

Exhibit F

Chart Detailing AT&T's Infringement of U.S. Patent No. 11,196,509 v. AT&T

Daingean Techs. v. AT&T Corp. et al., Case No. 2:23-cv-00123-JRG-RSP (E.D. Tex.)

The Accused Products include base stations operating in AT&T's network(s) that support or facilitate New Radio (NR, or 5G) capabilities (*e.g.*, gNodeBs or gNBs; 5G-aware eNodeBs or eNBs) ("Accused Base Stations").

Based on the information presently available to it, Plaintiff Daingean Technologies Limited ("Daingean" or "Plaintiff") is informed and believes that AT&T directly and indirectly infringes U.S. Patent No. 11,196,509 (the "'509 Patent"). AT&T directly infringes claims 4, 5, 10, and 11 of the '509 Patent when it makes, uses, sells, and/or imports the Accused Base Stations. AT&T indirectly infringes claims 4, 5, 10, and 11 of the '509 Patent by actively inducing the direct infringement of its customers; AT&T actively induces its customers to use the Accused Base Stations.

CLAIM 4		'509 PATENT v. AT&T
4[A]. A base station apparatus comprising:	The Accused Base Stations are a base station apparatus. See evidence and analysis provided in 10[A], which is incorporated fully herein by reference.	
4[B] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs;	The Accused Base Stations comprise a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs. On information and belief, the Accused Base Stations include a coding unit. The physical layer (L1) functions include FEC encoding and decoding of the transport channel, rate matching of the coded transport channel to physical channels, and mapping of coded transport channel onto physical channels.	

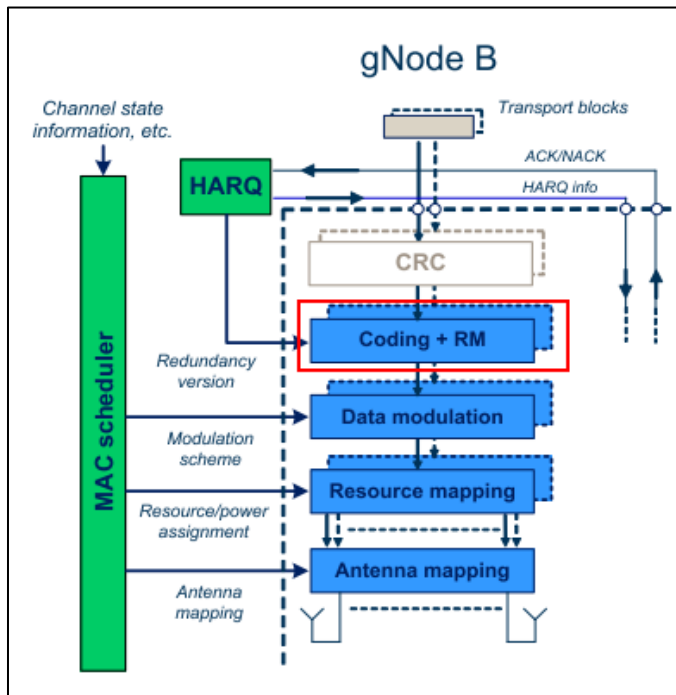
4.2 Overview of L1 functions

As mentioned in [2, TS 38.201], the physical layer is expected to perform the following functions to provide the data transport service:

- Error detection on the transport channel and indication to higher layers;
- FEC encoding/decoding of the transport channel;
- Hybrid ARQ soft-combining;
- Rate matching of the coded transport channel to physical channels;
- Mapping of the coded transport channel onto physical channels;

TS 38.202 at 6.¹ The FEC encoding/decoding operations are handled by a coding unit of the Accused Base Stations, as illustrated below.

¹ Unless otherwise noted, all citations to TS 38.202 are to Release 17.0.0 (2021-12).



TS 38.202 at 8 (red annotation added).

The relevant operation of this coding unit is detailed in the evidence and analysis provided regarding 10[B], which is fully incorporated herein by reference.

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

The Accused Base Stations comprise a transmitter configured to transmit the transport block.

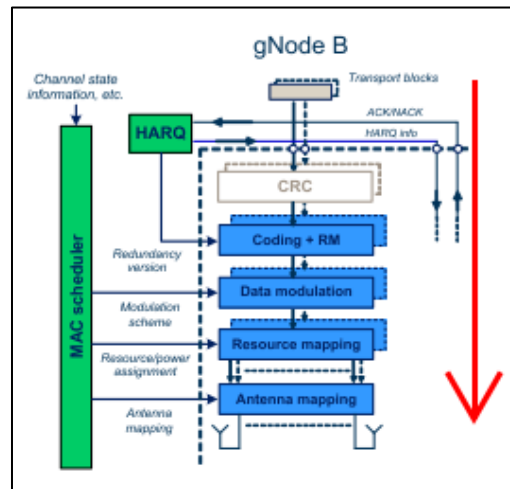
On information and belief, the Accused Base Stations include a transmitter.

The Accused Base Stations are responsible for conducting RF communications with UEs. As such, the Accused Base Stations include a transmitter to facilitate the transmission of RF signals to UEs. For instance, TS 38.202 discusses “Downlink Shared Channel transmission” from the gNodeB to the UE.

5.2.1 Downlink shared channel

The physical-layer model for **Downlink Shared Channel transmission** is described based on the corresponding PDSCH physical-layer-processing chain, see Figure 5.2.1-1. Processing steps that are relevant for the physical-layer model, e.g. in the sense that they are configurable by higher layers, are highlighted in blue.

TS 38.202 at 8. The flow of information from the gNode B is illustrated by the arrows in the figure below, going from the transport blocks all the way to the antenna mapping.



TS 38.202 at 8 (red annotation added).

The relevant operation of this transmitter is detailed in the evidence and analysis provided regarding 10[C], which is fully incorporated herein by reference.

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

The Accused Base Stations comprise a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs.

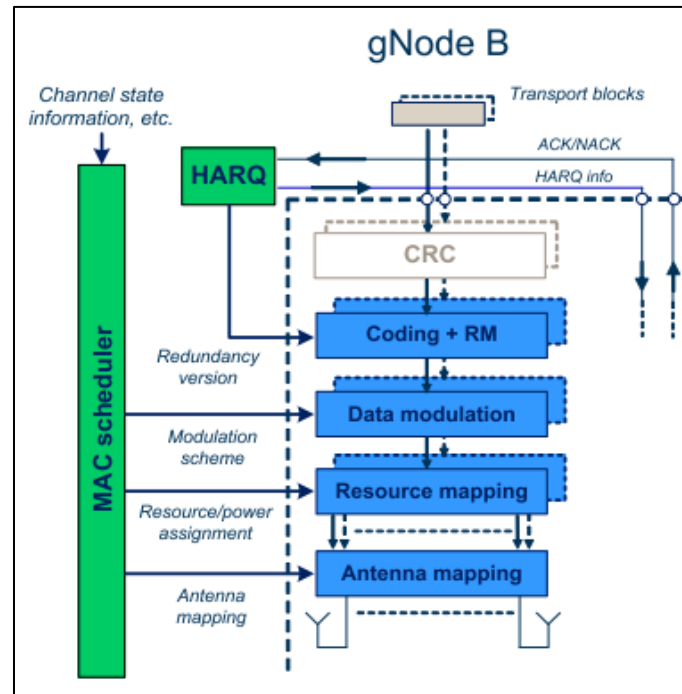
On information and belief, the Accused Base Stations include a receiver.

The Accused Base Stations are responsible for conducting RF communications with UEs. As such, the Accused Base Stations include a receiver to facilitate the reception of RF signals from UEs. For instance, TS 38.202 discusses “Uplink Shared Channel transmission” from the UE to the gNodeB.

5.1.1 Uplink shared channel

The physical-layer model for Uplink Shared Channel transmission is described based on the corresponding PUSCH physical-layer-processing chain, see Figure 5.1.1-1. Processing steps that are relevant for the physical-layer model, e.g. in the sense that they are configurable by higher layers, are highlighted in blue.

TS 38.202 at 8. The flow of ACK/NACK information into the gNode B is illustrated by the arrows in the figure below.



TS 38.202 at 8.

	The relevant operation of this receiver is detailed in the evidence and analysis provided regarding 10[D], which is fully incorporated herein by reference.
4[E] the multiple CBs include one or more first CBs and one or more second CBs,	The Accused Base Stations comprise the above components wherein the multiple CBs include one or more first CBs and one or more second CBs. <i>See evidence and analysis provided in 10[E], which is incorporated fully herein by reference.</i>
4[F] 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,	The Accused Base Stations comprise the above components wherein 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. <i>See evidence and analysis provided in 10[F], which is incorporated fully herein by reference.</i>
4[G] each of the multiple CBs is included in any one of the multiple CBGs,	The Accused Base Stations comprise the above components wherein each of the multiple CBs is included in any one of the multiple CBGs. <i>See evidence and analysis provided in 10[G], which is incorporated fully herein by reference.</i>
4[H] the multiple CBGs include one or more first CBGs and one or more second CBGs,	The Accused Base Stations comprise the above components wherein the multiple CBGs include one or more first CBGs and one or more second CBGs. <i>See evidence and analysis provided in 10[H], which is incorporated fully herein by reference.</i>
4[I] 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	The Accused Base Stations comprise the above components wherein 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. <i>See evidence and analysis provided in 10[I], which is incorporated fully herein by reference.</i>

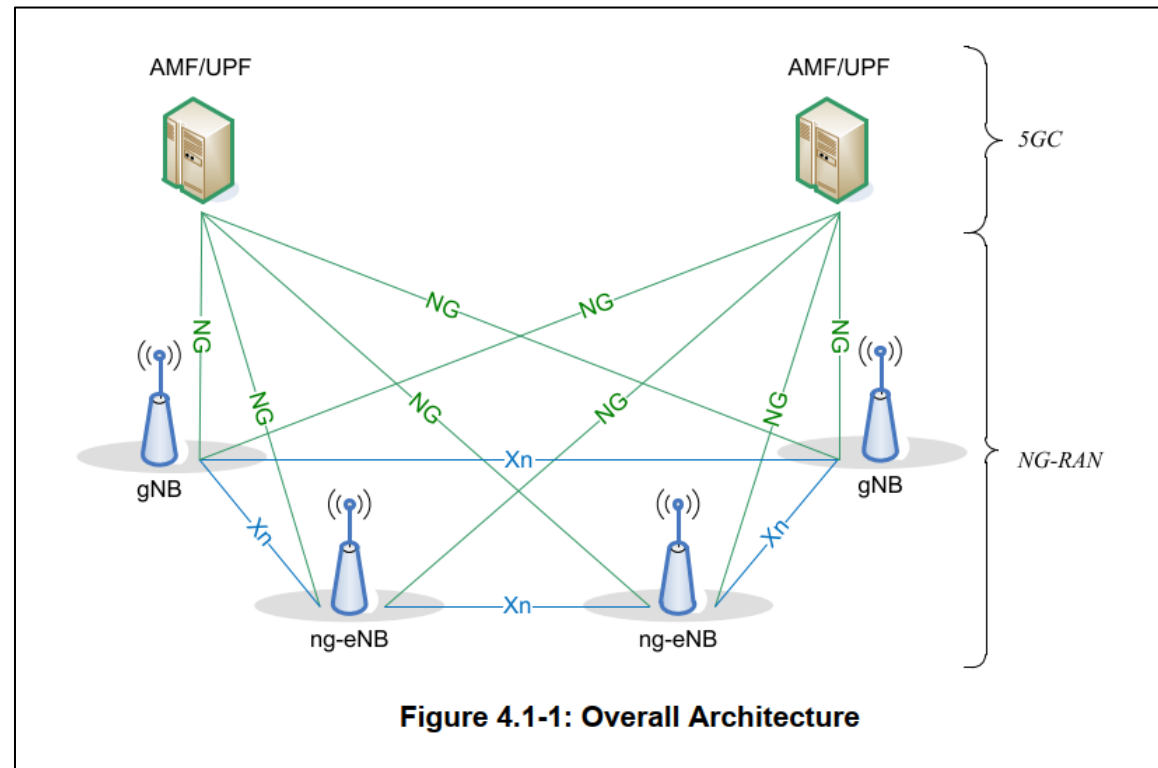
more second CBs included in each of the one or more second CBGs, and	
4[J] a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.	The Accused Base Stations comprise the above components wherein a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs. <i>See evidence and analysis provided in 10[J], which is incorporated fully herein by reference.</i>

CLAIM 5		'509 PATENT V. AT&T
5[A]. A base station apparatus comprising:	The Accused Base Stations are a base station apparatus. <i>See evidence and analysis provided in 4[A], which is incorporated fully herein by reference.</i>	
5[B] a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs,	The Accused Base Stations comprise a coding unit configured to segment a transport block into multiple CBs and to code each of the multiple CBs. <i>See evidence and analysis provided in 4[B], which is incorporated fully herein by reference.</i>	
5[C] a transmitter configured to transmit the transport block, and	The Accused Base Stations comprise a transmitter configured to transmit the transport block. <i>See evidence and analysis provided in 4[C], which is incorporated fully herein by reference.</i>	
5[D] a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs, wherein	The Accused Base Stations comprise a receiver configured to receive HARQ-ACKs corresponding to multiple CBGs. <i>See evidence and analysis provided in 4[D], which is incorporated fully herein by reference.</i>	
5[E] the multiple CBs include one or more first CBs and one or more second CBs,	The Accused Base Stations comprise the above components wherein the multiple CBs include one or more first CBs and one or more second CBs. <i>See evidence and analysis provided in 11[E], which is incorporated fully herein by reference.</i>	
5[F] 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,	The Accused Base Stations comprise the above components wherein 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. <i>See evidence and analysis provided in 11[F], which is incorporated fully herein by reference.</i>	

5[G] each of the multiple CBs is included in any one of the multiple CBGs,	The Accused Base Stations comprise the above components wherein each of the multiple CBs is included in any one of the multiple CBGs. <i>See evidence and analysis provided in 11[G], which is incorporated fully herein by reference.</i>
5[H] the multiple CBGs include one or more first CBGs and one or more second CBGs,	The Accused Base Stations comprise the above components wherein the multiple CBGs include one or more first CBGs and one or more second CBGs. <i>See evidence and analysis provided in 11[H], which is incorporated fully herein by reference.</i>
5[I] 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	The Accused Base Stations comprise the above components wherein 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. <i>See evidence and analysis provided in 11[I], which is incorporated fully herein by reference.</i>
5[J] 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.	The Accused Base Stations comprise the above components wherein 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. <i>See evidence and analysis provided in 11[J], which is incorporated fully herein by reference.</i>

CLAIM 10	'509 PATENT V. AT&T
10[A]. A communication method for a base station apparatus, the communication method comprising the steps of:	The Accused Base Stations implement a communication method for a base station apparatus. The Accused Base Stations are gNodeBs (or gNBs) or 5G-aware eNodeBs (or eNBs) which operate as base stations within a 5G (or NR) network architecture. gNB: node providing NR user plane and control plane protocol terminations towards the UE, and connected via the NG interface to the 5GC. TS 38.300 at 14.²

² Unless otherwise noted, all citations to TS 38.300 are to Release 16.2.0 (2020-07).

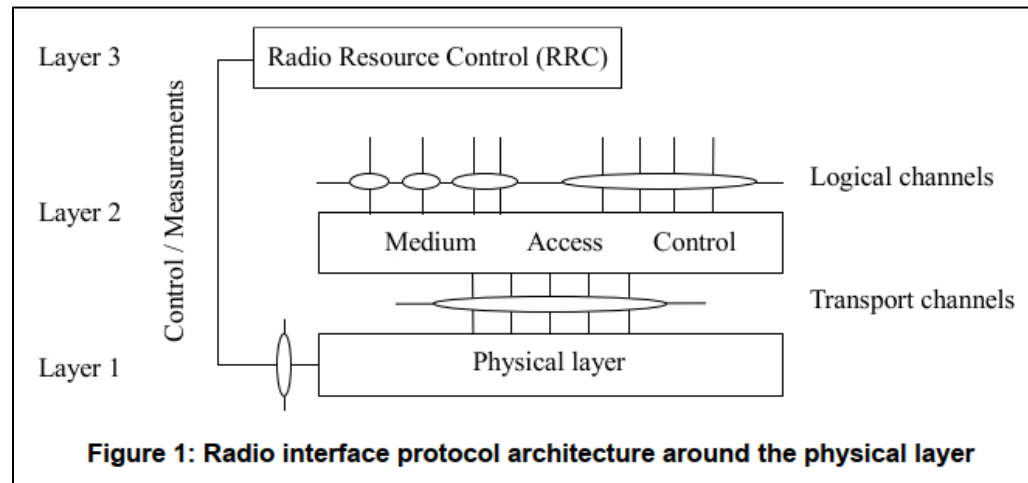


TS 38.300 at 16.

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

The Accused Base Stations perform the method step of segmenting a transport block into multiple CBs and coding each of the multiple CBs.

The radio interface protocol architecture around the physical layer for NR (5G) is illustrated below:



TS 38.201 at 6.³ Transport channels are used for communications between the physical layer and Medium Access Control (MAC) layer. The basic unit of communication used within these transport channels is a transport block.

4 Services and functions of the physical layer

4.1 General

The physical layer offers data transport services to higher layers.

The access to these services is through the use of transport channels via the MAC sub-layer.

A transport block is defined as the data delivered by MAC layer to the physical layer and vice versa.

TS 38.202 at 6. The physical channels available for downlink are as follows:

³ Unless otherwise noted, all citations to TS 38.201 are to Release 17.0.0 (2021-12).

The physical channels defined in the downlink are:

- the Physical Downlink Shared Channel (PDSCH),
- the Physical Downlink Control Channel (PDCCH),
- the Physical Broadcast Channel (PBCH),

TS 38.201 at 7. Each of these physical channels maps to a transport channel, as illustrated below:

Table 4.2-1 specifies the mapping of the downlink transport channels to their corresponding physical channels. Table 4.2-2 specifies the mapping of the downlink control channel information to its corresponding physical channel.

Table 4.2-1

TrCH	Physical Channel
DL-SCH	PDSCH
BCH	PBCH
PCH	PDSCH

TS 38.201 at 9.

The transport blocks for the Downlink Shared Channel (DL-SCH) are segmented into multiple code blocks (CBs) and each of the code blocks is then coded using the low density parity check (LDPC) algorithm.

Segmenting transport blocks into multiple code blocks for the DL-SCH is described in TS 38.201 § 7.2.3:

7.2.3 Code block segmentation and code block CRC attachment

The bits input to the code block segmentation are denoted by $b_0, b_1, b_2, b_3, \dots, b_{B-1}$ where B is the number of bits in the transport block (including CRC).

Code block segmentation and code block CRC attachment are performed according to Clause 5.2.2.

The bits after code block segmentation are denoted by $c_{r0}, c_{r1}, c_{r2}, c_{r3}, \dots, c_{r(K_r-1)}$, where r is the code block number and K_r is the number of bits for code block number r according to Clause 5.2.2.

TS 38.201 at 111. The details of the segmentation procedure are specified by TS 38.201 § 5.2.2, which is further discussed below regarding limitation 10[E].

After code block segmentation, channel coding is performed, as detailed in TS 38.201 § 7.2.4:

7.2.4 Channel coding

Code blocks are delivered to the channel coding block. The bits in a code block are denoted by $c_{r0}, c_{r1}, c_{r2}, c_{r3}, \dots, c_{r(K_r-1)}$, where r is the code block number, and K_r is the number of bits in code block number r . The total number of code blocks is denoted by C and each code block is individually LDPC encoded according to Clause 5.3.2.

After encoding the bits are denoted by $d_{r0}, d_{r1}, d_{r2}, d_{r3}, \dots, d_{r(N_r-1)}$, where the values of N_r is given in Clause 5.3.2.

TS 38.201 at 111.

	5.3 Channel coding Usage of coding scheme for the different types of TrCH is shown in table 5.3-1. Usage of coding scheme for the different control information types is shown in table 5.3-2. Table 5.3-1: Usage of channel coding scheme for TrCHs <table> <tr> <th>TrCH</th><th>Coding scheme</th></tr> <tr> <td>UL-SCH</td><td rowspan="3">LDPC</td></tr> <tr> <td>DL-SCH</td></tr> <tr> <td>PCH</td></tr> <tr> <td>BCH</td><td>Polar code</td></tr> </table> TS 38.201 at 13.	TrCH	Coding scheme	UL-SCH	LDPC	DL-SCH	PCH	BCH	Polar code
TrCH	Coding scheme								
UL-SCH	LDPC								
DL-SCH									
PCH									
BCH	Polar code								
10[C] transmitting the transport block, and	The Accused Base Stations perform the method step of transmitting the transport block. The model for downlink communication between a gNodeB and a UE is illustrated below:								

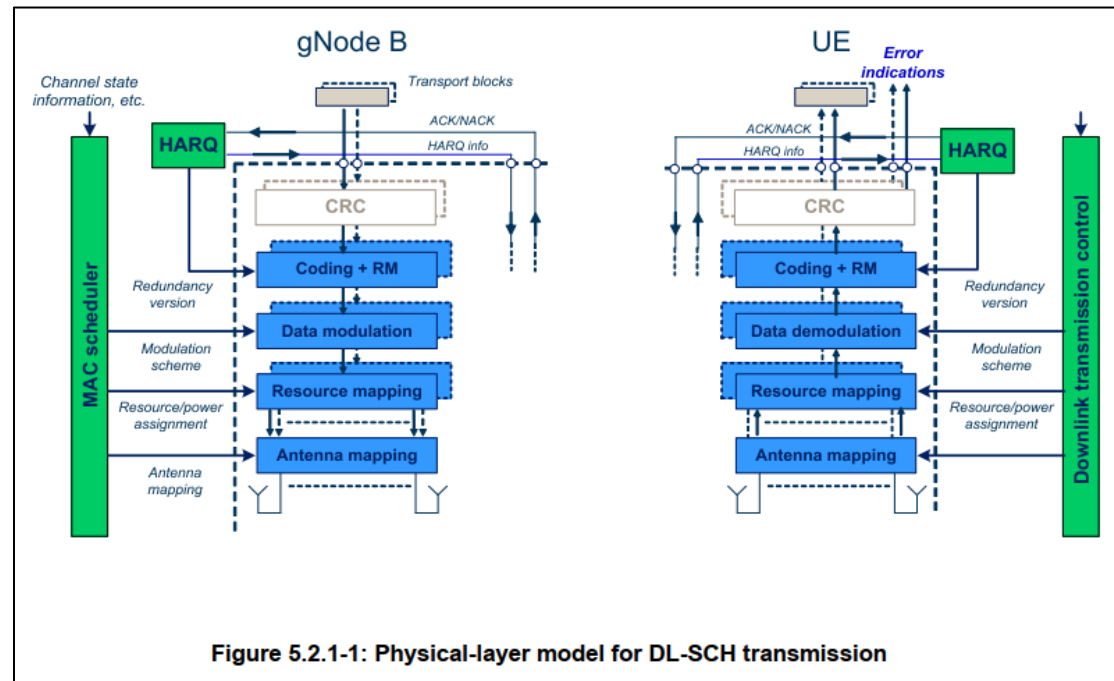


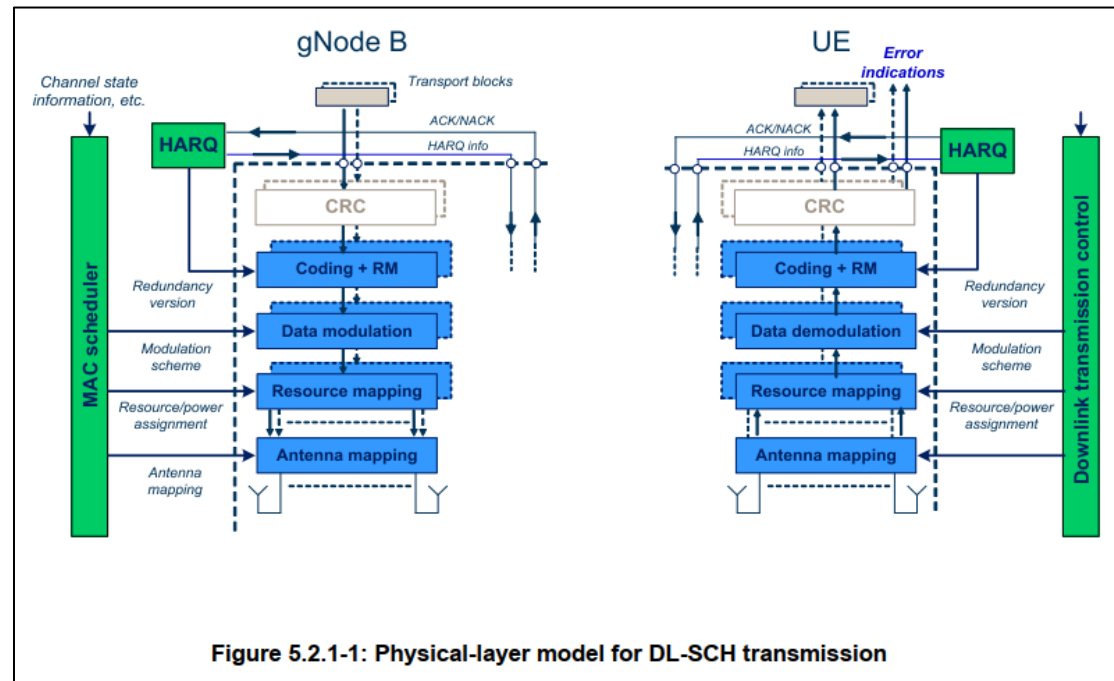
Figure 5.2.1-1: Physical-layer model for DL-SCH transmission

TS 38.202 at 8. As illustrated, transport blocks at the gNodeB are fed into the physical layer services (*e.g.*, coding, data modulation, resource mapping, antenna mapping) and transmitted over the air via antennas (the “Y” symbols in figure, below the “Antenna mapping” blocks).

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

The Accused Base Stations perform the method step of receiving HARQ-ACKs corresponding to multiple CBGs.

The model for downlink communication between a gNodeB and a UE is illustrated below:



TS 38.202 at 8. As illustrated, the HARQ block receives ACK/NACK information as generated by the UE.

The Accused Base Stations configure specific PDSCH parameters for a UE with the PDSCH-ServingCellConfig information element (IE).

PDSCH-ServingCellConfig

The IE *PDSCH-ServingCellConfig* is used to configure UE specific PDSCH parameters that are common across the UE's BWPs of one serving cell.

TS 38.331 at 675.⁴

⁴ Unless otherwise noted, all citations to TS 38.331 correspond to Release 17.0.0 (2022-03).

The codeBlockGroupTransmission element of the PDSCH-ServingCellConfig IE determines whether CBG-based HARQ is used.

```

PDSCH-ServingCellConfig ::=
    codeBlockGroupTransmission
    xOverhead
    nrofHARQ-ProcessesForPDSCH
    pucch-Cell
    ...
    SEQUENCE {
        SetupRelease { PDSCH-CodeBlockGroupTransmission }
        ENUMERATED { x0h6, x0h12, x0h18 }
        ENUMERATED {n2, n4, n6, n10, n12, n16}
        ServCellIndex
    }

```

TS 38.331 at 676.

PDSCH-ServingCellConfig field descriptions	
codeBlockGroupTransmission	Enables and configures code-block-group (CBG) based transmission (see TS 38.213 [13], clause 9.1.1). Network does not configure for a UE both spatial bundling of HARQ ACKs and codeBlockGroupTransmission within the same cell group.

TS 38.331 at 677.

When codeBlockGroupTransmission is enabled, the UE will transmit to the Accused Base Stations HARQ ACKs or NAKs per CBG received.

9.1.1 CBG-based HARQ-ACK codebook determination

If a UE is provided **PDSCH-CodeBlockGroupTransmission** for a serving cell, the UE receives a PDSCH scheduled by DCI format 1_1, that includes code block groups (CBGs) of a transport block. The UE is also provided *maxCodeBlockGroupsPerTransportBlock* indicating a maximum number $N_{\text{HARQ-ACK}}^{\text{CBG/TB, max}}$ of CBGs for generating respective HARQ-ACK information bits for a transport block reception for the serving cell.

For a number of C code blocks (CBs) in a transport block, the UE determines a number of CBGs M according to clause 5.1.7.1 of [6, TS 38.214] and determines a number of HARQ-ACK bits for the transport block as

$$N_{\text{HARQ-ACK}}^{\text{CBG/TB}} = M.$$

The UE generates an ACK for the HARQ-ACK information bit of a CBG if the UE correctly received all code blocks of the CBG and generates a NACK for the HARQ-ACK information bit of a CBG if the UE incorrectly received at least one code block of the CBG. If the UE receives two transport blocks, the UE concatenates the HARQ-ACK information bits for CBGs of the second transport block after the HARQ-ACK information bits for CBGs of the first transport block.

TS 38.213 at 72.

10[E] the multiple CBs include one or more first CBs and one or more second CBs,	The Accused Base Stations perform the method of claim 10 wherein the multiple CBs include one or more first CBs and one or more second CBs. Section 5.2.2 of TS 38.212 details how the number of code blocks per transport block is determined. <pre> Total number of code blocks C is determined by: if $B \leq K_{cb}$ $L = 0$ Number of code blocks: $C = 1$ $B' = B$ else $L = 24$ Number of code blocks: $C = \lceil B / (K_{cb} - L) \rceil$ $B' = B + C \cdot L$ end if </pre> TS 38.212 at 11-12.⁵ When the number of bits in a transport block (plus CRC) is less than K_{cb}, then a single code block is allocated for the transport block – <i>i.e.</i>, the transport block is not segmented. Otherwise, multiple code blocks are allocated for the transport block, and each code block has an additional 24-bit CRC value appended to it – <i>i.e.</i>, the transport block is segmented. The code blocks corresponding to non-segmented transport blocks are the first CBs, and the code blocks corresponding to segmented transport blocks are the second CBs.
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⁵ Unless otherwise noted, all citations to 38.212 are to Release 17.3.0 (2022-09).

10[F] 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,	The Accused Base Stations perform the method of claim 10 wherein 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. A first CB can be up to 8488 bits for LDPC graph 1 and 3840 bits for LDPC graph 2. For LDPC base graph 1, the maximum code block size is: - $K_{cb} = 8448$. For LDPC base graph 2, the maximum code block size is: - $K_{cb} = 3840$. TS 38.212 at 11. The second CBs are smaller than 8424 bits for LDPC graph 1 and 3816 bits for LDPC graph 2 because of the addition of a 24-bit CRC sequence for each code block with segmentation. The input bit sequence to the code block segmentation is denoted by $b_0, b_1, b_2, b_3, \dots, b_{B-1}$, where $B > 0$. If B is larger than the maximum code block size K_{cb}, segmentation of the input bit sequence is performed and an additional CRC sequence of $L=24$ bits is attached to each code block. TS 38.212 at 11. Section 5.2.2 of TS 38.212 illustrates how the L=24-bit CRC sequences are treated.
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Total number of code blocks C is determined by:

if $B \leq K_{cb}$

$$L = 0$$

Number of code blocks: $C = 1$

$$B' = B$$

else

$$L = 24$$

$$\text{Number of code blocks: } C = \lceil B / (K_{cb} - L) \rceil$$

$$B' = B + C \cdot L$$

end if

TS 38.212 at 11-12. For segmented code blocks (*i.e.*, bits $B > K_{cb}$), each code block has an additional $L=24$ -bit CRC value appended, such that the smaller size ($K_{cb} - L$) determines the number of CBs.

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

$c_{rk} = \langle \text{NULL} \rangle$

end for

TS 38.212 at 13.

	Therefore, based on non-segmentation and segmentation, a first size for a first CB of the first CBs (when the CB is close to maximum size) is larger than a second size for a second CB of the second CBs (which are 24 bits smaller than the maximum size).
10[G] each of the multiple CBs is included in any one of the multiple CBGs,	The Accused Base Stations perform the method wherein each of the multiple CBs is included in any one of the multiple CBGs. When code block groups are enabled, each CB is included in a CBG. 5.1.7.1 UE procedure for grouping of code blocks to code block groups If a UE is configured to receive code block group (CBG) based transmissions by receiving the higher layer parameter <i>codeBlockGroupTransmission</i> for PDSCH, the UE shall determine the number of CBGs for a transport block reception as $M = \min(N, C),$ where N is the maximum number of CBGs per transport block as configured by <i>maxCodeBlockGroupsPerTransportBlock</i> for PDSCH, and C is the number of code blocks in the transport block according to the procedure defined in Clause 7.2.3 of [5, TS 38.212]. Define $M_1 = \text{mod}(C, M)$, $K_1 = \left\lceil \frac{C}{M} \right\rceil$, and $K_2 = \left\lfloor \frac{C}{M} \right\rfloor$. If $M_1 > 0$, CBG m, $m = 0, 1, \dots, M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k$, $k = 0, 1, \dots, K_1 - 1$. CBG m, $m = M_1, M_1 + 1, \dots, M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k$, $k = 0, 1, \dots, K_2 - 1$. TS 38.214 at 65.⁶

⁶ Unless otherwise noted, all citations to TS 38.214 are to Release 17.3.0 (2022-09).

	5.1.7.2 UE procedure for receiving code block group based transmissions If a UE is configured to receive code block group-based transmissions by receiving the higher layer parameter <i>codeBlockGroupTransmission</i> for PDSCH, - The '<i>CBG transmission information</i>' (CBGTI) field of DCI format 1_1 is of length $N_{TB} \cdot N$ bits, where N_{TB} is the value of the higher layer parameter <i>maxNrofCodeWordsScheduledByDCI</i>. If $N_{TB} = 2$ the CBGTI field bits are mapped such that the first set of N bits starting from the MSB corresponds to the first TB while the second set of N bits corresponds to a second TB, if scheduled. The first M bits of each set of N bits in the CBGTI field have an in-order one-to-one mapping with the M CBGs of the TB, with the MSB mapped to CBG#0. - For initial transmission of a TB as indicated by the '<i>New Data Indicator</i>' field of the scheduling DCI, the UE may assume that all the code block groups of the TB are present. - For a retransmission of a TB as indicated by the '<i>New Data Indicator</i>' field of the scheduling DCI, the UE may assume that - The '<i>CBGTI</i>' field of the scheduling DCI indicates which CBGs of the TB are present in the transmission. A bit value of '0' in the <i>CBGTI</i> field indicates that the corresponding CBG is not transmitted and '1' indicates that it is transmitted. - If the '<i>CBG flushing out information</i>' (<i>CBGFI</i>) field of the scheduling DCI is present, '<i>CBGFI</i>' set to '0' indicates that the earlier received instances of the same CBGs being transmitted may be corrupted, and '<i>CBGFI</i>' set to '1' indicates that the CBGs being retransmitted are combinable with the earlier received instances of the same CBGs. - A CBG contains the same CBs as in the initial transmission of the TB. TS 38.214 at 65. Therefore, each of the said first and second CBs are grouped (i.e., included) into multiple CBGs.
10[H] the multiple CBGs include one or more first CBGs and one or more second CBGs,	The Accused Base Stations perform the method of claim 10 wherein the multiple CBGs include one or more first CBGs and one or more second CBGs. Code blocks are organized into code block groups. See 10[G]. The multiple CBGs include the first CBGs corresponding to code block groups that include code blocks for segmented transport blocks. The multiple CBGs also include the second CBGs corresponding to code block groups that include code blocks for a non-segmented transport block.

10[I] 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	The Accused Base Stations perform the method of claim 10 wherein 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. The first CBGs include more than one code block (<i>i.e.</i>, multiple code blocks corresponding to a segmented transport block), and the second CBGs include a single code block (<i>i.e.</i>, a single code block corresponding to a non-segmented transport block). Thus, the first total number of CBs in the first CBGs is greater than the second total number of CBs in the second CBGs.
10[J] a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.	The Accused Base Stations perform the method of claim 10 wherein a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs. The first CBGs include all of the second CBs and only second CBs. <i>See</i> 10[E] (defining the first and second CBs) and 10[H] (defining the first and second CBGs). Additionally, the number of CBs per CBG in the segmentation case is either K_1 or K_2 (which is generally K_1-1), as illustrated below.

5.1.7.1

UE procedure for grouping of code blocks to code block groups

If a UE is configured to receive code block group (CBG) based transmissions by receiving the higher layer parameter *codeBlockGroupTransmission* for PDSCH, the UE shall determine the number of CBGs for a transport block reception as

$$M = \min(N, C),$$

where N is the maximum number of CBGs per transport block as configured by *maxCodeBlockGroupsPerTransportBlock* for PDSCH, and C is the number of code blocks in the transport block according to the procedure defined in Clause 7.2.3 of [5, TS 38.212].

Define $M_1 = \text{mod}(C, M)$, $K_1 = \left\lceil \frac{C}{M} \right\rceil$, and $K_2 = \left\lfloor \frac{C}{M} \right\rfloor$.

If $M_1 > 0$, CBG m , $m = 0, 1, \dots, M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k$, $k = 0, 1, \dots, K_1 - 1$. CBG m , $m = M_1, M_1 + 1, \dots, M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k$, $k = 0, 1, \dots, K_2 - 1$.

TS 38.214 at 65. The first CBG (index 0) of the one or more first CBGs will include K_1 second CBs, which is a greatest number of the one or more second CBs in a code block group. Therefore, a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.

CLAIM 11		'509 PATENT V. AT&T	
11[A]. A communication method for a base station apparatus, the communication method comprising the steps of:		The Accused Based Stations perform a communication method for a base station apparatus. <i>See evidence and analysis provided in 10[A], which is incorporated fully herein by reference.</i>	
11[B] segmenting a transport block into multiple CBs and coding each of the multiple CBs;		The Accused Base Stations perform the method step of segmenting a transport block into multiple CBs and coding each of the multiple CBs. <i>See evidence and analysis provided in 10[B], which is incorporated fully herein by reference.</i>	
11[C] transmitting the transport block, and		The Accused Base Stations perform the method step of transmitting the transport block. <i>See evidence and analysis provided in 10[C], which is incorporated fully herein by reference.</i>	
11[D] receiving HARQ-ACKs corresponding to multiple CBGs, wherein		The Accused Base Stations perform the method step of receiving HARQ-ACKs corresponding to multiple CBGs. <i>See evidence and analysis provided in 10[D], which is incorporated fully herein by reference.</i>	
11[E] the multiple CBs include one or more first CBs and one or more second CBs,		The Accused Base Stations perform the method of claim 11 wherein the multiple CBs include one or more first CBs and one or more second CBs. Section 5.2.2 of TS 38.212 details how the number of code blocks per transport block is determined.	

Total number of code blocks C is determined by:

if $B \leq K_{cb}$

$L = 0$

Number of code blocks: $C = 1$

$B' = B$

else

$L = 24$

Number of code blocks: $C = \lceil B / (K_{cb} - L) \rceil$

$B' = B + C \cdot L$

end if

TS 38.212 at 11-12. When the number of bits in a transport block (plus CRC) is less than K_{cb} , then a single code block is allocated for the transport block – *i.e.*, the transport block is not segmented. Otherwise, multiple code blocks are allocated for the transport block, and each code block has an additional 24-bit CRC value appended to it – *i.e.*, the transport block is segmented.

For segmented transport blocks (*i.e.*, when the transport block size B is larger than the maximum code block size), code blocks are organized into code block groups as identified below.

	5.1.7.1 UE procedure for grouping of code blocks to code block groups If a UE is configured to receive code block group (CBG) based transmissions by receiving the higher layer parameter <i>codeBlockGroupTransmission</i> for PDSCH, the UE shall determine the number of CBGs for a transport block reception as $M = \min(N, C),$ where N is the maximum number of CBGs per transport block as configured by <i>maxCodeBlockGroupsPerTransportBlock</i> for PDSCH, and C is the number of code blocks in the transport block according to the procedure defined in Clause 7.2.3 of [5, TS 38.212]. Define $M_1 = \text{mod}(C, M)$, $K_1 = \left\lceil \frac{C}{M} \right\rceil$, and $K_2 = \left\lfloor \frac{C}{M} \right\rfloor$. If $M_1 > 0$, CBG m, $m = 0, 1, \dots, M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k$, $k = 0, 1, \dots, K_1 - 1$. CBG m, $m = M_1, M_1 + 1, \dots, M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k$, $k = 0, 1, \dots, K_2 - 1$. TS 38.214 at 65. Code blocks that are not padded with filler bits form the first code blocks. Code blocks that are padded with filler bits form the second code blocks. <pre> end if for $k = K'$ to $K - 1$ -- Insertion of filler bits $c_{rk} = \langle \text{NULL} \rangle$; end for </pre> TS 38.212 at 13.
11[F] a first size of a first CB of the one or more first CBs is greater than a	The Accused Base Stations perform the method of claim 11 wherein 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

second size of a second CB of the one or more second CBs,	The final code block, with index $M_1 * K_1 + (m - M_1) * K_2 + k$, is a second code block that is smaller in size than the first code blocks, except in the instance that the transport block size is evenly divisible by the maximum code block size. This smaller code block requires the insertion of filler bits. <pre> for $k = K'$ to $K - 1$ -- Insertion of filler bits $c_{rk} = \langle NULL \rangle$ end for </pre> TS 38.212 at 13.
11[G] each of the multiple CBs is included in any one of the multiple CBGs,	The Accused Base Stations perform the method of claim 11 wherein each of the multiple CBs is included in any one of the multiple CBGs. When code block groups are enabled, each CB is included in a CBG.

5.1.7.1

UE procedure for grouping of code blocks to code block groups

If a UE is configured to receive code block group (CBG) based transmissions by receiving the higher layer parameter *codeBlockGroupTransmission* for PDSCH, the UE shall determine the number of CBGs for a transport block reception as

$$M = \min(N, C),$$

where N is the maximum number of CBGs per transport block as configured by *maxCodeBlockGroupsPerTransportBlock* for PDSCH, and C is the number of code blocks in the transport block according to the procedure defined in Clause 7.2.3 of [5, TS 38.212].

Define $M_1 = \text{mod}(C, M)$, $K_1 = \left\lceil \frac{C}{M} \right\rceil$, and $K_2 = \left\lfloor \frac{C}{M} \right\rfloor$.

If $M_1 > 0$, CBG m , $m = 0, 1, \dots, M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k$, $k = 0, 1, \dots, K_1 - 1$. CBG m , $m = M_1, M_1 + 1, \dots, M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k$, $k = 0, 1, \dots, K_2 - 1$.

TS 38.214 at 65.

	5.1.7.2 UE procedure for receiving code block group based transmissions If a UE is configured to receive code block group-based transmissions by receiving the higher layer parameter <i>codeBlockGroupTransmission</i> for PDSCH, - The '<i>CBG transmission information</i>' (CBGTI) field of DCI format 1_1 is of length $N_{TB} \cdot N$ bits, where N_{TB} is the value of the higher layer parameter <i>maxNrofCodeWordsScheduledByDCI</i>. If $N_{TB} = 2$ the CBGTI field bits are mapped such that the first set of N bits starting from the MSB corresponds to the first TB while the second set of N bits corresponds to a second TB, if scheduled. The first M bits of each set of N bits in the CBGTI field have an in-order one-to-one mapping with the M CBGs of the TB, with the MSB mapped to CBG#0. - For initial transmission of a TB as indicated by the '<i>New Data Indicator</i>' field of the scheduling DCI, the UE may assume that all the code block groups of the TB are present. - For a retransmission of a TB as indicated by the '<i>New Data Indicator</i>' field of the scheduling DCI, the UE may assume that - The '<i>CBGTI</i>' field of the scheduling DCI indicates which CBGs of the TB are present in the transmission. A bit value of '0' in the <i>CBGTI</i> field indicates that the corresponding CBG is not transmitted and '1' indicates that it is transmitted. - If the '<i>CBG flushing out information</i>' (<i>CBGFI</i>) field of the scheduling DCI is present, '<i>CBGFI</i>' set to '0' indicates that the earlier received instances of the same CBGs being transmitted may be corrupted, and '<i>CBGFI</i>' set to '1' indicates that the CBGs being retransmitted are combinable with the earlier received instances of the same CBGs. - A CBG contains the same CBs as in the initial transmission of the TB. TS 38.214 at 65.
11[H] the multiple CBGs include one or more first CBGs and one or more second CBGs,	The Accused Base Stations perform the method of claim 11 wherein the multiple CBGs include one or more first CBGs and one or more second CBGs. Code blocks are organized into code block groups. See 11[G]. The CBGs m that include code blocks with indexes identified based on the K_1 value (and not the K_2 value) form the first code block groups.

	If $M_1 > 0$, CBG m, $m = 0, 1, \dots, M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k$, $k = 0, 1, \dots, K_1 - 1$. CBG m, $m = M_1, M_1 + 1, \dots, M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k$, $k = 0, 1, \dots, K_2 - 1$. TS 38.214 at 65. The CBGs m that include code blocks with indexes identified based on the K_2 value form the second code block groups. If $M_1 > 0$, CBG m, $m = 0, 1, \dots, M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k$, $k = 0, 1, \dots, K_1 - 1$. CBG m, $m = M_1, M_1 + 1, \dots, M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k$, $k = 0, 1, \dots, K_2 - 1$. TS 38.214 at 65.
11[I] 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	The Accused Base Stations perform the method of claim 11 wherein 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. The first CBGs each include K_1 code blocks. The second CBGs each include K_2 (or fewer) code blocks. Except in the instance when the number of code blocks is evenly divisible by the number of code block groups, K_2 is always $K_1 - 1$. Accordingly, 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.
11[J] 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	The Accused Base Stations perform the method of claim 11 wherein 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.

value of numbers of the one or more second CBs included in the one or more first CBGs.	The first CBGs do not include second CBs, and the average value of numbers of the one or more second CBs included in the one or more first CBGs is 0. The second CBGs include one or more second CBs, and the average value of numbers of the one or more second CBs included in the one or more second CBGs is 1 or greater.
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