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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04B 7/005

A3

(11) International Publication Number: WO 99/44305

(43) International Publication Date: 2 September 1999 (02.09.99)

(21) International Application Number: PCT/SE99/00248

(22) International Filing Date: 23 February 1999 (23.02.99)

(30) Priority Data:
09/031,635 27 February 1998 (27.02.98) US

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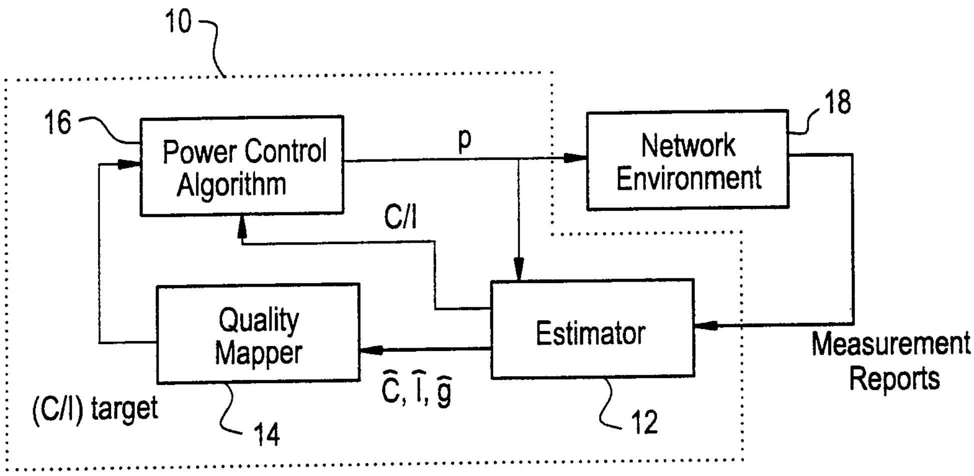
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, 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: 20 January 2000 (20.01.00)

(54) Title: METHOD AND SYSTEM FOR QUALITY-BASED POWER CONTROL IN CELLULAR COMMUNICATIONS SYSTEMS



(57) Abstract

A method and system for quality-based transmission power control in a cellular communications system (100) are disclosed, whereby a network operator can specify the transmission quality requirements using a measurement that better reflects the actual quality perceived by the users. All transmitter power levels in the network can be controlled by identical power regulators (200), each of which can adapt to individual traffic situations in order to achieve the specified quality. For example, in a GSM frequency-hopping network, the FER together with the parameters estimated from the current traffic situation (54), are mapped onto a target C/I (56), which in turn, the power control algorithm strives (16) to achieve (58, 60). Consequently, the power regulators can adapt to the traffic situation experienced by each receiver.

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INTERNATIONAL SEARCH REPORT

Inte 'ional Application No
PCT/SE 99/00248

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B7/005

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 6 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 741 467 A (AT & T CORP) 6 November 1996 (1996-11-06)	1,3,13, 15, 19-21, 27,33
A	* abstract * page 4, line 13 - line 21 page 5, line 1 -page 6, line 7 page 6, line 55 -page 7, line 1 figures 3-6	9

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

[X] Patent family members are listed in annex.

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"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)
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"P" document published prior to the international filing date but later than the priority date claimed

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"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
28 October 1999

Date of mailing of the international search report
25. 11. 1999

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INTERNATIONAL SEARCH REPORT

Inte ional Application No
PCT/SE 99/00248

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 574 982 A (ALMGREN MAGNUS K ET AL) 12 November 1996 (1996-11-12)	21
A	* abstract * column 2, line 47 -column 3, line 22	1,9,13, 19,27, 33-39
	column 5, line 18 - line 44 column 8, line 17 - line 30 claim 1; figures 3,5	
A	column 5, line 18 -column 6, line 32	22-26

X	EP 0 709 973 A (NIPPON TELEGRAPH & TELEPHONE) 1 May 1996 (1996-05-01)	21
A	* abstract * column 1, line 24 - line 31	1,9,13, 19,27, 33-39
	column 3, line 5 - line 32	

A	EP 0 790 713 A (LUCENT TECHNOLOGIES INC) 20 August 1997 (1997-08-20) * abstract * page 3, line 27 - line 39 page 4, line 10 -page 5, line 6 page 5, line 49 - line 58 page 6, line 17 - line 46	22-26

A	US 5 590 418 A (HOLOUBEK KEVIN J ET AL) 31 December 1996 (1996-12-31) * abstract * column 1, line 45 - line 55 column 2, line 19 - line 39 claim 1; figures 1,5	22-26

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00248

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claim : 1 to 21 and 27 to 39

   Method and system for quality-based power control in a mobile communications system. Estimations of interference distribution and path loss are used to compute carrier to interference ratio.

2. Claim : 22 to 26

   Method for performing quality-based power control in mobile communications systems. It identifies one or more time delays, determines if there are physical constraints and predicts limits for oscillations in local loops. It determines locations of local loops that keep a power controller operating in a stability region.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/SE 99/00248

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0741467 A	06-11-1996	CN 1136242 A	20-11-1996
		JP 8307344 A	22-11-1996
		US 5956649 A	21-09-1999
		US 5732328 A	24-03-1998
US 5574982 A	12-11-1996	AU 675849 B	20-02-1997
		AU 6810094 A	12-12-1994
		CA 2139768 A	24-11-1994
		CN 1109700 A,B	04-10-1995
		EP 0650647 A	03-05-1995
		FI 950157 A	13-01-1995
		JP 8500228 T	09-01-1996
		WO 9427380 A	24-11-1994
		SG 52335 A	28-09-1998
EP 0709973 A	01-05-1996	CN 1123976 A	05-06-1996
		JP 8181653 A	12-07-1996
		US 5873028 A	16-02-1999
EP 0790713 A	20-08-1997	US 5722051 A	24-02-1998
		CA 2196114 A	14-08-1997
		JP 9233021 A	05-09-1997
US 5590418 A	31-12-1996	DE 4497317 T	23-11-1995
		FI 952634 A	30-05-1995
		JP 8504074 T	30-04-1996
		SE 9501929 A	10-07-1995
		WO 9509489 A	06-04-1995