

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ericsson Inc., Nokia of America Corp., AT&T Services, Inc., Cellco Partnership
d/b/a Verizon Wireless, Google LLC, and T-Mobile USA, Inc.,
Petitioners

v.

KT Corporation (Patent Owner) and Pegasus Wireless Innovation LLC (Exclusive
Licensee)
Patent Owner

Case: IPR2025-00084

U.S. Patent No. 11,219,000

PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §312 AND 37 C.F.R. §42.104

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LIST OF EXHIBITS

Exhibit	Short Name	Description
Ex. 1001	'000 Patent	U.S. Patent No. 11,219,000
Ex. 1002	Declaration	Declaration of Dr. Sumit Roy
Ex. 1003	CV	<i>Curriculum Vitae</i> of Dr. Sumit Roy
Ex. 1004	'000 File History	File History of U.S. Patent No. 11,219,000
Ex. 1005		Reserved
Ex. 1006	Takeda	International Publication No. WO 2019/030929 A1
Ex. 1007	Certified Translation of Takeda	Certified Translation of International Publication No. WO 2019/030929 A1
Ex. 1008	Yan- PCT	International Publication No. WO 2017/024554 A1
Ex. 1009	Certified Translation of Yan- PCT	Certified Translation of International Publication No. WO 2017/024554 A1
Ex. 1010	Yan- U.S. Patent	U.S. Patent No. 10,736,085 B2
Ex. 1011	Marinier	U.S. Patent Application Publication No. US 2014/0056278 A1
Ex. 1012	R1-1711853	Activation/deactivation of bandwidth part
Ex. 1013		Reserved
Ex. 1014	Hooli	U.S. Patent Application Publication No. US 2018/0324786 A1
Ex. 1015	Yiu	U.S. Patent Application Publication No. US 2019/0044689 A1
Ex. 1016	Ahn	U.S. Patent Application Publication No. US 2019/0268123 A1
Ex. 1017	Bishop Declaration	Declaration of Craig Bishop

Exhibit	Short Name	Description
Ex. 1018	21.905 V12.0.0	3GPP Technical Specification 21.905 V12.0.0 (2013-06)
Ex. 1019	21.905 V14.1.1	3GPP Technical Specification 21.905 V.14.1.1 (2017-06)
Ex. 1020	Yang	U.S. Patent Application Publication No. US 2019/239214 A1
Ex. 1021	Takeda '856	U.S. Patent No. 11,265,856
Ex. 1022	Takeda '073	U.S. Patent No. 11,160,073
Ex. 1023	Zhang	International Publication NO. WO 2018/227538 A1
Ex. 1024	Li	U.S. Patent Application Publication NO. US 2016/0338041 A1
Ex. 1025	Ahn '664	U.S. Patent No. 10,305,664
Ex. 1026	Shaheen	U.S. Patent No. 10,805,941
Ex. 1027	'000 Claim Chart	U.S. Patent No. 11,219,000 Claim Chart
Ex. 1028	Order modifying deadlines	Order modifying case deadlines for D. Ct. Case Nos. 2:23-cv-00640-JRG, 2:23-cv-00638-JRG, and 2:23-cv-00639-JRG
Ex. 1029	First amended docket control order	First Amended Docket Control Order for D. Ct. Case Nos. 2:23-cv-00640-JRG, 2:23-cv-00638-JRG, and 2:23-cv-00639-JRG
Ex. 1030	Consolidation order	Order consolidating D. Ct. Case Nos. 2:23-cv-00640-JRG, 2:23-cv-00638-JRG, and 2:23-cv-00639-JRG for pretrial issues
Ex. 1031	Andrews	Jeffrey G. Andrews, <i>et al.</i> , "What Will 5G Be?" <i>IEEE Journal on Selected Areas in Communications</i> , Vol. 32, No. 6 (June 2014)
Ex. 1032	Oh	U.S. Patent No. 10,980,007
Ex. 1033	Wilson	U.S. Patent No. 10,588,143

Exhibit	Short Name	Description
Ex. 1034	Ratasuk	Repeepat Ratasuk, <i>et al.</i> , “Carrier Aggregation and Dual Connectivity,” Mobile Radio Research Lab, Nokia Bell Labs (2017)
Ex. 1035	Silva	Icaro Da Silva, <i>et al.</i> , “Tight integration of new 5G air interface and LTE to fulfill 5G requirements” <i>IEEE</i> (2015)
Ex. 1036	Marsch	Patrick Marsch, <i>et al.</i> , “5G Radio Access Network Architecture: Design Guidelines and Key Considerations” <i>IEEE Communications Magazine</i> (November 2016)
Ex. 1037	ATIS	ATIS.3GPP.37.863-01-01.V1540
Ex. 1038	Protective order	<i>Pegasus Wireless Innovation LLC v. Verizon Communications Inc. et al</i> , Nos. 2:23-cv-00640, 2:23-cv-00638, 2:23-cv-00639 (E.D. Tex.) Protective Order from Non-Jurisdictional Discovery

Ericsson Inc. (“Ericsson”), Nokia of America Corporation (“Nokia”), AT&T Services, Inc. (“AT&T”), Cellco Partnership d/b/a Verizon Wireless (“Verizon”), Google LLC (“Google”), and T-Mobile USA, Inc. (“T-Mobile”), (collectively “Petitioners”) petition for IPR under 35 U.S.C. §§311–319 and 37 C.F.R. §42 of Claims 1-12 (“the Challenged Claims”) of U.S. Patent No. 11,219,000 (“the ’000 Patent”). Petitioners request cancellation of the Challenged Claims.

I. STANDING UNDER 37 C.F.R. §42.104(a)

Petitioners certify the ’000 Patent is available for IPR, and Petitioners are not barred or estopped from requesting IPR.

II. PAYMENT OF FEES

Petitioners authorize Account No. 16-0605 to be charged.

III. OVERVIEW OF CHALLENGES AND RELIEF REQUESTED

Pursuant to 37 C.F.R. §42.22(a)(1) and 42.104(b)(1)–(2), Petitioners request cancellation of the Challenged Claims pursuant to the grounds below. Additional support is provided in the Declaration of Dr. Sumit Roy (Ex. 1002). Ex. 1002, ¶¶1-42. 59, 103.

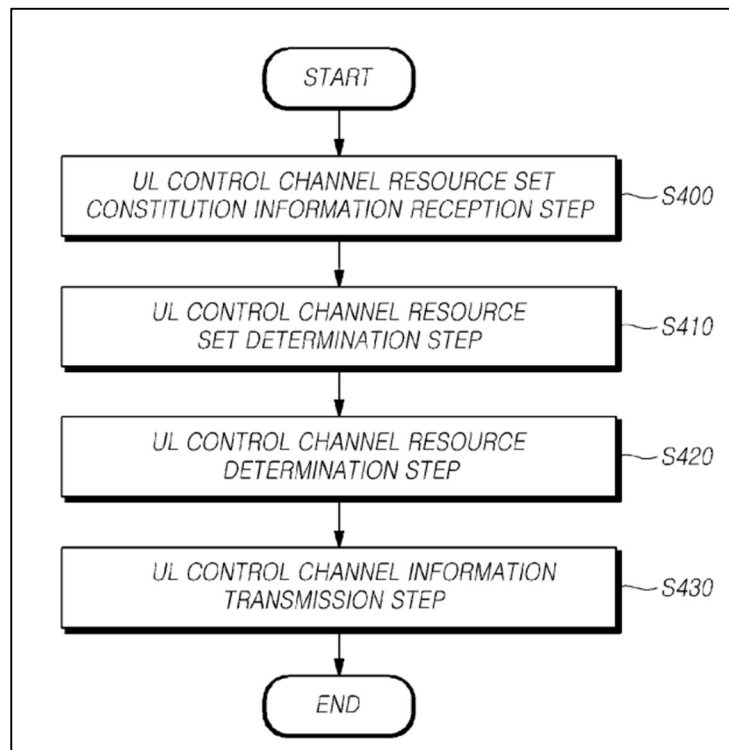
- **Ground 1**: Claims 1, 4-5, 8-9, and 12 are unpatentable under 35 U.S.C. § 103 over U.S. Patent No. 10,736,085 (“Yan”).

- **Ground 2**: Claims 1-12 are unpatentable under 35 U.S.C. § 103 over International Publication No. WO 2019/030929 A1 (“Takeda”) in view of Yan.
- **Ground 3**: Claims 2-3, 6-7, and 10-11 are unpatentable under 35 U.S.C. § 103 over Yan in view of 3GPP Submission No. R1-1711853 (“R1-1711853”).
- **Ground 4**: Claims 1-12 are unpatentable under 35 U.S.C. § 103 over U.S. Patent Publ. No. 2014/0056278 (“Marinier”) in view of Yan and R1-1711853.

IV. BACKGROUND

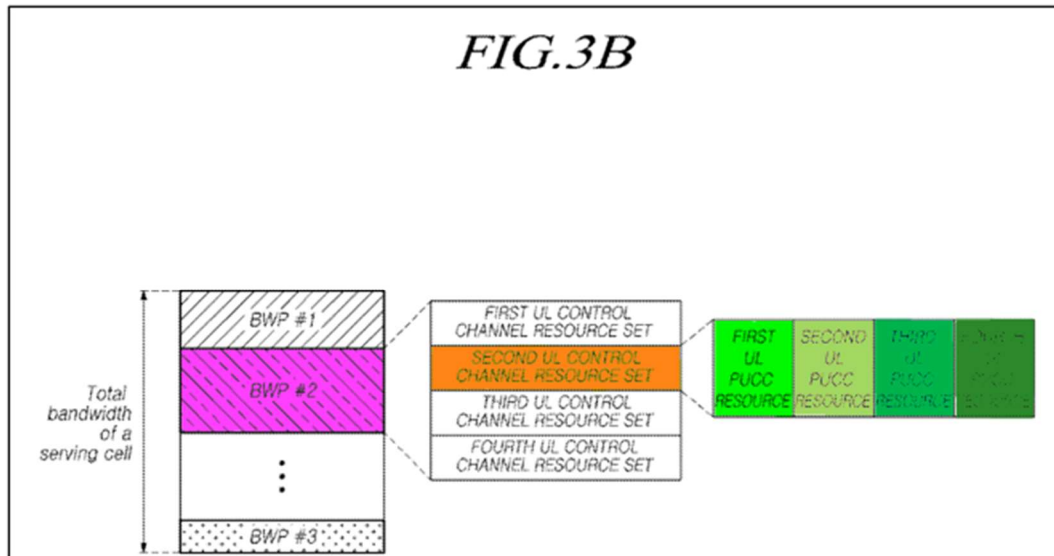
A. Technical Background

The ’000 Patent describes a typical user equipment (UE) that transmits uplink (UL) signals to a typical base station (BS). The ’000 Patent describes the UE’s uplink control information (UCI) transmission on UL control channel resources to the BS. Ex. 1001, 1:22-56. The ’000 Patent focuses on UL control channel resource allocation in 5G NR networks (*id.*), but those resource allocation methods were used in the older 4G LTE network. The UE communicates UCI “through [a] determined uplink control channel resource” (Ex. 1001, Abstract) according to the method illustrated in FIG. 4, reproduced below.

Ex. 1001, FIG. 4

The UE receives configuration information of uplink control channel resource sets from a BS (S400). Ex. 1001, 14:40-42. The BS sends the configuration information to the UE, for example, using higher layer signaling (radio resource control (RRC) signaling). *Id.*, 9:25-31. Annotated FIG. 3B, below, depicts how configuration information groups physical uplink control channel (PUCCH) resources into UL control channel resource sets, which “may be configured according to a PUCCH payload size to be transmitted by the UE.” *Id.*, 10:59-61.

Ex. 1001, FIG. 3B (annotated)



The steps of the UL control channel resource allocation method illustrated in FIG. 4 are 4G LTE techniques that were used in 5G NR before the priority date of the '000 Patent. Ex. 1002, ¶¶43-58, ¶¶64-74.

B. Prosecution History

U.S. Patent Application No. 16/826,482 was filed March 23, 2020. Ex. 1004, 526-530; 1002, ¶¶60-62. During prosecution, the application was allowed after the Applicant amended the independent claims to recite “the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.” Ex. 1004, 52-59, 74-77.

C. Priority Date

In this Petition, Petitioners assume that the earliest priority date for the '000 Patent is September 29, 2017. The '000 Patent has a filing date of March 23, 2020.

Ex. 1001; Ex. 1002, ¶63. The '000 Patent is a divisional of U.S. Patent No. 10,638,463, which has a filing date of September 28, 2018. Ex. 1001. The '000 Patent also claims priority to three Korean applications: 10-2018-0077270 (filed July 3, 2018), 10-2017-0162728 (filed November 30, 2017), and 10-2017-0128188 (filed September 29, 2017). Petitioners assume (without determining) that the foreign priority claims are proper. If Patent Owner disputes the prior art status of any of Petitioners' cited references, Petitioners reserve the right to challenge the priority date.

D. Claim Construction

Solely for purposes of this proceeding, the terms should receive their respective plain and ordinary meaning as understood by a person of ordinary skill in the art under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005), except as noted below.

Petitioners consider “a controller configured to determine one of UL control channel resource sets contained in the UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set” to be a means-plus-function term. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1350 (Fed. Cir. 2015).

To the extent that the Board agrees to use a means-plus-function understanding of the controller, Petitioners identify the following sections from the

specification of Ex. 1001 merely for the purpose of compliance with 37 C.F.R. § 42.104(b)(3). First, the specification recites that a UE includes a controller which “determines one of UL control channel resource sets contained in UL control channel resource set configuration information, and determines one of UL control channel resources configuring the determined one of UL control channel resource set.” Ex. 1001, 19:55-20:3; *see also Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1383-85, 91 USPQ2d 1481, 1491-93 (Fed. Cir. 2009) (holding that simply repeating the claimed functions in the specification is not a sufficient disclosure for an algorithm which, by definition, must contain a sequence of steps). Next, the specification generically states that “controller” (along with at least seven other terms) “are generally intended to refer to a computer-related entity, either hardware, a combination of hardware and software, software, or software in execution.” Ex. 1001, 20:62-66. Finally, the specification simply states “[b]y way of illustration, both an application running on a controller or processor and the controller or processor can be a component.” Ex. 1001, 21:3-5.

Without waiving any right to raise indefiniteness in the District Court due to the fact that the specification does not in fact describe sufficiently-definite structure or an algorithm, review is appropriate because a determination of unpatentability is not impossible whether the disclosed structure is sufficient or not. The prior art references disclose at least the same structure for performing the same functions as

described in the specification and claims. *Samsung Electronics America v. Prisua Engineering*, 948 F.3d 1342, 1355 (Fed. Cir. 2020); *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 812-813 (Fed. Cir. 2021). Here, Takeda discloses a “baseband signal processing unit 204 provided in the user terminal 20 [that] includes a **control unit 401**” Ex. 1007, [0173]. The control unit is described as “control[ing] ... the entire user terminal.” *Id.*, [0174]. Yan discloses a terminal including a “first processing unit” which “determine[s] a channel resource set of N channel resource sets as a first channel resource set, where ... the N channel resource sets are preconfigured by the access network device for the terminal device, ... and determine a channel resource that is in the first channel resource set.” Ex. 1010, 26:52-65; Ex. 1009, 36:5-13. Finally, Marinier discloses a WTRU including a “processor” that may perform “any other functionality that enables the WTRU 102 to operate in a wireless environment.” Ex. 1011, [0032]-[0039].

Even if the Board adopts a plain and ordinary meaning construction for the term “controller,” the grounds below illustrate that the claimed “controller” is disclosed in the prior art.

V. PRIOR ART REFERENCES

A. Takeda (Ex. 1006 and Ex. 1007)

PCT Publication No. WO/2019/030929 to NTT Docomo Inc., titled “User Terminal and Radio Communication Method,” was filed August 10, 2017. Takeda

is prior art under at least AIA 35 U.S.C. § 102(a)(2), based on the PCT application date. *See* 35 U.S.C. §102(d). A certified translation of the PCT application is attached as Ex. 1007.

B. Yan (Ex. 1010)

U.S. Patent No. 10,736,085 to Huawei Technologies, Co., Ltd., titled “Uplink Control Information Sending Method, Uplink Control Information Receiving Method, Apparatus, and System,” was filed as a continuation of PCT application no. PCT/CN2015/086763, which was filed on August 12, 2015. Ex. 1010, 1. Yan qualifies as prior art under at least 35 U.S.C. § 102(a)(2) based on the PCT application date. *See* 35 U.S.C. §102(d); *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper 34 at 29-32 (March 10, 2023) (precedential). Yan is presumptively prior art as it is a continuation of a PCT document which designated the United States and was filed prior to the '000 Patent. The PCT Publication of Yan (PCT Publication No. WO/2017/024554) is in Chinese and is provided as Ex. 1008. *See* Ex. 1008. A certified translation of the Chinese PCT publication has been attached as Ex. 1009. *See* Ex. 1009. Yan and the translated PCT publication describe the same subject matter and appear to be identical. Ex. 1002, ¶86.

This confirms that the subject matter upon which Petitioner relies was described in the priority document, the PCT application, as required. Petitioner provides parallel citations to Yan and the translated PCT publication herein.

C. Marinier (Ex. 1011)

U.S. Patent Application Publication No. 2014/0056278 to InterDigital Patent Holdings Inc., titled “Physical Layer Operation for Multi-Layer Operation in a Wireless System,” was filed on August 23, 2013, and published on February 27, 2014. Ex. 1011, 1. Marinier qualifies as prior art under 35 U.S.C. § 102(a)(1) and (a)(2) based on its publication date and filing date, respectively.

D. R1-1711853 (“R1-1711853”) (Ex. 1012)

3GPP R1-1711853 is a technical contribution submitted to the 3GPP TSG RAN WG1, NR AH 1706 meeting that was held between June 27-30, 2017. Ex. 1017, ¶¶30-33. As explained in detail by Craig Bishop (Ex. 1017), 3GPP technical specifications (TS) and contributions, including R1-1711853 (Ex. 1012), are publicly accessible as of the date they were uploaded to the 3GPP file server. Ex. 1017, ¶52. R1-1711853 was uploaded to the publicly available file server on June 29, 2017. *Id.* As a result, R1-1711853 became a “printed publication” under 35 U.S.C. § 102 on June 29, 2017. *See, e.g., Samsung Elecs. Co., Ltd. v. Huawei Techs. Co., Ltd.*, IPR2017-01487, Paper 45 (Final Written Decision), pg. 13-14 (concluding that technical reports and specifications uploaded to a standards organization’s file server before a challenged patent’s priority date qualify as prior art under 35 U.S.C. § 102) (P.T.A.B. Dec. 10, 2018). R1-1711853 qualifies as prior art under 35 U.S.C. § 102(a)(1) based on its public availability date.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) pertinent to the ’000 Patent would have had a bachelor’s degree in electrical engineering, computer engineering, or a related discipline, knowledge of the relevant 3GPP standards as of this time, and at least 2 years of experience working in a field involving wireless communications. Ex. 1002, ¶¶38-40. 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.* 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 compensates for their lesser experience. *Id.*

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Claims 1, 4-5, 8-9, and 12 are rendered obvious over Yan

Yan discloses or teaches the limitations of Claims 1, 4-5, 8-9, and 12. Ex. 1002, ¶104.

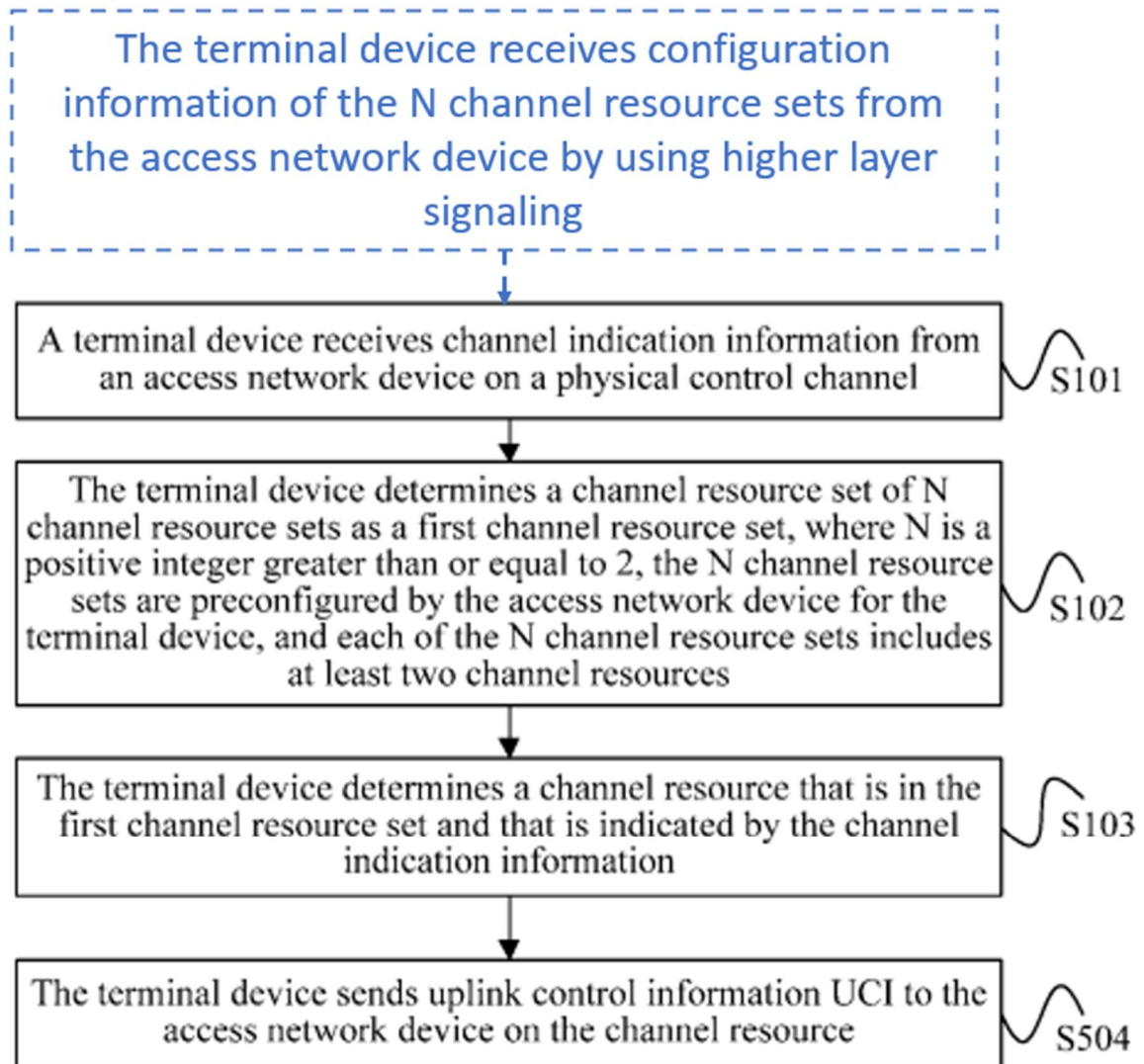
1. Overview of Ground 1

a. Yan

Annotated FIG. 1 of Yan shows a UL control sending method that includes selecting a control channel resource set identified within configuration information and transmitting a UL signal on a determined UL channel within the selected control

channel resource set. Ex. 1010, 10:15-17, 11:7-9; Ex. 1009, 13:21-22; 15:2-3; Ex. 1002, ¶¶86-91.

Ex. 1010, FIG. 1 (annotated)



2. Claim 1

a. 1[pre]: A method of transmitting uplink (UL) control information by a user equipment, the method comprising:

Yan teaches 1[pre], to the extent it is determined to be limiting. Ex. 1002, ¶¶105-106. Yan discloses a method of transmitting UL control information by a UE. Ex. 1002, ¶105. Indeed, Step S104¹ of Yan's FIG. 1 states "[t]he terminal device ***sends uplink control information UCI*** to the access network device ***on the channel resource.***" Ex. 1010, 12:25-33; Ex. 1009, 16:21-26.

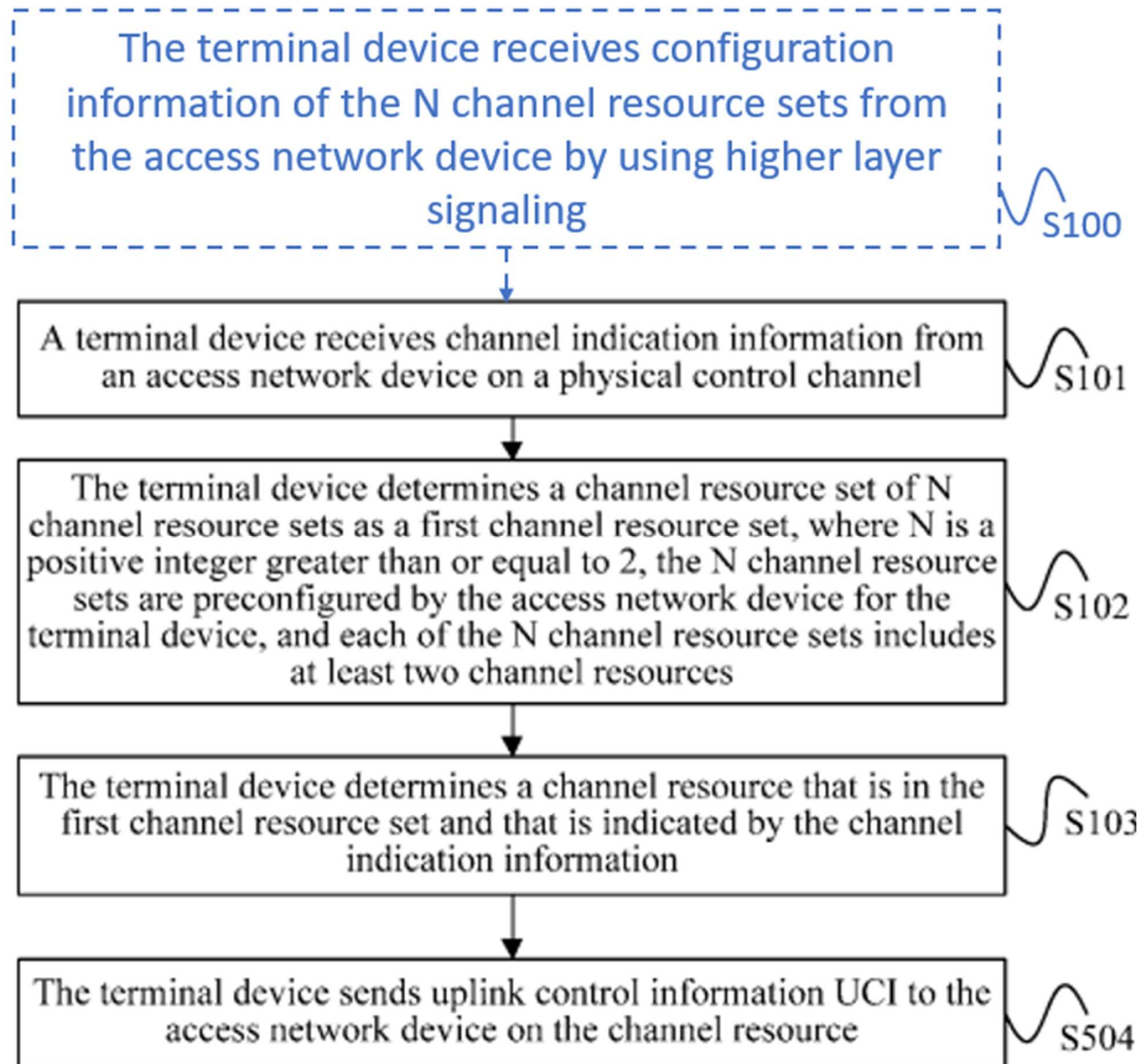
b. 1[a]: receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;

Yan teaches 1[a]. Ex. 1002, ¶¶107-113.

Yan describes a step occurring before the illustrated step S101 of the flowchart in FIG. 1: "[b]efore the receiving, by a terminal device channel indication information from an access network device on a physical control channel," the terminal device receives "***configuration information of the N channel resource sets from the access network device*** by using higher layer signaling." Ex. 1010, 19:5-12; Ex. 1009, 25:20-24. This step is added as S100 in annotated FIG. 1, below.

¹ While the specification of Yan recites S104, FIG. 1 lists the same step as S504.

Ex. 1010, FIG. 1 (annotated)



Yan's configuration information is equivalent to the "UL control channel resource set configuration information" in the '000 Patent, as they are each provided to the UE through higher layer signaling (e.g., RRC signaling) and define PUCCH

formats according to payload sizes of UL control information. Ex. 1001, 7:49-59, 10:15-17; Ex. 1010, 15:11-13, 19:5-12; Ex. 1009, 20:16-17, 25:20-24. .

c. 1[b]: determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information;

Yan teaches 1[b]. Ex. 1002, ¶¶114-119.

Step S102 of Yan's FIG. 1 maps to 1[b]. S102 states: "[t]he ***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, 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." Ex. 1010, 11:48-54, 20:1-42, 22:7-25; Ex. 1009, 15:29-16:8, 26:28-27:23, 29:24-30:5. Yan's "N channel resource sets" are contained in "configuration information" sent from the access network device. *See supra*, §VII.A.2.b; Ex. 1010, 9:49-59; Ex. 1009, 12:27-13:1.

d. 1[c]: determining one of UL control channel resources contained in the determined UL control channel resource set;

Yan teaches 1[c]. Ex. 1002, ¶¶120-122.

Step S103 of Yan's FIG. 1 maps to 1[c], stating "[t]he terminal device ***determines a channel resource*** that is ***in the first channel resource set*** and that is

indicated by the channel indication information.” Ex. 1010, 20:27-42; Ex. 1009, 26:28-27:4.

e. 1[d]: transmitting UL control information through the determined UL control channel resource,

Yan teaches 1[d]. Ex. 1002, ¶¶123-125.

Step S104 of Yan’s FIG. 1 maps to 1[d]. Step S104 states “[t]he terminal device *sends uplink control information UCI* to the access network device *on the channel resource.*” Ex. 1010, 12:25-33, 20:43-50, 22:42-50, 25:65-26:11, 26:47-67; Ex. 1009, 16:21-26, 27:24-28, 30:17-22, 35:2-10, 36:2-14. The channel resource “*is used to send the UCI* to the access network device.” Ex. 1010, 12:28-33; Ex. 1009, 16:23-26.

f. 1[e]: wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information:

Yan teaches 1[e]. Ex. 1002, ¶¶126-128.

At step S102 of Yan’s FIG. 1, Yan explains “*determining the channel resource set of the N channel resource sets as the first channel resource set may be according to a type or size of the UCI fed back by the terminal device* to the access network device.” Ex. 1010, 11:64-12:4; Ex. 1009, 16:7-11. Yan states “the size of the UCI may be specifically measured by using a quantity of bits of the UCI or an amount of UCI.” Ex. 1010, 11:64-12:4; Ex. 1009, 16:7-11. The channel

resource sets each have a capacity range for transmitting UCI of different bit quantities, and the channel resource set is determined so that the size of the UCI falls within a capacity range of the resource set. *See supra*, §VII.A.2.b; Ex. 1010, 14:61-15:32; Ex. 1009, 20:5-29.

g. 1[f]: wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

Yan teaches 1[f]. Ex. 1002, ¶¶129-134.

Yan explains that the terminal device receives “configuration information of the N channel resource sets from the access network device ***by using higher layer signaling.***” Ex. 1010, 19:5-12; Ex. 1009, 25:20-24.

Although Yan does not explicitly state that “higher layer signaling” is RRC, a POSITA would understand that Yan’s reference to “higher layer signaling” refers to RRC signaling or at least would render the use of RRC signaling as obvious. Ex. 1002, ¶¶130-134. A POSITA would recognize that configuration information which allocates UL resources is transmitted using either downlink control information (DCI) (for dynamic scheduling) or RRC (for configured grant scheduling) as a type of higher layer signaling. *See e.g.*, Ex. 1011, [0098], [0107]; Ex. 1018, 25. Since Yan states the configuration information is sent through higher layer signaling, a POSITA would understand this configuration information is ***transmitted via RRC signaling.*** Ex. 1002, ¶133. Furthermore, a POSITA would have known that the RRC

signaling is “UE-specific” because it provides configuration information of channel resource sets which are “preconfigured ... *for the terminal device.*” Ex. 1002, ¶133. Ex. 1010, 11:51-52, 12:34-36; Ex. 1009, 15:27-28, 16:27-28.

Alternatively, a POSITA would have recognized that using RRC signaling as the “higher layer signaling” for the UL control channel resource set configuration information would be obvious based on the disclosure of Yan. Ex. 1002, ¶134. A POSITA would have known that there are a limited number of higher layer signaling options with known data transmission functions, and that RRC was known for transmitting configuration information. Accordingly, a POSITA would have been motivated to use RRC signaling as one of the limited higher layer signaling types available. *Id.* The POSITA would have had a reasonable expectation of success, because RRC signaling has been known for providing configuration information to a UE from a BS to be used by the UE during subsequent UL transmissions. *Id.*

3. Claim 4

a. 4[pre] The method according to claim 1, further comprising:

Yan teaches 4[pre] for at least the reasons discussed for 1[pre]. *See supra*, §VII.A.2.a; Ex. 1002, ¶135.

b. 4[a]: receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,

Yan teaches 4[a]. Ex. 1002, ¶136.

Step S101 of Yan discloses “[a] terminal device receives channel indication information *from an access network device on a physical control channel*,” which Yan explains is a *physical downlink control* channel (PDCCH). Ex. 1010, 11:17-47, 19:37-67; Ex. 1009, 15:5-24, 26:8-9. Because the channel *indication information* is transmitted via a physical *downlink control* channel—the channel indication information constitutes downlink (DL) control information, as the term is used in the claim. Ex. 1010, 11:17-47, 19:37-67; Ex. 1009, 15:5-24, 26:8-9. Yan further explains that “the terminal device determines the channel resource that is in the first channel resource set *and that is indicated by the channel indication information*.” Ex. 1010, 12:5-24; Ex. 1009, 16:9-20.

c. 4[b]: wherein the one of the UL control channel resources is indicated from the base station through the DL control information.

Yan teaches 4[b]. Ex. 1002, ¶137.

As discussed above, Yan’s access network device (BS) provides the channel indication information through the PDCCH (as DCI), and the channel indication

information indicates one of UL control channel resources. Ex. 1010, 11:17-47, 12:5-24; 19:37-67; Ex. 1009, 15:5-24, 16:9-20, 26:8-9.

4. Claim 5

Claim 5 recites the same elements as Claim 1, but from the perspective of the BS. *See* Ex. 1027.

Yan teaches the limitations of claim 5 for at least those reasons discussed for Claim 1. Ex. 1002, ¶¶138-139; *see supra*, §§VII.A.2.a-g.

a. 5[pre]: A method of receiving uplink (UL) control information by a base station, the method comprising:

Yan teaches 5[pre] for at least the reasons discussed with respect to 1[pre]. Ex. 1002, ¶¶140-141; *see supra*, §VII.A.2.a. Yan teaches that UCI transmitted by a UE (as recited in Claim 1) is received by a BS.

b. 5[a]: transmitting, to a user equipment (UE), UL control channel resource set configuration information for UL control information;

5[a] states that UL control channel resource set configuration information is “transmitted”—reflecting that Claim 5 discusses the operation of the BS. Claim 1 recites that this information is “received” (by a UE) after being transmitted from a BS. Yan teaches that this information is transmitted by a BS, and therefore Yan teaches 5[a] for at least the reasons discussed with respect to 1[a]. Ex. 1002, ¶¶142-144; *see supra*, §VII.A.2.b.

c. 5[b]: receiving the UL control information through one of UL control channel resources in one of UL control channel resource sets contained in the transmitted UL control channel resource set configuration information,

In 5[b], a BS receives UL control information transmitted by a UE (e.g., in accordance with 1[d]) and references the UL control channel resources in one of UL control channel resource sets contained in the transmitted UL control channel resource set configuration information as reflected in 5[a], 1[b], and 1[c]. Yan teaches that UL control information transmitted by a UE is received by a BS, and therefore Yan teaches 5[b] for at least the reasons discussed with respect to 1[b]-1[d]. Ex. 1002, ¶¶145-147; *see supra*, §§VII.A.2.c-e, VII.A.4.

d. 5[c]: wherein the one of the UL control channel resource sets for the UL control information transmission is determined based on a size of the UL control information,

5[c] is identical to 1[e]. Yan teaches 5[c] for at least the reasons discussed for 1[e]. Ex. 1002, ¶148; *see supra*, §VII.A.2.f.

e. 5[d]: wherein the UL control channel resource set configuration information is transmitted through UE specific radio resource control (RRC) signaling.

5[d] is identical to 1[f]. Yan teaches 5[d] for at least the reasons discussed for 1[f]. Ex. 1002, ¶149; *see supra*, §VII.A.2.g.

5. Claim 9

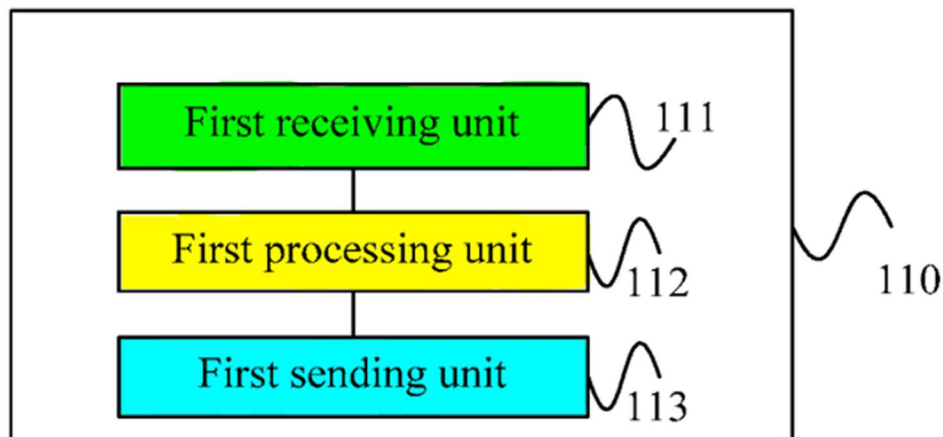
Claim 9 is a device claim that recites the same limitations as Claim 1. *See* Ex. 1027. Yan teaches a terminal device that performs the limitations of Claim 9, for at

least those reasons discussed for Claim 1. Ex. 1002, ¶¶152-153; *see supra*, §§VII.A.2.a-g. Yan’s disclosure of the additional elements of Claim 9 (e.g., “controller,” “receiver,” and “transmitter”) includes at least the same degree of detail in both structure and function as the disclosure of the ’000 Patent.

a. 9[pre]: A user equipment (UE) for transmitting uplink (UL) control information, comprising:

Yan discloses a UE, described as a “terminal device.” Ex. 1002, ¶¶154-155; *see* Ex. 1010, 26:47-67; Ex. 1009, 36:2-14. FIG. 11 of Yan, reproduced below with annotations, illustrates the user terminal.

Ex. 1010, FIG. 11 (annotated)



b. 9[a]: a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission;

Yan teaches that a terminal device includes a “first receiving unit 111” that receives the UL control channel resource set configuration information from a BS

as discussed for 1[a]. Ex. 1002, ¶156; *see supra*, §VII.A.2.b.Ex. 1010, 26:52-55; Ex. 1009, 36:5-8.

- c. 9[b]: a controller configured to determine one of UL control channel resource sets contained in the received UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set;***

Yan discloses that the terminal device includes a “first processing unit,” which is equivalent to a “controller” as recited in Claim 9. Ex. 1002, ¶¶157-158; Ex. 1010, 26:47-28:14; Ex. 1009, 36:2-38:5. Yan’s first processing unit performs the steps recited in 1[b] and 1[c], and therefore Yan teaches 9[b] for at least the reasons discussed with respect to 1[b] and 1[c]. *See supra*, §§VII.A.2.c-d.

- d. 9[c]: a transmitter configured to transmit the UL control information through the determined UL control channel resource,***

Yan discloses that the terminal device includes a “first sending unit,” which is equivalent to a “transmitter” as recited in Claim 9. Ex. 1002, ¶¶159-160; Ex. 1010, 26:47-67; Ex. 1009, 36:2-14. Yan’s first sending unit performs the steps recited in 1[c], and therefore Yan teaches 9[c] for at least the reasons discussed with respect to 1[d]. *See supra*, §VII.A.2.e.

e. 9[d]: wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information,

Yan teaches 9[d] for at least the reasons discussed with respect to 1[e]. Ex. 1002, ¶161; *see supra*, §VII.A.2.f.

f. 9[e]: wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

Yan teaches 9[e] for at least the reasons discussed with respect to 1[f]. Ex. 1002, ¶162; *see supra*, §VII.A.2.g.

6. Claims 8 and 12

Claim 8 recites the same limitations as Claim 4, but from the perspective of the BS, and Claim 12 recites the components that perform the limitations of Claim 4. As discussed for claims 5 and 9, Yan teaches the operation of a BS and the components of a UE. Moreover, Yan teaches the substantive limitations of claims 8 and 12 for at least those reasons discussed for Claim 4. Ex. 1002, ¶¶150-151, ¶¶163-164; *see supra*, §§VII.A.3.a-c.

B. Ground 2: Claims 1-12 are rendered obvious over Takeda in view of Yan

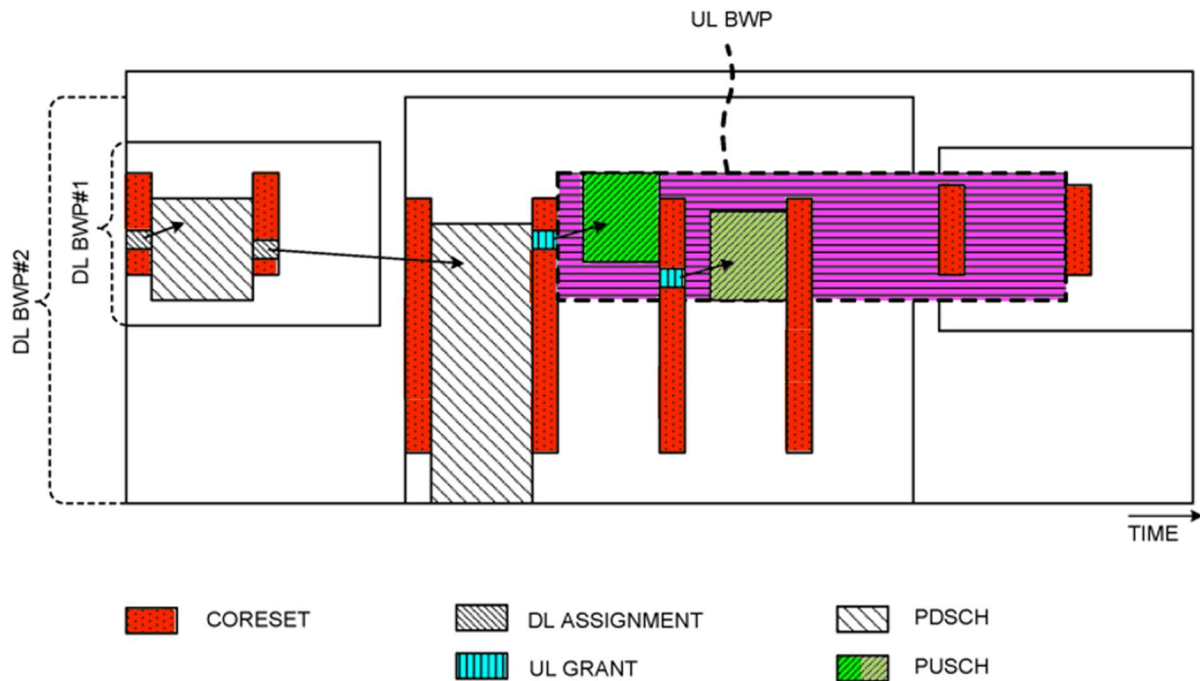
Takeda and Yan teach the limitations of Claims 1-12. Ex. 1002, ¶165.

1. Overview of Ground 2

a. Takeda

Takeda's FIG. 8 illustrates a plurality of Physical Uplink Shared Channels (PUSCHs) within a single bandwidth part (BWP), which can collectively constitute a UL channel set encompassing the PUSCHs (shown with different shades of green) within a single BWP (pink). See *id.*, FIG. 8. Ex. 1002, ¶¶75-85. The user terminal activates the uplink BWP based on the DCI and transmits the PUSCH scheduled in the uplink BWP. *Id.*, [0107], [0120].

Ex. 1007, FIG. 8 (annotated)



b. Motivation to combine

A POSITA would have been motivated to modify Takeda with the teachings of Yan to provide backwards network compatibility and to incorporate Yan’s UE power conservation by strategically allocating UL channel resources into Takeda’s methods for transmitting UL signals within BWPs. Ex. 1002, ¶¶166-173.

5G NR was implemented prior to priority date of the ’000 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. Ex. 1002, ¶167. In fact, Takeda states that its teachings are applicable to both 4G and 5G. Ex. 1007, [0239]; *see also* Ex. 1034, 10 (a “UE may be simultaneously connected to LTE and NR” for non-standalone (NSA) operation); Ex. 1033, 5:23-31 (a wireless communication network may include base stations of different communication technologies including “5G (New Radio or ‘NR’), fourth generation (4G)/LTE, 3G, Wi-Fi, Bluetooth, etc.”); Ex. 1037, 31 (specifying that a “5G NR UE” should support NSA LTE and NR). 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.” Ex. 1031, pg. 3; Ex. 1002, ¶167. Furthermore, “[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.” Ex.

1035, 1. Likewise, 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. *See* Ex. 1035, 1 (proposing “a tight integration of LTE and the new 5G air interface to fulfill the 5G requirements, aiming for simultaneous multi-connectivity in order to enable faster mobility and *common resource management*”), 5; Ex. 1002, ¶167. To 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. Ex. 1002, ¶167. 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. Ex. 1002, ¶167. This integration allows 5G NR-only capabilities (e.g., BWPs) to be implemented when possible, while retaining backwards-compatible methods for 4G LTE. Ex. 1002, ¶167.

From the UE perspective, a POSITA would have been motivated to modify Takeda’s method for transmitting UL signals to incorporate Yan’s resource allocation method to more efficiently use UE power reserves. Using Yan’s resource allocation method would further Takeda’s stated goal of reducing UE power consumption when transmitting UL signals. Ex. 1007, [0013]. Specifically, Yan discusses that some UL transmissions are inefficient—either underutilizing or overutilizing (resulting in discarding UCI bits) UL channel capacity—when

transmitting UCI from a UE. This mismatch of UL channel resource allocation and UCI size is relevant in transmissions in BWPs of 5G (as disclosed in Takeda), where UCI is transmitted in resources within BWPs. At least because Yan and Takeda discuss resource efficiencies for DL and UL transmission, a POSITA would be motivated to utilize Yan's UL resource allocation methods (including allocating UL channels to UEs for specific BWPs within "sets" configured for different sizes or types of UL transmissions and determining an individual resource for UL transmission from DCI provided from the BS on PDCCH) with 5G BWPs as disclosed in Takeda to efficiently utilize UL resources. Applying Yan's resource allocation methodologies to the UL BWPs of Takeda would ensure that UCI bits are not discarded, and would minimize UL resource consumption by UEs during UL transmission. Ex. 1010, 2:1-6; Ex. 1009, 2:7-10. Yan's method of allocating UL channel resources into sets would be implemented with Takeda's configuration of BWPs and activation of BWPs through DCI to take advantage of the power efficiencies provided by Yan.

Moreover, a POSITA would have been equally motivated to modify Yan with Takeda to incorporate Takeda's 5G BWP capabilities into Yan's method for allocating UL resources. Yan's UL resource allocation method provides flexibility for UEs to select a UL resource for transmitting UCI based on the predicted size of the UCI. Providing this functionality within BWPs, as disclosed in Takeda, would

allow determination of how UEs transmit UL signals to BSs in 5G. Moreover, Takeda discusses that transmitting in BWPs, instead of the entire channel, provides power use efficiencies (Ex. 1007, [0013]), and therefore a POSITA would have been motivated to use the UL resource allocation methods of Yan with 5G BWP configurations (as discussed in Takeda) to further Yan's goal of power-efficient UL signaling.

A POSITA would have had a reasonable expectation of success in combining Takeda and Yan because both references discuss UCI transmission and configuring channel resources within the time and frequency domains for UL transmission. Ex. 1002, ¶170; *see e.g.*, Ex. 1007, [0001]-[0010], [0102]-[0114], FIG. 8-9; Ex. 1010, 1:16-19, 11:7-16, 12:34-41, 21:43-57; Ex. 1009, 1:5-7, 14:30-15:4, 16:27-31, 29:5-14. Indeed, as evidenced by the secondary considerations outlined below in Section E, others had combined the technologies of Takeda and Yan for the reasons outlined herein, confirming that a POSITA would have had a motivation to combine and a reasonable expectation of success in doing so.

Yan discusses channel resource configuration for 4G LTE and Takeda discusses channel resource allocation within BWPs of 5G NR and activation of BWPs for UL transmission based on DCI. *See e.g.*, Ex. 1010, 1:23-38; Ex. 1009, 1:10-13; Ex. 1007, [0001]-[0010]. A POSITA would recognize that 5G NR BWPs still require resource allocation of PUCCH/PUSCH resources, and that 4G LTE

resource allocation processes (as discussed in Yan) would have been a viable method for resource allocation for 5G NR BWPs. Ex. 1002, ¶171.

Both Yan and Takeda discuss UL transmission in the frequency domain, and allocation of individual UL channel resources. Yan describes that the resources allocated for UL transmission are within individual carriers within the frequency domain. Ex. 1010, 11:20-35, 17:23-46, Ex. 1009, 15:7-16, 23:14-28. Takeda explains that 5G NR allocates a carrier “having a bandwidth [] wider than that of than existing LTE systems” (Ex. 1007, [0013] (parentheticals omitted)) and so Takeda discusses “semi-statically configuring [] one or more frequency bands within the carrier in user terminals” for resource allocation and that “[e]ach frequency band in the carrier is also referred to as a bandwidth part (BWP: Bandwidth Part).” *Id.* While the BWPs of Takeda add another degree of freedom for allocating UL resources as compared to Yan, both systems send the UCI in the frequency domain using the allocated resources.

Moreover, Takeda and Yan both disclose that a UE transmits UCI on a channel resource (e.g., PUCCH or PUSCH) that is determined from information transmitted to the UE from the BS. *See e.g.*, Ex. 1007, [0107] (“The user terminal activates a UL BWP, based on a UL grant detected in the CORESET. The user terminal transmits a PUSCH scheduled in a UL BWP, based on the UL grant.”), [0140], [0220] (UCI is transmitted on either PUSCH or PUCCH and the discussions

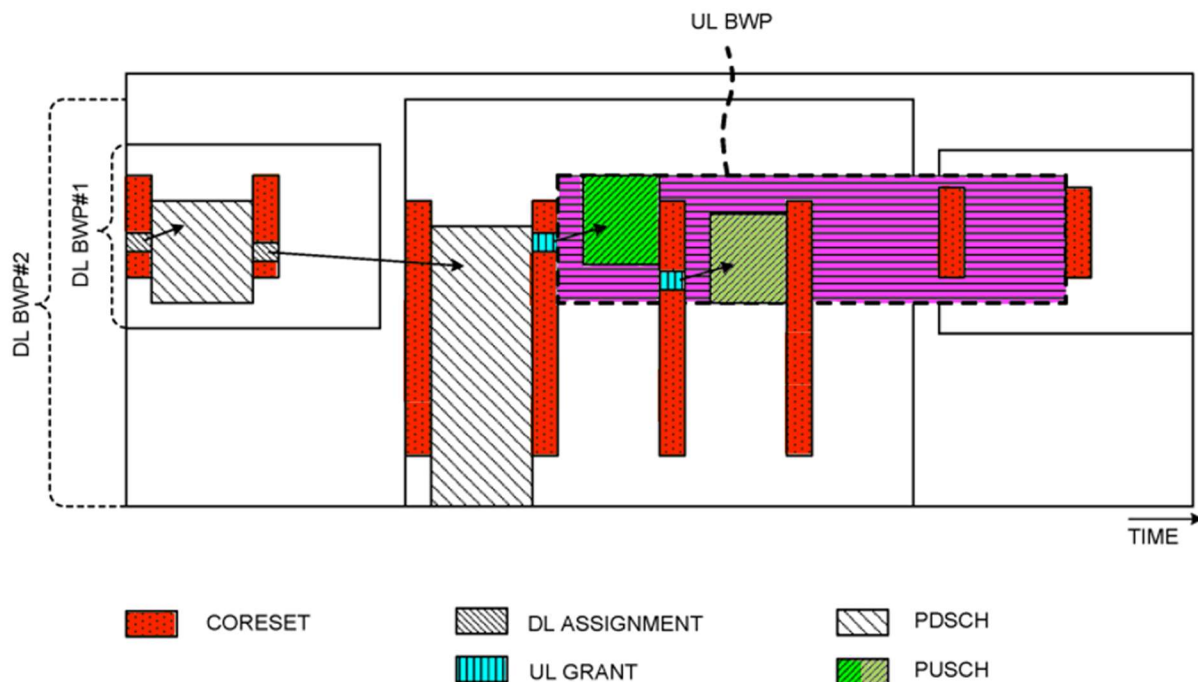
of PUSCH and/or PUCCH are interchangeable); Ex. 1010, 12:34-55; Ex. 1009, 16:27-17:9.

2. Claim 1

a. 1[pre]: A method of transmitting uplink (UL) control information by a user equipment, the method comprising:

Takeda teaches 1[pre]. Ex. 1002, ¶¶174-175. Takeda describes a user terminal that “controls transmission of n UL data channel.” *Id.*, [0004], [0140] (“***Uplink control information (UCI)...*** is ***transmitted on the PUSCH or the PUCCH***”). Takeda’s FIG. 8 illustrates transmission of a PUSCH scheduled in a UL BWP, as shown with annotations, below.

Ex. 1007, FIG. 8 (annotated)



Yan also teaches 1[pre], as discussed in Ground 1 above. *See supra*, §VII.A.2.a. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra*, §VII.B.1.b.

b. 1[a]: receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;

Takeda teaches 1[a]. Ex. 1002, ¶¶176-180. Takeda discloses that BWPs are configured through BWP configuration information received through RRC signals transmitted from a BS. Ex. 1007, [0099]-[0100], [0106]. Takeda states that the UE controls UL data channel transmission based on resource allocation information included in a UL grant that is included in DCI received from a BS. *See id.*, [0107]. Takeda also states that a UL BWP is activated based on the UL grant scheduling a UL transmission on a PUCCH or PUSCH. *Id.* A POSITA would understand that a UL BWP can be activated using a UL grant of a PUCCH or PUSCH transmission if the resource channels are configured for the BWP to be activated, and a POSITA would understand that this configuration would be provided through configuration information for the PUCCH or PUSCH resource. Ex. 1002, ¶176. Without resource configuration information linking a channel resource with a UL BWP, the UE would not identify the UL BWP for activation based on the UL grant. Ex. 1002, ¶176. For example, Takeda describes that an “index (BWP index) of the UL BWP in which a PUSCH is scheduled may be included in UL grant” (Ex. 1007, [0112]), suggesting

that this index encompasses the configuration information necessary to identify a BWP based on the PUSCH or PUCCH scheduled in a UL grant. Ex. 1002, ¶176. A POSITA would further recognize that a PUSCH or PUCCH transmission requires further configuration information, including time/frequency scheduling information that defines the time and frequency resources within the BWP encompassed by the PUSCH or PUCCH transmission. Ex. 1002, ¶176.

While Takeda does not state that the configuration information is provided to the UE, a POSITA would recognize that PUCCH or PUSCH resources would be provided to the UE in allocation information in UL grants of DCI, or with the BWP configuration information provided through RRC. Ex. 1002, ¶177. When provided as a part of the allocation information, the resource configuration information would include the BWP index mapping a scheduled PUSCH or PUCCH to a BWP, and would define the time duration and frequency band of the PUCCH or PUSCH. Ex. 1002, ¶177. When provided with the BWP configuration information via RRC, the BWP index and the time duration and frequency band for each PUSCH and PUCCH resource would be defined so that it can be used in response to a UL grant. Ex. 1002, ¶177.

Alternatively, a POSITA would have found it obvious to modify Takeda such that resources are configured through configuration information provided by the BS to the UE. Ex. 1002, ¶178. Takeda's FIG. 8 illustrates that PUSCH transmissions

have defined time durations and frequency bandwidths, and a POSITA would have been motivated to define these characteristics within configuration information provided to the UE from a BS, so that the BS controls the configuration of UL signals and can monitor UL signals within expected frequency bands and time durations. Ex. 1002, ¶178. A POSITA would have had a reasonable expectation of success in providing configuration information for resources to a UE based on the disclosure of Takeda, because Takeda's configuration information may be provided via RRC (BWP configuration information), and/or because Takeda's UL signals (e.g., PUSCH or PUCCH signals) are configured for transmission within defined frequency bands and time durations within a BWP. Ex. 1002, ¶178. *See e.g.*, Ex. 1011, [0098], [0107].

Moreover, a POSITA would be motivated to group the illustrated UL resources of Takeda's FIG 8 into sets and to provide configuration information as UL control channel resource set configuration information as a convenient manner for configuring the multiple resources (e.g., the PUSCH resources of Takeda's FIG. 8) and for indicating that multiple resources are available for UL transmission within a BWP. Ex. 1002, ¶179. Furthermore, grouping multiple resources into sets would enable a flexible UL channel structure for different UL characteristics. A POSITA would have had a reasonable expectation of success in grouping Takeda's UL resources into sets according to UL control channel resource set configuration

information because Takeda discloses a BWP index that associates UL channel resources with individual BWPs. The functionality of this index could be provided by UL control channel resource set configuration information that defines BWPs associated with each UL resource.

Yan also teaches 1[a] for at least the reasons discussed in Ground 1. *See supra*, §VII.A.2.b. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra*, §VII.B.1.b.

c. 1[b]: determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information;

Takeda teaches 1[b]. Ex. 1002, ¶¶181-184. As discussed for 1[a], a POSITA would have understood that a UE would receive “UL control channel resource set configuration information,” or a POSITA would have found it obvious for the UE to receive UL control channel resource set configuration information. *See supra*, §§VII.B.2.b. And a POSITA would have understood that Takeda’s UE would have determined one of those UL control channel resource sets when transmitting the ***multiple uplink signals transmitted within the UL BWP*** of Takeda’s FIG. 8 (as shown in shades of green within the UL BWP). For example, the determined UL control channel resource set may encompass the UL signals within the UL BWP illustrated in Takeda’s FIG. 8. The UL control channel resource set would be determined from the UL grant to enable the user terminal to activate the UL BWP

associated with the UL channel resource set and to transmit the multiple uplink signals of the UL channel resource set.

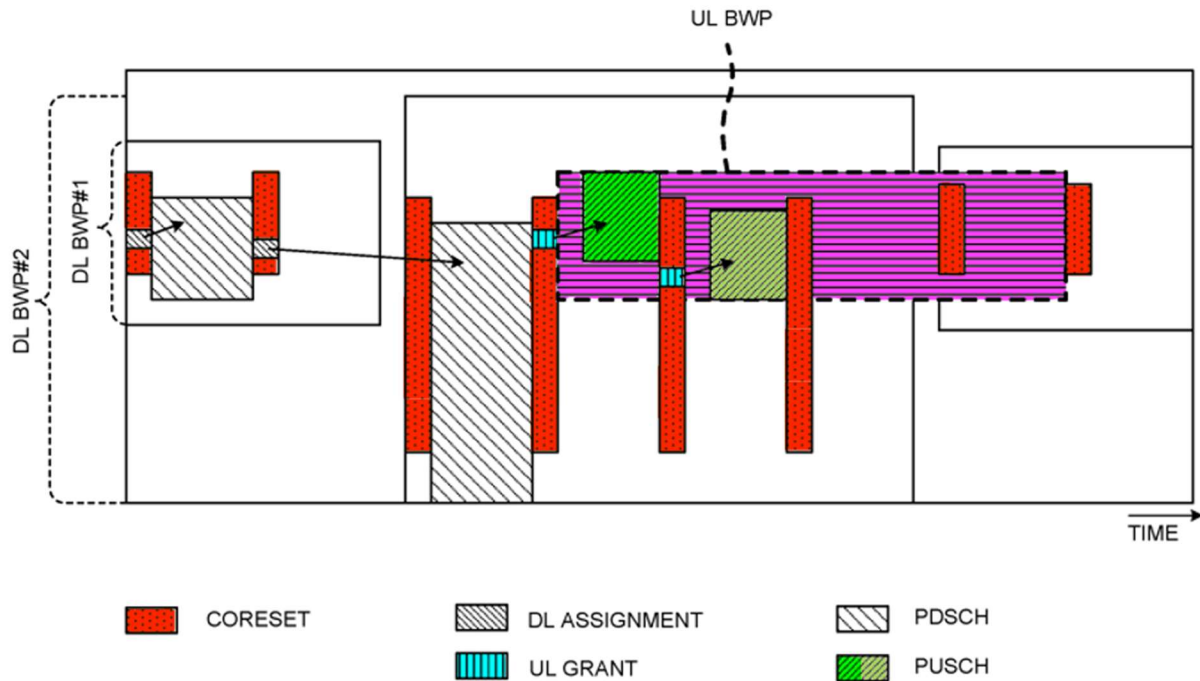
Moreover, Takeda describes that the PUSCH signals in FIGS. 8-9 are non-limiting examples, and the same principles apply to PUCCH resources for transmitting UCI. Ex. 1007, [0140] (“***Uplink control information (UCI)*** including at least one of acknowledgment information (A/N, HARQ-ACK), channel state information (CSI), and the like of the PDSCH is ***transmitted by the PUSCH or the PUCCH***”), [0220].

Yan also teaches 1[b] for at least the reasons discussed in Ground 1. *See supra*, §VII.A.1.c. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra* §VII.B.1.b.

d. 1[c]: determining one of UL control channel resources contained in the determined UL control channel resource set;

Takeda teaches 1[c]. Ex. 1002, ¶¶185-187. As shown in FIG. 8, ***the UE determines a UL control channel resource based on a UL grant***, as demonstrated by the arrow connecting the UL grant with a PUSCH. *Id.*, [0107]. To the extent that a POSITA would recognize that the UE would determine a control channel resource set (*supra*, §VII.B.2.c), the UL resource scheduled in the DCI would be within the determined control channel resource set.

Ex. 1007, FIG. 8 (annotated)



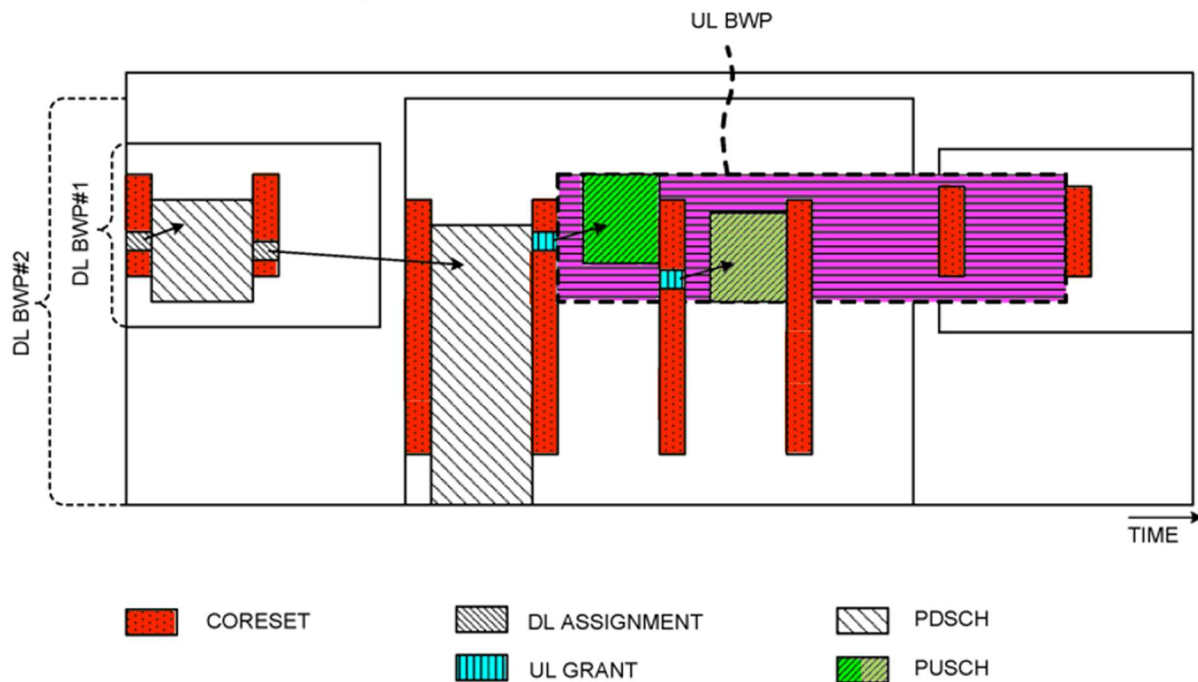
A PUSCH and PUCCH may be configured in the same way according to Takeda, and/or a PUSCH may be used to convey UCI. *See supra*, §VII.B.2.c. Therefore, Takeda confirms that a PUSCH is a UL control channel resource. *See e.g., id.*, [0140].

Yan also teaches 1[c] for at least the reasons discussed in Ground 1. *See supra*, §VII.A.2.d. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra*, §VII.B.1.b.

e. 1[d]: transmitting UL control information through the determined UL control channel resource,

Takeda teaches 1[d]. Ex. 1002, ¶¶188-189. Takeda's FIG. 8 demonstrates UL information transmission via a PUSCH. Takeda states that a PUCCH can be configured in the same way as a PUSCH. *See e.g.*, Ex. 1007, [0140].

Ex. 1007, FIG. 8 (annotated)



Yan also teaches 1[d] for at least the reasons discussed in Ground 1. *See supra*, §VII.A.2.e. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra*, §VII.B.1.b.

f. 1[e]: wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information,

Yan teaches 1[e] for at least the reasons discussed in Ground 1. Ex. 1002, ¶190; *see supra*, §VII.A.2.f.

g. 1[f]: wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

Yan teaches 1[f] for at least the reasons discussed in Ground 1. Ex. 1002, ¶¶191-193; *see supra*, §VII.A.2.g.

Additionally, Takeda discusses that RRC signaling is the higher level signaling used for providing configuration information to a UE (e.g., BWP configuration information, DL CORESET configuration information, including frequency resources, time resources, duration, Resource Element Group bundle size, transmission type, and/or a period of each CORESET). Ex. 1007, [0024]; Ex. 1002, ¶192.

Considering Takeda's explanation of RRC signaling for configuring BWPs and resources, and Yan's disclosure that higher layer signaling provides UL control channel resource set configuration information, a POSITA would recognize that providing Yan's UL control channel resource set configuration information to the UE would be performed using RRC. Ex. 1002, ¶193; Ex. 1010, 19:5-12; Ex. 1009, 25:20-24; Ex. 1007, 24.

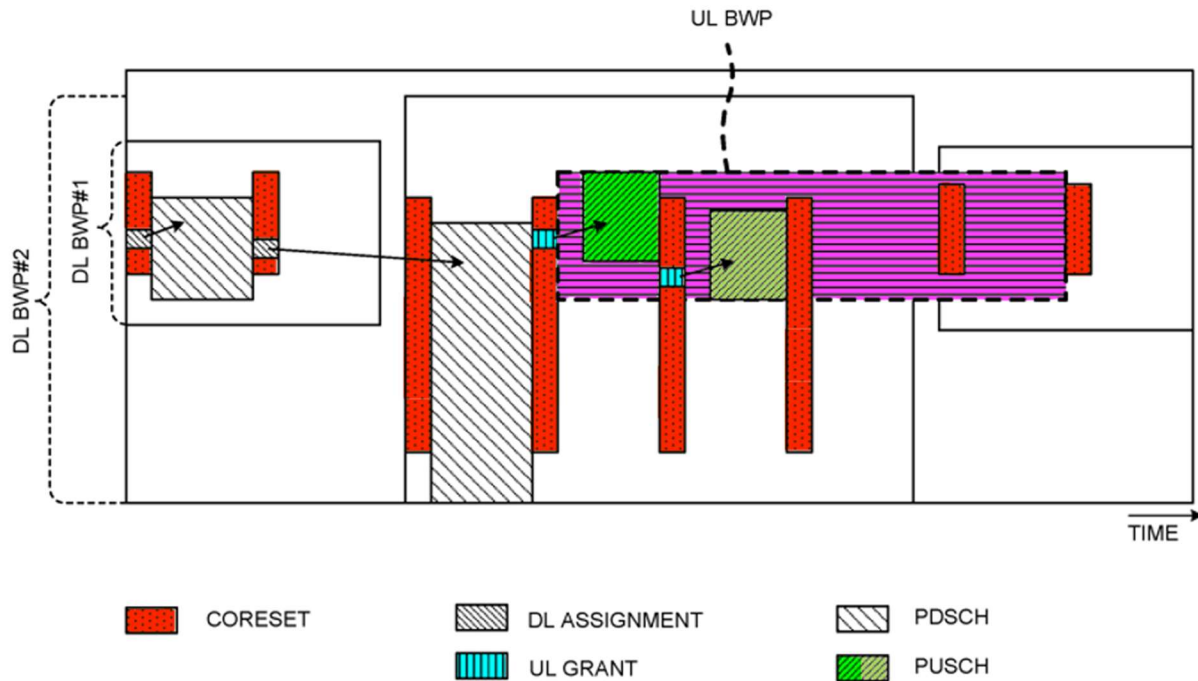
3. Claim 2

Claim 2 recites: the method according to Claim 1, “wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.”

Takeda teaches the limitations of Claim 2 in that it teaches multiple UL control channels (which a POSITA would collectively group into a set as discussed for 1[a]) configured for each BWP. *See supra*, §VII.B.2.b; Ex. 1002, ¶¶194-200; Ex. 1007, [0080] (“For example, the user terminal may transmit the ACK by using *a UL control channel (for example, PUCCH) or a UL data channel (for example, PUSCH) of the UL BWP*”); [0107] [0112], [0117], [0123].

FIGS. 8-9 of Takeda show that multiple UL resources are configured for a single UL BWP. As shown, *multiple uplink resources are used to transmit UL signals (PUSCHs) within a single UL BWP*. Therefore, Takeda discloses that sets (encompassing multiple UL resources) are configured for a BWP.

Ex. 1007, FIG. 8 (annotated)



Moreover, Takeda describes that the resources used to transmit the UL signals illustrated in FIGS. 8-9 are UL control channel resources. Ex. 1007, [0115] (“The UL signal is, for example, at least one of a UL data channel (for example, PUSCH), *a UL control channel (for example, PUCCH),...*”), [0140] (“*Uplink control information (UCI) ... is transmitted by the PUSCH or the PUCCH*”), [0220].

Takeda describes that *BWPs are configured for the user terminal*. Ex. 1007, [0095]-[0098] (describing “maximum bandwidth” and “minimum bandwidth” for “one or more BWPs *configured for the user terminal*”), [0103] (UL BWP), [0112] (plural UL BWPs).

As discussed above for 1[b], Yan teaches UL control channel resource sets configured within a carrier. *See supra*, §VII.A.2.c. When incorporating Takeda's BWP with Yan's teachings for allocating UL resources, the resulting UL resources and UL control channel resource sets would have been configured for BWPs that are configured for the UE. Takeda discloses that UL resources are configured for BWPs, and Yan's resource allocation method would be used for selecting among the UL resources that are configured for each BWP to conserve power by selecting size-appropriate UL resources for transmitting UCI. Ex. 1002, ¶200; *see supra*, §VII.B.1.b. Thus, Takeda in view of Yan teaches Claim 2.

4. Claim 3

Claim 3 recites: the method according to Claim 2, "wherein the each UL BWP is activated through downlink (DL) control information."

Takeda teaches Claim 3. Ex. 1002, ¶¶201-203. Takeda states "[t]he user terminal may control activation and/or deactivation of one or more UL BWPs configured for the user terminal based on the explicit or implicit indication information. The indication information may be, for example, a DCI [downlink control information] (UL grant)." Ex. 1007, [0120], [0139].

5. Claim 4

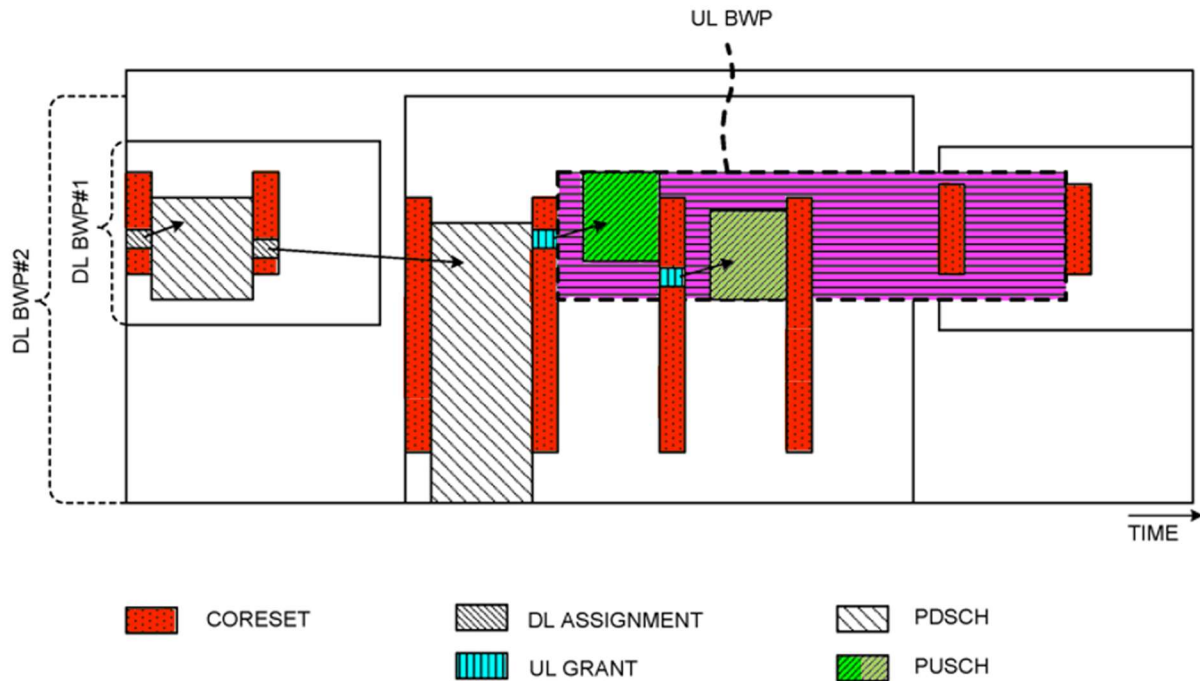
a. 4[pre] The method according to claim 1, further comprising:

Takeda and Yan teach 4[pre] for at least the reasons discussed for 1[pre]. See *supra*, §VII.B.2.a; Ex. 1002, ¶205.

b. 4[a]: receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,

Takeda teaches 4[a]. Ex. 1002, ¶¶206-207. Takeda states that a BS provides a UL grant as a part of DCI to the user terminal which identifies the PUCCH channel for transmission of UCI. Takeda states that a user terminal transmits a UL transmission based on an assigned control channel from a UL grant. Ex. 1007, [0107]. FIG. 8 (below) illustrates this: arrows connect ***UL grants in the CORESET to UL transmissions in the UL BWP***. *Id.* FIG. 8.

Ex. 1007, FIG. 8 (annotated)



Yan also teaches 4[a] as discussed in Ground 1 above. *See supra*, §VII.A.3.a. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra*, §VII.B.1.b.

c. 4[b]: wherein the one of the UL control channel resources is indicated from the base station through the DL control information.

Takeda teaches 4[b]. Ex. 1002, ¶¶208-209. Takeda teaches a UL grant *provided by the BS to the user terminal identifies the UL channel resource* to be used for UL signal transmission. Ex. 1007, [FIG. 10], [0080], [0091]-[0092], [0107], [0113]-[0120], [0139]-[0140], [0177], [0220], FIG. 8-9. The UL grant is provided within PDCCH as a part of DCI. *Id.*

Yan also teaches 4[b] as discussed in Ground 1 above. *See supra*, §VII.A.3.c. Yan would be used to modify Takeda for the reasons explained in the motivation to combine section. *See supra*, §VII.B.1.b.

6. Claim 5

Takeda and Yan teach Claim 5 for at least the reasons discussed for Claim 1 and as discussed for Claim 5 in Ground 1. Ex. 1002, ¶¶210-222; *see supra*, §§VII.A.4.a-e, VII.B.2.a-g.

7. Claim 9

Takeda and Yan teach the limitations of Claim 9, for at least those reasons discussed for Claim 1 and as discussed in Claim 9 for Ground 1. Ex. 1002, ¶¶173-203, ¶¶229-243; *see supra*, §§VII.A.5.a-f, VII.B.2.a-g.

8. Claims 6-8 and 10-12

Takeda and Yan teach Claims 6-8 and 10-12 for at least the reasons discussed for Claims 2-4 and Ground 1. Ex. 1002, ¶¶223-228, ¶¶244-249; *see supra*, §§VII.A.6, VII.B.3-5.

C. Ground 3: Claims 2-3, 6-7, and 10-11 are rendered obvious over Yan in view of R1-1711853

Yan alone teaches the limitations of Claims 1, 4-5, 8-9, and 12 as discussed in Ground 1 above. Ex. 1002, ¶250; *see supra*, §§VII.A.1-6. Yan and R1-1711853 teaches the limitations of Claims 2-3, 6-7, and 10-11.

1. Overview of Ground 3

a. R1-1711853

R1-1711853 discloses that activation and deactivation of DL/UL bandwidth parts may be “by means of DCI (explicitly and/or implicitly).” Ex. 1012; Ex. 1002, ¶¶101-102.

b. Motivation to Combine

As is described in Ground 1, a POSITA would have understood that Yan renders the independent claims obvious. *See supra*, §§VII.A.2.a-g.

A POSITA would have been motivated to use BWPs (or bandwidth parts, as discussed in R1-1711853) with Yan’s resource allocation methodology, to provide efficient use of power resources of the UE. Ex. 1002, ¶¶251-253. Specifically, a POSITA would have recognized that using BWPs improves UE power efficiency during UL transmission, because the UE only transmits over a subset of a carrier frequency band. Ex. 1002, ¶251. Using 5G NR BWPs as discussed in R1-1711853 would have provided further power conservation for UEs operating with Yan’s resource allocation methodology, which discusses power conservation by selecting UL resources that are optimal for the size/type of UCI to be transmitted by the UE. Ex. 1002, ¶251; Ex. 1010, 2:1-6; Ex. 1009, 2:7-10.

A POSITA would have a reasonable expectation of success in adapting Yan’s UL resource allocation methods for BWPs, because Yan’s resource allocation

method is usable to allocate resources in the frequency domain, and would be similarly usable with frequency bands defining BWPs. Ex. 1002, ¶252.

Moreover, R1-1711853 discloses that BWPs are activated “by means of DCI,” which may include a grant of a UL resource configured for the BWP to be activated. Ex. 1012, 2. A POSITA would recognize that the “grant” in R1-1711853 is equivalent to the channel indication information discussed in Yan, and therefore Yan’s channel indication information is already capable of activating an individual BWP in the manner discussed in R1-1711853. Ex. 1002, ¶253. Thus, the POSITA would have had a reasonable expectation of success in applying the BWPs and BWP activation method of R1-1711853 to Yan. Ex. 1002, ¶253.

2. Claim 2

As outlined in Ground 1, Yan discloses and/or renders obvious Claim 1. *See supra*, §§VII.A.2.a-g. R1-1711853 would be used to modify Yan for the reasons explained in the motivation to combine section. *See supra*, §VII.C.1.b; Ex. 1002, ¶¶254-257.

R1-1711853 discloses that UL BWPs are activated explicitly or implicitly by DCI, including by grants. Ex. 1012, 2. A POSITA reviewing R1-1711853 would understand that the grants provide instruction for a UE to determine a channel resource for transmitting UL signals. If a BWP were to be activated based on a grant, as discussed in R1-1711853, a POSITA would recognize that the resource would be

configured for the BWP that is configured for the UE, to enable the UE to determine the BWP to activate based on the grant. Without this configuration between the resource and the BWP, the grant itself would be insufficient for the UE to determine what BWP to activate.

As discussed above, Yan explains that resources are a part of resource sets. *See supra*, §§VII.A.2.a-g. Accordingly, the resource sets would be configured for the BWP for consistency with the disclosure of R1-1711853.

3. Claim 3

Yan does not discuss BWPs, but R1-1711853 teaches the limitations of Claim 3 and may be used to modify Yan for the reasons explained in the motivation to combine section. *See supra*, §§VII.C.1.b; Ex. 1002, ¶¶258-259. R1-1711853 states that activation of DL or UL bandwidth parts is performed “by means of DCI (explicitly or implicitly).” Ex. 1012, 1-2.

4. Claims 6-7 and 10-11

Yan and R1-1711853 teach Claims 6-7 and 10-11 for at least the reasons discussed for Claims 2-3. Ex. 1002, ¶¶260-267; *see supra*, §§VII.C.2-3.

D. Ground 4: Claims 1-12 are rendered obvious over Marinier in view of Yan and further in view of R1-1711853

Marinier, Yan, and R1-1711853 teach the limitations of Claims 1-12. Ex. 1002, ¶268.

1. Overview of Ground 4

a. Marinier

Marinier discloses wireless transmit/receive units (WTRUs) which determine a set of parameters which are configured by a serving site (e.g., base station) and are indicated via downlink control signaling (e.g., a PDCCH transmission with the uplink grant) or RRC signaling. Ex. 1011, [0062]-[0064], [0070], [0098], [0101], [0103], [0107], [0108], [0171], [0181]-[0194], [0257], [0261]-[0262]; Ex. 1002, ¶¶92-100. Bandwidth parts may be used for uplink transmissions such as UCI (*Id.*, [0078]) including WTRU-specific bandwidth parts. *Id.*, [0130], [0147].

b. Motivation to Combine

A POSITA would have been motivated to combine the teachings of Marinier, Yan, and R1-1711853. Ex. 1002, ¶¶269-272. A POSITA would have been motivated to modify Marinier's UL signal transmission methods to incorporate Yan's UL channel resource allocation methods to determine the most efficient UL channel resource based on a size of the UCI. Ex. 1002, ¶269. Yan explains that UL channel resource capacity may be underutilized, or UCI bits may be discarded if the UL channel capacity does not meet the size of UCI. Ex. 1010, 2:1-6, Ex. 1009, 2:7-10. This mismatch of UL channel resource size and UCI size is applicable for Marinier's BWP-based UL signaling configuration. Therefore, a POSITA would have incorporated Yan's method of determining a UL channel resource set based on UCI

size to efficiently utilize Marinier's UL channel resources and to conserve UE power during UL signaling. Ex. 1002, ¶269. Using Yan's resource allocation methodology within UL BWPs of Marinier would ensure that UL resources are used efficiently by UEs. Ex. 1010, 2:1-6; Ex. 1009, 2:7-10.

A POSITA would have had a reasonable expectation of successfully combining the teachings of Marinier and Yan. Ex. 1002, ¶270. Marinier and Yan both discuss UCI transmission and resource allocation. *See e.g.*, Ex. 1011, [0064] (“[T]he WTRU may be configured to transmit uplink control information (UCI) in a given subframe based on a Physical Downlink Shared Channel (PDSCH) transmission received from a first serving site.”); Ex. 1010, 1:16-19, 11:7-16, 12:34-41, 21:42-67; 21:43-57; Ex. 1009, 1:5-7, 14:30-15:4, 16:27-31, 29:5-14. Moreover, Marinier discusses that PUCCH parameters usable in specific BWPs are received from the BS, including “preconfigured set[s] of parameters” that define dedicated PUCCH resources control UL transmissions. Ex. 1011, [0101], [0130], [0181]. Yan discloses analogous features for determining a channel resource for UL signaling from resource sets included in configuration information from a BS. *See e.g.*, Ex. 1010, 12:34-55; Ex. 1009, 16:27-17:9. Therefore, a POSITA would have recognized that Marinier's methods for selecting a “preconfigured set of parameters” for UL transmission would be adaptable to utilize Yan's configuration information received from the BS, so that the UE can determine a UL resource.

Moreover, Marinier discusses BWPs, but not in the context of 5G NR (which did not exist at the time of Marinier's publication). A POSITA would have been motivated to modify the UL signaling method as taught by Marinier and Yan to incorporate the BWP activation protocol proposed in R1-1711853 to achieve improved power efficiency when transmitting UL signals from a UE using 5G NR. Ex. 1002, ¶271. Marinier explains that its resource allocation methods provide power efficiency. Incorporating 5G NR's BWPs and methods of activating those BWPs would further Marinier's goal of conserving UE power because 5G NR BWPs allow UEs to transmit on a portion of the carrier frequency band, instead of the entire carrier frequency band. Ex. 1002, ¶271.

A POSITA would have a reasonable expectation of success of combining Marinier's and Yan's teachings with R1-1711853's 5G NR BWPs and activation methods. Ex. 1002, ¶272. Marinier discusses that UL signals can be transmitted on BWPs based on UL grants received as a part of DCI, which would be relevant for selecting UL resources in accordance with the combined teachings of Marinier and Yan. R1-1711853 explains that BWPs can be activated using DCI, and so a POSITA would understand that R1-1711853's discussion would be usable with DCI activation of BWPs as discussed in Marinier. Ex. 1002, ¶272. Thus, a POSITA would have had a reasonable expectation of success in combining the teachings of Marinier, Yan, and R1-1711853. Ex. 1002, ¶272.

2. Claim 1

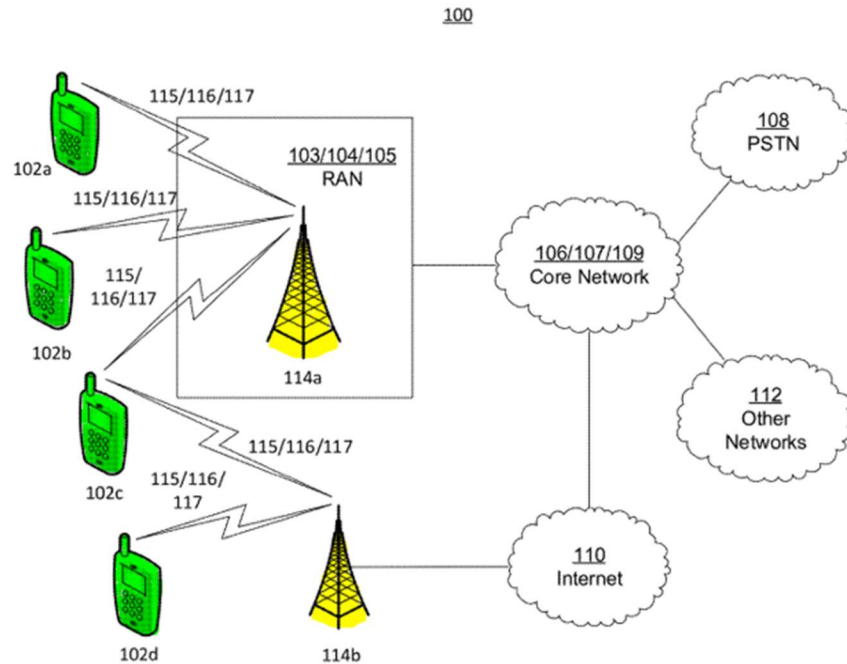
a. 1[pre]: A method of transmitting uplink (UL) control information by a user equipment, the method comprising:

Marinier teaches 1[pre], to the extent it is determined to be limiting. Ex. 1002, ¶¶273-274.

Marinier discusses the “operation of a *wireless transmit/receive unit (WTRU)* in a network in which the scheduling functionality for the downlink and/or *the uplink transmissions* is distributed in more than one physical location and/or node may present some challenges.” Ex. 1011, [0003]. Marinier states a WTRU “*may include user equipment (UE)*” and may “transmit *uplink control information (UCI)*.” *Id.*, [0064], [0105].

Moreover, Yan additionally teaches 1[pre] for at least the reasons discussed in Ground 1 and would be used to modify Marinier for the reasons explained in the motivation to combine section. *See supra*, §§VII.A.2.a, VII.D.1.b.

Ex. 1011, FIG. 1A (annotated)



b. 1[a]: receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;

Marinier teaches 1[a]. Ex. 1002, ¶¶275-278.

Marinier explains that the WTRU transmits UL signals to a serving site (alternatively referred to as a BS) using *transmission parameters that are provided by a serving site (e.g., via RRC signaling)*. See e.g., Ex. 1011, [0181] (“*the WTRU may receive one or more sets of parameters ... as ... an RRC configuration of parameters*”).

When received from a BS, Marinier’s RRC configuration of parameters, including the transmission parameters are equivalent to the “UL control channel

resource set configuration information” in the ’000 Patent. For example, the ’000 Patent states that PUCCH resource sets can be configured through higher layer signaling and the configuration information defines characteristics of a UL transmission and UL resources. Ex. 1001, 12:46-53. Marinier similarly describes transmission parameters as defining characteristics of a UL transmission, including “dedicated PUCCH resources.” *Id.*, [0103], [0084]. Moreover, Marinier’s transmission parameters include “dedicated PUCCH resources” match the ’000 Patent’s “UL control channel resources” are contained in a UL control channel resource set that is “contained in the received UL control channel resource set configuration information.” Ex. 1001, Claim 1.

In the event that Marinier is found not to teach 1[a], Yan does, as discussed in Ground 1 above, and would be used to modify Marinier for the reasons explained in the motivation to combine section. *See supra*, §§VII.A.2.b, VII.D.1.b.

c. 1[b]: determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information;

Marinier teaches 1[b]. Ex. 1002, ¶¶279-280.

Marinier explains that “the WTRU may be configured to operate using multiple sets of transmission parameters and *may select one or more appropriate set(s) of transmission parameters* to use in a given subframe based on various criteria.” Ex. 1011, [0181]. *Those sets of parameters may include “dedicated*

PUCCH resources,” so that selecting a set of parameters includes selecting a set of dedicated PUCCH resources. Id., [0103]. Marinier’s sets of transmission parameters are a part of the RRC configuration of parameters received from the BS. *Id., [0181].*

In the event that Marinier is found not to teach 1[b], Yan does, for at least the reasons discussed in Ground 1 above, and would be used to modify Marinier for the reasons explained in the motivation to combine section. Ex. 1002, ¶280; *see supra*, §§VII.A.2.c, VII.D.1.b.

d. 1[c]: determining one of UL control channel resources contained in the determined UL control channel resource set;

Marinier teaches 1[c]. Ex. 1002, ¶¶281-283.

Marinier states that “[t]he grants may direct the WTRU to transmit over on [sic] an uplink (UL) channel (e.g., Physical Uplink Control Channel (PUCCH) ...) ...” Ex. 1011, [0062]. The WTRU therefore determines one of UL control channel resources according to the UL grant. 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., [0062]-[0064], [0107], [0185], [0189], [0261]-[0262].* ***Determining 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.

In the event that Marinier is found not to teach 1[c], Yan does, as discussed in Ground 1 above, and would be used to modify Marinier for the reasons explained in the motivation to combine section. *See supra*, §§VII.A.2.d, VII.D.1.b.

e. 1[d]: transmitting UL control information through the determined UL control channel resource,

Marinier teaches 1[d]. Ex. 1002, ¶¶284-286.

Marinier provides examples of transmitting UL control information through the determined UL control channel resource. Ex. 1011, [0062], [0098], [0101]-[0107], [0181], [0185]-[0186]. As a specific example, Marinier states “*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.*” *Id.*, [0105]. 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.

Moreover, Yan additionally teaches 1[d] for at least the reasons discussed in Ground 1 above, and would be used to modify Marinier for the reasons explained in the motivation to combine section. *See supra*, §§VII.A.2.e, VII.D.1.b.

f. 1[e]: wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information:

Marinier teaches 1[e]. Ex. 1002, ¶¶287-288.

Marinier states that the WTRU selects transmission parameters (including dedicated PUCCH resources) “based on DCI contents received for one or more of the serving sites.” Ex. 1011, [0103], [0185]. *The “DCI may indicate multiple values for one or more transmission parameters” such as “a number of coded symbols for control information [or] a transport block size.” Id.* By selecting transmission parameters (including dedicated PUCCH resources) on the basis of DCI contents that may indicate a number of coded symbols for control information, Marinier’s WTRU determines a set of dedicated PUCCH resources based on the size (number of coded symbols) of the control information.

In the event that Marinier is found not to teach 1[e], Yan does for at least the reasons discussed in Ground 1 and would be used to modify Marinier for the reasons explained in the motivation to combine section. *See supra*, §§VII.A.2.f, VII.D.1.b.

g. 1[f]: wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

Marinier teaches 1[f]. Ex. 1002, ¶¶289-290.

The sets of transmission parameters discussed for 1[a] (which each includes dedicated PUCCH resources) may be transmitted via WTRU-specific (UE specific)

RRC signaling. Ex. 1011, [0186] (“the WTRU may be preconfigured and/or **receive RRC signaling that configures one or more parameters** that the WTRU should apply for transmission to a second serving site”).

In the event that Marnier is found not to teach 1[f], Yan does for at least the reasons discussed in Ground 1 and would be used to modify Marinier for the reasons explained in the motivation to combine section. *See supra*, §§VII.A.2.g, VII.D.1.b.

3. Claim 2

Marinier and Yan teach Claim 2. Ex. 1002, ¶¶291-296.

Marinier discusses the use of BWPs for communicating between a WTRU and a serving site. Ex. 1011, [0130] (“**Each serving site may be configured to utilize one or more of the BW parts for communicating with the WTRU . . .** For example, **each BW part may include corresponding PUCCH and PUSCH resources.**”).

The BWPs may be specifically configured for each WTRU. Ex. 1011, [0147] (discussing “**WTRU-specific BW parts**”).

Although Marinier describes PUCCH resource sets being configured for each UL BWP configured for the WTRU, Marinier’s disclosure focuses on 4G uses. *See id.*, [0002].

Nevertheless, to the extent Marinier’s teachings of BWPs are insufficient to render obvious Claim 1 of the ’000 Patent, R1-1711853 discusses activation of BWPs by means of RRC signaling or DCI signaling, including based on grants

included in DCI signaling. Ex. 1012, 2. Activation by DCI may be done “explicitly and/or implicitly.” *Id.* R1-1711853 would be used to modify Marinier and Yan for the reasons explained in the motivation to combine section. *See supra*, §VII.D.1.b.

4. *Claim 3*

Marinier, Yan, and R1-1711853 teaches Claim 3. Ex. 1002, ¶¶297-301.

Marinier discusses UL grants within DCI that “direct the WTRU to transmit over on [sic] an uplink (UL) channel (e.g., Physical Uplink Control Channel (PUCCH), Physical Uplink Shared Channel (PUSCH)).” *Id.*, [0062], [0103]. The WTRU uses the UL grant in the DCI to select the PUCCH resource from “dedicated PUCCH resources” within sets of parameters provided to the WTRU. *Id.*, [0103], [0185].

Upon receipt of a UL grant within DCI, the WTRU transmits a PUCCH transmission to a serving site. *Id.*, [0105]. As Marinier discloses that BW parts (containing PUCCH resources) are used for communication between serving sites and WTRUs (*Id.*, [0130], [0147]), a POSITA would further recognize that a bandwidth part “containing” the PUCCH used for UL transmission would need to be activated to perform the UL transmission. *Id.* Consequently, where a UL grant included within DCI is used to select a PUCCH in an inactive BW part for UCI transmission, a POSITA would understand that Marinier’s disclosure teaches that

the UE activates the BW part through the DL control information containing the UL grant, so that the UE can transmit on the PUCCH in the BW part.

In the event that Marinier is found not to teach Claim 3, R1-1711853 does. Ex. 1012; Ex. 1002, ¶301. R1-1711853 states that activation of DL or UL bandwidth parts is performed “by means of DCI (explicitly and/or implicitly).” *Id.* Therefore, Marinier, Yan, and R1-1711853, considered collectively, teaches 1[f]. Ex. 1002, ¶301. R1-1711853 would be used to modify Marinier and Yan for the reasons explained in the motivation to combine section, *supra*, §VII.D.1.b.

5. Claim 4

a. 4[pre] The method according to claim 1, further comprising:

Marinier, Yan, and R1-1711853 teach 4[pre] for at least the reasons discussed for 1[pre]. *See supra*, §VII.D.2.a; Ex. 1002, ¶¶302-303.

b. 4[a]: receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,

Marinier teaches 4[a]. Ex. 1002, ¶¶304-306.

Marinier states that the WTRU may receive grants from a scheduling site, and “[t]he grants may direct the WTRU to transmit over on an uplink (UL) channel (e.g., Physical Uplink Control Channel (PUCCH), Physical Uplink Shared Channel (PUSCH)).” Ex. 1011, [0062]. Marinier explains that the UL grants or other

information may be a part of downlink control information (DCI) transmitted on a PDCCH used for indicating appropriate resources to use in UL transmissions to the serving site. *Id.*, [0081], [0147]-[0148]. Marinier further explains that “sets of transmission parameters that may be used by the WTRU may be obtained by the WTRU in a number of ways” including “via downlink control signaling such as a PDCCH transmission” or RRC signaling. *Id.*, [0181].

In the event that Marinier is found not to teach 4[a], Yan does for at least the reasons discussed in Ground 1 above. *See supra*, §VII.A.2.b.

c. 4[b]: wherein the one of the UL control channel resources is indicated from the base station through the DL control information.

Marinier teaches 4[b]. Ex. 1002, ¶¶307-308.

As discussed for 4[a], Marinier discloses that the UL grants indicate a PUCCH resource to be used for UL transmissions, and those UL grants may be a part of DCI. Ex. 1011, [0105], [0127]; *see supra*, §VII.D.2.b.

In the event that Marinier is found not to teach 4[b], Yan does for at least the reasons discussed in Ground 1. *See supra*, §VII.A.2.c.

6. Claim 5

Independent Claim 5 recites the same elements as Claim 1, but they are recited from the perspective of the BS in Claim 5, instead of from the perspective of the UE, as recited in Claim 1. Ex. 1002, ¶¶309-310.

a. 5[pre]: A method of receiving uplink (UL) control information by a base station, the method comprising:

UCI transmitted by a UE (as recited in Claim 1) is received by a BS (as recited in Claim 5). Ex. 1002, ¶¶311-312.

Marinier teaches 5[pre] for at least the reasons discussed in 1[pre]. *See supra*, §VII.D.2.a. Moreover, Marinier explains that BSs “may be configured to transmit and/or *receive wireless signals* within a particular geographic region.” Ex. 1011, [0022], [0072], [0101].

b. 5[a]: transmitting, to a user equipment (UE), UL control channel resource set configuration information for UL control information;

Marinier and Yan teach 5[a] for at least the reasons discussed with respect to 1[a]. Ex. 1002, ¶313; *see supra*, §VII.D.2.b. As discussed therein, the grants received by the WTRU are *from scheduling sites*. Ex. 1011, [0062].

c. 5[b]: receiving the UL control information through one of UL control channel resources in one of UL control channel resource sets contained in the transmitted UL control channel resource set configuration information,

5[b] is equivalent to 1[d] and references the UL control channel resources determined by the UE as reflected in 1[b] and 1[c]. Ex. 1002, ¶¶314-315.

Marinier and Yan teach 5[b] for at least the reasons discussed with respect to 1[b]-1[d]. *See supra*, §§VII.D.2.c-e. As discussed therein, the WTRU transmits UL

control information *to serving sites* based on UL grants provided by the serving sites.

Ex. 1011, [0064].

d. 5[c]: wherein the one of the UL control channel resource sets for the UL control information transmission is determined based on a size of the UL control information,

5[c] is identical to 1[e]. Marinier and Yan teaches 5[c] for at least the reasons discussed with respect to 1[e]. Ex. 1002, ¶316; *see supra*, §VII.D.2.f.

e. 5[d]: wherein the UL control channel resource set configuration information is transmitted through UE specific radio resource control (RRC) signaling.

5[d] is identical to 1[f]. Marinier and Yan teaches 5[d] for at least the reasons discussed with respect to 1[f]. Ex. 1002, ¶317; *see supra*, §VII.D.2.g.

7. Claim 9

Independent Claim 9 recites the same elements as Claim 1, phrased as components of a UE for transmitting uplink (UL) control information. Ex. 1002, ¶¶324-325; *see also* Ex. 1027. Marinier's disclosure of the additional elements of Claim 9 (e.g., "controller," "receiver," and "transmitter") includes at least the same degree of detail in both structure and function as the disclosure of the '000 Patent. Ex. 1011, [0020], [0031]-[0030].

a. 9[pre]: A user equipment (UE) for transmitting uplink (UL) control information, comprising:

Marinier teaches 9[pre] for at least the reasons discussed with respect to 1[pre]. Ex. 1002, ¶326; *see supra*, §VII.D.2.a. Marinier also describes WTRUs "may

be configured to transmit and/or receive wireless signals and may include user equipment (UE).” Ex. 1011, [0020].

b. 9[a]: a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission;

Marinier and Yan teach 9[a] for at least the reasons discussed with respect to 1[a]. Ex. 1002, ¶¶327-328; *see supra*, §VII.D.2.b.

Moreover, Marinier describes that the WTRU may include “a transceiver 120, [and] a transmit/receive element 122.” Ex. 1011, [0031]-[0035]. The transmit/receive element 122 is described as being “configured to transmit signals to, or receive signals from, a base station.” *Id.*, [0033]. The transmit/receive element 122 may be a single element or multiple elements (e.g., a receiver and a transmitter). *Id.*, [0034]. These elements perform the transmission and reception steps discussed in Claim 1.

c. 9[b]: a controller configured to determine one of UL control channel resource sets contained in the received UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set;

Marinier and Yan teach 9[b] for at least the reasons discussed with respect to 1[b] and 1[c] and 9[b] of Ground 1. Ex. 1002, ¶329; *see supra*, §§VII.D.2.c-d, VII.A.5.c. Mariner’s discussion also states that the WTRU includes a “processor” that may perform “any other functionality that enables the WTRU 102 to operate

in a wireless environment.” Ex. 1011, [0031]-[0039]. This functionality includes the steps discussed in Claim 1.

d. 9[c]: a transmitter configured to transmit the UL control information through the determined UL control channel resource,

Marinier and Yan teach 9[c] for at least the reasons discussed with respect to 1[d]. Ex. 1002, ¶330; *see supra*, §VII.D.2.e. As discussed above, Marinier describes a “transmit/receive element 122” that may be embodied as a single component or multiple components (e.g., a transmitter and a receiver). Ex. 1011, [0033]-[0034].

e. 9[d]: wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information,

Marinier and Yan teach 9[d] for at least the reasons discussed with respect to 1[e]. Ex. 1002, ¶331; *see supra*, §VII.D.2.f.

f. 9[e]: wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

Marinier and Yan teach 9[e] for at least the reasons discussed with respect to 1[f]. Ex. 1002, ¶332; *see supra*, §VII.D.2.g.

8. Claims 6-8 and 10-12

Marinier, Yan, and R1-1711853 teach Claims 6-8 and 10-12 for at least the reasons discussed for Claims 2-4. Claims 6-8 are recited from the perspective of the BS, and Marinier, Yan, and R1-1711853 teach Claims 6-8 for at least those reasons

discussed for Claims 2-5. Ex. 1002, ¶¶318-323; *see supra*, §§VII.D.3-6. Claims 10-12 are recited from the perspective of UE components, and Marinier, Yan, and R1-1711853 teach Claims 10-12 for at least those reasons discussed for Claims 2-4 and 9. Ex. 1002, ¶¶333-338; *see supra*, §§VII.D.3-5, VII.D.7.a-f.

E. Secondary Considerations

U.S. Patent Number 10,980,007 to Oh (“Oh”) claims priority to a provisional filed on the same priority date as is alleged for the ’000 Patent (September 29, 2017). Oh discloses many of the same elements claimed by the ’000 Patent. For example, regarding 1[pre], Oh teaches “a method for transmitting uplink control information in a wireless communication system.” Ex. 1032, Abstract. Regarding 1[a], Oh teaches a terminal (UE) which receives “configuration information on a plurality of bandwidth parts (BWPs)” including “a configuration on one or more uplink control channel resource for each of the plurality of BWPs.” Ex. 1032, Claim 1, 2:58-3:4, 15:48-59 (“PUCCH configuration information”). Regarding 1[b]-1[d], Oh teaches that the terminal then “identif[ies] an uplink control channel resource for transmitting acknowledgment information” (which a POSITA would understand is a type of UL control information) and “transmit[s] the acknowledgment information on the identified uplink control channel resource.” Ex. 1032, 2:58-3:4; Ex. 1002, ¶339. Regarding Claim 2, Oh teaches that “PUCCH transmission resources may be configured for ... BWPs.” Ex. 1032, 15:48-59. As discussed for 1[a] of Ground 2, a

POSITA would further understand it to be obvious to group multiple PUCCH transmission resources into a “set.” *See supra*, §VII.B.2.b. Regarding Claim 3, Oh teaches that a “***BWP may be activated*** or deactivated via ... ***DCI conveyed in a DL control channel*** ...” Ex. 1032, 15:44-47.

The above teachings of Oh provide additional corroboration for each of the combinations, evidencing that there was not only a rationale to combine but others did in fact combine the concepts disclosed in these references. Ex. 1002, ¶340. It further evidences the reasonable expectation of success and provides a secondary consideration that the claims of the '000 Patent are obvious in light of the above Grounds. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). The Federal Circuit has stated that, “[t]he fact of near-simultaneous invention, though not determinative of statutory obviousness, is strong evidence of what constitutes the level of ordinary skill in the art.” *Ecolchem, Inc. v. Southern California Edison Co.*, 227 F.3d 1361, 1379 (Fed. Cir. 2000) (quoting *The Int’l Glass Co. v. United States*, 408 F.2d 395, 405 (Ct. Cl. 1969)). Oh and the patent at issue were independently developed and claim priority to documents filed on the same day. This demonstrates the level of skill in the art, and supports that a POSITA would have been motivated by the advancements from 4G to 5G occurring at the time, corroborating Petitioner the obviousness of at least applying resource allocation methods known in 4G to 5G BWPs.

VIII. DISCRETIONARY ISSUES

A. The Petition Does Not Present the Same References Addressed in Prosecution

Institution should not be denied under §325(d). Under *Advanced Bionics*, the Board uses a two-part framework in determining whether to exercise its discretion under §325(d), specifically:

- (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and
- (2) if either condition of [the] first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential). The Board has held that the first prong of *Advanced Bionics* is not met where “neither [the combination references] nor similar prior art was before the examiner and ... the prosecution history does not include any overlapping arguments directed to this prior art.” *Godbersen-Smith Constr. Co. v. Guntert & Zimmerman Const. Div., Inc.*, IPR2021-00050, Paper 24 at 19-21 (PTAB May 7, 2021).

Under the first prong, none of the references in Grounds 1-4 were cited or raised during prosecution, and the prosecution history does not include any overlapping arguments to this Petition. And there are no overlapping arguments

because the only argument made during prosecution was that Hooli, Yiu, and Ahn fail to disclose the added final wherein clause of the independent claims. Ex. 1004, 73-84. But, as previously demonstrated, Yan and Marinier address the exact limitation the Examiner argued was missing in the prior art— “wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.” Ex. 1004, 44-53; *see also Amphenol Corporation v. PPC Broadband, Inc.*, IPR2023-01363, Paper 9 at 30-31 (PTAB Mar. 20, 2024).

Accordingly, the combination of references used in this Petition cannot be cumulative of the art and/or arguments raised during prosecution as there are material differences between the grounds herein and what was previously presented. *Tianma Microelectronics Co., v. Japan Display Inc.*, IPR2021-01058, Paper 16 at 31 (PTAB Jan. 5, 2022). Because the first prong is not met, the Board need not move to the second prong. *See id.* at 21; *Oticon Med. AB v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 20 (PTAB Oct. 16, 2019).

For at least these reasons, the Board should not deny institution under §325(d).

B. The Board Should Not Deny Institution Under *Fintiv*

The claims of the '000 Patent have never been tested in view of the most relevant prior art. In view of these strong and compelling challenges and the three separate district court proceedings, institution should not be discretionarily denied

under §314(a). *See NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 19-20 (PTAB Sept. 12, 2018) (precedential); *Apple v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 13-14 (PTAB Mar. 20, 2020) (precedential).

Factor 1—a potential stay of the district court litigation— weighs against discretionary denial. In the district court litigation, counterclaim defendant and patent owner KT Corporation (“KT”) has disputed jurisdiction. The parties are engaged in jurisdictional discovery, and KT is seeking a protective order from (or stay of) non-jurisdictional discovery. Ex. 1038. If granted, KT’s requested relief could extend the district court trial date, which “allays concerns about inefficiency and duplication of efforts” in the PTAB. *Fintiv* at 8.

Factor 2—the district court trial date and the Board’s statutory deadline— should be considered at least neutral because jury selection is far in the future and is not set to begin until at least September 8, 2025. Even if jury selection were to proceed on September 8, 2025, jury selection would proceed with respect to only one of the three cases (e.g., the Verizon case, the AT&T case, or the T-Mobile case). Each of the defendant Petitioners are entitled to separate trials, which will necessarily proceed on separate dates. As such, there are explicit and inherent uncertainties for this case given the number of parties involved and the number of trials regarding this patent. In addition, and because much can change in ten months, the current trial date does not support denial. *See Dish Network v. Broadband iTV*,

IPR2020-01280, Paper 17 at 16 (PTAB Feb. 4, 2021) (“We cannot ignore the fact that the currently scheduled trial date is more than nine months away and much can change during this time”).²

Moreover, given the existence of three cases each with multiple parties, to include multiple intervenors, the likelihood that any trials will be scheduled serially, the potential length of the trials given the number of patents at issue (11) and claims at issue, and post-trial motions, it is likely that the district court proceedings will not be complete before the final written decision in this matter. Indeed, these cases additionally will likely be delayed (as explained earlier) because counterclaim defendant and patent owner KT has disputed jurisdiction and is seeking a protective order from (or stay of) non-jurisdictional discovery.

Altogether, this factor weighs against discretionary denial.

Factor 3—investment in the district court proceedings—weighs against discretionary denial. The district court cases are in their early stages and the district court has not issued any substantive rulings in either case with respect to the ’000

² For these reasons, the “statistics on median time-to-trial for civil actions in the district court in which the parallel litigation resides” are not illuminating, given the number of cases and number of defendants.

Patent. Specifically, infringement contentions were served on March 18, 2024, invalidity contentions were served on May 17, 2024, and the claim construction hearing is not scheduled until March 11, 2025. Ex. 1028, Ex. 1029. In addition, counterclaim defendant and patent owner, KT Corporation has yet filed an answer, which will likely further delay progress on the merits.

Altogether, there is much work to be done in the district court and most, if not all, of the work will be well in the future. Accordingly, the district court will not invest significant resources related to the challenged patent prior to the issuance of an institution decision. *See Fintiv*, IPR2020-00019, Paper 11 at 9-12; *DISH Network*, IPR2020-01280, Paper 17 at 18-21.

Factor 4—overlap between this proceeding and the district court proceedings—favors institution. Indeed, there will not be complete overlap between this IPR and the district court cases because there are 12 claims asserted in this case and a total of 113 asserted in the related district court cases. The district court will likely reduce the asserted claims prior to trial including some of the 12 claims at issue here. This factor thus weighs against the Board exercising its discretion to deny.

Factor 5—overlapping parties—is neutral as it is “far from an unusual circumstance that a petitioner in *inter partes* review and a defendant in a parallel

district court proceeding are the same.” *Sand Revolution*, IPR2019-01393, Paper 24 at 12-13.

The final *Fintiv* factor—other considerations—weighs strongly against discretionary denial. As detailed herein, this is a compelling case, and the merits of the Petition are strong. For example, this petition includes multiple grounds that are each independently suitable for finding the independent claims invalid. The Yan reference, for example, discusses the same steps for allocating UL resources, in the same order, and includes a flowchart that substantially matches the relevant flowchart of the ’000 Patent. Ex. 1002, ¶106. Moreover, none of the grounds asserted herein were previously considered by either the Office or the district courts. *Cf. Comcast Cable Commn’s, LLC v. Rovi Guides, Inc.*, IPR2019-00231, Paper 14 at 11 (PTAB May 20, 2019) (obviousness challenges not “previously considered by the Office or any court” weigh in favor of not denying institution). Moreover, the ’000 Patent is currently asserted in three district court cases. Institution of this IPR would simplify the litigations for the district court.

C. The Board Should Not Deny Institution Under *General Plastic*

The *General Plastic* factors do not apply because this is the first and only IPR petition filed by any Petitioner with respect to the ’000 Patent.

IX. CONCLUSION

Petitioners request cancellation of the Challenged Claims.

X. MANDATORY NOTICES UNDER 37 C.F.R. §42.8**A. Real Party in Interest Under 37 C.F.R. §42.8(b)(1)**

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,³ and Nokia of America Corporation.

Out of an abundance of caution, Petitioners have identified all current defendants in the below cases, as well as additional involved parties, as potential real parties in interest only for the purpose of this proceeding and only to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in this IPR. Petitioners do so to avoid the potential expenditure of resources to resolve such a challenge. Petitioners also acknowledge that each

³ Google LLC is a subsidiary of XXVI Holdings Inc. which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

petitioner has a number of affiliates. No unnamed entity is funding, controlling, or otherwise has an opportunity to control or direct this Petition or Petitioners' participation in any resulting IPR. Petitioners are also not aware of any affiliate that would be barred from filing this Petition under 35 U.S.C. § 315(e).

B. Related Matters Under 37 C.F.R. §42.8(b)(2)

The '000 Patent is the subject of the following litigation:

- *Pegasus Wireless Innovation LLC. v. AT&T Inc. et al.*, No. 2:23-cv-00638 (E.D. Tex) (hereafter, "AT&T Case");
- *Pegasus Wireless Innovation LLC. v. T-Mobile US, Inc. et al.*, No. 2:23-cv-00639 (E.D. Tex) (hereafter, "T-Mobile Case"); and
- *Pegasus Wireless Innovation LLC. v. Verizon Communications Inc. et al.*, No. 2:23-cv-00640 (E.D. Tex) (hereafter, "Verizon Case").

The above cases, which include defendants AT&T, T-Mobile, and Verizon and intervenors Nokia and Ericsson, have been consolidated into the Verizon Case for all pretrial issues. Ex. 1030. Petitioners are not aware of any other judicial or administrative matter that would affect or be affected by a decision in this IPR.

C. Designation of Counsel Under 37 C.F.R. §42.8(b)(3)

Petitioners provide the following designation of counsel. <u>Lead Counsel</u>	S. Benjamin Pleune Reg. No. 52,421 ALSTON & BIRD LLP Vantage South End 1120 S. Tryon Street, Suite 300
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Pursuant to 37 C.F.R. § 42.8(b)(4), counsel agrees to service by mail and electronic service by email as detailed above. Pursuant to 37 C.F.R. §42.10(b), a Power of Attorney executed by Petitioners accompanies this Petition.

D. Service Information

Please address all correspondence and service to the addresses listed above.

Petitioners consent to electronic service at the addresses above.

Date: November 15, 2024

By: /S. Benjamin Pleune/

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Reg. No. 52,421

Case No. IPR2025-00084

Patent No. 11,219,000

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CLAIMS APPENDIX

Claim	Recitation
1[pre]	A method of transmitting uplink (UL) control information by a user equipment (UE), 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 received 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 determining of the one of the UL control channel resource sets is performed based on a size of the UL control information, and
1[f]	wherein the UL control channel resource set configuration information is received through the UE specific radio resource control (RRC) signaling.
2	The method according to claim 1, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.
3	The method according to claim 2, wherein the each UL BWP is activated through downlink (DL) control information.
4[pre]	The method according to claim 1, further comprising:
4[a]	receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,
4[b]	wherein the one of the UL control channel resources is indicated from the base station through the DL control information.
5[pre]	A method of receiving uplink (UL) control information by a base station, the method comprising:

Claim	Recitation
5[a]	transmitting, to a user equipment (UE), UL control channel resource set configuration information for UL control information; and
5[b]	receiving the UL control information through one of UL control channel resources in one of UL control channel resource sets contained in the transmitted UL control channel resource set configuration information,
5[c]	wherein the one of the UL control channel resource sets for the UL control information transmission is determined based on a size of the UL control information, and
5[d]	wherein the UL control channel resource set configuration information is transmitted through UE specific radio resource control (RRC) signaling.
6	The method according to claim 5, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.
7	The method according to claim 6, wherein the each UL BWP is activated through downlink (DL) control information.
8[pre]	The method according to claim 5, further comprising
8[a]	transmitting, to the user equipment, downlink (DL) control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,
8[b]	wherein the one of the UL control channel resources is indicated to the UE through the DL control information.
9[pre]	A user equipment (UE) for transmitting uplink (UL) control information, comprising:
9[a]	a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission;
9[b]	a controller configured to determine one of UL control channel resource sets contained in the received UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set; and

Claim	Recitation
9[c]	a transmitter configured to transmit the UL control information through the determined UL control channel resource,
9[d]	wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information, and
9[e]	wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.
10	The UE according to claim 9, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.
11	The UE according to claim 10, wherein the each UL BWP is activated through downlink (DL) control information.
12[pre]	The UE according to claim 9,
12[a]	wherein the receiver receives, from the base station, DL control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,
12[b]	wherein the one of the UL control channel resources is indicated from the base station through the DL control information.

CERTIFICATION UNDER 37 C.F.R. §42.24

Petitioners certify that the word count in this Petition is 13,920 words, as counted by the word-processing program (Microsoft Word for Office 365) used to generate this Petition, where such word count excludes the table of contents, table of authorities, mandatory notices, certificate of service, appendix of exhibits, and this certificate of word count. This Petition is in compliance with the 14,000-word limit set in 37 C.F.R. § 42.24(a)(1)(i).

Date: November 15, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§42.6(e), 42.105 and in view of the agreement between the Parties under 37 C.F.R. § 42.105(b), the undersigned hereby certifies that true and correct copies of the above-captioned PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 11,219,000, all associated exhibits, and Petitioners' Power of Attorney were served in their entireties on November 15, 2024, upon the Patent Owner at the following addresses via UPS Next Day:

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