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**Datasheet for the decision
of 1 July 2013**

Case Number:	T 1876/09 - 3.4.01
Application Number:	01914265.2
Publication Number:	1281212
IPC:	H01Q 3/26, G01S 7/40
Language of the proceedings:	EN

Title of invention:
Self-calibration of feeders for array antennas

Applicant:
Telefonaktiebolaget LM Ericsson (publ)

Headword:
-

Relevant legal provisions (EPC 1973):
EPC Art. 84

Keyword:
"Clarity (no, all requests)"

Decisions cited:
-

Catchword:
-

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                    It can be changed at any time and without notice.
C9882.D

Case Number: T 1876/09 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 1 July 2013

Appellant: Telefonaktiebolaget LM Ericsson (publ)
(Applicant)   S-164 83 Stockholm   (SE)

Representative: Mrazek, Werner
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 15 April 2009 refusing European patent application No. 01914265.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: P. Fontenay
Members: H. Wolfrum
            M. J. Vogel

C9882.D

Summary of Facts and Submissions

I.   European patent application 01 914 265.2 (publication
      No. WO 01/71850) was refused by a decision of the
      examining division dispatched on 15 April 2009 for the
      reason of lack of inventive step (Articles 52(1) and 56
      EPC 1973) of the subject-matter of the claims of the
      requests then on file.

II.   The applicant lodged an appeal against the decision on
      9 June 2009. The prescribed appeal fee was paid on the
      same day. A statement of grounds of appeal was filed on
      12 August 2009.

      The appellant requested that the decision under appeal
      be set aside and that the application be remitted to
      the examining division for further prosecution on the
      basis of a set of claims 1 to 7 filed with telefax on
      27 May 2008, by way of a main request, or on the basis
      of a set of claims 1 to 5 filed with telefax on
      15 January 2009, by way of an auxiliary request.

III. On 7 February 2013 the appellant was summoned to oral
      proceedings to take place on 13 June 2013.

      In an annexed communication pursuant to Article 15(1)
      RPBA the Board identified *inter alia* problems having
      regard to the clarity of the claims on file.

IV.   The appellant did not comment on the Board's
      observations nor did it file any further amendments.
      Instead, by letter dated 19 February 2013 the appellant
      informed the Board that it had decided not to attend

the oral proceedings and announced that no written
submission would be filed.

V.   Oral proceedings were cancelled by notification of
        5 March 2013 and the appellant was informed that a
        decision was to follow in writing.

VI.   Independent claims 1 and 4 and dependent claim 3 of the
        appellant's **main request** read as follows:

"1.   *A method for self-calibration of feed cables of an*
array antenna for compensating a difference in receive
and transmit frequency, the electrical length of each
feed cable is known, comprising the steps of
        calculating a first feed cable phase weight set
$W_{RX}{}^{\langle k \rangle}$ *during reception by an adaptive algorithm for a*
received signal at a receive frequency f_{RX}, wherein k is
the index of a k:th antenna element in the array
antenna and whereby a full electrical feed cable length
is accounted for in the calculation;
characterized by *that the same feed cables are used for*
receive and transmit paths, said method further
comprising the steps of
        calculating from the first feed cable weight set
$W_{RX}{}^{\langle k \rangle}$ *a corresponding second cable phase weight set $W_{TX}{}^{\langle k \rangle}$*
for a chosen transmit frequency f_{TX}, said transmit
frequency differs from said receive frequency, applying
a proportional relation f_{TX}/f_{RX}, and
        applying the corresponding second cable phase
weight set $W_{TX}{}^{\langle k \rangle}$ as a phase correction of the array
antenna feed cables at transmit frequency f_{TX}, to
thereby facilitate a continuous beam steering with
coinciding receive and transmit directions.

3.   The method according to claim 1, characterized by the further step of using an adaptive beam forming algorithm such as a Sample Matrix Inversion (SMI) to compute a phase weight set that will produce a main transmit beam in the direction of one of the signals in the receive direction.

4.   A system for self-calibration of feed cables of an array antenna for compensating a difference in receiving and transmitting frequency, the electrical length of each feed cable is known, comprising

means for calculating a first feed cable weight set $W_{RX}^{\langle k \rangle}$ during reception by an adaptive algorithm for a received signal at a receive frequency f_{RX}, where k is the index of a k:th antenna element in the array antenna and whereby a full electrical feed cable length is accounted for;
characterized by *that the same feed cables are used for receiving and transmitting frequency, said system further comprises*

means for calculating from the first feed cable weight set $W_{RX}^{\langle k \rangle}$ a corresponding second cable phase weight set $W_{TX}^{\langle k \rangle}$ for a chosen transmit frequency f_{TX}, said transmit frequency differs from said receive frequency, applying a proportional relation f_{TX}/f_{RX}, and

means for applying the corresponding second cable weight set $W_{TX}^{\langle k \rangle}$ as a phase correction of the array antenna feed cables at transmit frequency f_{TX}, to thereby facilitate a continuous beam steering with coinciding receive and transmit directions."

Further claims 2 and 5 to 7 are dependent claims.

Independent claims 1 and 3 of the appellant's **auxiliary request** differ from respective claims 1 and 4 of the main request by the feature:

"according to a relation defined by
$$W_{TX}{}^{\langle k \rangle} = |W_{RX}{}^{\langle k \rangle}| \cdot exp (j \cdot (f_{TX}/f_{RX}) \cdot Arg (W_{RX}{}^{\langle k \rangle}))$$
k = 1,2,.. N
wherein Arg denotes the angular phase of the argument of $W_{RX}{}^{\langle k \rangle}$, and N is the number of elements in the array antenna,"
or
"utilizing a relation defined as
$$W_{TX}{}^{\langle k \rangle} = |W_{RX}{}^{\langle k \rangle}| \cdot exp (j \cdot (f_{TX}/f_{RX}) \cdot Arg (W_{RX}{}^{\langle k \rangle}))$$
k = 1,2,.. N
wherein Arg denotes the angular phase of the argument of $W_{RX}{}^{\langle k \rangle}$, and N is the number of elements in the array antenna,"
added respectively after the expression "*applying a proportional relation f_{TX}/f_{RX}*".

Dependent claim 2 corresponds to claim 3 of the main request and claims 4 and 5 are dependent on claim 3.

Reasons for the Decision

1.   The appeal complies with the requirements of Articles 106 to 108 and Rule 99 EPC and is, therefore, admissible.

2.   Clarity (Article 84 EPC 1973)

2.1   The present invention is concerned with the self calibration of feed cables of an array antenna.

In this context, the phrase "*and whereby a full electrical feed cable length is accounted for in the calculation*" in claim 1 of both requests on file could be misinterpreted as meaning that the respective calculation of the whole of the first feed cable phase weight set would be based on the length of only one of the feed cables.

2.2   Moreover, the indication in claims 1 and 4 of the main request "*applying a proportional relation f_{TX}/f_{RX}*" leaves doubts as to how exactly the said relation would determine the values of the second cable phase weight set. In this context, it is not apparent that any mathematical implementation of the relation f_{TX}/f_{RX} other than that defined by the additional feature, respectively, given in claims 2 and 5 of the main request and added into claims 1 and 3 of the auxiliary request would lead to meaningful weight values.

2.3   The expression "*characterized by the <u>further</u> step of …*" [emphasis added] given in claim 3 of the main request and claim 2 of the auxiliary request could be understood as referring to the calculation of a still further phase weight set, in addition to those referred to in respective claim 1. A similar concern arises for claims 6 and 7 of the main request and claims 4 and 5 of the auxiliary request.

2.4   For these reasons, the Board has come to the conclusion that the appellant's requests on file do not comply with the requirement of Article 84 EPC 1973.

The appellant's requests are therefore not allowable.

3.   Although having been informed about the above
        deficiencies, the appellant neither offered any
        explanation nor proposed further amendments to the
        claims.

        Given the fact that already a single deficiency renders
        a request unallowable, there is no need, for the
        purpose of the present decision, to consider other
        matters concerning the claims of the appellant's
        requests on file.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar   The Chairman

R. Schumacher   P. Fontenay