## **PCT**

# WORLD INTELLECTUAL PROPERTY ORGANIZATION International Bureau



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

(51) International Patent Classification 7: H04L 5/06, 27/26

**A3** 

(11) International Publication Number:

WO 99/62214

΄ Ι ω

(43) International Publication Date:

2 December 1999 (02.12.99)

(21) International Application Number:

PCT/IB99/00953

(22) International Filing Date:

26 May 1999 (26.05.99)

(30) Priority Data:

9801841-9

26 May 1998 (26.05.98)

SE

(71) Applicant (for all designated States except US): NERA ASA [NO/NO]; P.O. Box 6010, N-5020 Bergen (NO).

(72) Inventor; and

- (75) Inventor/Applicant (for US only): VAHLIN, Anders [SE/NO]; Sundts vei 28, N-5050 Nesttun (NO).
- (74) Agents: ANDERSSON, Per et al.; Albihns Patentbyrå Göteborg AB, P.O. Box 142, S-401 22 Göteborg (SE).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, 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, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, 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), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

#### Published

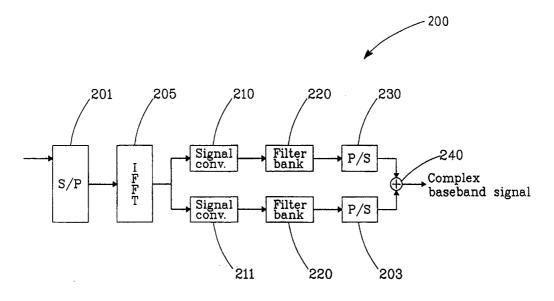
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(88) Date of publication of the international search report:

17 February 2000 (17.02.00)

(54) Title: DEVICE FOR MODULATION AND DEMODULATION IN A MULTI-CARRIER SYSTEM



#### (57) Abstract

Devices for modulation and demodulation in a system for transmission of serial digital information by means of multi-carrier Offset Quadrature Amplitude Modulation. The devices comprise S/P converters, P/S converters, means for inverse Fourier transformation (IFFT), and also at least two pulse-shaping/matching means arranged in each of a first and a second branch, data from which branches is summed in a summator. The pulse-shaping/matching means are designed and connected in such a manner that, in the demodulator, the means for IFFT can be connected directly to the P/S converter and, in the modulator, the S/P converter can be connected directly to the means for IFFT.

### FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

		770		T C	Y .1	SI	Slovenia
AL	Albania	ES	Spain	LS	Lesotho		Slovakia
AM	Armenia	FI	Finland	LT	Lithuania	SK	
AT	Austria	$\mathbf{F}\mathbf{R}$	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav	TM	Turkmenistan
BF	Burkina Faso	GR	Greece		Republic of Macedonia	TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	ΙL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	zw	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 99/00953

A. CLASSIFICATION OF SUBJECT MATTER		
IPC7: H04L 5/06, H04L 27/26 According to International Patent Classification (IPC) or to both no	ational classification and IPC	
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by	y elassification symbols)	
IPC7: H04L		
Documentation searched other than minimum documentation to the	extent that such documents are included in	n 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	ı terms used)
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category* Citation of document, with indication, where app	propriate, of the relevant passages	Relevant to claim No.
A IEEE GLOBECOM"94, Volume, November Francisco), G. Cariolaro and System with a Half Complexit page 237 - page 242, see page	d F. Vagliani, "An OFDM ty",	1-3
<u></u>		
A EP 0656705 A2 (SOCIETÀ ITALIANA DELL'ELETTRONICA S.I.SV.EI.S (07.06.95), page 5, line 2 figures 5-10	S.P.A.), 7 June 1995	1-3
A US 5313169 A (YVON FOUCHE ET AL) (17.05.94), column 9, line 3 figure 3	), 17 May 1994 34 - column 10, line 50,	1-3
Y Further documents are listed in the continuation of Box	x C. X See patent family anne.	x.
* Special categories of cited documents:  "A" document defining the general state of the art which is not considered to be of particular relevance	"I" later document published after the int date and not in conflict with the appli the principle or theory underlying the	cation but cited to understand
"E" erlier 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	"X" document of particular relevance: the considered novel or cannot be considered when the document is taken alon	ered to involve an inventive
"O" document referring to an oral disclosure, use, exhibition or other means	"Y" document of particular relevance: the considered to involve an inventive ste combined with one or more other such than the first the research felling in the	p when the document is h documents, such combination
"P" document published prior to the international filing date but later than the priority date claimed	heing obvious to a person skilled in the "&" document member of the same patent	
Date of the actual completion of the international search	Date of mailing of the international	search report
14 December 1999	2 0 -12- 1999	
Name and mailing address of the ISA/	Authorized officer	
Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Peder Gjervaldsaeter/mj Telephone No. +46 8 782 25 00	
T 205HHHC 140. 1 40 8 000 02 60		

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 99/00953

Catation of document, with indication, where appropriate, of the relevant passages   Relevant to dain	
7 October 1997 (07.10.97), column 11, line 4 - column 12, line 28; column 13, line 15 - column 14, line 48, figures 6,7,9, abstract   A US 5425050 A (WILLIAM F. SCHREIBER ET AL), 13 June 1995 (13.06.95), column 4, line 50 - column 5, line 2, figures 3-4   A EP 0837582 A2 (ALPINE ELECTRONICS, INC.), 22 April 1998 (22.04.98), page 3, line 21 - page 5, line 55   A IEEE TRANSACTIONS ON BROADCASTING, Volume 41, No 1, March 1995, Williagm Y. Zou and Yiyan WU, "COFDM:	im No.
13 June 1995 (13.06.95), column 4, line 50 - column 5, line 2, figures 3-4   A EP 0837582 A2 (ALPINE ELECTRONICS, INC.), 22 April 1998 (22.04.98), page 3, line 21 - page 5, line 55   A IEEE TRANSACTIONS ON BROADCASTING, Volume 41, No 1, March 1995, Williagm Y. Zou and Yiyan WU, "COFDM:	
22 April 1998 (22.04.98), page 3, line 21 - page 5, line 55  A IEEE TRANSACTIONS ON BROADCASTING, Volume 41, No 1, March 1995, Williagm Y. Zou and Yiyan WU, "COFDM:	
March 1995, Williagm Y. Zou and Yiyan WU, "COFDM:	
March 1995, Williaqm Y. Zou and Yiyan WU, "COPDM: AN OVERVIEW", page 1 - page 8, see section 3.2	
·	
	,

# INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/IB 99/00953

Patent documer cited in search rep		Publication date		Patent family member(s)		Publication date
EP 0656705	556705 A2	07/06/95	IT IT	1261364 T0930914		20/05/96 00/00/00
US 5313169	313169 A	17/05/94	AT AU CA DE EP ES FI FR JP NO NO SG WO	148970 641071 9091891 2073777 69124690 0513313 2098490 923426 2670062 5504037 306435 922959 46723 9210043	B A A D,T A,B T A,B T B A	15/02/97 09/09/93 25/06/92 31/05/92 05/06/97 19/11/92 01/05/97 29/07/92 05/06/92 24/06/93 01/11/99 27/07/92 20/02/98 11/06/92
US 567557	675572 A	07/10/97	JP	7095176	Α	07/04/95
US 542505	425050 A	13/06/95	US	5311543	A	10/05/94
EP 083758	837582 A2	22/04/98	JP	10126288	A	15/05/98