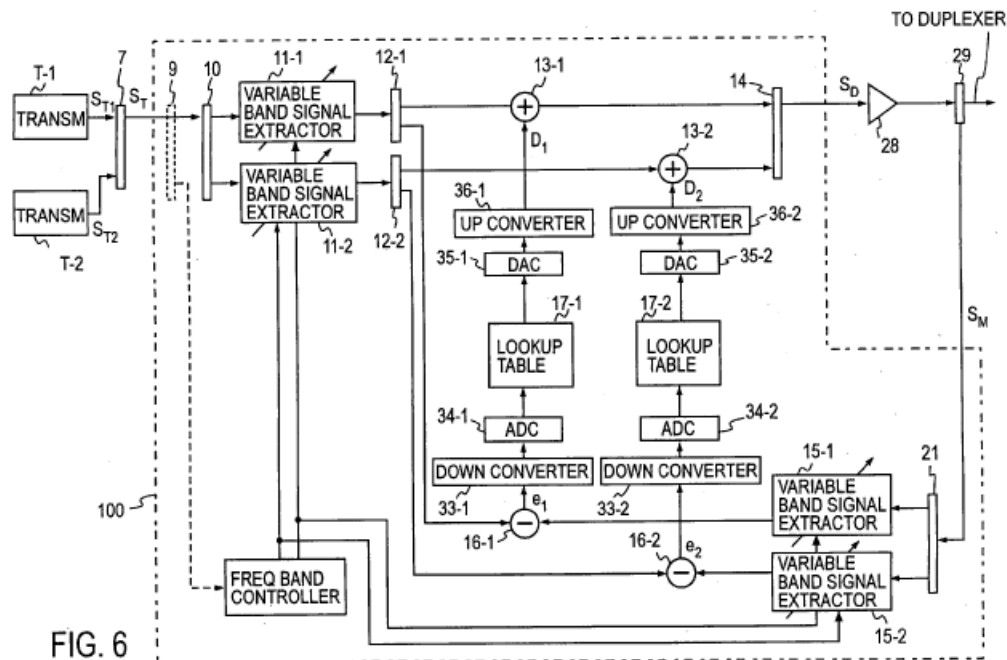


FIG. 6

Suzuki's Figure 6 showing predistorted signals from adders 13-1 and 13-2. Ex. 1004, Fig. 6.

Specifically, Petitioner contends that “one of the predistorted signals” from “adders 13-1 and 13-2” is the “first information,” and the other predistorted signal from adders 13-1 and 13-2 is the “second information,” relying on the description of these adders in Figure 1, which is the same as Figure 6.

Pet. 19 (citing Ex. 1004 ¶ 45), 21 (citing Ex. 1004 ¶ 45); Ex. 1004 ¶¶ 45 (describing adders 13-1 and 13-2 in Fig. 1), 63 (explaining that, in Fig. 6, “[t]he arrangements other than the distortion compensation data D_1 and D_2 are basically the same as those shown in Fig. 1”). According to Petitioner, these signals are transmitted in the frequency bands depicted in Figure 13A, reproduced previously. *Id.* at 19–20, 21–22.

Patent Owner responds that “[t]he predistortion compensation data identified by Petitioner” has “no information content that is transmitted.” PO Resp. 5 (citing Ex. 2013 ¶ 43). According to Patent Owner, this predistortion compensation data “is used by a digital predistortion system to

counteract the distortion” in the input signal. *Id.* Referring to its argument for claim 10, Patent Owner asserts that “the predistortion signals identified by Petitioner are cancelled out by Suzuki’s amplifier and are thus never transmitted as required by the claim.” *Id.*

After reviewing the full trial record, we find that Petitioner has carried its burden of showing that Suzuki discloses this limitation. As noted above, Petitioner relies on the signals output from ***adders 13-1 and 13-2*** in Suzuki’s Figure 6, which operate in basically the same manner as adders 13-1 and 13-2 in Figure 1. Pet. 19 (citing Ex. 1004 ¶ 45), 21 (citing Ex. 1004 ¶ 45); Ex. 1004 ¶¶ 45 (describing adders 13-1 and 13-2 in Fig. 1), 63 (explaining that, in Fig. 6, “[t]he arrangements other than the distortion compensation data D_1 and D_2 are basically the same as those shown in Fig. 1”). A bit of background is helpful to understand the information content of the signals from adders 13-1 and 13-2 in order to resolve this issue. In this regard, Suzuki explains that, in Figures 1 and 6, “[t]he input signal S_T including dual frequency bands of transmitting signals is divided into two input side variable band signal extractors 11-1 and 11-2 at the divider 10 and transmitting signals in dual frequency bands are extracted.” Ex. 1004 ¶ 45. Then, “[o]ne of the transmitting signals extracted in the dual frequency bands is divided to an adder 13-1” and “the other of the transmitting signals is divided to an adder 13-2.” *Id.* Adders 13-1 and 13-2 “add the distortion compensation data D_1 and D_2 to signals to be transmitted in frequency bands to perform distortion compensation (addition of predistortion),” thus “canceling the detected distortion components.” *Id.* ¶¶ 46–47. The outputs of adders 13-1 and 13-2 are fed to combiner 14, the output of which is provided to an amplifier and ultimately transmitted. *Id.* ¶¶ 45, 48.

Thus, the outputs of adders 13-1 and 13-2 include signals in a frequency band from input signal S_T as well as added predistortion data to cancel the distortion components that will be produced by power amplifier 28 before the signals are transmitted. We find that the inputs to adders 13-1 and 13-2 from signal S_T contain “information” to be transmitted because they contain information content in particular frequency bands from signal S_T that is sought to be transmitted. *See* Ex. 1004 ¶ 43 (referring to signal S_T as an “input transmitting signal”). We also find that the signal output from adders 13-1 and 13-2 continues to include this information content but also includes predistortion components D_1 and D_2 , which will ultimately be cancelled out by distortion from power amplifier 28 before transmission. *Id.* ¶ 48. We find that the addition of predistortion components D_1 and D_2 to the signals from S_T by adders 13-1 and 13-2 does not change the fact that the combined signals output by these adders still include information from input signal S_T that will be transmitted (the “first information” and “second information”) after the cancellation of the predistortion components by the distortion from amplifier 28.

Patent Owner’s reference to its argument for claim 10 on this issue is unavailing. *See* PO Resp. 5, 8–11. Claim 10, unlike claim 1, recites first and second “digital signals” comprising data to be transferred, and Petitioner relies on *different* signals in Suzuki as these “digital signals.” Pet. 31–32, 33–34. More specifically, for claim 10, Petitioner relies on predistortion compensation data from lookup tables 17-1 and 17-2 to teach the first and second digital signals, not the outputs from adders 13-1 and 13-2. *Id.* As a result, in its response to Petitioner’s argument for claim 10, Patent Owner focuses its argument on the predistortion compensation data from lookup

tables 17-1 and 17-2, not the outputs of adders 13-1 and 13-2, which Petitioner relies on for claim 1. Because Patent Owner's claim 10 arguments are not directed to the same signals Petitioner relies on for claim 1, we find that they are not applicable to Petitioner's arguments for claim 1.

Consequently, we find that Petitioner has demonstrated, by a preponderance of the evidence, that Suzuki discloses this limitation of claim 1. *See* Pet. 19–24.

c) Remaining Limitations of Claim 1

As noted previously, Petitioner provides a limitation-by-limitation analysis of claim 1, supported by argument and evidence, including testimony from Dr. Almeroth. Pet. 19–24. We have reviewed this argument and evidence, and find that Petitioner has proven, by a preponderance of the evidence, that Suzuki teaches the remaining limitations of claim 1.

d) Conclusion for Claim 1

For the foregoing reasons, we find that Petitioner has proven, by a preponderance of the evidence, that claim 1 is unpatentable over Suzuki.

5. Dependent Claims 2–4, 6, and 9 (Grounds 2 and 3)

Claims 2–4, 6, and 9 are dependent on claim 1. Claims 2–4 and 6 are raised in Ground 2, and claim 9 is raised in Ground 3. For claims 2–4, 6, and 9, under these Grounds, Petitioner provides a limitation-by-limitation analysis, supported by argument and evidence, including testimony of Dr. Almeroth. Pet. 24–29, 52–57. Patent Owner does not separately argue these dependent claims under these Grounds. PO Resp. 7–30. After reviewing the argument and evidence, we find that Petitioner has proven, by a preponderance of the evidence, that Suzuki teaches the limitations of

claims 2–4 and 6 under Ground 2, and that the Suzuki-Jalali combination teaches the limitations of claim 9 under Ground 3.

6. Dependent Claims 7 and 8 (Grounds 2 and 3)

Claim 7 is dependent on claim 1, and further recites that “the first information and the second information are the same data transmitted across two different frequencies.” Claim 8 is also dependent on claim 1, and recites that “the first information and the second information are from the same data stream.” Petitioner challenges claims 7 and 8 as unpatentable based on Suzuki alone in Ground 2, and as unpatentable based on Suzuki in combination with Jalali for Ground 3. Pet. 4.

With respect to claim 7, Petitioner argues that “Suzuki discloses predistorters for a multi-band wireless system operating on different frequency bands, which can, for example, ‘transmit[] both signals in [an] 800 MHz band *and* in 1.5 GHz simultaneously.’” Pet. 29 (citing Ex. 1004 ¶ 7). From this disclosure, Petitioner asserts, one of ordinary skill would “understand that the same information is being transmitted across two different frequencies.” *Id.* (citing Ex. 1003 ¶ 123). “At a minimum,” according to Petitioner, one of ordinary skill “would have found it obvious to transmit the same data across Suzuki’s multiple frequencies.” *Id.* For example, Petitioner contends, one of ordinary skill would be faced with only two design choices for transmitting data in Suzuki’s system: (1) sending the same data on the two frequencies; or (2) sending different data on the two frequencies. *Id.* (citing Ex. 1003 ¶ 124). “Sending the same data” on the two frequencies, Petitioner argues, would “have the well-known benefit of providing redundancy, especially in environments involving low signal-to-noise ratios.” *Id.*

Petitioner further argues that one of ordinary skill would have found claim 7 obvious in light of Jalali's disclosure that, with OFDM, "the overall transmission channel is essentially divided into a number of (L) parallel sub-channels that are used to transmit the *same or different data*." Pet. 52 (citing Ex. 1008, 8:50–53, 9:1–4 ("same data being transmitted on both sub-channels")). Petitioner argues that, "in the Suzuki-Jalali combination, Suzuki would likewise transmit information that is the same data" on "different frequency bands." *Id.* (citing Ex. 1003 ¶¶ 175–177).

Additionally, Petitioner argues that Suzuki teaches claim 8 when it explains that first and second information come from the "same data stream," namely S_T . Pet. 29 (comparing Fig. 1 showing single input data stream S_T with Fig. 6 showing two input data streams, S_{T1} and S_{T2} , combined into S_T). Additionally, Petitioner argues that claim 8 would have been obvious over the Suzuki-Jalali combination based on Jalali's disclosure that, with OFDM, "the overall transmission channel is essentially divided into a number of (L) parallel sub-channels that are used to transmit the *same or different data*." Pet. 52 (citing Ex. 1008, 8:50–53, 9:1–4 ("same data being transmitted on both sub-channels")). Petitioner argues that, in the Suzuki-Jalali combination, "Suzuki would like wise transmit information that . . . is from the same data stream . . . on different frequency bands." *Id.* (citing Ex. 1003 ¶¶ 175–177).

Patent Owner responds that one of ordinary skill would not have understood from Suzuki that the *same data* is being transmitted on the 800 MHz and 1.5 GHz bands simultaneously. PO Resp. 19 (citing Ex. 2013 ¶¶ 86–87). Patent Owner argues that Suzuki never states that the same data is transmitted on both bands and "[t]ransmitting the same information does

not follow from transmitting at two different frequency bands.” *Id.* Patent Owner also disagrees with Petitioner’s obviousness argument, asserting that Petitioner’s reliance on the modification being a “design choice” is inadequate and lacks sufficient motivation or explanation for the combination. *Id.* at 19–20. Patent Owner further contends that “there were any number of design choices and complexities that would need to be taken into account, including hardware, software, and the use of the digital signal processing method of space-time block coding as an alternative.” *Id.* at 20 (citing Ex. 2013 ¶ 87). Finally, Patent Owner argues that Suzuki focused on “sending multiple different signals from multiple different devices,” and never taught that “sending the same data was desirable or obvious.” *Id.*

Patent Owner also argues against the Suzuki-Jalali combination, asserting that “Petitioner fails to provide any actual evidence why a person of skill in the art would have been motivated to transmit the same data ***across two different frequencies*** as required by claim 7 or across the same data stream, as required by claim 8.” PO Resp. 21. According to Patent Owner, Petitioner’s argument is merely “applying hindsight with the benefit of the drafted claims of the ’802 patent.” *Id.*

After reviewing the full trial record, we find that Petitioner has persuasively shown that Suzuki discloses or renders obvious this limitation, either alone or in combination with Jalali. Both parties cite to paragraph 7 of Suzuki, which discusses “a multi-band wireless system” which includes “a system for transmitting both signals in 800 MHz band and in 1.5 GHz band simultaneously.” Ex. 1004 ¶ 7. Petitioner also relies on Figure 13A and paragraph 79, which states that “[t]he transmitting signal S_T is assumed to include signals in dual frequency bands FB1 and FB2 whose center

frequencies are f1 and f2 as shown in FIG. 13a, for example,” *Id.* ¶ 79, Fig. 13A; *see* Pet. 19–23. We do not see any restriction in Suzuki as to whether the data transmitted on the two frequency bands is the same data or different data, and we find that Suzuki’s disclosure is broad enough to encompass both situations. Ex. 1004 ¶¶ 7, 79, Figs. 6, 8, 13A. Indeed, it appears the system of Suzuki would work equally well whether the data transmitted on the different frequencies is the same data or different data, and Patent Owner does not explain why this would not be the case.

Moreover, we find that one of ordinary skill would “at once envisage” that the data transmitted on Suzuki’s different frequencies could be either the same data or different data, and thus Suzuki discloses both. *See Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 702 F.3d 1376, 1381 (Fed. Cir. 2015) (“[A] reference can anticipate a claim even if it ‘d[oes] not expressly spell out’ all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would ‘at once envisage’ the claimed arrangement or combination.”) (citing *In re Petering*, 301 F.2d 367, 681 (CCPA 1962)). We also find that Petitioner has sufficiently proven that one of ordinary skill would have found it obvious in the Suzuki-Jalali combination to transmit either the same or different data across different frequencies in light of Jalali’s statement that “the overall transmission channel is essentially divided into a number of (L) parallel sub-channels that are used to transmit the *same or different data*.” *See* Pet. 52; Ex. 1008, 8:50–53, 9:1–4 (“same data being transmitted on both sub-channels”); Ex. 1003 ¶¶ 175–177.

For similar reasons we also find that Petitioner has persuasively shown that one of ordinary skill would have found it obvious that “the first

information and the second information are from the same data stream,” as recited in claim 8, based on Suzuki either alone or in combination with Jalali. *See* Pet. 29, 51–52. Petitioner makes a persuasive showing for claim 8, and Patent Owner argues claim 7 and 8 together and does not meaningfully distinguish between them in its argument. *See* Pet. 29, 51–52; PO Resp. 20–22.

Consequently, we find that Petitioner has proven by a preponderance of the evidence that claims 7 and 8 are either taught by Suzuki or obvious over Suzuki in view of Jalali.

7. Independent Claim 10 (Ground 2)

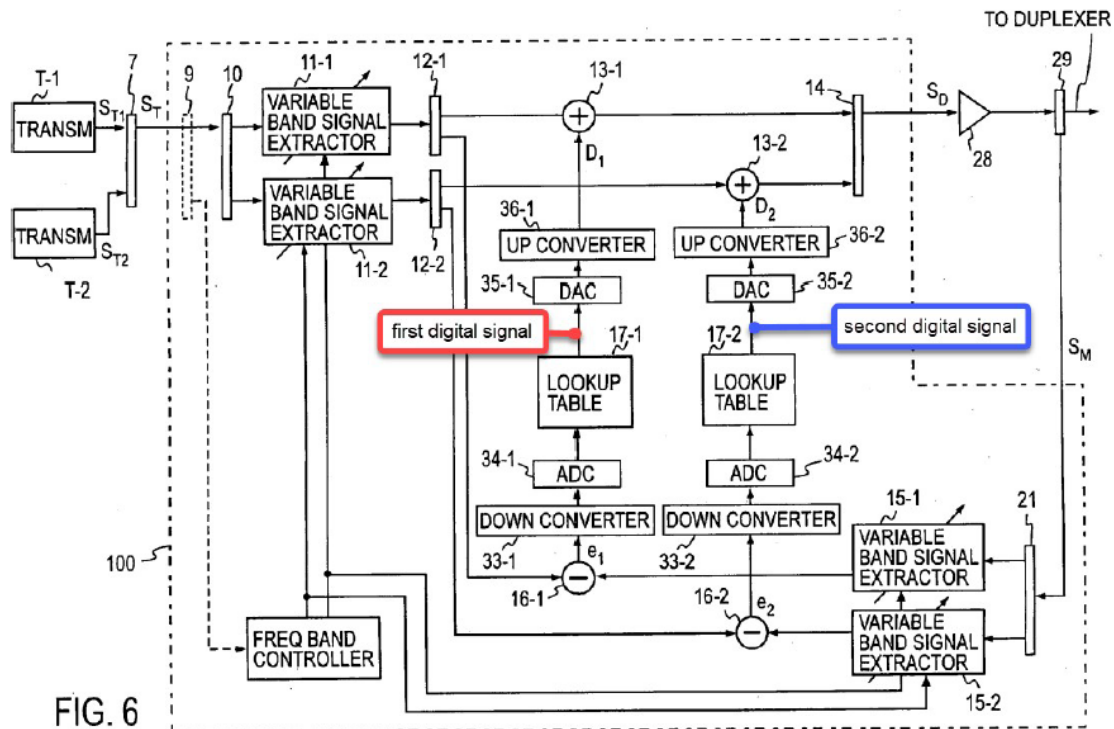
Petitioner provides a limitation-by-limitation analysis of claim 10 under this Ground, supported by argument and evidence, including testimony from Dr. Almeroth. Pet. 30–44. Petitioner relies on two separate embodiments, in the alternative, to meet the limitations of claim 10—the embodiment of Suzuki’s Figure 6 and the embodiment of Suzuki’s Figure 8. Pet. 30–44. Patent Owner raises two issues in response: (1) whether Suzuki’s Figure 6 embodiment discloses first and second digital signals comprising first and second data to be transmitted, as recited in limitations 10a and 10b; and (2) whether Suzuki’s Figure 8 embodiment discloses first and second up-converted analog signals, as recited in limitations 10e and 10f. We find that Petitioner has failed to carry its burden with respect to both of these issues for the reasons discussed below.

a) Whether Suzuki’s Figure 6 Embodiment Discloses First and Second Digital Signals Comprising First and Second Data to Be Transmitted

Limitation 10a and 10b recite “receiving a first digital signal comprising data to be transmitted” and “receiving a second digital signal

comprising second data to be transmitted.” The parties dispute whether Suzuki discloses this limitation. Pet. 31–33; PO Resp. 8–11; Pet. Reply 7–9; PO Sur-reply 4–5.

To support its argument, Petitioner relies on an annotated version of Suzuki’s Figure 6, reproduced below.



Petitioner’s annotated version of Suzuki’s Figure 6 showing the output of lookup table 17-1 as the “first digital signal” (red) and the output of lookup table 17-2 as the “second digital signal” (blue). Pet. 31.

Referring to Figure 6, Petitioner explains that “input signal S_T , including dual frequency bands of transmitting signals is divided into two inputside variable band signal extractors 11-1 and 11-2 at the divider 10 and transmitting signals in dual frequency bands are extracted.” *Id.* (citing Ex. 1004 ¶ 45. Petitioner asserts that “[t]he difference between the extracted symbols and monitor signals from SM is calculated, and used to receive predistortion compensation data from lookup tables 17-1 and 17-2, which

are the *first* and *second digital signals*, respectively.” *Id.* (citing Ex. 1004 ¶ 46). According to Petitioner, Suzuki discloses that these are digital signals because “tables 17-1 and 17-2 are implemented through digital signal processing.” *Id.* (citing Ex. 1004 ¶ 63). “The predistortion compensation data” from lookup tables 17-1 and 17-2, Petitioner contends, “*will be transmitted* with their respective frequency band as a predistorted signal.” *Id.* (citing Ex. 1003 ¶ 131).

Patent Owner responds that Petitioner’s argument is flawed because the predistortion signals from lookup tables 17-1 and 17-2 “are *never transmitted* and do not contain any data that is ever transmitted.” PO Resp. 8 (citing Ex. 2013 ¶ 50). Instead, Patent Owner argues, “the signals output from lookup tables 17-1 and 17-2 are merely pre-distortion signals that are cancelled in amplifier 28 prior to any transmission.” *Id.* at 9 (citing Ex. 2013 ¶ 54). More specifically, Patent Owner asserts, Suzuki’s lookup tables are used to determine the amount of predistortion that needs to be applied to the input signal of power amplifier 28, and outputs pre-distortion components D_1 and D_2 that compensate for the distortion caused by power amplifier 28. *Id.* at 9–10 (citing Ex. 1004 ¶¶ 1, 3, 63; Ex. 2013 ¶ 54). Adders 13-1 and 13-2 add distortion compensation data D_1 and D_2 to cancel the detected distortion components in the underlying signal. *Id.* at 10 (citing Ex. 1004 ¶ 47; Ex. 2013 ¶ 54). According to Patent Owner, distortion compensation data D_1 and D_2 derived from the output of lookup tables 17-1 and 17-2 are not signals that are either transmitted by the transmitter or contain “data to be transmitted,” but rather are “cancelled by the distortion caused by the power amplifier when the signal is amplified before transmission.” *Id.*

Petitioner responds that “Suzuki clearly refers to ‘distortion compensation *data* D_1 and D_2 ,’” which “are added to the respective frequency band from signal ST in order to predistort the output signal, which is then transmitted.” Pet. Reply 8 (citing Ex. 1004 ¶ 63; Ex. 1003 ¶ 131). Petitioner argues that, “even if the *effect*” of the signals from lookup tables 17-1 and 17-2 “is distortion compensation, Suzuki makes clear that the compensation data is *added* to the respective frequency band via adders 13-1 and 13-2.” *Id.* at 8–9 (citing Ex. 1030 ¶ 12; Ex. 1004 ¶¶ 47, 63). Thus, Petitioner contends, “the compensation data, which become part of the output signal, are transmitted.” *Id.* at 9 (citing Ex. 1030 ¶ 12).

Patent Owner responds that Petitioner’s argument “that the predistortion compensation data ‘become[s] part of the output signal’ and are thus transmitted” is an improper new argument that is not presented in the Petition. PO Sur-reply 5. Patent Owner also argues that, on the merits, Petitioner’s argument is contrary to Suzuki’s teaching that the predistortion compensation data, which Petitioner relies on as the first and second digital signals, are cancelled out in amplifier 28 prior to transmission. *Id.* (citing Ex. 1004 ¶ 46; PO Resp. 8–11 (citing Ex. 2013 ¶¶ 50–56)).

After reviewing the full trial record, we find that Petitioner has failed to sufficiently prove that Suzuki teaches “receiving a first digital signal comprising data *to be transmitted*” and “receiving a second digital signal comprising second data *to be transmitted*,” as recited in limitations 10a and 10b. Petitioner relies on the digital signals output from lookup tables 17-1 and 17-2 for these claimed first and second digital signals. Pet. 31; Pet. Reply 7–8. We agree with Petitioner that the signals output from lookup tables 17-1 and 17-2 are “digital signals” because, as Suzuki explains,

“tables 17-17 and 17-2 are implemented through digital signal processing.”
Ex. 1004 ¶ 63; *See* Pet. 31.

However, Petitioner has not sufficiently shown that these digital signals comprise “data to be transmitted,” as claim 10 requires. Both parties agree that the digital signals output from lookup tables 17-1 and 17-2 include predistortion compensation data. Pet. 31; PO Resp. 9; Pet. Reply 7–10; PO Sur-reply; Ex. 2013 ¶ 54. Suzuki explains that this digital predistortion compensation data is converted to analog by digital to analog converters 35-1 and 35-2, up-converted by up-converters 36-1 and 36-2, and added to the input signal by adders 13-1 and 13-2. Ex. 1004 ¶ 63, Fig. 6. The signals from adders 13-1 and 13-2 are combined in combiner 14 and the signal from combiner 14 is amplified by amplifier 28. *Id.*, Fig. 6, ¶¶ 45, 63.

We find credible and agree with Dr. Cooklev’s testimony that the predistortion signals from tables 17-1 and 17-2 “are cancelled out by Suzuki’s amplifier” 28. Ex. 2013 ¶ 50. Dr. Cooklev supports his opinion by referring to paragraph 1 of Suzuki, which states that Suzuki’s invention is directed to “a multi-band lookup table type predistorter” (such as the one implemented using lookup tables 17-1 and 17-2 in Figure 6) that “compensates for a distortion of a power amplifier.” Ex. 2013 ¶ 54; Ex. 1004 ¶ 1. Dr. Cooklev’s opinion is also supported by paragraph 3 of Suzuki, which explains that a conventional digital predistorter uses a lookup table “for linearizing non-linear characteristics of an amplifier.” Ex. 1004 ¶ 3; Ex. 2013 ¶ 54. Dr. Cooklev further supports his opinion by relying on Suzuki’s disclosure in paragraph 46 that power amplifier 28 is “subject to distortion compensation” by the predistorter, and that distortion components in the signal output by the amplifier are canceled by “distortion

compensation data [that] are read out from the lookup tables 17-1 and 17-2 and provided to the adders 13-1 and 13-2, respectively.” Ex. 1004 ¶ 46; Ex. 2013 ¶ 54. And, Dr. Cooklev’s opinion is supported by Suzuki’s disclosure in paragraph 47 that the distortion compensation added by adders 13-1 and 13-2 add the distortion compensation data from lookup tables 17-1 and 17-2 “to perform distortion compensation (addition of predistortion)” to “signals to be transmitted.” Ex. 1004 ¶ 47; Ex. 2013 ¶ 54. Petitioner agrees that the distortion compensation data from lookup tables 17-1 and 17-2 “are added to the respective frequency band from” input signal S_T “in order to predistort the output signal, which is then transmitted,” and does not dispute that the distortion compensation data from lookup tables 17-1 and 17-2 is ultimately cancelled out by the distortion created by amplifier 28. Pet. Reply 8.

In light of the above evidence, we agree with Patent Owner that Suzuki’s distortion components from lookup tables 17-1 and 17-2 in Figure 6 (which Petitioner relies on for the first and second digital signals in limitations 10a and 10b) are cancelled out by the distortion created by power amplifier 28 before the signal is ultimately transmitted. We agree with Petitioner that these first and second digital signals include data in the form of distortion compensation data. However, because these signals are cancelled by the distortion from amplifier 28 before transmission, the data from these signals is *never transmitted*. Thus, the first and second digital signals identified by Petitioner (the distortion compensation data from lookup tables 17-1 and 17-2) do not comprise data “to be transmitted,” as limitations 10a and 10b require.

We are not persuaded by Petitioner’s argument that “even if the *effect*” of the distortion compensation data from Suzuki’s lookup tables 17-1 and 17-2 “is distortion compensation, Suzuki makes clear that the compensation data is *added* to the respective frequency band via adders 13-1 and 13-2” and thus “the compensation data, which become part of the output signal, are transmitted.” Pet. Reply 8–9 (citing Ex. 1030 ¶ 12; Ex. 1004 ¶¶ 47, 63). As the previous discussion makes clear, even though the distortion compensation data is added to the signals by adders 13-1 and 13-2, that data is ultimately *cancelled out* by the distortion created by power amplifier 28 before it is transmitted. Although the distortion compensation data admittedly changes the transmitted signal from what it would otherwise be without those signals (by cancelling distortion created by amplifier 28), we do not find that the mere alteration of the transmitted signal necessarily means that the distortion compensation data *itself* is “transmitted.”

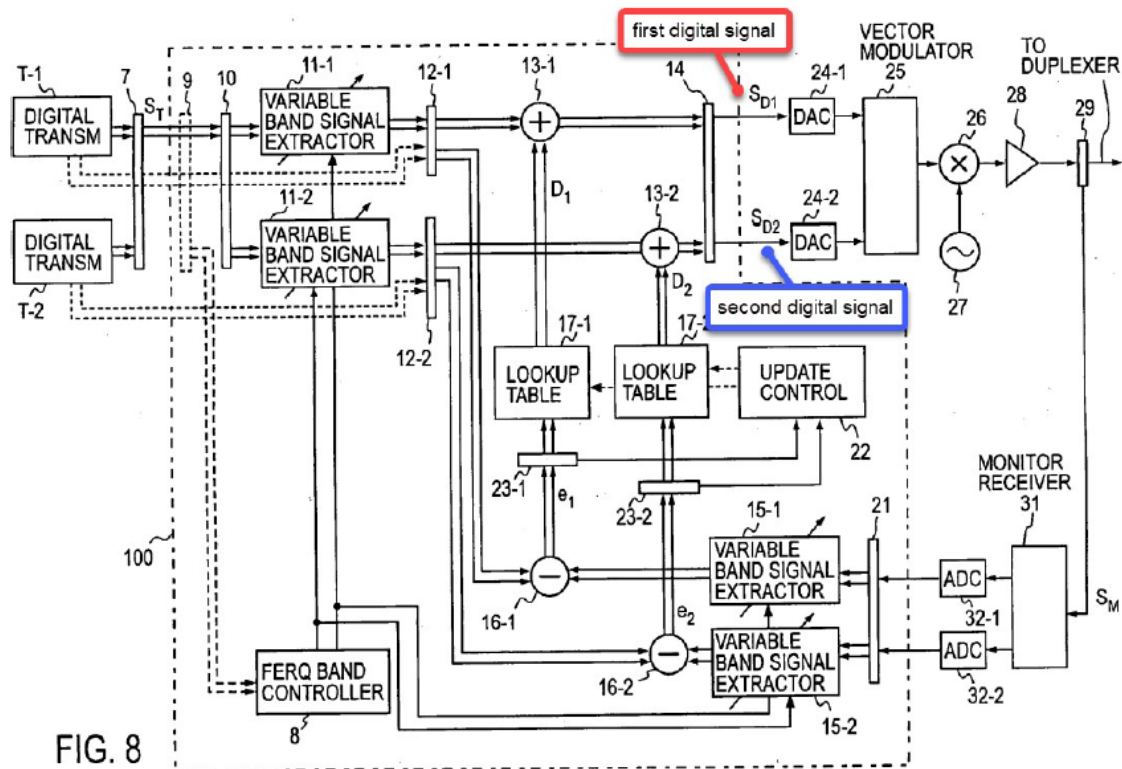
Consequently, we find that Petitioner has not proven by a preponderance of the evidence that the embodiment of Suzuki’s Figure 6 teaches “receiving a first digital signal comprising first data *to be transmitted*” and “receiving a second digital signal comprising second data *to be transmitted*,” as recited in limitations 10a and 10b.

b) Whether Suzuki’s Figure 8 Embodiment Discloses First and Second Up-Converted Analog Signals

Limitations 10e and 10f recite “up-converting the first analog signal to a first RF center frequency to produce a first up-converted analog signal” and “up-converting the second analog signal to a second RF center frequency to produce a second up-converted analog signal.”

Petitioner argues that Suzuki’s Figure 8 discloses this limitation. Pet. 37–40. Petitioner points to an annotated version of Suzuki’s Figure 8,

reproduced below, that identifies signals S_{D1} as the claimed “first digital signal” and signal S_{D2} as the “second digital signal.”



Petitioner’s first annotated version of Suzuki’s Figure 8 showing S_{D1} as the “first digital signal” in red and S_{D2} as the “second digital signal” in blue.
Pet. 33.

Petitioner relies on a second annotated version of Suzuki’s Figure 8 to show frequency converter 26 as an “up-converter.”

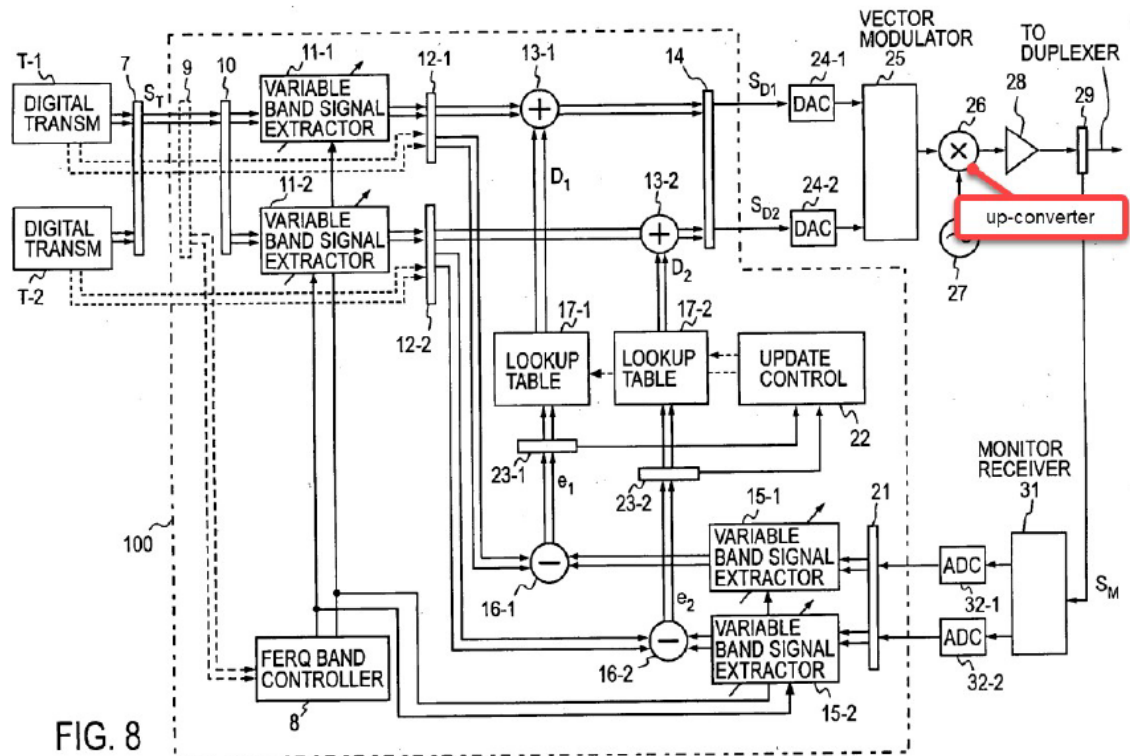
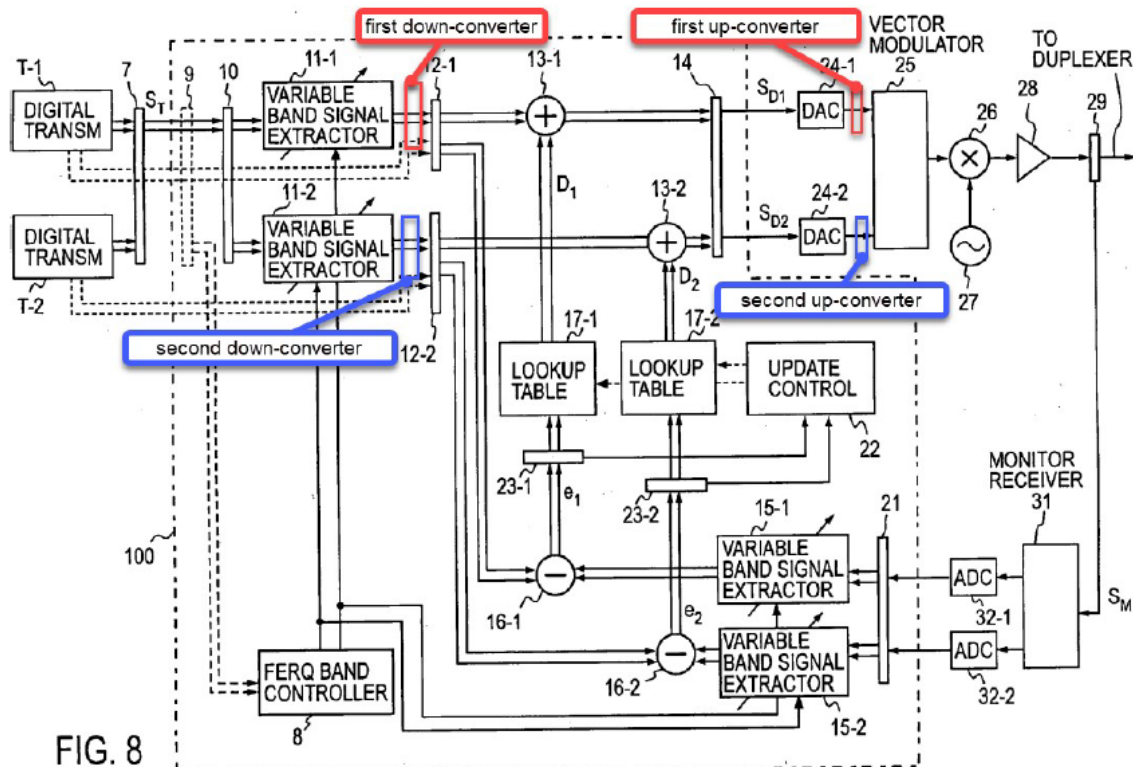


FIG. 8

Petitioner's second annotated version of Suzuki's Figure 8 showing frequency converter 26 as an "up-converter" in red. Pet. 38.

Petitioner argues that, in Figure 8, the analog signals from DACs 24-1 and 24-2 "are sent to a 'frequency-converter 26'" and are "frequency converted into a transmission signal of a radio frequency band by a carrier signal." *Id.* at 37 (citing Ex. 1004 ¶ 58). Petitioner asserts that one of ordinary skill "would understand a frequency-converter is an up-converter, because an up-converter converts signals to a higher frequency center for transmission over a radio band." *Id.* (citing Ex. 1003 ¶ 139). Thus, according to Petitioner, one of ordinary skill "would understand Suzuki discloses that frequency-converter 26 up-converts the analog signals to the frequency band centers used in the transmission signal, which are depicted as f1 and f2 in Figure 13A." *Id.*

Petitioner also argues that, “to the extent Patent Owner argues frequency-converter 26 is not an up-converter,” one of ordinary skill would have been motivated to add up converters before and after adders 13-1 and 13-2, as shown in Petitioner’s third annotated version of Suzuki’s Figure 8A, reproduced below.



Petitioner’s third annotated version of Suzuki’s Figure 8 showing an added first down-converter and first up-converter in red, and an added second down-converter and second up-converter in blue. Pet. 39.

Pet. 38–39. Specifically, according to Petitioner, in the event frequency-converter 26 is not an up-converter, one of ordinary skill “would have found it obvious to use a down-converter after the variable band signal extractors 11-1 and 11-2 to down-convert the signals to baseband frequency (a lower frequency spectrum), and then use an up-converter after DACs 24-1 and 24-2 to return the signal to the desired high frequency bands for transmission.” *Id.* at 38 (citing Ex. 1003 ¶ 140).

Patent Owner responds that Figure 8 does not show separately up-converting the signals output from DACs 24-1 and 24-2, but instead combines those two signals in vector modulator 25 “to produce a single combined signal, which is then transmitted to up-converter 25 to produce a single up-converted signal.” PO Resp 13 (citing Ex. 2013 ¶ 60; Ex. 1004 ¶ 58). Patent Owner points out that Suzuki’s Figure 8 shows a single line coming out of up-converter 26. *Id.* at 14 (citing Ex. 2013 ¶ 61). Patent Owner further contends that Petitioner’s proposed addition of up-converters to the output signals of DACs 24-1 and 24-2 is not applicable because Petitioner only makes this argument in the alternative “[t]o the extent Patent Owner argues that frequency-converter 26 is not an up-converter.” *Id.* (citing Pet. 38). Because there is no dispute that frequency-converter 26 is an up-converter, Patent Owner argues, “there is no need to make the alternate modification proposed by Petitioner to add additional upconverters.” *Id.* at 14–15. Patent Owner also argues that Suzuki’s Figure 8 does not show “a first up-converted frequency range” and “a second up-converted frequency range” as claimed because Suzuki never discloses that Figure 13A applies to Figure 8. *Id.* at 15–18.

Petitioner responds to Patent Owner’s argument that Suzuki fails to disclose the first and second up-converted signals by asserting that it “presented two alternative theories for this limitation: one based on Figure 6 of Suzuki, and one based on Figure 8,” and “Patent Owner does not dispute that Figure 6 discloses this limitation.” Pet. Reply 9 (citing Pet. 36–37). The remainder of Petitioner’s Reply directed to Figure 8 focuses on arguing that Figure 8 discloses the first and second upconverted frequency ranges

because the frequency ranges in Figure 13A would apply to Figure 8. *Id.* at 9–10.

After reviewing the full trial record, we find that Petitioner has failed to sufficiently prove that Suzuki’s Figure 8 embodiment discloses upconverting the first and second analog signals as claimed. As noted above, Petitioner relies on the signals from DACs 24-1 and 24-2 as the “first” and “second” analog signals. Pet. 33. Figure 8 shows that these first and second analog signals are combined by vector modulator 24 into a ***single signal***, and that this single signal is what is up-converted by frequency-converter 26. This is shown by the fact that Figure 8 depicts two separate signals entering vector modulator 25 and a single signal exiting vector modulator 25 and being fed to frequency converter 26. Ex. 1004, Fig. 8. It is also shown by Suzuki’s statement that vector modulator receives “two analog signals” and that “[t]he vector modulated signal” (singular) “is frequency converted-into a transmission signal of a radio frequency band.” *Id.* ¶ 58 (emphasis added). We find credible and agree with Dr. Cooklev’s testimony that Suzuki’s Figure 8 and paragraph 58 show that only a single analog signal is upconverted. Ex. 2013 ¶¶ 60–61.

We are not persuaded by Petitioner’s argument that, “to the extent Patent Owner argues frequency-converter 26 is not an up-converter,” one of ordinary skill would have been motivated to add up converters before and after adders 13-1 and 13-2. *See* Pet. 38–39; Ex. 1003 ¶ 140. As Patent Owner points out, Petitioner and Dr. Almeroth make this argument conditional on Patent Owner arguing that “frequency-converter 26 is not an up-converter,” and base their motivation to combine on that assumption. *Id.*; *see* Pet. 38; Ex. 1003 ¶ 140. However, as mentioned previously, Patent

Owner does not dispute that frequency-converter 26 *is* an up-converter. PO Resp. 14. Therefore, Petitioner’s condition and reason for adding additional up-converters to Figure 8—that frequency-converter 26 is not an up-converter—does not apply. Neither Petitioner nor Dr. Almeroth provides a reason or motivation to modify Figure 8 to add more up-converters and down-converters if frequency-converter 26 *is* an up-converter, which is not disputed here. *See* Pet. 38–39; Ex. 1003 ¶ 140.

We also are not persuaded by Petitioner’s argument in the Reply that the first and second upconverted signals are disclosed in Figure 6. Pet. Reply 9. The Petition relies on *alternative* theories for claim 10 based on the embodiments of Figures 6 and 8. Pet. 31 (“Petitioner relies on two alternative theories for [claim 10], that Suzuki’s embodiments in Figures 6 and 8 render this claim obvious.”), 31–33 (discussing Figures 6 and 8 in the alternative for limitations 10a and 10b), 36–41 (discussing Figures 6 and 8 in the alternative for limitations 10e and 10f). The Petition does not attempt to combine Figures 6 and 8, explain what such a combination would look like, or provide sufficient argument or evidence for why such a combination would have been obvious. *Id.* As discussed previously, Suzuki’s Figure 6 fails to teach claim 10 because it does not meet limitations 10a and 10b that recite “receiving a first digital signal comprising data to be transmitted” and “receiving a second digital signal comprising second data to be transmitted.” *See* §§ II.E.3(a), *supra*. Therefore, Petitioner’s attempt to use Figure 6 to fill gaps in Figure 8 is unavailing.

Finally, we are not persuaded by Petitioner’s argument at the oral hearing that Suzuki’s Figure 8 can be combined with Suzuki’s paragraph 94 and Figure 13A so that two signals would be upconverted instead of the

single signal coming out of vector modulator 25 and into frequency-converter 26. Tr. 15:10–17:7. Petitioner never raised this argument in its briefing, and therefore it has been forfeited. *See* Patent Trial and Appeal Board, Consolidated Trial Practice Guide § II.M (“During an oral hearing, a party . . . may only present arguments relied on in the papers previously submitted” and “no new evidence may be presented.”). Petitioner’s briefing only discussed Suzuki’s Figure 13A and paragraph 94 for the limitation requiring first and second “upconverted frequency range[s],” but never made this argument for the limitation requiring first and second upconverted analog signals. *See* Pet. 40– Pet. Reply 9–10.

Moreover, even if Petitioner’s new argument based on Suzuki’s Figure 13 and paragraph 94 were proper, we do not find it persuasive. Suzuki’s paragraph 94 describes the possibility of dividing the power output monitor signal SM into two frequency bands, but refers to the power amplifier output monitor signal itself in the singular (as a “signal” (singular) not “signals” (plural)). Ex. 1004 ¶ 94. Thus, if anything, this disclosure supports the conclusion that a single signal is output from vector modulator 25, is upconverted by frequency converter, and is amplified by power converter 28, as is shown by the single line extending from the output of vector modulator 25 through amplifier 28. We see nothing in Suzuki’s paragraph 94 that suggests either that the signal fed to frequency-converter 26 is actually multiple signals, or that suggests adding additional up-converters for the outputs of DACs 24-1 and 24.2, and Petitioner does not adequately support such a conclusion with sufficient argument or evidence.

Consequently, we find that Petitioner has not proven by a preponderance of the evidence that the embodiment of Suzuki’s Figure 8

teaches “up-converting the first analog signal to a first RF center frequency to produce a first up-converted analog signal” and “up-converting the second analog signal to a second RF center frequency . . . to produce a second up-converted analog signal,” as recited in limitations 10e and 10f.

c) Conclusion for Independent Claim 10

For the foregoing reasons, we find that Petitioner has not proven, by a preponderance of the evidence, that claim 10 is unpatentable over Suzuki.

8. Independent Claim 17 (Ground 2)

Petitioner also challenges independent claim 17 under Ground 2. Claim 17 is similar in many respects to claim 10, and the parties largely rely on the same arguments as they do for claim 10 for this Ground. Ex. 1001, 14:42–15:20, 16:1–42; Pet. 45; PO Resp. 7–18; Pet. Reply 6–10; PO Sur-reply 4–7. In particular, claim 17 includes: (1) limitation 17a reciting “a first digital signal comprising first data to be transmitted” and “a second digital signal comprising a second data to be transmitted” (similar to limitations 10a and 10b); and (2) limitations 17d and 17e reciting a “first up-converter” that outputs a “first up-converted analog signal comprising a first up-converted frequency range” and a “second up-converter” that outputs a “second up-converted analog signal comprising a second up-converted frequency range” (similar to limitations 10e and 10f).

For the reasons discussed above with respect to limitations 10a and 10b, we find that Petitioner has failed to sufficiently prove that Suzuki’s Figure 6 embodiment teaches first and second digital signals comprising first and second data “to be transmitted.” See § II.E.5(a), *supra*. Additionally, for the reasons discussed above with respect to limitations 10e and 10f, we find that Petitioner has failed to sufficiently prove that Suzuki’s Figure 8

embodiment teaches a “first up-converter” that outputs a “first up-converted analog signal comprising a first up-converted frequency range” and a “second up-converter” that outputs a “second up-converted analog signal comprising a second up-converted frequency range.” *See* § II.E.5(b), *supra*.

Consequently, Petitioner has failed to prove by a preponderance of the evidence that claim 17 is unpatentable over Suzuki.

9. Dependent Claims 13, 14, and 21–23 (Grounds 2–5)

Claims 13, 14, and 21–23 are dependent on claims 10 or 17.

Petitioner challenges claims 13 and 21 under Grounds 2 and 5, claim 14 under Ground 4, claim 22 under Grounds 2 and 3, and claim 23 under Ground 3. Pet. 4. As discussed previously, Petitioner has failed to prove, by a preponderance of the evidence, that independent claims 10 and 17 are unpatentable. Therefore, Petitioner has necessarily failed to prove, by a preponderance of the evidence, that claims 13, 14, and 21–23, which depend from claims 10 or 17, are unpatentable.

10. Independent Claim 24 (Ground 4)

Claim 24 recites, *inter alia*, “a first down-converter” that outputs a “first downconverted signal” (limitation 24a), “a second down-converter” that outputs a “second downconverted signal” (limitation 24b), and “a filter” that “receives the first and second down-converted signals” (limitation 24c). Petitioner argues that these limitations would have been obvious over the combination of Suzuki and Chen in Ground 4. Pet. 4.

Petitioner relies on an annotated version of Chen’s Figure 6, reproduced below, to show the “first down-converter,” “second down-converter,” and “filter” recited in limitations 24a–24c.

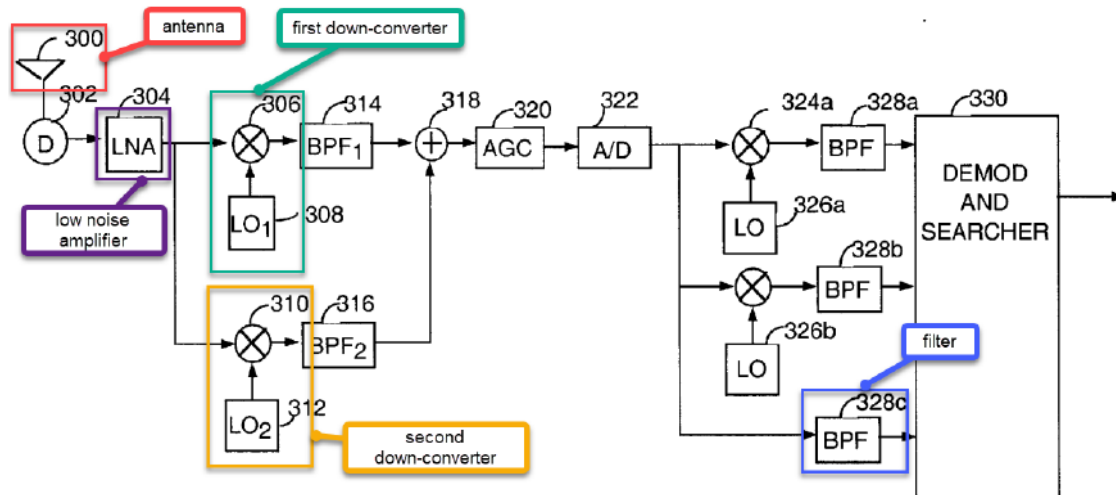


FIG. 6

Petitioner’s annotated version of Chen’s Figure 6 showing a “first down-converter” (green), a “second down-converter” (yellow), and a “filter” (blue). Pet. 71.

Petitioner argues that, in the Suzuki-Chen combination, Chen’s mixer 306 (the “first down-converter circuit”) receives an amplified signal containing the first frequency range in Suzuki’s Figure 13A, and Chen’s downconverter 310 (the “second down-converter circuit”) receives an amplified signal containing the second frequency range in Suzuki’s Figure 13A. Pet. 65–68, 68–70; Ex. 1003 ¶¶ 205–211, 214–215; Ex. 1009, 13:63–66, Fig. 6.

According to Petitioner, Chen discloses that “the output of the mixer 306 and downconverter 310 are, after downconversion, ‘already at baseband’ and ***provided directly*** to filter 328c.” *Id.* at 71 (citing Ex. 1009, 13:60–14:6, 14:13–15; Ex. 1003 ¶ 220).

Patent Owner disagrees, arguing that “the analog outputs of Chen’s down-converters 306 and 310 are ***not*** received by Chen’s filter 328c,” but instead “are converted to digital signals in the Analog to Digital Converter 322” before being “provided to the filter 328c.” PO Resp. 23 (citing Ex. 2013 ¶ 78); *see id.* at 24–25 (citing Ex. 2013 ¶ 80; Ex. 1009, 14:7–15).

Therefore, Patent Owner asserts, Chen does not disclose that the first and second downconverted signals are “receive[d]” by the claimed “filter.” *Id.* Patent Owner contrasts Chen to the ’802 patent, where “the down-converted signals are provided to the filter first and, only thereafter, are changed from analog to digital.” PO Resp. 23, 25-26 (citing Ex. 1001, Fig. 9, 11:60–64); Ex. 2013 ¶ 81. Patent Owner argues that analog signals (like those output by mixer 306 and down-converter 310) are different from digital signals (like those output from A/D converter 322) because analog signals have an infinite number of possible different waveforms, while digital signals have only a finite number of possible digital messages. PO Resp. 26–27 (citing Ex. 2013 ¶ 82; Ex. 1023 11–12).

Patent Owner also argues that Chen’s statement that the signals 250a and 252a in Chen’s Figure 5 are “provided directly to filter 328c” “does not mean that the downconverted signals that are the outputs of the down-converters 306 and 310 are ‘provided directly’ to filter 328c.” PO Resp. 28–29. “Instead,” Patent Owner asserts, the term “provided directly” in Chen “refers to the fact that the signals are already at baseband and do not need to be further downconverted before being sent to the filter 328c.” *Id.* at 29 (citing Ex. 2013 ¶ 85; Ex. 1009, 14:13–15). According to Patent Owner, “Chen is clear that the output of down-converters 306 and 310 are summed, then changed to digital signals, and it is these modified, digital signals that are transmitted to filter 328c, not the analog output of the down-converters.” *Id.* (citing Ex. 2013 ¶ 85).

Petitioner responds that Patent Owner’s reasoning is “fundamentally flawed” because it “tries to import into [c]laim 24 a limitation that the down-conversion must occur before converting to digital signals.” Pet. Reply 10

(citing PO Resp. 25–26). To the contrary, Petitioner asserts, “[c]laim 24 is silent as to whether the signals are digital or analog, let alone any conversion from analog to digital.” *Id.* (citing Ex. 1030 ¶ 15). According to Petitioner, “[r]eading in a completely new step—that is, conversion from analog to digital—goes beyond merely construing terms to ascertain meaning,” and instead “would impermissibly import a limitation wholesale from the Specification into the claims.” *Id.* at 10–11 (citing Ex. 1030 ¶ 15). “Therefore,” Petitioner contends, “there is no requirement in [c]laim 24 that the signals be converted from analog to digital, let alone that it must happen after down-conversion.” *Id.* at 11 (citing Ex. 1030 ¶ 15).

Patent Owner responds that Petitioner’s Reply “abandon’s [Petitioner’s] argument that Chen’s down converter outputs are ‘provided directly’ to filter 328c and instead focuses on whether the signals are analog or digital.” PO Sur-reply 7–8 (citing Pet 71; Pet. Reply 10–12). Patent Owner dismisses Petitioner’s argument that claim 24 is not limited to analog or digital signals and does not exclude an A/D conversion as a “strawman,” and contends that the real deficiency in Chen “is not that the down-converted signals are analog, but rather that Chen’s filter never receives the output of the identified down-converters.” *Id.*

After reviewing the full trial record, we find that Petitioner has sufficiently proven that Chen discloses a “filter” that “receives the first and second down-converted signals.” The parties do not dispute that Chen’s Figure 6 discloses first and second down-converted signals output from mixer 306 and downconverter 310, or that these signals are first and second down-converted signals as claimed. The parties also do not dispute that these first and second down-converted signals are combined in summer 318,

fed to automatic gain control (AGC) 320, and converted to digital signals in analog to digital (A/D) converter 322 before being fed to bandpass filter (BPF) 328c. The only issue is whether the first and second down-converted signals from mixer 306 and downconverter 310 can be considered to be “receive[d]” by filter 328c even though they are converted from analog to digital in A/D converter 322 before being fed to filter 328c.

We answer this question in the affirmative. We find that Chen’s filter 328c receives the first and second down-converted signals from mixer 306 and downconverter 310 even though those signals go through various signal processing operations, including analog to digital conversion, before being received by filter 328c. This conclusion is supported by the ’802 patent’s statement that the down-converted signals “may be processed . . . (e.g., filters, *ADCs* [analog to digital converters], and digital processing circuits in baseband processors 550),” indicating that analog to digital conversion can be considered simply one method of “processing” a signal rather than something that creates an entirely new signal. Ex. 1001, 8:52–56 (emphasis added). It is also supported by the ’802 patent’s statement that “[a]nalog-to-digital converter 560 is coupled to the output of filter 506 *to receive the first down-converted signal* 522,” even though there is a filter 506 in Figure 5 between the generation of first down-converted signal by down-converter 504 and the ADC 560. *Id.* at 8:63–67; *see id.* at 8:32–33 (defining the “first down-converted analog signal” as the signal coming out of first down-converter 504 and going into filter 506). This statement indicates that a circuit element can “receive” the down-converted signal even if there is another signal processing element (such as filter 506) between the downconverter and the circuit element receiving the signal. Additionally,

Chen explains that the down-converted signals 250a and 252a from mixer 306 and downconverter 310 are “*provided directly* to filter 328c” even though they go through an analog to digital conversion process after downconversion and before being received by filter 328c. Ex. 1009 13:63–14:3 (explaining that signals 250a and 252a are downconverted by mixer 306 and downconverter 310), 14:14–16 (explaining that “[t]he signal carried on carriers 250a and 252a” are “provided directly to filter 328c”). Moreover, nothing in claim 24 or limitation 24c requires that the first and second down-converted signals must be *directly* received by the filter, or precludes additional signal processing steps or circuitry between the downconverter and the filter. And, nothing in limitation 24c specifies that the signal has to be digital or analog.

We do not agree with Patent Owner’s argument that Chen’s statement that the down-converted signal is “provided directly to filter 328” only means that “the signals are already at baseband and do not need to be further downconverted before being sent to the filter 328c.” *See* PO Resp. 29. While it is true that the signals 250a and 252a are downconverted by mixer 306 and downconverter 310, those signals are fed through various signal processing stages, including A/D converter 322, before being received by filter 328c. We see no language in the cited portions of Chen that suggests that something other than the down-converted versions of signals 250a and 252a from mixer 306 and downconverter 310 are what Chen is stating are “provided directly to filter 328c.” *See* Ex. 1001, 13:60–14:16.

Consequently, we find that Petitioner has proven by a preponderance of the evidence that Chen teaches “a first down-converter” that outputs a “first downconverted signal” (limitation 24a), “a second down-converter”

that outputs a “second downconverted signal” (limitation 24b), and “a filter” that “receives the first and second down-converted signals” (limitation 24c).

Petitioner provides a limitation-by-limitation analysis for the remaining limitations of claim 24, supported by argument and evidence, including testimony from Dr. Almeroth. Pet. 68–71. We have reviewed this argument and evidence, and find that Petitioner has proven, by a preponderance of the evidence, that Suzuki teaches the remaining limitations of claim 24. Consequently, Petitioner has proven by a preponderance of the evidence that claim 24 is unpatentable over Suzuki and Chen.

11. Dependent Claim 25 (Ground 4)

Claim 25 depends from claim 24. Petitioner argues that claim 25 would have been obvious over the combination of Suzuki and Chen in Ground 4, relying on its argument for claim 2 in Ground 2. Pet. 4, 57 (“For Claim 25, *see* Ground 2, Claim 2.”).

Patent Owner argues that “Petitioner presents no argument or evidence that the combination of Suzuki and Chen renders [claim 25] obvious.” PO Resp. 29. Patent Owner asserts that the only discussion of claim 25 in Ground 4 is a cross-reference to claim 2 “without any discussion of the actual proposed . . . Suzuki/Chen combination, how the proposed Suzuki/Chen combination would render the claimed invention of claim 25 obvious as a whole, or why a person of skill in the art would be motivated to make such a combination.” *Id.* at 29–30. “Petitioner’s failure to identify its position with particularity,” Patent Owner contends, “compels a finding that Petitioner fails to meet its burden.” *Id.* at 30.

Petitioner responds that the Petition cross-references claim 2 for claim 25 “because the analysis for [c]laim 25 would be the same as for Ground 2,

[c]laim 2 by virtue of the claims’ identical language.” Pet. Reply 12 (citing Ex. 1030 ¶ 16; Pet. 24–25). More specifically, Petitioner points to the fact that claim 25 recites “wherein the frequency difference between the first RF frequency and the second RF frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range,” and claim 2 has language that is nearly identical except that it refers to the first and second “center frequency” instead of the first and second “RF frequency.” *Id.* Petitioner further points out that, although claim 2 does not recite “wherein first signal has a first frequency range and the second signal has a second frequency range,” the “first frequency range” and “second frequency range” limitations are discussed with respect to Ground 2, claim 1, from which claim 2 depends. *Id.* at 13 (citing Ex. 1030 ¶ 17; Pet. 18–20).

We agree with Petitioner that the Petition sufficiently addresses claim 25 by referencing its argument for claim 2, because the language of claim 2 is virtually identical to the language of claim 1, and raises no additional or different issues. We also agree with Petitioner that the Petition sufficiently addresses claim 25’s “first frequency range” and “second frequency range” limitations in its arguments for claim 1. *See* Pet. 18–20. Consequently, we find that Petitioner has proven by a preponderance of the evidence that the claim 25 is unpatentable over the Suzuki-Chen combination.

F. Grounds 6–9: Fernandez-Montojo Based Grounds

1. Overview of Fernandez (Ex. 1005)

Fernandez is directed to wideband signal generation systems and methods that employ frequency interleaving for generating wideband signals. Ex. 1004, code (57). The method increases a digitally synthesized signal’s bandwidth by frequency interleaving multiple digitally synthesized

signal sources of narrower bandwidth to create a continuous wideband signal by summing multiple narrower band signals that overlap in frequency. *Id.* According to certain embodiments, digital signal processing (DSP) and analog mixing are used to create the multiple narrower band signals. *Id.* As a result, a high fidelity, continuous wideband signal is produced when the multiple narrower band signals are summed. *Id.*

Fernandez's Background section also describes in Figure 2A, reproduced below, an exemplary prior art system for generating signals which sums the output of multiple signal generators to create multi-carrier wireless signals.

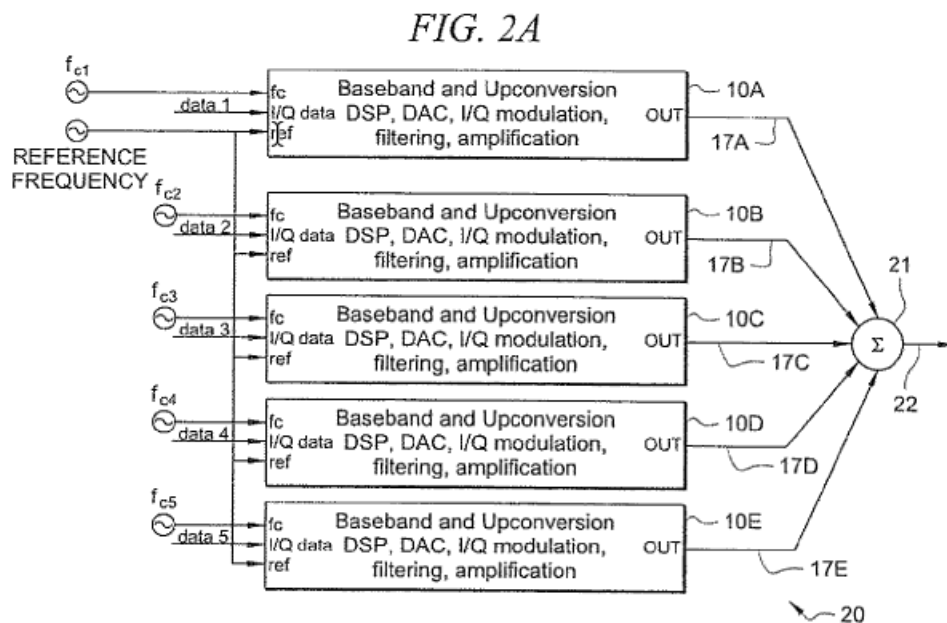


Figure 2A depicts an exemplary prior art system for generating signals which sums the output of multiple signal generators to create multi-carrier wireless signals. Ex. 1005 ¶ 36.

Fernandez explains that, in Figure 2A, signal generation system 20 includes multiple signal generators 10A–10E that may be employed to generate signals 17A–17E. Ex. 1005 ¶ 8. Each of these signal generators 10A–10E includes baseband and upconversion digital signal processing (DSC), a

digital to analog converter (DAC), I/Q modulation, filtering, and amplification. *Id.* at Fig. 2A, ¶ 8. Signals 17A–17E are summed by summing circuit 21 to generate multi-carrier wireless signal 22. *Id.* ¶ 8. Fernandez explains that this is “a common technique to create multi-carrier wireless signals.” Ex. 1005 ¶ 8.

Signals 17A–17E are shown in Figure 2B, reproduced below.

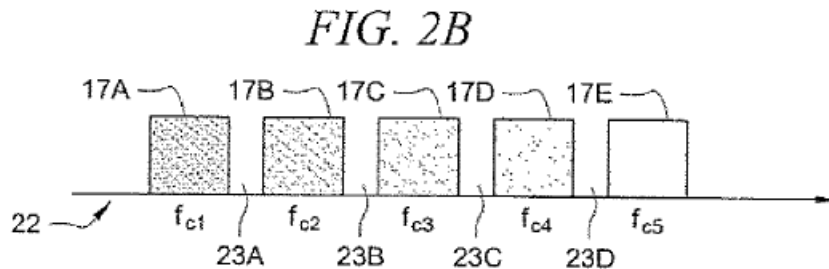


Figure 2B of Fernandez shows Signals 17A–17E from Figure 2A. Ex. 1005 ¶ 8, Fig. 2B.

As shown in Figure 2B, the multicarrier signal 22 contains the plurality of summed signals 17A–17E, along with holes 23A, 23B, 23C, and 23D interspersed between. *Id.* ¶ 8. Thus, Fernandez explains, multi-carrier wireless signal 222 is not truly wideband, and the sub-carriers do not necessarily share a fixed magnitude and phase relationship. *Id.*

2. Overview of Montojo (Ex. 1006)

Montojo is directed to a multi-carrier access terminal having a transmitter with a single power amplifier. Ex. 1006, code (57). In the system, the maximum transmission power available for a multi-carrier signal transmitted by the terminal is apportioned among multiple carriers on a priority basis. *Id.* After apportionment, the carriers are combined into a multi-carrier signal, amplified by the power amplifier, and transmitted. *Id.*

Montejo's Figure 5, reproduced below, shows a general application of a prioritized apportionment of transmission power among a plurality of carriers.

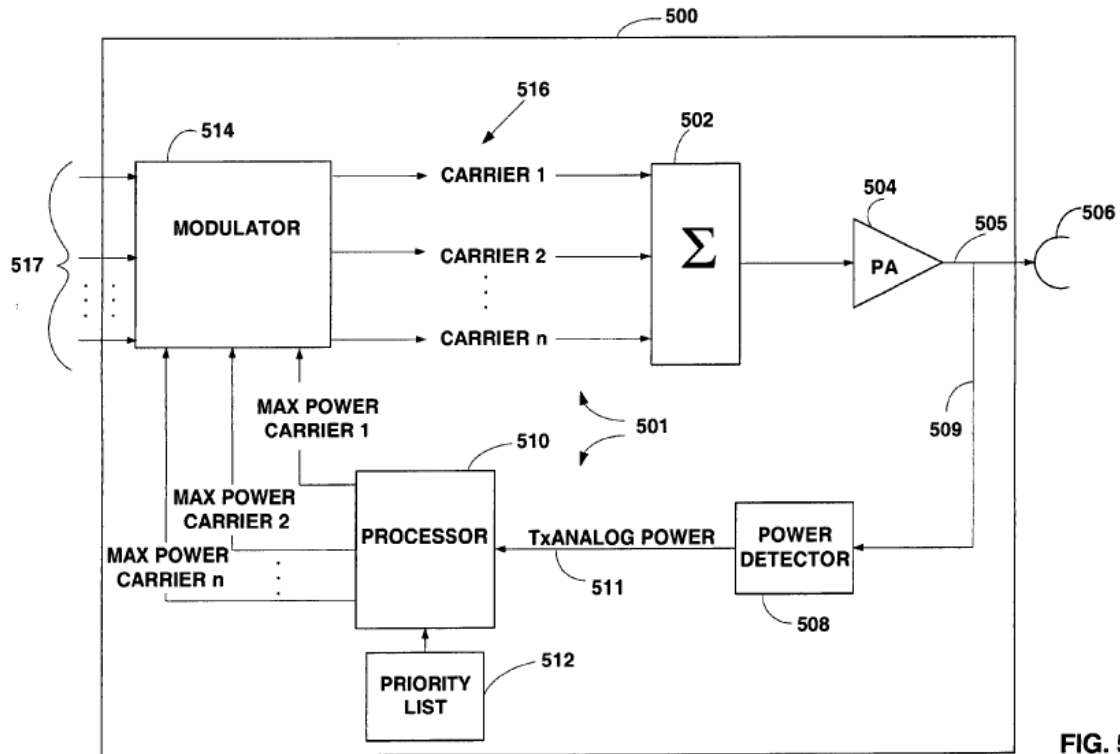


FIG. 5

Montejo's Figure 5 is a block diagram illustrating a general application of a prioritized apportionment of transmission power among a plurality of carriers served by a single power amplifier 504. Ex. 1006 ¶ 15, Fig. 5.

In Figure 5, transmitter 500 includes at least one multi-carrier transmission section 501 in which a plurality of carriers 516 are summed by signal combiner 502, which sums the carriers to produce a multi-carrier signal. *Id.* ¶ 45. The multi-carrier signal from combiner 502 is input to power amplifier (PA) 504, which produces an amplified multi-carrier signal on signal path 505, which connects power amplifier 504 to antenna 506. *Id.* The signal from amplifier 504 is sent on signal path 509 and measured by power detector 508, which generates a signal TxAnalogPower, which is then fed to processor 510. *Id.*

Processor 510 senses the power level of the amplified multi-carrier signal, and indirectly obtains the maximum available transmission power for each of the carriers (MaxPowerCarrier), each of which is fed to modulator 514. Ex. 1006 ¶ 45. Each MaxPowerCarrier signal indicates to modulator 514 the maximum available power level of a correspondingly-numbered carrier signal, and thereby performs the power carrier apportionment in accordance with a priority list 512 and the overall maximum power available for transmission (MaxTxPowerAnalog). *Id.* According to the priority apportionment scheme, “the highest priority carrier is allocated as much of MaxTxPowerAnalog as is necessary to satisfy whatever transmission requirements apply to it,” and “[a]ny lower-priority carrier (say, carrier y) will be accorded whatever remains of MaxTxPowerAnalog after allocation to active carriers with higher priority.” *Id.*

3. *Motivation to Combine Fernandez and Montojo*

Petitioner argues that one of ordinary skill “would have been motivated to combine Fernandez’s parallel system for generating a multi-carrier signal with Montojo’s single amplifier that amplifies a multi-carrier signal and single antenna for transmitting the amplified signal.” Pet. 75. Petitioner relies on Figure 2A of Fernandez, reproduced below, which, as discussed previously, shows an exemplary prior art system for generating signals by summing the output of multiple signal generators (10A–10E) to create multi-carrier wireless signals.

FIG. 2A

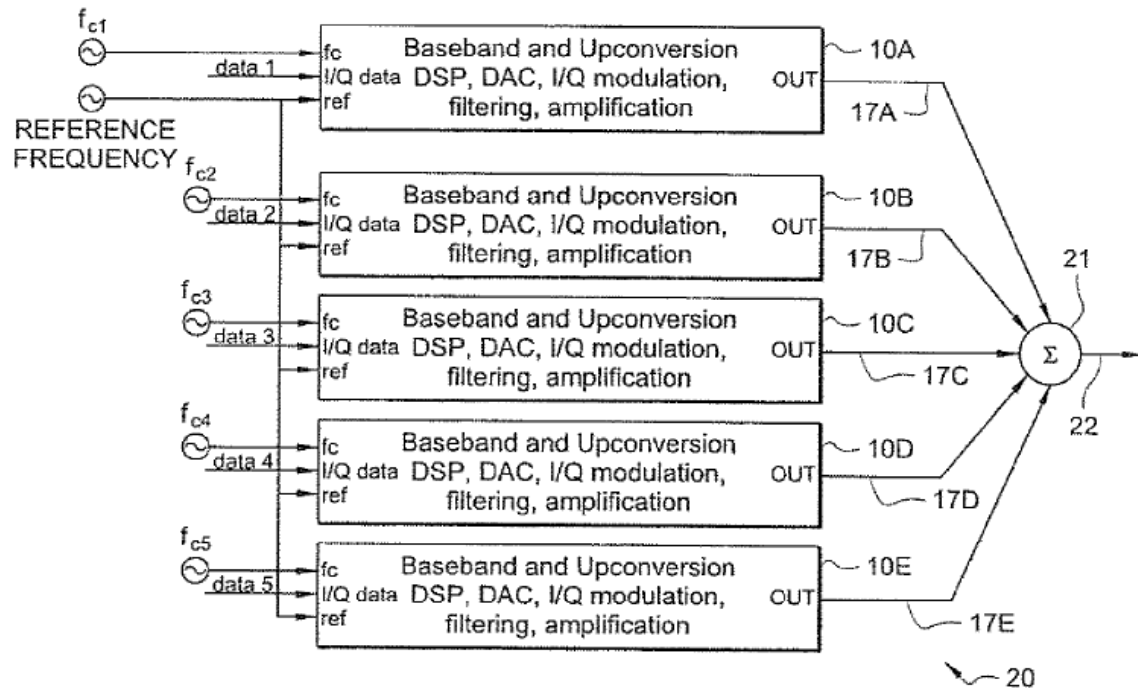
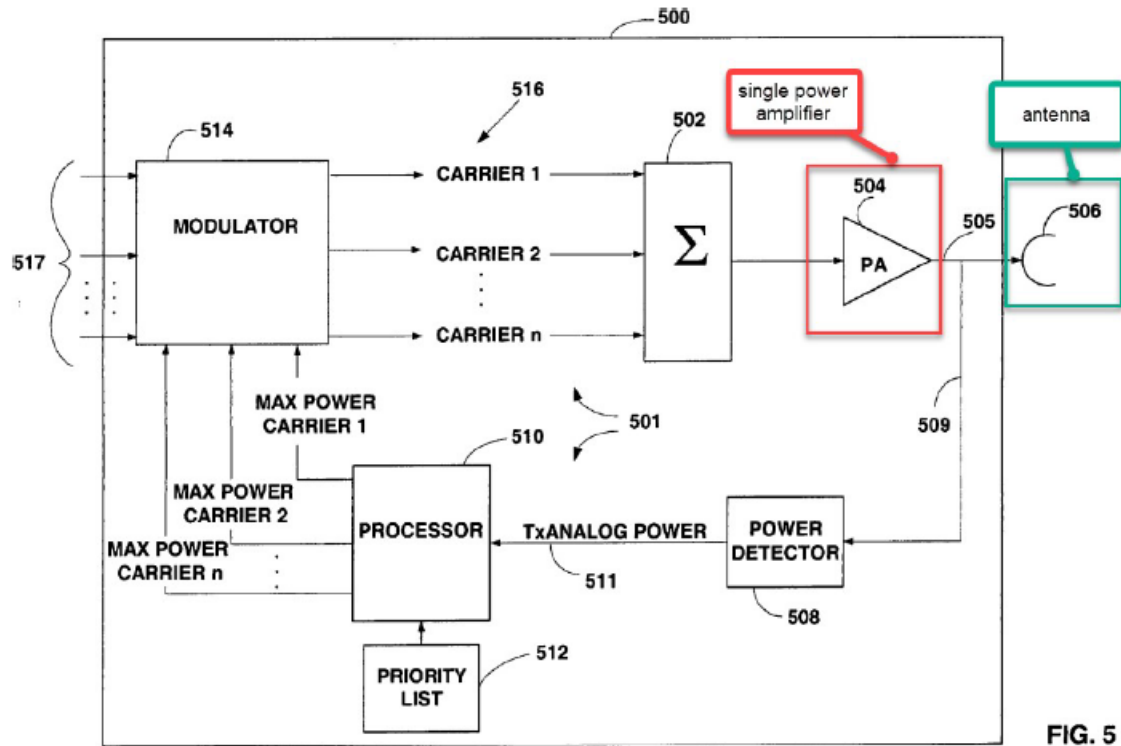


Figure 2A of Fernandez shows an exemplary prior art system for generating signals by summing the output of multiple signal generators to create multi-carrier wireless signals. Ex. 1005, Fig. 2A, ¶ 36.

Petitioner acknowledges that each of Fernandez’s signal generating systems 10A–10E “performs its own amplification,” but asserts that one of ordinary skill “would have found it obvious to modify Fernandez to use Montojo’s single amplifier.” Pet. 76. Petitioner argues that this modification would have been obvious based on Fernandez alone, and that one of ordinary skill “would have been motivated to make this modification because of well-known benefits of using a single amplifier to amplify a multi-carrier wireless signal.” *Id.* (citing Ex. 1003 ¶ 235). More specifically, Petitioner contends, “[a] single amplifier has several advantages compared to multiple amplifiers, including lower complexity, a single (vs. multiple) potential point of failure, and lower cost.” *Id.* at 76–77 (citing Ex. 1003 ¶ 235). Thus, Petitioner argues, one of ordinary skill “viewing Fernandez’s disclosure would have

found a single amplifier to be a simple matter of design preference.” *Id.* at 77 (citing Ex. 1003 ¶ 235).

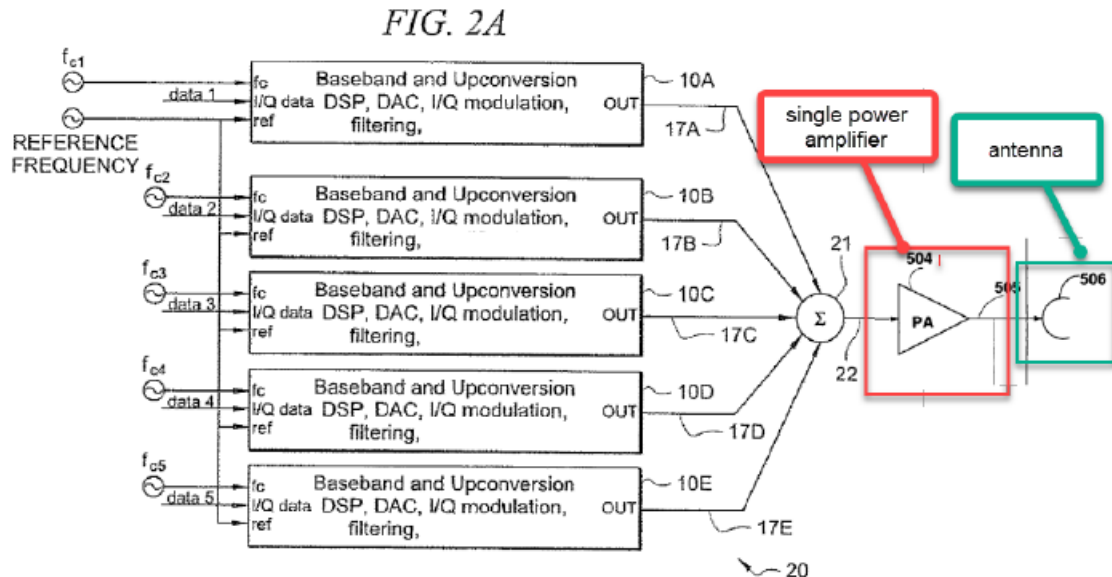
Petitioner further argues that “[t]hese well-known benefits are further underscored by Montojo,” which “teaches generating a multi-carrier signal and explains that while ‘multiple power amplification circuits, each dedicated to one carrier and each including a power amplifier’ is an option, this runs against ‘limitations on space, manufacturing cost, power consumption and other factors,’ which ‘dictate the need to share resources among the carriers, including power amplification circuitry.’” Pet. 77 (citing Ex. 1006 ¶ 5). Petitioner also points to Montojo’s statement that “it would be advantageous to utilize a single power amplifier for transmission of a plurality of carriers transmitted by a multi-carrier terminal.” *Id.* Petitioner provides an annotated version of Montojo’s Figure 5, reproduced below, showing its single power amplifier.



Petitioner’s annotated version of Montojo’s Figure 5 showing its single power amplifier 504 (red) and antenna 506 (green). Pet. 78.

Petitioner argues that one of ordinary skill “would have reasonably expected success in modifying Fernandez to use a single amplifier and antenna based either on Fernandez’s disclosure alone or in combination with Montojo.” Pet. 78 (citing Ex. 1003 ¶ 237). According to Petitioner, Montojo “teaches how to implement a single amplifier for multi-carrier transmission,” and implementing this single amplifier in Fernandez would have been within the level of ordinary skill. *Id.* (citing Ex. 1006 ¶¶ 21, 42, Fig. 5). Petitioner submits a figure it generated, reproduced below, depicting the proposed

Fernandez-Montojo combination.



Petitioner's figure showing on the left the Fernandez-Montojo combination including Fernandez's signal generating systems 10A–10E with amplification removed, and on the right a single power amplifier (red) and antenna (green) from Montojo. Pet. 79.

Petitioner further argues that, “by the time of the ’802 patent, power amplifiers that could amplify wideband multi-carrier signals of WiMAX and UWB (mentioned by Fernandez) were widely available.” *Id.* (citing Ex. 1003 ¶ 237; Ex. 1025). Finally, Petitioner argues, Fernandez and Montojo “are directed to the same field: simultaneously transmitting multiple sets of information using different frequency bands.” *Id.* (citing Ex. 1005 ¶ 8; Ex. 1006, code (57); Ex. 1003 ¶ 238).

Patent Owner responds that Petitioner fails to sufficiently show why and how one of ordinary skill “would have modified Fernandez in view of Montojo.” PO Resp. 36. Patent Owner argues that Montojo points to disadvantages of sharing a single amplifier among multiple carriers, including “power constraints imposed by spectral emission requirements, by on-board battery capacity, and also by any priority among the carriers.” *Id.*

(citing Ex. 1006 ¶ 7; Ex. 2013 ¶ 99). To address these problems, Patent Owner asserts, “Montejo discloses an apportionment system where the power amplifier amplifies the highest priority carrier according to its needs and will amplify the next priority carrier(s) only to the extent any amplification power is left over,” which is how Montejo’s Figure 5, relied on by Petitioner, works. *Id.* (citing Ex. 2013 ¶ 100; Ex. 1006 ¶¶ 9–10; Pet. 77–78, 95–96).

Specifically, Patent Owner argues that Montejo’s power amplifier accesses a “priority list 512” to obtain the priority and power needs of the different carriers, and then implements a priority apportionment scheme in which the highest priority carrier is allocated as much of the maximum transmission power as necessary to satisfy its transmission requirements, and any lower priority carriers will be accorded whatever remains of the maximum transmission power. PO Resp. 36–37 (citing Ex. 1006 ¶ 45). Patent Owner asserts that “Peticioner has not shown if Montejo’s priority-based power amplifier would be desirable or even functional in a system such as Fernandez, which is why Fernandez discloses that each signal generator has its own power amplifier to begin with.” *Id.* at 37 (citing Ex. 2013 ¶ 102). Patent Owner notes that Fernandez generates a wideband signal by summing together multiple, substantially equally amplified, narrower band signals, and argues that Petitioner fails to show how (or why) Montejo’s “priority-based amplifier that amplifies only the first signal based on its needs and which may or may not amplifier other signals depending on the left-over, would be either functional or desirable in Fernandez.” *Id.* at 38. For example, Patent Owner contends, “Peticioner does not address how Fernandez’s system would work if the first signal (17A in Fig. 2A) is fully

amplified, but the second signal (17B in Fig. 2A) is only partially amplified, and the remaining signals are not amplified at all.” *Id.* (citing Ex. 2013 ¶ 103).

Patent Owner also argues that Fernandez and Montojo do not render obvious the use of a single amplifier in Fernandez. PO Resp. 39 (citing Ex. 2013 ¶ 104). As noted above, Patent Owner asserts that Montojo explains that use of a single amplifier “has substantial, and potentially impractical drawbacks,” such as power constraints imposed by spectral emission requirements, on-board battery capacity, and any priority among the carriers. *Id.* (citing Ex. 1006 ¶¶ 7, 8). It is because of these drawbacks, according to Patent Owner, that Montojo proposes sharing a single power amplifier using its priority-based apportionment system. *Id.* at 40 (citing Ex. 1006 ¶ 9; Ex. 2013 ¶¶ 104–106). Finally, Patent Owner argues that Petitioner fails to perform any balancing of benefits and drawbacks to show that one of ordinary skill would in fact be motivated to modify Fernandez to use a single power amplifier for all the carriers. *Id.*

Petitioner responds that one of ordinary skill would have been motivated to combine Fernandez and Montojo because Montojo addresses a “known problem” in the art, namely that “limitations on space, manufacturing cost, power consumption and other factors dictated the need to share resources among the carriers, including power amplification circuitry.” Pet. Reply 15 (citing Ex. 1003 ¶ 236; Ex. 1006 ¶ 5). To address this issue, Petitioner argues, Montojo teaches the use of a single amplifier for the multi-carrier signal, which provides known benefits including less complexity, a single (vs. multiple) potential point of failure, and lower cost. *Id.* (citing Ex. 1003 ¶ 234–236; Ex. 1006 ¶¶ 5, 42). One of ordinary skill,

Petitioner contends, would recognize that Montojo’s single amplifier would improve similar multi-carrier transmission devices in the same way. *Id.* (citing Ex. 1003 ¶¶ 235, 238).

Petitioner also argues that the Petition explained how the Fernandez-Montojo combination is functional, and why one of ordinary skill would have had a reasonable expectation of success in combining the references. Pet. Reply 16 (citing PO Resp. 37–39; Pet. 78–79). Petitioner asserts that it showed “one way to modify Fernandez in view of Montojo” in its figure showing the combination, including Montojo’s single amplifier with Fernandez’s multi-carrier system (minus amplification in signal generating systems 10A–10E). *Id.* Petitioner contends that implementing this combination would involve “straightforward, off-the-shelf technology.” *Id.* (citing Ex. 1030 ¶ 20).

Finally, Petitioner argues that the drawbacks of Montojo identified by Patent Owner only apply to using a single amplifier for simultaneously transmitting *different types* of carriers with different priorities, and that Fernandez does not implicate these concerns because it “does not address different priority carriers or different ‘types’ of signals.” Pet. Reply 17 (citing Ex. 1006 ¶ 7; Ex. 1030 ¶¶ 21, 22). Moreover, Petitioner contends, the fact that there might be drawbacks to the combination does not doom the combination because “Petitioner merely needs to show that Montojo’s amplifier is a ‘suitable option’ to combine with Fernandez’s teachings,” and Petitioner has done so here. *Id.*

After reviewing the full trial record, we find that Petitioner has failed to sufficiently prove that one of ordinary skill would have been motivated to combine Fernandez and Montojo as proposed. Turning first to Petitioner’s

argument based on Fernandez alone, we find that Petitioner has not provided a sufficient evidentiary basis to support a motivation to remove the amplification from each of Fernandez’s signal generators 10A-10E and add a single power amplifier instead. *See* Pet. 76–77 Ex. 1003 ¶ 235.

Petitioner’s only rationale for this modification to Fernandez is that “[a] single amplifier has several advantages compared to multiple amplifiers, including lower complexity, a single (vs. multiple) potential point of failure, and lower cost,” and that one of ordinary skill “would have found a single amplifier to be a simple matter of design preference.” Pet. 76–77.

Dr. Almeroth simply repeats these cursory allegations without providing any further explanation or evidentiary support. Ex. 1003 ¶ 235.

Moreover, Dr. Cooklev provides credible testimony that replacing Fernandez’s amplification in signal generators 10A–10E with a single amplifier would not necessarily have the advantages that Petitioner suggests. *See* Ex. 2013 ¶¶ 99, 104–105. For example, Dr. Cooklev testifies that a single amplifier would need to have a wider bandwidth than the multiple amplifiers used in Fernandez, which could cause potential stability issues. *Id.* ¶ 105. According to Dr. Cooklev, this wider bandwidth would require more circuit elements, and thus would not provide the reduction in space usage and power consumption that Petitioner asserts. *Id.* According to Dr. Cooklev, Montojo also points to several “substantial, and potentially impractical, drawbacks” of using a single amplifier for multiple signal generators, including power constraints imposed by spectral emission requirements and on-board battery capacity. *Id.* ¶ 104 (citing Ex. 1006 ¶¶ 7–8). In light of this testimony, which we find credible, Petitioner has failed to provide sufficient explanation or evidence to support its assertion that one of

ordinary skill would have found it obvious to replace the multiple amplifiers in Fernandez’s signal generators with a single amplifier.

We also are not persuaded that Petitioner’s proposed replacement of Fernandez’s multiple amplifiers with a single amplifier would be “a simple matter of design preference.” *See* Pet. 77; Ex. 1003 ¶ 235. In *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361–1362 (Fed. Cir. 2016), the Federal Circuit explained that this sort of “common sense” argument “is typically invoked to provide a known *motivation to combine*, not to supply a missing claim element,” and that a missing claim element may only be supplied by common sense where “the limitation is question was unusually simple and the technology particularly straightforward.” Here, Petitioner uses its common sense “design preference” argument to supply a missing claim element (an amplifier that receives the upconverted signals as in claims 10 and 17), but does not establish that this missing claim element is “unusually simple” or that the technology involved is “particularly straightforward.” *See* Pet. 77; Ex. 1003 ¶ 235. The Federal Circuit also explained that “common sense” cannot “be used as a wholesale substitute for reasoned analysis and evidentiary support.” *Arendi* at 1362. But Petitioner provides only cursory analysis and support for its “design preference” argument here.

We also find that Petitioner has failed to sufficiently support its combination of Fernandez’s signal generators with Montojo’s single power amplifier. As Dr. Cooklev explains, Montojo teaches that it is not practical to share an amplifier among different carriers if all carriers are to be amplified based on their needs, and describes an apportionment system where the power amplifier amplifies the highest priority carrier according to

its needs and the next priority carrier(s) only to the extent any amplification power is left over. Ex. 2013 ¶¶ 99–100; Ex. 1006 ¶¶ 7–10. Specifically, Montojo explains that its power amplifier accesses a “priority list 512” to obtain the priority and power needs of the different carriers, and then implements a priority apportionment scheme in which the highest priority carrier is allocated as much of the maximum transmission power as necessary to satisfy its transmission requirements, and any lower priority carriers will be accorded whatever remains of the maximum transmission power. Ex. 1006 ¶ 45; *see* PO Resp. 36–37; Ex. 2013 ¶ 101.

Dr. Cooklev persuasively testifies that Petitioner’s argument and evidence fails to sufficiently show how or why this priority-based power amplifier and amplification scheme “would be desirable or even functional in a system such as Fernandez, which is why Fernandez discloses that each signal generator has its own power amplifier to begin with.” Ex. 2013 ¶¶ 102–103. For example, Fernandez’s wideband signal is generated by summing together narrower band signals shown as substantially equally amplified in Figure 2B, and Dr. Cooklev persuasively testifies that Petitioner fails to sufficiently address how Fernandez would work if the first signal (17A in Fig. 2B) is fully amplified but the second signal (17B in Fig. 2B) is only partially amplified, and the remaining signals are not amplified at all. Ex. 2013 ¶¶ 102–103; Ex. 1005 ¶ 8, Fig. 2B. And, as discussed above, Montojo teaches that, without its priority-based amplification scheme, the use of a single amplifier would have substantial drawbacks including power constraints imposed by spectral emission requirements, on-board battery capacity, and any priority among the carriers. Ex. 1005 ¶¶ 7–8; Ex. 2013 ¶ 104.

We are not persuaded by Petitioner’s argument that one of ordinary skill would have been motivated to combine Fernandez and Montojo because Montojo addresses a “known problem” in the art, namely that “limitations on space, manufacturing cost, power consumption and other factors dictated the need to share resources among the carriers, including power amplification circuitry.” Pet. Reply 15 (citing Ex. 1003 ¶ 236; Ex. 1006 ¶ 5). This statement appears in Montojo’s Background section, and Montojo describes addressing this problem by using its priority-based amplifier. Ex. 1006 ¶¶ 5, 10. As discussed above, Petitioner fails to sufficiently show that it would have been desirable or feasible to use Montojo’s priority-based amplifier in Fernandez. And, Montojo describes problems with using a general purpose single power amplifier for simultaneously transmission of different types of carrier signals, such as power constraints imposed by spectral emission requirements and on-board battery capacity, for example. *Id.* ¶ 7. Although Petitioner points out that this statement discusses “different types” of carrier signals, neither Petitioner nor Dr. Almeroth sufficiently explains why these issues do not apply to Fernandez’s system. Pet. Reply 17; Ex. 1030 ¶¶ 21–22. Although Dr. Almeroth characterizes this as merely “a problem involving different priority carriers,” he fails to sufficiently explain why Fernandez would not involve “different types” of carrier signals or why the issues with spectral emission requirements or on-board battery capacity identified by Montojo would not apply to Fernandez. Ex. 1030 ¶¶ 21–22.

Finally, we are not persuaded by Petitioner’s argument that, “by the time of the ’802 patent, power amplifiers that could amplify wideband multi-carrier signals of WiMAX and UWB (mentioned by Fernandez) were widely

available.” Pet. 79 (citing Ex. 1003 ¶ 237; Ex. 1025). For this assertion, Petitioner and Dr. Almeroth rely on a paper by Cassan describing “a 25 W Silicon LDMOS 2 stage RF integrated circuit (IC) designed for WiMAX at 3.5 GHz.” Ex. 1025, 87; Pet. 79; Ex. 1003 ¶ 237. The Cassan paper, however, states that it “is *the first report* demonstrating this type of Silicon LDMOS multistage amplifier performances at 3.5 GHz and at such a power level.” Ex. 1025, 87 (emphasis added). And, neither Petitioner nor Dr. Almeroth points to evidence in the Cassan article or elsewhere demonstrating that this amplifier was “widely available” as of any particular date, as Petitioner contends. Ex. 1025, 87; Pet. 79; Ex. 1003 ¶ 237. Petitioner does not rely on the Cassan article as part of the Ground, and does not demonstrate that this article, or the amplifier described in it, was basic knowledge or well-known to persons of ordinary skill in the art as of the critical date. *See K/S Himpp v. Hear-Wear Technologies, LLC*, 752 F.3d 1362, 1366 (Fed. Cir. 2014) (“the Board cannot accept general conclusions about what is ‘basic knowledge’ or ‘common’ sense as a replacement for documentary evidence for core factual findings in a determination of patentability”). Therefore, Petitioner’s reliance on the Cassan article is unavailing.

Consequently, we find that Petitioner has failed to prove by a preponderance of the evidence that it would have been obvious to combine Fernandez and Montojo as Petitioner proposes. Because all of Grounds 6–9 are based on this combination, Petitioner has failed to prove by a preponderance of the evidence that any of the claims challenged under these grounds are unpatentable.

4. *Conclusion as to Grounds 6–9*

All of Grounds 6–9 are based on the combination of Fernandez and Montojo. Pet. 4. As discussed above, Petitioner has failed to prove by a preponderance of the evidence that one of ordinary skill would have been motivated to combine Fernandez with Montojo as Petitioner proposes. *See* § II.F.3, *supra*. Because all of Petitioner’s challenges under Grounds 6–9 are based on the Fernandez-Montojo combination, Petitioner has failed to prove by a preponderance of the evidence that any of the claims challenged under these grounds are unpatentable.

III. CONCLUSION³

The outcome for the challenged claims of this Final Written Decision follows. In summary:

Claim(s)	35 U.S.C. §	Reference(s) /Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1	103(a)	Rick	1	
1–4, 6–8, 10, 13, 17, 21, 22	103(a)	Suzuki	1–4, 6–8	10, 13, 17, 21–22
7–9, 22, 23	103(a)	Suzuki, Jalali	7–9	22, 23
14, 24, 25	103(a)	Suzuki, Chen	24, 25	14
6, 13, 21	103(a)	Suzuki, Etemad	6	13, 21
1–4, 6–8, 10, 13, 17, 21, 22	103(a)	Fernandez, Montejo		1–4, 6–8, 10, 13, 17, 21, 22
7–9, 22, 23	103(a)	Fernandez, Montejo, Jalali		7–9, 22, 23
14, 24, 25	103(a)	Fernandez, Montejo, Chen		14, 24, 25
6, 13, 21	103(a)	Fernandez, Montejo, Etemad		6, 13, 21
Overall Outcome			1–4, 6–9, 24, 25	10, 13, 14, 17, 21, 22, 23

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–4, 6–9, 24, and 25 of the '802 patent have been shown to be unpatentable, and claims 10, 13, 14, 17, and 21–23 of the '802 patent have not been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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.

³ 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).

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