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**Datasheet for the decision
of 8 February 2011**

Case Number: T 2234/08 - 3.5.03

Application Number: 05778577.6

Publication Number: 1787399

IPC: H04B 1/10

Language of the proceedings: EN

Title of invention:

Method and apparatus for selecting a channel filter for a communication system

Applicants:

MStar Semiconductor, Inc, et al

Headword:

Filter apparatus/MSTAR SEMICONDUCTOR

Relevant legal provisions:

EPC Art. 56, 111(1)

Relevant legal provisions (EPC 1973):

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Keyword:

"Inventive step - main request and auxiliary request 1 (no)"
"Remittal - auxiliary request 2 (yes)"

Decisions cited:

T 0939/92

Catchword:

-



Case Number: T 2234/08 - 3.5.03

DECISION
of the Technical Board of Appeal 3.5.03
of 8 February 2011

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Decision under appeal:

**Decision of the examining division of the
European Patent Office posted 20 June 2008
refusing European patent application
No. 05778577.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: A. S. Clelland
Members: F. van der Voort
R. Moufang

Summary of Facts and Submissions

- I. This appeal is against the decision of the examining division refusing European patent application No. 05778577.6 (publication number EP 1787399) which was originally filed as international application PCT/GB2005/003485 (publication number WO 2006/027603 A).
- II. The refusal was based on the ground that the subject-matter of the independent claims of a main and an auxiliary request did not involve an inventive step (Articles 52(1) and 56 EPC).
- III. The following documents were cited in the international search report:
- D1: EP 1 429 469 A;
- D2: EP 1 122 891 A;
- D3: EP 1 041 726 A; and
- D4: US 5 465 410 A.
- IV. With the statement of grounds of appeal the applicant filed claims of a main request and three auxiliary requests together with amended description pages and arguments in support of these requests. Oral proceedings were conditionally requested.
- V. The appellants were summoned to oral proceedings. In a communication accompanying the summons the board drew attention to issues to be discussed at the oral proceedings.

VI. In preparation for the oral proceedings the appellants filed with a letter dated 25 January 2011 claims of a main request and two auxiliary requests, replacing all requests on file, and submitted arguments in support. In a further letter dated 7 February 2011 the appellant requested that the order of the auxiliary requests be changed.

VII. Oral proceedings were held on 8 February 2011 in the course of which the appellants filed, by way of replacement of all requests on file, claims of a main request and two auxiliary requests, i.e. auxiliary requests 1 and 2. The appellants requested that the decision under appeal be set aside and that a patent granted on the basis of the main request, auxiliary request 1, or auxiliary request 2, all as filed at the oral proceedings.

At the end of the oral proceedings the board's decision was announced.

VIII. Claim 1 of the **main request** reads as follows:

"Filter apparatus (302) for use in a communications signal receiver, the filter apparatus (302) comprising:

 a received signal buffer (301) arranged to store a received signal in digital form and consisting of a train of samples;

 a first filter (409) for filtering the stored received signal;

 a plurality of filter assessment branches (406, 403; 407, 404; 408, 405), each filter assessment branch (406, 403; 407, 404; 408, 405) including a respective further filter (406, 407, 408) arranged to filter a run

of samples from the stored train; and

a filter selection unit (402) arranged to receive the output of each filter assessment branch (406, 403; 407, 404; 408, 405) and on the basis of those outputs to select from a set of filter configurations the filter configuration that is to be used in the first filter to filter the stored received signal;

wherein the run of samples is the entirety of, or a segment of, the stored train of samples."

Claim 1 of **auxiliary request 1** reads as follows:

"Filter apparatus (302) for use in a communications signal receiver, the filter apparatus (302) comprising:

a symbol estimation unit (303);

a received signal buffer (301) arranged to store a received signal in digital form and consisting of a train of samples and comprising a training sequence and data carrying symbols requiring estimation by the symbol estimation unit;

a first filter (409) for filtering a subset of the stored train of samples;

a plurality of filter assessment branches (406, 403; 407, 404; 408, 405), each filter assessment branch (406, 403; 407, 404; 408, 405) including a respective further filter (406, 407, 408) arranged to filter a run of samples from the stored train; and

a filter selection unit (402) arranged to receive the output of each filter assessment branch (406, 403; 407, 404; 408, 405) and on the basis of those outputs to select from a set of filter configurations the filter configuration that is to be used in the first filter to filter the stored received signal;

wherein:

the run of samples corresponds to a training sequence in the received signal;
and

the subset does not include the training sequence but includes the data carrying symbols."

Auxiliary request 2 includes two independent claims, namely claims 1 and 13. Claim 1 is identical to claim 1 of the main request, except that the wording "a respective further filter (406, 407, 408) arranged to filter" is replaced by "a respective further filter (406, 407, 408) arranged to filter, according to a respective filter configuration," (underlining by the board) and that the following feature is added:

"and

the filter configurations of the further filters in the assessment branches are different to the filter configurations in the set".

Claim 13 of auxiliary request 2 reads as follows:

"A method of filtering a received signal in a communications system, the method comprising:

storing a received signal in digital form and consisting of a train of samples;

providing the stored received signal to a first filter (409) for filtering using a selected filter configuration;

providing a run of samples from the stored train to a plurality of filter assessment branches (406, 403; 407, 404; 408, 405), each filter assessment branch (406, 403; 407, 404; 408, 405) including a respective further filter (406, 407, 408) for filtering the run according

to a respective filter configuration;

assessing the quality of the filtered run for each filter assessment branch (406, 403; 407, 404; 408, 405); and

selecting said selected filter configuration from a set of filter configurations in dependence upon the filter quality assessment;

wherein:

the run of samples is the entirety of, or a segment of, the stored train of samples; and

the filter configurations of the further filters in the assessment branches are different to the filter configurations in the set."

Reasons for the Decision

1. *Main request*

1.1 D2 discloses, using the language of claim 1 of the main request, a filter apparatus (Fig. 3) for use in a communications signal receiver, the filter apparatus including:

a first filter, e.g. F1, for filtering a signal received through an antenna 1, which, after a sampling process, consists of a train of samples (paragraphs [0038] and [0039]);

a plurality of filter assessment branches FN, CN, 8_{CN}, 9_{CN} (Fig. 2), each filter assessment branch including a respective further filter FN arranged to filter a run of samples from the train of samples, wherein the run of samples is the entirety of the train of samples and wherein the further filters FN have different filter

configurations (paragraphs [0037] and [0047]: "different filters", "wide filter", "narrow filter", "asymmetrical filter");

a filter assessment branch $F_1, C_1, 8_{C_1}, 9_{C_1}$ (Fig. 2) including the first filter F_1 which is arranged to filter the entirety of the train of samples; and

a filter selection unit 3, 5, 10 (Figs 2 and 3) arranged to receive the output of each filter assessment branch $F_1, C_1, 8_{C_1}, 9_{C_1}; \dots; F_N, C_N, 8_{C_N}, 9_{C_N}$ (Fig. 2) and on the basis of those outputs to select an output signal from amongst output signals of the first and further filters F_1 to F_N that is estimated to give the best performance (paragraph [0031]). In other words, from amongst a set of filter configurations which correspond to the first and further filters F_1 to F_N , the filter configuration or filter which is estimated to give the best performance is selected and used for filtering the received signal (paragraph [0033]: "the best filter is chosen 10, and the corresponding signal is demodulated 4 and processed further to recreate the original information signal"). The board notes that, since in D2 each one of the filters F_1 to F_N filters the signal received through the antenna 1, any one of the filters F_1 to F_N and, in particular, the selected filter may be referred to as the "first filter".

1.2 The subject-matter of claim 1 differs from the filter apparatus of D2 in that, according to claim 1, a received signal buffer is provided which is arranged to store the received signal in digital form.

1.3 In the board's view, since the filter apparatus of D2 may be digitally implemented (paragraphs [0038] to [0040]), it would have been obvious for a person skilled in the art to

store the received signal in digital form, i.e. as digital samples, after the analog/digital conversion of the received, analog signal, in order to use the samples in the various delay lines of the digital filters. The provision of a buffer for storing the received signal in digital form does not therefore contribute to an inventive step. The board notes that at the oral proceedings the representative did not contest this argument.

- 1.4 Instead, the representative argued that D2 did not disclose that on the basis of the outputs of the filter assessment branches the first filter was configured, in particular by specifying its filter coefficients. Further, D2 was said not to disclose a first filter which was distinct from the filters in the assessment branches. This facilitated the implementation of the filters in that the first filter could be of a different complexity than the filters of the assessment branches.

The board notes however that claim 1 does not include features relating to configuring the first filter by specifying its filter coefficients. The claim merely defines that a filter configuration for use in the first filter is selected from a set of filter configurations. Further, the claim does not exclude that the "set of filter configurations" consists of the filter configurations of the further filters and, hence, that, as in D2, the selected filter, i.e. the first filter, may be part of a filter assessment branch and, consequently, need not be distinct from the filters in the assessment branches.

The arguments are therefore not convincing.

1.5 The board concludes that the subject-matter of claim 1 of the main request lacks an inventive step, Articles 52(1) and 56 EPC.

1.6 The main request is therefore not allowable.

2. *Auxiliary request 1*

2.1 The filter apparatus of claim 1 of auxiliary request 1 differs from that of claim 1 of the main request in that:

i) the filter apparatus further includes a symbol estimation unit;

ii) the first filter is for filtering a subset of the train of stored samples, which does not include the training sequence but includes the data carrying symbols; and

iii) the further filters are arranged to filter a run of samples from the stored train, which corresponds to a training sequence in the received signal.

2.2 In the filter apparatus of D2 the output signal of the selected filter is demodulated to recreate the original information signal (paragraph [0037] and Fig. 3, "demodulator 4"). Since the digital information signal to be demodulated contains a sequence of symbols which may include a training sequence for estimating the channel (paragraphs [0005] and [0032]), it is implicit that the received signal in digital form includes training sequence symbols as well as data carrying symbols and that, since the training sequence symbols are known (paragraphs [0034] and [0035] and Fig. 2), the recreation of the original

information signal involves an estimation of the received data carrying symbols.

Further, since each one of the filters F1 to FN filters the whole received signal, the first filter, e.g. filter F1, is *suitable* for filtering, *inter alia*, a subset of the train of samples, which does not include the training sequence but includes the data carrying symbols, and, similarly, the further filters FN are arranged to filter, *inter alia*, a run of samples from the train of samples, which corresponds to the training sequence in the received signal.

2.3 It follows that none of the above features i) to iii) contributes to an inventive step.

2.4 In view of the above and the reasons given in respect of claim 1 of the main request, the board concludes that the subject-matter of claim 1 of auxiliary request 1 lacks an inventive step, Articles 52(1) and 56 EPC.

2.5 Auxiliary request 1 is therefore not allowable.

3. *Auxiliary request 2*

3.1 Claim 1 of auxiliary request 2 is based on claim 1 as originally filed and further defines that the received signal is stored in digital form and consists of a train of samples and that the filters of the filter assessment branches are arranged to filter a run of samples from the stored train, which is the entirety of, or a segment of, the stored train of samples (cf. the description as filed, page 8, lines 16 to 18, page 9, lines 7 to 9 and 18 to 20, and page 11, lines 15 and 16 ("the whole burst")). The

claim further defines that the filter selection unit is arranged to select a filter configuration from a set of filter configurations (cf. page 9, lines 25 to 28, and page 11, lines 22 and 23). The last feature of the claim, according to which the filter configurations of the further filters are different to the filter configurations in the set of filter configurations, is based on the description as filed, page 4, lines 16 to 18, and page 10, lines 12 to 14.

The amendments in independent method claim 13 correspond to those in claim 1, in which claim 13 is based on independent claim 15 and the above-mentioned passages of the description of the application, as filed.

- 3.2 The board is therefore satisfied that the amendments in claims 1 and 13 of auxiliary request 2 do not give rise to objections under Article 123(2) EPC. Neither do these claims in the board's view give rise to objections under Article 84 EPC.
- 3.3 The last feature of claim 1, see point VIII above, is not known from D2, since in the filter apparatus of D2 the set of filter configurations from which one is selected coincides with the filter configurations of the filters in the filter assessment branches. This applies to all embodiments disclosed in D2 and the claims and the abstract of D2 are written accordingly. Hence, the board concludes that D2 neither discloses nor suggests the above-mentioned last feature of claim 1.
- 3.4 Nor does any one of the prior art documents on file, i.e. D1, D3 and D4, disclose or suggest this feature:

- 3.4.1 More specifically, in the receiving apparatus disclosed in D3 that output signal of one of a plurality of detection circuits 4, 5 (Fig. 1, claim 1) is selected which has the better detection results (paragraph [0016]). No further, distinct detection circuit of a different type is disclosed or suggested.
- 3.4.2 Similarly, in the FM receiver disclosed in D4 an encoder 118 (Fig. 1) identifies a favourably recovered signal (e.g., the one having the highest signal quality metric) amongst a plurality of output signals from signal recoverers 110-114 connected to respective filters 120-124. A multiplexer 116 then forms an output signal 126 based on the identified, recovered signal by selecting the output of the filter having the favourable signal quality metric (col. 2, lines 30 to 47, col. 5, lines 8 to 12, and Fig. 2, steps 207 and 209).
- 3.4.3 D1 discloses a multipath CDMA receiver including a rake receiver 101 (Fig. 4) for receiving communication signals and a pseudo-noise (pn) sequence and for producing filter coefficients 81 which configure an adaptive matched filter 79, or other adaptive filtering means, for filtering the received communication signals (paragraphs [0023] to [0025]). The rake receiver 101 consists of a parallel combination of path demodulators ("fingers") 103_0-103_n (Fig. 5) and the adaptive filter 79 is a transversal (finite impulse response) filter (col. 5, lines 19 to 24). The rake receiver 101 and the adaptive filter 79 compensate for multipath distortion due to multipath (paragraphs [0024] and [0033]).

D1 does not disclose alternative implementations of the rake receiver and the adaptive filter.

Hence, if it were argued that at the priority date it would have been obvious to a person skilled in the art, when starting out from D1 and faced with the problem of providing an alternative implementation, to replace the rake receiver and the adaptive filter by, respectively, a plurality of filter assessment branches and a set of filter configurations as defined in claim 1, it would be necessary to provide evidence that the plurality of filter assessment branches and the set of filter configurations indeed constitute alternative implementations of the rake receiver and the adaptive filter, respectively, and, on that basis, to provide a reasoning as to why, without the exercise of inventive skill, the skilled person would have applied these alternative components to the CDMA receiver of D1 and would thereby have arrived at a filter apparatus which includes all the features of claim 1. The board does not have such evidence at its disposal. Further, following the established case law, see, for example, T 939/92 (point 2.3, OJ EPO 1996, 309), if it were argued that the alternative implementations are part of the common general knowledge of the skilled person, in case of a dispute, it would be necessary to provide evidence in support. The board notes that in the present case the applicant indeed contested a similar argument put forward by the examining division (cf. the minutes of the oral proceedings before the examining division, points 5 and 6).

- 3.5 It follows that, in the absence of the above-mentioned evidence, the subject-matter of claim 1 involves an inventive step having regard to the disclosure of each of or any combination of the prior art documents D1 to D4 (Articles 52(1) and 56 EPC).

- 3.6 The above considerations apply, *mutatis mutandis*, to independent method claim 13, see point VIII above.
- 3.7 The board notes, however, that the above-mentioned last feature of claim 1 was not present in any one of the claims as originally filed. It is therefore unclear whether or not this feature has been searched and, hence, whether or not an additional search is required.
4. In view of the considerations set out at points 3.4.3 and 3.7, the board judges that in the present case it be appropriate to remit the case to the examining division pursuant to Article 111(1) EPC for further examination on the basis of auxiliary request 2.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance for further examination on the basis of auxiliary request 2.

The Registrar:

The Chairman:

G. Rauh

A. S. Clelland