

RADIO TEST REPORT
FOR
SCOPE COMMUNICATIONS UK LTD
ON
LTX UNIT
DOCUMENT NO. TRA-013040-47-00-A

HULL

Unit E, South Orbital Trading Park, Hedon Road, Hull, HU9 1NJ, UK.
T +44 (0)1482 801801 **F** +44 (0)1482 801806 **E** test@tracglobal.com
www.tracglobal.com

TRaC Wireless Test Report : TRA-013040-47-00-A

Applicant : Scope Communications UK Ltd

Apparatus : LTX UNIT

Specification(s) : CFR47 Part 90.217

Purpose of Test : **Certification**

FCCID : JRNUSAWAVETRACK

Authorised by

:



: Radio Product Manager

Issue Date : **1st March 2013**

Authorised Copy Number : *PDF*

Contents

Section 1:	Introduction	4
1.1	General	4
1.2	Tests Requested By	5
1.3	Manufacturer	5
1.4	Apparatus Assessed	5
1.5	Test Result Summary	6
1.6	Notes Relating To The Assessment	7
1.7	Deviations from Test Standards	7
Section 2:	Measurement Uncertainty	8
2.1	Measurement Uncertainty Values	8
Section 3:	Modifications	10
3.1	Modifications Performed During Assessment	10
Appendix A:	Formal Emission Test Results	11
A1	Maximum Radiated Output Power (Effective Radiated Power)	12
A2	Radiated Transmitter Spurious Emissions (ERP)	14
A3	Unintentional Radiated Emissions (Electric Field Strength)	17
A4	Power Line Conducted Emissions	19
A5	Occupied Bandwidth	21
Appendix B:	Supporting Graphical Data	25
Appendix C:	Additional Test and Sample Details	30
Appendix D:	Additional Information	36
Appendix E:	Photographs and Figures	37
Appendix F:	MPE Calculation	41

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.

Test performed by: TRaC Global []
Unit E
South Orbital Trading Park
Hedon Road
Hull, HU9 1NJ.
United Kingdom.

Telephone: +44 (0) 1482 801801
Fax: +44 (0) 1482 801806

TRaC Global [X]
Unit 1
Pendle Place
Skelmersdale
West Lancashire, WN8 9PN
United Kingdom

Telephone: +44 (0) 1695 556666
Fax: +44 (0) 1695 577077

Email: test@tracglobal.com
Web site: <http://www.tracglobal.com>

Tests performed by: D Winstanley

Report author: D Winstanley

This report must not be reproduced except in full without prior written permission from TRaC Global.

1.2 Tests Requested By

This testing in this report was requested by :

Scope Communications UK Ltd
Quantum House
Totnes
Devon
TQ9 5AL

1.3 Manufacturer

As above.

1.4 Apparatus Assessed

The following apparatus was assessed between 15th – 20th February 2013:

LTX UNIT

The apparatus is a pendant transmitter for use with an alarm system. The apparatus is designed to transmit between 430 MHz and 470 MHz with a carrier power below 120 mW to allow exemption from the full 47CFR Part 90 technical requirements.

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
Maximum Radiated Output Power	Title 47 of the CFR: Part 90.217	ASNI/TIA-603-C-2004	Pass
Transmitter Spurious Emissions Radiated (ERP)	Title 47 of the CFR: Part 2.1051	ASNI/TIA-603-C-2004	Pass
Unintentional Radiated Spurious Emissions (REFE)	Title 47 of the CFR: Part 15 Subpart (b) 15.109	ANSI C63.10:2009	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart (c) 15.207	ANSI C63.10:2009	N/A
Occupied bandwidth/ Frequency Stability	Title 47 of the CFR: Part 90.217 (b).	ASNI/TIA-603-C-2004	Pass

Abbreviations used in the above table:

ANSI C 63.10:2009 and ASNI/TIA-603-C-2004 is outside the scope of the laboratories UKAS accreditation.

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

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

1.6 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 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 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.

[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 (Frequency Counter) = **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	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 Maximum Radiated Output Power (Effective Radiated Power)

The assessment method used was a radiated measurement at normal test conditions.

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 (b) below.

Test Details: Maximum output power was verified with the EUT transmitting	
Regulation	Title 47 of the CFR: Part 90.217
Measurement standard	ASNI/TIA-603-C-2004
Application	Cabinet and Antenna
EUT sample number	S01
Modification state	0
SE in test environment	S03, S05
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	23°C
Photographs (Appendix E)	1 to 3

Ref No.	Freq (MHz)	Result (dBm)	Spec. Limit (dBm)	Margin (dB)	Summary
1	430.000	6.9	20.8	-13.9	Pass
2	450.000	4.0	20.8	-16.8	Pass
3	470.000	-0.4	20.8	-21.2	Pass

The frequency listed in the above table corresponds to the peak emission measured and does not necessarily correspond with the specified carrier frequency for devices employing frequency or phase shift keying techniques. Radiated carrier power tests are carried out at nominal test conditions only for equipment having an integral antenna

Limits:

In accordance with Title 47 of the CFR: Part 90.217 the effective radiated power shall not exceed 120mW (20.8dBm).

Notes:

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

A2 Radiated Transmitter Spurious Emissions (ERP)

The assessment method used was a radiated measurement at normal test conditions. Please refer to section A1 for Effective Radiated Power (Transmitter Carrier Power e.r.p). Preliminary scans were performed using a peak detector with the RBW = 100kHz. The effective radiated power emission test applies to all spurious emissions and harmonics emissions

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 (b) below.

Test Details: Maximum output power was verified with the EUT transmitting	
Regulation	Title 47 of the CFR: Part 90.217(b)
Measurement standard	ASNI/TIA-603-C-2004
Application	Cabinet and Antenna
EUT sample number	S01
Modification state	0
SE in test environment	S03, S05
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Temperature	23°C
Photographs (Appendix E)	1 to 3

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

ERP TX 430MHz						
Ref No.	Freq (MHz)	Det.	Result (dBm)	Spec. Limit (dBm)	Margin (dB)	Summary
1	860.0	Pk	-29.9	-23.1	-6.8	Pass
2	1290.0	Pk	-38.8	-23.1	-15.7	Pass
3	2580.0	Pk	-36.3	-23.1	-13.2	Pass
4	3010.0	Pk	-36.9	-23.1	-13.8	Pass

No further emissions were detected within 10dB of the specification limit

ERP TX 450MHz						
Ref No.	Freq (MHz)	Det.	Result (dBm)	Spec. Limit (dBm)	Margin (dB)	Summary
5	449.5	Pk	-45.8	-26.0	-19.8	Pass
6	900.0	Pk	-28.2	-26.0	-2.2	Pass
7	2250.0	Pk	-45.7	-26.0	-19.7	Pass
8	2700.0	Pk	-36.6	-26.0	-10.6	Pass
9	3150.0	Pk	-45.4	-26.0	-19.4	Pass

No further emissions were detected within 10dB of the specification limit

ERP TX 470MHz						
Ref No.	Freq (MHz)	Det.	Result (dBm)	Spec. Limit (dBm)	Margin (dB)	Summary
10	940	Pk	-40.7	-30.4	-10.3	Pass
11	1880.000	Pk	-50.3	-30.4	-19.9	Pass
12	2350.000	Pk	-41.3	-30.4	-10.9	Pass
13	2820.000	Pk	-39.0	-30.4	-8.6	Pass

No further emissions were detected within 10dB of the specification limit

Limits

In accordance with Title 47 of the CFR: Part 90.217 the radiated transmitter spurious emissions limit was determined relative to the maximum measured effective radiated power as at normal test conditions.

The limit in 100 kHz RBW = (Measured radiated carrier power -30dB)

Where:

Channel Frequency (MHz)	Measured ERP Carrier (dBm)	Measured ERP Carrier – 30dB	Emission Limit (dBm)
430.0	6.9	6.9 – 30	-23.1
450.0	4.0	4.0 – 30	-26.0
470.0	-0.4	-0.4 – 30	-30.4

Notes:

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

A3 Unintentional Radiated Emissions (Electric Field Strength)

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

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

3m open area test site :

☐

3m alternative test site :

☒

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

Test Details:	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.109
Measurement standard	ANSI C63.10:2009
Frequency range	30MHz to 5GHz
EUT sample number	S01
Modification state	0
SE in test environment	S03, S05
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix E)	1 to 3

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

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

No further Significant Emissions Within 10dB of Limit.

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1 For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak RBW=VBW= 1MHz
Average RBW=VBW= 1MHz

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

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

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

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

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

- (b) The levels may have been rounded for display purposes.
- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
Effect of Position of EUT cables & samples on emission levels	✓			
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) Parameter defined by client and / or single possible, refer to Appendix D (iii) Parameter had a negligible effect on emission levels, refer to Appendix D (iv) Worst case determined by initial measurement, refer to Appendix D				

A4 Power Line Conducted Emissions

Preview power line conducted emission measurements were performed with a peak detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b). Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector.

Test Details:	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.107
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S01
Modification state	0
SE in test environment	S03, S05
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	4

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	No Significant Emissions Within 10dB of Limit.					

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	No Significant Emissions Within 10dB of Limit.					

Specification limits :

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

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB μ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 ²	56 to 46 ²
0.5 to 5	56	46
5 to 30	60	50

Notes:

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

Notes:

- (a) The levels may have been rounded for display purposes.
- (b) The following table summarises the effect of the EUT operating mode and internal configuration on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
(i) Parameter defined by standard and / or single possible, refer to Appendix C (ii) Parameter defined by client and / or single possible, refer to Appendix C (iii) Parameter had a negligible effect on emission levels, refer to Appendix C (iv) Worst case determined by initial measurement, refer to Appendix C				

A5 Occupied Bandwidth

Test Details:	
Regulation	Title 47 of the CFR: Part 90.217(b)
Measurement standard	Title 47 of the CFR: Part 2.1049
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Measurements were made on the EUT at points 30 dB down from the peak carrier emission with the EUT transmitting at the lowest, middle and highest channels in turn.

430 MHz		
Test Conditions	Measured FL (MHz)	Measured FU (MHz)
-30°C	429.98966	430.00313
-20°C	429.99231	430.00577
-10°C	429.99383	430.00729
0°C	429.99431	430.00785
+10°C	429.99447	430.00793
+20°C	429.99423	430.00780
+30°C	429.99327	430.00681
+40°C	429.99335	430.00689
+50°C	429.99311	430.00657
Measured lowest FL (MHz)	429.98966	
Measured highest FH (MHz)	430.00793	
Permitted FL	429.98750	
Permitted FH	430.01250	
Result	PASS	

450 MHz		
Test Conditions	Measured FL (MHz)	Measured FU (MHz)
-30°C	449.98982	450.00337
-20°C	449.99247	450.00601
-10°C	449.99375	450.00729
0°C	449.99423	450.00777
+10°C	449.99439	450.00793
+20°C	449.99423	450.00777
+30°C	449.99311	450.00665
+40°C	449.99319	450.00673
+50°C	449.99295	450.00649
Measured lowest FL (MHz)		449.98982
Measured highest FH (MHz)		450.00793
Permitted FL		449.98750
Permitted FH		450.01250
Result		PASS

470 MHz		
Test Conditions	Measured FL (MHz)	Measured FU (MHz)
-30°C	469.98942	470.00296
-20°C	469.99231	470.00585
-10°C	469.99335	470.00689
0°C	469.99399	470.00753
+10°C	469.99407	470.00761
+20°C	469.99391	470.00745
+30°C	469.99271	470.00625
+40°C	469.99279	470.00633
+50°C	469.99255	470.00617
Measured lowest FL (MHz)		469.98942
Measured highest FH (MHz)		470.00761
Permitted FL		469.98750
Permitted FH		470.01250
Result		PASS

430 MHz				
Test Conditions	Fc (MHz)	Drift (kHz)	Drift (ppm)	Result
-30°C	429.99648	-0.00456	-0.0106	Pass
-20°C	429.99904	-0.00200	-0.0047	Pass
-10°C	430.00056	-0.00048	-0.0011	Pass
0°C	430.00104	0.00000	0.0000	Pass
+10°C	430.00120	0.00016	0.0004	Pass
+20°C	430.00104	1.04167	2.4225	Pass
+30°C	430.00008	-0.00096	-0.0022	Pass
+40°C	430.00008	-0.00096	-0.0022	Pass
+50°C	429.99984	-0.00120	-0.0028	Pass

450 MHz				
Test Conditions	Fc (MHz)	Drift (kHz)	Drift (ppm)	Result
-30°C	449.99655	-0.00441	-0.0098	Pass
-20°C	449.99928	-0.00168	-0.0037	Pass
-10°C	450.00048	-0.00048	-0.0011	Pass
0°C	450.00104	0.00008	0.0002	Pass
+10°C	450.00112	0.00016	0.0004	Pass
+20°C	450.00096	0.96154	2.1368	Pass
+30°C	449.99992	-0.00104	-0.0023	Pass
+40°C	449.99992	-0.00104	-0.0023	Pass
+50°C	449.99968	-0.00128	-0.0028	Pass

470 MHz				
Test Conditions	Fc (MHz)	Drift (kHz)	Drift (ppm)	Result
-30°C	469.99615	-0.00457	-0.0097	Pass
-20°C	469.99904	-0.00168	-0.0036	Pass
-10°C	470.00016	-0.00056	-0.0012	Pass
0°C	470.00077	0.00005	0.0001	Pass
+10°C	470.00088	0.00016	0.0003	Pass
+20°C	470.00072	0.72115	1.5344	Pass
+30°C	469.99944	-0.00128	-0.0027	Pass
+40°C	469.99956	-0.00116	-0.0025	Pass
+50°C	469.99936	-0.00136	-0.0029	Pass

Limits

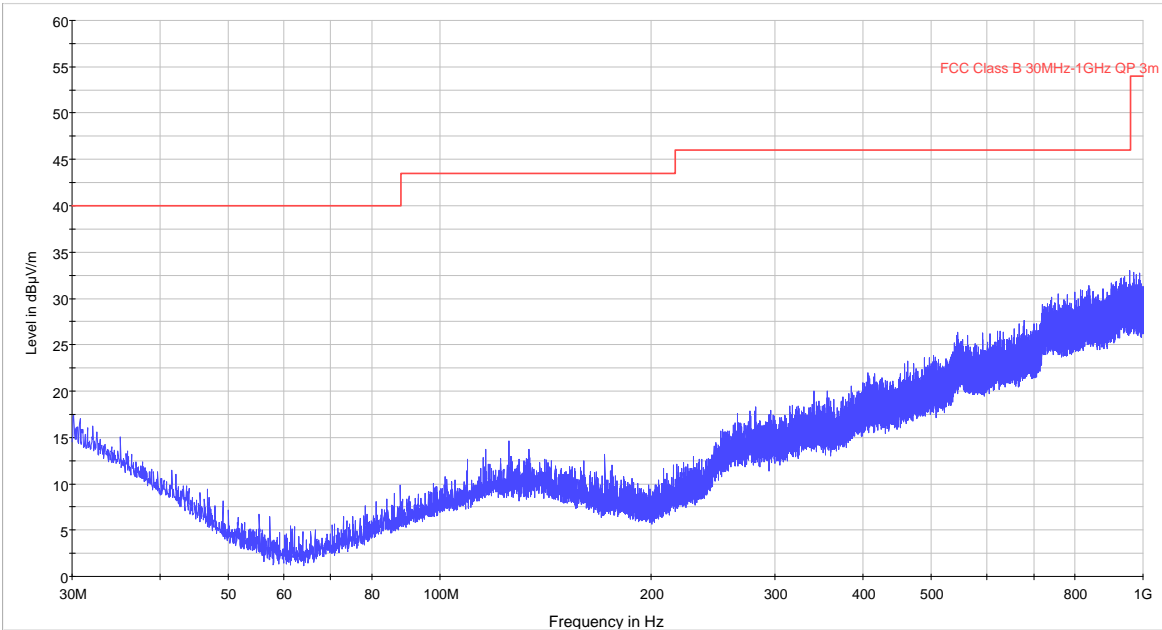
In accordance with Title 47 of the CFR: Part 90.217 (b) For equipment designed to operate with a 12.5 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 25 kHz or more removed from the assigned frequency is attenuated at least 30 dB below the unmodulated carrier.

Appendix B:**Supporting Graphical Data**

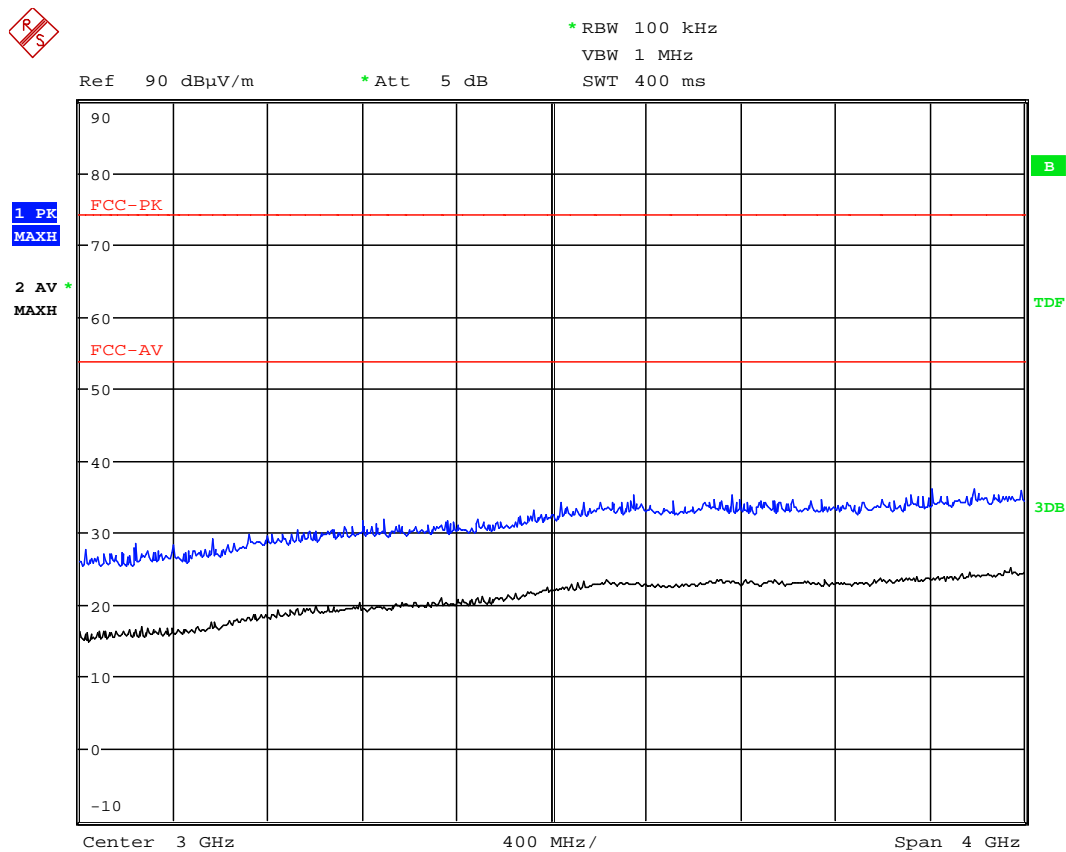
This appendix contains graphical data obtained during testing.

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.

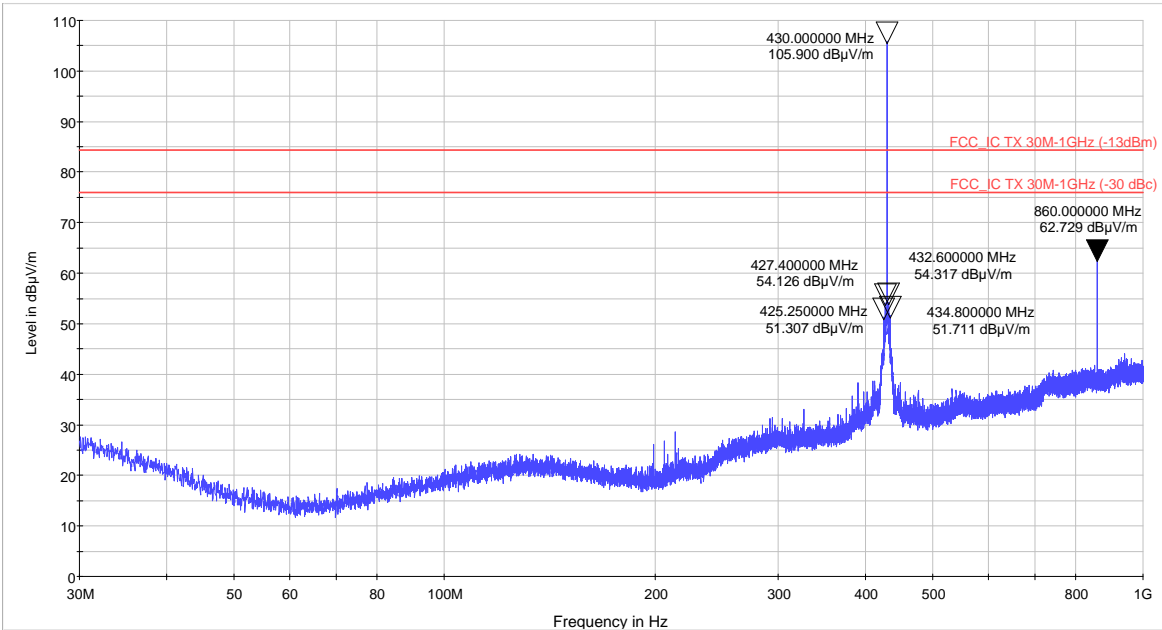


Unintentional Radiated spurious emissions 30 MHz to 1000MHz

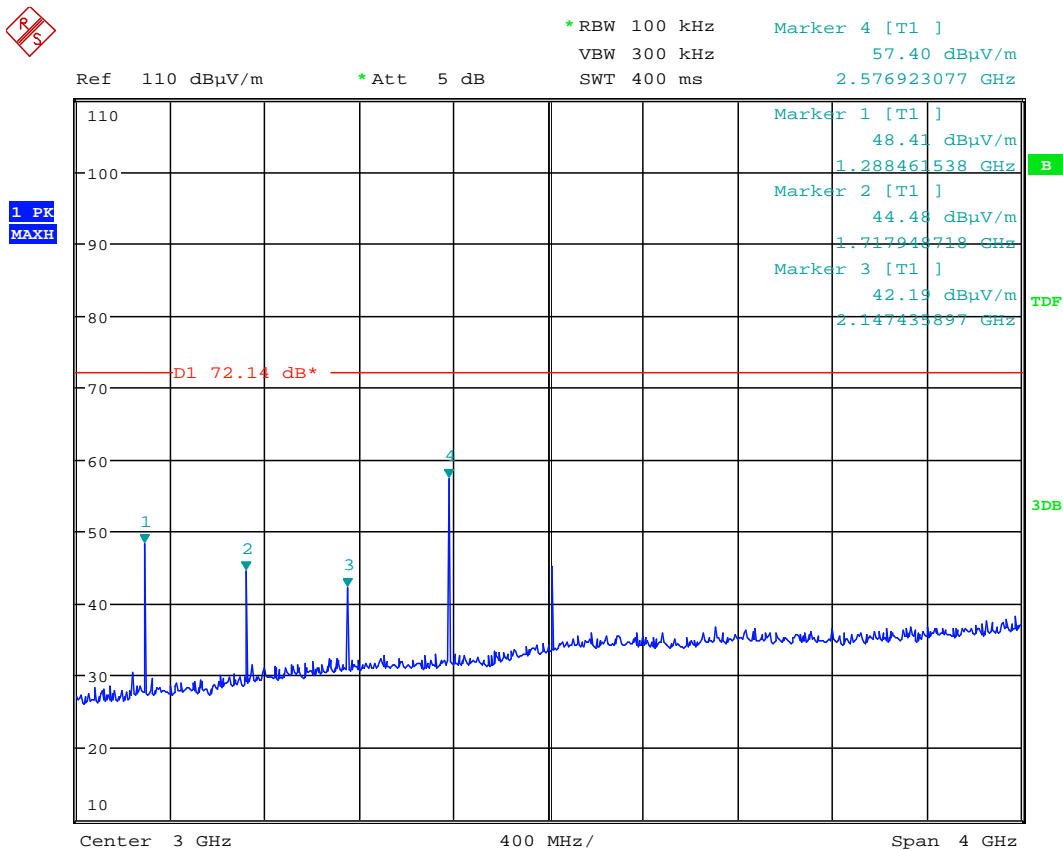


Date: 15.FEB.2013 14:20:42

Unintentional Radiated spurious emissions 1GHz to 5GHz

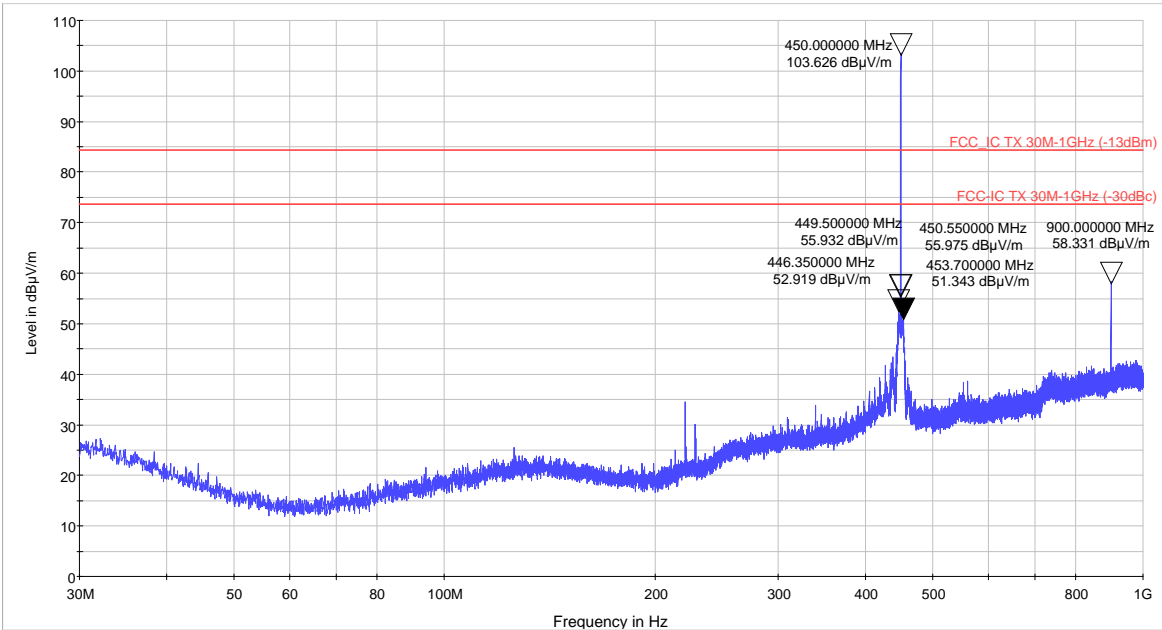


ERP TX 450MHz Radiated spurious emissions 30 MHz to 1000 MHz (Bottom channel)

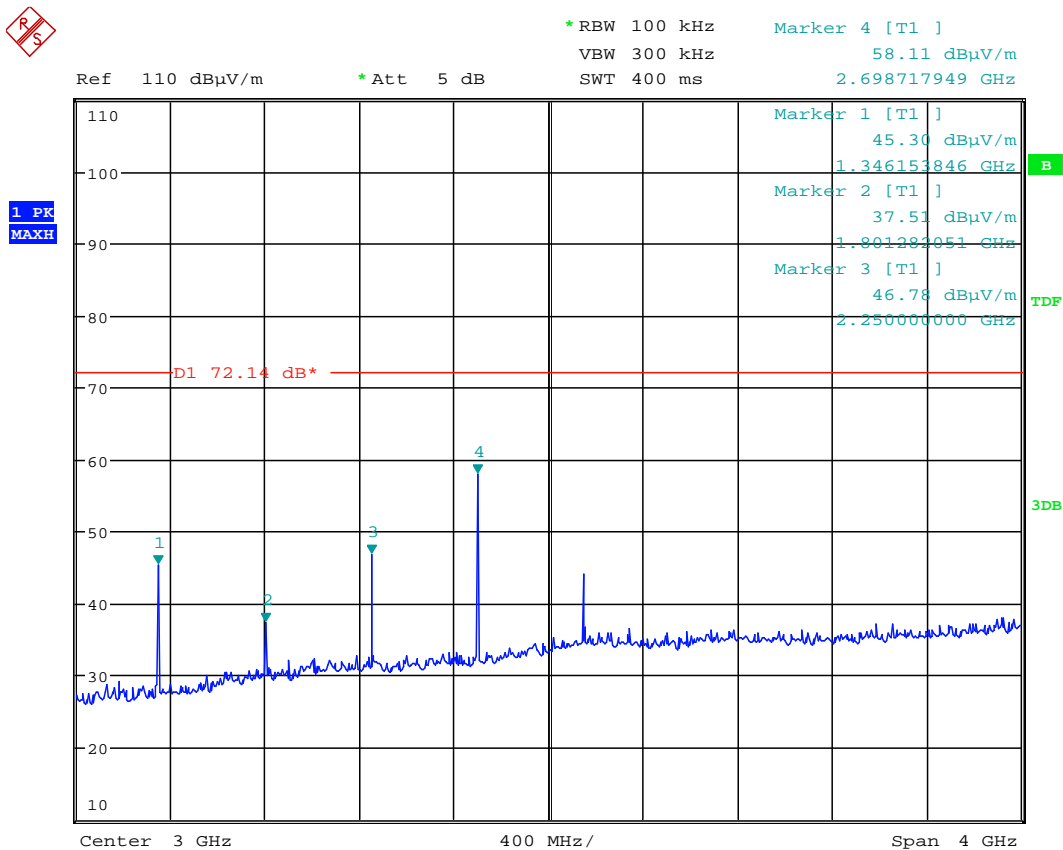


Date: 15.FEB.2013 14:13:34

ERP TX 450MHz Radiated spurious emissions 1GHz to 5GHz (Bottom channel)

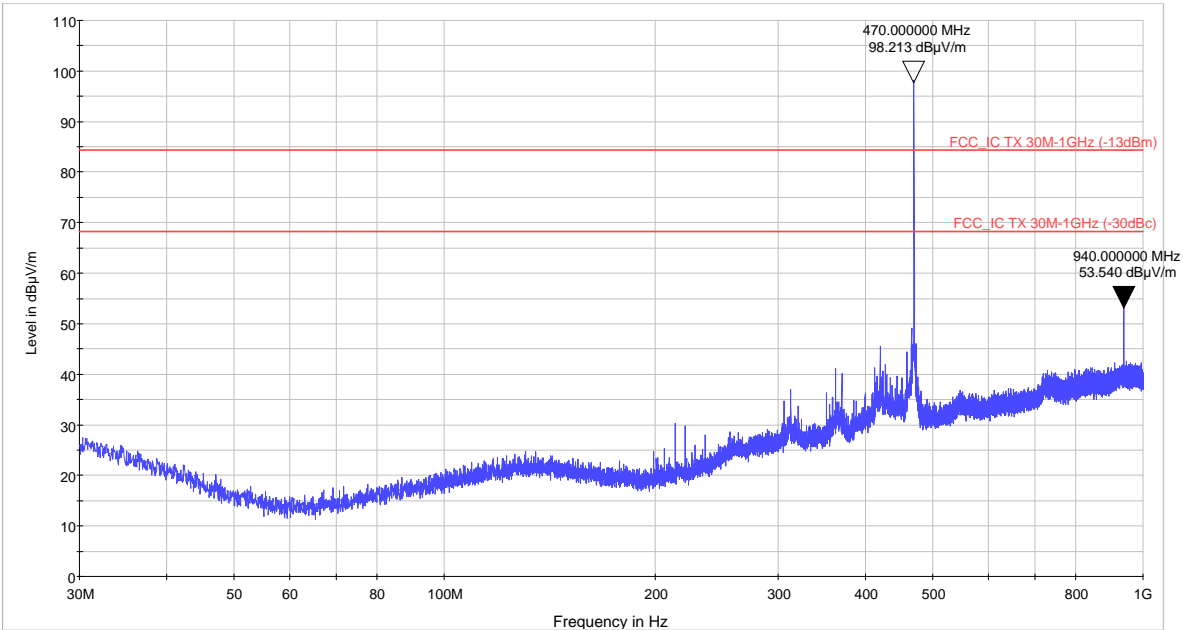


ERP TX 450MHz Radiated spurious emissions 30 MHz to 1000 MHz (Middle channel)

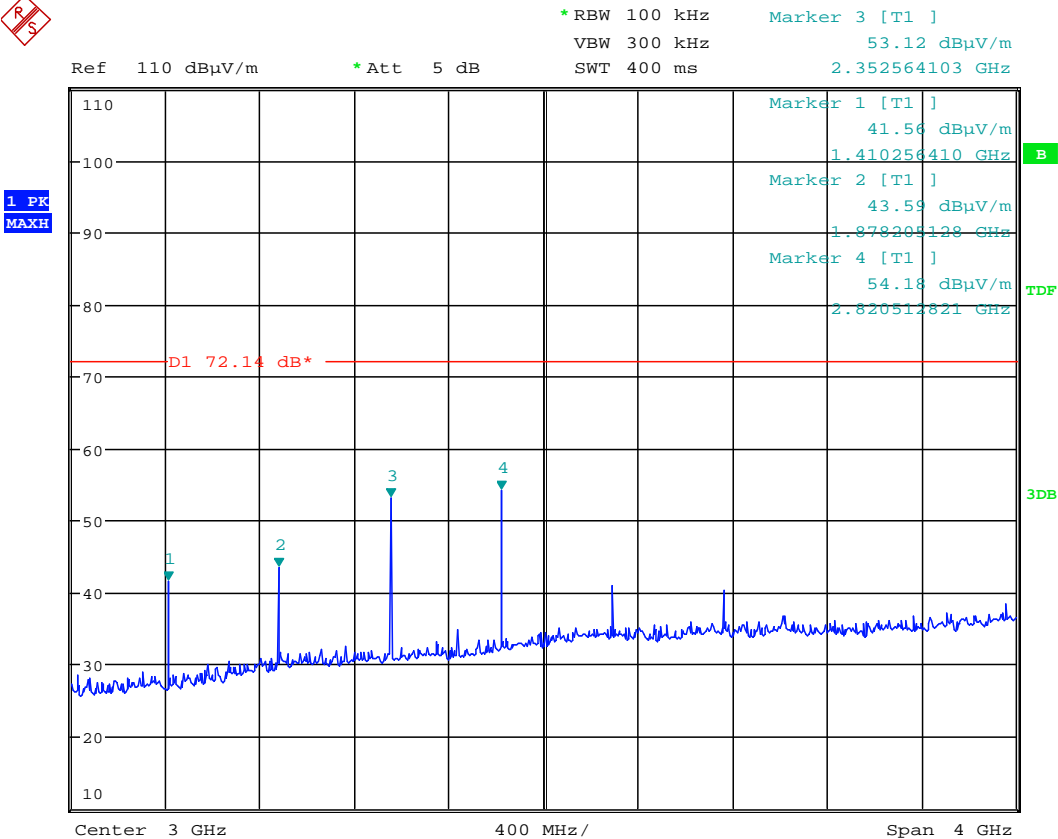


Date: 15.FEB.2013 14:17:19

ERP TX 450MHz Radiated spurious emissions 1GHz to 5GHz (Middle channel)



ERP TX 470MHz Radiated spurious emissions 30 MHz to 1000 MHz (Top channel)



Date: 15.FEB.2013 14:10:13

ERP TX 470MHz Radiated spurious emissions 1GHz to 5GHz (Top channel)

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
S01	LTX UNIT (Radiated Sample)	SCP544588E
S03	LTX UNIT (Conducted Sample)	SCP541708E
S03	Battery Mounting	None
S05	Control Button PCB	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 tests detailed in this report except receiver radiated (ERP) spurious emissions	EUT transmitting FSK modulation on 430MHz, 450 MHz and 470MHz

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

C3) EUT Configuration Information.

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

C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S01 & S02
Tests : Radiated & Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected
6-Way terminal	None	0	Control Buttons
2-Way terminal	2 wires	10cm	Power Supply / Battery

* Only connected during setup.

C5 Details of Equipment Used

TRaC No	Equipment Type	Equipment Description	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH003	ESHS10	Receiver	R&S	16/02/2012	12	16/02/2013
UH191	CBL611/A	Bilog	Chase	13/12/2012	24	13/12/2014
UH195	ESH3-Z5.831.5	Lisn	R&S	01/06/2012	12	01/06/2013
UH281	FSU46	Spectrum Analyser	R&S	09/02/2012	12	09/02/2013
UH396	ENV216	Lisn	R&S	12/04/2012	12	12/04/2013
L138	3115	1-18GHz Horn	EMCO	08/11/2011	24	08/11/2013
L193	VHA 9103 balu	Bicone Antenna	Chase	19/06/2012	24	19/06/2014
L203	UPA6108	Log Periodic Ant	Chase	19/06/2012	24	19/06/2014
L317	ESVS10	Receiver	R&S	09/01/2013	12	09/01/2014
L572	8449B	Pre Amp	Agilent	12/12/2012	24	12/12/2014
REF909	FSU26	Spectrum Analyser	R&S	04/02/2013	12	04/02/2014
REF916	SMBV100A	Signal Generator	R&S	23/07/2012	12	23/07/2013
REF940	ATS	Radio Chamber - PP	Rainford EMC	26/06/2012	12	26/06/2013

Appendix D:

Additional Information

No additional information is included within this test report.

Appendix E:

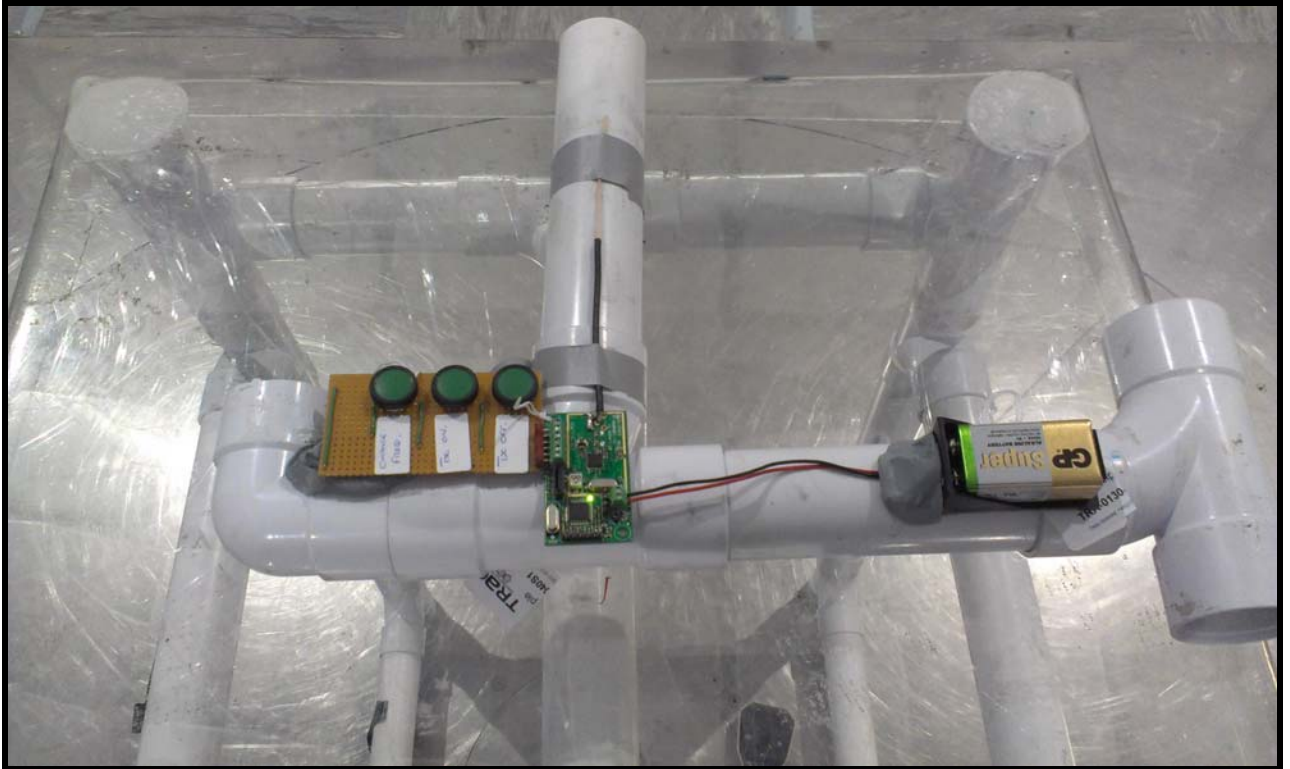
Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions: Over view.
2. Radiated electric field emissions: Close up.
3. AC Powerline Conducted emissions: Over view.



Photograph 1



Photograph 2



Photograph 3

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 1mW/cm² power density limit, as required under FCC rules.

Prediction of MPE limit at a given distance

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

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

where:

S = power density

R = distance to the centre of radiation of the antenna

EIRP = EUT Maximum power

Note:

The EIRP measurement was performed using a signal substitution method.

Result

Prediction Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) (mW/cm ²)	Distance (R) cm required to be less than 0.28 mW/cm ²
430 MHz	4.89	0.28	1.2

