Recognized by the
Federal Communications Commission and Industry Canada
Anechoic chamber registration No.: 90462 (FCC)
Anechoic chamber registration No.: IC 3463A-1
TCB ID: DE0001

Accredited by the
German Accreditation Council
DAR–Registration Number
DAT-P-176/94-D1

Independent ETSI
compliance test house

**Test report No. 2-4612-01-02/07**
**Applicant: Carlo Gavazzi SpA**
**Type: RAD-01**
**Test standard(s): FCC Part 15.245**
**RSS-210 Issue 6**
**FCC ID: U7PRAD01**
**IC: 7118A-RAD01**

# Table of contents

# 1 General information

## 1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

*Tester:*

| Date | Name | Signature |
|---|---|---|
| 2007-03-26 | Karsten Geraldy | |

*Technical responsibility for area of testing:*

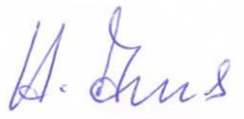
| Date | Name | Signature |
|---|---|---|
| 2007-03-26 | Harro Ames | |

Cetecom ICT Services
Accredited Test Laboratory
Untertürkheimer Str. 6-10
D-66117 Saarbrücken

| | |
|---|---|
| Certification Number: | 7118A-RAD01 |
| Model Number: | RAD-01 |
| Manufacturer: | Carlo Gavazzi Logistics SpA<br>Via Milano, 13<br>20020 Lainate (MI)<br>Italy |
| Tested to Radio Standards Specification (RSS) No.: | RSS-210 Issue 6 |
| Open Area Test Site Industry Canada Number: | 3463A-1 |
| Frequency Range (or fixed frequency) [MHz]: | 24075 – 24175 MHz (24130 MHz carrier) |
| RF Field strength (max): | Radiated: 108.3 dBµV/m@3m<br>Conducted: not performed |
| Antenna Type: | Patch antenna |
| Occupied Bandwidth (99% BW) [kHz]: | 1.0 |
| Type of Modulation: | N0N |
| Emission Designator (TRC-43): | 1K00N0N (single carrier) |
| Transmitter Spurious (worst case) [µV/m in 3m]: | < 500 µV/m @ 3m |
| Receiver Spurious (worst case) [µV/m in 3m]: | -/- |

**ATTESTATION:**
**DECLARATION OF COMPLIANCE:**
I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Signature:



Date: 2007-03-26

Test engineer: Harro Ames

## 1.2 Testing laboratory

CETECOM ICT Services GmbH
Untertürkheimerstraße 6–10
D-66117 Saarbrücken
Germany

Telephone : + 49 (0) 681 598–0
Fax : + 49 (0) 681 598–9075
e-mail : info@ict.cetecom.de
Internet : http://www.cetecom-ict.de

Accredited testing laboratory
Accredited by : Regulierungsbehörde für Telekommunikation und Post (RegTP)
Listed by : Federal Communications Commission (FCC)
Industry Canada (IC)

| Authority | Identification/Registration No. |
|---|---|
| RegTP | DAT-P-176/94-D1 |
| FCC | 90462 |
| IC | IC 3463A-1 |

Testing location, if different from CETECOM ICT Services GmbH: (Not applicable)

## 1.3 Details of applicant

| | | |
|---|---|---|
| Name | : | Carlo Gavazzi Logistics SpA |
| Street | : | Via Milano, 13 |
| Town | : | 20020 Lainate (MI) |
| Country | : | Italy |
| Phone | : | +39.02.931.76.1 |
| Fax | : | +39.02.931.76.301 |

Contact person

| | | |
|---|---|---|
| Name | : | Liviano Vicentini |
| Phone | : | +39.02.931.76.216 |
| Fax | : | +39.02.931.76.207 |
| E–Mail | : | liviano.vicentini@gavazziacbu.it |

## 1.4 Application details

| | | |
|---|---|---|
| Date of receipt of application | : | 2007-03-14 |
| Date of receipt of test item | : | 2007-03-14 |
| Date of test | : | 2007-03-19 and 2007-03-20 |
| Person(s) who have been present during the test | : | -/- |

## 1.5 Equipment under test (EUT)

| | | |
|---|---|---|
| Description | : | Field disturbance sensor |
| Type designation | : | RAD-01 |
| Manufacturer | | |
| Name | : | Carlo Gavazzi Logistics SpA |
| Street | : | Via Milano, 13 |
| Town | : | 20020 Lainate (MI) |
| Country | : | Italy |

## 1.6 Technical data

| | | |
|---|---|---|
| Frequency range | : | 24.075 GHz to 24.175 GHz |
| Operational frequency | : | 24.130 GHz |
| Field strength PEP | : | 108.3 dBµV/m @ 3 m |
| Type of modulation | : | N0N |
| Antenna | : | Patch antenna (see photographs) |
| Pulse period | : | CW carrier |
| Microwave modules | : | TX / RX – Module with integral antenna (patch antenna) |
| Normal power supply (U nom) | : | 12.0 - 24.0 V AC/DC |
| Extreme power supply | : | 12.0 - 24.0 V AC ±10 %<br>12.0 - 24.0 V DC +30 % / -10 % |

### 1.6.1 Operation conditions

| | | |
|---|---|---|
| Operation | : | As soon as the equipment is powered up, TX and RX start operating |

### 1.6.2 Equipment under test

RAD-01

## 1.7 Test standards

| | |
|---|---|
| | Code of Federal Regulations (CFR 47)<br>Federal Communications Commission (FCC) |
| FCC Part 15 | Radio Frequency Devices |
| | SECTION 15.245<br>Operation within the band 24.075 GHz to 24.175 GHz |
| | SECTION 15.205<br>Restricted bands of operation. |
| | SECTION 15.209<br>Radiation emission limits, general requirements |
| RSS-210 | Issue 6<br>Annex 7 |

# 2 Technical test

## 2.1 Summary of test results

[X] No deviations from the technical specification (s) were ascertained in the course of the performed tests.

[ ] The deviations as specified in 2.5 were ascertained in the course of the performed tests.

This test report:

[X] describes the first test

[ ] describes an additional test

[ ] is a verification of documents

[ ] is only valid with the test report no.

## 2.2 Test environment

The environmental conditions are documented especially for each test.

## 2.3 Measurement and test set-up

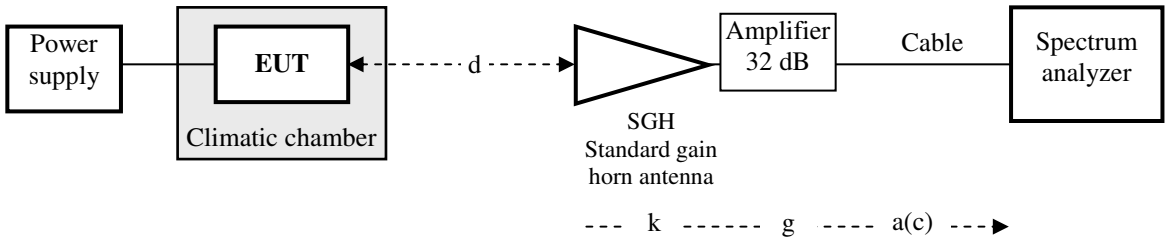
The measurement and test set-up is defined in the technical specification.

## 2.4 Measurement uncertainty

| Test parameter | Measurement uncertainty |
|---|---|
| Power supply | ±0.1 VDC |
| Temperature | ±0.2 °C |
| Frequency | ±0.01 ppm |
| Field strength <50 GHz | ±1.0 dB |
| Field strength >50 GHz | ±3.0 dB |

## 2.5 Test equipment utilized and test set-up

### 2.5.1 Field strength measurement of fundamental and spurious radiation in the frequency range 0.9 GHz to 33 GHz



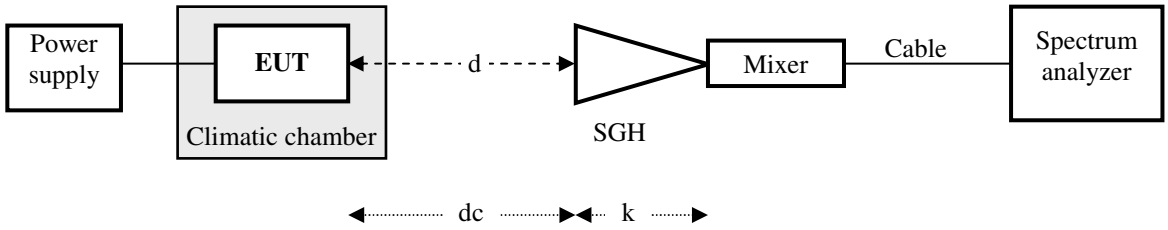

| Frequency f [GHz] | Distance d [m] | Antenna factor k [dB(1/m)] | Amp.gain g [dB] | Cable loss a(c) [dB] |
|---|---|---|---|---|
| 12.0 to 18.0 | 3.0 | 33.97 | 32.0 | 2.0 ... 2.7 |
| 18.0 to 26.5 | 3.0 | 36.73 | 32.0 | 2.7 ... 3.0 |
| 26.5 to 33.0 | 3.0 | 40.29 | 32.0 to 28.0 | 3.0 ... 3.2 |

Calculation:

| Field strength | = | analyser reading | + | cable loss | - | amplifier gain | + | antenna factor |
|---|---|---|---|---|---|---|---|---|
| e [dB(µV/m)] | = | u [dB(µV)] | + | a [dB] | - | g [dB] | + | k [dB(1/m)] |

| Test equipment | Manufacturer | Type | CETECOM reference |
|---|---|---|---|
| Spectrum Analyzer | HP | HP 8565E | 300000916 |
| SGH 12.0 to 18.0 GHz | narda | 639 | 300000787 |
| SGH 18.0 to 26.5 GHz | flann | 2024-20 | 300001968 |
| SHG 26.5 to 40.0 GHz | flann | 2224-20 | 300001973 |
| Amplifier 0.1 to 26.5 GHz | HP | HP 83017A | 300002267 |
| Climatic chamber | Vötsch | VUK 04/500 | 300000297 |
| DC Power supply | HP | HP 6038A | 300001174 |
| RF-cable | Insulated Wire Inc. | KPS-1533-590 | 300002290 |

### 2.5.2 Field strength and spurious radiation in the frequency range 33 GHz to 110 GHz




| Frequency range [GHz] | Distance d [m] | Distance correction dc (3 m/Xm) [dB] | Antenna factor k [dB 1/m] |
|---|---|---|---|
| 33.0 ..... 50.0 | 0.250 | -21.60 | 39.00 |
| 50.0 ..... 75.0 | 0.125 | -27.60 | 40.70 |
| 75.0 ... 110.0 | 0.125 | -27.60 | 45.10 |

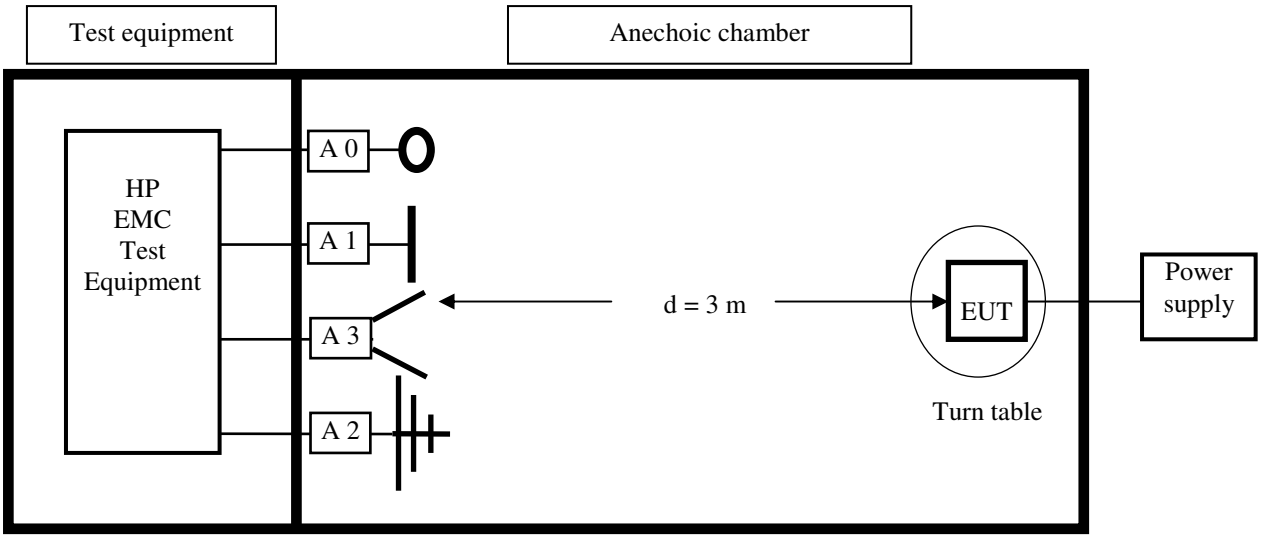
Calculation: Field strength = analyser reading + antenna factor - distance correction
e [dB(µV/m)] = u [dB(µV)] + k [dB(1/m)] - d [dB]

Remark: Cable loss is automatically taken into account if the S.A. is operating with external mixers

| Test equipment | Manufacturer | Type | CETECOM reference |
|---|---|---|---|
| Spectrum Analyzer | HP | HP 8565E | 300000916 |
| Power supply | HP | HP 6038A | 300001174 |
| SGH 33 ... 50 GHz | Thomson | COR 33_50 | 300000812 |
| Mixer 33 ... 50 GHz | HP | 11970Q | 300000781j |
| SGH 50 ... 75 GHz | Thomson | COR 50_75 | 300000789k |
| Mixer 50 ... 75 GHz | HP | 11970V | 300000871o |
| SGH 75 ... 110 GHz | Thomson | COR 75_110 | 300000789m |
| Mixer 75 ... 110 GHz | HP | 11970W | 300000871v |

### 2.5.3 Field strength and spurious radiation in the frequency range 9 kHz to 12 GHz

Set-up for radiated measurements




| Test equipment | Manufacturer | Type | Serial No. |
|---|---|---|---|
| Spectrum analyzer | HP | HP 85660B | 2478A05306 |
| Analyzer display | HP | HP 85662A | 2816A16541 |
| Quasi peak adapter | HP | HP 85650A | 2811A01131 |
| RF-preselector | HP | HP 85685A | 2833A00768 |
| Loop Antenna A 0 | R&S | HFH 2–Z2 | 881 058/42 |
| Biconical antenna A 1 | Emco | 3104 | 3758 |
| Log.-per.-antenna A 2 | Emco | 3146 | 2304 |
| Double ridge horn ant. A 3 | Emco | 3115 | 3007 |
| Relay switch | R&S | RSU | 375 339/002 |
| High pass filter | FSY Microwave | HM 985955 | 001 |
| Amplifier | Tron-Tech | P42-GA29 | B2302 |
| DC Power supply | HP | HP 6038A | 300001174 |
| RF-cable | HP | 5061-5359 | P36303 |

## 2.6 Test results

### 2.6.1 Test results overview

This test was performed:

☐ in addition to the test report no.

Verification of EUT:

☒ EUT is in accordance with the technical description

☐ EUT is not in accordance with the technical description

☒ The equipment is compliant to FCC requirement

### 2.6.2 Remarks on methods of measurements

The EUT is positioned in a non-conductive test fixture and can be rotated and tilted in all angles and in all planes.

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 110 GHz in semi-anechoic and fully-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-1992 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test set–ups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths (RBW) over various frequency ranges are set according to requirement ANSI C63-4-1992 clause 4.2.

1. Measurements of ERP/EIRP at fundamental and spurious frequencies

Spurious frequencies are produced by transmitter and receiver when the EUT is active. According to FCC requirements 15.209, spurious emissions have to be investigated as maximum field strength values in the frequency range from 9 kHz to 1000 MHz. Where possible, the measurement distance shall be 3 m. If other distances are used, the distance correction is added to the test result.

In the low frequency range (9 kHz to 30 MHz), the receiving antenna is an active loop antenna which is positioned at 3 m distance in a shielded, anechoic chamber (see page 11). In case of required measuring distances > 3 m, a distance correction factor is used to calculate the received field strength.

Spurious EIRP measurements in the frequency range 1000 MHz to 4 GHz are carried out in a shielded anechoic test chamber. The measurement distance is 3.0 m.

In the frequency range 4 GHz to 40 GHz, spurious EIRP measurements are performed in a shielded fully anechoic chamber with rectangular SGHs. The measurement distances are indicated underneath each plot, and a calculation for field strength is added, where all relevant factors like cable losses, antenna factors, etc are taken into account.

### 2.6.3 Test results in details

Equipment under test (EUT): see page 5
Ambient temperature: 23 °C
Relative humidity: 55 %

TRANSMITTER PARAMETERS SECTION 15.245

Fundamental frequency

Microwave module: RAD-01

| Test condition t = 23.0 ° C | TRANSMITTER FIELD STRENGTH | | | |
|---|---|---|---|---|
| EUT operating: TX on and RX on DC power supply | Frequency f [GHz] | S.A. e [dBµV/m] @ 3 m | Field strength e [dBµV/m] @ 3 m | See plot no.: |
| U DC = 15.0 | 24.130 | 101.8 plus correction factor of 6.5 dB (see page 9) | 108.3 | 1 |

REFERENCE OF TEST EQUIPMENT USED: see test set-up on page 9-11

LIMITS: SECTION 15.245

| Frequency range (GHz) | Measurement distance [m] | Field strength e [dBµV/m] @ 3 m | Field strength E [µV/m] |
|---|---|---|---|
| 24.075 to 24.175 | 3 | 128.0 | 2 500 mV/m |
| Harmonics | 3 | 88.0 | 25 mV/m |

| Verdict: | Fundamental frequency e.i.r.p. limits are kept |
|---|---|

Equipment under test (EUT): see page 5
Ambient temperature: 23 °C
Relative humidity: 55 %

TRANSMITTER PARAMETERS SECTION 15.245
Spurious Frequencies SECTION 15.205 / 15.209

Microwave module: RAD-01

| Test condition t = 23.0 ° C | TRANSMITTER SPURIOUS FIELD STRENGTH | | | |
|---|---|---|---|---|
| Frequency range [GHz] | Spurious frequencies [GHz] | S A u [dBµV/m] | E [µV/m] | See plot no.: |
| 9 kHz to 30.0 MHz (h + v) horizontal and vertical plane | noise | n.a. | < Limit | 2 |
| 0.030 to 4.0 (h + v) | noise | 36.7 | < Limit | 3 |
| 4.0 to 12.0 (h + v) | noise | 38.1 | < Limit | 4 |
| 12.0 to 18.0 (h + v) | noise | 37.7 | < Limit | 5 |
| 18.0 to 24.075 (h + v) | noise | 44.2 | < Limit | 6 |
| 24.175 to 26.0 (h +v) | noise | 39.2 | < Limit | 7 |
| 26.0 to 33.0 (h + v) | noise | 45.2 | < Limit | 8 |
| 33.0 to 50.0 (h + v) | noise | 33.2 | < Limit | 9 |
| 50.0 to 75.0 (h + v) | noise | 42.2 | < Limit | 10 |
| 75.0 to 110.0 (h + v) | noise | 43.9 | < Limit | 11 |

LIMITS: SECTION 15.205 / 15.209 / 15.245

| Frequency range (MHz) | Measurement distance [m] | Field strength e [dBµV/m] @ 3 m | Field strength E [µV/m] |
|---|---|---|---|
| 0.009 – 0.490 | 300 | 88.5 ... 53.8 | 2400/F(kHz) |
| 0.490 – 1.705 | 30 | 53.8 ... 43.0 | 24000/F(kHz) |
| 1.705 – 30.00 | 30 | 49.5 | 30 |
| 30.00 – 88.00 | 3 | 40.0 | 100 |
| 88.00 – 216.0 | 3 | 43.5 | 150 |
| 216.0 – 960.0 | 3 | 46.0 | 200 |
| > 960.0 | 3 | 54.0 (AV) | 500 |
| > 960.0 | 3 | 74.0 (PK) | 5,000 |
| Harmonics | 3 | 68.0 | 2,500 |
| Harmonics >17,700 | 3 | 77.5 | 7,500 |

| Verdict: | Field strength limits are kept |
|---|---|

Equipment under test (EUT): see page 5
Ambient temperature: 23 °C
Relative humidity: 55 %

TRANSMITTER PARAMETERS

SECTION 15.245
SECTION 15.107 / 15.207

Microwave module: RAD-01

Test measurement:

| Frequency Range | Spurious frequency | SA u [dBmV] | E [µV/m] | See Plot No.: |
|---|---|---|---|---|
| 150.0 kHz – 30.0 MHz | noise | < limit | < limit | 12 |
| | | | | |

LIMITS:

FCC SECTION 15.107 / 15.207
ICRSS 210, Issue 4 Section 6.6, 7.4
CISPR 22

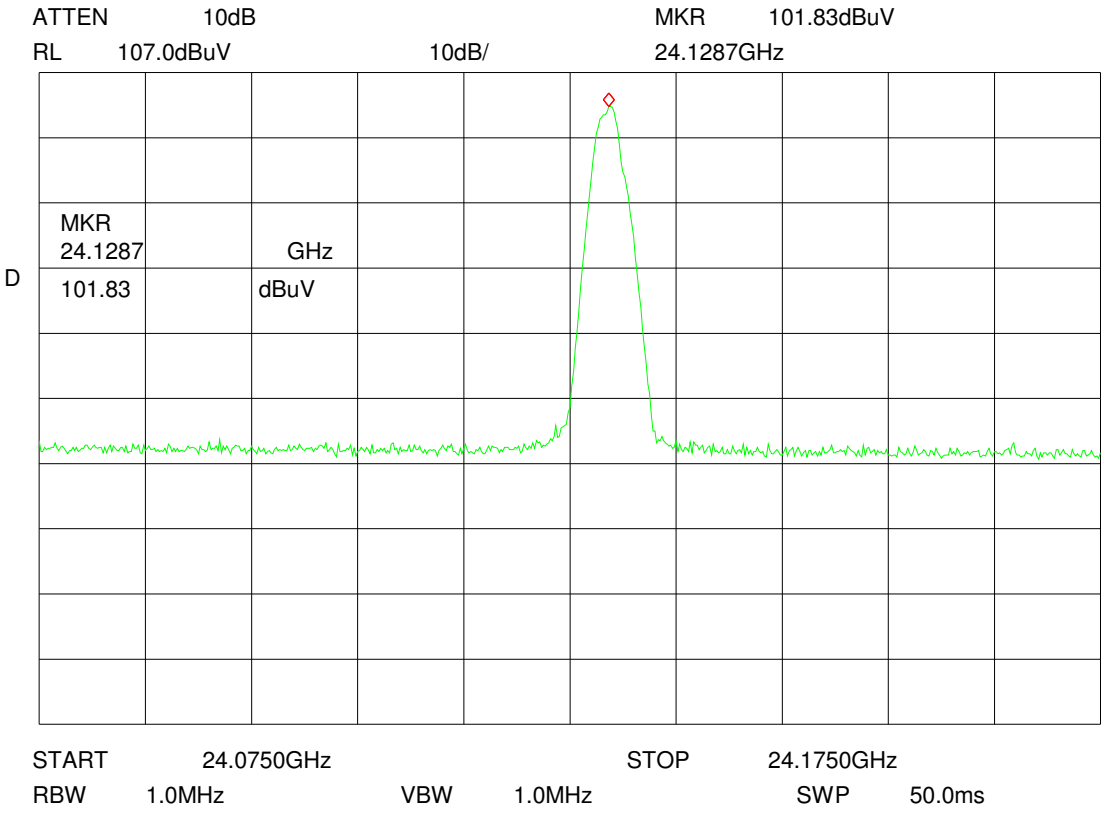
| Frequency of Emissions [MHz] | Conducted Limit [dBµV] | |
|---|---|---|
| | Quasi peak | Average |
| 0.150 – 0.500 | 66 to 56 * | 56 to 46 * |
| 0.500 – 5.000 | 56 | 46 |
| 5.000 – 30.000 | 60 | 50 |

* Decreases with the logarithm of the frequency

| Verdict: | AC conducted limits are kept |
|---|---|

# 3 Measurement results

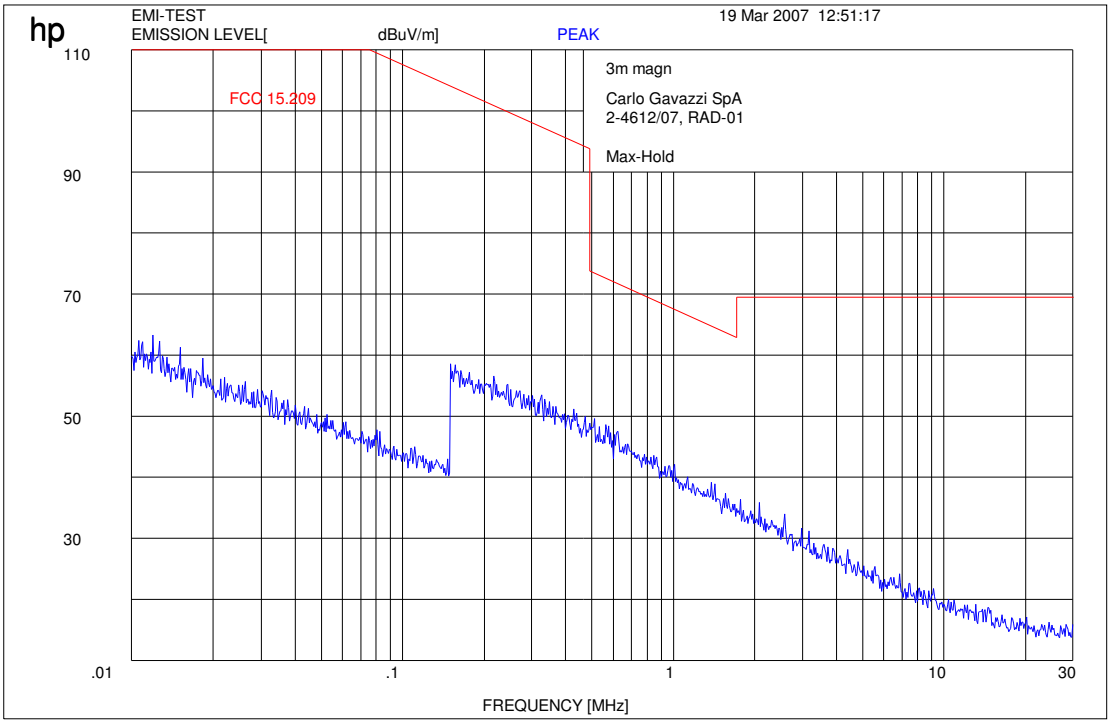
Plot no.: 1




Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
e [dB(µV/m)] = u [dB(µV)] + a [dB] - g [dB] + k [dB(1/m)]
see page 9-11

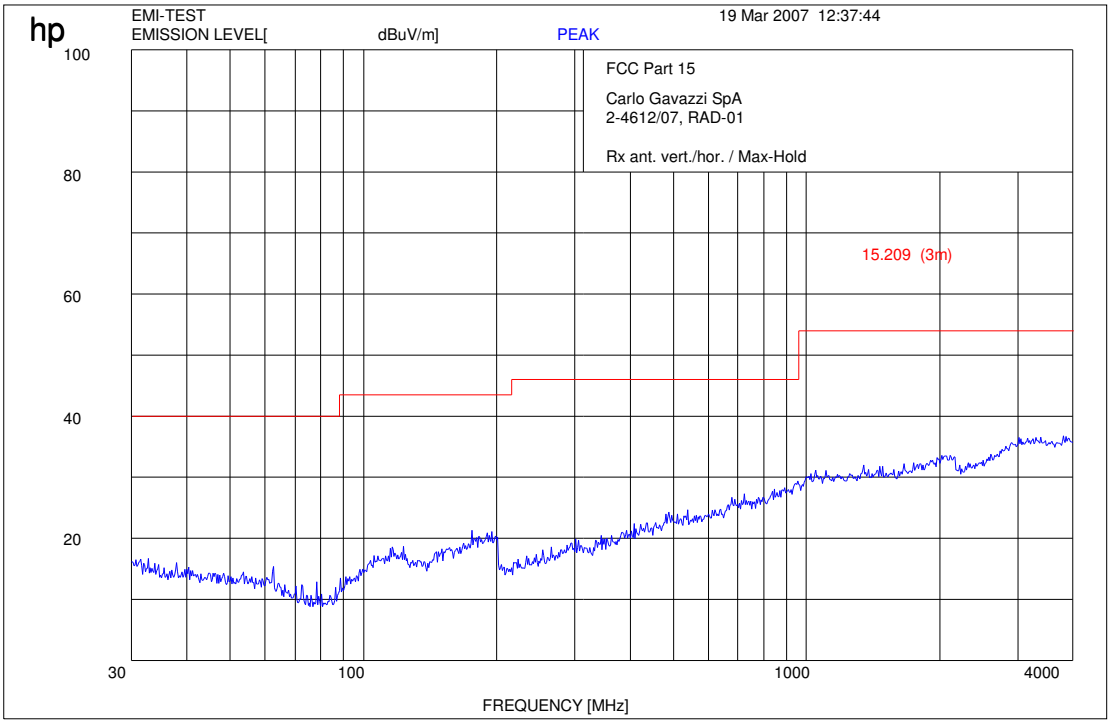
The offset (cable loss - amplifier gain + antenna factor) of 6.5 dB is NOT considered in the analyzer reading.

Plot no.: 2



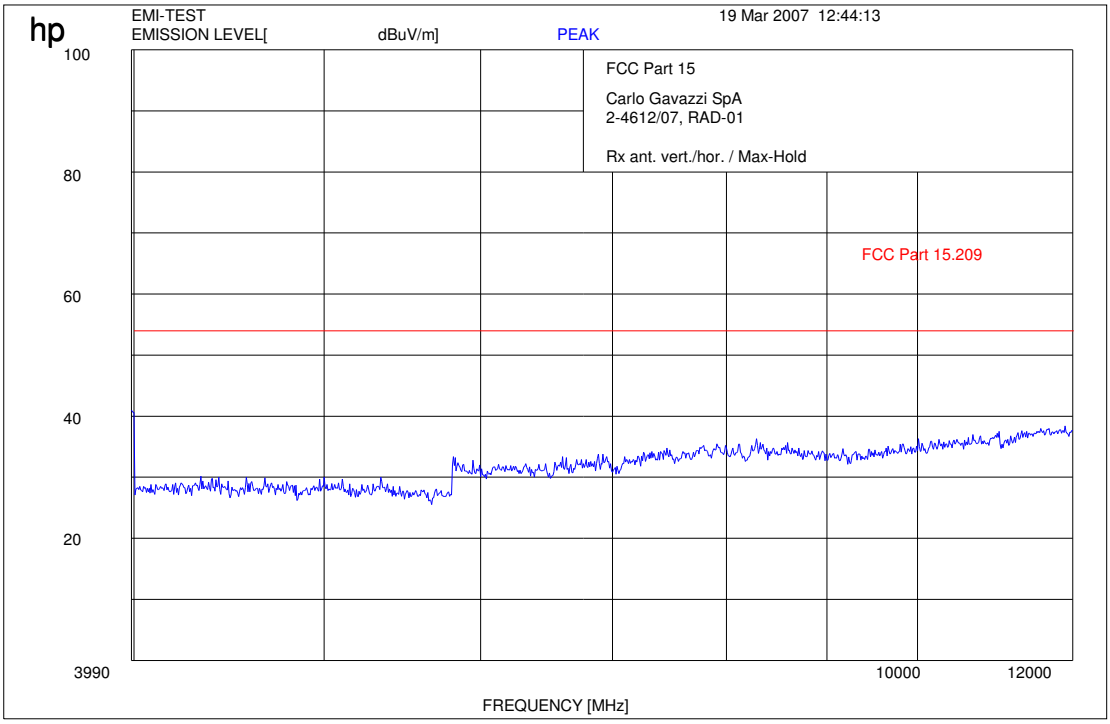

RBW / VBW: 200 Hz up to 150 kHz
9 kHz up to 30 MHz
120 kHz up to 1 GHz

Plot no.: 3



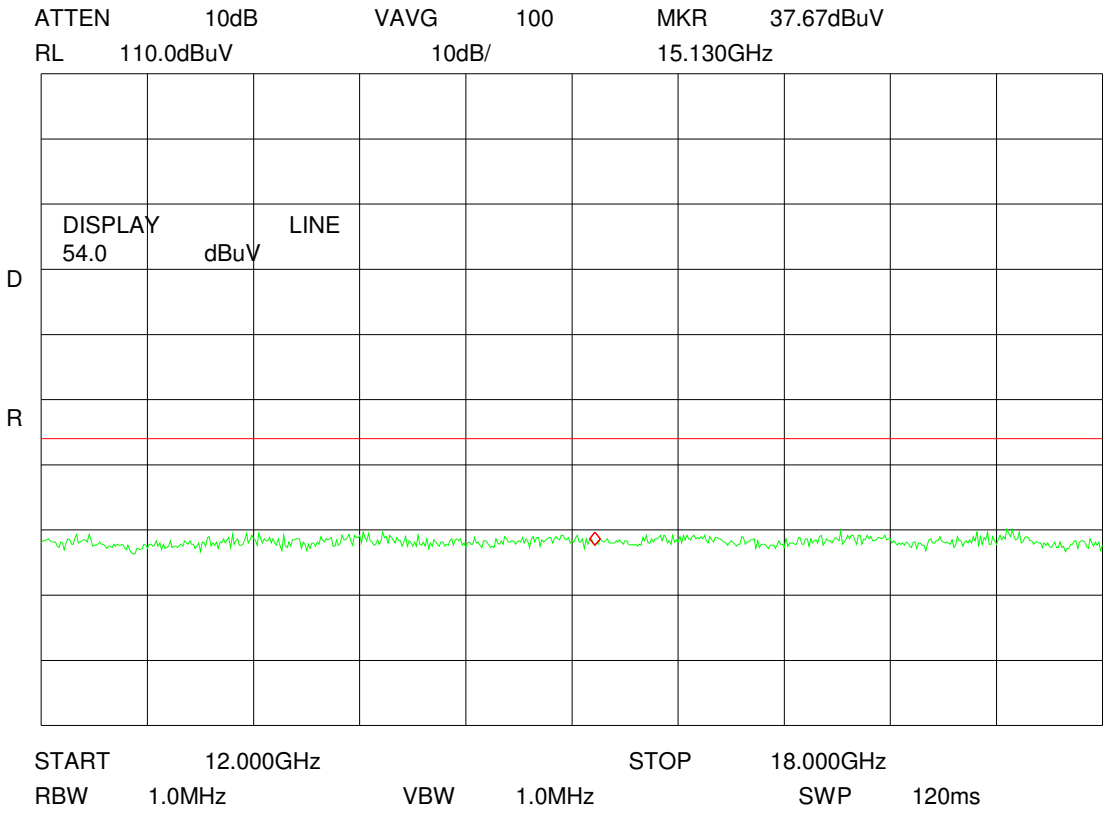

RBW / VBW: 120 kHz up to 1 GHz
1 MHz above 1 GHz

Plot no.: 4




RBW / VBW: 1 MHz above 1 GHz

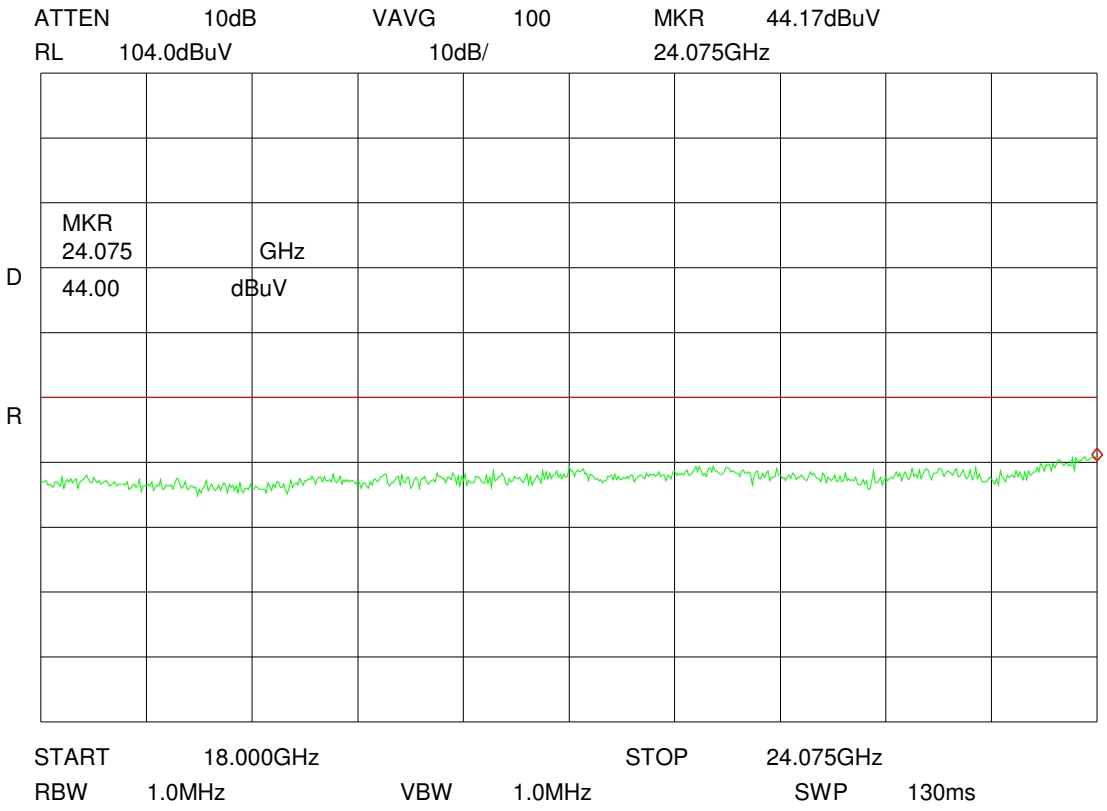
Plot no.: 5




Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
e [dB(µV/m)] = u [dB(µV)] + a [dB] - g [dB] + k [dB(1/m)]
see page 9-11

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

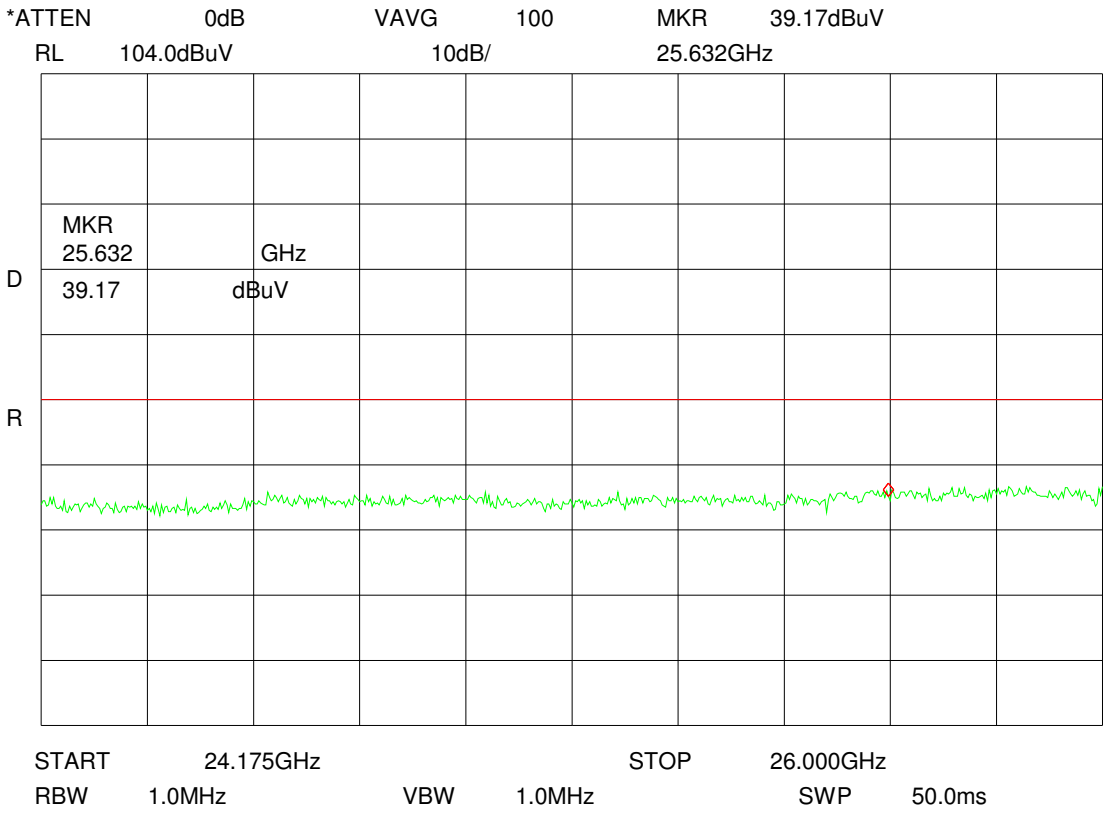
Plot no.: 6




Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
e [dB(µV/m)] = u [dB(µV)] + a [dB] - g [dB] + k [dB(1/m)]
see page 9-11

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

Plot no.: 7



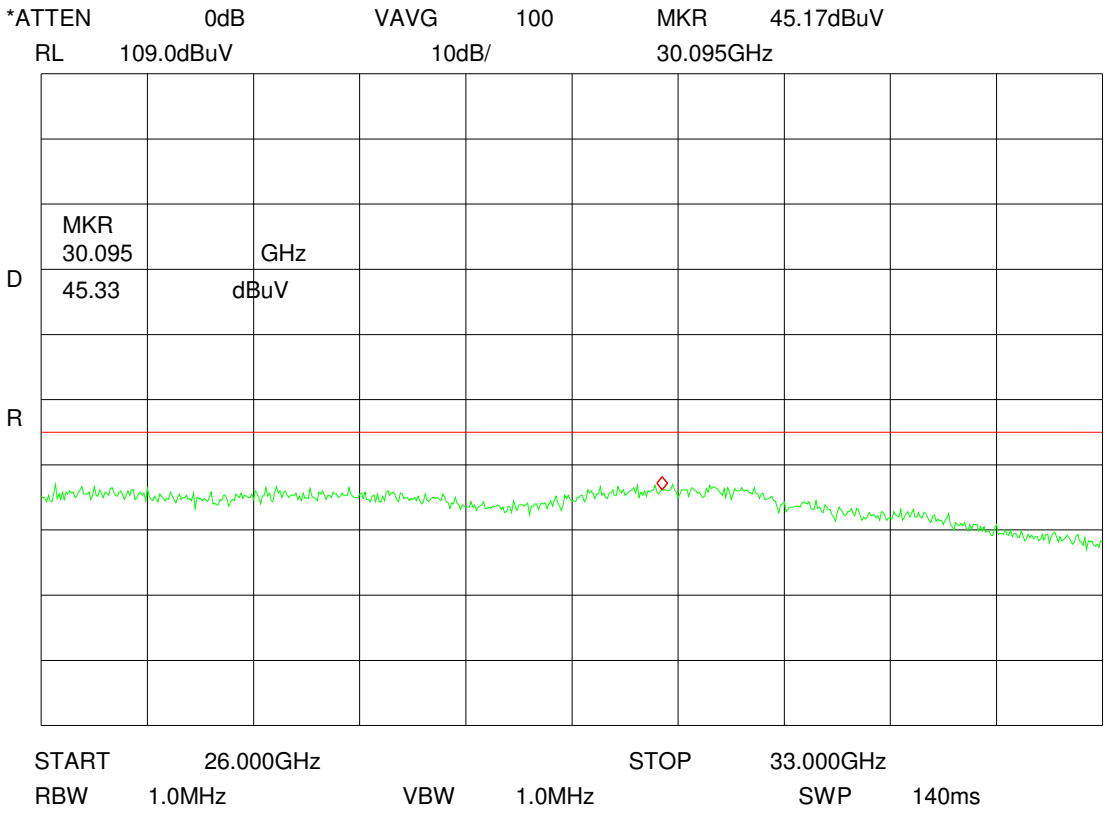

Calculation:

| Field strength | = | analyzer reading | + | cable loss | - | amplifier gain | + | antenna factor |
|---|---|---|---|---|---|---|---|---|
| e [dB(µV/m)] | = | u [dB(µV)] | + | a [dB] | - | g [dB] | + | k [dB(1/m)] |

see page 9-11

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

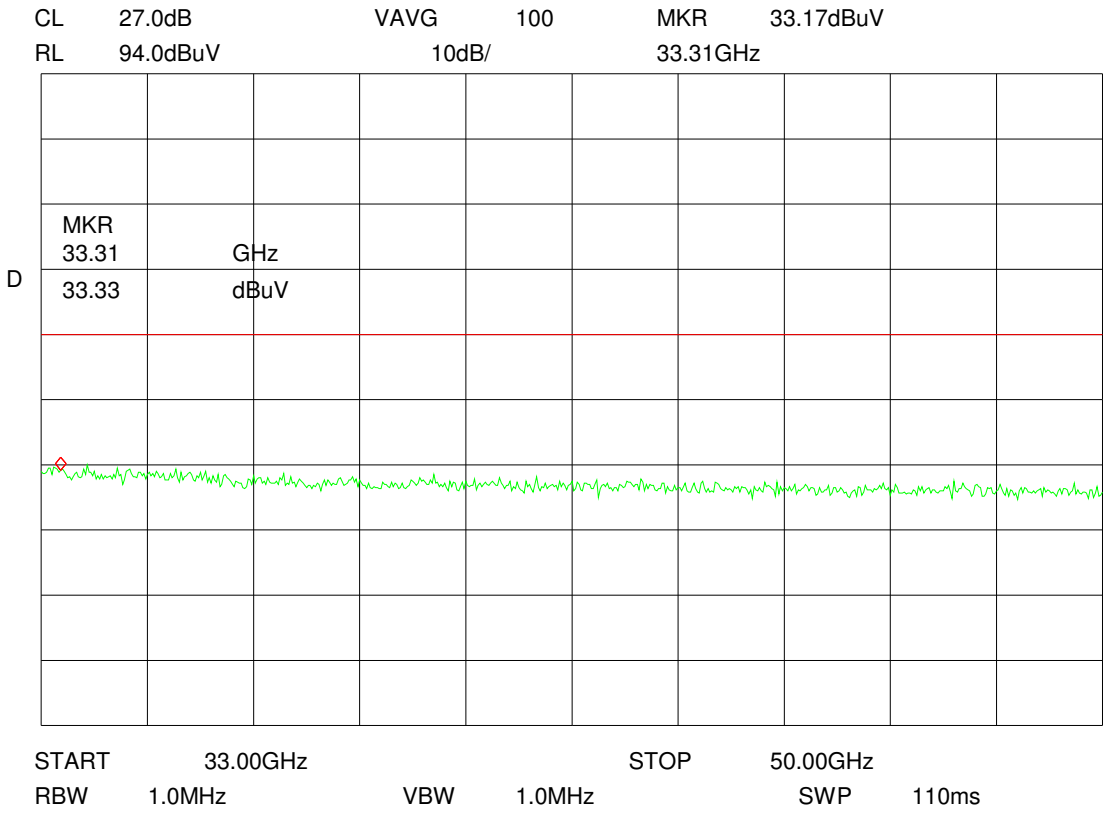
Plot no.: 8




Calculation: Field strength = analyzer reading + cable loss - amplifier gain + antenna factor
e [dB(µV/m)] = u [dB(µV)] + a [dB] - g [dB] + k [dB(1/m)]
see page 9-11

The offset (cable loss - amplifier gain + antenna factor) is calculated in the analyzer reading.

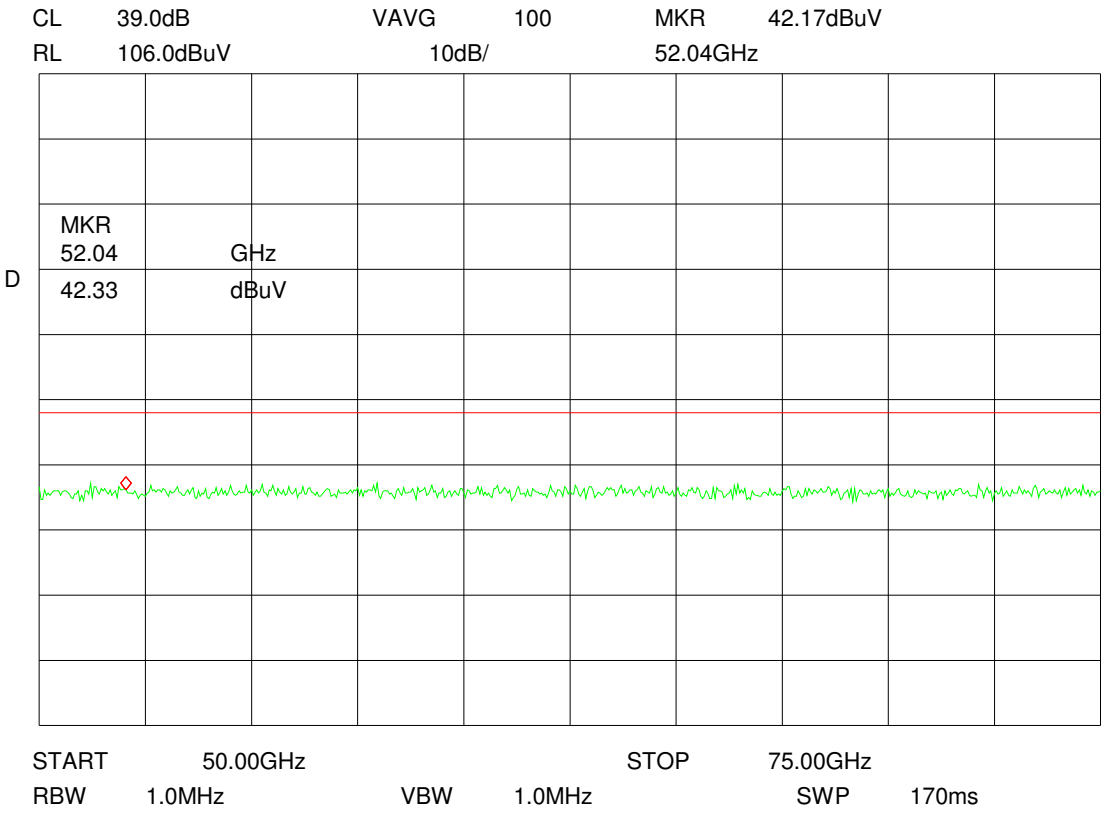
Plot no.: 9




Calculation: Field strength = analyser reading + antenna factor - distance correction
e [dB(µV/m)] = u [dB(µV)] + k [dB(1/m)] - d [dB]
see page 9-11

The offset (antenna factor - distance correction) is considered in the analyzer reading.

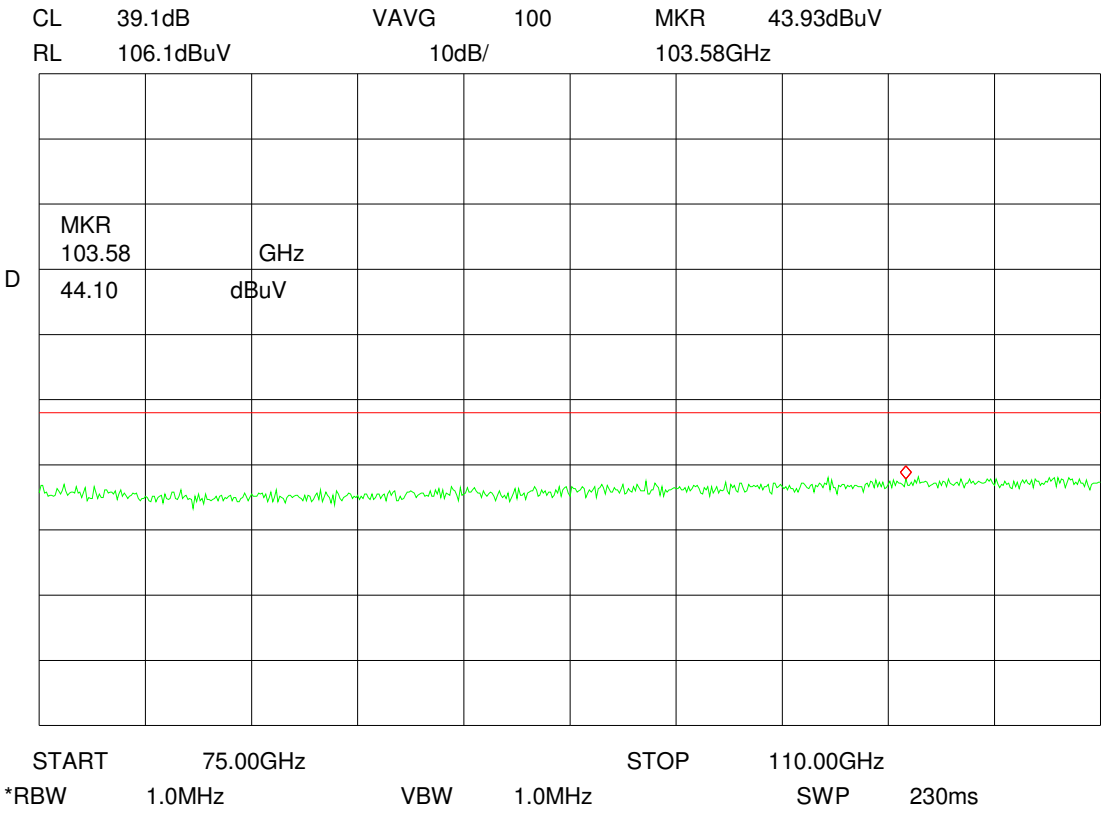
Plot no.: 10




Calculation: Field strength = analyser reading + antenna factor - distance correction
e [dB(µV/m)] = u [dB(µV)] + k [dB(1/m)] - d [dB]
see page 9-11

The offset (antenna factor - distance correction) is considered in the analyzer reading.

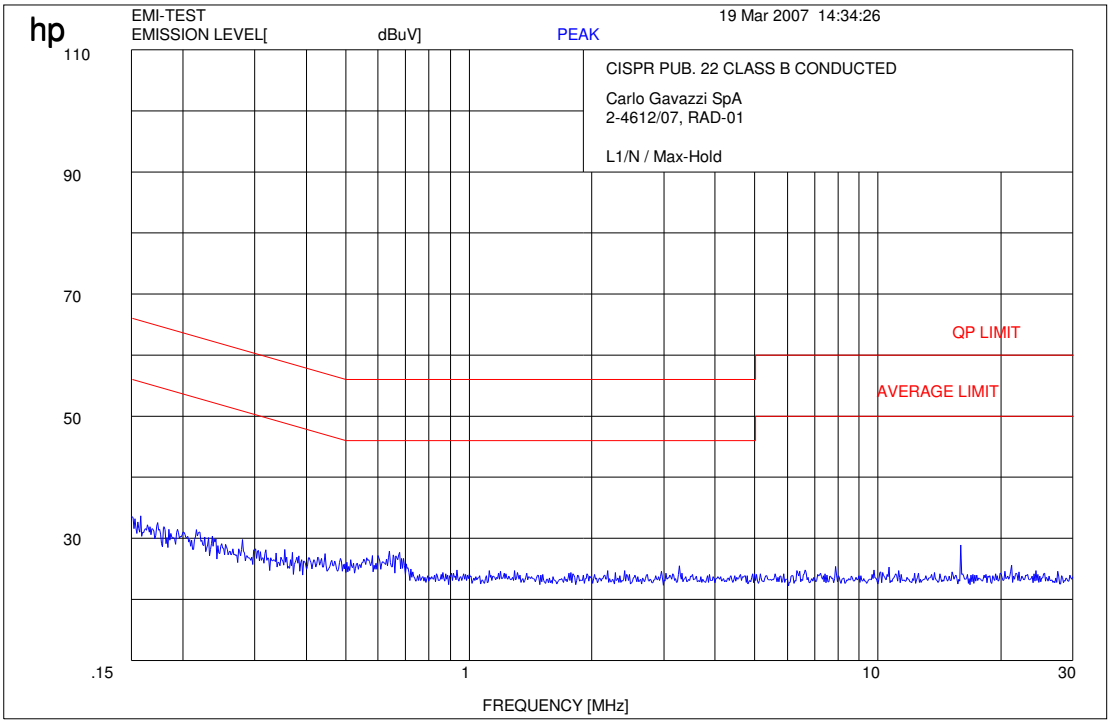
Plot no.: 11




Calculation: Field strength = analyser reading + antenna factor - distance correction
e [dB(µV/m)] = u [dB(µV)] + k [dB(1/m)] - d [dB]
see page 9-11

The offset (antenna factor - distance correction) is considered in the analyzer reading.

Plot no.: 12


hp
EMI-TEST
EMISSION LEVEL[ dBuV]
PEAK
19 Mar 2007 14:34:26
CISPR PUB. 22 CLASS B CONDUCTED
Carlo Gavazzi SpA
2-4612/07, RAD-01
L1/N / Max-Hold
QP LIMIT
AVERAGE LIMIT
110
90
70
50
30
.15
1
10
30
FREQUENCY [MHz]

# 4 Photographs

Photo no.: 1

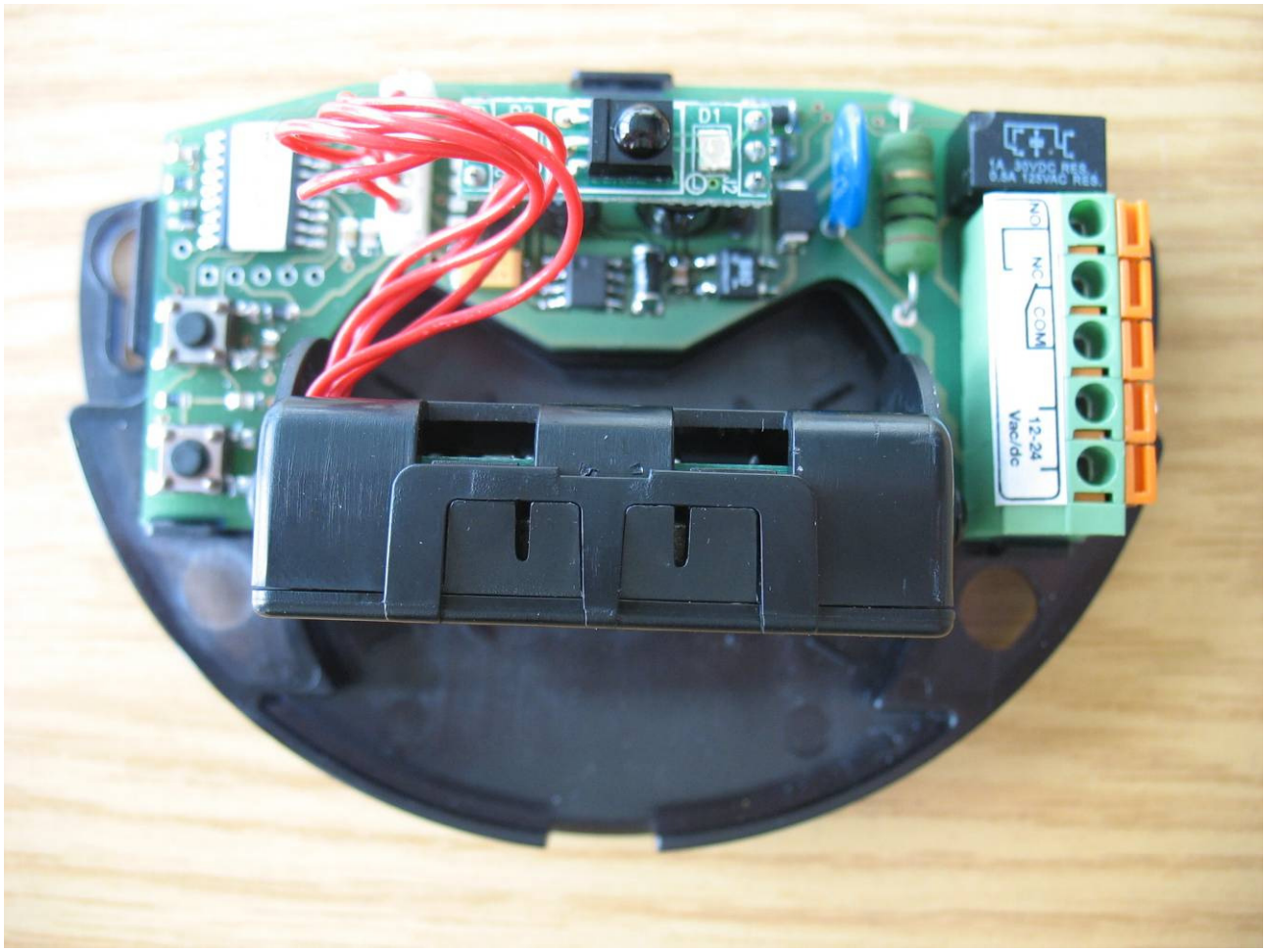


Photo no.: 2

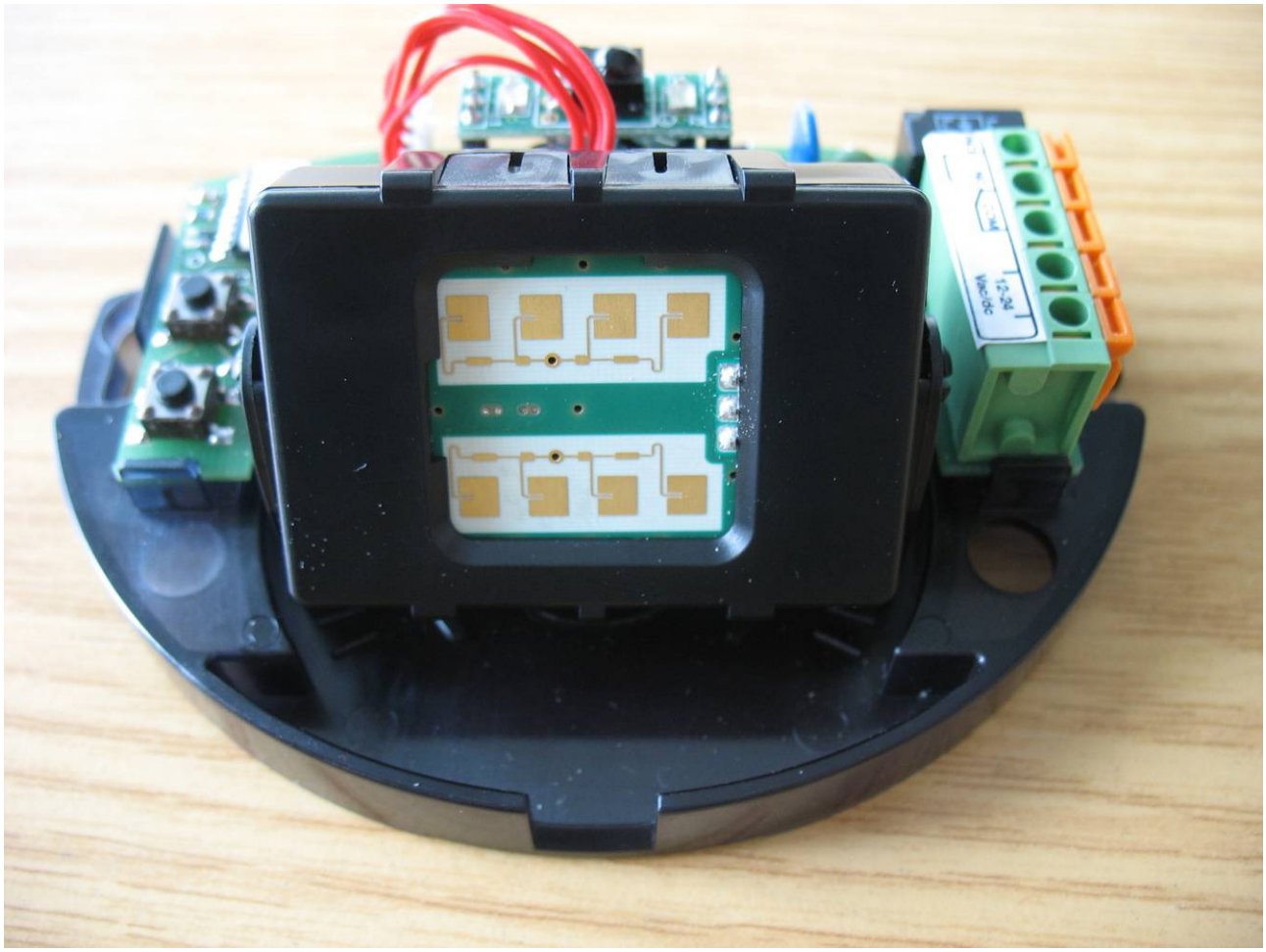


Photo no.: 3

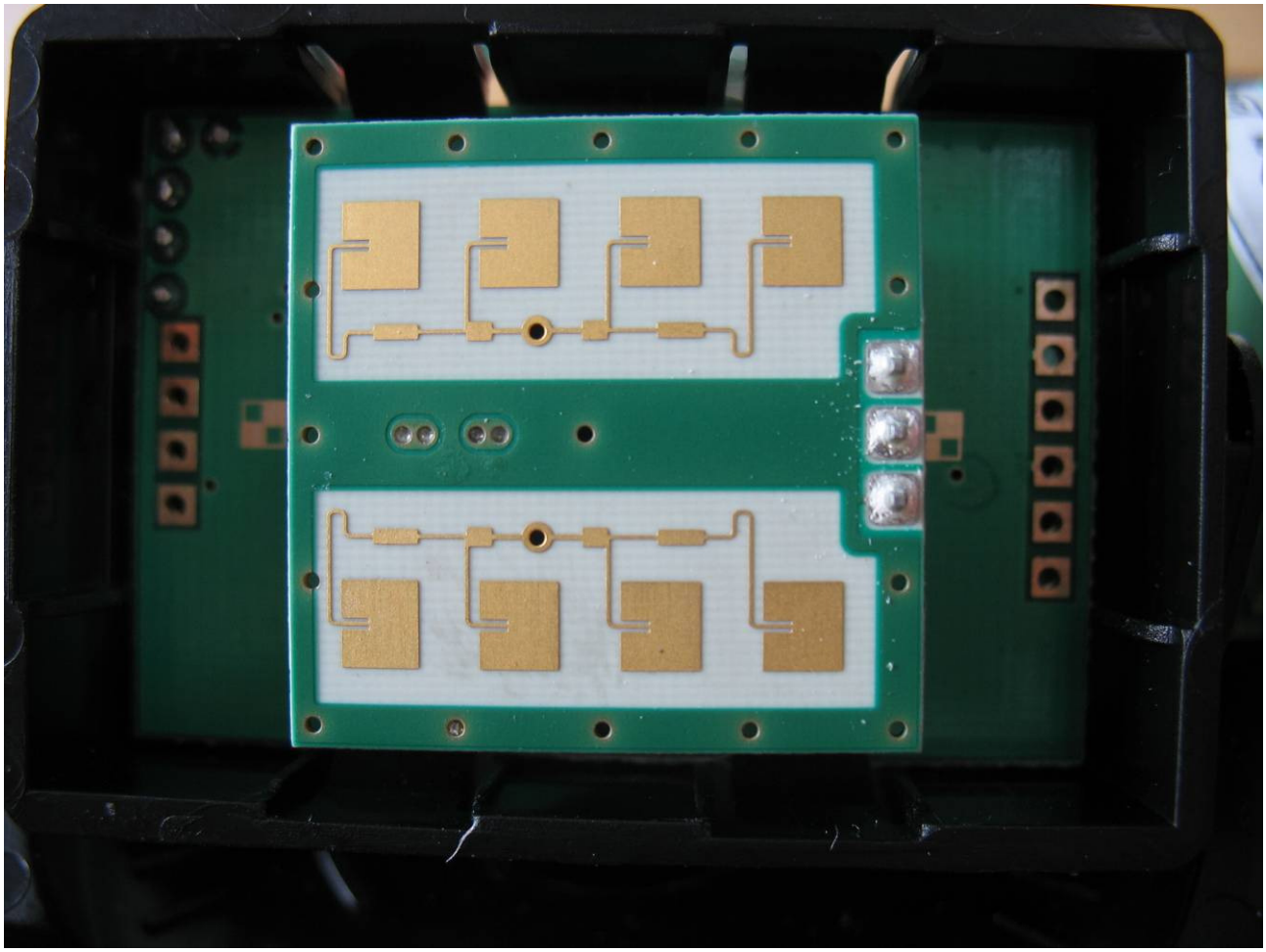


Photo no.: 4

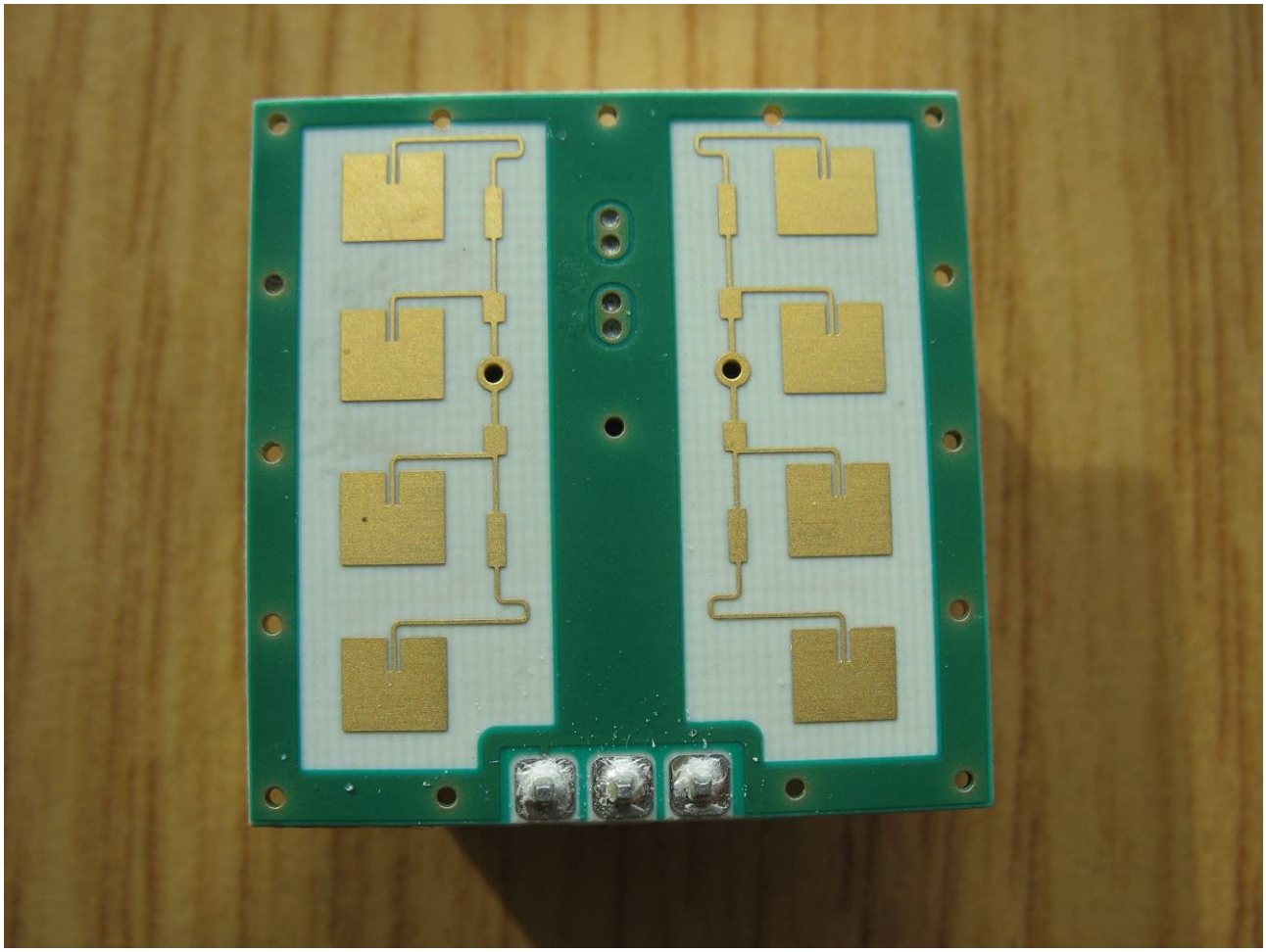


Photo no.: 5

Photo no.: 6

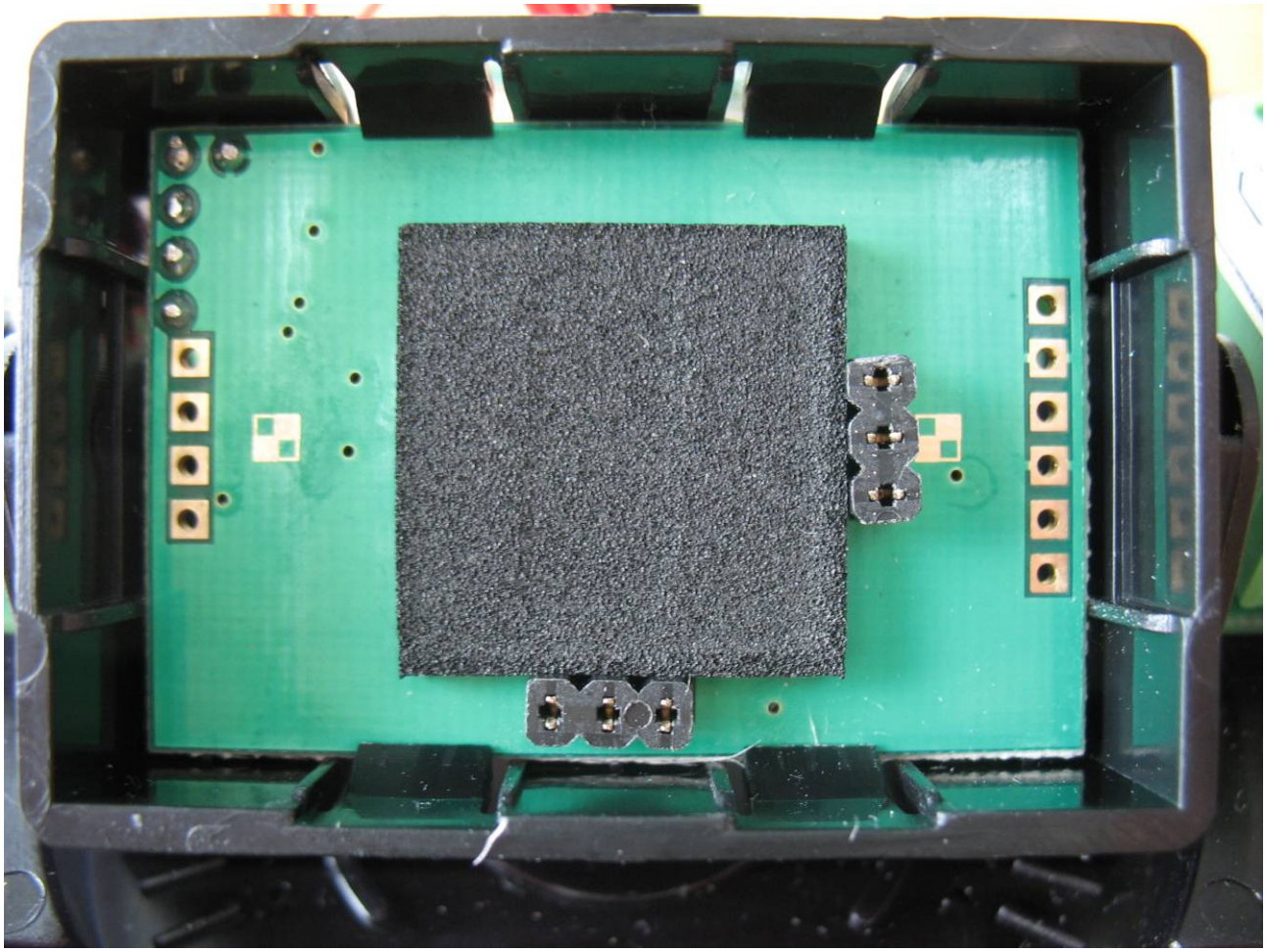


Photo no.: 7

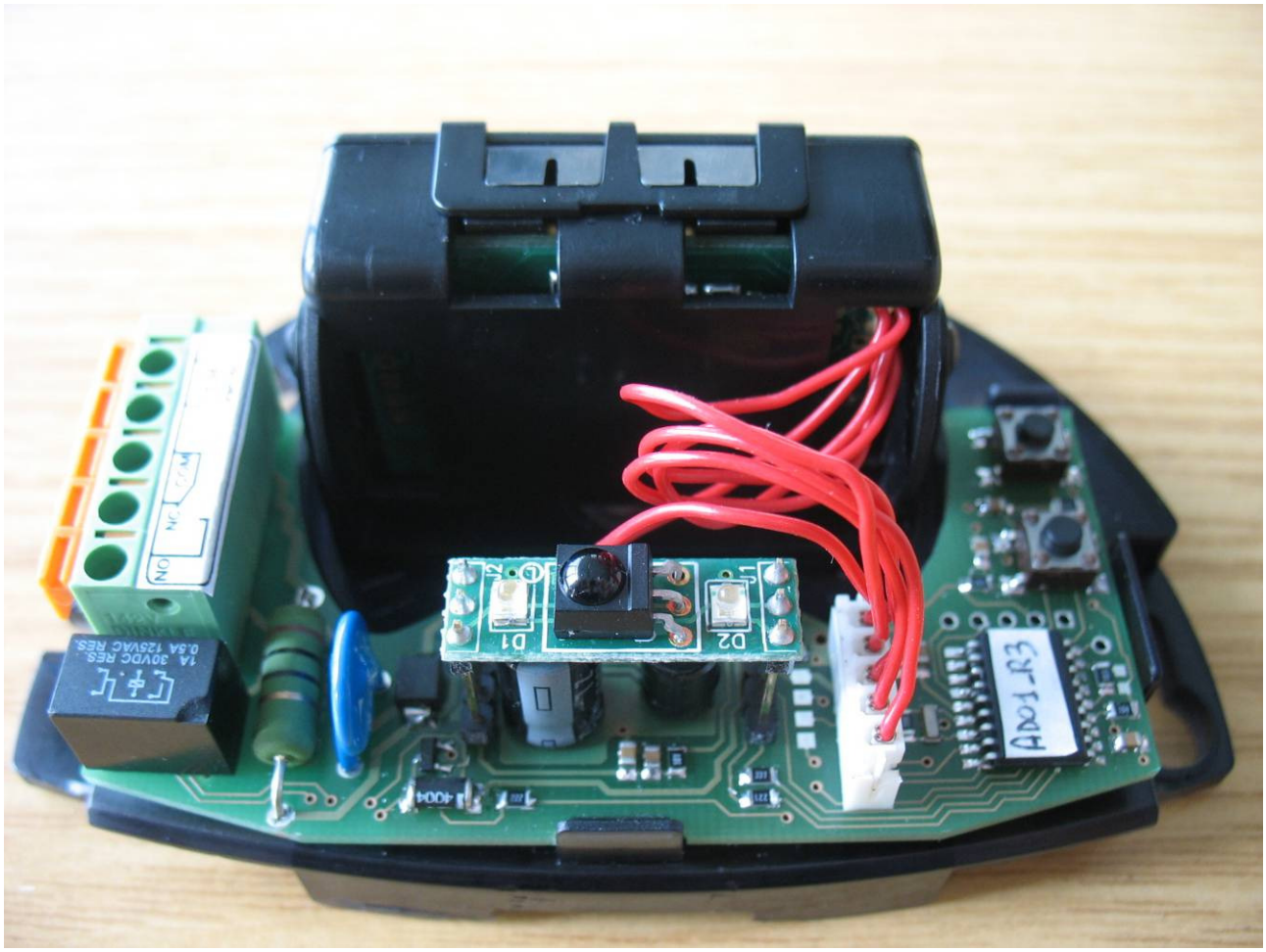


Photo no.: 8

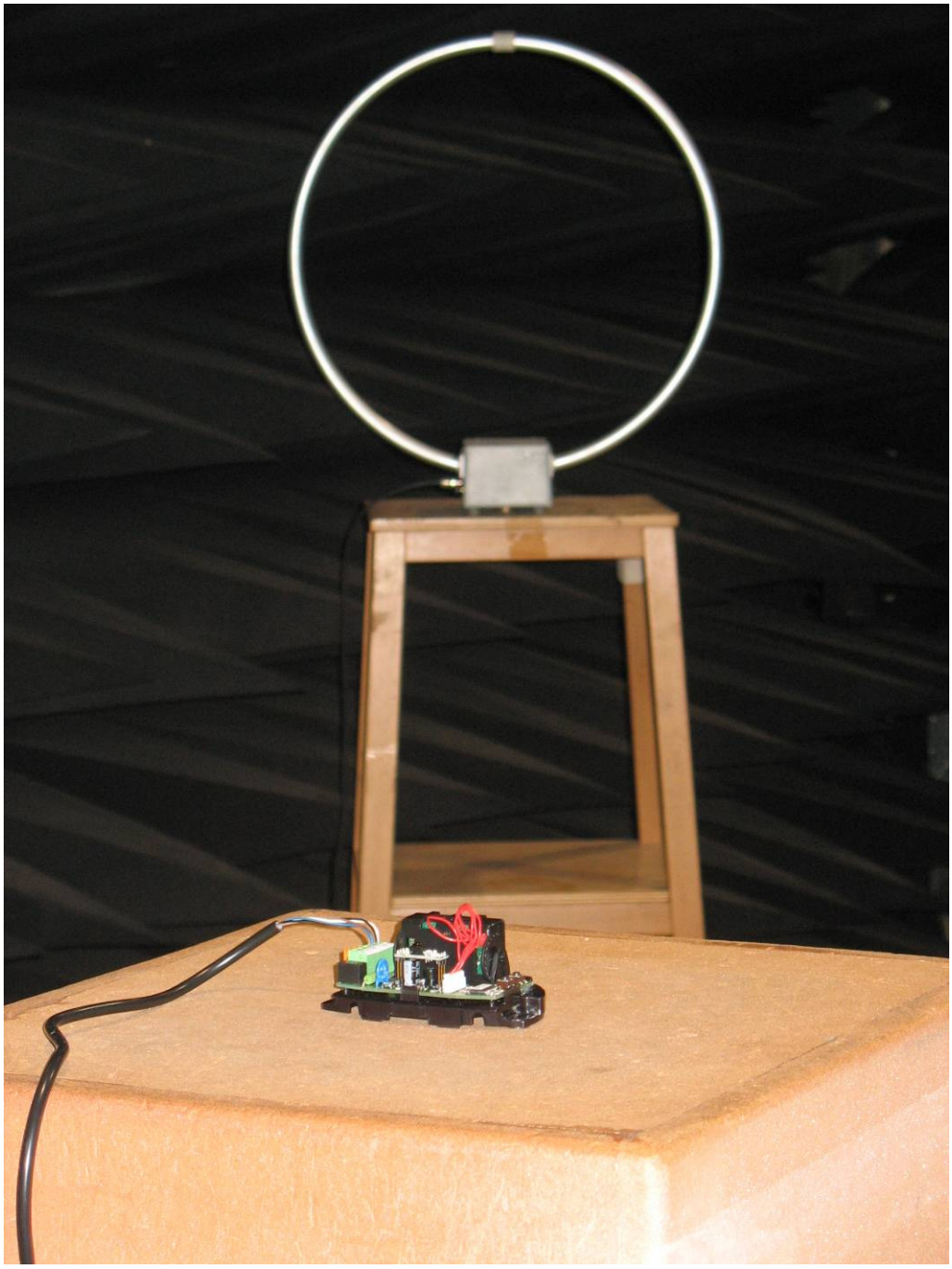


Photo no.: 9

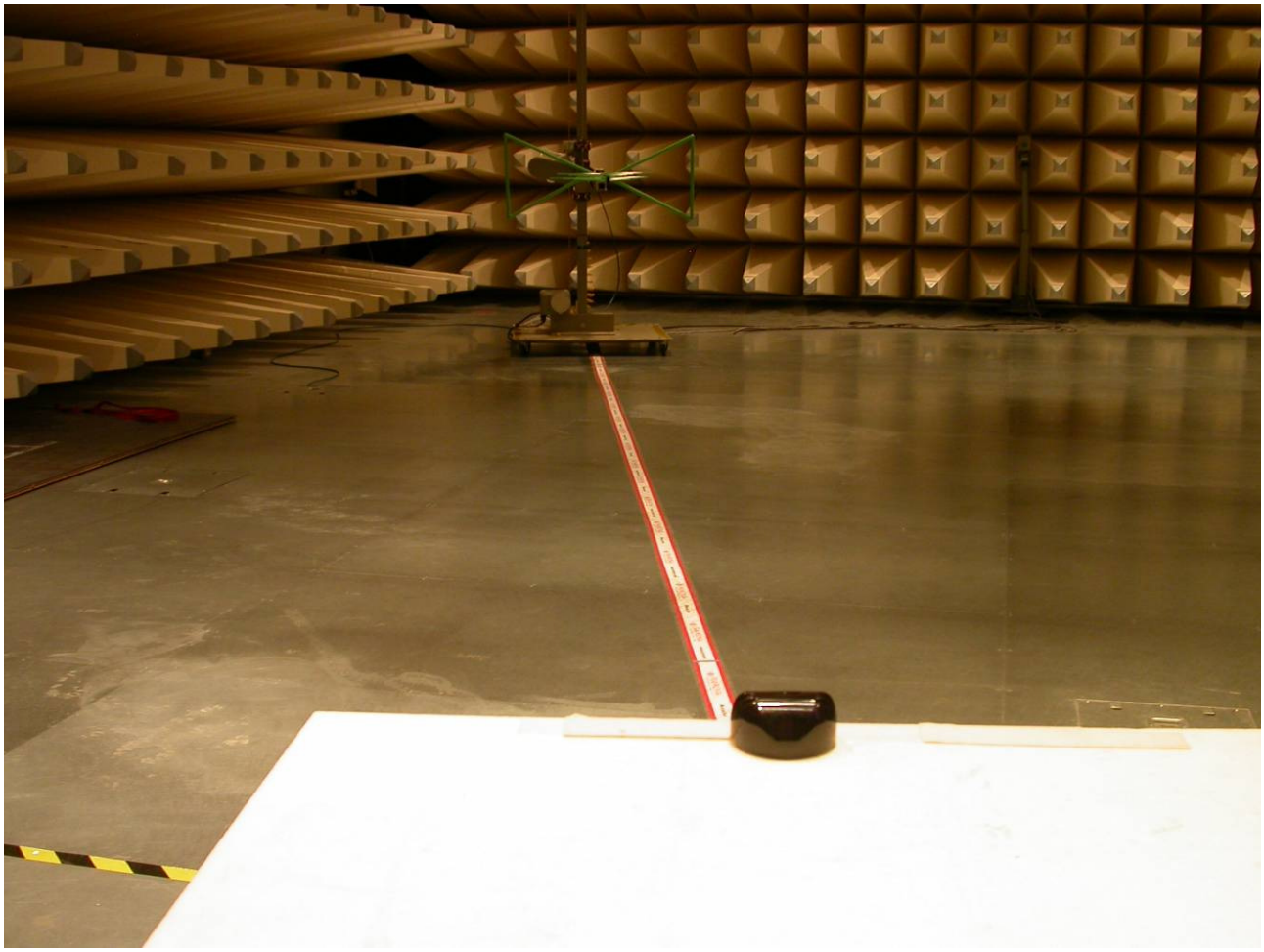


Photo no.: 10

Photo no.: 11

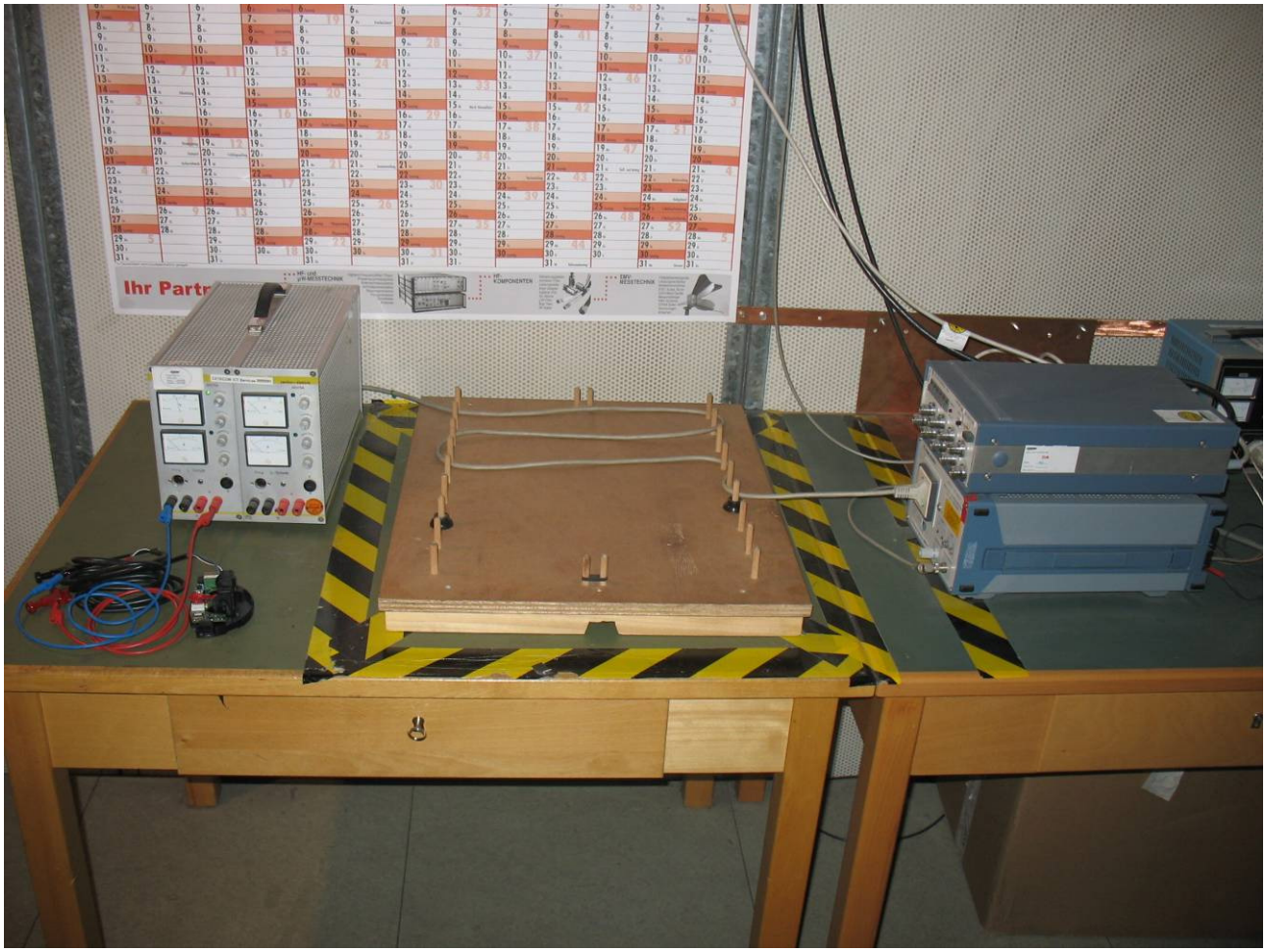
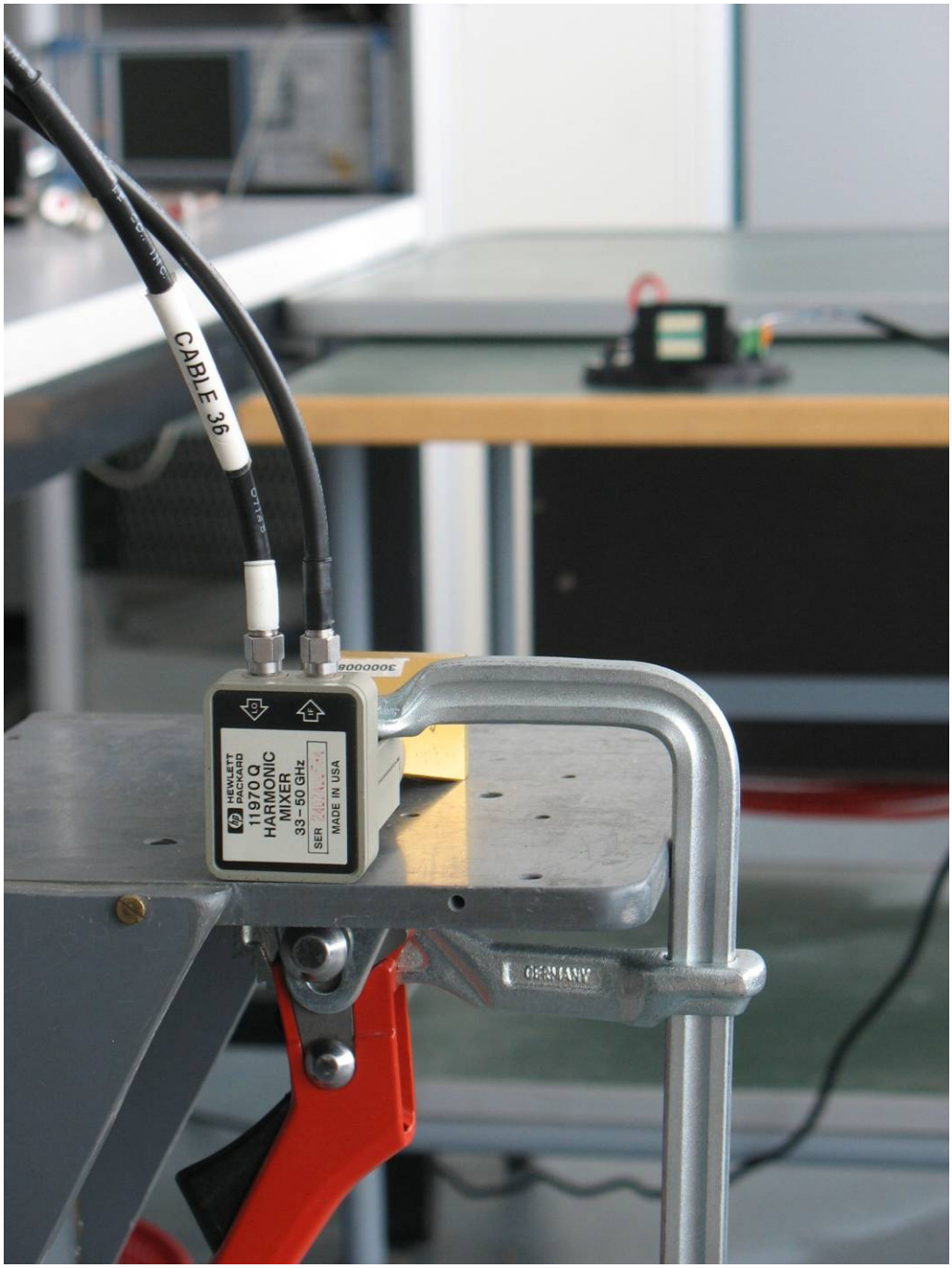


Photo no.: 12


CABLE 36
HEWLETT PACKARD
11970 Q
HARMONIC
MIXER
33 – 50 GHz
MADE IN USA
GERMANY