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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 January 2002 (31.01.2002)

PCT

(10) International Publication Number
WO 02/09305 A3

(51) International Patent Classification[7]: H04B 1/707, 7/08

(21) International Application Number: PCT/US01/22756

(22) International Filing Date: 17 July 2001 (17.07.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/624,319 24 July 2000 (24.07.2000) US

(71) Applicant: QUALCOMM INCORPORATED [US/US]; 5775 Morehouse Drive, San Diego, CA 92121-1714 (US).

(72) Inventors: SMEE, John, E.; Apt. M212, 5220 Fiore Terrace, San Diego, CA 92122 (US). JALALI, Ahmad; 5624 Willowmere Lane, San Diego, CA 92130 (US).

(74) Agents: WADSWORTH, Philip, R. et al.; Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, CA 92121-1714 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

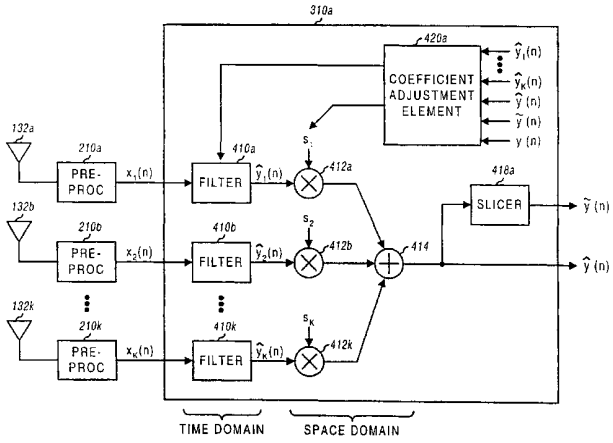
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
23 May 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR PROCESSING A MODULATED SIGNAL USING AN EQUALIZER AND A RAKE RECEIVER



(57) Abstract: In a method for achieving higher S/N, one or more signals are received and processed to provide one or more streams of samples. In a first processing scheme, the sample stream(s) are equalized and combined within an equalizer to generate symbol estimates, which may be subsequently processed (e.g., despread and decovered) to provide a first stream of recovered symbols. The sample stream(s) may be equalized (410) prior to being combined(414). In this case, each sample stream is filtered with a set of coefficients and may be scaled with a scaling factor (412). The scaled samples for all streams are then combined to generate the symbol estimates. Alternatively, the sample stream(s) may be combined prior to being equalized. In this case, each sample stream is scaled by a scaling factor. The scaled samples for all streams are then combined to generate summed samples that are further filtered with a set of coefficients to generate the symbol estimates. The sample stream(s) may also be processed by a second processing scheme with one or more rake receivers to provide a second stream of recovered symbols. The signal quality for each processing shceme can be estimated and used to select either the first or second processing scheme.

WO 02/09305 A3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/22756

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B1/707 H04B7/08

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 7 H04B

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 practical, search terms used)
EPO-Internal, INSPEC, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	GB 2 346 765 A (SIEMENS AG) 16 August 2000 (2000-08-16)	1,2,5,6, 8,10-14, 18-24, 33,34, 36,38, 39, 41-44, 46,47, 51,55
A	abstract	3,7, 15-17, 26,28, 35,37, 40,45,48
	page 2, line 14 -page 8, line 5 page 9, line 36 -page 17, line 16; claims 1-15; figures 3,4	

	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in 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 document 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	Date of mailing of the international search report
21 February 2002	28/02/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Nilsson, M

1

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	RAMOS J ET AL: "LOW-COMPLEXITY SPACE-TIME PROCESSOR FOR DS-CDMA COMMUNICATIONS" IEEE TRANSACTIONS ON SIGNAL PROCESSING, IEEE, INC. NEW YORK, US, vol. 48, no. 1, January 2000 (2000-01), pages 39-52, XP000932219 ISSN: 1053-587X	1,2,5,6, 8,10-14, 18-24, 33,34, 36,38, 39, 41-44, 46,47, 51,55
A	paragraphs '0001!-'00IV!	3,7, 15-17, 26,28, 35,37, 40,45,48
Y	figures 1,2	9
Y	EP 0 961 416 A (NIPPON TELEGRAPH & TELEPHONE) 1 December 1999 (1999-12-01) abstract; figure 13 column 1, line 1 -column 5, line 57	9
X	LEGNAIN A M ET AL: "New adaptive combined space-time receiver for multiuser interference rejection in synchronous CDMA systems" ELECTRICAL AND COMPUTER ENGINEERING, 1998. IEEE CANADIAN CONFERENCE ON WATERLOO, ONT., CANADA 24-28 MAY 1998, NEW YORK, NY, USA,IEEE, US, 24 May 1998 (1998-05-24), pages 421-424, XP010284910 ISBN: 0-7803-4314-X	1,2,5,6, 8,10-14, 18-24, 33,34, 36,38, 39, 41-44, 46,47, 51,55
A	paragraphs '0001!-'00IV!; figure 1	3,7, 15-17, 26,28, 35,37, 40,45,48

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 01/22756

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2346765 A	16-08-2000	CN 1277504 A	20-12-2000
		JP 2000324032 A	24-11-2000
EP 0961416 A	01-12-1999	EP 0961416 A1	01-12-1999
		US 6243412 B1	05-06-2001
		CA 2248345 A1	03-12-1998
		WO 9856121 A1	10-12-1998