

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

DAINGEAN TECHNOLOGIES LTD.,
Patent Owner.

Case No. IPR2024-00730
U.S. Patent No. 11,196,509

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,196,509**

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LIST OF EXHIBITS

Exhibit	Description
EX1001	U.S. Pat. No. 11,196,509 (“the ’509 Patent”)
EX1002	File History for U.S. Pat. No. 11,196,509
EX1003	Expert Declaration of Dr. Wayne Stark
EX1004	Curriculum Vitae of Dr. Wayne Stark
EX1005	U.S. Patent Publication No. 2019/0327024 (“Lee”)
EX1006	Provisional Patent Application No. 62/444,208 (“Lee Provisional”)
EX1007	U.S. Patent Publication No. 2019/0173499 (“Zheng”)
EX1008	Chinese Language Priority Application No. 201710008135.6 for the International Application No. PCT/CN2018/071643 (“Zheng Priority Application”)
EX1009	Certified Translation of Zheng PCT Publication
EX1010	Exhibit F to Patent Owner’s infringement contentions in Daingean Techs. v. AT&T Corp. et al., Case No. 2:23-cv-00123-JRG-RSP (E.D. Tex.) titled “Chart Detailing AT&T’s Infringement of U.S. Patent No. 11,196,509 v. AT&T”

Listing of Challenged Claims

(Limitation labels added for ease of reference)

Claim 4:

[4pre] A base station apparatus comprising:

[4a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs;

[4b] a transmitter configured to transmit the transport block, and

[4c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

[4d] the multiple CBs include one or more first CBs and one or more second CBs,

[4e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

[4f] each of the multiple CBs is included in any one of the multiple CBGs,

[4g] the multiple CBGs include one or more first CBGs and one or more second CBGs,

[4h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and

[4i] a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.

Claim 5:

[5pre] A base station apparatus comprising:

[5a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs;

[5b] a transmitter configured to transmit the transport block, and

[5c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

[5d] the multiple CBs include one or more first CBs and one or more second CBs,

[5e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

[5f] each of the multiple CBs is included in any one of the multiple CBGs,

[5g] the multiple CBGs include one or more first CBGs and one or more second CBGs,

[5h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and

[5i] an average value of numbers of the one or more second CBs included in the one or more second CBGs is greater than an average value of numbers of the one or more second CBs included in the one or more first CBGs.

Claim 10:

[10pre] A communication method for a base station apparatus, the communication method comprising the steps of:

[10a] segmenting a transport block into multiple CBs and coding each of the multiple CBs,

[10b] transmitting the transport block, and

[10c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein

[10d] the multiple CBs include one or more first CBs and one or more second CBs,

[10e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

[10f] each of the multiple CBs is included in any one of the multiple CBGs,

[10g] the multiple CBGs include one or more first CBGs and one or more second CBGs,

[10h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total

number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and

[10i] a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.

Claim 11:

[11pre] A communication method for a base station apparatus, the communication method comprising the steps of:

[11a] segmenting a transport block into multiple CBs and coding each of the multiple CBs,

[11b] transmitting the transport block, and

[11c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein

[11d] the multiple CBs include one or more first CBs and one or more second CBs,

[11e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

[11f] each of the multiple CBs is included in any one of the multiple CBGs,

[11g] the multiple CBGs include one or more first CBGs and one or more second CBGs,

[11h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and

[11i] an average value of numbers of the one or more second CBs included in the one or more second CBGs is greater than an average value of numbers of the one or more second CBs included in the one or more first CBGs.

AT&T Mobility LLC, AT&T Services Inc., Ericsson Inc., Nokia of America Corporation, and T-Mobile USA, Inc. (collectively, “Petitioners”) request *inter partes* review of claims 4, 5, 10 and 11 (the “Challenged Claims”) of U.S. Patent No. 11,196,509 (the “’509 Patent”) (EX1001), which, according to PTO records, was assigned to Daingean Technologies Ltd. (“Daingean” or “Patent Owner”). For the reasons set forth below, the Challenged Claims should be found unpatentable and canceled.

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

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

Related Matters: The ’509 Patent was asserted in *Daingean Tech. Ltd. v. AT&T Corp. et al.*, 2:23-cv-00123-JRG (E.D. Tex. Mar. 24, 2023) and *Daingean Tech. Ltd. v. T-Mobile USA, Inc.*, 2:23-cv-00347-JRG (E.D. Tex. July 24, 2023), but the assertions have been dismissed without prejudice in both matters.

Counsel and Service Information:

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

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A copy of this entire Petition, including all Exhibits and a Power of Attorney, is being served by FEDERAL EXPRESS, costs prepaid, to the address of the attorney or agent of record for Patent Owner at the USPTO: SHARP KABUSHIKI KAISHA C/O Keating & Bennett, LLP, 1800 Alexander Bell Drive, Suite 200, Reston, VA 20191.

II. FEES

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

III. GROUNDS FOR STANDING

Petitioners certify that the '509 Patent is available for IPR and Petitioners are not barred or estopped from requesting IPR on the grounds identified herein.

IV. OVERVIEW OF THE '509 PATENT

A. Overview

The '509 Patent is directed to wireless networks, such as 4G and 5G networks, and potential improvements to those networks. Specifically, the invention seeks to allow a terminal apparatus and/or base station to “efficiently perform uplink and/or downlink communication.” EX1001 at 5:48-51. Essentially, the '509 Patent discloses the well-known concept of segmenting a transport block into different sized code blocks (“CBs”) and grouping CBs into different sized code block groups (“CBGs”), such that HARQ-ACK is by CBG. *See* EX1001 at 2:60-3:32; *see also*, e.g., EX1005 at [0028], [0123]; EX1007 at [0022]-[0026].

B. Exemplary Claim

Claims 4, 5, 10 and 11 are each independent claims as challenged in this petition. Claims 10 and 11 are the communication method that recites the steps that the base station of Claims 4 and 5 must be configured to perform, respectively. Each claim has been included, with labels in the Listing of Challenged Claims, *supra*. Limitations 4d-4i are identical to limitations 10d-10i, respectively. Limitations 5d-5i are identical to limitations 11d-11i, respectively. Additionally, the limitations that

are not identical are simply rewritten from a recitation of a component configured to perform the method step and the method step itself. EX1003 at ¶¶ 46-47.

C. Priority Date

The earliest possible priority date of the '509 Patent is June 13, 2017. The '509 Patent claims priority to Japanese Application No. JP2017-115881, filed June 13, 2017.

V. CLAIM CONSTRUCTION

For IPR proceedings, the Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). Under *Phillips*, claim terms are typically given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention, taking into consideration the language of the claims, the specification, and the prosecution history of record. *Phillips*, 415 F.3d at 1313; *see also id.* at 1312–16. The Board, however, only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015- 00633, Paper 11 at 16 (PTAB Aug. 14, 2015); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). Petitioner respectfully submits that the Board need not expressly construe any term because the prior art invalidates the claims under any plausible construction. EX1003, ¶ 48.

VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art at the time of the alleged invention of the '509 Patent ("POSITA"), which for purposes of this proceeding is on or around June 13, 2017, would have had a B.S. in Electrical Engineering or a related field with at least three years of experience designing, developing, and/or testing telecommunication systems. EX1003, ¶¶ 31-32.¹ Additional education may supplement practical experience or *vice versa*. *Id.*

VII. PRECISE RELIEF REQUESTED AND GROUNDS RAISED

A. Grounds

Claims 4, 5, 10, and 11 should be cancelled based on the following grounds:

Ground 1: Claims 4, 5, 10 and 11 are unpatentable under post-AIA 35 U.S.C. § 102 and § 102 as being anticipated and rendered obvious by Lee.²

Ground 2: Claims 4, 5, 10 and 11 are unpatentable under post-AIA 35 U.S.C. § 102 and § 102 as being anticipated and rendered obvious by Zheng.³

¹ Petitioner submits the declaration of Dr. Stark (EX1003), an expert in the field of the '509 Patent. EX1004, ¶ 33.

² U.S. Patent Publication No. 2019/0327024 (EX1005, "Lee").

³ U.S. Patent Publication No. 2019/0173499 (EX1007, "Zheng").

B. 35 U.S.C. §325(d) is Inapplicable

The asserted references were not in an IDS filed during the prosecution of the '509 Patent, and the Examiner never identified them or used them to reject claims during prosecution. *See generally* EX1002. The Examiner also never considered the testimony of Petitioner's expert, Dr. Stark (EX1003), regarding these references and the knowledge of a POSITA. The grounds in this petition are not substantially the same as prior art or arguments the Office previously considered. Thus, 35 U.S.C. §325(d) is inapplicable to this case.

VIII. PRIOR ART

A. Lee

1. Overview of Lee

Lee is directed to apparatus and methods which “enable a receiver to process a data signal and provide an acknowledgement within a turnaround time.” EX1005 at [0027]. For example, a radio access network (“RAN”) node may enable encoded information to be segmented into multiple code blocks. *Id.* The RAN may then map the code block groups to be aligned with orthogonal frequency division multiplexing symbol boundaries, which enables pipeline processing. *Id.* Lee discloses that, by grouping code blocks, the receiver can efficiently process the received information. *Id.* at [0028]. Further, a cyclic redundancy check is performed per code block group, which allows the receiver to more reliably report back acknowledgements. *Id.*

An example of alignment of a code block group with an OFDM symbol group as taught by Lee is shown in Figure 3, reproduced below. The code block groups (340, 342 and 344, below) are aligned to the OFDM symbol groups (350, 352 and 354, below). In some scenarios, a single code block is mapped to a single OFDM symbol. *Id.* at [0039]. Lee discloses that it is possible to have a different number of CBs in the CBG. *Id.*

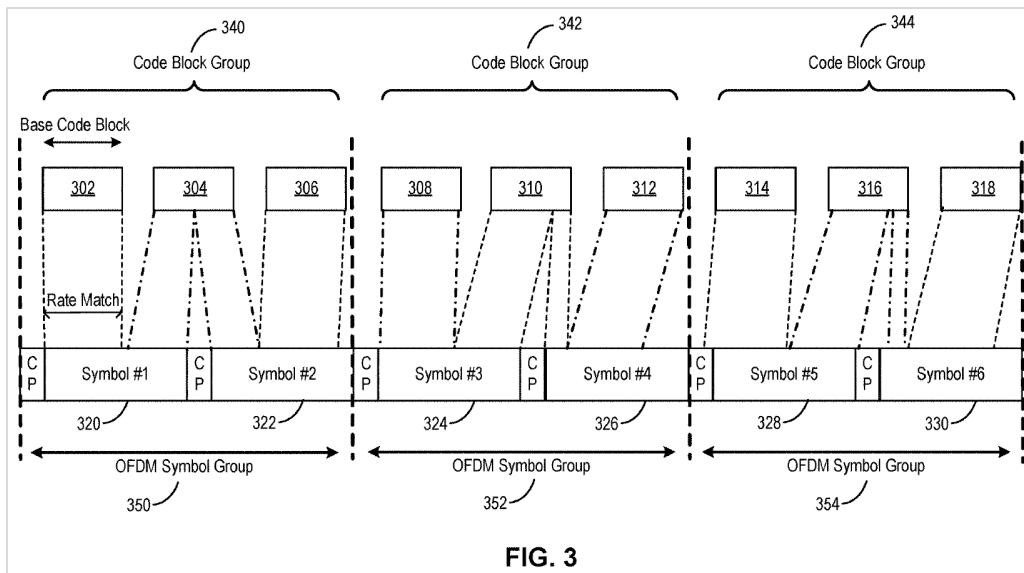


FIG. 3

EX1005 at Fig. 3.

Lee also discloses that certain code block groups may have smaller number of resource elements (“REs”) compared with certain other code block groups. *Id.* at [0042]. A RE is the smallest time/frequency unit of data transmission in OFDM – a single subcarrier for a single symbol duration. EX1003 at ¶ 37. If a first CBG has fewer REs than a second CBG, then the corresponding information bits segmented to the CBGs may be smaller for the first CBG than the second. *Id.*

2. Lee is Prior Art to the '509 Patent

Lee is a patent publication for an application filed on December 26, 2017. Lee claims priority to a provisional application filed January 9, 2017, before the '509 Patent's earliest claimed priority date of June 13, 2017. EX1005 at 1. Lee is therefore prior art under 35 U.S.C. § 102(a)(2) if the subject matter relied upon from Lee is supported by Lee's earlier priority applications.

The subject matter relied upon from Lee in Section IX.A below is supported in the Lee Provisional, as shown in the table below. EX1003 at ¶¶ 53-55. Accordingly, Lee is prior art to the '509 Patent under post-AIA § 102(a)(2) and (d).

Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
[0003]	p. 11
[0006]	p. 11
[0007]	p. 4
[0027]-[0028]	pp. 2-4
[0039]	p. 5
[0040]	pp. 5-6
[0041]	p. 6
[0042]	p. 7
[0043]	p. 7
[0045]	p. 7
[0068]	p. 11
[0130]-[0133]	pp. 7-8
Fig. 1	Fig. 1
Fig. 2	Fig. 2
Fig. 3	Fig. 3
Fig. 4	Fig. 4
Fig. 5	Fig. 5
Fig. 8	Fig. X-2
Figs. 16-18	Fig. X-1, p. 11

Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
Fig. 19	p. 11

Additionally, even though *Dynamic Drinkware*'s analysis of a reference patent or publication's claims is not required to establish the reference as prior art for post-AIA patents, Lee's claims are supported by the Lee Provisional. EX1003 at ¶ 56; *see also Penumbra, Inc. v. Rapidpulse, Inc.*, IPR2021-01466 Paper 34 (precedential) at 29-35 (holding that *Dynamic Drinkware* analysis of reference claims not required for determining prior art status of references for post-AIA patents). The table below identifies subject matter that supports Lee's claims.

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
1. An apparatus for a radio access network (RAN) node, comprising:	p. 11
a transmitter interface configured to provide a set of orthogonal frequency-division multiplex (OFDM) symbols to a transmitter for transmission to a user equipment (UE); and	pp. 4-5
a processor configured to:	p. 9
segment a bit sequence into blocks;	pp. 2-5
encode the blocks to form code blocks;	pp. 2-5
group the code blocks into a code block group, the code block group selected to fit an integer number of code blocks within an OFDM symbol group, the OFDM symbol group including an integer number of OFDM symbols;	pp. 4-5

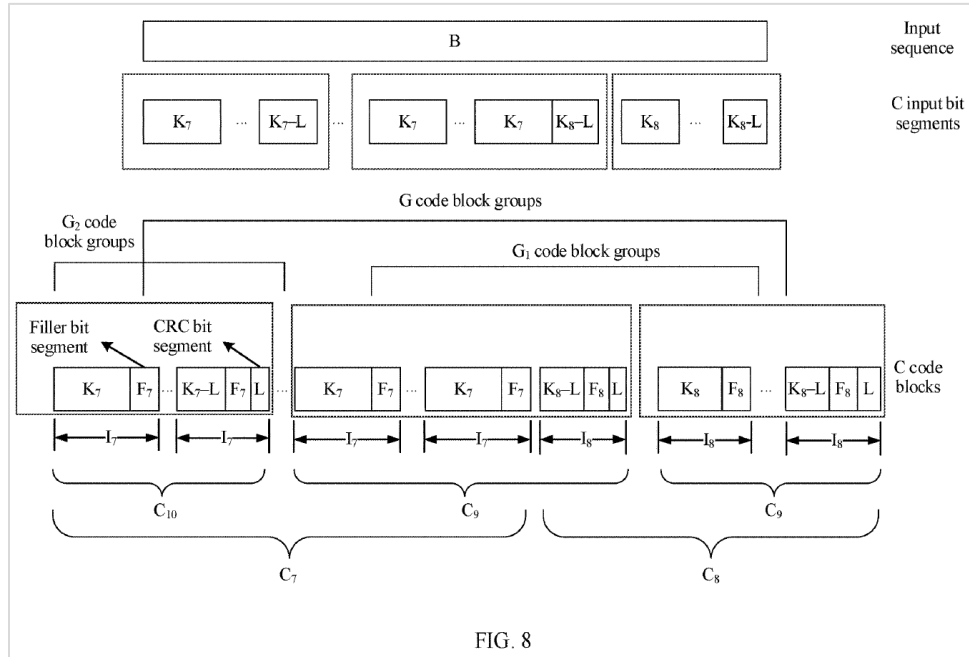
Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
encode the code block group to form the OFDM symbol group; and	pp. 4-6
provide the OFDM symbol group to the transmitter using the transmitter interface.	pp. 5-8

B. Zheng

1. Overview of Zheng

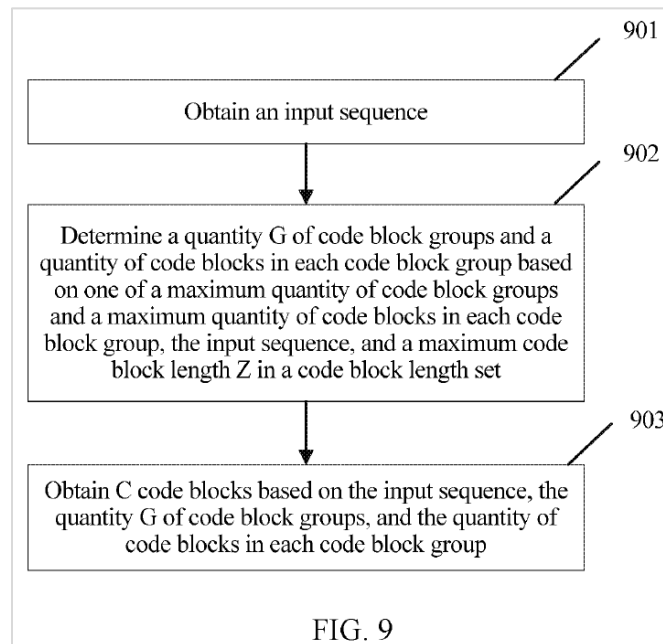
Zheng is directed to an information processing method in which a communication device obtains an input sequence. EX1007 at [Abstract]. The input sequence is transformed into one or more CBs, which are then encoded. Each CB includes a segment of the input sequence, including one or more CRC bits corresponding to the segment. *Id.* Zheng's system seeks to reduce transmission errors and improve transmission reliability. *Id.* at [0003]. Zheng discloses adding CRC bit segments by CBG in order to reduce CRC overheads. Additionally, ACK feedback is performed by CBG to improve both performance and efficiency of the system. *Id.* at [0026].

For example, Figure 8, reproduced below, demonstrates the code block segmentations taught by Zheng. In this example, an input sequence of B bits is segmented into C code blocks. The C code blocks are partitioned into G code block groups each having a CRC bit segment, where G is an integer greater than 0 and less than or equal to C. *Id.* at [0109].



EX1007 at Fig. 8.

Zheng further provides a flowchart demonstrating an information processing method according to the disclosure, Figure 9, reproduced below.



EX1007 at Fig. 9.

2. Zheng is Prior Art to the '509 Patent

Zheng is a patent publication for the U.S. National stage application, filed on January 31, 2019, of PCT Application No. PCT/CN2018/071643, filed on Jan. 5, 2018 and designating the United States. Zheng claims priority to Chinese application number 2017100081356, filed January 5, 2017, before the '509 Patent's earliest claimed priority date of June 17, 2017. EX1007 at 1. Zheng is therefore prior art under 35 U.S.C. § 102(a)(2) if the subject matter relied upon from Zheng is supported by Zheng's earlier priority applications.

The subject matter relied upon from Zheng in Section IX.B below is supported in the Zheng's Chinese priority application, as shown in the table below. EX1003 at ¶¶ 61-63. Petitioners have attached the Chinese priority application that the US publication claims priority to, as well as a certified translation of the Chinese priority application, as EX1008 and EX1009. Accordingly, Zheng is prior art to the '509 Patent under post-AIA § 102(a)(2) and (d).

Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
Fig. 1	Fig. 1
Fig. 4	Fig. 4
Figs. 5-8	Figs. 5-8
Fig. 9	Fig. 9
Table 1	Table 1
[0003]	p. 10
[0026]	p. 14
[0051]-[0054]	p. 16

Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
[0060]	p. 17
[0061]	p. 18
[0062]	p. 19
[0063]	p. 18
[0068]	p. 17
[0070]	p. 19
[0083]	p. 22
[0085]	p. 22
[0088]	p. 23
[0100]	p. 26
[0109]	p. 27
[0111]	p. 28
[0140]	p. 32
[0083]-[0140]	pp. 22-23
[0142]	p. 33

Additionally, even though *Dynamic Drinkware's* analysis of a reference patent or publication's claims is not required to establish the reference as prior art for post-AIA patents, Zheng's claims are supported by the Zheng PCT Publication. EX1003 at ¶ 64; *see also Penumbra, Inc. v. Rapidpulse, Inc.*, IPR2021-01466 Paper 34 (precedential) at 29-35 (holding that *Dynamic Drinkware* analysis of reference claims not required for determining prior art status of references for post-AIA patents). The table below identifies subject matter that supports Zheng's claims.

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
1. An information processing method in a communication system, comprising:	pp. 11, 19, Claim 1

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
obtaining, by a communication device, an input sequence, wherein the input sequence comprises a quantity B of information bits, and $B \geq 1$;	pp. 11, 19-20, Claim 1
transforming, by the communication device, the input sequence into a quantity C of code blocks, wherein C is an integer greater than or equal to 1; and	pp.20, Claim 1
encoding, by the communication device, each of the C code blocks individually, to obtain C encoded code blocks;	pp. 12, 15-16, 17, 25
wherein each of the C code blocks has a code block length less than or equal to a maximum code block length of Z bits;	pp. 11, 20, Claim 1
wherein each of the C code blocks comprises a segment of the input sequence and a quantity L of cyclic redundancy check (CRC) bits corresponding to the segment of the input sequence; and	pp. 13, 17, 20-21, Claim 1
wherein L is greater than or equal to 0.	p. 11, 20, Claim 1

IX. ASSERTED GROUNDS OF UNPATENTABILITY

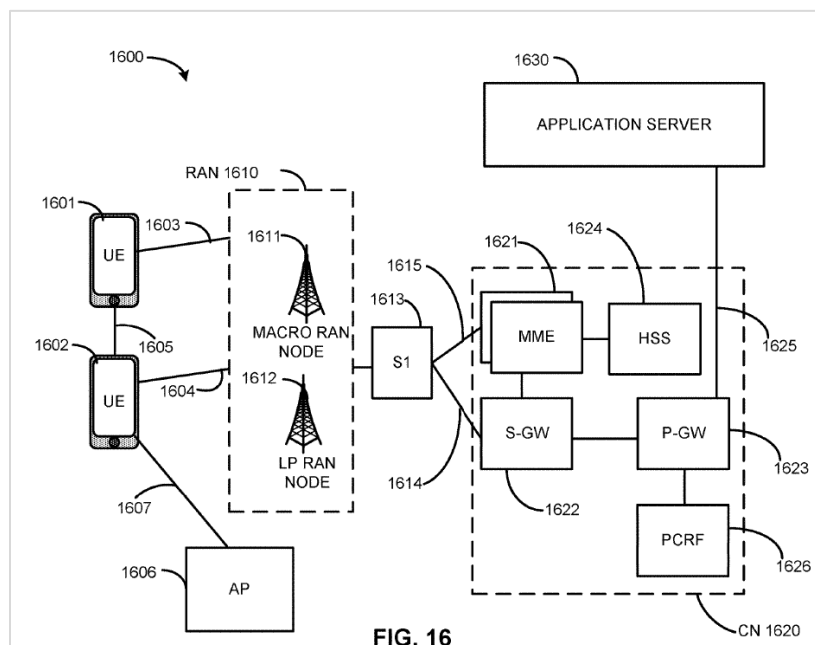
A. Ground 1: Lee

1. The Challenged Claims are Anticipated and Rendered Obvious by Lee

a) Claim 4

1) [4pre] A base station apparatus comprising:

Lee teaches this limitation. EX1003 at ¶ 66. For example, Lee teaches a radio access network (“RAN”) as shown in Figure 16, reproduced below. Lee discloses that the RAN “can include one or more access nodes” which “can be referred to as base stations.” EX1005 at [0068]. Lee also teaches that in general, wireless mobile communication technology transmits data between a base station and a wireless user device, or user equipment. EX1005 at [0003]. These base stations communicate with wireless communication devices, called UEs. EX1005 at [00003].



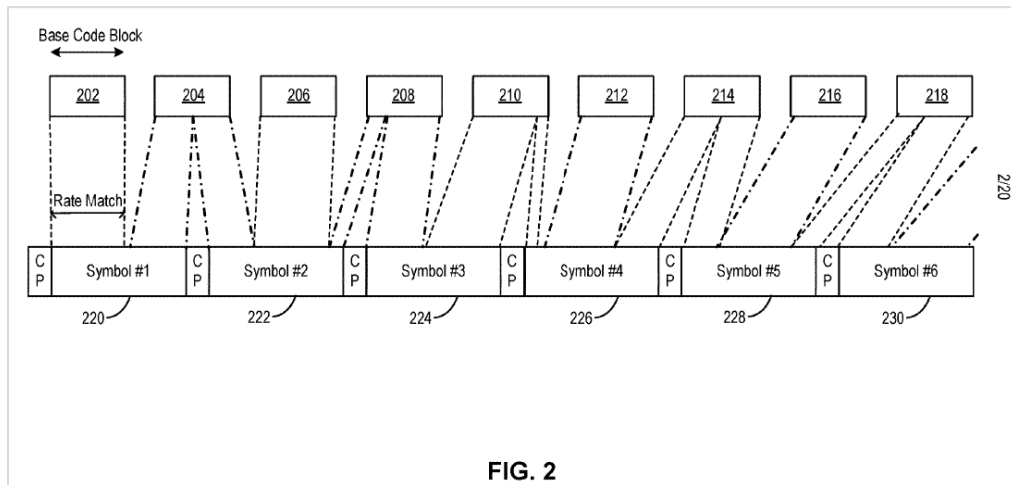
EX1005 at Fig. 16. *See also* EX1005 at Figs. 17-19.

Thus, Lee discloses element [4pre], a “base station apparatus.” EX1003 at ¶ 66.

2) [4a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs,

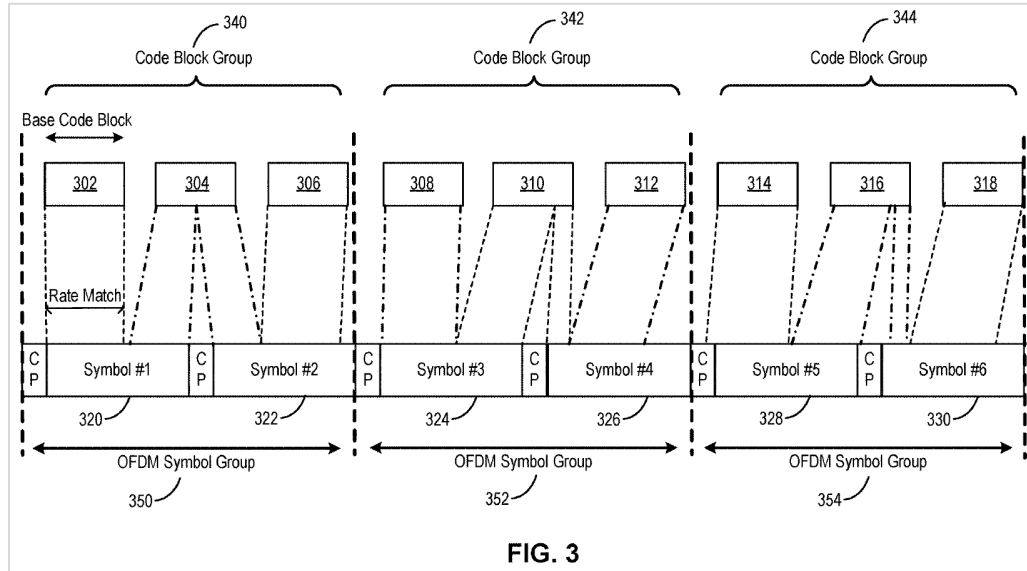
Lee teaches this limitation. EX1003 at ¶¶ 67-71. For example, Lee discloses a RAN node enabling “encoded information to be segmented into multiple code blocks” and that the code blocks are “to be aligned with orthogonal frequency division multiplexing (OFDM) symbol boundaries.” EX1005 at [0027]. Lee teaches that the groups of code blocks are aligned with OFDM symbol boundaries, and the purpose of grouping is to allow the receiver to more efficiently process information, such as pipelining. EX1005 at [0028].

Figure 2, reproduced below, depicts a transmitter information bit sequence which has been segmented into sub-blocks. EX1005 at [0007]. Lee's disclosure is directed to enabling information to be segmented into multiple code blocks, where the code blocks are sorted into code block groups and aligned with OFDM symbol boundaries, in order to implement processing pipelining. EX1005 at [0027]-[0028].



EX1005 at Fig. 2.

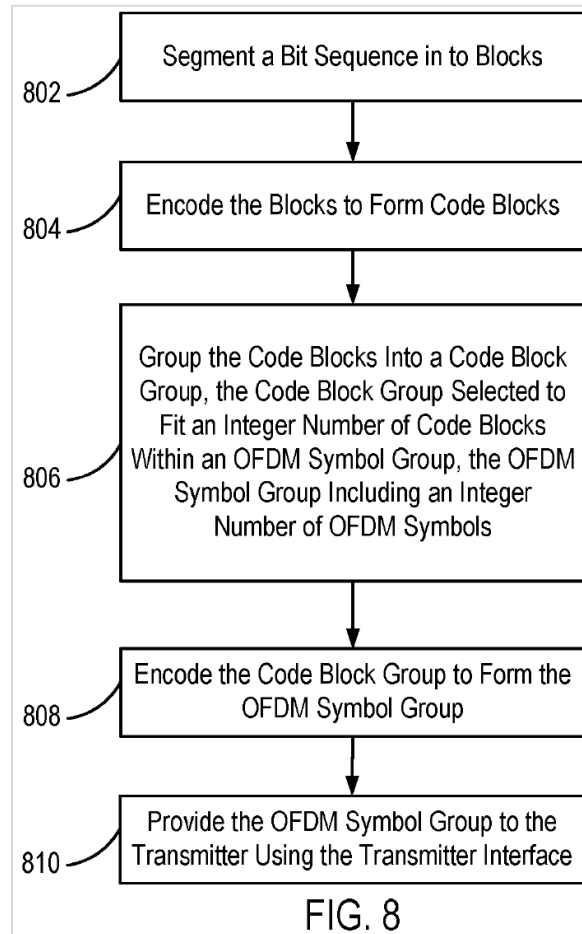
Figure 3, reproduced below, depicts the alignment of a code block group with an OFDM symbol group. EX1005 at [0039]. Lee teaches that it is possible to have a different number of code blocks in the code block group. EX1005 at [0039]. Lee further discloses that it is possible to have different code block sizes per CBG, or that each CBG may have a distinct size. EX1005 at [0039]; EX1003 at ¶ 71.



EX1005 at Fig. 3.

Lee also teaches that OFDM symbols can have varying numbers of available resource elements (“REs”) for data transmission, and that the number of REs may vary by code block group. EX1005 at [0040], Fig. 4. Bit padding can be done so that code block groups have similar code rates, and there may be additional segmentation within code block groups to align them to the OFDM symbol within OFDM symbol groups. EX1005 at [0041], Fig. 5. Code block groups may vary in size to provide more balanced performance. *See* EX1005 at [0042-0043]; EX1003 at ¶ 71.

Further, Lee explicitly illustrates the segmentation of a transport block (bit sequence) into blocks which are encoded to form code blocks, and then grouped into code block groups. *See* EX1005 at Fig. 8 (reproduced below); EX1003 at ¶¶ 67-68.



EX1005 at Fig. 8.

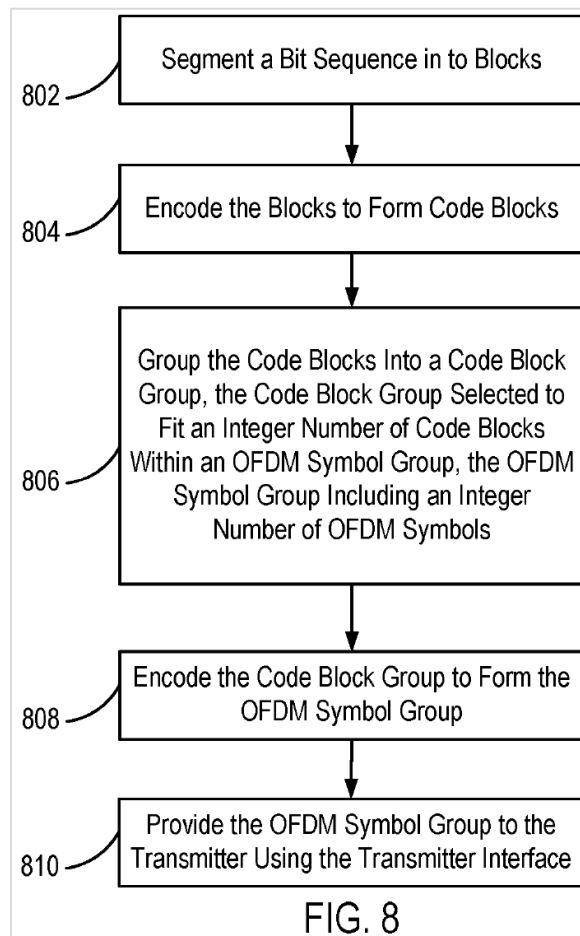
Thus, Lee discloses element [4a], “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs.” EX1003 at ¶ 67.

3) [4b] a transmitter configured to transmit the transport block, and

Lee teaches this limitation. EX1003 at ¶¶ 72-74. As an initial matter, as shown in connection with element [4pre], Lee teaches a base station, which a POSITA would understand includes both a transmitter for transmitting signals to UEs and a

receiver for receiving signals from UEs. Lee further teaches that the base station is configured to transmit a transport block, both as explained below and in connection with elements [4a] and [4d]-[4i].

For example, Lee discloses “providing the OFDM symbol group to the transmitter using the transmitter interface,” as illustrated by Figure 8, reproduced below. Further, Lee’s disclosure of a base station would indicate to a POSITA the presence of a transmitter configured to transmit the transport block. *See* EX1005 at Figs. 16-19, [0003] and [0068]; EX1003 at ¶ 74.



EX1005 at Fig. 8.

Lee also discloses that the group of code blocks are “within a transport block.” EX1005 at [0028]. In addition to a POSITA recognizing that a base station indicates the presence of a transmitter, a POSITA would understand that providing the OFDM symbols to the transmitter, the symbols corresponding to a transport block would necessarily be transmitted, thus rendering obvious transmission of the transport block. EX1003 at ¶¶ 72-73.

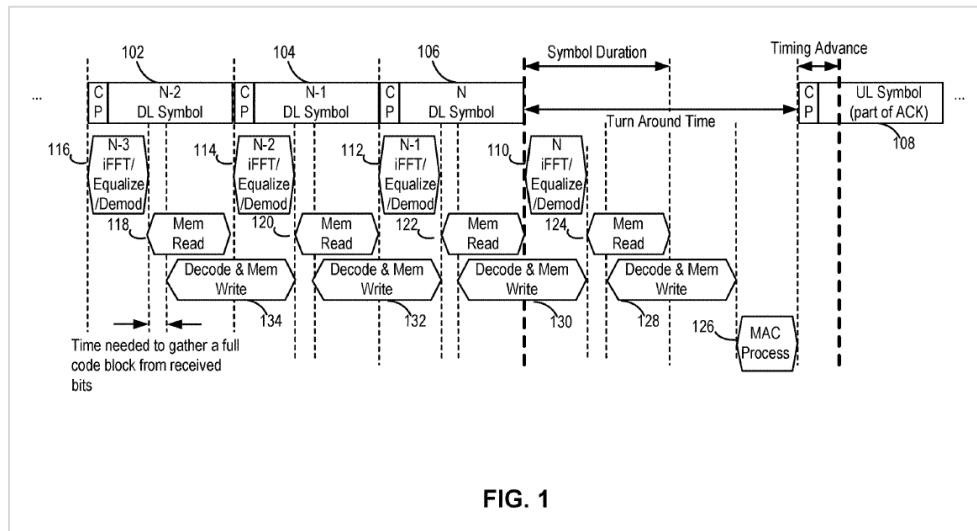
Thus, Lee discloses element [4b], “a transmitter configured to transmit the transport block.” EX1003 at ¶ 72.

4) [4c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

Lee teaches this limitation. EX1003 at ¶¶ 75-79. As an initial matter, as shown in connection with element [4pre], Lee teaches a base station, which a POSITA would understand includes both a transmitter for transmitting signals to UEs and a receiver for receiving signals from UEs. Lee further teaches that the base station is configured to receive HARQ-ACKs corresponding to multiple CBGs.

For example, as shown in Figure 1, reproduced below, Lee discloses a “pipelined processing of received data signal and transmission of an acknowledgement (ACK).” EX1005 at [0006]. A group of code blocks within the transport block are aligned with OFDM symbol boundaries using OFDM symbol

groups. EX1005 at [0028], [0039]. Lee teaches that this alignment of code block groups with OFDM symbol groups “allows the receiver to report back acknowledgement with more fidelity,” and also allows the ACK/NACK process to begin earlier in the sub frame, because “acknowledgements can be generated for each code block group.” EX1005 at [0028], [0045]; EX1003 at ¶¶ 75-76. Acknowledgement by code block group “also allows a transmitter to omit retransmission of a code block group that is already successfully received by the receiver.” EX1005 at [0045].



EX1005 at Fig. 1.

A POSITA would understand that the alignment of code block groups and associated HARQ-ACKs with OFDM symbols allows data to be processed in a pipelined fashion before an ACK/NACK is calculated for feedback for each code block group. EX1003 at ¶ 78. Further, Lee explicitly discloses a UE that receives

“an OFDM symbol group...wherein the OFDM symbol group boundary matches the code block group boundary; and provide[s] a response to the RAN node within a turnaround time acknowledging a receipt of the data from the OFDM symbol group.” EX1005 at [0130]. The processor of Lee is configured to compute a cyclic redundancy checksum (CRC) for each code block group, and then compare it to a second CRC, such that the response is an acknowledgement or negative acknowledgment based on the first CRC matching or not matching the second. EX1005 at [0132]-[0133].

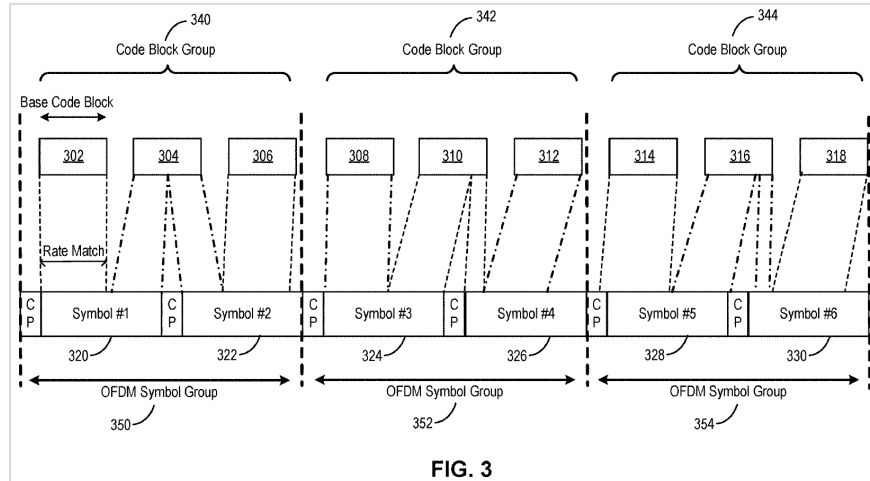
Further, the base station taught by Lee indicates the presence of a receiver. EX1003 at ¶ 79; *see supra* Section IX.A.1.a)1). Lee’s teaching of acknowledgement by CBG or OFDM symbol group indicates receiving HARQ-ACKs corresponding to multiple CBGs. EX1003 at ¶ 79. Therefore, Lee discloses a UE providing HARQ-ACKs corresponding to multiple CBGs to the base station. EX1003 at ¶ 79. A POSITA would find it obvious to have the base station receive the HARQ-ACKs corresponding to the multiple CBGs sent by the UE. *Id.*

Thus, Lee discloses or renders obvious element [4c], “a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs.” EX1003 at ¶ 75.

- 5) [4d] the multiple CBs include one or more first CBs and one or more second CBs, [4e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,**

Lee teaches limitations [4d] and [4e]. EX1003 at ¶¶ 80-87. Limitation [4d] requires the segmentation to include at least two different types of code block, and limitation 4[e] requires the first type of code block have “a first size” that is greater than “a second size” of the second type of code block. EX1003 at ¶ 80. Lee expressly teaches that a transport block can be segmented into code blocks with different sizes and provides multiple examples of segmentations of a transport block into code blocks of two or more different sizes. EX1005 at [0039], [0042], Figs. 3, 4, and 5. EX1003 at ¶¶ 80-87.

For example, Lee Figure 3, reproduced below, shows three code block groups each with three code blocks, with each code block group covering two OFDM symbols. EX1003 at ¶ 80. Code blocks 302, 308, and 314 each begin at the start of their respective OFDM symbol group, but leave the next code blocks (304, 310, 316) with noticeably different allocations between OFDM symbols. EX1003 at ¶ 80. Each code block group also leaves a different sized gap at the end of its respective OFDM symbol group. EX1003 at ¶ 80. This illustrates code blocks of at least two different sizes. EX1003 at ¶ 80.



EX1005 at Fig. 3. *See also id.* at Figs. 5-7.

Lee Figure 4, reproduced below with color added, provides another example of segmentation of a transport block into code blocks of at least two different sizes. EX1003 at ¶ 82. The key provided in Figure 4 identifies the resource elements allocated to each code block, as well as to demodulation reference signals and shows code blocks with two different sizes: code blocks 0, 2, and 3 have 12 resource elements and code block 1 has 6 resource elements. EX1003 at ¶ 82.

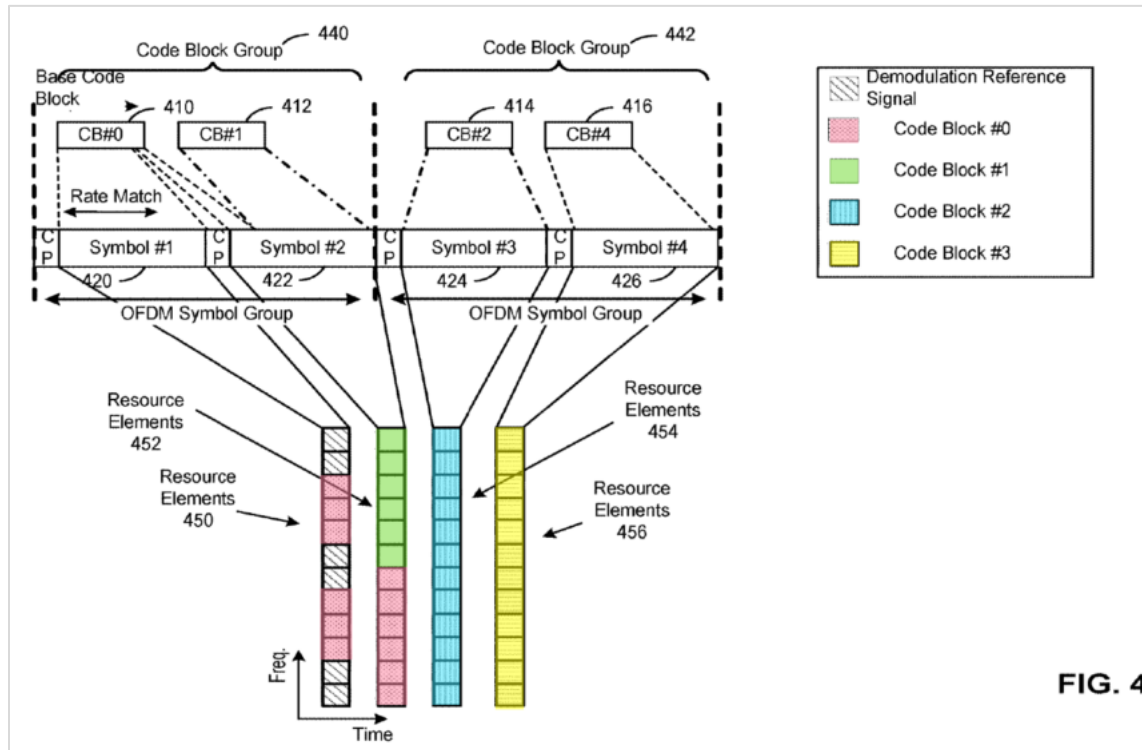


FIG. 4

EX1005 at Fig. 4 (color added).

Lee Figure 5 also shows segmentation of a transport block into code blocks having two different sizes. EX1003 at ¶ 83. Reproduced below with a colorized key, Lee Figure 5 shows one code block (code block 0) with 12 resource elements and three code blocks (1, 2, and 3) with 6 resource elements. EX1003 at ¶ 83.

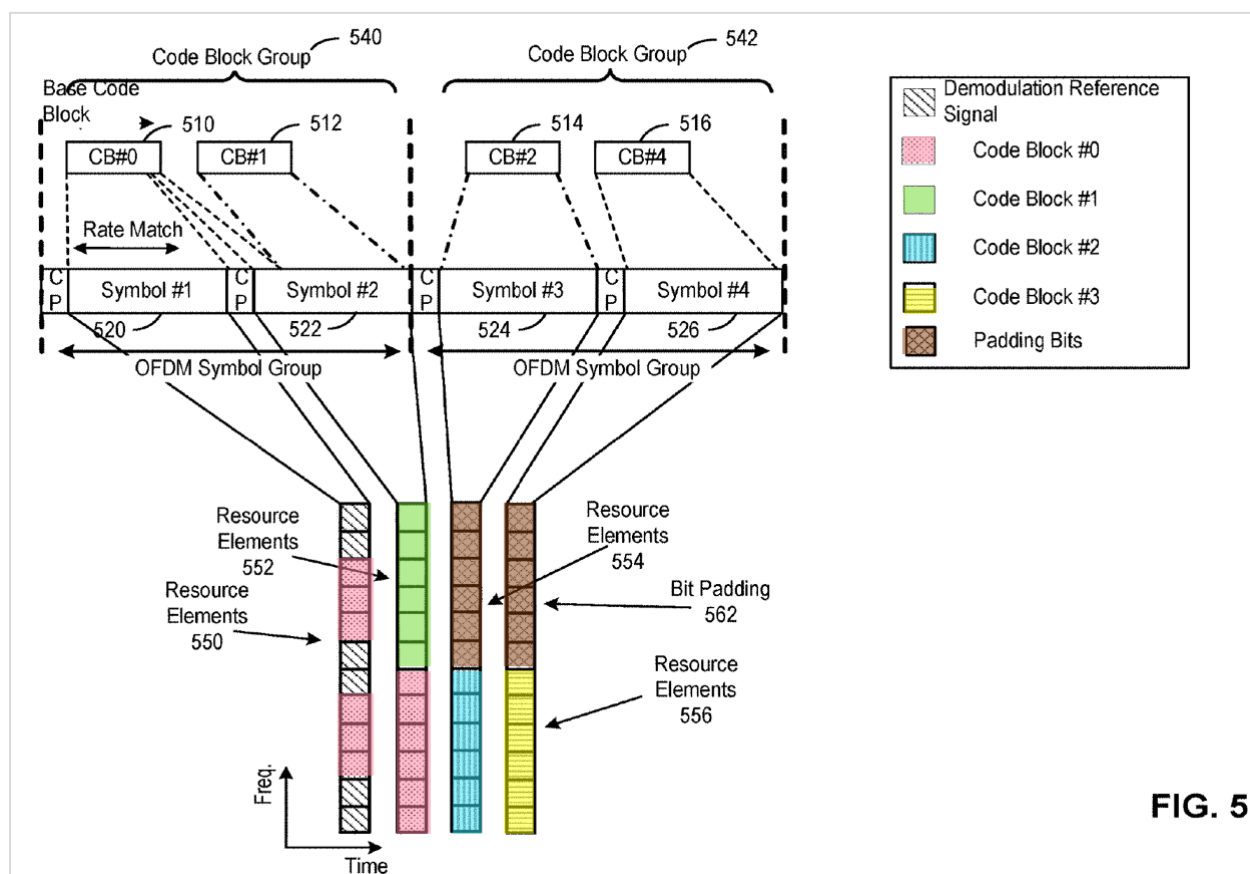
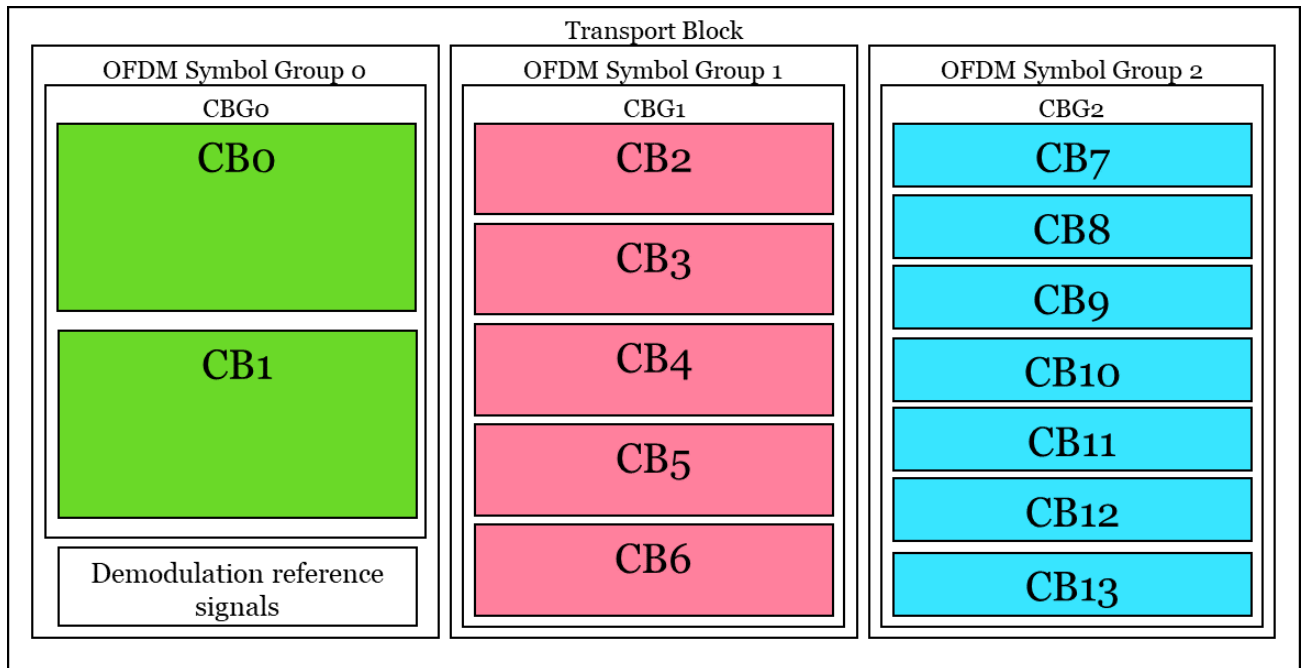


FIG. 5

EX1005 at Fig. 5 (color added).

Lee Paragraph 39 also expressly states that it is possible to have “different code block sizes per CBG [code block group] and each code block in each CBG may have a distinct size.” EX1005 at [0039]. Lee Paragraph 39 then provides an example: “a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0, CB1 are in CBG0, CB2-CB6 are in CBG1, and CB7-CB13 are in CBG2.” EX1005 at [0039]. The original text leaves CBG0 empty, but a POSITA would understand that CB0 and CB1 were to be in CBG0. EX1003 at ¶ 84. An example of this is illustrated by a figure prepared by Petitioner’s expert, below.

EX1003 at ¶ 84. Dr. Stark’s illustration is consistent with Lee’s teaching from Paragraph 39 and Figures 3-5 that each OFDM symbol group is the same size, and with Lee’s teaching from Figures 4 and 5 that the first OFDM symbol group also allocates some resource elements to demodulation reference signals. EX1003 at ¶ 84. A POSITA would have understood the figure below to be one arrangement described by Lee paragraph 39. EX1003 at ¶ 84. It too shows segmentation of a transport block into code blocks of two or more sizes. EX1003 at ¶ 84.



EX1003 at ¶ 84.

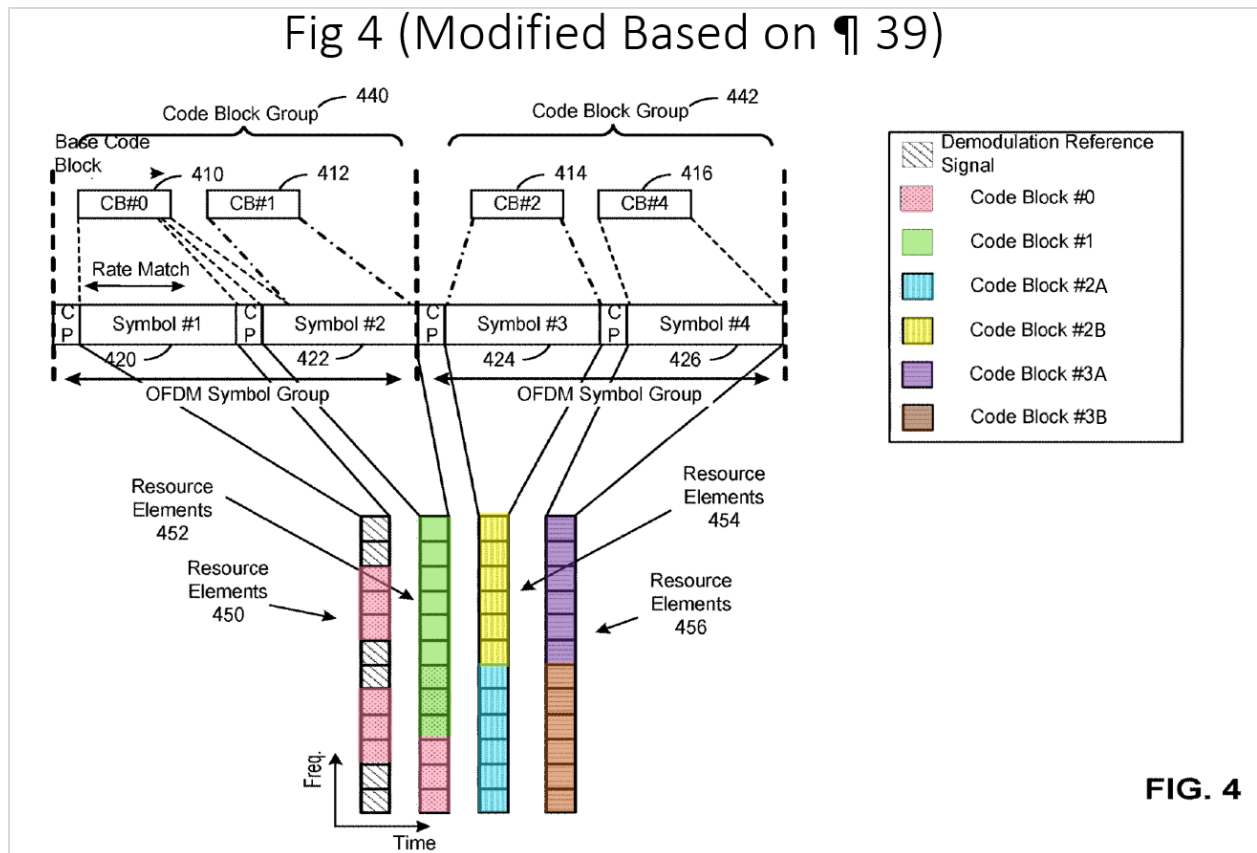
The arrangement described in paragraph 39, illustrated above, satisfies elements [4d] and [4e]. EX1003 at ¶ 96. Note that there are three rather than two code block sizes illustrated. EX1003 at ¶ 96. The claims are not limited to only two types of code blocks, and instead only require that “the multiple CBs include one or

more first CBs and one or more second CBs.” EX1003 at ¶ 86. This is satisfied by the example of Paragraph 39. EX1003 at ¶ 86.

Additionally, based on Lee Figures 4 and 5 and paragraph 39, a POSITA would have been motivated to use different sized code blocks when segmenting a transport block and allocating the code blocks across code block groups and OFDM symbol groups. EX1003 at ¶ 86. A POSITA would understand that the best size code block to use would depend on the amount of data to be transmitted, the desired coding rate, the number of available resource elements in each OFDM symbol group, and that different code block sizes may be selected for different conditions or different kinds of data. EX1003 at ¶ 86. Lee Figure 5, for example, uses two size six code blocks in its second code block group rather than one of the size 12 code blocks used in Lee Figure 4. EX1003 at ¶ 86. A POSITA would therefore be motivated to allocated transport blocks into different sized code blocks to adjust to conditions and reduce the need for retransmissions. EX1003 at ¶ 86.

For example, a POSITA would be motivated to apply the teachings of Lee Paragraph 39 to the example illustrated in Lee Figure 4, to make more, smaller code blocks in the second code block group and evenly sized code blocks in the first code block group. EX1003 at ¶ 87. Consistent with Lee Paragraph 39, it would have been obvious to segment the transport block such that the resource elements in the first code block group are divided between two code blocks, each with 9 resource

elements and the resource elements in the second code block group are divided between four code blocks, each with six resource elements. EX1003 at ¶ 87. This arrangement would evenly allocate the risk of error between code blocks in a code block group and would provide more redundancy for data transmitted further in time from demodulation reference signals, both of which would reduce the need for retransmissions. EX1003 at ¶ 87. This is illustrated in the modified Fig. 4 below.



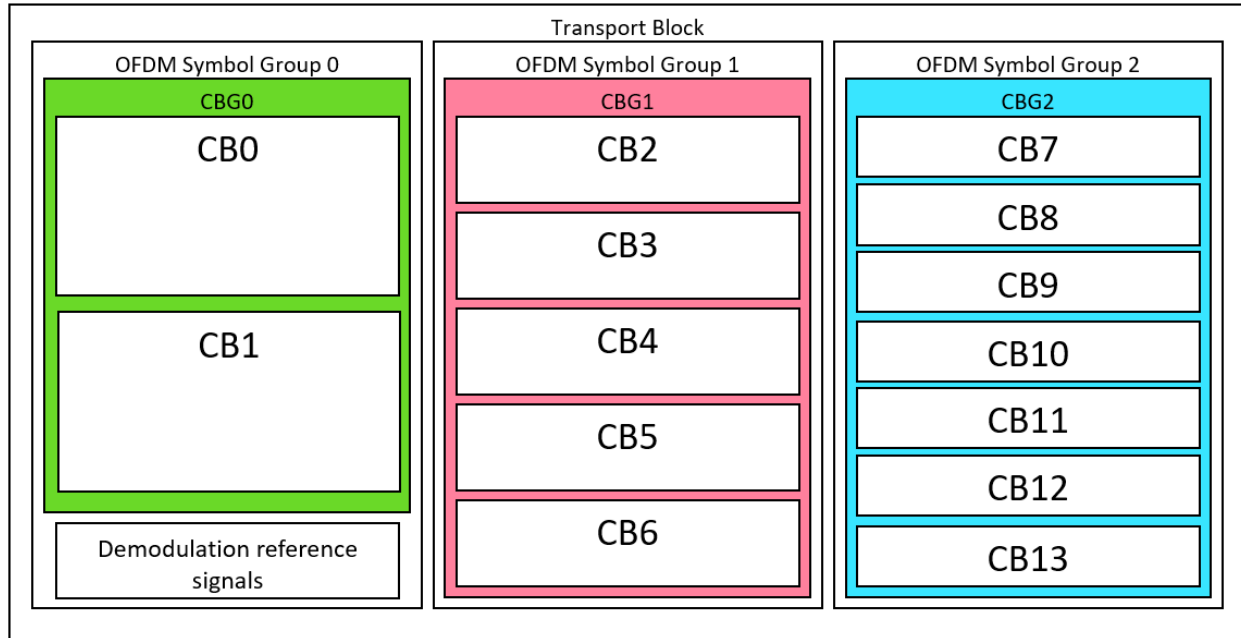
EX1003 at ¶ 87.

Thus, Lee discloses and renders obvious elements [4d] and [4e]. EX1003 at ¶ 80.

- 6) [4f] each of the multiple CBs is included in any one of the multiple CBGs, [4g] the multiple CBGs include one or more first CBGs and one or more second CBGs, [4h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and

Lee teaches and renders obvious limitations [4f], [4g], and [4h]. EX1003 at ¶¶ 88-95. Taken together, these limitations require the CBs to be in two or more CBGs [4f], the two or more CBGs to have two or more types (first CBGs and second CBGs) [4g], and that the first type of CBG have more of the first and second type CBs than the second type of CBG [4h]. EX1003 at ¶ 88. Lee provides express examples satisfying these limitations, and additionally renders them obvious.

For example, Lee teaches it is “possible to have a different number of code blocks (CB) in the code block group (CBG) and/or different code block sizes per CBG and/or each code block in each CBG may have a distinct size. For example, a transport block may have three code block groups, CBG0, CBG1, CBG2, wherein code blocks CB0, CB1 are in CBG0; CBG2-CBG6 are in CBG1; and CB7-CB13 are in CBG2.” EX1005 at [0039]. Petitioners’ expert illustrated what a POSITA would understand from this example in the figure below. EX1003 at ¶ 89.

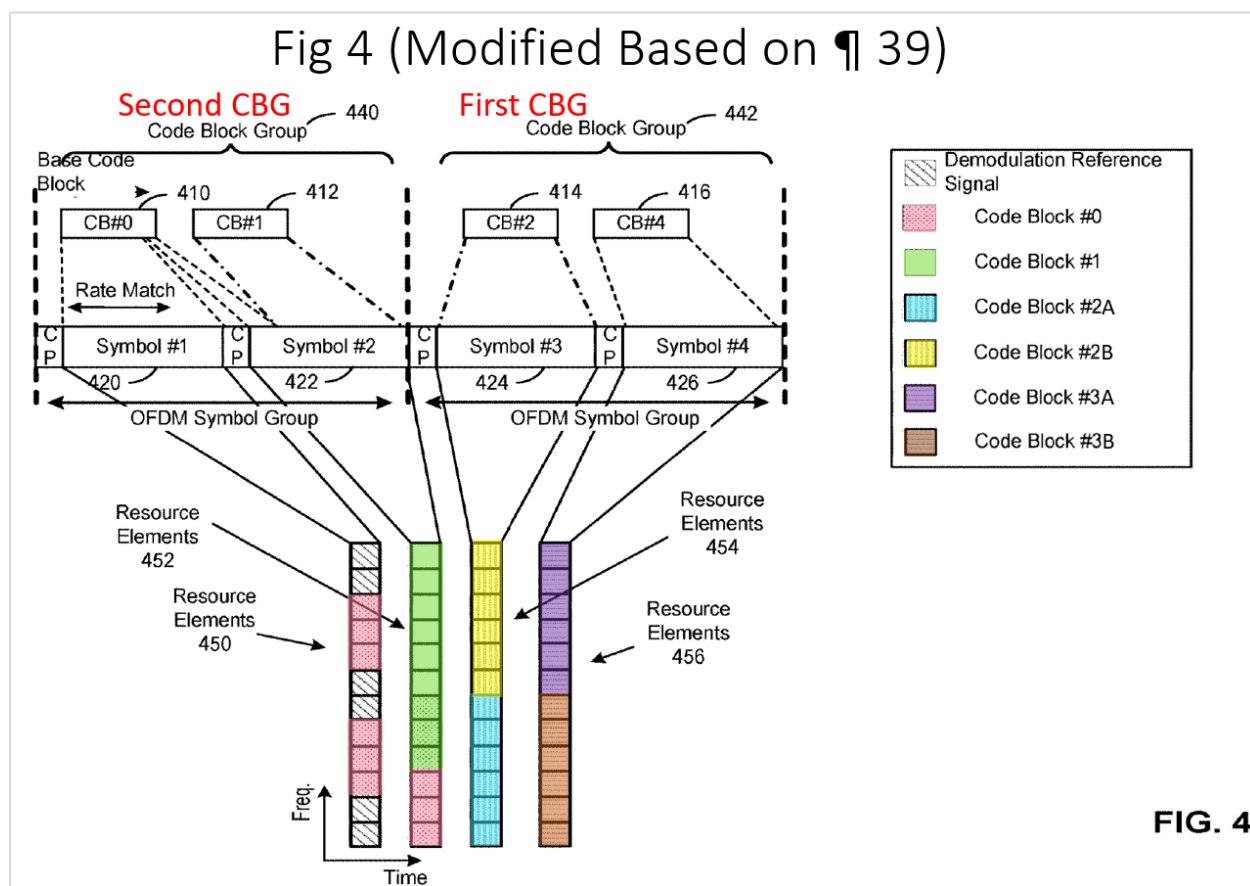


EX1003 at ¶ 89.

The example of Lee Paragraph 39 satisfies limitations [4f]-[4h], as it teaches two or more types of code block group, with different numbers of code block in each code block group. EX1003 at ¶ 90. For example, if the code blocks CB0 and CB1 are used to satisfy the “first CBs” elements and code blocks CB2-6 are used to satisfy the “second CBs” elements, then Lee CBG1 would satisfy the “first CBG” elements of limitations [4g] and [4h] and Lee CBG0 would satisfy the “second CBG” elements of limitations [4g] and [4h]. EX1003 at ¶ 90. Similarly, if the code blocks CB2-6 are used to satisfy the “first CBs” elements and code blocks CB7-13 are used to satisfy the “second CBs” elements, then Lee CBG2 would satisfy the “first CBG” elements of limitations [4g] and [4h] and Lee CBG1 would satisfy the “second

CBG” elements of limitations [4g] and [4h]. EX1003 at ¶ 90. Lee Paragraph 39 therefore teaches elements [4f]-[4h].

Additionally, applying the teachings of Lee Paragraph 39 to Lee Figure 4 would render the claims obvious. EX1003 at ¶ 90. As explained in connection with elements [4e] and [4f] above, a POSITA would have been motivated by Lee Paragraph 39 and to modify the segmentation shown in Lee Figure 4, so that code block group 440 included two code blocks of 9 REs and code block group 440 included four code blocks of 6 REs. EX1003 at ¶ 90. This modified figure is reproduced again below.



EX1003 at ¶ 90.

As modified, Lee Figure 4 teaches one code block group with four code blocks of one type (code block group 442), and one code block group with two code blocks of another type (code block group 440). EX1003 at ¶¶ 90-92. Code block group 442 satisfies the “first CBG” elements of limitations [4g] and [4h] and code block group 440 satisfies the “second CBG” elements of limitations [4g] and [4h]. EX1003 at ¶¶ 90-92. Accordingly, these limitations are obvious in view of Lee. EX1003 at ¶¶ 90-92.

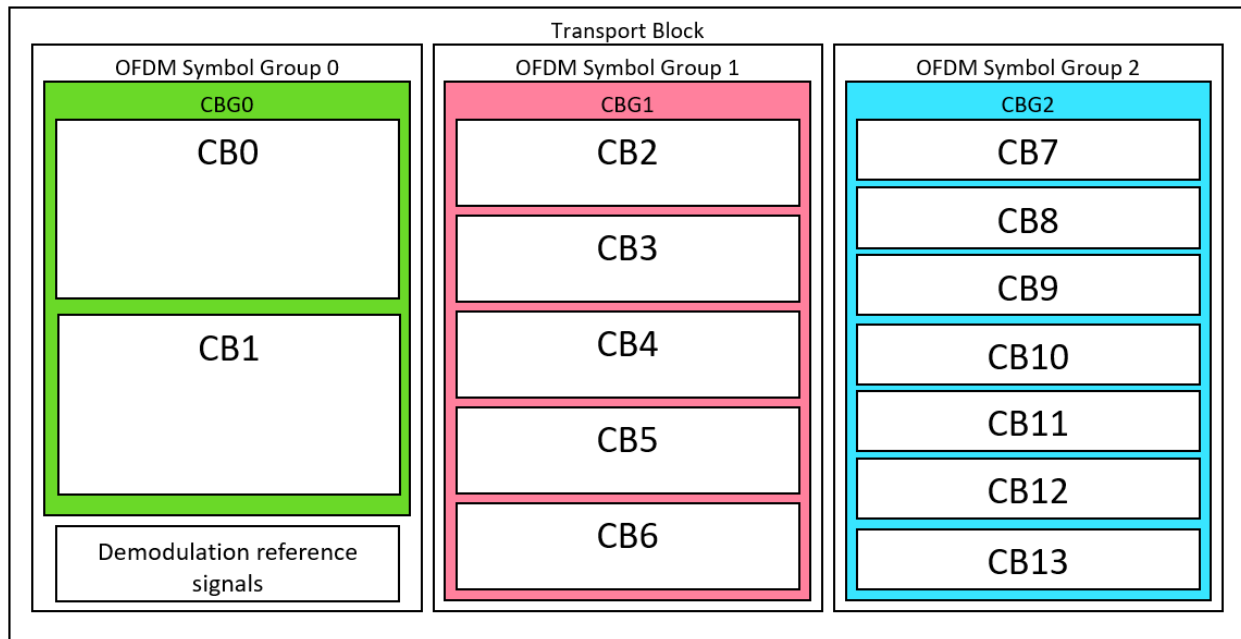
Additionally, though a POSITA would understand Lee paragraph 39 to suggest evenly sized code blocks, as illustrated by Dr. Stark, code block groups with only one size code block can satisfy this claim element under the interpretation of the claims advanced by Patent Owner in district court. EX1003 at ¶ 93. In district court, Patent Owner alleged infringement of this element where it contended all code blocks but one were the same size, so that all code block groups but one would necessarily have code blocks of only a single size. EX1010 at 21; EX1003 at ¶ 93. Patent Owner has therefore conceded that the claims do not require each of the first and second CBGs to have at least one first CB and at least one second CB. EX1003 at ¶ 94.

Thus, Lee discloses and renders obvious limitations [4f]-[4h]. EX1003 at ¶ 95.

7) [4i] a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.

Lee teaches this limitation. EX1003 at ¶¶ 96-100. Limitation [4i] requires that one of the “first CBGs” (the CBGs with more of the first and second CBs than the second CBGs) include “a greatest number” of the second CBs. This is taught both by Lee’s example of Paragraph 39 and rendered obvious by the application of Lee’s example of Paragraph 39 to Lee Figure 4.

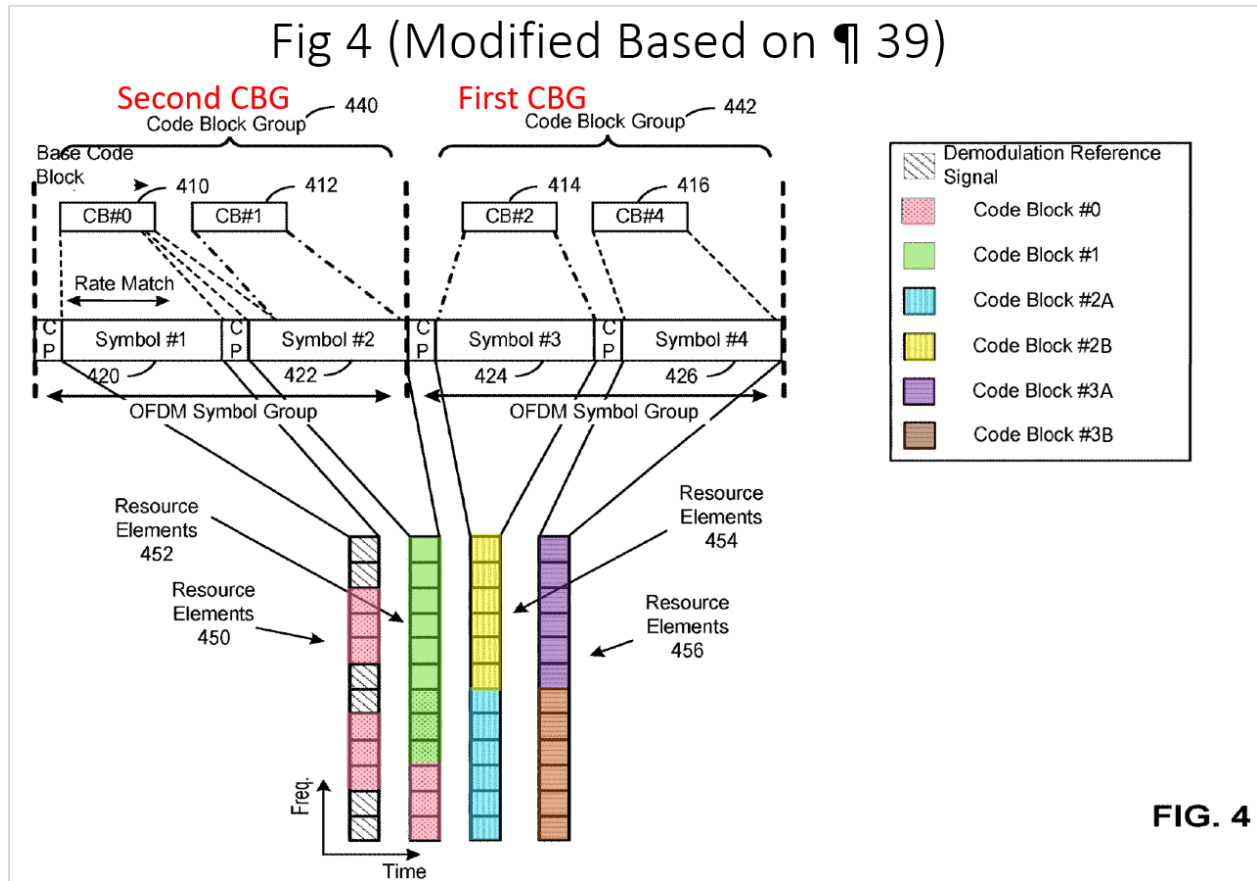
Lee’s teaching of Paragraph 39, illustrated by Petitioner’s expert below, shows a “first CBG” (the CBG with more CBs) including the greatest number of the one or more “second CBs” (the CBs that have a second size smaller than the first size of the first CBs). EX1003 at ¶ 96.



EX1003 at ¶ 96.

For example, if CB0 and CB1 from Lee Paragraph 39 are used to satisfy the “first CB” element of the claim, then CBs 2-6 or 7-13 satisfy the “second CB” element of the claim, and either CBG1 or CBG2 satisfy the “first CBG” element of the claim, and CBG0 satisfies the “second CBG” element of the claim. EX1003 at ¶ 97. The claims could likewise be satisfied with CBs 2-6 being the “first CB” elements, CBs 7-13 being the “second CB” elements, CBG2 being the “first CBG” elements, and CBG1 being the “second CBG” elements. EX1003 at ¶ 98.

Additionally, as discussed above in connection with limitations [4d] and [4e] and consistent with Lee Paragraph 39, it would have been obvious to segment the transport block such that the resource elements in the first code block group are divided between two code blocks, each with 9 resource elements and the resource elements in the second code block group are divided between four code blocks, each with six resource elements. EX1003 at ¶ 99. This arrangement would more evenly allocate the risk of error between code blocks in a code block group and would provide more redundancy for data transmitted further in time from demodulation reference signals, both of which would reduce the need for retransmissions. EX1003 at ¶ 99. In the example illustrated below, a first CBG of the one or more first CBGs (code block group 442) includes a greatest number of the one or more second CBs.



EX1003 at ¶ 99.

Thus, Lee discloses and renders obvious limitation [4i]. EX1003 at ¶ 100.

Because Lee teaches and renders obvious all elements of claim 4, Lee anticipates and renders obvious claim 4.

b) Claim 5:

1) [5pre] A base station apparatus comprising:

Lee teaches this limitation. EX1003 at ¶ 101. [5pre] recites the same limitation as [4pre]. Therefore, for the same reasons as [4pre], Lee discloses [5pre]. EX1003 at ¶ 101.

2) [5a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs,

Lee teaches this limitation. EX1003 at ¶ 102. [5a] recites the same limitation as [4a]. Therefore, for the same reasons as [4a], Lee discloses [5a]. EX1003 at ¶ 102.

3) [5b] a transmitter configured to transmit the transport block, and

Lee teaches this limitation. EX1003 at ¶ 103. [5b] recites the same limitation as [4b]. Therefore, for the same reasons as [4b], Lee discloses [5b]. EX1003 at ¶ 103.

4) [5c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

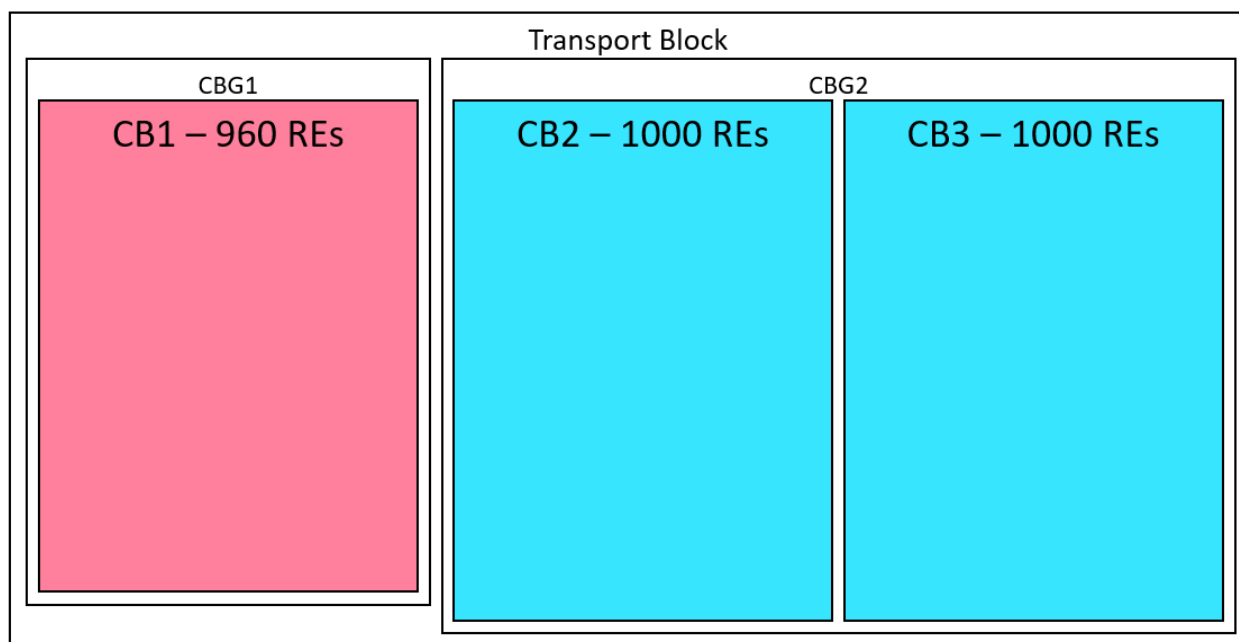
Lee teaches this limitation. EX1003 at ¶ 104. [5c] recites the same limitation as [4c]. Therefore, for the same reasons as [4c], Lee discloses [5c]. EX1003 at ¶ 104.

5) [5d] the multiple CBs include one or more first CBs and one or more second CBs, [5e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

Lee teaches these limitations. EX1003 at ¶ 105. [5d] and [5e] recite the same limitations as [4d] and [4e]. Therefore, for the same reasons as [4d] and [4e], Lee discloses [5d] and [5e]. EX1003 at ¶ 105.

In addition to the teachings and examples addressed in the analysis of limitations [4d] and [4e], Lee provides additional teachings of these limitations pertinent to claim 5. EX1003 at ¶ 105.

In Paragraph 42, Lee discloses that “code block segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3.” EX1005 at [0042]. Lee further discloses that, in an example, “CBG1 has 1 CB and 960 REs [resource elements], and CBG2 has 2 CBs and 1000 REs elements/bits/CB.” EX1005 at [0042]. Petitioners’ expert has illustrated this example below. EX1003 at ¶ 106.



EX1003 at ¶ 106.

The example of Lee Paragraph 42 teaches the segmentation of a transport block into three code blocks, one with 960 resource elements and two with 1000 resource elements. EX1005 at [0042]; EX1003 at ¶ 106. A first size of the larger

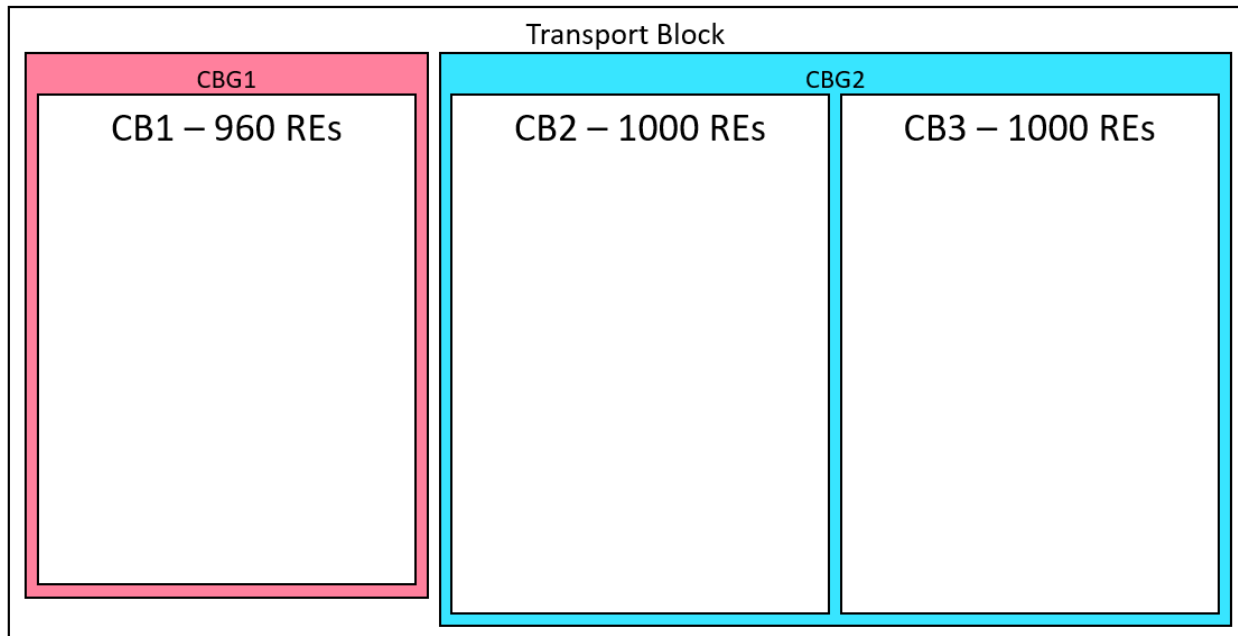
code blocks (1000 resource elements) is greater than a second size of the smaller code block (960 resource elements). EX1005 at [0042]; EX1003 at ¶ 106. Accordingly, the example of Lee Paragraph 42 also teaches limitations [5d] and [5e].

- 6) [5f] each of the multiple CBs is included in any one of the multiple CBGs, [5g] the multiple CBGs include one or more first CBGs and one or more second CBGs, [5h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and**

Lee teaches these limitations. EX1003 at ¶ 107. [5f], [5g], and [5h] recite the same limitations as [4f], [4g], and [4h]. Therefore, for the same reasons as [4f], Lee discloses and renders obvious [5f], [5g], and [5h]. EX1003 at ¶ 107.

In addition to the teachings and examples addressed in the analysis of limitations [4f], [4g], and [4h], Lee provides additional teachings of these limitations pertinent to claim 5. EX1003 at ¶ 108.

In Paragraph 42, Lee discloses that “code block segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3.” EX1005 at [0042]. Lee further discloses that, in an example, “CBG1 has 1 CB and 960 REs [resource elements], and CBG2 has 2 CBs and 1000 REs elements/bits/CB.” EX1005 at [0042]. Petitioners’ expert has illustrated this example below. EX1003 at ¶ 108.



EX1003 at ¶ 108.

The example of Lee Paragraph 42 teaches the grouping of code blocks of two different sizes into two code block groups, with one code block group (CBG2) having more code blocks than the other code block group (CBG1). EX1005 at [0042]; EX1003 at ¶ 108. The code block group with more code blocks (CBG2) satisfies the “first CBG” elements of limitations [4g] and [4h] while the code block group with fewer code blocks (CBG1) satisfies the “second CBG” elements of limitations [4g] and [4h]. EX1005 at [0042]; EX1003 at ¶ 108.

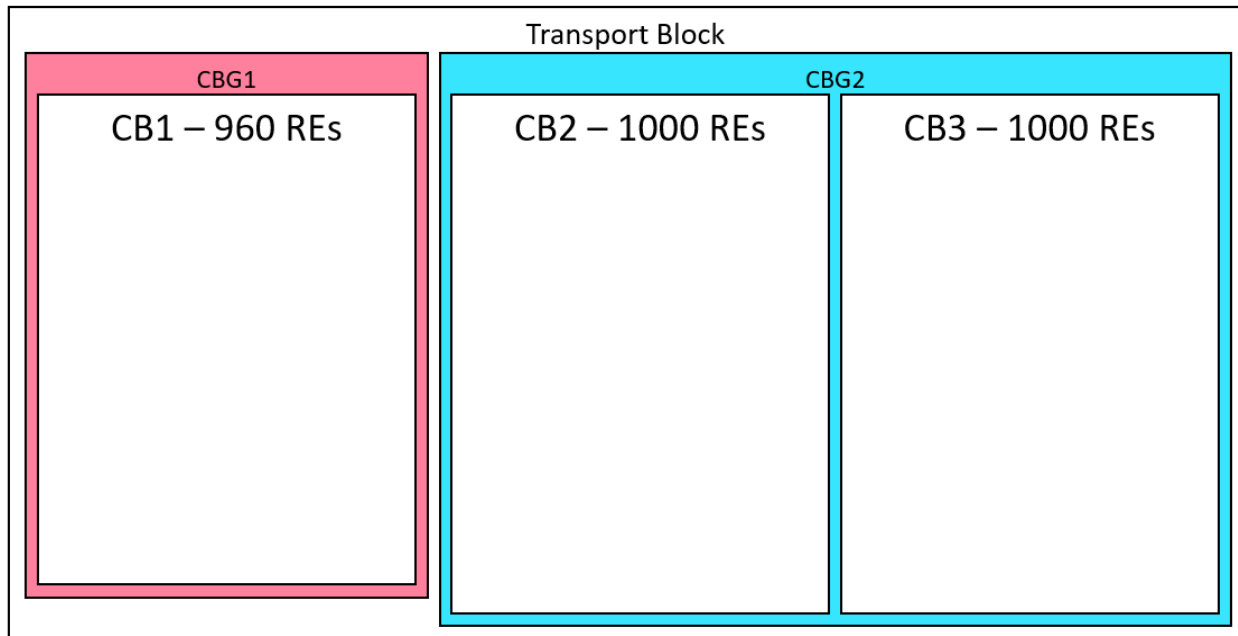
Additionally, as explained in connection with elements [4f]-[4h], Patent Owner has asserted this claim is met by a system where all code blocks but one are the same size; Patent Owner cannot now argue that the claims require each code block group include both first and second code blocks. EX1003 at ¶ 109.

Accordingly, the example of Lee Paragraph 42 also teaches limitations [5f], [5g] and [5h].

- 7) [5i] an average value of numbers of the one or more second CBs included in the one or more second CBGs is greater than an average value of numbers of the one or more second CBs included in the one or more first CBGs.**

Lee teaches this limitation. EX1003 at ¶ 110. Limitation [5i] requires that the average number of second CBs (the smaller CBs) in the second CBGs (the smaller CBGs) be greater than the average number of second CBs in the first CBGs (the larger CBGs). Lee's example of Paragraph 42 teaches this arrangement.

In Paragraph 42, Lee discloses that “code block segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3.” EX1005 at [0042]. Lee further discloses that, in an example, “CBG1 has 1 CB and 960 REs [resource elements], and CBG2 has 2 CBs and 1000 REs elements/bits/CB.” EX1005 at [0042]. Petitioners' expert has illustrated this example below. EX1003 at ¶ 110.



EX1003 at ¶ 110.

The example of Lee Paragraph 42 teaches the grouping of code blocks of two different sizes into two code block groups, with one code block group (CBG2) having more code blocks than the other code block group (CBG1). EX1005 at [0042]; EX1003 at ¶ 111. In this arrangement, the “second CBG,” with the smaller number of CBs, is CBG1, and the “first CBG,” with the larger number of CBs, is CBG2. EX1003 at ¶ 111. The “first CBs” are the CBs with 1000 REs (CB2 and CB3) and the “second CBs” are the CBs with 960 REs (CB1). EX1003 at ¶ 111. Accordingly, the average number of “second CBs” (CB1) in the “second CBG” (CBG1) is equal to 1, and the average number of “second CBs” (CB1) in the “first CBG” (CBG2) is equal 0. EX1003 at ¶ 111.

Because 1 is greater than 0, the example of Lee Paragraph 42 teaches element [5i].

Because Lee teaches and renders obvious all elements of claim 5, Lee anticipates and renders obvious claim 5.

c) Claim 10

Claim 10 is the communication method that recites the steps that the base station of Claim 4 must be configured to perform. EX1003 at ¶ 112. Limitations 4d-4i are identical to limitations 10d-10i, respectively. The same teachings of Lee that anticipate and render obvious the limitations of Claim 4, anticipate and render obvious the same limitations in Claim 10, because it is obvious for a base station apparatus to perform the steps of a communication method for a base station apparatus. EX1003 at ¶ 113.

1) [10pre] A communication method for a base station apparatus, the communication method comprising the steps of:

Limitation [4pre] recites a “base station apparatus” while limitation [10pre] recites a “A communication method for a base station apparatus.” As set forth in connection with limitation [4pre], Lee teaches this limitation. *See* Section IX.A.1.a)1). Further, a POSITA would understand that the base station disclosed by Lee would be configured to carry out a communication method. EX1003 at ¶ 114.

The same disclosures and analysis render limitation [10pre] obvious. EX1003 at ¶ 114.

2) [10a] segmenting a transport block into multiple CBs and coding each of the multiple CBs,

Limitation [4a] recites “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs” while limitation [10a] recites “segmenting a transport block into multiple CBs and coding each of the multiple CBs.” As set forth in connection with limitation [4a], Lee teaches this limitation. *See* Section IX.A.1.a)2). The same disclosures and analysis render limitation [10a] obvious. EX1003 at ¶ 115.

3) [10b] transmitting the transport block, and

Limitation [4b] recites “a transmitter configured to transmit the transport block” while limitation [10b] recites “transmitting the transport block.” As set forth in connection with limitation [4b], Lee teaches this limitation. *See* Section IX.A.1.a)3). The same disclosures and analysis render limitation [10b] obvious. EX1003 at ¶ 116.

4) [10c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein

Limitation [4c] recites “a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs” while limitation [10c] recites “receiving HARQ-ACKs corresponding to multiple CBGs.” As set forth in connection with limitation

[4c], Lee teaches this limitation. *See* Section IX.A.1.a)4). The same disclosures and analysis render limitation [10c] obvious. EX1003 at ¶ 117.

5) [10d] – [10i]

Limitations 10d-10i are identical to limitations 4d-4i, respectively. EX1003 at ¶ 118. The same teachings of Lee that anticipate and render obvious the limitations of Claim 4, anticipate and render obvious the same limitations in Claim 10. *See supra* Section IX.A.1.a)5-7).

d) Claim 11

Claim 11 is the communication method that recites the steps that the base station of Claim 5 must be configured to perform. EX1003 at ¶ 119. Limitations 5d-5i are identical to limitations 11d-11i, respectively. The same teachings of Lee that anticipate and render obvious the limitations of Claim 5, anticipate and render obvious the same limitations in Claim 11, because it is obvious for a base station apparatus to perform the steps of a communication method for a base station apparatus. Ex1002 at ¶ 120.

1) [11pre] A communication method for a base station apparatus, the communication method comprising the steps of:

Limitation [5pre] recites a “base station apparatus” while limitation [11pre] recites “A communication method for a base station apparatus.” As set forth in connection with limitation [5pre], Lee teaches this limitation. *See* Section

IX.A.1.a)1); IX.B.1.a)1). The same disclosures and analysis render limitation [11pre] obvious. EX1003 at ¶ 121.

2) [11a] segmenting a transport block into multiple CBs and coding each of the multiple CBs;

Limitation [5a] recites “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs” while limitation [11a] recites “segmenting a transport block into multiple CBs and coding each of the multiple CBs.” As set forth in connection with limitation [5a], Lee teaches this limitation. *See* Section IX.A.1.a)2); IX.B.1.a)2). The same disclosures and analysis render limitation [11a] obvious. EX1003 at ¶ 122.

3) [11b] transmitting the transport block

Limitation [5b] recites “a transmitter configured to transmit the transport block” while limitation [11b] recites “transmitting the transport block.” As set forth in connection with limitation [5b], Lee teaches this limitation. *See* Section IX.A.1.a)3); IX.B.1.a)3). The same disclosures and analysis render limitation [11b] obvious. EX1003 at ¶ 123.

4) [11c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein

Limitation [5c] recites “a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs” while limitation [11c] recites “receiving HARQ-ACKs corresponding to multiple CBGs.” As set forth in connection with limitation

[5c], Lee teaches this limitation. *See* Section IX.A.1.a)4); IX.B.1.a)4). The same disclosures and analysis render limitation [11c] obvious. EX1003 at ¶ 124.

5) [11d]-[11i]

Limitations 5d-5i are identical to limitations 11d-11i, respectively. EX1003 at ¶ 125. The same teachings of Lee that anticipate and render obvious the limitations of Claim 5, anticipate and render obvious the same limitations in Claim 11. *See supra* Sections IX.A.1.a)5-7); IX.B.1.a)5-7).

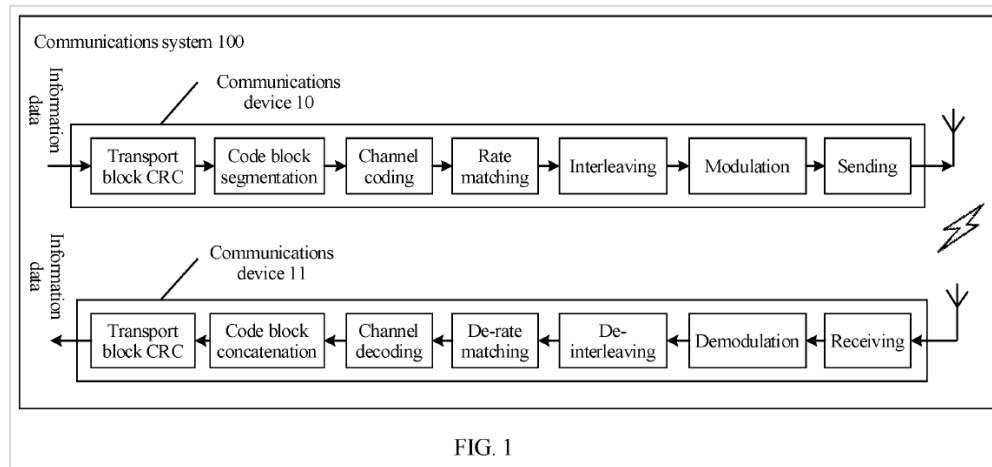
B. Ground 2: Zheng

1. The Challenged Claims are Anticipated and Rendered Obvious by Zheng

a) Claim 4

1) [4pre] A base station apparatus comprising:

Zheng teaches this limitation. EX1003 at ¶¶ 126-128. For example, in communications systems, information is transmitted between communications devices, i.e. between a base station and a terminal. EX1007 at [0003]. For example, Zheng discloses that “the communications device may be a network device in a communications system, such as a base station.” EX1007 at [0063]. The communications device is part of a communications system, which transmits control or data information between devices “for example, between a base station and a terminal.” EX1007 at [0003]. The communications system/device of Zheng referenced here is illustrated by Figure 1, reproduced below.



EX1007 at Fig. 1.

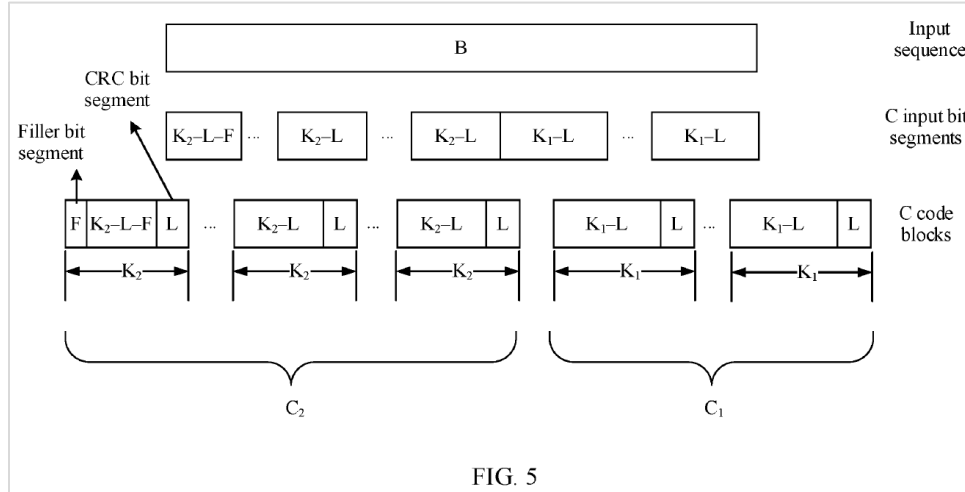
Thus, Zheng discloses element [4pre], a “base station apparatus.” EX1003 at ¶ 128.

2) [4a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs;

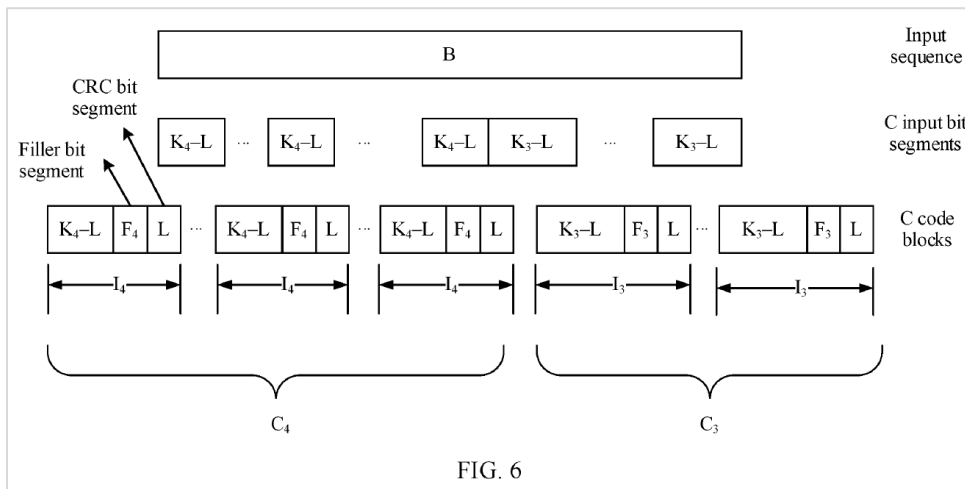
Zheng teaches this limitation. EX1003 at ¶¶ 129-133. For example, as illustrated below in Figure 9, Zheng discloses segmenting code block groups. For example, as shown in Figure 1, which was reproduced above, the transport block of Zheng is segmented. EX1007 at Fig. 1; EX1003 at ¶ 129; *see supra* Section IX.B.1.a)1).

Examples of different ways Zheng teaches for segmenting transport blocks into code blocks can be seen in Figs. 4-8, reproduced below. Zheng teaches that segmentation can be accomplished in a variety of different ways, as can the grouping of the code blocks into code block groups. EX1003 at ¶ 129. Each of Figures 5-8

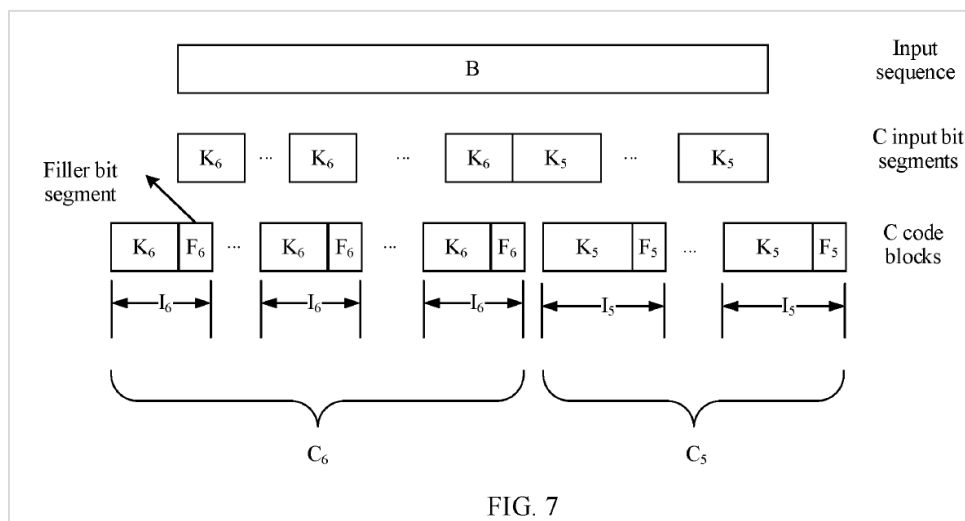
illustrate a schematic diagram of a code block segmentation manner according to Zheng's disclosure. EX1007 at [0051]-[0054].



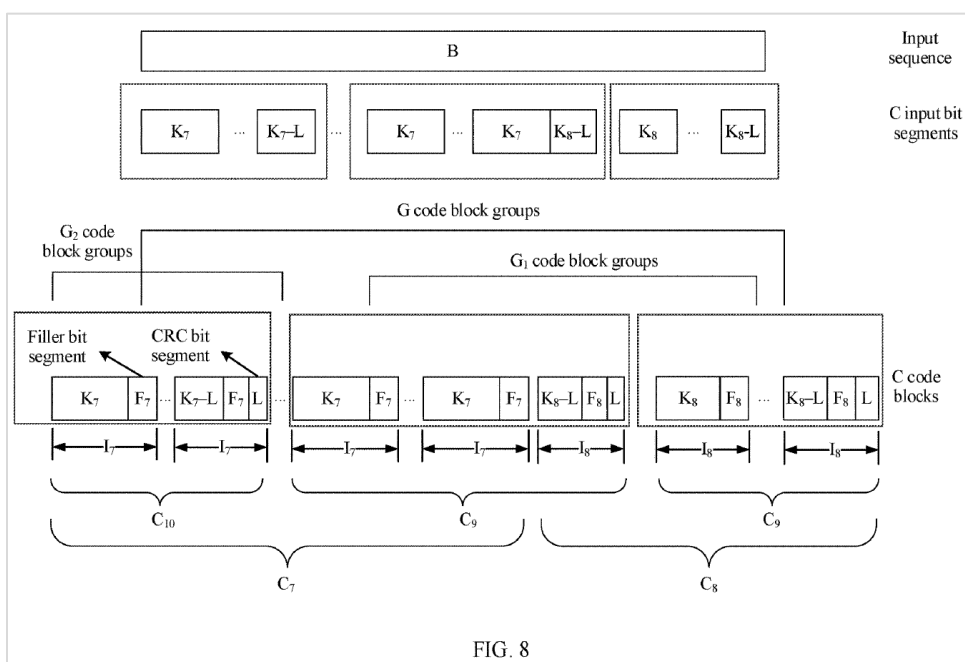
EX1007 at Fig. 5. As depicted here, Zheng teaches that two adjacent code blocks may have varying lengths. EX1007 at [0083]; EX1003 at ¶ 129.



EX1007 at Fig. 6 and [0088].



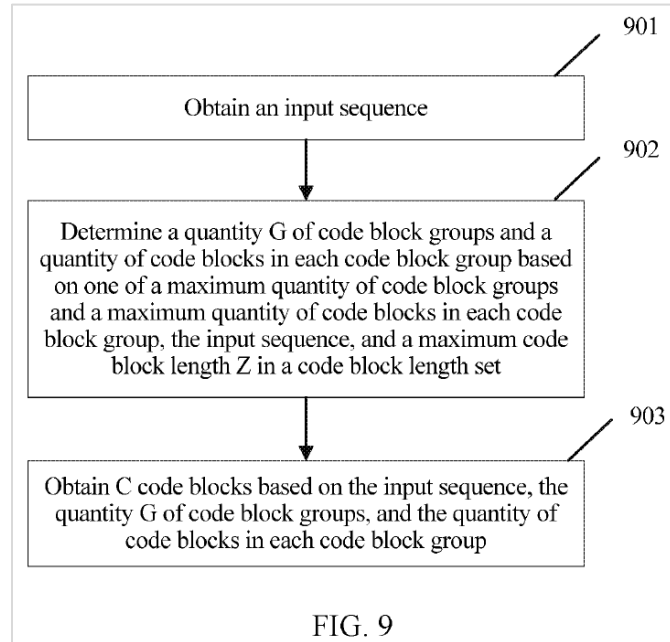
EX1007 at Fig. 7 and [0100].



EX1007 at Fig. 8 and [0109].

Zheng's system first obtains an input sequence, which may be a transport block or transport block to which transport block CRC bits are attached. EX1007 at [0070]. After receiving the input sequence, Zheng discloses segmenting the input

sequence (transport block) into multiple code blocks. *See* EX1007 at Fig. 9; EX1003 at ¶¶ 130-131.



EX1007 at Fig. 9.

As shown above, Figures 5-8 show different code block segmentation strategies according to Zheng's disclosure. *See* EX1007 at Figs. 5-8; EX1003 at ¶ 130. Zheng also discloses an example of code block segmentation in table form, showing the sizes of various fields in each code block, reproduced below. EX1007 at [0140].

TABLE 1

An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued

An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1007 at Table 1.

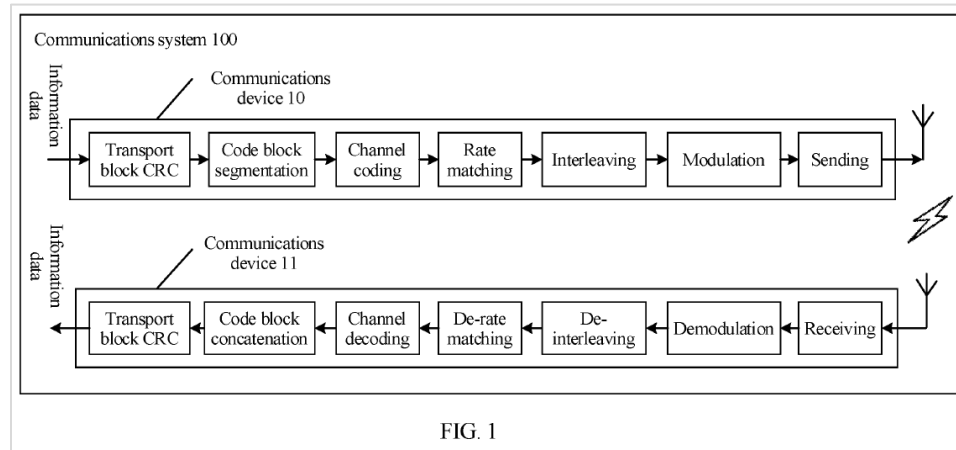
Thus, Zheng discloses element [4a], “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs.” EX1003 at ¶ 133.

3) [4b] a transmitter configured to transmit the transport block, and

Zheng teaches this limitation. EX1003 at ¶¶ 134-135. For example, as illustrated in Figure 1, reproduced below, the communications device transmits the transport block. *See* EX1007 at Fig. 1 and [0003]; EX1003 at ¶ 133. As shown in Figure 1 below, the communication device 10, which performs segmentation and coding, also sends via an antenna. A POSITA would understand this to show a

transmitter that is configured to transmit the segmented and coded transport block.

EX1003 at ¶ 133; EX1007 at [0060].



EX1007 at Fig. 1. Zheng also discloses that the method taught “may be applied to a device at a transmitting end.” EX1007 at [0068]. Thus, Zheng discloses element [4b], “a transmitter configured to transmit the transport block.” EX1003 at ¶ 135.

4) [4c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

Zheng teaches this limitation. EX1003 at ¶¶ 136-139. For example, Zheng discloses that “ACK feedback is performed by code block group” which improves performance and system efficiency. EX1007 at [0026]. Feedback is information received, in the form of acknowledgements (“acks”) or negative acknowledgements (“nacks”), in response to transmitted information (here, a transport block segmented into code blocks, where are grouped into code block groups). EX1003 at ¶ 136. A

POSITA would understand that a base station includes a receiver configured to receive feedback acks and nacks. EX1003 at ¶ 136.

Zheng further discloses that “CRC bits are attached by code block group.” EX1007 at [0111] and [0142]. This reduces CRC overheads because CRC bit segments are attached by CBG after the input sequence has been processed. EX1007 at [0111] and [0142]. Further, Zheng teaches that “a hybrid automatic repeat request (HARQ) is used in a system to feed back acknowledgement/negative acknowledgement (ACK/NACK) information by group.” EX1007 at [0142]. Zheng explains that this CRC attachment based on CBG reduces feedback signaling overhead while improving system efficiency. EX1007 at [0142]. A POSITA would understand that Zheng’s disclosure of receiving HARQ-ACKs by group discloses the HARQ-ACKS corresponding to the multiple CBGs. EX1003 at ¶ 137.

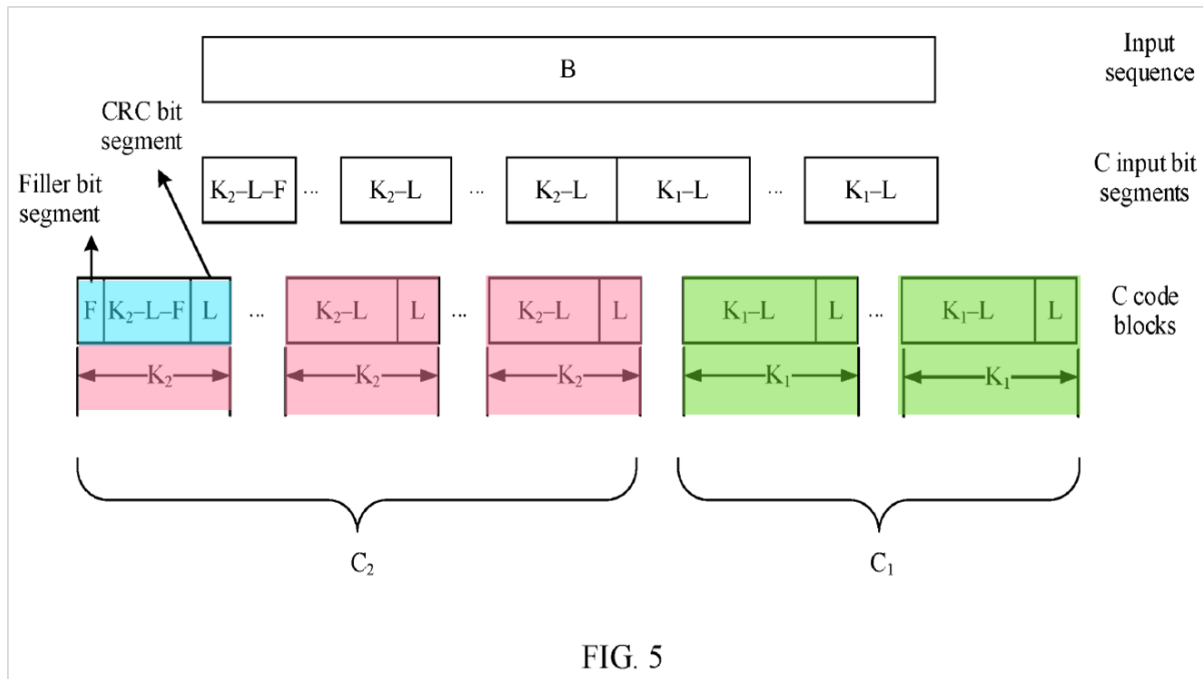
Additionally, a POSITA would recognize based on Zheng’s disclosure that segmentation of transmissions into smaller code blocks and grouping of code blocks together allow feedback to more specifically identify the portion of a transmission that must be retransmitted, reducing the amount of unnecessary retransmission. EX1003 at ¶ 138. A POSITA would be motivated to send feedback following successful receipt of each CBG so that transmissions can be acked/nacked with less delay. EX1003 at ¶ 138.

Thus, Zheng discloses or renders obvious, element [4c], “a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs.” EX1003 at ¶ 139.

5) [4d] the multiple CBs include one or more first CBs and one or more second CBs, [4e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

Zheng teaches limitations [4d] and [4e]. EX1003 at ¶¶ 140-148. Limitation [4d] requires the segmentation include at least two different types of code block, and limitation 4[e] requires the first type of code block have “a first size” that is greater than “a second size” of the second type of code block. EX1003 at ¶ 140. Zheng expressly teaches that a transport block can be segmented into code blocks with different sizes, multiple examples of which are illustrated by Figures 5-8. EX1007 at [0051]-[0054]. Each example includes at least two sizes of code blocks. EX1003 at ¶ 141. Zheng adopts this approach of having two or more different sized code blocks in order to accommodate a fixed set of possible code block sizes, referred to as a code block length set. EX1007 at [0007]; EX1003 at ¶ 141. Using two or more code block lengths allows Zheng to better fit data into an input data sequence of arbitrary length, reducing the need for filler bits and improving efficiency. EX1003 at ¶ 141.

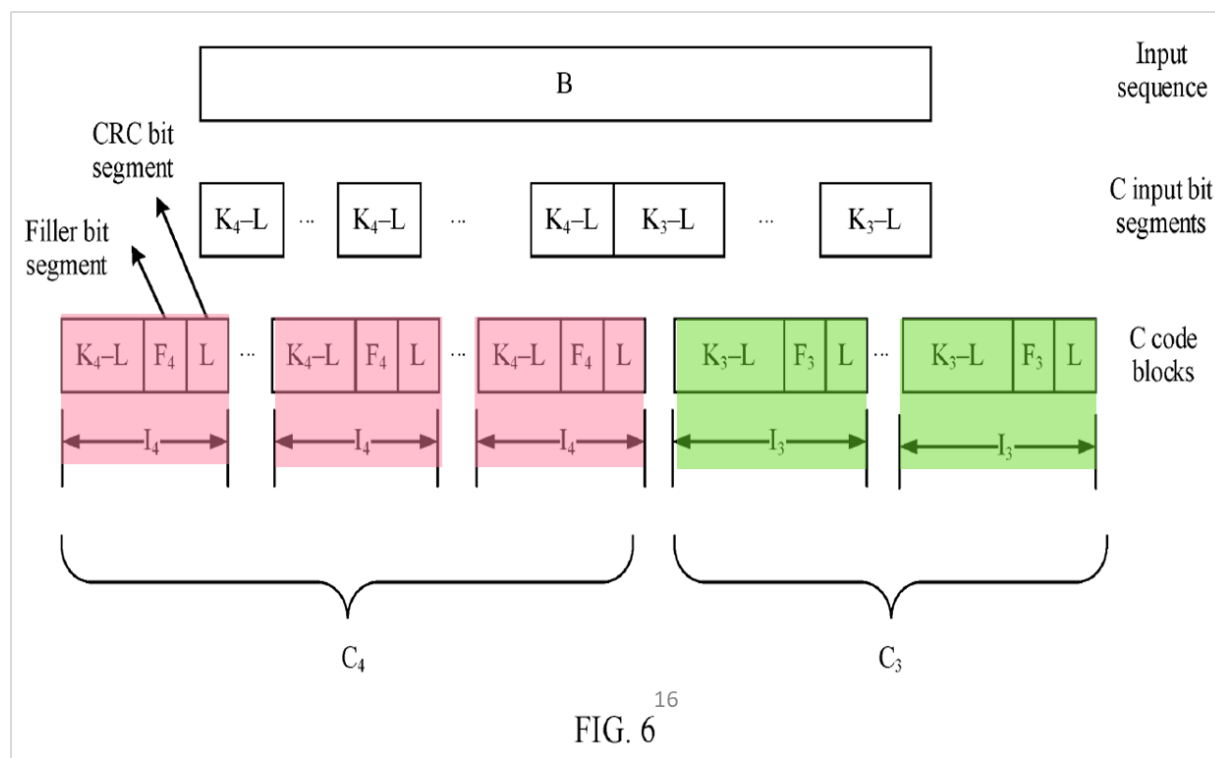
Zheng Fig. 5, below, depicts a total of C code blocks each having total lengths K_1 and K_2 , with segment sizes in each code block of F , L , K_2-L-F , K_2-L , or K_1-L . The “size” limitation may be understood as referring to multiple quantities or segment lengths in each block. EX1003 at ¶ 142. If assessed by the size of the input bit segment of each code block, there are three code block sizes illustrated. If assessed by the total length of the final code block, or in other words the sum of all segments in each block, there are two code block sizes. EX1003 at ¶ 142.



EX1007 at Fig. 5 (color added) and [0083]; EX1003 at ¶ 142.

Zheng Fig. 6, below, depicts C code blocks having total lengths I_3 and I_4 , with each of the code blocks of each length having uniform segment sizes. That is, all code blocks with a total length of I_4 have equal sized input bit segments, filler bit

segments, and CRC bit segments. EX1003 at ¶ 143. However, the input bit segments and filler bit segments may be differently sized between the total length I_3 and total length I_4 blocks. EX1003 at ¶ 143. Here, I_n denotes a minimum code block length in code block lengths greater than or equal to K_n in the code block set. EX1007 at [0090], [0093].

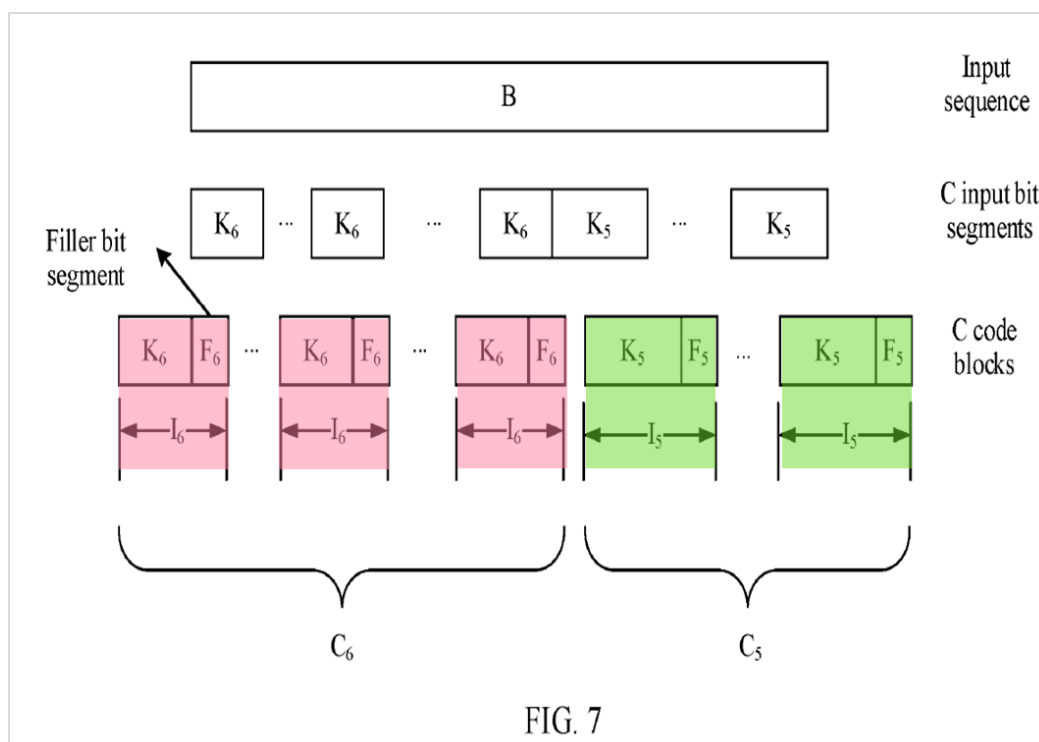


EX1007 at Fig. 6 (color added); EX1003 at ¶ 143.

Zheng Fig. 7, below, depicts C code blocks having total lengths I_5 and I_6 , with each of the code blocks of each length having uniform segment sizes. That is, all code blocks with a total length of I_6 have equal sized input bit segments and filler bit segments. EX1003 at ¶ 144. However, the input bit segments and filler bit segments

may be differently sized between the total length I_5 and total length I_6 blocks.

EX1003 at ¶ 144.



EX1007 at Fig. 7 (color added) and [0100]; EX1003 at ¶ 144.

Zheng Fig. 8, below, depicts C code blocks having total lengths I_7 and I_8 , with segment sizes in each code block of $K_7, F_7, K_7-L, L, K_8-L, F_8$, or K_8 . If assessed by the size of the input bit segment of each code block, there are four code block sizes illustrated. If assessed by the total length of the final code block, there are two code block sizes. EX1003 at ¶ 145.

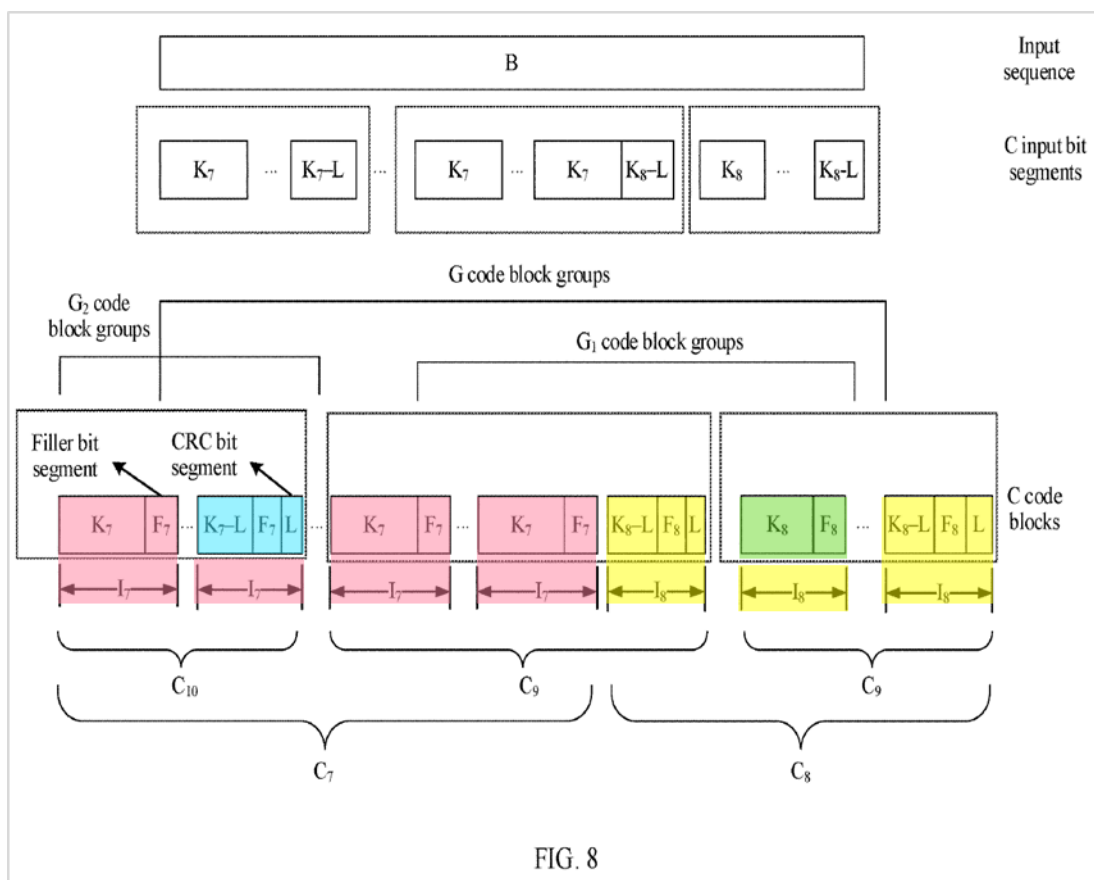


FIG. 8

EX1007 at Fig. 8 (color added) and [0109]; EX1003 at ¶ 145.

Zheng further provides Table 1, which shows an exemplary code block segmentation with multiple code blocks (identified by code block number). *See also* [0083]-[0140] discussing various code block segmentations of transport blocks. EX1003 at ¶ 146. As shown in Table 1, each code block number has corresponding sizes. For example, the “Length (bits) of an input bit segment,” is one size of the code block. EX1003 at ¶ 146. This is consistent with Patent Owner’s reading of the claim, as Patent Owner asserted that code blocks having different input bit length segments had different sizes. EX1010 at 21; EX1003 at ¶ 148. There are multiple

code blocks with the same input bit segment lengths in Table 1. Table 1 has been reproduced below with color added to indicate code blocks of a same size. Each of CB0, 1, 3, 4, 5, 7, 8 and 9 (highlighted in pink below) have an input bit segment length of 6140. EX1003 at ¶ 146. Each of CB11, 12 and 13 (highlighted in blue below) have an input bit segment length of 6139. EX1003 at ¶ 146.

TABLE 1				
An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued				
An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1003 at ¶ 146.

Because a first size of a “first CB” of the one or more first CBs (6140) is greater than a second size of a “second CB” of the one or more second CBs (6139), the code block segmentation illustrated in Table 1 satisfies limitations [4d] and [4e]. EX1003 at ¶ 147.

Thus, Zheng discloses elements [4d] and [4e]. EX1003 at ¶ 140.

- 6) [4f] each of the multiple CBs is included in any one of the multiple CBGs, [4g] the multiple CBGs include one or more first CBGs and one or more second CBGs, [4h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and

Zheng teaches limitations [4f], [4g], and [4h]. EX1003 at ¶¶ 149-151. As discussed above, taken together, these limitations require the CBs to be in two or more CBGs [4f], the two or more CBGs to have two or more types (“first CBGs” and “second CBGs”) [4g], and that the first type of CBG have more of the “first” and “second” type CBs than the second type of CBG [4h]. EX1003 at ¶ 149. Zheng provides express examples satisfying these limitations, and additionally renders them obvious.

As described above, Zheng discloses various segmentations of transport blocks into code blocks with different sizes. *See supra* Section IX.B.1.a)5); EX1003 at ¶ 150. The annotated Zheng Table 1 below shows “first CBs” (of a greater size) annotated in pink, and smaller “second CBs” (annotated in blue).

TABLE 1

An Example of Code Block Segmentation

Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued

An Example of Code Block Segmentation

Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1007 at Table 1 (color added).

Table 1 further shows that each of these “first and second CBs” is included into one of multiple CBGs. *See* EX1007 at Table 1; EX1003 at ¶ 151. There are four code block groups, numbered 0 through 3. EX1003 at ¶ 151. CBG0 includes CB0, CB1, and CB2. CBG1 includes CB3, CB4, CB5, and CB7, and so on. *Id.* Further if code blocks CB0, 1, 3, 4, 5, 7, 8 and 9 (annotated in pink) are used to satisfy the “first CB” elements and code blocks CB11, 12 and 13 (annotated in blue) are used to satisfy the “second CB” elements, then CBG1, CBG2, and CBG3 would satisfy the “first CBG” elements of limitations [4g] and [4h] and CBG0 would satisfy the “second CBG” elements of limitations [4g] and [4h]. CBG3 (the “first type of CBG”) has more of the first and second type CBs (3 of the second type CBs) than the second

type of CBG (CBG0, which has 2 of the first type CBs), as required by limitation [4h]. EX1003 at ¶ 151. Zheng therefore teaches elements [4f]-[4h].

7) [4i] a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.

Zheng teaches this limitation. EX1003 at ¶¶ 152-157. Limitation [4i] requires that one of the “first CBGs” (the CBGs with more of the first and second CBs than the second CBGs) include “a greatest number” of the second CBs. This is both taught and rendered obvious by Zheng.

The annotated table below shows “first CBs” annotated in pink, and smaller “second CBs” (annotated in blue). As illustrated by the table below, Zheng discloses a “first CBG” (the CBG with more CBs, or CBG3 below) includes the greatest number of the one or more “second CBs” (the “second CBs” have a size smaller than the size of the “first CBs”).

TABLE 1

An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued

An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1007 at Table 1 (color added). One of the “first CBGs” (CBG3) includes a greatest number of the one or more second CBs (3 second CBs, highlighted in blue). EX1003 at ¶ 152.

Zheng has additional disclosures which are examples of limitation [4i].

EX1003 at ¶ 153. For example, consider a scenario with a transport block of size 2514, two code block groups, and five code blocks. For example, Zheng provides that there may be L=24 CRC bits associated with each CBG, and there are codewords with possible information sizes 128, 256, 512, 640, ..., 6144. *See*

EX1007 at [0074]. Applying the procedure disclosed in Zheng paragraphs [0127]-[0137], one of the code blocks has a segment of length $K_7 = \lfloor (B + G \cdot L)/C \rfloor = 513$. EX1003 at ¶ 153. Further, at least one of the code blocks comprises filler bits with a length of $F_7 = I_7 - K_7 = 127$. At least one of the code blocks has a length of $K_8 = \lfloor (B + G \cdot L)/C \rfloor = 512$. There are $C_8 = C \cdot K_7 - (B + G \cdot L) = 5 \cdot 513 - (2514 + 2 \cdot 24) = 3$ such code blocks, and the number of code blocks with K_7 information size then is $C_7 = C - C_8 = 5 - 3 = 2$. [0137]. EX1003 at ¶ 153. This example is illustrated by the table created by Petitioner's expert, reproduced below.

Code Group Number	Code block Number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length of filler bit segment	Total length of encoder input
0	0	513	0	127	640
	1	489	24	103	640
1	2	512	0	0	512
	3	512	0	0	512
	4	488	24	0	512

EX1003 at ¶ 153.

In CB0, there are 513 input bits and 127 filler bits. In CB1, there are 489 input bits, 103 filler bits and 24 CRC bits. EX1003 at ¶ 156; EX1007 at [0136]. The “first CBs” would be the CBs with total length 640, and the “second CBs” would be the CBs with total length 512. Because the length of the “first CB” is greater than that of the “second CBs”, limitation [4e] is satisfied. The total of “first and second CBs” in the “first CBG” (CBG1 in the example above), is greater than the total of “first

and second CBs” in the “second CBG” (CBG0 in the example above), satisfying limitation [4h]. Finally, because the “first CBG” has the greatest number of “second CBs” (CBG1 having 3 second CBs), the example also satisfies limitation [4i].

Thus, Zheng discloses element [4i], “a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.” EX1003 at ¶ 157.

Because Zheng teaches and renders obvious all elements of claim 4, Zheng anticipates and renders obvious claim 4.

b) Claim 5:

1) [5pre] A base station apparatus comprising:

Zheng teaches this limitation. EX1003 at ¶ 158. [5pre] recites the same limitation as [10pre]. Therefore, for the same reason as with respect to [10pre], Zheng discloses [5pre]. *Id.*

2) [5a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs,

Zheng teaches this limitation. EX1003 at ¶ 159. [5a] recites the same limitation as [10a]. Therefore, for the same reason as with respect to [10a], Zheng discloses [5a]. *Id.*

3) [5b] a transmitter configured to transmit the transport block, and

Zheng teaches this limitation. EX1003 at ¶ 160. [5b] recites the same limitation as [10b]. Therefore, for the same reason as with respect to [10b], Zheng discloses [5b]. *Id.*

4) [5c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

Zheng teaches this limitation. EX1003 at ¶ 161. [5c] recites the same limitation as [10c]. Therefore, for the same reason as with respect to [10c], Zheng discloses [5c]. *Id.*

5) [5d] the multiple CBs include one or more first CBs and one or more second CBs, [5e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

Zheng teaches these limitations. EX1003 at ¶ 162. [5d] and [5e] recite the same limitations as [4d] and [4e]. Therefore, for the same reasons as [4d] and [4e], Zheng discloses [5d] and [5e]. EX1003 at ¶ 162. In addition to the teachings and examples addressed in the analysis of limitations [4d] and [4e], Zheng provides additional teachings of these limitations pertinent to claim 5. EX1003 at ¶ 162.

Table 1 of Zheng has been reproduced below with annotation by Petitioners' expert. As noted in Petitioners' analysis of elements [4d] and [4e], each code block number has corresponding sizes. In claim 4, Petitioners pointed to the quantity

“Length (bits) of an input bit segment” as “a size” used in the claim to distinguish between code blocks. For Claim 5, Petitioners point to one of the other sizes of the code block: the “length (bits) of a filler bit segment” as the code block size, which is also a size of the code blocks. EX1003 at ¶ 163. This is consistent with Patent Owner’s reading of the claim, as Patent Owner asserted that code blocks having different filler bit length segments had different sizes. EX1010 at 21; EX1003 at ¶ 164. Organized in this fashion, table one shows first code blocks with a first size (5 bits) greater than a second size (4 bits) of the second code blocks. EX1007 at Table 1; EX1003 at ¶ 163.

TABLE 1

An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued

An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1003 at ¶ 163. Accordingly, the example of Table 1 teaches limitations [5d] and [5e].

- 6) **[5f] each of the multiple CBs is included in any one of the multiple CBGs, [5g] the multiple CBGs include one or more first CBGs and one or more second CBGs, [5h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and**

Zheng teaches these limitations. EX1003 at ¶ 165. [5f], [5g], and [5h] recite the same limitations as [4f], [4g], and [4h]. Therefore, for the same reasons as [4f], [4g], and [4h], Zheng discloses and renders obvious [5f], [5g], and [5h]. EX1003 at ¶ 165.

Additionally, as articulated in connection with elements [5d] and [5e], Zheng Table 1 provides multiple different sizes for each of its code blocks, and if the filler bit segment length is used to satisfy “a [first/second] size” of the code blocks of the claims, then Zheng Table 1 illustrates code blocks of two types: those with 5 filler bits (first CBs), annotated in blue and those with 4 filler bits (second CBs), annotated in pink. These two types of CBs are grouped into four code block groups. This is illustrated in the annotated figure below.

TABLE 1

An Example of Code Block Segmentation

Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued

An Example of Code Block Segmentation

Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1003 at ¶ 165.

Code block group 0 has 3 CBs of the first and second type while code block groups 1, 2, and 3 have 4 CBs of the first and second type. Zheng therefore teaches the grouping of code blocks of two different sizes into code block groups of two different sizes. EX1007 at Table 1; EX1003 at ¶ 166. The code block group with more code blocks (e.g. CBG3) satisfies the “first CBG” elements of limitations [4g] and [4h] while the code block group with fewer code blocks (CBG0) satisfies the “second CBG” elements of limitations [4g] and [4h]. EX1003 at ¶ XX.

Additionally, as explained in connection with elements [4f]-[4h], Patent Owner has asserted this claim is met by a system where all code blocks but one are

the same size, and so cannot now argue that the claims require each code block group include both first and second code blocks. EX1003 at ¶ 166.

Accordingly, the example of Zheng Table 1 teaches limitations [5f], [5g] and [5h]. EX1003 at ¶ 166.

- 7) [5i] an average value of numbers of the one or more second CBs included in the one or more second CBGs is greater than an average value of numbers of the one or more second CBs included in the one or more first CBGs.**

Zheng teaches this limitation. EX1003 at ¶ 167.

As explained in connection with limitations [5d]-[5h] above, Table 1 teaches the segmentation of a transport block into code blocks of two sizes (filler bit length 5 and filler bit length 4) which are then grouped into code block groups having two numbers of code blocks (4 code blocks or 3 code blocks). EX1003 at ¶ 167. An annotated Table 1 is reproduced below for illustration.

TABLE 1				
An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
0	0	6140	0	4
	1	6140	0	4
	2	6116	24	4
1	3	6140	0	4
	4	6140	0	4
	5	6140	0	4
	6	6116	24	4

TABLE 1-continued				
An Example of Code Block Segmentation				
Group number	Code block number	Length (bits) of an input bit segment	Length (bits) of a CRC bit segment	Length (bits) of a filler bit segment
2	7	6140	0	4
	8	6140	0	4
	9	6140	0	4
	10	6116	24	4
3	11	6139	0	5
	12	6139	0	5
	13	6139	0	5
	14	6115	24	5

EX1007 at Table 1 (color added).

Limitation 5[i] requires that the average number of “second CBs” (the smaller CBs) be greater in the smaller code block groups (“second CBGs”) than in the larger code block groups (“first CBGs”). This limitation is taught by Table 1 as illustrated above. EX1003 at ¶ 168. There is one “second CBG” (Zheng CBG0, with three code blocks). EX1003 at ¶ 168. Each of the 3 code blocks in Zheng CBG0 are second CBs (with 4 rather than 5 filler bits) so the average number of “second CBs” in the “second CBGs” is 3. EX1003 at ¶ 168. There are 3 “first CBGs” (Zheng CBG1, CBG2, CBG3), with a total of 8 “second CBs” between them (CBs 3-10). EX1003 at ¶ 168. The average number of second CBs in the “first CBGs” is therefore $8/3$, or ~ 2.667 .

Because 3 is greater than 2.667, Zheng teaches limitation 5[i]. EX1003 at ¶ 169.

Because Zheng teaches and renders obvious all elements of claim 5, Zheng anticipates and renders obvious claim 4.

c) Claim 10

Claim 10 is the communication method that recites the steps that the base station of Claim 4 must be configured to perform. EX1003 at ¶ 170. Limitations 4d-4i are identical to limitations 10d-10i, respectively. The same teachings of Zheng that anticipate and render obvious the limitations of Claim 4, anticipate and render obvious the same limitations in Claim 10, because it is obvious for a base station apparatus to perform the steps of a communication method for a base station apparatus. EX1003 at ¶ 171.

1) [10pre] A communication method for a base station apparatus, the communication method comprising the steps of:

Limitation [4pre] recites a “base station apparatus” while limitation [10pre] recites “A communication method for a base station apparatus.” As set forth in connection with limitation [4pre], Zheng teaches this limitation. *See* Section IX.B.1.a)1). The same disclosures and analysis render limitation [10pre] obvious. EX1003 at ¶ 172.

2) [10a] segmenting a transport block into multiple CBs and coding each of the multiple CBs,

Limitation [4a] recites “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs” while limitation [10a] recites “segmenting a transport block into multiple CBs and coding each of the multiple CBs.” As set forth in connection with limitation [4a], Zheng teaches this limitation. *See* Section IX.B.1.a)2). The same disclosures and analysis render limitation [10a] obvious. EX1003 at ¶ 173.

3) [10b] transmitting the transport block, and

Limitation [4b] recites “a transmitter configured to transmit the transport block” while limitation [10b] recites “transmitting the transport block.” As set forth in connection with limitation [4b], Zheng teaches this limitation. *See* Section IX.B.1.a)3). The same disclosures and analysis render limitation [10b] obvious. EX1003 at ¶ 174.

4) [10c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein

Limitation [10c] recites “a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs” while limitation [4c] recites “receiving HARQ-ACKs corresponding to multiple CBGs.” As set forth in connection with limitation [4c], Zheng teaches this limitation. *See* Section IX.B.1.a)4). The same disclosures and analysis render limitation [10c] obvious. EX1003 at ¶ 175.

5) [10d] – [10i]

Limitations 4d-4i are identical to limitations 10d-10i, respectively. EX1003 at ¶ 176. The same teachings of Zheng that anticipate and render obvious the limitations of Claim 4, anticipate and render obvious the same limitations in Claim 10. *See supra* Section IX.B.1.a)5-7).

d) Claim 11

Claim 11 is the communication method that recites the steps that the base station of Claim 5 must be configured to perform. EX1003 at ¶ 177. Limitations 5d-5i are identical to limitations 11d-11i, respectively. The same teachings of Zheng that anticipate and render obvious the limitations of Claim 5, anticipate and render obvious the same limitations in Claim 11, because it is obvious for a base station apparatus to perform the steps of a communication method for a base station apparatus. Ex-1002 at ¶ 178.

1) [11pre] A communication method for a base station apparatus, the communication method comprising the steps of:

Limitation [5pre] recites a “base station apparatus” while limitation [11pre] recites “A communication method for a base station apparatus.” As set forth in connection with limitation [5pre], Zheng teaches this limitation. *See* Section IX.A.1.a)1); IX.B.1.a)1). The same disclosures and analysis render limitation [11pre] obvious. EX1003 at ¶ 179.

2) [11a] segmenting a transport block into multiple CBs and coding each of the multiple CBs;

Limitation [5a] recites “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs” while limitation [11a] recites “segmenting a transport block into multiple CBs and coding each of the multiple CBs.” As set forth in connection with limitation [5a], Zheng teaches this limitation. *See* Section IX.A.1.a)2); IX.B.1.a)2). The same disclosures and analysis render limitation [11a] obvious. EX1003 at ¶ 180.

3) [11b] transmitting the transport block

Limitation [5b] recites “a transmitter configured to transmit the transport block” while limitation [11b] recites “transmitting the transport block.” As set forth in connection with limitation [5b], Zheng teaches this limitation. *See* Section IX.A.1.a)3); IX.B.1.a)3). The same disclosures and analysis render limitation [11b] obvious. EX1003 at ¶ 181.

4) [11c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein

Limitation [5c] recites “a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs” while limitation [11c] recites “receiving HARQ-ACKs corresponding to multiple CBGs.” As set forth in connection with limitation [5c], Zheng teaches this limitation. *See* Section IX.A.1.a)4); IX.B.1.a)4). The same disclosures and analysis render limitation [11c] obvious. EX1003 at ¶ 182.

5) [11d]-[11i]

Limitations 5d-5i are identical to limitations 11d-11i, respectively. EX1003 at ¶ 183. The same teachings of Zheng that anticipate and render obvious the limitations of Claim 5, anticipate and render obvious the same limitations in Claim 11. *See supra* Sections IX.A.1.a)5-7); IX.B.1.a)5-7).

X. CONCLUSION

For the reasons given above, Petitioners request institution of *inter partes* review of the '509 Patent to cancel the Challenged Claims based on each of the grounds specified in this petition.

Respectfully submitted,

Dated: March 27, 2024

By: /Scott W. Hejny
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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 11,196,509 contains, as measured by the word processing system used to prepare this paper, 12,323 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: March 27, 2024

By: /Scott W. Hejny
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CERTIFICATE OF SERVICE

I hereby certify that on March 27, 2024, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 11,196,509 and supporting exhibits was served on the following parties via Federal Express or Express Mail:

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