

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Kari P. Pajukoski et al.
U.S. Patent No.: 9,185,688
Issue Date: November 10, 2015
Appl. Serial No.: 14/793,941
Filing Date: July 8, 2015
Title: Providing Improved Scheduling Request Signaling With
ACK/NACK or CQI

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT

NO. 9,185,688 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

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EXHIBITS

HUAWEI-1001	U.S. Patent No. 9,185,688 to Pajukoski, et al. (“the ’688 Patent”)
HUAWEI-1002	Excerpts from the Prosecution History of the ’688 Patent (“the Prosecution History”)
HUAWEI-1003	Declaration of Narayan Mandayam
HUAWEI-1004	Curriculum Vitae of Narayan Mandayam
HUAWEI-1005	U.S. Patent No. 7,852,883 to Kwak <i>et al.</i> (“KwakPat883”)
HUAWEI-1006	Prosecution History of KwakPat883
HUAWEI-1007	Prosecution History of Provisional Application No. 60/954,812 of KwakPat883 filed on Aug. 8, 2007. Including its Certified English Translation (“KwakProv812”)
HUAWEI-1008	(Reserved)
HUAWEI-1009	Prosecution History of Provisional Application No. 60/979,860 of KwakPat883 filed on Oct. 14, 2007, including its Certified English Translation (“KwakProv860”)
HUAWEI-1010	(Reserved)
HUAWEI-1011	U.S. Patent Application Publication No. US 2008/0316959 to Bachl <i>et al.</i> (“Bachl”)
HUAWEI-1012	U.S. Patent Application Publication No. US 2009/0022135 to Papasakellariou <i>et al.</i> (“Papasakellariou”)
HUAWEI-1013	3GPP TSG-RAN WG1 Meeting #50, doc R1-073485, <i>Proposed Scheduling Request (SR) structure and multiplexing with PUCCH</i> (August 20-24, 2007), available as “R1-073485.zip”, http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_50/Docs/ (uploaded 8/15/2007, p.2:07 PM) (“LGE”)

HUAWEI-1014	Declaration of Xiaoan Fan (“Fan_Decl.”)
HUAWEI-1015	Exhibit No. 1004 of IPR2017-00591
HUAWEI-1016	<div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div> <div style="background-color: black; height: 1.2em; width: 100%;"></div>
HUAWEI-1017	3GPP TSG-RAN WG1 Meeting #49bis, doc R1-073011, <i>Multiplexing of Scheduling Request and ACK/NACK and/or CQI</i> (June 25 – 29, 2007), available as “R1-073011.zip”, at http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_49b/Documents/
HUAWEI-1018	U.S. Patent No. 5,544,156 to Teder <i>et al.</i> (“Teder”)
HUAWEI-1019	U.S. Patent Application Publication Number US 2007/0171849 to Zhang <i>et al.</i> (“Zhang”)
HUAWEI-1020	U.S. Patent No. 8,094, 554 to Gholmieh <i>et al.</i> (“Gholmieh”)
HUAWEI-1021	U.S. Patent No. 7,881,398 to Mujtaba <i>et al.</i> (“Mujtaba”)
HUAWEI-1022	Frequently Asked Questions, available at http://web.archive.org/web/20070630180057/http://www.3gpp.org:80/faq/faq_2005_2.htm (“3GPP FAQ”)
HUAWEI-1023	3GPP Delegates Corner, available at http://web.archive.org/web/20070702235036/http://www.3gpp.org:80/delegates/delegates.htm (“3GPP Delegates Corner”)
HUAWEI-1024	3GPP Webpage, available at http://web.archive.org/web/20070703092005/http://www.3gpp.org:80/About/about.htm (“About 3GPP”)

HUAWEI-1025	Dictionary Definition of “allocate”
HUAWEI-1026	Affidavit of Office Manager at the Internet Archive
HUAWEI-1027	U.S. Patent No. 9,148,877 to Pajukoski, et al. (“the ‘877 Patent”)
HUAWEI-1028	Excerpts from the Prosecution History of the ’877 Patent (“the Prosecution History of the ’877 Patent”)
HUAWEI-1029	Claim Construction Memorandum and Order, from Case No. 2:16-cv-00754-JRG-RSP E.D. Tex, May 19, 2017 (Markman Order)

Huawei Technologies Co. Ltd. (“Petitioner”) petitions for Inter Partes Review (“IPR”) under 35 U.S.C. §§ 311–319 and 37 C.F.R. § 42 of claims 1-24, 37-40, 42-48 (“the Challenged Claims”) of U.S. Patent No. 9,185,688 (“the ’688 Patent”). As explained in this petition, there exists a reasonable likelihood that Petitioner will prevail (“RLP”) with respect to at least one of the Challenged Claims.

The Challenged Claims are unpatentable based on teachings set forth in at least the references presented in this petition. Petitioner respectfully submits that an IPR should be instituted, and that the Challenged Claims should be canceled as unpatentable.

I. REQUIREMENTS FOR IPR

A. Grounds for Standing

Petitioner certifies that the ’688 Patent is available for IPR. The petition is being filed within one year of service of a complaint against Petitioner. Petitioner is not barred or estopped from requesting this review.

B. Challenge and Relief Requested

Petitioner requests IPR of the Challenged Claims on the grounds in the table below, as explained in this petition and in HUAWEI-1003, Declaration of Dr. Narayan Mandayam (“Decl.”).

Grounds	'688 Patent Claims	Basis for Rejection
Ground-1A	1-2, 4-9, 37-39, and 42-45	§102: KwakPat883
Ground-1B	1-2, 4-9, 37-39, and 42-45	§102: LGE
Ground-2A	3 and 40	§102: LGE
Ground-2B	3 and 40	§103: KwakPat883 and LGE
Ground-3A	43-45	§103: KwakPat883
Ground-3B	1-9, 37-40, and 42- 45	§103: LGE
Ground-4A	10, 11, 13-15, 17- 24, and 46-48	§103: KwakPat883 and Bachl
Ground-4B	10, 11, 13-15, 17- 24, and 46-48	§103: LGE and Bachl
Ground-5A	12 and 16	§103: LGE and Bachl
Ground-5B	12 and 16	§103: KwakPat883, LGE and Bachl

Each reference qualifies as prior art.

(1) KwakPat883

KwakPat883 issued from U.S. application 12/594,159 filed as a National Phase application of PCT/KR2008/004590, which was published in English, designated the United States, and was filed on 08/07/2008 before the 07/08/2015 “Filing Date” of the ’688 Patent. U.S. Application 12/594,159 of KwakPat883 shares identical disclosure to PCT/KR2008/004590. Thus, KwakPat883 qualifies as prior art to the ’688 Patent as of its PCT filing date, unless Patent Owner is able to prove that the ’688 Patent is entitled to its provisional filing date of 10/30/2007 (“Provisional Date”).¹

KwakPat883 also claims priority under 35 U.S.C. 119(e) to U.S. Provisional Application 60/954,812 (“KwakProv812”), which was filed on 08/08/2007, before the Provisional Date. KwakProv812 was incorporated by reference into Kwak-

¹ If Patent Owner is unable to prove that the ’688 Patent is entitled to the Provisional Date, the analysis regarding KwakProv812 in Section-III is unnecessary. Indeed, at least claims 37-39&42 of the ’688 patent cannot claim priority to the Provisional Date because these claims are disclosed in connection with FIGS.9A-9C, which are absent from the Provisional Patent Application No. 61/001,207, filed on the Provisional Date.

Pat883. HUAWEI-1005,1:5-12. Pursuant to 37 C.F.R. 1.78(a)(5), an English-language translation and a statement that the translation is accurate were filed for each provisional application. HUAWEI-1007,pp.45-46.

As shown in the below chart, claim 1 of KwakPat883 is fully supported by KwakProv812. *See also* Decl.¶¶63-84. Because at least one claim of KwakPat883 is supported by disclosure in KwakProv812, teachings common to KwakPat883 and KwakProv812 are available as prior art as of KwakProv812's 08/08/2007 filing date. *See Cisco v. Capella*, IPR2014-01276, Paper 40, 22 (P.T.A.B. 2016)(citing *Dynamic Drinkware v. National Graphics*, 800 F.3d 1375 (Fed. Cir. 2015)). Such teachings are identified throughout the present Petition by parallel citations to exemplary corresponding disclosure in KwakProv812. Additionally, as KwakProv812 is incorporated by reference into KwakPat883 (HUAWEI-1005,1:5-12), any disclosure in KwakProv812 is necessarily available in KwakPat883 by virtue of the incorporation. Citations to disclosure within KwakProv812 are intended to represent citations to corresponding incorporated subject matter within KwakPat883.

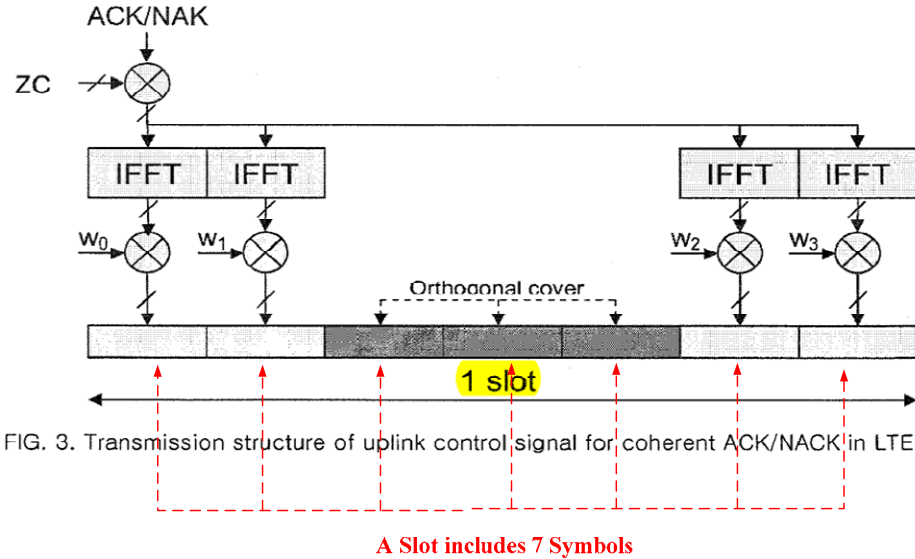
Claim 1 of KwakPat883	Support from KwakProv812

A method of transmitting up-link control signals	<p>“a transmission method² which can support both the control signal and the SR,” HUAWEI-1007,48:3-4. FIG.2 (reproduced below) shows control signals are transmitted by a user equipment (UE) on “UL Control Channel,” HUAWEI-1007,49:17-20. Decl.¶¶65-66.</p> <p>KwakProv812-FIG.2 (annotated)</p>
in a wireless communication system	<p>“a broadband communication system...to maximize efficiency in limited wireless resources.” HUAWEI-1007,48:22-23.</p>
using at least one subframe comprising two slots	<p>The above FIG.2 shows transmitting control channel <i>using at</i></p>

² Bolded text represents emphases added by Petitioner in each citation, unless otherwise specified.

	<p><i>least one subframe comprising two slots.</i>³ Additionally, FIG. 3 (reproduced below) “shows a control channel structure [of one slot in one sub-frame] for transmitting coherent ACK/NACK transmission” in LTE. HUAWEI-1007,50:3-5, FIG.3, Title. Decl.¶67.</p>
<p>each slot including a plurality of symbols,</p>	<p>KwakProv812 shows in FIG. 3 and discloses <i>each slot includes a plurality of</i> (i.e.,7) <i>symbols</i>: “transmitting an SR signal in a 2D spreading channel structure ... like an LTE ACK/NACK channel” as shown in FIG.3 (HUAWEI-1007,51:19-20), “the SR channel is configured by respectively allocating the orthogonal codes having a length of 4 to OFDM symbols for carrying SR information and the orthogonal codes having a length of 3 [symbols] to a section used as RS” (HUAWEI-1007,56:1-5). Decl.¶¶68-69.</p>

³ Italics are added by Petitioner to highlight claim language, unless otherwise specified.

	 <p>FIG. 3. Transmission structure of uplink control signal for coherent ACK/NACK in LTE</p> <p>A Slot includes 7 Symbols</p> <p>KwakProv812-FIG.3 (annotated)</p>
<p>the wireless communication system configured to transmit a scheduling request (SR) via a preassigned SR physical uplink control channel</p>	<p>KwakProv812 discloses <i>this feature</i> by referencing the SR channel and ACK/NACK channel as <i>preassigned uplink control channel resources</i> (e.g., “configure a dedicated SR channel by allocating certain time/frequency/code resources.” HUAWEI-1007,50:9-10; “configuring an SR channel and an ACK/NACK channel through the code allocation,” HUAWEI-1007,52:13-14; Decl. ¶¶71-77. KwakProv812 teaches transmission of SR and ACK/NACK on such previously allocated (i.e., which is a synonym for preassigned)</p>

<p>(PUCCH) re-source and to transmit a ACK/NACK via a preassigned ACK/NACK physical uplink control channel (PUCCH) re-source,</p>	<p>channel resources, respectively: “the SR ...can be transmitted through the previously allocated SR channel” (HUAWEI-1007,59:16-18); and “the ACK/NACK information undergoes the coherent modulation/demodulation through the previously allocated ACK/NACK channels” (HUAWEI-1007,59:23-24). <i>See also</i> FIG. 3 shows “Transmission structure of uplink control signal for coherent ACK/NACK in LTE.” Decl.¶¶71-73.</p> <p>The SR channel and ACK/NACK channel are physical uplink control channel (PUCCH) resources, as acknowledged by the '688 Patent. It had been known that, in LTE, UE transmits uplink acknowledgment on a PUCCH when the UE has no UL data to transmit. <i>See</i> Section-II-B-(1); Decl.¶74. Here, KwakProv812 discloses that “[i]f there is no data to be transmitted along with the control signal, ... the user equipment for transmitting only the control channel transmits the [uplink] control signal by demodulating the control signal to this allocated region in the form of SCFDM (refer to FIG.2).” HUAWEI-1007,49:19-20. Indeed, FIG. 2 (reproduced above) shows the “UL Control Channel,” i.e., “this</p>
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	allocated region” for “L1/L2 control signal,” is distinguished from the data region denoted as the physical uplink shared channel (“ PUSCH ”), further substantiating KwakProv812’s disclosure of a physical uplink control channel (PUCCH). <i>See id.</i> Decl.¶¶75-77.
the method comprising: determining whether or not an ACK/NACK and a SR are to be transmitted in a subframe; and	KwakProv812 discloses determining “[i]f the transmission of the ACK/NACK signal is required at the SR transmission like (2) of FIG.7,” HUAWEI-1007,59:16-17; “ transmission [of SR] simultaneous with ... the ACK/NACK signal, ” HUAWEI-1007,52:17-20; <i>see also</i> FIG.7 where the selection of path (1) or (2) is based on the determination of “SR Triggering.” Decl.¶¶78-80).
transmitting the ACK/NACK and the SR in the subframe via the preassigned SR PUCCH resource if the step	KwakProv812 discloses that “ both the SR and ACK/NACK can be transmitted through the previously allocated SR channel. ” HUAWEI-1007,59:17-18; <i>see also</i> FIG.7 where, upon the determining that SR is to be transmitted together with the ACK/NACK Signal at “SR Triggering,” path (2) is selected where the SR and the ACK/NACK are transmitted simultaneously in the SR channel, which “like an LTE

<p>of determining</p> <p>indicates that the</p> <p>ACK/NACK and</p> <p>the SR are to be</p> <p>transmitted in</p> <p>the subframe.</p>	<p>ACK/NACK channel” has 7 symbols is “of one slot” “in the</p> <p>subframe” (as shown in (1) in FIG.7 and FIG.3), HUAWEI-</p> <p>1007,51:4,6-7;50:3-6; FIGS.2-4; Decl.¶81.)</p> <p>KwakProv812-FIG.7 (annotated)</p>
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(2) LGE

The Third Generation Partnership Project (3GPP) develops technical specifications for its Organizational Partners that in-turn adopt those specifications in to their regional standards. Fan_Decl.¶¶9-14; Decl.¶36. The development of specifications by 3GPP is an ongoing, collaborative effort involving hundreds of engineers from many companies. *Id.* Members of the various 3GPP working groups submit written contributions and discussion documents before, during, and after scheduled working group meetings. 3GPP stores these documents electronically and retains them on 3GPP's public FTP server indefinitely. *Id.*

LGE is a 3GPP contribution that was publically available by 08/20-24/2007, and as early as 08/15/2007. *See* Fan_Decl.¶¶18-43. For each of the reasons described below and in the Fan Declaration, LGE was published prior to 10/30/2007, and thus is prior art under pre-AIA 35 U.S.C § 102(a). If Patent Owner is unable to prove that the '688 Patent is entitled to the Provisional Date, LGE is 102(b) prior art. HUAWEI-1013,p.1.

First, copies of LGE were disseminated to interested members of the public at 3GPP TSG RAN WG1 Meeting #50, which was held on 08/20-24/2007, in Athens, Greece. Fan_Decl.¶¶21-23. (“Based on my personal knowledge, [LGE] was electronically available to attendees at RAN WG1 Meeting #50 via a local electronic distribution system.”) RAN WG1 Meeting #50 was attended by 205 individuals representing more than 70 different organizations. *Id.*; *Suffolk Techs., LLC v. AOL Inc.*, 752 F.3d 1358, 1364 (Fed. Cir. 2014) (LGE was “sufficiently disseminated at the time of its publication”); *Mass. Inst. of Tech. v. AB Fortia*, 774 F.2d 1104, 1108–09 (Fed. Cir. 1985). Accordingly, LGE was publicly accessible by August 20-24, 2007, and qualifies as a prior art printed publication. *See LG Elecs. v. Core Wireless Licensing S.A.R.L.*, IPR2015-01988, Paper 31, pp.16–26 (PTAB Mar. 16, 2017) (finding “sufficient actual dissemination of the [3GPP] documents at issue to qualify them as printed publications”).

Second, copies of LGE were disseminated to interested members of the public who subscribed to RAN WG1's public e-mail reflector list (3GPP_TSG_RAN_WG1@LIST.ETSI.ORG) or who navigated to RAN WG1 e-mail reflector's online archive on 08/15/2007. Fan_Decl.¶¶24-29.

Third, copies of LGE were disseminated to interested members of the public on 3GPP's public FTP server on 08/15/2007 at 2:07PM. Fan_Decl.¶¶30-43. Specifically, any member of the public could have freely navigated 3GPP's public FTP directory and used the available index for RAN WG1 Meeting #50 to easily search the RAN WG1 Meeting #50 contributions, and thus access LGE. *Id.*; see also HUAWEI-1022; HUAWEI-1023.

Additionally, the Patent Owner previously acknowledged that 3GPP contributions, such as LTE, are printed publications that are freely available on 3GPP's public FTP server. *E.g.*, HUAWEI-1015, [20]-[21].

(3) Bachl

Bachl is a publication corresponding to U.S. Patent Application filed on 6/19/2007, before the Provisional Date, thus qualifies as 102(e) prior art. Bachl was cited as an anticipatory reference during prosecution of the '688 Patent's parent application of U.S. Patent 9,148,877 ("the '877 Patent"). *See* HUAWEI-1028, p.351. In the present Petition, Bachl is used as a secondary reference for its express disclosure of common-place features such as a "processor," "memory," and "non-

transitory computer readable medium” of an apparatus (e.g., user equipment) in a wireless communication system. Grounds-4A&4B,5A&5B.

C. Claim Construction under 37 C.F.R. §§ 42.104(b)(3)⁴

A claim subject to IPR is given its “broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b). For the purpose of this proceeding only, Petitioner addresses the term “a sequence that is unmodulated via a modulation scheme used for the acknowledgement data.”⁵

⁴ In co-pending litigation, the District Court issued a Markman Order noting the ’688 Patent has no terms in construction disputes. HUAWEI-1029, footnote 1.

⁵ This interpretation determines whether the prior art anticipates or renders the Challenged Claims obvious. Petitioner does not concede that any Challenged Claim meets statutory standards for patent claiming, and neither Petitioner’s interpretations of the Challenged Claims, nor Petitioner’s analysis of the Challenged Claims relative to the cited art should be treated as such a concession. Petitioner recognizes that IPR is not an appropriate forum to address certain issues, such as the patentability of the claimed invention under 35 U.S.C. § 101 or the failure to comply with 35 U.S.C. § 112, and, therefore reserves all rights to contend that one or more Challenged Claims are invalid for reasons out of scope for IPR. The failure to claim patentable subject matter under 35 U.S.C. § 101 or the presence of

The remaining claim terms need not be construed at this time.

Under the Broadest Reasonable Interpretation(BRI) Standard, “a sequence that is unmodulated via a modulation scheme used for the acknowledgement data” should be interpreted broadly enough to encompass “reference signals.” Such an interpretation is supported by intrinsic evidence: dependent claim 7 recites “where the physical uplink control channel comprises *an unmodulated sequence*,” and makes it plain that “*the unmodulated sequence comprises reference signals*.” Such an interpretation is consistent with the specification and prosecution history of the ’688 Patent and the ordinary meaning of the term to a person of skill in the art by

definiteness and description problems in the Challenged Claims is no bar to IPR in appropriate circumstances; the Board may set aside such issues when reviewing claims under 35 U.S.C. §§ 102 and 103. *E.g., Vibrant Media, Inc. v. Gen’l Elec. Co.*, IPR2013-00172, 2014 WL 3749773, at *6–7 (PTAB, July 28, 2014). The standard for district court (“ordinary and customary meaning”) is different than the BRI standard applied in IPR. Due to these differences, disclosure identified by Petitioner as teaching terms of the ’688 Patent is not an admission that the terms are met by any disclosure for infringement purposes.

the time of the earliest possible priority date of the '688 Patent ("POSITA")⁶.

Decl.¶¶55-62.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

For at least the above reasons, the broadest reasonable construction of "a sequence that is unmodulated via a modulation scheme used for the acknowledgment data" should encompass "reference signals."

II. SUMMARY OF THE '688 Patent

A. Brief Description

The '688 Patent relates to "signaling of a scheduling request [SR] in conjunction with an acknowledgement or channel quality indicator [CQI]."

HUAWEI-1001,1:21-23. *See also* Decl.¶¶34-44. Particularly, the '688 Patent considers "a multiplexing case where data-non-associated control signals, such as ACK/NACK [acknowledgement/negative acknowledgement] "(e.g., DL[downlink]

⁶ In this Petition and Dr. Mandayam's declaration, statements w.r.t. a POSITA, even if casted in the present tense, are meant to reflect the understanding of a POSITA as of the earliest possible priority date of the '688 Patent.

“ACK/NACK) and/or periodic CQI, exist simultaneously with an UL[uplink]

“SR.” HUAWEI-1001,4:3-5. Annotated FIG.5 of the '688 Patent below shows four cases of resources used for transmission of one or more of the SR, ACK/NACK, and CQI control signals:

(1) Only ACK/NACK; no SR or CQI => Use ACK/NACK resources.

See HUAWEI-1001,6:28-30.

(2) CQI (with or without ACK/NACK); no SR => Use CQI resources.

See HUAWEI-1001,6:30-33.

(3) Only SR; no ACK/NACK => Use SR resources:

See HUAWEI-1001,6:36-41.

(4) Both SR and ACK/NACK => Use SR resources:

See HUAWEI-1001,6:41-45.

The '688 Patent, FIG.5 (annotated)

B. Admitted Prior Art Teachings of the '688 Patent

In Background Section, the '688 Patent acknowledges that “The 3GPP has been working on the standardization of LTE [long term evolution of UTRAN (E-UTRAN)],” Decl.¶46, and it had been known and agreed that:

(4) UE transmits UL acknowledgment on a PUCCH when the UE has no UL data to transmit:

“In the case where the UE has no data to transmit (i.e., on the UL), the ACK/NACK is signaled on the PUCCH.” HUAWEI-1001,2:43-44. “[D]ata-non-associated control signals (e.g., ACK/NACK, periodic CQI) are transmitted on the PUCCH.” HUAWEI-1001,2:3-5. Decl.¶47.

(5) Acknowledgment data (e.g., ACK/NACK signals) includes a modulated BPSK or QPSK sequence:

“(a) *ACK/NACK (only) signals are transmitted utilizing modulated CAZAC¹ sequences (coherent)*. BPSK is used for 1-bit ACK/NACK and **QPSK for 2-bit ACK/NACK.**” HUAWEI-1001,2:5-8. Decl.¶48.

(6) Acknowledgment data (e.g., ACK/NACK signals) are transmitted with reference signals, where the reference signals are unmodulated sequences:

The ACK/NACK signals are transmitted based on *coherent* demodulation. See HUAWEI-1001,2:5-7. It is common knowledge to a POSITA that *coherent* demodulation of modulated data relies on channel information estimated based on the reference signals.

Decl.¶49. The reference signals have to be un-modulated, at least un-modulated via a modulation scheme used for the data, so as to provide the auxiliary channel information necessary for coherent demodulation of the modulated data. Decl.¶49-50.

Specifically, “[b]lock-wise spreading with SF=3/SF=4 (*pilot/data*) is applied for the modulated CAZAC₁ sequences.”

HUAWEI-1001,2:7-10. In other words, here the *coherent* demodulation of the acknowledgement data uses a specific pilot/data ratio: 3 pilots/*references signals* for 4 data sequences. The acknowledgment data sequences are *modulated* CAZAC sequences whereas the “same sequences [i.e., *unmodulated* true CAZAC sequences or “computer searched Zero-Autocorrelation (ZAC) sequences”] “are applied as reference signals.” *Id.* 2:10-11. Decl.¶¶51-52.

As such, the '688 Patent acknowledges that several of its claimed features (e.g., “the transmitting is on a [PUCCH]” (claim 5), “the unmodulated sequence comprises reference signals” (claim 7), and “the acknowledgement data comprises

a BPSK/QPSK modulated sequence” (claim 7)) had been known in the art by the time of invention of the ’688 Patent. These acknowledgements, in combination with the clear disclosure in KwakPat883 of the combining of a SR and an acknowledgment on a SR resource, eviscerate, if not directly refute, the patentability of the claims of the ’688 Patent. Decl.¶¶45-52. The unpatentability of the Challenged Claims will be discussed in greater detail below.

C. Summary of the Prosecution History of the ’688 Patent

U.S. 9,185,688 issued on 11/10/2015, from U.S. Patent Application No. 14/793,941 which was filed on 07/08/2015, a continuation of U.S. Patent Application No. 14/051,646, filed 10/11/2013 (the ’877 Patent) and No. 12/290,547, filed on 10/30/2008. HUAWEI-1001,1:8-13. A preliminary amendment was filed on 07/08/2015, replacing all original claims 1-55 with the claims 56-103 that correspond to the allowed claims 1-48. HUAWEI-1002 at 103.

Notably, the ’688 Patent’s claims are substantially the same as the ’877 Patent’s, except slightly different language w.r.t. “unmodulated sequence.” *See* respective claim 1 of the ’688 Patent and ’877 Patent.

Less than a month from the filing date, the Examiner issued a first action allowance, indicating the reasons for allowance:

the prior art does not teach [*sic*] adequately suggest an unmodulated sequence via a modulation scheme used for acknowledge data in

addition to a scheduling request being combined with an acknowl-
edgement on a physical uplink control channel.

HUAWEI-1002 at 13-17 [emphasis added].

Similar language can be found in file history of the '877 Patent. *See* HUAWEI-1028, p.30.

Per Section-III below, such a feature is disclosed in at least the primary references, KwakPat883 and LGE, supporting the likelihood that at least one of the Challenged Claims of the '688 Patent is unpatentable. KwakPat883 and LGE were included in a Supplemental Information Disclosure Statement ("IDS") during prosecution of the '877 Patent. HUAWEI-1028, p.10. However, neither KwakPat883 nor LGE was used by the Examiner to form rejections; nor did the Applicant overcome or argue against KwakPat883 or LGE during prosecution of the '877 Patent or the '688 Patent. *See* HUAWEI-1002, HUAWEI-1028.

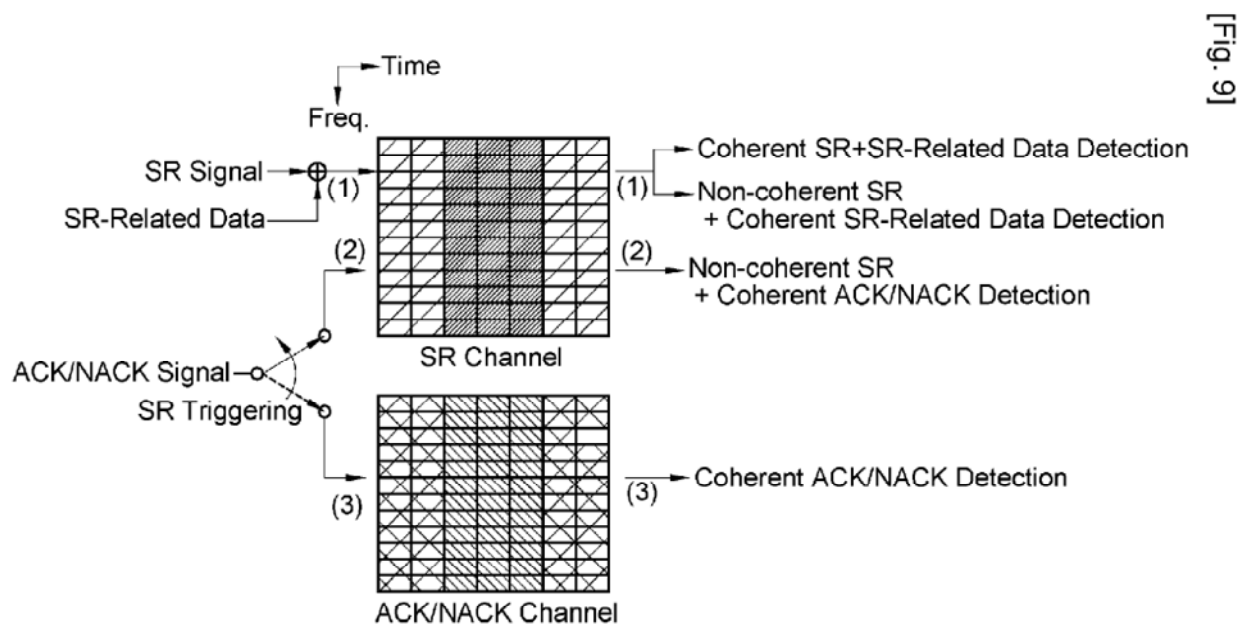
III. MANNER OF APPLYING CITED PRIOR ART TO EVERY CLAIM FOR WHICH AN IPR IS REQUESTED, THUS ESTABLISHING A REASONABLE LIKELIHOOD THAT AT LEAST ONE CLAIM OF THE '688 PATENT IS UNPATENTABLE

This request shows how the primary references, identified above, alone or in combination, disclose the limitations of the Challenged Claims, thereby invalidating the Challenged Claims of the '688 Patent. As detailed below, this Petition shows an RLP w.r.t. at least one of the Challenged Claims of the '688 Patent.

For clarity and conciseness, for each dependent claim discussed below, the information sets forth w.r.t. the claim it depends from is incorporated by reference as if fully set forth in connection with the dependent claim. Additionally, for each element of the Challenged Claims that is disclosed by KwakPat883's Claim 1, the corresponding support from KwakProv812 in Section-I-B-(1) is incorporated by reference as if fully sets forth in connection with the corresponding element.

A. Grounds-1A&1B: KwakPat883 and LGE each alone anticipates claims 1-2, 4-9, 37-39, and 42-45

Ground-1A demonstrates how KwakPat883 addresses “simultaneously transmitting a scheduling request (SR) and other control signals,” HUAWEI-1005,2:18-19. As shown in FIG.9 below, KwakPat883 discloses three scenarios for SR transmission: “a path (1) denotes transmission of the SR. A path (2) denotes transmission of the SR and an ACK/NACK signal. A path (3) denotes transmission of the ACK/NACK signal.” HUAWEI-1005,11:42-45.



KwakPat883-FIG.9

See support from KwakProv812: “a transmission method which can **support both the control signal and the SR in the same time-frequency resource,**”

HUAWEI-1007,48:8-10, and the same three scenarios, paths (1), (2) and (3) as shown in FIG.7 (reproduced below), for SR transmission:

First, if **only the SR signal is transmitted through the SR channel** configured through the spreading code (refer to **(3) of FIG.7**), the feature of the coherent SR channel allows additional information related to the SR to be transmitted together...

If the transmission of the ACK/NACK signal is required at the SR transmission **like (2) of FIG.7**, **both the SR and ACK/NACK can be transmitted through the previously allocated SR channel...**

Lastly, if only the ACK/NACK is transmitted like (1) of FIG.7, the ACK/NACK information undergoes the coherent modulation/demodulation through the previously allocated ACK/NACK channels.

HUAWEI-1007,59:7-24.

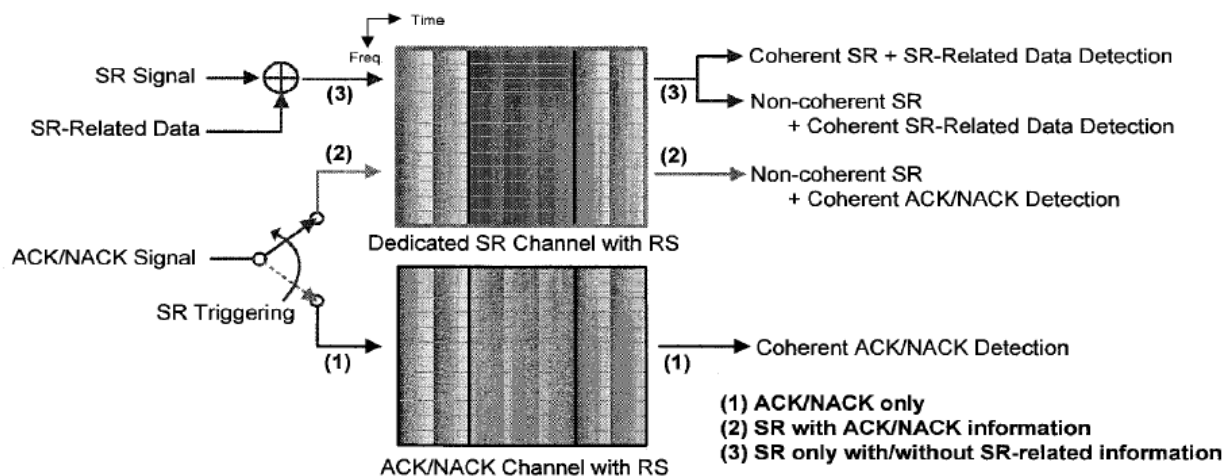


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7

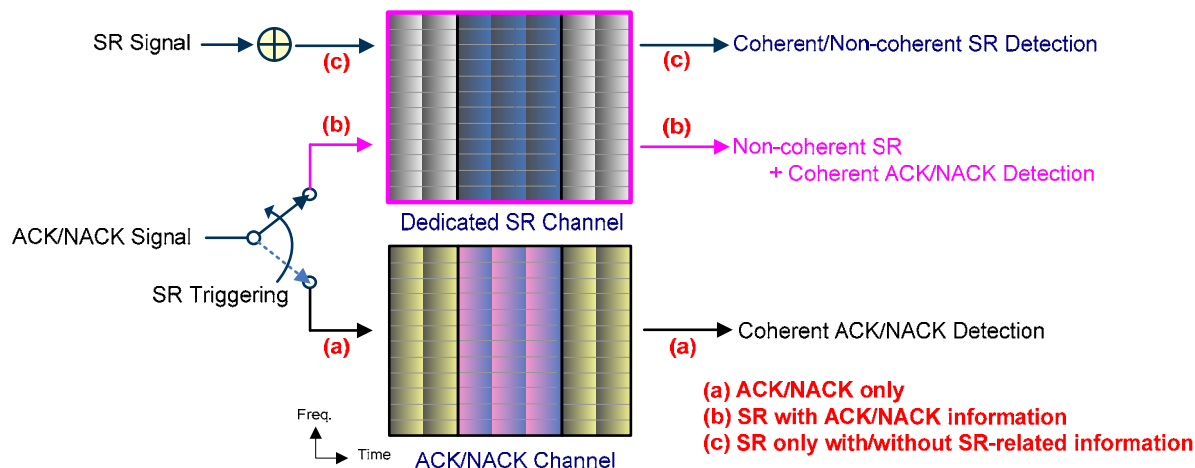
Complementing Ground-1A, Ground-1B demonstrates how LGE, a standard publication proposed by the assignee of KwakPat883, provides similar disclosure to KwakPat883. In fact, similar to KwakPat883, LGE discloses the same multiplexing of uplink control signals, such as, “simultaneous transmission with ACK/NAK or CQI is required when SR is to be transmitted.” HUAWEI-1013,p.1.Decl.¶¶167-170.

LGE proposed two schemes for addressing the “situations where simultaneous transmission with ACK/NAK or CQI is required when SR is to be transmitted.” HUAWEI-1013,p.1. The scheme “Alternative 2’ makes it possible for UEs to transmit SR and ACK/NACK simultaneously in one subframe.” HUAWEI-1013,p.1.

Notably, LGE’s “Alternative 2” is similar, if not identical, to KwakPat883’s scheme for simultaneous transmission of SR and ACK/NACK. This is not particularly surprising since KwakPat883 is an LGE patent. For example, LGE also discloses three scenarios, denoted as (a), (b) and (c) as shown in FIG.5 (reproduced below):

Figure 5 shows the exemplary operation how to transmit SR and/or ACK/NACK signal with ‘Alternative 2’ proposal. As can be seen in the figure, **two separate channels** will be utilized by one UE in order to transmit **either one of SR or ACK/NACK signal without multiplexing at a given time**. ...However, **when the UE should transmit its SR and ACK/NACK signal simultaneously, the ACK/NACK information is not transmitted on the ACK/NACK channel, but on the dedicated SR channel ((b) in Figure 5)**.... In case of **SR-only transmission ((c) in Figure 2/sic/)**, the SR can be allocated to the dedicated SR channel and detected in a non-coherent or coherent manner...

HUAWEI-1013,p.5.



LGE-FIG.5

For conciseness and given the similarity in the references, KwakPat883 and LGE have been addressed together under each claim element below. Specifically, for each claim element, Petitioner first applies KwakPat883 as Ground-1A, explaining how disclosure from KwakPat883 anticipates the claim element. Then, as Ground-1B, Petitioner provides citation to LGE that demonstrates how LGE has disclosure that is similar to the disclosure of KwakPat883 applied to the claim element in Ground-1A, thereby showing LGE anticipates the claim element in a similar manner to KwakPat883.

[1A]: “A method comprising”

See KwakPat883’s Claim 1, which recites substantially the same features as claim 1 of the ’688 Patent. See KwakProv812’s support for KwakPat883’s Claim 1 in Section-I-B-(1). Decl.¶85. KwakPat883 discloses “a *method* of transmitting a

plurality of multiplexed uplink control signals.” HUAWEI-1005,2:25-26. *See* support from KwakProv812: “**methods** for transmitting additional information ... if a [SR] is made through time or frequency spreading channels for a control signal.” HUAWEI-1007,48:6-8. Decl.¶¶86-87.

LGE discloses “2. Proposed Scheduling Request (SR) structure and operational **method**.” HUAWEI-1013,p.1. Decl.¶171.

[1B] “determining that an acknowledgment is to be sent on a physical uplink control channel,”

KwakPat883 discloses determining that an acknowledgment is to be sent: “[t]ransmission of the **ACK/NACK signal is predetermined** according to transmission of downlink data.” HUAWEI-1005,12:20-21. KwakPat883 discloses the acknowledgment is to be sent on a PUCCH: “preparing a **ACK/NACK resource for transmitting the ACK/NACK signal** for HARQ of downlink data **on an uplink control channel**,” HUAWEI-1005, Abstract, where “[a]n **uplink control channel** assigned to the control region **is referred to as a physical uplink control channel (PUCCH)**,” HUAWEI-1005,5:41-43. FIG.4 shows the control region that “is generally assigned to a control channel.” *Id.* Decl.¶88.

KwakProv812 supports the disclosure of determining that an acknowledgment is to be sent: “[i]f the **transmission of the ACK/NACK signal** is required at

the SR transmission like (2) of FIG.7, both the SR and **ACK/NACK can be transmitted** through the previously allocated SR channel.” HUAWEI-1007,59:16-18.

KwakProv812 supports that an acknowledgment is to be sent on an uplink control channel by showing in FIG.3, entitled “Transmission structure of **uplink control signal for coherent ACK/NACK** in LTE,” “a control channel structure for transmitting **coherent ACK/NACK transmission.**” HUAWEI-1008,4:3-4. As admitted by the ’688 Patent, it had been known that in LTE UE transmits uplink acknowledgment on a PUCCH when the UE has no UL data to transmit. *See* Section II-B-(1). Here, KwakProv812 discloses ACK/NACK transmission is on a PUCCH by disclosing “[i]f there is **no data to be transmitted along with the control signal**, some of a system band [that] “is distinguished and allocated by FDM and **the user equipment** for transmitting only the control channel **transmits the [uplink] “control signal** by demodulating the control signal **to this allocated region** in the form of SCFDM (refer to FIG.2).” HUAWEI-1007,49:19-20. Moreover, KwakProv812’s disclosure of a **physical** uplink control channel is further substantiated by FIG.2’s (reproduced below, corresponding to KwakPat883’s FIG.4) showing of “this allocated region” for “L1/L2 control signal” separated from the data region labeled as the **physical** uplink shared channel (PUSCH). HUAWEI-1007,FIG.2.. Decl.¶¶88-90.

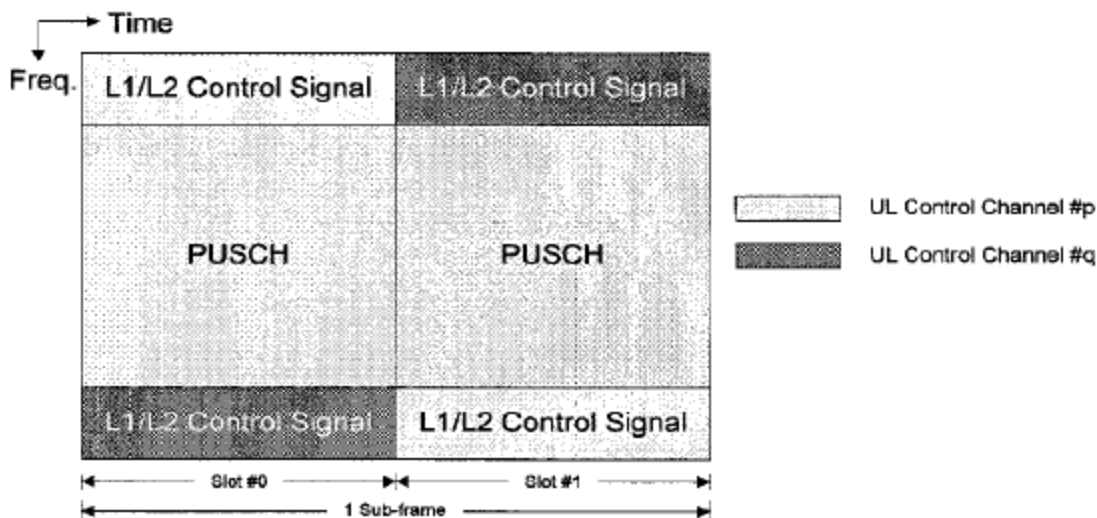


FIG. 2. Transmission of the control signal when there is no data

KwakProv812-FIG.2

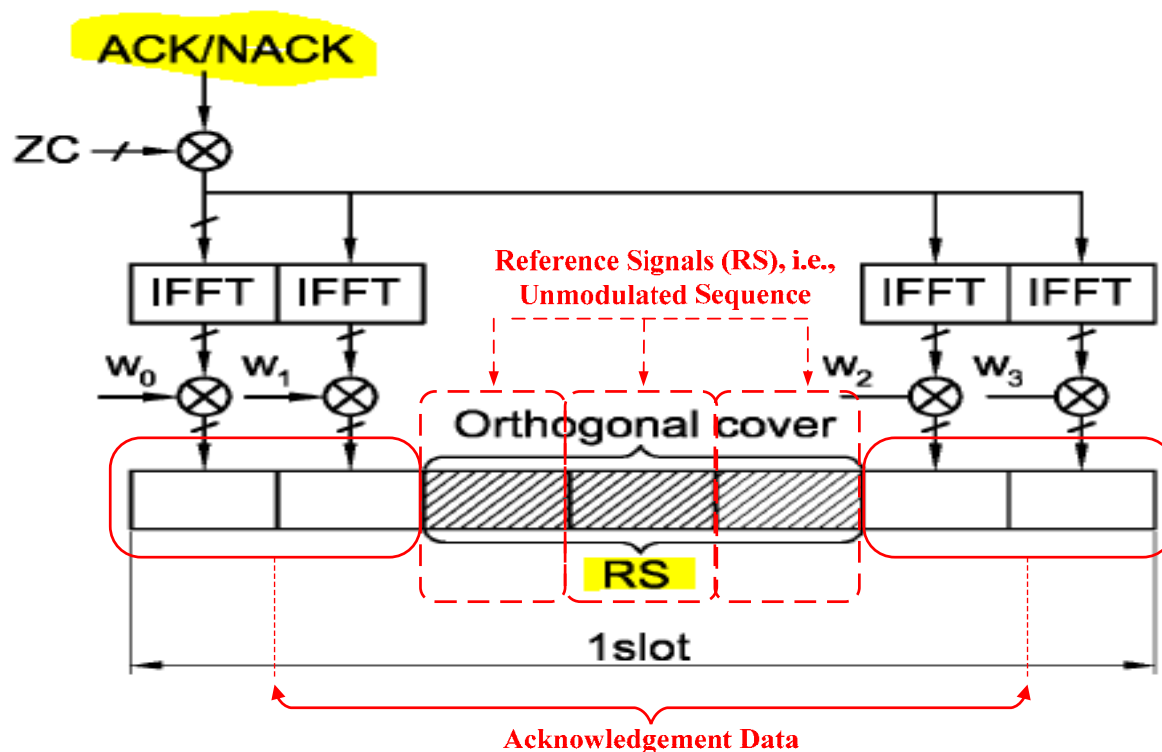
LGE discloses “[i]n order to transmit the SR and **ACK/NACK** simultaneously at the same subframe,” (HUAWEI-1013,p.5) and the **SR is transmitted on PUCCH**, (see “Proposed Scheduling Request (SR) structure and multiplexing with PUCCH,” HUAWEI-1013,Title). Accordingly, LGE discloses determining an acknowledgment (i.e., **ACK/NACK**) is to be sent on the PUCCH. Decl.¶172.

[1C] “where transmission of the acknowledgement on the physical uplink control channel comprises in addition to the acknowledgement data, a sequence that is unmodulated via a modulation scheme used for the acknowledgement data;”

As discussed in the claim construction section, “a sequence that is unmodulated via a modulation scheme used for the acknowledgement data” encompasses reference signals (RS) and KwakPat883 discloses that transmission of the

acknowledgement comprises reference signals in addition to the acknowledgement data (i.e., ACK/NACK signal). Specifically, FIG.5 [annotated below] shows transmission of the acknowledgement: “FIG.5 shows a structure of an ACK/NACK channel[,] a control channel through which an ACK/NACK signal is transmitted.” HUAWEI-1005,6:13-15. “Referring to FIG.5, among 7 OFDM symbols included in one slot, **a reference signal (RS) is carried on three consecutive OFDM symbols in the middle portion of the slot and the ACK/NACK signal** is carried on the remaining four OFDM symbols.” HUAWEI-1005,6:19-23; Decl.¶¶91-93.

FIG. 5



KwakPat883-FIG.5 (annotated)

See support from KwakProv812, where annotated FIG.3 below shows transmission of the acknowledgement that includes ACK/NACK data and reference signals: “the **existing channel for transmitting the ACK/NACK control signal...**, **the control channel** is configured by 2D spreading using ZC codes in the frequency domain and orthogonal codes having a **length of 4** (for short CP) **for the**

ACK/NACK data or orthogonal codes having a length of 3 for RS in the time domain.” HUAWEI-1007,52:23-26; Decl.¶¶94-95.

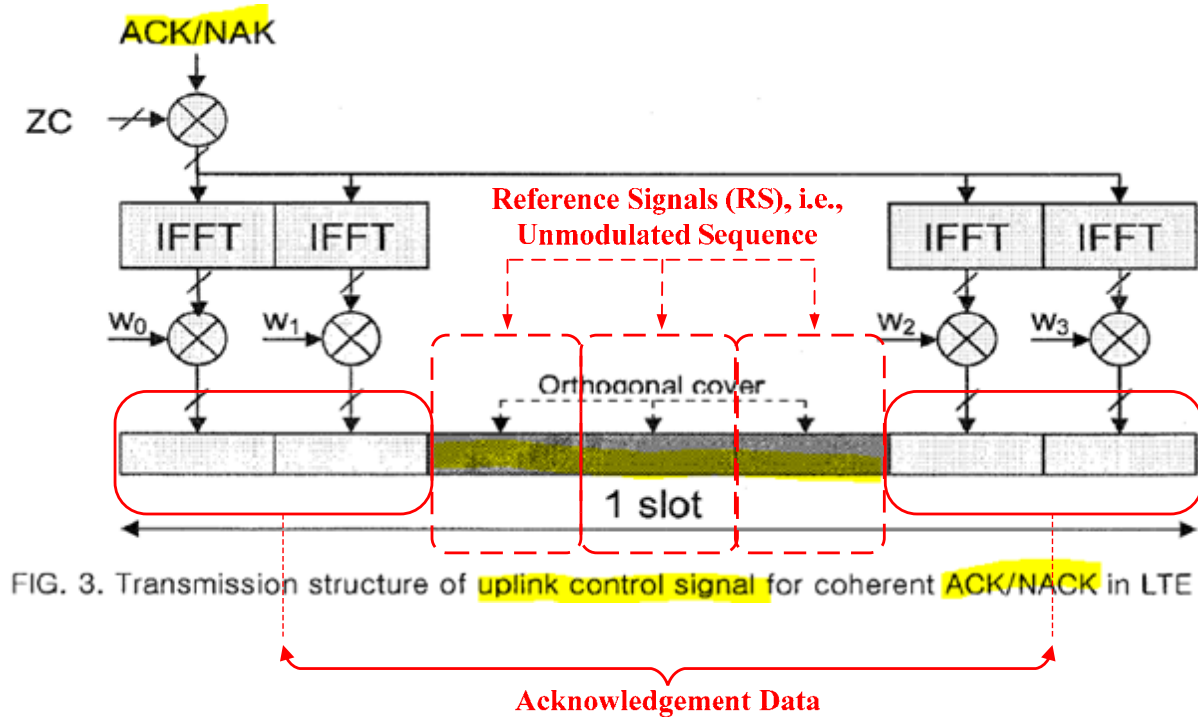


FIG. 3. Transmission structure of uplink control signal for coherent ACK/NACK in LTE

KwakProv812-FIG.3 (annotated)

LGE discloses that transmission of the acknowledgement comprises reference signals (RS) in addition to the acknowledgement data (i.e., ACK/NACK signal) by disclosing coherent detection is used to detect the ACK/NACK: “when the UE should transmit its SR and ACK/NACK signal simultaneously, the ACK/NACK information is not transmitted on the ACK/NACK channel, but on the dedicated SR channel ((b) in Figure 5). In this case, **ACK/NACK information**

is obtained by coherent detection.” HUAWEI-1013,p.5. A POSITA would readily understand that coherent detection of the ACK/NACK requires reference signals (RS) to be transmitted with the ACK/NACK. Decl.¶173. In fact, LGE shows the reference signals (i.e., unmodulated sequence) in addition to the ACK/NACK signal in FIG.5 (annotated below) for “Coherent ACK/NACK Detection.”

HUAWEI-1013,p.6; Decl.¶¶174-181.

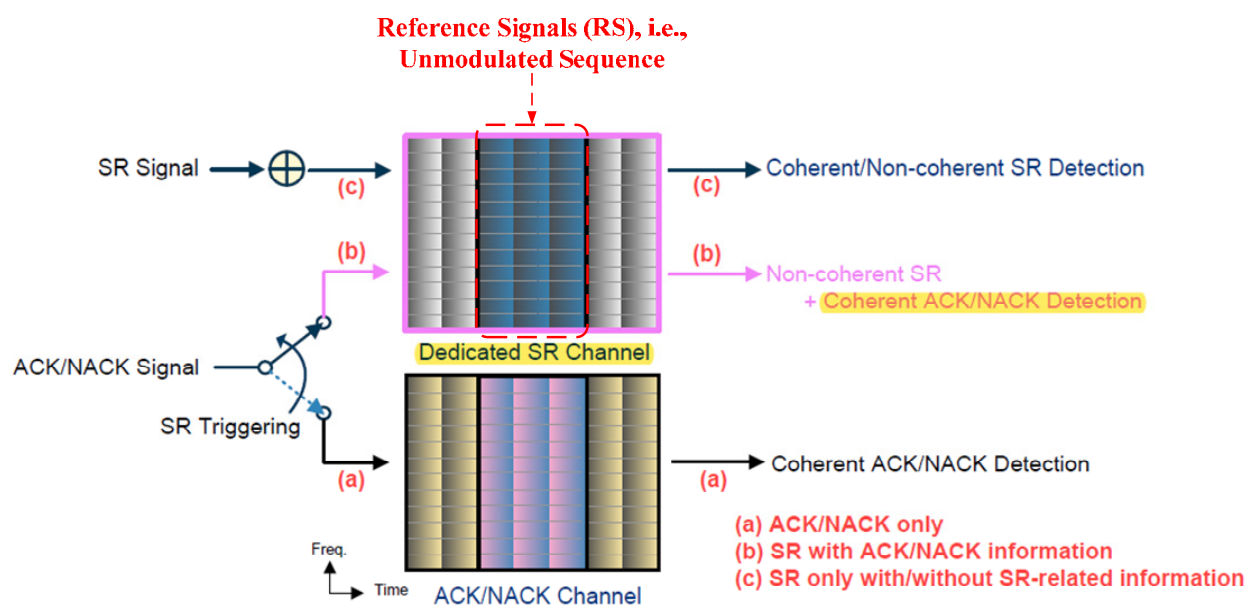


Figure 5: An illustration of multiplexing SR and/or ACK/NACK

LGE-FIG.5 (annotated)

[1D] “for a case where there is also a [SR] to be sent, combining the acknowledgment with the [SR] on a scheduling resource,⁷”

KwakPat883 discloses “**when both the ACK/NACK signal and the [SR] are transmitted** in the subframe” (i.e., *for a case where there is also a [SR] to be*

7

[REDACTED]

[REDACTED]

[REDACTED]

Moreover, the '688 Patent uses the term “resource” broadly to at least encompass a “channel” as it repeatedly equates: “**SR resources** (SR [physical uplink control **channel**, PUCCH]) and “**ACK/NACK resource** (ACK/NACK PUCCH),” HUAWEI-1001,5:22-32, 5:46-6:45. The '688 Patent also references “resource” as “**resource(s) configured for channels**”: “**ACK/NACK resources configured for 18 parallel ACK/NACK channels**” and “**SR resources configured for 72 parallel SR channels**” (HUAWEI-1001,4:22-24) and notes that “Any reference to ‘**resource**’ should be construed as covering a single resource or multiple **resources assigned for the specified signaling**” (HUAWEI-1001,5:41-43). Decl. footnote 4.

Regardless, KwakPat883 satisfies this “resource” feature by, for example, expressly referencing a “scheduling request **resource**” and further providing that

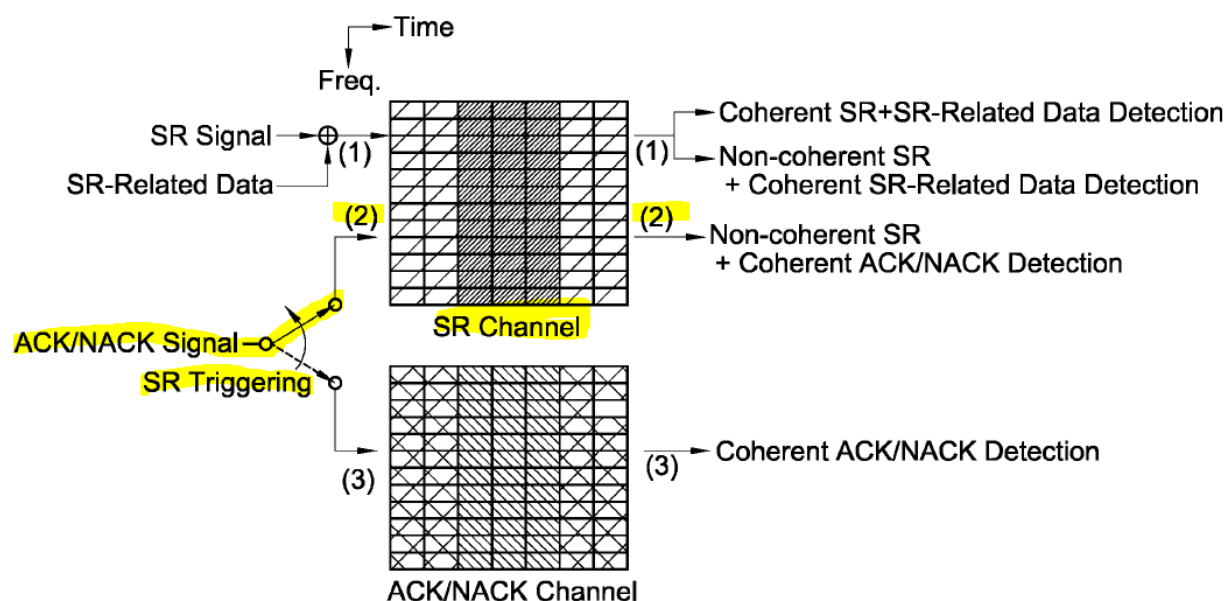
sent), “**transmitting the ACK/NACK signal and the [SR] on the uplink control channel which is configured by the [SR] resource**” (i.e., *combining the acknowledgment with the [SR] on a scheduling resource*), HUAWEI-1005,3:17-19. See also *id.*, FIG.9, 11:63-12:8; Decl.¶¶96-97.

“**the uplink control channel which is configured by the scheduling request resource.**” See *e.g.*, HUAWEI-1005, 3:17-19.

KwakProv812 satisfies this feature by referencing the “**SR channel and the ACK/NACK channel [] configured in the allocated time-frequency resources**” and “**configure a dedicated SR channel by allocating certain time/frequency/code resources.**” See *e.g.*, HUAWEI-1007,52:1-2,13-14;50:9-10.

LGE satisfies this feature by expressly referencing “**dedicated resource for SR**” and “**common resource assigned for ACK/NACK transmission**” corresponding to a “**dedicated SR channel** and “**ACK/NACK channel**” in FIG.5, respectively, and disclosing “**ACK/NACK signal [] diverted to the dedicated resource which is assigned to the UE for SR transmission from common resource for ACK/NACK signal.**” See *e.g.*, HUAWEI-1013, pp. 5-6.

FIG. 9



KwakPat883-FIG.9 (with highlighted path (2))

See support from KwakProv812: “[i]f the transmission of the ACK/NACK signal is required at the SR transmission like (2) of FIG.7, both the SR and ACK/NACK can be transmitted through the previously allocated SR channel.” HUAWEI-1007,59:16-18; Decl.¶¶98-99.

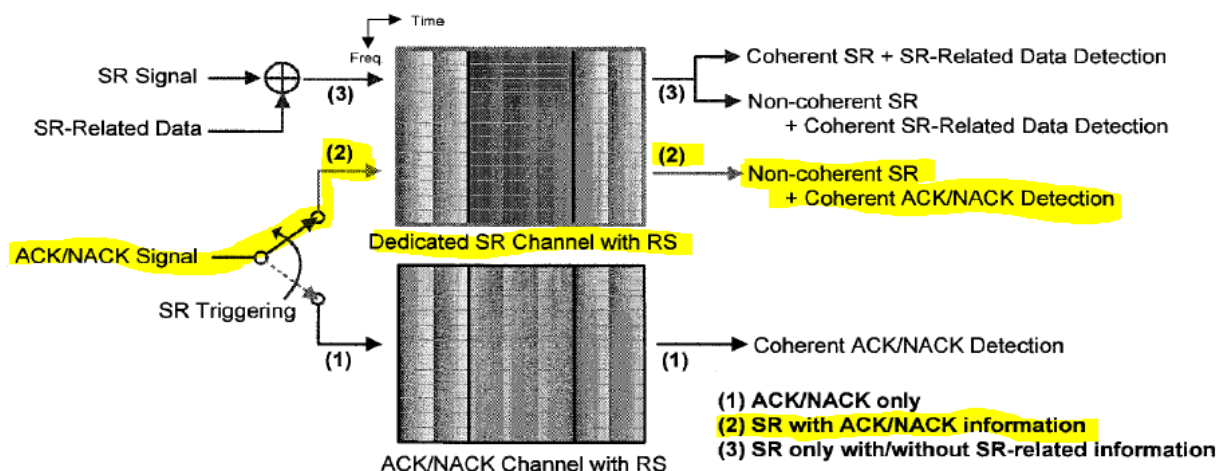
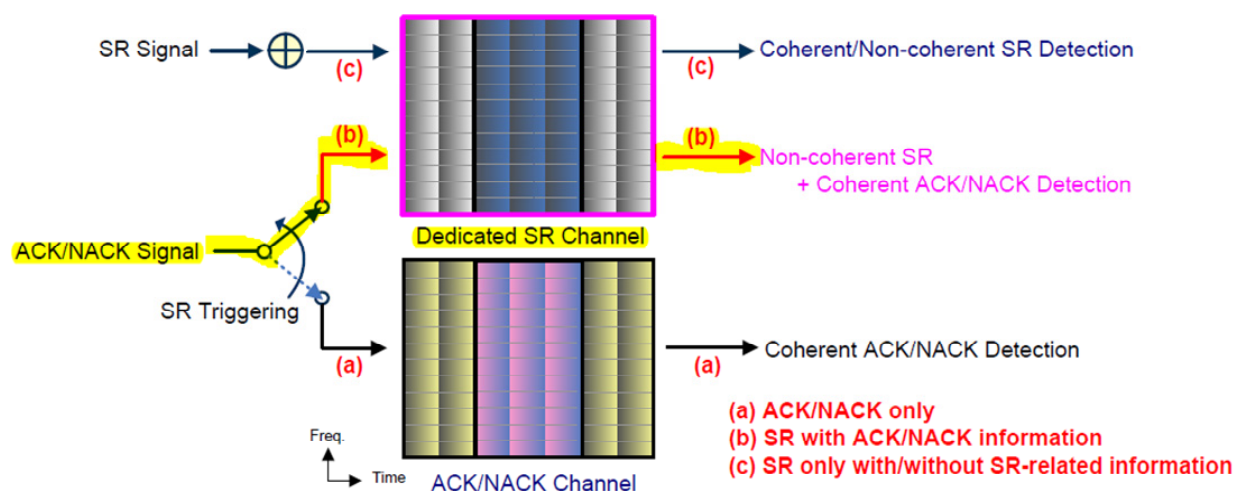


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7 (with highlighted path (2))

LGE discloses “when the UE should transmit its SR and ACK/NACK signal simultaneously, the ACK/NACK information is not transmitted on the ACK/NACK channel, but on the dedicated SR channel ((b) in Figure 5).”

HUAWEI-1013,p.5; Decl.¶¶182-183.

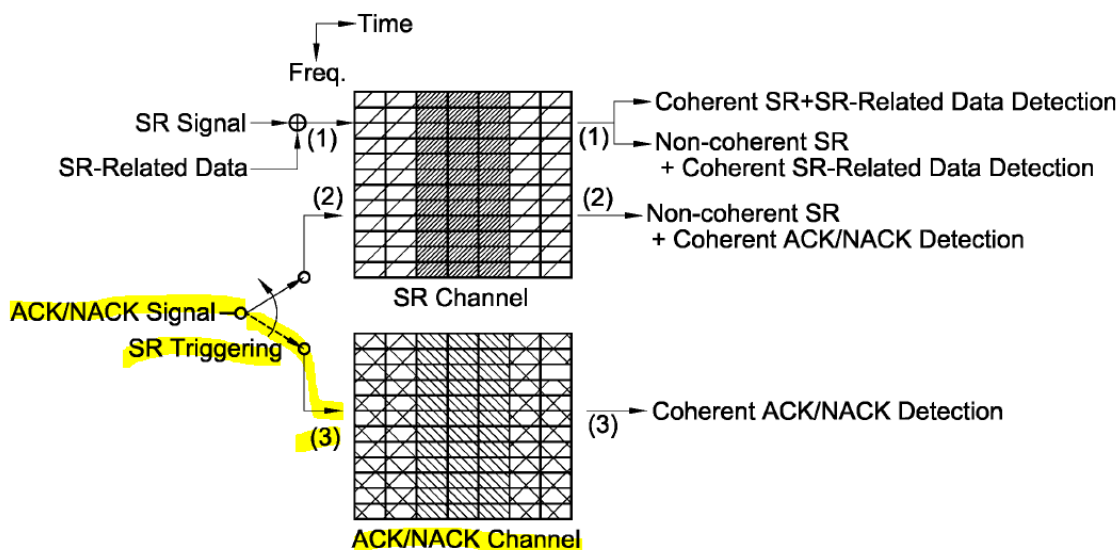


LGE-FIG.5 (with highlighted Path (b))

[1E] “else placing the acknowledgment in another resource.”

KwakPat883 discloses *else placing the acknowledgment in another resource* (i.e., “an ACK/NACK channel which is configured by an ACK/NACK resource for the ACK/NACK signal”): as shown in FIG.9, “In the path (3), **when only the ACK/NACK signal is transmitted, the ACK/NACK signal is transmitted on an ACK/NACK channel which is configured by an ACK/NACK resource for the ACK/NACK signal.**” HUAWEI-1005,12:9-12; Decl.¶¶100-101.

FIG. 9



KwakPat883-FIG.9 (with highlighted path (3))

See support from KwakProv812: “if only the ACK/NACK is transmitted like (1) of FIG.7, the ACK/NACK information undergoes the coherent modulation/demodulation through the previously allocated ACK/NACK channels.”
HUAWEI-1007,59:22-24; Decl.¶¶102-103.

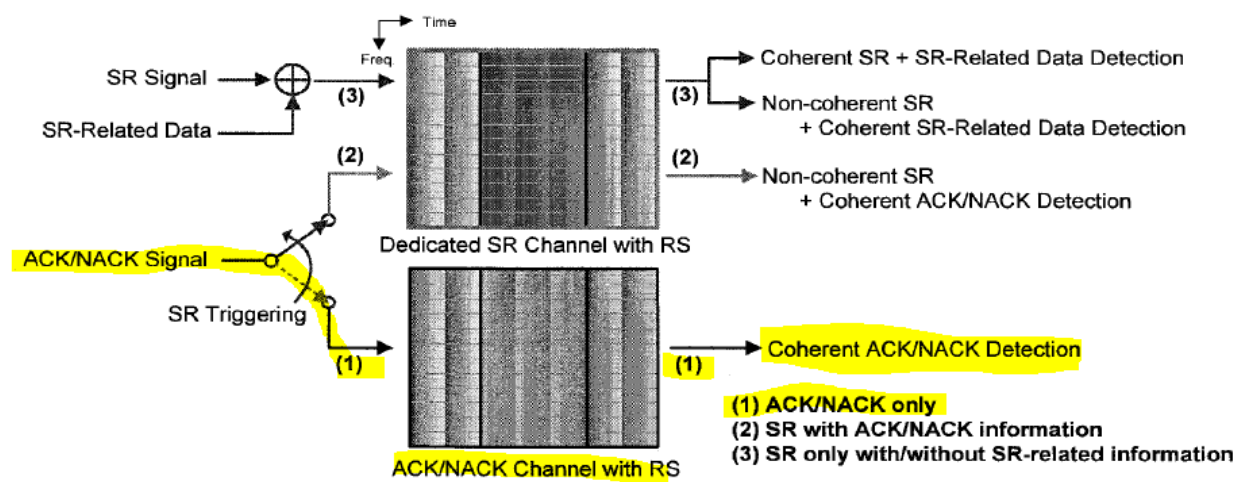


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7 (with highlighted path (1))

As shown in highlighted FIG.5 below, LGE discloses, when there is not [SR] to be sent (i.e., no “SR Triggering”), placing the acknowledgment in another resource (i.e., “ACK/NACK channel”): “two separate channels will be utilized by one UE in order to transmit either one of SR or ACK/NACK signal without multiplexing at a given time.” HUAWEI-1013,p.5; Decl.¶¶184-185.

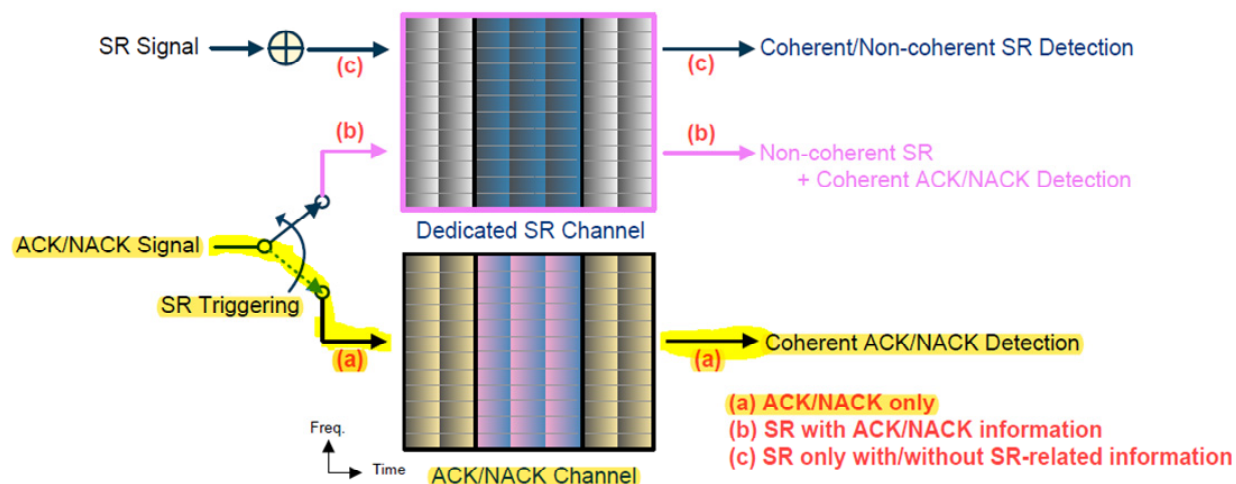


Figure 5: An illustration of multiplexing SR and/or ACK/NACK

LGE-FIG.5 (with highlighted Path (a))

[2] “The method of claim 1, comprising: for the case where there is also the [SR] to be sent, transmitting the acknowledgment with the [SR] on the scheduling resource.

KwakPat883 discloses “when both the ACK/NACK signal and the [SR] are transmitted in the subframe” (i.e., *for a case where there is also a [SR] to be sent*), “transmitting the ACK/NACK signal and the [SR] on the uplink control channel which is configured by the [SR] resource” (i.e., *transmitting the acknowledgment with the [SR] on the scheduling resource*), HUAWEI-1005,3:17-19. See support from KwakProv812: “[i]f the transmission of the ACK/NACK signal is required at the SR transmission like (2) of FIG.7, **both the SR and ACK/NACK can be transmitted through the previously allocated SR channel.**” HUAWEI-1007,59:16-18. Decl.¶104.

LGE discloses “**when the UE should transmit its SR and ACK/NACK signal simultaneously, the ACK/NACK information is not transmitted on the ACK/NACK channel, but on the dedicated SR channel ((b) in Figure 5).**”
HUAWEI-1013,p.5; Decl.¶186.

[4] “**The method of claim 1, where the another resource is a data-non-associated resource.**”

The ’688 Patent identifies “data-non-associated (DNA) resources, such as ACK/NACK PUCCH,” HUAWEI-1001 6:38-40.

KwakPat883 discloses the another resource is an ACK/NACK PUCCH: “**an ACK/NACK resource** for transmitting an ACK/NACK signal ... **on the uplink control channel,**” wherein “[a]n **uplink control channel** assigned to the control region is referred to as a [PUCCH].” HUAWEI-1005,5:41-43, FIG.4.

See KwakProv812 identifying the another resource (i.e., “the ACK/NACK channel [...] configured in allocated time-frequency resources,” HUAWEI-1007,52:1-2) as an uplink control channel: “Transmission structure of **uplink control signal** for coherent ACK/NACK in LTE,” (*id.*, FIG.3 Title). See prior explanation of KwakProv812’s disclosure of ACK/NACK channel being in PUCCH in Ground-1A, [1B]. Decl.¶¶105-107.

LGE discloses that another resource is “ACK/NACK channel,” *see* Ground-1B, [1E], and the ACK/NACK channel is on PUCCH disclosing that “[t]his dedicated **SR channel** (i.e., ‘Alternative 2’)” “which **reuse** the CDM-based **structure of ACK/NACK channel**” and having “**the same slot format as for ACK/NACK transmission**” “**is fully compatible and co-existing with the PUCCH.**”

HUAWEI-1013,p.5. Accordingly, the ACK/NACK channel is also “**fully compatible and co-existing with the PUCCH.**” *Id.* *See also* the ’688 Patent’s admitted prior art that “[D]ata-non-associated control signals (e.g., ACK/NACK, periodic CQI) are transmitted on a **PUCCH.**” HUAWEI-1001,2:3-5; Decl.¶¶191-192.

[5] “**The method of claim 2, where the transmitting is on a [PUCCH].**”

“The transmitting” refers to the “transmitting the acknowledgment with the [SR] on the scheduling resource” as recited in claim 2.

KwakPat883 discloses the “[SR] **resource** for transmitting a [SR] and the ACK/NACK signal **on the uplink control channel,**” wherein “[a]n **uplink control channel** assigned to the control region is referred to as a [PUCCH].”

HUAWEI-1005,5:41-43, FIG.4.

See support from KwakProv812: “like (2) of FIG.7, **both the SR and ACK/NACK can be transmitted through** the previously allocated **SR channel** [i.e., the scheduling resource].” HUAWEI-1007,59:16-18. KwakProv812 further

supports that the SR channel is on a PUCCH by disclosing the SR channel, “like an LTE ACK/NACK channel” (HUAWEI-1007,51:20), is on PUCCH. *See* prior explanation of KwakProv812’s disclosure of ACK/NACK channel being on PUCCH in Ground-1A, [1B]. Decl.¶¶ 108-110.

LGE discloses “when the UE should transmit its SR and ACK/NACK signal simultaneously, **the ACK/NACK information is transmitted ... on the dedicated SR channel ((b) in Figure 5).**” HUAWEI-1013,p.5. LGE further discloses that “[t]his **dedicated SR channel** (i.e., ‘Alternative 2’) **is fully compatible and co-existing with the PUCCH.**” *Id.* Decl.¶¶193-194.

[6] “**The method of claim 2, where the transmitting is on an uplink.**”

KwakPat883, KwakProv812 and LGE both disclose that the transmitting is on a physical **uplink** control channel, and thus on an uplink. *See* Ground-1A&1B, [5]. Decl.¶111. LGE makes clear that “[t]his approach is appropriate for maintaining the single-carrier property for **UL transmission** while supporting the simultaneous transmission of SR and ACK/NACK.” HUAWEI-1013,p.6. Decl.¶¶195-196.

[7A] “The method of claim 1, where the physical uplink control channel comprises an unmodulated sequence, where the unmodulated sequence comprises reference signals and”

See Grounds-1A&1B, [1B]-[1C]; claim construction in Section I-C, the ’688 Patent’s admitted prior art teaching that the unmodulated sequence comprises reference signals in Section-II-B-(3), and Grounds-1A&1B, Decl.¶¶112, 197.

[7B] “the acknowledgement data comprises a BPSK/QPSK modulated sequence.”

The phrase “BPSK/QPSK” should refer to “BPSK or QPSK” because QPSK and BPSK are alternative modulation schemes as the ’688 Patent admits that “BPSK is used for 1-bit ACK/NACK and QPSK for 2-bit ACK/NACK.” HUAWEI-1001,2:8-9. Decl.¶113.

KwakPat883 discloses that the acknowledgement data comprises a QPSK modulated sequence: “The **ACK/NACK signal (e.g., a QPSK symbol)** is transmitted on a [SR] channel.” HUAWEI-1005,11:64-65.

KwakProv812 supports such disclosure by recognizing that the acknowledgement data comprises a modulated sequence: “the **ACK/NACK information is obtained by the same coherent demodulation** as the existing demodulation method of the ACK/NACK channel” (HUAWEI-1007,59:19-20) and a modulated sequence can be a QPSK modulated sequence for transmitting 2-bit information:

“2-bit transmission is achieved by QPSK modulation ..., additional information can be all transmitted by QPSK modulation and thus additional information transmission of the maximum 2bit is possible.” HUAWEI-1007,59:11-16. Decl.¶¶114-115.

LGE discloses the ACK/NACK comprises a modulated sequence by disclosing that **“ACK/NACK information is obtained by coherent detection,”** and **“eNB should perform coherent demodulation for ACK/NACK,”** HUAWEI-1013,p.5-6. The '688 Patent expressly admitted that it had been agreed in the LTE Standard that **“BPSK is used for 1-bit ACK/NACK and QPSK for 2-bit ACK/NACK,”** HUAWEI-1001,2:4-7. LGE is a 3GPP publication proposing discloses its techniques being used in an LTE standard system. Accordingly, a POSITA reviewing LGE would understand that BPSK or QPSK would be used for modulation when applying LGE's techniques. *See* HUAWEI-1013,p.1. Decl.¶¶198-199. Therefore, KwakPat883 and LGE each disclose that the acknowledgement data comprises a BPSK/QPSK modulated sequence. *See also* admitted prior art disclosure in Section II-B-(2).

[8] “The method of claim 1 implemented in a wireless communications network.”

KwakPat883 discloses “[a] **“method of transmitting uplink control signals in a wireless communication system.”** HUAWEI-1005, Abstract, and FIG.1 “shows **a wireless communication system.**” HUAWEI-1005,3:58; 4:32.

KwakProv812 supports such a disclosure by disclosing **“a broadband communication system [...]** to maximize efficiency in limited **wireless resources.”** HUAWEI-1007,48:21-23. Decl.¶¶116-117.

LGE, a 3GPP publication, is entitled “Proposed Scheduling Request (SR) structure and multiplexing with PUCCH [of LTE]”. HUAWEI-1013,p.1. The ’688 Patent admitted in the Background Section, particularly among the abbreviations, that “The 3GPP has been working on the standardization of LTE [long term evolution of UTRAN (E-UTRAN)],” where “E-UTRAN” stands for “evolved universal terrestrial radio access network [i.e., a wireless communication system].” HUAWEI-1001 2: 1-2; 1:46-47. Decl.¶200. Accordingly, LGE discloses the method of claim 1 is implemented in a wireless communication system.

[9] “The method of claim 1 implemented in an evolved universal terrestrial radio access network.”

While KwakPat883 does not expressly recite this feature, it incorporates by reference KwakProv812 that discloses that the method of claim 1 is implemented

in LTE: “a transmission structure for an uplink control signal in **long term evolution (LTE)**.” HUAWEI-1007,49:3-4, FIG.3. HUAWEI-1006, p.309.

LGE, a 3GPP publication, is entitled “Proposed Scheduling Request (SR) structure and multiplexing with PUCCH [of LTE].” HUAWEI-1013,p.1.

As admitted by the '688 Patent, LTE is “long term evolution of UTRAN (E-UTRAN)” and “E-UTRAN” stands for “evolved universal terrestrial radio access network.” HUAWEI-1001,1:46-47.

Thus, a POSITA would readily understand that both KwakPat883 and LGE disclose that the method of claim 1 is implemented in an E-UTRAN. Decl.¶¶118, 201-202.

[37A] “A method comprising:”

See Grounds-1A&1B, [1A].

[37B] “determining that a [SR] resource and at least one other resource are reserved for a user equipment in a same sub-frame; and”

KwakPat883 discloses determining that a [SR] resource is reserved/prepared for a user equipment (UE): “**preparing a [SR] resource** for transmitting a [SR].” “The SR is a signal transmitted when it is required **by the UE**.” HUAWEI-1005,

Abstract, 12:19-20. FIG.9 shows a SR resource (i.e., a “SR Channel”/“[SR] channel assigned with a [SR] resource”) reserved for the UE for transmitting the SR only (path (1)) as well as an ACK/NACK signal (path (2)):

In the path (1), if only the SR is transmitted on a [SR] channel, the SR is transmitted on **the [SR] channel assigned with a [SR] resource**. The [SR] resource can be regarded as a resource for the SR. When considering the path (2), **the [SR] resource can be regarded as a resource for simultaneously transmitting the SR and the ACK/NACK signal**. Information on **the [SR] resource may be predetermined** between a BS and a UE or may be reported by the BS to the UE.

In the path (2), the SR and the ACK/NACK signal are simultaneously transmitted. The ACK/NACK signal is transmitted on **a [SR] channel** which is configured for **a [SR] resource allocated to transmit the SR**.

HUAWEI-1005,11:46-55, 11:63-66.

See support from KwakProv812 that a SR resource (e.g., a “dedicated SR channel” with allocated codes) is reserved for a UE: **“the 2D spreading codes in the ACK/NACK are effectively reserved** for the SR transmission and allocated for the SR, so that **a SR dedicated channel can be configured.”** HUAWEI-1007,52:28-30. “[A] “certain UE is required to transmit

the SR signal and the control signal.” HUAWEI-1007,51:10-11. *See also* HUAWEI-1007,59:7-18, FIG.7. Decl.¶¶120-121.

KwakPat883 discloses at least one other resource (i.e., an “ACK/NACK Channel”/“ACK/NACK channel which is configured by an ACK/NACK resource”) is reserved for the UE: “**preparing a ACK/NACK resource** for transmitting the ACK/NACK signal for HARQ of downlink data on an uplink control channel.” “**Transmission of the ACK/NACK signal is predetermined** according to transmission of downlink data.” HUAWEI-1005, Abstract, 12:20-21. “In the path (3), when only the ACK/NACK signal is transmitted, the ACK/NACK signal is transmitted on **an ACK/NACK channel** which is **configured by an ACK/NACK resource** for the ACK/NACK signal.” HUAWEI-1005,12:9-12. *See* support from KwakProv812 that that at least one other resource (e.g., an “ACK/NACK Channel” with allocated codes) is reserved by allocating codes for the UE: “the **existing channel for transmitting the ACK/NACK control signal** as shown in FIG.3, the control channel is **configured by 2D spreading using ZC codes in the frequency domain and orthogonal codes....**” HUAWEI-1007,52:22-25. Decl.¶¶122-125.

KwakPat883 further discloses that the SR resource (i.e., the “SR channel” configured with sequences) and the at least one other resource (i.e., the

“ACK/NACK Channel” configured with sequences) are reserved for a UE in a same subframe: **“preparing a ACK/NACK resource** for transmitting the ACK/NACK signal for HARQ of downlink data on an uplink control channel, **preparing a [SR] resource for transmitting a [SR]** and the ACK/NACK signal on the uplink control channel **in one subframe.**” **“Transmission of the ACK/NACK signal is predetermined** according to transmission of downlink data. Therefore, **one UE may simultaneously transmit the SR and the ACK/NACK signal in the same subframe.**” HUAWEI-1005, Abstract, 12:19-23. Decl. ¶¶124-125. *See* support from KwakProv812: determining **“[i]f the transmission of the ACK/NACK signal is required at the SR transmission** like (2) of FIG.7,” (i.e., **“transmission [of SR] simultaneous with ... the ACK/NACK signal,”**) **“both the SR and ACK/NACK can be transmitted through the previously allocated SR channel.**” HUAWEI-1007, 52:17-20; 59:16-18. *See also* FIG.7 show that the SR and the ACK/NACK are transmitted simultaneously in the SR channel, which “like an LTE ACK/NACK channel” has 7 symbols is “of one slot” “in the subframe.” HUAWEI-1007, 51:4, 52:6-7, 50:3-6; FIGS.2-4. Decl. ¶¶126.

KwakPat883 also discloses that the channels (e.g., SR channel and ACK/NACK channel) are configured “using sequence allocation.” HUAWEI-1005, 8:22-23. Three sequence assignment methods for configuring the SR channel and the ACK/NACK channels are given as examples. *See* HUAWEI-

1005,8:54-11:40. By reserving a certain number of sequences for the SR, a corresponding number of SR channels is reserved, while the remaining number of sequences are reserved for the ACK/NACK channels. *See id.*, Tables 1- 6.

Decl.¶¶127-128.

See support from KwakProv812: “configuring an SR channel and an ACK/NACK channel through the code allocation.” HUAWEI-1007,52:13-14. Particularly, “(6) The ACK/NACK channel and the SR channel have to be flexibly **configured in the allocated time-frequency resources.** (7) The flexibility of code allocation has to be enhanced when **a dedicated SR channel is configured through the code allocation.**” HUAWEI-1007,52:3-4. The SR channel is “compatible with the existing ACK/NACK channel structure as shown in FIG.3” that includes 7 SC-FDM symbols **in a same slot and hence in a same subframe.** *See* HUAWEI-1007,49:22-23, FIGS.2 and 3. Specifically, the SR channel is reserved by allocating a certain number of codes for the SR, while the remaining number of codes are reserved for the ACK/NACK channels for simultaneous transmission of **the SR and the ACK/NACK signal** (“the 2D spreading codes in the ACK/NACK are effectively **reserved for the SR transmission and allocated for the SR,** so that **a SR dedicated channel can be configured...** when **both the SR signal and the ACK/NACK signal are simultaneously transmitted.**” HUAWEI-1007,52:28-33). *See* KwakProv812’s support for KwakPat883’s disclosure “three

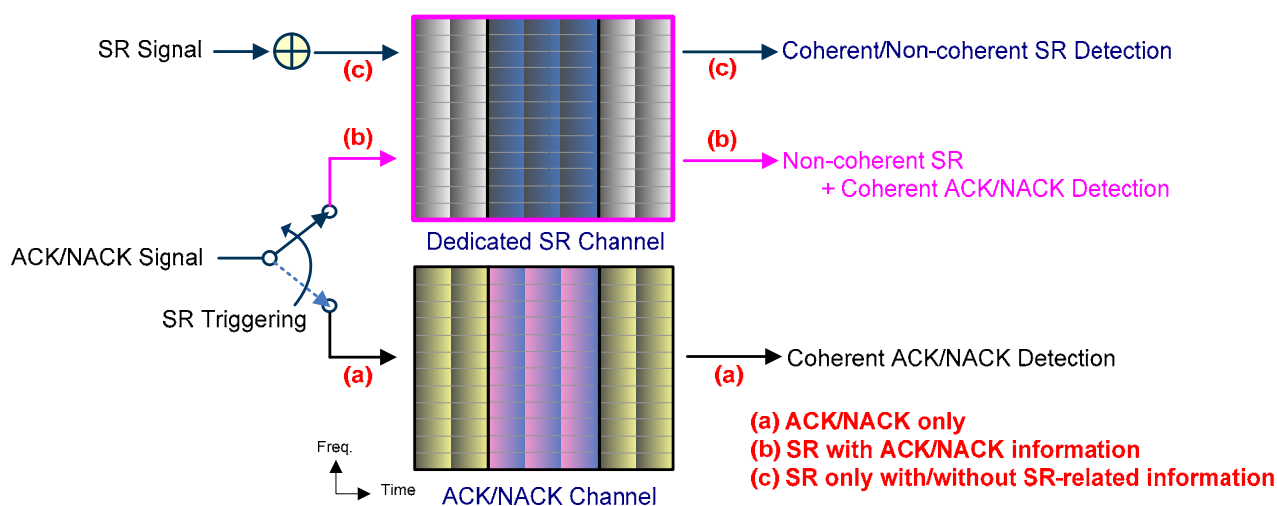
code allocation methods for configuring the ACK/NACK channel and the dedicated SR channel.” HUAWEI-1007,53:2-10; All Tables. Decl.¶¶129-132. Indeed, “like (2) of FIG.7, **both the SR and ACK/NACK can be transmitted** through the previously **allocated SR channel**” having 7 symbols in a same slot, HUAWEI-1007,59:17-18, the dedicated SR channel with allocated codes (i.e., SR resource) and ACK/NACK channel with allocated codes (i.e., at least one other resource) are both reserved and indeed transmitted in the same slot and, hence, in the same subframe. HUAWEI-1007,p.60, FIG.7, Decl.¶133.

LGE makes clear that a “Dedicated SR channel” (i.e., a SR resource) and an “ACK/NACK Channel” (i.e., at least one other resource) are reserved for a user equipment in a same subframe: 1) the two separate channels are reserved; 2) the “dedicated SR channel is configured “to transmit the SR and ACK/NACK simultaneously **at the same subframe,**” and 3) “eNB is required to **monitor both SR channel and ACK/NACK channel at the same time**”:

As can be seen in the figure [Figure 5], **two separate channels will be utilized by one UE** in order to transmit either one of SR or ACK/NACK signal without multiplexing at a given time. In other words, **if SR transmission from certain UE happens to coincide with its ACK/NACK signal transmission at the same subframe,** ACK/NACK signal for this UE should be diverted to the **dedicated**

resource which is assigned to the UE for SR transmission from **common resource for ACK/NACK signal** as shown in figure 5. However, when the UE should transmit its SR and ACK/NACK signal simultaneously, the ACK/NACK information is not transmitted on the ACK/NACK channel, but **on the dedicated SR channel ((b) in Figure 5)**. ... In case of SR-only transmission ((c) in Figure 2), the SR can be allocated to the dedicated SR channel and detected in a non-coherent or coherent manner. In order to support this operation, **eNB is required to monitor both SR channel and ACK/NACK channel at the same time.**

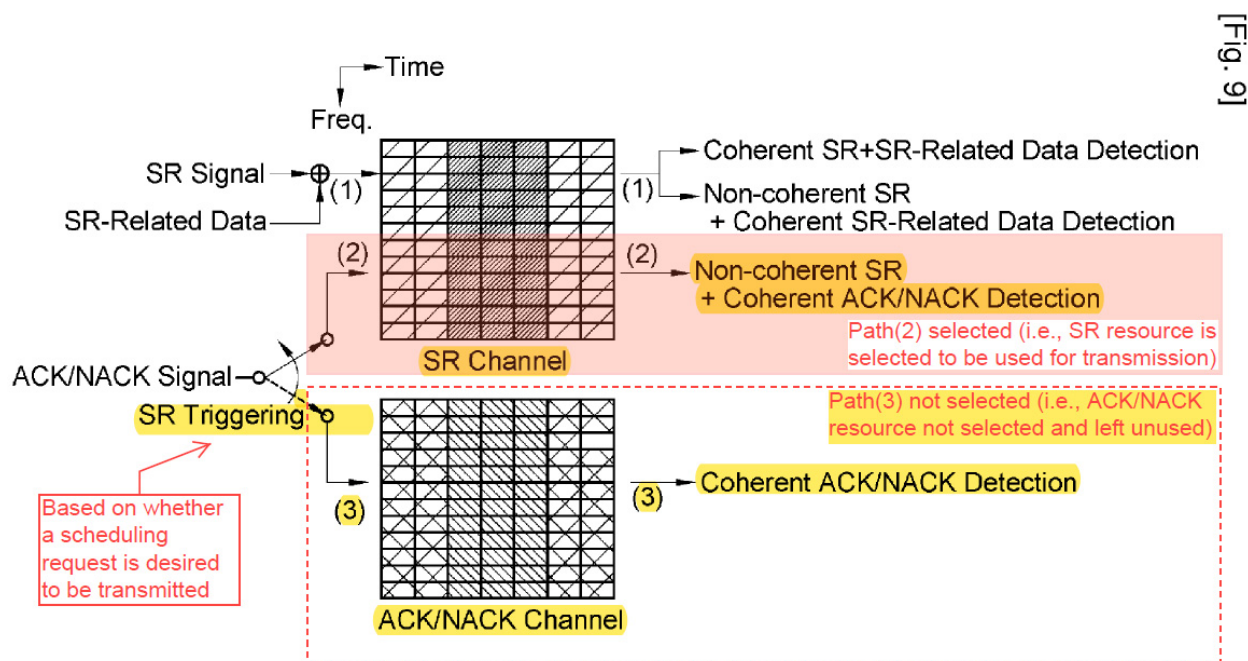
HUAWEI-1013,p.5-6.Decl.¶¶204-205.



LGE-FIG.5

[37C] “based on whether a [SR] is desired to be transmitted by the user equipment, placing at least one of an acknowledgment/negative acknowledgement and a channel quality indicator that is desired to be transmitted by the user equipment in one of the resources and leaving at least one other resource unused,”

As shown in below annotated FIG.9, KwakPat883 discloses that, based on whether a SR is desired to be transmitted by the UE, it triggers placing ACK/NACK signal (i.e., at least *one of an acknowledgment/negative acknowledgement and a channel quality indicator(CQI)*) that is desired to be transmitted by the UE in one of the resources (i.e., “a [SR] channel which is configured for a [SR] resource”): “In the path (2), the SR and the ACK/NACK signal are simultaneously transmitted. The ACK/NACK signal is transmitted on a **[SR] channel which is configured for a [SR] resource** allocated to transmit the SR.” HUAWEI-1005,11:63-66. *See also* footnote 7 of this Petition. In this instance, Path (2) is selected over Path (3), thus leaving at least one other resource (e.g., “ACK/NACK channel which is configured by an ACK/NACK resource”) in Path (3) unused: “In the path (3), when only the ACK/NACK signal is transmitted, the ACK/NACK signal is transmitted on an ACK/NACK channel which is configured by an ACK/NACK resource for the ACK/NACK signal.” HUAWEI-1005,12:9-12. Decl.¶¶134-135.



KwakPat883-FIG.9 (annotated)

See KwakProv812's supporting disclosure that, as shown in below annotated FIG.7, based on whether a SR is desired to be transmitted by the user equipment, it triggers placing ACK/NACK signal that is desired to be transmitted by the UE in one of the resources (i.e., "allocated SR channel"): "If the transmission of the ACK/NACK signal is required at the SR transmission like (2) of FIG.7, both the SR and ACK/NACK can be transmitted through the previously **allocated SR channel**." HUAWEI-1007,59:16-24. In this case, Path (2) is selected over Path (1), thus leaving at least one other resource (e.g., "allocated ACK/NACK channels") in Path (1) unused: "Lastly, **if only the ACK/NACK is transmitted like (1) of**

FIG.7, the ACK/NACK information undergoes the coherent modulation/demodulation through the previously **allocated ACK/NACK channels.**” HUAWEI-1007,59:22-24. Decl. *See also* Decl.¶¶136-139.

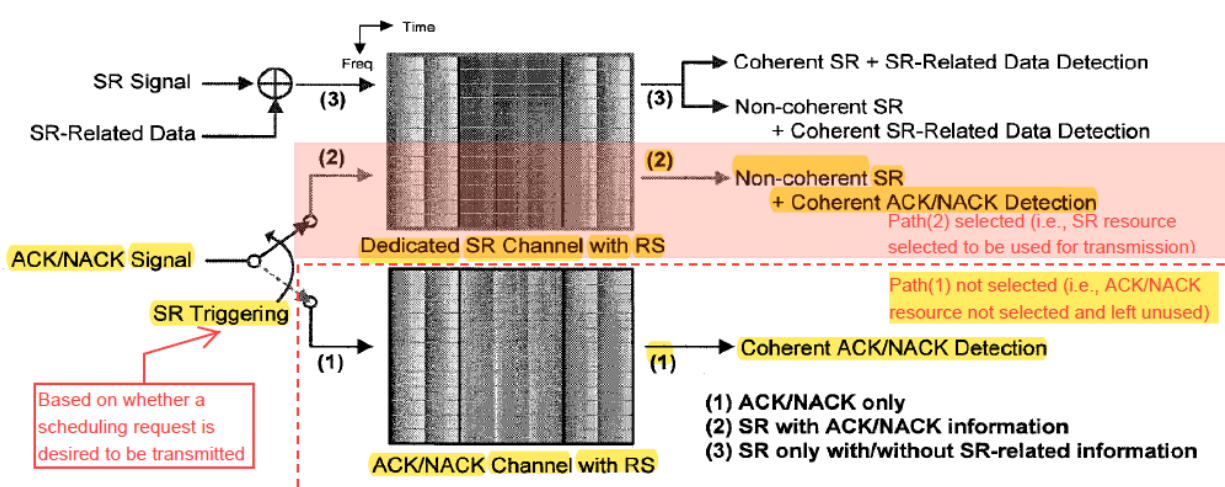
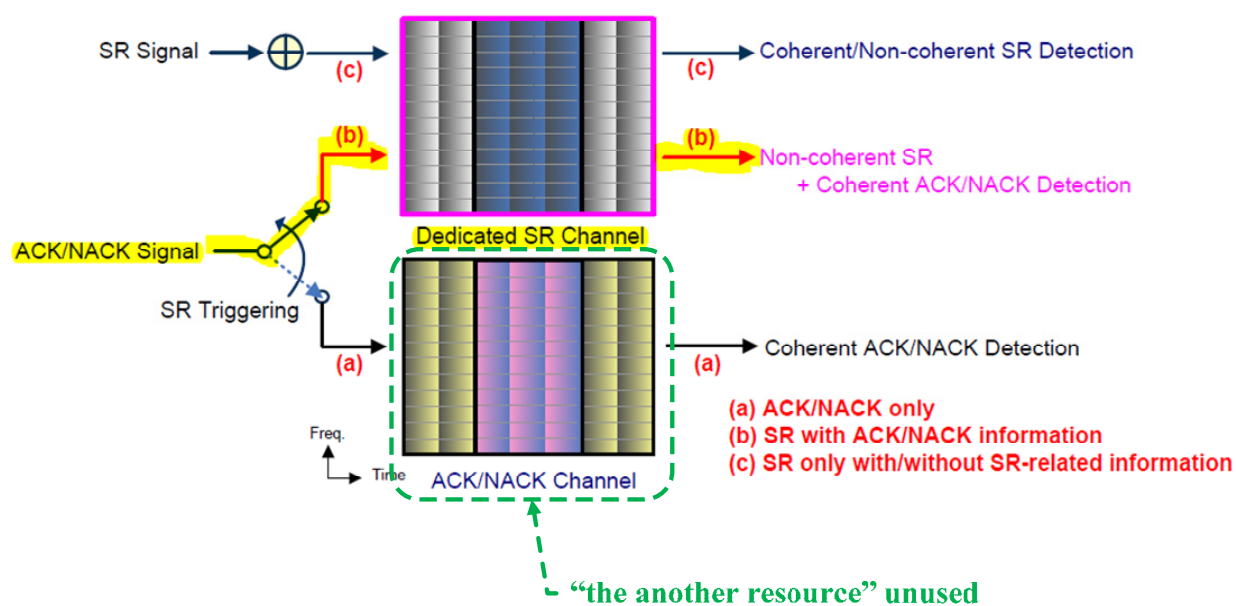


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7 (annotated)

LGE discloses based on that a SR is desired to be transmitted by the user equipment, it triggers placing ACK/NACK signal (i.e., *at least one of an acknowledgment/negative acknowledgement and a CQI*) that is desired to be transmitted by the user equipment in one of the resources (i.e., “**dedicated resource**,” “Dedicated SR Channel” in FIG.5) according to Path (b) (“ACK/NACK signal for this UE should be **diverted to the dedicated resource** which is **assigned to the UE for SR transmission from common resource for ACK/NACK signal** as shown in figure 5), thus leaving at least one other resource (e.g., “common resource for

ACK/NACK signal” “ACK/NACK channel” in FIG.5) in Path (a) unused: “when the UE should transmit its SR and ACK/NACK signal simultaneously, the ACK/NACK information is **not transmitted on the ACK/NACK channel, but on the dedicated SR channel ((b) in Figure 5).**” HUAWEI-1013,p.5. *See also* footnote 7 of this Petition. Decl.¶¶206-207.



LGE-FIG.5 (annotated)

[37D] “where the transmission comprises in addition to acknowledgement data, a sequence that is unmodulated via a modulation scheme used for the acknowledgment data.”

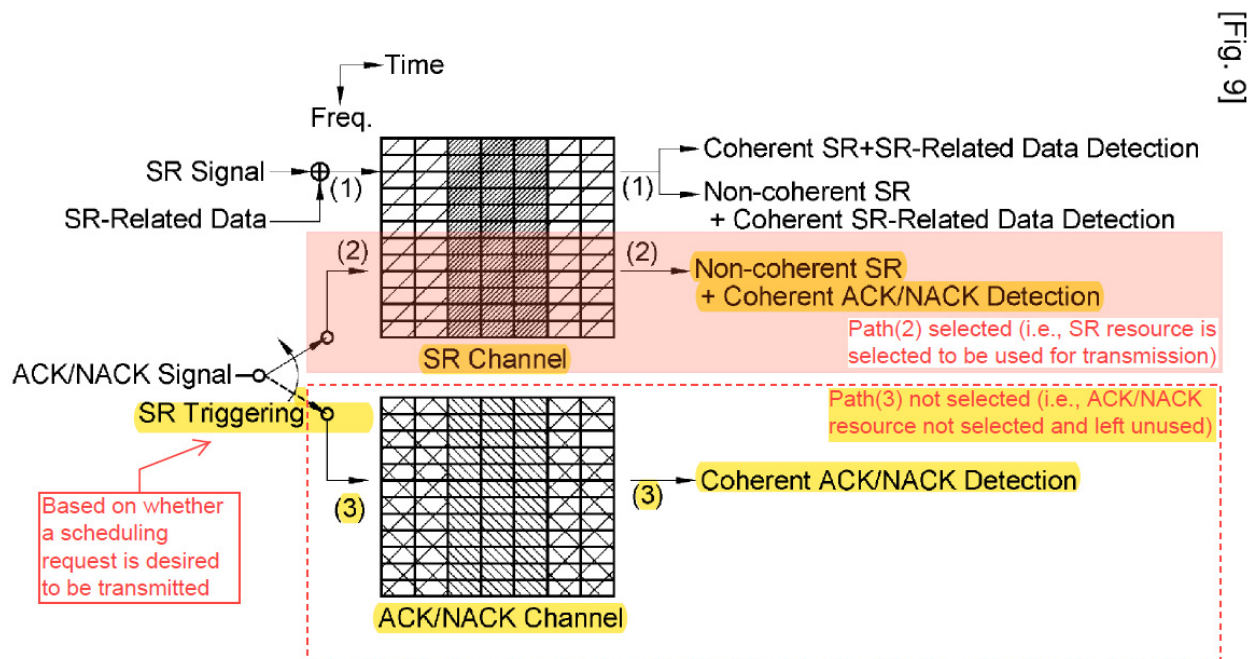
See Grounds-1A&1B, [1C]. Decl.¶¶140,208.

[38] “The method of claim 37, where the [SR] resource and the at least one other resource are [PUCCH] resources.”

See Grounds-1A&1B, [1B]&[5]. Decl.¶¶141,209.

[39A] “The method of claim 37 comprising: for a case where the user equipment desires to transmit a [SR] and transmit an acknowledgment/negative acknowledgment, transmitting the acknowledgment/negative acknowledgment with the [SR] on the [SR] resource and leaving the at least one other resource unused.”

As shown in below annotated FIG.9, KwakPat883 discloses: “In the path (2), the SR and the ACK/NACK signal are simultaneously transmitted [i.e., *for a case where the user equipment desires to transmit a [SR] and transmit an acknowledgment/negative acknowledgment*]. The ACK/NACK signal is transmitted on a [SR] channel which is configured for a [SR] resource allocated to transmit the SR [i.e., *transmitting the acknowledgment/negative acknowledgment with the [SR] on the [SR] resource*].” HUAWEI-1005,11:63-67. In this instance, Path (2) is selected over Path (3), thus leaving at least one other resource (e.g., “ACK/NACK channel which is configured by an ACK/NACK resource”) in Path (3) unused. *See* HUAWEI-1005,12:9-12. *See also* Grounds-1A&1B, [37C]. Decl.¶¶142-143.



KwakPat883-FIG.9 (annotated)

See support from KwakProv812 that, as shown in below annotated FIG.7, “If the **transmission of the ACK/NACK signal is required at the SR transmission** like (2) of FIG.7,” “**both the SR and ACK/NACK can be transmitted through the previously allocated SR channel**,” HUAWEI-1007,59:17-18,22-24;52:20-66:8, All Tables. See also Grounds-1A&1B, [37C]. Decl.¶¶144-145.

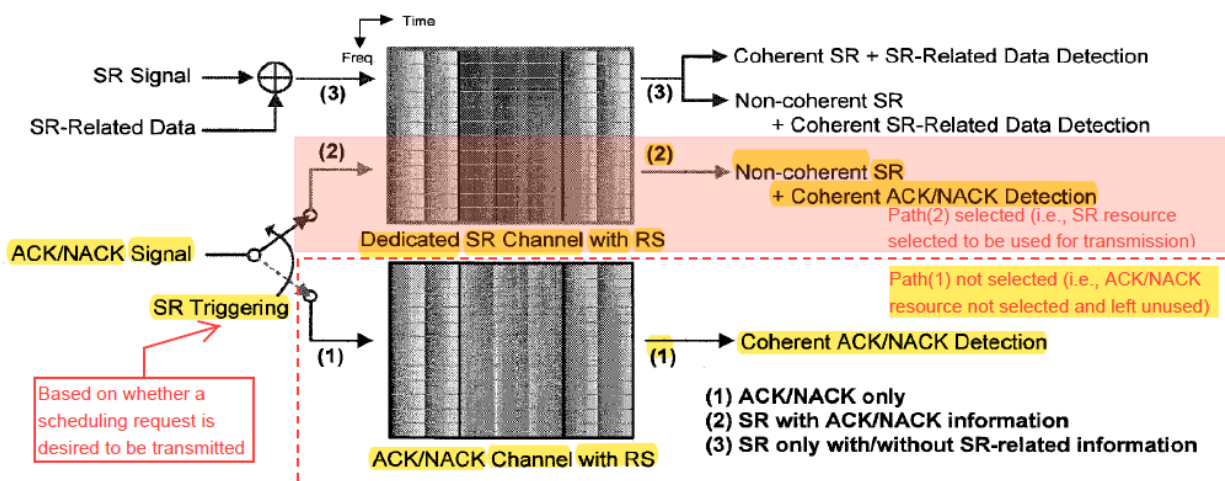
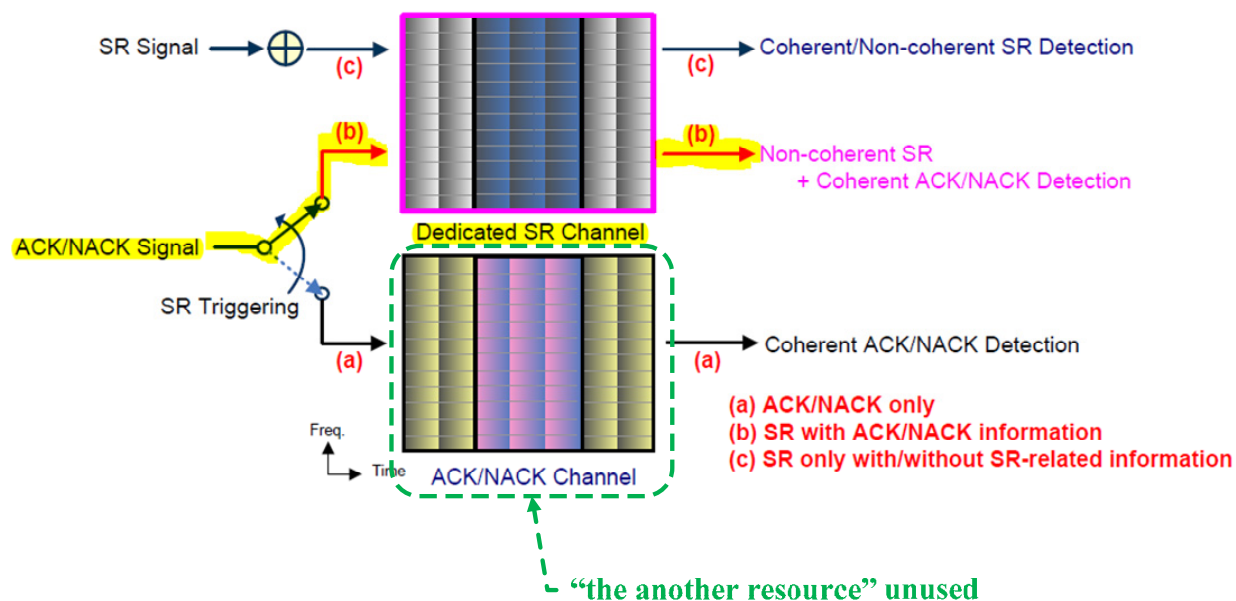


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7 (annotated)

LGE discloses “when the UE should transmit its SR and ACK/NACK signal simultaneously,” (i.e., *for a case where the user equipment desires to transmit a [SR] and transmit an acknowledgment/negative acknowledgement*), “the ACK/NACK information is **not transmitted on the ACK/NACK channel, but on the dedicated SR channel ((b) in Figure 5)**” (i.e., *transmitting the acknowledgment/negative acknowledgement with the [SR] on the [SR] resource and leaving the at least one other resource unused*). HUAWEI-1013,p.5. Decl.¶¶210-211.



LGE-FIG.5 (annotated)

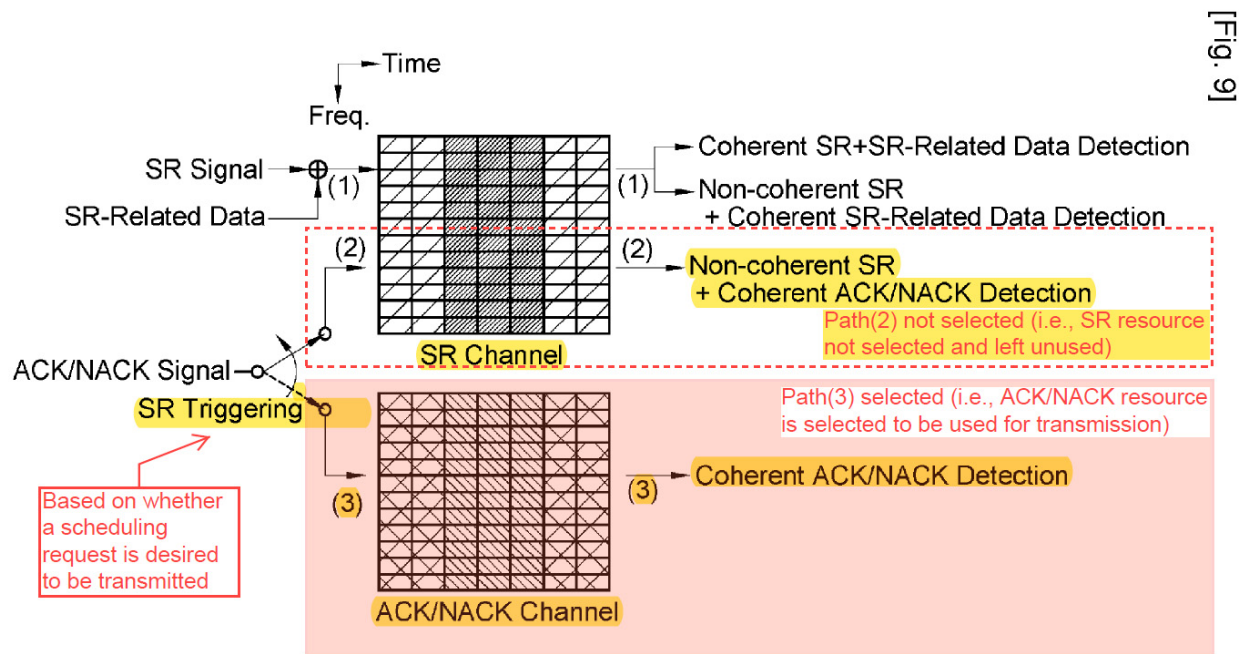
[39B] “or for a case where the user equipment does not desire to transmit a [SR] and does desire to transmit an acknowledgment/negative acknowledgment, transmitting the acknowledgment/negative acknowledgement on the at least one other resource and leaving the [SR] resource unused.”

KwakPat883 and LGE each satisfy claim 39 by satisfying [39A] because elements [39A]&[39B] are recited via the connector “or.” KwakPat883 and LGE also each satisfy [39B] as discussed below, thus further anticipating or rendering obvious of claim 39.

For example, as show in Path (3) of below annotated FIG.9, KwakPat883 discloses *where the user equipment does not desire to transmit a [SR] and does desire to transmit an acknowledgment/negative acknowledgement (i.e., ACK/NACK Signal without SR), transmitting the acknowledgment/negative acknowledgement*

on the at least one other resource (e.g., “ACK/NACK Channel”) in Path (3) (e.g., “ACK/NACK channel which is configured by an ACK/NACK resource”): “In the path (3), **when only the ACK/NACK signal is transmitted**, the ACK/NACK signal is **transmitted on an ACK/NACK channel which is configured by an ACK/NACK resource for the ACK/NACK signal.**” HUAWEI-1005,12:9-12.

Consequently, the [SR] resource (i.e., “a [SR] channel which is configured for a [SR] resource”) in Path (2) is left unused. *See id.* Decl. ¶¶146-148.



KwakPat883-FIG.9 (annotated)

See KwakProv812’s supporting disclosure regarding Path (1) of below annotated FIG.7 for transmitting the acknowledgment/negative acknowledgement on the at least one other resource (e.g., “allocated ACK/NACK channels”) in Path (1),

thus leaving the [SR] resource (i.e., “allocated SR channel”) in Path (2) unused: “**if only the ACK/NACK is transmitted like (1) of FIG.7, the ACK/NACK information** undergoes the coherent modulation/demodulation through the previously **allocated ACK/NACK channels.**” HUAWEI-1007,59:22-24. “If the transmission of the ACK/NACK signal is required, the SR transmission like (2) of FIG.7, **both the SR and ACK/NACK can be transmitted** through the previously **allocated SR channel.**” HUAWEI-1007,59:16-18. Decl.¶¶149-151.

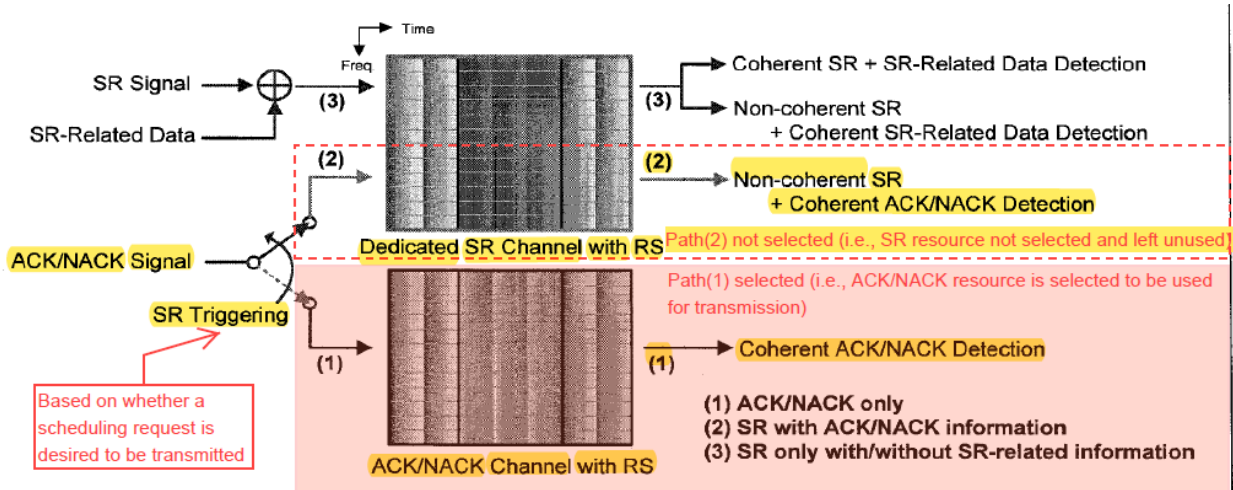
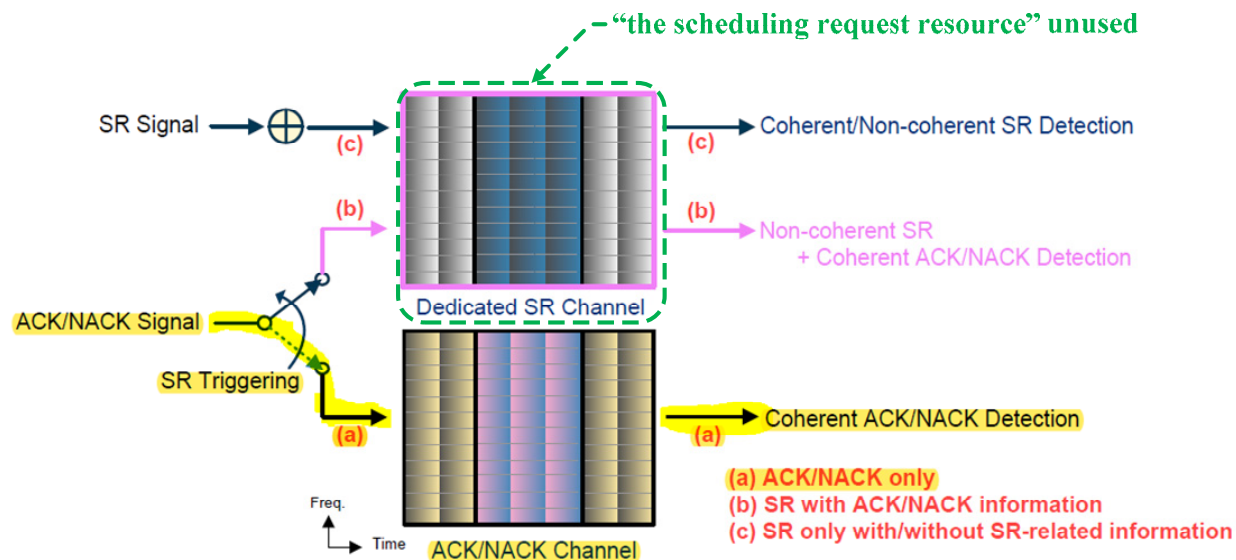


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7 (annotated)

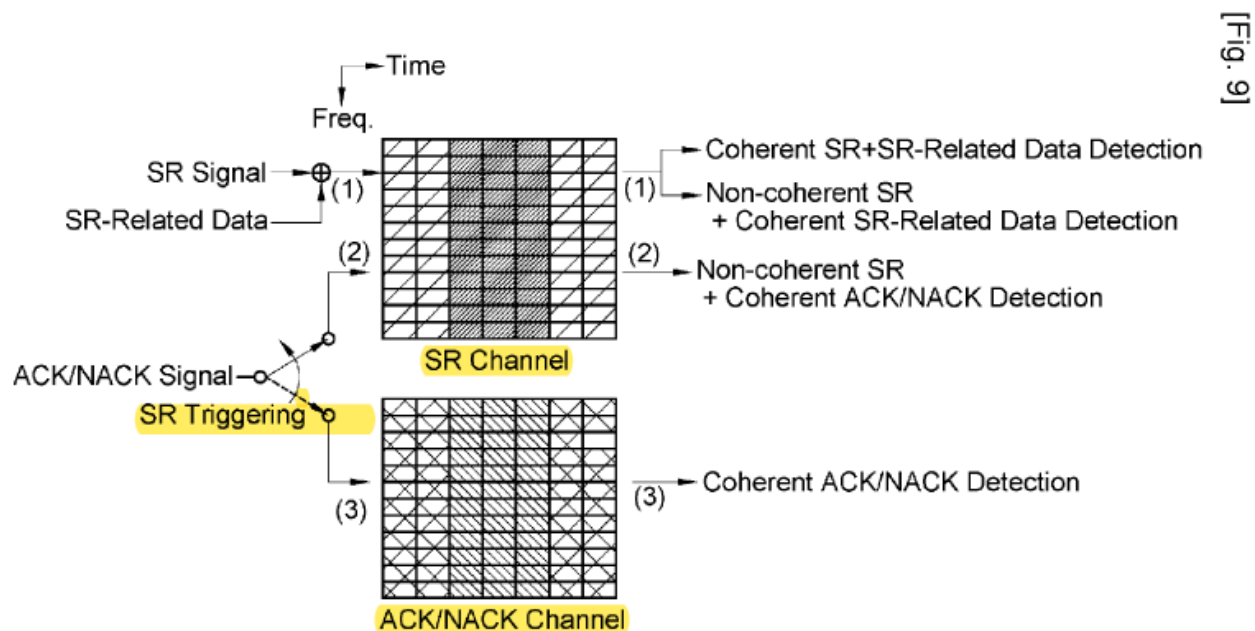
LGE discloses where the user equipment does not desire to transmit a [SR] (i.e., no “SR Triggering”) and does desire to transmit an acknowledgment/negative acknowledgement (i.e., ACK/NACK), transmitting the acknowledgment/negative acknowledgement on the at least one other resource (e.g., “common resource for ACK/NACK signal,” “ACK/NACK channel” in FIG.5) in Path (a), thus leaving the [SR] resource (i.e., “dedicated resource,” “Dedicated SR Channel”) in Path (b) unused: **“two separate channels will be utilized by one UE in order to transmit either one of SR or ACK/NACK signal without multiplexing at a given time,”** in contrast to the scenario “if SR transmission from certain UE happens to coincide with its ACK/NACK signal transmission at the same subframe, ACK/NACK signal for this UE should be diverted to the **dedicated resource** which is assigned to the UE **for SR transmission from common resource for ACK/NACK signal** as shown in figure 5.” HUAWEI-1013,p.5. Decl.¶¶212-214.



LGE-FIG.5 (annotated)

[42] “The method of claim 37, where the [SR] information is conveyed based on a selected [PUCCH] selection.”

As shown in below highlighted FIG.9 of KwakPat883, FIG.7 of KwakProv812 and FIG.5 of LGE, each of KwakPat883, KwakProv812, and LGE discloses “SR triggering” causes the selection between “SR channel” and “ACK/NACK” channel, both of which are [PUCCHs]. *See* Grounds-1A&1B, [1B] [1D]&[5]. Accordingly, the [SR] information (e.g., whether a SR is presented or not) is conveyed based on a selected PUCCH selection (e.g., either “SR channel” or “ACK/NACK” channel). *See* footnote 7 of this Petition; Decl.¶¶152-158, 216-218.



KwakPat883-FIG.9 (highlighted)

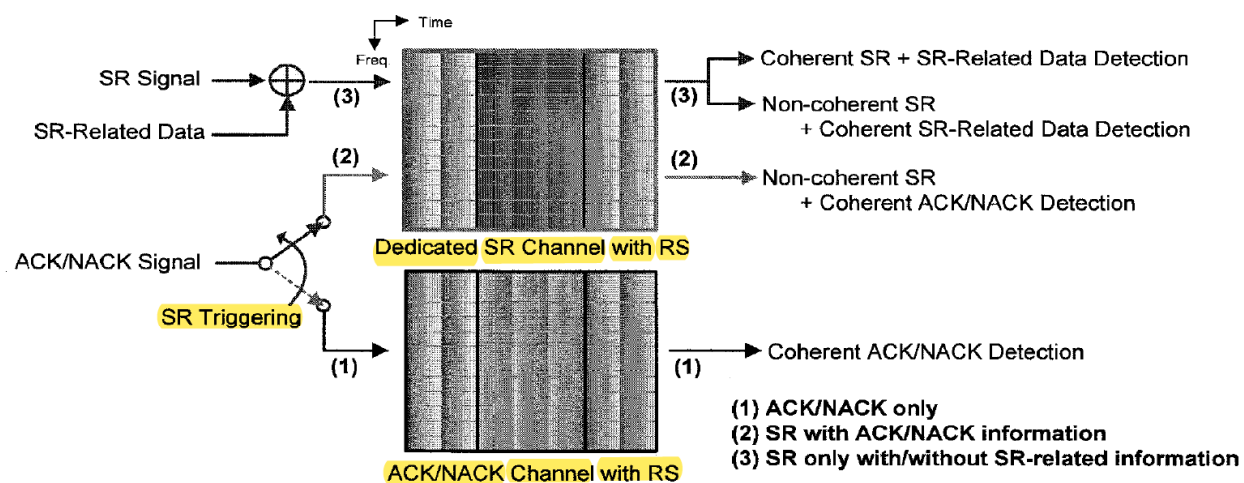


FIG. 7. Method for transmitting and receiving SR signals through the coherent SR channels having the dedicated RS

KwakProv812-FIG.7 (highlighted)

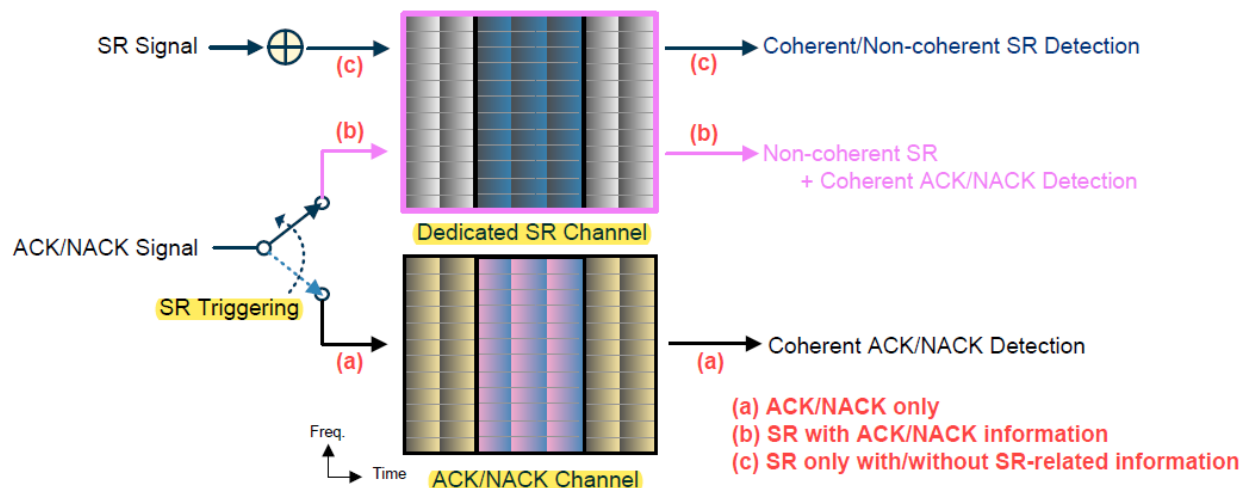


Figure 5: An illustration of multiplexing SR and/or ACK/NACK

LGE-FIG.5 (highlighted)

[43A] “A method comprising.”

See Grounds-1A&1B, [1A]. Decl.¶¶159,219.

[43B] “determining that an acknowledgment data transmission is to be sent.”

See Grounds-1A&1B, [1B]. Decl.¶¶160,220.

[43C] “for a case where there is also a [SR] to be sent, transmitting the acknowledgment data with the [SR] on a scheduling resource in an uplink,

See Grounds-1A&B, [1D]&[2]. Decl.¶¶161,221.

[43D] “where there is no need to specify a separate modulation or multiplexing operation used for transmission of the acknowledgement data with the [SR], from a modulation or multiplexing operation used for transmission of the acknowledgement on another resource.”

KwakPat883, through its incorporation of KwakProv812 by reference, discloses this feature by explaining “the ACK/NACK information is obtained by **the**

same coherent demodulation as the existing demodulation method of the ACK/NACK channel.” HUAWEI-1007,59:16-20. Decl.¶¶162-164.

KwakPat883 further discloses this feature by disclosing “**transmit[ing] modulation symbols for the ACK/NACK signal** through the scheduling request channel” so that “**existing resources can be utilized without having to reserve additional resources,**” and “resource efficiency can be enhanced.” *See* HUAWEI-1005,12:28-60. A POSITA reading KwakPat883’s disclosure in context would have understood that there is no need to specify a separate modulation or multiplexing operation used for transmission of the acknowledgement data with the scheduling request. Decl.¶¶162-164.

LGE also discloses this feature by distinguishing its “dedicated SR channel (i.e., ‘Alternative 2’)” from a scheme in its cited reference [2] that uses a separate modulation with an “increased modulation order” for “[m]ultiplexing of Scheduling Request and ACK/NACK and/or CQI” (HUAWEI-1017, p.1) and emphasizes its “dedicated SR channel (i.e., ‘Alternative 2’) is **fully compatible and co-existing with the PUCCH** in the same time-frequency resource **in a different way from the modified ACK/NACK channel structures for the SR transmission on the PUCCH [2]**” and thus there is no need to specify a separate modulation used for transmission of the acknowledgement data with the [SR], from the one used for

transmission of the acknowledgement on another resource. HUAWEI-1013,p.5;
Decl.¶222.

[44] “The method of claim 43, comprising: transmitting the acknowledgment with the [SR] on the scheduling resource.”

See Grounds-1A&1B, [1D]&[2]. Decl.¶¶165,223.

[45] “The method of claim 43, where the transmitting is on a [PUCCH].”

See Grounds-1A&1B, [1B]&[5]. Decl.¶¶166,224.

B. Ground-2A: LGE anticipates claims 3 and 40

[3] “The method of claim 1, comprising: for a case where a [CQI] is also to be sent, the [CQI] is not sent and the another resource is unused.”

LGE makes clear that “in case of ‘Alternative 2’ structure” (i.e., for simultaneous transmission of SR and ACK/NACK), **when a CQI is also to be sent, “the same operational method as described in section 2.1.3 can be exploited when considering the multiplexing with CQI signal also in case of ‘Alternative 2’ structure. Hence, CQI is skipped or delayed (depending on CQI schemes) when CQI and SR transmission timing is overlapped as shown in Figure 4.”**

HUAWEI-1013,p.5. Decl.¶¶187-188. Accordingly, LGE discloses *the CQI is not sent* in the ‘Alternative 2’ structure”:

2.1.3 Scheduling Request transmission in the presence of CQI transmission

From time to time, **SR transmission may happen to coincide with CQI transmission. If it happens,** it seems to be reasonable that

SR (with higher priority in most cases) is mainly transmitted instead of CQI. We can also apply priority based selection method when they coincide at the same time. **Figure 4 shows the exemplary case where CQI is skipped or delayed (depending on CQI schemes) when CQI transmission was scheduled at the same time when UE tries to transmit SR to eNB.**

HUAWEI-1013,p.5.

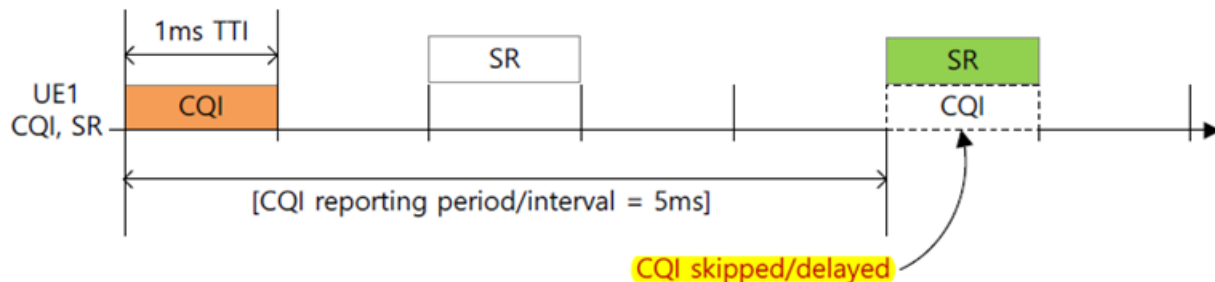
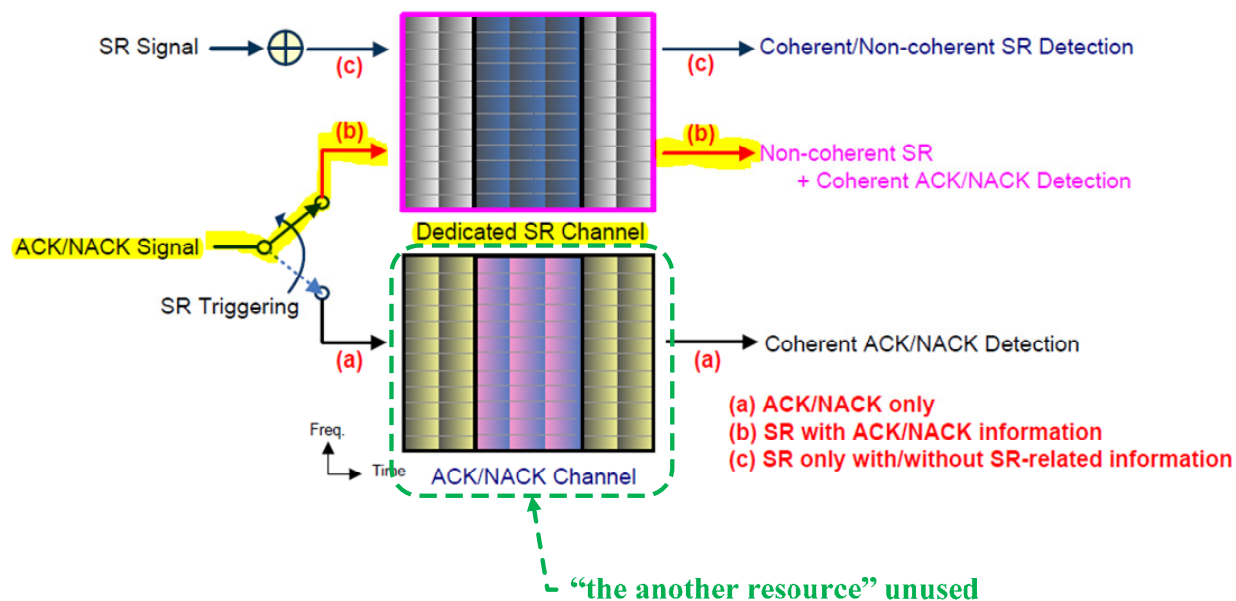


Figure 4: SR transmission when CQI is scheduled to be transmitted

LGE-FIG.4 (highlighted)

LGE also discloses *the another resource* (“**common resource for ACK/NACK signal,**” “**ACK/NACK channel**” in FIG.5) *is unused* by showing in FIG.5, “**two separate channels** will be utilized by one UE in order **to transmit either one of SR or ACK/NACK signal** without multiplexing at a given time.” The ACK/NACK channel is **unused** because “**ACK/NACK signal ... should be diverted to the dedicated resource ... for SR transmission from common resource for ACK/NACK signal** as shown in figure 5. However, when the UE

should transmit its SR and ACK/NACK signal simultaneously, **the ACK/NACK information is not transmitted on the ACK/NACK channel**, but on the dedicated SR channel ((b) in Figure 5).” HUAWEI-1013,p.5. Decl.¶¶189-190.



LGE-FIG.5 (annotated)

[40] “The method of claim 37 comprising: for a case where the user equipment desires to transmit a [SR] and a [CQI] but no acknowledgment/negative acknowledgment, transmitting the [SR] on the [SR] resource and not transmitting the [CQI] leaving the at least one other resource unused.”

See Grounds-1A&1B, [37A]-[37D] and Ground-2A, [3]. Decl.¶215.

C. Ground-2B: KwakPat883 in view of LGE renders obvious claims 3 and 40

As discussed in the beginning of Section III-A, KwakPat883 and LGE are affiliated with same entity and disclose the same idea of multiplexing SR and up-link control signals, particularly simultaneous transmitting SR and ACK/NACK on

a scheduling resource. *See e.g.*, HUAWEI-1005, FIG. 9; HUAWEI-1007, p. 60, FIG. 7; and HUAWEI-1013, FIG. 5.

Additionally, KwakPat883 explains that “[t]he present invention provides a method transmitting a plurality of **multiplexed uplink control signals**,” and “a method of **transmitting a [SR] ... together with other control signals** through one uplink control channel.” HUAWEI-1005, 2:25-26, 2:27-30. KwakPat883 identifies that “the **control signal includes ... (CQI)**.” HUAWEI-1005, 5:49-50. KwakPat883 further makes clear that “**Although the ACK/NACK signal will be described hereinafter**, the [SR] channel can also be used for other control signals.” HUAWEI-1005, 8:27-30. *See* similar disclosure in KwakProv812 that: “[t]he **SR channel structure proposed** in the present invention can be extended as a general SR channel configuration method irrespective of presence of an arbitrary control signal as long as it is **not limited to only the transmission simultaneous with a certain control signal such as the ACK/NACK signal**.” HUAWEI-1007, 52:17-20. KwakProv812 also identifies CQI is a control signal: “the existing **control signal (ACK/NACK or CQI)**.” *Id.*

LGE discloses how the [SR] channel can also be used for other control signals, particularly, a CQI. *See* Ground-2A. Particularly, LGE discloses “Scheduling Request transmission in the presence of CQI.” HUAWEI-1013, §2.1.3.

A POSITA would have been motivated to review and analyze publications on the same or similar subject matter prepared or provided by the same entity, and would realize that KwakPat883 discloses a system for uplink transmission having largely the same characteristics as the system disclosed by LGE. A POSITA reviewing the former would look to the latter for implementation details of specifics not covered in the former. In doing so, they would discover treatment of a common problem that occurs in such systems when transmission of an SR and a CQI happen to coincide. HUAWEI-1013,p.6. A solution to this problem is proposed by LGE as being to simply skip or delay the CQI transmission. *Id.* A POSITA reviewing KwakPat883 would anticipate a similar problem as potentially occurring in KwakPat883's system and would turn to LGE's teachings, which, after all, describe a system largely identical to the system of KwakPat883, to provide a solution to address the problem. In fact, KwakPat883 makes clear that its "[SR] channel **can also be used for other control signals,**" besides **the ACK/NACK signal.** HUAWEI-1005,8:27-30; 5:49-50. Accordingly, a POSITA would be motivated to combine KwakPat883's system with LGE's teachings related to simultaneous transmission of SR with CQI, thereby, achieving the above envisioned scope and capabilities of KwakPat883's system. Decl.¶¶225-229.

The combined teachings of KwakPat883 and LGE make it plain that for a case where a CQI is also to be sent, the CQI is not sent and the another resource is

unused. *See* Ground-2A. Decl. ¶¶230-236. Thus KwakPat883 in view of LGE renders obvious claims 3 and 40.

D. Ground-3A: KwakPat883 renders obvious claims 43-45

See Ground-1A, [43D]. To the extent that the Board does not agree that KwakPat883 discloses that there is no need to specify a separate modulation or multiplexing operation used for transmission of the acknowledgement data with the SR feature, a POSITA reading KwakPat883 would have found it readily obvious given KwakPat883's disclosure that, by **“transmit[ing] modulation symbols for the ACK/NACK signal through the scheduling request channel,” “existing resources can be utilized without having to reserve additional resources”** (e.g., additional power or signaling overhead if a separate modulation or multiplexing operation were to be used). *See* HUAWEI-1005,12:28-60; Decl. ¶¶162-164.

As discussed above in Grounds-1A, KwakPat883 discloses each and every other feature of claims 43-45, which are incorporated by reference herein. Accordingly, KwakPat883 renders obvious claims 43-45. Decl. ¶¶159-166.

E. Ground-3B: LGE renders obvious claims 1-9, 37-40, and 42-45

See Ground-1B, [1C]. To the extent that the Board does not agree that LGE discloses transmission of the acknowledgement comprises reference signals (RS)

(a sequence that is unmodulated via a modulation scheme used for the acknowledgment data) in addition to the acknowledgement data by disclosing that **“ACK/NACK information is obtained by coherent detection.”** HUAWEI-1013,p.5, a POSITA reading LGE would have found this feature obvious because it had been basic knowledge of wireless communications that, for coherent detection of a signal (e.g., ACK/NACK), RS are transmitted together with the signal so that the signal can be detected based on channel estimation obtained based on the RS. Decl.¶¶173-176. In view of LGE’s express identification of “Coherent ACK/NACK Detection” in FIG.5 (annotated below), a POSITA would have found it obvious that, in path (b), the transmission of the “ACK/NACK Signal” over the “Dedicated SR Channel” would include the RS (i.e., unmodulated sequence) in addition to the ACK/NACK signal, thus satisfying claim element [1C]. Decl.¶¶177-181.

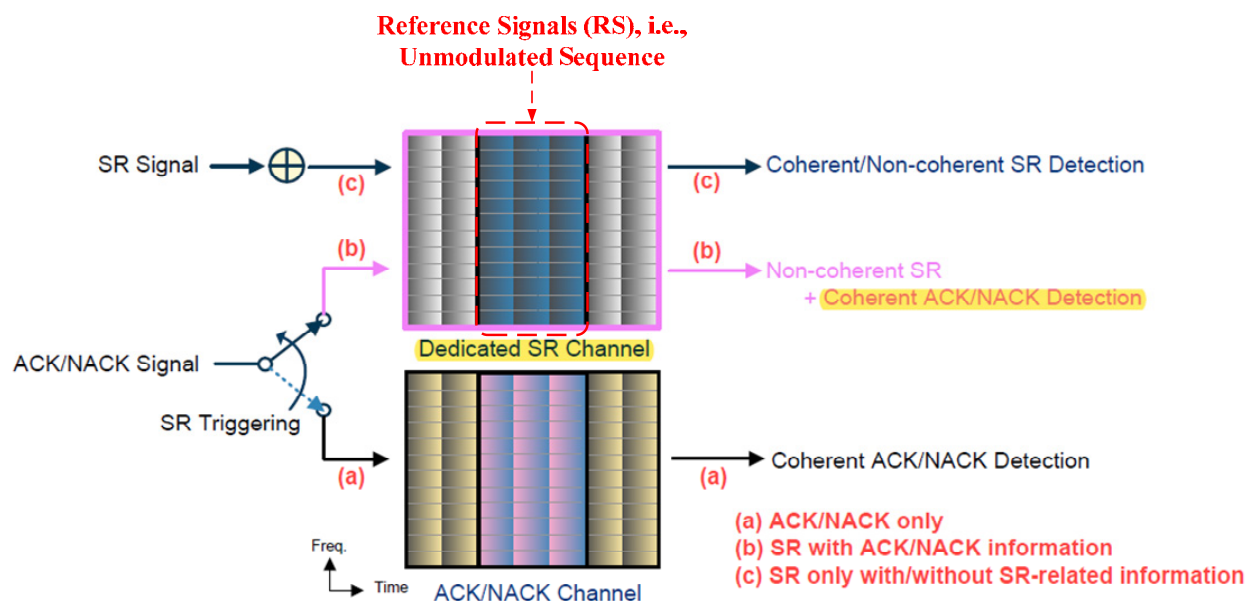


Figure 5: An illustration of multiplexing SR and/or ACK/NACK

LGE-FIG.5 (annotated)

As discussed above in Grounds-1B, LGE discloses each and every other feature of claims 1-9, 37-40, and 42-45, which are incorporated by reference herein.

Accordingly, LGE renders these claims obvious. Decl. ¶¶167-224.

F. Ground-4A&4B: (KwakPat883 in view of Bachl) OR (LGE in view of Bachl) each renders obvious claims 10, 11, 13-15, 17-24, and 46-48

Claims 10, 11, 13-15, 17-24, and 46-48 are computer-readable medium and apparatus claims that recite similar, if not identical language to the method claims 1-2, 4-9, 37-40, and 42-45. As described in Grounds-1A&1B and 3, KwakPat883, KwakProv812, and LGE each disclose an apparatus (e.g., UE) performing the re-

cited operations of claims 10, 11, 13-15, 17-24, and 46-48. Particularly, KwakPat883 discloses that the apparatus (e.g., UE) including at least one “processor” and “memory,” or a “non-transitory computer readable medium” for performing the disclosed operations:

The present invention can be implemented with **hardware, software or combination** thereof. In hardware implementation..., a **processor**, a controller, a microprocessor, other electronic units, and combination thereof, which are **designed to perform the aforementioned functions**. In software implementation, the present invention can be implemented with a module for performing the aforementioned functions. **Software is storable in a memory unit and executed by the processor. Various means** widely known to those skilled in the art **can be used as the memory unit or the processor.**

HUAWEI-1005,17:19-32.

KwakProv812’s disclosure that UE performs the recited operations supports KwakPat883’s above disclosure of implementation details because a POSITA would have readily understood, a UE would have included at least one “processor,” “memory” or “non-transitory computer readable medium” to perform its disclosed functions. Decl.¶¶237-239. As such, KwakPat883 and LGE each render obvious claims 10, 11, 13-15, 17-24, and 46-48.

However, to the extent that Patent Owner argues that a UE would not have included at least one “processor” and “memory” to perform its disclosed functions

because KwakProv812 and LGE do not but KwakPat883 does expressly disclose so, Bachl is used as a supporting reference to show that, by the time of the earliest possible priority date of the '688 Patent, it had been well-known in the art that a UE would have included at least one “processor,” “memory” or “non-transitory computer readable medium” for its disclosed functions, and thus a POSITA would have readily found that KwakPat883 in view of Bachl and LGE in view of Bachl each disclose each and every feature of claims 10, 11, 13-15, 17-24, and 43-48. Decl. ¶¶240-247, 285-292.

Similar to KwakPat883 and LGE, Bachl also discloses “methods are provided for transmitting [SR]s over uplink channels.” HUAWEI-1013, Abstract. Both KwakPat883, LGE and Bachl relates to “wireless communication systems,” particularly, LTE systems. *See e.g.*, HUAWEI-1005, 2:34-3:8; HUAWEI-1007, 49:2-21; HUAWEI-1013, p.1 (for discussion and decision at 3GPP RAN 1 meeting for LTE); HUAWEI-1011, [0002], [0007]&[0008]. Both references solve the same problems of simultaneous transmission of SR and other uplink control signals including ACK/NACK. *See e.g.*, HUAWEI-1005, 7:28-43; 12:19-27; HUAWEI-1007, 51:9-11; HUAWEI-1013, pp.1&5, HUAWEI-1011, [0011]-[0013]. A POSITA seeking to implement a system based on KwakPat883/LGE would have been led to Bachl to identify a specific configuration of a UE that would have the capabilities to implement the techniques of KwakPat883/LGE. In doing so, they

would recognize that it is a known, common practice in the art that the disclosed operations of the UE (e.g., for “transmitting [SR]s over uplink channels,” (*see* HUAWEI-1011, Abstract; HUAWEI-1005,3:2-21; HUAWEI-1007,50:7-10; HUAWEI-1013,p.5)) could be software implemented by a computer system or electronic device (i.e., an apparatus) that includes a “processing unit,” “memory” and “program storage medium” as Bachl explains:

terms such as **“processing” or “computing” or “calculating” or “determining” or “displaying” or the like, refer to the action and processes of a computer system, or similar electronic computing device**, that manipulates and transforms data represented as physical, electronic quantities within **the computer system's registers and memories** into other data similarly represented as physical quantities within the **computer system memories** or registers **or other such information storage**, transmission or display devices.

Note also that the **software implemented** aspects of the invention are typically encoded on some form of **program storage medium....** The program storage medium may be magnetic (e.g., a floppy disk or a hard drive) or optical (e.g., a compact disk read only **memory**, or “CD ROM”)....

HUAWEI-1011, [0023], [0024].Decl.¶241.

Bachl further specifies that “[a] ‘mobile unit’ (‘such as ... user equipment’) includes ‘a processing unit’ configured to perform the disclosed operations of the UE (‘determine ...; and encode...’). *See* HUAWEI-1011, [0004], claim 22.

As such, in view of Bachl, a POSITA would have readily recognized that the UE disclosed by KwakProv812 as incorporated by reference into KwakPat883 or LGE could be implemented through use of at least one “processing unit” (i.e., processor), “memory,” or “program storage medium” (i.e., non-transitory computer readable medium) for performing the disclosed operations that satisfy claims 10, 11, 13-15, 17-24, and 46-48, which is further corroborated by KwakPat883’s express disclosure. HUAWEI-1005,17:19-32. Such a recognition would have directly followed from a POSITA’s common-sense knowledge because it is a well-known, routine practice in the art to use a device that has a “processing unit” and a “memory” when the device, like that disclosed in KwakProv812 or LGE, is useful in executing techniques that require processing and storage of data. Moreover, it is a well-known and routine practice in the art to implement such techniques in software and, hence, via the “processing unit” executing a program accessed from a “program storage medium.” Indeed, use of a “processor,” “memory” and a “program storage medium” in the UE of KwakProv812 or LGE would have been an implementation of a known technique or device for its ordinary purposes in the same way as has already been disclosed for similar devices (i.e., Bachl’s “mobile

unit...such as ... user equipment”) versus KwakProv812’s UE or LGE’s UE) to achieve a predictable result (e.g., transmitting [SR]s over uplink channels, particularly, addressing the same problems of simultaneous transmission of SR and other uplink control signals including ACK/NACK). *See e.g.*, HUAWEI-1011, Abstract, [0011]-[0013]; HUAWEI-1005,17:19-32; HUAWEI-1007,51:9-11; HUAWEI-1013,p.5; Decl.¶¶242-243, 288-290.

Notably, a POSITA looking into Bachl for implementation guidance of a UE that embodies the techniques of KwakPat883/LGE would have reasons to stick to the similar techniques disclosed by both KwakPat883 and LGE over those of Bachl for simultaneous transmission of SR and other uplink control signals, because as KwakPat883 identifies, by implementing the former, **“Performance deterioration does not occur** when the ACK/NACK signal is detected after detecting the SR” and “The **same [SR] detection scheme** is used irrespective of a presence/absence of the ACK/NACK signal.” HUAWEI-1005,8:15-16. *See* support from HUAWEI-1007,52:9-10. Decl.¶¶244-247, 291-292.

Also, LGE advocates its “dedicated SR channel (i.e., ‘Alternative 2’)” over a scheme similar to Bachl’s in the cited reference [2] that uses “increased modulation order” for “[m]ultiplexing of Scheduling Request and ACK/NACK and/or CQI” because the “dedicated SR channel (i.e., ‘Alternative 2’) is fully compatible

and co-existing with the PUCCH in the same time-frequency resource.” HUAWEI-1013,p.5; HUAWEI-1017, p.1; Decl.¶291.

Accordingly, in view of KwakProv812 (as incorporated by reference into KwakPat883) or LGE and Bachl, a POSITA would have found it obvious to implement the UE of KwakProv812 (as incorporated by reference into KwakPat883) or LGE through use of at least one “processor,” “memory,” and “program storage medium” for its disclosed functions, and thus KwakPat883 or LGE in view of Bachl discloses each and every feature of claims 10, 11, 13-15, 17-24, and 46-48. Decl.¶¶241-247, 285-292.

[10A] “A non-transitory computer readable medium encoded with a computer program executable by a processor to perform actions comprising”

KwakPat883 discloses a UE for performing the disclosed actions, e.g., “one UE may simultaneously transmit the SR and the ACK/NACK signal in the same subframe.” HUAWEI-1005,12:21-23. *See* support from HUAWEI-1007,51:10-11.

LGE also discloses a UE for performing the disclosed actions, for example, “two separate channels will be **utilized by one UE** in order to transmit either one of SR or ACK/NACK signal” and “when **the UE** should transmit its SR and ACK/NACK signal simultaneously,” HUAWEI-1013,p.5.

Bachl discloses a non-transitory computer readable medium encoded with a

computer program executable by a processor to perform actions of a UE: “the software implemented aspects of the invention are typically encoded on some form of **program storage medium** or implemented over some type of transmission medium,” and “[a] “mobile unit” (“such as ... **user equipment**”) includes “a processing unit” (i.e., processor) configured to perform the disclosed operations of the UE (“determine ...; and encode...”). *See* HUAWEI-1011, [0004], [0023], [0024], claim 22.

As discussed in the beginning of Section III-F, a POSITA would have been led to combine KwakPat883/LGE and Bachl and found it obvious that KwakPat883/LGE in view of Bachl discloses the preamble of claim 10. Decl.¶¶248-250,293-295.

[10B] “determining that an acknowledgment with acknowledgement data is to be sent on a [PUCCH],”

See Grounds-1A&1B, [1B]. Decl.¶¶251,296.

[10C] “where transmission of the acknowledgement on the [PUCCH] comprises in addition to the acknowledgement data, a sequence that is unmodulated via a modulation scheme used for the acknowledgment data; and

See Grounds-1A&1Band 3, [1C]. Decl.¶¶252,297.

[10D] “for a case where there is also a [SR] to be sent, combine the acknowledgment with the [SR] on a scheduling resource,

See Grounds-1A&1B, [1D]. Decl.¶¶253,298.

[10E] “else placing the acknowledgment in another resource.

See Grounds-1A&1B, [1E]. Decl.¶¶254,299.

[11] “The non-transitory computer readable medium encoded with a computer program of claim 10, comprising: for the case where there is also the [SR] to be sent, transmitting the acknowledgment with the [SR] on the scheduling resource.”

See Grounds-1A&1B, [2]. Decl.¶¶255,300.

[13] “The non-transitory computer readable medium encoded with a computer program of claim 10, where the another resource is a data-non-associated resource.”

See Grounds-1A&1B, [4]. Decl.¶¶256,302.

[14A] “An apparatus comprising”

KwakPat883 expressly discloses hardware implementations of an apparatus (i.e., a UE) for performing the disclosed method:

The present invention can be implemented with **hardware**, software or combination thereof. In hardware implementation, the present invention can be implemented with ... a **processor...designed to perform the aforementioned functions**. In software implementation, the present invention can be implemented with a module for performing the aforementioned functions. **Software is storable in a memory unit and executed by the processor. Various means** widely known to those skilled in the art **can be used as the memory unit or the processor.**

HUAWEI-1005,17:19-32.

See also KwakProv812 discloses an apparatus (i.e., a UE) for performing the disclosed method: “proposing an effective SR transmission method ... that **a certain UE is required to transmit the SR signal and the control signal.**”

HUAWEI-1007,51:10-11.Decl.¶¶257-258.

LGE discloses an apparatus (i.e., a UE) for performing the disclosed method: “two separate channels will be **utilized by one UE** in order to transmit either one of SR or ACK/NACK signal” and “when **the UE** should transmit its SR and ACK/NACK signal simultaneously,” HUAWEI-1013,p.5. Decl.¶303.

[14B] “at least one processor; and”

Bachl discloses “[a] “mobile unit” (“such as ... user equipment”) includes “**a processing unit**” (i.e., processor) configured to perform the disclosed operations of the UE (“determine ...; and encode...”). *See* HUAWEI-1011,claim 22.

As discussed in the beginning of Section III-F, a POSITA would have been led to combine KwakPat883 or LGE with Bachl and found it obvious that the UE disclosed by KwakProv812 as incorporated by reference into KwakPat883 or LGE could have included at least one processor. Decl.¶¶304-305. Such an obvious implementation is further supported by KwakPat883’s express disclosure of at least one processor for hardware implementations of a UE: “the present invention can be

implemented with ... a **processor ... designed to perform the aforementioned functions.**” HUAWEI-1005,17:19-32.

[14C] “**at least one memory including computer program code, where the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to at least:**”

Bachl discloses at least one memory (“memory”) including computer program code, where the at least one memory and the computer program code are configured, with the at least one processor (“a processing unit”), to cause the apparatus (“user equipment”) to at least perform the recited operations:

terms such as “**processing**” or “**computing**” or “**calculating**” or “**determining**” or “**displaying**” or the like) (“**refer to the action and processes of a computer system, or similar electronic computing device, that manipulates and transforms data represented as physical, electronic quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission or display devices.**”

the software implemented aspects of the invention are typically encoded on some form of **program storage medium**[.]

A mobile unit, comprising:

a processing unit configured to:

determine ...; and

encode...

See HUAWEI-1011, [0004], [0023], [0024], claim 22.

As discussed in the beginning of Section III-F, a POSITA would have been led to combine KwakProv812 (as incorporated by reference into KwakPat883) or LGE with Bachl and found it obvious that KwakProv812 (as incorporated by reference into KwakPat883) or LGE in view of Bachl discloses the claim element [14C]. Decl. ¶¶261-262, 306-307. Such an obvious implementation is further supported by KwakPat883's express disclosure that an apparatus (e.g., UE) includes at least one memory including computer program code, where the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to perform actions:

The present invention can be implemented with hardware, **software** or **combination** thereof....In **software implementation**, the present invention can be implemented with a module for performing the aforementioned functions. **Software is storable in a memory unit and executed by the processor. Various means** widely known to those skilled in the art **can be used as the memory unit or the processor.**

HUAWEI-1005, 17:19-32.

[14D] **“determine that an acknowledgment is to be sent on a [PUCCH],”**

See Grounds-1A&1B, [1B]. Decl. ¶¶263, 308.

[14E] **“where transmission of the acknowledgement on the [PUCCH] comprises in addition to the acknowledgement data, a sequence that is unmodulated via a modulation scheme used for the acknowledgment data; and”**

See Grounds-1A&1B and 3, [1C]. Decl. ¶¶264, 309.

[14F] “for a case where there is also a [SR] to be sent, combine the acknowledgment with the [SR] on a scheduling resource,”

See Grounds-1A&1B, [1D]. Decl.¶¶265,310.

[14G] “else placing the acknowledgment in another resource.”

See Grounds-1A&1B, [1E]. Decl.¶¶266,311.

[15] “The apparatus of claim 14, where the at least one memory including the computer program code is configured with the at least one processor to cause the apparatus, for the case where there is also the [SR] to be sent, to transmit the acknowledgment with the [SR] on the scheduling resource.”

See Grounds-1A&1B, [2]. Decl.¶¶267,312.

[17A] The apparatus of claim 14, where the acknowledgment transmission is communicated on the scheduling resource if there is also a scheduling request combined with the acknowledgment transmission on the scheduling resource,

See Grounds-1A&1B, [1D]&[2], Decl.¶¶268,314.

[17B] else the acknowledgment transmission is communicated on another resource.

See Grounds-1A&1B, [1E], Decl.¶¶269,315.

[18] “The apparatus of claim 14, where the another resource is a data-non-associated resource.”

See Grounds-1A&1B, [4]. Decl.¶¶270,316.

[19] “The apparatus of claim 15, where the acknowledgment with the [SR] is transmitted on a [PUCCH].”

See Grounds-1A&1B, [5]. Decl.¶¶271,317.

[20] “The apparatus of claim 15, where the transmitter is configured to transmit the acknowledgment with the [SR] on an uplink.”

See Grounds-1A&1B, [6]. Decl.¶¶272,318.

[21A] “The apparatus of claim 15, where the physical uplink control channel comprises an unmodulated sequence, and where the unmodulated sequence comprises reference signals and”

See Grounds-1A&1B, [7A]. Decl.¶¶273,319.

[21B] “the acknowledgement data comprises a BPSK/QPSK modulated sequence.”

See Grounds-1A&1B, [7B]. Decl.¶¶274,320.

[22] “The apparatus of claim 15, embodied in a user equipment.”

KwakPat883 discloses a UE for performing the disclosed actions, e.g., “one UE may simultaneously transmit the SR and the ACK/NACK signal in the same subframe.” HUAWEI-1005,12:21-23. *See* support from KwakProv812 HUAWEI-1007,51:10-11. Decl.¶275.

Similarly, LGE discloses, e.g., “UEs [] transmit SR and ACK/NACK simultaneously in one subframe.” HUAWEI-1013,p.1. Decl.¶321.

[23] “The apparatus of claim 15, configured to operate in a wireless communications network.”

See Grounds-1A&1B, [8]. Decl.¶¶276,322.

[24] “The apparatus of claim 14 configured to operate in an evolved universal terrestrial radio access network.”

See Grounds-1A&1B, [9]. Decl.¶¶277,323.

[46A] “An apparatus comprising:”

See Grounds-1A&1B, [14A]. Decl.¶¶278,324.

[46B] “at least one processor; and”

See Grounds-1A&1B, [14B]. Decl.¶¶279,325.

[46C] “at least one memory including computer program code, where the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to at least:”

See Grounds-1A&1B, [14C]. Decl.¶¶280,326.

[46D] “determine that an acknowledgment transmission is to be sent.”

See Grounds-1A&1B, [43B] and Grounds-4A&4B, [14D]. Decl.¶¶281,327.

[46E] “for a case where there is also a [SR] to be sent, transmit the acknowledgment with the [SR] on a scheduling resource in an uplink, where there is no need to specify a separate modulation or multiplexing operation used for transmission of the acknowledgement with the [SR], from a modulation or multiplexing operation used for transmission of the acknowledgement on another resource.”

See Grounds-1A&1B, [43C]&[43D]. Decl.¶¶282,328.

[47] “The apparatus of claim 46, where the at least one memory including the computer program code is configured with the at least one processor to cause the apparatus to transmit the acknowledgment with the [SR] on the scheduling resource.”

See Grounds-4A&4B, [15]. Decl.¶¶283,329.

[48] “The apparatus of claim 46, where the transmitting is on a [PUCCH].”

See Grounds-1A&1B, [1B]&[5]. Decl.¶¶284,330.

G. Ground-5A: LGE and Bachl render obvious claims 12 and 16

As set forth in Ground-4B, a POSITA would have been led to combine LGE and Bachl for implementation details of a UE for performing the disclosed operations of LGE. The combined teachings of LGE and Bachl disclose independent claims 10 and 14, from which claims 12 and 16 depend, respectively.

[12] “The non-transitory computer readable medium encoded with a computer program of claim 10, comprising: for a case where a [CQI] is also to be sent, the [CQI] is not sent and the another resource is unused.”

See Ground-4B, [10A]-[10E] and Ground-2A, [3]. Decl.¶301.

[16] “The apparatus of claim 14, where the at least one memory including the computer program code is configured with the at least one processor to cause the apparatus, for a case where a [CQI] is also to be sent, to drop the [CQI] such that it is not sent and the another resource is unused.

See Ground-4B, [14A]-[14G] and Ground-2A, [3]. Decl.¶313.

Accordingly, the combined teachings of LGE and Bachl render dependent claims 12 and 16 obvious.

H. Ground-5B: KwakPat883 in view of LGE and Bachl renders obvious claims 12 and 16

As set forth in Ground-4A, a POSITA would have been led to combine KwakPat883 and Bachl for implementation details of a UE for performing the disclosed operations of KwakPat883. The combined teachings of KwakPat883 and Bachl disclose independent claims 10 and 14, from which claims 12 and 16 depends, respectively.

As set forth in Ground-2B, a POSITA would have been led to combine KwakPat883 and LGE for solutions of transmitting the SR for a case where a CQI is also to be sent. The combined teachings of KwakPat883 and LGE disclose the body of dependent claims 12 and 16.

The POSITA referring to Bachl when reviewing KwakPat883 would have been led to combine KwakPat883, LGE and Bachl for at least the same reasons set forth above in Ground-2B for the combination of KwakPat883 and LGE when the POSITA reviewing KwakPat883 and LGE for solutions of transmitting the SR for a case where a CQI is also to be sent. Decl.¶¶331-333. Accordingly, the combined teachings of KwakPat883, LGE and Bachl render dependent claims 12 and 16 obvious. *See* Ground-4A, [10A]-[10E], [14A]-[14G] and Ground-2B, [3].

IV. REDUNDANCY

Grounds-1A, 2B, 3A, 4A, and 5B are not redundant with Grounds-1B, 2A, 3B, 4B and 5A because the two sets of grounds rely on two different primary references, KwakPat883 and LGE, respectively. KwakPat883 and LGE have different prior art dates, require different authentication proofs and disclose different elements of the Challenged Claims in varying degrees of specificity. Accordingly, Petitioner respectfully requests that the Board institute all grounds presented to avoid prejudicing the Petitioner.

V. CONCLUSION

The Challenged Claims are invalid as set forth in Grounds 1A-5B. Petitioner authorizes charge of necessary fees to Deposit Acct. 06-1050.

VI. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

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

Huawei Technologies Co. Ltd., Huawei Device USA, Inc., HiSilicon Technologies Co., Ltd. and Shenzhen Huawei Investment and Holding Co., Ltd. are the real parties-in-interest.

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

The '688 Patent is the subject of Civil Action Number 2:16-cv- 00754-JRG-RSP.

C. Lead And Back-Up Counsel And Service Information

Petitioner designates W. Karl Renner, Reg. No. 41,265, as Lead Counsel and Roberto J. Devoto, Reg. No. 55,108 and Thomas H. Reger II, Reg. No. 47,892, as Backup Counsel, all available at 3200 RBC Plaza, 60 South Sixth Street, Minneapolis, MN 55402 (T: 202-783-5070; F: 877- 769-7945), or electronically by e-mail at IPR35548-0041IP1@fr.com (referencing No. 35548-0041IP1 and cc'ing PTABInbound@fr.com).

Respectfully submitted,

Dated: 6-12-17

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Attorneys for Petitioner

CERTIFICATION UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13999, which is less than the 14000 allowed under 37 CFR § 42.24(a)(i).

Respectfully submitted,

Date: 6-12-17

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CERTIFICATE OF SERVICE

P Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on June 12, 2017, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

HARRINGTON & SMITH
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Service was also made to the litigation counsel of the Patent Owner by serving the correspondence email address of record as follows:

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