A RADIO TEST REPORT

FOR

DIGI INTERNATIONAL Ltd

ON

WR44 WLAN MODULE

DOCUMENT NO. TRA-008044-W-US-1

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TRaC Wireless Test Report	**:** TRA-008044-W-US-1
Applicant	**:** Digi International Ltd
Apparatus	**:** WR44 WLAN module
Specification(s)	**:** CFR47 Part 15.247
FCCID	**:** MCQ55M1644
Purpose of Test	**: Certification**
Authorised by	**:** 
	: Radio Product Manager
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UKAS TESTING 0026

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 :

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1.3 Manufacturer

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1.4 Apparatus Assessed

The following apparatus was assessed between 7th – 21st June 2012:

WR44 WLAN module

WLAN Module operating in the 2.4GHz band utilising IEEE 802.11 b/g/n

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 C63.10:2009	Pass
Conducted spurious emissions (Non-restricted bands)	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10:2009	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart C; 15.207	ANSI C63.10:2009	Pass
Occupied Bandwidth	Title 47 of the CFR : Part 15 Subpart C; 15.247(a)(2)	ANSI C63.10:2009	Pass
Conducted Carrier Power	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)	ANSI C63.10:2009	Pass
Power Spectral Density	Title 47 of the CFR : Part 15 Subpart C; 15.247(d)	ANSI C63.10:2009	Pass
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart B; 15.109	ANSI C63.10:2009	Pass
Digital Modulation	Title 47 of the CFR: Part 15 Subpart C; 15.403	-	Pass
RF Safety	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)(5)	-	Pass

Abbreviations used in the above table:

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

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

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 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: 802.11b	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
EUT sample number	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
Temperature	17
EUT set up	Refer to Appendix C

802.11b 1Mb

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 20 dB Bandwidth (kHz)	Limit (kHz)	Result
2412	2406.903846	2417.144231	10240.385	>500	Pass
2437	2431.903846	2442.144231	10240.385	>500	Pass
2462	2456.903846	2467.144231	10240.385	>500	Pass

802.11b 11Mb

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 20 dB Bandwidth (kHz)	Limit (kHz)	Result
2412	2406.663462	2417.048077	10384.615	>500	Pass
2437	2431.903846	2442.048077	10144.231	>500	Pass
2462	2456.567308	2467.048077	10480.769	>500	Pass

Plots of the 6 dB bandwidth are contained in Appendix B of this test report.
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Ref level offset is adjusted for Cable loss

6 dB Bandwidth - Continued

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: 802.11g	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
EUT sample number	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
Temperature	17
EUT set up	Refer to Appendix C

802.11g 6Mb

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 20 dB Bandwidth (kHz)	Limit (kHz)	Result
2412	2403.778846	2420.269231	16490.385	>500	Pass
2437	2428.836538	2445.269231	16432.693	>500	Pass
2462	2453.778846	2470.250000	16471.154	>500	Pass

802.11b 54Mb

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 20 dB Bandwidth (kHz)	Limit (kHz)	Result
2412	2403.75	2420.355769	16605.769	>500	Pass
2437	2428.75	2445.384615	16634.615	>500	Pass
2462	2453.75	2470.317308	16567.308	>500	Pass

Plots of the 6 dB bandwidth are contained in Appendix B of this test report.
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Ref level offset is adjusted for Cable loss

6 dB Bandwidth - Continued

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: 802.11n HT20	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
EUT sample number	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
Temperature	17
EUT set up	Refer to Appendix C

802.11n HT20 MCS0 6.5Mb

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 20 dB Bandwidth (kHz)	Limit (kHz)	Result
2412	2403.153846	2420.894231	17740.385	>500	Pass
2437	2428.153846	2445.884615	17730.769	>500	Pass
2462	2453.153846	2470.789077	17635.231	>500	Pass

802.11b HT20 MCS7 65Mb

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 20 dB Bandwidth (kHz)	Limit (kHz)	Result
2412	2403.115385	2420.942308	17826.923	>500	Pass
2437	2428.105769	2445.942308	17836.539	>500	Pass
2462	2453.105769	2470.826923	17721.154	>500	Pass

Plots of the 6 dB bandwidth are contained in Appendix B of this test report.
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Ref level offset is adjusted for Cable loss

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	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

802.11b 1Mb

Channel Frequency (MHz)	Conducted Peak Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	16.64	0.0461	1	Pass
2437	17.54	0.0568	1	Pass
2462	17.45	0.0556	1	Pass

802.11b 11Mb

Channel Frequency (MHz)	Conducted Peak Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	19.37	0.0865	1	Pass
2437	20.30	0.1072	1	Pass
2462	20.59	0.1146	1	Pass

Notes:

Conducted measurements were performed on the unique antenna connector and cable assembly supplied with the module.
Measured peak output power does not include the gain of any antenna being used
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Plots of the Conducted peak Carrier power are contained in Appendix B of this test report.
Ref level offset is adjusted for Cable loss

Transmitter Peak Output Power – Conducted - Continued

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	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

802.11g 6Mb

Channel Frequency (MHz)	Conducted Peak Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	16.5	0.0444	1	Pass
2437	17.4	0.0551	1	Pass
2462	17.7	0.0589	1	Pass

802.11g 54Mb

Channel Frequency (MHz)	Conducted Peak Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	16.1	0.0411	1	Pass
2437	17.1	0.0518	1	Pass
2462	17.3	0.0542	1	Pass

Notes:

Conducted measurements were performed on the unique antenna connector and cable assembly supplied with the module.
Measured peak output power does not include the gain of any antenna being used
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Plots of the Conducted peak Carrier power are contained in Appendix B of this test report.
Ref level offset is adjusted for Cable loss

Transmitter Peak Output Power – Conducted - Continued

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	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

802.11n HT20 MCS0 6.5Mb

Channel Frequency (MHz)	Conducted Peak Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	16.7	0.0466	1	Pass
2437	17.6	0.0578	1	Pass
2462	17.9	0.0611	1	Pass

802.11b HT20 MCS7 65Mb

Channel Frequency (MHz)	Conducted Peak Carrier Power		Limit (W)	Result
	(dBm)	(W)		
2412	15.8	0.0383	1	Pass
2437	16.8	0.0476	1	Pass
2462	17.0	0.0499	1	Pass

Notes:

Conducted measurements were performed on the unique antenna connector and cable assembly supplied with the module.
Measured peak output power does not include the gain of any antenna being used
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Plots of the Conducted peak Carrier power are contained in Appendix B of this test report.
Ref level offset is adjusted for Cable loss

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	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

802.11b 1Mb

Channel Frequency (MHz)	Conducted Peak Power Spectral Density	Limit (W)	Result
2412	-12.90	+8 dBm	Pass
2437	-12.02	+8 dBm	Pass
2462	-11.88	+8 dBm	Pass

802.11b 11Mb

Channel Frequency (MHz)	Conducted Peak Power Spectral Density	Limit (W)	Result
2412	-11.15	+8 dBm	Pass
2437	-10.22	+8 dBm	Pass
2462	-10.15	+8 dBm	Pass

Notes:

Conducted measurements were performed on the unique antenna connector and cable assembly supplied with the module.
Measured Power Spectral Density does not include the gain of any antenna being used
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Plots of the Transmitter Power Spectral Density are contained in Appendix B of this test report.
Ref level offset is adjusted for Cable loss and 100 kHz – 3 kHz bandwidth correction

Transmitter Power Spectral Density - Continued

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	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

802.11g 6Mb

Channel Frequency (MHz)	Conducted Peak Power Spectral Density	Limit (W)	Result
2412	-18.0	+8 dBm	Pass
2437	-17.0	+8 dBm	Pass
2462	-16.9	+8 dBm	Pass

802.11g 54Mb

Channel Frequency (MHz)	Conducted Peak Power Spectral Density	Limit (W)	Result
2412	-19.3	+8 dBm	Pass
2437	-18.2	+8 dBm	Pass
2462	-18.1	+8 dBm	Pass

Notes:

Conducted measurements were performed on the unique antenna connector and cable assembly supplied with the module.
Measured Power Spectral Density does not include the gain of any antenna being used
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Plots of the Transmitter Power Spectral Density are contained in Appendix B of this test report.
Ref level offset is adjusted for Cable loss and 100 kHz – 3 kHz bandwidth correction

Transmitter Power Spectral Density - Continued

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	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

802.11b HT20 MCS0 6.5Mb

Channel Frequency (MHz)	Conducted Peak Power Spectral Density	Limit (W)	Result
2412	-18.0	+8 dBm	Pass
2437	-17.0	+8 dBm	Pass
2462	-16.9	+8 dBm	Pass

802.11b HT20 MCS7 65Mb

Channel Frequency (MHz)	Conducted Peak Power Spectral Density	Limit (W)	Result
2412	-19.2	+8 dBm	Pass
2437	-18.2	+8 dBm	Pass
2462	-18.1	+8 dBm	Pass

Notes:

Conducted measurements were performed on the unique antenna connector and cable assembly supplied with the module.
Measured Power Spectral Density does not include the gain of any antenna being used
Measurements were performed as per DTS 558074 D01 DTS Meas Guidance v02
Plots of the Transmitter Power Spectral Density are contained in Appendix B of this test report.
Ref level offset is adjusted for Cable loss and 100 kHz – 3 kHz bandwidth correction

A4 RF Antenna 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 turn.

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
Frequency range	9 kHz to 25 GHz
EUT sample number	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

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

802.11b 1Mb

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	No Significant Emissions Within 20 dB of the limit					

802.11b 11Mb

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	No Significant Emissions Within 20 dB of the limit					

Notes:

1. The conducted limit for emissions outside the restricted bands, defined in 47CFR15.205(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 accordance15.33 (a)(1).
3. The measurements at 2400 MHz and 2483.5 MHz were made to ensure band edge compliance.
4. 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
5. Plots for highest output power mode of operation, 802.11b 11Mb,can be found in Annex B

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

The limit in 100 kHz RBW = (Maximum Peak Conducted Carrier)-20dB

RF Antenna Conducted Spurious Emissions continued:

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 turn.

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
Frequency range	9 kHz to 25 GHz
EUT sample number	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

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

802.11b 6Mb

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	No Significant Emissions Within 20 dB of the limit					

802.11b 54Mb

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	No Significant Emissions Within 20 dB of the limit					

Notes:

1. The conducted limit for emissions outside the restricted bands, defined in 47CFR15.205(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 accordance15.33 (a)(1).
3. The measurements at 2400 MHz and 2483.5 MHz were made to ensure band edge compliance.
4. 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
5. Plots for highest output power mode of operation, 802.11b 11Mb,can be found in Annex B

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

The limit in 100 kHz RBW = (Maximum Peak Conducted Carrier)-20dB

RF Antenna Conducted Spurious Emissions continued:

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 turn.

Test Details: 802.11n HT20	
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	9 kHz to 25 GHz
EUT sample number	S08
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	17

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

802.11b HT20 MCS0 6.5Mb

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	No Significant Emissions Within 20 dB of the limit					

802.11b HT20 MCS7 65Mb

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	No Significant Emissions Within 20 dB of the limit					

Notes:

1. The conducted limit for emissions outside the restricted bands, defined in 47CFR15.205(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 accordance15.33 (a)(1).
3. The measurements at 2400 MHz and 2483.5 MHz were made to ensure band edge compliance.
4. 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.
5. Plots for highest output power mode of operation, 802.11b 11Mb,can be found in Annex B

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

The limit in 100 kHz RBW = (Maximum Peak Conducted Carrier)-20dB

A5 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) below.

Test Details: 802.11b 1Mb	
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	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

Channel 1

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4823.974	Pk	V	49.10	3.6	32.7	35.7	0.7	50.40	74	-23.60	Pass
4823.974	Av	V	38.34	3.6	32.7	35.7	0.7	39.64	54	-14.36	Pass

Channel 6

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4873.990	Pk	V	51.29	3.7	32.9	35.7	0.6	52.79	74	-21.21	Pass
4873.990	Av	V	44.03	3.7	32.9	35.7	0.6	45.53	54	-8.47	Pass

Channel 11

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4923.967	Pk	V	49.16	3.8	33	35.7	0.6	50.86	74	-23.14	Pass
4923.967	Av	V	41.04	3.8	33	35.7	0.6	42.74	54	-11.26	Pass

Plots for highest output power mode of operation, 802.11b 11Mb, can be found in Annex B

Radiated Electric Field Emissions within the Restricted Band 15.205 continued:

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

Test Details: 802.11b 11Mb	
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	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

Channel 1

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4823.974	Pk	V	48.80	3.6	32.7	35.7	0.7	50.10	74	-23.90	Pass
4823.974	Av	V	34.44	3.6	32.7	35.7	0.7	35.74	54	-18.26	Pass

Channel 6

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4873.990	Pk	V	50.75	3.7	32.9	35.7	0.6	52.25	74	-21.75	Pass
4873.990	Av	V	37.40	3.7	32.9	35.7	0.6	38.90	54	-15.10	Pass

Channel 11

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4923.967	Pk	V	49.26	3.8	33	35.7	0.6	50.96	74	-23.04	Pass
4923.967	Av	V	35.74	3.8	33	35.7	0.6	37.44	54	-16.56	Pass

Plots for highest output power mode of operation, 802.11b 11Mb, can be found in Annex B

Radiated Electric Field Emissions within the Restricted Band 15.205 continued:

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

Test Details: 802.11g 6Mb	
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	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

Channel 1

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Channel 6

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4873.990	Pk	V	47.9	3.7	32.9	35.7	0.6	49.40	74	-24.6	Pass
4873.990	Av	V	34.1	3.7	32.9	35.7	0.6	35.60	54	-18.4	Pass

Channel 11

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Plots for highest output power mode of operation, 802.11b 11Mb, can be found in Annex B

Radiated Electric Field Emissions within the Restricted Band 15.205 continued:

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

Test Details: 802.11g 54Mb	
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	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

Channel 1

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Channel 6

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4873.990	Pk	V	47.16	3.7	32.9	35.7	0.6	48.66	74	-25.34	Pass
4873.990	Av	V	33.69	3.7	32.9	35.7	0.6	35.19	54	-18.81	Pass

Channel 11

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Plots for highest output power mode of operation, 802.11b 11Mb, can be found in Annex B

Radiated Electric Field Emissions within the Restricted Band 15.205 continued:

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

Test Details: 802.11n HT20 MCS0 6.5Mb	
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	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

Channel 1

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Channel 6

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4873.990	Pk	V	47.19	3.7	32.9	35.7	0.6	48.69	74	-25.31	Pass
4873.990	Av	V	33.60	3.7	32.9	35.7	0.6	35.10	54	-18.90	Pass

Channel 11

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Plots for highest output power mode of operation, 802.11b 11Mb, can be found in Annex B

Radiated Electric Field Emissions within the Restricted Band 15.205 continued:

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

Test Details: 802.11n HT20 MCS7 65Mb	
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	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

Channel 1

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Channel 6

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
4873.990	Pk	V	46.92	3.7	32.9	35.7	0.6	48.42	74	-25.58	Pass
4873.990	Av	V	33.4	3.7	32.9	35.7	0.6	34.90	54	-19.1	Pass

Channel 11

Emission Frequency (MHz)	Type (Pk/Av)	Poln. (H/V)	Max Reading (dBµV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp (dB)	Filter Loss dB	3m Field Strength (dBµV/m)	3m Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20dB of the Limit											

Plots for highest output power mode of operation, 802.11b 11Mb, can be found in Annex B

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. Plots can be found in annex B
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 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

A6 Power Line Conducted Emissions

Preview power line conducted emission measurements were performed with a peak detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b). Where required formal measurements of the emissions were performed with peak and quasi peak detectors. The EUT was set to transmit on its lowest, centre and highest carrier frequency in turn. The formal measurements are detailed below:

Test Details:	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10
Frequency range	150kHz to 30MHz
EUT sample number	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 3

The worst-case power line conducted emission measurements are listed below:

Results measured using the average detector compared to the average limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	6.53	31.84	TX Live	50	18.16	Pass
2	6.99	31.43	RX live	50	18.57	Pass
3	7.05	32.63	TX Live	50	17.37	Pass
4	7.42	32.02	TX Neu	50	17.98	Pass
5	25	32.69	TX Neu	50	17.31	Pass

Results measured using the quasi-peak detector compared to the quasi–peak limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.28	36.17	RX Neu	60.82	24.65	Pass
2	0.35	36.48	TX Neu	58.96	22.48	Pass
3	0.39	36.31	RX Neu	58.06	21.75	Pass
4	0.41	37.29	TX Live	57.65	20.36	Pass
5	0.435	37.13	TX Live	57.16	20.03	Pass
6	0.535	34.10	RX Live	56	21.90	Pass
7	7.055	36.79	TX Live	60	23.21	Pass
7	7.055	36.79	TX Live	60	23.21	Pass

Specification limits :

Conducted emission limits (47 CFR Part 15: Clause 15.207):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dBμV	
	Quasi-peak	Average
0.15 to 0.5	66 to 56[2]	56 to 46[2]
0.5 to 5	56	46
5 to 30	60	50

Notes:
1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

Notes:

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

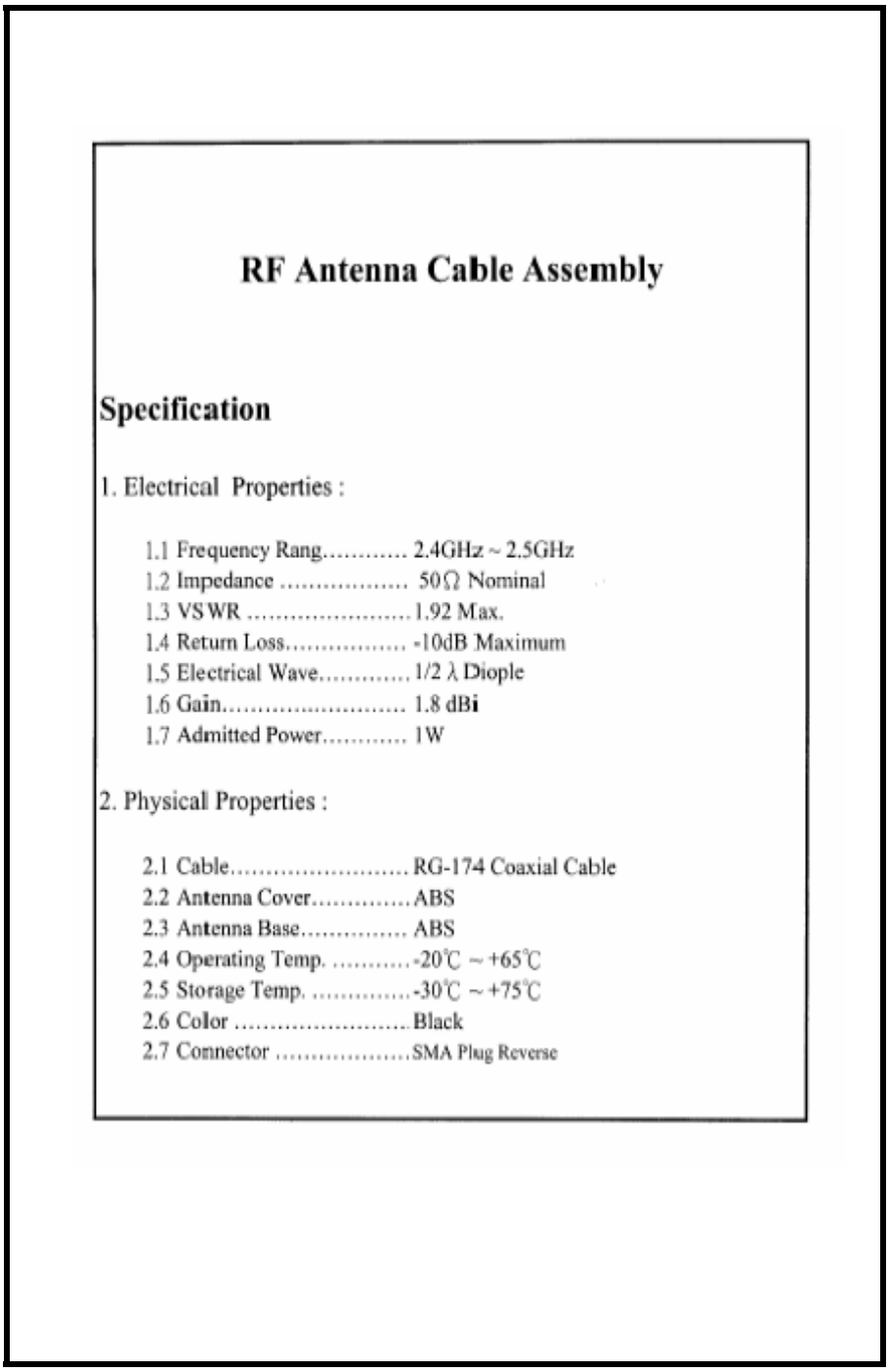
(b) The following table summarises the effect of the EUT operating mode and internal configuration on the measured emission levels :

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

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

A7 Antenna Gain

The maximum antenna gain for the antenna types to be used with the EUT is 1.8 dBi.



RF Antenna Cable Assembly

Specification

1. Electrical Properties :

1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
1.2 Impedance ..... 50Ω Nominal
1.3 VSWR ..... 1.92 Max.
1.4 Return Loss..... -10dB Maximum
1.5 Electrical Wave..... 1/2 λ Diople
1.6 Gain..... 1.8 dBi
1.7 Admitted Power..... 1W

2. Physical Properties :

2.1 Cable..... RG-174 Coaxial Cable
2.2 Antenna Cover..... ABS
2.3 Antenna Base..... ABS
2.4 Operating Temp. ..... -20℃ ~ +65℃
2.5 Storage Temp. ..... -30℃ ~ +75℃
2.6 Color ..... Black
2.7 Connector ..... SMA Plug Reverse

A8 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 : [X]

Test Details: 2412 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.10
Frequency range	30MHz – 25GHz
EUT sample number	S08, S03
Modification state	0
SE in test environment	S01, S02
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	19
Photographs (Appendix F)	1 & 2

The worst case radiated emission measurements for spurious emissions are shown below and continued Overleaf

Ref No.	Ch	Det	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	N/A	QP	39.30	8.30	0.92	12.85	-	22.07	-	12.69	100
2	N/A	QP	41.45	9.80	0.93	11.78	-	22.51	-	13.35	100
3	N/A	QP	42.70	10.20	0.94	11.15	-	22.29	-	13.02	100
4	N/A	QP	45.35	11.50	0.95	9.79	-	22.24	-	12.94	100
5	N/A	QP	75.00	29.80	1.12	6.00	-	36.92	-	70.15	100
6	N/A	QP	175.00	16.30	1.81	8.60	-	26.71	-	21.65	150
7	N/A	QP	225.00	34.10	1.94	9.00	-	45.04	-	178.65	200
8	N/A	QP	250.00	18.20	2.11	11.90	-	32.21	-	40.78	200
9	N/A	QP	275.00	19.50	2.19	12.60	-	34.29	-	51.82	200
10	N/A	QP	325.00	16.20	2.32	13.80	-	32.32	-	41.30	200
11	N/A	QP	350.00	9.80	2.42	14.40	-	26.62	-	21.43	200
12	N/A	QP	375.00	23.70	2.46	15.00	-	41.16	-	114.29	200
13	N/A	QP	425.00	20.60	2.70	16.50	-	39.80	-	97.72	200

Unintentional Radiated Electric Field Emissions - 15.109 - Continued

Ref No.	Ch	Det	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)
14	N/A	QP	475.00	15.70	2.85	16.90	-	35.45	-	59.22	200
15	N/A	QP	500.00	12.90	2.85	17.20	-	32.95	-	44.41	200
16	N/A	QP	525.00	17.10	2.97	17.65	-	37.72	-	76.91	200
17	N/A	QP	566.65	10.80	3.03	18.60	-	32.43	-	41.83	200
18	N/A	QP	575.00	16.20	3.05	18.70	-	37.95	-	78.98	200
19	N/A	QP	601.30	8.60	3.16	18.60	-	30.36	-	32.96	200
20	N/A	QP	625.00	22.50	3.20	18.85	-	44.55	-	168.85	200
21	N/A	QP	650.00	9.60	3.28	19.00	-	31.88	-	39.26	200
22	N/A	QP	675.00	16.80	3.34	18.90	-	39.04	-	89.54	200
23	N/A	QP	725.00	11.40	3.51	19.65	-	34.56	-	53.46	200
24	N/A	QP	874.95	15.50	3.89	20.40	-	39.79	-	97.61	200
25	N/A	P	3199.89	51.14	2.7	30.7	35.5	49.04	-9.54	94.38	500
26	N/A	A	3199.89	43.34	2.7	30.7	35.5	41.24	-9.54	38.45	500
27	N/A	P	2500.00	53.71	2.1	28.5	35.6	48.71	-9.54	90.86	500
28	N/A	A	2500.00	49.36	2.1	28.5	35.6	44.36	-9.54	55.07	500
29	N/A	P	2249.90	53.71	2.1	28.0	35.6	48.21	-9.54	85.78	500
30	N/A	A	2249.90	49.36	2.1	28.0	35.6	43.86	-9.54	51.99	500
31	N/A	P	1974.95	55.39	2.1	27.5	35.7	49.29	-9.54	97.14	500
32	N/A	A	1974.95	51.84	2.1	27.5	35.7	45.74	-9.54	64.55	500
33	N/A	P	1874.90	54.95	2.1	27.5	35.9	48.65	-9.54	90.24	500
34	N/A	A	1874.90	50.93	2.1	27.5	35.9	44.63	-9.54	56.80	500
35	Bot	P	3215.98	51.40	2.8	30.8	35.5	49.50	-9.54	99.51	500
36	Bot	A	3215.98	45.13	2.8	30.8	35.5	43.23	-9.54	48.35	500
37	Mid	P	6498.67	50.29	4.3	34.2	36.0	52.79	-9.54	145.34	500
38	Mid	A	6498.67	44.84	4.3	34.2	36.0	47.34	-9.54	77.60	500
39	Top	P	6565.34	50.27	4	34.4	36.0	52.67	-9.54	143.34	500
40	Top	A	6565.34	43.00	4	34.4	36.0	45.40	-9.54	62.07	500

Ch = N/A denotes frequency present regardless of EUT frequency of operation.
Plots showing emissions for EUT operating on centre frequency can be found in annex B

Appendix B: Supporting Graphical Data

This appendix contains graphical data obtained during testing.

Notes:

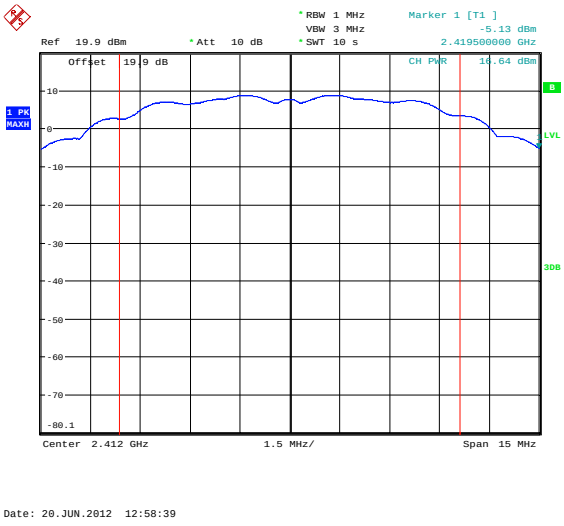
(a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.

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

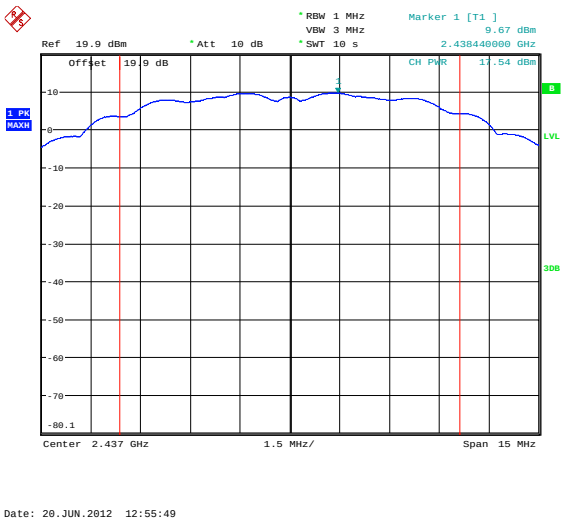
(c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.

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

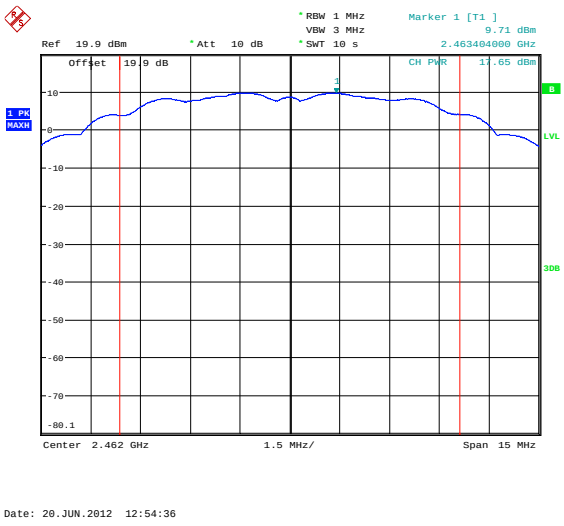
(e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.



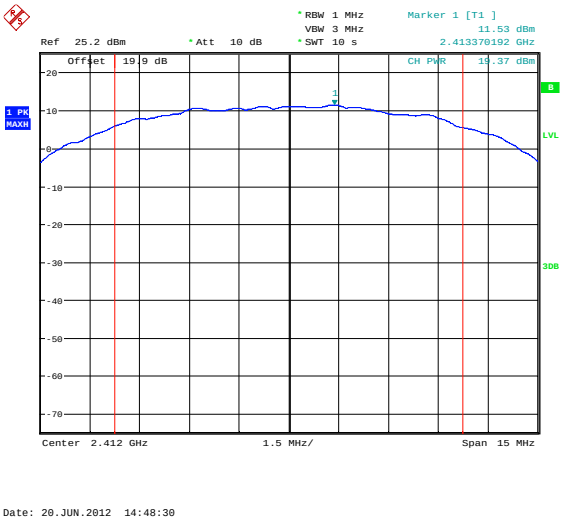
Conducted carrier power 2412MHz – 802.11b 1Mb



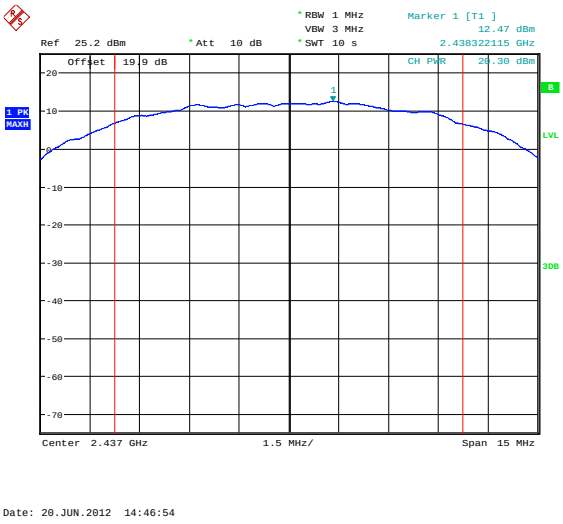
Conducted carrier power 2437 MHz – 802.11b 1Mb



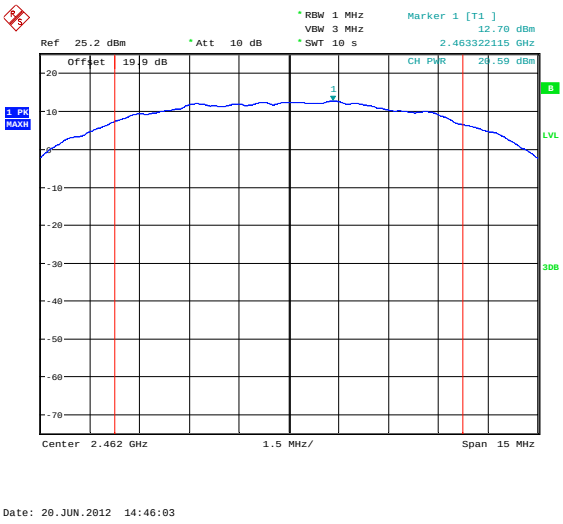
Conducted carrier power 2462 MHz – 802.11b 1Mb



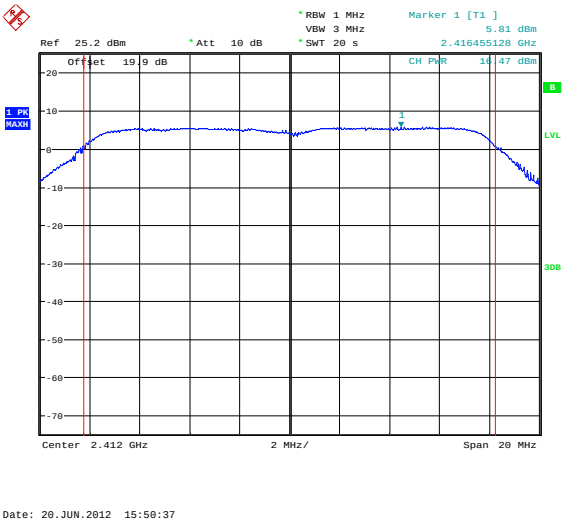
Conducted carrier power 2412MHz – 802.11b 11Mb



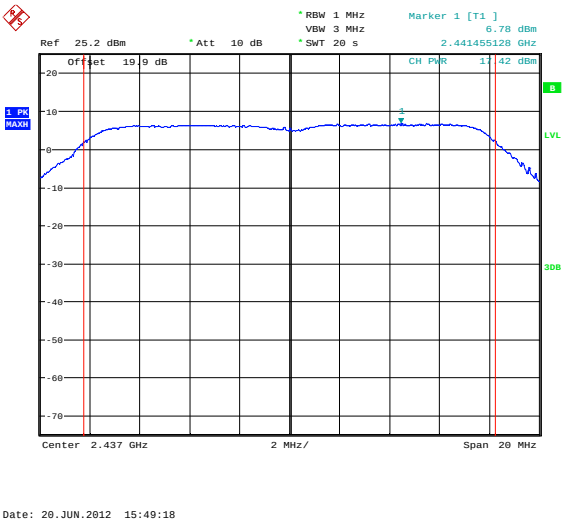
Conducted carrier power 2437 MHz – 802.11b 11Mb



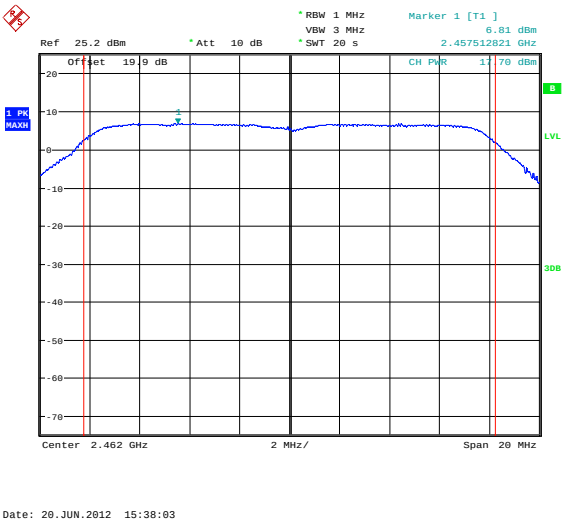
Conducted carrier power 2462 MHz – 802.11b 11Mb



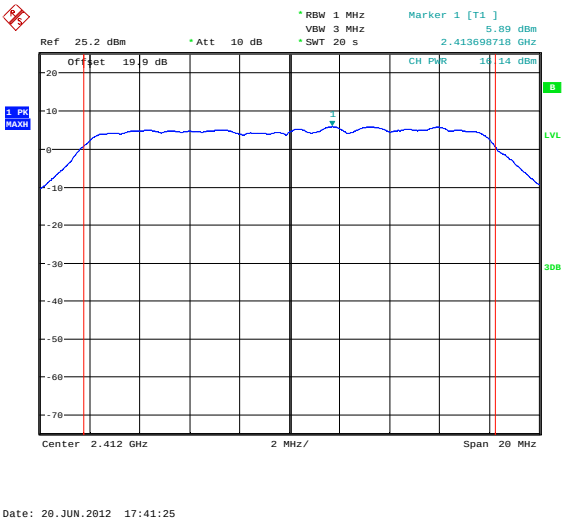
Conducted carrier power 2412MHz – 802.11g 6Mb



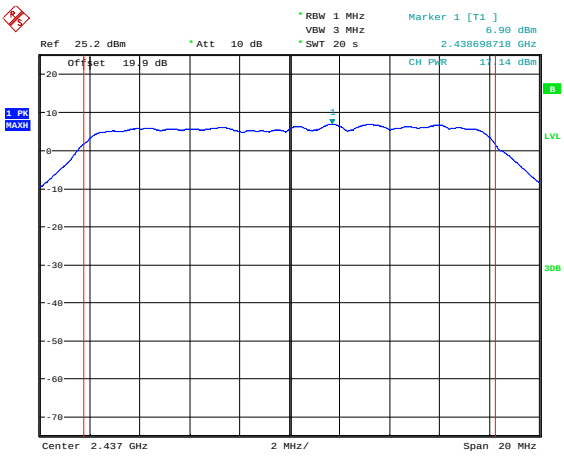
Conducted carrier power 2437 MHz – 802.11g 6Mb



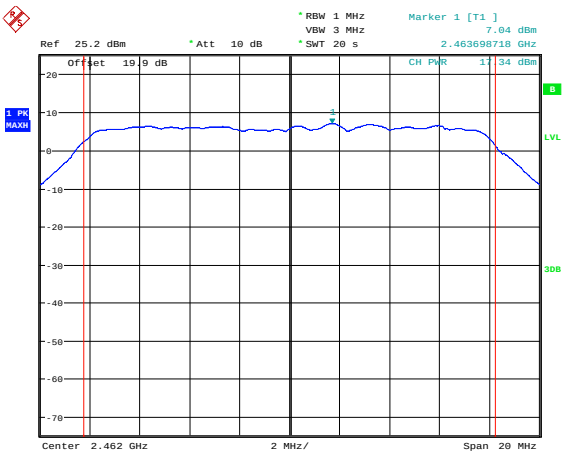
Conducted carrier power 2462 MHz – 802.11g 6Mb



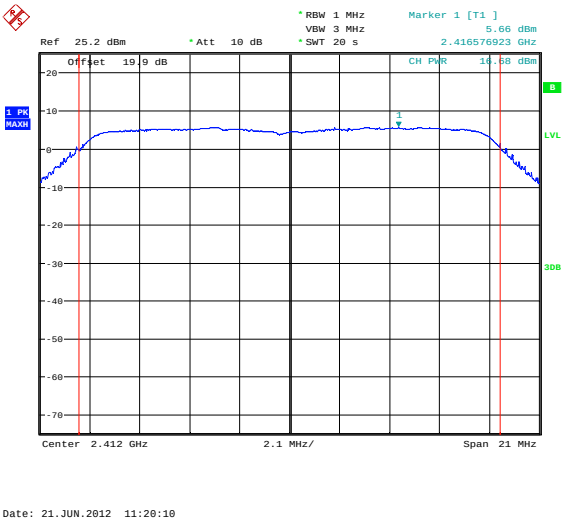
Conducted carrier power 2412MHz– 802.11g 54Mb



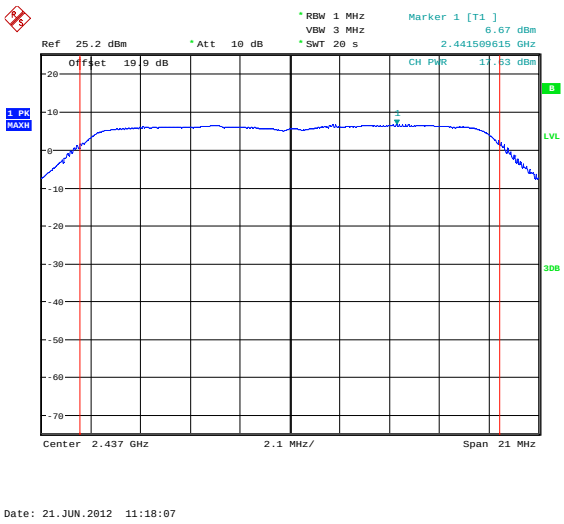
Conducted carrier power 2437 MHz– 802.11g 54Mb



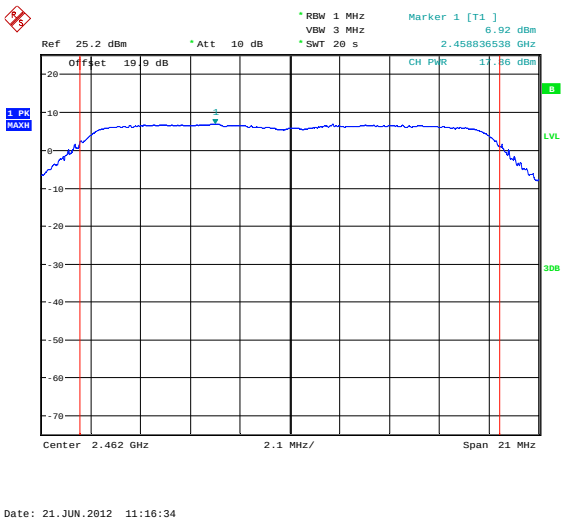
Conducted carrier power 2462 MHz– 802.11g 54Mb



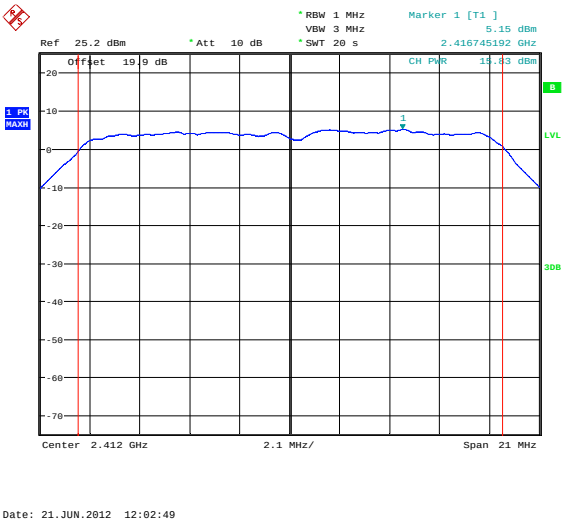
Conducted carrier power 2412MHz – 802.11n HT20 MCS0 6.5Mb



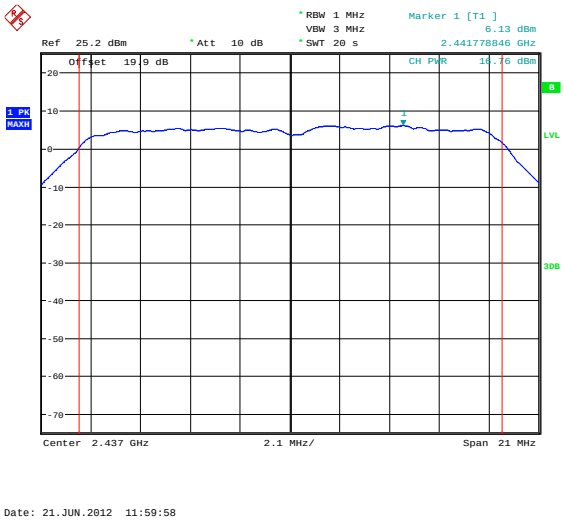
Conducted carrier power 2437 MHz – 802.11n HT20 MCS0 6.5Mb



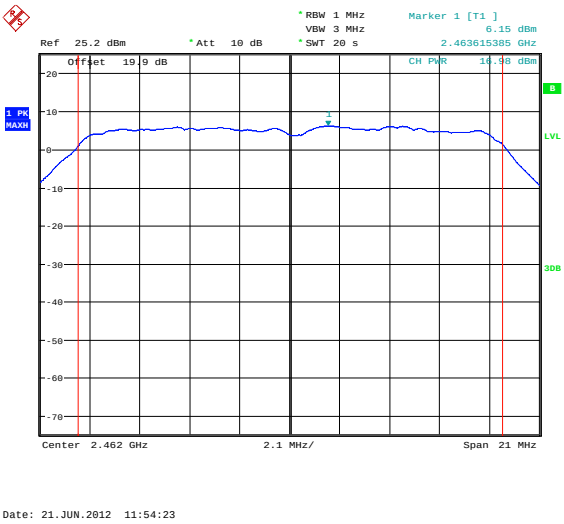
Conducted carrier power 2462 MHz – 802.11n HT20 MCS0 6.5Mb



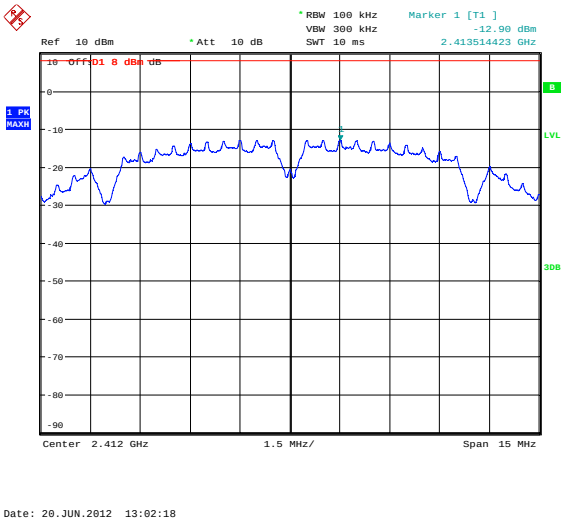
Conducted carrier power 2412MHz – 802.11n HT20 MCS7 65Mb



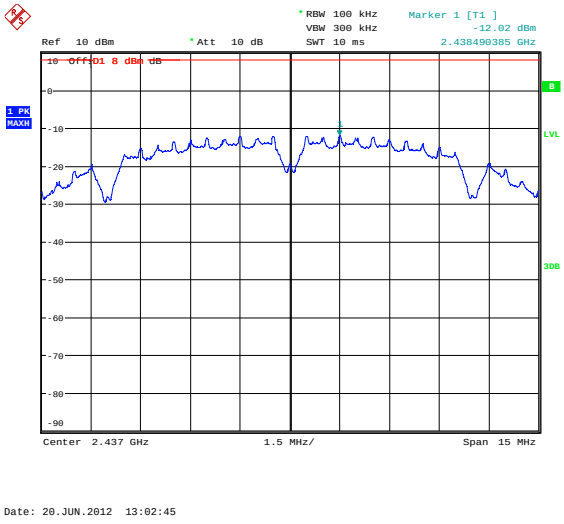
Conducted carrier power 2437 MHz – 802.11n HT20 MCS7 65Mb



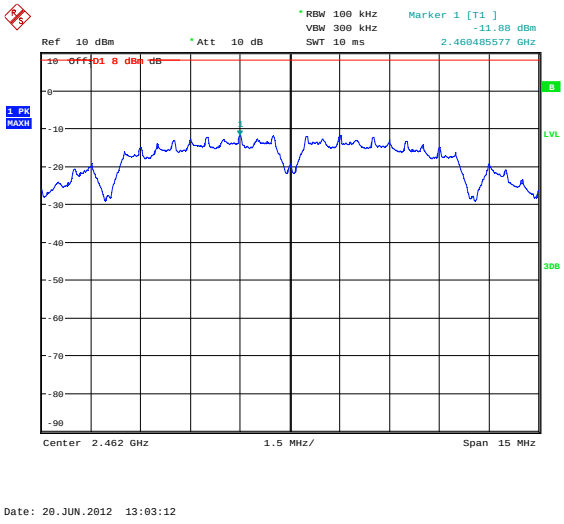
Conducted carrier power 2462 MHz – 802.11n HT20 MCS7 65Mb



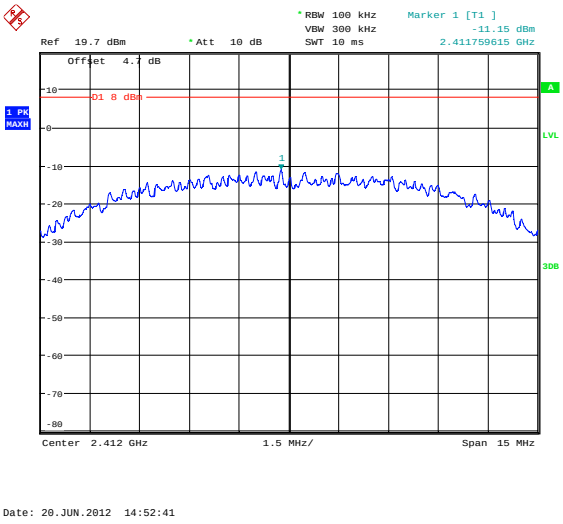
Conducted power spectral density 2412MHz – 802.11b 1Mb



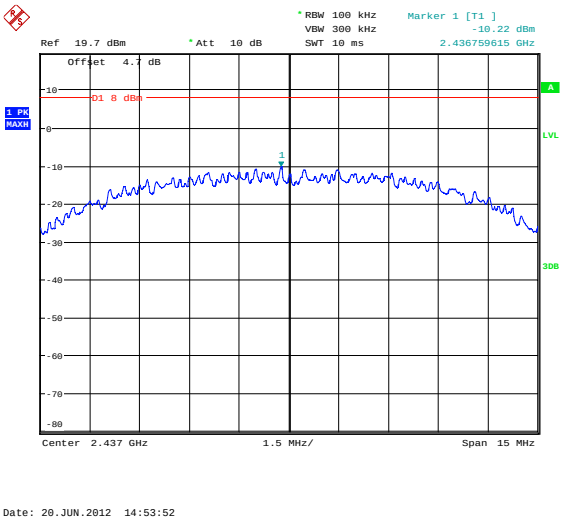
Conducted power spectral density 2437 MHz – 802.11b 1Mb



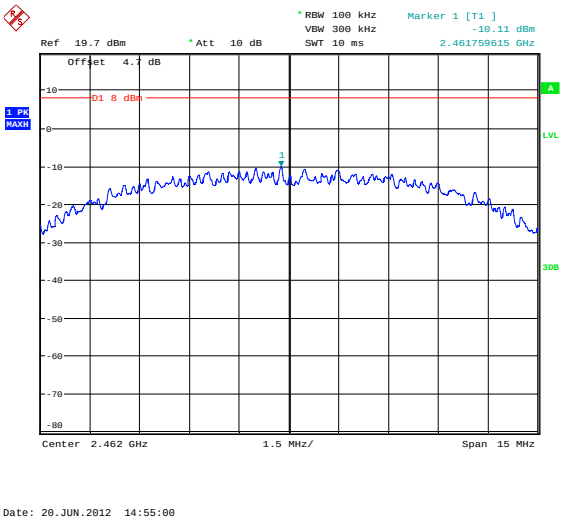
Conducted power spectral density 2462 MHz – 802.11b 1Mb



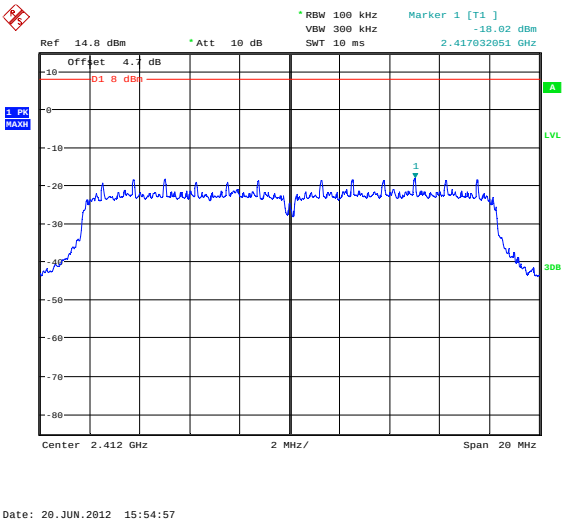
Conducted power spectral density 2412MHz – 802.11b 11Mb



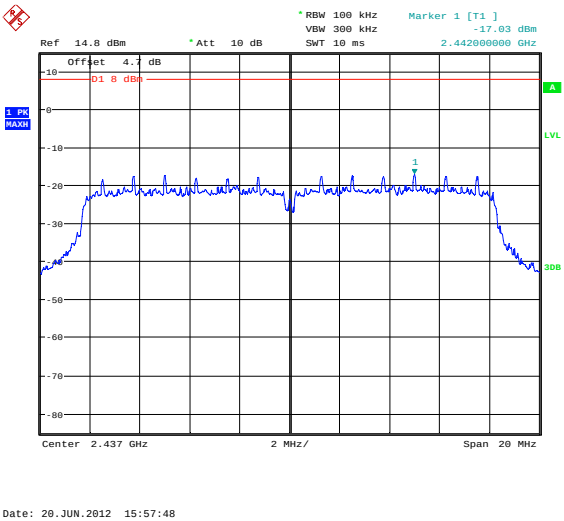
Conducted power spectral density 2437 MHz – 802.11b 11Mb



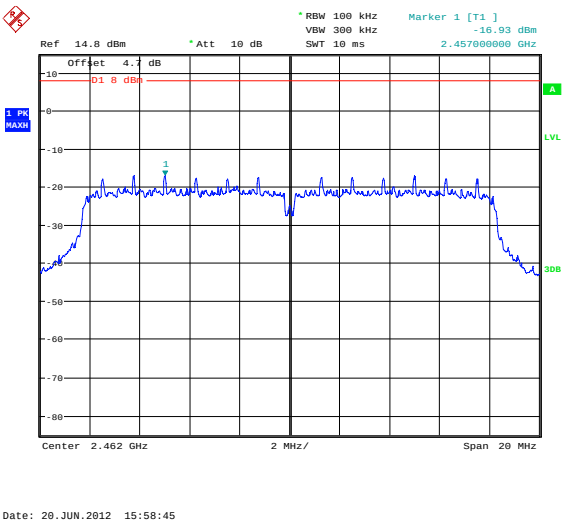
Conducted power spectral density 2462 MHz – 802.11b 11Mb



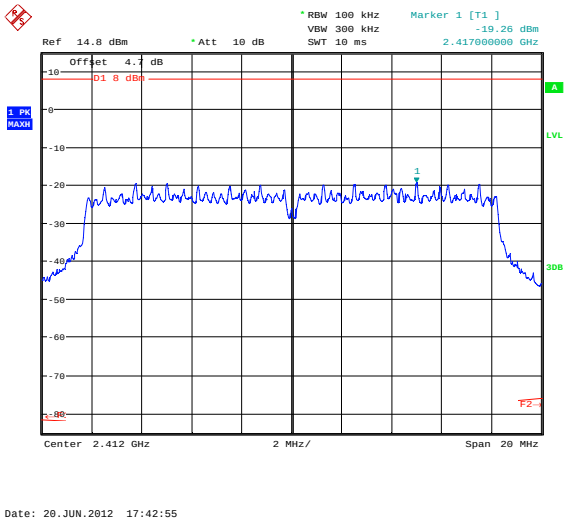
Conducted power spectral density 2412MHz – 802.11g 6Mb



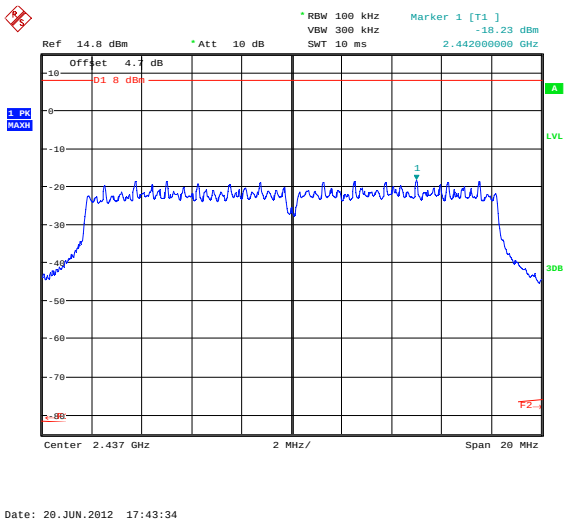
Conducted power spectral density 2437 MHz – 802.11g 6Mb



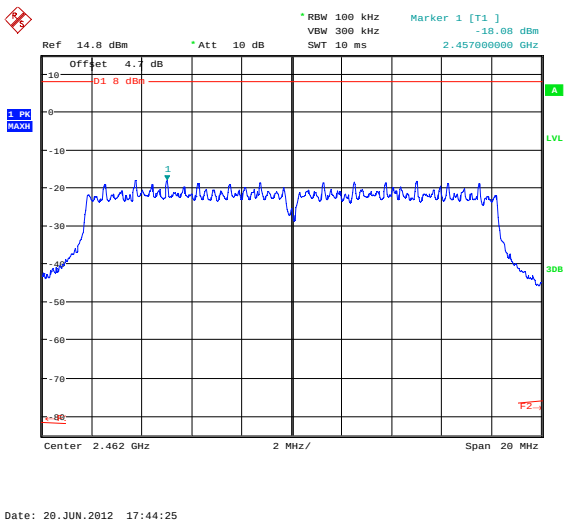
Conducted power spectral density 2462 MHz – 802.11g 6Mb



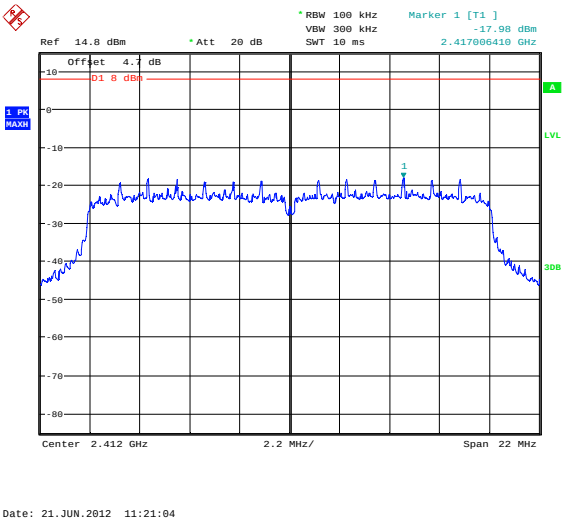
Conducted power spectral density 2412MHz– 802.11g 54Mb



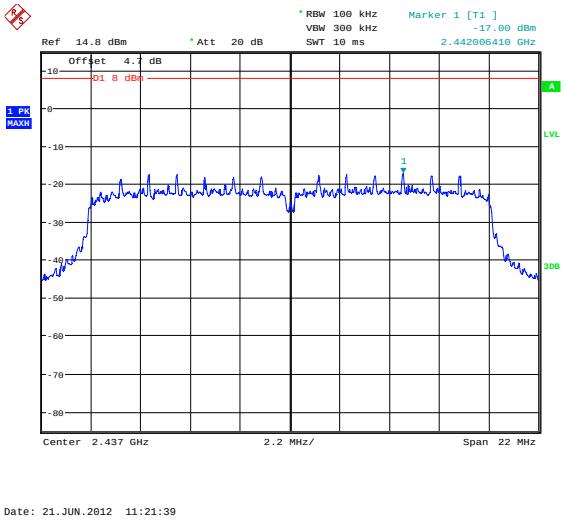
Conducted power spectral density 2437 MHz– 802.11g 54Mb



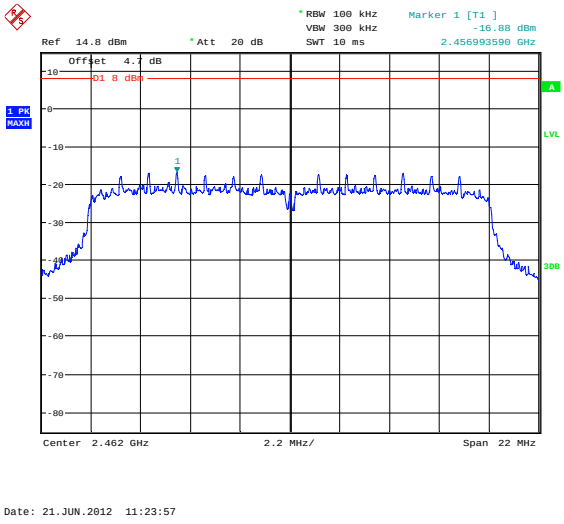
Conducted power spectral density 2462 MHz– 802.11g 54Mb



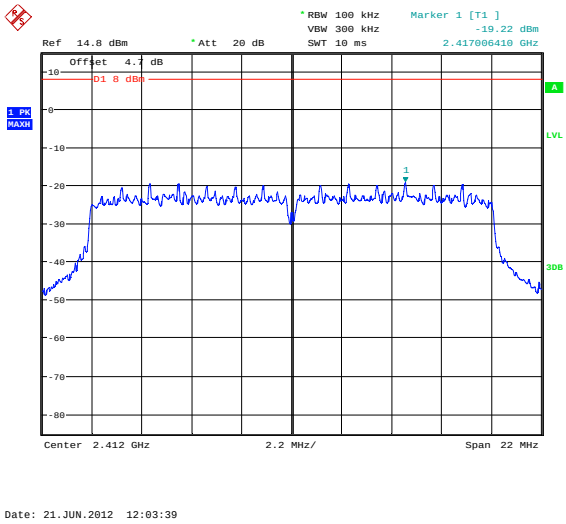
Conducted power spectral density 2412MHz – 802.11n HT20 MCS0 6.5Mb



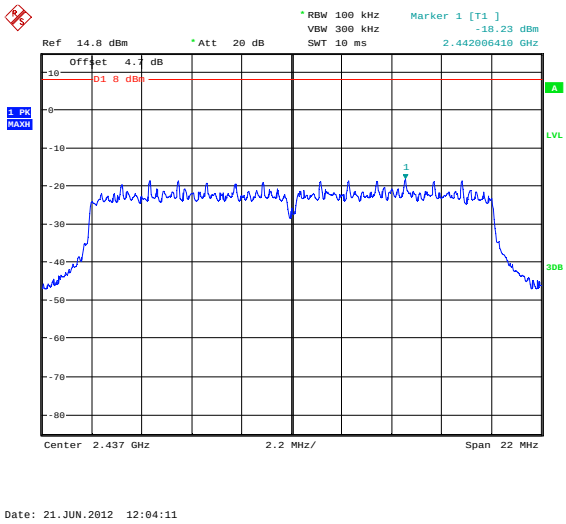
Conducted power spectral density 2437 MHz – 802.11n HT20 MCS0 6.5Mb



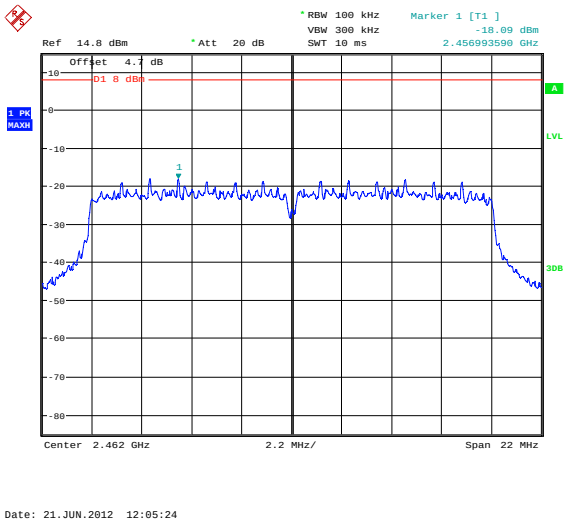
Conducted power spectral density 2462 MHz – 802.11n HT20 MCS0 6.5Mb



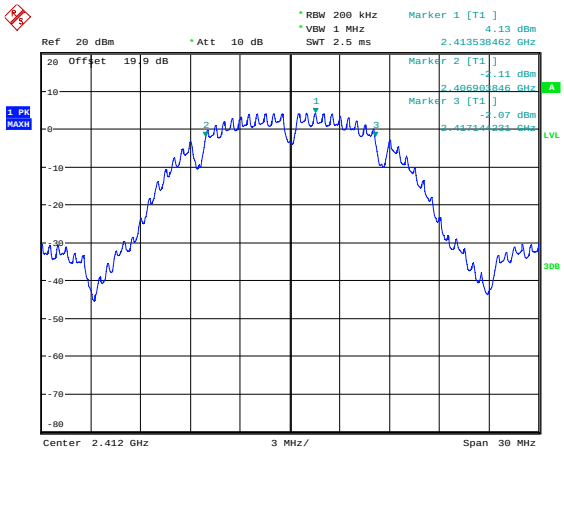
Conducted power spectral density 2412MHz – 802.11n HT20 MCS7 65Mb



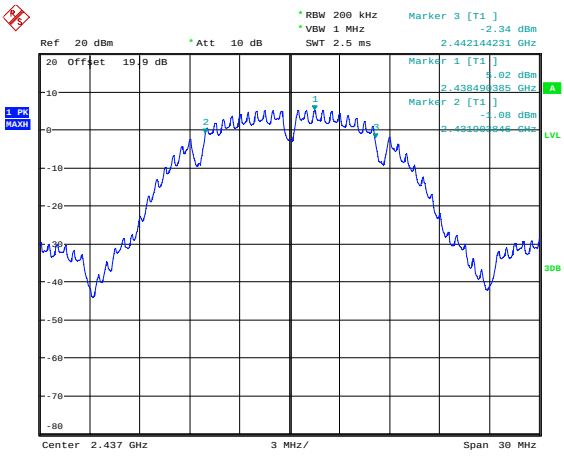
Conducted power spectral density 2437 MHz – 802.11n HT20 MCS7 65Mb



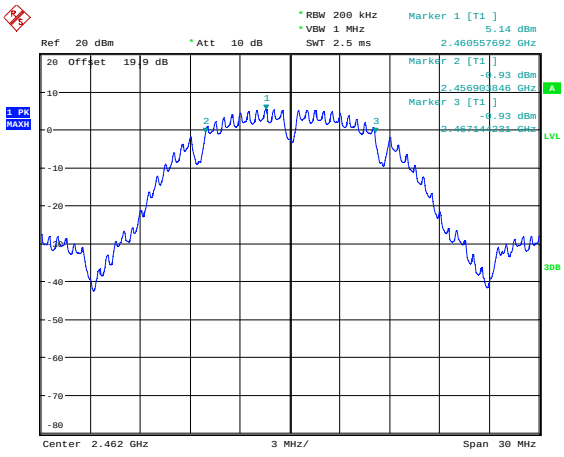
Conducted power spectral density 2462 MHz – 802.11n HT20 MCS7 65Mb



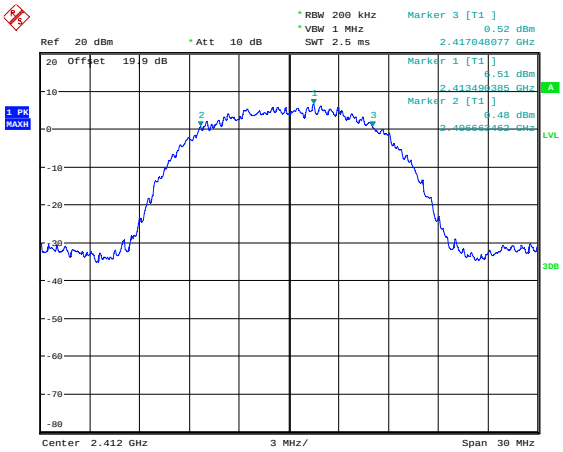
6dB Bandwidth 2412MHz – 802.11b 1Mb



6dB Bandwidth 2437 MHz – 802.11b 1Mb



6dB Bandwidth 2462 MHz – 802.11b 1Mb



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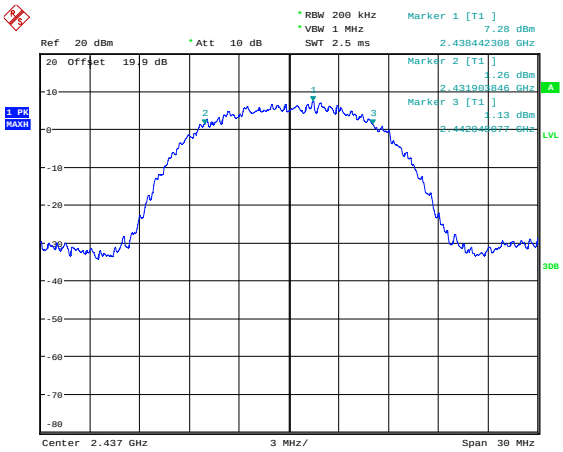
6dB Bandwidth 2412MHz – 802.11b 11Mb



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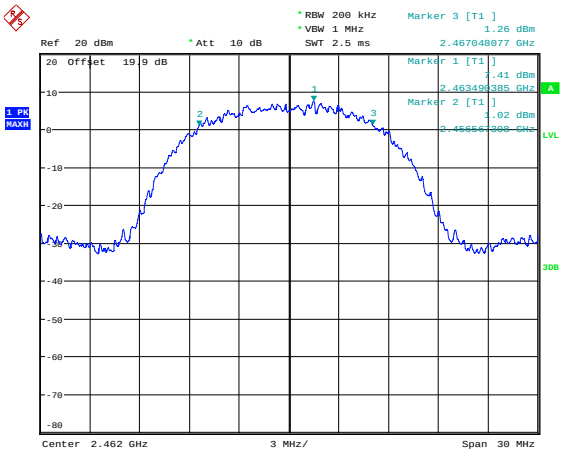
6dB Bandwidth 2437 MHz – 802.11b 11Mb



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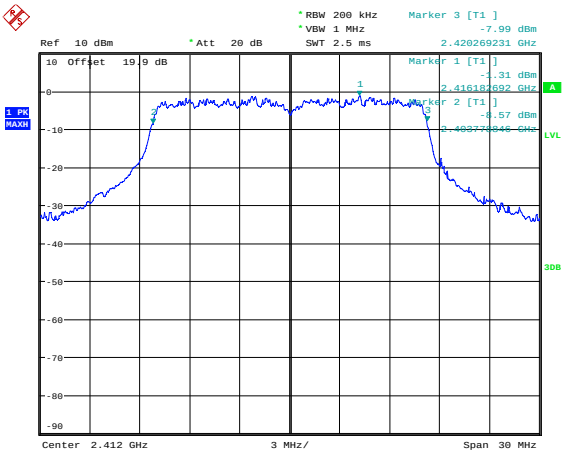
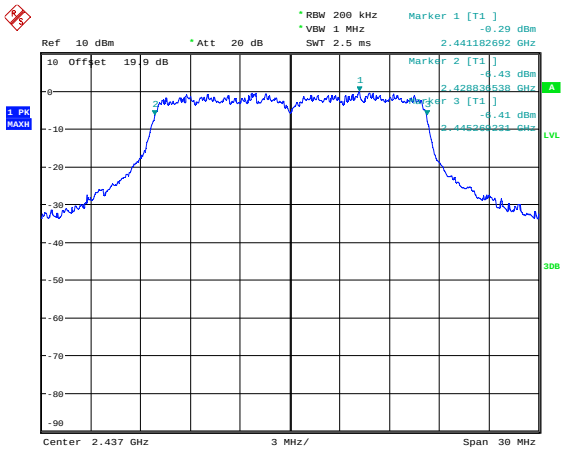
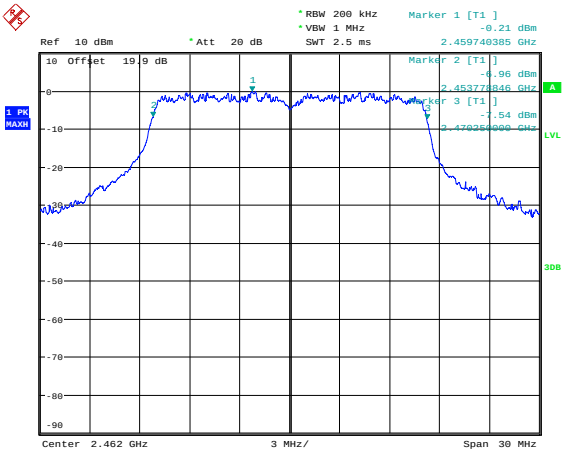
6dB Bandwidth 2462 MHz – 802.11b 11Mb



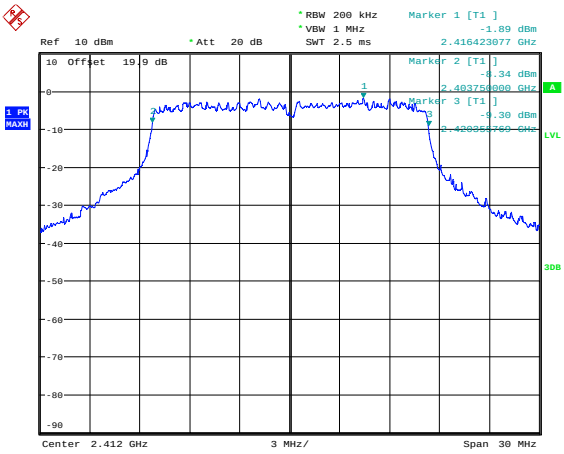
6dB Bandwidth 2412MHz – 802.11g 6Mb



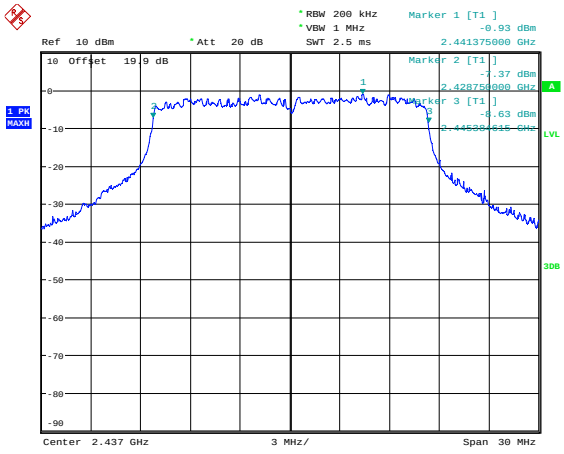
6dB Bandwidth 2437 MHz – 802.11g 6Mb



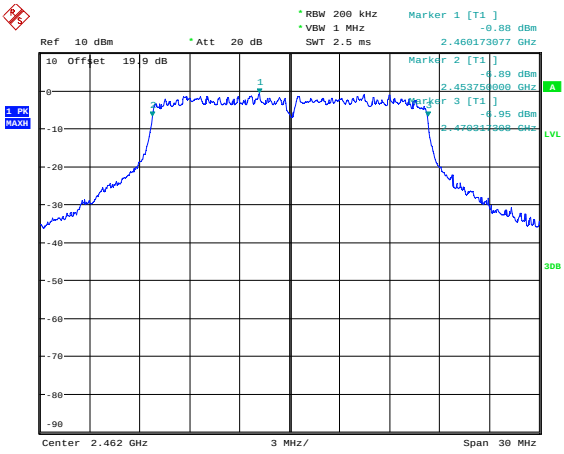
6dB Bandwidth 2462 MHz – 802.11g 6Mb



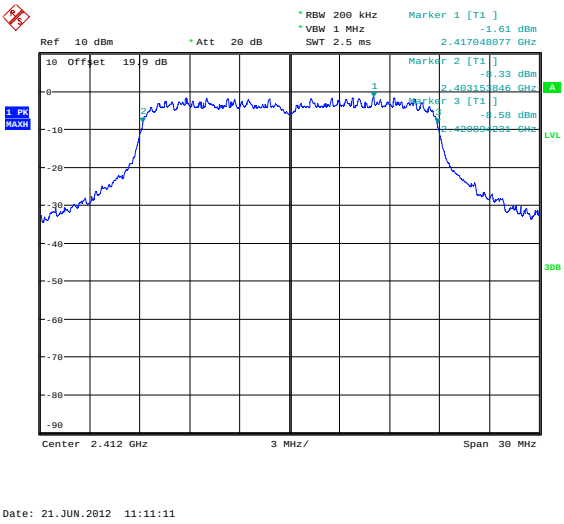
6dB Bandwidth 2412MHz– 802.11g 54Mb



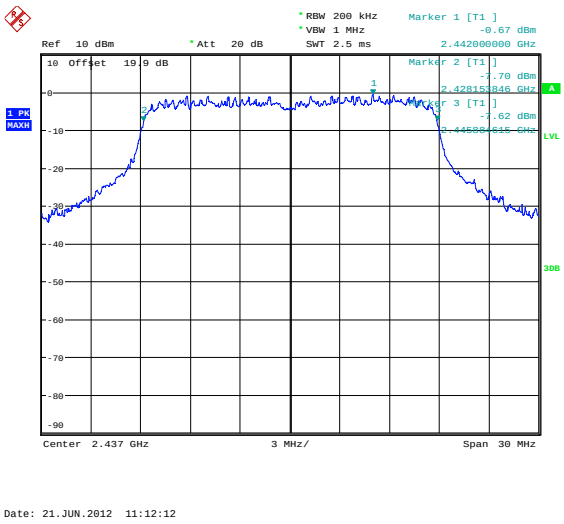
6dB Bandwidth 2437 MHz– 802.11g 54Mb



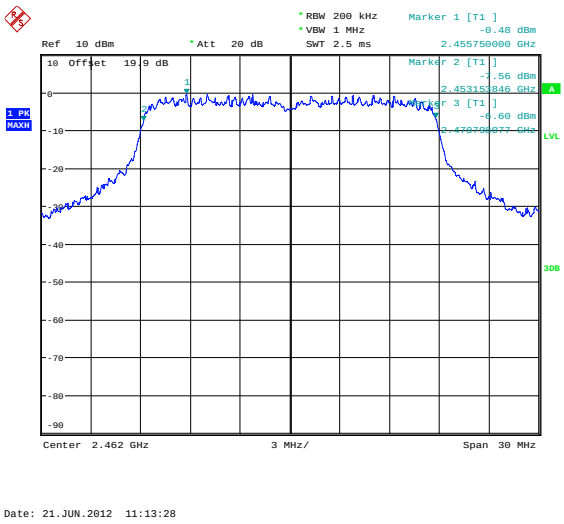
6dB Bandwidth 2462 MHz– 802.11g 54Mb



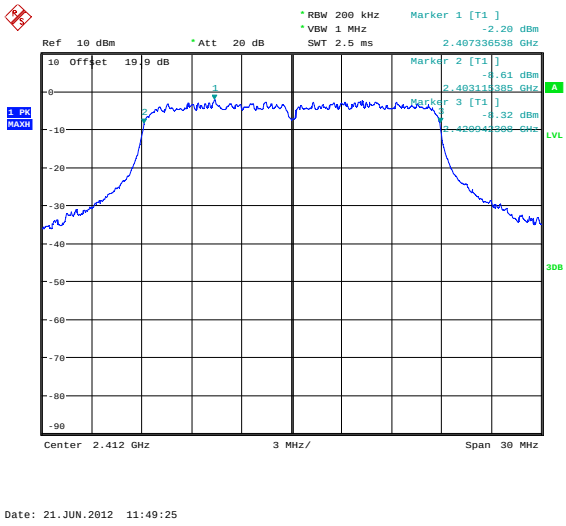
6dB Bandwidth 2412MHz – 802.11n HT20 MCS0 6.5Mb



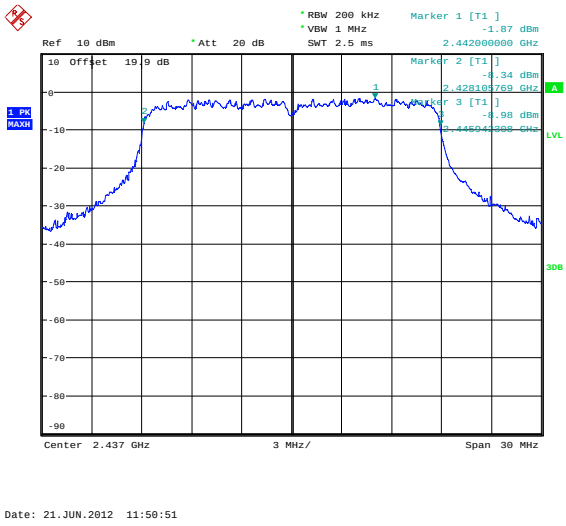
6dB Bandwidth 2437 MHz – 802.11n HT20 MCS0 6.5Mb



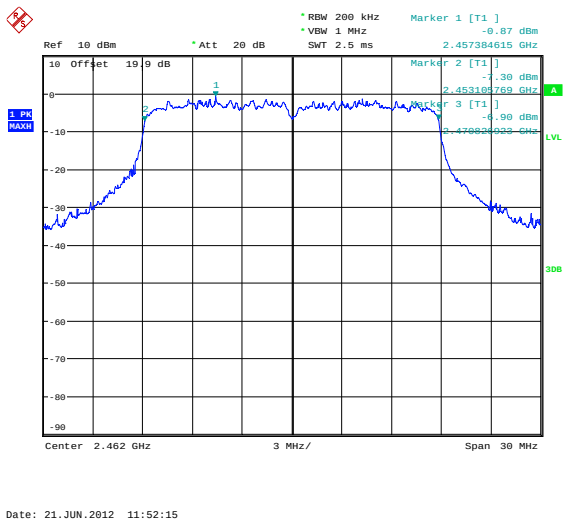
6dB Bandwidth 2462 MHz – 802.11n HT20 MCS0 6.5Mb



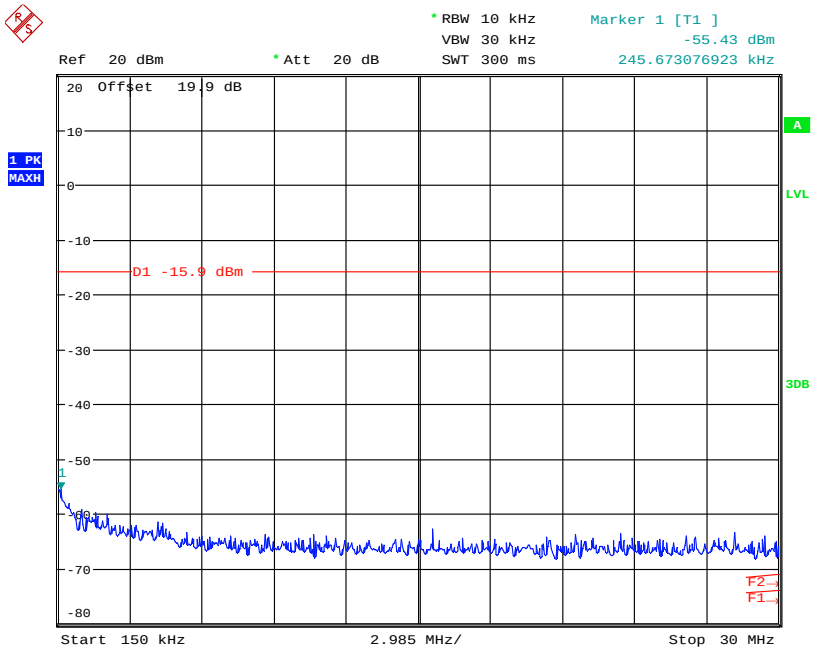
6dB Bandwidth 2412MHz – 802.11n HT20 MCS7 65Mb



6dB Bandwidth 2437 MHz – 802.11n HT20 MCS7 65Mb



6dB Bandwidth 2462 MHz – 802.11n HT20 MCS7 65Mb



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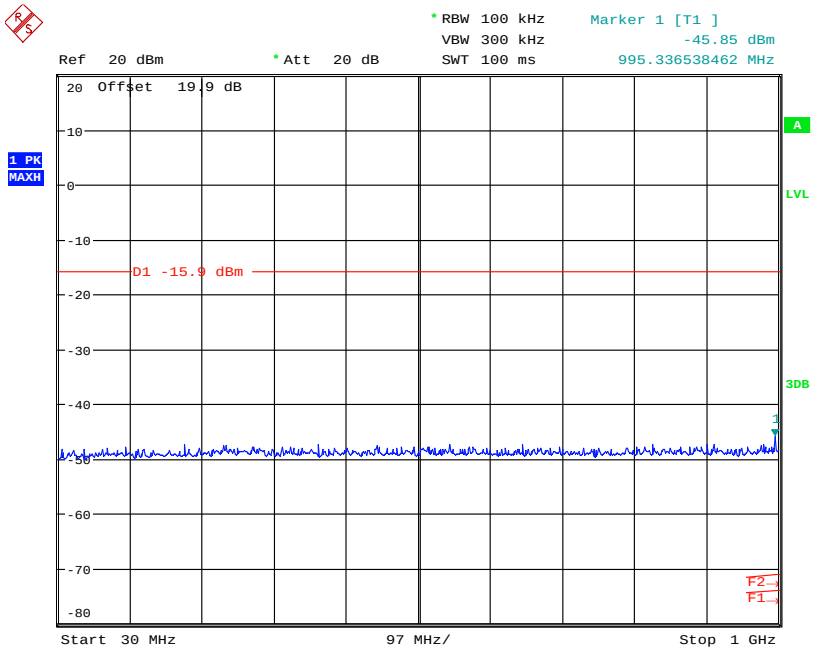
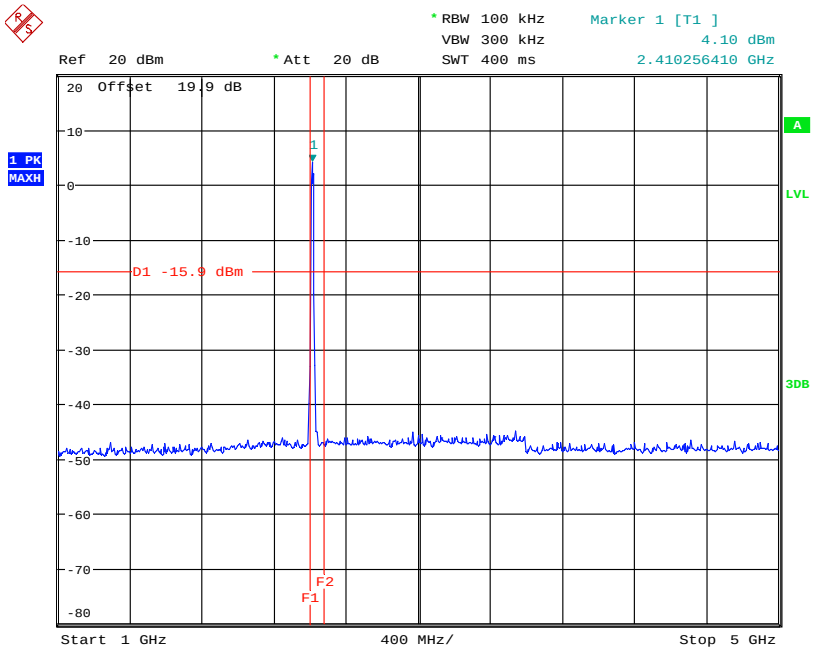
Conducted Spurious emissions 100kHz to 30 MHz – 2412MHz



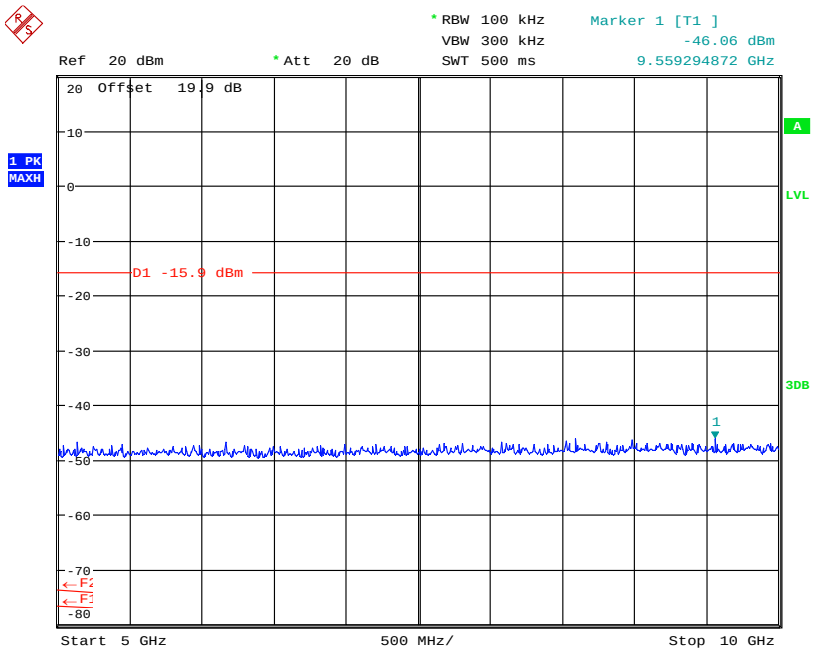
Date: 20.JUN.2012 15:21:52

Conducted Spurious emissions 30 MHz to 1 GHz – 2412MHz



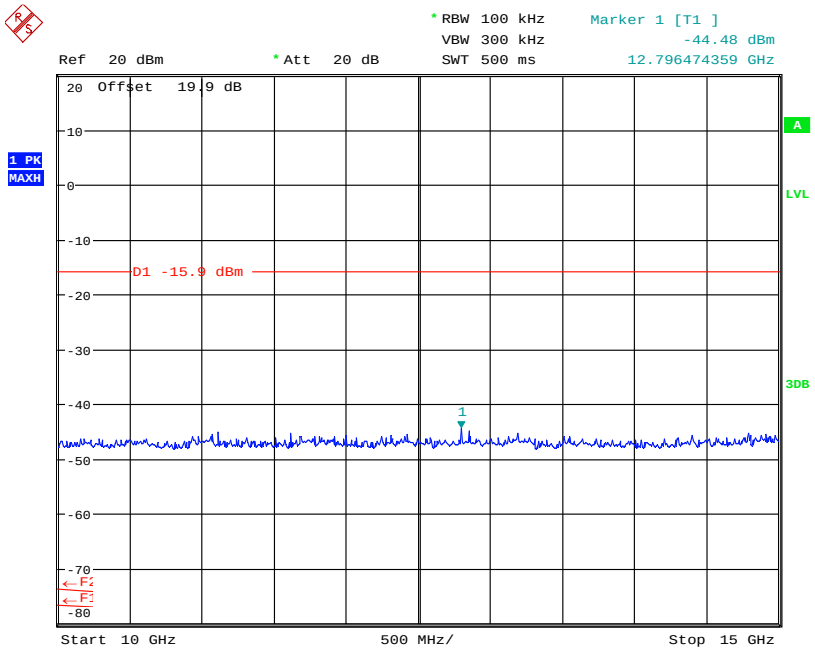
Date: 20.JUN.2012 15:09:19

Conducted Spurious emissions 1 GHz to 5 GHz – 2412MHz



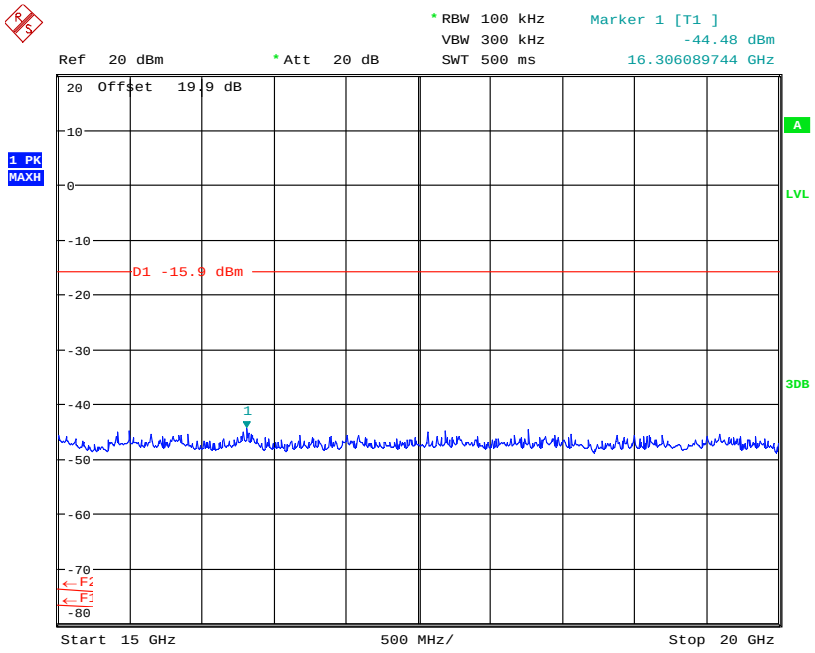
Date: 20.JUN.2012 15:12:01

Conducted Spurious emissions 5 GHz to 10 GHz – 2412MHz



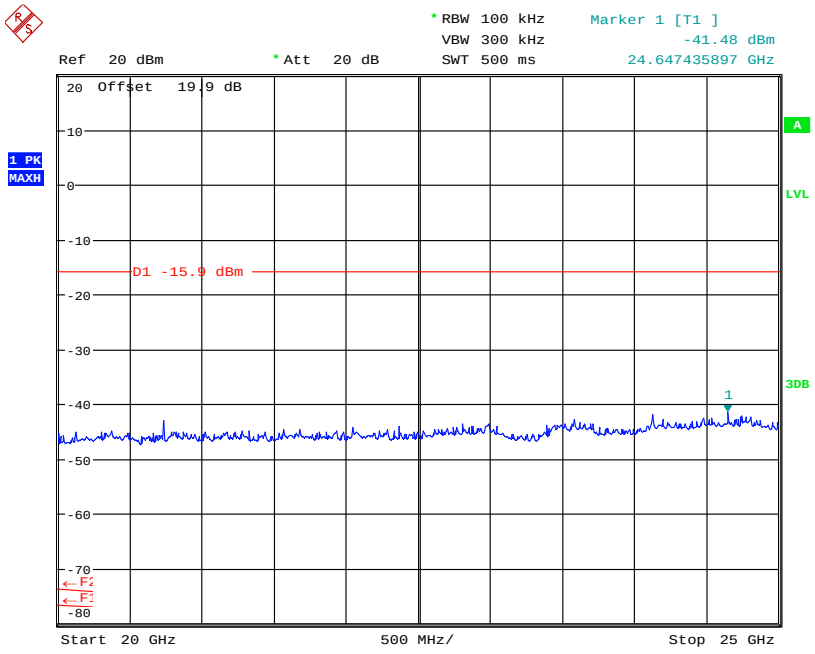
Date: 20.JUN.2012 15:14:12

Conducted Spurious emissions 10 GHz to 1 G5Hz – 2412MHz

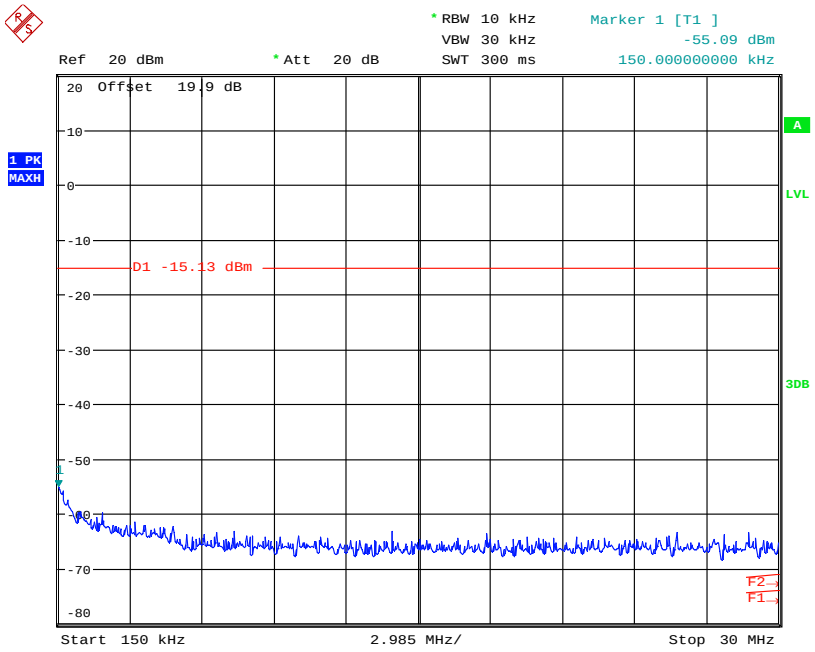


Date: 20.JUN.2012 15:14:29

Conducted Spurious emissions 15 GHz to 20 GHz – 2412MHz

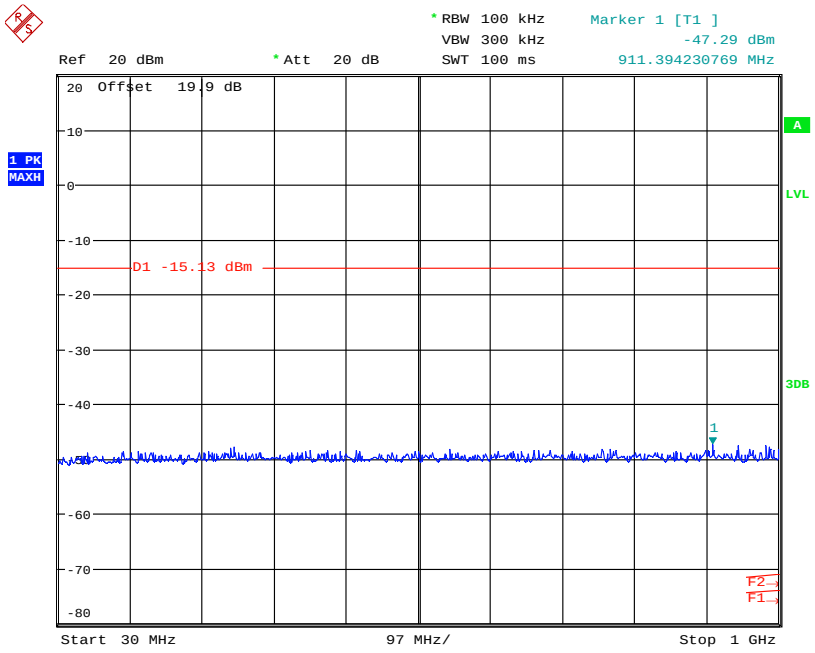


Conducted Spurious emissions 20 GHz to 25 GHz – 2412MHz



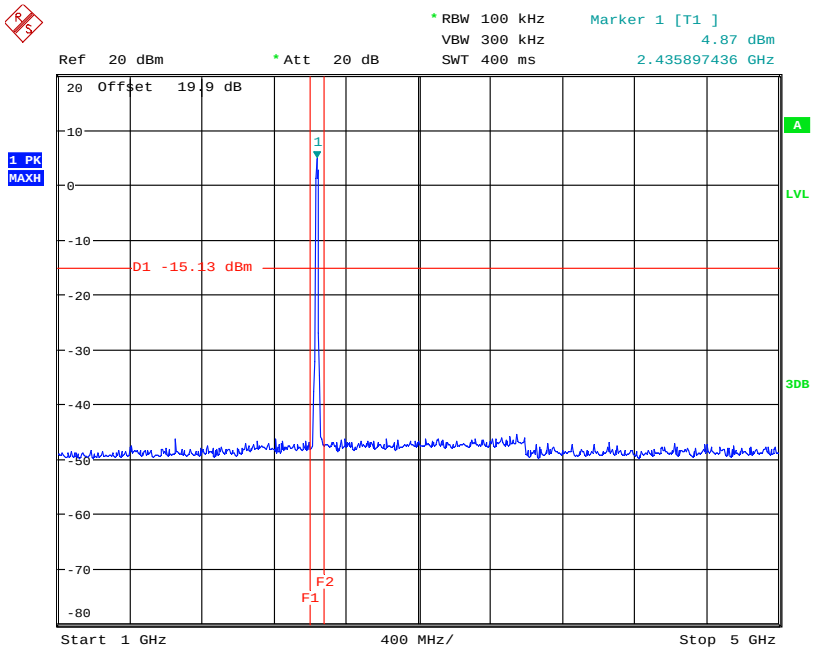
Date: 20.JUN.2012 15:03:17

Conducted Spurious emissions 100kHz to 30 MHz – 2437 MHz



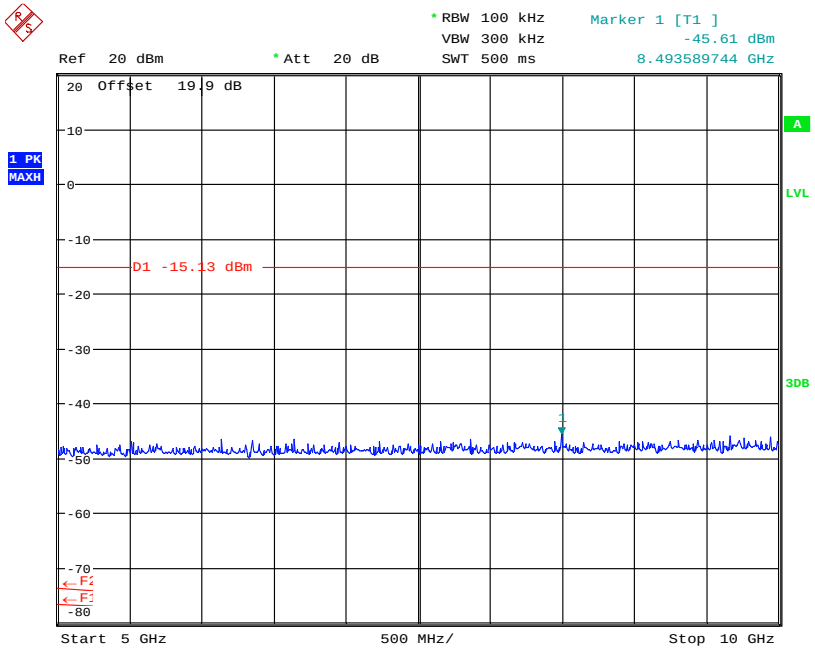
Date: 20.JUN.2012 15:03:52

Conducted Spurious emissions 30 MHz to 1 GHz – 2437 MHz



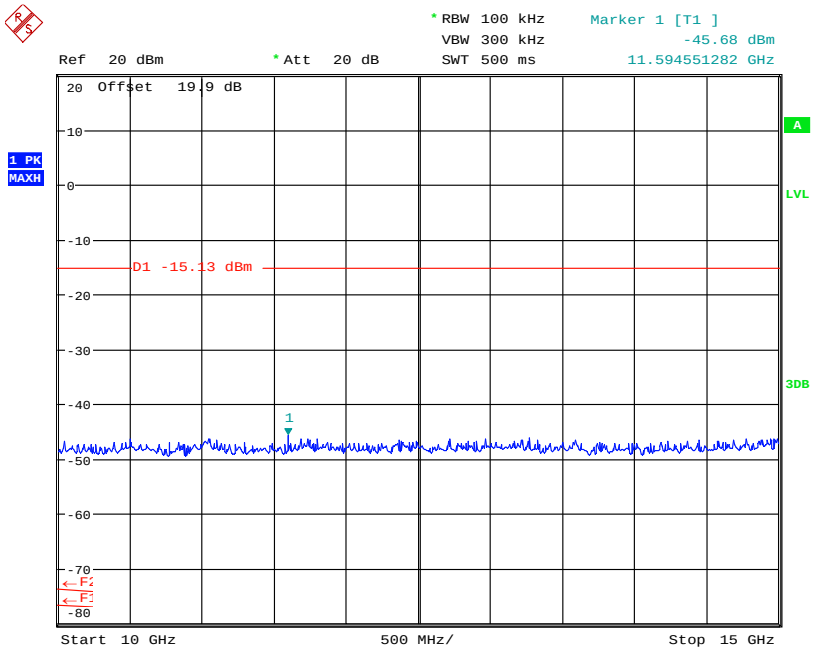
Date: 20.JUN.2012 15:00:33

Conducted Spurious emissions 1 GHz to 5 GHz – 2437 MHz



Date: 20.JUN.2012 15:01:13

Conducted Spurious emissions 5 GHz to 10 GHz – 2437 MHz



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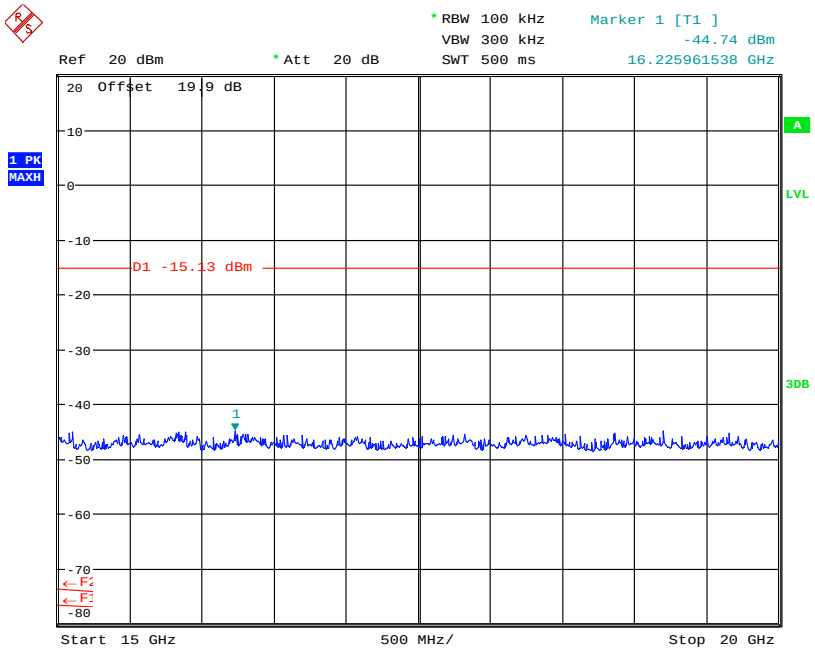
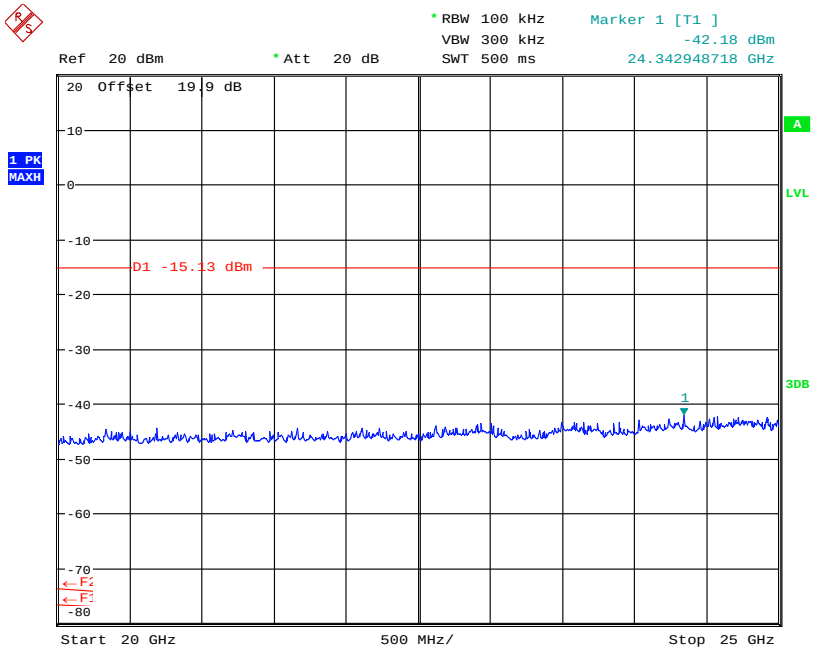
Conducted Spurious emissions 10 GHz to 15GHz – 2437 MHz

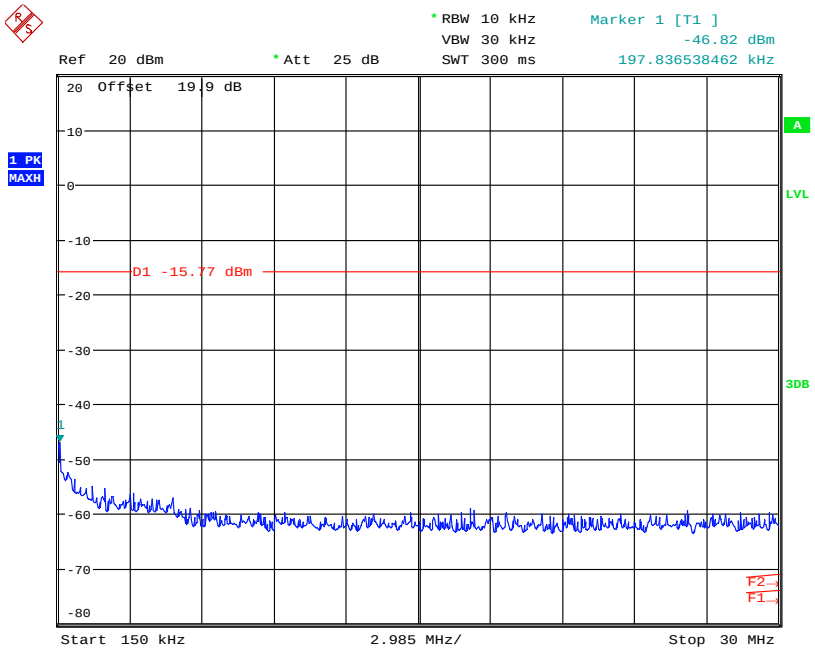


Date: 20.JUN.2012 15:01:54

Conducted Spurious emissions 15 GHz to 20GHz – 2437 MHz

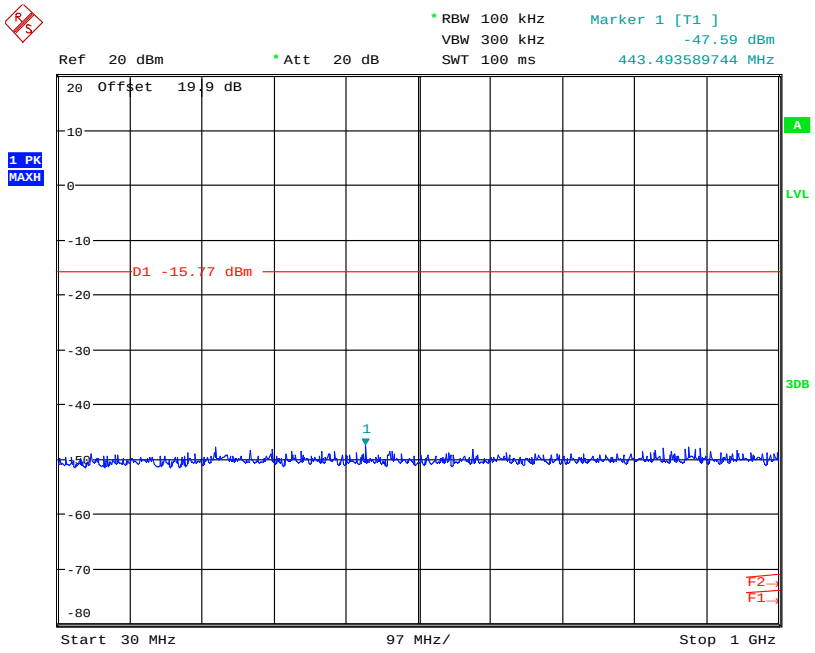


Conducted Spurious emissions 20 GHz to 25GHz – 2437 MHz



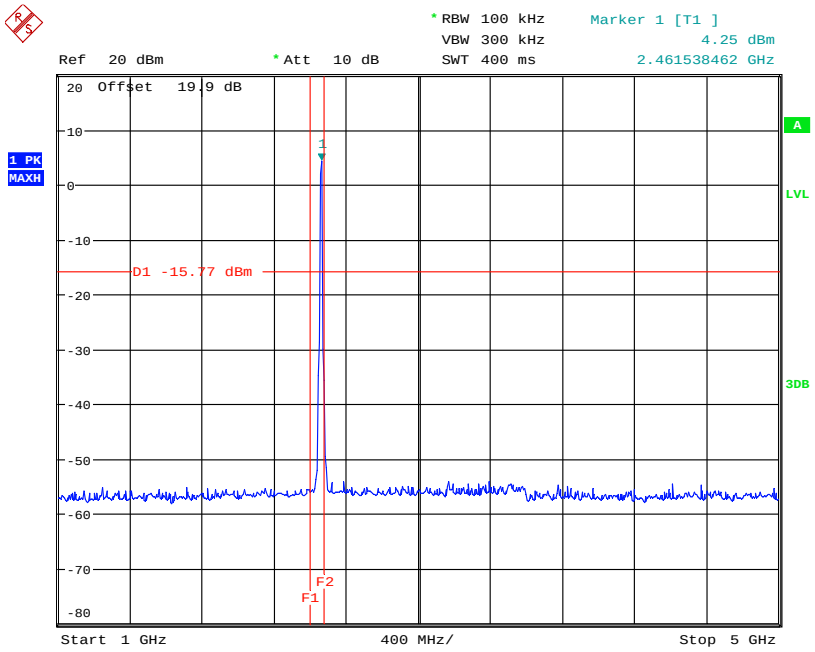
Date: 20.JUN.2012 14:58:00

Conducted Spurious emissions 100 kHz to 30 MHz – 2462MHz



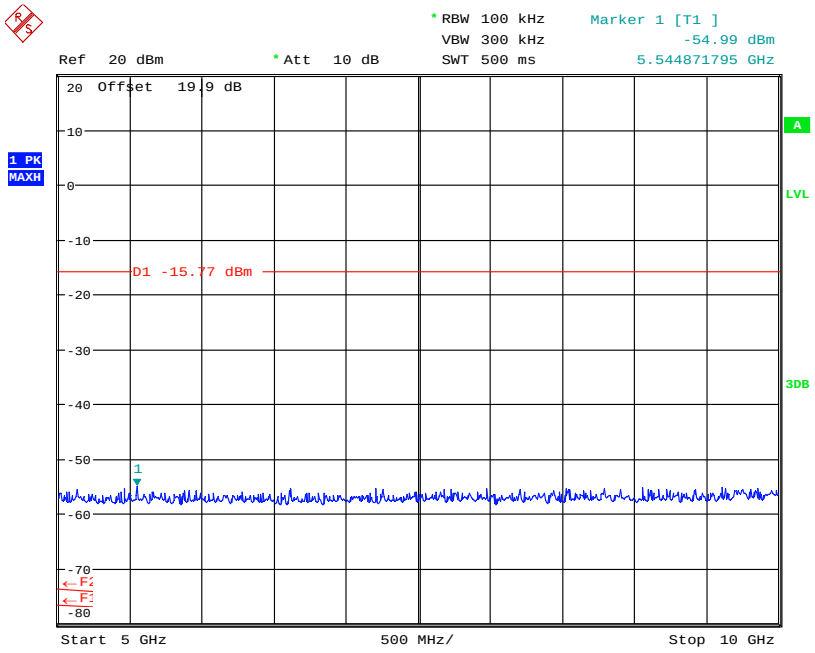
Date: 20.JUN.2012 14:58:23

Conducted Spurious emissions 30 MHz to 1 GHz – 2462MHz



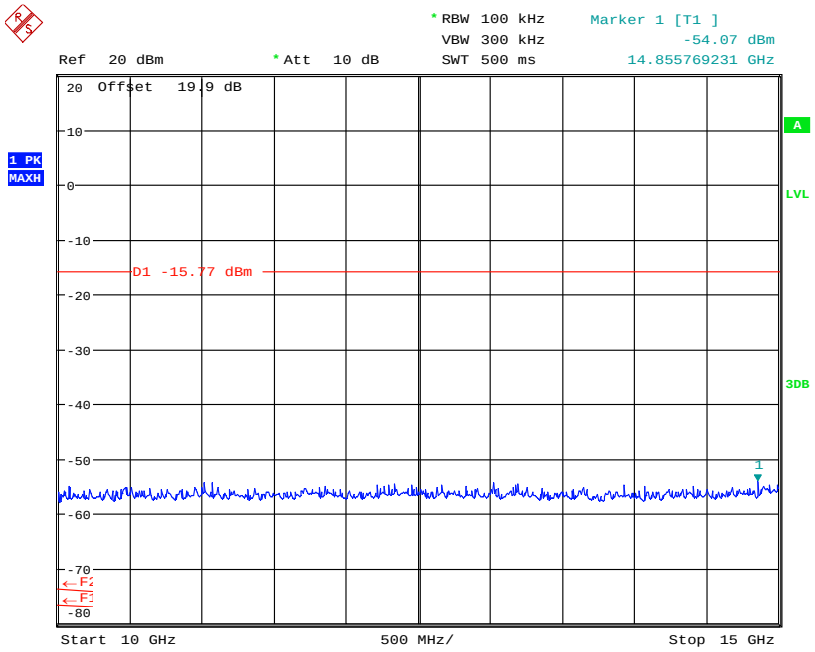
Date: 20.JUN.2012 14:55:56

Conducted Spurious emissions 1 GHz to 5 GHz – 2462MHz



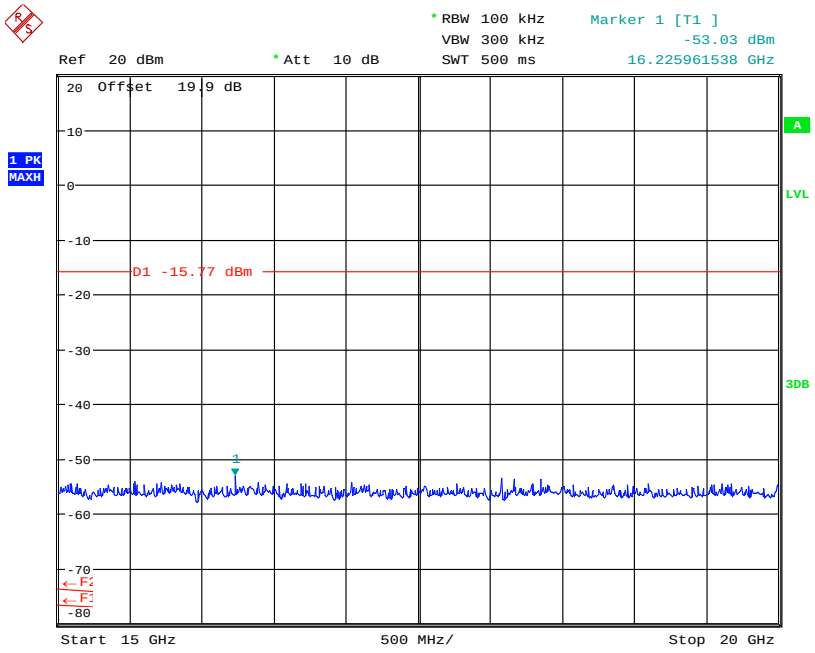
Date: 20.JUN.2012 14:56:12

Conducted Spurious emissions 5 GHz to 10 GHz– 2462MHz



Date: 20.JUN.2012 14:56:31

Conducted Spurious emissions 10 GHz to 15 GHz– 2462MHz



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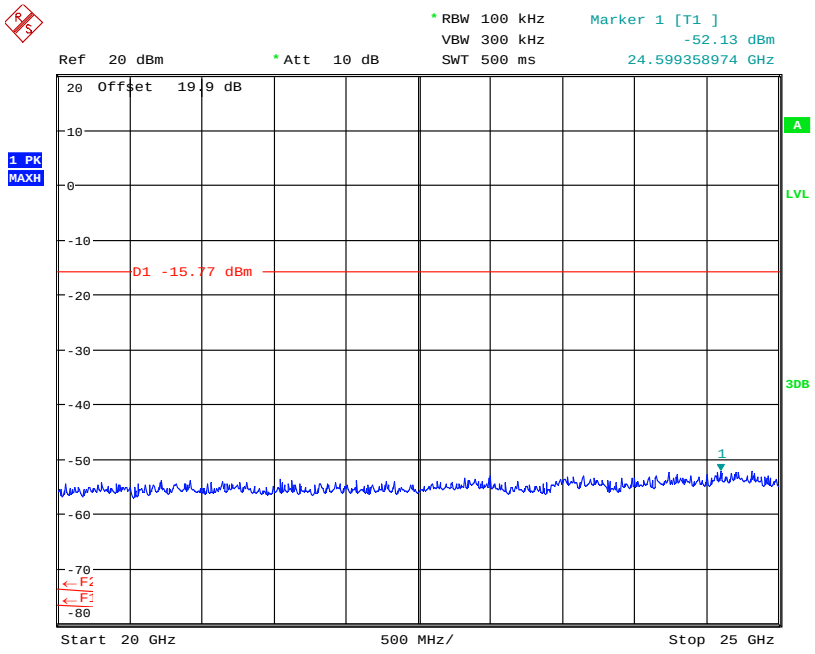
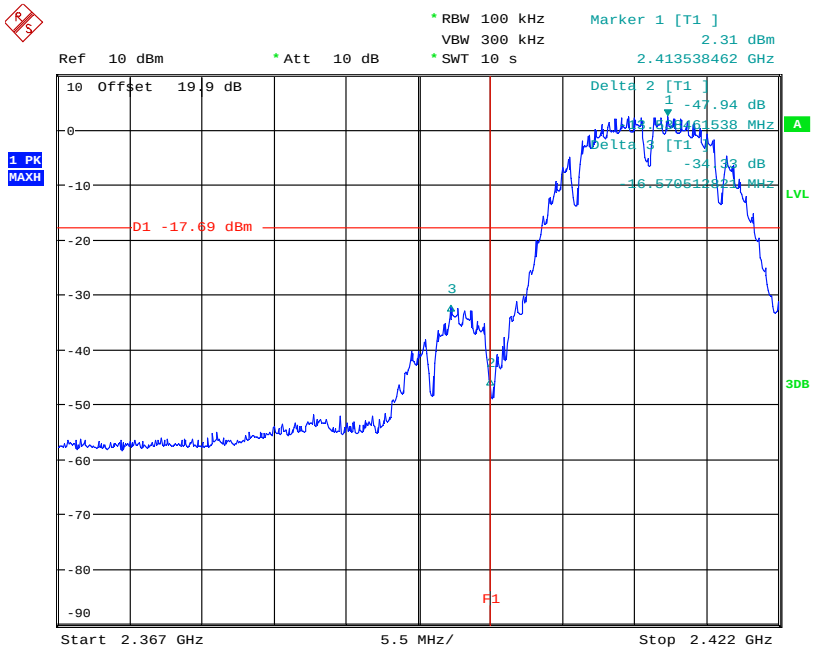
Conducted Spurious emissions 15 GHz to 20 GHz– 2462MHz



Date: 20.JUN.2012 14:57:01

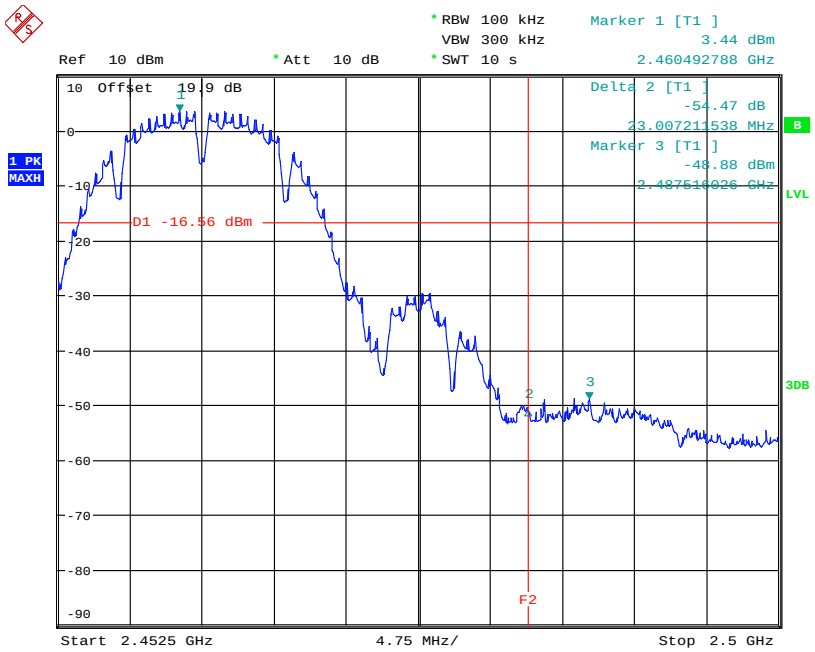
Conducted Spurious emissions 20 GHz to 25 GHz– 2462MHz

Conducted Bandedge Compliance 802.11b 1Mb



Date: 21.JUN.2012 13:10:54

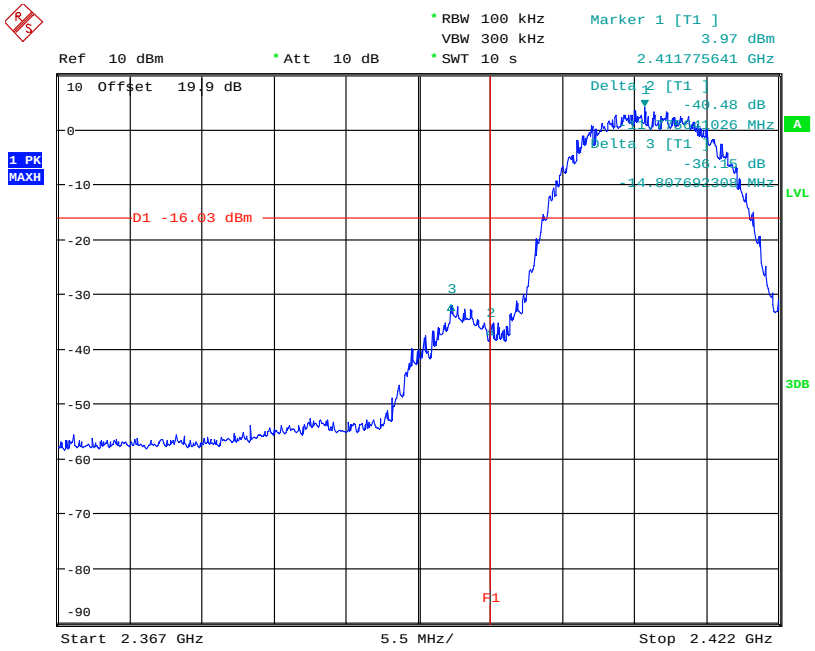
Lower Bandedge



Date: 21.JUN.2012 13:10:05

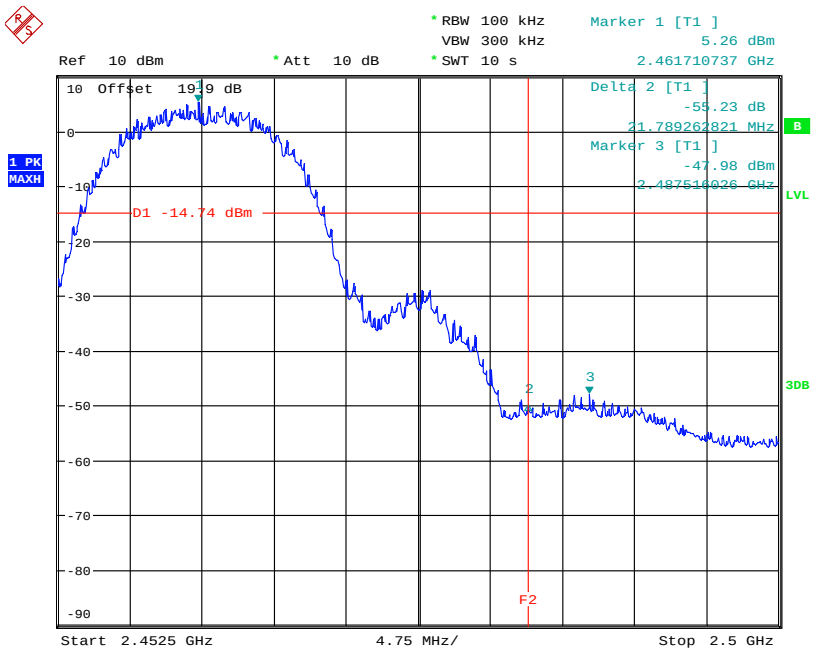
Upper Bandedge

Conducted Bandedge Compliance 802.11b 11Mb



Date: 21.JUN.2012 13:11:39

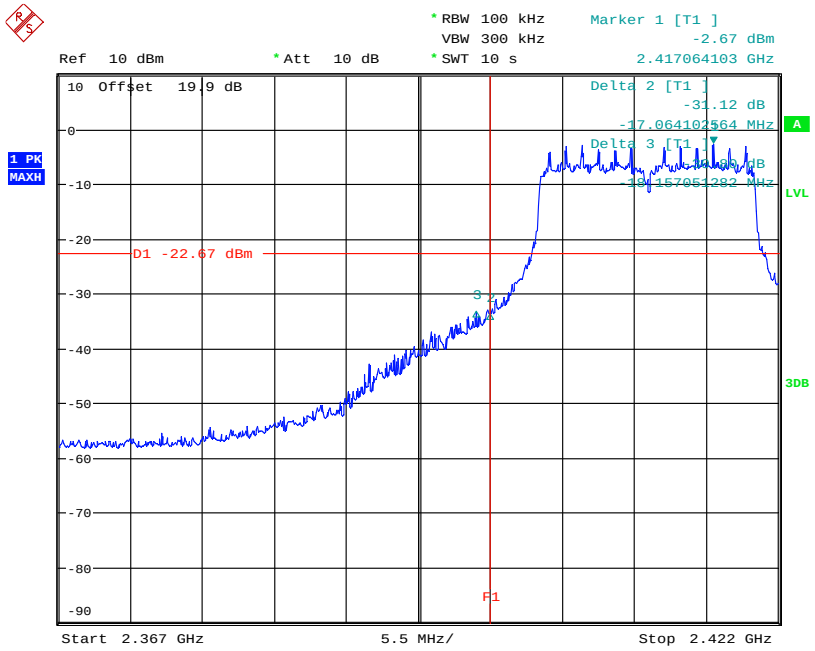
Lower Bandedge



Date: 21.JUN.2012 13:09:25

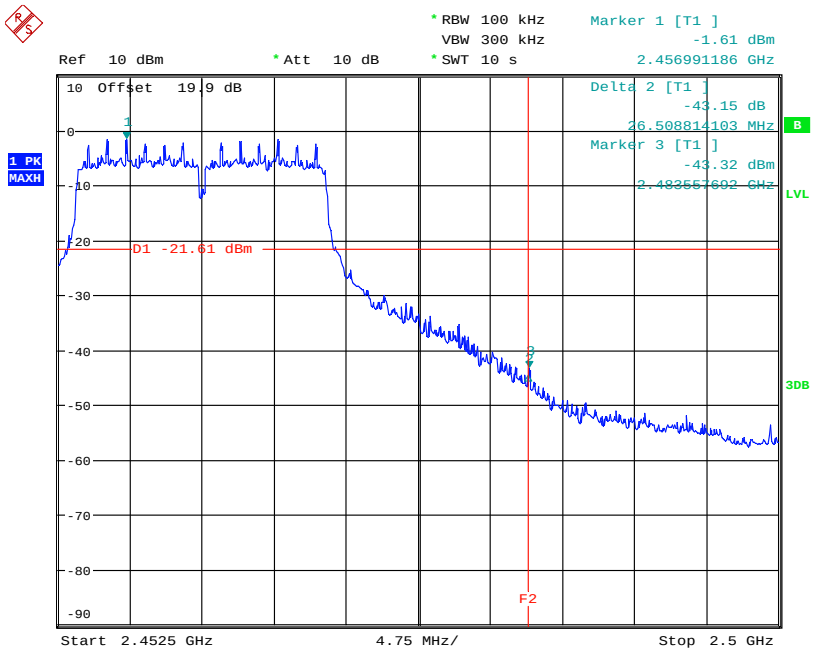
Upper Bandedge

Conducted Bandedge Compliance 802.11g 6Mb



Date: 21.JUN.2012 13:07:19

Lower Bandedge



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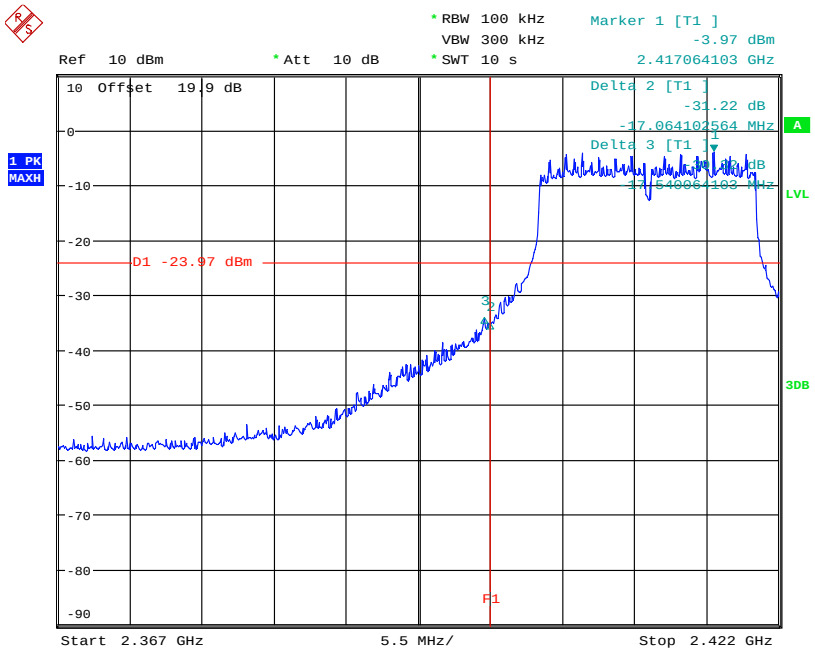
Upper Bandedge

Conducted Bandedge Compliance 802.11g 54Mb



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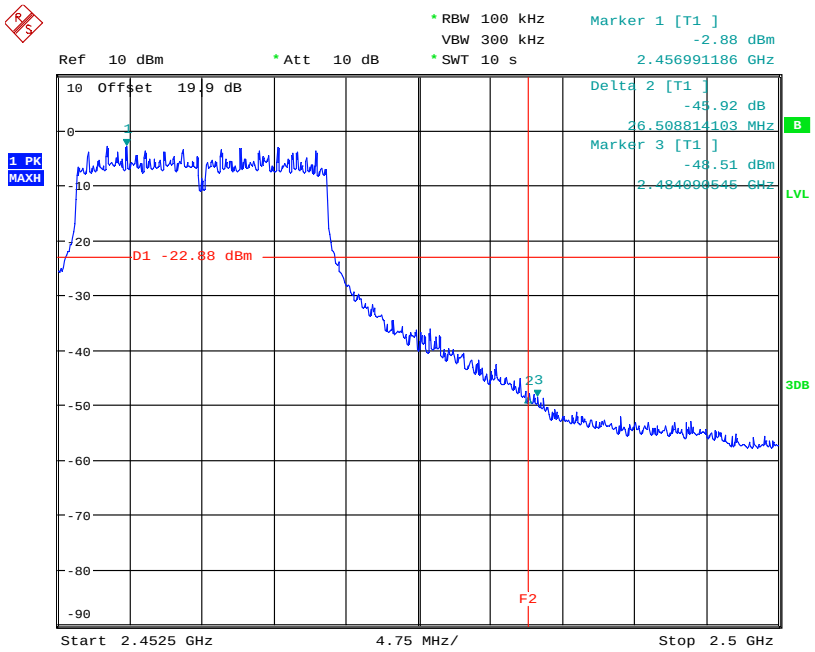
Lower Bandedge



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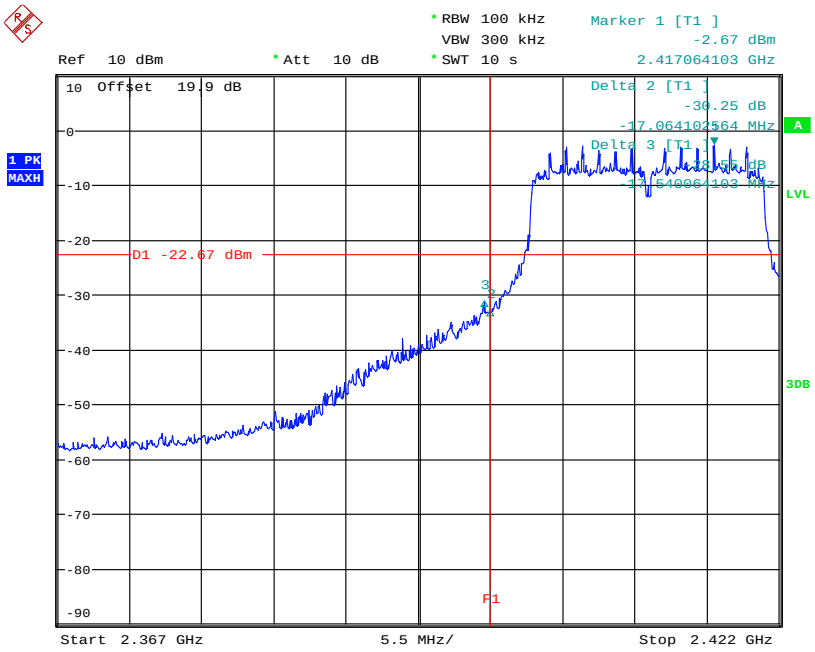
Upper Bandedge

Conducted Bandedge Compliance 802.11n HT20 MCS0 6.5Mb



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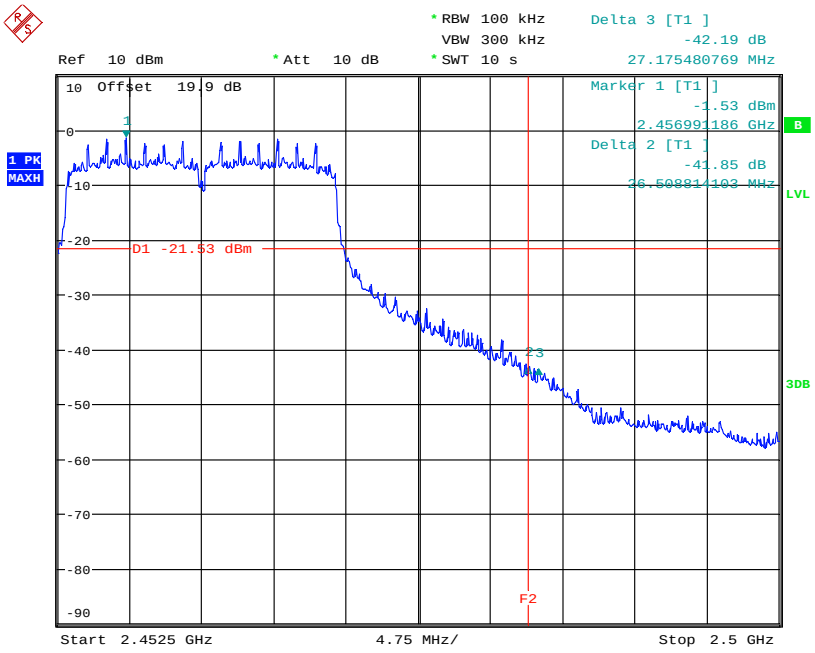
Lower Bandedge



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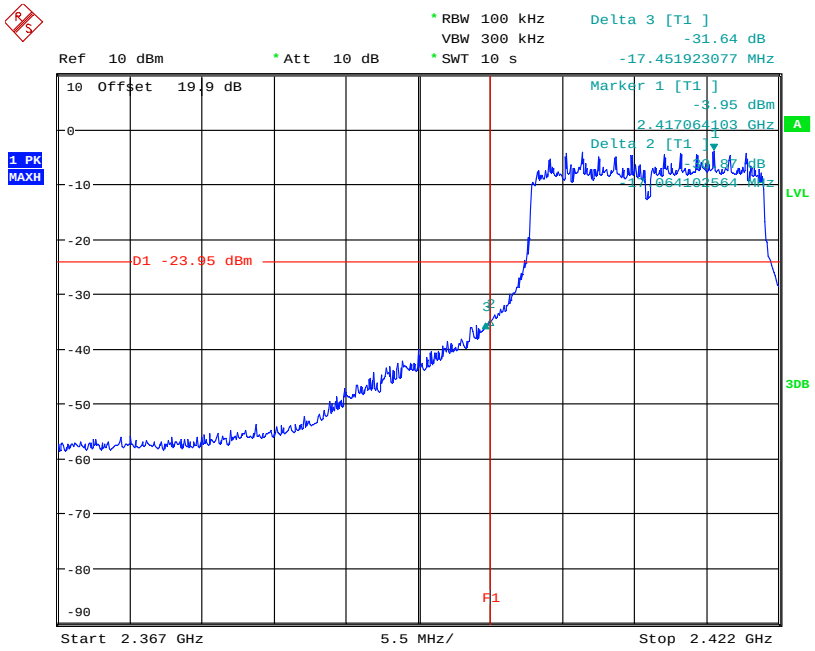
Upper Bandedge

Conducted Bandedge Compliance 802.11n HT20 MCS7 65Mb



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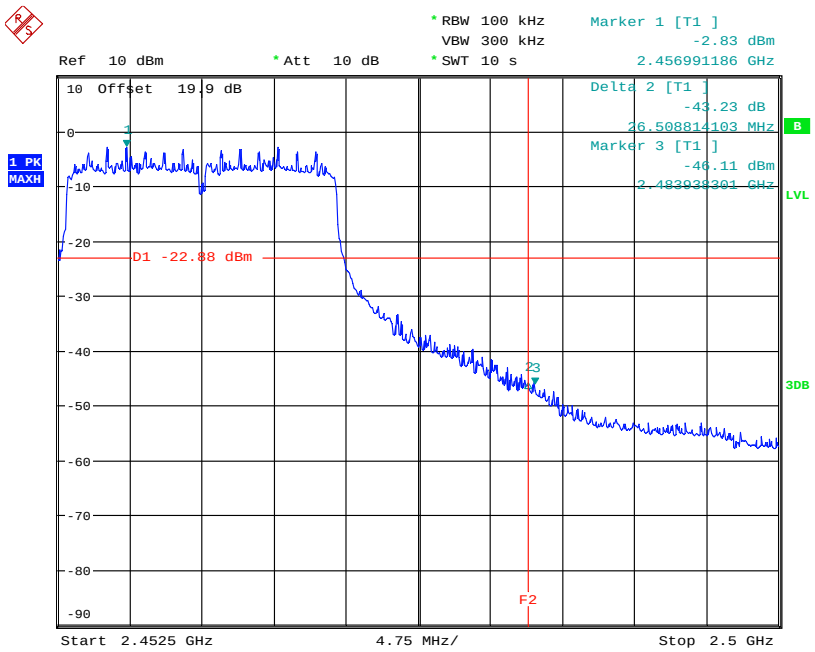
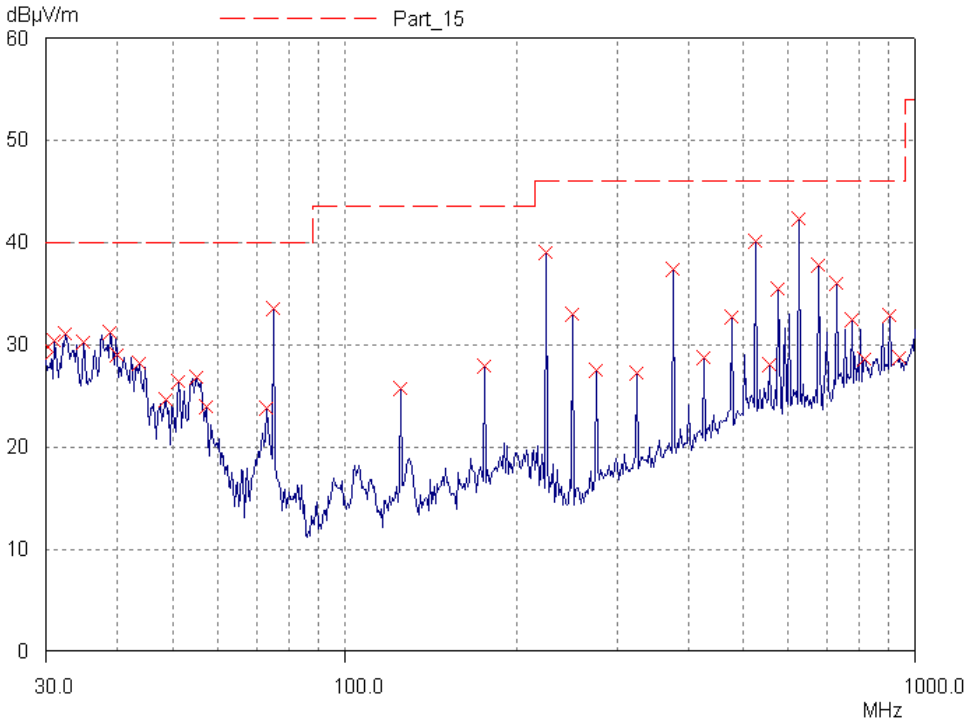
Lower Bandedge

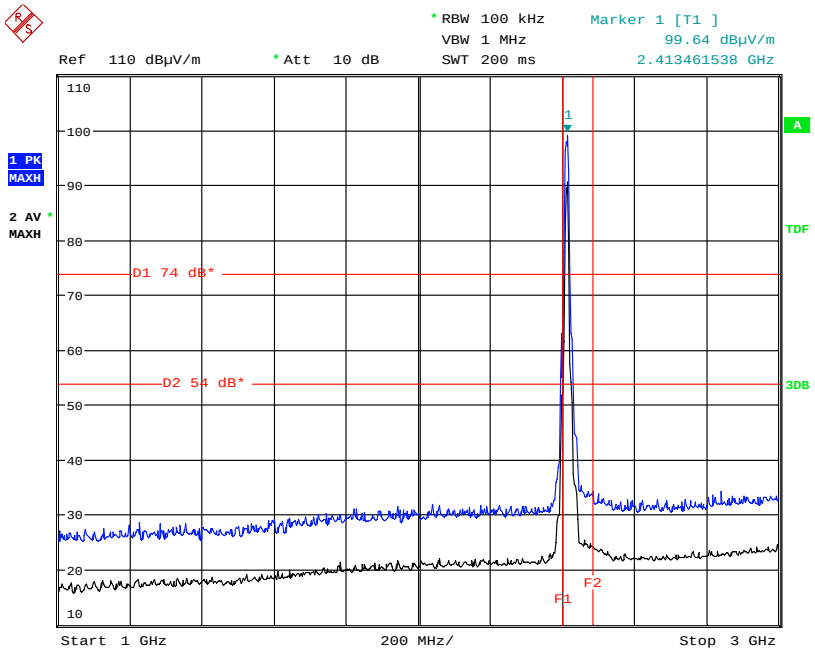


Date: 21.JUN.2012 13:04:29

Upper Bandedge

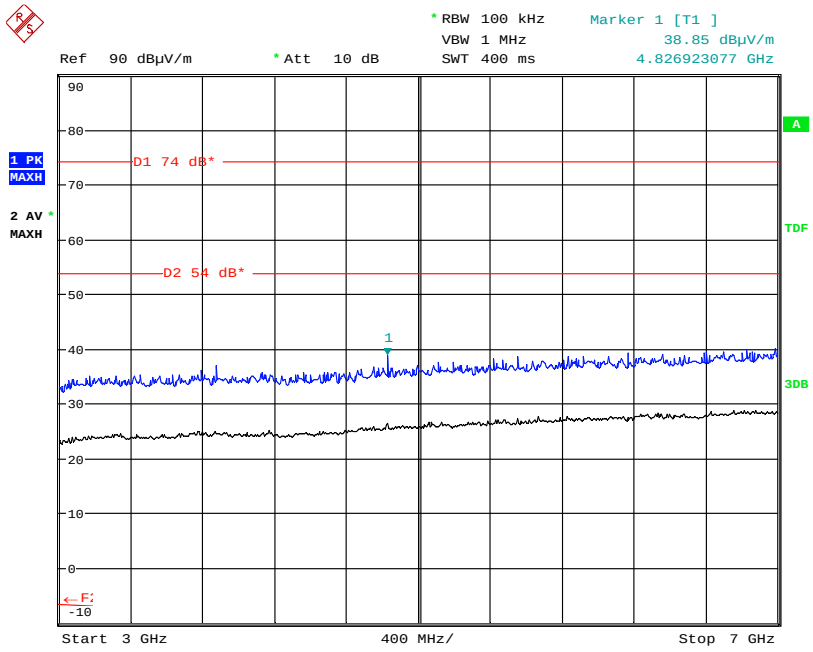


Radiated Spurious emissions 30 MHz to 1 GHz – 2412MHz



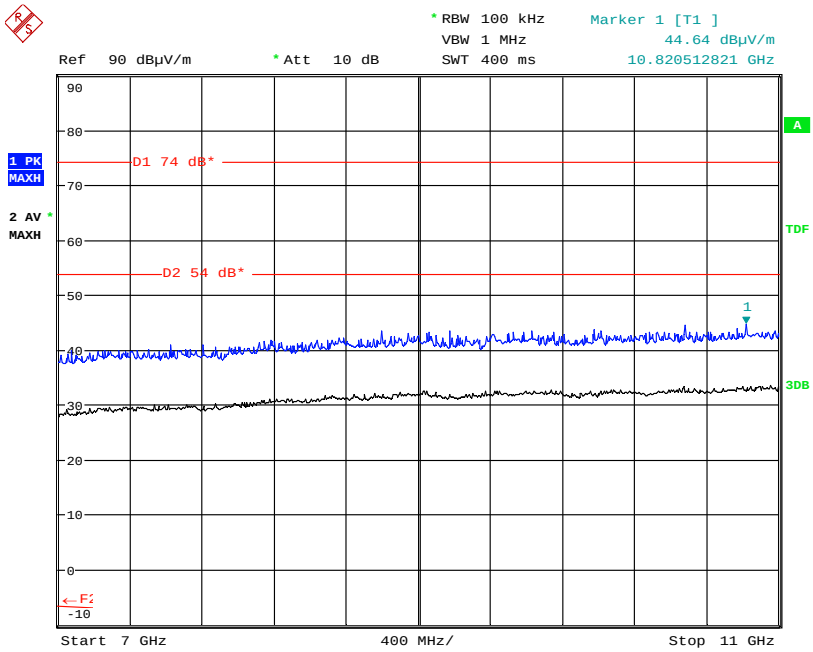
Date: 8.JUN.2012 11:50:30

Radiated Spurious emissions 1 GHz to 3 GHz – 2412MHz



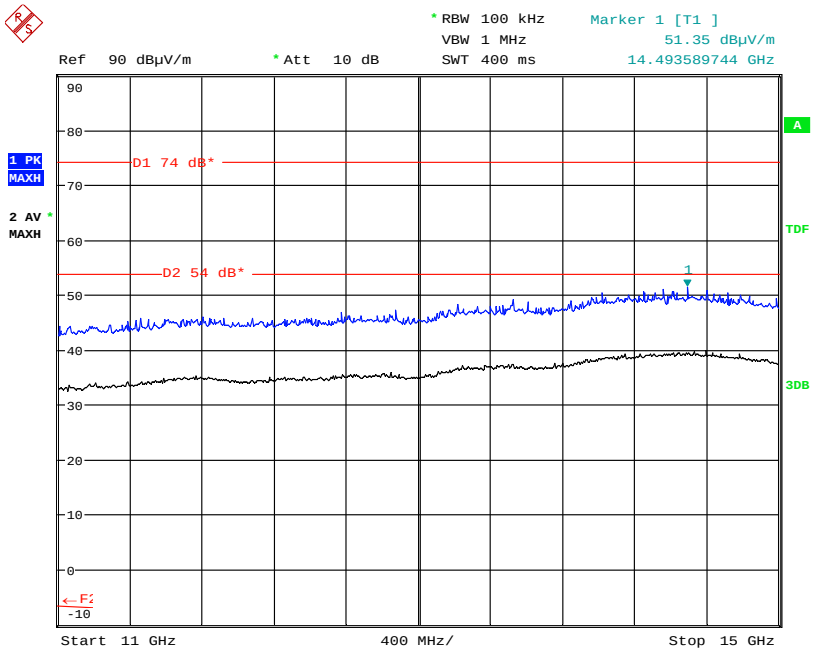
Date: 7.JUN.2012 16:30:06

Radiated Spurious emissions 3 GHz to 7 GHz – 2412MHz



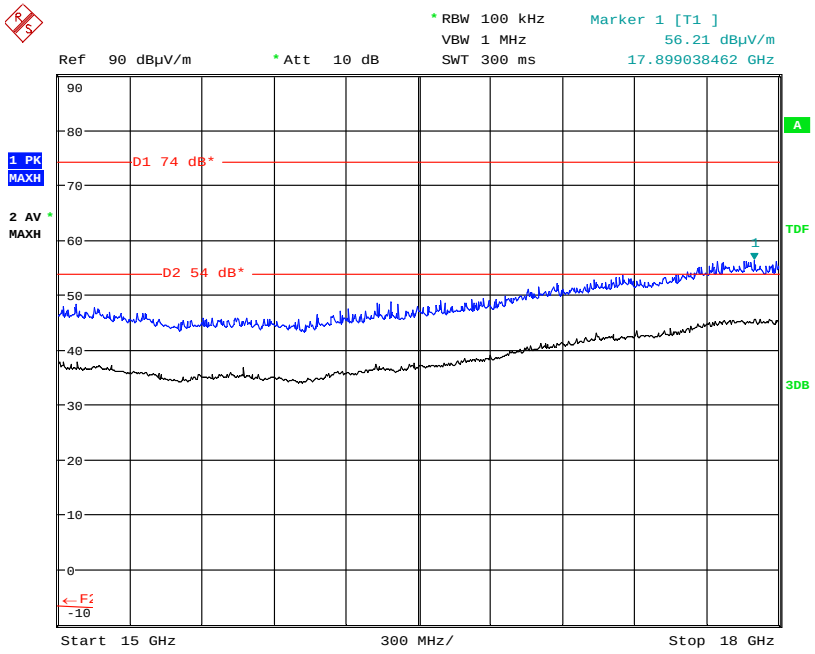
Date: 7.JUN.2012 16:30:54

Radiated Spurious emissions 7 GHz to 11 GHz – 2412MHz



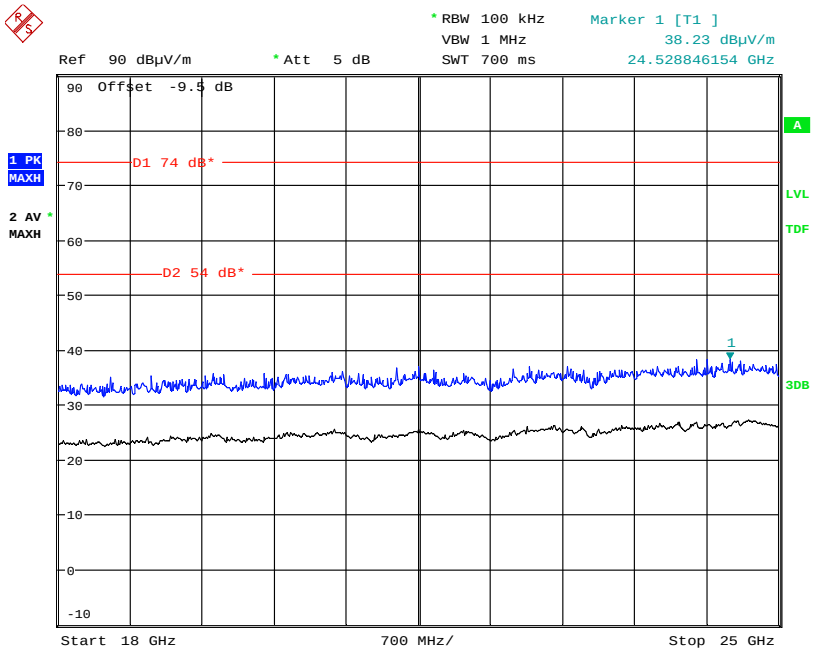
Date: 7.JUN.2012 16:33:19

Radiated Spurious emissions 11 GHz to 15 GHz – 2412MHz



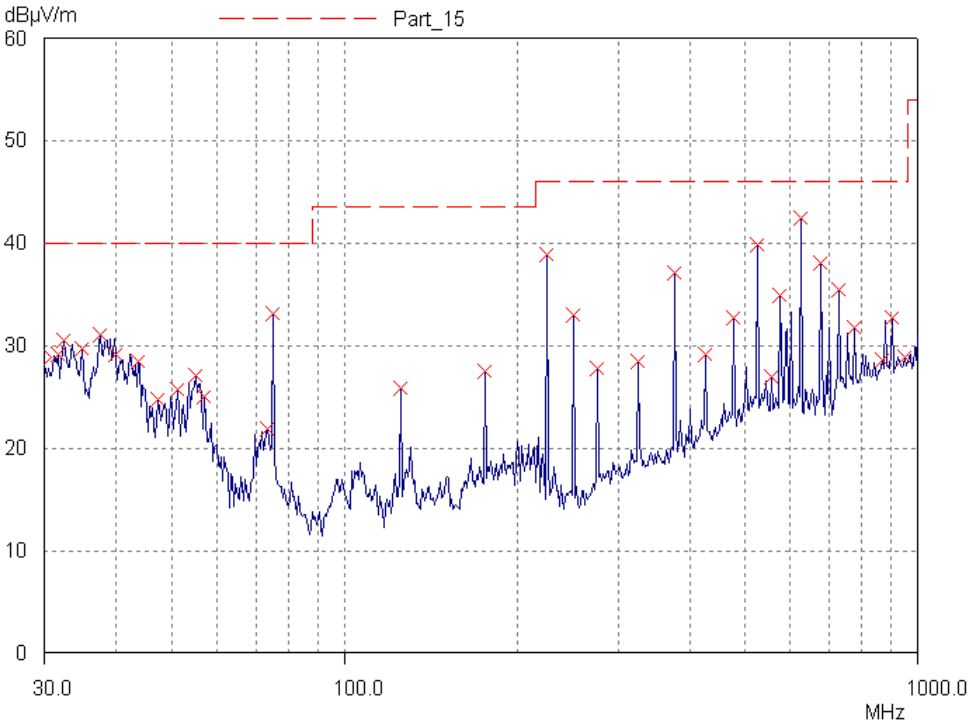
Date: 7.JUN.2012 16:33:55

Radiated Spurious emissions 15 GHz to 18 GHz – 2412MHz

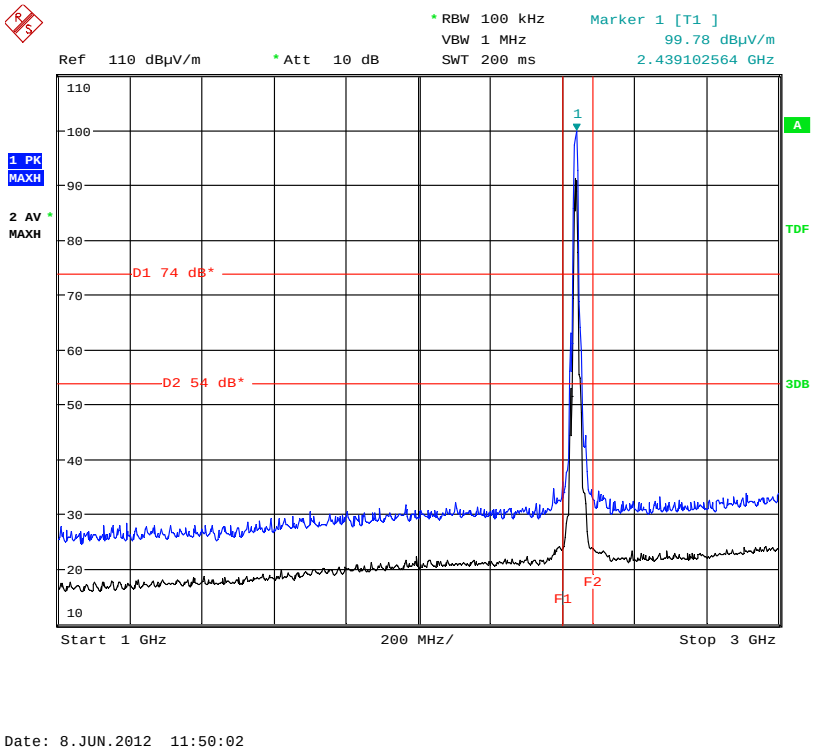


Date: 8.JUN.2012 12:50:36

Radiated Spurious emissions 18 GHz to 25 GHz – 2412MHz

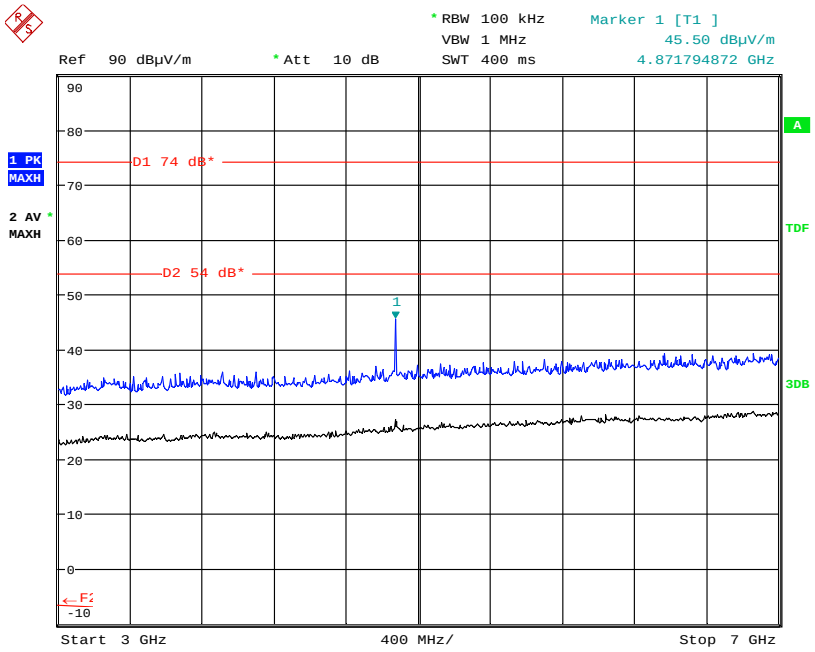


Radiated Spurious emissions 30 MHz to 1 GHz – 2437MHz



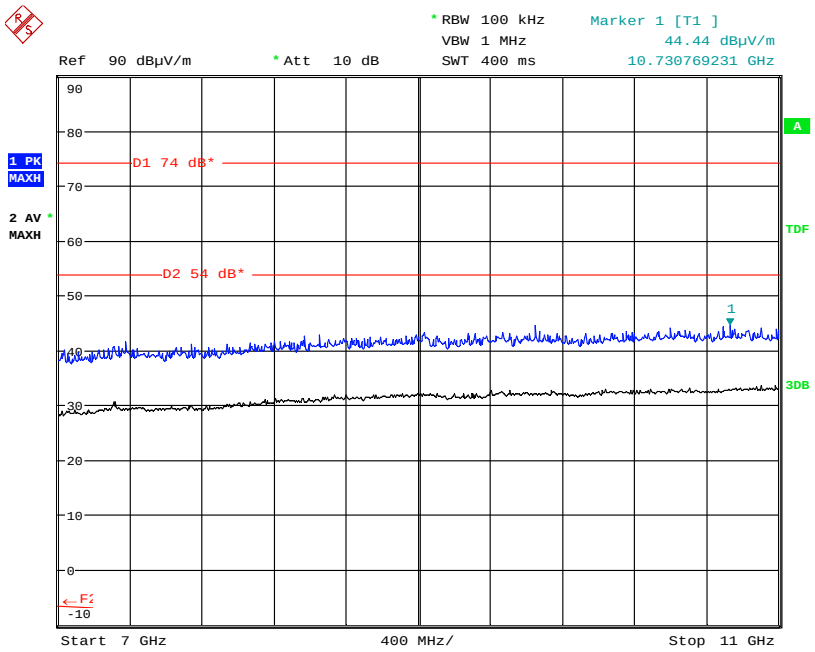
Date: 8.JUN.2012 11:50:02

Radiated Spurious emissions 1 GHz to 3 GHz – 2437MHz



Date: 7.JUN.2012 16:49:04

Radiated Spurious emissions 3 GHz to 7 GHz – 2437MHz



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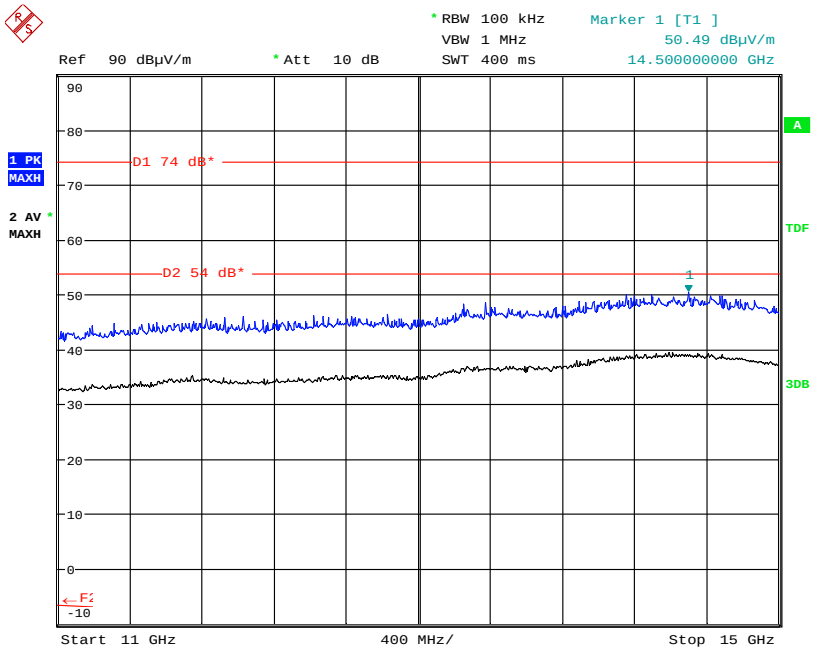
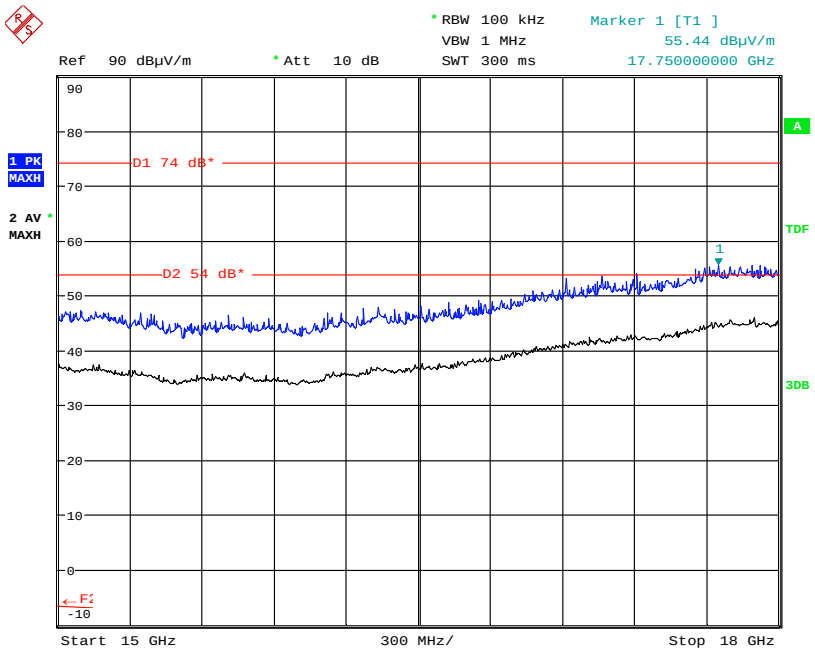
Radiated Spurious emissions 7 GHz to 11 GHz – 2437MHz



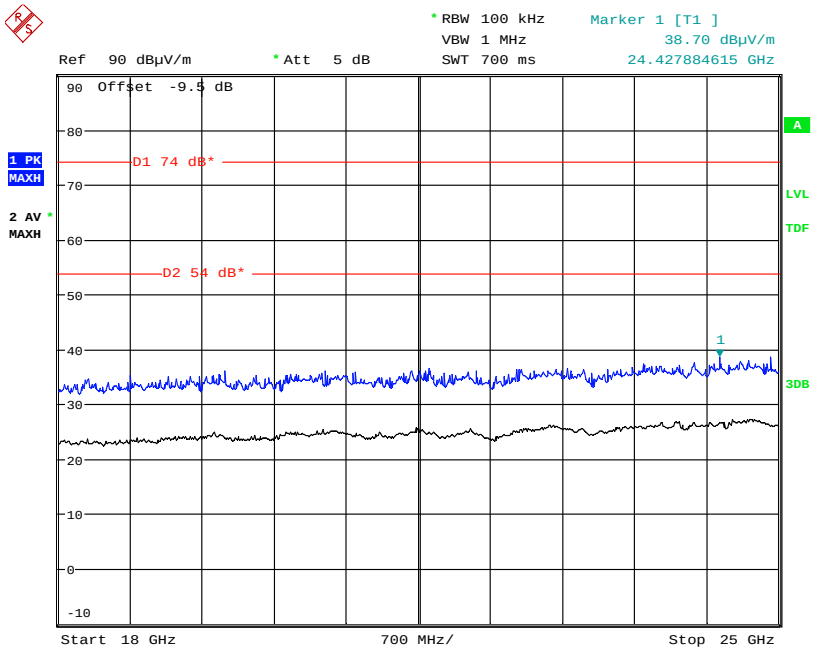
Date: 7.JUN.2012 16:47:34

Radiated Spurious emissions 11 GHz to 15 GHz – 2437MHz

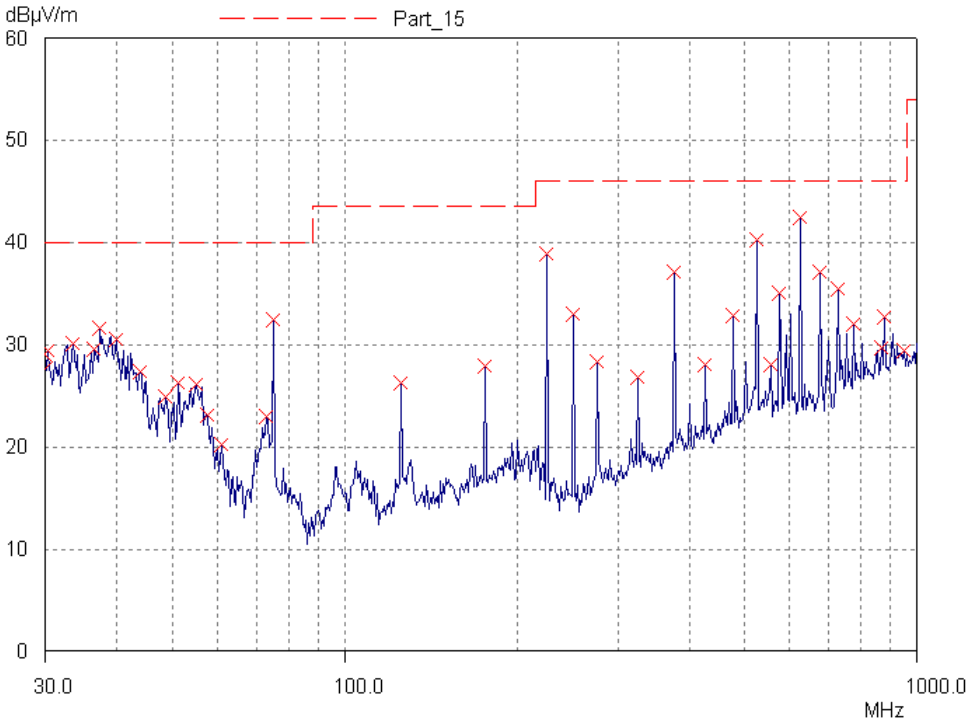


Date: 7.JUN.2012 16:46:52

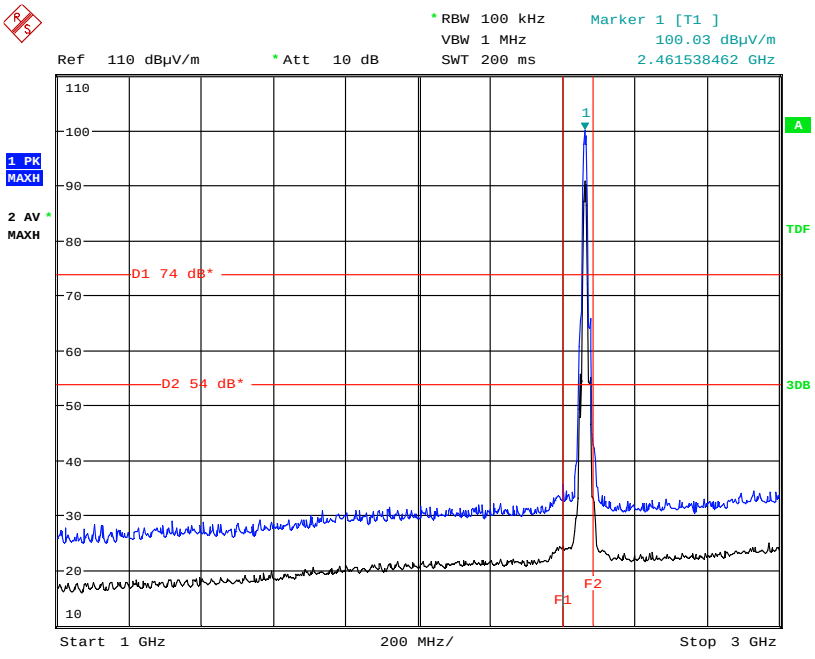
Radiated Spurious emissions 15 GHz to 18 GHz – 2437MHz



Radiated Spurious emissions 18 GHz to 25 GHz – 2437MHz

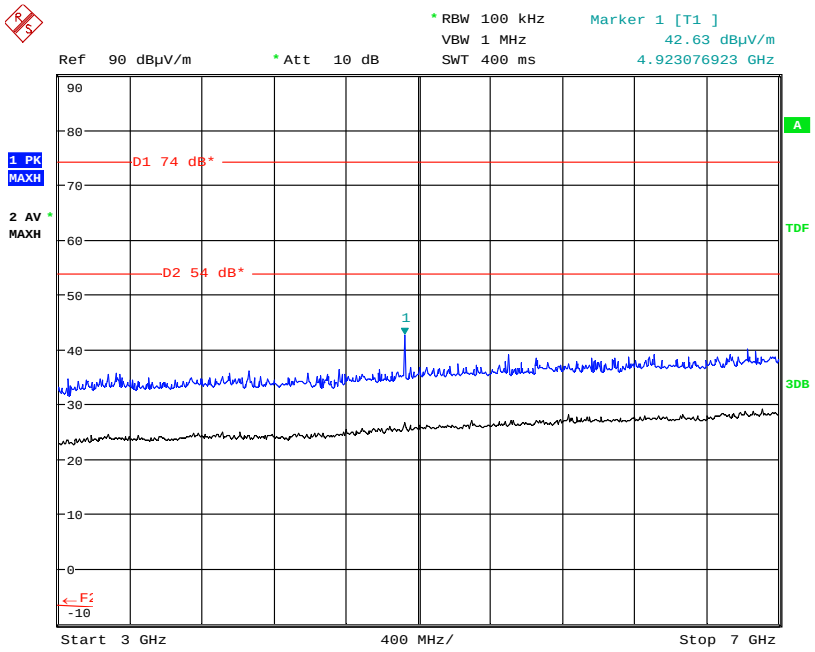


Radiated Spurious emissions 30 MHz to 1 GHz – 2462MHz



Date: 8.JUN.2012 11:48:44

Radiated Spurious emissions 1 GHz to 3 GHz – 2462MHz



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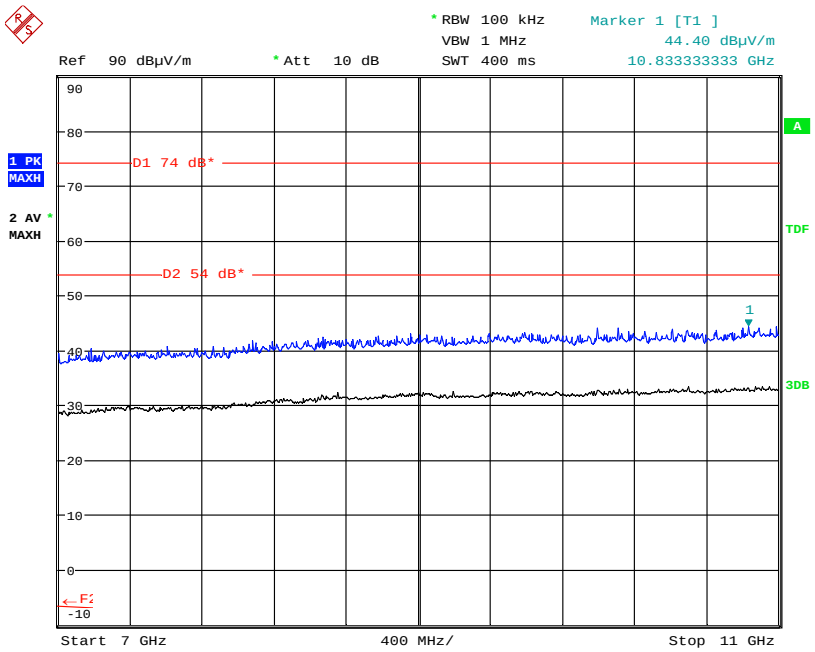
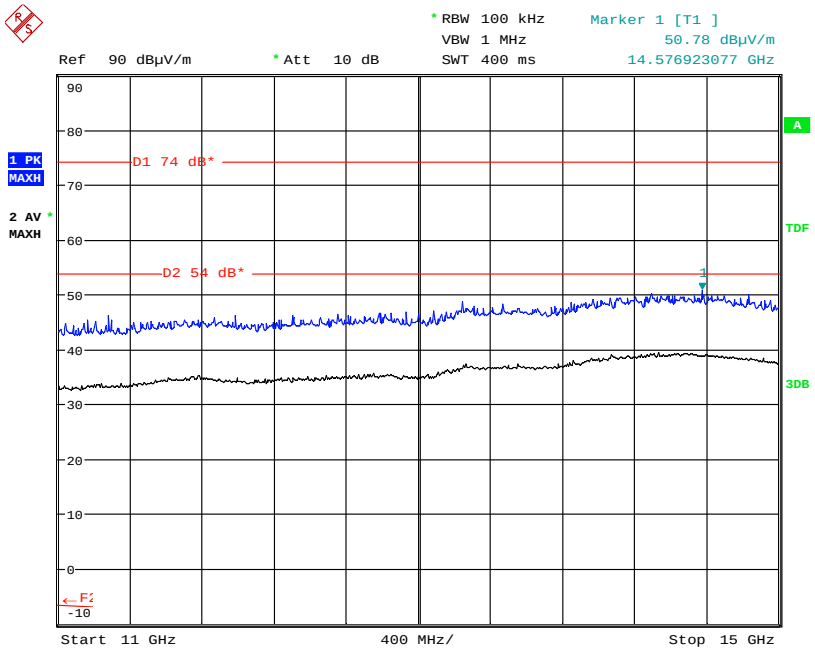
Radiated Spurious emissions 3 GHz to 7 GHz – 2462MHz



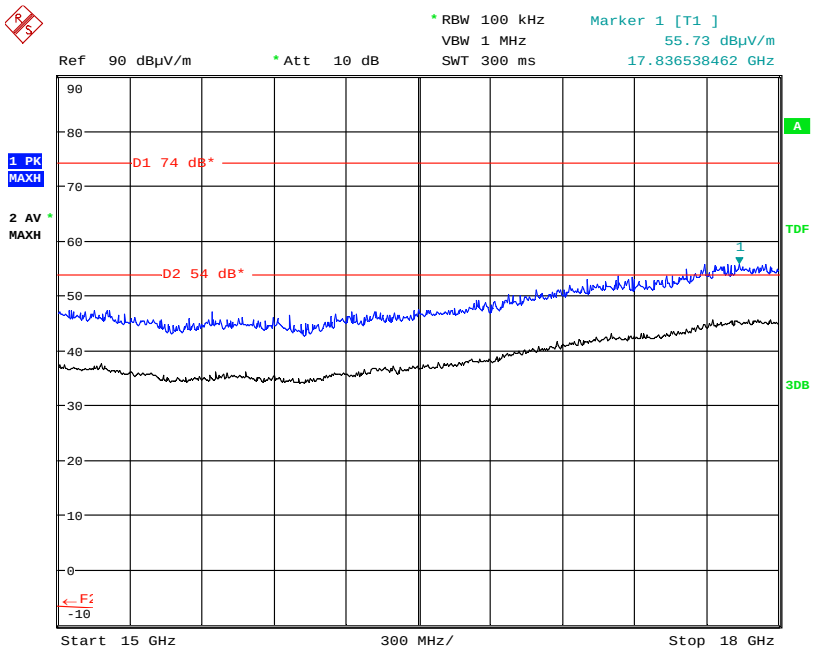
Date: 7.JUN.2012 16:50:13

Radiated Spurious emissions 7 GHz to 11 GHz – 2462MHz



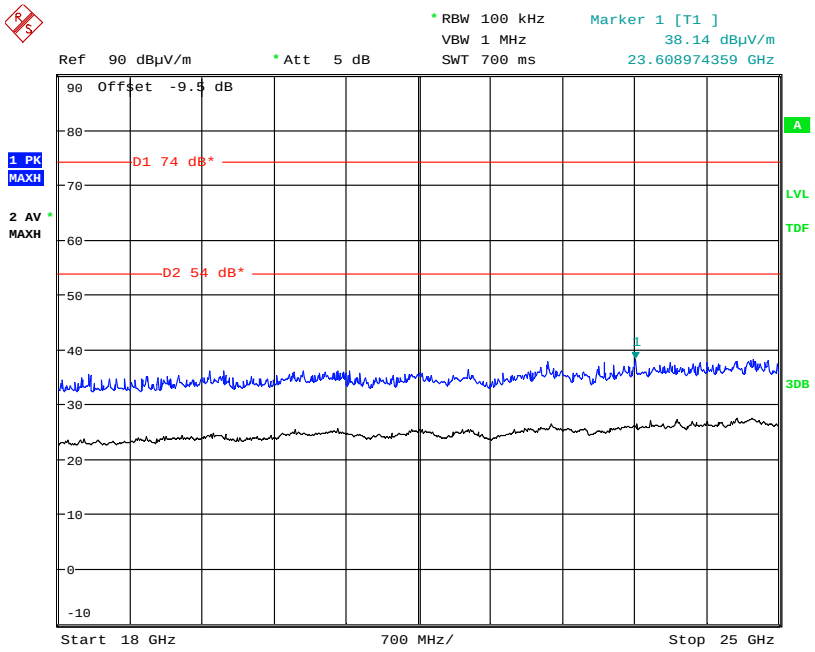
Date: 7.JUN.2012 16:51:24

Radiated Spurious emissions 11 GHz to 15 GHz – 2462MHz



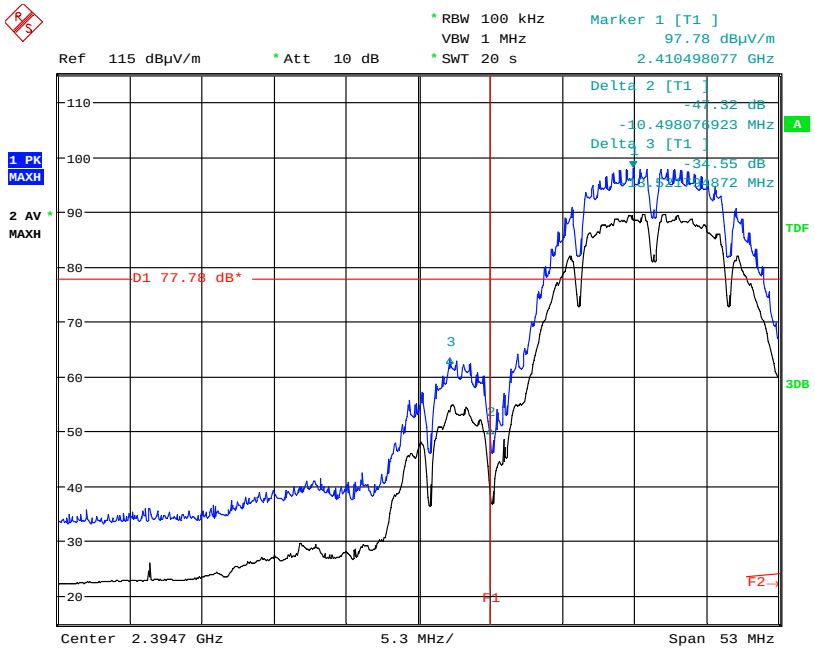
Date: 7.JUN.2012 16:52:17

Radiated Spurious emissions 15 GHz to 18 GHz – 2462MHz



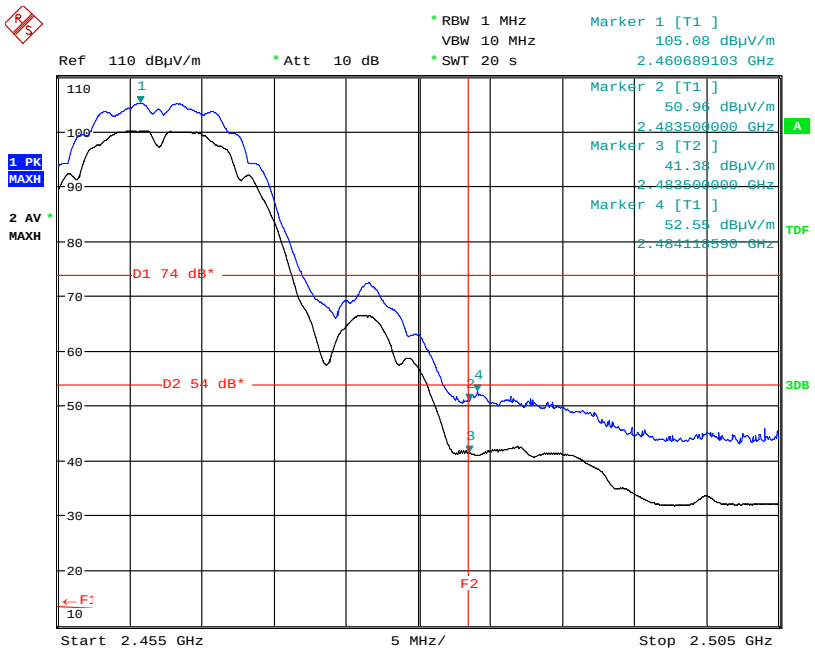
Radiated Spurious emissions 18 GHz to 25 GHz – 2462MHz

Radiated Bandedge Compliance 802.11b 1Mb



Date: 8.JUN.2012 12:34:58

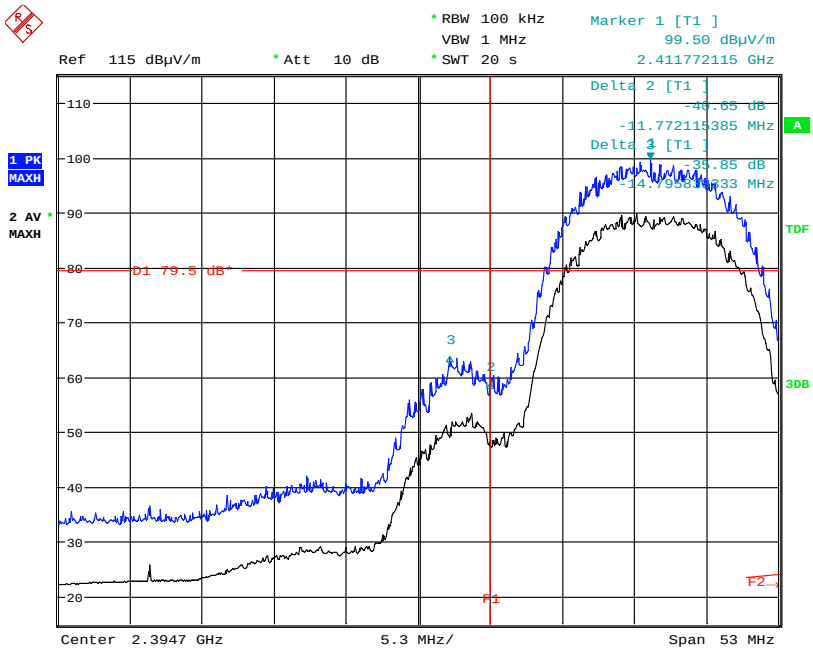
Lower Bandedge



Date: 8.JUN.2012 12:18:06

Upper Bandedge

Radiated Bandedge Compliance 802.11b 11Mb



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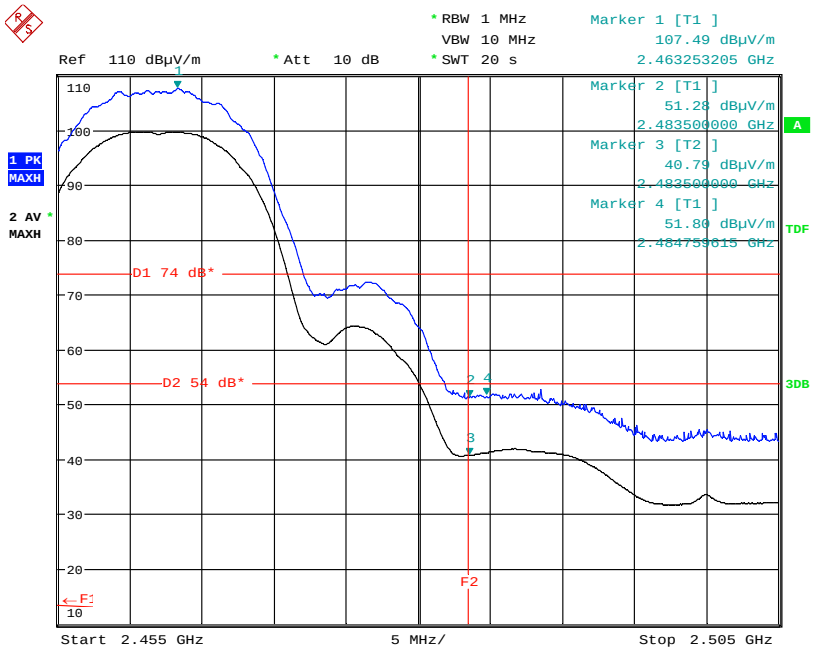
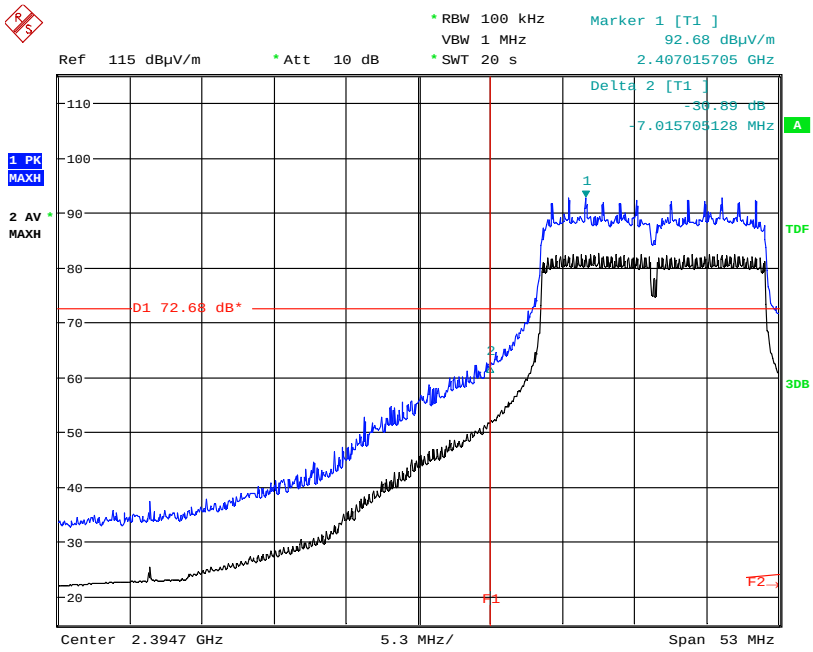
Lower Bandedge



Date: 8.JUN.2012 12:17:26

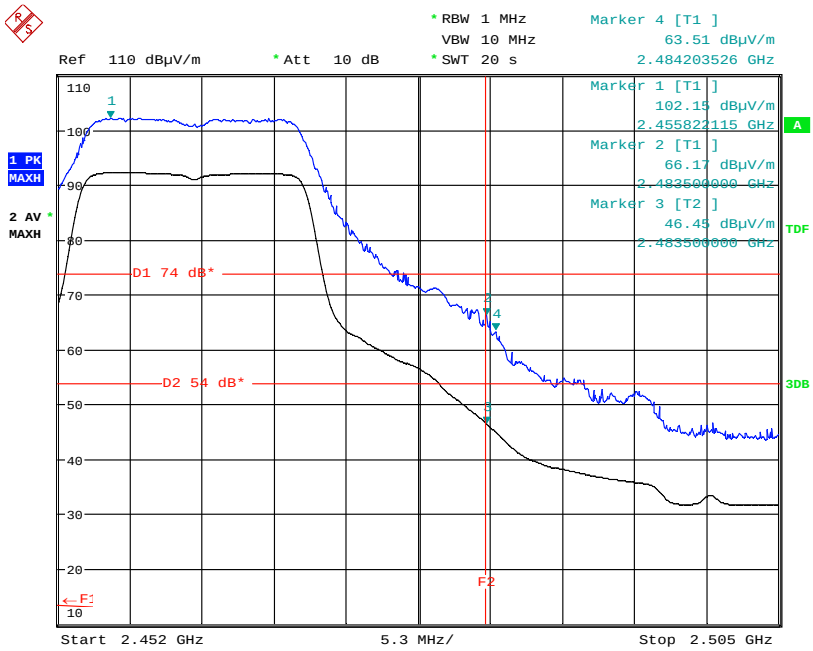
Upper Bandedge

Radiated Bandedge Compliance 802.11g 6Mb



Date: 8.JUN.2012 12:33:06

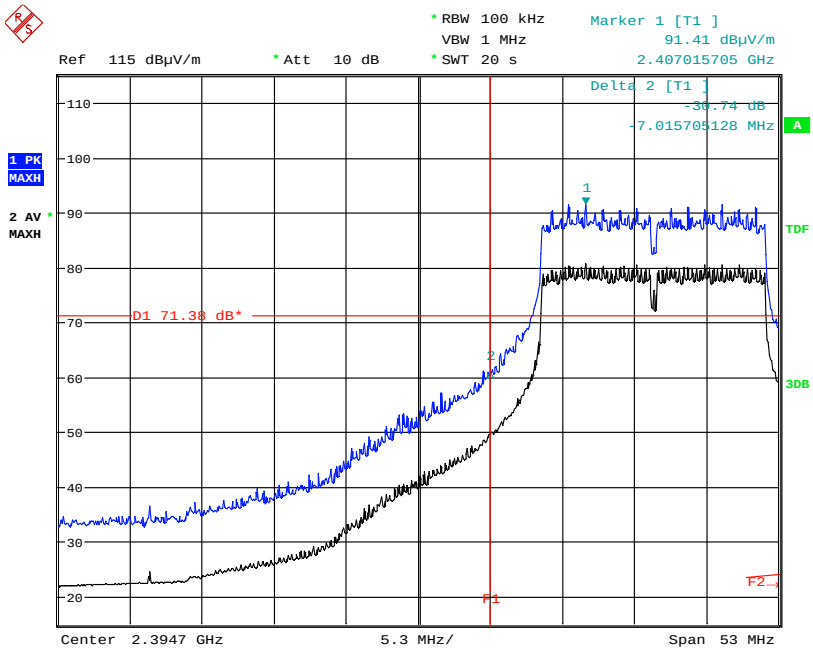
Lower Bandedge



Date: 8.JUN.2012 12:20:34

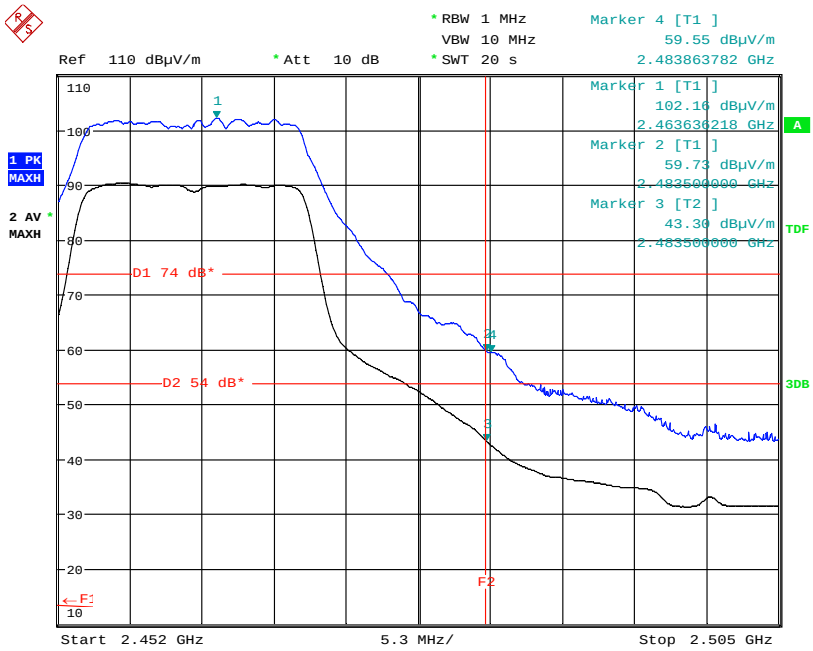
Upper Bandedge

Radiated Bandedge Compliance 802.11g 54Mb



Date: 8.JUN.2012 12:32:22

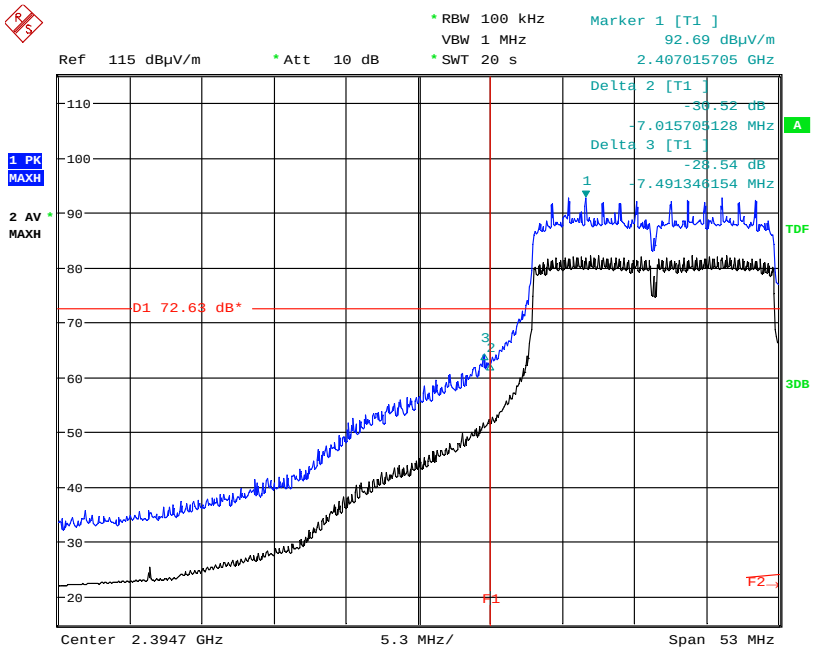
Lower Bandedge



Date: 8.JUN.2012 12:22:00

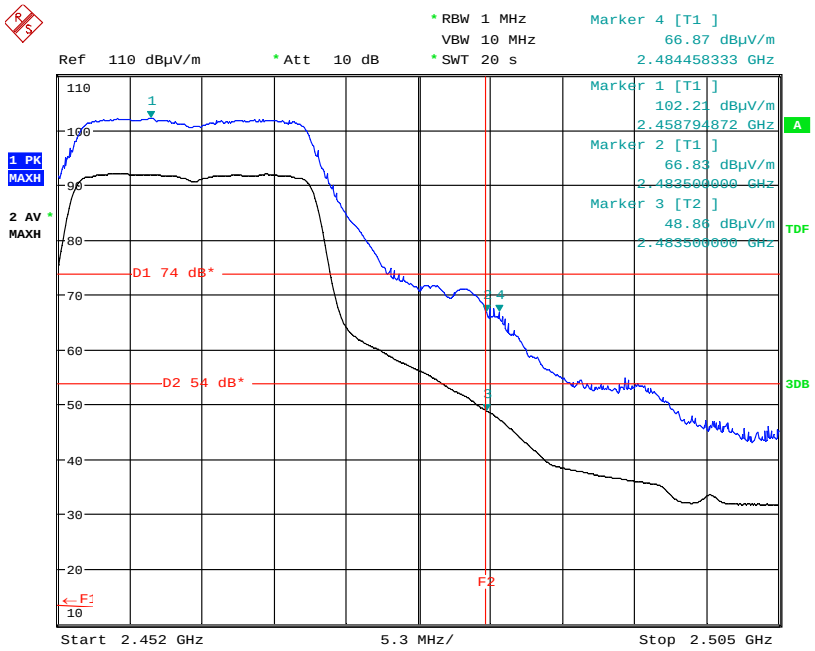
Upper Bandedge

Radiated Bandedge 802.11n HT20 MCS0 6.5Mb



Date: 8.JUN.2012 12:30:24

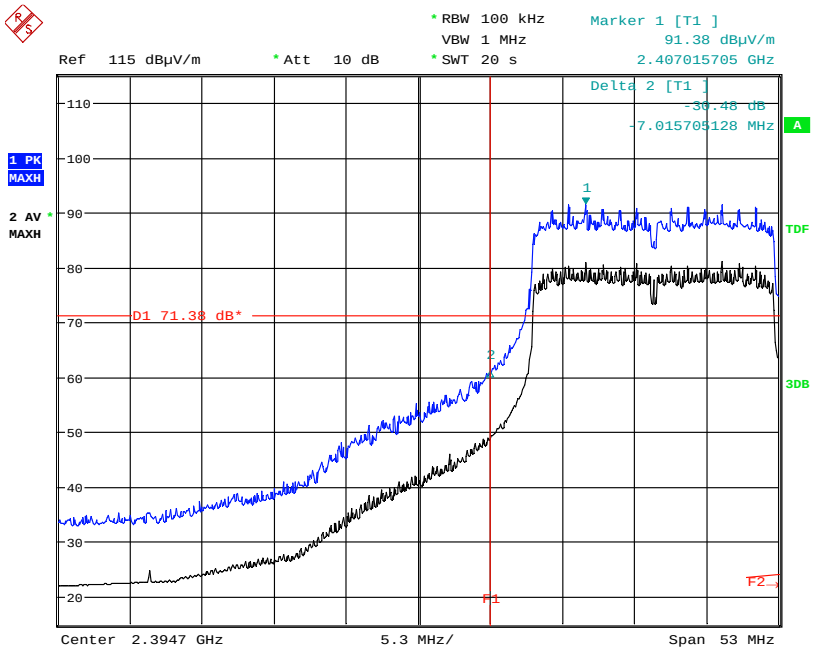
Lower Bandedge



Date: 8.JUN.2012 12:22:51

Upper Bandedge

Radiated Bandedge Compliance 802.11n HT20 MCS7 65Mb



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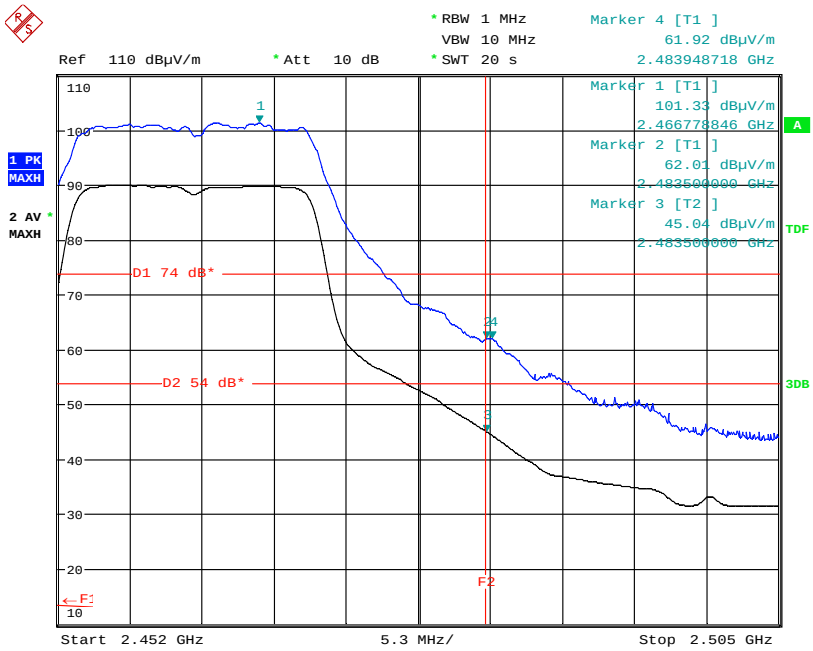
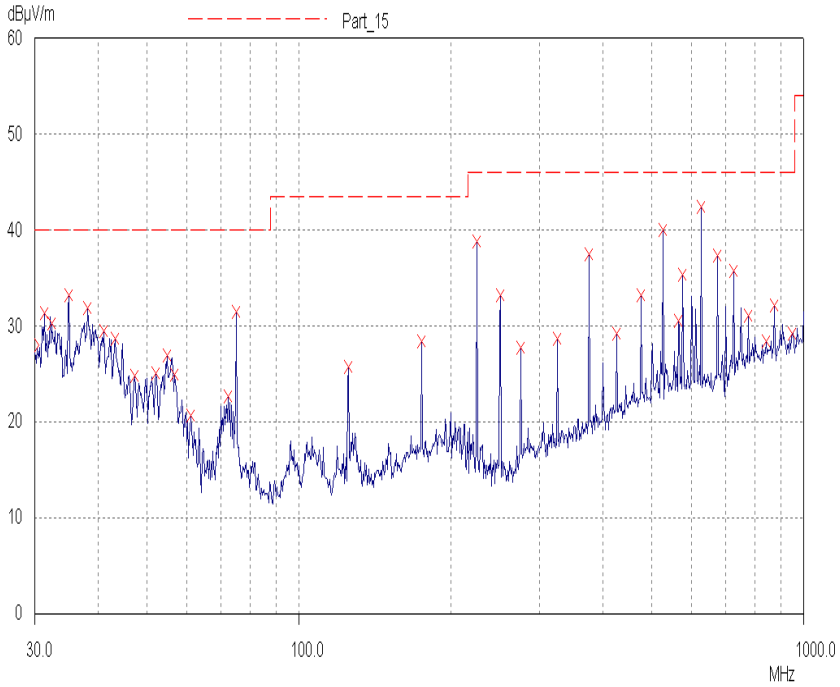
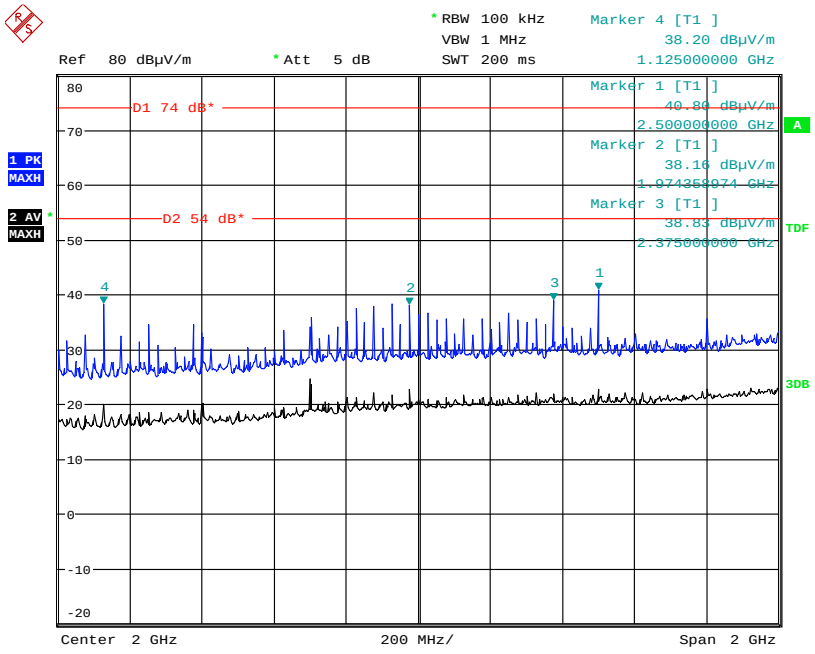


Date: 8.JUN.2012 12:24:03

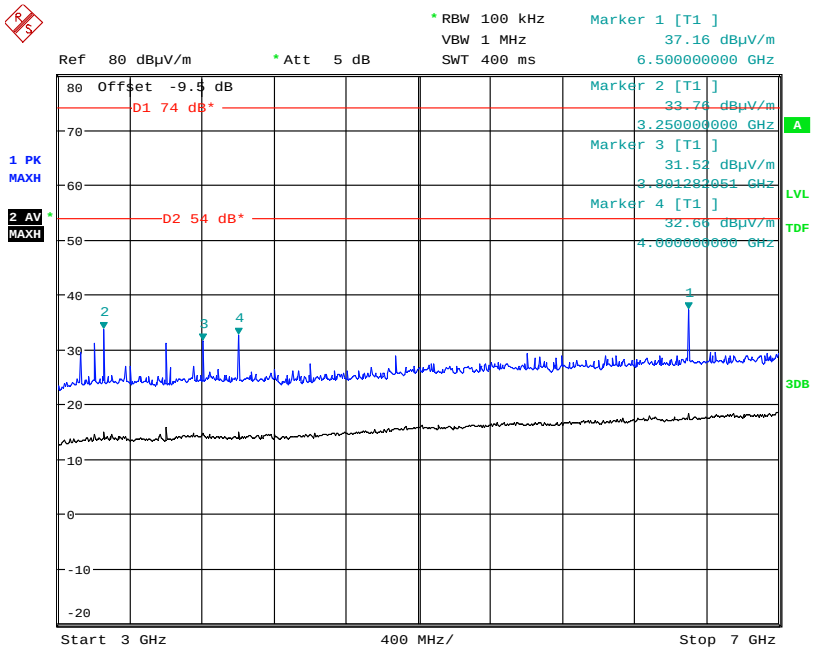
Upper Bandedge



Unintentional Radiated Spurious emissions 30 MHz to 1 GHz

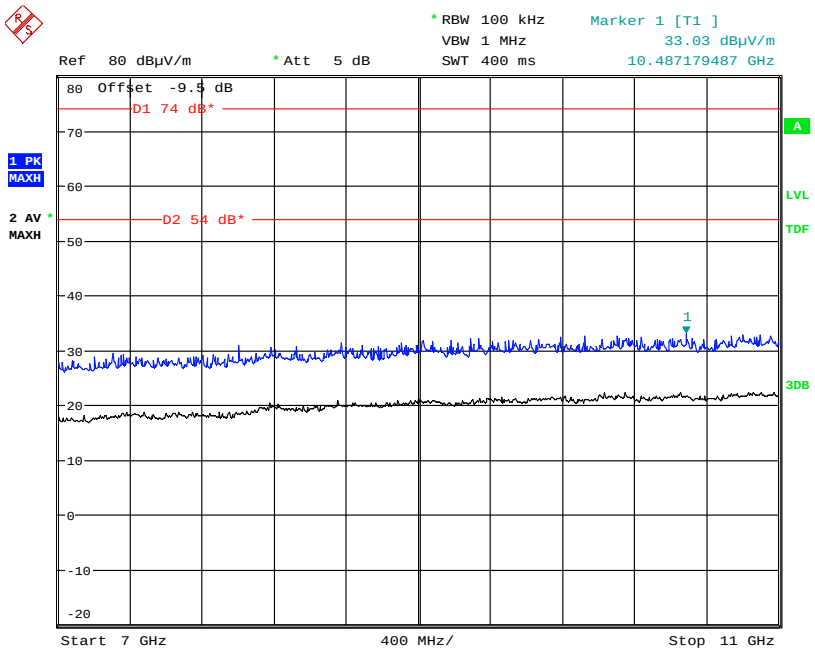


Unintentional Radiated Spurious emissions 1 GHz to 3 GHz



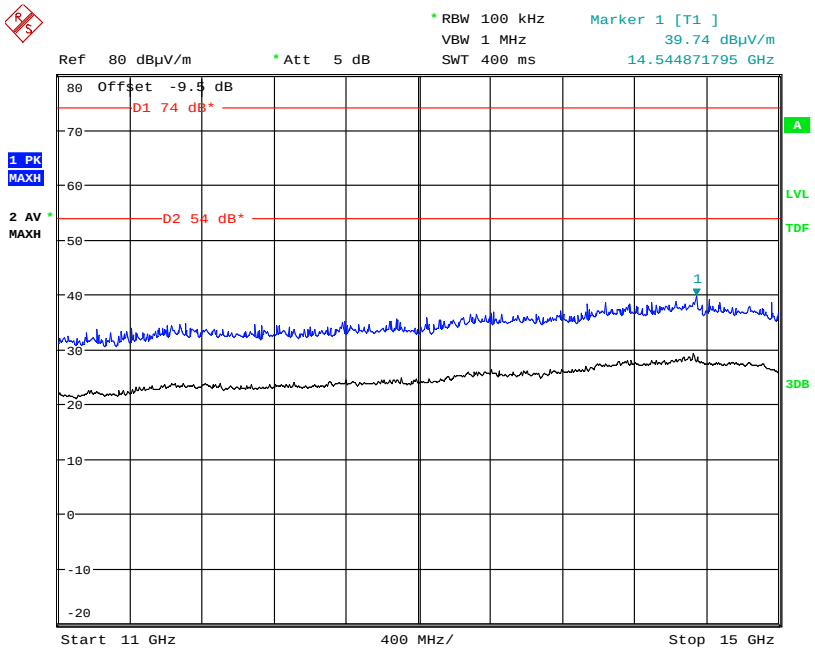
Date: 20.JUN.2012 09:55:19

Unintentional Radiated Spurious emissions 3 GHz to 7 GHz



Date: 8.JUN.2012 14:33:15

Unintentional Radiated Spurious emissions 7 GHz to 11 GHz



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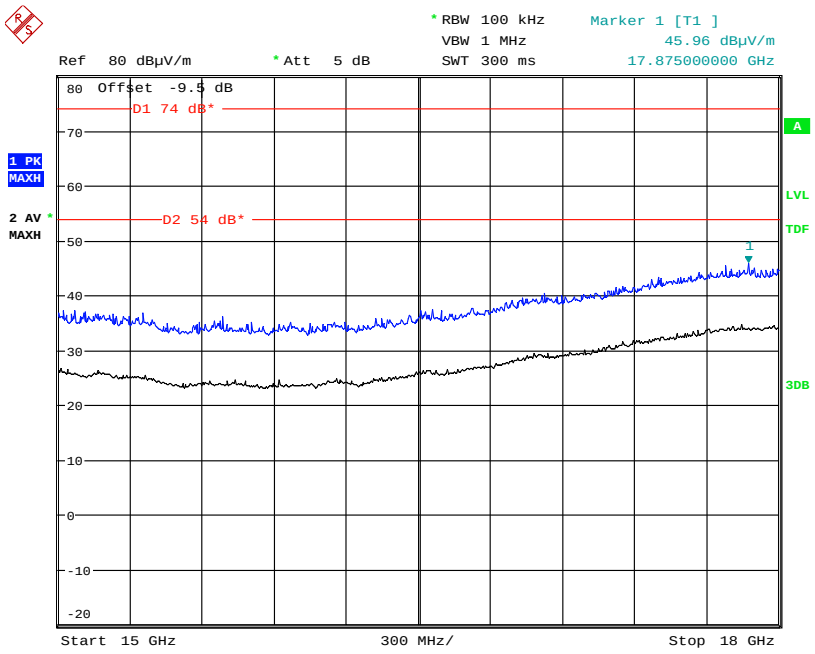
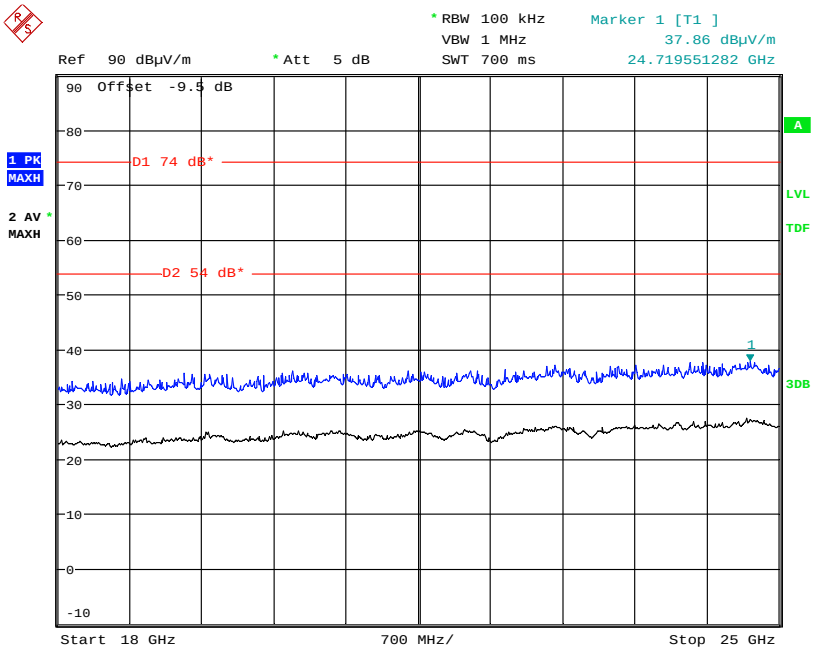
Unintentional Radiated Spurious emissions 11 GHz to 15GHz

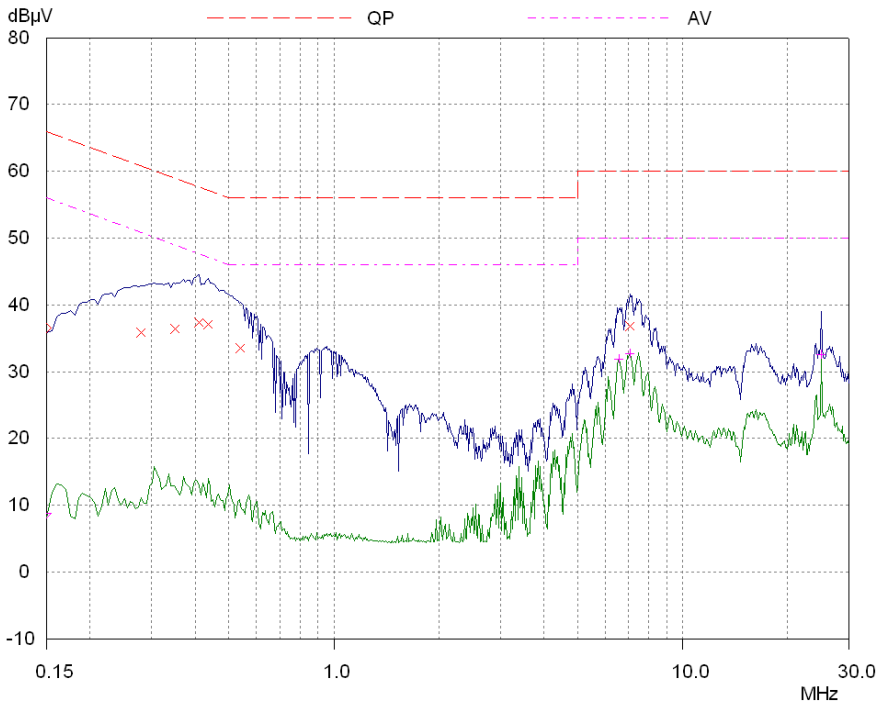


Date: 8.JUN.2012 14:32:37

Unintentional Radiated Spurious emissions 15 GHz to 18GHz



Unintentional Radiated Spurious emissions 18 GHz to 25 GHz



AC Powerline Conducted Emissions

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 Global upon request.

C1) Test samples

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

Sample No.	Description	Identification
S08	WR44 RF Module	None
S03	WiFi Antenna	None

The following samples of apparatus were submitted by the client as host, support or drive equipment (auxiliary equipment):

Sample No.	Description	Identification
S01	WR44v2 interface Unit	205019
S02	Globtek PSU	D0210

The following samples of apparatus were supplied by TRaC Global as support or drive equipment (auxiliary equipment):

Identification	Description
	None

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode:
All Transmitter Tests	EUT active and transmitting on top, middle or bottom frequencies using the required modulation.

Test	Description of Operating Mode:
Receiver radiated spurious emissions	EUT active but non-transmitting.

Test	Description of Operating Mode:
PLCE	EUT active and transmitting on top, middle or bottom frequencies using the required modulation. EUT active but non-transmitting.

C3) EUT Configuration Information.

The EUT was submitted for testing in one single possible configuration. The EUT was set viia it header onto the interface PCB that allowed control of the RF modules operation.

The RF module has additional connection to ground of the host PCB via the securing screws. These screws must be utilised when the module is installed to ensure compliance in line with the results detailed in this report.

C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S01
Tests : Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected
10 Way Header	None	0	WR44v2
Antenna port	U-FL- Reverse SMA Coax	21cm	Measurement system

Sample : S01 & S03
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
10 Way Header	None	0	WR44v2
Antenna port	U-FL- Reverse SMA Coax	21cm	S03

* Only connected during setup.

C5 Details of Equipment Used

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
UH093	CBL6112B	Bilog	Chase	20/06/2011
UH281	FSU46	Spectrum Analyser	R&S	09/02/2012
L138	3115	1-18GHz Horn	EMCO	08/11/2011
L317	ESVS10	Receiver	R&S	21/12/2011
L572	8449B	Pre Amp	Agilent	24/11/2010
REF909	FSU26	Spectrum Analyser	R&S	04/08/2011
REF940	ATS	Radio Chamber - PP	Rainford EMC	13/07/2011
REF936	0.5m 3.5mm	Cable	Rosenberger	09/11/2011
REF937	10m 3.5mm	Cable	Rosenberger	09/11/2011
REF920	4m 2.92mm	Cable	Teledyne	08/11/2011
REF938	5m 3.5mm	Cable	Rosenberger	09/11/2011
N/A	N/A	20 dB Attenuator	N/A	Cal in Use

Appendix D: Additional Information

No additional information is included within this test report.

Appendix E: Calculation of the duty cycle correction factor

Using a spectrum analyser in zero span mode, centred on the fundamental carrier frequency with a RBW of 1MHz and a video Bandwidth of 1MHz the sweep time was set accordingly to capture the pulse train. The transmit pulsewidths and period was measured. A plots of the pulse train is contained in Appendix B of this test report.

If the pulse train was less than 100 ms, including blanking intervals, the duty cycle was calculated by averaging the sum of the pulsewidths over one complete pulse train. However if the pulse train exceeds 100ms then the duty cycle was calculated by averaging the sum of the pulsewidths over the 100ms width with the highest average value. (The duty cycle is the value of the sum of the pulse widths in one period (or 100ms), divided by the length of the period (or 100ms). The duty cycle correction factor was then expressed in dB and the peak emissions adjusted accordingly to give an average value of the emission.

Correction factor dB = 20 x (Log_{10} Calculated Duty Cycle)

Therefore the calculated duty cycle was determined:

The pulse train period was greater than >100ms and in as shown from the plots in contained in appendix B of this test report.

$$\text{Duty cycle} = \frac{\text{the sum of the highest average value pulsewidths over 100ms}}{100\text{ms}}$$

e.g

$$= \frac{7.459ms}{100ms} = 0.07459$$

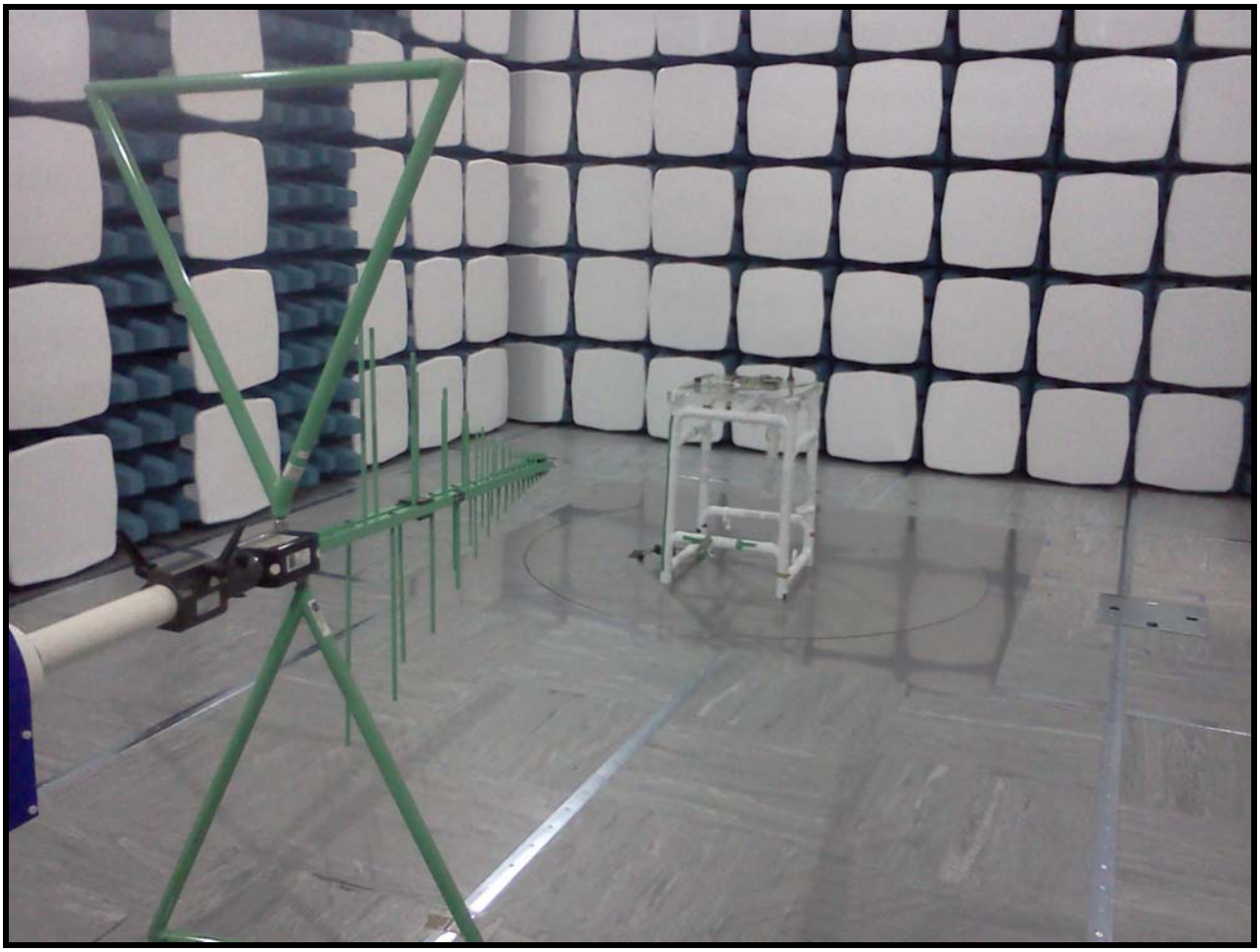
0.07459 or 7.459%

Correction factor (dB) = 20 x (Log_{10} 0.07459) = -22.54dB

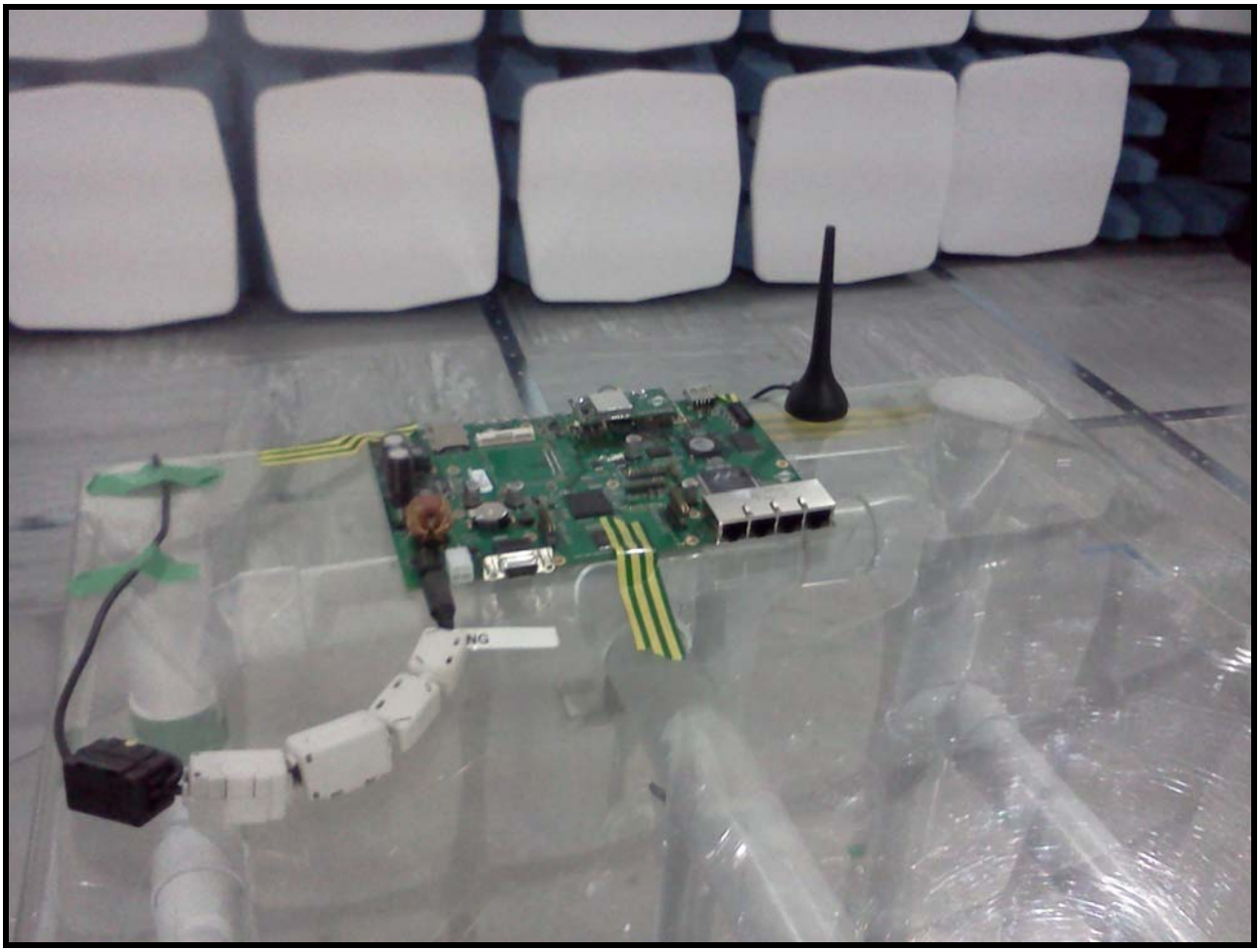
Appendix F: Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: WR44 WLAN module front view.
2. Radiated electric field emissions arrangement: WR44 WLAN module close up.



Photograph 1



Photograph 2

Appendix G: MPE Calculation

OET Bulletin No. 65, Supplement C 01-01

47 CFR §§1.1307 and 2.1091

2.1091 Radio frequency radiation exposure evaluation: mobile devices.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than 1mW/cm^2 power density limit, as required under FCC rules.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4\pi R^2} \quad \text{re - arranged} \qquad R = \sqrt{\frac{EIRP}{S\ 4\pi}}$$

where:

S = power density
R = distance to the centre of radiation of the antenna
EIRP = EUT Maximum power

Note:

The EIRP measurement was performed using a signal substitution method.

Result

Prediction Frequency (MHz)	Maximum EIRP	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than 1mW/cm^2
2462	173.38	1	3.8

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