TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Net2 PaxLock

FCC ID: USE901172

IC Certification Number: 10217A-901172

To: FCC Part 15.247, Industry Canada RSS-210 & RSS-Gen

Test Report Serial No.:
RFI-RPT-RP86275JD04A V2.0

Version 2.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:	pp 
Checked By:	Ian Watch
Signature:	
Date of Issue:	14 March 2012

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1. Customer Information

Company Name:	Paxton Ltd.
Address:	Paxton House Home Farm Brighton Sussex BN1 9HU United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart B (Unintentional Radiators) - Section 15.109
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Intentional Radiators) - Section 15.209
Specification Reference:	RSS-Gen Issue 3 December 2010
Specification Title:	General Requirements and Information for the Certification of Radio Apparatus
Specification Reference:	RSS-210 Issue 8 December 2010
Specification Title:	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
Site Registration:	FCC: 209735; Industry Canada: 3245B-2
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	17 February 2012 to 21 February 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.109	RSS-Gen 4.10/6	Receiver/Idle Mode Radiated Spurious Emissions	✓
Part 15.247(a)(2)	RSS-Gen 4.6.2 RSS-210 A8.2(a)	Transmitter 6 dB Bandwidth	✓
Part 2.1049	RSS-Gen 4.6.1	Transmitter 20 dB Bandwidth	✓
Part 15.247(e)	RSS-210 A8.2(b)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	RSS-Gen 4.8 RSS-210 A8.4(4)	Transmitter Maximum Peak Output Power	✓
Part 15.247(d)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Radiated Emissions	✓
Part 15.247(d)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Band Edge Radiated Emissions	✓

Key to Results

✓ = Complied ✗ = Did not comply

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices
Reference:	FCC KDB 558074 D01
Title:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under 15.247

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Net2 PaxLock
Model Name or Number:	901–172
Serial Number:	6000030
Hardware Version:	z-pl01 rev4, ppc-pl01 revC
Software Version:	N/A
FCC ID:	USE901172
IC Certification Number:	10217A-901172

3.2. Description of EUT

The Equipment Under Test was a door lock with intelligent access control using an IEEE802.15.4 bespoke proprietary wireless network protocol named Net2Air transceiver. It also incorporates a 125 kHz proximity reader.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	IEEE 802.15.4 Digital Transmission System		
Category of Equipment:	Wide Band Data Transmission		
Type of Unit:	Transceiver		
Modulation:	O-QPSK		
Data Rate:	250 kbps		
Power Supply Requirement(s):	Nominal	6.0 VDC	
Channel Spacing:	5 MHz		
Transmit Frequency Range:	2405 MHz to 2475 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	11	2405
	Middle	18	2440
	Top	25	2475
Receive Frequency Range:	2405 MHz to 2475 MHz		
Receive Channel Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Top	25	2475

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Net2Air USB Bridge
Brand Name:	Net2Air
Model Name or Number:	477–268

Description:	RFID tag
Brand Name:	Net2Air
Model Name or Number:	User4

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Continuously transmitting at maximum power on the bottom, middle and top channels as required.
- Receive/Idle Mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The EUT was powered by four AA type batteries. New batteries were fitted before testing commenced and the voltage levels were monitored during testing.
- Channels were selected on the EUT using a laptop PC provided by the Customer together with the NetAir bridge, USB cable and RFID card. When the EUT was in the correct mode the support equipment was removed from the test site.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

5.2. Test Results

5.2.1. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	21

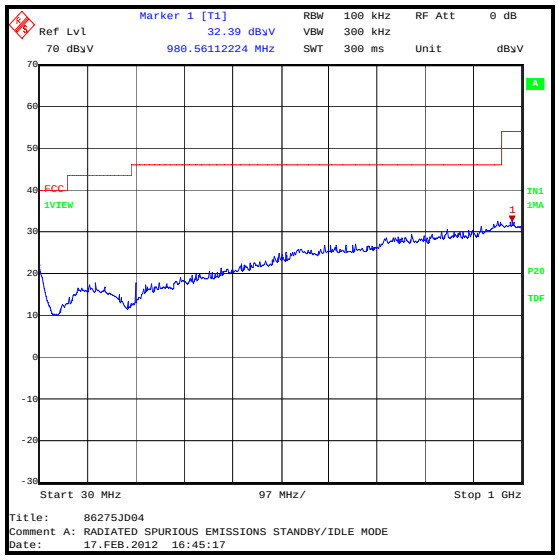
Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
980.561	Vertical	32.4	54.0	21.6	Complied

Note(s):

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Receiver/Idle Mode Radiated Spurious Emissions (continued)



Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range:	1 GHz to 12.5 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	21

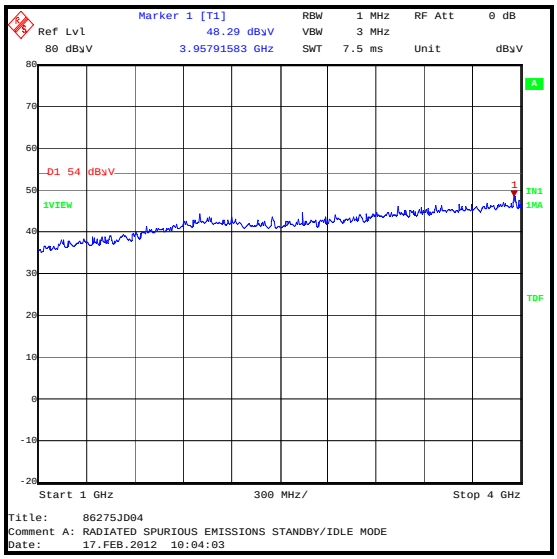
Results:

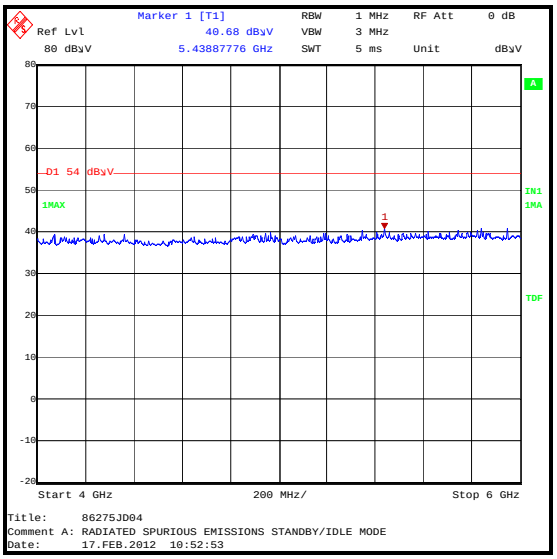
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
3957.916	Vertical	48.3	54.0	5.7	Complied

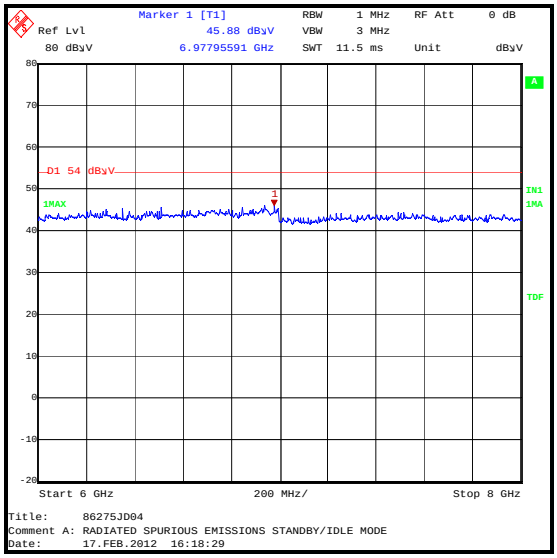
Note(s):

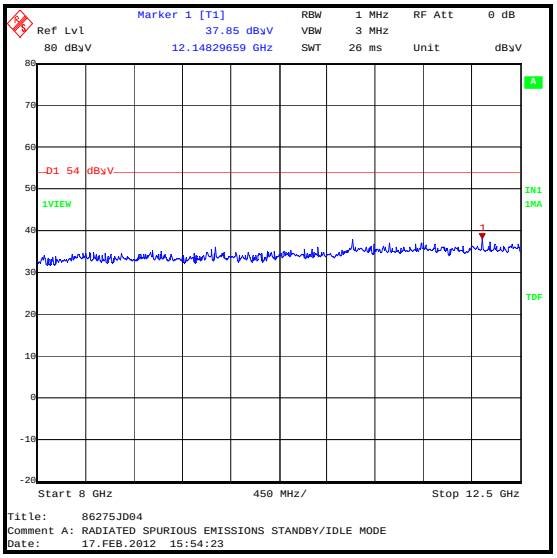
1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
3. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Receiver/Idle Mode Radiated Spurious Emissions (continued)









5.2.2. Transmitter 6 dB Bandwidth

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	21 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.247(a)(2)
Test Method Used:	As detailed in FCC KDB 558074 Section 5.1.1

Environmental Conditions:

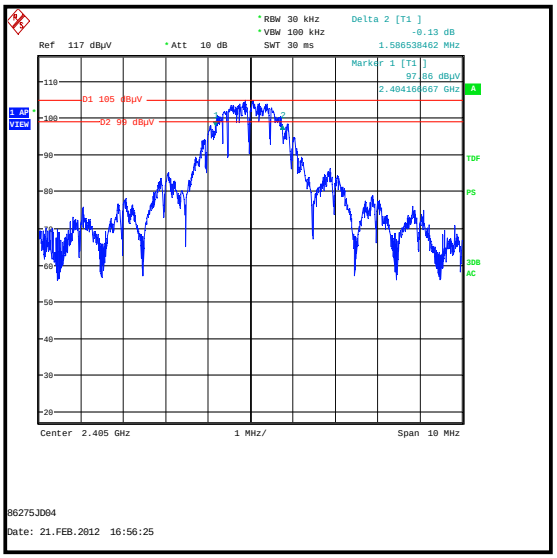
Temperature (°C):	26
Relative Humidity (%):	21

Results:

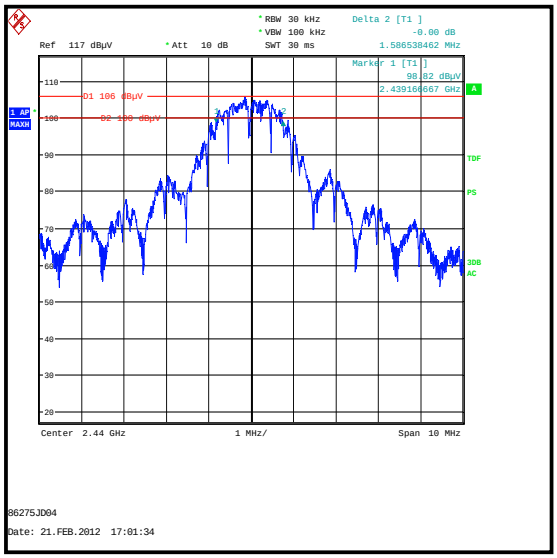
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	1.587	≥0.5	1.087	Complied
Middle	1.587	≥0.5	1.087	Complied
Top	1.683	≥0.5	1.183	Complied

Transmitter 6 dB Bandwidth (continued)

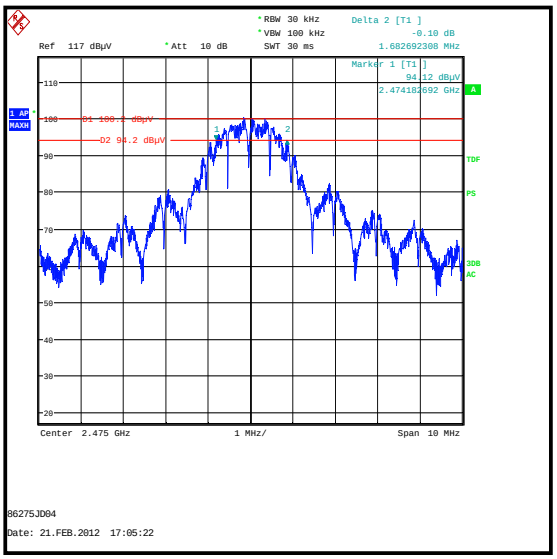
Results:



Bottom Channel



Middle Channel



Top Channel

5.2.3. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	21 February 2012
Test Sample Serial No:	6000030		

FCC Part:	2.1049
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.1

Environmental Conditions:

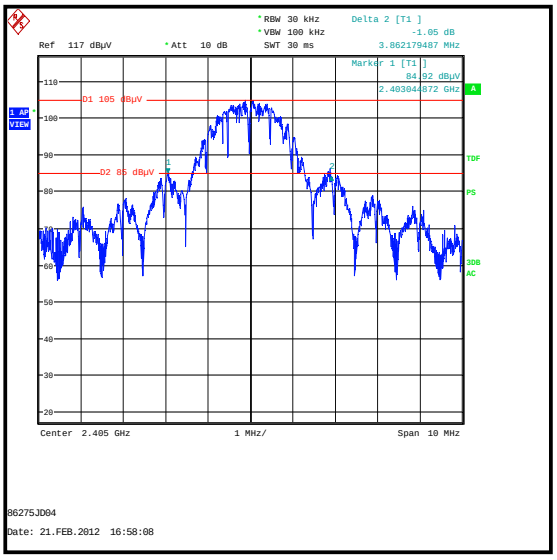
Temperature (°C):	26
Relative Humidity (%):	21

Results:

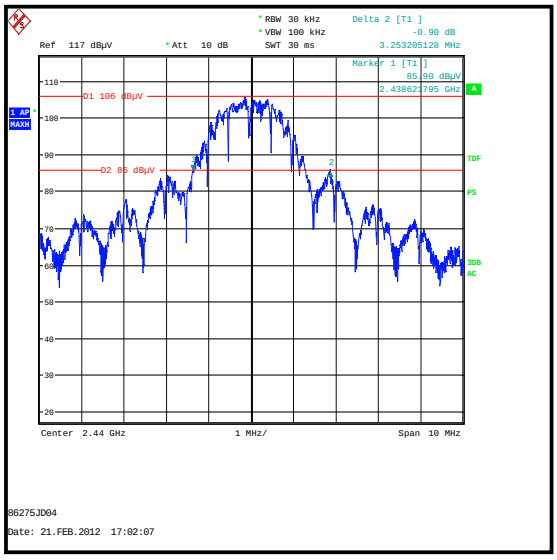
Channel	20 dB Bandwidth (MHz)
Bottom	3.862
Middle	3.253
Top	4.054

Transmitter 20 dB Bandwidth (continued)

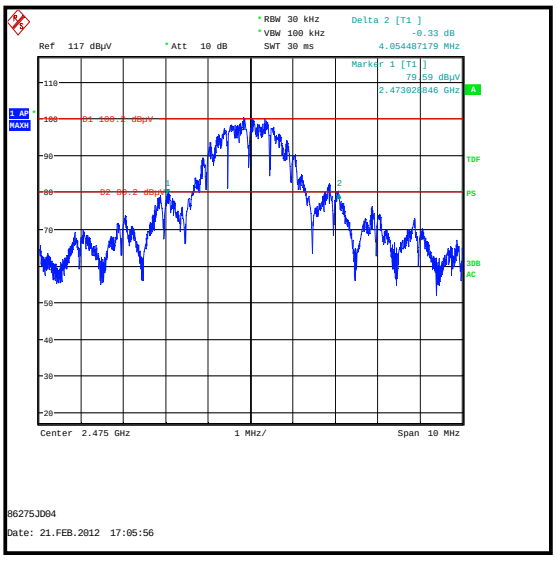
Results:



Bottom Channel



Middle Channel



Top Channel

5.2.4. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	21 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.247(e)
Test Method Used:	As detailed in FCC KDB 558074 Section 5.3.1

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	21

Results:

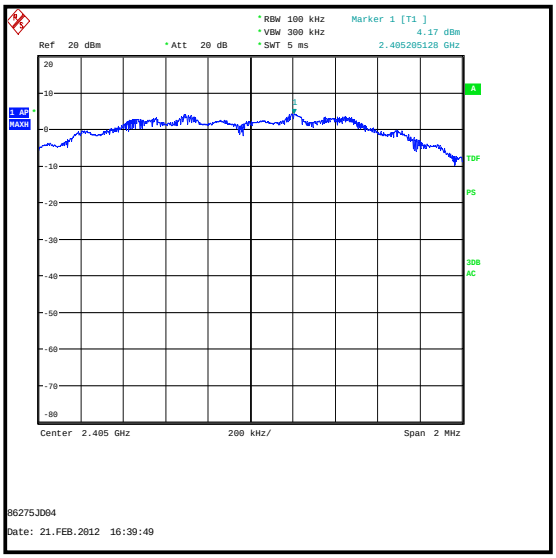
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-11.0	8.0	19.0	Complied
Middle	-13.0	8.0	21.0	Complied
Top	-12.3	8.0	20.3	Complied

Note(s):

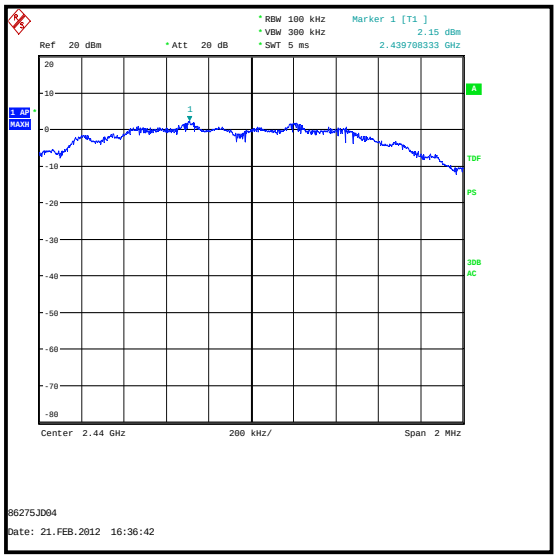
1. These tests were performed radiated as the EUT has an integral antenna and does not have an external antenna port. Tests were performed using a combination of the conducted test method described in ANSI C63.10 Section 6.10.2 and the test methods for radiated emissions measurements described in Sections 6.3 and 6.6.
2. The measured power was scaled to an equivalent value in the required 3 kHz bandwidth by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).

Transmitter Power Spectral Density (continued)

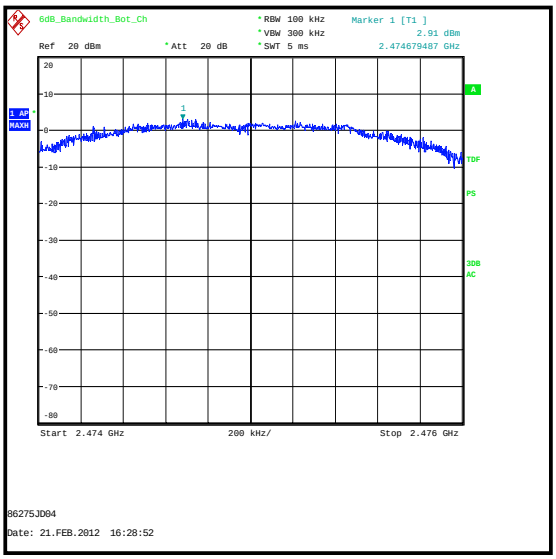
Results:



Bottom Channel



Middle Channel



Top Channel

5.2.5. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.247(b)(3)
Test Method Used:	As detailed in ANSI C63.10 Section 6.10.2 and FCC KDB 558074 Section 5.2.1.2

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	22

Results:

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	5.3	30.0	24.7	Complied
Middle	3.6	30.0	26.4	Complied
Top	3.5	30.0	26.5	Complied

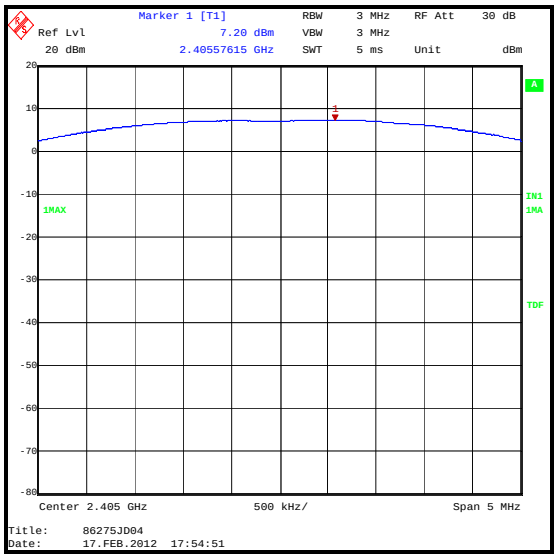
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	5.3	1.9	7.2	36.0	28.8	Complied
Middle	3.6	1.9	5.5	36.0	30.5	Complied
Top	3.5	1.9	5.4	36.0	30.6	Complied

Note(s):

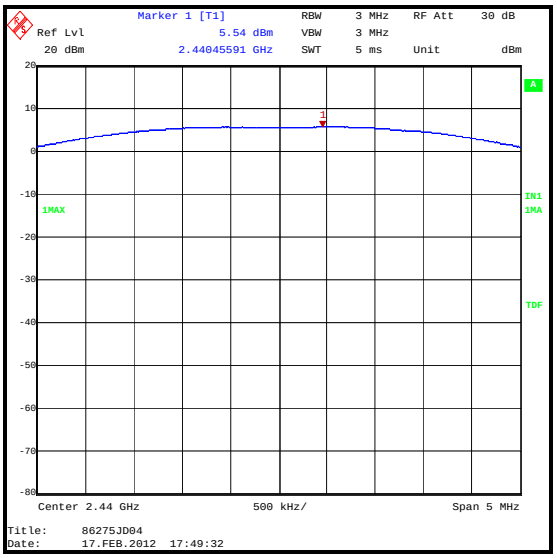
1. EIRP tests were performed using a combination of the conducted test method described in ANSI C63.10 Section 6.10.2 and the test methods for radiated emissions measurements as described in Sections 6.3 & 6.6 and FCC KDB 558074. The reason for this being that the measurements were performed radiated as the EUT has an integral antenna and does not have an external antenna port.
2. The EIRP was measured and the declared antenna gain was subtracted from the EIRP to obtain the conducted power:

Conducted power = EIRP (dBm) - antenna gain (dBi)

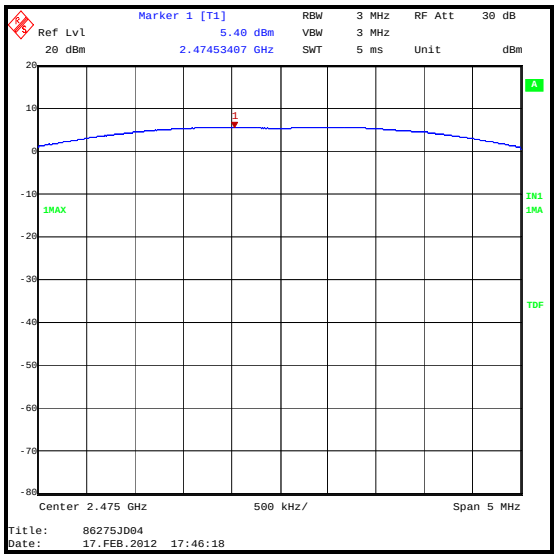
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

5.2.6. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	21

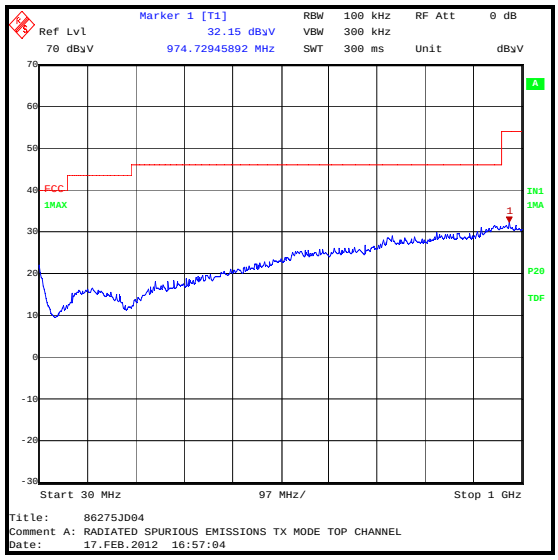
Results: Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
974.729	Vertical	32.2	54.0	21.8	Complied

Note(s):

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
3. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Radiated Emissions (continued)



Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	21

Results: Peak Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4808.970	Vertical	68.8	74.0	5.2	Complied
7213.215	Vertical	52.1	80.2*	28.1	Complied
9617.825	Vertical	38.7	80.2*	41.5	Complied
12022.267	Vertical	42.5	74.0	31.5	Complied

Results: Average Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4808.970	Vertical	50.9	54.0	3.1	Complied
12022.267	Vertical	28.6	54.0	25.4	Complied

Transmitter Radiated Emissions (continued)

Results: Peak Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4879.047	Vertical	68.0	74.0	6.0	Complied
7318.528	Vertical	52.1	74.0	21.9	Complied
9757.862	Vertical	38.1	80.9	42.8	Complied
12197.416	Vertical	43.1	74.0	30.9	Complied

Results: Average Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4879.047	Vertical	49.9	54.0	4.1	Complied
7318.528	Vertical	37.9	54.0	16.1	Complied
12197.416	Vertical	42.7	54.0	11.3	Complied

Results: Peak Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2327.202	Vertical	49.0	74.0	25.0	Complied
4949.003	Vertical	66.8	74.0	7.2	Complied
7426.165	Vertical	52.8	74.0	21.2	Complied
9901.855	Vertical	51.7	80.9	29.2	Complied
12372.546	Vertical	42.9	74.0	31.1	Complied

Results: Average Top Channel

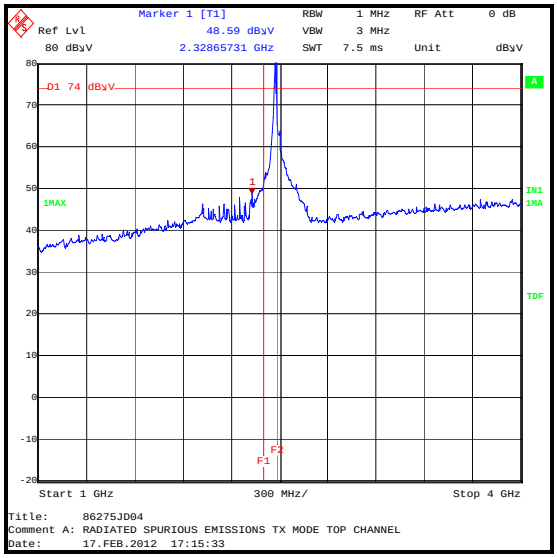
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2327.202	Vertical	36.2	54.0	17.8	Complied
4949.003	Vertical	49.0	54.0	5.0	Complied
7426.165	Vertical	38.2	54.0	15.8	Complied
12372.546	Vertical	29.3	54.0	24.7	Complied

Transmitter Radiated Emissions (continued)

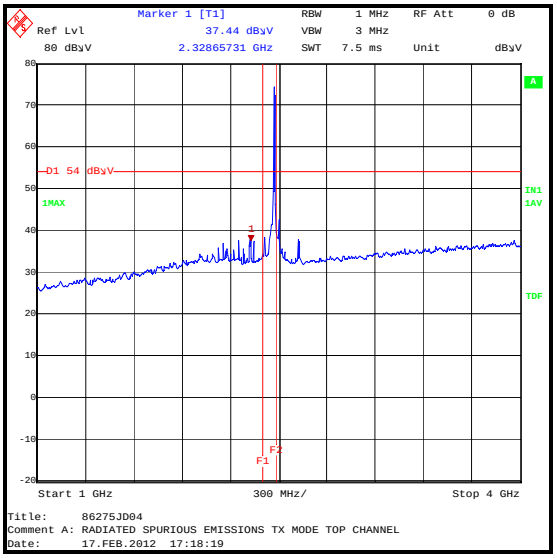
Note(s):

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. *-20 dBc limit.
3. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
4. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental. Frequency lines on the plot show the upper and lower band edges.
5. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Final measurements were performed using appropriate RF attenuators and filters as required.

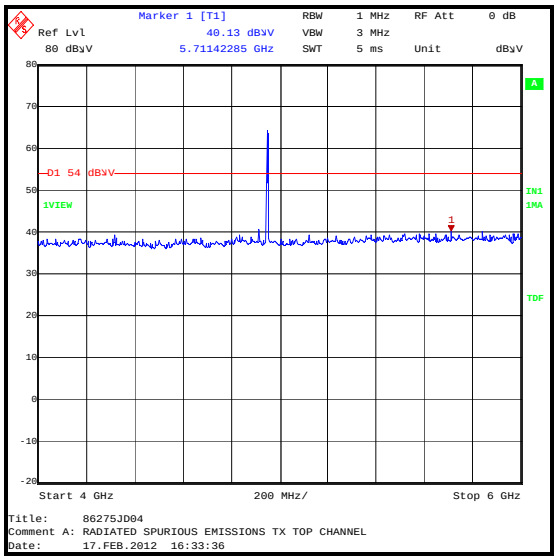
Transmitter Radiated Emissions (continued)

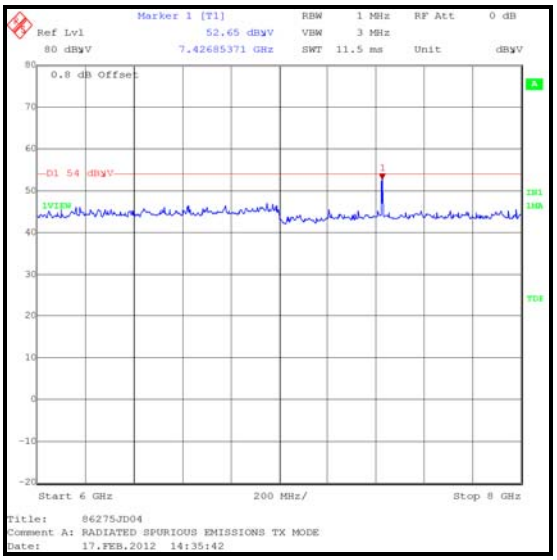


Peak detector / Peak limit

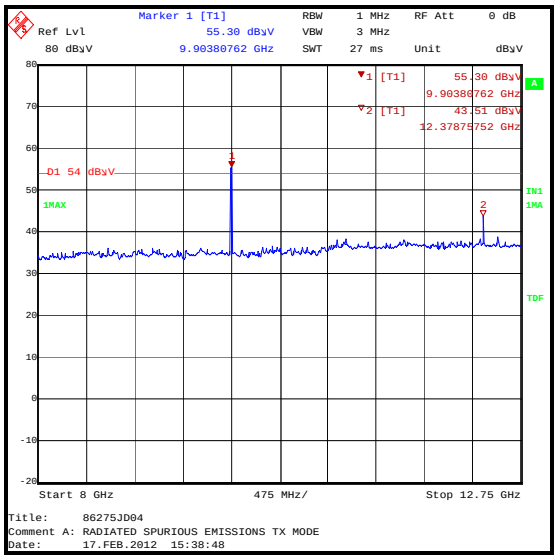


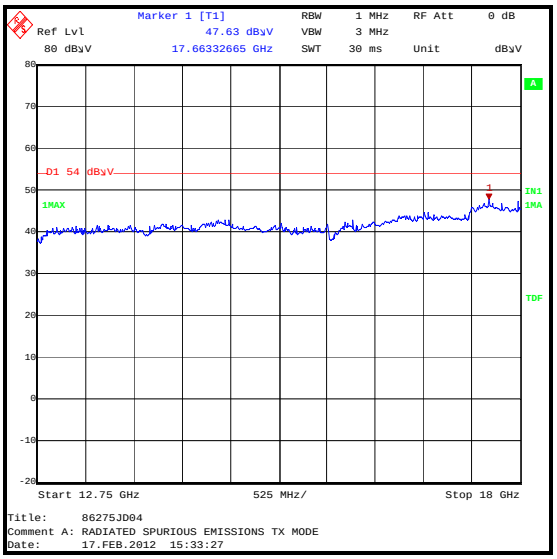
Average detector / Average limit

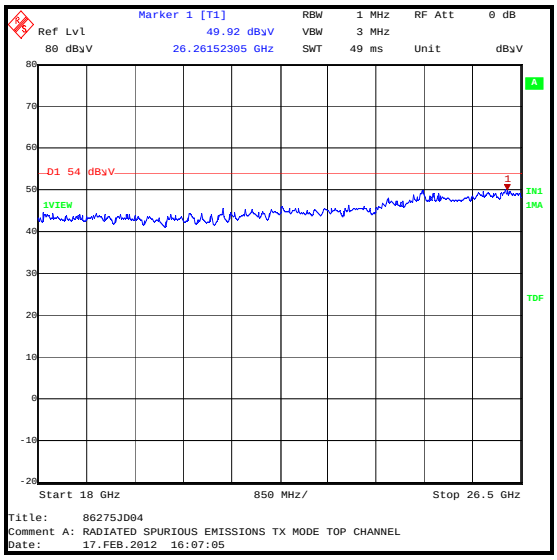




Transmitter Radiated Emissions (continued)







Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

5.2.7. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 February 2012
Test Sample Serial No:	6000030		

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	22

Results: Peak

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400	61.7	80.2*	18.5	Complied
2483.5	70.1	74.0	3.9	Complied

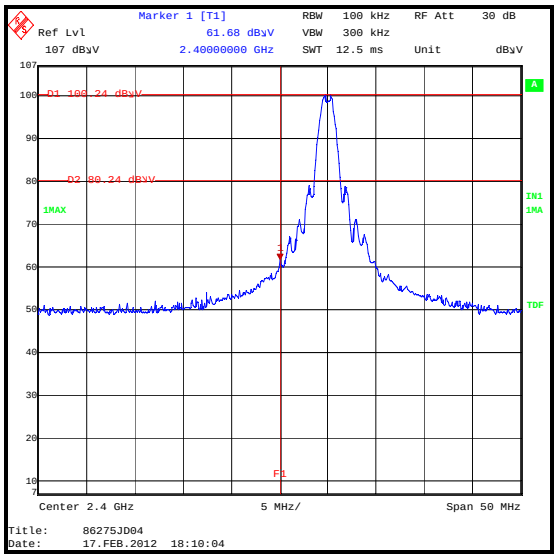
Results: Average

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	34.0	54.0	20.0	Complied

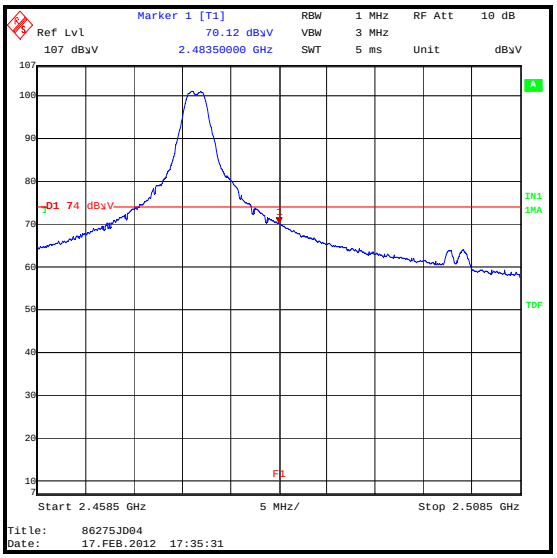
Note(s):

1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
2. * -20 dBc limit.

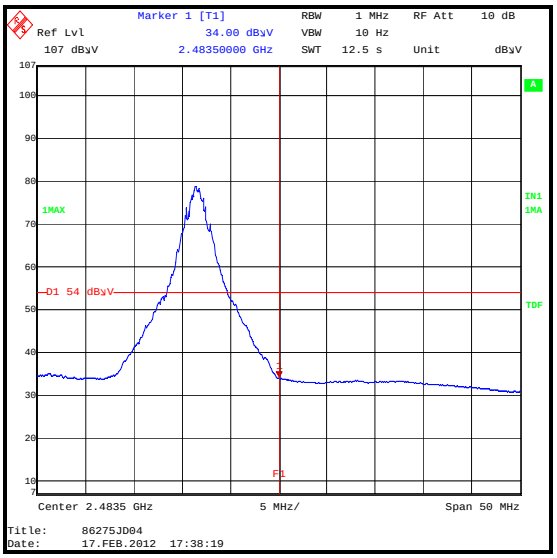
Transmitter Band Edge Radiated Emissions (continued)



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
20 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 26.5 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (months)
A032	Antenna	EMCO	3115	2874	03 Mar 2013	36
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	09 Oct 2012	12
A1818	Antenna	EMCO	3115	00075692	09 Oct 2012	12
A1981	High Pass Filter	AtlanTecRF	AFH-05000	09110200090	28 Feb 2012	12
A253	Antenna	Flann Microwave	12240-20	128	09 Oct 2012	12
A254	Antenna	Flann Microwave	14240-20	139	09 Oct 2012	12
A255	Antenna	Flann Microwave	16240-20	519	09 Oct 2012	12
A256	Antenna	Flann Microwave	18240-20	400	09 Oct 2012	12
A288	Antenna	Chase	CBL6111A	1589	19 Aug 2012	12
A436	Antenna	Flann	20240-20	330	09 Oct 2012	12
A490	Antenna	Chase	CBL6111A	1590	11 Apr 2012	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	29 May 2012	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	09 Oct 2012	12
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	09 Jan 2013	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESI26	100046K	29 Jun 2012	12
M1590	Test Receiver	Rohde & Schwarz	ESU26	100239	15 Jun 2012	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	06 Feb 2013	12

NB In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.