

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

HTC CORPORATION and HTC AMERICA, Inc.,

Petitioner,

v.

CELLULAR COMMUNICATIONS EQUIPMENT LLC,

Patent Owner.

Patent No. 8,867,472 B2
Issue Date: October 21, 2014
Title: Signalling of Channel Information

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT 8,867,472 B2
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R §§ 42.100**

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TABLE OF EXHIBITS

Exhibit	Description
Ex. 1001	U.S. Patent No. 8,867,472 B2 (“the ’472 patent”)
Ex. 1002	U.S. Patent No. 8,867,472 File History
Ex. 1003	Declaration of Tim Williams (“Williams Decl.”)
Ex. 1004	U.S. Patent No. 8,625,513 B2 (“Seo”)
Ex. 1005	International Application No. PCT/KR2009/007858 (“the Seo PCT”)
Ex. 1006	U.S. Provisional Application No. 61/141,211 (“the Seo Provisional”)
Ex. 1007	Certified translation of the Seo Provisional

I. INTRODUCTION

Petitioner respectfully requests *inter partes* review of claims 1, 10, 11, 14, 28, and 41 of U.S. Patent No. 8,867,472 (Ex. 1001) in accordance with 35 U.S.C. §§ 311-19 and 37 C.F.R. § 42.100 *et seq.*

II. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8(b)

A. Real Parties-in-Interest

HTC Corporation and HTC America, Inc., (collectively “Petitioner”) are the real parties-in-interest.

B. Related Matters

The following would affect, or be affected by, a decision in this proceeding:

District Court Litigations	<i>Cellular Commc’ns Equipment LLC v. AT&T Inc. et al.</i>		2:15-cv-00576 (E.D. Tex.)
	<i>Cellular Commc’ns Equipment LLC v. Sprint Corp. et al.</i>		2:15-cv-00579 (E.D. Tex.)
	<i>Cellular Commc’ns Equipment LLC v. T-Mobile USA, Inc. et al.</i>		2:15-cv-00580 (E.D. Tex.)
	<i>Cellular Commc’ns Equipment LLC v. Verizon Commc’ns, Inc. et al.</i>		2:15-cv-00581 (E.D. Tex.)
Related Patents, Applications	U.S. 9,019,932 (B2)	CN102907029 (B)	KR101454737 (B1)
	U.S. 9,078,262 (B2)	EP2550762 (A1)	TW201203920 (A)
	U.S. 14/691,515	JP2013524561 (A)	

Comm. Inc., et al. Case No. 2:15-cv-00581.

C. Lead and Backup Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel:

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D. Service Information

Counsel for Petitioner consent to service by electronic mail and delivery to the postal mailing address of lead counsel designated above.

III. PAYMENT OF FEES

The undersigned authorizes the Office to charge Deposit Account No. 033975 for the fee set forth 37 C.F.R. § 42.15(a), and for any other applicable or additional fees for or in connection with this Petition or the *inter partes* review proceeding.

IV. GROUNDS FOR STANDING (37 C.F.R. § 42.104(a))

Petitioner certifies that the '472 patent is available for *inter partes* review, and that Petitioner is not barred or estopped from requesting *inter partes* review challenging the claims of the '472 patent on the identified grounds.

V. IDENTIFICATION OF CHALLENGE (37 C.F.R. §§ 42.22, 42.104(b))

The '472 patent matured from U.S. patent application no. 13/637,222, filed, November 14, 2012, and claims priority to International Application No. PCT/EP2010/053919, filed March 25, 2010. Petitioner does not concede that the claims of the '472 patent are entitled to benefit from this PCT filing date.

A. Patents or Printed Publications Relied Upon

Petitioner relies on the following patents or printed publications:

Ex. 1004: U.S. Patent No. 8,625,513 B2 ("Seo") is based on US Application No. 13/142,539 (filed June 28, 2011), a national stage commencement under 35 U.S.C. § 371 of International Application No. PCT/KR2009/007858 ("the Seo PCT," Ex. 1005), filed December 29, 2009, which claims domestic priority to U.S. Provisional Application No. 61/141,211 ("the Seo Provisional," Ex. 1006; certified translation at Ex. 1007), filed December 29, 2008. Seo is prior art under pre-AIA 35 U.S.C. § 102(e) based on the filing dates of either the Seo PCT or the Seo Provisional. Each feature in Seo relied upon is fully supported by the Seo PCT and the Seo Provisional. Further, the Seo Provisional provides adequate written description support for at least one claim of Seo. (*See* Ex. 1003 ["Williams Decl."])

¶¶ 58-63 and the accompanying claim chart.) *See Dynamic Drinkware LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015). Citations to the Seo PCT and the certified translation of the Seo Provisional follow each citation to Seo.

Seo was neither before the examiner during prosecution. Seo is also not cumulative of any prior art considered by the examiner.

B. Statutory Grounds on Which the Challenge is Based

Claims 1, 10, 11, 14, 28, and 41 of the '472 patent are unpatentable on the following grounds under 35 U.S.C.:

#	Claims	§	Prior Art
A	1, 10, 11, 14, 28, 41	103	Seo

The proposed grounds are not redundant because only one ground of rejection is proposed.

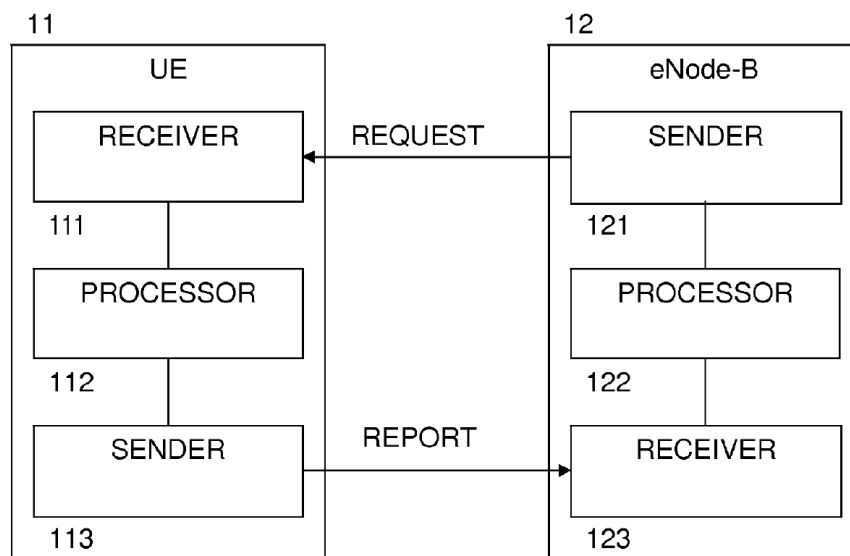
VI. OVERVIEW OF THE '472 PATENT (EX. 1001)

A. Summary of the Alleged Invention

The '472 patent titled “Signalling of Channel Information,” describes providing aperiodic channel information for a downlink component carrier. (Ex. 1001, Abstract.) In telecommunications systems such as LTE-Advanced, carrier aggregation is used to provide large transmission bandwidths to a single user. (*Id.*, 1:51-53, 1:65-2:1.) In carrier aggregation, the total system bandwidth

contains a set of N component carriers, each providing bandwidth $BW_1, BW_2, \dots BW_N$. (*Id.*, 1:54-61.) For example, carrier aggregation may use up to 5 component carriers of 20 MHz each to form bandwidths of up to 100 MHz. (*Id.*, 1:62-65.)

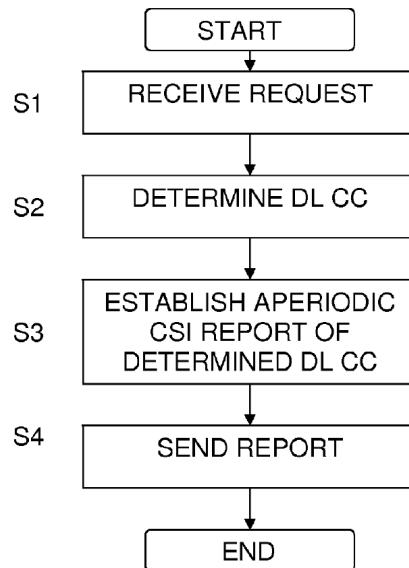
To use the carrier-aggregated bandwidth efficiently, the user equipment (UE) must report frequency selective channel state information (CSI) feedback, including channel quality indicators (CQI), to the eNode-B LTE base station. (*Id.*, 2:1-9, 3:4-9.) The '472 patent does not allege to have invented such CSI reports. Instead, the '472 patent admits, 3GPP RAN WG#1 specifies that in LTE Rel-8 and Rel-9, the eNodeB can trigger the UE to send it an aperiodic CSI report on PUSCH. (*Id.*, 3:4-9.) The eNodeB triggers the aperiodic CSI request with one specific bit in an uplink ("UL") grant to the UE (using DCI format 0, as specified in 3GPP TS 36.212 V9.0.0 (December 2009)). (*Id.*, 3:10-12; *see also id.*, References Cited: Other Publications.)



(’472 Patent, Fig. 1)

The ’472 patent, however, sees these prior art aperiodic CSI reports as problematic because the UE can use up to 64 bits in a UL transmission to report the CSI for a particular downlink component carrier (“DL CC”). When reporting on multiple DL CCs as in carrier aggregation, this would lead to large CSI reports. (*Id.*, 2:17-21, 3:20-29.) For example, in the 5-component carrier aggregation system discussed above, the reports would consume $5 \times 64 \text{ bits} = 320 \text{ bits}$. (*Id.*, 3:20-24.) This high signalling overhead limits UL capacity. (*Id.*, 3:24-26.) Also, it is not possible to guarantee UL coverage for such large payloads. (*Id.*, 3:26-28.) Thus, the object of the ’472 patent is to reduce the size of the prior art aperiodic CSI reports, to reduce the UL signalling burden. (*Id.*, 2:20-27, 3:28-29.)

To achieve this object, the eNodeB requests a detailed, aperiodic channel information (e.g., CSI) report for only a specific downlink component carrier (DL CC), and only a coarse wideband CSI for the other DL CCs. (*Id.*, 3:35-40.) The ’472 patent proceeds to describe six alternative embodiments, the common denominator among them being that “they provide a way to indicate for which DL CC the detailed frequency selective CSI report is derived.” (*Id.*, 4:62-65, Fig. 2A (step S2).)



(’472 Patent, Fig. 2A)

The first alternative embodiment of the ’472 patent, (*Id.*, 5:22-33), is important because it is encompassed by the claims challenged here. In the first embodiment, “the detailed frequency selective aperiodic CSI report is derived from the DL CC that carried the UL grant with the aperiodic CSI trigger.” (*Id.*, 5:22-24.) “That is, when the UE 11 receives UL grant on which the trigger (request for providing aperiodic channel information) on a particular component carrier, it knows that it has to detect the channel state or quality information on this particular component carrier.” (*Id.*, 5:25-29.) “Thus, the indication which particular component carrier is selected is provided by sending the request, in this case the UL grant including the request, on this particular component carrier.” (*Id.*, 5:30-33.)

“Additionally wideband reports for other DL CC in the DL CC monitoring set can be reported simultaneously.” (*Id.*, 4:65-67; *see also id.*, 3:35-40, 6:7-8, 7:50-51, 8:51-52, 9:47-48, 10:51-52.)

B. Original Prosecution of the ’472 Patent

During prosecution of the application leading to the ’472 patent, the examiner rejected the independent claims at issue here as anticipated by U.S. Patent Application Publication No. 2012/0269153 to Seo *et al.* (not related by subject matter to any reference applied in this Petition). (Ex. 1002 at 166-69 (Non-Final Office Action mailed June 5, 2014).) In response, to distinguish the prior art, the Applicant amended these independent claims to recite that determining the selected downlink component carrier is “based on which component carrier of the plurality of component carriers carried the request for providing the aperiodic channel information.” (*Id.* at 132-36 (Amendment dated August 29, 2014).) The examiner cited solely this amendment as the reason for allowing the application. (*Id.* at 24 (Examiner’s statement of reasons for allowance).)

VII. CLAIM CONSTRUCTION

Claims of an unexpired patent, like the ’472 patent, are given their “broadest reasonable construction in light of the specification.” 37 C.F.R. § 42.100(b). Under this standard, claim terms undefined in the specification are given a broad interpretation. *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir.

2007). Pursuant to 37 C.F.R. § 42.104(b)(3), Petitioners propose constructions for three sets of claim terms. Other terms have a construction that is apparent.

First, independent claim 1 contains a typographical error in the phrase, “determine the selected downlink component *earner* based on which component carrier of the plurality of component carriers carried the request for providing the aperiodic channel information.” (Ex. 1001, 13:8-11 (emphasis added).) The phrase “downlink component *earner*” should be read as “downlink component carrier.” (See, e.g., *id.*, 13:3-6 (claim 1), 2:28-42, 3:47-56, 4:7-12, 34-45, 5:1-7.)

Second, independent claims 1 and 28 recite both “aperiodic channel information” and “channel information,” separate and apart from each other. Dependent claims 10 and 11 recite only “the channel information,” whereas claims 14 and 41 recite only “the aperiodic channel information.” The patentee’s deliberate use of these differing terms means they are presumed to have different meanings. *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1382 (Fed. Cir. 2008) (citing *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1333 n.3 (Fed. Cir. 2006)); see also *PPC Broadband, Inc. v. Corning Optical Comm’ns. RF, LLC*, 815 F.3d 747, 752 (Fed. Cir. 2016) (“There is a canon of construction: the general assumption is that different terms have different meanings.”). Specifically, the claimed “aperiodic channel information” is a subset of the claimed “channel information.” Under the broadest reasonable

interpretation, the claimed “channel information” broadly includes channel state information (CSI) feedback, including “channel quality indicators (CQI), Precoding Matrix Indicators (PMI), Rank Indicators (RI) and/or channel frequency or impulse response and/or channel covariance matrix.” (Ex. 1001, 2:4-8.)

This “channel information” can be either “periodic” or “aperiodic.” (*Id.*, 3:7-9.) “Aperiodic channel information” is the channel information that the UE sends when it is triggered to do so by an eNodeB request:

It has been specified in the 3GPP RAN WG#1 that in LTE Rel-8 and Rel-9, the eNodeB can in any subframe (excluding the ones when the UE is configured to DRX/DTX) force the UE to send an aperiodic CSI report on PUSCH. *That is, in contrast to a periodic CSI report, an aperiodic CSI report is sent by the UE when it is triggered to do so.*

(*Id.*, 3:4-9 (emphasis added).)

In particular, the UE comprises a receiver (receiving means) 111 which is configured to receive a request (e.g., an aperiodic CQI or CSI trigger as described in the following) for providing aperiodic channel information with respect to a selected downlink component carrier of a plurality of component carriers.

(*Id.*, 3:47-52.) In the alternative, “channel information” here may be construed, in a narrower fashion, as coextensive with “aperiodic channel information.” Even under this narrower alternative construction, the challenged claims are unpatentable under both grounds presented in this Petition.

And third, claim 10 recites that “the processor is configured to provide channel information for at least one of the other component carriers of the plurality of component carriers other than the selected downlink component carrier, and the sender is configured to send the channel information for the at least one of the other component carriers.” Claim 11, which depends from claim 10, recites that “the channel information for the at least one of the other component carriers is a wideband channel information.” Thus, the phrase recited in claim 10, “channel information for at least one of the other component carriers of the plurality of component carriers other than the selected downlink component carrier,” includes at least “wideband channel information,” as recited in claim 11.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art is evidenced by the prior art. *See In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). An ordinary artisan at the time the '472 patent was filed, the prior art discussed and Dr. Williams's declaration demonstrate, would have been aware of carrier aggregation and signaling in wireless networks. An example of such an ordinary artisan is one having a

Bachelor of Science or Bachelor of Engineering degree in Electrical Engineering or Computer Engineering from an institution accredited by the Accreditation Board for Engineering and Technology (ABET) or an equivalent accrediting organization and five years of work experience in wireless systems, data networking, or signal processing. Another example is one having a Master of Science or Master of Engineering degree in Electrical or Computer Engineering from an equivalently accredited institution and two years of similar work experience. (*See Williams Decl. ¶¶ 40-43.*)

IX. SPECIFIC GROUNDS OF CHALLENGE

Although the '472 patent alleges to have invented a method of aperiodic channel quality indication for carrier aggregated networks, such techniques were known prior to filing of the application which issued as the '472 patent. As demonstrated below, the prior art references render claims 1, 10, 11, 14, 28, and 41 of the '472 patent unpatentable.

This Petition is supported by the Declaration testimony of Professor Tim Williams (Ex. 1003), which describes the scope and content of the prior art at the time of the alleged invention of the '472 patent.

A. Claims 1, 10, 11, 14, 28, and 41 are Rendered Obvious by Seo (Ex. 1004) under 35 U.S.C. § 103

1. Overview

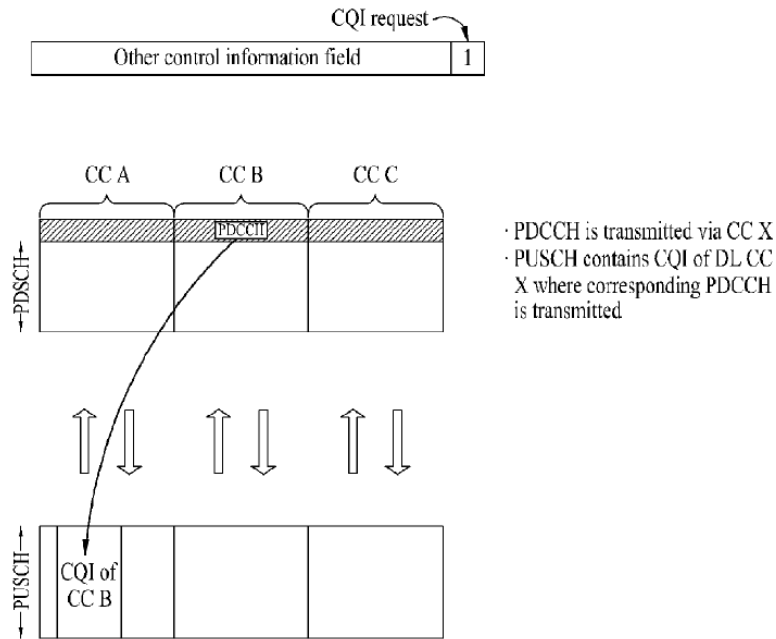
Seo is related to “a method for transmitting control information to request a Channel Quality Indicator (CQI) in a wireless communication system supporting a plurality of transmission bandwidths.” (Ex. 1004, 1:21-23; *see also* Ex. 1005 at Abstract and ¶1; Ex. 1007, at p. 2, paragraphs 1-2.) Like the ’472 patent, Seo explains that “[f]or efficient communication, it is necessary to feed back channel information.” (Ex. 1004, 4:28-29; *see also* Ex. 1005 ¶¶ 35; Ex. 1007, at p. 2, paragraph 5.) “In general, information about a downlink channel is transmitted on an uplink and information about an uplink channel is transmitted on a downlink. This channel information is called a CQI.” (Ex. 1004, 4:29-32; *see also* Ex. 1005 ¶¶ 35; Ex. 1007, at p. 2, paragraph 5.) And like the ’472 patent, Seo recognizes the problem that “[h]ow to report the above-described CQI in the multi-carrier system becomes an issue to be solved.” (Ex. 1004, 5:36-37; *see also* Ex. 1005 ¶¶ 46; Ex. 1007, at p. 5, paragraph 7.) In particular, Seo discloses that “[a]s a plurality of CCs is configured for each of the downlink and uplink and thus the plurality of downlink CCs are available for simultaneous transmission and reception as illustrated in FIG. 7, there is a need for newly defining the configuration and meaning of a CQI request used for non-periodic CQI reporting, included in an uplink grant.” (Ex. 1004, 14:22-27; *see also* Ex. 1005 ¶¶ 162; Ex. 1007, at p. 3,

paragraph 3, p. 5, paragraph 6-7, and p. 10, paragraph 2.) “Transmission of a CQI for each downlink CC whenever a CQI request is included in an uplink grant increases overhead.” (Ex. 1004, 14:28-29; *see also* Ex. 1005 ¶¶ 162; Ex. 1007, at p. 3, paragraph 3 and p. 5, paragraph 6-7.) Thus, Seo identifies a similar problem as the ’472 patent.

Seo adopts a similar solution to this problem as the ’472 patent. “Therefore, it is proposed that a CQI request is configured to request reporting of a CQI for one CC in the present invention.” (Ex. 1004, 14:30-32; *see also* Ex. 1005 ¶¶ 162; Ex. 1007, at p. 11, paragraphs 2-3.) In an embodiment labelled “Embodiment 2,” Seo discusses that “a downlink CC requiring CQI reporting is implicitly indicated in a PDCCH carrying a CQI request.” (Ex. 1004, 15:9-10; *see also* Ex. 1005 ¶¶ 171; Ex. 1007, at p. 11, paragraphs 2-3.) “Only a 1-bit CQI request per CC is used and a CQI is supposed to be reported for a downlink CC in which a PDCCH carrying an uplink grant is transmitted.” (Ex. 1004, 15:11-13; *see also* Ex. 1005 ¶¶ 172; Ex. 1007, at p. 11, paragraphs 2-3.)

“FIG. 9 illustrates the structure of control information fields including a CQI request field.” (Ex. 1004, 15:14-15; *see also* Ex. 1005 ¶¶ 173; Ex. 1007, at p. 11, paragraphs 2-3.) “[T]he control information fields includes a 1-bit CQI request field. If the CQI request field is set to 1, this implies that a CQI report is

requested.” (Ex. 1004, 15:18-19; *see also* Ex. 1005 ¶¶ 173; Ex. 1007, at p. 11, paragraphs 2-3.)



(Seo, FIG. 9)

“Thus, upon receipt of the control information, the UE transmits a CQI for a downlink CC, CC B in which it has received a PDCCH carrying the uplink grant in an uplink CC scheduled by the uplink grant . . . [T]o request CQI reporting for a specific downlink CC, a PDCCH including an uplink grant should be transmitted in the specific downlink CC.” (Ex. 1004, 15:19-28; *see also* Ex. 1005 ¶¶ 173; Ex. 1007, at p. 11, paragraphs 2-3.)

Further, Seo discusses a number of modes of transmission of CQI after receiving such a non-periodic CQI transmission request. (Ex. 1004, 11:19-12:35;

see also Ex. 1005 ¶¶ 113-41; Ex. 1007, at p. 6, paragraph 6-p. 8, paragraph 7.)

Seo's Table 2 summarizes these transmission modes.

		PMI Feedback Type		
		No PMI	Single PMI	Multiple PMI
PUSCH CQI feedback type	Wideband (wideband CQI)			Mode 1-2
	UE Selected (subband CQI)	Mode 2-0		Mode 2-2
	Higher Layer-configured (subband CQI)	Mode 3-0	Mode 3-1	

(Ex. 1004, 11:29-40; *see also* Ex. 1005 Table 2; Ex. 1007, at chart 2.) Regardless of transmission mode, Seo also generates and transmits “a wideband CQI for a total system frequency band or a frequency band set by [a] higher layer.” (Ex. 1004, 11:19-12:35; *see also* Ex. 1005 ¶¶ 113-41; Ex. 1007, at p. 6, paragraph 6-p. 8, paragraph 7 and p. 11, paragraphs 2-10.)

Although Seo's disclosure is written with the terms “exemplary embodiments,” “an exemplary embodiment,” and “in accordance with another exemplary embodiment,” Seo discloses that an ordinarily skilled person would understand and be able to select and combine features from different disclosed embodiments:

Exemplary embodiments described above are combinations of elements and features of the present invention. The elements or features may be considered

selective unless otherwise mentioned. Each element or feature may be practiced without being combined with other elements or features. Further, an embodiment of the present invention may be constructed by combining parts of the elements and/or features. Operation orders described in embodiments of the present invention may be rearranged. Some constructions of any one embodiment may be included in another embodiment and may be replaced with corresponding constructions of another embodiment.

(Ex. 1004, 17:16-27 (emphasis added); *see also* Ex. 1005 ¶¶ 194; Ex. 1007, at p. 11, paragraph 4..) Therefore, to the extent that Seo does not explicitly disclose certain features of aperiodic channel quality indication for carrier aggregated networks together in a single embodiment (as may be required to find anticipation), it would have been obvious to one of ordinary skill in the art to combine or substitute those known features and techniques with one another, according to their known methods and functions, to yield the predictable result of establishing and sending channel information with respect to the determined selected downlink component carrier. (Williams Decl. ¶ 54-57 and 69.) The addition of the various disclosed techniques and options, often presented as examples and alternatives in the system for aperiodic channel quality indication, would have taken no more than ordinary skill to implement. (*Id.* ¶ 54-57 and 69.) *See Boston Scientific Scimed,*

Inc. v. Cordis Corp., 554 F.3d 982, 991 (Fed. Cir. 2009) (“Combining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness”); *Global Tel*Link Corp. v. Securus Techs., Inc.*, IPR2014-00824, Paper 36 at 39 (Dec. 2, 2015).

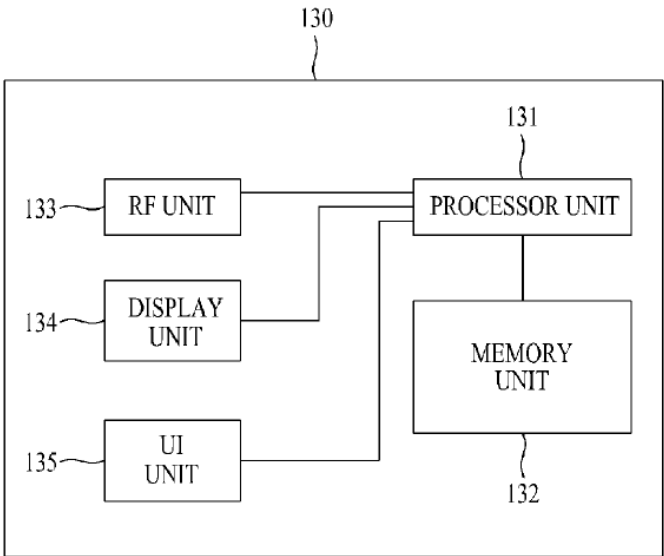
As further demonstrated in the claim charts that follow, Seo discloses each of the limitations of claims 1, 10, 11, 14, 28, and 41 of the ’472 patent.

2. Claim Charts

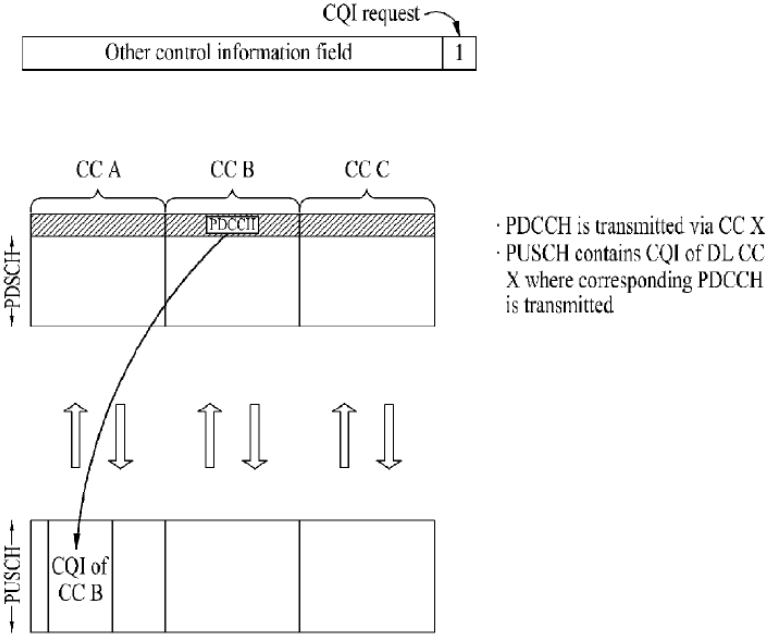
Claim 1	Seo (Ex. 1004)
[1pre] An apparatus comprising:	<p>Seo discloses a user equipment (UE).</p> <div data-bbox="727 892 1292 1367" data-label="Diagram"> <pre> graph LR 130[130] --- 133[133 RF UNIT] 130 --- 134[134 DISPLAY UNIT] 130 --- 135[135 UI UNIT] 130 --- 131[131 PROCESSOR UNIT] 130 --- 132[132 MEMORY UNIT] 133 --- 131 134 --- 131 135 --- 131 131 --- 132 </pre> <p>The diagram shows a rectangular box representing the apparatus 130. Inside the box, there are five rectangular blocks. On the left side, there are three blocks stacked vertically: '133 RF UNIT', '134 DISPLAY UNIT', and '135 UI UNIT'. On the right side, there are two blocks stacked vertically: '131 PROCESSOR UNIT' and '132 MEMORY UNIT'. Lines connect each of the three blocks on the left (133, 134, 135) to the '131 PROCESSOR UNIT' block. A line also connects the '131 PROCESSOR UNIT' block to the '132 MEMORY UNIT' block. A bracket on the left side of the box groups the three left-side blocks, and a bracket on the right side groups the two right-side blocks. The number '130' is written above the box with a bracket pointing to the entire assembly.</p> </div> <p>(Seo, Fig. 13)</p> <ul style="list-style-type: none"> ▪ “Referring to FIG. 13, <i>an apparatus 130</i> includes a processor unit 131, a memory unit 132, a Radio Frequency (RF) unit 133, a display unit 134, and a User Interface (UI) unit 135. The processor unit 131 takes charge of physical interface protocol layers and provides a control plane and a user plane. The processor unit 131 may also perform the functionalities of each layer. The memory unit 132 is electrically connected to the processor

Claim 1	Seo (Ex. 1004)
	<p>unit 131 and stores an operating system, application programs, and general files. <i>If the apparatus 130 is a UE</i>, the display unit 134 may display a variety of information and may be implemented with a known Liquid Crystal Display (LCD), an Organic Light Emitting Diode (OLED), or the like. The UI unit 135 may be configured in combination with a known UI like a keypad, a touch screen, etc. The RF unit 133 is electrically connected to the processor unit 131, for transmitting and receiving RF signals.” (Ex. 1004, 17:1-15 (emphasis added).)</p> <p>▪ <i>See also</i> Ex. 1005 ¶¶ 193; Ex. 1007, at p. 2, paragraphs 1-2 and 5.</p>
<p>[1a] a receiver configured to receive a request for providing aperiodic channel information with respect to a selected downlink component carrier of a plurality of component carriers;</p>	<p>Seo discloses a receiver configured to receive a request for providing aperiodic channel information with respect to a selected downlink component carrier of a plurality of component carriers.</p> <div data-bbox="722 1050 1291 1522" data-label="Diagram"> <pre> graph LR subgraph 130 [Apparatus 130] 133[RF UNIT] --- 131[PROCESSOR UNIT] 134[DISPLAY UNIT] --- 131 135[UI UNIT] --- 131 131 --- 132[MEMORY UNIT] end </pre> <p>The diagram shows a block labeled 130 representing an apparatus. Inside this block, there are five sub-units: an RF UNIT (labeled 133), a DISPLAY UNIT (labeled 134), a UI UNIT (labeled 135), a PROCESSOR UNIT (labeled 131), and a MEMORY UNIT (labeled 132). The RF UNIT, DISPLAY UNIT, and UI UNIT are arranged vertically on the left side of the block. The PROCESSOR UNIT is located in the upper right, and the MEMORY UNIT is located below it. Lines connect the RF UNIT, DISPLAY UNIT, and UI UNIT to the PROCESSOR UNIT. A line also connects the PROCESSOR UNIT to the MEMORY UNIT.</p> </div> <p>(Seo, Fig. 13)</p> <p>▪ “Referring to FIG. 13, an apparatus 130 includes a processor unit 131, a memory unit 132, a <i>Radio Frequency (RF) unit 133</i>, a display unit 134, and a User Interface (UI) unit 135. The processor unit 131 takes charge of physical interface protocol layers and provides a control plane and a user plane.</p>

Claim 1	Seo (Ex. 1004)
	<p>The processor unit 131 may also perform the functionalities of each layer. The memory unit 132 is electrically connected to the processor unit 131 and stores an operating system, application programs, and general files. <i>If the apparatus 130 is a UE</i>, the display unit 134 may display a variety of information and may be implemented with a known Liquid Crystal Display (LCD), an Organic Light Emitting Diode (OLED), or the like. The UI unit 135 may be configured in combination with a known UI like a keypad, a touch screen, etc. <i>The RF unit 133 is electrically connected to the processor unit 131, for transmitting and receiving RF signals.</i>” (Ex. 1004, 17:1-15 (emphasis added).)</p> <p>▪ “As a plurality of CCs is configured for each of the downlink and uplink and thus the plurality of downlink CCs are available for simultaneous transmission and reception as illustrated in FIG. 7, there is a need for newly defining the configuration and meaning of a CQI request used for non-periodic CQI reporting, included in an uplink grant. Transmission of a CQI for each downlink CC whenever a CQI request is included in an uplink grant increases overhead. <i>Therefore, it is proposed that a CQI request is configured to request reporting of a CQI for one CC in the present invention.</i>” (Ex. 1004, 14:22-32 (emphasis added).)</p> <p>▪ “Embodiment 2</p> <p><i>In accordance with another exemplary embodiment of the present invention, a downlink CC requiring CQI reporting is implicitly indicated in a PDCCH carrying a CQI request.</i></p> <p>Only a 1-bit CQI request per CC is used and a CQI is supposed to be reported for a downlink CC in which a PDCCH carrying an uplink grant is transmitted.</p>

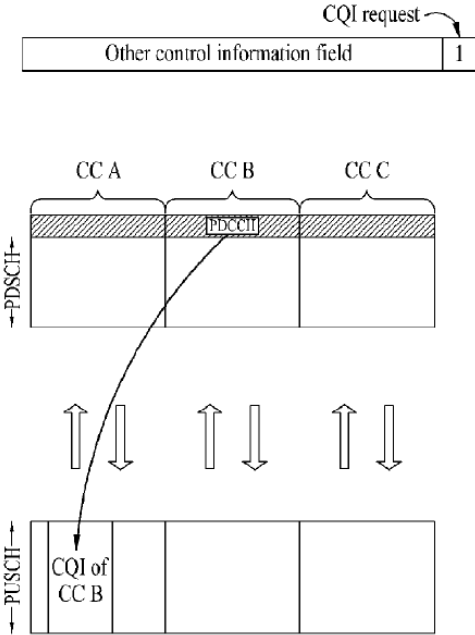
Claim 1	Seo (Ex. 1004)
	<p>FIG. 9 illustrates the structure of <i>control information fields including a CQI request field</i> and a CQI transmission method according to another exemplary embodiment of the present invention. Referring to FIG. 9, the control information fields includes a 1-bit CQI request field. If the CQI request field is set to 1, this implies that a CQI report is requested. <i>Thus, upon receipt of the control information, the UE transmits a CQI for a downlink CC, CC B in which it has received a PDCCH carrying the uplink grant in an uplink CC scheduled by the uplink grant.</i> This exemplary embodiment offers the benefits of still using a conventional signal format and reducing signaling overhead relative to Embodiment 1. However, to request CQI reporting for a specific downlink CC, a PDCCH including an uplink grant should be transmitted in the specific downlink CC. (Ex. 1004, 15:6-28 (emphasis added).)</p> <p>▪ See also Ex. 1005 ¶¶ 162, 170-74, 193, and Fig. 13; Ex. 1007, at p. 2, paragraphs 1-2 and 5 and p. 11, paragraphs 2-4.</p>
[1b] a processor configured to:	<p>Seo discloses a processor.</p>  <pre> graph LR 130 --- 131 133 --- 131 134 --- 131 135 --- 131 131 --- 132 </pre>

Claim 1	Seo (Ex. 1004)
	<p data-bbox="906 258 1112 294">(Seo, Fig. 13)</p> <ul style="list-style-type: none"> <li data-bbox="641 359 1437 1203">▪ “Referring to FIG. 13, an apparatus 130 includes <i>a processor unit 131</i>, a memory unit 132, a Radio Frequency (RF) unit 133, a display unit 134, and a User Interface (UI) unit 135. <i>The processor unit 131 takes charge of physical interface protocol layers and provides a control plane and a user plane. The processor unit 131 may also perform the functionalities of each layer.</i> The memory unit 132 is electrically connected to the processor unit 131 and stores an operating system, application programs, and general files. <i>If the apparatus 130 is a UE</i>, the display unit 134 may display a variety of information and may be implemented with a known Liquid Crystal Display (LCD), an Organic Light Emitting Diode (OLED), or the like. The UI unit 135 may be configured in combination with a known UI like a keypad, a touch screen, etc. The RF unit 133 is electrically connected to the processor unit 131, for transmitting and receiving RF signals.” (Ex. 1004, 17:1-15 (emphasis added).) <li data-bbox="641 1268 1437 1350">▪ <i>See also</i> Ex. 1005 ¶¶ 193 and Fig. 13; Ex. 1007, at p. 10, paragraph 2.
<p data-bbox="186 1371 565 1785">[1c] determine the selected downlink component earner based on which component carrier of the plurality of component carriers carried the request for providing the aperiodic channel information; and</p>	<p data-bbox="584 1371 1437 1581">Seo discloses that the processor is configured to determine the selected downlink component earner based on which component carrier of the plurality of component carriers carried the request for providing the aperiodic channel information.</p>

Claim 1	Seo (Ex. 1004)
	 <p style="text-align: center;">(Seo, Fig. 9)</p> <ul style="list-style-type: none"> ▪ “Embodiment 2 <i>In accordance with another exemplary embodiment of the present invention, a downlink CC requiring CQI reporting is implicitly indicated in a PDCCH carrying a CQI request.</i> <i>Only a 1-bit CQI request per CC is used and a CQI is supposed to be reported for a downlink CC in which a PDCCH carrying an uplink grant is transmitted.</i> ▪ FIG. 9 illustrates the structure of control information fields including a CQI request field and a CQI transmission method according to another exemplary embodiment of the present invention. Referring to FIG. 9, the control information fields includes a 1-bit CQI request field. If the CQI request field is set to 1, this implies that a CQI report is requested. Thus, upon receipt of the control information, <i>the UE transmits a CQI for a downlink CC, CC B in which it has received a PDCCH carrying the uplink grant in an uplink CC scheduled by the uplink grant.</i> This exemplary embodiment

Claim 1	Seo (Ex. 1004)
	<p>offers the benefits of still using a conventional signal format and reducing signaling overhead relative to Embodiment 1. However, <i>to request CQI reporting for a specific downlink CC, a PDCCH including an uplink grant should be transmitted in the specific downlink CC.</i> (Ex. 1004, 15:6-28 (emphasis added).)</p> <ul style="list-style-type: none"> ▪ See also Ex. 1005 ¶¶ 170-74 and Fig. 9; Ex. 1007, at p. 11, paragraphs 2-10.
<p>[1d] establish channel information with respect to the selected downlink component carrier; and</p>	<p>Seo discloses that the processor is configured to establish channel information with respect to the selected downlink component carrier.</p> <div data-bbox="721 898 1292 1451" data-label="Diagram"> <pre> graph TD BS[BS] -- "Downlink Measurement" --> UE[UE] UE -- "CQI reporting" --> BS </pre> </div> <p>(Seo, Fig. 3)</p> <ul style="list-style-type: none"> ▪ “FIG. 3 illustrates the concept of <i>CQI generation</i> and <i>CQI reporting</i>. A <i>User Equipment (UE)</i> measures a <i>downlink channel quality</i> and reports a <i>CQI value</i> selected based on the <i>downlink channel quality measurement</i> to a <i>Base Station (BS)</i> on an uplink control channel. The BS performs downlink scheduling based on CQI reports received from UEs.

Claim 1	Seo (Ex. 1004)
	<p>The downlink scheduling involves selecting a UE and allocating resources to the selected UE. A <i>CQI value may be any of SINR, Carrier to Interference and Noise Ratio (CINR), Bit Error Rate (BER), and Frame Error rate (FER). Alternatively, the CQI value may be a transmittable value as which one of the SINR, CINR, BER and FER is expressed.</i> In the MIMO system, Rank Indicator (RI), Precoding Matrix Index (PMI), etc. may be added as channel state information.” (Ex. 1004, 4:54-67 (emphasis added.)</p> <p>▪ “Embodiment 2</p> <p>In accordance with another exemplary embodiment of the present invention, a downlink CC requiring CQI reporting is implicitly indicated in a PDCCH carrying a CQI request.</p> <p>Only a 1-bit CQI request per CC is used and a CQI is supposed to be reported for a downlink CC in which a PDCCH carrying an uplink grant is transmitted.</p> <p>FIG. 9 illustrates the structure of control information fields including a CQI request field and a CQI transmission method according to another exemplary embodiment of the present invention. Referring to FIG. 9, the control information fields includes a 1-bit CQI request field. If the CQI request field is set to 1, this implies that a CQI report is requested. <i>Thus, upon receipt of the control information, the UE transmits a CQI for a downlink CC, CC B in which it has received a PDCCH carrying the uplink grant in an uplink CC scheduled by the uplink grant.</i> This exemplary embodiment offers the benefits of still using a conventional signal format and reducing signaling overhead relative to Embodiment 1. However, to request CQI reporting for a specific downlink CC, a PDCCH</p>

Claim 1	Seo (Ex. 1004)
	<p>including an uplink grant should be transmitted in the specific downlink CC. (Ex. 1004, 15:6-28 (emphasis added).)</p> <p>▪ See also Ex. 1005 ¶¶ 39, 170-74, and Fig. 3; Ex. 1007, at p. 11, paragraphs 2-10.</p>
<p>[1e] a sender configured to send the channel information with respect to the selected downlink component carrier.</p>	<p>Seo discloses a sender configured to send the channel information with respect to the selected downlink component carrier.</p>  <p>(Seo, Fig. 9)</p> <p>▪ “Embodiment 2</p> <p>In accordance with another exemplary embodiment of the present invention, a downlink CC requiring CQI reporting is implicitly indicated in a PDCCH carrying a CQI request.</p> <p>Only a 1-bit CQI request per CC is used and a <i>CQI is supposed to be reported for a downlink CC in which a PDCCH carrying an uplink grant is transmitted.</i></p> <p>▪ FIG. 9 illustrates the structure of control</p>

Claim 1	Seo (Ex. 1004)
	<p>information fields including a CQI request field and a CQI transmission method according to another exemplary embodiment of the present invention. Referring to FIG. 9, the control information fields includes a 1-bit CQI request field. If the CQI request field is set to 1, this implies that a CQI report is requested. <i>Thus, upon receipt of the control information, the UE transmits a CQI for a downlink CC, CC B in which it has received a PDCCH carrying the uplink grant in an uplink CC scheduled by the uplink grant.</i> This exemplary embodiment offers the benefits of still using a conventional signal format and reducing signaling overhead relative to Embodiment 1. However, to request CQI reporting for a specific downlink CC, a PDCCH including an uplink grant should be transmitted in the specific downlink CC. (Ex. 1004, 15:6-28 (emphasis added).)</p> <p>▪ See also Ex. 1005 ¶¶ 170-74 and Fig. 9; Ex. 1007, at p. 11, paragraphs 2-10.</p>

Claim 10	Seo (Ex. 1004)
<p>[10a] The apparatus according to claim 1, wherein the processor is configured to provide channel information for at least one of the other component carriers of the plurality of component carriers other than the selected downlink component carrier, and</p>	<p>Seo discloses that the processor is configured to provide channel information for at least one of the other component carriers of the plurality of component carriers other than the selected downlink component carrier.</p> <p>▪ “1) Transmission of CQI/PMI/RI on PUSCH after Receiving CQI Request</p> <p>This kind of CQI transmission takes place when a CQI request is included in an uplink grant for PUSCH scheduling, received on a Physical Downlink Control CHannel (PDCCH). Table 2 below illustrates CQI/PMI/RI transmission modes</p>

Claim 10	Seo (Ex. 1004)																							
	<p>on a PUSCH.</p> <p>TABLE 2</p> <table><tr><th colspan="2"></th><th colspan="3">PMI Feedback Type</th></tr><tr><th colspan="2"></th><th>No PMI</th><th>Single PMI</th><th>Multiple PMI</th></tr><tr><td rowspan="3">PUSCH CQI feedback type</td><td>Wideband (wideband CQI)</td><td></td><td></td><td>Mode 1-2</td></tr><tr><td>UE Selected (subband CQI)</td><td>Mode 2-0</td><td></td><td>Mode 2-2</td></tr><tr><td>Higher Layer-configured (subband CQI)</td><td>Mode 3-0</td><td>Mode 3-1</td><td></td></tr></table> <p>The CQI transmission modes illustrated in Table 2 are selected by the higher layer and a CQI, a PMI and an RI are all transmitted in the same PUSCH subframe.</p> <p>1-1) Mode 1-2</p> <p>On the assumption that data is transmitted only in each subband, a precoding matrix is selected.</p> <p><i>A UE generates a wideband CQI for a total system frequency band or a frequency band set by the higher layer based on the selected precoding matrix.</i></p> <p>The UE transmits the wideband CQI and PMIs for the respective subbands. The bandwidth of each subband may vary with the bandwidth of the system frequency band.</p> <p>1-2) Mode 2-0</p> <p>The UE selects M preferred subbands from the system frequency band or the higher layer-set frequency band.</p> <p>The UE generates one CQI on the assumption that data is transmitted in the selected M subbands.</p> <p><i>In addition, the UE generates one wideband CQI for the system frequency band or the higher layer-set frequency band.</i></p> <p>If a plurality of codewords is transmitted in the M</p>			PMI Feedback Type					No PMI	Single PMI	Multiple PMI	PUSCH CQI feedback type	Wideband (wideband CQI)			Mode 1-2	UE Selected (subband CQI)	Mode 2-0		Mode 2-2	Higher Layer-configured (subband CQI)	Mode 3-0	Mode 3-1	
		PMI Feedback Type																						
		No PMI	Single PMI	Multiple PMI																				
PUSCH CQI feedback type	Wideband (wideband CQI)			Mode 1-2																				
	UE Selected (subband CQI)	Mode 2-0		Mode 2-2																				
	Higher Layer-configured (subband CQI)	Mode 3-0	Mode 3-1																					

Claim 10	Seo (Ex. 1004)
	<p>subbands, a CQI for each codeword is a differential value. The differential CQIs are the differences between indexes of CQI values for the M subbands and an index of the <i>wideband CQI</i>.</p> <p>The UE transmits information about the positions of the M subbands, the single CQI value for the M subbands, and the wideband CQI value for the system frequency band or the higher layer-set frequency band. The bandwidth of each subband and the M value may vary with the bandwidth of the system frequency band.</p> <p>1-3) Mode 2-2</p> <p>On the assumption that data is transmitted in M preferred subbands, the UE simultaneously selects the positions of M subbands and a single precoding matrix for the M subbands.</p> <p>A CQI is generated for each codeword in the M subbands.</p> <p><i>In addition, the UE generates a single wideband CQI for the system frequency band or the higher layer-set frequency band.</i></p> <p>The UE transmits information about the positions of the M subbands, the single CQI value for the M subbands, a single PMI for the M subbands, a wideband PMI, and the wideband CQI value. The bandwidth of each subband and the M value may vary with the bandwidth of the system frequency band.</p> <p>1-4) Mode 3-0</p> <p><i>The UE generates a wideband CQI value.</i></p> <p>On the assumption that data is transmitted in each subband, the UE generates a CQI value for each subband. Even though an RI is larger than 1, a CQI value is only for a first codeword.</p> <p>1-5) Mode 3-1</p> <p>The UE generates a single precoding matrix for the system frequency band or the higher layer-set frequency band.</p>

Claim 10	Seo (Ex. 1004)
	<p>The UE generates a CQI on a codeword basis on the assumption of the single precoding matrix for each subband.</p> <p><i>The UE generates a wideband CQI on the assumption of a precoding matrix.</i></p> <p>A CQI for each subband is a differential CQI value. The differential CQIs are the differences between indexes of CQI values for the respective subbands and an index of the wideband CQI.</p> <p>The bandwidth of each subband may vary with the bandwidth of the system frequency band.” (Ex. 1004, 11:21-12:36 (emphasis added).)</p> <p>▪ <i>See also</i> Ex. 1005 ¶¶ 114-141; Ex. 1007, at p. 6, paragraph 6-p. 8, paragraph 7 and p. 11, paragraphs 4-10.</p>
<p>[10b] the sender is configured to send the channel information for the at least one of the other component carriers.</p>	<p>Seo discloses that the sender is configured to send the channel information for the at least one of the other component carriers.</p> <p>▪ “1) Transmission of CQI/PMI/RI on PUSCH after Receiving CQI Request</p> <p><i>This kind of CQI transmission takes place when a CQI request is included in an uplink grant for PUSCH scheduling, received on a Physical Downlink Control CHannel (PDCCH). Table 2 below illustrates CQI/PMI/RI transmission modes on a PUSCH.</i></p>

Claim 10	Seo (Ex. 1004)																							
	<div>TABLE 2</div> <table><tr><th colspan="2"></th><th colspan="3">PMI Feedback Type</th></tr><tr><th colspan="2"></th><th>No PMI</th><th>Single PMI</th><th>Multiple PMI</th></tr><tr><td rowspan="3">PUSCH CQI feedback type</td><td>Wideband (wideband CQI)</td><td></td><td></td><td>Mode 1-2</td></tr><tr><td>UE Selected (subband CQI)</td><td>Mode 2-0</td><td></td><td>Mode 2-2</td></tr><tr><td>Higher Layer-configured (subband CQI)</td><td>Mode 3-0</td><td>Mode 3-1</td><td></td></tr></table> <p>The CQI transmission modes illustrated in Table 2 are selected by the higher layer and a CQI, a PMI and an RI are all transmitted in the same PUSCH subframe.</p> <p>1-1) Mode 1-2</p> <p>On the assumption that data is transmitted only in each subband, a precoding matrix is selected.</p> <p>A UE generates a wideband CQI for a total system frequency band or a frequency band set by the higher layer based on the selected precoding matrix.</p> <p><i>The UE transmits the wideband CQI and PMIs for the respective subbands. The bandwidth of each subband may vary with the bandwidth of the system frequency band.</i></p> <p>1-2) Mode 2-0</p> <p>The UE selects M preferred subbands from the system frequency band or the higher layer-set frequency band.</p> <p>The UE generates one CQI on the assumption that data is transmitted in the selected M subbands.</p> <p>In addition, the UE generates one wideband CQI for the system frequency band or the higher layer-set frequency band.</p> <p>If a plurality of codewords is transmitted in the M subbands, a CQI for each codeword is a differential value. The differential CQIs are the differences</p>			PMI Feedback Type					No PMI	Single PMI	Multiple PMI	PUSCH CQI feedback type	Wideband (wideband CQI)			Mode 1-2	UE Selected (subband CQI)	Mode 2-0		Mode 2-2	Higher Layer-configured (subband CQI)	Mode 3-0	Mode 3-1	
		PMI Feedback Type																						
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PUSCH CQI feedback type	Wideband (wideband CQI)			Mode 1-2																				
	UE Selected (subband CQI)	Mode 2-0		Mode 2-2																				
	Higher Layer-configured (subband CQI)	Mode 3-0	Mode 3-1																					

Claim 10	Seo (Ex. 1004)
	<p>between indexes of CQI values for the M subbands and an index of the wideband CQI.</p> <p><i>The UE transmits</i> information about the positions of the M subbands, the single CQI value for the M subbands, and <i>the wideband CQI value for the system frequency band or the higher layer-set frequency band</i>. The bandwidth of each subband and the M value may vary with the bandwidth of the system frequency band.</p> <p>1-3) Mode 2-2</p> <p>On the assumption that data is transmitted in M preferred subbands, the UE simultaneously selects the positions of M subbands and a single precoding matrix for the M subbands.</p> <p>A CQI is generated for each codeword in the M subbands.</p> <p>In addition, the UE generates a single wideband CQI for the system frequency band or the higher layer-set frequency band.</p> <p><i>The UE transmits</i> information about the positions of the M subbands, the single CQI value for the M subbands, a single PMI for the M subbands, a wideband PMI, and <i>the wideband CQI value</i>. The bandwidth of each subband and the M value may vary with the bandwidth of the system frequency band.</p> <p>1-4) Mode 3-0</p> <p>The UE generates a wideband CQI value.</p> <p>On the assumption that data is transmitted in each subband, the UE generates a CQI value for each subband. Even though an RI is larger than 1, a CQI value is only for a first codeword.</p> <p>1-5) Mode 3-1</p> <p>The UE generates a single precoding matrix for the system frequency band or the higher layer-set frequency band.</p> <p>The UE generates a CQI on a codeword basis on the assumption of the single precoding matrix for</p>

Claim 10	Seo (Ex. 1004)
	<p>each subband.</p> <p>The UE generates a wideband CQI on the assumption of a precoding matrix.</p> <p>A CQI for each subband is a differential CQI value. The differential CQIs are the differences between indexes of CQI values for the respective subbands and an index of the wideband CQI.</p> <p>The bandwidth of each subband may vary with the bandwidth of the system frequency band.” (Ex. 1004, 11:21-12:36 (emphasis added).)</p> <ul style="list-style-type: none"> ▪ <i>See also</i> Ex. 1005 ¶¶ 114-141; Ex. 1007, at p. 6, paragraph 6-p. 8, paragraph 7 and p. 11, paragraphs 4-10.

Claim 11	Seo (Ex. 1004)
<p>The apparatus according to claim 10, wherein the channel information for the at least one of the other component carriers is a wideband channel information.</p>	<p>Seo discloses that the channel information for the at least one of the other component carriers is a wideband channel information.</p> <ul style="list-style-type: none"> ▪ “1) Transmission of CQI/PMI/RI on PUSCH after Receiving CQI Request <p>This kind of CQI transmission takes place when a CQI request is included in an uplink grant for PUSCH scheduling, received on a Physical Downlink Control CHannel (PDCCH). Table 2 below illustrates CQI/PMI/RI transmission modes on a PUSCH.</p>

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	<div>TABLE 2</div> <table><tr><th colspan="2"></th><th colspan="3">PMI Feedback Type</th></tr><tr><th colspan="2"></th><th>No PMI</th><th>Single PMI</th><th>Multiple PMI</th></tr><tr><td rowspan="4">PUSCH CQI feedback type</td><td>Wideband (wideband CQI)</td><td></td><td></td><td>Mode 1-2</td></tr><tr><td>UE Selected (subband CQI)</td><td>Mode 2-0</td><td></td><td>Mode 2-2</td></tr><tr><td>Higher Layer-configured (subband CQI)</td><td>Mode 3-0</td><td>Mode 3-1</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table> <p>The CQI transmission modes illustrated in Table 2 are selected by the higher layer and a CQI, a PMI and an RI are all transmitted in the same PUSCH subframe.</p> <p>1-1) Mode 1-2</p> <p>On the assumption that data is transmitted only in each subband, a precoding matrix is selected.</p> <p><i>A UE generates a wideband CQI for a total system frequency band or a frequency band set by the higher layer based on the selected precoding matrix.</i></p> <p><i>The UE transmits the wideband CQI and PMIs for the respective subbands. The bandwidth of each subband may vary with the bandwidth of the system frequency band.</i></p> <p>1-2) Mode 2-0</p> <p>The UE selects M preferred subbands from the system frequency band or the higher layer-set frequency band.</p> <p>The UE generates one CQI on the assumption that data is transmitted in the selected M subbands.</p> <p><i>In addition, the UE generates one wideband CQI for the system frequency band or the higher layer-set frequency band.</i></p> <p>If a plurality of codewords is transmitted in the M subbands, a CQI for each codeword is a differential value. The differential CQIs are the differences</p>			PMI Feedback Type					No PMI	Single PMI	Multiple PMI	PUSCH CQI feedback type	Wideband (wideband CQI)			Mode 1-2	UE Selected (subband CQI)	Mode 2-0		Mode 2-2	Higher Layer-configured (subband CQI)	Mode 3-0	Mode 3-1					
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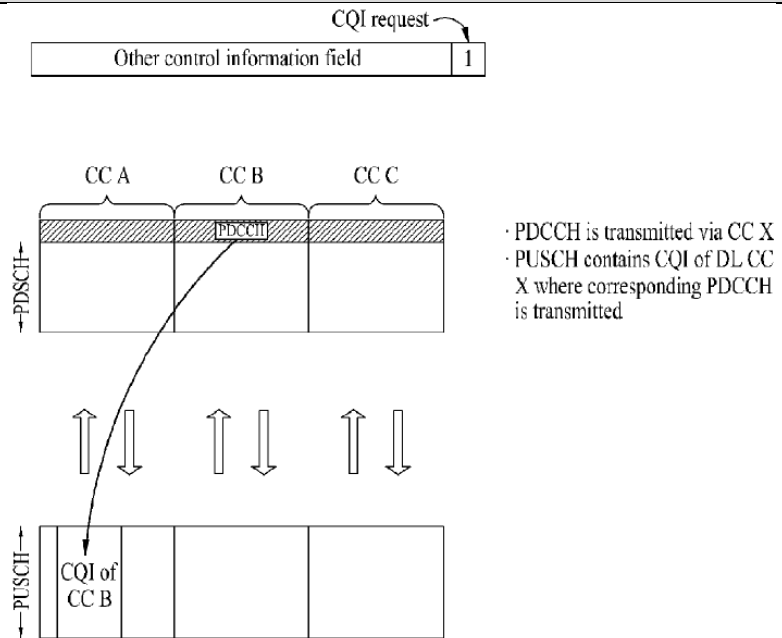
Claim 11	Seo (Ex. 1004)
	<p>between indexes of CQI values for the M subbands and an index of the <i>wideband CQI</i>.</p> <p>The UE transmits information about the positions of the M subbands, the single CQI value for the M subbands, <i>and the wideband CQI value for the system frequency band or the higher layer-set frequency band</i>. The bandwidth of each subband and the M value may vary with the bandwidth of the system frequency band.</p> <p>1-3) Mode 2-2</p> <p>On the assumption that data is transmitted in M preferred subbands, the UE simultaneously selects the positions of M subbands and a single precoding matrix for the M subbands.</p> <p>A CQI is generated for each codeword in the M subbands.</p> <p><i>In addition, the UE generates a single wideband CQI for the system frequency band or the higher layer-set frequency band.</i></p> <p>The UE transmits information about the positions of the M subbands, the single CQI value for the M subbands, a single PMI for the M subbands, a wideband PMI, and <i>the wideband CQI value</i>. The bandwidth of each subband and the M value may vary with the bandwidth of the system frequency band.</p> <p>1-4) Mode 3-0</p> <p><i>The UE generates a wideband CQI value.</i></p> <p>On the assumption that data is transmitted in each subband, the UE generates a CQI value for each subband. Even though an RI is larger than 1, a CQI value is only for a first codeword.</p> <p>1-5) Mode 3-1</p> <p>The UE generates a single precoding matrix for the system frequency band or the higher layer-set frequency band.</p> <p>The UE generates a CQI on a codeword basis on the assumption of the single precoding matrix for</p>

Claim 11	Seo (Ex. 1004)
	<p>each subband.</p> <p><i>The UE generates a wideband CQI on the assumption of a precoding matrix.</i></p> <p>A CQI for each subband is a differential CQI value. The differential CQIs are the differences between indexes of CQI values for the respective subbands and an index of the <i>wideband CQI</i>.</p> <p>The bandwidth of each subband may vary with the bandwidth of the system frequency band.” (Ex. 1004, 11:21-12:36 (emphasis added).)</p> <ul style="list-style-type: none"> ▪ <i>See also</i> Ex. 1005 ¶¶ 114-141; Ex. 1007, at p. 6, paragraph 6-p. 8, paragraph 7 and p. 11, paragraphs 4-10.

Claim 14	Seo (Ex. 1004)
<p>The apparatus according to claim 1, wherein the request for providing the aperiodic channel information is included in an uplink grant.</p>	<p>Seo discloses that the request for providing the aperiodic channel information is included in an uplink grant.</p> <ul style="list-style-type: none"> ▪ “As a plurality of CCs is configured for each of the downlink and uplink and thus the plurality of downlink CCs are available for simultaneous transmission and reception as illustrated in FIG. 7, <i>there is a need for newly defining the configuration and meaning of a CQI request used for non-periodic CQI reporting, included in an uplink grant.</i> Transmission of a CQI for each downlink CC whenever <i>a CQI request is included in an uplink grant</i> increases overhead. Therefore, it is proposed that a CQI request is configured to request reporting of a CQI for one CC in the present invention.” (Ex. 1004, 14:22-32 (emphasis added).)

Claim 14

Seo (Ex. 1004)



(Seo, Fig. 9)

▪ “Embodiment 2

In accordance with another exemplary embodiment of the present invention, a downlink CC requiring CQI reporting is implicitly indicated in a PDCCH carrying a CQI request.

Only a 1-bit CQI request per CC is used and a CQI is supposed to be reported for a downlink CC in which a PDCCH carrying an uplink grant is transmitted.

FIG. 9 illustrates the structure of control information fields including a CQI request field and a CQI transmission method according to another exemplary embodiment of the present invention. Referring to FIG. 9, the control information fields includes a 1-bit CQI request field. If the CQI request field is set to 1, this implies that a CQI report is requested. Thus, upon receipt of the control information, the UE transmits a CQI for a downlink CC, CC B in which *it has received a PDCCH carrying the uplink grant in an uplink CC scheduled by the uplink grant.* This exemplary embodiment

Claim 14	Seo (Ex. 1004)
	<p>offers the benefits of still using a conventional signal format and reducing signaling overhead relative to Embodiment 1. <i>However, to request CQI reporting for a specific downlink CC, a PDCCH including an uplink grant should be transmitted in the specific downlink CC.</i> (Ex. 1004, 15:6-28 (emphasis added).)</p> <p>▪ <i>See also</i> Ex. 1005 ¶¶ 162, 170-74, and Fig. 9; Ex. 1007, at p. 11, paragraphs 2-10.</p>

Claim 28	Seo (Ex. 1004)
[28pre] A method comprising:	<i>See</i> claim chart above for [1pre] and [1b].
[28a] receiving a request for providing aperiodic channel information with respect to a selected downlink component carrier of a plurality of component carriers;	<i>See</i> claim chart above for [1a].
[28b] determining the selected downlink component carrier based on which component carrier of the plurality of component carriers carried the request for providing the aperiodic channel information;	<i>See</i> claim chart above for [1c].
[28c] establishing channel information with respect to the selected downlink	<i>See</i> claim chart above for [1d].

Claim 28	Seo (Ex. 1004)
component carrier; and	
[28d] sending the channel information with respect to the selected downlink component carrier.	<i>See</i> claim chart above for [1e].

Claim 41	Seo (Ex. 1004)
The method according to claim 28, wherein the request for providing the aperiodic channel information is included in an uplink grant.	<i>See</i> claim chart above for [14].

X. CONCLUSION

For the foregoing reasons, Petitioners request institution of an *inter partes* review to cancel claims 1, 10, 11, 14, 28, and 41 of the '472 patent.

Dated: July 27, 2016

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CERTIFICATION OF WORD COUNT

Pursuant to 37 C.F.R. 42.24, I hereby certify that the “**PETITION FOR INTER PARTES REVIEW OF U.S. PATENT 8,867,472 B2 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R §§ 42.100**” contains 7,904 words, not including a table of contents, table of authorities, mandatory notices under § 42.8, certificate of service or word count, or appendix of exhibits or claim listing, as counted by the word-processing system used to prepare the paper.

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CERTIFICATE OF SERVICE

I, hereby certify that a true copy of the “**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT 8,867,472 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R §§ 42.100**” and all exhibits and attachments thereto (Exhibits 1001 – 1007) were served in their entirety by EXPRESS MAIL this 27th day of July, 2016, on the patent owner at the correspondence address of record for the subject patent, as indicated below:

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