

CETECOM ICT Services GmbH

Radio Satellite Communication

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Test report No.: 2-3820-01-05/04

This test report consists of 29 pages

Page 1 of 29

Recognized by the
Federal Communications Commission and Industry Canada
Anechoic chamber registration No.: 90462 (FCC)
Anechoic chamber registration No.: 3463 (IC)
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. 2-3820-01-05/04
Feig Electronic GmbH
MWD BP
FCC ID: PJMMWDBP
IC: 6633A-MWDBP
Test standard: FCC Part 15 / RSS-210

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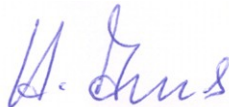
1 General information

1.1 Notes

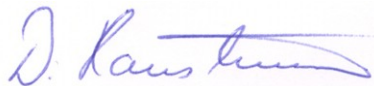
The test results of this test report relate exclusively to the test item specified in 1.5. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by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

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Tester:

| Date | Name | Signature |
|------------|------------|--|
| 2006-06-27 | Harro Ames |  |

Technical responsibility for area of testing:

| Date | Name | Signature |
|-------------|-----------------|--|
| 2006-006-27 | Dirk Hausknecht |  |



CETECOM ICT Services GmbH

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1.2 Testing laboratory

| | |
|----------------------------|---------------------------|
| CETECOM ICT Services GmbH | CETECOM ICT Services GmbH |
| Untertürkheimerstraße 6–10 | P.O. Box 10 04 45 |
| D-66117 Saarbrücken | D-66004 Saarbrücken |
| Germany | Germany |

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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 | 3463 |

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

1.3 Details of applicant

Name : Feig Electronic GmbH
Street : Lange Strasse 4
Town : D-35781 Weilburg
Country : Germany
Telephone : +49 (0) 6471 31 09-0
Telefax : +49 (0) 6471 31 09-99
Contact : Mr. Scheu
Telephone : +49 (0) 6471 31 09-432
Telefax : +49 (0) 6471 31 09-99
Email : alwin.scheu@feig.de

1.4 Application details

Date of receipt of application : 2006-06-22
Date of receipt of test item : 2006-06-22
Date(s) of test : 2006-06-22
Person(s) who have been present during the test : Mr. Scheu

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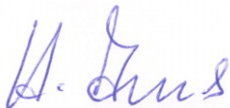
1.5 Test item (EUT) / Test Report Cover Sheet

Equipment model name : MWD BP
Type of equipment : Radar movement detector
Certification number :
Manufacturer : Feig Electronic GmbH
Lange Strasse 4
D-35781 Weilburg
Germany
Tested to radio standards : RSS-210
specification no :
Open area test site industrial Canada : 3463
number :
Frequency range : 24 GHz ISM.band (24.075 to 24.175 GHz)
Number of channels : 1
Field strength (at 3 meter) : 121.1 dB μ V/m @ 3m
Frequencies of the EUT : 24.125 GHz
Channel separation : -
Type of modulation : CW
Emission Designator (TRC-43) : 1K00N0N
Antenna information : Planar system
Transmitter Spurious (worst case): 75.9 dB μ V/m @ 3m
Receiver Spurious (worst case) :
Power supply : 24V DC or AC

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.

(Harro Ames)



Signature:

Date: 2006-06-27

1.6 Operation conditions

- Operation: : As soon as the equipment is powered on, Tx and Rx start operating
- Purpose of operation : Microwave Motion Detector with direction recognition for door openers

1.7 Test standards

Code of Federal Regulations (CFR 47)
Federal Communications Commission (FCC)

FCC Part 15 Radio Frequency Devices (04/2006)

SECTION 15.209
Radiation emission limits, general requirements

SECTION 15.245
Operation within the band 24.075 GHz to 24.175 GHz

2 Technical test

2.1 Summary of test results

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:

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

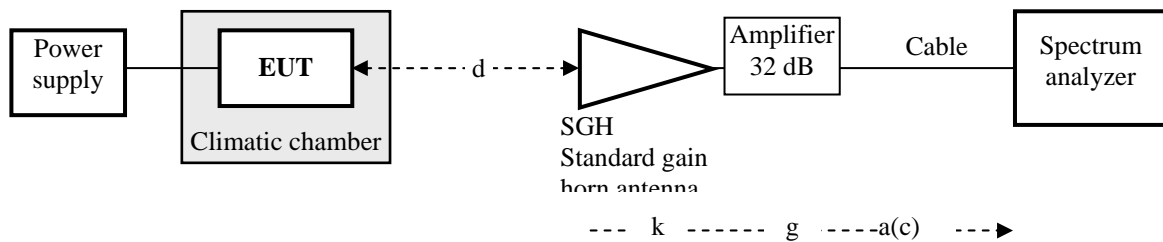
The environmental conditions are documented especially for each test.

2.3 Measurement and test set-up

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

2.4 Test equipment utilized and test set-up

2.4.1 Field strength measurement of fundamental and spurious 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] |
|-------------------|----------------|----------------------------|------------------|----------------------|
| 0.9 to 2.0 | 3.0 | 23.45 | 32.0 | 0.5 ... 0.7 |
| 2.0 to 4.0 | 3.0 | 23.68 | 32.0 | 0.7 ... 0.8 |
| 4.0 to 6.0 | 3.0 | 27.31 | 32.0 | 0.8 ... 1.2 |
| 6.0 to 8.0 | 3.0 | 30.06 | 32.0 | 1.2 ... 1.6 |
| 8.0 to 12.0 | 3.0 | 33.70 | 32.0 | 1.6 ... 2.0 |
| 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 |

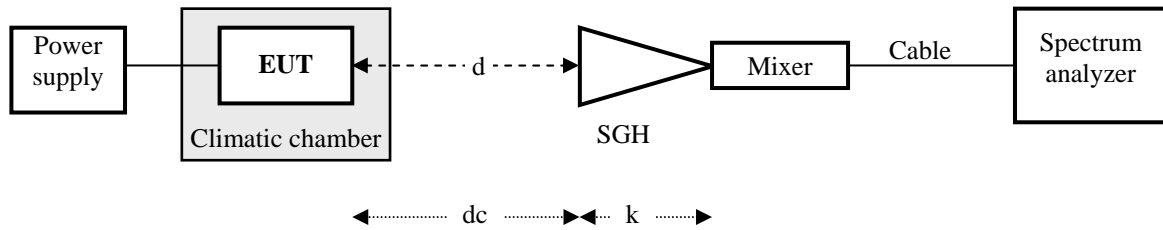
Calculation: Field strength = analyser reading + cable loss - amplifier gain + antenna factor
 $e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + a \text{ [dB]} - g \text{ [dB]} + k \text{ [dB(1/m)]}$

| Test equipment | Manufacturer | Type | CETECOM reference |
|---------------------------|---------------------|--------------|-------------------|
| Spectrum Analyser | HP | HP 8565E | 300000916 |
| SGH 1.0 to 2.0 GHz | flann | 0624-10 | 300000225 |
| SGH 2.0 to 4.0 GHz | narda | 644 | 300000769 |
| SGH 4.0 to 6.0 GHz | narda | 643 | 300002447 |
| SGH 6.0 to 8.0 GHz | narda | 642 | 300000767 |
| SGH 8.0 to 12.5 GHz | narda | 640 | 300000784 |
| SGH 12.0 to 18.0 GHz | narda | 639 | 300000787 |
| SGH 18.0 to 26.5 GHz | flann | 2024-20 | 300001968 |
| SGH 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 |

Measurement uncertainty

| Test parameter | Measurement uncertainty |
|-----------------|-------------------------|
| DC Power supply | ±0.5 V |
| Temperature | ±0.2 °C |
| Frequency | ±0.01 ppm |
| eirp | ±1.5 dB |

2.4.2 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/X m) [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(μ V/m)] = u [dB(μ V)] + k [dB(1/m)] - d [dB]

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

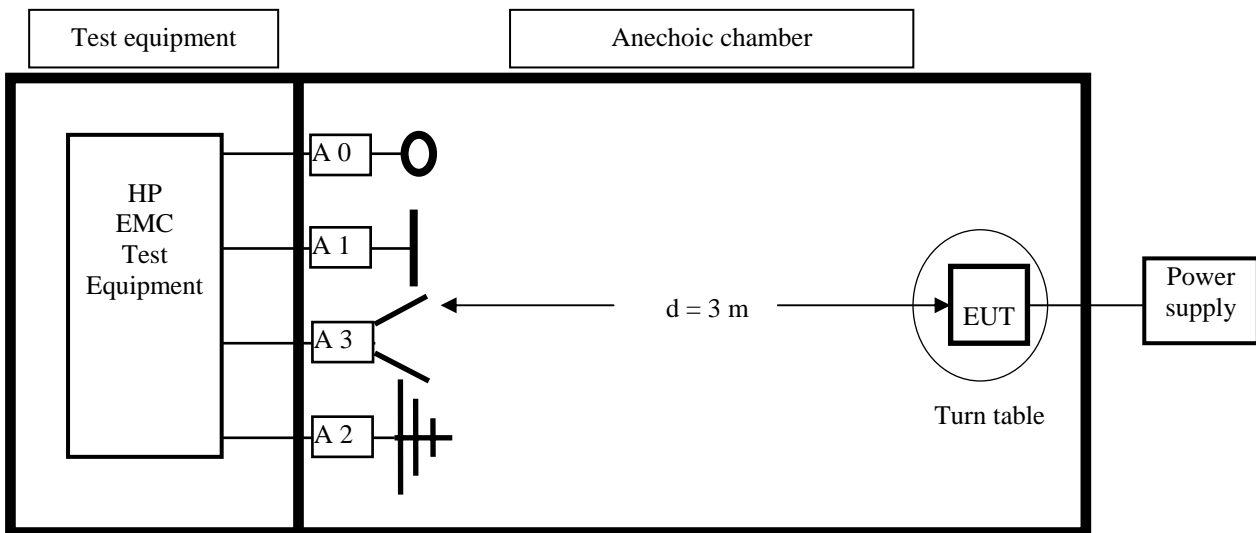
| Test equipment | Manufacturer | Type | CETECOM reference |
|----------------------|--------------|------------|-------------------|
| Spectrum Analyser | HP | HP 8565E | 300000916 |
| Power supply | HP | HP 6038A | 300001174 |
| SGH 33 ... 50 GHz | Thomson | COR 33_50 | 300000812 |
| Mixer 33 ... 50 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 |

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 |

2.4.3 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 analyser | HP | HP 85660B | 2478A05306 |
| Analyser 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 |

Measurement uncertainty

| Test parameter | Measurement uncertainty |
|------------------------|-------------------------|
| Power supply | ±0.5 V |
| Temperature | ±0.2 °C |
| Frequency | ±0.01 ppm |
| RF-power | ±1.5 dB |
| Field strength >50 GHz | ±3.0 dB |

2.5 Test results

2.5.1 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

2.5.2 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 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 conform with specifications ANSI C63.2-1987 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 960 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 8). 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 960 MHz to 4 GHz are carried out in a shielded semi-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.

2.5.3 Test results in details

Equipment under test (EUT): see page 5
Ambient temperature: 21 °C
Relative humidity: 45 %

TRANSMITTER PARAMETERS

SECTION 15.245

Fundamental frequency and harmonics

Microwave module:

| Test condition t = 21 °C | TRANSMITTER FIELD STRENGTH | | | |
|--|----------------------------|--------------------------|------------------------------------|------------------|
| | Frequency f [GHz] | S.A. e [dBμV] @ 0.3 m | Field strength e [dBμV/m] @ 3 m | See plot no.: |
| EUT operating: TX / RX on DC power supply | | | | |
| U = 24.0 Vdc (CW-mode) | 24.114 | 94.4 | 121.1 | 1 |
| | 48.176 | | 75.9 | 2 |
| | 72.26 | noise | noise | 3 |
| | 96.35 | noise | noise | 4 |

Note:

The values are recalculated from a test distance of 0.3 m to 3 m with 20 dB/decade according to the FCC requirements.

REFERENCE OF TEST EQUIPMENT USED:

see test set-up on page 8 / 9

LIMITS:

SECTION 15.245

| Frequency range (MHz) | Measurement distance [m] | Field strength e [dBμV/m] @ 3 m | Field strength E [mV/m] |
|--------------------------|-----------------------------|------------------------------------|----------------------------|
| 24,075 to 24,175 | 3 | 128.0 | 2,500 |
| Harmonics | 3 | 88.0 | 25 |

Verdict: Field strength limits are kept

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Equipment under test (EUT): see page 5
 Ambient temperature: 21 °C
 Relative humidity: 45 %

TRANSMITTER PARAMETERS
 Spurious Frequencies

SECTION 15.245
 SECTION 15.209

Microwave module:

| Test condition t = 21 °C | TRANSMITTER SPURIOUS FIELD STRENGTH | | | |
|--|-------------------------------------|------------------|-------------|------------------|
| Frequency range [GHz] | Spurious frequencies [GHz] | SA u [dBμV/m] | E [μV/m] | See plot no.: |
| 0.009 to 30.0 MHz (h + v) horizontal and vertical plane | noise | n.a. | < limit | 5 |
| 0.030 to 4.0 (h + v) | noise | n.a. | < limit | 6 |
| 4.0 to 12.0 (h + v) | noise | n.a. | < limit | 7 |
| 12.0 to 24.0 (h + v) | noise | n.a. | < limit | 8 |
| > 24.0 | fundamental and harmonics | | < limit | 1 - 4 |

Note:

9 kHz to 150 kHz : 200 Hz ResBw/VideoBw
 150 kHz to 30 MHz : 9 kHz ResBw/VideoBw
 30 MHz to 1 GHz : 100 kHz ResBw/VideoBw
 above 1 GHz : 1 MHz ResBw/VideoBw

LIMITS:

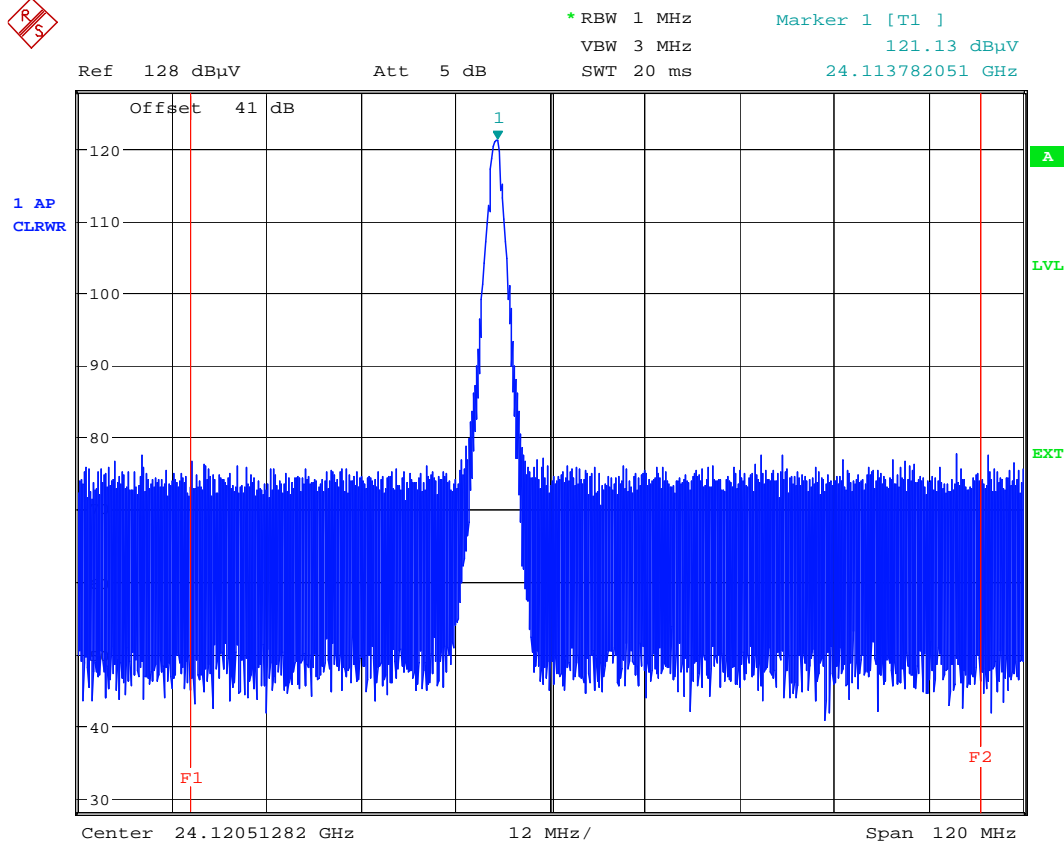
SECTION 15.209 / 15.245

| 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 – 30.0 | 30 | 49.5 | 30 |
| 30.0 – 88.0 | 3 | 40.0 | 100 |
| 88.0 – 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 |
| 2nr/rd harmonic | 3 | 88.0 | 25,000 |

Verdict: Field strength limits are kept.

3 Measurement results

Plot no. 1: powered with 24V DC , normal conditions



Date: 22.JUN.2006 10:00:14

Calculation: Field strength = analyser reading + antenna factor - distance correction
 $e \text{ [dB}(\mu\text{V/m)}] = u \text{ [dB}(\mu\text{V)}] + k \text{ [dB(1/m)}] - d \text{ [dB]}$

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

antenna factor = 40.2
 distance correction 0.5 to 3m = -15.5 dB
 analyser readout = 96.4 dBµV

All this settings are set into the analyser, so that the screen shows the real fieldstrength recalculated to 3m.

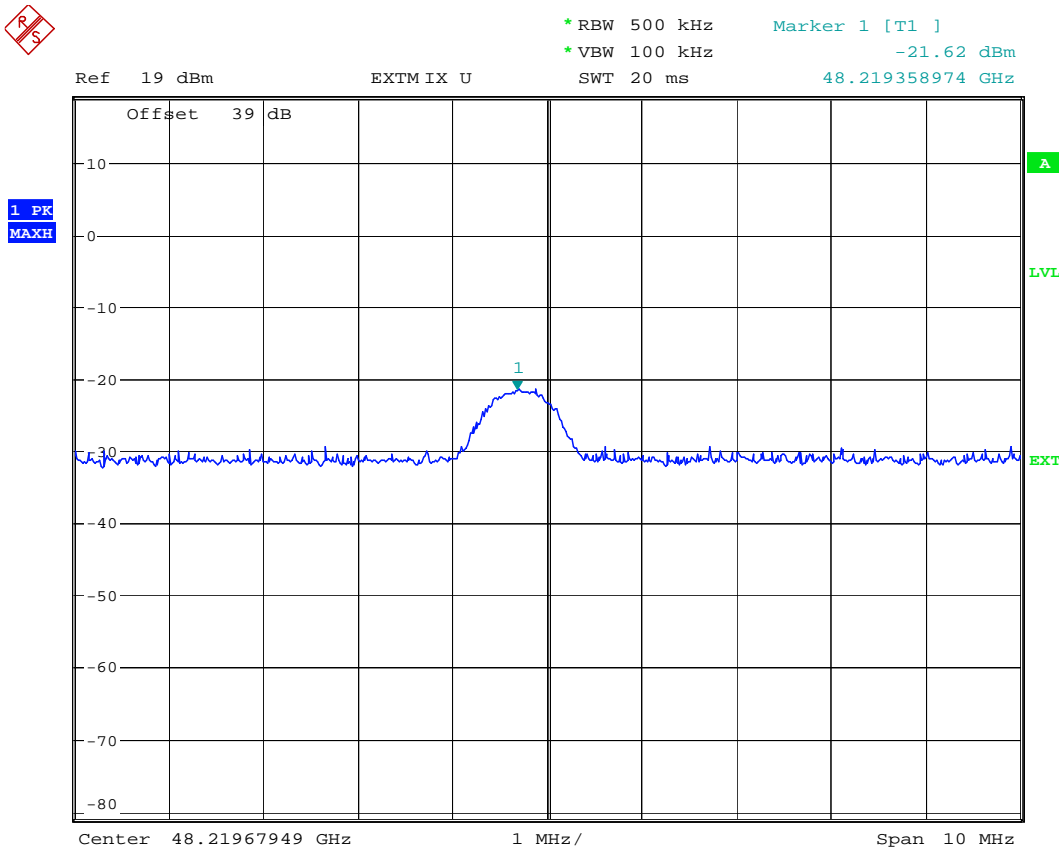
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Date: 2006-06-27

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Plot no. 2: powered with 24V DC , normal conditions



Date: 22.JUN.2006 10:42:46

Calculation: Output power (dBm) = readout of analyser + antenna gain – path loss

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

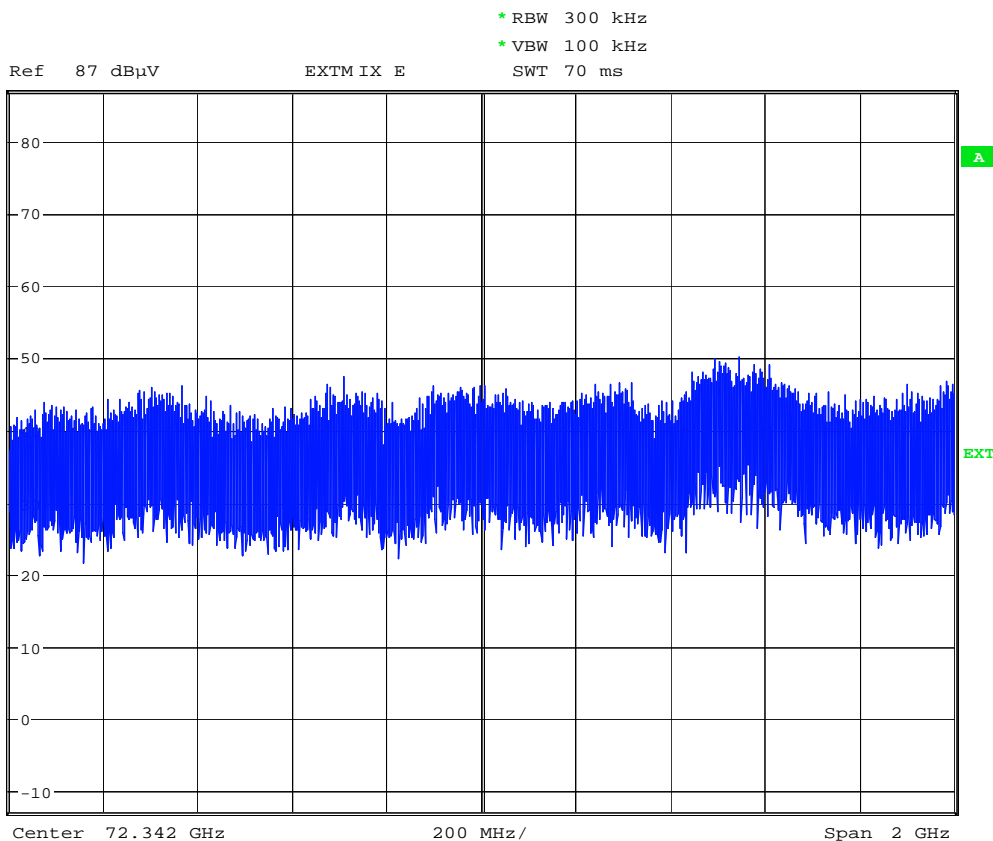
antenna gain = 19.0 dBi
 path loss at 0.25 m = 58 dB
 analyser readout = -21.6 dBm

Recalculated to field strength at 3m with the formula $e = 17 + p - 20 \cdot \log d$, here 97.5 dB
 where e = field strength@3m, p = radiated power in dBpW, d = distance in meter

-21.6 dBm + 97.5dB = **75.9 dBµV/m@3m**. Limit is 88.0 dBµV/m@3m

Plot no. 3: (without offset)

The readout has to be increased by 35.5 dB



Date: 22.JUN.2006 10:53:19

Readout = 50.1 dBμV
corr.factor = 35.5 dB (mixer loss)

Calculated max spurious => 85.6 dBμV/m Peak at3m

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Plot no. 4:



* RBW 300 kHz

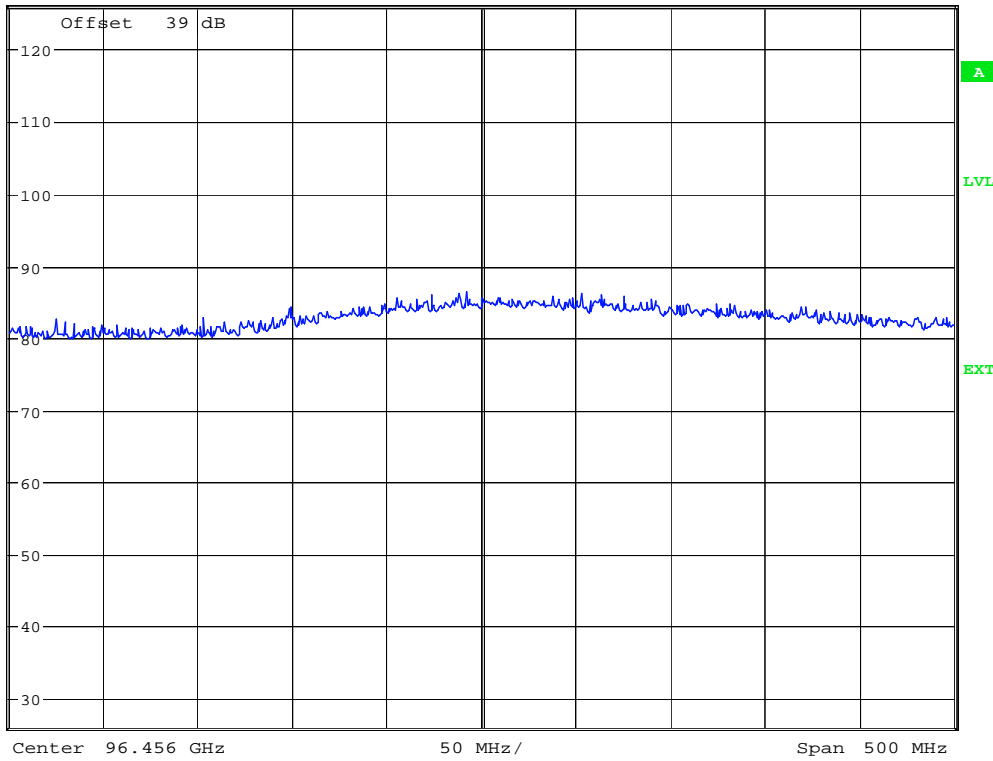
* VBW 100 kHz

SWT 20 ms

Ref 126 dB μ V

EXTMIX W

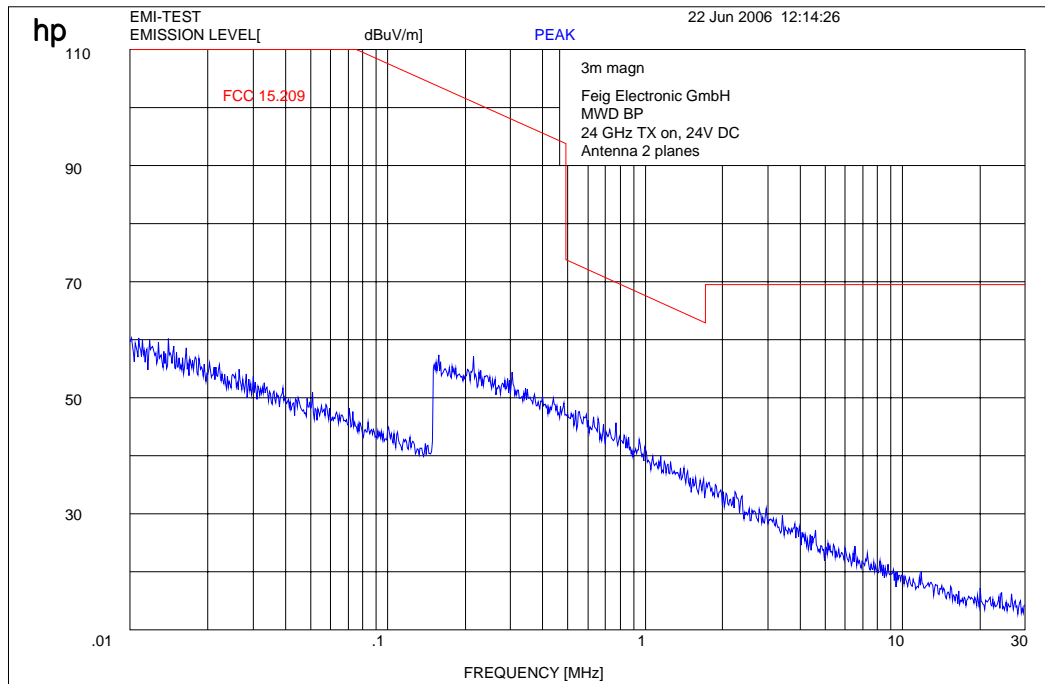
1 PK
MAXH



Date: 22.JUN.2006 10:58:06

max peak => 85.2 dB μ V/m Peak at 3m

Plot no. 5:



Note:

The limit lines were recalculated from a test distance of 300 m/30 m to 3 m with 40 dB/decade according to the FCC requirements.

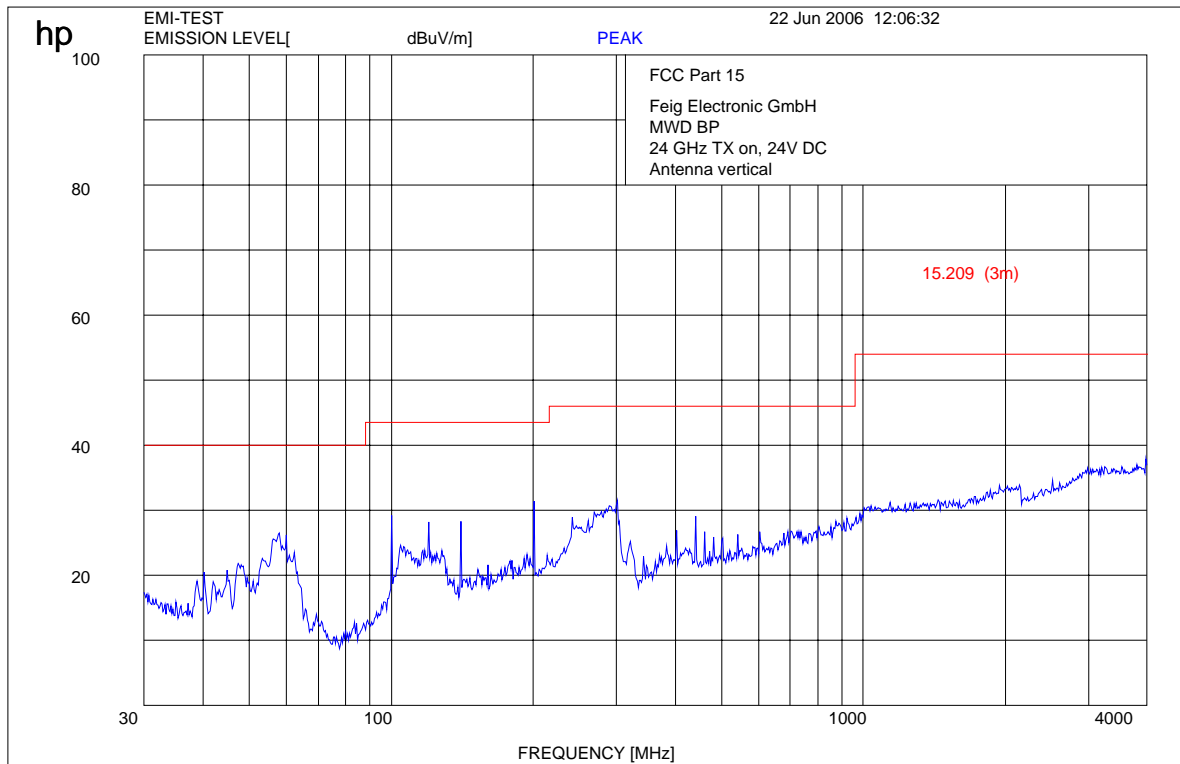
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Date: 2006-06-27

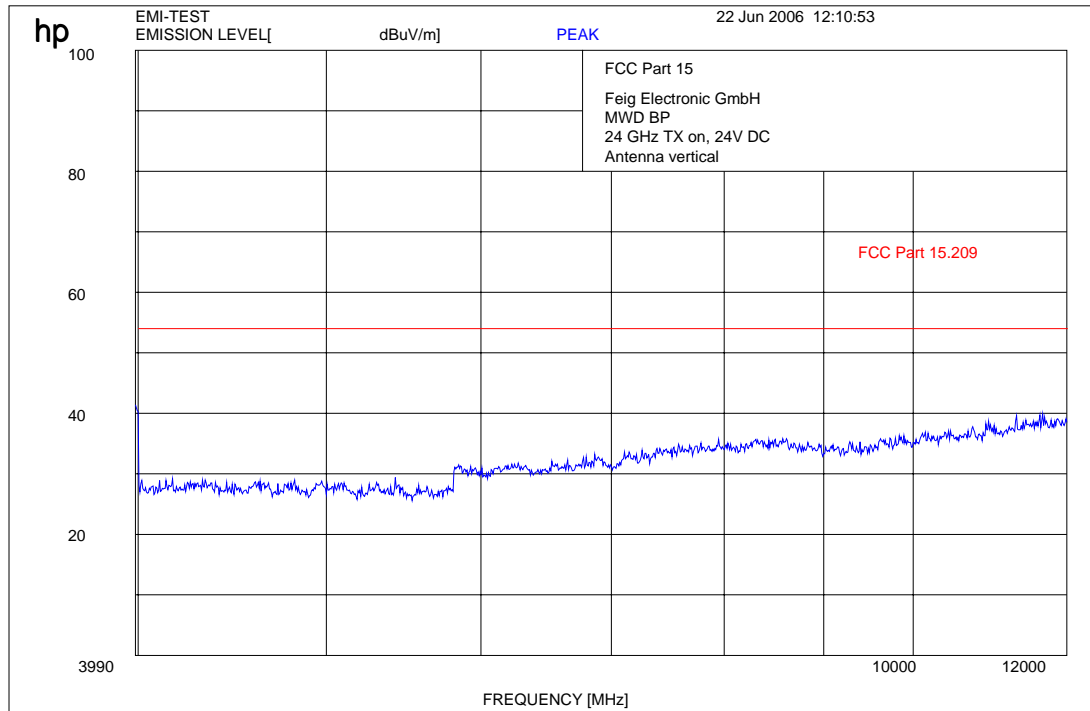
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Plot 6: 30 MHz to 4 GHz



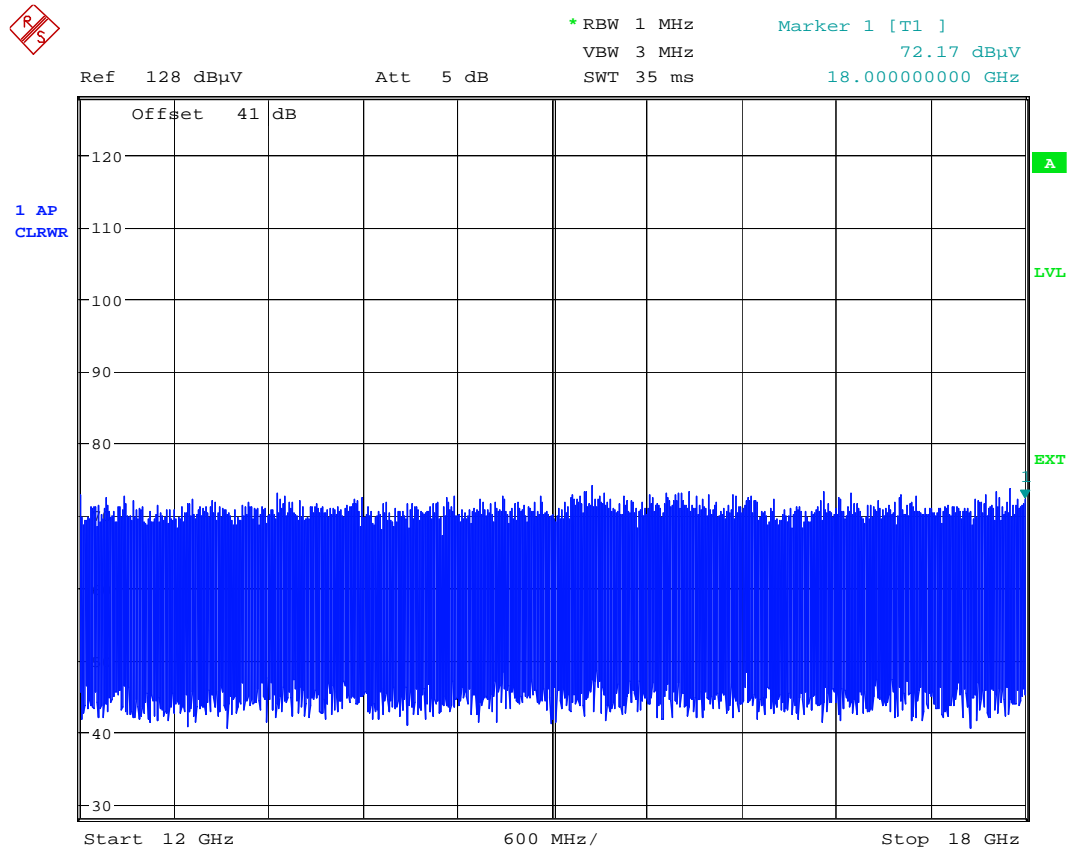
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Plot 7: 4 GHz to 12 GHz



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Plot 8: 12 – 18 GHz



Date: 22.JUN.2006 10:06:40

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Date: 2006-06-27

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Plot 9: 18 – 26 GHz



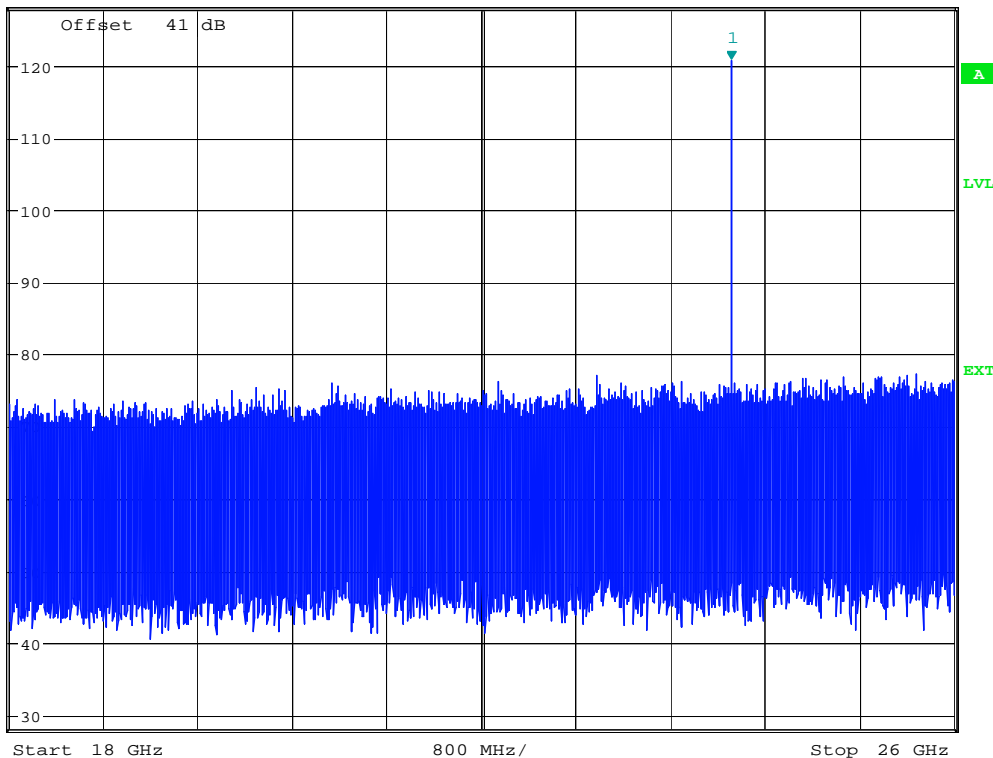
*RBW 1 MHz
VBW 3 MHz
SWT 50 ms

Marker 1 [T1]
120.77 dBuV
24.112820513 GHz

Ref 128 dBuV

Att 5 dB

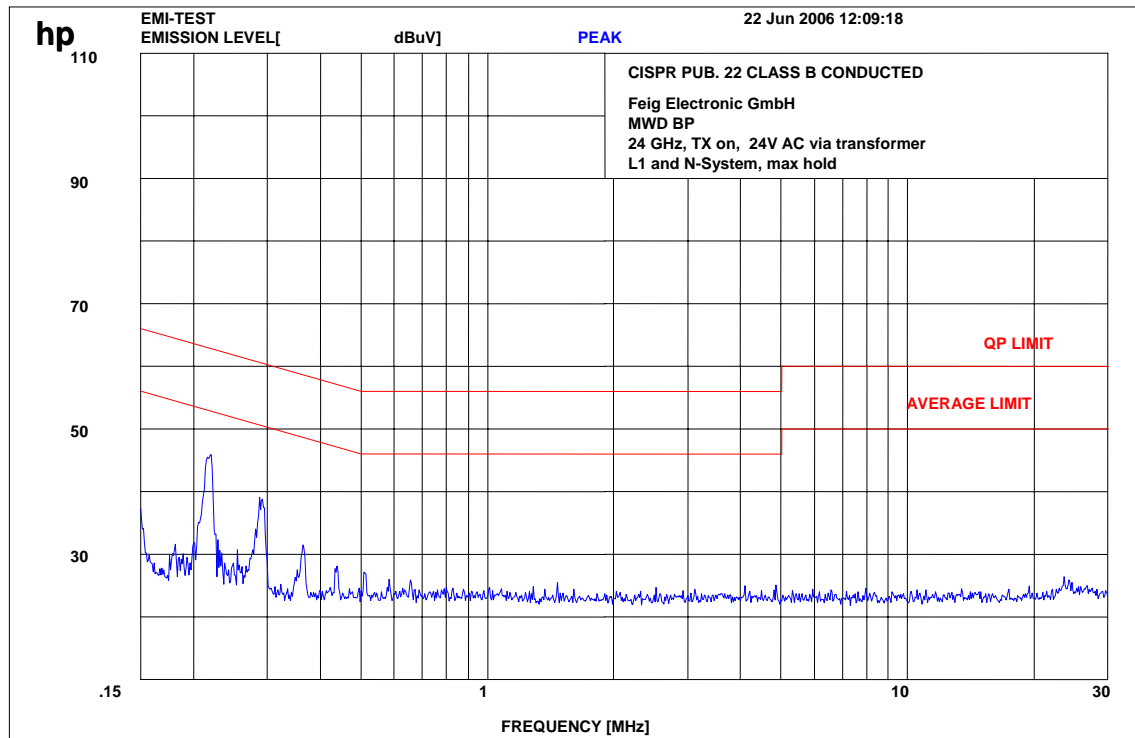
1 AP
CLRWR



Date: 22.JUN.2006 10:04:31

CETECOM ICT Services GmbH

Plot no. 10: Ac conducted



4 Photographs

Photo no. 1 radiated emissions

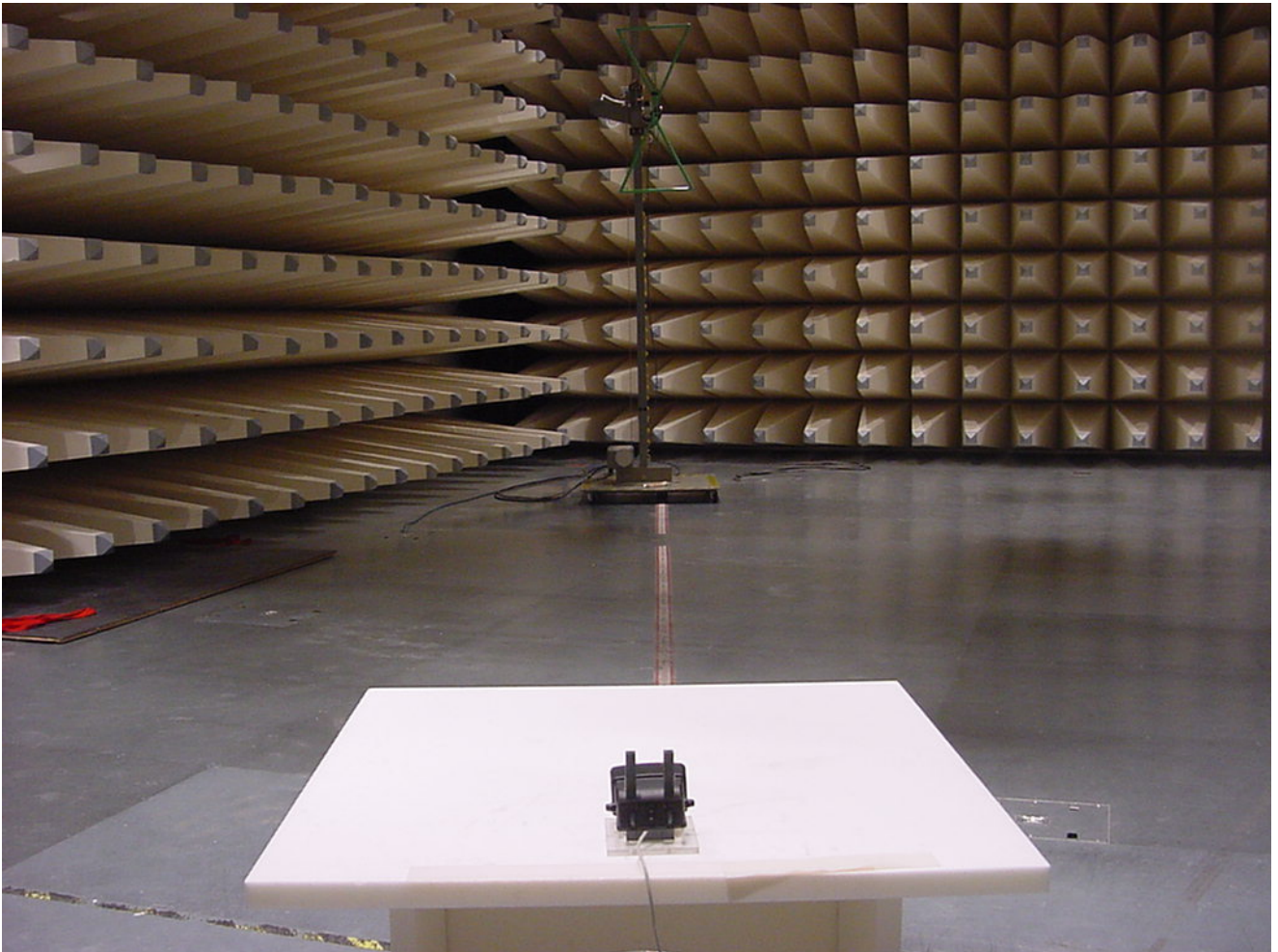
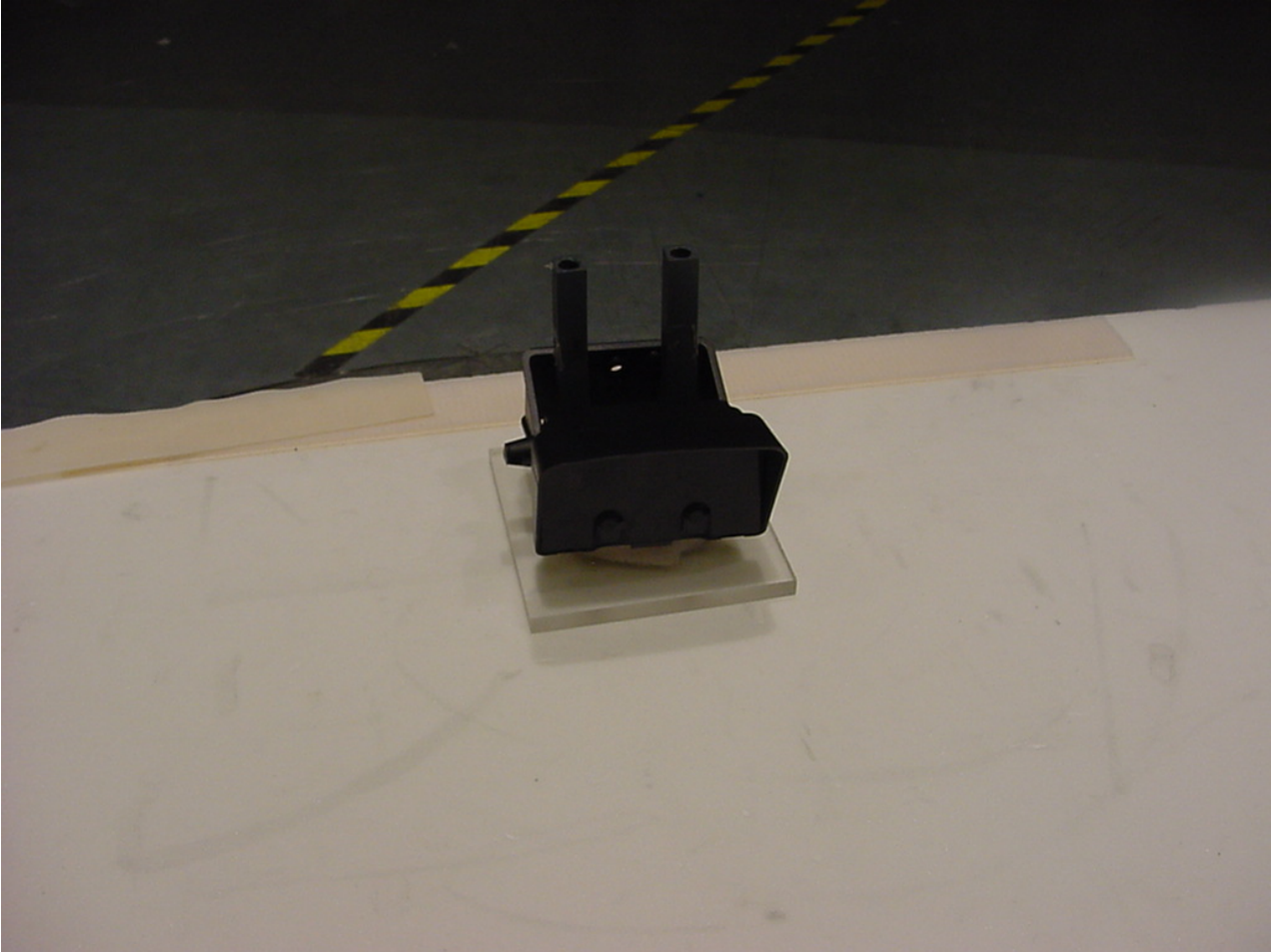


Photo no. 2



Pictures of the sample

Photo no. 3



CETECOM ICT Services GmbH

Photo no. 4

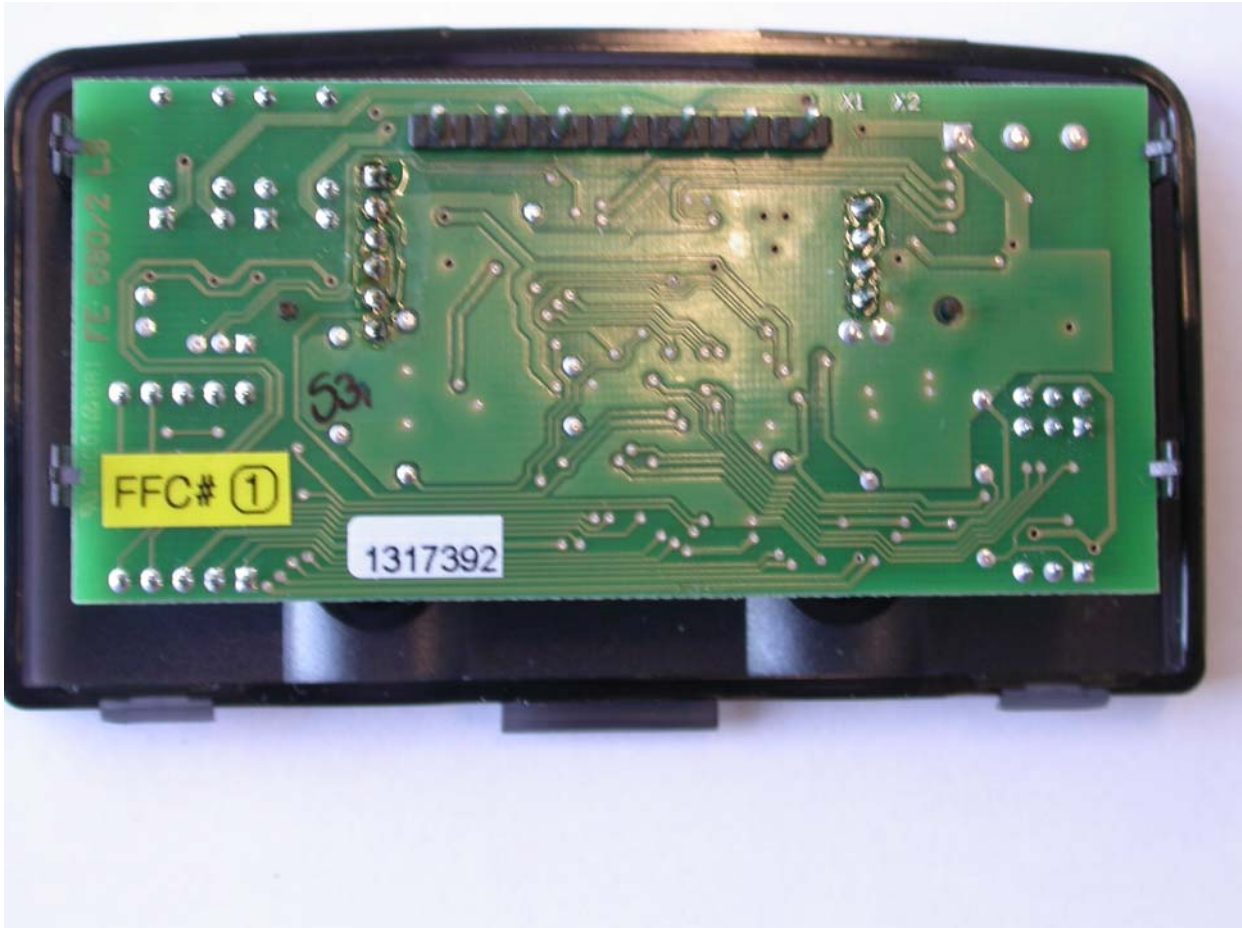


Photo no. 5

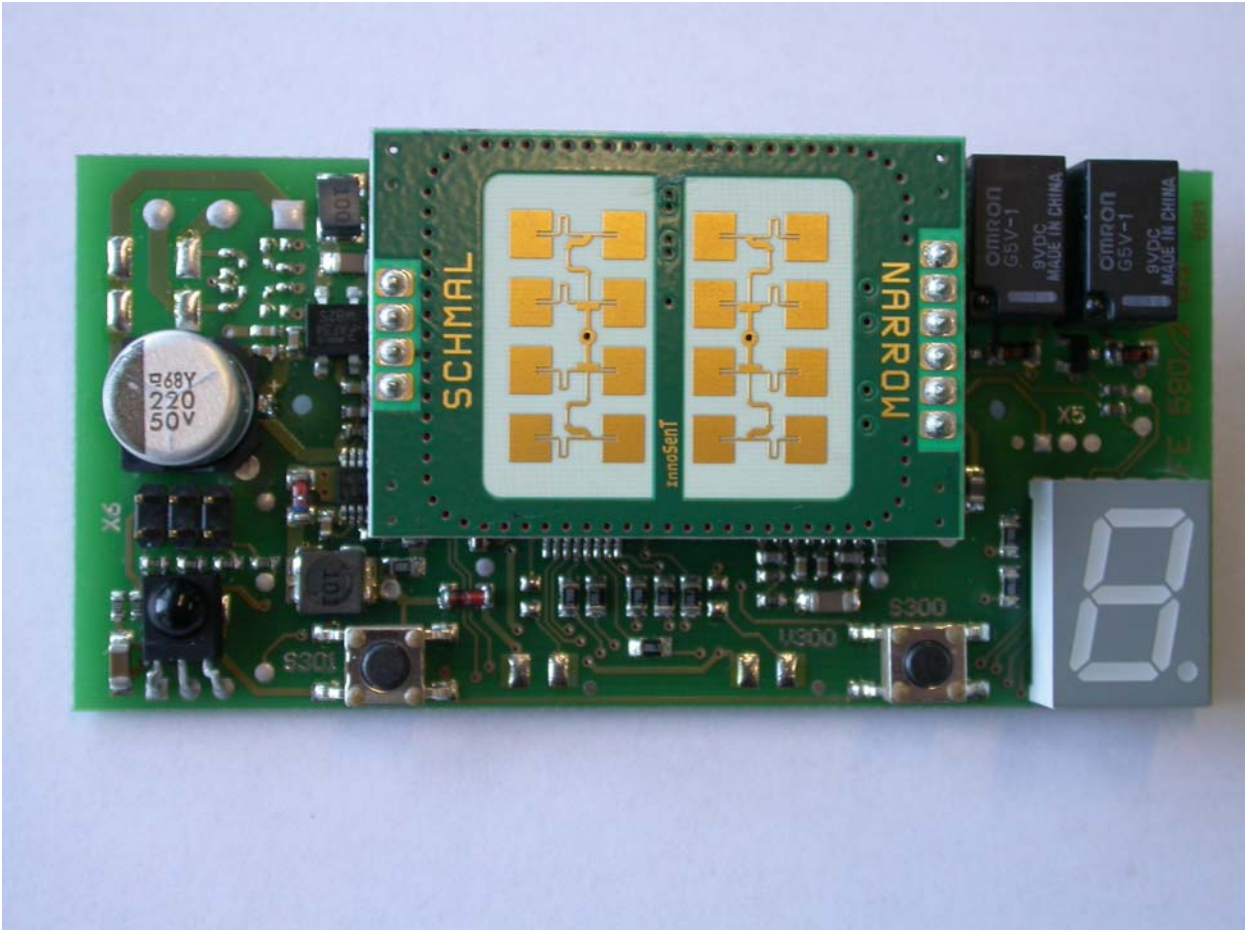


Photo no. 6 AC conducted

