

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 May 2004 (13.05.2004)

PCT

(10) International Publication Number
WO 2004/040794 A3

(51) International Patent Classification⁷: H04B 7/005,
H04L 1/00

(21) International Application Number:
PCT/US2003/034269

(22) International Filing Date: 28 October 2003 (28.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/283,935 29 October 2002 (29.10.2002) US

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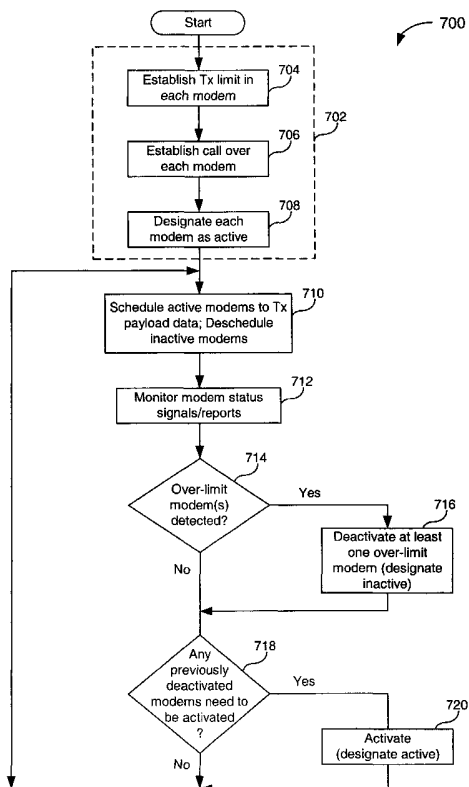
(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH,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

(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

[Continued on next page]

(54) Title: CONTROLLING MULTIPLE MODEMS IN A WIRELESS TERMINAL USING ENERGY-PER-BIT DETERMINATIONS

(57) Abstract: A mobile wireless terminal (MWT) includes multiple wireless modems. The multiple modems have their respective transmit outputs combined to produce an aggregate transmit output. The multiple modems can concurrently transmit data in a reverse link direction and receive data in a forward link direction. The MWT is constrained to operate under an aggregate transmit power limit. Each of the multiple modems has an individual transmit limit related to the aggregate transmit power limit. An MWT controller controls the total number of modems that transmit data at any given time, based on an average energy-per-transmitted bit, or alternatively, individual energy-per-transmitted bits of the modems.



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Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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.

Published:

— *with international search report*

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

23 December 2004

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/34269

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H04B7/005 H04L1/00

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 H04L

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 982 813 A (DUTTA SANTANU ET AL) 9 November 1999 (1999-11-09) * abstract * column 3, line 34 - column 4, line 14 column 5, line 49 - column 7, line 38; figure 2	1, 16, 20, 25, 40, 44
A	EP 0 887 948 A (NOKIA MOBILE PHONES LTD) 30 December 1998 (1998-12-30) * abstract * page 3, line 12 - line 52 page 5, line 11 - line 14 page 7, line 49 - line 54 figures 1, 2, 4	1, 16, 20, 25, 40, 44

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Further documents are listed in the continuation of box C.

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

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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.
- *Z* document member of the same patent family

Date of the actual completion of the international search
17 March 2004

Date of mailing of the international search report
13. 07. 2004

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/34269

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 737 687 A (GREGORY SHERMAN ET AL) 7 April 1998 (1998-04-07) column 5, line 24 - line 45 column 6, line 44 - line 65 figures 1-3 -----	1, 16, 20, 25, 40, 44

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/34269

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.:
1-22, 25-46

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. claims: 1-22,25-46

Method of operating a wireless device within an aggregate transmit power limit, the wireless device including N wireless modems having their respective transmit outputs combined to produce an aggregate transmit output, comprising: (a) scheduling a plurality, M, of active ones of the N modems to transmit payload data, where M is less than or equal to N; (b) monitoring status reports from at least the active modems; (c) determining, based on the status reports, whether to modify the number of active modems in order to maximize an aggregate transmit data rate of the N modems while maintaining an aggregate transmit power of the N modems at or below the aggregate transmit power limit; and (d) modifying the number of active modems when it is determined in step (c) that the number of active modems should be modified to maintain the aggregate transmit power level of the N modems at or below the aggregate transmit power level.

2. claims: 23-24,47

Method for dynamically calibrating a wireless terminal including N wireless modems having their respective transmit outputs combined to produce an aggregate transmit output, the method comprising: (a) scheduling each of the N modems to concurrently transmit respective data, thereby causing each of the N modems to concurrently transmit; (b) receiving respective reported transmit powers $Prep(i)$ from the N modems corresponding to when the N modems concurrently transmit, where i designates a respective modem from 1 to N; (c) measuring, at the aggregate transmit output, an aggregate transmit power $Pagg$ of the N modems corresponding to when the N modems concurrently transmit; (d) generating an equation representing the aggregate transmit power as a cumulative function of each reported transmit power $Prep(i)$ and a corresponding, undetermined, modem dependent gain factor $g(i)$; (e) repeating steps (a),(b),(c), and (d) N times to generate N simultaneous equations; and (f) determining all of the modem dependent gain factors from the N simultaneous equations.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/34269

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