Internal distribution code:

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

Datasheet for the decision of 22 December 2015

Case Number: T 0220/11 - 3.4.01

Application Number: 06830365.0

Publication Number: 2038963

IPC: H01Q9/04

Language of the proceedings: EN

Title of invention:
COMPACT DIELECTRIC RESONATOR ANTENNA

Applicant:
Sony Ericsson Mobile Communications AB

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

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 0220/11 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 22 December 2015

Appellant: (Applicant)	Sony Ericsson Mobile Communications AB 221 88 Lund (SE)
Representative:	Awapatent AB P.O. Box 5117 200 71 Malmö (SE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 8 September 2010 refusing European patent application No. 06830365.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Assi
Members:	P. Fontenay
	C. Schmidt

Summary of Facts and Submissions

I. The appeal lies from the decision of the examining division to refuse European patent application No. 06 830 365.0.

The impugned decision was remitted to the post on 8 September 2010.

II. In the "*Reasons for the decision*", the examining division held that the subject-matter of claim 1 then on file was not new in the sense of Article 54(1),(2) EPC 1973 in view of document D1 (GB-A-2 355 855).

The examining division further considered that the claimed subject-matter underlying the decision was not inventive in view of document D3 (WO-A-00/14826) in combination with D4 (Ratner et al., "*Neural network simulation of a dielectric ring resonator antenna*", Journal of Systems Architecture, Elsevier Science Publishers BV., Amsterdam (NL), Vol. 44, No. 8, April 1998, pages 569-581) and/or D5 (US-A-2002/0036596).

III. The notice of appeal was filed on 18 October 2010. The appeal fee was paid on the same day. The statement of grounds of appeal was filed on 4 January 2011.

IV. With the statement of grounds of appeal, the appellant requested that the decision under appeal be set aside and a patent be granted on basis of a set of claims filed with the statement of grounds.

As a further auxiliary request, the appellant requested that oral proceedings be appointed.

V. In accordance with the appellant's request, summons to attend oral proceedings were issued.

VI. In a communication of the Board pursuant to Article 15(1) RPBA issued on 20 October 2015, the appellant was informed of the provisional opinion of the Board with regard to the requests then pending.

In particular, the Board observed that the subject-matter of claim 1 did not appear to fulfill the requirements of Article 84 EPC 1973. In this respect, it was noted that the claimed dielectric resonator antenna (DRA) arrangement was to be used for simultaneously transmitting and receiving a plurality of signals at the same frequency, obtaining a reduced coupling between these signals, and achieving that the radiation patterns as well as the polarisations be orthogonal to each other.

In the Board's opinion, essential features regarding the geometry of the claimed DRA arrangement, required for achieving the recited effects, were missing in claim 1.

The Board further observed that a claim which would incorporate all the essential features required to achieve the effects recited above would be new in view of D1 or D3.

VII. By letter dated 23 November 2015, the appellant filed amended sets of claims according to a new main request and auxiliary requests I and II. Arguments were presented as to the behaviour of the resonator when transmitting or receiving simultaneously three separate signals at the same frequency. Concerning the geometry of the resonators, the appellant underlined, that a variety of dielectric volumes would permit to generate

the resonance modes underlying the claimed invention. In particular cubical, hemispherical, cylindrical, half-cylindrical and pyramidal volumes were envisageable.

VIII. As announced with letter of 23 November 2015, the appellant did not take part to the oral proceedings which took place on 22 December 2015.

IX. Claim 1 of the appellant's main request reads:

"1. Dielectric resonator antenna arrangement (28) for a multiple input and multiple output (MIMO) application in which the antenna is fed with three signals of the same frequency and in which the antenna is arranged to also receive three signals, having the same frequency, over the air, comprising a ground plane (17) and comprising
a dielectric (20; 20, 32) volume having a central axis (z) in the centre of the volume provided as a normal to the ground plane (17), and
a number of mode exciting elements (22, 24, 26; 26, 28, 30) including
a first mode exciting element (22; 28) provided in or attached to the dielectric volume (20) and extending in a plane provided at a first distance (d1) from the central axis (z) and being perpendicular to the ground plane (17),

whereby the plane containing a second mode exciting element (24; 39) provided in or attached to the dielectric volume (2) and provided at a second distance (d2) from the central axis (z) is both perpendicular to the ground plane (17) and to the plane of the first mode exciting element, and

further comprising a third mode exciting element (26) in the centre of the dielectric (20) volume extending along the central axis (z) in the direction of the normal away from the ground plane (17),

whereby said dielectric resonator antenna arrangement (18) is arranged to provide three orthogonal polarization modes that are arranged to be excited simultaneously."

Claim 1 of appellant's auxiliary request I reads as follows:

"*1. Dielectric resonator antenna arrangement (28) for a multiple input and multiple output (MIMO) application in which the antenna is fed with three signals of the same frequency and in which the antenna is arranged to also receive three signals, having the same frequency, over the air, comprising a ground plane (17) and comprising*

a dielectric (20; 20, 32) volume having a central axis (z) in the centre of the volume provided as a normal to the ground plane (17), and

a number of mode exciting elements (22, 24, 26; 26, 28, 30) including

a first mode exciting element (22; 28) provided in or attached to the dielectric volume (20) and extending in a plane provided at a first distance (dl) from the central axis (z) and being perpendicular to the ground plane (17),

whereby the plane containing a second mode exciting element (24; 39) provided in or attached

to the dielectric volume (2) and provided at a second distance (d2) from the central axis (z) is both perpendicular to the ground plane (17) and to the plane of the first mode exciting element, and

further comprising a third mode exciting element (26) in the centre of the dielectric (20) volume extending along the central axis (z) in the direction of the normal away from the ground plane (17),

whereby said dielectric resonator antenna arrangement (18) is arranged to provide three orthogonal polarization modes that are arranged to be excited simultaneously,

wherein the dielectric volume is cubical, hemispherical, cylindrical, half-cylindrical or pyramid shaped".

Claim 1 according to appellant's auxiliary request II reads:

"*1. Dielectric resonator antenna arrangement (28) for a multiple input and multiple output (MIMO) application in which the antenna is fed with three signals of the same frequency and in which the antenna is arranged to also receive three signals, having the same frequency, over the air, comprising a ground plane (17) and comprising*

a dielectric (20; 20, 32) volume having a central axis (z) in the centre of the volume provided as a normal to the ground plane (17), and

a number of mode exciting elements (22, 24, 26; 26, 28, 30) including

a first mode exciting element (22; 28) provided in or attached to the dielectric volume (20) and extending in a plane provided at a first distance (d1) from the central axis (z) and being perpendicular to the ground plane (17),

whereby the plane containing a second mode exciting element (24; 39) provided in or attached to the dielectric volume (2) and provided at a second distance (d2) from the central axis (z) is both perpendicular to the ground plane (17) and to the plane of the first mode exciting element, and

further comprising a third mode exciting element (26) in the centre of the dielectric (20) volume extending along the central axis (z) in the direction of the normal away from the ground plane (17),

whereby said dielectric resonator antenna arrangement (18) is arranged to provide three orthogonal polarization modes that are arranged to be excited simultaneously,

wherein the dielectric volume is cubical, hemispherical, cylindrical or half-cylindrical".

Reasons for the Decision

1. Text applicable

It is noted that the revised version of the Convention (EPC 2000) does not apply to European patent applications pending at the time of its entry into force

(13 December 2007), unless otherwise provided. In this decision, where Articles or Rules of the former version of the EPC apply, their citation is followed by the indication "*1973*".

2. Admissibility

The appeal meets the requirements of Articles 106 to 108 EPC and Rule 99 EPC. It is thus admissible.

3. Main request

3.1 Inventive step - Article 56 EPC 1973

3.1.1 Document D3 discloses a dielectric resonator antenna (cf. page 2, lines 24, 25) and thus pertains to the same field as the claimed arrangement. The arrangement of D3 is designed to be fed with two signals of the same frequency and, reciprocally, to receive two signals of the same frequency (cf. page 7, lines 16-23). Moreover, D3 shares essential structural elements with the claimed arrangement. In particular, the dielectric resonator antenna of D3 is formed of a dielectric volume provided on a ground plane and three mode exciting elements attached to the dielectric volume (cf. page 2, lines 24-32; page 3, lines 26-32; page 13, lines 13-23). For all these reasons document D3 is considered to illustrate the closest prior art.

3.1.2 In D3, the first mode exciting element, which may be formed of a metal strip (cf. page 8, lines 14-16), extends in a plane provided at a first distance from the central axis and perpendicular to the ground plane. The second mode exciting element, which may also be formed of a metal strip, is attached to the dielectric volume at a second distance from its central axis and is both

perpendicular to the ground plane and to the plane of the first mode exciting element (cf. page 7, lines 16-22; page 8, lines 13-25; page 13, lines 20-24, page 14, lines 4, 5; figures 1A, 1B, 4A). The third mode exciting element of D3, adapted to generate signals in a different frequency band, extends above the dielectric volume along the central axis in the direction of the normal away from the ground plane (cf. page 3, lines 26-32, Figure 4A).

Although primarily conceived to generate a circularly polarised radiation pattern (cf. page 2, lines 26-29; page 8, lines 26-30), the arrangement of D3 would also permit to generate orthogonal polarisation modes. In this respect, it is observed that the actual polarisation of the resulting modes depends on the phase relationship of the signals used to feed the two mode exciting elements. Moreover, the geometry of the antenna in D3 being identical with the claimed arrangement insofar as two mode exciting elements are concerned, the two antennas can be considered to behave similarly, i.e. to generate signals according to similar patterns and polarisations, when fed with the same feeding signals (cf. decision under appeal, section III.5.1).

In D3, the resonator volume may have a cylindrical, rectangular, octagonal or square shape (cf. D3, page 7, lines 28-30).

3.1.3 Consequently, the resonator arrangement defined in claim 1 differs from this known antenna arrangement in that the antenna is fed with three signals of the same frequency and is also arranged to receive three signals having the same frequency, the third exciting element being provided in the center of the dielectric volume.

In the Board's judgement, it would be obvious for the skilled person, in order for the claimed arrangement to permit transmission of three different signals of the same frequency, to adapt the third radiating antenna element of D3 accordingly, so that it resonates at the same frequence as the two others.

The radiation pattern generated by the third mode exciting element is not affected by its position along the central axis of the dielectric volume, i.e. whether it is above or within the dielectric element (cf. D1, page 10, lines 20-22; page 15, lines 22-24). It follows that no technical effect, insofar as the radiation pattern is concerned, may be derived from the claimed configuration compared to the one known from the prior art with said radiating element above the dielectric volume since both geometries appear to be equivalent, in this respect.

Even if it may be argued, in favour of the appellant, that the claimed configuration permits to save space and renders the claimed arrangement less cumbersome, the Board observes that the skilled person would have immediately recognised from the configuration disclosed in D1 (cf. page 15, lines 22-24) which advantages in terms of space saving would result from the presence of the third mode exciting element within the dielectric volume.

As a matter of fact, a hint at a configuration of the DRA with the third mode exciting element in the center of the dielectric material may be found in D3 itself where it is acknowledged that the presence of an external body such as a screw, bolt or other fastener in the center axis of the resonator would not interfere

with the radiation pattern of the antenna (cf. D3, page 7, line 33 to page 8, line 3).

3.1.4 In conclusion, the skilled person would have amended the resonator arrangement of D3 in the light of D1 by incorporating the third exciting element within the dielectric material and by modifying its characteristics so as to resonate at the chosen frequency.

The claimed subject-matter thus results in an obvious manner from the known prior art. Therefore, it does not involve an inventive step in the sense of Article 56 EPC 1973.

3.2 Auxiliary requests I and II

3.2.1 Claim 1 according to auxiliary request I differs from claim 1 of the main request in that it specifies that the dielectric volume is cubical, hemispherical, cylindrical, half-cylindrical or pyramid shaped.

Claim 1 according to auxiliary request II differs from claim 1 of the main request in that it specifies that the dielectric volume is cubical, hemispherical, cylindrical or half-cylindrical.

3.2.2 According to a preferred embodiment in D3, the resonator is cylindrically shaped (cf. D3, page 7, lines 28, 29) thus reproducing one of the alternative recited in claim 1 of the first and second auxiliary requests. Alternatively, the resonator of D3 may have other shapes such as rectangular, octagonal, square (cf. D3, page 7, lines 29, 30). Incidentally, document D1 also suggests that the resonator may take the form of a pyramid (cf. D1, page 4, lines 19-23).

3.2.3 Therefore, the additional features recited in claim 1 of auxiliary requests I and II do not define any additional difference between the claimed invention and said closest prior art D3.

Consequently, the analysis developed above with regard to claim 1 of the main request applies also to claim 1 of auxiliary request I and II.

The subject-matter of claim 1 of auxiliary requests I and II is therefore not inventive in the sense of Article 56 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar: The Chairman:

R. Schumacher G. Assi

Decision electronically authenticated