



# TEST REPORT

**Test Report No. : UL-RPT-RP91476JD20A V3.0**

**Manufacturer** : BENTLEY MOTORS LIMITED  
**Model No.** : D189050  
**FCC ID** : 2AAKLD189050  
**IC Certification No.** : 11196A-D189050  
**Technology** : Proprietary (Wireless Audio Systems)  
**Test Standard(s)** : FCC Parts 15.207, 15.209(a) & 15.247,  
Industry Canada RSS-210 A8.2(a), A8.2(b), A8.4(4) & A8.5 and  
RSS-Gen 4.6.1, 4.6.2, 4.8 & 4.9

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. The 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:**

01 April 2014

**Checked by:**

Sarah Williams  
Engineer, Radio Performance

**Issued by :**

pp

John Newell  
Group Quality Manager,  
Basingstoke,  
UL VS LTD



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

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## **1. Customer Information**

<b>Company Name:</b>	BENTLEY MOTORS LIMITED
<b>Address:</b>	Pyms Lane Cheshire CW1 3PL 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) 2012: Part 15 Subpart C (Intentional Radiators) - Section 15.247
<b>Specification Reference:</b>	47CFR15.209
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart C (Intentional Radiators) - Section 15.209
<b>Specification Reference:</b>	RSS-GEN Issue 3 December 2010
<b>Specification Title:</b>	General Requirements and Information for the Certification of Radio Apparatus
<b>Specification Reference:</b>	RSS-210 Issue 8 December 2010
<b>Specification Title:</b>	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
<b>Site Registration:</b>	FCC: 209735; Industry Canada: 3245B-2
<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>	15 May 2013 to 22 May 2013

### 2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.247(a)(2)	RSS-Gen 4.6.2 / RSS-210 A8.2(a)	Transmitter Minimum 6 dB Bandwidth	✓
N/A	RSS-Gen 4.6.1	Transmitter 99% Occupied 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	✓
<b>Key to Results</b>			
✓ = Complied	✗ = Did not comply		

### **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 v03r01 April 9, 2013
<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>	BENTLEY MOTORS LIMITED
<b>Model Name or Number:</b>	D189050
<b>Test Sample Serial Number:</b>	621D1890501312AN50427 ( <i>Radiated sample</i> )
<b>Hardware Version Number:</b>	H10
<b>Software Version Number:</b>	34
<b>FCC ID:</b>	2AAKLD189050
<b>Industry Canada Certification Number:</b>	11196A-D189050

<b>Brand Name:</b>	BENTLEY MOTORS LIMITED
<b>Model Name or Number:</b>	D189050
<b>Test Sample Serial Number:</b>	621D1890501312AN50429 ( <i>Conducted sample with RF port</i> )
<b>Hardware Version Number:</b>	H10
<b>Software Version Number:</b>	34
<b>FCC ID:</b>	2AAKLD189050
<b>Industry Canada Certification Number:</b>	11196A-D189050

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

The equipment under test was a Loader (D189050) that forms part of a Rear Seat Entertainment System. The Texas chip set is a combination of 2 TI chips: CC8530 plus CC2590 that make a proprietary 2.4 GHz system. The Loader transmits the digital audio signal to the wireless headphones.

#### **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>	Proprietary (Digital Transmission System)				
<b>Type of Unit:</b>	Transceiver				
<b>Channel Spacing:</b>	4 MHz				
<b>Modulation:</b>	FSK				
<b>Data Rate:</b>	5 Mbps				
<b>Power Supply Requirement(s):</b>	Nominal	12.0 VDC			
<b>Maximum Conducted Output Power:</b>	10.8 dBm				
<b>Antenna Gain:</b>	3.3 dBi				
<b>Transmit Frequency Range:</b>	2406 MHz to 2474 MHz				
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Number</b>	<b>Channel Frequency (MHz)</b>		
	Bottom	1	2406		
	Middle	9	2438		
	Top	18	2474		

### **3.5. Support Equipment**

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

<b>Brand Name:</b>	BENTLEY MOTORS LIMITED
<b>Model Name or Number:</b>	D189070
<b>Description:</b>	Body Connectivity Unit
<b>Serial Number:</b>	621D1890701306AH00141
<b>Hardware Version Number:</b>	H08
<b>Software Version Number:</b>	34

<b>Brand Name:</b>	BENTLEY MOTORS LIMITED
<b>Model Name or Number:</b>	LCD screen
<b>Serial Number:</b>	621D1890901303OS10227
<b>Hardware Version Number:</b>	H07
<b>Software Version Number:</b>	0007

**Support Equipment (continued)**

<b>Description:</b>	Car battery
<b>Brand Name:</b>	Optima batteries
<b>Model Name or Number:</b>	8012-254
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	Power Harnessing
<b>Brand Name:</b>	Bentley
<b>Model Name or Number:</b>	Not marked or stated

<b>Description:</b>	Laptop PC
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	D610
<b>Serial Number:</b>	0062

<b>Description:</b>	Male to male USB cable
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated

<b>Description:</b>	Cabling
<b>Brand Name:</b>	Not marked or stated
<b>Model Name or Number:</b>	Not marked or stated

<b>Description:</b>	HDMI cable
<b>Brand Name:</b>	Generic
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated

<b>Description:</b>	High Definition Multimedia Interface
<b>Brand Name:</b>	SUMVISION
<b>Model Name or Number:</b>	Cyclone Micro
<b>Serial Number:</b>	SUM091104017

<b>Description:</b>	SD card
<b>Brand Name:</b>	Generic
<b>Model Name or Number:</b>	Not marked or stated
<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):

- Transmitting at maximum power in test mode with modulation, maximum possible data length available, with a pay load set to set Pseudorandom Bit Sequence 9.

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

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

- Controlled using a software application on the laptop PC supplied by the customer. The application was used to enable continuous transmission and to select the test channels as required.
- The EUT was powered by the BCU which was connected to a car battery.
- For radiated measurements the EUT was powered via the Body Connectivity Unit which was connected to a car battery.
- For conducted measurements the EUT was powered via the Body Connectivity Unit which was connected to a bench DC power supply.
- The EUT conducted sample with serial number: 621D1890501312AN50429 was used for 6 dB bandwidth, 99% emission bandwidth, power spectral density and maximum peak output power.
- The EUT radiated sample with serial number: 621D1890501312AN50427 was used for radiated spurious emissions tests.
- For transmitter radiated emissions all active ports were terminated.

## **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. Transmitter Minimum 6 dB Bandwidth**

#### **Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	15 May 2013
Test Sample Serial Number:	621D1890501312AN50429		

FCC Reference:	Part 15.247(a)(2)
Industry Canada Reference:	RSS-Gen 4.6.2 / RSS-210 A8.2(a)
Test Method Used:	As detailed in FCC KDB 558074 Section 8.1

#### **Environmental Conditions:**

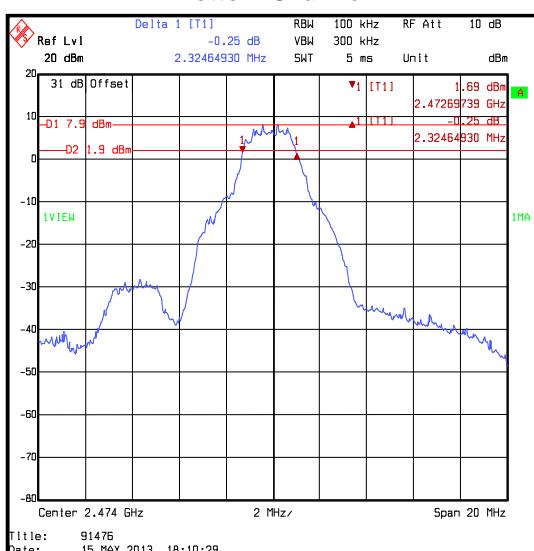
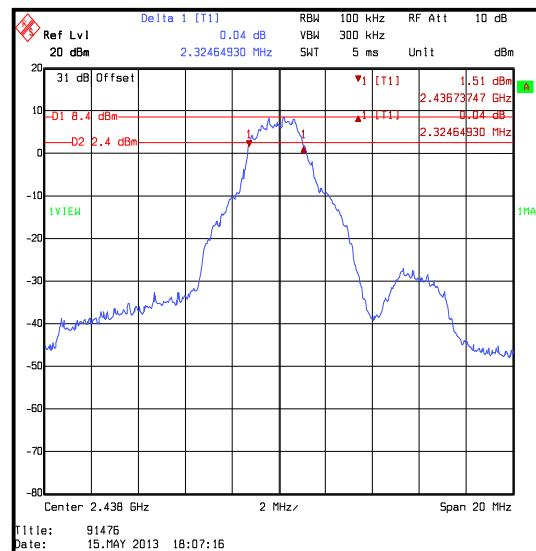
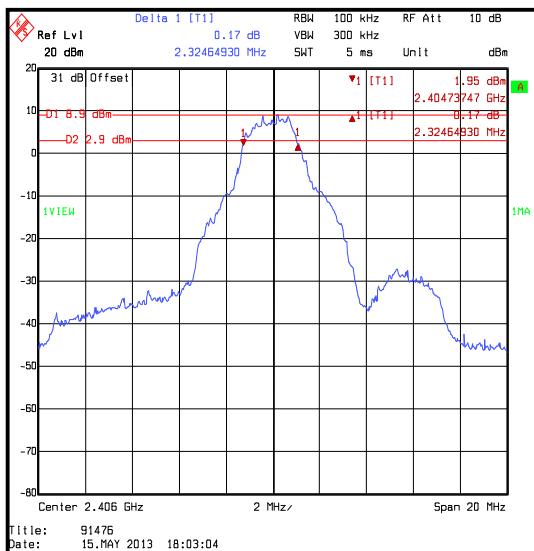
Temperature (°C):	23
Relative Humidity (%):	34

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

1. 6 dB DTS bandwidth tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.1 option 1.
2. The spectrum analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode Max Hold. The span was set to 20 MHz. Normal and delta markers were placed 6 dB down from the peak of the carrier. These results are documented in the table below.
3. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

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

Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	2324.649	≥500	1824.649	Complied
Middle	2324.649	≥500	1824.649	Complied
Top	2324.649	≥500	1824.649	Complied



**Transmitter Minimum 6 dB Bandwidth (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2142	Attenuator	Atlan TecRF	AN18-20	081120-23	10 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
M1229	Digital Multimeter	Fluke	179	87640015	18 Jun 2013	12
M1658	Thermometer Hygrometer Station	JM Handelpunkt	30.5015.13	Not stated	10 Jun 2013	12
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-

**5.2.2. Transmitter 99% Occupied Bandwidth****Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	15 May 2013
Test Sample Serial Number:	621D1890501312AN50429		

FCC Reference:	N/A
Industry Canada Reference:	RSS-Gen 4.6.1
Test Method Used:	Spectrum Analyser Occupied Bandwidth function

**Environmental Conditions:**

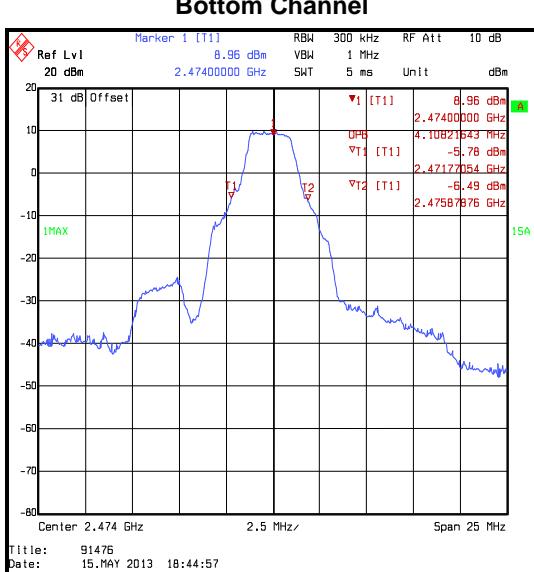
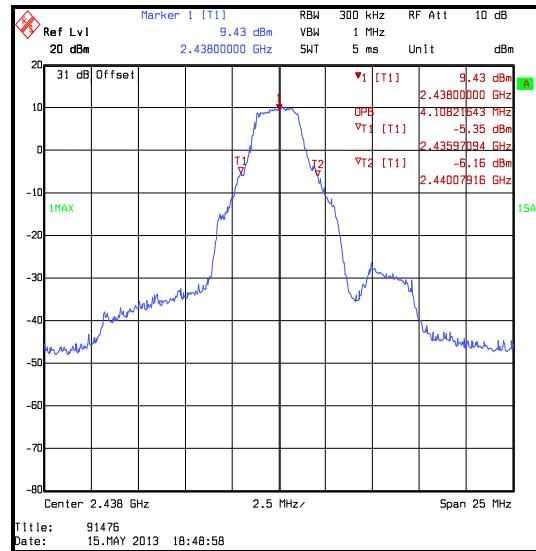
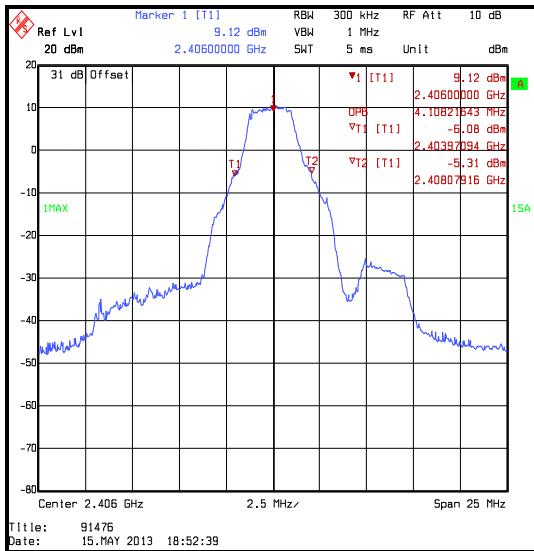
Temperature (°C):	24
Relative Humidity (%):	31

**Note(s):**

1. Occupied bandwidth (99% bandwidth) was measured using a spectrum analyser occupied bandwidth function. The span was wide enough to cover all possible emission skirts. The resolution bandwidth was set to 1% of the span and the video bandwidth set to 3 time the resolution bandwidth.
2. The spectrum analyser resolution bandwidth was set to 300 kHz and video bandwidth 1 MHz. A sample detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 20 MHz. The analyser function set the measurements to be made at 99% of the emission bandwidth. The results are given in the table below.
3. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

**Transmitter 99% Occupied Bandwidth (continued)****Results:**

Channel	99% Occupied Bandwidth (MHz)
Bottom	4.108
Middle	4.108
Top	4.108



**Transmitter 99% Occupied Bandwidth (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2142	Attenuator	Atlan TecRF	AN18-20	081120-23	10 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
M1229	Digital Multimeter	Fluke	179	87640015	18 Jun 2013	12
M1658	Thermometer Hygrometer Station	JM Handelpunkt	30.5015.13	Not stated	10 Jun 2013	12
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-

**5.2.3. Transmitter Power Spectral Density****Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	15 May 2013
Test Sample Serial Number:	621D1890501312AN50429		

FCC Reference:	Part 15.247(e)
Industry Canada Reference:	RSS-210 A8.2(b)
Test Method Used:	As detailed in FCC KDB 558074 Section 10.2

**Environmental Conditions:**

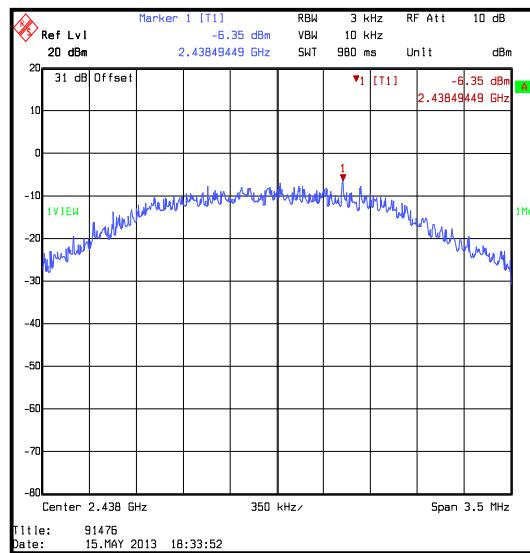
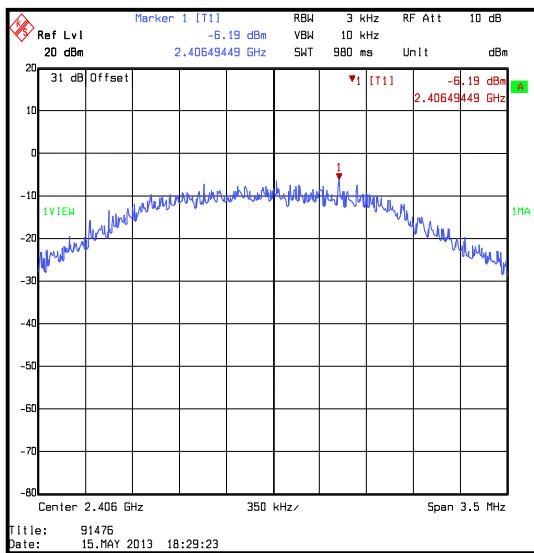
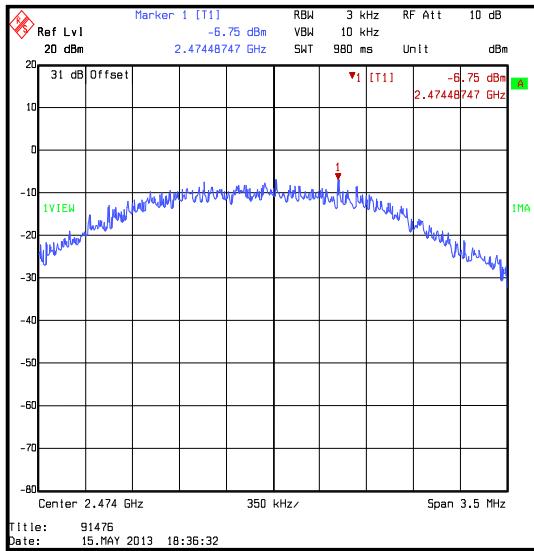
Temperature (°C):	24
Relative Humidity (%):	32

**Note(s):**

1. Transmitter Power Spectral Density tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 10.2 measurement method PKPSD.
2. The spectrum analyser resolution bandwidth was set to 3 kHz and video bandwidth of 10 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 1.5 times the measured DTS bandwidth. A marker was placed at the peak of the signal and the results recorded in the table below.
3. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

**Transmitter Power Spectral Density (continued)****Results:**

Channel	Output Power (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-6.2	8.0	14.2	Complied
Middle	-6.4	8.0	14.4	Complied
Top	-6.8	8.0	14.8	Complied

**Bottom Channel****Middle Channel****Top Channel**

**Transmitter Power Spectral Density (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2072	Directional Coupler	Narda	4242B	03549	Calibrated before use	-
A2142	Attenuator	Atlan TecRF	AN18-20	081120-23	10 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	05 Feb 2014	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	12 Jun 2013	12
M1175	Power Sensor	Hewlett Packard	8485A	2942A10299	05 Sep 2013	12
M1229	Digital Multimeter	Fluke	179	87640015	18 Jun 2013	12
M1658	Thermometer Hygrometer Station	JM Handelpunkt	30.5015.13	Not stated	10 Jun 2013	12
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-

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

Test Engineer:	Andrew Edwards	Test Date:	15 May 2013
Test Sample Serial Number:	621D1890501312AN50429		

FCC Reference:	Part 15.247(b)(3)
Industry Canada Reference:	RSS-Gen 4.8 / RSS-210 A8.4(4)
Test Method Used:	As detailed in FCC KDB 558074 Section 9.1.1

**Environmental Conditions:**

Temperature (°C):	24
Relative Humidity (%):	32

**Note(s):**

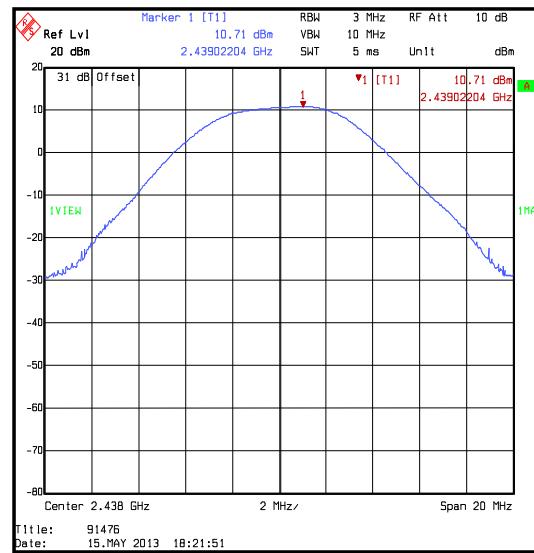
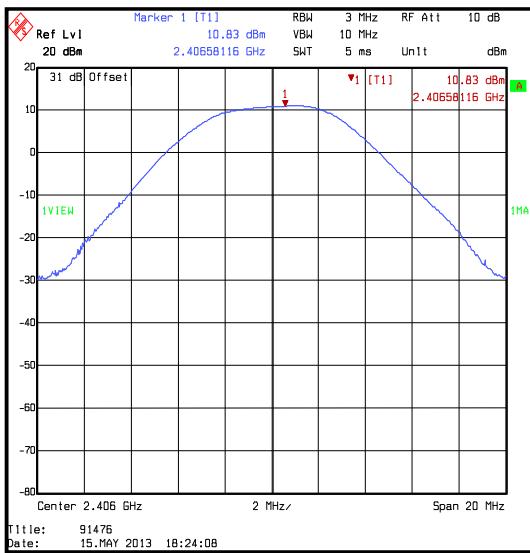
- Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.1.1 measurement method RBW  $\geq$  DTS bandwidth.
- The spectrum analyser resolution bandwidth was set to 3 MHz and video bandwidth of 10 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 20 MHz. A marker was placed at the peak of the signal and the results recorded in the table below.
- The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

**Results:**

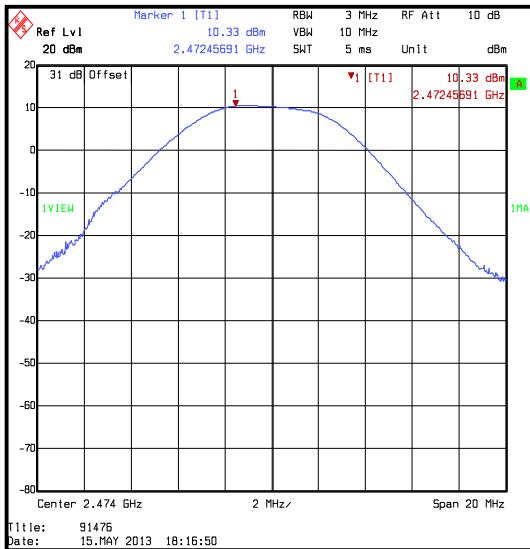
Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	10.8	30.0	19.2	Complied
Middle	10.7	30.0	19.3	Complied
Top	10.3	30.0	19.7	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	10.8	3.3	14.1	36.0	21.9	Complied
Middle	10.7	3.3	14.0	36.0	22.0	Complied
Top	10.3	3.3	13.6	36.0	22.4	Complied

### Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel

Top Channel

**Transmitter Maximum Peak Output Power (continued)****Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A2072	Directional Coupler	Narda	4242B	03549	Calibrated before use	-
A2142	Attenuator	Atlan TecRF	AN18-20	081120-23	10 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	13 Aug 2013	12
M1021	Signal Generator	Rohde & Schwarz	SMP02	833286/004	05 Feb 2014	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	12 Jun 2013	12
M1175	Power Sensor	Hewlett Packard	8485A	2942A10299	05 Sep 2013	12
M1229	Digital Multimeter	Fluke	179	87640015	18 Jun 2013	12
M1658	Thermometer Hygrometer Station	JM Handelpunkt	30.5015.13	Not stated	10 Jun 2013	12
S0537	DC Power Supply Unit	TTI	EL302D	249928	Calibrated before use	-

### **5.2.5. Transmitter Radiated Emissions**

#### **Test Summary:**

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	22 May 2013
<b>Test Sample Serial Number:</b>	621D1890501312AN50427		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Industry Canada Reference:</b>	RSS-Gen 4.9 / RSS-210 A8.5
<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:**

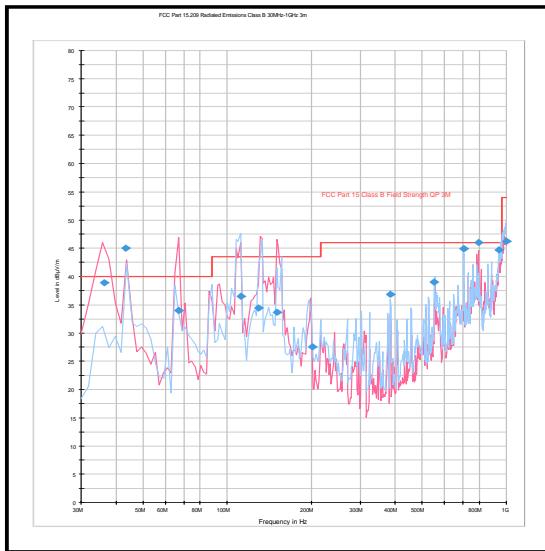
<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	30

#### **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 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 noise floor of the measurement system.
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.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
6. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span big enough to see the whole emission.

#### **Results: Top Channel**

<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>
111.889	Horizontal	36.5	43.5	7.0	Complied
129.711	Vertical	34.5	43.5	9.0	Complied
996.271	Horizontal	46.2	54.0	7.8	Complied

**Transmitter Radiated Emissions (continued)**

*Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.*

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A490	Antenna	Chase	CBL6111A	1590	18 Apr 2014	12
A1834	Attenuator	Hewlett Packard	8491B	10444	27 Jan 2014	12
G0543	Amplifier	Sonoma	310N	230801	04 Jul 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	07 Feb 2014	12
M1656	Thermometer Hygrometer Station	JM Handelspunkt	30.5015.13	Not stated	10 Jun 2013	12

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

<b>Test Engineers:</b>	Andrew Edwards & Mark Percival	<b>Test Dates:</b>	16 May 2013 & 21 May 2013
<b>Test Sample Serial Number:</b>	621D1890501312AN50427		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Industry Canada Reference:</b>	RSS-Gen 4.9 / RSS-210 A8.5
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing FCC KDB 558074 Section 11.0
<b>Frequency Range</b>	1 GHz to 26.5 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	22 to 24
<b>Relative Humidity (%):</b>	42 to 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. 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. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto. Peak and average measurements were performed with their own appropriate detectors during the pre-scan measurements.
6. Final peak emissions were measured with the test receiver set to the same configuration as the pre-scan except with a span that could see the whole emission. Final average measurements that fall within the restricted bands were made with the test receiver resolution bandwidth was set to 1 MHz and video bandwidth 10 Hz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The spectrum analyser was left to sweep for a sufficient length of time in order to maximise the out-of-band emissions.
7. \*-20 dBc limit

**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
1071.543	Horizontal	60.4	74.0	13.6	Complied
1254.649	Horizontal	55.7	73.2*	17.5	Complied
1254.649	Horizontal	64.1	74.0	9.9	Complied
1340.217	Horizontal	62.0	74.0	12.0	Complied
1434.219	Horizontal	53.0	73.2*	20.2	Complied
1529.298	Vertical	60.9	74.0	13.1	Complied
1620.761	Horizontal	59.1	74.0	14.9	Complied
1719.268	Horizontal	62.9	74.0	11.1	Complied
2999.980	Horizontal	55.9	73.2*	17.3	Complied

**Results: Average / Bottom Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1071.453	Horizontal	46.1	54.0	7.9	Complied
1259.053	Horizontal	50.7	54.0	3.3	Complied
1339.811	Horizontal	48.1	54.0	5.9	Complied
1436.393	Vertical	44.7	54.0	9.3	Complied
1530.260	Horizontal	47.2	54.0	6.8	Complied
1612.435	Horizontal	46.1	54.0	7.9	Complied
1719.659	Horizontal	40.8	54.0	13.2	Complied

**Results: Peak / Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1053.387	Horizontal	60.7	74.0	13.3	Complied
1258.434	Horizontal	55.2	74.1*	18.9	Complied
1259.579	Horizontal	65.2	74.0	8.8	Complied
1339.886	Horizontal	62.4	74.0	11.6	Complied
1536.061	Vertical	61.4	74.0	12.6	Complied
1622.746	Horizontal	59.1	74.0	14.9	Complied
1733.909	Horizontal	62.9	74.0	11.1	Complied
2999.999	Horizontal	55.5	74.1*	18.6	Complied

**Transmitter Radiated Emissions (continued)****Results: Average / Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1055.701	Horizontal	46.5	54.0	7.5	Complied
1259.158	Horizontal	50.9	54.0	3.1	Complied
1339.826	Horizontal	49.3	54.0	4.7	Complied
1530.170	Vertical	47.2	54.0	6.8	Complied
1612.525	Horizontal	46.2	54.0	7.8	Complied
1719.721	Horizontal	49.6	54.0	4.4	Complied

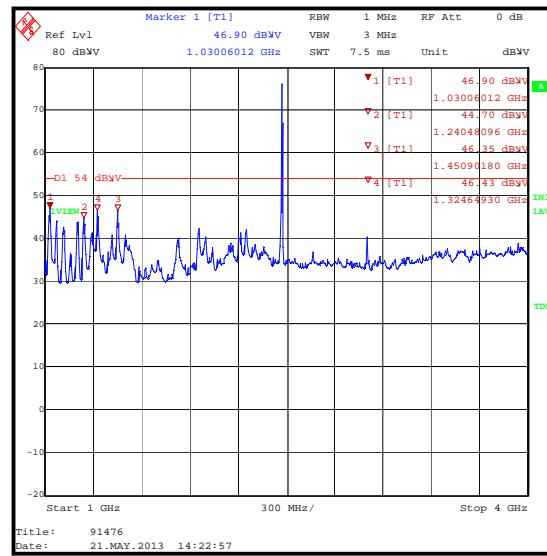
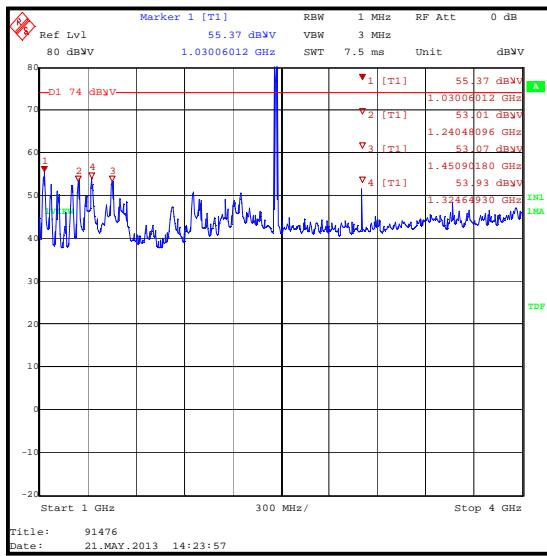
**Results: Peak / Top Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1071.543	Horizontal	60.4	74.0	13.6	Complied
1254.649	Horizontal	64.1	74.0	9.9	Complied
1340.217	Horizontal	62.0	74.0	12.0	Complied
1529.298	Vertical	60.9	74.0	13.1	Complied
1620.761	Horizontal	59.1	74.0	14.9	Complied
1719.268	Horizontal	62.9	74.0	11.1	Complied
2999.980	Horizontal	55.9	75.9*	20.0	Complied

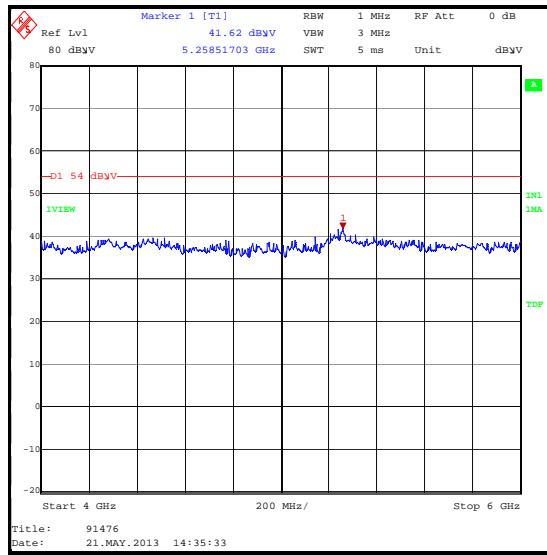
**Results: Average / Top Channel**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
1071.453	Horizontal	46.1	54.0	7.9	Complied
1259.053	Horizontal	50.7	54.0	3.3	Complied
1339.811	Horizontal	48.1	54.0	5.9	Complied
1436.393	Vertical	44.7	54.0	9.3	Complied
1530.260	Horizontal	47.2	54.0	6.8	Complied
1612.435	Horizontal	46.1	54.0	7.9	Complied
1719.659	Horizontal	40.8	54.0	13.2	Complied

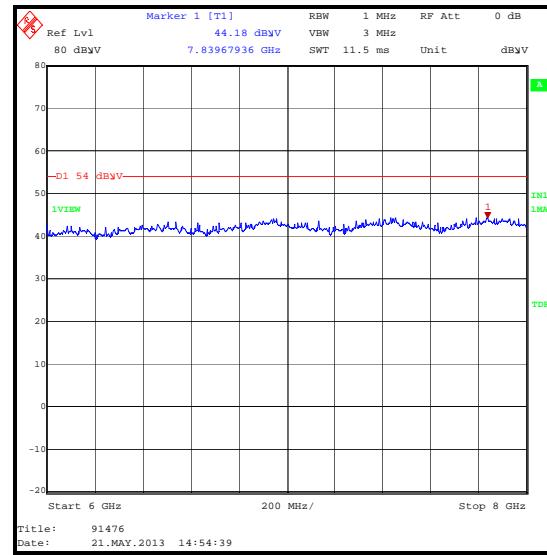
## Transmitter Radiated Emissions (continued)



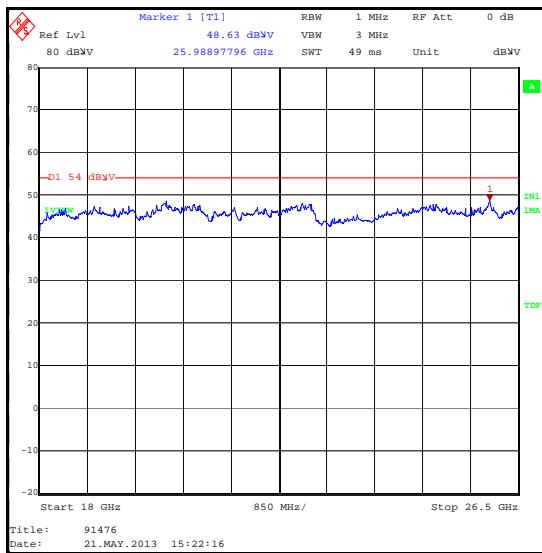
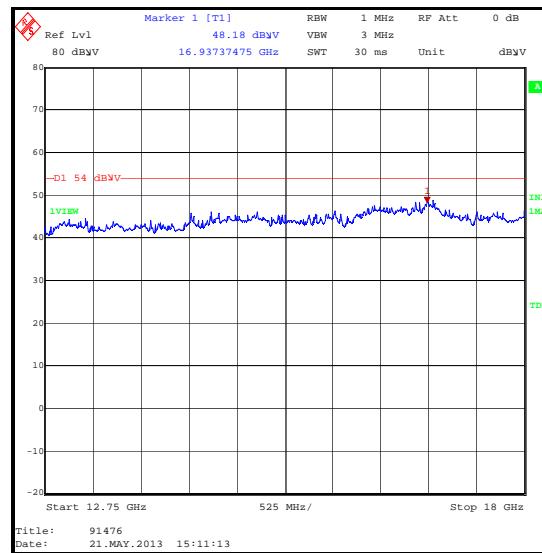
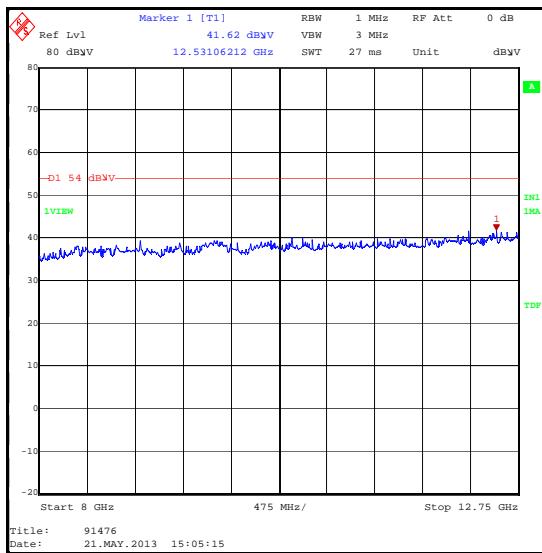
## Peak Detector



## Average Detector



### **Transmitter Radiated Emissions (continued)**



*Note: The above 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)
A253	Antenna	Flann	12240-20	128	04 Nov 2013	12
A254	Antenna	Flann	14240-20	139	04 Nov 2013	12
A255	Antenna	Flann	16240-20	519	04 Nov 2013	12
A256	Antenna	Flann	18240-20	400	04 Nov 2013	12
A436	Antenna	Flann	20240-20	330	04 Nov 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
L1014	Test Receiver	Rohde & Schwarz	ESIB 40	100014	10 May 2014	24
M1656	Thermometer Hygrometer Station	JM Handelpunkt	30.5015.13	Not stated	10 Jun 2013	12

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

<b>Test Engineer:</b>	Andrew Edwards	<b>Test Date:</b>	16 May 2013
<b>Test Sample Serial Number:</b>	621D1890501312AN50427		

<b>FCC Reference:</b>	Parts 15.247(d) & 15.209(a)
<b>Industry Canada Reference:</b>	RSS-Gen 4.9 / RSS-210 A8.5
<b>Test Method Used:</b>	As detailed in ANSI C63.10 Section 6.9.2 referencing FCC KDB 558074

**Environmental Conditions:**

<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	35

**Note(s):**

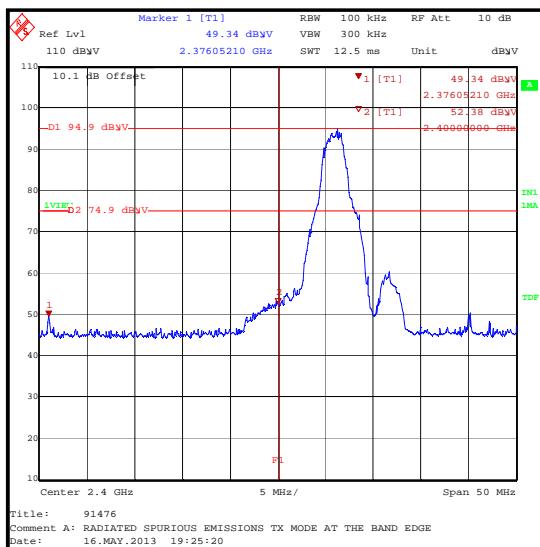
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. For the lower band edge measurements: As the lower band edge falls within the non-restricted band only peak measurements are required. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. As the maximum conducted output power was measured using a peak detector in accordance with FCC KDB 558074 Section 9.1.1 an out-of-band limit line was placed 20 dB below the peak level (FCC KDB 558074 Section 11.1(a)). A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent non-restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
3. For the upper band edge measurements: As the upper band edge falls within restricted band both peak and average measurements were recorded by placing a marker at the edge of the band (2483.5 MHz). For peak measurements the test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the test receiver resolution bandwidth was set to 1 MHz and video bandwidth 10 Hz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
4. \* -20 dBc limit.

**Transmitter Band Edge Radiated Emissions (continued)****Results: Peak**

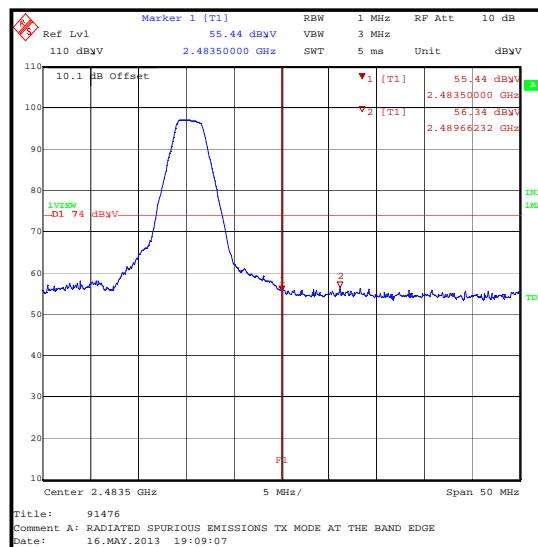
Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2400.0	52.4	74.9*	22.5	Complied
2483.5	55.4	74.0	18.6	Complied
2489.662	56.3	74.0	17.7	Complied

**Results: Average**

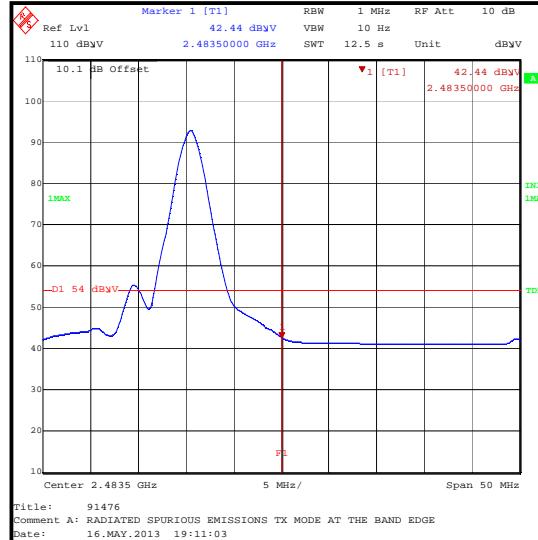
Frequency (MHz)	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
2483.5	42.4	54.0	11.6	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

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

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	10 May 2014	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
L1014	Test Receiver	Rohde & Schwarz	ESIB 40	100014	10 May 2014	24
M1656	Thermometer Hygrometer Station	JM Handelpunkt	30.5015.13	Not stated	10 Jun 2013	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 measured (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
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	$\pm 1.13$ dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	$\pm 1.13$ dB
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	$\pm 0.92$ ppm
99% Occupied Bandwidth	2.4 GHz to 2.4835 GHz	95%	$\pm 0.92$ ppm
Radiated Spurious Emissions	30 MHz to 26.5 GHz	95%	$\pm 2.94$ 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 of Loader and BCU updated, Industry Canada certification number updated
3.0	-	-	Updates to sections 3.2 & 4.2