

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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T-MOBILE USA,  
Petitioner,<sup>1</sup>

v.

DALI WIRELESS, INC.,  
Patent Owner.

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IPR2022-01293  
Patent 10,334,499 B2

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Before KARL D. EASTHOM, BARBARA A. BENOIT, and  
SHARON FENICK, *Administrative Patent Judges*.

FENICK, *Administrative Patent Judge*.

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

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<sup>1</sup> The Board joined T-Mobile USA, Inc. as a (petitioner) party to this proceeding. Original petitioners CommScope Technologies LLC and Corning Optical Communications LLC have been terminated in this proceeding.

## I. INTRODUCTION

### *A. Background and Summary*

CommScope Technologies LLC (“CommScope”) and Corning Optical Communications LLC (“Corning”) filed a Petition (Paper 1, “Pet.”) requesting institution of *inter partes* review of claims 1–19 (“the challenged claims”) of U.S. Patent No. 10,334,499 B2 (Ex. 1001, “the ’499 patent”). CommScope and Corning filed a Preliminary Reply (Paper 11) after Dali Wireless Inc. (“Patent Owner”) filed a Preliminary Response (Paper 7). Subsequently, after a joint request of Patent Owner and Corning, we terminated the proceeding as to Corning. Papers 9, 10, 14. We determined that the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail with respect to at least one of the challenged claims, and therefore we instituted this proceeding on March 9, 2023, as to all challenged claims and all grounds of unpatentability. Paper 18 (“Dec. on Inst.”). Patent Owner filed a Patent Owner Response (Paper 22, “PO Resp.”) and CommScope filed a Reply (Paper 25, “Pet. Reply”). We granted a request in IPR2023-00830 by T-Mobile USA, Inc. to be joined as a Petitioner in this proceeding. Paper 26. After a joint request of Patent Owner and CommScope, we terminated the proceeding as to CommScope, leaving T-Mobile USA, Inc. (“Petitioner”) as the lead (and sole) petitioner in this proceeding. Papers 27, 28, 30.

While provided for in the Scheduling Order (Paper 19), Patent Owner did not file a sur-reply. The parties presented oral arguments, and the Board entered a transcript into the record. Paper 36 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(b)(4). For the reasons set forth in this Final Written Decision pursuant to 35 U.S.C. § 318(a), we

determine that Petitioner demonstrates by a preponderance of evidence that the challenged claims are unpatentable.

*B. Real Parties in Interest*

As noted, the proceeding has been terminated as to CommScope and Corning. Papers 14, 30. Petitioner identifies T-Mobile USA, Inc., and T-Mobile US, Inc. as the real parties in interest. Paper 34 (Petitioner's Updated Mandatory Notices), 1.

Patent Owner identifies only itself as real party in interest. Paper 4 (Patent Owner's Mandatory Notices), 1; Paper 20 (Patent Owner's Updated Mandatory Notices), 1.

*C. Related Matters*

Petitioner presents a list of district court cases, and asserts that each involved the '499 patent but is no longer involved in pending litigation. Paper 34, 1–2. Each of the cases cited by Patent Owner, in an earlier-dated filing, as ongoing cases involving the '499 patent is listed by Petitioner as no longer pending. *Id.*; Paper 20, 1. These cases include *Dali Wireless, Inc. v. Cellco Partnership*, No. 6:22-cv-01313-ADA (W.D. Tex.) (“the WD Tex. *Cellco* case”)<sup>2</sup> and *Dali Wireless, Inc. v. AT&T Corp.*, No. 2:22-cv-00012 (E.D. Tex.) (“the ED Tex. *AT&T* case”). Paper 34, 1–2; Paper 20, 1.

Petitioner and Patent Owner each disclose that the '499 patent is also challenged in IPR2022-01419.<sup>3</sup> Paper 34, 2; Paper 20, 2. Petitioner and Patent Owner each acknowledge that the '499 patent was the subject of

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<sup>2</sup> This case is identified in Paper 34 and Paper 20 as *Dali Wireless, Inc. v. Ericsson Inc.*

<sup>3</sup> We note that a final written decision is issuing in IPR2022-01419 contemporaneously with this Decision, addressing the patentability of the same claims.

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IPR2020-01430 (“the 01430 IPR”), where institution was denied. Pet. 2; Paper 34, 2; Paper 20, 2.

The parties additionally discuss IPR2020-01473 (“the 01473 IPR”), which challenged claims of Patent 10,080,178 B2 (“the ’178 patent”) (Ex. 1012). Pet. 1–2, 5, 9–12; PO Resp. 25–29. The ’499 patent issued from an application that was a continuation of the application that issued as the ’178 patent. Ex. 1001, code (63).

The parties further discuss IPR2018-00571 (“the 00571 IPR”), which challenged claims of Patent 9,531,473 B2 (“the ’473 patent”) (Ex. 1016). Pet. 10, 45; PO Resp. 19; Pet. Reply 24. The ’499 patent and the ’473 patent share an overlapping specification. Pet. 10; PO Resp. 19. The final written decision in the 00571 IPR (IPR2018-00571, Paper 53 (PTAB Aug. 12, 2019) (Ex. 1017) was affirmed by the Federal Circuit. *Dali Wireless Inc. v. CommScope Techn’s LLC*, No. 2020-1045, 2023 WL 5740247 (Fed. Cir. 2023) (“*CommScope*”) (Ex. 1072).

#### *D. The ’499 Patent*

The ’499 patent is titled “Distributed Antenna System” and relates to a Distributed Antenna System (DAS) that “enables a high degree of flexibility to manage, control, enhance, [and] facilitate the usage and performance of a distributed wireless network.” Ex. 1001, codes (54), (57). According to one embodiment of the invention, a distributed antenna system includes a digital access unit (DAU), which connects to associated base stations. *Id.* at 4:40–44. The distributed antenna system receives downlink data via radio frequency (RF) signals from a base station. *Id.* at 4:63–65. The DAUs provide the received signals to multiple digital remote units (DRUs). *Id.* at 4:41–44, 5:4–9.

Figure 1 of the '499 patent, reproduced below, is a block diagram showing the basic structure and an example of a downlink (base station to DRU) transport scenario.

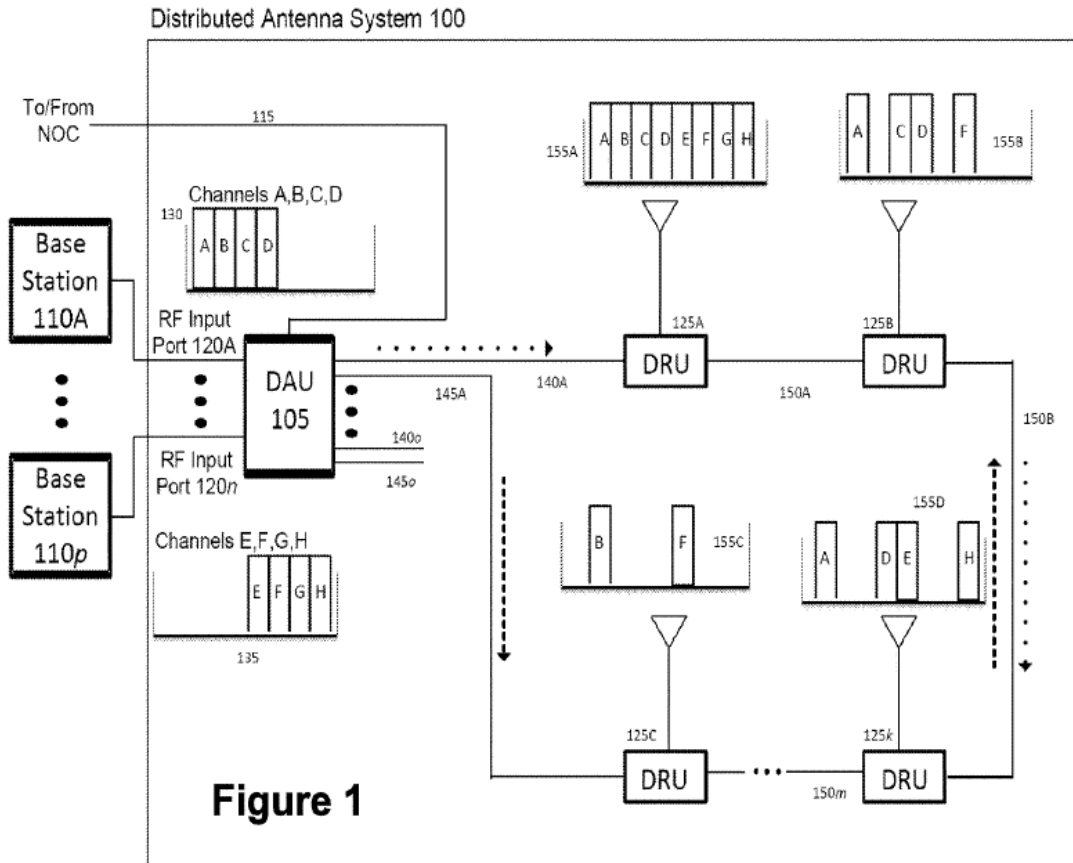


Figure 1 depicts DAU 105, which provides signals to DRUs 125A, 125B, 125C, through 125k. *Id.* at 4:41–44, 4:62–5:6. DAU 105 receives composite downlink input signal 130, containing carriers<sup>4</sup> A–D, from base

<sup>4</sup> Elements A–H are alternatively referred to as “carriers” and as “channels” in the '499 patent. *Compare* Ex. 1001 at 5:20–28, 7:61–65, 8:46–49, Fig. 1 (describing A–H as channels), *with id.* at 5:65–6:2, 6:18–26, 6:34–38, 6:45–49, 7:23–25, 7:47–50, (describing A–H as carriers); *see also id.* at 5:34–36, 5:45–52, 7:63–8:2. The '499 patent additionally specifies that “a wireless operator may have more than one RF carrier per channel allocated to a single

station 110a. *Id.* at 5:62–66. DAU 105 receives second composite downlink input signal 135, containing carriers E–H, from base station 110p. *Id.* at 5:66–6:2. DRUs 125A, 125B, 125C, through 125k. DRUs 125A–k are connected in a ring configuration via bidirectional optical cables, and the downlinked carriers are propagated around the ring, or alternatively, in a daisy chain configuration, to provide all carriers to all DRUs 125A–k. *Id.* at 4:35–39, 5:4–9, 5:20–31, 6:9–20, 6:63–7:2. While the exemplary embodiment of Figure 1 shows all carriers arriving at each DRU, “the number of channels received at each DRU is assigned by the DAU and need not be equal, adjacent or sequential, but instead will typically be any configuration that optimizes network utilization.” *Id.* at 5:28–31.

Generally, software settings within a DRU are configured either manually or automatically to determine which of the carriers received at the DRU are present in the downlink output signal at the antenna port of the DRU. *Id.* at 6:21–27. In one embodiment, the DAU monitors which carriers and corresponding time slots are active for each DRU. *Id.* at 12:15–17. The DAU communicates with a software module in the DRU to enable or disable the transmission of specific radio resources by the DRU. *Id.* at 12:17–37.

#### *E. Illustrative Claims*

Claims 1, 8, and 14 of the challenged claims of the ’499 patent are independent. Claim 1 illustrates the claimed subject matter, and is reproduced with annotations used in the Petition in brackets:

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base station” and describes Figure 1 and the related disclosure as explaining the situation where composite downlink signal 130 from a first base station comprises carriers A–D. *Id.* at 5:53–66. We use “carriers” in this section to refer to A–H.

1. [1A] A system for transporting wireless communications, comprising:

[1B] a baseband unit;

[1C] a plurality of signal sources, including at least a first signal source and a second signal source;

[1D] a plurality of remote units, including at least a first remote unit and a second remote unit;

[1E] wherein the baseband unit comprises a plurality of interfaces to communicatively couple the baseband unit to the plurality of signal sources;

[1F] wherein the baseband unit is configured to receive a plurality of radio resources from the first signal source and the second signal source;

[1G] wherein the baseband unit is configured to send a digital representation of a first set of radio resources to the first remote unit at a first point in time, the first set of radio resources for transmission at an antenna of the first remote unit;

[1H] wherein the baseband unit is configured to send a digital representation of a second set of radio resources to the first remote unit at a second point in time, the second set of radio resources for transmission at the antenna of the first remote unit;

[1I] wherein a number of radio resources in the first set of radio resources is different from a number of radio resources in the second set of radio resources; [1J] and

wherein the baseband unit is configured to receive digital signals from each of the plurality of remote units.

Ex. 1001, 14:2–29.

*F. Evidence*

Petitioner relies on the following patent evidence.

<b>Name</b>	<b>Patent Document</b>	<b>Exhibit</b>
Sabat-522	US 6,963,552 B2	Ex. 1011
Hettstedt	US 2008/0119198 A1	Ex. 1006
Sabat-426	US 2009/0180426 A1	Ex. 1010
Wu	US 2010/0128676 A1	Ex. 1005

Petitioner relies on the following non-patent literature evidence.

<b>Name</b>	<b>Non-Patent Literature Title</b>	<b>Author</b>	<b>Exhibit</b>
OBSAI standard	OBSAI Reference Point 3 Specification Version 3.1	Open Base Station Architecture Initiative	Ex. 1008

Petitioner additionally relies on a declaration by Dr. Anthony Acampora (Ex. 1003) and a supplemental declaration by Dr. Acampora (Ex. 1071). Patent Owner relies on a declaration by Douglas A. Chrissan, Ph.D. (Ex. 2018).

*G. Prior Art and Asserted Grounds*

Petitioner asserts that claims 1–19 would have been unpatentable on the following grounds:

<b>Claim(s) Challenged</b>	<b>35 U.S.C. §<sup>5</sup></b>	<b>Reference(s)/Basis</b>
1–5, 8–11, 13–16, 18, 19	102	Wu
1–5, 8–11, 13–16, 18, 19	103	Wu alone or with Sabat-426

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<sup>5</sup> The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102, 103. Because the ’499 patent claims priority to an application filed before the effective date of the applicable AIA amendment, we refer to the pre-AIA version of 35 U.S.C. § 102 and § 103. *See* Ex. 1001, code (63).

Claim(s) Challenged	35 U.S.C. § <sup>5</sup>	Reference(s)/Basis
6, 7, 12, 17	103	Wu, Sabat-552
1–19	103	Any preceding ground and OBSAI standard
1–5, 8–11, 13–16, 18, 19	102	Hettstedt
1–5, 8–11, 13–16, 18, 19	103	Hettstedt, Wu
6, 7, 12, 17	103	Hettstedt, Sabat-552

Pet. 4.

## II. ANALYSIS

### A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring [*inter partes*] review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in *inter partes* review). Furthermore, Petitioner must explain with particularity how the prior art would have rendered the challenged claims unpatentable. 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104(b)(4) (“The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon.”).

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir.

2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test,” i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009); *accord In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990).

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) objective evidence of nonobviousness, i.e., secondary considerations.<sup>6</sup> *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

### *B. Collateral Estoppel*

Petitioner raises collateral estoppel with respect to the 01473 IPR and the 00571 IPR. Pet. 5, 9–12, 37–40 & n.2, 45.

Our reviewing court sanctions common law collateral estoppel as it applies to prior *inter partes* review judgments. *See, e.g., MaxLinear Inc. v. CF CRESPE LLC*, 880 F.3d 1373, 1377 (Fed. Cir. 2018) (remanding to the Board to consider applying collateral estoppel based on prior IPR judgments

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<sup>6</sup> The record contains no evidence or argument regarding objective evidence of nonobviousness.

even though the judgments involved *different* prior art and dependent claims *not considered in the prior judgments*, holding that “the sole remaining question at issue is whether the dependent claims 4, 6–9, and 21, *not addressed in the earlier IPRs*, are unpatentable”) (emphasis added)).

*VirnetX Inc. v. Apple, Inc.*, 909 F.3d 1375, 1378 (Fed. Cir. 2018) (“Apple is correct that VirnetX is collaterally estopped by our Rule 36 judgment in *VirnetXI* from relitigating the question of whether RFC 2401 was a printed publication.”); *M2M Solutions LLC v. Amazon.com, Inc.*, Nos. 2022-1122, 2022-1124, slip op. at 8–9 (Fed. Cir. Feb. 22, 2023) (holding that collateral estoppel applies because “this same issue was actually litigated in the ’1892 IPR and agree[ing] with the Board that M2M is collaterally estopped from arguing that Kloba failed to disclose ‘consumer usage information’ as required by claims 1 and 20 of the ’477 patent”) (citing *Ohio Willow Wood Co. v. Alps South, LLC*, 735 F.3d 1333, 1342 (Fed. Cir. 2013) (“Our precedent does not limit collateral estoppel to patent claims that are identical.”)).

*1. Collateral Estoppel With Respect to the 01473 IPR*

In the 01473 IPR, the Board instituted *inter partes* review, and then granted a request for adverse judgement after Patent Owner moved to cancel the challenged claims. IPR2020-01473, Paper 18 (PTAB March 12, 2021) (instituting review) (Ex. 1013); IPR2020-01473, Paper 21 (PTAB June 30, 2021) (granting request for adverse judgment after institution of trial) (Ex. 1014). Before institution, Petitioner contended that Patent Owner was prevented from opposing institution because the four elements of issue preclusion were met with respect to the issue of whether a reasonable likelihood had been presented that Wu anticipates the claims of the ’499 patent, which Petitioner argued included the same features as the claims in

the '178 patent that were at issue in the 01473 IPR. Pet. 37–40. We did not deem it necessary to reach the issue in our Decision on Institution. Dec. on Inst. 26–27. Petitioner additionally argued that the adverse judgment would give rise to issue preclusion post-institution. Pet. 37 n.2; Pet. Reply 6–7.

When deciding whether issue preclusion applies, we consider whether: (1) a prior action presents an identical issue; (2) the prior action actually litigated and adjudged that issue; (3) the judgment in that prior action necessarily required determination of the identical issue; and (4) the prior action featured full representation of the estopped party. *VirnetX Inc. v. Apple, Inc.*, 909 F.3d 1375, 1377 (Fed. Cir. 2018) (citing *Stephen Slesinger, Inc. v. Disney Enterprises, Inc.*, 702 F.3d 640, 644 (Fed. Cir. 2012)).

To the extent Petitioner asks us to consider the 01473 IPR institution decision for issue preclusion, we do not. In that decision the Board reached a finding based on the institution standard (showing of a “reasonable likelihood that the petitioner will prevail,” 35 U.S.C. § 314(a)) rather than proof by a preponderance of the evidence, which is before us now (35 U.S.C. § 316(e)). Ex. 1016. Thus, issues before us here were not presented and adjudged in that institution decision. Regarding the 01473 IPR adverse judgment decision, that decision did not require determination of any issues before us, as that decision was based on Patent Owner canceling the challenged claims rather than any determination regarding unpatentability that had been shown by a preponderance of the evidence. Ex. 1014.

## 2. Collateral Estoppel With Respect to the 00571 IPR

We find and determine that the final written decision in the 00571 IPR, and the Federal Circuit’s *CommScope* decision affirming that decision, satisfies the conditions for applying collateral estoppel because the 00571

IPR presented and litigated the identical and necessary issue of whether Wu discloses materially the same claim limitations<sup>7</sup> challenged here, and Patent Owner had full representation throughout the proceedings.

Setting aside the factors of issue preclusion for a moment, our reviewing court's affirmance of our final written decision in *CommScope* is persuasive authority that supports our prior construction of "packetizing" and Petitioner's showing that Wu teaches the disputed packetizing limitations under that construction. In addition, issue preclusion prevents Patent Owner from re-litigating the issue of whether Wu teaches materially the same disputed limitation. *See* Pet. Reply 24; Ex. 1017, 31–34 (final written decision determining obviousness of claims 9, 10, 14, and 16 of the '473 patent over Wu and Sabat-426); Ex. 1072, 5 (summarizing the final written decision regarding the packetizing limitations), 10–16 (finding no error in the determinations regarding the packetizing limitations).

Patent Owner does not address Petitioner's collateral estoppel argument specifically.<sup>8</sup> Patent Owner argues, with respect to the claims that require packetizing each digital representation of sets of radio resources, that Wu's disclosure of using CPRI for the link that connects its host units with its remote units does not mean that destination information is included in the exchanged packets. *Id.* at 42–43. Patent Owner argues that "Wu mentions

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<sup>7</sup> The claim limitations being discussed here are those in dependent claims 2, 3, 9, 10, 15, and 19, since these claims recite "packet[ization] of a radio resource" or the inclusion of destination information in the digital representation of radio resources. Ex. 1001, 14:30–37, 15:14–22, 16:17–21, 16:37–39.

<sup>8</sup> Patent Owner cites the final written decision in the 00571 IPR to note that its proposed construction is consistent with that decision. PO Resp. 19; Ex. 1017.

standards such as CPRI only to describe how data is serialized and framed” and that the petition does not explain why certain non-mandatory portions of the CPRI standard would be implemented by Wu. *Id.* at 43–46. Patent Owner additionally argues that a CPRI data frame is not addressed, but the destination can only be determined by reference to the position in the stream of the frame, and the synchronization clock. *Id.* at 47.

The *CommScope* decision addressed each of these issues, finding that “[s]ubstantial evidence supports the Board’s finding that . . . the CPRI Specification disclose[s] a digital [link] between the base station and host unit;” that “[t]he Board’s determination that the CPRI Specification . . . disclose[s] addressing in the [link] is supported by substantial evidence;” that the CPRI supports addressing in multiple topologies including ones with multiple recipients, and that “nothing in the Board’s construction excludes the kind of sequential/temporal addressing used by the CPRI standard.” Ex. 1072, 11–14. In the *CommScope* decision, which affirms the determination in the 00571 IPR that packetizing claims in the ’473 patent would have been obvious over a combination of Wu and Sabat-426, the determinations by the Federal Circuit regarding the Wu and the CPRI Specification disclosures and their use in materially similar claim limitations are identical to those at issue in this proceeding, and they were litigated, adjudged, and necessary to the determination before the Federal Circuit. *See id.* at 15 (determining that the “finding that an ordinary artisan would combine *Wu*’s matrix switch with CPRI . . . is supported by substantial evidence”), 16 (citing Dr. Acampora’s testimony in the 00571 IPR “that *Wu* already teaches using the CPRI link between the remote hosts and the host unit 230, and that it would have been obvious to use the same protocol upstream.”)

Accordingly, collateral estoppel precludes Patent Owner from arguing that the CPRI specification, as used in digital communications in a system such as Wu, does not disclose the packetizing of digital representations with destination information identifying the remote unit transmitted to as claimed.

*C. Level of Ordinary Skill in the Art*

Petitioner asserts that “[a] person of ordinary skill in the art (POSITA) would have a bachelor’s degree in electrical engineering (or equivalent field) with 2–3 years of work experience in wireless communications.” Pet. 21 (citing Ex. 1003 ¶¶ 20–22).

Patent Owner argues that one of ordinary skill in the art “would have an educational background in electrical engineering and experience in the design of wireless communication systems,” and “[m]ore particularly, a POSA would be a person with a bachelor’s degree in electrical engineering (or a similar technical degree or equivalent work experience) and at least 3 years of experience working with wireless communication systems.” PO Resp. 13.

We found in the Decision on Institution that Patent Owner’s definition was generally consistent with Petitioner’s definition, with the exception of requiring 3 years or more (as opposed to 2 to 3 years) of work experience in wireless communication systems and, for the purpose of institution, we adopted Petitioner’s provided definition for the level of skill of a person of ordinary skill in the art as reasonable and consistent with the prior art. Dec. on Inst. 20–21.

The record does not contain further argument or evidence regarding the level of skill of one of ordinary skill in the art, and we again adopt Petitioner’s definition, which does not encompass an open-ended (“at least 3 years”) amount of experience and which is supported by the testimony of Dr.

Acampora. We would reach the same conclusions if we were to remove the open-ended terminology from Patent Owner’s definition and adopt that definition.

*D. Claim Construction*

*1. “a digital representation of a . . . set of radio resources”*

*a) The Parties’ Positions*

Claim 1 recites a baseband unit “configured to send a digital representation of a first set of radio resources to [a] first remote unit at a first point in time” and “configured to send a digital representation of a second set of radio resources to the first remote unit at a second point in time,” where each set of radio resources is recited as being “for transmission at an antenna of the first remote unit.” Ex. 1001, 14:15–24. Claim 8 and Claim 14 include similar recitations. *Id.* at 15:1–10, 16:4–13 (method claim 14 including step of “transmitting from the baseband unit, at a first point in time, a digital representation of a first set of radio resources”). Claim 3, which depends from claim 1, recites that “the digital representation of the first set of radio resources” and “the digital representation of the second set of radio resources” each “includes destination information identifying the first remote unit.” *Id.* at 14:33–37. Claims 10 and 15, which depend from claims 8 and 14 respectively, recite identical limitations as claim 3. *Id.* at 14:17–22, 16:16–21.

No construction was proposed by the parties before institution for “a digital representation of radio resources,” and the Decision on Institution did not provide any preliminary construction for this term. Dec. on Inst. 21–26. However, we did provide a partial construction of the term “radio resources,” which we construed as “encompass[ing] RF carriers, CDMA codes, and TDMA time slots, including those in which underlying data is

transmitted.” *Id.* We noted that this was consistent with a preliminary construction in the WD Tex. *Cellco* case, which specified that “when data is modulated on an RF carrier, the RF carrier is a radio resource, but the data modulated on the RF carrier is not a radio resource.” *Id.* at 26 (quoting Ex. 1059, 2–3) (emphasis omitted).

Patent Owner argues that the proper construction of “digital representation of a [first/second] set of radio resources” should include “sending digital information defining or describing a set of radio resources to be used for transmitting data over the air via the antenna of a remote radio unit.” PO Resp. 13–18 (citing Ex. 2018 ¶¶ 44–48). Patent Owner argues that this proposed construction means that “‘digital representations of radio resources’ are *identifiers* of RF carriers, CDMA codes, TDMA time slots, and other information defining or describing the way data is being transmitted by a remote radio unit,” that digital representations of radio resources would not include user payload data, and that, in comparison to payload signals, the digital representations of radio resources would “involve relatively small amounts of data.” *Id.* at 26–27 (emphasis added) (citing Ex. 2018 ¶¶ 55–56), 33.

Patent Owner argues that “the digital representation of a radio resource is not merely the digitized form of a radio resource, but rather *includes information defining or describing how radio resources are to be used in over the air transmission as well as information identifying radio resources.*” *Id.* at 17–18 (emphasis added). Patent Owner cites the disclosure in the ’499 patent specification that the DAU provides configuration settings to DRUs to remotely turn on or off individual carriers via gain control parameters. *Id.* at 15–17 (citing Ex. 1001, 4:50–62, 6:33–44, 7:44–50, 12:15–39, 12:58–13:2; Ex. 2018 ¶ 46). Patent Owner argues

that the digital representations of radio resources are sent “to communicate to [a remote unit] which resources to use for subsequent transmission of user data.” *Id.* at 54.

Petitioner contends the term “digital representation of a . . . set of radio resources” should be given a plain and ordinary meaning, and that meaning must encompass a digitized form of radio resources. Pet. Reply 1–4. Petitioner argues that we should reject any requirement that the digital representation of a set of radio resources must include configuration information for a remote unit. *Id.* at 2.

*b) Our Conclusion*

We conclude that the proper construction of “digital representation of a . . . set of radio resources” encompasses user payload data packaged in or combined with RF carrier channels. We further conclude that “digital representation of a . . . set of radio resources” is not limited to and does not necessarily include configuration information that is required to or used to reconfigure remote radio units.

Patent Owner notes that it disagrees with our preliminary construction in the Decision on Institution regarding “radio resources.” PO Resp. 14–15. Patent Owner argues that a construction of radio resources encompassing “data modulated on an RF carrier” “should not apply here to a different claim term which involves ‘digital representations,’” and generally appears to separate the issue of the proper construction of “radio resource” from the proper construction of “digital representation” of sets of radio resources. *Id.* at 15 & 14–15 n.1.

However, as Petitioner argues, there does not appear to be any indication in the specification and other intrinsic evidence that “digital representation” should be given more than its ordinary meaning, or that an

underlying construction of “radio resources” would not be applied to this claim term, which explicitly includes “radio resources.” Pet. Reply 2–3 (citing Ex. 1001, 4:63–5:6 as confirming the use of the ordinary meaning of “digital representation” in the specification of the ’499 patent). As in our Decision on Institution, we determine that “radio resources” encompasses RF carriers, CDMA codes, and TDMA time slots. *See* Dec. on Inst. 22–23; Ex. 1001, 12:3–9, 12:58–13:2. Our construction is further supported by the language of the claims, which requires that each “set of radio resources” is “for transmission at an antenna of the first remote unit.” Ex. 1001, 14:17–19, 14:22–24, 15:3–5, 15:8–10, 16:6–8, 16:11–13. Consistent with the claim construction determinations in the WD Tex. *Cellco* case and the ED Tex. *AT&T* case, we determine that an RF carrier with data modulated on it is a radio resource, but the data modulated on the RF carrier is not a radio resource. Ex. 1059, 3–4; Ex. 1066, 8–11; *see* Dec. on Inst. 23–26.

With respect to the “digital representation” of “set[s] of radio resources,” the specification of the ’499 patent describes that in the downlink (base station to DRU antenna) path for data, RF signals received at the DAU from base station(s), are down-converted, digitized, and further processed resulting in “independently serialized, parallel data streams” that are delivered to DRUs. Ex. 1001, 4:63–5:12. Petitioner contends that this description of delivery of a digitized version of an RF signal to DRUs describes the sending/transmission of a digital representation of the radio. This accords with the testimony of Dr. Chrissan, who states that “a digital representation of any signal has a plain and ordinary meaning [which is] digital information defining or describing a signal such that that signal can be reconstructed from the digital information.” Ex. 1061, 145:1–19.

While Patent Owner appears to argue that a “digital representation” of a radio resource would be only an “identifier” of, e.g., an RF carrier (PO Resp. 26), this does not appear to be supported by the specification or the cited testimony of Dr. Chrissan. We do not see a reason to relate “digital representation of . . . a set of radio resources” in the claims to the description in the ’499 patent specification of the remote configuration of DRU parameter settings via the DAU, including detecting or determining radio resources assigned to a DRU and configuring the DRU, turning on and off individual carriers transmitted and received by a DRU. PO Resp. 15–17 (citing Ex. 1001, 4:50–62, 6:33–44, 7:44–50, 12:15–39, 12:58–13:2). No cited portion of the specification describes these signals sent from a DAU to control a DRU as digital representations of a set of radio resources. While Patent Owner cites, in support, Dr. Chrissan’s declaration, it does not limit the “digital representation of . . . a set of radio resources” to information identifying a resource; rather, his testimony is that “the digital representation of a radio resource *is not merely* the digitized form of a radio resource, but *includes* information defining or describing how radio resources are to be used in over-the-air transmission, *as well as* information identifying radio resources.” Ex. 2018 ¶ 47 (emphasis added) (cited at PO Resp. 13, 18, 30, 33). We credit Dr. Acampora’s testimony that

[d]igitizing merely captures a digital picture or version of the shape of the RF carriers arriving from the base stations. The resulting digital baseband signal preserves the shape of the original base station signal, i.e. the shape of its amplitude, frequency and phase modulations. One of skill in the art would understand that digitizing a signal by taking digital samples of a signal creates a digital representation of that signal. A digital baseband version of RF carrier signals from a base station is a digital representation of those RF carrier signals.

Ex. 1071 ¶ 8 (cited at Pet. Reply 2, 8).

Patent Owner argues that only its proposed construction is “consistent” with the decision denying institution in the 1430 IPR. PO Resp. 15. In that decision, the Board determined that “the plain and ordinary meaning of ‘radio resources’ . . . includes RF carriers, CDMA codes, and TDMA time slots [and] excludes data that does not incorporate information used in the transmission of the radio resource from an antenna of the remote unit.” Ex. 2002, 11–12 (Decision Denying Institution in 1430 IPR). The Board’s construction in the 1430 IPR decision, however, does not provide the payload data exclusion argued by Patent Owner. The pertinent issue in the 1430 IPR was whether the payload data carried using RF carriers, CDMA codes, and TDMA time slots is by itself and divorced from the means of transmission, a radio resource. *Id.* at 10 (“No indication is given that the data carried wirelessly . . . is, itself, a radio resource.”). Thus, the claim construction discussion in 1430 IPR decision (and an ultimate conclusion in that decision) differentiated a radio resource from payload carried using a radio resource. *See id.* at 17–19; Pet. Reply 3. Here, consistently, we do not find that a digitized version of the payload that was previously carried, e.g., on an RF signal, extracted from that RF signal, would be a digital representation of a radio resource. Rather, we find that the correct construction encompasses user payload data packaged in or combined with RF carrier channels, which is not contradicted by the finding in the 1430 IPR. This is also consistent with the finding in IPR2022-01345 regarding a related patent. *See* Ex. 1067 (Decision Granting Institution in IPR2022-01345), 3 (noting the relationship to the ’499 patent), 13–14 (claim construction that “radio resources include RF carriers, CDMA codes, and

TDMA time slots, even if the carriers, codes, and/or slots include underlying transmitted payload data”).

## 2. *Additional Terms*

Petitioner and Patent Owner disagree regarding the construction of “packetize” or “packetizing” as recited in claims 2, 9, and 14. PO Resp. 19–20; Pet. Reply 5–6.

Patent Owner argues that we should construe “packetize” to mean “create data packets that include destination information.” PO Resp. 19–20. Patent Owner argues that this is consistent with how the Board previously interpreted this claim term in the 00571 IPR. PO Resp. 19 (citing Ex. 1017).

We do not need to construe “packetizing” because collateral estoppel prevents Patent Owner from arguing that Wu does not disclose “packetizing” as explained below. We also do not need to construe any other terms to resolve the disputes before us. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms ... that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

### *E. Grounds Based on Wu Alone and Wu and Sabat-552*

The Petition brings several grounds based on Wu alone or Wu in combination with Sabat-552, which we address in this section. Pet. 25–57.

#### 1. *Wu – Ex. 1005*

Wu is titled “Carrier Channel Distribution System” and describes a system where signals are communicated between base transceiver stations (BTSS) and remote transceiver units (RTUs), providing fine-grained control for this communication, splitting carrier channels and routing only some channels to RTUs according to a routing policy. Ex. 1005, codes (54), (57),

¶¶ 9, 11, 38–44. A BTS receives signals within a plurality of frequency bands, each of which may comprise multiple channels. *Id.* ¶¶ 11, 35, 37, 38. Figure 2 of Wu, reproduced below, is a schematic of a base transceiver station and associated host units.

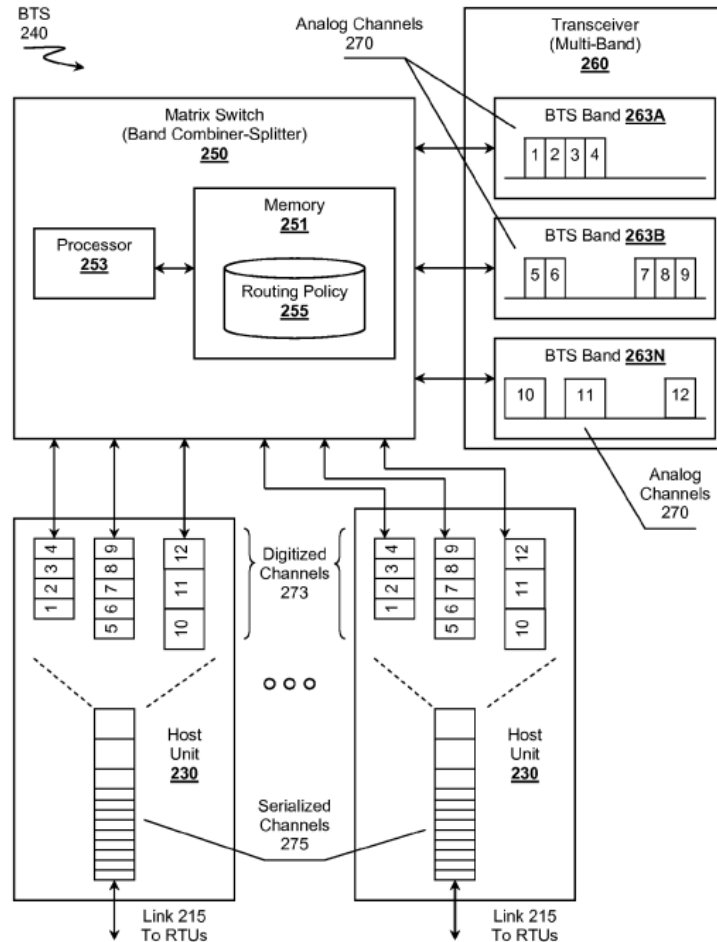


Figure 2

Figure 2 shows BTS 240 including transceiver 260, matrix switch 250, and host units 230. *Id.* ¶¶ 15, 34–36. Transceiver 260 receives signals on BTS bands 263A through 263N, and each may include multiple channels 270, e.g., channels 270 labelled 5 through 9 in BTS band 263B. *Id.* ¶¶ 35, 37. Transceiver 260 forwards the received channels 270 to matrix switch 250 that routes them according to Routing Policy 255 to host unit 230, which

further distributes them to RTUs over links 215. *Id.* ¶ 38. The system is bi-directional, and carrier channel signals are received by host units 230 from RTUs and forwarded to transceiver 260 for transmission within bands 263. *Id.* ¶¶ 36, 49. Wu also discloses that some signals may be received at an RTU with another RTU acting as intermediary. *Id.* at Figs. 1, 4, ¶¶ 33, 51.

Routing policy can be reconfigured in order to change the routing of channels to the various RTUs. *Id.* ¶¶ 48, 49. Channels may be routed, allocated, or distributed, for example, based on anticipated requirements of areas at a certain time of day, or on current traffic load. *Id.* ¶¶ 43, 44. Transmissions between host units and RTUs are disclosed as preferably occurring according to the CPRI Standard. *Id.* ¶¶ 31, 49.

## *2. Sabat-552 – Ex. 1011*

Sabat-552 describes an open access RF signal distribution system supporting wireless voice, data, and other services. Ex. 1011, code (57), 5:6–9. The system is comprised of base stations located at hub sites, with the hubs connected via high speed fiber links to distributed RF access nodes (RANs) distributed throughout a given community, which are used to distribute RF signals and provide wireless service to end customers. *Id.* at 5:6–58, 6:1–23. In one embodiment, hubs are connected via digital cross-connects so a base station located at any hub site can transmit to any RAN. *Id.* at 6:55–59.

## *3. Anticipation by or Obviousness over Wu – Claims 1–5, 8–11, 13–16, 18, and 19*

Petitioner argues that claims 1–5, 8–11, 13–16, 18, and 19 are anticipated by Wu. Pet. 25–50. Petitioner additionally argues that these claims would have been obvious in view of Wu. *Id.* at 50–52. Patent Owner

presents several arguments regarding Petitioner's contentions. PO Resp. 2–3, 20–21, 24, 30–53.

*a) Analysis of Claim 1*

According to Petitioner, Wu discloses a system for wireless communications, as recited in the preamble of claim 1,<sup>9</sup> denoted limitation 1A by Petitioner. Pet. 28 (citing Ex. 1005 ¶¶ 2, 9; Ex. 1003 ¶ 101).

Petitioner asserts that Wu discloses the baseband unit in the combination of the matrix switch 250 and host units (130, 230, 430), which are described as being within Wu's BTS and "make up a system that manages baseband communications to and from the plurality of RTUs on behalf of the operator's signal source." Pet. 28–29 (citing Ex. 1005 ¶¶ 31, 49–50; Ex. 1003 ¶¶ 102–104).

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<sup>9</sup> Neither party presents an argument regarding whether this preamble is limiting, however, as we determine that Wu discloses the system recited in the preamble, we do not address this question.

Petitioner presents an annotated version of Wu's Figure 2 to illustrate its argument:

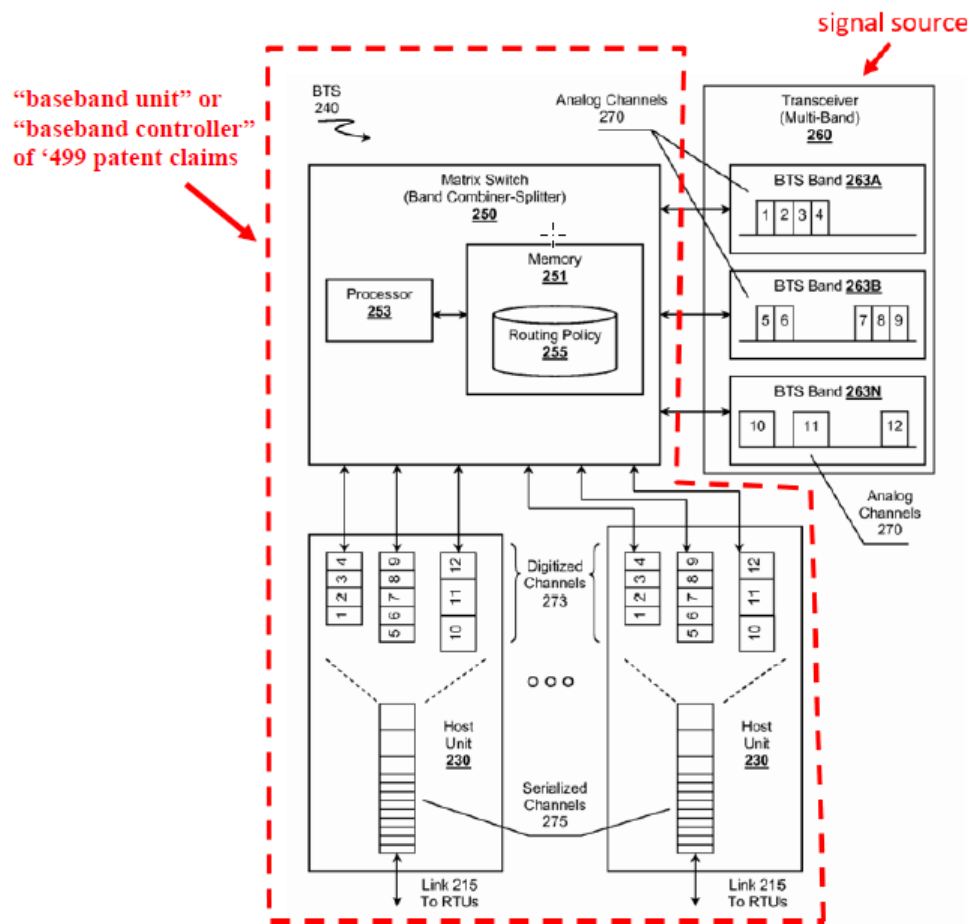


Figure 2

*Id.* at 27. Petitioner's annotated version of Wu's Figure 2 shows a dotted line around matrix switch 250 and host units 230, labelled "'baseband unit' or 'baseband controller' of '499 patent claims.'" *Id.* Petitioner cites Wu's disclosure that the host units include downconverters and analog-to-digital converters for converting downlink RF signals into digital baseband data for transport to Wu's RTUs. *Id.* at 29 (citing Ex. 1005 ¶¶ 49, 54–55; Ex. 1003 ¶ 103). Petitioner argues that the inclusion of the Wu host units and matrix switch within one element (the BTS) and the functional placement of the matrix switch support the combination of these elements disclosing a

baseband “unit” as in limitation 1B or teaching such a unit. *Id.* at 29 (citing Ex. 1005, Figs. 2, 4; Ex. 1003 ¶ 105), 50–51 (citing Ex. 1003 ¶ 166). In its obviousness contentions, Petitioner argues that it would have been obvious “to place the functionality of both components (matrix switch and units 230) within a single housing or unit” to “reduce the system complexity, reduce installation costs by simplifying installation, and minimize errors in coupling separate components.” *Id.* at 50–51 (citing Ex. 1003 ¶¶ 166–168). Petitioner also argues that a “POSITA would have had a reasonable expectation of success because no new functionality is required, merely grouping Wu’s already-disclosed components into a single unit or housing.” *Id.* at 51 (citing Ex. 1003 ¶ 166).

Petitioner argues that Wu discloses the subject matter of limitation 1C, requiring that the system comprise “a plurality of signal sources, including at least a first signal source and a second signal source” in Wu’s disclosure that multiple frequency bands are provided by Wu’s multiband transceiver 260, and that the system may be coupled to more than one multiband transceiver 260. Pet. 31 (citing Ex. 1005 ¶¶ 34–39, Fig. 2; Ex. 1003 ¶ 106).

Petitioner argues that Wu discloses limitation 1D, requiring a plurality of remote transceiver units, in the disclosure of remote transceiver units, such as RTUs 110, 310, and 410. *Id.* at 31 (citing Ex. 1005 ¶¶ 11, 30, 31; Ex. 1003 ¶ 107).

Petitioner cites Wu’s description of analog interfaces coupling the matrix switch 250 and transceiver 260 as disclosing the “plurality of interfaces to communicatively couple the baseband unit to the plurality of signal sources” of limitation 1E. *Id.* at 32–33 (citing Ex. 1005 ¶ 34, Fig. 2 (element 270), Fig. 5-2; Ex. 1003 ¶ 108).

With respect to element 1F, “wherein the baseband unit is configured to receive a plurality of radio resources from the first signal source and the second signal source,” Petitioner cites Wu’s disclosure of the matrix switch 250 receiving downlink analog carrier channels in multiple bands from multi-band transceiver(s) 260. *Id.* at 33–34 (citing Ex. 1005 ¶¶ 34–39; Ex. 1003 ¶¶ 109–110).

Limitations 1G and 1H require that “the baseband unit is configured to send a digital representation of a first set of radio resources to the first remote unit at a first point in time” and similarly configured “to send a digital representation of a second set of radio resources to the first remote unit at a second point in time” with each of the first and second set of radio resources being “for transmission at the antenna of the first remote unit.” Ex. 1001, 14:15–24.

Petitioner argues that these limitations are taught in the ability of matrix switch and host units to send digital representations of the downlink channel signals individually or in arbitrary groups to the Wu RTUs. Pet. 34–36 (citing Ex. 1005 ¶¶ 4, 9, 11, 30, 38–47, 49; Ex. 1003 ¶¶ 111–115). Wu describes host units containing analog-to-digital converters (“ADCs”) for creating digitized representations of the carrier signals for transport to the RTUs. Ex. 1005 ¶¶ 30 (“Host units 130 relay digitized signals between BTS 140 and [RTUs] 110.”), 54 (“[A] matrix switch operating as a band combiner/splitter routes channels to one or more RTUs . . . . The channels can be digitized using an ADC individually or as a group within an envelope.”). Petitioner cites, for the first and second set of radio resources of limitations 1G and 1H the routing policy in Wu that may change the channels or number of channels routed to a given RTU (“first remote unit”) when a given condition occurs. Pet. 35–36 (citing Ex. 1005 ¶¶ 38–47).

With respect to the radio resources being “for transmission at the antenna of the first remote unit,” Petitioner asserts that:

Wu discloses that the RTUs provide “wireless coverage” to cellular regions or cell area. EX-1005 ¶¶ 0030, 0004. It is well understood that “wireless” communications are transmitted using an antenna and that there are antennas associated with the RTUs for providing the wireless coverage within their area. EX-1003 ¶113.

Pet. 35.

Limitation 1I requires that “a number of radio resources in the first set of radio resources is different from a number of radio resources in the second set of radio resources.” Ex. 1001, 14:25–27. Petitioner argues that Wu discloses the allocation of more channels to a region to increase “bandwidth available” in that condition, which discloses providing an increased number of channels (radio resources) in a second set of assigned channels. Pet. 36 (citing Ex. 1005 ¶ 46; Ex. 1003 ¶ 116).

Limitation 1J requires that “the baseband unit is configured to receive digital signals from each of the plurality of remote units.” Ex. 1001, 14:28–29. Petitioner argues that Wu discloses a bi-directional system, and that RTUs include ADCs that allow uplink traffic to be sent to the host units. Pet. 36 (citing Ex. 1005 ¶¶ 36, 49; Ex. 1003 ¶¶ 117–119).

Patent Owner argues that Wu does not disclose limitations 1G and 1H because Wu’s radio units are “pass-through” units that “merely relay traffic they receive to the mobile end users.” PO Resp. 30 (emphasis omitted). Patent Owner’s argument is premised on its claim construction of “digital representation of radio resources” as necessarily including configuration information; because Wu’s units merely relay what communications they receive, Patent Owner argues, they do not receive configuration information.

*Id.* at 30–35 (citing Ex. 2018 ¶¶ 44–48, 57–60). Patent Owner argues that “Wu’s RTU’s are fundamentally different from the ’499 patent’s reconfigurable remote radio units in which its settings can be dynamically changed in accordance with updated radio resource information used for radio transmissions.” *Id.* at 35. However, as discussed *supra* at Section II.D.1, we do not adopt Patent Owner’s claim construction for “digital representation of a . . . set of radio resources.”

Patent Owner additionally argues that Wu does not disclose the transmission of two sets of radio resources at two different times at “an antenna of a first remote unit.” PO Resp. 37–38. Patent Owner argues that Wu’s RTU sends different carriers to different boosters, citing Wu’s Figure 3 as showing an RTU that delivers carrier channels 1–4 to a first booster and carrier channels 5–12 to a second booster. *Id.* (citing Ex. 2018 ¶¶ 61–63; Ex. 1005 ¶ 50, Fig. 3). Because two boosters are included, Patent Owner argues, Wu does not send all channels to a single antenna. *Id.*; Ex. 2018 ¶ 63. The dispute does not center around whether Wu would include one or more antennas – the parties agree that a booster as shown in Figure 3 would be connected to an antenna. Ex. 1061, 45:18–46:20 (Dr. Chrissan testifying that Wu’s RTUs (remote transceiver units) would provide wireless coverage via an antenna; *see* Ex. 1071 ¶¶ 14–16, 18–26; Ex. 1070. Rather, Patent Owner contends that Figure 3 of Wu shows two boosters, that “Wu’s RTU sends different carriers to different boosters” and, therefore, “Wu does not contain any disclosure of sending all channels to a single antenna, nor does it teach changing the set of channels and sending them to the same antenna as required by the challenged claims.” *Id.* at 38. But the claims, if interpreted as limiting transmission to one single antenna, do not require that “all

channels” be sent to that antenna, but rather that different sets of radio resources sent at different sets of times be “for transmission” by the antenna. We find compelling Petitioner’s argument that even in the exemplary Figure 3, two different sets of radio resources within the same band sent at different times (e.g. with the first set of radio resources being only channel 1 and the second set of radio resources being channels 1 through 4) would each be transmitted through the antenna attached to the booster that channels 1–4 are allocated to. Pet. Reply 15–17 (citing Ex. 1017 ¶¶ 37–40). Additionally, Wu’s Figure 3 is exemplary, and Wu does not disclose that an RTU requires two boosters; in fact, Wu discloses that the received channels at the RTU are converted back to analog channels, which “can then be distributed to **one or more boosters** for re-transmission” and that these channels “can be allocated to the boosters as desired.” Ex. 1005 ¶¶ 16, 50. We credit Petitioner’s argument and the testimony of Dr. Acampora that “[w]here there is only one booster, necessarily, every set of channels is transmitted by the same booster” and thus would be transmitted by any antenna or antennas connected to that booster. Pet. Reply 15 (citing Ex. 1071 ¶ 30).

Patent Owner additionally argues that Wu does not disclose a baseband unit, as recited in 1B and additionally recited in the wherein limitations 1E through 1H and 1J. PO Resp. 39–41. In addition to arguments addressed above, Patent Owner argues that “Wu does not disclose the ability to send specific downlink signals to specific remote units or assign specific radio resources to specific RTUs” and that “Wu does not provide any selectivity to target specific RTUs or which radio resources get assigned to which specific RTU connected to each Host Unit.” *Id.* at 39–41. But this argument is not tied to any claim language and is not commensurate with the scope of the claim, which does not require selectivity to assign

radio resources to only some RTUs (and not others) connected to a host unit, as Patent Owner argues. Additionally, as Petitioner shows, Wu does not require that more than one RTU be assigned to each host unit, and in fact includes an example of a host unit connected to a single RTU in one-to-one or “[u]nicast” configuration. Pet. Reply (citing Ex. 1005 ¶ 51, Fig. 4). We additionally note that the Federal Circuit’s decision in affirming the 00571 IPR final written decision addresses an identical or substantially similar issue and stands as persuasive authority that supports this determination. Ex. 1072, 6–7 (finding that the Board was correct in rejecting an argument that a similar claim limitation required selected signals to be sent to only a single remote unit, and that Wu disclosed that similar claim limitation.)

Based on the record, Petitioner’s showing with respect to claim 1 is persuasive. Accordingly, we determine that Petitioner shows by a preponderance of evidence that claim 1 is anticipated by Wu and would have been obvious over Wu.

*b) Analysis of Claims 8 and 14*

Claims 8 and 14 are similar to claim 1 in many respects, and Petitioner refers to its arguments with respect to claim 1 for these claims, with the exception of claim 8’s recitation of “at least one interface to communicatively couple the baseband unit to a plurality of remote units, including at least a first remote unit” (Ex. 1001, 14:62–64), which Petitioner argues is disclosed by Wu’s disclosure that host units include a digital optical cable interface for communicating with the RTUs. Pet. 41–43. (citing Ex. 1005 ¶¶ 31, 49, 50, Figs. 1, 2, 4, 5; Ex. 1003 ¶ 124).

Patent Owner presents no additional arguments with respect to these claims.

Based on the record, Petitioner’s showing with respect to claims 8 and 14 is persuasive. Accordingly, we determine that Petitioner shows by a preponderance of evidence that claims 8 and 14 are anticipated by Wu and would have been obvious over Wu.

*c) Analysis of Claims 2, 3, 9, 10, 15, and 19*

Claim 2 depends from claim 1 and recites that “the baseband unit is configured to packetize each digital representation of a radio resource,” and claims 9 and 19, which depend from claim 8 and 14 respectively, include similar recitations. Ex. 1001, 14:30–32, 15:14–16, 16:37–39. Claims 2, 9, and 19 are argued together by Petitioner. Pet. 43–45. Claim 3 depends from claim 1 and recites that “the digital representation of the first set of radio resources includes destination information identifying the first remote unit and the digital representation of the second set of radio resources includes destination information identifying the first remote unit” and claims 10 and 15, which depend from claims 8 and 14 respectively, include similar limitations. Ex. 1001, 14:33–37, 15:17–22, 16:17–21.<sup>10</sup> These claims are argued together by Petitioner. Pet. 46–47.

With respect to claims 2, 9, and 19, Petitioner argues that Wu discloses that its baseband unit is configured to packetize each digital representation of a radio resource in Wu’s discussion of the use of the OBSAI standard or the CPRI standard for communications between the host

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<sup>10</sup> Claim 15 contains a recitation of “destination information identifying the second remote unit,” however a second remote unit does not appear elsewhere in the claim or in claim 14 from which it depends. Ex. 1001, 15:39–16:21. The parties focus on the question of whether destination information identifying any remote unit would be included in the digital representation of radio resources. See, e.g., Pet. 46–47 & n.5; Pet. Reply 24–25.

units and RTUs. Pet. at 43–45 (citing Ex. 1005 ¶¶ 31, 49, 50; Ex. 1007, 84; Ex. 1003 ¶¶ 73–98, 136–158). Petitioner further argues that the inclusion of destination information for the intended remote unit in the digital representations sent to that remote unit, as in claims 3, 10, and 15 is taught by the use of addresses in these standards. *Id.* at 46–47 (citing Ex. 1003 ¶¶ 136–157, 159–160; Ex. 1007, 84).

Patent Owner argues that Wu does not disclose packetizing. PO Resp. 42–49. As discussed above, Section II.B.2, collateral estoppel precludes Patent Owner from arguing that the CPRI specification, as used in digital communications in a system such as Wu, does not teach the packetizing of digital representations with destination information identifying the remote unit transmitted to as claimed. Even if collateral estoppel does not apply, Petitioner’s showing for these limitations in claims 2, 9, and 19 is persuasive.

With respect to claims 3, 10, and 15, Patent Owner relies on its arguments with respect to claims 2, 9, and 19. PO Resp. 48–49. Collateral estoppel applies, and we find Petitioner’s showing that the destination address included in the packets sent to the remote unit would be the address of the remote unit to be persuasive.

Based on the record, Petitioner’s showing with respect to claims 2, 3, 9, 10, 15, and 19 is persuasive. Accordingly, we determine that Petitioner shows by a preponderance of evidence that claims 2, 3, 9, 10, 15, and 19 are anticipated by Wu and would have been obvious over Wu.

*d) Analysis of Claims 4, 11, 13, 16, and 18*

Claim 4 depends from claim 1 and recites that “the first set of radio resources is a subset of the plurality of radio resources and includes at least some radio resources from the first signal source and at least some radio

resources from the second signal source,” and claims 11 and 16 (which depend from claims 8 and 14 respectively) include similar recitations. Ex. 1001, 14:38–42, 15:23–27, 16:22–26. Claim 13 depends from claim 8 and recites that “the plurality of radio resources include a first composite signal from the first signal source and a second composite signal from the second signal source, and the baseband unit is configured to form the digital representation of the first set of radio resources from a first subset of the first composite signal and a second subset of the second composite signal,” and claim 18 depends from claim 14 and includes similar recitations. *Id.* at 15:32–38, 16:30–36.

Petitioner argues, for each of these claims, that Wu discloses that signals from the multiband transceiver (signal source) are composite signals including multiple carrier channels and that there can be multiple signal sources. Pet. 47–48 (citing Ex. 1005 ¶¶ 34–35, Fig. 2). Petitioner additionally argues that Wu’s matrix switch teaches that the carrier channels can be allocated in arbitrary groups. *Id.* at 48–49 (citing Ex. 1005 ¶¶ 47, 49). Thus, Petitioner argues, the recitations in these claims regarding the plurality of radio resources and the composition of the sets of radio resources are disclosed in Wu. *Id.* (citing Ex. 1003 ¶¶ 161–162).

Patent Owner argues that one of ordinary skill in the art would not understand the combinations of Wu to include radio resources from different signal sources. PO Resp. 49 (citing Ex. 2018 ¶¶ 78–80). The declaration testimony by Dr. Chrissan relied on for this states that “there is no disclosure of forming [a] combination of radio resources comprising radio resources from across multiple-band transceivers.” Ex. 2018 ¶ 79. This does not address Wu’s disclosure “individual channels from different bands [being] split from their bands, and combined together” or of allocating carrier

channels “in arbitrary groups.” Ex. 1005 ¶¶ 47, 49. We credit Dr. Acampora’s testimony, supported by the Wu disclosure, regarding the proper understanding of these disclosures in Wu.

Based on the record, Petitioner’s showing with respect to claims 4, 11, 13, 16, and 18 is persuasive. Accordingly, we determine that Petitioner shows by a preponderance of evidence that claims 4, 11, 13, 16, and 18 are anticipated by Wu and would have been obvious over Wu.

*e) Analysis of Claim 5*

Claim 5 recites that the baseband unit and at least one of the signal sources “are part of a baseband controller.” Ex. 1001, 14:43–45. Petitioner asserts that the matrix switch and host units of Wu are shown as being located within the same structure, or would have been obvious to include in a single structure, together forming a baseband unit. Pet. 49 (citing 1005, Figs. 2, 4), 50–52 (citing Ex. 1003 ¶¶ 166–168). Petitioner indicates that “the matrix switch and host units (together the *baseband unit*) can be located within the same structure as the multiband receiver (a *signal source*).” Pet. 49 (citing Ex. 1005, Figs. 2, 4). Petitioner further argues that Wu’s system provides control over the carrier channels by implementing a policy that dictates the distribution from the matrix switch and host units of digital baseband representations of carrier channels to bolster its argument that Wu discloses a baseband *controller*. *Id.* at 49–50 (citing Ex. 1005 ¶¶ 9, 39–40; Ex. 1003 ¶¶ 163–164).

Patent Owner presents no additional arguments with respect to this claim.

Based on the record, Petitioner’s showing with respect to claim 5 is persuasive. Accordingly, we determine that Petitioner shows by a

preponderance of evidence that claim 5 is anticipated by Wu and would have been obvious over Wu.

*4. Obviousness over Wu and Sabat-552 – Claims 6, 7, 12, and 17*

Petitioner argues that claims 6, 7, 12, and 17 would have been obvious over Wu and Sabat-552. Pet. 50–53. Patent Owner relies only on arguments already addressed for these contentions. PO Resp. 53.

Petitioner argues that Wu does not disclose a baseband unit communicatively coupled to another baseband unit, or receiving radio resources from another baseband unit, as claimed in claims 6, 12, and 17, or the indirect connection to yet another baseband unit, as claimed in claim 7, but that this is disclosed by the hubs taught in Sabat-552. Pet. 53–56 (citing Ex. 1011, 6:55–61, Fig. 1, Fig. 3; Ex. 1003 ¶¶ 171–176). Petitioner argues that the combination would be motivated by Sabat-552’s teaching of easily sharing the system among service providers to reduce costs, and that one of ordinary skill in the art would have expected success. *Id.* at 54–55 (citing Ex. 1011, 2:48–58, 3:65–4:5; Ex. 1003 ¶¶ 173–175).

Based on the record, Petitioner’s showing with respect to claims 6, 7, 12, and 17 is persuasive. Accordingly, we determine that Petitioner shows by a preponderance of evidence that claim 6, 7, 12, and 17 would have been obvious over Wu and Sabat-552.

*F. Additional Grounds*

The Petition includes additional arguments, including relating to the unpatentability of additional claims based on Wu in combination with Sabat-426, grounds including the OBSAI standard, and grounds based in whole or in part on Hettstedt. Pet. 50–53, 57–92.

Because we determine that Petitioner has shown claims 1–19 are unpatentable on other grounds, we do not reach Petitioner’s challenge to

these same claims based on other combinations or arguments. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App'x 984, 990 (Fed. Cir. 2020) (nonprecedential) (“We agree that the Board need not address [alternative grounds] that are not necessary to the resolution of the proceeding.”).

### III. CONCLUSION<sup>11</sup>

In summary:

<b>Claim(s)</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/ Basis</b>	<b>Claim(s) Shown Unpatentable</b>	<b>Claim(s) Not shown Unpatentable</b>
1–5, 8–11, 13–16, 18, 19	102	Wu	1–5, 8–11, 13–16, 18, 19	
1–5, 8–11, 13–16, 18, 19	103	Wu	1–5, 8–11, 13–16, 18, 19	
1–5, 8–11, 13–16, 18, 19	103	Wu, Sabat-426 <sup>12</sup>		

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<sup>11</sup> Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

<sup>12</sup> We do not reach Petitioner’s obviousness challenge based on Wu and Sabat-426 because we determine that Petitioner has shown that claims 1–5, 8–11, 13–16, 18, and 19 are anticipated by and obvious over Wu.

6, 7, 12, 17	103	Wu, Sabat-552	6, 7, 12, 17	
1–19	103	Any preceding ground and OBSAI standard <sup>13</sup>		
1–5, 8–11, 13–16, 18, 19	102	Hettstedt <sup>14</sup>		
1–5, 8–11, 13–16, 18, 19	103	Hettstedt, Wu		
6, 7, 12, 17	103	Hettstedt, Sabat-552		
<b>Overall Outcome</b>			1–19	

#### IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown that claims 1–19 of the '499 Patent are unpatentable;

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

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<sup>13</sup> We do not reach this challenge because we determine that Petitioner has shown that 1–19 unpatentable on other grounds.

<sup>14</sup> We do not reach challenges based on the Hettstedt reference because we determine that Petitioner has shown that 1–19 unpatentable on grounds based on the Wu reference.

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