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**Datasheet for the decision  
of 24 June 2008**

**Case Number:** T 1626/06 - 3.4.01

**Application Number:** 00302808.1

**Publication Number:** 1043593

**IPC:** G01R 21/12; G01R 15/08

**Language of the proceedings:** EN

**Title of invention:**  
Switched attenuator diode microwave power sensor

**Patentee:**  
Agilent Technologies, Inc.

**Opponent:**  
Rohde & Schwarz GmbH & Co KG

**Headword:**  
-

**Relevant legal provisions:**  
-

**Relevant legal provisions (EPC 1973):**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1626/06 - 3.4.01

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.01  
of 24 June 2008

**Appellant:**  
(Opponent)

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**Respondent:**  
(Patent Proprietor)

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**Decision under appeal:**

Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
18 August 2006 concerning maintenance of  
European patent No. 1043593 in amended form.

**Composition of the Board:**

**Chairman:** B. Schachenmann  
**Members:** P. Fontenay  
H. Wolfrum

## Summary of Facts and Submissions

- I. The appeal lies from the interlocutory decision of the Opposition Division to maintain the patent in amended form according to the first auxiliary request filed by the patent proprietor during oral proceedings held on 16 December 2005. The decision was notified on 18 August 2006.
- II. The appellant (opponent) filed an appeal against the above decision by notice filed on 18 October 2006, supported by a statement of grounds of appeal filed on 14 November 2006. The prescribed appeal fee was paid on 18 October 2006.

The appellant requested that the European patent be revoked in its entirety on the ground of lack of inventive step. Oral proceedings were requested as well.

- III. The appellant relied in its statement setting out the grounds of appeal essentially on an analysis of a prior use, identified by the Opposition Division as closest prior art, relating to a test system TS 8510 that had been supplied to Siemens AG by the appellant before the priority date of the patent. In order to substantiate this prior use, the following evidence had been provided:

D11: block diagram of the test system TS 8510;

D12: Delivery specification dated 16.05.1994 addressed to "Siemens AG";

D13: Site acceptance concerning the "BST TS 8510" dated 1.07.1994;

- D14: affidavit of Mr J. Kiermaier;
- D15: "Power Sensors NRV-Z for RF and microwave power measurements" from "Rohde & Schwarz", pages 1 to 8;
- D16: "Neues von Rohde & Schwarz", N° 146 (1994/III), pages 3, 44, 45.

Reference was also made during the proceedings to the following documents:

- D2: US-A-4 943 764;
- D5: US-A-4 873 484;
- D7: US-A-5 204 613;
- D8: US-A-5 656 929.

- IV. No reply to the statement setting out the grounds of appeal has been received from the respondent (patentee).
- V. In a communication of the Board the attention of the parties was drawn to certain issues to be further elaborated under Article 56 EPC 1973 in view of the alleged prior use. In response to this communication, the appellant reiterated its request that Mr Kiermaier, author of the affidavit D14, be heard as a witness. Such a request had already been filed with the notice of opposition.

In a decision dated 27 March 2008 on taking of evidence under Rule 117 EPC, the Board decided to hear the oral evidence proposed by the appellant in order to complete the information already available from documents D11 to D16 by putting questions to Mr J. Kiermaier.

VI. The taking of evidence was held as a part of the oral proceedings before the Board of Appeal on 24 June 2008 which took place in the absence of the respondent as had been previously announced in a letter of its representative dated 23 May 2008. This letter constituted the only reaction of the respondent during the appeal procedure and did not address the substantive issues raised in the statement of grounds or the Board's communication.

The Board concluded from the silence of the respondent that maintenance of the patent, in the form as amended during the opposition proceedings and upheld by the Opposition Division, was still requested and that it therefore also requested that dismissal of the appeal be pronounced.

VII. The decision under appeal was based on the set of amended claims 1 and 2 according to the then pending first auxiliary request. Claim 1 of which reads as follows:

*"1. A diode microwave power sensor (10, 20, 30, 50) comprising:  
means for receiving RF signals having wide dynamic power ranges;  
sensor diode means (D1-D4) operating within a square law region for measuring the power level of the received RF signals wherein the sensor diode means (D1-D4) include a pair of sensor diodes (D1, D2) for measuring the power levels of the received RF signals. [sic]*

*a switched attenuator means (12, 34, 52) having a first low loss state for lower power range RF signals wherein the lower power level range is between approximately -70 dBm and -20 dBm. [sic] and a second attenuated state for higher power range RF signals; the switched attenuator means (12, 34, 52) switching the received RF signals through the first low loss state to the sensor diode means (D1-D4) when the received RF power level is at the lower power level, said switched attenuator means (12, 34, 52) switching the RF signals through the second attenuated state to the sensor diode means (D1-D4) when the received RF power level is above the lower power level range such that the sensor diode means (D1-D4) operate in the square law region and measure the power levels over the wide dynamic ranges of the received RF signals; and wherein the switched attenuator (12, 34, 52) includes means for receiving a calibration signal for calibrating the sensor diode means."*

Claim 2 is a dependent claim.

## **Reasons for the Decision**

This decision is issued after the entry into force of the EPC 2000 on 13 December 2007.

In accordance with Article 7(1), 2nd sentence of the Revision Act of 29 November 2000 ("Act revising the Convention on the Grant of European Patents (European Patent Convention) of 5 October 1973, last revised on 17 December 1991"), the revised version of the Convention shall not apply to European patent

applications pending at the time of its entry into force, unless otherwise decided by the Administrative Council of the European Patent Organisation. Attention is drawn in this respect to Article 1 of the Decision of the Administrative Council of 28 June 2001.

Where Articles or Rules of the former version of the EPC apply, their citations are followed by the indication "1973".

1. The appeal is admissible.
2. *Added subject-matter - Extension of protection*

Claim 1 upheld by the Opposition Division corresponds to a combination of granted claims 1, 2, 3 and 6. Said granted claims were also in substance identical to original claims 1, 2, 3 and 6. The requirements of Article 123(2) and (3) EPC are therefore met.

3. *Inventive step*
  - 3.1 Prior use

The prior use (test system TS 8510) is considered by the appellant to illustrate the closest prior art. Documentary evidence in support of this prior use has been filed in the form of written documents D11 to D16 and later completed by the hearing of the author of affidavit D14 (cf. minutes of the taking of evidence before the Board of Appeal). As illustrated in bloc diagram D11, the test apparatus, defined by the broken line, is connected to a diode power sensor (NRVD Ch. B and Ch. A). As further derivable from D14, the sensor

diode is to be operated in its square law region. Switched attenuator means with two different attenuation states (K23, R4 or K4, R1) are also provided in order for the sensor diode to operate in its square law region.

The Board therefore concurs with the view expressed by the Opposition Division and the appellant underlining that test system TS 8510 does not only reproduce a large number of the recited features, but also shares a common function of measuring the power of received RF signals with the claimed subject-matter.

### 3.2 Features known from the prior use

3.2.1 More specifically, D11 discloses a diode microwave power sensor (NRVD) and means for receiving RF signals: reference is made to the connection port between test apparatus and signal generator SMP. These means are adapted for receiving RF signals having wide dynamic power ranges. This feature derives from the statement in document D14 (cf. page 2, second paragraph) according to which the signal generated by the signal generator might be of low power or high power. Sensor diode means (NRVD Ch. B) operating within a square law region for measuring the power level of the received RF signals are also provided in the test system of D11 (cf. D14, second paragraph).

The test system further comprises a switched attenuator means (K23, R4) having a first low loss state for lower power range RF signals and a second attenuated state for higher power range RF signals. These switched attenuator means switch the received RF signals through



the first low loss state to the sensor diode means when the received RF power level is at the lower power level and through the second attenuated state to the sensor diode means when the received RF power level is above the lower power level range such that the sensor diode means operate in the square law region and measure the power levels over the wide dynamic ranges of the received RF signals (see D14, page 2, second paragraph).

- 3.2.2 The Board further concurs with the appellant in its finding that the switched attenuator means disclosed in D11 includes means for receiving a calibration signal for calibrating the sensor diode means, which feature the Opposition Division considered to be absent from the test system of D11.

Firstly, the structure of the claim does not necessarily imply that the means for receiving RF signals are different from the means for receiving a calibration signal.

In fact, while the claim is precise as to the location of the means for receiving a calibration signal, it is, on the contrary, vague as to the location of the means for receiving the RF signals, merely reciting that the latter means are comprised in the claimed diode microwave power sensor. Due to the absence of a limitation as to the location of the means for receiving the RF signals the claim definition cannot be construed as implying that the means for receiving the RF signals are necessarily separated from the sensor diode means or from the switched attenuator means. The means for receiving the RF signals could, for example,

be directly associated with the diode sensor means. In this case, the transmission of the RF signals via the switched attenuator means would only constitute an option of the power sensor. Moreover, the reference in a claim to various means for performing different functions does not exclude that the means as such, i.e. the structural elements defining said means, are the same.

The Board also notes, in this respect, that the patentee, when filing its first auxiliary request on 16 December 2005 before the Opposition Division, also interpreted claim 1, as resulting from the combination of granted claims 1 to 3 and 6, in the sense that it would also encompass a power sensor in which the means for receiving RF signals and the means for receiving a calibration signal would be the same. This finding results from the initial intention of the patentee to make granted claim 7, which explicitly referred to the ability of the switched attenuator to receive either a calibration signal or an RF input from an RF switch preceding said attenuator means, dependent on claim 1 of the first auxiliary request (cf. minutes of the oral proceedings before the Opposition Division, points 41 and 42).

Secondly, as clarified by the witness during the taking of evidence (see minutes of the taking of evidence, pages 9, 10), the software which had been developed in connection with the test system allowed a direct connection to be established between the signal generator SME and channel B of the power meter, thus defining additional means adapted to receive a calibration signal.

It follows that the connection port between signal generator SMP and the test apparatus, which also defines means for receiving RF signals, as well as the connection port between signal generator SME and the test apparatus constitute means for receiving a calibration signal for possibly calibrating the sensor diode means.

### 3.3 Distinguishing features

In the Board's view, the fact that claim 1 refers to a power sensor implies, when giving the term "power sensor" its generally accepted meaning in the technical field, that the various means recited in claim 1 define a certain "unit", whether structural or functional. While the Board does not exclude that said various means may possibly define subunits assembled together, insofar as the resulting entity defines such a unit, it cannot accept the view of the appellant according to which a power sensor would also encompass the combination of a device as, for example, illustrated in D15 with a switched attenuator means defining a component pertaining to a separate device. Hence, the Board cannot accept the view defended by the appellant, that the switched attenuator means (K23, R4) in D11, which defines a constituting element of the test apparatus TS 8510, could be equated with a switched attenuator means in the sense of claim 1, i.e. as a component of a power sensor.

The skilled person would therefore certainly be able to identify in D11 in the box labelled "Power meter NRVD Ch. B" and the neighbouring unit defined by the broken

line, a power sensor connected to a switched attenuator means within a test apparatus. However, the cognitive action of associating the switched attenuator means (K23, R4) with the power sensor NRVD within the one and single concept of "power sensor" could only be performed under knowledge of the claimed wording, i.e. amounts to an ex-post facto analysis of the available prior art.

The subject-matter of claim 1 differs, thus, from the test system disclosed in D11 in that:

- i) the various means recited above are comprised within the diode microwave power sensor;
- ii) the sensor diode means include a pair of sensor diodes for measuring the power levels of the received RF signals; and in that
- iii) the lower power level range is between approximately -70 dBm and -20 dBm.

The Board concurs with the appellant and the Opposition Division in that features ii) and iii) cannot, as such, justify an inventive step of the claimed subject-matter.

The use of a pair of sensor diodes to measure the power level of RF signals corresponds to a standard measure (cf. patent description, [0019]) in order to improve the stability of the measurements, as is for example also illustrated in documents D2 and D7 (see e.g. D2, column 3, lines 58 - column 4, line 3; or D7, column 2, lines 38-47).

Concerning feature (iii) relating to the definition of the lower power level range, the Board notes that it is

a direct consequence of the fact that the sensor diode means should operate within a square law region. Since it is well known from the characteristics of the diodes commonly used for power measurements that the square law region permits accurate measurements to be carried out in the -70 dBm to -20 dBm range (see D2, column 3, lines 20-26; D5, column 1, lines 12-20), it would be straightforward for the skilled man to define the switching level of the switched attenuator means accordingly.

#### 3.4 Non-obviousness of the claimed invention

The issue as to the inventive merits of the claimed diode microwave power sensor hinges, therefore, on the question whether feature i) as to the integration in the power sensor of the switched attenuator means justifies an inventive step.

The Board is not convinced by the approach defended by the appellant that the integration of the switched attenuator means of the known test system TS 8510 in the power sensor would permit to solve the problem resulting from the large dimensions of the test apparatus. Even if a reduction of the size of the housing of the test apparatus would certainly be welcome (see minutes of the taking of evidence, page 13), it is doubtful whether the transfer of the sole switched attenuator (K23, R4) would notably affect the size of a test housing of about 19 inches width and 25 cm height (see minutes of the taking of evidence, page 12). Moreover, the transfer of this switched attenuator means in the power sensor would be compensated by a corresponding increase of the

dimensions of the power meter, so that the total space occupied by the test system including the test apparatus and the various units connected thereto would probably not be affected by this measure.

The integration of the switched attenuator means in the power sensor of D11 is also not perceived by the Board as a mere design alternative to the configuration actually disclosed in D11. The transfer of the switched attenuator means to the outside of the test housing would deprive the test assembly from one of its functional components. It should be stressed, in this respect, that the power sensor can well be independently replaced by a different one. The absence of the switched attenuator means in the test apparatus would thus reduce its autonomy since it could only be associated with power sensors incorporating the missing functionality, i.e. power sensors including such a switched attenuator means.

Even more importantly, notwithstanding the large number of conforming features with the claimed subject-matter, the Board does not consider the public prior use by test system TS 8510 according to documents D11 to D16 to represent a proper starting point for technical considerations concerning further technical developments of diode microwave power sensors within the meaning given in paragraph 3.3 above, since power sensors (see power meters "NRVD ChA" and "NRVD ChB" in D11) form only peripheral items of a massive and complex laboratory test system. Thus, the skilled person working with the known test system has no reason to contemplate technical modifications to the power meters, let alone to specifically consider measures

which would render an individual power sensor useful for a wider dynamic power range.

For these reasons, the subject-matter of claim 1 is regarded inventive when considering the public prior use disclosed in relation with documents D11 to D16.

4. *Inventive step - alternative approaches relying on documents D2 or D5*

4.1 Documents D2 (see in particular figure 6 and the corresponding description) and D5 (see figures 1 and 2 and the corresponding description) disclose diode microwave power sensors incorporating two separate sensor diode means in order to measure signals of various power levels. Documents D2 and D5 differ essentially from the claimed diode microwave power sensor in that the diode means for measuring lower power range RF signals and the diode means measuring RF signals of a higher power range constitute separate entities.

4.2 In this respect, the Board does not concur with the analysis put forward by the appellant according to which the wording of claim 1 would not necessarily imply that the sensor diode means measuring lower power range RF signals are the same as those measuring RF signals of a higher power level. On a fair reading of claim 1 the use of the definite article in both expressions "switching the received RF signals through the first low loss state to the sensor diode means when the received RF power level is at the lower power level" and "switching the RF signals through the second attenuated state to the sensor diode means when the

received RF power level is above the lower power level range" implies that the same means are actually meant. The indication in claim 1 that the sensor diode means include a pair of sensor diodes and are, hence, not limited to two diodes only, does not affect this analysis. The finding is namely not contradicted by the fact that the number of diodes may exceed two, as for example, illustrated in figure 2 of the patent in suit.

In this respect, the indication "Switching the input between the two component sensors is not needed between ranges." given in column 2, lines 18-20, of document D2 cannot be construed as a suggestion to render obsolete the use of two distinct diode means for measuring signals of a high and a low power range, respectively, and thus does not incite the skilled person to devise a circuit using the same diode means for measuring in the high and the low power range, as recited in claim 1 under consideration.

- 4.3 The Board is also not convinced that the subject-matter of claim 1 derives in an obvious manner from a combination of documents D5 and D8. While document D8 (cf. figure 1) indeed discloses switch means positioned before the diode sensor means, said switch means perform a selection between two different kinds of input signals and do not permit to select among paths of differing attenuation leading to the same sensor diode means as required from the wording of claim 1. Moreover, contrary to the opinion expressed by the appellant, the introduction of a switch in the circuit disclosed in figure 1 in document D5 would not necessarily be carried out between attenuator R5 and diode sensor means D1, but could as well be carried out



on the input side of the circuit so as to perform a selection between the upper path defined by resistor R4 and diode D1 and the lower path defined by resistor R3 and diode D2.

5. In consequence, the arguments put forward by the appellant are not convincing. The subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC 1973.

## **Order**

### **For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

R. Schumacher

B. Schachenmann