

TEST REPORT

Test report no.: 1-3661/11-01-04



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH
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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

Indutech GmbH
Ahornweg 6-8
72226 Simmersfeld / GERMANY
Phone: +49 7484 9297-31
Fax: + 49 7484 9297-33
Contact: Elisabeth Katz
e-mail: elisabeth.katz@indutech.com
Phone: + 49 7484 9297-41

Manufacturer

Indutech GmbH
Ahornweg 6-8
72226 Simmersfeld / GERMANY

Test standard/s

47 CFR Part 15 Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission Subchapter A – General, Part 15-Radio Frequency Devices
RSS – 210 Issue 8 Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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

Test item

Kind of test item: Precision Microwave Detector
Model name: PMD 2450-2
FCC ID: ZYLPMD2450-2
IC: 9883A-PMD2450V2
Frequency: 2400 MHz – 2483.5 MHz
Power supply: 115 V AC
Temperature range: -20°C to +50 °C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

Karsten Geraldly

Test performed:

Meheza Walla

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2 General information

2.1 Notes

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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In no case this test report can be considered as a Letter of Approval.

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:	2011-09-01
Date of receipt of test item:	2008-09-29
Start of test:	2008-09-29
End of test:	2011-10-11
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Version	Test standard description
47 CFR Part 15	2009-10	Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter A - general, Part 15-Radio frequency devices
RSS - 210 Issue 8	2010-12	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+50 °C during high temperature tests
	T_{min}	-20 °C during low temperature tests
Relative humidity:		55 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	115 V AC
	V_{min}	98 V AC
	V_{max}	135 V AC

5 Test item

Kind of test item	:	Precision Microwave Detector
Type identification	:	PMD 2450-2
S/N serial number	:	PMD 2450: 1081-07/2011
HW hardware status	:	None
SW software status	:	None
Frequency band [MHz]	:	2400 MHz – 2483.5 MHz
Type of modulation	:	Stepped CW
Number of channels	:	10 (2405 MHz; 2410 MHz; 2420 MHz; 2430 MHz; 2440 MHz; 2450 MHz; 2460 MHz; 2470 MHz; 2475 MHz; 2480 MHz)
Antenna	:	For more information see Annex B “External photographs of the EUT”
Power supply	:	115 V AC
Temperature range	:	-20 °C to +50 °C

6 Test laboratories sub-contracted

None

7 Summary of measurement results

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8, Annex 2	Passed	2011-10-13	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Results (max.)
§ 15.35(c) RSS Gen (Issue 3) / 4.5	Timing of the transmitter	Nominal	Nominal	TX	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Not limited
RSS Gen (Issue 3) / 4.6.1	99% - Occupied Bandwidth	Nominal	Nominal	TX	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Not limited
§15.249(a)(e) RSS-210 / A2.9(a)	Maximum field strength	Nominal	Nominal	TX	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.249(d) RSS-210 / A2.9(a)(b)	Band edge compliance radiated	Nominal	Nominal	TX	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.249(d) RSS-210 / A2.9(a)(b)	TX spurious emissions radiated	Nominal	Nominal	TX	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	Idle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a) RSS-Gen	Spurious emissions radiated < 30 MHz	Nominal	Nominal	TX/Idle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.249(b)2	Frequency tolerance	Extreme	Extreme	TX	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

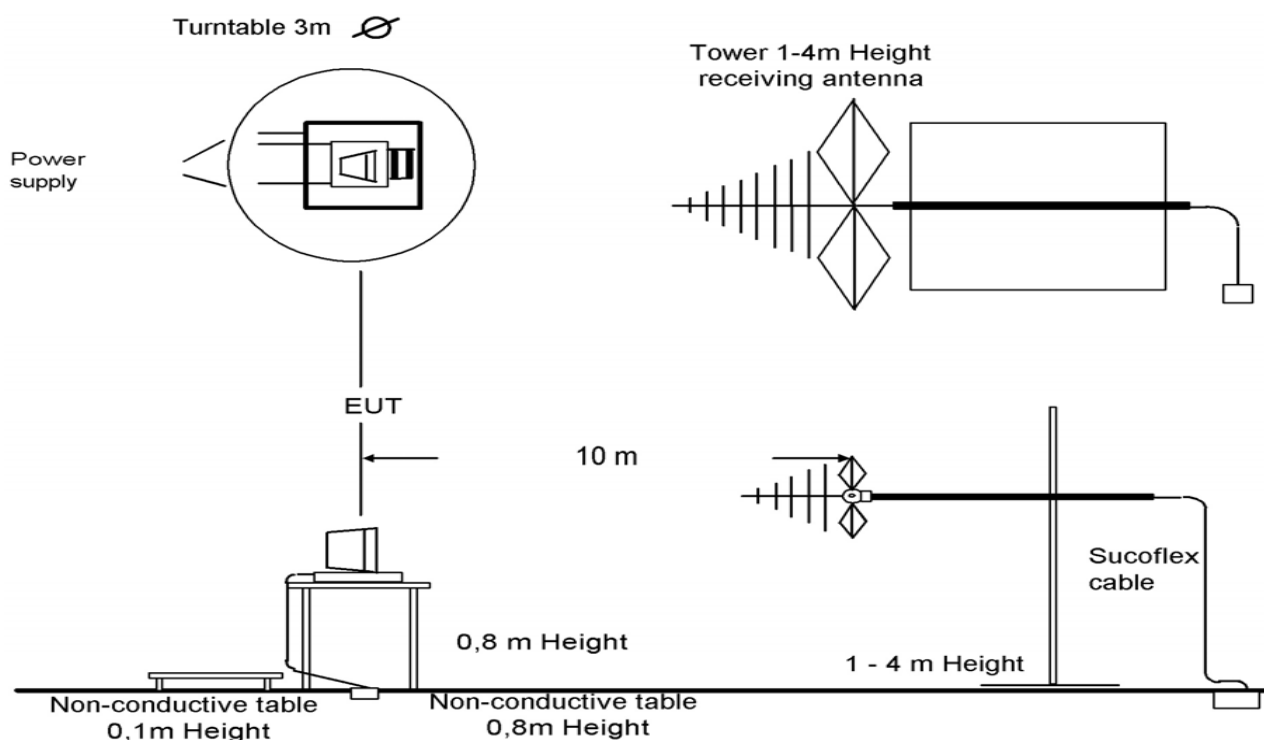
8.1 Description of test setup

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 C63.10-2009 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 analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.10-2009 clause 4.2.

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

Semi anechoic chamber



Picture 1: Diagram radiated measurements

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 or with battery.

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☐ No test mode available.
Iperf was used to ping another device with the largest support packet size

☒ Special software is used.

As soon as the Precision Microwave Detector PMD 2450 with integral control and display touch screen is powered up, TX and RX start operating.

The measurements were performed with 3 different antennas.

Antenna 1



Antenna 2



Antenna 3



8.3 RSP100 test report cover sheet / performance test data

Test report number	:	1-3661/11-01-04
Equipment model number	:	PMD 2450-2
Certification number	:	9883A-PMD2450V2
Manufacturer (complete address)	:	Indutech GmbH Ahornweg 6-8 72226 Simmersfeld / GERMANY
Tested to radio standards specification no.	:	RSS 210, Issue 8, Annex 2
Open area test site IC No.	:	IC 3462C-1
Frequency range	:	ISM band 2400 MHz to 2483.5 MHz (lowest channel 2405 MHz, highest channel 2480 MHz)
RF-field strength [dB μ V/m] (max.)	:	84.42 dB μ V/m (Antenna 1) 81.89 dB μ V/m (Antenna 2) 55.31 dB μ V/m (Antenna 3)
Occupied bandwidth (99%-BW)	:	149 kHz
Type of modulation	:	Stepped CW
Emission designator (TRC-43)	:	149K0P0N
Antenna information	:	For more information please see Annex B "External photographs of the EUT"
Transmitter spurious (worst case) [dB μ V/m @ 10m]:		24.6 dB μ V/m @ 151.7 MHz
Receiver spurious (worst case) [dB μ V/m @ 10m] :		24.6 dB μ V/m @ 151.7 MHz

ATTESTATION:

DECLARATION OF COMPLIANCE:

I attest 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:

2011-10-13

Date

Meheza Walla

Name



Signature

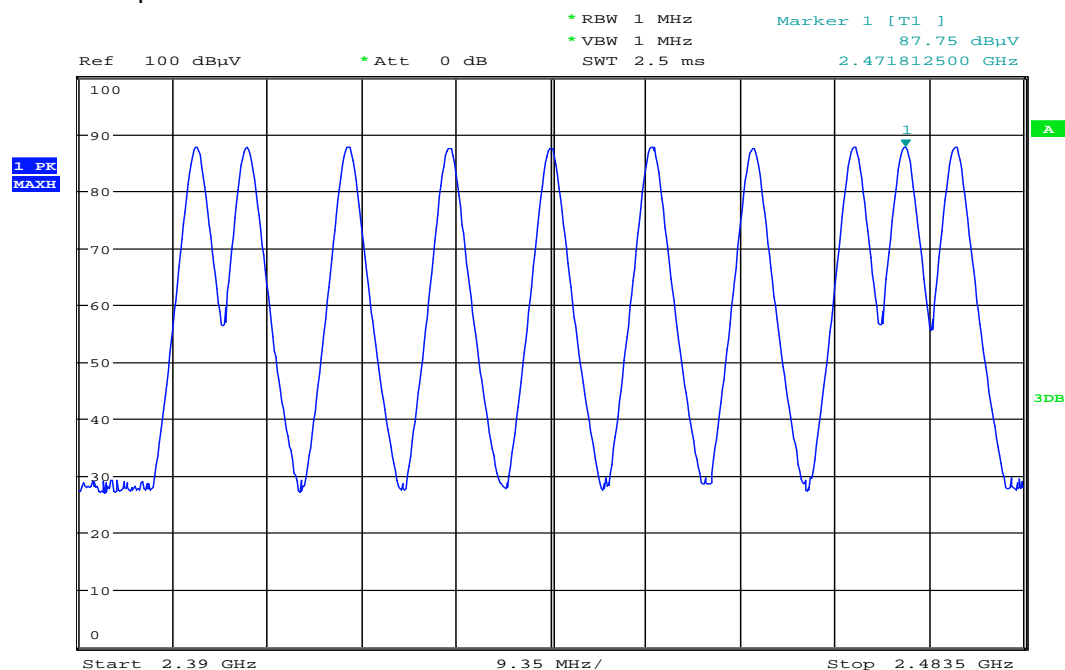
9 Measurement results

9.1 Timing of the transmitter

Measurement:

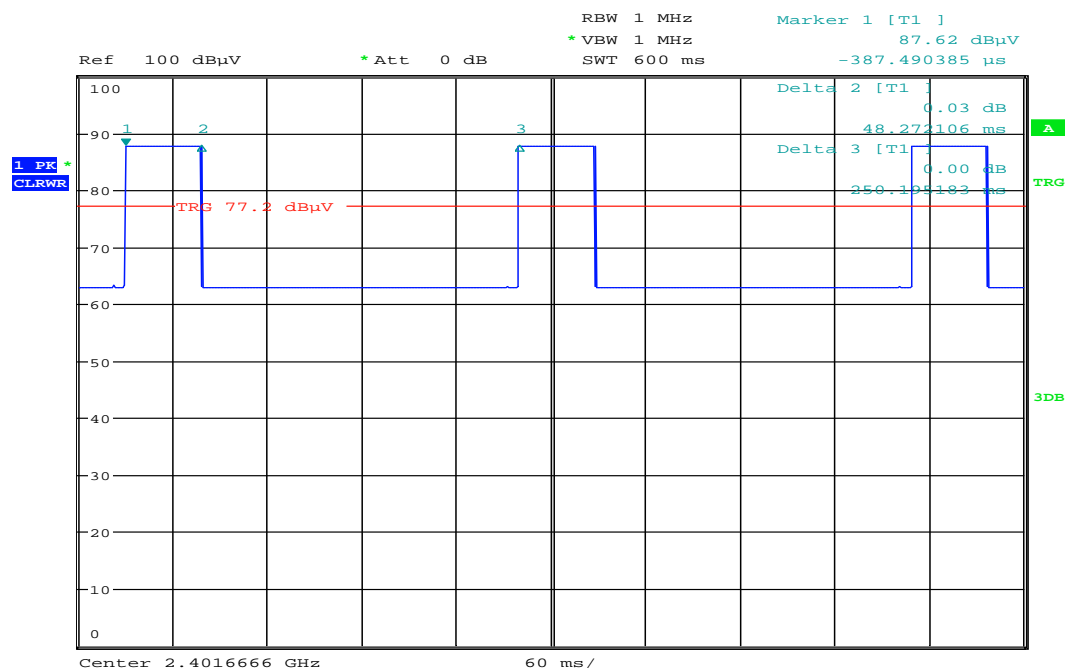
Measurement parameter	
Detector:	Peak
Sweep time:	See plot
Resolution bandwidth:	See plot
Video bandwidth:	See plot
Span:	Zero
Trace-Mode:	Single

Plot 1: normal operation



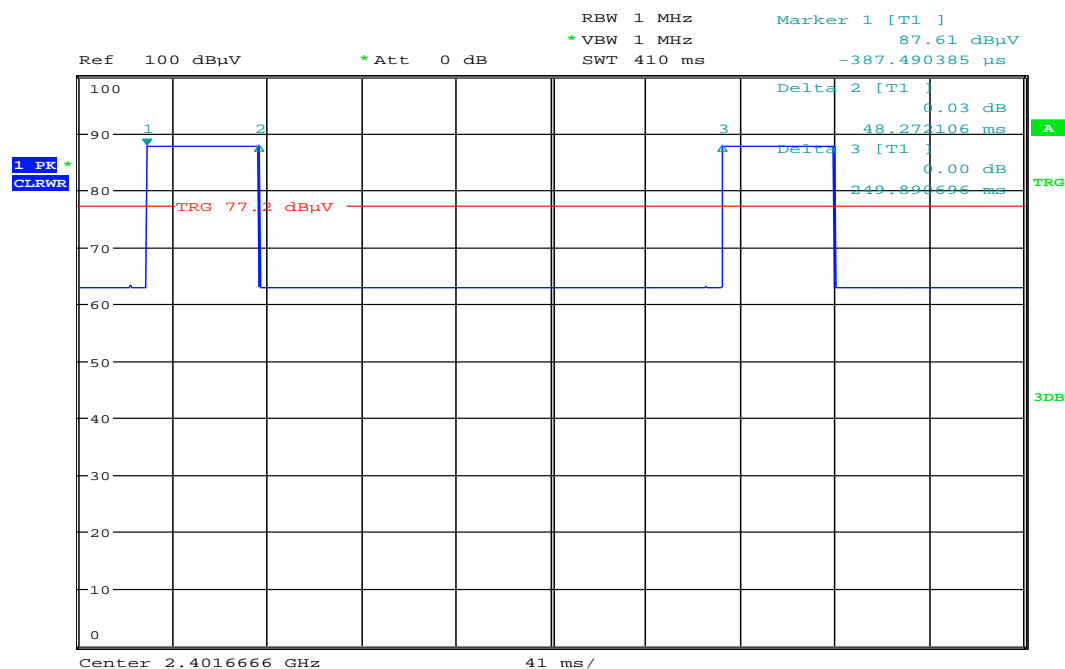
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Plot 2:



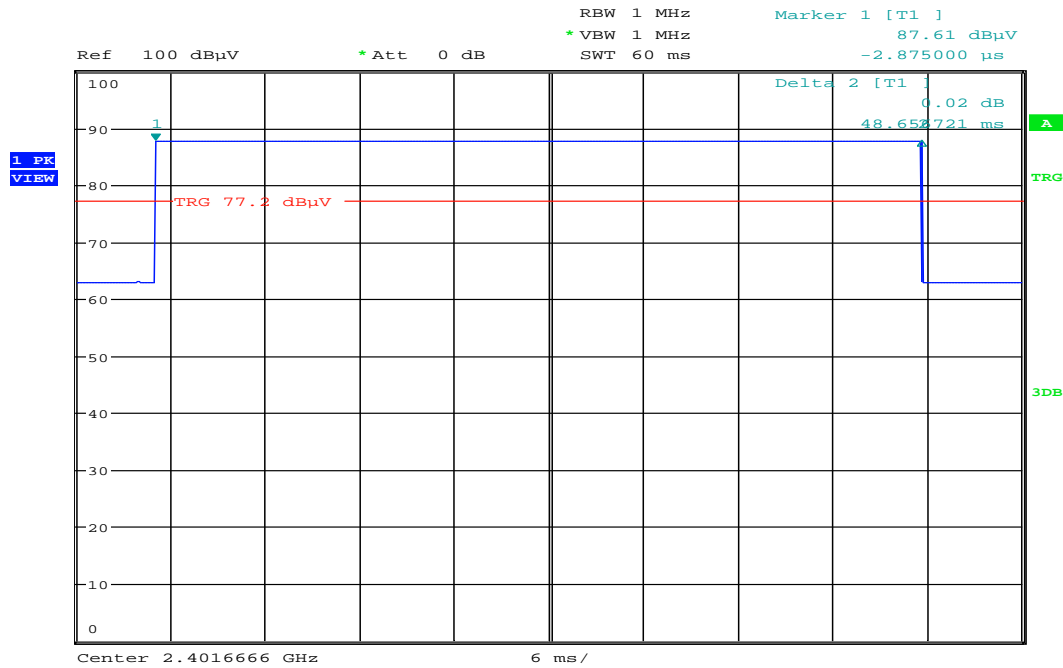
Date: 11.OCT.2011 09:30:15

Plot 3:



Date: 11.OCT.2011 09:30:56

Plot 4:



Date: 11.OCT.2011 09:32:18

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.35 (c)	RSS-GEN Issue 3 Section 4.5
Timing of the transmitter	
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.	

Result: The measurement is passed.

9.2 Spectrum bandwidth – 99% bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	30 kHz
Video bandwidth:	30 kHz
Span:	3 MHz
Trace-Mode:	Max Hold

Limits:

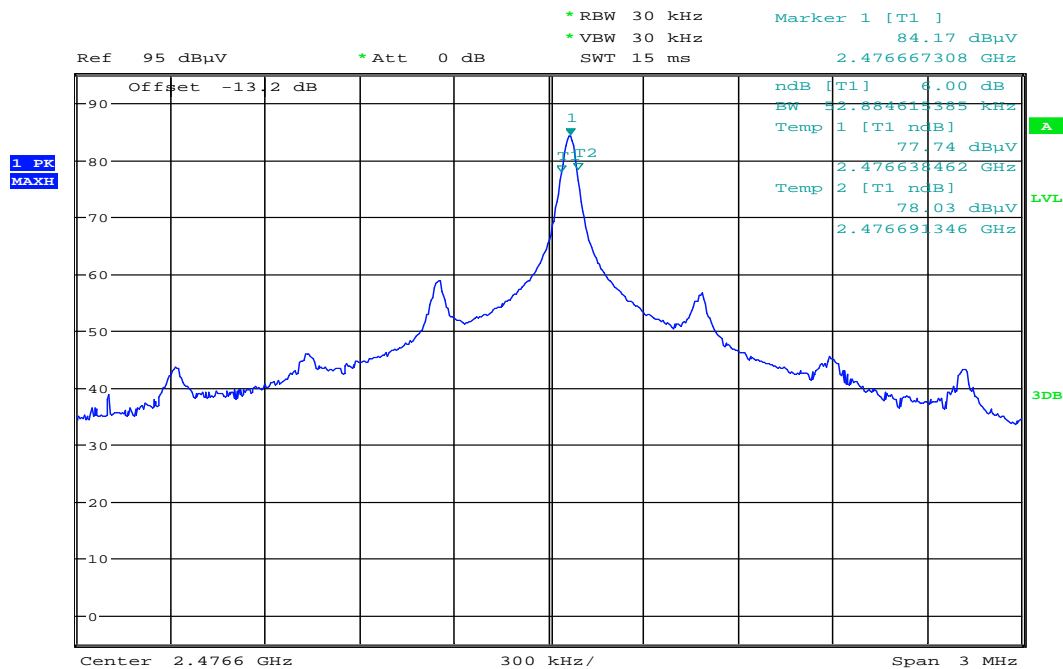
FCC	IC
-	RSS Gen, Issue 3, 4.6.1
Spectrum Bandwidth – 99% Bandwidth	
Required for emission designator	

Measured with the integrated OBW-function of the spectrum analyser Rohde&Schwarz FSU50 (measurement criteria is the integrated power in %)

Results:

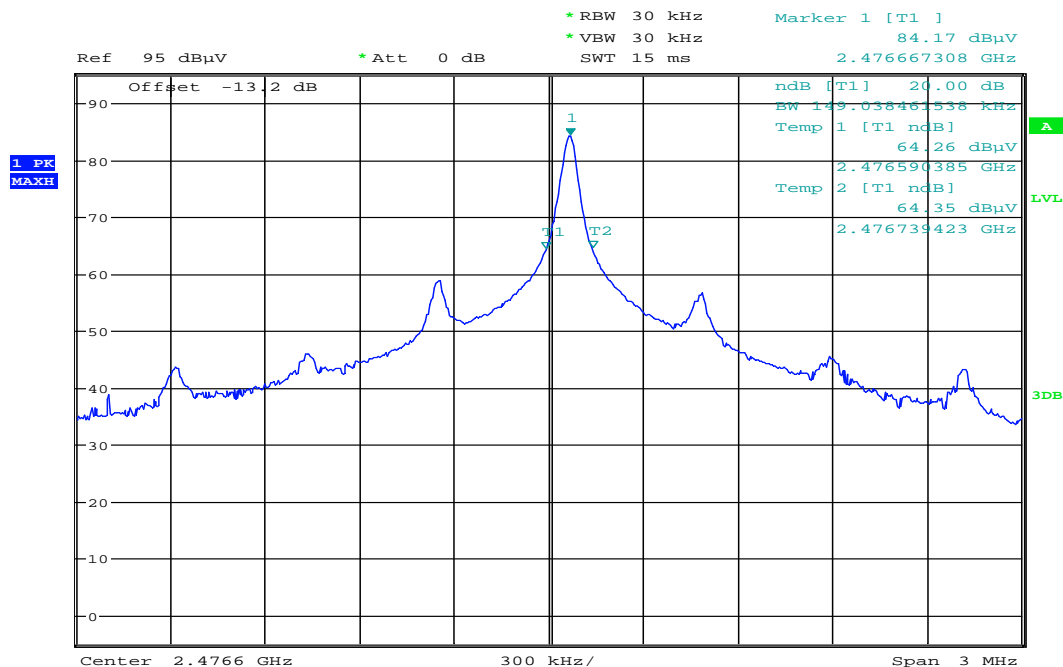
	Occupied Bandwidth (kHz)
6 dB (75%)	53
20 dB (99%)	149

Plot 5: 6dB (75%) – Bandwidth



Date: 4.OCT.2011 12:42:29

Plot 6: 20dB (99%) – Bandwidth



Date: 4.OCT.2011 12:42:07

9.3 Maximum field strength

Description:

Measurement of the maximum field strength radiated.

Measurement:

Measurement parameter	
Detector:	Peak
Resolution bandwidth:	1 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR 15.249(a)(e)	RSS-210, Issue 8, A2.9(a)
Maximum field strength	
The field strength of emissions of intentional radiators shall comply with the following: Field strength of fundamental: 50 mV/m / (94 dB μ V/m) @ 3 m (AVG) 500 mV/m / (114 dB μ V/m) @ 3 m (Peak)	

Result:

- Antenna 1:

TEST CONDITIONS (T _{nom} ; V _{nom})	MAXIMUM POWER (dB μ V/m)
2405 MHz	83.82
2410 MHz	83.97
2420 MHz	84.08
2430 MHz	84.21
2440 MHz	83.95
2450 MHz	83.43
2460 MHz	83.60
2470 MHz	84.37
2475 MHz	84.17
2480 MHz	84.42
Measurement uncertainty	± 3 dB

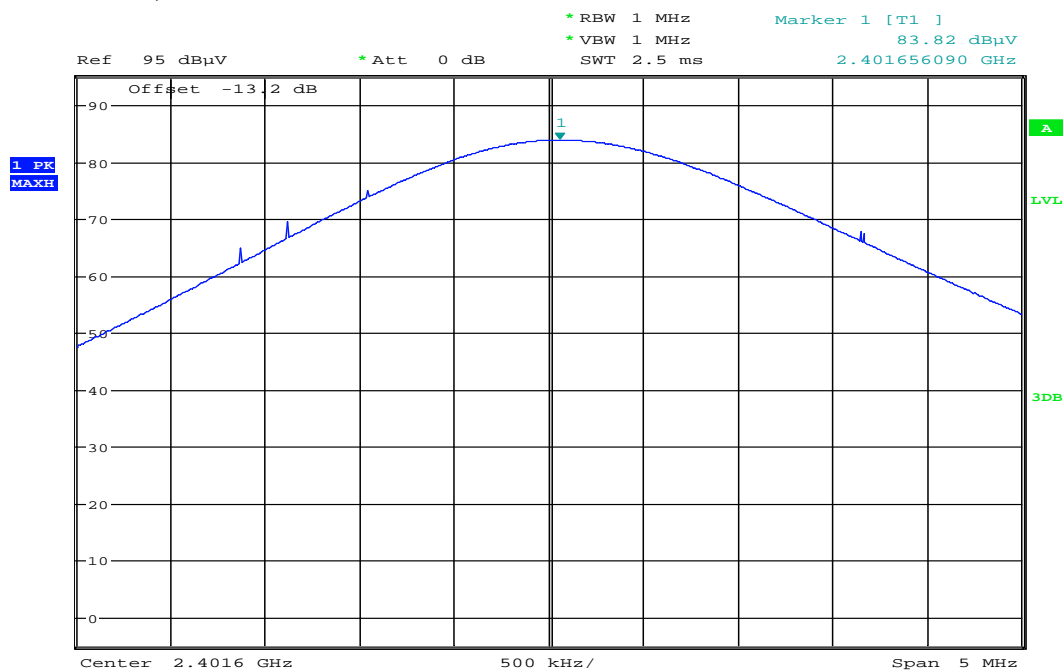
- **Antenna 2:**

TEST CONDITIONS (T _{nom} ; V _{nom})	MAXIMUM POWER (dB μ V/m)
2405 MHz	79.83
2410 MHz	80.77
2420 MHz	81.89
2430 MHz	81.00
2440 MHz	79.71
2450 MHz	78.57
2460 MHz	79.32
2470 MHz	79.88
2475 MHz	79.81
2480 MHz	79.81
Measurement uncertainty	± 3 dB

- **Antenna 3:**

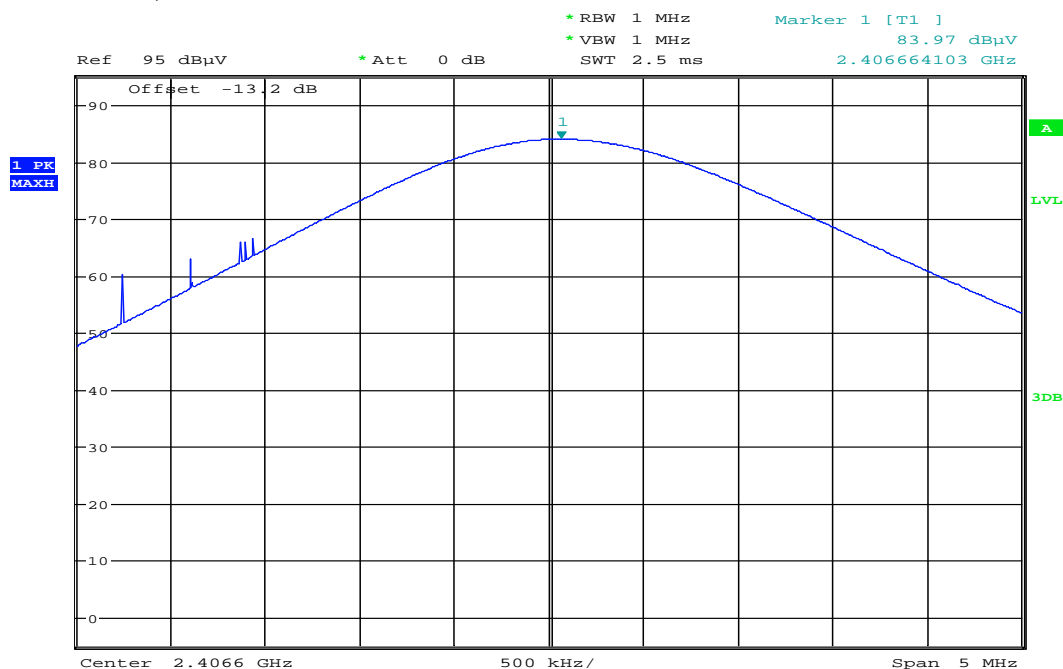
TEST CONDITIONS (T _{nom} ; V _{nom})	MAXIMUM POWER (dB μ V/m)
2405 MHz	55.31
2410 MHz	54.85
2420 MHz	54.63
2430 MHz	52.34
2440 MHz	53.17
2450 MHz	52.50
2460 MHz	54.62
2470 MHz	52.32
2475 MHz	50.39
2480 MHz	50.87
Measurement uncertainty	± 3 dB

Plot 7: 2405 MHz, Antenna 1



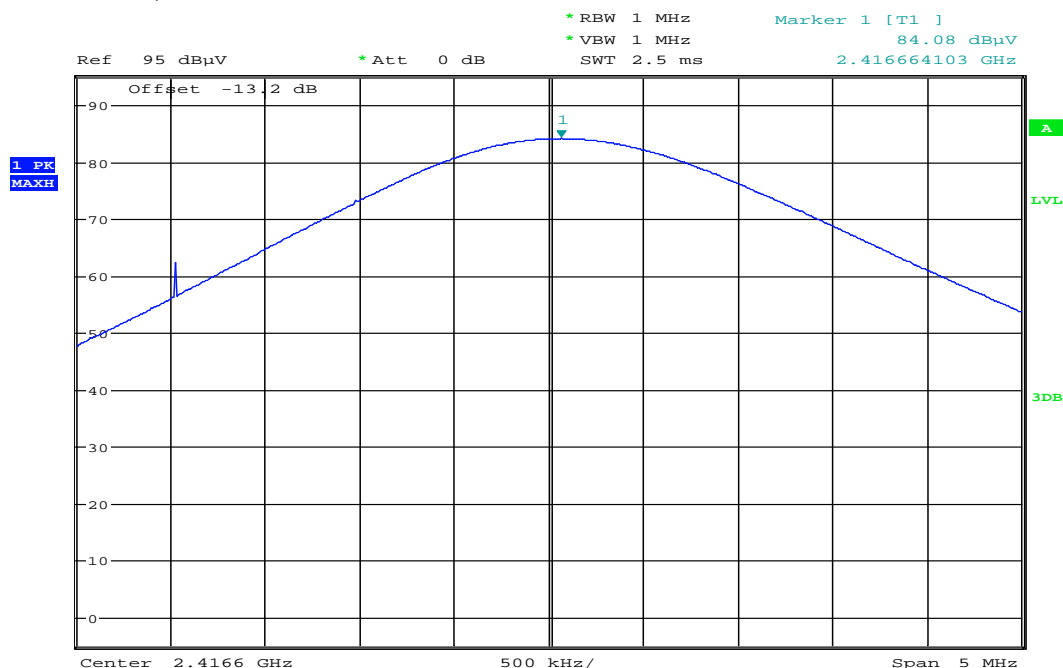
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Plot 8: 2410 MHz, Antenna 1



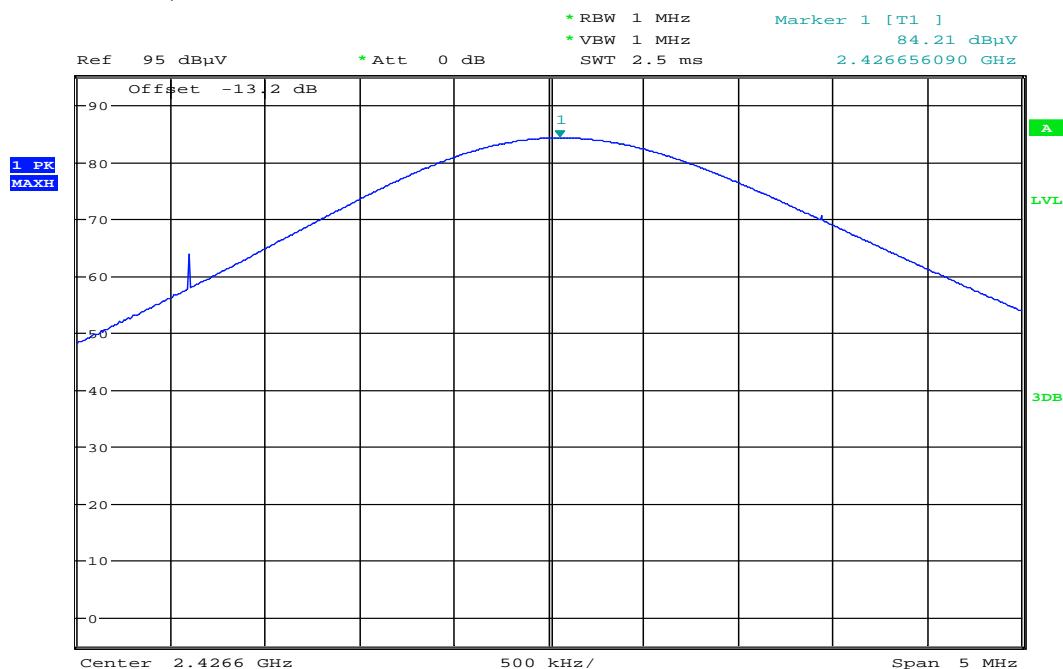
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Plot 9: 2420 MHz, Antenna 1



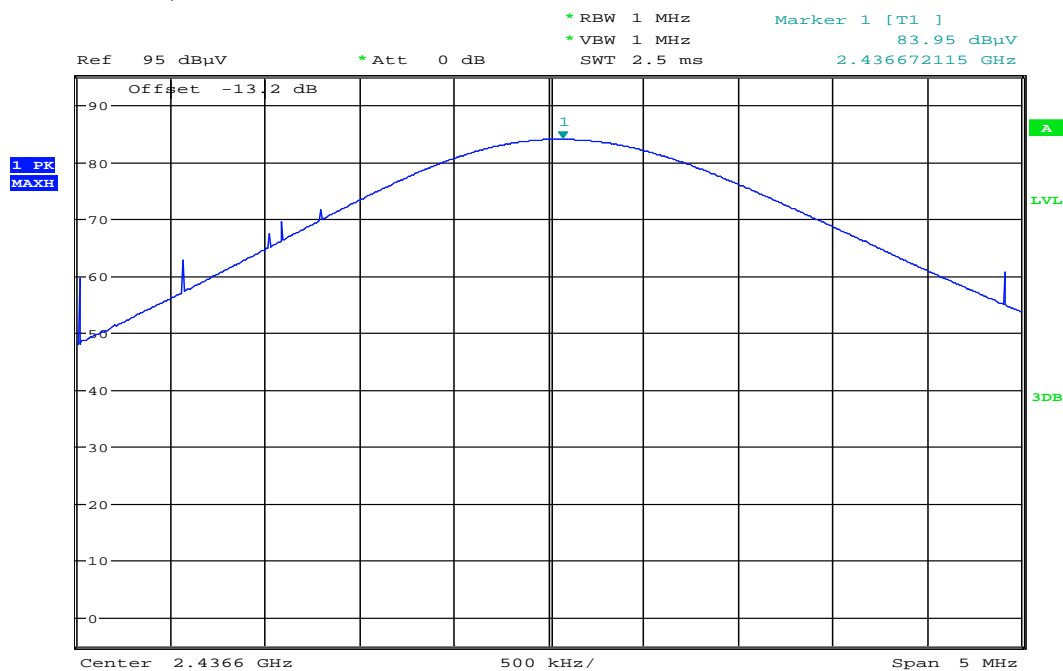
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Plot 10: 2430 MHz, Antenna 1



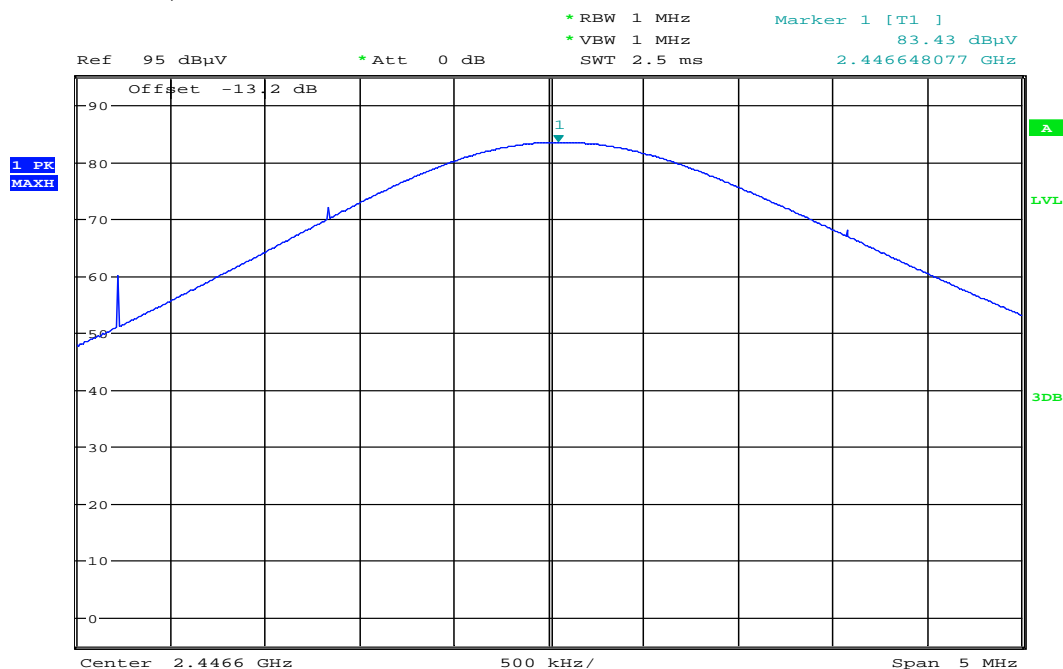
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Plot 11: 2440 MHz, Antenna 1



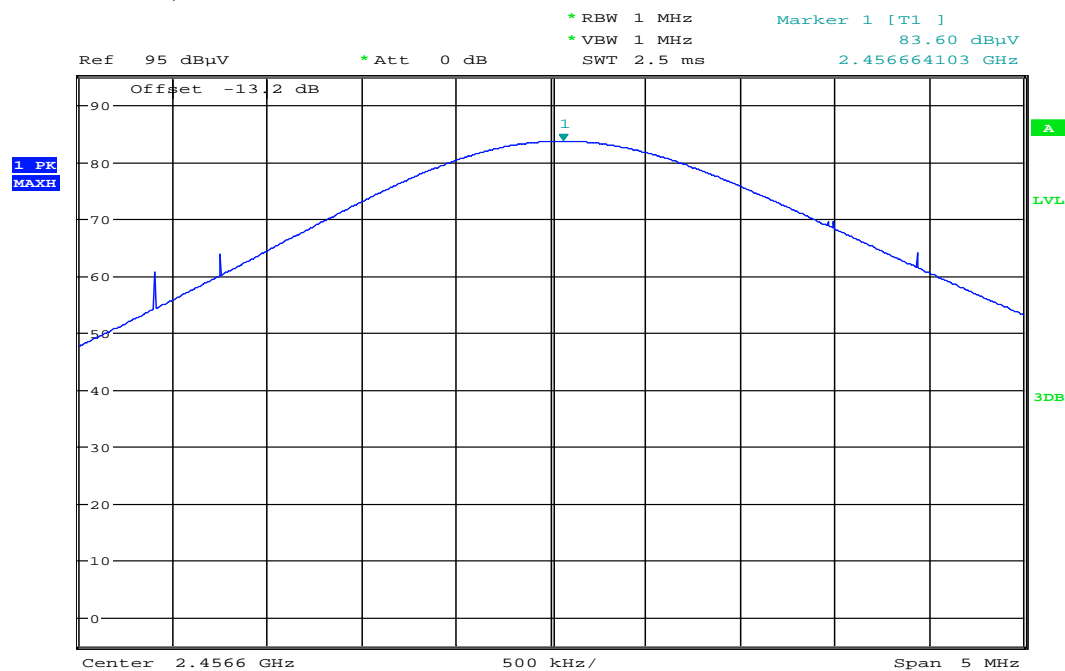
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Plot 12: 2450 MHz, Antenna 1



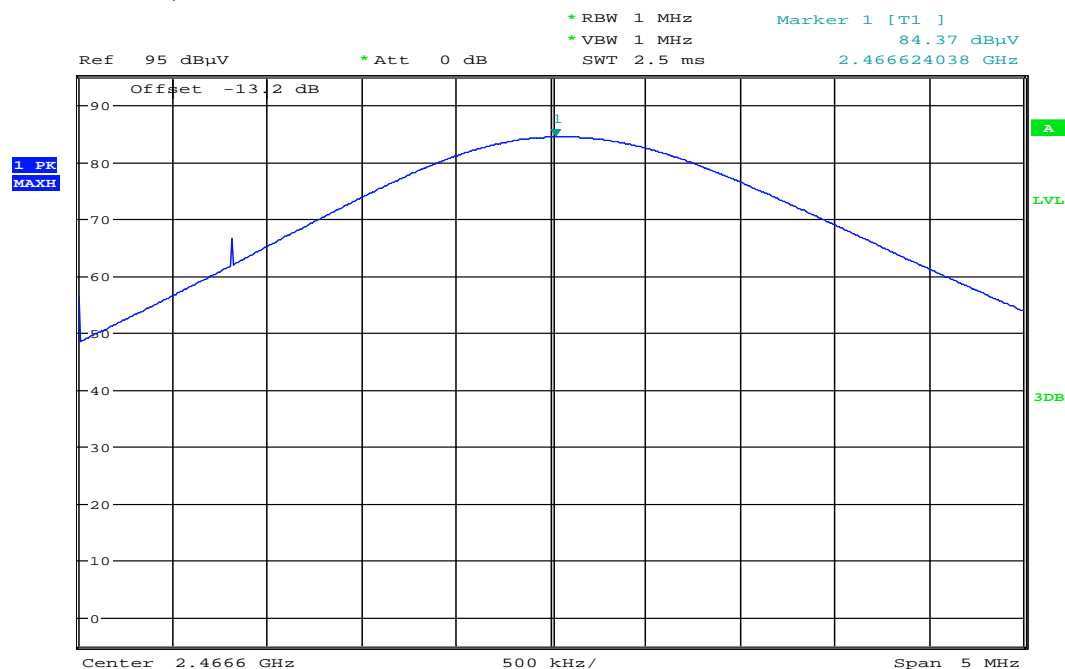
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Plot 13: 2460 MHz, Antenna 1



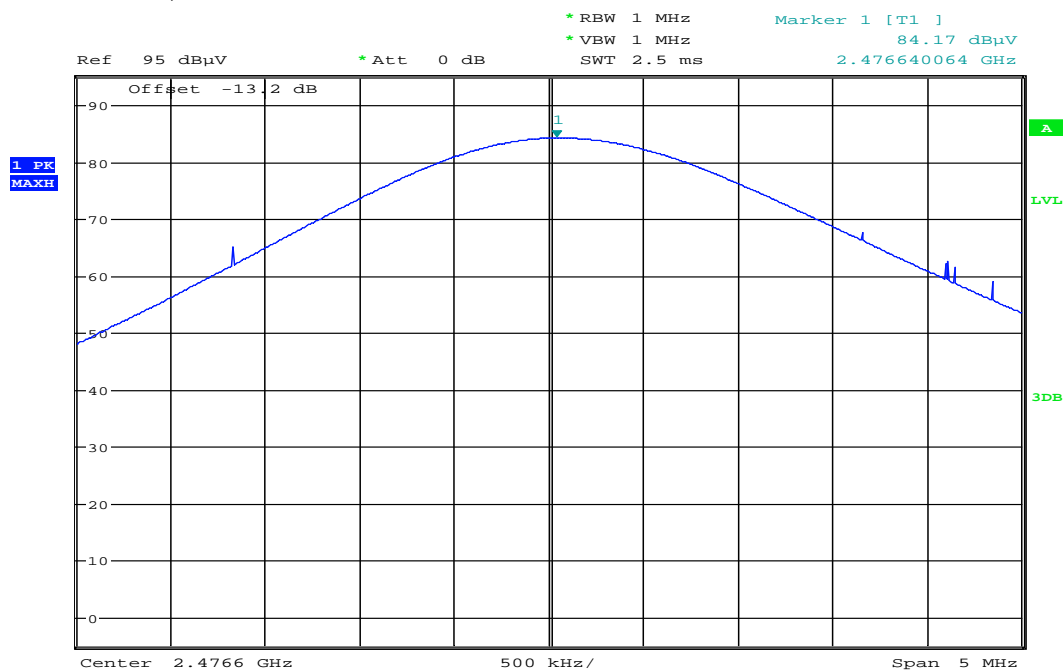
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Plot 14: 2470 MHz, Antenna 1



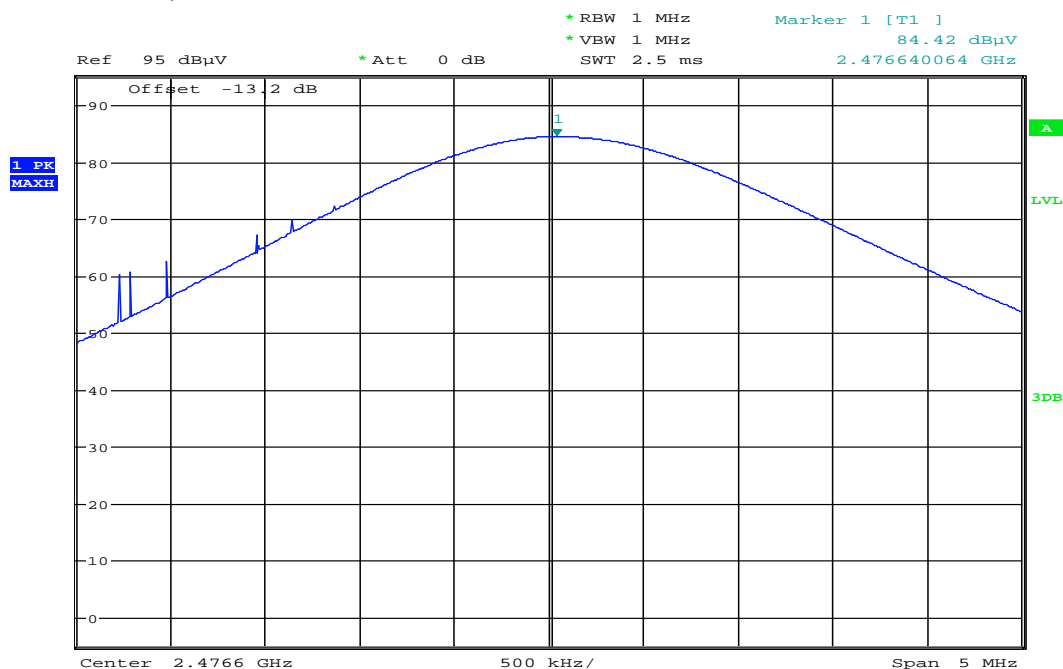
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Plot 15: 2475 MHz, Antenna 1



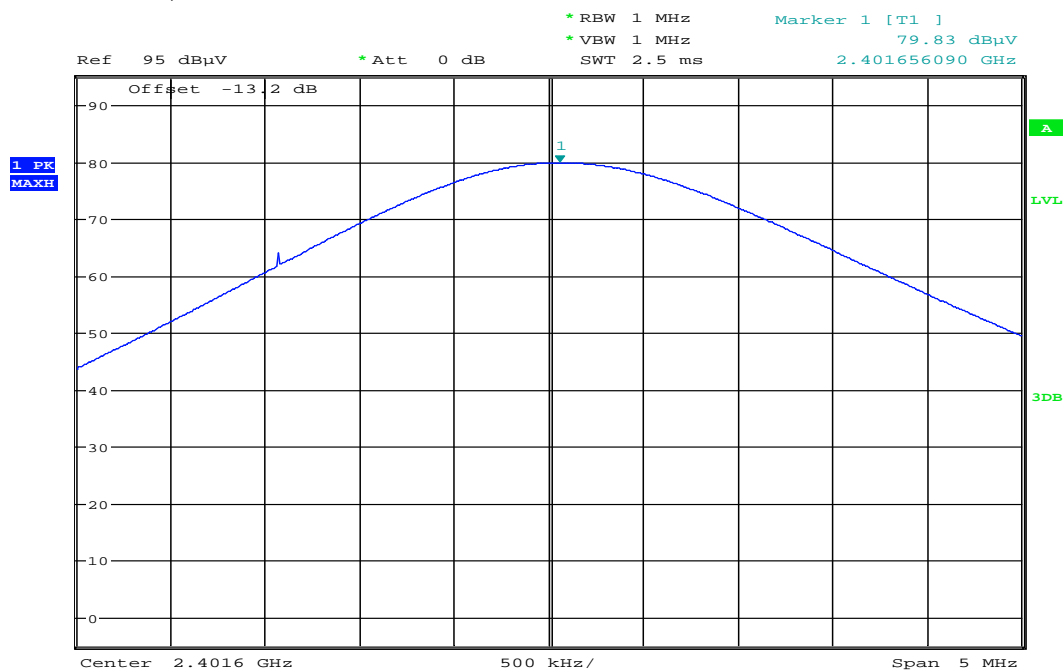
Date: 4.OCT.2011 12:04:19

Plot 16: 2480 MHz, Antenna 1



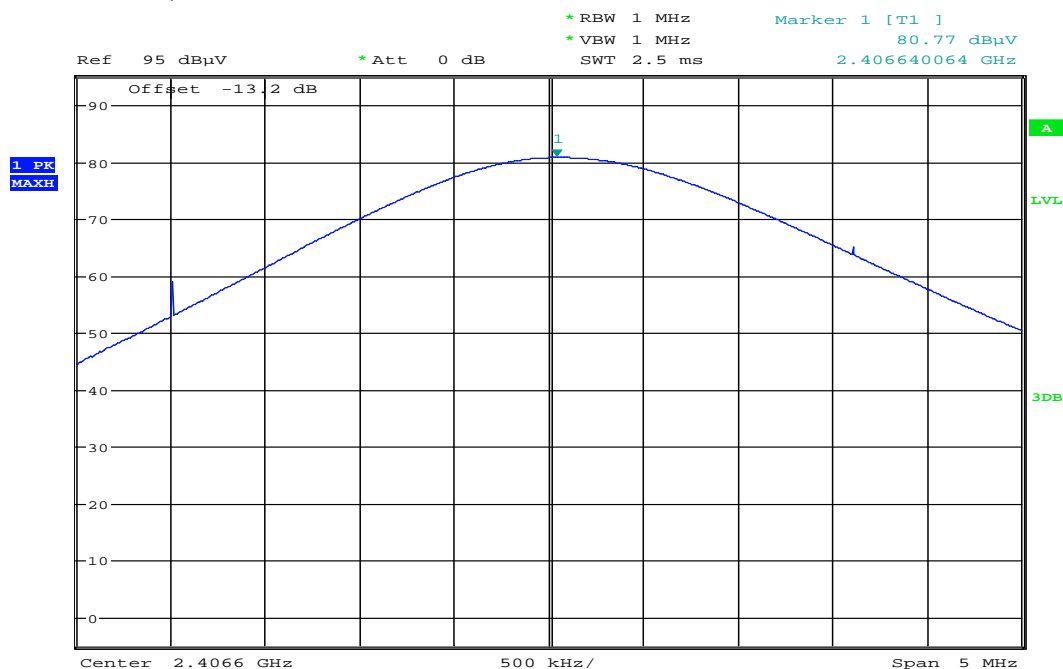
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Plot 17: 2405 MHz, Antenna 2



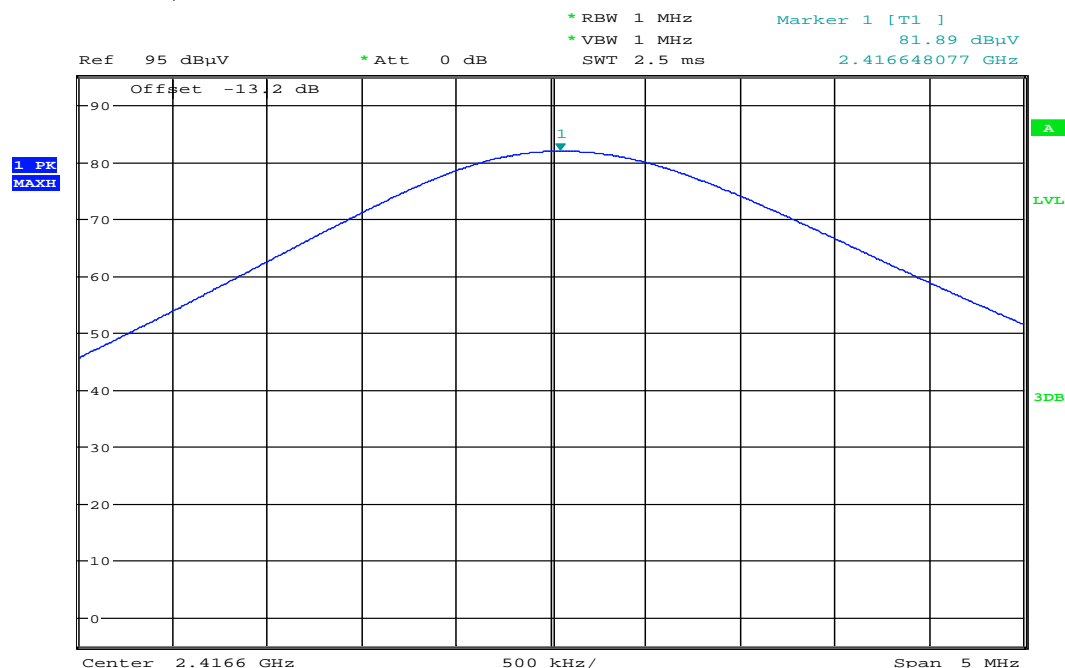
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Plot 18: 2410 MHz, Antenna 2



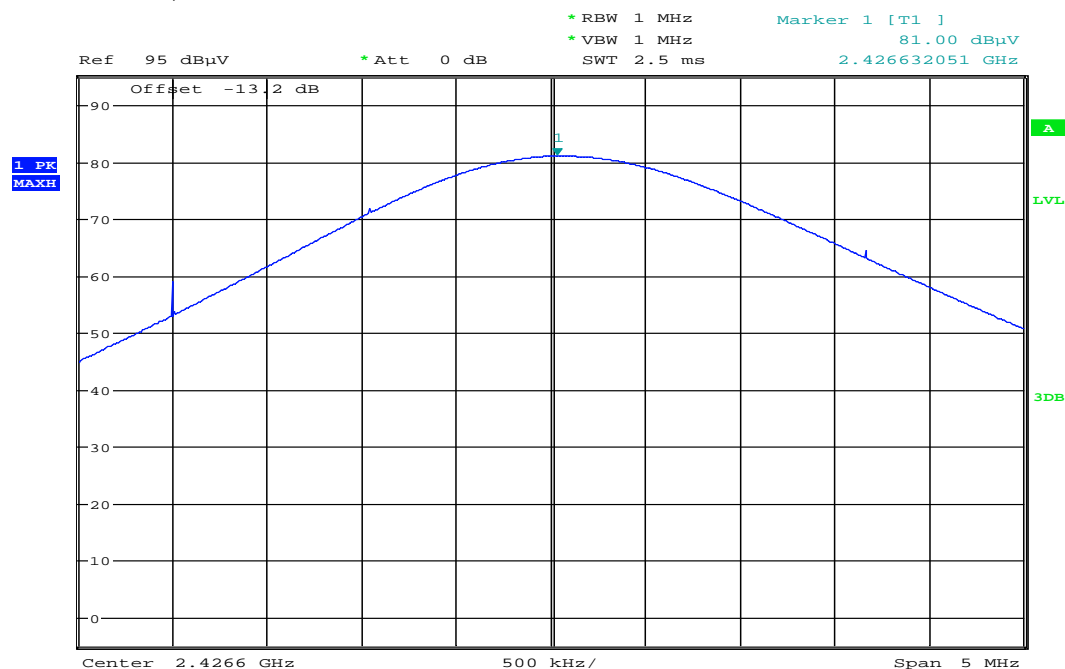
Date: 5.OCT.2011 09:32:35

Plot 19: 2420 MHz, Antenna 2



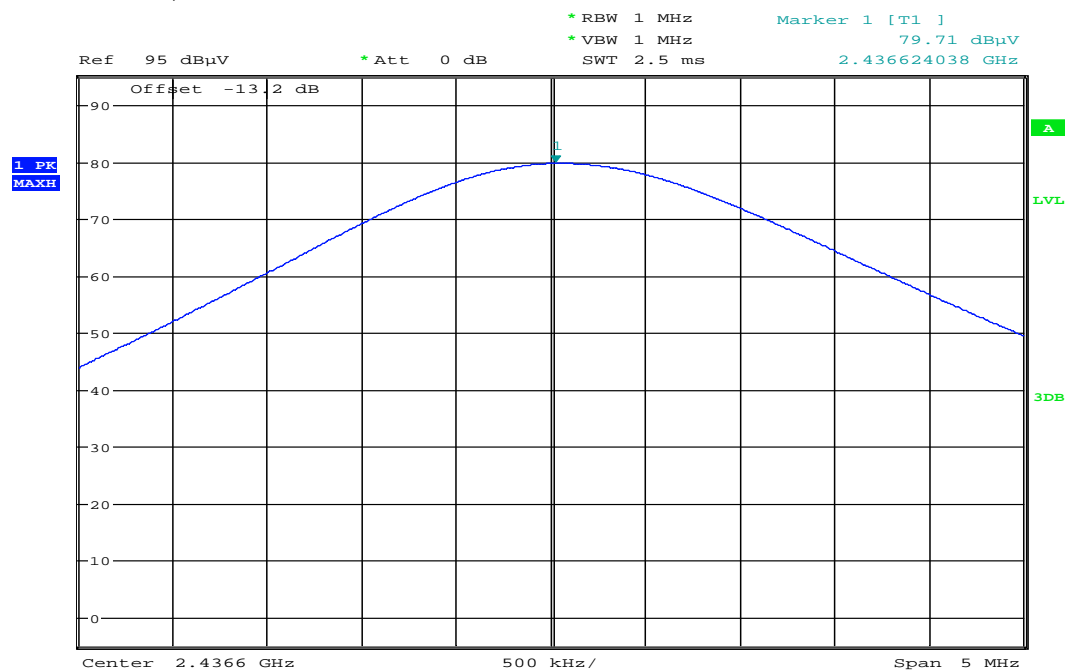
Date: 5.OCT.2011 09:34:49

Plot 20: 2430 MHz, Antenna 2



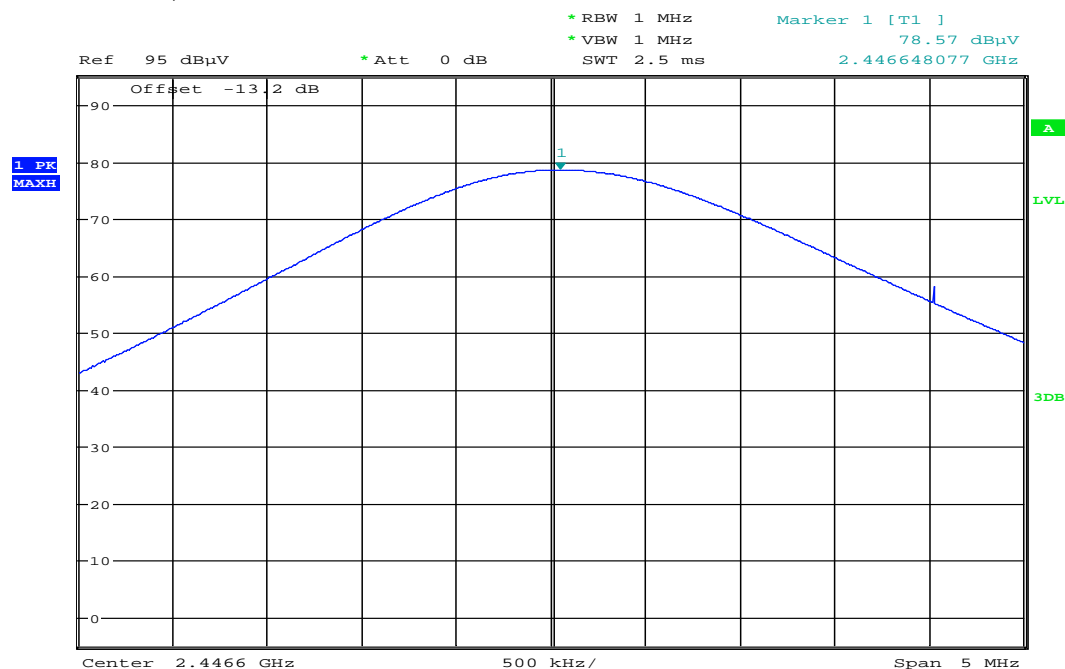
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Plot 21: 2440 MHz, Antenna 2



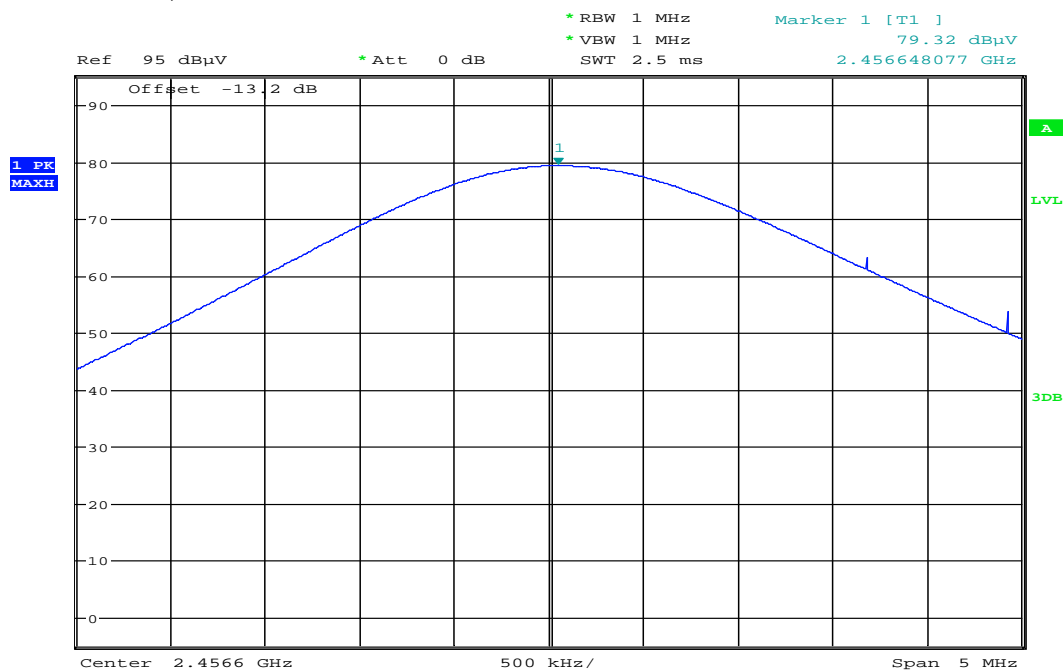
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Plot 22: 2450 MHz, Antenna 2



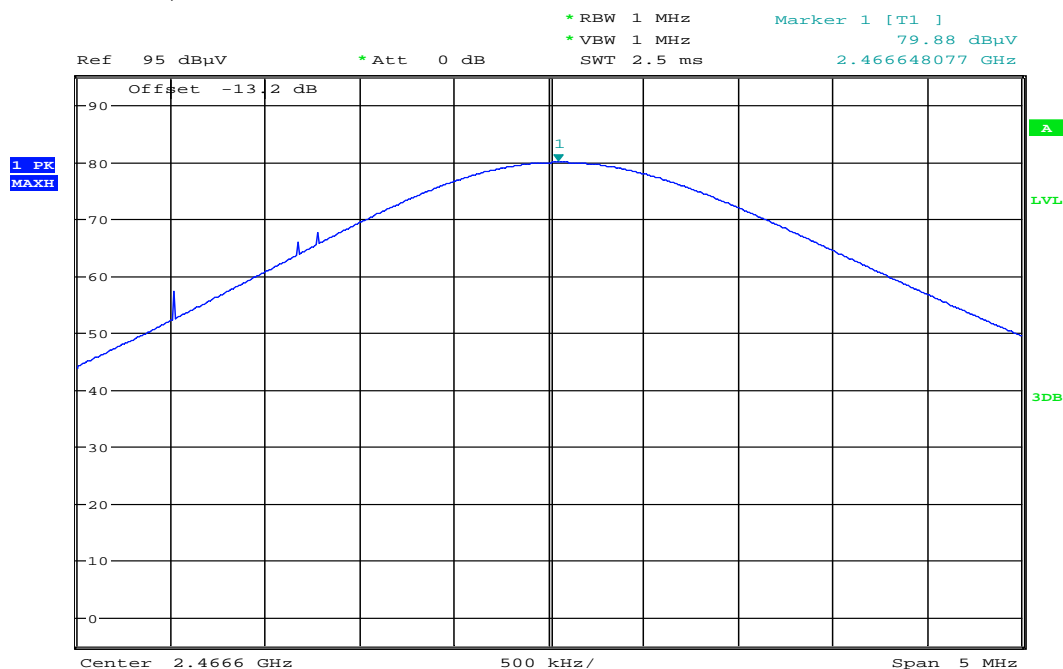
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Plot 23: 2460 MHz, Antenna 2



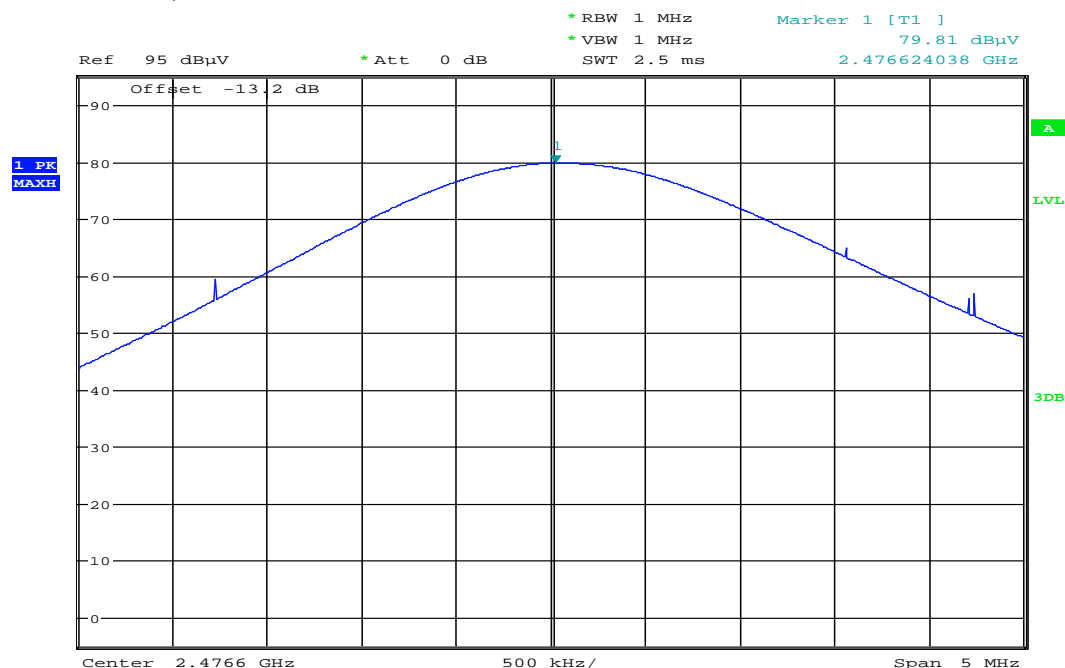
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Plot 24: 2470 MHz, Antenna 2



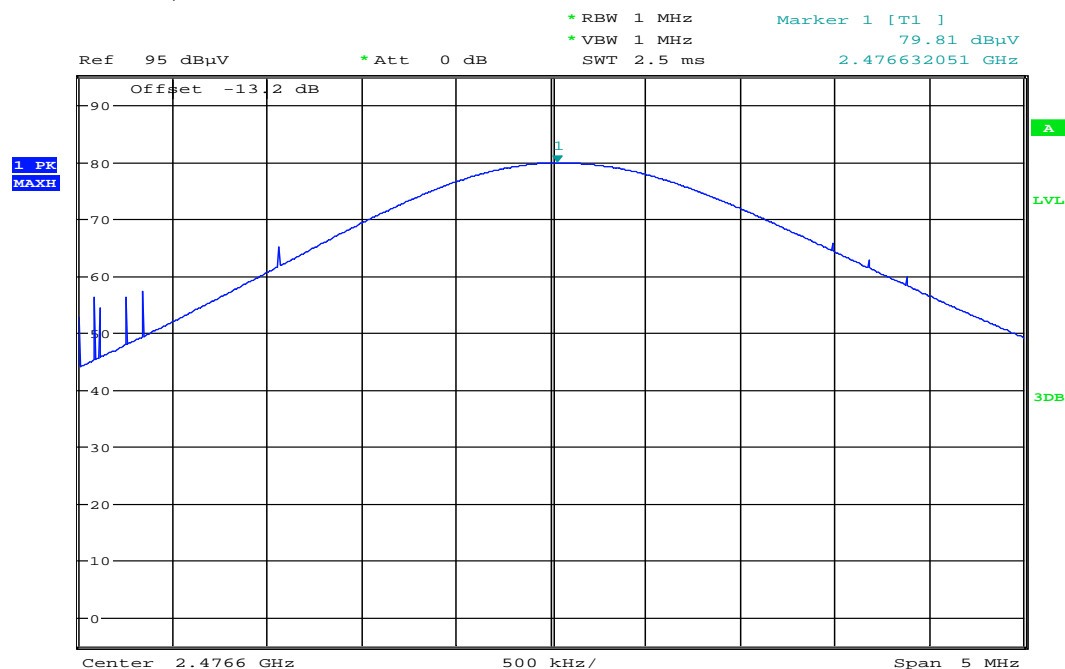
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Plot 25: 2475 MHz, Antenna 2



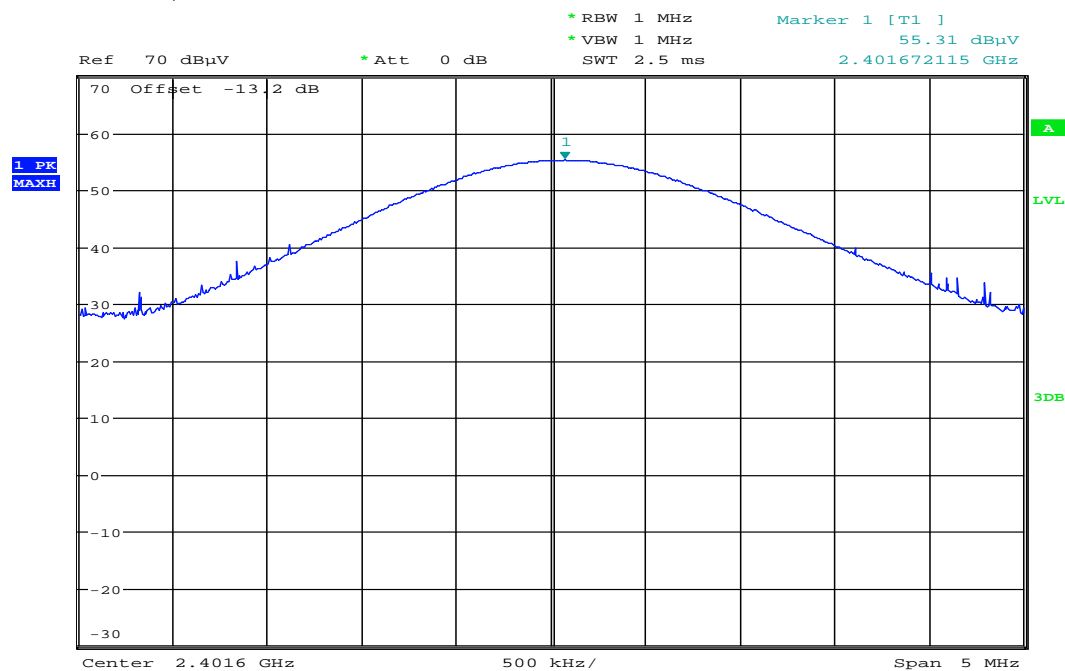
Date: 5.OCT.2011 09:43:35

Plot 26: 2480 MHz, Antenna 2



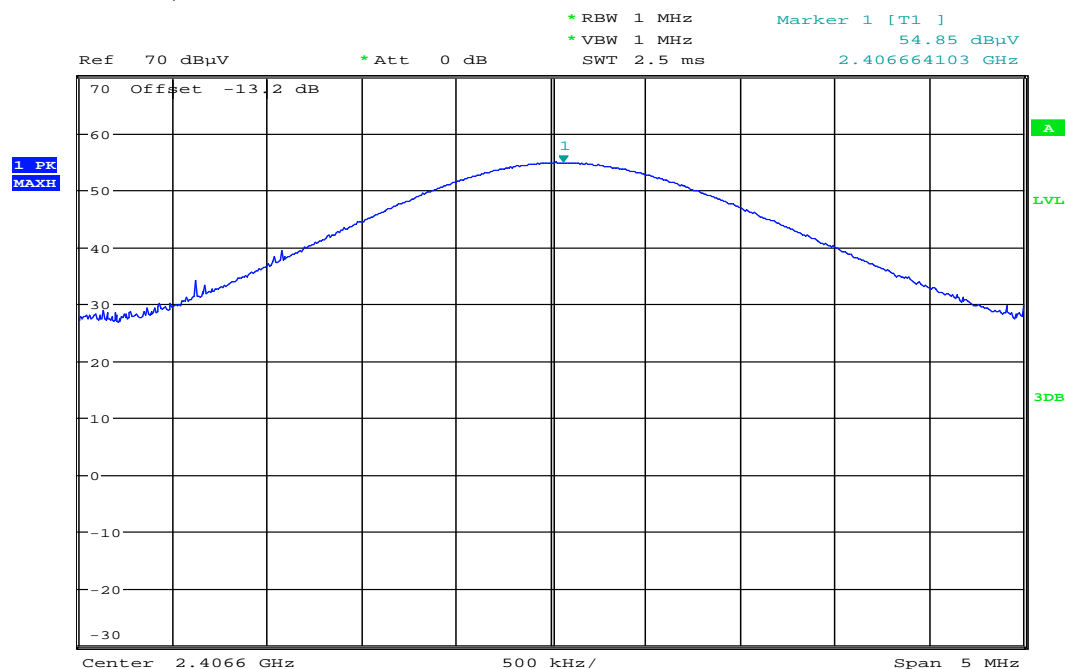
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Plot 27: 2405 MHz, Antenna 3



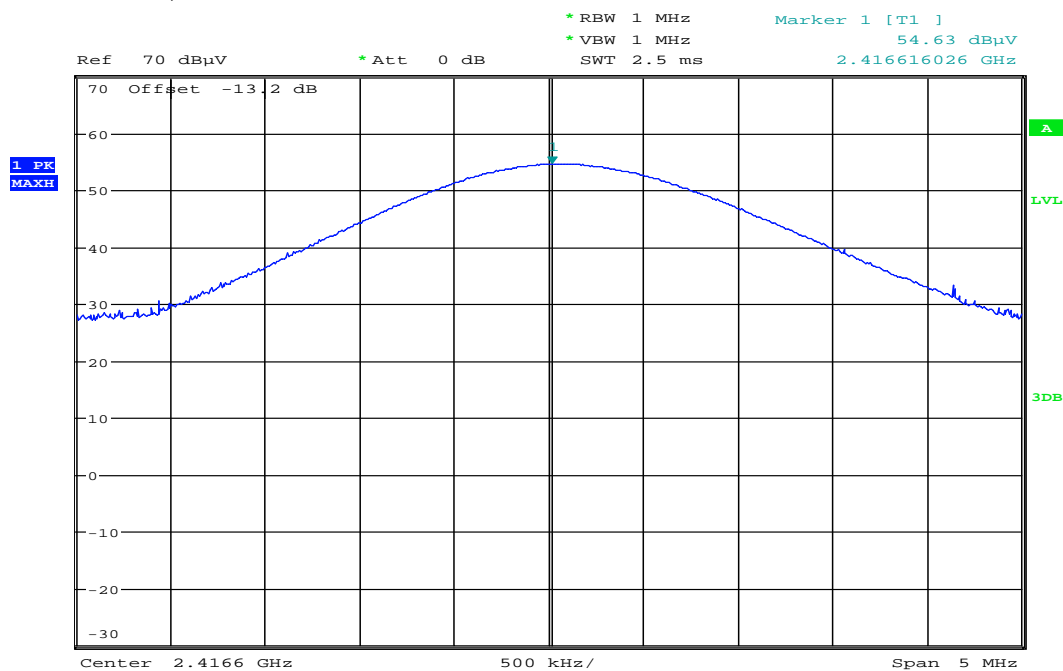
Date: 5.OCT.2011 14:04:27

Plot 28: 2410 MHz, Antenna 3



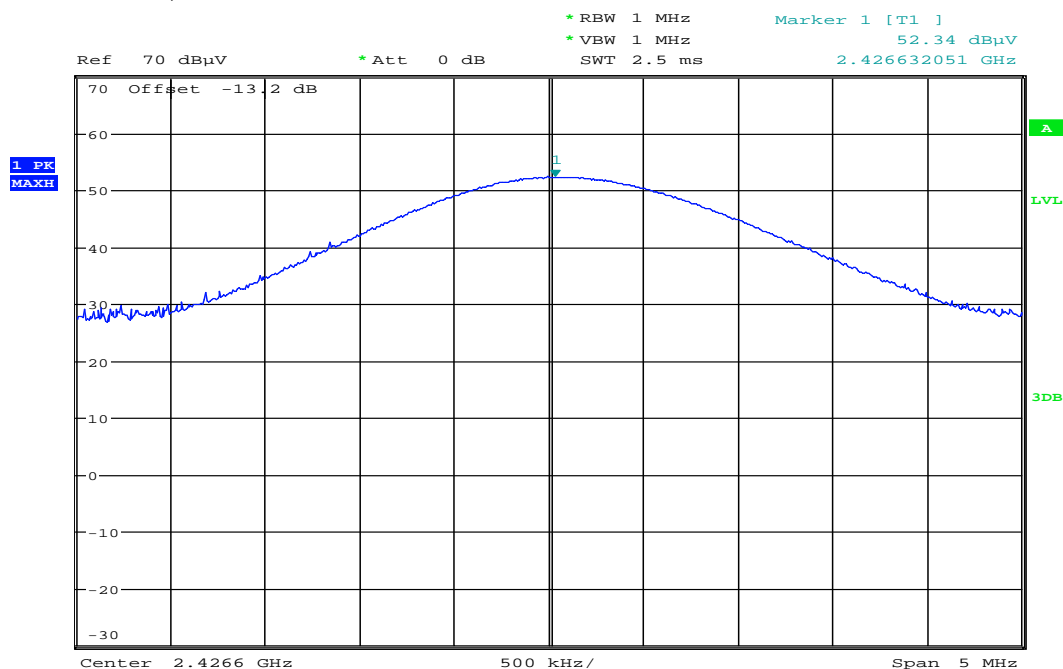
Date: 5.OCT.2011 14:18:39

Plot 29: 2420 MHz, Antenna 3



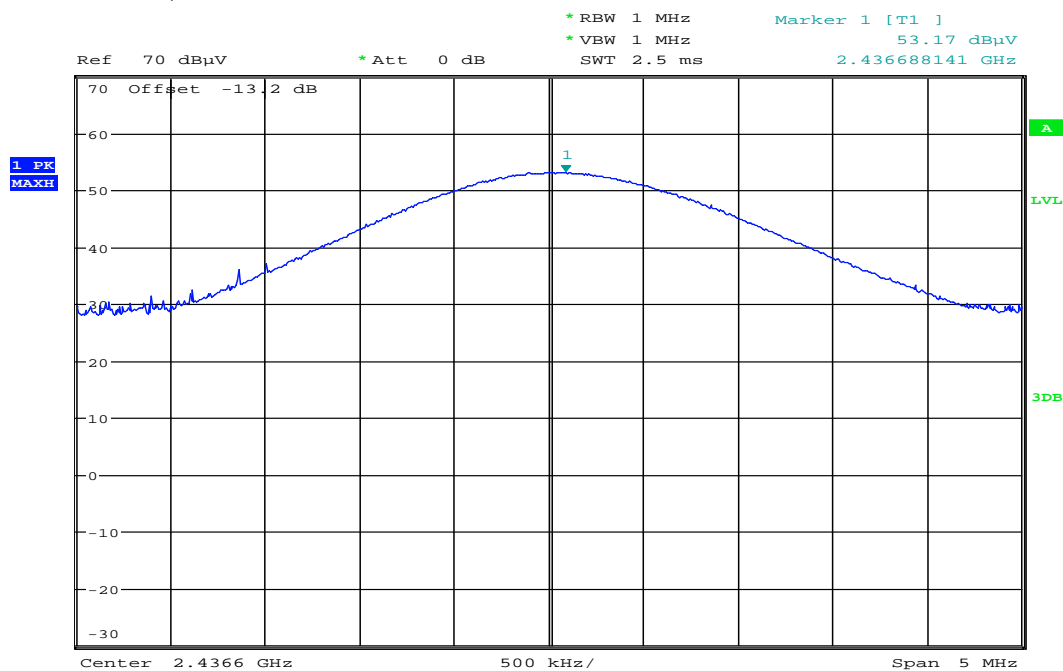
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Plot 30: 2430 MHz, Antenna 3



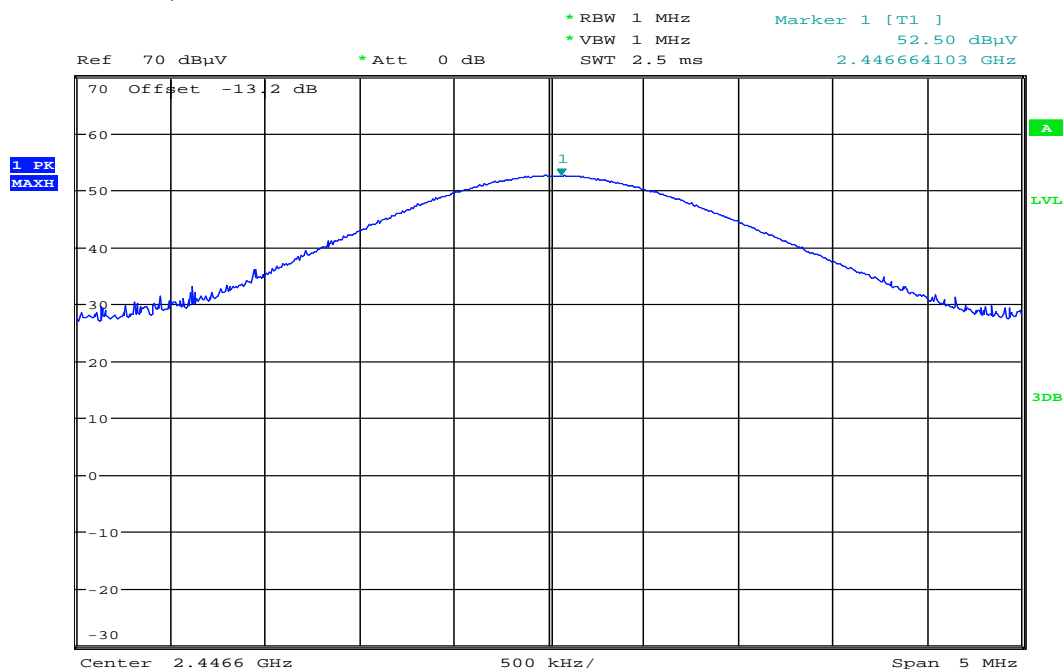
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Plot 31: 2440 MHz, Antenna 3



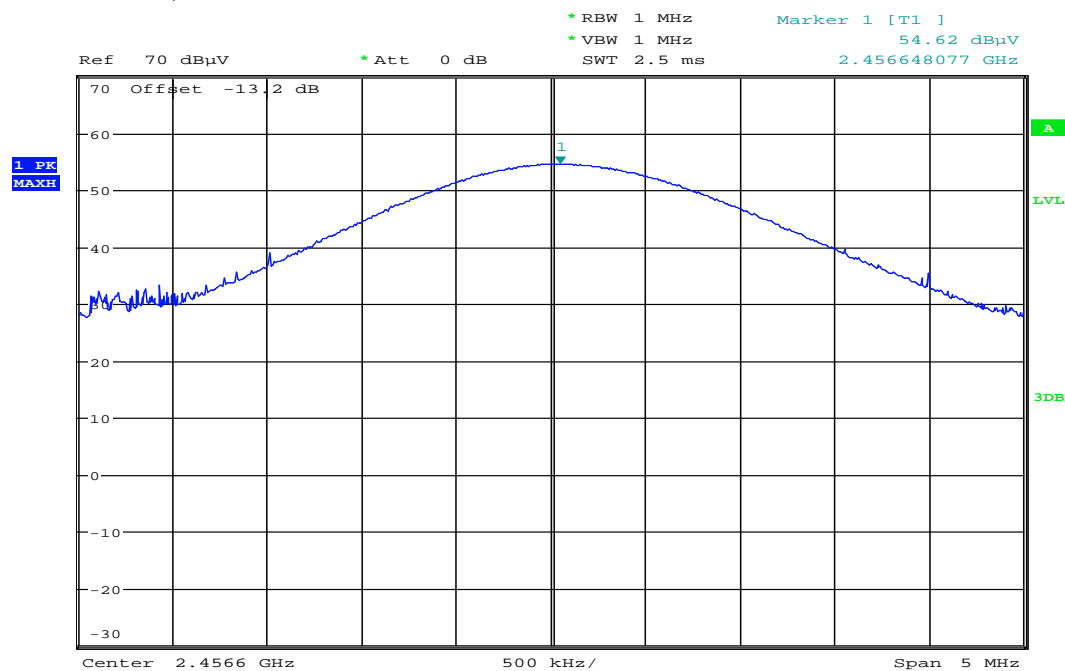
Date: 5.OCT.2011 14:08:52

Plot 32: 2450 MHz, Antenna 3



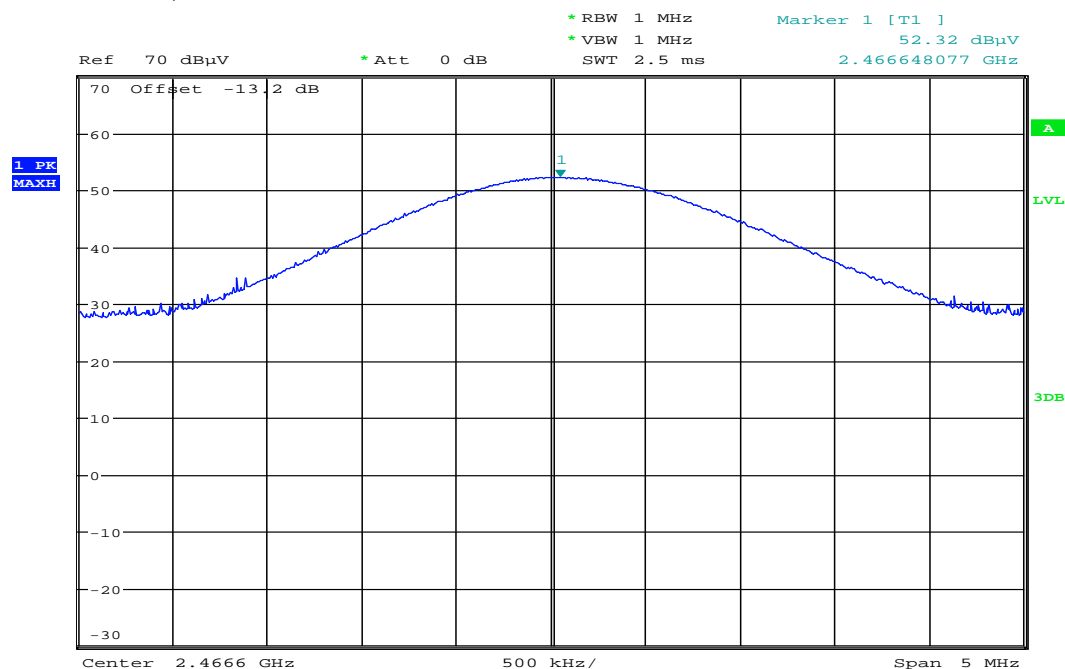
Date: 5.OCT.2011 14:15:44

Plot 33: 2460 MHz, Antenna 3



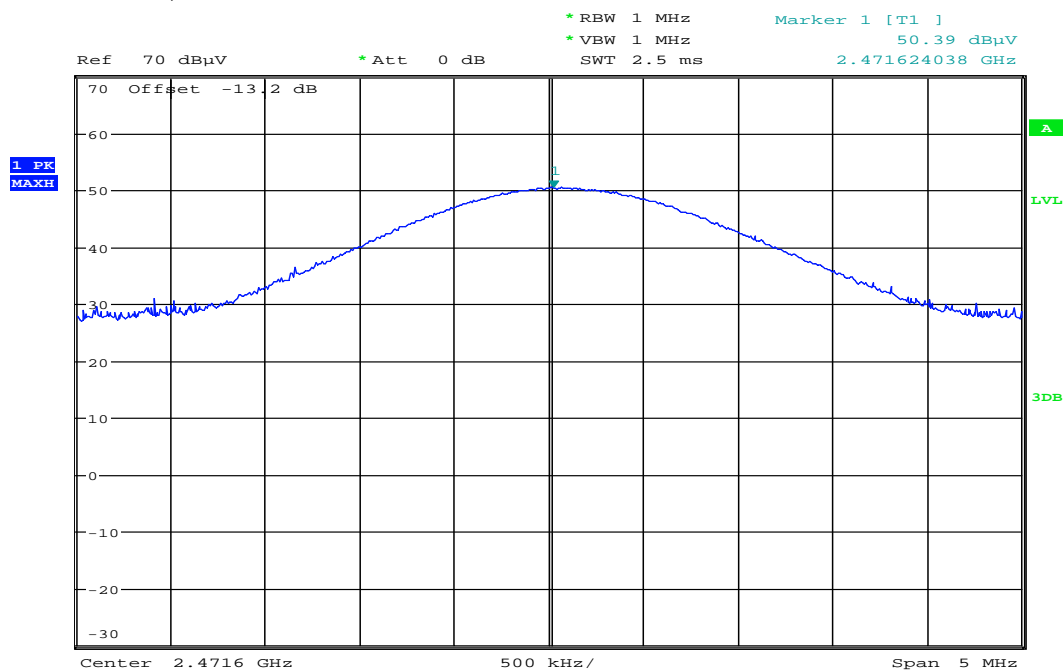
Date: 5.OCT.2011 14:14:45

Plot 34: 2470 MHz, Antenna 3



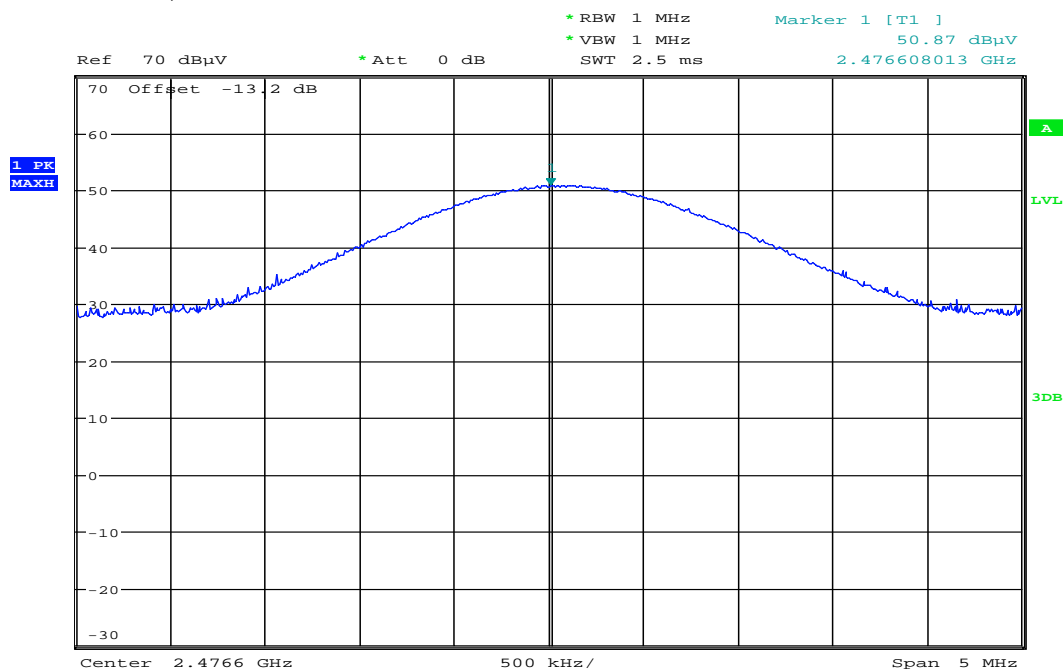
Date: 5.OCT.2011 14:13:42

Plot 35: 2475 MHz, Antenna 3



Date: 5.OCT.2011 14:12:09

Plot 36: 2480 MHz, Antenna 3



Date: 5.OCT.2011 14:11:09

Result: The measurement is passed.

9.4 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to lowest channel for the lower restricted band and to highest channel for the upper restricted band.

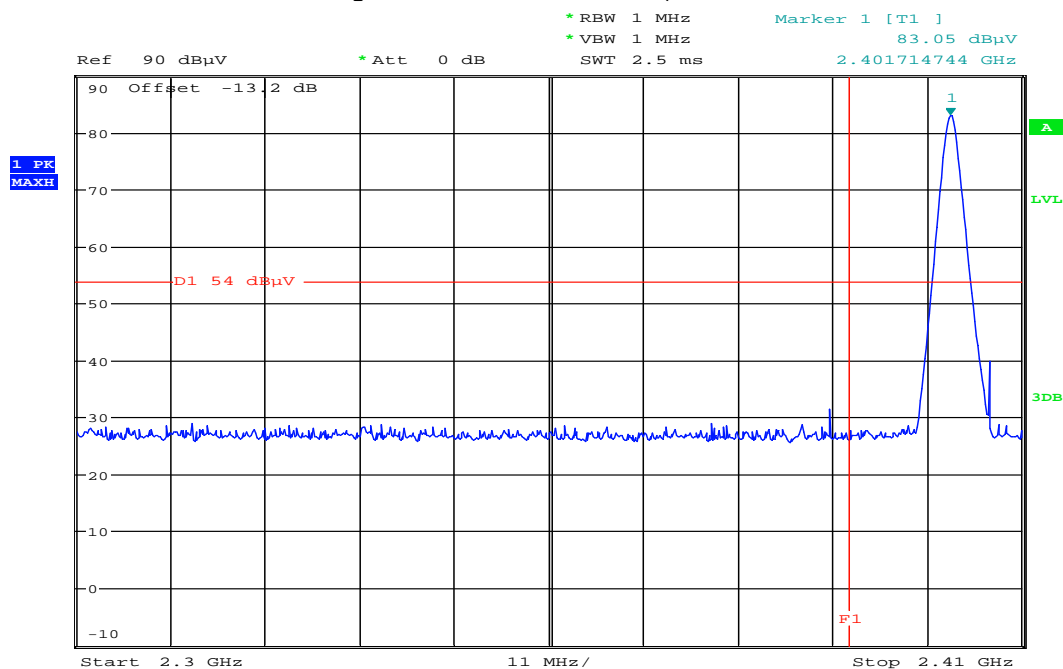
Limits:

FCC	IC
CFR Part 15.249(d)	RSS 210, Issue 8, A 2.9(a)(b)
Band Edge Compliance Radiated	
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 / RSS GEN, whichever is the lesser attenuation.	
54 dBμV/m (AVG) / 74 dBμV/m (Peak)	

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41			

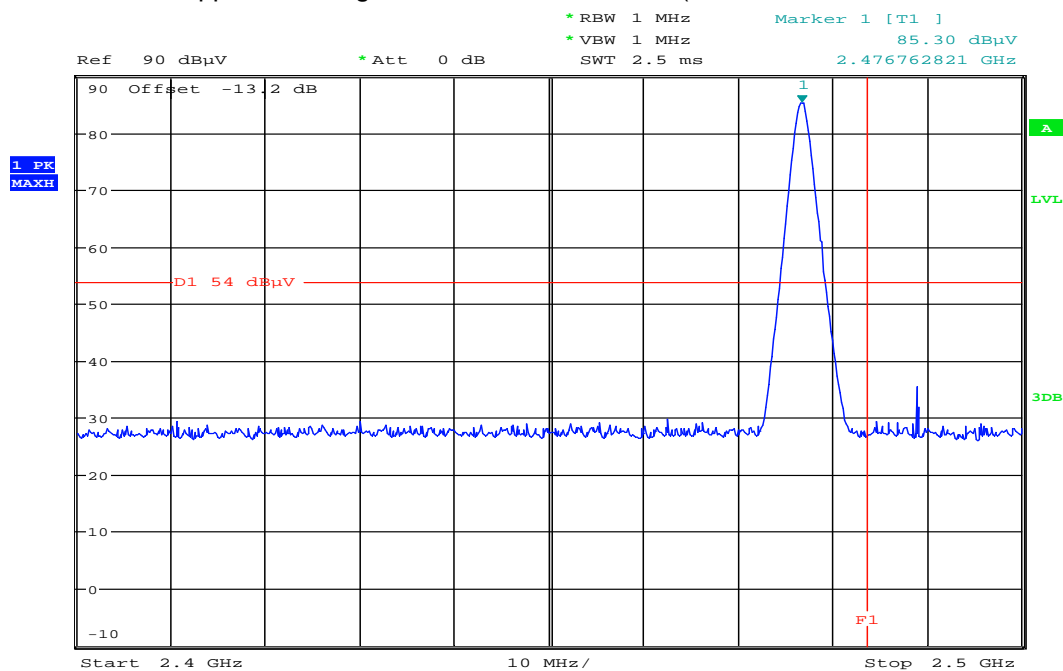
- **Antenna 1:**

Plot 37: Antenna 1, lower band edge, Channel 1, 2405 MHz (Restricted band 2310 MHz – 2390 MHz)



Date: 4.OCT.2011 13:42:14

Plot 38: Antenna 1, upper band edge, Channel 10, 2480 MHz (Restricted band 2483.5 MHz – 2500 MHz)

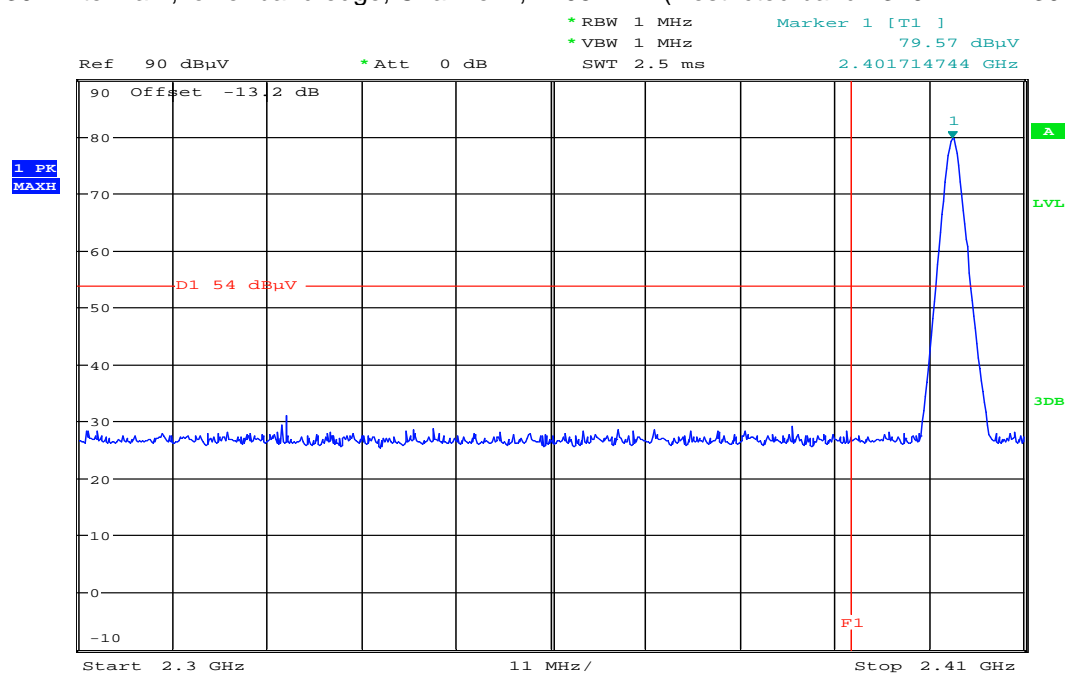


Date: 4.OCT.2011 14:25:43

Result: The measurement is passed.

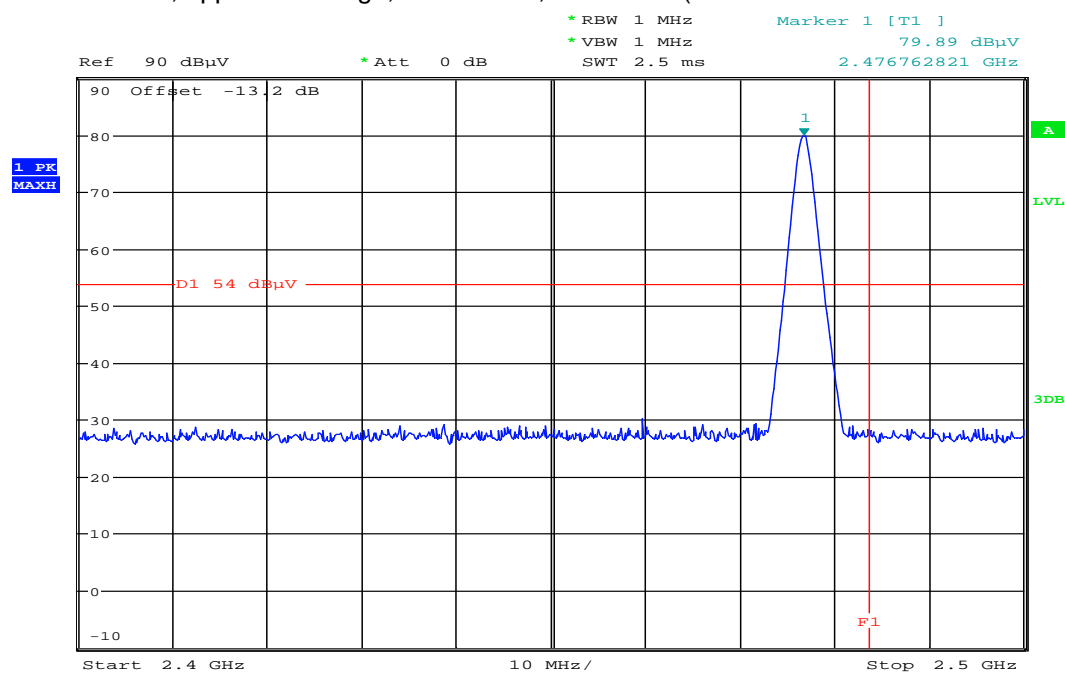
- Antenna 2:

Plot 39: Antenna 2, lower band edge, Channel 1, 2405 MHz (Restricted band 2310 MHz – 2390 MHz)



Date: 5.OCT.2011 10:01:37

Plot 40: Antenna 2, upper band edge, Channel 10, 2480 MHz (Restricted band 2483.5 MHz – 2500 MHz)

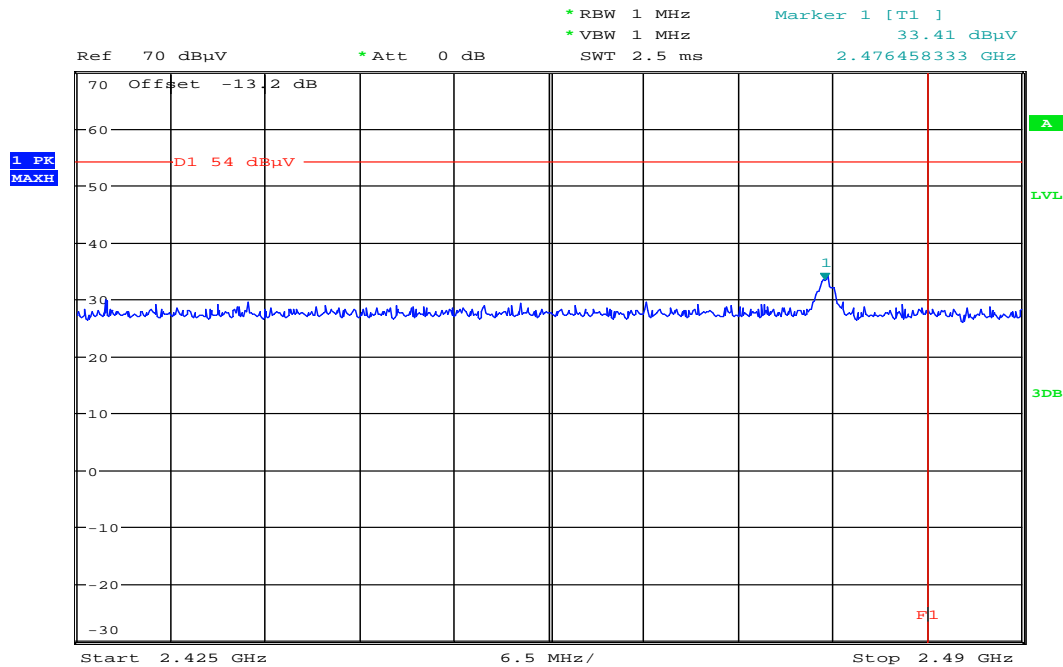


Date: 5.OCT.2011 09:58:12

Result: The measurement is passed.

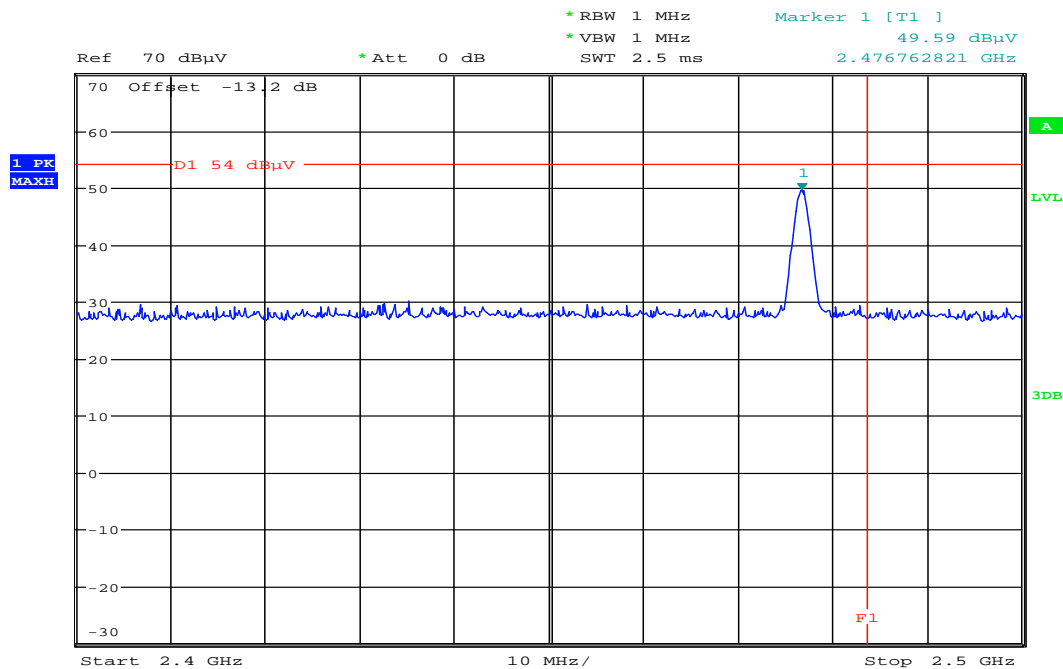
- **Antenna 3:**

Plot 41: Antenna 3, lower band edge, Channel 1, 2405 MHz (Restricted band 2310 MHz – 2390 MHz)



Date: 5.OCT.2011 16:20:57

Plot 42: Antenna 3, upper band edge, Channel 10, 2480 MHz (Restricted band 2483.5 MHz – 2500 MHz)



Date: 5.OCT.2011 14:23:48

Result: The measurement is passed.

9.5 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	See table / See plots
Video bandwidth:	See table / See plots
Trace-Mode:	Max Hold

Limits:

FCC		IC
SUBCLAUSE § 15.209 (a)		RSS-210 Issue 7
Field strength of the harmonics and spurious.		
Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dBμV/m)	30
30 – 88	100 (40 dBμV/m)	3
88 – 216	150 (43.5 dBμV/m)	3
216 – 960	200 (46 dBμV/m)	3
Above 960	500 (54 dBμV/m)	3

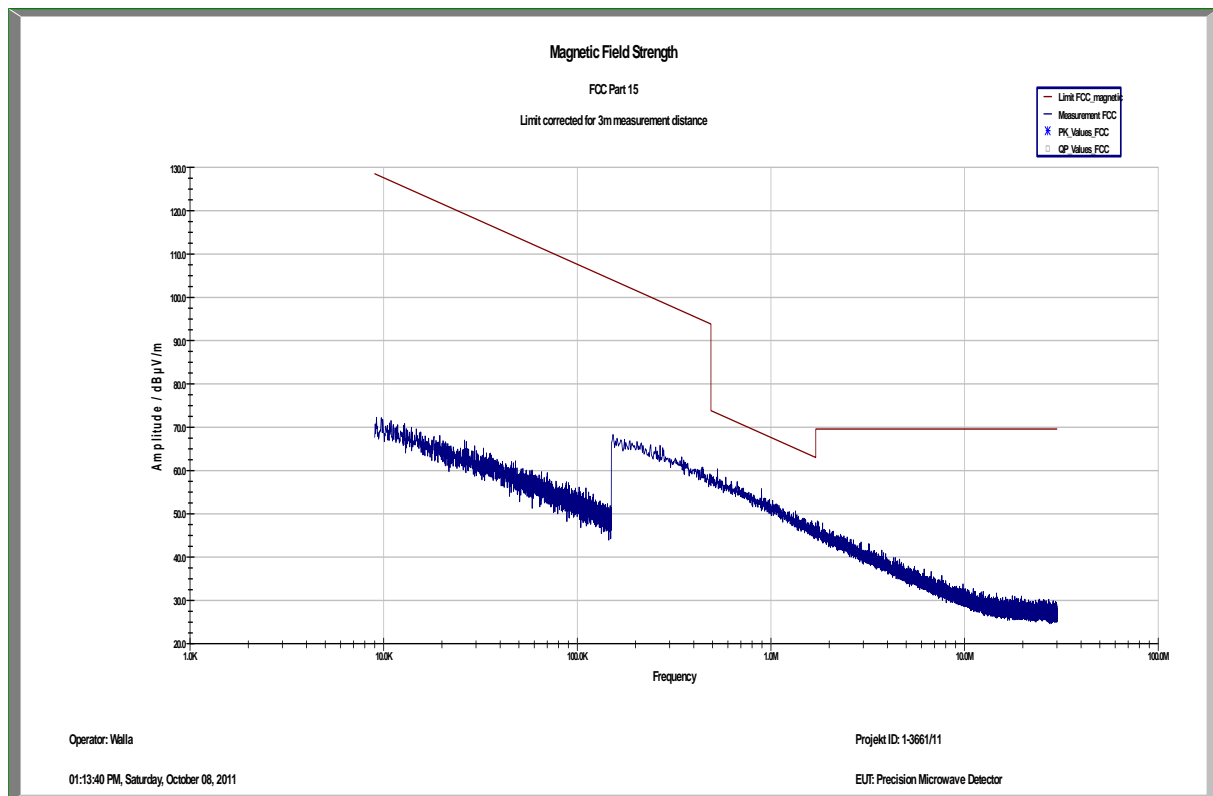
Result:

TX Spurious Emissions Radiated [dBμV/m]								
2405 MHz			2440 MHz			2480 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
See table								
Measurement uncertainty			± 3 dB					

Result: The measurement is passed.

- **Antenna 1:**

Plot 43: 9 kHz – 30 MHz (Valid for all channels)



Channel 1: 2405 MHz, antenna 1

Plot 44: 30 MHz – 1 GHz

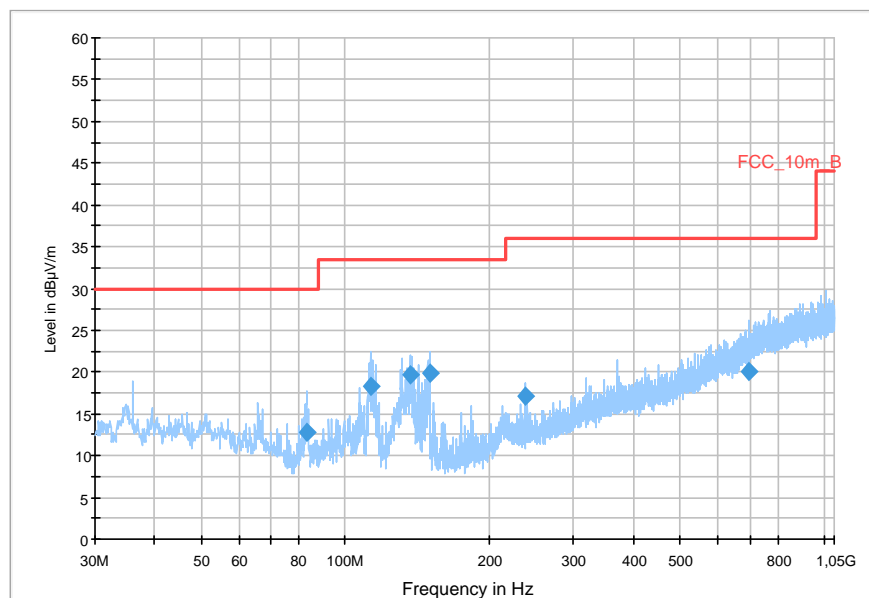
EUT:	PMD 2450-2
Serial Number:	1081-07/2011
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	cont. TX 2405 MHz
Operator Name:	Hennemann
Comment:	AC: 115 V

Scan Setup: STAN_Fin [EMI radiated]

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

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

FCC_10m(B)_5



Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
83.280000	12.8	1000.0	120.000	145.0	V	271.0	9.6	17.2	30.0
112.800000	18.2	1000.0	120.000	125.0	V	73.0	10.8	15.3	33.5
136.320000	19.7	1000.0	120.000	107.0	V	-2.0	8.9	13.8	33.5
150.000000	19.8	1000.0	120.000	131.0	V	73.0	8.9	13.7	33.5
237.840000	17.1	1000.0	120.000	270.0	H	292.0	13.0	18.9	36.0
696.840000	20.0	1000.0	120.000	138.0	V	55.0	22.4	16.0	36.0

Plot 45: 1 GHz – 12 GHz

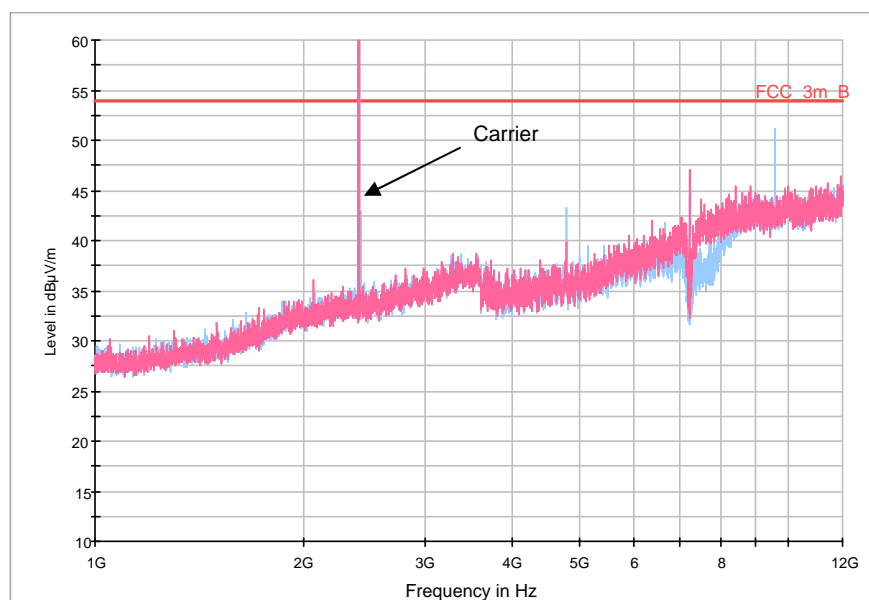
EUT:	PMD 2450-2
Serial Number:	1081-07/2011
Test Description:	FCC part 15 class B @ 3 m
Operating Conditions:	cont. TX 2405 MHz
Operator Name:	Hennemann
Comment:	AC: 115 V

Scan Setup: C_FIN [EMI radiated]

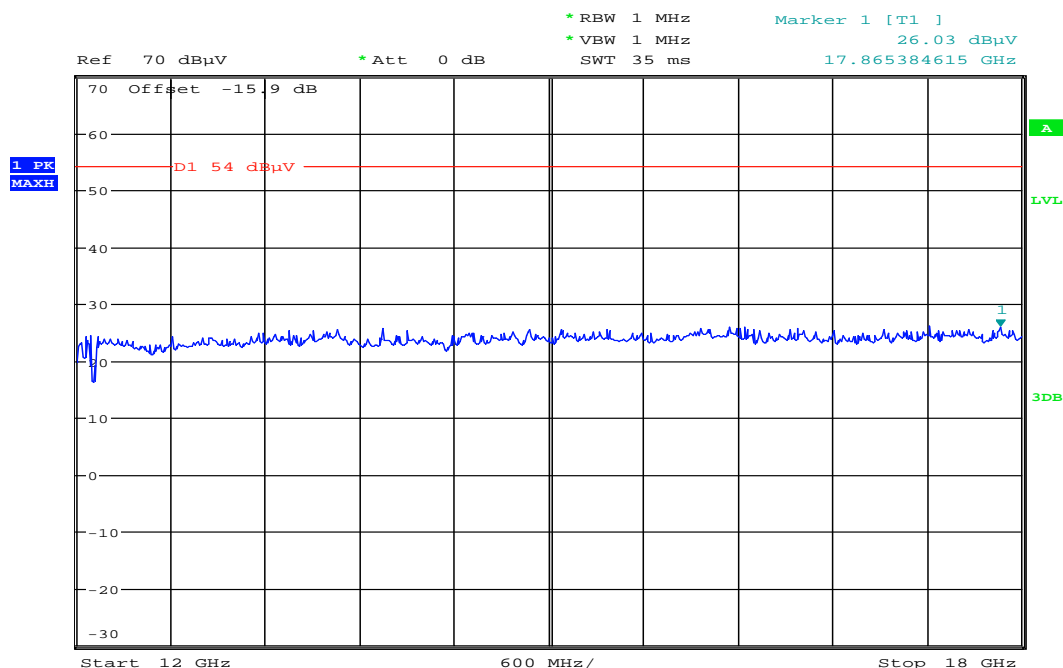
Hardware Setup:	C_MATRIX
Receiver:	[ESU 26]
Level Unit:	dBµV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
1 GHz - 4 GHz	400 kHz	AVG	1 MHz	0,1 s	0 dB
4 GHz - 12 GHz	1 MHz	AVG	1 MHz	0,1 s	0 dB

FCC_1_18_B_oH

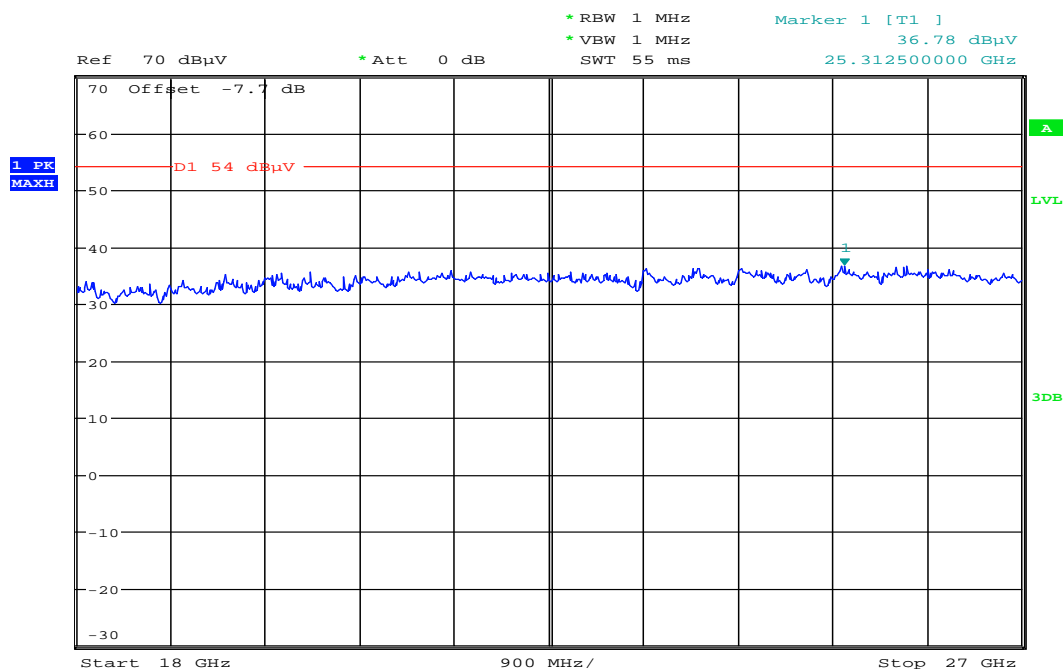


Plot 46: 12 GHz – 18 GHz



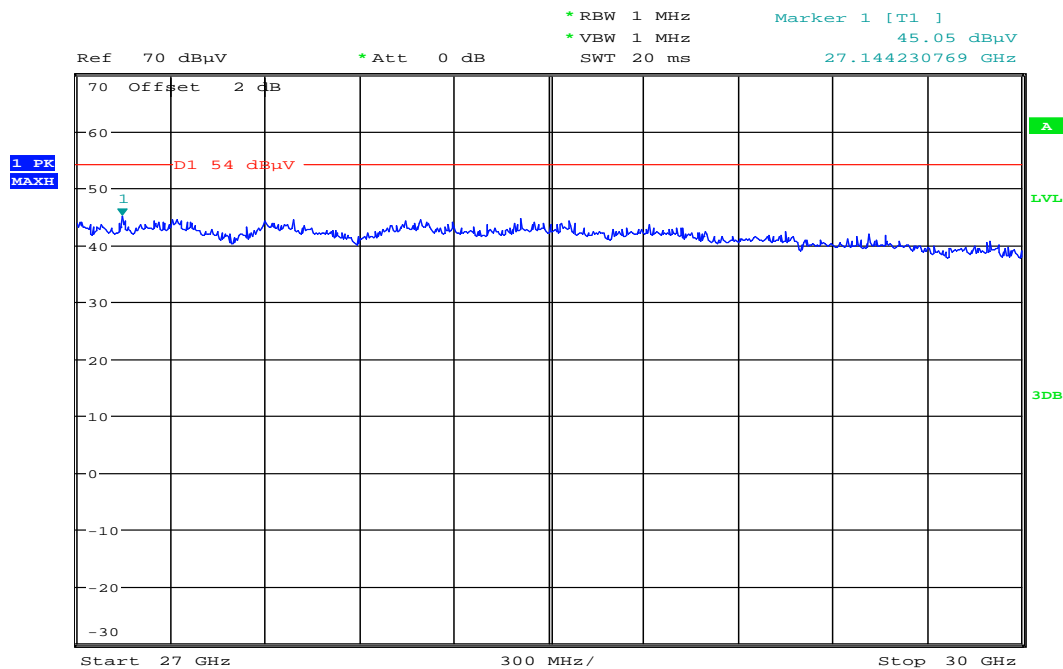
Date: 4.OCT.2011 13:13:39

Plot 47: 18 GHz – 27 GHz



Date: 4.OCT.2011 13:16:35

Plot 48: 27 GHz – 30 GHz

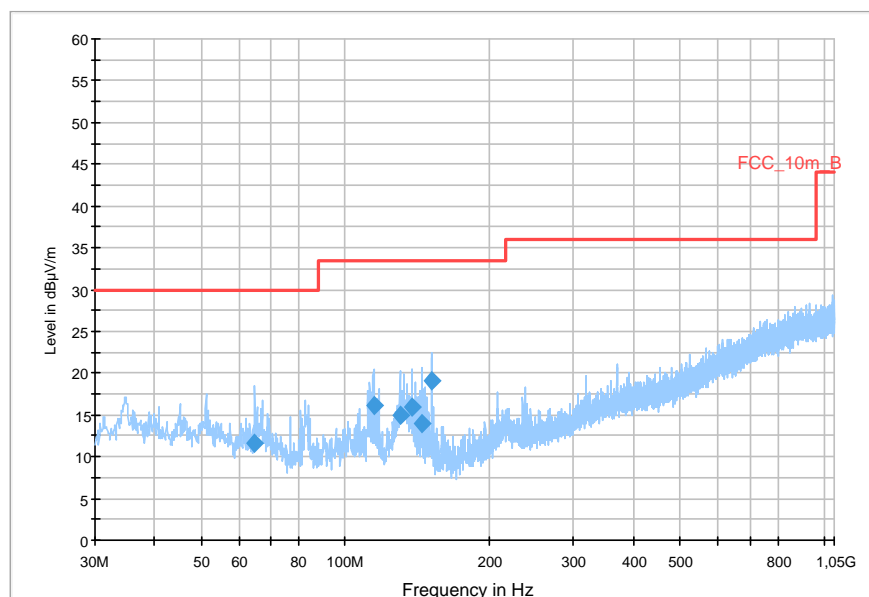


Date: 4.OCT.2011 13:31:28

Channel 2: 2440 MHz, antenna 1

Plot 49: 30 MHz – 1 GHz

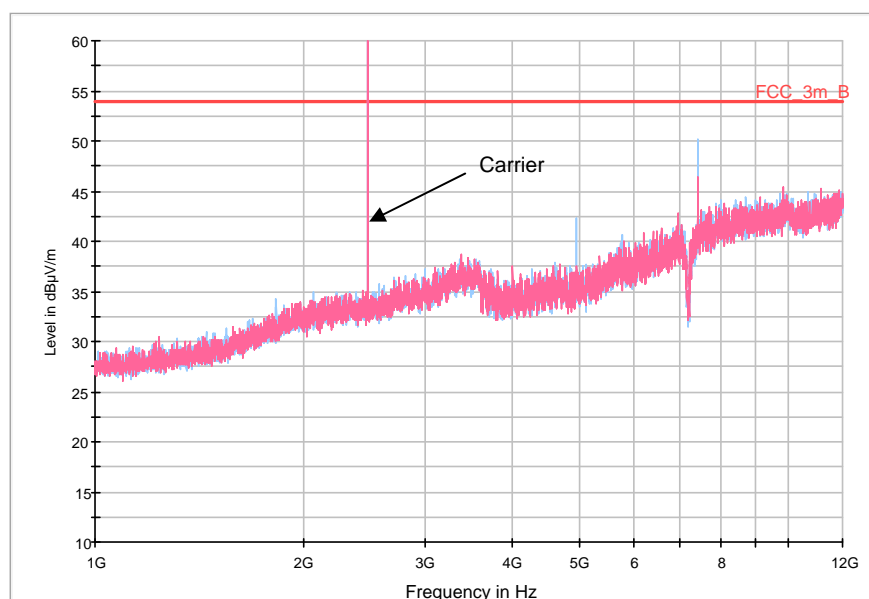
FCC_10m(B)_5



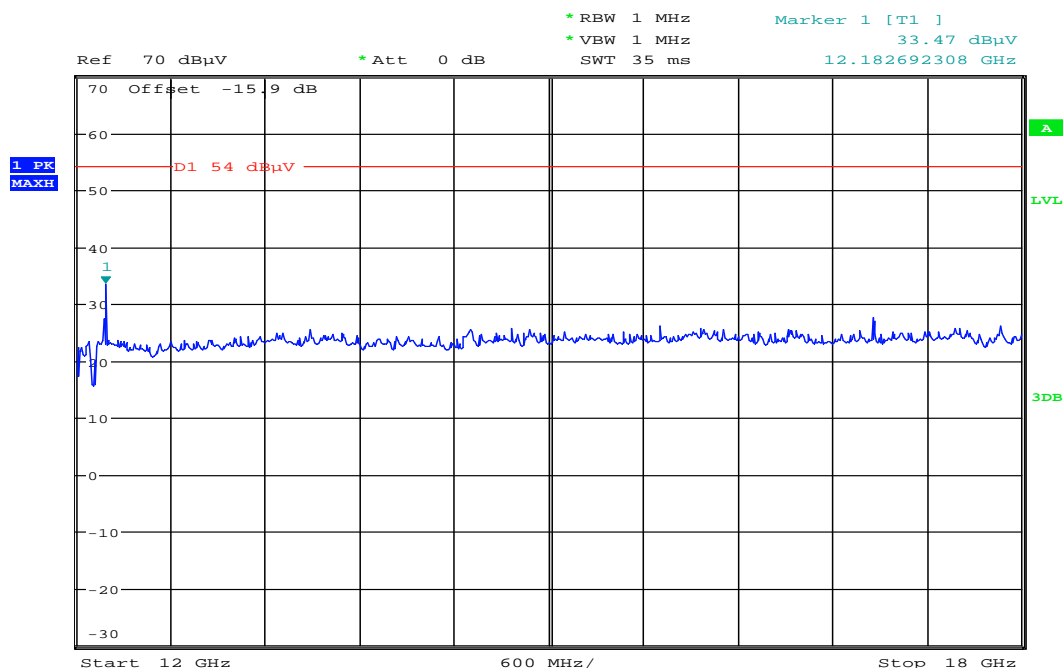
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
64.800000	11.5	1000.0	120.000	270.0	V	355.0	10.5	18.5	30.0
114.480000	16.0	1000.0	120.000	142.0	V	26.0	10.7	17.5	33.5
129.960000	15.0	1000.0	120.000	229.0	V	26.0	9.4	18.5	33.5
137.880000	15.9	1000.0	120.000	108.0	V	308.0	8.8	17.6	33.5
144.720000	14.0	1000.0	120.000	158.0	V	-2.0	8.8	19.5	33.5
151.080000	19.1	1000.0	120.000	98.0	V	-2.0	9.0	14.4	33.5

Plot 50: 1 GHz – 12 GHz

FCC_1_18_B_oH

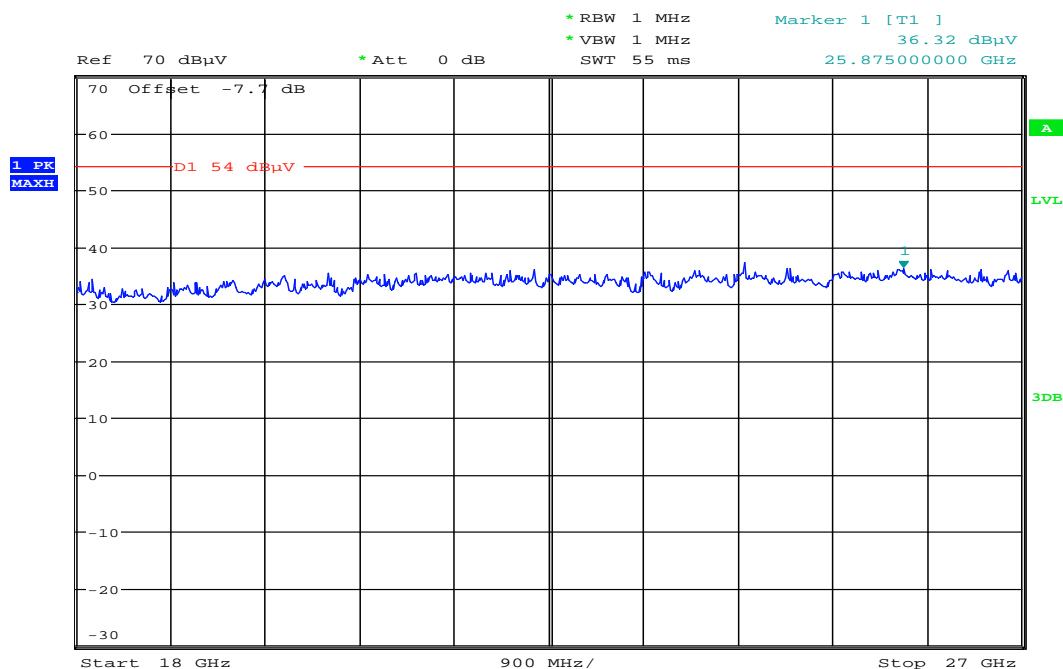


Plot 51: 12 GHz – 18 GHz



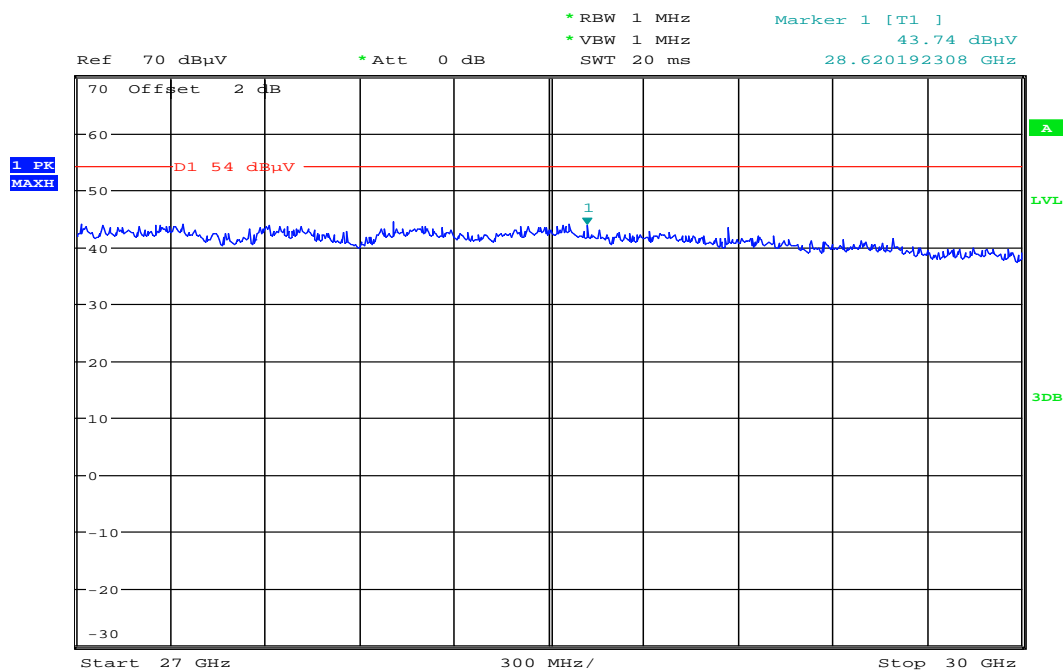
Date: 4.OCT.2011 13:11:57

Plot 52: 18 GHz – 27 GHz



Date: 4.OCT.2011 13:17:11

Plot 53: 27 GHz – 30 GHz

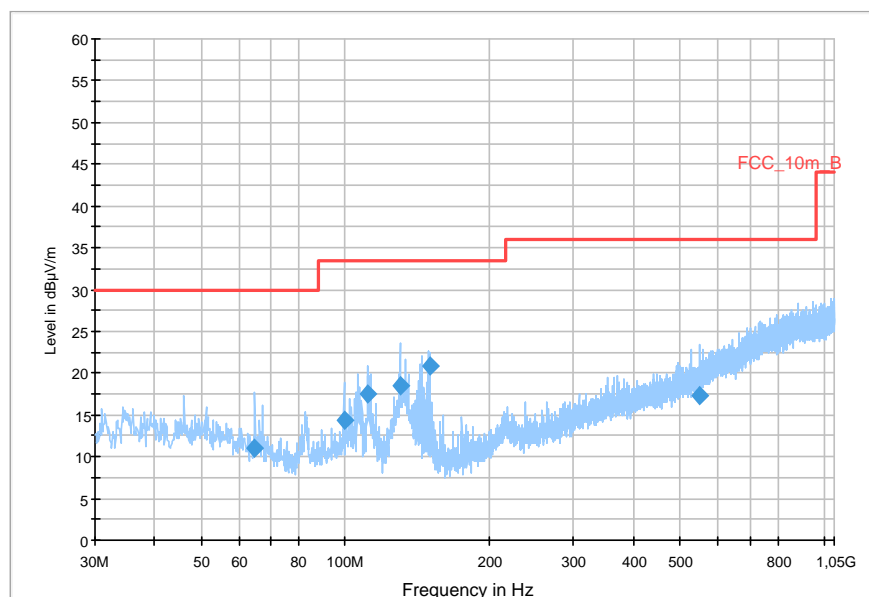


Date: 4.OCT.2011 13:32:00

Channel 3: 2480 MHz, antenna 1

Plot 54: 30 MHz – 1 GHz

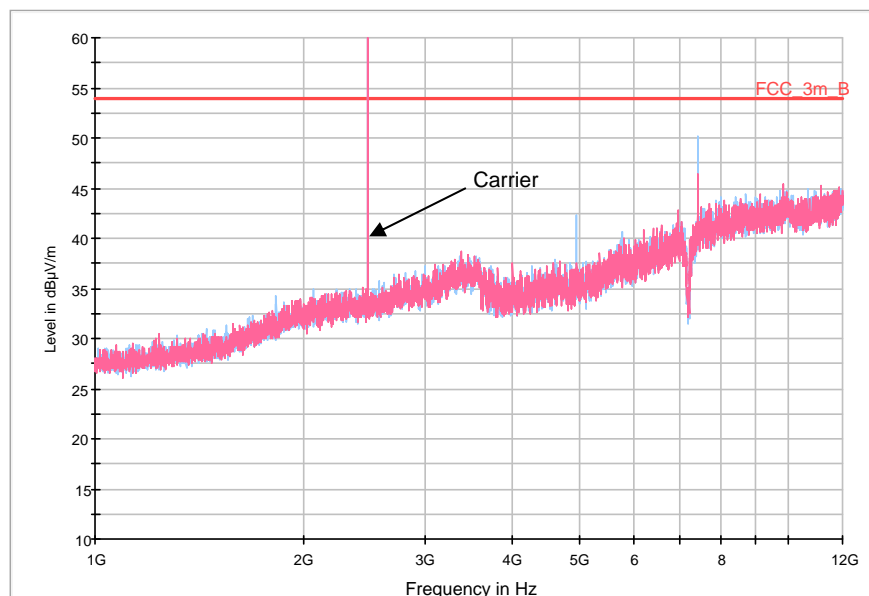
FCC_10m(B)_5



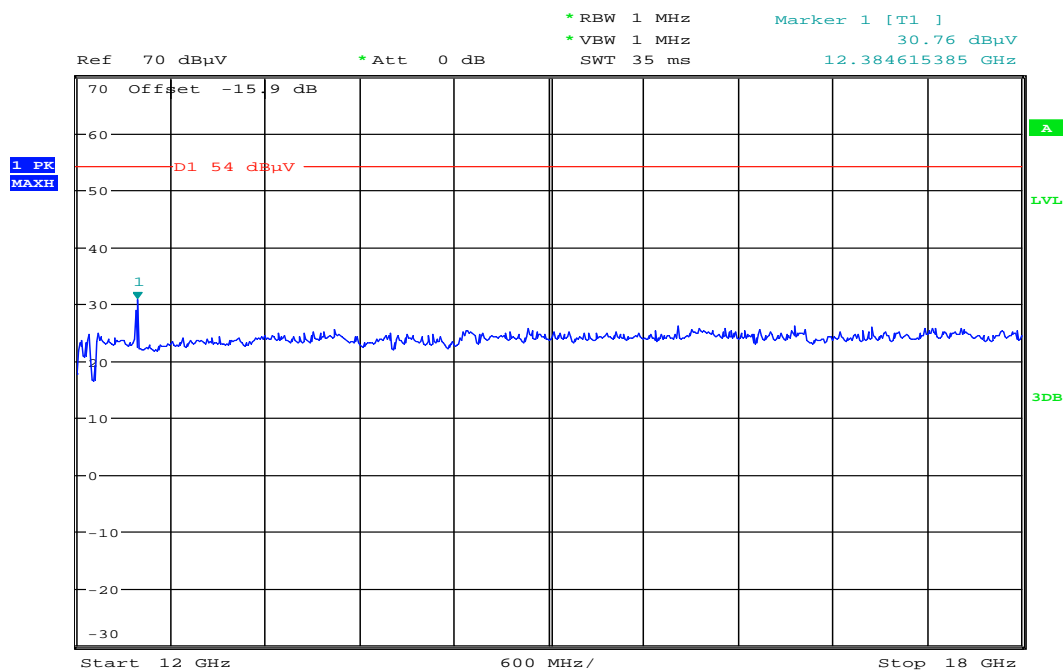
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
64.800000	11.1	1000.0	120.000	270.0	V	26.0	10.5	18.9	30.0
99.360000	14.4	1000.0	120.000	119.0	V	-2.0	11.8	19.1	33.5
111.360000	17.6	1000.0	120.000	109.0	V	63.0	10.9	15.9	33.5
129.960000	18.4	1000.0	120.000	155.0	V	-2.0	9.4	15.1	33.5
150.000000	20.9	1000.0	120.000	120.0	V	26.0	8.9	12.6	33.5
548.280000	17.3	1000.0	120.000	250.0	V	14.0	19.3	18.7	36.0

Plot 55: 1 GHz – 12 GHz

FCC_1_18_B_oH

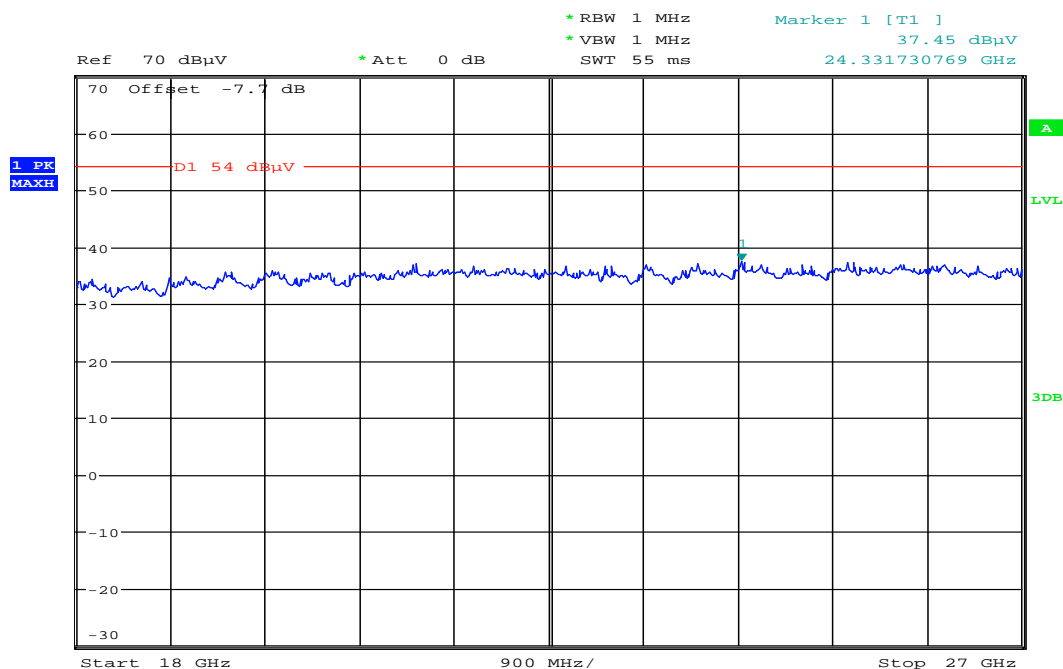


Plot 56: 12 GHz – 18 GHz



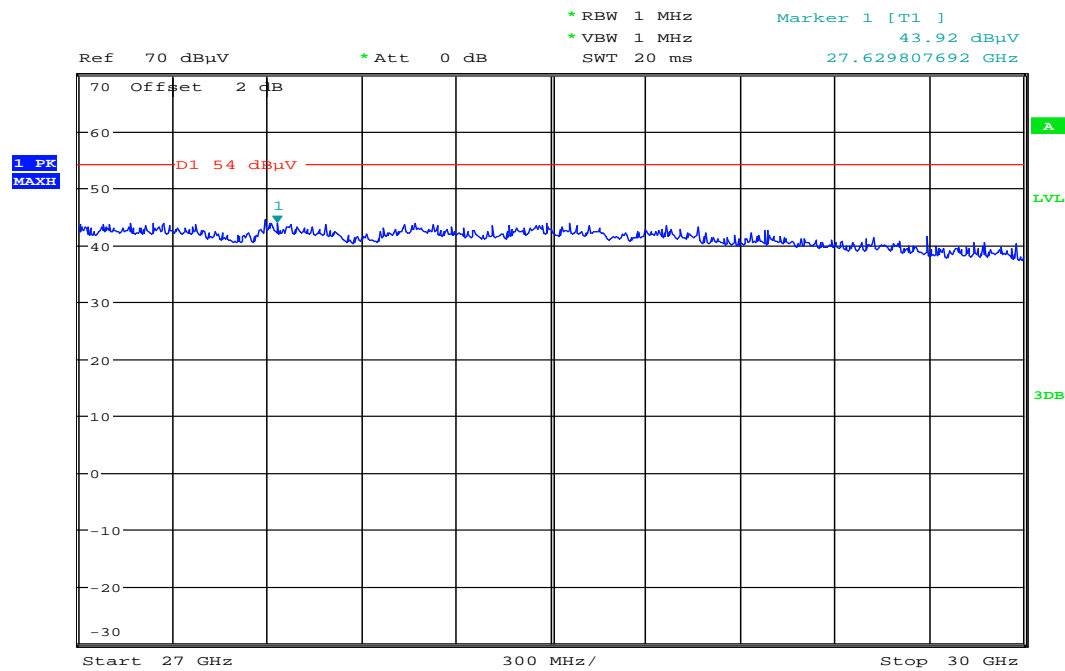
Date: 4.OCT.2011 13:10:42

Plot 57: 18 GHz – 27 GHz



Date: 4.OCT.2011 13:29:03

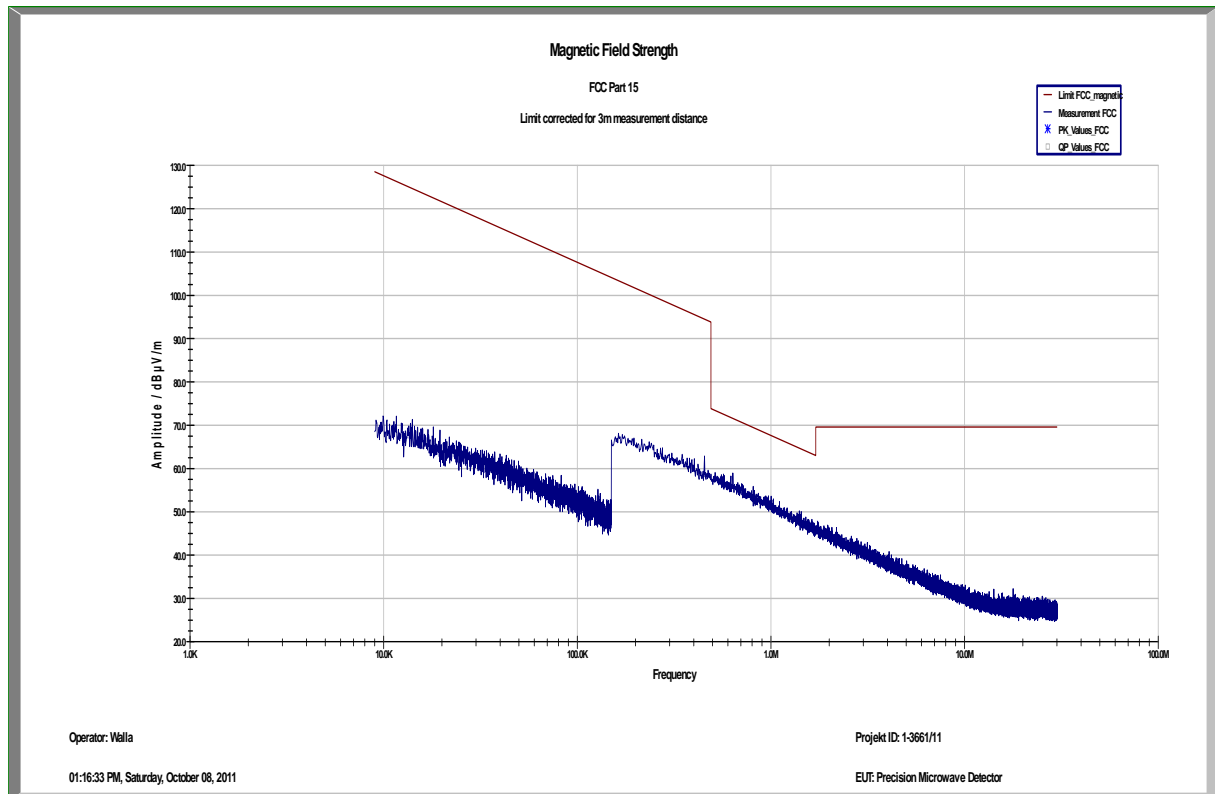
Plot 58: 27 GHz – 30 GHz



Date: 4.OCT.2011 13:32:30

- **Antenna 2:**

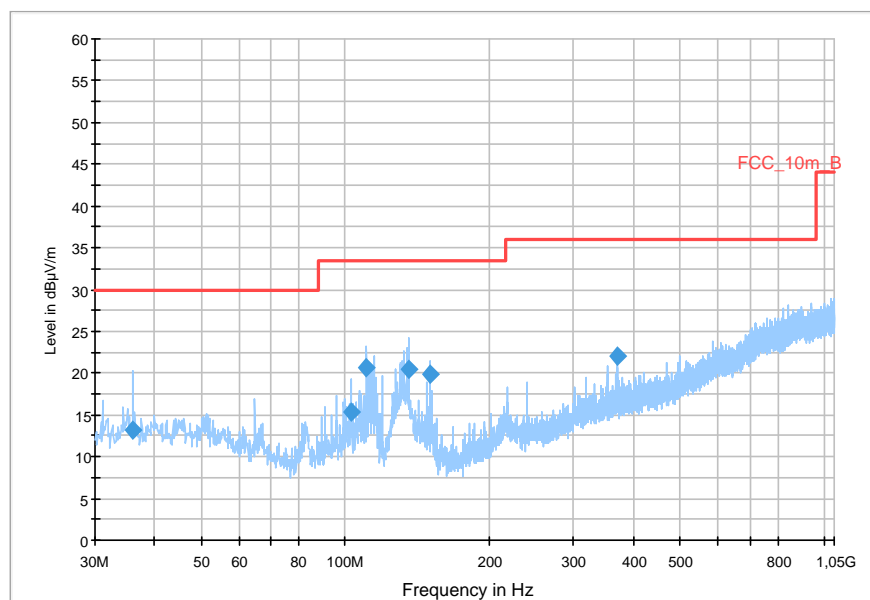
Plot 59: 9 kHz – 30 MHz (Valid for all channels)



Channel 1: 2405 MHz, antenna 2

Plot 60: 30 MHz – 1 GHz

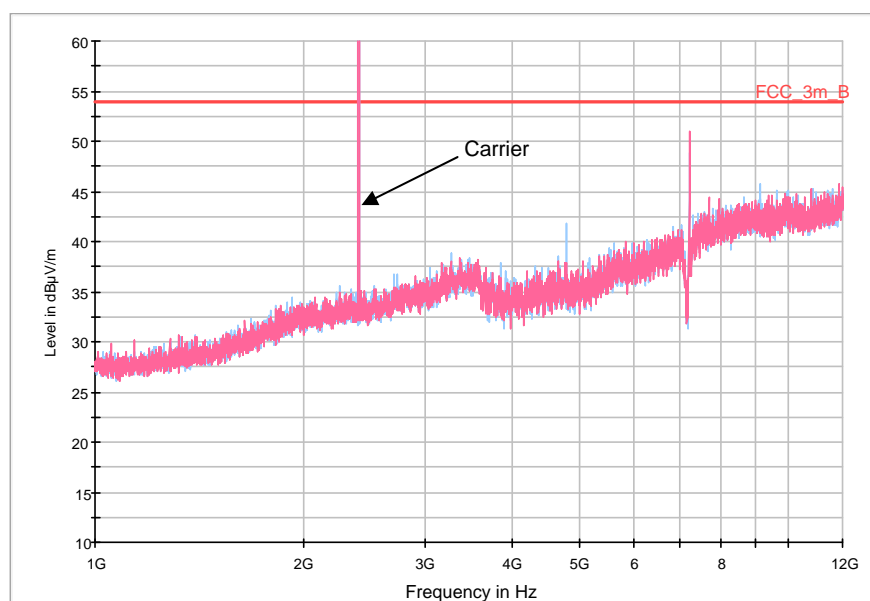
FCC_10m(B)_5



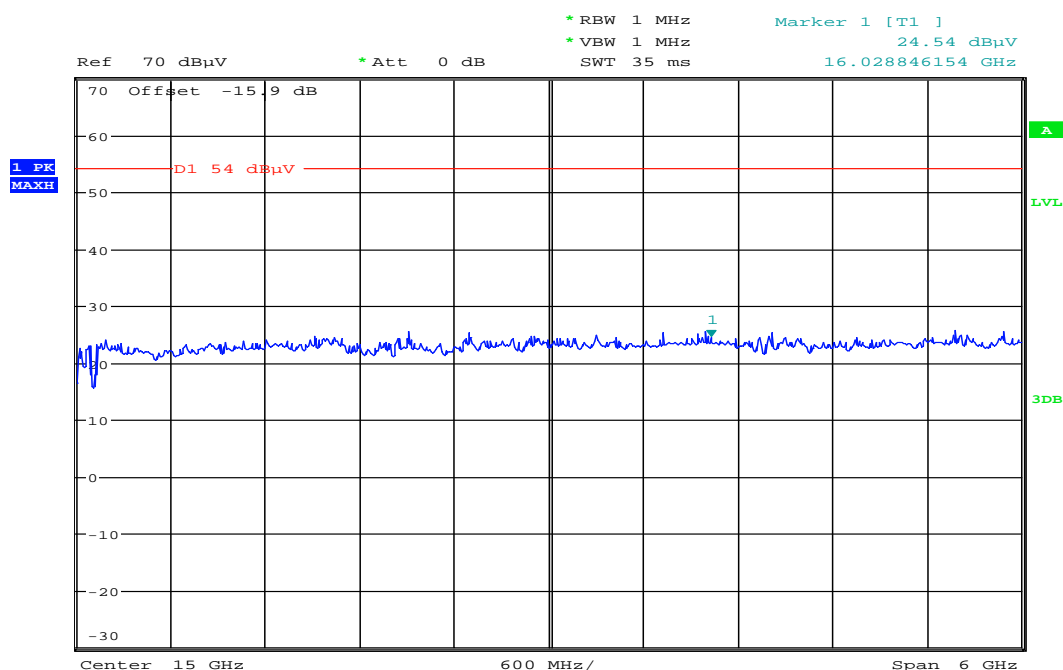
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
36.000000	13.2	1000.0	120.000	120.0	V	357.0	13.1	16.8	30.0
103.080000	15.4	1000.0	120.000	270.0	V	-2.0	11.6	18.1	33.5
110.880000	20.6	1000.0	120.000	98.0	V	133.0	11.0	12.9	33.5
135.960000	20.4	1000.0	120.000	98.0	V	27.0	9.0	13.1	33.5
150.000000	20.0	1000.0	120.000	98.0	V	97.0	8.9	13.5	33.5
369.120000	22.1	1000.0	120.000	249.0	H	97.0	16.4	13.9	36.0

Plot 61: 1 GHz – 12 GHz

FCC_1_18_B_oH

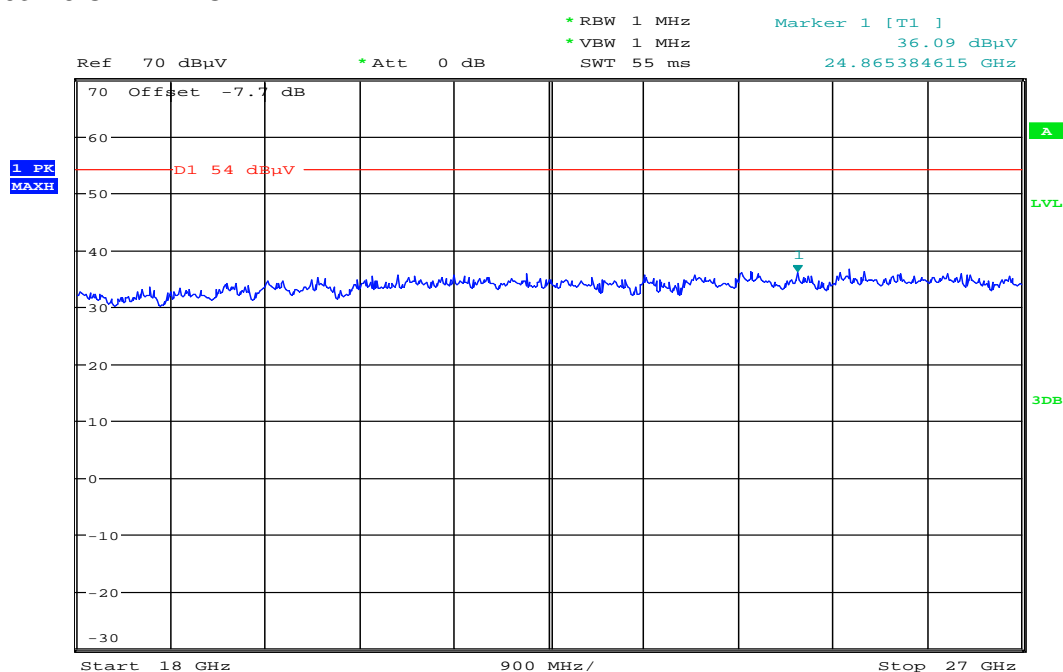


Plot 62: 12 GHz – 18 GHz



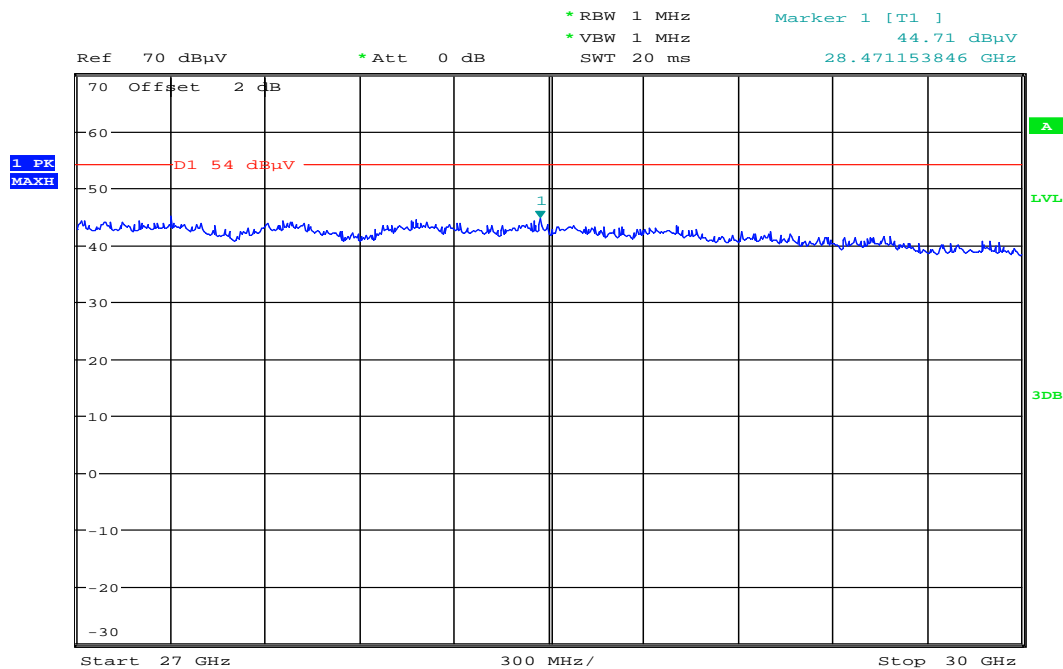
Date: 5.OCT.2011 10:38:09

Plot 63: 18 GHz – 27 GHz



Date: 5.OCT.2011 10:41:48

Plot 64: 27 GHz – 30 GHz

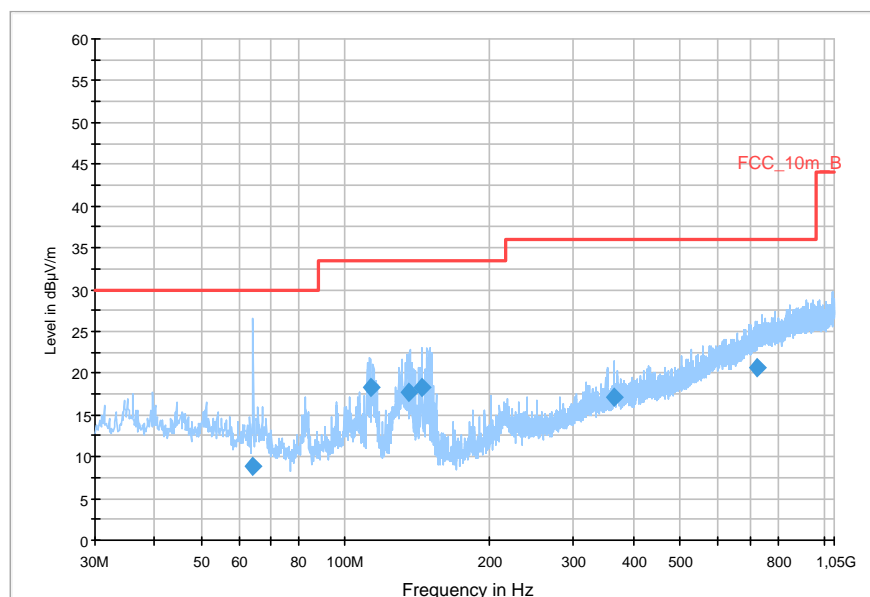


Date: 5.OCT.2011 11:03:23

Channel 2: 2440 MHz, antenna 2

Plot 65: 30 MHz – 1 GHz

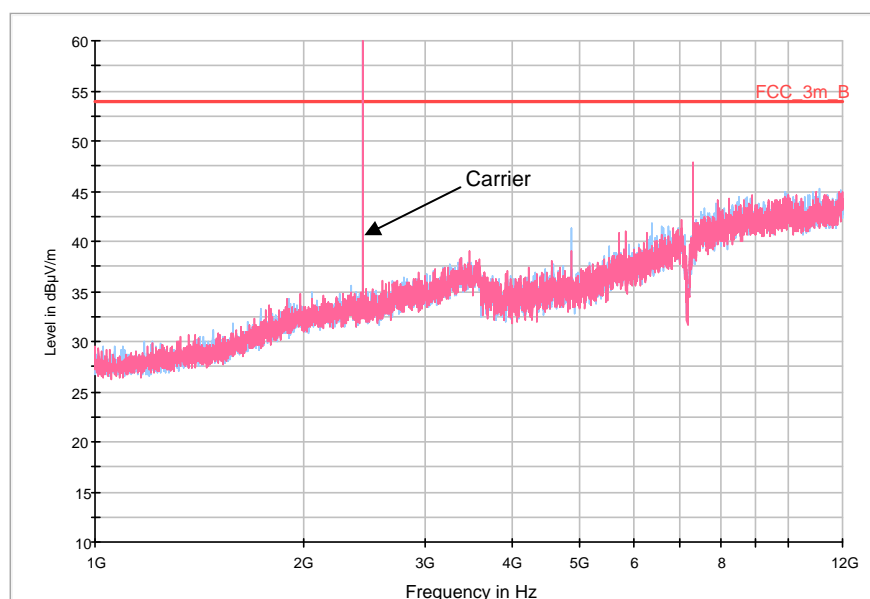
FCC_10m(B)_5



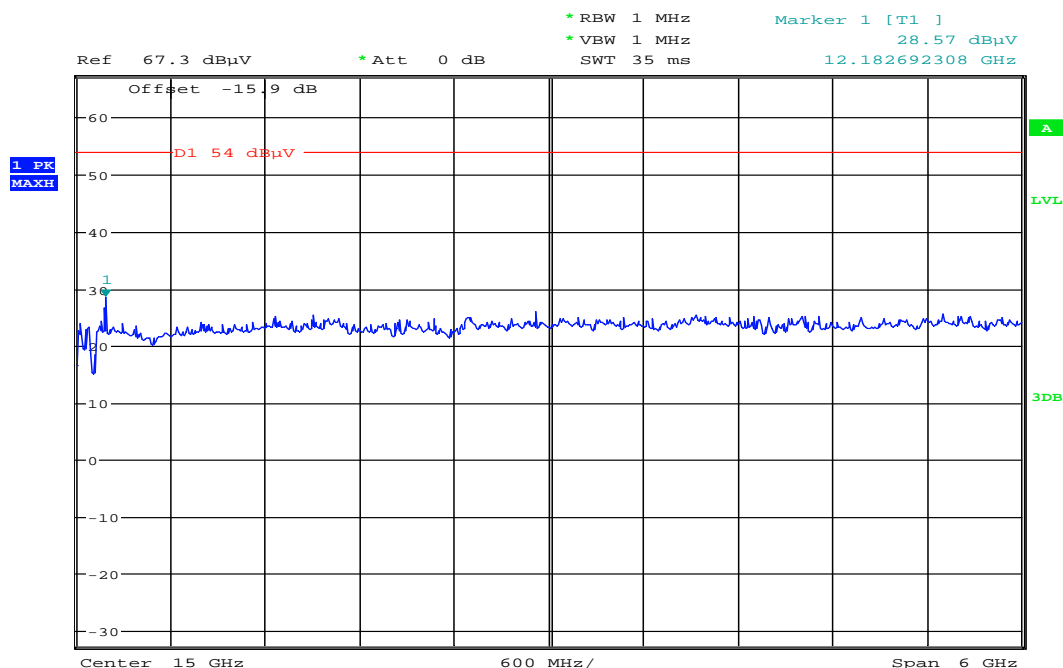
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
64.200000	8.9	1000.0	120.000	270.0	V	-2.0	10.6	21.1	30.0
112.800000	18.4	1000.0	120.000	98.0	V	-2.0	10.8	15.1	33.5
136.200000	17.7	1000.0	120.000	98.0	V	-2.0	8.9	15.8	33.5
144.600000	18.3	1000.0	120.000	98.0	V	342.0	8.8	15.2	33.5
363.240000	17.1	1000.0	120.000	270.0	H	92.0	16.3	18.9	36.0
722.520000	20.6	1000.0	120.000	159.0	H	144.0	23.0	15.4	36.0

Plot 66: 1 GHz – 12 GHz

FCC_1_18_B_oH

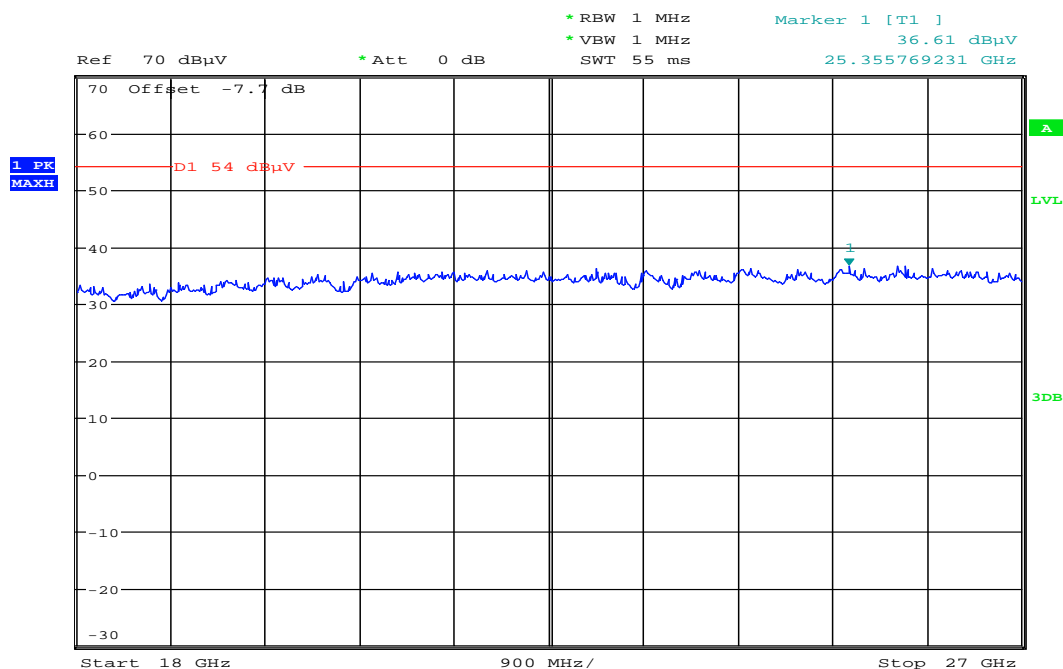


Plot 67: 12 GHz – 18 GHz



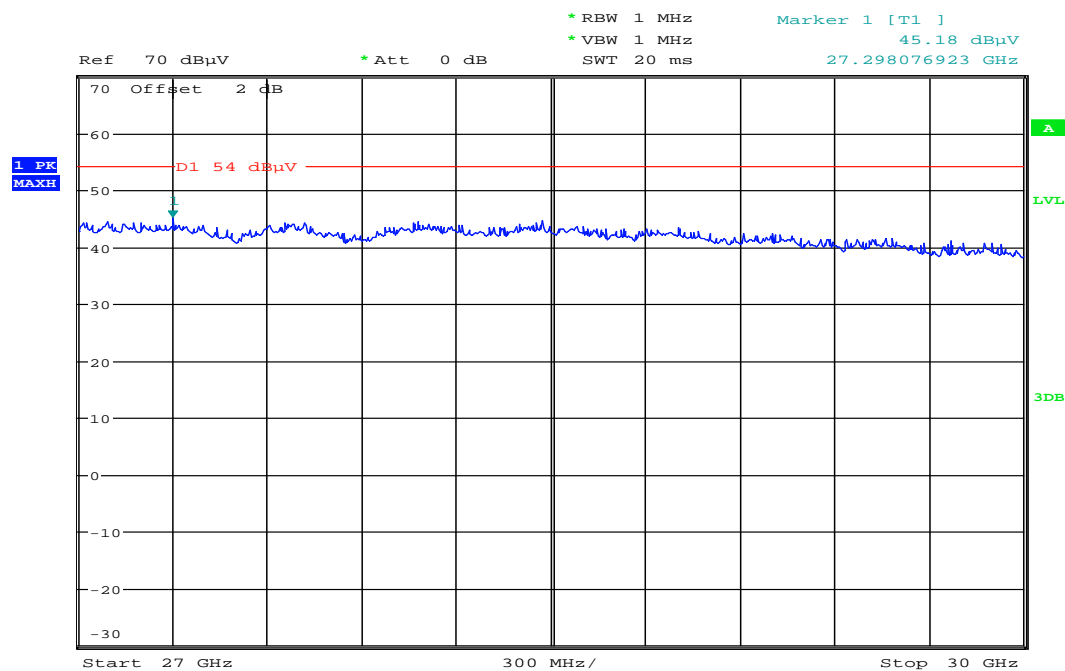
Date: 5.OCT.2011 10:36:15

Plot 68: 18 GHz – 27 GHz



Date: 5.OCT.2011 10:42:55

Plot 69: 27 GHz – 30 GHz

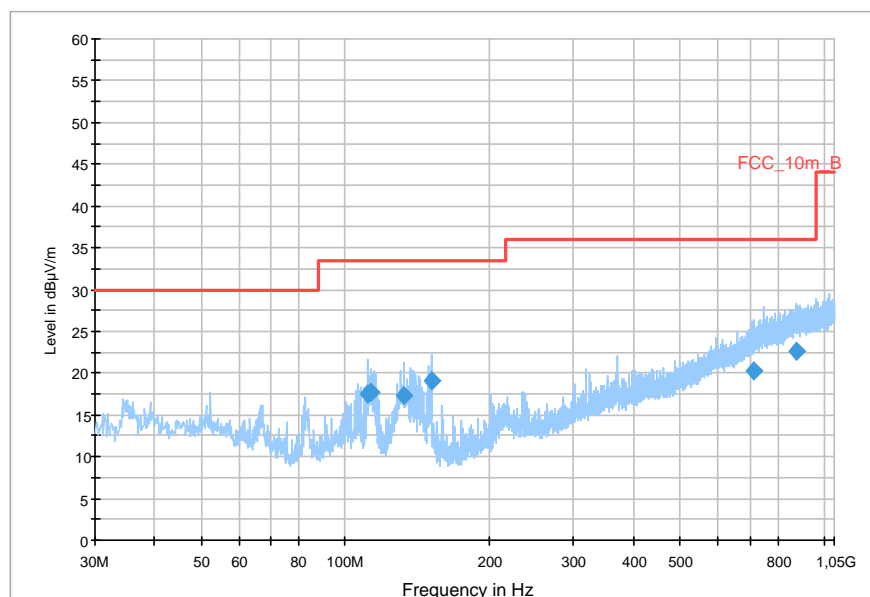


Date: 5.OCT.2011 11:03:44

Channel 3: 2480 MHz, antenna 2

Plot 70: 30 MHz – 1 GHz

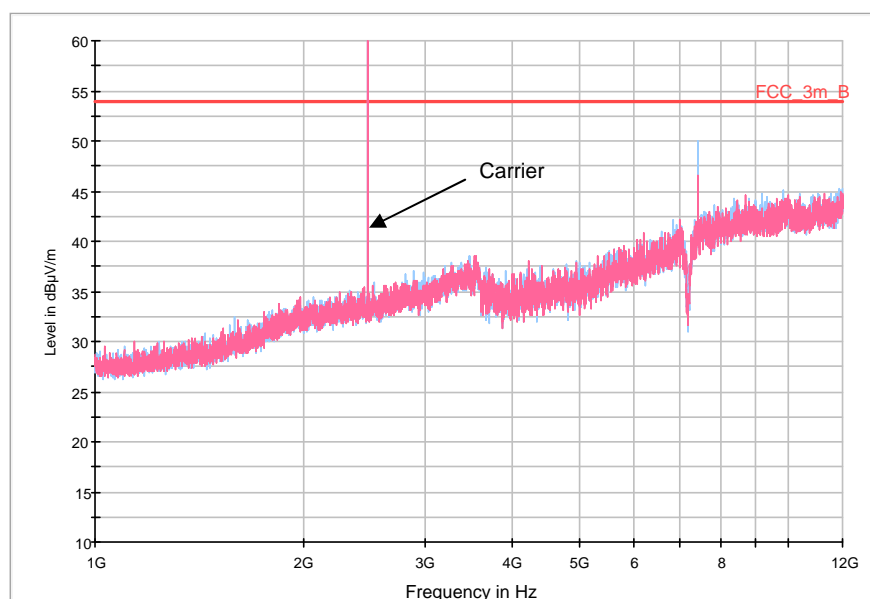
FCC_10m(B)_5



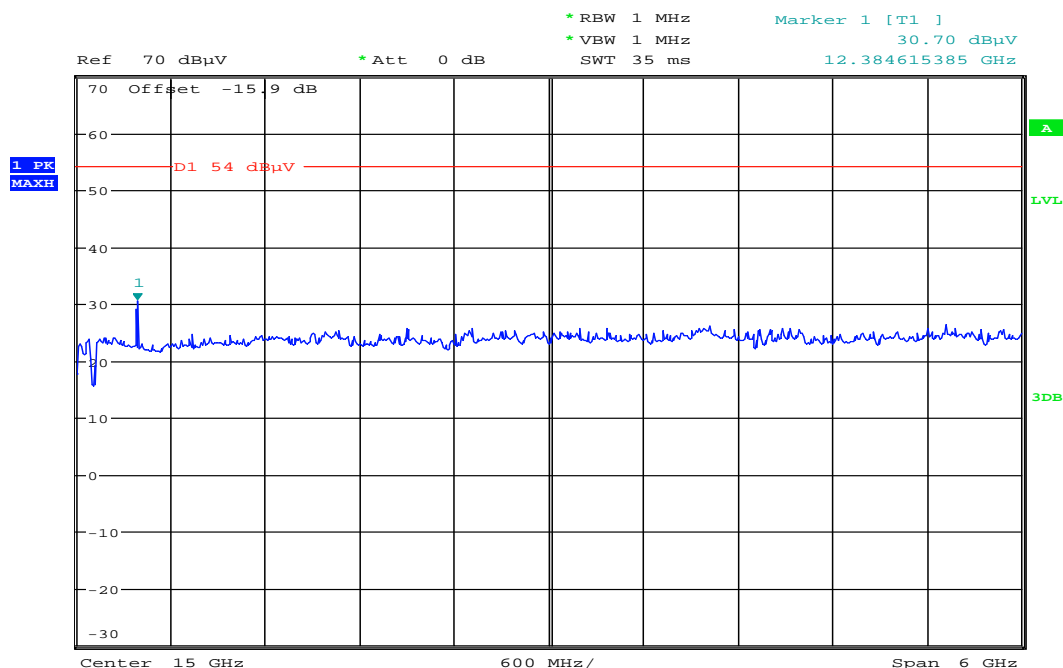
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
111.360000	17.4	1000.0	120.000	120.0	V	80.0	10.9	16.1	33.5
113.280000	17.6	1000.0	120.000	98.0	V	13.0	10.8	15.9	33.5
132.840000	17.3	1000.0	120.000	165.0	V	321.0	9.2	16.2	33.5
151.440000	19.1	1000.0	120.000	98.0	V	329.0	9.0	14.4	33.5
711.840000	20.4	1000.0	120.000	259.0	V	134.0	22.8	15.6	36.0
878.160000	22.6	1000.0	120.000	270.0	V	357.0	24.9	13.4	36.0

Plot 71: 1 GHz – 12 GHz

FCC_1_18_B_oH

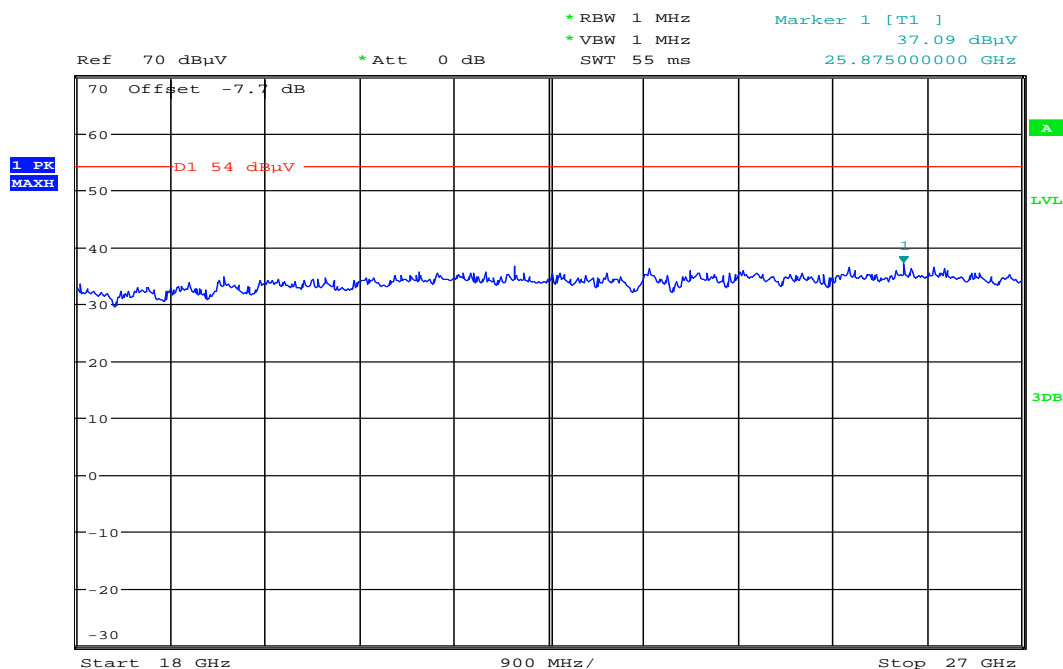


Plot 72: 12 GHz – 18 GHz



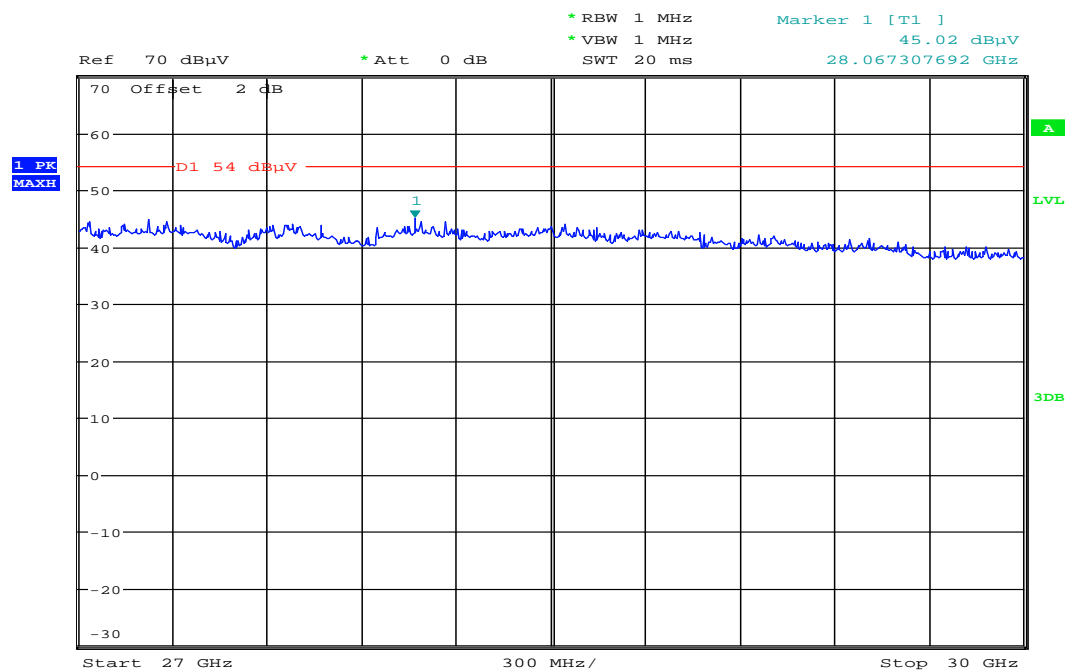
Date: 5.OCT.2011 10:39:39

Plot 73: 18 GHz – 27 GHz



Date: 5.OCT.2011 10:44:04

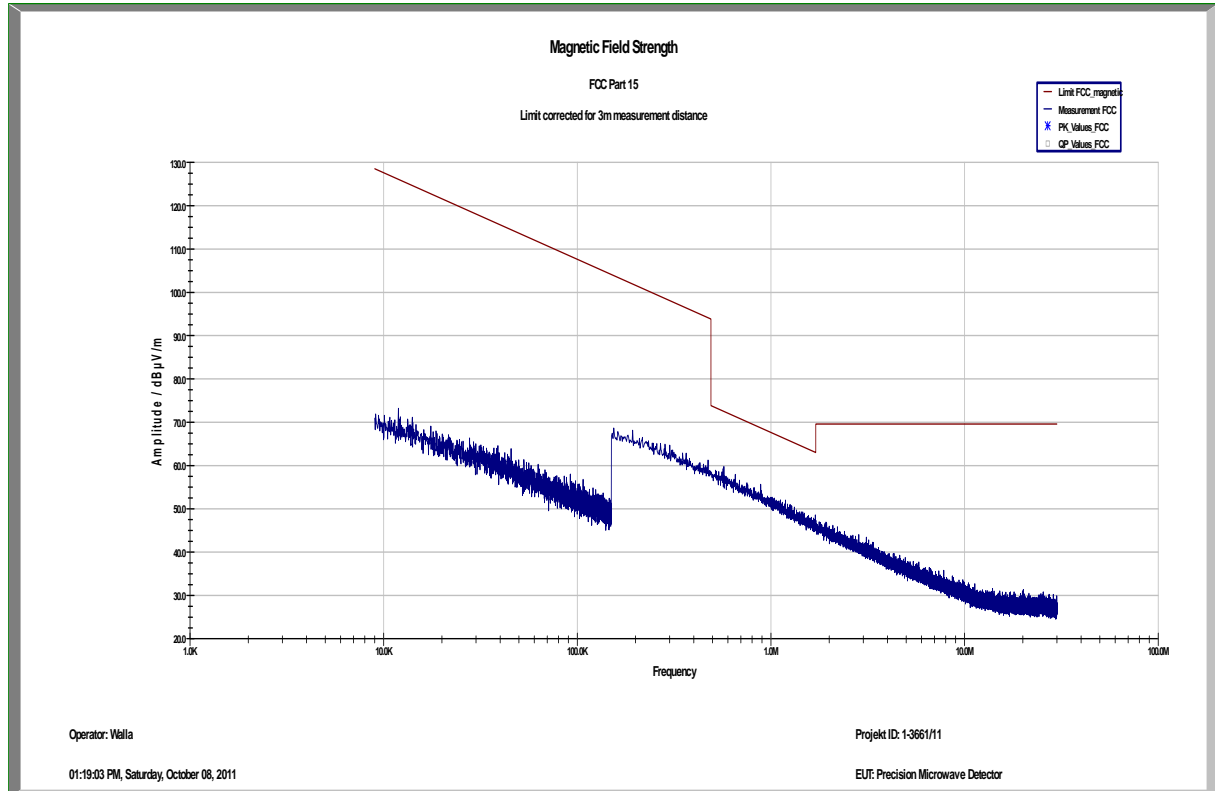
Plot 74: 27 GHz – 30 GHz



Date: 5.OCT.2011 11:04:29

- **Antenna 3:**

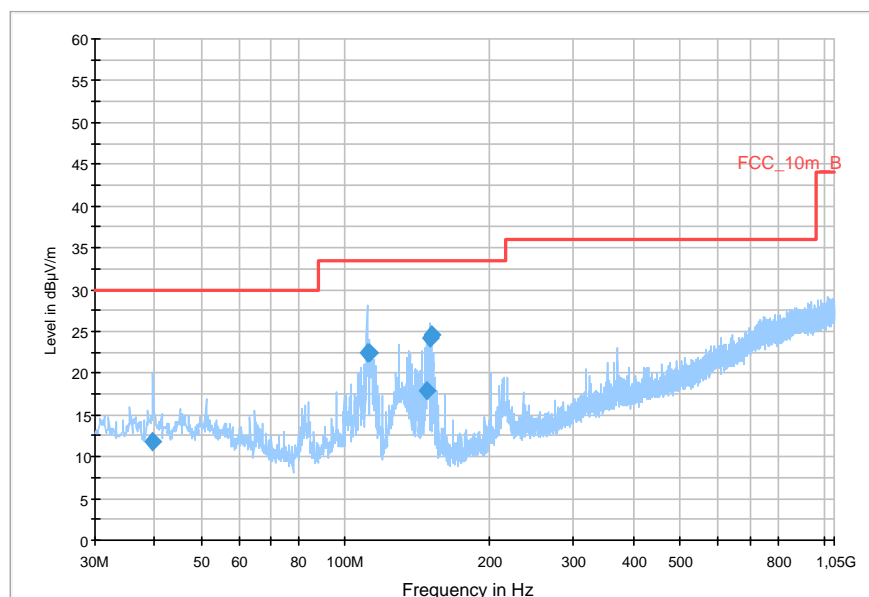
Plot 75: 9 kHz – 30 MHz (Valid for all channels)



Channel 1: 2405 MHz, antenna 3

Plot 76: 30 MHz – 1 GHz

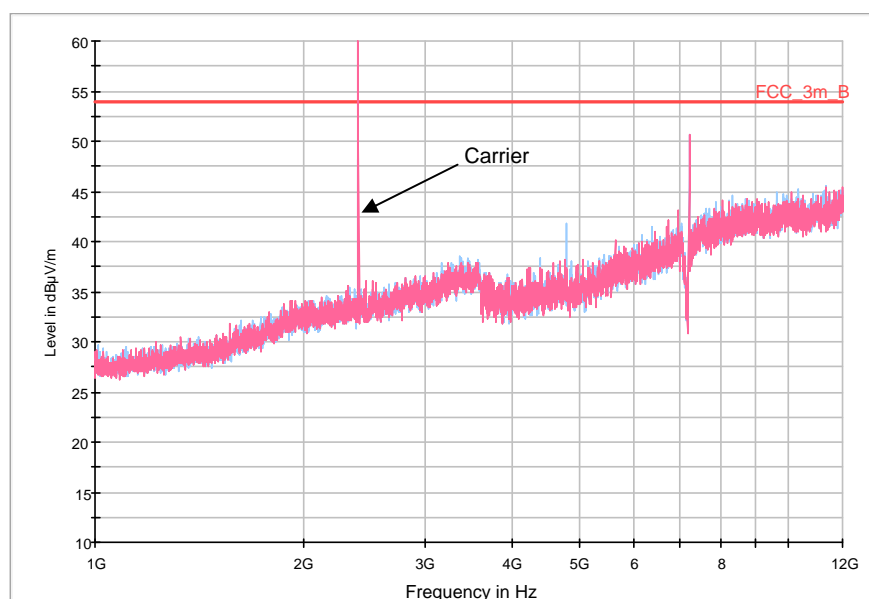
FCC_10m(B)_5



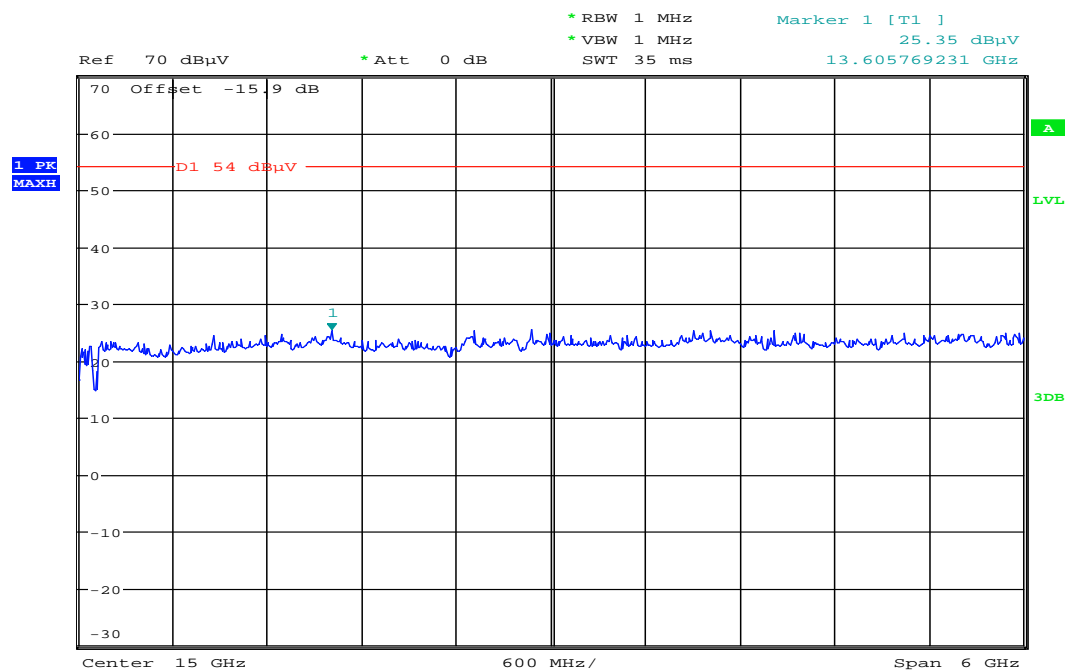
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
39.600000	11.8	1000.0	120.000	235.0	V	59.0	13.4	18.2	30.0
111.000000	22.5	1000.0	120.000	120.0	V	98.0	10.9	11.0	33.5
112.680000	22.4	1000.0	120.000	98.0	V	68.0	10.8	11.1	33.5
148.080000	17.8	1000.0	120.000	98.0	V	81.0	8.9	15.7	33.5
150.000000	24.1	1000.0	120.000	112.0	V	108.0	8.9	9.4	33.5
151.080000	24.6	1000.0	120.000	134.0	V	90.0	9.0	8.9	33.5

Plot 77: 1 GHz – 12 GHz

FCC_1_18_B_oH

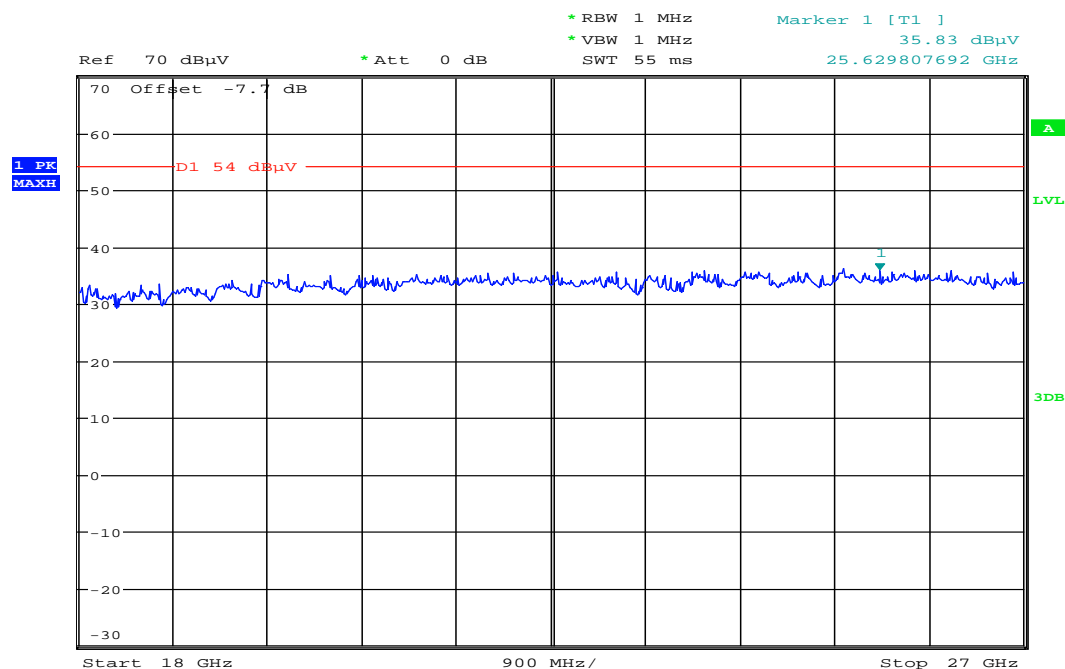


Plot 78: 12 GHz – 18 GHz



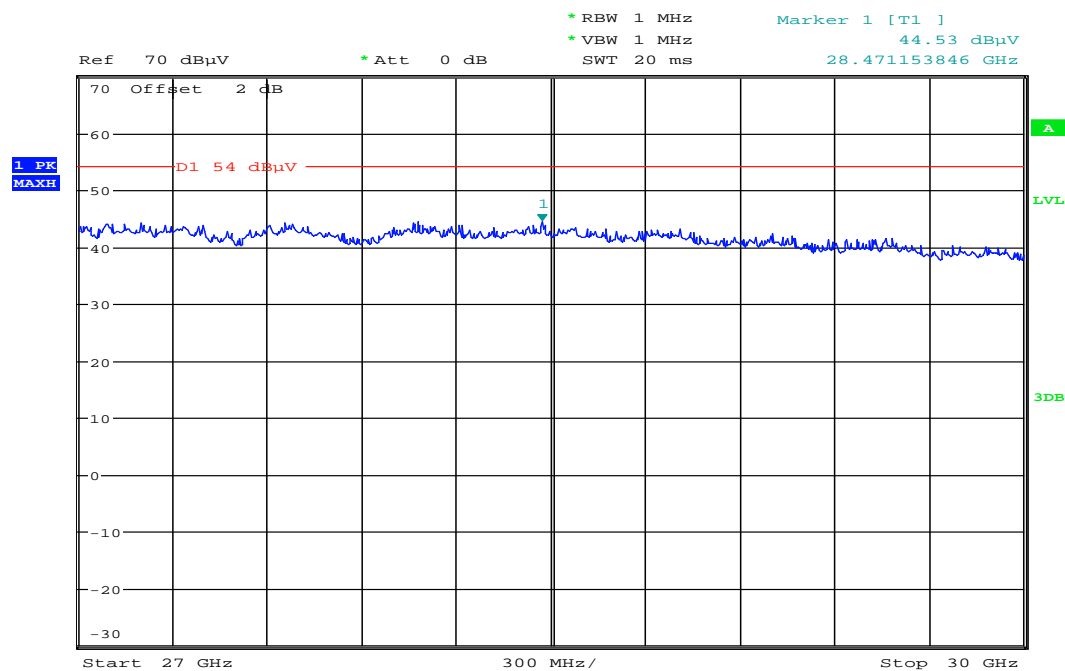
Date: 5.OCT.2011 10:37:39

Plot 79: 18 GHz – 27 GHz



Date: 5.OCT.2011 10:45:17

Plot 80: 27 GHz – 30 GHz

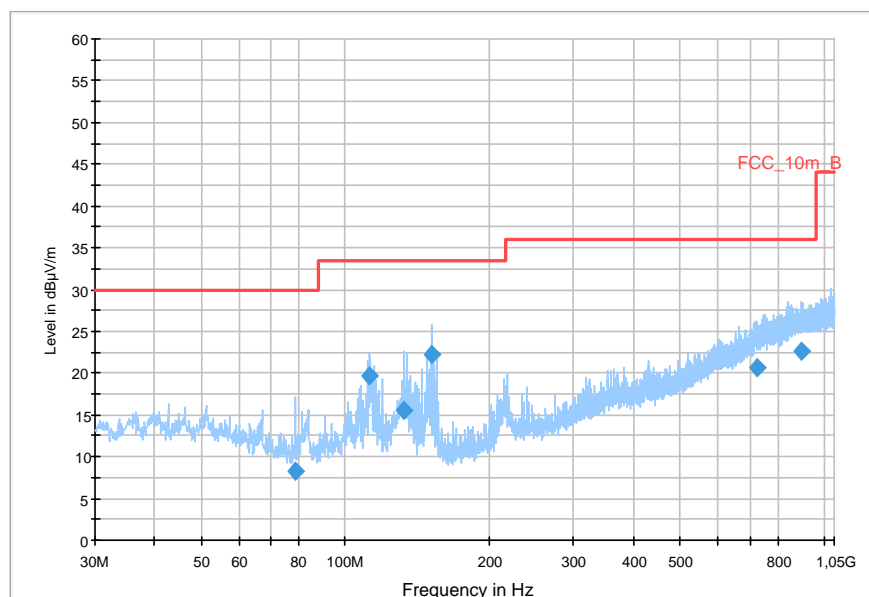


Date: 5.OCT.2011 11:02:36

Channel 2: 2440 MHz, antenna 3

Plot 81: 30 MHz – 1 GHz

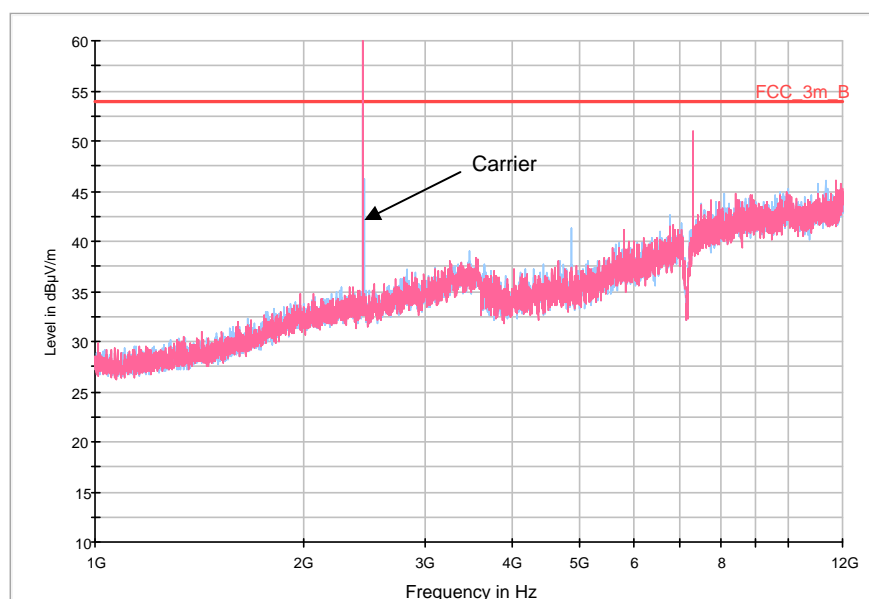
FCC_10m(B)_5



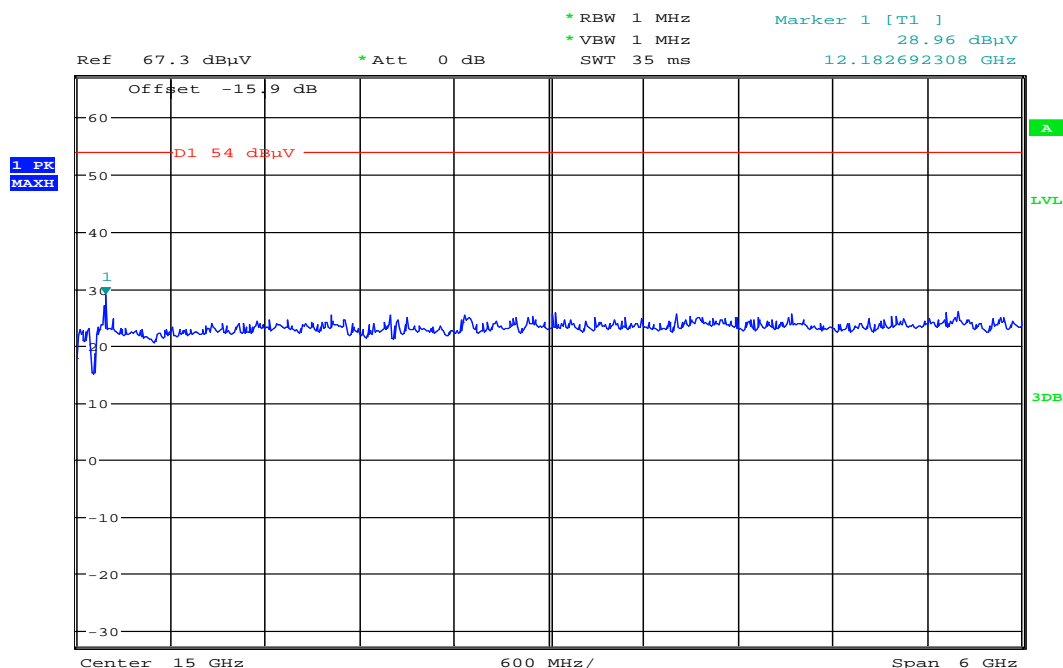
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
78.480000	8.3	1000.0	120.000	196.0	V	319.0	9.1	21.7	30.0
112.680000	19.7	1000.0	120.000	98.0	V	132.0	10.8	13.8	33.5
132.960000	15.5	1000.0	120.000	143.0	V	335.0	9.2	18.0	33.5
151.080000	22.2	1000.0	120.000	105.0	V	292.0	9.0	11.3	33.5
725.280000	20.6	1000.0	120.000	270.0	V	225.0	23.1	15.4	36.0
899.640000	22.7	1000.0	120.000	123.0	V	292.0	25.2	13.3	36.0

Plot 82: 1 GHz – 12 GHz

FCC_1_18_B_oH

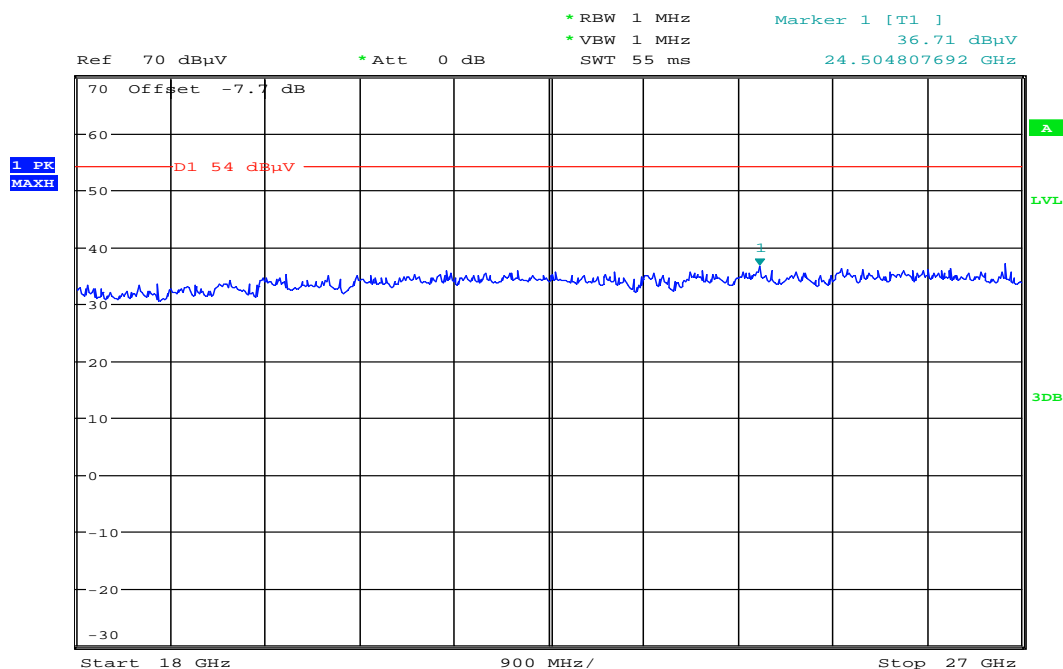


Plot 83: 12 GHz – 18 GHz



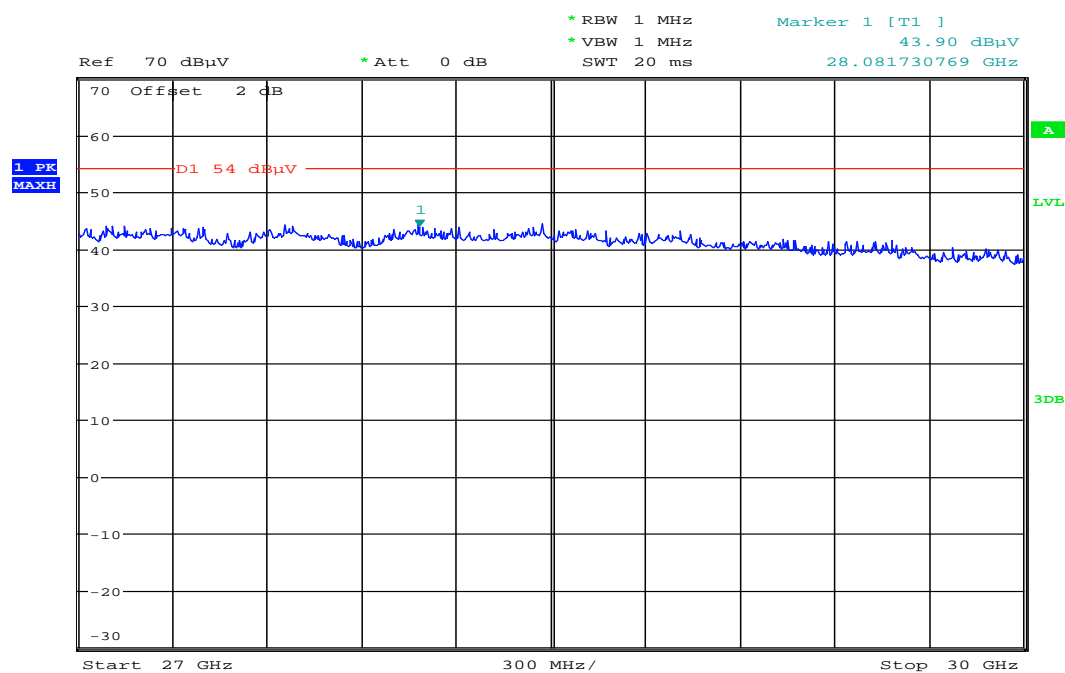
Date: 5.OCT.2011 10:36:56

Plot 84: 18 GHz – 27 GHz



Date: 5.OCT.2011 10:45:43

Plot 85: 27 GHz – 30 GHz

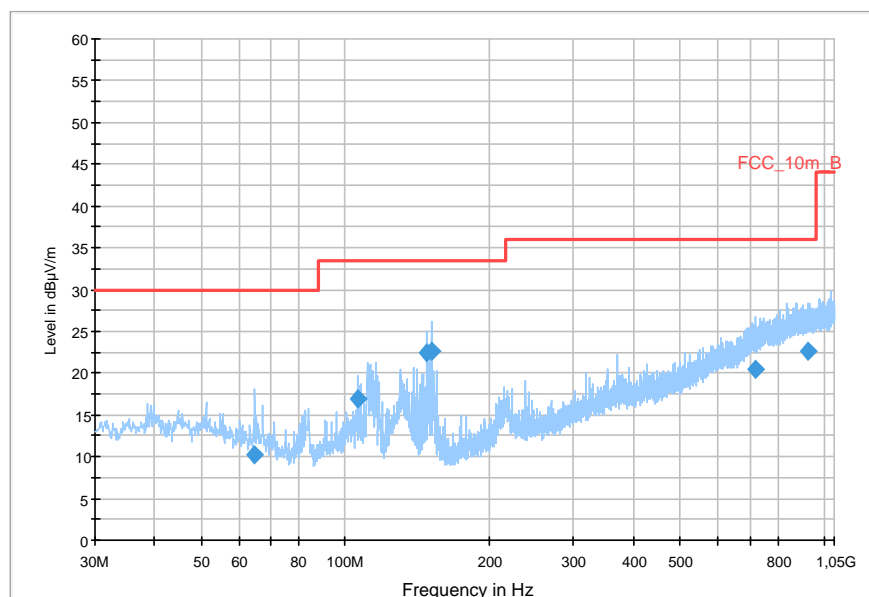


Date: 5.OCT.2011 11:02:18

Channel 3: 2480 MHz, antenna 3

Plot 86: 30 MHz – 1 GHz

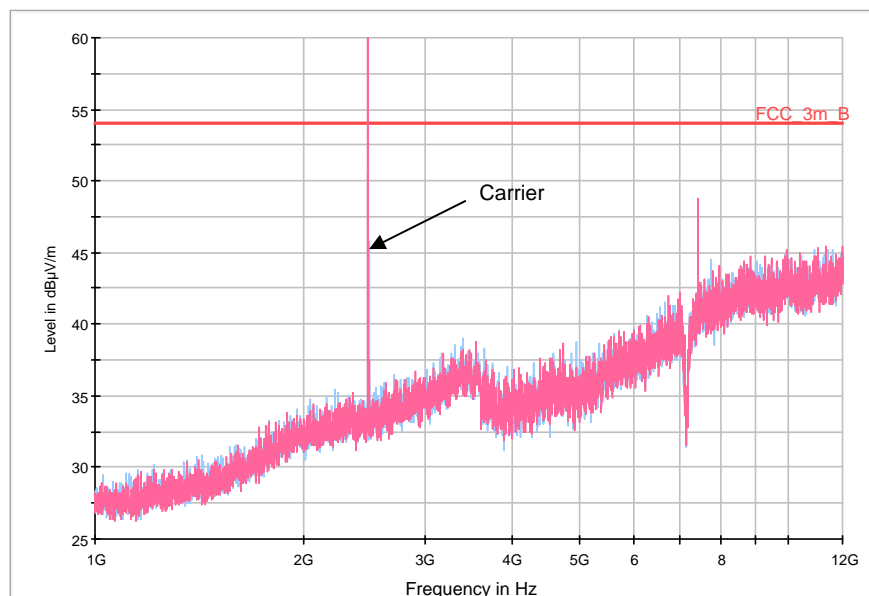
FCC_10m(B)_5



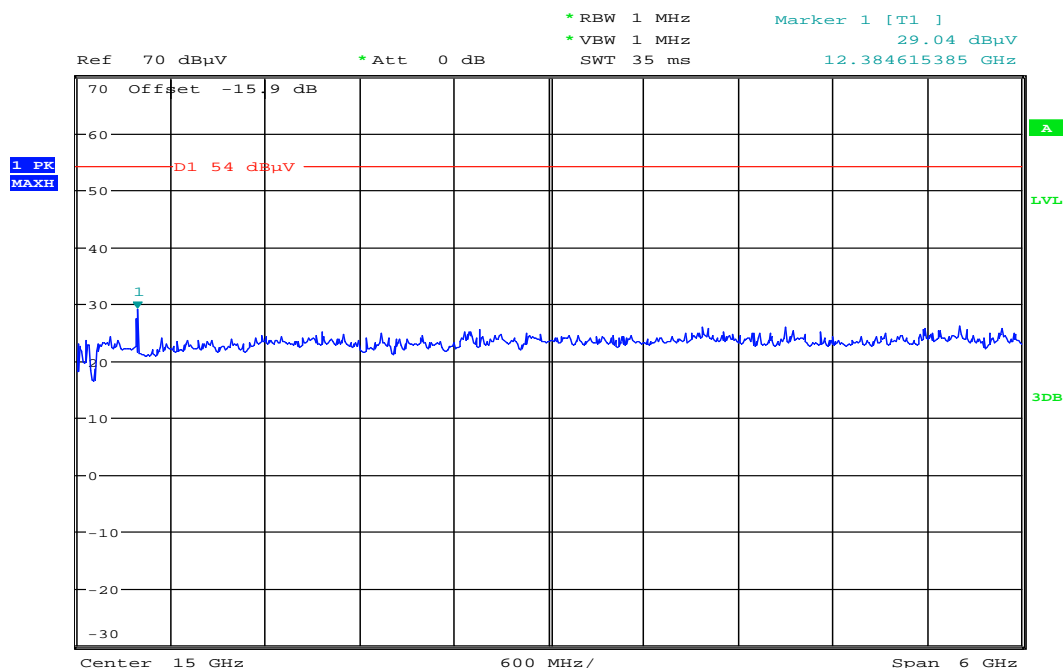
Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
64.800000	10.2	1000.0	120.000	154.0	V	-2.0	10.5	19.8	30.0
106.200000	16.9	1000.0	120.000	98.0	V	135.0	11.4	16.6	33.5
148.200000	22.4	1000.0	120.000	124.0	V	117.0	8.9	11.1	33.5
151.320000	22.6	1000.0	120.000	123.0	V	117.0	9.0	10.9	33.5
720.480000	20.5	1000.0	120.000	270.0	H	180.0	23.0	15.5	36.0
928.200000	22.7	1000.0	120.000	145.0	V	180.0	25.3	13.3	36.0

Plot 87: 1 GHz – 12 GHz

FCC_1_18_B_oH

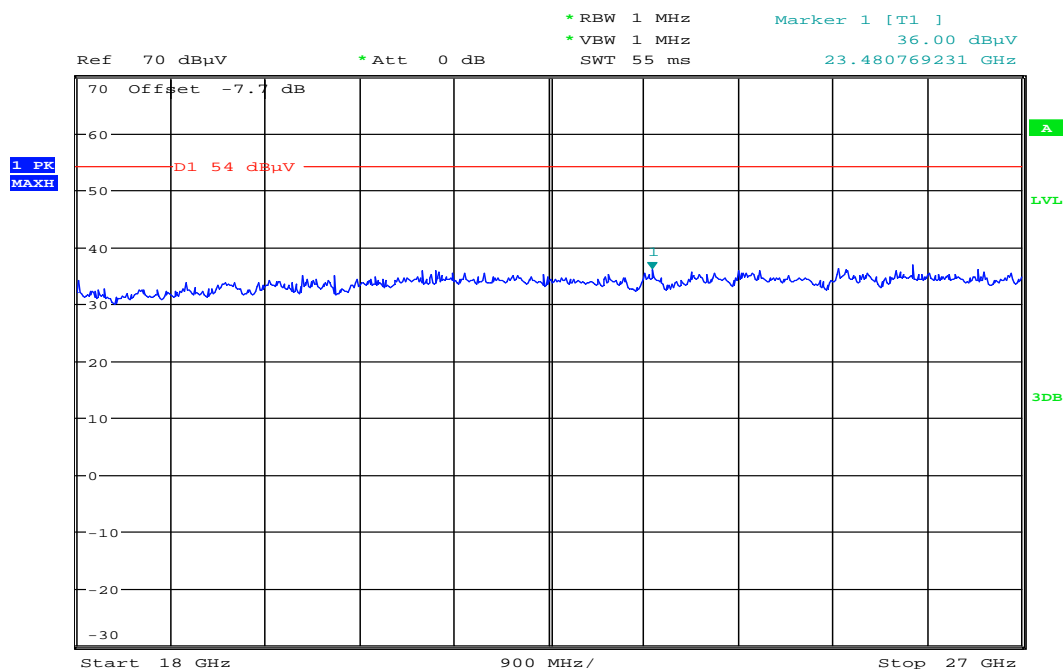


Plot 88: 12 GHz – 18 GHz



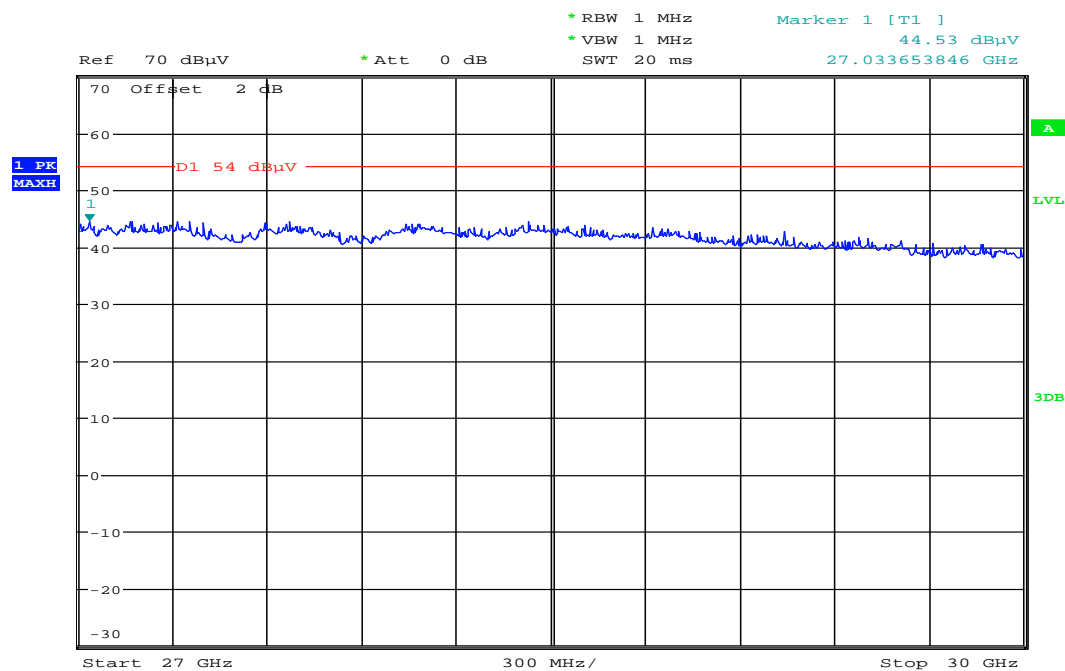
Date: 5.OCT.2011 10:40:12

Plot 89: 18 GHz – 27 GHz



Date: 5.OCT.2011 10:44:45

Plot 90: 27 GHz – 30 GHz



Date: 5.OCT.2011 11:01:43

Result: The measurement is passed.

9.6 RX spurious emissions radiated

As soon as the Precision Microwave Detector PMD 2450 with integral control and display touch screen is powered up, TX and RX start operating.

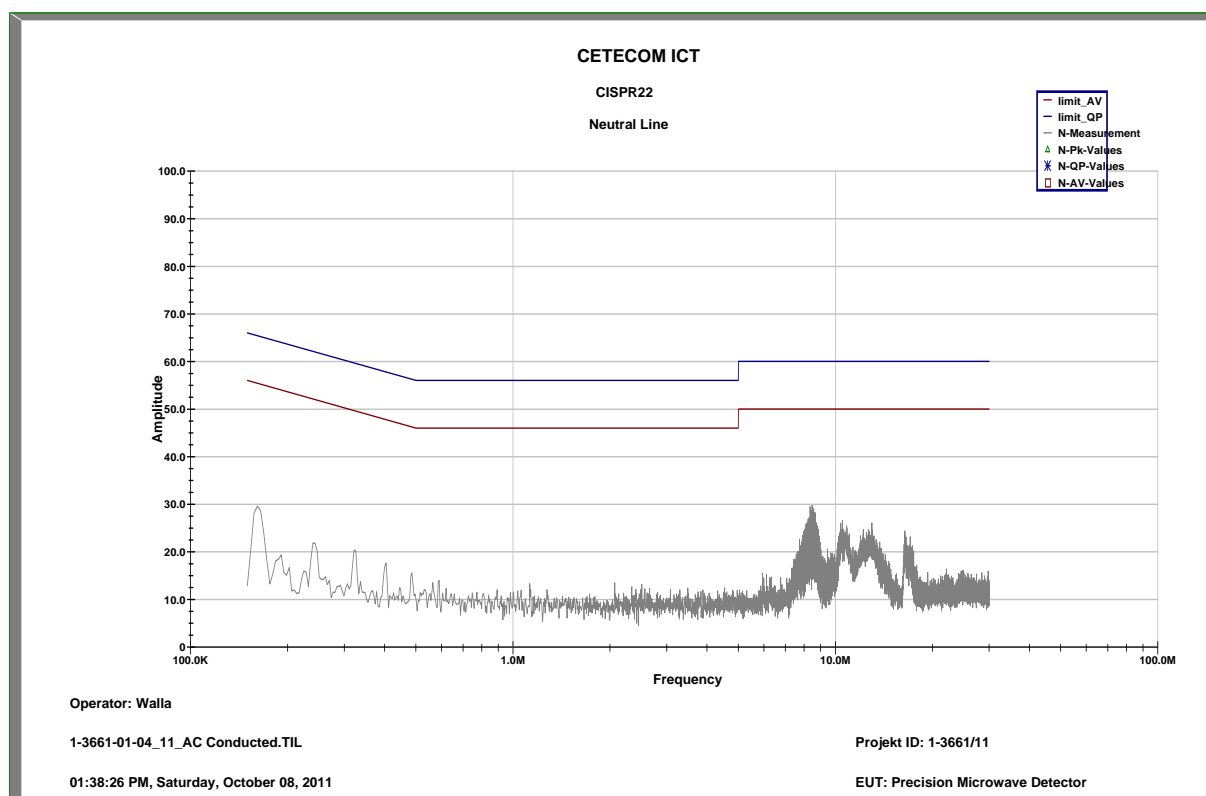
No separate Rx mode available.

9.7 Conducted limits

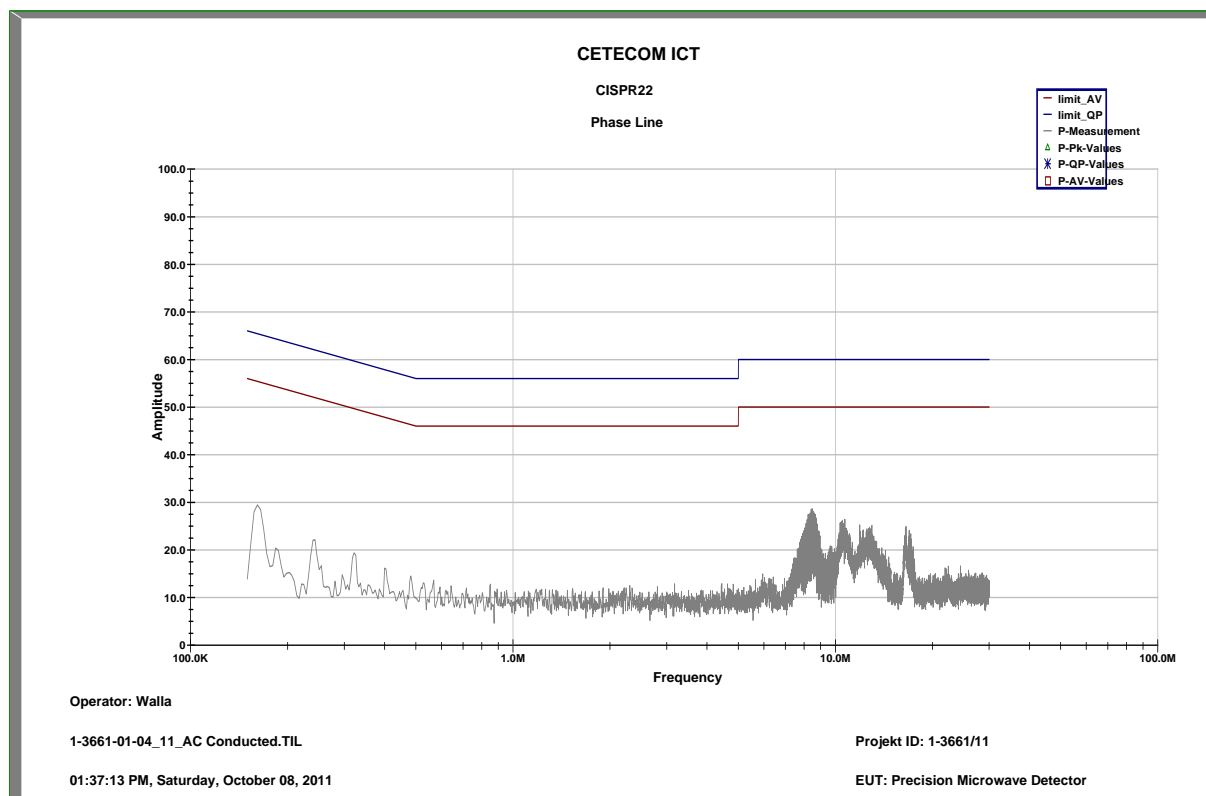
Measurement:

Measurement parameter	
Detector:	Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	10 kHz
Video bandwidth:	10 kHz
Span:	150 kHz – 30 MHz
Trace-Mode:	Max Hold

Plot 91: Neutral line, (Valid for all antennas and all channels)



Plot 92: Phase line, (Valid for all antennas and all channels)



Limits:

FCC		IC	
SUBCLAUSE § 15.107 / 15.207		-/-	
Conducted limits			
Frequency of Emission (MHz)	Conducted Limit (dBµV)		
	Quasi-peak	Average	
0.15 – 0.5	66 to 56 *	56 to 46 *	
0.5 – 5	56	46	
5 - 30	60	50	

*Decreases with the logarithm of the frequency

Result: The measurement is passed.

9.8 Frequency tolerance

Description:

The Frequency tolerance over temperature / over voltage is defined as the frequency deviation compared to the measured frequency (operating frequency) at 23 °C over the defined operating temperature range (-20 °C to +50°C) / voltage range (98 V to 135 V).

FREQUENCY TOLERANCE					
Over temperature variation			Over voltage variation		
2401.665 570 MHz (Operating frequency)			2401.665 570 MHz (Operating frequency)		
T [°C]	Frequency [MHz]	result	Power voltage [V]	Frequency [MHz]	result
-20°	2401.666 350	Pass	98	2401.665 570	Pass
-10°	2401.666 425	Pass	100	2401.665 570	Pass
0°	2401.666 620	Pass	105	2401.665 570	Pass
10°	2401.666 525	Pass	110	2401.665 570	Pass
20°	2401.666 150	Pass	115	2401.665 570	Pass
30°	2401.665 535	Pass	120	2401.665 570	Pass
40°	2401.665 275	Pass	125	2401.665 570	Pass
50°	2401.665 400	Pass	135	2401.665 570	Pass
Measurement uncertainty			±100 Hz		

Limits:

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.001\%$ of the operating frequency over a temperature variation of - 20°C to +50°C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C.

Result: The measurement is passed.

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	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	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	Agilent	MY48250080	300003812	08.09.2010	08.09.2012
5	EMI Preselector 9 kHz - 1 GHz (N9039A)	Agilent	MY48260003	300003825	08.09.2010	08.09.2012
6	Microwave Analog Signal Generator (N5183A)	Agilent	MY47420220	300003813	08.09.2010	08.09.2012
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	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.	
26	Control Computer	F+W	FW0502032	300003303	-/-	-/-
27	Trilog Antenna VULB 9163	Schwarzbeck	295	300003787	01.04.2010	01.04.2012
28	Amplifier - 0518C-138	Veritech	-/-	-/-	-/-	-/-
29	Switch - 3488A	HP		300000368	-/-	-/-
30	EMI Test receiver - ESCI	R&S	100083	300003312	05.01.2011	05.01.2013
31	Turntable Controller - 1061 3M	EMCO	1218	300000661	-/-	-/-
32	Tower Controller / 1051 Controller	EMCO	1262	300000625	-/-	-/-
33	Tower - 1051	EMCO	1262	300000625	-/-	-/-
34	Ultra Notch-Filter Rejected band Ch. 62	WRCD	9	-/-	-/-	-/-
35	Spectrum Analyser FSU50	R&S	200012	300003443	01.07.2010	01.07.2012
36	Spectrum Analyser 8565E	HP	3738A00773	300001665	08.01.2010	08.01.2012
37	Amplifier 0.1 to 26.0 GHz 83017A	HP	00419	300002267	10.03.2011	10.03.2012
38	DC Power supply 6038A	HP	2848A07027	300001174	07.01.2009	07.01.2012
39	RF-cable	H & S		-/-	cyclic verification	

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
v/k!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

Annex A Photographs of the test setup

Photo 1: EUT and antenna 1

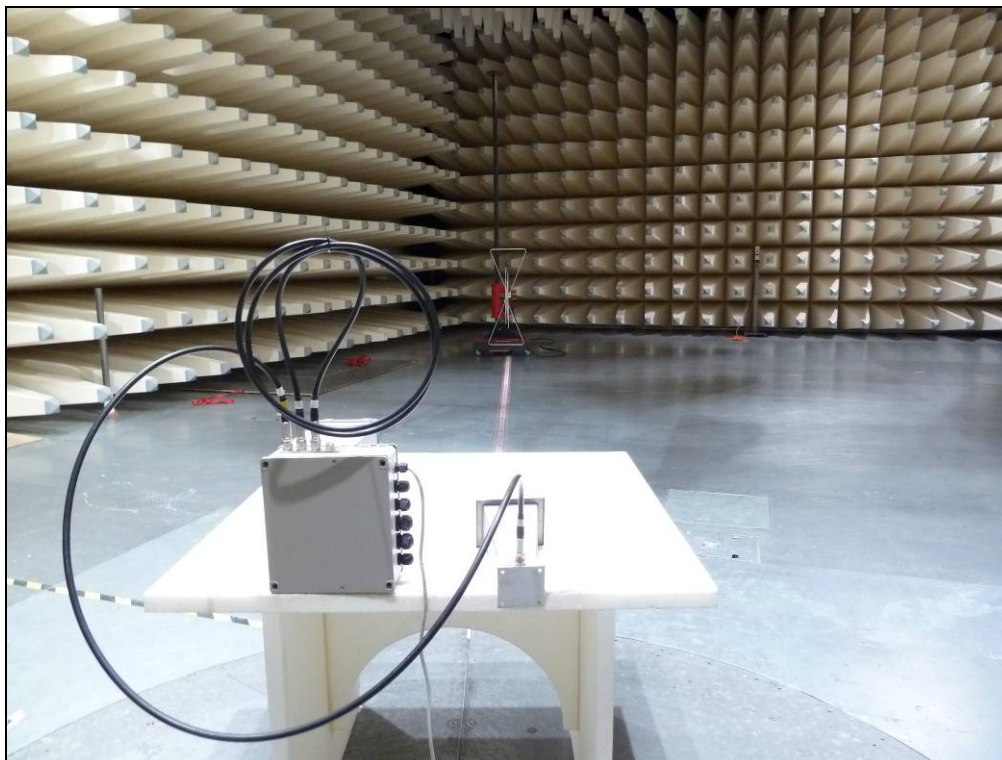


Photo 2: EUT and antenna 1

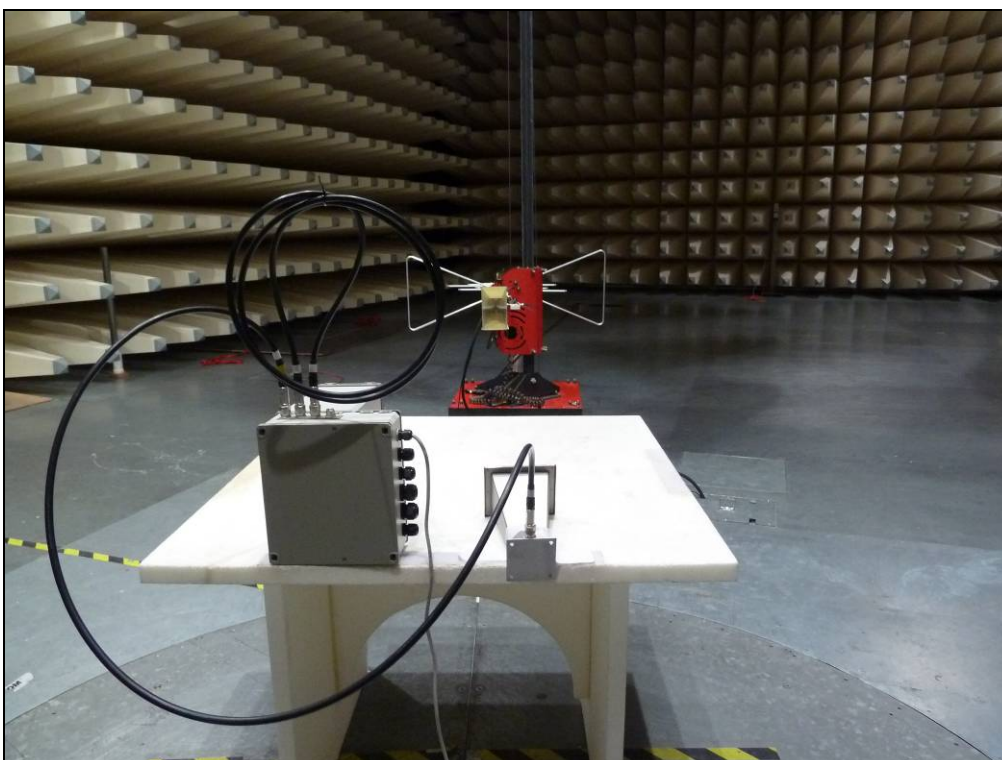


Photo 3: EUT and antenna 2

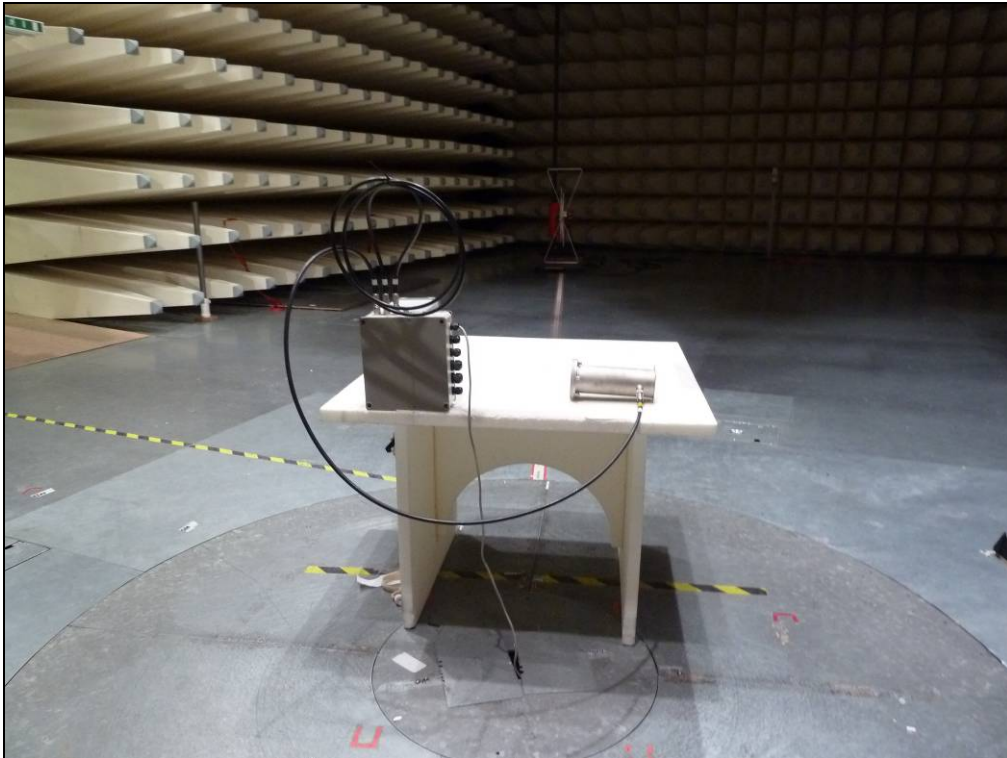


Photo 4: EUT and antenna 2

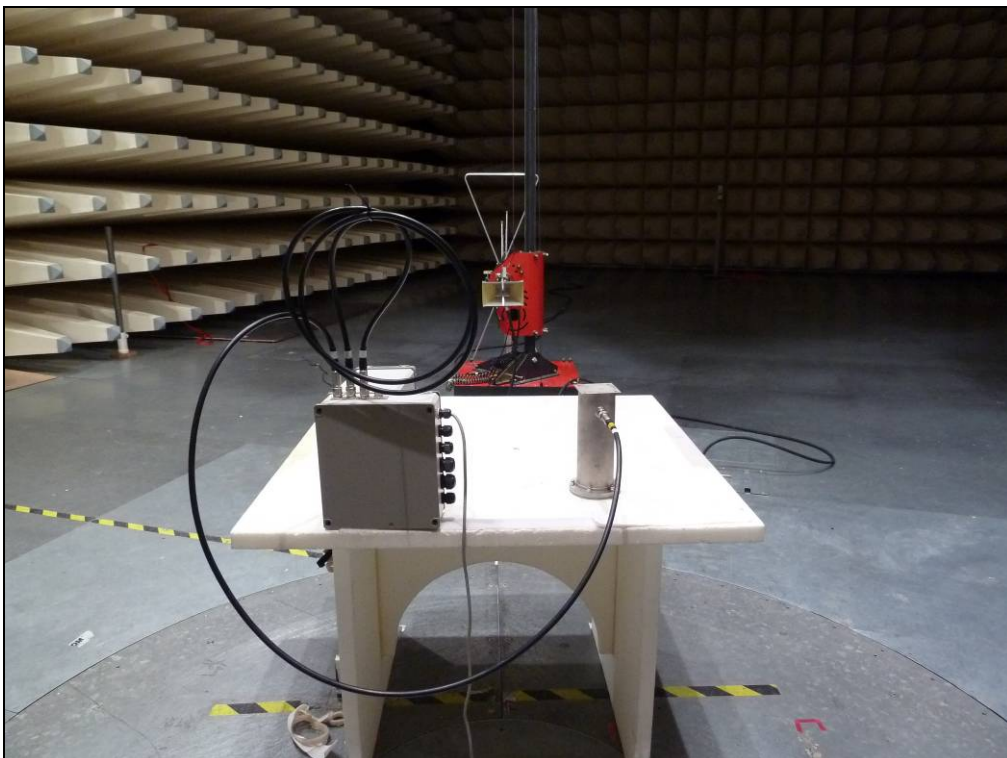


Photo 5: EUT and antenna 3

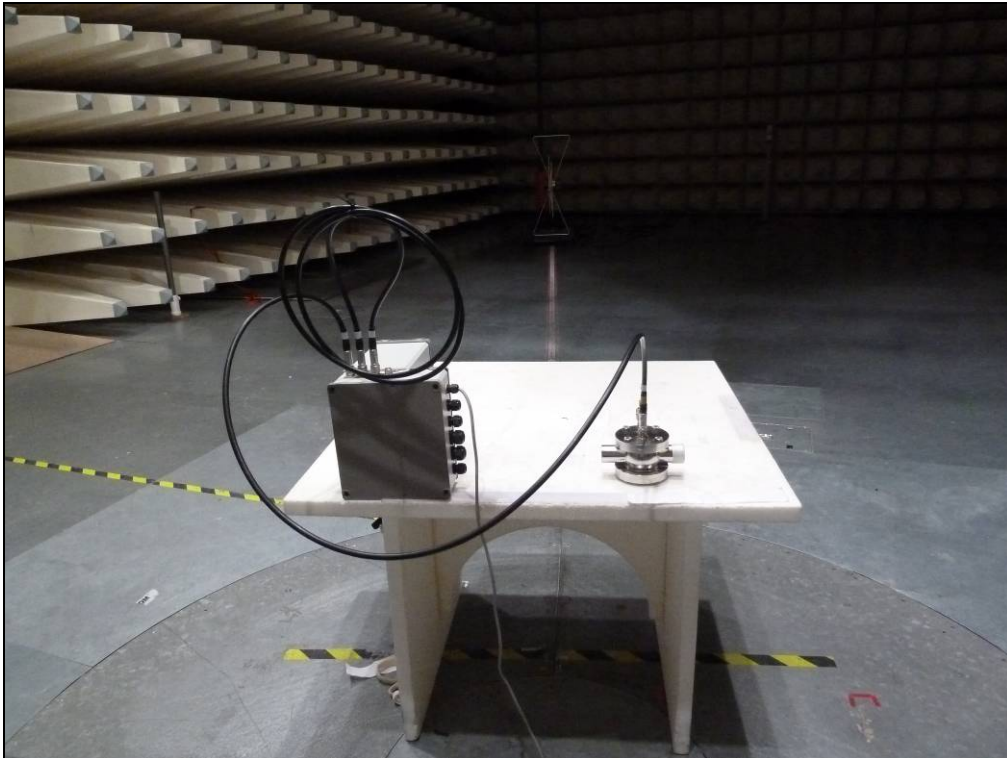
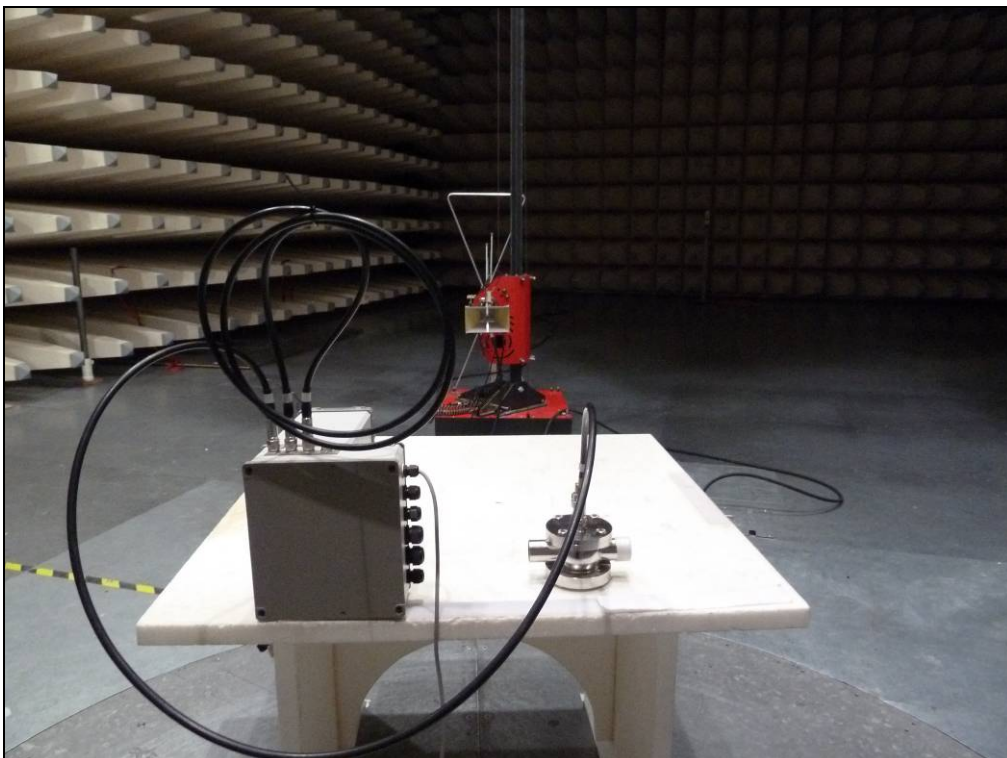


Photo 6: EUT and antenna 3



Annex B External photographs of the EUT

Photo 7:



Photo 8:



Photo 9:



Photo 10:

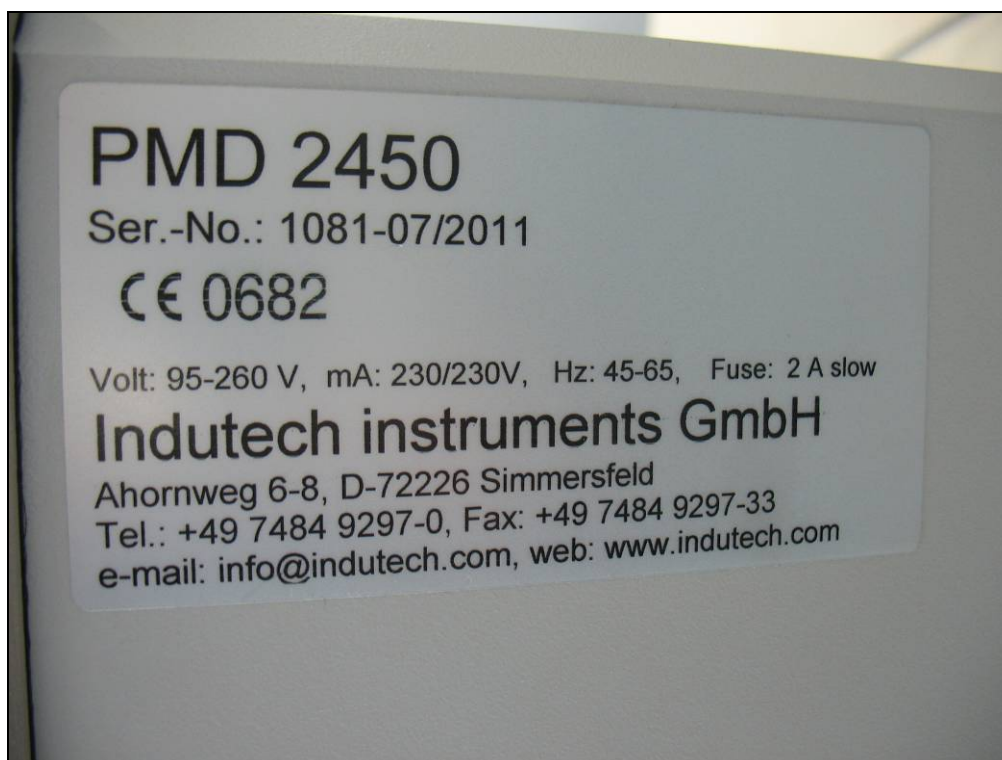


Photo 11: Antenna 1



Photo 12: Antenna 2



Photo 13: Antenna 2



Photo 14: Antenna 3



Annex C Internal photographs of the EUT

Photo 15:



Photo 16:



Photo 17:

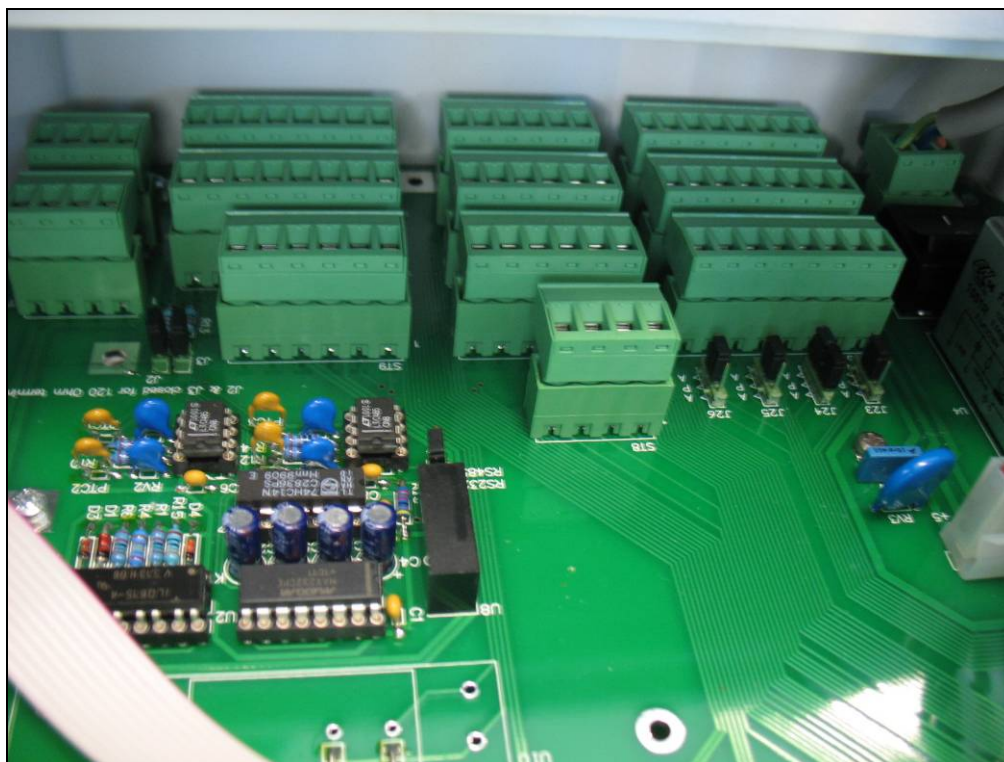


Photo 18:

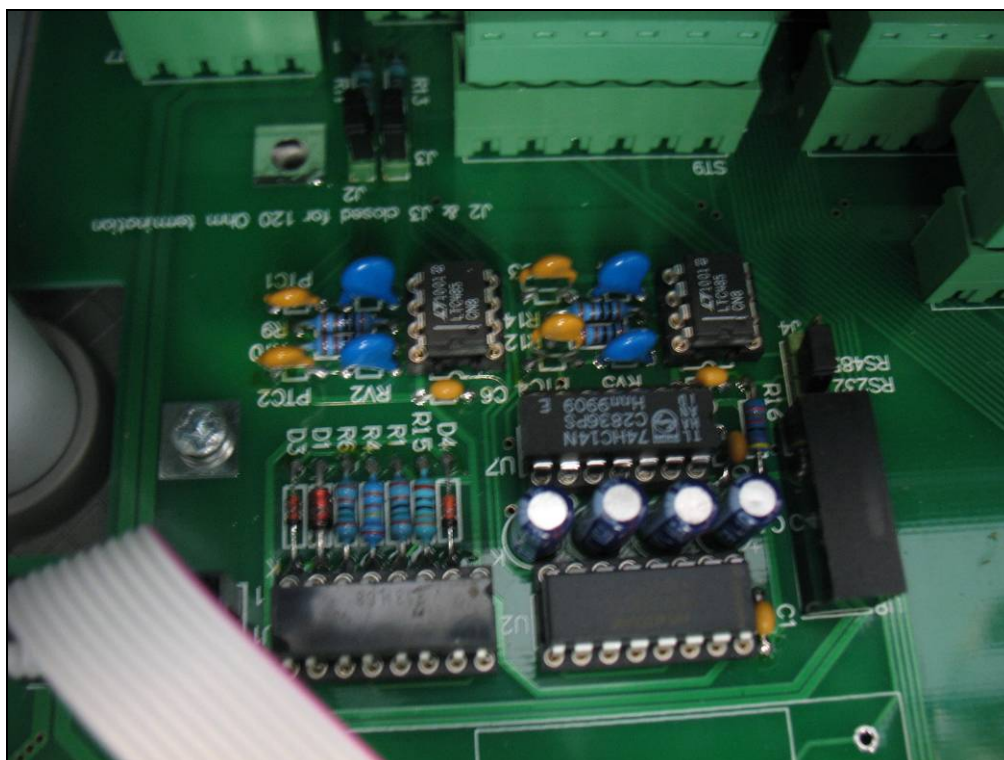


Photo 19:



Photo 20:

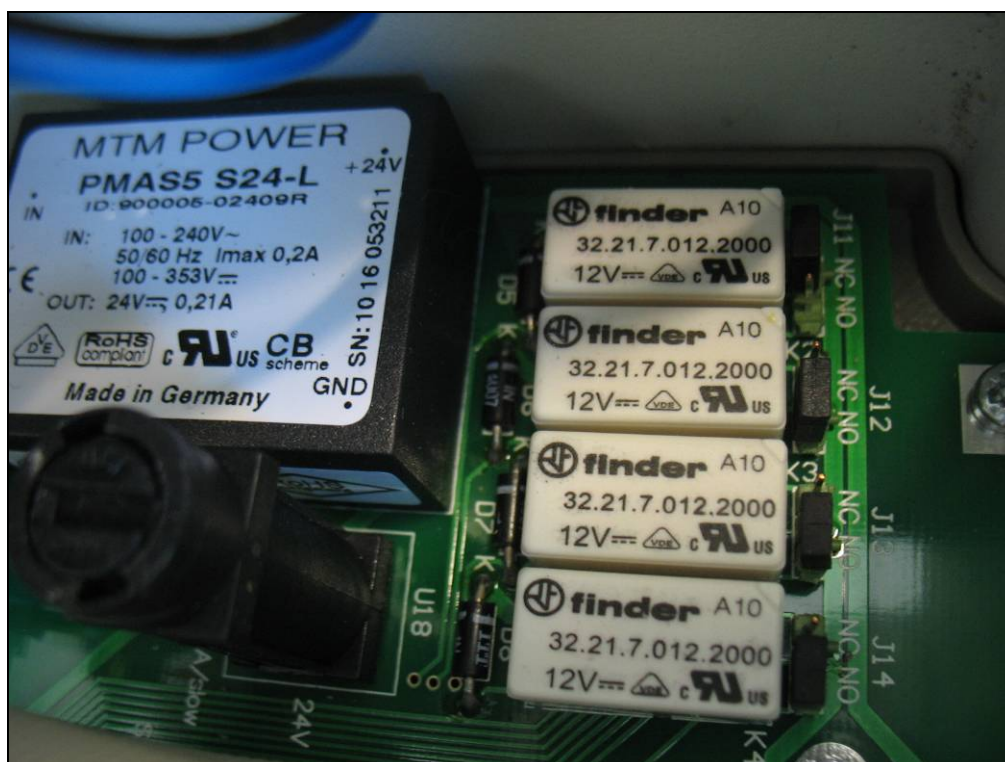


Photo 21:



Photo 22:

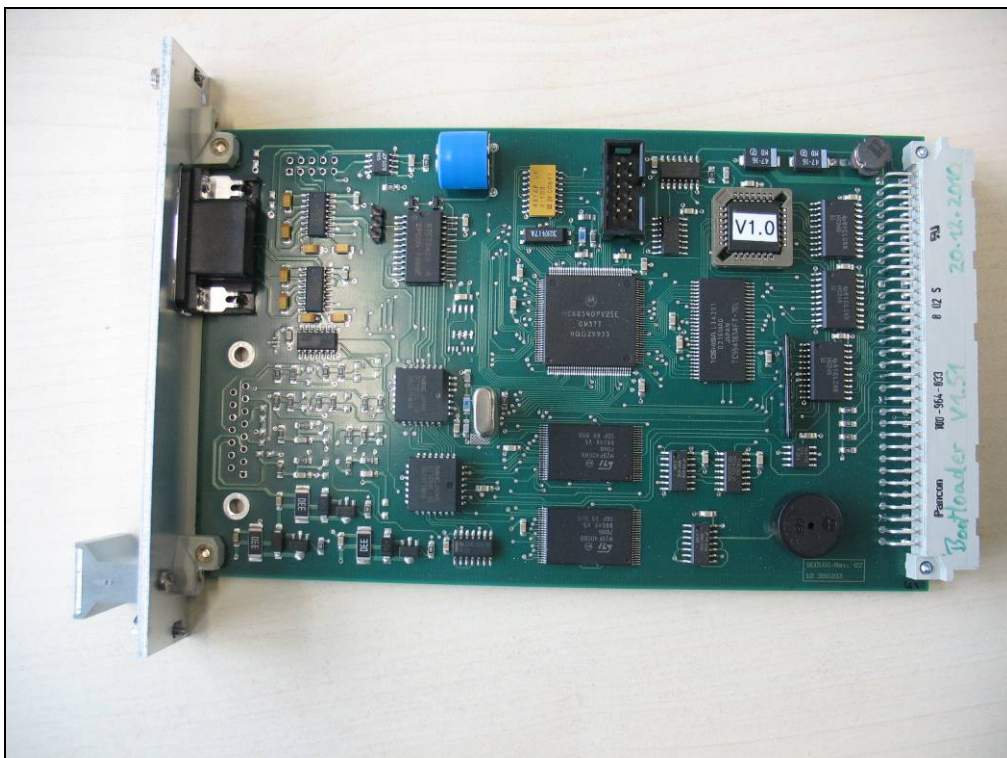
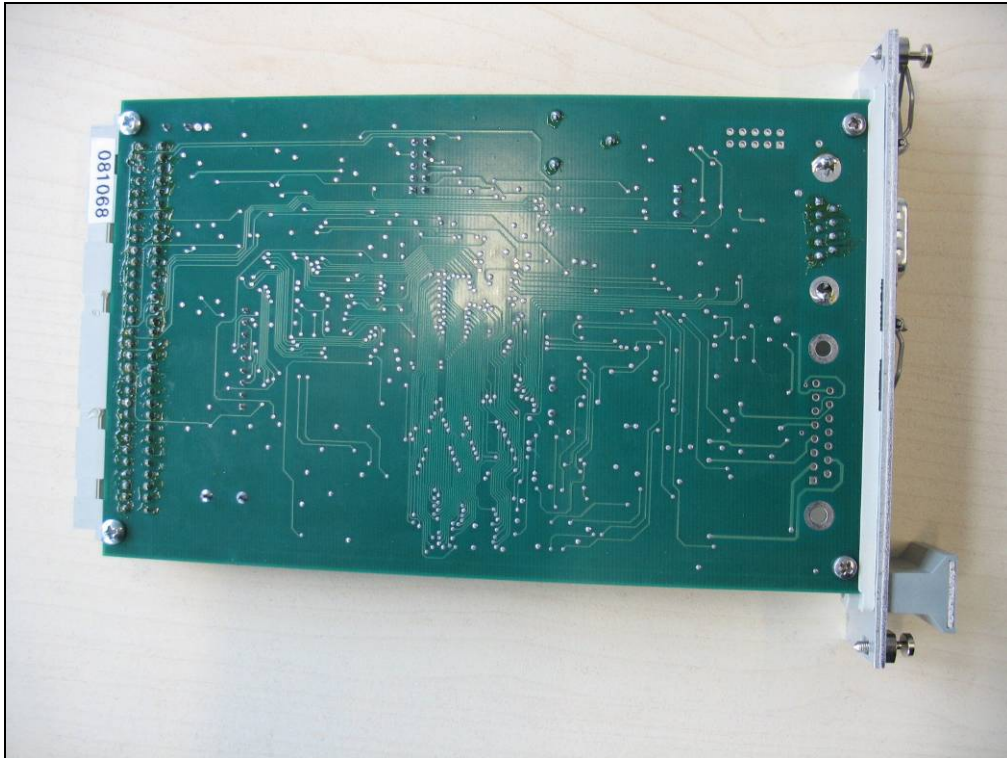


Photo 23:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-10-13

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



Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation



The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10
66117 Saarbrücken

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

Wired communications and DECT
Acoustic
Radio
Short Range Devices (SRD)
RFID
WiMax and Richtfunk
Mobile radio (GSM / DCS), Over the Air (OTA) Performance
Electromagnetic Compatibility (EMC) Incl. Automotive
Product safety
SAR and Hearing Aid Compatibility (HAC)
Environmental simulation
Smart Card Terminals
Bluetooth
Wi-Fi-Services

The accreditation certificate shall only apply in connection with the notice of accreditation of 13.04.2011 with the accreditation number D-PL-12076-01 and is valid until 03.09.2014. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 82 pages.

Registration number of the certificate: **D-PL-12076-01-01**

Frankfurt am Main, 13.04.2011

Dr. Ute (Ute) Egner
Head of Division 2

This document is a translation. The definitive version is the original German accreditation certificate.

See notes on back

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10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAKKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAKKS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAKKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:

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ILAC: www.ilac.org

IAF: www.iaf.eu

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Back side of the certificate

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

http://www.cetecom.com/fileadmin/de/CETECOM_D_Saarbruecken/accreditations_Jan_2010/DAKKS_Akkredi_Urk_EN17025-En_incl_Annex.pdf