



**TRaC Radio Test Report**

**FOR**

**CorinTech Ltd On Behalf Of Fertility Focus Ltd.**

**ON**

**Ovusense**

**Document No. TES-004397WUS1**

**TRaC Wireless Test Report** : TES-004397WUS1


**Applicant** : CorinTech Ltd. On Behalf of Fertility Focus Ltd

**Apparatus** : Ovusense

**Specification(s)** : CFR47 Part 15 C 15.225:July 2008

**FCCID** : Z8YM009-V1

**Purpose of Test** : Certification

**Authorised by** : 

: K J Anderson, Authorised Signatory

**Issue Date** : 18<sup>th</sup> November 2011

**Total number of pages:** 61

**Authorised Copy Number** : PDF

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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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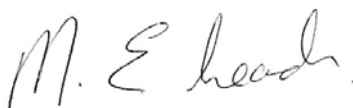
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## **1.2 Tests Requested By**

This testing in this report was requested by:

CorinTech Ltd.  
Ashford Mill  
Station Road  
Fordingbridge  
Hants  
SP61DZ  
United Kingdom

## **1.3 On Behalf Of**

Fertility Focus Ltd  
Unit 19D  
University of Warwick Science Park  
Warwick Innovation Centre  
Warwick Technology Park  
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Warwick  
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United Kingdom

## **1.4 Manufacturer**

Same as above.

## **1.5 Apparatus Assessed**

The following apparatus was assessed between 12/09/11 and 20/10/11:

Ovusense

The product is an advanced fertility monitoring system and has two parts – a personal sensor shaped like a small tampon, which is inserted inside the vagina overnight, and a reader, the box which stores the sensor and which logs and stores data and provides information on a display. The reader can be powered via an integral battery or by the use of an external power supply as supplied and contains a 13.56 MHz co-located radio transceiver.

## 1.6 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 1.7 to 1.8 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
Intentional H-Field Emission Field Strength	Title 47 of the CFR : Part 15 Subpart C; 15.225(a, b and c)	ANSI C63.10	Pass
Radiated spurious emissions (TX mode)	Title 47 of the CFR : Part 15 Subpart C; 15.225(d)  Title 47 of the CFR: Part 15 Subpart C; 15.209	ANSI C63.10	Pass
Radiated spurious emissions (Restricted bands)	Title 47 of the CFR: Part 15 Subpart C; 15.205	ANSI C63.10	Pass
Transmitter Frequency Tolerance	Title 47 of the CFR : Part 15 Subpart C; 15.225(e)	ANSI C63.4	Pass
20dB Bandwidth	Title 47 of the CFR : Part 15 Subpart C; 15.215(c)	ANSI C63.4	Pass
ac Power conducted emissions	Title 47 of the CFR: Part 15 Subpart C; 15.207	ANSI C63.10	Pass
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart B; 15.109	ANSI C63.4	Pass
ac Power conducted emissions	Title 47 of the CFR: Part 15 Subpart B; 15.107	ANSI C63.4	Pass

## **1.7 Notes Relating To The Assessment**

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

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

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

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.8 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 was performed under the following environmental conditions:

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

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

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

## **1.8 Deviations from Test Standards**

There were no deviations from the standards tested to.

**Section 2:****Measurement Uncertainty****2.1 Measurement Uncertainty Values**

For the test data recorded, 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.

**Radiated Electric Field Emissions**

Quantity Range	Quantity	Expanded Uncertainty
9kHz to 150 kHz	Amplitude dB( $\mu$ V/m)	$\pm 1.6$ dB
150 kHz to 30 MHz	Amplitude dB( $\mu$ V/m)	$\pm 2.1$ dB
30MHz to 300MHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 5.1$ dB
30MHz to 300MHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 5.2$ dB
300MHz to 1GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 5.4$ dB
300MHz to 1GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 5.2$ dB
1GHz to 18GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 4.4$ dB
1GHz to 18GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 4.4$ dB
18GHz to 26.5GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 4.2$ dB
18GHz to 26.5GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 4.2$ dB
26.5GHz to 40GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 4.3$ dB
26.5GHz to 40GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 4.3$ dB

**Power Line Conducted Emissions**

Quantity Range	Quantity	Expanded Uncertainty
9kHz to 150kHz	Amplitude dB( $\mu$ V)	$\pm 4.2$ dB
150kHz to 30MHz	Amplitude dB( $\mu$ V)	$\pm 3.1$ dB

**Transmitter Frequency Tolerance and 20dB Bandwidth**

Quantity Range	Quantity	Expanded Uncertainty
13.56MHz	Frequency (Hz)	$\pm 34$ Hz



## **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
		ATS	: Alternative Test Site
EUT	: Equipment Under Test		
SE	: Support Equipment	Ref	: Reference
		Freq	: Frequency
L	: Live Power Line		
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

**A1 Intentional H-Field Emission Field Strength**

Carrier power was verified with the EUT transmitting on its centre carrier frequency only.

Test Details: Battery Powered	
Regulation	Title 47 of the CFR : Part 15 Subpart C; 15.225(a, b and c)
Measurement standard	ANSI C63.10
EUT sample number	S01 and S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Carrier H-Field Strength: battery Powered											
Ref No.	FREQ. (MHz)	Det.	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	Measurement distance (m)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)	Margin (dB)
1	13.559	QP	27.25	0.2	18.4	3	45.85	40	5.85	84.0	-78.15

Test Details: ac Powered	
Regulation	Title 47 of the CFR : Part 15 Subpart C; 15.225(a, b and c)
Measurement standard	ANSI C63.10
EUT sample number	S01, S02 and S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Carrier H-Field Strength: ac Powered											
Ref No.	FREQ. (MHz)	Det.	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	Measurement distance (m)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)	Margin (dB)
2	13.559	QP	31.27	0.2	18.4	3	49.87	40	9.87	84.0	-74.13

**Note**

Carrier power was verified with the EUT transmitting on its centre carrier frequency only.

Plots of the Intentional Emission Field Strength (Carrier Mask) are contained in Appendix B of this test report.

**Notes:**

- 1 Results quoted are extrapolated as indicated
- 2 Receiver detector @  $f_c$  = Quasi Peak 10 kHz
- 3 When battery powered the EUT was powered with new batteries
- 4 Extrapolation 3 - 30 Meters: 40dB as per 15.31(f)(2)

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10
  - 2 Measuring distance = 3m
  - 3 EUT 0.8 m above ground plane
  - 4 Emissions maximized by rotation of EUT, on an automatic turntable
  - 5 Horizontal and vertical polarizations, of the receive antenna
  - 6 EUT orientation in three orthogonal planes
  - 7 Maximum results recorded

**Limits Title 47 of the CFR : Part 15 Subpart C; 15.225(a, b and c)**

The carrier output levels shall not exceed the values in the table below.

Frequency Range	H-Field Strength Limit ( $H_f$ ) dB $\mu$ V/m at 30m
13.553 to 13.567	84.0
13.410 to 13.553 13.567 to 13.710	50.5
13.110 to 13.410 13.710 to 14.010	40.5
Outside 13.110 to 14.010	29.5

**A2 Spurious Emissions Radiated: (TX Mode)**

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The EUT was set to transmit on its centre carrier frequency only.

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: Battery Powered	
Regulation	Title 47 of the CFR : Part 15 Subpart C; 15.225(d) and 15.209
Measurement standard	ANSI C63.10
Frequency range	9kHz to 1GHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 and 2

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

Ref No.	FREQ. (MHz)	Det.	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)	Margin (dB)
1	32.897	QP	39.5	0.5	12.4	31.5	20.9	0.0	20.9	40.0	-19.1
2	62.204	QP	34.3	0.6	7.9	31.6	11.2	0.0	11.2	40.0	-28.8
3	124.000	QP	34.9	1.0	11.7	31.5	16.1	0.0	16.1	43.5	-27.4
4	459.993	QP	50.4	2.7	16.8	31.5	38.4	0.0	38.4	46.0	-7.6
5	474.581	QP	51.0	2.7	17.1	31.6	39.2	0.0	39.2	46.0	-6.8
6	488.140	QP	51.9	2.7	17.4	31.6	40.4	0.0	40.4	46.0	-5.6

**Spurious Emissions Radiated (TX Mode) continued**

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

Test Details: ac Powered	
Regulation	Title 47 of the CFR : Part 15 Subpart C; 15.225(d) and 15.209
Measurement standard	ANSI C63.10
Frequency range	9kHz to 1GHz
EUT sample number	S01, S02 and S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 and 2

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

Ref No.	FREQ. (MHz)	Det.	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)	Margin (dB)
1	32.773	QP	43.5	0.6	12.4	31.5	25.0	0.0	25.0	40.0	-15.0
2	40.678	QP	50.3	0.5	11.4	31.6	30.6	0.0	30.6	40.0	-9.4
3	62.780	QP	52.5	0.7	7.9	31.6	29.5	0.0	29.5	40.0	-10.5
4	67.797	QP	54.2	0.9	7.8	31.6	31.3	0.0	31.3	40.0	-8.7
5	69.999	QP	49.1	0.9	8.5	31.6	26.9	0.0	26.9	40.0	-13.1
6	119.997	QP	53.2	0.8	11.4	31.6	33.8	0.0	33.8	43.5	-9.7
7	311.865	QP	52.4	1.6	14.5	31.5	37.0	0.0	37.0	46.0	-9.0
8	352.543	QP	54.0	1.9	14.3	31.5	38.7	0.0	38.7	46.0	-7.3
9	461.019	QP	51.8	2.6	16.8	31.5	39.7	0.0	39.7	46.0	-6.3
10	474.579	QP	49.3	2.7	17.1	31.6	37.5	0.0	37.5	46.0	-8.5
11	501.698	QP	47.0	2.9	17.9	31.6	36.2	0.0	36.2	46.0	-9.8
12	542.376	QP	46.9	3.0	18.0	31.6	36.3	0.0	36.3	46.0	-9.7

**Notes:**

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10-2009 section 4.5, Table 1 and 6.4.2
- 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= 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= 1 MHz, VBW = 10 Hz or using an average detector.

These settings as per ANSI C63.10-2009

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

## Limits

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

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
0.009-0.490	$2400/F(\text{kHz})$	300	$67.6/F(\text{kHz})$
0.490-1.705	$24000/F(\text{kHz})$	30	$87.6/F(\text{kHz})$
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

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

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

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 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				



**A3 Transmitter Frequency Stability**

Carrier power was verified with the EUT transmitting on its centre carrier frequency only.

<b>Test Details: Battery Powered</b>	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) 15.225(e)
Measurement standard	ANSI C63.4-2003
EUT sample number	S01 and S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

<b>Voltage (Vac) = Vnom</b>	<b>Temperature (°C)</b>	<b>Measured frequency (MHz)</b>	<b>Frequency Error (kHz)</b>	<b>Limit = ± 0.01%</b>
3.6	+20 °C	13.559508	0.492000	1.3560000
3.6	+50 °C	13.559618	0.382000	1.3560000
3.6	-20 °C	13.559535	0.465000	1.3560000

Notes:

For battery operated equipment, the equipment tests shall be performed using a new battery.

**Transmitter Frequency Stability continued:**

<b>Test Details: ac Powered</b>	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) 15.225(e)
Measurement standard	ANSI C63.4-2003
EUT sample number	S01, S02 and S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

<b>Voltage (Vac) = Vnom</b>	<b>Temperature (°C)</b>	<b>Measured frequency (MHz)</b>	<b>Frequency Error (kHz)</b>	<b>Limit = ± 0.01%</b>
110	+20 °C	13.559591	0.409000	1.3560000
110	+50 °C	13.55958	0.420000	1.3560000
110	-20 °C	13.559507	0.493000	1.3560000

<b>Voltage (Vac) 85% - 115% (-/+15%)</b>	<b>Temperature (°C)</b>	<b>Measured frequency (MHz)</b>	<b>Frequency Error (kHz)</b>	<b>Limit = ± 0.01%</b>
93.5	+20	13.559591	0.409000	1.3560000
126.5	+20	13.559588	0.412000	1.3560000

**Limits:**

Title 47 of the CFR 2008, Part 15 Subpart (c) 15.225(e)

The frequency tolerance of the carrier signal shall be maintained within ± 0.01% (100ppm)

**A4 20dB Bandwidth**

Title 47 of the CFR: Part 15 Subpart (c) 15.215(c) requires the measurement of the bandwidth of the transmission between the -20 dB points on the transmitted spectrum.

<b>Test Details: Battery Powered</b>	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) 15.215 (c)
Measurement standard	ANSI C63.4-2003
EUT sample number	S01 and S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

<b>Band occupancy @ -20 dBc: Battery Powered</b>			
<b>Frequency (MHz)</b>	<b>f<sub>lower</sub>(MHz)</b>	<b>f<sub>higher</sub>(MHz)</b>	<b>Band occupancy (kHz)</b>
13.56	13.5562	13.5627	6.5865

<b>Test Details: ac Powered</b>	
Regulation	Title 47 of the CFR 2008, Part 15 Subpart (c) 15.215 (c)
Measurement standard	ANSI C63.4-2003
EUT sample number	S01, S02 and S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

<b>Band occupancy @ -20 dBc: ac Powered</b>			
<b>Frequency (MHz)</b>	<b>f<sub>lower</sub>(MHz)</b>	<b>f<sub>higher</sub>(MHz)</b>	<b>Band occupancy (kHz)</b>
13.56	13.5562	13.5627	6.5865

Plots of the 20dB bandwidth are contained in Appendix B of this test report.

**A5 ac Power Line Conducted Emissions – Transmit Mode**

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 centre carrier frequency only. The formal measurements are detailed below:

<b>Test Details: Transmit Mode</b>	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10
Frequency range	150kHz to 30MHz (Excluding 15.225 operating band: 13.110MHz to 14.010MHz)
EUT sample number	S01, S02 and S03
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 3

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

**Results measured using the average detector compared to the average limit**

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.185	L1	36.7	54.3	-17.6	Pass
2	0.230	L1	32.3	52.4	-20.1	Pass
3	0.278	L1	32.1	50.9	-18.8	Pass
4	0.410	L1	39.9	47.6	-7.7	Pass
5	0.419	L1	39.4	47.5	-8.1	Pass
6	0.445	L1	32.3	47.0	-14.7	Pass
7	0.750	L1	23.4	46.0	-22.6	Pass
8	0.940	L1	24.1	46.0	-21.9	Pass
9	0.981	L1	22.4	46.0	-23.6	Pass
10	1.080	L1	22.4	46.0	-23.6	Pass
11	1.440	L1	22.6	46.0	-23.4	Pass
12	1.540	L1	22.7	46.0	-23.3	Pass
13	3.800	L1	24.1	46.0	-21.9	Pass
14	19.000	L1	37.6	50.0	-12.4	Pass
15	0.185	N	45.0	54.3	-9.3	Pass
16	0.230	N	35.2	52.4	-17.2	Pass
17	0.278	N	35.4	50.9	-15.5	Pass
18	0.410	N	43.2	47.6	-4.4	Pass
19	0.419	N	42.5	47.5	-5.0	Pass
20	0.445	N	35.9	47.0	-11.1	Pass
21	0.750	N	28.0	46.0	-18.0	Pass
22	0.940	N	29.5	46.0	-16.5	Pass
23	0.981	N	28.5	46.0	-17.5	Pass
24	1.080	N	27.8	46.0	-18.2	Pass
25	1.440	N	28.1	46.0	-17.9	Pass
26	1.540	N	28.8	46.0	-17.2	Pass
27	3.800	N	24.5	46.0	-21.5	Pass
28	19.000	N	30.6	50.0	-19.4	Pass

**ac Power Line Conducted Emissions – Transmit Mode continued:****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	0.185	L1	48.7	64.3	-15.6	Pass
2	0.230	L1	46.3	62.4	-16.1	Pass
3	0.278	L1	46.0	60.9	-14.9	Pass
4	0.410	L1	53.1	57.6	-4.5	Pass
5	0.419	L1	54.0	57.5	-3.5	Pass
6	0.445	L1	44.3	57.0	-12.7	Pass
7	0.750	L1	31.7	56.0	-24.3	Pass
8	0.940	L1	32.9	56.0	-23.1	Pass
9	0.981	L1	32.2	56.0	-23.8	Pass
10	1.080	L1	32.3	56.0	-23.7	Pass
11	1.440	L1	30.5	56.0	-25.5	Pass
12	1.540	L1	31.4	56.0	-24.6	Pass
13	3.800	L1	32.8	56.0	-23.2	Pass
14	19.000	L1	38.0	60.0	-22.0	Pass
15	0.185	N	49.0	64.3	-15.3	Pass
16	0.230	N	45.8	62.4	-16.6	Pass
17	0.278	N	46.0	60.9	-14.9	Pass
18	0.410	N	54.0	57.6	-3.6	Pass
19	0.419	N	55.0	57.5	-2.5	Pass
20	0.445	N	46.4	57.0	-10.6	Pass
21	0.750	N	39.2	56.0	-16.8	Pass
22	0.940	N	41.5	56.0	-14.5	Pass
23	0.981	N	41.5	56.0	-14.5	Pass
24	1.080	N	40.4	56.0	-15.6	Pass
25	1.440	N	38.8	56.0	-17.2	Pass
26	1.540	N	40.3	56.0	-15.7	Pass
27	3.800	N	32.8	56.0	-23.2	Pass
28	19.000	N	36.0	60.0	-24.0	Pass

**ac Power Line Conducted Emissions – Transmit Mode continued:**

When measuring the ac conducted emissions from a device that operates between 150 kHz and 30 MHz a non-detachable antenna may be replaced with a dummy load for the measurements within the fundamental emission band of the transmitter, but only for those measurements; KDB reference: 174176.

<b>Test Details: Transmit Mode (Antenna dummy loaded)</b>	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10 section 6.2.5 in accordance with KDB174176
Frequency range	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.225 operating band: 13.110MHz to 14.010MHz
EUT sample number	S02, S03 and S07
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 3

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

**Results measured using the peak detector compared to the average limit**

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	13.110	L1	37.3	50.0	-12.7	Pass
2	13.559	L1	40.2	50.0	-9.8	Pass
3	14.010	L1	37.8	50.0	-12.2	Pass
4	13.110	N	33.2	50.0	-16.8	Pass
5	13.560	N	39.9	50.0	-10.1	Pass
6	14.010	N	33.5	50.0	-16.5	Pass

**Specification limits :**

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

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB $\mu$ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 <sup>2</sup>	56 to 46 <sup>2</sup>
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				

**A6 Unintentional Radiated Electric Field Emissions - 15.109 (Receiver/Digital circuitry)**

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.

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

3m open area test site :

☐

3m alternative test site :

☒

Test Details: Battery Powered	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.4-2003
Frequency range	30MHz to 1GHz
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 and 2

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

Ref No.	FREQ. (MHz)	Det.	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)	Margin (dB)
1	32.897	QP	39.5	0.5	12.4	31.5	20.9	0.0	20.9	40.0	-19.1
2	62.204	QP	34.3	0.6	7.9	31.6	11.2	0.0	11.2	40.0	-28.8
3	164.273	QP	32.3	0.9	12.1	31.5	13.8	0.0	13.8	43.5	-29.7
4	439.987	QP	42.1	2.5	16.0	31.5	29.1	0.0	29.1	46.0	-16.9
5	449.996	QP	41.8	2.6	16.5	31.5	29.4	0.0	29.4	46.0	-16.6
6	459.996	QP	48.9	2.7	16.8	31.5	36.9	0.0	36.9	46.0	-9.1
7	479.996	QP	45.4	2.7	17.2	31.6	33.7	0.0	33.7	46.0	-12.3
8	499.996	QP	38.9	2.6	17.8	31.6	27.7	0.0	27.7	46.0	-18.3
9	519.995	QP	42.4	2.9	17.2	31.6	30.9	0.0	30.9	46.0	-15.1
10	539.995	QP	41.0	3.0	17.8	31.6	30.2	0.0	30.2	46.0	-15.8



**Unintentional Radiated Electric Field Emissions - 15.109 (Receiver/Digital circuitry):**

Test Details: ac Powered	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.4-2003
Frequency range	30MHz to 1GHz
EUT sample number	S03 and S06
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 and 2

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

Ref No.	FREQ. (MHz)	Det.	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)	Margin (dB)
1	33.000	QP	44.7	0.5	12.4	31.5	26.1	0.0	26.1	40.0	-13.9
2	66.393	QP	44.5	0.8	7.6	31.6	21.3	0.0	21.3	40.0	-18.7
3	119.999	QP	45.4	0.8	11.4	31.6	26	0.0	26	40.0	-14.0
4	189.998	QP	56.6	1.3	13.0	31.5	39.4	0.0	39.4	43.5	-4.1
5	439.981	QP	39.7	2.5	16.0	31.5	26.7	0.0	26.7	46.0	-19.3
6	449.996	QP	39.1	2.6	16.5	31.5	26.7	0.0	26.7	46.0	-19.3
7	459.996	QP	45.4	2.7	16.8	31.5	33.4	0.0	33.4	46.0	-12.6
8	479.996	QP	38.4	2.7	17.2	31.6	26.7	0.0	26.7	46.0	-19.3
9	499.987	QP	36.8	2.6	17.8	31.6	25.6	0.0	25.6	46.0	-20.4
10	519.995	QP	41.1	2.9	17.2	31.6	29.6	0.0	29.6	46.0	-16.4
11	539.995	QP	40.6	3.0	17.8	31.6	29.8	0.0	29.8	46.0	-16.2

**Specification limits :**

The upper frequency of the measurement range was decided according to 47 CFR 15:2008 Clause 15.33.

Radiated emission limits (47 CFR 15:2008 Clause 15.109):

Except for a Class A digital device, the field strength of radiated emissions from unintentional radiators at a distance of 3m shall not exceed the following values:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Field strength $\text{dB}\mu\text{V/m}$
30-88	100	40.0 (quasi-peak)
88-216	150	43.5 (quasi-peak)
216-960	200	46.0 (quasi-peak)
960-1000	500	54.0 (quasi-peak)
Above 1000	500	54.0 (average)
Above 1000	-	74.0 (peak)

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:

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

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	✓			
(v) Parameter defined by standard and / or single possible, refer to Appendix C (vi) Parameter defined by client and / or single possible, refer to Appendix C (vii) Parameter had a negligible effect on emission levels, refer to Appendix C (viii) Worst case determined by initial measurement, refer to Appendix C				

**A7 ac Power Line Conducted Emissions 15.107 (Receiver/Digital circuitry)**

Preview ac power line port 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) below. Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector. The formal measurements are detailed below:

Test Details: Receive Mode	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109
Measurement standard	ANSI C63.4-2003
Class	B
Frequency range	150kHz to 30MHz
EUT sample number	S03 and S06
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 3

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

**Results measured using the average detector compared to the average limit**

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.184	L1	44.2	54.3	-10.1	Pass
2	0.230	L1	34.5	52.4	-17.9	Pass
3	0.277	L1	32.1	50.9	-18.8	Pass
4	0.371	L1	26.1	48.5	-22.4	Pass
5	0.419	L1	38.3	47.5	-9.2	Pass
6	0.446	L1	35.9	46.9	-11.0	Pass
7	0.748	L1	13.8	46.0	-32.2	Pass
8	0.981	L1	24.2	46.0	-21.8	Pass
9	1.697	L1	21.3	46.0	-24.7	Pass
10	2.300	L1	20.5	46.0	-25.5	Pass
11	3.000	L1	22.5	46.0	-23.5	Pass
12	4.000	L1	23.8	46.0	-22.2	Pass
13	18.500	L1	30.1	50.0	-19.9	Pass
14	0.184	N	44.9	54.3	-9.4	Pass
15	0.230	N	37.5	52.4	-14.9	Pass
16	0.277	N	35.5	50.9	-15.4	Pass
17	0.371	N	30.1	48.5	-18.4	Pass
18	0.418	N	42.4	47.5	-5.1	Pass
19	0.446	N	39.1	46.9	-7.8	Pass
20	0.748	N	17.9	46.0	-28.1	Pass
21	0.981	N	29.2	46.0	-16.8	Pass
22	1.697	N	26.8	46.0	-19.2	Pass
23	2.300	N	25.5	46.0	-20.5	Pass
24	3.000	N	24.3	46.0	-21.7	Pass
25	4.000	N	23.5	46.0	-22.5	Pass
26	18.500	N	30.8	50.0	-19.2	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	0.184	L1	45.0	64.3	-19.3	Pass
2	0.230	L1	48.2	62.4	-14.2	Pass
3	0.277	L1	45.6	60.9	-15.3	Pass
4	0.371	L1	41.0	58.5	-17.5	Pass
5	0.419	L1	53.8	57.5	-3.7	Pass
6	0.446	L1	51.1	56.9	-5.8	Pass
7	0.748	L1	24.6	56.0	-31.4	Pass
8	0.981	L1	33.8	56.0	-22.2	Pass
9	1.697	L1	30.9	56.0	-25.1	Pass
10	2.300	L1	29.2	56.0	-26.8	Pass
11	3.000	L1	30.3	56.0	-25.7	Pass
12	4.000	L1	32.1	56.0	-23.9	Pass
13	18.500	L1	36.9	60.0	-23.1	Pass
14	0.184	N	49.7	64.3	-14.6	Pass
15	0.230	N	47.3	62.4	-15.1	Pass
16	0.277	N	45.5	60.9	-15.4	Pass
17	0.371	N	42.2	58.5	-16.3	Pass
18	0.418	N	55.0	57.5	-2.5	Pass
19	0.446	N	52.2	56.9	-4.7	Pass
20	0.748	N	29.4	56.0	-26.6	Pass
21	0.981	N	42.4	56.0	-13.6	Pass
22	1.697	N	39.0	56.0	-17.0	Pass
23	2.300	N	36.6	56.0	-19.4	Pass
24	3.000	N	34.4	56.0	-21.6	Pass
25	4.000	N	32.8	56.0	-23.2	Pass
26	18.500	N	35.7	60.0	-24.3	Pass

**Specification limits :**

Conducted emission limits (47 CFR Part 15 Subpart (c): Clause 15.107):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB $\mu$ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 <sup>2</sup>	56 to 46 <sup>2</sup>
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 :

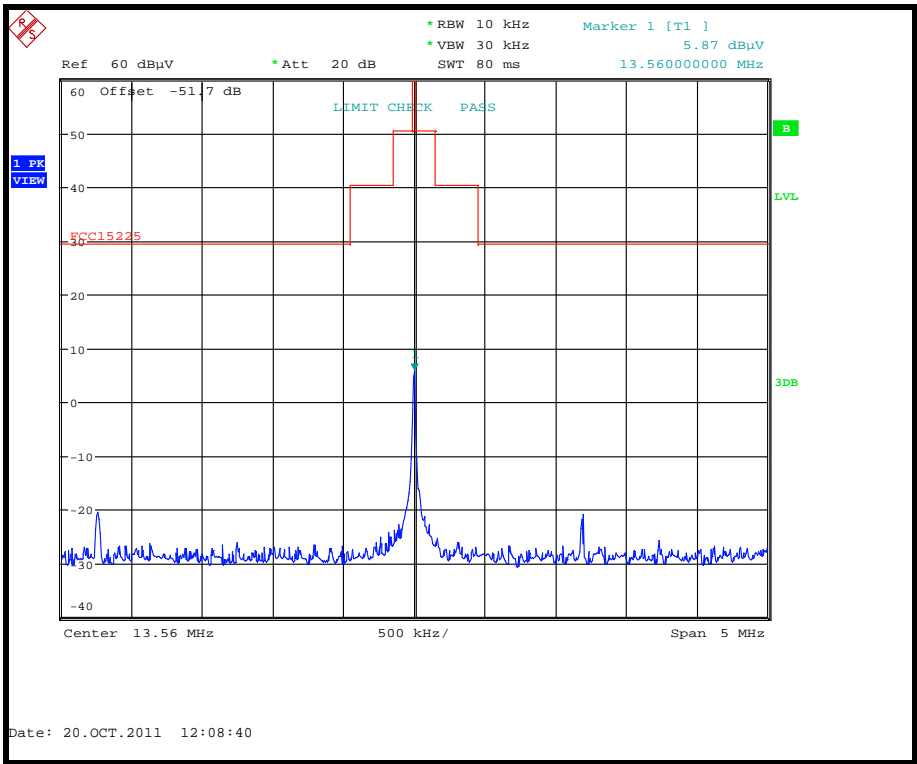
	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
(i) Parameter defined by standard and / or single possible, refer to Appendix C (ii) Parameter defined by client and / or single possible, refer to Appendix 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**

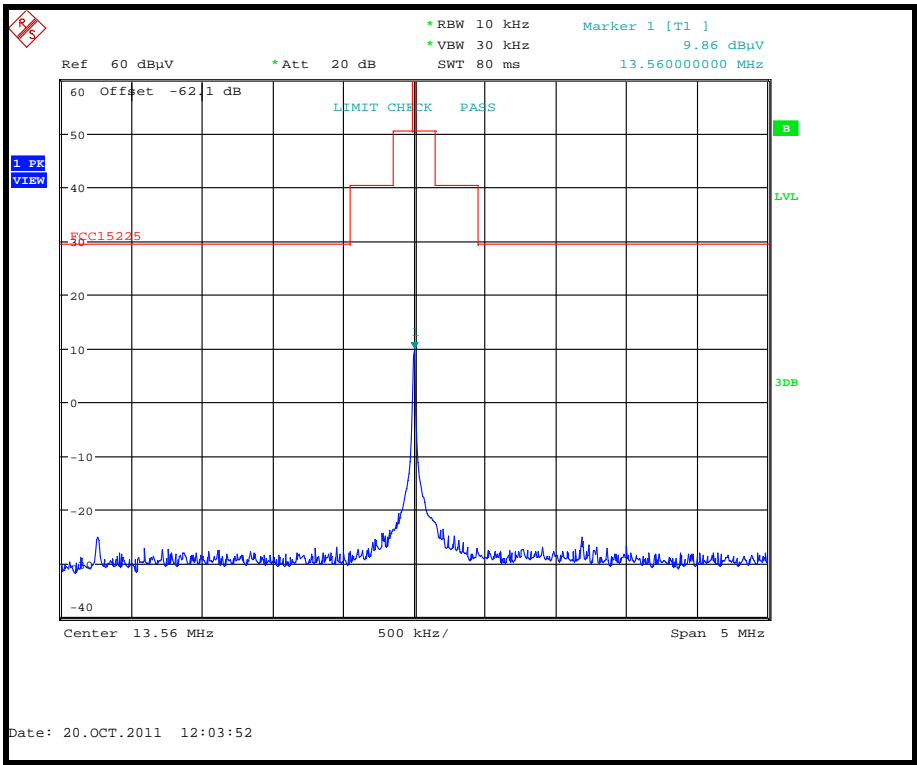
This appendix contains graphical data obtained during testing.

Notes:

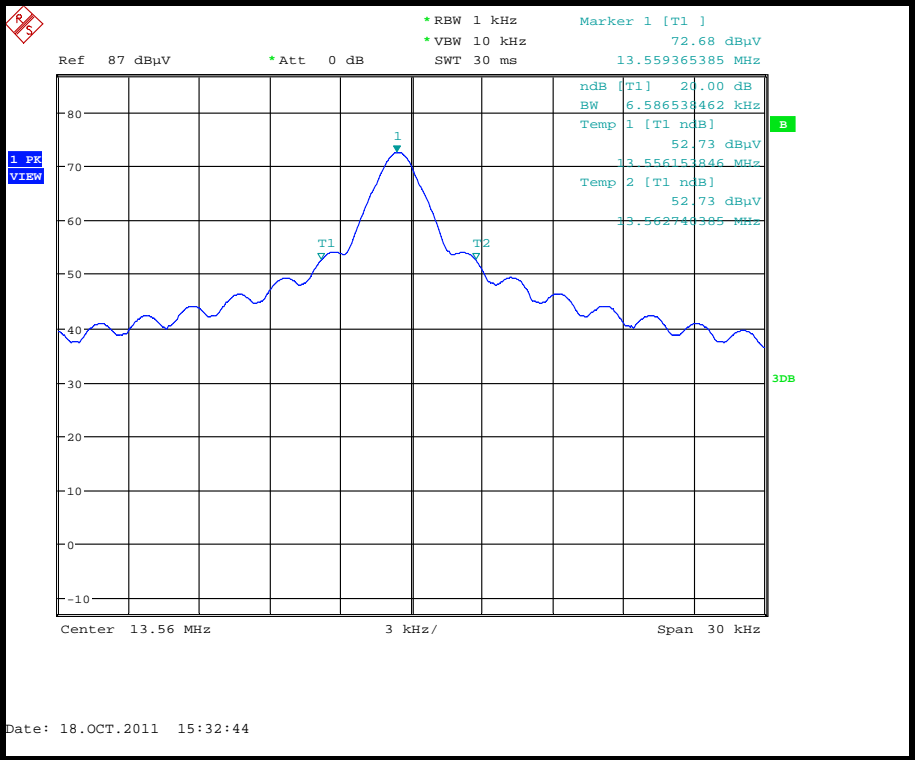
- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power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



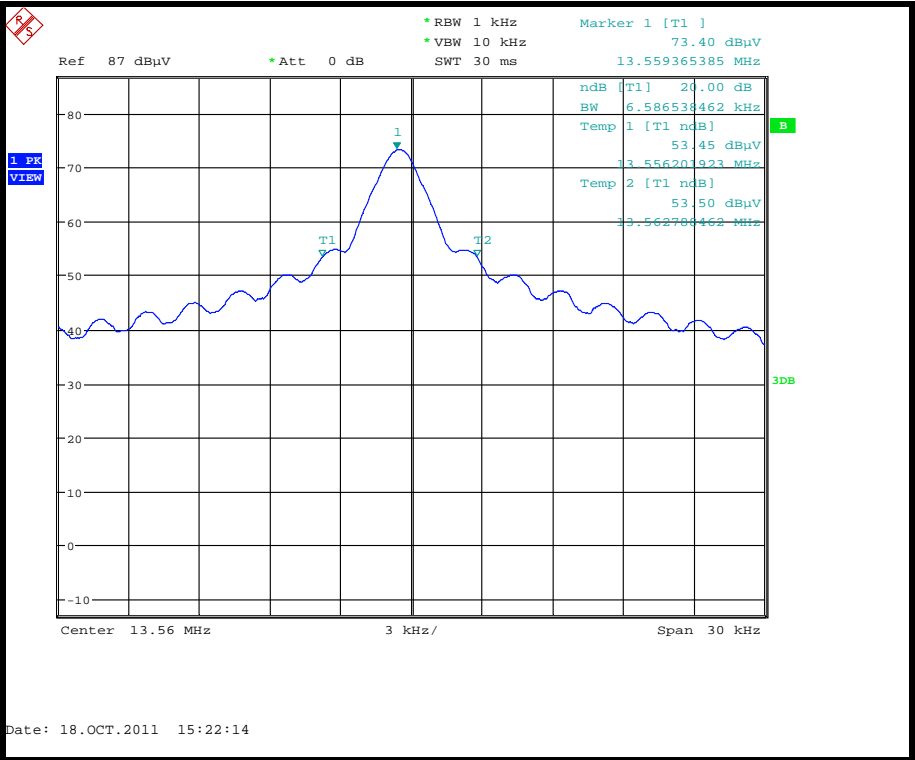
Intentional Emission Field Strength (Carrier Mask) - Battery Powered: S01 and S02



Intentional Emission Field Strength (Carrier Mask) - ac Powered: S01, S02 and S03

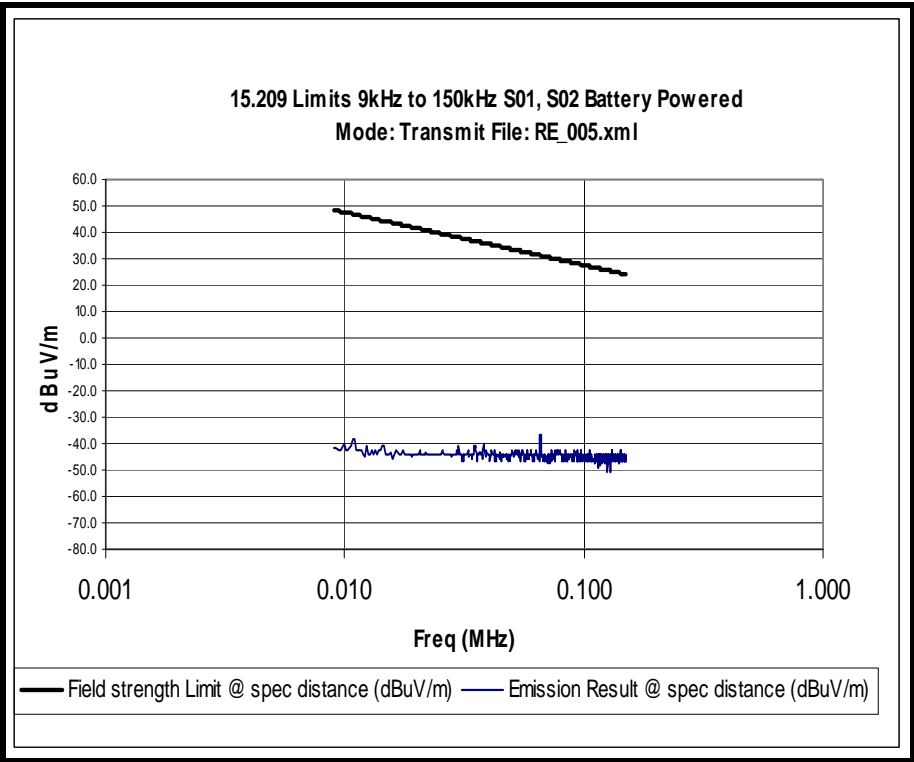


20dB Bandwidth – Battery Powered

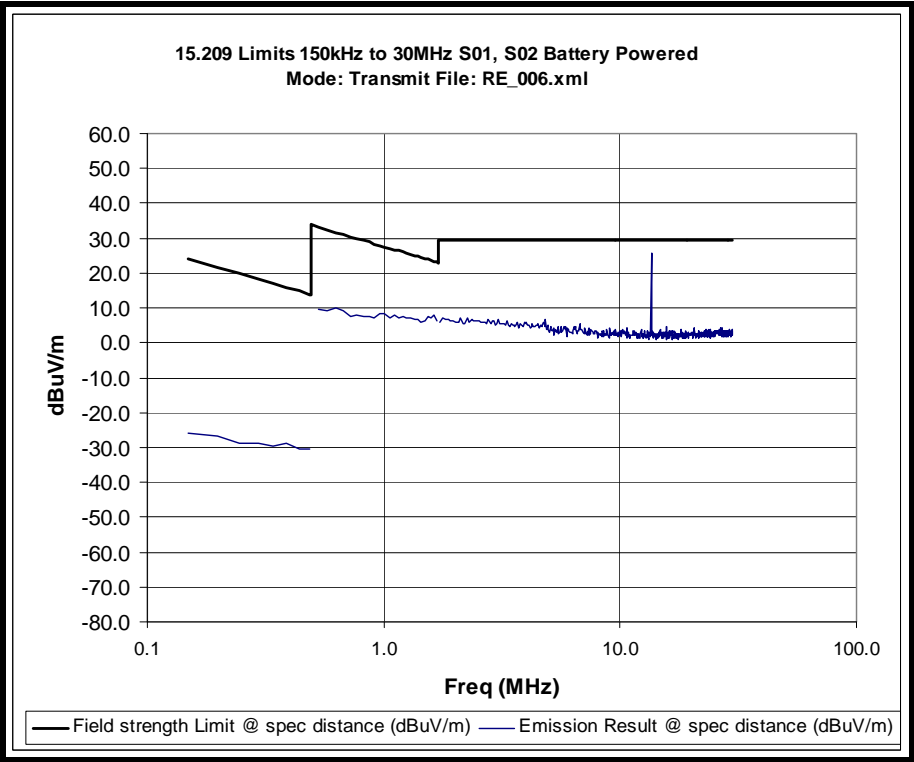


20dB Bandwidth – ac Powered

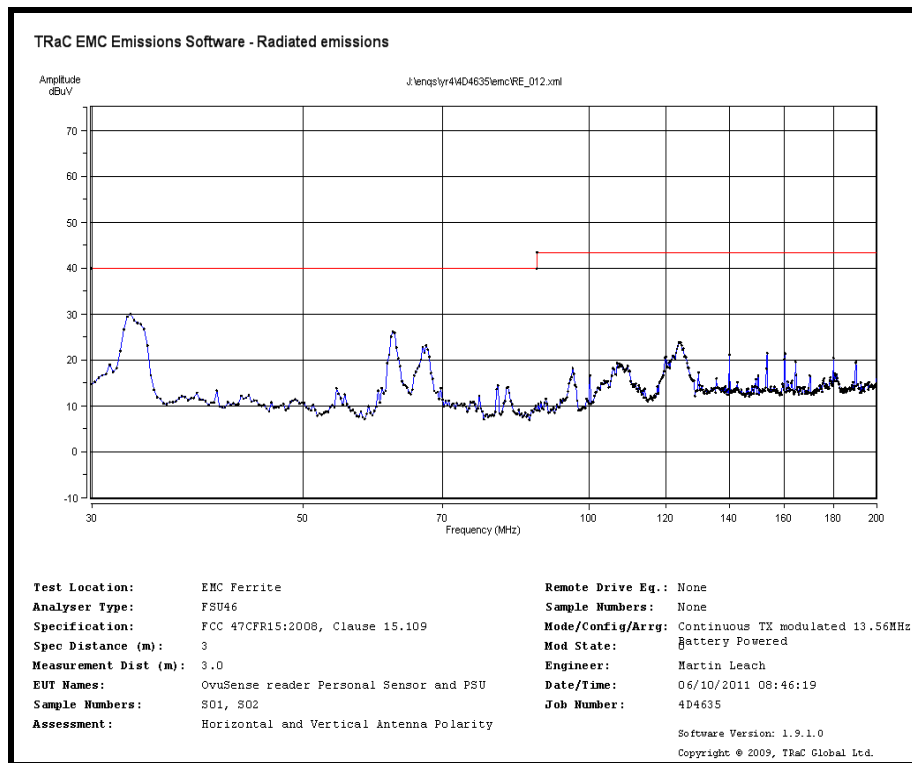




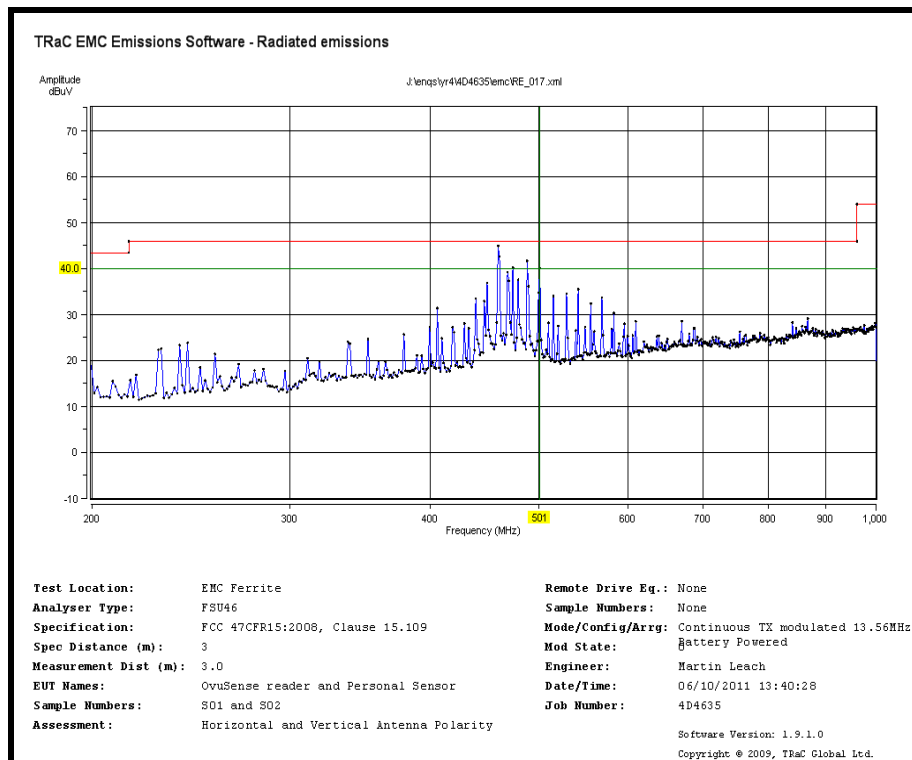
Radiated Spurious emissions 9kHz to 150kHz – Tx Mode, Battery Powered



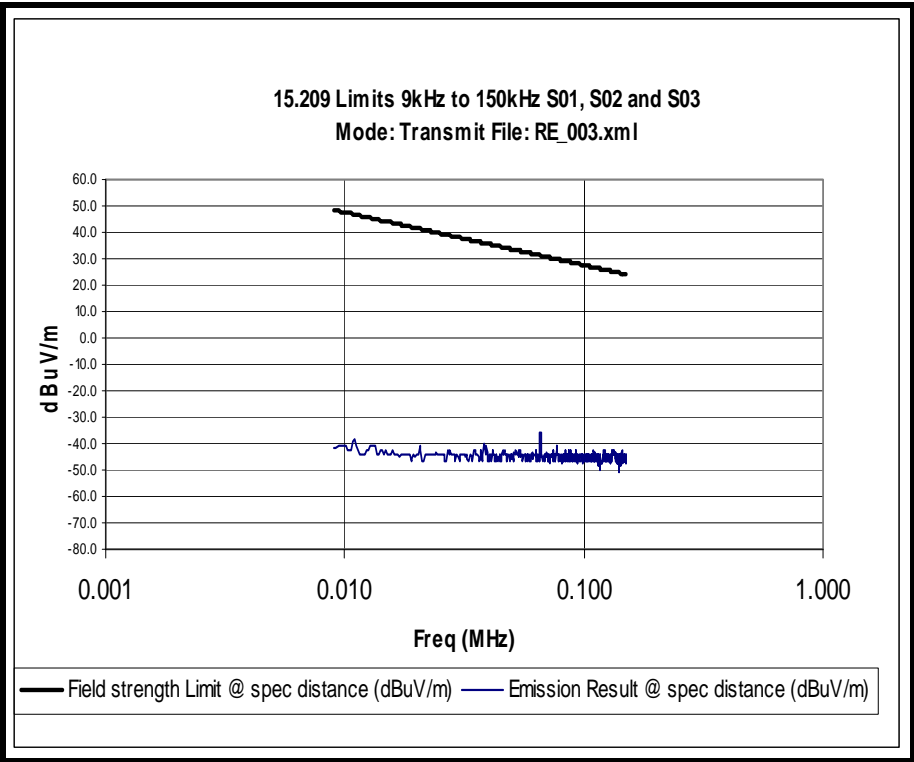
Radiated Spurious emissions 150kHz to 30MHz – Tx Mode, Battery Powered



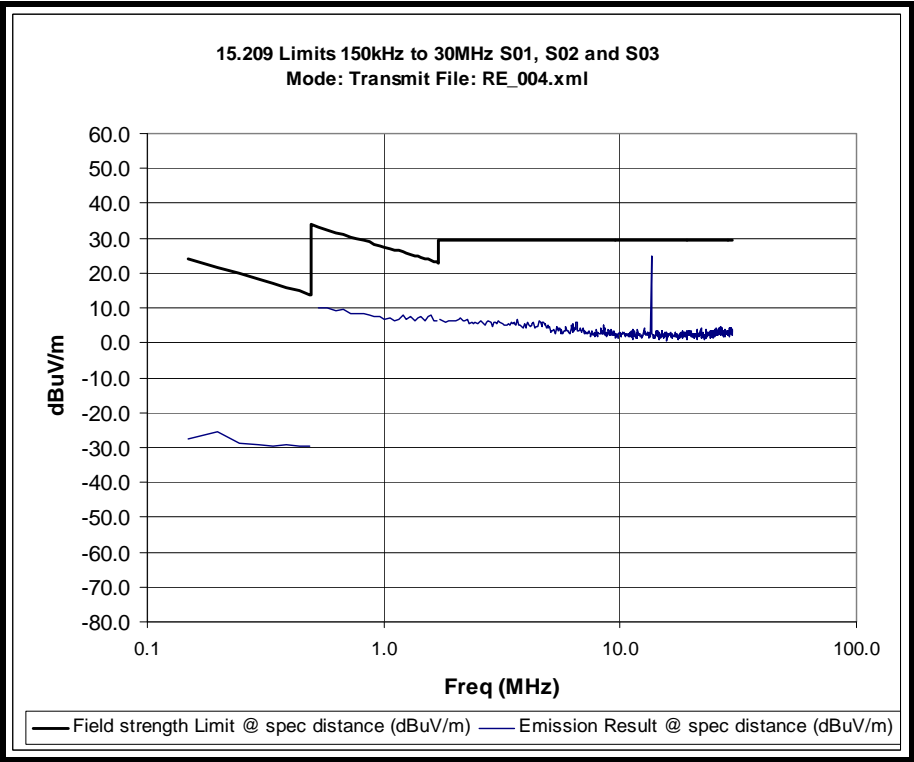
Radiated Spurious emissions 30MHz to 200MHz – Tx Mode, Battery Powered



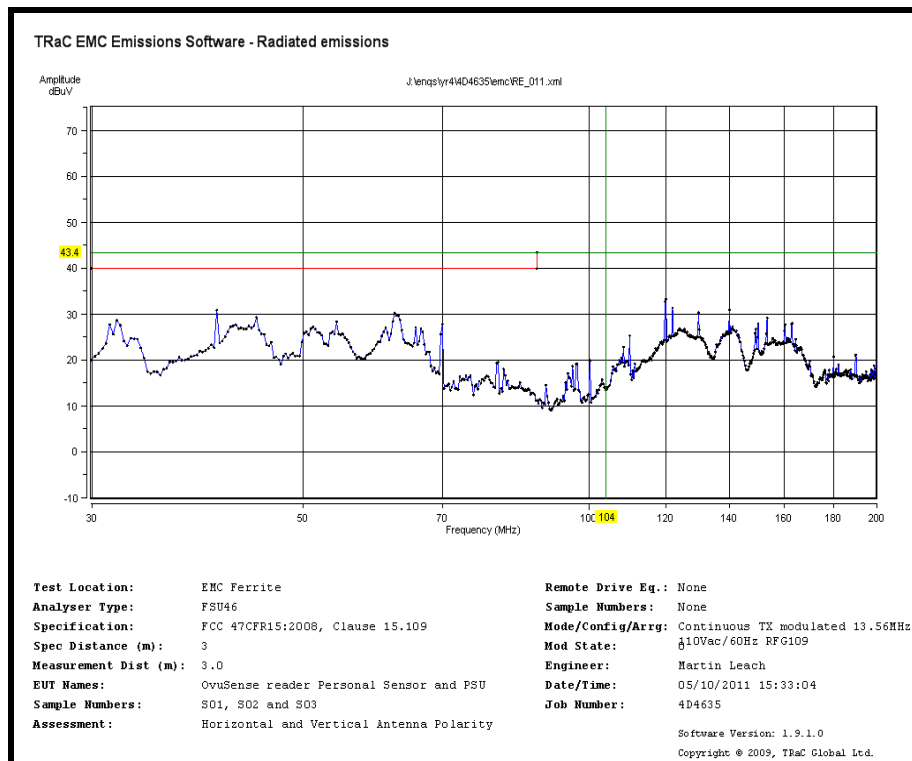
Radiated Spurious emissions 200 MHz to 1 GHz – Tx Mode, Battery Powered



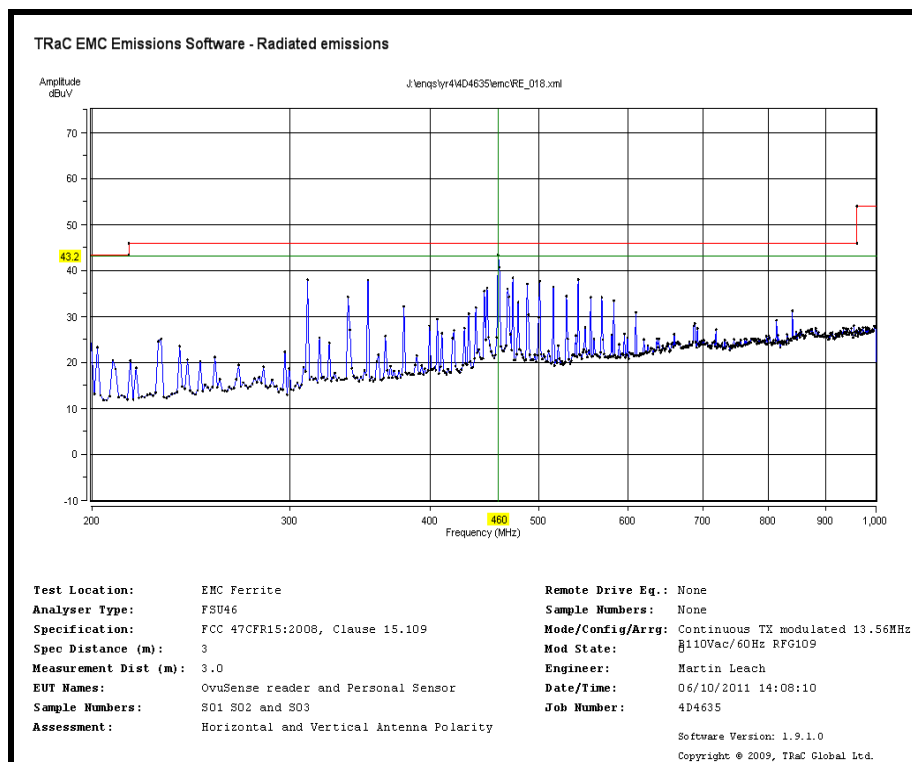
Radiated Spurious emissions 9kHz to 150kHz – Tx Mode, ac Powered



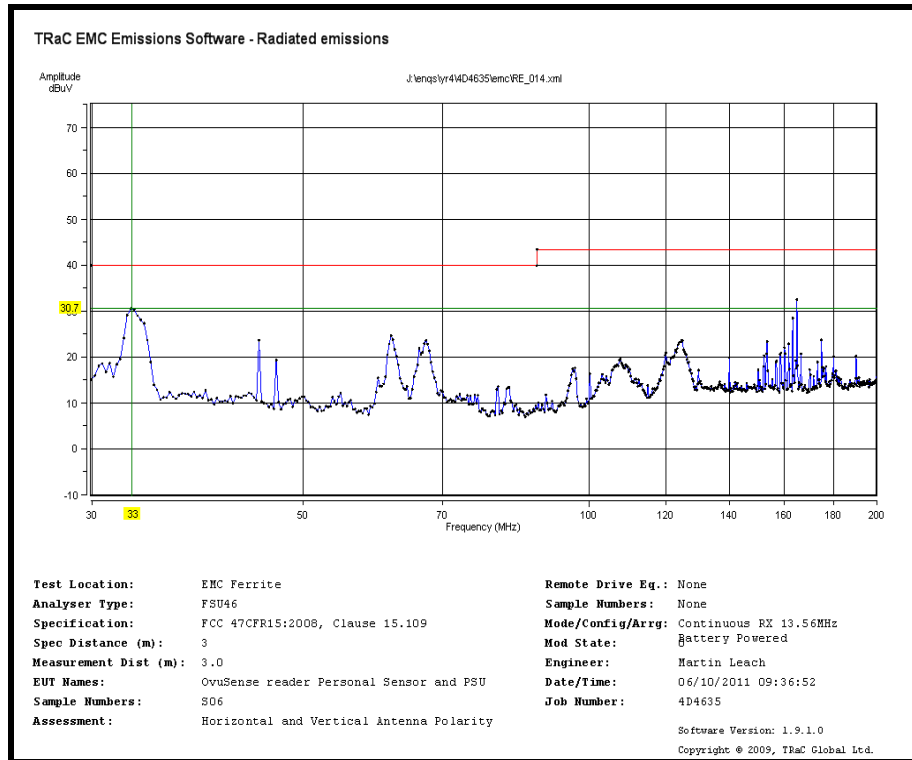
Radiated Spurious emissions 150kHz to 30MHz – Tx Mode, ac Powered



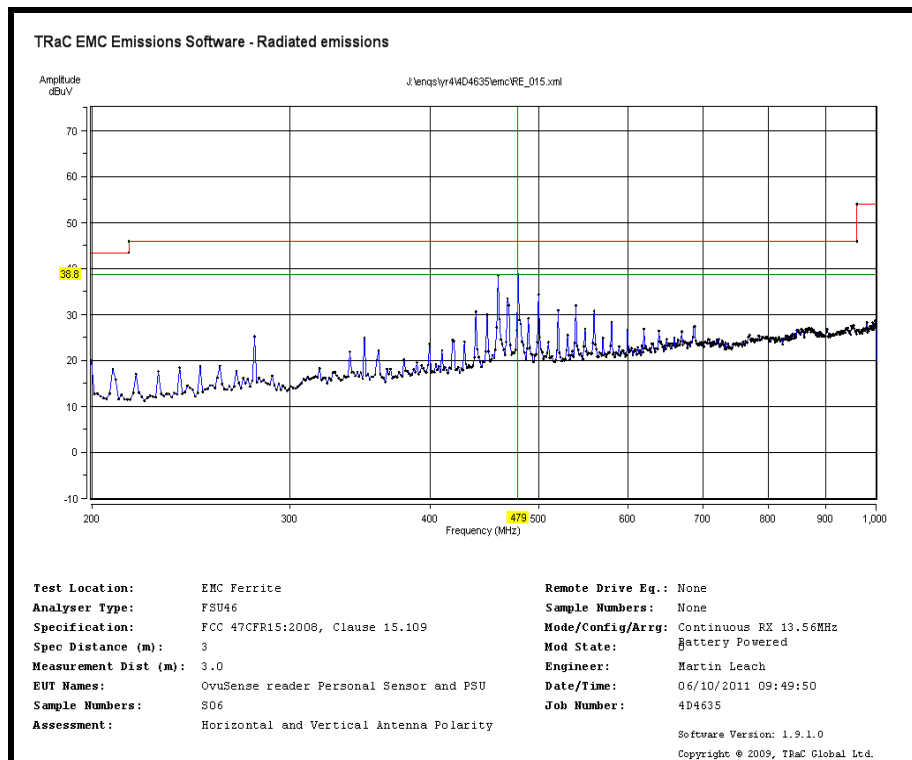
Radiated Spurious emissions 30MHz to 200MHz – Tx Mode, ac Powered



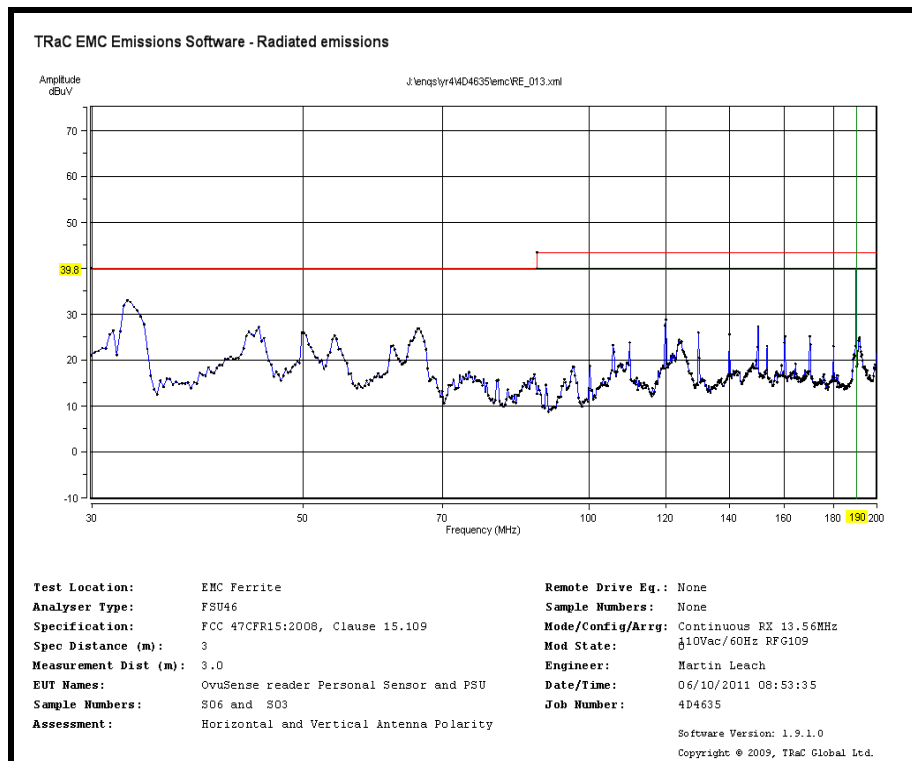
Radiated Spurious emissions 200MHz to 1GHz – Tx Mode, ac Powered



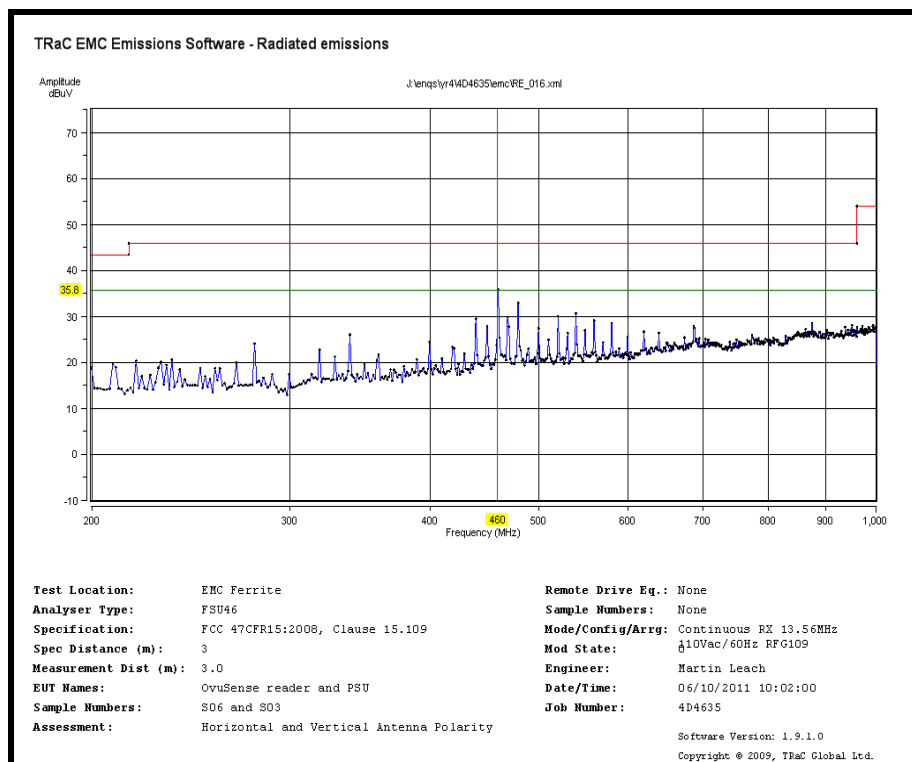
Unintentional Radiated Spurious emissions 30MHz to 200MHz – Rx Mode, Battery Powered



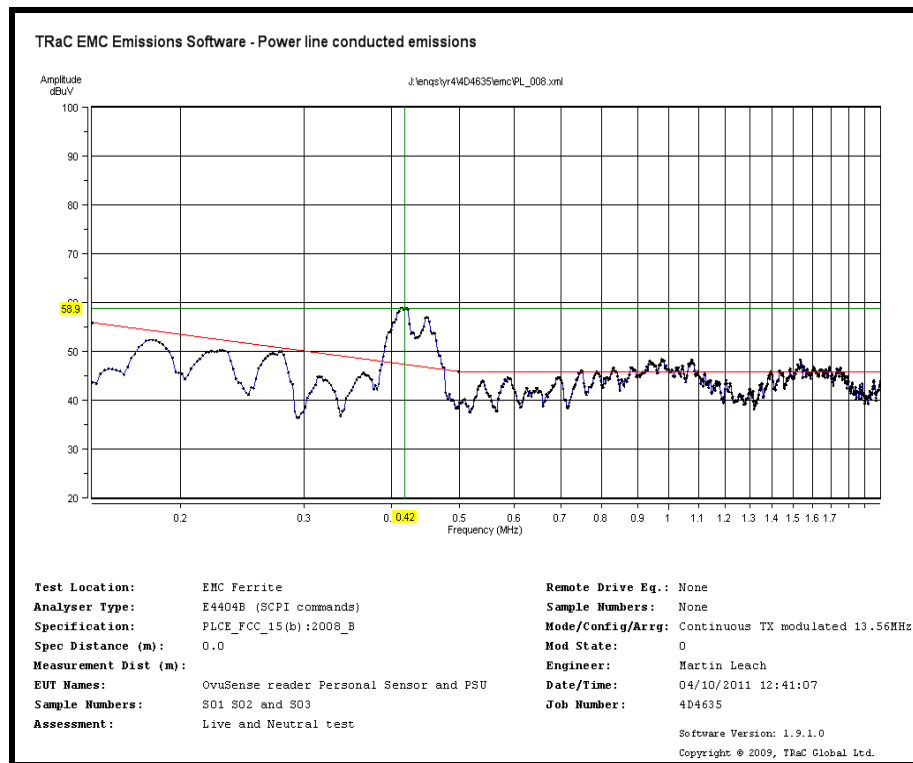
Unintentional Radiated Spurious emissions 200MHz to 1GHz – Rx Mode, Battery Powered



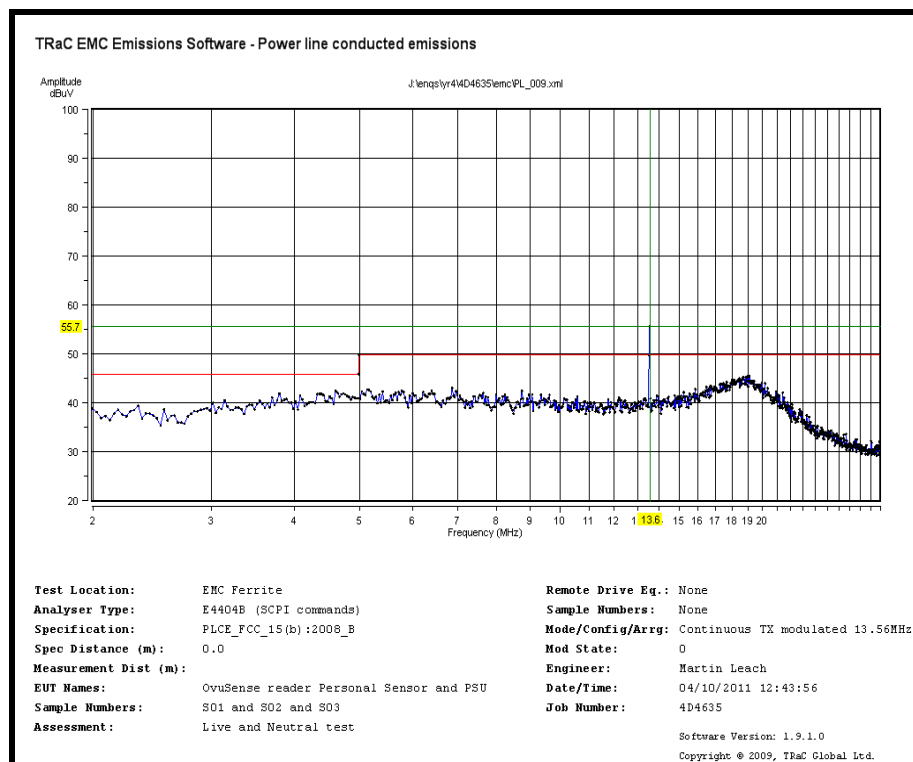
Unintentional Radiated Spurious emissions 30MHz to 200MHz – Rx Mode, ac Powered



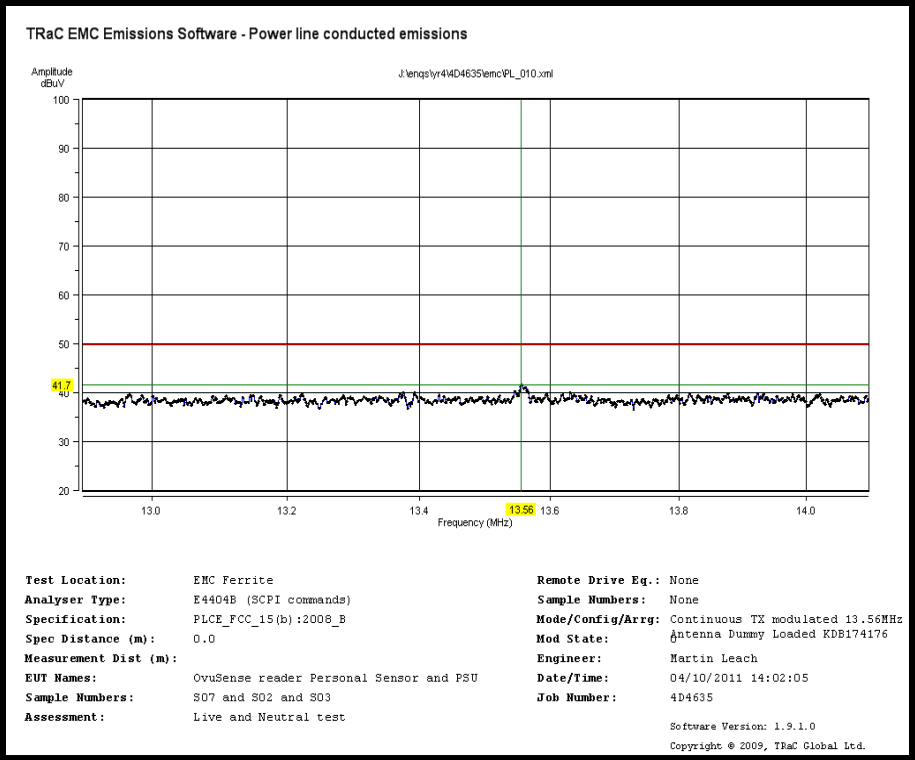
Unintentional Radiated Spurious emissions 200MHz to 1GHz – Rx Mode, ac Powered



Power Line Conducted emissions 150kHz to 2MHz – Tx Mode

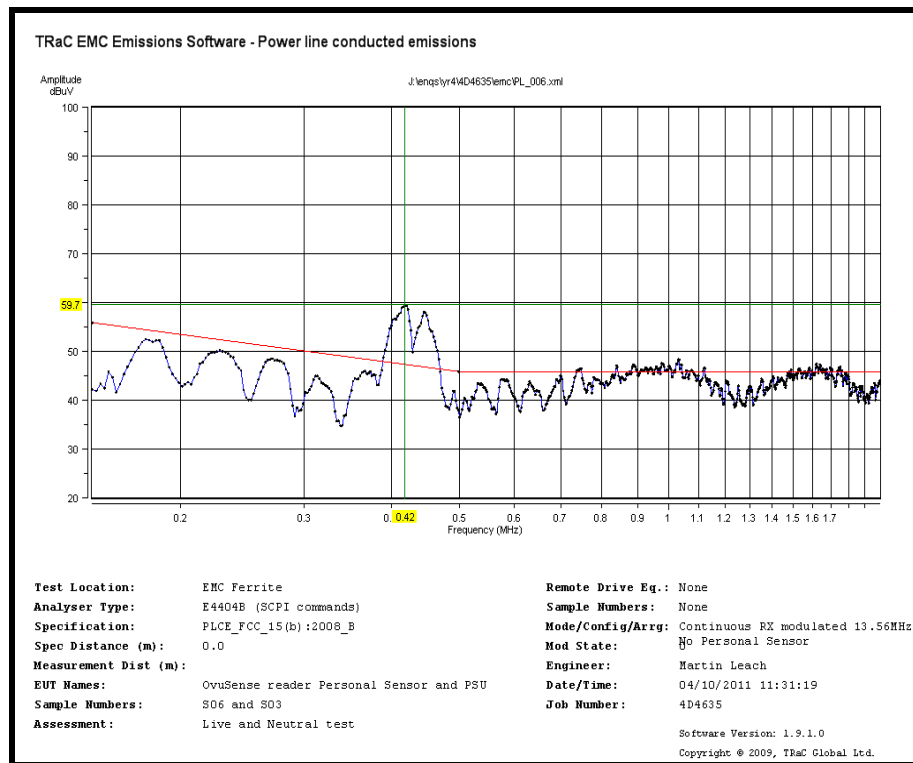


Power Line Conducted emissions 2MHz to 30MHz – Tx Mode

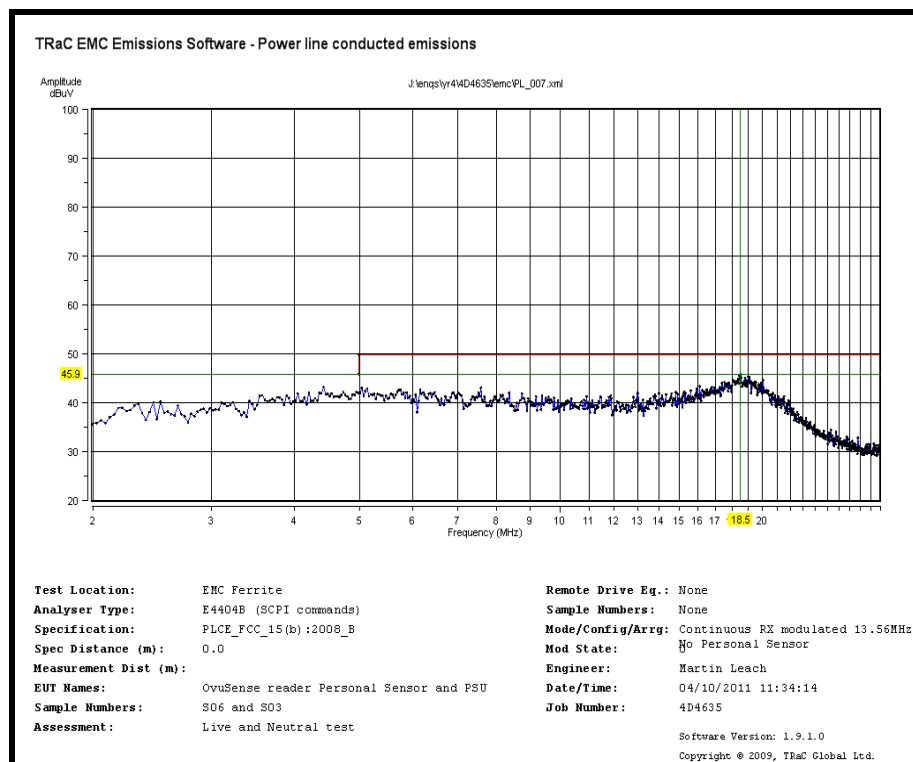


Power Line Conducted emissions 13.110MHz to 14.010MHz – Tx Mode, Antenna port dummy loaded





Power Line Conducted emissions 150kHz to 2MHz – Rx Mode



Power Line Conducted emissions 2MHz to 30MHz – Rx Mode

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

This appendix contains details of:

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

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

**Sample No:** Sxx Mod w

where:

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

The following terminology is used throughout the test report:

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

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

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

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

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

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

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

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

**C1 Test samples**

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

Sample No.	Description	Identification
S01	Ovusense advanced fertility monitoring reader	None
S02	Personal Sensor	None
S03	XP Power Plug top power supply unit Model VEP8US09	S/N: 1039-00535
S06	Ovusense advanced fertility monitoring reader (receive mode)	None
S07	Ovusense advanced fertility monitoring reader (Antenna 50Ohm dummy loaded)	None

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

TRaC Identification	Description
RFG109	110Vac 60Hz power supply
REF915	110Vac 60Hz power supply
RFG636	110Vac 60Hz power supply

**C2 EUT Operating Mode During Testing.**

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

Test	Description of Operating Mode:TX (ac Powered)
Intentional Emission Field Strength, Spurious Emissions Radiated, Transmitter Frequency stability, 20dB Bandwidth and ac Power Line Conducted Emissions – Transmit Mode.	The EUT (S01, S02 and S03) was powered via RFG109 or REF916 110V / 60Hz power supply. The EUT was transmitting on maximum power, 100% duty cycle using 100% AM modulation. S02 was collated within S01

Test	Description of Operating Mode:TX (battery Powered)
Intentional Emission Field Strength, Spurious Emissions Radiated, Transmitter Frequency stability and 20dB Bandwidth	The EUT (S01, S02) was powered via the 3.6Vdc integral battery. The EUT was transmitting on maximum power, 100% duty cycle using 100% AM modulation. S02 was collated within S01

Test	Description of Operating Mode: RX/Idle mode (ac Powered)
Unintentional Radiated Spurious Emissions and ac Power Line Conducted Emissions – Receive Mode.	The EUT (S03 and S06) was powered via RFG636 or REF915 110Vac / 60Hz power supply. The EUT was in continuous Receive / Idle mode

Test	Description of Operating Mode: RX/Idle mode (Battery Powered)
Unintentional Radiated Spurious Emissions	The EUT (S06) was powered via RFG636 or REF915 110Vac / 60Hz power supply. The EUT was in continuous Receive / Idle mode

**C3 EUT Configuration Information.**

Sample	Internal Configuration Details
S01	Single possible internal configuration
S02	Single possible internal configuration
S03	Single possible internal configuration
S06	Single possible internal configuration
S07	Single possible internal configuration

**C4 List of EUT Ports**

The tables below describe the termination of EUT ports (ac powered mode):

Sample : S01

Tests : Intentional Emission Field Strength, Spurious Emissions Radiated, Transmitter Frequency stability, 20dB Occupied Bandwidth

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	2 core unscreened	1.8m	S03
USB	None	N/A	None

Sample : S06

Tests : Unintentional Radiated Spurious Emissions and ac Power Line Conducted Emissions – Receive Mode.

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	2 core unscreened	1.8m	S03
USB	None	N/A	None

Sample : S07

Tests : ac Power Line Conducted Emissions – Transmit Mode.

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	2 core unscreened	1.8m	S03
USB	None	N/A	None

The table below describes the termination of EUT ports:

Sample : S03

Tests : Intentional Emission Field Strength and Spurious Emissions Radiated

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	RFG109
dc power port	2 core unscreened	1.8m	S01

Sample : S03

Tests : Transmitter Frequency stability and 20dB Occupied Bandwidth

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	REF916
dc power port	2 core unscreened	1.8m	S01

**List of EUT Ports continued (ac powered mode):**

Sample : S03  
 Tests : ac Power Line Conducted Emissions – Transmit Mode.

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	RFG636
dc power port	2 core unscreened	1.8m	S01 or S07

Sample : S03  
 Tests : ac Power Line Conducted Emissions – Receive Mode.

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	RFG636
dc power port	2 core unscreened	1.8m	S06

Sample : S03  
 Tests : Unintentional Radiated Spurious Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	RFG109
dc power port	2 core unscreened	1.8m	S06

**List of EUT Ports (Battery powered mode):**

The table below describes the termination of EUT ports:

Sample : S01  
 Tests : Intentional Emission Field Strength, Spurious Emissions Radiated, Transmitter Frequency stability and 20dB Occupied Bandwidth

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	None	N/A	None
USB	None	N/A	None

Sample : S06  
 Tests : Unintentional Radiated Spurious Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	None	N/A	None
USB	None	N/A	None

**C5 Details of Equipment Used**

For Radiated Measurements:

Intentional Emission Field Strength and Spurious Emissions Radiated between 9kHz to 30MHz

RFG No	Type	Description	Manufacturer	Date Calibrated
REF886	Lab 16	Large Anechoic Chamber	TRaC	27/07/11
023	HFH-Z2	Mag Loop Antenna	R&S	24/03/11
REF909	FSU	Spectrum Analyser	R&S	04/08/11
125	ESHS 10	Test Receiver (LF)	R&S	19/05/11
REF881		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF882		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF884		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF885		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF915	PCR500L	ac/dc Power Supply	Kikusui	N/A

Spurious Emissions Radiated and Unintentional Radiated Spurious Emissions between 30MHz and 1GHz

RFG No	Type	Description	Manufacturer	Date Calibrated.
REF886	Lab 16	Large Anechoic Chamber	TRaC	27/07/11
095	96002	Bicon Antena (30-200MHz)	Eaton	12/05/10
191	3146	Log Periodic Antenna (200-1000MHz)	EMCO	12/05/10
REF927	310	Pre-Amp (9kHz-1GHz)	Sonoma	17/07/11
REF909	FSU	Spectrum Analyser	R&S	04/08/11
126	ESVS 20	Test Receiver (HF)	R&S	18/05/11
452		1m UTIFLEX sma to sma cable	Teledyne Reynolds	25/05/11
REF881		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF882		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF884		HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF885		HF RF coaxial cable	Teledyne Reynolds	06/06/11
109	8559	110Va/60Hz Power Supply	IR Group	N/A
REF887	34405A	Digital Multi meter	Agilent	25/08/11

For ac Power Line Conducted Emissions – Transmit and Receive Modes

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
N/A	Lab 7	Screened room 1	TRaC	N/A
189	ESH3-Z5	2-Phase LISN	R&S	09/06/11
674	ESH3-Z2	Pulse Limiter	R&S	02/05/11
657	E4404B	Spectrum Analyser	Agilent	17/05/11
295	K0017F	BNC Type 3m Cable RF	Huber & Suhner UK Ltd	12/09/11
299	K0017F	BNC Type 3m Cable RF	Huber & Suhner UK Ltd	12/09/11
125	ESHS 10	Test Receiver (LF)	R&S	19/05/11
636	NSG 1007	5kVA ac Power Source	Schaffner	N/A



**Details of Equipment Used continued:**

For Transmitter Frequency Stability

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
REF837	PSA	E4440A Spectrum Analyser	Agilent	18/05/11
REF887	34405A	Multi-meter	Agilent	25/08/11
REF477	SMA	HF cable (SMA to SMA)	Semflex	25/05/11
RFG408	7429-1	Loop antenna (Pickup)	Solar Electronics	Cal Before use
REF520	710 PV	Portavolt Variac	Claude Lyons	Cal Before use
REF916	PCR 500L	110Vac / 60Hz supply	KIKUSUI	Cal Before use
REF365	BM 80 / - 20/150/P	Environmental Chamber	JTS	17/06/11

For 20dB Bandwidth and Intentional Carrier Field Strength (carrier mask)

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
REF909	FSU	Spectrum analyser	R&S	04/08/11
REF887	34405A	Multi-meter	Agilent	25/08/11
REF477	SMA	HF cable (SMA to SMA)	Semflex	25/05/11
RFG408	7429-1	Loop antenna (Pickup)	Solar Electronics	Cal Before use
REF520	710 PV	Portavolt Variac	Claude Lyons	Cal Before use
REF916	PCR 500L	110Vac / 60Hz supply	KIKUSUI	Cal Before use

**Appendix D:**

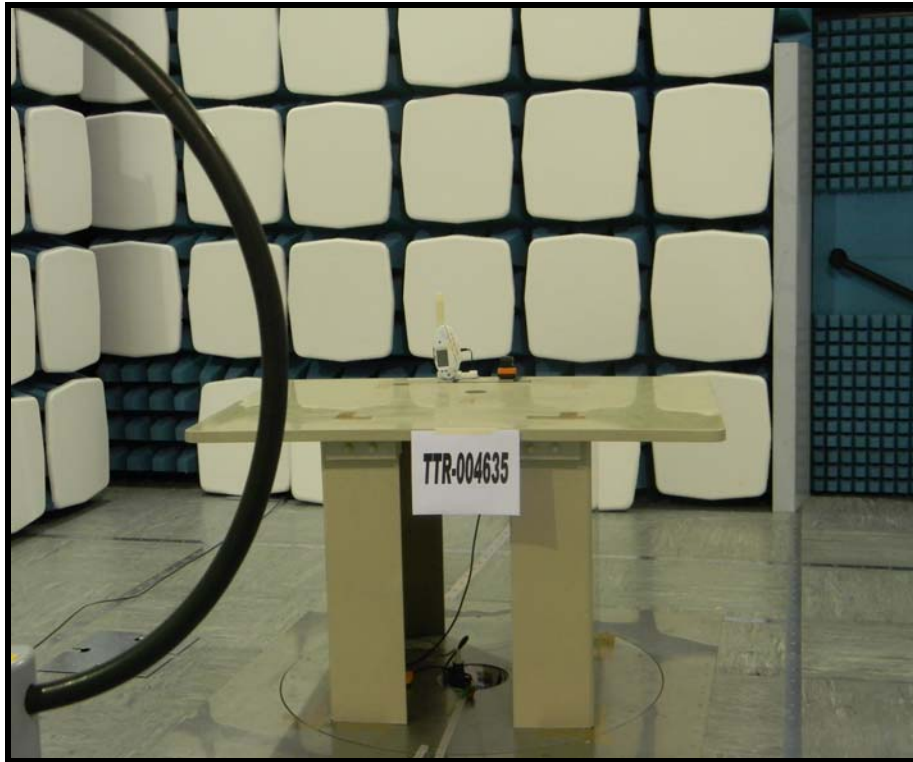
**Additional Information**

No additional information is included within this test report.

**Appendix E:****Photographs and Figures**

The following photographs were taken of the test samples:

1. Radiated Magnetic field emissions arrangement: front view.
2. Radiated Magnetic field emissions arrangement: front view.
3. Radiated electric field emissions arrangement: front view.
4. Radiated electric field emissions arrangement: rear view.
5. Power line conducted emissions
6. Power line conducted emissions
7. Photo of the EUT front view (S01)
8. Photo of the EUT front view (S01 and S02)
9. Photo of the EUT bottom view (S01)
10. Photo of the EUT rear view (S01)
11. Photo of the EUT, top casing removed (S01)
12. Photo of the EUT, top casing removed (S01)
13. Photo of the EUT, top casing removed (S01)
14. Photo of the EUT, PCB rear view (S01)
15. Photo of the EUT, front view (S03)
16. Photo of the EUT, side view (S03)



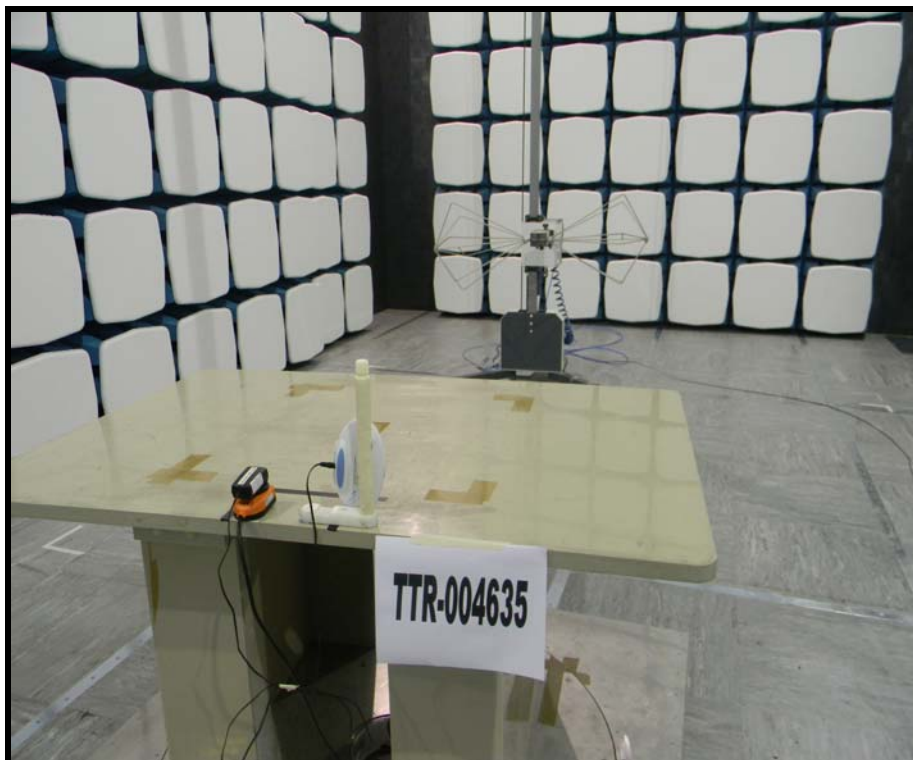
Photograph 1



Photograph 2



Photograph 3



Photograph 4



Photograph 5



Photograph 6





Photograph 7



Photograph 8



Photograph 9

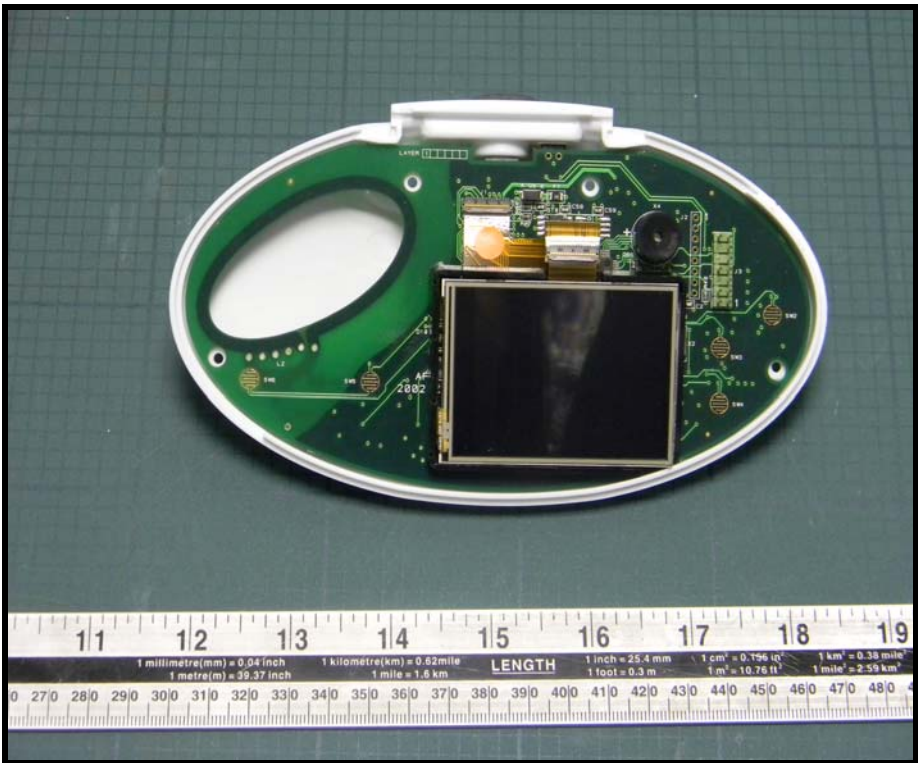


Photograph 10

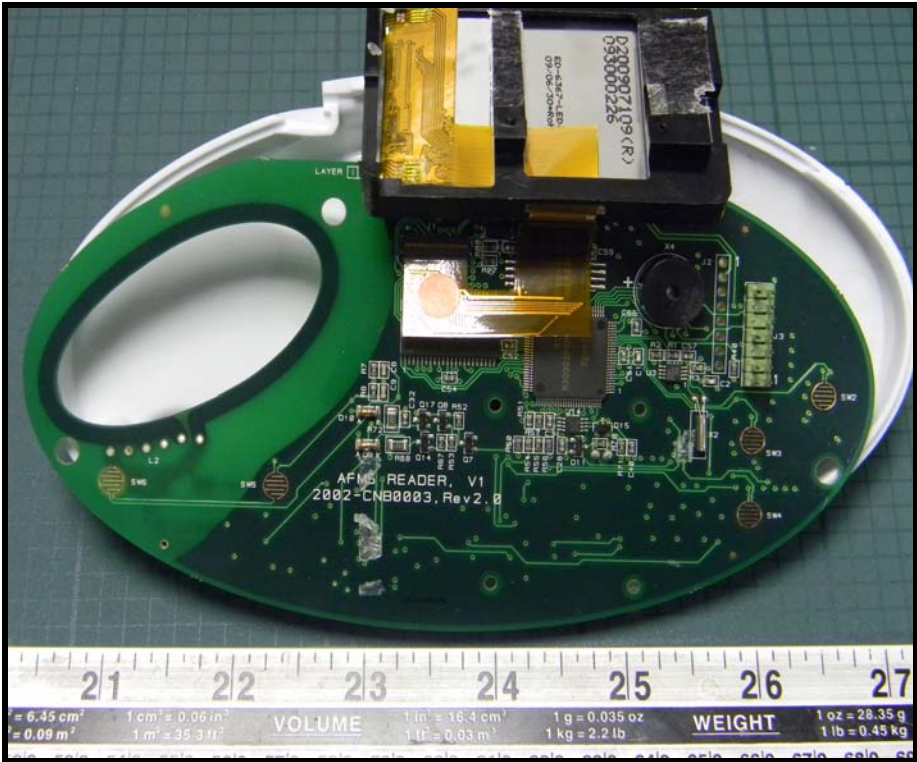




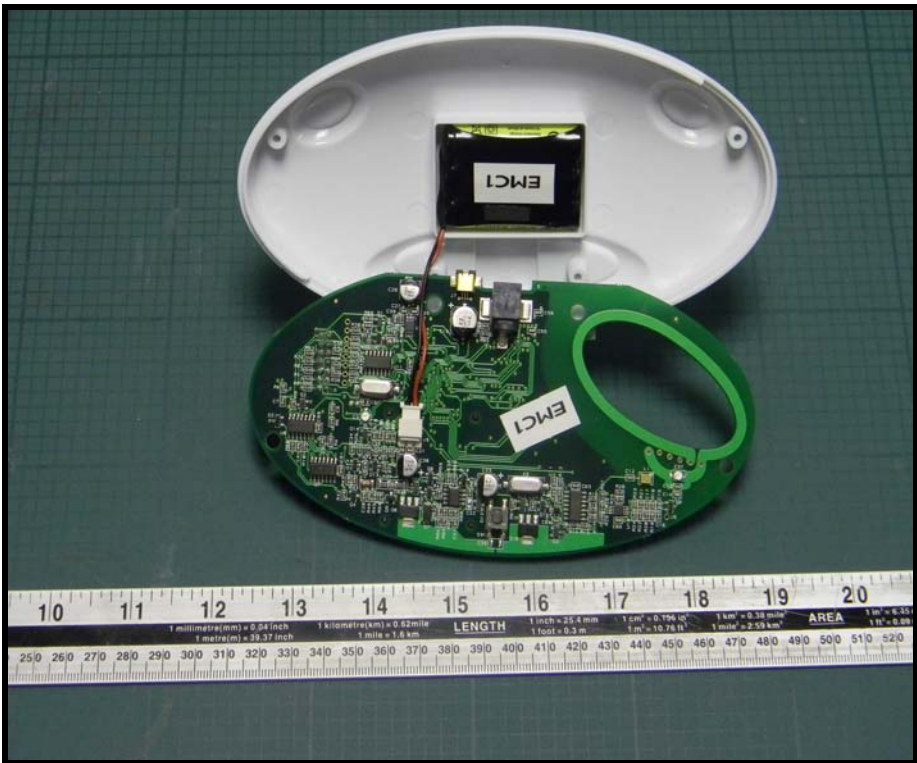
Photograph 11



Photograph 12



Photograph 13



Photograph 14





Photograph 15



Photograph 16

**Appendix F:****MPE Calculation**

OET Bulletin No. 65, Supplement C 01-01

**47 CFR §§1.1307 and 2.1091**

2.1091 Radio frequency radiation exposure evaluation: mobile devices.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than **0.9789mW/cm<sup>2</sup>** power density limit, as required under FCC rules.

**Prediction of MPE limit at a given distance**

Equation from Supplement B to OET Bulletin No. 65 Edition 97-01 June 2001, Page 17

$$S = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2} \text{ re-arranged } R = \sqrt{\frac{EIRP}{S4\pi}}$$

where:

R = distance to the centre of radiation of the antenna (appropriate units, e.g., cm)

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

EIRP = equivalent (or effective) isotropically radiated power

Note:

The EIRP value was determined using the peak H Field measurement

Result:

Prediction Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) (mW/cm <sup>2</sup> )	Distance (R) cm required to be less than 0.9789 mW/cm <sup>2</sup>
13.56	2.89229E-05	0.978933	0.001533345

**Limits:**

Supplement C 01-01 to OET Bulletin No. 65 Edition 97-01 June 2001:  
Page 26, (B) Limits for General Population/Uncontrolled Exposure

Frequency range = 1.34MHz-30MHz

Power density limit (S) = (180/f<sup>2</sup>) (f= MHz)

