

## TEST REPORT

Test report no.: 1-6038/13-01-03



Deutsche  
Akkreditierungsstelle  
D-PL-12076-01-01

### Testing laboratory

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#### Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01  
Area of Testing: Radio/Satellite Communications

### Applicant

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10153 Torino / ITALY  
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Fax:  
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### Manufacturer

**GUGLIELMI S.n.c.**  
Via Cagliari 19  
10153 Torino / ITALY

### Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I  
Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

### Test Item

**Kind of test item:** Microwave Motion Detector Doppler  
**Model name:** HAWK2  
**FCC ID:** 2AAJSAK2  
**Frequency:** 24.075 GHz – 24.175 GHz  
**Antenna:** Integrated planar antenna  
**Power Supply:** 12 – 24 V AC  
12 – 30 V DC from Power Supply  
**Temperature Range:** -20 °C to +55 °C



### Test report authorised:

*Gerald Karsten*

2013-10-30 Karsten Gerald  
Senior Testing Manager

### Test performed:

*M. Walla*

2013-10-30 Meheza Walla  
Expert



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## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. 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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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### 2.2 Application details

Date of receipt of order:	2013-04-08
Date of receipt of test item:	2013-04-22
Start of test:	2013-04-24
End of test:	2013-06-26
Person(s) present during the test:	-/-

## 3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices

#### 4 Test environment

Temperature:	$T_{nom}$	+22 °C during room temperature tests
Relative humidity content:		55 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	$V_{nom}$	12 V DC from Power Supply

#### 5 Test item

Kind of test item	:	Microwave Motion Detector Doppler
Type identification	:	HAWK2
S/N serial number	:	Prototype
HW hardware status	:	-/-
SW software status	:	-/-
Frequency band	:	24.075 GHz – 24.175 GHz
Type of modulation	:	CW
Number of channels	:	1
Antenna	:	Integrated planar antenna
Power supply	:	12 – 30 V DC from Power Supply
Temperature range	:	+22 °C (Tests made under nominal temperature)

#### 6 Test laboratories sub-contracted

None

## 7 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	47 CFR Part 15	Passed	2013-10-30	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Results (max.)
§15.245(b)	Field strength of emissions (wanted signal)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	103 dB $\mu$ V
§2.1049	Occupied bandwidth (99% bandwidth)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	152 kHz
§15.209(a) / §15.245(b)(1)(2)(3)	Field strength of emissions (spurious)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.207(a)	Conducted emissions < 30 MHz	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

**Note:** NA = Not Applicable; NP = Not Performed

## 8 RF measurement testing

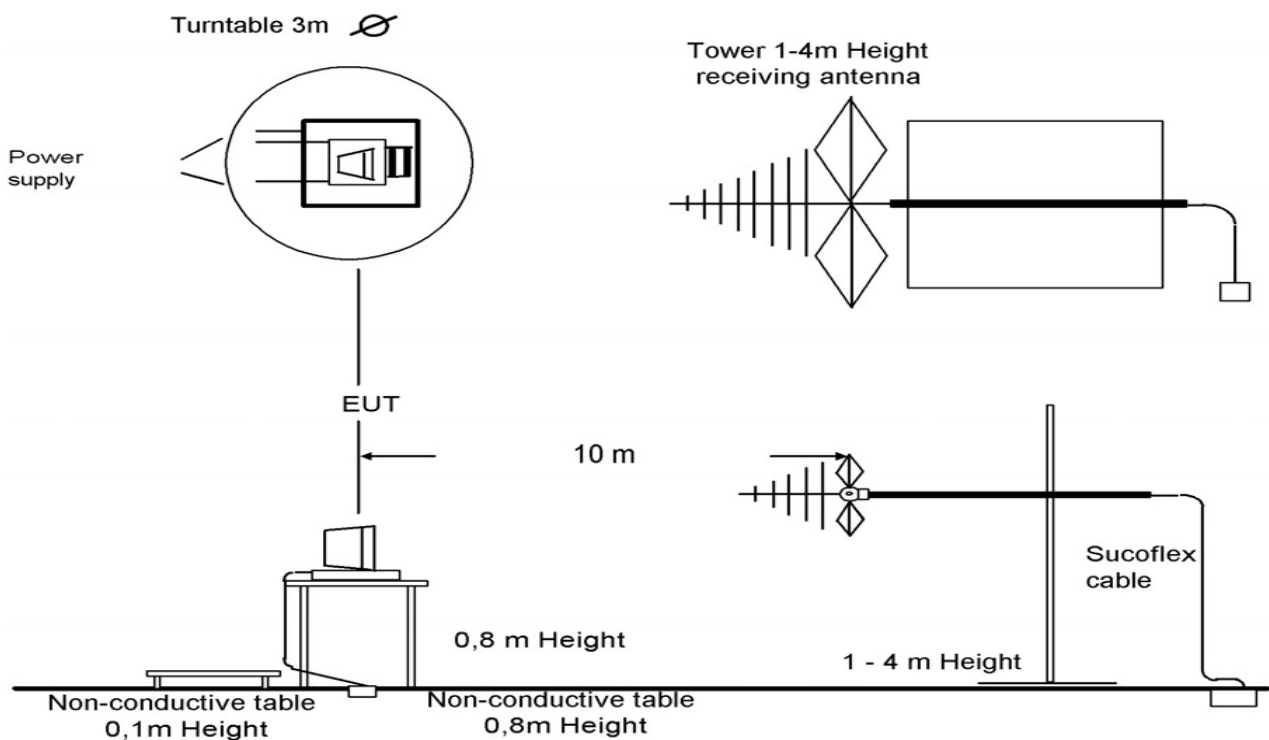
### 8.1 Description of test setup

#### 8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 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 are confirmed with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2009 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 setups 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 over various frequency ranges are set according to requirement ANSI C63-4-2009 clause 4.2.

Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber

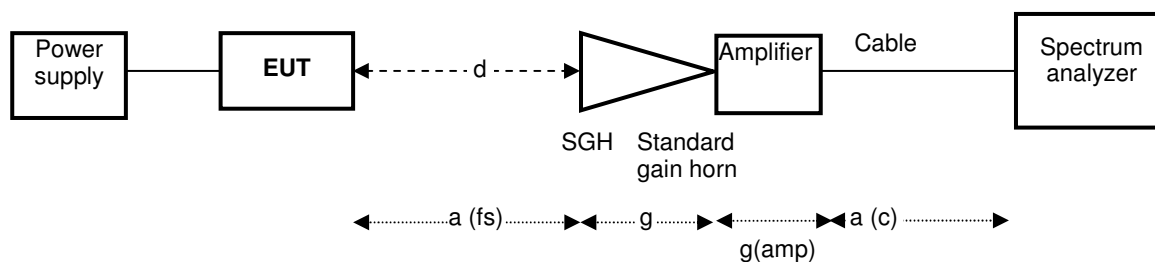


Picture 1: Diagram radiated measurements (up to 1 GHz)

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

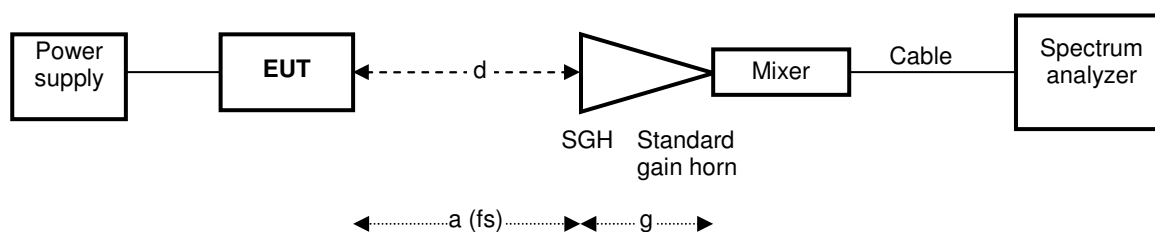
The EUT is powered by an external power supply with nominal voltage

Test set-up for the measurement of spurious radiation in the frequency range 12 GHz to 50 GHz:



Picture 2: Diagram radiated measurements (12 GHz – 50 GHz)

Test set-up for the measurement of spurious radiation and EIRP in the frequency range 50 GHz to 110 GHz:



Picture 3: Diagram radiated measurements (50 GHz – 110 GHz)

## 8.1.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☒ Normal operation, no special test mode available.

☐ Special software is used.

## 9 Measurement results

### 9.1 Field strength of emissions (wanted signal)

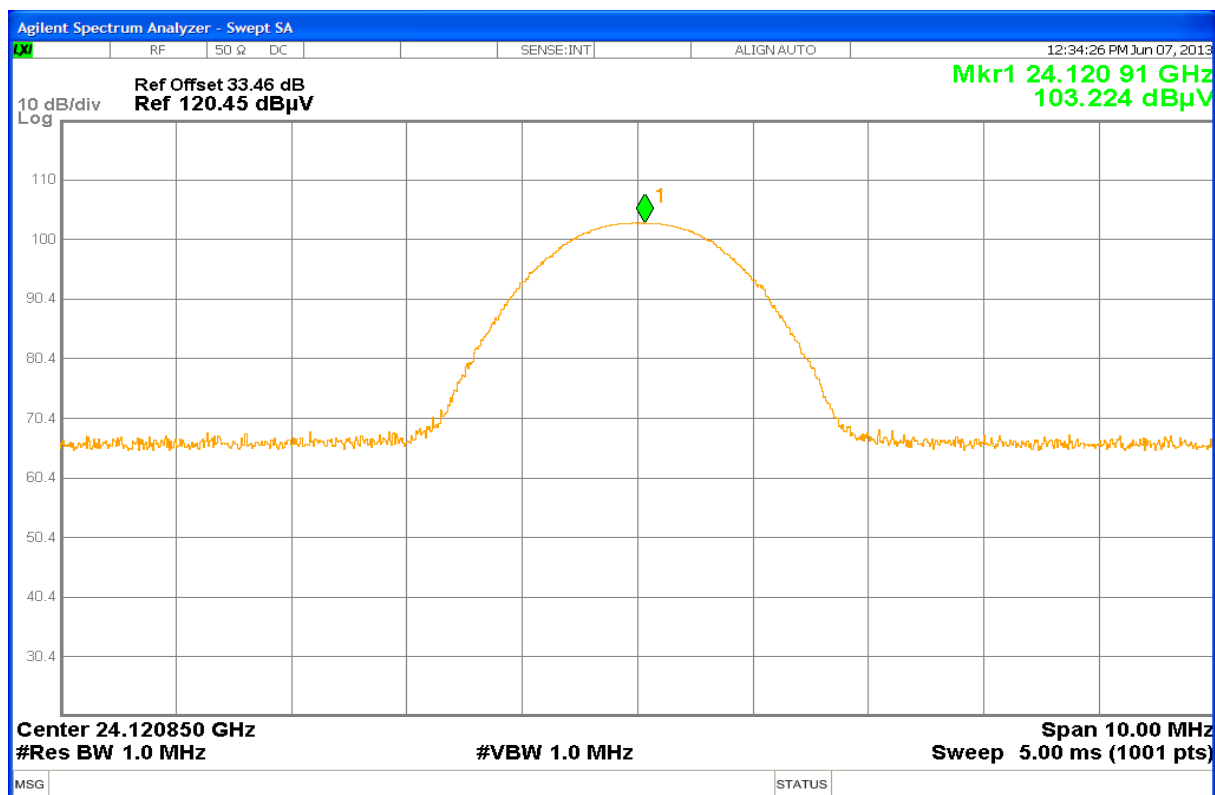
#### Description:

Measurement of the maximum radiated field strength of the wanted signal.

#### Measurement:

Measurement parameter	
Detector:	Pos-Peak
Sweep time:	Auto
Video bandwidth:	1 MHz
Resolution bandwidth:	1 MHz
Span:	10 MHz
Trace-Mode:	Max Hold

Plot 1:  $T_{\text{nom}} / V_{\text{nom}}$





**Result:**

Test condition	Maximum field strength [dB $\mu$ V/m @ 3 m]
T <sub>nom</sub> / V <sub>nom</sub>	103.22
Measurement uncertainty	$\pm 3$ dB

**Limits:**

FCC		
CFR Part 15.245(b)		
Field strength of emissions		
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:		
Frequency [ GHz ]	Field Strength [ dB $\mu$ V/m ]	Measurement distance
24.075 – 24.175	128	3

**Result:** The measurement is passed.

## 9.2 Occupied bandwidth (99% bandwidth)

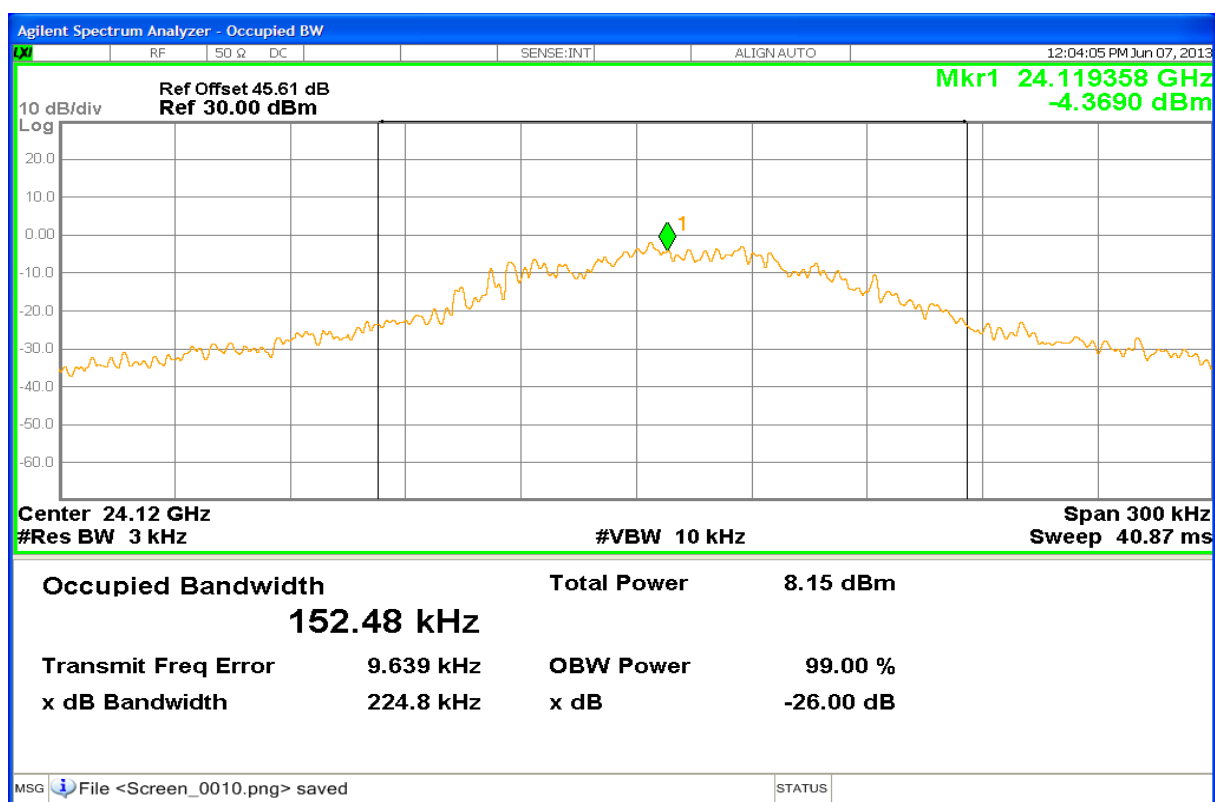
### Description:

Measurement of the 99% bandwidth of the wanted signal.

### Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	Auto
Resolution bandwidth:	3 kHz
Span:	300 kHz
Trace-Mode:	Max Hold

Plot 2: 99% Bandwidth,  $T_{nom} / V_{nom}$



**Result:**

Test condition	99 % Occupied Bandwidth [kHz]
$T_{\text{nom}} / V_{\text{nom}}$	152.5
Measurement uncertainty	$\pm \text{span}/1000$

**Result:** The measurement is passed.

### 9.3 Field strength of emissions (radiated spurious)

#### Description:

Measurement of the radiated spurious emissions in transmit mode.

#### Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Frequency range:	30 MHz to 110 GHz
Trace-Mode:	Max Hold

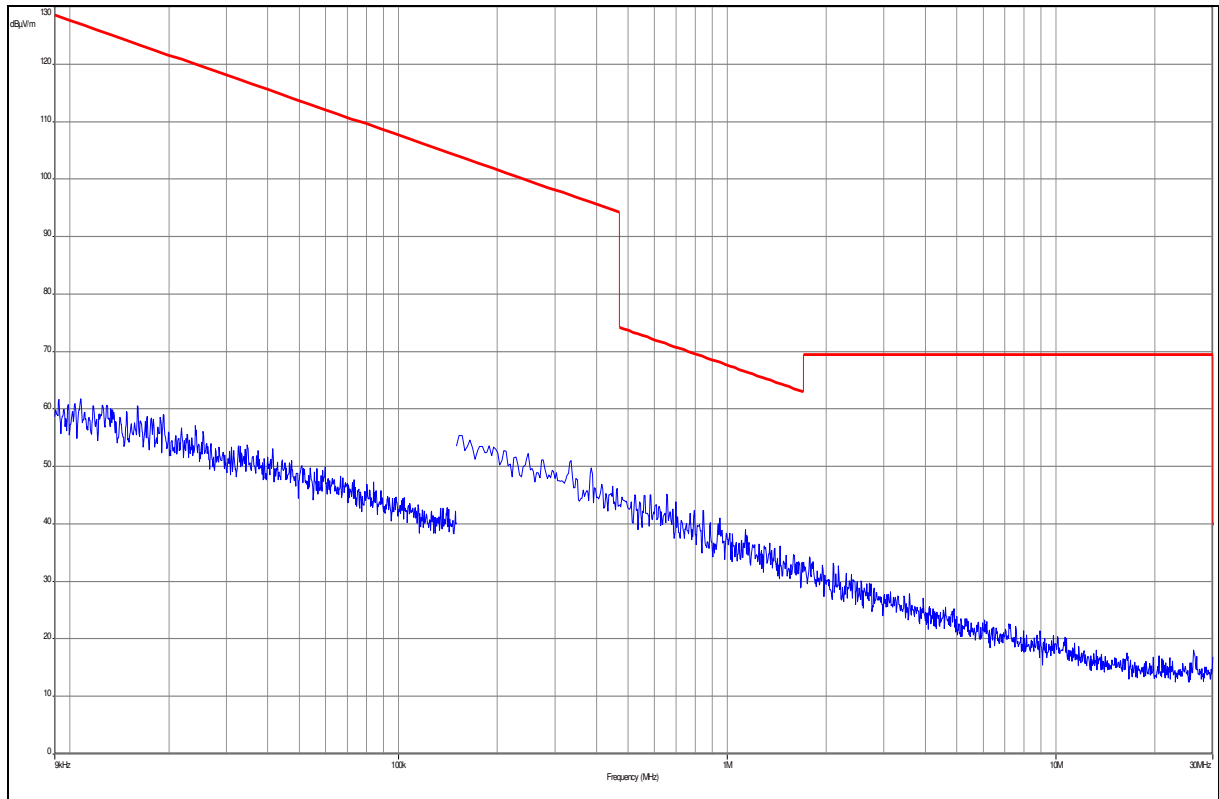
#### Limits:

FCC		
CFR Part 15.209(a)		
Radiated Spurious Emissions		
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

**Note:** Harmonics shall not exceed 25.0 millivolts/meter (88.0 dBμV/m)

**Result:** The measurement is passed.

Plot 3: Traffic mode up to 30 MHz



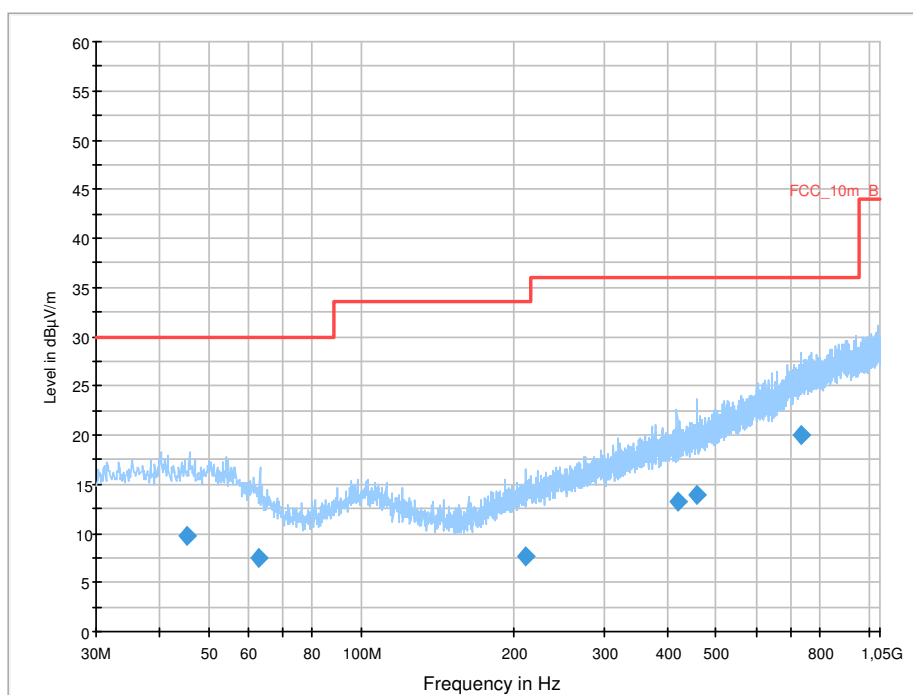
Plot 4: 30 MHz to 1 GHz, vertical / horizontal polarization

EUT:	APRO 20 K
Serial Number:	-/-
Test Description:	FCC class B @ 10 m
Operating Conditions:	TX-Mode
Operator Name:	Hennemann
Comment:	DC: 24 V

Scan Setup: STAN\_Fin [EMI radiated]

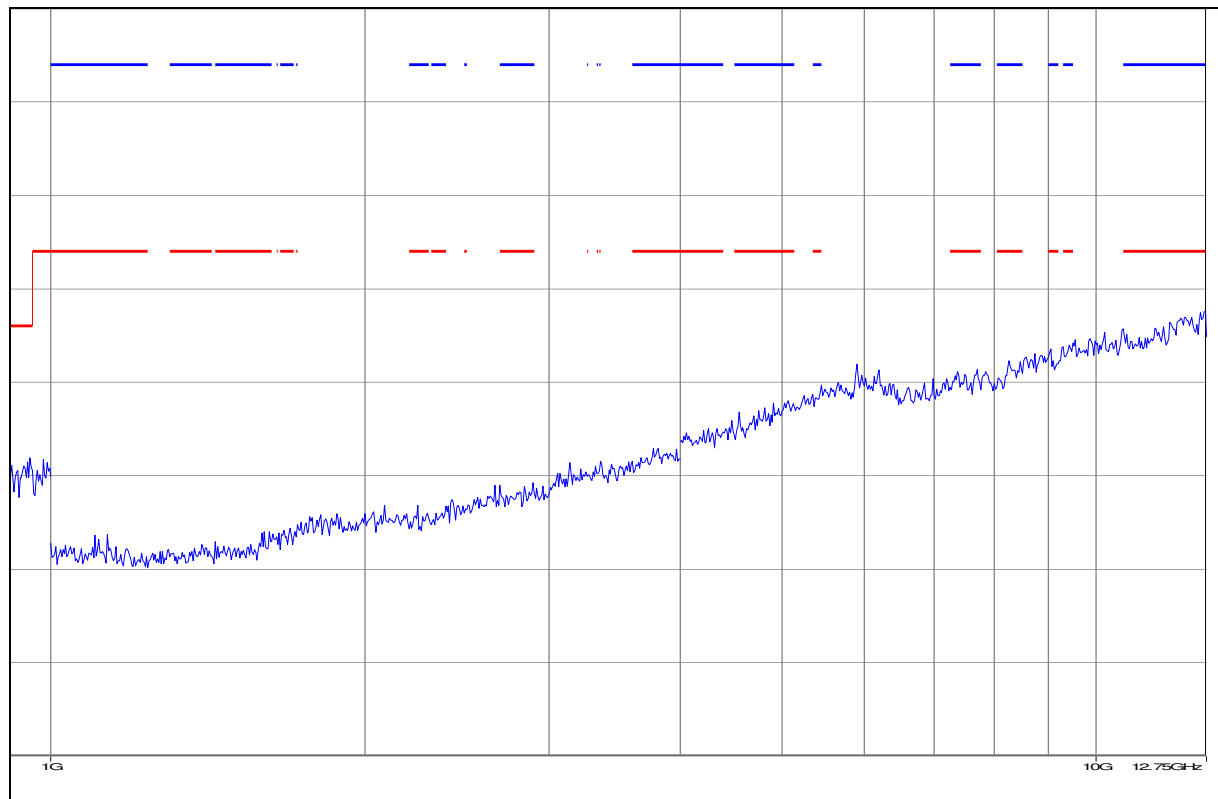
Hardware Setup:	Electric Field (NOS)
Receiver:	[ESCI 3]
Level Unit:	dB $\mu$ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

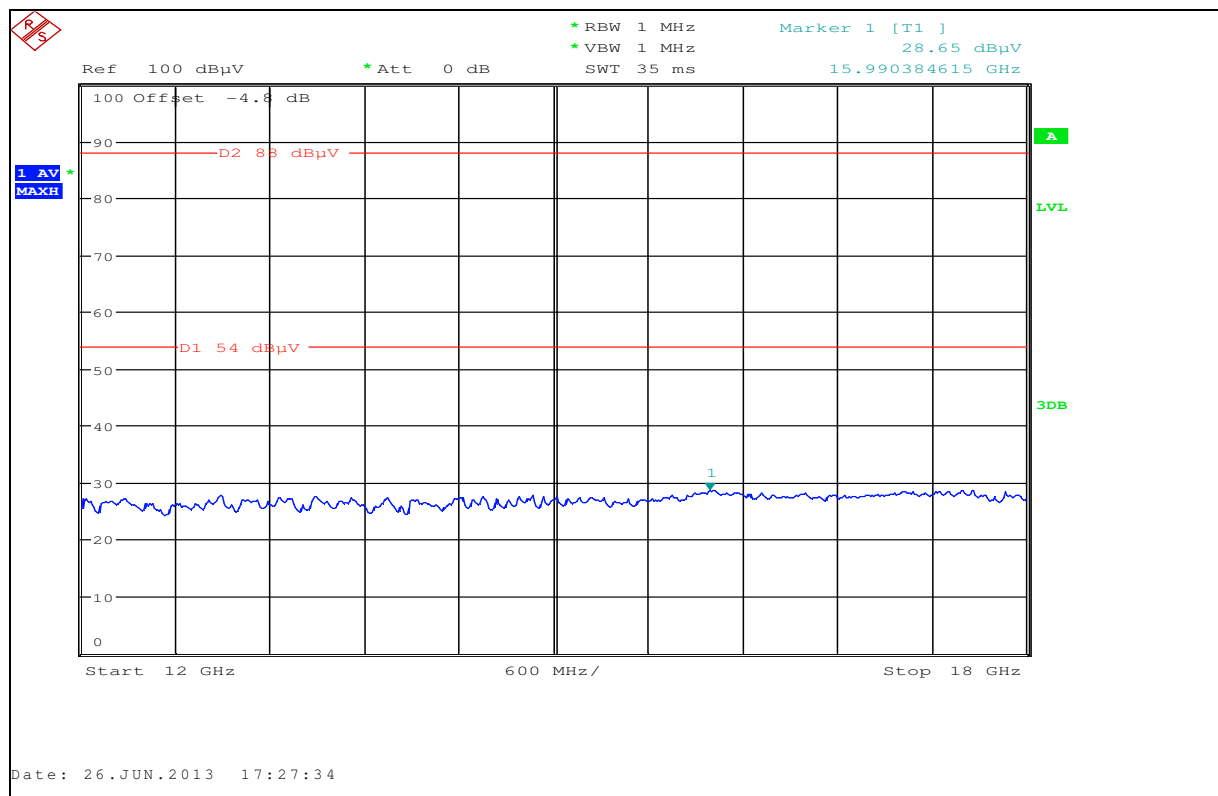


Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
45.30600	9.7	1000.	120.000	200.0	H	4.0	13.3	20.3	30.0
62.68560	7.4	1000.	120.000	100.0	V	9.0	11.0	22.6	30.0
210.95010	7.6	1000.	120.000	400.0	H	107.0	12.1	25.9	33.5
418.90920	13.2	1000.	120.000	168.0	H	140.0	17.2	22.8	36.0
458.24325	13.9	1000.	120.000	387.0	H	-44.0	17.8	22.1	36.0
732.74130	20.0	1000.	120.000	200.0	V	44.0	23.3	16.0	36.0

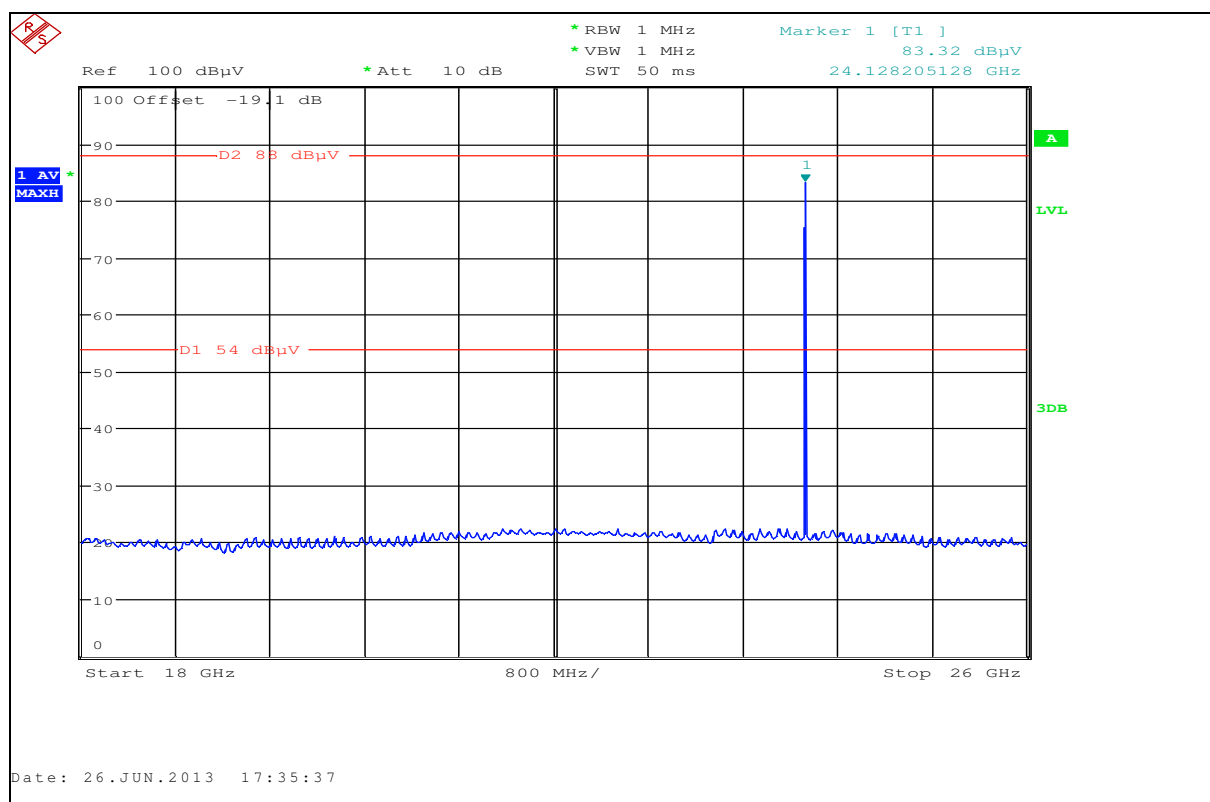
Plot 5: 1 GHz to 12 GHz, vertical / horizontal polarization



Plot 6: 12 GHz to 18 GHz, vertical / horizontal polarization

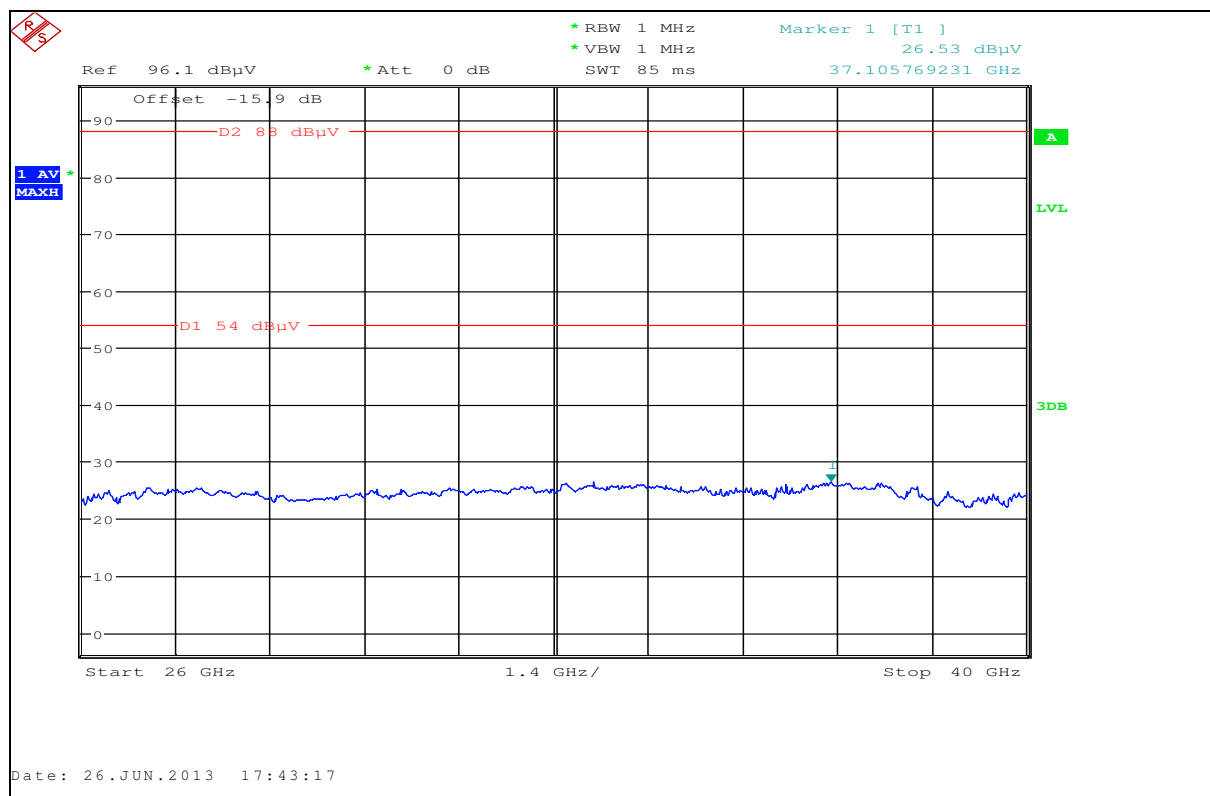


Plot 7: 18 GHz to 26 GHz, vertical / horizontal polarization



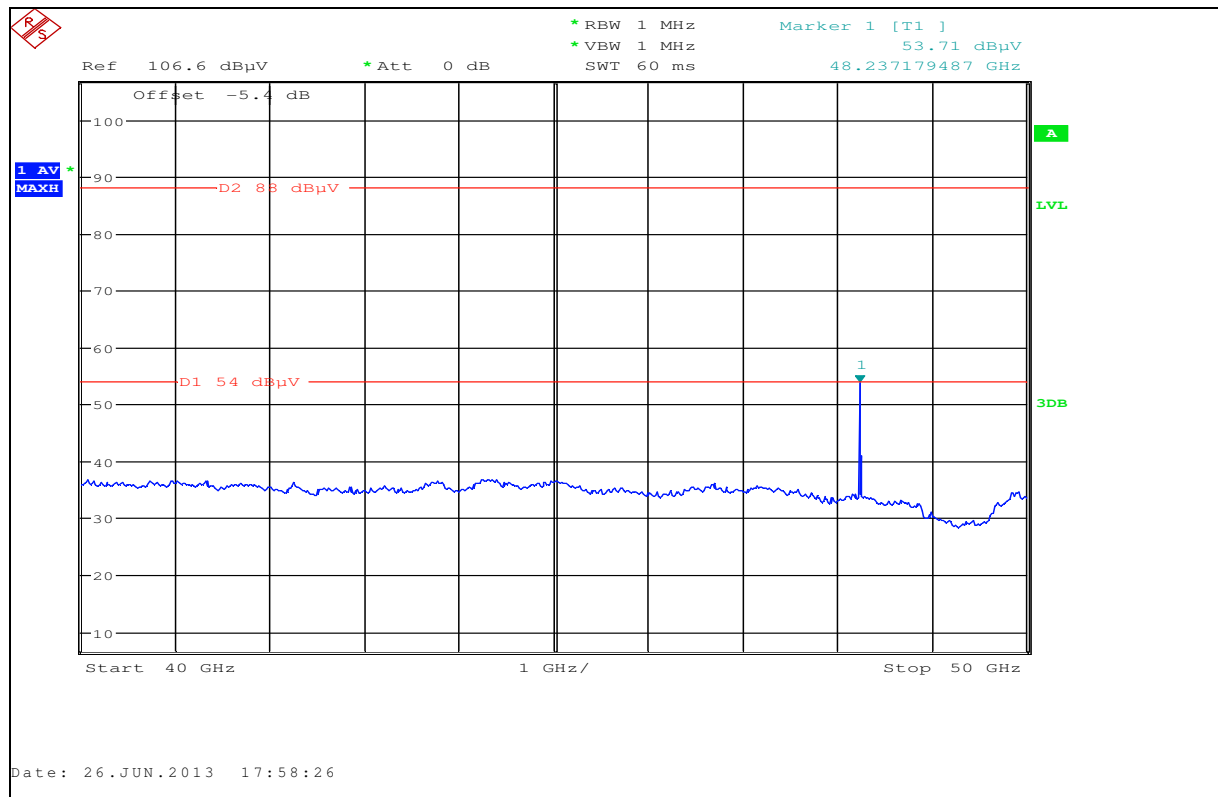
(Plot shows the carrier at 24 GHz)

Plot 8: 26 GHz to 40 GHz, horizontal / vertical polarization

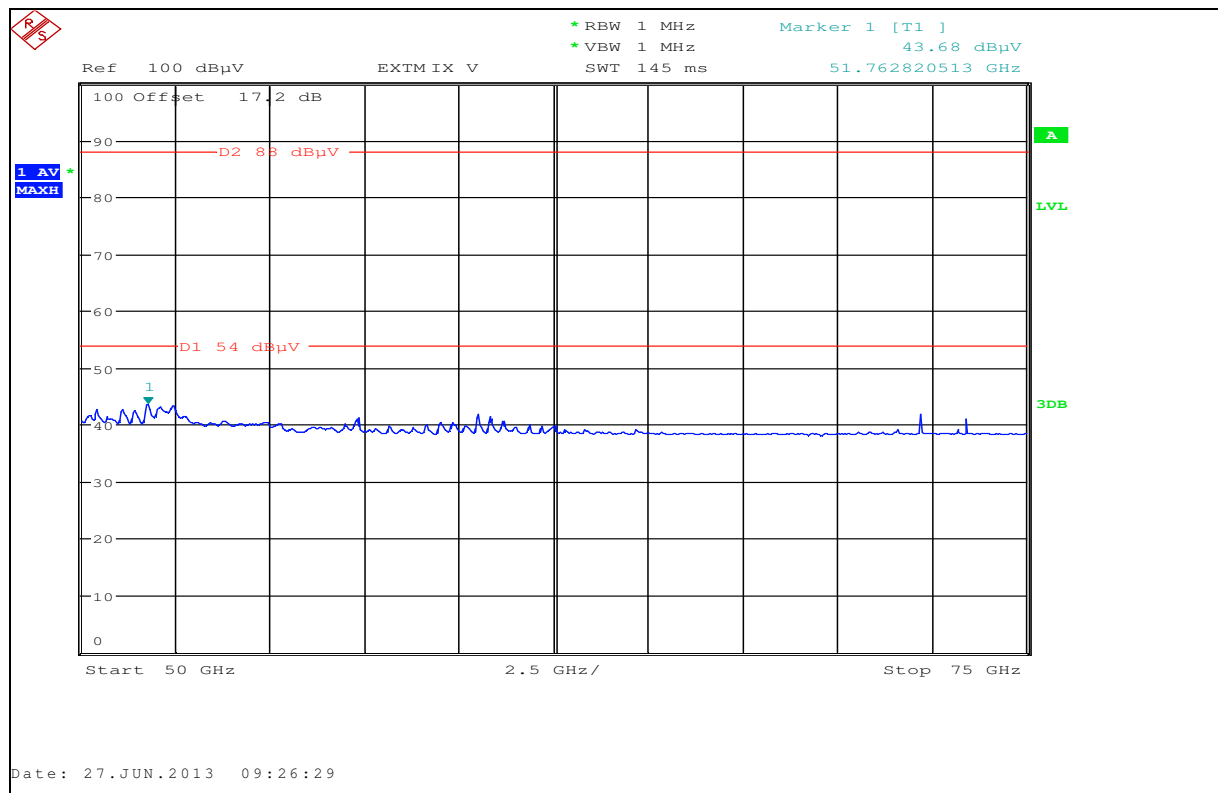




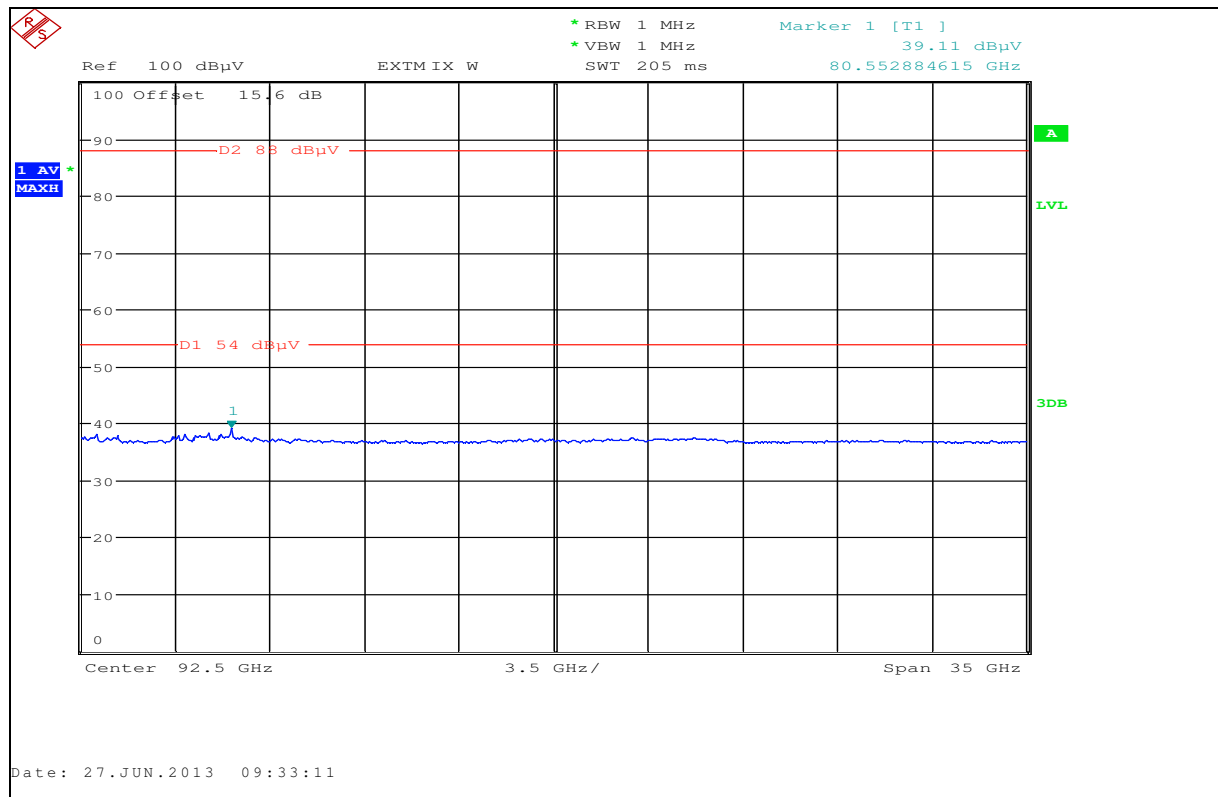
Plot 9: 40 GHz to 50 GHz, horizontal / vertical polarization



Plot 10: 50 GHz to 75 GHz, horizontal / vertical polarization



Plot 11: 75 GHz to 110 GHz, horizontal / vertical polarization



## 9.4 Conducted spurious emissions < 30 MHz

### Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

### Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

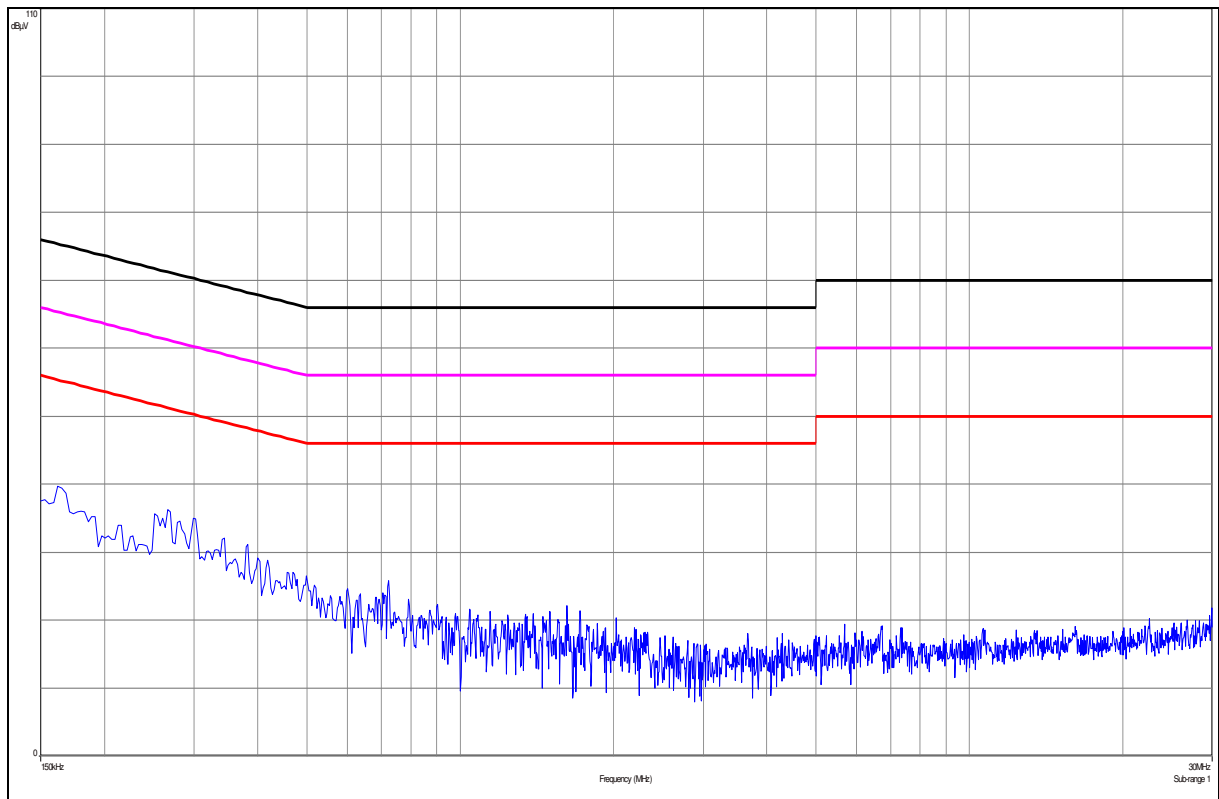
### Limits:

FCC		
CFR Part 15.207(a)		
Conducted Spurious Emissions < 30 MHz		
Frequency (MHz)	Quasi-Peak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

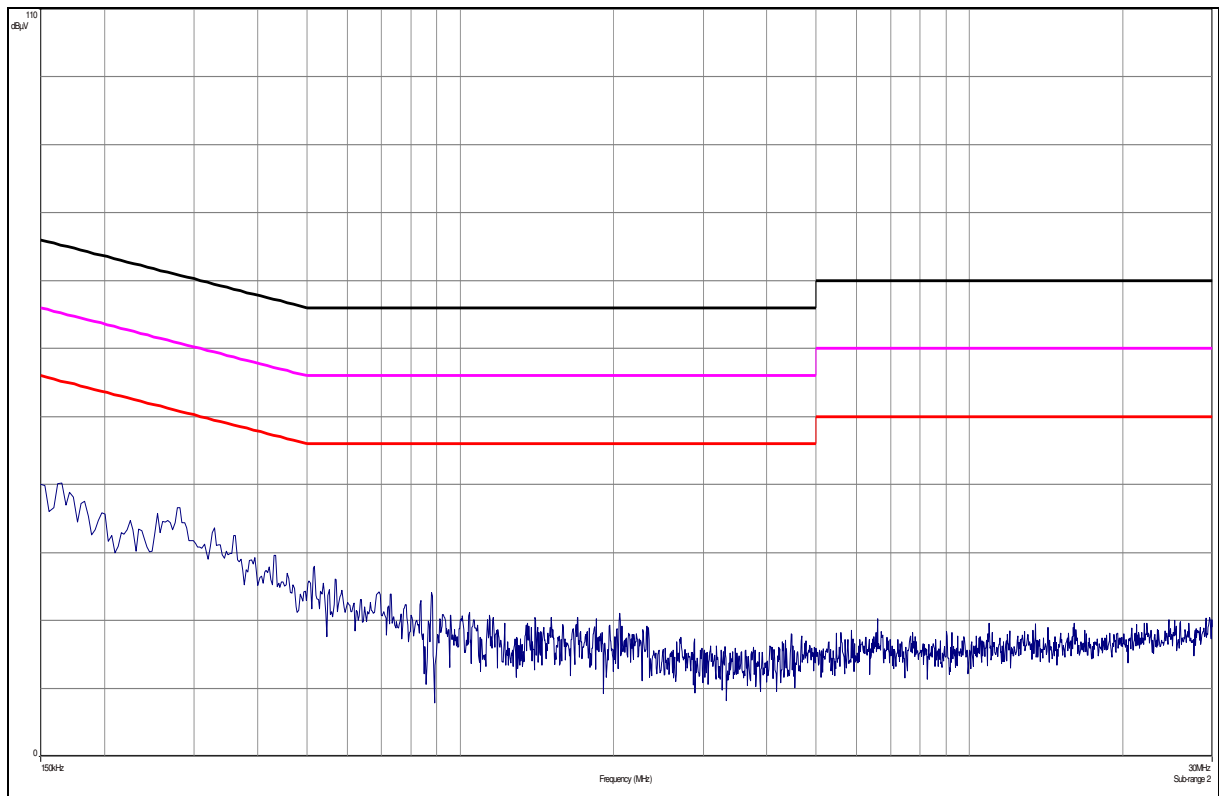
\*Decreases with the logarithm of the frequency

**Result:** The measurement is passed.

Plot 12: Phase line



Plot 13: Neutral line



## 10 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	CR 79	Std. Gain Horn Antenna 26.5- 40.0 GHz	V637	Narda	7911	300001751	ne		
2	11b	Microwave System Amplifier, 0.5- 26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
3	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000787	ne		
4	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300002442	ne		
5	A035	Std. Gain Horn Antenna	COR 50_75	Thomson CSF		300000813	ne		
6	n. a.	Power Supply	LA30/5GA	Zentro Elektronik	2046	300000711	NK!		
7	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	Ve	09.10.2012	09.10.2014
8	n. a.	Spectrum Analyzer Mixer 2-Port, 75-110 GHz	SAM-110-7	Radiometer Physics GmbH	002	300004155	k	11.09.2012	11.03.2014
9	n. a.	Broadband Low Noise Amplifier 18-50 GHz	CBL18503070-XX	CERNEX	19338	300004273	ne		
10	n. a.	PXA Spectrum Analyzer 3Hz to 50GHz	N9030A PXA Signal Analyzer	Agilent Technologies	US51350267	300004338	k	16.12.2012	16.12.2013
11	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	12.01.2012	12.01.2015
12	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	08.05.2013	08.05.2015
13	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
14	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
15	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2012	06.01.2014
16	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
17	9	Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155	ne		
18	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
19	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
20	n. a.	Amplifier	js42-00502650- 28-5a	Parzich GMBH	928979	300003143	ne		
21	n. a.	Band Reject filter	WRCG1855/1910- 1835/1925- 40/8SS	Wainwright	7	300003350	ev		

22	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
23	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
24	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vkl!	14.10.2011	14.10.2014
25	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	21.02.2013	21.02.2014
26	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
27	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
28	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
29	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	09.01.2013	09.01.2014
30	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
31	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
32	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
33	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
34	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
35	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	12.04.2012	12.04.2014
36	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	16.01.2013	16.01.2014

**Agenda:** Kind of Calibration

k	calibration / calibrated		EK	limited calibration
ne	not required (k, ev, izw, zw not required)		zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification		izw	internal cyclical maintenance
Ve	long-term stability recognized		g	blocked for accredited testing
vkl!	Attention: extended calibration interval			
NK!	Attention: not calibrated		*)	next calibration ordered / currently in progress

**11 Observations**

No observations exceeding those reported with the single test cases have been made.

## Annex A Photographs of the test setup

Photo 1:



Photo 2:



**Annex B External photographs of the EUT**

Photo 3:





## Annex C Internal photographs of the EUT

Photo 4:

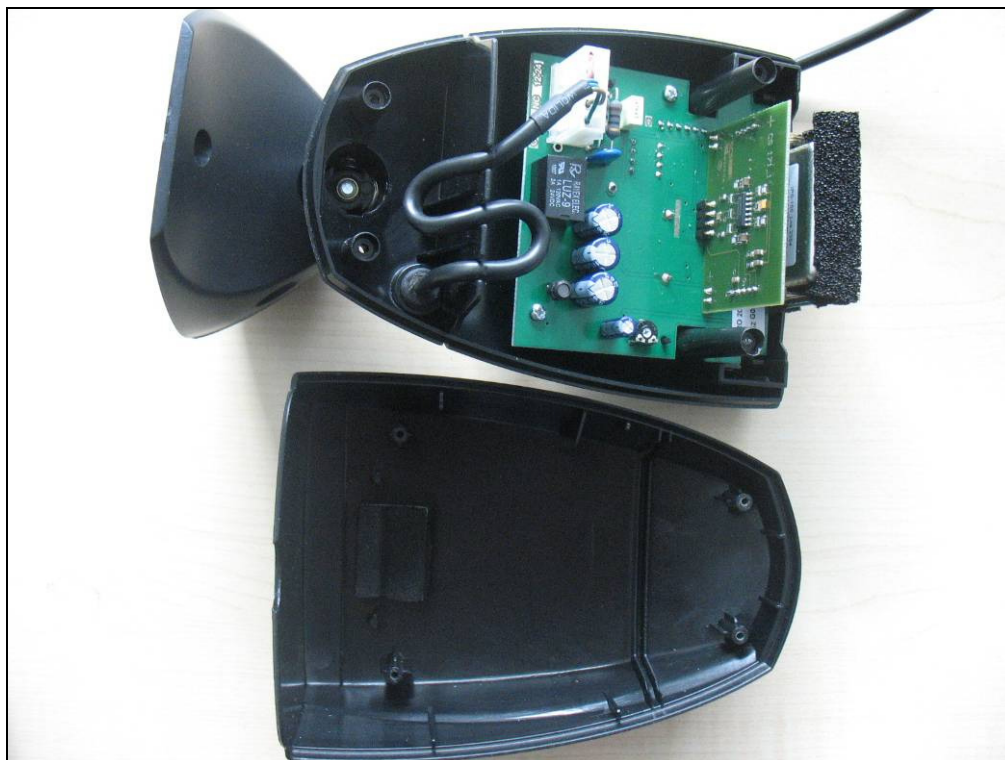


Photo 5:



Photo 6:

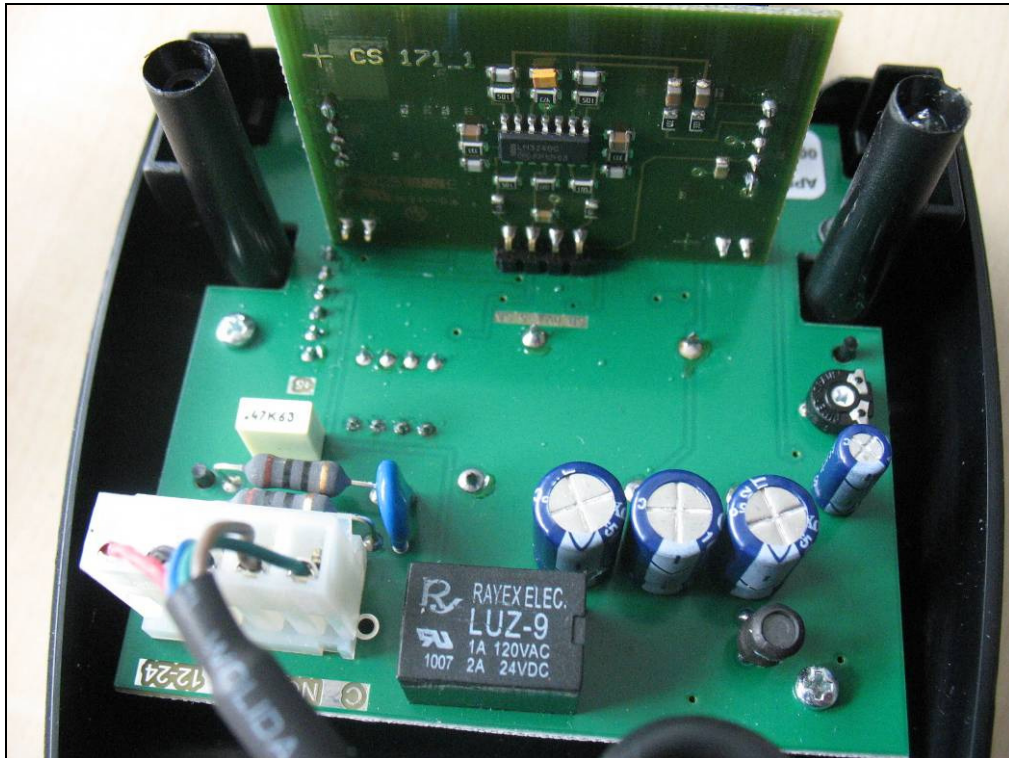


Photo 7:

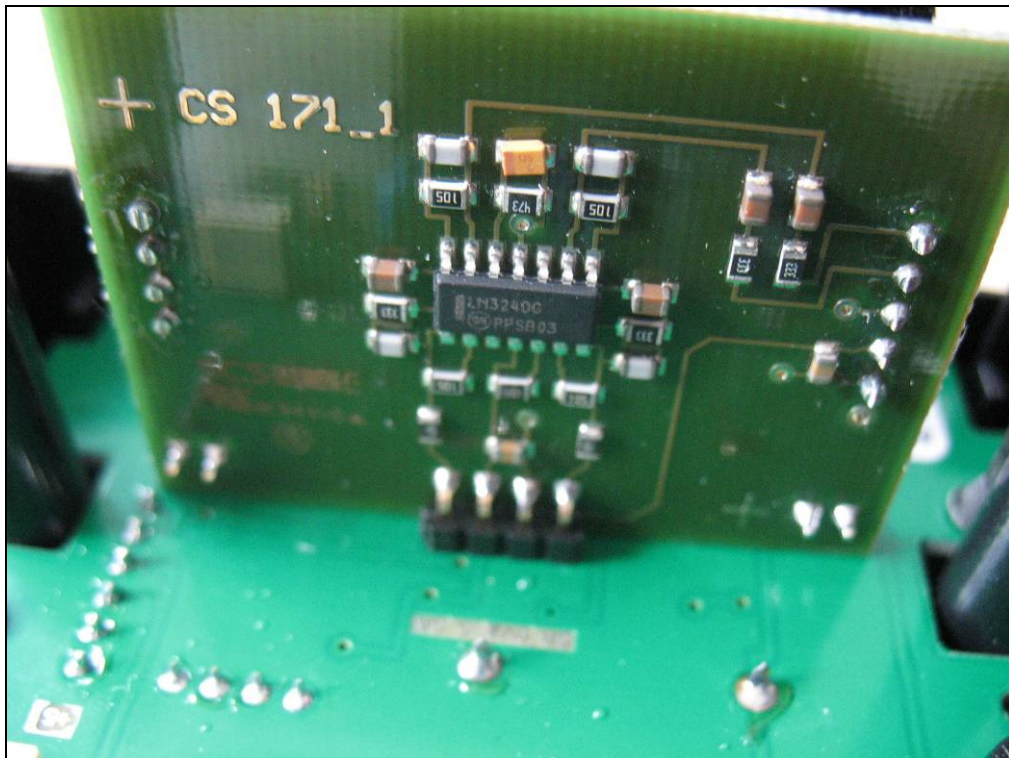




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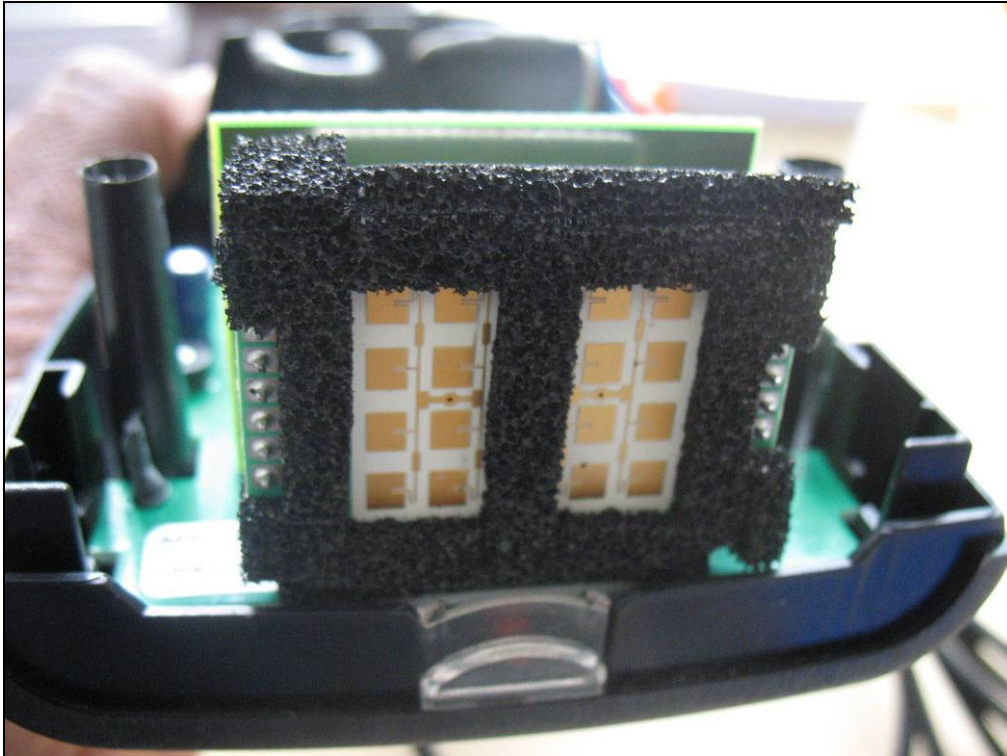


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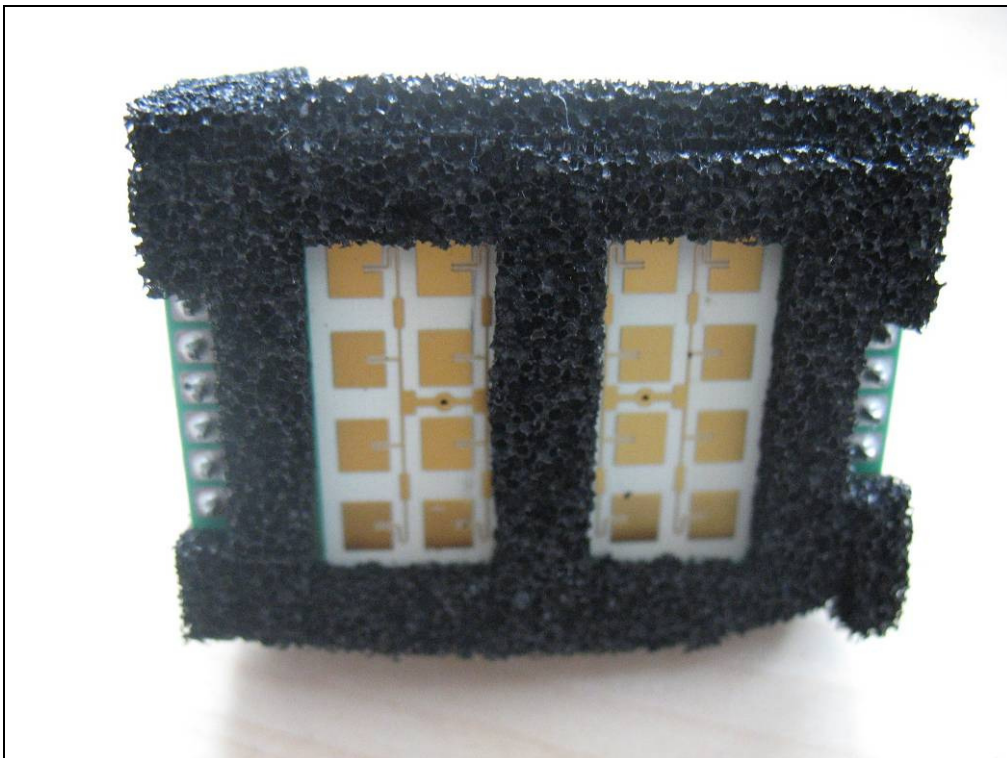


Photo 10:



Photo 11:





Photo 12:

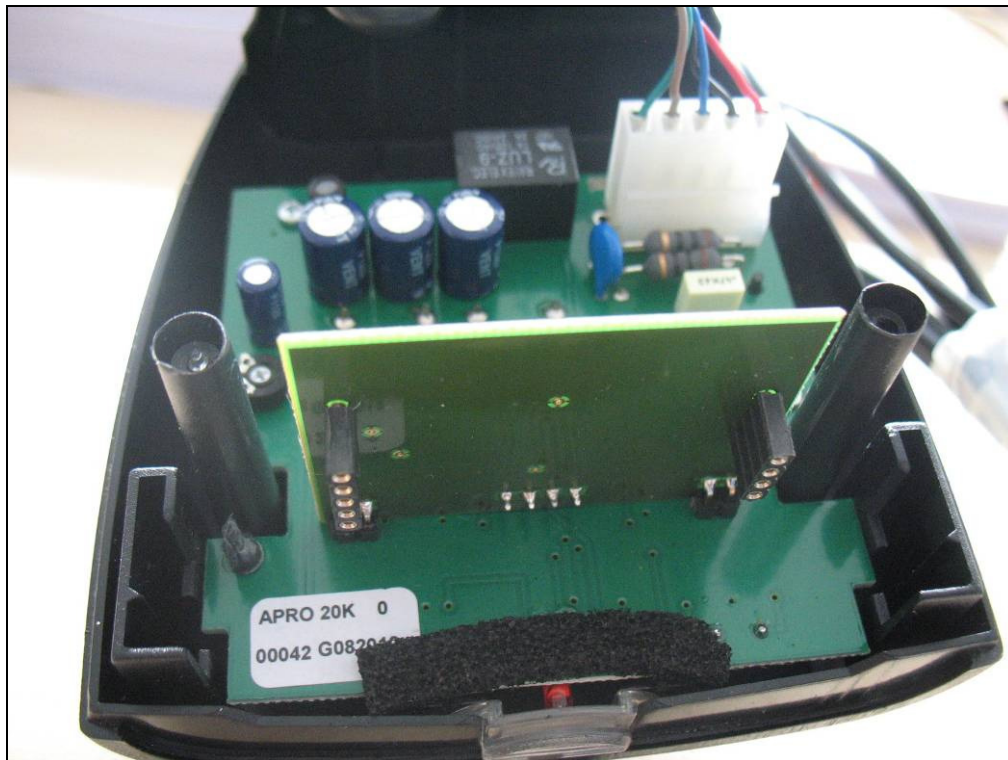


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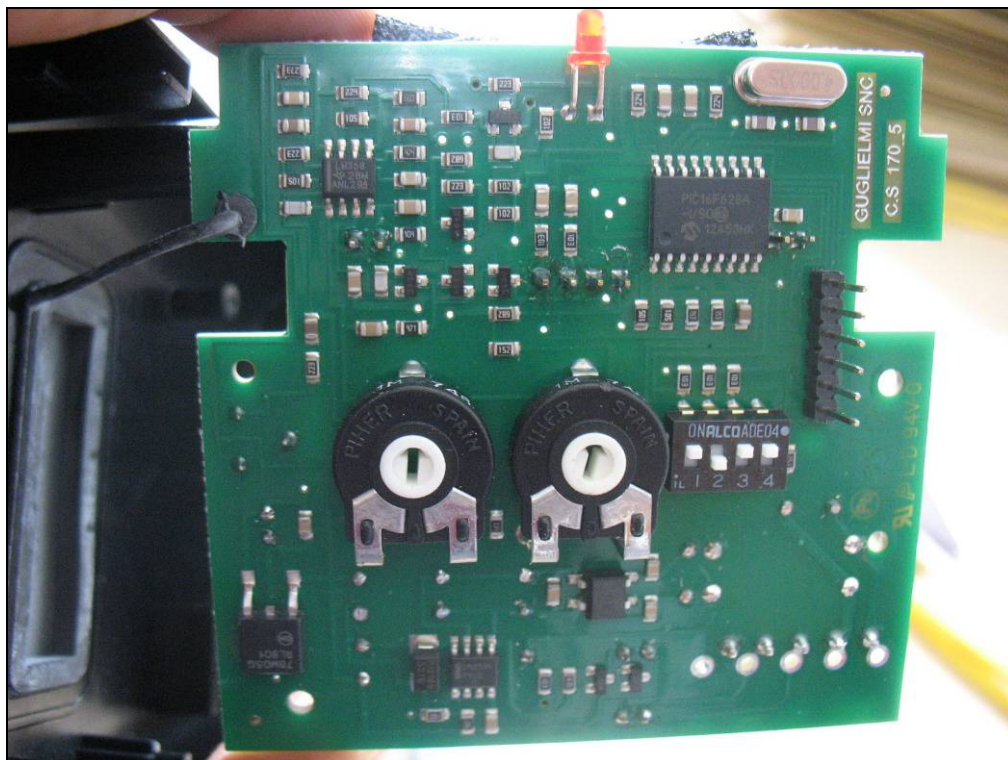


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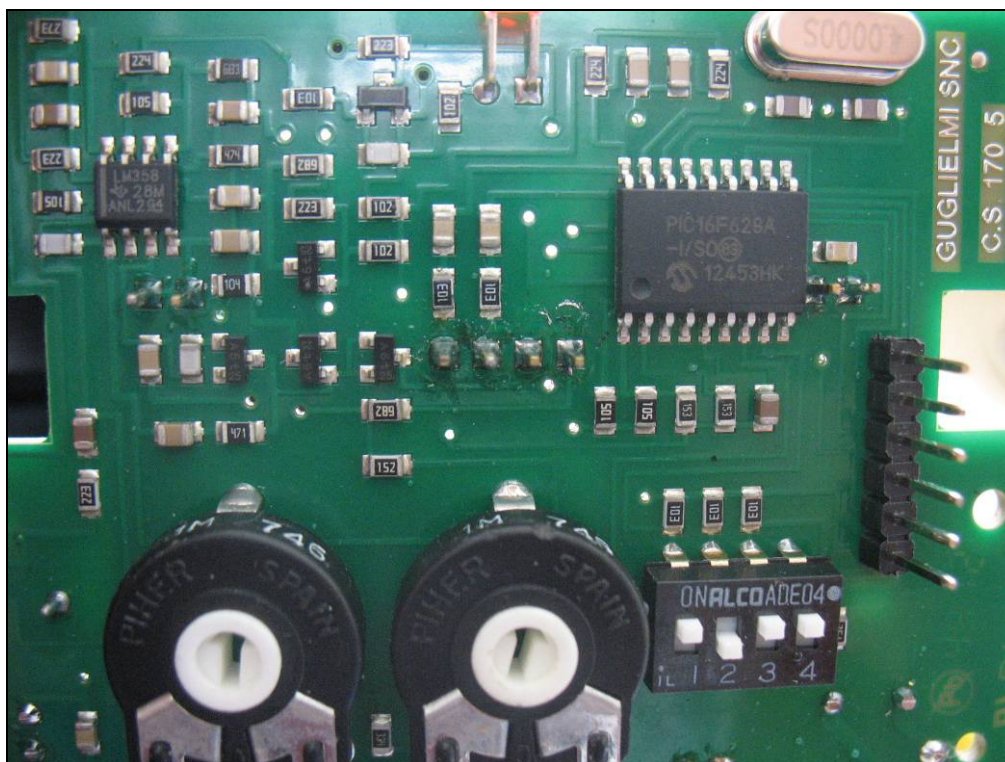
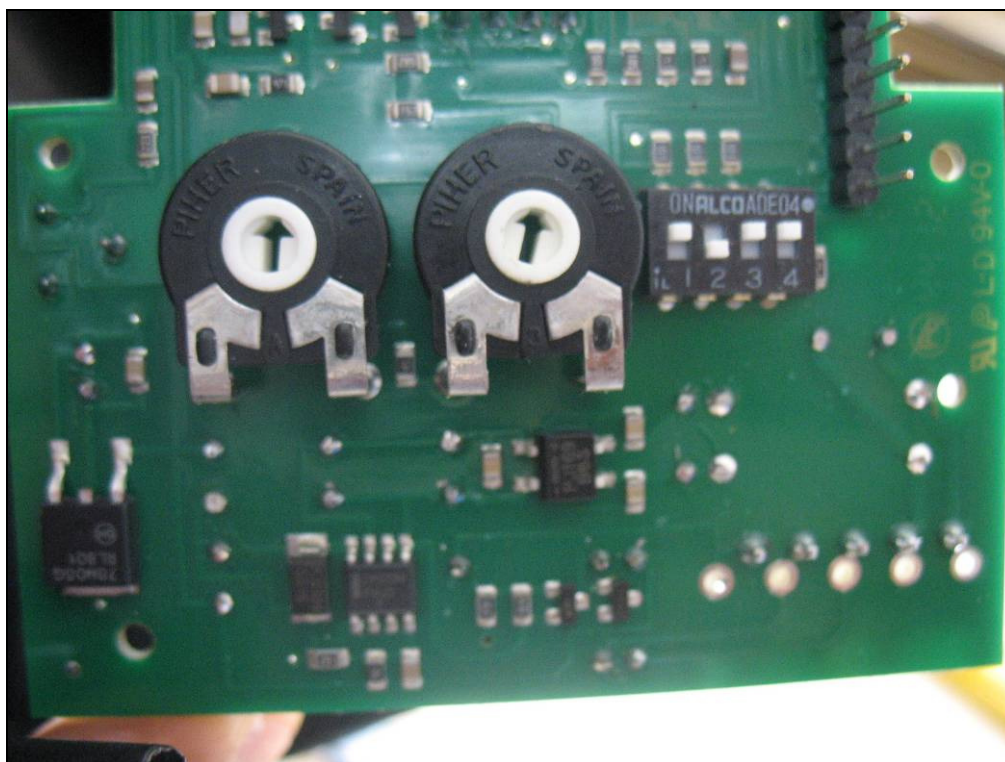


Photo 15:



**Annex D Document history**

Version	Applied changes	Date of release
1.0	Initial release	2013-10-30

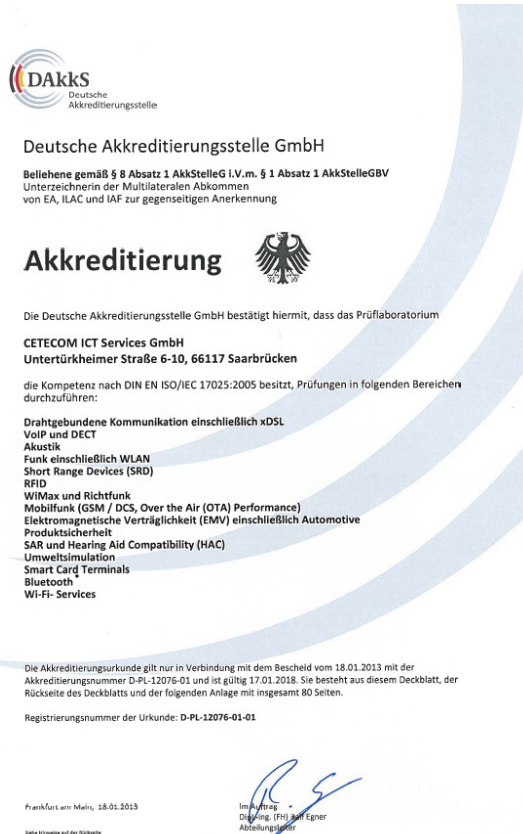
**Annex E Further information****Glossary**

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

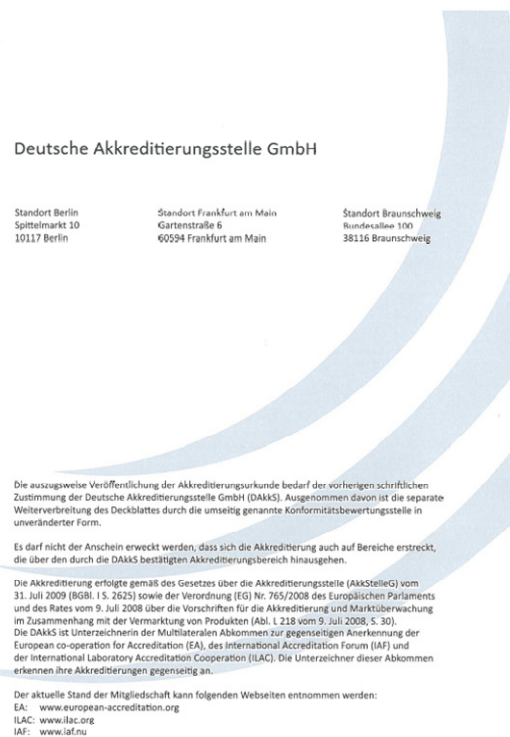


## Annex F Accreditation Certificate

Front side of certificate



Back side of certificate



### Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>