

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS, AT&T SERVICES,
INC., T-MOBILE USA, INC., GOOGLE LLC, ERICSSON, INC., AND NOKIA
OF AMERICA CORPORATION.

Petitioners,

v.

PEGASUS WIRELESS INNOVATION LLC,
Patent Owner.

U.S. PATENT NO. 10,181,931
Title: METHOD FOR UPLINK CONTROL CHANNEL RESOURCE
ALLOCATION OF TERMINAL AND APPARATUS THEREOF

Inter Partes Review No.: IPR2025-00138

PETITION FOR *INTER PARTES* REVIEW OF U.S. PAT. NO. 10,181,931

Mail Stop “PATENT BOARD”

Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. OVERVIEW	1
III. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A)).....	6
IV. REASONS FOR REQUESTED RELIEF	6
V. BACKGROUND	6
A. Summary of the '931 Patent.....	6
B. Prosecution History	6
C. Priority Date	8
D. Claim Construction	9
E. POSITA	9
F. State of the Art	9
1. HARQ ACK/NACK Scheduling	10
2. MTC	11
a. Coverage Enhancement	11
b. MTC HARQ ACK/NACK Scheduling	12
VI. IDENTIFICATION OF CHALLENGES.....	13
A. Challenged Claims	13
B. Statutory Grounds for Challenges.....	13
VII. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE.....	15
A. Ground 1: Claims 1-7 are unpatentable over You in view of Kim	15

1.	You.....	15
2.	Kim.....	17
3.	Motivation to Combine You and Kim	19
4.	Application of You and Kim to Challenged Claims.....	20
a.	Claim 1.....	20
b.	Claim 2.....	32
c.	Claim 3.....	33
d.	Claim 4.....	36
e.	Claim 5.....	36
f.	Claim 6.....	39
g.	Claim 7.....	40
B.	Ground 2: Claims 1-7 are unpatentable over Lee in view of Zhang.....	43
1.	Lee.....	43
2.	Zhang.....	44
3.	Motivation to Combine Lee and Zhang.....	45
4.	Application of Lee and Zhang to the Challenged Claims.....	47
a.	Claim 1.....	47
b.	Claim 2.....	62
c.	Claim 3.....	62
d.	Claim 4.....	66
e.	Claim 5.....	66
f.	Claim 6.....	71

g.	Claim 7.....	72
VIII.	THE BOARD SHOULD NOT EXERCISE ITS DISCRETION AND DENY INSTITUTION	75
A.	The Petition Does Not Present the Same References Addressed in Prosecution	75
B.	The Board Should Not Deny Institution Under <i>Fintiv</i>	77
C.	The Board Should Not Deny Institution Under <i>General Plastic</i>	81
IX.	MANDATORY NOTICES UNDER 37 C.F.R. § 42.8.....	81
A.	Real Party-in-Interest (37 C.F.R. § 42.8(b)(1)).....	81
B.	Related Matters (37 C.F.R. § 42.8(b)(2)).....	82
C.	Related Patents	83
X.	Lead/Back-up Counsel (37 C.F.R. § 42.8(b)(3)).....	83
A.	Notice of Service Information (37 C.F.R. § 42.8(b)(4)).....	85
XI.	CONCLUSION.....	85

TABLE OF AUTHORITIES

Regulatory Cases

<i>Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH</i> , IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020)	75-76
<i>Apple Inc. v. Koss Corporation</i> , IPR2021- 00255	14
<i>Apple v. Fintiv, Inc.</i> , IPR2020-00019, Paper 11 at 13-14 (PTAB Mar. 20, 2020)	77-78, 80
<i>Cf. Comcast Cable Commn's, LLC v. Rovi Guides, Inc.</i> , IPR2019-00231, Paper 14 at 11 (PTAB May 20, 2019)	81
<i>Dish Network v. Broadband iTV</i> , IPR2020-01280, Paper 17 at 16 (PTAB Feb. 4, 2021)	78, 80
<i>Godbersen-Smith Constr. Co. v. Guntert & Zimmerman Const. Div., Inc.</i> , IPR2021-00050, Paper 24 at 19-21 (PTAB May 7, 2021)	76
<i>NHK Spring Co. v. Intri-Plex Techs., Inc.</i> , IPR2018-00752, Paper 8 at 19-20 (PTAB Sept. 12, 2018)	77
<i>Penumbra, Inc. v. RapidPulse, Inc.</i> (IPR2021-01466), Paper 34 (March 10, 2023)	14-15
<i>Sand Revolution</i> , IPR2019-01393, Paper 24 at 12-13	80
<i>Tianma Microelectronics Co., v. Japan Display Inc.</i> , IPR2021-01058, Paper 16	77
<i>Tianma Microelectronics Co., v. Japan Display Inc.</i> , IPR2021-01058, Paper 16 at 31 (PTAB Jan. 5, 2022)	77

Federal Statutes

35 U.S.C. § 102(a)(2)	13-15
35 U.S.C. § 103	1, 13
35 U.S.C. § 311	1
35 U.S.C. § 314(a)	77

35 U.S.C. § 315(e)	82
35 U.S.C. § 325(d)	75, 77
35 U.S.C. § 371	13-14

Regulations

37 C.F.R. § 42.1	1
37 CFR 1.57(b)	13

Non-Periodical Publications

MPEP (8th Ed) §2163.07(b)	14
---------------------------------	----

Petitioners' Exhibit List

<i>Exhibit #</i>	<i>Description</i>
1001	U.S. Patent No. 10,181,931 (the “’931 Patent”)
1002	Prosecution history of the ’931 Patent (“File History”)
1003	Declaration of Petitioners’ Expert
1004	U.S. Patent No. 11,470,619 (“Lee”)
1005	U.S. Provisional Application No. 61/863,328 (“Lee ’328”)
1006	International Patent Publication WO 2014/048487 (“Zhang”)
1007	3GPP TS 36.213 v.11.3.0 (“36.213”)
1008	ZTE, “Discussion on Repetition for Control Channel and Traffic Channel”, R1-133062, 3GPP TSG RAN WG1 Meeting #74 (August 2013) (“ZTE”)
1009	U.S. Publication No. 2014/0105191 (“Yang”)
1010	U.S. Publication No. 2016/0127952 (“You”)
1011	Certified Translation of U.S. Provisional Application No. 61/843,456 (“You ’456”)
1012	Certified Translation of International Patent Publication WO 2013/027963 (“Kim”)
1013	International Patent Publication WO/2014/204128 (“You PCT”)
1014	International Patent Publication WO/2015/021318 (“Lee PCT”)
1015	Curriculum Vitae of Petitioner’s Expert Dr. Mark Lanning
1016	3GPP TS 36.211 v.11.4.0 (“36.211”)
1017	U.S. Provisional Application No. 61/843,456
1018	International Patent Publication WO/2014/204128
1019	International Patent Publication WO 2013/027963
1020	3GPP TS 36.212 v.11.3.0 (“36.212”)
1021	U.S. Patent Application Publication No. 2014/0098761 (“Lee ’761”)

<i>Exhibit #</i>	<i>Description</i>
1022	U.S. Provisional Application No. 61/843,456
1023	International Patent Publication WO 2013/027963
1024	<i>Pegasus Wireless Innovation LLC. v. Verizon Communications Inc. et al.</i> , No. 2:23-cv-00640 (E.D. Tex) Dkt. 150
1025	<i>Pegasus Wireless Innovation LLC. v. Verizon Communications Inc. et al.</i> , No. 2:23-cv-00640 (E.D. Tex) Dkt. 68
1026	<i>Pegasus Wireless Innovation LLC. v. Verizon Communications Inc. et al.</i> , No. 2:23-cv-00640 (E.D. Tex) Dkt. 16

I. INTRODUCTION

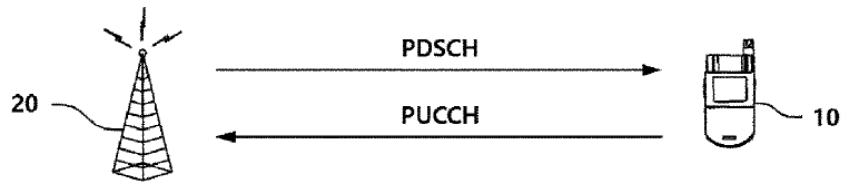
Pursuant to 35 U.S.C. §§ 311 *et seq.* and 37 C.F.R. §§ 42.1 *et seq.*, Cellco Partnership d/b/a Verizon Wireless, AT&T Services, Inc., T-Mobile USA, Inc., Google LLC, Ericsson, Inc. and Nokia of America Corporation (collectively “Petitioners”) hereby petition for an *inter partes* review of U.S. Patent No. 10,181,931 (the “’931 Patent”). Petitioners respectfully submit that claims 1-7 (the “Challenged Claims”) of the ’931 Patent are unpatentable under 35 U.S.C. §103 in view of the prior art herein.

II. OVERVIEW

The ’931 Patent is directed to allocating resources for an uplink control channel for transmitting a Hybrid Automatic Repeat Request (“HARQ”) acknowledgement (“ACK”) or negative acknowledgement (“NACK”) in a wireless communication system. EX-1001, 1:18-22.

In conventional 3GPP LTE/LTE-Advanced systems, HARQ ACK/NACK feedback is transmitted by user equipment (“UE”) on a Physical Uplink Control Channel (“PUCCH”) resource in response to a downlink transmission of a Physical Downlink Shared Channel (“PDSCH”) by a base station (“BS”). EX-1001, 6:40-43.

FIG. 1



EX-1001, FIG. 1.

PUCCH resource mapping for the HARQ ACK/NACK is determined according to:

$$n_{\text{PUCCH}}^{(1,p0)} = n_{\text{CCE}} + N_{\text{PUCCH}}^{(1)}$$

$$n_{\text{PUCCH}}^{(1,p1)} = n_{\text{CCE}} + N_{\text{PUCCH}}^{(1)}$$

The equations calculate the HARQ ACK/NACK feedback resource for an antenna port 0 ($n_{\text{PUCCH}}^{(1,p0)}$) and antenna port 1 ($n_{\text{PUCCH}}^{(1,p1)}$). n_{CCE} denotes the lowest Control Channel Element (“CCE”) index in which the corresponding downlink assignment downlink control information (“DCI”) is transmitted. $N_{\text{PUCCH}}^{(1)}$ denotes a cell-specific parameter configured by higher layer (“RRC”) signaling. EX-1001, 6:40-62.

The '931 Patent is directed to providing modified ways of determining a

PUCCH resource for sending an HARQ ACK/NACK response by a machine type communication (“MTC”) terminal. MTC terminals have low performance hardware and software compared to typical LTE/LTE-Advanced terminals/UEs. Consequently, a BS repeatedly transmits PDCCH and PDSCH downlink information to an MTC terminal through a plurality of subframes to improve reception. The repeated transmission across multiple subframes may cause issues in allocating uplink resources for HARQ ACK/NACK, including an uncertainty in the CCE index value to be applied to the lowest CCE index by the MTC terminal and possible collisions between a PUCCH resource of the MTC terminal and the PUCCH resource of an LTE terminal. The '931 Patent discloses three different embodiments, which “solve” these problems. EX-1001, 7:13-16, 7:25-36, 7:52-62.

In the first embodiment, the conventional PUCCH resource mapping equation is reused with different procedures for determining the PUCCH Resource Offset ($N_{\text{PUCCH},\text{MTC}}^{(1)}$) and the lowest CCE index (n_{CCE}) as defined by:

$$n_{\text{PUCCH}}^{(1,p0)} = n_{\text{CCE}} + N_{\text{PUCCH},\text{MTC}}^{(1)}$$

$$n_{\text{PUCCH}}^{(1,p1)} = n_{\text{CCE}} + 1 + N_{\text{PUCCH},\text{MTC}}^{(1)}$$

The $N_{\text{PUCCH},\text{MTC}}^{(1)}$ is configured similarly to a traditional LTE terminal, such as by UE- or cell-specific RRC signaling or by defining a set of start offset parameters and determining the specific parameter using a new or existing DCI field. $N_{\text{PUCCH},\text{MTC}}^{(1)}$ is determined implicitly based on the number of PDCCH

repetitions used for transmitting the corresponding DCI. When the PDCCH is repeatedly transmitted for better reception, n_{CCE} may be defined in a number of ways, including as the lowest CCE index used for the first PDCCH, the lowest CCE index of the N^{th} PDCCH, or the smallest CCE index among all the CCE indexes transmitted across the multiple PDCCHs. EX-1001, 8:6-8; 8:21-9:1-7; 9:24-34.

In the second embodiment, a PUCCH resource is allocated with a DCI message sent on the PDCCH. A BS pre-configures a set of candidate PUCCH resource values, and the specific PUCCH resource value is directly indicated to the MTC terminal in the corresponding PDCCH DCI field. A new DCI field is defined or an existing DCI field is utilized. This process is illustrated in Table 1:

TABLE 1	
PUCCH resource indicator value in downlink allocation DCI	$n_{PUCCH}^{(1P)}$
'00'	First PUCCH resource value configured by higher layer
'01'	Second PUCCH resource value configured by higher layer
'01'	Third PUCCH resource value configured by higher layer
'11'	Fourth PUCCH resource value configured by higher layer

EX-1001, TABLE 1.

Each resource candidate indicates the number of PUCCH repetitions (i.e., the number of times the HARQ ACK/NACK should be repeatedly transmitted).

EX-1001, 9:48-59; 10:25-31.

In the third embodiment, an additional ACK/NACK resource offset value ($\Delta_{ARO,MTC}$) is defined through a PDCCH DCI field shown in Table 2.

TABLE 2

ACK/NACK resource offset field in DCI format 1A/1B/1D/1/2A/2/2B/2C/2D	$\Delta_{ARO,MTC}$
0	0
1	-1
2	-2
3	2

The $\Delta_{ARO,MTC}$ value is applied to the equations defined above to calculate the PUCCH resource:

$$n_{PUCCH}^{(1,p0)} = n_{CCE} + N_{PUCCH,MTC}^{(1)} + \Delta_{ARO,MTC}$$

$$n_{PUCCH}^{(1,p1)} = n_{CCE} + 1 + N_{PUCCH,MTC}^{(1)} + \Delta_{ARO,MTC}$$

EX-1001, 10:36-11:7.

The Challenged Claims broadly claim these purported improvements in the alternative and vary only in class (e.g., method/apparatus) and frame of reference (e.g., UE/BS). As acknowledged by the '931 Patent, the basic equations for allocating PUCCH resources were known and the incremental modifications to these equations disclosed by '931 Patent are broadly claimed such that the claims do not recite anything inventive.

The cited prior art discloses the broadly claimed subject matter. This

Petition demonstrates a reasonable likelihood of unpatentability for at least one Challenged Claim, and therefore Petitioners respectfully request that the Board institute *inter partes* review.

III. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A))

Petitioners certify that the '931 Patent is available for IPR and Petitioners are not barred or estopped from requesting an IPR of the Challenged Claims on the grounds identified herein. 37 C.F.R. § 42.104(a).

IV. REASONS FOR REQUESTED RELIEF

As explained below and in the Declaration of Petitioners' Expert Mark Lanning (EX-1003), the Challenged Claims were obvious to a person of ordinary skill in the art ("POSITA") at the time of the invention.

V. BACKGROUND

A. Summary of the '931 Patent

As described above, the '931 Patent broadly claims techniques for allocating resources of an uplink control channel for HARQ ACK/NACK feedback of an MTC terminal in a wireless communication system.

B. Prosecution History

The '931 Patent issued from U.S. Patent Application No. 15/025,262, which was filed on March 25, 2016, as a National Stage Entry of PCT/KR2014/008765. During prosecution, the claims were repeatedly rejected and amended.

Before examination, the Applicant cancelled and amended several claims

resulting in 16 total claims of which 4 were independent. EX-1002, 274-279. Each independent claim recited three alternative ways to determine the resource allocated to the uplink control channel. EX-1002, 274-278.

In the last rejection before allowance, the claims were rejected as obvious over U.S. Patent Publication No. 2013/0315159 to Xia et al. (“Xia”) in view of “Text proposal on PUCCH coverage improvement for Section 9.5.5 of TR 36.888” presented at the 3GPP Meeting #72bis (“RAN72”), U.S. Patent Publication No. 2017/0180098 (“You 098”), and U.S. Patent Publication No. 2013/0250882 to Dinan et al. (“Dinan”). EX-1002, 379-405.

In response, Applicant amended the independent claims to incorporate the limitations of six dependent claims. These limitations required “the start offset information of the resource allocated to the uplink control channel is configured separated from start offset information for a terminal different from the MTC terminal” and “a plurality of pieces of start offset information of the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are received through cell-specific high layer signaling for the MTC terminal from a base station.” EX-1002, 424-433. While these limitations further limit the “the start offset information,” this is only *one* of the *three alternatives* recited by the independent claims, as the alternative language recited by the independent claims, i.e., “at least one of,” was never deleted. EX-

1003 ¶89.

Applicant argued Xia in view of RAN72, Dinan, and You 098 fails to disclose that the start offset information is configured *separated* from the start offset information for a terminal *different from* the MTC terminal. Applicant further argued that the references fail to disclose a plurality of pieces of start offset information, which are received through cell-specific higher level signaling.¹ EX-1002, 430-433.

A Notice of Allowance then issued stating that the Applicant's arguments were persuasive. EX-1002, 465-473.

C. Priority Date

Patent Owner bears the burden of establishing that it is entitled to the priority date of KR 10-2013-0115367 ("367 Provisional"), filed September 27, 2013, and/or KR 10-2014-0057938 ("938 Provisional"), filed May 14, 2014. For this Petition, the issue does not need to be resolved because each of the cited prior

¹ Applicant also argued RAN72 and You 098 did not qualify as prior art because the application claimed priority to two foreign applications and thus has an earlier effective filing date than these references. EX-1002, 430-431. Applicant submitted a certified translation of the priority document KR 10-2013-0115367. EX-1002, 434-462.

art references is prior art to the Challenged Claims of the '931 Patent regardless of whether the Challenged Claims are entitled to the filing date of the '367 Provisional or the '938 Provisional.

D. Claim Construction

Petitioners propose each claim term be given its plain and ordinary meaning. The prior art meets each claim limitation under any reasonable construction.

E. POSITA

A person of ordinary skill in the art (“POSITA”) pertinent to the '931 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. A person with a different degree, but with additional relevant experience, could still qualify if the additional experience compensates for the different educational background. 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. Ex. 1003, ¶¶28-32.

F. State of the Art

The following section describes the state of the art as of the priority date. The prior art references and the discussions of what a POSITA knew provide the factual support for the general description of the state of the art, assist in

understanding how a POSITA understood the prior art, and provide the motivation to modify or combine the teachings of references.

1. HARQ ACK/NACK Scheduling

By the priority date, scheduling a HARQ ACK/NACK uplink channel was well known. A group known as the 3rd Generation Partnership Project (“3GPP”) defines global technical specifications (“TS”) and reports for present and future wireless communication systems, including HARQ ACK/NACK procedures. EX-1003 ¶¶33-38. These standards are used by equipment manufacturers – both for BSs and UEs – to ensure that the devices may communicate with one another. EX-1003 ¶¶33-38. The 3GPP-defined procedure for allocating a HARQ ACK/NACK uplink channel was established before the priority date, as evidenced by 3GPP TS36.213 v.11.3.0 (EX-1007) (“36.213”). EX-1003, ¶47.

Specifically, 36.213 provides a method for the UE to calculate its PUCCH resource for sending an HARQ ACK/NACK in response to a received PDSCH transmission indicated by the detection of a corresponding PDCCH/EPDCCH from the BS. EX-1007, Section 10.1.3.1. The UE determines its PUCCH resource by utilizing a starting offset ($N^{(1)}_{\text{PUCCH}}$) specified by higher signaling and the number of the first CCE used for transmission of the corresponding PDCCH (n_{CCE}). EX-1007, Section 10.1.3.1. 36.213 further discloses another method for calculating the PUCCH resource by using an additional ACK/NACK resource offset received in a

EDPCCH DCI field. EX-1007, Table 10.1.3.1-2; EX-1003 ¶¶48-50.

36.213 also discloses transmitting the HARQ ACK/NACK by repeatedly using the same PUCCH resource. EX-1007, Section 10.1.4. A UE-specific parameter, *ackNackRepetition*, is configured by higher layers and, when enabled, directs a UE to repeat any HARQ ACK/NACK transmission with a repetition factor (N_{ANRep}), also provided by higher layers. EX-1007, Section 10.1.4. For a HARQ ACK/NACK response to a PDSCH indicated by a corresponding PDCCH/EPDCCH, the initial HARQ ACK/NACK is transmitted to a PUCCH resource as determined by the method described above and the $N_{\text{ANRep}}-1$ repetitions are always transmitted on a single PUCCH resource, $n^{(1,p)}_{\text{PUCCH,ANRep}}$, which is signaled by higher layers. EX-1007, Section 10.1.4; EX-1003 ¶51.

2. MTC

MTC involves machines communicating with each other without human interaction. EX-1001, 1:26-30. MTC terminals are often installed in areas where radio wave environments are poor compared to traditional UEs/terminals. EX-1001, 1:33-37; EX-1003 ¶52.

a. Coverage Enhancement

MTC terminals may support coverage enhancement. EX-1001, 3:56-58. Methods of achieving coverage enhancement, such as transmission repetition, were well-known by the priority date, as such concepts already were included in the

technical specifications. EX-1007, Section 10.1.4. These known techniques, including repeated transmission of control channels, were also being extended to MTC terminals. EX-1008, Sections 1, 2.1; EX-1005 ¶46; EX-1021 ¶¶123, 128; EX-1003 ¶53. For example, ZTE’s submission for the 3GPP TSG RAN WG1 Meeting #74 teaches that to achieve a coverage enhancement target of 15dB, 10 repetitions of PUCCH are required. EX-1008, Table 1; EX-1003 ¶53.

b. MTC HARQ ACK/NACK Scheduling

The ’931 Patent acknowledges that determining the resources of an uplink control channel for HARQ ACK/NACK by an MTC terminal may be uncertain and such resources may conflict with the resources of an uplink control channel of a typical terminal. EX-1001, 1:41-51. Such issues were well-known before the priority date and solutions were being actively considered. EX-1003 ¶54.

For example, Yang (EX-1009) discloses an invention that “can be usefully applied to MTC.” EX-1009 ¶67. Yang proposes having a BS pre-configure four resource sets through higher layer signaling and communicating to a UE which resource set the UE should use through 2-bit information. EX-1009 ¶85. Yang also proposes using the lowest CCE index used for PDCCH transmission (n_{CCE}) and resource offset ($N^{(1)}_{\text{PUCCH}}$) to determine the PUCCH resource to use for transmission:

$$N^{(1)}_{\text{PUCCH}} = n_{\text{CCE}} + N^{(1)}_{\text{PUCCH}}$$

EX-1009 ¶¶89-90; EX-1003 ¶55.

For multiple UEs, Yang proposes reserving an ACK/NACK transmission resource for each UE through RRC signaling. EX-1009 ¶111; EX-1003 ¶56.

VI. IDENTIFICATION OF CHALLENGES

A. Challenged Claims

This Petition challenges claims 1-7 of the '931 Patent.

B. Statutory Grounds for Challenges

The Challenges are detailed below and summarized as follows:

Ground	Claims	Basis	Reference(s)
1	1-7	§ 103	You in view of Kim
2	1-7	§ 103	Lee in view of Zhang

U.S. Patent Application No. 14/898,553, published as U.S. Patent Publication No. 2016/0127952 (EX-1010) (“You”), is a National Stage Entry under 35 U.S.C. § 371 of PCT/KR2014/005100, filed on June 11, 2014, and published as WO/2014/204128 (“You PCT”) (EX-1013) on December 24, 2014. The You PCT claims the benefit of and thus incorporates by reference U.S. Provisional Application No. 61/843,456 (EX-1011, “You ’456”), filed on July 8, 2013, and qualifies as prior art under 35 U.S.C. §102(a)(2). 37 CFR 1.57(b). You meets the procedural requirements for claiming priority to the You PCT and meets the ministerial requirements for claiming priority to You ’456 because it properly claims the benefit of You ’456 and the You PCT was filed co-pending with You

'456. *Penumbra, Inc. v. RapidPulse, Inc.* (IPR2021-01466), Paper 34 (March 10, 2023).

International Patent Application No. PCT/KR2012/006493 was filed on August 16, 2012, and published as International Publication No. WO/2013/027963 to Kim et al. (EX-1013) ("Kim"). Kim qualifies as prior art under 35 U.S.C. §102(a)(2).

United States Patent No. 11,470,619 to Lee et al. (EX-1004) ("Lee") is a National Stage Entry under 35 U.S.C. § 371 of International Application No. PCT/US2014/050211, filed on Feb. 5, 2016, and published as WO/2015/021318 ("Lee PCT") (EX-1014) on February 12, 2015. The Lee PCT claims the benefit of U.S. Provisional Application No. 61/863,328 (EX-1005, "Lee '328"), filed on Aug. 7, 2013, and qualifies as prior art under 35 U.S.C. §102(a)(2). Lee expressly incorporated by reference the entirety of Lee '328. Ex-1004, 1:9-15. Thus, the disclosure of Lee '328 forms part of Lee for all purposes as explicitly contained therein. MPEP (8th Ed) §2163.07(b) ("information incorporated is as much a part of the application as filed as if the text was repeated in the application, and should be treated as part of the text of the application as filed."); *Apple Inc. v. Koss Corporation*, IPR2021- 00255, Paper 54 (Final Written Decision) (May 31, 2022), at 25-30 (holding claims obvious over host reference, relying on material from two provisional applications incorporated in their entirety). Thus, because Lee includes

the entirety of Lee '328, Lee '328 should be treated as part of the text of Lee, and thus, for this Petition, citations to Lee include citations to EX-1004 and EX-1005. Further, Lee meets the procedural requirements for claiming priority to the Lee PCT and meets the ministerial requirements for claiming priority to Lee '328 because it properly claims the benefit of Lee '328 and the Lee PCT was filed co-pending with Lee '328. *Penumbra, Inc. v. RapidPulse, Inc.* (IPR2021-01466), Paper 34 (March 10, 2023).

International Patent Application No. PCT/EP2012/069193 was filed on September 28, 2012, and published as International Publication No. WO 2014/048487 to Zhang et al. (EX-1006) (“Zhang”). Zhang qualifies as prior art under 35 U.S.C. §102(a)(2).

VII. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Claims 1-7 are unpatentable over You in view of Kim

1. You

You is directed to datalink data transmission techniques for MTC UEs. EX-1011, p.14.

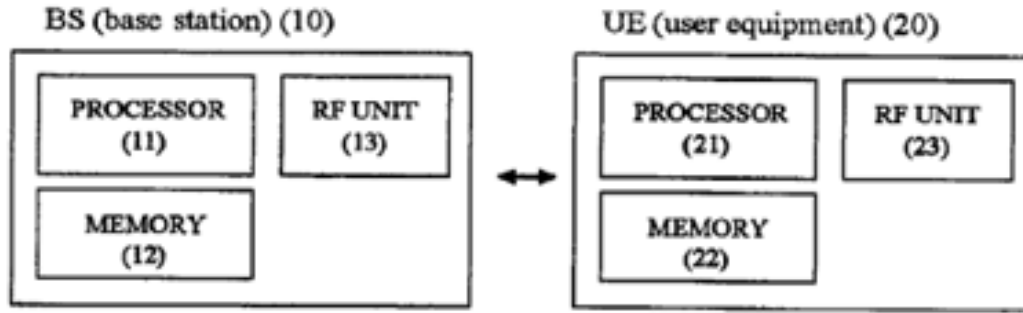


Figure 5. System for implementing present invention

EX-1010, FIG. 17; EX-1011, FIG. 5.

You discloses techniques for low-cost MTC UEs operating at a reduced bandwidth (e.g., 1.4MHz, 3MHz, 5MHz) compared to the maximum bandwidth supported by traditional LTE UEs (e.g., 20MHz). To support this reduced bandwidth, You discloses adaptations to how downlink and uplink channels are configured and data is transmitted and received. EX-1010 ¶161-162; EX-1011, pp.57-58.

One such adaptation is to the common search space (“CSS”). To receive downlink data in a PDSCH, a UE first searches for a downlink grant through the CSS of a PDCCH. You discloses configuring the PDCCH CSS of an MTC terminal differently from the PDCCH CSS of a non-MTC terminal. You further discloses configuring the CSS of a coverage-enhanced MTC terminal separately, i.e. differently, from the CSS of a non-coverage enhanced MTC terminal. EX-1010 ¶¶197-198; EX-1011, p.62.

You also discloses techniques for determining the PUCCH resource for

HARQ ACK/NACK transmission by determining a PUCCH resource for uplink transmission based on:

$$n_{PUCCH}^{(1,p=p_0)} = (M - m - 1) \cdot N_c + m \cdot N_{c+1} + n_{CCE} + N_{PUCCH}^{(1)}$$

where, $N_{PUCCH}^{(1)}$ is a parameter configured by higher layers, and n_{CCE} is the number of the first CCE used for transmission of the corresponding PDCCH. EX-1011, p.29.

Alternatively, You discloses determining the PUCCH resource by first configuring four possible PUCCH resources through higher-layer signaling. Then, the particular PUCCH resource to use is signaled in the TPC field in the DCI format of the corresponding PDCCH. EX-1011, pp.47-48; Table 19-2.

2. Kim

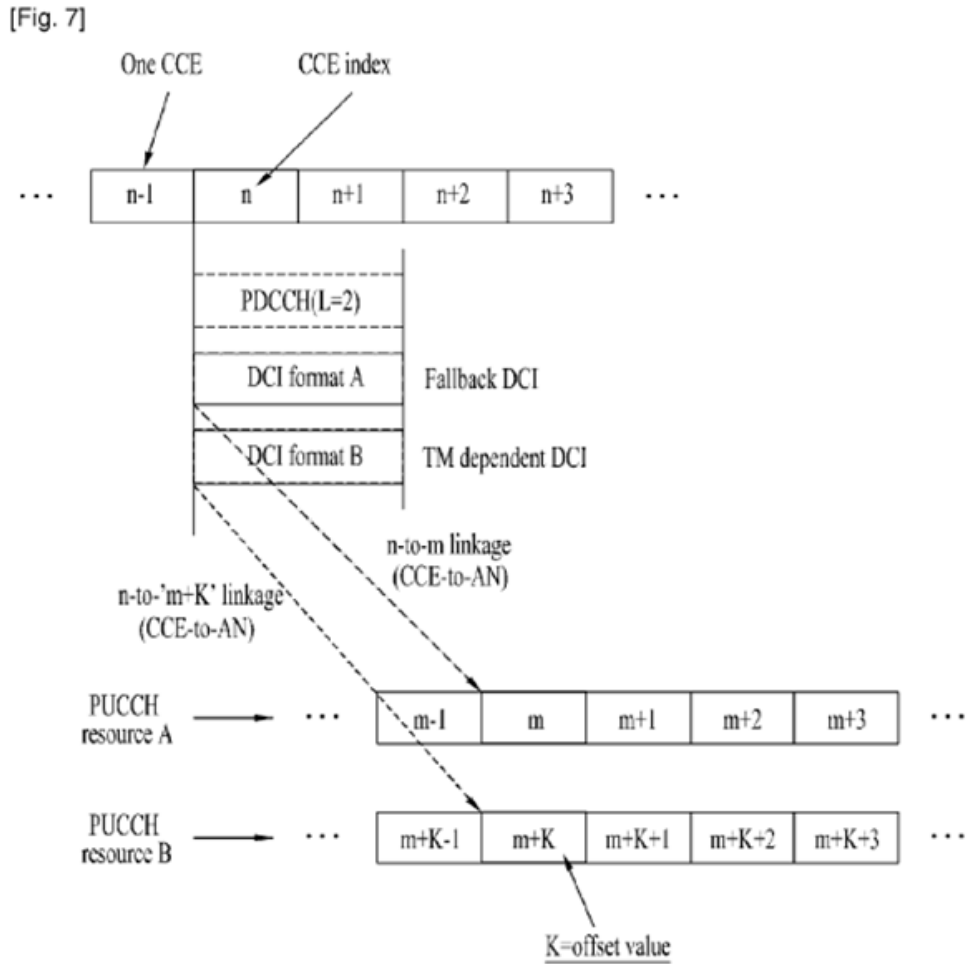
Kim is directed to providing more efficient methods for transmitting and receiving an uplink signal, including methods of configuring PUCCH resources for uplink HARQ ACK/NACK transmission. EX-1012 ¶¶7, 10. Kim discloses configuring PUCCH resources according to:

$$n_{PUCCH}^{(1,p=p_0)} = n_{CCE} + N_{PUCCH}^{(1)}$$

This equation is based on the first CCE index used for PDCCH transmission (n_{CCE}) and a configuration parameter signaled by higher layers ($N_{PUCCH}^{(1)}$). The configuration parameter, $N_{PUCCH}^{(1)}$, corresponds to a location at which a dynamic PUCCH resource is stated among PUCCH resources of a cell, i.e., a resource index

offset. EX-1012 ¶¶112-115, 117.

Kim further discloses dynamic PUCCH resources that are configured UE-specifically, UE-group specifically, or TM-specifically and are configured separately from $N_{PUCCH}^{(1)}$, which is provided cell-specifically. EX-1013 ¶117. In addition to n_{CCE} and $N_{PUCCH}^{(1)}$, Kim discloses transmitting a UE-specific PUCCH offset value, K. The UE calculates its PUCCH resource by adding the K value to the equation. EX-1012 ¶¶117-120.



EX-1013, FIG. 7.

3. Motivation to Combine You and Kim

You specifically discloses determining a PUCCH resource for uplink transmission based on an equation which includes $N_{PUCCH}^{(1)}$, a parameter configured by higher layers, and n_{CCE} , the number of the first CCE used for transmission of the corresponding PDCCH. EX-1011, p.29; EX-1003 ¶116. Kim similarly discloses configuring an uplink resource based on the same parameters: $N_{PUCCH}^{(1)}$ and n_{CCE} . EX-1012 ¶¶112-115; EX-1003 ¶116. Further, both You and Kim contemplate configuring resources for MTC UEs. EX-1011, p.58; EX-1012 ¶2; EX-1003 ¶117.

A POSITA would have understood that the reduced bandwidth capabilities of low-cost MTC UEs would require adaptations to uplink and downlink transmissions. *See* EX-1011, p.58; EX-1010 ¶¶161-162; EX-1003 ¶116. While You provides general background about how PUCCH resources are determined based on the PDDCH for scheduling each PDSCH, You does not expressly disclose any changes to determining UE-specific PUCCH resources. *See* EX-1003 ¶116. As such, a POSITA would have been motivated to look to other references for ways to increase efficiency of uplink communications including assigning UE-specific resources and dealing with different types of UEs (e.g., legacy and MTC). EX-1003 ¶116. Kim is directed to providing a method and apparatus for efficiently transmitting/receiving an uplink signal. Ex. 1012 ¶8, EX-1003 ¶117. Kim's proposed solution is to configure additional dynamic PUCCH resources by

transmitting a UE-specific, UE group-specific, or TM-specific resource index offset value K to the UE, separately from a PUCCH resource index offset value cell-specifically based on DCI formats. EX-1012 ¶¶119-120; EX-1003 ¶117. As such, it would thus have been obvious for a POSITA to turn to Kim for more information on configuring PUCCH uplink resources and for increased efficiency of uplink communications. EX-1003 ¶¶117-118. Further still, both references are assigned to LG Electronics, Inc., a further motivation to a POSITA to combine the teachings of both references. EX-1003 ¶117.

A POSITA would have had a reasonable expectation of success of combining You and Kim given that Kim provides a straightforward modification of the conventional methodology for determining PUUCH resources, such as those disclosed by You. EX-1003 ¶117.

4. Application of You and Kim to Challenged Claims

a. Claim 1

- i. [1.0] A method of transmitting response information of downlink data of a Machine Type Communication (MTC) terminal, the method comprising:*

You discloses² the preamble to the extent it is limiting. EX-1003 ¶119.

² As used throughout this Petition, “discloses” encompasses what a reference would teach, suggest, or render obvious to a POSITA.

Specifically, You discloses transmitting downlink data for an MTC terminal:

The present invention proposes ***downlink data transmission techniques for MTC UE*** with reduced PDSCH transmission BW for lost-cost characteristics.

EX-1011, p.11³, pp.10, 57; EX-1010 ¶¶173-174; EX-1003 ¶119.

You discloses transmitting response information (*ACK/NACK/DTX response*) of downlink data (*PDSCH transmission with corresponding PDCCH*):

HARQ-ACK(j), $1 \leq j \leq M-1$, is the ACK/NACK/DTX response for the PDSCH transmission with corresponding PDCCH and DAI value in the PDCCH equal to 'j'.

EX-1011, p.36; EX-1010 ¶82; EX-1003 ¶120.

You discloses limitation [1.0] to the extent it is limiting. EX-1003 ¶121.

- ii. ***[1.1] receiving structural information that contains at least one of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource allocated to the uplink control channel;***

You discloses a UE receiving structural information on a resource allocated to an uplink control channel ($n_{PUCCH}^{(1,p)}$) for transmitting the response information

³ All emphasis added unless otherwise stated.

(HARQ-ACK):

For TDD HARQ-ACK ... *the UE shall use PUCCH resource $n^{(l,p)}_{PUCCH}$ for transmission of HARQ-ACK* in subframe n on antenna port p for PUCCH format 1a/1b.

EX-1011, p.28; EX-1003 ¶122.

You further discloses that the resource to an uplink control channel ($n^{(1)}_{PUCCH}$) is allocated by a BS (*eNodeB*) according to a specified equation and received by the UE via high-layer signaling:

For a PDSCH transmission or a PDCCH indicating downlink SPS release in subframe $n - k_i$ where $k_i \in K$, the PUCCH resource $n^{(1)}_{PUCCHi} = (M - i - 1) \cdot N_c + i \cdot N_{c+1} + n_{CCEi} + N^{(1)}_{PUCCH}$, where ... n_{CCEi} is the number of the first CCE used for transmission of the corresponding PDCCH in subframe $n - k_i$ and $N^{(1)}_{PUCCH}$ *is configured by higher layers*.

EX-1011, p.29; *id.*, p.64; EX-1003 ¶123.

You references $N^{(1)}_{PUCCH}$, but does not elaborate on its use. A POSITA would have turned to other references for a further understanding as to the manner in which $N^{(1)}_{PUCCH}$ is used. EX-1003 ¶124. Kim discloses similar equations to those disclosed by You to determine the resource allocated to an uplink control channel (*PUCCH resource*):

Specifically, in the 3GPP LTE/LTE-A system, PUCCH resource indexes for transmission by two antenna ports (p_0 and p_1) are determined as follows.

[Equation 5]

$$n_{PUCCH}^{(1,p=p_0)} = n_{CCE} + N_{PUCCH}^{(1)}$$

[Equation 6]

$$n_{PUCCH}^{(1,p=p_1)} = n_{CCE} + 1 + N_{PUCCH}^{(1)}$$

EX-1012 ¶¶112-114; EX-1003 ¶124.

Kim further discloses that $N_{PUCCH}^{(1)}$ specifies the location after which a UE acquires its PUCCH resource, i.e., start offset information:

$N_{PUCCH}^{(1)}$ corresponds to a location at which a dynamic PUCCH resource is stated among PUCCH resources of a cell.... In other words, according to a legacy 3GPP LTE/LTE-A system, UEs located in a specific cell ***share dynamic PUCCH resources after $N_{PUCCH}^{(1)}$*** and the dynamic PUCCH resources are linked to CCE indexes commonly applied to the specific cell, respectively.

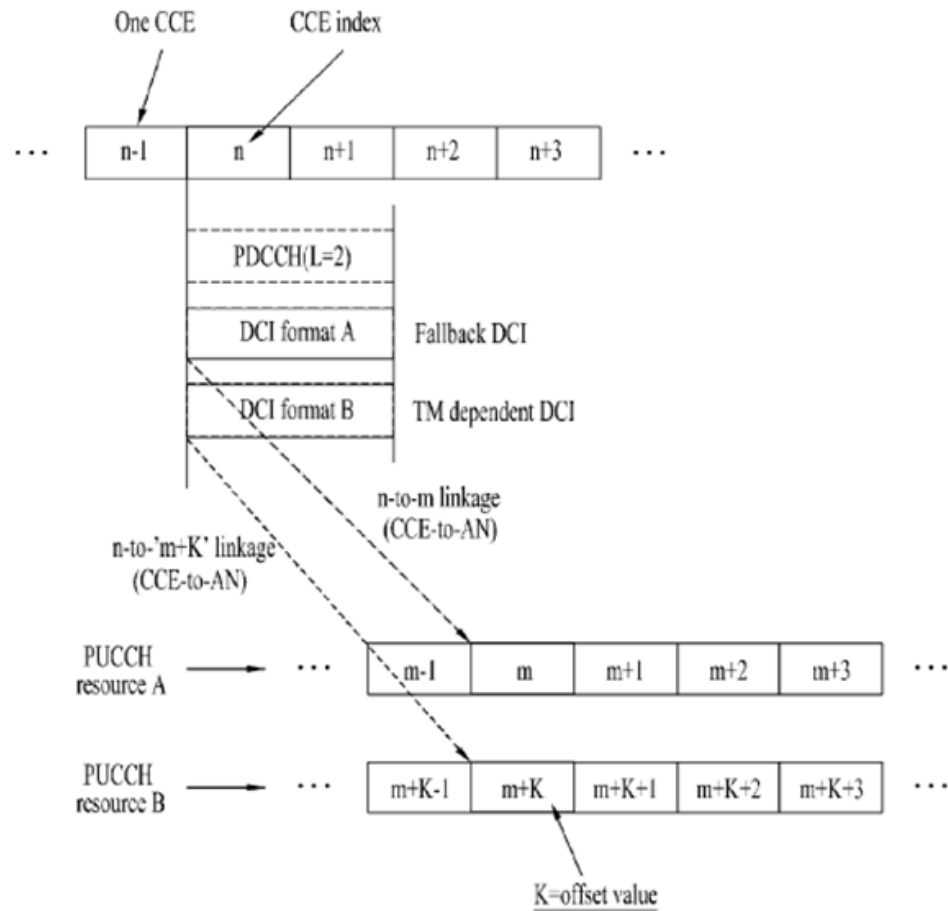
EX-1012 ¶¶ 115-116; EX-1003 ¶125.

In addition to the start offset information, Kim discloses an additional offset value (*absolute start location*):

However, instead of the relative value based on $N_{PUCCH}^{(1)}$, ***a value indicating an absolute start location may be used as the offset value indicating the start location of the additionally configured dynamic PUCCH resource according to the present invention.***

EX-1012 ¶121; EX-1003 ¶126.

[Fig. 7]



EX-1012, FIG. 7.

You in view of Kim renders obvious limitation [1.1]. EX-1003 ¶127.

iii. [1.2] receiving downlink control information for scheduling the downlink data;

You discloses receiving downlink control information (*DCI*) for scheduling downlink data on a downlink shared channel (*DL-SCH*):

The PDCCH may carry a transport format ***and a resource allocation of a downlink shared channel (DL-SCH)*** The BS determines a PDCCH format ***according to a DCI*** to be transmitted to the UE, and attaches a cyclic redundancy check (CRC) to control information.

EX-1011, p.13; EX-1010 ¶¶85-86; EX-1003 ¶128.

You discloses limitation [1.2]. EX-1003 ¶129.

iv. [1.3] receiving the downlink data; and

You discloses receiving downlink data:

The present invention proposes **downlink data transmission** techniques for MTC UE....

EX-1011, pp.11, 57-58; EX-1010 ¶¶171, 173-175, 179, 196, 205; EX-1003 ¶130.

You discloses limitation [1.3]. EX-1003 ¶131.

v. [1.4] transmitting the response information on the downlink data by using the resource allocated to the uplink control channel,

Both You and Kim disclose transmitting the response information (*HARQ-ACK*) on the downlink data using the resource allocated to the uplink channel (*PUCCH*). Specifically, You discloses:

HARQ-ACK transmission on two antenna ports ($p \in [p_0, P_1]$) is supported for ***PUCCH format 1a/1b*** with TDD HARQ-ACK bundling feedback mode and for ***PUCCH format 3***.

EX-1011, p.28; EX-1010 ¶112; EX-1003 ¶132.

Kim discloses transmitting response information (*ACK/NACK*) using a resource allocated to the uplink control channel ($n_{PUCCH}^{(1)}$):

[T]he ACK/NACK information is transmitted using a physical uplink control channel (*PUCCH*) resource ***determined based on***

"[Equation 1] $n^{(1)}_{PUCCH} = f(n_{CCE}, N^{(1)}_{PUCCH}, X)$ "....

EX-1012 ¶10; EX-1003 ¶133.

You in combination with Kim thus discloses limitation [1.4]. EX-1003 ¶134.

- vi. *[1.5] wherein the resource allocated to the uplink control channel is determined based on at least one of: i) information on a resource of a downlink control channel for scheduling the downlink data; ii) the information on the resource allocated to the uplink control channel; and iii) the start offset information on the resource allocated to the uplink control channel;*

You discloses that the resource allocated to an uplink control channel ($n^{(1,p)}_{PUCCH}$) is determined based on information on a resource of a downlink control channel (*the number of the first CCE used for transmission of the corresponding PDCCH* (n_{CCEi}).

For a PDSCH transmission or a PDCCH indicating downlink SPS release in subframe $n - k_i$ where $k_i \in K$, the PUCCH resource $n^{(1)}_{PUCCHi} = (M - i - 1) \cdot N_c + i \cdot N_{c+1} + n_{CCEi} + N^{(1)}_{PUCCH}$, where ... ***n_{CCEi} is the number of the first CCE used for transmission of the corresponding PDCCH*** in subframe $n - k_i$ and $N^{(1)}_{PUCCH}$ is configured by higher layers.

EX-1011, p.28; EX-1003 ¶135.

Accordingly, You discloses claim element [1.5], which requires the

determining of the resource allocated to the uplink control channel to be based on only one of three alternatives (e.g., information on a resource of a downlink control channel for scheduling the downlink data) due to the language “at least one of.” EX-1003 ¶136.

However, You and Kim also disclose the other two recited alternatives for determining the resources allocated to the uplink control channel. For example, both You and Kim discloses start offset information ($N_{PUCCH}^{(1)}$) since UEs search PUCCH resources after $N_{PUCCH}^{(1)}$. EX-1011, p.28; EX-1012 ¶¶115-116; EX-1003 ¶137. Kim also discloses an additional/alternative offset (*value indicating absolute start location*), which can be applied to determine the PUCCH resource. EX-1012 ¶121; EX-1003 ¶138.

Both You and Kim disclose determining the resource allocated to the uplink channel (*PUCCH*) based on the information on the resource allocated to the uplink control channel (*TPC DCI field in the corresponding PDCCH*):

The TPC field in the DCI format of the corresponding PDCCH shall be used to determine the PUCCH resource values from one of the four resource values configured by higher layers....

EX-1011, p.47; EX-1012 ¶129; EX-1003 ¶¶140-142.

You in view of Kim discloses limitation [1.5]. EX-1003 ¶143.

vii. [1.6] wherein the start offset information of the resource allocated to the uplink control

channel is configured separated from start offset information for a terminal different from the MTC terminal;

You discloses the need to develop new operation techniques for MTC UEs.

EX-1011, pp.57-58; EX-1003 ¶144. With respect to how MTCs/UEs receive downlink transmission, You discloses that an MTC/UE receives a downlink transmission (*cell-specific PDSCH*) by first searching through the CSS of a PDCCH:

When the MTC UE must receive a cell-specific PDSCH, the ***UE first searches for a DL grant for receiving a PDSCH through a common search space (CSS) region of a PDCCH.***

EX-1011, p.62; EX-1010 ¶¶195-197; EX-1003 ¶145.

You further discloses that the CSS of an MTC/UE terminal is configured differently for a terminal that is different from the MTC terminal (*legacy UE*):

To this end, the present invention proposes to ***differently configure a CSS region of an MTC UE and a CSS region of a legacy UE.***

EX-1011, p.62; EX-1010 ¶198; EX-1003 ¶¶146-147.

As mentioned in VII.A.4.a.vi, the resource allocated to the uplink control channel is configured based on the first CCE used for transmission of the corresponding PDCCH. EX-1011, p.28; EX-1003 ¶148. A POSITA understood that because the CSS region of the PDCCH of a non-MTC terminal is configured differently than the CSS region of the PDCCH of an MTC terminal, the resource

allocated to the uplink control channel of a non-MTC terminal would be configured differently from the resource allocated to the uplink control channel of an MTC terminal. EX-1003 ¶148. A POSITA thus understood that the start offset information of an MTC terminal would be necessarily different from the start offset information of a non-MTC terminal. EX-1003 ¶148.

Kim also discloses this claim element. Specifically, Kim is directed toward a problem of transmission where the downlink cell in which the downlink cell from which a UE receives information may be different from the uplink cell to which a UE sends its response. EX-1012 ¶116; EX-1003 ¶149. To solve this problem, Kim discloses configuring UE-specific dynamic uplink control channel (*PUCCH*) resources:

[T]he present invention proposes *UE-specifically*, UE group-specifically, or TM-specifically *configuring a set of additional dynamic PUCCH resources separately from a set of cell-specifically configured conventional dynamic PUCCH resources*.

EX-1012 ¶117; EX-1003 ¶150.

You in view of Kim discloses limitation [1.6]. EX-1003 ¶151.

viii. [1.7] wherein a plurality of pieces of start offset information of the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are received through cell-

***specific high layer signaling for the MTC
terminal from a base station;***

Both You and Kim disclose receiving the start offset information ($N_{PUCCH}^{(1)}$) through higher level signaling. See EX-1011, p.29; EX-1012 ¶115; EX-1003 ¶152. Kim further discloses that the configuration parameter ($N_{PUCCH}^{(1)}$), which is disclosed in both You and Kim, is cell-specific. EX-1012 ¶119 (“...a PUCCH resource index offset value (e.g., $N^{(1)}PUCCH$) cell-specifically provided for cell 1.”); EX-1003 ¶153. Kim further discloses transmitting a UE-specific additional offset value, K. EX-1012 ¶119; EX-1003 ¶153. You and Kim thus disclose receiving a plurality of pieces of start offset information through higher-level signaling. EX-1003 ¶153.

You in view of Kim discloses limitation [1.7]. EX-1003 ¶154.

***ix. [1.8] wherein the start offset information on
the resource allocated to the uplink control
channel is determined based on a coverage
level; and***

You discloses configuring different CSS regions of PDCCH resources, which a POSITA understood as resulting in allocating different resources to the uplink control channel for non-MTC and MTC terminals because the uplink control channel allocation is based on the PDCCH resources. VII.A.4.a.vii; EX-1003 ¶155. You further discloses configuring different CCS regions of PDCCH based on a coverage level of an MTC terminal.

[T]he present invention proposes to differently configure the CSS region of *an MTC UE for which a coverage enhancement technique is required* and the CSS region of *an MTC UE for which a coverage enhancement technique is not required*.

EX-1011, p.62; EX-1010 ¶198; EX-1003 ¶155.

Because the resource allocated to the uplink channel is configured based on the configuration of the CSS region of the PDCCH (*see* VII.A.4.a.vii), a POSITA understood the start offset information is applied differently based on MTC coverage enhancement. EX-1003 ¶156. You discloses a terminal which determines the start offset of the resource allocated to the uplink channel with both a configuration value ($N_{PUCCH}^{(1)}$) and the value of the first CCE used for transmission of the corresponding PDCCH (n_{CCE}). EX-1011, p.29; EX-1003 ¶156. Because the n_{CCE} value is based on the PDCCH, it, and therefore the start offset information of the resource allocated to the uplink channel, are determined based on a coverage level. EX-1003 ¶156.

You discloses limitation [1.8]. EX-1003 ¶157.

- x. *[1.9] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.*

You discloses utilizing repeated transmissions when in coverage limited mode. EX-1011, p.57; EX-1003 ¶158. Repeated transmission of a PUCCH resource for HARQ ACK/NACK using a single, identical PUCCH resource in each subframe was known. V.F.1; EX-1003 ¶159.

Repeated transmission of PUCCH was also a well-understood means of achieving coverage enhancement, which would be advantageous to provide to MTCs given that it was known for them to operate in poor radio wave environments. V.F.2.a; EX-1001, 1:33-37; EX-1003 ¶159. A POSITA understood the benefits of repeatedly transmitting a HARQ ACK/NACK to ensure reception, and thus would utilize the well-known method of repeatedly transmitting HARQ ACK/NACK through PUCCH over multiple subframes. V.F.1; EX-1003 ¶159. It would further have been obvious to a POSITA to use the same uplink control channel resource in each subframe to avoid recalculating the uplink control channel resource. EX-1003 ¶159.

You discloses limitation [1.9], and therefore You in view of Kim renders obvious claim 1. EX-1003 ¶160.

b. Claim 2

- i. [2.] The method of claim 1, wherein: at least one of the plurality of pieces of start offset information is applied according to a corresponding coverage level of the MTC terminal.*

You in view of Kim renders obvious claim 1. VII.A.4.a; EX-1003 ¶161. As discussed, You discloses configuring the CSS of MTC terminals differently based on whether they are coverage enhanced, which results in the start offset information being determined differently according to a coverage level. VII.A.4.a.ix; EX-1003 ¶161. You thus discloses applying start offset information based on a corresponding coverage level. EX-1003 ¶161.

Accordingly, You in view of Kim renders obvious claim 2 of the '931 Patent. EX-1003 ¶162.

c. **Claim 3**

- i. ***[3.0] A method of configuring a resource of response information of downlink data for a Machine Type Communication (MTC) terminal in a base station, the method comprising:***

You discloses the preamble to the extent it is limiting. EX-1003 ¶163. You discloses a method of configuring a resource of response information of downlink data for an MTC terminal. VII.A.4.a.i. You further discloses that the wireless communication system performing the method is a BS (*BS 10*). EX-1011, p.14; EX-1010 ¶49; EX-1003 ¶164.

You thus discloses limitation [3.0] to the extent it is limiting. EX-1003 ¶165.

- ii. ***[3.1] transmitting structural information that contains at least one of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource allocated to the uplink control channel;***

You and Kim disclose this limitation as discussed in VII.A.4.a.ii. EX-1003

¶166.

- iii. ***[3.2] transmitting downlink control information for scheduling the downlink data; and***

You and Kim discloses this limitation as discussed in VII.A.4.a.iii. EX-

1003 ¶167.

- iv. ***[3.3] transmitting the downlink data,***

You discloses this limitation as discussed in VII.A.4.a.iv. EX-1003 ¶168.

- v. ***[3.4] wherein the resource of the uplink control channel for transmitting the response information of the downlink data is determined based on at least one piece of information on: i) a resource of a downlink control channel for scheduling the downlink data; ii) the information on the resource allocated to the uplink control channel; and iii) the start offset information on the resource allocated to the uplink control channel;***

You and Kim disclose this limitation as discussed in VII.A.4.a.vi. EX-1003

¶169.

- vi. *[3.5] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from offset information on a terminal different from the MTC terminal;*

You and Kim disclose this limitation as discussed in VII.A.4.a.vii. EX-1003

¶170.

- vii. *[3.6] wherein a plurality of pieces of start offset information on the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are transmitted through cell-specific high layer signaling for the MTC terminal to the MTC terminal;*

You and Kim disclose this limitation as discussed in VII.A.4.a.viii. EX-

1003 ¶171.

- viii. *[3.7] wherein the start offset information on the resource allocated to the uplink control channel is determined based on a coverage level; and*

You discloses this limitation as discussed in VII.A.4.a.ix. EX-1003 ¶172.

- ix. *[3.8] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each*

uplink subframe in which the uplink control channel is repeatedly transmitted.

You discloses this limitation as discussed in VII.A.4.a.x. EX-1003 ¶173.

Therefore, You and Kim render obvious claim 3. EX-1003 ¶173.

d. Claim 4

- i. [4.] The method of claim 3, wherein: at least one of the plurality of pieces of start offset information is applied according to a corresponding coverage level of the MTC terminal.***

You and Kim render obvious claim 3 as discussed in VII.A.4.c. EX-1003 ¶175. You further discloses this claim for the same reasons discussed in VII.A.4.b. EX-1003 ¶¶175-176.

e. Claim 5

- i. [5.0] A Machine Type Communication (MTC) terminal for transmitting response information of downlink data to a base station, the terminal comprising:***

You discloses the preamble to the extent it is limiting. EX-1003 ¶177. As discussed above in [1.0], You discloses an MTC terminal configured to receive downlink data and transmit response information. VII.A.4.a.i; EX-1003 ¶178. You further discloses a BS that receives an uplink signal. EX-1011, p.14; EX-1010 ¶51; EX-1003 ¶178.

You discloses limitation [5.0] to the extent it is limiting. EX-1003 ¶179.

- ii. *[5.1] a receiving unit configured to receive structural information that contains at least one piece of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource to which the uplink control channel is allocated, configured to receive downlink control information for scheduling the downlink data, and configured to receive the downlink data;*

You discloses a receiving unit (*receiver*):

In downlink ... *a receiver may be a part of the UE 20.*

EX-1011, p.14; EX-1010 ¶51; EX-1003, ¶181.

You in view of Kim discloses the remainder of the limitation as discussed in VII.A.4.a.ii-VII.A.4.a.iv. EX-1003 ¶182.

- iii. *[5.2] a controller configured to determine a resource allocated to the uplink control channel for transmitting the response information of the downlink data based on at least one of i) information on a resource of a downlink control channel for scheduling the downlink data, ii) the information on the resource allocated to the uplink control channel, and iii) the start offset information on the resource allocated to the uplink control channel; and;*

You discloses a controller (*processor 21*):

A UE 20 may include *a processor 21*, a memory 22, and a RF unit 23.

The processor 21 may be configured to implement proposed procedures and/or methods described in this application.

EX-1011, p.14; EX-1010 ¶¶236-237; EX-1003 ¶183.

You in view of Kim discloses the remainder of this limitation as discussed in VII.A.4.a.vi. EX-1003 ¶184.

- iv. [5.3] a transmitting unit configured to transmit the response information of the downlink data by using the determined resource of the uplink control channel,*

You discloses a transmitting unit (*transmitter*) as a part of the UE transmitting the response information:

In uplink, *a transmitter may be a part of the UE 20*

EX-1011, p.14; EX-1010 ¶51; EX-1003 ¶185.

You in view of Kim discloses the remainder of this limitation as discussed in VII.A.4.a.v. EX-1003 ¶186.

- v. [5.4] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from offset information on a terminal different from the MTC terminal;*

You and Kim discloses this limitation as discussed in VII.A.4.a.vii. EX-1003 ¶187.

- vi. [5.5] wherein a plurality of pieces of start offset information on the resource allocated*

to the uplink control channel are provided, and the plurality of pieces of start offset information are received through cell-specific high layer signaling for the MTC terminal from the base station;

You and Kim disclose this limitation as discussed in VII.A.4.a.viii. EX-1003 ¶188.

vii. [5.6] wherein the start offset information on the resource allocated to the uplink control channel is determined based on a coverage level; and

You discloses this limitation as discussed in VII.A.4.a.ix. EX-1003 ¶189.

viii. [5.7] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.

You discloses this limitation as discussed in VII.A.4.a.x. EX-1003 ¶190.

Therefore, You and Kim render obvious claim 5. EX-1003 ¶191.

f. Claim 6

i. [6.] The MTC terminal of claim 5, wherein: at least one of the plurality of pieces of start offset information is applied according to a corresponding coverage level of the MTC terminal.

You and Kim render obvious claim 5 as discussed in VII.A.4.e. EX-1003

¶192. You discloses this claim as discussed in VII.A.4.b. EX-1003 ¶¶193-194.

g. Claim 7

- i. [7.0] A base station for configuring a resource of response information of downlink data for a Machine Type Communication (MTC) terminal, the base station comprising:***

You discloses the preamble to the extent it is limiting. EX-1003 ¶195. You discloses a method of configuring a resource of response information of downlink data for an MTC terminal as discussed in VII.A.4.a.i. EX-1003 ¶196. You also discloses that a base station (*BS 10*) configures the resource for response information. EX-1011, p.14; EX-1010 ¶51; 1003 ¶197.

You thus discloses limitation [7.0] to the extent it is limiting. EX-1003 ¶198.

- ii. [7.1] transmitting unit configured to transmit structural information, downlink control information for scheduling the downlink data, and the downlink data;***

You discloses that the BS includes a transmitting unit (*transmitter*):

In uplink, *a transmitter may be a part of the UE 20....*

EX-1011, p.14; EX-1010 ¶51; EX-1003 ¶199.

You and Kim disclose the rest of this limitation as discussed in VII.A.4.c.ii-VII.A.4.c.iv. EX-1003 ¶200.

- iii. *[7.2] wherein the structural information contains at least one piece of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource allocated to the uplink control channel;*

You and Kim disclose this limitation as discussed in VII.A.4.e.ii. EX-1003

¶201.

- iv. *[7.3] wherein the resource of the uplink control channel for transmitting the response information of the downlink data is determined based on at least one piece of i) information on a resource of a downlink control channel for scheduling the downlink data, ii) the information on the resource allocated to the uplink control channel, and iii) the start offset information of the resource allocated to the uplink control channel;*

You and Kim disclose this limitation as discussed in VII.A.4.c.v. EX-1003

¶202.

- v. *[7.4] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from offset information on a terminal different from the MTC terminal;*

You and Kim disclose this limitation as discussed in VII.A.4.c.vi. EX-1003

¶203.

- vi. *[7.5] wherein a plurality of pieces of start offset information on the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are transmitted through cell-specific high layer signaling for the MTC terminal to the MTC terminal;*

You and Kim disclose this limitation as discussed in VII.A.4.c.vii. EX-1003

¶204.

- vii. *[7.6] wherein the start offset information of the resource allocated to the uplink control channel is determined based on a coverage level; and*

You disclose this limitation as discussed in VII.A.4.c.viii. EX-1003 ¶205.

- viii. *[7.7] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.*

You discloses this limitation as discussed in VII.A.4.c.ix. EX-1003 ¶206.

Therefore, You and Kim render obvious claim 7. EX-1003 ¶207.

B. Ground 2: Claims 1-7 are unpatentable over Lee in view of Zhang

1. Lee

Lee discloses a method of cell selection for an MTC device⁴ in which an MTC device communicates with a low power node (“LPN”) as opposed to directly with a BS in a traditional macro cell. An MTC may operate in “decoupled” mode where it receives a downlink signal from a BS but transmits its uplink signal to an LPN, which then relays the signal to the BS. EX-1005 ¶¶28-29; EX-1004 10:28-42.

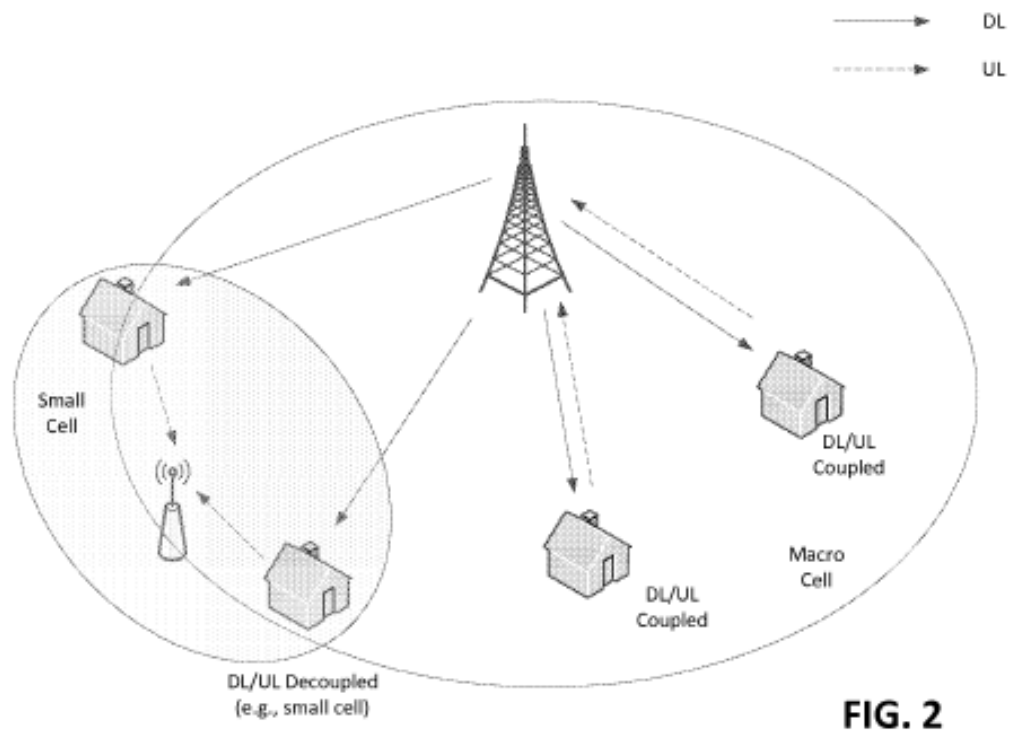


FIG. 2

⁴ Lee states that UE and LC-MTC are used interchangeably. EX-1005 ¶32; EX-1004, 16:15-21; EX-1003 ¶212n.7.

EX-1005, FIG. 2; EX-1004, FIG. 2.

When transmitting to the LPN, the MTC operates in a decoupled, coverage-limited mode, which includes coverage-enhancement transmission schemes such as repetitions. EX-1005 ¶46; EX-1004, 30:18-26. When operating in this decoupled, coverage-limited mode, time and frequency synchronization between the LPN and the macro cell is required for uplink transmissions. The synchronization is obtained as an offset value from the downlink transmission through higher level signaling. EX-1005 ¶¶80, 82; EX-1004, 55:8-15, 57:30-32. The required configuration can be provided over a X2 interface. EX-1005 ¶¶76, 79-80; EX-1004, 69:50-56; EX-1003 ¶¶110-111.

Lee also discloses several mechanisms for HARQ feedback from the MTC terminal when operating in decoupled mode, including ST-based PDSCH HARQ, legacy PUCCH-based HARQ, PUSCH-based HARQ, and modified PDSCH HARQ timing. When using legacy PUCCH-based HARQ operations, the MTC terminal receiving a configuration parameter which may indicate which subframes it may use to send the PDSCH HARQ ACK/NACK via PUCCH. EX-1005 ¶¶83, 91; EX-1004, 62:17-22, 64:4-14; EX-1003 ¶112.

2. Zhang

Zhang generally discloses configuring a PUCCH resource for the UE to transmit a HARQ ACK/NACK to the BS corresponding to a PDSCH scheduled via

EPDCCH. EX-1006, 4:15-17. Zhang specifically addresses the problem of possible collisions between PUCCH resources resulting from a downlink being transmitted across multiple downlink subframes. To avoid such a collision, the following formula (discussed in the 3GPP RAN1#70 meeting) with a dynamic resource offset is utilized:

$$n^{(1)}_{\text{PUCCH}} = n_{\text{eCCE}} + N^{(1)}_{\text{UE-PUCCH}} + k$$

where $n^{(1)}_{\text{PUCCH}}$ is the PUCCH resource for the HARQ ACK/NACK, n_{eCCE} is the lowest CCE index of the EPDCCH, $N^{(1)}_{\text{UE-PUCCH}}$ is the UE- and EPDCCH-set-specific resource offset configured by higher level signaling, and k is the dynamic resource offset. EX-1006, 4:18-23; 5:1-5; 6:21-25.

The dynamic offset mechanism is provided to solve the problem of PUCCH resource collision. EX-1006, 7:3-5. Zhang discloses that the dynamic offset modifier may be derived independently from the DCI carried by the EPDCCH. EX-1006, 6:25-31; 7:28-31.

3. Motivation to Combine Lee and Zhang

Lee is directed to providing coverage enhancements for LC-MTC devices, which enable machines to communicate without human intervention. EX-1005 ¶1; EX-1004, 1:19-21; EX-1003 ¶208. Lee discloses that one or more mechanisms may be used for HARQ communications, including SR-based PDSCH HARQ, legacy PUCCH-based HARQ, PUSCH-based HARQ, and modified PDSCH

HARQ. EX-1005 ¶83; EX-1004, 62:17-22; EX-1003 ¶208. A POSITA understood Lee as not being specific as to which methodology to use and thus been motivated to look to other references to determine a suitable methodology for implementing HARQ feedback, including for PUCCH-based HARQ feedback, for MTC devices, so as to avoid collisions. EX-1003 ¶208.

Zhang is directed to PUCCH format 1a/1b resource allocation for HARQ feedback (*i.e.*, HARQ-ACKs) based on discussions during the 3GPP RAN1#70 meeting. EX-1006, 1:33-2:5, 10:11-31; EX-1003 ¶209. Zhang discloses methods for PUCCH resource allocation designed to advantageously avoid PUCCH resource collisions between EPDCCH and PDCCH, which are both contemplated and discussed in Lee. EX-1006, 3:33-4:2; EX-1005 ¶¶51-60; EX-1003 ¶209. In fact, Zhang expressly discloses that an eNB allocates the PUCCH resources via signaling and then receives HARQ feedback from the UE on the allocated resource. EX-1006, 14:8-17; EX-1003 ¶209.

Further, Zhang discloses that its invention is applicable to *any* user terminal or communication system, which supports PUCCH resource allocation for HARQ-ACK corresponding to PDSCH scheduled via EPDCCH. EX-1006, 9:35-10:2; EX-1003 ¶210. Lee discloses exactly such a user terminal and communication system, and thus it would be obvious to a POSITA to use the PUCCH resource allocation method disclosed by Zhang in the MTC communication system

disclosed by Lee. EX-1003 ¶210. A POSITA would have had a reasonable expectation of success in combining the teachings of Lee with those of Zhang given that Zhang was using known techniques (e.g., those agreed to during RAN1#70 meeting) in a known way to yield a predictable result (e.g., PUCCH resource allocation). EX-1006, 6:21-35; EX-1003 ¶210.

4. Application of Lee and Zhang to the Challenged Claims

a. Claim 1

- i. [1.0] A method of transmitting response information of downlink data of a Machine Type Communication (MTC) terminal, the method comprising:*

Lee discloses this limitation to the extent the preamble is limiting. EX-1003 ¶211. Specifically, Lee discloses “[s]ystems, methods, and instrumentalities are disclosed to describe cell selection in low cost machine type communication (LC-MTC) devices.” EX-1005 ¶2; EX-1004, 1:35-37. Lee further discloses an MTC terminal (*LC-MTC device/UE*) receiving downlink data (*downlink; data received via PDSCH*). EX-1005, ¶28; EX-1004, 10:28-33.

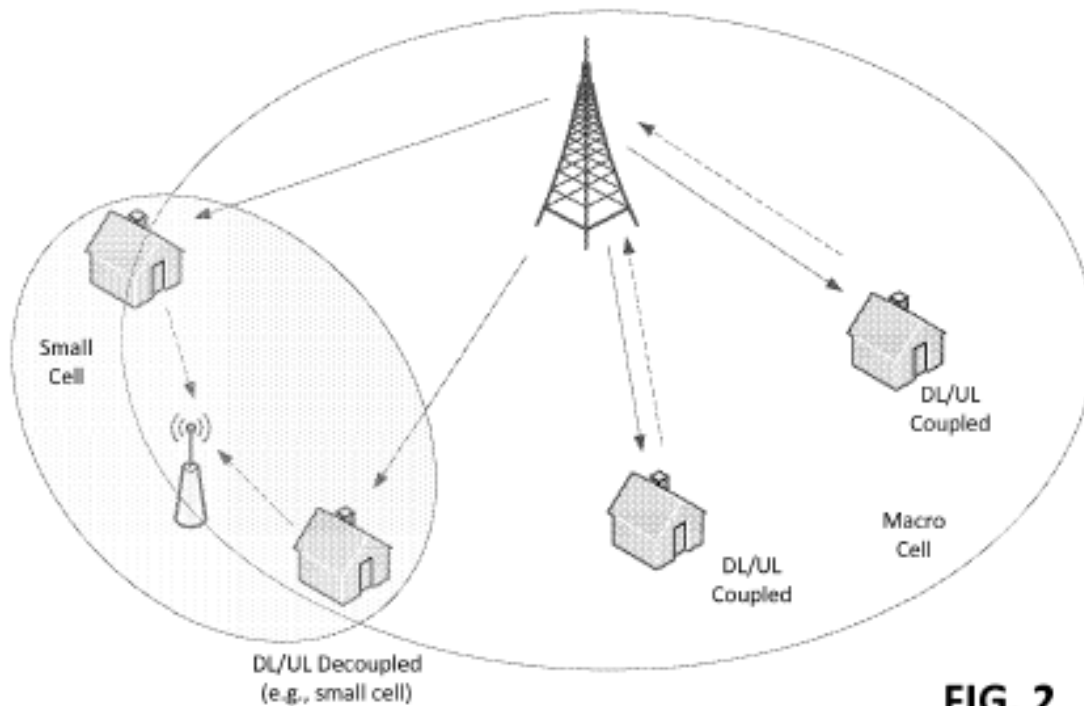


FIG. 2

EX-1005, FIG. 2; EX-1004, FIG. 2; EX-1003, ¶211.

Finally, Lee discloses sending response information of downlink data (*HARQ feedback*) to the LPN, which is ultimately forwarded to the Macro/eNB:

In decoupled operation arrangement ... *the UE may send the corresponding Hybrid Automatic request (HARQ) feedback to the LPN. The LPN may communicate the feedback to the serving eNB....*

EX-1005 ¶38; EX-1004, 61:35-42; EX-1003 ¶212.

Lee thus discloses limitation [1.0] to the extent it is limiting. EX-1003 ¶213.

- ii. *[1.1] receiving structural information that contains at least one of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information*

on the resource allocated to the uplink control channel;

Lee discloses receiving structural information, including information on a resource allocated to an uplink control channel for transmitting the response (*configuration parameter*):

The UE may receive ***a configuration parameter***, e.g., a parameter *r* which may indicate that each *r-th subframe may include PUCCH resources allocated to the UE and/or the UE may transmit PDSCH HARQ ACK/NACK bits (e.g., via PUCCH) in those subframes.*

EX-1005, ¶91; EX-1004, 64:5-14; EX-1003 ¶214.

Because Lee does not explicitly disclose how the configuration parameter is applied to allocate an uplink resource, a POSITA would have been motivated to turn to other references, such as Zhang, for a more expansive explanation of legacy-PUCCH. VII.B.3; EX-1003 ¶215.

Zhang discloses a PUCCH resource allocation method to address the issues discussed during the RAN1#70 meeting:

In the case of FDD, the PUCCH format 1a/1b HARQ-ACK resource in response to EPDCCH scheduled PDSCH may be described with the following formula (RAN1#70 agreement):

$$n^{(1)}_{\text{PUCCH}} = n_{\text{eCCE}} + N^{(1)}_{\text{UE-PUCCH}} + k$$

EX-1006, 6:21-25, 3:15-31; EX-1003 ¶216.

Zhang further discloses that, in addition to the configuration parameter $(N^{(1)}_{UE-PUCCH})$, the formula includes a dynamic offset modifier (*start offset information*):

k is *a dynamic offset modifier* such as an antenna port-specific offset associated with antenna port p , where p is the antenna port allocated to the first CCE of corresponding EPDCCH or other explicitly signaled or implicitly derived parameter.

EX-1006, 6:29-35; EX-1003 ¶217.

Lee in view of Zhang renders obvious limitation [1.1]. EX-1003 ¶218.

iii. [1.2] receiving downlink control information for scheduling the downlink data;

Lee discloses receiving downlink control information (*data on a downlink control channel (EPDCCH)*):

The coupled mode may support data and *control channel* while decoupled mode may support data channel, where the data and *control channels* may include but not limited to PDSCH, PUSCH, PHICH, *(E)PDCCH [Enhanced Physical Downlink Control Channel]*, PUCCH, SR, and SRS.

EX-1005 ¶¶42, 44; EX-1004, 22:25-33; EX-1003 ¶219.

A POSITA understood that downlink control channels, such as EPDCCH, transmit downlink control information to UE/MTC. EX-1003 ¶220 (citing EX-1006, 15:22-24).

Lee in view of Zhang renders obvious limitation [1.2]. EX-1003 ¶221.

iv. [1.3] receiving the downlink data; and

Lee discloses receiving downlink data (*downlink; data received via PDSCH*). EX-1005 ¶38, EX-1004, 61:35-40; FIG. 2; EX-1003 ¶222. A POSITA understood that by receiving the PDSCH, a UE would be receiving downlink data. EX-1003 ¶223.

Lee discloses limitation [1.3]. EX-1003 ¶223.

v. [1.4] transmitting the response information on the downlink data by using the resource allocated to the uplink control channel,

Lee discloses transmitting response information (*HARQ feedback*):

In decoupled operation arrangement ... the UE may send the corresponding Hybrid Automatic reQuest (HARQ) feedback to the LPN. The LPN may communicate the feedback to the serving eNB which may have sent the corresponding PDSCH.

EX-1005 ¶38; EX-1004, 61:35-42; EX-1003 ¶224.

Lee further discloses transmitting this response information on a predetermined resource allocated to the uplink control channel (*PUCCH*):

The UE may receive *a configuration parameter, e.g., a parameter r which may indicate that each r-th subframe* may include PUCCH resources allocated to the UE and/or the UE may transmit PDSCH HARQ ACK/NACK bits (e.g., via PUCCH) in those subframes.

EX-1005 ¶91; EX-1004, 64:5-14; EX-1003 ¶225.

Further, when the teachings of Lee are combined with those of Zhang, a POSITA understood that an MTC would transmit the response information (*HARQ feedback*) using the allocated resource (*PUCCH*):

Before transmitting the signalling in item 802, eNB 401 15 may configure the resources in item 801. In item 803, eNB 401 may receive the HARQ-ACK signalling transmitted from UE 401 *by utilizing the configured PUCCH format 1 a/b resource for EPDCCH signalling in TDD*.

EX-1006, 14:14-17; EX-1003 ¶226.

Zhang expressly discloses that an eNB allocates the PUCCH resources via signaling at 802 and then receives HARQ feedback from the UE on the allocated resource at 803. EX-1006, 14:8-17; EX-1003 ¶227.

Lee in combination with Zhang thus discloses limitation [1.4]. EX-1003 ¶228.

- vi. *[1.5] wherein the resource allocated to the uplink control channel is determined based on at least one of: i) information on a resource of a downlink control channel for scheduling the downlink data; ii) the information on the resource allocated to the uplink control channel; and iii) the start offset information on the resource allocated to the uplink control channel;*

Lee discloses an MTC/UE receives a configuration parameter (*start offset information*), which indicates which uplink subframes (*PUCCH*) to use in a transmission of response information (*PDSCH HARQ ACK/NACK*):

The UE may receive a configuration parameter indicating the subframes the UE may use to send PDSCH HARQ ACK/NACK bits (e.g., via PUCCH). *The UE may receive a configuration parameter, e.g., a parameter r which may indicate that each r -th subframe may include PUCCH resources allocated to the UE and/or the UE may transmit PDSCH HARQ ACK/NACK bits* (e.g., via PUCCH) in those subframes.

EX-1005 ¶91; EX-1004, 64:4-14; EX-1003 ¶229.

As mentioned above, Lee does not expressly disclose how the configuration parameter or the corresponding resources are determined/allocated, but Zhang does. VII.B.3; EX-1003 ¶230. Zhang discloses a formula for determining an uplink resource, $n^{(1)}_{\text{PUCCH}} = n_{\text{eCCE}} + N^{(1)}_{\text{UE-PUCCH}} + k$, which includes start offset information ($N^{(1)}_{\text{UE-PUCCH}}$ and k):

$N^{(1)}_{\text{UE-PUCCH}}$ is UE- and EPDCCH-set-specific PUCCH resources offset configured by higher layers (via a protocol layer higher than the physical layer), and *k is a dynamic offset modifier* such as an antenna port-specific offset associated with antenna port p ,

EX-1006, 6:25-32; EX-1003 ¶231.

Accordingly, Lee in view of Zhang discloses claim element [1.5]. EX-1003

¶232.

While limitation [1.5] only requires the determining of the resource allocated to the uplink control channel to be based on only one of the three alternatives due to the “at least one of” language, Lee in view of Zhang also discloses the other two. Specifically, the formula disclosed in Zhang also includes information on a resource of a downlink control channel for scheduling the downlink data (n_{eCCE}):

n_{eCCE} is the index of the lowest eCCE of the detected EPDCCH carrying the DL assignment....

EX-1006, 15:21-24; EX-1003 ¶233.

Further, Lee discloses a configuration parameter which corresponds to the information on the resource allocated to the uplink control channel (*a parameter r which may indicate that each r -th subframe may include PUCCH resources allocated to the UE*). EX-1005 ¶91; EX-1004, 64:4-14; EX-1003 ¶234; *see also* VII.B.4.a.ii.

Lee in view of Zhang discloses limitation [1.5]. EX-1003 ¶235.

vii. [1.6] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from start offset information for a terminal different from the MTC terminal;

Lee discloses that an MTC terminal (*LC-MTC device*) may operate in “decoupled” mode in which the MTC terminal utilizes LPNs and uses start offset

information, which is configured separated from start offset information for another MTC operating in “coupled mode” or a traditional LTE terminal:

As illustrated in FIG. 2, in DL/UL coupled case, *an LC-MTC device may communicate with a Macro cell for uplink and/or downlink*. In DL/UL decoupled case, *an LC-MTC device may communicate with Macro cell for downlink while transmitting uplink signal to low power node (LPN)*.

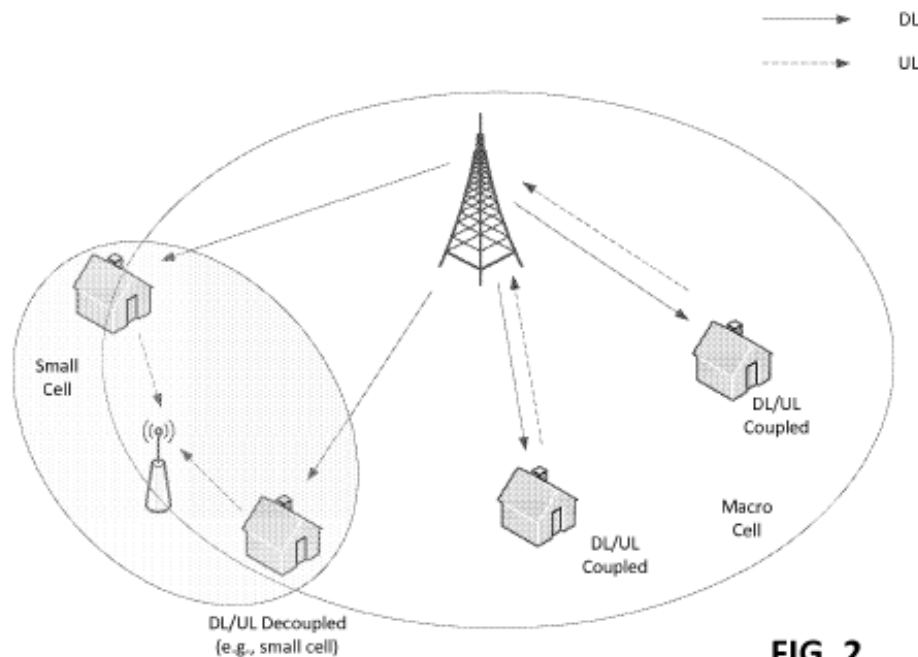


FIG. 2

EX-1005 ¶¶27, 80, FIG. 2; EX-1004, 10:28-33, FIG. 2.

In decoupled operation arrangement ... [t]he timing requirement for eNB to receive the PDSCH HARQ feedback may not be sufficient due to the extra LPN processing and further communication and/or communication delay between LPN and eNB... An improved HARQ operation may be provided.

EX-1005 ¶38; EX-1004, 61:35-51; EX-1003 ¶236.

Given this timing issue, Lee discloses calculating a time and frequency offset (i.e., start offset information) for an LPN which is relative to (and thus separated from) a Macro cell:

A UE may determine the *time and frequency offset of a LPN with respect to the Macro cell*. ... A UE may maintain separate timing and/or frequency offsets for UL and/or DL transmissions.

EX-1005 ¶82; EX-1004, 57:9-20; EX-1003 ¶237.

While Lee discloses performing these operations through a decoupled configuration via an LPN, none of the limitations in this claim require a direct connection between an MTC terminal and BS. Further, Lee discloses that these offsets are configured by the Macro Cell over an X2 interface:

A Macro cell may configure one or many LPNs with the one or more parameters to receive a broadcasted PRACH preamble by a UE that may experience poor UL coverage to the Macro cell. *The configuration may be provided over X2 interface*. The contents of the configuration may include ... *one or more time/frequency resources*

EX-1005, ¶76; EX-1004, 53:65-54:7; EX-1003 ¶237.

A POSITA understood that one of the main reasons for using an X2 interface is to reduce delay and allows for standard operations such as data and voice. EX-1003 ¶238. Thus, the start offset of the resource allocated to an uplink

control channel for an MTC terminal (*LC-MTC device*) in decoupled mode is calculated relative to (and thus different from) an offset of a terminal operating in coupled mode in a Macro cell. EX-1003 ¶239.

The foregoing disclosures from Lee are consistent with those in Zhang, which expressly contemplates providing UE-specific PUCCH resources for transmitting HARQ ACK/NACK. EX-1006, 6:21-33, 7:12-24, 8:10-24, 15:7-12; EX-1003 ¶239. Indeed, a POSITA would have understood that the MTC/UE-specific PUCCH resources would include start offset information for an MTC terminal that would be configured separated from start offset information for a terminal (e.g., UE/MTC) different from the MTC terminal. EX-1003 ¶240.

Lee in view of Zhang discloses limitation [1.6]. EX-1003 ¶241.

viii. [1.7] wherein a plurality of pieces of start offset information of the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are received through cell-specific high layer signaling for the MTC terminal from a base station;

Lee discloses that the configuration for each UE in an LPN cell is provided via higher layer signaling:

The configuration of LPN cells may be used for UL transmission. The configuration may be *UE-specific and may be provided, e.g., via higher layer signaling to UEs* that have Macro cell access.

EX-1005 ¶64; EX-1004, 43:43-50.

A UE may determine time and frequency offset of a LPN with respect to the Macro cell...The UL synchronization may be obtained as an offset value of the DL synchronization values. *The offsets to use may be provided by the Macro cell, e.g., via higher layer signaling.*

EX-1005 ¶82; EX-1004, 57:27-34; EX-1003 ¶242.

Zhang, like Lee, discloses receiving a PUCCH resources offset and a dynamic offset modifier (*plurality of start offset information*) through higher level signaling (*RRC signaling*):

$$n^{(1)}_{\text{PUCCH}} = n_{\text{eCCE}} + N^{(1)}_{\text{UE-PUCCH}} + k,$$

....

$N^{(1)}_{\text{UE-PUCCH}}$ is *UE- and EPDCCH-set-specific PUCCH resources offset* configured *by higher layers* (via a protocol layer higher than the physical layer), and k is a *dynamic offset modifier* such as an antenna port-specific offset associated with antenna port p ,

EX-1006, 6:25-32; EX-1003 ¶243.

Zhang further discloses transmitting configuration information through a configuration signal transmitted through higher level signaling (*RRC signaling*):

In the example of Figure 6, a network node 401 (which may comprise e.g. a LTE-capable base station (eNode-B, eNB)) used to configure may transmit a configuration signal 602 to a user terminal 402 (UE), for configuring UE 402 to transmit a HARQ-ACK signal 606 by utilizing

a PUCCH format 1 a/b resource for EPDCCH signaling in TDD. ***This signaling 602 may be e.g. dedicated higher layer (i.e. higher than L1) signaling (e.g. RRC signaling).***

EX-1006, 13:18-25.

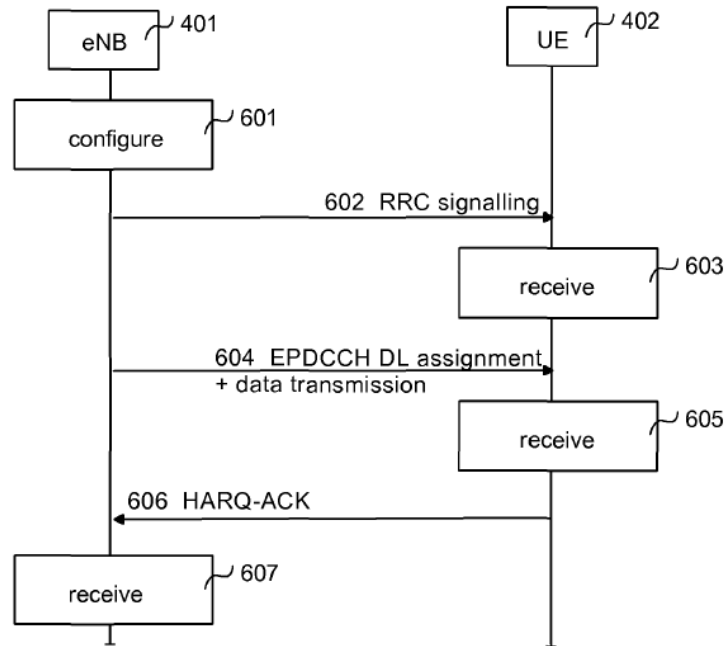


Fig. 6

EX-1006, FIG. 6; EX-1003 ¶244.

Finally, Zhang discloses that the starting offset may be configured as a UE-specific (*cell-specific*) value for each EPDCCH set:

In an exemplary embodiment, a single semi-static ***UE-specific resource*** starting offset $N^{(1)}_{\text{UE-PUCCH}}$ may be configured for each EPDCCH set assuming $M=1$.

EX-1006, 7:12-13; EX-1003 ¶245.

Lee in view of Zhang discloses limitation [1.7]. EX-1003 ¶246.

- ix. ***[1.8] wherein the start offset information on the resource allocated to the uplink control channel is determined based on a coverage level; and***

As discussed above with respect to [1.6], a UE may operate in a decoupled state where it may uplink to an LPN in which case the start offset information (*time and frequency offset information*) on the resource allocated to the uplink control channel (*PUCCH*) is determined based on a UE uplink transmission to an LPN.

VII.B.4.a.vii; EX-1003 ¶247.

Lee further discloses that an LPN will be chosen for transmission based on a coverage level of a UE/MTC (*decoupled mode used when LC-MTC is in a limited lower coverage level*). EX-1005 ¶61; *see also id.* ¶¶28-29; EX-1004, 42:61-65, 10:28-42; EX-1003 ¶248. Lee therefore discloses determining transmission to an LPN (and thus a particular determination of start offset information) based on a coverage level. EX-1003 ¶249.

Lee discloses limitation [1.8]. EX-1003 ¶250.

- x. ***[1.9] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.***

Lee discloses utilizing repeated transmissions when in coverage limited mode. EX-1005 ¶46; EX-1004, 30:18-26; EX-1003 ¶251. Lee further discloses utilizing different repetitions based on coverage levels:

For different coverage limitation level, the coverage limited mode of operation may be configured, e.g., configured separately for downlink and uplink. For example, *the number of repetition for PDSCH for coverage enhancement may be separately configured with the number of repetitions for PUSCH for coverage enhancement.*

EX-1005 ¶46; EX-1004, 30:20-26; EX-1003 ¶252.

As discussed above, repeated transmission of a PUCCH resource for HARQ ACK/NACK using a single, identical PUCCH resource in each subframe was well known in the art. V.F.1; VII.A.4.a.x; EX-1003 ¶253. Repeated transmission of PUCCH was also a well understood means of achieving coverage enhancement. V.F.2.a; EX-1003 ¶253. As the '931 Patent acknowledges, MTC terminals often operate in areas with relatively poor radio wave environments. EX-1001, 1:33-37; EX-1005 ¶1; EX-1004, 1:19-31; EX-1003 ¶253. A POSITA understood the benefits of repeatedly transmitting a HARQ ACK/NACK to ensure reception. EX-1003 ¶253. Thus, a POSITA would utilize the well-known method of repeatedly transmitting HARQ ACK/NACK through PUCCH over multiple subframes. V.F.1; EX-1003 ¶253.

Lee discloses limitation [1.9]. EX-1003 ¶254. Thus, Lee in view of Zhang

renders obvious claim 1 of the '931 Patent. EX-1003 ¶254.

b. Claim 2

- i. [2.] The method of claim 1, wherein: at least one of the plurality of pieces of start offset information is applied according to a corresponding coverage level of the MTC terminal.*

Lee in view of Zhang renders obvious claim 1 as discussed in VII.B.4.a. EX-1003 ¶255. Lee discloses that an LPN will be chosen for transmission based on a coverage level of a UE/MTC. VII.B.4.a.ix; EX-1003 ¶256. Lee further discloses that the difference in timing of transmitting the response information between the LPN (used for low coverage level UEs) and the Macro cell (used for higher coverage level UEs) may include start offset information (timing and frequency offset):

The Macro may indicate to the LPNs one or more of an C-RNTI used by the Macro, a pathloss to the Macro, *a timing and frequency offset* of the Macro, or security keys used by the UE at the Macro cell.

EX-1005, ¶77; EX-1004, 54:23-29; EX-1003 ¶256.

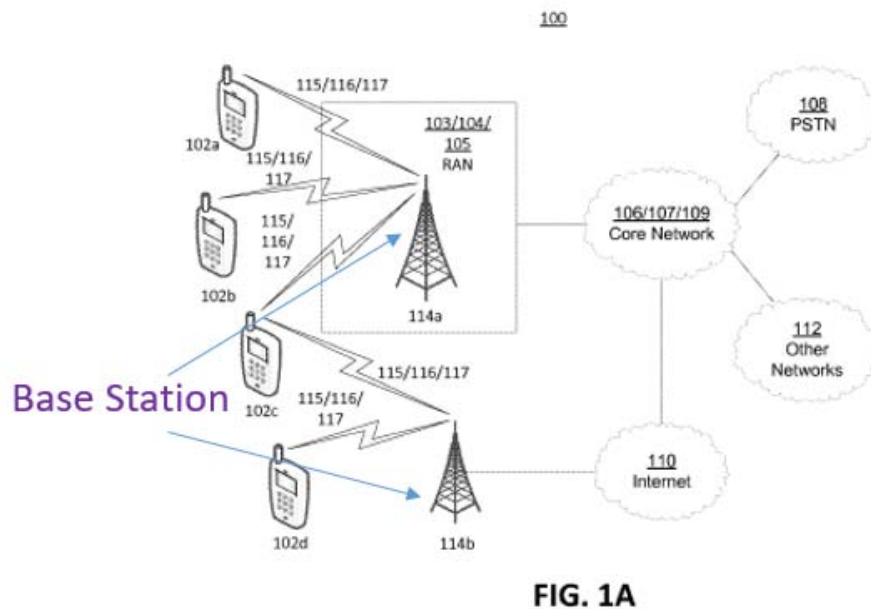
Lee in view of Zhang renders obvious claim 2. EX-1003 ¶257.

c. Claim 3

- i. [3.0] A method of configuring a resource of response information of downlink data for a Machine Type Communication (MTC)*

terminal in a base station, the method comprising:

Lee discloses the preamble to the extent it is limiting. EX-1003 ¶258. Lee discloses a method of configuring a resource of response information of downlink data for a Machine Type Communication (MTC) terminal. VII.B.4.a.i. Lee further discloses that the system includes a BS (*base station 114b*) that performs the method. EX-1005 ¶10; EX-1004, 3:20-21.



EX-1005, FIG. 1A, ¶¶28, 38; EX-1004, FIG. 1A; EX-1003 ¶258.

Lee thus discloses limitation [3.0] to the extent it is limiting. EX-1003 ¶259.

- ii. [3.1] transmitting structural information that contains at least one of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information***

on the resource allocated to the uplink control channel;

Lee and Zhang discloses this limitation as discussed in VII.B.4.a.ii. EX-1003 ¶260.

iii. [3.2] transmitting downlink control information for scheduling the downlink data; and

Lee and Zhang disclose this limitation as discussed in VII.B.4.a.iii. EX-1003 ¶261.

iv. [3.3] transmitting the downlink data,

Lee discloses this limitation as discussed in VII.B.4.a.iv. EX-1003 ¶262.

v. [3.4] wherein the resource of the uplink control channel for transmitting the response information of the downlink data is determined based on at least one piece of information on: i) a resource of a downlink control channel for scheduling the downlink data; ii) the information on the resource allocated to the uplink control channel; and iii) the start offset information on the resource allocated to the uplink control channel;

Lee and Zhang disclose this limitation as discussed in VII.B.4.a.vi. EX-1003 ¶263.

vi. [3.5] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from offset

information on a terminal different from the MTC terminal;

Lee and Zhang disclose this limitation as discussed in VII.B.4.a.vii. EX-1003 ¶264.

- vii. [3.6] wherein a plurality of pieces of start offset information on the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are transmitted through cell-specific high layer signaling for the MTC terminal to the MTC terminal;***

Lee and Zhang disclose this limitation as discussed in VII.B.4.a.viii. EX-1003 ¶265.

- viii. [3.7] wherein the start offset information on the resource allocated to the uplink control channel is determined based on a coverage level; and***

Lee discloses this limitation as discussed in VII.B.4.a.ix. EX-1003 ¶266.

- ix. [3.8] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.***

Lee discloses this limitation as discussed in VII.B.4.a.x. EX-1003 ¶267.

Therefore, Lee and Zhang render obvious claim 3. EX-1003 ¶268.

d. **Claim 4**

- i. ***[4.] The method of claim 3, wherein: at least one of the plurality of pieces of start offset information is applied according to a corresponding coverage level of the MTC terminal.***

Lee in view of Zhang renders obvious claim 3 as discussed in VII.A.4.c.

EX-1003 ¶269. Lee discloses this claim as discussed in VII.B.4.b. EX-1003 ¶¶269-270.

e. **Claim 5**

- i. ***[5.0] A Machine Type Communication (MTC) terminal for transmitting response information of downlink data to a base station, the terminal comprising:***

Lee discloses the preamble to the extent it is limiting. EX-1003 ¶271. Lee discloses an MTC terminal configured to receive downlink data and transmit response information as discussed in VII.B.4.a.i. EX-1003 ¶271. Lee further discloses a BS (*base station 114a*) that receives an uplink signal. EX-1005 ¶¶10-11; EX-1004, 3:20-21, 3:39-42; EX-1003 ¶271.

Lee discloses limitation [5.0] to the extent it is limiting. EX-1003 ¶272.

- ii. ***[5.1] a receiving unit configured to receive structural information that contains at least one piece of i) information on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource to***

which the uplink control channel is allocated, configured to receive downlink control information for scheduling the downlink data, and configured to receive the downlink data;

Lee discloses a receiving unit (*transceiver 120*):

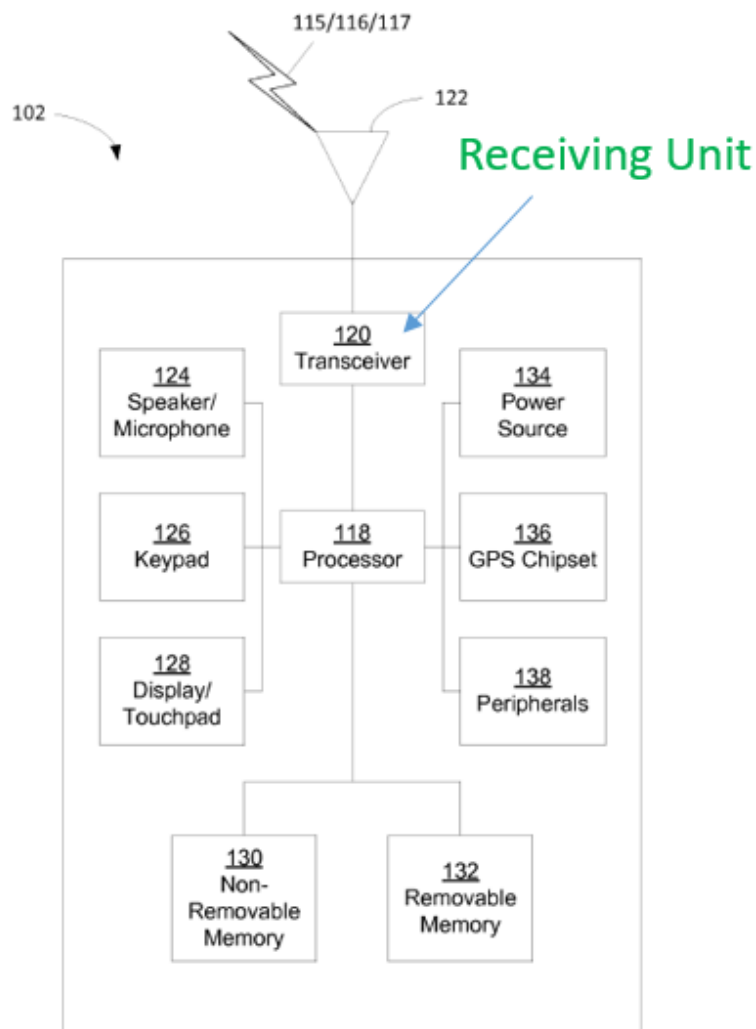


FIG. 1B

EX-1005, FIG. 1B, ¶17; EX-1004, FIG. 1B, 5:15-18; EX-1003 ¶273.

Lee in view of Zhang discloses the remainder of the limitation as discussed in VII.B.4.a.ii-VII.B.4.a.iv. EX-1003 ¶274.

- iii. [5.2] a controller configured to determine a resource allocated to the uplink control channel for transmitting the response information of the downlink data based on at least one of i) information on a resource of a downlink control channel for scheduling the downlink data, ii) the information on the resource allocated to the uplink control channel, and iii) the start offset information on the resource allocated to the uplink control channel; and;*

Lee discloses a controller (*processor 118*):

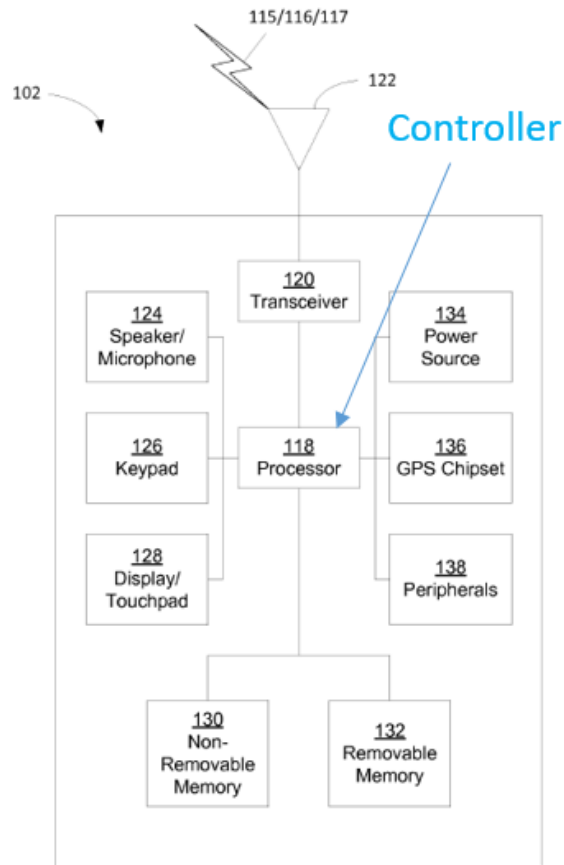


FIG. 1B

EX-1005, FIG. 1B, ¶17; EX-1004, FIG. 1B, 5:15-18; EX-1003 ¶275.

Lee in view of Zhang discloses the remainder of this limitation as discussed in VII.B.4.a.vi. EX-1003 ¶276.

- iv. ***[5.3] a transmitting unit configured to transmit the response information of the downlink data by using the determined resource of the uplink control channel,***

Lee discloses a transmitting unit (*transceiver 120*):

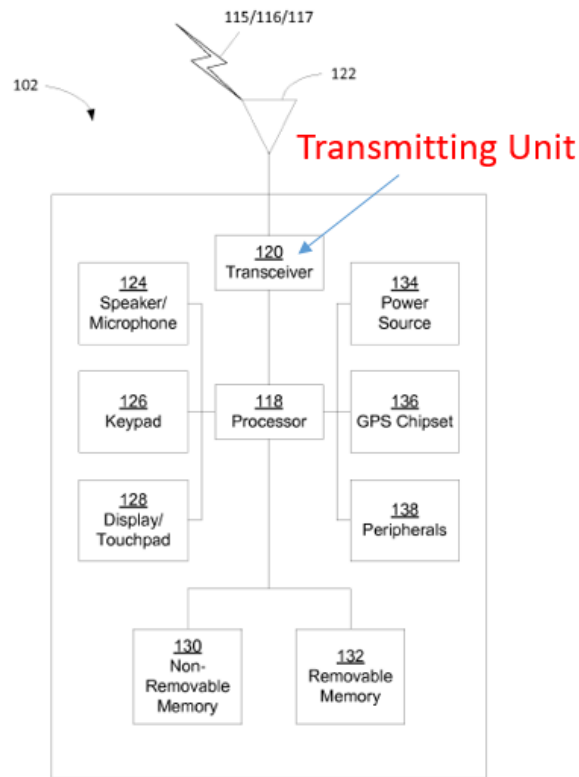


FIG. 1B

EX-1005, FIG. 1B, ¶17; EX-1004, FIG. 1B, 5:15-18; EX-1003 ¶277.

Lee in view of Zhang discloses the remainder of this limitation as discussed in VII.B.4.a.v. EX-1003 ¶278.

- v. ***[5.4] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from offset information on a terminal different from the MTC terminal;***

Lee in view of Zhang discloses this limitation as discussed in VII.B.4.a.vii.

EX-1003 ¶279.

- vi. *[5.5] wherein a plurality of pieces of start offset information on the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are received through cell-specific high layer signaling for the MTC terminal from the base station;*

Lee in view of Zhang discloses this limitation as discussed in VII.B.4.a.viii.

EX-1003 ¶280.

- vii. *[5.6] wherein the start offset information on the resource allocated to the uplink control channel is determined based on a coverage level; and*

Lee discloses this limitation as discussed in VII.B.4.a.ix. EX-1003 ¶281.

- viii. *[5.7] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.*

Lee discloses this limitation as discussed in VII.B.4.a.x. EX-1003 ¶282.

Therefore, Lee and Zhang renders obvious claim 5. EX-1003 ¶283.

f. **Claim 6**

- i. *[6.] The MTC terminal of claim 5, wherein: at least one of the plurality of pieces of start offset information is applied according to a*

corresponding coverage level of the MTC terminal.

Lee and Zhang render obvious claim 5 as discussed in VII.A.4.e. EX-1003

¶284. Lee discloses claim 6 for the reasons discussed in VII.B.4.b. EX-1003

¶285. Accordingly, Lee and Zhang renders obvious claim 6. EX-1003 ¶286.

g. Claim 7

- i. [7.0] A base station for configuring a resource of response information of downlink data for a Machine Type Communication (MTC) terminal, the base station comprising:***

Lee discloses the preamble to the extent it is limiting. EX-1003 ¶287. Lee discloses a method of configuring a resource of response information of downlink data for an MTC terminal. VII.B.4.a.i. Lee further discloses that a BS (*base station 114b*) configures the resource response information. EX-1005, ¶¶10, 26; EX-1004, 3:20-21, 10:28-33;1003 ¶287.

Lee thus discloses limitation [7.0] to the extent it is limiting. EX-1003 ¶288.

- ii. [7.1] transmitting unit configured to transmit structural information, downlink control information for scheduling the downlink data, and the downlink data;***

As discussed above, Lee discloses a transmitting unit (*transceiver 120*):

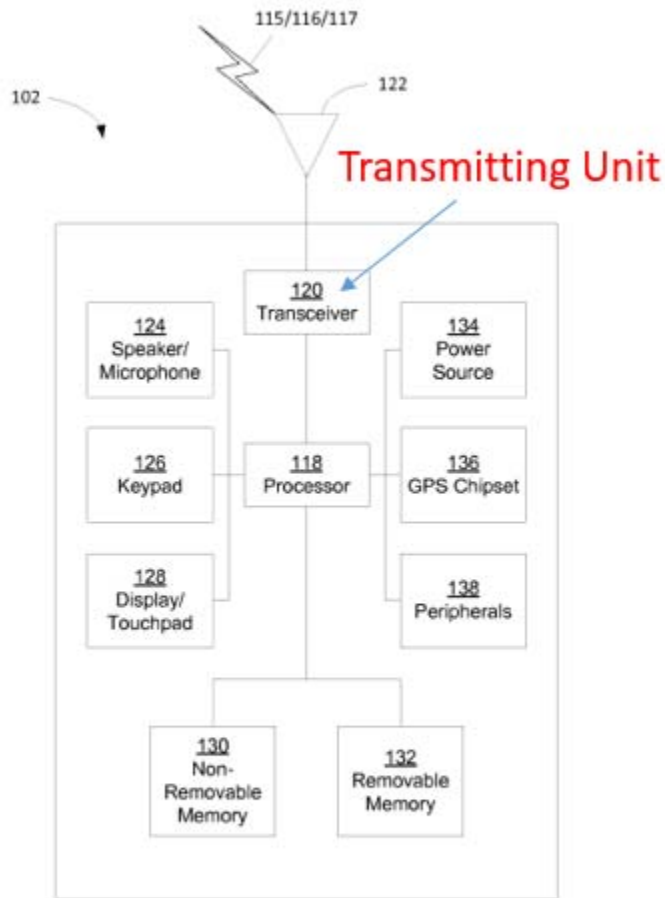


FIG. 1B

EX-1005, FIG. 1B, ¶17; EX-1004, FIG. 1B, 5:15-18; EX-1003 ¶290; *see also* VII.B.4.e.iv.

Lee and Zhang disclose the transmission of structural information, downlink control information for scheduling the downlink data, and the downlink data as discussed in VII.B.4.c.ii-VII.A.4.c.iv. EX-1003 ¶291.

iii. [7.2] wherein the structural information contains at least one piece of i) information

on a resource allocated to an uplink control channel for transmitting the response information and ii) start offset information on the resource allocated to the uplink control channel;

Lee and Zhang disclose this limitation as discussed in VII.A.4.e.ii. EX-1003

¶292.

- iv. [7.3] wherein the resource of the uplink control channel for transmitting the response information of the downlink data is determined based on at least one piece of i) information on a resource of a downlink control channel for scheduling the downlink data, ii) the information on the resource allocated to the uplink control channel, and iii) the start offset information of the resource allocated to the uplink control channel;***

Lee and Zhang disclose this limitation as discussed in VII.B.4.c.v. EX-1003

¶293.

- v. [7.4] wherein the start offset information of the resource allocated to the uplink control channel is configured separated from offset information on a terminal different from the MTC terminal;***

Lee and Zhang disclose this limitation as discussed in VII.B.4.c.vi. EX-

1003 ¶294.

- vi. *[7.5] wherein a plurality of pieces of start offset information on the resource allocated to the uplink control channel are provided, and the plurality of pieces of start offset information are transmitted through cell-specific high layer signaling for the MTC terminal to the MTC terminal;*

Lee and Zhang disclose this limitation as discussed in VII.B.4.c.vii. EX-1003 ¶295.

- vii. *[7.6] wherein the start offset information of the resource allocated to the uplink control channel is determined based on a coverage level; and*

Lee discloses this limitation as discussed in VII.B.4.c.viii. EX-1003 ¶296.

- viii. *[7.7] wherein when the response information of the downlink data of the MTC terminal is repeatedly transmitted, the repeated transmission is performed using a same uplink control channel resource in each uplink subframe in which the uplink control channel is repeatedly transmitted.*

Lee discloses this limitation as discussed in VII.B.4.c.ix. EX-1003 ¶297.

Therefore, Lee and Zhang render obvious claim 7. EX-1003 ¶298.

VIII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION AND DENY INSTITUTION

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, neither the combination of You and Kim nor the combination of Lee and Zhang was before the Examiner, and the prosecution history does not include any overlapping arguments to this Petition. For example, You was never considered by the Examiner as it was not discussed during prosecution or cited on the face of the '931 Patent. And there are no overlapping arguments with those made during prosecution. *See generally* Ex. 1002. While the

examiner did consider a publication from the same inventor (You 098), these are different pieces of prior art and are not related.

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.

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 '931 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. Intrix-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) (“*Fintiv*”).

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-1024. 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, and 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 with this case given the number of parties involved and the number of trials regarding this patent. In addition, and because much can change in twelve 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”).⁵

⁵ For these reasons, the “statistics on median time-to-trial for civil actions in the

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 because (as explained earlier) 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 '931 Patent. 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-1025. In addition, counterclaim defendant and patent owner, KT Corporation, has not yet filed an answer, which will likely further delay progress on the merits.

district court in which the parallel litigation resides” do not apply to this case given the number of cases and number of defendants.

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 7 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. 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, You in view of Kim, as well as Lee in view Zhang, expressly disclose limitations 1.6 and 1.7 which the Applicant incorporated into Claim 1 to overcome prior art. *See* VII.A.4.a.vii-VII.A.4.a.viii; VII.B.4.a.vii-

VII.B.4.a.viii; V.B. 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 '931 Patent is currently asserted in three district court cases. Institution of this IPR provides the opportunity for narrowing and simplifying 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 *inter partes review* (“IPR”) petition filed by any Petitioner with respect to the '931 Patent.

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

A. Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

The real parties in interest are Celco 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 LLC⁶, 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 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 (37 C.F.R. § 42.8(b)(2))

As of the filing date of this Petition and to the best knowledge of Petitioners, the '931 Patent is involved in the following litigations:

⁶ 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.

- *Pegasus Wireless Innovation LLC. v. AT&T Inc. et al.*, No. 2:23-cv-00638 (E.D. Tex) (hereinafter, “AT&T Case”);
- *Pegasus Wireless Innovation LLC. v. T-Mobile US, Inc. et al.*, No. 2:23-cv-00639 (E.D. Tex) (hereinafter, “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-1026. Petitioners are not aware of any other judicial or administrative matter that would affect or be affected by a decision in this IPR.

These are referenced collectively herein as the “Related Litigation(s).”

C. Related Patents

Petitioners are unaware of any related patents.

X. Lead/Back-up Counsel (37 C.F.R. § 42.8(b)(3)):

Lead Counsel:

Jarrad M. Gunther, USPTO Reg. No. 63,903

DUANE MORRIS LLP, 30 S. 17th Street,

Philadelphia, PA 19103

P: (215) 979-1837; JMGunther@duanemorris.com

Back-Up Counsel for Petitioners Cellco Partnership D/B/A/ Verizon Wireless, AT&T Services, Inc., T-Mobile USA, Inc., Ericsson, Inc. and

Nokia of America Corporation:

Patrick D. McPherson, USPTO Reg. No. 46,255

DUANE MORRIS LLP, 901 New York Ave. NW Suite 700 East,
Washington, D.C. 20001

P: (202) 776-5214; PDMcPherson@duanemorris.com

Kevin Anderson, USPTO Reg. No. 43,471

DUANE MORRIS LLP, 901 New York Ave. NW Suite 700 East,
Washington, D.C. 20001

P: (202) 776-5213; KPAnderson@duanemorris.com

Ross R. Barton, USPTO Reg. No. 51,438

Christopher TL Douglas, USPTO Reg. No. 56,950

S. Benjamin Pleune Reg. No. 52,421

J. Ravindra Fernando Reg. No. 73,762

ALSTON & BIRD LLP, Vantage South End 1120 South Tryon Street,
Suite 300, Charlotte, NC 28203-6818

P: (704) 444-1000; ross.barton@alston.com;
christopher.douglas@alston.com; ben.pleune@alston.com;
ravi.fernando@alston.com

David S. Frist, USPTO Reg. No. 60,511

ALSTON & BIRD LLP, One Atlantic Center, 1201 West Peachtree Street,
Suite 4900, Atlanta, GA 30309-3424

P: (404) 881-7000; david.frist@alston.com

Back-Up Counsel for Petitioner Google LLC:

Patrick C. Keane, USPTO Reg. No. 32,858

Roger H. Lee, USPTO Reg. No. 46,317

Buchanan Ingersoll & Rooney PC, 1737 King Street, Suite 500

Alexandria, Virginia 22314

P: (703) 836-6620; patrick.keane@bipc.com; roger.lee@bipc.com

Andrew J. Koopman, USPTO Reg. No. 65,537

Tanya S. Gaylord, USPTO Reg. No. 71,344

Buchanan Ingersoll & Rooney PC, 2200 Renaissance Blvd., Suite 350

King of Prussia, PA 19406

P: (610) 407-0700; andrew.koopman@bipc.com; tanya.gaylord@bipc.com

A. Notice of Service Information (37 C.F.R. § 42.8(b)(4)):

Please direct all correspondence to lead and back-up counsel at the above addresses. Petitioners consent to electronic service at the email addresses above.

XI. CONCLUSION

Petitioners request the Board institute *inter partes* review and find the Challenged Claims unpatentable.

Respectfully submitted,

DUANE MORRIS LLP

BY: /Jarrad M. Gunther/

Jarrad M. Gunther

USPTO Reg. No. 63,903

Duane Morris LLP

30 S. 17th Street,

Philadelphia, PA 19103

Dated: November 27, 2024

CERTIFICATION OF SERVICE ON PATENT OWNER

Pursuant to 37 C.F.R. §§42.6(e), 42.8(b)(4) and 42.105, the undersigned certifies that on November 27, 2024, a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent 10,181,931 and all supporting exhibits were served via Federal Express, postage prepaid, to the correspondence address of record for the '931 Patent:

IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA
UNITED STATES

/Jarrad M. Gunther/
Jarrad M. Gunther, USPTO Reg. No. 63,903
30 S. 17th Street
Philadelphia, PA 19103
P: (215) 979-1837
F: (215) 979-1020
JMGunther@duanemorris.com

ATTORNEY FOR PETITIONERS

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24 *et seq.*, the undersigned certifies that this document complies with the type-volume limitations. This document contains 13,951 words as calculated by the “Word Count” feature of Microsoft Word 2010, the word processing program used to create it. In addition, there were 6 words added to the annotated Figures herein as counted manually.

Dated: November 27, 2024

/Jarrad M. Gunther/

Jarrad M. Gunther, USPTO Reg. No. 63,903
30 S. 17th Street
Philadelphia, PA 19103
P: (215) 979-1837
F: (215) 979-1020
JMGunther@duanemorris.com