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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 November 2012 (22.11.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/156955 A3

(51) International Patent Classification:
H04J 11/00 (2006.01) *H04B 7/08* (2006.01)

(21) International Application Number:
PCT/IB20 12/052524

(22) International Filing Date:
18 May 2012 (18.05.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/1 10,270 18 May 201 1 (18.05.201 1) US

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(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, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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, 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, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) Title: REDUCED COMPLEXITY RECEIVER FOR UL COMP

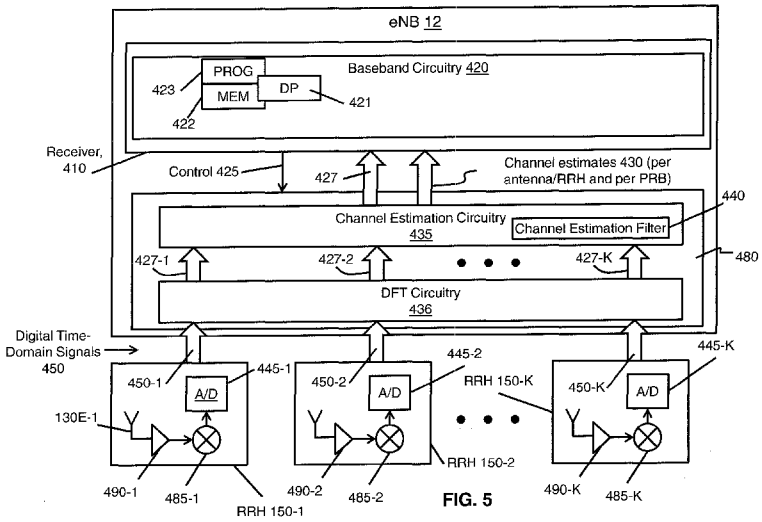

FIG. 5

(57) Abstract: Methods, apparatus and computer program products are disclosed. A method includes receiving signals from a number of antennas, the signals from a number of user equipments and comprising a number of sub-bands allocated to the number of user equipments; selecting, based on one or more criteria and for each of number of selected sub-bands allocated to a selected one of the number of user equipments, one or more antennas of the number of antennas to be used for signal detection and interference suppression on the received signals for the selected user equipment; and performing, for the selected user equipment, the signal detection and interference suppression on the received signals for each of the number of selected sub-bands based on the corresponding selected one or more antennas for each of the number of selected sub-bands to create an output signal.

WO 2012/156955 A3

— *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))*

(88) Date of publication of the international search report:
3 January 2013 (03.01.2013)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB20 12/052524

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: H04B, H04J

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

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Grant, S.; Tidestav, C ; Xinyu Gu; Johansson, N., "Uplink CoMP for HSPA," Vehicular Technology Conference (VTC Spring), 201 1 IEEE 73rd , vol., no., pp.1 ,5 , 15-1 8 May 201 1 doi: 10.1 109/VETECS.201 1.5956383 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=595 6383&isnumber=59561 03; whole document; Sections I-III.b --	1-20

☒ 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

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"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 fding 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

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Date of the actual completion of the international search	Date of mailing of the international search report
17-05-201 3	17-05-201 3

Name and mailing address of the ISA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-1 02 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Sebastian Diskay Telephone No. +46 8 782 25 00

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	3GPP TSG-RAN WG1 #56, "UL CoMP Scheme and System Level Performance Evaluation", R1-090923, Athens, Greece, Feb 9-13, 2009; whole document; Sections 2-2; 8.2	1, 10, 20
A	--	2-9, 11-19
A	Naizheng, Zheng; Boussif, M.; Rosa, C ; Kovacs, I.Z.; Pedersen, K.I.; Wigard, J.; Mogensen, P.E., "Uplink Coordinated Multi-Point for LTE-A in the Form of Macro-Scopic Combining," Vehicular Technology Conference (VTC 2010-Spring), 2010 IEEE 71st , vol., no., pp.1,5, 16-19 May 2010 doi: 10.1109/VETECS.2010.5493982 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5493982&isnumber=5493597; whole document	1-20
	--	
A	Marsch, P.; Fettweis, G., "A Framework for Optimizing the Uplink Performance of Distributed Antenna Systems under a Constrained Backhaul," Communications, 2007. ICC '07. IEEE International Conference on , vol., no., pp.975,979, 24-28 June 2007 doi: 10.1109/ICC.2007.165 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4288836&isnumber=4288671 ; whole document	1-20
	--	
A	3GPP TSG RAN WG1 Meeting #57, "Uplink DM RS from CoMP viewpoint", R1-091760 San Francisco, USA, 4-8 May 2009; whole document	1, 10, 20
	--	
A	3GPP TSG RAN WG1 meeting #56bis, "Considerations on the Uplink Reference Signal for CoMP", R1-091267 Seoul, Korea, March 23-27, 2009; whole document	1, 10, 20
	--	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB20 12/052524

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	3GPP TSG RAN WG1 Meeting #65, "UL CoMP performance w/o inter-cell orthogonal reference signal", R1-111739 Spain, Barcelona, 9-13 May, 2011; whole document --	1, 10, 20
P, X	WO 2011109544 A1 (QUALCOMM INC ET AL), 9 September 2011 (2011-09-09); paragraphs [0001]-[0008], [0106] -- --------	1-20

International application No.
PCT/IB20 12/052524

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International Patent Classification (IPC)

H04J 17/00 (2006.01)
H04B 7/08 (2006.01)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB20 12/052524

WO	201 1109544	A 1	09/09/201 1	CN	102783230	A	14/1 1/201 2
				EP	2543221	A 1	09/01/201 3
				KR	201 201 35286	A	12/1 2/201 2
				US	201 20057535	A 1	08/03/201 2