

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T MOBILITY LLC, AT&T SERVICES, INC., ERICSSON INC., NOKIA
OF AMERICA CORPORATION, AND T-MOBILE USA, INC.

Petitioners,

v.

DAINGEAN TECHNOLOGIES LTD.,
Patent Owner.

Case No. IPR2024-00510
U.S. Patent No. 10,484,976

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,484,976**

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LIST OF EXHIBITS

Exhibit	Description
EX1001	U.S. Pat. No. 10,484,976 (“the ’976 Patent”)
EX1002	File History for U.S. Pat. No. 10,484,976
EX1003	Provisional Patent Application No. 62/443,464
EX1004	Expert Declaration of Dr. Mark Mahon
EX1005	Curriculum Vitae of Dr. Mark Mahon
EX1006	U.S. Pat. No. 10,959,218 (“Babaei”)
EX1007	Provisional Patent Application No. 62/421,821 (“Babaei Provisional”)
EX1008	International Publication No. WO 2016/130175 A1 (“Fwu”)
EX1009	U.S. Pat. Pub. No. 2018/0035332 (“Agiwal”)
EX1010	Provisional Patent Application No. 62/368,369 (“Agiwal Provisional”)
EX1011	U.S. Pat. No. 10,869,331 (“Lee”)
EX1012	International Publication No. WO 2017/171526 A1 (“Lee PCT Publication”)
EX1013	Certified translation of Lee PCT Publication
EX1014	Provisional Patent Application No. 62/403,061 (“Lee Provisional”)
EX1015	Certified translation of Lee Provisional

Listing of Challenged Claims

(Limitation labels added for ease of reference)

Claim 2:

[2pre] A base station apparatus that communicates with a user equipment (UE), comprising:

[2a] transmitting circuitry configured to transmit a radio resource control (RRC) message comprising first information used for configuring a periodicity,

[2b] the transmitting circuitry configured to transmit a RRC message comprising second information used for configuring a numerology,

[2c] the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and

[2d] receiving circuitry configured to receive confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,

[2e] the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein

[2f] the receiving circuitry is configured to receive confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and

[2g] the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),

[2h] the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and

[2i] the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

Claim 4:

[4pre]A communication method of a base station apparatus that communicates with a user equipment (UE), comprising:

[4a] transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity;

[4b] transmitting a RRC message comprising second information used for configuring a numerology;

[4c] transmitting in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for the uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;

[4d] receiving confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI;

[4e] receiving, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology;

[4f] receiving confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, wherein

[4g] the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),

- [4h] the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and
- [4i] the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

AT&T Mobility LLC, AT&T Services, Inc., Ericsson Inc., Nokia of America Corporation, and T-Mobile USA, Inc. (collectively, “Petitioners”) request *inter partes* review of claims 2 and 4 (the “Challenged Claims”) of U.S. Patent No. 10,484,976 (the “’976 Patent”) (Ex. 1001), which, according to PTO records, was assigned to Daingean Technologies Ltd. (“Daingean” or “Patent Owner”). For the reasons set forth below, the Challenged Claims should be found unpatentable and canceled.

I. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

Real Parties-in-Interest: Petitioners identify the following as the real parties-in-interest: AT&T Corp., AT&T Mobility LLC, AT&T Mobility II LLC, AT&T Services, Inc., Ericsson Inc., Nokia of America Corporation, and T-Mobile USA, Inc. No other parties have directed, funded, or controlled the filing of this Petition.

Related Matters: The ’976 Patent is asserted in *Daingean Tech. Ltd. v. AT&T Corp. et al.*, 2:23-cv-00123-JRG (E.D. Tex. Mar. 24, 2023) and *Daingean Tech. Ltd. v. T-Mobile USA, Inc.*, 2:23-cv-00347-JRG (E.D. Tex. July 24, 2023).

Counsel and Service Information:

Petitioners identify lead and backup counsel below. A Power of Attorney is filed concurrently herewith under 37 C.F.R. § 42.10(b). Petitioner consents to email service at: ATT_Daingean@mckoolsmith.com.

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Scott W. Hejny Reg. No. 45,882 shejny@McKoolSmith.com MCKOOL SMITH P.C. 300 Crescent Court, Suite 1500 Dallas, TX 75201 Telephone: 214.978.4000 Facsimile: 214.978.4044	Eric Hansen Reg. No. 63,095 ehansen@McKoolSmith.com MCKOOL SMITH P.C. 300 Crescent Court, Suite 1500 Dallas, TX 75201 Telephone: 214.978.4204 Facsimile: 214.978.4044

A copy of this entire Petition, including all Exhibits and a Power of Attorney, is being served by FEDERAL EXPRESS, costs prepaid, to the address of the attorney or agent of record for Patent Owner in the district court proceedings regarding the '976 Patent: Demetrios Anaipakos, Alavi & Anaipakos PLLC, 609 Main Street, Suite 3200, Houston, TX 77002; and to the address of the attorney or agent of record at the USPTO: Austin Rapp, 299 S. Main Street, Suite 1300-95891, Salt Lake City, UT 84111.

II. FEES

The Office is authorized to charge the fee in 37 C.F.R. § 42.15(a) to Deposit Account No. DA-505723 and any additional fees that are due.

III. GROUNDS FOR STANDING

Petitioners certify that the '976 Patent is available for IPR and Petitioners are not barred or estopped from requesting IPR on the grounds identified herein.

IV. OVERVIEW OF THE '976 PATENT

A. Background

The '976 Patent is directed to wireless networks, such as 4G and 5G networks, and potential improvements intended to allow those networks to offer a broader range of services. EX1001 at 1:41-46. “More specifically, the ['976 Patent's] disclosure relates to new signaling, procedures, user equipment, and base stations for uplink ultra-reliable low latency communication (URLLC).” EX1001 at 1:19-22. URLLC was a known prior art service for 5G networks and employed a wider subcarrier spacing but shorter symbol time than enhanced Mobile Broadband (eMBB) communication. EX1001 at 7:8-21; 18:21-32.

B. Purported Invention

Although not a focus of the '976 Patent's specification, the challenged claims are directed to the signaling surrounding a periodic uplink resource grant that is configured by RRC and activated and deactivated by DCI formats scrambled using an RNTI different from a C-RNTI or an SPS-RNTI. *See* Claim 2, limitation [2c]. The only reference in the '976 Patent to an RNTI being “different” from another RNTI is a reference to the URLLC C-RNTI being “different RNTI from SPS C-RNTI.” EX1001 at 8:41-46. The invention, to the extent actually disclosed in the '976 Patent's specification, is a semi-persistently scheduled URLLC transmission. EX1004 at ¶ 35.

C. Exemplary Claim

Claims 2 and 4 are both independent claims as challenged in this petition. Claim 4 is the communication method that recites the steps that the base station of Claim 2 must be configured to perform. Both claims have been included, with labels in the Listing of Challenged Claims, *supra*. Limitations 2g, 2h, and 2i are identical to limitations 4g, 4h, and 4i, respectively. Additionally, the limitations that are not identical are simply rewritten from a recitation of a component configured to perform the method step and the method step itself. EX1004 at ¶ 57.

D. Asserted Priority Date

The '976 Patent claims priority to Provisional Application No. 62/443,464, filed January 6, 2017. As discussed in Section VIII *infra*, the Challenged Claims are not entitled to the benefit of that priority date.

V. CLAIM CONSTRUCTION

For IPR proceedings, the Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). Under *Phillips*, claim terms are typically given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention, taking into consideration the language of the claims, the specification, and the prosecution history of record. *Phillips*, 415 F.3d at 1313; *see also id.* at 1312–16. The Board, however, only construes the claims when necessary to resolve the underlying

controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015- 00633, Paper 11 at 16 (PTAB Aug. 14, 2015); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). Petitioner respectfully submits that the Board need not expressly construe any other term because the prior art invalidates the claims under any plausible construction. EX1004, ¶ 66.

VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art at the time of the alleged invention of the '976 Patent ("POSITA"), which for purposes of this proceeding is on or around January 6, 2017, would have had a B.S. in Electrical Engineering or a related field with at least three years of experience designing, developing, and/or testing telecommunication systems. EX1004, ¶¶ 34-39.¹ A POSITA would also have familiarity with the wireless standards and protocols related to data transmission and network management. *Id.*, ¶¶ 37-38. Additional education may supplement practical experience or *vice versa*. *Id.*

VII. PRECISE RELIEF REQUESTED AND GROUNDS RAISED

Claims 2 and 4 should be cancelled based on the following grounds:

¹ Petitioner submits the declaration of Dr. Mahon (EX1004), an expert in the field of the '976 Patent. EX1004, ¶ 38.

Ground 1: Claims 2 and 4 are unpatentable under post-AIA 35 U.S.C. § 103 as being obvious in view of Babaei² and Fwu.³

Ground 2: Claims 2 and 4 are unpatentable under post-AIA 35 U.S.C. § 103 as being obvious in view of Babaei and Fwu in further view of Lee.⁴

Ground 3: Claims 2 and 4 are unpatentable under post-AIA 35 U.S.C. § 103 as being obvious in view of Babaei and Fwu in further view of Agiwal.⁵

A. 35 U.S.C. §325(d) is Inapplicable

The asserted references were not in an IDS filed during the prosecution of the '976 Patent, and the Examiner never identified them or used them to reject claims during prosecution. *See generally* EX1002. The Examiner also never considered the testimony of Petitioner's expert, Dr. Mahon (EX1004), regarding these references and the knowledge of a POSITA. The grounds in this petition are not substantially the same as prior art or arguments the Office previously considered. Thus, 35 U.S.C. §325(d) is inapplicable to this case.

² U.S. Patent No. 10,959,218 (EX1006, "Babaei").

³ International Publication No. WO 2016/130175 A1 (EX1008, "Fwu").

⁴ U.S. Patent No. 10,869,331 (EX1011, "Lee").

⁵ U.S. Patent Pub. No. 2018/0035332 (EX1009, "Agiwal")

VIII. PRIORITY DATE OF THE CHALLENGED CLAIMS

To be entitled to priority to an earlier-filed application, the earlier-filed application must provide full written description support for the later-claimed subject matter. 35 U.S.C. § 112; *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306 (Fed. Cir. 2008). The written description requirement of 35 U.S.C. § 112 requires an application to demonstrate that the inventors possessed all elements of the later claimed invention at the time of filing. *Id.* Entitlement to priority is limited to the subject matter actually disclosed and does not extend to subject matter that may be obvious over the priority application's disclosure. *Id.* Though priority may be claimed during prosecution, the patentee bears the burden of proving entitlement to its claimed priority date and is not entitled to the benefit of its filing date without such a showing. *Nat. Alts. Int'l, Inc. v. Iancu*, 904 F.3d 1375, 1380 (Fed. Cir. 2018).

The Challenged Claims are not entitled to claim priority to Provisional Application No. 62/443,464 (the '464 Application) because the '464 Application fails to disclose and support the Challenged Claims as required by 35 U.S.C. § 112. Specifically, at least claim limitations [2c] and [4c] require both (1) “a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI)” and (2) that the DCI Format must be transmitted in a common search space.

A. The '464 Application Only Discloses Scrambling with C-RNTIs

The '464 Application addresses scrambling only in paragraphs [0051] and [0069], and in all cases the scrambling described is performed using C-RNTIs. In paragraph [0051], scrambling using an SPS C-RNTI and a URLLC C-RNTI are described. In Paragraph [0069], scrambling using a C-RNTI is described. The '464 Patent describes no scrambling of the CRC of a DCI format by any RNTI that is not a C-RNTI. EX1004. at ¶¶ 60-61.

C-RNTIs, including SPS C-RNTIs and URLLC C-RNTIs, define UE-specific search spaces. EX1003 at [0053]. They are unique identifiers assigned to specific UEs. EX1004 at ¶ 61. Each is a C-RNTI. *Id.* Therefore, neither the C-RNTI, the SPS C-RNTI, nor the URLLC C-RNTIs described in connection with scrambling in the '464 Application are “different from a C-RNTI” as required by the Challenged Claims. *Id.* Accordingly, the '464 Application fails to show possession of at least this limitation.

B. The '464 Application does not Disclose using a Common Search Space to Activate and Deactivate PUSCH Data Transmissions

Although the '464 Application discloses the existence of a common search space, it neither teaches nor suggests that the common search space be used to (1) send DCI formats with CRCs scrambled by an RNTI that is different from a C-RNTI or a semi-persistent scheduling C-RNTI or (2) send activation or deactivation messages. The '464 Application only mentions the common search space twice, in

paragraphs [0053] and [0137]. EX1004 at ¶ 62. In paragraph [0053], the '464 Application says that the common search space is one of the search spaces the UE may monitor, but does not indicate that the base station would transmit the claimed DCI format on the common search space. EX1003 at [0054]; EX1004 at ¶ 63. In fact, paragraph [0053] identifies separate, UE-specific search spaces to be determined based on C-RNTI, SPS C-RNTI, and/or URLLC C-RNTI. *Id.* There is no reason that a POSITA would take, from the disclosure, the understanding that the DCI format recited in the claims would be transmitted in the common search space. *Id.* This disclosure therefore does not demonstrate possession of the claimed subject matter. EX1004 at ¶¶ 62-65.

Paragraph [0137] is no more helpful for Patent Owner. Unlike paragraph [0053], paragraph [0137] does contemplate transmitting DCI messages in the common search space, but not the DCI format required by the claims. EX1004 at ¶ 64. Instead, paragraph [0137] describes sending a DCI format that communicates the association timing between the base station's downlink slot and uplink slot. EX1003 at [0137]; EX1004 at ¶ 64. There is no reason that a POSITA would read paragraph [0137] to disclose transmitting the claimed DCI format on the common search space, rather than the information actually recited in paragraph [0137]. EX1004 at ¶ 64. The 464 Application therefore does not demonstrate possession of

the claimed subject matter and cannot support a priority claim for the Challenged Claims. EX1004 at ¶¶ 62-65.

IX. PRIOR ART

A. Babaei

1. Overview of Babaei

Babaei relates to improvements in telecommunications protocols to accommodate more varied and more numerous services to be offered by communications networks. EX1004 at ¶¶ 67-71. In particular, Babaei is concerned with the signaling required to support multiple periodic uplink resource allocations for a single UE in a network. EX1006 at 1 (Abstract); EX1004 at ¶ 68. Babaei teaches that multiple periodic uplink resource allocations may be useful for supporting a range of new “V2X” communication services, where UEs integrated into vehicles interact both with the network and with other devices. EX1006 at 13:66-14:49, 16:64-17:8; EX1004 at ¶ 69. Babaei taught that the addition of these new kinds of services, on top of traditional periodic grants (e.g., used for VOIP traffic), require the ability to configure multiple different periodic grants for a UE. EX1006 at 17:54-18:3; EX1004 at ¶ 69.

Babaei contemplates the use of RRC signaling to configure a UE for multiple different periodic resource allocations, and then activating and releasing those periodic resource allocations using a DCI Format scrambled with an SPS RNTI

assigned for that purpose. EX1006 at 16:64-17:8, 19:16-31, 20:48-67; EX1004 at ¶ 70. In response to a DCI Format activating or deactivating a periodic resource allocation, Babaei teaches that the wireless device transmits and the base station receives a MAC CE confirming the activation/release of the resource. EX1006 at 24:56-25:3, 29:4-33:4; EX1004 at ¶ 71. Babaei Fig. 18, reproduced below, illustrates the signaling between a base station and a wireless device to configure, activate, release, and confirm activation/release of a periodic resource allocation.

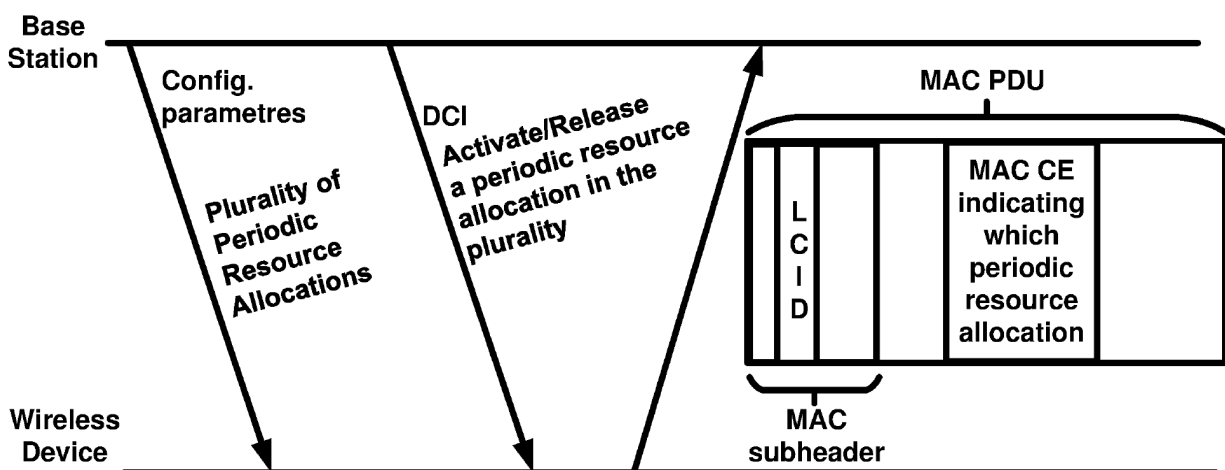


FIG. 18

2. Babaei is Prior Art to the '976 Patent

Babaei is a patent filed on Nov. 17, 2017. Because the Challenged Claims are not supported by the '464 Application (See Section VIII), Babaei's actual filing date is prior to the earliest effective filing date for the Challenged Claims, and Babaei is prior art under 35 U.S.C. § 102(a)(2).

Additionally, Babaei claims priority to two provisional applications filed on November 14 and 15, 2016, before the '976 Patent's earliest claimed priority date. EX1006 at 1. Babaei is therefore prior art under 35 U.S.C. § 102(a)(2) if the subject matter relied upon from *Babaei* is supported by Babaei's earlier priority applications. *Penumbra, Inc. v. Rapidpulse, Inc.*, IPR2021-01466 Paper 34 (precedential) at 29-35 ("*Penumbra*"). *Penumbra* rejected the application of *Dynamic Drinkware* for the purposes of determining prior art status under post-AIA § 102(a)(2) and (d) and held that a patent is available as a prior art reference if the subject matter relied upon as prior art was supported by an earlier-filed provisional application. *Id.*

The subject matter relied upon from Babaei in Section XI below is supported in the Babaei Provisional, as shown in the table below. EX1004 at ¶¶ 72-74. Accordingly, Babaei is prior art to the '976 Patent under post-AIA § 102(a)(2) and (d).

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ⁶
Abstract	Pp. 49-50, 64-66, 68-69, 72-74
3:9-10, 4:65-5:14, 15:49-55, 16:4-42	Pp. 31, 49-51, 62-64
5:40-6:3	Pp. 7, 18 ([0020])
13:7-49	P. 52-53
13:66-14:49	Pp. 64-67
2:47, 14:50-15:31	Pp. 62
16:64-17:8	Pp. 50, 64-68

⁶ Page numbers for EX1007 refer to the page number in the exhibit, not the page number in the underlying application within the exhibit.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ⁶
17:54-18:18	Pp. 64-65
19:5-31	P. 66
20:25-22:12	Pp. 64-69
22:24-55, 23:22-26	Pp. 66, 68-69
22:56-65	Pp. 63, 66-68
24:56-25:3	Pp. 72-77
25:4-33	Pp. 58-60
26:4-22	Pp. 72-77
28:18-33:4	Pp. 72-77
28:40-67	Pp. 69, 73-76
29:4-26	P. 74
30:15-19	Pp. 74-75
30:27-36	P. 75
35:43-58	Pp. 64-65, 72-76
36:12-27	Pp. 64-65, 72-76
37:19-54	Pp. 64-65, 72-76
Figs. 9, 13-15, 17	Pp. 64-65, 72-76
Fig. 18	Pp. 60, 64-65, 72-76
Figs. 23-25, 28, 29	Pp. 60, 64-65, 72-76

Additionally, even though *Dynamic Drinkware's* analysis of a reference patent or publication's claims is no longer required to establish the reference as prior art, Babaei's claims are supported by the Babaei Provisional. EX1004 at ¶ 75. The table below identifies subject matter that supports Babaei's claims.

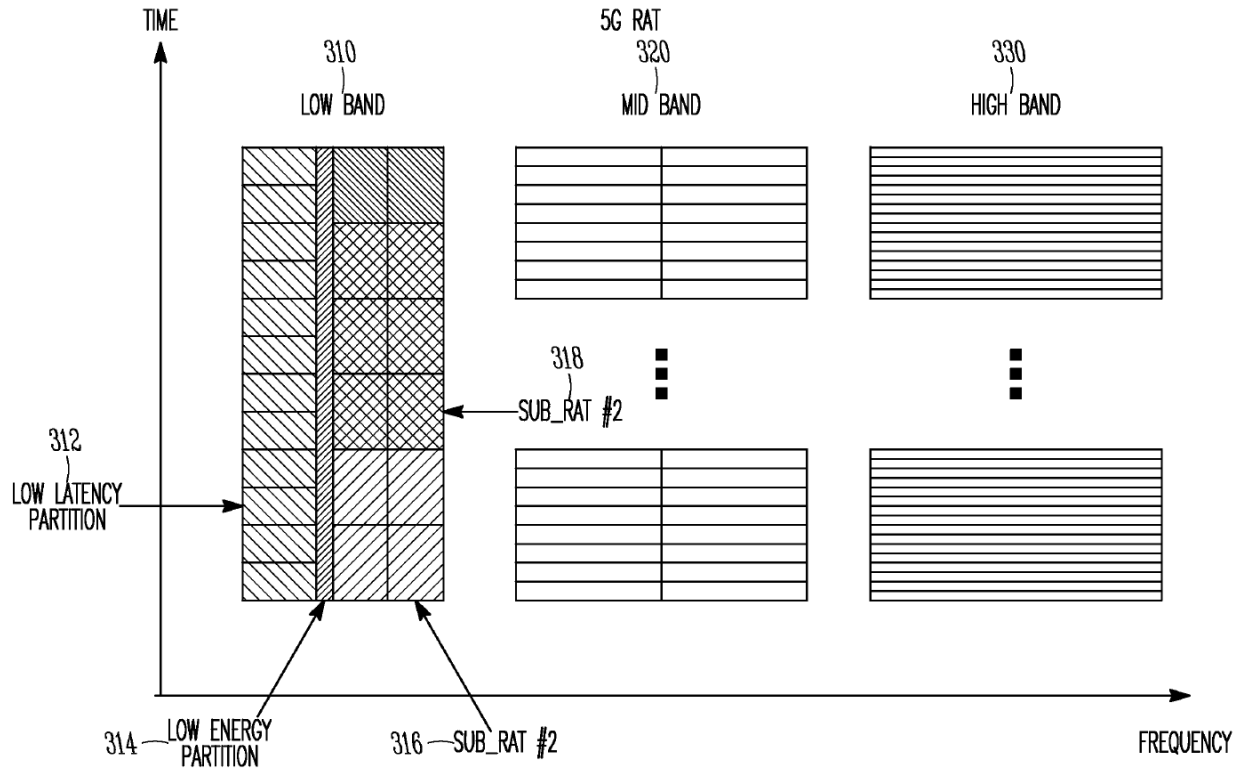
Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
1. A method comprising: receiving, by a wireless device, configuration parameters for a	Pp. 64-69

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
plurality of periodic resource allocations;	
receiving downlink control information (DCI) that comprises an indication of activation or release of at least one periodic resource allocation of the plurality of periodic resource allocations; and	Pp. 64-69
sending, after receiving the DCI, a medium access control (MAC) protocol data unit (PDU) comprising:	Pp. 58-60, 72-76
a confirmation MAC control element (MAC CE) comprising a plurality of fields, wherein at least one of the plurality of fields indicates receipt of the indication of activation or release by using a same value to indicate either the activation or the release; and	Pp. 60, 72-76
a logical channel identifier that indicates that the MAC PDU comprises the confirmation MAC CE.	Pp. 60, 72-76

B. Fwu

1. Overview of Fwu

Fwu relates to a unified, flexible 5G air interface where different numerologies, with different latency and TTI characteristics, can be configured as part of the same radio network. EX1008 at 1 (abstract); EX1004 at ¶¶ 76-78. Fwu Fig. 3, reproduced below, illustrates a 5G RAT with a low band region, a mid-band region, and a high-band region.



Mid-band region and high-band region have different numerologies (indicated by the width and duration of the blocks in the diagram). EX1008 at [0040]. The low-band region consists of three different numerologies, called sub-RATS or partitions, with different numerologies suitable to different services. EX1008 at [0040], [0044].

Fwu teaches that the different numerologies it contemplates can be configured using UE-specific dedicated Radio Resource Control (RRC) signaling. EX1008 at [0073], [0078], [0082], [0092].

2. Fwu is Prior Art to the '976 Patent

Fwu is an International Patent Publication published on August 18, 2016. EX1008 at 1. Fwu is therefore prior art under 35 U.S.C. § 102(a)(1).

C. Lee

1. Overview of Lee

Lee, like Babaei, relates to new signaling used to support new kinds of periodic resource allocations for new services. EX1011 at 1 (abstract). And like Babaei, Lee contemplates configuring UEs with different SPS configurations, with different corresponding RNTIs, to accommodate new services such as V2X SPS services. EX1011 at 13:56-14:35. Lee Figs. 8 and 9, reproduced below, show the configuration, activation, and release signaling for a VoIP SPS service (Fig. 8, left) and a V2X SPS service (Fig. 9, right).

FIG. 8

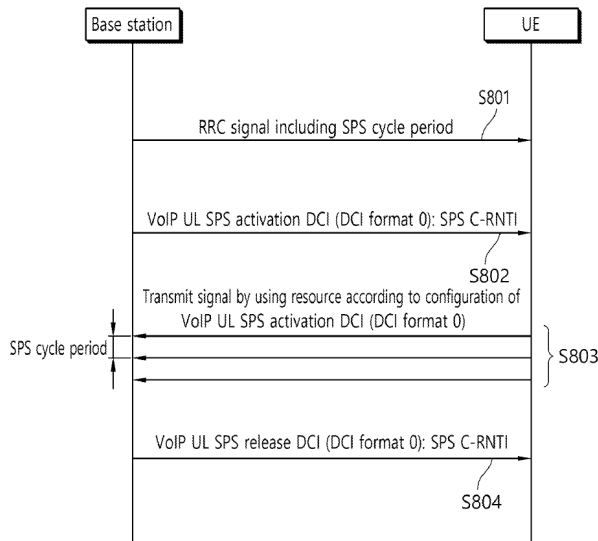
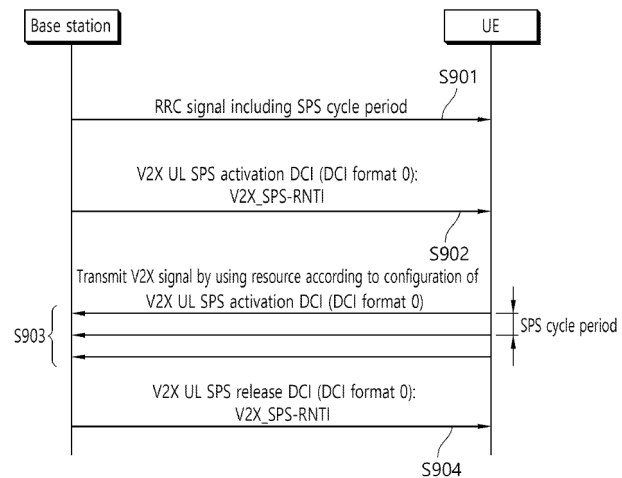


FIG. 9



In both cases, Lee teaches configuring periodic uplink grants using RRC signaling, then activating and deactivating the grant using DCI formats with CRCs scrambled with RNTIs. EX1011 at 13:56-14:35. For VoIP UL SPS, an SPS C-RNTI is used, while for V2X SPS a V2X-SPS-RNTI is used. EX1011 at 13:56-14:35.

2. Lee is Prior Art to the '976 Patent

Lee is a patent filed on April 3, 2017.⁷ Because the Challenged Claims are not supported by the '464 Application (*see* Section VIII), Lee's actual filing date is prior to the earliest effective filing date for the Challenged Claims, and Lee is prior art under 35 U.S.C. § 102(a)(2).

Additionally, Lee claims priority to nine provisional applications filed between April 1, 2016 and October 3, 2016, each before the '976 Patent's earliest claimed priority date. EX1011 at 1-2. Lee is therefore prior art under 35 U.S.C. § 102(a)(2) if the subject matter relied upon from Lee is supported by Lee's earlier priority applications. *Penumbra* at 29-35.

The subject matter relied upon from Lee in Section XI below is supported in the Lee Provisional, as shown in the table below. EX1004 at ¶¶ 82-84. Accordingly, Lee is prior art to the '976 Patent under post-AIA § 102(a)(2) and (d).

⁷ The following analysis reflects the fact that the US Provisional Application establishes the priority date of Lee. Petitioner has attached the PCT application that likewise claims priority to the US Provisional Application, as well as a certified translation of the PCT Application, as EX1012 and EX1013.

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
Abstract	pp. 15-19
2:8-26	pp. 15-19, 36
4:7-21	pp. 15-19, 36
10:30-40	pp. 17-18, 28, 35
13:56-14:35	pp. 15-20, p. 28
15:50-16:30	pp. 16, 19
17:13-22	pp. 16, 19
Fig. 1	pp. 15-19, 23
Fig. 8	pp. 15-19
Fig. 9	pp. 16, 19
Fig. 10	pp. 16, 19
Fig. 11	pp. 16, 19

Additionally, even though *Dynamic Drinkware's* analysis of a reference patent or publication's claims is no longer required to establish the reference as prior art, Lee's claims are supported by the Lee Provisional. EX1004 at ¶ 85. The table below identifies subject matter that supports Lee's claims.

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015) ⁸
1. A method of transmitting downlink control information (DCI) by a base station in a wireless communication system, the method comprising: generating the DCI; and transmitting the DCI to a user equipment (UE),	pp. 15-19, 28
wherein based on the DCI being generated to activate a sidelink semi-	pp. 16, 28-29, 36

⁸ Page numbers for EX1015 refer to the page number in the exhibit, not the page number in the underlying application within the exhibit.

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015) ⁸
persistent scheduling (SPS) between the UE and another UE for a Vehicle-to-Everything (V2X) communication, the DCI comprises (i) a sidelink SPS configuration index field and (ii) a sidelink SPS activation field,	
wherein the sidelink SPS configuration index field informs a sidelink SPS configuration that is related to control information of the DCI that was generated to activate the sidelink SPS,	pp. 28-29
wherein the sidelink SPS activation field informs an activation of the sidelink SPS configuration, and	pp. 28-29
wherein based on the DCI being generated to activate an uplink SPS between the UE and the base station for a V2X communication, the DCI comprises a demodulation reference signal (DM-RS) cyclic shift field that informs an index of an uplink SPS configuration that is related to control information of the DCI that was generated to activate the uplink SPS.	pp. 16, 31-32

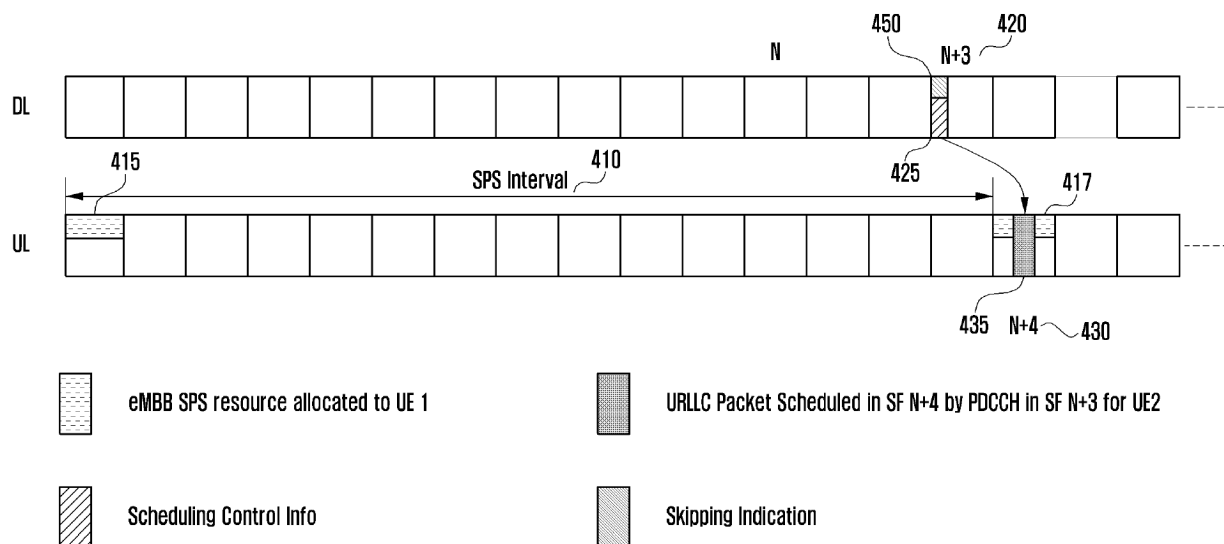
D. Agiwal

1. Overview of Agiwal

Agiwal relates to a 4G/5G communication system supporting both periodic uplink transmissions, such as SPS, as well as low-latency traffic transmitted using a different numerology, such as URLLC. EX1009 at 1 (abstract); Fig. 4. Agiwal recognized that eMBB uplink grants, such as SPS or dynamically scheduled traffic,

are scheduled before URLLC service demands would be known. *See, e.g.*, EX1009 at [0061]. URLLC traffic, in turn, is transmitted with a wider subcarrier spacing but a shorter symbol time (a different numerology), and so would collide with only a portion of scheduled eMBB traffic (those eMBB symbols corresponding to the URLLC transmission). *See, e.g.*, EX1009 at [0061].

To avoid these collisions, Agiwal contemplates a skip indication, such as a DCI Format with its CRC scrambled using a special SKIP-RNTI, that scheduled UEs can monitor for potential collisions with newly scheduled URLLC transmissions. EX1009 at [0060]-[0061]. Agiwal Fig. 4, reproduced below, shows the operation of the skip indication in action in combination with an SPS transmission. A previously activated SPS transmission is scheduled with a periodicity (415, 417). The base station determines a URLLC transmission is necessary and schedules it (425). At the same time, the base station transmits a skip indication (e.g., a DCI format with its CRC scrambled using the SKIP-RNTI), which the SPS UE receives and decodes. The SPS UE then deactivates its SPS transmission (417) and reactivates it to accommodate the late-scheduled URLLC packet 435.



2. Agiwal is Prior Art to the '976 Patent

Agiwal is a patent publication for an application filed on July 26, 2017. Because the Challenged Claims are not supported by the '464 Application (*see* Section VIII), Agiwal's actual filing date is prior to the earliest effective filing date for the Challenged Claims, and Agiwal is prior art under 35 U.S.C. § 102(a)(2).

Additionally, Agiwal claims priority to a provisional application filed July 29, 2016, before the '976 Patent's earliest claimed priority date. EX1009 at 1. Agiwal is therefore prior art under 35 U.S.C. § 102(a)(2) if the subject matter relied upon from Agiwal is supported by Agiwal's earlier priority applications. *Penumbra* at 29-35.

The subject matter relied upon from Agiwal in Section XI below is supported in the Agiwal Provisional, as shown in the table below. EX1004 at ¶¶ 89-91. Accordingly, Agiwal is prior art to the '976 Patent under post-AIA § 102(a)(2) and (d).

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
Abstract	P. 21
[0003]	p. 21
[0008]	pp. 21-22
[0061]	pp. 23-25 (Figs. 1, 2, 4)
[0058]-[0061]	p. 22
[0060]	p. 21-25
[0054] – [0102]	pp. 21-29
Fig. 1	p. 23 (Fig. 1)
Fig. 4	p. 25 (Fig. 4)
Fig. 6	p. 27 (Fig. 5)

Additionally, even though *Dynamic Drinkware*'s analysis of a reference patent or publication's claims is no longer required to establish the reference as prior art, Agiwal's claims are supported by the Agiwal Provisional. EX1004 at ¶ 92. The table below identifies subject matter that supports Agiwal's claims.

Agiwal Claim 1 (EX1009)	Supporting Disclosure from Agiwal Provisional (EX1010)
1. A communication method of a terminal, the method comprising: receiving, from a base station, scheduling information for a first uplink packet transmission in a first time slot;	Fig. 2 (DL Control in SF N1: UL packet scheduled in SF X)
determining whether the first uplink packet transmission in the first time slot is restricted based on information corresponding to a second uplink packet transmission in the first time slot of another terminal; and	Fig. 2 (Packet scheduled for UE3; DL control in SF N3: Skipping Indication; Determine if skipping indication corresponds to its UL transmission or not)

Agiwal Claim 1 (EX1009)	Supporting Disclosure from Agiwal Provisional (EX1010)
if the first uplink packet transmission in the first time slot is restricted, skipping the first uplink packet transmission in a first time slot.	Fig. 2 (If yes, skip certain symbol(s) during UL packet transmission in SF X or skip UL packet transmission)

X. ASSERTED GROUNDS OF UNPATENTABILITY

A. Ground 1: Babaei combined with Fwu

1. Motivation to Combine Babaei with Fwu

Babaei addresses the provision of new kinds of services, including vehicular communication (V2X) services, over a 3GPP network. EX1006 at 13:66-14:10; EX1004 at ¶ 93. In particular, Babaei contemplates configuring UEs requiring two or more different services with multiple parallel UL SPS configurations with different grant amounts and periodicities tailored to the needs of different traffic types. EX1006 at 20:25-21:20; EX1004 at ¶ 94.

Likewise, Fwu addresses the improvement and configuration of 3GPP networks to provide new kinds of services with different requirements. EX1008 at [0032], [0036]-[0038]; EX1004 at ¶ 95. Fwu contemplates configuring UEs to use different numerologies for different time and frequency resources in order to provide services suitable for different needs. *Id.* For example, Fwu contemplates providing low-latency services using a numerology with a wide subcarrier spacing to support

vehicle-to-vehicle applications. EX1008 at [0052]. These are the same kind of services (V2X) that Babaei contemplates improving. EX1004 at ¶ 95.

A POSITA looking to provide a range of periodic services on 3GPP networks would thus be motivated to combine Babaei and Fwu to configure UEs for services with a range of potential periodicities and numerologies. EX1004 at ¶ 96. Further, a POSITA would have seen an obvious benefit to combining Babaei, with its multiple configurable periodicities, and Fwu, with its multiple configurable numerologies, as changes in numerology change symbol time, which changes the possible transmission time intervals (TTIs) available to the system. EX1004 at ¶ 97; EX1008 at [0036]-[0038]. TTIs are the smallest unit of time the eNB is able to schedule (EX1008 at [0035]), so changes in TTI will change the potentially available periodicities.

A POSITA would further expect success in such a combination, as configuring a recurring allocation reduces control signaling overhead compared to dynamic grants regardless of the periodicity or TTI the eNB configures. Combining these teachings would yield the predictable result of an eNB being able to configure a UE to transmit at both a periodicity and a numerology suitable for the demands of the UE's application. EX1004 at ¶ 98.

2. The Challenged Claims are Obvious in View of *Babaei* and *Fwu*

a) Claim 2

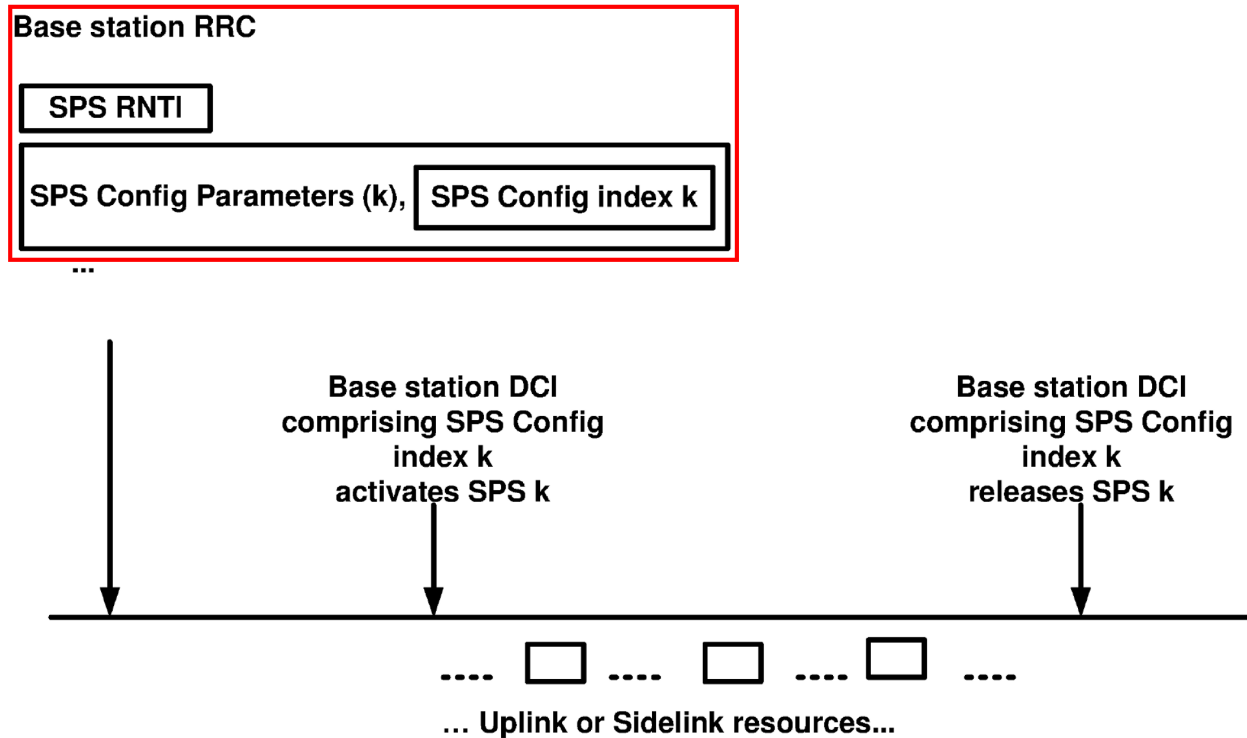
1) [2pre] A base station apparatus that communicates with a user equipment (UE), comprising:

Babaei and *Fwu* each teach this limitation. EX1004 at ¶¶ 99-102. For example, in *Babaei* Fig. 4 illustrates a base station, Fig. 5C illustrates the physical downlink transmission chain from a base station, and Figs. 9, 17, 18, and 23 show exchanges of communications between a base station and a UE. EX1006; EX1004 at ¶ 99. *Babaei* Fig. 25 shows a method, performed by a base station with a UE, for configuring the UE with periodic resource allocations and then activating or deactivating one of the allocations. EX1006; EX1004 at ¶ 100. *Babaei* explains that the base station establishes a bi-directional radio link with a wireless device using its communication interface, meaning the base station both transmits signals to and receives signals from the wireless device. EX1006 at 5:40-6:3; EX1004 at ¶ 101. The disclosure relied upon in *Babaei* for this limitation is supported by *Babaei*'s Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74. Similarly, *Fwu* teaches base stations (eNBs) that communicate with UEs over bi-directional radio links, including at Fig. 1, abstract, and Paragraphs 16-18. EX1008; EX1004 at ¶ 102.

2) [2a] transmitting circuitry configured to transmit a radio resource control (RRC) message comprising first information used for configuring a periodicity,

Babaei and *Fwu* each teach this limitation. EX1004 at ¶¶ 103-1018. As an initial matter, both *Babaei* and *Fwu* disclose base stations that communicate with UEs, including transmitting circuitry. *See* Section X.A.2.a).1); EX1004 at ¶ 103. Specifically, *Babaei* teaches a base station and wireless device connected by a bi-directional wireless link, where both the base station and wireless device send and receive data using multiple frequency carriers. EX1006 at 5:40-6:3; EX1004 at ¶ 104. *Fwu* similarly discloses circuitry for transmitting signals in a base station. EX1008 at [0026]; EX1004 at ¶ 104.

Additionally, *Babaei* Figs. 14 and 15 teach a base station using RRC signaling to configure two or more periodic SPS allocations, each with its own periodicity. EX1006; EX1004 at ¶ 105. For example, *Babaei* Fig. 14, reproduced below, shows the base station sending an RRC message including SPS configuration. *See also* EX1006 at 21:59-22:12.



Babaei teaches a system where a UE can have multiple SPS configurations, each with different periodicity. EX1004 at ¶ 106; EX1006 at 17:55-18:18, 20:36-47, 21:21-43. Further, Babaei expressly identifies “periodicity” as a configuration parameter that may be configured by RRC messaging. EX1006 at 22:41-55, 23:22-26; EX1004 at ¶ 106. Babaei Fig. 13 illustrates two such periodicities. EX1006. Babaei Figs. 18 and 25 illustrate methods for configuring two or more periodic allocations, as well as activation and releasing of those allocations. EX1006; EX1004 at ¶ 107. Babaei Fig. 18, reproduced below with annotation, provides a high-level overview of the configuration, activation/release, and confirmation signaling contemplated by Babaei. The signaling pertinent to limitation 2a of the Challenged Claims is annotated in yellow.

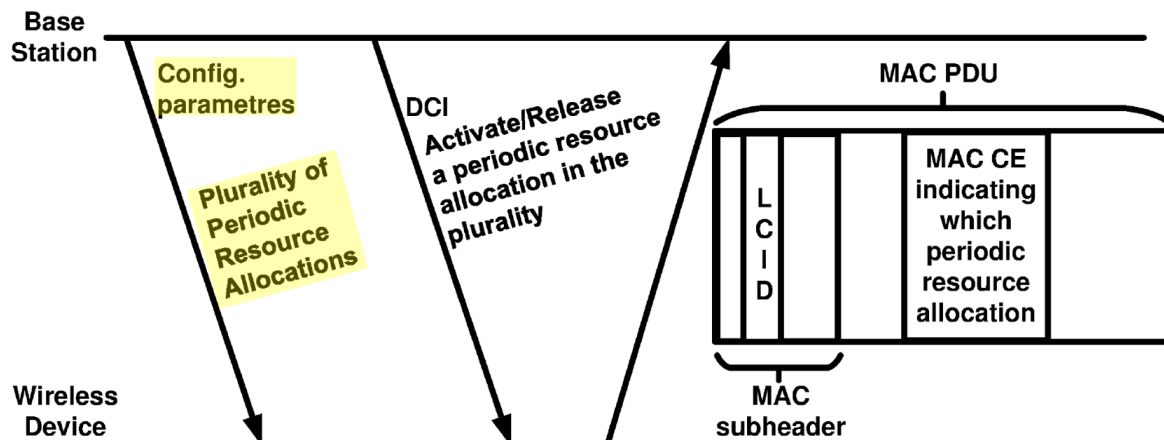


FIG. 18

The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74.

Fwu also teaches configuration of SPS by higher layer signaling before activation, reactivation, or release by DCI format. EX1008 at [0023]. A POSITA would be familiar with the SPS terminology used in 3GPP specifications, as referenced in Fwu [0023], and would understand both that the "higher layer signaling" of Fwu refers to RRC signaling and that configuration of SPS includes a configuration of the periodicity of the SPS uplink or downlink allocation. EX1004 at ¶ 108. This limitation is therefore obvious over the teachings of each of Babaei and Fwu.

3) [2b] the transmitting circuitry configured to transmit a RRC message comprising second information used for configuring a numerology,

Fwu teaches this limitation and, in combination with Babaei, renders it obvious. As an initial matter, both Babaei and Fwu disclose base stations that

communicate with UEs, including transmitting circuitry. *See* Sections X.A.2.a).1) and 2); EX1004 at ¶ 109. Fwu teaches an improvement to 3GPP base stations called Flexible Radio Access Technology, or FRAT. EX1008 at Fig. 3, abstract.

In Fwu's FRAT, the base station defines different radio access modes, called RATs or sub-RATs, and provides the allocation, partition information, and numerology of the RATs to the UE. EX1008 at Fig. 3, abstract; EX1004 at ¶ 109. Fwu teaches that each RAT "has a flexible subcarrier spacing and symbol duration, and is associated with at least one of different temporal and frequency resources," so the UE requires configuration information from the eNB to use the RAT. EX1008 at Fig. 3, abstract; EX1004 at ¶¶ 109-110.

Fwu further teaches that, for each RAT or sub-RAT, the numerologies, resource allocation, and partition information in the time domain can be configured by UE-specific RRC signaling. EX1008 at [0041]-[0042], [0073], [0078], [0082], [0092]; EX1004 at ¶ 111.

Fwu further teaches multiplexing different RATs or sub-RATs in the same frequency resource or frequency band. EX1008 at [0034], [0041]-[0046]; EX1004 at ¶ 111. This allows different kinds of services suited to different numerologies to be served by the same base station using the same resources. EX1004 at ¶ 111. For example, Fwu [0056] includes three tables showing example numerologies, including two different numerologies for different services sharing the same

frequency band. EX1008 at [0056]; EX1004 at ¶ 112. These examples show a 1.5KHz numerology for low power, low complexity communications using the same sub-3GHz band along-side a conventional 15KHz numerology. EX1008 at [0056]; EX1004 at ¶ 112. The base station in Fwu assigns UEs to the MTC or the conventional numerology based on the UE's capability and the kind of coverage the UE requires or requests. EX1008 at [0038]-[0039]; EX1004 at ¶ 112. Fwu Fig. 3, reproduced below, introduces a third sub-RAT partition in the low band for low-latency communications.

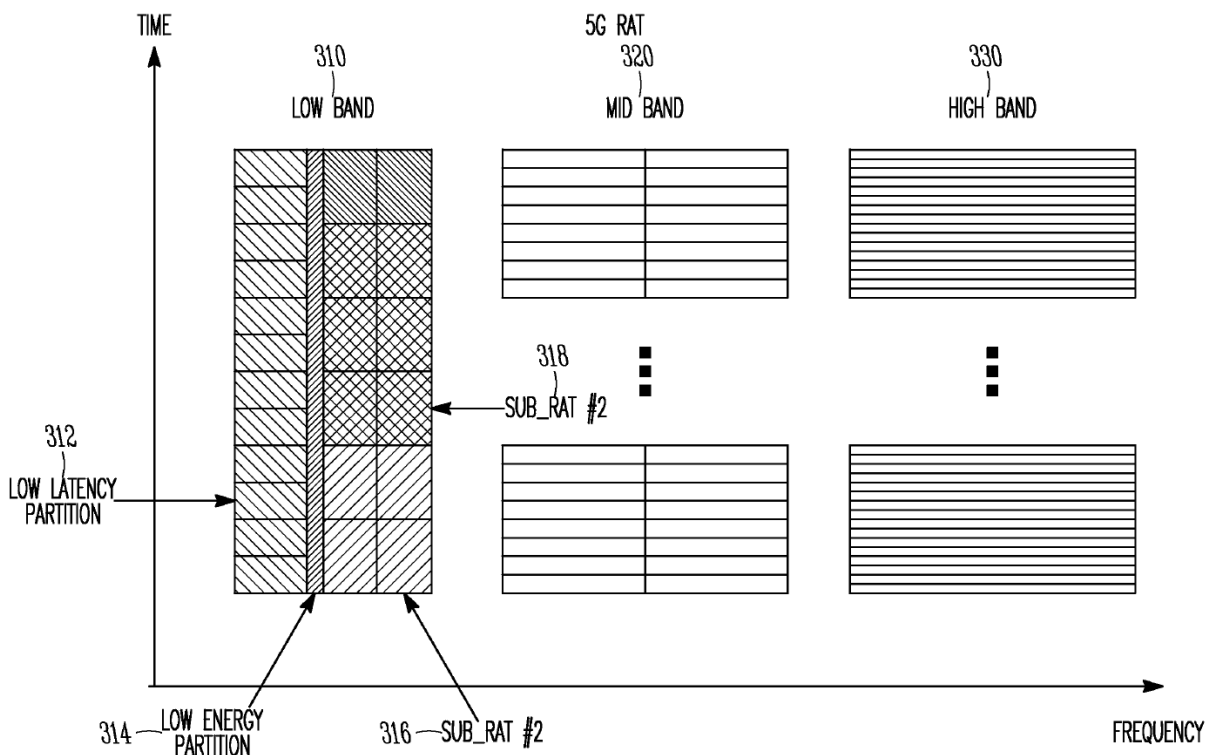


FIG. 3

Fwu teaches that the low-latency numerology could use a wider sub-carrier spacing (30KHz) and shorter symbol time, making it suitable for “mission critical MTC applications and Vehicle-to-Vehicle applications.” EX1008 at [0052]; EX1004 at ¶ 114.

As explained in Section X.A.1 above, a POSITA would have been motivated to combine these teachings of the configuration of different numerologies from Fwu with the teaching of different periodic grants from Babaei to arrive at the claimed invention. EX1004 at ¶ 115. Both Babaei and Fwu teach strategies for adapting wireless networks to support new kinds of services with different service requirements, with Babaei focusing on demand for an increasing number of periodic services at varying intervals and Fwu focusing on demand for services at varying latencies and over a wider range of frequencies. EX1004 at ¶ 115. It would have been obvious to combine the teachings of both references to obtain a wireless network capable of offering more numerous and varied periodic services (per Babaei) and services with varying latencies over a broader range of frequencies (per Fwu). EX1004 at ¶ 116.

- 4) [2c] the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and

Babaei teaches this limitation and, in combination with Fwu, renders it obvious. As an initial matter, both Babaei and Fwu disclose base stations that communicate with UEs, including transmitting circuitry. *See* Sections X.A.2.a).1) and 2); EX1004 at ¶ 117. Both Babaei and Fwu also teach activating and deactivating a periodic uplink allocation with a numerology using a DCI format with a CRC scrambled by the appropriate RNTI. EX1006 at 22:56-65; EX1008 at [0023]; EX1004 at ¶ 117. Scrambling the CRC of DCI formats using an RNTI was the known and accepted manner of addressing DCI formats to the desired UE and service. EX1004 at ¶ 117.

Babaei illustrates using DCI formats to activate or deactivate a previously configured uplink grant at Figs. 14, 15, 18, 24, 25, 28, and 29. EX1004 at ¶ 118. Babaei Fig. 18, reproduced below with annotations, illustrates the transmission of a

DCI to activate or deactivate (release) a previously configured periodic resource allocation (annotated in red). EX1004 at ¶ 118.

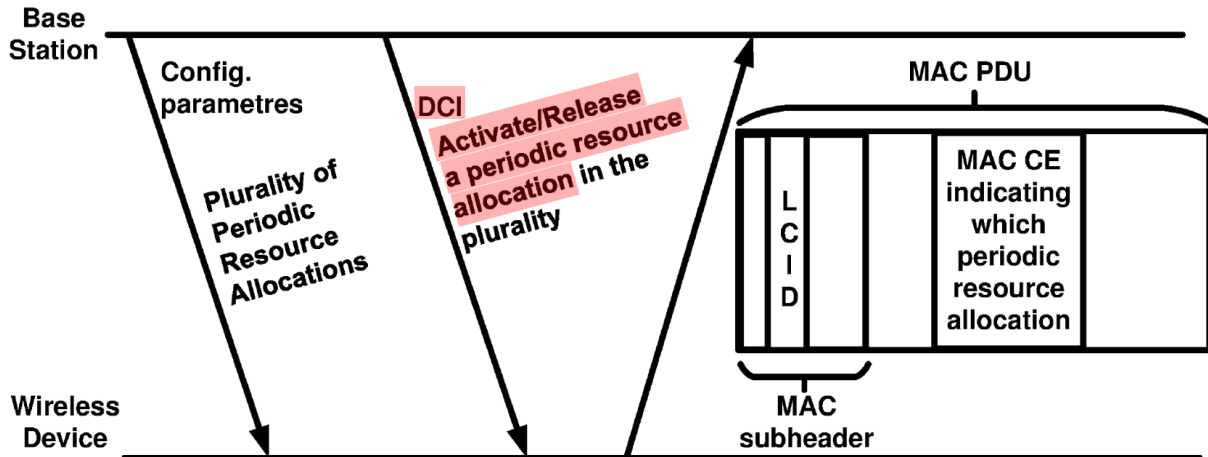


FIG. 18

Further, both Babaei and Fwu contemplate using the same, distinct RNTI for the DCI formats that activate or deactivate (release) the periodic grant. EX1006 at 22:56-65; EX1008 at [0023]; EX1004 at ¶ 119. Both references also describe the search space for DCI formats, with a common search space for DCI formats applicable to multiple UEs and UE-specific search spaces for DCI formats applicable to specific UEs. EX1006 at 2:47, 14:50-15:31; EX1008 at [0023]; EX1004 at ¶ 119. Babaei also discloses that the DCI format it teaches may be used for uplink SPS, DCI Format 0, and explains that its fields may be a different size depending on whether the DCI format 0 is transmitted in a UE-specific search space. EX1006 at 2:47, 14:50-15:31; EX1004 at ¶ 120. Babaei therefore teaches, or at least

suggests, that the DCI format 0 used for scheduling could be sent in the common rather than UE-specific search space. EX1004 at ¶ 120.

Further, a POSITA would have been motivated by Babaei's concerns about UE processing requirements and power consumption to employ a common search space for Babaei's enhanced SPS services. EX1004 at ¶ 121. Babaei recognizes that employing many SPS RNTIs could cause a UE to expend processing and power resources. EX1006 at 21:1-5. One solution Babaei proposes is configuring some UEs to use the same SPS RNTI for two or more SPS configurations. *See, e.g.*, EX1006 at 22:32-40; EX1004 at ¶ 121. In other words, the two SPS configurations would share the SPS RNTI and its associated search space. EX1004 at ¶ 121. A POSITA would recognize that different UEs could share the SPS RNTI, and its search space, in common and each UE's SPS-ConfigIndex could be used to determine to which UE the activation / deactivation DCI format should be applied. EX1004 at ¶ 122. This would be a common search space. EX1004 at ¶ 122. A POSITA would also find it obvious to use the cell's common search space (CSS), as UEs are already receiving and attempting to decode any DCI formats sent in that search space. EX1004 at ¶ 122.

The periodic uplink grants contemplated by both Babaei and Fwu are grants to transmit data in the PUSCH. EX1004 at ¶ 123; EX1008 at [0022]-[0023]; EX1006 at 3:9-10, 4:65-5:14, 15:49-55, 16:4-42. Fwu and Babaei both teach, and a POSITA

would understand from his general knowledge in the art, that 3GPP eNBs provide for reception of two physical uplink channels: a physical uplink control channel (PUCCH) for transmission of control information to the eNB, and a physical uplink shared channel (PUSCH) for the transmission of everything else, including data, to the eNB. EX1004 at ¶ 123. Further the information elements for SPS taught by Babaei are for PUSCH transmission, indicating that the SPS configurations taught by Babaei are for data transmission on the PUSCH. EX1004 at ¶ 123; EX1006 at 15:49-55, 16:4-42.

The Challenged Claims require the “first RNTI” used to scramble the CRC of the DCI format to be “different from ... a semi-persistent scheduling RNTI.” EX1001 at limitation 2c. Much of Babaei’s disclosure focuses on different ways to configure more than one SPS for a UE, and one of Babaei’s solutions is to use multiple different RNTIs for each SPS configuration. EX1006 at 16:64-17:8, EX1004 at ¶ 124. In that example, an RNTI for a first SPS configuration (VOIP) is the first SPS RNTI and the RNTI for a second SPS configuration (V2X) is the second SPS RNTI. *Id.* If the disclosed SPS RNTIs of Babaei are “different from” a semi-persistent scheduling C-RNTI, the disclosed SPS RNTIs satisfy the claims. EX1004 at ¶ 125. Both RNTIs are different from the C-RNTI, which Babaei teaches is used for dynamic scheduling. EX1006 at 13:7-49; EX1004 at ¶¶ 124-125.

If Patent Owner argues that the SPS RNTIs of Babaei are semi-persistent scheduling C-RNTIs, Babaei still satisfies the requirement that the “first RNTI” be “different from ... a semi-persistent scheduling C-RNTI” because Babaei teaches the configuration of multiple SPS RNTIs. EX1004 at ¶ 125; EX1006 at 19:5-31. Where Babaei refers to SPS C-RNTIs, it makes clear that, to support multiple SPS configurations, the SPS C-RNTIs for the different SPS configurations are “different.” EX1006 at 19:20-31. The SPS RNTI for the first SPS configuration (voice) is therefore “different from” the SPS RNTI for the second SPS configuration (V2X) as required by limitation 2c of the Challenged Claims. EX1004 at ¶ 125. The table below is illustrative:

RNTI	Use	Different from C-RNTI?	Different from First SPS RNTI?	Different from Second SPS RNTI?
C-RNTI ⁹	Dynamic scheduling	No	Yes	Yes
First SPS RNTI ¹⁰	Scheduling of periodic voice transmissions	Yes	No	Yes
Second SPS RNTI ¹¹	Scheduling of periodic V2X transmissions	Yes	Yes	No

⁹ EX1006 at 13:7-49.

¹⁰ EX1006 at 19:23-24.

¹¹ EX1006 at 19:24-26.

The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74.

5) [2d] receiving circuitry configured to receive confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,

Babaei teaches this limitation. As an initial matter, both Babaei and Fwu disclose base stations that communicate with UEs, including receiving circuitry. *See* Section X.A.2.a).1). Specifically, Babaei teaches a base station and wireless device connected by a bi-directional wireless link, where both the base station and wireless device send and receive data using multiple frequency carriers. EX1006 at 5:40-6:3; EX1004 at ¶ 127. Fwu similarly discloses circuitry for receiving signals in a base station. EX1008 at [0026]; EX1004 at ¶ 127.

Babaei further teaches the sending (by the wireless device) and the receiving (by the base station) of a confirmation MAC CE in response to a DCI activating or deactivating (releasing) a periodic uplink grant. EX1006 at Figs. 18, 24, 25, 28, 29, 24:56-25:3, 26:4-22, 28:18-33:4; 35:43-58, 36:12-27, 37:19-54; EX1004 at ¶ 128. Babaei Fig. 18 is reproduced below, with annotations showing the receipt by the UE of the MAC CE (annotated in green) in response to a DCI message activating a periodic resource grant (annotated in red).

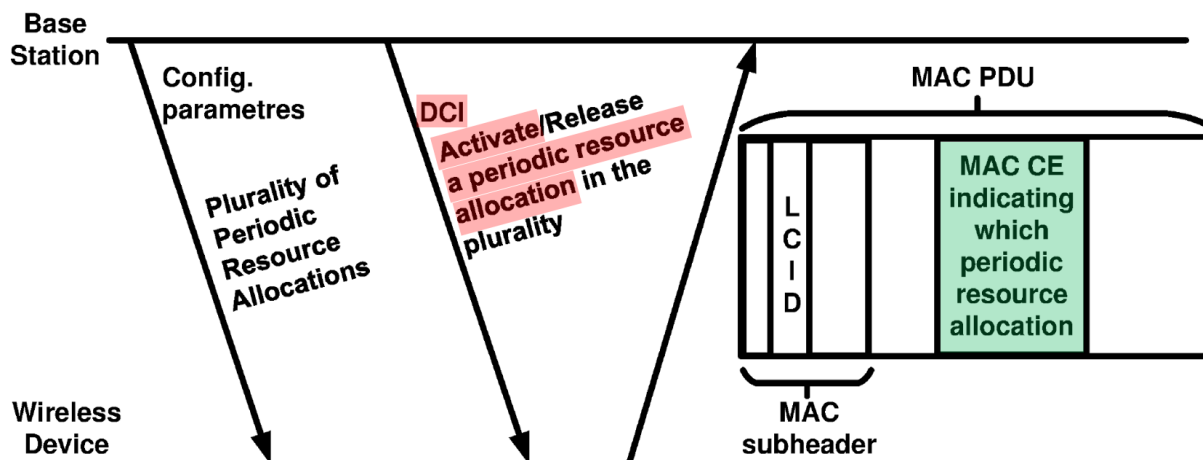


FIG. 18

Babaei is titled “Semi-Persistent Scheduling Confirmation” so, unsurprisingly, Babaei teaches many variations on DCI activation/release messages and associated confirmation MAC CEs, and much of the variation involves UE behavior. Babaei succinctly explains the transaction from the perspective of the base station in connection with Fig. 25 and 36:12-27. EX1004 at ¶ 129. Babaei explains that, first, the base station transmits configuration parameters for a plurality of periodic resource allocations. EX1006 at 36:13-15. This corresponds to limitation 2a of the Challenged Claims. EX1004 at ¶ 129. Then, the base station transmits a DCI to indicate activation or deactivation of one of the periodic resource allocations. EX1006 at 36:15-18. This corresponds to limitation 2c of the Challenged Claims. EX1004 at ¶ 129. Then, “in response to transmitting the DCI,” the base station receives a MAC PDU comprising a confirmation MAC CE. EX1006 at 36:19-27.

This corresponds to limitations 2d and 2f-2i of the Challenged Claims. EX1004 at ¶ 130.

The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74.

6) [2e] the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein

Babaei teaches this limitation and, in combination with Fwu, renders it obvious. As an initial matter, both Babaei and Fwu disclose base stations that communicate with UEs, including receiving circuitry. *See* Sections X.A.2.a).1) and 5). Both Babaei and Fwu also disclose base stations periodic uplink data transmissions from UEs configured with periodic uplink grants. *See* Sections X.A.2.a).2) and 4). A POSITA would understand that, after successful activation of a UL SPS as contemplated by both Babaei and Fwu, the receiving circuitry in the activating base station would then be configured to receive, at the assigned periodicity and on the assigned frequencies and times, the uplink data transmissions of the configured UE. EX1004 at ¶¶ 131-132. Babaei Figs. 14-16 illustrate the UE's use of allocated resources after allocation. EX1004 at ¶ 132. The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74.

- 7) [2f] the receiving circuitry is configured to receive confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and

Babaei teaches this limitation and, in combination with Fwu, renders it obvious. As an initial matter, both Babaei and Fwu disclose base stations that communicate with UEs, including receiving circuitry. *See* Sections X.2.a).1) and 5). Additionally, as shown for limitation 2d, Babaei teaches the receiving of confirmation information MAC CEs in response to DCI format scrambled by the RNTI corresponding to a previously configured periodic uplink grant. The same disclosure also teaches the receiving of a MAC CE in response to a DCI format that releases (that is, deactivates) the uplink grant. EX1004 at ¶¶ 133-134.

Babaei Fig. 18 is reproduced below, with annotations showing the receipt by the UE of the MAC CE (annotated in green) in response to a DCI message activating a periodic resource grant (annotated in red).

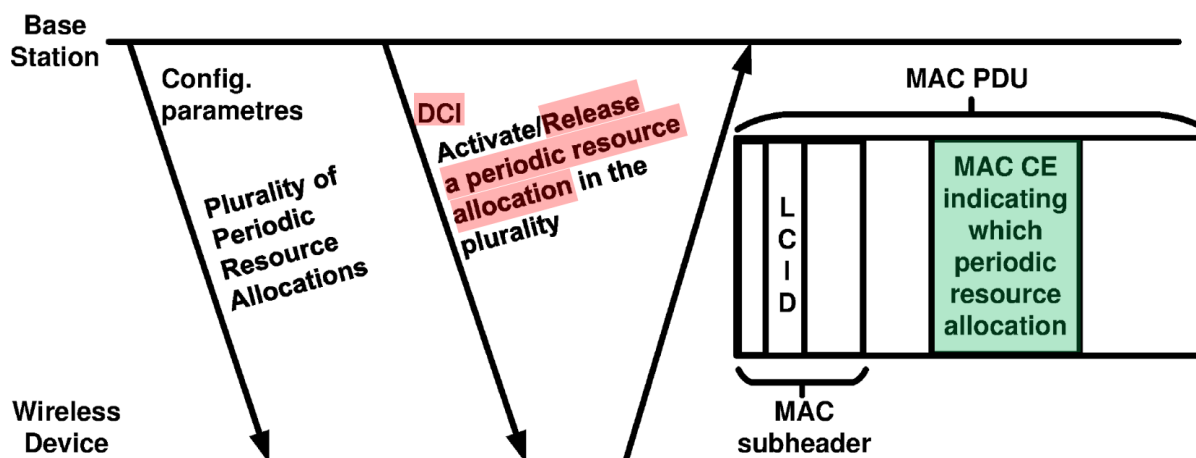


FIG. 18

As explained in connection with Limitation 2d, Babaei teaches the sending (by the wireless device) and the receiving (by the base station) of a confirmation MAC CE in response to a DCI either activating or deactivating (releasing) a periodic uplink grant. EX1006 at Figs. 18, 24, 25, 28, 29, 24:56-25:3, 26:4-22, 28:18-33:4; 35:43-58, 36:12-27, 37:19-54; EX1004 at ¶ 135. This limitation (2f) corresponds to the case where the DCI format releases the periodic uplink grant, and the eNB then receives a confirmation MAC CE corresponding to the release uplink grant. EX1004 at ¶ 135.

The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74.

- 8) [2g] the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID), [2h] the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and

Babaei teaches Limitations 2g and 2h. Limitations 2g and 2h relate to how the confirmation information MAC CEs recited in limitations 2d and 2f, respectively, are received by the claimed base station. Both require the MAC CE to be in a MAC protocol data unit (PDU) and identified by a MAC PDU subheader with a logical channel identifier (LCID). EX1004 at ¶ 136. This architecture for sending MAC CEs is expressly disclosed by Babaei. *Id.*

Babaei Fig. 18, annotated below, shows the structure of the MAC PDU that carries the confirmation information MAC CE in response to a DCI format that activates or release a periodic resource allocation. EX1006 at Fig. 18; EX1004 at ¶ 137. The MAC PDU (purple) is sent in response to a DCI message that either activates or release a periodic resource allocation (red). The MAC PDU includes the confirmation information MAC CE (green), which is identified by a MAC subheader (blue) that includes an LCID (orange). EX1004 at ¶ 137.

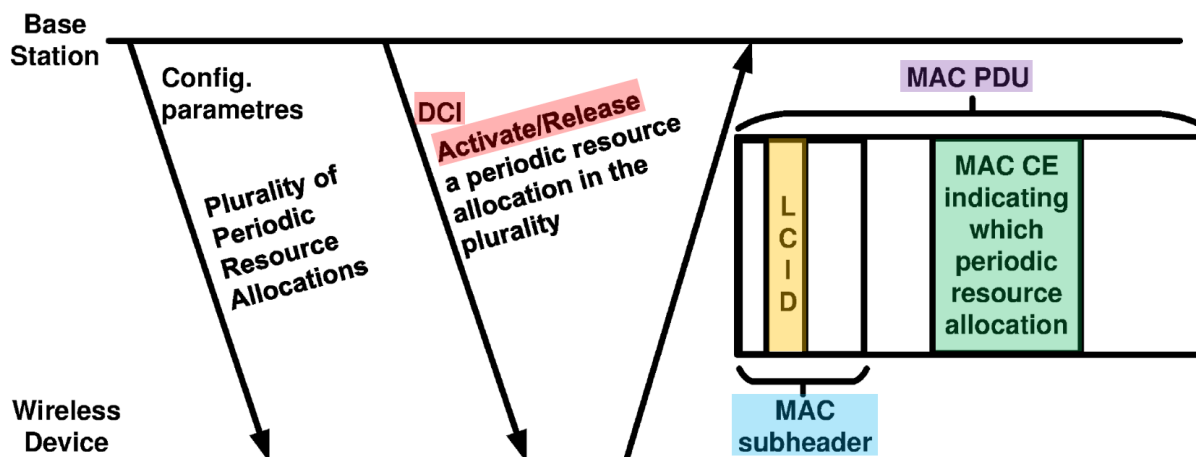


FIG. 18

Babaei describes the structure of the MAC PDU at 25:4-24. EX1004 at ¶ 138. A MAC PDU includes a MAC PDU header, which includes one or more MAC subheaders, each of which corresponds to a MAC service data unit (SDU) or MAC CE. EX1006 at 25:8-11; EX1004 at ¶ 138. The subheader consists of four to six fields, including, in all cases, an LCID field. EX1006 at 25:11-20; EX1004 at ¶ 138. The LCID is 5 bits, and identifies the logical channel instance of the corresponding MAC SDU or the type of the MAC CE. EX1006 at 25:27-30; EX1004 at ¶ 139.

Regarding confirmation MAC CEs for periodic resource allocations, Babaei describes its LCID scheme at 30:12-36. EX1004 at ¶ 140. “[T]he SPS confirmation MAC CE is identified by a MAC PDU subheader with an LCID that corresponds to the SPS configuration for which the SPS confirmation MAC CE corresponds to.” EX1006 at 30:12-15. Babaei teaches using eight different LCIDs to correspond to eight different SPS configurations, allowing the base station to receive confirmation

MAC CEs for as many as eight different SPS configurations for a single UE. EX1006 at 30:15-19; EX1004 at ¶ 140. Babaei also discloses an example where two SPS configurations are used, one for VOIP and one for V2X applications, each with its own corresponding LCID. EX1006 at 30:27-36; EX1004 at ¶ 140.

Babaei further illustrates the sending (by the UE) and receiving (by the base station) of a confirmation MAC CE at Figs. 24 and 25. EX1004 at ¶ 141. These figures are further described at Babaei 35:43-58 and 36:12-27. EX1004 at ¶ 141. Both disclosures make clear that the base station receives a MAC PDU with a MAC subheader comprising a LCID indicating that the MAC PDU comprises a confirmation MAC CE confirming the activation or deactivation of the periodic resource allocation. EX1004 at ¶ 141; EX1006 35:51-55, 36:21-24. Thus, whether the DCI format is an activation message (including the third information) or a deactivation or release message (including the fourth information), Babaei teaches the receipt of a MAC PDU in accordance with limitations 2g and 2h.

The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶¶ 72-74.

- 9) [2i] the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

Babaei teaches this claim limitation. As shown for limitations 2g and 2h, Babaei teaches a MAC PDU with a MAC subheader including an LCID that identifies the confirmation MAC CE. EX1004 at ¶ 142; *see* Section X.A.2.a).8). Babaei also teaches that the LCID used for the confirmation MAC CE for both activation and deactivation (third and fourth information) should be the same. EX1004 at ¶ 142.

For example, Babaei at 28:40-67 teaches that the LCID to be used should correspond to the periodic resource allocation being activated or released. EX1004 at ¶ 143. Babaei at 30:12-36 teaches another embodiment with the same feature of matching separate LCIDs for confirmation MAC CEs. EX1004 at ¶ 143. Babaei also proposed using the same LCID for both legacy and enhanced SPS confirmation MAC CEs, with the content of the confirmation MAC CEs indicating which applies. EX1006 at 29:4-26; EX1004 at ¶ 143. Both approaches (one LCID for each SPS configuration or one LCID for all SPS configurations) satisfy the claim's requirement that the confirmation MAC CE for both activation and deactivation or release be sent in a MAC PDU with a MAC subheader with an LCID that is the same for activation and deactivation or release. EX1004 at ¶ 144.

The disclosure relied upon in Babaei for this limitation is supported by Babaei's Priority application. See Section IX.A.2; EX1004 at ¶ 72-74.

b) Claim 4

Claim 4 is substantively the same as claim 2 but is directed to a communication method of a base station rather than the base station itself. EX1004 at ¶ 145. Claim 4's limitations, where not identical to claim 2's limitations, recite the step the corresponding limitation requires the base station to be configured to perform. *Id.* The same teachings of Babaei and Fwu that render the limitations of claim 2 obvious render the same limitations in claim 4 obvious, as it is obvious both to configure a base station to perform a step and to have the base station actually perform the step. *Id.*

1) [4pre] A communication method of a base station apparatus that communicates with a user equipment (UE), comprising:

Limitation 4pre recites a "communication method of a base station apparatus that communicates with a [UE]" while limitation 2pre recites a "base station that communicates with a UE." As set forth in connection with limitation 2pre, Babaei and Fwu render that limitation obvious. See Section X.A.2.a).1). The same disclosures and analysis render limitation 4pre obvious. EX1004 at ¶ 146.

2) [4a] transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity;

Limitation 4a recites “transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity” while limitation 2a recites “transmitting circuitry configured to transmit” the same RRC message. As set forth in connection with limitation 2a, Babaei and Fwu render that limitation obvious. See Section X.A.2.a).2). The same disclosures and analysis render limitation 4a obvious. EX1004 at ¶ 147.

3) [4b] transmitting a RRC message comprising second information used for configuring a numerology;

Limitation 4b recites “transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity” while limitation 2b recites “transmitting circuitry configured to transmit” the same RRC message. As set forth in connection with limitation 2b, Babaei and Fwu render that limitation obvious. See Section X.A.2.a).3). The same disclosures and analysis render limitation 4b obvious. EX1004 at ¶ 148.

- 4) [4c] transmitting in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for the uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;**

Limitation 4c recites “transmitting ... a downlink control information (DCI) format ...” with certain requirements while limitation 2c recites “transmitting circuitry configured to transmit” the same DCI format with the same requirements. As set forth in connection with limitation 2c, Babaei and Fwu render that limitation obvious. See Section X.A.2.a).4). The same disclosures and analysis render limitation 4c obvious. EX1004 at ¶ 149.

- 5) [4d] receiving confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI;**

Limitation 4d recites “receiving confirmation information Medium Access Control (MAC) Control Element (CE) ...” with certain requirements while limitation 2d recites “receiving circuitry configured to receive” the same MAC CE with the same requirements. As set forth in connection with limitation 2d, Babaei

renders that limitation obvious. See Section X.A.2.a).5). The same disclosures and analysis render limitation 4d obvious. EX1004 at ¶ 150.

6) [4e] receiving, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology;

Limitation 4e recites “receiving ... the uplink data transmission on the PUSCH ...” configured to while limitation 2e recites “receiving circuitry configured to receive” the same uplink transmission. As set forth in connection with limitation 2e, Babaei and Fwu render that limitation obvious. See Section X.A.2.a).6). The same disclosures and analysis render limitation 4e obvious. EX1004 at ¶ 151.

7) [4f] receiving confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, wherein

Limitation 4f recites “receiving confirmation information MAC CE ...” with certain requirements while limitation 2f recites “receiving circuitry configured to receive” the same MAC CE with the same requirements. As set forth in connection with limitation 2f, Babaei renders that limitation obvious. See Section X.A.2.a).7). The same disclosures and analysis render limitation 4f obvious. EX1004 at ¶ 152.

- 8) [4g] the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID), [4h] the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and [4i] the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

Limitations 4g, 4h, and 4i are identical to limitations 2g, 2h, and 2i, respectively, and the same disclosure and analysis that render limitations 2g, 2h, and 2i obvious likewise render limitations 4g, 4h, and 4i obvious. See Sections X.A.2.a).8) and 9). EX1004 at ¶ 153.

B. Ground 2: Babaei and Fwu combined with Lee

1. Motivation to Combine Lee with Babaei and Fwu

A POSITA would have been motivated to combine Babaei and Fwu for the reasons provided in Section X.A.1, *supra*. EX1004 at ¶¶ 93-98. That analysis is incorporated by reference here.

A POSITA would have been further motivated to combine Babaei and Fwu with Lee because each reference is in the same field of endeavor (late 4G / early 5G cellular communications) and address the problem of adding support for new services with different requirements to a radio access network. EX1004 at ¶¶ 154-

159. Specifically, Lee, like Babaei and Fwu, addresses the needs of vehicle-related communication, and semi-persistent scheduling for vehicle-related communication in particular. EX1011 at 2:8-26. Lee, like Babaei, is concerned with the signaling necessary to configure, activate, and deactivate different kinds of periodic uplink grants. EX1011 at 13:59-14:11 (RRC signaling configuring and DCI signaling activating and deactivating VoIP UL SPS), 14:12-35 (RRC signaling configuring and DCI signaling activating and deactivating V2X UL SPS); EX1004 at ¶ 155.

A POSITA would have been further motivated to combine these references by the concern, identified in Babaei, that employing a large number of SPS RNTIs would increase UE processing requirements and power consumption. EX1006 at 21:1-5; EX1004 at ¶156. Babaei contemplates UEs supporting 4 or 8 SPS configurations for V2X traffic in addition to SPS configurations for other traffic, such as VOIP. EX1006 at 21:8-10; EX1004 at ¶ 156. Babaei suggests using a single SPS RNTI for multiple SPS traffic types and adding signaling to the DCI to distinguish between SPS configurations. EX1006 at 22:24-27; EX1004 at ¶ 156. However, a POSITA would understand that DCI Format messages are compact, and limited in how many SPS configurations could be signaled. EX1004 at ¶ 157. A single bit would allow a DCI format with one SPS RNTI to signal one of two SPS configurations, two bits would allow one SPS RNTI to signal four SPS configurations, and so on. EX1004 at ¶ 157. Bits reserved for distinguishing between

SPS configurations would be lost for other purposes, so a POSITA would be motivated to combine multiple SPS RNTIs with the use of multiple SPS configurations per SPS RNTI in order to optimize both the DCI Format capacity and the resources required for additional SPS RNTIs. EX1004 at ¶ 157.

Lee teaches the use of a first RNTI for conventional VoIP UL traffic, the SPS-C-RNTI, and a second RNTI, the V2X-SPS-RNTI, for V2X UL SPS traffic. EX1011 at 13:59-14:35; EX1004 at ¶ 158. Lee, like Babaei, also teaches a UL SPS configuration index, allowing multiple different UL SPS configurations with a single RNTI. EX1011 at Figs. 11-12, 15:50-16:30; EX1004 at ¶ 158. A POSITA would see Lee's use of two RNTIs for these two different kinds of SPS traffic and be motivated to resolve Babaei's concern over using too many SPS RNTIs by using Lee's SPS-C-RNTI and V2X-SPS-RNTI solution. EX1004 at ¶ 159.

2. The Challenged Claims are Obvious in View of Lee combined with Babaei and Fwu

a) Claim 2

1) Limitations 2pre-2b and 2d-2i

Claim limitations 2pre-2b and 2d-2i are rendered obvious by Babaei and Fwu without the benefit of Lee for the reasons set forth for Ground 1, *supra*. See Sections X.A.2.a).1)-3) and 5)-9). The same disclosures and arguments, made in further view of Lee, still render these claim limitations obvious. EX1004 at ¶ 160.

Lee, like Babaei and Fwu, also teaches a base station that communicates with UEs, satisfying limitation 2Pre. EX1011 at Figs. 1, 8, 9; 4:7-21.

Lee, like Babaei and Fwu, also teaches a base station with transmitting circuitry that transmits an RRC message with information to configure the periodicity of a periodic uplink grant, as required by limitation 2a. EX1011 at Figs. 8, 9; 13:59-61, 14:17-19; EX1004 at ¶ 161.

Additionally, Lee, like Babaei and Fwu, also teaches a base station with receiving circuitry for receiving data periodically transmitted on the PUSCH in response to an activation DCI and a previously configured periodicity. EX1011 at Figs. 8, 9, 14:1-3, 14:28-30; EX1004 at ¶ 161.

Lee does not address MAC CE confirmation signaling, but this is taught by Babaei. EX1004 at ¶ 162.

The disclosure relied upon in Lee for this limitation is supported by Lee's provisional application. See Section IX.C.2; EX1004 at ¶¶ 82-84.

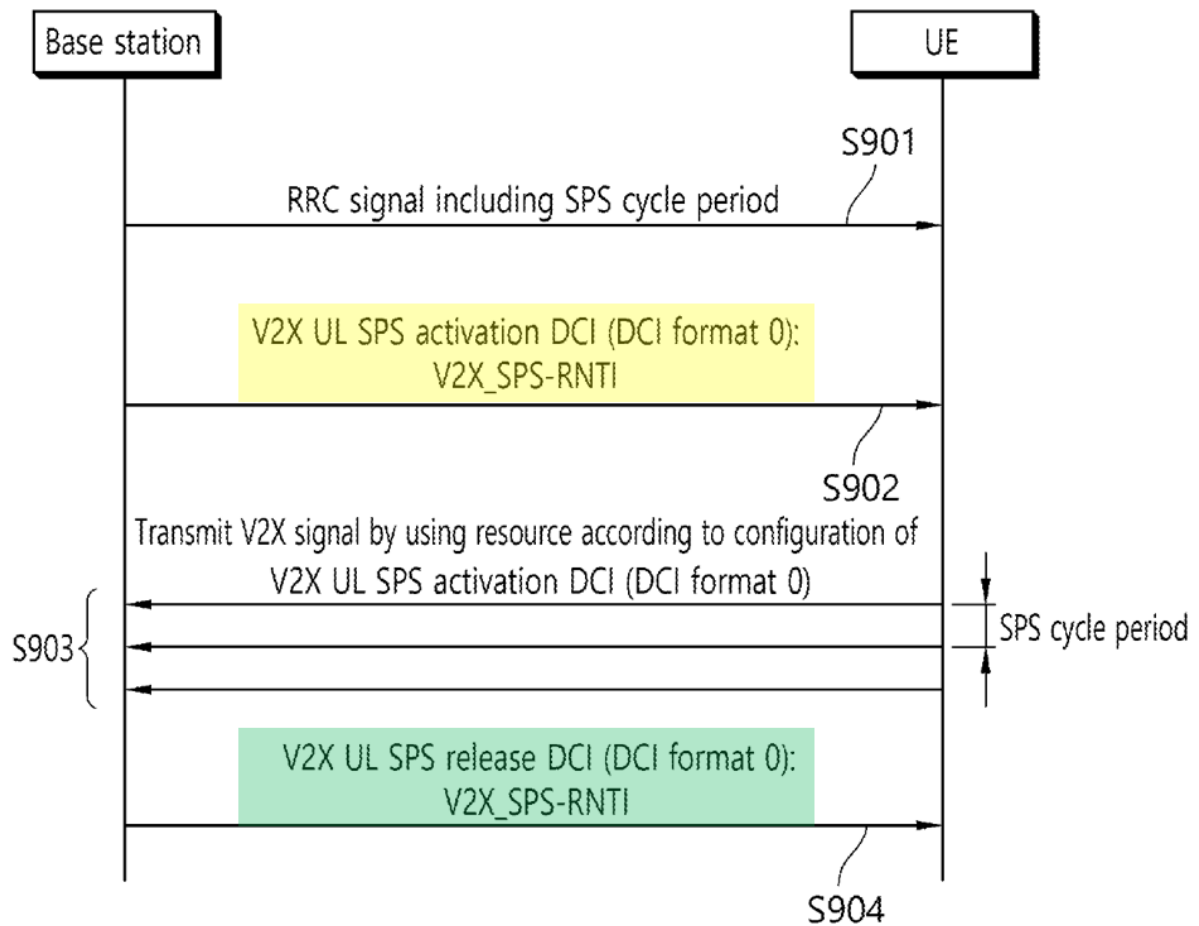
2) Limitation 2c

Lee, in combination with Babaei and Fwu, renders limitation 2c obvious. EX1004 at ¶ 163.

As laid out in Section X.B.1, *supra*, Lee, like Babaei and Fwu, relate to the improvement and extension of late 4G and early 5G technology to accommodate services with different requirements, and in particular services that require periodic

access to uplink resources, such as VoIP and V2X. EX1011 at Fig. 8; Fig. 9 13:56-14:35; EX1004 at ¶ 163. A POSITA would find it obvious to combine Lee's V2X-SPS-RNTI and SPS-C-RNTI with Babaei's teaching of both multiple RNTIs for periodic uplink grants and Babaei's use of SPS configuration indices to share RNTIs between configurations. EX1004 at ¶ 163.

Lee's V2X-SPS-RNTI and SPS-C-RNTI solution teaches the limitations of limitation 2c. EX1004 at ¶ 164. Lee Fig. 9 illustrates a V2X UL SPS activation and release (deactivation). EX1011 at Fig. 9, 14:12-35. Lee describes the scrambling of the CRC of the activation and release DCI formats by the V2X-SPS-RNTI, which is "differentiated from the above-described first RNTI." EX1011 at 14:22-27; EX1004 at ¶ 165. The "first RNTI" referenced here is the SPS-C-RNTI used for VoIP UL SPS. EX1011 at Fig. 8, 13:62-67; EX1004 at ¶ 165. Both of Lee's SPS-C-RNTI and V2X-SPS-RNTI are different from the C-RNTI used for dynamic scheduling. EX1011 at 10:35-40 (describing dynamic scheduling as an alternative to SPS scheduling); Babaei at 13:7-49 (describing use of C-RNTI with dynamic scheduling); EX1004 at ¶ 166. Lee therefore discloses an RNTI, the V2X-SPS-RNTI, that is different both from an SPS-RNTI and a C-RNTI. *Id.* Lee Fig. 9, reproduced below with annotations, shows a V2X-SPS-RNTI scrambled activation DCI (in yellow) and a V2X-SPS-RNTI scrambled release DCI (deactivating the periodic grant) in green. EX1004 at ¶ 167.



Lee also discloses using the common search space (CSS) for DCI messages scrambled with the V2X-SPS-RNTI. EX1011 at 17:13-22; EX1004 at ¶ 168. Lee also confirms that SPS uplink transmissions are on the PUSCH. EX1011 at 10:30-40; EX1004 at ¶ 169.

The disclosure relied upon in Lee for this limitation is supported by Lee's provisional application. See Section IX.C.2; EX1004 at ¶¶ 82-84.

b) Claim 4

1) Limitations 4pre-4b and 4d-4i

Limitations 4pre-4b and 4d-4i are rendered obvious by Babaei and Fwu without the benefit of Lee for the reasons set forth for Ground 1, *supra*. See Sections X.B.2.a).1), X.A.2.a).1)-3) and 5)-9), and X.A.2.b).1)-3) and 5)-9). The same disclosures and arguments, made in further view of Lee, still render these claim limitations obvious. EX1004 at ¶ 170.

2) Limitation 4c

Limitation 4c recites “transmitting ... a downlink control information (DCI) format ...” with certain requirements while limitation 2c recites “transmitting circuitry configured to transmit” the same DCI format with the same requirements. As set forth in connection with limitation 2c, Babaei, Fwu, and Lee render that limitation obvious. See Section X.B.2.a).2). The same disclosures and analysis render limitation 4c obvious. EX1004 at ¶ 171.

C. Ground 3: Babaei and Fwu combined with Agiwal

1. Motivation to Combine Agiwal with Babaei and Fwu

Like Babaei and Fwu, addressed in Section X.A.1 *supra*, Agiwal is directed to improvements in late 4G and early 5G communications systems related to the expansion in available services, and the signaling parameters necessary to support those services. EX1009 at [0003]. Specifically, Agiwal is concerned with resolving conflicts between enhanced Mobile Broadband (eMBB), ultra-reliable and low-

latency communication (URLLC) and massive machine type communication (mMTC). EX1009 at [0008]. These three categories correspond to Fwu's low latency partition (URLLC), the low energy partition (mMTC), and the other (normal) sub-RATs in the sub-3GHz frequency space (eMBB). EX1008 at [0044]; EX1004 at ¶¶ 172-178.

Agiwal is particularly concerned about the problem that can arise when two different numerologies are multiplexed in frequency, and URLLC traffic collides with eMBB traffic. EX1009 at [0054]-[0102]. Collisions can occur because the URLLC transmissions are lower latency and higher priority than eMBB transmissions, so the need for a URLLC transmission may not be apparent when the eMBB transmission was scheduled. EX1009 at Fig. 1; EX1004 at ¶ 174. Additionally, SPS transmissions, which are periodic and recurring, will be scheduled long in advance. EX1009 at Fig. 4; EX1004 at ¶ 174. Further, the interrupting URLLC packet has the potential to span many eMBB allocations. EX1009 at Fig. 6; EX1004 at ¶ 176.

Agiwal's solution to such collisions is a skip indication, which is a DCI message addressed to a new RNTI, the skip-RNTI. EX1009 at [0060]; EX1004 at ¶ 177. Agiwal's skip indication is transmitted in the common search space, so that each potentially affected UE can learn of the skip indication from the same DCI. EX1009 at [0060]; EX1004 at ¶ 177.

A POSITA would have been motivated to combine Agiwal's skip-RNTI solution with Babaei and Fwu's SPS signaling and numerology configuration disclosure to allow multiplexing of different sub-RATs in a frequency range. EX1004 at ¶ 178. A POSITA would recognize that the high-priority, low-latency communication enabled by URLLC is not always needed, and permanently devoting frequency space to URLLC would prevent the network from using that space for other purposes (e.g., eMBB). *Id.* A POSITA would therefore see the further addition of Agiwal to Babaei and Fwu as a reliable way maximize available bandwidth while avoiding collisions between different numerologies multiplexed into overlapping frequency spaces. EX1004 at ¶ 178.

2. The Challenged Claims are Obvious in View of Agiwal combined with Babaei and Fwu

a) Claim 2

1) Limitations 2pre-2b and 2e

Claim limitations 2pre-2b and 2e are rendered obvious by Babaei and Fwu without the benefit of Agiwal for the reasons set forth for Ground 1, *supra*. See Sections X.A.2.a).1)-3) and 6). The same disclosures and arguments, made in further view of Agiwal, still render these claim limitations obvious. EX1004 at ¶ 179.

2) Limitation 2c

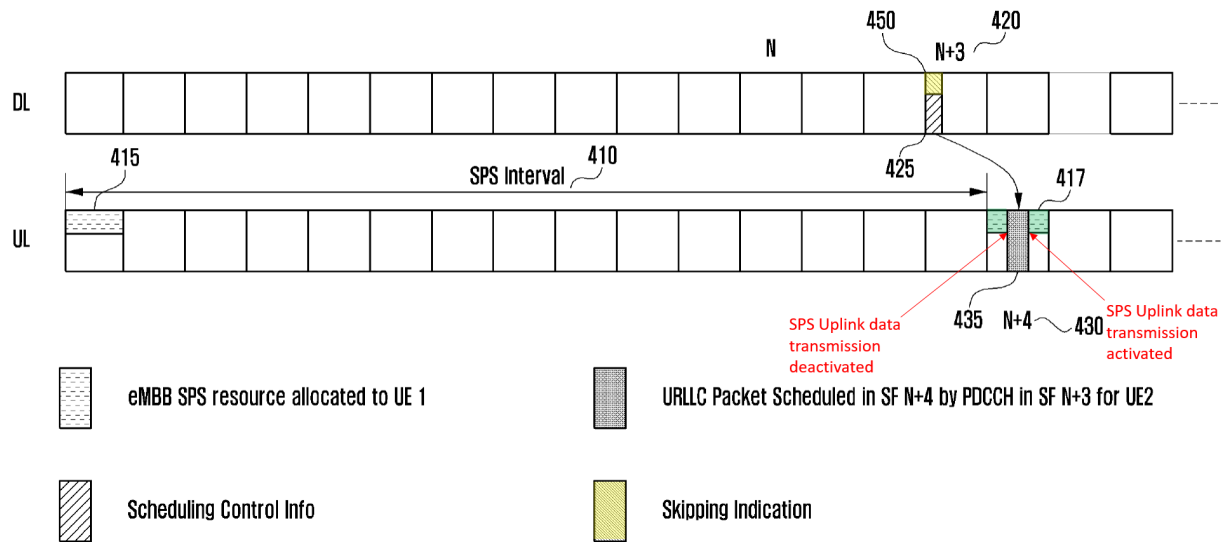
Agiwal's skip-RNTI scheme for avoiding collisions between URLLC transmissions and SPS uplink transmissions, combined with the teachings of Babaei and Fwu set forth for Ground 1, render limitation 2c obvious.

Specifically, the DCI format addressed to the skip-RNTI and broadcast in the common search space is a DCI format scrambled by an RNTI different from a C-RNTI or a semi-persistent scheduling C-RNTI that both activates and deactivates the uplink SPS transmission. EX1004 at ¶ 180.

As an initial matter, a POSITA would understand a DCI format to be addressed to an RNTI when the CRC for the DCI format is scrambled using the RNTI. EX1004 at ¶ 181. This is part of the blind decoding process, and how UEs determine whether a received DCI format is intended for that UE. *Id.* So, when Agiwal says the skip indication “can be addressed to a new RNTI (e.g., skip-RNTI)” a POSITA would understand this to refer to a DCI format with its CRC scrambled using the skip-RNTI. EX1009 at [0060]; EX1004 at ¶ 181.

Additionally, Agiwal teaches that its skip indication can be broadcast in the common search space. EX1004 at ¶ 182. For example, Agiwal says “the indication 150 can be ... downlink control information (DCI) in PDCCH or group common DCI in PDCCH.” EX1009 at [0060]; EX1004 at ¶ 182.

Finally, the skipping indication in Agiwal both activates and deactivates the periodic uplink transmission configured for the SRS UE. EX1004 at ¶ 183. Annotated Agiwal Fig. 4, below, shows the skipping indication both activating and deactivating an SPS uplink data transmission.



The disclosure relied upon in Agiwal for this limitation is supported by Agiwal's provisional application. See Section IX.D.2; EX1004 at ¶¶ 89-91.

3) Limitations 2d and 2f-2i

Limitations 2d and 2f-2i relate to the confirmation information MAC CE sent in response to a successfully received DCI Format activating or deactivating a periodic uplink grant. EX1004 at ¶¶ 184-186. In Ground 1, Petitioner relies upon the confirmation information MAC CEs described in Babaei for confirming DCI messages addressed to a UE's assigned RNTIs for one or more different SPS

configurations. *See* Sections X.A.2.a).5) and 7)-8). That analysis is incorporated here by reference.

However, it would have been obvious to send a confirmation information MAC CE to confirm receipt of the skip-RNTI in Agiwal if the UE's scheduled allocation overlaps the skipped region. EX1004 at ¶ 185. A POSITA would realize that the base station needs to know whether the conflicting SPS UE will allow the URLLC UE to transmit uncontested. *Id.*

Babaei teaches that each MAC CE is identified by a logical channel identifier (LCID). *See, e.g.,* EX1006 at 25:31-33. As a result, the confirmation MAC CE for the skip-RNTI would satisfy both limitations 2d and 2f-2i because there would be one confirmation MAC CE for both the third information (when to activate SPS) and the fourth information (when to deactivate SPS), which by necessity would have the same LCID.

The disclosure relied upon in Agiwal for this limitation is supported by Agiwal's provisional application. *See* Section IX.D.2; EX1004 at ¶¶ 89-91. The disclosure relied upon in Babaei for this limitation is supported by Babaei's provisional application. *See* Section IX.A.2; EX1004 at ¶¶ 72-74.

b) Claim 4

1) Limitations 4pre-4b and 4e

Claim limitations 4pre-4b and 4e are rendered obvious by Babaei and Fwu without the benefit of Agiwal for the reasons set forth for Ground 1, *supra*. See Sections X.A.2.a).1)-3) and 6) and X.A.2.b).1)-3) and 6). The same disclosures and arguments, made in further view of Agiwal, still render these claim limitations obvious. EX1004 at ¶ 187.

2) Limitation 4c

Limitation 4c recites “transmitting ... a downlink control information (DCI) format ...” with certain requirements while limitation 2c recites “transmitting circuitry configured to transmit” the same DCI format with the same requirements. As set forth in connection with limitation 2c, Babaei, Fwu, and Agiwal render that limitation obvious. See Section X.C.2.a).2). The same disclosures and analysis render limitation 4c obvious. EX1004 at ¶ 188.

3) Limitations 4d and 4f-4i

Limitation 4d recites “receiving confirmation information Medium Access Control (MAC) Control Element (CE) ...” with certain requirements while limitation 2d recites “receiving circuitry configured to receive” the same MAC CE with the same requirements. Limitation 4f recites “receiving confirmation information MAC CE ...” with certain requirements while limitation 2f recites

“receiving circuitry configured to receive” the same MAC CE with the same requirements. Limitations 4g, 4h, and 4i are identical to limitations 2g, 2h, and 2i, respectively. The same disclosure and analysis that render limitations 2d and 2f-2i obvious likewise render limitations 4d and 4f-4i obvious. *See* Section X.C.2.a).3). EX1004 at ¶¶ 189-190.

XI. CONCLUSION

For the reasons given above, Petitioners request institution of *inter partes* review of the '976 Patent to cancel the Challenged Claims based on each of the grounds specified in this petition.

Respectfully submitted,

Dated: January 26, 2024

By: /Scott W. Hejny/

Scott W. Hejny

Reg. No. 45,882

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 10,484,976 contains, as measured by the word processing system used to prepare this paper, 11,602 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: January 26, 2024

By: /Scott W. Hejny/

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CERTIFICATE OF SERVICE

I hereby certify that on January 26, 2024, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 10,484,976 and supporting exhibits was served on the following parties via Federal Express or Express Mail:

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A courtesy copy was also sent via electronic mail to Patent Owner's litigation counsel listed below:

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