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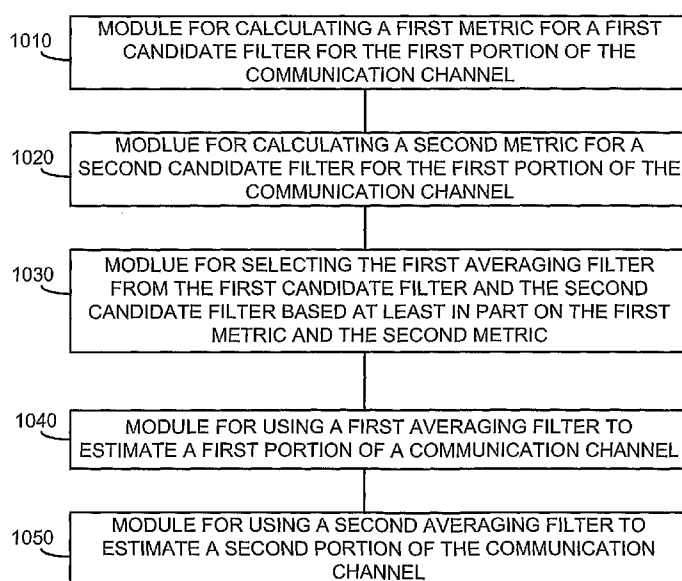
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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

[Continued on next page]

(54) Title: CHANNEL ESTIMATION IN COMMUNICATION SYSTEM



(57) Abstract: A time averaging filter for channel estimation is described. Different time averaging is used for different taps or tones of a communication system. Two methods are suggested for determining the time-averaging filter for channel estimation for the communication systems without prior knowledge of SNR, channel Doppler and fading statistics. The first method includes a bank of different filters, each tuned for optimality in a certain range of SNR and Doppler. For each tone in the frequency domain (or tap in the time domain), the first method selects a filter among the set of filters that minimizes a certain computed metric. The second method directly computes, at each tone (or tap), the "best" filter in a least-squares sense, using empirically determined second-order statistics.

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Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L25/02

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)
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.
X	EP 1 401 164 A (ERICSSON TELEFON AB L M [SE]) 24 March 2004 (2004-03-24)	1-5, 10, 11, 15-19, 24, 25, 29-33, 40-44
Y	page 2, line 34 - line 56 page 3, line 29 - line 55 page 4, line 24 - line 29 page 5, line 5 - page 6, line 53 page 10, line 43 - page 15, line 57 ----- -/--	12, 26, 38, 49

☒ 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
- *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

11 April 2007

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/032899

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 2003/112882 A1 (SAMPATH HEMANTH [US]) 19 June 2003 (2003-06-19) page 2, paragraph 12 page 2, paragraph 19 - paragraph 22 -----	1-11, 15-25, 29-37, 40-48
Y	DE 102 05 742 C1 (FRAUNHOFER GES FORSCHUNG [DE]) 18 December 2003 (2003-12-18) abstract page 2, paragraph 5 - paragraph 6 page 2, paragraph 9 page 3, paragraph 18 - paragraph 27 page 5, paragraph 51 - page 6, paragraph 68 page 8, paragraph 84 - paragraph 87 claim 1 -----	12,26, 38,49
A	US 2001/036235 A1 (KADOUS TAMER [US]) 1 November 2001 (2001-11-01) abstract page 1, paragraph 12 - page 2, paragraph 21 page 3, paragraph 32 - page 4, paragraph 44 -----	12,26, 38,49
A	EP 1 533 961 A2 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 25 May 2005 (2005-05-25) page 2, paragraph 1 claim 1 -----	12,26, 38,49

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2006/032899

Box II Observations where certain claims were found unsearchable (Continuation of item 2 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 III Observations where unity of invention is lacking (Continuation of item 3 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. claims: 1-11, 15-25, 29-37 and 40-48

Increasing the accuracy of a filter selection algorithm

2. claims: 12-14, 26-28, 38-39 and 49-51

Algorithm for directly calculating the averaging filters

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2006/032899

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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			JP 2005151447 A	09-06-2005