

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners,

v.

KT CORPORATION (Patent Owner) and
PEGASUS WIRELESS INNOVATION LLC (Exclusive Licensee)

U.S. Patent No. 11,540,272

Issue Date: December 27, 2022

Title: METHOD AND DEVICE FOR ALLOCATING DATA CHANNEL
RESOURCE FOR NEXT-GENERATION WIRELESS ACCESS NETWORK

Inter Partes Review No.: IPR2025-00137

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
11,540,272
UNDER 35 U.S.C. §§ 311-319 and 37 C.F.R. §§ 42.1-.80, 42.100-.107**

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TABLE OF AUTHORITIES

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<i>NHK Spring Co. v. Intri-Plex Techs., Inc.</i> , IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential)	78

Petitioners' Exhibit List

<i>Exhibit #</i>	<i>Description</i>
1001	U.S. Patent No. 11,540,272 (“the ‘272 Patent”)
1002	Select portions of prosecution history of the ‘272 Patent (“File History”)
1003	Declaration of Petitioners’ Expert (“Melodia Declaration”)
1004	U.S. Pat. Pub. No. 2018/0376497 (“You”)
1007	KR2016/008093 (“You PCT”) filed on July 25, 2016
1006	Certified Translation of EX-1007
1007	U.S. Pat. Pub. No. 2020/0187169 (“Gao”)
1008	CN201610849716.8 (“Gao Priority Application”)
1009	Certified Translation of EX-1008
1010	3GPP Specification 36.213, Release 13.1.0 (published March 2016)
1011	3GPP Specification 36.212, Release 13.1.0 (published March 2016)
1012	Declaration of Craig Bishop (“Bishop Declaration”)
1013	List of related patents
1014	Plaintiff Pegasus Wireless Innovations LLC’s Disclosure of Asserted Claims and Infringement Contentions, Verizon Case.
1015	‘272 Patent Priority Application (October 31, 2016)
1016	Certified Translation Of October 31, 2016 Priority Application For ‘272 Patent
1017	RAN 84-BIS list of attendees (including inventor)
1018	RAN 86 list of attendees (including inventor)
1019	RAN 86-BIS list of attendees (including inventor)
1020	R1-1610129
1021	RAN1#86-BIS Meeting Draft Minutes (dated October 20, 2016).
1022	<i>Pegasus Wireless v. Cellco Partnership d/b/a Verizon Wireless</i> , Case 2:23-cv-00640-JRG (EDTX), Docket Control Order

<i>Exhibit #</i>	<i>Description</i>
1023	Websters definition of “table” (https://www.merriam-webster.com/dictionary/table)
1024	Brittanica definition of “table” (https://www.britannica.com/dictionary/table)
1025	KT Corporation Motion For Protective Order From Questioning Beyond The Scope Of Jurisdictional Discovery (Redacted), Dkt. No. 172, case 2:23-cv-00640.
1026	Excerpts from Prosecution History Of Application 16/346,108 (parent application to ‘272 patent)
1027	Order Granting Protective Order, case 2:23-cv-00640-JRG Document 178 (12/12/2024)

Claim Element Table

Element	Claim Language
1.0	1. A base station, comprising: a transceiver; a receiver; and a controller which controls the transceiver and receiver thereby performing operations including:
1.1	transmitting, to a wireless device, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource, wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,
1.2	wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and
1.3	wherein the determined number of OFDM symbols is smaller than or equal to a number of OFDM symbols included in a slot; and
1.4	transmitting, to the wireless device, downlink control information (DCI), including a field including a bit string,
1.5	wherein the bit string in the field relates to a row index of an allocation table, and
1.6	wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.
8.0	8. A wireless device, comprising: a transceiver; a receiver; and a controller which controls the transceiver and receiver thereby performing operations including:
8.1	receiving, from a base station, a radio resource control (RRC) signal including information on one or more allocations of a time-domain

	resource, wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,
8.2	wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and
8.3	wherein the determined number of OFDM symbols is smaller than or equal to a number of OFDM symbols included in a slot; and
8.4	receiving, from the base station, downlink control information (DCI), including a field including a bit string,
8.5	wherein the bit string in the field relates to a row index of an allocation table, and
8.6	wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.
15.0	15. An operation method of wireless device, comprising:
15.1	receiving, from a base station, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource, wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,
15.2	wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and
15.3	wherein the determined number of OFDM symbols is smaller than or equal to a number of OFDM symbols included in a slot; and
15.4	receiving, from the base station, downlink control information (DCI), including a field including a bit string,
15.5	wherein the bit string in the field relates to a row index of an allocation table, and

15.6	wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.
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I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311 *et seq.* and 37 C.F.R. §§ 42.1 *et seq* Nokia of America Corp., Ericsson Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, Google LLC, and T-Mobile, USA, Inc., (collectively, “Petitioners”) hereby petition for *inter partes* review (“IPR”) of U.S. Patent No. 11,540,272 (“the ‘272 patent”). Petitioners respectfully submit that Claims 1-20 (the “Challenged Claims”) are obvious in view of the prior art herein, none of which was cited during the abbreviated ‘272 patent prosecution. This Petition demonstrates a reasonable likelihood that Petitioners will prevail with respect to at least one claim. Accordingly, Petitioners respectfully request that the Board institute IPR.

II. OVERVIEW

The Challenged Claims are directed to two concepts related to data transmitted from a base station (“BS”) to a user equipment (“UE”) in a cellular system: (1) the transmitted data’s content; and (2) the transmission format.

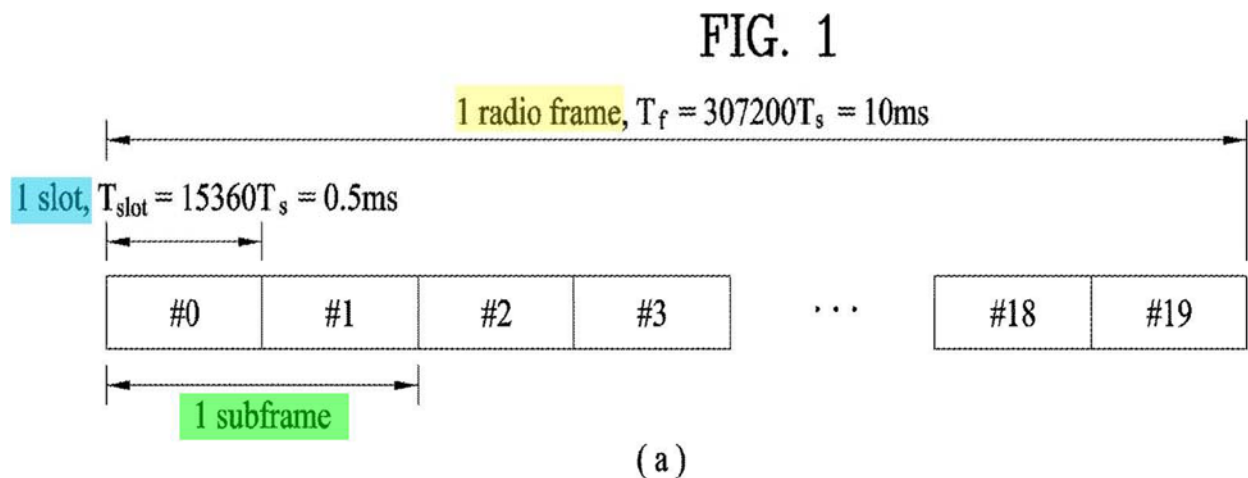
First, the claimed data content relates to specifying (“allocating”) radio “resources” more granularly for a 5G cellular system than was specified for a 4G system. As detailed in Sections IV.F.3-IV.F.4, this more granular allocation was discussed at 3GPP meetings cited, and quoted in the ‘272 patent’s priority application (Korean Application No. 10-2016-0143013 (“Priority Application”),

filed on October 31, 2016 (“Priority Date”). EX-1016, 0036. Thus, this data content was known before the Priority Date and cannot provide patentability.

Section 5.

The claims also specify the transmission format using a known data structure of a “table” with “rows” accessed by an “index.” This claimed format transmits the (known) more granular resource allocation from a BS to a UE. Such formats were known before the Priority Date and thus also cannot provide patentability.

Regarding the data content, an LTE prior art system transmits data in “frames.” You’s Figure 1(a) (EX-1004) depicts this LTE frame:

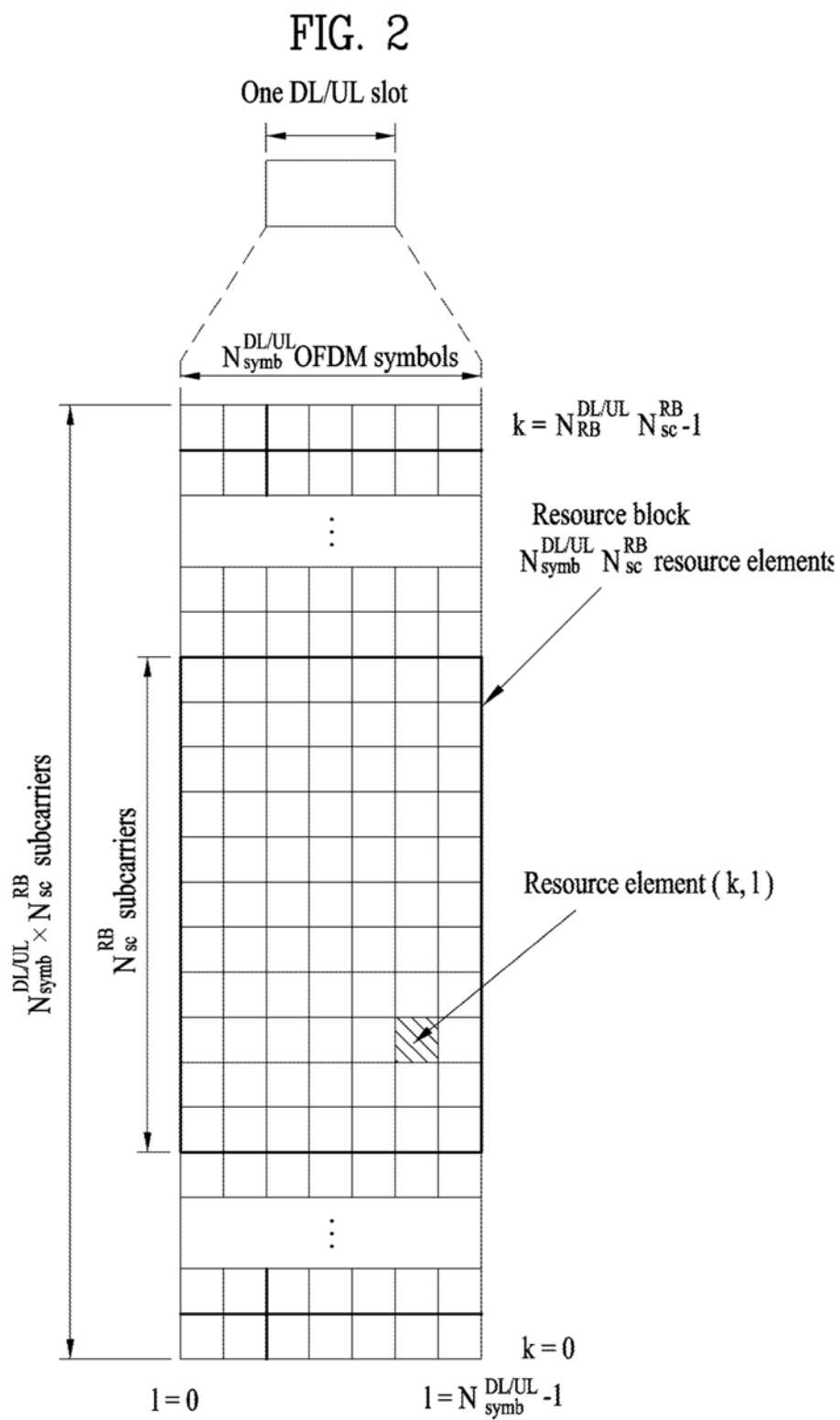


EX-1004, Fig. 1(a).¹ As shown, an LTE frame contains 10 “subframes” each containing two “slots.” EX-1004, 0058.

The LTE “slots” indicate the “resources” that could be used to transmit data

¹ Unless noted, all emphases and annotations herein are added.

from the base station to the user equipment. Your Fig. 2 depicts the LTE “slot.”



EX-1004, Fig. 2. In the “time domain” (horizontally), the slot is seven OFDM

symbols, and in the “frequency domain” (vertically) the slot is different “subcarriers” (*i.e.*, different frequencies). EX-1004, 0062-0065. Thus, a “resource element” is identified by a particular “time” (which OFDM symbol in the time domain) on a particular “frequency” (which particular subcarrier). EX-1004, 0064. The resources are allocated for either the BS to transmit data to the UE (on a downlink shared channel [PDSCH]) or the UE to transmit data to the BS (on an uplink shared channel [PUSCH]). EX-1004, 0053. EX-1003, ¶¶77-85.

The ‘272 patent recognized that prior art LTE systems allocated resources using a resource block (RB) basis in the frequency domain and a subframe basis in the time domain. EX-1001, 2:21-29. Thus, because an LTE subframe had 2 slots and each slot had 7 OFDM symbols, the LTE system (generally) allocated resources in blocks of 14 OFDM symbols in the time domain. EX-1003, ¶¶86-88.

The ‘272 patent relates to allocating time-domain resources more granularly: the “basic concept will be discussed for allocating time-domain resource using OFDM symbol allocation information based on a unit of an OFDM symbol or a group of symbols....” EX-1001, 9:14-18.

As detailed below in Sections IV.C and 4 and Grounds 1 and 2, the 3GPP working groups had discussed allocating resources at the OFDM symbol-level granularity before the Priority Date – as the ‘272 patent acknowledges. *See* Sections IV.C and 4. For example, You taught allocating a “shortened TTI” of 2

or 3 OFDM symbols. EX-1004, 0144-146, 0058. The ‘272 patent embodiments use this same “short TTI formed in the TTI (... 2 symbols or 3 symbols in the above example)” as the basis for the claimed OFDM symbol allocation. EX-1001, 10:9-12.

Thus, the idea of allocating resources at the OFDM symbol granularity was not novel as of the Priority Date.

Rather, as detailed in Section IV.C, the ‘272 claims focus on the format of transmitting resource allocations from the BS to the UE. In the claims, resource allocation information is transmitted in a “table” accessed by a “row index.” EX-1001, 19:54-58. Each row contains a pattern of resource allocations (start symbol and length of symbols). EX-1001, 19:59-61. These particular data structures using tables, rows, and indexes are well known implementation details in the computer and telecom fields. Sections 2, 5, *infra*.

The prior art cited herein discloses the claimed concepts.² As with the ‘272 patent, the You reference and Gao (EX-1007) recognize that, in the NR/5G radio system, resources are allocated at the OFDM symbol granularity. Both You and Gao teach a set of resource allocation “patterns.” Each pattern in the set of

² As used herein, “discloses” or “teaches” includes that the reference’s disclosure renders the discussed concept (element, claim) obvious to a POSITA.

patterns (corresponding to row in a table) contains a different resource allocation pattern including the location / start of OFDM symbols and the length (number) of symbols. A particular pattern is selected by an index into the set of patterns. *E.g.*, EX-1004, 0222. These sets of “patterns” represent and render obvious the claimed “table.” *Supra*, Ground 1, 1.4-1.6; Ground 2, 1.4-1.6.

While You and Gao do not explicitly apply the term “table” to their resource patterns, those patterns nonetheless render obvious an implementation of a “table.” *Supra*, Ground 1, 1.4-1.6; Ground 2, 1.4-1.6. The ‘272 patent does not recite any particular requirements for a data structure to be identified as a “table.” Rather, a POSITA would understand a “table” in the ‘272 patent’s context to be disclosed (including rendered obvious) by an organized and ordered grouping of data that can be accessed by identifying one of the groupings though, for example, an index. EX-1003, ¶¶277-286, 369-375, 138-163.

Moreover, such resource allocation table data structures were already known and used in the 3GPP standards. For example, the 3GPP standard 36.213 v.13.1.0 (March 2016) contains a resource allocation “table” that is largely identical to the “symbol allocation table” that the inventors used in the Priority Application.

TS 36.213 (March 2016) (EX- 1010), Table 8.1.3-1, Section 8.1.3	8.1.3 Uplink resource allocation type 2 Table 8.1.3-1: <table border="1"> <tr> <th>Value of resource allocation field</th><th>Allocated resource blocks</th></tr> <tr> <td>'000'</td><td>0</td></tr> <tr> <td>'001'</td><td>1</td></tr> <tr> <td>'010'</td><td>2</td></tr> <tr> <td>'011'</td><td>3</td></tr> <tr> <td>'100'</td><td>4</td></tr> <tr> <td>'101'</td><td>5</td></tr> <tr> <td>'110'</td><td>0 and 1</td></tr> <tr> <td>'111'</td><td>2 and 3</td></tr> </table>	Value of resource allocation field	Allocated resource blocks	'000'	0	'001'	1	'010'	2	'011'	3	'100'	4	'101'	5	'110'	0 and 1	'111'	2 and 3
Value of resource allocation field	Allocated resource blocks																		
'000'	0																		
'001'	1																		
'010'	2																		
'011'	3																		
'100'	4																		
'101'	5																		
'110'	0 and 1																		
'111'	2 and 3																		
Priority Application (October 31, 2016) (EX-1015) at 0063.	Examples of symbol allocation table <table border="1"> <tr> <th>Symbol allocation field in DCI</th><th>Allocated symbol indices for PDSCH(or PUSCH)</th></tr> <tr> <td>000</td><td>0,1,2,3,4,5,6</td></tr> <tr> <td>001</td><td>0,1,2,3</td></tr> <tr> <td>010</td><td>0,1,4,5,6</td></tr> <tr> <td>011</td><td>2,3,4,5,6</td></tr> <tr> <td>100</td><td>0,1</td></tr> <tr> <td>101</td><td>2,3</td></tr> <tr> <td>110</td><td>4,5,6</td></tr> <tr> <td>111</td><td>reserved</td></tr> </table>	Symbol allocation field in DCI	Allocated symbol indices for PDSCH(or PUSCH)	000	0,1,2,3,4,5,6	001	0,1,2,3	010	0,1,4,5,6	011	2,3,4,5,6	100	0,1	101	2,3	110	4,5,6	111	reserved
Symbol allocation field in DCI	Allocated symbol indices for PDSCH(or PUSCH)																		
000	0,1,2,3,4,5,6																		
001	0,1,2,3																		
010	0,1,4,5,6																		
011	2,3,4,5,6																		
100	0,1																		
101	2,3																		
110	4,5,6																		
111	reserved																		

Thus, the '272 patent claims do not recite any novel or nonobvious concept. Allocating at OFDM symbol-level granularity was known and already discussed in the 3GPP working groups as detailed in Sections 4, IV.A. Implementing resource allocations using tables and indexing those tables by DCI bits was also already known in the prior art. Section 5.

During prosecution, the prior art cited herein was not considered. Petitioners respectfully request that the Board institute trial and cancel all Challenged Claims.

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

Petitioners certify that the ‘272 patent is available for IPR and that Petitioners are not barred or estopped from requesting IPR of the Challenged Claims on the grounds herein. 37 C.F.R. § 42.104(a). This Petition is filed pursuant to 37 C.F.R. § 42.106(a).

IV. REASONS FOR THE REQUESTED RELIEF

As explained herein and in the attached Declaration of Petitioners’ Expert, Dr. Tommaso Melodia (“Melodia Declaration”), EX-1003, the Challenged Claims were obvious over the prior art to a person of ordinary skill in the art (“POSITA”) at the invention time.

A. Prosecution History

The ‘272 patent’s application received a first Office Action allowance on August 16, 2022. EX-1002, 0070-0077. The Examiner’s stated patentability basis related to the “allocation table” implementation and DCI bit field relating to a row index. EX-1002, 0075-0077. The ‘272 patent’s parent was allowed based upon amendments and arguments related to this table format. EX-1026, 0009-0016.

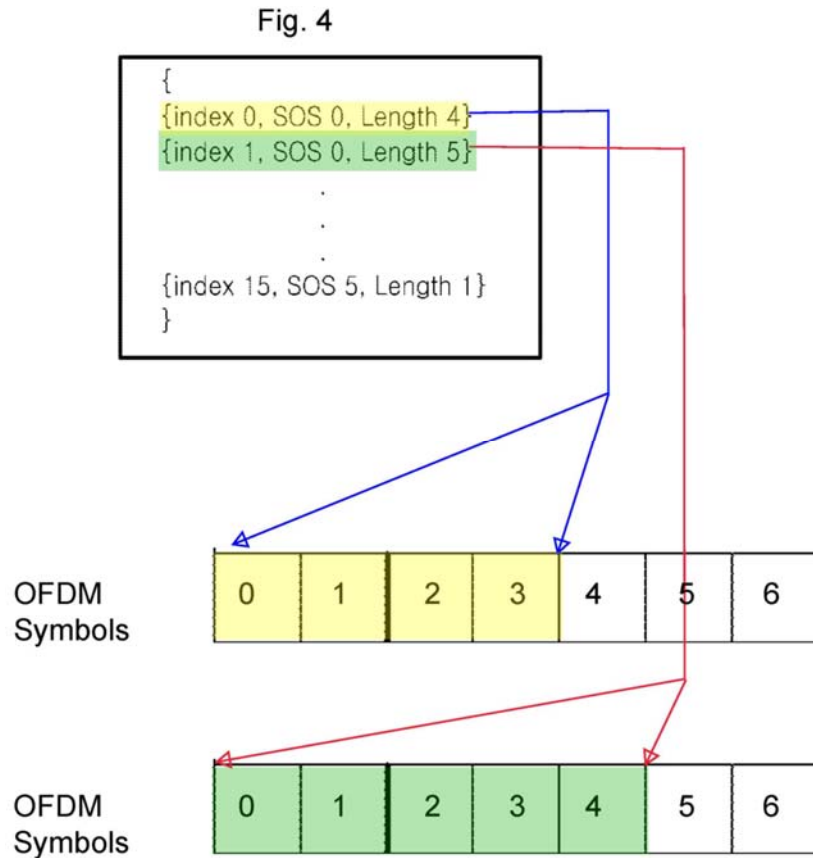
B. Priority Date

Petitioners do not concede the ‘272 claims are entitled to the Priority Date, but Petitioners’ prior art predates this date.

C. The ‘272 Patent’s Summary

The ‘272 claims are directed to a particular implementation to communicate the resource allocation to the UE. In particular, the ‘272 claims recite using known data structures: (1) a “table that has (2) “rows” that are indexed by (3) “bits.” Thus, the claim elements reflect using known data structures (tables with rows) to communicate known information (OFDM symbol-level allocations).

The ‘272 patent’s Figures 4 and 5 depict exemplary tables (not present in the Priority Application). EX-1001, 2:56-60. The Priority Application’s Table 1 depicts a different “table.” EX-1016, 0060-0063. Each table row reflects a different set / pattern of OFDM symbols (depicted at the annotated diagram’s bottom portion added to Fig. 4).

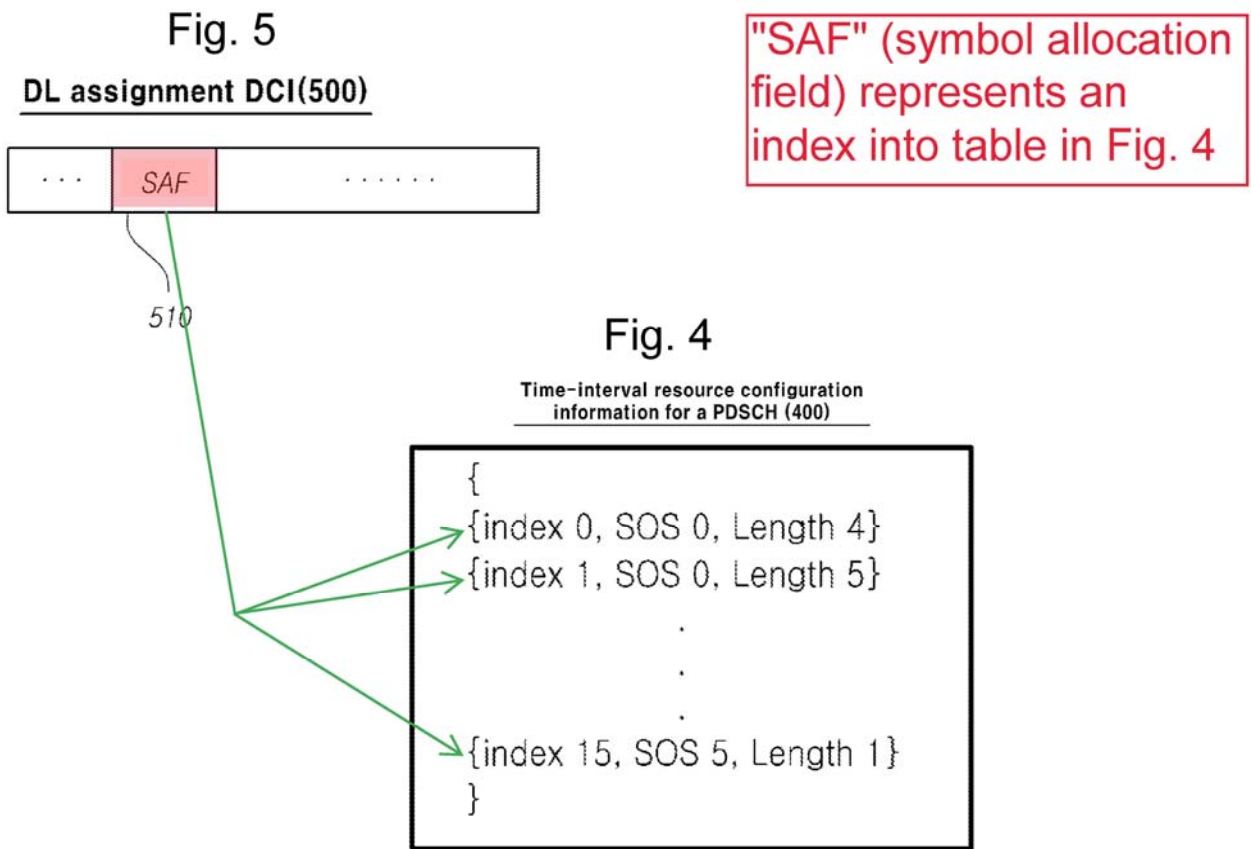


EX-1001, Fig. 4 (annotated). The row with “index 0” allocates a region of symbols with a “SOS” (“starting OFDM symbol”) of symbol 0 and a “length” of 4 symbols. The row with “index 1” reflects a different set / pattern of symbols in a region of symbols with a “SOS” of symbol 0 and a “length” of 5 symbols. This “allocation table” and its “row index” are recited in claim elements [1.5]-[1.6] discussed below.

In the ‘272 claims, bits in the downlink control information (“DCI”)³ specify

³ DCI is transmitted in 4G and 5G systems (long before the ‘272 patent) by the BS to the UE to provide control information specifying how to interpret/decode the

an “index” in the table row used to specify OFDM symbols for transmission. This arrangement can be shown by using Figs. 4 and 5 together:



EX-1001, Figs. 4-5 (annotated). The “SAF” (“symbol allocation field”) bits relate to an index to select the row in Figure 4 identifying a pattern of OFDM symbols for data transmissions between the BS and UE. EX-1001, 14:4-29; EX-1003, ¶¶27-30. These SAF bits are referenced in element [1.4] below.

Before the Priority Date, the 3GPP standards groups working on 5G technology (known as “new radio” or “NR”), already identified in various downlink data transmissions from the BS to the UE.

“discussions” that NR should permit resource allocation on a more granular level than the “subframe” used in LTE. EX-1001, 2:30-33 (“in the NR [standards body], discussions have been conducted for allocating a time-domain resource”), 6:26-8:21 (summarizing “discussions” in the NR groups). The 3GPP working group identified that more granular allocations would benefit 5G services such as URLLC that were more sensitive to delays (latency). EX-1001, 6:37-48.

To that end, the ‘272 patent acknowledges that in the 3GPP working group “a mini-slot formed of fewer symbols than the typical slot has been defined.” EX-1004, 6:26-7:34. As detailed in Section 4, the 3GPP working group articulated these “mini-slots” and OFDM symbol-level allocation granularity before the Priority Date. EX-1020 (throughout).

D. Claim Construction

Petitioners propose that each claim term be given its plain and ordinary meaning in this proceeding, and that no specific construction of any claim term is required because the prior art relied on herein meets each claim term under any reasonable construction.

E. POSITA

A POSITA in October 2016 would have had a bachelor’s degree in electrical engineering, computer engineering, or a related discipline, knowledge of relevant 3GPP standards, and at least two years of experience working in wireless

communications. A POSITA may trade more education for less experience and vice-versa. A person with a different degree but with additional relevant experience could still qualify if the additional experience compensates for the different educational background. EX-1003, ¶¶37-39.

F. State of the Art

This section describes the state of the art for transmission resource allocation on the Priority Date. The prior art, and the discussions of what was known to a POSITA, describe the state of the art and additional motivations to modify or combine the references. Accordingly, the Board should consider these references.

1. The 3GPP Standards Defined Resource Allocation For Transmissions Between Wireless Components.

As the ‘272 patent acknowledges, many concepts described and claimed in the ‘272 patent were known in 3GPP standards before the Priority Date. For example, DCI formats that contained “bits” that related to resource allocation were well-known. As shown in 3GPP TS 36.212, Section 5.3.3 (“Downlink control information”) included 20 different “DCI formats.” EX-1011 at Section 5.3.3.1. EX-1003, ¶¶133-135.

The known 3GPP DCI formats included “bits” used for resource allocation. For example, in DCI “Format 1,” “bits provide the resource allocation” for the “resource block assignments” for the PDSCH channel. EX-1011, Section 5.3.3.1.2. Similar “bits” are used for resource allocation in almost all DCI formats.

EX-1011, Section 5.3.3.1. EX-1003, ¶¶134-135.

The LTE time-domain allocation was generally performed for an entire subframe of 14 OFDM symbols. In LTE, DCI bits identified the “resource block assignments” – among other resources – including the different subcarriers (frequencies) allocated for the channel (*e.g.*, PDSCH/PUSCH). EX-1003, ¶136.

Thus, using DCI bits to specify resource allocations was well-known and used in 3GPP standards before the Priority Date. EX-1003, ¶¶133-137.

2. The Data Structure Of A “Table” Was Well-Known.

The ‘272 patent does not explicitly define a “table.” Indeed, many patents contain structures identified as “tables” in the specification. *E.g.*, EX-1001, 10:30-11:16; EX-1004, 0060-0061, 0070; EX-1007, 0004-0005.

In the Challenged Claims’ context, “table” relates to “a systematic arrangement of data usually in rows and columns for ready reference.” Websters. EX-1023. Similar words express the same concept. EX-1024 (Britannica defining “table” as “a collection of information that is arranged in rows and columns”). The ‘272 patent does not teach any particular aspect or feature of the claimed “table” data structure beyond that already known to POSITAs. EX-1003, ¶¶138-163.

This concept of a table as an arrangement of data in rows and columns is used pervasively throughout 3GPP standards. Using the 3GPP document 36.213 v.13.1.0 (EX-1010) as one exemplar, this table concept (known to be arrangements

of rows with related information) is pervasively present. *E.g.*, EX-1010, Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2. EX-1003, ¶¶157-162.

3. The Inventors Incorporated Materials And Concepts From The RAN1 Working Groups Into The Patent And Deleted The Citation To The RAN1#86-BIS Meeting From The Specification.

The '272 patent contains materials taken from the RAN1#86 meeting that occurred on October 10-14, 2016 (about 3 weeks before the Priority Date). This is apparent for three reasons:

1. The Priority Application expressly states that it takes disclosure from RAN1#86-BIS. EX-1016 at 0036.
2. The '272 patent and Priority Application each include content taken verbatim from the RAN1#86-BIS Meeting Minutes. Compare EX-1001, 7:61-8:14 and EX-1016, 0039-0052 with EX-1021, 0137 (RAN1#86-BIS Minutes).
3. One inventor (Woo-Jin Choi) attended RAN1#86-BIS and RAN1#86. EX-1018, EX-1019.

Notably, in the application presented to the Examiner, the inventors removed the statement in #1 above identifying that the concepts discussed in columns 6-8 were taken from the October 10, 2016 RAN1#86-BIS meeting.

4. As Admitted In The ‘272 Patent, The RAN1#86-BS 3GPP Working Groups Detailed Allocating Resources On An OFDM Symbol Granularity Before The Priority Date.

As the ‘272 patent acknowledges, the 3GPP “NR” working groups discussed allocating time-domain resources on a symbol-level before the Priority Application – including at the RAN1#86-BIS meeting cited by the Priority Application, as numerous submissions reflect.

These submissions from the RAN1#86-BIS meeting include **R1-1610129**, which was a large (prior art) submission by Qualcomm summarizing many companies’ contributions. EX-1020. R1-1610129 summarized various proposals for allocating time-domain resources including:

- Fujitsu: “Duration of 1 symbol is proposed....” EX-1020 at 7, 18 (“1 symbol”);
- CATT: “Mini-slot is the minimum scheduling unit ... Mini-slot is 1 OFDM symbols.” EX-1020 at 9.
- LG: “Mini-slot ... of 2” symbols. EX-1020 at 10.
- ETRI: “2 symbol mini-slot.” EX-1020 at 10.
- Interdigital: allocations of “2 symbols.” EX-1020 at 11.

R1-1610129 exemplifies the ‘272 patent statements that “discussions” already occurred in the NR working groups and that those “discussions” included time-domain allocations at the OFDM symbol level. EX-1003, ¶¶123-129.

RAN1#86-BIS Meeting Minutes (EX-1021) cites to R1-1610129 and many other related submissions detailing allocating resources on a more granular level. EX-1021, Section 8.1.2.2; EX-1012, ¶77.

The Priority Application cited to the RAN1#86-BIS meeting at which R1-1610129 (and many other similar submissions) were presented and quoted from the RAN1#86-BIS Meeting Minutes (EX-1021). EX-1016. However, the ‘272 patent inventors did not submit R1-1610129 (or the materials cited therein) or the Meeting Minutes to the Examiner. Also, while R1-1610129 and the Meeting Minutes identified many companies’ presentations, there was no 3GPP presentation or submission by the ‘272 inventors or their employer, KT Corporation (the ‘272 patent assignee). Instead, the inventors merely referenced these “discussions” in the Priority Application – filed a few weeks after the RAN1#86-BIS meeting including content from this meeting.

Unsurprisingly, numerous prior art references disclose allocating resources on an OFDM symbol level because it was so widely known and discussed in the 3GPP working groups – as the ‘272 patent acknowledges in columns 6-8.

5. 3GPP Standards Used Resource Allocation Tables Indexed By DCI Bits Before The Priority Date.

The Examiner’s patentability basis was the “allocation table” implementation format and “index” bits in the DCI. Section IV.A. Such implementation details were known in 3GPP in materials that the ‘272 inventors

did not submit to the Examiner.

The 3GPP standards 36.213 (v13.1.0) (EX-1010) (“3GPP36-213”) and 36.212 (v.13.1.0) (EX-1011) (“3GPP36-212”) teach one example of known resource allocation tables indexed by DCI bits. Both standards published in March 2016 – seven months before the ‘272 patent’s priority application. EX-1012.

3GPP36-213 teaches the same implementation / format of resource allocation table used in the Priority Application as shown in the comparison below:

3GPP36-213 (March 2016) (EX-1010), Section 8.1.3	8.1.3 Uplink resource allocation type 2 Table 8.1.3-1: <table><tr><th>Value of resource allocation field</th><th>Allocated resource blocks</th></tr><tr><td>'000'</td><td>0</td></tr><tr><td>'001'</td><td>1</td></tr><tr><td>'010'</td><td>2</td></tr><tr><td>'011'</td><td>3</td></tr><tr><td>'100'</td><td>4</td></tr><tr><td>'101'</td><td>5</td></tr><tr><td>'110'</td><td>0 and 1</td></tr><tr><td>'111'</td><td>2 and 3</td></tr></table>	Value of resource allocation field	Allocated resource blocks	'000'	0	'001'	1	'010'	2	'011'	3	'100'	4	'101'	5	'110'	0 and 1	'111'	2 and 3
Value of resource allocation field	Allocated resource blocks																		
'000'	0																		
'001'	1																		
'010'	2																		
'011'	3																		
'100'	4																		
'101'	5																		
'110'	0 and 1																		
'111'	2 and 3																		

‘272 application (October 31, 2016) (EX-1015) at 0063.	Examples of symbol allocation table	
	Symbol allocation field in DCI	Allocated symbol indices for PDSCH(or PUSCH)
	000	0,1,2,3,4,5,6
	001	0,1,2,3
	010	0,1,4,5,6
	011	2,3,4,5,6
	100	0,1
	101	2,3
	110	4,5,6
	111	reserved

3GPP36-212 (March 2016) taught using DCI bits to index into the resource allocation table (later adopted by the Priority Application).

5.3.3.1.11 Format 6-0B

DCI format 6-0B is used for the scheduling of PUSCH in one UL cell.

The following information is transmitted **by means of the DCI format** 6-0B: ...

- 3 bits provide the resource allocation within the indicated narrowband as specified in section 8.1.3 of [3]

EX-1011, Section 5.1.3.1.11. Reference [3] is “3GPP TS 36.213.” EX-1011, Section 2.

Thus, using three DCI bits to index a resource allocation table was known and adopted by 3GPP at least seven months before the Priority Date. EX-1003, ¶¶107-113; EX-1012, ¶¶58-71.

V. IDENTIFICATION OF CHALLENGES

A. Challenged Claims

Claims 1-20 are challenged.

B. Statutory Grounds for Challenges

The Challenges are set forth in detail below and summarized as follows:

Ground	Claims	Basis	Reference
1	1-20	§ 103	Gao, alone, or in view of You
2	1-20	§ 103	You, alone, or in view of Gao
3	1-20	§ 103	Gao, alone, or in view of You, in further view of 3GPP36-213 and 3GPP36-212
4	1-20	§ 103	You, alone, or in view of Gao in further view of 3GPP36-213 and 3GPP36-212
5	5, 12, 19	§ 103	Grounds 1-4 in further view of R1-1610129

Each reference below is prior art under Section 102 (post-AIA).

Grounds 1 and 2:

U.S. Pat. Appl. 2020/0187169 (“Gao”) (EX-1007) is the publication of U.S. Pat. No. 10,980,013 and claims priority to CN201610849716.8 filed on September 23, 2016. Gao has substantively the same content as CN201610849716.8 and U.S. Pat. No 10,980,013. EX-1008, EX-1009 (certified translation).

U.S. Patent 2018/0376497 (“You”) (EX-1004) published on December 27, 2018 from application No. 15/747,028 which is the U.S. National Stage of PCT KR2016/008093 filed on July 25, 2016. You has substantively the same content as KR2016/008093. EX-1005, EX-1006 (certified translation).

Grounds 3 and 4:

3GPP Standard TS 36.213 v13.1.0 (EX-1010) published and was publicly available no later than March 2016. EX-1012, Bishop Declaration, ¶¶58-64.

3GPP Standard TS 36.212 v13.1.0 (EX-1011) published and was publicly available no later than March 2016. EX-1012, Bishop Declaration, ¶¶65-71.

Ground 5:

R1-1610129 (EX-1020) was published and publicly available no later than October 14, 2016. EX-1012, Bishop Declaration, ¶¶72-76.

VI. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE

Ground 1 and Ground 2 both rely upon Gao and You. The different Grounds use different primary references because Gao and You each have particularly strong disclosures that supplement the other references as detailed in the individual elements below. For example, Gao expressly teaches the resource allocation patterns include the claimed start and length of OFDM resources. *See* Ground 1, [1.5]-[1.6]. Similarly, You explicitly teaches the DCI contains a specific field specifying an “index” into the resource allocation patterns and that the resource patterns are transmitted using RRC signals. *See* Ground 2, [1.2].

The dependent claims largely recite minor ancillary features. Thus, the analysis for dependent claims 2-7 (which are effectively identical to 9-14 and 16-20) is the same for each of Ground 1 and 2. Section VI.C presents the analysis for

the dependent claims for both Ground 1 and Ground 2.

Grounds 3 and 4 add references (3GPP36-213 and 3GPP36-212) that expressly disclose a “table” implementing resource allocations. Section IV.F.5, *supra*. Thus, if Patent Owner (“PO”) argues patentability based upon the data structure implementing a “table,” a POSITA would recognize that it would be obvious to implement the sets of patterns in Gao and You using the known data structure of a resource allocation table already used in the 3GPP standards (e.g., 3GPP36-213 and 3GPP36-212). Ground 5 presents the known sub-carrier spacing elements.

A. Ground 1: Claims 1-20 Are Invalid Over Gao alone or in combination with You

1. Gao.

Like the ‘272 patent, Gao’s BS allocates time-domain resources more granularly than previous LTE systems – at an OFDM symbol granularity. Gao’s “time units” can be divided into different OFDM symbol “regions:”

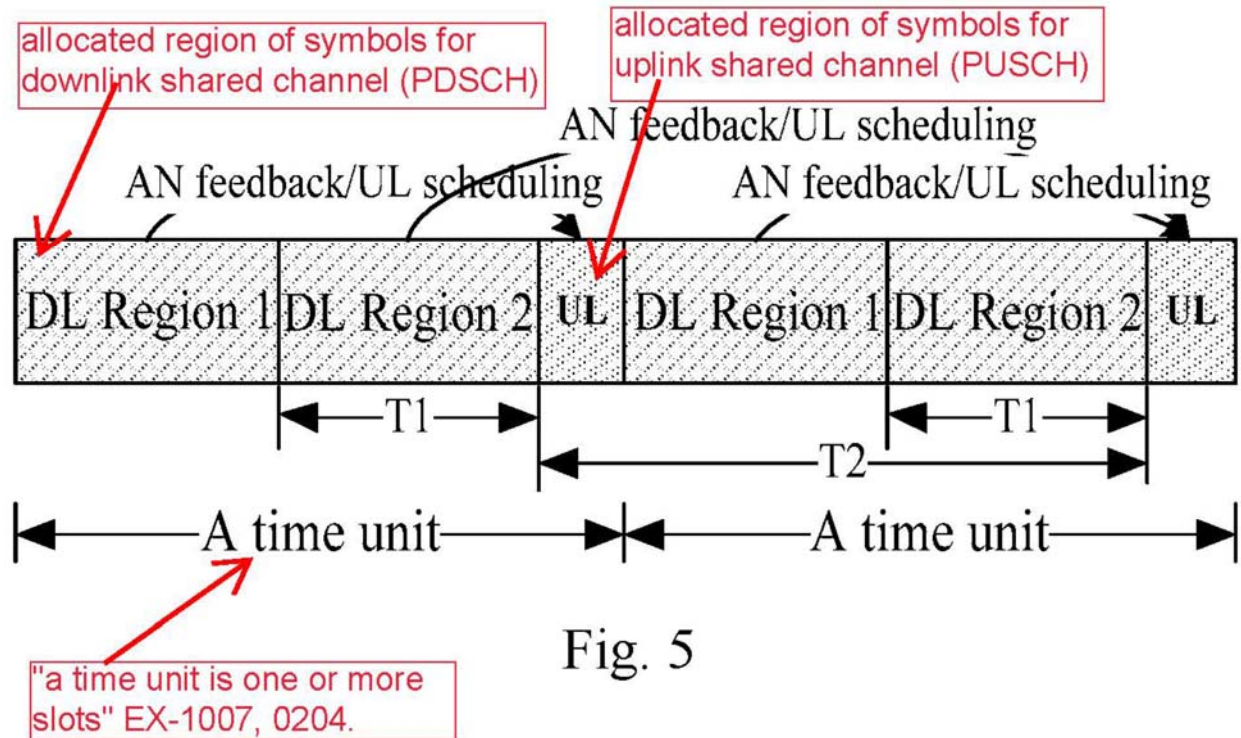


Fig. 5

EX-1007, Fig. 5. A “time unit is one or more slots...” EX-1007, 0204. The “regions” are defined by OFDM symbols. EX-1007, 0137 (BS provides information for a “UE to determine a resource (e.g., a symbol or a mini-slot”), 0140 (“region” is 2 or 3 OFDM symbols), 0147. EX-1003, ¶¶52-60.

Gao’s BS transmits resource allocation information to the UE in a “plurality of patterns ... wherein each pattern includes an allocation of a length and a position of the [downlink (DL)/uplink (UL)] region[s] in the time unit.” EX-1007, 0031-0032. The “regions” (within the “patterns”) are transmitted to the UE using RRC signaling. EX-1007, 0179. After transmitting the set of “patterns” to the UE, the BS “notif[ies] the UE of one of predefined patterns” using “configuration signaling” in the downlink control information (“DCI”). EX-1007, 0031, 0150.

EX-1003, ¶¶61-69.

Notably, the ‘272 patent’s language mirrors Gao. For example, the ‘272 patent relies upon the concepts of “mini-slot” and “time unit” to describe time-domain OFDM symbol allocations. EX-1001, 7:1-3 (“a slot and a mini-slot may be defined as a time unit used for UL/DL scheduling”); 6:58-59 (“supporting one or more time units ... in the time domain”).

The ‘272 patent’s adoption of Gao’s language is unsurprising because the ‘272 patent relies upon “discussions” in the 3GPP NR working groups. Section IV.F.3. Gao is assigned to China Academy Of Telecommunications Technology (“CATT”) which was a contributing participant to the 3GPP working groups. *E.g.*, R1-1610129 (EX-1020) at 9-10 (CATT 3GPP proposal that “[m]ini-slot is 1 OFDM symbols....”). Thus, Gao reflects the “discussions” that the ‘272 patent references as the basis for its claimed concepts.

2. You

Like Gao, You discloses a BS that allocates resources more granularly than was known in LTE systems – an OFDM symbol level. Like Gao, You discloses “resource patterns” that define “regions” of allocated OFDM symbols for channels such as PDSCH. EX-1004, 0222 (“sPDSCH transmission resource pattern may indicate ... a resource region in which the sPDSCH is transmitted within an OFDM symbol region...”). Like Gao, You’s BS transmits “patterns” with “regions”

allocating OFDM symbols to the UE using RRC signals. EX-1004, 0224.

Like Gao, You's BS uses the DCI to "index" into the resource patterns. You explicitly implements bits in the "(RA) field of DCI" in which an indexed "pattern actually applied to an sPDSCH among 2^N sPDSCH transmission resource patterns may be indicated to the UE through N bits." EX-1004, 0222.

Like Gao (and unlike the '272 patent), You is assigned to a company (LG) that contributed to the 3GPP NR "discussions" cited by the '272 patent. Section IV.F.3. For example, in R1-1610129, LG suggested allocating two OFDM symbols in a "mini-slot." EX-1020, at 10. Thus, You (like Gao) reflects the concepts that the '272 patent relied upon for its invention. EX-1003, ¶¶89-99.

3. Motivation To Combine Gao And You.

A POSITA would have been motivated to combine Gao and You with a reasonable expectation of success with either being the primary reference. EX-1003, ¶¶176-189. The technology and teachings of Gao and You heavily overlap as detailed in Grounds 1 and 2 and in the descriptions above. Both references:

- teach a BS allocating resources for wireless transmissions to/from a UE on a PDSCH and PUSCH;
- teach communicating the allocations in various formats to the UE;
- teach using resource "patterns" to communicate the specific OFDM symbols in the resource allocations through "regions" of allocated

symbols; and

- were filed in the same time frame, and are concerned with technical matter being discussed in the RAN1 group in 3GPP around that time.

EX-1003, ¶¶178-182.

Gao and You each fill in additional implementation details regarding the “patterns” that are described less explicitly in the other reference. For example, Gao explicitly describes that each pattern contains an OFDM symbol location and length. You’s patterns are “regions” which logically have a starting OFDM symbol location and length (in time domain), and You benefits from Gao expressly stating the pattern contains information (location and length) defining You’s regions. EX-1003, ¶¶179-181

Similarly, Gao teaches using DCI to indicate one of the patterns. You details a field (DCI RA bits) used to select the particular pattern used for resource allocation. *Infra*, Grounds 1, 2 at [1.4]. A POSITA would recognize that You provides an efficient specific implementation of selecting the pattern by using DCI bits. EX-1003, ¶182.

Furthermore, when considering Gao (or You), a POSITA would be motivated to consider the teachings of other participants in the relevant 3GPP NR working groups, including those participants making contributions reflected in R1-1610129. EX-1003, ¶183. These participants were working toward a common goal

of interoperability using complementary techniques, concepts, and terminology. For Gao and You, given the heavy overlap in terminology (“regions” within “patterns”), a POSITA would recognize that each reference provides specific implementations that are advantageously applied to the other reference’s teachings. EX-1003, ¶¶184-185.

A POSITA would be confident in the combination’s success because each reference (Gao and You) supplies known techniques for implementation of “patterns” to perform resource allocation — techniques being used for their known and intended purposes. EX-1003, ¶186.

Gao and You are also analogous art to the claimed invention, being in the same network communications field. Gao and You derive from the same 3GPP working groups that the ‘272 patent cites as having “discussions” regarding the claimed invention. Sections VI.A, VI.F.3.

Further, the combination and each reference address the same problem as the ‘272 patent – allocating resources at a more granular level in a 5G system than were allocated in the 4G system such as at the OFDM symbol level. EX-1003, ¶188.

Gao and You each describe a similar solution to this problem – using sets of “patterns” from which individual resource allocation patterns are selected and identified by an index in the DCI sent from the BS to the UE. EX-1003, ¶189.

4. Detailed Application to the Challenged Claims

Claim 1

[1.0] 1. A base station, comprising: a transceiver; a receiver; and a controller which controls the transceiver and receiver thereby performing operations including:

Gao's eNB is a “**base station**”⁴ including a transceiver (“**transceiver and receiver**”) that is controlled by a processor (“**controller**”) as depicted in Fig. 22.

EX-1003, ¶¶191-200.

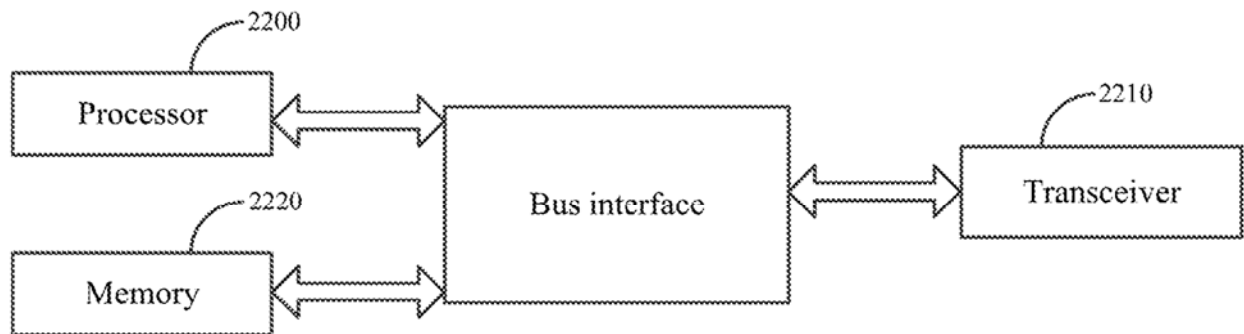


Fig. 22

EX-1007, Fig. 22.

FIG. 22 is an eNB ... the eNB includes: a processor 2200 configured ...to allocate DL regions in a time unit, where the time unit includes at least two DL regions; and a transceiver 2210 configured to receive and transmit data under the control of the processor 2200 to notify a UE of the allocated DL regions via configuration signaling.

⁴ EX-1001, 3:49-50.

EX-1007, 0222.

[1.1] transmitting, to a wireless device, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource, wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,

Gao discloses this element. Gao's eNB "*transmit[s]... a RRC signal*" that includes "a plurality of patterns of combinations of the sizes and the positions of DL regions [and] an uplink region..." to the UE ("*information on one or more allocations of a time-domain resource*"). EX-1007, 0151. The RRC signal (and patterns / regions) reflect allocated / configured time-domain resources for the "uplink shared channel" (PUSCH) and "downlink shared channel" (PDSCH). *E.g.*, EX-1004, 0148-0161; EX-1003, ¶¶202-241.

"[E]ach pattern includes an allocation of lengths and positions of the [DL/UL] regions in the time unit." EX-1007, 0011-0012, 0021-0022. *See also* EX-1007, 0031-0032, 0041-0042, 0051-0052, 0061-0062, 0095, 0106-0111, 0191-0192, 0206-0207, 0223-0224, 0239-0240 (collectively "Gao Pattern Citations"), claims 1-2 (patterns with a length and start position of the region); Figs. 4-19 (all showing allocated regions within time units).

Gao's "allocating module" may perform the claimed allocation.

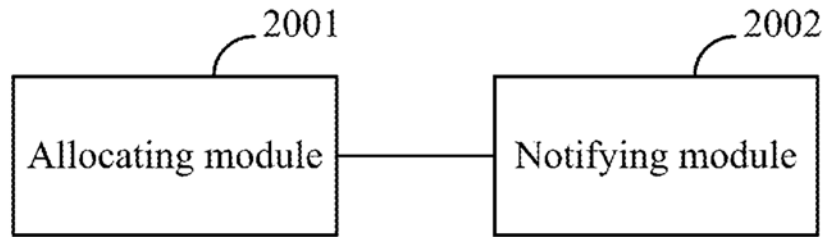


Fig. 20

EX-1007, Fig. 20, 0190. Fig. 2 depicts the allocation.

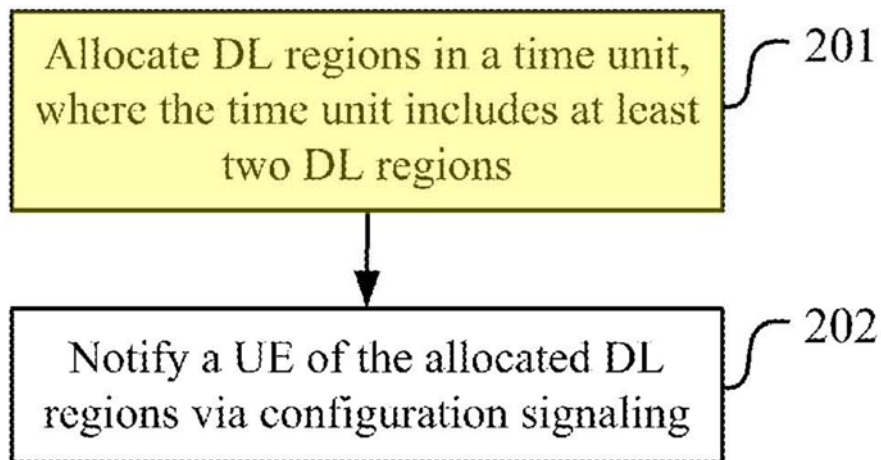


Fig. 2

EX-1007, Fig. 2, 0100.

Gao allocates “regions” within “time units” which are “one or more slots....” EX-1007, 0019. Figure 5 shows two “time units” each divided into multiple “regions” for downlink and uplink shared channels. EX-1003, ¶¶205-211.

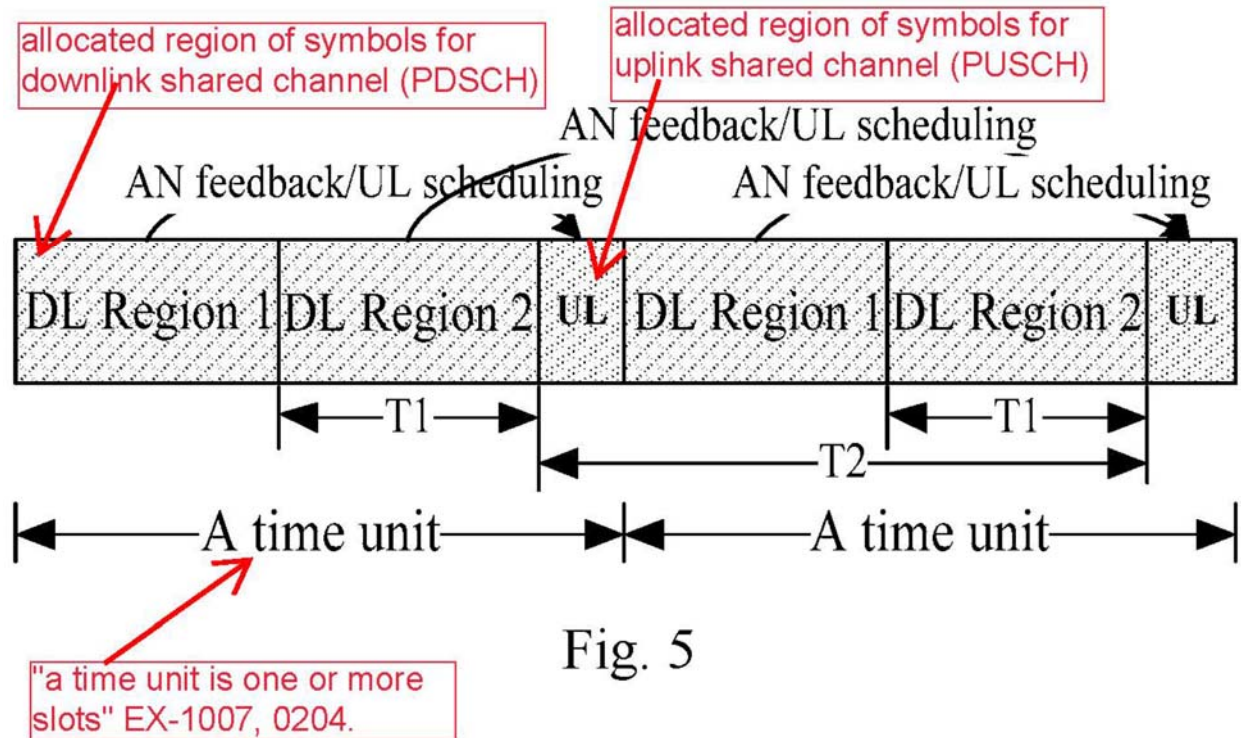


Fig. 5

EX-1007, Fig. 5, 0147-0161. The pattern can specify the time “length T” for each region. EX-1007, 0147.

Gao’s “regions” are (allocated) as, and include / identify, OFDM symbols (*“the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols”*). EX-1007, [0137] (control channel provides information for a “UE to determine a resource (e.g., a symbol or a mini-slot”). For example, Gao’s eNB “indicates a time domain position of the UL region directly, e.g., the number of a symbol, a micro-slot, a slot, a sub-frame, etc., ...” EX-1007, 0128. Gao’s allocation examples include “two symbols in the first DL region, and three symbols in the second DL region.” EX-1007, 0140. *See also* EX-1007, 0147 (“transmission in the DL [UL] region may occupy only a part of

OFDM symbols or a part of mini-slots in the DL[UL] region...”), 0170. EX-1003, ¶¶212-222.

Gao’s eNB may transmit (configure) the patterns with the allocated regions to the UE through higher-layer signaling such as RRC signals. “[T]he eNB can further pre-configure a DL region to be detected by the UE, and this configuration can be made semi-statically via Radio Resource Control (RRC) signaling....” EX-1007, 0159, 0179. A POSITA would understand Gao’s reference to pre-configuring a downlink (DL) region to disclose transmitting the patterns that define each region using RRC signals. EX-1003, ¶¶223-226.

If PO asserts the claims require resource’s only a single OFDM symbol, Gao discloses (including rendering obvious) such single OFDM symbol resources based on the disclosure above. Figures 4-19 each show regions of different sizes. Gao’s “region” can be any number of symbols and a “subset” of the available space. EX-1007, 0188; EX-1003, ¶¶225-226.

If PO argues that Gao does not expressly recite its “plurality of patterns” is transmitted via RRC, such an implementation is obvious, particularly in light of You. As noted above, Gao states that the “region” configuration uses RRC. EX-1007, 0159. Because regions are configured by patterns, it is at least obvious that the patterns are transmitted using RRC. EX-1003, ¶¶227-228.

You describes such RRC configuration. You’s resource allocation

“patterns” indicate “regions” for the PDSCH (DL shared channel), and those patterns are transmitted via RRC. *Infra*, Ground 2, [1.1] (incorporated herein); EX-1004, 0222-0224. A POSITA would recognize You’s explicit description of an implementation of Gao using RRC to transmit the patterns containing the regions (which Gao states are transmitted via RRC). EX-1003, ¶228.

[1.2] wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and;

Gao discloses this limitation for the reasons in [1.1]. EX-1003, ¶¶230-241.

Gao’s “regions” include symbols for PDSCH and PUSCH as shown in Figure 5:

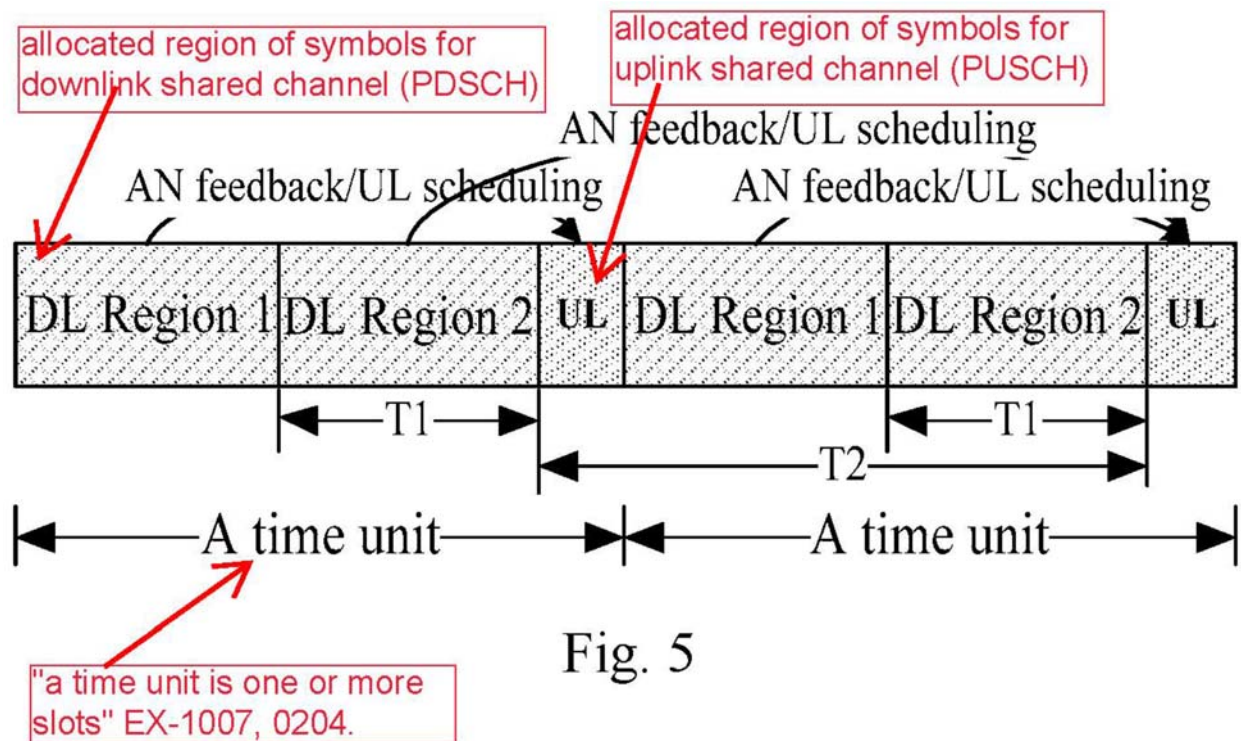


Fig. 5

EX-1007, Fig. 5, 0153 (“schedule the UE to receive a downlink shared channel in

the selected DL region, or to transmit an uplink shared channel in a corresponding UL region”); Figs. 4-19; EX-1003, ¶¶231-235.

The ‘272 patent references PDSCH and PUSCH as the “DL shared channel” and “UL shared channel.” EX-1001, 6:15-25. Gao pervasively “determines” the symbols for a “downlink shared channel” and/or a “uplink shared channel” identified by “regions” as detailed in [1.1]. The “determined” number of symbols is the number of symbols in the “regions” specified by the “patterns” as detailed in 1.1

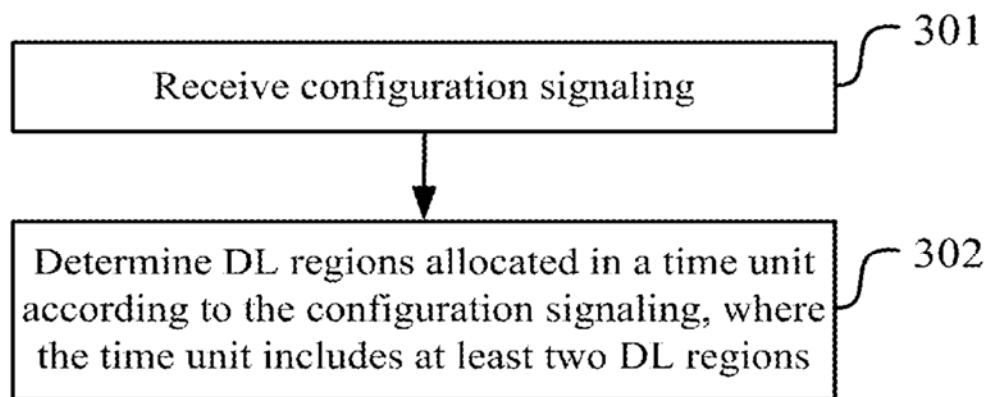


Fig. 3

EX-1007, Fig. 3, 0104, 0109, 0130, 0152, 0172, 0180, 0192-0220. Gao’s UE “determine[s] the DL regions allocated ... by: determining one of a plurality of predefined patterns according to the configuration signaling, where each pattern includes an allocation of lengths and positions of the DL regions in the time unit...” EX-1007, 0206. EX-1003, ¶¶238-241.

Gao discloses a “determining module” that may perform the claimed

determination:

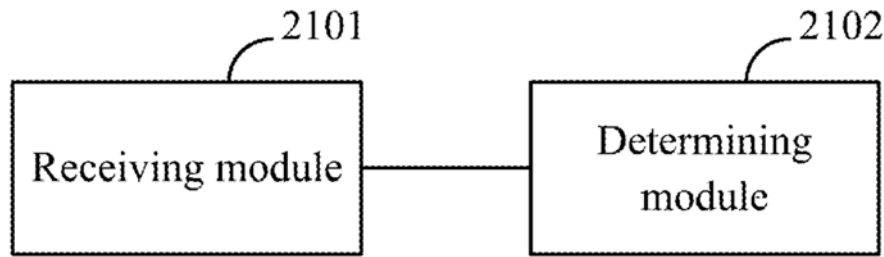


Fig. 21

EX-1007, Fig. 21; 0205-0209. Gao’s “detecting module” also performs the claimed determining. EX-1007, 0210-0212. EX-1003, ¶¶236-241.

[1.3] wherein the determined number of OFDM symbols is smaller than or equal to a number of OFDM symbols included in a slot; and;

Gao discloses this element. As detailed in [1.1], Gao’s “time unit is one or more slots” and may include multiple “regions” with OFDM symbols. EX-1007, 0149, 0204, 0219. Thus, the “regions” must be at least ***smaller than or equal to the number of OFDM symbols included in a slot.*** EX-1003, ¶¶243-245.

Furthermore, “a slot may be formed of 14 symbols.” EX-1001, 7:7. As identified in 1.1, Gao teaches regions including 1, 2 or 3 symbols – which is “***smaller than ... a number of OFDM symbols included in a slot.***” EX-1007, 0140. Gao’s regions may include OFDM “symbols” or “mini-slots” which meet this element also. EX-1007, 0147. EX-1003, ¶245.

[1.4] transmitting, to the wireless device, downlink control information (DCI), including a field including a bit string,

[1.5] wherein the bit string in the field relates to a row index of an allocation table, and

[1.6] wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.

Gao's "patterns" discloses (at a minimum, renders obvious) these inter-related elements reciting allocation transmission formats to the UE. EX-1003, ¶¶247-286. The DCI includes bits that "relate to" a row index into a "table" that includes information on a "starting OFDM symbol" and "the number of the OFDM symbols." While the '272 patent does not articulate any criteria to determine what is a "table" for the claims, at a minimum, Gao's patterns render obvious the claimed "table" implementation under any reasonable interpretation as detailed below.

Gao's "DCI" includes "configuration signaling" ("***bit string***") identifying "one of a plurality of predefined patterns" (rendering obvious "***relates to a row index of an allocation table***") "wherein each of the plurality of patterns includes an allocation of lengths and positions of the DL regions" (rendering obvious an "***allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols***") wherein each "region" is "***smaller than or equal to the number of OFDM symbols included in the slot***" (detailed in [1.3]). E.g., EX-1007, 0011-0012, 0191-0192. EX-1003, ¶¶249-285.

First, Gao's BS uses DCI to communicate the specific pattern to the UE through "configuration signaling."

the notifying module is configured to notify the UE of the allocated DL regions **via the configuration signaling** by: ... notifying the UE of one of a plurality of predefined patterns, where each pattern includes an allocation of lengths and positions of the DL regions in the time unit; ...

EX-1007, 0191. Gao's "notifying module" performs configuration signaling.

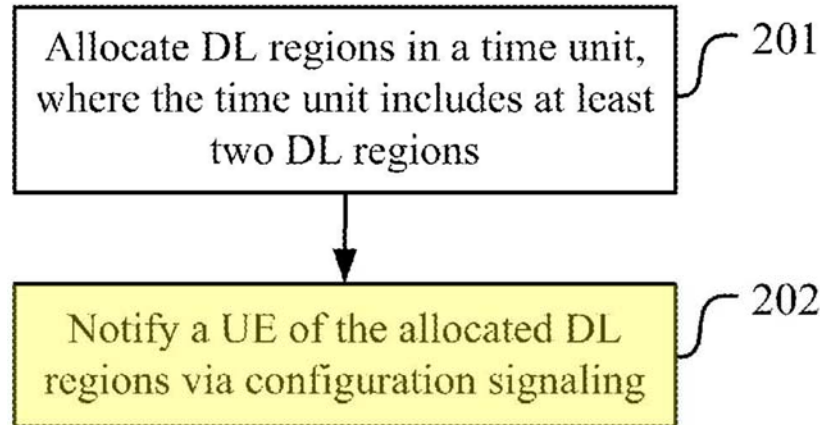


Fig. 2

EX-1007, Fig. 2; *see also* EX-1007, 0223-0224, 0011-0012, 0031-0032, 0051-0052, 0106-0107. In Gao, "one of the patterns can be indicated **via signaling**" from "a plurality of patterns of combinations of the sizes and the positions of DL regions, an UL region, and a GP region in a time unit [that are] predefined." EX-1007, 0151. EX-1003, ¶¶251-256.

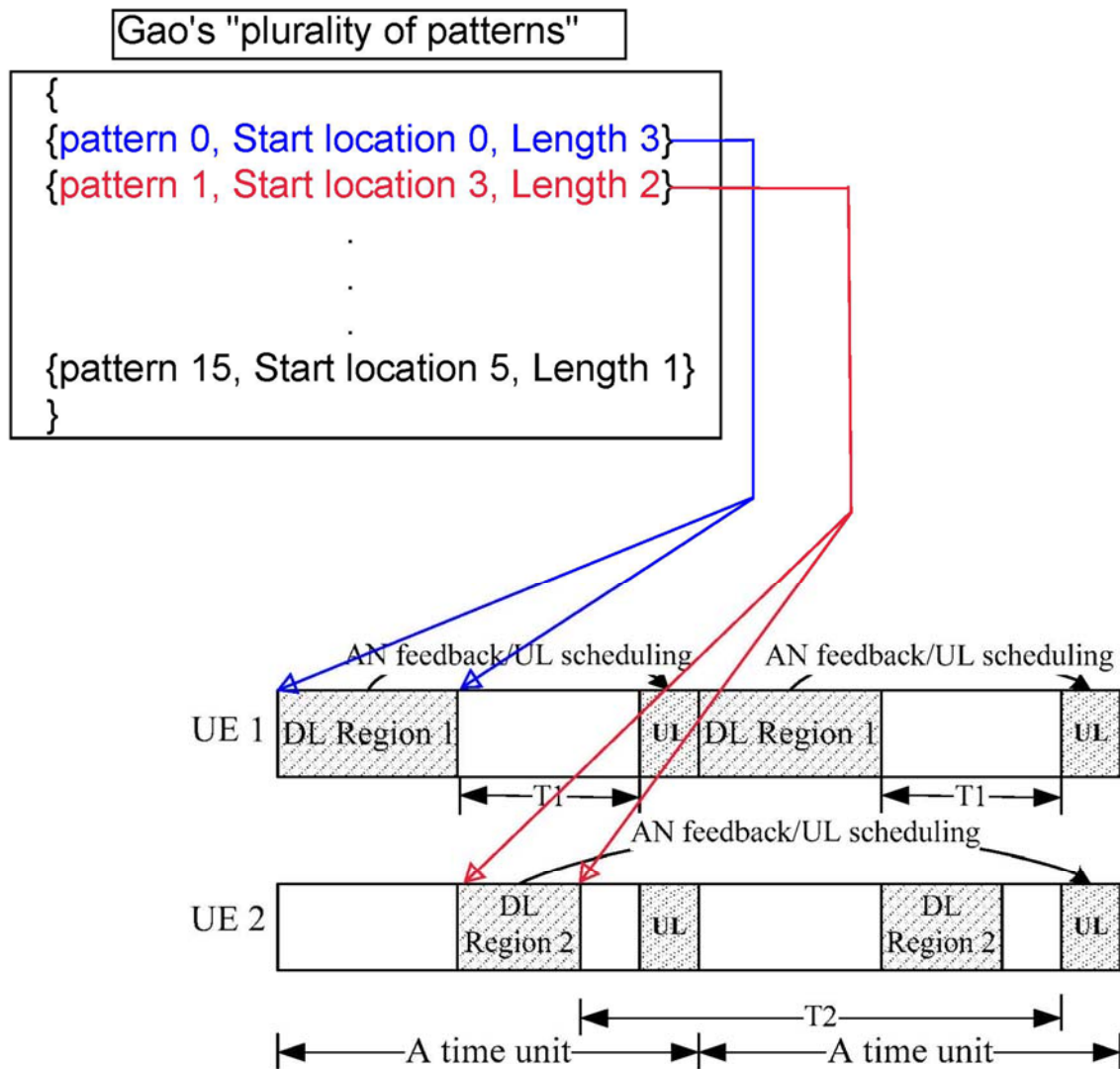
Gao's "configuration signaling" may be transmitted in the "Downlink

Control Information (DCI)” to the UE: “the configuration signaling ... can be transmitted in a control channel (e.g., in a preset Downlink Control Information (DCI) format...)” EX-1007, 0150. *See also* EX-1007, 0024 (“downlink control signaling”); 0209, 0151, 0154-0156 (eNB transmits DCI to “schedule... DL region[s]”). Scheduling transmissions also includes identification of the pattern with its associated region(s). The “configuration signaling” within DCI allows the UE to detect / determine the DL and uplink (UL) regions using the patterns. EX-1007, 0170, 0206 (“determining one of a plurality of predefined patterns according to the configuration signaling”), 0207-0211. EX-1003, ¶¶257-262.

Gao’s DCI provides the “configuration signaling” to “schedule a UE [] to receive a downlink shared channel” in various “DL regions” and “UL regions.” EX-1007, 0154-0158; 0160-0167; 0173-0185, 0239-0240. This “configuration” includes that the DCI specifies an index into a collection of resource patterns discussed in 1.1. A POSITA would recognize that it would be obvious to implement Gao’s “plurality of predefined patterns” as an “allocation table” and that the DCI information used by Gao to identify “one of” the patterns provides an index into those patterns. EX-1003, ¶¶263-265. Moreover, because it was known that the DCI was a collection of fields in a computer data structure, a POSITA would have understood the entries in the DCI, including Gao’s configuration signaling to be bit strings as claimed. EX-1003, ¶266.

The following example uses Gao's teaching for the downlink shared channel (PDSCH). The same analysis applies to Gao's uplink shared channel (PUSCH). Gao identifies a "plurality predefined pattern" and "each pattern includes an allocation of the length(s) and the position(s) of the DL region(s) in the time unit." EX-1007, 0011, 0191.

Gao's "plurality of predefined patterns" are illustrated in the example using Fig. 6 below. In Figure 6, "DL Region 1" appears slightly larger than "DL Region 2." Thus, using Gao's example of "two symbols in [one] DL region, and three symbols in [a different] DL region" (EX-1004, 0140), the pattern implementation using a table (top left) would have "plurality of predefined patterns, where each pattern includes an allocation of lengths and positions of the DL regions." Thus, for example, Gao would have, *e.g.*, patterns 0 to 15 as shown below with each pattern including the location (start) and length of a DL region:

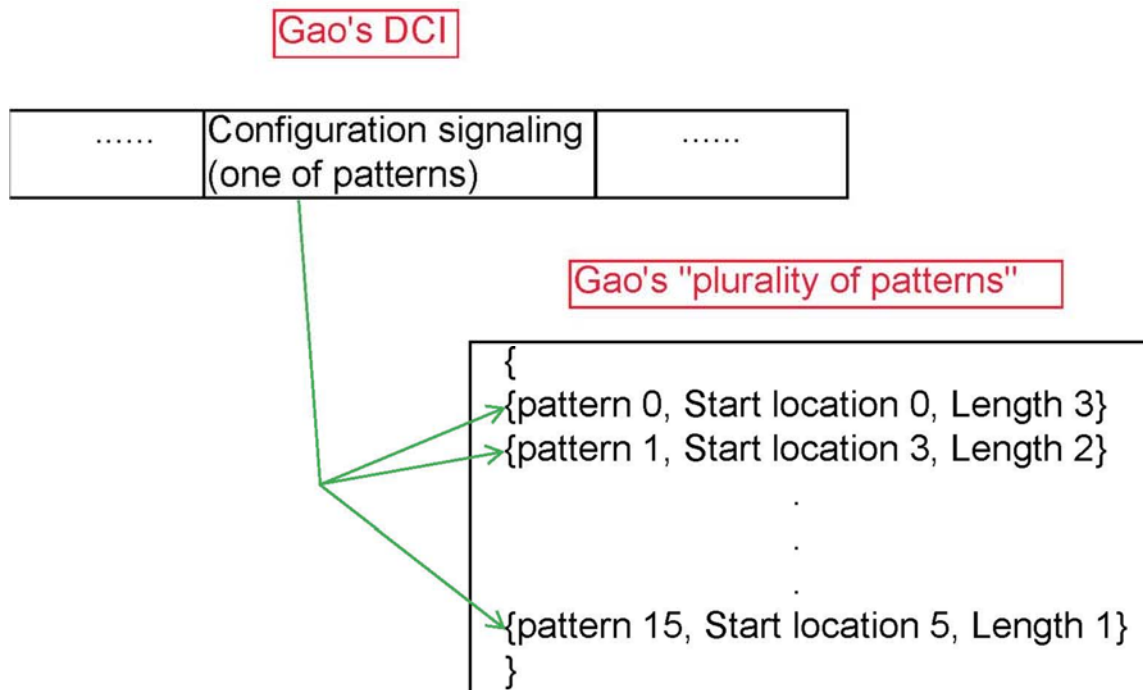


In this example, pattern 0 starts at symbol location 0 and has a symbol length of 3 symbols. Pattern 1 starts at symbol location 3 and has a symbol length of 2 symbols. Any of Gao's Figures 4-19 would provide a similar example of different patterns defining the region's start position and length. EX-1003, ¶¶267-270.

Moreover, the "plurality of predefined patterns" could include each pattern shown

in Figures 4-19 or some subset of those exemplary patterns or other patterns.⁵

As detailed above, Gao uses DCI “configuration signaling” to “notify[] the UE of one of [the] plurality of predefined patterns...” EX-1007, 0191-0192, 0206-0207, 0224, 0240, 0110. Pictorially, this would appear like:



⁵ Gao’s “pattern” might indicate multiple “regions.” In that embodiment, the set of patterns would reflect the multi-region patterns. *E.g.*, EX-1007, Figs. 4-19. Using multiple regions within one pattern does not impact the invalidity analysis – at least because the claims do not exclude such an arrangement. With a multi-region pattern, each pattern would include an indication (explicit or implicit) of the regions and their location / lengths. EX-1003, ¶¶271-273.

While Gao does not explicitly use the term “table” or “index,” Gao renders obvious such an implementation. Gao’s patterns have an “index” (either implicitly or explicitly) because Gao repeatedly describes the ability to specify “one of” the patterns in the DCI (or it would be necessary and/or obvious to include such an index). EX-1007, 0192, 0207, 0224, 0240, 0110; EX-1003, ¶¶274-283.

Gao’s “plurality of patterns” at least renders obvious a table implementation as claimed. As detailed in Section IV.F.2, a POSITA would understand a “table” in the ‘272 patent’s context to be rendered obvious by a data structure implementing an organized grouping of data that can be accessed by identifying one of the groupings through, for example, an index that is specified either implicitly or explicitly. EX-1003, ¶¶279, 138-163. Gao’s “predefined patterns” render obvious such a table data structure. In Gao, “each pattern includes an allocation of lengths and positions of the [DL/UL] regions in the time unit.” EX-1007, 0191-0192 (and citations above). Gao’s patterns each correspond to a table row identified by the “configuration signaling” index for the particular groupings for different time units. EX-1003, ¶¶280-281.

Furthermore, Gao’s patterns render obvious “allocation tables” as claimed because, as noted above, the patterns reflect the “allocation” of resources (*e.g.*, regions of OFDM symbols) for a particular “time unit.” EX-1003, ¶282. Gao’s patterns “*include[] information on a starting OFDM symbol and the number of*

the OFDM symbols” as claimed because “each pattern includes an allocation of lengths and positions of the [DL/UL] regions.” *E.g.*, EX-1007, 0011-0012; Gao’s Pattern Citations. Gao’s “position” for each region is “information on a starting OFDM symbol” because it identifies the OFDM symbol on which that region starts. EX-1003, ¶283; EX-1007, 0128 (“a time domain position of the [] region” can be “the number of a symbol”); 0137. Gao’s “length” of each region is “information on ... the number of the OFDM symbols” because it defines the length (in number of symbols) of that region. EX-1003, ¶283.

Furthermore, consistent with a POSITA’s understanding of Gao’s “plurality of predefined patterns” rendering obvious a table implementation, a POSITA would understand that it would be obvious to implement resource allocation “patterns” as “tables” indexed by bits specified in a DCI. EX-1003, ¶284. Such tables provide the benefit of a known data structure that can be efficiently indexed to be able to re-use data (the patterns) while minimizing the overall amount of transmissions. EX-1003, ¶284. The 3GPP standards already included “allocation tables” indexed by DCI bits. Such “patterns” were reflected in “tables” that are indexed by “bits” in a DCI. Section IV.F.5, *supra*. Notably, the 3GPP standards allocations have an essentially identical form to the one example in the Priority Application of a table. EX-1003, ¶¶101-113. PO claims priority to the Priority Application. EX-1014, at 6. Therefore, PO cannot object that the same table

format discloses, or renders obvious, the claimed table's format.

Finally, as detailed in [1.3], Gao's "regions" specified by "patterns" have *"smaller than or equal to the number of OFDM symbols included in the slot."*

EX-1003, ¶285.

If PO argues that Gao does not explicitly recite "bits" or a "bit string" in the DCI to index the patterns, You discloses such an implementation for the reasons detailed in [1.6] of Ground 2. For example, You details a DCI with resource allocation (RA) field using N bits used to index 2^N resource allocation patterns. EX-1004, 0222. A POSITA would recognize that You's "N bits" correspond to, and represent an implementation of, Gao's "configuration signaling" used as an index identifying one of the plurality of patterns. You provides the motivation to use You's implementation in identifying that this implementation will "reduce the size of a resource allocation (RA) field of DCI" which a POSITA would recognize as desirable to increase the wireless system's efficiency. EX-1003, ¶286.

Claims 8 and 15

Claim 8 is substantively the same as claim 1 except claim 8 is written from the "wireless device" perspective receiving transmissions from the "base station" in claim 1. Claim 15 is substantively the same as claim 8 except that claim 15 is a method reciting the steps recited in claim 8 for the "controller." Thus, claims 8 and 15 are invalid for the same reasons as claim 1.

For claims 8 and 15, the substantive analysis is in the corresponding element for claim 1. For example, elements 8.6 and 15.6 are disclosed for the reasons cited in element 1.6. The Claim Element Table above provides the element numbering.

Gao's "UE" is the claimed "wireless device" that receives allocation information and determines allocated symbols. EX-1007, Fig. 23, 0238-0253, claim 1; EX-1003, ¶¶288-291; EX-1001, 4:40-53.

B. Ground 2: Claims 1-20 Are Invalid Over You alone or in combination with Gao

In this combination, You is the primary reference. Gao supplements You's teachings as noted in elements below. Primarily, Gao provides an explicit teaching that each pattern in the set of patterns includes a location (start position) and length (number of symbols) for the allocated regions.

The references (You and Gao) and the general motivations to combine are detailed in Ground 1 and incorporated herein.

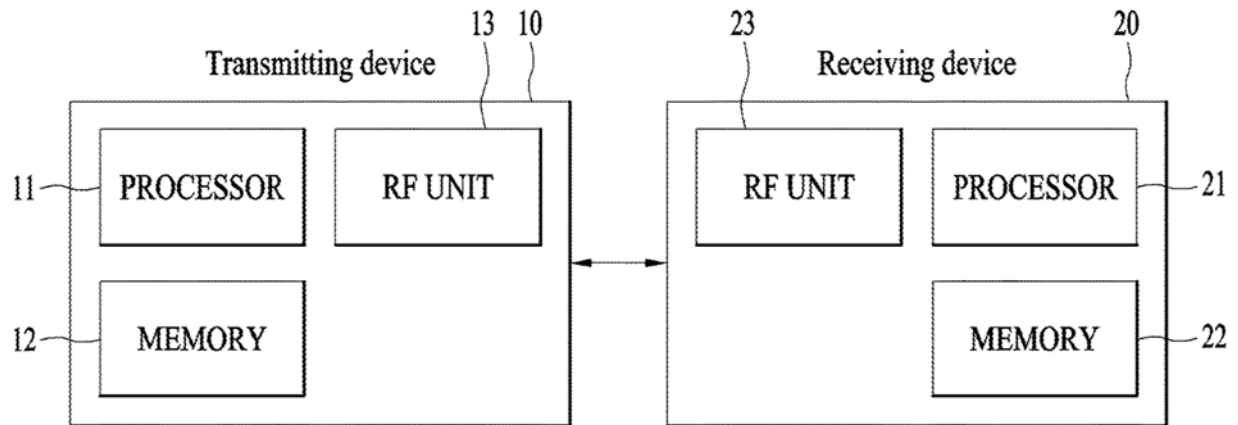
1. Detailed Application to the Challenged Claims

Claim 1

[1.0] A base station, comprising: a transceiver; a receiver; and a controller which controls the transceiver and receiver thereby performing operations including:

You's "eNB" ("***base station***", EX-1001, 1:60-2:49) includes an RF unit ("***transceiver***" and "***receiver***") that is controlled by a processor ("***controller***") as depicted in Fig. 14. EX-1003 ¶¶295-300.

FIG. 14



EX-1004, Fig. 14, 0324-0327.

You's eNB "processors ... generally control the overall operation ... [and] may be referred to as controllers, microcontrollers...." EX-1004, 0327, 0325 (describing RF unit transmitting / receiving data), 0327-0335 (describing BS and UE transmitting/receiving data). In downlink, the eNB transmits to the UE. In uplink, the eNB receives from the UE. EX-1004, 0331. EX-1003 ¶¶299-300.

[1.1] transmitting, to a wireless device, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource, wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,

You's eNB transmits RRC signals including "resource patterns" that are

(and include) “*information on ... allocations⁶ of time-domain resources*” for channels including sPDSCH (“shortened PDSCH”) EX-1004, 0038. You’s resource patterns “indicate ... a resource region in which the sPDSCH is transmitted within an OFDM symbol region.” EX1004, 0222. The “resource region” is an allocation of time-domain resources including one or more OFDM symbols. EX-1003, ¶¶303-318. You discloses this element. EX-1003, ¶¶302-337.

First, You’s eNB transmits RRC signals that include “resource patterns” with resource configuration / allocation information.

Each sPDSCH transmission resource pattern indicated by the RA field may be configured by an RRC layer. The UE may receive configuration information about the sPDSCH transmission resource pattern(s) through an RRC signal and determine that one of the sPDSCH transmission resource pattern(s) configured by the RRC signal is an sPDSCH transmission resource, based on the value of the RA field. EX-1004, 0224. EX-1003, ¶¶307-308.

You repeatedly states that RRC transmits resource allocation information.

⁶ You uses “configure” (or “configuration”) to describe allocating resources and conveying allocations to a UE. The ‘272 patent uses “configure” (or variants) to describe resource allocation. EX-1001, 9:24-49, 10:19-49. EX-1003, ¶304.

“Allocation of sPDSCH PRB ... [t]he PRB resource in which the PDSCH can be scheduled may be ... configured through RRC by the eNB.” EX-1004, 0204-0205, 0215-0220. EX-1003, ¶309.

You’s “resource patterns” include information on resource allocation such as the “resource region” allocated to PDSCH.

Such an sPDSCH transmission resource pattern may indicate only a PRB resource region in which the sPDSCH is transmitted.

Alternatively, the sPDSCH transmission resource pattern may indicate not only the PRB resource region in which the sPDSCH is transmitted but also a resource region in which the sPDSCH is transmitted within an OFDM symbol region in which the sPDCCH is transmitted in the PRB resource region in which the sPDSCH is transmitted.

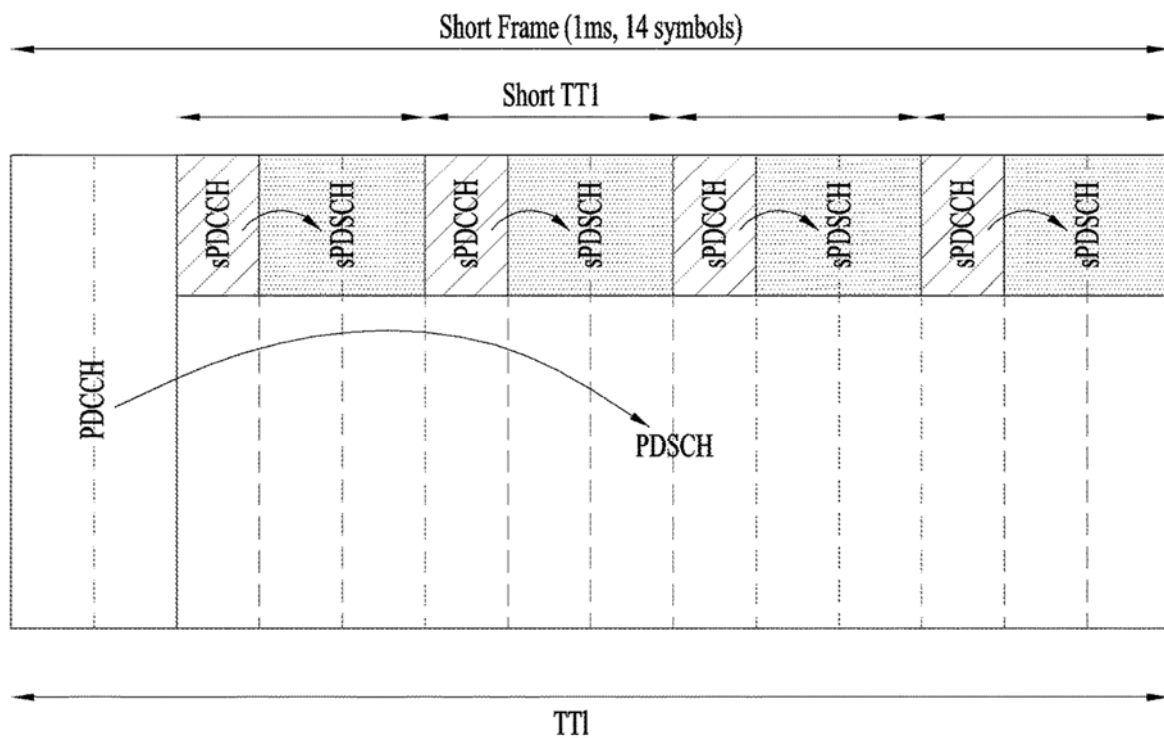
EX-1004, 0222. EX-1003, ¶¶310-313. “[A] plurality of resource patterns in which the sPDSCH can be transmitted may be defined and pattern information indicating through which pattern among the plural patterns the sPDSCH is transmitted may be used as the indication information.” EX-1004, 0321.

You’s “resource regions” are, or include, “*information on one or more allocations of a time-domain resource, wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols*” as claimed. You discloses “*allocations of a time-domain*

resource” in multiple fashions that each allocate OFDM symbols. EX-1003, ¶¶314-332.

You teaches a “shortened TTI (sTTI)” (transmission time interval”) with one or more OFDM symbols. EX-1004, 0144-146, 0058.⁷ For example, Figure 7 shows a “TTI” with 14 symbols and four sTTIs each with three OFDM symbols.

FIG. 7



EX-1004, Fig. 7, 0149; EX-1003, ¶¶315-323. You’s exemplary sTTIs have 2, 3, 4,

⁷ The ‘272 patent acknowledges that TTI is a “time domain scheduling unit” known in 3GPP. EX-1001, 6:45-54.

or 7 OFDM symbols. EX-1004, 0145. You's Figures 7-13 show examples of sTTIs of 2-7 OFDM symbols. EX-1004, Fig. 7-13. EX-1003, ¶¶319-323. As detailed in [1.3] (and shown in Figs. 2-7), the sPDDCH may occupy 1-4 of the sTTI symbols. Therefore the sPDSCH allocation can be 1 symbol (e.g., in a sTTI of 2 symbols with 1 sPDCCH symbol).

“The eNB processor and the UE processor ... are configured to allocate/decode a signal within an sTTI which is shorter than a legacy TTI. The sTTI may consist of OFDM symbols.” EX-1004, 0332. *See also* EX-1004, 0062-0067 (describing transmission structure using “OFDM symbols in the time domain” and organized into resource blocks, slots, and resource elements comprised of OFDM symbols), 0093, 0146. EX-1003, ¶¶324-327.

You allocates “OFDM symbol regions” which transmit PDSCH data and which are allocated for sTTIs:

[A] PDSCH transmitted within an sTTI (i.e., sPDSCH) may be transmitted. For example, referring to FIG. 7, a plurality of the sTTIs may be configured within one subframe, using different OFDM symbols. For example, the OFDM symbols in the subframe may be divided into one or more sTTIs in the time domain. OFDM symbols constituting an sTTI may be configured, ... Transmission of the

...sPDSCH may be performed in a TDM manner within the sTTI, using different OFDM symbol regions.

EX-1004, 0149. *See also* EX-1004, 0227 (“The sPRB may be configured by OFDM symbol(s) within the sTTI in the time domain...”); 0228 (“an sPRB for the sPDSCH ... may be configured by OFDM symbol(s) within the sTTI in the time domain...”); 0199. EX-1003, ¶¶328-330.

You’s “resource patterns” may configure / allocate “resource regions” within “OFDM symbol regions” for PDSCH – used, for example, to establish sTTIs as detailed above. EX-1004, 0222. These resource regions and “OFDM symbol regions” are an “**allocation of a time-domain resource**” of one or more OFDM symbols. EX-1003, ¶¶331-332.

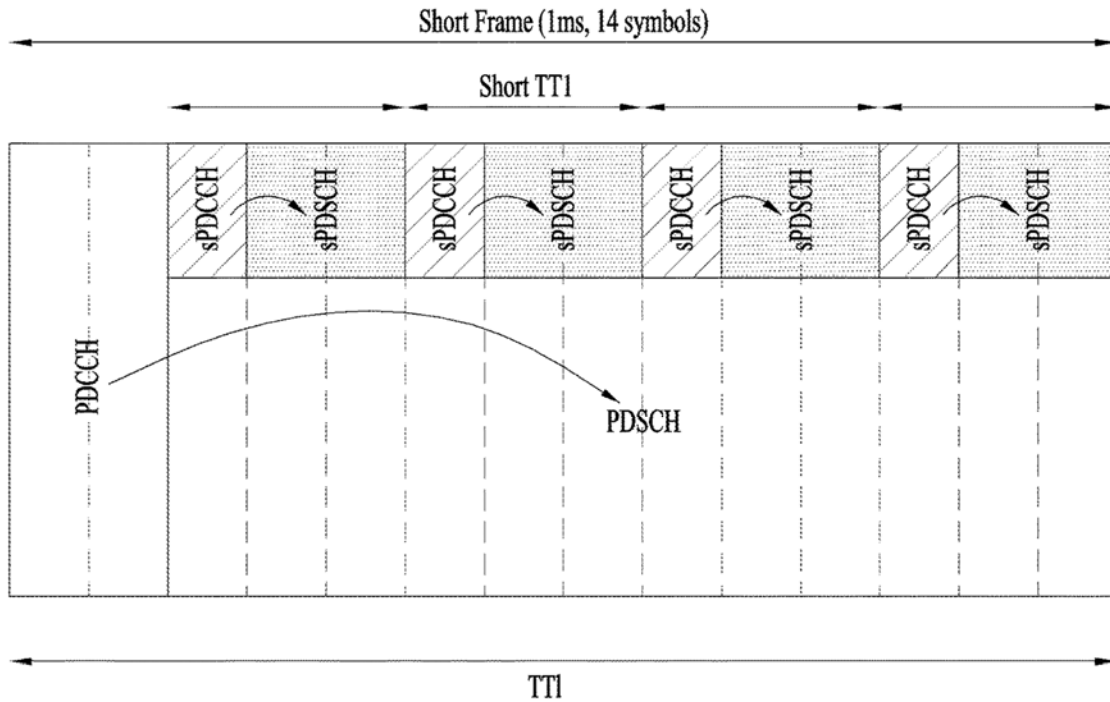
The ‘272 patent’s preferred embodiments used the same “short TTI” with 2 or 3 symbols that You teaches. EX-1001, 9:21-10:18. “[A] short TTI [is] formed in the TTI (the size of a mini-slot corresponding to the short TTI, e.g., 2 symbols or 3 symbols in the above example)....” EX-1001, 10:9-12; 9:54-10:23; EX-1003, ¶¶333-337.

[1.2] wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and;

You discloses this limitation for the reasons in [1.1]. EX-1003, ¶¶339-345.

For example, You allocates OFDM symbols for sPDSCH in Figure 7:

FIG. 7



EX-1004, Fig. 7. EX-1004, 0198-0225. “Determined” in this context includes to identify the number of allocated OFDM symbols (e.g., for the sTTI or regions).

EX-1001, 10:5-12. EX-1003, ¶341. You’s “sPDSCH” is “a shortened PDSCH” which is a PDSCH. EX-1004, 0038, 0149; EX-1003, ¶¶339-342.

You’s UE “determine[s]” the number of symbols by receiving and using the allocation configuration information to successfully receive, identify, and decode the allocated OFDM symbols. EX-1003, ¶343.

As noted in [1.1], You’s eNB determines the pattern of OFDM symbols

allocated for each channel (e.g., PDSCH) as shown in Figs. 7-13. These patterns identify one or more “regions.” You’s BS “determines” a number of OFDM symbols by specifying the specific “region” corresponding to PDSCH as detailed in [1.4] below. EX-1003, ¶344.

You’s BS communicates these patterns (and the regions specified therein) to You’s UE through the “resource patterns” discussed in [1.1] which may be transmitted using RRC signals. EX-1004, 0221-0224, 0321-0323. You’s BS identifies the specific “pattern” to You’s UE using DCI transmission as detailed in [1.4]. The UE uses this DCI to determine specific OFDM symbols for a channel such as PDSCH and uses that information to receive the specific channels. EX-1004, 0332. EX-1003, ¶345.

[1.3] wherein the determined number of OFDM symbols is smaller than or equal to a number of OFDM symbols included in a slot; and;

You discloses this element. “[A] slot [may be] formed of 14 symbols.” EX-1001, 7:7. As detailed in [1.1], You’s “sTTI” examples teach PDSCH region allocations of 2-4 or 7 OFDM symbols. EX-1004, 0145. Thus, You teaches that ***“the determined number of OFDM symbols is smaller than ... the number ... in a slot.”*** EX-1003, ¶347-350.

Moreover, the sTTI may contain 1 to 4 OFDM symbol used for PDCCH (not PDSCH). EX-1004, 0067, Figs. 7-13, 0222-0224. Thus, using You’s examples of

sTTIs with 2-4 or 7 OFDM symbols, the number of PDSCH OFDM symbols specified by the pattern(s) for the sTTI will be less than the number of OFDM symbols in a slot, including that the PDSCH may have only one symbol. *See also* EX-1004, 0199-0220 (showing “methods” in which PDSCH is within an allocation including PDCCH and therefore less than the number of symbols in a slot). In a slot containing both PDCCH and PDSCH symbols, the number of PDSCH symbols is “*smaller than or equal to a number of OFDM symbols included in a slot*” as claimed. EX-1003, ¶350.

[1.4] transmitting, to the wireless device, downlink control information (DCI), including a field including a bit string,

As noted in Ground 1, [1.4]-[1.6] recite a well-known data format for transmitting resource allocations in 3GPP systems. These elements recite: (1) using an “allocation table”; (2) the “allocation table” includes the start OFDM symbol and number of OFDM symbols; and (3) indexing the “allocation table” by DCI bits. You teaches (and/or renders obvious) these concepts / elements – particularly in light of the well-known 3GPP usage of such tables. EX-1003, ¶¶352-366; Section IV.F.5.

You transmits “***downlink control information (DCI)***” including a “resource allocation (RA) field” (“***a bit string***”) identifying a specific resource pattern from the set of patterns:

[0221] Method 7. Resource Pattern Indication

[0222] To reduce the size of a resource allocation (RA) field of DCI, each value indicated by the RA field may mean a specific sPDSCH transmission resource pattern. For example, a pattern actually applied to an sPDSCH among 2^N sPDSCH transmission resource patterns may be indicated to the UE through N bits.

[0223] For example, an sPDSCH transmission resource pattern meant by each value indicated by the RA field may be configured as follows. With respect to each PRB size (i.e., the number of PRBs), multiple (e.g., 2) PRB patterns may be present. A PRB size of the sPDSCH and one pattern index among a plurality of PRB patterns for the PRB size may be indicated through the RA field.

[0224] Each sPDSCH transmission resource pattern indicated by the RA field may be configured by an RRC layer. The UE may ... determine that one of the sPDSCH transmission resource pattern(s) configured by the RRC signal is an sPDSCH transmission resource, based on the value of the RA field.

EX-1004, 0221-0224. The DCI in existing 3GPP standards included an “RA” field of bits. EX-1003, ¶¶353-355.

You teaches three options for a DCI field to transmit the pattern index of resource patterns.

[A] plurality of resource patterns in which the sPDSCH can be transmitted may be defined and pattern information indicating through which pattern among the plural patterns the sPDSCH is transmitted may be used as the indication information. The indication information indicating a resource pattern used for transmission of the sPDSCH may be transmitted through an explicit field in DCI, may be transmitted using an additional one or multiple bits in an RA field, or may be transmitted through the RA field.

EX-1004, 0321. *See* EX-1004, 0322-323, 0320, 0074 (“DCI includes resource allocation information for a UE”); 0152 (“DCI may configure a transmission resource of the sPDSCH/sPUSCH....”). EX-1003, ¶¶356-358.

A POSITA would understand You’s use of a DCI field to include “a field including a bit string.” EX-1003, ¶359. As discussed above, You discloses “ 2^N sPDSCH transmission resource patterns may be indicated to the UE through N bits.” EX-1004, 0222. Thus, for example, if You’s “ N ” was three, there would be 3 DCI bits used to index one out of $2^N (= 8)$ patterns.

If PO argues a “bit string” differs from You’s disclosure of using bits as an index, then You’s disclosure, at a minimum, renders obvious such a bit string. To make such an argument, PO would have to assert that four bits (e.g., “1011”) is different in a “string” format from the binary interpretation of 1011 (which would

be a decimal value of 11). No disclosure in the '272 patent supports such a distinction nor is it patentable. EX-1003, ¶360.

You teaches a highly optimized mechanism in which the number of bits in the RA field used for identifying the pattern is minimized. EX-1004, 0222. A POSITA recognizes such optimization provides benefits by reducing the overall number of bits necessary to transmit wirelessly to identify the allocation information (resource patterns). EX-1003, ¶¶361-362.

If PO argues the bit string must be included within the allocation table, a POSITA would recognize that You's disclosure, at a minimum, renders obvious such an implementation of the patterns. As detailed in Section IV.F.5, it was known within 3GPP to include such bit strings in resource allocation tables. Moreover, the '272 patent's disclosure (and the Priority Application's disclosure) is virtually identical to known structures in 3GPP standards. Section IV.F.5. EX-1003, ¶¶362-364.

A POSITA viewing You's disclosure would understand that You renders obvious multiple implementations. In one implementation, the DCI bit string itself is interpreted as the row index into the resource pattern table. In another implementation, the DCI bit string may be matched against bit strings in the resource pattern table to identify the row in the resource pattern allocation. EX-1003, ¶¶364-365. Selecting from two well-known implementations is, at a

minimum, obvious over You's disclosure. Moreover, if the '272 patent is limited to a particular implementation, such implementation does not provide patentability – particularly in light of the known 3GPP implementations and the '272 patent's effective copying of such 3GPP implementations. EX-1003, ¶366.

[1.5] wherein the bit string in the field relates to a row index of an allocation table, and.

You renders obvious this element. EX-1003, ¶¶368-375. As detailed in [1.1]–[1.4], You describes “a plurality of resource patterns” (rendering obvious an “***allocation table***” implementation) defining time resources allocations (OFDM symbols). EX-1004, 0221-0224, 0321. As detailed in [1.4], You teaches a DCI “RA” field which is a “pattern index” [***bit string ... relates to a row index...***] identifying a “specific sPDSCH transmission resource pattern.” EX-1004, 0222. A POSITA would recognize that You's “resource patterns” (detailed in [1.1]–[1.4]) render obvious an “allocation table” implementation of the patterns. Each “pattern” identifies an allocated region for the PDSCH as detailed in [1.1]–[1.3]. EX-1004, 0222-0224, 0321. EX-1003, ¶¶368-370.

Thus, PO's only possible dispute would be that You does not explicitly recite the patterns are a “table.” A POSITA would recognize You's collection of resource patterns renders obvious an implementation in the claimed “table” format, including for the same reasons cited for Gao in Ground 1 for [1.6].

A POSITA would understand a “table” to be rendered obvious by a set of

data entries in which each entry (row) may be identified (indicated) by an index.

Section IV.F.2. You describes such a set of data entries. There is a set of “resource patterns” in which a “pattern index” (bits in the RA field) identifies / indicates each entry in the set. EX-1003, ¶¶371-375

The ‘272 patent mirrors You’s (earlier) disclosure of using a number of bits (“N”) to index 2^N rows corresponding to entries in the ‘272 patent’s table. The ‘272 patent’s examples use three bits for 8 table rows and 4 bits for 16 rows. EX-1001, 10:19-11:58. This corresponds to You’s teaching that the number of bits (“N”) can index 2^N patterns. EX-1004, 0222. Similarly, the ‘272 patent uses the term “indication information” to reference the DCI field identifying the table entry for PDSCH and PUSCH allocations. EX-1001, 11:49-55;10:22-24. You similarly uses the term “indicate” to refer to identifying the resource pattern (table) entry that includes PDSCH allocations. EX-1004, 0222-0224, EX-1003, ¶374.

Thus, a POSITA would understand You’s resource patterns render obvious the claimed “allocation table” implementation under any reasonable understanding of “table.” EX-1003, ¶375.

[1.6] wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.

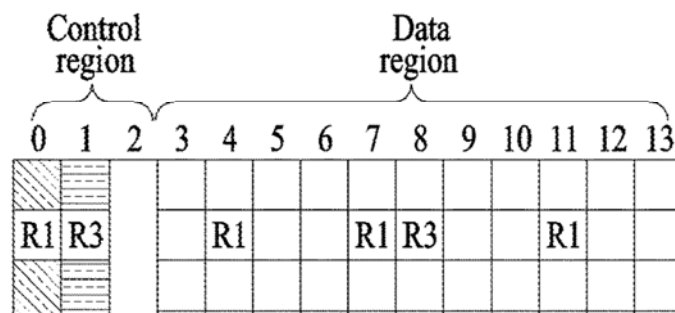
You renders obvious this element alone, or in combination with Gao. EX-

1003, ¶¶377-391. As detailed in [1.3-1.5], You allocates OFDM symbols within “regions” identified within a set of “resource patterns” that render obvious the claimed “*allocation table*.” As detailed for [1.3], You’s allocated number of OFDM symbols is “*smaller than ... the number of OFDM symbols included in the slot*.”

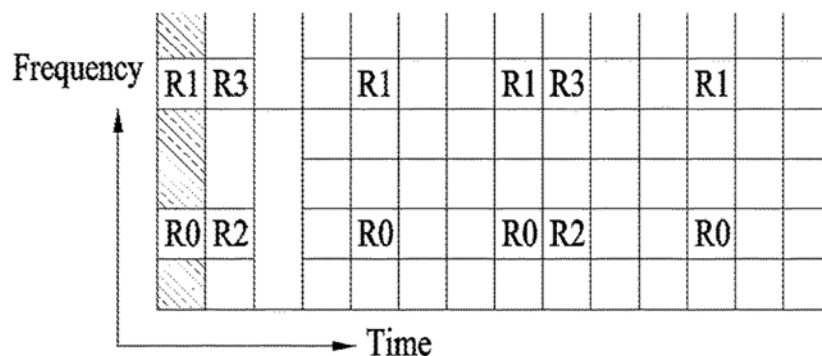
A POSITA would understand You’s “regions” within the “patterns” to disclose, or suggest, “*information on a starting OFDM symbol and the number of the OFDM symbols*” for each pattern. EX-1003, ¶¶378-386. Thus, You’s disclosure by itself renders obvious claim 1.

First, You’s “regions” teach or suggest the start OFDM symbol and number of symbols in the “region.” The plain meaning of “region” within You’s context includes a specific identification of a starting point and number of OFDM symbols. EX-1003, ¶¶379-385. You’s Figure 3 exemplifies “regions.”

FIG. 3



...



EX-1004, Fig. 3 (excerpted). You defines “regions” in terms of OFDM symbols including the starting OFDM symbol and the length/number of symbols in the time domain:

Referring to FIG. 3, a maximum of 3 (or 4) OFDM symbols located in a front part of a first slot of a subframe corresponds to the control region. ... OFDM symbols other than the OFDM symbol(s) used in the control region correspond to the data region to which a physical downlink shared channel (PDSCH) is allocated. Hereinafter, a resource region available for PDSCH transmission in the DL subframe is referred to as a PDSCH region.

EX-1004, 0067. EX-1003, ¶¶381-384. *See also* EX-1004, 0222 (“sPDSCH transmission resource pattern may indicate not only the PRB resource region in which the sPDSCH is transmitted but also a resource region in which the sPDSCH is transmitted within an OFDM symbol region in which the sPDCCH is transmitted in the PRB resource region in which the sPDSCH is transmitted”); 0149 (“OFDM symbols constituting an sTTI may be configured, ... Transmission of the sPDCCH

and sPDSCH may be performed in a TDM manner within the sTTI, using different OFDM symbol regions").

You devotes an entire section to "D. Starting OFDM Symbol location of sPDSCH Transmission." EX-1004, 0226-0300. Within Section D, You describes methods of identifying the starting PDSCH OFDM symbol location. One method corresponds to the "patterns" above. First, You repeatedly states "[t]he sPDSCH transmission starting OFDM symbol location may be semi-statically configured by the eNB through ... an RRC signal." EX-1004, 0243, 0248, 0262, 0268, 0279, 0285, 0292. This "RRC signal" corresponds to You's teaching that the patterns are transmitted using RRC signals as detailed for [1.1]. A POSITA would understand this teaching to disclose the "starting" OFDM symbol location would be identified within the patterns configured by RRC. EX-1003, ¶¶385.

Second, as detailed in Section IV.F.5, a POSITA would have understood that one known obvious implementation of "resource patterns" was an allocation table including the start resource and the number of allocated resources. EX-1003, ¶386.

Third, if PO argues that You does not disclose this element, then You combined with Gao discloses that each pattern includes "***information on a starting OFDM symbol and the number of the OFDM symbols.***" As detailed in Ground 1, Gao's system mirrors You's system in which the BS allocates OFDM symbols for transmitting PDSCH and PUSCH using "patterns." EX-1003, ¶¶387-390.

Gao's allocation patterns include "*information on a starting OFDM symbol and the number of the OFDM symbols.*" *Supra*, Ground 1, [1.6] (incorporated by reference herein). *E.g.*, EX-1007, 0011-0012 ("each pattern includes an allocation of a length and a position of the [] region in the time unit").

Thus, in this proposed combination, You's resource patterns (supplemented by Gao's teachings) include the PDSCH region's position ("*a starting OFDM symbol*") and length ("*the number of the OFDM symbols*"). EX-1003, ¶¶389-390

As detailed in [1.3], the number of OFDM symbols for PDSCH is smaller than the number of OFDM symbols in the slot. EX-1003, ¶391.

Claims 8 and 15

As noted for Ground 1, claims 8 and 15 substantively match claim 1 written from the UE perspective receiving signals transmitted by the BS recited in claim 1.

You's "receiving device" ("UE") is a "wireless device" receiving allocation information and determining allocated symbols. EX-1004, Fig. 14, 0324-0334, 0003-0008, claims 1-10; EX-1003, ¶¶393-395; EX-1001, 4:40-53.

C. Analysis of Dependent Claims 2-7, 9-14, and 16-20 For Grounds 1 And 2.

The dependent claims' analysis is the same for Ground 1 and Ground 2 and does not depend upon which of Gao or You is used as the primary reference. The dependent claims recite features and functionality largely separate from the independent claims. Thus, these claims are invalid using either Ground 1 or Ground 2 combined with the analysis below.

Dependent claims 9-14 recite substantively the same elements as claims 2-7. Claims 16-20 recite substantively the same elements as claims 2-6. Thus, claims 9-14 and 15-20 are invalid for the same reasons discussed above for claims 2-7 and these claims are presented together.

Claims 2, 9, 16

The base station [wireless device / method] of claim 1 [8 / 15], wherein the bit string is 3 bits in length.

This limitation is disclosed by the Grounds 1 and 2 combinations. The bit string size reflects an implementation detail related to the maximum number of allocation table entries and does not independently impart patentability. The '272 patent does not identify any benefit to "3 bits" over any size. EX-1003, ¶¶400-401.

Gao's disclosure does not limit the number of pre-defined patterns in Gao's patterns set. Thus, Gao, at a minimum, renders obvious any number of patterns including, for example, a set of eight patterns that could be uniquely, and

efficiently, indexed by 3 DCI bits. EX-1003, ¶402.

You identifies why, and how, a POSITA would select a specific number of bits:

To reduce the size of a resource allocation (RA) field of DCI, each value indicated by the RA field may mean a specific sPDSCH transmission resource pattern. For example, a pattern actually applied to an sPDSCH among 2^N sPDSCH transmission resource patterns may be indicated to the UE through N bits.

EX-1004, 0222. Thus, for example, a bit string of 3 bits can efficiently index $2^3 = 8$ different patterns. EX-1003, ¶¶403-404.

Finally, the ‘272 patent’s disclosure of a 3-bit resource allocation table matches, almost verbatim, a known 3GPP resource allocation table. Section IV.F.5. EX-1003, ¶¶101-113.

Thus, the combination discloses this claim.

Claims 3, 10, 17

The base station [wireless device / method] of claim 1 [8 / 15], wherein the DCI further includes information on one or more allocations of a frequency-domain resource.

This limitation is disclosed by the combinations. EX-1003, ¶¶407-415. The sole disclosure within the ‘272 patent related to this element is one passage stating “allocation information of frequency resource (RB) ... may be included in DL

control information.” EX-1001, 9:8-12. The combined disclosure of You and Gao discloses this claim in greater detail and renders this claim obvious.

You (like the ‘272 patent) identifies that “Resource blocks (RBs)” are allocations “in the frequency domain.” EX-1004, 0062. In You, “[t]he DCI includes resource allocation information for a UE....” EX-1004, 0074. You’s allocations include different frequency blocks. EX-1004, [0063-0067]. You’s RB is “mapped to one physical resource block (PRB)” and “ N_{sc}^{RB} (e.g. 12) consecutive subcarriers in the frequency domain.” EX-1004, 0064-0065. EX-1003, ¶408.

You’s “PRB resource location within the PRB resource may be transmitted through DCI or fast DCI.” EX-1004, 0202-0203. You repeatedly teaches that the DCI information can include the PRB resource location. EX-1004, 0206-0209. The “PRB resource location” identifies the specific PRB and discloses *“information on one or more allocations of a frequency-domain resource.”* EX-1003, ¶409.

Moreover, You teaches that the TTI / sTTIs may occupy “some or all frequency resources in the frequency band of the default TTI.” EX-1004, 0146. Identifying “some” allocated frequency resources teaches using information in the DCI. EX-1003, ¶410.

Furthermore, You teaches “[a] PRB size of the sPDSCH and one pattern index among a plurality of PRB patterns for the PRB size may be indicated

through the RA field.” EX-1004, 0223. The RA field is within the DCI. EX-1004, 0222. Given that “PRB size” is “the number of PRBs” allocated and the number of PRBs relates to the frequency allocation, the PRB size in the DCI discloses “information on one or more allocations of a frequency-domain resource.” EX-1003, ¶¶411-413.

Thus, this combination discloses claim 3.

It would also be obvious to include such frequency allocation information because Gao and You each describe “regions” for allocations. Such “regions” are defined in one axis by time (OFDM symbols) and in the other axis by frequency. Thus, to be able to define a 2-dimension region, a POSITA would have found it obvious that the DCI includes both the time domain and frequency domain axes information to define what frequency domain resource extents are allocated by the “region.” EX-1003, ¶414.

Finally, given that existing 3GPP standards already included a DCI field with “*information on one or more allocations of a frequency-domain resource*,” it would have been obvious to include such information when implementing Gao and/or You. *Infra*, Grounds 3 and 4. EX-1003, ¶415.

Claims 4, 10, 18

The base station [wireless device / method] of claim 1 [8 / 15], wherein the base station supports a new radio access technology (NR).

Gao and You disclose this limitation. EX-1003, ¶¶416-418. “New Radio” (“NR”) is referenced as “next-generation/5G radio access network” as a known technology. EX-1001, 1:21-23, 3:52-59.

Gao discloses BSs “in the existing 5G system.” EX-1007, 0008, 0095. You’s BSs use “new radio access technology (RAT)” for “next generation communication” in “next-generation RAT” for a “new RAT environment.” EX-1004, 0135, 0147.

Claims 6, 13, 20

The base station [wireless device / method] of claim 1 [8 / 15], wherein the operations further include: transmitting, to the wireless device, downlink data via the PDSCH; and receiving, from the wireless device, uplink data via the PUSCH.

You and Gao each discloses this element. *See supra* [1.1]-[1.3] in Grounds 1 and 2. *E.g.*, EX-1004, 0333, 0077 (PDSCH), 0198-0300 (sPDSCH), 0087 (PUSCH). Gao’s “UE receives a corresponding downlink shared channel (‘*PDSCH*’)” transmitted by the eNB via PDSCH. EX-1007, 0160. *E.g.*, EX-1007, 0161-0162; 0153-0155. Gao’s “UE [] transmits a corresponding uplink shared channel (‘*PUSCH*’)” received by the eNB. EX-1007, 0163-0164, 0180-0184, 0124; Figs. 2-3, 20-22. EX-1003, ¶419.

Claim 7

7. The base station of claim 1, wherein the number of the OFDM symbols is a maximum of 14.

Gao's regions with PDSCH and PUSCH symbols include 1-3 symbols. EX-1007, 0140. *Supra*, Ground 1, [1.1]-[1.3]; You's "sTTI" examples containing PDSCH regions with 1-4 or 7 OFDM symbols. EX-1004, 0145. *Supra*, Ground 2, [1.1]-[1.3]. Thus, each has less than 14 symbols. EX-1003, ¶420.

D. Grounds 3 and 4: Claims 1-20 Are Invalid Over Grounds 1 and 2 in further view of 3GPP36-213 and 3GPP36-212

As detailed in Section 5 (incorporated herein), 3GPP36-213 implements resource allocation using a “table” format and 3GPP36-212 shows a DCI with bits to index an entry in that table format. EX-1003, ¶¶423-435, 101-113. If PO asserts that Gao’s and You’s “patterns” do not render obvious an implementation that uses a “table” data structure, 3GPP36-213 and 3GPP36-212 supply a POSITA’s knowledge for such an implementation for all Challenged Claims 1-20. EX-1003, ¶424.

In the Grounds 3 and 4 combinations, a POSITA would be motivated to combine the references and recognize the “patterns” in Gao and/or You would be implemented using the data structure of a resource allocation table. A POSITA would recognize a “table” would be one of a few known design choices for implementing the sets of patterns discussed in Gao and You. Each pattern reflects an organized set of related data, and a POSITA would recognize the well-known table format provides an efficient and obvious vehicle in which to associate the individual patterns for efficient access. EX-1003, ¶¶425-426.

Moreover, as a further motivation, a POSITA would recognize You’s stated advantage that 2^N bits can efficiently index N patterns and that a table provided an implementation to achieve these efficiencies. *See* Ground 2, [1.4]-[1.6]; EX-1003, ¶427.

Thus, in this proposed combination, the primary reference (Gao and/or You) provides the information / data used within the table (*e.g.*, the “resources” defined at the OFDM symbol-level in Grounds 1 and 2 at [1.1-1.3], [1.6]). EX-1003, ¶¶428. 3GPP36-213 provides the data structure format (table) in which to incorporate the data. EX-1010, Section 8.1.3. 3GPP36-212 confirms the teachings in You and Gao that DCI bits can be used to index the patterns (implemented as a table) to select one of the patterns (table row). EX-1011, Section 8.1.3. While the 3GPP36-213 table allocates “resources” that are not at the OFDM symbol granularity, it is not being relied upon for the type of allocated resources, but rather the format specifying the allocated resources. EX-1003, ¶¶429-430. A POSITA would find it obvious to combine 3GPP36-213 and 3GPP36-212 with a reasonable expectation of success because they reflect corresponding portions of the same wireless standard that explicitly cross-references sections defining the table and index usage described herein. EX-1003, ¶¶431-432.

In addition to the table implementation, 3GPP36-213 and 3GPP36-212 provide the following teachings.

Claims 2/9/16. If PO asserts patentability based on the specific number of DCI bits (“3 bits”), 3GPP36-213 and 3GPP36-212 explicitly shows a resource allocation table that is indexed by 3 DCI bits. EX-1003, ¶¶433, 101-113.

Claims 3/10/17. Existing 3GPP standards already included frequency

resource allocation information. *E.g.*, EX-1011, Section 5.3.3.1 (“DCI formats”) at §§5.3.3.1.2-5.3.3.1.5D, 5.3.3.1.8-5.3.3.1.14 (nineteen DCI format with “resource block assignment”). “Resource block assignment” represents “information on one or more allocations of a frequency-domain resource” because, for example, it is information on “resource block groups” that are “indexed in the order of increasing frequency... starting that the lowest frequency.” EX-1010, Section 7.1.6.1; EX-1003, ¶¶434-435; EX-1001, 2:21-23 (“resource blocks” allocate “in the frequency domain”).

E. Ground 5: Claims 5, 12, and 19 Are Invalid Over Grounds 1-4 in further view of R1-1610129.

Claims 5, 12, 19

The base station [wireless device / method] of claim 1 [8 / 15], wherein the base station supports different numerologies which are defined by a subcarrier spacing (SCS).

The proposed combinations disclose this limitation. EX-1003, ¶¶437-453. The ‘272 patent acknowledged that, in the 3GPP working groups, “methods have been discussed for ... supporting numerologies each having different SCS values.” EX-1001, 7:29-34, 6:48-51. This Ground adds the 3GPP “discussions” reflected in R1-1610129 in which BS’s support numerologies defined by SCS.

R1-1610129 details numerous proposals in which the BS supports different numerologies defined by SCS. EX-1020, 0004-0013. For example, NTT Docomo presented the following example of numerologies for different SCS:

SCS	15kHz	30kHz	60kHz	120kHz	240kHz	480kHz
No. of symbols per Tx duration	14/7	14/7	14/7	28/14	56/28	112/56
Tx duration in ms (depends on ref. num., this may not be exact)	1ms/ 0.5ms	0.5ms/ 0.25ms	0.25ms/ 0.125ms	0.25ms/ 0.125ms	0.25ms/ 0.125ms	0.25ms/ 0.125ms

EX-1020, 0004-0005. Many other companies presented similar numerologies defined by SCS. EX-1020, 0002 (identifying SCS's from 15kHz to 480kHz for the different numerologies), 0005-0006 (Panasonic), 0007 (Fujitsu), 0008 (MediaTek, Nokia, Samsung), 0009-0010 (CATT, LG, ETRI, Intel). Notably absent is any contribution from the inventors' employer KT Corporation. EX-1003, ¶¶438-442.

The entirety of the '272 patent's discussion of "numerologies" and "subcarrier" spacing relates to these known and existing 3GPP NR "discussions." EX-1001, 6:49-7:44. The '272 patent inventors did not add any novel concepts unknown to the 3GPP participants in these discussions before the Priority Application. EX-1003, ¶443.

A POSITA would have recognized the benefits of supporting numerologies defined by SCS as a motivation to combine these references. EX-1003, ¶¶444-446. For example, the '272 patent acknowledges that the 3GPP working groups recognized that "eMBB, mMTC, and URLLC" would benefit from numerologies defined by SCS. EX-1001, 6:45-53. For example, "methods of satisfying each requirement of URLLC and eMBB have been discussed by defining different SCSs" by the 3GPP working groups. EX-1001, 7:41-45. EX-1003, ¶446.

R1-1610129 (summarizing other companies' ideas) reflects the

“discussions” cited by the ‘272 patent and contains extensive discussions about BS supporting different numerologies defined by subcarrier spacings to support eMBB and URLLC. EX-1020 at Section 1.1 (“Slot Lengths and Subcarrier Spacings”); 0004-0011 (submissions discussing numerologies and subcarrier spacings for eMBB and URLLC). EX-1003, ¶446.

Gao’s BS supports separate patterns with eMBB and URLLC.

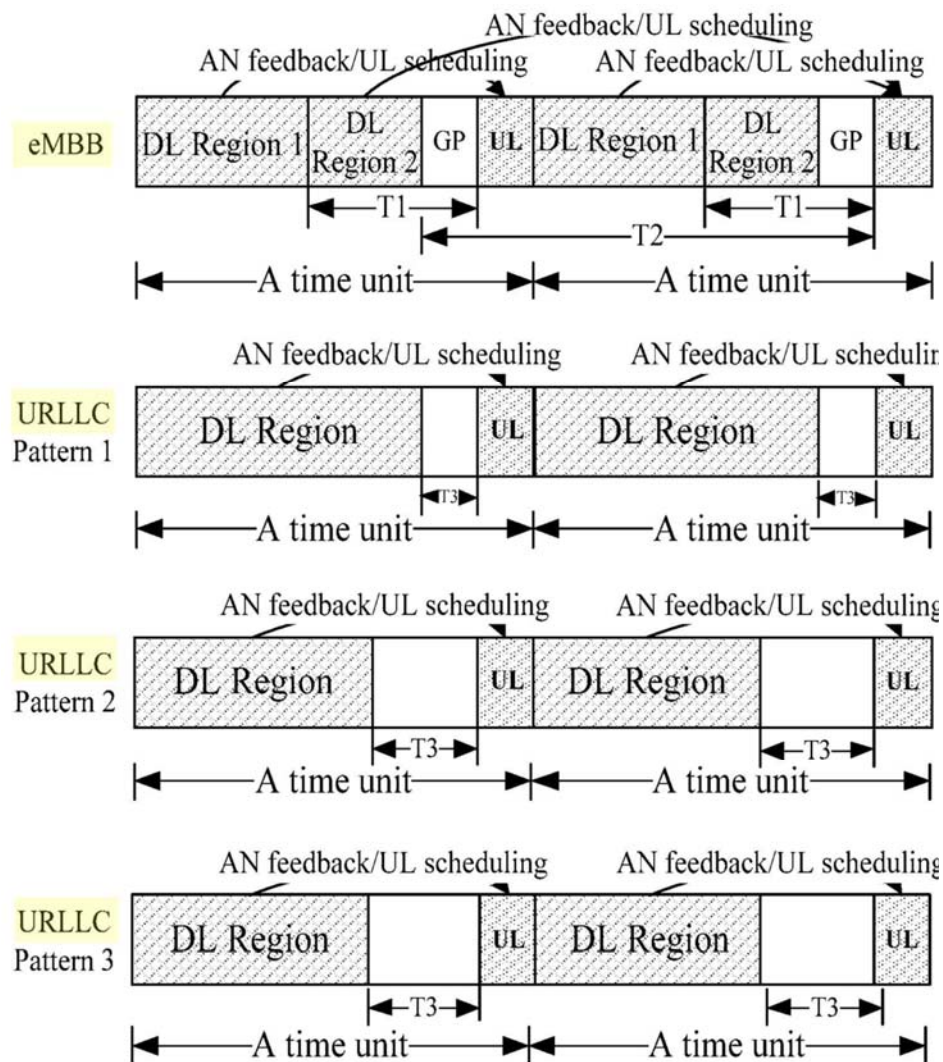


Fig. 10

EX-1007, Fig. 10. In Gao, eMBB and URLLC can be supported together. EX-1007, 0168, 0188; Figs. 11, 18-19. Thus, because it was known that eMBB and URLLC would benefit from different numerologies based upon subcarrier spacings and because Gao supports both eMBB and URLLC, a POSITA would understand it would be obvious that Gao's BS would support multiple numerologies based on SCS. EX-1003, ¶¶447-450. You teaches mMTC and URLLC and a POSITA would understand You to benefit similarly from the different numerologies based on SCS in light of R1-1610129. EX-1004, 0133-0135; EX-1003, ¶451.

The motivation for such a combination would be the benefits (as recognized by the 3GPP working group and repeated in the '272 patent) of different SCS supporting the different requirements. There would have been a reasonable expectation of success because the various companies were proposing supporting multiple SCS with overlapping implementations to allow for different numerologies based on SCS to be supported in the common standard. EX-1003, ¶¶452-453.

Thus, these claims are obvious because: (1) the '272 patent merely copied this element from pre-existing "discussions" in the 3GPP working groups; and (2) R1-1610129 reflects these discussions disclosing the elements and a POSITA would recognize these to be obvious from the disclosure of Gao and You. EX-1003, ¶453.

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

A. The Board Should Not Deny Institution Under 35 U.S.C. § 325

The Examiner did not cite any prior art herein. Thus, the Board should not discretionarily deny institution under § 325.

B. The Board Should Not Deny Institution Under 35 U.S.C. § 314(a)

The Challenged Claims have never been tested against the most relevant prior art. This is a particularly strong IPR because: (a) the prior art shows what the Examiner found to be patentable; and (b) the prior art shows that the claimed materials was publicly disclosed and known in the 3GPP working groups before the Priority Application. As detailed above: (1) the inventors copied relevant material from RAN1#86-bis into the specification, including Meeting Minutes excerpts, and then deleted the meeting reference from the specification before examination; (2) the 3GPP working group had “discussions” (as the ‘272 patent admits) on the claimed subject matter; (3) those “discussions” (Sections IV.F.3, IV.F.4) included the specific OFDM symbol-level resource allocation incorporated into the claims; and (4) the table format recited in the claims was obvious, and had already been used in 3GPP standards seven months before the Priority Date.

In view of these compelling challenges and the three separate district court proceedings, institution should not be discretionarily denied under §314(a). *See NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 19-20 (PTAB

Sept. 12, 2018) (precedential); *Apple v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 13-14 (PTAB Mar. 20, 2020) (precedential).

Factor 1—a district court litigation stay— weighs against discretionary denial. In the district court litigation, third-party defendant and patent owner KT Corporation (“KT”) disputes jurisdiction. The parties are engaged in jurisdictional discovery, and the Court granted a protective order from non-jurisdictional discovery during the jurisdictional discovery period. EX-1027. This could extend the district court trial date, which “allays concerns about inefficiency and duplication of efforts” in the PTAB. *Fintiv* at 8.

Factor 2—proximity of trial to FWD—should be considered at least neutral because jury selection is not set to begin until at least September 8, 2025. Even if jury selection were to proceed on September 8, 2025, jury selection would proceed with respect to only one case (*e.g.*, the Verizon case, the AT&T case, or the T-Mobile case). Each defendant Petitioner is entitled to a separate trial. There are explicit and inherent uncertainties given the number of parties involved and the number of trials regarding this patent. In addition, and because much can change in ten months, the current trial date does not support denial. *See Dish Network v. Broadband iTV*, IPR2020-01280, Paper 17 at 16 (PTAB Feb. 4, 2021).⁸

⁸ The “statistics on median time-to-trial for civil actions in the district court in

Moreover, with three cases each with multiple parties (including multiple intervenors), the unlikelihood that any trials will be scheduled serially, the potential trials' length given the number of patents (11) and claims at issue, and post-trial motions, it is likely that the district court proceedings will not be complete before the final written decision in this matter. Altogether, this factor weighs against discretionary denial.

Factor 3—investment in the district court proceedings—weighs against discretionary denial. The district court cases are in their early stages. The district court has not issued any substantive rulings in either case with respect to the '272 patent. The parties exchanged infringement contentions and invalidity contentions on March 18, 2024 and May 17, 2024, respectively. The claim construction hearing is scheduled on March 11, 2025. EX-1014, EX-1022. In addition, third-party defendant and patent owner, KT has disputed jurisdiction and has yet to file an Answer, and the Court has granted KT a protective order from non-jurisdictional discovery, which will likely further delay progress on the merits.

Altogether, there is much work to be done in the district court and most, if not all, of the work will be well in the future. Accordingly, the district court will not

which the parallel litigation resides” are not illuminating for this case given the number of cases and defendants.

invest significant resources before an institution decision. *See Fintiv*, IPR2020-00019, Paper 11 at 9-12; *DISH Network*, IPR2020-01280, Paper 17 at 18-21.

Factor 4—overlap between this proceeding and the district court proceedings—favors institution. Indeed, there will not be complete overlap between this IPR and the district court cases because there are twenty ‘272 patent claims asserted and a total of 113 asserted all patents in the related district court cases. The district court will likely reduce the asserted claims before trial. This factor thus weighs against the Board exercising its discretion to deny.

Factor 5—overlapping parties—is neutral as it is “far from an unusual circumstance that a petitioner in IPR and a defendant in a parallel district court proceeding are the same.” *Sand Revolution*, IPR2019-01393, Paper 24 at 12-13.

Factor 6—other considerations—weighs strongly against discretionary denial. As detailed above in the beginning of the *Fintiv* analysis, this case presents a unique and overwhelming invalidity case – including using materials that were apparently the basis for the Priority Application.

Neither the Office nor any district court has considered the prior art herein. *Cf. Comcast Cable Commn’s, LLC v. Rovi Guides, Inc.*, IPR2019-00231, Paper 14 at 11 (PTAB May 20, 2019). Moreover, the ‘272 patent is currently asserted in three district court cases. Institution provides the opportunity for narrowing and simplifying the litigations for the district court.

VIII. Mandatory Notices Under 37 C.F.R. §42.8

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

The real parties in interest are Cellco Partnership d/b/a Verizon Wireless, Verizon Business Network Services LLC, Verizon Corporate Services Group Inc., TracFone Wireless, Inc., AT&T Corp., AT&T Services, Inc., AT&T Mobility LLC, AT&T Mobility II LLC, New Cingular Wireless PCS, LLC, Cricket Wireless LLC, T-Mobile, USA, Inc., Sprint Solutions LLC, Sprint Spectrum LLC, Ericsson Inc., Telefonaktiebolaget LM Ericsson, Google LLC,⁹ and Nokia of America Corporation..¹⁰

⁹ Google LLC is a subsidiary of XXVI Holdings Inc. which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

¹⁰ Out of an abundance of caution, Petitioners identify all current defendants in the below identified cases as potential real parties in interest only for the purpose of this proceeding and only to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in this IPR. Petitioners do so to avoid the potential expenditure of resources to resolve such a challenge. Petitioners also acknowledge that each petitioner has a number of affiliates. No unnamed entity is funding, controlling, or otherwise has an

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

1. Judicial Matters

As of the filing date of this Petition, the '272 patent is currently asserted in three pending district court cases:

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

The above cases, which include defendants AT&T, T-Mobile, and Verizon and intervenors Nokia and Ericsson, have been consolidated into the Verizon Case for all pretrial issues. EX-1022. The district court cases are in their early stages and the district court has not issued any substantive rulings in either case with respect to the '272 patent.

Petitioners are not aware of any other judicial or administrative matter that

opportunity to control or direct this Petition or Petitioners' participation in any resulting IPR. Petitioners are also not aware of any affiliate that would be barred from filing this Petition under 35 U.S.C. § 315(e).

would affect or be affected by a decision in this IPR.

Administrative Matters:

As of the filing date of this Petition and to the best knowledge of Petitioners, the ‘272 patent has not been subject to any Petitions for *inter partes* reviews.

2. Related Patents

See Exhibit 1013.

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

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

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

IX. CONCLUSION

Petitioners request the Board institute IPR and cancel all Challenged Claims.

Respectfully submitted,

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ATTORNEY FOR PETITIONERS

December 24, 2024

CERTIFICATION OF SERVICE ON PATENT OWNER

Pursuant to 37 C.F.R. §§ 42.6(e), 42.8(b)(4) and 42.105, the undersigned certifies that on the 24th of December, 2024, a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent No. 11,540,272 and all supporting exhibits were served by electronic means by agreement with Patent Owner to:

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Petition for *Inter Partes* Review of U. S. Patent No. 11,540,272

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CERTIFICATE OF COMPLIANCE

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