



- (51) **International Patent Classification:**
H04W 36/30 (2009.01) H04W 72/04 (2009.01)
- (21) **International Application Number:**
PCT/US2019/057665
- (22) **International Filing Date:**
23 October 2019 (23.10.2019)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
62/750,230 24 October 2018 (24.10.2018) US
16/660,328 22 October 2019 (22.10.2019) US
- (71) **Applicant: QUALCOMM INCORPORATED** [US/US];
ATTN: International IP Administration, 5775 Morehouse
Drive, San Diego, California 92121-1714 (US).
- (72) **Inventors: VENUGOPAL, Kiran;** QUALCOMM Incor-
porated, 5775 Morehouse Drive, San Diego, California
92121-1714 (US). **JOHN WILSON, Makesh Pravin;**
QUALCOMM Incorporated, 5775 Morehouse Drive, San
Diego, California 92121-1714 (US). **RYU, Jung Ho;**
QUALCOMM Incorporated, 5775 Morehouse Drive, San
Diego, California 92121-1714 (US). **BAI, Tianyang;**
QUALCOMM Incorporated, 5775 Morehouse Drive, San

Diego, California 92121-1714 (US). **LUO, Tao;** QUAL-
COMM Incorporated, 5775 Morehouse Drive, San Diego,
California 92121-1714 (US). **ZHANG, Xiaoxia;** QUAL-
COMM Incorporated, 5775 Morehouse Drive, San Diego,
California 92121-1714 (US).

(74) **Agent: OLDS, Mark E.;** Muncy, Geissler, Olds & Lowe,
P.C., 4000 Legato Road, Suite 310, Fairfax, Virginia 22033
(US).

(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,

(54) **Title:** BEAM FAILURE RECOVERY WITH SUPPLEMENTARY UPLINK

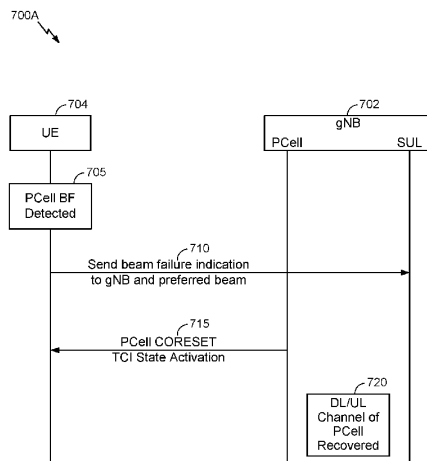


FIG. 7A

(57) **Abstract:** Disclosed are techniques for beam failure recovery in a wireless communications system. In an aspect, a user equipment (UE) detects a beam failure of a first downlink beam received at the UE from a base station, wherein the first downlink beam is a primary downlink beam for a first cell supported by the base station, sends, to the base station, on a supplementary uplink (SUL) beam, a message including an indication of the beam failure and an identification of a second downlink beam to replace the first downlink beam as the primary downlink beam for the first cell, and, based on the base station configuring the second downlink beam as the primary downlink beam for the first cell, establishes an uplink beam for the first cell based on properties of the second downlink beam.

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))