Recognized by the
Federal Communications Commission and Industry Canada
Anechoic chamber registration No.: 90462 (FCC)
Anechoic chamber registration No.: 3462C-1
TCB ID: DE0001

Accredited by the
German Accreditation Council
DAR–Registration Number
DGA-PL-176/94-D1

Test report No.: 1-2272-01-02/10
Applicant: CIAS Elettronica Srl
Type: Murena
FCC ID: OIFMURENA
IC Certification No: 3325A-MURENA
Test standard: FCC Part 15.245

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 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
2010-05-12	Nicolas Stamber	

Technical responsibility for area of testing:

Date	Name	Signature
2010-05-12	Karsten Geraldy	

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

1.2 Testing laboratory

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

CETECOM ICT Services GmbH
P.O. Box 10 04 45
D-66004 Saarbrücken
Germany

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

Accredited testing laboratory
Listed by : Federal Communications Commission (FCC)
Industry Canada (IC)

Authority	Identification/Registration No.
DAR	DGA-PL-176/94-D1
FCC	90462
IC	3462C-1

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

1.3 Details of applicant

Name : CIAS Elettronica Srl
Street : Via Durando, 38
Town : 20158 Milano
Country : Italy
Phone : +39 02 376716239
Fax : +39 02 39311225

Contact person
Name : Mr. Giovanni Sanna
Phone : +39 02 376716239
E–Mail : sanna.giovanni@cias.it

1.4 Application details

Date of receipt of application : 2010-04-13
Date of receipt of test item : 2010-05-10
Date of test : 2010-05-10
Person(s) who have been present during the test : Mr. Giovanni Sanna

1.5 Test item (EUT)

Description	:	Field disturbance Sensor
Type designation	:	Murena
Manufacturer	:	CIAS Elettronica Srl
Street	:	Via Durando, 38
Town	:	20158 Milano
Country	:	Italy

1.6 Technical data

Frequency range	:	10.500 – 10.550 GHz
Operational frequency	:	10.514 GHz
Field strength PEP	:	117.87 dBµV/m @ 3m distance
Type of modulation	:	FSK
Pulse duration	:	continuous signal
Pulse period	:	continuous signal
Microwave modules	:	TX / RX – Module with integrated patch antenna
Normal power supply (U nom)	:	13.8 V DC
Extreme DC power supply	:	-/-

1.6.1 Operation conditions

Operation:	:	As soon as the equipment is powered up, TX and RX start operating
Purpose of operation	:	Motion Sensor

1.6.2 Equipment under test

Murena

1.7 Test standards

	Code of Federal Regulations (CFR 47) Federal Communications Commission (FCC)
FCC Part 15	Radio Frequency Devices
	SECTION 15.245 Operation within the band 10.500 GHz to 10.550 GHz
	SECTION 15.205 Restricted bands of operation.
	SECTION 15.209 Radiation emission limits, general requirements
	SECTION 15.207 Conducted limits
RSS 210	Issue 7, Annex 7 - Field Disturbance Sensors Operating in the Bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10.5-10.55 GHz and 24.075-24.175 GHz
RSS-GEN	Issue 2 June 2007 SECTION 4.6.1 Occupied Bandwidth

1.8 Test Report Cover Sheet

Type of equipment	:	Field disturbance sensor
Model name	:	Murena
Manufacturer	:	CIAS Elettronica Srl
Address	:	Via Durando, 38
City	:	20158 Milano
Country	:	Italy
Tested to Radio Standards Specification(RSS) No.	:	210 Issue 7
Open Area Test Site Industry Canada Number	:	IC 3462C-1
Frequency Range (or fixed frequency)	:	10.514 GHz
R F: Power in Watts	:	-/-
Field Strength (at what distance)	:	117.87 dBµV/m @ 3m distance
Occupied Bandwidth (99% BW)	:	2.676 MHz
Type of Modulation	:	F1N (FSK)
Emission Designator	:	2M68F1N
Antenna Information	:	Integrated patch antenna array
Transmitter Spurious (worst case)	:	44.6 dBµV/m in 3m
Receiver Spurious (worst case)	:	44.6 dBµV/m in 3m (TX and RX operate simultaneously)
IC no.	:	3325A-MURENA
FCC ID	:	OIFMURENA

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.

Laboratory Manager :

2010-05-12	RSC	Nicolas Stamber	N. Stamber
Date	Section	Name	Signature

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

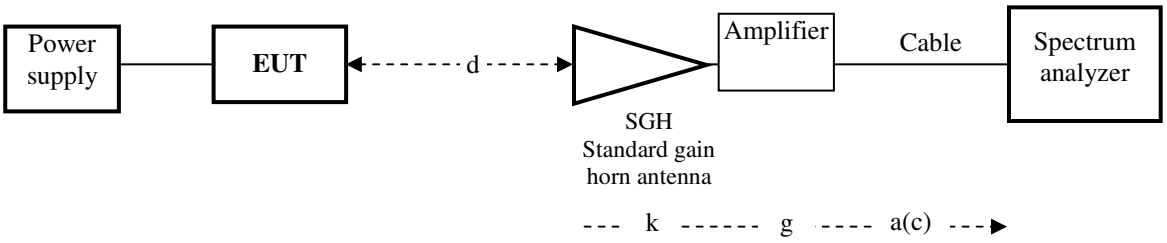
The environmental conditions are documented especially for each test.

2.3 Measurement and test set-up

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

2.4 Test equipment utilized and test set-up

2.4.1 Field strength and spurious radiation in the frequency range 12 GHz to 50 GHz



Frequency f [GHz]	Distance d [m]	Distance Correction dc (3 m/Xm) [dB]	Antenna factor k [dB(1/m)]	Amp.gain g [dB]	Cable loss a(c) [dB]
12.0 to 18.0	0.375	-18.0	33.97	33.4 … 35.9	2.7 … 2.8
18.0 to 26.0	0.375	-18.0	40.22	30.8 … 33.4	2.8 … 4.3
26.0 to 40.0	0.375	-18.0	44.00	17.4 … 23.1	4.3 … 4.8
40.0 to 50.0	0.375	-18.0	42.32	3.4 … 17.4	4.8 … 6.7

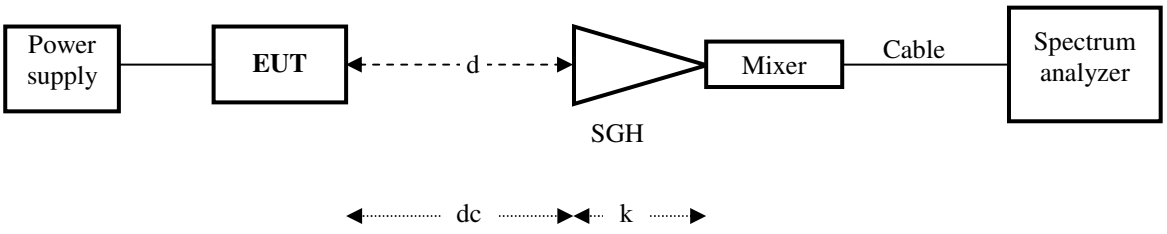
Calculation : Field strength = analyser reading + cable loss - amplifier gain + antenna factor
e [dB(µV/m)] = u [dB(µV)] + a [dB] - g [dB] + k [dB(1/m)]

Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	Rohde & Schwarz	FSU 50	300003443
SGH 12.0 to 18.0 GHz	narda	639	300000787
SGH 18.0 to 26.0 GHz	narda	638	300002442
SGH 26.0 to 40.0 GHz	narda	V637	300001751
SGH 40.0 to 50.0 GHz	Flann	2324-20	-/-
Amplifier 0.1 to 26.0 GHz	HP	HP 83017A	300002267
Amplifier 26.0 to 50.0 GHz	Farran Technology	-/-	-/-
DC Power supply	HP	HP 6038A	300001174
RF-cable	Huber & Suhner	div.	-/-

Measurement uncertainties

Test parameter	Measurement uncertainty
DC Power supply	±0.5 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
eirp	±2.0 dB

2.4.3 Field strength and spurious radiation in the frequency range 50 GHz to 54 GHz



Frequency range [GHz]	Distance d [m]	Distance correction dc (3 m/Xm) [dB]	Antenna factor k [dB 1/m]
50.0 … 54.0	0.375	-18.0	40.7

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

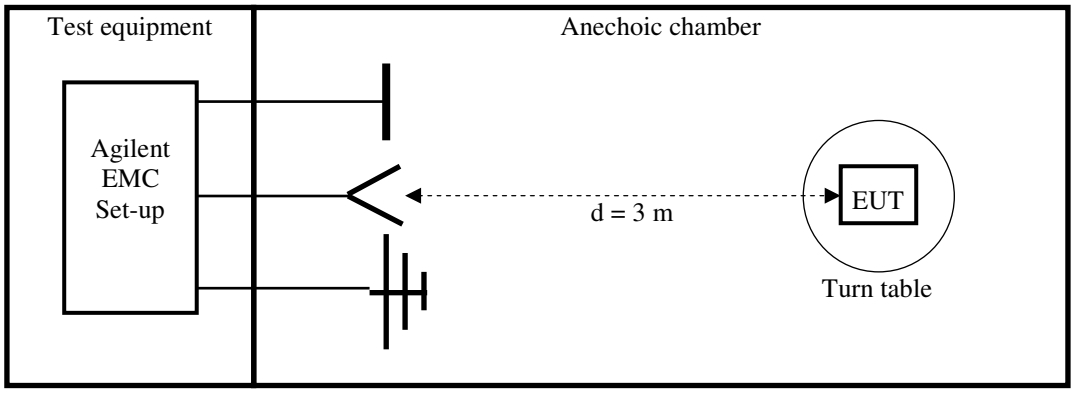
Test equipment	Manufacturer	Type	CETECOM reference
Spectrum Analyser	Rohde & Schwarz	FSU 50	300003443
Power supply	HP	HP 6038A	300001174
SGH 50 ... 54 GHz	Thomson	COR 50_75	300000813
Mixer 50 ... 54 GHz	HP	11970V	300000781n

Measurement uncertainty

Test parameter	Measurement uncertainty
Power supply	±0.1 VDC
Temperature	±0.2 °C
Frequency	±0.01 ppm
Field strength <50 GHz	±2.0 dB
Field strength >50 GHz	±3.0 dB

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

Set-up for radiated measurements



No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400/02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	PSA-Spektrumanalysator 3 Hz - 26.5 GHz (E4440A)	Agilent	MY48250080	300003812	05.08.2008	24	05.08.2010
5	EMI Preselector 9 kHz - 1 GHz (N9039A)	Agilent	MY48260003	300003825	19.08.2008	24	19.08.2010
6	Microwave Analog Signal Generator (N5183A)	Agilent	MY47420220	300003813	06.08.2008	24	06.08.2010
7	PC	F+W			n.a.		
8	TILE	TILE			n.a.		
9	TRILOG Super Broadband Antenna (VULB9163)	Schwarzbeck	371	300003854	Monthly verification (System cal.)		
10	Double Ridged Antenna 3115	EMCO	3088	300001032	Monthly verification (System cal.)		
11	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
12	Switch / Control Unit 3488A	HP	2719A15013	300001156	n.a.		
13	Power Supply 6032A	HP	2818A03450	300001040	08.01.2009	36	08.01.2012
14	Busisolator	Kontron		300001056	n.a.		
15	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
16	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
17	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
18	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		
19	Hochpassfilter WHK1.1/15G-10SS	Wainwright	3	300003255	Monthly verification (System cal.)		
20	Hochpassfilter WHKX2.9/18G-12SS	Wainwright	1	300003492	Monthly verification (System cal.)		
21	Hochpassfilter WHKX7.0/18G-8SS	Wainwright	18	300003789	Monthly verification (System cal.)		
22	Switch / Control Unit 3488A	HP	2605e08770	300001443	n.a.		
23	Trenntrafo RT5A	Grundig	9242	300001263	n.a.		
24	Relais Matrix PSU	R&S	890167/024	300001168	n.a.		
25	Netznachbildung ESH3-Z5	R&S	828576/020	300001210	n.a.		

Measurement uncertainties

Performance	Measurement uncertainty
Input power (DC)	±0.5 V
Temperature	±0.2 °C
Frequency	±0.01 ppm
RF-power	±2.0 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 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 C63.4-2003 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 analyzers where the detector modes and resolution bandwidths (RBW) over various frequency ranges are set according to requirement ANSI C63-4-2003 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 10). 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 12 GHz are carried out in a shielded anechoic test chamber. The measurement distance is 3.0 m.

In the frequency range 12 GHz to 54 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 : 23 °C
Relative humidity : 55 %

TRANSMITTER PARAMETERS SECTION 15.245

Fundamental frequency

Microwave module : **Murena**

Test condition t = 23.0 ° C	TRANSMITTER FIELD STRENGTH			
EUT operating: TX on and RX on DC power supply	Frequency f [GHz]	Field strength e [dBµV/m] @ 3 m	Field strength E [V/m] @ 3 m	See plot no.:
U DC = 13.8 V	10.514	117.87	0.78	1

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8 - 10

LIMITS: SECTION 15.245

Frequency range (MHz)	Measurement distance [m]	Field strength e [dBµV/m] @ 3 m	Field strength E [mV/m]
10.500 to 10.550	3	128.0	2 500
Harmonics	3	88.0	25
Spurious emissions	3	54.0 or -50dBc	0.5

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
Spurious Frequencies SECTION 15.205 / 15.209
Microwave module : **Murena**

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.:
0.009 to 30.0 MHz (h + v) horizontal and vertical plane	noise	< Limit	< Limit	2
0.030 to 1.0 (h + v)	See plot	< Limit	< Limit	3
1.0 to 12.0 (h)	Noise + Carrier	< Limit	< Limit	4
1.0 to 12.0 (v)	Noise + Carrier	< Limit	< Limit	5
12.0 to 18.0 (h + v)	noise	< Limit	< Limit	6
18.0 to 26.0 (h + v)	21.026 (2nd Harmonic)]	44.63	170	7
26.0 to 40.0 (h + v)	noise	< Limit	< Limit	8
40.0 to 50.0 (h + v)	noise	< Limit	< Limit	9
50.0 to 54.0 (h + v)	noise	< Limit	< Limit	10

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 – 30.0	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) (or -50 dBc)	500
> 960.0	3	74.0 (PK)	5000
Harmonics	3	88.0	25000

Verdict : Field strength limits are kept

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

TRANSMITTER PARAMETERS SECTION RSS-GEN 4.6.1

Emission Bandwidth

Microwave module : **Murena**

Test condition t = 23.0 ° C	Emission Bandwidth		
EUT operating: TX on and RX on DC power supply	Frequency f [GHz]	Emission Bandwidth [MHz]	See plot no.:
U DC = 13.8 V	10.512	2.676	11

REFERENCE OF TEST EQUIPMENT USED : see test set-up on page 8 - 10

LIMITS: SECTION RSS-GEN 4.6.1

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.
The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.
The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.
The span between the two recorded frequencies is the occupied bandwidth.

Verdict :	Bandwidth limits are kept

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

TRANSMITTER PARAMETERS SECTION 15.207
Conducted Limits

Microwave module : **Murena**

Test measurement:

Frequency Range	DUT	SA u [dBmV]	E [µV/m]	See Plot No.:
150.0 kHz – 30.000 MHz	Murena	< limit	< limit	12 (Neutral)
150.0 kHz – 30.000 MHz	Murena	< limit	< limit	13 (Phase)

Limit: FCC CFR Part 15.207, 15.107
CISPR 22

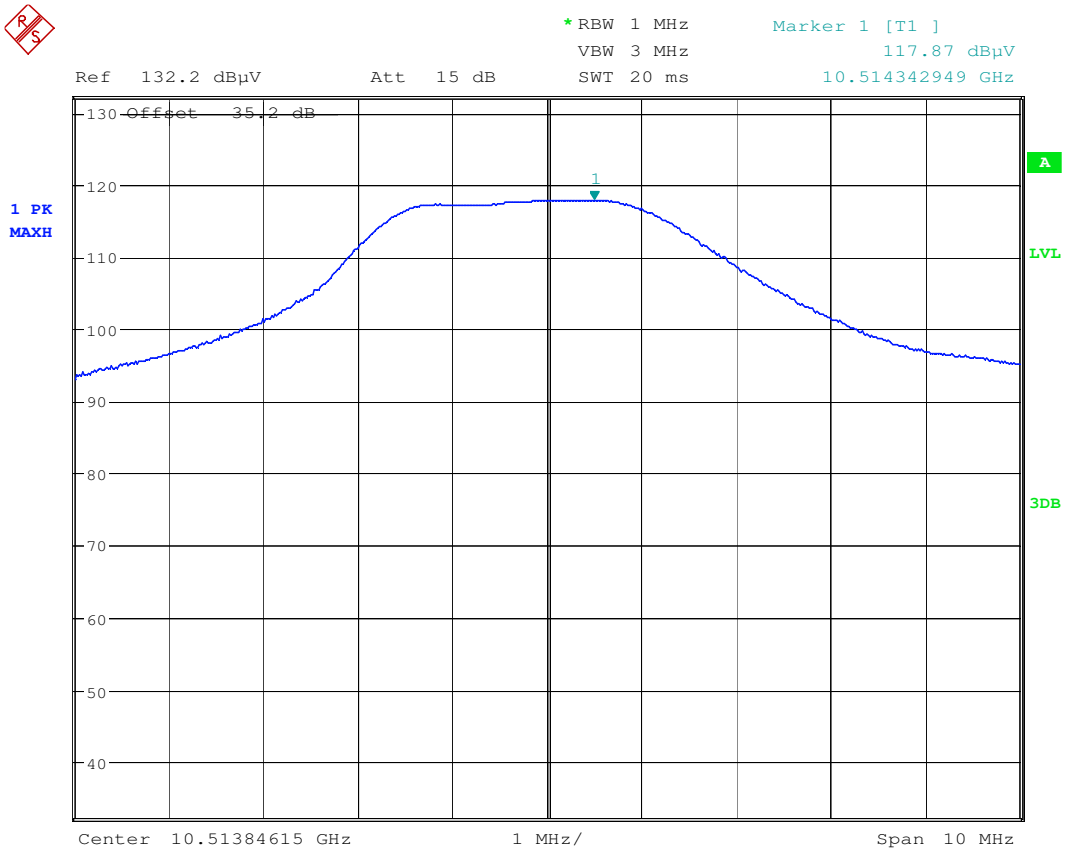
Frequency of Emissions [MHz]	Conducted Limit [dBµV]	
	Quasi peak	Average
0.150 – 0.500	66 to 56 *	56 to 46 *
0.500 – 5.000	56	46
5.000 – 30.000	60	50

- Decreases with the logarithm of the frequency

Verdict :	Conducted limits are kept

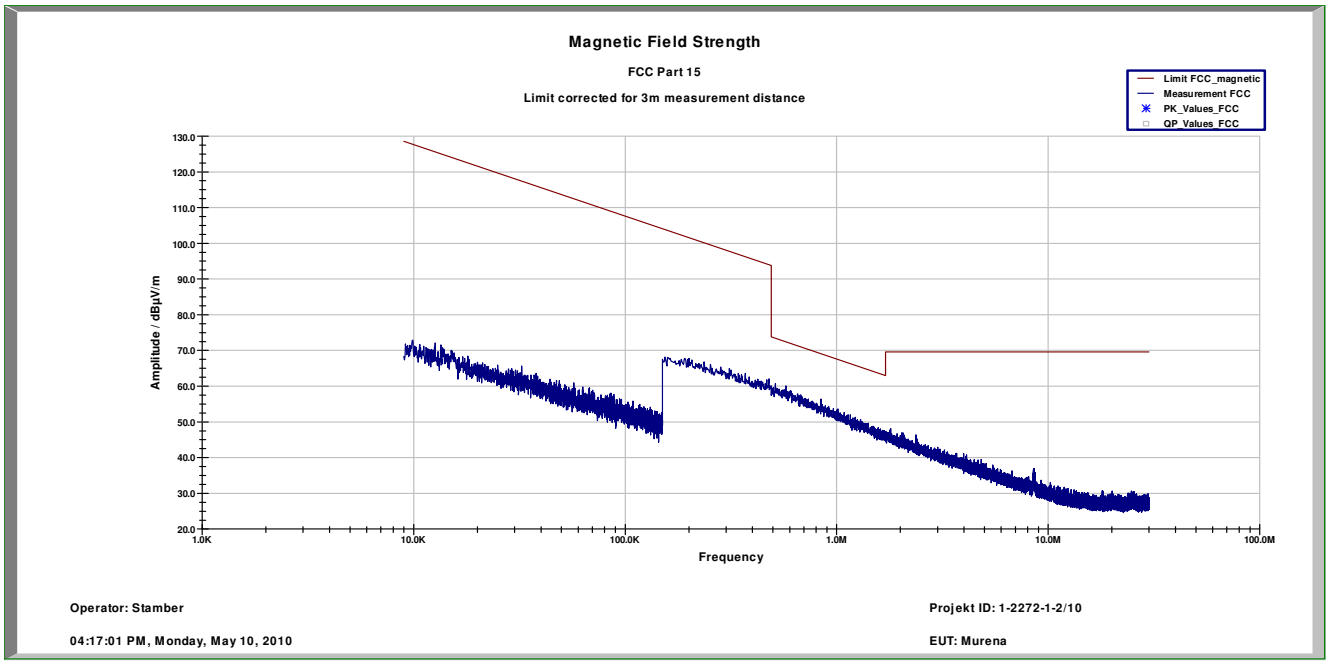
3 Plots, graphs and data sheets:

Plot 1:

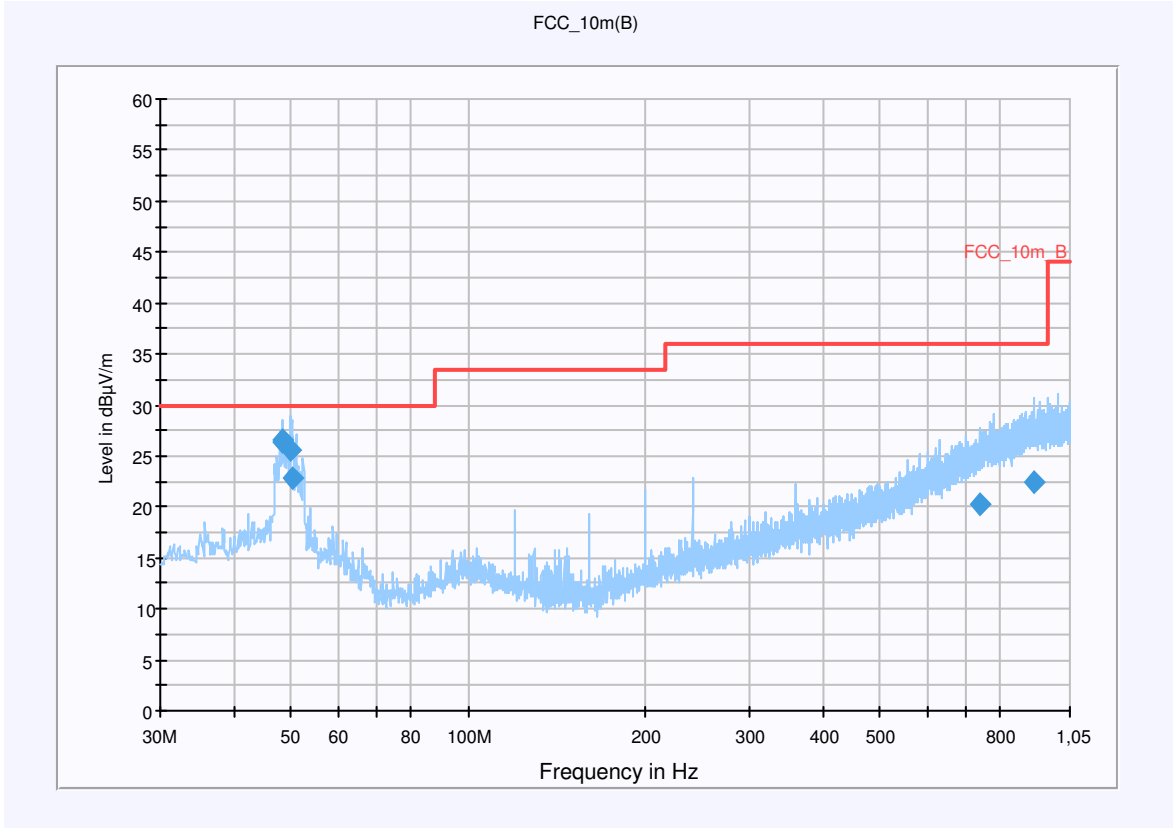


Date: 10.MAY.2010 10:39:22

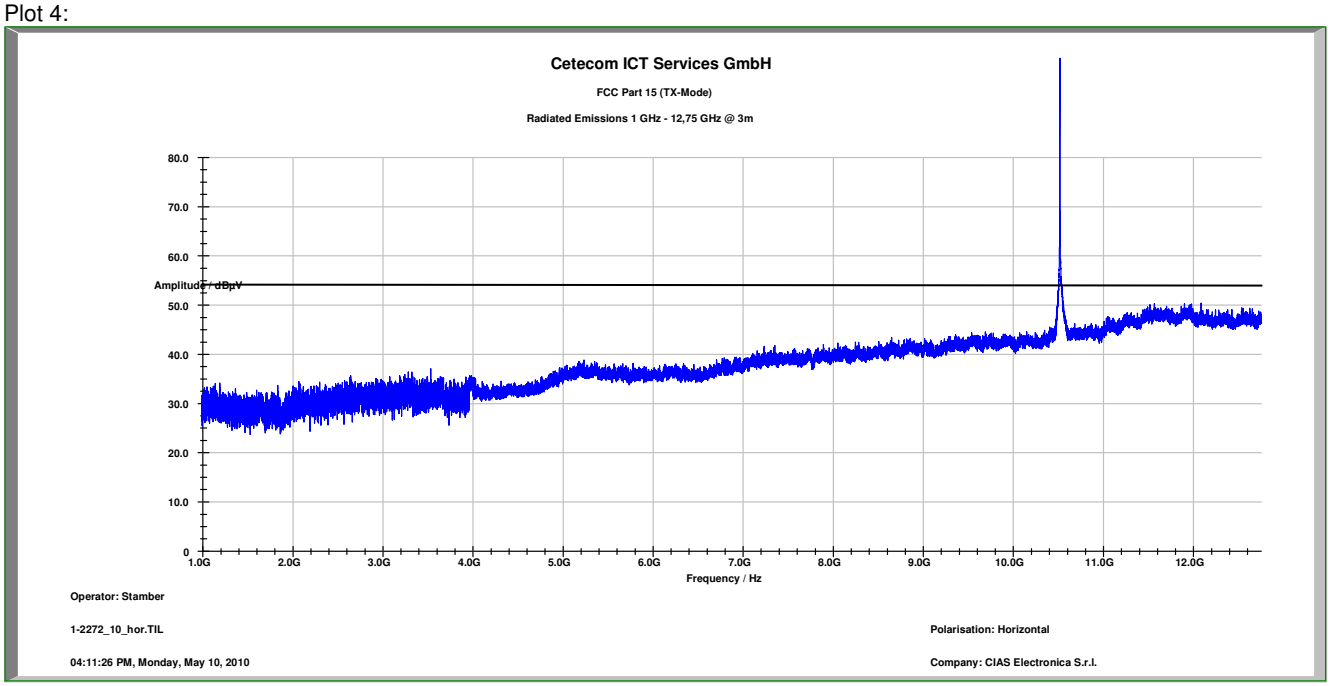
Plot 2:


Magnetic Field Strength
FCC Part 15
Limit corrected for 3m measurement distance
Limit FCC_magnetic
Measurement FCC
PK_Values_FCC
QP_Values_FCC
Amplitude / dBµV/m
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
1.0K
10.0K
100.0K
1.0M
10.0M
100.0M
Frequency
Operator: Stamber
04:17:01 PM, Monday, May 10, 2010
Projekt ID: 1-2272-1-2/10
EUT: Murena

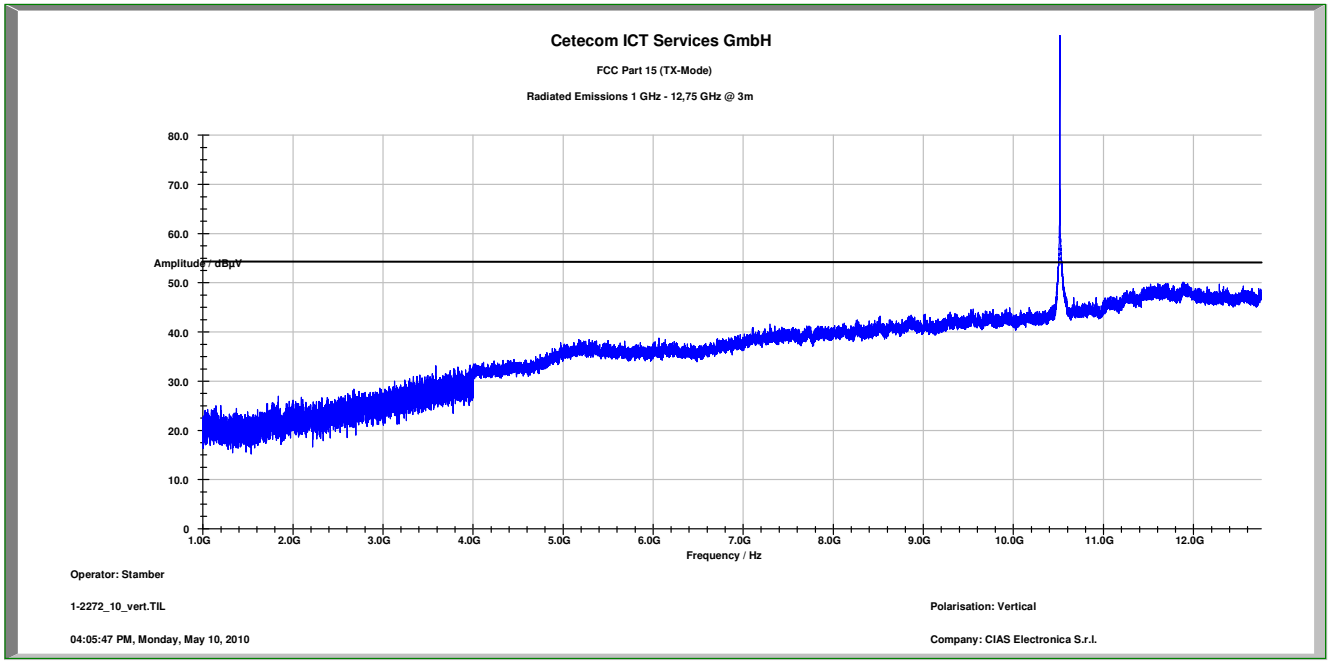
Plot 3:


FCC_10m(B)
FCC_10m_B
Level in dBµV/m
60
55
50
45
40
35
30
25
20
15
10
5
0
30M
50
60
80
100M
200
300
400
500
800
1,05
Frequency in Hz

Plot 4:

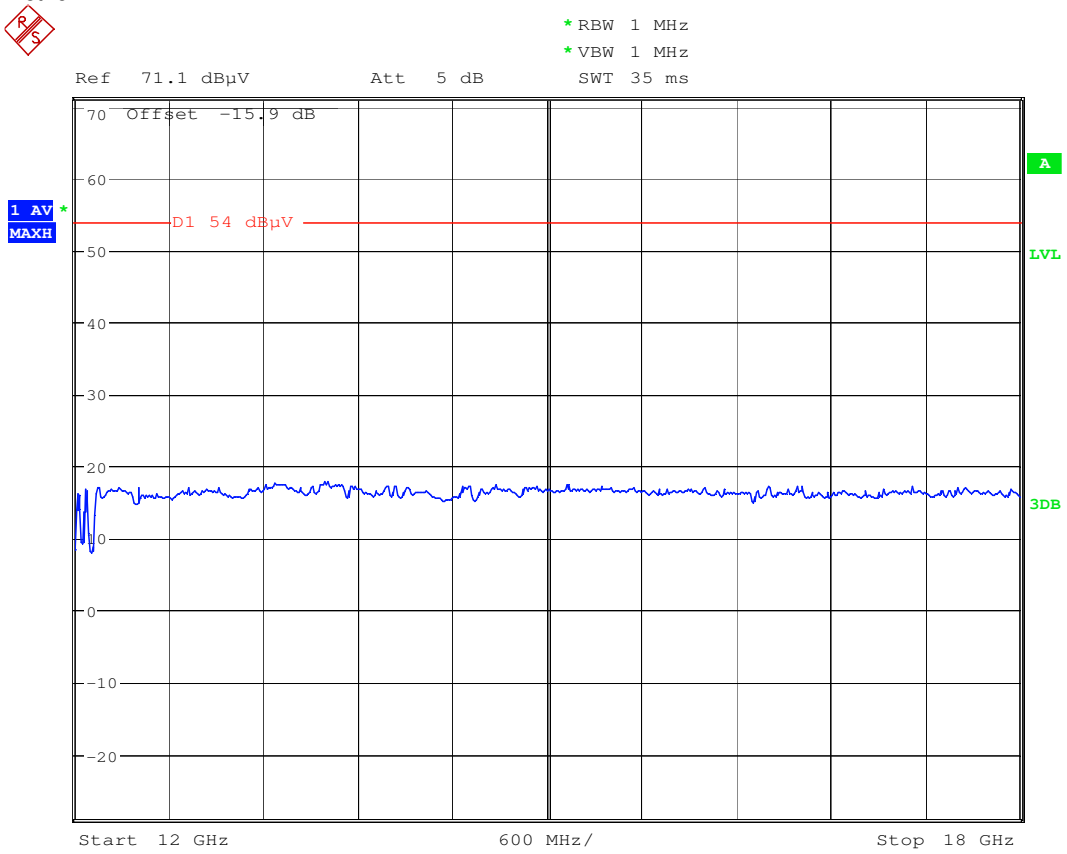


Plot 5:



The peaks at 10.5 GHz show the carrier frequency.

Plot 6:



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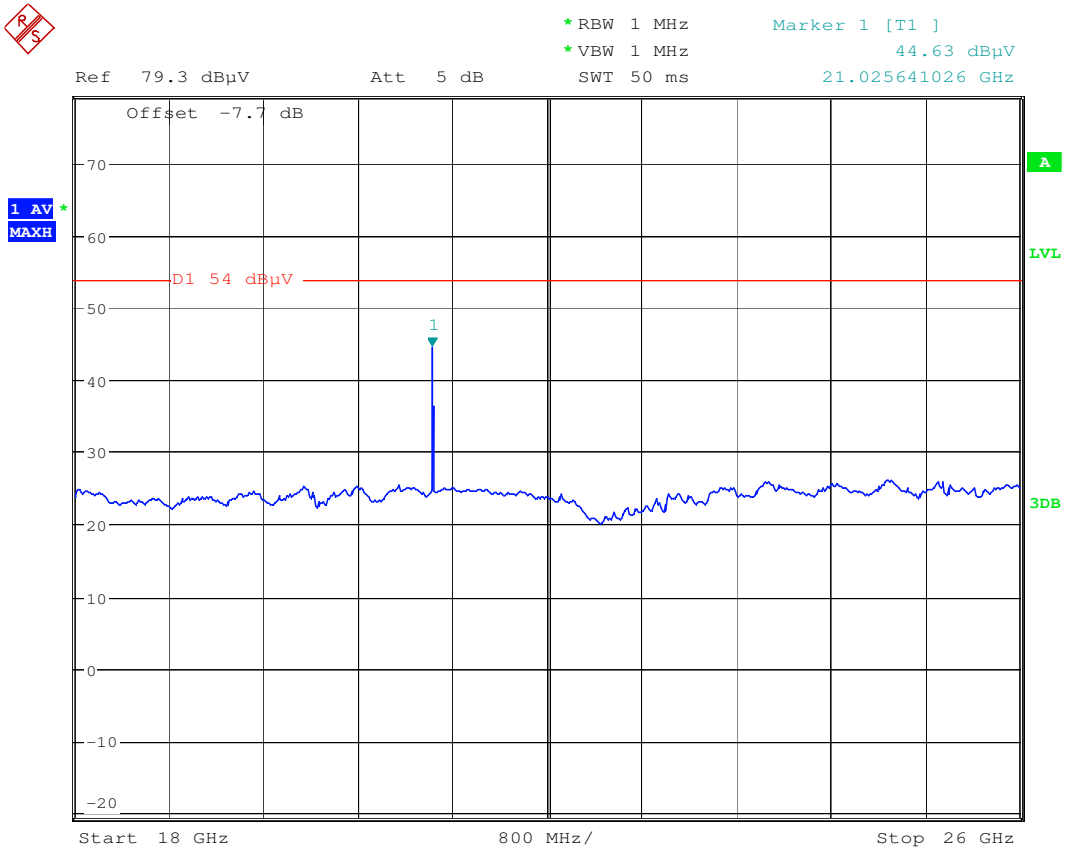
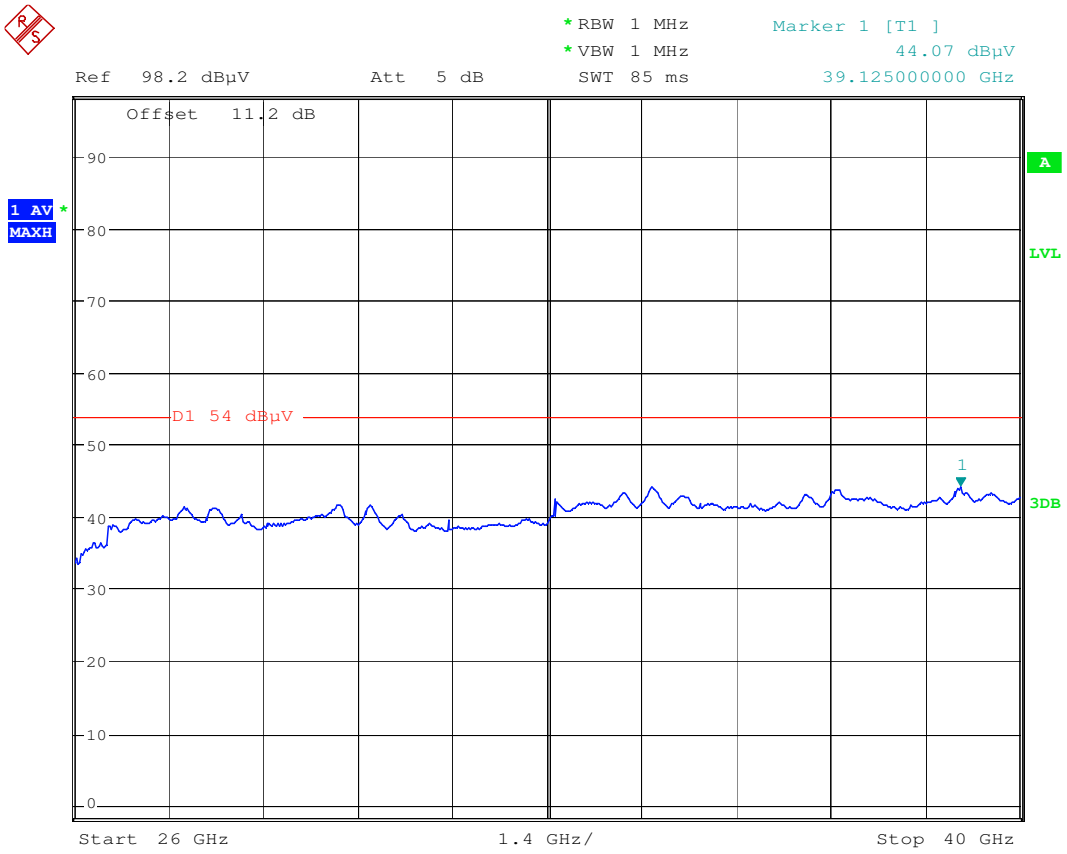


Date: 10.MAY.2010 12:49:10

Plot 8:



Date: 10.MAY.2010 12:55:42

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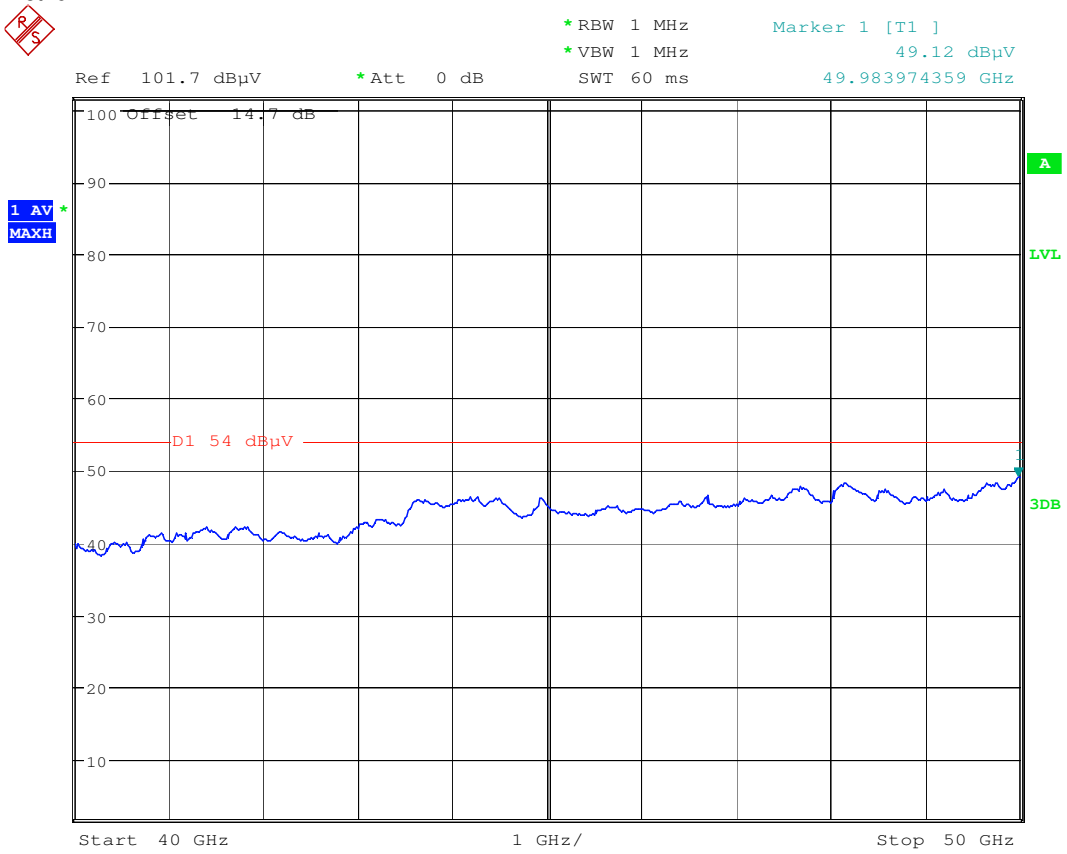
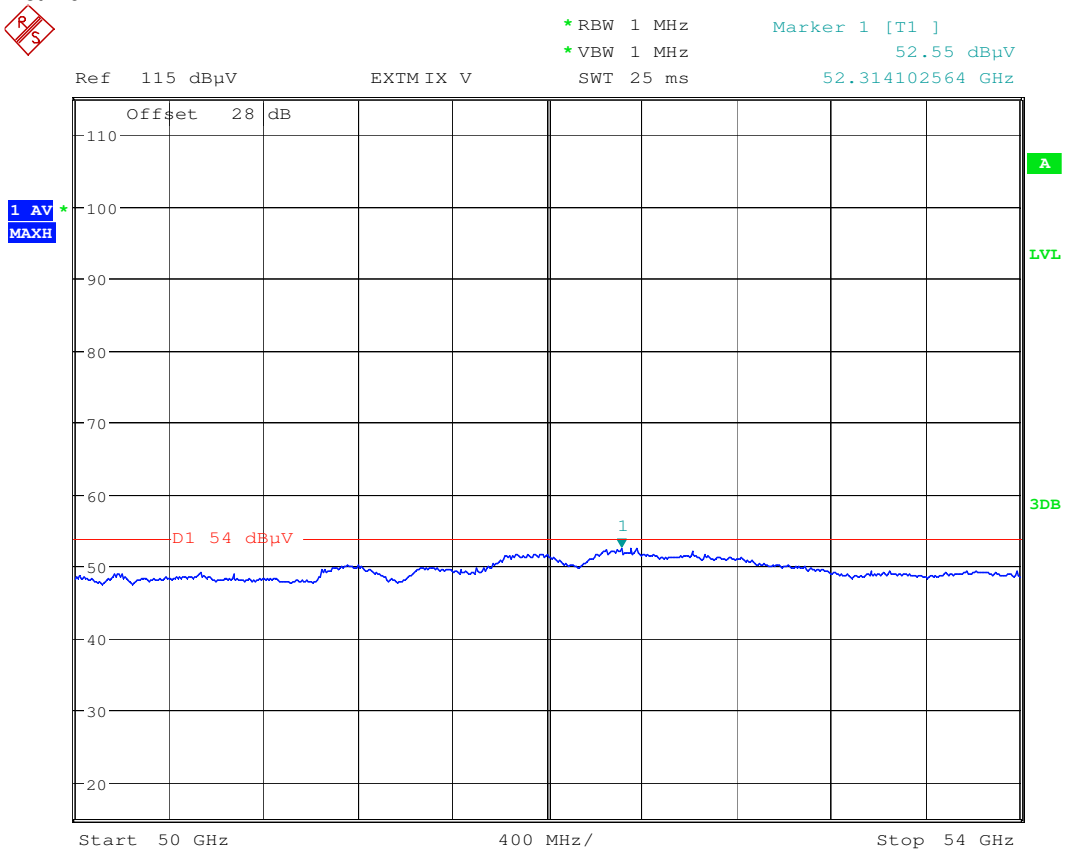


Date: 10.MAY.2010 13:07:49

Plot 10:



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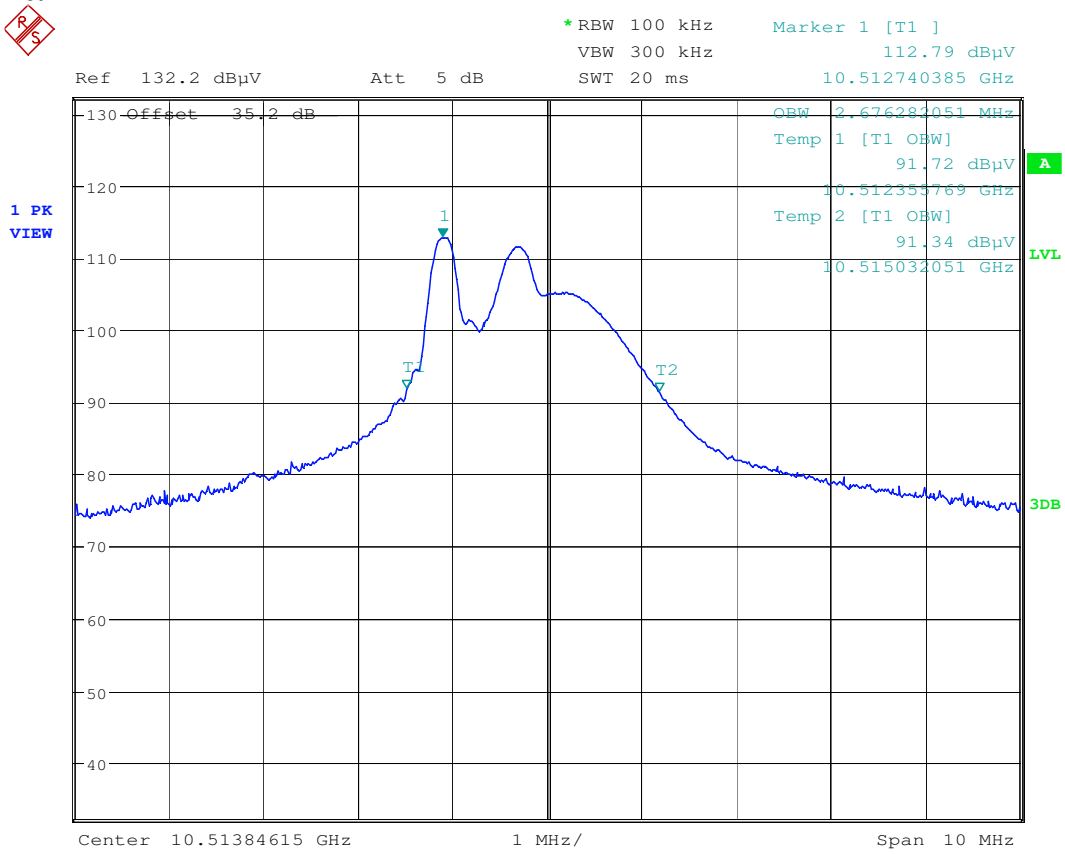
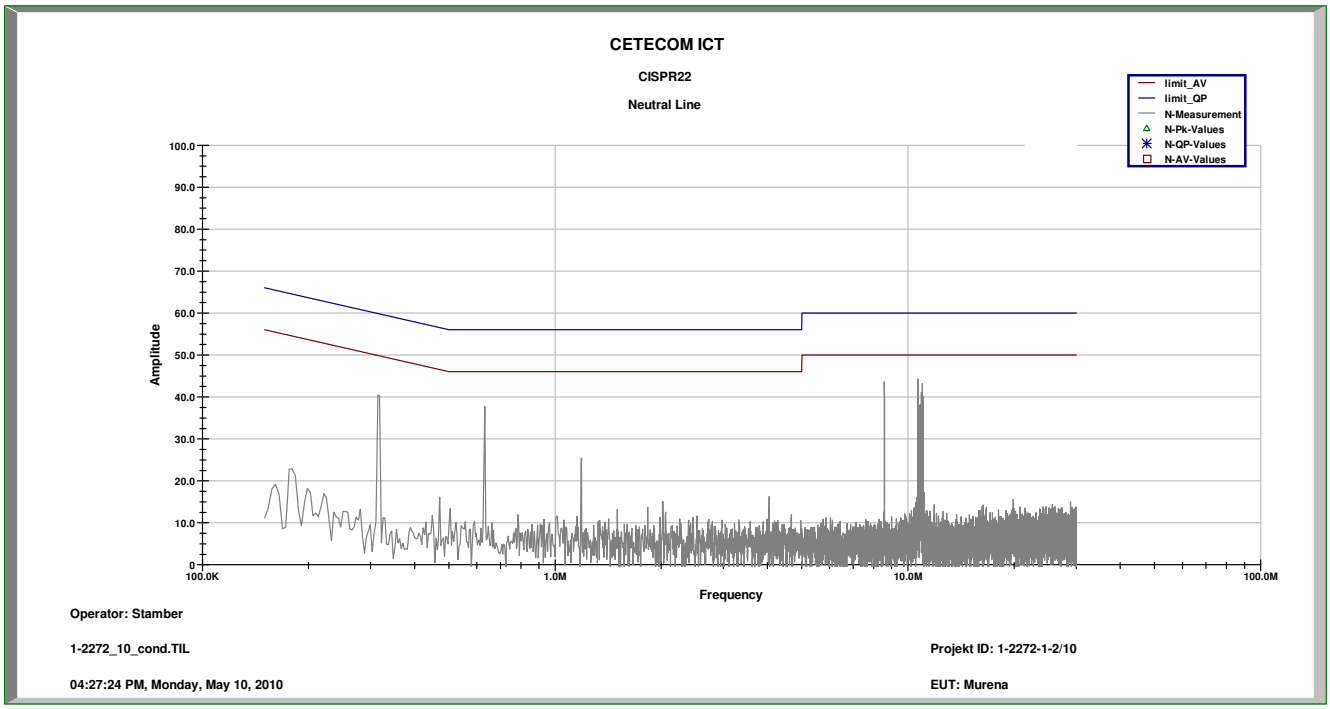
Plot 11:

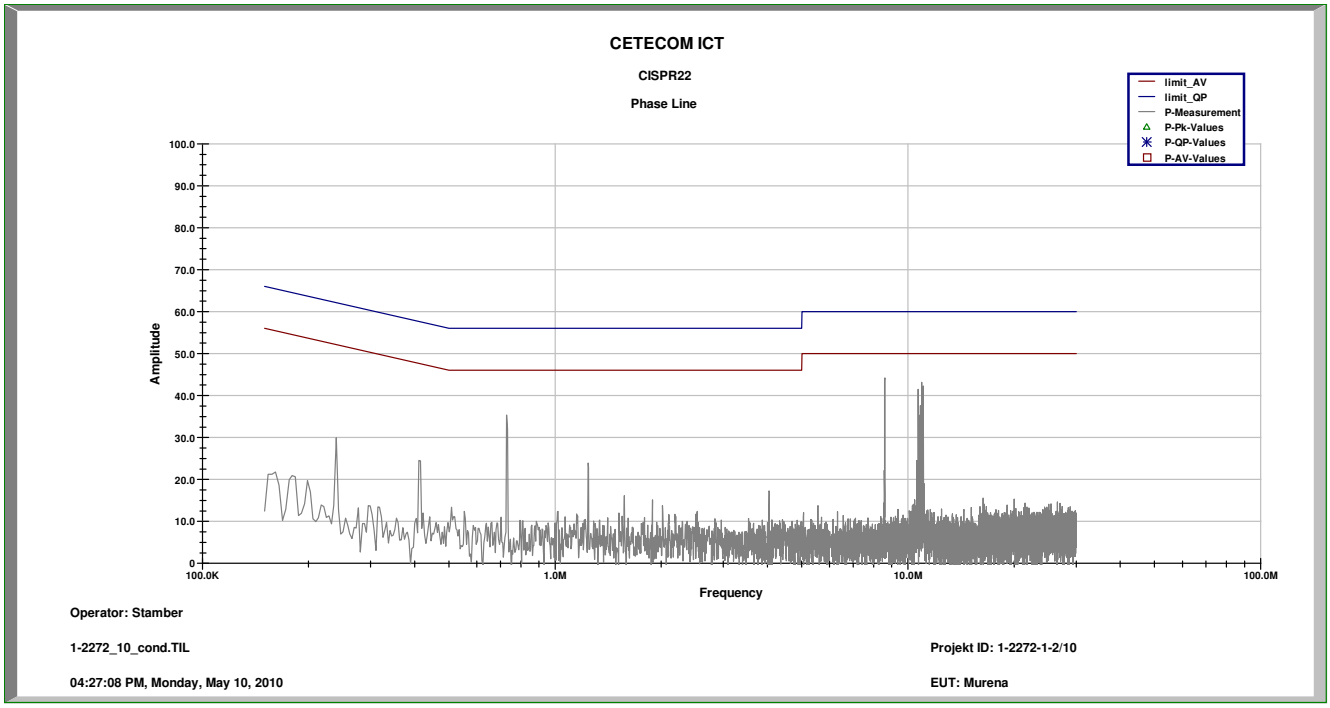


Date: 10.MAY.2010 10:47:17

Plot 12:



Plot 13:



4 Photographs:

Photograph No.: 1

EUT front view

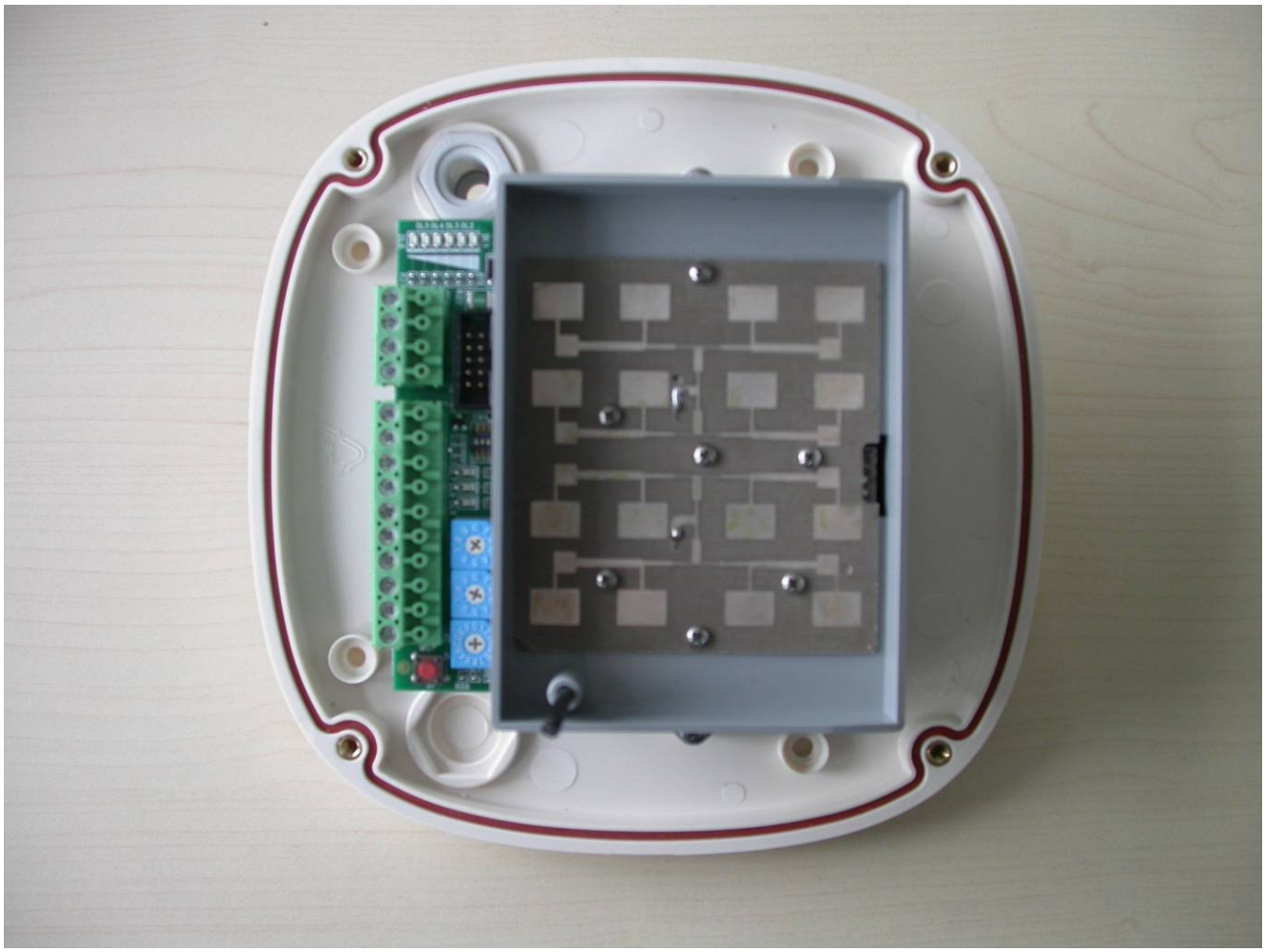
Photograph No.: 2

EUT side view

Photograph No.: 3

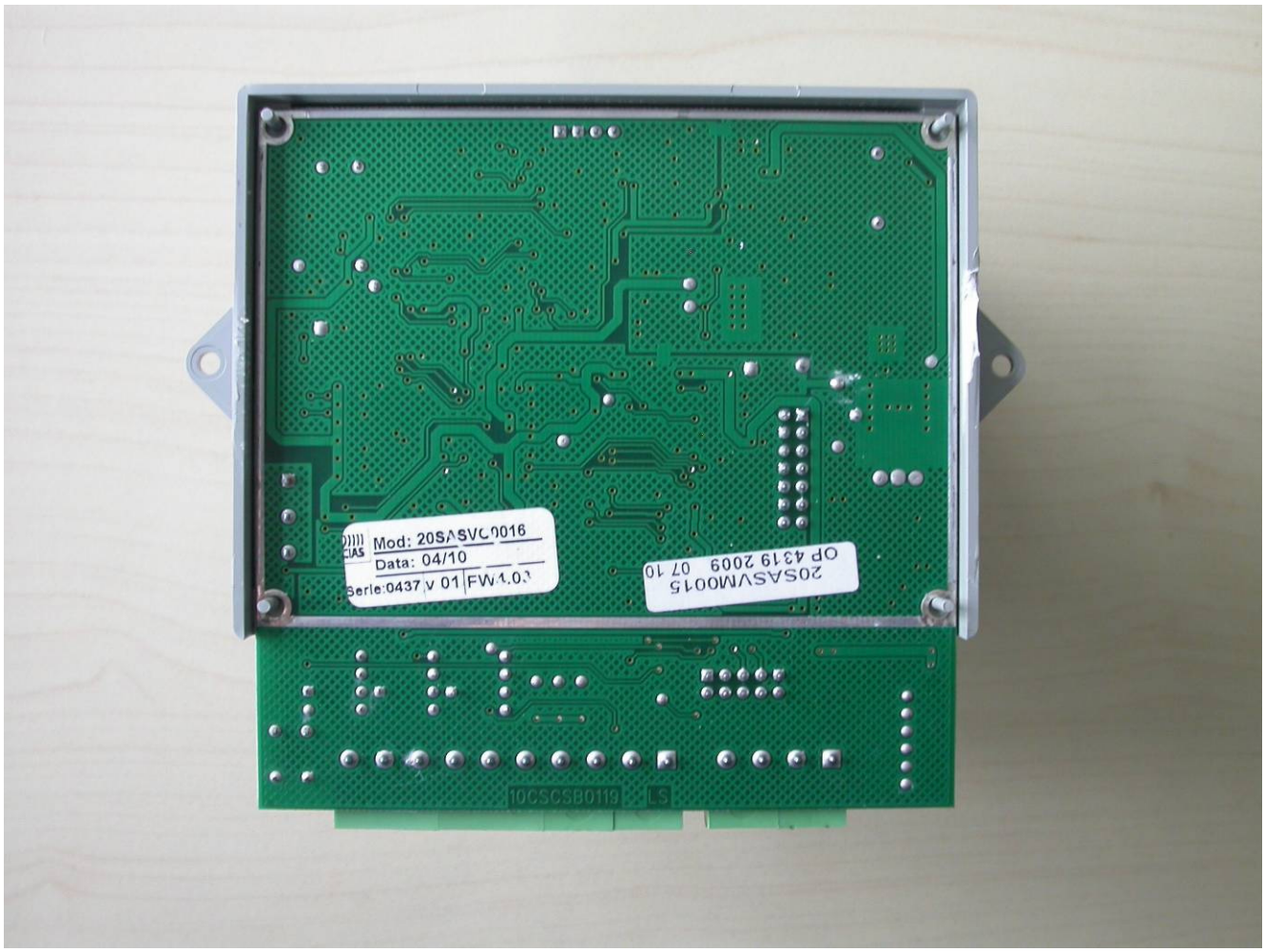
EUT rear view

Photograph No.: 4



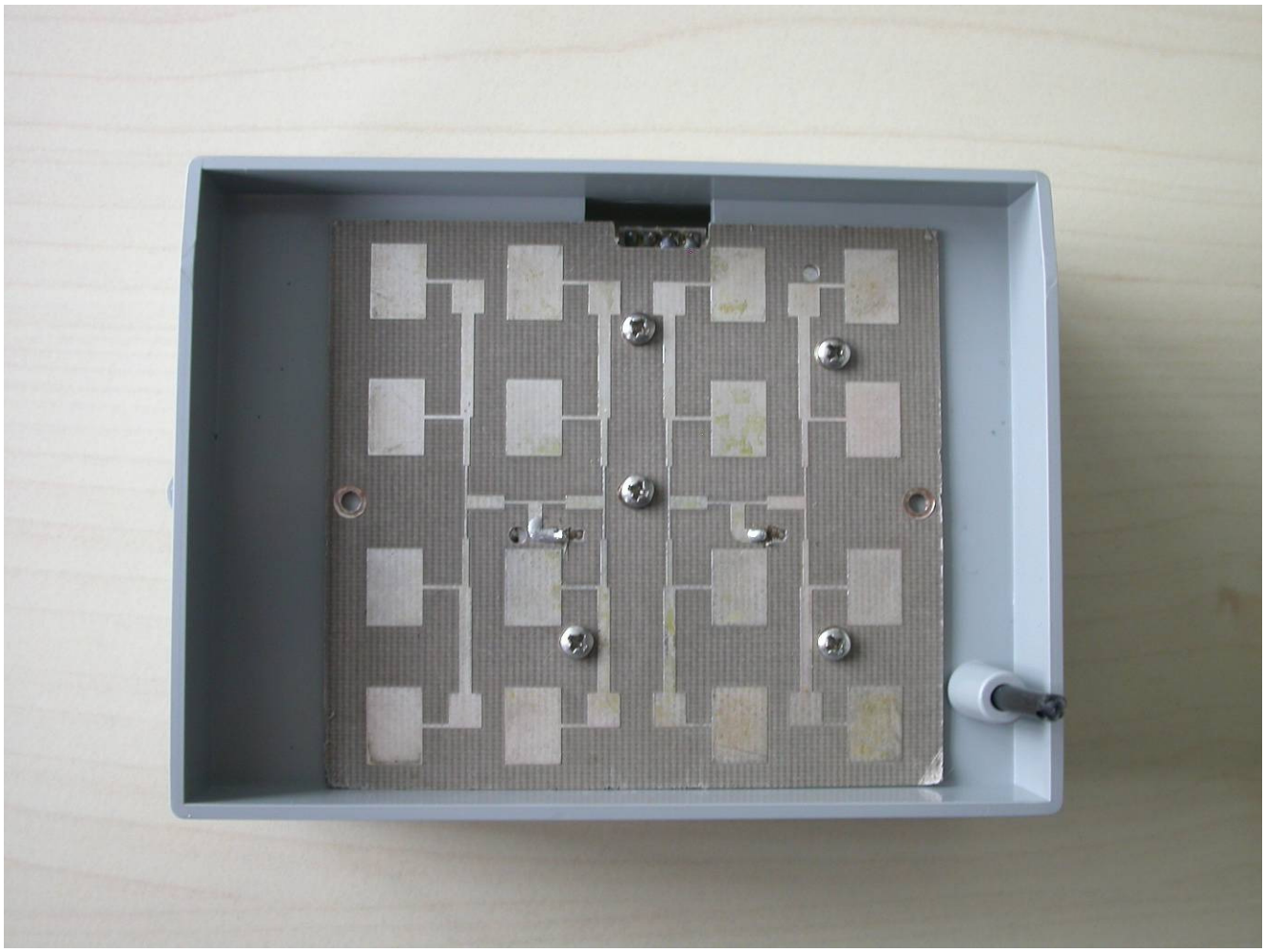
EUT cover removed

Photograph No.: 5



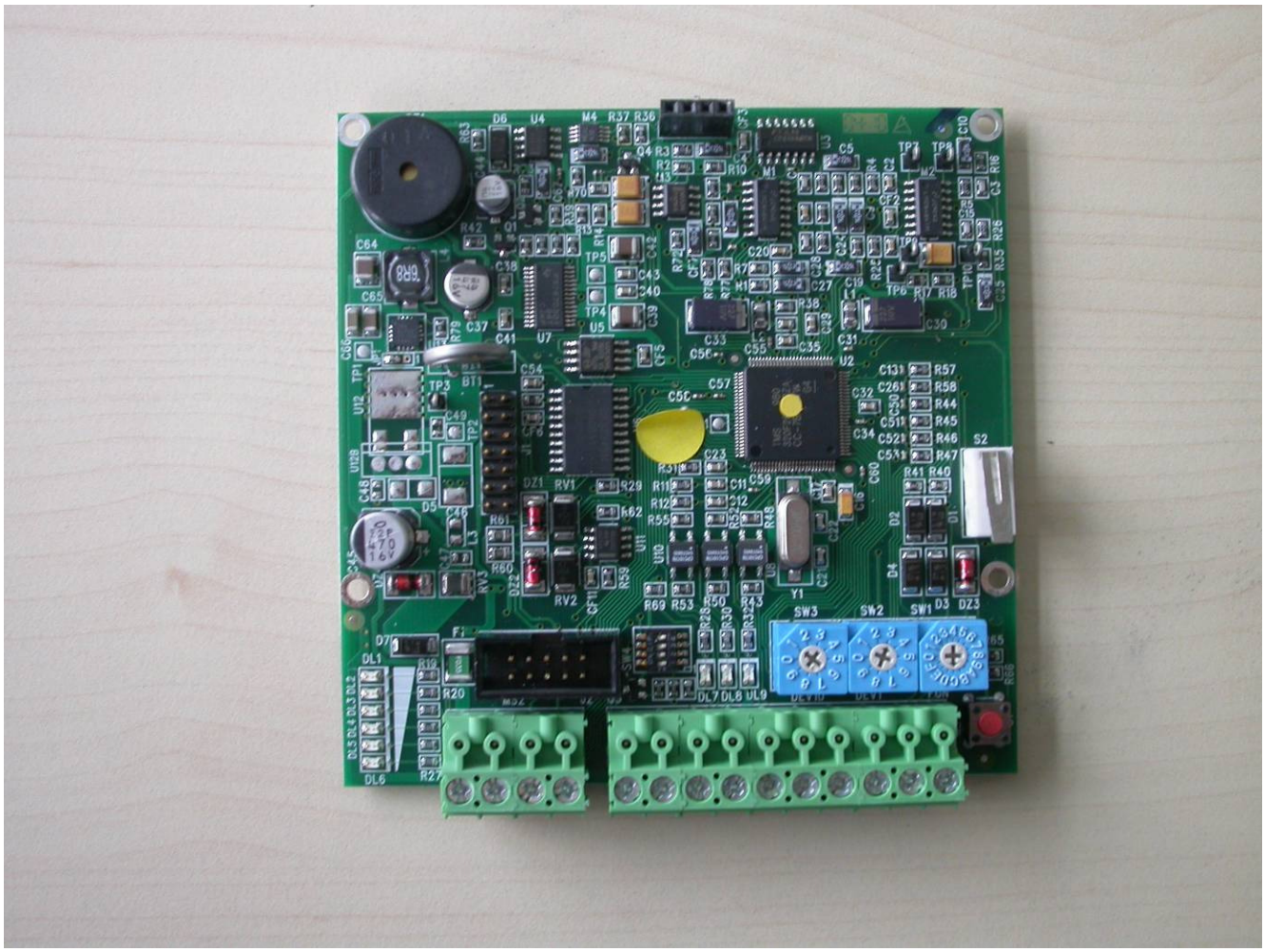
Mainboard rear view

Photograph No.: 6



RF Module with patch antenna field

Photograph No.: 7

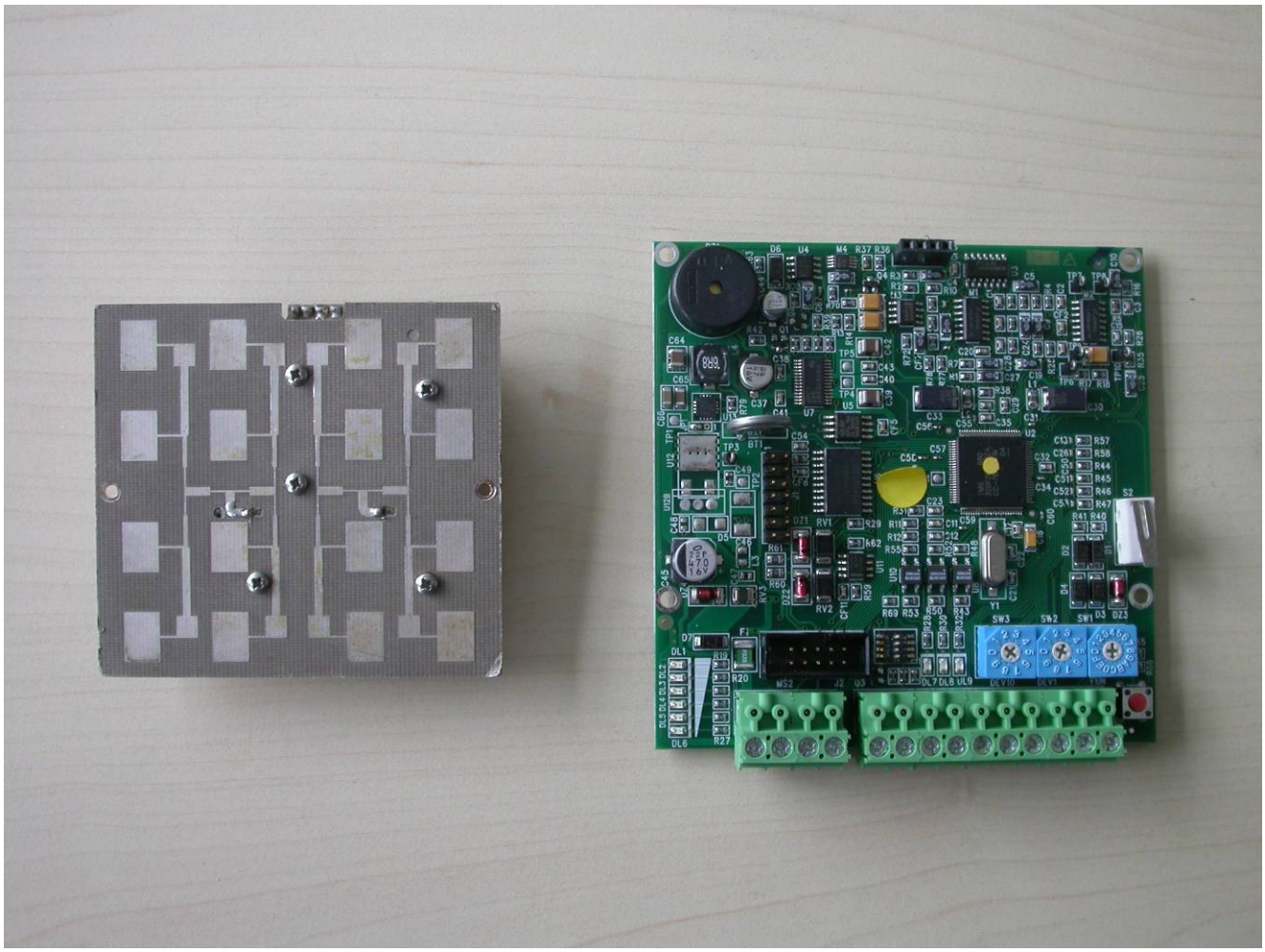


Mainboard front view

Photograph No.: 8

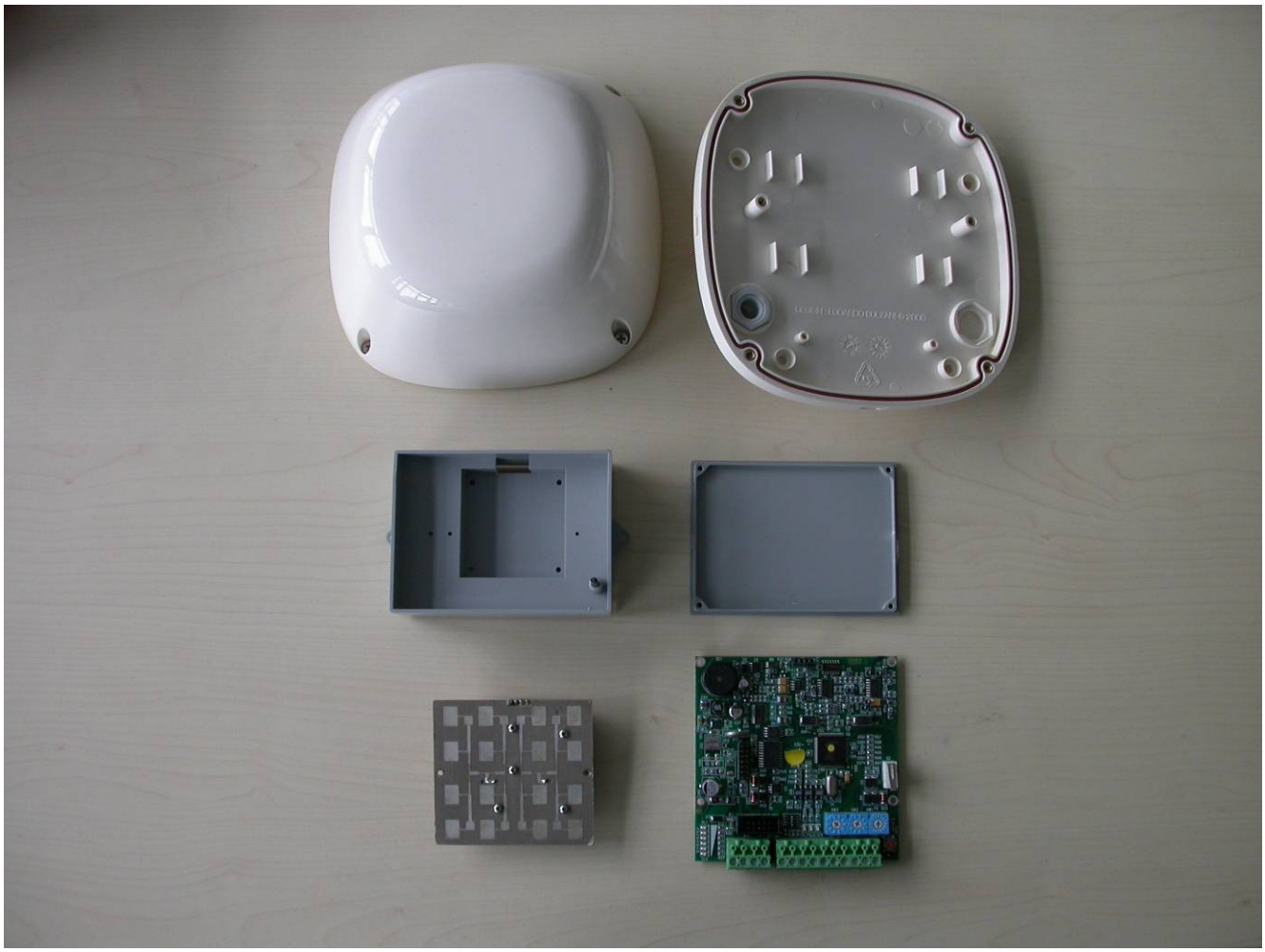
RF module rear view

Photograph No.: 9



RF module and mainboard

Photograph No.: 10

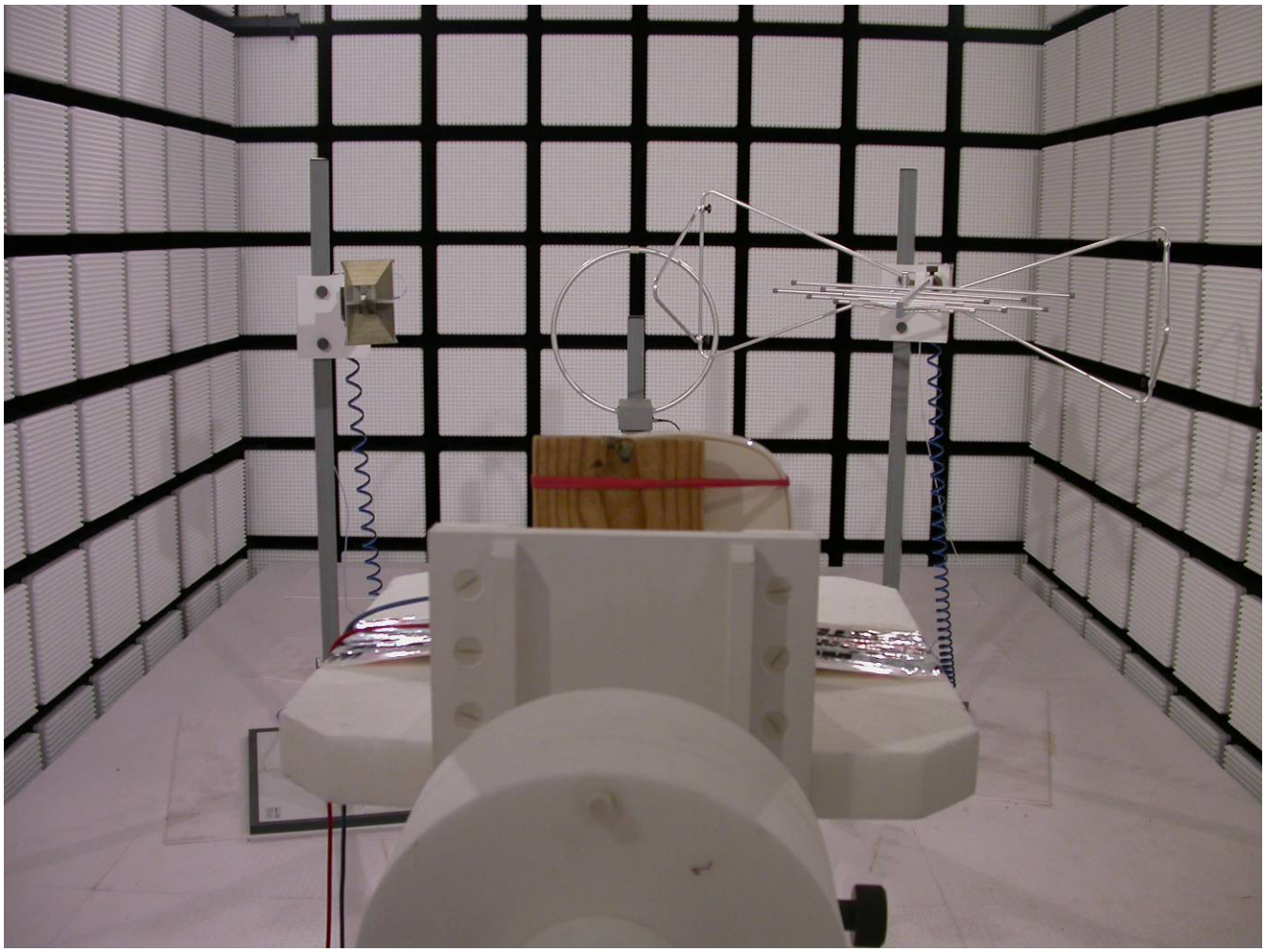


All parts of the EUT

Photograph No.: 11

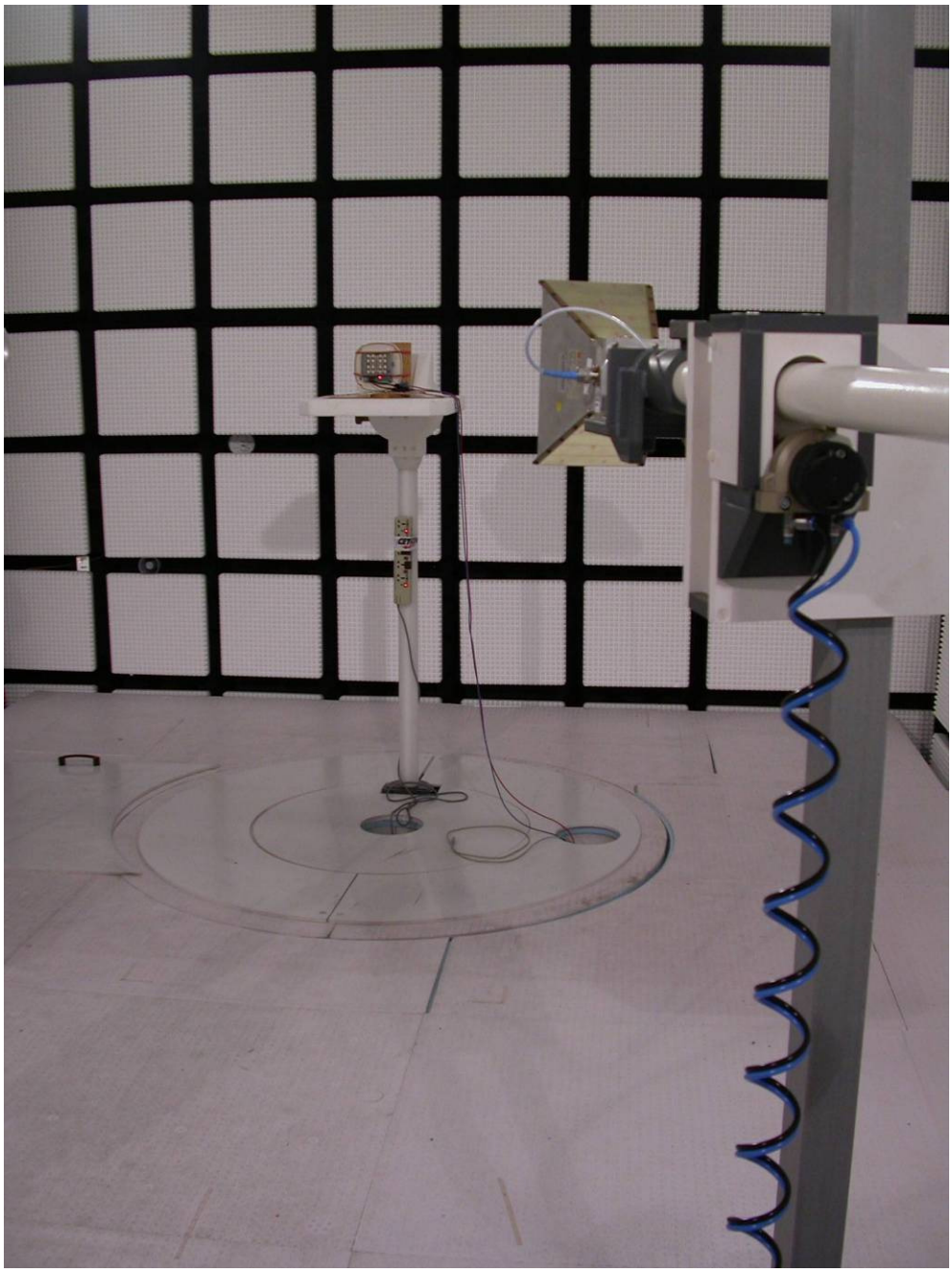
Spurious Emission measurement 1 GHz – 12 GHz

Photograph No.: 12



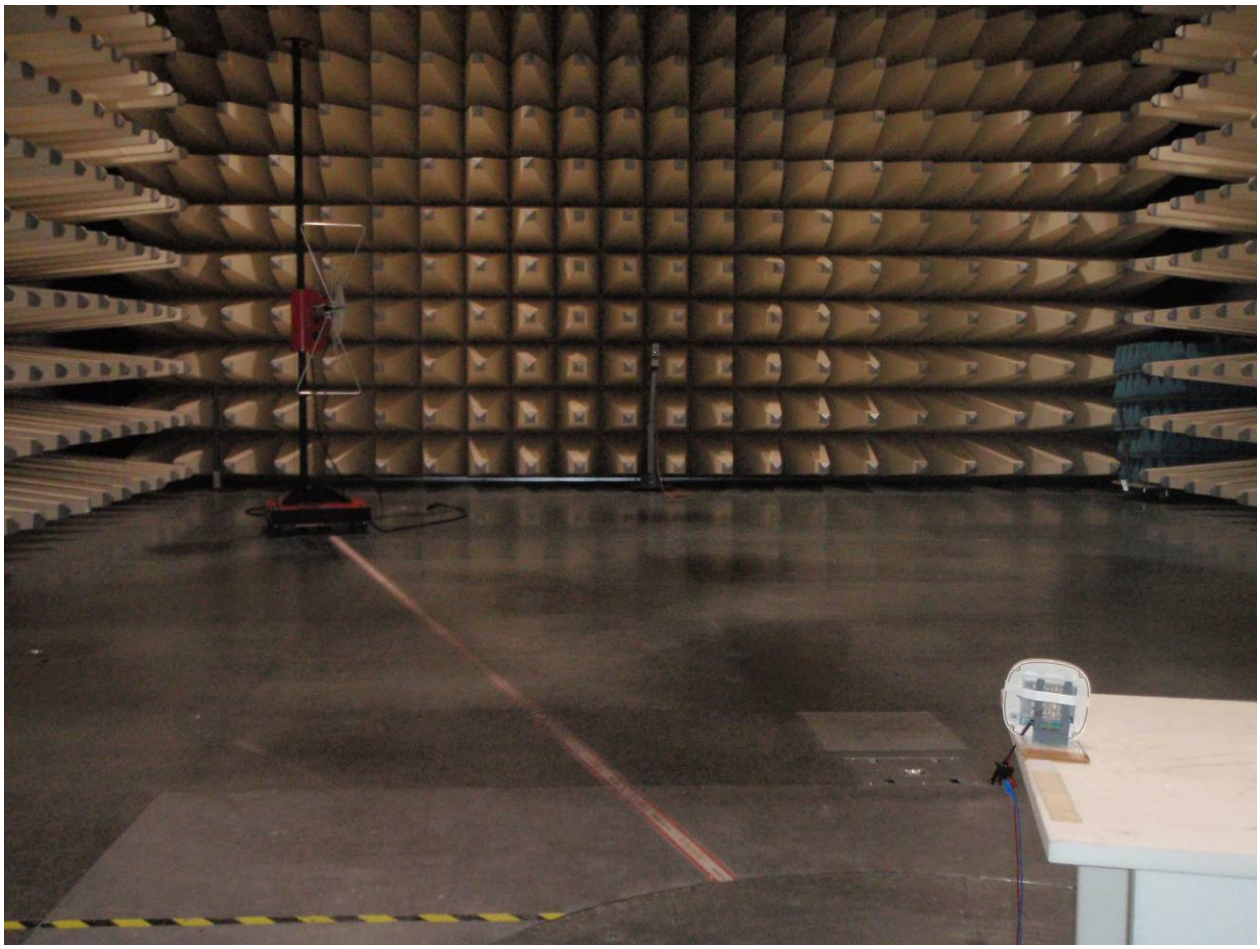
Spurious Emission measurement 1 GHz – 12 GHz

Photograph No.: 13



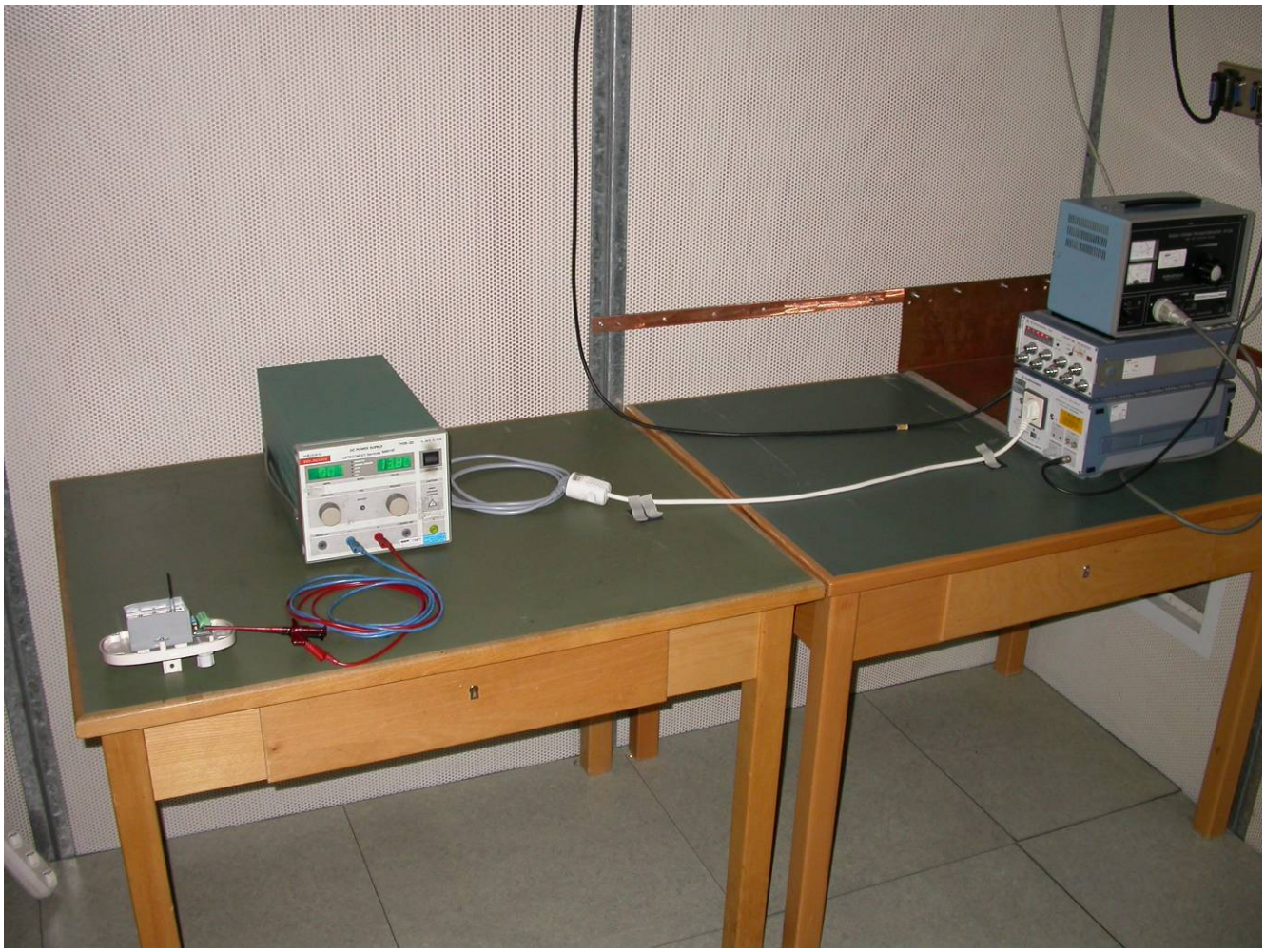
Spurious Emission measurement 1 GHz – 12 GHz

Photograph No.: 14



Spurious Emission measurement 30 MHz – 1 GHz

Photograph No.: 15



AC-conducted line measurement

Photograph No.: 16

Spurious Emission test equipment 12 – 54 GHz