Test Report

for

IDC Ltd.

on

ZB110

Document No. TES-003840WUS1

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TRaC Wireless Test Report	**:** TES-003840WUS1
Applicant	**:** IDC Ltd.
Apparatus	**:** ZB110
Specification(s)	**:** CFR47 Part 15.247, June 2011
FCCID	**:** V7OZB110
Purpose of Test	**:** Certification
Authorised by	**:** 
	: Radio Product Manager
Issue Date	**:** 2nd August 2011
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Contents

Section 1: Introduction

1.1 General

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on samples submitted to the Laboratory.

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1.2 Tests Requested By

This testing in this report was requested by:

IDC Ltd.
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1.3 Manufacturer

Same as above

1.4 Apparatus Assessed

The following apparatus was assessed between the 16th and 20th of May 2011.

The tested unit is a Zigbee device operating in the 2.4GHz ISM Band.

The ZB110 can have a number of different options fitted. The unit tested had all options fitted. Details of the options and codes are as follows:

Model: ZB110 Basic Wireless Keypad (only)
Model: ZB110(P) Sounder Option included
Model: ZB110(T) Temperature and Humidity Option included
Model: ZB110(TL) Temperature and Humidity with Logging Option included
Model: ZB110(A) Accelerometer Option included
Model: ZB110(AL) Accelerometer with Logging Option included

1.5 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

Test Type	Regulation	Measurement standard	Result
Radiated spurious emissions (Restricted bands)	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10	Pass
Conducted spurious emissions (Non-restricted bands)	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10	N/A
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart C; 15.207	ANSI C63.10	N/A
Occupied Bandwidth	Title 47 of the CFR : Part 15 Subpart C; 15.247(a)(2)	ANSI C63.10	Pass
Conducted Carrier Power	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)	ANSI C63.10	Pass
Power Spectral Density	Title 47 of the CFR : Part 15 Subpart C; 15.247(d)	ANSI C63.10	Pass
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart B; 15.109	ANSI C63.10	Pass
Digital Modulation	Title 47 of the CFR: Part 15 Subpart C; 15.403	-	N/A
RF Safety	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)(5)	-	N/A

Abbreviations used in the above table:

Mod : Modification
CFR : Code of Federal Regulations
REFE : Radiated Electric Field Emissions
ANSI : American National Standards Institution
PLCE : Power Line Conducted Emissions

1.6 Notes Relating to the Assessment

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, “Pass” indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

Where relevant, the apparatus was only assessed using the monitoring methods and susceptibility criteria defined in this report.

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 17 to 23 °C
Humidity	: 45 to 75 %
Barometric Pressure	: 86 to 106 kPa

All dates used in this report are in the format dd/mm/yy.

This assessment has been performed in accordance with the requirements of ISO/IEC 17025.

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2: Measurement Uncertainty

2.1 Application of Measurement Uncertainty

The following table contains the measurement uncertainties for measurements

The following procedure is used when determining the result of a measurement:

(i) If specification limits are not exceeded by the measured result, extended by the positive component of the expanded uncertainty interval at a confidence level of 95%, then a pass result is recorded.

(ii) Where a specification limit is exceeded by the result even when the result is decreased by the negative component of the expanded uncertainty interval, a fail result is recorded.

(iii) Where the result measured is below a limit, but by a margin less than the positive measurement uncertainty component, it is not possible to record a pass based on a 95% confidence level. However, the result indicates that a pass result is more probable than a fail result.

(iv) Where a measured result is above a limit, but by a margin less than the negative measurement uncertainty component, it is not possible to record a fail based on a 95% confidence level. However the result indicates that a fail is more probable than a pass.

2.2 Measurement Uncertainty Values

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**
Uncertainty in test result (Equipment – TRL05) = **1.08dB**
Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**
Uncertainty in test result (Equipment – TRL05) = **0.113ppm**
Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious Emissions

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**
Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%,** Uncertainty in Amplitude measurement = **0.82%**

[12] Power Line Conduction

Uncertainty in test result = **3.4dB**

[13] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[14] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[15] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[16] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[17] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[18] Receiver Threshold

Uncertainty in test result = **3.23dB**

[19] Transmission Time Measurement

Uncertainty in test result = **7.98%**

Section 3: Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A: Formal Emission Test Results

Abbreviations used in the tables in this appendix:

Spec	: Specification
Mod	: Modification
EUT	: Equipment Under Test
SE	: Support Equipment
L	: Live Power Line
N	: Neutral Power Line
E	: Earth Power Line
Pk	: Peak Detector
QP	: Quasi-Peak Detector
Av	: Average Detector
CDN	: Coupling & decoupling network

ALSR	: Absorber Lined Screened Room
OATS	: Open Area Test Site
ATS	: Alternative Test Site
Ref	: Reference
Freq	: Frequency
MD	: Measurement Distance
SD	: Spec Distance
Pol	: Polarisation
H	: Horizontal Polarisation
V	: Vertical Polarisation

A1 6 dB Bandwidth

Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2) requires the measurement of the bandwidth of the transmission between the -6 dB points on the transmitted spectrum.

Test Details:	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
Temperature	20 deg C
EUT set up	Refer to Appendix C

Unit operating with CALL Case Cover:

Channel Frequency (MHz)	F_{lower} (MHz)	F_{higher} (MHz)	Measured 20 dB Bandwidth (kHz)	Minimum Limit (kHz)	Result
2404.759615	2404.198718	2405.833333	1634.615385	500	Pass
2439.743590	2439.198718	2440.833333	1634.615385	500	Pass
2474.759615	2474.198918	2475.833333	1634.615385	500	Pass

Unit operating with APS case cover:

Channel Frequency (MHz)	F_{lower} (MHz)	F_{higher} (MHz)	Measured 20 dB Bandwidth (kHz)	Minimum Limit (kHz)	Result
2405.272436	2404.198718	2405.833333	1634.615385	500	Pass
2439.759615	2439.182692	2440.17308	1634.615385	500	Pass
2475.272436	2474.198918	2475.833333	1634.615385	500	Pass

Plots of the 6 dB bandwidth are contained in Appendix B of this test report.

A2 Transmitter Peak Output Power

Carrier power was verified with the EUT transmitting on its lowest, centre and highest carrier frequency in turn.

Test Details:	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C

Unit operating with CALL Case Cover:

Channel Frequency (MHz)	Peak Carrier Power (mW)	Peak Antenna Gain (dBi)	EIRP (mW)	Limit (W)	Result
2404.503205	0.587	2.1	0.953	1	Pass
2439.423077	0.222	2.1	0.36	1	Pass
2474.503205	0.218	2.1	0.354	1	Pass

Unit operating with APS Case Cover:

Channel Frequency (MHz)	Peak Carrier Power (mW)	Peak Antenna Gain (dBi)	EIRP (mW)	Limit (W)	Result
2404.695513	0.494	2.1	0.802	1	Pass
2439.711538	0.344	2.1	0.557	1	Pass
2474.639423	0.177	2.1	0.288	1	Pass

Notes:

Conducted Measurements

1. Measured Peak Carrier power includes highest gain of any antenna to be used.
2. Highest Gain of any antenna to be used, i.e., 2.1 dBi
3. Conducted measurements were performed with a temporary antenna connector provided by the client.

Radiated Measurements

1. Measuring distance of 3m from the EUT
2. EUT 0.8 metre above ground plane
3. Emissions maximised by rotation of EUT, on an automatic turntable
4. Raising and lowering the receiver antenna between 1m & 4m >30MHz
5. Horizontal and vertical polarisations, of the receive antenna
6. EUT orientation in three orthogonal planes
7. Maximum results recorded

A3 Transmitter Power Spectral Density

Transmitter Power Spectral Density was verified with the EUT transmitting on its lowest, centre and highest carrier frequency in turn.

Test Details:	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C

Unit operating with CALL Case Cover:

Channel Frequency (MHz)	Peak Power Spectral Density (dBm)	Limit (dBm)	Result
2404.503205	-17.09	8	Pass
2439.423077	-21.72	8	Pass
2474.503205	-21.05	8	Pass

Unit operating with APS Case Cover:

Channel Frequency (MHz)	Peak Power Spectral Density (dBm)	Limit (dBm)	Result
2404.695513	-19.35	8	Pass
2439.711538	-42.76	8	Pass
2474.639423	-21.9	8	Pass

Notes:

Conducted Measurements

1. Measured Power Spectral Density includes highest gain of any antenna to be used.
2. Highest Gain of any antenna to be used, i.e., 2.1 dBi
3. Conducted measurements were performed with a temporary antenna connector provided by the client.
4. The resolution bandwidth on the analyser was set to 3kHz and trace set to max hold.
5. The span is set to 3MHz
6. The sweep time is 1000 seconds (Span/3kHz).

Radiated Measurements

1. Measuring distance of 3m from the EUT
2. EUT 0.8 metre above ground plane
3. Emissions maximised by rotation of EUT, on an automatic turntable
4. Raising and lowering the receiver antenna between 1m & 4m >30MHz
5. Horizontal and vertical polarisations, of the receive antenna
6. EUT orientation in three orthogonal planes
7. Maximum results recorded

A4 Radiated Electric Field Emissions within the Restricted Bands of 15.205

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric filed emission test applies to spurious emissions and harmonics that fall within the restricted bands listed in Section 15.205. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit on its lowest, centre and highest carrier frequency.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : ☐ 3m alternative test site : ☑

The effect of the EUT set-up on the measurements is summarised in note (c) of this section.

Unit operating with CALL Case Cover:

Test Details	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10
Frequency range	30MHz – 25GHz
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C
Photographs (Appendix F)	1, 3

The worst case radiated emission measurements for spurious emissions and harmonics that fall within the restricted bands are listed below:

Ref No.	Frequency. (MHz)	Channel	Detector Type (Peak/Average)	Rx Antenna Polarisation	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1.	4810.032	Bot	A	V	44.23	54	-9.77
2.	4810.032	Bot	A	H	43.28	54	-10.72
3.	7213.65	Bot	P	V	61.12	74	-12.88
4.	7213.65	Bot	A	V	53.30	54	-0.7
5.	7213.65	Bot	P	H	57.35	74	-16.65
6.	7213.65	Bot	A	H	48.82	54	-5.18
7.	4880	Mid	A	V	43.34	54	-10.66
8.	4880	Mid	A	H	46.63	54	-7.37
9.	7318.633	Mid	P	V	57.00	74	-17
10.	7318.633	Mid	A	V	47.97	54	-6.03
11.	7318.633	Mid	P	H	54.48	74	-19.52
12.	7318.633	Mid	A	H	44.64	54	-9.36
13.	4950.02	Top	A	V	43.32	54	-10.68
14.	4950.02	Top	P	H	54.23	74	-19.77
15.	4950.02	Top	A	H	46.69	54	-7.31
16.	7423.66	Top	P	V	56.92	74	-17.08
17.	7423.66	Top	A	V	47.99	54	-6.01
18.	7423.66	Top	A	H	41.98	54	-12.02

Unit operating with APS Case Cover:

Test Details	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10
Frequency range	30MHz – 25GHz
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C
Photographs (Appendix F)	2, 4

The worst case radiated emission measurements for spurious emissions and harmonics that fall within the restricted bands are listed below:

Ref No.	Frequency. (MHz)	Channel	Detector Type (Peak/Average)	Rx Antenna Polarisation	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1.	4810.032	Bot	A	V	43.89	54	-10.11
2.	4810.032	Bot	P	H	54.56	74	-19.44
3.	4810.032	Bot	A	H	48.82	54	-5.18
4.	7213.65	Bot	P	V	61.69	74	-12.31
5.	7213.65	Bot	A	V	53.79	54	-0.21
6.	7213.65	Bot	P	H	58.51	74	-15.49
7.	7213.65	Bot	A	H	49.68	54	-4.32
8.	4880	Mid	A	V	40.04	54	-13.96
9.	4880	Mid	A	H	47.03	54	-6.97
10.	7318.633	Mid	P	V	56.87	74	-17.13
11.	7318.633	Mid	A	V	49.72	54	-4.28
12.	7318.633	Mid	P	H	53.60	74	-20.4
13.	7318.633	Mid	A	H	43.41	54	-10.59
14.	4950.02	Top	A	V	42.47	54	-11.53
15.	4950.02	Top	A	H	42.54	54	-11.46
16.	7423.66	Top	P	V	57.10	74	-16.9
17.	7423.66	Top	A	V	47.88	54	-6.12
18.	7423.66	Top	P	H	54.89	74	-19.11
19.	7423.66	Top	A	H	44.86	54	-9.14

Notes:

1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1
2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
3 Measurements at 2400 & 2483.5 MHz were made to ensure band edge compliance.
4 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
5 For Frequencies below 1 GHz, RBW= 100 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak RBW=VBW= 1MHz
Average RBW=VBW= 1MHz

These settings as per ANSI C63.10

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 15 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits (47 CFR Part 15: Clause 15.209) for emissions falling within the restricted bands defined in 15.205(a):

Frequency of emission (MHz)	**Field strength μV/m**	**Measurement Distance m**	**Field strength dBμV/m**
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

Notes:

(a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation}\,(\text{dB}) = 20\log_{10}\left(\frac{\text{measurement distance}}{\text{specification distance}}\right)$$

The results displayed take into account applicable antenna factors and cable losses.

(b) The levels may have been rounded for display purposes.

(c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓			
Effect of EUT internal configuration on emission levels		✓		
Effect of Position of EUT cables & samples on emission levels			✓	

(i) Parameter defined by standard and / or single possible, refer to Appendix D
(ii) Parameter defined by client and / or single possible, refer to Appendix D
(iii) Parameter had a negligible effect on emission levels, refer to Appendix D
(iv) Worst case determined by initial measurement, refer to Appendix D

A5 Antenna Gain

The maximum antenna gain for the antenna types to be used with the EUT, as declared by the client, is **2.1 dBi**.

A6 Unintentional Radiated Electric Field Emissions - 15.109

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The maximum permitted field strength is listed in Section 15.109. The EUT was set to receive mode only on its lowest, centre and highest carrier frequency in turn.

The following test site was used for final measurements as specified by the standard tested to :

3m open area test site : ☐ 3m alternative test site : ☑

Unit operating with CALL Case Cover:

Test Details	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.10
Frequency range	30MHz to 25 GHz
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C
Photographs (Appendix F)	1, 3

Ref No.	Frequency (MHz)	Channel	Detector Type (Peak/Average)	Rx Antenna Polarisation	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1.	4810.032	Bot	A	V	41.66	54	-12.34
2.	4810.032	Bot	A	H	47.76	54	-6.24
3.	4880.048	Mid	A	V	41.64	54	-12.36
4.	4880.048	Mid	A	H	46.69	54	-7.31
5.	4950.064	Top	A	V	40.73	54	-13.27
6.	4950.064	Top	A	H	44.25	54	-9.75

Unit operating with APS Case Cover:

Test Details	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.10
Frequency range	30MHz to 25 GHz
EUT sample number	S04, S05
Modification state	0
SE in test environment	N/A
SE isolated from EUT	N/A
EUT set up	Refer to Appendix C
Temperature	20 deg C
Photographs (Appendix F)	2, 4

Ref No.	Frequency (MHz)	Channel	Detector Type (Peak/Average)	Rx Antenna Polarisation	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1.	4810.032	Bot	A	V	41.21	54	-12.79
2.	4810.032	Bot	A	H	47.38	54	-6.62
3.	4880.048	Mid	A	V	41.97	54	-12.03
4.	4880.048	Mid	A	H	46.39	54	-7.61
5.	4950.064	Top	A	V	43.99	54	-10.01
6.	4950.064	Top	A	H	40.95	54	-13.05

Appendix B: Supporting Graphical Data

This appendix contains graphical data obtained during testing.

Notes:

(a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.

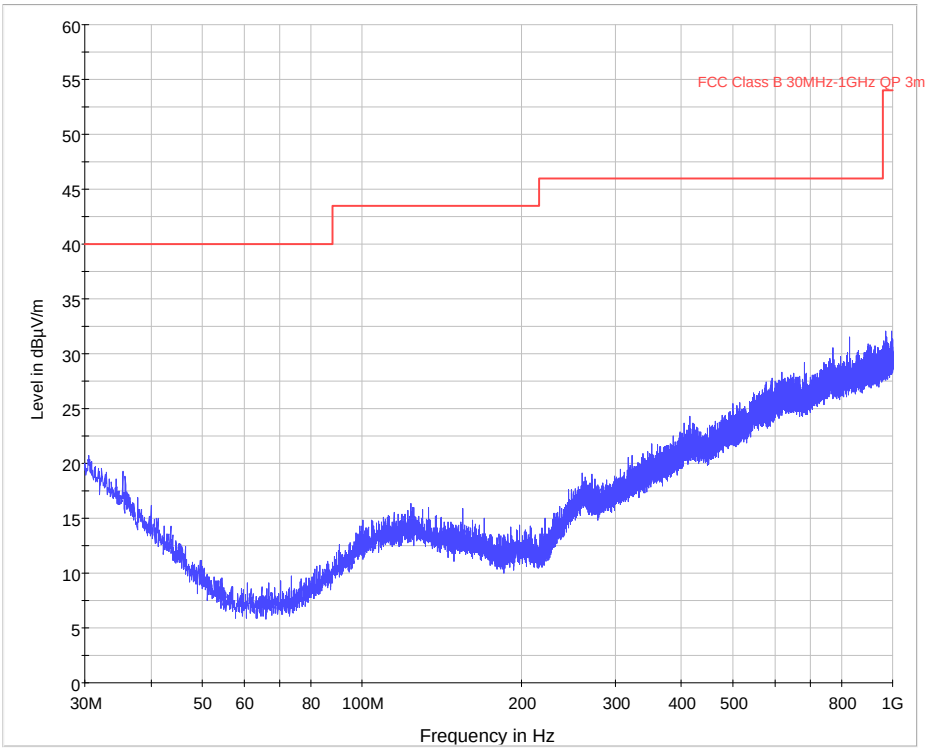
(b) The time and date on the plots do not necessarily equate to the time of the test.

(c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.

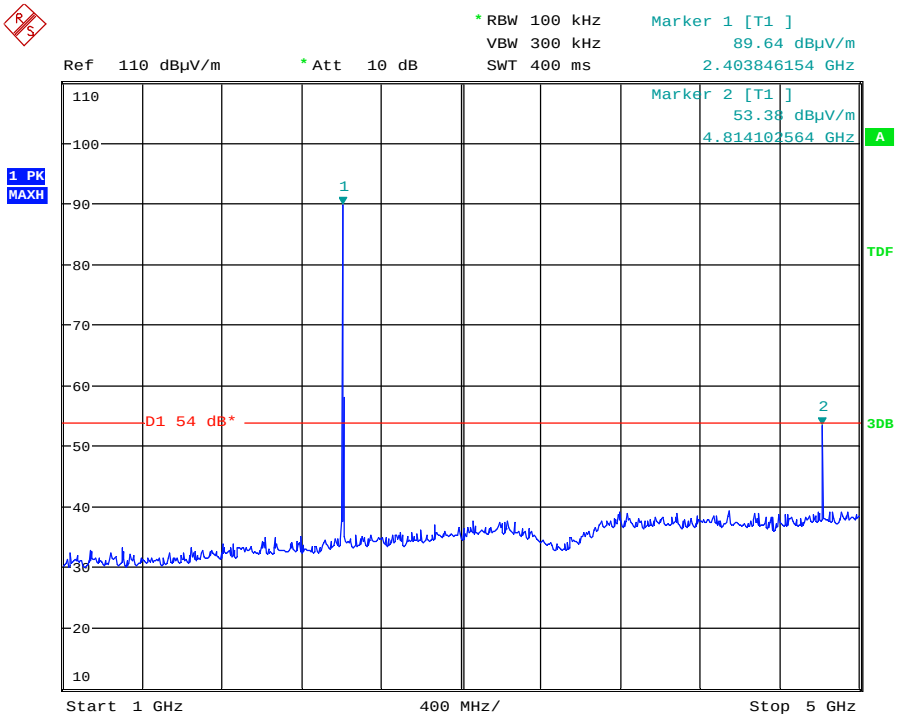
(d) Appendix C details the numbering system used to identify the sample and its modification state.

(e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.

Radiated Spurious emissions 30 MHz to 1 GHz - Bottom Channel

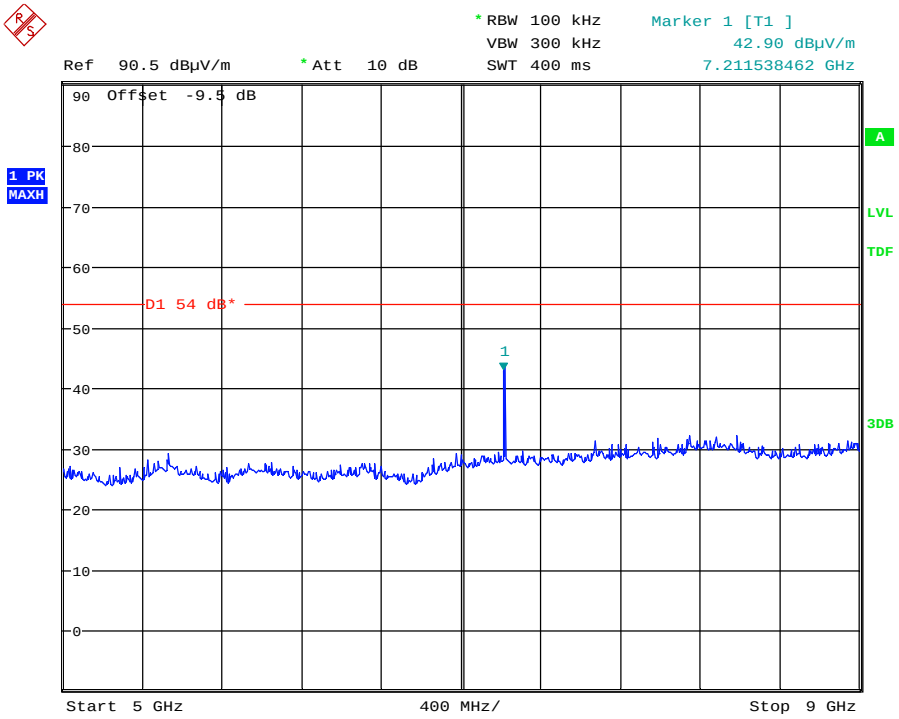


Radiated Spurious emissions 1 GHz to 5 GHz – Bottom Channel



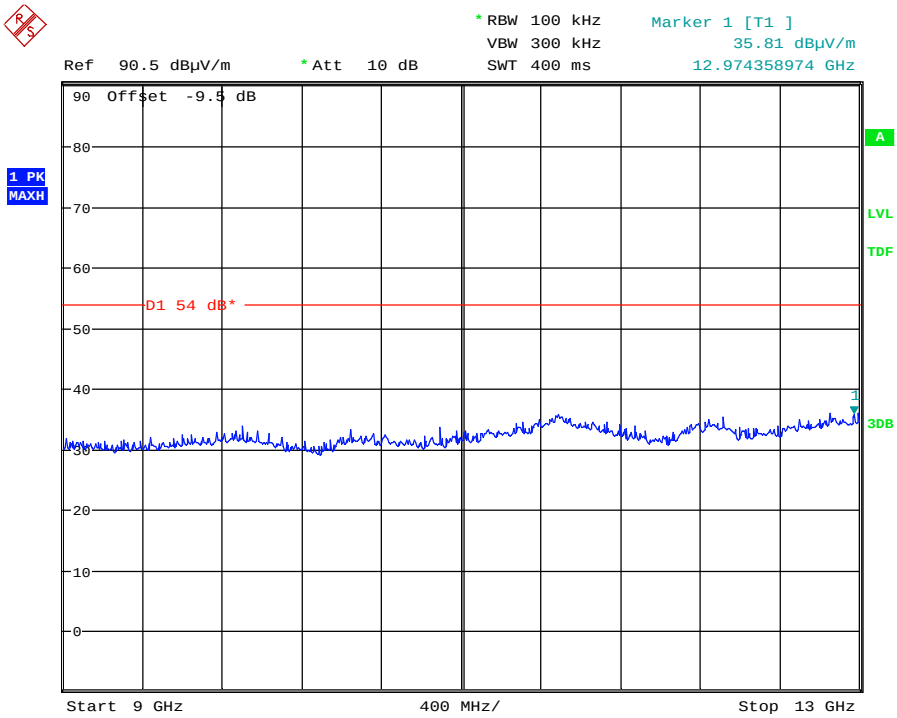
Date: 25.MAR.2011 11:28:00

Radiated Spurious emissions 5 GHz to 9 GHz – Bottom Channel



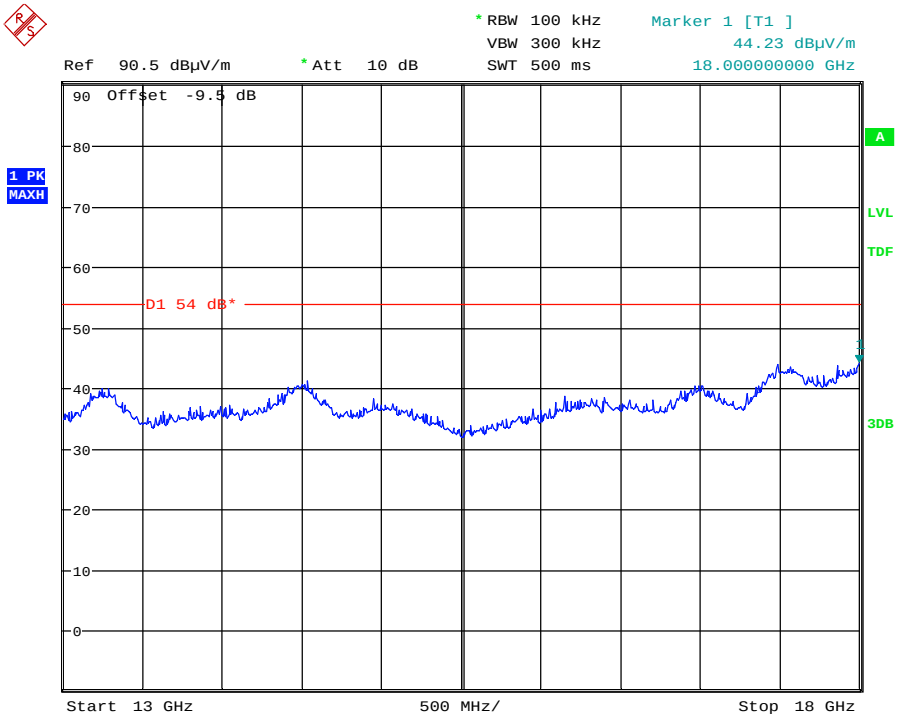
Date: 25.MAR.2011 12:42:29

Radiated Spurious emissions 9 GHz to 13 GHz – Bottom Channel



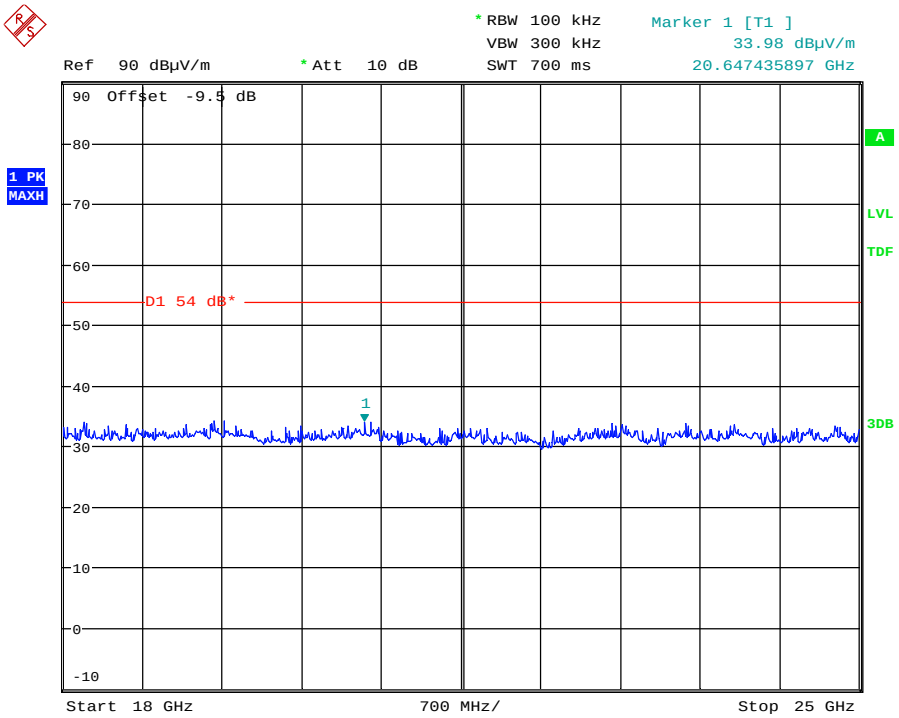
Date: 25.MAR.2011 12:44:17

Radiated Spurious emissions 13 GHz to 18GHz – Bottom Channel



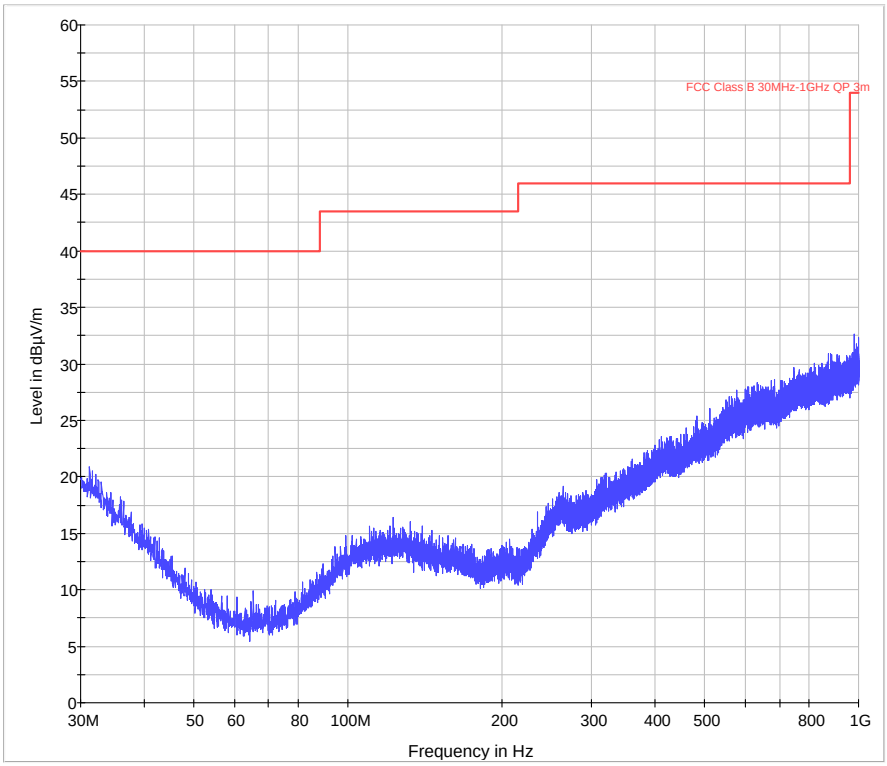
Date: 25.MAR.2011 12:45:20

Radiated Spurious emissions 18 GHz to 25 GHz – Bottom Channel

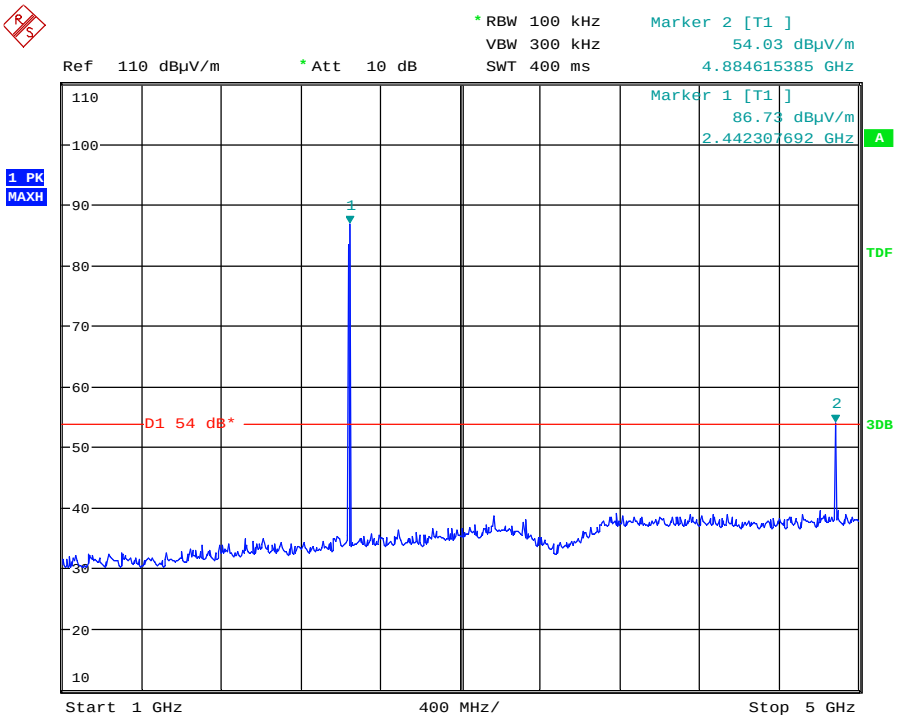


Date: 25.MAR.2011 14:44:29

Radiated Spurious emissions 30 MHz to 1 GHz – Middle Channel.

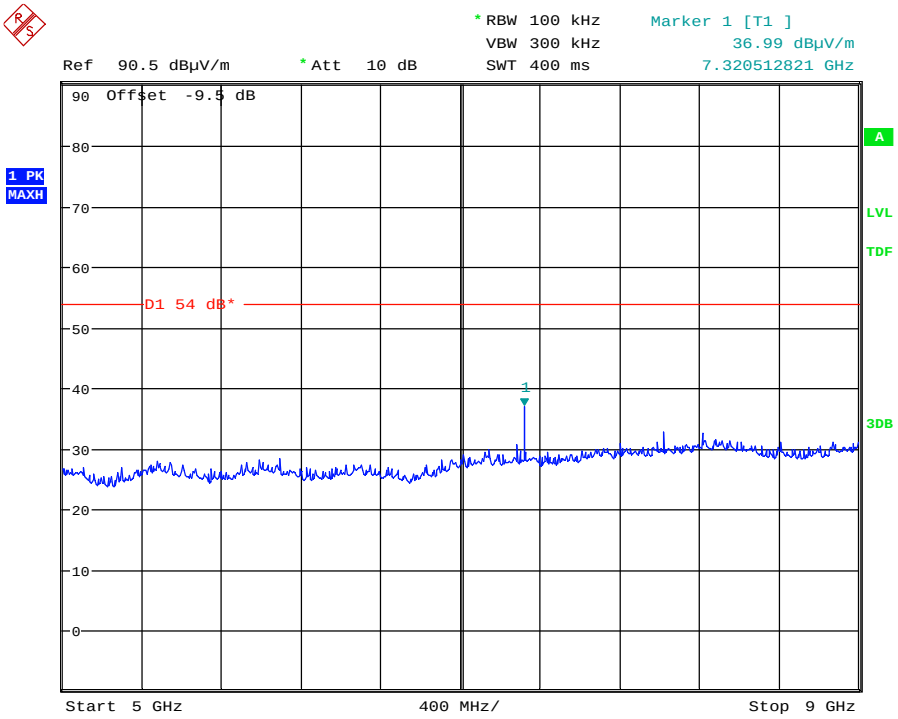


Radiated Spurious emissions 1 GHz to 5 GHz – Middle Channel



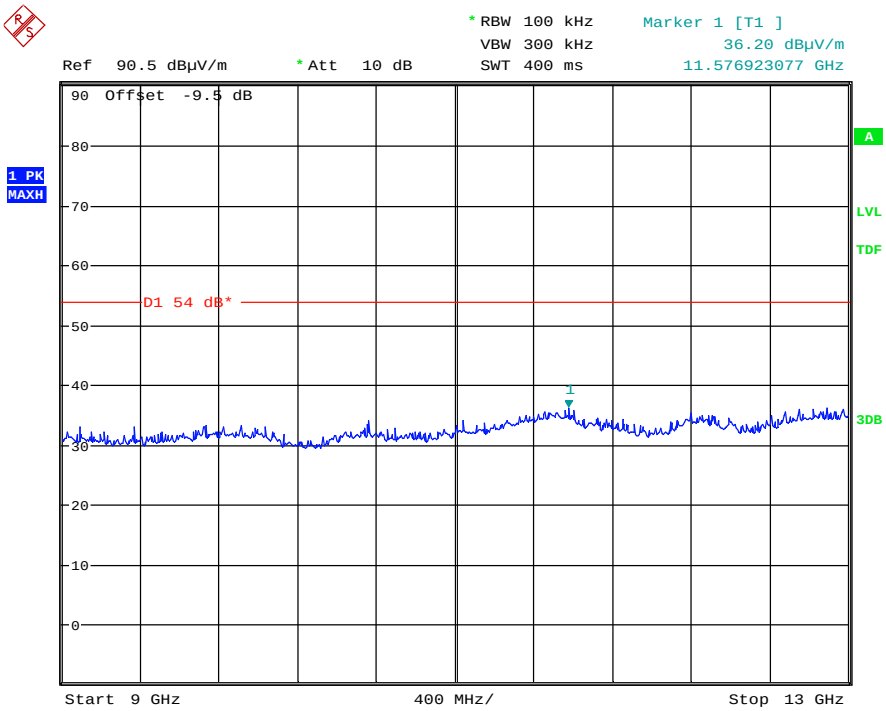
Date: 25.MAR.2011 11:26:31

Radiated Spurious emissions 5 GHz to 9 GHz – Middle Channel



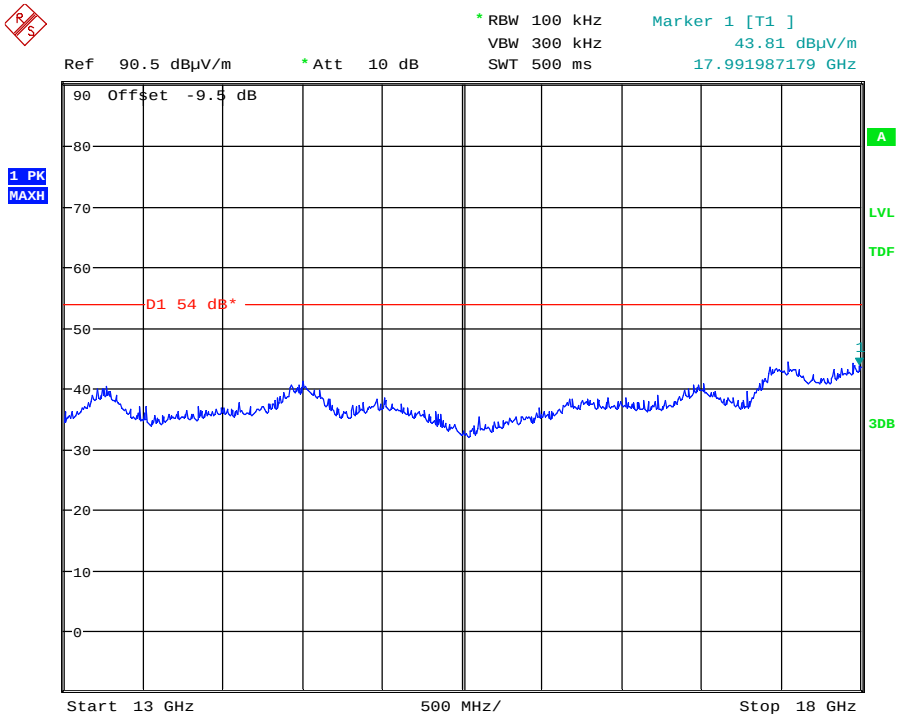
Date: 25.MAR.2011 12:48:01

Radiated Spurious emissions 9 GHz to 13 GHz – Middle Channel



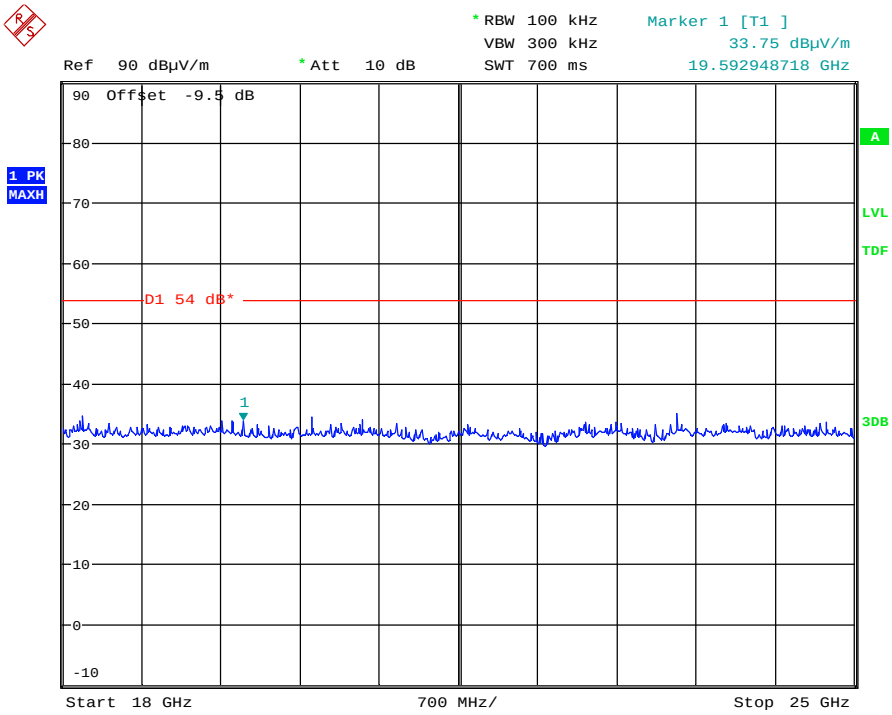
Date: 25.MAR.2011 12:49:48

Radiated Spurious emissions 13 GHz to 18GHz – Middle Channel



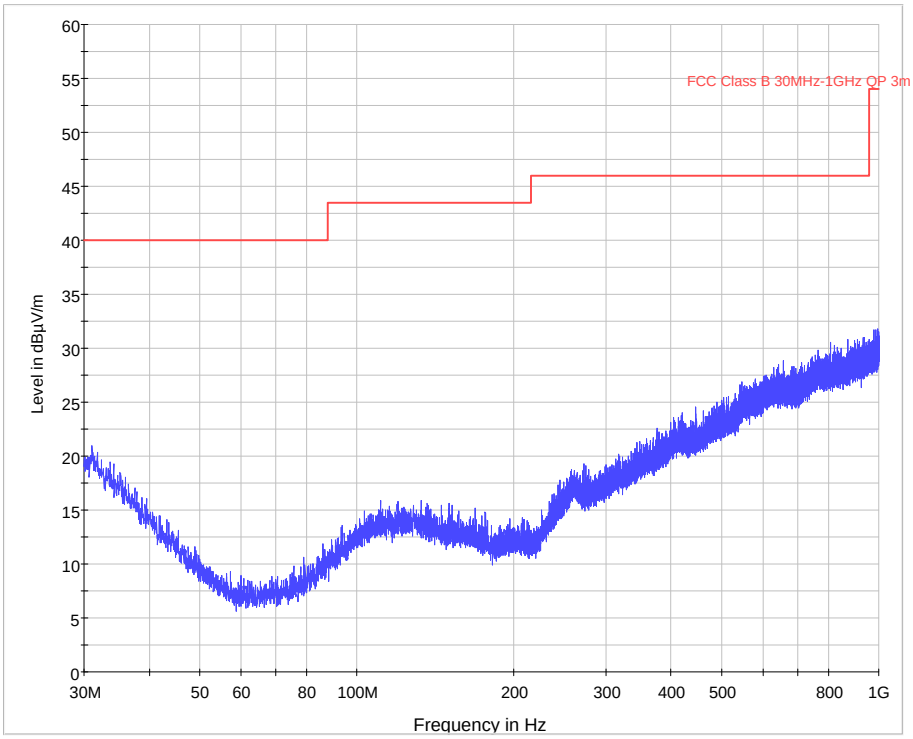
Date: 25.MAR.2011 12:50:57

Radiated Spurious emissions 18 GHz to 25 GHz – Middle Channel

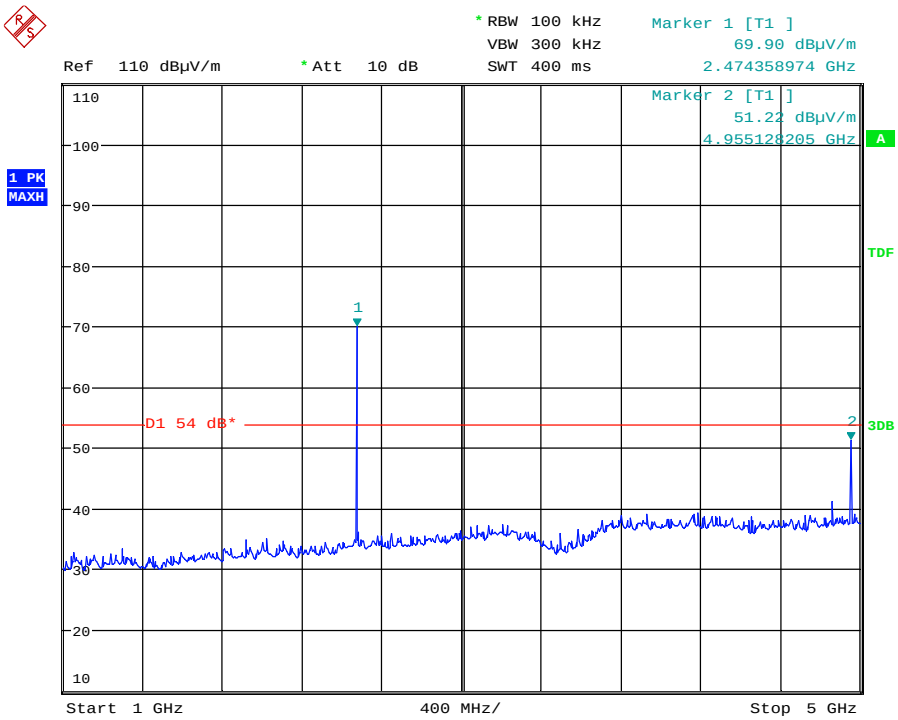


Date: 25.MAR.2011 14:43:25

Radiated Spurious emissions 30 MHz to 1 GHz – Top Channel

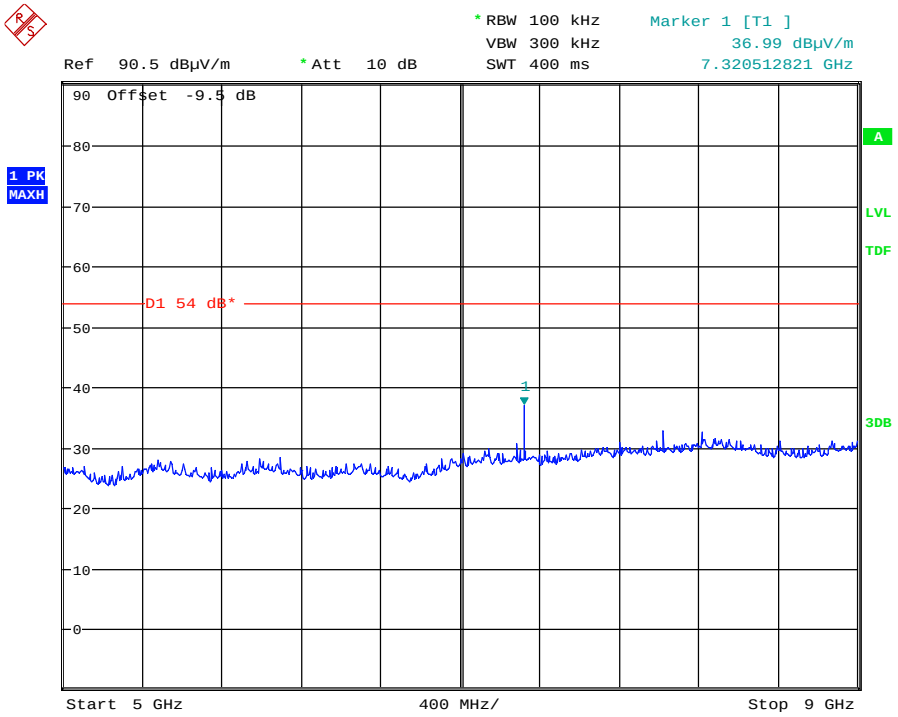


Radiated Spurious emissions 1 GHz to 5 GHz – Top Channel



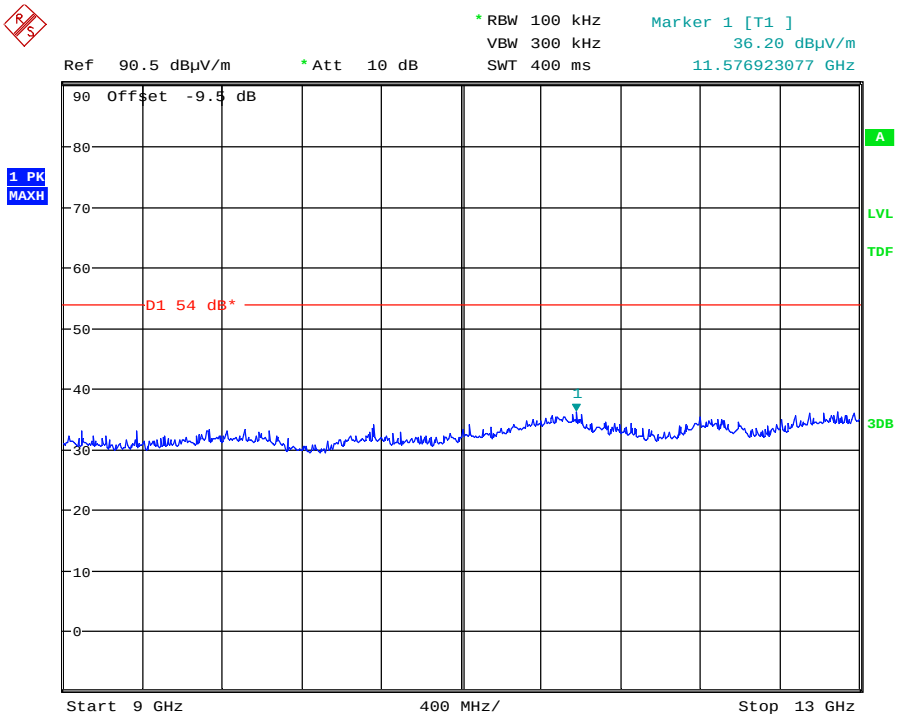
Date: 25.MAR.2011 11:23:58

Radiated Spurious emissions 5 GHz to 9 GHz – Top Channel



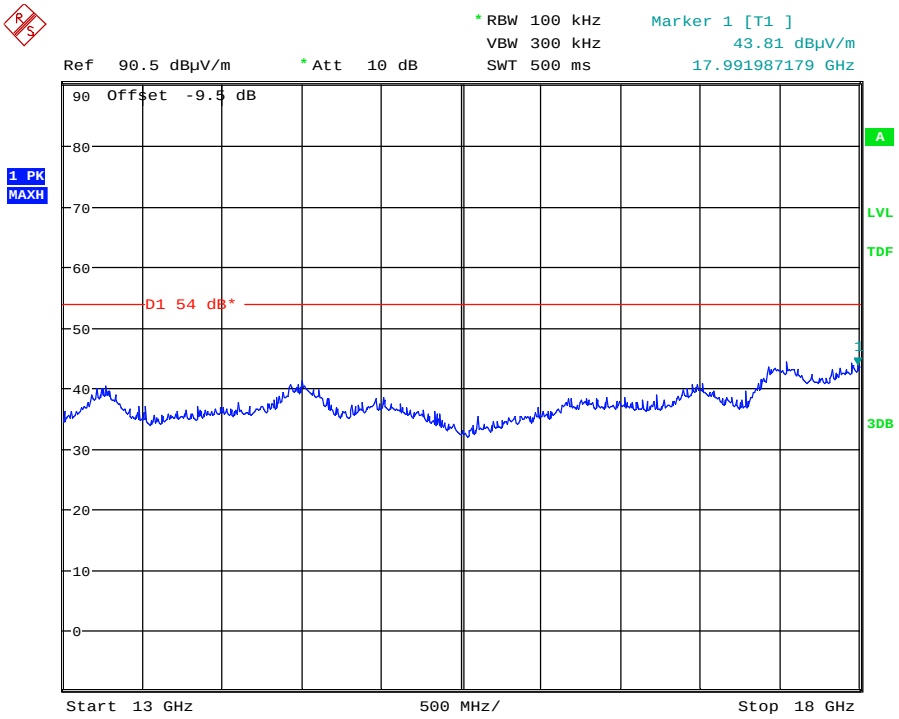
Date: 25.MAR.2011 12:48:01

Radiated Spurious emissions 9 GHz to 13 GHz – Top Channel



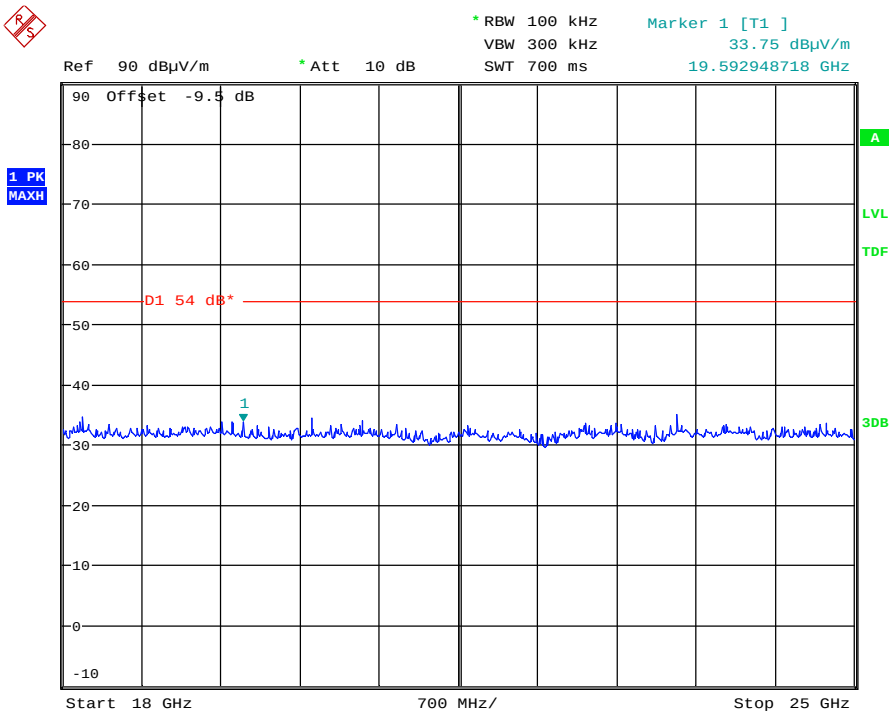
Date: 25.MAR.2011 12:49:48

Radiated Spurious emissions 13 GHz to 18GHz – Top Channel



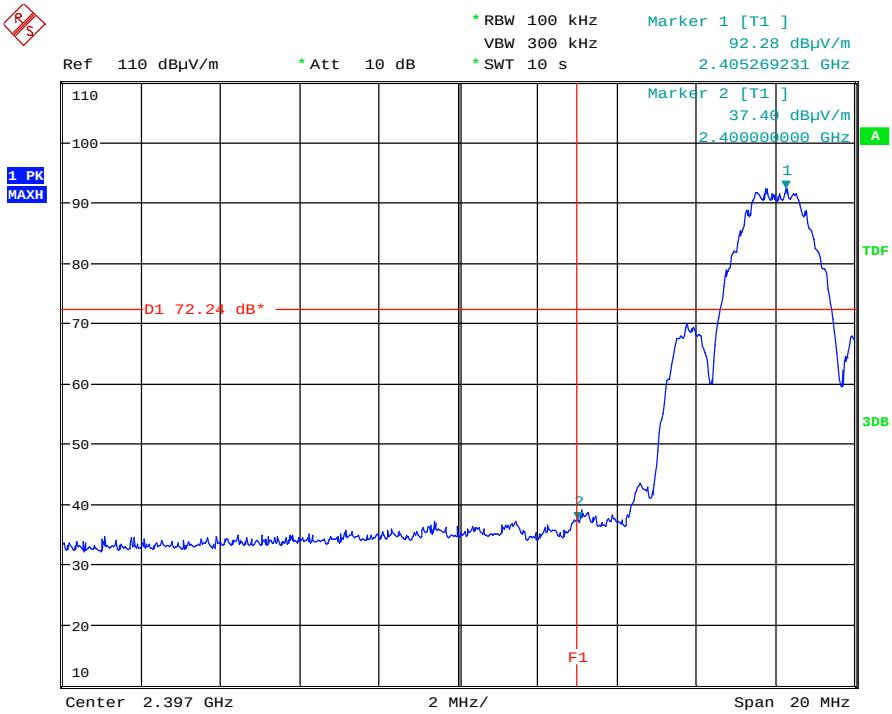
Date: 25.MAR.2011 12:50:57

Radiated Spurious emissions 18 GHz to 25 GHz – Top Channel



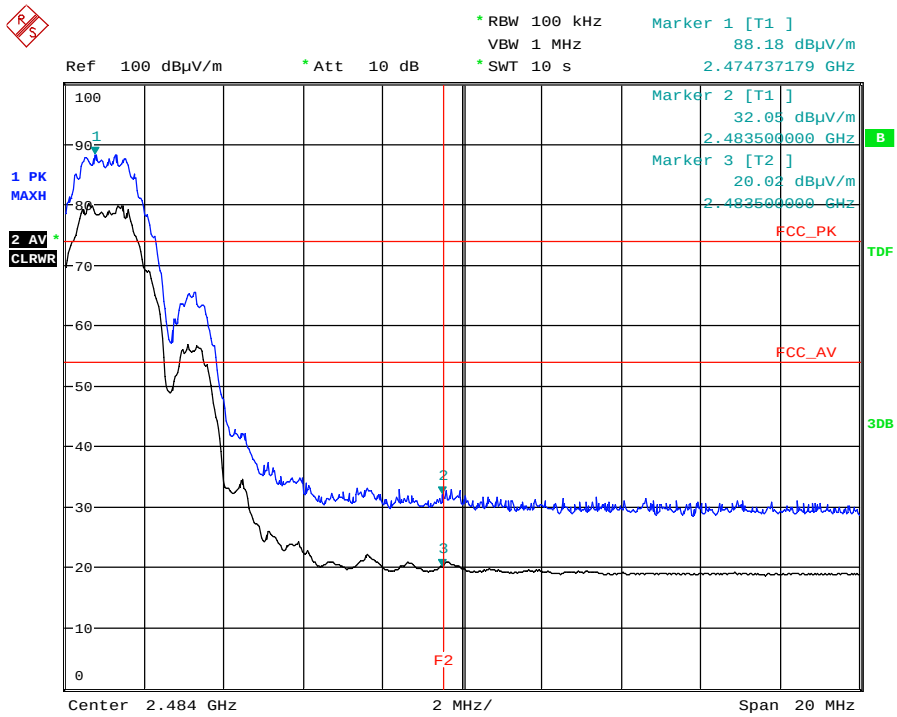
Date: 25.MAR.2011 14:43:25

Radiated Bandedge Compliance (CALL) - Lower Band Edge



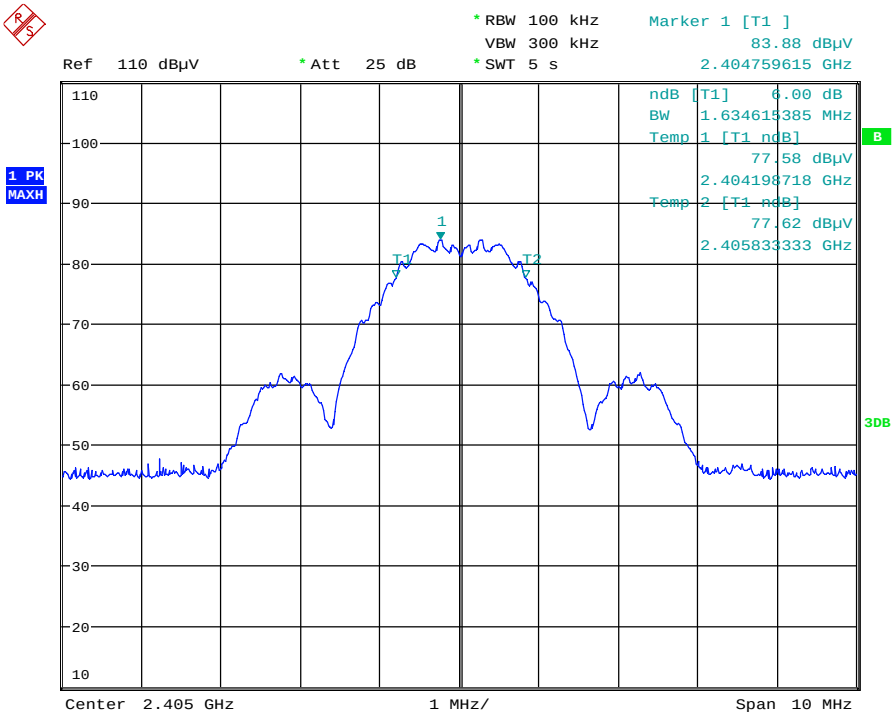
Date: 17.JUN.2011 15:31:46

Radiated Bandedge Compliance (CALL) - Upper Band Edge



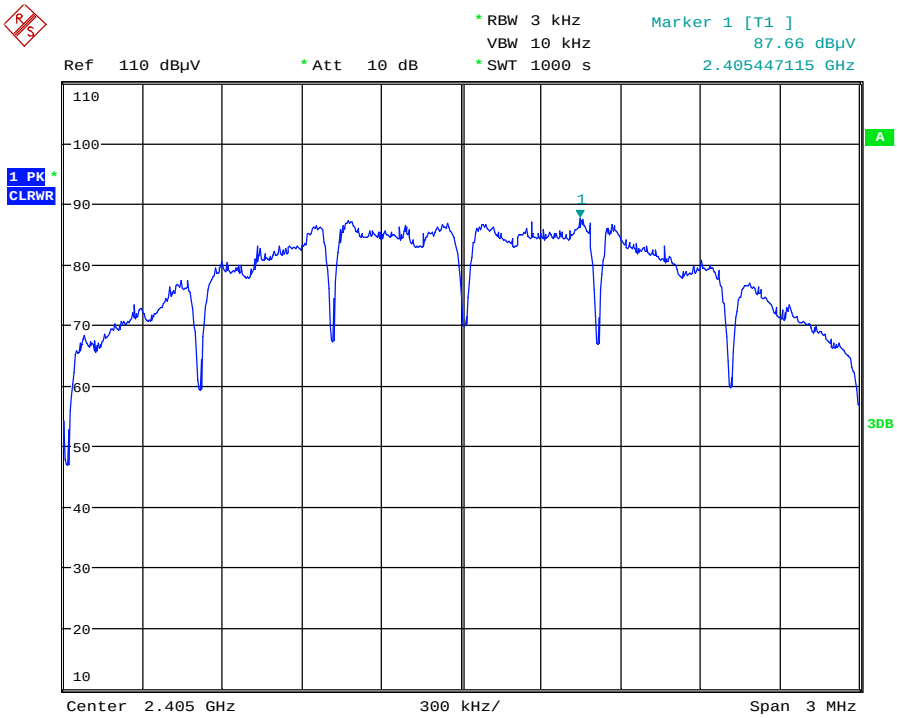
Date: 20.JUN.2011 10:23:33

6 dB Bandwidth (CALL) – Bottom Channel



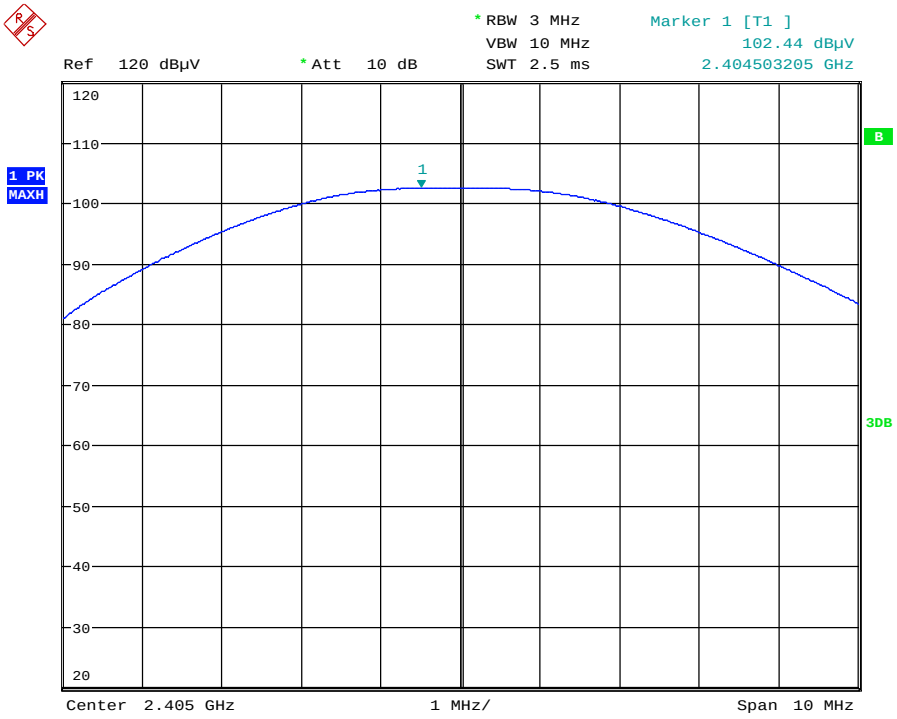
Date: 17.JUN.2011 15:08:58

Power Spectral Density (CALL) – Bottom Channel



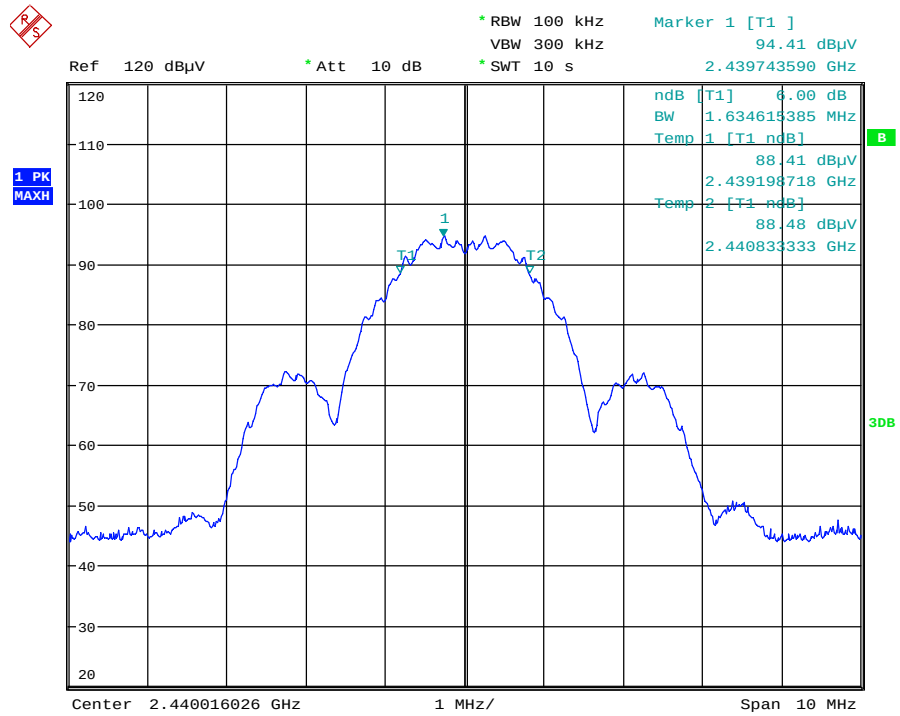
Date: 20.JUN.2011 09:24:04

Carrier Power (CALL) – Bottom Channel



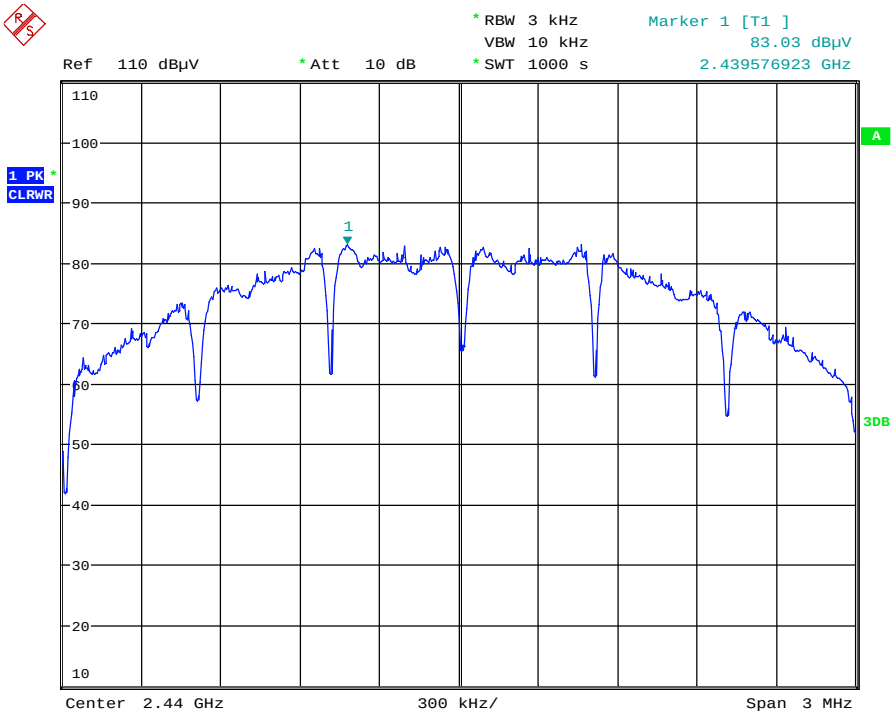
Date: 17.JUN.2011 15:28:48

6 dB Bandwidth (CALL) – Middle Channel



Date: 20.JUN.2011 09:32:11

Power Spectral Density (CALL) – Middle Channel



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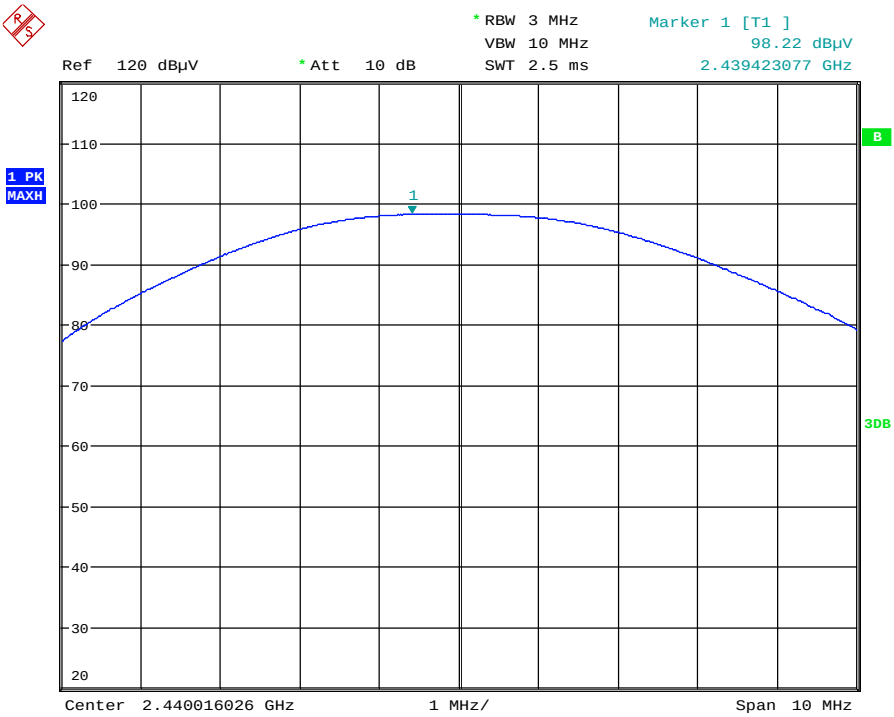
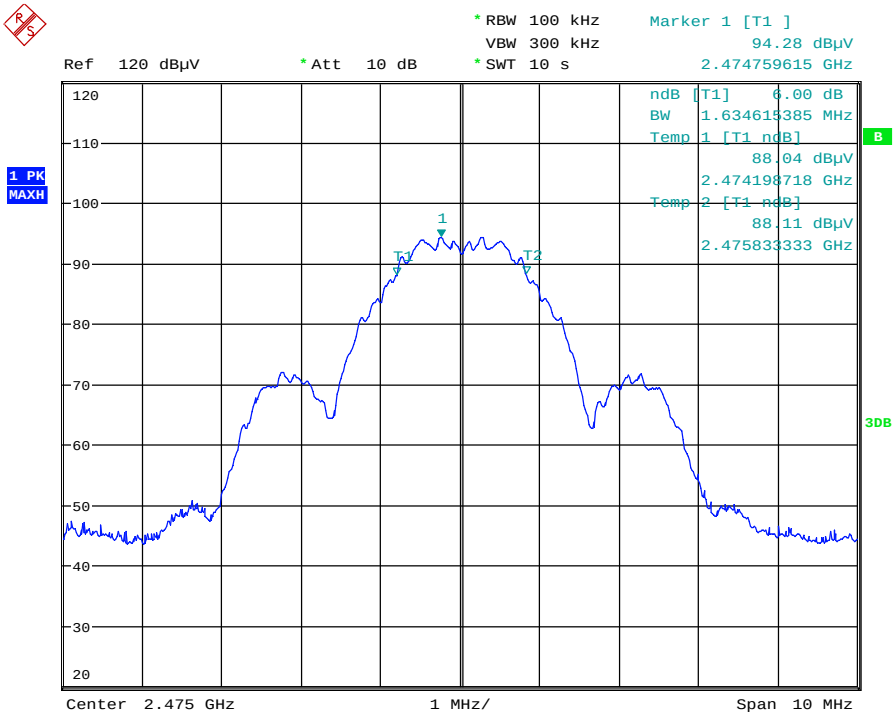
Carrier Power (CALL) – Middle Channel



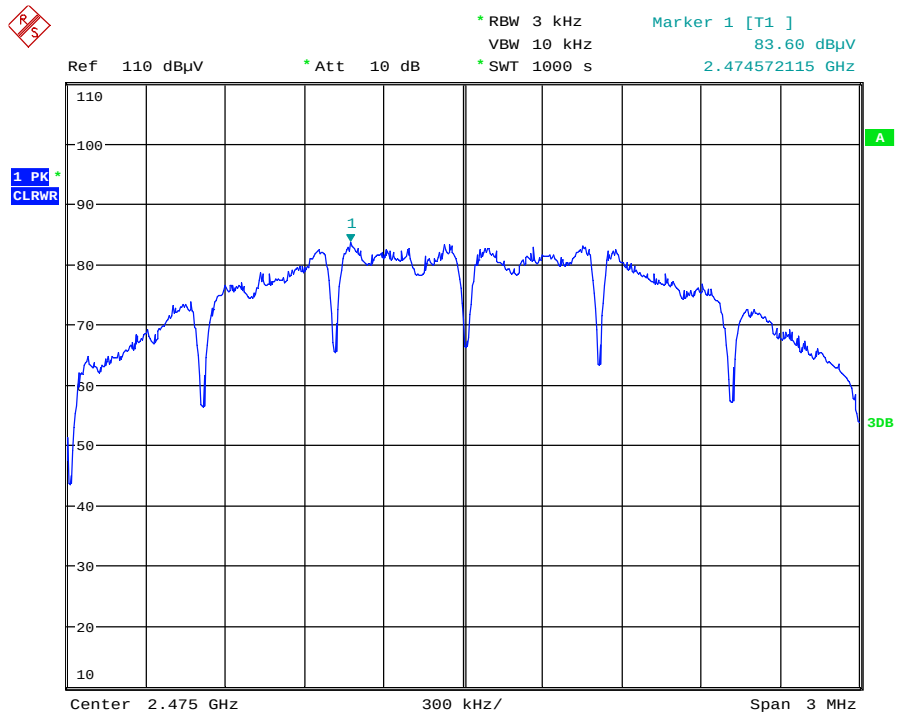
Date: 20.JUN.2011 09:36:16

6 dB Bandwidth (CALL) – Top Channel



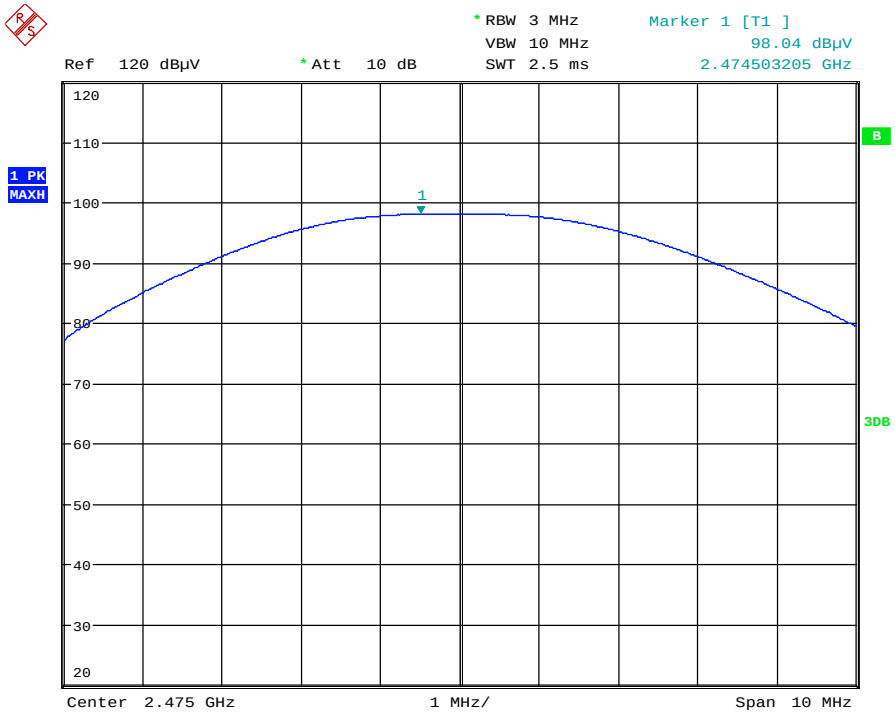
Date: 20.JUN.2011 10:13:38

Power Spectral Density (CALL) – Top Channel



Date: 20.JUN.2011 10:43:24

Carrier Power (CALL) – Top Channel



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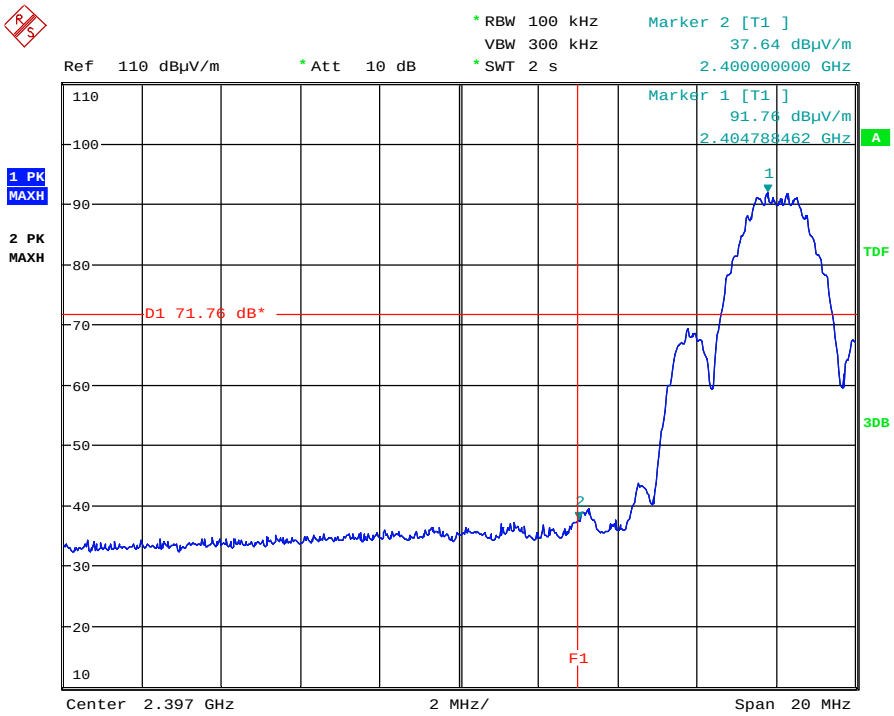
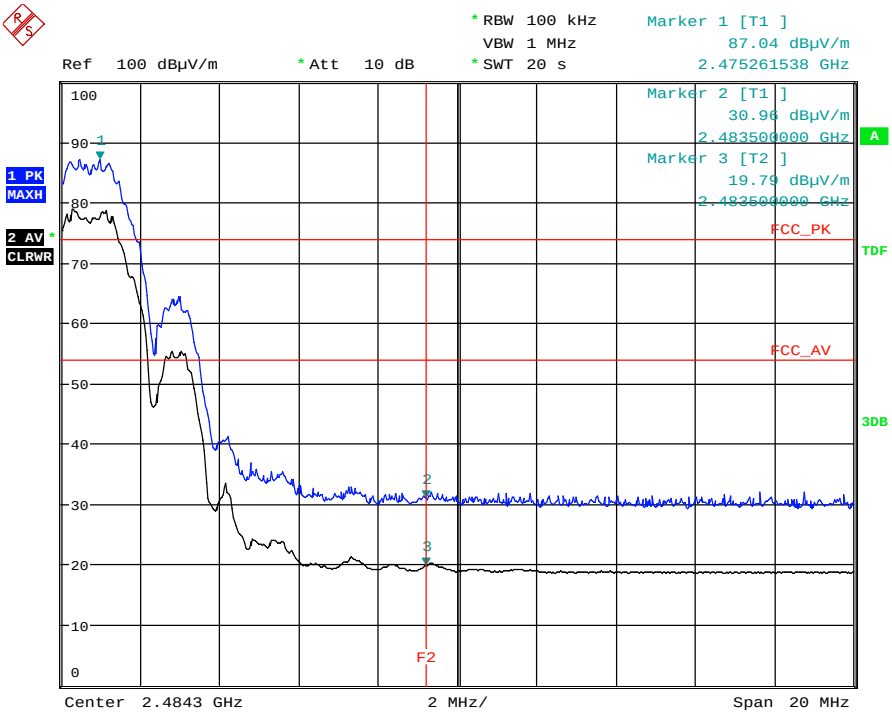
Radiated Bandedge Compliance (APS) - Lower Band Edge



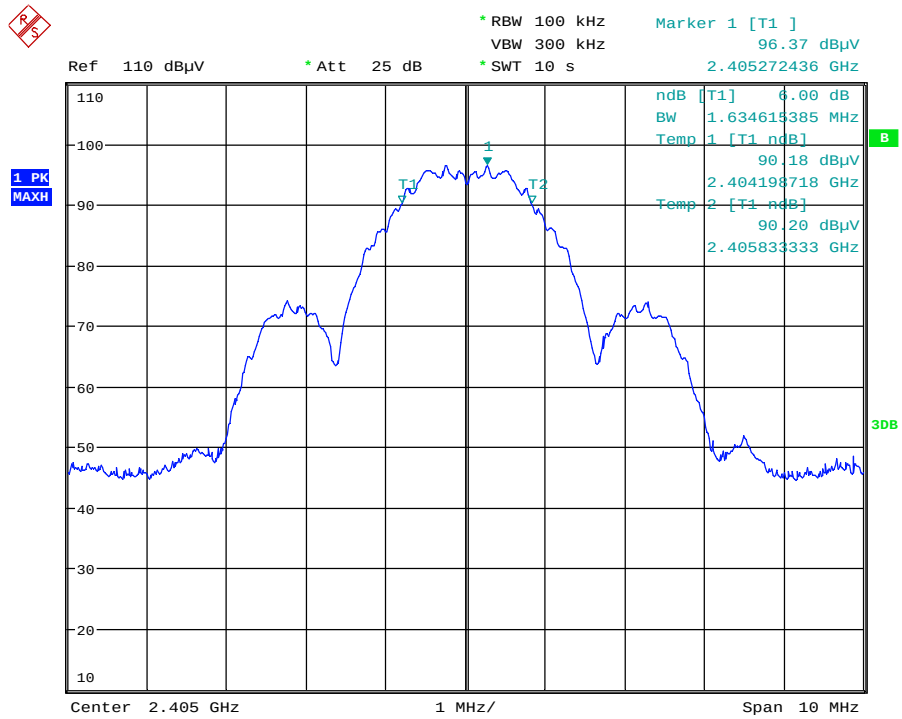
Date: 17.JUN.2011 11:39:41

Radiated Bandedge Compliance (APS) - Upper Band Edge



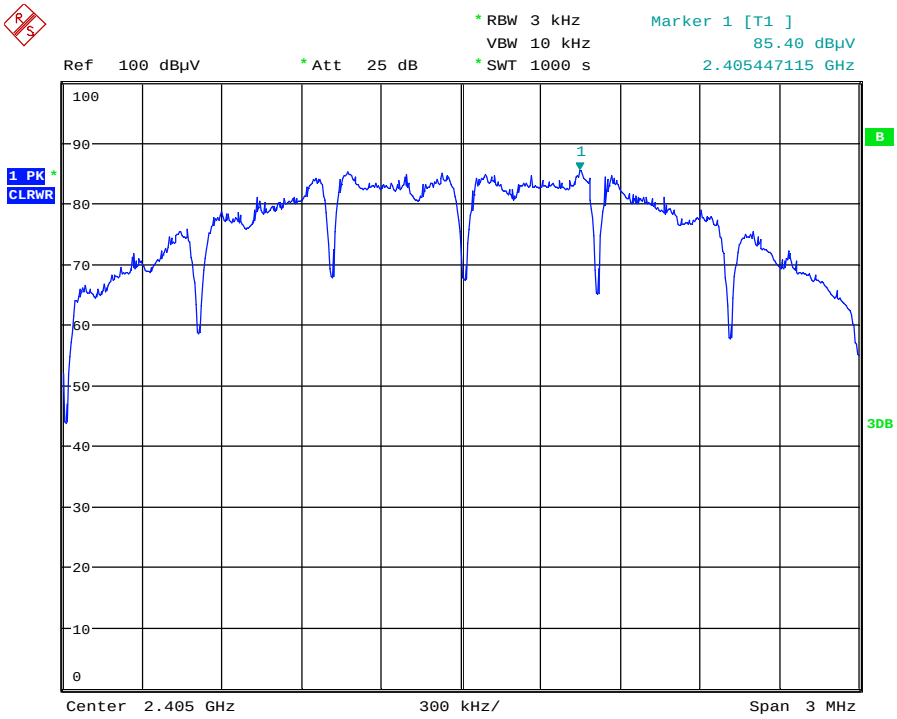
Date: 17.JUN.2011 11:59:04

6 dB Bandwidth (APS) – Bottom Channel



Date: 17.JUN.2011 14:38:25

Power Spectral Density (APS) – Bottom Channel



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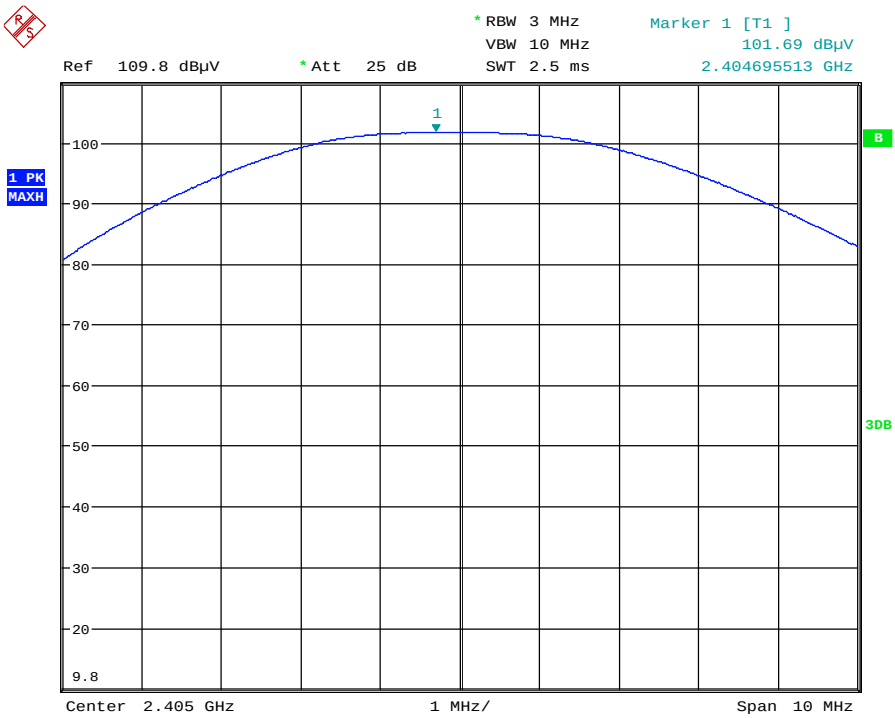
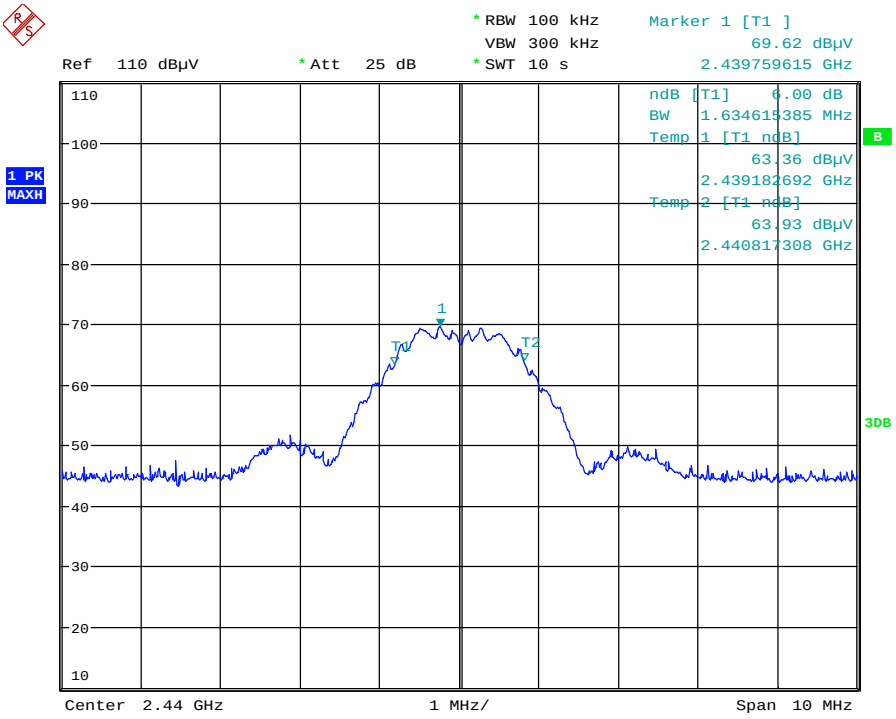
Carrier Power (APS) – Bottom Channel



Date: 17.JUN.2011 11:41:31

6 dB Bandwidth (APS) – Middle Channel



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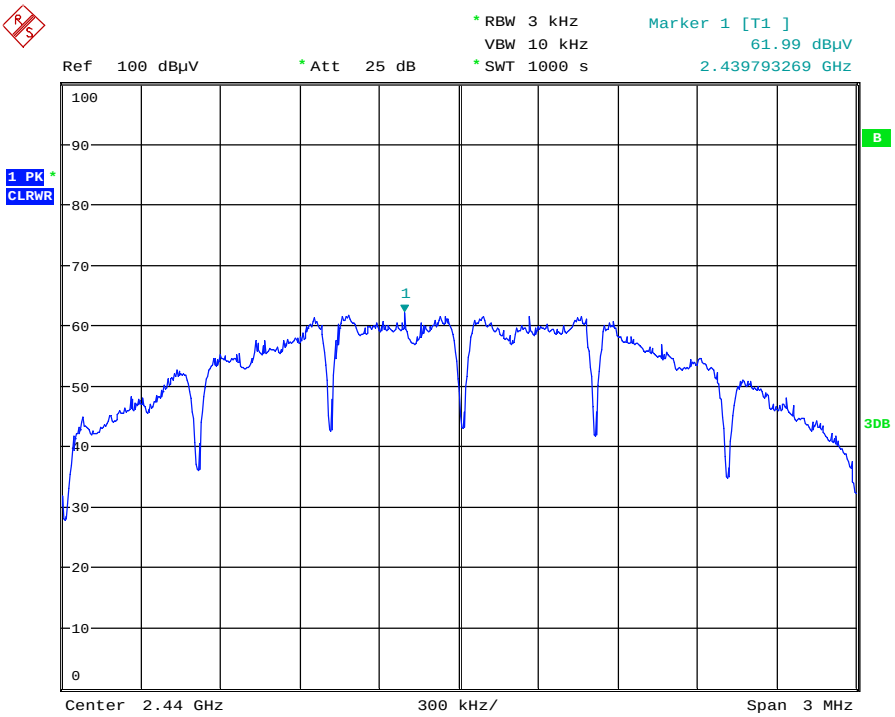
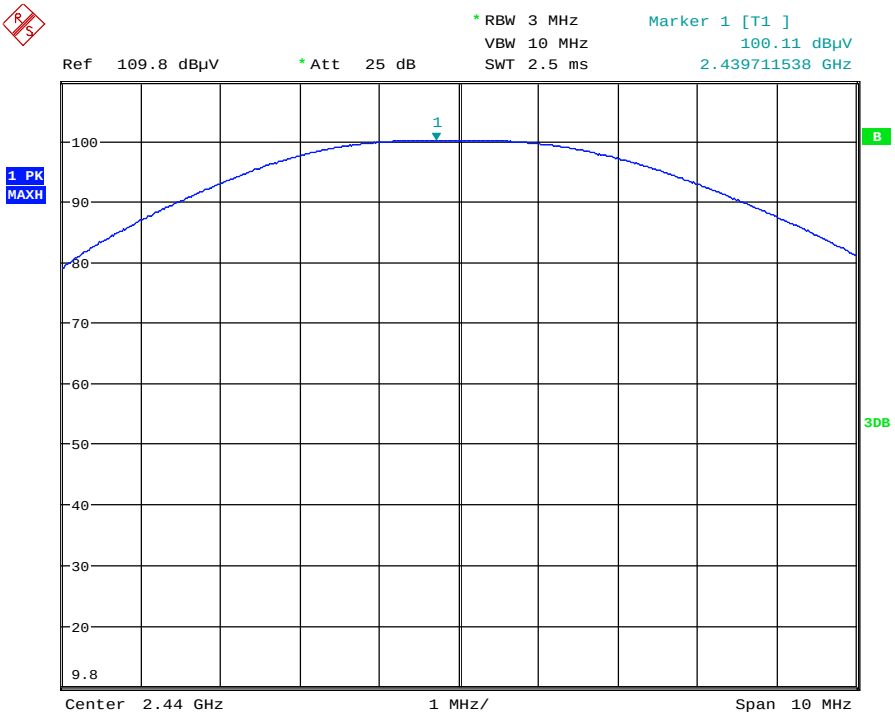
Power Spectral Density (APS) – Middle Channel



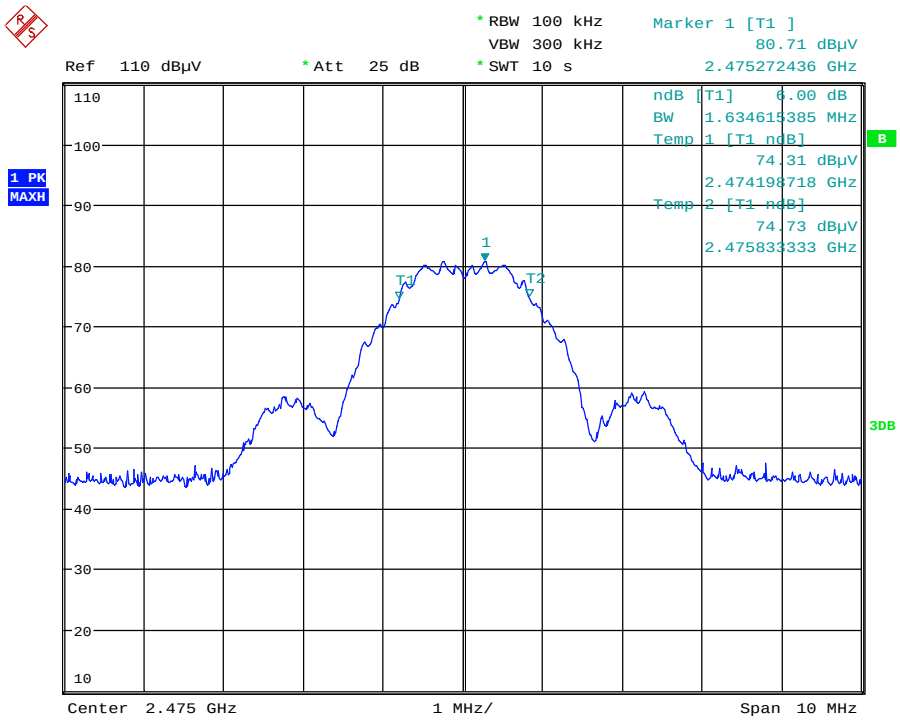
Date: 17.JUN.2011 14:01:45

Carrier Power (APS) – Middle Channel



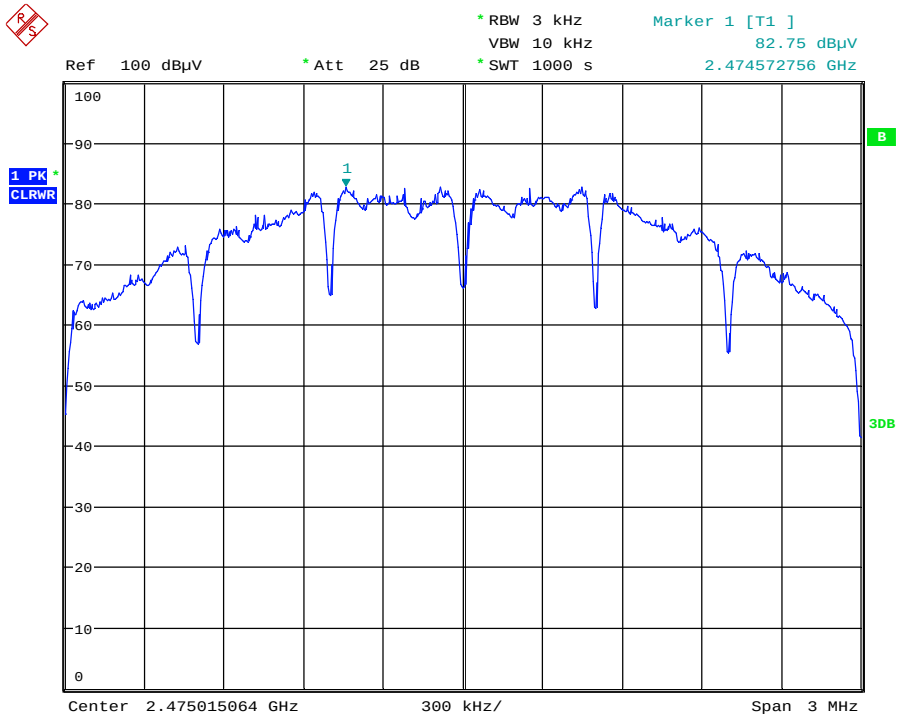
Date: 17.JUN.2011 11:45:46

6 dB Bandwidth (APS) – Top Channel



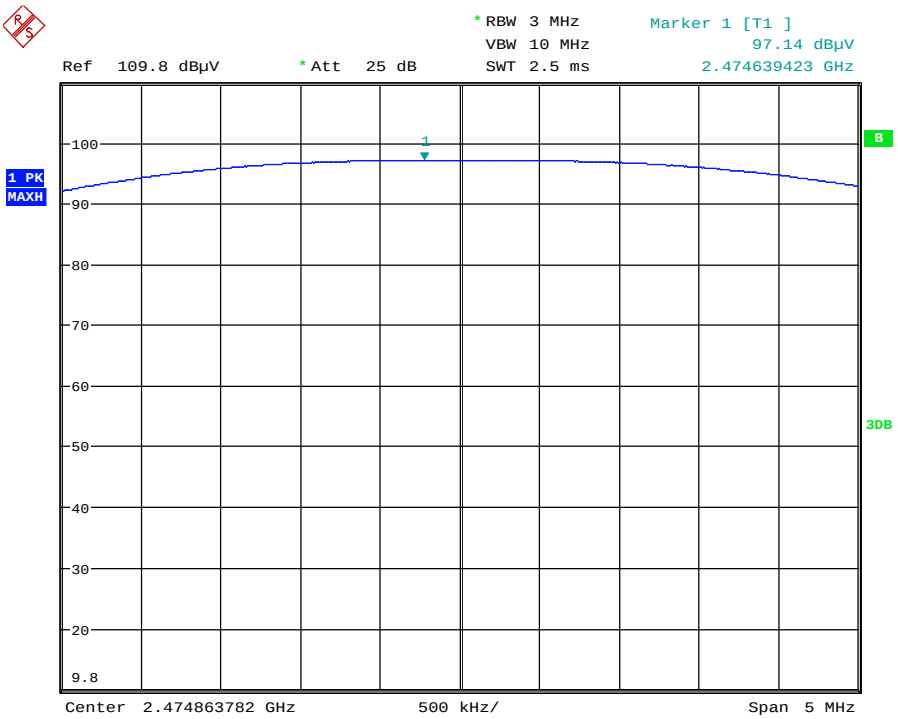
Date: 17.JUN.2011 14:47:38

Power Spectral Density (APS) – Top Channel



Date: 17.JUN.2011 13:32:46

Carrier Power (APS) – Top Channel



Date: 17.JUN.2011 12:00:12

Appendix C: **Additional Test and Sample Details**

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

Sample No: Sxx Mod w

where:

xx = sample number eg. S01
w = modification number eg. Mod 2

The following terminology is used throughout the test report:

Support Equipment (SE) is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

EUT configuration refers to the internal set-up of the EUT. It may include for example:

Positioning of cards in a chassis.
Setting of any internal switches.
Circuit board jumper settings.
Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as “single possible configuration”.

EUT arrangement refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC Telecoms & Radio upon request.

C1 Test samples

The following samples of the apparatus were submitted by the client for testing:

Sample No.	Description	Identification
S04	ZB110 CALL Model	Red Colour case cover with CALL printed on it
S05	ZB110 APS Model	Blue Colour case cover with APS printed on it

C2 EUT Operating Mode during Testing

During testing, the EUT was exercised as described in the following table:

Test	Description of Operating Mode
All tests detailed in this report	EUT active in Transmit/Receive mode accordingly

C3 EUT Configuration Information

The EUT was submitted for testing in one single possible configuration.

C4 List of EUT Ports

None

C5 Details of Equipment Used

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRLUH281	FSU46	Spectrum Analyser	Rhode & Schwarz	28/10/2008
TRL138	3115	1-18GHz Horn Antenna	EMCO	23/05/2007
TRL139	3115	1-18GHz Horn Antenna	EMCO	23/05/2007
TRL572	8499B	1 – 26.5 GHz Pre Amplifier	Agilent	04/07/2008
TRLUH186	ESHS10	Receiver	Rhode & Schwarz	03/04/2009
TRLUH191	CBL611/A	BiLog Periodic Antenna	York	01/10/2008
TRLUH28	UHALP 9108	Bicone elements	Schwarzbeck	30/05/2007
TRLUH29	VHBA	Log Periodic Antenna	Schwarzbeck	06/05/2007
TRL193	VHA 193 blau	Bicone elements	Chase	06/05/2008
TRL203	UPA6108	Log Periodic Antenna	Chase	06/05/2008
TRLUH372	6201-69	30MHz – 1 GHz Pre Amplifier	Watkins Johnson	27/11/2008
TRLUH340	83630B	Signal Generator	HP	03/06/2009
REF838	N4010A	Wireless Connectivity Test Set	Agilent	Ref Only

Appendix D: Additional Information

No additional information is included within this test report.

Appendix E: Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: CALL Model Front View
2. Radiated electric field emissions arrangement: APS Model Front View
3. Close-up shot of the CALL Model
4. Close-up shot of the APS Model

Photograph 1

Photograph 2

Photograph 3

Photograph 4

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