



(51) International Patent Classification:

H04L 1/00 (2006.01) H04L 1/18 (2006.01)  
H04L 1/16 (2006.01) H04L 5/00 (2006.01)

(21) International Application Number:

PCT/EP2020/061052

(22) International Filing Date:

21 April 2020 (21.04.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

16/393516 24 April 2019 (24.04.2019) US

(71) Applicant: **TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)** [SE/SE]; SE-164 83 Stockholm (SE).

(72) Inventors: **KARAKI, Reem**; Adalbertsteinweg 45, 52070 AACHEN (DE). **CHENG, Jung-Fu**; 1806 Mandan Place, FREMONT, 94539 (US). **KOORAPATY, Havish**; 13425 Kodiak Place, SARATOGA, 95070 (US). **FALAHATI, Sorour**; Wargentinsgatan 6, 112 29 Stockholm (SE). **LIU, Yuhang**; Särklandsgatan 3, 224 74 Lund (SE). **RUNE, Johan**; Terrängvägen 12, 181 29 LIDINGÖ (SE).

(74) Agent: **ERICSSON**; Patent Development Torshamnsgatan 21-23, 164 80 STOCKHOLM (SE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available):

ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: HARQ-ACK REPORTING WITH PDSCH GROUPING

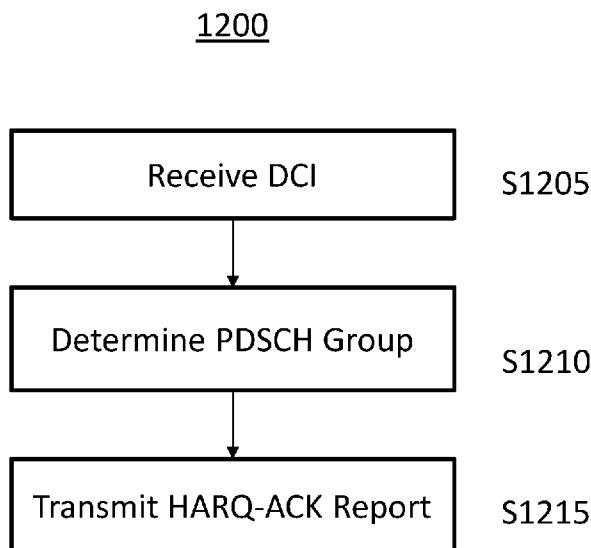


FIG. 12

(57) Abstract: a wireless device receives downlink control information (DCI) from a network node, determines a physical downlink shared channel (PDSCH) group based on information in the received DCI, transmits a hybrid automatic repeat request acknowledgement (HARQ-ACK) report to the network node based on the determined PDSCH group, and receives radio resource control (RRC) configuration information, wherein determining the PDSCH group comprises identifying a PDSCH group index within the DCI based on the received RRC configuration information, the RRC configuration information comprises an indication of whether PDSCH grouping functionality is enabled with respect to the wireless device.



**(88) Date of publication of the international search report:**  
11 March 2021 (11.03.2021)

INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2020/061052

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H04L1/00  
ADD. H04L1/16                    H04L1/18                    H04L5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
H04L H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EPO-Internal, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>HUAWEI: "Feature lead summary of HARQ enhancements for NR-U", 3GPP DRAFT; R1-1905649 FEATURE LEAD SUMMARY FOR 7.2.2.2.3 NRU HARQ RAN96BISV4, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS</p> <p>vol. RAN WG1, no. Xi'an, China; 20190408 - 20190412 10 April 2019 (2019-04-10), XP051707708, Retrieved from the Internet: URL:<a href="http://www.3gpp.org/ftp/tsg%5Fran/WG1%5FRL1/TSGR1%5F96b/Docs/R1%2D1905649%2Ezip">http://www.3gpp.org/ftp/tsg%5Fran/WG1%5FRL1/TSGR1%5F96b/Docs/R1%2D1905649%2Ezip</a> [retrieved on 2019-04-10] * subsection 2.1 *</p> <p style="text-align: center;">----- -/--</p>	1-18

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search  2 February 2021	Date of mailing of the international search report  11/02/2021
--	--

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Garrammone, Giuliano
--	--

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2020/061052

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2019/066630 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 4 April 2019 (2019-04-04)	1-8,18
A	abstract paragraph [0082] - paragraph [0085] figure 5	9-17
A	----- INTERDIGITAL INC: "Scheduling enhancements for NR-based access to unlicensed spectrum", 3GPP DRAFT; R2-1804825 (R15 NRU SI SCHEDULING), 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE  , vol. RAN WG2, no. Sanya, China; 20180416 - 20180420 6 April 2018 (2018-04-06), XP051415659, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg%5Fran/WG2%5FRL2/TSGR2%5F101bis/Docs/ [retrieved on 2018-04-06] * section 2 *	1-18
X	----- VIVO: "Feature lead summary for Configured grant enhancement", 3GPP DRAFT; R1-1901441 SUMMARY ON 7.2.2.2.4 CONFIGURED GRANT ENHANCEMENTS-, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CED  , vol. RAN WG1, no. Taipei; 20190121 - 20190125 24 January 2019 (2019-01-24), XP051601353, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg%5Fran/WG1%5FRL1/TSGR1%5FAH/NR%5FAH%5F1901/Docs/R1%2D1901441%2Ezip [retrieved on 2019-01-24] * section 5 *	9-18
A	* section 5 *	1-8
E	----- WO 2020/205728 A1 (APPLE INC [US]) 8 October 2020 (2020-10-08) abstract paragraph [0033] - paragraph [0061]	9-18
A	----- WO 2018/166447 A1 (HUAWEI TECHNOLOGIES CO LTD) 20 September 2018 (2018-09-20) abstract & EP 3 567 957 A1 (HUAWEI TECH CO LTD [CN]) 13 November 2019 (2019-11-13) paragraph [0307]  -----	1-18

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2020/061052

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-8(completely); 18(partially)

"downlink control information (DCI)", "determining (S1210) a physical downlink shared channel (PDSCH) group based on information in the received DCI" , "receiving radio resource control (RRC) configuration information, wherein determining the PDSCH group comprises identifying a PDSCH group index within the DCI based on the received RRC configuration information, the RRC configuration information comprises an indication of whether PDSCH grouping functionality is enabled with respect to the wireless device"

---

2. claims: 9-17(completely); 18(partially)

"a trigger", "wherein the HARQ-ACK report comprises a new data indicator (NDI) value for a latest received physical downlink shared channel (PDSCH) of each HARQ process to be reported, along with the corresponding HARQ feedback for the latest received PDSCH "

---

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2020/061052

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2019066630	A1	04-04-2019	US 2019103943 A1
			US 2020295882 A1
			WO 2019066630 A1
-----			
WO 2020205728	A1	08-10-2020	NONE
-----			
WO 2018166447	A1	20-09-2018	CN 108574987 A
			EP 3567957 A1
			JP 2020511824 A
			US 2020008229 A1
			WO 2018166447 A1
-----			