

TRaC Wireless Test Report : 8H1942WUS1

Applicant : Cambridge Silicon Radio Inc

Apparatus : BlueSlim Bluetooth Module

Specification : CFR47 Part 15.247 July 2008, Radiated Emissions Only

Authorised by

: 

: Radio Product Manager

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Section 1:

Introduction

1.1 General

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

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1.2 Tests Requested By

This testing in this report was requested by :

Cambridge Silicon Radio Inc
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1.3 Manufacturer

FoxConn (Taiwan)
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1.4 Apparatus Assessed

The following apparatus was assessed between 1st June and 19th June 2009:

BlueSlim is a Bluetooth Module that enables wireless communications within personal computers and Laptops.

This report covers the radiated emissions testing of the BSMAN1 Blueslim Bluetooth Module.

For Conducted Emissions and Frequency hopping requirements see Trac Telecoms & Radio report Number 8H1942WUS1.

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	Title 47 of the CFR: 2008, Part 15 Subpart (c) 15.247	ANSI C63.4: 2003	Pass/Fail/ Marginal Or N/A
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: 2008, Part 15 Subpart (c) 15.109	ANSI C63.4: 2003	Pass/Fail/ Marginal Or N/A

Abbreviations used in the above table:

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

1.6 Notes Relating To The Assessment

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

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

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

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

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

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

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

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

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

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

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2:

Measurement Uncertainty

2.1 Application of Measurement Uncertainty

The following table contains the measurement uncertainties for measurements

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

- (i) If specification limits are not exceeded by the measured result, extended by the positive component of the expanded uncertainty interval at a confidence level of 95%, then a pass result is recorded.
- (ii) Where a specification limit is exceeded by the result even when the result is decreased by the negative component of the expanded uncertainty interval, a fail result is recorded.
- (iii) Where measured result is below a limit, but by a margin less than the positive measurement uncertainty component, it is not possible to record a pass based on a 95% confidence level. However, the result indicates that a pass result is more probable than a fail result.
- (iv) Where a measured result is above a limit, but by a margin less than the negative measurement uncertainty component, it is not possible to record a fail based on a 95% confidence level. However the result indicates that a fail is more probable than a pass.

2.2 Measurement Uncertainty Values

For the test data recorded in accordance with note (iii) of Section 2.1 the following measurement uncertainty was calculated :

Radio Testing – General Uncertainty Schedule

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

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

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

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

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

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

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**

Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

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

A1 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 field emission test applies to spurious emissions and harmonics that fall within the restricted bands listed in Section 15.205. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit on its lowest, centre and highest carrier frequency at each operational data rate in turn. 3 different combinations of connector/antenna were testing in the modes described.

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: C1 Configuration, 1Mb/s, 2402 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	
Modification state	0
SE in test environment	None
SE isolated from EUT	S33, S46
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dB μ V/m)	Spec. Limit (dB μ V/m)	Margin (dB)	Summary
1.	4804.000	H	44.55	54.00	-9.45	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 1Mb/s, 2441 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S0x
Modification state	
SE in test environment	
SE isolated from EUT	
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBμV/m)	Spec. Limit (dBμV/m)	Margin (dB)	Summary
1.	4881.932	H	42.61	54.00	-11.39	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 1Mb/s, 2480 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S0x
Modification state	
SE in test environment	
SE isolated from EUT	
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	4960.000	H	40.84	54.00	-13.16	Pass
2.	7440.048	H	40.16	54.00	-13.84	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 2Mb/s, 2402 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	
Modification state	0
SE in test environment	None
SE isolated from EUT	S33, S46
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	4804.032	H	34.82	54.00	-19.18	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 2Mb/s, 2441 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S0x
Modification state	
SE in test environment	
SE isolated from EUT	
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	4882.192	H	34.02	54.00	-19.98	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 2Mb/s, 2480 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S0x
Modification state	
SE in test environment	
SE isolated from EUT	
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
No Significant Emissions Within 20 dB of the Limit						

¹See section 2.2 Note (iii).

~ 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: C1 Configuration, 3Mb/s, 2402 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	
Modification state	0
SE in test environment	None
SE isolated from EUT	S33, S46
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	4804.112	H	34.27	54.00	-19.73	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 3Mb/s, 2441 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S0x
Modification state	
SE in test environment	
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	4882.000	V	34.46	54.00	-19.54	Pass

¹See section 2.2 Note (iii).

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: C1 Configuration, 3Mb/s, 2480 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S0x
Modification state	
SE in test environment	
SE isolated from EUT	
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	4960.000	H	34.14	54.00	-19.86	Pass

¹See section 2.2 Note (iii).

A2 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 :



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

Test Details: BSMAN3, 2402 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S21
Modification state	0
SE in test environment	S26, S46
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dB μ V/m)	Spec. Limit (dB μ V/m)	Margin (dB)	Summary
1.	2400.576	V	35.10	54.00	-18.90	Pass

¹See section 2.2 Note (iii).

Unintentional Radiated Electric Field Emissions 15.109 continued:

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

Test Details: BSMAN3, 2441 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S21
Modification state	0
SE in test environment	S26, S46
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	2439.506	V	39.92	54.00	-14.08	Pass

¹See section 2.2 Note (iii).

Unintentional Radiated Electric Field Emissions 15.109 continued:

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

Test Details: BSMAN3, 2480 MHz	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.4:2003
Frequency range	30MHz to 25 GHz
EUT sample number	S21
Modification state	0
SE in test environment	S26, S46
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	18°C
Photographs (Appendix F)	Photograph 1 and 2

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

Ref No.	Freq (MHz)	Pol.	Result (dBµV/m)	Spec. Limit (dBµV/m)	Margin (dB)	Summary
1.	2478.557	V	43.44	54.00	-10.56	Pass

¹See section 2.2 Note (iii).

A3 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 applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector. The EUT was set to transmit on its lowest, centre and highest carrier frequency in turn. The formal measurements are detailed below:

Test Details: BSMAN3	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.4:2003
Frequency range	150kHz to 30MHz
EUT sample number	46, 47, 48, 49
Modification state	0
EUT set up	Refer to Appendix C
Temperature	18°C

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	0.174	Live	45.5	54.8	-9.3	Pass
2	0.270	Live	50.8	51.1	-0.3	Pass*
3	0.317	Live	41.1	49.8	-8.7	Pass
4	0.541	Live	42.8	46.0	-3.2	Pass*
5	0.581	Live	45.5	46.0	-0.5	Pass*
6	0.945	Live	35.2	46.0	-10.8	Pass
7	2.300	Live	26.1	46.0	-19.9	Pass
8	0.174	Neutral	51.5	54.8	-3.3	Pass*
9	0.270	Neutral	50.8	51.1	-0.3	Pass*
10	0.317	Neutral	40.3	49.8	-9.5	Pass
11	0.541	Neutral	41.9	46.0	-4.1	Pass
12	0.581	Neutral	44.5	46.0	-1.5	Pass*
13	0.945	Neutral	32.9	46.0	-13.1	Pass
14	2.300	Neutral	26.1	46.0	-19.9	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	0.174	Live	52.1	64.8	-12.7	Pass
2	0.270	Live	53.6	61.1	-7.5	Pass
3	0.317	Live	54.8	59.8	-5.0	Pass
4	0.541	Live	47.3	56.0	-8.7	Pass
5	0.581	Live	52.1	56.0	-3.9	Pass*
6	0.945	Live	48.6	56.0	-7.4	Pass
9	0.174	Neutral	53.0	64.8	-11.8	Pass
10	0.270	Neutral	53.0	61.1	-8.1	Pass
11	0.317	Neutral	53.9	59.8	-5.9	Pass
12	0.541	Neutral	47.9	56.0	-8.1	Pass
13	0.581	Neutral	50.8	56.0	-5.2	Pass
14	0.945	Neutral	46.3	56.0	-9.7	Pass

*See section 2.2 Note (iii).

Specification limits :

Conducted emission limits (47 CFR 15:2008 Clause 15.207):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB μ V	
	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				

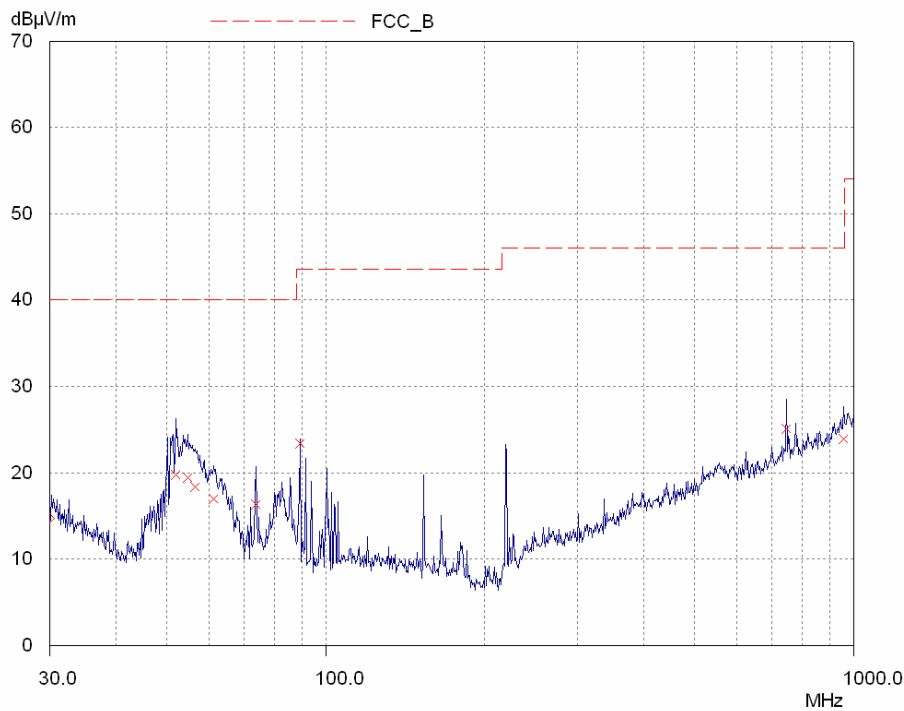
Appendix B:

Supporting Graphical Data

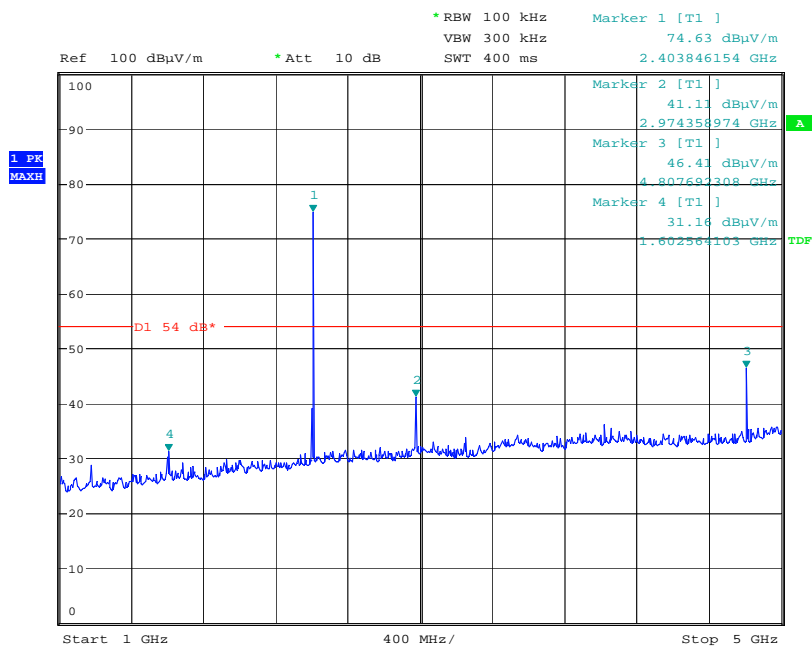
This appendix contains graphical data obtained during testing.

Notes:

- (a) The radiated electric field emissions 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) Appendix C details the numbering system used to identify the sample and its modification state.
- (d) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.

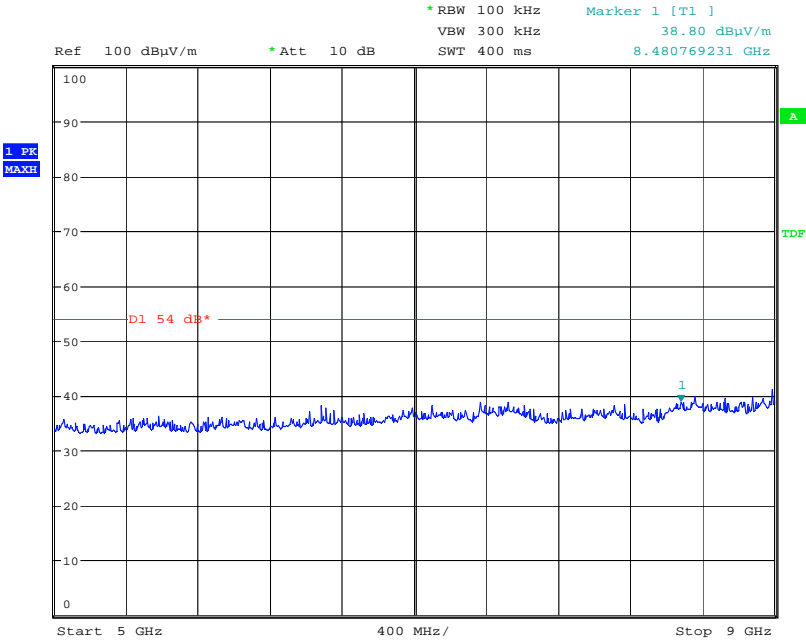


Radiated Spurious emissions 30 MHz to 1 GHz – 2402MHz 1Mb/s



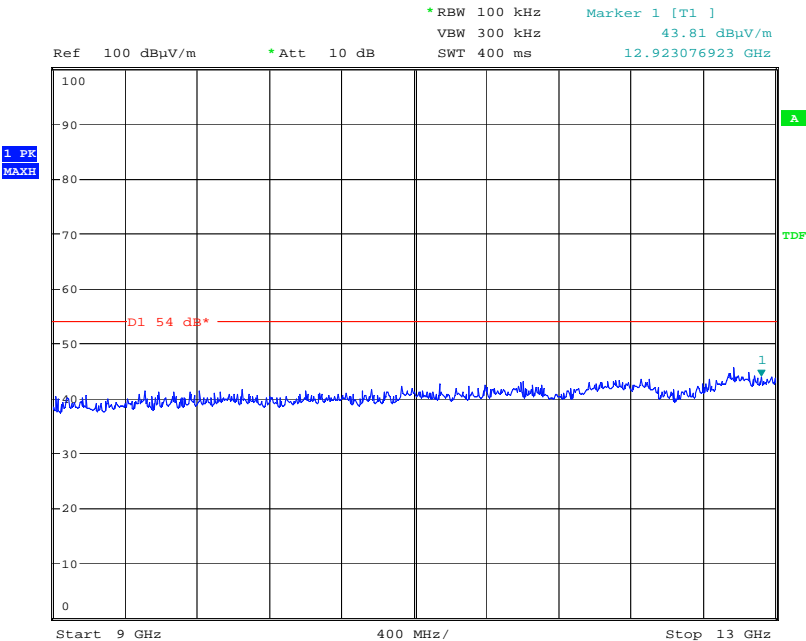
Date: 16.JUN.2009 16:24:54

Radiated Spurious emissions 1 GHz to 5 GHz – 2402MHz 1Mb/s



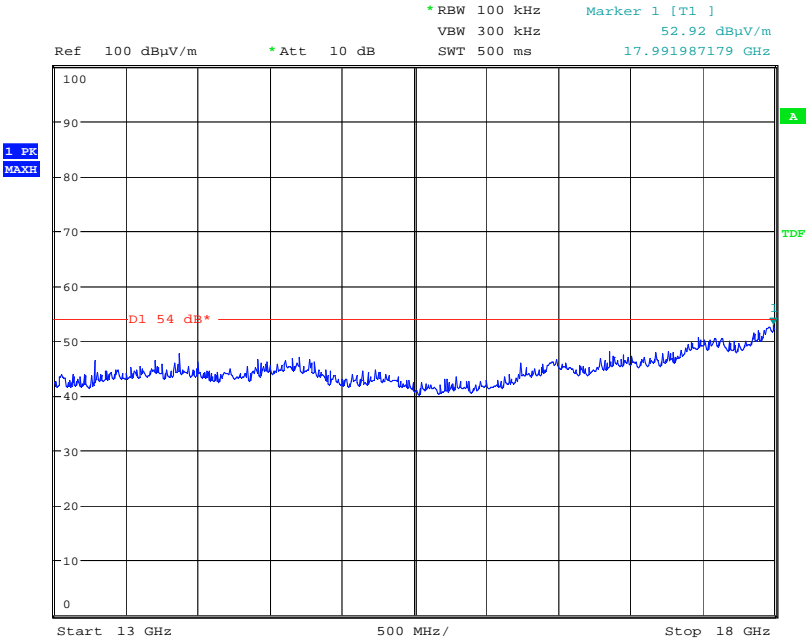
Date: 16.JUN.2009 16:24:32

Radiated Spurious emissions 5 GHz to 9 GHz – 2402MHz 1Mb/s



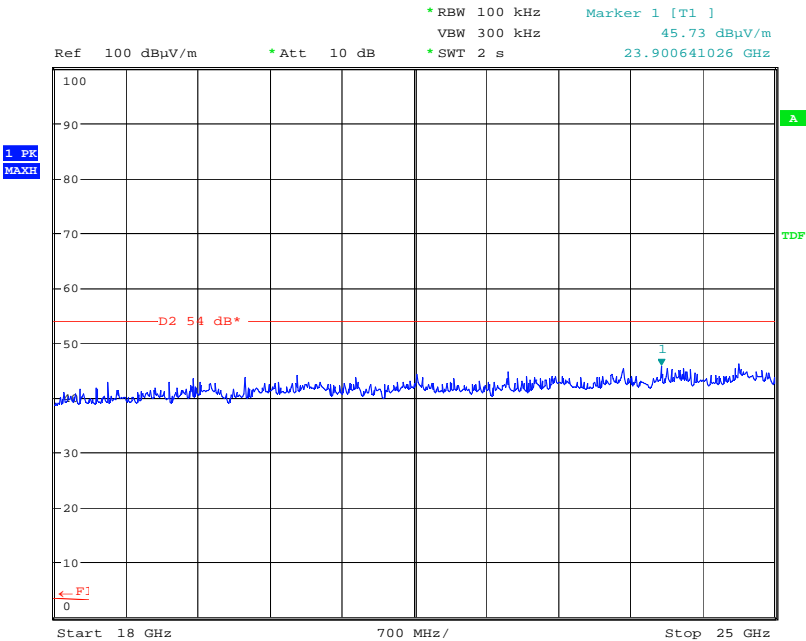
Date: 16.JUN.2009 16:24:20

Radiated Spurious emissions 9 GHz to 13 GHz – 2402MHz 1Mb/s



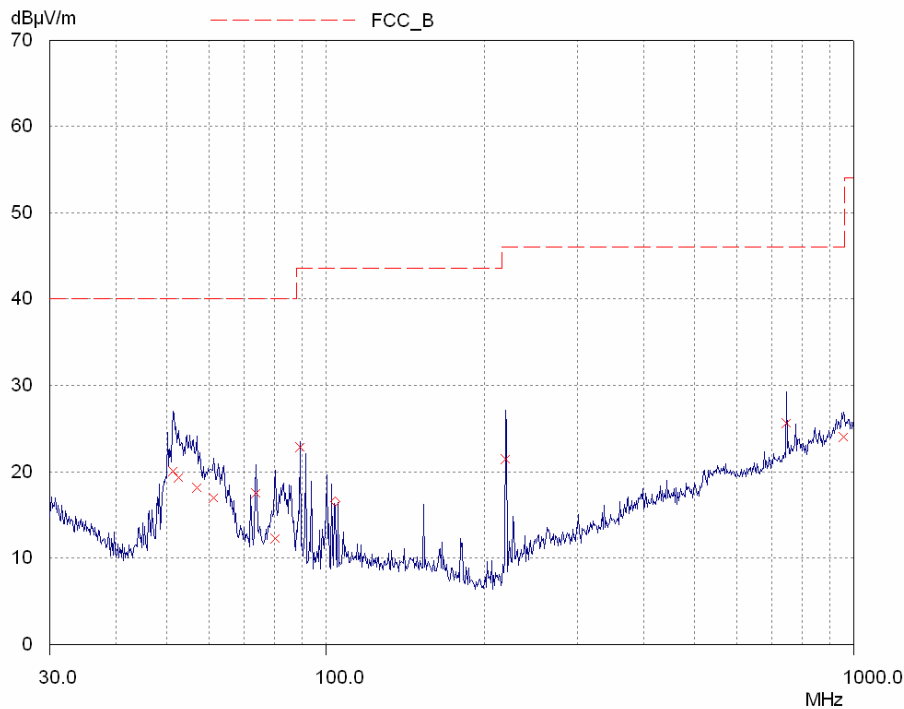
Date: 16.JUN.2009 16:24:07

Radiated Spurious emissions 13 GHz to 18GHz – 2402MHz 1Mb/s

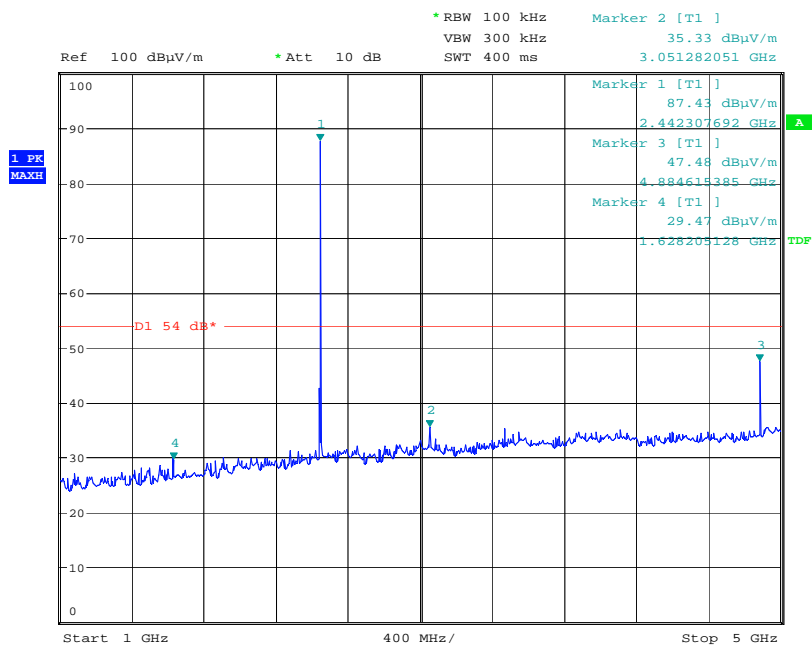


Date: 19.JUN.2009 09:30:24

Radiated Spurious emissions 18 GHz to 25 GHz – 2402MHz 1Mb/s

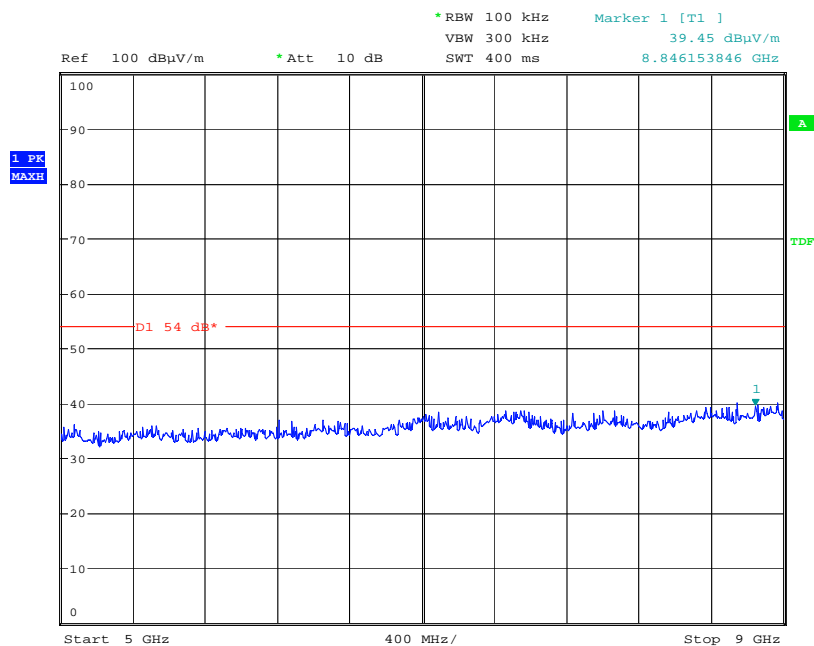


Radiated Spurious emissions 30 MHz to 1 GHz – 2441MHz 1Mb/s



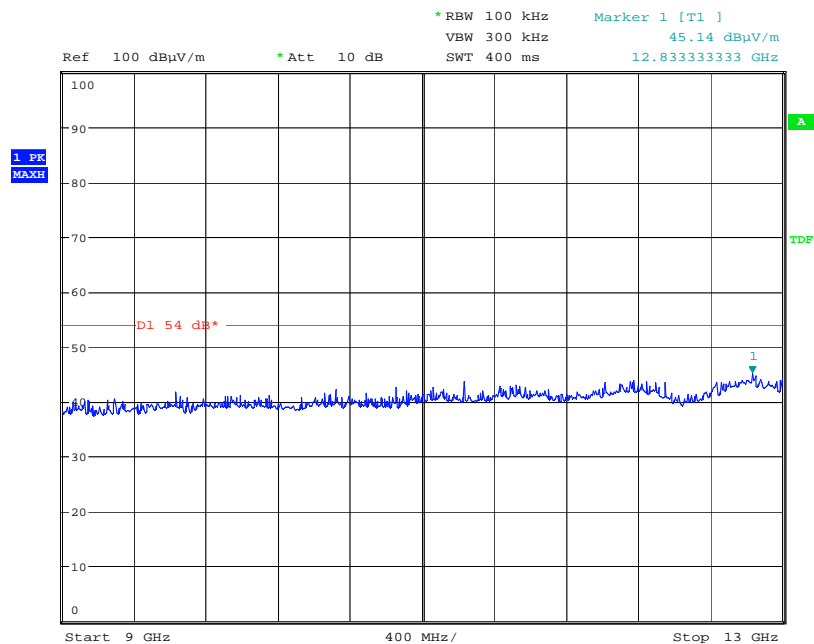
Date: 16.JUN.2009 16:25:49

Radiated Spurious emissions 1 GHz to 5 GHz – 2441MHz 1Mb/s



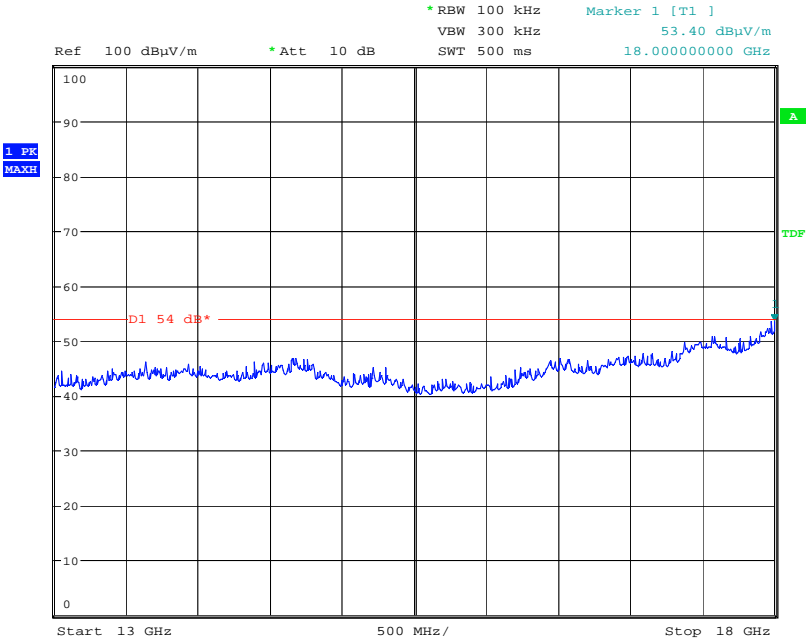
Date: 16.JUN.2009 16:26:10

Radiated Spurious emissions 5 GHz to 9 GHz – 2441MHz 1Mb/s



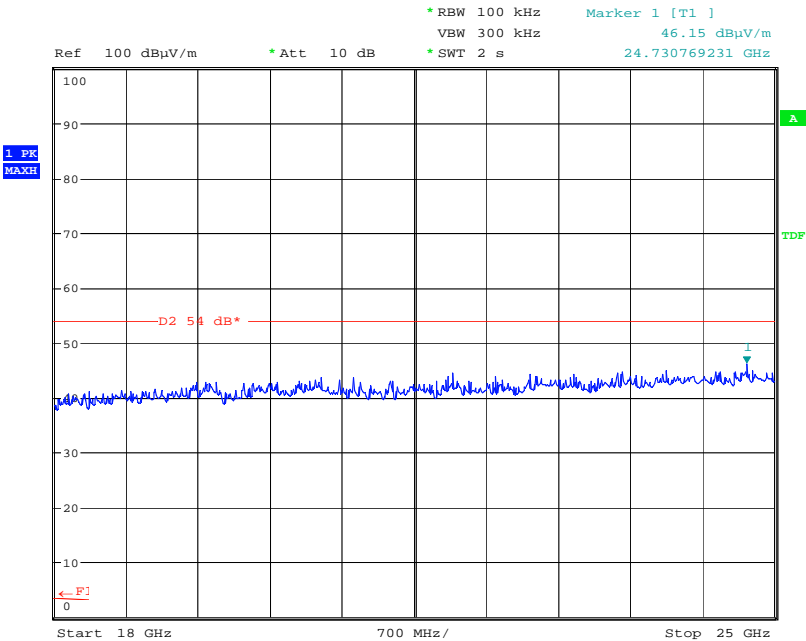
Date: 16.JUN.2009 16:26:23

Radiated Spurious emissions 9 GHz to 13 GHz – 2441MHz 1Mb/s



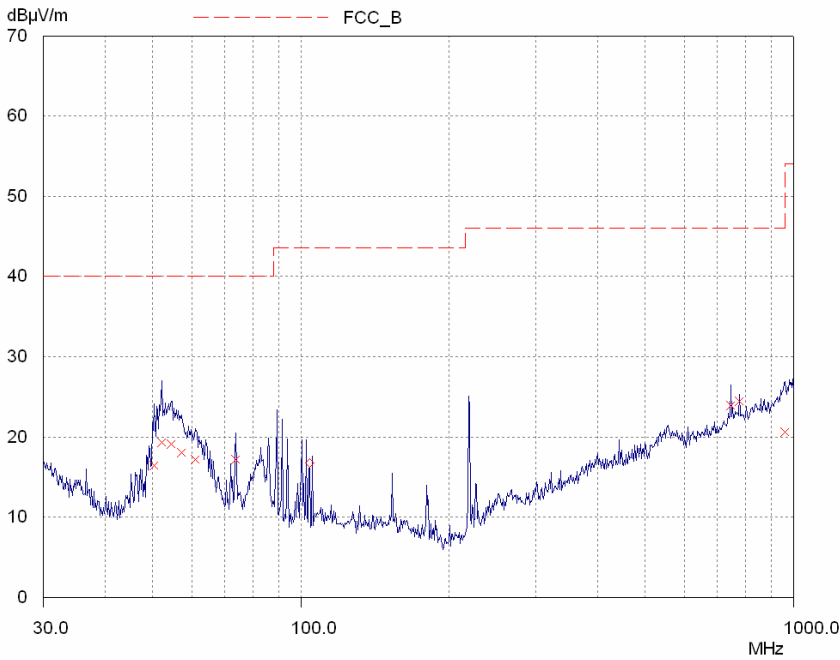
Date: 16.JUN.2009 16:26:34

Radiated Spurious emissions 13 GHz to 18GHz – 2441MHz 1Mb/s

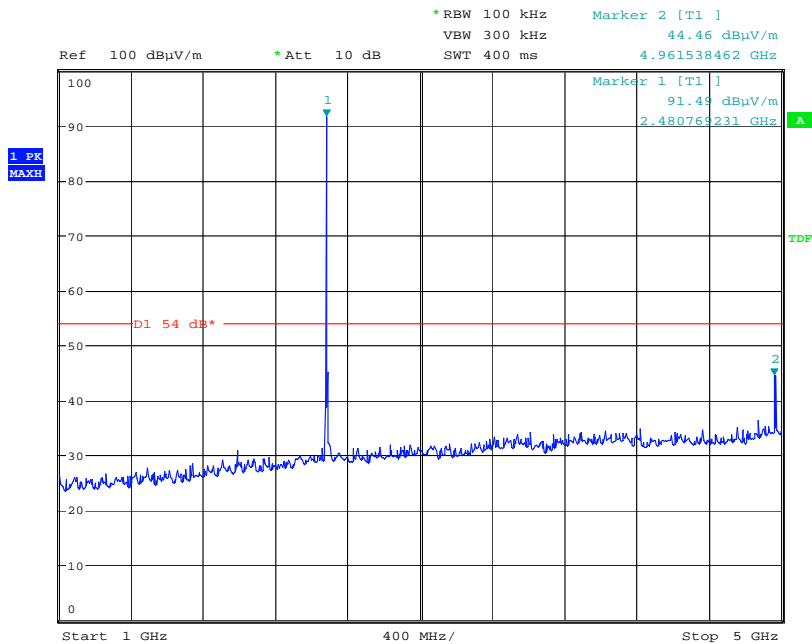


Date: 19.JUN.2009 09:29:23

Radiated Spurious emissions 18 GHz to 25 GHz – 2441MHz 1Mb/s

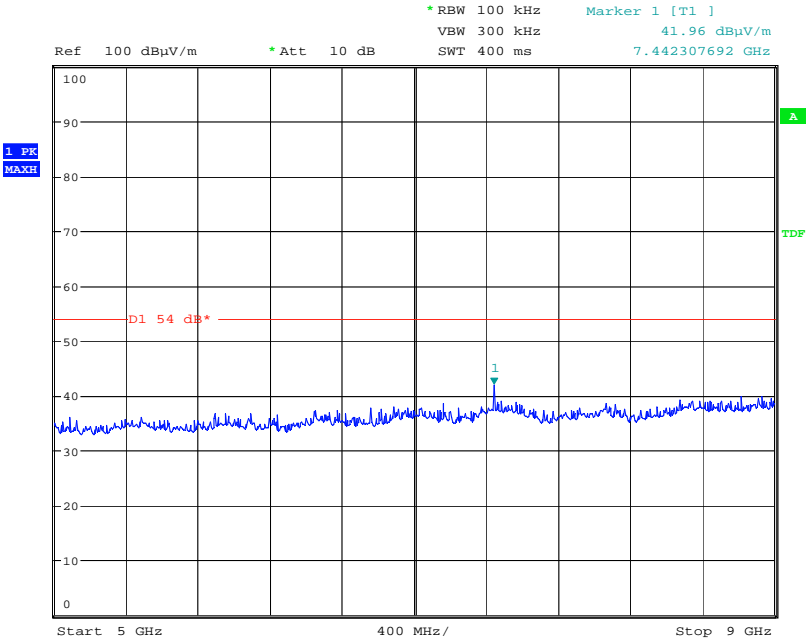


Radiated Spurious emissions 30 MHz to 1 GHz – 2480MHz 1Mb/s



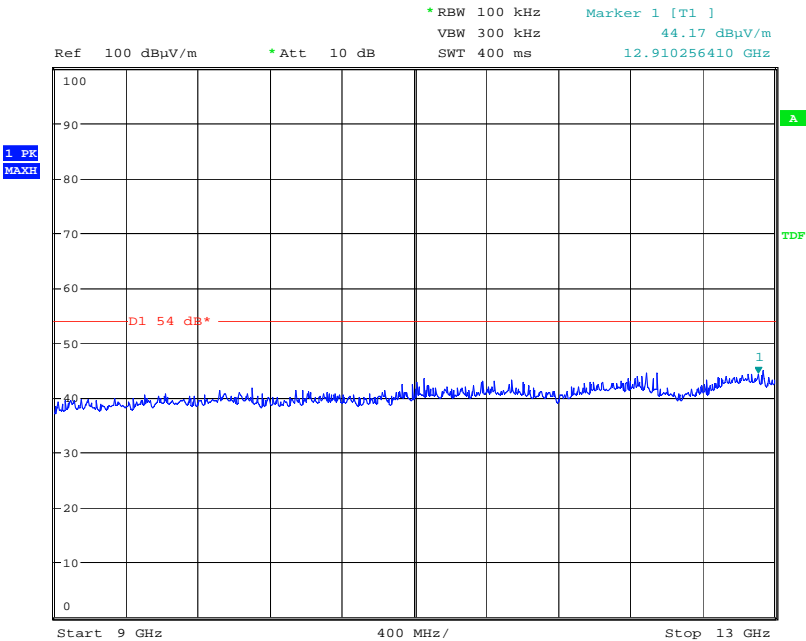
Date: 16.JUN.2009 16:30:54

Radiated Spurious emissions 1 GHz to 5 GHz – 2480MHz 1Mb/s



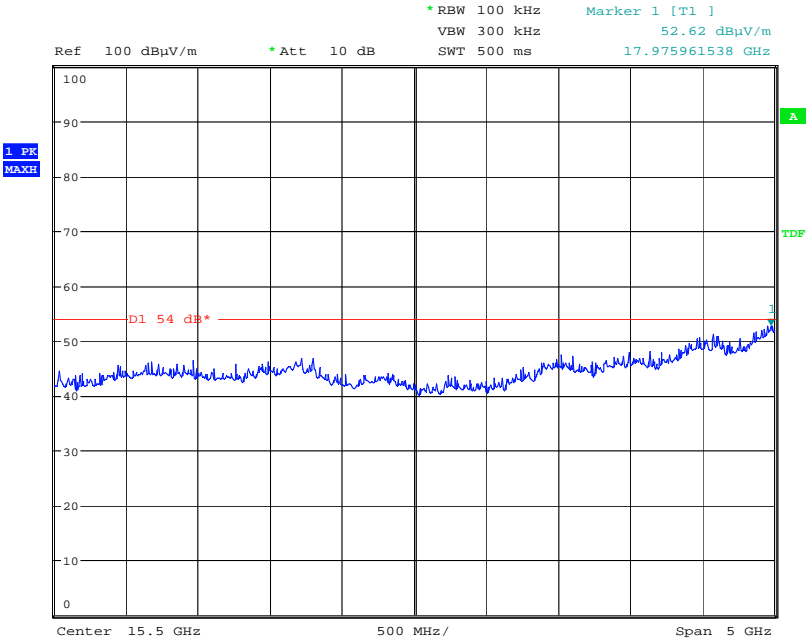
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Radiated Spurious emissions 5 GHz to 9 GHz – 2480MHz 1Mb/s



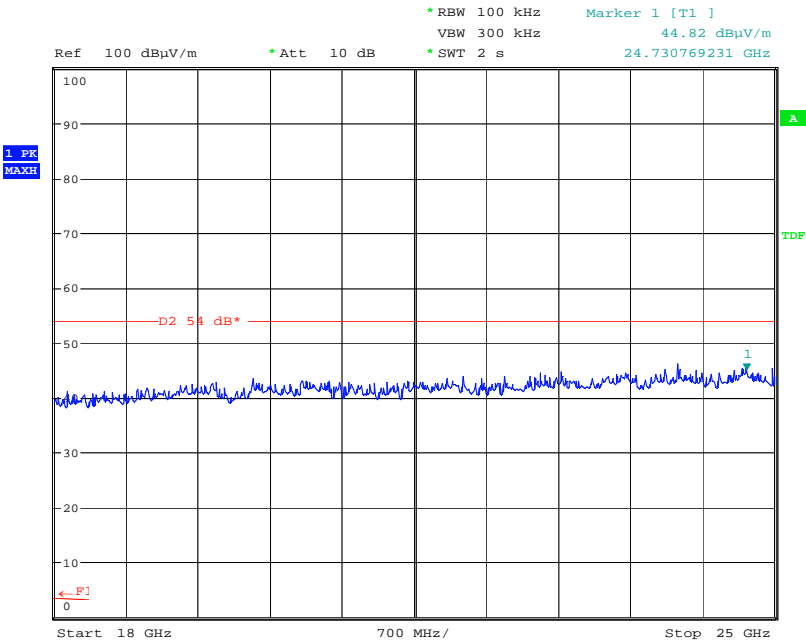
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Radiated Spurious emissions 9 GHz to 13 GHz – 2480MHz 1Mb/s



Date: 16.JUN.2009 16:29:49

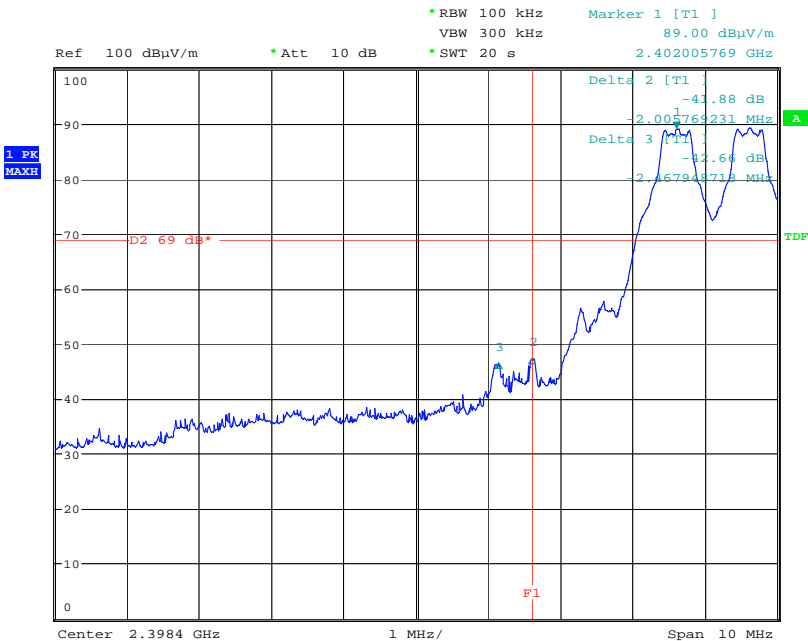
Radiated Spurious emissions 13 GHz to 18GHz – 2480MHz 1Mb/s



Date: 19.JUN.2009 09:31:22

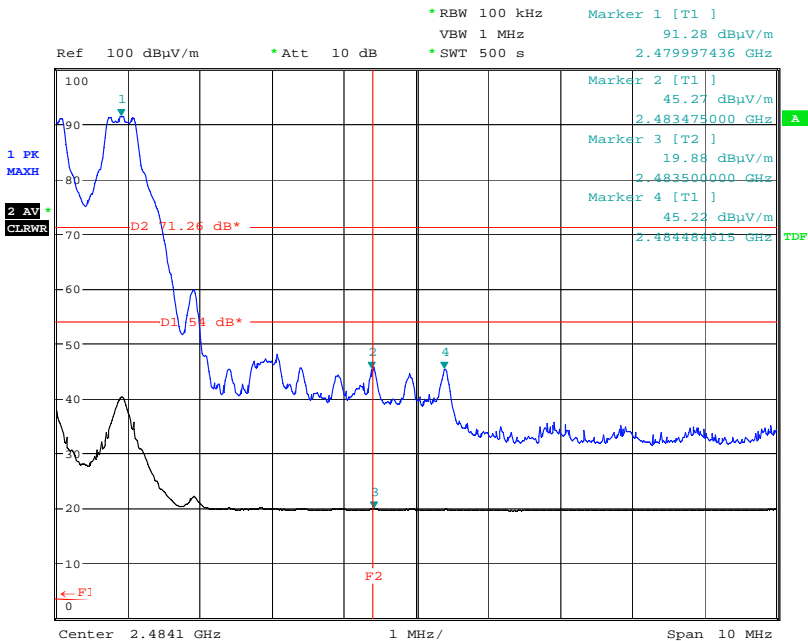
Radiated Spurious emissions 18 GHz to 25 GHz – 2480MHz 1Mb/s

Radiated Bandedge Compliance



Date: 18.JUN.2009 14:06:06

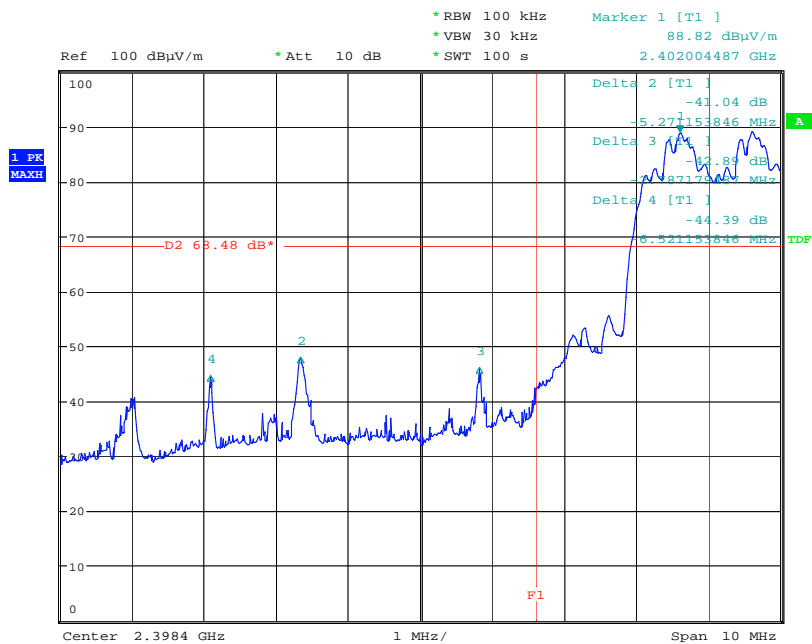
Lower Bandedge - Operational Data Rate 1Mb/s



Date: 18.JUN.2009 14:27:21

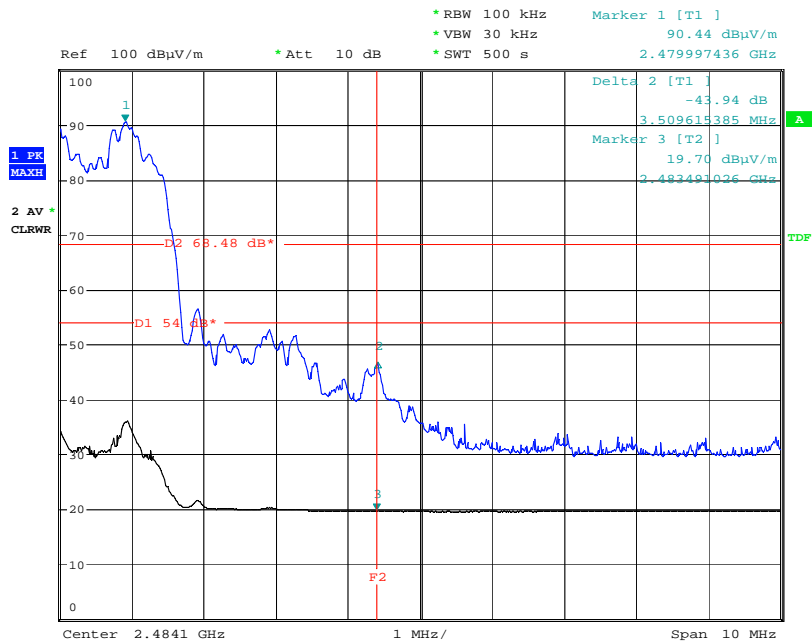
Upper Bandedge - Operational Data Rate 1Mb/s

Radiated Bandedge Compliance



Date: 18.JUN.2009 12:21:00

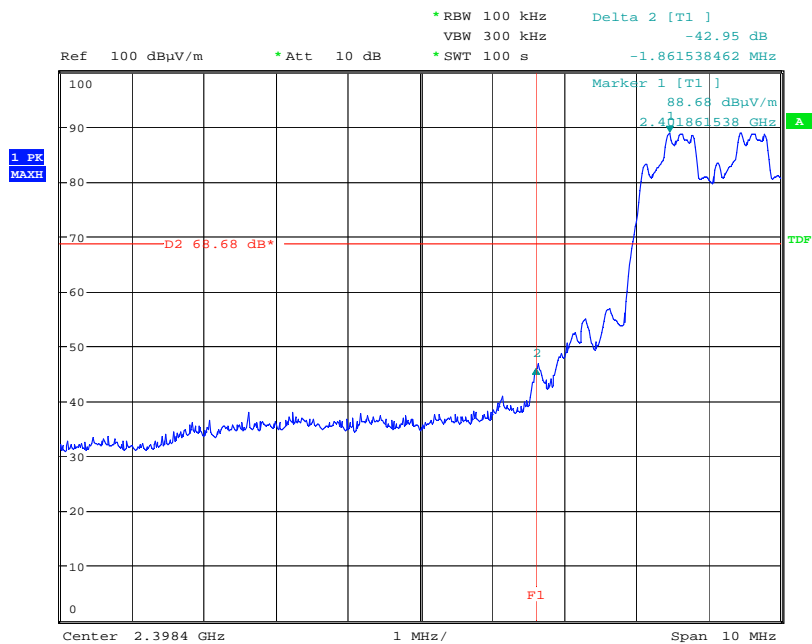
Lower Bandedge - Operational Data Rate 2Mb/s



Date: 18.JUN.2009 12:08:57

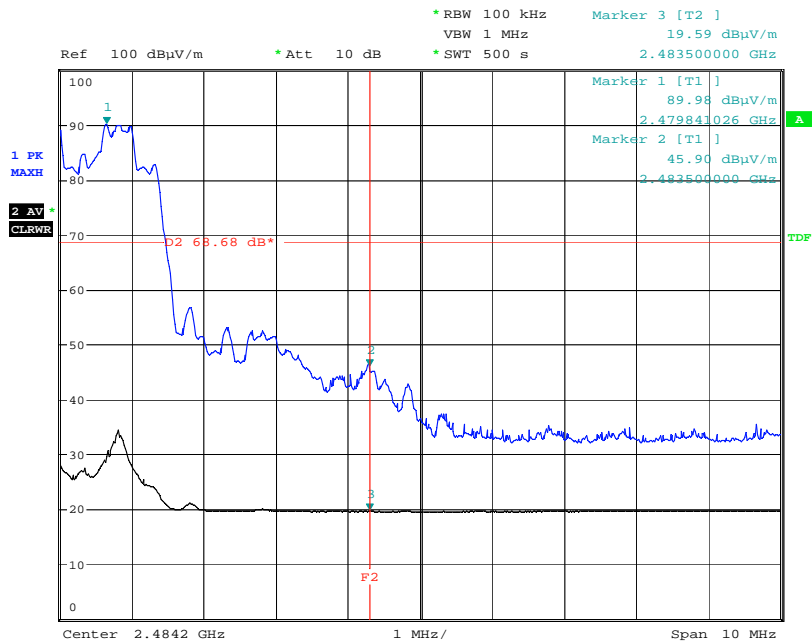
Upper Bandedge - Operational Data Rate 2Mb/s

Radiated Bandedge Compliance



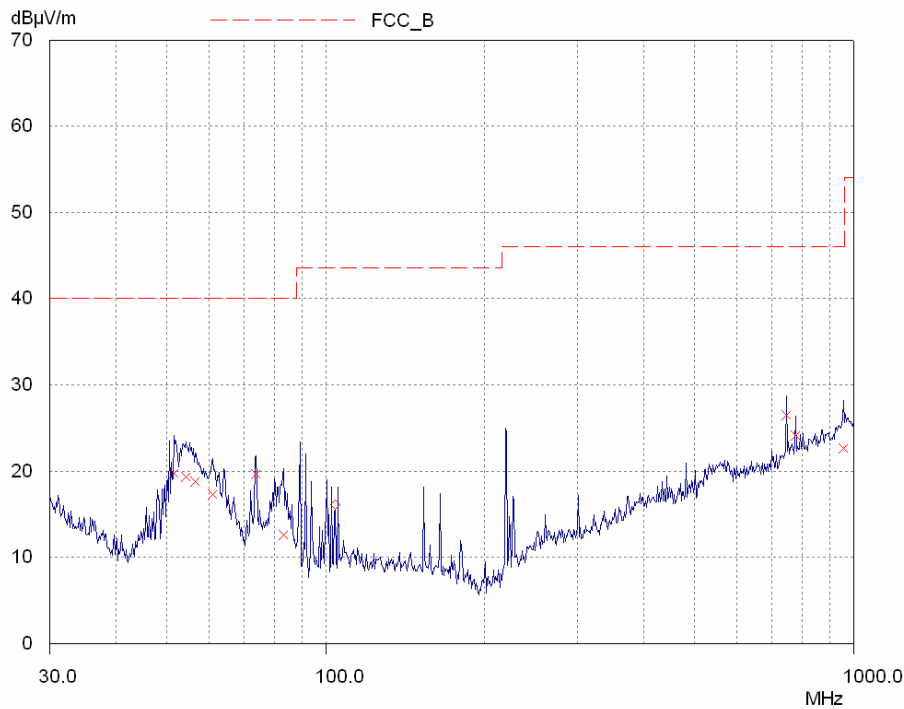
Date: 18.JUN.2009 12:43:48

Lower Bandedge - Operational Data Rate 3Mb/s

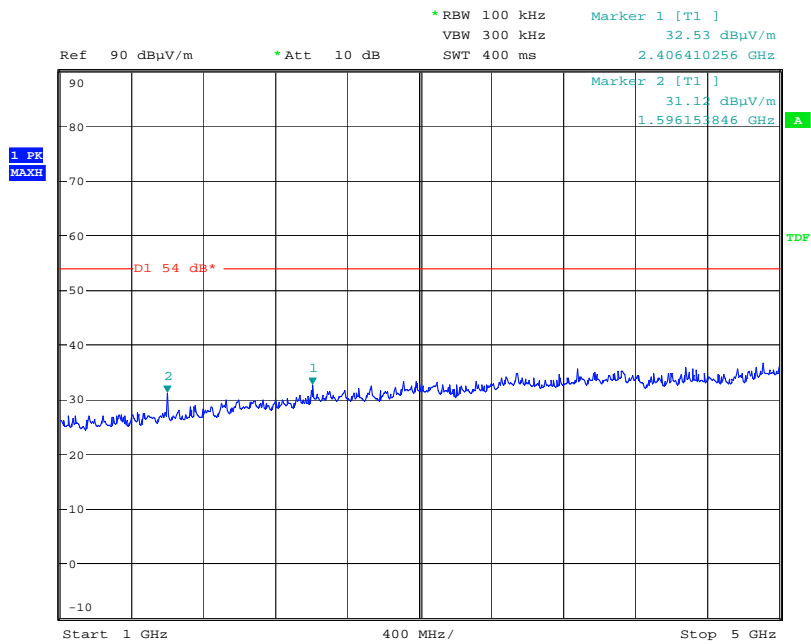


Date: 18.JUN.2009 13:44:16

Upper Bandedge - Operational Data Rate 3Mb/s

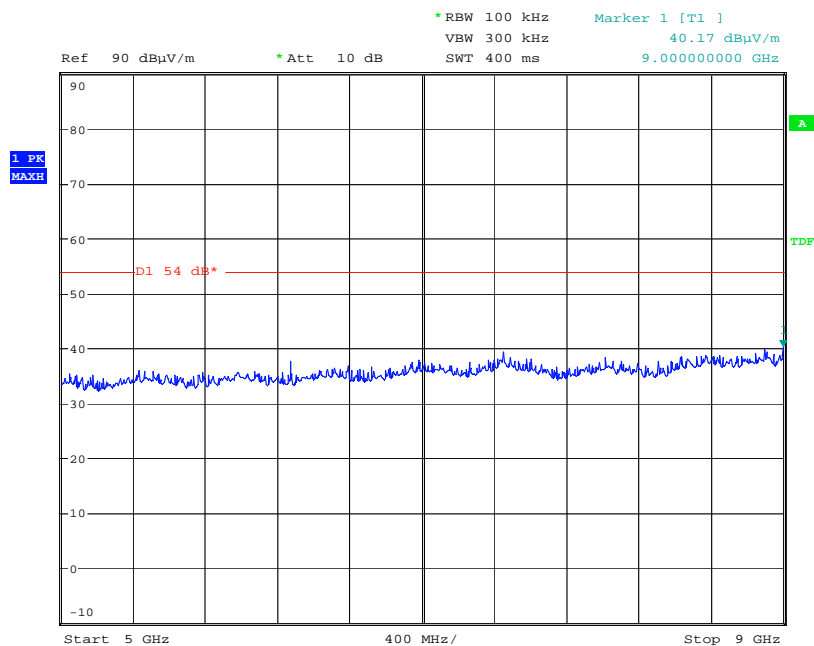


Radiated Spurious emissions 30 MHz to 1 GHz – 2402MHz



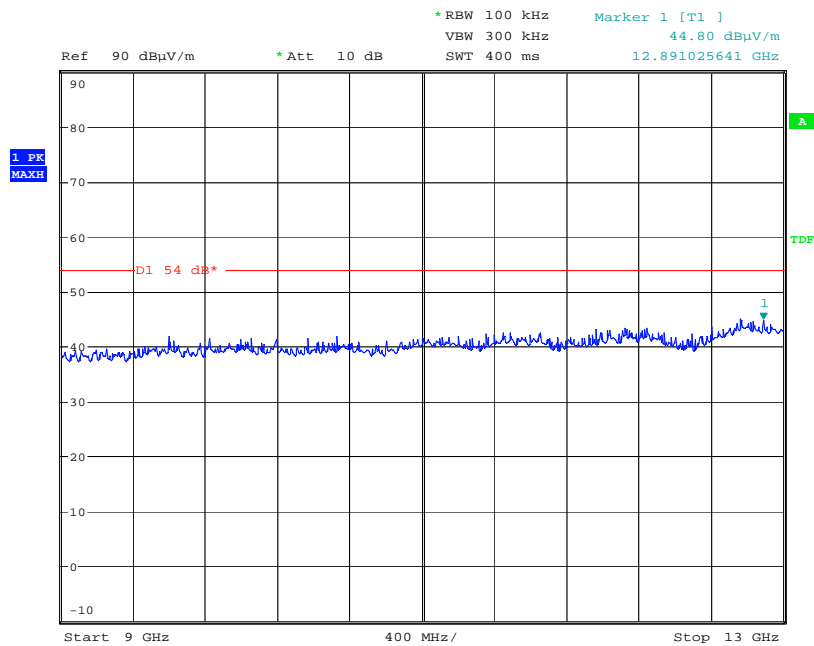
Date: 16.JUN.2009 15:49:49

Radiated Spurious emissions 1 GHz to 5 GHz – 2402MHz



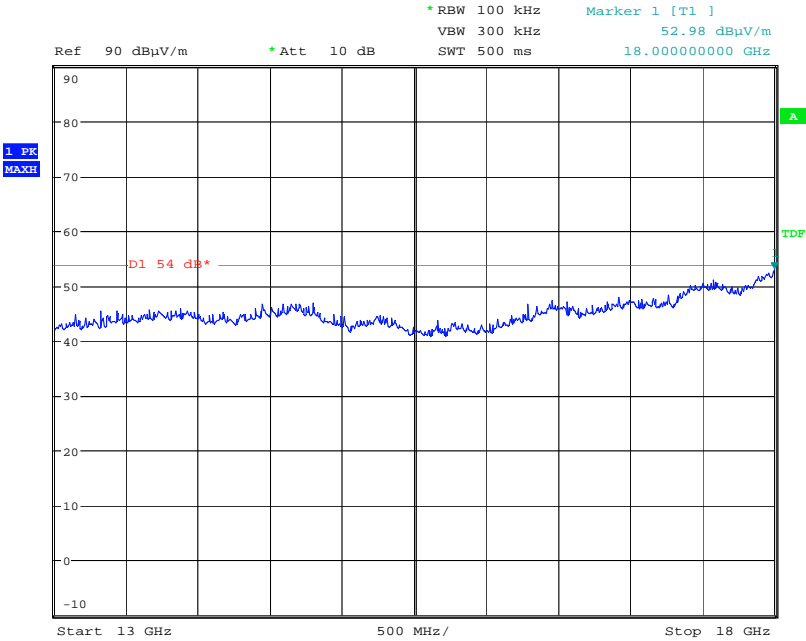
Date: 16.JUN.2009 15:48:54

Radiated Spurious emissions 5 GHz to 9 GHz – 2402MHz



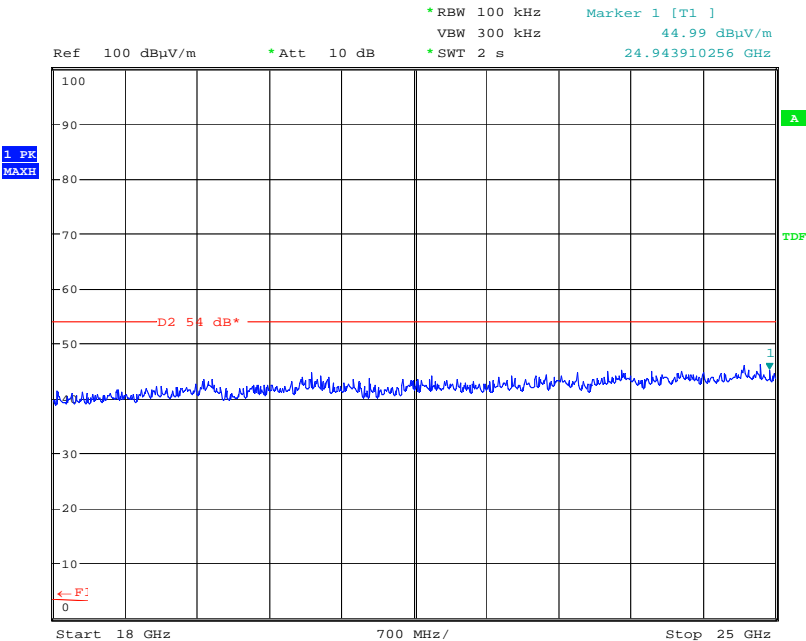
Date: 16.JUN.2009 15:48:42

Radiated Spurious emissions 9 GHz to 13 GHz – 2402MHz



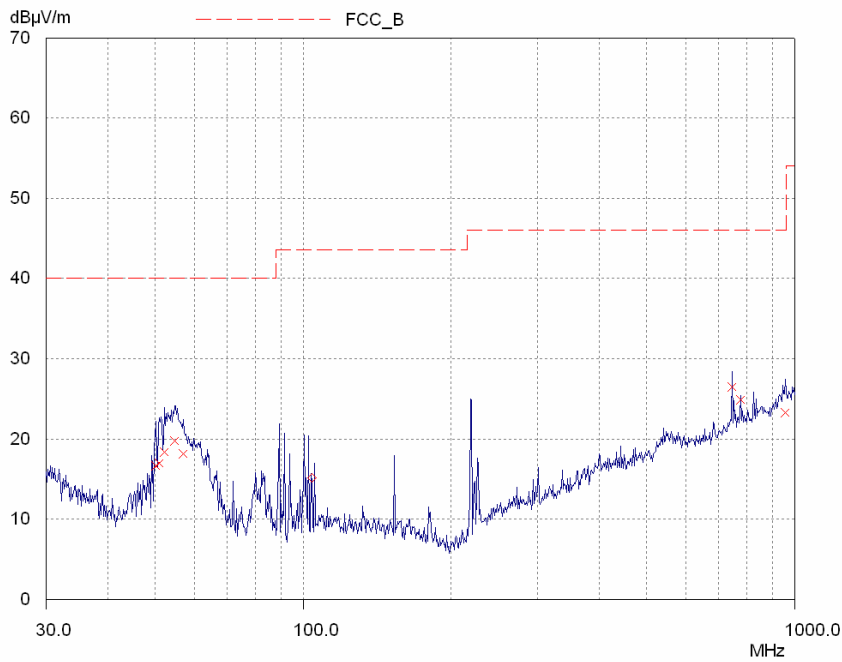
Date: 16.JUN.2009 15:48:27

Radiated Spurious emissions 13 GHz to 18GHz – 2402MHz

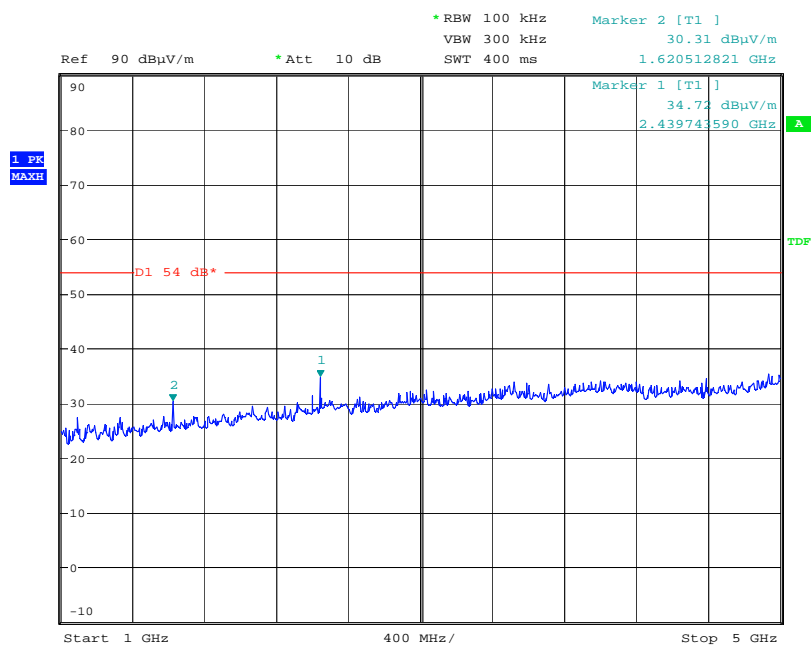


Date: 19.JUN.2009 09:31:57

Radiated Spurious emissions 18 GHz to 25 GHz – 2402MHz

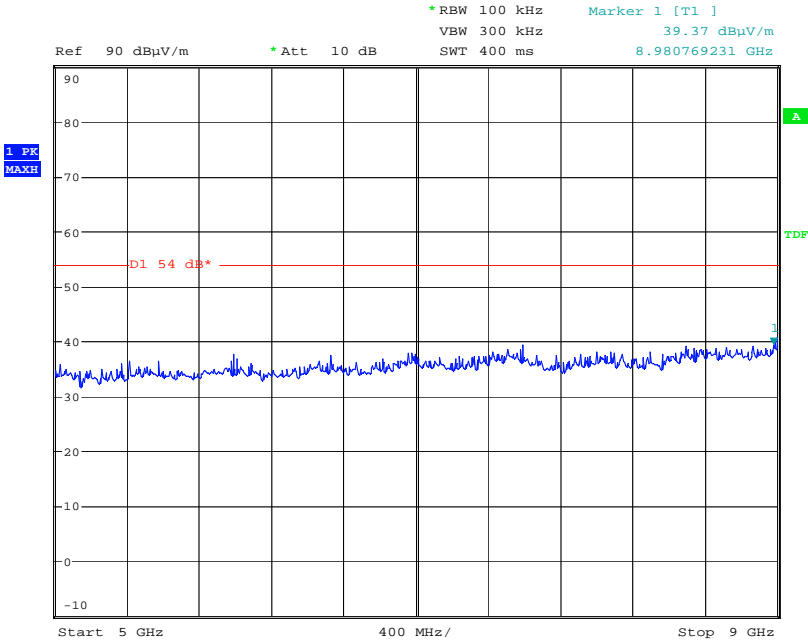


Radiated Spurious emissions 30 MHz to 1 GHz – 2441MHz



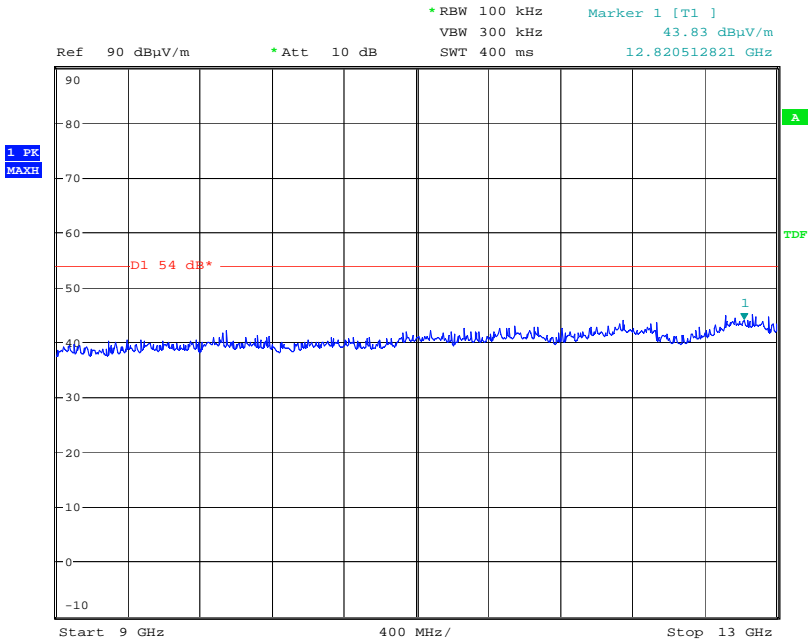
Date: 16.JUN.2009 15:39:51

Radiated Spurious emissions 1 GHz to 5 GHz – 2441MHz



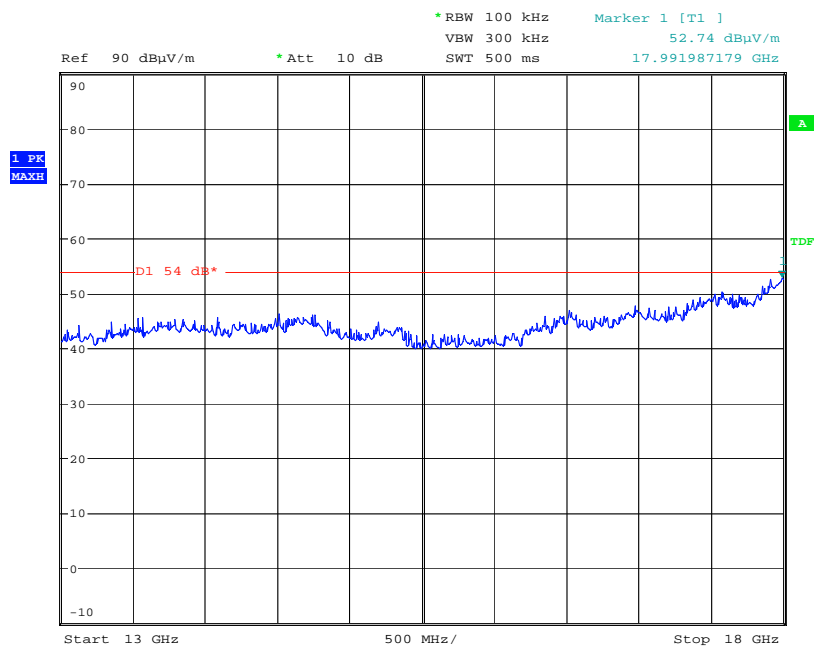
Date: 16.JUN.2009 15:39:26

Radiated Spurious emissions 5 GHz to 9 GHz – 2441MHz



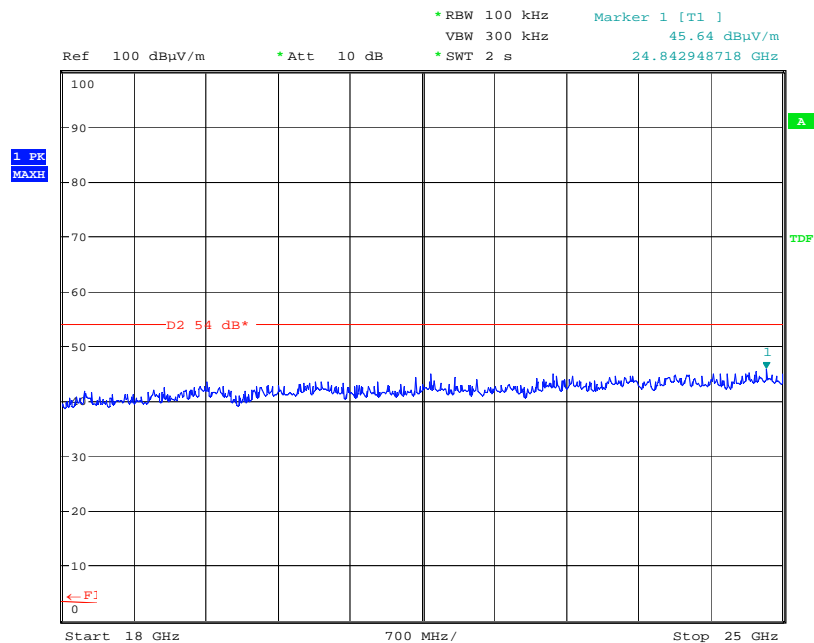
Date: 16.JUN.2009 15:39:15

Radiated Spurious emissions 9 GHz to 13 GHz – 2441MHz



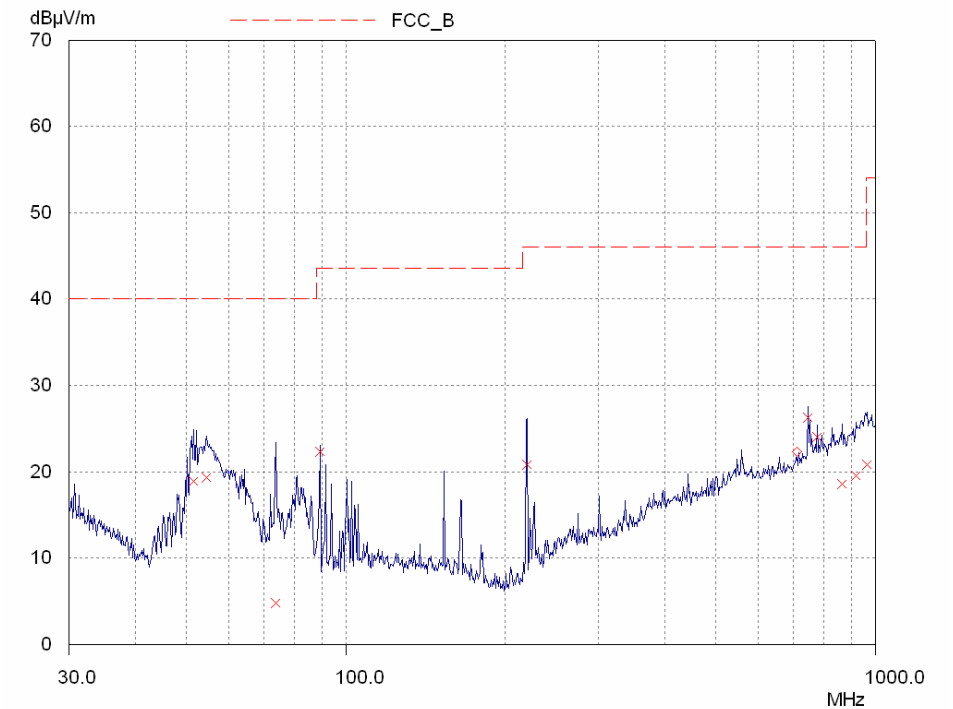
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Radiated Spurious emissions 13 GHz to 18GHz – 2441MHz

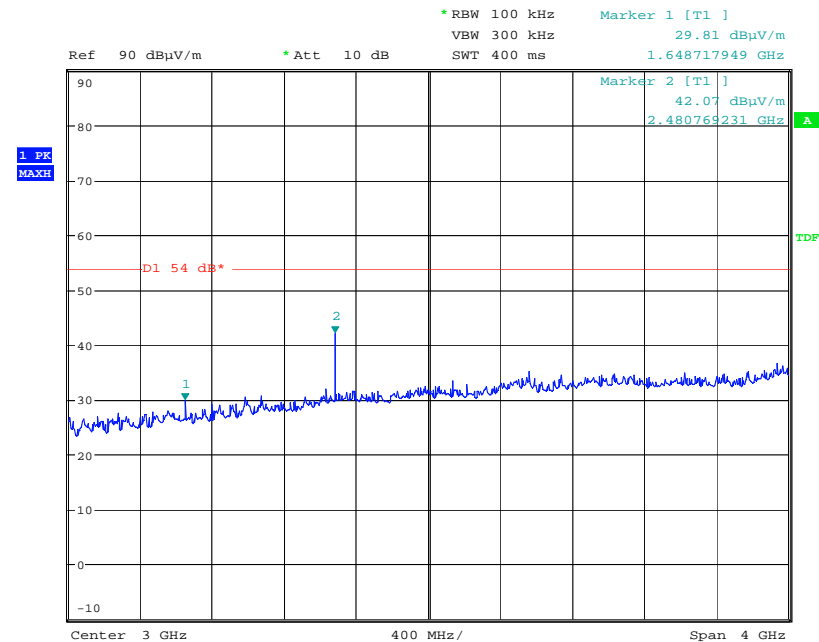


Date: 19.JUN.2009 09:33:39

Radiated Spurious emissions 18 GHz to 25 GHz – 2441MHz

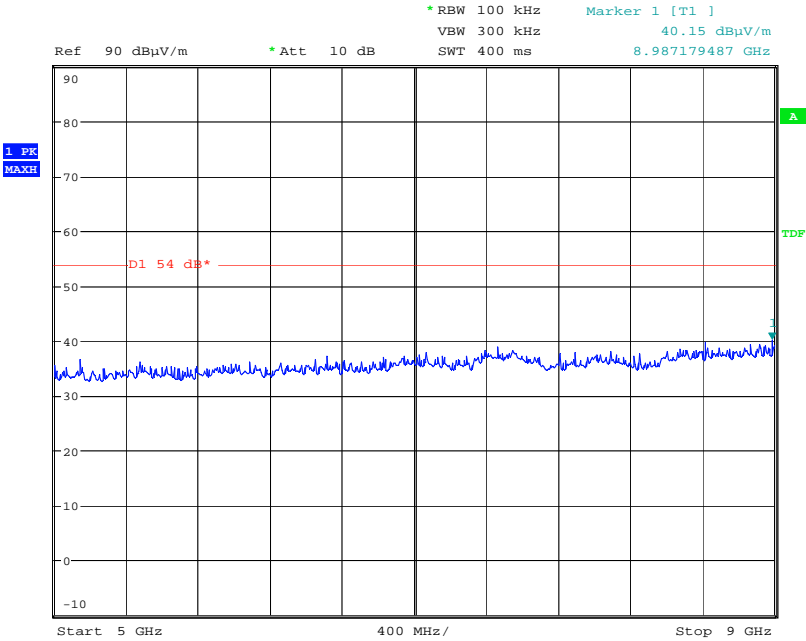


Radiated Spurious emissions 30 MHz to 1 GHz – 2480MHz



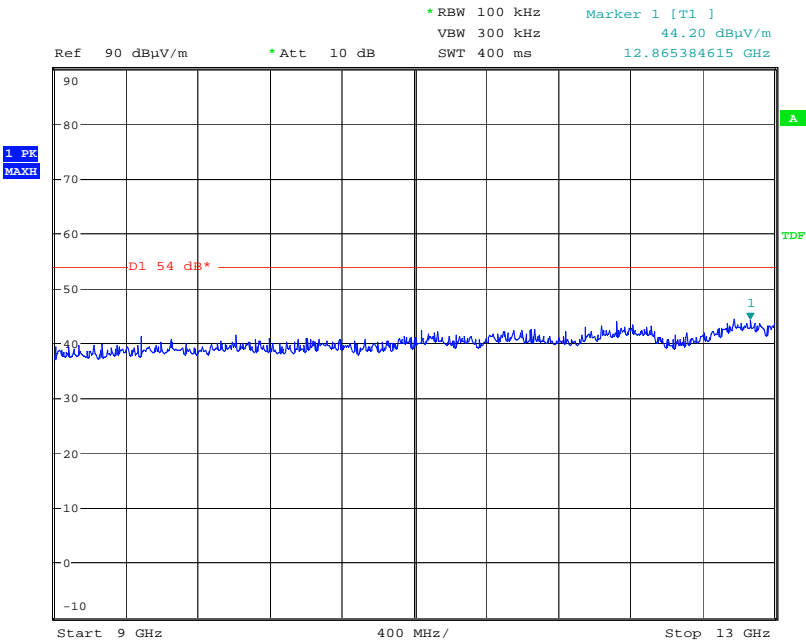
Date: 16.JUN.2009 15:31:05

Radiated Spurious emissions 1 GHz to 5 GHz – 2480MHz



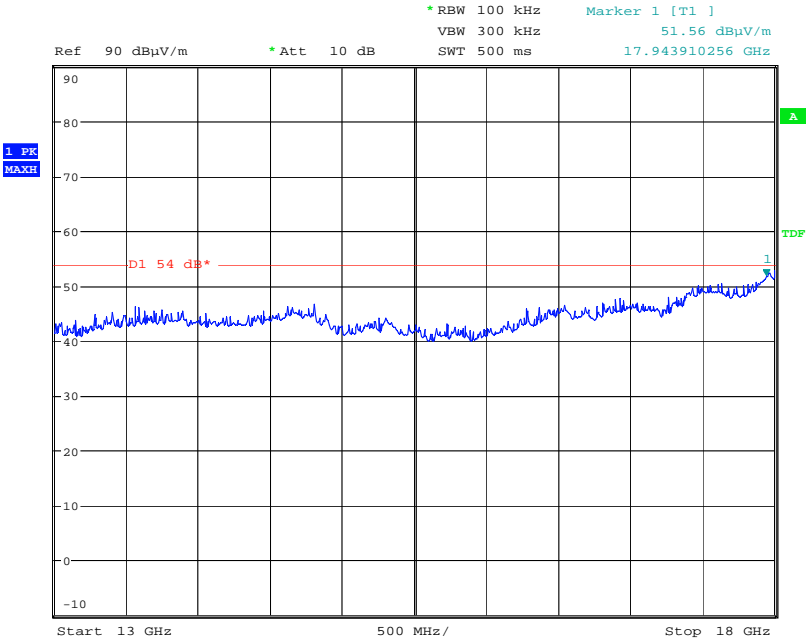
Date: 16.JUN.2009 15:31:20

Radiated Spurious emissions 5 GHz to 9 GHz – 2480MHz



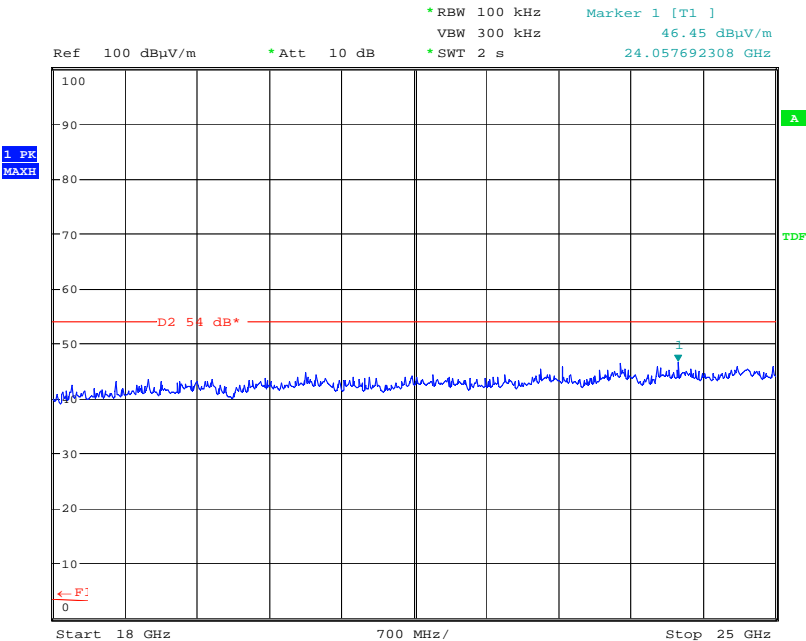
Date: 16.JUN.2009 15:31:33

Radiated Spurious emissions 9 GHz to 13 GHz – 2480MHz



Date: 16.JUN.2009 15:31:46

Radiated Spurious emissions 13 GHz to 18GHz – 2480MHz



Date: 19.JUN.2009 09:34:36

Radiated Spurious emissions 18 GHz to 25 GHz – 2480MHz

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 KTL upon request.

C1) Test samples

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

Sample No.	Description	Identification
S	BSMAN3 Configuration BlueSlim Module	

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

Sample No.	Description	Identification
S46	Dell Latitude Laptop	008140
S	USB – BSMAN1 Connector Adaptor	

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

Identification	Description
REF838	Wireless Connectivity Test Set

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode
All tests detailed in this report	Unless Specified as set to a specific frequency the EUT transmitting on maximum power using FHSS over 79 channels with 1 MHz channel spacing using DH1 packets with the following modulations: 1 Mb/s GFSK 2Mb/s $\pi/4$ -DQPSK 3Mb/s 8DPSK

Test	Description of Operating Mode:
Receiver conducted and radiated (ERP) spurious emissions	EUT active but non-transmitting.

C3) EUT Configuration Information.

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

C4) List of EUT Ports

Sample : S
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
Host Connector	USB – Host Connector Adaptor	N/A	Dell Latitude Laptop

C5 Details of Equipment Used

For Radiated Measurements:

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

For power line conducted emissions

RFG No	Type	Description	Manufacturer	Date Calibrated
n/a	Lab 11	Small Screened Chamber	TRaC	-
189	ESH3-Z5	Single-phase LISN	R & S	14/05/08
190	ESH3-Z2	Pulse Limiter	R & S	24/04/08
125	ESHS 10	Test Receiver (LF)	R & S	24/11/08
404	E4407B	Spectrum Analyser	Agilent	07/04/08
296	BNC	RF coaxial cable (Lab 11)	TRaC	23/09/08
298	BNC	RF coaxial cable (Lab 11)	TRaC	23/09/08

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 = $20 \times (\text{Log}_{10} \text{ Calculated Duty Cycle})$

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.

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

e.g

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

0.07459 or 7.459%

Correction factor (dB) = $20 \times (\text{Log}_{10} 0.07459) = -22.54\text{dB}$

OR

For EUT that uses Zigbee device technology the EUT is designed to be compliant with the requirements of IEEE 802.15.4, which in general assumes a maximum duty cycle of 1%. Therefore in accordance with 47CFR 15.35(c), the emissions may be reduced by a factor of 100 (40 dB). Plots of the duty cycle showing the duty cycle to be less than 1% are contained in Appendix B of this report.

Appendix F:

Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: BSMAN1 front view.
2. Radiated electric field emissions arrangement: BSMAN1 close up.
3. Photo of the BSMAN1 Overview

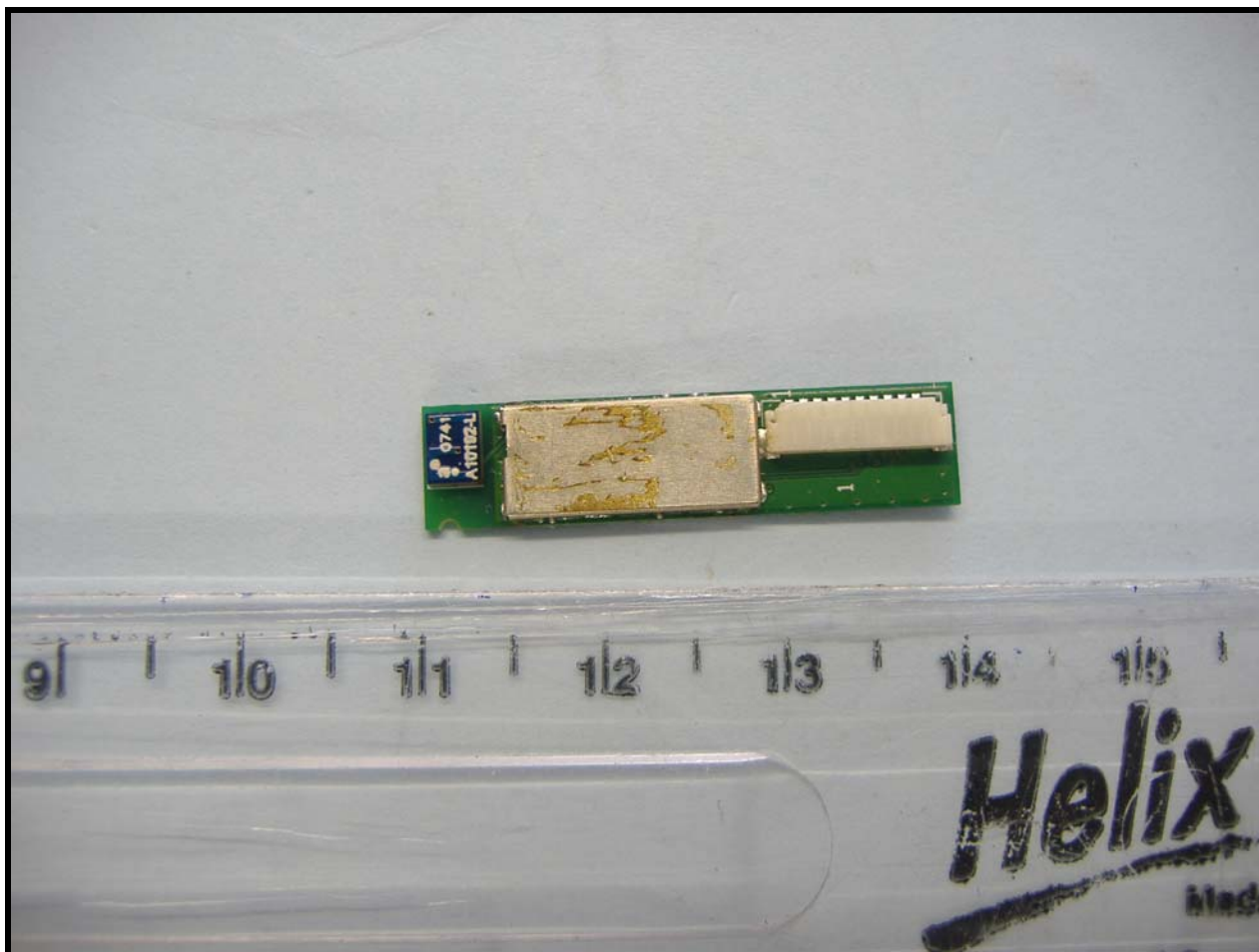
Photograph 1



Photograph 2



Photograph 3



The results herein relate only to the sample tested. Full results are contained in the relevant works order file.

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www.tracglobal.com