(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
05 April 2018 (05.04.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/064555 A2

(51) International Patent Classification:
*H04L 5/00* (2006.01)

(21) International Application Number:
PCT/US2017/054463

(22) International Filing Date:
29 September 2017 (29.09.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/402,748 30 September 2016 (30.09.2016) US
15/718,914 28 September 2017 (28.09.2017) US

(71) Applicant: **QUALCOMM INCORPORATED** [US/US]; ATTN: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121-1714 (US).

(72) Inventors: **SUN, Jing**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **CHEN, Wanshi**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **JI, Tingfang**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **LUO, Tao**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **LEE, Heechoon**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **XU, Hao**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **GAAL, Peter**; c/o Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, California 92121-1714 (US).

(74) Agent: **BINDSEIL, James J.** et al.; c/o Arent Fox LLP, 1717 K Street NW, Washington, District of Columbia 20006-5344 (US).

(54) Title: ASPECTS OF NEW RADIO PDCCH DESIGN

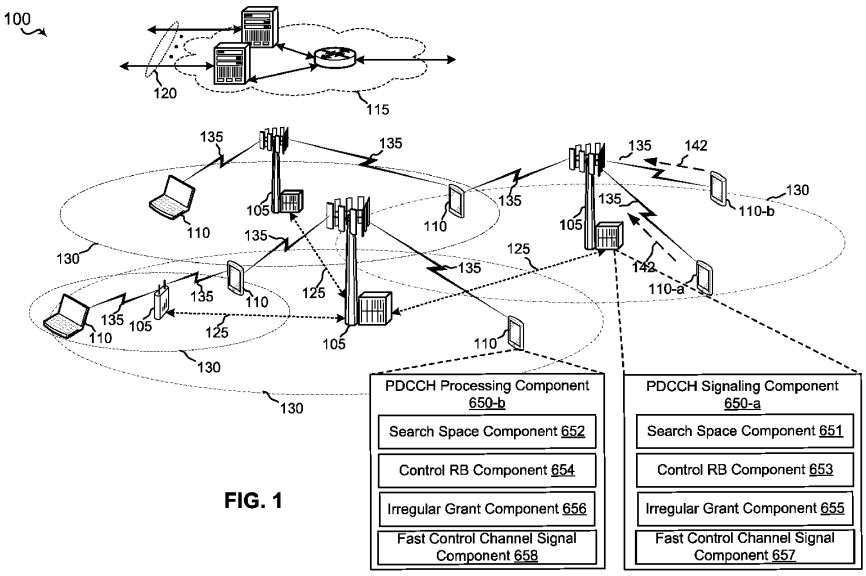


FIG. 1

(57) Abstract: The present disclosure describes various aspects of the implementation and design of Physical Downlink Control Channel (PDCCH) in 5G new radio (NR) applications. Aspects include methods, apparatuses, and computer-readable medium for one or more of multiple PDCCH search spaces, control resource block (CRB), irregular multiple slots or mini-slots grants, or fast control channel signaling for grant-free uplink (UL). For example, different scheduling entities can each have one or two search spaces defined (e.g., common and/or user equipment (UE)-centric search spaces). Also, CRBs can be used as units for PDCCH transmission instead of resource element groups/control channel elements (REGs/CCEs). In addition, irregularities in time domain, frequency domain, or both can be introduced in the granting of resource blocks (RBs) over multiple slots or mini-slots. Moreover, signaling can be used to indicate to a UE configured for grant-free UL the portion of the pool of resources available for grant-free UL.

WO 2018/064555 A2

*[Continued on next page]*

(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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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:**

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*