

Radio Test Report

for

Toumaz Technology Ltd

on

Sensiumbridge

Document No: TRA-008895-W-US-2

HULL

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TRaC Wireless Test Report : TRA-008895-W-US-2

Applicant : Toumaz Technology Ltd

Apparatus : Sensiumbridge

Specification : CFR47 Parts 15.247 & 15.249, July 2011

FCCID : AEJ-TZ202020R1

Purpose of Test : Certification

Authorised by :



(Radio Products Manager)

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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:

Toumaz Technology Ltd
Building 3
115 Milton Park
Abingdon OX14 4RZ
Oxfordshire, UK

1.3 Manufacturer

Same as above

1.4 Apparatus Assessed

The following apparatus was assessed between: 16th April 2012 and 8th June 2012

Sensiumbridge

The above device consists of a Wi-Fi module capable of transmitting 802.11b and 802.11g signals.

1.5 Test Result Summary – 15.247

Full details of test results are contained within Appendices A and B. The following tables 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 Appendices A and B. 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	Pass
Occupied 6dB 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
Peak 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 C63.4	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(i)	-	N/A

Notes:

1. FCC KDB Publication 558074 D01 DTS Meas Guidance v02 was also used for measurements
2. ANSI C 63.10:2009 falls outside the scope of the laboratory's UKAS accreditation.

Abbreviations used in the above tables:

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

1.6 Test Result Summary – 15.249

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
Spurious Emissions Radiated <1000MHz	Title 47 of the CFR: Part 15 Subpart (c) 15.209 & 15.249(a)	ANSI C63.10:2009	Pass
Spurious Emissions Radiated >1000MHz	Title 47 of the CFR: Part 15 Subpart (c) 15.209 & 15.249(a)	ANSI C63.10:2009	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart (c) 15.207	ANSI C63.10:2009	N/A
Intentional Emission Frequency	Title 47 of the CFR: Part 15 Subpart (c) 15.249(a)	ANSI C63.10:2009	Pass
Intentional Emission Field Strength	Title 47 of the CFR: Part 15 Subpart (c) 15.249(a)	ANSI C63.10:2009	Pass
Intentional Emission Band Occupancy	Title 47 of the CFR: Part 15 Subpart (c) 15.215(c)	ANSI C63.10:2009	Pass
Intentional Emission ERP (mW)	Title 47 of the CFR: Part 15 Subpart (c)	ANSI C63.10:2009	N/A
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart (b) 15.109	ANSI C63.10:2009	Pass
Antenna Arrangements Integral:	Title 47 of the CFR: Part 15 Subpart (c) 15.203	-	Pass
Antenna Arrangements External Connector	Title 47 of the CFR: Part 15 Subpart (c) 15.204	-	N/A
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	-
Maximum Frequency of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	-
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	-

Abbreviations used in the above table:

ANSI C 63.10:2009 is outside the scope of the laboratories UKAS accreditation.

CFR : Code of Federal Regulations
REFE : Radiated Electric Field Emissions

ANSI : American National Standards Institution
PLCE : Power Line Conducted Emissions

1.7 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.

1.8 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2:**Measurement Uncertainty****2.1 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 (Power Meter) = **1.08dB**

Uncertainty in test result (Spectrum Analyser) = **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 (Power Meter) = **0.113ppm**

Uncertainty in test result (Spectrum Analyser) = **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

Uncertainty in test result – Up to 8.1GHz = **3.31dB**

Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result – 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 Test Results – 15.247**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
		ATS	: Alternative Test Site
EUT	: Equipment Under Test		
SE	: Support Equipment	Ref	: Reference
		Freq	: Frequency
L	: Live Power Line		
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

A1 6dB 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 6dB points on the transmitted spectrum.

Test Details: 802.11b	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
Measurement standard	ANSI C63.10, OET Guidance Notes
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
Temperature	20°C
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
2412	9.214	≥500	Pass
2442	9.134	≥500	Pass
2472	9.214	≥500	Pass

Notes:

1. Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
2. EUT was set to transmit in maximum power setting

Test Details: 802.11g	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
Measurement standard	ANSI C63.10, OET Guidance Notes
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
Temperature	20°C
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit (kHz)	Result
2412	16.682	≥500	Pass
2442	16.682	≥500	Pass
2472	16.714	≥500	Pass

Notes:

1. Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
2. EUT was set to transmit in maximum power setting

A2 Maximum Conducted Output Power

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

Test Details: 802.11b	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10, OET Guidance Notes
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20°C

Channel Frequency (MHz)	Peak Conducted Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	19.84	0.096	1	Pass
2442	19.97	0.099	1	Pass
2472	19.42	0.087	1	Pass

Notes:

1. Measured peak output power does not include the gain of any antenna being used
2. Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
3. EUT was set to transmit in maximum power setting

Test Details: 802.11g	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10, OET Guidance Notes
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20 ⁰ C

Channel Frequency (MHz)	Peak Conducted Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	20.77	0.119	1	Pass
2442	20.45	0.111	1	Pass
2472	20.40	0.110	1	Pass

Notes:

1. Measured peak output power does not include the gain of any antenna being used
2. Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
3. EUT was set to transmit in maximum power setting

A3 Transmitter Power Spectral Density

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

Test Details: 802.11b	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10, OET Guidance Notes
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20°C

Channel Frequency (MHz)	Conducted Peak Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-9.79	8	Pass
2442	-9.55	8	Pass
2472	-10.2	8	Pass

Notes:

1. Measured Power Spectral Density does not include the gain of any antenna being used
2. Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
3. EUT was set to transmit in maximum power setting

Test Details: 802.11g	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10, OET Guidance Notes
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20 ⁰ C

Channel Frequency (MHz)	Conducted Peak Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-14.71	8	Pass
2442	-16.16	8	Pass
2472	-16.03	8	Pass

Notes:

1. Measured Power Spectral Density does not include the gain of any antenna being used
2. Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
3. EUT was set to transmit in maximum power setting

A4 Conducted Spurious Emissions

Measurement of conducted spurious emissions at the antenna port was performed using a peak detector with the RBW set to 100kHz and the VBW>RBW. Frequencies were scanned up through to the 10th harmonic with the EUT transmitting on its lowest, centre and highest carrier frequency in turns.

Test Details: 802.11b	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10, OET Guidance Notes
Frequency range	9 kHz to 25 GHz
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20°C

The worst case conducted emission measurements at the antenna port are listed below:

Ref No.	Emission Freq (MHz)	Det.	Restricted band? (Y/N)	Emission power (RBW =100kHz) (dBm)	15.247(d) Limit (dBm)	Summary
No emissions detected within 20dB of the limit						

Test Details: 802.11g	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10, OET Guidance Notes
Frequency range	9 kHz to 25 GHz
EUT sample number	S01
Modification state	0
SE in test environment	S02, S03, S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	20°C

The worst case conducted emission measurements at the antenna port are listed below:

Ref No.	Emission Freq (MHz)	Det.	Restricted band? (Y/N)	Emission power (RBW =100kHz) (dBm)	15.247(d) Limit (dBm)	Summary
No emissions detected within 20dB of the limit						

Notes:

1. The conducted emission limit for emissions outside the restricted bands, defined in 47CFR Part 15.205(a) are based on a transmitted carrier level of 15.247(b). With the EUT transmitting on its lowest, centre and highest carrier frequencies in turn, emissions from the EUT are required to be 20 dB below the level of the highest fundamental as measured within a 100 kHz RBW in accordance with 15.247(d) using a peak detector.
2. The RBW = 100 kHz, Video bandwidth (VBW) > RBW and the radio spectrum was investigated up to the 10th harmonic in accordance 15.33 (a)(1).
3. The measurements at 2400 MHz and 2483.5 MHz were made to ensure band edge compliance
4. EUT was set to transmit in maximum power setting
5. The carrier level was measured whilst varying the supply voltage between 85% and 105% of the nominal supply voltage as required by 15.31(e). No variation in carrier level was observed. All other emissions were at least 20dB below the test limit
6. The plots for worst case emissions on one of the modulation types can be found in Appendix B

The limit outside the restricted band in 100 kHz RBW is defined using the following formula in accordance with 15.247(d):

$$\text{The limit in 100 kHz RBW} = (\text{Maximum Peak Conducted Carrier}) - 20\text{dB}$$

A5 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with RBW = 100kHz. The radiated electric field 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) below.

Test Details: 802.11b	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10, OET Guidance Notes
Frequency range	30MHz – 25GHz
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	S02, S03, S04
EUT set up	Refer to Appendix C
Temperature	20°C
Photographs (Appendix F)	1

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

Frequency (MHz)	Max Reading (dBuV)	Detector	Cable Loss (dB)	Antenna Fact (dB/m)	Preamp (dB)	Field Strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824	47.98	Av	3.6	32.7	35.7	48.58	54	-5.42
7236	43.38	Av	4.2	36.0	36.2	47.38	54	-6.62
4884	45.21	Av	3.8	32.9	35.7	46.21	54	-7.79
7326	41.23	Av	4.2	36.3	36.2	45.53	54	-8.47
4944	41.70	Av	3.7	33.1	35.7	42.80	54	-11.2
7416	47.49	Av	4.2	36.5	36.3	51.89	54	-2.11

Test Details: 802.11g	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10, OET Guidance Notes
Frequency range	30MHz – 25GHz
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	S02, S03, S04
EUT set up	Refer to Appendix C
Temperature	20°C
Photographs (Appendix F)	1

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

Frequency (MHz)	Max Reading (dBuV)	Detector	Cable Loss (dB)	Antenna Fact (dB/m)	Preamp (dB)	Field Strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824	45.45	Av	3.6	32.7	35.7	46.05	54	-7.95
7236	48.22	Av	4.2	36.0	36.2	52.22	54	-1.78
4884	45.41	Av	3.8	32.9	35.7	46.41	54	-7.59
7326	37.77	Av	4.2	36.3	36.2	42.07	54	-11.93
4944	45.26	Av	3.7	33.1	35.7	46.36	54	-7.64
7416	46.29	Av	4.2	36.5	36.3	50.69	54	-3.31

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 EUT was set to transmit in maximum power setting
- 5 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
- 6 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

- 7 The plots for worst case emissions out of different modulation types in worst case polarisations can be found in Appendix B

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 ($\mu\text{V/m}$)	Measurement Distance (m)	Field strength ($\text{dB}\mu\text{V/m}$)
0.009-0.490	$2400/F(\text{kHz})$	300	$67.6/F(\text{kHz})$
0.490-1.705	$24000/F(\text{kHz})$	30	$87.6/F(\text{kHz})$
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

A6 Unintentional Radiated Electric Field Emissions

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 EUT was also checked for common unintentional emissions in all modulation types and channels.

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 :

☒

Test Details: See note	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.10, OET Guidance Notes
Frequency range	30MHz to 25 GHz
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	S02, S03, S04
EUT set up	Refer to Appendix C
Temperature	20 ⁰ C
Photographs (Appendix E)	1

The worst case radiated emission measurements are listed below:

Ref No.	FREQ. (MHz)	MEAS Rx (dBμV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBμV/m)	EXTRAP FACT (dB)	FIELD ST'GH (μV/m)	LIMIT (μV/m)
1.	4823.99 _{Pk}	55.4	3.6	32.7	35.7	56.00	-9.54	1892.34	5000
2.	4823.99 _{Av}	52.17	3.6	32.7	35.7	52.77	-9.54	1304.67	500
3.	9648.012 _{Pk}	50.03	5	37.7	36.8	55.93	-9.54	1877.15	5000
4.	9648.012 _{Av}	40.15	5	37.7	36.8	46.05	-9.54	601.87	500

Note: The above emissions were seen on all channels and did not change with frequency of operation.

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 ($\mu\text{V/m}$)	Measurement Distance (m)	Field strength ($\text{dB}\mu\text{V/m}$)
0.009-0.490	$2400/F(\text{kHz})$	300	$67.6/F(\text{kHz})$
0.490-1.705	$24000/F(\text{kHz})$	30	$87.6/F(\text{kHz})$
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

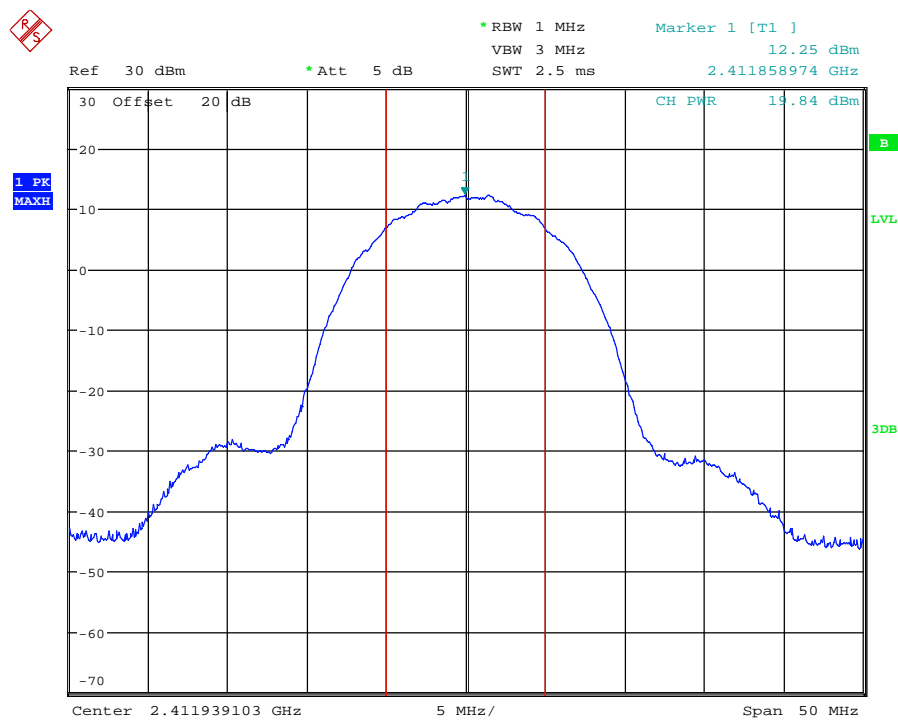
Appendix B:**Supporting Graphical Data – 15.247**

This appendix contains graphical data obtained during testing.

Notes:

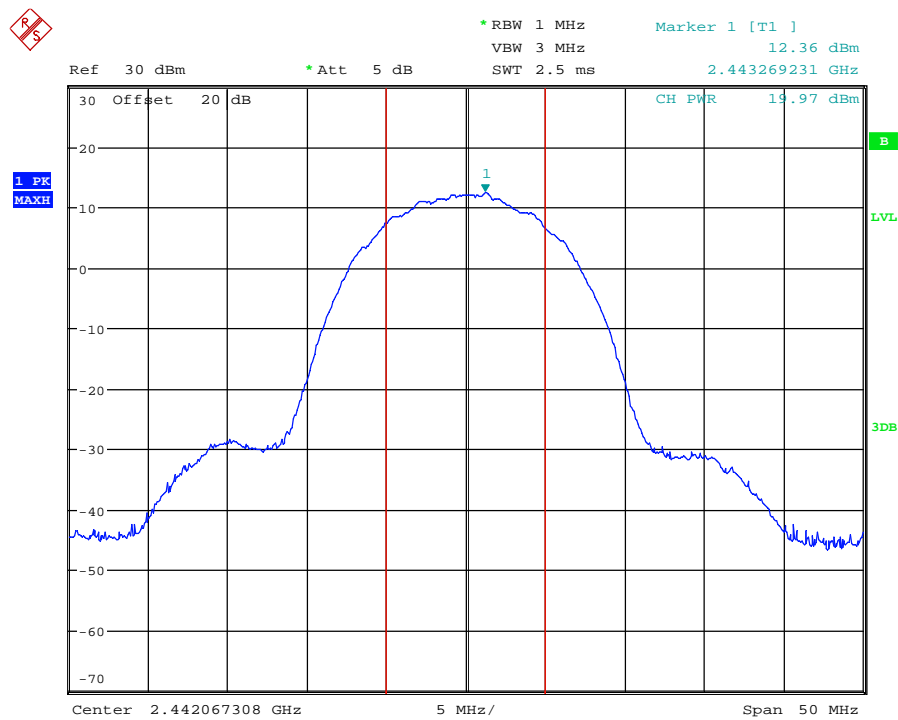
- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power 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.

802.11b Carrier Power – Bottom Channel



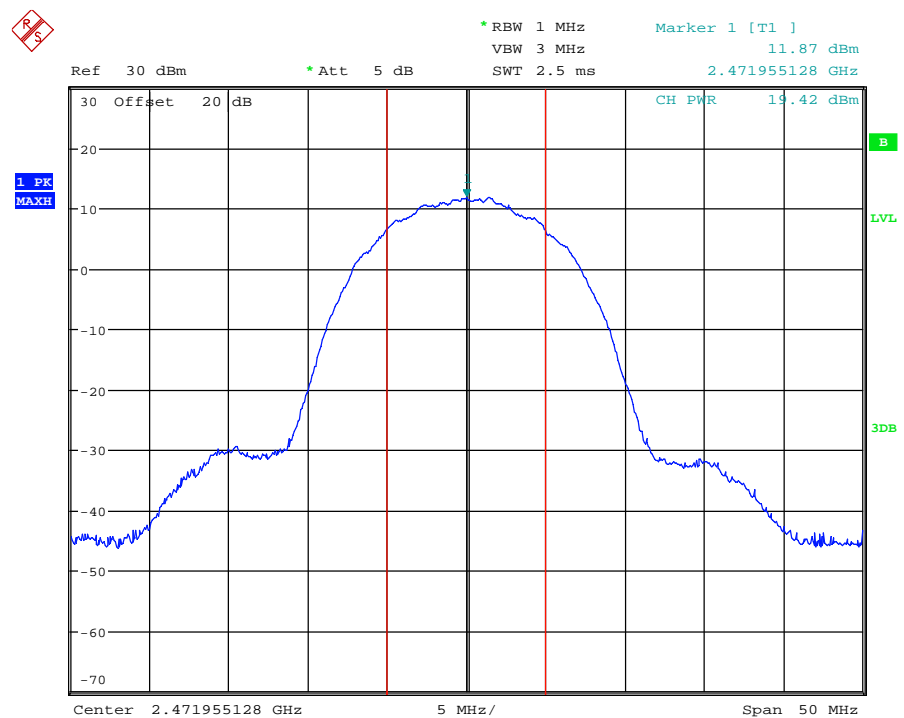
Date: 3.MAY.2012 16:23:24

802.11b Carrier Power – Middle Channel



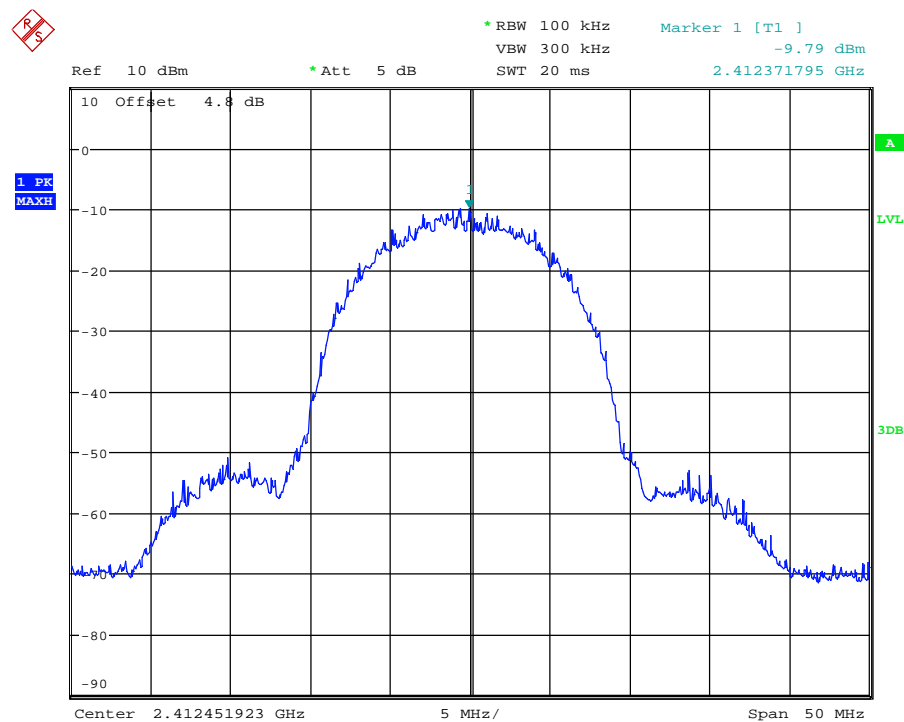
Date: 3.MAY.2012 16:24:04

802.11b Carrier Power - Top Channel



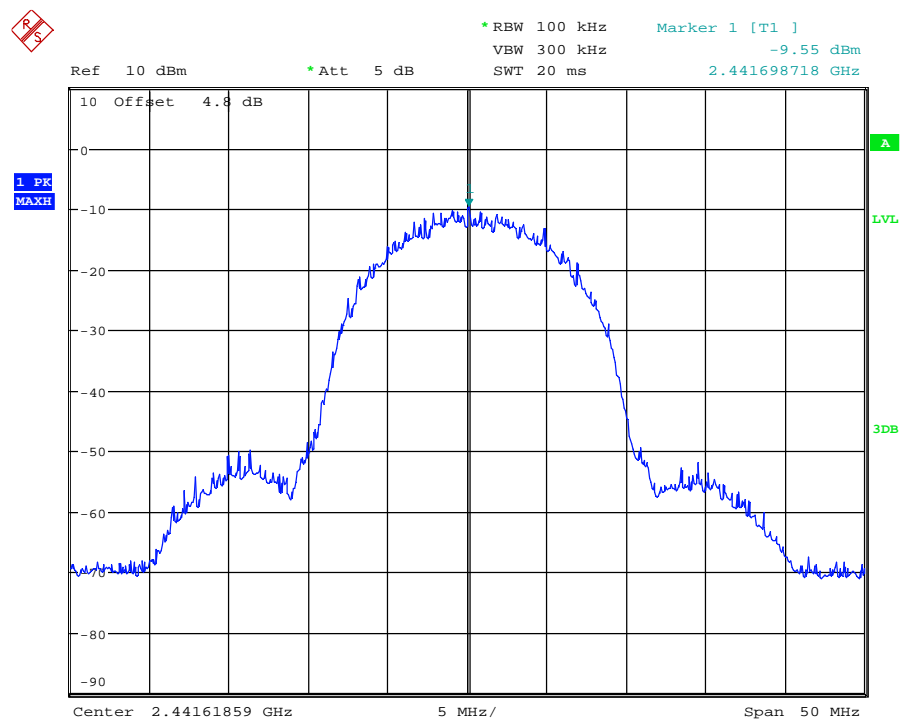
Date: 3.MAY.2012 16:24:50

802.11b Peak Power Spectral Density - Bottom Channel



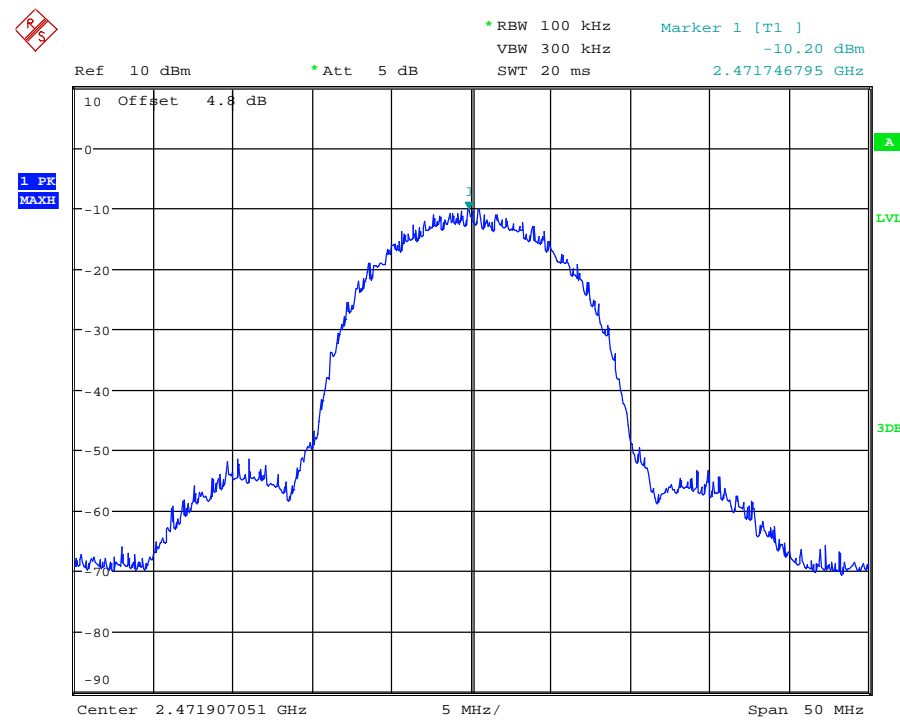
Date: 3.MAY.2012 17:28:51

802.11b Peak Power Spectral Density – Middle Channel



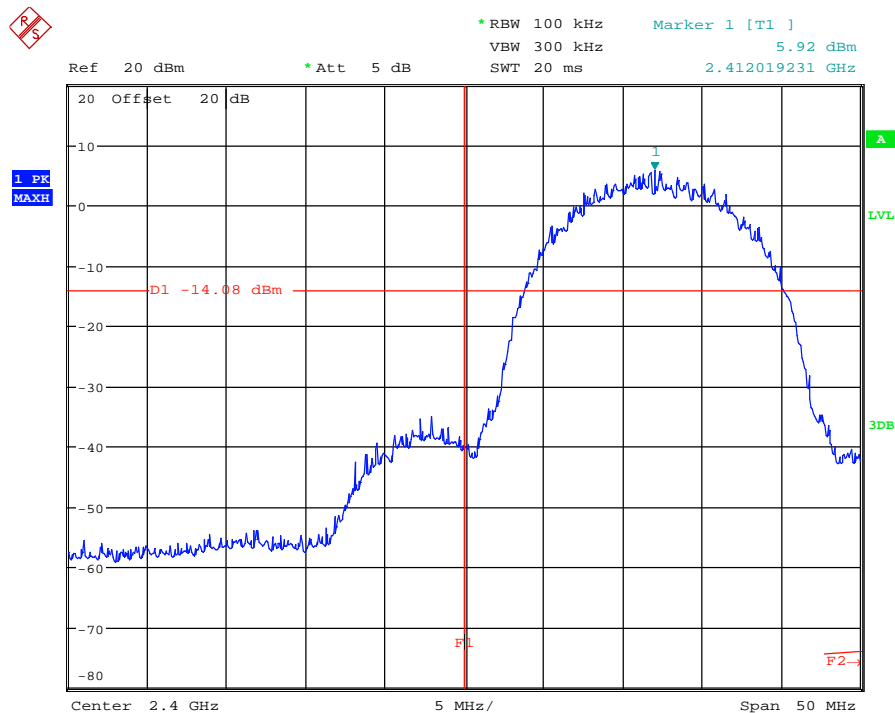
Date: 3.MAY.2012 17:28:14

802.11b Peak Power Spectral Density - Top Channel



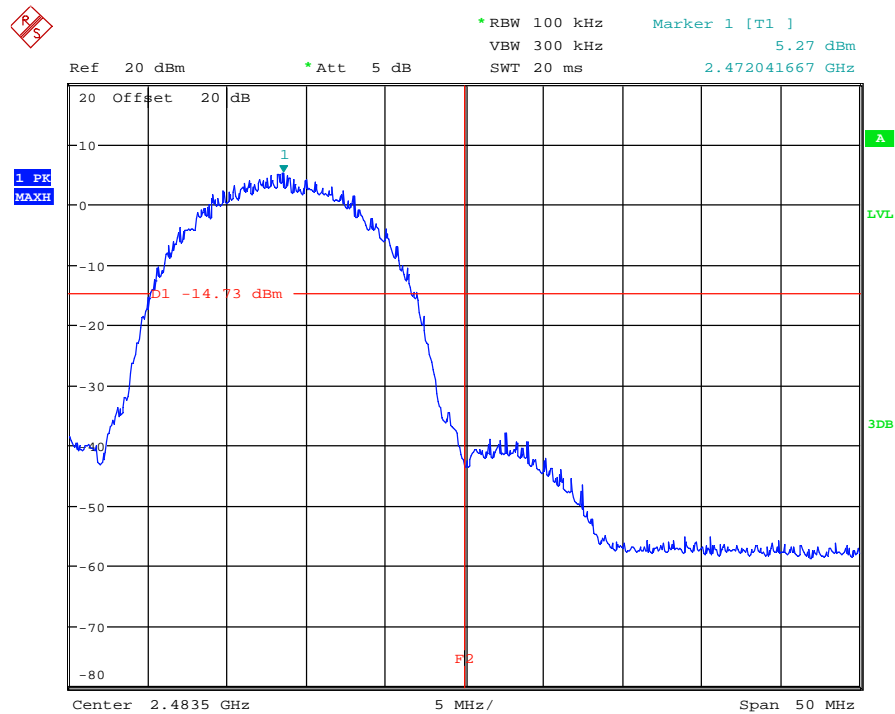
Date: 3.MAY.2012 17:27:06

802.11b Conducted Lower Band-edge Compliance



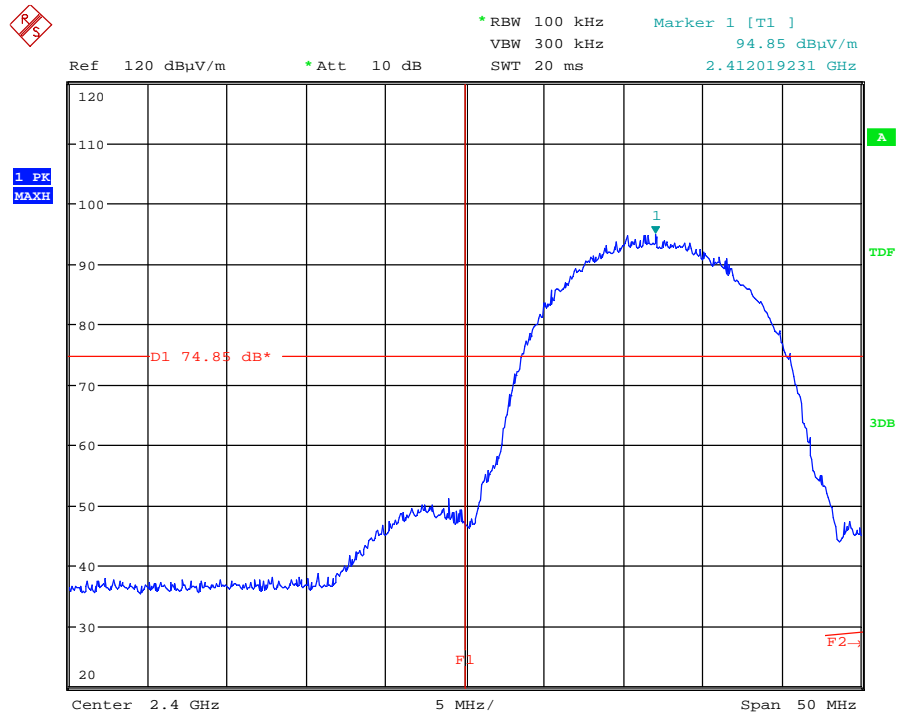
Date: 3.MAY.2012 16:30:45

802.11b Conducted Upper Band-edge Compliance



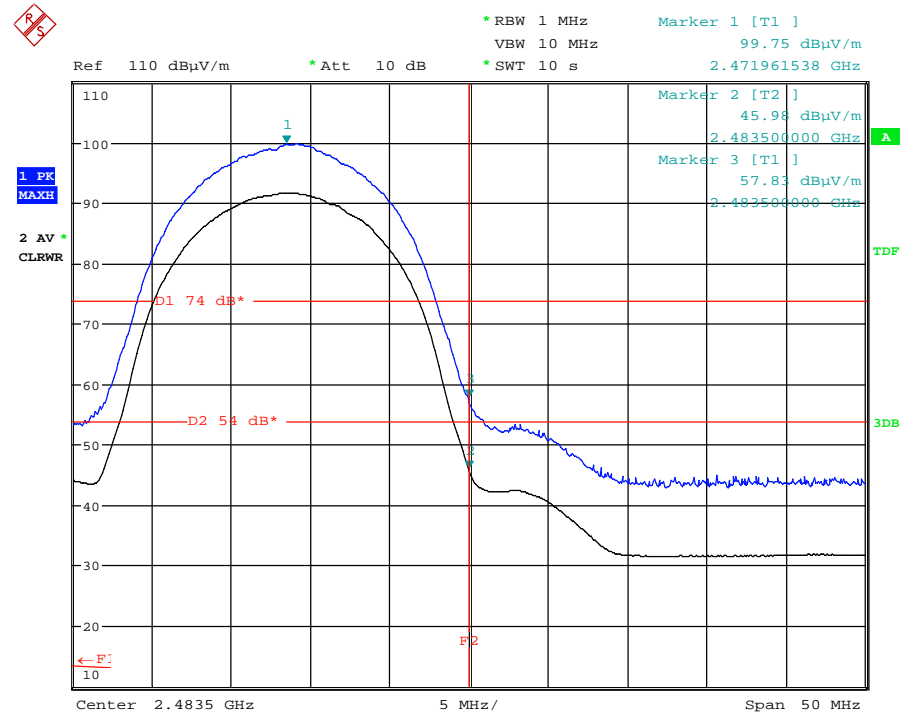
Date: 3.MAY.2012 16:29:34

802.11b Radiated Upper Band-edge Compliance



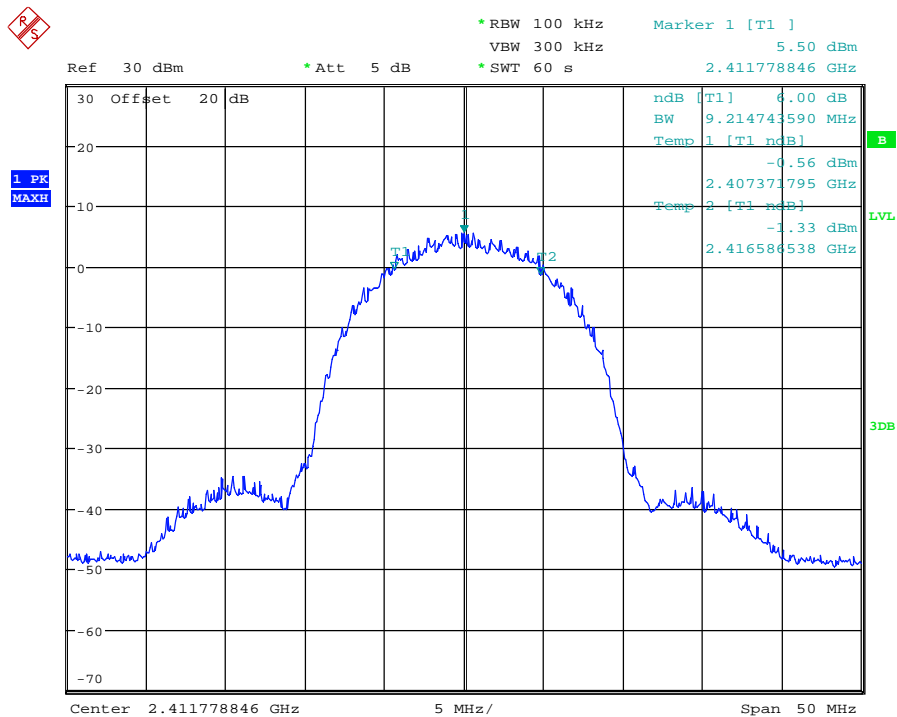
Date: 14.JUN.2012 16:58:07

802.11b Radiated Upper Band-edge Compliance



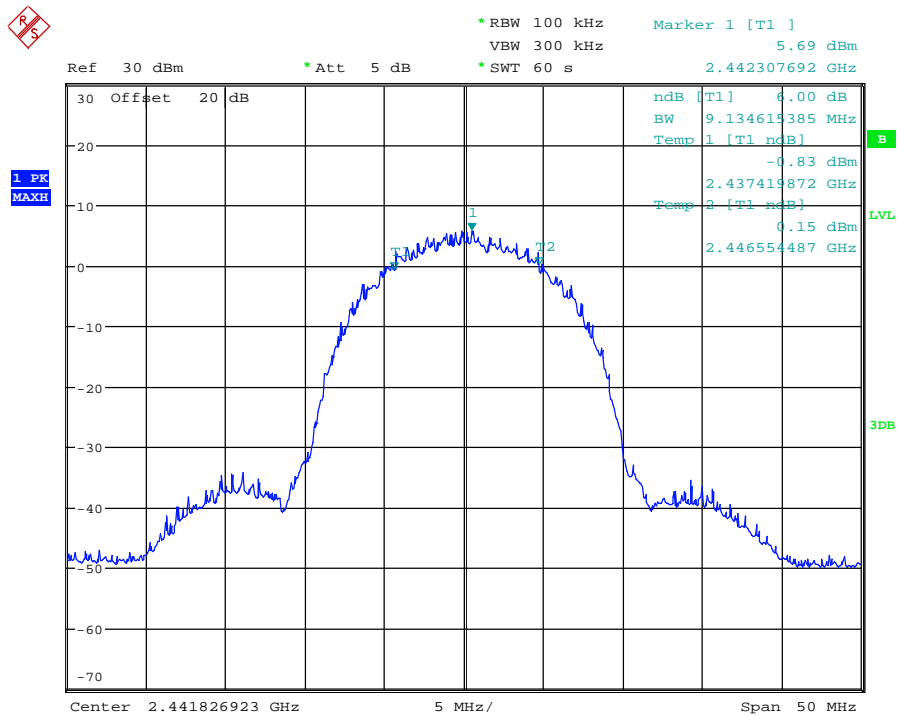
Date: 14.JUN.2012 17:16:22

802.11b 6dB Bandwidth - Bottom Channel



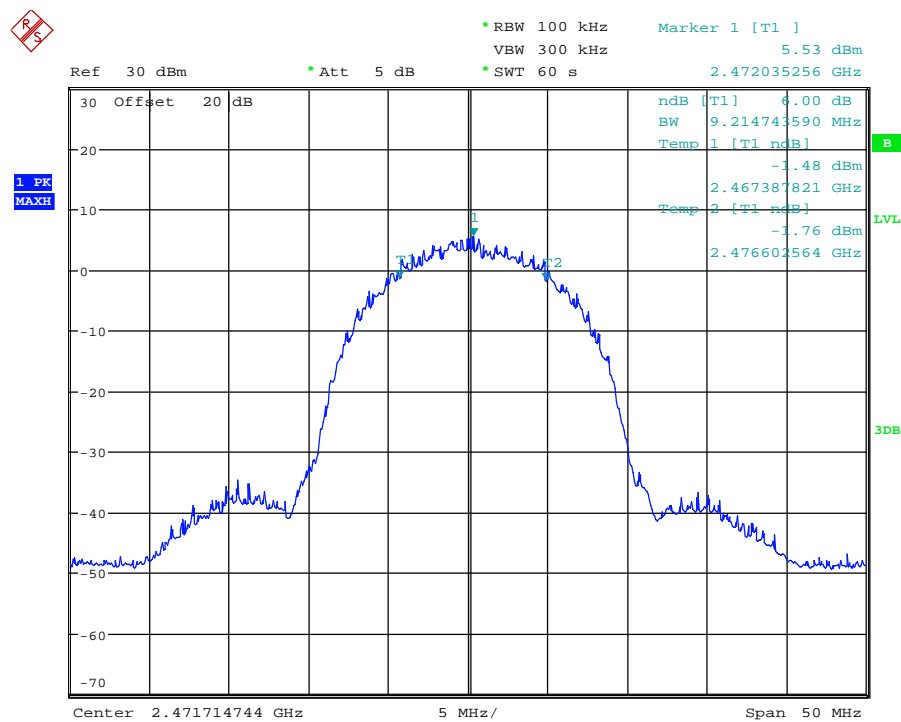
Date: 3.MAY.2012 16:20:02

802.11b 6dB Bandwidth - Middle Channel



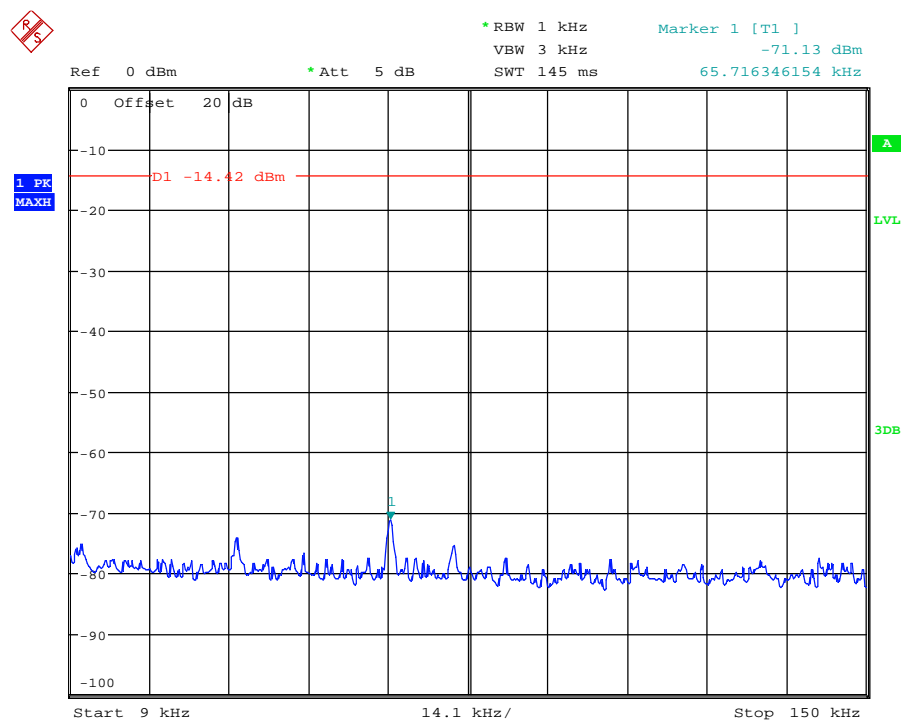
Date: 3.MAY.2012 16:06:54

802.11b 6dB Bandwidth – Top Channel



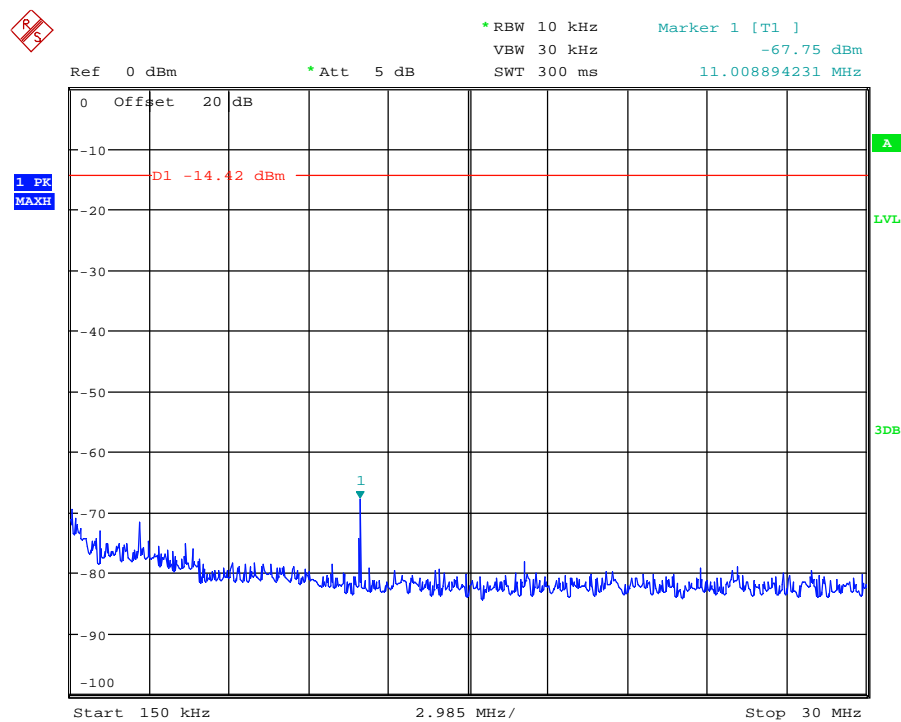
Date: 3.MAY.2012 16:13:11

802.11b Conducted Emissions 9kHz -150kHz



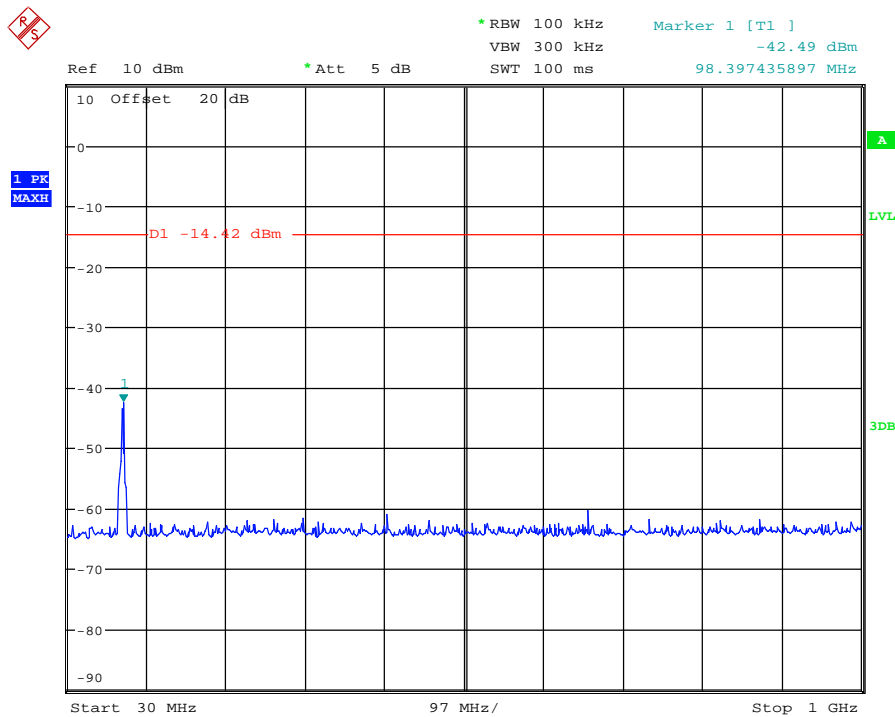
Date: 3.MAY.2012 16:34:50

802.11b Conducted Emissions 150kHz – 30MHz



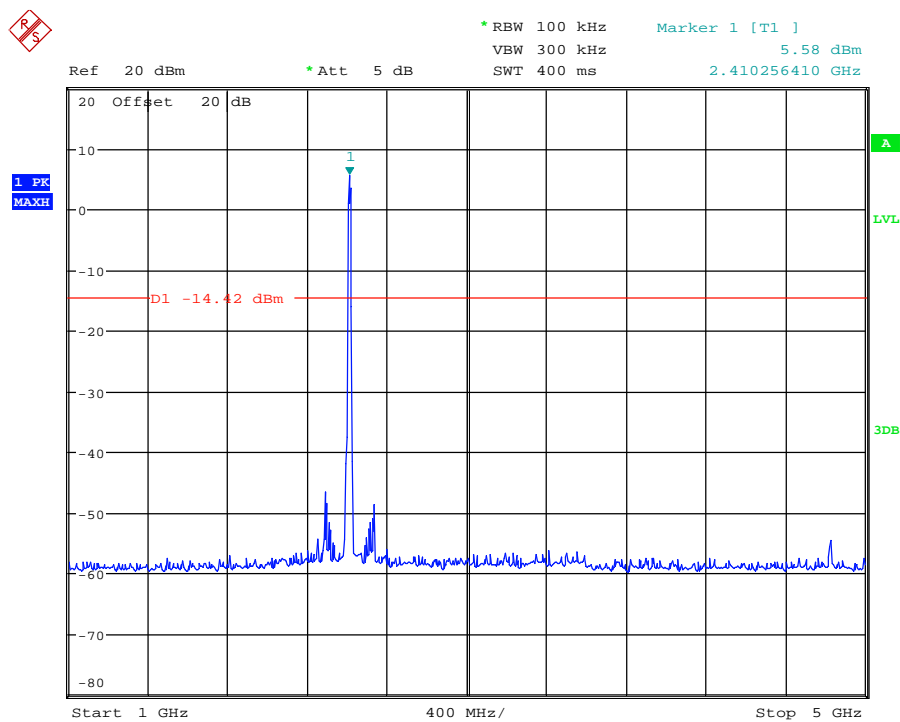
Date: 3.MAY.2012 16:35:16

802.11b Conducted Emissions 30MHz – 1GHz



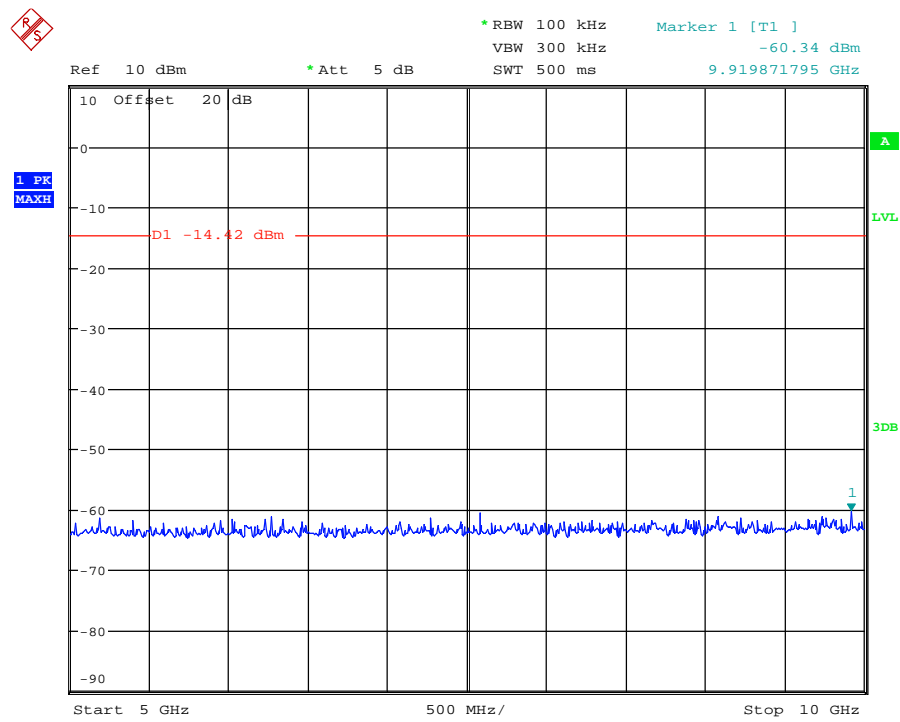
Date: 3.MAY.2012 16:36:23

802.11b Conducted Emissions 1GHz – 5GHz



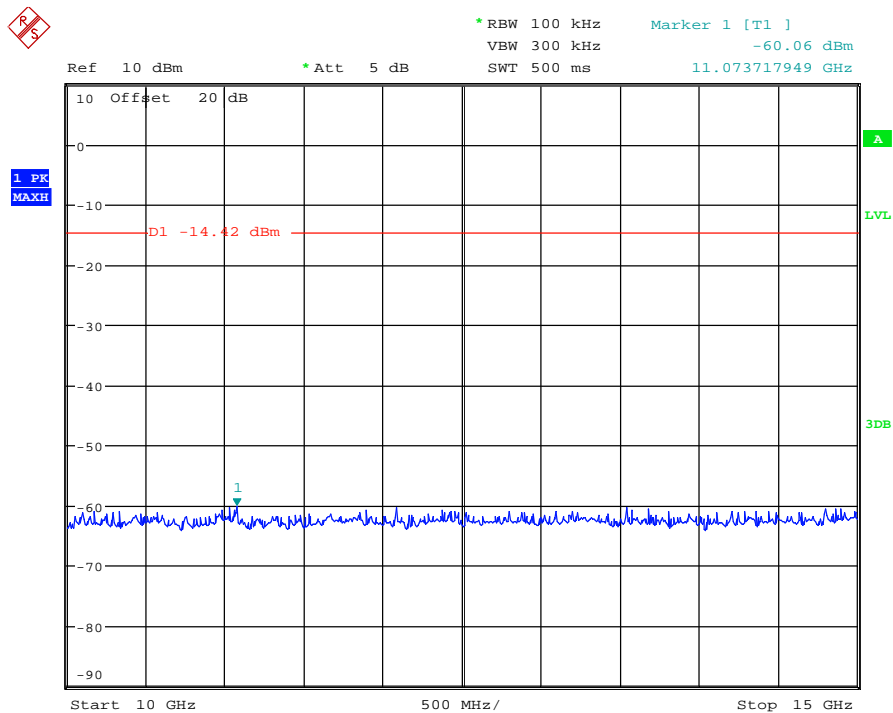
Date: 3.MAY.2012 16:32:01

802.11b Conducted Emissions 5GHz – 10GHz



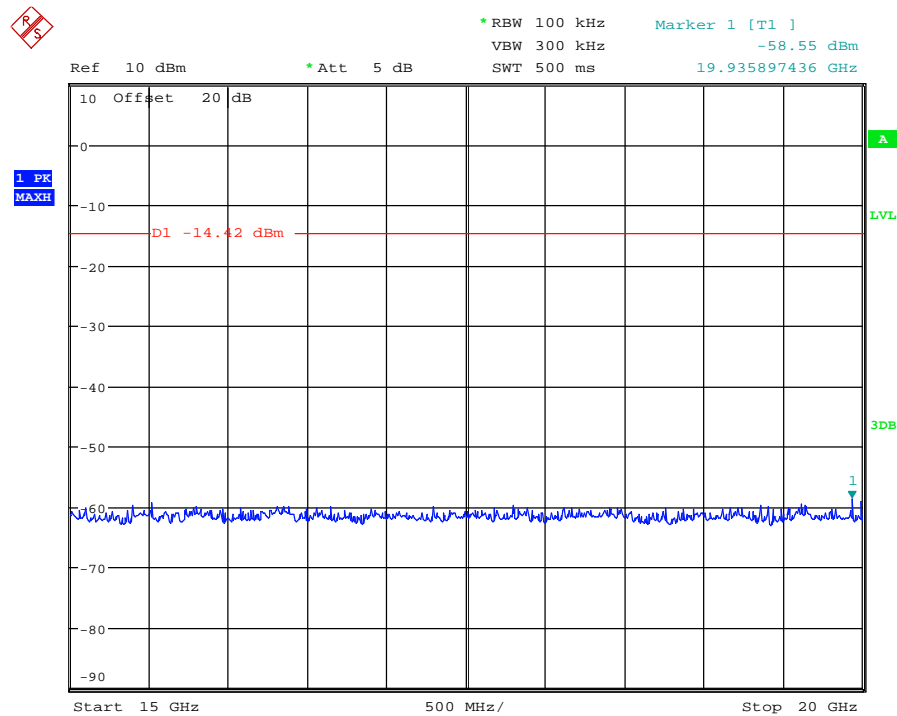
Date: 3.MAY.2012 16:32:36

802.11b Conducted Emissions 10GHz – 15GHz



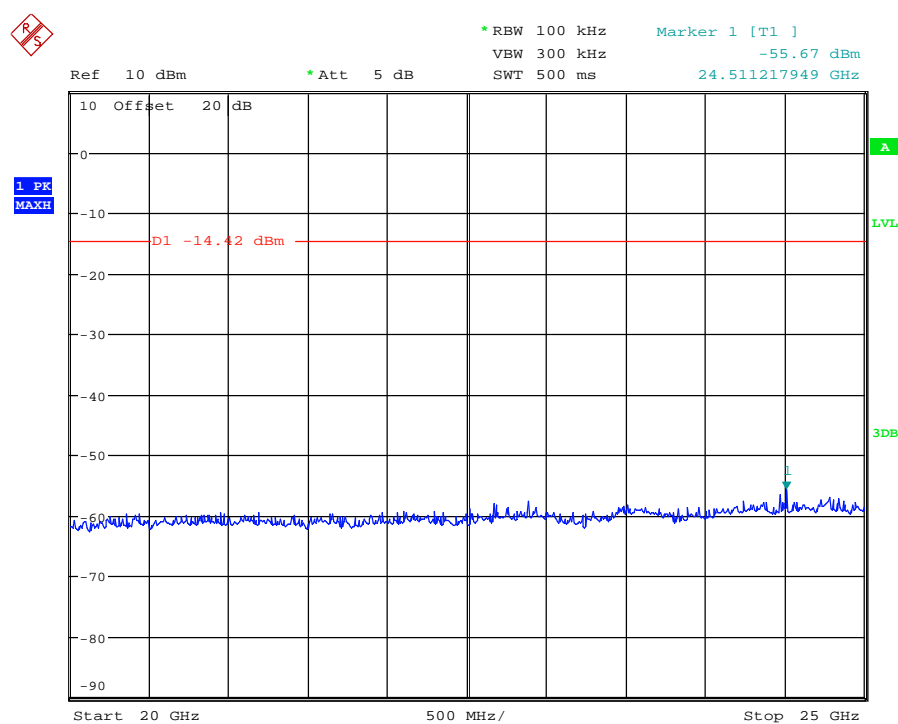
Date: 3.MAY.2012 16:32:59

802.11b Conducted Emissions 15GHz – 20GHz



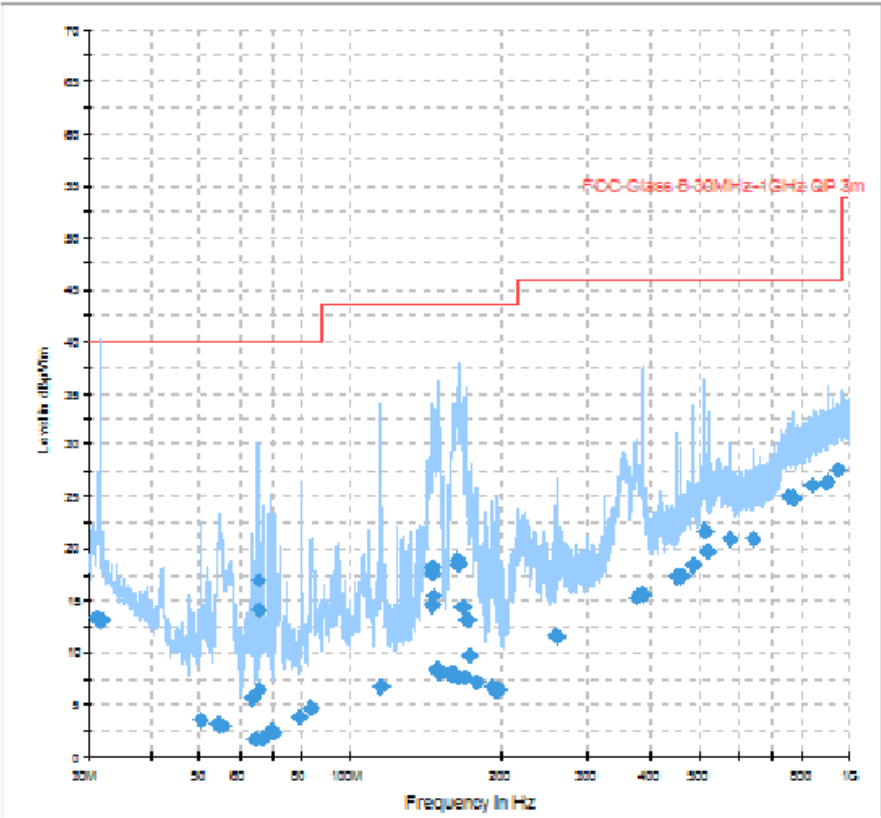
Date: 3.MAY.2012 16:33:53

802.11b Conducted Emissions 20GHz – 25GHz

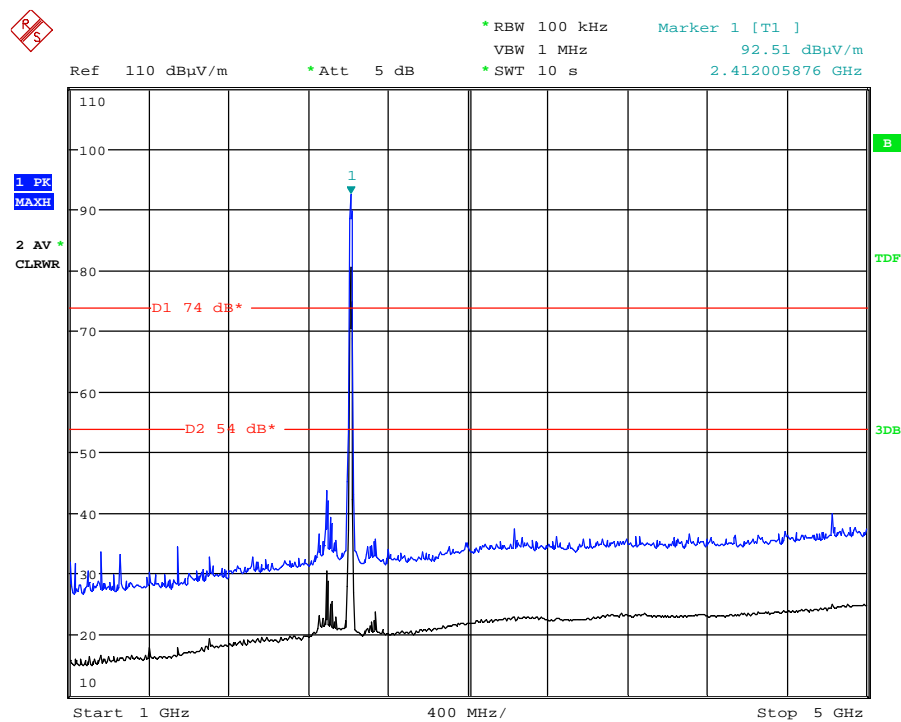


Date: 3.MAY.2012 16:34:15

802.11b Radiated Emissions 30MHz – 1GHz

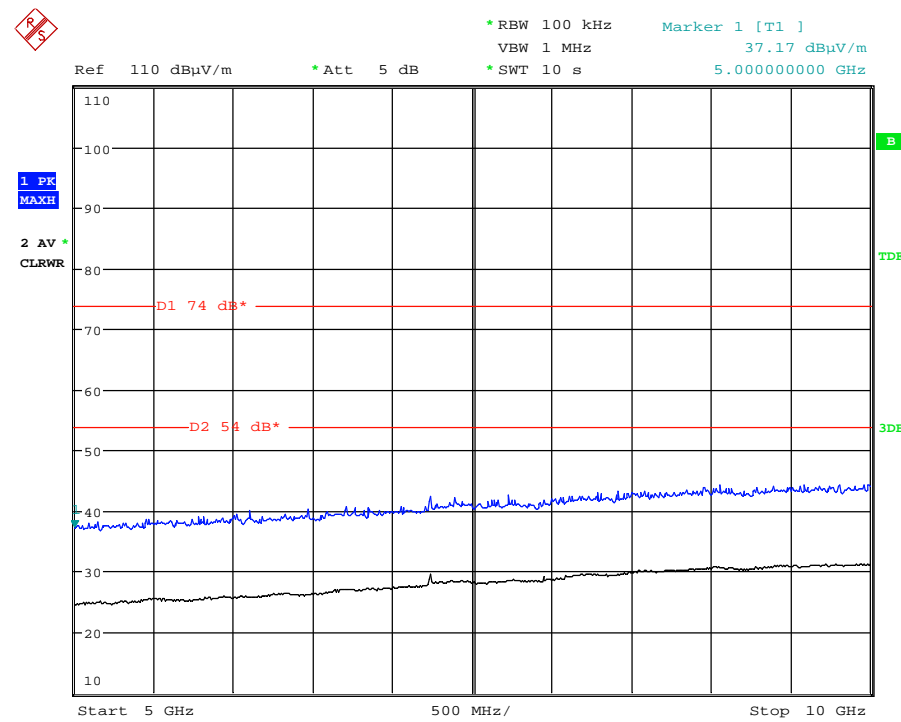


802.11b Radiated Emissions 1GHz – 5GHz



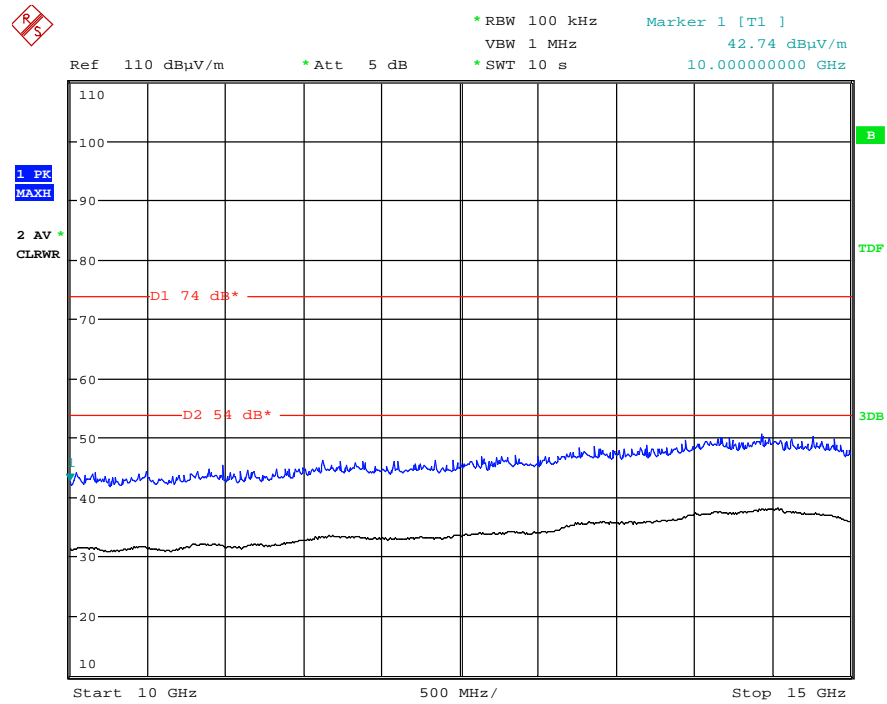
Date: 1.MAY.2012 15:28:51

802.11b Radiated Emissions 5GHz – 10GHz



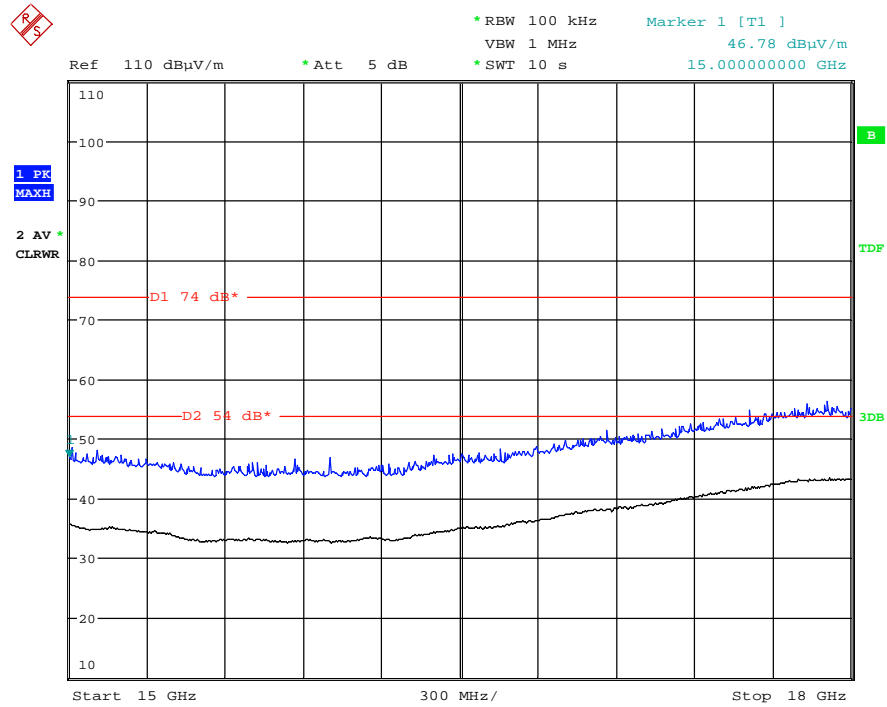
Date: 1.MAY.2012 15:48:10

802.11b Radiated Emissions 10GHz – 15GHz



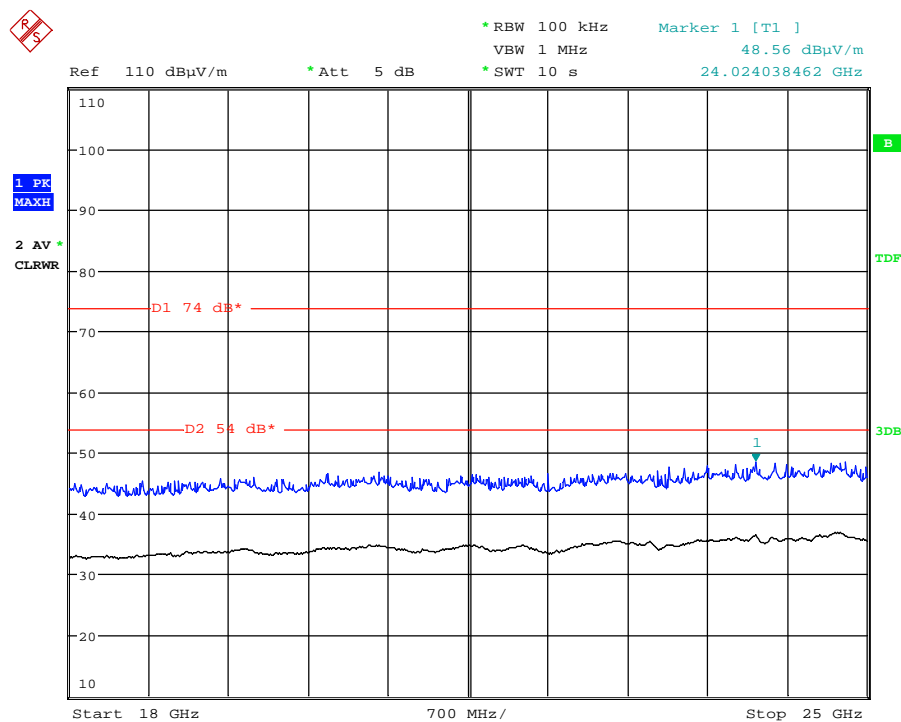
Date: 1.MAY.2012 15:49:19

802.11b Radiated Emissions 15GHz – 18GHz



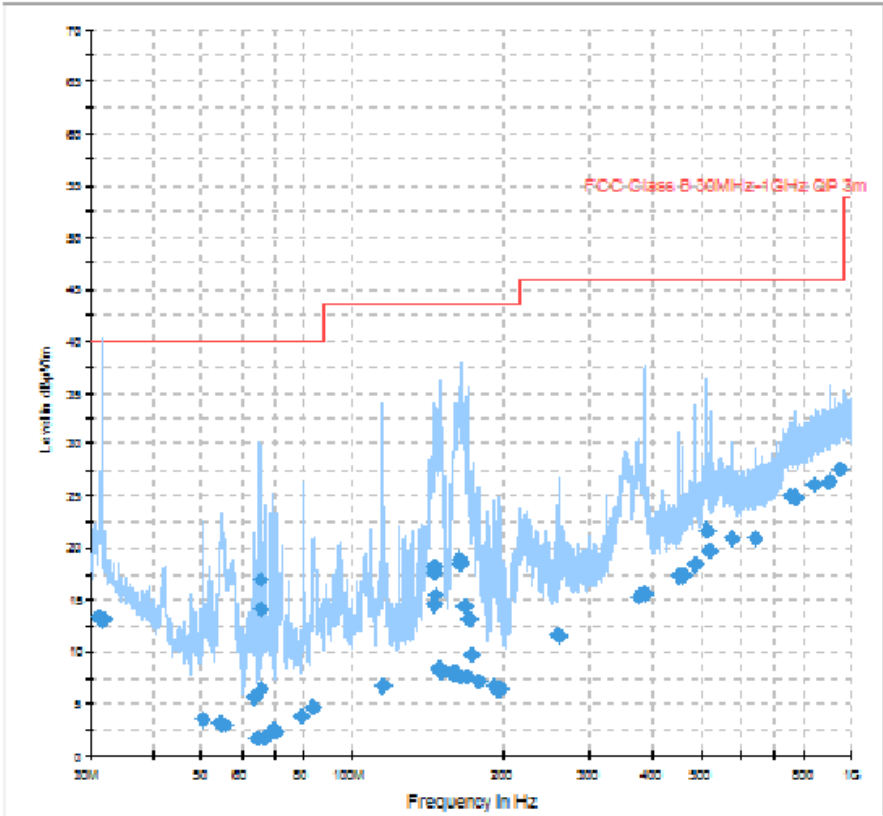
Date: 1.MAY.2012 15:50:17

802.11b Radiated Emissions 18GHz – 25GHz

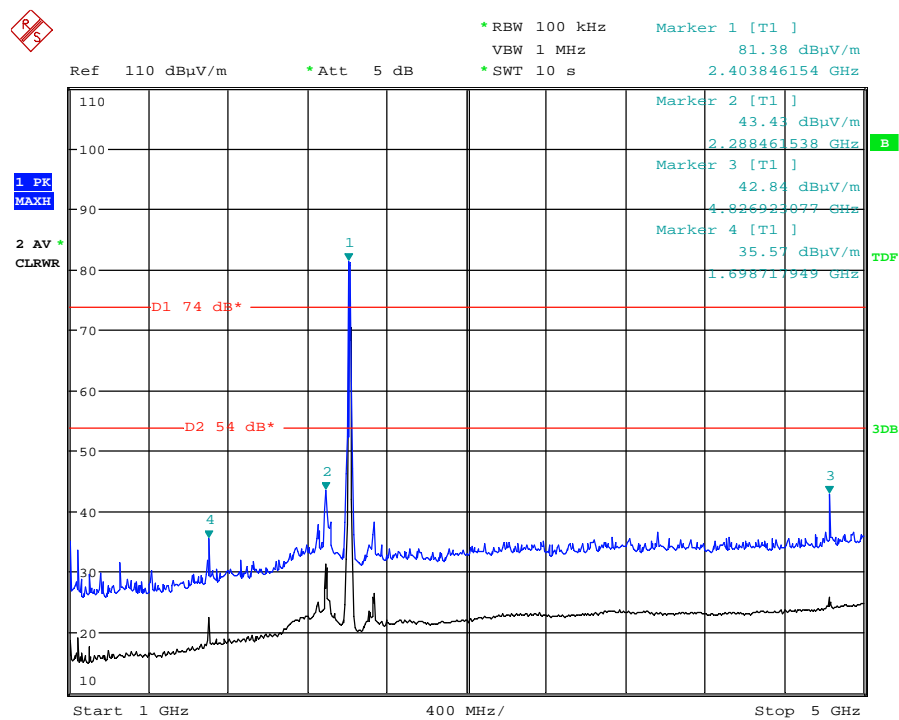


Date: 1.MAY.2012 17:39:21

802.11g Radiated Emissions 30MHz – 1GHz

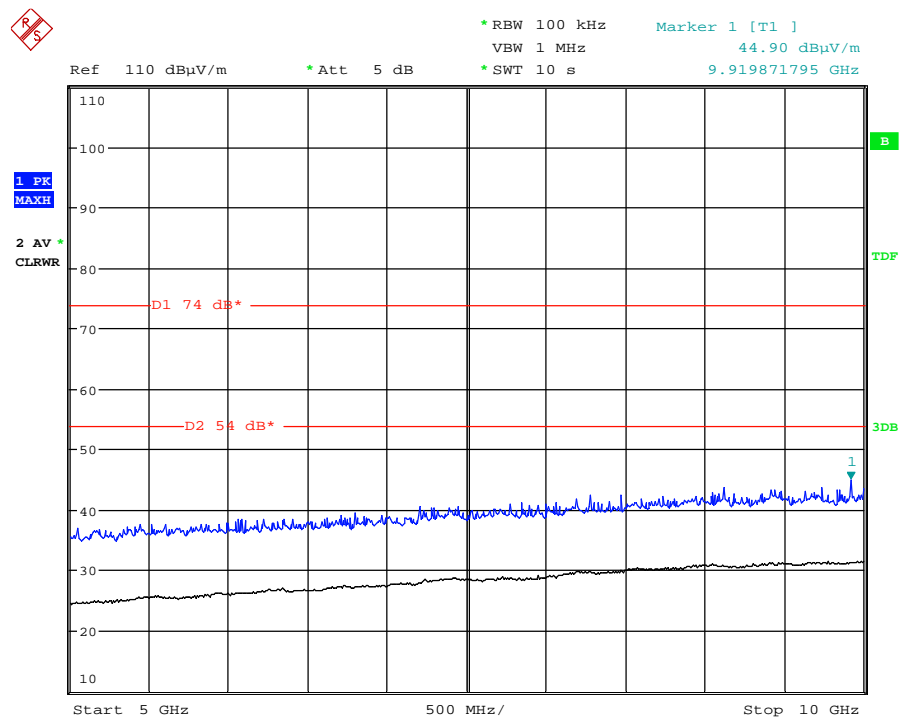


802.11g Radiated Emissions 1GHz – 5GHz



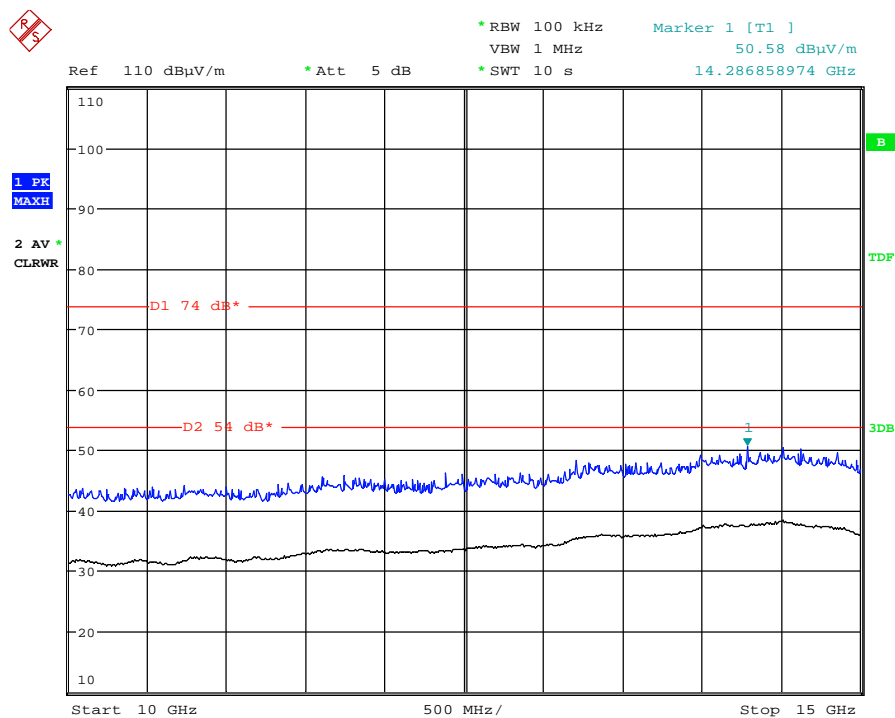
Date: 2.MAY.2012 10:59:30

802.11g Radiated Emissions 5GHz – 10GHz



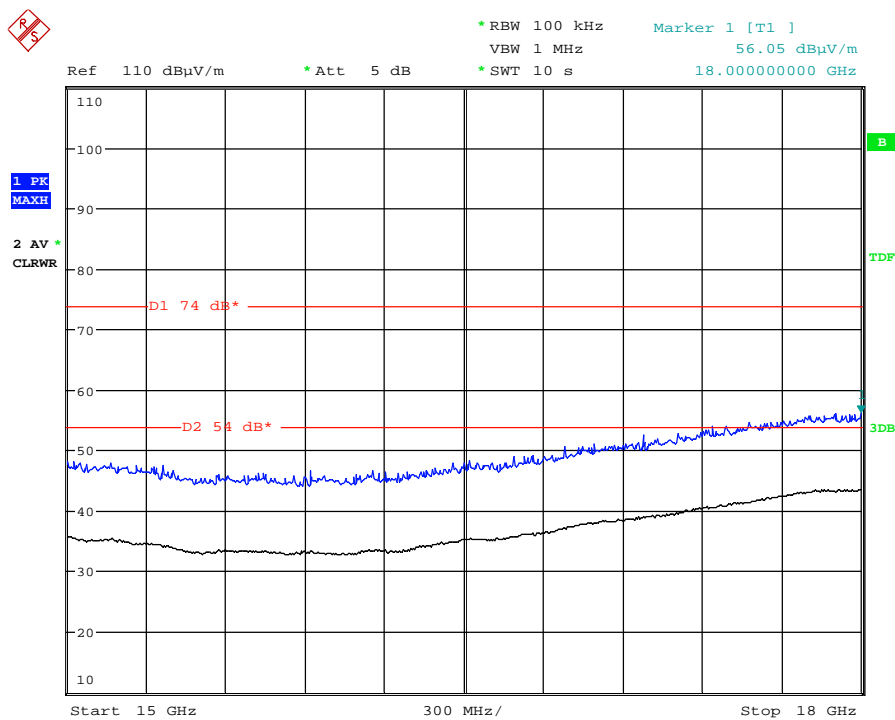
Date: 2.MAY.2012 10:58:47

802.11g Radiated Emissions 10GHz – 15GHz



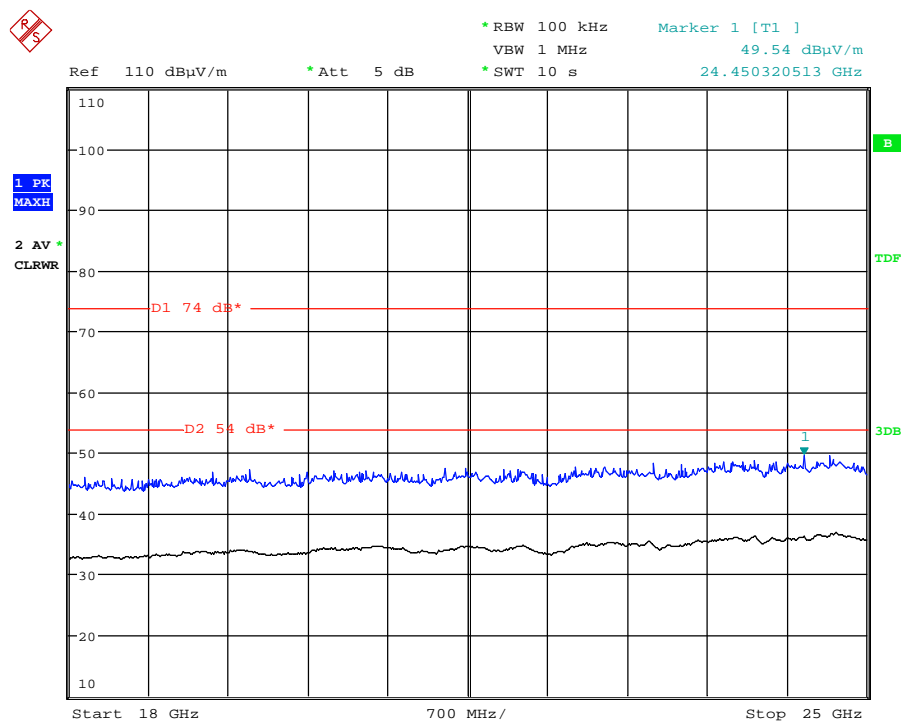
Date: 2.MAY.2012 10:58:26

802.11g Radiated Emissions 15GHz – 18GHz



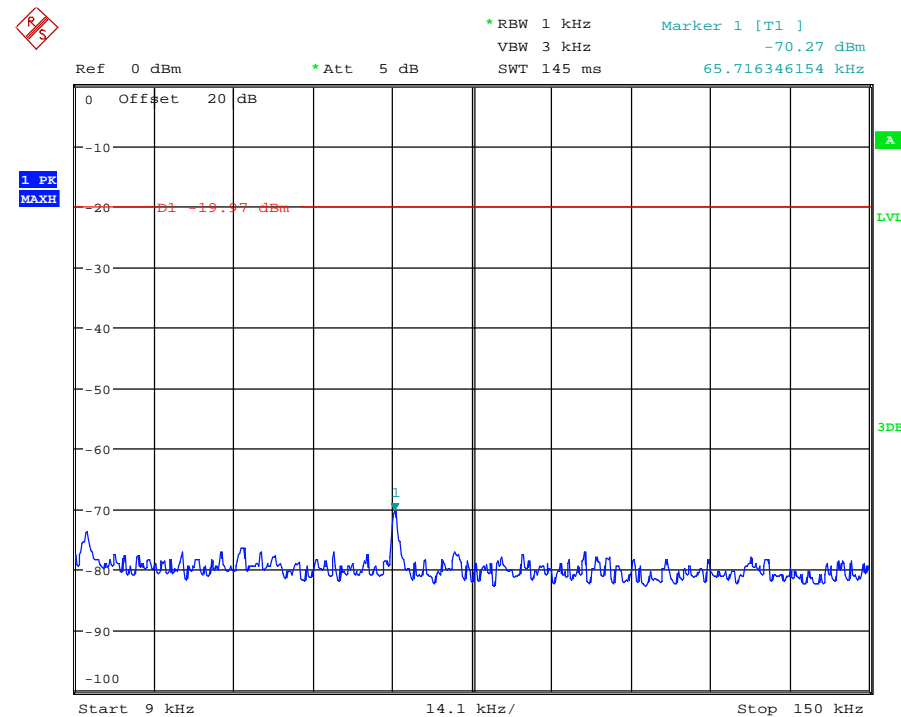
Date: 2.MAY.2012 10:58:04

802.11g Radiated Emissions 18GHz – 25GHz



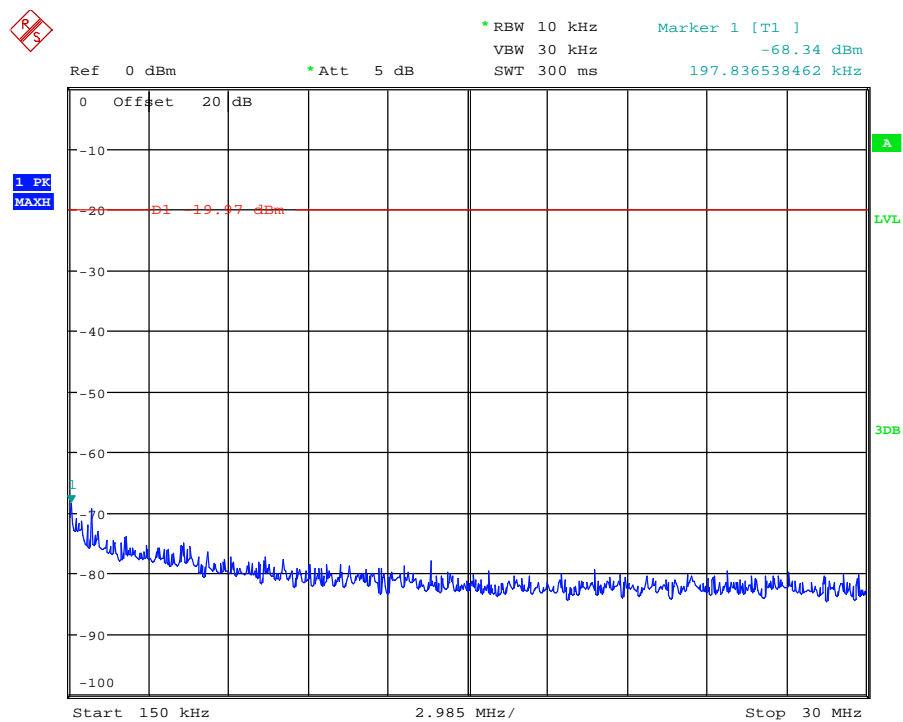
Date: 2.MAY.2012 12:22:20

802.11g Conducted Emissions 9kHz – 150kHz



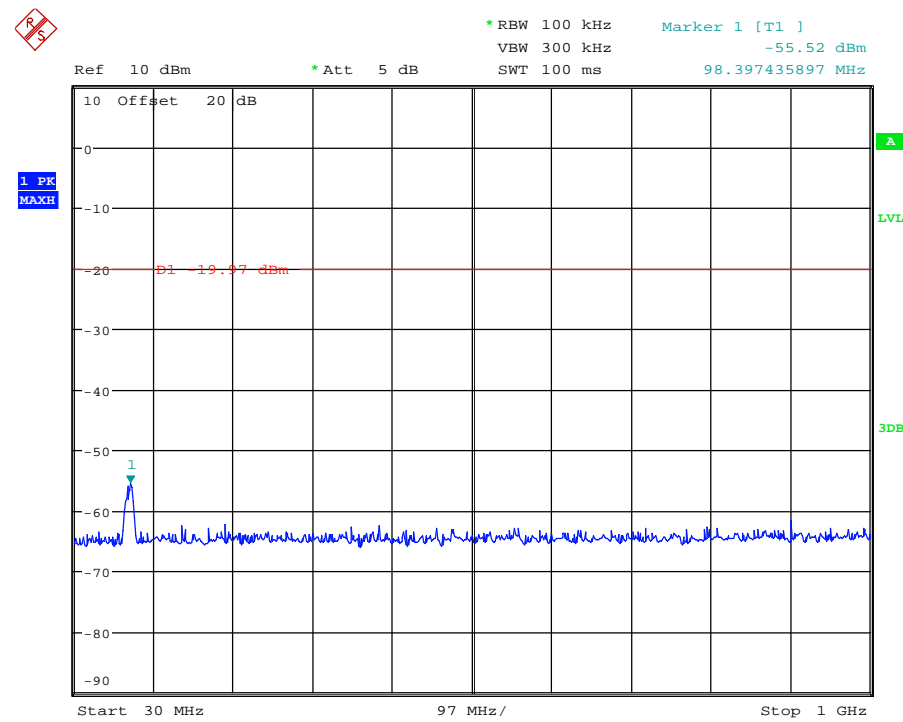
Date: 9.MAY.2012 10:24:40

802.11g Conducted Emissions150kHz – 30MHz



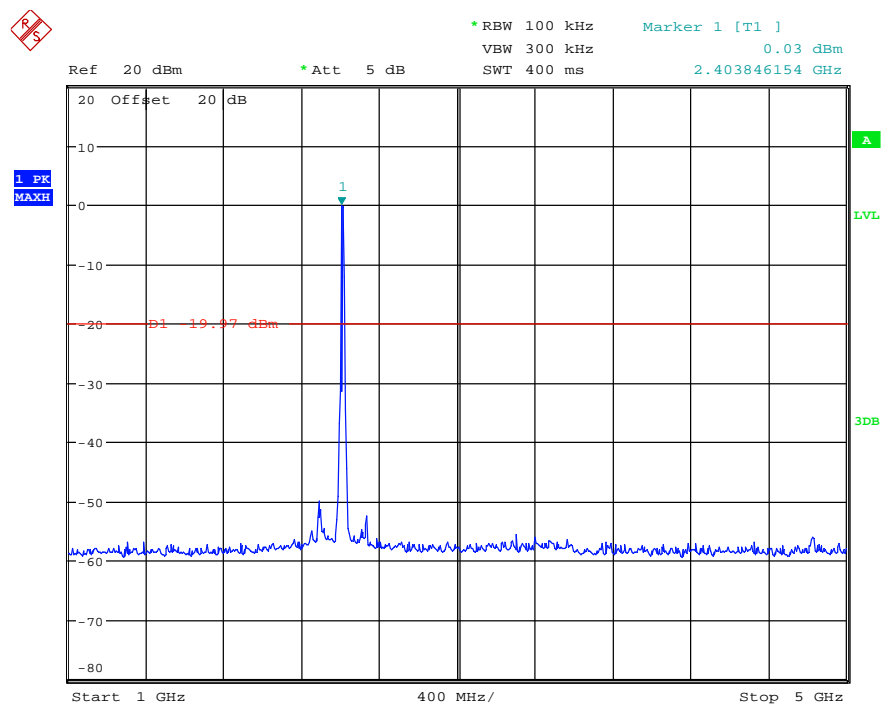
Date: 9.MAY.2012 10:25:08

802.11g Conducted Emissions 30MHz – 1GHz



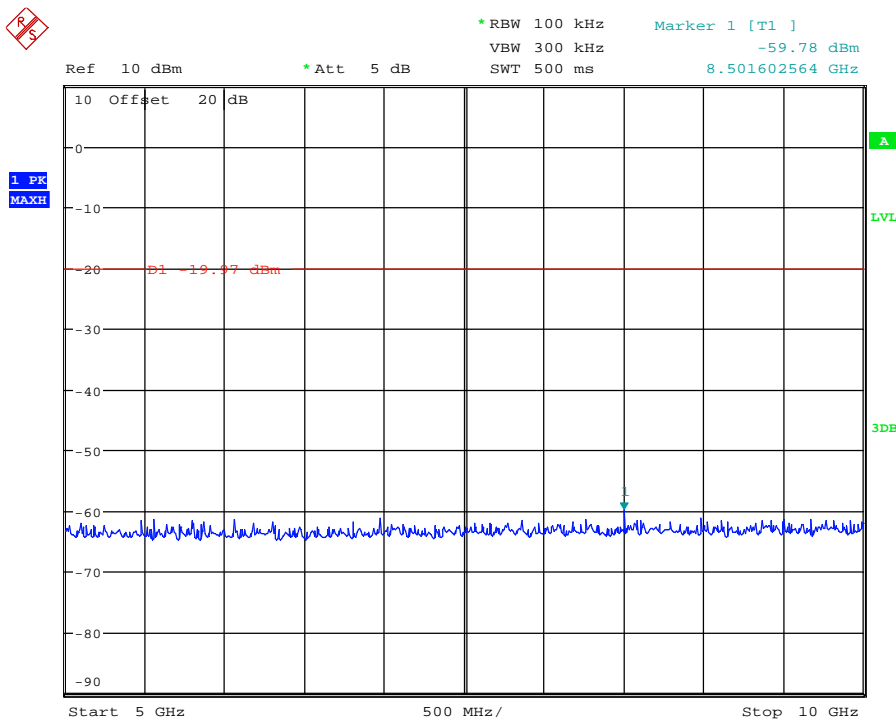
Date: 9.MAY.2012 10:25:41

802.11g Conducted Emissions 1GHz – 5GHz



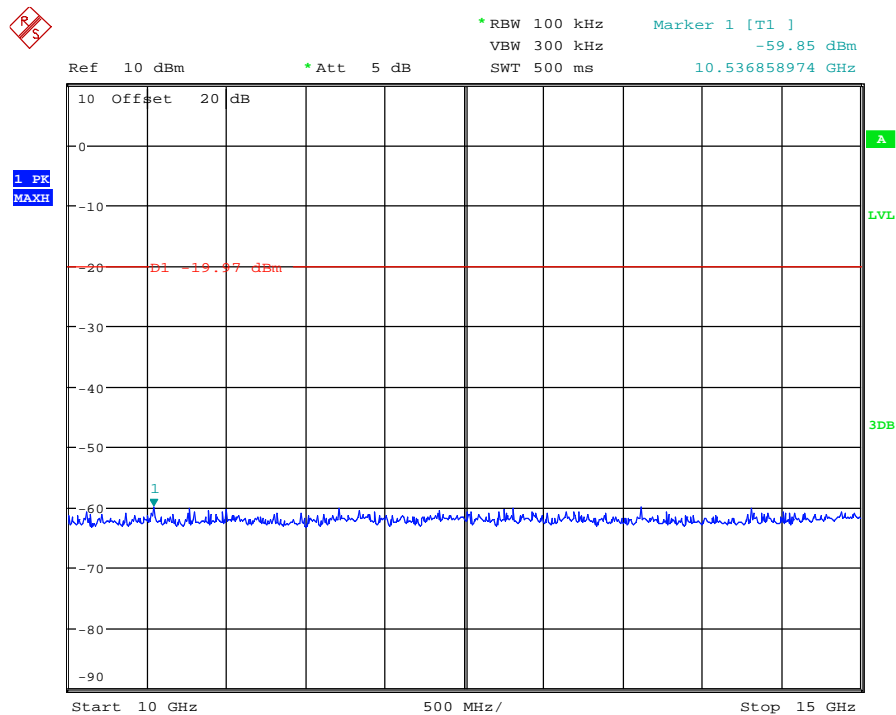
Date: 9.MAY.2012 10:21:49

802.11g Conducted Emissions 5GHz – 10GHz



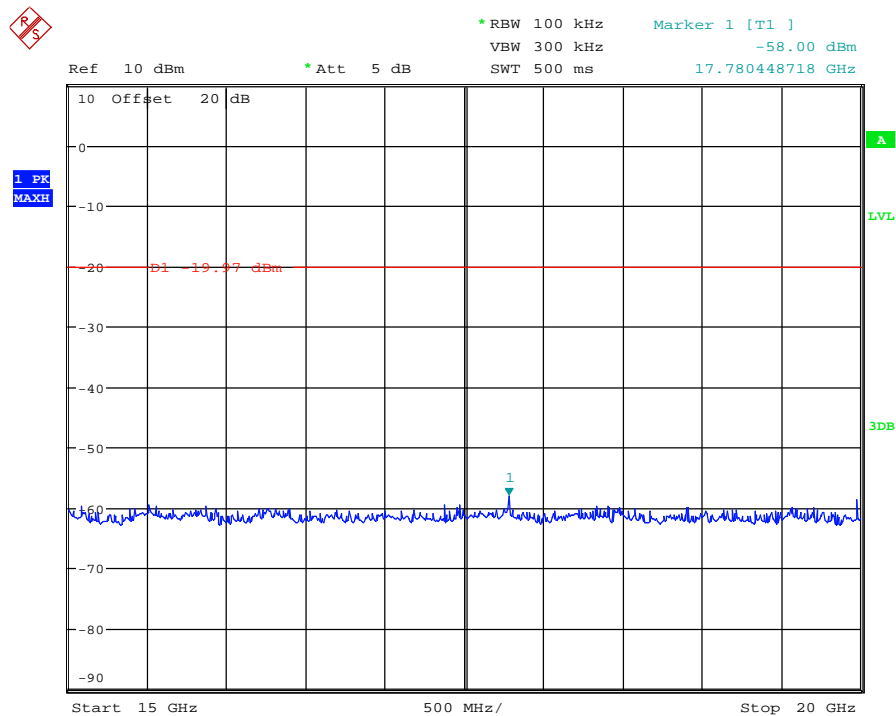
Date: 9.MAY.2012 10:22:19

802.11g Conducted Emissions 10GHz – 15GHz



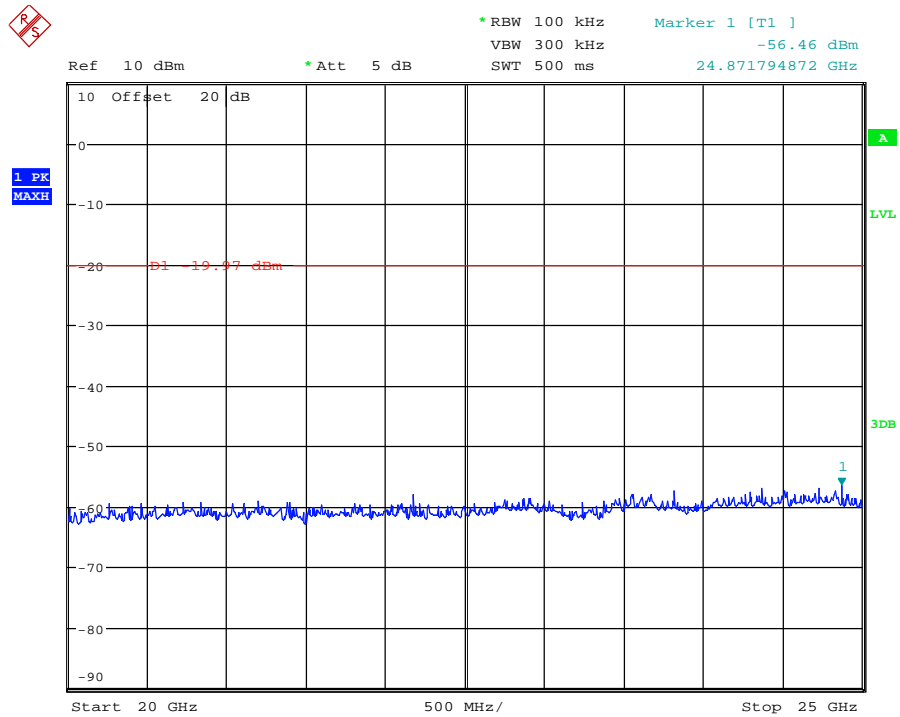
Date: 9.MAY.2012 10:23:12

802.11g Conducted Emissions 15GHz – 20GHz



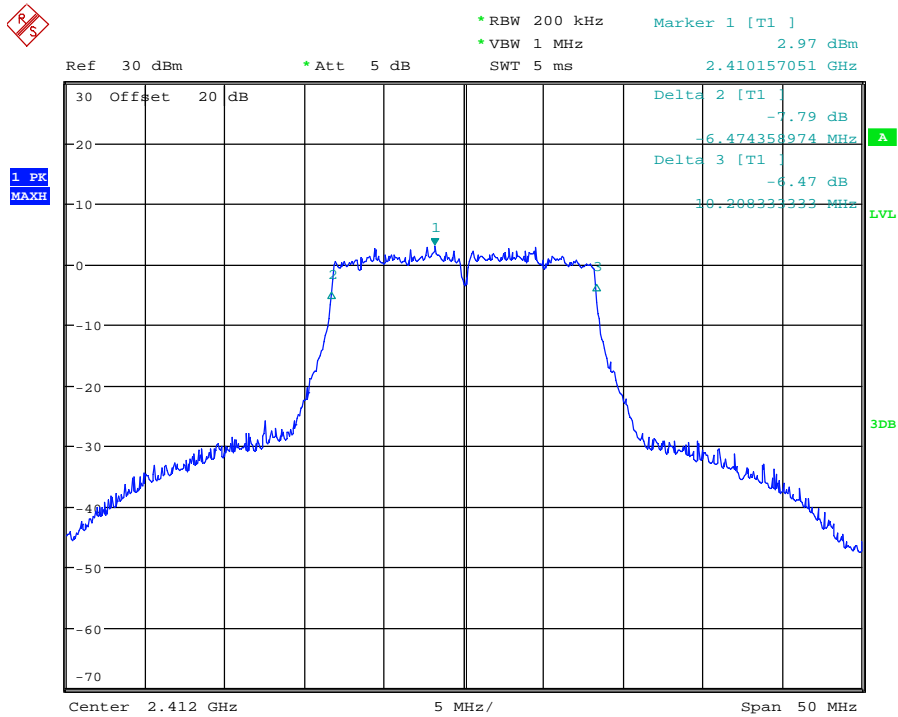
Date: 9.MAY.2012 10:23:42

802.11g Conducted Emissions 20GHz – 25GHz



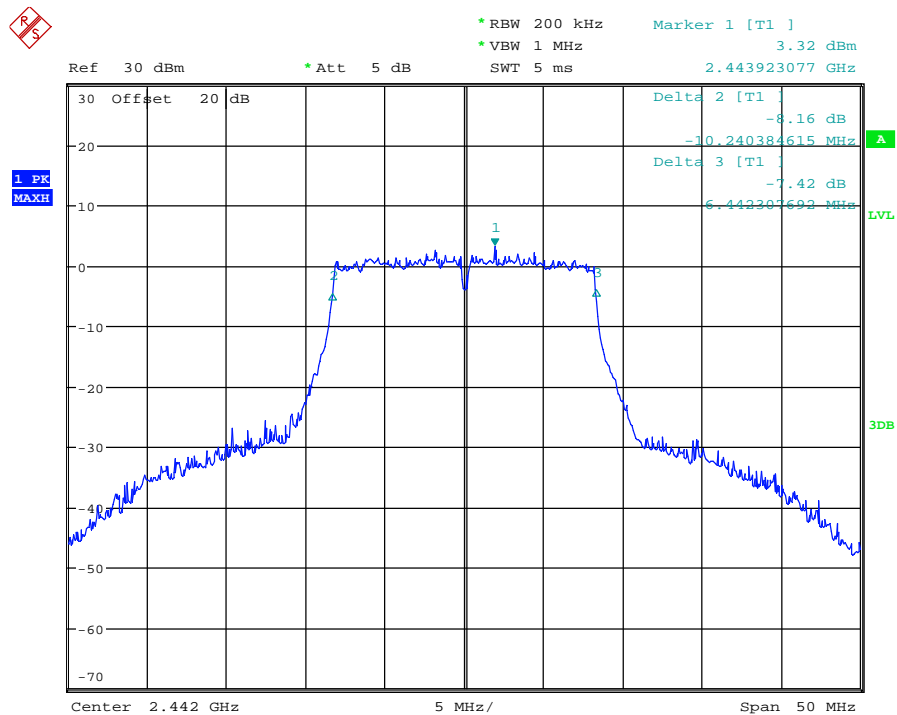
Date: 9.MAY.2012 10:24:04

802.11g 6dB Bandwidth – Bottom Channel



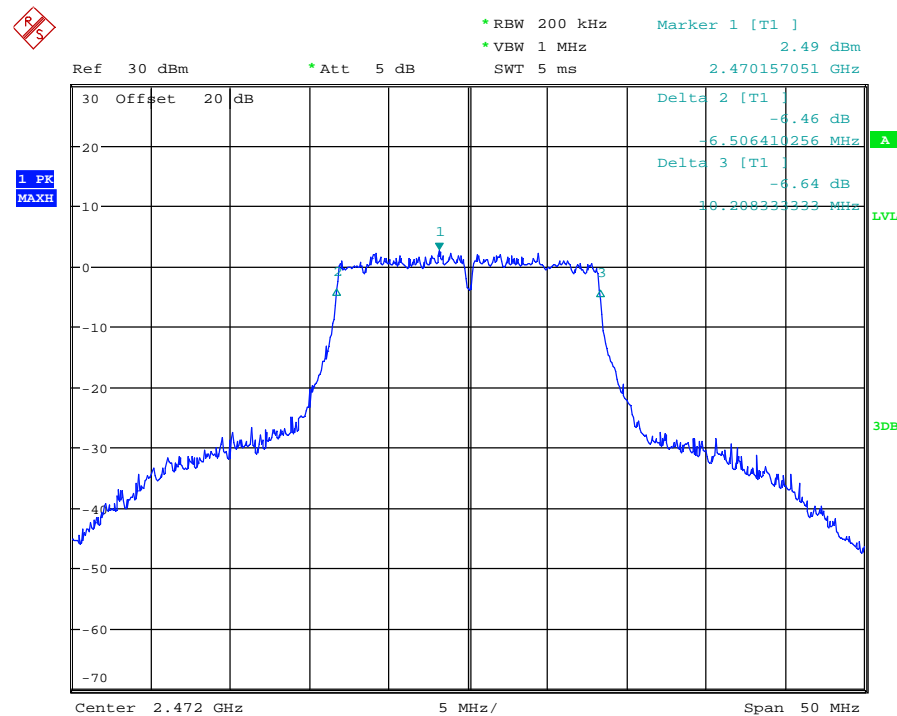
Date: 9.MAY.2012 10:08:43

802.11g 6dB Bandwidth – Middle Channel



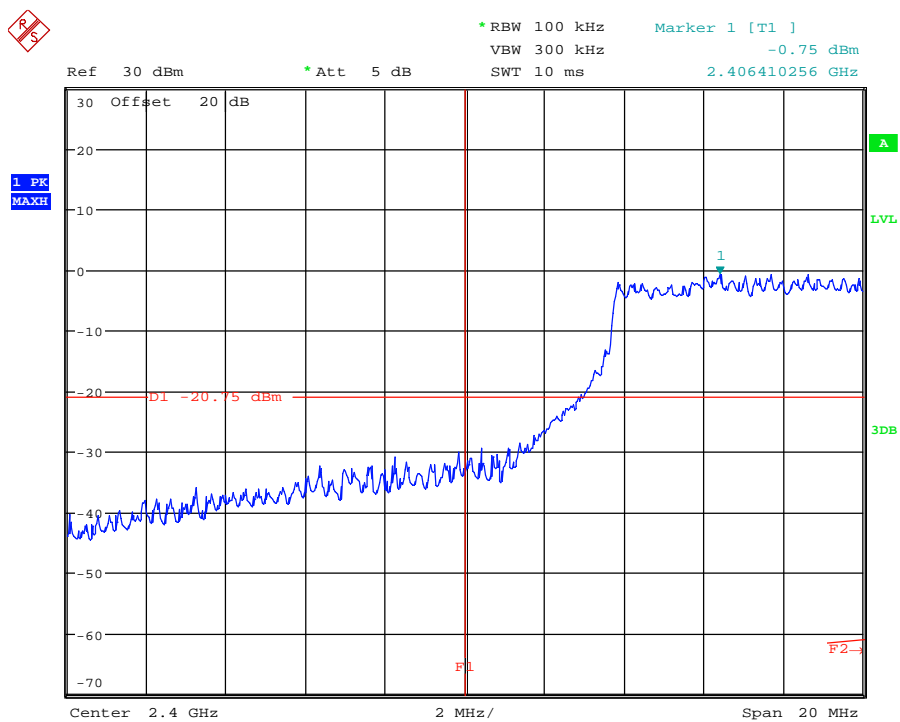
Date: 9.MAY.2012 10:07:30

802.11g 6dB Bandwidth – Top Channel



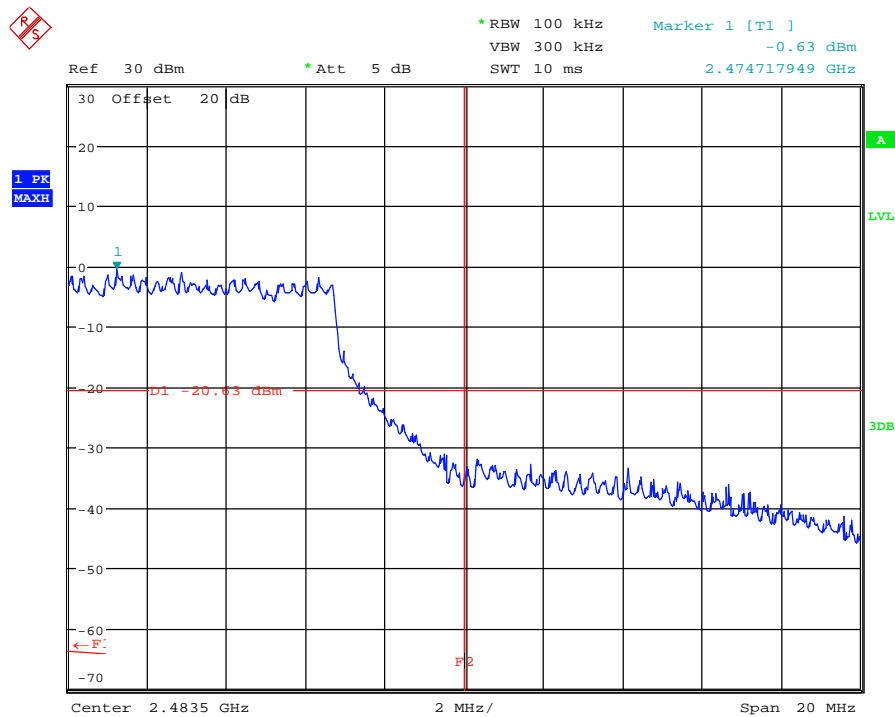
Date: 9.MAY.2012 10:10:27

802.11g Conducted Lower Band-edge Compliance



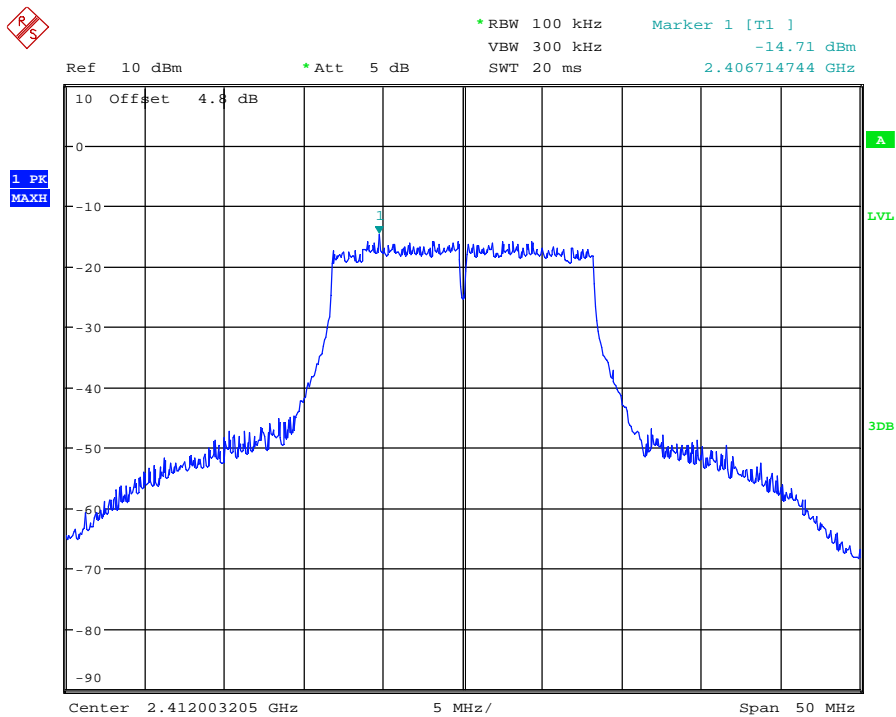
Date: 9.MAY.2012 10:18:39

802.11g Conducted Upper Band-edge Compliance



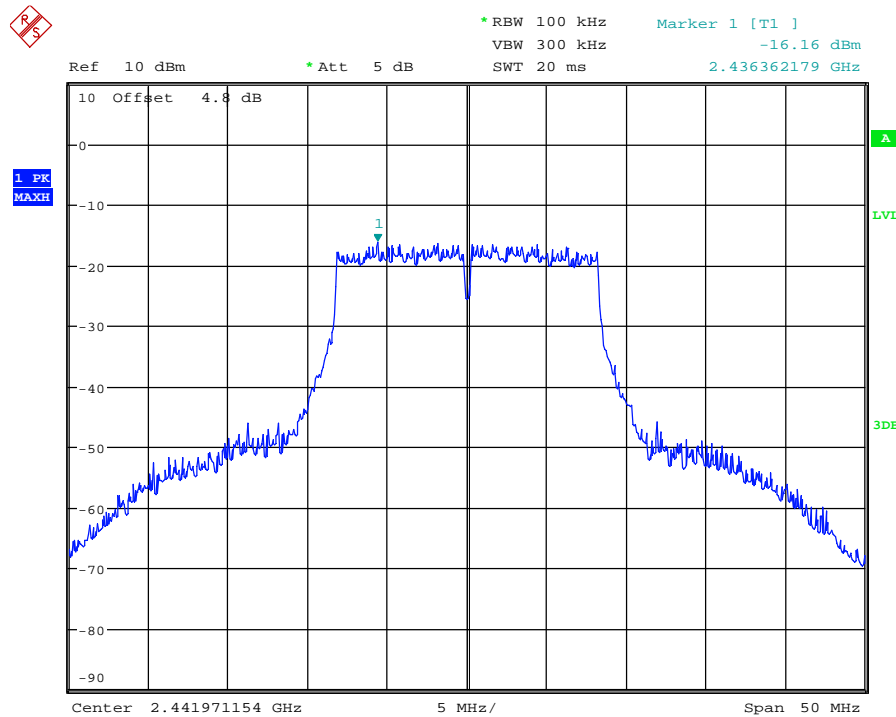
Date: 9.MAY.2012 11:08:34

802.11g Peak Power Spectral Density – Bottom Channel



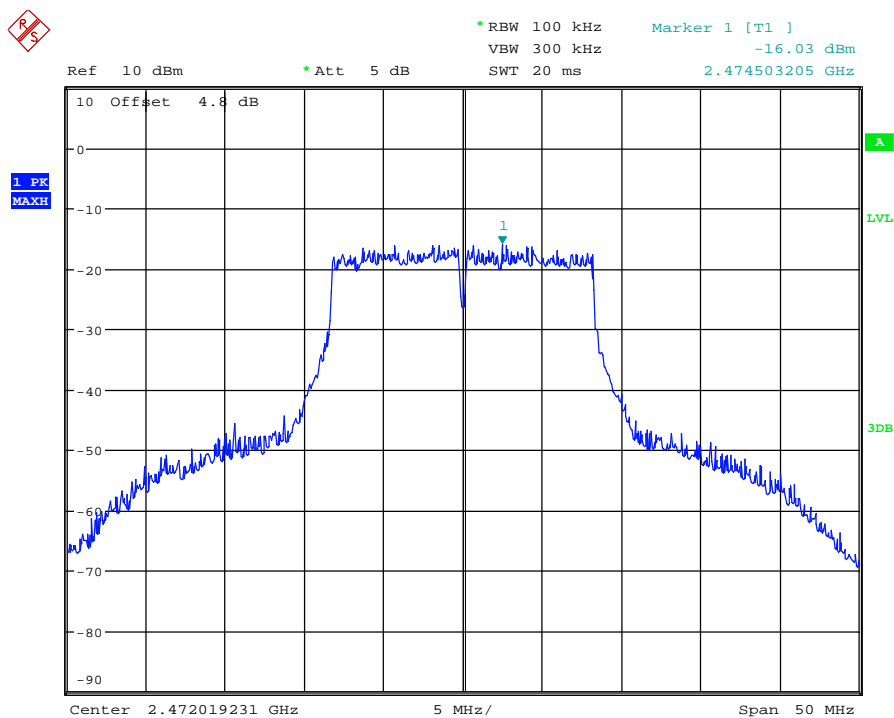
Date: 4.MAY.2012 12:44:17

802.11g Peak Power Spectral Density – Middle Channel



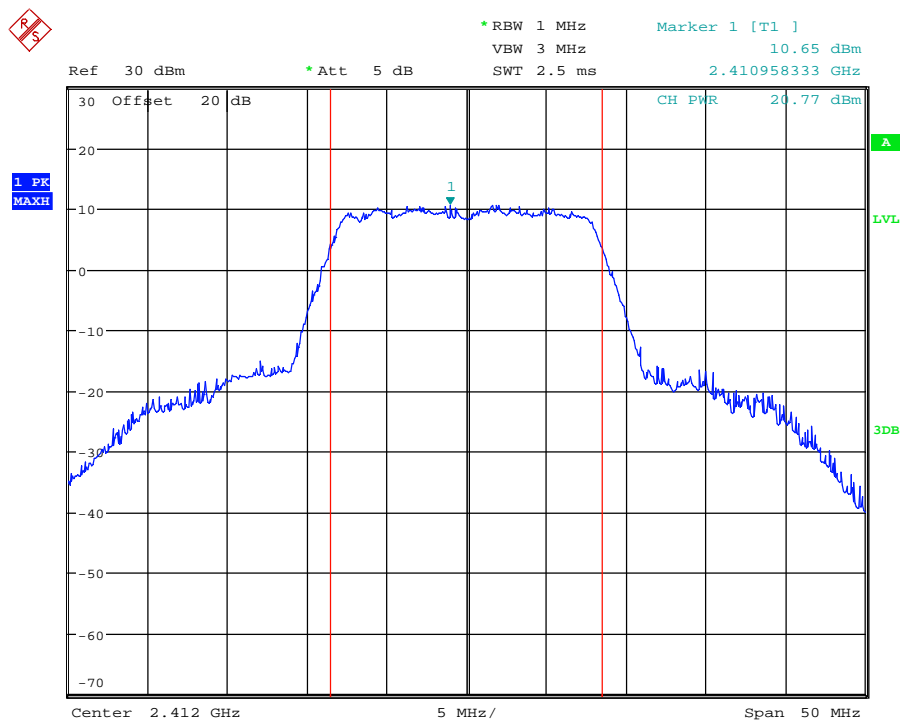
Date: 4.MAY.2012 12:45:08

802.11g Peak Power Spectral Density – Top Channel



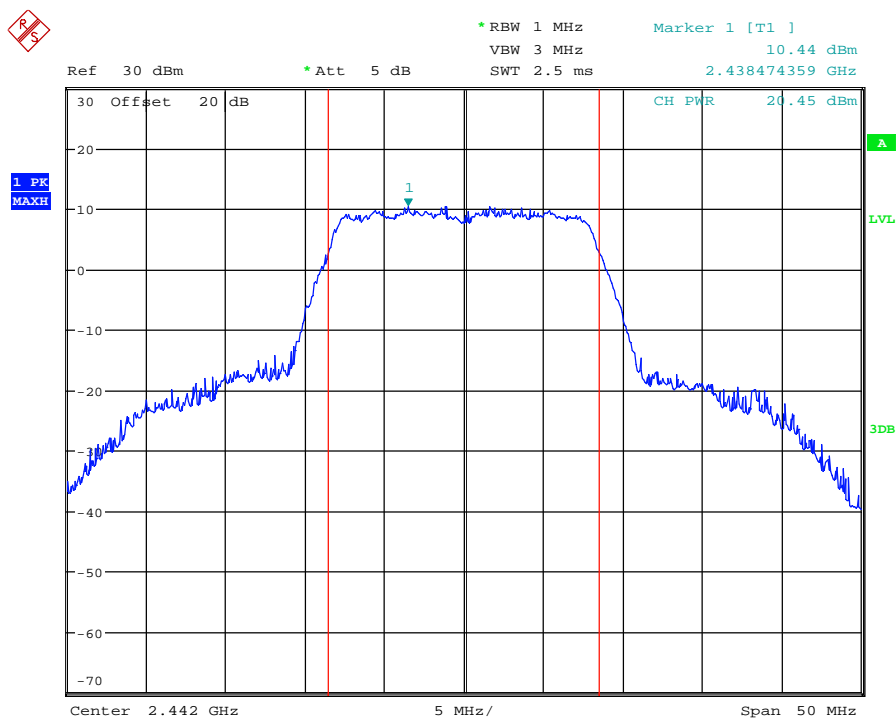
Date: 4.MAY.2012 12:46:17

802.11g Carrier Power – Bottom Channel



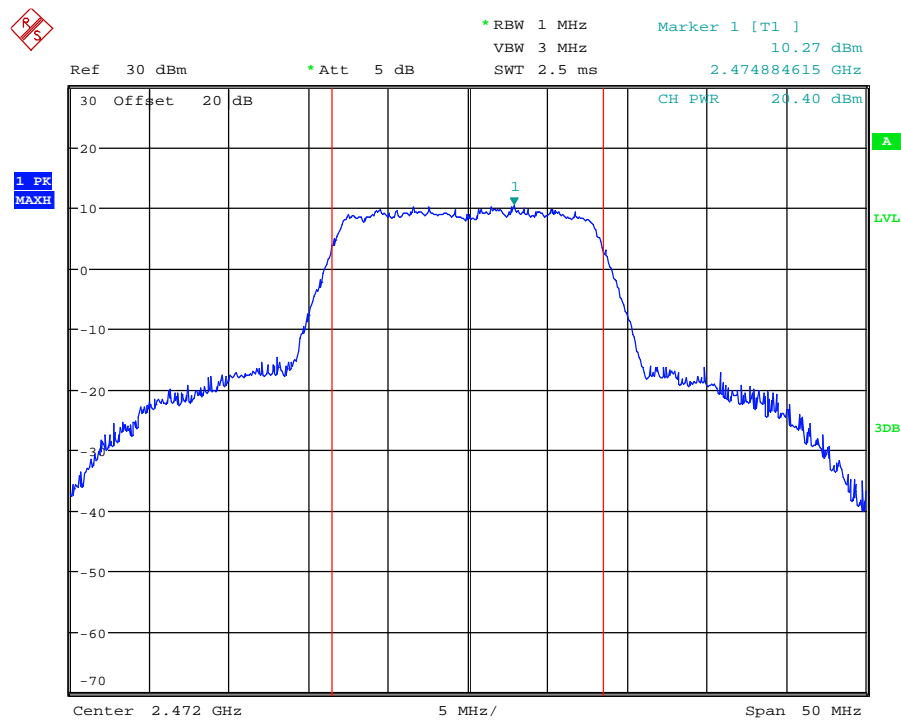
Date: 9.MAY.2012 10:16:19

802.11g Carrier Power – Middle Channel

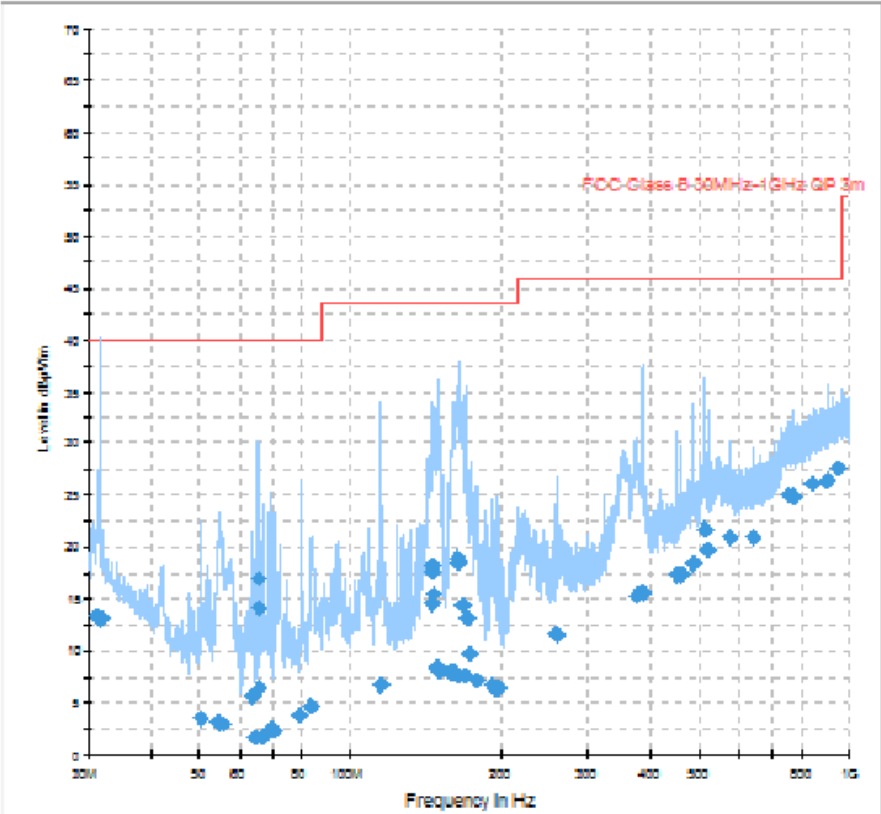


Date: 9.MAY.2012 10:14:59

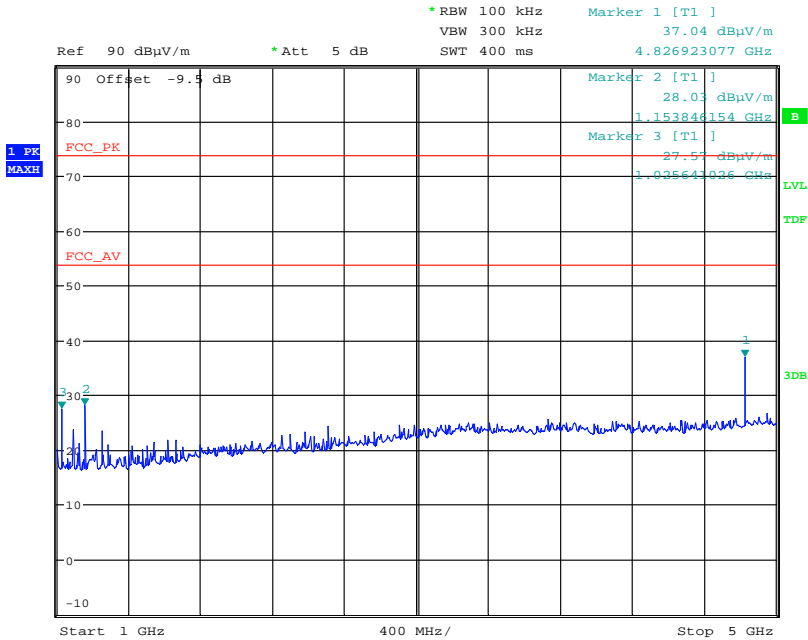
802.11g Carrier Power – Top Channel



Date: 9.MAY.2012 10:13:16

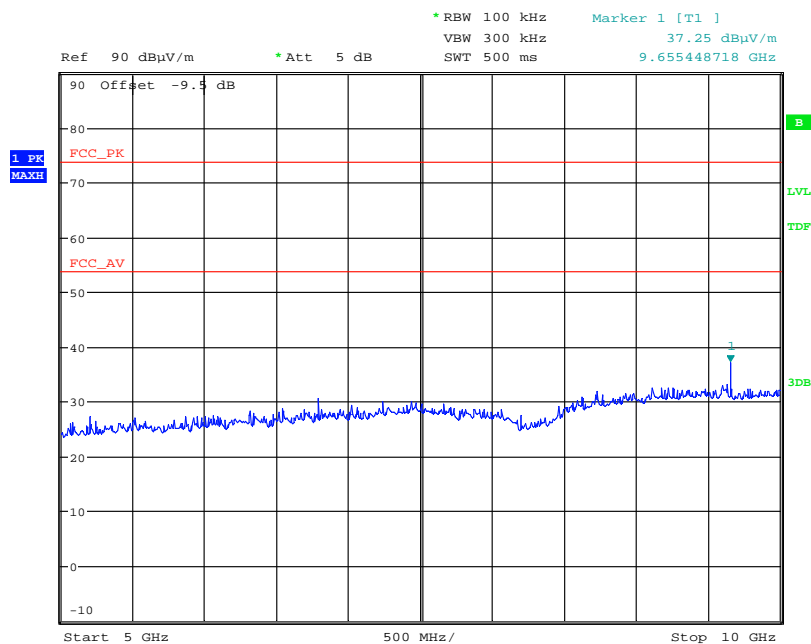


Unintentional Radiated Emissions 30MHz – 1GHz



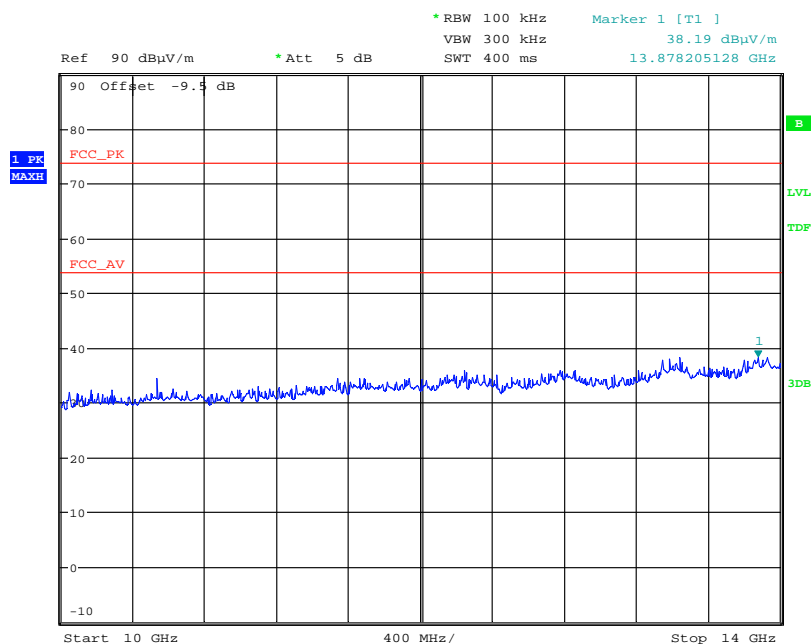
Date: 22.MAR.2012 06:50:13

Unintentional Radiated Emissions 1GHz – 5GHz



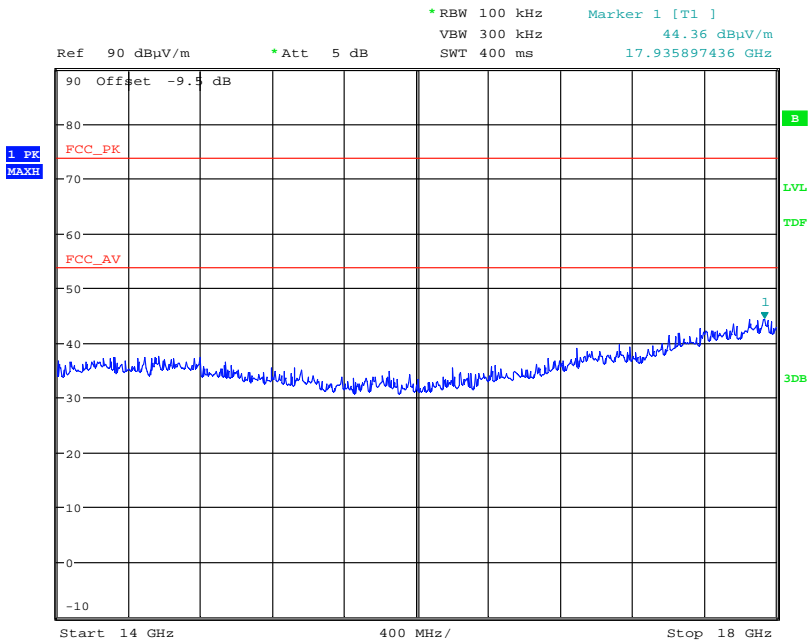
Date: 22.MAR.2012 06:50:47

Unintentional Radiated Emissions 5GHz – 10GHz



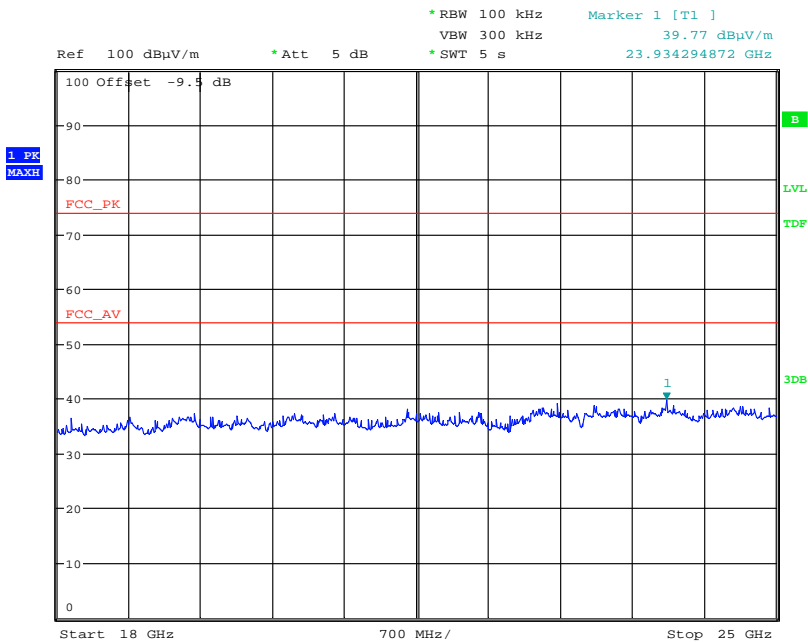
Date: 22.MAR.2012 06:51:13

Unintentional Radiated Emissions 10GHz – 14GHz



Date: 22.MAR.2012 06:53:40

Unintentional Radiated Emissions 14GHz – 18GHz



Date: 23.MAR.2012 07:23:43

Unintentional Radiated Emissions 18GHz – 25GHz

Appendix C:**Formal Test Results – 15.249**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
		ATS	: Alternative Test Site
EUT	: Equipment Under Test		
SE	: Support Equipment	Ref	: Reference
		Freq	: Frequency
L	: Live Power Line		
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

C1 Transmitter Intentional Emission Radiated

Carrier power was verified with the EUT transmitting Test Details:	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.249(b)(1)
Measurement standard	ANSI C63.10:2003
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17
Photographs (Appendix F)	1&2

Base station 1

FREQ. (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR (dB/m)	PRE AMP (dB)	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (mV/m)
903.2	59.70	3.9	20.8	-	84.4	16.65
915.0	62.50	4.0	20.8	-	87.3	23.07
927.8	59.04	4.0	20.8	-	83.9	15.58
Limit value @ fc			50mV/m @ 3m			

Base station 2

FREQ. (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR (dB/m)	PRE AMP (dB)	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (mV/m)
903.2	59.40	3.9	20.8	-	84.1	16.09
915.0	60.84	4.0	20.8	-	85.6	19.05
927.8	60.80	4.0	20.8	-	85.6	19.08
Limit value @ fc			50mV/m @ 3m			

- Notes:**
- 1 Results quoted are extrapolated as indicated
 - 2 Receiver detector @ fc = Quasi Peak 120kHz bandwidth
 - 3 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per, ANSI C63.10
 - 2 Measuring distances 3m
 - 3 EUT 0.8 metre above ground plane
 - 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded

C2 Band occupancy

Carrier power was verified with the EUT transmitting Test Details:	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.215(c)
Measurement standard	ANSI C63.10:2003
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17
Photographs (Appendix F)	1&2

Base Station 1

Frequency	f lower	f higher
903.2 MHz	903.114 MHz	903.298 MHz
	184.0 kHz	
915.0 MHz	914.916 MHz	915.096 MHz
	180.0 kHz	
927.8 MHz	927.714 MHz	927.898 MHz
	184.0 kHz	

Base Station 2

Frequency	f lower	f higher
903.2 MHz	903.114 MHz	903.300 MHz
	186.0 kHz	
915.0 MHz	914.916 MHz	915.096 MHz
	180.0 kHz	
927.8 MHz	927.714 MHz	927.900 MHz
	186.0 kHz	

Notes: 1 When battery powered the EUT was powered with new batteries

Test Method: 1 As per ANSI C63.10

C3 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit as required using both base stations.

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) below.

Test Details: 903.2 MHz	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10:2003
Frequency range	30MHz – 10GHz
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17
Photographs (Appendix F)	1&2

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

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	1605.66 _{Pk}	54.68	1.7	25.9	36.4	45.88	-	196.79	5000
2.	1605.66 _{Av}	47.54	1.7	25.9	36.4	38.74	-	86.50	500
3.	1806.48 _{Pk}	54.43	2.1	27.1	36.0	47.63	-	240.71	5000
4.	1806.48 _{Av}	46.81	2.1	27.1	36.0	40.01	-	100.12	500

Test Details: 915.0 MHz	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10:2003
Frequency range	30MHz – 10GHz
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17
Photographs (Appendix F)	1&2

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

Ref No.	FREQ. (MHz)	MEAS Rx (dBμV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBμV/m)	EXTRAP FACT (dB)	FIELD ST'GH (μV/m)	LIMIT (μV/m)
1.	1626.63 _{PK}	54.84	1.8	26.1	36.4	46.34	-	207.49	5000
2.	1626.63 _{AV}	47.88	1.8	26.1	36.4	39.38	-	93.11	500
3.	1830.06 _{PK}	55.21	1.9	27.2	35.9	48.41	-	263.33	5000
4.	1830.06 _{AV}	47.55	1.9	27.2	35.9	40.75	-	109.02	500

Test Details: 927.8 MHz	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10:2003
Frequency range	30MHz – 10GHz
EUT sample number	S01
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17
Photographs (Appendix F)	1&2

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

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	1649.39	55.7	1.9	26.2	36.3	47.50	-	237.14	5000
2.	1649.39	48.18	1.9	26.2	36.3	39.98	-	99.77	500
3.	1855.60	55.22	2	27.3	35.9	48.62	-	269.77	5000
4.	1855.60	47.8	2	27.3	35.9	41.20	-	114.82	500

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 For emissions below 30MHz the cable losses are assumed to be negligible.
- 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 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.
- 4 For Frequencies below 1 GHz, RBW= 120 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

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 all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
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

- (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:

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

- (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				

C4 Unintentional Radiated Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions on directly related to the transmitter. The maximum permitted field strength is listed in Section 15.109. The EUT was set to operate in a transmit standby / receive mode.

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) below.

Test Details:	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.109
Measurement standard	ANSI C63.10:2003
Frequency range	30MHz – 10GHz
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17
Photographs (Appendix F)	1&2

The worst case radiated emission measurements for spurious emissions are listed below:

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
No Significant Emissions									

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 For emissions below 30MHz the cable losses are assumed to be negligible.
- 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 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.
- 4 For Frequencies below 1 GHz, RBW = 120 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

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 15:2008 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR Part 15: Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
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

- (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:

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

- (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 :

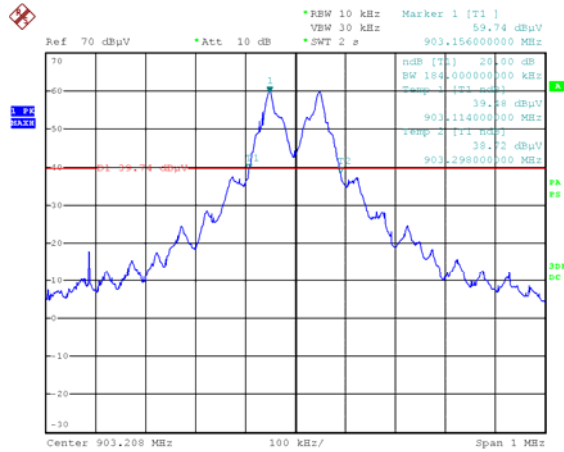
	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓			
Effect of EUT internal configuration on emission levels	✓			
Effect of Position of EUT cables & samples on emission levels	✓			
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) 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				

Appendix D:**Supporting Graphical Data – 15.249**

This appendix contains graphical data obtained during testing.

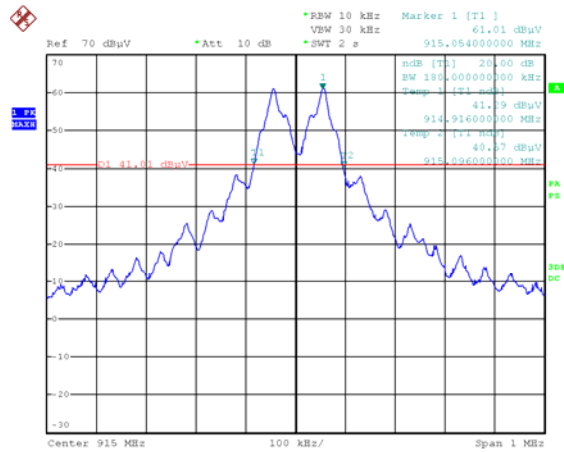
Notes:

- (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.
- (f) 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.



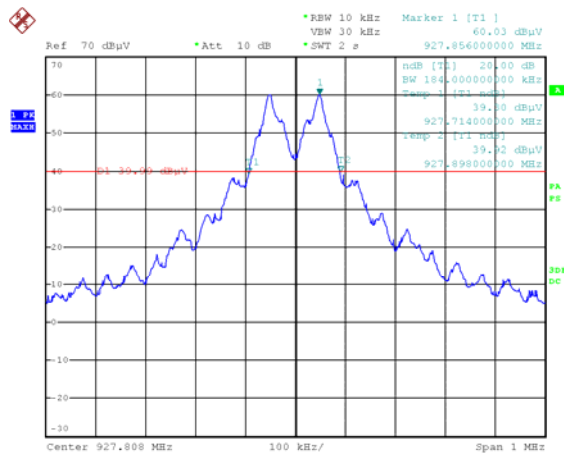
Date: 21.MAR.2012 10:18:08

20dB Bandwidth – 903.2 MHz Base Station 1



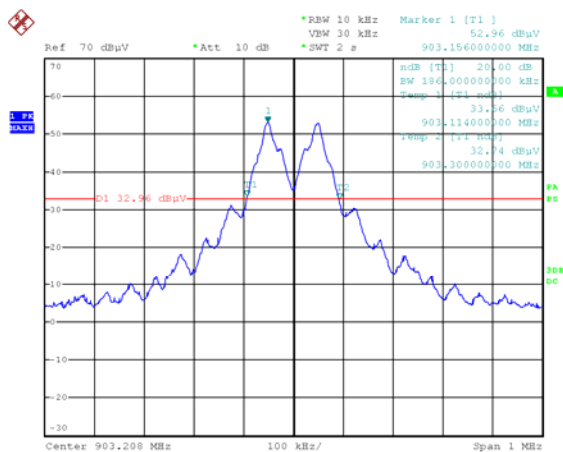
Date: 21.MAR.2012 10:21:35

20dB Bandwidth – 915.0 MHz Base Station 1



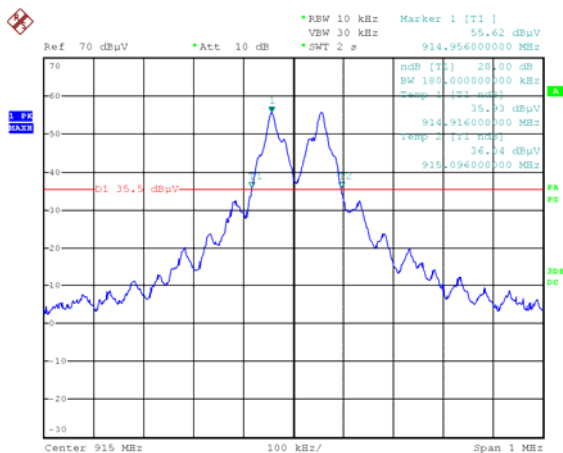
Date: 21.MAR.2012 10:24:05

20dB Bandwidth – 927.8 MHz Base Station 1



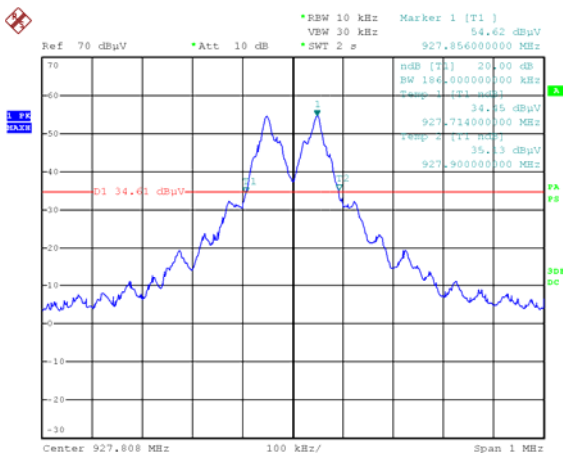
Date: 21.MAR.2012 10:17:25

20dB Bandwidth – 903.2 MHz Base Station 2



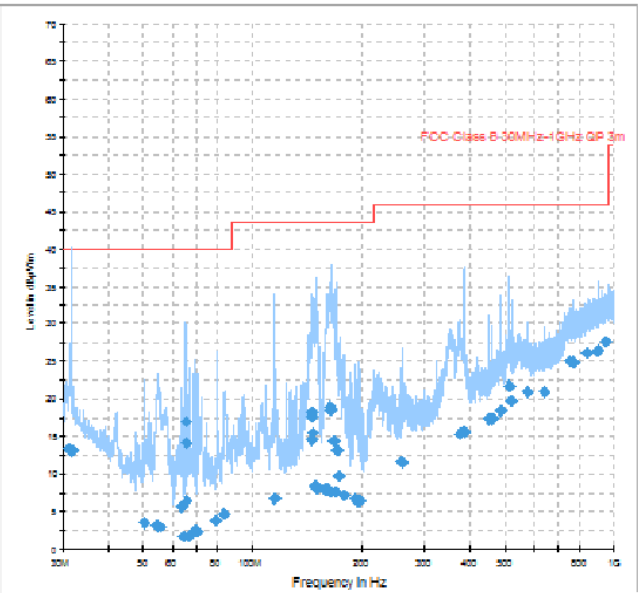
Date: 21.MAR.2012 10:22:12

20dB Bandwidth – 915.0 MHz Base Station 2

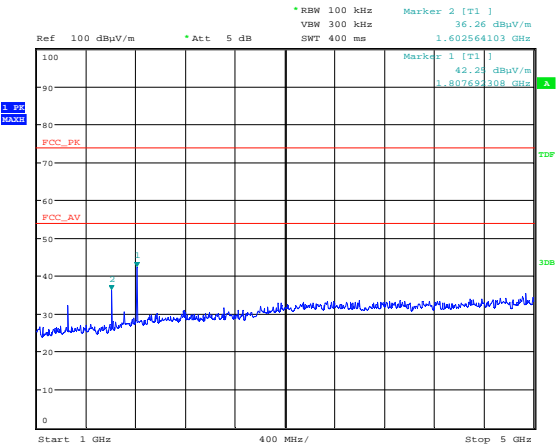


Date: 21.MAR.2012 10:25:14

20dB Bandwidth – 927.8 MHz Base Station 2

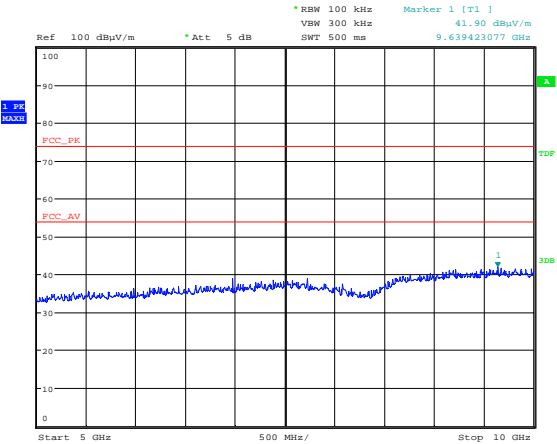


Radiated spurious emissions 30 MHz to 1 GHz – 903.2 MHz



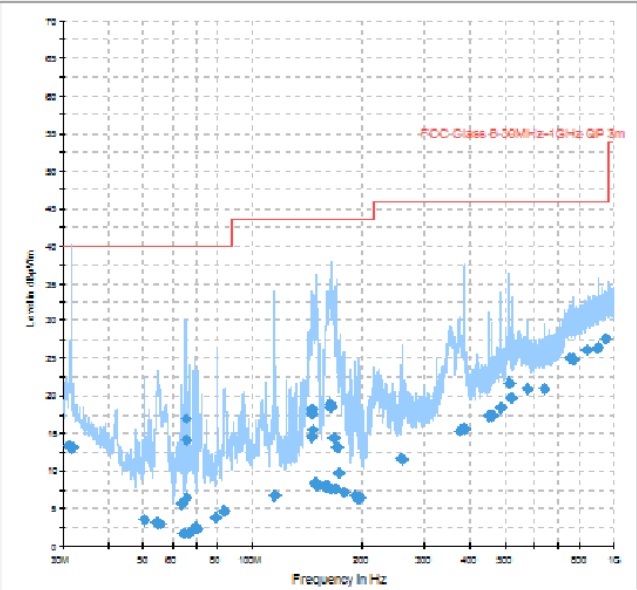
Date: 22.MAR.2012 10:27:03

Radiated spurious emissions 1 GHz to 5 GHz – 903.2 MHz

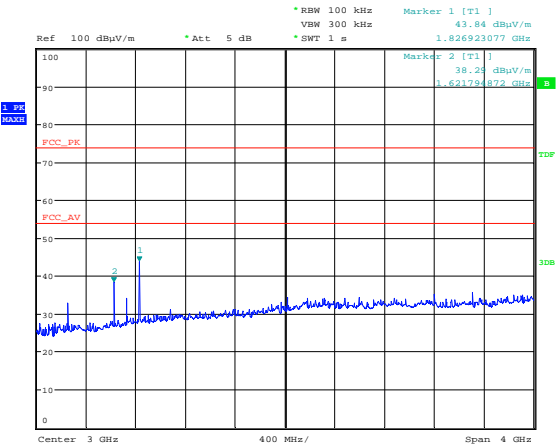


Date: 21.MAR.2012 12:45:12

Radiated spurious emissions 5 GHz to 10 GHz – 903.2 MHz

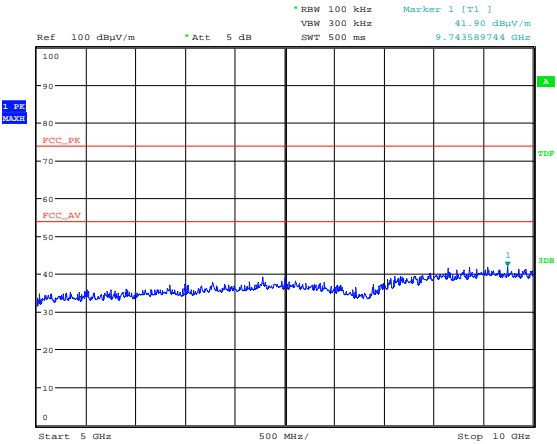


Radiated spurious emissions 30 MHz to 1 GHz – 915.0 MHz



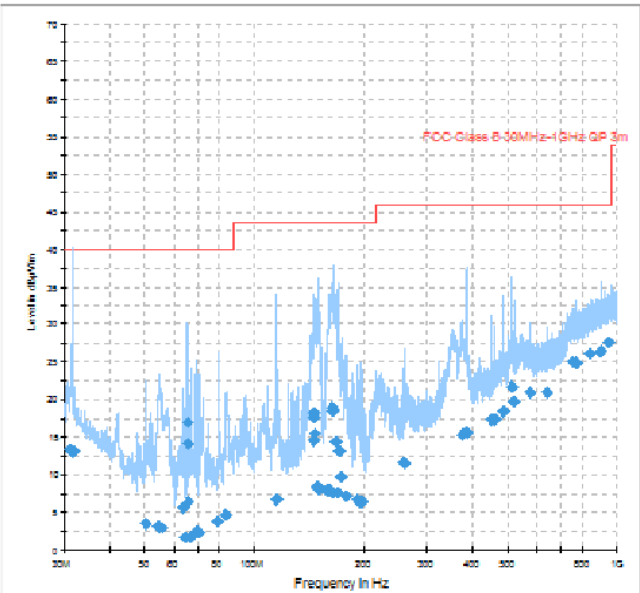
Date: 22.MAR.2012 10:15:01

Radiated spurious emissions 1 GHz to 5 GHz – 915.0 MHz

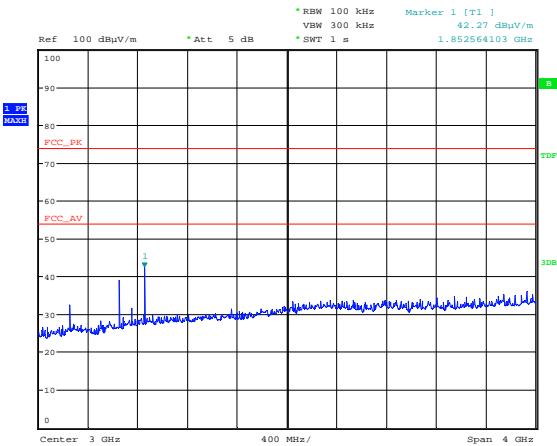


Date: 21.MAR.2012 12:48:40

Radiated spurious emissions 5 GHz to 10 GHz – 915.0 MHz

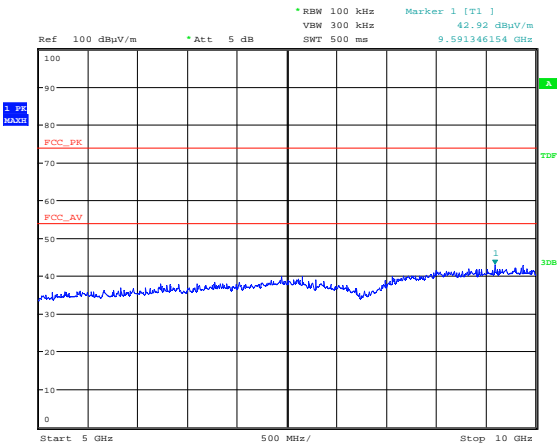


Radiated spurious emissions 30 MHz to 1 GHz – 927.8 MHz



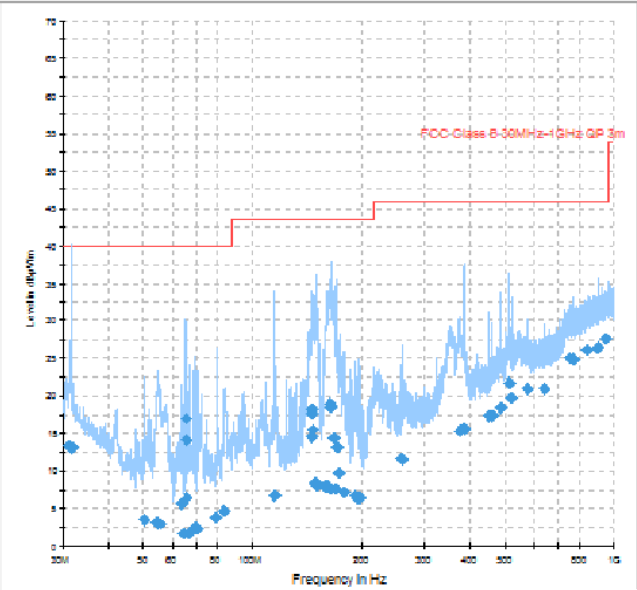
Date: 22.MAR.2012 10:12:54

Radiated spurious emissions 1 GHz to 5 GHz – 927.8 MHz

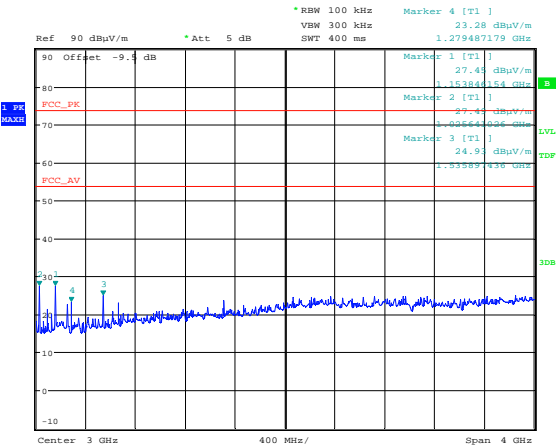


Date: 21.MAR.2012 12:52:05

Radiated spurious emissions 5 GHz to 10 GHz – 927.8 MHz

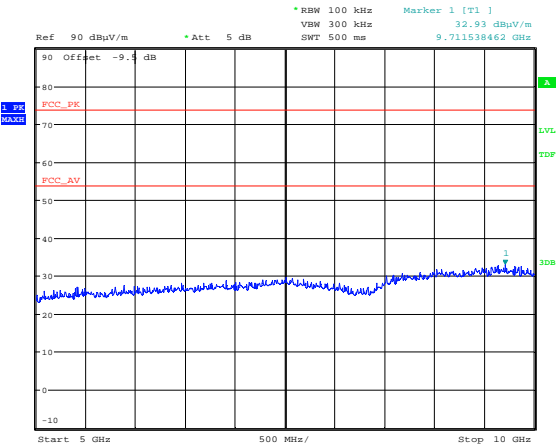


Unintentional Radiated spurious emissions 30 MHz to 1 GHz



Date: 22.MAR.2012 09:56:18

Unintentional Radiated spurious emissions 1 GHz to 5 GHz



Date: 22.MAR.2012 09:57:51

Unintentional Radiated spurious emissions 5 GHz to 10 GHz

Appendix E:**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 its 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 Global upon request.

E1 Test samples

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

Sample Number	Description	Identification
S01	Sensiumbridge	TZ202020
S02	Laptop	Dell
S03	Modem	Talk Talk/Huawei
S04	POE Injector	SL Power/Ault

E2 EUT operating mode during testing

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

Test	Description of Operating Mode
All tests except unintentional radiated emissions	EUT was set to transmit in maximum power setting
Unintentional radiated emissions	EUT in receive mode

E3 EUT Configuration Information

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

E4 List of EUT Ports

The tables below describe the termination of EUT ports.

Sample : S01

Port	Description of Cable Attached	Cable length	Equipment Connected
8P8C	Unshielded Ethernet Cable	1.5m	POE Injector

E5 Details of Equipment Used

Ref	Type	Description	Manufacturer	Date Calibrated
REF940	ATS	Ferrite Lined Chamber	Rainford EMC	13/07/2011
TRL138	3115	1GHz - 18GHz Horn Antenna	EMCO	08/11/2011
UH191	CBL611/A	30MHz - 1GHz Bilog Antenna	Chase	08/11/2010
UH281	FSU46	Spectrum Analyser	R&S	09/02/2012
TRL572	8449B	Pre-ampifier	Agilent	24/11/2010
UH004	ESVS10	E-field Receiver	R&S	12/01/2012
L300	20240-20	18GHz - 26GHz Horn Antenna	Flann	17/11/2011

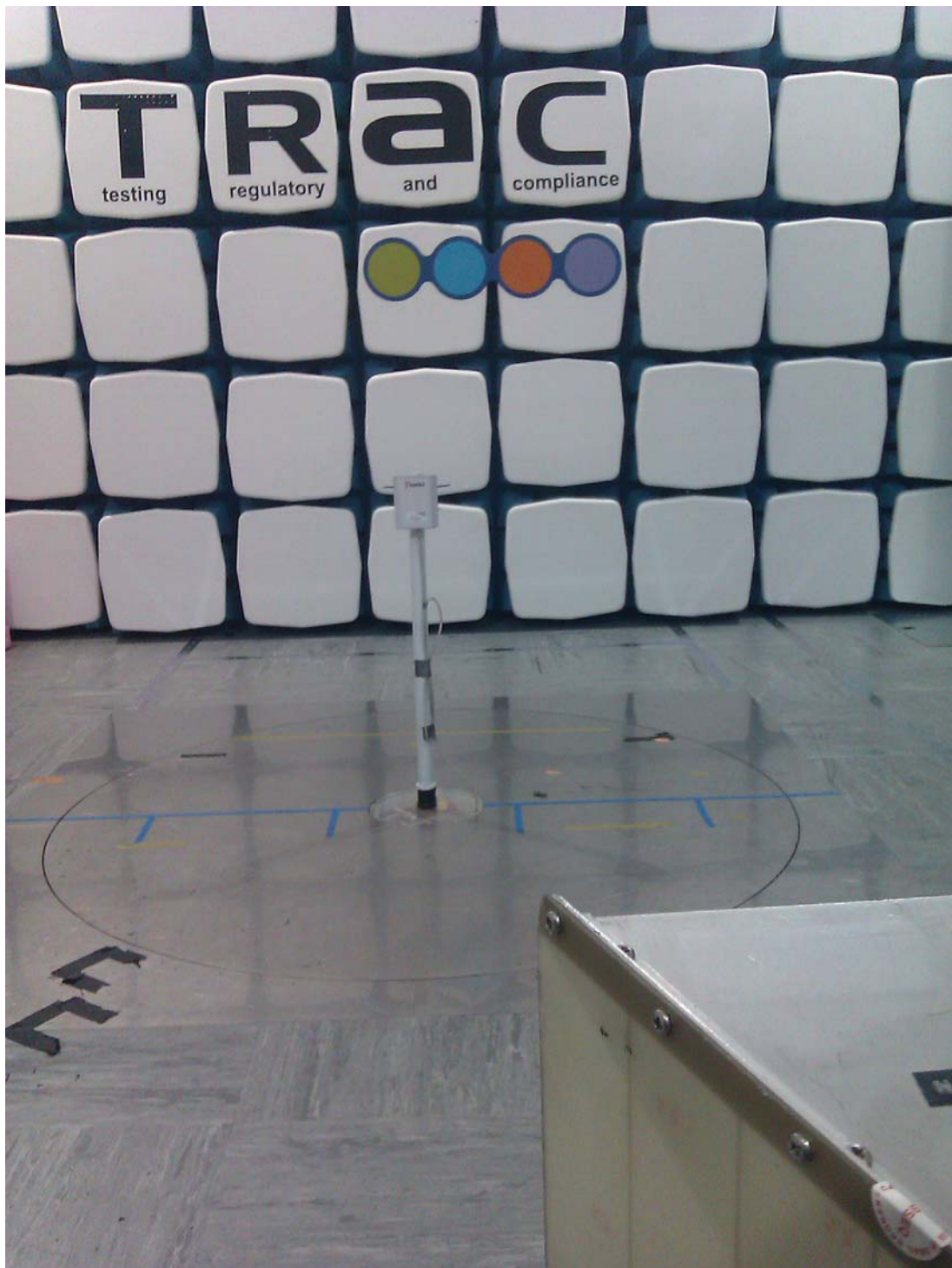
Appendix F:

Additional Information

No additional information is included within this test report.

Appendix G:**Photographs and Figures**

The following photograph was taken of the sample under test.



Radiated electric field emissions arrangement (1GHz – 18GHz)

