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Datasheet for the decision of 13 January 2016

Case Number: T 1258/11 - 3.4.01

Application Number: 07291130.8

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IPC: H01Q3/26

Language of the proceedings: EN

Title of invention:
Method and device for calibrating an array antenna

Applicant:
Airbus DS GmbH

Headword:

Relevant legal provisions:
EPC 1973 Art. 84

Keyword:
Claims - clarity (no)

Decisions cited:

Catchword:

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Case Number: T 1258/11 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 13 January 2016

Appellant: (Applicant)	Airbus DS GmbH Robert-Koch-Straße 1 82024 Taufkirchen (DE)
Representative:	Frenkel, Matthias Alexander Wuesthoff & Wuesthoff Patentanwälte PartG mbB Schweigerstrasse 2 81541 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 14 January 2011 refusing European patent application No. 07291130.8 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Assi
Members:	F. Neumann
	D. Rogers

Summary of Facts and Submissions

I. The appeal lies from the decision of the examining division refusing European patent application number 07 291 130.8.

II. With the statement setting out the grounds of appeal, the appellant filed seven sets of claims forming the basis of a Main Request and Auxiliary Requests 1 to 6.

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 22 of the Main request, or, alternatively, on the basis of one of the sets of claims of Auxiliary Requests 1 to 6.

In addition thereto, oral proceedings were requested.

III. The Board issued a communication setting out some provisional and non-binding remarks concerning added subject-matter (Article 123(2) EPC), clarity (Article 84 EPC 1973), sufficiency of disclosure (Article 83 EPC 1973) and inventive step (Article 56 EPC 1973).

IV. In response to the Board's communication, with letter of 5 January 2016, the appellant withdrew all previous auxiliary requests and filed a new set of claims forming the basis of a single auxiliary request.

V. The final requests of the appellant, confirmed at the oral proceedings before the Board, were as follows:

As a Main Request, that the decision under appeal be set aside and that a patent be granted on the basis of claims 1-22 filed as the Main Request with the statement setting out the grounds of appeal.

As an Auxiliary Request, that the decision under appeal be set aside and that a patent be granted on the basis of claims 1-22 filed as the Auxiliary Request with the letter of 5 January 2016.

VI. Claim 1 of the Main Request reads as follows:

"*A method for calibrating an array antenna having several branches, comprising*
- generating a test signal by using a pseudo-random sequence assigned to a certain branch of the several branches of the array antenna, wherein the pseudo-random sequence is the test signal,
- adding the generated test signal in the certain branch of the array to a useful signal, which leads to a summed signal to be emitted via a radiator of the certain branch of the array antenna,
- receiving the summed signal with a receiver antenna,
- correlating the received summed signal with a replica of the pseudo-random sequence identical to this used for the generation of the test signal by means of a correlator,
- estimating the characteristics of the certain branch by processing the correlation result, wherein the processing of the correlation result comprises deducing the group delay and the propagation losses and the phase shift of the certain branch, and
calibrating the array antenna based on the estimated characteristics by controlling the excitation of the array antenna,
wherein the delay and the losses and phase shift in the receiver path starting from the receiver antenna output to the correlator input are deduced by

- switching the pseudo-random sequence used for generating the test signal to the input of the receiver path,
- correlating the pseudo-random sequence, switched to the input of the receiver path, with a replica of the pseudo-random sequence, and
- deducing the delay and the losses and phase shifts in the receiver path by processing the correlation result."

Claim 1 of the Auxiliary Request reads as follows:

"*A method for calibrating an array antenna having several branches, comprising*
- generating, for each of the several branches, a test signal by using a pseudo-random sequence assigned to a respective branch of the several branches of the array antenna, wherein the pseudo-random sequence is the test signal,
- adding the generated test signal in each of the several branches of the array antenna to a useful signal, which leads, in each of the several branches, to a summed signal to be emitted via a radiator of the respective branch of the several branches of the array antenna,
- receiving the summed signal of each of the several branches with a receiver antenna,
- correlating each of the received summed signals with a replica of the pseudo-random sequence identical to this used for the generation of the test signal by means of a correlator,
- estimating the characteristics of the several branches by processing the correlation result, wherein the processing of the correlation result comprises deducing the group delay and the propagation losses and the phase shift of each of the several branches, and calibrating

the array antenna based on the estimated characteristics by controlling the excitation of the array antenna, wherein estimating the characteristics of the several branches comprises
deducing the delay and the losses and phase shift in a receiver path starting from the receiver antenna output to the correlator input by
- switching the pseudo-random sequence used for generating the respective test signal to the input of the receiver path,
- correlating the pseudo-random sequence, switched to the input of the receiver path, with a replica of the pseudo-random sequence, and
- deducing the delay and the losses and phase shifts in the receiver path by processing the correlation result."

Both requests contain an independent claim 19 which is a device claim corresponding to the respective independent method claim. The wording of claim 19 of neither request is relevant to the present decision and so will not be reproduced here.

VII. The arguments of the appellant, insofar as they are pertinent to the present decision, are set out below in the reasons for the decision.

Reasons for the Decision

1. The appeal is admissible.

2. Main Request

2.1 Claim 1 sets out a number of method steps for calibrating an array antenna which involve, *inter alia*, the estimation of the characteristics of the respective branches of the array antenna and, based on these

estimated characteristics, the calibration of the array antenna. Claim 1 then goes on to list a number of additional steps which serve to deduce "*the delay and the losses and phase shift in the receiver path*". From the wording of the claim, the role of the delay, losses and phase shift in the receiver path is not clear. There is no connection in claim 1 between the determination of these latter parameters and the calibration of the array antenna, giving the impression that the delay, losses and phase shift in the receiver path are not related to the calibration of the antenna. In this respect claim 1 is unclear (Article 84 EPC 1973).

2.2 The appellant had no comments to make with respect to this objection.

2.3 The main request is therefore not allowable.

3. Auxiliary Request

3.1 Claim 1 has been amended to clarify that the step of "*estimating the characteristics of the several branches*" comprises the steps involved in "*deducing the delay and the losses and phase shift in a receiver path*". The above-mentioned clarity objection raised against claim 1 of the main request has therefore been overcome insofar as a link is now provided between the two portions of the claim and it is now clear that the calibration of the antenna somehow involves the values derived for the receiver path.

3.2 However, claim 1 suffers from a further lack of clarity since the wording does not exclude that the step of "*correlating the pseudo-random sequence, switched to the input of the receiver path, with a replica of the*

pseudo-random sequence" is performed on two identical signals.

Since it is not clear where the correlator is positioned with respect to the input of the receiver path, it is not clear whether any degradation of the pseudo-random sequence which is switched into the receiver path will actually occur. The Board notes that the receiver path is defined in claim 1 as extending between the output of the receiver antenna and the input of the correlator. The wording of claim 1 does not exclude that the correlator could be positioned directly at the output of the receiver antenna. It is therefore not apparent that any delay, losses or phase shift will actually occur along a "*receiver path*" defined in this manner. The correlation of a pseudo-random sequence injected into the input of the receiver path with a replica thereof will therefore amount to a correlation of two identical signals. This correlation exercise will therefore be meaningless in terms of the determination of delay, losses and phase shift in the "*receiver path*" since no such delay, losses or phase shift can be determined in this manner.

3.3 The appellant submitted that the correlator of claim 1 was used in a first correlation step to determine the group delay, propagation losses and phase shift of the summed signals passing through each branch of the transmission antenna. However, the degradation of the summed signal arriving at the correlator would be due to degradation not only in the transmission path, but also in the receiver path. Specifically, as the summed signal passed through the receiver path, it would inevitably undergo some degradation which was attributable to the chain of processing electronics of the receiver. Injecting the pseudo-random sequence into the input of

the receiver path enabled a second correlation step to be performed at the correlator in which the degraded pseudo-random signal was correlated with a replica of the pseudo-random sequence injected into the input of the receiver path. From the result of this correlation, the group delay, propagation losses and phase shift attributable to just the receiver path could be derived.

The appellant also referred to Figure 5 which illustrated that a coupler was used to route the pseudo-random sequence generated at the test signal generation unit into the receiver path. This coupler would inevitably introduce some degradation into the pseudo-random sequence. It was this degraded signal that was correlated with the replica signal.

3.4 These arguments did not persuade the Board.

Whilst it is clear that certain losses are likely to occur if the pseudo-random sequence has to pass through a chain of processing elements, claim 1 does not define any details of the receiver path other than the fact it is bounded by the output of the receiver antenna and the input of the correlator. Not even the first part of the claim, in which the correlator is introduced, explains where the correlator is located with respect to the receiver antenna output. There is no indication that any processing elements are located between the receiver antenna output and the correlator and therefore no basis for an interpretation that the pseudo-random sequence applied to the input of the correlator will be in any way degraded by its passage through the "*receiver path*" as defined.

With respect to the coupling losses, the Board notes that the receiver path is defined as starting from the

output of the receiver antenna and that the pseudo-random sequence is switched into the input of the receiver path. Any coupling losses which may occur between the test signal generation unit and the input of the receiver path cannot be indicative or in any way representative of the delay, losses and phase shift occurring in the receiver path as it is defined in claim 1. Inspection of Figure 5 suggests that the pseudo-random sequence which is injected into the input of the receiver path is indeed likely to be a degraded version of the pseudo-random sequence generated at the test signal generation unit and that this degradation is due, in part, to the coupling elements used in the switching path. However, the Board notes that the couplers of Figure 5 do not appear in claim 1. Claim 1 merely refers to a switching of the pseudo-random sequence to the input of the receiver path. Following the wording of claim 1, there is no suggestion that the pseudo-random sequence which is switched into the receiver path has been subject to any degradation before entering the receiver path.

3.5 Since the arguments presented by the appellant are not convincing, the Board concludes that claim 1 is not clear (Article 84 EPC 1973).

3.6 Consequently, the auxiliary request is 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