

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 30 June 2017**

Case Number: T 1497/12 - 3.4.01

Application Number: 06820679.6

Publication Number: 1964210

IPC: H01Q21/00, H01Q3/26

Language of the proceedings: EN

Title of invention:
PHASED ARRAY ANTENNA

Applicant:
LEONARDO MW LTD

Headword:

Relevant legal provisions:
EPC 1973 Art. 54, 56

Keyword:
Novelty - main request (no)
Inventive step - auxiliary request (no)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1497/12 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 30 June 2017

Appellant: LEONARDO MW LTD
(Applicant) Christopher Martin Road
Basildon, Essex SS14 3EL (GB)

Representative: Wojcik, Lucy Eleanor
Leonardo MW Ltd
c/o Impetus IP Limited
Suite 31
West Devon Business Park
Brook Lane
Tavistock
Devon PL19 9DP (GB)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted on 27 December
2011 refusing European patent application No.
06820679.6 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman G. Assi
Members: P. Fontenay
J. Geschwind

Summary of Facts and Submissions

- I. The examining division refused European patent application No. 06 820 679.
- II. In the "Reasons" for the decision under appeal, the examining division observed that claim 1 then pending was not allowable since it defined added subject-matter contrary to Art. 123(2) EPC.

The examining division further held that, notwithstanding the unallowable amendment, the subject-matter of claim 1 would not be new in the sense of Art. 54(1) EPC 1973 having regard to document D1 (FR-A-2 741 478).

Dependent claims 2-4, 6 and 7 also lacked novelty over D1, whereas claims 5 and 8 lacked an inventive step (Art. 56 EPC 1973) with regard to D1.

- III. The appellant (applicant) filed an appeal against the decision and requested that the decision under appeal be set aside and a patent be granted on the basis of a main request corresponding to the request underlying the impugned decision.

As an auxiliary request, the appellant requested that a patent be granted on the basis of a set of claims 1 to 8 filed with the statement of grounds.

- IV. At the appellant's request, a summons to attend oral proceedings was issued.
- V. In a communication pursuant to Art. 15(1) RPBA, the appellant was informed of the provisional opinion of the Board with regard to the appellant's requests.

VI. In a letter dated 26 June 2017, the Board was informed that the appellant did not intend to attend the oral proceedings.

The appellant did not comment on the communication issued by the Board.

VII. On 30 June 2017, oral proceedings took place before the Board in the absence of the appellant.

VIII. Claim 1 of the main request reads:

*"1. An antenna array (10) comprising:
a plurality of phased array antenna radar processing elements (78), wherein the phased array antenna elements (78) are arranged in groups (74), each of the groups (74) comprising horizontal strips (72) of antenna elements (78) with a variable number of the antenna elements (78) in the horizontal strips of each group (74); and
a plurality of communication modules (66), wherein each communication module (66) is connected to the antenna elements (78) within a respective one of said groups (74) of antenna elements (78);
characterised in that each of the groups (74) of the antenna elements (78) is configured to be driven with a common signal; and the variable number of the antenna elements (78) in the horizontal strips (72) of each group (74) is a different number of antenna elements (78) in the horizontal strips of each group to prevent a regular pattern of phase centres in the array."*

Claims 2 to 8 of the main request are dependent claims.

Claim 1 of the auxiliary request reads:

"1. An antenna array (10) comprising:
a plurality of phased array antenna radar elements (78), wherein the phased array antenna elements (78) are arranged in groups (74), each of the groups (74) comprising horizontal strips (72) of antenna elements (78) with a variable number of the antenna elements (78) in the horizontal strips of each group (74); and
a plurality of communication modules (66),
wherein each communication module (66) is connected to the antenna elements (78) within a respective one of said groups (74) of antenna elements (78);
where each of the groups (74) of the antenna elements (78) is configured to be driven with a common signal; and the variable number of the antenna elements (78) in the horizontal strips (72) of each group (74) is a different number of antenna elements (78) in the horizontal strips of each group to prevent a regular pattern of phase centres in the array;
characterised in that the signals output from each phase centre in the array are combined by suitable analogue means."

Claims 2 to 8 are dependent claims.

Reasons for the Decision

1. Admissibility of the appeal

The appeal meets the requirements of Art. 106 to 108 EPC as well as R. 99 EPC. It is thus admissible.

2. Main request - Novelty

- 2.1 Reference is made to document D1, relied upon by the examining division to refuse the application.

Document D1 discloses an antenna array (cf. page 1, lines 2-4; page 7, lines 17-28) with a plurality of phased array antenna radar processing elements arranged in groups ("*sous-réseaux 41-46*" - cf. page 4, lines 5-12). Each of the groups (41-46) comprises horizontal strips of antenna elements with a variable number of the antenna elements in the horizontal strips of each group (cf. Figures 4, 5). The antenna array further comprises a plurality of communication modules ("*chaines de réception 61-66*"), each of which being connected to the antenna elements within a respective one of said groups of antenna elements (cf. page 7, line 32 to page 8, line 19; Figures 5 and 6). As shown in Figures 4 and 5, each of the groups of antenna elements (41-46) is configured to be driven with a common signal.

Moreover, the feature according to which a "*variable number of the antenna elements in the horizontal strips of each group is a different number of antenna elements in the horizontal strips of each group*" is also known from D1. Reference is made, in this respect, to the paragraphs on page 2, lines 18-22 and page 6, lines 16-21 of D1 where this option is explicitly envisaged. The configuration thus disclosed in D1 leads to an irregular pattern of phase centers in the array as recited in claim 1.

- 2.2 It is acknowledged that D1 describes a system for digital beam-forming (cf. page 4, lines 13-24). As underlined by the appellant, the signal from each phase center of the antenna are first digitized and then combined in an adaptive manner.

However, contrary to the appellant's view, the claimed antenna array does not, as such, appear to incorporate any structural limitation that would limit its use to a system relying on an analogue combination of the signals from each phase center. In this respect, it is noted that the processing of the signals collected from the various antenna elements within an antenna array is independent of the actual array structure. In other terms, the antenna array structure is not exclusive to a particular type of signal processing which might apply to the various signals it generates.

It is further stressed that the digital signal combination which takes place in the system of D1 follows the step of sampling the various signals obtained. This sampling operation occurs at the output of the antenna array or sub-arrays, that is, it is carried out in dedicated means ("*chaines de réception*" 61-66) which are external to the claimed antenna array (cf. page 7, line 32 to page 8, line 19; Figure 6). It follows that the antenna array of D1, considered as such, may indeed generate output signals which could be the object of analogue combination.

For these reasons, no distinguishing features can be recognised between the claimed antenna array and the antenna array disclosed in D1.

- 2.3 The subject-matter of claim 1 according to the main request is thus not new in the sense of Art. 54(1) EPC 1973.
- 2.4 The main request is, therefore, not allowable.
3. *Auxiliary request - Inventive step*

3.1 Document D1 explicitly addresses the problem of costs resulting from the presence, in the systems known from the prior art, of a transmitter/receiver module for each array element in the antenna (cf. page 1, lines 22-30).

The appellant holds that the subject-matter of claim 1 according to the auxiliary request differs from the antenna array of D1 by the characterising feature according to which "*the signal output from each phase centre in the array are combined by suitable analogue means*". This is correct.

As underlined by the appellant, D1 describes a system for digital beam-forming where the signals from each phase center are digitized and then combined for further processing. The objective technical problem which might be defined on the basis of the distinctive feature identified above, would thus consist in adapting the device of D1 so as to make it suitable for analogue combination of the signals it generates.

The definition of the problem, however, appears artificial in view of D1, considering that the step (606) of digitally converting the output signals directly precedes the digital proceeding taking place in the computer means required to control the beam forming operations. In this context, the incorporation of an additional preliminary step of combining the analogue signals generated by a plurality of sub-arrays before digital conversion of the resulting signals would directly affect the ability of the system to generate and control the beam forming process. Such an approach would further be at odd with the teaching of D1 in that it would lead to some redundant processing

chains 61-66 contrary to the declared purpose of the system disclosed in D1.

In conclusion, although D1 shares a common purpose and various structural limitations with the claimed invention, it does not qualify as closest prior art.

- 3.2 The prior art as acknowledged on page 1, lines 4-10, of the published application appears to constitute a more realistic starting point when assessing the issue of inventive step. Said item of prior art is identified in the following as D0.

D0 concerns phased array antennas in which each phased array antenna element is linked to a single, expensive, transmit/receive module. The passage of the description relating to D0 does not make any distinction between analogue or digital beam forming architectures.

The claimed antenna array, in essence, differs from D0 in that the antenna elements are arranged in groups of various sizes, each group being connected to a communication module, said groups of elements defining an irregular pattern.

The distinguishing feature regarding the association of a plurality of array elements in groups permits to reduce the amount of electronic components required, since said elements are shared by multiple array elements. Moreover, an irregular pattern permits to reduce the side lobes generated by the whole array antenna (cf. page 1, lines 26-29 of the published application).

The objective problem solved by the invention thus consists in reducing the costs while maintaining a high

level of performance and functionality (cf. page 1, lines 4-10).

Said problem is explicitly acknowledged in document D1 (cf. page 1, lines 22-30). Moreover, the same solution as the one actually claimed is disclosed (cf. page 1, lines 31-33; page 2, lines 11-22; page 4, lines 13-24; Figures 3-5).

The fact that D1 relates to a system in which the output signals are digitized before being combined is not an obstacle for its teaching being taken into account by the skilled person. It is namely stressed that the skilled person would recognise that the objective problem is not limited to a specific type of processing, as confirmed by a passage of the present application (cf. page 2, lines 1 and 2) which specifies that the invention would be applicable to both analogue and digital systems.

The skilled person would have hence adapted the system of D0 by arranging the various array elements in groups of various sizes, as disclosed in D1 (cf. page 1, lines 31, 32; Figures 4, 5). In order to reduce side lobes, the skilled person would also have arranged the various groups of elements according to an irregular pattern (cf. D1, page 2, lines 18-22; page 4, lines 20-24; page 6, lines 18-21), thus arriving at the claimed subject-matter.

3.3 Consequently, the subject-matter of claim 1 according to the auxiliary request is not inventive in the sense of Art. 56 EPC 1973.

3.4 The auxiliary request is, therefore, not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



R. Schumacher

G. Assi

Decision electronically authenticated