

EXHIBIT B16

Patent Number: US 9,184,881

Patent Title: Method for feeding back confirmation information on a physical uplink shared channel

Filing Date: 2010-10-15

Publication Date: 2015-11-10

Claim 1: A method for feeding back confirmation information on a physical uplink shared channel, which is used for enabling a user equipment to feed back to an eNodeB whether data of a downlink sub-frame is correctly received in a situation that a number of the downlink sub-frames is greater than a number of uplink sub-frames in a time division duplex system, wherein the method comprises:

the eNodeB carries, in downlink control information, a number value of the downlink sub-frame corresponding to the confirmation information which is fed back by one uplink sub-frame, and transmits data on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information, wherein the number of the downlink sub-frames which transmit the data is equal to a number of the downlink sub-frames corresponding to the confirmation information fed back by the one uplink sub-frame;

after the user equipment receives the downlink sub-frame which carries the downlink control information, the data is received from the downlink sub-frame which transmits the data after this downlink sub-frame, and the confirmation information of receiving the data is fed back together with uplink data to the eNodeB through a physical uplink shared channel through an uplink sub-frame;

wherein, in a situation that the user equipment feeds back a plurality of groups of the confirmation information, an amount of the confirmation information fed back in each group is equal to a maximum number of codeword streams in this downlink sub-frame, and respective confirmation information in each group corresponds to the confirmation information of the codeword stream of a corresponding downlink sub-frame; in the situation that the number of codeword streams of the downlink sub-frames is smaller than the maximum number of the codeword streams of the downlink sub-frame, the user equipment feeds back the confirmation information of the number of the maximum codeword streams, wherein confirmation information without a corresponding codeword stream is set as a predefined fixed value; when the user equipment fails to detect the physical downlink control channel corresponding to the transmitted data in the sub-frame which transmits the data, the user equipment feeds back the negative acknowledgement message as the confirmation information of each codeword stream in a group corresponding to this downlink sub-frame.

Accused Product: Samsung Galaxy S21 5G Smartphone

References Used:

Samsung Galaxy S21 5G Highlights

Samsung Galaxy S21 5G Models

Samsung Galaxy S21 Performance

Samsung Galaxy S21 Compare

Buy Samsung Galaxy S21 5G

Galaxy S21 5G 128GB (Unlocked)

3GPP TS 36.213 version 16.2.0 Release 16 (LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures)

Reference Links:

<https://www.samsung.com/us/smartphones/galaxy-s21-5g/>

<https://www.samsung.com/us/smartphones/galaxy-s21-5g/models/>

<https://www.samsung.com/us/smartphones/galaxy-s21-5g/performance/>

<https://www.samsung.com/us/smartphones/galaxy-s21-5g/compare/?device-1=samsung-galaxy-s21-fe-5g&device-2=samsung-galaxy-s21-5g&device-3=samsung-galaxy-s21%2B-5g>

<https://www.samsung.com/us/smartphones/galaxy-s21-5g/buy>

<https://www.samsung.com/us/business/mobile/phones/galaxy-s/galaxy-s21-5g-128gb-unlocked-sm-g991uzvaxaa/>

https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf

Overview

Plaintiff accuses the making, using, selling, offering for sale and/or importation of Defendant Samsung (fka SAMSUNG ELECTRONICS CO., LTD.) and Defendant’s parents, affiliates, subsidiaries (“Samsung” or “Defendant”) accused system and method, including without limitation the products implementing 3GPP 5th generation telecommunications technology standard (5G) features (Galaxy S21 5G Smartphone) and all other substantially similar products (the “Accused Device(s)”) of directly infringing U.S. Patent No. (the “’881 Patent”). The term “Accused Device(s)” includes the associated computer hardware and internal semiconductors, software and data, and processes and methods related thereto. The foregoing infringing products includes operating characteristics that infringe upon the claims of the ’881 Patent which teaches an improved mechanism for feeding back confirmation information on a physical uplink shared channel. The technical solution of the ’881 Patent enables a user equipment to feedback information to an eNodeB whether data of a downlink sub-frame is correctly received in a situation that a number of the downlink sub-frames is greater than a number of uplink sub-frames in a time division duplex system.

Plaintiff further accuses Samsung of indirectly infringing the ’881 Patent by providing its customers and others the Accused Devices to utilize in an infringing manner. Samsung intends to cause infringement by its customers and users as Samsung instructs the users to use the Accused Device in an infringing manner for example, by providing features like HyperFast downloads, lag-free gaming and streaming, HD video calling, etc. Samsung further instructs users to operate the Accused Device in an infringing manner, for example, by providing instructions on using 5G enabled features like HyperFast downloads, lag-free gaming and streaming, HD video calling, etc. Samsung also provides support services for the Accused Device, including providing instructions, configurations, guides, online materials and technical support.

The asserted claims include elements that are implemented, at least in part, by proprietary electronics, firmware and software in the Accused Device. The precise designs, processes, and algorithms used in them are held secret, at least in part, and are not publicly available in their entirety. An inspection of the Accused Device, and an analysis of Samsung’s documentation and/or source code may be necessary to fully and accurately describe all infringing features and functionality of the Accused Device and, accordingly, Plaintiff reserves the right to supplement these contentions once such information is made available to Plaintiff. Furthermore, Plaintiff reserves the right to revise these contentions, including as discovery in the case progresses, in view of the Court’s final claim construction in this action and in connection with the provision of its expert reports.

9,184,881 Claim 1	Evidence
1. A method for feeding back confirmation information on a physical uplink shared channel, which is used for enabling a user equipment to feed back to an eNodeB whether data of a downlink sub-frame is correctly received in a situation that a number of the downlink sub-	This is the preamble of the claim and is not limiting. This element, if construed as a limitation, is present literally and under the doctrine of equivalents in the Accused Device. The Accused Device is a smartphone device comprising 5nm Octa-Core (2.8GHz, 2.4GHz, 1.8GHz) processor, Dynamic AMOLED 2X 120 Hz display, high resolution front and rear cameras, 8GB RAM with 128GB/256GB internal storage and 4000mAh battery. The Accused Device is configured to support features like Biometric Authentication: Ultrasonic Fingerprint and Face recognition, Hybrid Optic Zoom, 8K Video quality, Zoom Lock etc. The Accused Device is available in different models varying based on Cell Phone Carrier, Internal Memory and Color. The various models available for the Accused Device are SM-G991UZAAXAA, SM-G991UZAAXAA, SM-G991UZAATMB, SM-G991UZAATT, SM-

frames is greater than a number of uplink sub-frames in a time division duplex system, wherein the method comprises:

G991UZAASPR, SM-G991UZAAUSC, SM-G991UZAEXAA, SM-G991UZAEVZW, SM-G991UZAETMB, SM-G991UZAЕATT, SM-G991UZAESPR, SM-G991UZAЕUSC, SM-G991UZWAXAA, SM-G991UZWAVZW, SM-G991UZWATMB, SM-G991UZWAATT, SM-G991UZWASPR, SM-G991UZWAUSC, SM-G991UZVAXAA, SM-G991UZVAVZW, SM-G991UZVATMB, SM-G991UZVAATT, SM-G991UZVASPR, SM-G991UZVAUSC, SM-G991UZIAXAA, SM-G991UZIАVZW, SM-G991UZIATMB, SM-G991UZIAATT, SM-G991UZIASPR, and SM-G991UZIAUSC.

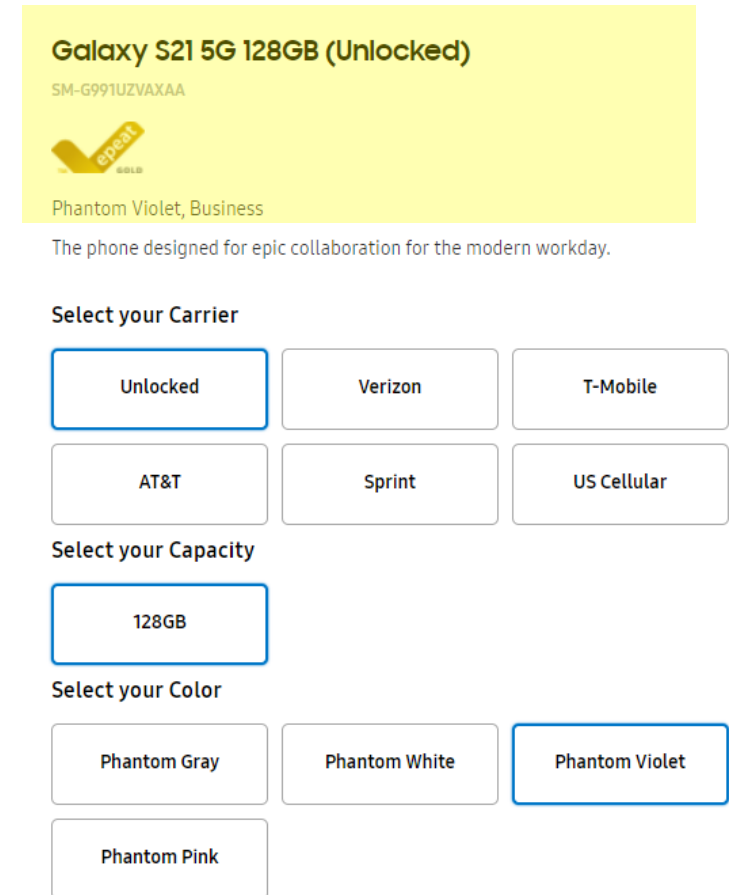


Image of the Accused Device Galaxy S21 5G Smartphone SM-G991UZVAXAA (available from <https://www.samsung.com/us/business/mobile/phones/galaxy-s/galaxy-s21-5g-128gb-unlocked-sm-g991uzvaxaa/>).

Discover the camera that captures it all

Find distant details with 30x digital zoom.³ Pinch way in and see glorious 64MP detail. Shoot stunning feed-ready selfies with a tap. The list goes on.

12MP

Ultra Wide Camera

12MP

Wide-angle Camera

64MP

Telephoto Camera

Experts Online



Screenshot showing Image of the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/>).

Galaxy S21 5G

▼

Front Camera

It's never been easier to put your best face forward.



10MP

Selfie Camera

Galaxy S21 5G

Rear Camera & Zoom

Capture incredible detail and clarity, all with a tap.

1

12MP

Ultra Wide Camera

2

12MP

Wide-angle Camera

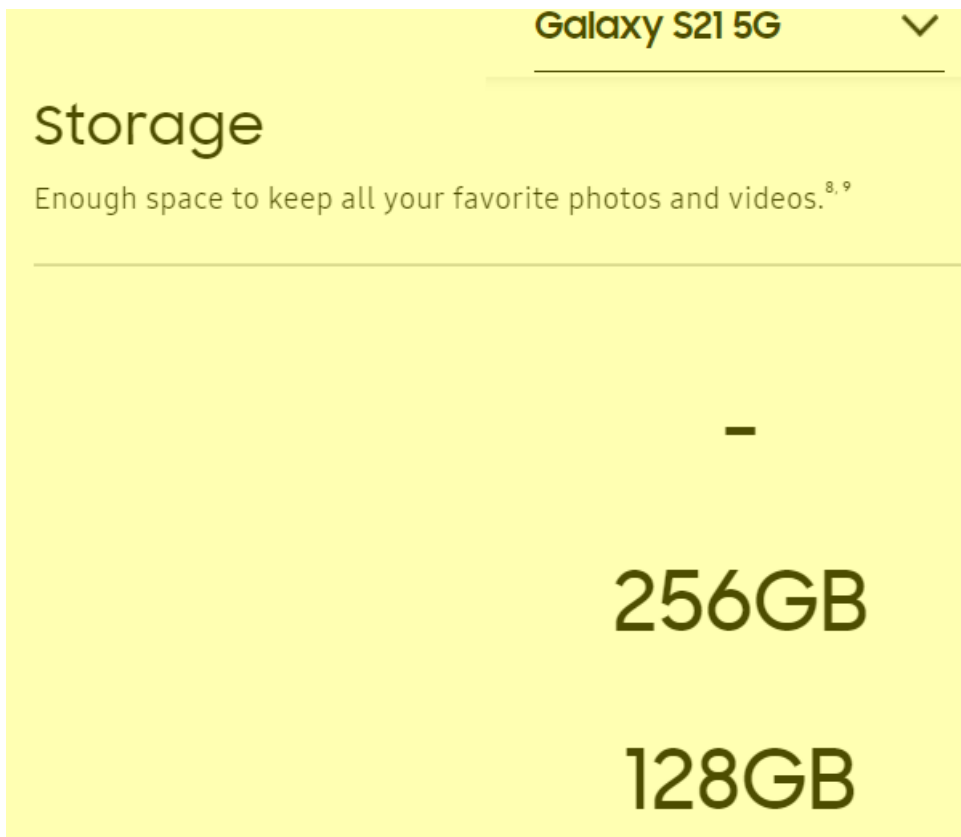
3

64MP

Telephoto Camera

30X

Space Zoom⁵



Screenshot showing features of the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/models/>).

NEW

Galaxy S21 5G



Colors^b



Screen Size^c

6.2"

Weight

6.03 oz.

Max. Refresh Rate

120Hz

Rear Quad Camera^d

Wide: 12MP AF (f/1.8)

Ultra wide: 12MP (f/2.2)

Telephoto: 64MP (f/2.0)

FHD Video recording up to 120fps in
Pro Video Mode.

	Front Camera 10MP AF Battery^e 4,000 mAh Storage^f 128GB/256GB S Pen Support^g No Dimensions 2.80" x 5.97" x 0.31" Screenshot showing features of the Accused Device (available from https://www.samsung.com/us/smartphones/galaxy-s21-5g/buy/). The Accused Device can be configured as a mobile terminal to support 5G telecommunications standard for providing services like hyper-fast content streaming, faster uploads and downloads, and optimizing gameplay.
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Galaxy S21 5G 128GB (Unlocked)

[FEATURES](#) [SPECS](#) [RESOURCES](#) [SUPPORT](#)



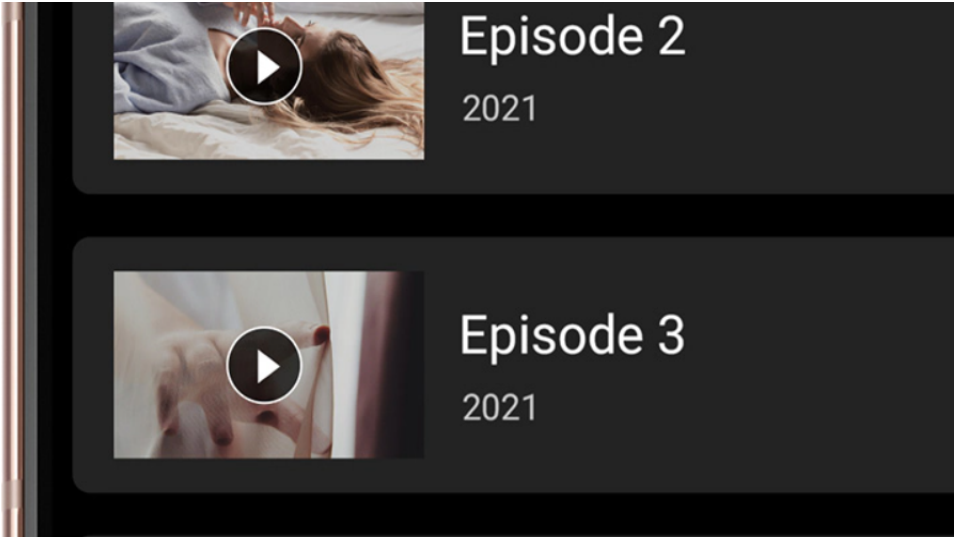
Innovation Comes Fast. Be Ready with 5G.

Nothing can slow you down with the Galaxy S21 and a 5G connection. Download large files quickly, video chat with virtually no lag, and always be connected when you create your own secure 5G hotspot.⁷

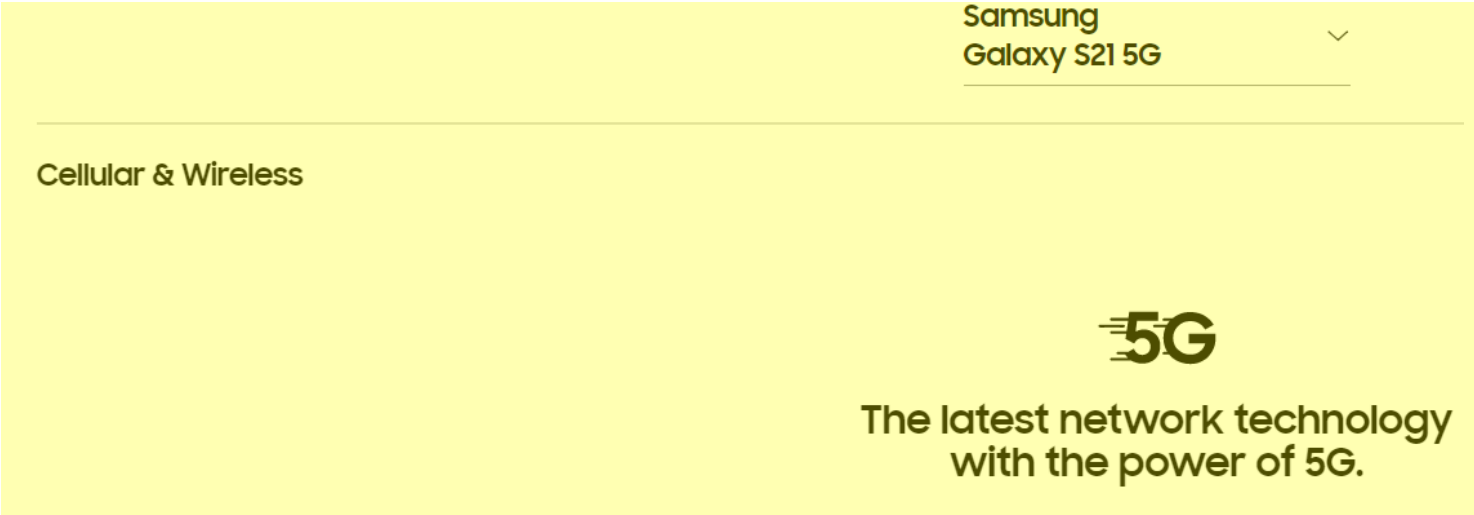


Screenshots showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/business/mobile/phones/galaxy-s/galaxy-s21-5g-128gb-unlocked-sm-g991uzvaxaa/>).

HyperFast 5G lets you download a whole season of your favorite show in a flash. The 5G-compatible chipset delivers faster speeds to keep you connected as you upload or download.^{16, 17, 18} While Wi-Fi 6 connects you to everything you love quickly and reliably.¹⁹



Screenshot showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/performance/>).



Screenshot showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/compare/?device-1=samsung-galaxy-s21-fe-5g&device-2=samsung-galaxy-s21-5g&device-3=samsung-galaxy-s21%2B-5g>).

- Q. What is 5G?**
- A.** 5G is a fifth-generation wireless network technology that delivers up to 100 times current 4G speed. Check with your carrier for specific coverage information.

Screenshot showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/buy/>).

Upon information and belief, the Accused Device is configured as a User Equipment Terminal and supports 3GPP 5G Standard, including but not limited to 3GPP TS 36.213 version 16.2.0 Release 16 (LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures).

ETSI TS 136 213 V16.2.0 (2020-09)



**LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Physical layer procedures
(3GPP TS 36.213 version 16.2.0 Release 16)**

1 Scope

The present document specifies and establishes the characteristics of the physical layer procedures in the FDD and TDD modes of E-UTRA.

Screenshot showing the scope of standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 10)

from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the Accused Device, configured as the User Equipment, is configured to feedback confirmation information to an eNB in response to receiving a downlink sub-frame.

10 Physical uplink control channel procedures

If the UE is configured with *shortTTI*, PUCCH in this clause refers to SPUCCH defined in [3] if the HARQ-ACK is sent in response to PDSCH scheduled by DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G or scheduling request is sent on resources configured by higher layer parameter *sr-slotSPUCCH-IndexFH* or *sr-slotSPUCCH-IndexNoFH* or *sr-subslotSPUCCH-Resource* for slot/subslot-based transmissions, unless otherwise noted.

Screenshot showing Physical uplink control channel procedures from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 395 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
 - if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
 - if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;

- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

In a Time Division Duplex System, the Accused Device is configured to transmit HARQ-ACK response in Uplink subframe/slot upon detection of a PDSCH transmission by eNB.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n - k$, where $k \in K$, intended for the UE and for which HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

The Accused Device is configured to perform spatial bundling of the HARQ-ACK corresponding to subframe-PDSCH for TDD if the HARQ-ACK is to be transmitted on slot s and spatialBundlingPUCCH is set TRUE. Upon information and belief, the spatial bundling of the HARQ-ACK on PUCCH implies that a number of the downlink sub-frames is greater than a number of uplink sub-frames in a time division duplex system.

10.1.3 TDD HARQ-ACK feedback procedures

For TDD and a UE that does not support aggregating more than one serving cell with frame structure type 2, two HARQ-ACK feedback modes are supported by higher layer configuration.

- HARQ-ACK bundling and
- HARQ-ACK multiplexing

Screenshot showing TDD HARQ-ACK feedback procedures from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 421 from

If the UE is configured with higher layer parameter *shortTTI*, and the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which slot/subslot-PUCCH including HARQ-ACK and SR (if any) is to be transmitted on slot/subslot *s* of subframe *n*,

- If the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *dai*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUCCH if the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D on subframe $n - k$ of a serving cell and if the slot/subslot-PUCCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK;

and

- $k = k_p$ for FDD, and $k \in K$ for TDD where K is defined in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH, and in Table 10.1.3.1-1 otherwise.
- spatial bundling of the HARQ-ACK corresponding to subframe-PDSCH is applied if the HARQ-ACK is to be transmitted on
 - subslot *s* or
 - slot *s* and *spatialBundlingPUCCH* is set *TRUE*.

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 256 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled} .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 265 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

1a. the eNodeB carries, in downlink control information, a number value of the downlink sub-frame corresponding to the confirmation information which is fed back by one uplink sub-frame, and transmits data on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information, wherein the number of the downlink sub-frames which transmit the data is equal to a number of the downlink sub-

The Accused Device is configured such that the eNodeB carries, in downlink control information, a number value of the downlink sub-frame corresponding to the confirmation information which is fed back by one uplink sub-frame, and transmits data on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information, wherein the number of the downlink sub-frames which transmit the data is equal to a number of the downlink sub-frames corresponding to the confirmation information fed back by the one uplink sub-frame.

Upon information and belief, the Accused Device is configured to receive from eNB subframe-PDSCH within subframe/slot(s) $n-k$ of a serving cell for which HARQ-ACK response will be provided by the Accused Device in UL subframe/slot n . The number value of the downlink sub-frame PDSCH is received by the Accused Device in the downlink control information PDCCH.

frames corresponding to the confirmation information fed back by the one uplink sub-frame;

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
- if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
- if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the downlink subframes PDSCH are transmitted on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information PDCCH. The PDSCH sub-frames are transmitted within continuous subframe/slot(s) $n-k$.

The Accused Device is configured to detect PDSCH transmission within subframe/slot(s) $n-k$. The PDSCH transmission within these subframe/slot(s) is intended for HARQ-ACK response from the Accused Device configured as the UE.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n-k$, where $k \in K$, intended for the UE and for which

HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

- Table 10.1.3.1-1E if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 0, 5, 9, and 10,
- Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* for special subframe configuration 3, 4, and 8,
- Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 1, 2, 6, 7,
- Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-based PDSCH and
- Table 10.1.3.1-1 otherwise.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

	Screenshot showing Downlink association set from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 426 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
1b. after the user equipment receives the downlink sub-frame which carries the downlink control information, the data is received from the downlink sub-frame which transmits the data after this downlink sub-frame, and the confirmation information of receiving the data is fed back together with uplink data to the eNodeB through a physical uplink shared channel through an uplink sub-frame;	The Accused Device is configured to receive the downlink sub-frame which carries the downlink control information and then the data is received from the downlink sub-frame which transmits the data after this downlink sub-frame, and the confirmation information of receiving the data is fed back together with uplink data to the eNodeB through a physical uplink shared channel through an uplink sub-frame. Upon information and belief, the Accused Device, configured as the User Equipment, is configured to feedback confirmation information to an eNB in response to receiving data on a PDSCH sub-frame after receiving the downlink control information on PDCCH sub-frame. The confirmation information HARQ-ACK/NACK is fed back together with uplink data to the eNodeB through a physical uplink shared channel PUCCH/PUSCH through an uplink sub-frame. 10 Physical uplink control channel procedures If the UE is configured with <i>shortTTI</i>, PUCCH in this clause refers to SPUCCH defined in [3] if the HARQ-ACK is sent in response to PDSCH scheduled by DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G or scheduling request is sent on resources configured by higher layer parameter <i>sr-slotSPUCCH-IndexFH</i> or <i>sr-slotSPUCCH-IndexNoFH</i> or <i>sr-subslotSPUCCH-Resource</i> for slot/subslot-based transmissions, unless otherwise noted. Screenshot showing Physical uplink control channel procedures from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 395 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
 - if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
 - if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

In a Time Division Duplex System, the Accused Device is configured to transmit HARQ-ACK response in Uplink subframe/slot upon detection of a PDSCH transmission by eNB.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n-k$, where $k \in K$, intended for the UE and for which

HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

1c. wherein, in a situation that the user equipment feeds back a plurality of groups of the confirmation information, an amount of the confirmation information fed back in each group is equal to a maximum number of codeword streams in this downlink sub-frame, and respective confirmation information in each group corresponds to the confirmation information of the codeword stream of a corresponding downlink sub-frame;

The Accused Device is configured wherein, in a situation that the user equipment feeds back a plurality of groups of the confirmation information, an amount of the confirmation information fed back in each group is equal to a maximum number of codeword streams in this downlink sub-frame, and respective confirmation information in each group corresponds to the confirmation information of the codeword stream of a corresponding downlink sub-frame.

Upon information and belief, for TDD, the Accused Device is configured with HARQ-ACK bundling and HARQ-ACK multiplexing. For HARQ-ACK transmission, the UE generates M bits of HARQ-ACK by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot.

For TDD HARQ-ACK bundling, the UE is configured to generate 2 HARQ-ACK bits when both codeword 0 and 1 are enabled.

For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter *harq-Bundling* in *ce-PDSCH-MultiTB-Config* and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI,

- for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate M HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle A_b where $b = 1, \dots, M$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled} .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 265 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

Screenshot showing Downlink association set from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 426 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from

https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

1d. in the situation that the number of codeword streams of the downlink sub-frames is smaller than the maximum number of the codeword streams of the downlink sub-frame, the user equipment feeds back the confirmation information of the number of the maximum codeword streams, wherein confirmation information without a corresponding codeword stream is set as a predefined fixed value;

The Accused Device is so configured that in the situation that the number of codeword streams of the downlink sub-frames is smaller than the maximum number of the codeword streams of the downlink sub-frame, the user equipment feeds back the confirmation information of the number of the maximum codeword streams, wherein confirmation information without a corresponding codeword stream is set as a predefined fixed value.

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

	Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). The patent specifications specifies that for any missing codeword stream of the downlink sub-frame, the confirmation information is set to a default value of NACK information which is considered as a predefined fixed value. To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
1e. when the user equipment fails to detect the physical downlink control channel corresponding to the transmitted data in the sub-frame which transmits the data, the user equipment feeds back the negative acknowledgement message as the confirmation information of each codeword stream in a group corresponding to this downlink sub-frame.	The Accused Device is configured such that when the user equipment fails to detect the physical downlink control channel corresponding to the transmitted data in the sub-frame which transmits the data, the user equipment feeds back the negative acknowledgement message as the confirmation information of each codeword stream in a group corresponding to this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 254 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from

	https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 2	Evidence
2. The method according to claim 1, wherein the eNodeB uses a signaling in the downlink control information for representing an index of the uplink sub-frame for transmitting uplink data in the situation that the number of the downlink sub-frames is smaller than the number of the uplink sub-frames to carry the number of the downlink sub-frames corresponding to the confirmation information which is fed back by the one uplink sub-frame.	Every claim limitation of claim 1 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein the eNodeB uses a signaling in the downlink control information for representing an index of the uplink sub-frame for transmitting uplink data in the situation that the number of the downlink sub-frames is smaller than the number of the uplink sub-frames to carry the number of the downlink sub-frames corresponding to the confirmation information which is fed back by the one uplink sub-frame. Upon information and belief, the Accused Device is configured to receive from eNB subframe-PDSCH within subframe/slot(s) n-k of a serving cell for which HARQ-ACK response will be provided by the Accused Device in UL subframe/slot n. The number value of the downlink sub-frame PDSCH is received by the Accused Device in the downlink control information PDCCH which also provides an index of the uplink sub-frame for transmitting uplink data.

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
 - if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
 - if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the downlink subframes PDSCH are transmitted on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information PDCCH. The PDSCH sub-frames are transmitted within continuous subframe/slot(s) $n-k$.

The Accused Device is configured to detect PDSCH transmission within subframe/slot(s) $n-k$. The PDSCH transmission within these subframe/slot(s) is intended for HARQ-ACK response from the Accused Device configured as the UE.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n-k$, where $k \in K$, intended for the UE and for which

HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

- Table 10.1.3.1-1E if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 0, 5, 9, and 10,
- Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* for special subframe configuration 3, 4, and 8,
- Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 1, 2, 6, 7,
- Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-based PDSCH and
- Table 10.1.3.1-1 otherwise.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

	Screenshot showing Downlink association set from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 426 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). Upon information and belief, in case the number of downlink sub-frames carrying the data sent by the eNodeB to the Accused Device is 1 corresponding to codeword 0, the Accused Device configured as UE generates 2 HARQ-ACK bits assuming both codewords 0 and 1 are enabled. For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 3	Evidence
3. The method according to claim 1, wherein the eNodeB determines a set of number values of all the downlink sub-frames corresponding to information which is fed back by the one uplink sub-frame according to a configuration pattern for the current number of downlink/uplink sub-frames, and selects corresponding number	Every claim limitation of claim 1 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein the eNodeB determines a set of number values of all the downlink sub-frames corresponding to information which is fed back by the one uplink sub-frame according to a configuration pattern for the current number of downlink/uplink sub-frames, and selects corresponding number values from the set according to an amount of the data actually required to be transmitted to be carried in the downlink control information. Upon information and belief, the downlink subframes PDSCH are transmitted on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information PDCCH. The PDSCH sub-frames are transmitted within continuous subframe/slot(s) n-k. The Accused Device is configured to detect PDSCH transmission within subframe/slot(s) n-k. The PDSCH transmission within these subframe/slot(s) is intended for HARQ-ACK response from the Accused Device configured as the UE. The HARQ-ACK response is transmitted

values from the set according to an amount of the data actually required to be transmitted to be carried in the downlink control information.

in UL subframe/slot n .

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n-k$, where $k \in K$, intended for the UE and for which

HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

- Table 10.1.3.1-1E if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 0, 5, 9, and 10,
- Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* for special subframe configuration 3, 4, and 8,
- Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 1, 2, 6, 7,
- Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-based PDSCH and
- Table 10.1.3.1-1 otherwise.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from

https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

Table 10.1.3.1-1B: Downlink association set $K^A : \{k_0^A, k_1^A, \dots, k_{M^A-1}^A\}$ for TDD and UE configured with higher layer parameter *shortProcessingTime*

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	-	3	3	-	-	-	3	3
1	-	-	3	3	-	-	-	3	3	-
2	-	-	3	-	-	-	-	3	-	-
3	-	-	5	4	3	-	-	-	-	-
4	-	-	6	3	-	-	-	-	-	-
5	-	-	3	-	-	-	-	-	-	-
6	-	-	6	4	4	-	-	6	3	-

Table 10.1.3.1-1C: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD with special subframe configuration 1, 2, 6, 7 and UE configured with higher layer parameter *shortTTI*

UL/DL Configurati on	slot n																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0					4	4	4								4	4	4			
1					6,5	5,4	4								6,5	5,4	4			
2					8,7, 12	7,6, 5,4									8,7,1 2	7,6,5 ,4				
3					14, 13, 12	12,1 1, 10	10, 9	9,8	8, 7	7										
4					16, 15, 14, 13	13,1 2, 11,1 0	10, 9, 8,7	7,6, 5												
5					18, 17, 16, 15, 14, 13, 12,22	12,1 1, 10,9, 8,7,6 ,5,4														
6					6	6	6	6	6						4	4	4			

Table 10.1.3.1-1D: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD with special subframe configuration 3, 4 or 8 and UE configured with higher layer parameter *shortTTI*

UL/DL Configurati on	slot n																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0					4	4	4	4							4	4	4	4		
1					6,5	5,4	4	4							6,5	5,4	4	4		
2					8,7, 12,11	7,6, 5,4									8,7,1 2,11	7,6,5 ,4				
3					14, 13, 12	12,1 1, 10	10, 9	9,8	8, 7	7 , 6										
4					16, 15, 14, 13	13,1 2, 11,1 0	10, 9, 8,7	7,6, 5,4												
5					18, 17, 16, 15, 14, 13, 12,22 ,21	12,1 1, 10,9, 8,7,6 ,5,4														
6					6	6	6	6	6	6					4	4	4	4		

Table 10.1.3.1-1E: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD with special subframe configuration 0, 5, 9, 10 and UE configured with higher layer parameter *shortTTI*

UL/DL Configurati on	slot n																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0					4	4	4								4	4	4		
1					6,5	5	5	5							6,5	5	5	5	
2					8,7, 12	7,6, 5,4									8,7,1 2	7,6,5 ,4			
3					14, 13, 12	12,1 1, 10	10, 9	9,8	8, 7	7									
4					16, 15, 14, 13	13,1 2, 11,1 0	10, 9, 8,7	7,6, 5											
5					18, 17, 16, 15, 14, 13, 12,22	12,1 1, 10,9, 8,7,6 ,5,4													
6					6,5		6,5		6						4	4	4		

Screenshot showing Downlink association sets from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 426-428 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9,184,881 Claim 4

Evidence

4. The method according to claim 1, wherein the eNodeB sends a control signaling associated with the allocation of the physical uplink shared channel on a first

Every claim limitation of claim 1 is present in the Accused Device as described above and incorporated herein by reference.

The Accused Device is configured wherein the eNodeB sends a control signaling associated with the allocation of the physical uplink shared channel on a first downlink sub-frame in the downlink sub-frames corresponding to the confirmation information fed back by the uplink sub-frame.

downlink sub-frame in the downlink sub-frames corresponding to the confirmation information fed back by the uplink sub-frame.

Upon information and belief, for a PDSCH data transmissions signalled via PDCCH in common search space for which HARQ-ACK response shall be provided, the Accused Device configured as the UE assumes the value of the DAI field in the corresponding DCI format is equal to '1'. The value of the counter Downlink Assignment Indicator (DAI) denotes the accumulative number of {serving cell, subframe/slot}-pair(s) in which PDSCH transmission(s) associated with PDCCH/EPDCCH/SPDCCH or PDCCH/EPDCCH/SPDCCH indicating downlink SPS release is present.

Upon information and belief, the DAI value of '1' corresponds to the first downlink sub-frame in the downlink sub-frames corresponding to the confirmation information fed back by the uplink sub-frame.

- For a PDSCH data transmissions signalled via PDCCH in common search space for which HARQ-ACK response shall be provided, the UE shall assume the value of the DAI field in the corresponding DCI format is equal to '1'. If the UE transmits HARQ-ACK on PUSCH scheduled via PDCCH in common search space, the UE shall assume the value of the DAI field in the DCI format for scheduling the PUSCH is equal to '1' and the UE is not expected to receive PDSCH scheduled via PDCCH/EPDCCH in UE-specific search space for which the HARQ-ACK response is multiplexed onto the PUSCH.

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 255 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

If a UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *dai* or with higher layer parameter *codebooksizeDeterminationsSTTI-r15* = *dai*, the value of the counter Downlink Assignment Indicator (DAI) in DCI format 1/1A/1B/1D/2/2A/2B/2C/2D/7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G denotes the accumulative number of {serving cell, subframe/slot}-pair(s) in which PDSCH transmission(s) associated with PDCCH/EPDCCH/SPDCCH or PDCCH/EPDCCH/SPDCCH indicating downlink SPS release is present, up to the present serving cell and present subframe/slot, first in increasing order of serving cell index and then in increasing order of subframe/slot index within subframe(s) /slot(s) $n-k$ where $k \in K$; the value of the total DAI in DCI format 1/1A/1B/1D/2/2A/2B/2C/2D/7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G denotes the total number of {serving cell, subframe/slot }-pair(s) in which PDSCH transmission(s) associated with PDCCH/EPDCCH/SPDCCH(s) or PDCCH/EPDCCH/SPDCCH indicating downlink SPS release is present, up to the present subframe/slot within subframe/slot (s) $n-k$ where $k \in K$, and shall be updated from subframe/slot to subframe/slot. Denote $V_{C-DAI,c,k}^{DL}$ as the value of the counter DAI in DCI format 1/1A/1B/1D/2/2A/2B/2C/2D/7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G scheduling PDSCH transmission or indicating downlink SPS release for serving cell c in subframe/slot $n-k$ where $k \in K$ according to table 7.3.2.1-1. Denote $V_{T-DAI,k}^{DL}$ as the value of the total DAI in subframe/slot $n-k$ where $k \in K$, according to Table 7.3.2.1-1. The UE shall assume a same value of total DAI in all PDCCH/EPDCCH/SPDCCH scheduling PDSCH transmission(s) and PDCCH/EPDCCH/SPDCCH indicating downlink SPS release in a subframe/slot.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 271 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9,184,881 Claim 5

Evidence

5. The method according to claim 1, wherein in the uplink sub-frames fed back to the eNodeB, the user equipment, according to the order of serial numbers of the received downlink sub-frames which transmit the data, receives

Every claim limitation of claim 1 is present in the Accused Device as described above and incorporated herein by reference.

The Accused Device is configured wherein in the uplink sub-frames fed back to the eNodeB, the user equipment, according to the order of serial numbers of the received downlink sub-frames which transmit the data, receives each downlink sub-frame which transmits the data and feeds back corresponding confirmation information.

Upon information and belief, the Accused Device is configured to receive from eNB subframe-PDSCH within subframe/slot(s) $n-k$ of a serving cell for which HARQ-ACK response will be provided by the Accused Device in UL subframe/slot n . The number value of the downlink

each downlink sub-frame which transmits the data and feeds back corresponding confirmation information.

sub-frame PDSCH is received by the Accused Device in the downlink control information PDCCH.

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
 - if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
 - if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
 - the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the downlink subframes PDSCH are transmitted on a plurality of continuous downlink sub-frames after the sub-frame carrying the downlink control information PDCCH. The PDSCH sub-frames are transmitted within continuous subframe/slot(s) $n-k$.

The Accused Device is configured to detect PDSCH transmission within subframe/slot(s) $n-k$. The PDSCH transmission within these subframe/slot(s) is intended for HARQ-ACK response from the Accused Device configured as the UE.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n-k$, where $k \in K$, intended for the UE and for which

HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

- Table 10.1.3.1-1E if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 0, 5, 9, and 10,
- Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* for special subframe configuration 3, 4, and 8,
- Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 1, 2, 6, 7,
- Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-based PDSCH and
- Table 10.1.3.1-1 otherwise.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

	Screenshot showing Downlink association set from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 426 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 6	Evidence
6. The method according to claim 1, wherein in a situation that the user equipment fails to receive the data of in the sub-frame, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame;	Every claim limitation of claim 1 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein in a situation that the user equipment fails to receive the data of in the sub-frame, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement if it has not received subframe PDSCH for a serving cell on subframe $n-k$. - If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter <i>codebooksizeDetermination-r13</i> = <i>cc</i>, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK; - the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect

	the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
6a. in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.	The Accused Device is configured such that in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information. Upon information and belief, the Accused Device is configured to detect the PDCCH transmission and analyse the data in the PDSCH sub-frame. In case the Accused Device configured as the UE detects that at least one downlink assignment is missing, it generates a NACK-HARQ acknowledgement. Else, in case the analysis of data in the PDSCH sub-frame does not result in missing any downlink assignment, a positive HARQ-ACK is generated. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. - For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

	Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 7	Evidence
7. The method according to claim 6, wherein in a situation that the data in the downlink sub-frame that transmits the data is sent as a single codeword stream, each piece of confirmation information in the uplink sub-frame fed back by the user equipment to the eNodeB corresponds to a codeword stream of one downlink sub-frame that transmits the data;	Every claim limitation of claim 6 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured such that in a situation that the data in the downlink sub-frame that transmits the data is sent as a single codeword stream, each piece of confirmation information in the uplink sub-frame fed back by the user equipment to the eNodeB corresponds to a codeword stream of one downlink sub-frame that transmits the data. Upon information and belief, when the Accused Device configured as the UE detects only the PDSCH transmission associated with a single codeword 0 within the bundled subframes, the UE generates NACK for the codeword 1. For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).
7a. in a situation that the data in the downlink sub-frame that transmits the data is sent as multiple codeword streams, for one downlink sub-frame that transmits the data, the user	The Accused Device is configured such that in a situation that the data in the downlink sub-frame that transmits the data is sent as multiple codeword streams, for one downlink sub-frame that transmits the data, the user equipment acquires the confirmation information corresponding to each codeword stream thereof, in a situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement; in a situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement.

equipment acquires the confirmation information corresponding to each codeword stream thereof, in a situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement;

Upon information and belief, in a situation the Accused Device receives the downlink sub-frame PDSCH as multiple codeword streams, the confirmation information corresponding to each codeword stream is received thereof by the Accused Device. Further, for TDD HARQ-ACK bundling or HARQ-ACK multiplexing, the Accused Device configured as the UE generates one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot.

Upon information and belief, the logical AND operation on each codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot satisfies the situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement.

For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter *harq-Bundling* in *ce-PDSCH-MultiTB-Config* and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI,

- for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate M HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle A_b where $b = 1, \dots, M$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled} .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the

	Accused Device (available on pages 265 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). For subframe-PUSCH and TDD HARQ-ACK multiplexing and a subframe n with $M > 1$, spatial HARQ-ACK bundling across multiple codewords within a downlink or special subframe is performed by a logical AND operation of all the corresponding individual HARQ-ACKs. In case the UE is transmitting on PUSCH, the UE shall determine the number of HARQ-ACK feedback bits O^{ACK} and the HARQ-ACK feedback bits o_n^{ACK}, $n = 0, \dots, O^{ACK} - 1$ to be transmitted in subframe n. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 271 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
7b. in a situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement.	The Accused Device is configured such that in a situation that the data in the downlink sub-frame that transmits the data is sent as multiple codeword streams, for one downlink sub-frame that transmits the data, the user equipment acquires the confirmation information corresponding to each codeword stream thereof, in a situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement; in a situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement. Upon information and belief, in a situation the Accused Device receives the downlink sub-frame PDSCH as multiple codeword streams, the confirmation information corresponding to each codeword stream is received thereof by the Accused Device. Further, for TDD HARQ-ACK bundling or HARQ-ACK multiplexing, the Accused Device configured as the UE generates one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot. Upon information and belief, the logical AND operation on each codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot satisfies the situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement.

For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter *harq-Bundling* in *ce-PDSCH-MultiTB-Config* and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI,

- for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate M HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle A_b where $b = 1, \dots, M$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 257 from

https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled} .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 265 from

https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For subframe-PUSCH and TDD HARQ-ACK multiplexing and a subframe n with $M > 1$, spatial HARQ-ACK bundling across multiple codewords within a downlink or special subframe is performed by a logical AND operation of all the corresponding individual HARQ-ACKs. In case the UE is transmitting on PUSCH, the UE shall determine the number of HARQ-ACK feedback bits O^{ACK} and the HARQ-ACK feedback bits o_n^{ACK} , $n = 0, \dots, O^{ACK} - 1$ to be transmitted in subframe n .

	Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 271 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 8	Evidence
8. The method according to claim 1, wherein in a situation that the downlink sub-frames sent by the eNodeB to the user equipment includes special sub-frames which cannot transmit data, the user equipment does not consider the special sub-frames when feeding back the confirmation information.	Every claim limitation of claim 1 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein in a situation that the downlink sub-frames sent by the eNodeB to the Accused Device, configured as the user equipment, includes special sub-frames which cannot transmit data, the user equipment does not consider the special sub-frames when feeding back the confirmation information. The Accused Device is configured to detect PDSCH transmission within subframe/slot(s) $n-k$, where $k \in K$. The PDSCH transmission within these subframe/slot(s) is intended for HARQ-ACK response from the Accused Device configured as the UE. The HARQ-ACK response is transmitted in UL subframe/slot n. The value of 'K' depends upon the special subframe configuration. Upon information and belief, for TDD the special subframe of the serving cell is excluded from the HARQ-ACK codebook size determination.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n-k$, where $k \in K$, intended for the UE and for which

HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

- Table 10.1.3.1-1E if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 0, 5, 9, and 10,
- Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* for special subframe configuration 3, 4, and 8,
- Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* for slot-PDSCH and special subframe configuration 1, 2, 6, 7,
- Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-based PDSCH and
- Table 10.1.3.1-1 otherwise.

For TDD, when PUCCH format 3/4/5 is configured for transmission of HARQ-ACK,

- for special subframe configurations 0, 5 and 10 if configured by *ssp10-CRS-LessDwPTS* with normal downlink CP or configurations 0 and 4 with extended downlink CP in a serving cell, shown in table 4.2-1 [3], the special subframe of the serving cell is excluded from the HARQ-ACK codebook size determination. In this case, if the serving cell is the primary cell, there is no PDCCH/EPDCCH indicating downlink SPS release in the special subframe.
- for special subframe configurations 1, 2, 6, and 7 and slot-PDSCH, the second slot of DwPTS of the serving cell is excluded from the HARQ-ACK codebook size determination. In this case, if the serving cell is the primary cell, there is no PDCCH/SPDCCH indicating downlink SPS release in the second slot of DwPTS.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from

https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

Table 10.1.3.1-1B: Downlink association set $K^A : \{k_0^A, k_1^A, \dots, k_{M^A-1}^A\}$ for TDD and UE configured with higher layer parameter *shortProcessingTime*

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	-	3	3	-	-	-	3	3
1	-	-	3	3	-	-	-	3	3	-
2	-	-	3	-	-	-	-	3	-	-
3	-	-	5	4	3	-	-	-	-	-
4	-	-	6	3	-	-	-	-	-	-
5	-	-	3	-	-	-	-	-	-	-
6	-	-	6	4	4	-	-	6	3	-

Table 10.1.3.1-1C: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD with special subframe configuration 1, 2, 6, 7 and UE configured with higher layer parameter *shortTTI*

UL/DL Configurati on	slot n																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0					4	4	4								4	4	4			
1					6,5	5,4	4								6,5	5,4	4			
2					8,7, 12	7,6, 5,4									8,7,1 2	7,6,5 ,4				
3					14, 13, 12	12,1 1, 10	10, 9	9,8	8, 7	7										
4					16, 15, 14, 13	13,1 2, 11,1 0	10, 9, 8,7	7,6, 5												
5					18, 17, 16, 15, 14, 13, 12,22	12,1 1, 10,9, 8,7,6 ,5,4														
6					6	6	6	6	6						4	4	4			

Table 10.1.3.1-1D: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD with special subframe configuration 3, 4 or 8 and UE configured with higher layer parameter *shortTTI*

UL/DL Configurati on	slot n																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0					4	4	4	4							4	4	4	4	
1					6,5	5,4	4	4							6,5	5,4	4	4	
2					8,7, 12,11	7,6, 5,4									8,7,1 2,11	7,6,5 ,4			
3					14, 13, 12	12,1 1, 10	10, 9	9,8	8, 7	7 , 6									
4					16, 15, 14, 13	13,1 2, 11,1 0	10, 9, 8,7	7,6, 5,4											
5					18, 17, 16, 15, 14, 13, 12,22 ,21	12,1 1, 10,9, 8,7,6 ,5,4													
6					6	6	6	6	6	6					4	4	4	4	

Table 10.1.3.1-1E: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD with special subframe configuration 0, 5, 9, 10 and UE configured with higher layer parameter *shortTTI*

UL/DL Configurati on	slot n																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0					4	4	4								4	4	4		
1					6,5	5	5	5							6,5	5	5	5	
2					8,7, 12	7,6, 5,4									8,7,1 2	7,6,5 ,4			
3					14, 13, 12	12,1 1, 10	10, 9	9,8	8, 7	7									
4					16, 15, 14, 13	13,1 2, 11,1 0	10, 9, 8,7	7,6, 5											
5					18, 17, 16, 15, 14, 13, 12,22	12,1 1, 10,9, 8,7,6 ,5,4													
6					6,5		6,5		6						4	4	4		

Screenshot showing Downlink association sets from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 426-428 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9,184,881 Claim 9

Evidence

9. A method for feeding back confirmation information on a physical uplink shared channel, wherein, when the confirmation information is fed back together

This is the preamble of the claim and is not limiting. This element, if construed as a limitation, is present literally and under the doctrine of equivalents in the Accused Device.

The Accused Device is a smartphone device comprising 5nm Octa-Core (2.8GHz, 2.4GHz, 1.8GHz) processor, Dynamic AMOLED 2X 120 Hz display, high resolution front and rear cameras, 8GB RAM with 128GB/256GB internal storage and 4000mAh battery. The Accused Device is

with uplink data on the physical uplink shared channel, in a situation that a user equipment fails to detect a physical downlink control channel corresponding to transmitted data in a sub-frame transmitting data, the user equipment feeds back a negative acknowledgement message as confirmation information of this downlink sub-frame;

configured to support features like Biometric Authentication: Ultrasonic Fingerprint and Face recognition, Hybrid Optic Zoom, 8K Video quality, Zoom Lock etc.

The Accused Device is available in different models varying based on Cell Phone Carrier, Internal Memory and Color. The various models available for the Accused Device are SM-G991UZAAXAA, SM-G991UZAAXAA, SM-G991UZAATMB, SM-G991UZAAATT, SM-G991UZAASPR, SM-G991UZAAUSC, SM-G991UZAEXAA, SM-G991UZAEVZW, SM-G991UZAETMB, SM-G991UZAEATT, SM-G991UZAESPR, SM-G991UZAEUUSC, SM-G991UZWAXAA, SM-G991UZWAVZW, SM-G991UZWATMB, SM-G991UZWAATT, SM-G991UZWASPR, SM-G991UZWAUSC, SM-G991UZVAXAA, SM-G991UZVAVZW, SM-G991UZVATMB, SM-G991UZVAATT, SM-G991UZVASPR, SM-G991UZVAUSC, SM-G991UZIAXAA, SM-G991UZIIVZW, SM-G991UZIATMB, SM-G991UZIAATT, SM-G991UZIASPR, and SM-G991UZIAUSC.



Galaxy S21 5G 128GB (Unlocked)

SM-G991UZVAXAA



Phantom Violet, Business

The phone designed for epic collaboration for the modern workday.

Select your Carrier

Unlocked

Verizon

T-Mobile

AT&T

Sprint

US Cellular

Select your Capacity

128GB

Select your Color

Phantom Gray

Phantom White

Phantom Violet

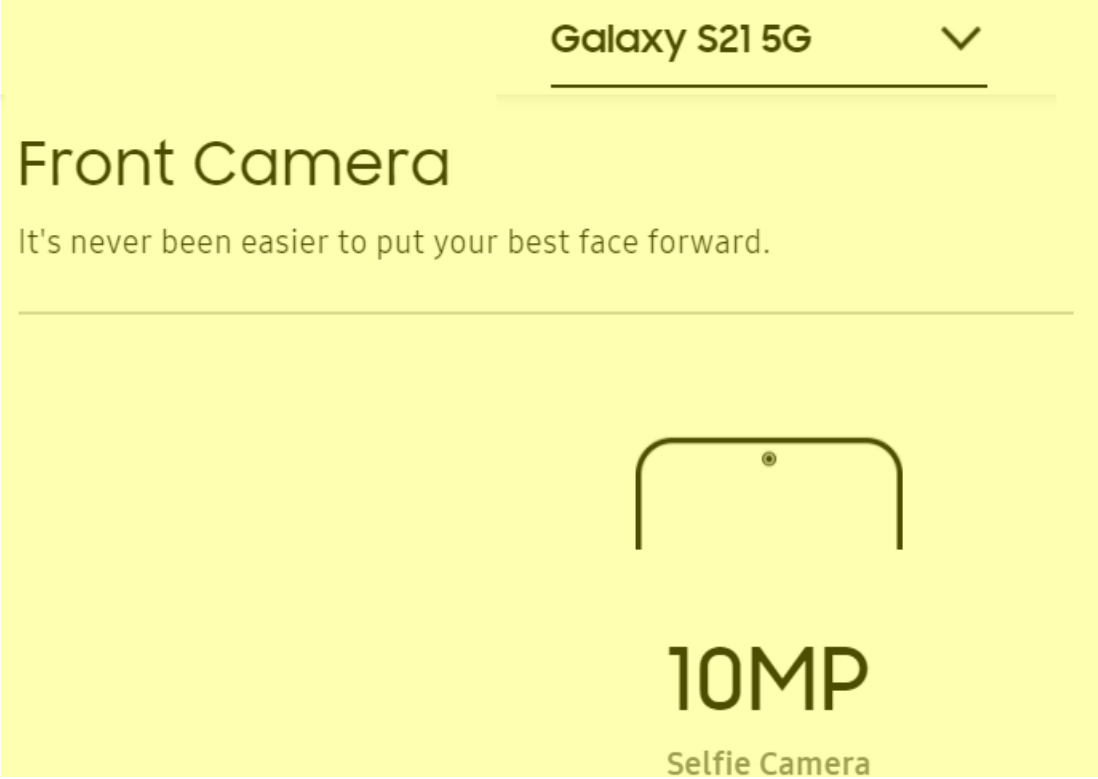
Phantom Pink

Image of the Accused Device Galaxy S21 5G Smartphone SM-G991UZVAXAA (available from

<https://www.samsung.com/us/business/mobile/phones/galaxy-s/galaxy-s21-5g-128gb-unlocked-sm-g991uzvaxaa/>).



Screenshot showing Image of the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/>).



Galaxy S21 5G

Rear Camera & Zoom

Capture incredible detail and clarity, all with a tap.

1

12MP

Ultra Wide Camera

2

12MP

Wide-angle Camera

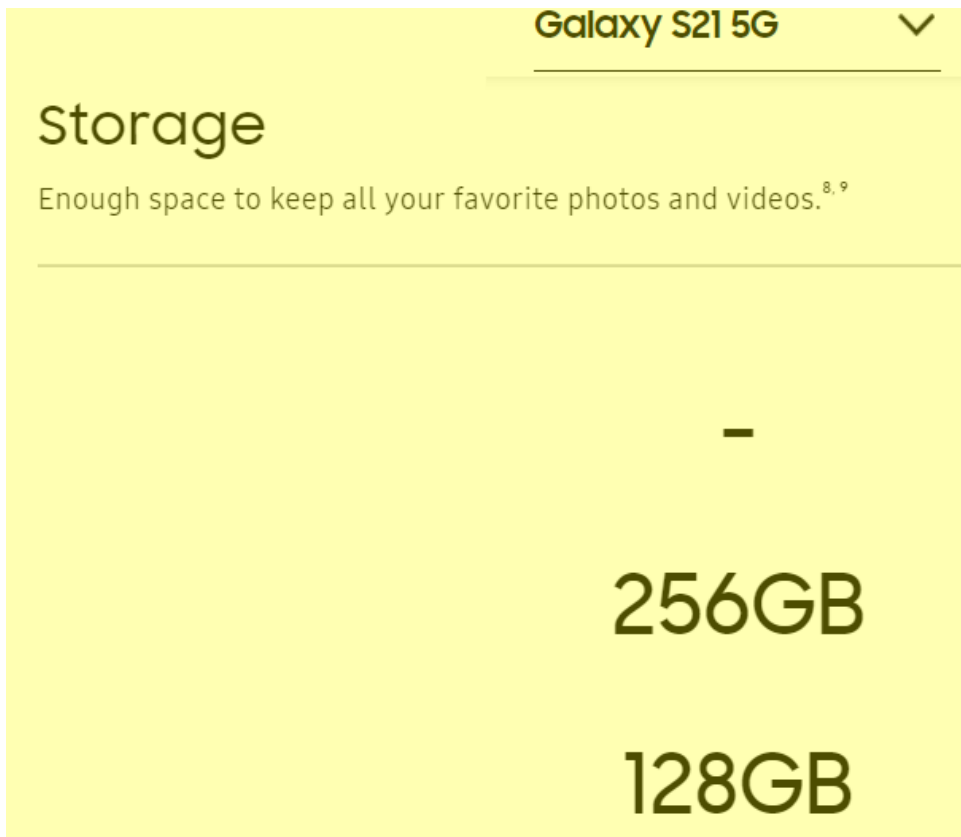
3

64MP

Telephoto Camera

30X

Space Zoom⁵



Screenshot showing features of the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/models/>).

NEW

Galaxy S21 5G



Colors^b



Screen Size^c

6.2"

Weight

6.03 oz.

Max. Refresh Rate

120Hz

Rear Quad Camera^d

Wide: 12MP AF (f/1.8)

Ultra wide: 12MP (f/2.2)

Telephoto: 64MP (f/2.0)

FHD Video recording up to 120fps in Pro Video Mode.

	Front Camera 10MP AF Battery^e 4,000 mAh Storage^f 128GB/256GB S Pen Support^g No Dimensions 2.80" x 5.97" x 0.31" Screenshot showing features of the Accused Device (available from https://www.samsung.com/us/smartphones/galaxy-s21-5g/buy/). The Accused Device can be configured as a mobile terminal to support 5G telecommunications standard for providing services like hyper-fast content streaming, faster uploads and downloads, and optimizing gameplay.
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Galaxy S21 5G 128GB (Unlocked)

[FEATURES](#) [SPECS](#) [RESOURCES](#) [SUPPORT](#)



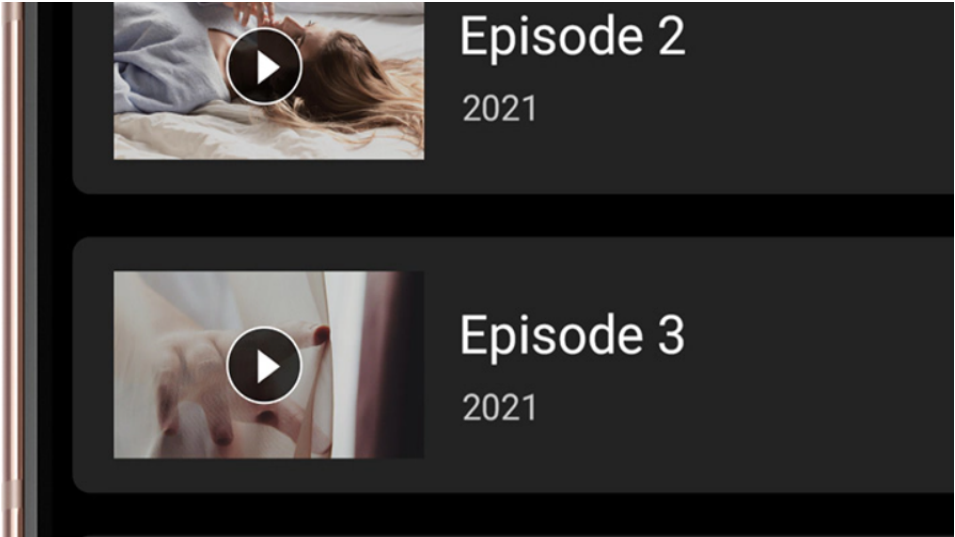
Innovation Comes Fast. Be Ready with 5G.

Nothing can slow you down with the Galaxy S21 and a 5G connection. Download large files quickly, video chat with virtually no lag, and always be connected when you create your own secure 5G hotspot.⁷

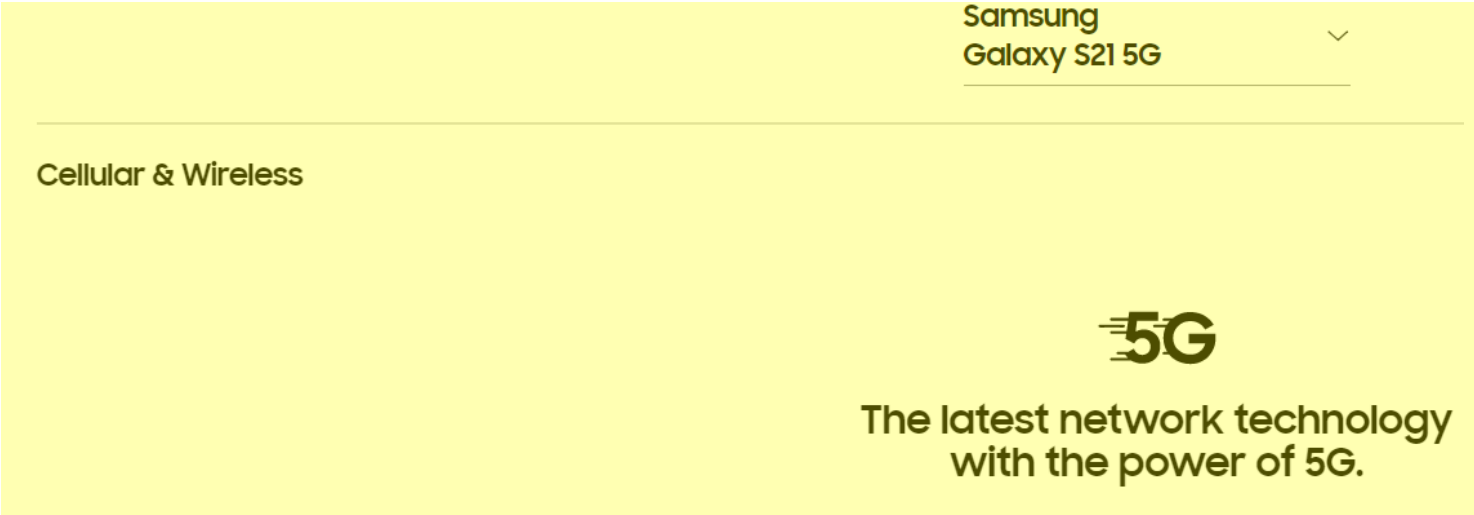


Screenshots showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/business/mobile/phones/galaxy-s/galaxy-s21-5g-128gb-unlocked-sm-g991uzvaxaa/>).

HyperFast 5G lets you download a whole season of your favorite show in a flash. The 5G-compatible chipset delivers faster speeds to keep you connected as you upload or download.^{16, 17, 18} While Wi-Fi 6 connects you to everything you love quickly and reliably.¹⁹



Screenshot showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/performance/>).



Screenshot showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/compare/?device-1=samsung-galaxy-s21-fe-5g&device-2=samsung-galaxy-s21-5g&device-3=samsung-galaxy-s21%2B-5g>).

Q. What is 5G?

A. 5G is a fifth-generation wireless network technology that delivers up to 100 times current 4G speed. Check with your carrier for specific coverage information.

Screenshot showing 5G technology standard supported by the Accused Device (available from <https://www.samsung.com/us/smartphones/galaxy-s21-5g/buy/>).

Upon information and belief, the Accused Device is configured as a User Equipment Terminal and supports 3GPP 5G Standard, including but not limited to 3GPP TS 36.213 version 16.2.0 Release 16 (LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures).

ETSI TS 136 213 V16.2.0 (2020-09)



**LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Physical layer procedures
(3GPP TS 36.213 version 16.2.0 Release 16)**

1 Scope

The present document specifies and establishes the characteristics of the physical layer procedures in the FDD and TDD modes of E-UTRA.

Screenshot showing the scope of standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 10)

from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the Accused Device, configured as the User Equipment, is configured to feedback confirmation information to an eNB in response to receiving a downlink sub-frame.

10 Physical uplink control channel procedures

If the UE is configured with *shortTTI*, PUCCH in this clause refers to SPUCCH defined in [3] if the HARQ-ACK is sent in response to PDSCH scheduled by DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G or scheduling request is sent on resources configured by higher layer parameter *sr-slotSPUCCH-IndexFH* or *sr-slotSPUCCH-IndexNoFH* or *sr-subslotSPUCCH-Resource* for slot/subslot-based transmissions, unless otherwise noted.

Screenshot showing Physical uplink control channel procedures from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 395 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
 - if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
 - if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;

- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

In a Time Division Duplex System, the Accused Device is configured to transmit HARQ-ACK response in Uplink subframe/slot upon detection of a PDSCH transmission by eNB.

7.3.2.1 TDD HARQ-ACK reporting procedure for same UL/DL configuration

Unless otherwise stated, the procedure in this subclause applies to non-BL/CE UEs.

For TDD, the UE shall upon detection of a PDSCH transmission or a PDCCH/EPDCCH/SPDCCH indicating downlink SPS release (defined in Subclause 9.2) within subframe/slot(s) $n - k$, where $k \in K$, intended for the UE and for which HARQ-ACK response shall be provided, transmit the HARQ-ACK response in UL subframe/slot n and K is defined in

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 263 and 264 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement if it has not received subframe PDSCH for a serving cell on subframe $n - k$.

- If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK;

	- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9a. in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information;	The Accused Device is configured such that in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information. Upon information and belief, the Accused Device is configured to detect the PDCCH transmission and analyse the data in the PDSCH sub-frame. In case the Accused Device configured as the UE detects that at least one downlink assignment is missing, it generates a NACK-HARQ acknowledgement. Else, in case the analysis of data in the PDSCH sub-frame does not result in missing any downlink assignment, a positive HARQ-ACK is generated.

If the UE is configured with higher layer parameter *shortTTI*, and the UE transmits slot/subslot-PUSCH on slot/subslot *s* of subframe *n* without associated PDCCH/SPDCCH or with associated PDCCH/SPDCCH with DCI format 7-0A/7-0B and if the UE is not configured with simultaneous PUSCH and PUCCH transmission,

- the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH on the slot/subslot-PUSCH if the UE has received subframe-PDSCH on subframe $n - k$ of a serving cell and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;
- if the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter *codebooksizeDetermination-r13* = *cc*, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUSCH if the UE has received slot/subslot-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/SPDCCH with DCI format 7-1A/7-1B/7-1C/7-1D/7-1E/7-1F/7-1G for which HARQ-ACK response shall be provided on slot/subslot *s* of subframe *n*, and
 - if the UE has received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for at least one of the serving cell(s) on subframe $n - k$, or
 - if the UE has not received subframe-PDSCH without an associated PDCCH/EPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for any of the serving cell(s) on subframe $n - k$, and if the slot/subslot-PUSCH is the first occurrence of the slot/subslot-PUCCH/PUSCH in the subframe;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9b. wherein in a situation that the user equipment feeds back a plurality of groups of the confirmation information, an amount of the

The Accused Device is configured wherein, in a situation that the user equipment feeds back a plurality of groups of the confirmation information, an amount of the confirmation information fed back in each group is equal to a maximum number of codeword streams in this downlink sub-frame, and respective confirmation information in each group corresponds to the confirmation information of the codeword stream of a corresponding downlink sub-frame.

confirmation information fed back in each group is equal to a maximum number of codeword streams in this downlink subframe, and respective confirmation information in each group corresponds to the confirmation information of the codeword stream of a corresponding downlink subframe;

Upon information and belief, for TDD, the Accused Device is configured with HARQ-ACK bundling and HARQ-ACK multiplexing. For HARQ-ACK transmission, the UE generates M bits of HARQ-ACK by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot.

For TDD HARQ-ACK bundling, the UE is configured to generate 2 HARQ-ACK bits when both codeword 0 and 1 are enabled.

For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter *harq-Bundling* in *ce-PDSCH-MultiTB-Config* and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI,

- for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate M HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle A_b where $b = 1, \dots, M$;

Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled} .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 265 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

Table 10.1.3.1-1: Downlink association set $K : \{k_0, k_1, \dots, k_{M-1}\}$ for TDD

UL/DL Configuration	Subframe n									
	0	1	2	3	4	5	6	7	8	9
0	-	-	6	-	4	-	-	6	-	4
1	-	-	7, 6	4	-	-	-	7, 6	4	-
2	-	-	8, 7, 4, 6	-	-	-	-	8, 7, 4, 6	-	-
3	-	-	7, 6, 11	6, 5	5, 4	-	-	-	-	-
4	-	-	12, 8, 7, 11	6, 5, 4, 7	-	-	-	-	-	-
5	-	-	13, 12, 9, 8, 7, 5, 4, 11, 6	-	-	-	-	-	-	-
6	-	-	7	7	5	-	-	7	7	-

Screenshot showing Downlink association set from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on page 426 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9c. in a situation that the number of the codeword streams of the downlink sub-frame is smaller than the maximum number of the codeword streams of the

The Accused Device is so configured that in the situation that the number of codeword streams of the downlink sub-frames is smaller than the maximum number of the codeword streams of the downlink sub-frame, the user equipment feeds back the confirmation information of the number of the maximum codeword streams, wherein confirmation information without a corresponding codeword stream is set as a predefined fixed value.

downlink sub-frame, the user equipment feeds back the confirmation information of the maximum number of the codeword streams, wherein confirmation information without a corresponding codeword stream is set as a predefined fixed value;

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

The patent specifications specifies that for any missing codeword stream of the downlink sub-frame, the confirmation information is set to a default value of NACK information which is considered as a predefined fixed value. To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

	Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9d. when the user equipment fails to detect the physical downlink control channel corresponding to the transmitted data in the sub-frame which transmits the data, the user equipment feeds back the negative acknowledgement message as the confirmation information of each codeword stream in a group corresponding to this downlink sub-frame.	The Accused Device is configured such that when the user equipment fails to detect the physical downlink control channel corresponding to the transmitted data in the sub-frame which transmits the data, the user equipment feeds back the negative acknowledgement message as the confirmation information of each codeword stream in a group corresponding to this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. - If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter <i>codebooksizeDetermination-r13</i> = <i>cc</i>, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 254 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). - For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

	For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 10	Evidence
10. The method according to claim 9, wherein in a situation that the data in the downlink sub-frame that transmits the data is sent as a single codeword stream, each piece of confirmation information in the uplink sub-frame fed back by the user equipment to an eNodeB corresponds to a codeword stream of one downlink sub-frame that transmits the data;	Every claim limitation of claim 9 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured such that in a situation that the data in the downlink sub-frame that transmits the data is sent as a single codeword stream, each piece of confirmation information in the uplink sub-frame fed back by the user equipment to the eNodeB corresponds to a codeword stream of one downlink sub-frame that transmits the data. Upon information and belief, when the Accused Device configured as the UE detects only the PDSCH transmission associated with a single codeword 0 within the bundled subframes, the UE generates NACK for the codeword 1. For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1. For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the

	Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).
10a. in a situation that the data in the downlink sub-frame which transmits the data is sent as multiple codeword streams, for one downlink sub-frame that transmits the data, the user equipment acquires the confirmation information corresponding to each codeword stream thereof, in a situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement;	The Accused Device is configured such that in a situation that the data in the downlink sub-frame that transmits the data is sent as multiple codeword streams, for one downlink sub-frame that transmits the data, the user equipment acquires the confirmation information corresponding to each codeword stream thereof, in a situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement; in a situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement. Upon information and belief, in a situation the Accused Device receives the downlink sub-frame PDSCH as multiple codeword streams, the confirmation information corresponding to each codeword stream is received thereof by the Accused Device. Further, for TDD HARQ-ACK bundling or HARQ-ACK multiplexing, the Accused Device configured as the UE generates one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot. Upon information and belief, the logical AND operation on each codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot satisfies the situation that any one or more pieces of confirmation information among the confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement. For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter <i>harq-Bundling</i> in <i>ce-PDSCH-MultiTB-Config</i> and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI, - for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate M HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle A_b where $b = 1, \dots, M$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter *shortTTI* and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter *shortProcessingTime* and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled} .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 265 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For subframe-PUSCH and TDD HARQ-ACK multiplexing and a subframe n with $M > 1$, spatial HARQ-ACK bundling across multiple codewords within a downlink or special subframe is performed by a logical AND operation of all the corresponding individual HARQ-ACKs. In case the UE is transmitting on PUSCH, the UE shall determine the number of HARQ-ACK feedback bits O^{ACK} and the HARQ-ACK feedback bits o_n^{ACK} , $n = 0, \dots, O^{ACK} - 1$ to be transmitted in subframe n .

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 271 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

10b. in a situation that all the confirmation information acquired is the acknowledgement

The Accused Device is configured such that in a situation that the data in the downlink sub-frame that transmits the data is sent as multiple codeword streams, for one downlink sub-frame that transmits the data, the user equipment acquires the confirmation information corresponding to each codeword stream thereof, in a situation that any one or more pieces of confirmation information among the

message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement.	confirmation information acquired is the negative acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as a negative acknowledgement; in a situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement. Upon information and belief, in a situation the Accused Device receives the downlink sub-frame PDSCH as multiple codeword streams, the confirmation information corresponding to each codeword stream is received thereof by the Accused Device. Further, for TDD HARQ-ACK bundling or HARQ-ACK multiplexing, the Accused Device configured as the UE generates one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot. Upon information and belief, the logical AND operation on each codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot satisfies the situation that all the confirmation information acquired is the acknowledgement message, the user equipment sets the confirmation information of this downlink sub-frame as an acknowledgement. For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter <i>harq-Bundling</i> in <i>ce-PDSCH-MultiTB-Config</i> and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI, - for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate M HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle A_b where $b = 1, \dots, M$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). For TDD HARQ-ACK bundling or HARQ-ACK multiplexing and a subframe/slot n with $M = 1$, the UE shall generate one or two HARQ-ACK bits by performing a logical AND operation per codeword across M subframe(s)/slot(s) downlink and special subframes associated with a single UL subframe/slot, of all the corresponding $U_{DAI} + N_{SPS}$ individual PDSCH transmission HARQ-ACKs and individual ACK in response to received PDCCH/EPDCCH/SPDCCH indicating downlink SPS release, where M is the number of elements in the set K defined in Table 10.1.3.1-1D if the UE is configured with higher layer parameter <i>shortTTI</i> and special subframe configuration 3, 4, 8 for slot-PDSCH, in Table 10.1.3.1-1C if the UE is configured with higher layer parameter <i>shortTTI</i> and special subframe configuration 0, 1, 2, 5, 6, 7, 9, 10 for slot-PDSCH, in Table 10.1.3.1-1B if the UE is configured with higher layer parameter <i>shortProcessingTime</i> and the corresponding PDCCH with CRC scrambled by C-RNTI is in the UE-specific search space for subframe-PDSCH and in Table 10.1.3.1-1 otherwise. The UE shall detect if at least one downlink assignment has been missed, and for the case that the UE is transmitting on PUSCH the UE shall also determine the parameter N_{bundled}.
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	Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 265 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). For subframe-PUSCH and TDD HARQ-ACK multiplexing and a subframe n with $M > 1$, spatial HARQ-ACK bundling across multiple codewords within a downlink or special subframe is performed by a logical AND operation of all the corresponding individual HARQ-ACKs. In case the UE is transmitting on PUSCH, the UE shall determine the number of HARQ-ACK feedback bits O^{ACK} and the HARQ-ACK feedback bits o_n^{ACK}, $n = 0, \dots, O^{ACK} - 1$ to be transmitted in subframe n. Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 271 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 11	Evidence
11. The method according to claim 2, wherein in a situation that the user equipment fails to detect a physical downlink control channel corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame;	Every claim limitation of claim 2 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein in a situation that the user equipment fails to detect a physical downlink control channel corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement if it has not received subframe PDSCH for a serving cell on subframe $n-k$. - If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter <i>codebooksizeDetermination-r13</i> = <i>cc</i>, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK;

	- the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
11a. in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.	The Accused Device is configured such that in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information. Upon information and belief, the Accused Device is configured to detect the PDCCH transmission and analyse the data in the PDSCH sub-frame. In case the Accused Device configured as the UE detects that at least one downlink assignment is missing, it generates a NACK-HARQ acknowledgement. Else, in case the analysis of data in the PDSCH sub-frame does not result in missing any downlink assignment, a positive HARQ-ACK is generated. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9,184,881 Claim 12

Evidence

12. The method according to claim 3, wherein in a situation that the user equipment fails to

Every claim limitation of claim 3 is present in the Accused Device as described above and incorporated herein by reference.

The Accused Device is configured wherein in a situation that the user equipment fails to detect a physical downlink control channel

detect a physical downlink control channel corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame;	corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement if it has not received subframe PDSCH for a serving cell on subframe $n-k$. - If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter <i>codebooksizeDetermination-r13</i> = <i>cc</i>, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK; - the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
12a. in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation	The Accused Device is configured such that in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information. Upon information and belief, the Accused Device is configured to detect the PDCCH transmission and analyse the data in the PDSCH sub-frame. In case the Accused Device configured as the UE detects that at least one downlink assignment is missing, it generates a NACK-HARQ acknowledgement. Else, in case the analysis of data in the PDSCH sub-frame does not result in missing any downlink assignment, a positive HARQ-ACK is generated.

information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, N_{bundled} is determined by the UE as $N_{\text{bundled}} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it.

Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

9,184,881 Claim 13	Evidence
13. The method according to claim 4, wherein in a situation that the user equipment fails to detect a physical downlink control channel corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame;	Every claim limitation of claim 4 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein in a situation that the user equipment fails to detect a physical downlink control channel corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement if it has not received subframe PDSCH for a serving cell on subframe $n-k$. - If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter <i>codebooksizeDetermination-r13</i> = <i>cc</i>, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK; - the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
13a. in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame	The Accused Device is configured such that in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.

transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.

Upon information and belief, the Accused Device is configured to detect the PDCCH transmission and analyse the data in the PDSCH sub-frame. In case the Accused Device configured as the UE detects that at least one downlink assignment is missing, it generates a NACK-HARQ acknowledgement. Else, in case the analysis of data in the PDSCH sub-frame does not result in missing any downlink assignment, a positive HARQ-ACK is generated.

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

	To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
9,184,881 Claim 14	Evidence Every claim limitation of claim 5 is present in the Accused Device as described above and incorporated herein by reference. The Accused Device is configured wherein in a situation that the user equipment fails to detect a physical downlink control channel corresponding to transmitted data in the sub-frame transmitting the data, or fails to receive the data thereof, the user equipment feeds back a negative acknowledgement message as the confirmation information of this downlink sub-frame. Upon information and belief, the Accused Device is configured to generate NACK acknowledgement if it has not received subframe PDSCH for a serving cell on subframe $n-k$. - If the UE is configured with no more than five serving cells or if the UE is configured with higher layer parameter <i>codebooksizeDetermination-r13</i> = <i>cc</i>, the UE shall transmit the HARQ-ACK corresponding to subframe-PDSCH for all serving cells on the slot/subslot-PUCCH regardless whether the UE has received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D associated with subframe-PDSCH for any of the serving cell(s) on subframe $n - k$. If the UE has not received subframe-PDSCH for a serving cell on subframe $n - k$, the corresponding HARQ-ACK bit(s) is NACK; - the corresponding HARQ-ACK bit(s) is NACK, if the UE has not received subframe-PDSCH without an associated PDCCH/SPDCCH or with an associated PDCCH/EPDCCH with DCI format 1/1A/1B/1D/2/2A/2B/2C/2D for a serving cell(s) on subframe $n - k$; Screenshot showing UE procedure for reporting HARQ-ACK from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 256 and 257 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).

14a. in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.

The Accused Device is configured such that in a situation that the user equipment detects the physical downlink control channel corresponding to the transmitted data in the sub-frame transmitting the data, the user equipment analyzes the data in this downlink sub-frame, and feeds back an acknowledgement message as the confirmation information in a situation that the analysis is successful, otherwise, the negative acknowledgement message is fed back as the confirmation information.

Upon information and belief, the Accused Device is configured to detect the PDCCH transmission and analyse the data in the PDSCH sub-frame. In case the Accused Device configured as the UE detects that at least one downlink assignment is missing, it generates a NACK-HARQ acknowledgement. Else, in case the analysis of data in the PDSCH sub-frame does not result in missing any downlink assignment, a positive HARQ-ACK is generated.

Upon information and belief, the Accused Device is configured to generate NACK acknowledgement for all the codewords whose downlink assignment has been missed. For example, when the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

- For the case that the UE is transmitting on PUSCH and the PUSCH transmission is performed based on a detected PDCCH/EPDCCH/SPDCCH with DCI format 0/4/7-0A/7-0B intended for the UE and TDD UL/DL configurations 1-6, if $V_{DAI}^{UL} \neq (U_{DAI} + N_{SPS} - 1) \bmod 4 + 1$ the UE detects that at least one downlink assignment has been missed and the UE shall generate NACK for all codewords where $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL} + 2$. If the UE does not detect any downlink assignment missing, $N_{bundled}$ is determined by the UE as $N_{bundled} = V_{DAI}^{UL}$. UE shall not transmit HARQ-ACK if $U_{DAI} + N_{SPS} = 0$ and $V_{DAI}^{UL} = 4$.

Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 266 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf).

For TDD HARQ-ACK bundling, when the UE is configured by transmission mode 3, 4, 8, 9 or 10 defined in Subclause 7.1 and HARQ-ACK bits corresponding to a subframe-PDSCH are transmitted on PUSCH, the UE shall always generate 2 HARQ-ACK bits assuming both codeword 0 and 1 are enabled. For the case that the UE detects only the PDSCH transmission associated with codeword 0 within the bundled subframes, the UE shall generate NACK for codeword 1.

For TDD HARQ-ACK bundling, when HARQ-ACK response corresponds to a slot-PDSCH, the UE shall always generate 1 HARQ-ACK bit.

	Screenshot showing TDD HARQ-ACK reporting procedure from standard 3GPP TS 36.213 version 16.2.0 Release 16 supported by the Accused Device (available on pages 269 from https://www.etsi.org/deliver/etsi_ts/136200_136299/136213/16.02.00_60/ts_136213v160200p.pdf). To the extent that this step is not literally present in the Accused Device, the Accused Device would nevertheless infringe under the doctrine of equivalents, because the Accused Device performs a step that is, if not literally the step recited in the claim, then equivalent to it. Plaintiff reserves the right to supplement these infringement contentions once it has been afforded the opportunity to review and inspect the internal hardware (e.g., data processors and other internal components), and software (e.g., software and firmware).
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