TEST REPORT

Test Report No. : UL-RPT-RP89056JD21D V2.0

Manufacturer	:	Bang & Olufsen a/s
Model No.	:	BeoVision 11-55
FCC ID	:	TTULBWA1ZZPD
IC Certification No.	:	3775B-LBWA1ZZPD
Test Standard(s)	:	FCC Parts 15.407(b), 15.209(a), Industry Canada Parts RSS-Gen Issue 3 December 2010 4.9, RSS-210 Issue 8 December 2010 A9.2(1),(2),(3) & (4)

1. This test report shall not be reproduced in full or partial, without the written approval of RFI Global Services Ltd trading as UL.
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 2.0 supersedes all previous versions.

Date of Issue: 25 January 2013

Checked by:

Sarah Williams
WiSE Laboratory Engineer

Issued by :

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ilac-MRA UKAS TESTING 0644

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

Company Name:	Bang & Olufsen a/s
Address:	Peter Bangs Vej 15 7600 Struer Denmark

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.407
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Sections 15.403 and 15.407
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: 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 trading as UL, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Date:	01 November 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.407(b)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A9.2 (1),(2),(3) & (4)	Transmitter Out of Band 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 789033 D01 v01r02 9/26/2012
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	FCC KDB 662911 D01 v01r02 9/26/2012
Title:	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
Reference:	FCC Response To Inquiry
Title:	Tracking Number 969369 Date: 21 February 2012

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 specifications identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Bang & Olufsen
Model Name or Number:	BeoVision 11-55
Serial Number:	22951332
Software Version Number:	1.0.1.26536
FCC ID:	TTULBWA1ZZPD
Industry Canada Certification Number:	3775B-LBWA1ZZPD

3.2. Description of EUT

The equipment under test was an IEEE 802.11a/b/g/n WLAN module operating in the 2.4 GHz and 5 GHz bands. The module is incorporated into a 55” television.

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 802.11 / Unlicensed National Information Infrastructure Devices (U-NII)		
Type of Unit:	Transceiver		
Modulation:	CCK, BPSK, QPSK, 16QAM, 64QAM		
Data rates:	802.11a	6, 9, 12, 18, 24, 36 ,48 & 54 Mbps	
	802.11n	6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78, 104, 117 & 130 Mbps	
Power Supply Requirement(s):	Nominal	120 VAC 60 Hz	
Channel Spacing:	20 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	36	5180
	Middle	40	5200
	Top	48	5240
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	52	5260
	Middle	56	5280
	Top	64	5320
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	100	5500
	Middle	116	5580
	Top	140	5700
Transmit Frequency Band:	5725 MHz to 5825 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	149	5745
	Middle	153	5765
	Top	161	5805

Additional Information Related to Testing (continued)

Channel Spacing:	40 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	38	5190
	Top	46	5230
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	54	5270
	Top	62	5310
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	102	5510
	Middle	110	5550
	Top	134	5670
Transmit Frequency Band:	5725 MHz to 5825 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	151	5755
	Top	159	5795

3.5. Support Equipment

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

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	D610
Serial Number:	RFI Asset No. PC343NT

Description:	Internal Antenna
Brand Name:	TE Connectivity Ltd
Model Name or Number:	PUCK

Description:	Internal Antenna
Brand Name:	TE Connectivity Ltd
Model Name or Number:	UAM

Description:	Ethernet hub
Brand Name:	Netgear
Model Name or Number:	GS605
Serial Number:	1YG194390218E

Description:	Ethernet cables
Brand Name:	Not stated
Model Name or Number:	Not stated
Serial Number:	Not stated

Description:	HDMI Cables / 2 metres length
Brand Name:	Not Stated
Model Name or Number:	Not Stated
Serial Number:	Not Stated

Description:	HDMI Monitor
Brand Name:	Philips
Model Name or Number:	MUT1121T
Serial Number:	AU1A1017002190

Support Equipment (continued)

Description:	Scart cable
Brand Name:	Not Stated
Model Name or Number:	Not Stated
Serial Number:	Not Stated

Description:	USB dongle
Brand Name:	Integral
Model Name or Number:	8 GB
Serial Number:	Not Stated

3.6. Antenna

The table below lists the antennas used with this product:

Type	Stated Gain (dBi)	Model	Part No.
Dual-band	4.0	PUCK	1551868-1
Dual-band	3.0	UAM	1513472-7

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 with a modulated carrier at maximum power on the bottom, middle and top channels as required using the supported data rate/modulation type.

4.2. Configuration and Peripherals

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

- Transmitting in test mode with 100% duty cycle and controlled using a bespoke application on a laptop PC. The application was used to enable continuous transmission and to select the test channels, data rate and modulation scheme as required. The Customer supplied instructions on how to configure the EUT for test purposes.
- Transmitter spurious emissions were performed with the EUT transmitting with a data rate of 13 Mbps (MCS8) with a channel bandwidth of 20 MHz, as this was found to have the highest power level and therefore deemed to be worst case.

  Please refer to RFI-RPT-RP89056JD13F for details of these measurements.
- Radiated emissions tests were performed with all unused ports terminated.
- The 3 internal antennas are connected to the WLAN module ports within the television as follows:

Module Port	Antenna Type	TX	RX
ANT0	PUCK	Yes	Yes
ANT1	UAM	Yes	Yes
ANT2	PUCK	No	Yes

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 Out of Band Radiated Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	01 November 2012
Test Sample Serial Number:	22951332		

FCC Reference:	Parts 15.407(b)(3),(6),(7) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(3)
Test Method Used:	FCC KDB 789033 G) & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	28

Note(s):

1. Measurements below 1 GHz were limited to the 5.47-5.725 GHz band, 802.11n HT20 / MCS8 /13 Mbps as it produced the highest conducted output power and was therefore deemed worst case.
2. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
3. 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.
4. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
5. 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.

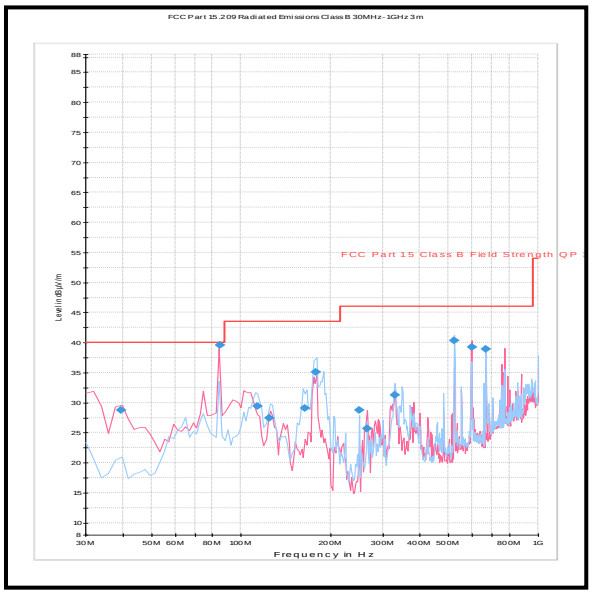
Transmitter Out of Band Radiated Emissions (continued)

Results: Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
113.400	Horizontal	29.5	43.5	14.0	Complied
125.044	Horizontal	27.4	43.5	16.1	Complied
164.382	Horizontal	29.1	43.5	14.4	Complied
250.010	Horizontal	28.8	46.0	17.2	Complied
266.562	Vertical	25.7	46.0	20.3	Complied
330.018	Vertical	31.2	46.0	14.8	Complied

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
522.203	Horizontal	-54.8	-27.0	27.8	Complied



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

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	01 November 2012
Test Sample Serial Number:	22951332		

FCC Reference:	Parts 15.407(b)(1),(7) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(1)
Test Method Used:	FCC KDB 789033 G) & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	40

Note(s):

1. FCC Part 15.407(b)(1) states for devices operating in the 5.15 to 5.25 GHz band, all emissions outside the 5.15-5.35 GHz band shall not exceed and EIRP of -27 dBm/MHz. Part 15.407(b)(7) states the provisions of 15.205 apply, eg restricted bands of operation.
2. Industry Canada RSS-210 A9.2(1) states emissions outside the band 5150 to 5250 MHz shall not exceed -27 dBm/MHz e.i.r.p.
3. Pre-scans above 1 GHz were performed with the EUT transmitting in the 5.47-5.725 GHz band as it produced the highest conducted output power in this band. However, final measurements were performed on any emission seen for each band as stated in FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012).
4. Measurements were performed with the EUT transmitting 13 Mbps / MCS8 / 20 MHz channel width as all configurations were previously measured and this combination produced the highest output power. Pre-scans were performed with the EUT transmitting on the top channel.
5. The second harmonic emission visible on the pre-scan in the 5.47-5.725 GHz band was measured. Due to the lower power setting in this band the emission was not present.
6. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
7. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
8. 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.

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)

Results: Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1265.369	Vertical	-53.8	-27.0	26.8	Complied
1332.074	Horizontal	-48.6	-27.0	21.6	Complied
1665.491	Vertical	-35.6	-27.0	8.6	Complied
1831.756	Vertical	-43.0	-27.0	16.0	Complied
1997.930	Vertical	-36.0	-27.0	9.0	Complied
2331.124	Horizontal	-41.9	-27.0	14.9	Complied
2663.757	Vertical	-43.6	-27.0	16.6	Complied

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1332.074	Horizontal	46.6	74.0	27.4	Complied
1665.491	Vertical	59.6	74.0	14.4	Complied
2331.124	Horizontal	53.3	74.0	20.7	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1332.074	Horizontal	35.0	54.0	19.0	Complied
1665.491	Vertical	38.4	54.0	15.6	Complied
2331.124	Vertical	34.2	54.0	19.8	Complied

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1255.150	Vertical	-51.8	-27.0	24.8	Complied
1332.164	Vertical	-47.8	-27.0	20.8	Complied
1665.330	Vertical	-44.6	-27.0	17.6	Complied
1813.527	Vertical	-43.4	-27.0	16.4	Complied
1998.110	Vertical	-37.2	-27.0	10.2	Complied
2330.975	Horizontal	-42.0	-27.0	15.0	Complied
2664.061	Vertical	-43.3	-27.0	16.3	Complied

Results: Middle Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1332.164	Vertical	47.4	74.0	26.6	Complied
1665.330	Vertical	50.6	74.0	23.4	Complied
2330.975	Vertical	53.2	74.0	20.8	Complied

Results: Middle Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1332.164	Vertical	35.0	54.0	19.0	Complied
1665.330	Vertical	31.9	54.0	22.1	Complied
2330.975	Horizontal	33.9	54.0	20.1	Complied

Transmitter Out of Band Radiated Emissions (5.15-5.25 GHz band operation) (continued)Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1260.031	Vertical	-51.9	-27.0	24.9	Complied
1332.144	Vertical	-46.3	-27.0	19.3	Complied
1665.540	Horizontal	-43.8	-27.0	16.8	Complied
1819.809	Vertical	-46.2	-27.0	19.2	Complied
1998.030	Vertical	-36.5	-27.0	9.5	Complied
2331.180	Vertical	-40.6	-27.0	13.6	Complied
2663.930	Vertical	-43.4	-27.0	16.4	Complied

Results: Top Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1332.144	Vertical	48.9	74.0	25.1	Complied
1665.540	Horizontal	51.4	74.0	22.6	Complied
2331.180	Vertical	54.6	74.0	19.4	Complied

Results: Top Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1332.144	Vertical	35.5	54.0	18.5	Complied
1665.540	Vertical	31.8	54.0	22.2	Complied
2331.180	Vertical	33.0	54.0	21.0	Complied

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation)

Test Summary:

Test Engineers:	David Doyle & Mark Percival	**Test Date:**	01 November 2012
Test Sample Serial Number:	22951332		

FCC Reference:	Parts 15.407(b)(2),(7) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(2)
Test Method Used:	FCC KDB 789033 G) & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	40

Note(s):

1. FCC Part 15.407(b)(2) states for devices operating in the 5.25 to 5.35 GHz band that generate emissions in the 5.15 to 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 to 5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15 to 5.25 GHz band. Part 15.407(b)(7) states the provisions of 15.205 apply eg restricted bands of operation.
2. Industry Canada RSS-210 A9.2(2) states emissions outside the band 5250 to 5350 MHz shall not exceed -27 dBm/MHz EIRP.
3. Pre-scans above 1 GHz were performed with the EUT transmitting in the 5.47-5.725 GHz band as it produced the highest conducted output power in this band. However, final measurements were performed on any emission seen for each band as stated in FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012).
4. Measurements were performed with the EUT transmitting 13 Mbps / MCS8 / 20 MHz channel bandwidth as all configurations were previously measured and this combination produced the highest output power. Pre-scans were performed with the EUT transmitting on the top channel.
5. The second harmonic emission visible on the pre-scan in the 5.47-5.725 GHz band was measured. Due to the lower power setting in this band the emission was not present.
6. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
7. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
8. 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.

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)

Results: Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1664.879	Vertical	-39.0	-27.0	12.0	Complied
1819.789	Vertical	-45.5	-27.0	18.5	Complied
1998.046	Vertical	-41.7	-27.0	14.7	Complied
2332.214	Vertical	-48.8	-27.0	21.8	Complied
2663.978	Vertical	-48.1	-27.0	21.1	Complied

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.879	Vertical	58.4	74.0	15.6	Complied
2332.214	Vertical	48.6	74.0	25.4	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.879	Vertical	50.3	54.0	3.7	Complied
2332.214	Vertical	38.8	54.0	15.2	Complied

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1664.679	Vertical	-38.4	-27.0	11.4	Complied
1819.889	Vertical	-45.7	-27.0	18.7	Complied
1998.146	Vertical	-41.5	-27.0	14.5	Complied
2330.812	Vertical	-47.3	-27.0	20.3	Complied
2663.778	Vertical	-48.3	-27.0	21.3	Complied

Results: Middle Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.679	Vertical	59.0	74.0	15.0	Complied
2330.812	Vertical	50.1	74.0	23.9	Complied

Results: Middle Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.679	Vertical	47.5	54.0	6.5	Complied
2330.812	Vertical	39.7	54.0	14.3	Complied

Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1665.281	Vertical	-35.5	-27.0	8.5	Complied
1819.889	Vertical	-43.4	-27.0	16.4	Complied
1998.046	Vertical	-39.5	-27.0	12.5	Complied
2330.711	Vertical	-45.2	-27.0	18.2	Complied
2664.078	Vertical	-46.9	-27.0	19.9	Complied

Results: Top Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1665.281	Vertical	59.7	74.0	14.3	Complied
2330.711	Vertical	50.0	74.0	24.0	Complied

Results: Top Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1665.281	Vertical	50.0	54.0	4.0	Complied
2330.711	Vertical	38.9	54.0	15.1	Complied

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	01 November 2012
Test Sample Serial Number:	22951332		

FCC Part:	15.407(b)(3),(7) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(3)
Test Method Used:	FCC KDB 789033 G) & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	40

Note(s):

1. FCC Part 15.407(b)(3) states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply eg restricted bands of operation.
2. Industry Canada RSS-210 A9.2(3) states emissions outside the band 5470 to 5725 MHz shall not exceed -27 dBm/MHz EIRP.
3. Pre-scans were performed on the 5.47-5.725 GHz band as it produced the highest conducted output power. However, final measurements were performed on any emission seen for each band as stated in FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012).
4. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
5. 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.
6. The emission shown on the 4 GHz to 6 GHz plot is the EUT fundamental.
7. Measurements were performed across the two restricted bands closest to the bands of operation with the EUT transmitting on the top channel in the 5.47 to 5.725 GHz band. Plots are included in this section of the test report. Peak and average measurements were made.
8. 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.

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)

Results: Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1664.780	Vertical	-36.2	-27.0	9.2	Complied
1821.092	Vertical	-43.2	-27.0	16.2	Complied
1997.946	Vertical	-38.9	-27.0	11.9	Complied
2330.812	Vertical	-46.6	-27.0	19.6	Complied
2663.477	Vertical	-47.0	-27.0	20.0	Complied
4400.006	Horizontal	-46.6	-27.0	19.6	Complied
10997.046	Horizontal	-48.6	-27.0	21.6	Complied

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.780	Vertical	58.8	74.0	15.2	Complied
2330.812	Vertical	48.6	74.0	25.4	Complied
10997.046	Horizontal	46.6	74.0	27.4	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.883	Vertical	47.8	54.0	6.2	Complied

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1665.080	Vertical	-36.2	-27.0	9.2	Complied
1820.691	Vertical	-42.7	-27.0	15.7	Complied
1997.946	Vertical	-38.9	-27.0	11.9	Complied
2331.012	Vertical	-45.0	-27.0	18.0	Complied
2664.178	Vertical	-47.5	-27.0	20.5	Complied
4464.175	Horizontal	-45.3	-27.0	18.3	Complied
11165.693	Horizontal	-47.0	-27.0	20.0	Complied

Results: Middle Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1665.080	Vertical	59.0	74.0	15.0	Complied
2331.012	Vertical	50.2	74.0	23.8	Complied
11165.693	Horizontal	48.2	74.0	25.8	Complied

Results: Middle Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1665.080	Vertical	49.6	54.0	4.4	Complied

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1664.780	Vertical	-36.7	-27.0	9.7	Complied
1819.188	Vertical	-53.0	-27.0	26.0	Complied
1998.046	Vertical	-39.5	-27.0	12.5	Complied
2331.012	Vertical	-46.3	-27.0	19.3	Complied
2663.777	Vertical	-48.0	-27.0	21.0	Complied
4559.862	Horizontal	-42.2	-27.0	15.2	Complied
11400.602	Horizontal	-47.4	-27.0	20.4	Complied

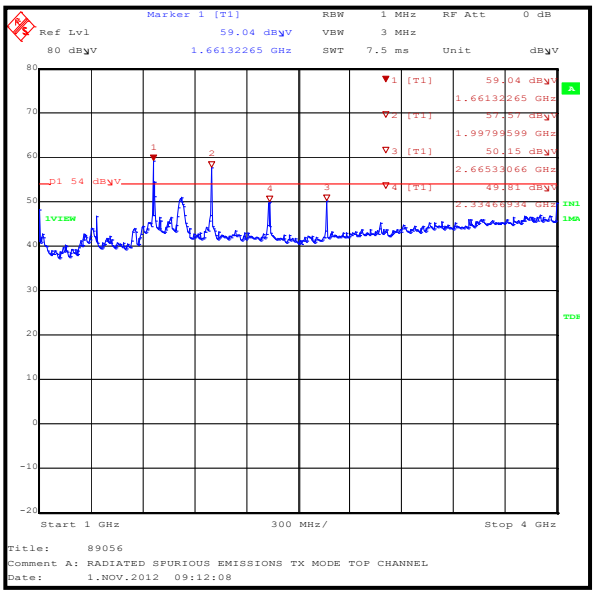
Results: Top Channel / Field strength / Peak

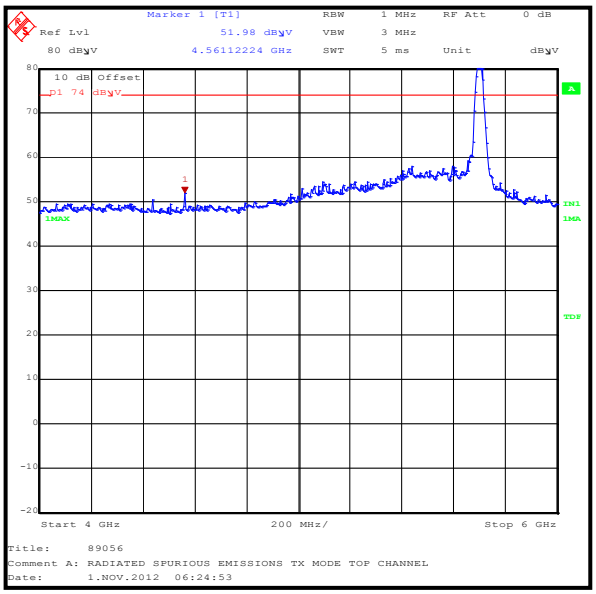
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.780	Vertical	58.5	74.0	15.5	Complied
2331.012	Vertical	48.9	74.0	25.1	Complied
11400.602	Horizontal	47.8	74.0	26.2	Complied

Results: Top Channel / Field strength / Average

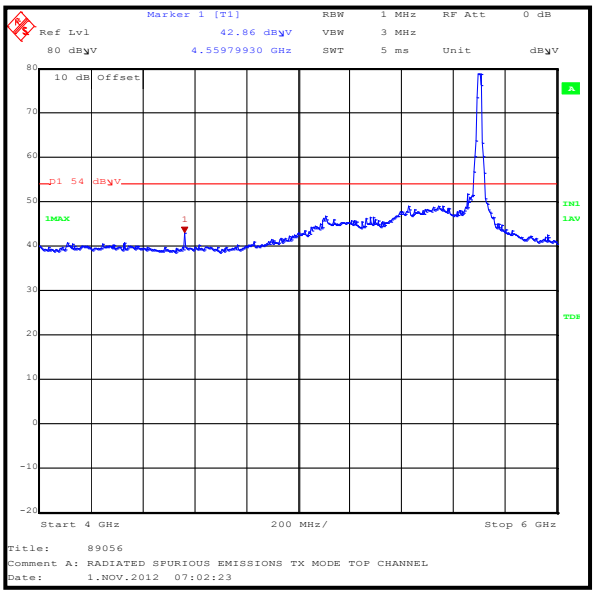
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.780	Vertical	48.4	54.0	5.6	Complied

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)

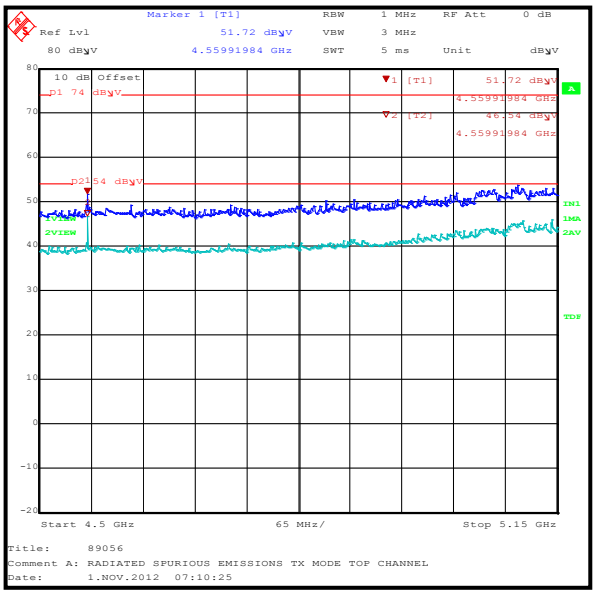




Peak Detector

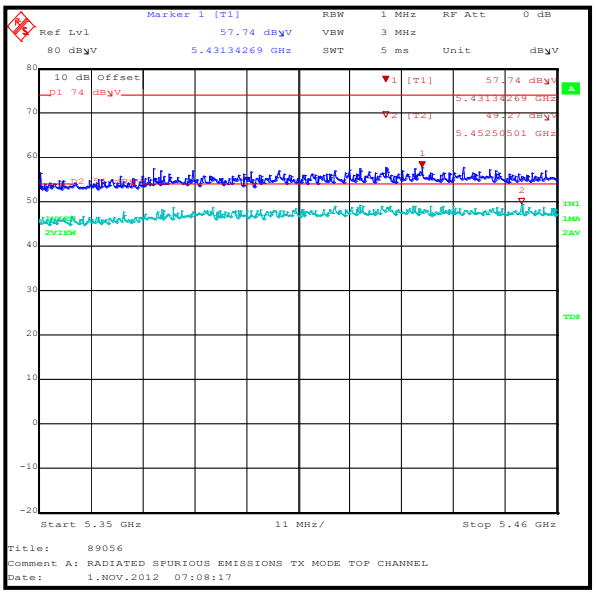


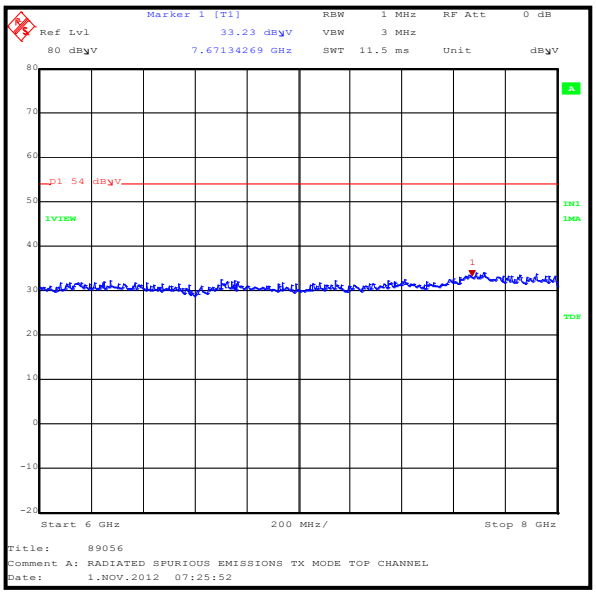
Average Detector



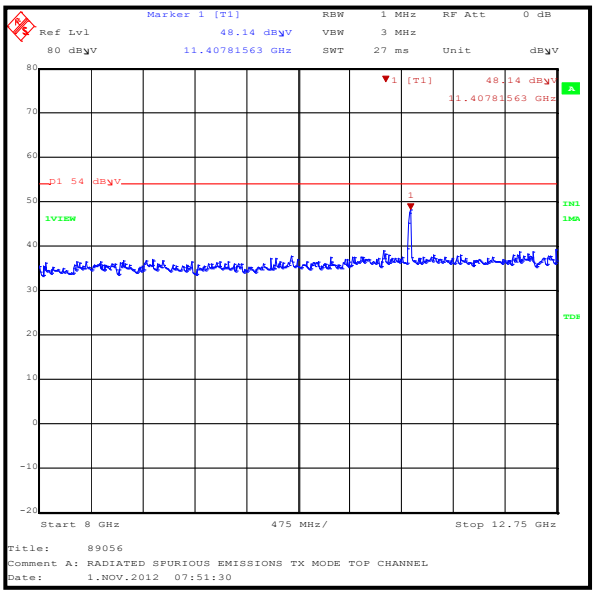
Restricted Band 4.5 GHz to 5.15 GHz

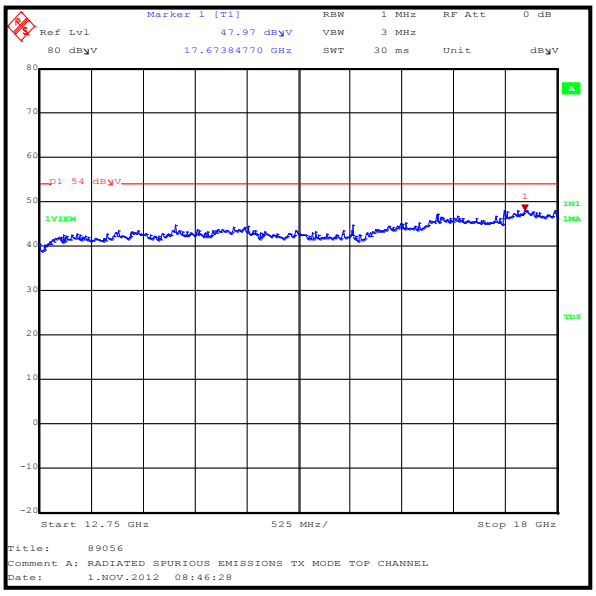
Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)



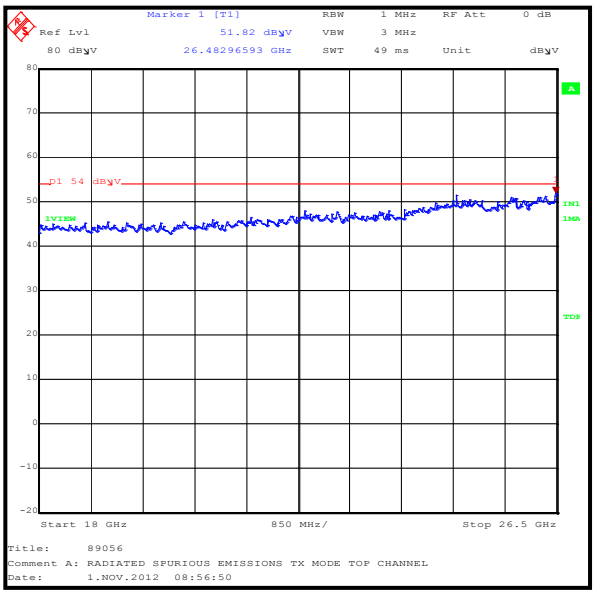


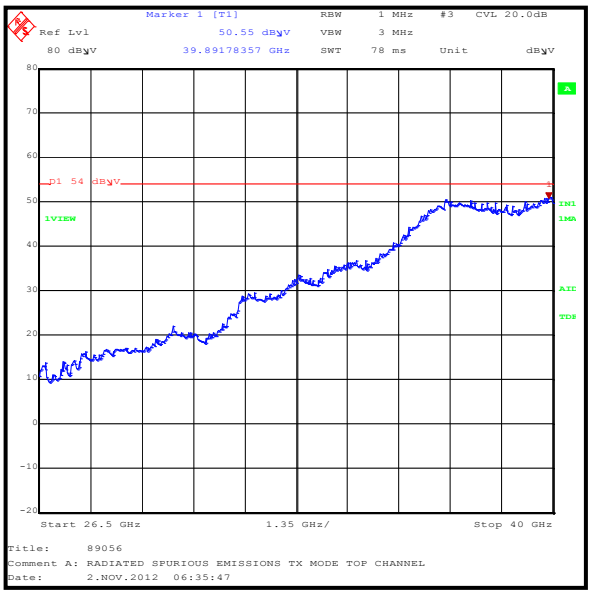
Restricted Band 5.35 GHz to 5.46 GHz





Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)





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

Transmitter Out of Band Radiated Emissions (5.725-5.825 GHz band operation) (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	01 November 2012
Test Sample Serial Number:	22951332		

FCC Reference:	Parts 15.407(b)(4),(7) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(4)
Test Method Used:	FCC KDB 789033 G) & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	40

Note(s):

1. FCC Part 15.407(b)(4) states for devices operating in the 5.725 to 5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions will not exceed -27 dBm/MHz. Part 15.407(b)(7) states the provisions of 15.205 apply eg restricted bands of operation.
2. Industry Canada RSS-210 A9.2(4) states for the band 5725 to 5825 MHz, emissions within the frequency range from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz EIRP. For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed -27 dBm/MHz EIRP.
3. Pre-scans above 1 GHz were performed with the EUT transmitting in the 5.47-5.725 GHz band as it produced the highest conducted output power in this band. However, final measurements were performed on any emission seen for each band as stated in FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012).
4. Measurements were performed with the EUT transmitting 13 Mbps / MCS8 / 20 MHz channel bandwidth as all configurations were previously measured and this combination produced the highest output power. Pre-scans were performed with the EUT transmitting on the top channel.
5. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
6. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
7. 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.

Transmitter Out of Band Radiated Emissions (5.725-5.825 GHz band operation) (continued)

Results: Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1664.679	Vertical	-35.6	-27.0	8.6	Complied
1815.481	Vertical	-43.6	-27.0	16.6	Complied
1998.046	Vertical	-39.1	-27.0	12.1	Complied
2331.212	Vertical	-46.1	-27.0	19.1	Complied
2663.878	Vertical	-46.0	-27.0	19.0	Complied
4596.061	Horizontal	-43.6	-27.0	16.6	Complied
11490.255	Horizontal	-41.3	-27.0	14.3	Complied

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.679	Vertical	59.6	74.0	14.4	Complied
2331.212	Vertical	49.1	74.0	24.9	Complied
4596.061	Horizontal	55.3	74.0	18.7	Complied
11490.255	Horizontal	53.9	74.0	21.1	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.679	Vertical	48.5	54.0	5.5	Complied
4596.061	Horizontal	51.6	54.0	2.4	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.825 GHz band operation) (continued)

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1665.180	Vertical	-37.0	-27.0	10.0	Complied
1818.287	Vertical	-43.9	-27.0	16.9	Complied
1998.046	Vertical	-39.0	-27.0	12.0	Complied
2332.414	Vertical	-46.2	-27.0	19.2	Complied
2664.379	Vertical	-46.6	-27.0	19.6	Complied
4627.915	Horizontal	-43.8	-27.0	16.8	Complied
11560.129	Horizontal	-48.2	-27.0	21.2	Complied

Results: Middle Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1665.180	Vertical	58.2	74.0	15.8	Complied
2332.414	Vertical	49.0	74.0	25.0	Complied
4627.915	Horizontal	54.8	74.0	19.2	Complied
11560.129	Horizontal	47.0	74.0	27.0	Complied

Results: Middle Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1665.180	Vertical	48.5	54.0	5.5	Complied
4627.915	Horizontal	51.4	54.0	2.6	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.825 GHz band operation) (continued)

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1664.980	Vertical	-35.9	-27.0	8.9	Complied
1818.086	Vertical	-43.9	-27.0	16.9	Complied
1998.146	Vertical	-39.1	-27.0	12.1	Complied
2331.413	Vertical	-46.1	-27.0	19.1	Complied
2663.978	Vertical	-47.7	-27.0	20.7	Complied
4643.792	Horizontal	-42.6	-27.0	15.6	Complied
11612.458	Horizontal	-46.3	-27.0	19.3	Complied

Results: Top Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.980	Vertical	59.8	74.0	14.2	Complied
2331.413	Vertical	49.1	74.0	24.9	Complied
4643.792	Horizontal	55.7	74.0	18.3	Complied
11612.458	Horizontal	48.9	74.0	26.1	Complied

Results: Top Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1664.980	Vertical	48.0	54.0	6.0	Complied
4643.792	Horizontal	52.6	54.0	1.4	Complied

Transmitter Out of Band Radiated Emissions (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	06 Jul 2013	12
A1534	Pre-Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A1785	Pre-Amplifier	Farran Technology	FLNA-28-30	FTL 6483	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	04 Nov 2013	12
A203	Antenna	Flann Microwave	22240-20	343	11 May 2013	36
A253	Antenna	Flann Microwave	12240-20	128	04 Nov 2013	12
A254	Antenna	Flann Microwave	14240-20	139	04 Nov 2013	12
A255	Antenna	Flann Microwave	16240-20	519	04 Nov 2013	12
A256	Antenna	Flann Microwave	18240-20	400	04 Nov 2013	12
A2176	High Pass Filter	Atlan TecRF	AFH-07000	800980	25 May 2013	12
A366	Isolator	MRI	FRR-400	169	Calibrated before use	-
A436	Antenna	Flann	20240-20	330	04 Nov 2013	12
G088	Power Supply Unit	Thurlby Thandar	CPX200	100700	Calibrated before use	-
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	04 Nov 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1390	Harmonic Mixer	Farran Technology	WHMP 28	FTL1677B	Calibrated before use	-

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
Radiated Spurious Emissions	30 MHz to 40 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	-	-	Antenna information added