



# TEST REPORT

**Test Report No. : UL-RPT-RP10284207JD02A V3.0**

**Manufacturer** : Paxton Access Ltd  
**Model No.** : 921-130-US  
**FCC ID** : USE921130  
**Technology** : IEEE 802.15.4  
**Test Standard(s)** : FCC Parts 15.109, 15.35(c), 15.209(a) & 15.247

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 3.0 supersedes all previous versions.

**Date of Issue:** 04 November 2014

**Checked by:**

Steven White  
Project Lead, Radio Laboratory

**Issued by :**

pp

John Newell  
Quality Manager  
UL VS LTD



This laboratory is accredited by UKAS.  
The tests reported herein have been performed in accordance with its terms of accreditation.

---

**UL VS LTD**

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK  
Telephone: +44 (0)1256 312000  
Facsimile: +44 (0)1256 312001

This page has been left intentionally blank.

**Table of Contents**

<b>1. Customer Information.....</b>	<b>4</b>
<b>2. Summary of Testing.....</b>	<b>5</b>
2.1. General Information	5
2.2. Summary of Test Results	6
2.3. Methods and Procedures	6
2.4. Deviations from the Test Specification	6
<b>3. Equipment Under Test (EUT) .....</b>	<b>7</b>
3.1. Identification of Equipment Under Test (EUT)	7
3.2. Description of EUT	7
3.3. Modifications Incorporated in the EUT	7
3.4. Additional Information Related to Testing	7
3.5. Support Equipment	8
<b>4. Operation and Monitoring of the EUT during Testing .....</b>	<b>9</b>
4.1. Operating Modes	9
4.2. Configuration and Peripherals	9
<b>5. Measurements, Examinations and Derived Results.....</b>	<b>10</b>
5.1. General Comments	10
5.2. Test Results	11
5.2.1. Idle Mode Radiated Spurious Emissions	11
5.2.2. Transmitter Minimum 6 dB Bandwidth	15
5.2.3. Transmitter Duty Cycle	17
5.2.4. Transmitter Maximum Output Power	19
5.2.5. Transmitter Radiated Emissions	22
5.2.6. Transmitter Band Edge Radiated Emissions	29
<b>6. Measurement Uncertainty .....</b>	<b>31</b>
<b>7. Report Revision History .....</b>	<b>32</b>

### **1. Customer Information**








<b>Company Name:</b>	Paxton Access Ltd
<b>Address:</b>	Paxton House Home Farm Brighton Sussex BN1 9HU United Kingdom

## **2. Summary of Testing**

### **2.1. General Information**

<b>Specification Reference:</b>	47CFR15.247
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
<b>Specification Reference:</b>	47CFR15.109
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart B (Unintentional Radiators) – Section 15.109
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.209
<b>Site Registration:</b>	FCC: 209735
<b>Location of Testing:</b>	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
<b>Test Dates:</b>	27 August 2014 to 25 September 2014

## 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.109	Receiver/Idle Mode Radiated Spurious Emissions	
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.247(e)	Transmitter Power Spectral Density	Note 2
Part 15.247(b)(3)	Transmitter Maximum Output Power	
Part 15.247(d)/ 15.209(a)	Transmitter Radiated Emissions	
Part 15.247(d)/ 15.209(a)	Transmitter Band Edge Radiated Emissions	
<b>Key to Results</b>		
 = Complied  = Did not comply		

### Note(s):

1. This measurement was performed to assist in the calculation of the output power level.
2. In accordance with FCC KDB 558074 Section 10.1, PSD measurements were not required as the maximum conducted output power was measured and found to be less than the PSD limit of 8 dBm / 3 kHz. The PSD levels are therefore deemed to be equal to the measured total output power.

## 2.3. Methods and Procedures

<b>Reference:</b>	ANSI C63.4 (2009)
<b>Title:</b>	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
<b>Reference:</b>	ANSI C63.10 (2009)
<b>Title:</b>	American National Standard for Testing Unlicensed Wireless Devices
<b>Reference:</b>	KDB 558074 D01 v03r02 June 5, 2014
<b>Title:</b>	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)**

<b>Brand Name:</b>	Paxton Access Ltd
<b>Model Number:</b>	921-130-US
<b>Test Sample Serial Number:</b>	2616728
<b>Hardware Version:</b>	z-pl17 rev 8, ppc-pl17 rev E
<b>Software Version:</b>	V5.03.24
<b>FCC ID:</b>	USE921130

#### **3.2. Description of EUT**

The Equipment Under Test was an all-in-one battery powered lock and wireless access control system. The unit combines a 125 kHz proximity reader, 2.4 GHz wireless interface (IEEE 802.15.4) and a lockset.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

#### **3.4. Additional Information Related to Testing**

<b>Technology Tested:</b>	IEEE 802.15.4 (Digital Transmission System)		
<b>Type of Unit:</b>	Transceiver		
<b>Modulation:</b>	OQPSK		
<b>Power Supply Requirement(s):</b>	Nominal	6.0 VDC	
<b>Maximum Conducted Output Power:</b>	-4.7 dBm		
<b>Antenna Gain:</b>	1.9 dBi		
<b>Transmit Frequency Range:</b>	2405 MHz to 2475 MHz		
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>
	Bottom	11	2405
	Middle	18	2440
	Top	25	2475

### **3.5. Support Equipment**

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

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude E5500
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	USB Bridge
<b>Brand Name:</b>	Net2Air
<b>Model Name or Number:</b>	477-268
<b>Serial Number:</b>	1730371

<b>Description:</b>	USB cable, 1.8 metres length
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	RFID token
<b>Brand Name:</b>	Net2 proximity ISO card
<b>Model Name or Number:</b>	692-500
<b>Serial Number:</b>	Not marked or stated



## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

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

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

### **4.2. Configuration and Peripherals**

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

- The required configuration on the EUT was selected by using the supplied customer software 'Net2Air USB Bridge & Nano Test Application'. This was achieved using a laptop PC provided by the manufacturer together with the Net2Air bridge. These were connected to the PC by the USB cable.
- To place the EUT in the required test condition, a communication link was established between the Net2Air bridge and EUT. This was achieved by pressing the 'Bind Nano' button, selecting a value of 27 and clicking custom test button on the application. An RFID token was presented to the EUT to establish the bond. Once the bond had been achieved, the test application allowed the EUT to be placed in the required test mode.
- Once the EUT was in the correct test mode and transmitting, all support equipment was removed from the test site.
- The EUT was assembled into a door lock which in turn, was fitted to a portion of a door. Both parts were supplied by the manufacturer for test purposes. The only orientation that the EUT could be positioned was with the door lock vertically. This is the orientation that the EUT will be used in its normal mode of operation. All tests were carried out with the EUT in this orientation.
- The EUT has an internal antenna. It does not have an external antenna connector. All tests were performed radiated.
- The EUT was powered by four AA type batteries. New batteries were fitted before testing commenced and the voltage levels were monitored during testing.

## **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.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

## **5.2. Test Results**

### **5.2.1. Idle Mode Radiated Spurious Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Date:</b>	29 August 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Part 15.109
<b>Test Method Used:</b>	ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
<b>Frequency Range:</b>	30 MHz to 1000 MHz

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	33

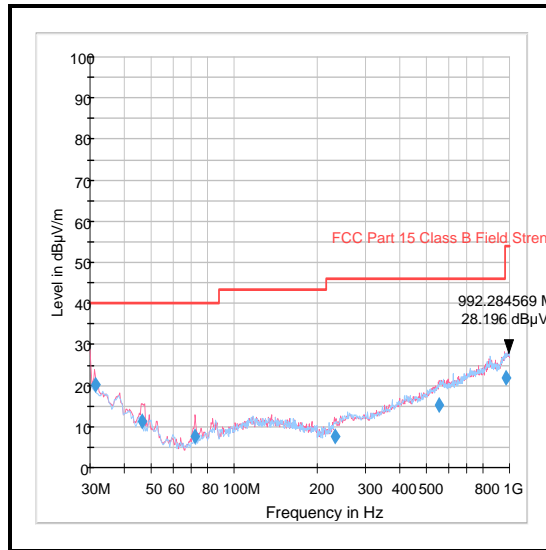
#### **Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All emissions shown on the pre-scan plots were >20 dB below the applicable limit or below the measurement system noise floor. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (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.

#### **Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Level (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
992.285	Vertical	28.2	54.0	25.8	Complied

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



**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
G0543	Amplifier	Sonoma	310N	230801	20 Nov 2014	3
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
A1834	Attenuator	Hewlett Packard	8491B	10444	15 Nov 2014	12

**Idle Mode Radiated Spurious Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	29 August 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Part 15.109
<b>Test Method Used:</b>	ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
<b>Frequency Range:</b>	1 GHz to 12.5 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	47

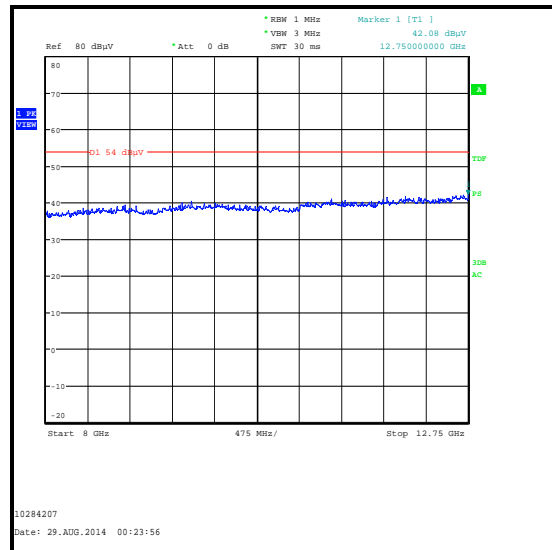
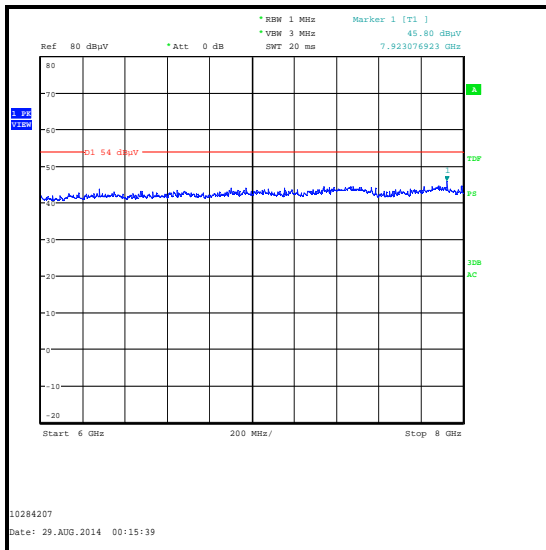
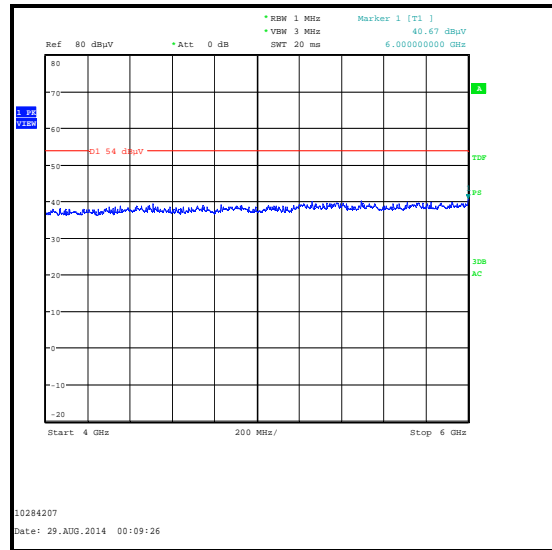
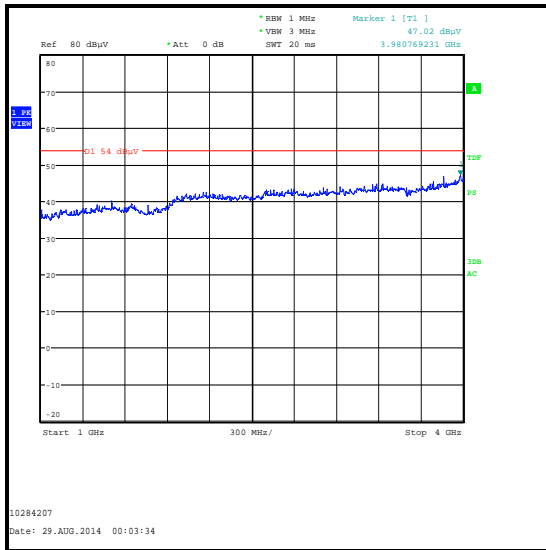
**Note(s):**

1. The final measured value, for the given emission, in the table below 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 below. 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 (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 (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.

**Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Peak Level (dB<math>\mu</math>V/m)</b>	<b>Average Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
3980.769	Vertical	47.0	54.0	7.0	Complied

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



**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A254	Antenna	Flann Microwave	14240-20	139	14 Nov 2014	12
A255	Antenna	Flann Microwave	16240-20	519	14 Nov 2014	12

**5.2.2. Transmitter Minimum 6 dB Bandwidth****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	27 August 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Part 15.247(a)(2)
<b>Test Method Used:</b>	FCC KDB 558074 Section 8.1 Option 1

**Environmental Conditions:**

<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	51

**Note(s):**

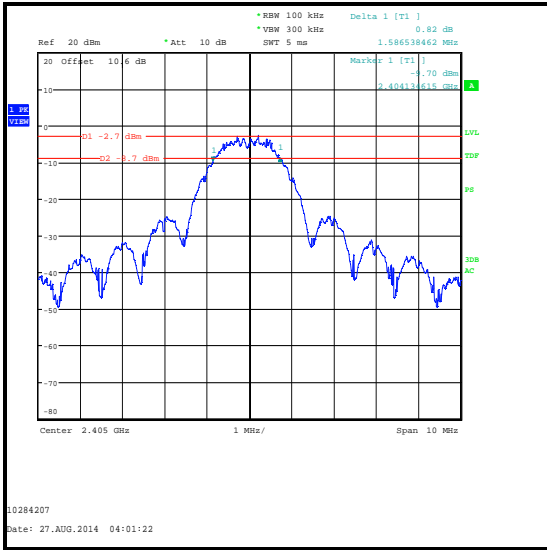
1. Transmitter minimum 6 dB bandwidth tests were performed using a test receiver in accordance with FCC KDB 558074 Section 8.1 Option 1 measurement procedure.
2. The measurement was performed using a radiated sample in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres.

**Results:**

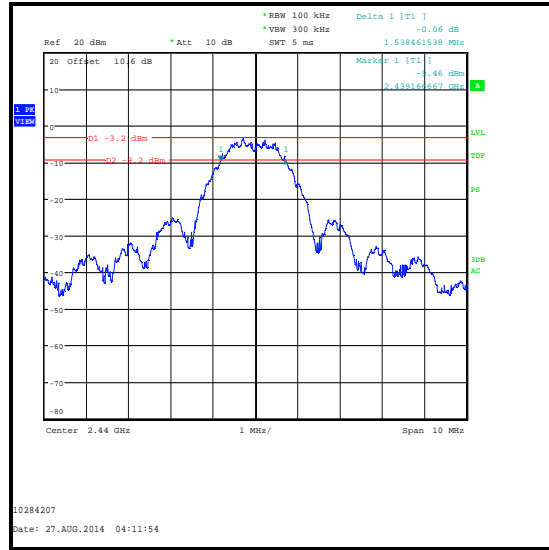
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	1586.538	≥500	1086.538	Complied
Middle	1538.462	≥500	1038.462	Complied
Top	1602.564	≥500	1102.564	Complied

**Transmitter Minimum 6 dB Bandwidth (continued)**

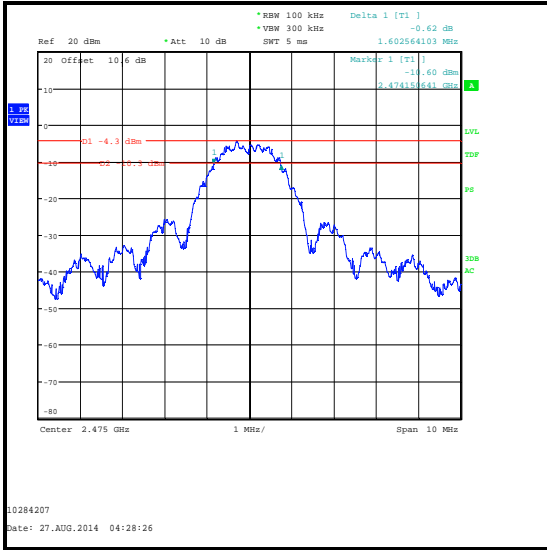
**Results:**



**Bottom Channel**



**Middle Channel**



**Top Channel**

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohyrometer	JM Handlungspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12



**5.2.3. Transmitter Duty Cycle****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	23 September 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Part 15.35(c)
<b>Test Method Used:</b>	As detailed in FCC KDB 558074 Section 6.0 & ANSI C63.10 Sections 6.3 and 6.6

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	42

**Note(s):**

- In order to assist with the determination of the average level of fundamental and spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by using the following calculation:

$$10 \log (1 / (\text{On Time} / \text{Period}))$$

$$10 \log (1 / (3.871 \text{ ms} / 6.294 \text{ ms})) = 2.1 \text{ dB}$$

- The measurement was performed using a radiated sample in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres.
- Measurements were performed using a combination of the conducted method described in FCC KDB 558074 Section 6.0 and the test method for radiated emissions measurements described in ANSI C63.10 Sections 6.3 and 6.6 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.

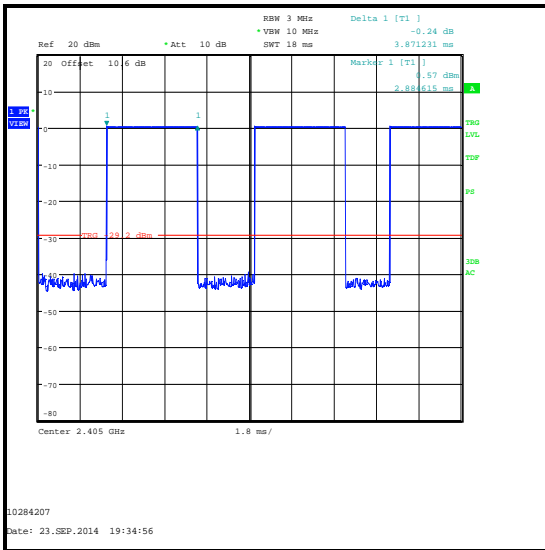
**Results:**

<b>Pulse Duration (ms)</b>	<b>Duty Cycle (dB)</b>
3.871	2.1

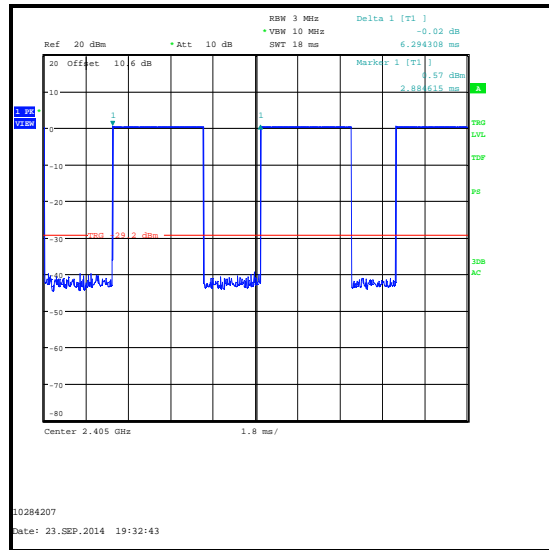
<b>Silent Period (ms)</b>
2.423

**Transmitter Duty Cycle (continued)**

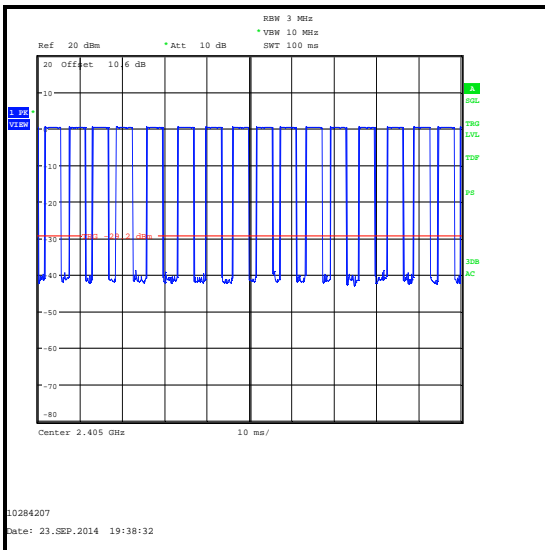
**Results:**



**TX on time**



**TX on + off time / period**



**100ms**

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohyrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12

**5.2.4. Transmitter Maximum Output Power****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	28 August 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Part 15.247(b)(3)
<b>Test Method Used:</b>	As detailed in FCC KDB 558074 Section 9.2.2.5

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	51

**Note(s):**

- Maximum output power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.2.2.5 Measurement Procedure Method AVGSA-2 Alternative.
- The 99% occupied bandwidth was measured using the spectrum analyser occupied bandwidth function in order to set the parameters of the test in accordance with FCC KDB 558074 Section 9.2.2.5.
- All tests were performed radiated therefore the EUT antenna gain is encompassed in the final results and not measured.
- The EUT has an integral antenna. The declared antenna gain (1.9 dBi) was subtracted from the measured EIRP to obtain the corrected conducted power.

$$EIRP - \text{Declared Antenna Gain} = \text{Corrected Conducted Power}$$

The duty cycle correction factor was then subtracted from the corrected conducted power to obtain the actual conducted power:

$$\text{Corrected Conducted Power} - \text{Duty Cycle Correction} = \text{Conducted Power}$$

- Measurements were performed using a combination of the conducted method described in FCC KDB 558074 Section 9.2.2.5 and the test method for radiated emissions measurements described in ANSI C63.10 Section 6.3 and 6.6 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.
- The measurement sweep time was calculated in accordance with FCC KDB 558074 Section 9.2.2.5 f) as

Manually set the sweep time  $\geq 10 \times$  (number of sweep points in sweep)  $\times$  (total on/off period of the transmitting signal)

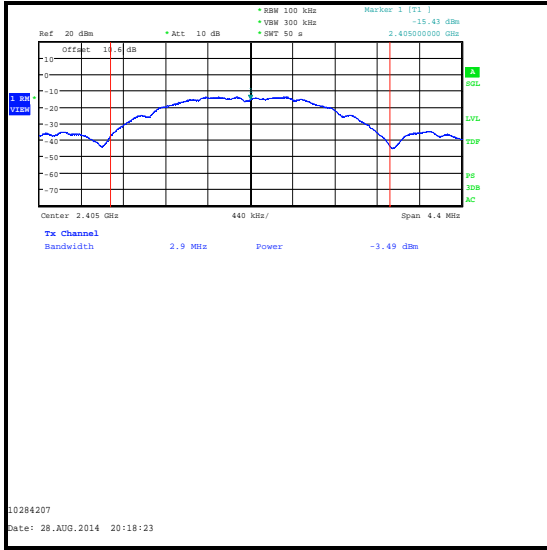
$$\geq (10) \times (625) \times (6.294 \text{ ms}) = 39.338 \text{ ms}$$

**Transmitter Maximum Output Power (continued)****Results:**

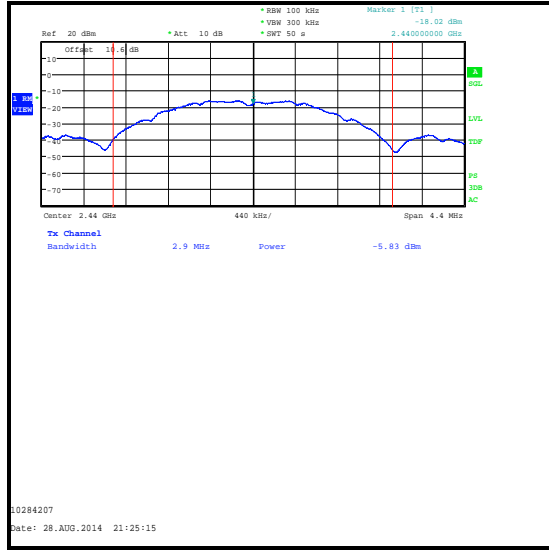
Channel	Conducted Power (dBm)	Duty Cycle Correction (dB)	Corrected Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)	Result
Bottom	-7.5	2.1	-5.4	30.0	35.4	Complied
Middle	-9.8	2.1	-7.7	30.0	37.7	Complied
Top	-6.8	2.1	-4.7	30.0	34.7	Complied

Channel	Corrected Conducted Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-5.4	1.9	-3.5	36.0	39.5	Complied
Middle	-7.7	1.9	-5.8	36.0	41.8	Complied
Top	-4.7	1.9	-2.8	36.0	38.8	Complied

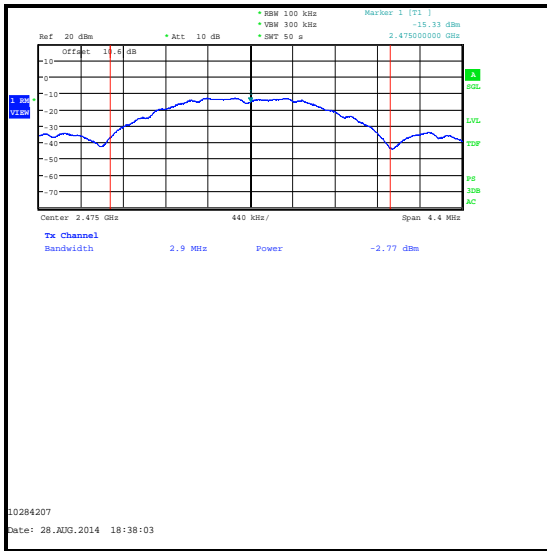
**Transmitter Maximum Output Power (continued)**



**Bottom Channel**



**Middle Channel**



**Top Channel**

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12

**5.2.5. Transmitter Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	David Doyle	<b>Test Date:</b>	29 August 2014
<b>Test Sample Serial Number:</b>	2616728		

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

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	33

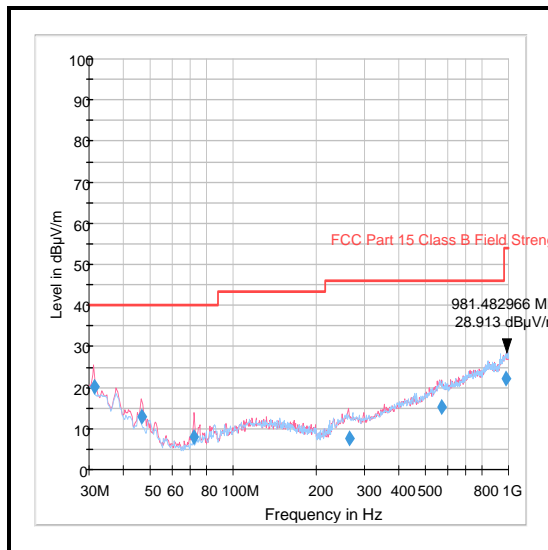
**Note(s):**

1. The final measured value, for the given emission, in the table below 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. All emissions shown on the pre-scan plots were >20 dB below the applicable limit or below the measurement system noise floor. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (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.

**Results:**

<b>Frequency (MHz)</b>	<b>Antenna Polarity</b>	<b>Level (dB<math>\mu</math>V/m)</b>	<b>Limit (dB<math>\mu</math>V/m)</b>	<b>Margin (dB)</b>	<b>Result</b>
981.483	Vertical	28.9	54.0	25.1	Complied

**Transmitter Radiated Emissions (continued)**



**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
G0543	Amplifier	Sonoma	310N	230801	20 Nov 2014	3
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
A1834	Attenuator	Hewlett Packard	8491B	10444	15 Nov 2014	12

**Transmitter Radiated Emissions (continued)****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Dates:</b>	27 August 2014 & 28 August 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in FCC KDB 558074 Sections 11.3 & 12.1 referencing ANSI C63.10 Sections 6.3 and 6.5 & ANSI C63.4
<b>Frequency Range</b>	1 GHz to 25 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	24 to 25
<b>Relative Humidity (%):</b>	44 to 48

**Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. 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.
3. The emission shown on the 1 GHz to 4 GHz plot is the EUT fundamental.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (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 (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.
5. \*Emissions in restricted bands: In accordance with C63.10 section 6.6.4.2, Note 1, where the peak detected amplitude was shown to comply with the average limit, an average measurement was not performed.
6. \*\* -30 dBc limit applies in non-restricted bands.



**Transmitter Radiated Emissions (continued)****Results: Peak / Bottom Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4808.878	Vertical	62.5	74.0	11.5	Complied
7216.314	Horizontal	53.1	63.6**	10.5	Complied
9621.811	Vertical	47.8	63.6**	15.8	Complied
12027.308	Vertical	55.9	74.0	18.1	Complied

**Results: Average / Bottom Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4809.968	Vertical	42.1	54.0	11.9	Complied
12022.332	Vertical	39.5	54.0	14.5	Complied

**Results: Peak / Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4878.846	Vertical	58.5	74.0	15.5	Complied
7318.365	Vertical	52.9	54.0*	1.1	Complied
9757.837	Horizontal	46.0	62.0**	16.0	Complied
12197.500	Vertical	55.6	74.0	18.4	Complied

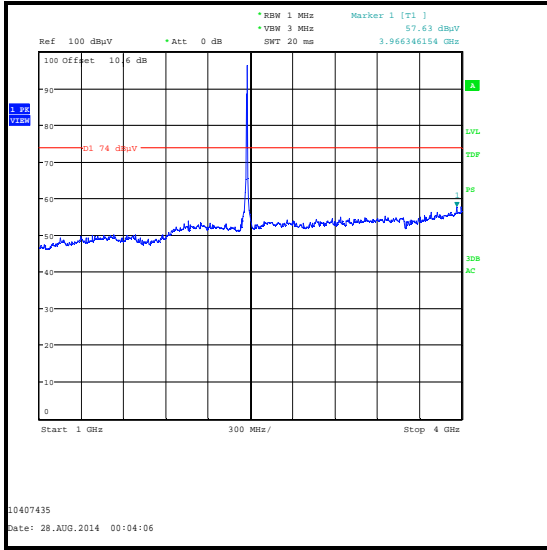
**Results: Average / Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
4881.683	Horizontal	39.7	54.0	14.3	Complied
12197.196	Vertical	39.5	54.0	14.5	Complied

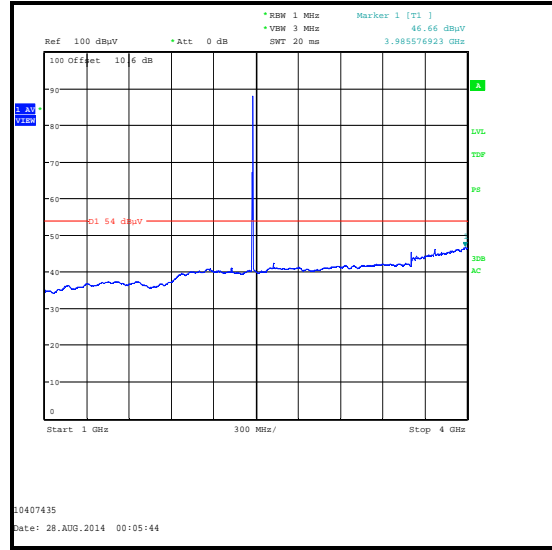
**Results: Peak / Top Channel**

Frequency (MHz)	Antenna Polarity	Peak Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
4948.990	Vertical	52.1	54.0*	1.9	Complied
7423.526	Vertical	52.0	54.0*	2.0	Complied
12372.340	Vertical	50.3	54.0*	3.7	Complied

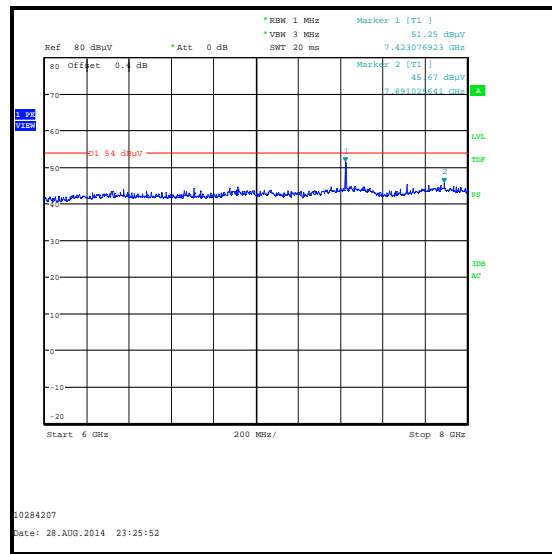
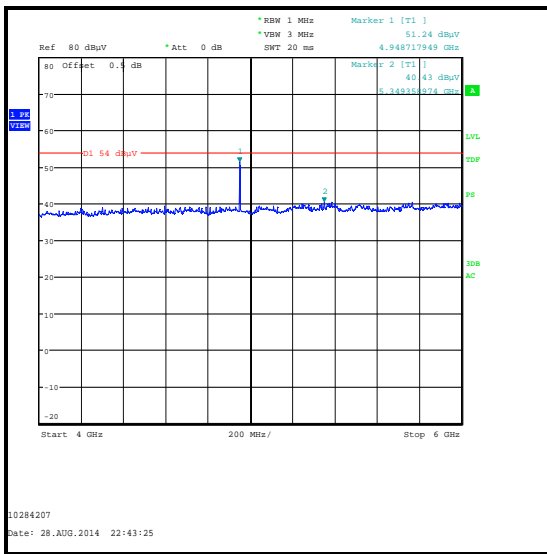
**Transmitter Radiated Emissions (continued)**



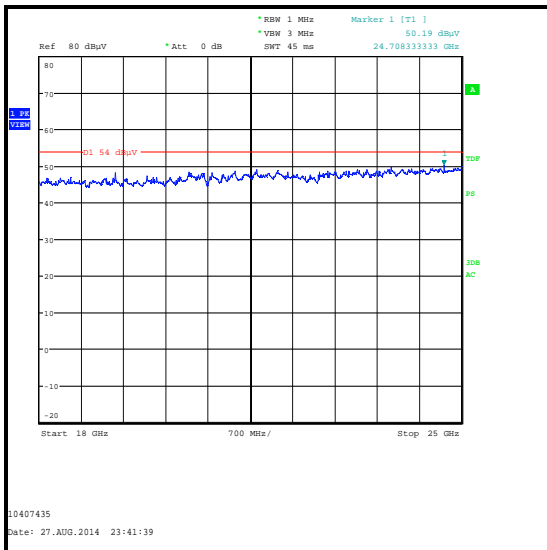
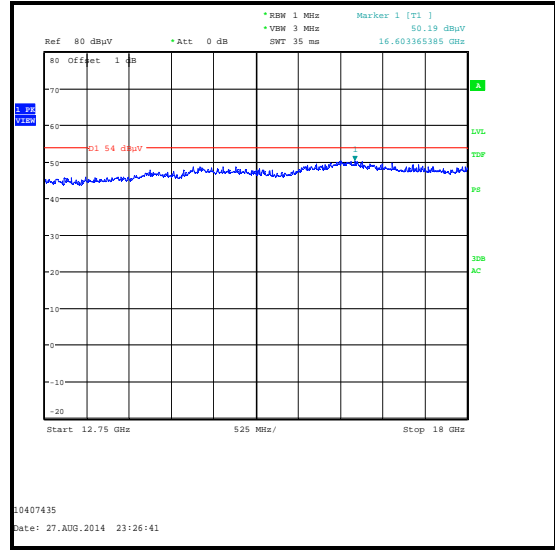
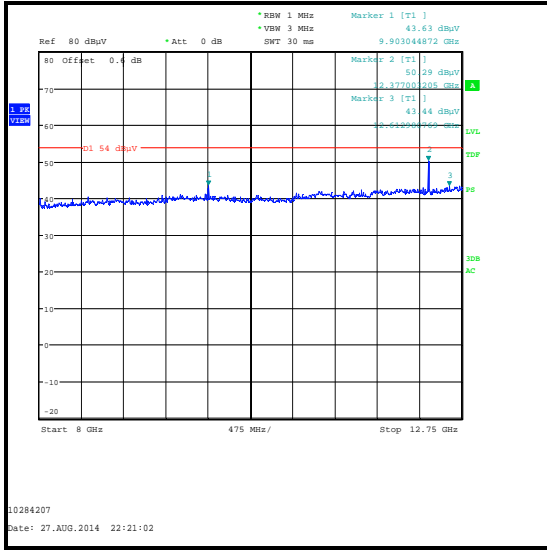
**Peak Detector**



**Average Detector**



**Transmitter Radiated Emissions (continued)**



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

**Transmitter Radiated Emissions (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A254	Antenna	Flann Microwave	14240-20	139	14 Nov 2014	12
A255	Antenna	Flann Microwave	16240-20	519	14 Nov 2014	12
A256	Antenna	Flann Microwave	18240-20	400	14 Nov 2014	12
A436	Antenna	Flann Microwave	20240-20	330	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	12 Apr 2015	12
A2176	High Pass Filter	AtlanTecRF	AFH-037000	800980	12 Apr 2015	12

**5.2.6. Transmitter Band Edge Radiated Emissions****Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	25 September 2014
<b>Test Sample Serial Number:</b>	2616728		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.9.2 & FCC KDB 558074 Section 11.0.

**Environmental Conditions:**

<b>Temperature (°C):</b>	24
<b>Relative Humidity (%):</b>	45

**Note(s):**

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. \* - 30 dBc limit.

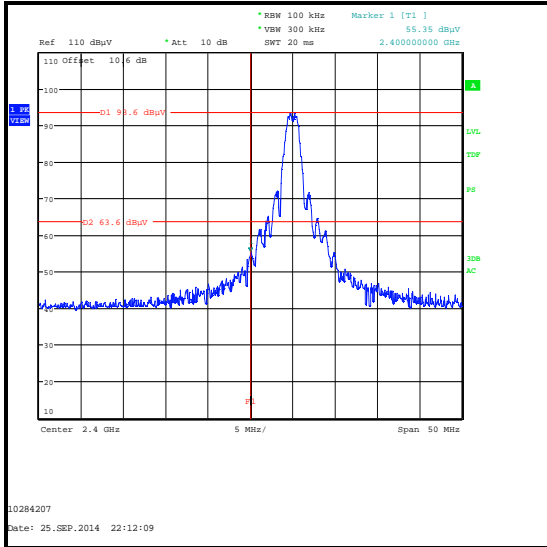
**Results: Peak**

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2390.000	61.6	74.0	12.4	Complied
2400	55.4	63.6*	8.2	Complied
2483.5	64.4	74.0	9.6	Complied

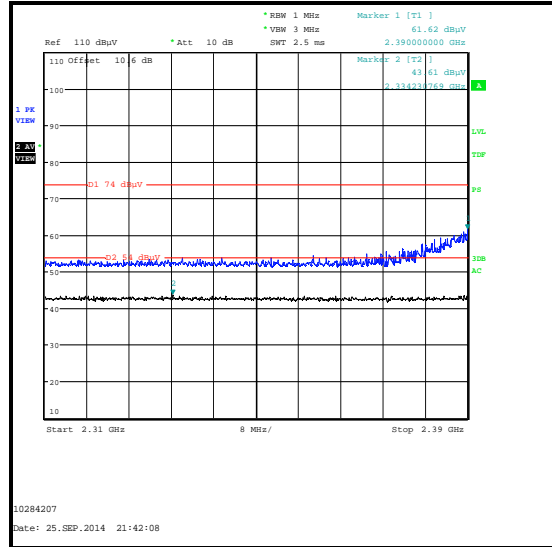
**Results: Average**

Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2334.231	43.6	54.0	10.4	Complied
2483.5	39.0	54.0	15.0	Complied

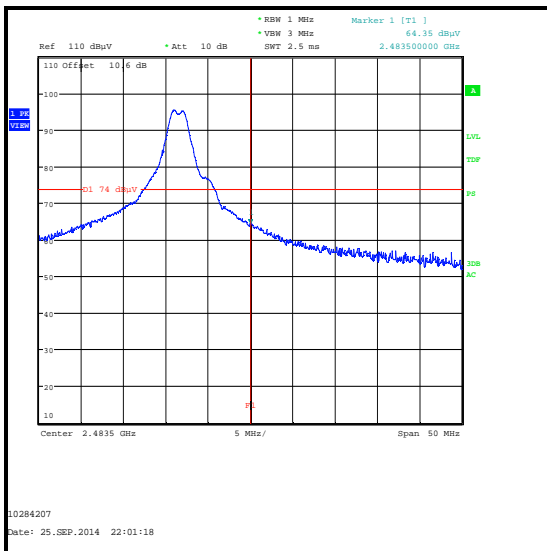
**Transmitter Band Edge Radiated Emissions (continued)**



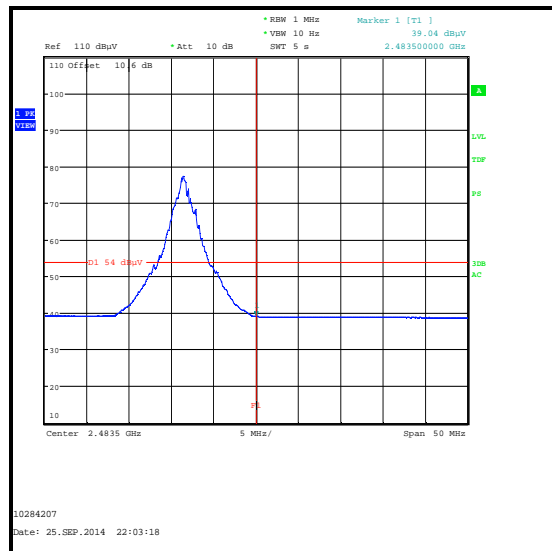
**Lower Band Edge Peak Measurement**



**2310-2390 MHz Restricted Band Measurement**



**Upper Band Edge Peak Measurement**



**Upper Band Edge Average Measurement**

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12

## **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".

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
Radiated 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
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 25 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.

## **7. Report Revision History**

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Model number updated Support equipment updated Note added to Section 5.2.4
3.0	-	-	Update to Sections 3.4 & 5.2.4

--- END OF REPORT ---