A Radio Test Report

FOR

European Engineers Limited

ON

foc.us headset

DOCUMENT NO. TRA-015066-W-US-1

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TRaC Wireless Test Report	**:** TRA-015066-W-US-1
Applicant	**:** European Engineers Limited
Apparatus	**:** foc.us headset
Specification(s)	**:** CFR47 Part 15.247 July 2010 & RSS-210, Issue 8
FCCID	**:** WYV-EN110
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Contents

Section 1: Introduction

1.1 General

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

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1.2 Tests Requested By

This testing in this report was requested by :

European Engineers Limited
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1.3 Manufacturer

As Above

1.4 Apparatus Assessed

The following apparatus was assessed between 3rd – 19th July 2013:

Foc.us headset

The above product is a Transcranial Direct Current Stimulation Headset incorporating Bluetooth LE operating in the 2.4 GHz ISM band. The Bluetooth LE connection is used for controlling the headset via an App installed on another Bluetooth device (e.g. a smart phone).

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)	RSS-210 Issue 8 December 2010 Annex 8, A8.5	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10:2009	Pass
Conducted spurious emissions (Non-restricted bands)	RSS-210 Issue 8 December 2010 Annex 8.A4(4	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10:2009	Pass
AC Power conducted emissions	RSS-GEN Issue 3 December 2010 Annex 7, 7.2.4	Title 47 of the CFR: Part 15 Subpart C; 15.207	ANSI C63.10:2009	N/A
Occupied Bandwidth	RSS-210 Issue 8 December 2010 Annex 8.A8.2a	Title 47 of the CFR : Part 15 Subpart C; 15.247(a)(2)	ANSI C63.10:2009	Pass
Conducted Carrier Power	RSS-210 Issue 8 December 2010 Annex 8.A4(4).	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)	ANSI C63.10:2009	Pass
Power Spectral Density	RSS-210 Issue 8 December 2010 Annex 8.A8.2b	Title 47 of the CFR : Part 15 Subpart C; 15.247(d)	ANSI C63.10:2009	Pass
Unintentional Radiated Spurious Emissions	RSS-GEN Issue 3 December 2010 7.2.2(c)	Title 47 of the CFR: Part 15 Subpart B; 15.109	ANSI C63.10:2009	Pass
RF Safety	RSS-102	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)(5)	-	Pass

The foc.us headset will only be powered by batteries

Abbreviations used in the above table:

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

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

1.6 Notes Relating To The Assessment

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

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

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

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

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

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

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

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

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

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

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2: Measurement Uncertainty

2.1 Application of Measurement Uncertainty

The following table contains the measurement uncertainties for measurements

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

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

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

(iii) Where 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 (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.

RSS-210 Issue 8 December 2010 requires the measurement of the bandwidth of the transmission between the -6 dB points on the transmitted spectrum.

Test Details:	
Regulation	Part 15 Subpart (c) 15.247(a)(2), RSS-210 Annex 8.A8.2a
Measurement standard	ANSI C63.10, KDB Document: 558074
EUT sample number	S10
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	22^0C
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	F_{lower}	F_{Higher}	Measured 6 dB Bandwidth (kHz)	Limit	Result
2402	2401.690705	2402.395833	705.1282	>500kHz	Pass
2440	2439.679487	2440.392628	713.1410	>500kHz	Pass
2480	2479.687500	2480.400641	713.1410	>500kHz	Pass

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

A2 Transmitter Peak Output Power

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

Test Details:	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10, KDB Document: 558074
EUT sample number	S10
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	22^0C
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	Conducted Peak Carrier Power (dBm)	Conducted Peak Carrier Power (mW)	Limit (W)	Result
2402	-3.36	0.46	1	Pass
2440	-4.00	0.4	1	Pass
2480	-4.52	0.35	1	Pass

Notes:

Conducted Measurement

Conducted measurements were performed with a temporary antenna connector provided by the client.

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	Part15 Subpart (c) 15.247(b)(3), RSS-210 Annex 8.A8.2b
Measurement standard	ANSI C63.10, KDB Document: 558074
EUT sample number	S10
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	22^0C
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	Conducted Peak Power Spectral Density (dBm)	Limit (dBm)	Result
2402	-15.51	+8	Pass
2440	-15.94	+8	Pass
2480	-17.14	+8	Pass

Notes:

Conducted Measurement

Conducted measurements were performed on the unique antenna connector.

Measurements performed as per KDB Document:

558074 D01 DTS Meas Guidance v02
Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

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.

Regulation	Part 15 Subpart (c) Clause 15.247(d), RSS-210 Annex 8.A8.5
Measurement standard	ANSI C63.10, KDB Document: 558074
Frequency range	9 kHz to 25 GHz
EUT sample number	S10
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	22^0C
EUT set up	Refer to Appendix C

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

Test Details: 2402 MHz					
Ref No.	Measured Freq (MHz)	Det.	Measured Peak Conducted power (RBW =100kHz) (dBuV)	Limit (dBuV)	Summary
No significant emissions within 20dBm of limit.					

Test Details: 2440 MHz					
Ref No.	Measured Freq (MHz)	Det.	Measured Peak Conducted power (RBW =100kHz) (dBuV)	Limit (dBuV)	Summary
No significant emissions within 20dBm of limit.					

Test Details: 2480MHz					
Ref No.	Measured Freq (MHz)	Det.	Measured Peak Conducted power (RBW =100kHz) (dBuV)	Limit (dBuV)	Summary
No significant emissions within 20dBm of limit.					

Notes:

1. The conducted emission limit for emissions are based on a transmitted carrier level of 15.247(b) / Annex 8, A8.4(2). 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) and Annex 8, A8.5 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) and RSS-GEN 4.9.
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

The limit defined using the following formula in accordance with 15.247(d) and Annex 8, A8.5

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

Where:

The maximum peak conducted power was measured using a peak power meter. Please refer to section A1 of this test report.

Channel Frequency (MHz)	Measured Peak Carrier (dBm)	Emission Limit In a 100 kHz RBW (dBm)
2404	-3.96	-23.9
2440	-4.56	-24.5
2480	-5.49	-25.1

A5 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The maximum permitted field strength is listed in Section 15.209 and per RSS – 210 Annex 8, A8.5. 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 : [X]

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

Test Details:	
Regulation	Part 15 Subpart (c) Clause 15.247(d), RSS – 210 Annex 8, A8.5
Measurement standard	ANSI C63.10, KDB Document: 558074
Frequency range	30MHz – 25GHz
EUT sample number	S09 (2402 & 2440 MHz) or S10 (2480MHz)
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	24^0C
EUT set up	Refer to Appendix C
Photographs (Appendix F)	1 & 2

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

Test Details: 2402 MHz									
Ref No.	**FREQ. (MHz)**	**MEAS Rx (dBµV)**	**CABLE LOSS (dB)**	**ANT FACT. (dB/m)**	**PRE AMP (dB)**	**FIELD ST'GH (dBµV/m)**	**EXTRAP FACT (dB)**	**FIELD ST'GH (µV/m)**	**LIMIT (µV/m)**
1.	336.002	14.3	1.9	14.0	-	30.2	-	32.4	200
2.	384.008	11.4	2.2	15.1	-	28.7	-	27.23	200
3.	4804.1(Pk)	38.1	8.0	32.9	34.7	44.3	-	164.1	5011.8
4.	4804.1(Av)	29.8	8.0	32.9	34.7	36.0	-	63.0	500

Test Details: 2440 MHz									
Ref No.	**FREQ. (MHz)**	**MEAS Rx (dBµV)**	**CABLE LOSS (dB)**	**ANT FACT. (dB/m)**	**PRE AMP (dB)**	**FIELD ST'GH (dBµV/m)**	**EXTRAP FACT (dB)**	**FIELD ST'GH (µV/m)**	**LIMIT (µV/m)**
1.	336.002	14.3	1.9	14.0	-	30.2	-	32.4	200
2.	384.008	11.4	2.2	15.1	-	28.7	-	27.23	200
3.	4880.104(Pk)	38.4	8.3	33.2	34.7	45.2	-	181.97	5011.8
4.	4880.104(Av)	29.2	8.3	33.2	34.7	36.0	-	63.0	500

Test Details: 2480 MHz									
Ref No.	**FREQ. (MHz)**	**MEAS Rx (dBµV)**	**CABLE LOSS (dB)**	**ANT FACT. (dB/m)**	**PRE AMP (dB)**	**FIELD ST'GH (dBµV/m)**	**EXTRAP FACT (dB)**	**FIELD ST'GH (µV/m)**	**LIMIT (µV/m)**
1.	336.002	14.3	1.9	14.0	-	30.2	-	32.4	200
2.	384.008	11.4	2.2	15.1	-	28.7	-	27.23	200
3.	4960.08(Pk)	38.67	8.3	33.5	34.7	45.8	-	194.98	5011.8
4.	4960.08(Av)	29.07	8.3	33.5	34.7	36.2	-	64.56	500

Radiated Electric Field Emissions – Bandedge Compliance

Lower Bandedge Compliance	
Measurement	PK
Carrier power (100kHz RBW)	80.5 dBuV/m
Power At Bandedge dBuV/m	45.1 dBuV/m
Limit (@ -20 dBc)	60.5 dBuV/m
Margin	15.4 dB
Result	Compliant

Upper Bandedge Compliance		
Measurement	PK	AV
Level At Bandedge dBuV/m	44.1 dBuV/m	37.4 dBuV/m
Limit dBuV/m	74.0 dBuV/m	54.0 dBuV/m
Margin	29.9 dB	16.6 dB
Result	Compliant	Compliant

Plots are contained in appendix 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.
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) and RSS-Gen 4.3.

Radiated emission limits (47 CFR Part 15: Clause 15.209) for emissions falling within the restricted bands defined in 15.205(a) and RSS-Gen 7.2.2:

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 Antenna Gain

The maximum antenna gain for the antenna types to be used with the EUT, as declared by the client, is 1.7dBi.

A7 Unintentional Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The maximum permitted field strength is listed in Section 15.109 and in RSS- GEN Section 7.2.3. 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:	
Regulation	Part 15 Subpart (b) Clause 15.109, RSS – GEN Section 7.2.3
Measurement standard	ANSI C63.10
Frequency range	30MHz to 25 GHz
EUT sample number	S09 (2402 & 2440 MHz) or S10 (2480MHz)
Modification state	0
SE in test environment	None
SE isolated from EUT	None
Temperature	24^0C
EUT set up	Refer to Appendix C
Photographs (Appendix F)	1 & 2

The worst case radiated emission measurements for spurious emissions:

Test Details: 2402 MHz									
Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	336.002	14.3	1.9	14.0	-	30.2	-	32.4	200
2.	384.008	11.4	2.2	15.1	-	28.7	-	27.23	200
3.	4806.102(Pk)	38.8	8	32.9	34.7	45.0	-	177.8	5011.8
4.	4806.102(AV)	30.1	8	32.9	34.7	36.3	-	65.3	500

Test Details: 2440 MHz									
Ref No.	**FREQ. (MHz)**	**MEAS Rx (dBµV)**	**CABLE LOSS (dB)**	**ANT FACT. (dB/m)**	**PRE AMP (dB)**	**FIELD ST'GH (dBµV/m)**	**EXTRAP FACT (dB)**	**FIELD ST'GH (µV/m)**	**LIMIT (µV/m)**
1.	336.002	14.3	1.9	14.0	-	30.2	-	32.4	200
2.	384.008	11.4	2.2	15.1	-	28.7	-	27.23	200
3.	4806.102(Pk)	38.8	8	32.9	34.7	45.0	-	177.8	5011.8
4.	4806.102(AV)	30.1	8	32.9	34.7	36.3	-	65.3	500

Test Details: 2480 MHz									
Ref No.	**FREQ. (MHz)**	**MEAS Rx (dBµV)**	**CABLE LOSS (dB)**	**ANT FACT. (dB/m)**	**PRE AMP (dB)**	**FIELD ST'GH (dBµV/m)**	**EXTRAP FACT (dB)**	**FIELD ST'GH (µV/m)**	**LIMIT (µV/m)**
1.	336.002	14.3	1.9	14.0	-	30.2	-	32.4	200
2.	384.008	11.4	2.2	15.1	-	28.7	-	27.23	200
3.	4806.102(Pk)	38.8	8	32.9	34.7	45.0	-	177.8	5011.8
4.	4806.102(AV)	30.1	8	32.9	34.7	36.3	-	65.3	500

Sample Plots for 2440 MHz operation can be found in Appendix 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 For emissions below 30MHz the cable losses are assumed to be negligible.
2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
4 For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak	RBW= 1MHz, VBW ≥ RBW
Average	RBW= 1MHz, VBW ≥ RBW

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) and RSS-Gen 4.3.

Radiated emission limits 47 CFR Part 15: Clause 15.209 and RSS – GEN Section 7.2.3 for all emissions:

Frequency of emission (MHz)	Field strength μV/m	Measurement Distance m	Field strength dBμV/m
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

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

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

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

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

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

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

Appendix B: Supporting Graphical Data

This appendix contains graphical data obtained during testing.

Notes:

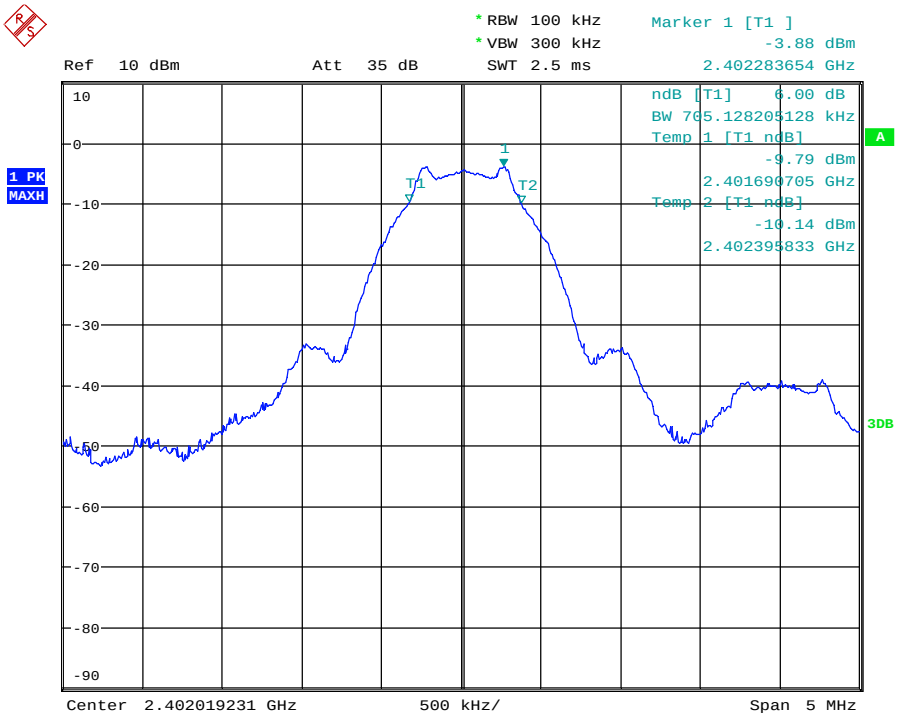
(a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.

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

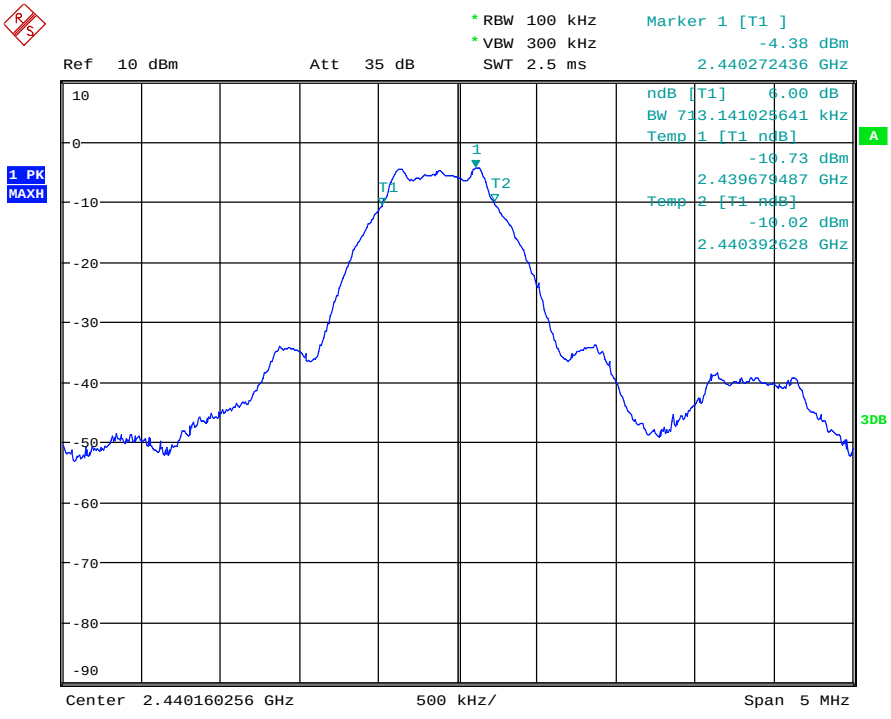
(c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.

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

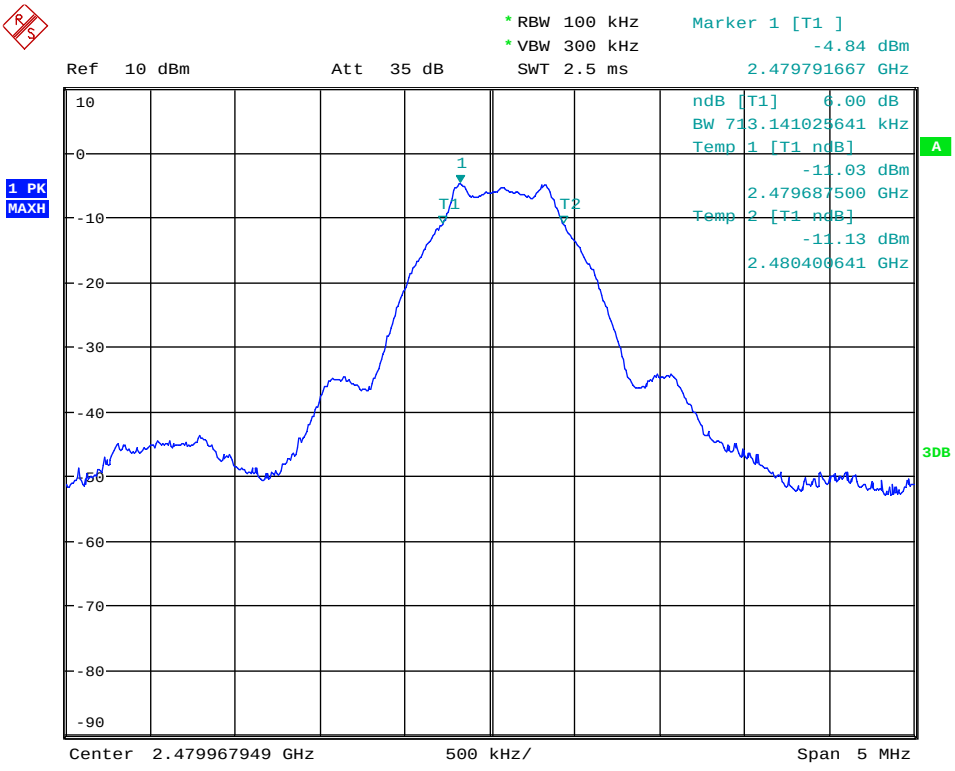
(e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.



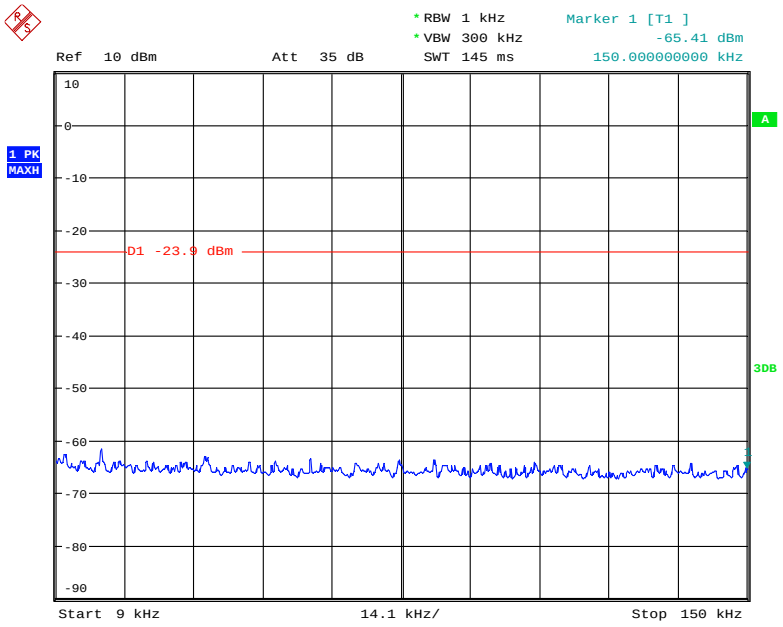
6dB Bandwidth 2402 MHz



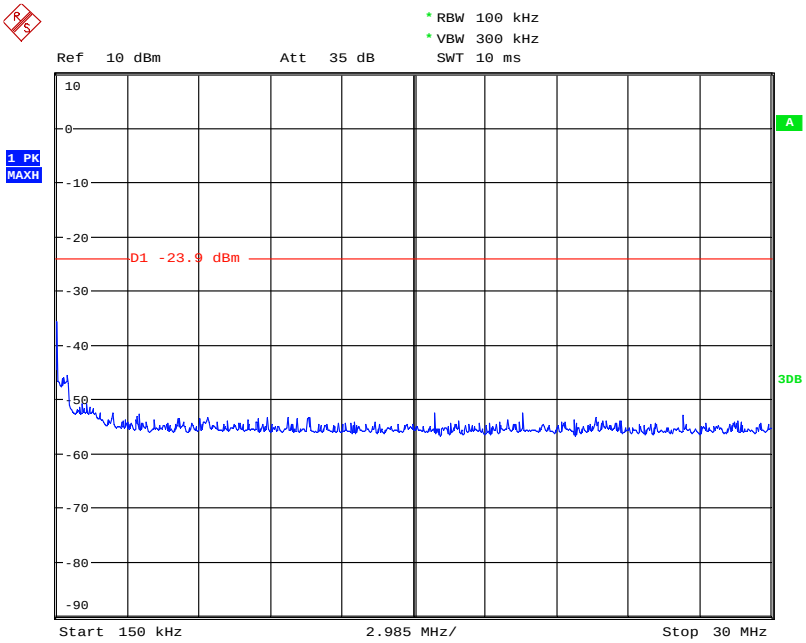
6dB Bandwidth 2440 MHz



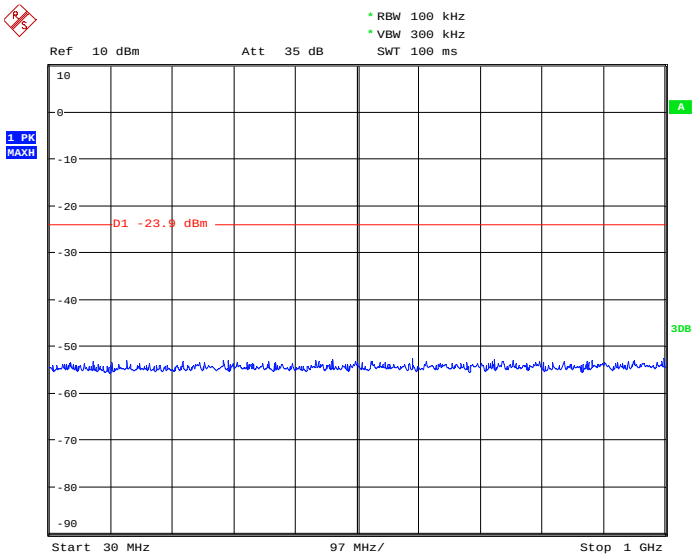
6dB Bandwidth 2480 MHz



Conducted Spurious emissions 9kHz to 150 MHz – 2402MHz

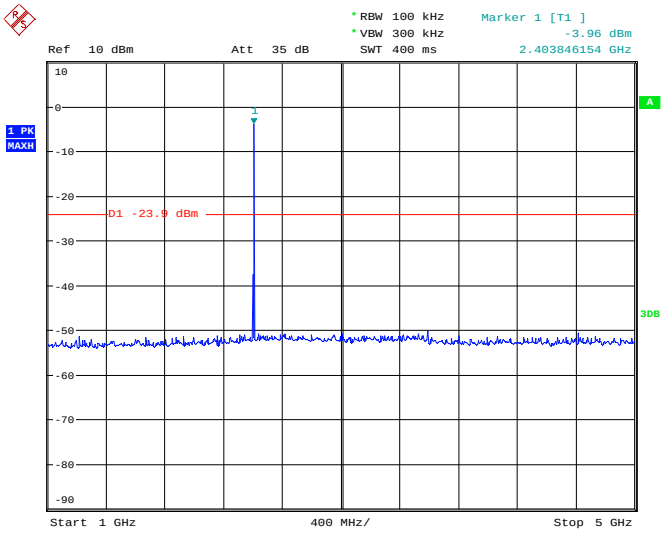


Conducted Spurious emissions 150kHz to 30 MHz – 2402MHz



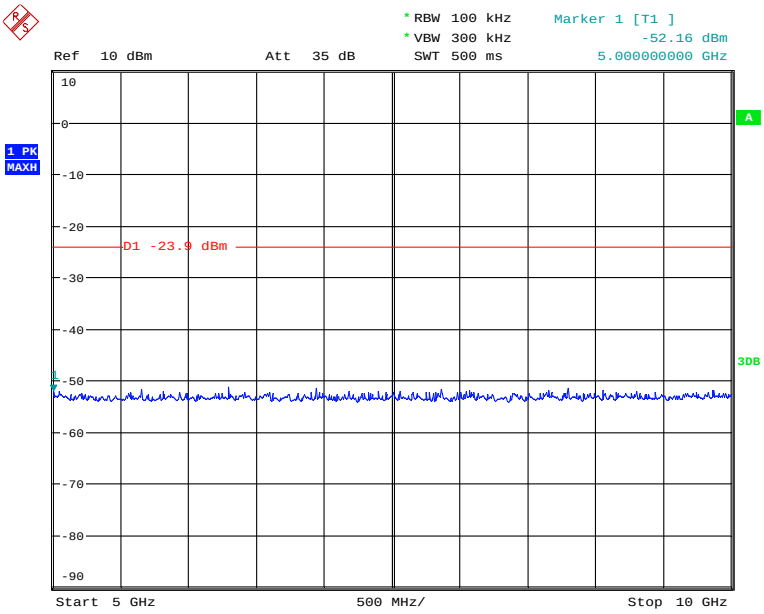
Date: 17.JUL.2013 11:21:18

Conducted Spurious emissions 30 MHz to 1 GHz – 2405MHz



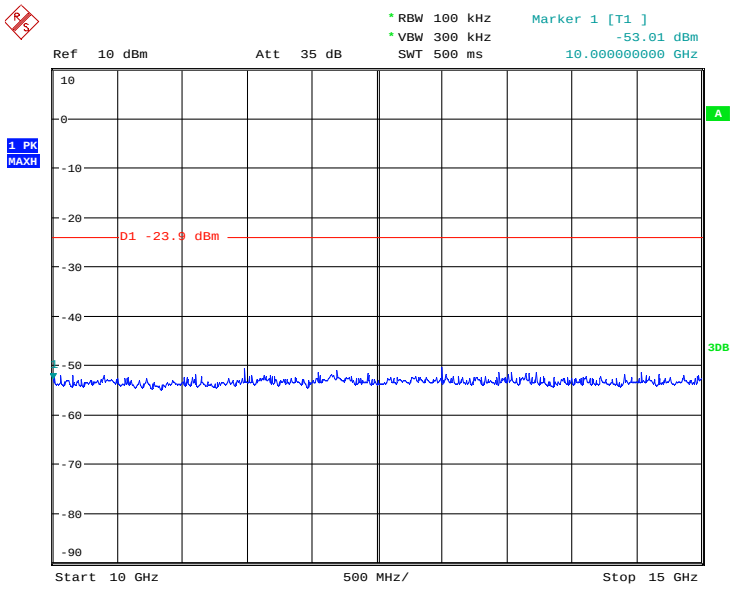
Date: 17.JUL.2013 11:33:16

Conducted Spurious emissions 1 GHz- 5GHz – 2402MHz



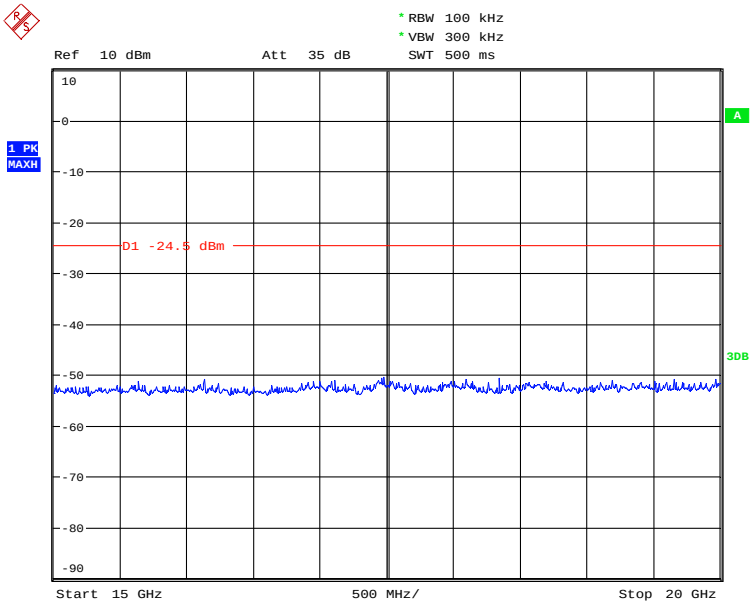
Date: 17.JUL.2013 11:37:40

Conducted Spurious emissions 5 GHz to 10 GHz – 2402MHz



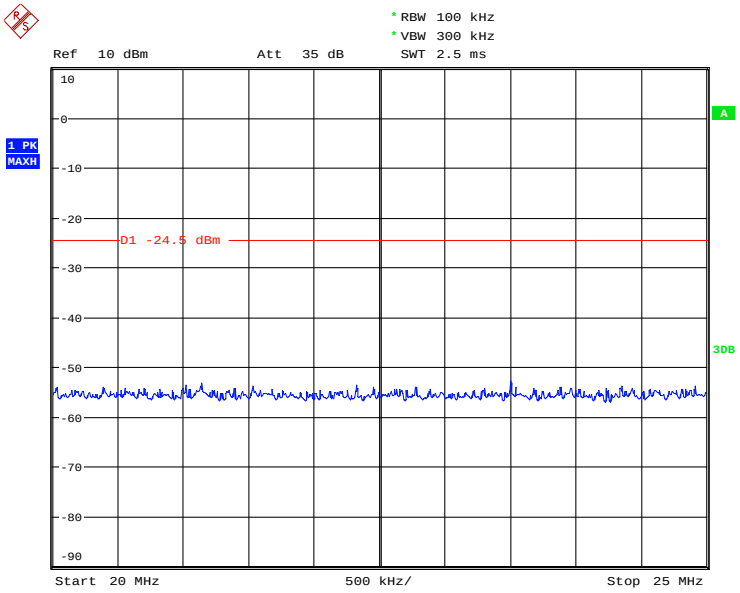
Date: 17.JUL.2013 11:40:57

Conducted Spurious emissions 10 GHz to 15GHz – 2402MHz



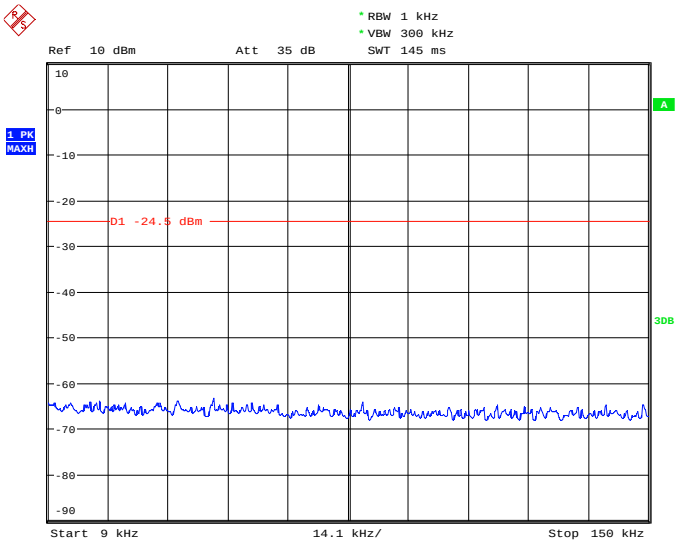
Date: 17.JUL.2013 13:29:19

Conducted Spurious emissions 15 GHz to 20 GHz – 2402MHz



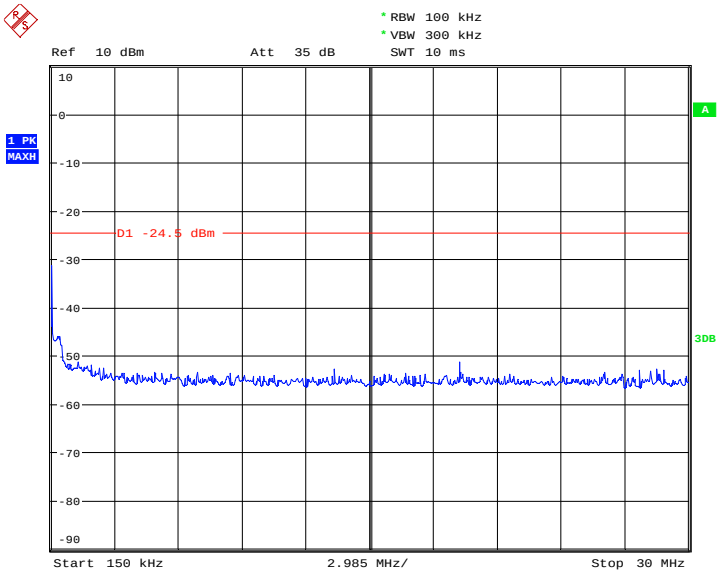
Date: 17.JUL.2013 13:31:08

Conducted Spurious emissions 20 GHz to 25 GHz – 2402MHz



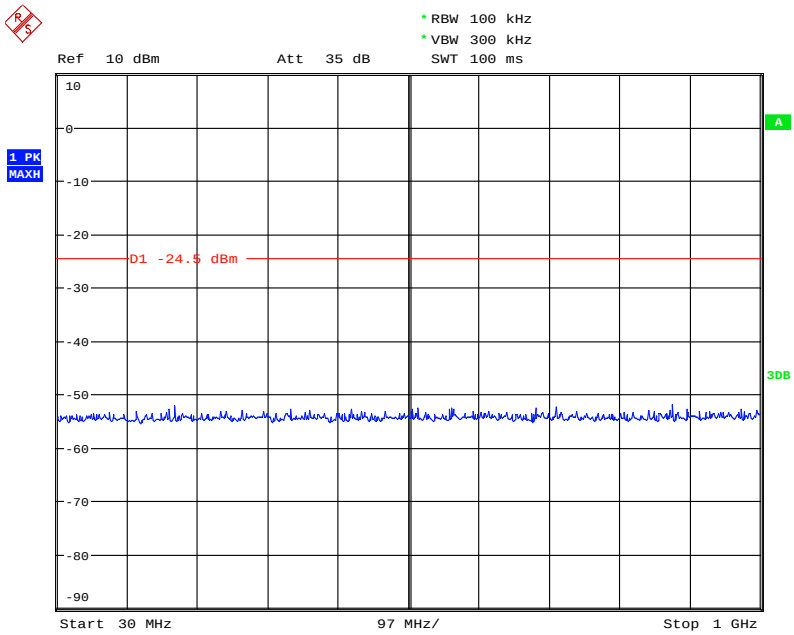
Date: 17.JUL.2013 13:11:43

Conducted Spurious emissions 9kHz to 150 MHz – 2440MHz



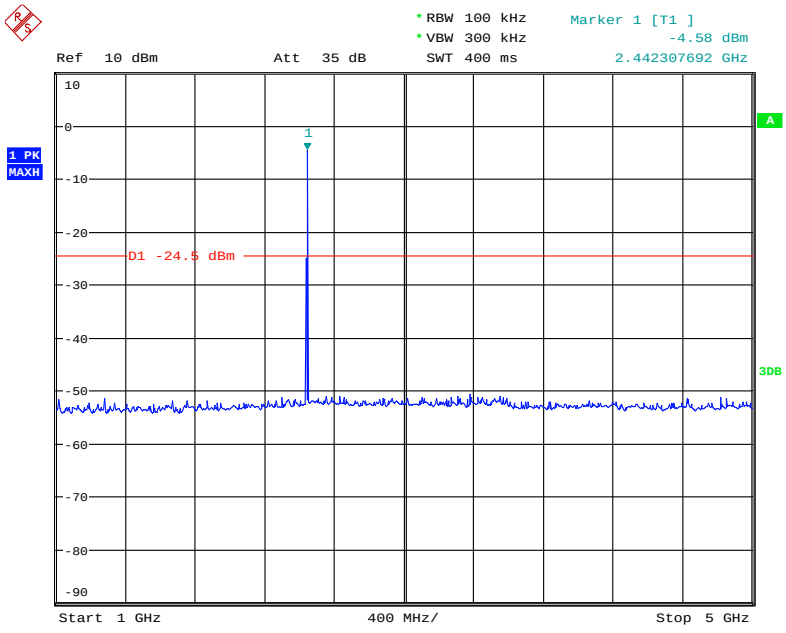
Date: 17.JUL.2013 13:13:59

Conducted Spurious emissions 150kHz to 30 MHz – 2440 MHz



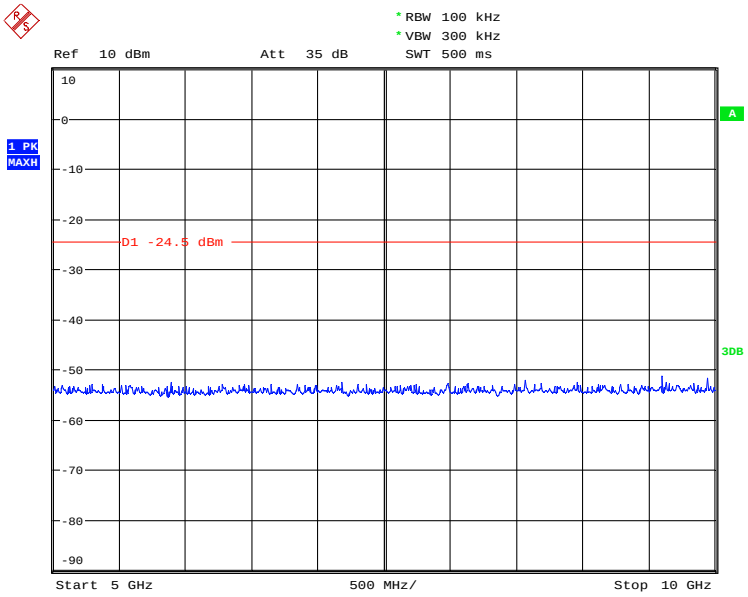
Date: 17.JUL.2013 13:15:07

Conducted Spurious emissions 30 MHz to 1 GHz – 2440 MHz



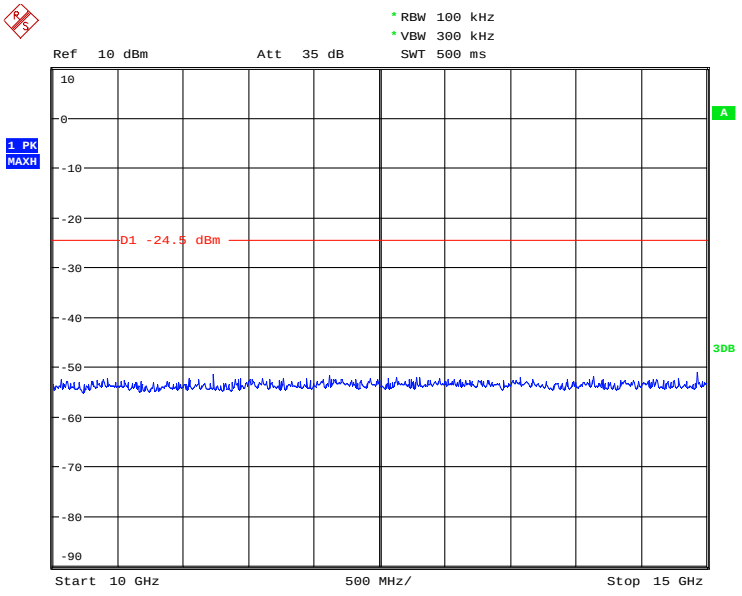
Date: 17.JUL.2013 13:20:55

Conducted Spurious emissions 1 GHz to 5 GHz – 2440 MHz



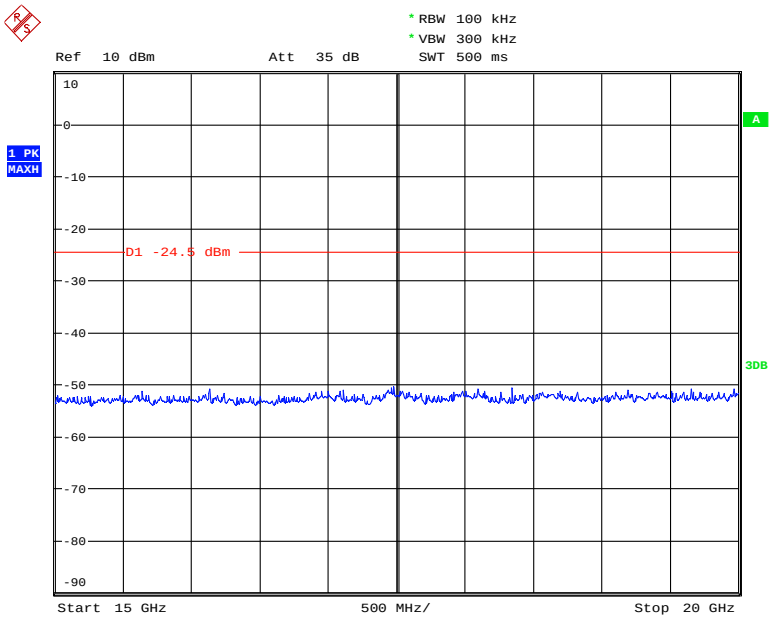
Date: 17.JUL.2013 13:21:42

Conducted Spurious emissions 5 GHz to 10 GHz – 2440 MHz

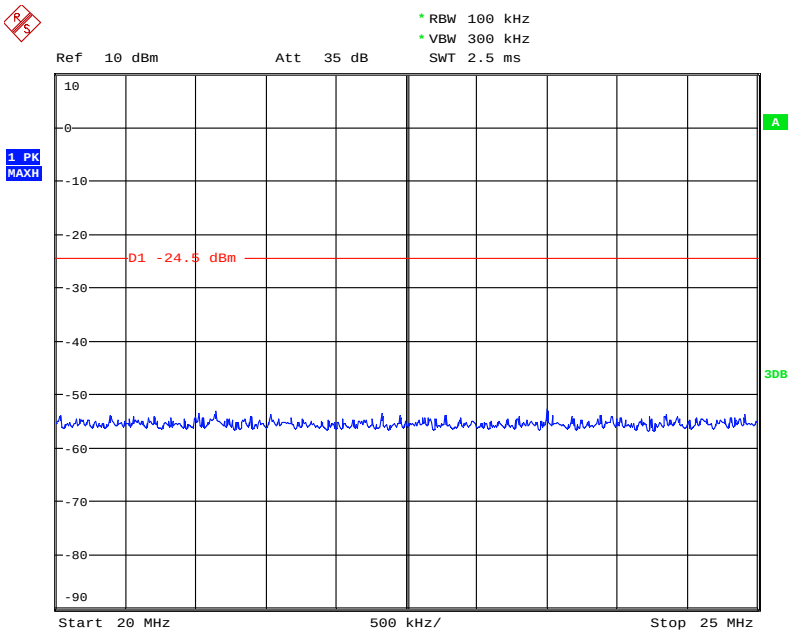


Date: 17.JUL.2013 13:32:19

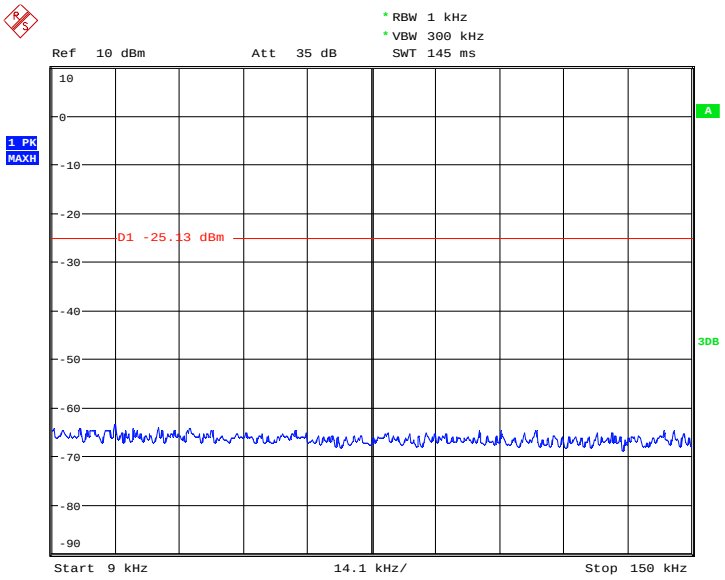
Conducted Spurious emissions 10 GHz to 15GHz – 2440 MHz



Conducted Spurious emissions 15 GHz to 20GHz – 2440 MHz

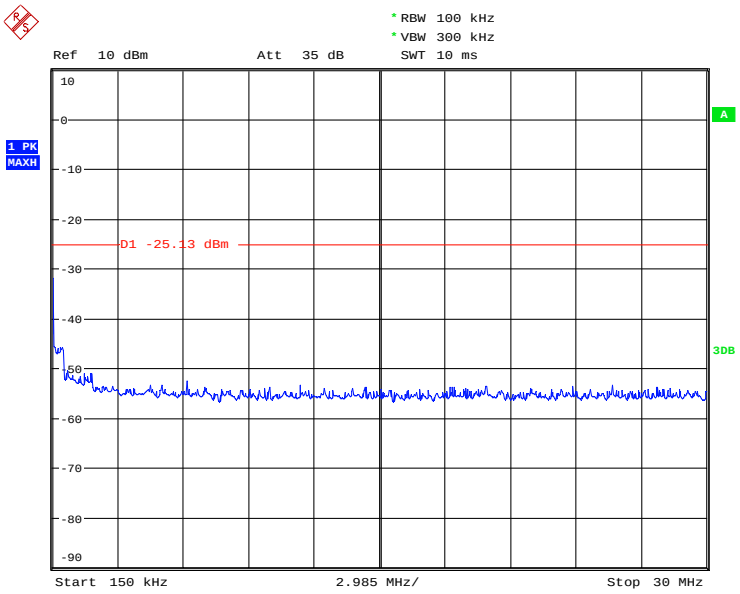


Conducted Spurious emissions 20 GHz to 25GHz – 2440 MHz



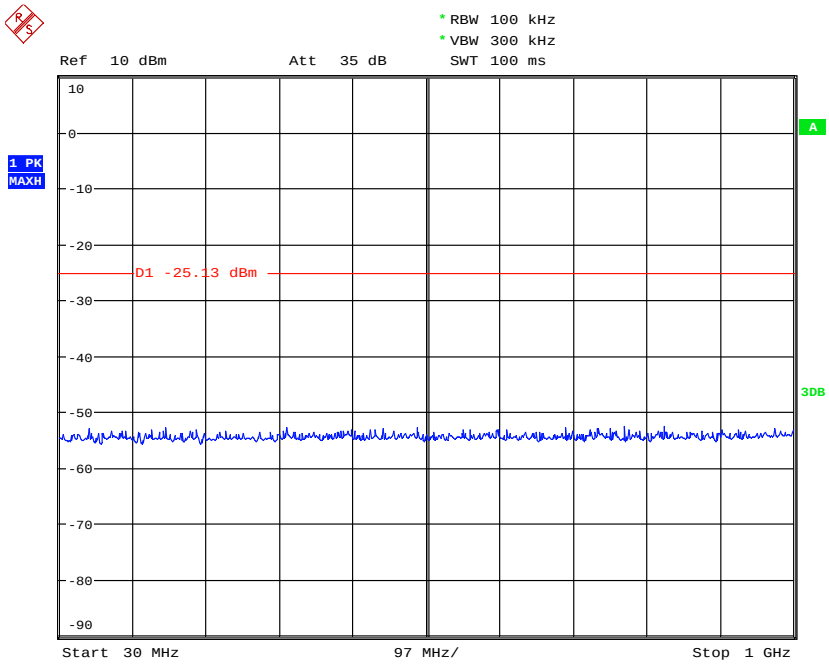
Date: 17.JUL.2013 13:40:28

Conducted Spurious emissions 9kHz to 150 MHz – 2480MHz



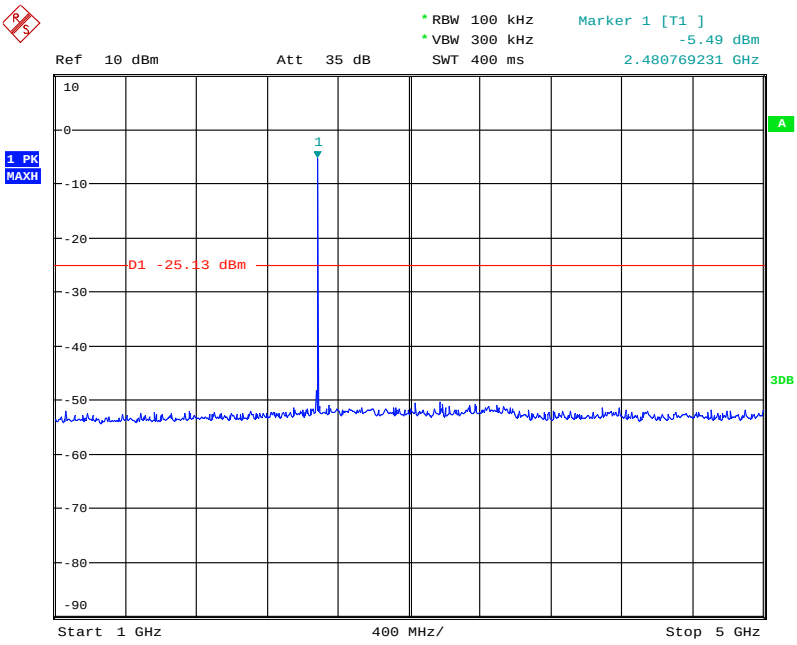
Date: 17.JUL.2013 13:42:54

Conducted Spurious emissions 150 kHz to 30 MHz – 2480MHz



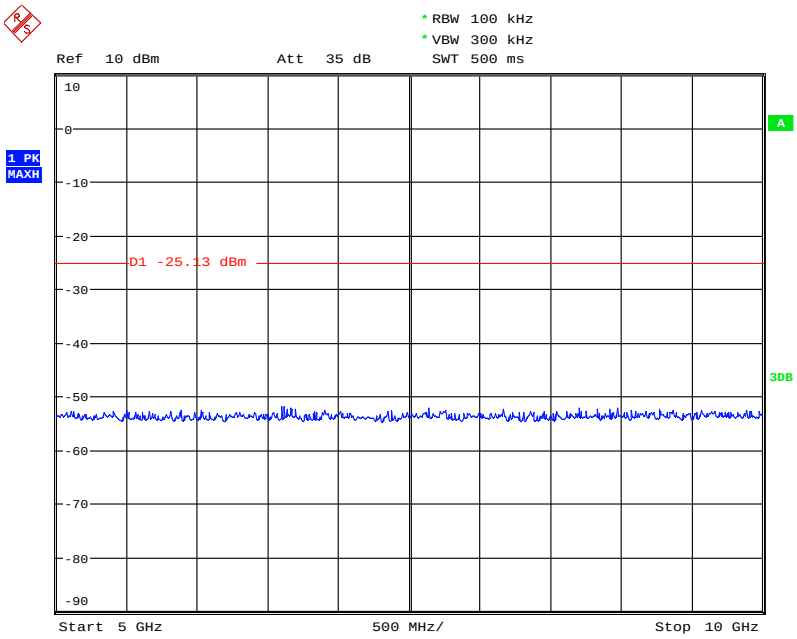
Date: 17.JUL.2013 13:44:16

Conducted Spurious emissions 30 MHz to 1 GHz – 2480MHz



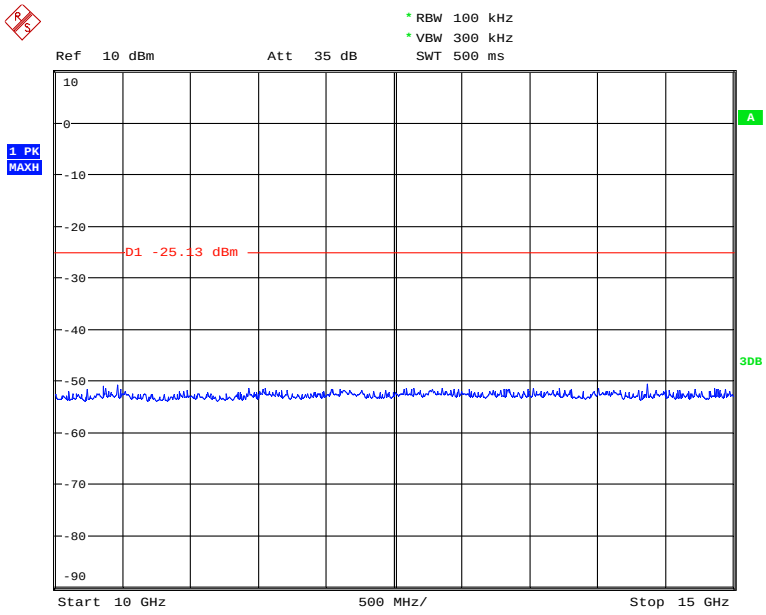
Date: 17.JUL.2013 13:49:03

Conducted Spurious emissions 1 GHz to 5 GHz – 2480MHz



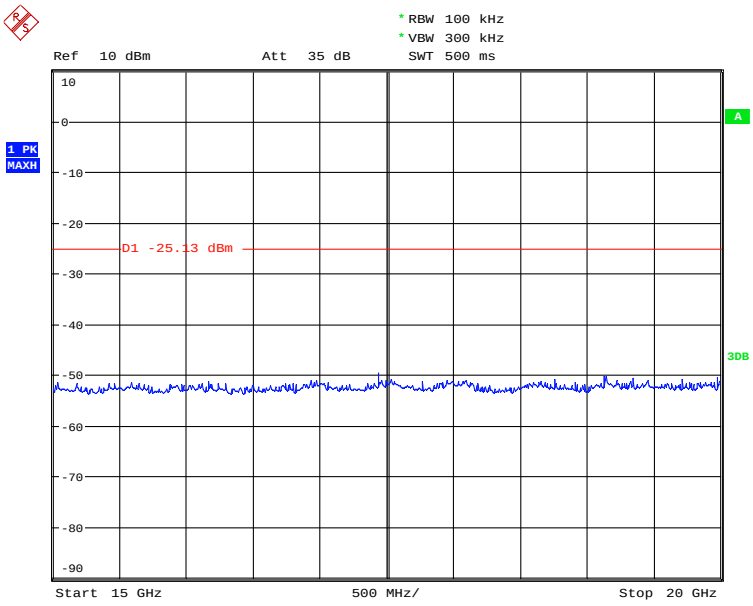
Date: 17.JUL.2013 13:50:48

Conducted Spurious emissions 5 GHz to 10 GHz– 2480MHz



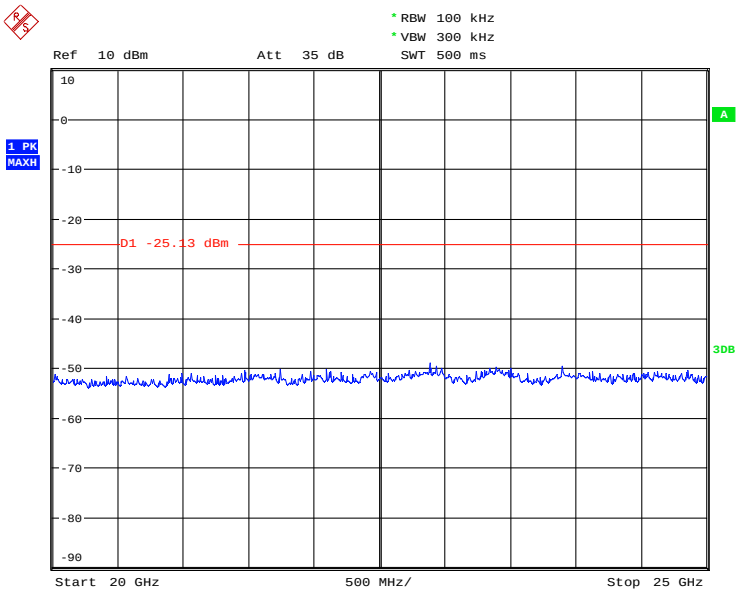
Date: 17.JUL.2013 13:53:52

Conducted Spurious emissions 10 GHz to 15 GHz– 248 MHz



Date: 17.JUL.2013 13:56:35

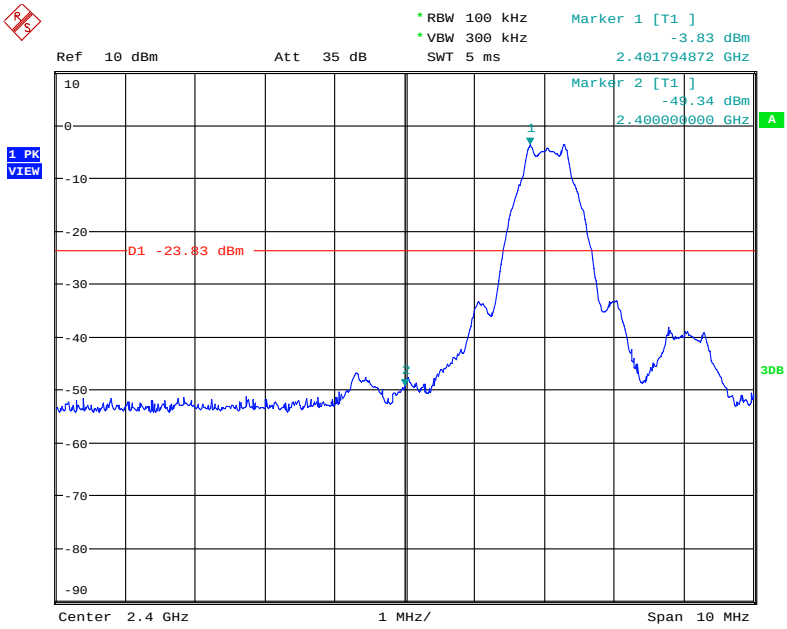
Conducted Spurious emissions 15 GHz to 20 GHz– 2480MHz



Date: 17.JUL.2013 13:58:19

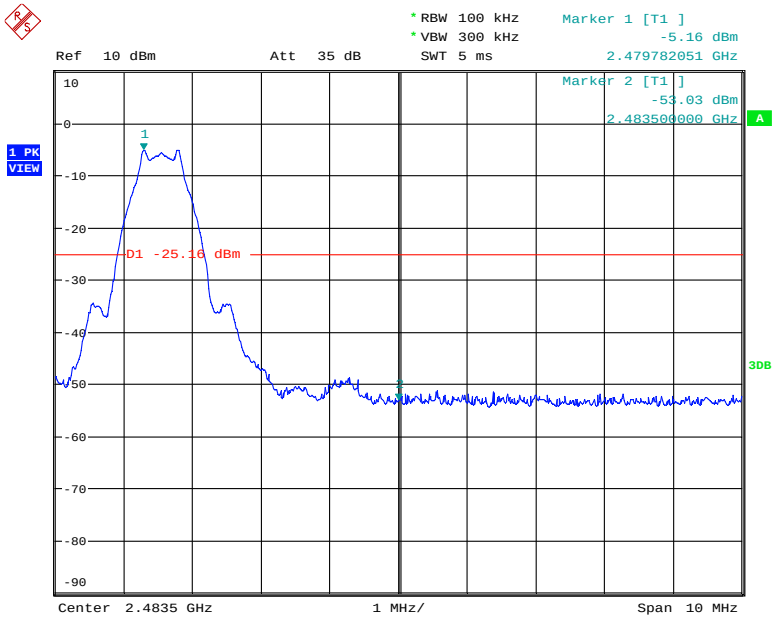
Conducted Spurious emissions 20 GHz to 25 GHz– 2480MHz

Conducted Bandedge Compliance



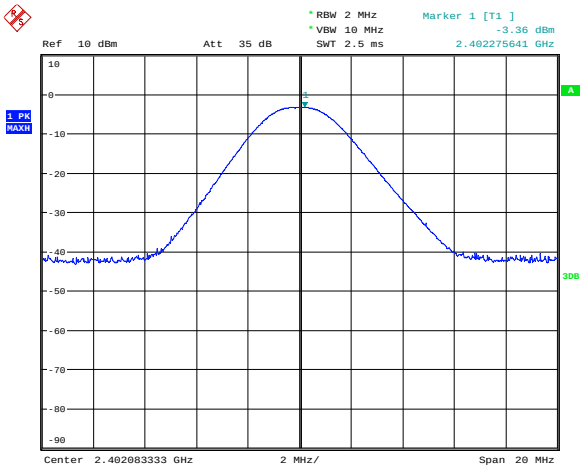
Date: 19.JUL.2013 14:27:34

Lower Bandedge

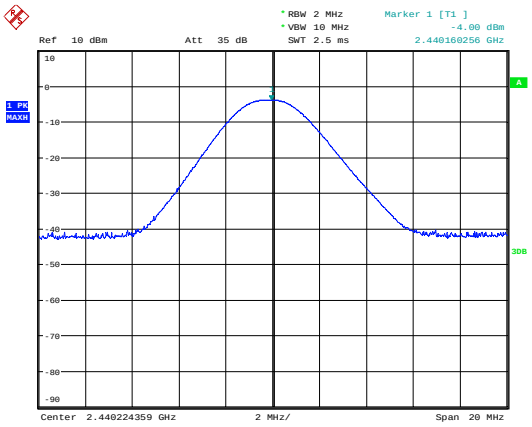


Date: 19.JUL.2013 14:32:00

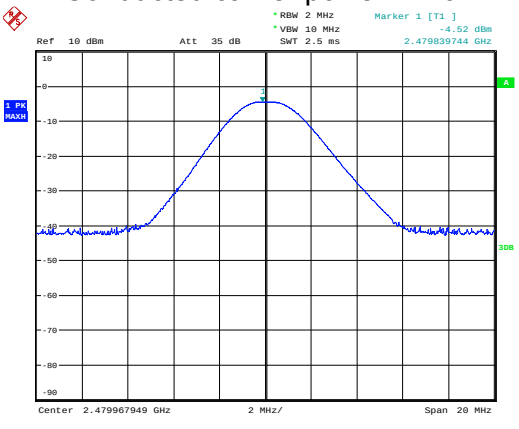
Upper Bandedge



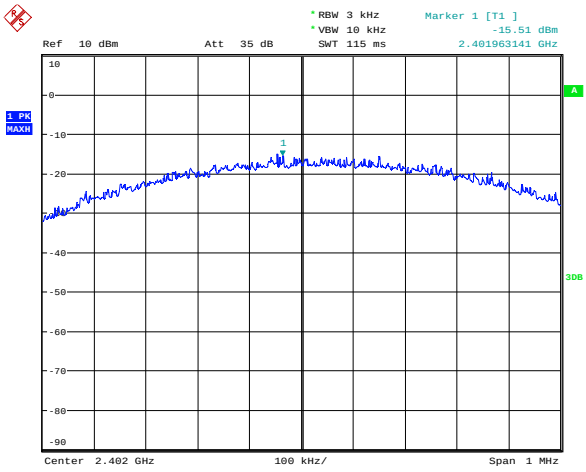
Conducted carrier power 2402MHz



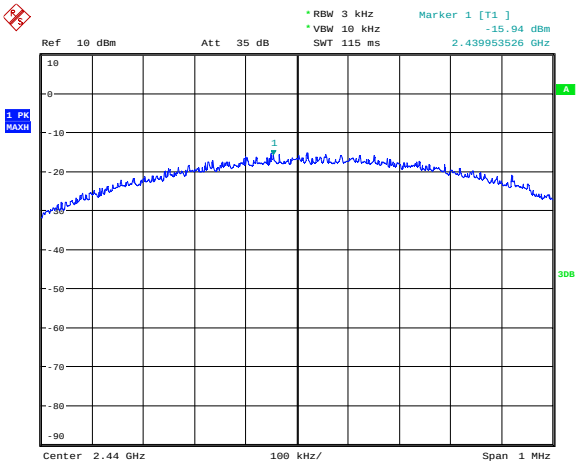
Conducted carrier power 2440 MHz



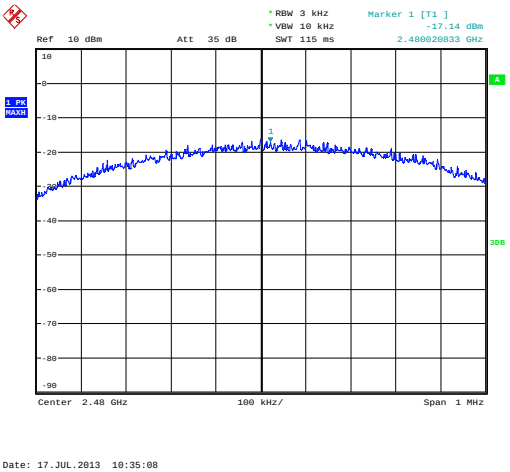
Conducted carrier power 2480 MHz



Conducted power spectral density 2402MHz

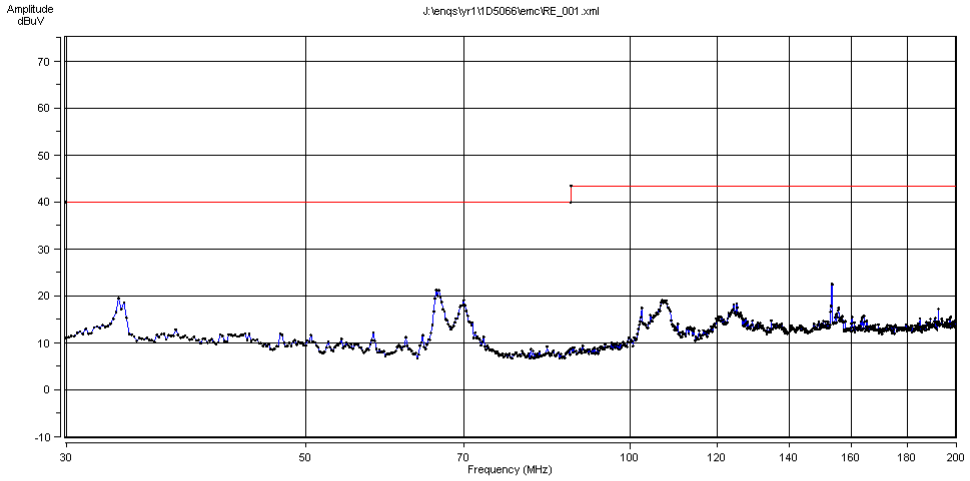


Conducted power spectral density 2440 MHz



Conducted power spectral density 2480 MHz

TRaC EMC Emissions Software - Radiated emissions

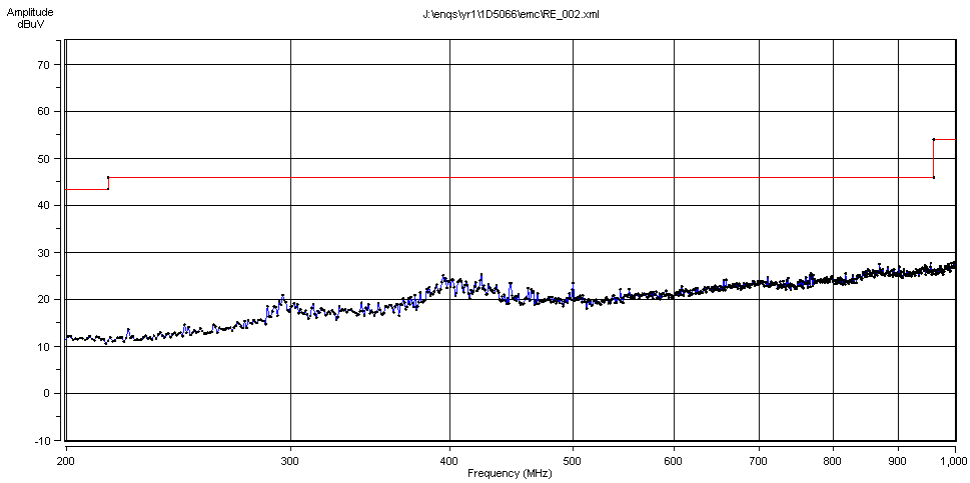


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 09:01:09
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 30 MHz to 200 MHz – 2402MHz

TRaC EMC Emissions Software - Radiated emissions

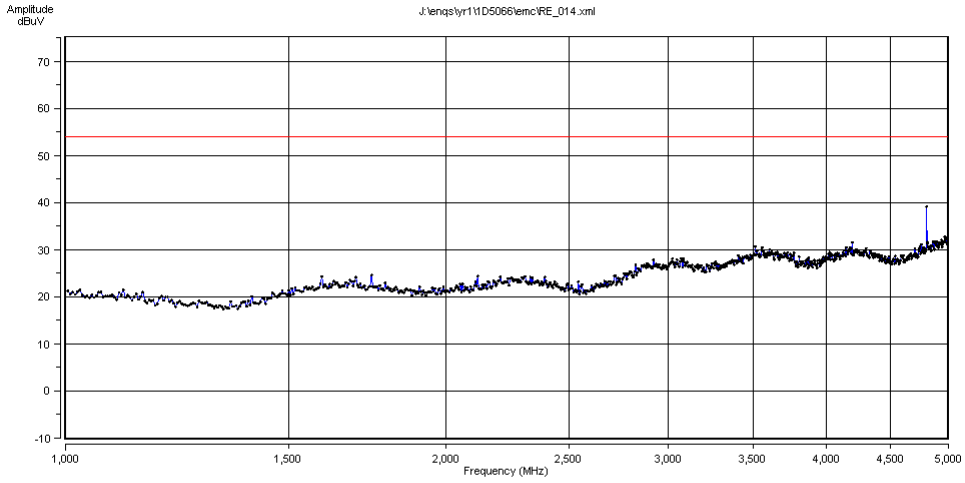


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 09:19:23
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 200 MHz to 1 GHz – 2402MHz

TRaC EMC Emissions Software - Radiated emissions

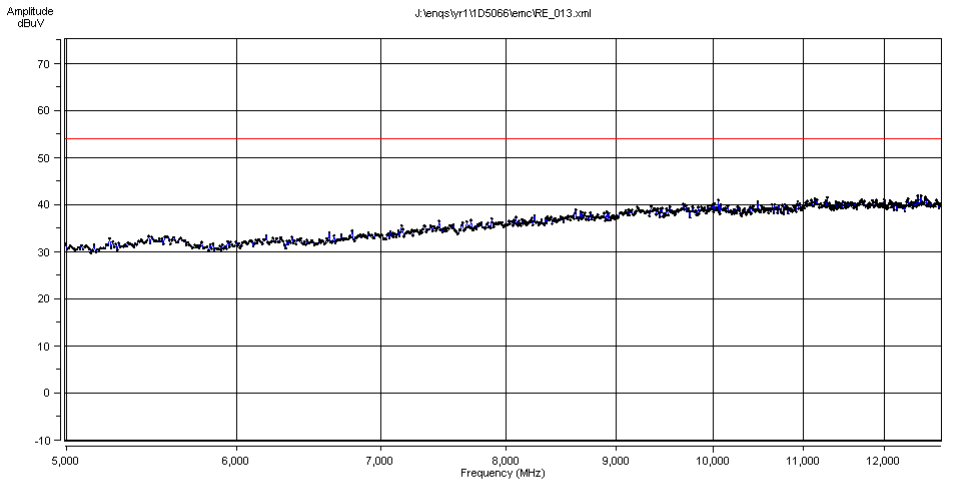


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:31:49
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 1 GHz to 5 GHz – 2402MHz

TRaC EMC Emissions Software - Radiated emissions

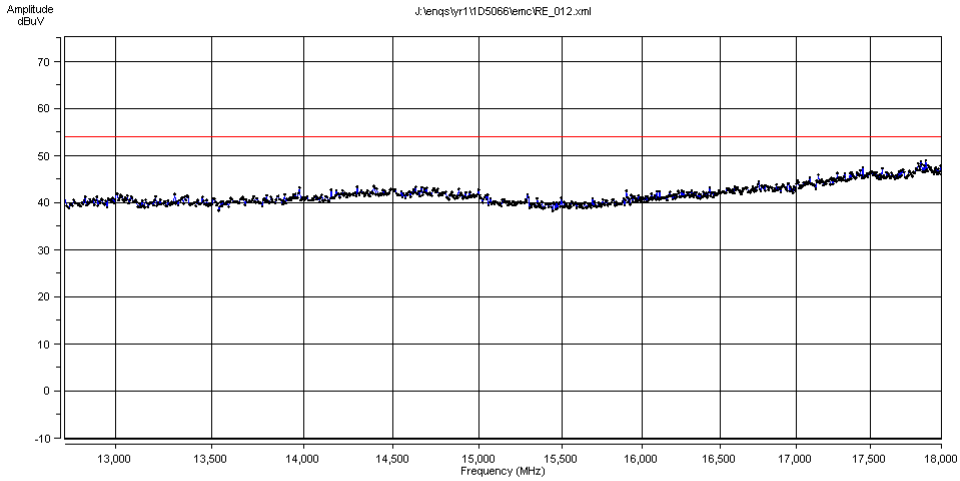


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:24:46
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 5 GHz to 12.5 GHz – 2402MHz

TRaC EMC Emissions Software - Radiated emissions

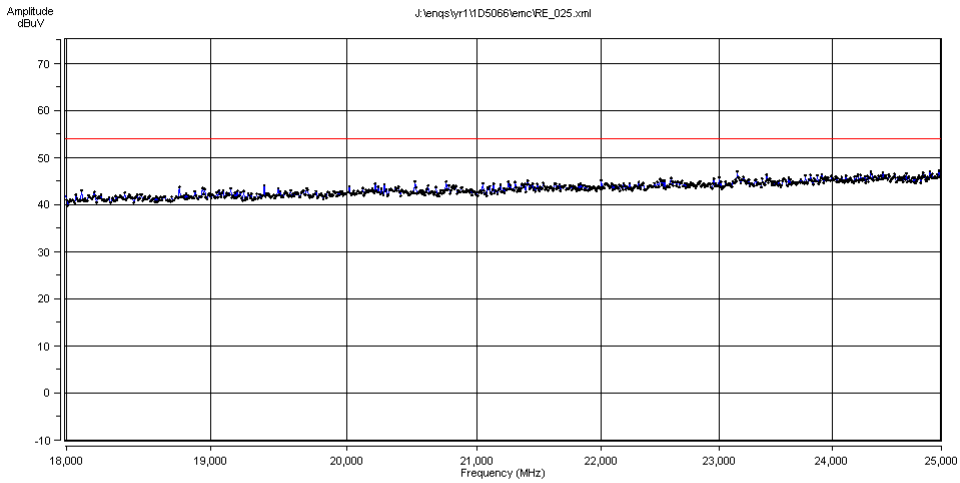


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:21:19
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 12.5 GHz to 18GHz – 2402MHz

TRaC EMC Emissions Software - Radiated emissions

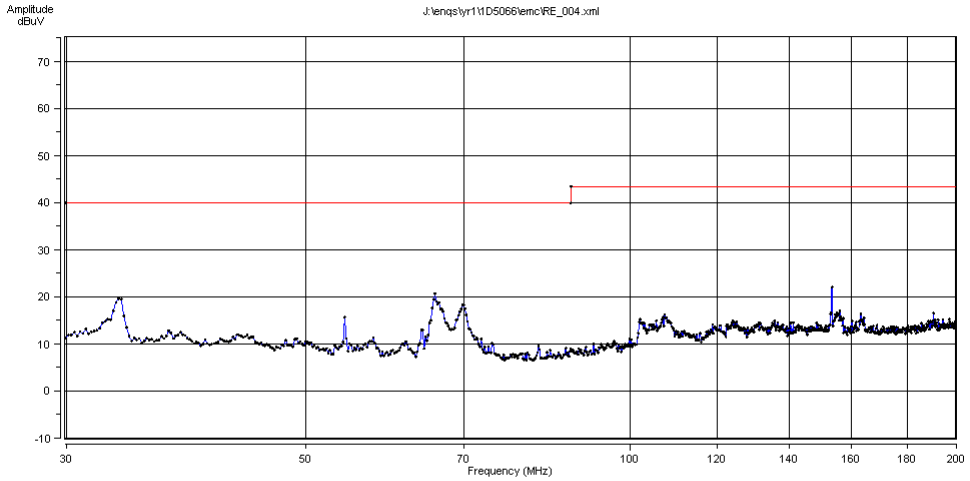


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	18/07/2013 14:56:02
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 18 GHz to 25 GHz – 2402MHz

TRaC EMC Emissions Software - Radiated emissions

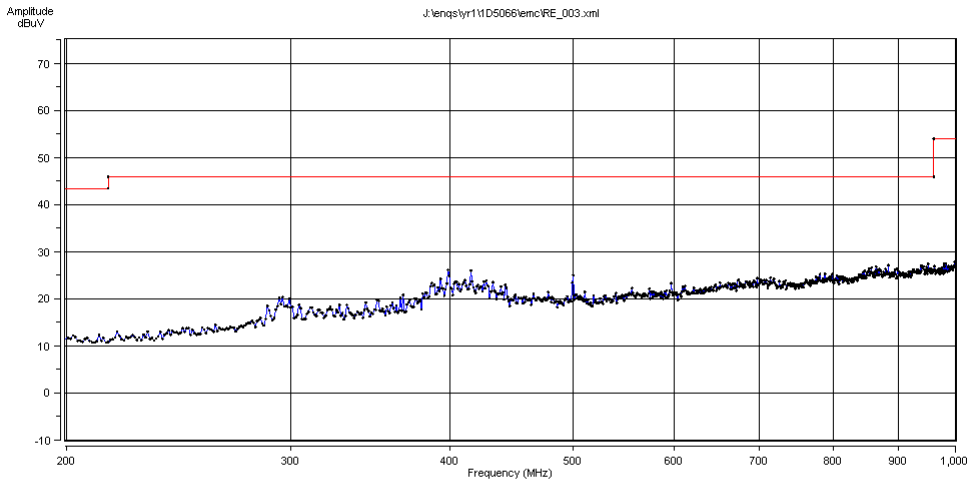


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Middle Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 09:30:01
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 30 MHz to 200 MHz – 2440MHz

TRaC EMC Emissions Software - Radiated emissions

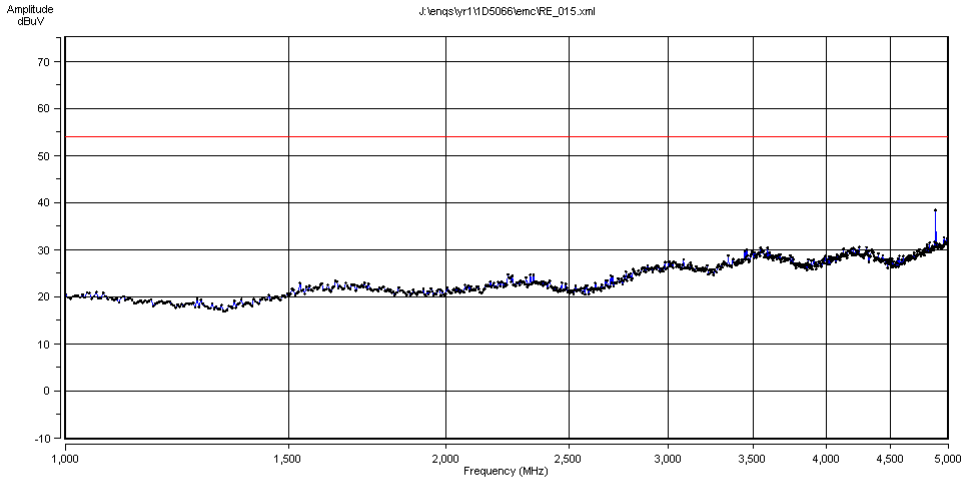


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Middle Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 09:24:58
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 200 MHz to 1GHz – 2440MHz

TRaC EMC Emissions Software - Radiated emissions

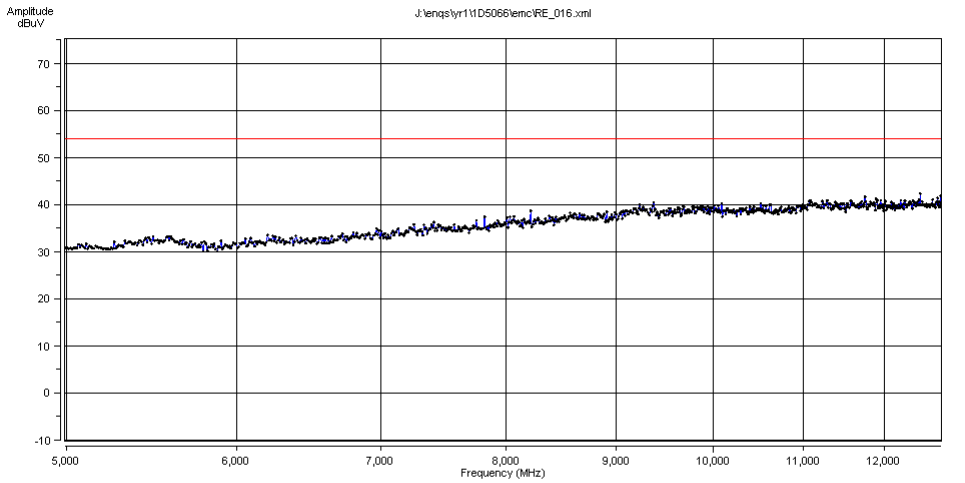


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Middle Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:37:15
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 1 GHz to 5 GHz – 2440MHz

TRaC EMC Emissions Software - Radiated emissions

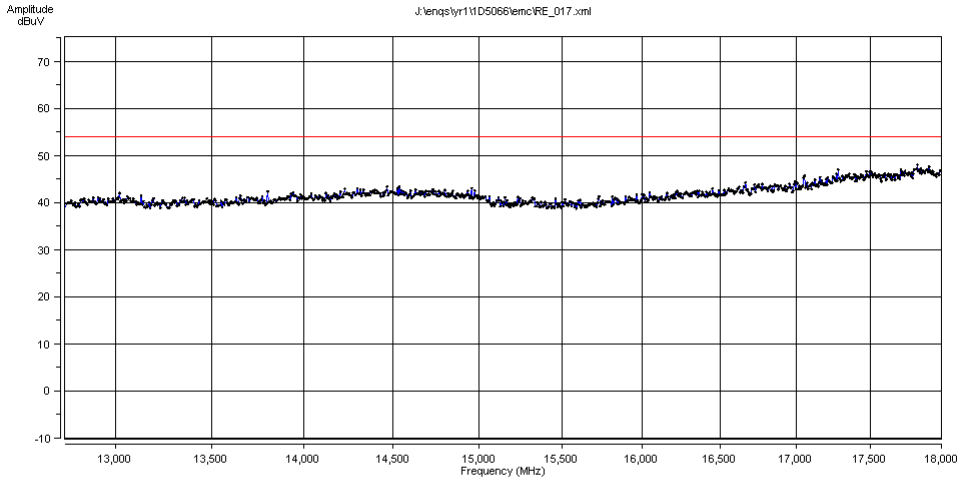


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Middle Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:41:34
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 5 GHz to 12.5 GHz – 2440MHz

TRaC EMC Emissions Software - Radiated emissions

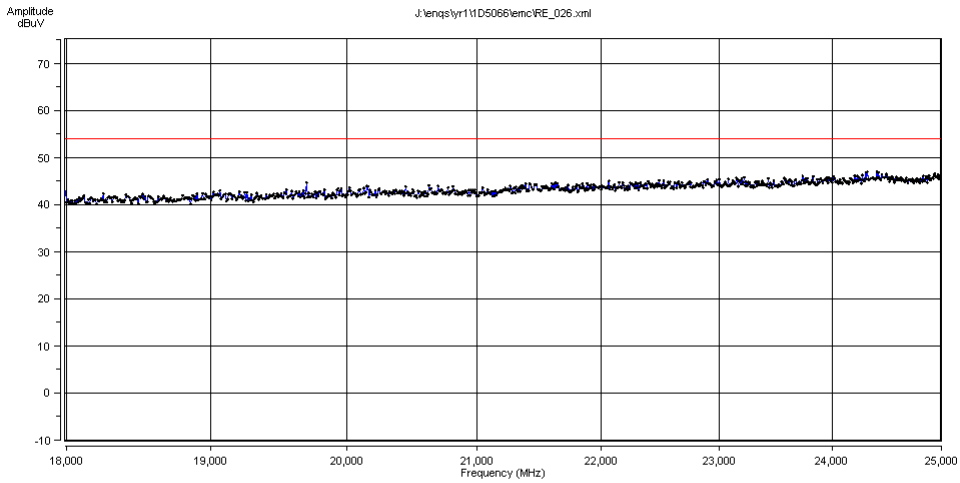


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Middle Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:45:49
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 12.5 GHz to 18GHz – 2440MHz

TRaC EMC Emissions Software - Radiated emissions

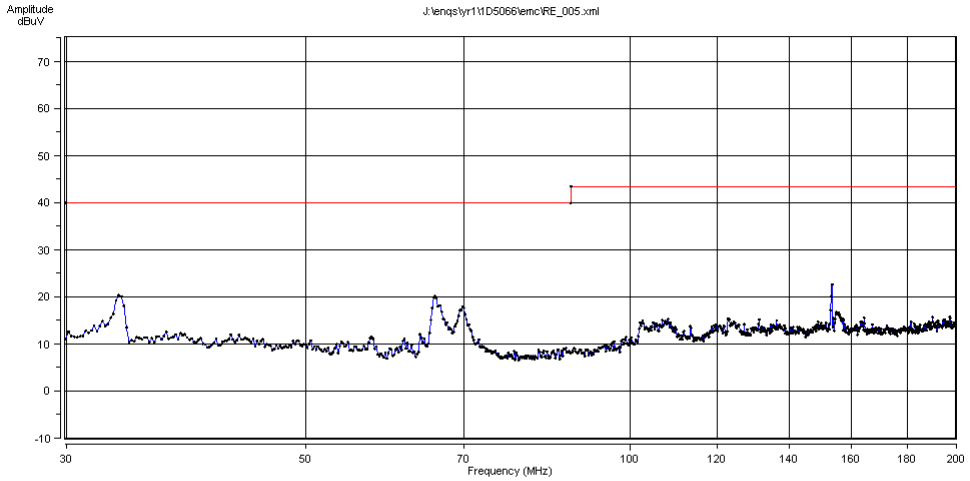


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Middle Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	18/07/2013 15:13:41
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 18 GHz to 25 GHz – 2440MHz

TRaC EMC Emissions Software - Radiated emissions

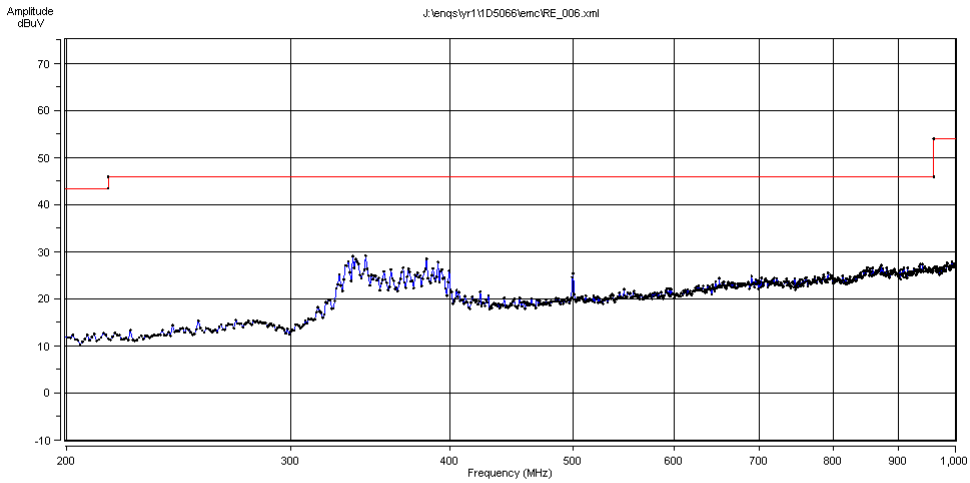


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 10:30:29
Sample Numbers:	S10	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 30 MHz to 200 MHz – 2480MHz

TRaC EMC Emissions Software - Radiated emissions

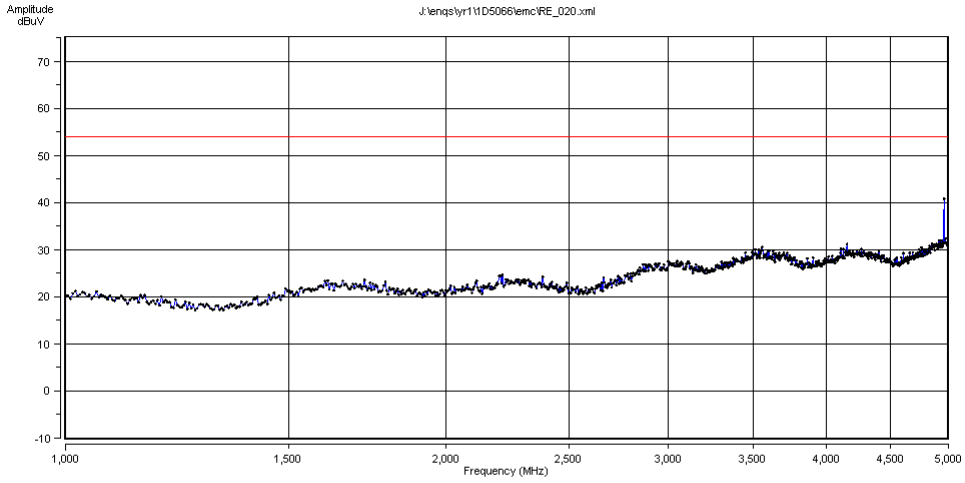


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 10:35:53
Sample Numbers:	S10	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 200 MHz to 1 GHz – 2480MHz

TRaC EMC Emissions Software - Radiated emissions

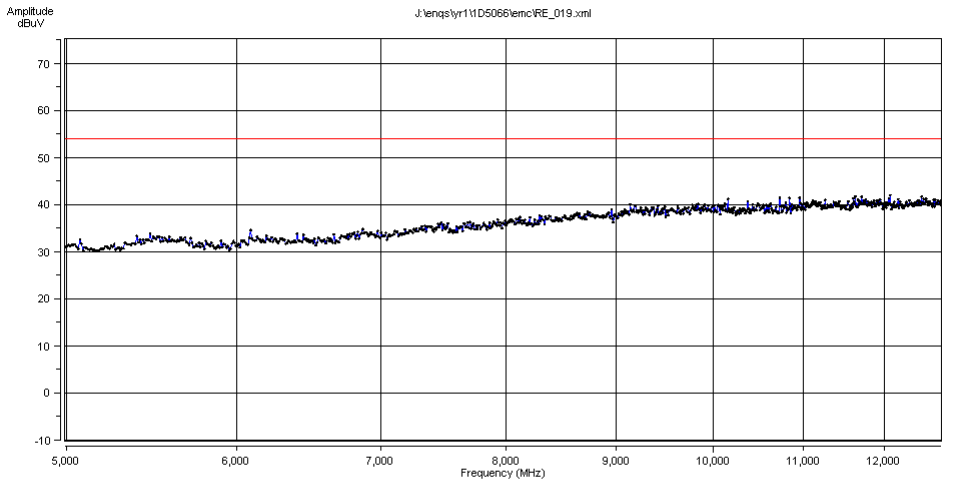


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 15:07:44
Sample Numbers:	S10	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 1 GHz to 5 GHz – 2480MHz

TRaC EMC Emissions Software - Radiated emissions

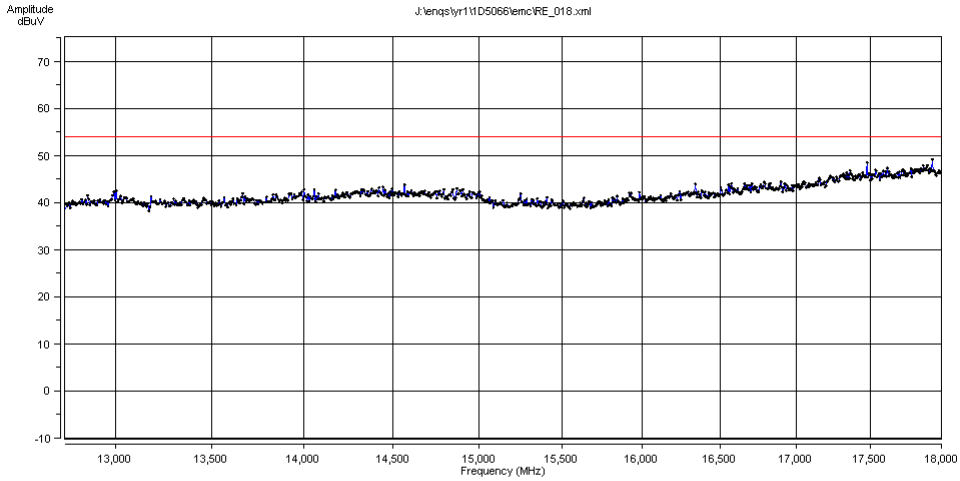


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 15:00:48
Sample Numbers:	S10	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 5 GHz to 12.5 GHz – 2480MHz

TRaC EMC Emissions Software - Radiated emissions

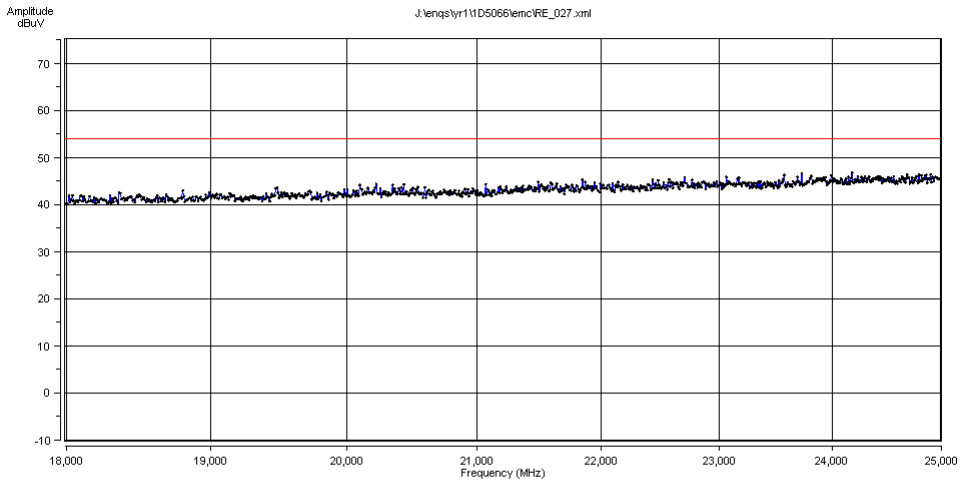


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 14:56:18
Sample Numbers:	S10	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 12.5 GHz to 18GHz – 2480MHz

TRaC EMC Emissions Software - Radiated emissions



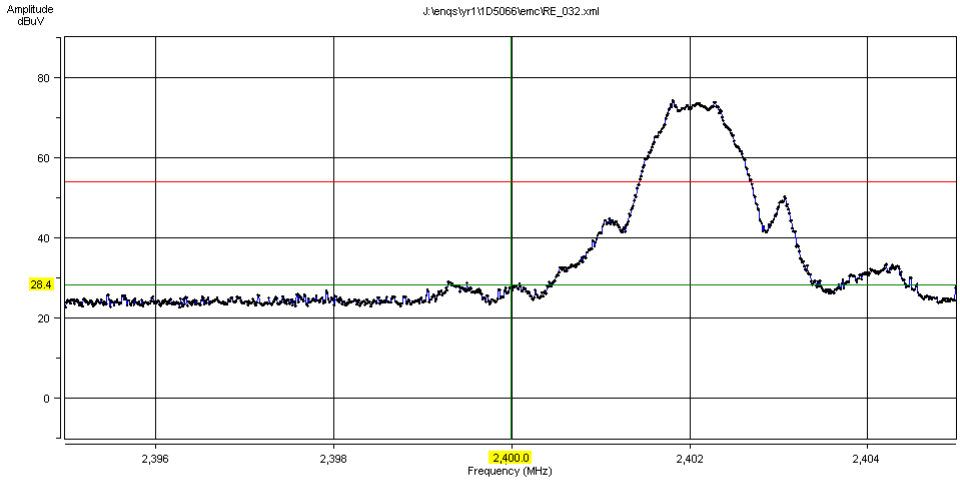
Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	18/07/2013 15:26:05
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Radiated Spurious emissions 18 GHz to 25 GHz – 2480MHz

Radiated Bandedge Compliance

TRaC EMC Emissions Software - Radiated emissions

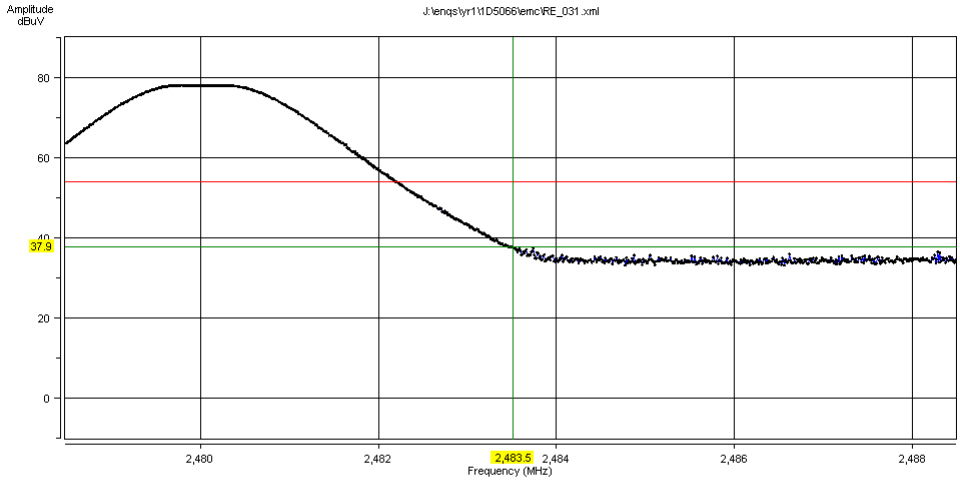


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	FSU46	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Bottom Channel Band Edge Measurement
Spec Distance (m):	3	**Mod State:**	8
Measurement Dist (m):	1	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	24/07/2013 10:31:19
Sample Numbers:	SO9	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Lower Bandedge

TRaC EMC Emissions Software - Radiated emissions

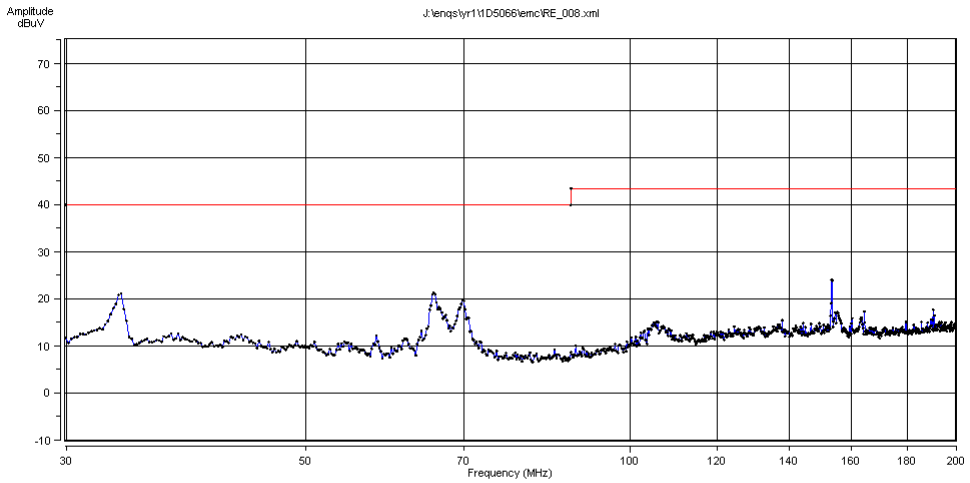


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	FSU46	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Continuous Tx Top Channel Band Edge Measurement
Spec Distance (m):	3	**Mod State:**	8
Measurement Dist (m):	1	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	24/07/2013 09:33:33
Sample Numbers:	SO9	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Upper Bandedge – Peak Trace (Average limit shown)

TRaC EMC Emissions Software - Radiated emissions

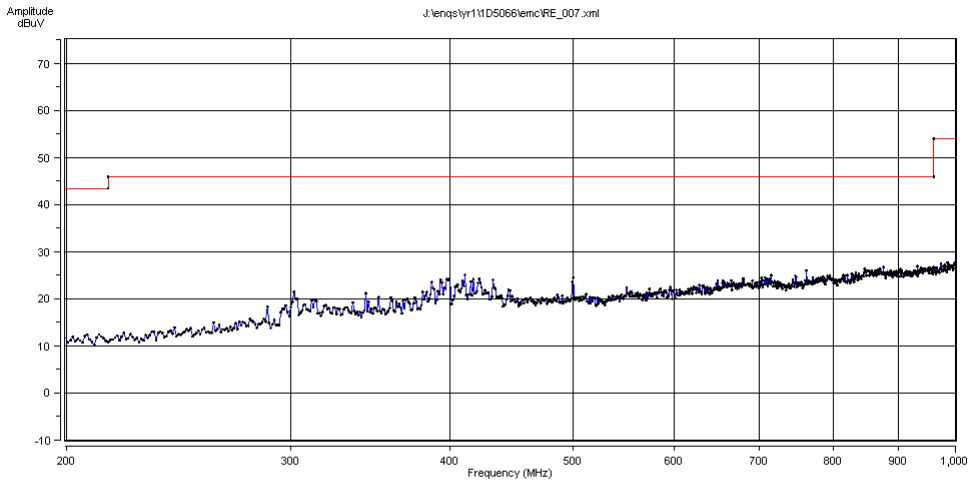


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Not Transmitting
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 10:51:26
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Unintentional Radiated Spurious emissions 30 MHz to 200 MHz

TRaC EMC Emissions Software - Radiated emissions

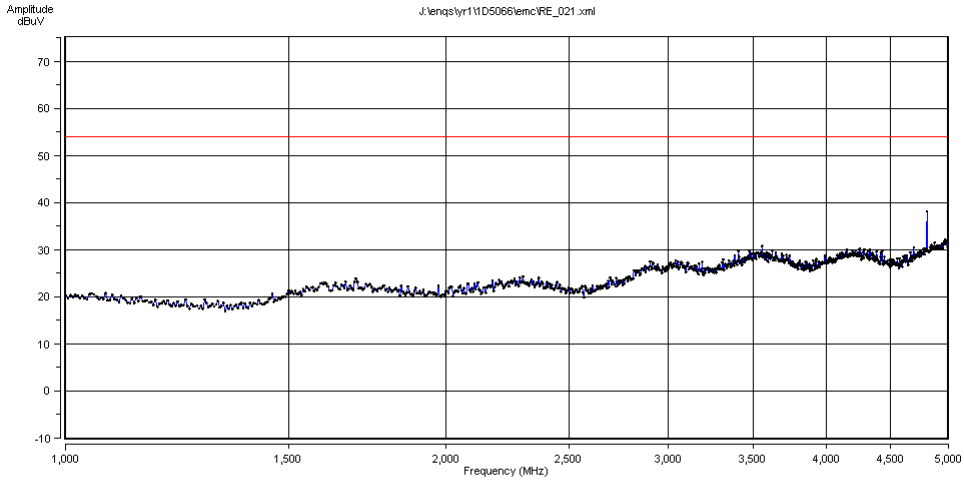


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Not Transmitting
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	3.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 10:46:08
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Unintentional Radiated Spurious emissions 200 MHz to 1 GHz

TRaC EMC Emissions Software - Radiated emissions

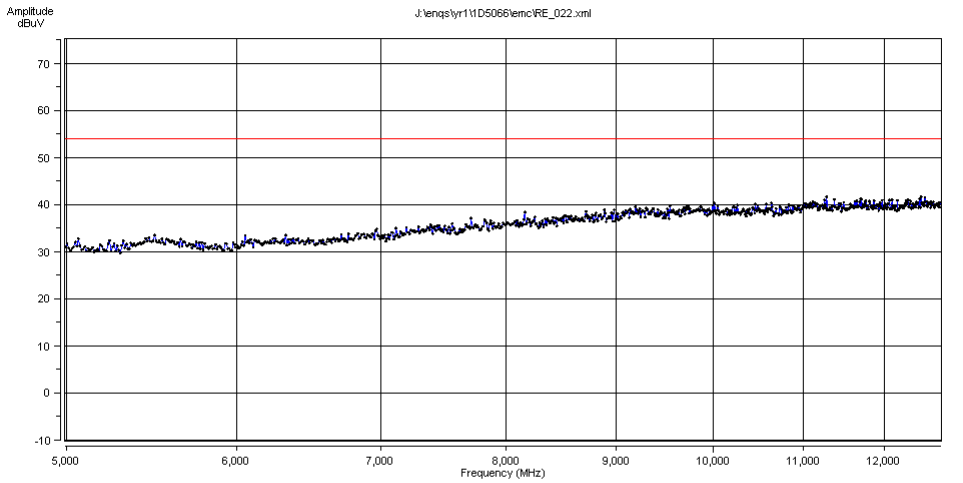


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Not Transmitting
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 15:41:47
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Unintentional Radiated Spurious emissions 1 GHz to 5 GHz

TRaC EMC Emissions Software - Radiated emissions

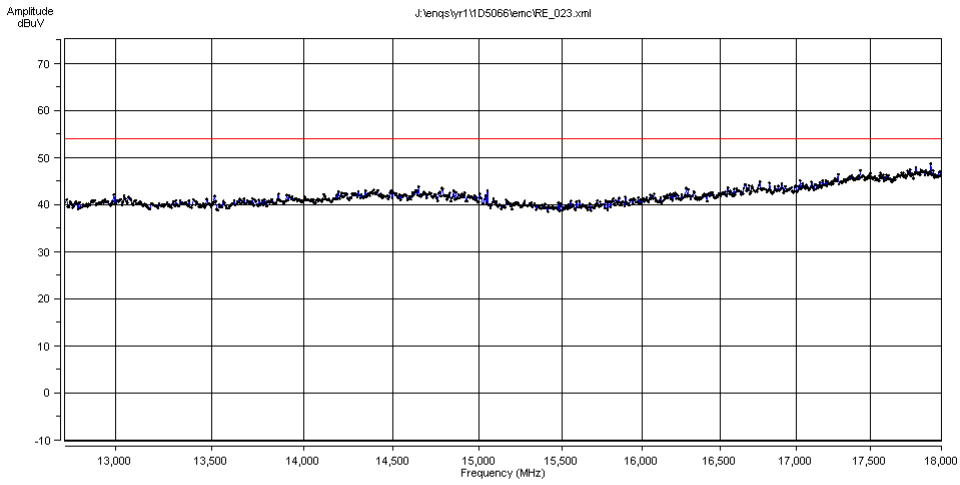


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Not Transmitting
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 15:44:37
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Unintentional Radiated Spurious emissions 5 GHz to 12.5 GHz

TRaC EMC Emissions Software - Radiated emissions

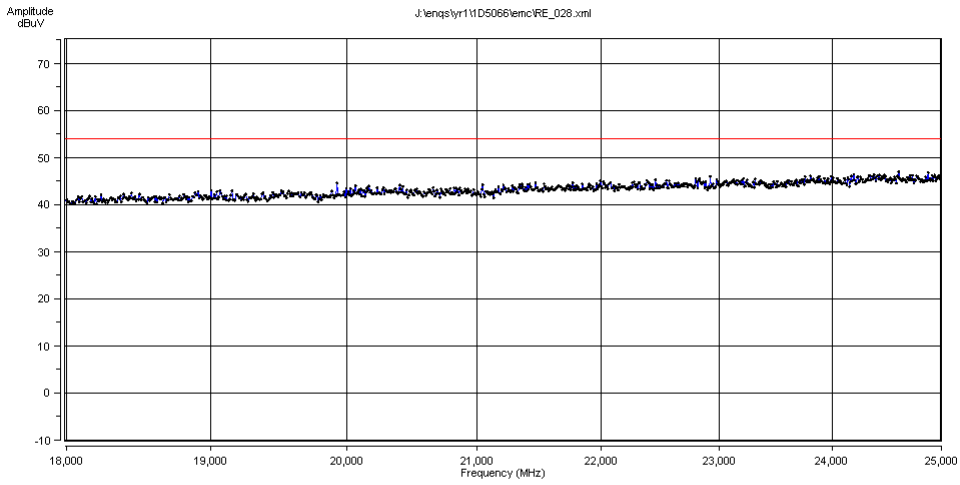


Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Not Transmitting
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1.0	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	03/07/2013 15:49:06
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Unintentional Radiated Spurious emissions 12.5 GHz to 18GHz

TRaC EMC Emissions Software - Radiated emissions



Test Location:	EMC Ferrite	**Remote Drive Eq.:**	
Analyser Type:	ESU40	**Sample Numbers:**	
Specification:	FCC 47CFR15:2008, Clause 15.209	**Mode/Config/Arrg:**	Rx (Not transmitting)
Spec Distance (m):	3	**Mod State:**	0
Measurement Dist (m):	1	**Engineer:**	Adam Longley
EUT Names:	foc.us headset	**Date/Time:**	18/07/2013 15:30:51
Sample Numbers:	S09	**Job Number:**	1D5066
Assessment:	Horizontal and Vertical Antenna Polarity		

Software Version: 1.9.1.0

Unintentional Radiated Spurious emissions 18 GHz to 25 GHz

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
S09	Foc.us headset	None
S10	Foc.us headset	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 detailed in this report	EUT transmitting modulated carrier for all formal measurements, CW signal for spurious emissions scans only

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

C3) EUT Configuration Information.

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

C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S10
Tests : Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected
Micro USB*	None	None	None
SMA**	Coaxial RF cable	10cm	*Measuring Instruments*

Sample : S09, S10
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
Micro USB	None	None	None

* Only used for charging the battery.
** SMA cable fitted in place of surface mount antenna for the conducted tests only.

C5 Details of Equipment Used

TRaC No	Equipment Type	Equipment Description	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
REF 910	FSU46	Spectrum Analyser	Rohde&Schwarz	03/2013	12 months	03/2014
REF 837	PSA	Spectrum Analyser	Agilent	10/05/2013	12 months	10/05/2014
REF 927	310	Pre-Amp	Sonoma	15/09/2011	12 months	15/09/2013
REF 913	HP8449B	Pre-Amp	HP	31/01/2013	12 months	31/01/2014
RFG 095	96002	Biconical Antenna	Eaton	12/05/2010	36 months	12/09/2013
RFG 191		Log Periodic Antenna	EMCO	12/05/2010	36 months	12/09/2013
REF 880	HL050	Log Periodic Antenna	Rohde&Schwarz	26/05/2011	24 month	26/09/2013
RFG 129	3115	Horn Antenna	EMC	14/09/2011	24 month	14/09/2013
RFG 629	QSH20S20S	Horn Antenna	Q-par	18/11/2011	24 month	18/11/2013
REF 886		3m Semi-Anechoic Chamber	Rainford	10/05/2013	12 months	10/05/2014

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.

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

e.g

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

0.07459 or 7.459%

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

Duty cycle correction may not be applicable / required by the device covered in this report.
The correction factor above is for example of how the correction is calculated.
Any applicable duty cycle used will be recorded in the relevant results sections of this report.

Duty cycle correction was not used during for the device.

Appendix F: Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: Over view.
2. Radiated electric field emissions arrangement: 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 & RSS - 102

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 and 10W/m^2 power density limit, as required under IC rules.

$$1\text{mW/cm}^2 \quad \equiv \quad 10\text{W/m}^2$$

Prediction of MPE limit at a given distance

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

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

where:

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

Note:

The EIRP measurement was performed by adding the declared antenna gain to the maximum conducted output power.

EIRP = -3.96dBm + 1.7dBi

EIRP = -2.26 dBm 0.59mW

Result

Prediction Frequency (MHz)	Maximum EIRP	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than 1mW/cm^2
2402	0.59mW	1	0.3cm

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