

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, T-MOBILE USA, INC
Petitioners,

v.

DAINGEAN TECHNOLOGIES LTD.,
Patent Owner.

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

DECLARATION OF DR. WAYNE STARK

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I, Dr. Wayne Stark, declare as follows:

I. INTRODUCTION

1. I have been retained by Petitioners and their counsel, McKool Smith P.C. (“McKool Smith”), as an independent expert consultant in this proceeding regarding U.S. Patent No. 11,196,509 (“the ’509 Patent”) (EX1001). I have been asked to consider whether certain references disclose or suggest the limitations recited in claims 4, 5, 10, and 11 of the ’509 Patent (“the Challenged Claims”).

2. I am being compensated for my work in this proceeding at a rate of \$600 per hour and receiving reimbursement for expenses incurred in the course of my work. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

3. This declaration is directed to the Challenged Claims of the ’509 Patent and sets forth certain opinions I have formed, the conclusions I have reached, and the bases for each. The conclusions I present are based on my own judgment. I am not an employee of the Petitioners, McKool Smith, the inventors of the ’509 Patent, or of any affiliated companies.

4. Based on my experience, knowledge of the art at the relevant time, and analysis of prior art references, it is my opinion that the Challenged

Claims of the '509 Patent are unpatentable over the prior art references discussed below.

II. QUALIFICATIONS

A. Educational Background and Academia Experiences

5. I received a Bachelor's of Science Degree in 1978, a Master's of Science Degree in 1979, and a Ph.D. in 1982, all in Electrical Engineering, and all from the University of Illinois. Since that time, I have been at the University of Michigan as Professor of Electrical Engineering and Computer Science. I retired in December 2023. I am now Professor Emeritus.

6. In 1985, the National Science Foundation awarded me the Presidential Young Investigator Award. I served on a National Science Foundation Panel investigating Wireless Technologies around the world.

7. In 1997, I was named an IEEE fellow for my contributions to coding and modulation for spread-spectrum systems. I was an associate editor for the IEEE Transactions on Communications. I was a member of the board of governors of the IEEE Information Society. I served as a guest editor for the IEEE Journal on Selected areas in Communications and am currently on the editorial board of the IEEE Journal on Selected Areas in Communications.

8. I have received several awards for my professional achievements. For example, I received the 2002 Military Communications

Conference (MILCOM) Technical Achievement Award. In 2009, MILCOM awarded me the Best Paper Award for my paper titled “Enhancing Cognitive Radio Dynamic Spectrum Sensing through Adaptive Learning.” Additionally, in 2010, the Journal of Communications and Network awarded me the Best Paper Award for my paper titled “Minimum Energy-Per-Bit Wireless Multi-Hop Networks with Spatial Reuse.”

9. I also received research funding from the National Science Foundation, the Army Research Office, and the Defense Advanced Research Projects Agency. Many of the research projects related to the use of error control coding in wireless communication systems.

10. During the course of my professional career, I have authored and coauthored more than 200 publications in the field of wireless communications, including publications addressing various aspects of wireless communication protocols and error control coding as applied to spread-spectrum systems.

11. A complete list of my publications and patents appears in my curriculum vitae (CV) attached as EX1004, which I incorporate by reference herein.

B. Industry Experience

12. I have consulted with a number of companies, including

Ericsson. I spent 9 months at Ericsson in North Carolina while on sabbatical from my teaching role in the 1996-1997 time frame. During that time, I did research on various topics related to cellular communications and satellite communications.

13. Over the last 40 years, I have conducted fundamental research in academia and in industry on wireless communications. I have taken sabbaticals or leaves of absence from my academic career to work in industry, including 1 year at IBM in Zurich, Switzerland; 9 months at Ericsson in Cary, North Carolina; 3 months at Microsoft in Redmond, Washington; and 6 months at Uhnder in Austin, Texas. In these roles, I have worked on practical aspects of wireless communications, including satellite communications and cellular communications. I have also worked on the development of radar systems.

C. Patents

14. I am a named inventor or co-inventor on 13 U.S. patents, including patents related to telecommunication systems. My patents are identified in my CV (EX1004).

D. List of Prior Testimony

15. I have served as expert witnesses on cases involving telecommunication systems, including cellular, Wi-Fi, and satellite systems.

A list of cases in which I have testified during the last four years appears in my CV (EX1004).

III. MATERIALS REVIEWED AND CONSIDERED

16. My findings contained in this declaration are based on my education, research, experience, and background in the field of communication systems, and specifically, in relation to wireless communication systems, as well as on my investigation and study of prior art references and other documents disclosed in this declaration, including the following:

Exhibit No.	Description
EX1001	U.S. Pat. No. 11,196,509 (“the ’509 Patent”)
EX1002	File History for U.S. Pat. No. 11,196,509
EX1005	U.S. Pat. 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 Priority Application
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”

IV. MY UNDERSTANDING OF CERTAIN PATENT LAW PRINCIPLES

17. As a technical expert, I am not offering any legal opinions. Rather I am offering technical assessments and opinions. In rendering my analysis, I have been informed by counsel regarding various legal standards for determining patentability. I have applied those standards in forming my technical opinions expressed in this declaration.

18. I understand that in this proceeding, Petitioners have the burden of proving that the Challenged Claims are invalid by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true.

19. The patent claims define the invention made by the inventors and define what the patent owner owns and what the owner may prevent others from using. I understand that an independent claim sets forth all the requirements that must be met to be covered by that claim. I further understand that a dependent claim does not itself recite all of the requirements of the claim but refers to another claim and incorporates all of the requirements of the claim to which it refers.

20. I understand that a claim in an issued patent is unpatentable as anticipated if the recited invention is described in a single prior-art reference that discloses each limitation, either expressly or inherently.

21. It is my understanding that a claimed invention is unpatentable if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Obviousness, as I understand it, is based on the scope and content of the prior art, the differences between the prior art and the claim, and the level of ordinary skill in the art.

22. I understand that under 35 U.S.C. § 103, “[a] patent for a claimed invention may not be obtained through the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

23. I understand that a patent claim may be unpatentable as obvious over a single prior art reference or in view of a combination of prior art references. I understand that prior art references may also be combined with the knowledge of a person of ordinary skill in the art. I further understand that a person of ordinary skill in the art is presumed to know the relevant prior art. I understand that the obviousness analysis may take into account the

inferences and creative steps that a person of ordinary skill in the art would employ.

24. I understand that when evaluating obviousness, one must not consider whether the claimed invention would have been obvious to a layman or to an expert; not use hindsight when comparing the prior art to the claimed invention; and not consider what was learned from the teachings of the patent. In particular, I understand that it is improper to use the patent claims as a road map for selecting and combining items of prior art. In other words, one should avoid using the challenged patent as a guide through the prior art references, combining the right references in the right way so as to achieve the result of the claims at issue. Instead, one must put oneself in the place of a person of ordinary skill at the time the invention was made and consider only what was known before the invention was made.

25. I understand that obviousness should be considered in light of the problems known to the person having ordinary skill in the art at the relevant time and the complexity of the alternatives for solving the problem. That individual elements of the claimed invention are disclosed in the prior art is not alone sufficient to reach a conclusion of obviousness.

26. I also understand that when considering the obviousness of a patent claim, one must consider whether a teaching, suggestion, or motivation

to combine the references exists so as to avoid impermissibly applying hindsight when considering the prior art. I understand that a teaching, suggestion, or motivation may be found explicitly or implicitly: (1) in the prior art; (2) in the knowledge of those of ordinary skill in the art; or (3) from the nature of the problem to be solved. I also understand that the legal determination of the motivation to combine references allows recourse to logic, judgment, and common sense, but that any such motivation to combine references must still avoid the improper application of hindsight or reliance on the patentee's disclosure of his invention as found in the patent specification, drawings, and claims. In a similar vein, I understand that one should consider whether a person of ordinary skill in the art would have had a reasonable expectation of success in achieving the purported invention.

27. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of the invention, unexpected results of the invention, any long-felt but unresolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I

understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also understand that contemporaneous independent invention by others is a secondary consideration tending to show obviousness.

28. I understand that in determining whether a prior art reference would have been combined with other prior art or with other information within the knowledge of a person of ordinary skill in the art, the following are examples of approaches and rationales that may be considered:

- combining prior art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;
- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” i.e., choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or

other market forces if the variations would have been predictable to one of ordinary skill in the art;

- numerical ranges disclosed in the prior art that overlap with numerical limitations set forth in the challenged claims;
- whether certain aspects of the patented subject matter were result-effective, such that a person of ordinary skill in the art would know that such element is determinative as to the effectiveness of the patent subject matter; and
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion or motivation may come from prior art references or from the knowledge or common sense of one of ordinary skill in the art.

29. I have been informed by counsel that the Board construes claims according to the so-called “*Phillips*” standard. Under the *Phillips* standard, terms in a claim are given their ordinary and customary meaning, consistent with the patent’s specification, as understood by a POSITA. I have been informed by counsel that what is to be considered includes the claims, the patent specifications and drawings, and the prosecution history, including any

art listed by the examiner or the Applicant. I have been informed by counsel that information external to the patent, including expert and inventor testimony and unlisted prior art, are to be considered if ambiguities remain.

V. LEVEL OF ORDINARY SKILL IN THE ART

30. It is my understanding that a person of ordinary skill in the art (“POSITA”) is a hypothetical person who analyzes the prior art without the benefit of hindsight. I have been instructed that the level of ordinary skill may be reflected by the prior art of record, and that a person of ordinary skill in the art to which the claimed subject matter pertains would have the capability of understanding the scientific and engineering principles applicable to the pertinent art. I have been instructed that there are multiple factors that may be considered in determining the level of ordinary skill in the art, including: (1) type of problems encountered in the prior art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. I also understand that a POSITA is also a person of ordinary creativity, not an automaton. They would be able to fit the teachings of multiple patents together like a puzzle and have the capability of understanding the scientific and engineering principles applicable to the pertinent art.

31. As stated in the ’509 Patent, the “Technical Problem” to which

the alleged invention is directed is providing “a terminal apparatus capable of efficiently performing uplink and/or downlink communication.” EX1001 at 1:53-61. More specifically, the ’509 Patent is directed to segmenting transport blocks into different sizes code blocks, and then grouping those code blocks into different size code block groups. EX1001 at 2:60-3:32. In this system, HARQ-ACK is done by CBG. *Id.* I have been asked to provide a definition for the level or ordinary skill in the art for a POSITA in the field of the ’509 Patent at the time the priority application for the ’509 Patent was filed. To that end, I have been asked to assume for purposes of this declaration that the ’509 Patent is entitled to claim priority to June 13, 2017, which corresponds to the filing date of Japanese Application No. JP2017-115881.

32. In my opinion, a POSITA in reference to the ’509 Patent would possess (1) the equivalent of an undergraduate degree in Electrical Engineering or a related field; and (2) at least three years of experience in design, development, and/or testing of telecommunication systems. It is also my opinion that this definition is flexible in the sense that additional education (*e.g.*, a PhD in Electrical Engineering) could substitute for professional experience or *vice versa*.

33. I consider myself to have at least the credentials of a POSITA, and I am capable of addressing the issues from the perspective of such a

person. As a result of my education, academic experience, and industrial experience, I am familiar with cellular networks, including the wireless standards on which they are based, and with the state of that technology on or around June 13, 2017.

34. All of my opinions in this declaration are from the perspective of a POSITA, as I have defined it above and during the relevant time frame.

VI. TECHNICAL BACKGROUND

A. Background

35. The '509 Patent relates to wireless communications, for example in a cellular network, and in particular to a terminal apparatus "capable of efficiently performing uplink and/or downlink communication." As in any communication system, in the design of a cellular communication system consideration of the bandwidth efficiency and energy efficiency is of great importance. Bandwidth efficiency relates to how large a rate of user information per second can be reliably communicated within a certain bandwidth. This is often measured in units of bits per second per Hertz. Energy efficiency relates to how much energy at the transmitter or receiver does it take to communicate a bit of information. This is often measured in joules per bit. Lower energy for transmission of a bit increases the time before the battery runs out of energy. Methods for improving the bandwidth

efficiency or energy efficiency are desirable in a cellular communication system. A cellular system includes base stations and terminals or user equipment. The transmission from a base station to a terminal is called a downlink transmission. The transmission from a terminal to a base station is called an uplink transmission. Generally, there are two types of information transmitted. User information is information that the user desires to communicate, while control information is information to coordinate the transmission. The user information is formatted into blocks of data called a transport block. When a transport block is transmitted a cyclic redundancy check (CRC) can be appended to the information block. The CRC is type of code for error detection. That is, it is used at the receiver to detect if there are any errors in the received information block. If there are no errors in the information block, then an acknowledgement (ACK) is sent back to the transmitter. On the other hand, if there are errors then a negative acknowledgement (NACK) is sent back. One bit of control information would be needed to send an ACK/NACK. This is often called automatic repeat request (ARQ).

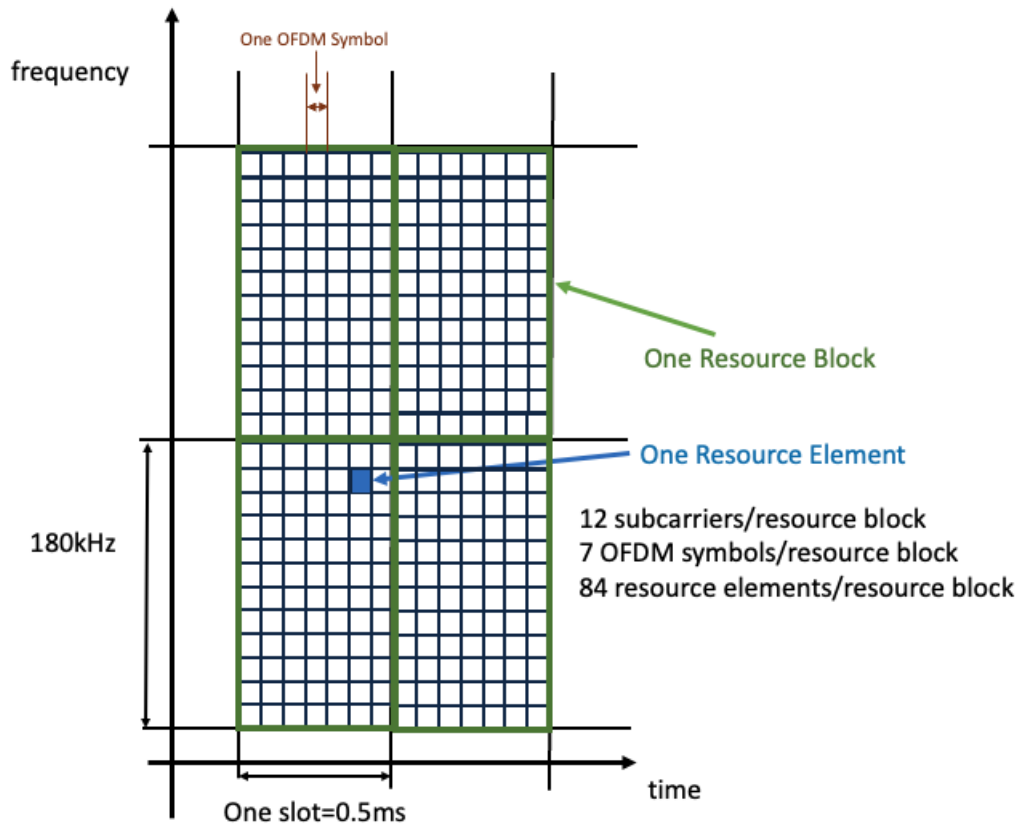
36. In addition to using CRC for error detection, forward error control (FEC) is often used. At the transmitter redundant bits are generated based on the information bits and are appended to the information bits. At the

receiver, the redundant bits are used to try to correct any errors that might have occurred in the process of recovering the information. However, it can occur that too many errors were present in the received signal and the FEC cannot correct the errors. In that case the CRC is used to detect errors and ask for a retransmission by the receiver sending back a NACK. The combination of FEC and ARQ is called hybrid ARQ-ACK (HARQ-ACK). A system could use very short blocks of information in a HARQ-ACK system but would require more feedback than using longer blocks. However, if a longer block is used, then a failure would require retransmission of a longer piece of information, utilizing more spectral (bandwidth) resources.

37. Fourth generation (4G) cellular system operation by dividing time and frequency into a grid like structure. The communication system divides time into frames, subframes and slots. Slots are further divided into OFDM symbols. In 4G cellular communication systems one slot is 0.5ms long and is divided into 7¹ symbol times. The frequency resource (spectrum) is divided into 180 kHz regions and then further divided into twelve 15 kHz regions. The combination of one 180 kHz frequency region and one slot is called a resource block. The combination of one 15 kHz region and one

¹ The system does allow for 8 symbols in certain cases.

OFDM symbol time is called a resource element. This is illustrated in the figure below. In each resource element a modulation is used to transmit information. One such modulation is quadrature phase shift keying (QPSK) in which 2 bits are transmitted using one of four possible phases of a carrier frequency. Other modulations include 16 quadrature amplitude modulation (16 QAM) and 256 QAM. The combination of many resource elements during the same time interval is called orthogonal frequency division multiplexing (OFDM) because different information is sent on different frequencies such that they can be individually recovered without interfering with each other. This is similar to different radio stations using different frequencies that do not interfere with each other. Note that part of the resource elements can be dedicated to demodulation reference symbols to help the receiver recover the signal. Also, resource elements can be dedicated to control information.



B. Overview of The '509 Patent

38. The '509 Patent is entitled "Terminal Apparatus, Base Station Apparatus, and Communication Method." The claimed invention relates to providing efficient uplink and downlink communication in a cellular communication system.

39. The '509 Patent is directed to a cellular communication system consisting of base stations (BS) and terminals or user equipment (UE). EX1001 at 1:12-17, 15:59-64. The communication system divides time into frames, subframes and slots. EX1001 at 2:50-12. This concept is shown in FIG. 2 from the '509 Patent, reproduced below.

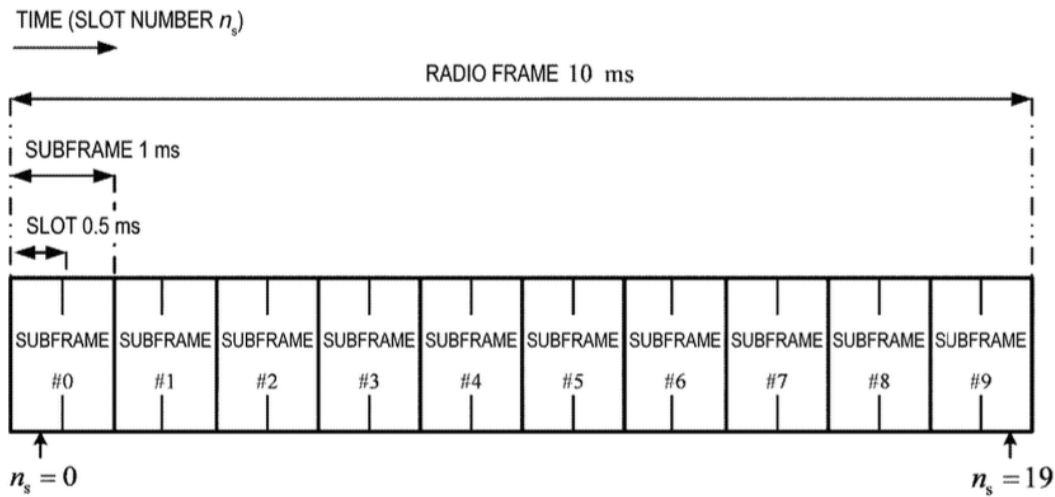


FIG. 2

40. As described above, time and frequency are divided into resource blocks, with each resource block consisting of one slot with 7 OFDM symbols and 12 different frequencies (also called subcarriers). There are multiple resource blocks used for cellular systems. Transport blocks are described as a unit of data transmitted within a prescribed time interval. EX1001 at 2:2:57-58. The transmission technique considered in the '509 Patent is orthogonal frequency division multiplexing (OFDM). In OFDM, the time and spectrum (set of frequencies) is divided in a grid like fashion as described above. Each region in the grid consisting of a time duration and a frequency is called a resource element ("RE"). An OFDM symbol consists of all the transmissions at different frequencies during a given time interval. In 4G cellular communication systems, one slot is 0.5 ms long and is divided into 7 OFDM

symbol times. One resource block consists of 7 OFDM symbol times and 12 different frequencies. There are multiple resource blocks used for cellular systems. These symbols help the receiver demodulate the received signal but do not carry any user data.

41. The user data is transmitted in each resource element can use a variety of different modulation methods including “Quadrature Phase Shift Keying (QPSK), 16 Quadrature Amplitude Modulation (QAM), 64 QAM, and 256 QAM.” EX1001 at 19:1-3.

42. User information, in the form of a transport block, is encoded, scrambled, and modulated before transmission. EX1001 at 18:41-54. The transport block is used as the input to a cyclic redundancy check (CRC) unit. A CRC is a method to check at the receiver whether or not the data has been received correctly. The way a CRC is used is called hybrid automatic request repeat-acknowledgement (HARQ-ACK). Basically, if the CRC of a sequence of data does not check a request is made to repeat the transmission. The hybrid part is an indication that in addition to CRC there is forward error correction applied to correct errors. However, there is a limit, depending on the code rate and the code length, of how many errors the code can correct. When the limit is exceeded the CRC with HARQ-ACK will remedy the problem by request a retransmission, e.g., by sending a negative acknowledgement back to the

transmitter. In one embodiment the transport block and attached CRC are segmented into multiple sequence groups or code block groups (CBGs). EX1001 at 20:34-36.

43. To make code block groups (“CBGs”), the transmitter first segments a transport block into code blocks. A code block would be a sequence of bits that is encoded separately from another code block, typically with a CRC sequence that allows each code block to be verified. EX1001 at 22:35-36. An encoder may be limited in the number of bits that can be encoded in a single block by the kind of code used to generate and check the block. EX1001 at 22:11-23. These code blocks are then grouped together so that one feedback bit can be used to signal the receipt of a group of code blocks. This was well known in the art. See, e.g., EX1007 at [0074] (describing possible code block lengths for LDPC coding) and [0111] (describing ACK feedback by code block group).

44. Figure 11 of the ’509 Patent illustrates an example of segmentation into code block groups and code blocks. In each configuration there are four CBGs containing 11 CBs. There may be different types of CBs and different types of CBGs. The number of CBs in a CBG may be an indication of the type of CBG. EX1001 at 22:65-23:3.

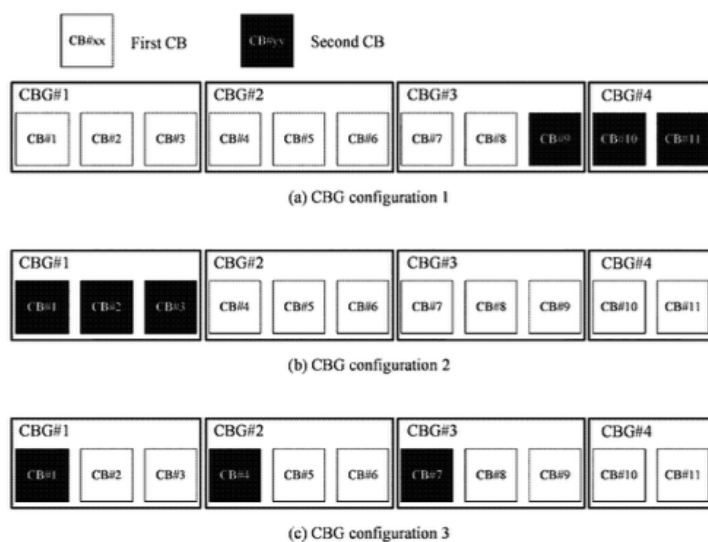


FIG. 11

45. The problem that the '509 Patent purportedly addresses is that significantly different size CBGs for a transport block can lead to a deterioration in performance. EX1001 at 24:22-33. An example is where the difference between the number of code blocks in the first type of CBG and the second type of CBG is only 1. EX1001 at 23: 37-48.

46. The claims at issue here are claim 4, 5, 10, and 11. Claim 4 and 5 are apparatus claims. Claims 10 and 11 are corresponding method claims. The following table shows the similarities between the claims.

Claim 4	Claim 10
[4pre] A base station apparatus comprising:	[10pre] A communication method for a base station apparatus, the communication method comprising the steps of:
[4a] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs;	[10a] segmenting a transport block into multiple CBs and coding each of the multiple CBs
[4b] a transmitter configured to transmit the transport block, and	[10b] transmitting the transport block, and
[4c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein	[10c] receiving HARQ-ACKs corresponding to multiple CBGs, wherein
[4d] the multiple CBs include one or more first CBs and one or more second CBs,	[10d] 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	[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,	of the one or more second CBs,
[4f] each of the multiple CBs is included in any one of the multiple CBGs,	[10f] 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,	[10g] 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	[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
[4i] a first CBG of the one or more first CBGs includes a	[10i] a first CBG of the one or more first CBGs includes a

greatest number of the one or more second CBs.	greatest number of the one or more second CBs.
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47. Claim 5 and 11 differ from claims 4 and 10 respectively only in the last element. That is, elements [4i] and [10i] are replaced by [5i] and [11i], as shown below.

Claim 5	Claim 11
[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.	[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.

VII. CLAIM CONSTRUCTION

48. I have been told that claim terms in an *inter partes* review proceeding are to be given their ordinary and accustomed meaning as understood by a person of ordinary skill in the art. In my analysis of the

Challenged Claims, I have applied the plain and ordinary meaning as understood by a person of ordinary skill in the art at the relevant time. In my analysis, it was not necessary to construe any terms because all limitations in the '509 Patent are disclosed in the prior art under any reasonable interpretation of the claim terms.

VIII. PRIOR ART

A. Lee

1. Overview of Lee

49. Lee is directed to cellular communication systems. EX1005 at [0002]. Lee considers a base station including a radio access network (RAN) EX1005 at [0003]. RANs communicate to user equipment (UE). EX1005 at [0004]. The claimed invention in Lee is an apparatus and method to enable a receiver to process a data signal and provide an acknowledgement within a turnaround time. EX1005 at [0027]. To accomplish this “a radio access network (RAN) node enables encoded information to be segmented into multiple code blocks and map a group of code blocks to be aligned with orthogonal frequency division multiplexing (OFDM) symbol boundaries such that efficient receiver processing can implement processing pipelining” EX1005 at [0027]. Code blocks within a transport block are aligned with OFDM symbol boundaries. EX1005 at [0028]. Also, a CRC is added per group of

code blocks to allow the receiver to efficiently process the information.

50. As an example of segmenting the transport block into code block groups and code blocks is provided by Figure 3, shown below. In this figure there are three code block groups (340, 342 and 344). Each code block group is partitioned into 3 code blocks (302,304,306...318). The first code block group is aligned with OFDM symbols #1 and #2. The second code block group is aligned with OFDM symbols #2 and #4. Once the processing at the receiver of OFDM symbol group containing symbol #1 and symbol #2 is completed, the code blocks in code block group 340 can be completed. Then an ACK/NACK can be sent for that code block group. If code block 306 also used some part of OFDM symbol 3, there would be a longer delay, or turnaround time, in sending back the ACK/NACK for code block group 340.

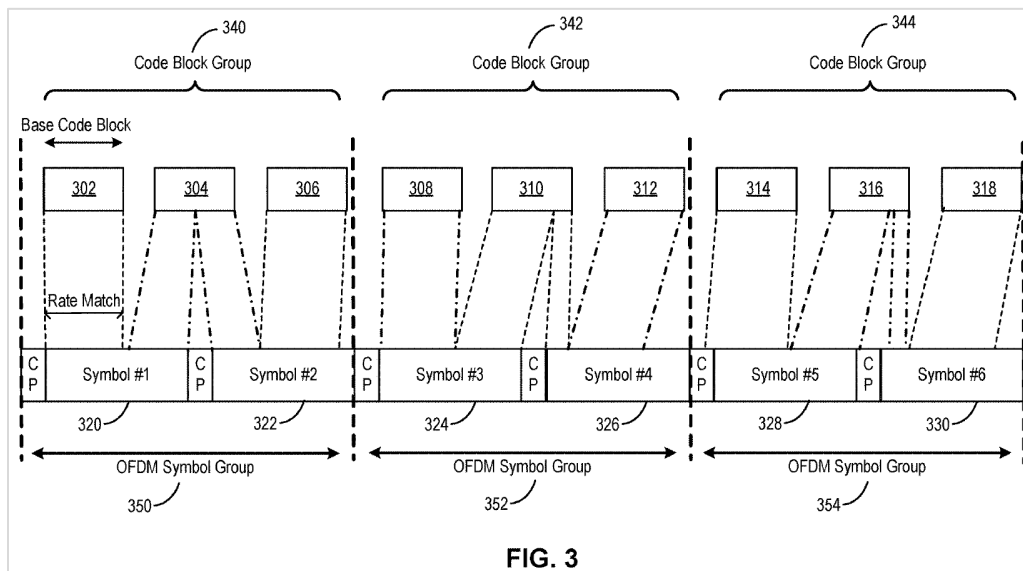


FIG. 3

EX1005 at Fig. 3.

51. There are various different ways disclosed in Lee of organizing the code blocks and code block groups. “It may be also 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; CB2-CB6 are in CBG1; and CB7-CB13 are in CBG2.” EX1005 at [0039]. “In an embodiment, if a first code block group has smaller REs compared with the second code block group, information bits that are segmented to the first code block group may be smaller than the second code block group.” EX1005 at [0042].

52. In Lee a CRC check can be applied to code block groups. Figure 7, shown below, illustrates a CRC check being applied to code block groups. The information payload (702) or transport block is encoded and segmented into code blocks and code block groups. In this example there are three code blocks in a code block group and a CRC is appended to each code block group.

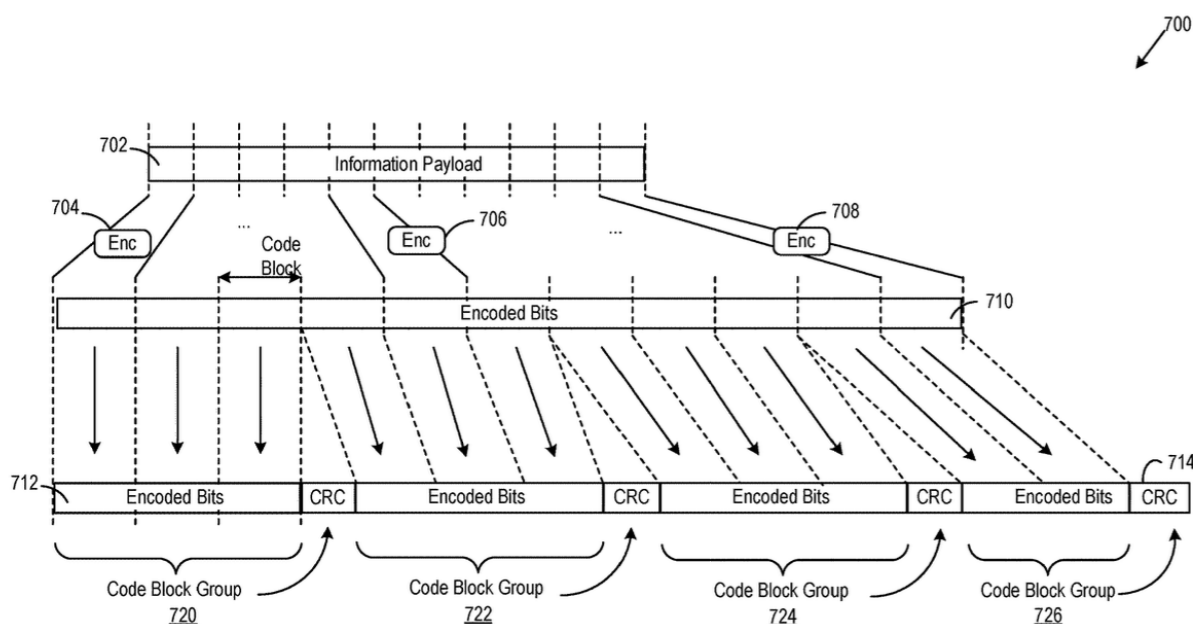


FIG. 7

EX1005 at Fig. 7.

2. Lee is Entitled to its Provisional Filing Date

53. I understand that Lee claims priority to U.S. Prov. App. No. 62/444,208 filed on January 9, 2017.

54. I have been informed by counsel and understand that because the filing date of the provisional which Lee Claims priority to is before June 13, 2017, Lee is considered prior art if the subject matter relied upon from Lee is supported by Lee's earlier priority applications.

55. It is my opinion that the subject matter relied upon from Lee in my analysis below is supported in the Lee Provisional Applications, as shown in the table below.

Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
[0003] Wireless mobile communication technology uses various standards and protocols to transmit data between a base station and a wireless mobile device. Wireless communication system standards and protocols can include the 3rd Generation Partnership Project (3GPP) long term evolution (LTE); the Institute of Electrical and Electronics Engineers (IEEE) 802.16 standard, which is commonly known to industry groups as worldwide interoperability for microwave access (WiMAX); and the IEEE 802.11 standard for wireless local area networks (WLAN), which is commonly known to industry groups as Wi-Fi. In 3GPP radio access networks (RANs) in LTE systems, the base station can include a RAN node such as a Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Node B (also commonly denoted as evolved Node B, enhanced Node B, eNodeB, or eNB) and/or Radio Network Controller (RNC) in an E-UTRAN, which communicate with a wireless communication device, known as user equipment (UE). In fifth generation (5G) wireless RANs, RAN nodes can include a 5G node, new radio (NR) node or g Node B (gNB).	In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. p. 11
[0006] FIG. 1 is a diagram illustrating a pipelined processing of received data signal and transmission of an acknowledgement (ACK) consistent with embodiments disclosed herein.	In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. p. 11
[0007] FIG. 2 is a diagram illustrating a transmitter information bit sequence segmented into sub-blocks consistent with embodiments disclosed herein.	At the transmitter information bit sequence is segmented into sub-blocks. Each sub-block is encoded (e.g. Low-Density Parity Check (LDPC)) and turned into base coded sub-block. Base coded sub-block is the encoded information bits of a segmented information bits that is not rate matched. It may correspond to a mother code rate of the encoder (e.g. LDPC). After rate matching a base coded sub-block, rate-matched base coded sub-blocks are obtained and these are mapped to available resources in the assigned OFDM symbols. An example is shown in Figure 2. p. 4

Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
[0027] Techniques, apparatus and methods are disclosed that enable a receiver to process a data signal and provide an acknowledgement within a turnaround time. In a first embodiment, a radio access network (RAN) node enables encoded information to be segmented into multiple code blocks and map a group of code blocks to be aligned with orthogonal frequency division multiplexing (OFDM) symbol boundaries such that efficient receiver processing can implement processing pipelining. In a second embodiment, the transmitter can provide more time or reduce complexity of the packet, such as by repetition of bits of code blocks of the encoded information or by reserving resource elements (REs) such that the receiver has effectively more time (or less complexity) to process the last or last few code blocks of the packet.	By grouping the codeblocks, the receiver can efficiently process the received information. Furthermore, addition of cyclic redundancy check (CRC) per group of codeblocks allow the receiver to report back acknowledgement with more fidelity. After data signal is received, the device typically has certain amount of time to perform demodulation and decoding to verify the correctness of the received bits and send acknowledgement (ACK) of the correctly received bits. The time between end of data signal and transmission of acknowledgement is the turnaround time. p. 2 At the transmitter information bit sequence is segmented into sub-blocks. Each sub-block is encoded (e.g. Low-Density Parity Check (LDPC)) and turned into base coded sub-block. Base coded sub-block is the encoded information bits of a segmented information bits that is not rate matched. It may correspond to a mother code rate of the encoder (e.g. LDPC). After rate matching a base coded sub-block, rate-matched base coded sub-blocks are obtained and these are mapped to available resources in the assigned OFDM symbols. An example is shown in Figure 2. p. 4
[0028] In a first embodiment, groups of code blocks within a transport block are aligned with OFDM symbol boundaries. By grouping the code blocks, the receiver can efficiently process the received information. Furthermore, an addition of a cyclic redundancy check (CRC) per group of code blocks allows the receiver to report back acknowledgement with more fidelity.	Various embodiments may enable encoded information to be segmented into multiple codeblocks and map a group of codeblocks to be aligned with Orthogonal Frequency Division Multiplexing (OFDM) symbol boundaries such that efficient receiver processing utilizing processing pipelining can be implemented. In various embodiments, codeblocks may be grouped within a transport block, and a OFDM symbol boundaries may be aligned for each group of codeblocks. p. 2
[0039] FIG. 3 is a block diagram of alignment of a code block group with an OFDM symbol group. N code blocks (e.g., 302, 304 and 306; 308, 310 and 312; or 314, 316 and 318), called a code block group 340, 342, 344, are aligned to M OFDM symbols (e.g., 320 and 322; 324 and 326; or 328 and 330), called an OFDM symbol group 350, 352 or 354. In one example, N and M can be 1. This results in a single code block mapped to a single OFDM symbol. This integer number of code block mapping to a group of OFDM symbols allows efficient pipelined process at the receiver. Furthermore, each group of code blocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block has multiple groups of code blocks. It may be also 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 CBG1; CB2-CB6 are in CBG1; and CB7-CB13 are in CBG2.	In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2. p. 5

Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
[0040] FIG. 4 is a diagram 400 illustrating varying available resource elements (REs) 450, 452, 454 and 456 per OFDM symbol 420, 422, 424 and 426. Each OFDM symbol 420, 422, 424 and 426 of the allocated data transmission may have a different number of available REs for data transmission. If a code block group 440 or 442 (comprising base code blocks 410, 412, 414 and 416) is rate matched to always fit into M OFDM symbols 420, 422, 424 and 426, different code block groups 440, 442 can end up with different code rates. This may result in different link performance. This example of different OFDM symbols 420, 422, 424 and 426 containing a different number of allocated REs is shown in FIG. 4. In the example, the second code block group 442 is sent over more REs compared with the first code block group 440 due to the demodulation reference signal (DRS) utilizing a portion of the REs 450.	Each OFDM symbol of the allocated data transmission, may have different number of available resource elements (REs) for data transmission. If the codeblock group is rate matched to always fit into M OFDM symbols, different codeblock groups may end up with different code-rates. This may result in different link performance. An example of different OFDM symbols containing different number of allocated REs is shown in Figure 4. In the example, the second codeblock group is sent over more REs compared with the first codeblock group. pp. 5-6
[0041] FIG. 5 is a block diagram 500 illustrating bit padding to avoid a variable code rate. To avoid a variable code rate within the transport block, bit padding 562 can be used such that code block groups 540 and 542 have similar effective code rates. The bit padding 562 can be done prior to the encoding, where known bit sequences (or bit sequences that could be computed from received and decoded bits prior to padding) are used for padding. Alternatively, bit padding 562 can be done after encoding and rate matching. The padded bits can be inserted in the front or end of each code block or inserted in the front end of the code block group 540 or 542 (that contains base code blocks 510, 512, 514 and 516). Another option is to use repetition instead of padding (e.g., repeat REs rather than unusable padded bits). Within a code block group 540 and 542, there may be further segmentation to align code blocks to the OFDM symbol 520, 522, 524 within OFDM symbol groups and 526 boundaries as well.	To avoid variable code rate within the transport block, bit padding can be used such that each codeblock groups have similar effective code-rates. The bit padding can be done prior to the encoding, where known bit sequences (or bit sequences that could be computed from received and decoded bits prior to padding) are used for padding. Alternatively, bit padding can be done after encoding and rate matching. The padded bits can be inserted in front or at the end of each codeblock or inserted in the front of end of the codeblock group. An example of padding is shown in Figure 5. Another option is to use repetition instead of padding. Within a code block group, there may be further segmentation to align code blocks to the OFDM symbol boundaries as well. p. 6
[0042] An alternative method to avoid a variable code rate within the transport block is to perform non-equal size information payload segmentation. In an embodiment, if a first code block group has smaller REs compared with the second code block group, information bits that are segmented to the first code block group may be smaller than the second code block group. For example, if CBG1 has 1 CB and 960 REs, and CBG2 has 2 CBs and 1000 REs/CB, and transmission is performed using a modulation coding scheme (MCS) of one half code rate and quadrature phase-shift keying (QPSK) modulation, and the transport block size (TBS) is 2960 bits, code block segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3. The segmentation can use the modulation order and code rate to determine the segmentation size for each segment.	An alternative technique to avoid variable code rate within the transport block includes performing non-equal size information payload segmentation. For example, if the first codeblock group has smaller REs compared with the second codeblock group, the information bits that are segmented to the first codeblock group may be smaller than the second codeblock group. For e.g. if codeblock group 1 (CBG1) has 1 CB and 960 REs, and CBG2 has 2 CBs and 1000 REs/CB, and transmission is performed using modulation coding scheme (MCS) of 1/2 code rate and Quadrature Phase Shift Keying (QPSK) modulation, and transport block size (TBS) is 2960 bits, codeblock segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3. The segmentation can will use the modulation order and code rate to determine the segmentation size for each segment. p. 7

Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
[0043] A determination of the code block group size and the OFDM symbol group size can be determined by the receiver capability and signaled by control signals. Configurable code block segmentation can also be used, wherein the code block segmentation applied on a particular transmission (for a transport block or a service) or a link (e.g., downlink/uplink) can be explicitly configured, e.g., by a network entity such as a base station. Thus, the configurable segmentation allows segmentation to support a fast pipelined operation in case of low-latency/fast turnaround, while it can also support an operation where balanced performance (across all code blocks) is targeted with a somewhat relaxed processing requirement.	The determination of the codeblock group size and the OFDM symbol group size can be determined by the receiver capability and signaled by control signals. Configurable code block segmentation may also be used, wherein the code block segmentation applied on a particular transmission (for a transport block or a service) or a link (e.g. downlink/uplink) can be explicitly configured e.g. by a network entity such as a base station. Thus, the configurable segmentation enables allows segmentation to support a fast pipelined operation in case of low-latency/fast turn-around, while it can also support an operation where balanced performance (across all code blocks) is targeted with a somewhat relaxed processing requirement. p. 7
In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry.	In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2. p. 7
[0068] The RAN 1610 can include one or more access nodes that enable the connections 1603 and 1604. These access nodes (ANs) can be referred to as base stations (BSs), NodeBs, evolved NodeBs (eNBs), next Generation NodeBs (gNB), RAN nodes, and so forth, and can comprise ground stations (e.g., terrestrial access points) or satellite stations providing coverage within a geographic area (e.g., a cell). The RAN 1610 may include one or more RAN nodes for providing macrocells, e.g., macro RAN node 1611, and one or more RAN nodes for providing femtocells or picocells (e.g., cells having smaller coverage areas, smaller user capacity, or higher bandwidth compared to macrocells), e.g., low power (LP) RAN node 1612.	In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. p. 11

Subject Matter from EX1005 Cited
in Analysis Below

[0130] Example 8 is an apparatus for a user equipment (UE), comprising a receiver interface and a processor. The receiver interface is configured to provide a set of orthogonal frequency-division multiplex (OFDM) symbols from a receiver from a radio access network (RAN) node. The processor is configured to: receive an OFDM symbol group from the receiver interface; decode a set of codeblocks forming a codeblock group, the codeblock group selected to fit an integer number of codeblocks within an OFDM symbol group, the OFDM symbol group including an integer number of OFDM symbols, wherein the OFDM symbol group boundary matches the codeblock group boundary; and provide a response to the RAN node within a turnaround time acknowledging a receipt of the data from the OFDM symbol group.

[0132] Example 10 is the apparatus of Example 1, wherein the processor is further configured to compute a first cyclic redundancy checksum (CRC) for the codeblock group and compare the first CRC to a second CRC appended to the codeblock group.

[0133] Example 11 is the apparatus of any of Examples 10, wherein the response is an acknowledgement based at least in part on the first CRC matching the second CRC.

Supporting Corresponding Subject Matter
in Lee Provisional (EX1006)

Because acknowledgements can be generated for each codeblock group, it may be possible for the transmitter to omit the transmission of a codeblock group and transmit data signals for another receiver that requires much more urgent data delivery. It also allows a transmitter to omit retransmission of a code block group that is already successfully received by the receiver.

The omission of such codeblock group can be signaled by the transmitter. One example of the signaling is done in the padding bits of the codeblock group prior to the codeblock group omission. An example is shown in Figure 6.

pp. 7-8

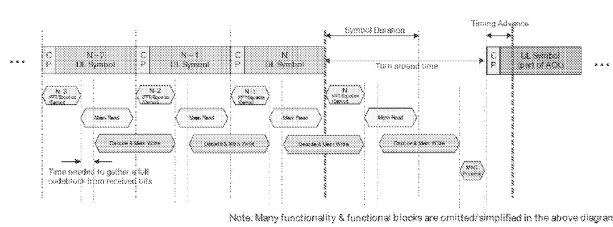
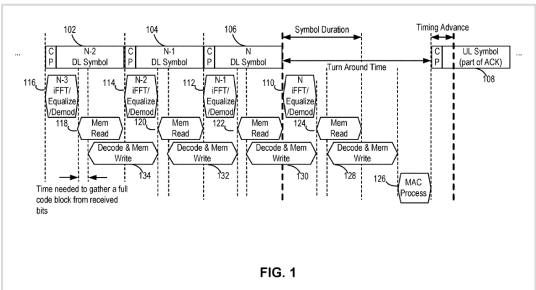


Figure 1

Fig. 1

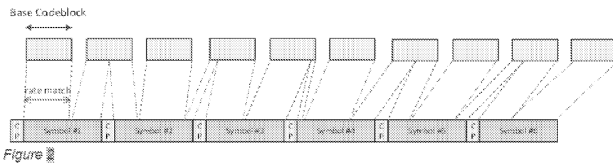
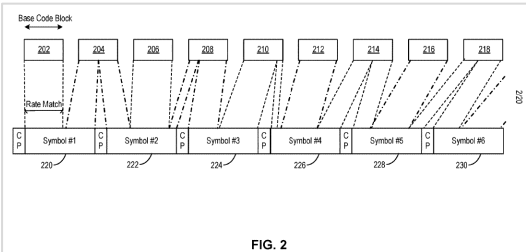
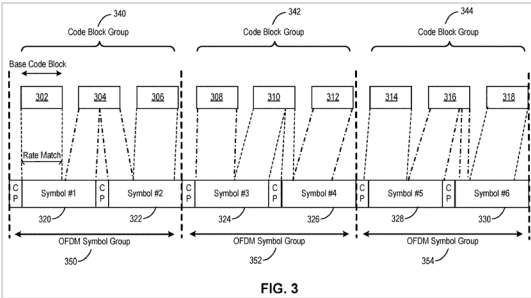


Fig. 2

Subject Matter from EX1005 Cited
in Analysis Below



Supporting Corresponding Subject Matter
in Lee Provisional (EX1006)

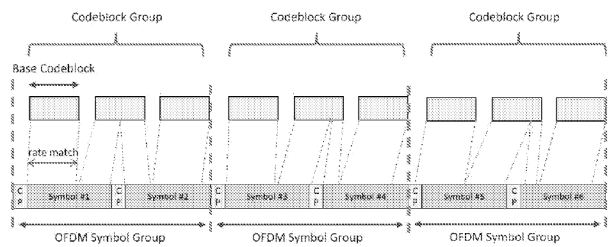


Fig. 3

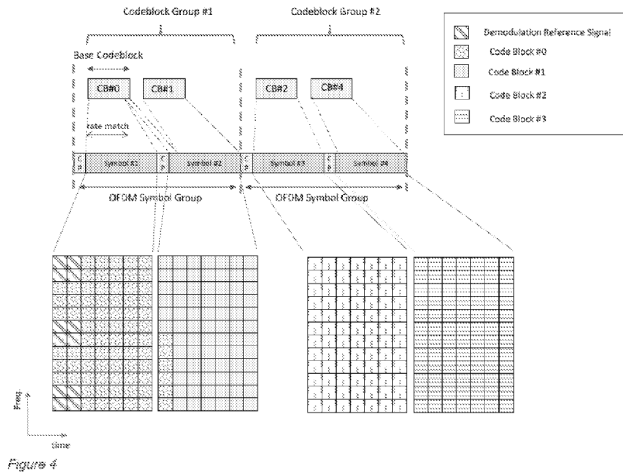
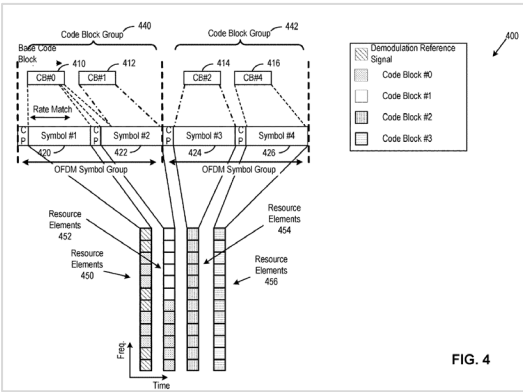
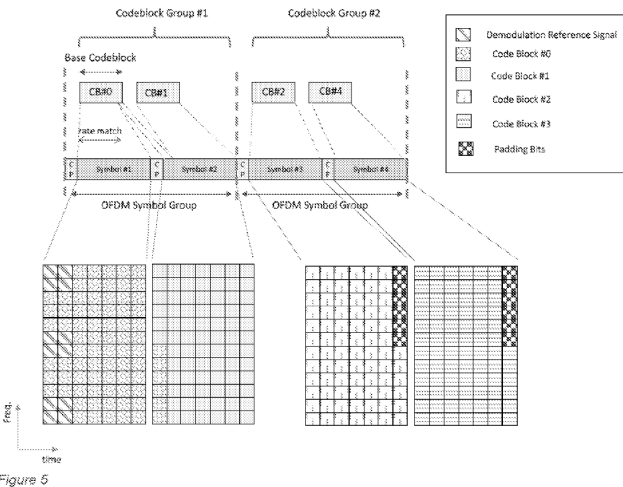
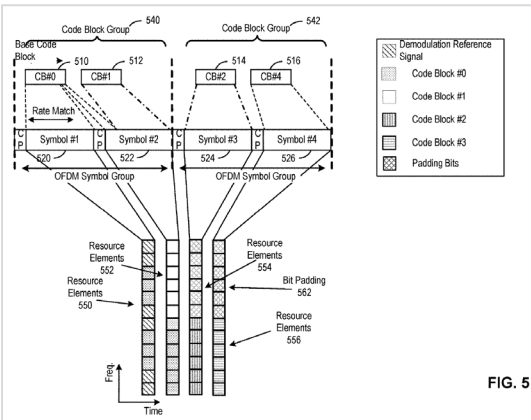
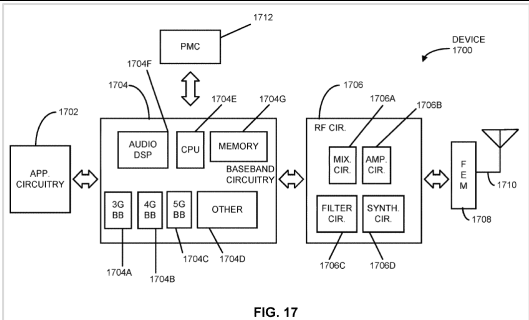
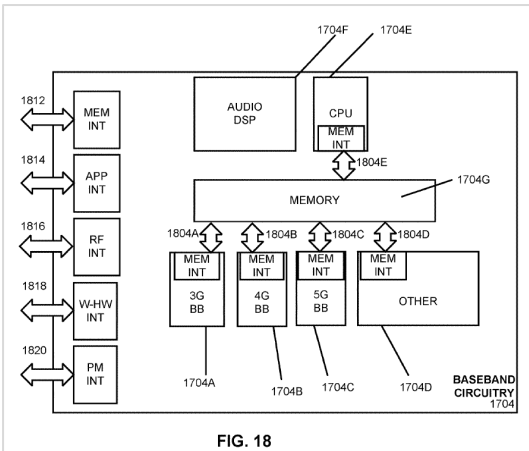


Fig. 4



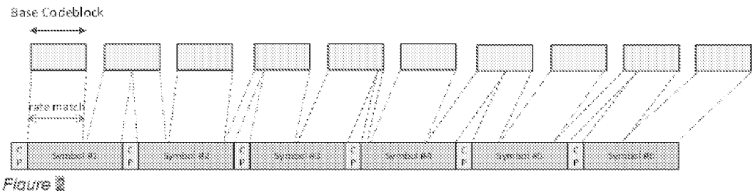
Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
802 Segment a Bit Sequence in to Blocks 804 Encode the Blocks to Form Code Blocks 806 Group the Code Blocks Into a Code Block Group, the Code Block Group Selected to Fit an Integer Number of Code Blocks Within an OFDM Symbol Group, the OFDM Symbol Group Including an Integer Number of OFDM Symbols 808 Encode the Code Block Group to Form the OFDM Symbol Group 810 Provide the OFDM Symbol Group to the Transmitter Using the Transmitter Interface FIG. 8	Group plurality of codeblocks Map groups of codeblocks to respective OFDM symbols FIGURE X-2 Fig. X-2
1600 1601 UE 1602 UE 1606 AP 1610 RAN 1611 MACRO RAN NODE 1612 LP RAN NODE 1630 APPLICATION SERVER 1613 S1 1614 S-GW 1615 MME 1616 HSS 1617 P-GW 1618 PCRF 1620 CN 1621 1622 1623 1624 1625 1626 FIG. 16	100 102 102a 102b 104 104a 104b 104c 104d 104e 104f 106 106a 106b 106c 106d 108 108a 108b 110 Antenna Figure X-1 Fig. X-1.

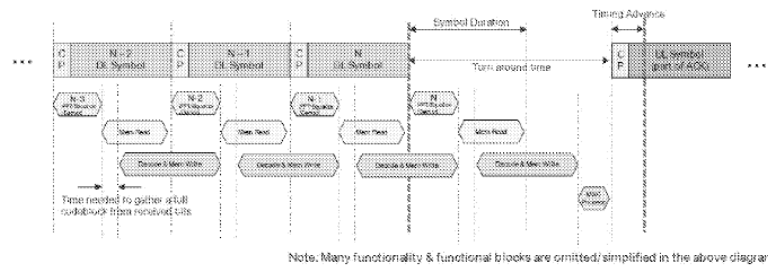
Subject Matter from EX1005 Cited in Analysis Below	Supporting Corresponding Subject Matter in Lee Provisional (EX1006)
 FIG. 17  FIG. 18	In some embodiments, the baseband circuitry 104 may include elements of a protocol stack such as, for example, elements of an evolved universal terrestrial radio access network (E-UTRAN) protocol including, for example, physical (PHY), media access control (MAC), radio link control (RLC), packet data convergence protocol (PDCP), and/or radio resource control (RRC) elements. A central processing unit (CPU) 104e of the baseband circuitry 104 may be configured to run elements of the protocol stack for signaling of the PHY, MAC, RLC, PDCP and/or RRC layers. In some embodiments, the baseband circuitry may include one or more audio p. 11 In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. p. 11 In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. p. 11

56. It is also my opinion that Lee’s Claims are supported by the Lee Provisional. The table below identifies subject matter that supports Lee’s

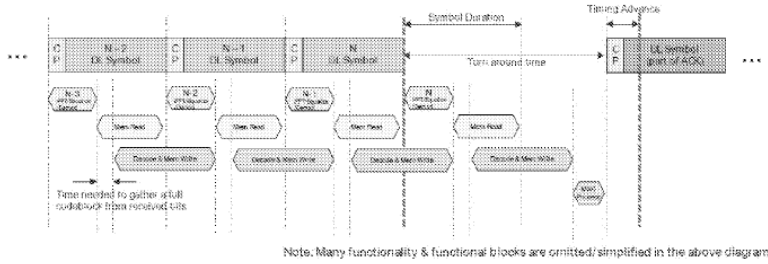
Claims.

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
1. An apparatus for a radio access network (RAN) node, comprising:	In some embodiments, the baseband circuitry 104 may include elements of a protocol stack such as, for example, elements of an evolved universal terrestrial radio access network (E-UTRAN) protocol including, for example, physical (PHY), media access control (MAC), radio link control (RLC), packet data convergence protocol (PDCP), and/or radio resource control (RRC) elements. A central processing unit (CPU) 104e of the baseband circuitry 104 may be configured to run elements of the protocol stack for signaling of the PHY, MAC, RLC, PDCP and/or RRC layers. In some embodiments, the baseband circuitry may include one or more audio digital signal processor(s) (DSP) 104f. The audio DSP(s) 104f may include elements for compression/decompression and echo cancellation and may include other suitable processing elements in other embodiments. The baseband circuitry 104 may further include computer-readable media 104g (also referred to as “CRM 104g”, “memory 104g”, “storage 104g”, or “CRM 104g”). The CRM 104g may be used to load and store data and/or instructions for operations performed by the processors of the baseband circuitry 104. CRM 104g for one embodiment may include any combination of suitable volatile memory and/or non-volatile memory. The CRM 104g may include any combination of various levels of memory/storage including, but not limited to, read-only memory (ROM) having embedded software instructions (e.g., firmware), random access memory (e.g., dynamic random access memory (DRAM)), cache, buffers, etc.). The CRM 104g may be shared among the various processors or dedicated to particular processors. Components of the baseband circuitry 104 may be suitably combined in a single chip, a single chipset, or disposed on a same circuit board in some embodiments. In some embodiments, some or all of the constituent components of the baseband circuitry 104 and the application circuitry 102 may be implemented together, such as, for example, on a system on a chip (SOC). In some embodiments, the baseband circuitry 104 may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry 104 may support communication with an E-UTRAN and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry 104 is configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. p. 11

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
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	 Figure 2 At the transmitter information bit sequence is segmented into sub-blocks. Each sub-block is encoded (e.g. Low-Density Parity Check (LDPC)) and turned into base coded sub-block. Base coded sub-block is the encoded information bits of a segmented information bits that is not rate matched. It may correspond to a mother code rate of the encoder (e.g. LDPC). After rate matching a base coded sub-block, rate-matched base coded sub-blocks are obtained and these are mapped to available resources in the assigned OFDM symbols. An example is shown in Figure 2. p. 4 In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2. p. 5
a processor configured to:	As used herein, the term "circuitry" may refer to, be part of, or include an Application Specific Integrated Circuit (ASIC), an electronic circuit, a processor (shared, dedicated, or group), and/or memory (shared, dedicated, or group) that execute one or more software or firmware programs, a combinational logic circuit, and/or other suitable hardware components that provide the described functionality. In some embodiments, the circuitry may be implemented in, or functions associated with the circuitry may be implemented by, one or more software or firmware modules. In some embodiments, circuitry may include logic, at least partially operable in hardware.

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
	p. 9
segment a bit sequence into blocks;	Various embodiments may enable encoded information to be segmented into multiple codeblocks and map a group of codeblocks to be aligned with Orthogonal Frequency Division Multiplexing (OFDM) symbol boundaries such that efficient receiver processing utilizing processing pipelining can be implemented. In various embodiments, codeblocks may be grouped within a transport block, and a OFDM symbol boundaries may be aligned for each group of codeblocks. By grouping the codeblocks, the receiver can efficiently process the received information. Furthermore, addition of cyclic redundancy check (CRC) per group of codeblocks allow the receiver to report back acknowledgement with more fidelity. After data signal is received, the device typically has certain amount of time to perform demodulation and decoding to verify the correctness of the received bits and send acknowledgement (ACK) of the correctly received bits. The time between end of data signal and transmission of acknowledgement is the turnaround time. p. 2  Note. Many functionality & functional blocks are omitted/simplified in the above diagram Figure 1 Figure 1 is an example of pipelined processing of received data signal and transmission of ACK. Assuming total of N OFDM symbols for data, the receiver can start the processing of #N-3 symbol after complete reception of #N-3 symbol. The receiver performs inverse FFT, equalization, demodulation, and de-interleaving (if needed). The decoder reads the demodulated received bits for decoding process. Transmit information is usually segmented into codeblocks, where each codeblock is decoded separately. Therefore, the decoder has to read enough bits (or log-likelihood ratios (LLRs)) of a codeblock for it to start decoding process. p. 3.

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
	At the transmitter information bit sequence is segmented into sub-blocks. Each sub-block is encoded (e.g. Low-Density Parity Check (LDPC)) and turned into base coded sub-block. Base coded sub-block is the encoded information bits of a segmented information bits that is not rate matched. It may correspond to a mother code rate of the encoder (e.g. LDPC). After rate matching a base coded sub-block, rate-matched base coded sub-blocks are obtained and these are mapped to available resources in the assigned OFDM symbols. An example is shown in Figure 2. p. 4 In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2. p. 5
encode the blocks to form code blocks;	Various embodiments may enable encoded information to be segmented into multiple codeblocks and map a group of codeblocks to be aligned with Orthogonal Frequency Division Multiplexing (OFDM) symbol boundaries such that efficient receiver processing utilizing processing pipelining can be implemented. In various embodiments, codeblocks may be grouped within a transport block, and a OFDM symbol boundaries may be aligned for each group of codeblocks. By grouping the codeblocks, the receiver can efficiently process the received information. Furthermore, addition of cyclic redundancy check (CRC) per group of codeblocks allow the receiver to report back acknowledgement with more fidelity. After data signal is received, the device typically has certain amount of time to perform demodulation and decoding to verify the correctness of the received bits and send acknowledgement (ACK) of the correctly received bits. The time between end of data signal and transmission of acknowledgement is the turnaround time. p. 2

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
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Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
	p. 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;	At the transmitter information bit sequence is segmented into sub-blocks. Each sub-block is encoded (e.g. Low-Density Parity Check (LDPC)) and turned into base coded sub-block. Base coded sub-block is the encoded information bits of a segmented information bits that is not rate matched. It may correspond to a mother code rate of the encoder (e.g. LDPC). After rate matching a base coded sub-block, rate-matched base coded sub-blocks are obtained and these are mapped to available resources in the assigned OFDM symbols. An example is shown in Figure 2. p. 4 In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2. p. 5
encode the code block group to form the OFDM symbol group; and	At the transmitter information bit sequence is segmented into sub-blocks. Each sub-block is encoded (e.g. Low-Density Parity Check (LDPC)) and turned into base coded sub-block. Base coded sub-block is the encoded information bits of a segmented information bits that is not rate matched. It may correspond to a mother code rate of the encoder (e.g. LDPC). After rate matching a base coded sub-block, rate-matched base coded sub-blocks are obtained and these are mapped to available resources in the assigned OFDM symbols. An example is shown in Figure 2. p. 4

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
	In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2. p. 5 To avoid variable code rate within the transport block, bit padding can be used such that each codeblock groups have similar effective code-rates. The bit padding can be done prior to the encoding, where known bit sequences (or bit sequences that could be computed from received and decoded bits prior to padding) are used for padding. Alternatively, bit padding can be done after encoding and rate matching. The padded bits can be inserted in front or at the end of each codeblock or inserted in the front of end of the codeblock group. An example of padding is shown in Figure 5. Another option is to use repetition instead of padding. Within a code block group, there may be further segmentation to align code blocks to the OFDM symbol boundaries as well. p. 6
provide the OFDM symbol group to the transmitter using the transmitter interface.	In various embodiments, N codeblocks, called codeblock group, may be aligned to M OFDM symbols, called OFDM symbol group. An example is shown in Figure 3. In one example, N and M can be 1. This results in single codeblock mapped to a single OFDM symbol. An integer number of codeblock mapping to a group of OFDM symbols, allows efficient pipelined process at the receiver. Furthermore, each group of codeblocks can be associated with an acknowledgement bit. This results in multiple acknowledgement bits per transport block when the transport block have multiple group of codeblocks. It may be also possible to have different number of codeblocks in the codeblock group and/or different code block size per code block group and/or each code block in each code block group may have distinct size. For example, a transport block may have three code block groups CBG0, CBG1, CBG2, wherein code blocks CB0,CB1 are in CBG1, CB2,CB3,CB4,CB5,CB6 are in CBG1, and CB7-CB13 are in CBG2.

Lee Claim 1 (EX1005)	Supporting Disclosure from Lee Provisional (EX1006)
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B. Zheng

1. Overview of Zheng

57. Zheng is directed to communicating information “between communication devices (for example, between a base station and a terminal) in the form of information sequences. EX1007 at [0003]. Figure 1, shown below, illustrates the transmitter and receiver in a communication system.

The transmitter is shown as communication device 10, while the receiver is shown as communication device 11. The communication device 10 includes a unit that does code block segmentation, channel coding, rate matching, interleaving and modulation before sending (transmitting) a signal through the antenna. Similarly, the communication device 11 includes a receiving unit, demodulation, deinterleaving, de-rate matching, channel decoding, code block concatenation.

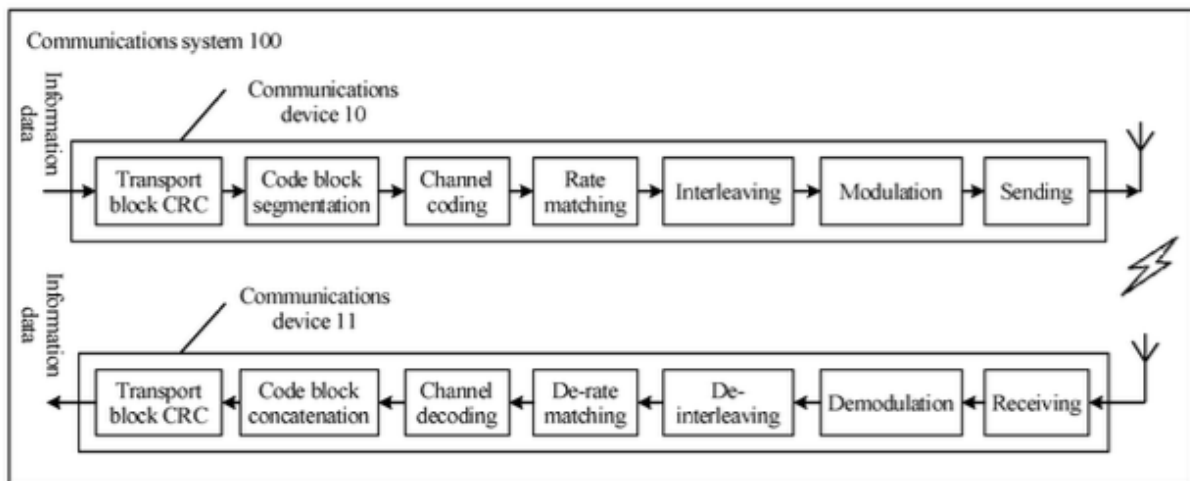


FIG. 1

EX1007 at Fig. 1.

58. “Because the environment for wireless propagation is complex and varied, transmitted information sequences are susceptible to interference, and errors may occur. To reliably send the information sequences, a device at a transmitting end performs processing such as cyclic redundancy check

(CRC), segmentation and check, channel coding, rate matching, and interleaving on the information sequence, and maps interleaved coded bits into modulation symbols and sends the modulation symbols to a device at a receiving end.” EX1007 at [0003]. An input sequence of size B is partitioned into C code blocks depending on the input sequence length, B , and the maximum code block length Z .

59. Figure 8, reproduced below, show an embodiment of the invention. In this figure an input sequence of size B is partitioned into C code blocks of different lengths. “The C code blocks belong to G code block groups.” EX1007 at [110]. “The CRC bit segment ...may be a parity bit segment generation for input bit segments in all code blocks in a code block group.” EX1007 at [0110]. “System CRC overheads can be reduced because CRC bit segments are attached, by code block group, to a plurality of code blocks obtained after the input sequence is processed. In addition, when ACK feedback is performed by code block group, performance is better, and system efficiency is improved.” EX1007 at [0111].

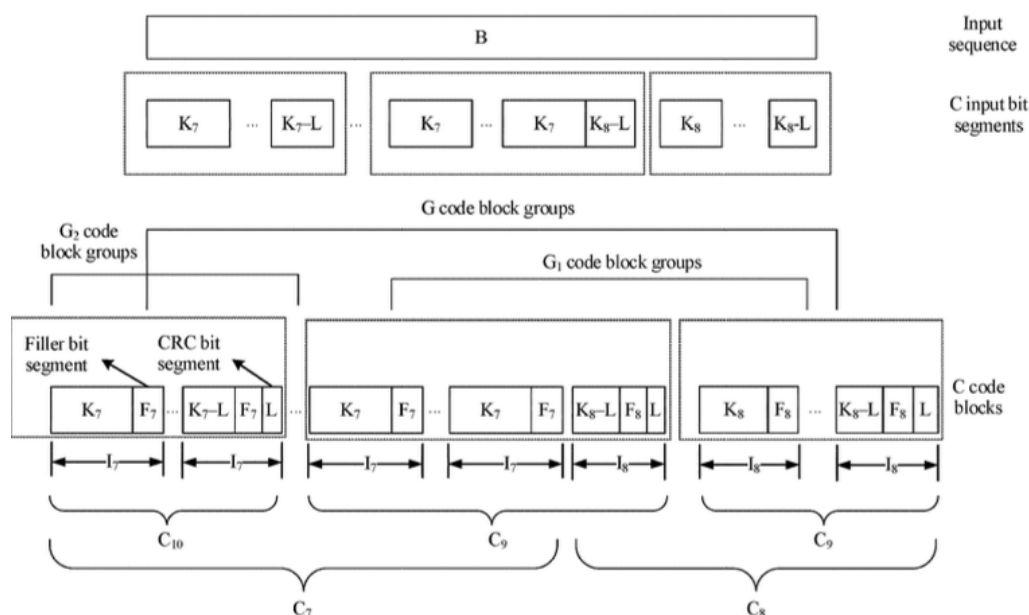


FIG. 8

EX1007 at Fig. 8.

60. Zheng considers both the case where the input segment is first partitioned into code blocks and then grouped into code block groups and the case where the input segment is partitioned into code block groups and then further partitioned into code blocks. EX1007 at [0113-0114]. There are various methods described to determine the code block lengths, the number of code block groups, and the number of code blocks. An example of a partition of an input information sequence of length 92000 is given in Table 1, shown below. In this table there are 4 code block groups and 15 code blocks with various sizes for the code blocks. As can be seen for each code block group there is a sequence of 24 bits for the CRC. “CRC bits are attached by

code block group, so that CRC check overheads can be reduced, and system performance can be further improved. If a hybrid automatic repeat request (HARQ) is used in a system to feed back acknowledgement/negative acknowledgement (ACK/NACK) information by group, CRC attachment based on the code block group can reduce feedback signaling overheads and improve system transmission efficiency.” EX1007 at [0142].

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
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.

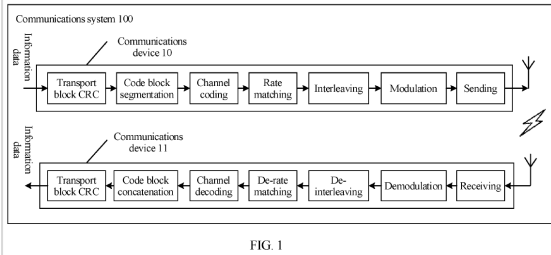
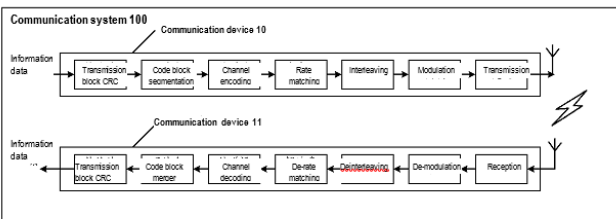
2. Zheng is Entitled to its Foreign Priority Filing Date

61. I understand that 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 201710008135.6, filed

January 5, 2017.

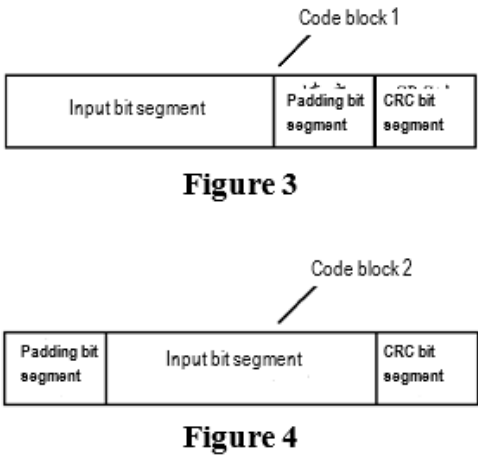
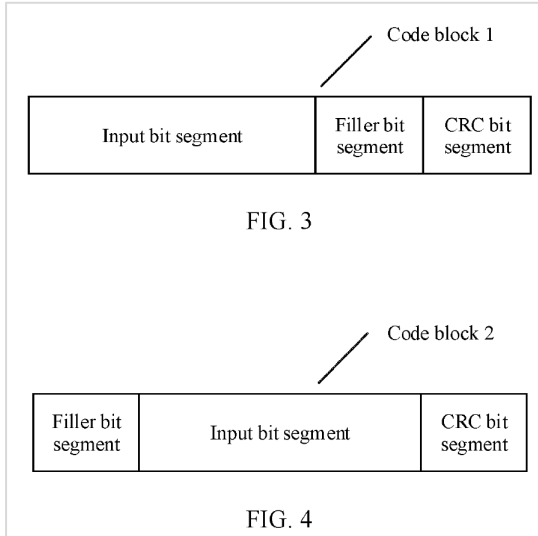
62. I have been informed by counsel and understand that because the filing dates of the provisional which Zheng claims priority to is before June 17, 2017, Zheng is considered prior art if the subject matter relied upon from Zheng is supported by Zheng’s earlier priority applications.

63. It is my opinion that the subject matter relied upon from Zheng in my analysis below is supported in the Zheng Chinese priority application, as shown in the table below.

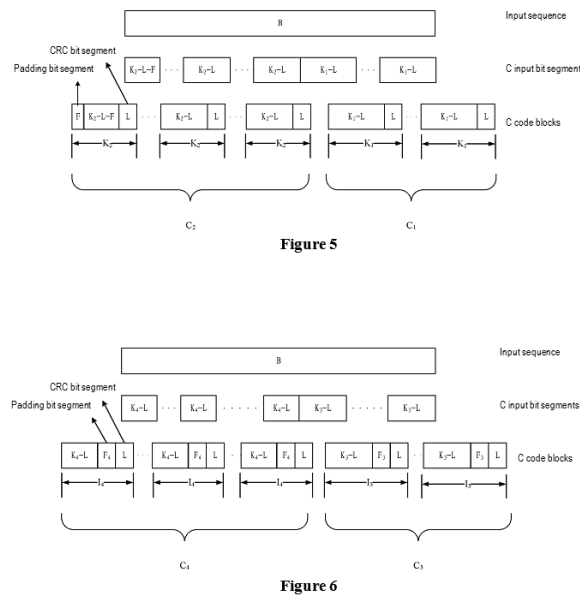
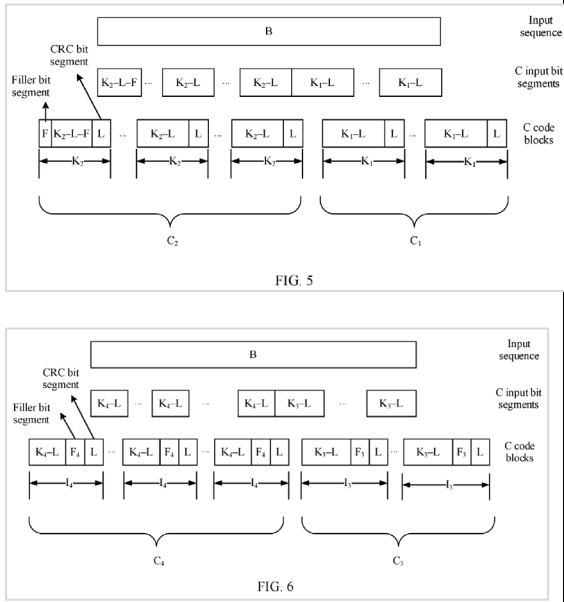
64. Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
 FIG. 1	 Figure 1 Fig. 1

64. Subject Matter
from EX1007 Cited in
Analysis Below

Supporting Corresponding Subject Matter
in Zheng Chinese priority application
(EX1008, EX1009)



Figs. 3-4



64. Subject Matter
from EX1007 Cited in
Analysis Below

Supporting Corresponding Subject Matter
in Zheng Chinese priority application
(EX1008, EX1009)

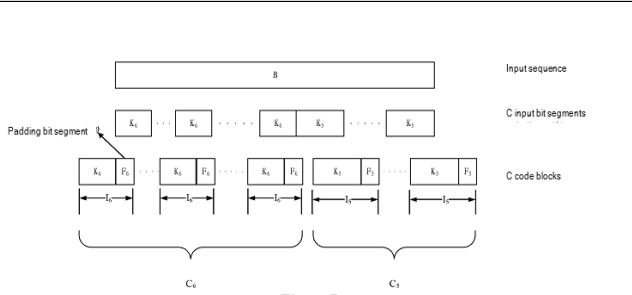
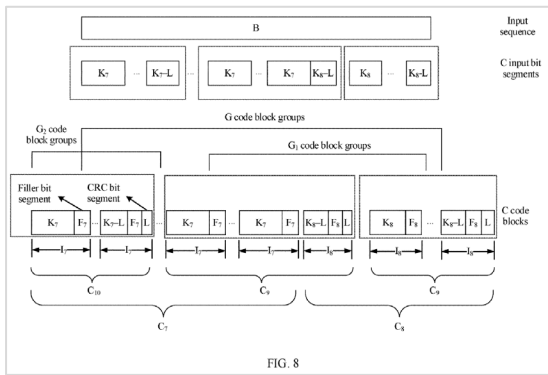
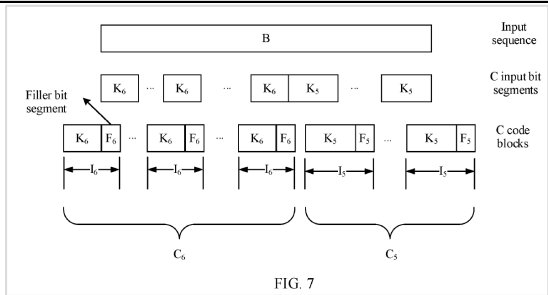


Figure 7

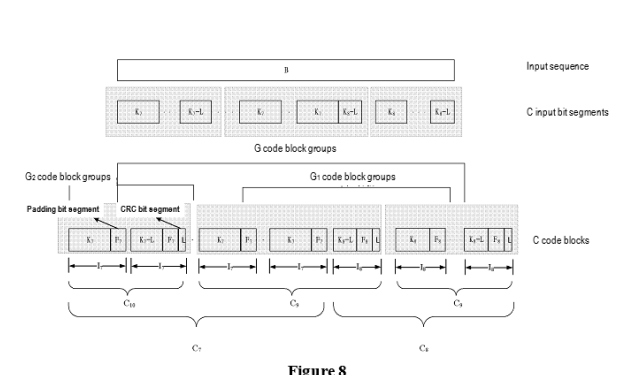


Figure 8

Figs. 5-8

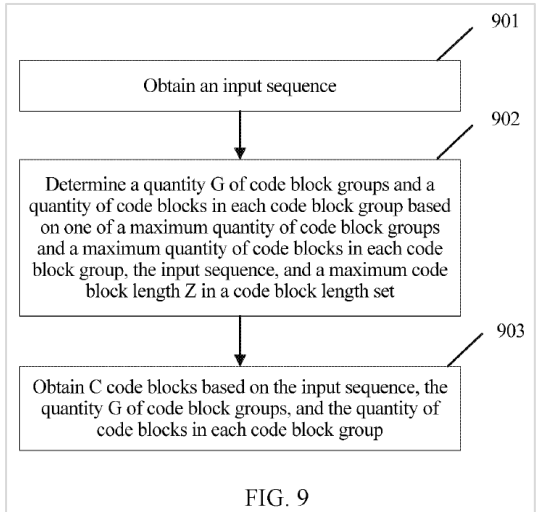


FIG. 9

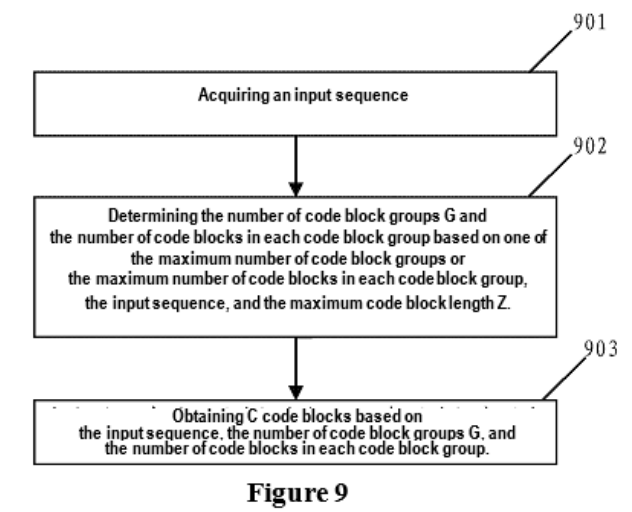


Figure 9

64. Subject Matter
from EX1007 Cited in
Analysis Below

Supporting Corresponding Subject Matter
in Zheng Chinese priority application
(EX1008, EX1009)

Fig. 9

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

Table 1: Examples of Code Block Segmentation				
Group No.	Code Block No.	Input Bit Segment Length (bits)	CRC Bit Segment Length (bits)	Padding Bit Segment Length (bits)
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
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

Table 1

[0003] In a communications system, information, such as control information or data information, is usually transmitted between communications devices (for example, between a base station and a terminal) in the form of information sequences. Because the environment for wireless propagation is complex and varied, transmitted information sequences are susceptible to interference, and errors may occur. To reliably send the information sequences, a device at a transmitting end performs processing such as cyclic redundancy check (CRC), segmentation and check, channel coding, rate matching, and interleaving on the information sequence, and maps interleaved coded bits into modulation symbols and sends the modulation symbols to a device at a receiving end. After receiving the modulation symbols, the communications device at the receiving end correspondingly restores the modulation symbols to the information sequence through de-interleaving, de-rate matching, decoding, concatenation, and CRC. These processes can reduce transmission errors, and improve data transmission reliability.

In a communication system, control information or data information is usually transmitted between communication devices (for example, base stations or terminals) in the form of information sequences. Due to the complexity and variety of the wireless propagation environment, the transmitted information sequences are susceptible to interference and errors. In order to reliably transmit an information sequence, the transmitting end device performs CRC check, segmentation and check, channel coding, rate matching and interleaving on the information sequence, and maps the interleaved coded bits into modulation symbols and sends them to the receiving end device. After receiving the modulation symbol, the receiving-end communication device recovers the information sequence by deinterleaving, de-rate matching, decoding, concatenation and CRC check. These processes can reduce transmission errors and improve the reliability of data transmission.

p. 10

64. Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
[0026] System CRC overheads can be reduced because CRC bit segments are added, by code block group, to a plurality of code blocks obtained by performing process on the input sequence. In addition, when an ACK feedback is performed by code block group, performance is better, and system efficiency is improved.	Since a plurality of code blocks obtained after processing the input sequence are added with CRC bit segments according to the code block group, the system's CRC overhead can be saved, and the performance of ACK feedback is better when provided on a code block group basis, and system efficiency is improved. p. 14
[0047] FIG. 1 is a schematic diagram of a communications system in which embodiments of the present application may be implemented; [0048] FIG. 2 is a flowchart of an information processing method according to an embodiment of the present application; [0049] FIG. 3 is a schematic structural diagram of a code block according to an embodiment of the present application; [0050] FIG. 4 is a schematic structural diagram of a code block according to another embodiment of the present application; [0051] FIG. 5 is a schematic diagram of a code block segmentation manner according to an embodiment of the present application; [0052] FIG. 6 is a schematic diagram of a code block segmentation manner according to another embodiment of the present application; [0053] FIG. 7 is a schematic diagram of a code block segmentation manner according to yet another embodiment of the present application; [0054] FIG. 8 is a schematic diagram of a code block segmentation manner according to still another embodiment of the present application; [0055] FIG. 9 is a flowchart of an information processing method according to another embodiment of the present application;	Figure 1 is a structural schematic view illustrating a communication system provided by an embodiment of the present invention. Figure 2 is a flow diagram illustrating an information processing method provided by another embodiment of the present invention. Figure 3 is a structural schematic view illustrating a code block provided by another embodiment of the present invention. Figure 4 is a structural schematic view illustrating a code block provided by another embodiment of the present invention. Figure 5 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. Figure 6 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. Figure 7 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. Figure 8 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. Figure 9 is a flow diagram illustrating an information processing method provided by another embodiment of the present invention. p. 16

64. Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
[0060] As shown in FIG. 1, a communications system 100 includes a communications device 10 and a communications device 11. Information, such as control information or data information, is received and sent between the communications device 10 and the communications device 11 in the form of information sequences. The communications device 10 serves as a device at a transmitting end, and sends the information in transport blocks, and transport block CRC bits are attached to each transport block. A transport block to which transport block CRC bits are attached is referred to as an input sequence. If a length of the input sequence is less than a maximum code block length Z, the input sequence is inserted with filler bits based on a code block length in a code block length set, and is input into an encoder, to perform channel coding. If a length of the input sequence exceeds a maximum code block length Z, the input sequence is divided into a plurality of input bit segments. Each code block that is input into the encoder includes one of the input bit segments. Further, CRC bit segments may be attached to some or all code blocks to improve error detection performance of the code blocks. Further, filler bits may be inserted to some or all code blocks so that a block length of each code block equals an allowable code block length defined in a block length set. The communications device 10 performs channel coding such as LDPC code-based coding on each code block to obtain a corresponding coded block. Each coded block includes a plurality of information bits and a plurality of parity bits generated through coding. The information bits and the parity bits are collectively referred to as coded bits.	As shown in Figure 1, communication system 100 comprises a communication device 10 and a communication device 11, and control information or data information is received and transmitted between the communication device 10 and the communication device 11 as an information sequence. The communication device 10 functions as a transmitting end device, and transmits an information sequence on the basis of a transmission block (TB), and a transmission block CRC bit is added to each transmission block. A transmission block added with a transmission block CRC functions as an input sequence. If the length of the input sequence is less than the maximum code block length Z, padding bits may be added based on the code block length in the set of code block lengths, and then enter the encoder for channel coding. If the length of the input sequence exceeds the maximum code block length Z, the input sequence is divided into a number of input bit segments, and each code block (CB) entering the encoder includes one of the input bit segments, CRC check bit segments may be added to some or all of the code blocks to improve the error detection performance of the code blocks. Padding bits may also be added to some or all of the code blocks so that the block length of each code block satisfies the legal code block length requirements defined for the set of code block lengths. The communication device 10 performs channel coding on each code block separately, for example, coding using LDPC code to obtain a corresponding encoded code block. Each of the encoded code blocks includes a plurality of pre-coding information bits and check bits generated by the code - which are collectively referred to as coded bits. p. 17
[0061] The coded block is stored in a circular buffer of the communications device 10 after sub-block interleaving, and the communications device 10 selects a segment of coded bits from the circular buffer, also referred as a coded bit segment. The coded bit segment is interleaved and mapped into modulation symbols for sending. During retransmission, the communications device 10 selects another coded bit segment from the circular buffer for sending. If all data in the circular buffer has been transmitted, coded bits are selected again from a front end of the circular buffer.	The encoded code block is interleaved by the sub-block and stored in the circular buffer of the communication device 10. The communication device 10 selects a segment of coded bit from the circular buffer, that is, a coded bit segment is interleaved and mapped into a modulation symbol for transmission. When the communication device 10 retransmits, another coded bit segment is selected and sent from the circular buffer. If the data in the circular buffer is transmitted once, the data is returned to the front end of the circular buffer to re-encode the bit. p. 18

64. Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
[0062] The communications device 11, which is used as a device at a receiving end, demodulates the received modulation symbols, and stores soft values of the received coded bit segment in a corresponding position in a soft buffer after de-interleaving. If retransmission occurs, the communications device 11 combines soft values of retransmitted coded bit segments and stores the combined soft values in the soft buffer. The combination herein means that if coded bits received in different times are in a same position, soft values of the coded bits received in the different times are combined. The communications device 11 decodes all soft values in the soft buffer to obtain a code block in the information sequence. Because the communications device 11 may obtain a transport block size, the communications device 11 determines a quantity of code blocks into which a transport block is segmented and a length of each code block. The communications device 11 may obtain an output bit segment in each code block. If the code block includes a CRC bit segment, the communications device 11 may further check the output bit segment in the code block or the output bit segment and a filler bit segment in the code block by using the CRC bit segment. The communications device 11 concatenates output bit segments into an output sequence, namely, a transport block, and further checks and concatenates transport blocks to finally obtain an information sequence. It can be learned that the communications device 11 performs an inverse process of an information processing method of the communications device 10.	As the receiving end device, the communication device 11 demodulates the received modulation symbols, and after <u>deinterleaving</u>, stores the soft values of the received encoded bit segments in corresponding positions in the soft buffer. If a retransmission occurs, the communication device 11 combines the soft values of the coded bit segments retransmitted each time and stores them in the soft buffer, where combination as used herein indicates that if the coded bits received in two occasions are in the same position, the soft values of the coded bits received in two occasions are combined. The communication device 11 decodes all soft values in the soft buffer to obtain a code block of the information sequence. Since the communication device 11 can acquire the transmission block size, the number of code blocks in which a transmission block is divided and the length of each code block can be determined, and the communication device 11 can obtain the output bit segment in each code block. If the code block includes the CRC bit segment, the communication device 11 can also use the CRC bit segment to verify the output bit segment or the output bit segment and the padding bit segment in the code block. The communication device 11 combines the various output bit segments into an output sequence, that is, a transmission block, and further sifts and combines the transmission block to finally obtain an information sequence. It can be seen that the communication device 11 performs the inverse of the information processing method of the communication device 10. p. 19
[0063] In the embodiments of the present application, the communications device 10 may be a network device in a communications system, such as a base station, and correspondingly, the communications device 11 may be a terminal. Alternatively, the communications device 10 may be a terminal in a communications system, and correspondingly, the communications device 11 may be a network device in the communications system, such as a base station.	It should be noted that, in various embodiments of the present invention, for example, the communication device 10 may be a network device in a communication system, such as a base station, etc, and the corresponding communication device 11 may be a terminal. The communication device 10 may also be a terminal in a communication system, and accordingly, the communication device 11 may be a network device in a communication system, such as a base station or the like. p. 18
[0068] FIG. 2 is a flowchart of an information processing method in a communications system according to an embodiment of the present application. The method may be applied to a device at a transmitting end, and includes the following steps.	Figure 2 is a flow diagram illustrating an information processing method provided by another embodiment of the present invention. p. 17

64. Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
[0070] In the embodiments of the present application, the input sequence may be a transport block or a transport block to which transport block CRC bits are attached. The transport block herein is used to transmit control information or data information. The transport block or the transport block to which the transport block CRC bits are attached, which is obtained by the device at the transmitting end, may be used as an input sequence for code block segmentation.	In various embodiments of the invention, the input sequence may be a transmission block or a transmission block to which a transmission block CRC is added. Here, the transmission block is used to transmit control information or data information. The transmission block acquired by the transmitting end device or the transmission block to which the transmission block CRC is added may be used as an input sequence for code block segmentation. p. 19
[0083] FIG. 5 is a schematic diagram of a code block segmentation manner according to an embodiment of the present application. In this manner, only one code block includes a filler bit segment. This is applicable to a case in which two adjacent code block lengths in the code block length set have a relatively small difference. As shown in FIG. 5, the segmentation manner includes the following content. [0083]-[0085]	Figure 5 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. In this way, the padding bit segments are concentrated in one code block, which is suitable for the case where two adjacent code block lengths in the set of code block lengths have a small interval. As shown in Figure 5: p. 22
[0088] FIG. 6 is a schematic diagram of a code block segmentation manner according to another embodiment of the present application.	Figure 6 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. As shown in Figure 6: p. 23
[0100] FIG. 7 is a schematic diagram of a code block segmentation manner according to yet another embodiment of the present application. In this manner, no CRC bit segment is added to each code block; in other words, $L=0$.	Figure 7 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. In this method, no CRC bit segment is added to each code block, that is, $L=0$. As shown in Figure 7: p. 26
[0109] FIG. 8 is a schematic diagram of a code block segmentation manner according to still another embodiment of the present application. The manner may be applied to a scenario in which one CRC bit segment is added to a plurality of input bit segments. In this case, the C code blocks include G code blocks having the CRC bit segment, where G is an integer greater than 0 and less than or equal to C.	Figure 8 is a schematic view illustrating an information processing method provided by another embodiment of the present invention. The method can be used to add a CRC bit segment to a plurality of input bit segments. In this case, the number of code blocks in the C code blocks that includes the CRC bit segment is G, where G is an integer greater than 0 and less than or equal to C. As shown in Figure 8: p. 27

64. Subject Matter from EX1007 Cited in Analysis Below	Supporting Corresponding Subject Matter in Zheng Chinese priority application (EX1008, EX1009)
[0111] System CRC overheads can be reduced because CRC bit segments are attached, by code block group, to a plurality of code blocks obtained after the input sequence is processed. In addition, when ACK feedback is performed by code block group, performance is better, and system efficiency is improved.	Since a plurality of code blocks obtained after processing the input sequence are added with CRC bit segments according to the code block group, the system's CRC overhead can be saved, and the performance of ACK feedback is better when provided on a code block group basis, and system efficiency is improved. p. 28
[0140] For example, $B=92000$, $M=4$, $Z=6144$, and $L=24$. In this case, a quantity of code block groups is $G=\lceil B/(M \cdot Z - L) \rceil$, $G=4$, a quantity of code blocks is $C=\lceil (B+G \cdot L)/Z \rceil$, and $C=15$. The 15 code blocks are divided into four code block groups that separately include three code blocks, four code blocks, four code blocks, and four code blocks. After balanced segmentation is performed, K_7 is 6140 bits, K_8 is 6139 bits, there are 11 code blocks in which the mixed segment has the length of K_7, and there are four code blocks in which the mixed segment has the length of K_8. A length of a filler bit segment in the code block in which the mixed segment has the length of K_7 is four bits, and a length of a filler bit segment in the code block in which the mixed segment has the length of K_8 is five bits. For example, a length of mixed segments in the 11 code blocks in groups 0 to 2 may be 6140 bits, and a length of mixed segments in the four code blocks in group 3 may be 6139 bits. Table 1 shows an example of a length of an input bit segment, a length of a CRC bit segment, and a length of a filler bit segment in each code block in this block segmentation manner. Certainly, a length of mixed segments in code blocks 0 to 3 may be 6139 bits, and a length of mixed segments in code blocks 4 to 14 may be 6140 bits.	Taking $B=92000$, $M=4$, $Z=6144$ and $L=24$ as an example, the number of code block groups at this time is $G=\lceil B/(M \cdot Z - L) \rceil$, $G=4$, the number of code blocks is $C=\lceil (B+G \cdot L)/Z \rceil$, $C=15$. The 15 code blocks are divided into 4 code block groups with the code block groups each containing 3, 4, 4, and 4 code blocks, respectively. After evenly dividing the block, $K_7=6140$ bits, $K_8=6139$ bits, the number of code blocks having a hybrid segment length of K_7 is 11, and the number of code blocks having a hybrid segment length of K_8 is 4. In the code block with a hybrid segment length of K_7, the length of the padding segment is 4 bits, and in the code block with a hybrid segment length of K_8, the length of the padding segment is 5 bits. For example, the hybrid segment length in the 11 code blocks of the 0-2nd group may be 6140 bits, and that in the 4 code blocks of the third group is 6139 bits. Table 1 shows the lengths of input bit segments, CRC bit segments and padding bit segments in various code blocks with this manner of segmentation. Of course, the hybrid segment length in the 0-3rd code block may be 6139 bits, and the hybrid segment length in the 4-14th code block is 6140. p. 32
[0083]-[0140]	See pp. 22-23
[0142] CRC bits are attached by code block group, so that CRC check overheads can be reduced, and system performance can be further improved. If a hybrid automatic repeat request (HARQ) is used in a system to feed back acknowledgement/negative acknowledgement (ACK/NACK) information by group, CRC attachment based on the code block group can reduce feedback signaling overheads and improve system transmission efficiency.	Adding CRC according to the code block group can save the overhead of CRC check and further improve system performance. If the system adopts hybrid automatic repeat-request (HARQ) and implements grouped feedback on positive/negative (ACK/NACK) information, then adding CRC according to the code block group can save feedback signaling overhead and improve system transmission efficiency. p. 33

65. It is also my opinion that Zheng's Claims are supported by the Zheng Provisional. 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:	In view of the above, the embodiments of the present invention provide a method, a device and a communication system for processing information, and the code blocks output after processing the input sequence can be adapted to the requirements of channel coding. In a first aspect, a method of information processing in a communication system is provided, comprising: p. 11 Figure 2 is a flow diagram illustrating an information processing method used in a communication system provided by an embodiment of the present invention, the method may be used in a transmitting end device, and comprises the following steps: p. 19 1. A method for processing information in a communication system, comprising: Claim 1
obtaining, by a communication device, an input sequence, wherein the input sequence comprises a quantity B of information bits, and $B \geq 1$;	acquiring an input sequence, the input sequence having a length of B; obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. p. 11 201: acquiring an input sequence. In various embodiments of the invention, the input sequence may be a transmission block or a transmission block to which a transmission block CRC is added. Here, the transmission block is used to transmit control information or data information. The transmission block acquired by the transmitting end device or the transmission block to which the transmission block CRC is added may be used as an input sequence for code block segmentation. The length of the input sequence is B, that is, the input sequence is composed of B bits, and can be generally expressed as $b_0, b_1, \dots, b_{B-1}$, and B is an integer greater than zero.

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
	pp. 19-20 acquiring an input sequence, the input sequence having a length of B; B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. 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	202: obtaining C code blocks based on the input sequence acquired in step 201 and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one code block includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment. Wherein Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. Each code block obtained by the transmitting end device performing code block segmentation on the input sequence is its output sequence, and each code block can be represented as $C_{r0}, C_{r1}, C_{r2}, C_{r3}, \dots, C_{r(K_r-1)}$, where r is the code block number, $0 \leq r < C$, and K_r is the code block length of the rth code block, that is, the number of bits in the rth code block. In a possible embodiment, the input sequence is divided into C input bit segments based on the maximum code block length Z, and among the C code blocks, the code block i includes the input bit segment i, and the code block j includes the input bit segment j, and so on, where $0 \leq i, j < C$. p. 20 obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. Claim 1

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
encoding, by the communication device, each of the C code blocks individually, to obtain C encoded code blocks;	In the above embodiments, in each of the code blocks obtained by processing the input sequence, the code block lengths of any two code blocks are equal, or are two adjacent code block lengths in the set of code block lengths, and the valid information bits in any two code blocks differ by at most 1 bit, so that the code rate of each code block is uniform. Using these code blocks as input for encoding or decoding can avoid system performance fluctuations. p. 12 In the method, device and communication system of the embodiment of the present invention, the code block outputted after the processing of the input sequence can meet the requirements of code block length sets in different channel coding modes, and the difference in code rate between various code blocks is balanced. By using these code blocks for encoding or decoding, the processing performance of communication system can be improved. pp. 15-16 As shown in Figure 1, communication system 100 comprises a communication device 10 and a communication device 11, and control information or data information is received and transmitted between the communication device 10 and the communication device 11 as an information sequence. The communication device 10 functions as a transmitting end device, and transmits an information sequence on the basis of a transmission block (TB), and a transmission block CRC bit is added to each transmission block. A transmission block added with a transmission block CRC functions as an input sequence. If the length of the input sequence is less than the maximum code block length Z, padding bits may be added based on the code block length in the set of code block lengths, and then enter the encoder for channel coding. If the length of the input sequence exceeds the maximum code block length Z, the input sequence is divided into a number of input bit segments, and each code block (CB) entering the encoder includes one of the input bit segments, CRC check bit segments may be added to some or all of the code blocks to improve the error detection performance of the code blocks. Padding bits may also be added to some or all of the code blocks so that the block length of each code block satisfies the legal code block length requirements defined for the set of code block lengths. The communication device 10 performs channel coding on each code block separately, for example, coding using LDPC code to obtain a corresponding encoded code block. Each of the encoded code blocks includes a plurality of pre-coding information bits and check bits generated by the code - which are collectively referred to as coded bits. p. 17

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
	obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. p. 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;	obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. p. 11 Wherein Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. Usually, a set of code block lengths is defined in the system, including one or more legal code block lengths, where the maximum code block length is Z. With different channel coding methods, the set of code block lengths may be different. Taking LDPC coding as an example of channel coding, if the size of the LDPC base matrix is 34×50, where the number of columns corresponding to the information bits is 16, the extension factor z is {8, 10, 12, 14, 16, 20, 24, 28, 32, 40, 48, 56, 64, 80, 96, 112, 128, 160, 192, 224, 256, 320, 384}, the code block length in the set of code block lengths is $16 \times z$, and the maximum code block length Z is $16 \times 384 = 6144$ bits. It should be noted that the description is merely illustrative and not limiting. Each code block obtained by the transmitting end device performing code block segmentation on the input sequence is its output sequence, and each code block can be represented as $C_{r0}, C_{r1}, C_{r2}, C_{r3}, \dots, C_{r(K_r-1)}$, where r is the code block number, $0 \leq r < C$, and K_r is the code block length of the <u>r</u>th code block, that is, the number of bits in the <u>r</u>th code block. In a possible embodiment, the input sequence is divided into C input bit segments based on the maximum code block length Z, and among the C code blocks, the code block <u>i</u> includes the input bit segment <u>i</u>, and the code block j includes the input bit segment j, and so on, where $0 \leq i, j < C$. p. 20

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
	obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. 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	In another possible embodiment of the above aspect, if $L > 0$, each of the code blocks includes a CRC bit segment, and the CRC bit segment is a check bit segment generated for the input bit segment in each of the code blocks, or the CRC bit segment is a check bit segment generated for the input bit segment and padding bit segment in each of the code blocks. p. 13 As shown in Figure 1, communication system 100 comprises a communication device 10 and a communication device 11, and control information or data information is received and transmitted between the communication device 10 and the communication device 11 as an information sequence. The communication device 10 functions as a transmitting end device, and transmits an information sequence on the basis of a transmission block (TB), and a transmission block CRC bit is added to each transmission block. A transmission block added with a transmission block CRC functions as an input sequence. If the length of the input sequence is less than the maximum code block length Z, padding bits may be added based on the code block length in the set of code block lengths, and then enter the encoder for channel coding. If the length of the input sequence exceeds the maximum code block length Z, the input sequence is divided into a number of input bit segments, and each code block (CB) entering the encoder includes one of the input bit segments, CRC check bit segments may be added to some or all of the code blocks to improve the error detection performance of the code blocks. Padding bits may also be added to some or all of the code blocks so that the block length of each code block satisfies the legal code block length requirements defined for the set of code block lengths. The communication device 10 performs channel coding on each code block separately, for example, coding using LDPC code to obtain a corresponding encoded code block. Each of the encoded code blocks includes a plurality of pre-coding information bits and check bits generated by the code - which are collectively referred to as coded bits. p. 17

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
	After adopting the new channel coding mode, for example, LDPC coding, which has better self-checking capability, and the method of adding the CRC bit segment is also flexible, and a CRC bit segment with the length of L can be added to each input bit segment. A CRC bit segment with the length of L may be added to a plurality of input bit segments together, and a CRC bit segment may not be added to the input bit segment, in which case $L=0$. Correspondingly, for the C code blocks, the number of code blocks including the CRC bit segment may be C, that is, each code block includes a CRC bit segment; the number of code blocks including the CRC bit segment may also be G, where G is an integer greater than 0, and less than or equal to C, that is, one of the plurality of code blocks includes a CRC bit segment; the number of code blocks including the CRC bit segment may also be 0, that is, each code block does not include the CRC bit segment, or $L=0$. pp. 20-21 obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. Claim 1
wherein L is greater than or equal to 0.	obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. p. 11 202: obtaining C code blocks based on the input sequence acquired in step 201 and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one code block includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment. Wherein Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z.

Zheng Claim 1 (EX1007)	Supporting Disclosure from Zheng Chinese priority application (EX1008, EX1009)
	p. 20 obtaining C code blocks based on the input sequence and the maximum code block length Z in a set of code block lengths, wherein each of the code blocks includes an input bit segment of the input sequence, and at least one of the C code blocks includes a cyclic redundancy check (CRC) code bit segment with a length of L or a padding bit segment; wherein B, Z and C are integers greater than 0, and L is an integer greater than or equal to 0 and less than Z. Claim 1

IX. CLAIMS 4, 5, 10, AND 11 ARE UNPATENTABLE

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

a) Claim 4

[4pre] A base station apparatus comprising:

66. Lee teaches a cellular communication system. “In 3GPP radio access networks (RANs) in LTE systems, the base station can include a RAN node such as a Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Node B (also commonly denoted as evolved Node B, enhance Node B, eNodeB, or eNB) which communicate with a wireless communication device, known as user equipment (UE).” EX1005 at [0003]. A “network entity such as a base station” can determine code block group size and code block segmentation. EX1005 at [0043].

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

67. Lee discloses this element. For example Lee describes “a radio access network (RAN) node enables encoded information to be segmented into multiple code blocks and map a group of code blocks to be aligned with orthogonal frequency division multiplexing (OFDM) symbol boundaries such that efficient receiver processing can implement processing pipelining.” EX1005 at [0027]. In addition, “groups of code blocks within a transport block are aligned with OFDM symbol boundaries.” EX1005 at [0028]. Figure 8 of Lee shown below shows the segmenting of a transport block into groups of code blocks.

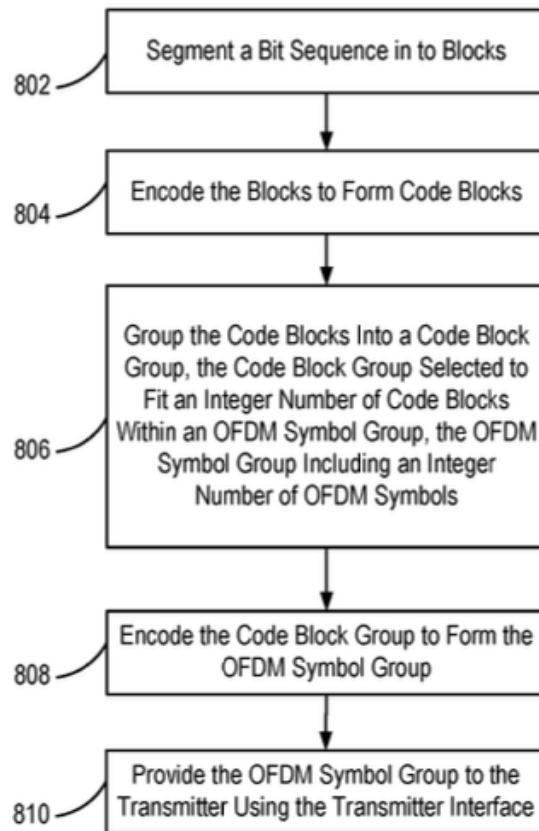


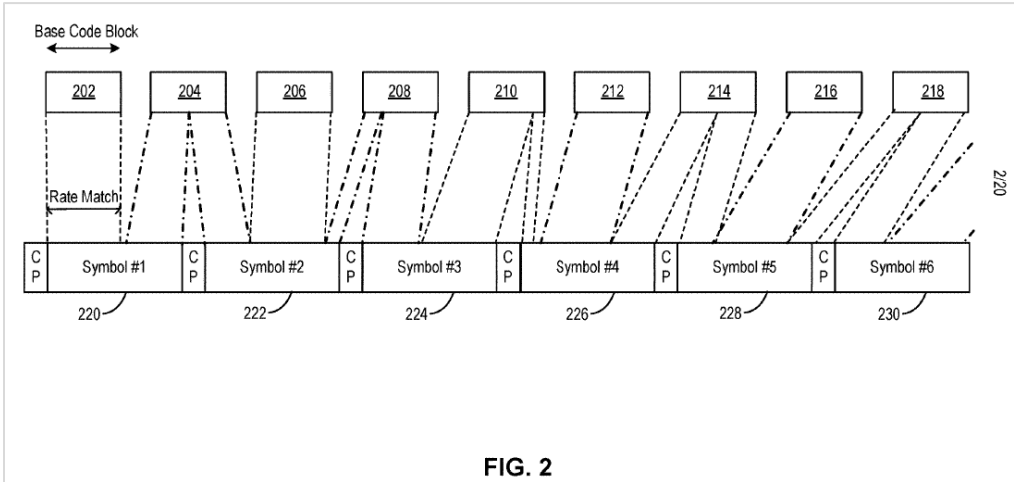
FIG. 8

EX1005 at Fig. 2.

68. “In block 802, a RAN node segments a bit sequence into blocks. In block 804, the RAN node encodes the blocks to form code blocks. In block 806, the RAN node groups 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. In block 808, the RAN node encodes the code block group to form the OFDM symbol group. In block **810**, the RAN node provides the OFDM symbol group to the transmitter using the transmitter

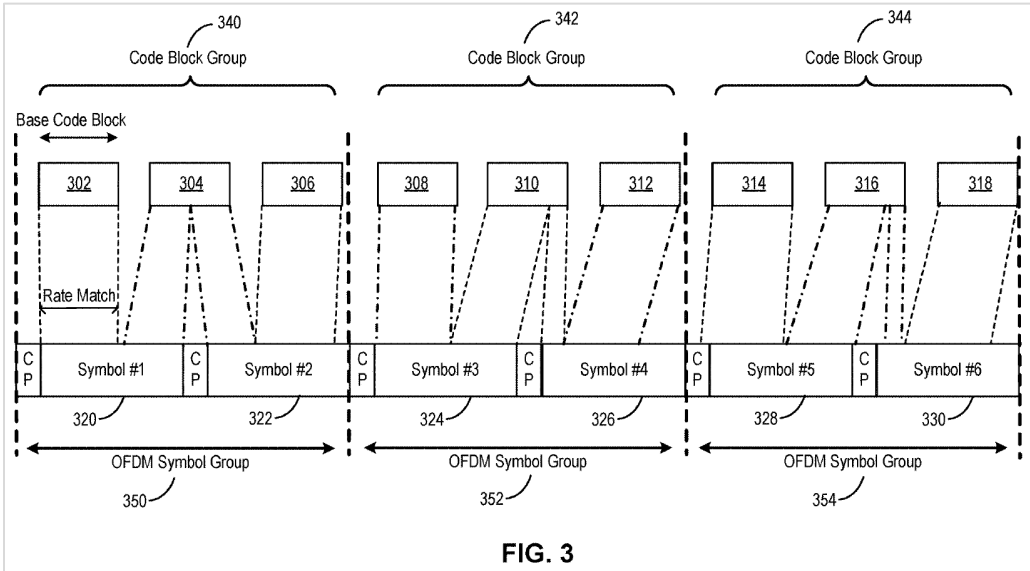
interface.” EX1005 at [0047].

69. Figure 2 of Lee illustrates a transmitter information bit sequence segmented into sub-blocks. EX1005 at [0007].



EX1005 at Fig. 2.

70. Figure 3 illustrates the alignment of a code block group with an OFDM symbol group. EX1005 at [0039].



EX1005 at Fig. 3.

71. Lee teaches that it is possible to have a different number of code blocks in a CBG, and further discloses that there may be different code block sizes per CBG, or that each CBG may have a distinct size. EX1005 at [0039]. OFDM symbols can have varying numbers of available resource elements (“REs”) for data transmission, the number of REs may similarly vary by CBG. EX1005 at [0040], Fig. 4. Code block groups may vary in size to provide more balanced performance. *See* EX1005 at [0042-0043].

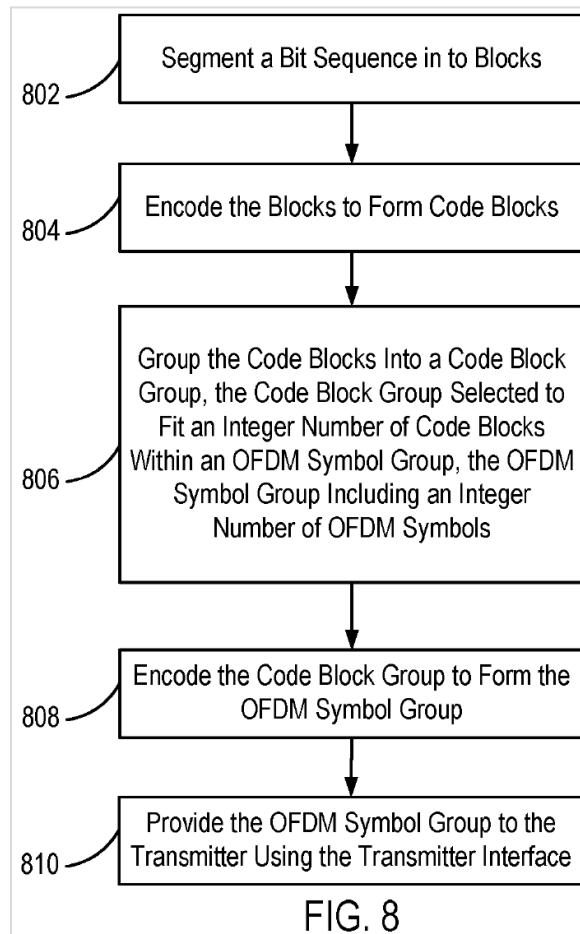
[4b] a transmitter configured to transmit the transport block, and

72. Lee discloses “a transmitter configured to transmit the transport block.” “In block 810, the RAN node provides the OFDM symbol group to the transmitter using the transmitter interface.” EX1005 at [0047]. So the transport block is transmitted after segmenting the transport block into OFDM symbols. Lee discloses a transmitter also in Figure 17. The transmitter includes “baseband circuitry 1704, Radio Frequency (RF) circuitry 1706, front-end module (FEM) circuitry 1708, [and] one or more antennas 1710.” EX1005 at [0080].

73. A POSITA would understand this circuitry would be used as a transmitter and/or receiver. As explained in connection with limitations [4a] and [4d]-[4i], the base station of Lee is configured to transmit a transport block. A POSITA would understand, based on Lee’s disclosure of a base

station and its transmission of the transport block, that a transmitter is included in the base station. Further, Lee discloses that a group of code blocks are “within a transport block.” EX1005 at [0028].

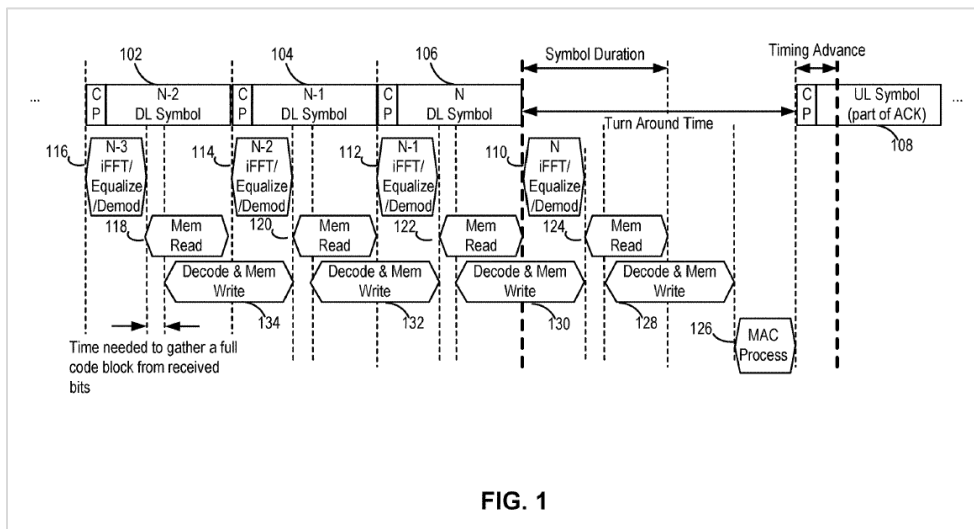
74. Figure 8 of Lee discloses at step 810, “provid[ing] the OFDM symbol group to the transmitter using the transmitter interface.” A POSITA would understand that the symbols corresponding to the transport block would need to be transmitted, and it would be obvious to a POSITA that Lee’s system necessarily includes a transmitter configured to transmit the transport block.



EX1005 at Fig. 8.

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

75. Lee discloses this element. For example, Figure 1 of Lee discloses “pipelined processing of received data signal and transmission of an acknowledgement (ACK).” EX1005 at [0006]. Alignment of code blocks with OFDM symbol boundaries using OFDM symbol groups is done to allow the ACK/NACK process to begin earlier in the sub frame. EX1005 at [0028], [0039], [0045].



EX1005 at Fig. 1.

76. Lee also discloses that acknowledgement by CBG “allows a transmitter to omit retransmission of a code block group that is already successfully received by the receiver.” EX1005 at [0045]. “FIG. 7 is a diagram illustrating transmission of a cyclic redundancy check (CRC) with a

code block group.” EX1005 at [0046]. This shows CRCs attached to multiple CBGs. Each CRC attached to a CBG at the receiver would generate an ACK/NACK (or HARQ-ACK).

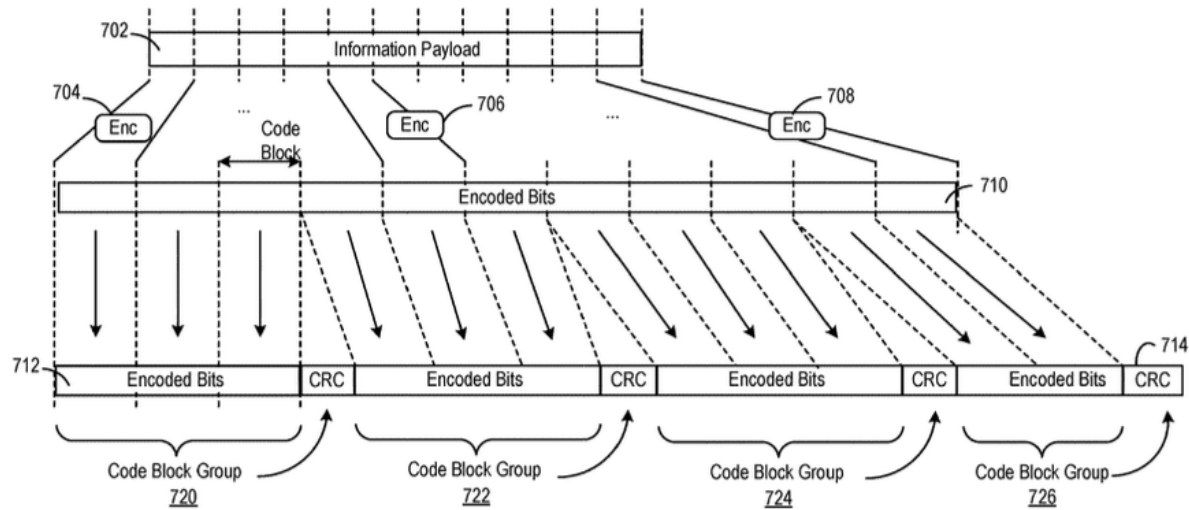


FIG. 7

EX1005 at Fig. 7.

77. As discussed above, the purpose of a CRC is to check whether a signal has been successfully received in order to send back an ACK/NACK signal back to the transmitter. Since there is a CRC check disclosed in Lee, a POSITA would understand that the base station would have a receiver capable of receiving ACK/NACKs and processing them accordingly. Since there is also forward error control coding disclosed Lee at [0032], this would necessarily be a hybrid ARQ (HARQ) transmission strategy. That is a

combination of forward error control and automatic repeat request (ARQ) none as HARQ. HARQ is also disclosed in Lee at [0051] and Lee at [0108]. As such Lee discloses “a receiver configured to receive HARQ-ACKS corresponding to multiple CBGs.”

78. A POSITA would understand that the alignment of CBGs 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 CBG. 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 based on the first CRC matching the second. EX1005 at [0132]-[0133].

79. As discussed above, the base station of Lee indicates the presence of a receiver. Lee’s teaching of acknowledgement by CBG or OFDM symbol group indicates receiving HARQ-ACKs corresponding to multiple CBGs. In other words, Lee discloses a UE providing HARQ-ACKs corresponding to multiple CBGs to the base station. A POSITA would find it

obvious to have the base station receive the HARQ-ACKs corresponding to the multiple CBGs sent by the UE.

[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,

80. Lee teaches these elements. As seen in Figure 3 of Lee, there are multiple code blocks (302, 304, 306, 308, 310, 312, 314, 316, 318). The different code blocks are indicated with different sizes. For example, based on the different sized gaps at the end of code block 306 and code block 312 in OFDM symbols 2 and 4, the total length/size of code blocks 302, 304, and 306 is larger than the total code block length/size of code blocks 308, 308, and 310. This would require there to be at least two different code block lengths. If there are two different code block lengths then one would have to be larger than the other.

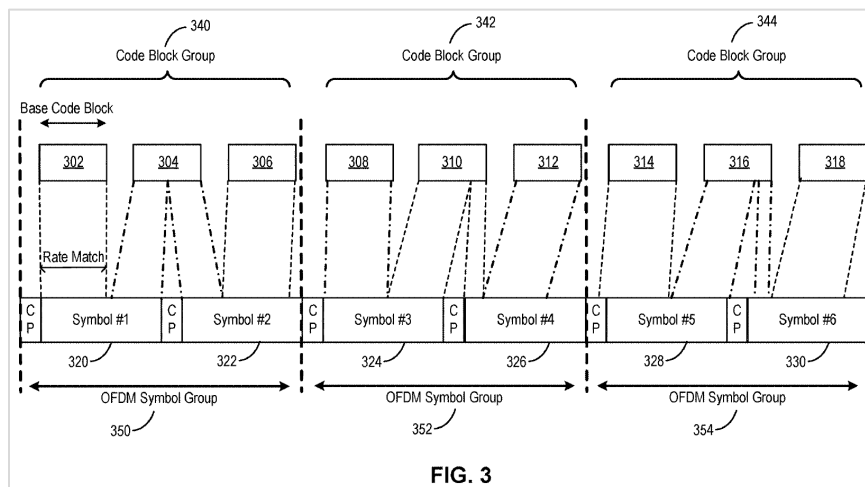


FIG. 3

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

81. Lee also teaches this directly. “It may be also 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; CB2-CB6 are in CBG1; and CB7-CB13 are in CBG2.” EX1005 at [0039]. Again, different code blocks lengths would mean that one code block length was longer than another.

82. Figure 4 of Lee, color coded and reproduced below, also shows different two different code block lengths. In particular Code Block #0, #2, and #3 are using 12 resource elements, while Code Block #1 is only using 6 resource elements. This is an indication that there are at least two code blocks that have different sizes with one being larger than the other.

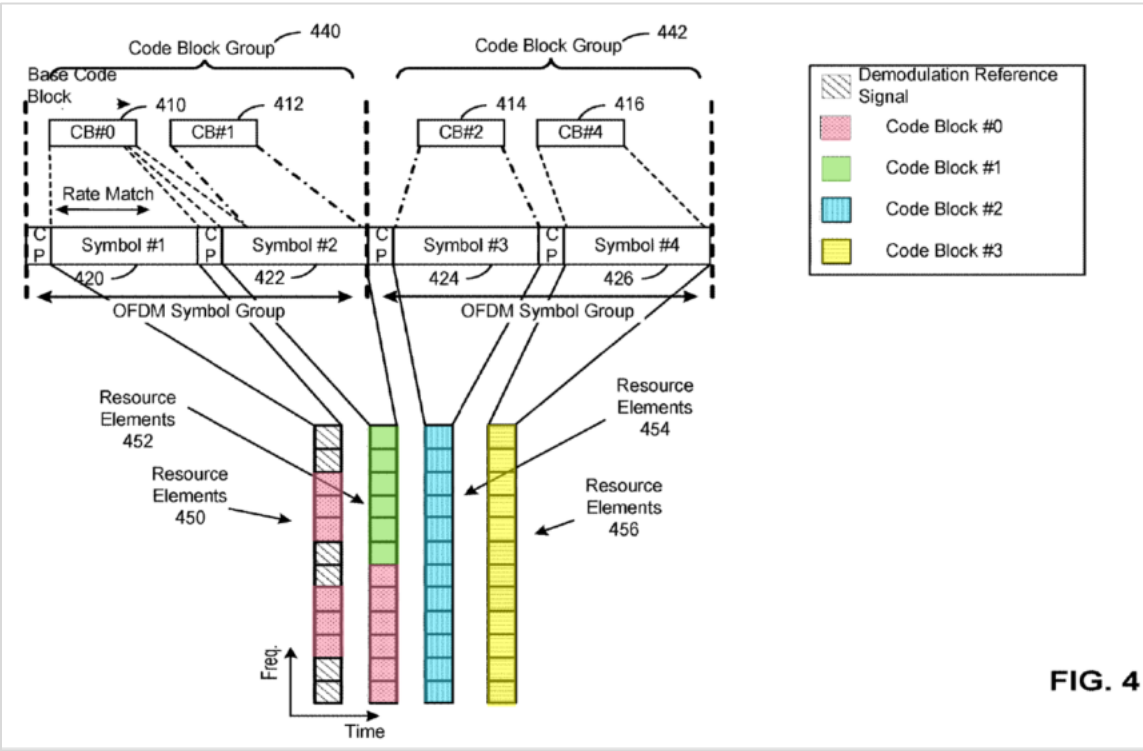
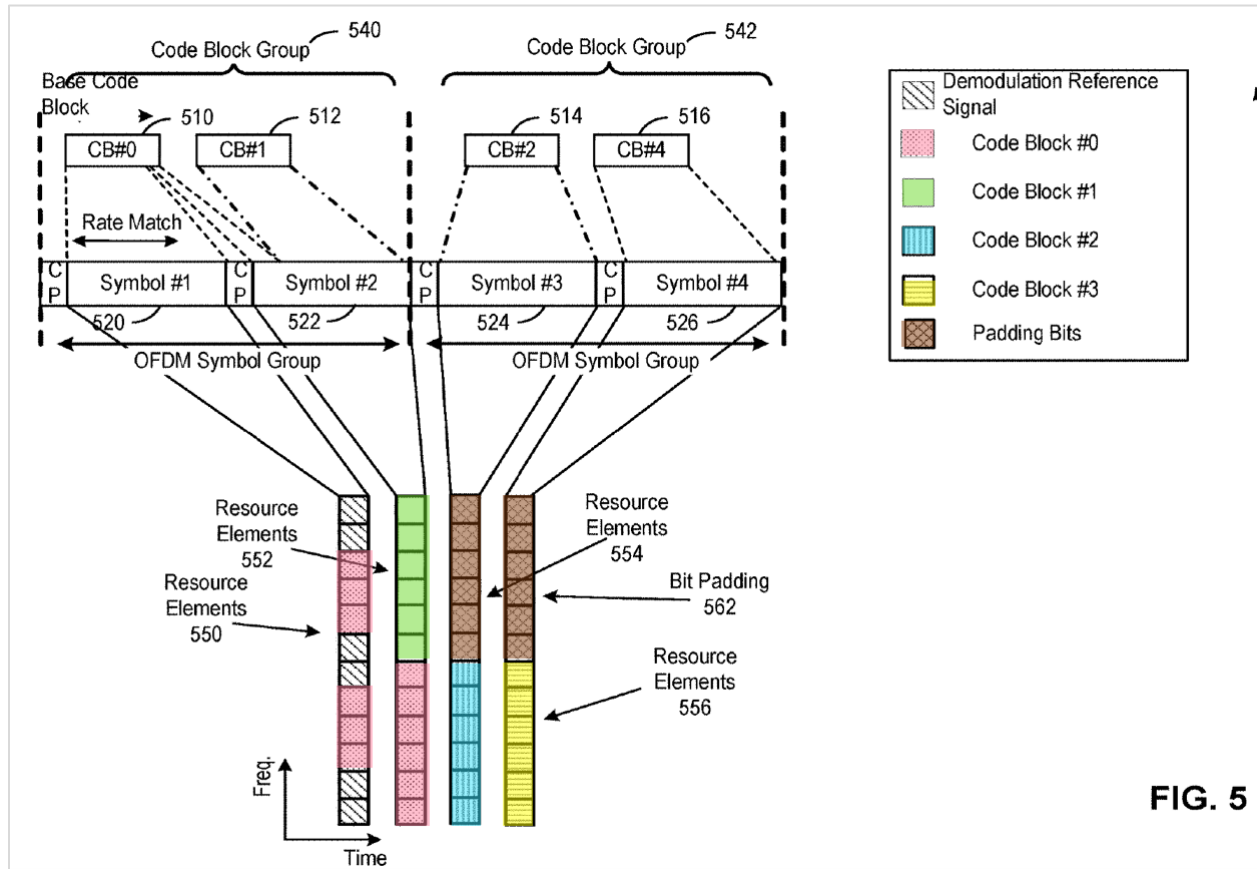


FIG. 4

EX1005 at Fig. 4 (color added).

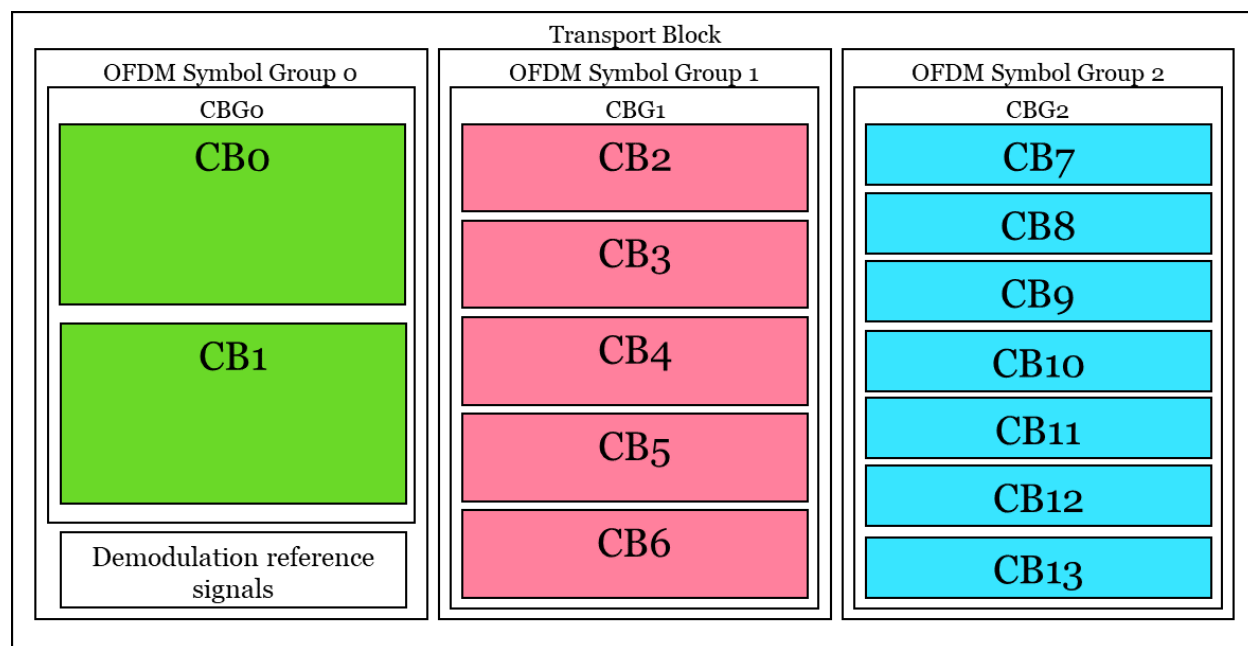
83. Figure 5, reproduced below with color added, also shows segmentation of a transport block into CBs of two sizes. For example, there is one code block (Code Block #0) with 12 resource elements, and the remaining code blocks each with 6 resource elements.

**FIG. 5**

EX1005 at Fig. 5 (color added).

84. Another example of Lee disclosing different size code blocks is as follows. “For 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]. If each CBG was mapped to a single OFDM symbol group of the same size then we could illustrate the organization with the figure below. Here the OFDM Symbol Group 0 has two CBs and some resource elements dedicated to reference symbols. OFDM Symbol Group 1 has 5 CBs and OFDM Symbol Group 2 has 7 CBs. A POSITA would understand that an identical size OFDM

symbol groups (which would be the most efficient way of organizing symbol groups) would imply different size CBs. As a result one CB would have a larger size than another CB.



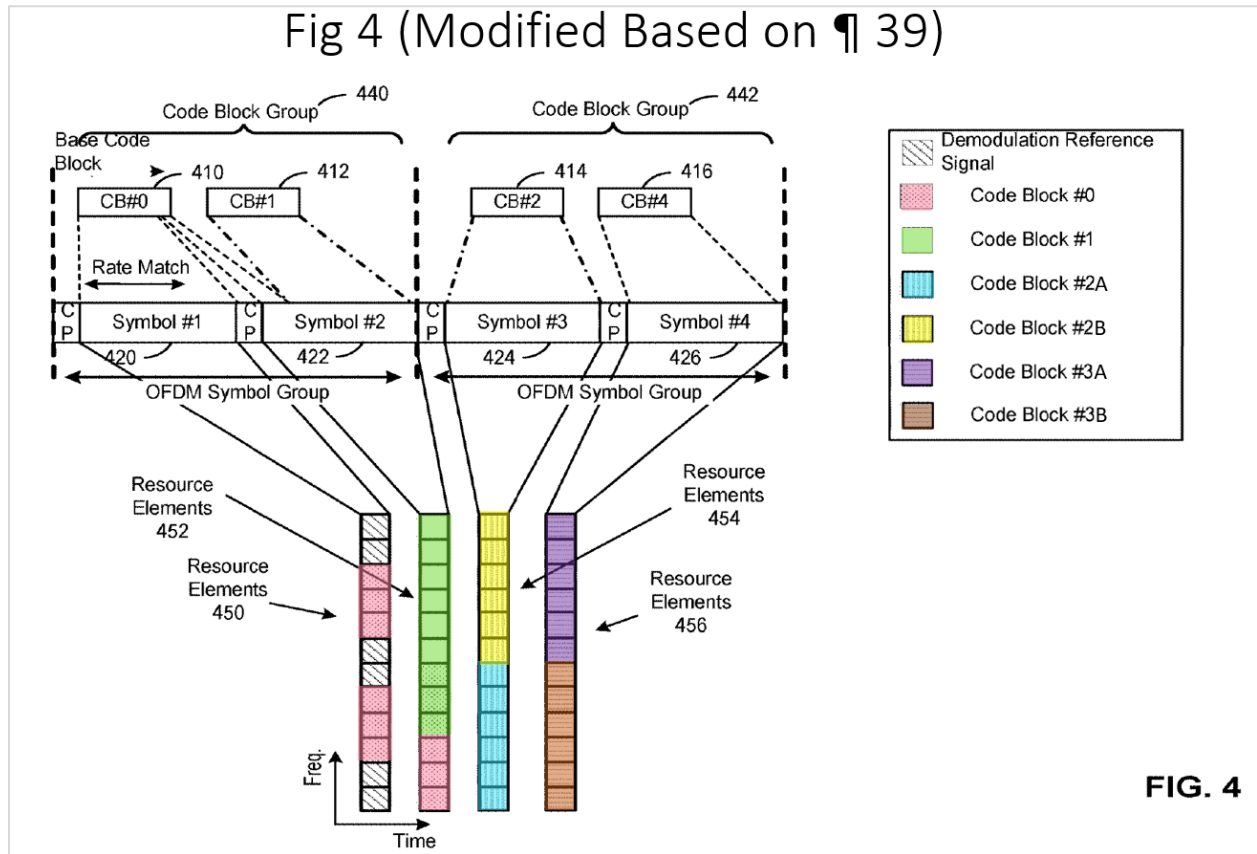
85. This teaching from Lee as illustrated above, teaches limitations [4d] and [4e]. In this example, three code block sizes are illustrated. Notably, the claims do not limit to only two types of code blocks but rather require at least first and second code blocks.

86. Based on Lee Figures 4 and 5 and paragraph 39, each explained/depicted above, 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. A POSITA would understand that the best size code block to use would depend

on a number of factors, including the amount of data to be transmitted, the desired coding rate, and/or the number of available resource elements in each OFDM in each OFDM symbol group. A POSITA would thus recognize the ability to select different CB sizes depending on these factors and types of data. In the Figure 5 example, Lee depicts using two size six CBs in the second CBG while Figure 4 depicts using one CB of size 12. A POSTIA would understand and be motivated to allocate transport blocks into different size CBs to adjust to conditions and reduce the need for retransmissions.

87. An example of this is illustrated in the modified Figure 4 below. A POSITA would apply Lee's teachings at paragraph 39 to make more, smaller CBs in the second CBs and more evenly sized CBs in the first CBG. It would have been obvious to segment the resource elements in the first code block group into two code blocks, each with 9 resource elements, and to segment the resource elements in the second code block group into four code blocks, each with six resource elements. This would evenly allocate the risk of error between code blocks in a code block group, and provide more redundancy for data transmitted further in time from demodulation reference signals, both of which would reduce the need for retransmissions. Lee also discusses the desire to avoid a variable code rate in order to avoid variable link performance within a transport block (e.g., at Paragraphs 41 and 42), and

keeping the code block size / code rate the same within each code block group, as illustrated below, would appeal to a POSITA for the same reason.

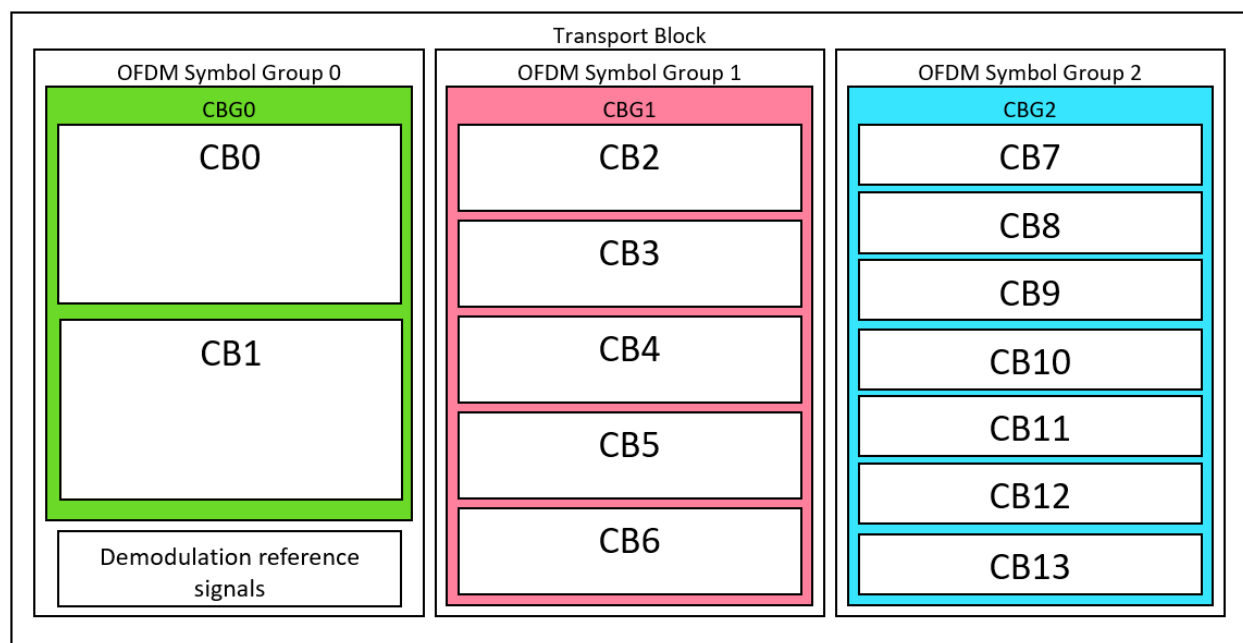


[4f] each of the multiple CBs is included in any one of the multiple CBGs,
 [4g] the multiple CBGs include one or more first CBGs and one or more second CBGs,
 [4h] a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater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

88. Lee discloses these claim elements. These limitations require the CBs to be in two or more CBGs [4f], the two or more CBGs to have two or

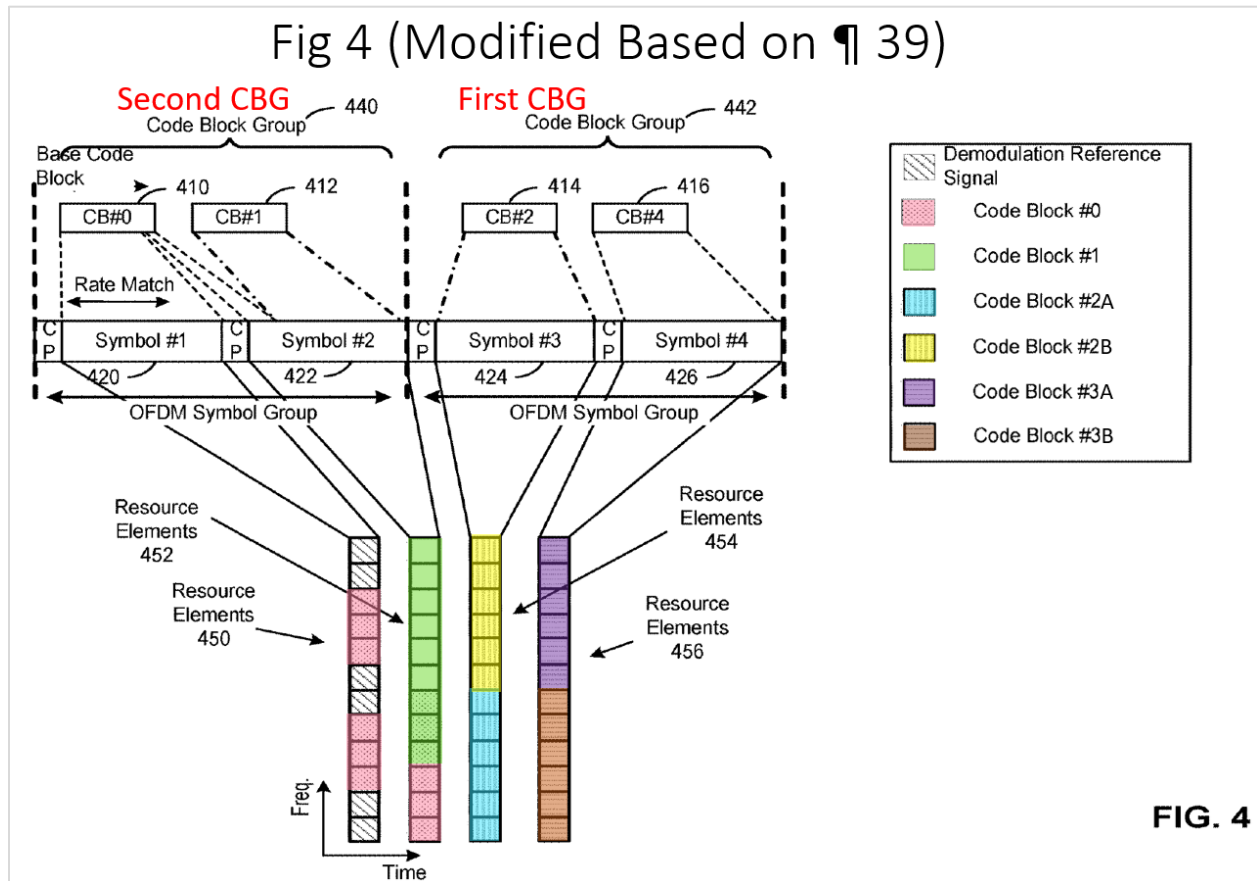
more types (first CBGs and second CBGs) [4g], and that the first type of CBG have more of the first and second type CBs than the second type of CBG [4h]. Lee's teachings provide examples of each of these limitations, and also renders them obvious.

89. 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]. I have illustrated this teaching in the figure below. In other words, Lee's disclosure at paragraph 39 satisfies each of these claim limitations, teaching two or more types of CBGs with a different number of CBs in each CBG. For example, CB0 and CB1 may be the first CBs and CB2-6 may be the second CBs. In this configuration, CBG1 would be the first CBG and CBG0 would be the second CBG. If CB2-6 are the first CBs, and CB7-13 are the second CBs, then CBG2 would be the first CBG and CBG1 would be the second CBG.



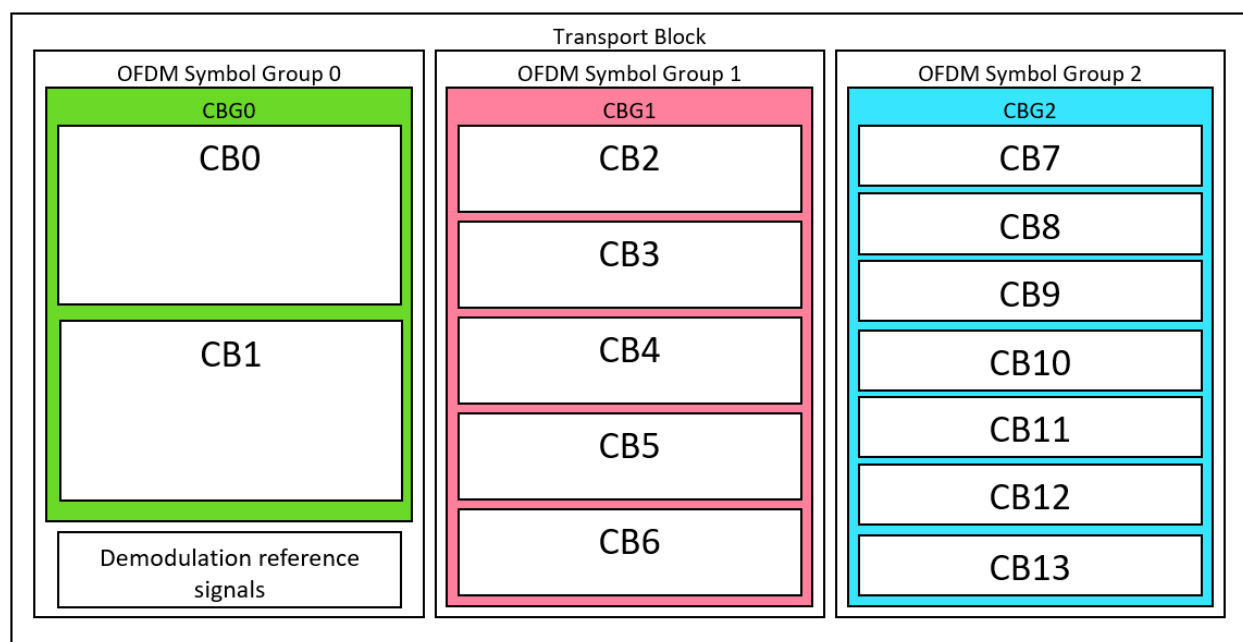
90. As discussed above, a POSITA would also have been motivated by Lee's disclosure at paragraph 39 to modify the segmentation shown in Lee Figure 4, so that code block group 440 included two code blocks of 9 REs and code block group 440 included four code blocks of 6 REs. Figure 4 of Lee, reproduce with color added below, shows 4 code blocks. CB#0 is mapped to 12 resource elements, CB#1 is mapped to 6 resource elements, and CB#2 and CB#3 are each mapped to 12 resource elements. A more balanced allocation would be CB#0 and CB#1 allocated 9 resource elements while CB#2 and CB#3 split into 4 CBs (CB#2a, CB#2b, CB#3a, CB#3b) each with 6 resource elements shown below. Lee teaches that "balanced performance (across all code blocks) is targeted," so making the block sizes similar in size is preferred. With this allocation the "first CBG" would be CBG 442 Lee. The "second

CBG” would be CBG 440 of Lee. The “first CBs” would be CB #0, CB #1, of size 9 REs. The “second CBs” would be CB #2A, CB #2B, CB #3A, CB #3B of size 6. The “first CBG” would be CBG 442 and the “second CBG” would be CBG 440. The “first CBG” would have more “first and second CBs” than the “second CBG.” This allocation would satisfy these claim limitations, as well as the previous mentioned claim elements.



91. The example in [0039] also discloses these claim limitations. The figure below illustrates the segmentation of a transport block into 14 CBs and 3 CBGs, there are at least two different size CBs and there are multiple types

of CBGs. So, the example from [0039] has three different CBGs and 3 different numbers of different sized CBs and thus satisfies claim limitations [4f] and [4g].



92. This example also satisfies the claim element [4h] that the total number of “first CBs” and “second CBs” in a “first CBG” is larger than the same total in a “second CBG.” If I take the “first CBs” to be CB0 and CB1 of Lee and the “second CBs” to be CB2-6 of Lee, and the “first CBG” and be Lee CBG1 containing CB2-6 and the “second CBG” to be Lee CBG0, then the total number of “first CBs” and “second CBs” in a “first CBG” is 5 (0 “first CBs and 5 “second CBs) and is larger than the same total in a “second CBG” (2 “first CBs” and 0 “second CBs in Lee CBG0).

93. A POSITA would understand from paragraph 39 that Lee

suggests evenly sized code blocks, and CBGs with only one size code block can satisfy this limitation under the interpretation of the claims advanced by Patent Owner in district court. Specifically, I understand that in district court, Patent Owner alleged infringement of this element where all CBs but one were the same size, so that all CBs but one would have CBs of a single size. EX1010 at 21 (reproduced below).

Additionally, except in the case where the transport block size is evenly divisible by the maximum code block size, the final code block within a segmented transport block is smaller than the other code blocks within that transport block. This smaller code block requires the insertion of filler bits.

```

for  $k = K^*$  to  $K - 1$  -- Insertion of filler bits
     $c_{ik} = \langle \text{NULL} \rangle$ ;
end for

```

TS 38.212 at 13.

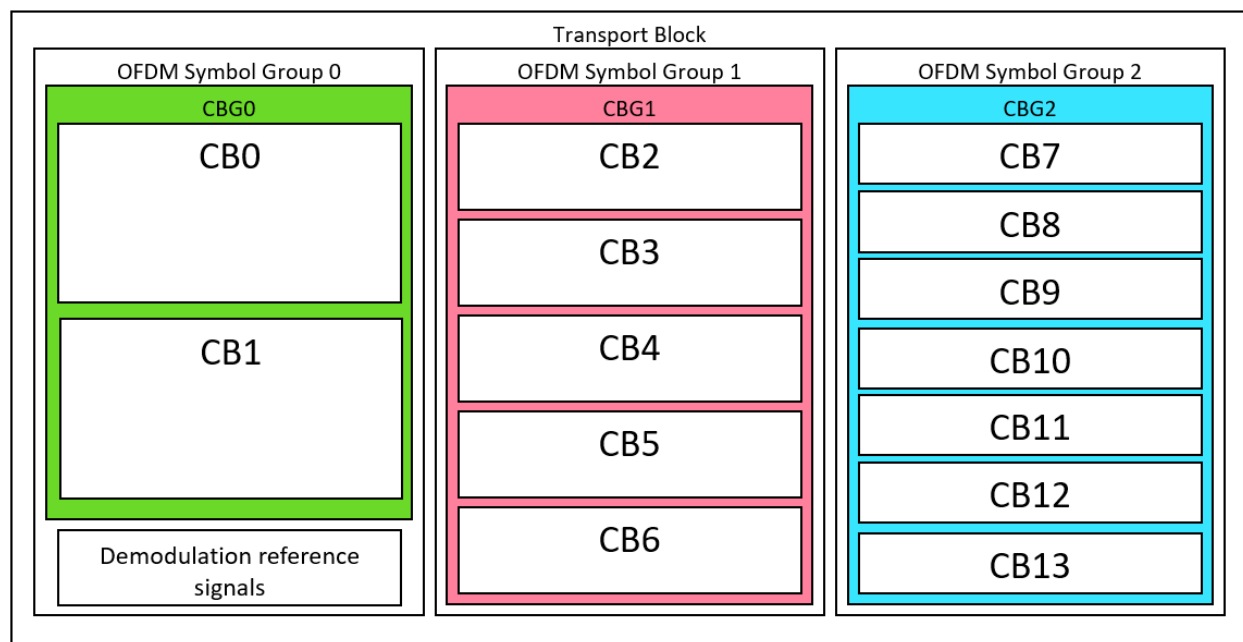
94. In other words, Patent Owner has conceded that the '509 claims do not require each of the first and second CBGs have at least one first CB and at least one second CB.

95. These examples demonstrate the Lee discloses claim elements [4f], [4g, and [4h].

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

96. The examples cited above also satisfy the claim that “a first CBG of the one or more “first CBGs includes a greatest number of the one or more second CBs.” The illustration of the example of Paragraph 39 I provided

earlier demonstrates a first CBG (the CBG with more CBs) including the greatest number of the one or more second CBs (the CBs that are have a second size smaller than the first size of the first CBs).

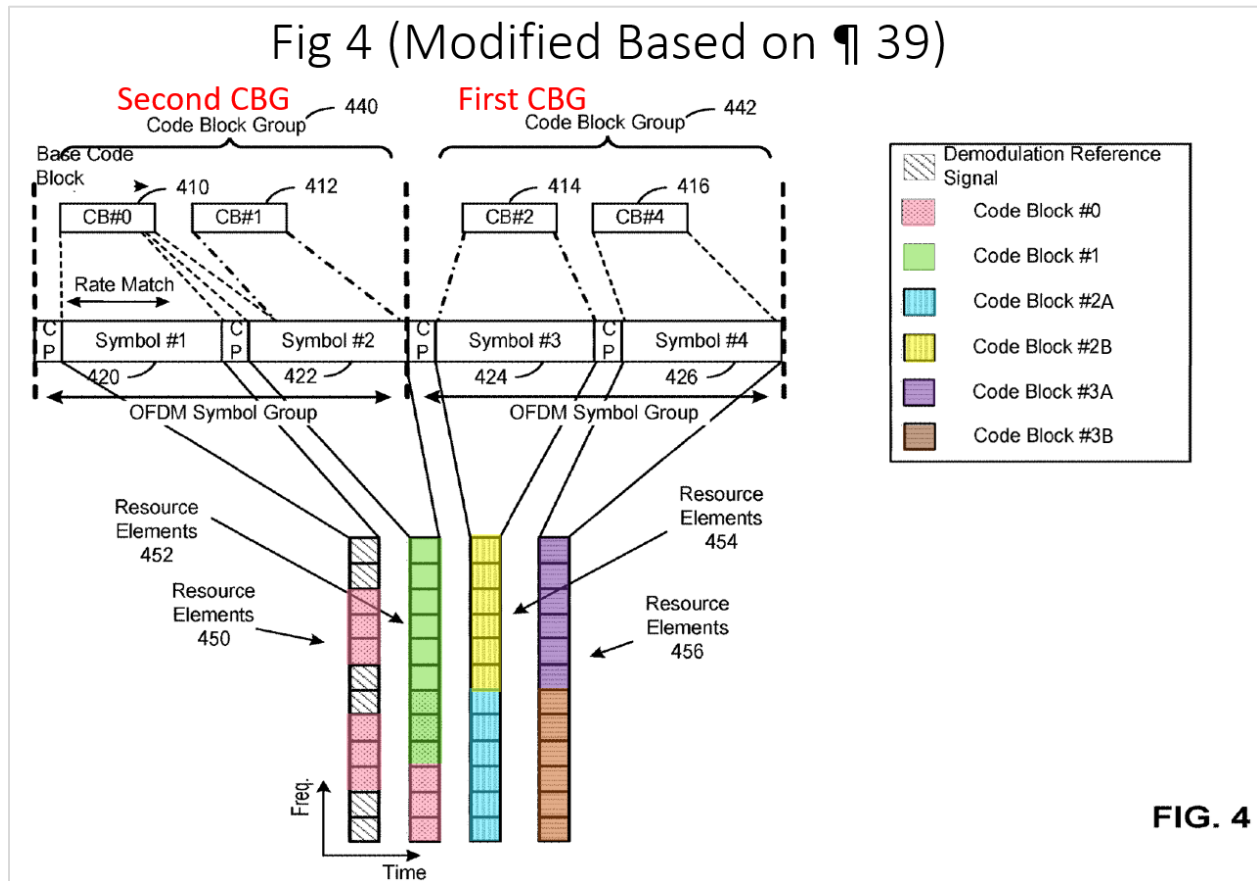


97. If CB0 and CB1 from Lee Paragraph 39 are used to satisfy the “first CB” element of the claim, then CBs 2-6 or 7-13 satisfy the second CB element of the claim, and either CBG1 or CBG2 satisfy the “first CBG” element of the claim, and CBG0 satisfies the second CBG element of the claim. CBG1 or CBG2 would have the only “second CBs” in the transport block, and so would have the greatest number of “second CBs,” satisfying limitation [4i].

98. Similarly, if CBs 2-6 are used to satisfy the “first CB” elements, CBs 7-13 are the “second CB” elements, CBG2 is the “first CBG”, and CBG1

is the “second CBG.” CBG2 has the most “second CBs” and limitation [4i] is satisfied.

99. Consider also Figure 4 of Lee as modified and shown below to obtain a more balanced allocation of resources. The “first CBG” (442 in Lee) has 4 “second CBs” while the “second CBG” (440 in Lee) does not have any “second CBs”. Thus a “first CBG” has a greatest number “second CBs.”



100. So, Lee discloses claim element [4i] for both of the example segmentations of a transport block into code blocks and code block groups.

b) Claim 5:

[5pre] A base station apparatus comprising:

101. For the same reasons claim limitation [4pre] is disclosed by Lee,
claim limitation [5pre] is disclosed by Lee.

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

102. For the same reasons claim limitation [4a] is disclosed by Lee,
claim limitation [5a] is disclosed by Lee.

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

103. For the same reasons claim limitation [4b] is disclosed by Lee,
claim limitation [5b] is disclosed by Lee.

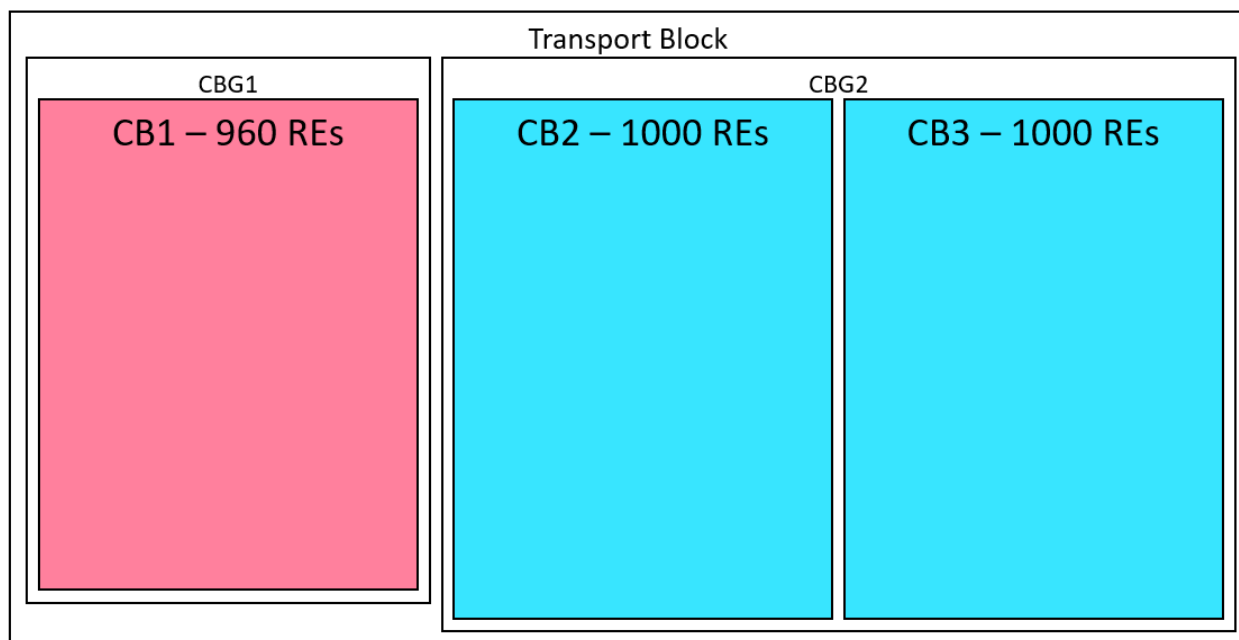
[5c] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein

104. For the same reasons claim limitation [4c] is disclosed by Lee,
claim limitation [5c] is disclosed by Lee.

**[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,**

105. For the same reasons claim limitations [4d] and 4[e] are disclosed
or rendered obvious by Lee, claim limitations [5d] and [5e] are disclosed or
rendered obvious by Lee.

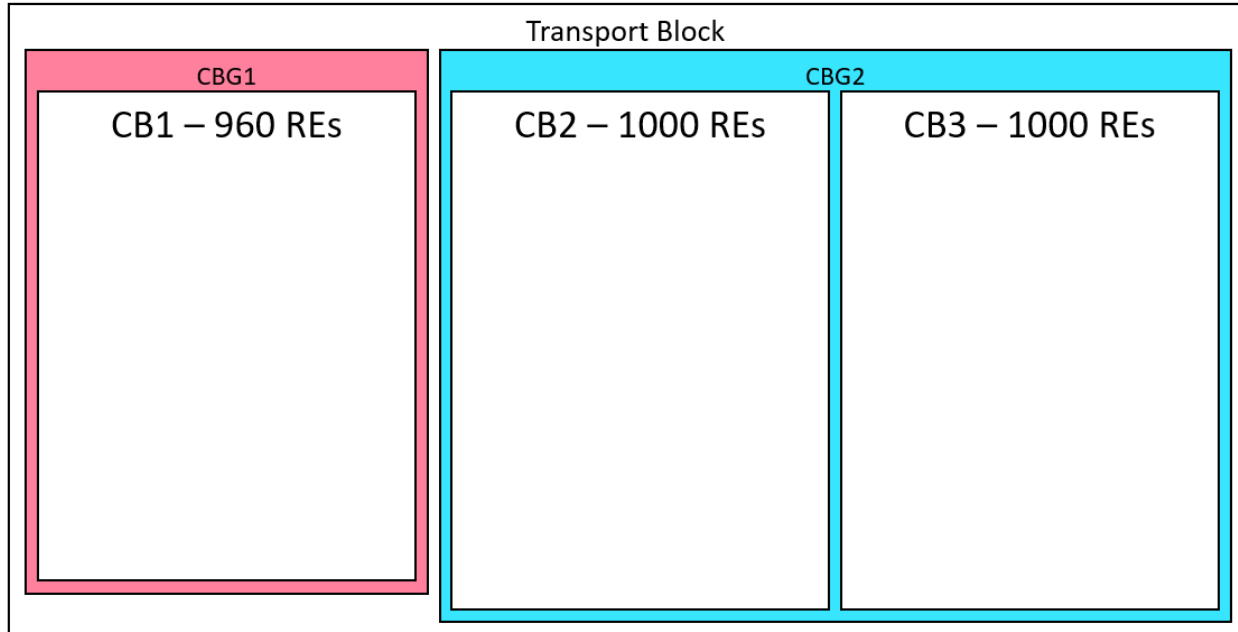
106. Additionally, limitations [5d] and [5e] are also disclosed by Lee's example from paragraph [0042]. The example disclosed by Lee in [0042] has one CBG with 1 CB of length 960 resource elements and another CBG with two CBs, each of length 1000 resource blocks. The two CBs of length 1000 bits are the "first CBs" and the one CB of length 960 bits is the "second CBs." This is illustrated in the figure below. So the "first CBs" have greater size than the "second CBs." Accordingly, the segmentation described in Lee paragraph 42 also discloses elements [5d] and [5e].



[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

107. For the same reasons claim limitations [4f], [4g], and [4h] are disclosed or rendered obvious by Lee, claim limitations [5f], [5g], and [5h] are disclosed or rendered obvious by Lee.

108. In addition to the disclosures cited for Claim 4, Lee's example of paragraph 42 also discloses these limitations. 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]. For example, as illustrated below, Lee teaches that "code block segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3." EX1005 at [0042]. In this example, CBG1 has 1 CB and 960 REs, and CBG2 has 2 CBs and 100 REs elements/bits/CB. This example teaches grouping CBs of two different sizes into different CBGs, where one CBG has more CCBs than the other. The code block group with more code blocks (CBG2) is the "first CBG" of limitations [4g] and [4h], and the code block group with fewer code blocks (CBG1) is the "second CBG" of limitations [4g] and [4h].

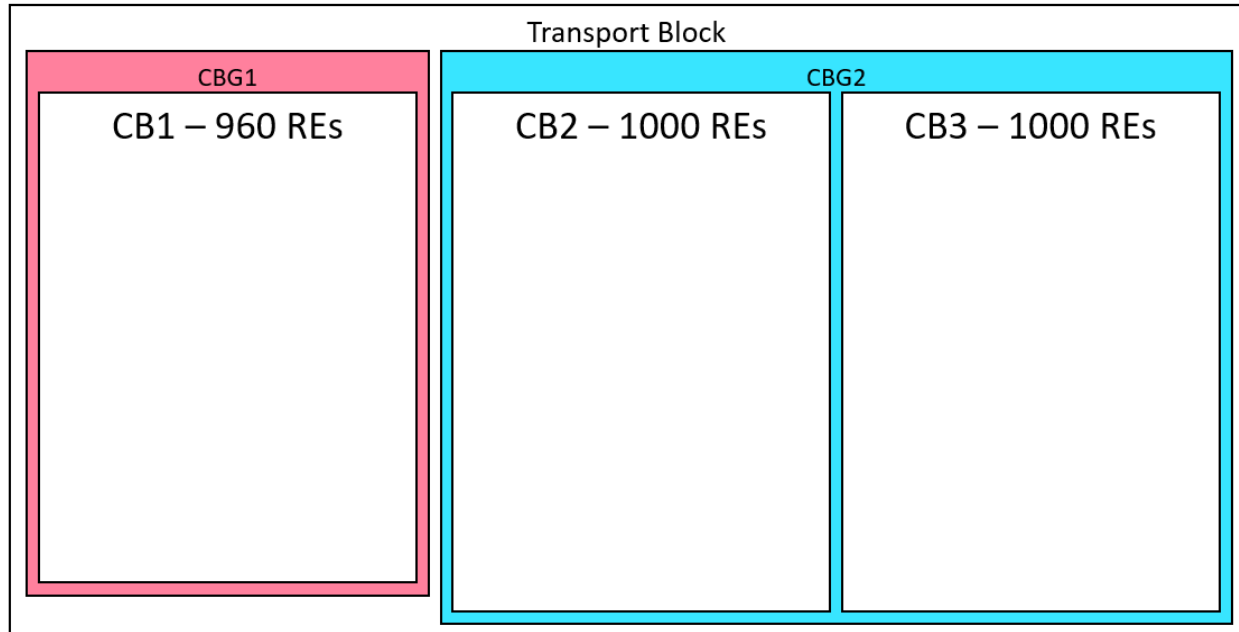


109. Additionally, as noted above, Patent Owner has asserted this claim is met by a system where all CBs but one are the same size. Therefore, Patent Owner cannot argue that the claims require each CBG to have both a first and second code block.

[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.

110. Lee's example of paragraph 42 teaches this limitation. 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]. For example, as illustrated below, Lee teaches that "code block segmentation of the transport block can be 960 for the first CB1, 1000 for CB2 and CB3." EX1005 at

[0042]. In this example, CBG1 has 1 CB and 960 REs, and CBG2 has 2 CBs and 100 REs elements/bits/CB. This example teaches grouping CBs of two different sizes into different CBGs, where one CBG has more CBs than the other CBG.



111. Using this same example Lee in [0042], there are of 0 “second CBs” in the “first CBG” and there is 1 “second CB” in the “second CBG.” The “first CBs” are the CBs with 1000 REs (CB2 and CB3) and the “second CBs” are the CBs with 960 REs (CB1). So the average number of “second CBs” in the “second CBGs” is greater than the average number of “second CBs” in the “first CBGs.” So this claim element is disclosed by Lee.

c) Claim 10:

112. In my opinion, Claim 10 is substantively the same as Claim 4,

but is directed to the communication method that recites the steps that the base station of Claim 4 must be configured to perform. Claim 10's limitations, where not identical to Claim 4's limitations, recite the step the corresponding limitation requires the base station to be configured to perform the recited function.

113. Therefore, the same teachings of Lee that anticipate and render the limitations of Claim 4 obvious, anticipate and render the same limitations in Claim 10 obvious, as it is obvious both to configure a base station to perform a step and to have the base station actually perform the step.

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

114. 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], Lee teaches this limitation. Lee not only teaches this limitation, but a POSITA would understand that the base station taught by Lee would be configured to carry out the communication method of claim 10. For the same reasons as I described with respect to limitation [4pre], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [10pre].

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

115. 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.” For the same reasons as I described with respect to limitation [4a], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [10a].

[10b] transmitting the transport block, and

116. Limitation [4b] recites “a transmitter configured to transmit the transport block” while limitation [10b] recites “transmitting the transport block.” For the same reasons as I described with respect to limitation [4b], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [10b].

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

117. 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.” For the same reasons as I described with respect to limitation [4c], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [10c].

[10d]-[10i]

118. Limitations [10d]-[10i] are identical to limitations [4d]-[4i], respectively. For the same reasons as I described with respect to limitations [4d]-[4i], the same disclosures and analysis regarding Lee anticipate and render obvious limitations [10d]-[10i].

d) Claim 11:

119. In my opinion, Claim 11 is substantively the same as Claim 5, but is directed to the communication method that recites the steps that the base station of Claim 5 must be configured to perform. Claim 11's limitations, where not identical to Claim 5's limitations, recite the step the corresponding limitation requires the base station to be configured to perform the recited function.

120. Therefore, the same teachings of Lee that anticipate and render the limitations of Claim 5 obvious, anticipate and render the same limitations in Claim 11 obvious, as it is obvious both to configure a base station to perform a step and to have the base station actually perform the step.

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

121. 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. Lee not only teaches this limitation, but a POSITA would understand that the base station taught by Lee would be configured to carry out the communication method of claim 11. For the same reasons as I described with respect to limitation [5pre], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [11pre].

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

122. 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.” For the same reasons as I described with respect to limitation [5a], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [11a].

[11b] transmitting the transport block, and

123. Limitation [5b] recites “a transmitter configured to transmit the transport block” while limitation [11b] recites “transmitting the transport block.” For the same reasons as I described with respect to limitation [5b], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [11b].

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

124. 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.” For the same reasons as I described with respect to limitation [5c], the same disclosures and analysis regarding Lee anticipate and render obvious limitation [11c].

[11d]-[11i]

125. Limitations [11d]-[11i] are identical to limitations [5d]-[5i], respectively. For the same reasons as I described with respect to limitations [5d]-[5i], the same disclosures and analysis regarding Lee anticipate and render obvious limitations [11d]-[11i].

B. Ground 2: The Challenged Claims are Anticipated and Rendered Obvious by Zheng

e) Claim 4

[4pre] A base station apparatus comprising:

126. Zheng discloses a base station. “In a communications system, information, such as control information or data information, is usually transmitted between communications devices (for example, between a base station and a terminal) in the form of information sequences.” EX1007 at [0003]. “In the embodiments of the present application, the communications device **10** may be a network device in a communications system, such as a

base station, and correspondingly, the communications device **11** may be a terminal. Alternatively, the communications device **10** may be a terminal in a communications system, and correspondingly, the communications device **11** may be a network device in the communications system, such as a base station.” EX1007 at [0063]. Zheng also discloses that “A base station (BS) may also be referred to as a base station device, and is a device deployed in a radio access network to provide a wireless communication function.” EX1007 at [0066].

127. The communication system/device of Zheng is illustrated in Figure 1, reproduced below.

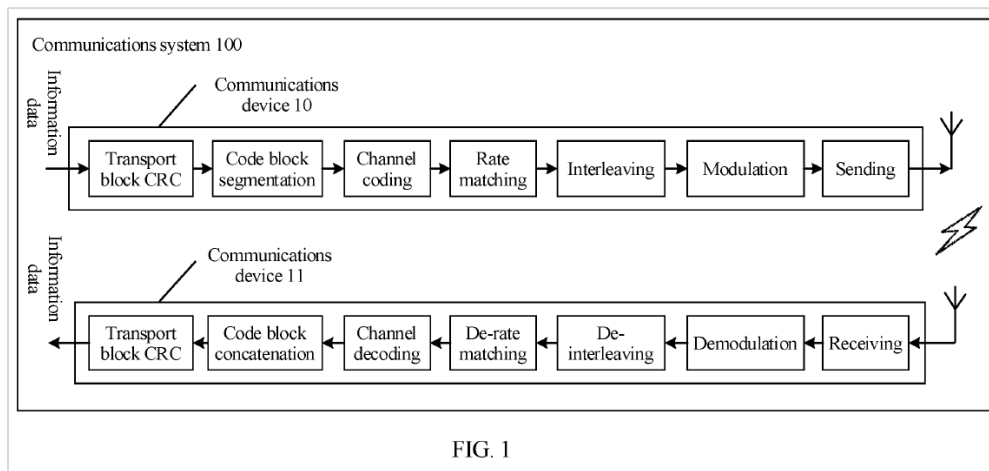


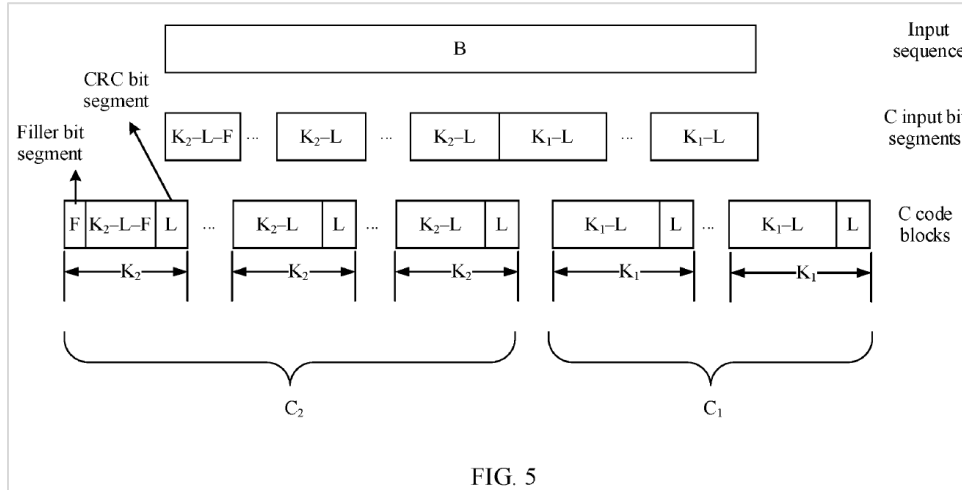
FIG. 1

EX1007 at Fig. 1.

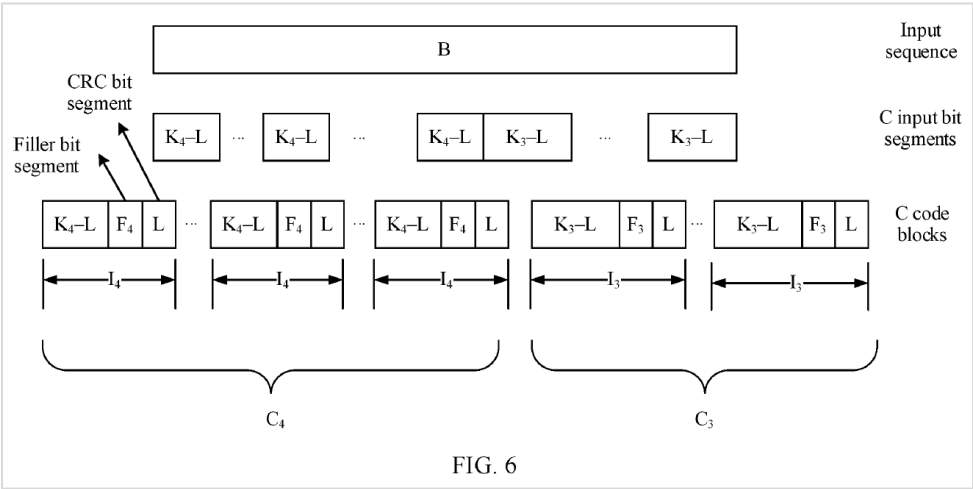
128. Therefore, Zheng discloses a base station apparatus.

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

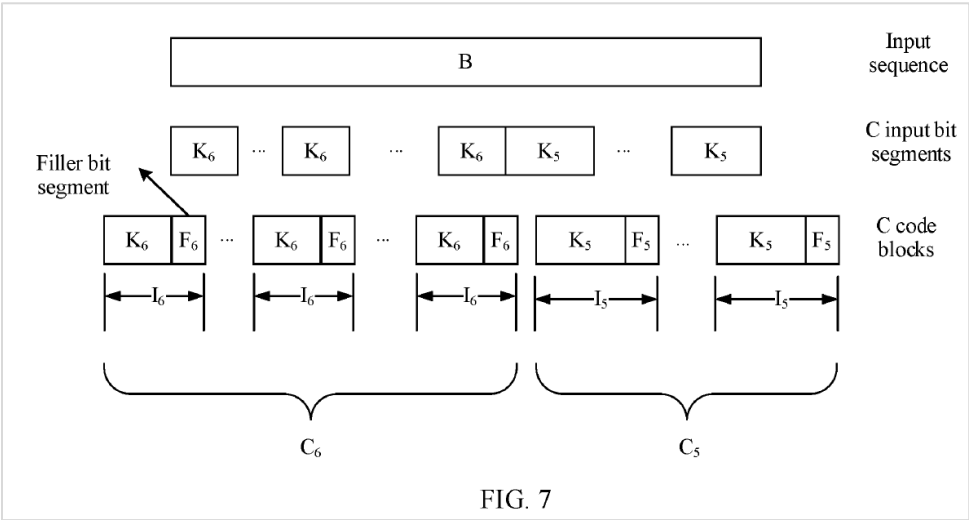
129. Zheng discloses “a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs.” As shown above in Figure 1, reproduced above in connection with limitation [4pre], the transport block is segmented. EX1007 at Fig. 1. Zheng discloses a variety of ways for segmenting transport blocks into code blocks, which are then grouped into code block groups. Figures 5-8, reproduced below, provide illustrations of some of the different examples Zheng provides for code block segmentation. *See* EX1007 at [0051—[0054]; Figs. 5-8.



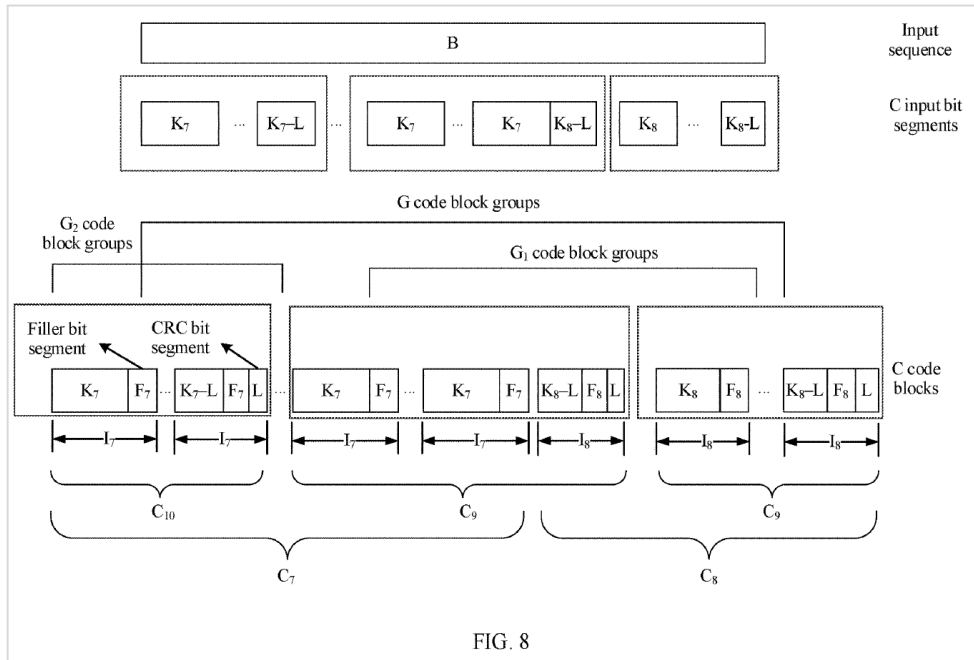
EX1007 at Fig. 5. Here, Zheng illustrates that adjacent code blocks may have varying lengths, indicating the presence of at least two sizes of code blocks. EX1007 at [0083].



EX1007 at Fig. 6 and [0088].



EX1007 at Fig. 7 and [0100].



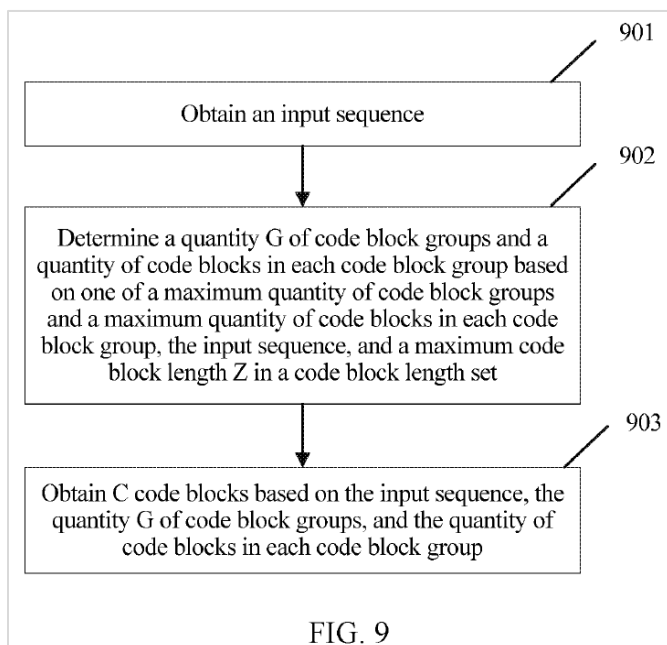
EX1007 at Fig. 8 and [0109].

130. As another example, Zheng discloses segmenting transport blocks into code blocks, which are then grouped into code block groups. *See* EX1007 at [0113]-[0114] (reproduced below). Figures 5-8 show examples of different code block segmentations according to Zheng.

[0113] In a possible implementation, the input sequence is segmented into C input bit segments, and the C input bit segments are divided into G groups. In this case, code blocks including a corresponding input bit segment in one group are in one code block group. In other words, the C code blocks belong to the G code block groups.

[0114] In another possible implementation, the input sequence is divided into G bit groups, and each bit group is further segmented to obtain a total of C input bit segments. Code blocks including input bit segments in a same bit group are in one code block group, so that the C code blocks belong to the G code block groups.

131. Zheng also discloses this limitation in the form of a flow chart at Figure 9, reproduced below. At step 901, Zheng's system obtains an input sequence, which Zheng explains may be a transport block or transport block to which CRC bits are attached. EX1007 at [0070].



EX1007 at Fig. 9.

132. In addition to the figures discussed above, Zheng also demonstrates an example of code block segmentation in Table 1.

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.

133. Therefore, Zheng discloses “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

134. Zheng discloses this limitation. Zheng discloses a transmitter. Figure 1 of Zheng, shown below, shows a transmitter 10 for communicating information. “The communications device **10** serves as a device at a transmitting end, and sends the information in transport blocks.” EX1007 at [0060]. A POSITA would understand the transmitter of this figure would be configured to transmit the segmented and coded transport block.

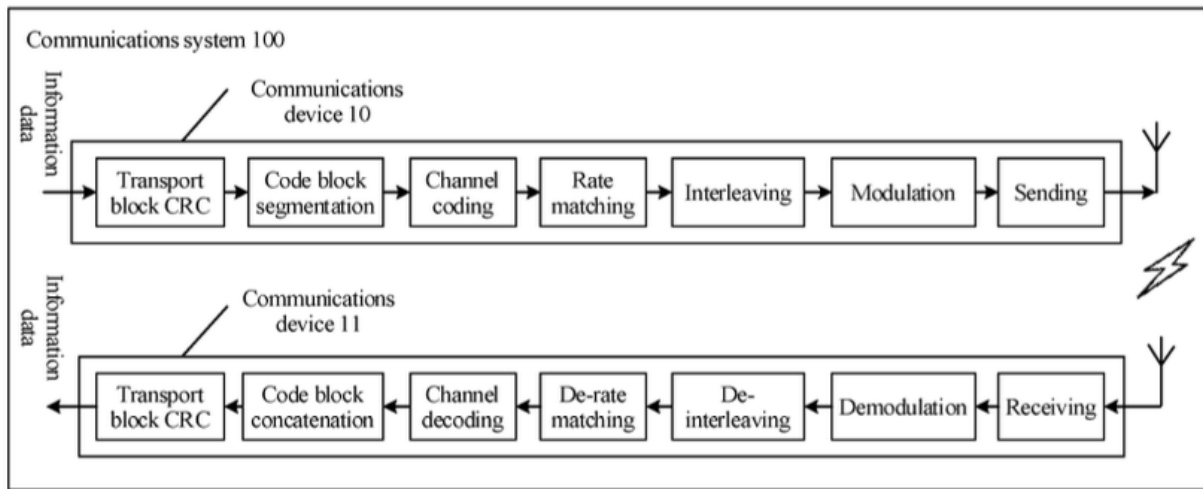


FIG. 1

EX1007 at Fig. 1.

135. Zheng further discloses that the method “may be applied to a device at a transmitting end.” EX1007 at [0068]. Again, a POSITA would understand this as disclosing that the transmitter is configured to transmit the transport block. Thus, Zheng teaches limitation [4b].

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

136. Zheng discloses this limitation. As shown above in Figure 1, “the communications device 11, which is used as a device at a receiving end, demodulates the received modulation symbols, and stores soft values of the received coded bit segment in a corresponding position in a soft buffer after de-interleaving.” EX1007 at [0062]. A POSITA would recognize that the

receiver described in Figure 1 could receive any type of information, whether the information is user information or control information such as HARQ-ACK information. Zheng also explicitly discloses that “ACK feedback is performed by code block group” which improves performance and system efficiency. EX1007 at [0026]. Feedback information, which is received in the form of acknowledgements (“ACKs”)/negative acknowledgements (“NACKs”), is provided in response to transmitted information. Here, the ACK/NACK would be provided in response to a transport block (segmented into code blocks, which are then grouped into code block groups). The BS would require a receiver which would be configured to receive feedback ACKs and NACKs.

137. As discussed above, Zheng discloses CRCs corresponding to code block groups (CBGs). “The CRC bit segment ...may be a parity bit segment generation for input bit segments in all code blocks in a code block group.” EX1007 at [0110]. “System CRC overheads can be reduced because CRC bit segments are attached, by code block group, to a plurality of code blocks obtained after the input sequence is processed. In addition, when ACK feedback is performed by code block group, performance is better, and system efficiency is improved.” EX1007 at [0111].

138. Zheng also explains 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]. The CRC attachment based on CBG improves overall system efficiency in addition to reducing feedback. EX1007 at [0142]. A POSITA would understand that a HARQ-ACK would be generated for each CRC which corresponds to the multiple code block groups. A POSITA would also understand that segmenting transmissions into code blocks, and then grouping those code blocks into code block groups, allows feedback to more specifically identify portions of transmissions that must be retransmitted. This would be known to reduce retransmissions and improve overall system efficiency. By sending feedback following successful receipt of each CBG, a POSITA would recognize that transmissions could be acknowledged more promptly, or with less delay.

139. Therefore, Zheng teaches and renders obvious limitation [4c].

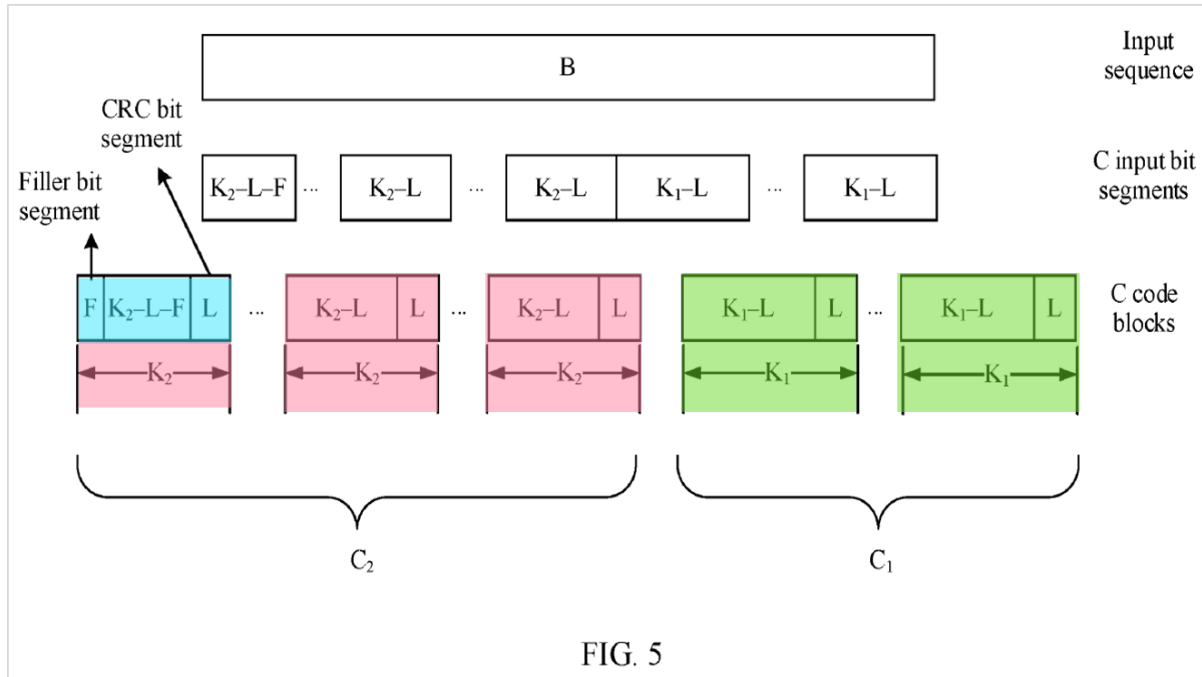
[4d] the multiple CBs include one or more first CBs and one or more second CBs, [4e] a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,

140. Zheng discloses limitations [4d] and [4e]. Limitation [4d] requires that the segmentation include at least two types of code blocks, and Limitation [4e] requires that the first type of code block have “a first size” that

is greater than “a second size” of the second type of code block.

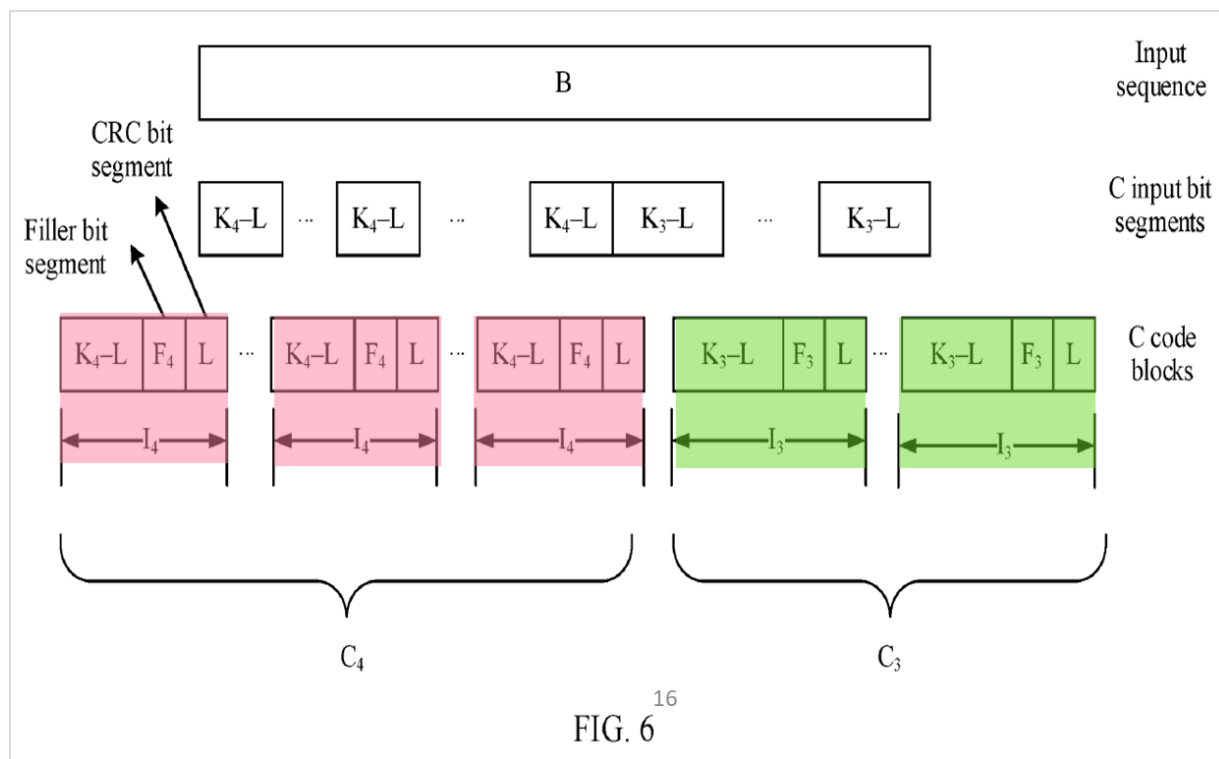
141. As I discussed above, Zheng teaches that a transport block can be segmented into code blocks of varying sizes, multiple examples of which are provided by Figures 5-8, reproduced in their original form above. In each of these figures, Zheng illustrates at least two sizes of code blocks, which accommodates a fixed set of possible code block sizes (i.e., a code block length set). EX1007 at [0007]. Zheng’s disclosure of multiple lengths of code blocks allows the system to better fit data, which reduces the need of filler bits, and ultimately improves overall system efficiency.

142. Figure 5, reproduced with color added below, depicts a total of C code blocks 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” of the claim limitation could be understood as referring to multiple quantities or segment lengths in each block. If assessed by the size of the input bit segment of each code block, there are three code block sizes illustrated (blue, pink and green). If assessed by the total length of the final code block (the sum of all segments in each block), there are two code block sizes (pink and green).



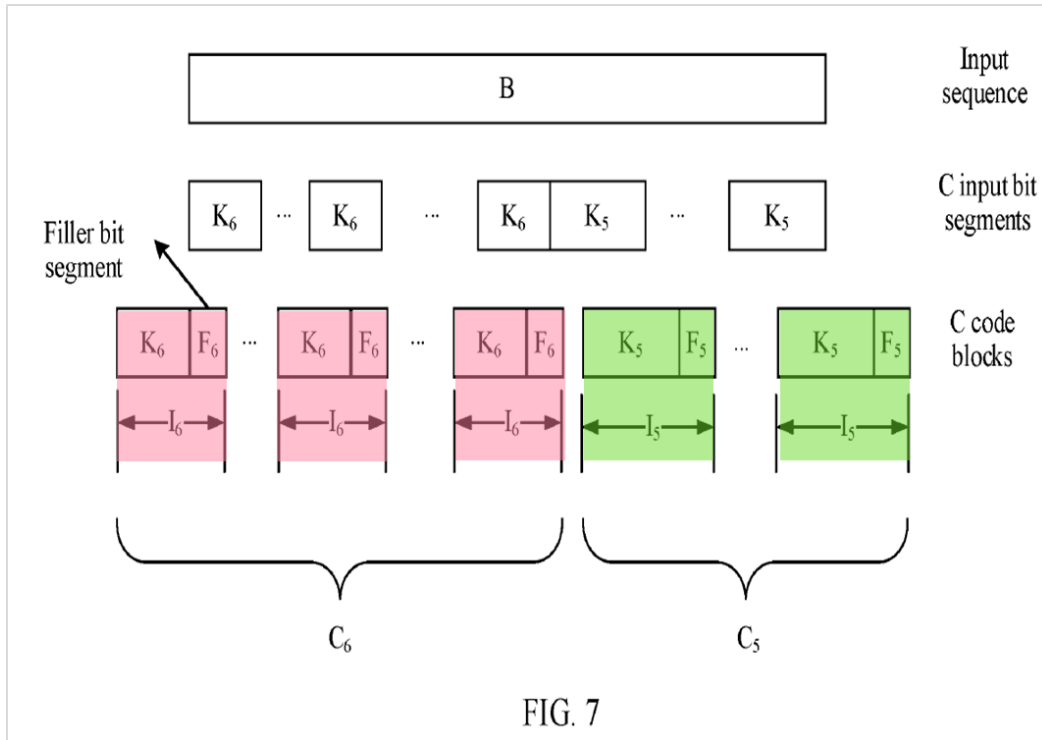
EX1007 at Fig. 5 (color added) and [0083].

143. Figure 6, reproduced with color added below, depicts C code blocks having total lengths I_3 and I_4 . All code blocks with a total length of I_4 (pink) have equal sized input bit segments, filler bit segments, and CRC bit segments. In some scenarios, the input bit segments and filler bit segments may be differently sized between the total length I_3 and total length I_4 blocks. 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 ¶ XX.

144. Fig. 7, reproduced with color added 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. In other words, all code blocks with a total length of I_6 (pink) have equal sized input bit segments and filler bit segments. The input bit segments and filler bit segments may be differently sized between the total length I_5 and total length I_6 blocks.



EX1007 at Fig. 7 (color added) and [0100].

145. Fig. 8, reproduced with color added 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 . As I discussed above, the size of the code block could be interpreted in a variety of ways. If assessed by the size of the input bit segment of each code block, there are four code block sizes illustrated (pink, blue, yellow, and green). If assessed by the total length of the final code block, there are two code block sizes (pink and yellow).

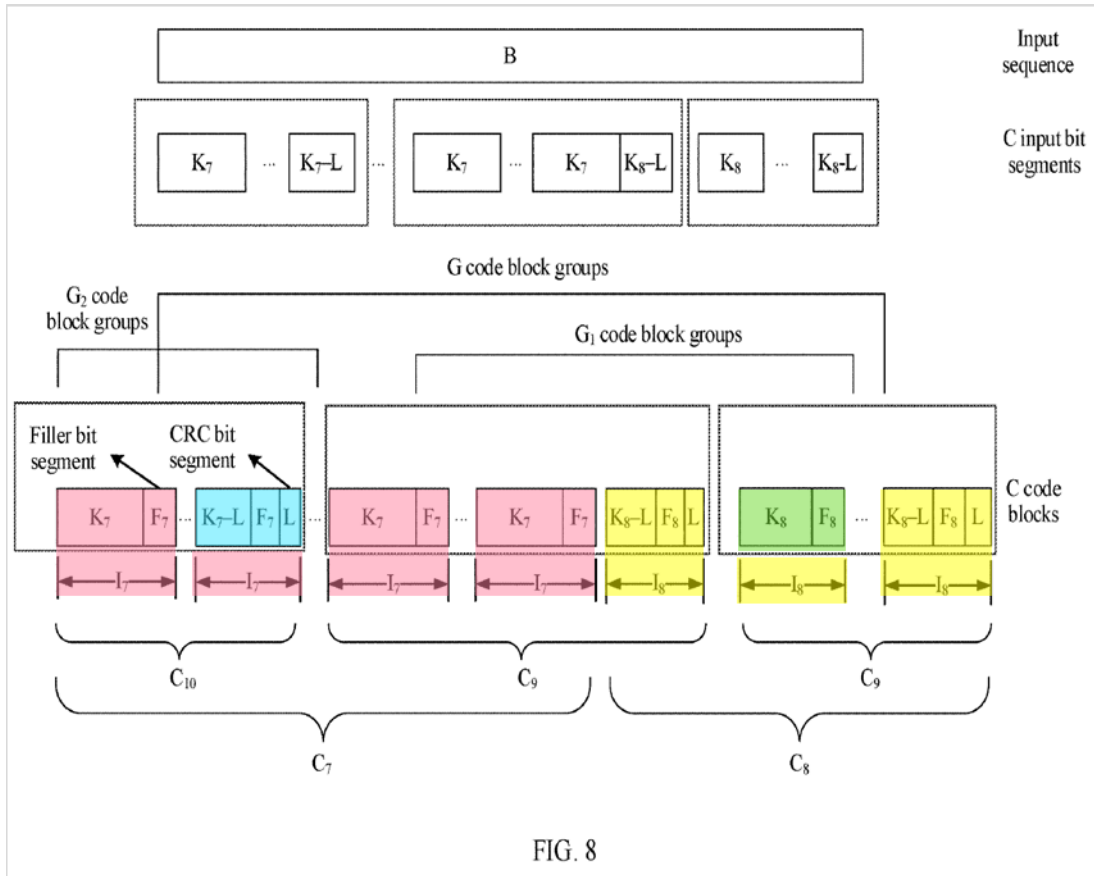


FIG. 8

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

146. Table 1 of Zheng, annotated and shown below, also illustrates an exemplary method for code block segmentation with multiple code blocks resulting. *See also* [0083]-[0140]. Each of the code blocks in Table 1 is given a code block number for reference. Table 1 shows a set of 4 CBGs and a set of 15 CBs. Zheng CBs 0-CB2 are in Zheng CBG0, Zheng CBs 3-CB6 are in Zheng CBG1, Zheng CBs 7-CB10 are in Zheng CBG2, Zheng CBs 11-CB14 are in Zheng CBG3. There are different types of CBs. One way to characterize a CBs is by the length of an input segment. With this characterization, there

are CBs with lengths 6115, 6116, 6139 and 6140. We can specifically call the CBs with length of an input big segment 6140 as “first CBs” and CBs with length of an input bit segment 6139 as “second CBs”. As such, Zheng discloses “the multiple CBs include one or more first CBs and one or more second 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

147. The size of the first CB of the one or more first CBs (6140) is therefore greater than the size of the second CB of the one or more second CBs (6139). Therefore, Zheng discloses limitations [4d] and [4e].

148. This is also 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. Specifically, Patent Owner

contended that code blocks having identical total lengths were nonetheless different sizes where one of the code blocks included more filler bits than the other code blocks:

Additionally, except in the case where the transport block size is evenly divisible by the maximum code block size, the final code block within a segmented transport block is smaller than the other code blocks within that transport block. This smaller code block requires the insertion of filler bits.

```

for  $k = K^*$  to  $K - 1$  -- Insertion of filler bits
     $c_{ix} = \langle \text{NULL} \rangle$ 
end for

```

TS 38.212 at 13.

[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

149. Zheng discloses these limitations. These limitations require the CBs to be in two or more CBGs, the two or more CBGs to have two or more types (“first CBGs” and “second CBGs”), and that the first type of CBG have more of the “first” and “second” type CBs than the second type of CBG. Zheng both expressly provides examples disclosing these limitations, and additionally renders them obvious.

150. As discussed above, Zheng provides examples of different ways

to segment a transport block into code blocks of different sizes. Table 1 of Zheng, annotated and shown below, shows a set of 4 CBGs and a set of 15 CBs. The CBs highlighted in pink are the “first CBs” of a greater size, and the CBs highlighted in blue are the “second CBs” of a smaller size.

151. As shown in Table 1 below, each of these CBs is included into the code block groups. There are four code block groups shown, numbered CBG0-CBG3. There are 3 “first CBs” in Zheng CBG1, 3 “first CBs in Zheng CBG2, and 3 “second CBs” in Zheng CBG3. So the total is 9 “first and second CBs” in the “first CBG.” The total number of “first CBs” and “second CBs” in each of the one or more “second CBGs” is 2. There are 0 “first CBs” in Zheng CBG0 and 2 “second CBs” in Zheng CBG0. So, the total is 2 “first and second CBs” in the “second CBG”. Thus, there are more “first and second CBs” in the “first CBG” than in the “second CBG.” Thus, Zheng discloses “the multiple CBGs include one or more first CBGs and one or more second CBGs.”

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).

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

152. Zheng teaches this limitation. Table 1 of Zheng, annotated and shown below, shows a set of 4 CBGs and a set of 15 CBs. There are “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” that are have a second size smaller than the first size of the “first CBs”). One of the first CBGs (CBG3 here) includes a greatest number of the one or more second CBs (3).

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).

153. This is not the only example that meets the limitations of this claim. For example, consider a transport block of size 2514, with two code block groups and 5 code blocks. Suppose that there are $L=24$ CRC bits associated with each CBG and that the same set of possible information segments is used as in [0074]. That is, there are codewords with possible information sizes 128, 256, 512, 640...6144. Then, apply the procedure in [0127]-[0137]. Then one of the code blocks has a segment of length $K_7 = \lfloor (B + G \cdot L)/C \rfloor = 513$. There are filler bits in at least one of the code blocks whose length is $F_7 = I_7 - K_7 = 127$.

154. “At least one of the C code blocks includes a mixed segment whose length is” $K_8 = \lfloor (B + G \cdot L)/C \rfloor = 512$. There are $C_8 = C \cdot K_7 - (B + G \cdot L) = 5 \cdot 513 - (2514 + 2 \cdot 24) = 3$ such code blocks. The number of code blocks with K_7 information size then is $C_7 = C - C_8 = 5 - 3 = 2$. [0137].

155. The set of code blocks and code block groups are shown in the table 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

156. There are 513 input bits and 127 filler bits in code block 0. There are 489 input bits, 103 filler bits, and 24 CRC bits code block 1. EX1007 at [0136]. This is because $I_7 = 640$ “is the minimum code block length greater than or equal to K_7 in the code block set.” EX1007 at [0136]. In this example the “first CBs” would be the CBs with total length 640. In this example we identify the “size” to be the total input size (including filler bits and CRC bits) of a code block. The “second CBs” would be the CBs with total length 512. This satisfies the claim element [4e] that the length of the “first CBs,” (640)

is longer than the length of the “second CBs” (512). It also satisfies the claim element [4h] that the total of “first and second CBs” in the “first CBG” (CBG1 in the table) is larger than the total “first and second CBs” in the “second CBG” (CBG0 in the table). Finally it satisfies the claim element that the “first CBG” has a greatest number of “second CBs” since CBG1 (the “first CBG”) has 3 “second “second CBs.” Besides these claim elements, it also satisfies the other limitations of claim 4 for the same reason as discussed above.

157. Therefore, Zheng teaches limitation [4i]. Zheng discloses each and every element of claim 4. Thus, Zheng anticipates the invention of Claim 4 of the 509 Patent.

f) Claim 5:

[5pre] A base station apparatus comprising:

158. For the same reason claim element [4pre] is disclosed by Zheng, claim element [5pre] is disclosed by Zheng.

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

159. For the same reason claim element [4a] is disclosed by Zheng, claim element [5a] is disclosed by Zheng.

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

160. For the same reason claim element [4b] is disclosed by Zheng,

claim element [5b] is disclosed by Zheng.

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

161. For the same reason claim element [4c] is disclosed by Zheng,
claim element [5c] is disclosed by Zheng.

**[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,**

162. Zheng discloses these limitations. First, [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]. Further, Zheng also provides additional teachings which discloses these limitations and are relevant to claim 5 in particular.

163. Table 1 is reproduced below, with color added differently now focusing on length (bits) of a filler bit segment. For claim 4, Petitioners pointed to the quantity “Length (bits) of an input bit segment” as the “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.

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).

164. This is also 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. Specifically, Patent Owner contended that code blocks having identical total lengths were nonetheless different sizes where one of the code blocks included more filler bits than the other code blocks:

Additionally, except in the case where the transport block size is evenly divisible by the maximum code block size, the final code block within a segmented transport block is smaller than the other code blocks within that transport block. This smaller code block requires the insertion of filler bits.

```

for  $k = K'$  to  $K - 1$  -- Insertion of filler bits
     $c_{ik} = \langle \text{NULL} \rangle$ 
end for

```

TS 38.212 at 13.

[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

165. Zheng discloses these limitations. Firstly, because [5f], [5g], and [5h] recite the same limitations as [4f], [4g], and [4h], the same disclosures of Zheng therefore teach and render obvious these limitations. Zheng also provides additional disclosures relevant to claim 5. As explained above, if length (bits) of filler bit segment is used to map the first/second size of the CBs, then Table 1 of Zheng depicts two code block types. There are code blocks with 5 filler bits (first CBs, blue), and those with 4 filler bits (second CBs, pink).

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).

166. CBG3 has 4 code blocks of length 3, for example, while CBG0 has 3 code blocks of length 4. 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]. Because Patent Owner has previously asserted that this claim is met by a system where all code blocks but one are the same size, they cannot now argue that each CBG must include both first and second type code blocks. Thus, Table 1 of Zheng discloses limitations [5g]-[5h].

[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.

167. Zheng discloses this limitation. As discussed above, Zheng discloses segmenting a transport block into code blocks of two sizes, filler bit length 4 (pink) and filler bit length 5 (blue). This is illustrated in the annotated version of Table 1, reproduced below. The code blocks are grouped into CBGs, each group in this example having either 3 or 4 code blocks.

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).

168. Limitation [5i] 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”), which is illustrated by Zheng table 1. There is one “second CBG” (Zheng CBG0, with three code blocks). 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. There are 3 “first CBGs” (Zheng CBG1, CBG2, CBG3), with a total of 8 “second CBs” between them (CBs 3-10). The average number of second CBs in the “first CBGs” is therefore $8/3$, or ~ 2.667 .

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

g) Claim 10:

170. In my opinion, Claim 10 is substantively the same as Claim 4, but is directed to the communication method that recites the steps that the base station of Claim 4 must be configured to perform. Claim 10’s limitations, where not identical to Claim 4’s limitations, recite the step the corresponding limitation requires the base station to be configured to perform the recited function.

171. Therefore, the same teachings of Zheng that anticipate and render the limitations of Claim 4 obvious, anticipate and render the same limitations in Claim 10 obvious, as it is obvious both to configure a base station to perform a step and to have the base station actually perform the step.

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

172. 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. Zheng not only teaches this limitation, but a POSITA would understand that the base station taught by Zheng would be configured to carry out the communication method of claim 10. For the same reasons as I described with respect to limitation [4pre], the same disclosures and analysis regarding Zheng anticipate and render obvious limitation [10pre].

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

173. 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.” For the same reasons as I described with respect to limitation [4a], the same disclosures and analysis regarding Zheng anticipate and render obvious limitation [10a].

[10b] transmitting the transport block, and

174. Limitation [4b] recites “a transmitter configured to transmit the transport block” while limitation [10b] recites “transmitting the transport

block.” For the same reasons as I described with respect to limitation [4b], the same disclosures and analysis regarding Zheng anticipate and render obvious limitation [10b].

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

175. 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.” For the same reasons as I described with respect to limitation [4c], the same disclosures and analysis regarding Zheng anticipate and render obvious limitation [10c].

[10d]-[10i]

176. Limitations [10d]-[10i] are identical to limitations [4d]-[4i], respectively. For the same reasons as I described with respect to limitations [4d]-[4i], the same disclosures and analysis regarding Zheng anticipate and render obvious limitations [10d]-[10i].

h) Claim 11:

177. In my opinion, Claim 11 is substantively the same as Claim 5, but is directed to the communication method that recites the steps that the base station of Claim 5 must be configured to perform. Claim 11’s limitations, where not identical to Claim 5’s limitations, recite the step the corresponding limitation requires the base station to be configured to perform the recited

function.

178. Therefore, the same teachings of Zheng that anticipate and/or render the limitations of Claim 5 obvious, anticipate and/or render the same limitations in Claim 11 obvious, as it is obvious both to configure a base station to perform a step and to have the base station actually perform the step.

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

179. 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. Zheng not only teaches this limitation, but a POSITA would understand that the base station taught by Zheng would be configured to carry out the communication method of claim 11. For the same reasons as I described with respect to limitation [5pre], the same disclosures and analysis regarding Zheng anticipates and renders obvious limitation [11pre].

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

180. 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.” For the same reasons as I described with

respect to limitation [5a], the same disclosures and analysis regarding Zheng anticipates and renders obvious limitation [11a].

[11b] transmitting the transport block, and

181. Limitation [5b] recites “a transmitter configured to transmit the transport block” while limitation [11b] recites “transmitting the transport block.” For the same reasons as I described with respect to limitation [5b], the same disclosures and analysis regarding Zheng anticipates and renders obvious limitation [11b].

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

182. 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.” For the same reasons as I described with respect to limitation [5c], the same disclosures and analysis regarding Zheng anticipates and renders obvious limitation [11c].

[11d]-[11i]

183. Limitations [11d]-[11i] are identical to limitations [5d]-[5i], respectively. For the same reasons as I described with respect to limitations [5d]-[5i], the same disclosures and analysis regarding Zheng anticipate and render obvious limitations [11d]-[11i].

X. CONCLUSION

184. The Challenged Claims simply recite concepts known in the art at the time. Thus, the Challenged Claims were either anticipated or rendered obvious by the prior art. Based on my experience, knowledge of the field at the relevant time, and a thorough analysis of prior art references, it is my expert opinion that the Challenged Claims of the '509 Patent are unpatentable.

Date: March 26, 2024

Executed: Wayne E. Stark