

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T SERVICES, INC., CELLCO PARTNERSHIP d/b/a
VERIZON WIRELESS, GOOGLE LLC, and T-MOBILE USA, INC.,
Petitioner,

v.

PEGASUS WIRELESS INNOVATION LLC,
Patent Owner.

IPR2025-00083
Patent 10,638,463 B2

Before KRISTEN L. DROESCH, JASON M. REPKO, and
STEPHEN E. BELISLE, *Administrative Patent Judges*.

DROESCH, *Administrative Patent Judge*.

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

I. INTRODUCTION

We have authority to hear this *inter partes* review under 35 U.S.C. § 6, and this Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has established by a preponderance of the evidence that claims 1–9 of U.S. Patent No. 10,638,463 B2 (Ex. 1001, “the ’463 Patent”) are unpatentable.

A. Background and Procedural History

Ericsson Inc., Nokia of America Corporation, AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, Google LLC, and T-Mobile USA, Inc. filed a petition requesting *inter partes* review of claims 1–9 of the ’463 Patent. Paper 7 (“Petition” or “Pet.”). Exclusive Licensee Pegasus Wireless Innovation LLC (hereinafter “Patent Owner”) timely filed a preliminary response. Paper 11.

With our authorization, Petitioner filed a preliminary reply (Paper 12) and Patent Owner filed a preliminary sur-reply (Paper 13). Also with our authorization, the parties filed supplemental briefs to address related district court proceedings. Papers 14, 15.

Upon review of the parties’ arguments and supporting evidence, we instituted review with respect to all grounds and claims set forth in the Petition. Paper 18.

Following institution, Ericsson Inc. and Patent Owner filed a Joint Motion to Partially Terminate the Proceeding as to Ericsson. Paper 43. Nokia of America Corporation and Patent Owner also filed a Joint Motion to Partially Terminate the Proceeding as to Nokia. Paper 46. We granted the Motions. Papers 45, 51. Consequently, only AT&T Services, Inc., Cellco

Partnership d/b/a Verizon Wireless, Google LLC, and T-Mobile USA, Inc. (collectively, “Petitioner”) remain as parties to this proceeding with Patent Owner.

Patent Owner filed a Response to the Petition (Paper 37, “PO Resp.” or “Response”) to which Petitioner filed a Reply (Paper 48, “Pet. Reply” or “Reply”), and Patent Owner filed a Sur-reply (Paper 53, “PO Sur-reply”).

In support of the Petition, Petitioner relies upon a declaration of Dr. Sumit Roy. Ex. 1002. In support of the Response, Patent Owner relies upon a declaration of Jacob Sharony, Ph.D. Ex. 2005. The parties filed transcripts of depositions of Dr. Roy (Ex. 2006) and Dr. Sharony (Ex. 1050).

An oral hearing was held on February 25, 2026, and a transcript of the hearing is included in the record. Paper 58.

B. Real Parties in-Interest

Petitioner states:

The real parties in interest are Cellco Partnership d/b/a Verizon Wireless, Verizon Business Network Services LLC, Verizon Corporate Services Group Inc., TracFone Wireless, Inc., AT&T Corp., AT&T Services, Inc., AT&T Mobility LLC, AT&T Mobility II LLC, New Cingular Wireless PCS, LLC, Cricket Wireless LLC, T-Mobile USA, Inc., Sprint Solutions LLC, Sprint Spectrum LLC, Ericsson Inc., Telefonaktiebolaget LM Ericsson, Google LLC, and Nokia of America Corporation.¹

¹ As mentioned above, the proceedings have been terminated with respect to Ericsson Inc. and Nokia of America Corporation. Papers 45, 51.

Pet. 88. Patent Owner states that “[t]he real parties-in-interest for this proceeding include: Patent Owner^[2], Pegasus Wireless Innovation LLC.” Paper 8.

C. Related Matters

The parties indicate that the ’463 Patent is the subject of:

Pegasus Wireless Innovation LLC. v. AT&T Inc. et al., No. 2:23-cv-00638 (E.D. Tex.);

Pegasus Wireless Innovation LLC. v. T-Mobile US, Inc. et al., No. 2:23-cv-00639 (E.D. Tex.); and

Pegasus Wireless Innovation LLC. v. Verizon Communications Inc., No. 2:23-cv-00640 (E.D. Tex.).

Pet. 72 (citing Ex. 1030); Paper 8, 1, Paper 29, 1. Petitioner indicates the AT&T case and T-Mobile case have been consolidated for all pre-trial issues. Pet. 72 (citing Ex. 1030); Paper 29, 1.

D. The ’463 Patent

The ’463 Patent is titled “Apparatus and Method of Uplink Control Channel Resource Allocation for New Radio.” Ex. 1001, code (54).

The ’463 Patent relates to “allocating an uplink control channel resource in a next-generation/5G radio access network (hereinafter, referred to as a new radio (NR)).” *Id.* at 1:18–21. “[T]he 3rd generation partnership project (3GPP)” and, in particular, the “Radio Access Network Working Group 1

² Pegasus Wireless Innovation LLC is the exclusive licensee. *See* Reel 065219, Frame 0144-0180 (recorded exclusive license). Under the license, Pegasus is granted, *inter alia*, “any and all other substantial right to and in the Patents necessary and sufficient under any applicable law or precedent to confer standing to Assignee and permit Assignee to initiate any actions on its own.” *Id.* at 0149.

(RAN WG1)” studies “5G radio access technology” including “frame structures, channel coding and modulation, waveforms, multiple access methods, and the like for a new radio (NR).” *Id.* at 1:23–30. The ’463 Patent discloses “a need to develop a method for enabling a user device to transmit an uplink channel, such as an uplink control channel and an uplink data channel, to a base station based on a bandwidth part (BWP) when the user device uses various BWPs in NR.” *Id.* at 1:42–46. The ’463 Patent describes configuring “one or more bandwidth parts (BWPs) constituting bandwidths obtained by subdividing an NR CC [component carrier].” *Id.* at 7:1–2.

Figure 3B of the ’463 Patent is reproduced below.

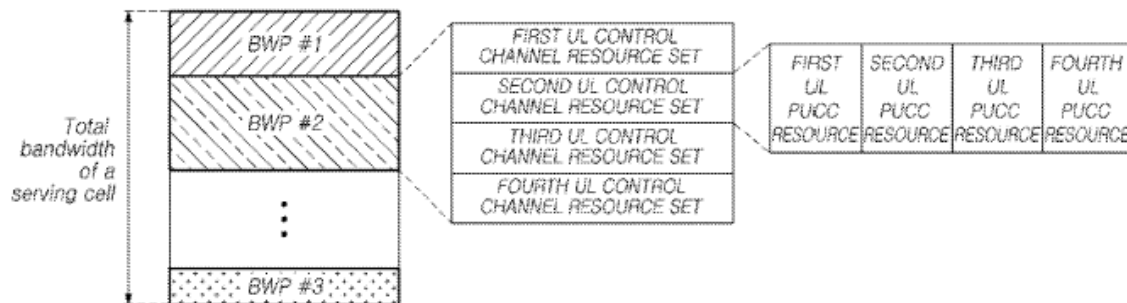


Figure 3B of the ’463 Patent is a diagram illustrating configuring physical uplink (UL) control channel (PUCCH) resources. *See id.* at 10:48–51.

Figure 3B, “illustrat[es] i) PUCCH resource sets configuring each of N BWPs and ii) PUCCH resources configuring each PUCCH resource set.” *Id.* at 2:57–59. Figure 3B shows non-overlapping UL BWP #1, BWP #2, and BWP #3 configured for user equipment (UE) from the “[t]otal bandwidth of a serving cell.” *Id.* at 9:49–56. As shown in Figure 3B, a base station (BS) configures first to fourth PUCCH resource sets for BWP #2. *See id.* at 9:61–10:3. “[E]ach PUCCH resource may be defined as PUCCH format configuration information, time/frequency domain PUCCH resource

configuration information (or additionally code domain resource configuration information) in the UL BWP.” *Id.* at 10:6–10. As shown in Figure 3B, the “second PUCCH resource set” is “configured by a first to fourth PUCCH resources.” *Id.* at 10:10–14.

E. Illustrative Claim

Petitioner challenges claims 1–9 of the ’463 Patent. *See* Pet. 1. Of the challenged claims, claims 1, 4, and 7 are independent. *See* Ex. 1001, 21:1–22:43. Claims 2 and 3 depend directly from claim 1; claims 5 and 6 depend directly from claim 4; and claims 8 and 9 depend directly from claim 7. *See id.* Claim 1 is illustrative and reproduced below.

- [1[pre]] A method of transmitting uplink (UL) control information by a user equipment, the method comprising:
- [1[a]] receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;
- [1[b]] determining one of UL control channel resource sets contained in the UL control channel resource set configuration information;
- [1[c]] determining one of UL control channel resources contained in the determined UL control channel resource set; and
- [1[d]] transmitting UL control information through the determined UL control channel resource;
- [1[e]] wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment; and
- [1[f]] wherein the each UL BWP is activated through downlink (DL) control information.

Ex. 1001, 21:1–19.³

³ Throughout this Decision we use Petitioner’s designations, shown in brackets, for the elements of claim 1. *See* Pet. 19–35.

F. Patentability Challenges and Asserted Prior Art

Petitioner challenges the patentability of claims 1–9 on the following grounds and prior art (*see* Pet. 1–2):

Claim(s) Challenged	35 U.S.C. §⁴	Reference(s)/Basis
1–9	103	Takeda, ⁵ Yan ⁶
1–9	103	Marinier, ⁷ Yan, 3GPP R1-1711853 ⁸

II. ANALYSIS

A. Legal Standards

A claim is unpatentable as obvious if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. 35 U.S.C. § 103 (2024). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of

⁴ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the challenged claims of the ’463 Patent have an apparent effective filing date after March 16, 2013, the AIA version of § 103 applies. Our determinations and findings herein would not change if the pre-AIA provisions applied.

⁵ WO 2019/030929 A1 (Ex. 1006, Ex. 1007 (certified translation)).

⁶ U.S. Patent No. 10,736,085 B2 (Ex. 1010).

⁷ US 2014/0056278 A1 (Ex. 1011).

⁸ 3GPP TSG RAN 1 NR Ad-Hoc#2 R1-1711853, Qingdao, P/R. China June 27th-30th, 2017, Agenda Item: 5.1.7, “Activation/deactivation of bandwidth part.” (Exhibit 1012).

nonobviousness, i.e., secondary considerations.⁹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art would have had “a bachelor’s degree in electrical engineering, computer engineering, or a related discipline, knowledge of the relevant 3GPP standards” and “at least 2 years of experience working in a field involving wireless communications.” Pet. 10 (citing Ex. 1002 ¶¶ 38–40). According to Petitioner, a “person with a different degree but with additional relevant experience could still qualify if the additional experience compensates for the different educational background.” *Id.* Petitioner also asserts a “person with less than 2 years of experience working in a field involving wireless communications could still qualify if the person has additional education that compensate[s] for their lesser experience.” *Id.* Patent Owner does not dispute Petitioner’s proposed level of skill. *See generally* PO Resp.

We find that “at least” in Petitioner’s formulation of the level of skill in the art is vague and open-ended. Otherwise, we adopt Petitioner’s formulation of the level of ordinary skill in the art, because it appears consistent with the ’463 Patent Specification and the prior art of record.

C. Claim Construction

We interpret the challenged 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

⁹ The parties do not present evidence of secondary considerations.

ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b). Under that standard, we generally give claim terms their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history.

Phillips v. AWH Corp., 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

Petitioner asserts that elements 1[b] and 1[c] constitute a mean-plus-function limitation under 35 U.S.C. § 112(f) and Patent Owner disputes Petitioner’s assertion. *See* Pet. 5–7; PO Resp. 11–13. As demonstrated below, there is no dispute as to whether the prior art teaches limitations 1[b] and 1[c] under Petitioner’s claim construction. Therefore, we need not address whether 35 U.S.C. § 112 (f) applies. “The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Patent Owner also raises an argument regarding the interpretation of “each UL bandwidth part (BWP) configured for the user equipment” recited in element 1[e] of claim 1 and “the each UL BWP is activated” recited in element 1[f] of claim 1. *See* PO Resp. 13–15. We address Patent Owner’s arguments below in Section II.D.3.d. addressing elements 1[e] and 1[f] in view of Takeda and Yan.

D. Patentability Challenge Based on Takeda and Yan

1. Overview of Takeda (Ex. 1007)

Takeda is titled “User Terminal and Wireless Communication Method.” Ex. 1007, code (54). Takeda is directed to a user terminal and a

wireless communication method in a next generation mobile communication system. *See id.* ¶ 1. In mobile communication systems, such as “4G, 5G, 5G+ (Plus), NR (New RAT),” user equipment “controls reception of a DL [downlink] data channel . . . based on downlink control information (DCI: Downlink Control Information).” *Id.* ¶¶ 2, 4.

Takeda describes “a user terminal” that comprises “a receiving unit for monitoring a control resource domain of a frequency band for downlink (DL) in a carrier and receiving downlink control information (DCI)” and “a control unit for controlling transmission of an uplink (UL) signal in a frequency band for UL in the carrier based on the DCI” where “the control unit controls activation or deactivation of the frequency band for UL.” *Id.* ¶ 10. The user terminal also receives “BWP [bandwidth part] configuration information using higher layer signaling,” including, for example radio resource control “RRC signaling.” *Id.* ¶ 100. A “user terminal may be configured with only a single UL BWP, or may be configured with a plurality of UL BWPs.” *Id.* ¶ 103.

Figure 9 of Takeda is reproduced below.

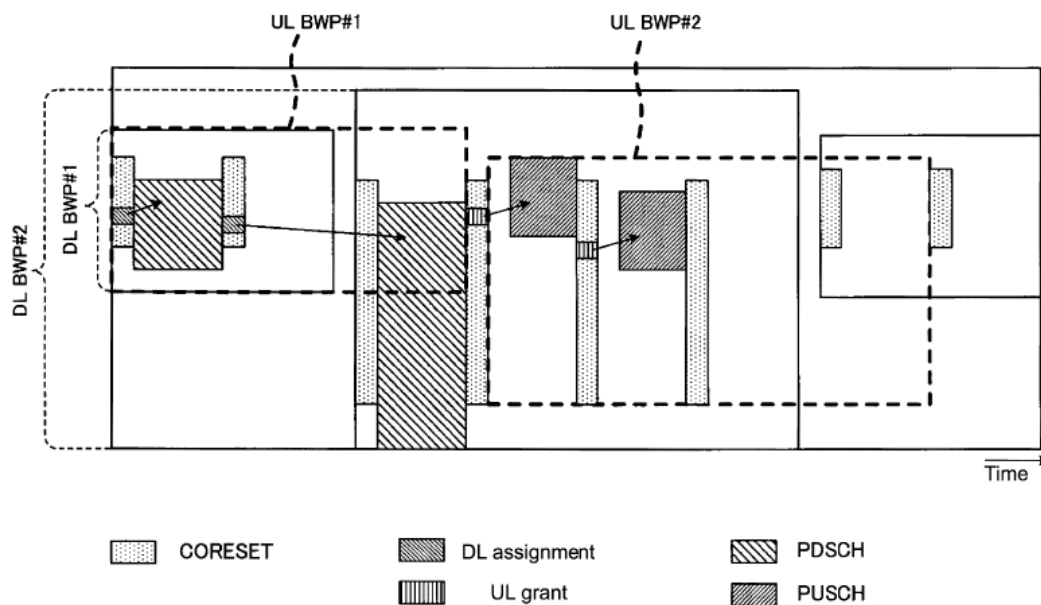


Figure 9 depicts a diagram illustrating UL BWP#1 configured with the same bandwidth as DL BWP#1 and UL BWP#2 composed of a portion of the bandwidth of DL BWP#2. *See id.* ¶¶ 110–112. At least one of the DL BWPs configured in the user terminal includes a control resource set (CORESET), which is denoted using dots in the illustration in Figure 9. *See id.* ¶ 22, Fig. 9. The user terminal controls “activation of the UL BWP based on the BWP index.” *Id.* ¶ 112. In Takeda, “the user terminal monitors the CORESET configured in the activated DL BWP” and, in the example illustrated in Figure 9, “BWP index #2 is included in the UL grant detected in this CORESET, and thus the user terminal may deactivate UL BWP #1 and activate UL BWP #2.” *Id.* ¶ 113.

2. Overview of Yan

Yan is titled “Uplink Control Information Sending Method, Uplink Control Information Receiving Method, Apparatus, And System.” Ex. 1010, code (54).

Figure 1 of Yan is reproduced below.

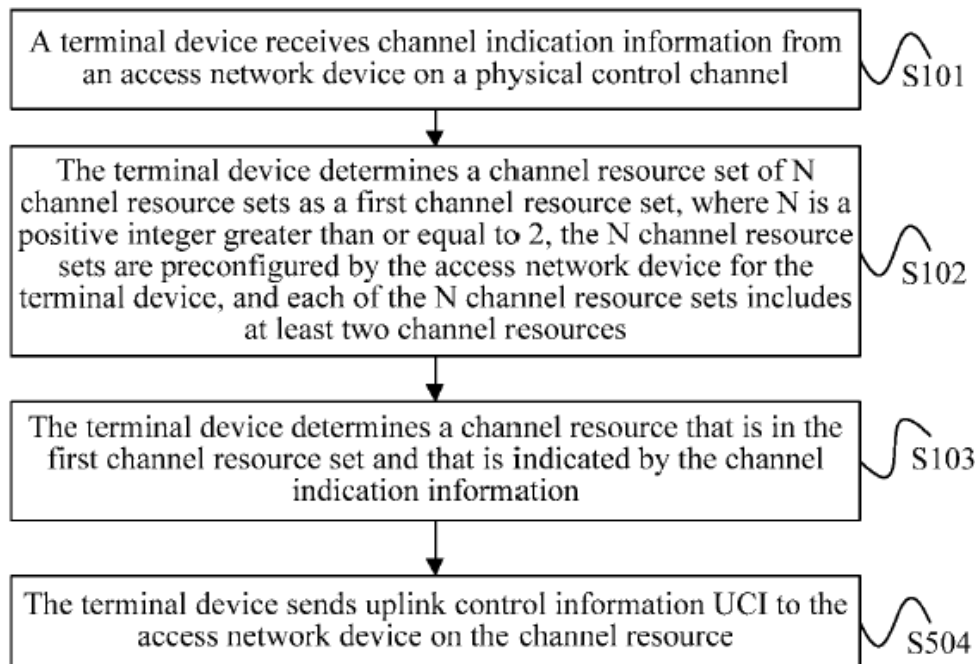


Figure 1 depicts a flowchart of an uplink control information sending method having four steps (S101 through S104). *See id.* at 11:7–8. As shown in Figure 1, in step S101, a terminal device “receives channel indication information from an access network device on a physical control channel.” *Id.* at 11:17–19, Fig. 1. In step 102, the “terminal device determines a channel resource set of N channel resource sets as a first channel resource set, where N is a positive integer greater than or equal to 2.” *Id.* at 11:48–51. Yan describes that “the N channel resource sets are preconfigured by the access network device for the terminal device, and each of the N channel resource sets includes at least two channel resources.” *Id.* at 11:51–54. In step S103, the “terminal device determines a channel resource that is in the first channel resource set and that is indicated by the channel indication information.” *Id.* at 12:5–7. In step S104, the “terminal device sends uplink control information UCI to the access network device” on “the channel resource determined in step S103.” *Id.* at 12:25–30.

3. Analysis of Claim 1

a. Motivation to Combine

The Petition includes a sub-section titled “Motivation to Combine,” in which Petitioner presents several alternative arguments. *See* Pet. 13–17 (citing Ex. 1002 ¶¶ 105–111). Of the arguments presented, we focus our analysis on Petitioner’s argument addressing backward compatibility. Petitioner asserts that,

[t]o the extent it is argued that any elements are not explicitly taught by Takeda and/or such elements were not well known to the POSITA [(person of ordinary skill in the art)], Takeda in view of Yan teaches the limitations of Claims 1–9 and, . . . the POSITA would have combined Takeda and Yan.

Id. (citing Ex. 1002 ¶ 104). Petitioner asserts that a person of ordinary skill in the art “would have been motivated to modify Takeda in view of Yan to provide backwards network compatibility.” Pet. 13 (citing Ex. 1002 ¶¶ 105–111). In support of its arguments, Petitioner asserts that “5G NR was implemented prior to the priority date of the ’463 Patent while 4G LTE remained in use, and therefore a POSITA would have recognized benefits for 5G-capable UEs to continue to connect with 4G LTE BSs.” Pet. 14 (citing Ex. 1002 ¶ 106). Petitioner asserts that “Takeda states that its teachings are applicable to both 4G and 5G.” *Id.* (citing Ex. 1007 ¶ 239; Ex. 1033, 5:23–31; Ex. 1034, 10; Ex. 1037, 31). According to Petitioner, “[a] POSITA would know that dual network connectivity requires ‘increased integration between different RATs, with a typical 5G-enabled device having radios capable of supporting not only a potentially new 5G standard’ but also ‘numerous releases of 4G LTE.’” *Id.* (citing Ex. 1002 ¶ 106; Ex. 1031, 3). Petitioner contends that “[f]urthermore, ‘[a] common understanding is that the 5G RAN should allow integrating Long Term Evolution-Advanced (LTE-A) evolution and novel 5G radio on the RAN level.’” *Id.* (citing Ex. 1035, 1). According to Petitioner, “[l]ikewise, it would have been beneficial to allow a 5G non-standalone operation mode to reuse 4G principles of resource allocation for UL transmission from a UE having 4G LTE capabilities, but not 5G NR.” *Id.* (citing Ex. 1002 ¶ 106; Ex. 1035, 1, 5). Petitioner contends that,

[t]o facilitate backwards compatibility, a POSITA would recognize efficiencies in implementing Yan’s method of allocating UL channel resource sets (e.g., the steps of Yan’s FIG. 4) with Takeda’s 5G NR BWPs. . . . By using the same resource allocation methodology in 4G LTE and 5G NR, UEs and BSs do not need distinct protocols for connecting to each network type. . . . This integration allows 5G NR-only

capabilities (e.g., BWPs) to be implemented when possible, while retaining backwards-compatible methods for 4G LTE.

Pet. 15 (citing Ex. 1002 ¶ 106).

In response, Patent Owner contends that Petitioner's backward compatibility arguments are "illogical." *See* PO Resp. 26; PO Sur-reply 4. According to Patent Owner, "[b]ackwards compatibility is achieved by having a user equipment that is able to comply with multiple standards, such as both 5G NR and 4G LTE, such that it could comply with either standard." PO Resp. 26 (citing Ex. 2005 ¶ 78); *see* PO Sur-reply 4–5 (same argument, citing Ex. 2005 ¶ 78). Patent Owner asserts that "ensuring backwards compatibility does not mean that a POSITA would be motivated to incorporate previous generation, 4G LTE standards solutions into a system designed to operate according to 5G NR standards." PO Resp. 26 (citing Ex. 2005 ¶ 80); PO Sur-reply 5 (citing Ex. 2005 ¶ 80). According to Patent Owner, "[m]ixing standards and behaviors does not ensure backwards compatibility, and instead creates a risk that the user equipment might not comply with either standard because it is not fully compliant with either standard." PO Resp. 26–27 (citing Ex. 2005 ¶ 80); PO Sur-reply 5 (same argument, citing Ex. 2005 ¶ 80).

In the Reply, Petitioner points out that Patent Owner's expert Dr. Sharony's testimony on cross-examination contradicts Patent Owner's arguments. *See* Pet. Reply 14–15. According to Petitioner, "Dr. Sharony described such backwards compatibility as 'very' useful for a UE, agreeing that 'it would be useful to have your UE able to communicate according to both the 5G protocol and the 4G protocol.'" *Id.* at 14 (citing Ex. 1050, 178:16–179:3, 180:10–13). Petitioner further asserts that "Dr. Sharony even recognized that earlier, 'non-standalone' UEs had the same functionality as

Petitioners’ proposed combination, namely, ‘the ability to communicate under both standards.’” *Id.* at 14–15 (citing Ex. 1050, 181:6–182:16).

Petitioner contends that Dr. Sharony’s testimony aligns with Dr. Roy’s testimony that “it would have been beneficial to allow a 5G non-standalone operation mode to reuse 4G principles of resource allocation for UL transmission from a UE having 4G LTE, but not 5G NR capabilities.” *Id.* at 15 (citing Pet. 14–15; Ex. 1002 ¶ 106).

We do not agree with Patent Owner’s arguments disputing Petitioner’s backward compatibility rationale for combining the teachings of Yan and Takeda. Patent Owner’s arguments are misplaced because they are premised incorrectly on Takeda’s teachings being limited to 5G NR (i.e., standalone 5G NR), and the proposed combination requiring “mixing standards and behaviors.” To the contrary, Petitioner explicitly asserts that “Takeda states that its teachings are applicable to both 4G and 5G”—i.e., non-standalone 5G. Pet. 14 (citing Ex. 1007 ¶ 239). Likewise, instead of mixing 5G and 4G standards and behaviors as argued by Patent Owner, Petitioner merely proposes retaining Yan’s 4G method of allocating UL channel resources sets with Takeda’s teaching of 5G NR BWPs. *See* Pet. 14–15.

We credit Dr. Roy’s testimony that a person of ordinary skill in the art would have been motivated to modify Takeda’s teachings with Yan’s teachings to provide Takeda with backwards network capability because it is supported by the cited evidence of record. *See* Ex. 1002 ¶¶ 105, 106 (citing Ex. 1007 ¶ 239; Ex. 1031, 1, 3; Ex. 1033, 5:23–31; Ex. 1034, 10; Ex. 1035, 1, 5; Ex. 1037, 31). Moreover, as pointed out by Petitioner, Dr. Shimony’s deposition testimony regarding the usefulness of backward compatibility and the importance of a non-standalone UE having the ability to communicate

over both 4G and 5G standards supports Dr. Roy’s testimony, yet undermines Patent Owner’s arguments. *See* Ex. 1050, 178:16–182:16; Pet. Reply 14–15. Based on the entire record developed during trial, we are persuaded by a preponderance of the evidence that Petitioner provides sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to a person of ordinary skill in the art to modify Takeda’s teachings with Yan’s teachings to provide Takeda with backwards network compatibility.¹⁰ *See* Pet. 13–15; *KSR*, 550 U.S. at 418.

b. Preamble – Element 1[pre]

The preamble, element 1[pre], recites “[a] method of transmitting uplink (UL) control information by a user equipment, the method comprising.” Ex. 1001, 21:2–3. Petitioner contends that each of Takeda and Yan teaches the preamble. *See* Pet. 19–20. More specifically, Petitioner asserts that “Takeda describes a user terminal that ‘controls transmission of a UL data channel.’” Pet. 19 (reproducing Ex. 1007, Fig. 8 (with Petitioner’s annotations added); citing Ex. 1007 ¶¶ 4, 140). Petitioner relies on Takeda’s description that “[u]plink control information (UCI) . . . is transmitted on the PUSCH [(physical uplink shared channel)] or the PUCCH.” *Id.* (citing Ex. 1007 ¶ 140).

Petitioner also contends that “Yan discloses a method of transmitting UL control information by UE.” Pet. 20 (citing, *e.g.*, Ex. 1010, 12:25–33;

¹⁰ Petitioner provides alternative reasons to combine the teachings of Takeda and Yan (*e.g.*, UE power conservation, avoid mismatch of UL channel resource allocation and UCI size). *See* Pet. 13, 15–18. We need not address Petitioner’s alternative stated reasons because we find that the preponderance of the evidence supports Petitioner’s rationale to combine the teachings of Takeda and Yan based on backward compatibility.

Fig. 1). Petitioner relies on Yan's disclosure that "[t]he terminal device sends uplink control information UCI to the access network device on the channel resource." *Id.* (citing Ex. 1010, 12:25–33).

c. Elements 1[a], 1[b], 1[c], and 1[d]

Element 1[a] recites "receiving, from a base station, UL control channel resource set configuration information for UL control information transmission." Ex. 1001, 21:4–6. Element 1[b] recites "determining one of UL control channel resource sets contained in the UL control channel resource set configuration information." Ex. 1001, 21:7–9. Element 1[c] recites "determining one of UL control channel resources contained in the determined UL control channel resource set." Ex. 1001, 21:10–12. Element 1[d] recites "transmitting UL control information through the determined UL control channel resource." Ex. 1001, 21:13–14.

Petitioner relies on the teachings of Takeda to address elements 1[a], 1[b], 1[c], and 1[d]. *See* Pet. 20–32. In addressing element 1[a], Petitioner asserts that Takeda discloses: (1) the BWPs are configured for a UE and for PUSCH/PUCCH UL transmissions; (2) the BWPs are configured through BWP configuration information received through RRC signals transmitted from a BS; (3) the UE controls transmission of a UL data channel based on resource allocation information included in a UL grant that is included in DCI received from a BS; and (4) a UL BWP is activated based on the UL grant scheduling a UL transmission on a PUCCH or PUSCH. *See* Pet. 20 (citing Ex. 1007 ¶¶ 99–100, 106, 107). Petitioner acknowledges that "Takeda does not state that the configuration information is provided to the UE." Pet. 21 (citing Ex. 1002 ¶ 121). Petitioner, however, contends that a person or ordinary skill in the art would have understood that, based on

Takeda's teachings, configuring resource channels would have been "provided through configuration information for the PUCCH resource or the PUSCH resource." Pet. 20–21 (citing Ex. 1007 ¶¶ 99, 100, 106, 107, Fig. 8; Ex. 1002 ¶ 120). In the alternative, Petitioner asserts that a person of ordinary skill in the art "would have found it obvious to modify Takeda such that resources are configured through configuration information provided by the [base station] to the [user equipment]." Pet. 22–23 (citing, e.g., Ex. 1002 ¶¶ 122–123; Ex. 1010, 2:1–6; Ex. 1011 ¶¶ 98, 107).

In addressing element 1[b], Petitioner asserts that a person of ordinary skill in the art would have understood, based on Takeda's teachings, that

Takeda's UE would have determined one of those UL control channel resource sets [that is UL control channel resource sets received by the user equipment in element 1[a]] when transmitting the *uplink signals transmitted within the UL BWP* of Takeda's FIG. 8 (shown in shades of green within the UL BWP).

Pet. 26–27 (citing Ex. 1007 ¶¶ 140, 220).

In the alternative, Petitioner contends that a person of ordinary skill in the art "would have found that 'determining one of UL control channel resource sets contained in the UL control channel resource set configuration information' to be an obvious modification." Pet. 27 (citing Ex. 1007 ¶¶ 10, 76, 84, 104, 107, 112, 113, 123, Figs. 8, 9; Ex. 1002 ¶ 133). According to Petitioner, "a POSITA reviewing Takeda would have been motivated to determine a UL control channel resource set prior to determining an individual UL control channel resource to provide flexibility for identifying a UL channel resource based on UCI characteristics (e.g., a size of the UCI)." Pet. 27–28 (citing Ex. 1002 ¶ 133). Petitioner asserts that "a POSITA would understand that grouping multiple UL channels into

resource sets would enable a flexible UL channel structure that provides different channel resources for different UL characteristics.” Pet. 28 (citing Ex. 1002 ¶ 133).

In addressing element 1[c], Petitioner contends that Takeda’s “PUSCH is a UL control channel resource” and relies on related teachings in Takeda. *See* Pet. 29–31 (citing, *e.g.*, Ex. 1007 ¶¶ 10, 140, 220, Fig. 8; Pet. 26–29). In addressing element 1[d], Petitioner contends that Figure 8 of Takeda demonstrates transmission of UL information via a PUSCH and Takeda discloses a PUCCH is configured in the same way. *See* Pet. 31 (citing Ex. 1007 ¶ 140).

Petitioner also alternatively relies on the teachings of Takeda combined with Yan for teaching elements 1[a], 1[b], 1[c], and 1[d]. *See* Pet. 20–32. Petitioner asserts that Yan teaches element 1[a] based on Yan’s disclosure that, prior to the terminal device receiving channel indication information from an access network device on a physical control device in Step S101 in Figure 1, the terminal device receives configuration information of the N channel resources sets from the access network device by using higher layer signaling, and in step 102. *See* Pet. 23–25 (reproducing Ex. 1010, Fig. 1 (with Petitioner’s annotations added); citing Ex. 1002 ¶¶ 124–128; Ex. 1010, 19:5–12). Petitioner contends that Yan teaches element 1[b] based on Yan’s disclosure of Step S102 in Figure 1 in which the terminal device determines a channel resource set of the N channel resource sets as the first channel resource set and disclosure that the “N channel resource sets” are contained in “configuration information” sent from the access network device. *See* Pet. 29 (citing Ex. 1002 ¶¶ 134–137; Ex. 1010, 9:49–59, 11:48–54, 20:1–42, 22:7–25; Pet. 20–26).

Petitioner asserts that Yan teaches element 1[c] based on Step S103 of Figure 1 in which the terminal device determines a channel resource that is in the first channel resource set and that is indicated by the channel indication information. *See* Pet. 31 (citing Ex. 1010, 20:27–42). Petitioner contends that Yan teaches element 1[d] based on Yan’s disclosure of Step S104 in Figure 1 in which the terminal device sends uplink control information UCI to the access network device on the channel resource. *See* Pet. 32 (citing Ex. 1010, 12:25–33, 20:43–50, 22:42–50, 25:65–26:11, 26:47–67). Petitioner asserts that a “POSITA would have implemented the resource allocation methods of Yan with the BWP configurations of Takeda” for the reasons set forth in the sub-section titled “Motivation to Combine.” *See* Pet. 23 (citing Pet. 13–18; Ex. 1002 ¶ 128); Pet. 29 (citing Pet. 13–18; Ex. 1002 ¶ 134); Pet. 31 (citing Pet. 13–18; Ex. 1002 ¶¶ 142, 146).

Patent Owner does not address Petitioner’s showing for elements 1[pre], 1[a], 1[b], 1[c], and 1[d] of claim 1. *See generally* PO Resp. In any event, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). Based on the entire record developed during trial, we determine that Petitioner demonstrates by a preponderance of the evidence that the combination of Takeda and Yan teaches the preamble and elements 1[a], 1[b], 1[c], and 1[d] of claim 1.

d. Elements 1[e] and 1[f]

Element 1[e] recites “wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment.” Ex. 1001, 21:15–17. Element 1[f] recites “wherein the each

UL BWP is activated through downlink (DL) control information.”

Ex. 1001, 21:18–19. Patent Owner, in addressing claim construction, asserts that “each UL bandwidth part configured for the user equipment” recited in element 1[e] can be one or more UL BWPs, whereas under 5G NR “the each UL BWP is activated through downlink control information” recited in element 1[f] means only one BWP can be activated for a UE. *See* PO Resp. 13–14 (citing Ex. 1007 ¶¶ 103, 107, 113, 125, Figs. 8–9, 11; Ex. 2005 ¶ 49; Ex. 2006, 29:5–6; PO Resp. 6–10). Petitioner responds that “each UL BWP is activated” of element 1[f] encompasses a scenario in which more than one bandwidth part is activated for a user equipment because the claims are not limited to 5G NR. *See* Pet. Reply 3 (citing Ex. 1001, 7:22–27; Ex. 1050, 54:15–55:16). We need not address this dispute regarding interpretation of the term “each” because, as explained below, Petitioner demonstrates that Takeda teaches or suggest elements 1[e] and 1[f] under either party’s interpretation.

Petitioner asserts that Takeda “teaches multiple UL control channels (which a POSITA would collectively group into a set) are scheduled for transmission within each particular bandwidth part.” Pet. 32 (citing Ex. 1007 ¶¶ 80, 107, 112, 117, 123; Pet. 19–20). Petitioner contends that Figures 8 and 9 “of Takeda show multiple UL resources are configured for a single UL BWP. . . . Therefore, Takeda discloses that sets (encompassing multiple UL resources) are configured for a BWP.” Pet. 32–33 (reproducing Ex. 1007, Fig. 8 (with Petitioner’s annotations added)). Petitioner asserts that the resources used to transmit UL signals in Figures 8 and 9 are UL control channel resources, e.g., physical uplink control channel (PUCCH). *See* Pet. 33 (citing Ex. 1007 ¶¶ 115, 140, 220). Petitioner further contends that Takeda teaches that BWPs are configured for the user terminal based on

Takeda's disclosure of maximum or minimum bandwidth for one or more BWPs configured for the user terminal. *See* Pet. 34 (citing Ex. 1007 ¶¶ 95–98, 103, 112).

Petitioner asserts that Yan teaches UL control channel resource sets configured with a carrier which would be used to modify the teachings of Takeda for the reasons explained in the sub-section titled “Motivation to Combine.” *See* Pet. 34 (citing Pet. 13–18). According to Petitioner,

[w]hen incorporating Yan's teachings for allocating UL resources, including the inclusion of UL control channel resource sets, with Takeda's BWP-based UL transmission method (as is described in the *motivation to combine* section), the resulting UL resources and the UL control channel resource sets that include those resources would have been configured for BWPs that are configured for the UE.

Pet. 34 (citing Ex. 1002 ¶ 153; Pet. 13–18).

As to element 1[f], Petitioner asserts that Takeda teaches that the user terminal may control activation and/or deactivation of one or more UL BWPs configured in the user terminal based on the explicit or implicit indication information, including explicit indication information as a DCI (UL grant). *See* Pet. 35 (citing Ex. 1007 ¶¶ 120, 139; Ex. 1002 ¶¶ 154–156).

Patent Owner faults Petitioner's showing for limitation 1[f] as providing no analysis and only quoting Takeda's sentences explaining that the user terminal may control activation and/or deactivation of one or more UL BWPs configured for the user terminal. *See* PO Resp. 34. According to Patent Owner “‘one or more’ is not the same as ‘each.’” *Id.* at 35 (citing Ex. 2005 ¶¶ 85–88).

Patent Owner disputes Petitioner's showing for limitation 1[e] as relying on Takeda's disclosure regarding “one or more BWPs configured for the user terminal,” by arguing that “‘one or more’ is not the same as ‘each.’”

PO Resp. 17 (citing Ex. 1007 ¶ 103; Ex. 2005 ¶ 85; Pet. 34). According to Patent Owner, “Petitioners simply rely on Takeda’s vague disclosure regarding ‘one or more BWPs configured for the user terminal’ without addressing the claim requirements that must be satisfied for each UL BWP configured for a user terminal.” PO Resp. 36 (citing Ex. 2005 ¶¶ 85–88; Pet. 34). Patent Owner contends that “Takeda does not disclose distinct UE-specific UL control channel resource sets for each UL BWP.” PO Resp. 18 (citing Ex. 2005 ¶ 68); *see* PO Resp. 27 (similar argument, citing Ex. 2005 ¶ 83). According to Patent Owner, “[b]ecause the Petitioners are not specific about the number or identity of BWPs configured for a user terminal, Petitioners therefore also fail to establish that Takeda teaches the claimed features of element 1[e] for *each* UL BWP configured for a user terminal.” *Id.* (citing Ex. 2005 ¶¶ 85–88).

In the Reply, Petitioner asserts that Patent Owner does not present a consistent interpretation of “each” in elements 1[e] and 1[f]. *See* Pet. Reply 5. Nonetheless, Petitioner asserts that Takeda teaches elements 1[e] and 1[f] under any interpretation. *See id.*

Petitioner contends that “the phrase ‘each UL bandwidth part (BWP) configured for the user equipment’ in element 1[e] could be satisfied by a UE that is configured with a single UL BWP.” *Id.* at 6. According to Petitioner, “[i]f only one UL BWP is configured for the UE, then the claim can be satisfied by configuring UL control channel resource sets for that BWP, and activating that BWP—and there is no dispute that Takeda provides disclosure of one UL BWP that is configured and activated.” *Id.* (citing Pet. 11–12, 32, Ex. 1002 ¶ 149; Ex. 1007, Fig. 8). Petitioner asserts that “by the plain language of the claim, Takeda’s disclosure of an

embodiment having one configured and activated UL BWP is sufficient to satisfy elements 1[e] and 1[f].” *Id.*

Petitioner further contends that Patent Owner incorrectly and inconsistently interprets element 1[e] as requiring configuring more than one BWP or all BWPs, and interprets element 1[f] as requiring activating only one BWP. *See* Pet. Reply 7–9. Petitioner asserts that Takeda teaches elements 1[e] and 1[f] even applying Patent Owner’s inconsistent interpretations for “each.” *See id.* at 9. According to Petitioner,

Takeda discloses configuring each of the plurality (i.e. both) of the BWPs in Fig. 9. Takeda then teaches activating only one BWP. EX1007, ¶ 113 (“the user terminal may deactivate UL BWP #1 and activate UL BWP #2.”). Thus, Takeda discloses configuring more than one BWP (both BWP #1 and BWP #2) but activating only one BWP.

Id. at 10 (citing Ex. 1007 ¶ 113). Petitioner further contends that Takeda also discloses that both UL BWPs of Figure 9 may be active at the same time. *Id.* (citing Ex. 1007 ¶ 114).

We do not agree with Patent Owner’s arguments because they address the teachings of Takeda alone instead of addressing the combined teachings Takeda and Yan proposed by Petitioner. Non-obviousness cannot be established by attacking the references individually, when the obviousness rationale is based on a combination. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Moreover, Patent Owner’s argument that Takeda does not disclose distinct UE-specific UL control channel resource sets for each UL BWP (*see* PO Resp. 17, 28) is misplaced because it does not meaningfully address Petitioner’s argument that Yan teaches UL control channel resources sets configured within a carrier and would be used to modify Takeda resulting in the UL resources and UL control channel

resource sets that include those resources that would have been configured for BWPs that are configured for the UE. *See* Pet. 34 (citing Ex. 1002 ¶ 153; Pet. 13–18). Likewise, Patent Owner does not meaningfully address Petitioner’s argument that a POSITA would understand that grouping multiple UL channels into resource sets in Takeda would enable a flexible UL channel structure that provides different channel resources for different UL characteristics. *See* Pet. 28 (citing Ex. 1002 ¶ 133).

We also do not agree with Patent Owner’s arguments directed to “each UL BWP” and “the each UL BWP” aspects of elements 1[e] and 1[f]. We find that Takeda as modified by Yan teaches elements 1[e] and 1[f] under either party’s interpretation based on the following teachings of Takeda (modified by Yan): (1) UL control channel resource sets configured for one UL BWP and the one UL BWP is activated; (2) UL control channel resource sets configured for two UL BWPs and only one UL BWP is activated; and (3) UL control channel resource sets configured for two UL BWPs and both UL BWPs are activated. *See* Pet. Reply 5–11; Ex. 1007 ¶¶ 103–104, 106–107, 112–114, Figs. 8–9.

For the forgoing reasons and based on the complete record developed during trial, we determine that Petitioner demonstrates by a preponderance of the evidence that the combination of Takeda and Yan teaches these disputed limitations of claim 1.

e. Conclusion

Based on the complete record developed during trial, we determine that Petitioner demonstrates by a preponderance of the evidence that claim 1 would have been unpatentable under 35 U.S.C. § 103 as obvious over the combination of Takeda and Yan.

4. Analysis of Claims 2–9

Claims 4 and 7 are independent claims directed to a method of receiving uplink control information by a base station and a user equipment for transmitting uplink control information, respectively. Each of claims 4 and 7 recite recitations similar to those recited in claim 1 including that both claims 4 and 7 recite elements identical to elements 1[e] and 1[f]. *Compare* Ex. 1001, 21:2–14, *with id.* at 21:31–44, *and id.* at 22:13–31. Petitioner relies, for the most part, on its contentions with respect to claim 1 for how the combination of Takeda and Yan teaches the subject matter of independent claims 4 and 7. *See* Pet. 38–43. Patent Owner relies on its arguments directed to independent claim 1, which we address above in connection with our analysis of claim 1. *See* PO Resp. 37, 40.

Based on our analysis of claim 1, and review of Petitioner’s additional contentions and corresponding cited evidence directed to claims 4 and 7, and based on the complete record developed during trial, we determine that Petitioner demonstrates by a preponderance of the evidence that independent claims 4 and 7 would have been unpatentable under 35 U.S.C. § 103 as obvious over the combination of Takeda and Yan.

Claims 2 and 3 depend, directly, from claim 1; claims 5 and 6 depend, directly, from claim 4; and claims 8 and 9 depend, directly, from claim 7. Petitioner provides a detailed element-by-element analysis for claims 2, 3, 5, 6, 8, and 9. *See* Pet. 35–38, 43. Patent Owner does not substantively address the merits of Petitioner’s challenge to the dependent claims apart from its arguments addressing independent claims 1, 4, and 7. *See* PO Resp. 16–29, 33–37, 40.

We have reviewed Petitioner’s assertions and the evidence cited in support thereof for claims 2, 3, 5, 6, 8, and 9. *See* Pet. 38–43. Based on the

complete record developed during trial, including our analysis of independent claims 1, 4, and 7, we determine that Petitioner demonstrates by a preponderance of the evidence that dependent claims 2, 3, 5, 6, 8, and 9 would have been unpatentable under 35 U.S.C. § 103 as obvious over Takeda and Yan.

E. Patentability Challenge Based on Marinier, Yan, and R1-1711853

1. Overview of Marinier (Ex. 1011)

Marinier is titled “Physical Layer Operation for Multi-Layer Operation in a Wireless System.” Ex. 1010, code (54). Marinier is directed to providing physical layer resources to a plurality of medium access control (MAC) instances that are associated with different base stations that are independently scheduled. *See id.* at code 57. A wireless transmit/receive unit (WTRU) may utilize a first physical layer configuration for transmitting to a first serving site (i.e., base station) associated with a first MAC instance and utilize a second physical layer configuration for transmitting to a second serving site (i.e., base station) associated with a second MAC instance. *See id.* The WTRU may prevent conflicts between transmission requests from the first MAC instance and the second MAC instance by utilizing one or more of time segregation or frequency segregation for transmissions associated with the first MAC instance and transmissions associated with the second MAC instance. *See id.* Marinier further discloses an example of frequency segregation in order to transmit to multiple base station in the same subframe that entrails the bandwidth (BW) utilized by different base stations being divided into a plurality of BW parts. *See id.* ¶ 130. Each base station may be configured to utilize one or more BW parts for communicating with the WTRU. *See id.* Each BW part may be treated as a

component carrier in carrier aggregation and may include corresponding physical uplink control channel (PUCCH) and physical uplink shared channel (PUSCH) resources. *See id.*

2. Overview of R1-1711853 (Ex. 1012)

R1-1711853 is titled “Activation/deactivation of bandwidth part.” Ex. 1012, 1. R1-1711853 discloses that activation/deactivation of uplink or downlink bandwidth parts can be by means of DCI either implicitly or explicitly, including an indication in DCI that triggers activation/deactivation. *See id.* at 2.

3. Analysis of Claim 1

a. Preamble - Element 1[pre]

The preamble recites “[a] method of transmitting uplink (UL) control information by a user equipment, the method comprising.” Ex. 1001, 21:2–3. Petitioner contends that Marinier teaches the preamble based on Marinier’s wireless transmit/receive unit (WTRU) that may include user equipment and transmits uplink control information. *See* Pet. 47–48 (reproducing Ex. 1011, Fig. 1A (with Petitioner’s added annotations); citing Ex. 1011 ¶¶ 3, 64, 105; Ex. 1002 ¶¶ 205–206).

b. Elements 1[a], 1[b], 1[c], and 1[d]

Element 1[a] recites “receiving, from a base station, UL control channel resource set configuration information for UL control information transmission.” Ex. 1001, 21:4–6. Element 1[b] recites “determining one of UL control channel resource sets contained in the UL control channel resource set configuration information.” Ex. 1001, 21:7–9. Element 1[c] recites “determining one of UL control channel resources contained in the determined UL control channel resource set.” Ex. 1001, 21:10–12.

Element 1[d] recites “transmitting UL control information through the determined UL control channel resource.” Ex. 1001, 21:13–14.

Petitioner relies on the teachings of Marinier to address elements 1[a], 1[b], 1[c], and 1[d]. *See* Pet. 48–51. In addressing element 1[a], Petitioner asserts that Marinier discloses that the WTRU transmits UL signals to a serving site (i.e., base station (BS)) using transmission parameters that are provided by a serving site in the form of RRC configuration of parameters. *See* Pet. 48 (citing Ex. 1011 ¶ 181; Ex. 1002 ¶¶ 207–210). According to Petitioner, “Marinier’s RRC configuration of parameters, including transmission parameters, are equivalent to the ‘UL control channel resource set configuration information’ in the ’463 Patent.” Pet. 48; *see* Pet. 48–49 (citing Ex. 1001, 12:46–53). Petitioner asserts that Marinier further “describes transmission parameters as defining characteristics of a UL transmission including ‘dedicated PUCCH resources’ . . . that match the ’463 Patent’s ‘UL control channel resources’ and are contained in a UL control channel resource set that is ‘contained in the received UL control channel resource set configuration information.’” Pet. 49 (citing Ex. 1001, claim 1; Ex. 1011 ¶¶ 84, 103).

In addressing element 1[b], Petitioner asserts that Marinier discloses that the WTRU may be configured to operate using multiple sets of transmission parameters and may select one or more appropriate sets of transmission parameters to use in a given subframe. *See* Pet. 49 (citing Ex. 1011 ¶ 181; Ex. 1002 ¶¶ 211–213). According to Petitioner, “[t]hose sets of parameters may include ‘dedicated PUCCH resources,’ so that selecting a set of parameters includes selecting a set of dedicated PUCCH resources.” Pet. 49–50 (citing Ex. 1011 ¶¶ 103, 181).

In addressing element 1[c], Petitioner contends that Marinier discloses that UL grants may direct the WTRU to transmit over an UL channel (e.g., PUCCH). *See* Pet. 50 (citing Ex. 1011 ¶ 62; Ex. 1002 ¶¶ 214–216). Petitioner contends that the WTRU determines one of UL control channel resources according to the UL grant. *See id.* Petitioner reiterates that “the UL control channel resources (including ‘dedicated PUCCH resources’) are within sets of parameters that may be used by the WTRU to transmit to a serving site.” *Id.* (citing Ex. 1011 ¶¶ 62–64, 107, 185, 189, 261–262). According to Petitioner “[d]etermining one of the UL control channel resources according to the UL grant therefore includes selecting a UL control channel resource contained in the ‘dedicated PUCCH resources’ that are within a determined set of transmission parameters.” *Id.*

In addressing element 1[d], Petitioner contends that Marinier discloses a WTRU may be configured to transmit a PUCCH transmission to a first serving site and a PUSCH transmission to a second serving site in the same subframe. *See* Pet. 51 (citing Ex. 1011 ¶¶ 62, 98, 101–107, 181, 185–186; Ex. 1002 ¶¶ 214–216). Petitioner reiterates that “the UL grant determines the channel resource for transmitting UL control information, and so the subsequent transmission is performed on the determined channel resource of the UL grant.” *Id.*

Petitioner also alternatively relies on the teachings of Marinier combined with Yan for teaching elements 1[a], 1[b], 1[c], and 1[d]. *See* Pet. 49–51. Petitioner specifically relies on the teachings of Yan discussed in Petitioner’s analysis challenging patentability based on Takeda and Yan. *See id.* (citing Pet. 21–32). Petitioner asserts that Yan would be used to modify the teachings of Marinier for the reasons explained in the section titled “Motivation to Combine.” *See id.* (citing Pet. 44–47).

Patent Owner does not address Petitioner's showing for the preamble and the foregoing limitations of claim 1. *See generally* PO Resp.

c. Element 1[e]

Element 1[e] recites “wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment.” Ex. 1001, 21:15–17. Petitioner asserts that Marinier teaches element 1[e] based on Marinier's disclosures of: 1) bandwidth (BW) used by different serving sites (base stations or BSs) may be divided into a plurality of BW parts; 2) each serving site may be configured to utilize one or more BW parts for communication with the WTRU; 3) each BW part may include corresponding physical uplink control channel (PUCCH) and physical uplink shared channel (PUSCH) resources; and 4) WTRU-specific BW parts. *See* Pet. 51–52 (citing Ex. 1011 ¶¶ 130, 147); *see also* Pet. Reply 17 (similar argument, citing Ex. 1011 ¶ 130). In acknowledging that Marinier's and Yan's disclosures focus on 4G, Petitioner contends that “Marinier describes PUCCH resource sets being configured for each UL BWP configured for the WTRU.” *Id.* (citing Ex. 1011 ¶ 2).

Patent Owner contends that the citations to Marinier addressing element 1[e] in the Petition are not explained by Petitioner. *See* PO Resp. 37–38 (citing Pet. 52; Ex. 1011 ¶¶ 130, 147). Patent Owner asserts that Petitioner's citations miss the point of establishing the claimed characteristics of each UL BWP configured for the user equipment in element 1[e]. *See id.* at 38 (citing Ex. 2005 ¶ 95). According to Patent Owner, “while Marinier discloses that BWPs may be specifically configured for each WTRU, Marinier fails to disclose that ‘UL control channel resource

sets are configured for each' such UL BWP configured for a user equipment.” *Id.* (citing Ex. 2005 ¶ 95).

We agree with Patent Owner’s arguments. Aside from directing our attention to Marinier’s disclosure that each BW part may include corresponding PUCCH and PUSCH resources (*see* Pet. 52; Ex. 1011 ¶ 130), Petitioner does not explain how Marinier’s PUCCH resources teaches UL control channel resource **sets**.

Based on the plain language of element 1[e], we interpret “the UL control channel resource sets” as referring to plural UL control channel resource sets. Elements 1[b] and 1[c] of claim 1 confirm this interpretation. Element 1[b] recites “determining **one of** UL control channel resource **sets**,” which implies that there are at least two UL control channel resource sets from which the one set is determined. Element 1[b] also provides antecedent basis for “**the** UL control channel resource **sets**” of element 1[e]. Likewise, element 1[b] also provides antecedent basis for the singular “**the determined** UL control channel resource **set**” of element 1[c]. In summary, reading element 1[e] in the context of elements 1[b] and 1[c] confirms that element 1[e] requires plural UL control channel resource sets. Petitioner does not explain how Marinier’s PUCCH resources teaches plural UL control channel resource sets configured for each BW part configured for a WTRU. *See* Pet. 51–52. Petitioner does not rely on the teachings of Yan or the teachings of Marinier as modified by Yan to address the plural UL control channel resource sets configured for each BW part recited in element 1[e]. *See id.*

Petitioner’s assertions that Marinier teaches antecedent elements 1[b] and 1[c] of claim 1 are no more illuminating. For example, in addressing element 1[b], Petitioner asserts that Marinier discloses selecting a set of

dedicated PUCCH resources from sets of transmission parameters that include dedicated PUCCH resources, and, in addressing element 1[c], Petitioner asserts that Marinier discloses dedicated PUCCH resources that are within a determined set of transmission parameters. *See* Pet. 49–50 (citing Ex. 1011 ¶¶ 62–64, 103, 107, 181, 185, 189, 261–262; Ex. 1002 ¶¶ 211–216). The Petition is silent as to Marinier disclosing, teaching, or suggesting plural dedicated PUCCH resource sets or plural transmission parameter sets configured for each UL BW part. *See* Pet. 49–52.

For the forgoing reasons and based on the entire record developed during trial, Petitioner fails to show by a preponderance of the evidence that Marinier, and Marinier as modified by Yan and R1-1711853, discloses, teaches, or suggests element 1[e] of claim 1.

d. Conclusion

Based on the complete record developed during trial, we determine that Petitioner fails to demonstrate by a preponderance of the evidence that claim 1 would have been unpatentable under 35 U.S.C. § 103 as obvious over the combination of Marinier, Yan, and R1-1711853.

4. Analysis of Claims 2–9

Claims 4 and 7 are independent claims directed to a method of receiving uplink control information by a base station and a user equipment for transmitting uplink control information, respectively. Each of claims 4 and 7 recite recitations similar to those recited in claim 1 including that both claims 4 and 7 recite elements identical to elements 1[e] and 1[f]. *Compare* Ex. 1001, 21:2–14, *with id.* at 21:31–44 *and id.* at 22:13–31. Petitioner relies, for the most part, on its contentions with respect to claim 1 for how the combination of Marinier, Yan, and R1-1711853 teaches the subject

matter of independent claims 4 and 7. *See* Pet. 57–61. Patent Owner relies its arguments directed to independent claim 1, which we address above in connection with our analysis of claim 1. *See* PO Resp. 39–40. For the same reasons as those explained above addressing claim 1, based on the complete record developed during trial Petitioner fails to demonstrate by a preponderance of the evidence that independent claims 4 and 7 would have been unpatentable under 35 U.S.C. § 103 as obvious over the combination of Marinier, Yan, and R1-1711853. Due to the dependency of claims 2, 3, 5, 6, 8, and 9 from independent claims 1, 4, and 7, based on the complete record developed during trial Petitioner fails to demonstrate by a preponderance of the evidence that claims 2, 3, 5, 6, 8, and 9 would have been unpatentable under 35 U.S.C. § 103 as obvious over the combination of Marinier, Yan, and R1-1711853.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner demonstrates by a preponderance of the evidence that claims 1–9 are unpatentable.¹¹ Our conclusions are summarized in the following table.

¹¹ 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).

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–9	103	Takeda, Yan	1–9	
1–9	103	Marinier, Yan, R1-1711853		1–9
Overall Outcome			1–9	

IV. ORDER

For the foregoing reasons, it is:

ORDERED that Petitioner demonstrates by a preponderance of the evidence that claims 1–9 of the '463 Patent are unpatentable; and

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

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Patent 10,638,463 B2

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