



TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: LBWA1ZZPDZ-385

FCC ID: TTULBWA1ZZPD

IC Certification Number: 3775B-LBWA1ZZPD

To: FCC Part 15.407: 2011 & Industry Canada RSS-210 Issue 8 December 2010, RSS-Gen Issue 3 December 2010

> Test Report Serial No.: RFI-RPT-RP84552JD02A V3.0

Version 3.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of John Newell, Group Quality Manager:	Su
Checked By:	Sarah Williams
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Date of Issue:	06 July 2012

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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) 2011: Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Section 15.407
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart B (Unintentional Radiators) - Sections 15.107 and 15.109
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Specification Reference:	RSS-Gen Issue 3 December 2010
Specification Title:	General Requirements and Information for the Certification of Radio Apparatus
Specification Reference:	RSS-210 Issue 8 December 2010
Specification Title:	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
Site Registration:	FCC: 209735; Industry Canada: 3245B-2
Location of Testing:	RFI Global Services Ltd., Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	04 January 2012 to 17 March 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.107(a)	RSS-Gen 7.2.4	Receiver/Idle Mode AC Conducted Emissions	0
Part 15.109	RSS-Gen 4.10	Receiver/Idle Mode Radiated Spurious Emissions	0
Part 15.207	RSS-Gen 7.2.4	Transmitter AC Conducted Emissions	0
Part 15.403(i)	N/A	Transmitter 26 dB Emission Bandwidth	0
N/A	RSS-Gen 4.6.1 / RSS-210 A9.2	Transmitter 99% Emission Bandwidth	۲
Part 15.407(a)(1)	N/A	Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band)	
Part 15.407(a)(2)	RSS-Gen 4.8 / RSS-210 A9.2(2) & A9.2(3)	Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)	۲
Part 15.407(a)(3)	RSS-Gen 4.8 / RSS-210 A9.2(4)	Transmitter Maximum Conducted Output Power (5.725-5.825 GHz band)	۲
N/A	RSS-Gen 4.8 / RSS-210 A9.2(1)	Transmitter Maximum Equivalent Isotropically Radiated Power (EIRP) (5.15-5.25 GHz band)	۲
N/A	RSS-Gen 4.8 / RSS-210 A9.2(2) & A9.2(3)	Transmitter Maximum Equivalent Isotropically Radiated Power (EIRP) (5.25-5.35 GHz & 5.47-5.725 GHz bands)	۲
N/A	RSS-Gen 4.8 / RSS-210 A9.2(4)	Transmitter Maximum Equivalent Isotropically Radiated Power (EIRP) (5.725-5.825 GHz band)	0
Part 15.407(a)(1)	N/A	Transmitter Peak Power Spectral Density (5.15-5.25 GHz band)	
N/A	RSS-210 A9.2(1)	Transmitter EIRP Spectral Density (5.15-5.25 GHz band)	
Part 15.407(a)(2)	RSS-210 A9.2(2) & A9.2(3)	Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)	۲
Part 15.407(a)(3)	RSS-210 A9.2(4)	Transmitter Peak Power Spectral Density (5.725-5.825 GHz band)	
Part 15.407(a)(6)	N/A	Transmitter Peak Excursion	
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	Ø

Summary of Test Results (Continued)

Part 15.407(b)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A9.2(1),(2),(3) & (4)	Transmitter Band Edge Radiated Emissions	۲
Part 15.407(g)	RSS-Gen 4.7	Transmitter Frequency Stability (Temperature & Voltage Variation)	Solution Note 1
Part 15.407(h)(1)	RSS-210 A9.2	Transmitter Power Control	Note 2
Key to Results			
Somplied Solution = Did not comply			

Note(s):

- 1. Frequency stability is better than 20 ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.
- 2. Transmit Power Control was not tested as the maximum EIRP is less than 500 mW (27 dBm).
- 3. DFS test results can be found in RFI test report RFI-RPT-RP84452JD02B V2.0.

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 FCC KDB 789033 D01 v01r01 3/5/2012 **Reference:** Title: Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E **Reference:** FCC KDB 662911 D01 v01r01 10/25/2011 Title: Emissions Testing of Transmitters with Multiple Outputs in the Same Band **Reference:** FCC Response To Inquiry Tracking Number 969369 Date: 21 February 2012 Title:

2.3. Methods and Procedures

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 Number:	Murata LBWA1ZZPDZ-385
Specification Number:	JEBMM0-0505
Firmware Version:	2.4.0.0 ,Size: 371412 bytes, date: 20110223
Serial Number:	Not marked or stated
FCC ID:	TTULBWA1ZZPD
IC Certification Number:	3775B-LBWA1ZZPD

Brand Name:	Bang & Olufsen
Model Name or Number:	Beo Play V1-32 32" TV containing a Murata LBWA1ZZPDZ- 385 module
Serial Number:	22582545

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 normally incorporated into a 32" television. The EUT has three external antenna ports, two transmit chains and three receive chains, MIMO is supported. For 802.11n operation the device uses MIMO (2 transmitters and 3 receivers). Depending on the 802.11 MCS, the device transmits 1 or 2 spatial stream. The device uses spatial multiplexing and from an RF point of view the streams are uncorrelated.

The Customer supplied a Video Engine which contains the WLAN Module and is part of the television. The Video Engine contained input and output ports (serial, Ethernet, HDMI, USB and RF ports). The Video Engine was powered from 5 V and 12 VDC supplies. The Video Engine allowed conducted measurements to be performed.

The EUT supports DFS as a Client without Radar Detection.

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		
Type of Unit:	Transceiver		
Modulation:	CCK, BPSK, QPSK, 16QAM, 64QAM		
Data rates:	802.11a	6, 9, 12, 18, 24, 3	6 ,48 & 54 Mbps
	802.11n	6.5, 13, 19.5, 26, 78, 104, 117 & 13	39, 52, 58.5, 65, 30 Mbps
TV Power Supply Requirement(s):	Nominal	120 VAC 60 Hz	
Channel Spacing:	20 MHz		
Transmit & Receive Frequency Band:	5150 MHz to 5250 MHz		
Transmit & Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	36	5180
	Middle	40	5200
	Тор	48	5240
Transmit & Receive Frequency Band:	5250 MHz to 5350 MHz		
Transmit & Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	52	5260
	Middle	56	5280
	Тор	64	5320
Transmit & Receive Frequency Band:	5470 MHz to 5725 MHz		
Transmit & Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	100	5500
	Middle	116	5580
	Тор	140	5700
Transmit & Receive Frequency Band:	5725 MHz to 5825 MHz		-
Transmit & Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	149	5745
	Middle	153	5765
	Тор	161	5805

Additional Information Related to Testing (continued)

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

3.5. Support Equipment

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

Description:	Lanton
Brend Name	
Brand Name:	
Model Name or Number:	D610
Serial Number:	RFI Asset No. PC343NT
Description:	External Antenna
Brand Name:	Тусо
Model Name or Number:	1513711-1
Serial Number:	Not marked or stated
Description:	Serial to Ethernet cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated
Description:	Ethernet cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated
Description:	HDMI Cables / 2 metres length

Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	HDMI Player
Brand Name:	Sumvision
Model Name or Number:	Cyclone
Serial Number:	SUM0911

Description:	USB Stick
Brand Name:	Integral
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Support Equipment (continued)

Description:	Digital Terrestrial Receiver
Brand Name:	Samsung
Model Name or Number:	DTB-B260V
Serial Number:	6RDLCOO101E

Description:	Wireless N router
Brand Name:	Cisco
Model Name or Number:	Linkseys E4200
Serial Number:	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):

- Receiver/Idle mode. The 802.11 mode was active but not transmitting.
- Continuously transmitting with a modulated carrier at maximum power on the bottom, middle and top channels as required using the supported data rates/modulation types.

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 using Hyperterminal PC application. The application was used to enable continuous transmit mode or receive mode and to select the test channels, data rates and modulation schemes as required. The Customer supplied instructions on how to configure the EUT for test purposes.
- RF conducted measurements were performed with the EUT fitted to the Video Engine and tests
 made with the measurement equipment connected to antenna ports (Port 0 & Port 1). Short internal
 RF cables were fitted between the Video Engine and the SMA antenna ports. The Customer
 declared the antenna gain was 1.0 dBi in the 5 GHz bands. This figure is the antenna manufacturer's
 stated antenna gain less the loss of the internal RF cables. DC voltage to the Video Engine (5.0 VDC
 and 12.0 VDC) was supplied by two bench power supplies. Voltage was monitored using two
 calibrated voltmeters.
- The EUT has three RF ports, two transmit/receive RF ports (labelled as Port 0 and Port 1) and an
 additional receive RF port (labelled as Port 2). Conducted measurements were performed on Port 0
 and Port 1. RF cables and attenuators connecting the test equipment to the EUT ports were
 calibrated before use and the calibration data incorporated into the conducted measurement results.
- AC conducted emissions tests were performed with the television powered from a 120 VAC 60 Hz single phase mains supply via a LISN.
- Radiated measurements and AC conducted measurements were made with the EUT fitted to the 32" television. A Tyco Electronics TE Connectivity 1513711-1 antenna (supporting MIMO) was connected to the 3-way antenna port. The antenna was placed on the highest point of the television using a temporary bracket. The following accessories were representative of typical accessories that are normally used in conjunction with the television incorporating the EUT: HDMI player, USB memory stick, Digital Terrestrial Receiver and Wireless N Router. These were connected using suitable cables in order to terminate all ports during radiated testing. The television was powered from a 120 VAC 60 Hz single phase mains supply.
- For transmitter radiated spurious emissions tests, the TV was configured to be transmitting on both
 ports which were then connected to the Tyco antenna. The EUT was transmitting with a data rate of
 13 Mbps / MCS8 with a channel bandwidth of 20 MHz. Initial measurements were carried out on one
 channel and this was found to have the highest power level and therefore deemed to be worst case.
 Pre-scans were performed on the top channel and if any emissions seen, final measurements were
 carried out on bottom, middle and top channels.
- Photographs of the test setup using the Video Engine can be found in Appendix 2.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

5.2. Test Results

5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	07 March 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Part 15.107(a)
Industry Canada Reference:	RSS-Gen 7.2.4
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	29

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.240	Live	58.3	62.1	3.8	Complied
0.438	Live	45.6	57.1	11.5	Complied
0.479	Live	48.8	56.4	7.6	Complied
0.933	Live	44.1	56.0	11.9	Complied
0.965	Live	47.8	56.0	8.2	Complied
1.163	Live	44.1	56.0	11.9	Complied
2.382	Live	45.8	56.0	10.2	Complied
2.652	Live	45.9	56.0	10.1	Complied
2.868	Live	51.5	56.0	4.5	Complied
14.361	Live	30.9	60.0	29.1	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.240	Live	51.9	52.1	0.2	Complied
0.479	Live	41.7	46.4	4.7	Complied
0.888	Live	29.3	46.0	16.7	Complied
0.956	Live	39.3	46.0	6.7	Complied
2.621	Live	36.9	46.0	9.1	Complied
2.864	Live	40.5	46.0	5.5	Complied
2.985	Live	38.2	46.0	7.8	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.164	Neutral	52.3	65.3	13.0	Complied
0.479	Neutral	47.0	56.4	9.4	Complied
0.965	Neutral	48.1	56.0	7.9	Complied
1.190	Neutral	45.4	56.0	10.6	Complied
1.428	Neutral	46.1	56.0	9.9	Complied
1.671	Neutral	45.0	56.0	11.0	Complied
2.382	Neutral	46.0	56.0	10.0	Complied
2.630	Neutral	47.6	56.0	8.4	Complied
2.864	Neutral	53.3	56.0	2.7	Complied
3.098	Neutral	45.4	56.0	10.6	Complied

Results: Neutral / Quasi Peak

Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.240	Neutral	47.5	52.1	4.6	Complied
0.294	Neutral	47.3	50.4	3.1	Complied
0.479	Neutral	39.1	46.4	7.3	Complied
0.717	Neutral	36.6	46.0	9.4	Complied
0.956	Neutral	39.6	46.0	6.4	Complied
2.625	Neutral	35.4	46.0	10.6	Complied
2.864	Neutral	40.6	46.0	5.4	Complied
2.985	Neutral	40.1	46.0	5.9	Complied
13.479	Neutral	38.1	50.0	11.9	Complied



Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

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

5.2.2. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	17 February 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Part 15.109
Industry Canada Reference:	RSS-Gen 4.10
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	23

Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
34.306	Vertical	29.1	40.0	10.9	Complied
42.782	Vertical	26.6	40.0	13.4	Complied
60.046	Vertical	6.5	40.0	33.5	Complied
66.759	Vertical	13.2	40.0	26.8	Complied
70.789	Vertical	12.9	40.0	27.1	Complied
96.040	Vertical	15.3	43.5	28.2	Complied
132.041	Vertical	12.5	43.5	31.0	Complied
199.990	Horizontal	31.5	43.5	12.0	Complied
375.005	Vertical	29.7	46.0	16.3	Complied
550.001	Horizontal	37.1	46.0	8.9	Complied
770.008	Horizontal	39.7	46.0	6.3	Complied
936.080	Vertical	22.8	46.0	23.2	Complied

Note(s):

- 1. The final measured value, for the given emission, in the table above incorporates the calibrated antenna factor and cable loss.
- 2. 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. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.



Receiver/Idle Mode Radiated Spurious Emissions (continued)

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

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineers:	Andrew Edwards & Nick Steele	Test Dates:	14 February 2012 & 15 February 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Part 15.109
Industry Canada Reference:	RSS-Gen 4.10
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range:	1 GHz to 30 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	21

Results:

Frequency	Antenna	Peak Level	Average Limit	Margin	Result
(MHz)	Polarity	(dBμV/m)	(dBμV/m)	(dB)	
26244.489	Vertical	50.0	54.0	4.0	Complied

Note(s):

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

VERSION 3.0

1 MHz 3 MHz 7.5 ms Ref Lvl 80 dByV RBW RF Att 0 dB 46.54 dByV 3.86773547 GHz VBW SWT Unit dbyv ▼1 [T1] 46.54 dBW D1 54 BNV. n. VIEW where nhu Start 1 GHz 300 MHz/ Stop 4 GHz Sitle: 84552 Comment A: RADIATED SPURIOUS EMISSIONS STANDBY/IDLE MODE Date: 14.FEB.2012 14:29:43

<u> </u>	Marker 1 [T1]		RBW	1	MHz	RF Att	0 dB
Ref Lvl	45.2	9 dbyv	VBW	3	MHz		
80 dByv	6.773547	09 GHz	SWT	11.5	ms	Unit	dBM
10							
70							
0					-		
_D1 54 dByV							
0	1						
Menodelina	manum	menner	CONTRACT AND AND	men	men	unally	mone
0			0	-			
0							
20							
.0					-		
0					_		
.0							
20							
Start 6 GHz		200	MHz/			Sto	op 8 GHz
le: 84552							
ment A: RADIATE	D SPURIOUS EMIS	SIONS S	TANDBY/	IDLE M	ODE		



475 MHz/

Title: 84552 Comment A: RADIATED SPURIOUS EMISSIONS STANDBY/IDLE MODE Nate: 14.FEB.2012 13:56:09

Start 8 GHz

Stop 12.75 GHz

VERSION 3.0

RF Att

0 dB



Receiver/Idle Mode Radiated Spurious Emissions (continued)

RF Att

0 dB

1 MHz

RBW

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



RBW

1 MHz

5.2.3. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	07 March 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Part 15.207
Industry Canada Reference:	RSS-Gen 7.2.4
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	29

Transmitter AC Conducted Spurious Emissions (continued)

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.236	Live	56.9	62.3	5.4	Complied
0.407	Live	46.3	57.7	11.4	Complied
0.456	Live	48.3	56.8	8.5	Complied
0.951	Live	48.2	56.0	7.8	Complied
1.136	Live	44.3	56.0	11.7	Complied
2.337	Live	44.4	56.0	11.6	Complied
2.612	Live	45.7	56.0	10.3	Complied
2.823	Live	50.6	56.0	5.4	Complied
2.990	Live	43.4	56.0	12.6	Complied
3.044	Live	46.8	56.0	9.2	Complied

Results: Live / Quasi Peak

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.236	Live	50.6	52.3	1.7	Complied
0.402	Live	38.0	47.8	9.8	Complied
0.474	Live	39.3	46.4	7.1	Complied
0.708	Live	34.0	46.0	12.0	Complied
0.947	Live	38.3	46.0	7.7	Complied
1.419	Live	33.2	46.0	12.8	Complied
2.823	Live	40.7	46.0	5.3	Complied
2.985	Live	38.3	46.0	7.7	Complied
12.197	Live	40.1	50.0	9.9	Complied
12.809	Live	38.5	50.0	11.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.155	Neutral	53.4	65.8	12.4	Complied
0.609	Neutral	44.3	56.0	11.7	Complied
0.947	Neutral	48.9	56.0	7.1	Complied
1.136	Neutral	43.9	56.0	12.1	Complied
1.410	Neutral	46.0	56.0	10.0	Complied
2.346	Neutral	45.2	56.0	10.8	Complied
2.612	Neutral	47.1	56.0	8.9	Complied
2.828	Neutral	51.3	56.0	4.7	Complied
3.003	Neutral	43.6	56.0	12.4	Complied
3.048	Neutral	46.7	56.0	9.3	Complied

Results: Neutral / Quasi Peak

Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.240	Neutral	47.0	52.1	5.1	Complied
0.290	Neutral	46.0	50.5	4.5	Complied
0.474	Neutral	37.8	46.4	8.6	Complied
0.708	Neutral	35.0	46.0	11.0	Complied
0.947	Neutral	38.7	46.0	7.3	Complied
2.823	Neutral	41.9	46.0	4.1	Complied
2.985	Neutral	41.4	46.0	4.6	Complied
11.954	Neutral	36.7	50.0	13.3	Complied
12.197	Neutral	35.9	50.0	14.1	Complied
12.809	Neutral	34.8	50.0	15.2	Complied



Transmitter AC Conducted Spurious Emissions (continued)

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

5.2.4. Transmitter 26 dB Emission Bandwidth

Test Summary:

Test Engineers:	Andrew Edwards	Test Dates:	17 March 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.403(i)
Industry Canada Reference:	N/A
Test Method Used:	FCC KDB 789033 Section D)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	25

Note(s):

- 1. All bandwidth measurements were performed on Port 0 as both ports were initially checked and Port 0 was found to have the highest RF output power.
- 2. All configurations supported by the EUT were investigated on the middle channel of one of the frequency bands in accordance with KDB 789033 Section D emission bandwidth test procedure. The data rates that produced the widest bandwidth (worst case) have been reported as detailed below:
 - o 802.11n 20 MHz channel 64QAM / MCS15 / 130 Mbps
 - o 802.11n 40 MHz channel 16QAM / MCS12 / 78 Mbps
- 3. Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top channels.
- 4. For the power measurements in this test report, the highest power output level was recorded when the EUT was configured as BPSK / MCS8 / 13 Mbps in both supported channel widths. Emission bandwidth plots in this configuration have been included as 'Reference plots' at the end of this Section and the results used for calculations in Sections 5.2.6, 5.2.7 and 5.2.8.

Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	64QAM	130 / 15	20.441
Middle	5200	64QAM	130 / 15	20.401
Тор	5240	64QAM	130 / 15	20.321

Results: 802.11n / 20 MHz / 5.15-5.25 GHz band



Bottom Channel





Middle Channel

Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	64QAM	130 / 15	20.321
Middle	5280	64QAM	130 / 15	20.321
Тор	5320	64QAM	130 / 15	20.681





Middle Channel



Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	64QAM	130 / 15	20.200
Middle	5580	64QAM	130 / 15	20.321
Тор	5700	64QAM	130 / 15	20.200

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band



Bottom Channel





Middle Channel

Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	64QAM	130 / 15	20.200
Middle	5765	64QAM	130 / 15	20.200
Тор	5805	64QAM	130 / 15	20.321

Results: 802.11n / 20 MHz / 5.725-5.825 GHz band



Bottom Channel





Middle Channel

Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	16QAM	78 / 12	43.287
Тор	5230	16QAM	78 / 12	44.409

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band







Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	16QAM	78 / 12	40.240
Тор	5310	16QAM	78 / 12	40.401





Bottom Channel



Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	16QAM	78 / 12	45.932
Middle	5550	16QAM	78 / 12	46.814
Тор	5670	16QAM	78 / 12	47.615

Results: 802.11n / 40 MHz / 5.47-5.725 GHz band



Bottom Channel





Middle Channel

Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	16QAM	78 / 12	47.134
Тор	5795	16QAM	78 / 12	47.675

Results: 802.11n / 40 MHz / 5.725-5.825 GHz band





VERSION 3.0

Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	13 / 8	20.561
Middle	5200	BPSK	13 / 8	20.521
Тор	5240	BPSK	13 / 8	20.561









Middle Channel
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	13 / 8	20.561
Middle	5280	BPSK	13 / 8	20.681
Тор	5320	BPSK	13 / 8	20.321









Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	13 / 8	20.681
Middle	5580	BPSK	13 / 8	20.681
Тор	5700	BPSK	13 / 8	20.561



Bottom Channel





Middle Channel

VERSION 3.0

Transmitter 26 dB Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	13 / 8	20.681
Middle	5765	BPSK	13 / 8	20.681
Тор	5805	BPSK	13 / 8	20.681



Bottom Channel





Middle Channel

RBW

VBW

SWT

mm

0.04 dB

man

40.64128257 MHz

dB Offs

MMM

17.MAF

13

500 kHz

20 ms

2 MHz

▼1 [T1]

RF Att

Unit

why.

10 dB

04 d

257 M

Span 120 MHz

-21.15 dB 20967936 GH

641:

dBm

Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	BPSK	13 / 8	40.882
Тор	5230	BPSK	13 / 8	40.641







Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.25-5.35 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	BPSK	13 / 8	40.541
Тор	5310	BPSK	13 / 8	40.641







RBW

VBW

SWT

-0.31 dB 40.64128257 MHz

mymm

17.MAF

m

500 kHz

20 ms

2 MHz

▼1 [T1]

man

RF Att

Unit

10 dB

-21.70 dB .28967936 GH

Span 120 MHz

641 57 M

dBm

Top Channel

VERSION 3.0

Transmitter 26dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.47-5.725 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	BPSK	13 / 8	40.401
Middle	5550	BPSK	13 / 8	40.641
Тор	5670	BPSK	13 / 8	40.401



Bottom Channel





Middle Channel

VERSION 3.0

Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.725-5.825 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	BPSK	13 / 8	40.882
Тор	5795	BPSK	13 / 8	40.962





5.2.5. Transmitter 99% Emission Bandwidth

Test Summary:

Test Engineer:	Andrew Edwards	Test Dates:	30 January 2012, 31 January 2012 & 17 March 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	N/A
Industry Canada Reference:	RSS-210 A9.2
Test Method Used:	RSS-Gen 4.6.1 & FCC KDB 789033 D)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	29

Note(s):

- 1. All bandwidth measurements were performed on Port 0 as both ports were initially checked and Port 0 was found to have the highest RF output power.
- All configurations supported by the EUT were investigated on the middle channel of one of the frequency bands in accordance with FCC KDB 789033 D) emission bandwidth test procedure. The data rates that produced the widest bandwidth (worst case) have been reported as detailed below:
 - 802.11a 20 MHz channel bandwidth BPSK / MCS1 / 9 Mbps
 - o 802.11n 20 MHz channel bandwidth BPSK / MCS8 / 13 Mbps
 - 802.11n 40 MHz channel bandwidth 64QAM / MCS15 / 130 Mbps
- 3. Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top channels.
- 4. For the power measurements in this test report, the highest power output level was recorded when the EUT was configured as BPSK / MCS8 / 13 Mbps in both supported channel widths. Emission bandwidth plots for 802.11n / 40 MHz BPSK / MCS8 / 13 Mbps configuration have been included as 'Reference plots' at the end of this Section and the results used for calculations in Sections 5.2.7, 5.2.8, 5.2.9, 5.2.10 and 5.2.11.

Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.15-5.25 GHz band

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5180	BPSK	9 / 1	18.998
Middle	5200	BPSK	9 / 1	19.028
Тор	5240	BPSK	9 / 1	18.878



Bottom Channel





Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5260	BPSK	9 / 1	18.878
Middle	5280	BPSK	9 / 1	18.758
Тор	5320	BPSK	9 / 1	18.998









Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5500	BPSK	9 / 1	18.998
Middle	5580	BPSK	9 / 1	18.758
Тор	5700	BPSK	9 / 1	18.637

Results: 802.11a / 20 MHz / 5.47-5.725 GHz band









Middle Channel

Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5745	BPSK	9 / 1	18.878
Middle	5765	BPSK	9 / 1	18.704
Тор	5805	BPSK	9 / 1	18.878

Results: 802.11a / 20 MHz / 5.725-5.825 GHz band









Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5180	BPSK	13 / 8	19.359
Middle	5200	BPSK	13 / 8	19.719
Тор	5240	BPSK	13 / 8	19.599

Results: 802.11n / 20 MHz / 5.15-5.25 GHz band









Middle Channel

Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5260	BPSK	13 / 8	19.639
Middle	5280	BPSK	13 / 8	19.599
Тор	5320	BPSK	13 / 8	19.599









Middle Channel

Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5500	BPSK	13 / 8	21.042
Middle	5580	BPSK	13 / 8	19.479
Тор	5700	BPSK	13 / 8	19.599

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band









Middle Channel

Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5745	BPSK	13 / 8	19.599
Middle	5765	BPSK	13 / 8	19.359
Тор	5805	BPSK	13 / 8	19.599

Results: 802.11n / 20 MHz / 5.725-5.825 GHz band









Middle Channel

Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5190	64QAM	130 / 15	38.637
Тор	5230	64QAM	130 / 15	38.798

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band





Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5270	64QAM	130 / 15	38.717
Тор	5310	64QAM	130 / 15	38.637

Results: 802.11n / 40 MHz / 5.25-5.35 GHz band



Bottom Channel



Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5510	64QAM	130 / 15	38.958
Middle	5550	64QAM	130 / 15	38.958
Тор	5670	64QAM	130 / 15	38.958

Results: 802.11n / 40 MHz / 5.47-5.725 GHz band









Middle Channel

Transmitter 99 % Emission Bandwidth (continued)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5755	64QAM	130 / 15	38.958
Тор	5795	64QAM	130 / 15	38.878

Results: 802.11n / 40 MHz / 5.725-5.825 GHz band



Bottom Channel



RBW

VBW SWT

500 kHz

2 MHz 20 ms

▼1 [T1]

T1 <u>_1</u>

RF Att

Unit

10 dB

-18.87 dBm .21040080 GHz

0.23 dB 9.03807615 MHz

men

Span 120 MHz

dBm

Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5190	BPSK	13 / 8	38.878
Тор	5230	BPSK	13 / 8	39.038

Delta

0.23 dB 39.03807615 MHz

m.

12 MHz/

Top Channel



Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.25-5.35 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	Bottom 5270		13 / 8	39.198
Тор	5310	BPSK	13 / 8	38.878



Bottom Channel



500 kHz 2 MHz 20 ms RF Att

Unit

10 dB

dBr

RBW

VBW SWT

Delta 1 [T1] -0.06 dB 38.87775551 MHz

VERSION 3.0

Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.47-5.725 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5510	BPSK	13 / 8	38.958
Middle	5550	BPSK	13 / 8	39.198
Тор	5670	BPSK	13 / 8	38.958



Bottom Channel





Middle Channel

RF Att

10 dB

Transmitter 99 % Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.725-5.825 GHz band (Reference plots)

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5755	BPSK	13 / 8	39.198
Тор	5795	BPSK	13 / 8	39.359





RBW

5.2.6. Transmitter Maximum Conducted Output Power

Test Summary:

Test Engineer:	Andrew Edwards	Test Dates:	04 January 2012 & 05 January 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.407(a)(1)
Industry Canada Reference:	N/A
Test Method Used:	FCC KDB 789033 D01 Section C) 4) & FCC KDB 662911 D01

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

Note(s):

- 1. All conducted power tests in all bands were performed using a wideband power meter with associated thermal power head in accordance with FCC KDB 789033 D01 C)4) Method PM.
- 2. The EUT has two RF ports, Port 0 and Port 1. Power from both ports was measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01.
- 3. The EUT was transmitting at 100% duty cycle.
- 4. The EUT antenna has a gain of <6 dBi.
- 5. All supported modes and channel widths were initially investigated on one channel. The mode that produced the highest power i.e. closest to the limit, (BPSK / 13 Mbps / MCS8) was deemed to be worst case. Measurements were then performed in this mode on bottom, middle and top channels on both ports, both channel widths in all operating bands. For all modes/channel widths initially investigated, results are available upon request.
- The Part 15.407(a)(1) limit is the lesser of 50 mW (17.0 dBm) or 4 dBm + 10 log₁₀ B, where B is the previously measured 26 dB emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

20 MHz channel width / Bottom channel = $4 dBm + 10 \log_{10} 20.6 = 17.1 dBm$ 20 MHz channel width / Middle channel = $4 dBm + 10 \log_{10} 20.5 = 17.1 dBm$ 20 MHz channel width / Top channel = $4 dBm + 10 \log_{10} 20.46 = 17.1 dBm$ 40 MHz channel width / Bottom channel = $4 dBm + 10 \log_{10} 40.9 = 20.1 dBm$ 40 MHz channel width / Top channel = $4 dBm + 10 \log_{10} 40.9 = 20.1 dBm$

Therefore the lesser of the two limits is the fixed limit of 50 mW (17 dBm). This was applied to the results.

Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (Continued)

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5180	11.6	9.2	13.6	17.0	3.4	Complied
Middle	5200	12.8	10.7	14.9	17.0	2.1	Complied
Тор	5240	12.2	10.0	14.2	17.0	2.8	Complied

Results: FCC Part 15.407 / 802.11n / 20 MHz

Results: FCC Part 15.407 / 802.11n / 40 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5190	11.5	9.0	13.4	17.0	3.6	Complied
Тор	5230	12.1	10.1	14.2	17.0	2.8	Complied

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)

Test Summary:

Test Engineer:	Andrew Edwards	Test Dates:	04 January 2012 & 05 January 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Part 15.407(a)(2)
Industry Canada Reference:	RSS-Gen 4.8, RSS-210 A9.2(2) & A9.2(3)
Test Method Used:	FCC KDB 789033 D01 Section C) 4) & FCC KDB 662911 D01

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

Note(s):

 The FCC Part 15.407(a)(2) limit is the lesser of 250 mW (24.0 dBm) or 11 dBm + 10 log₁₀ B, where B is the previously measured 26 dB emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

5.25-5.35 GHz band

20 MHz channel width / Bottom channel = $11 dBm + 10 \log_{10} 20.6 = 24.1 dBm$ 20 MHz channel width / Middle channel = $11 dBm + 10 \log_{10} 20.7 = 24.2 dBm$ 20 MHz channel width / Top channel = $11 dBm + 10 \log_{10} 20.3 = 24.1 dBm$ 40 MHz channel width / Bottom channel = $11 dBm + 10 \log_{10} 40.5 = 27.1 dBm$ 40 MHz channel width / Top channel = $11 dBm + 10 \log_{10} 40.6 = 27.1 dBm$

5.47-5.725 GHz band

20 MHz channel width / Bottom channel = $11 dBm + 10 \log_{10} 20.7 = 24.2 dBm$ 20 MHz channel width / Middle channel = $11 dBm + 10 \log_{10} 20.7 = 24.2 dBm$ 20 MHz channel width / Top channel = $11 dBm + 10 \log_{10} 20.6 = 24.1 dBm$ 40 MHz channel width / Bottom channel = $11 dBm + 10 \log_{10} 40.4 = 27.1 dBm$ 40 MHz channel width / Middle channel = $11 dBm + 10 \log_{10} 40.6 = 27.1 dBm$ 40 MHz channel width / Top channel = $11 dBm + 10 \log_{10} 40.4 = 27.1 dBm$

The lesser of the two limits is the fixed limit of 250 mW (24.0 dBm). This was applied to the FCC Part 15.407 results.

<u>Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)</u> (continued)

The Industry Canada RSS-210 limit is the lesser of 250 mW (24.0 dBm) or 11 dBm + 10 log₁₀ B, where B is the previously measured 99% emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

5.25-5.35 GHz band

20 MHz channel width / Bottom channel = $11 dBm + 10 \log_{10} 19.6 = 23.9 dBm$ 20 MHz channel width / Middle channel = $11 dBm + 10 \log_{10} 19.6 = 23.9 dBm$ 20 MHz channel width / Top channel = $11 dBm + 10 \log_{10} 19.6 = 23.9 dBm$ 40 MHz channel width / Bottom channel = $11 dBm + 10 \log_{10} 39.2 = 26.9 dBm$ 40 MHz channel width / Top channel = $11 dBm + 10 \log_{10} 38.9 = 26.9 dBm$

5.47-5.725 GHz band

20 MHz channel width / Bottom channel = $11 + 10 \log_{10} 21.0 = 24.2 dBm$ 20 MHz channel width / Middle channel = $11 + 10 \log_{10} 19.5 = 23.9 dBm$ 20 MHz channel width / Top channel = $11 + 10 \log_{10} 19.6 = 23.9 dBm$ 40 MHz channel width / Bottom channel = $11 + 10 \log_{10} 39.0 = 26.9 dBm$ 40 MHz channel width / Middle channel = $11 + 10 \log_{10} 39.2 = 26.9 dBm$ 40 MHz channel width / Top channel = $11 + 10 \log_{10} 39.0 = 26.9 dBm$

The lesser of the two limits was applied to the Industry Canada RSS-210 results.

<u>Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)</u> (continued)

Results: FCC Part 15.407 / 802.11n / 20 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	13.0	11.6	15.4	24.0	8.6	Complied
Middle	5280	12.8	10.8	14.9	24.0	9.1	Complied
Тор	5320	12.2	10.7	14.5	24.0	9.5	Complied

Results: FCC Part 15.407 / 802.11n / 40 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5270	11.9	9.8	14.0	24.0	10.0	Complied
Тор	5310	11.6	9.8	13.8	24.0	10.2	Complied

Results: FCC Part 15.407 / 802.11n / 20 MHz / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	13.0	12.4	15.7	24.0	8.3	Complied
Middle	5550	11.7	11.7	14.7	24.0	9.3	Complied
Тор	5700	11.6	10.5	14.1	24.0	9.9	Complied

Results: FCC Part 15.407 / 802.11n / 40 MHz / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5510	11.6	11.3	14.5	24.0	9.5	Complied
Middle	5550	10.3	10.8	13.6	24.0	10.4	Complied
Тор	5670	11.3	10.7	14.0	24.0	10.0	Complied

<u>Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)</u> (continued)

Results: Industry Canada RSS-210 / 802.11n / 20 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	13.0	11.6	15.4	23.9	8.6	Complied
Middle	5280	12.8	10.8	14.9	23.9	9.1	Complied
Тор	5320	12.2	10.7	14.5	23.9	9.4	Complied

Results: Industry Canada RSS-210 / 802.11n / 40 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5270	11.9	9.8	14.0	24.0	10.0	Complied
Тор	5310	11.6	9.8	13.8	24.0	10.2	Complied

Results: Industry Canada RSS-210 / 802.11 n / 20 MHz / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	13.0	12.4	15.7	24.0	8.3	Complied
Middle	5550	11.7	11.7	14.7	23.9	9.2	Complied
Тор	5700	11.6	10.5	14.1	23.9	9.8	Complied

Results: Industry Canada RSS-210 / 802.11 n / 40 MHz / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5510	11.6	11.3	14.5	24.0	9.5	Complied
Middle	5550	10.3	10.8	13.6	24.0	10.4	Complied
Тор	5670	11.3	10.7	14.0	24.0	10.0	Complied

Transmitter Maximum Conducted Output Power (5.725-5.825 GHz band)

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	05 January 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.407(a)(3)
Industry Canada Reference:	RSS-Gen 4.8 & RSS-210 A9.2(4)
Test Method Used:	FCC KDB 789033 D01 Section C) 4) & FCC KDB 662911 D01

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

Note(s):

 FCC Part 15.407(a)(3) limit is the lesser of 1 W (30.0 dBm) or 17 dBm + 10 log₁₀ B, where B is the previously measured 26 dB emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

5.725-5.825 GHz band

20 MHz channel width / Bottom channel = $17 dBm + 10 \log_{10} 20.7 = 30.2 dBm$ 20 MHz channel width / Middle channel = $17 dBm + 10 \log_{10} 20.7 = 30.2 dBm$ 20 MHz channel width / Top channel = $17 dBm + 10 \log_{10} 20.7 = 30.2 dBm$ 40 MHz channel width / Bottom channel = $17 dBm + 10 \log_{10} 40.9 = 33.1 dBm$ 40 MHz channel width / Top channel = $17 dBm + 10 \log_{10} 41.0 = 33.1 dBm$

The lesser of the two limits is the fixed limit of 1 W (30.0 dBm). This was applied to the FCC Part 15.407 results.

 The Industry Canada RSS-210 limit is the lesser of 1 W (30.0 dBm) or 17 dBm + 10 log₁₀ B, where B is the previously measured 99% emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

5.725-5.825 GHz band

20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 19.6 = 29.9 dBm$ 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 19.4 = 29.9 dBm$ 20 MHz channel width / Top channel = $17 + 10 \log_{10} 19.6 = 29.9 dBm$ 40 MHz channel width / Bottom channel = $17 + 10 \log_{10} 39.2 = 32.9 dBm$ 40 MHz channel width / Top channel = $17 + 10 \log_{10} 39.4 = 33.0 dBm$

The lesser of the two limits was applied to the Industry Canada RSS-210 results.

Transmitter Maximum Conducted Output Power (5.725-5.825 GHz band) (continued)

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	11.3	10.1	13.8	30.0	16.2	Complied
Middle	5765	11.4	10.1	13.8	30.0	16.2	Complied
Тор	5805	10.7	9.6	13.2	30.0	16.8	Complied

Results: FCC Part 15.407 / 802.11 n / 20 MHz

Results: FCC Part 15.407 / 802.11 n / 40 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5755	10.4	9.5	13.0	30.0	17.0	Complied
Тор	5795	10.4	9.2	12.9	30.0	17.1	Complied

Results: Industry Canada RSS-210 / 802.11 n / 20 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	11.3	10.1	13.8	29.9	16.1	Complied
Middle	5765	11.4	10.1	13.8	29.9	16.1	Complied
Тор	5805	10.7	9.6	13.2	29.9	16.7	Complied

Results: Industry Canada RSS-210 / 802.11 n / 40 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5755	10.4	9.5	13.0	30.0	17.0	Complied
Тор	5795	10.4	9.2	12.9	30.0	17.1	Complied

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5.2.7. Transmitter Maximum Equivalent Isotropically Radiated Power

Test Summary:

Test Engineer:	Andrew Edwards	Test Dates:	04 January 2012 & 05 January 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	N/A
Industry Canada Reference:	RSS-210 A9.2(1)
Test Method Used:	FCC KDB 789033 D01 Section C) 4) & FCC KDB 662911 D01

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

Note(s):

- 1. All power tests in all bands were performed using a wideband power meter with associated thermal power head in accordance with FCC KDB 789033 D01 C)4) Method PM.
- 2. The EUT has two RF ports, Port 0 and Port 1. Power from both ports was measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01.
- 3. The EUT was transmitting at 100% duty cycle.
- 4. The Customer declared the antenna gain as 1.0 dBi in the 5 GHz bands. This figure is the antenna manufacturer's stated antenna gain less the loss of the internal RF cables. The antenna gain was added to the combined power of both ports to calculate the EIRP.
- 5. All supported modes and channel widths were initially investigated on one channel. The mode that produced the highest power i.e. closest to the limit (BPSK / 13 Mbps / MCS8) was deemed to be worst case. Measurements were then performed in this mode on bottom, middle and top channels on both ports, both channel widths in all operating bands. For all modes/channel widths initially investigated, results are available upon request.
- The Industry Canada RSS-210 Section A9.2(1) EIRP limit is the lesser of 200 mW (23.0 dBm) or 10 + 10 log₁₀ B, where B is the previously measured 99% emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

20 MHz channel width / Bottom channel = $10 + 10 \log_{10} 19.4 = 22.9 dBm$ 20 MHz channel width / Middle channel = $10 + 10 \log_{10} 19.7 = 22.9 dBm$ 20 MHz channel width / Top channel = $10 + 10 \log_{10} 19.6 = 22.9 dBm$ 40 MHz channel width / Bottom channel = $10 + 10 \log_{10} 38.9 = 25.9 dBm$ 40 MHz channel width / Top channel = $10 + 10 \log_{10} 38.9 = 25.9 dBm$

The lesser of the two limits was applied to the Industry Canada RSS-210 results.

<u>Transmitter Maximum Equivalent Isotropically Radiated Power (5.15-5.25 GHz band)</u> (continued)

Results: Industry Canada RSS-210 / 802.11n / 20 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5180	11.6	9.2	13.6	1.0	14.6	22.9	8.3	Complied
Middle	5200	12.8	10.7	14.9	1.0	15.9	22.9	7.0	Complied
Тор	5240	12.2	10.0	14.2	1.0	15.2	22.9	7.7	Complied

Results: Industry Canada RSS-210 / 802.11n / 40 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5190	11.5	9.0	13.4	1.0	14.4	23.0	8.6	Complied
Тор	5230	12.1	10.1	14.2	1.0	15.2	23.0	7.8	Complied

Transmitter Maximum Equivalent Isotropically Radiated Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)

Test Summary:

Test Engineer:	Andrew Edwards	Test Dates:	04 January 2012 & 05 January 2012
Test Sample Serial No.:	22582545		

FCC Reference:	N/A
Industry Canada Reference:	RSS-210 A9.2(2) & A9.2(3)
Test Method Used:	FCC KDB 789033 D01 Section C) 4) & FCC KDB 662911 D01

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

Note(s):

The Industry Canada RSS-210 A9.2(2) & A9.2(3) EIRP limit is the lesser of 1 W (30.0 dBm) or 17 + 10 log₁₀ B, where B is the previously measured 99% emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

5.25-5.35 GHz band

20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 19.6 = 29.9 dBm$ 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 19.6 = 29.9 dBm$ 20 MHz channel width / Top channel = $17 + 10 \log_{10} 19.6 = 29.9 dBm$ 40 MHz channel width / Bottom channel = $17 + 10 \log_{10} 39.2 = 32.9 dBm$ 40 MHz channel width / Top channel = $17 + 10 \log_{10} 38.9 = 32.9 dBm$

5.47-5.725 GHz band

20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 21.0 = 30.2 dBm$ 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 19.5 = 29.9 dBm$ 20 MHz channel width / Top channel = $17 + 10 \log_{10} 19.6 = 29.9 dBm$ 40 MHz channel width / Bottom channel = $17 + 10 \log_{10} 39.0 = 32.9 dBm$ 40 MHz channel width / Middle channel = $17 + 10 \log_{10} 39.2 = 32.9 dBm$ 40 MHz channel width / Top channel = $17 + 10 \log_{10} 39.0 = 32.9 dBm$

The lesser of the two limits was applied to the Industry Canada RSS-210 results.

2. Maximum calculated EIRP was <500 mW (27 dBm) in both operating bands, therefore there is no requirement to implement TPC.

Transmitter Maximum Equivalent Isotropically Radiated Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: Industry Canada RSS-210 / 802.11n / 20 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	13.0	11.6	15.4	1.0	16.4	29.9	13.5	Complied
Middle	5280	12.8	10.8	14.9	1.0	15.9	29.9	14.0	Complied
Тор	5320	12.2	10.7	14.5	1.0	15.5	29.9	14.4	Complied

Results: Industry Canada RSS-210 / 802.11n / 40 MHz / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5270	11.9	9.8	14.0	1.0	15.0	30.0	15.0	Complied
Тор	5310	11.6	9.8	13.8	1.0	14.8	30.0	15.2	Complied

Results: Industry Canada RSS-210 / 802.11n / 20 MHz / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	13.0	12.4	15.7	1.0	16.7	30.0	13.3	Complied
Middle	5550	11.7	11.7	14.7	1.0	15.7	29.9	14.3	Complied
Тор	5700	11.6	10.5	14.1	1.0	15.1	29.9	14.9	Complied

Results: Industry Canada RSS-210 / 802.11n / 40 MHz / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5510	11.6	11.3	14.5	1.0	15.5	30.0	14.5	Complied
Middle	5550	10.3	10.8	13.6	1.0	14.6	30.0	15.4	Complied
Тор	5670	11.3	10.7	14.0	1.0	15.0	30.0	15.0	Complied
Transmitter Maximum Equivalent Isotropically Radiated Power (5.725-5.825 GHz band)

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	05 January 2012	
Test Sample Serial No:	Not marked or stated			

FCC Reference:	N/A
Industry Canada Reference:	RSS-210 A9.2(4)
Test Method Used:	FCC KDB 789033 D01 Section C) 4) & FCC KDB 662911 D01

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	25

Note(s):

 The Industry Canada RSS-210 A9.2(4) EIRP limit is the lesser of 4 W (36.0 dBm) or 23 + 10 log₁₀ B, where B is the previously measured 99% emission bandwidth in MHz for BPSK / 13 Mbps / MCS8 configuration. The limit for each channel was calculated as below:

5.725-5.825 GHz band

20 MHz channel width / Bottom channel = $23 + 10 \log_{10} 19.6 = 35.9 dBm$ 20 MHz channel width / Middle channel = $23 + 10 \log_{10} 19.4 = 35.9 dBm$ 20 MHz channel width / Top channel = $23 + 10 \log_{10} 19.6 = 35.9 dBm$ 40 MHz channel width / Bottom channel = $23 + 10 \log_{10} 39.2 = 38.9 dBm$ 40 MHz channel width / Top channel = $23 + 10 \log_{10} 39.4 = 39.0 dBm$

The lesser of the two limits was applied to the Industry Canada RSS-210 results.

<u>Transmitter Maximum Equivalent Isotropically Radiated Power (5.725-5.285 GHz band)</u> (continued)

Results: Industry Canada RSS-210 / 802.11 n / 20 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	11.3	10.1	13.8	1.0	14.8	35.9	21.1	Complied
Middle	5765	11.4	10.1	13.8	1.0	14.8	35.9	21.1	Complied
Тор	5805	10.7	9.6	13.2	1.0	14.2	35.9	21.7	Complied

Results: Industry Canada RSS-210 / 802.11 n / 40 MHz

Channel	Frequency (MHz)	Port 0 Power (dBm)	Port 1 Power (dBm)	Combined Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5750	10.4	9.5	13.0	1.0	14.0	36.0	22.0	Complied
Тор	5795	10.4	9.2	12.9	1.0	13.9	36.0	22.1	Complied

ISSUE DATE: 06 JULY 2012

5.2.8. Transmitter Peak Power Spectral Density

Test Summary:

Test Engineers:	Andrew Edwards, Sarah Williams & Mark Percival	Test Dates:	04 February 2012, 13 February 2012 & 14 February 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.407(a)(1)
Industry Canada Reference:	N/A
Test Method Used:	FCC KDB 789033 E) referencing KDB 789033 C)b), Method SA-1

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	26

Note(s):

- 1. Transmitter Peak Power Spectral Density tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 789033 D01 C)b) Method SA-1.
- 2. The EUT has two RF ports, Port 0 and Port 1. PPSD from both ports were measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01.
- 3. The EUT was transmitting at 100% duty cycle.
- 4. The EUT antenna has a gain of <6 dBi.
- 5. All supported modes and channel widths were initially investigated on one channel. The mode that produced the highest PPSD i.e. closest to the limit, for 20 MHz channels (BPSK / 13 Mbps / MCS8) and 40 MHz channels (BPSK / 19.5 Mbps / MCS2) were found to be worst case. Measurements were then performed in these modes on bottom, middle (where applicable) and top channels on both ports, both channel widths in all operating bands. For all modes/channel widths initially investigated, results are available upon request.

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5180	-1.9	-4.4	0.0	4.0	4.0	Complied
Middle	5200	-1.4	-3.4	0.7	4.0	3.3	Complied
Тор	5240	-0.8	-2.5	1.4	4.0	2.6	Complied

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5190	-4.5	-6.7	-2.5	4.0	6.5	Complied
Тор	5230	-4.6	-7.0	-2.6	4.0	6.6	Complied

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11 n / 20 MHz / 13 Mbps / MCS8 / Port 0



Bottom Channel



Ref Lvl 20 dBm 1 [T1] 1 MHz At -1.40 dBm 5.20429860 GHz VBW SWT 3 MHz 5 ms Unit dBr 24.7 dB Offs -1.40 dBm .20429860 GHz ₹1 [T1] IVIEN -81 Span 30 MHz Center 5.2 GHz 3 MHz∕ Title: 84552 Comment A: PPSD Date: 04.FEB.2012 11:00:22 **Middle Channel**

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11 n / 20 MHz / 13 Mbps / MCS8 / Port 1



Bottom Channel



Top Channel



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Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 0



VERSION 3.0

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 1



Transmitter EIRP Spectral Density (5.15-5.25 GHz band)

Test Summary:

Test Engineers:	Andrew Edwards, Sarah Williams & Mark Percival	Test Dates:	04 February 2012, 13 February 2012 & 14 February 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	N/A
Industry Canada Reference:	RSS-210 A9.2(1)
Test Method Used:	FCC KDB 789033 E) referencing KDB 789033 C)b), Method SA-1

Environmental Conditions:

Temperature (°C):	20 to 22
Relative Humidity (%):	26 to 32

Note(s):

- 1. EIRP Spectral Density tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 789033 D01 C)b) Method SA-1.
- 2. The EUT has two RF ports, Port 0 and Port 1. PPSD from both ports were measured and combined using the measure-and-sum method stated in FCC KDB 662911 D01.
- 3. The EUT was transmitting at 100% duty cycle.
- 4. The Customer declared the antenna gain as 1.0 dBi. The antenna gain was added to the combined power of both ports to calculate the EIRP.
- 5. The EUT antenna has a gain of <6 dBi.
- 6. All supported modes and channel widths were initially investigated on one channel. The mode that produced the highest PPSD i.e. closest to the limit, for 20 MHz channels (BPSK / 13 Mbps / MCS8) and 40 MHz channels (BPSK / 19.5 Mbps / MCS2) were found to be worst case. Measurements were then performed in these modes on bottom, middle (where applicable) and top channels on both ports, both channel widths in all operating bands. For all modes/channel widths initially investigated, results are available upon request.

Transmitter EIRP Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8

Channel	Frequency (MHz)	Port 0 PPSD dBm/MHz	Port 1 PPSD dBm/MHz	Combined PPSD dBm/MHz	Antenna Gain (dBi)	EIRP PPSD dBm/MHz	Limit (dBm)	Margin (dB)	Result
Bottom	5180	-1.9	-4.4	0.0	1.0	1.0	10.0	9.0	Complied
Middle	5200	-1.4	-3.4	0.7	1.0	1.7	10.0	8.3	Complied
Тор	5240	-0.8	-2.5	1.4	1.0	2.4	10.0	7.6	Complied

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2

Channel	Frequency (MHz)	Port 0 PPSD dBm/MHz	Port 1 PPSD dBm/MHz	Combined PPSD dBm/MHz	Antenna Gain (dBi)	EIRP PPSD dBm/MHz	Limit (dBm)	Margin (dB)	Result
Bottom	5190	-4.5	-6.7	-2.5	1.0	-1.5	10.0	11.5	Complied
Тор	5230	-4.6	-7.0	-2.6	1.0	-1.6	10.0	11.6	Complied

Transmitter EIRP Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 0



Bottom Channel





Middle Channel

ISSUE DATE: 06 JULY 2012

Transmitter EIRP Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 1



Bottom Channel





Middle Channel

Transmitter EIRP Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 0



ISSUE DATE: 06 JULY 2012

Transmitter EIRP Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 1



Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)

Test Summary:

Test Engineers:	Andrew Edwards, Sarah Williams & Mark Percival	Test Dates:	04 February 2012 & 14 February 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.407(a)(2)
Industry Canada Reference:	RSS-210 A9.2(2) & A 9.2(3)
Test Method Used:	FCC KDB 789033 E) referencing KDB 789033 C)b), Method SA-1

Environmental Conditions:

Temperature (°C):	20 to 22
Relative Humidity (%):	26 to 32

Note(s):

1. FCC Part 15.407(a)(2) and Industry Canada RSS-210 A9.2(2) & A 9.2(3) limits for PPSD in the 5.25-5.35 GHz and 5.47-5.725 GHz operating bands is <11 dBm/MHz.

<u>Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)</u> (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	1.1	-0.5	3.4	11.0	7.6	Complied
Middle	5280	0.5	-1.1	2.8	11.0	8.2	Complied
Тор	5320	0.6	-1.0	2.9	11.0	8.1	Complied

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / 5.25-5.35 GHz band

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5270	-2.6	-4.1	-0.3	11.0	11.3	Complied
Тор	5310	-3.0	-4.4	-0.6	11.0	11.6	Complied

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 0 / 5.25-5.35 GHz band





Top Channel



Middle Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

1 MHz 3 MHz 5 ms r 1 [T1] -0.48 dBm 5.26423848 GHz RBL Ref Lvi 20 dBm VBM SMT Unit dBm 24.5 dB Offs -10 **IVIEW** -20 -80 Center 5.26 GHz 3 MHz∕ Span 30 MHz Title: 84552 Comment A: PPSD Date: 04.FEB.2012 12:19:31 **Bottom Channel**





<u>Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)</u> (continued)



Results: 802.11n / 40 MHz / MCS2 / Port 0 / 5.25-5.35 GHz band

VERSION 3.0

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)





Bottom Channel

<u>Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)</u> (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / 5.47-5.725 GHz band

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-0.5	-0.1	2.7	11.0	8.3	Complied
Middle	5580	0.3	0.6	3.5	11.0	7.5	Complied
Тор	5700	-1.0	-1.6	1.7	11.0	9.3	Complied

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / 5.47-5.725 GHz band

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5510	-2.7	-3.2	0.1	11.0	10.9	Complied
Middle	5550	-3.1	-2.8	0.1	11.0	10.9	Complied
Тор	5670	-2.7	-3.8	-0.2	11.0	11.2	Complied

VERSION 3.0

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 0 / 5.47-5.725 GHz band



Bottom Channel





Middle Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 1 / 5.47-5.725 GHz band









Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)



Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 0 / 5.47-5.725 GHz band







Middle Channel

VERSION 3.0

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2/ Port 1 / 5.47-5.725 GHz band



Bottom Channel







Middle Channel

Transmitter Peak Power Spectral Density (5.725-5.825 GHz band)

Test Summary:

Test Engineers:	Sarah Williams, Mark Percival & Andrew Edwards	Test Dates:	06 February 2012 & 14 February 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.407(a)(3)
Industry Canada Reference:	RSS-210 A9.2(4)
Test Method Used:	FCC KDB 789033 E) referencing KDB 789033 C)b), Method SA-1

Environmental Conditions:

Temperature (°C):	22 to 24
Relative Humidity (%):	20 to 26

Note(s):

1. FCC Part 15.407(a)(3) and Industry Canada RSS-210 A9.2(4) limits for PPSD in the 5.725-5.825 GHz operating band is ≤17 dBm/MHz.

Transmitter Peak Power Spectral Density (5.725-5.825 GHz band) (continued)

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 1 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-0.6	-1.4	2.0	17.0	15.0	Complied
Middle	5765	-0.3	-1.2	2.3	17.0	14.7	Complied
Тор	5805	-1.2	-2.7	1.1	17.0	15.9	Complied

Results: 802.11n / 20 MHz / 13 Mbps / MCS8

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2

Channel	Frequency (MHz)	PPSD Port 0 (dBm /MHz)	PPSD Port 0 (dBm /MHz)	Combined PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5755	-3.7	-5.0	-1.3	17.0	18.3	Complied
Тор	5795	-3.7	-5.2	-1.4	17.0	18.4	Complied

Transmitter Peak Power Spectral Density (5.725-5.825 GHz band) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 0



Bottom Channel





Middle Channel

VERSION 3.0

Transmitter Peak Power Spectral Density (5.725-5.825 GHz band) (continued)

Results: 802.11n / 20 MHz / 13 Mbps / MCS8 / Port 1



Bottom Channel



Top Channel



Middle Channel

Transmitter Peak Power Spectral Density (5.725-5.825 GHz band) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 0



VERSION 3.0

Transmitter Peak Power Spectral Density (5.725-5.825 GHz band) (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 1



5.2.9. Transmitter Peak Excursion

Test Summary:

Test Engineers:	Sarah Williams & Mark Percival	Test Dates:	07 February 2012, 08 February 2012 & 14 February 2012
Test Sample Serial No.:	Not marked or stated		

FCC Reference:	Part 15.407(a)(6)
Industry Canada Reference:	N/A
Test Method Used:	FCC KDB 789033 F)

Environmental Conditions:

Temperature (°C):	22 to 24
Relative Humidity (%):	21 to 26

Note(s):

- 1. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest peak excursion i.e. closest to the limit, for 20 MHz channels (64QAM / 65 Mbps / MCS7) and 40 MHz channels (QPSK / 19.5 Mbps / MCS2) were found to be worst case. Measurements were then performed in these modes on both ports, both channel widths in all operating bands. Results are shown for middle channels when using a 20 MHz channel bandwidth. Results are shown for the middle channels in all other bands when using a 40 MHz channel bandwidth. Results are shown for the top channels in all other bands when using a 40 MHz channel bandwidth as centre channels are not supported. For all modes/channel widths initially investigated, results are available upon request.
- The peak measurement (first trace) was performed in accordance with FCC KDB 789033 F) using a peak detector. The second measurement (trace 2) was performed in accordance with FCC KDB 789033 E) and FCC KDB 789033 C)3)b) Method SA-1 using an RMS detector. A marker was placed at the peak of the first trace and a limit line placed at this level. A second limit line was placed at the peak of the second trace. The peak excursion is the delta between the two limit lines.
- 3. The EUT has two RF ports, Port 0 and Port 1. Peak excursion on both ports was measured. The highest peak excursion from either port was compared to the limit in order to obtain the margin.
- 4. The EUT was transmitting at 100% duty cycle.

ISSUE DATE: 06 JULY 2012

Transmitter Peak Excursion (continued)

Results: 802.11n / 20 MHz / 65 Mbps / MCS7

Band (GHz)	Middle Frequency (MHz)	Peak Excursion Port 0 (dB)	Peak Excursion Port 1 (dB)	Limit (dB)	Lowest Margin (dB)	Result
5.15-5.25	5200	10.5	10.1	13.0	2.5	Complied
5.25-5.35	5280	10.0	10.0	13.0	3.0	Complied
5.47-5.725	5580	10.1	9.8	13.0	2.9	Complied
5.725-5.825	5765	9.9	10.3	13.0	2.7	Complied

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2

Band (GHz)	Frequency (MHz)	Peak Excursion Port 0 (dB)	Peak Excursion Port 1 (dB)	Limit (dB)	Lowest Margin (dB)	Result
5.15-5.25	5230	10.2	10.2	13.0	2.9	Complied
5.25-5.35	5310	10.1	10.3	13.0	2.7	Complied
5.47-5.725	5550	10.2	10.8	13.0	2.2	Complied
5.725-5.825	5795	10.5	10.1	13.0	2.5	Complied



Transmitter Peak Excursion (continued)





Middle Channel / 5.47-5.725 GHz band





Middle Channel / 5.725-5.825 GHz band

Transmitter Peak Excursion (continued)

Results: 802.11n / 20 MHz / 65 Mbps / MCS7 / Port 1



Middle Channel / 5.15-5.25 GHz band



Middle Channel / 5.47-5.725 GHz band





Middle Channel / 5.725-5.825 GHz band

Transmitter Peak Excursion (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps / MCS2 / Port 0







Middle Channel / 5.47-5.725 GHz band





Top Channel / 5.725-5.825 GHz band
Transmitter Peak Excursion (continued)

Results: 802.11n / 40 MHz / 19.5 Mbps/ MCS2 / Port 1



Top Channel / 5.15-5.25 GHz band



Middle Channel / 5.47-5.725 GHz band





Top Channel / 5.725-5.825 GHz band

5.2.10. Transmitter Out of Band Radiated Emissions

Test Summary:

Test Engineer:	Nick Steele	Test Date:	09 March 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(1),(6),(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 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	25

- Pre-scans with the EUT transmitting on the top channel were measured according to FCC Part 15.407(b)(1). This states that for transmitters operating in the band 5.15 to 5.25 GHz: all emissions outside of the 5.15-5.35 GHz band will not exceed an EIRP of -27 dBm/MHz. Part15.407(b)(6) states unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Part15.407(b)(7) states the provisions of 15.205 apply, eg restricted bands of operation.
- 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. As the measurement was performed with a quasi-peak detector the results were converted from dBµV/m to EIRP (dBm) using the calculation as detailed in ANSI C63.10 Section 7.10.3.8.
- 3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
- 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.
- 5. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
- 6. 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.

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
75.003	Vertical	27.0	40.0	13.0	Complied
249.991	Horizontal	38.6	46.0	7.4	Complied
399.988	Vertical	36.1	46.0	9.9	Complied

Results: Top Channel / Field Strength

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
75.003	Vertical	-68.2	-27.0	41.2	Complied
249.991	Horizontal	-56.6	-27.0	29.6	Complied
399.988	Vertical	-59.1	-27.0	32.1	Complied



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

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	15 February 2012 & 12 March 2012
Test Sample Serial No.:	22582545		

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):	23
Relative Humidity (%):	21

- 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.
- 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.
- 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. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
- 5. 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.

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4144.062	Vertical	-47.3	-27.0	20.3	Complied
15542.926	Horizontal	-43.7	-27.0	16.7	Complied

Results: Bottom Channel / EIRP

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4144.062	Vertical	51.8	74.0	22.2	Complied
15542.926	Horizontal	51.5	74.0	22.5	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4144.062	Vertical	47.3	54.0	6.7	Complied
15542.926	Horizontal	32.2	54.0	21.8	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4159.944	Vertical	-46.9	-27.0	19.9	Complied
15603.093	Horizontal	-41.0	-27.0	14.0	Complied

Results: Middle Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4159.944	Vertical	51.6	74.0	22.4	Complied
15603.093	Horizontal	54.2	74.0	19.8	Complied

Results: Middle Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4159.982	Vertical	47.0	54.0	7.0	Complied
15598.471	Horizontal	30.9	54.0	23.1	Complied

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4191.931	Vertical	-46.8	-27.0	19.8	Complied
15723.263	Horizontal	-42.4	-27.0	15.2	Complied

Results: Top Channel / EIRP

Results: Top Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4191.931	Vertical	52.2	74.0	21.8	Complied
15723.263	Horizontal	52.8	74.0	21.2	Complied

Results: Top Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4191.985	Vertical	48.3	54.0	5.7	Complied
15723.263	Horizontal	31.5	54.0	22.5	Complied

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

Test Summary:

Test Engineer:	Nick Steele	Test Date:	09 March 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(2),(6),(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 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	25

- Pre-scans with the EUT transmitting on the top channel were measured according to FCC Part 15.407(b)(2). This states 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. Emissions below 1 GHz must comply with the general field strength limits set forth in FCC part 15.209.
- Industry Canada RSS-210 A9.2(2) states emissions outside the band 5150 to 5250 MHz shall not exceed -27 dBm/MHz e.i.r.p. As the measurement was performed with a quasi-peak detector the results were converted from dBµV/m to EIRP (dBm) using the calculation as detailed in ANSI C63.10 Section 7.10.3.8.
- 3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
- 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.
- 5. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
- 6. 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.

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

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
74.993187	Vertical	28.5	40.0	11.6	Complied
250.000802	Horizontal	39.4	46.0	6.6	Complied
399.997595	Vertical	35.9	46.0	10.1	Complied

Results: Top Channel / Field Strength

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
74.993187	Vertical	-66.7	-27.0	39.7	Complied
250.000802	Horizontal	-55.8	-27.0	28.8	Complied
399.997595	Vertical	-59.3	-27.0	32.3	Complied



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

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	15 February 2012 & 12 March 2012
Test Sample Serial No.:	22582545		

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):	23
Relative Humidity (%):	21

- 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.
- 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 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 table above incorporates the calibrated antenna factor and cable loss.
- 5. 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.

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4208.041	Vertical	-46.6	-27.0	19.6	Complied
15783.101	Horizontal	-41.3	-27.0	14.3	Complied

Results: Bottom Channel / EIRP

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4208.041	Vertical	52.8	74.0	21.2	Complied
15783.101	Horizontal	53.9	74.0	20.1	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4208.041	Vertical	48.7	54.0	5.3	Complied
15783.101	Horizontal	34.2	54.0	19.8	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4223.917	Vertical	-46.5	-27.0	19.5	Complied
15842.939	Horizontal	-44.5	-27.0	17.5	Complied

Results: Middle Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4223.917	Vertical	53.0	74.0	21.0	Complied
15842.939	Horizontal	50.7	74.0	23.3	Complied

Results: Middle Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4223.917	Vertical	48.8	54.0	5.2	Complied
15842.939	Horizontal	32.3	54.0	21.7	Complied

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4256.076	Vertical	-47.2	-27.0	20.2	Complied
15963.233	Horizontal	-45.2	-27.0	18.2	Complied

Results: Top Channel / EIRP

Results: Top Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4256.076	Vertical	52.3	74.0	21.7	Complied
15963.233	Horizontal	50.0	74.0	24.0	Complied

Results: Top Channel / Field strength

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4256.093	Vertical	47.8	54.0	6.2	Complied
15963.233	Horizontal	28.8	54.0	25.2	Complied

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

Test Summary:

Test Engineer:	Nick Steele	Test Date:	07 March 2012
Test Sample Serial No.:	22582545		

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):	26
Relative Humidity (%):	28

- Pre-scans with the EUT transmitting on the top channel were measured according to FCC Part 15.407(b)(3) which states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band shall not exceed -27 dBm/MHz. Part(b)(6) states unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Part(b)(7) states the provisions of 15.205 apply, eg restricted bands of operation.
- Industry Canada RSS-210 A9.2(3) states emissions outside the band 5470 to 5725 MHz shall not exceed -27 dBm/MHz EIRP. As the measurement was performed with a quasi-peak detector the results were converted from dBµV/m to EIRP (dBm) using the calculation as detailed in ANSI C63.10 Section 7.10.3.8.
- 3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
- 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.
- 5. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
- 6. 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.

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

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
75.003	Vertical	34.8	40.0	5.2	Complied
250.010	Horizontal	45.5	46.0	0.5	Complied
400.007	Vertical	38.8	46.0	7.2	Complied

Results: Top Channel / Field Strength

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
75.003	Vertical	-60.4	-27.0	33.4	Complied
250.010	Horizontal	-49.7	-27.0	22.7	Complied
400.007	Vertical	-56.4	-27.0	29.4	Complied



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

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	15 February 2012 & 12 March 2012
Test Sample Serial No.:	22582545		

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):	23
Relative Humidity (%):	21

- 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.
- 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. No emissions were observed above the noise floor of the measurements system.
- 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.

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4399.995	Vertical	-45.6	-27.0	18.6	Complied
11001.025	Horizontal	-50.1	-27.0	23.1	Complied

Results: Bottom Channel / EIRP

Results: Bottom Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4399.995	Vertical	53.3	74.0	20.7	Complied
11001.025	Horizontal	45.1	74.0	28.9	Complied

Results: Bottom Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4399.937	Vertical	50.0	54.0	4.0	Complied
11001.025	Horizontal	29.5	54.0	24.5	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4464.095	Vertical	-45.2	-27.0	18.2	Complied
11161.064	Horizontal	-50.9	-27.0	23.9	Complied

Results: Middle Channel / Field strength / Peak

Frequency	Antenna	Level	Limit	Margin	Result
(MHz)	Polarity	(dBµV/m)	(dBµV/m)	(dB)	
11161.064	Horizontal	44.3	74.0	29.7	Complied

Results: Middle Channel / Field strength / Average

Frequency	Antenna	Level	Limit	Margin	Result
(MHz)	Polarity	(dBµV/m)	(dBµV/m)	(dB)	
11161.064	Horizontal	28.4	54.0	25.6	Complied

Results: Top Channel / EIRP						
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result	
4559.959	Vertical	-42.6	-27.0	15.6	Complied	
11398.297	Horizontal	-51.5	-27.0	24.5	Complied	

Results: Top Channel / Field strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4559.959	Vertical	55.8	74.0	18.2	Complied
11398.297	Horizontal	41.2	74.0	32.8	Complied

Results: Top Channel / Field strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4559.959	Vertical	52.2	54.0	1.8	Complied
11398.297	Horizontal	27.9	54.0	26.1	Complied











Restricted Band 5.35 GHz to 5.46 GHz

Ref Lvl -10 dBm [T1 RBW 1 MHz RF Att 0 dB Ref Lvl -10 dBm ker 1 [T1] RBW 1 MHz RF Att dB -51.71 dBm 11.39829659 GHz -49.33 dBm 6.72144289 GHz VBW 3 MHz SWT 11.5 ms VBW SWT 3 MHz 27 ms Unit dBm Unit dBm Ð1 мах when 4.4 un -110 -110 Start 6 GHz 200 MHz/ Stop 8 GHz Start 8 GHz 475 MHz/ Stop 12.75 GHz Fitle: 84552 Comment A: RADIATED SPURIOUS EMISSIONS TX MODE TOP CHANNEL Date: 15.FEB.2012 19:31:00 Title: 84552 Comment A: RADIATED SPURIOUS EMISSIONS TX MODE TOP CHANNEL Date: 15.FEB.2012 20:01:42 1 [T1] RBW -44.99 dBm VBW RBW VBW 1 MHz 1 MHz er 1 [T1] -51.09 dBm 17.09519038 GHz RF Att 0 dB RF Att 0 dB 1 MU₂ Ref Lvl Ref Lvl 3 MHz SWT 30 ms Unit dBm 26.41482966 GHz 49 ms Unit dBm -10 dBm -10 dBm SWT ▼1 [T1] -51.09 dBm 17.09519038 GHz А [T1] -50.15 dE 17.60020040 GH мах MAX weenhymen menninger VL. montelano

-110

Start 18 GHz

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





850 MHz/

Fitle: 84552 Comment A: RADIATED SPURIOUS EMISSIONS TX MODE TOP CHANNEL Date: 15.FEB.2012 21:22:44

Stop 26.5 GHz



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)

Test Summary:

Test Engineer:	Nick Steele	Test Date:	09 March 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(4),(6),(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 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	25

- 1. Measurements below 1 GHz were performed in accordance with FCC KDB 789033 G). Part 15.407 (b)(7) states the provisions of Part 15.205 also apply.
- Industry Canada RSS-210 A9.2(4) states emissions outside the band 5725 to 5825 MHz and more than 10 MHz above or below the band edges shall not exceed -27 dBm/MHz e.i.r.p. As the measurement was performed with a quasi-peak detector the results were converted from dBµV/m to EIRP (dBm) using the calculation as detailed in ANSI C63.10 Section 7.10.3.8.
- 3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
- 4. 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.
- 5. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
- 6. 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.

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

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
75.003	Vertical	34.8	40.0	5.2	Complied
250.010	Horizontal	45.5	46.0	0.5	Complied
400.007	Vertical	38.8	46.0	7.2	Complied

Results: Top Channel / Field Strength

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
75.003	Vertical	-60.4	-27.0	33.4	Complied
250.010	Horizontal	-49.7	-27.0	22.7	Complied
400.007	Vertical	-56.4	-27.0	29.4	Complied



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

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	15 February 2012 & 12 March 2012
Test Sample Serial No.:	22582545		

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):	23
Relative Humidity (%):	21

- 1. FCC Part 15.407(b)(4) states for transmitters operating in the band 5.725 to 5.825 GHz: 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 Part 15.205 apply.
- 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 e.i.r.p. For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed -27 dBm/MHz EIRP.
- Pre-scans were performed on the 5.47-5.725 GHz band as the EUT produced the highest conducted output power in this band. 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. 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.

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4595.942	Vertical	-41.7	-27.0	14.7	Complied
11496.015	Horizontal	-49.0	-27.0	22.0	Complied

Results: Bottom Channel / EIRP

Results: Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4595.942	Vertical	56.4	74.0	17.6	Complied
11496.015	Horizontal	46.2	74.0	27.8	Complied

Results: Bottom Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4595.942	Vertical	52.9	54.0	1.1	Complied
11496.015	Horizontal	32.2	54.0	21.8	Complied

Results: Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4611.994	Vertical	-41.5	-27.0	14.5	Complied
11530.596	Horizontal	-47.2	-27.0	20.2	Complied

Results: Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4611.994	Vertical	56.8	74.0	17.2	Complied
11530.596	Horizontal	48.0	74.0	26.0	Complied

Results: Middle Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4611.994	Vertical	53.2	54.0	0.8	Complied
11530.596	Horizontal	32.8	54.0	21.2	Complied

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4644.008	Vertical	-41.2	-27.0	14.2	Complied
11615.896	Horizontal	-44.8	-27.0	17.8	Complied

Results: Top Channel / EIRP

Results: Top Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4644.008	Vertical	57.0	74.0	17.0	Complied
11615.896	Horizontal	50.4	74.0	23.6	Complied

Results: Top Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
4644.008	Vertical	53.3	54.0	0.7	Complied
11611.653	Horizontal	34.8	54.0	19.2	Complied

5.2.11. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	16 February 2012 & 17 February 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(1), 15.407(b)(7), 15.205 & 15.209(a)		
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(1)		
Test Method Used:	ANSI C63.10 Section 6.9.2		

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	21

- FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012) confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. Transmitter power in all modes was previously measured and BPSK / MCS8 was found to have the highest power output. Occupied bandwidth in all modes was previously measured and 64QAM / MCS15 was found to have the widest bandwidth. Band edge testing was performed in both modes on both supported channel widths.
- 2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
- 3. For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
- 4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.

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

Results: 2	0 MHz	Channel /	BPSK /	MCS8 / Peak

Frequency (MHz)	(MHz) Level Limit Margin (dBμV/m) (dBμV/m) (dB)		Result	
5148.447	46.8	74.0	27.2	Complied
5150	44.6	74.0	29.4	Complied
5350	45.5	74.0	28.5	Complied
5377.886	46.6	74.0	27.4	Complied

Results: 20 MHz Channel / BPSK / MCS8 / Average

Frequency (MHz)	Level (dBµV/m)	Limit Margin (dBµV/m) (dB)		Result
5147.846	31.5	54.0	22.5	Complied
5150	31.5	54.0	22.5	Complied
5350	31.9	54.0	22.1	Complied
5367.405	32.1	54.0	21.9	Complied

<u>Transmitter Band Edge Radiated Emissions (5.15-5.25 GHz band operation) (continued)</u> <u>Results: 20 MHz Channel / BPSK / MCS8</u>



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

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

Results: 20 MHz Channel / 64QAM / MCS15 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5146.944	45.2	74.0	28.8	Complied
5150	43.9	74.0	30.1	Complied
5350	44.9	74.0	29.1	Complied
5417.044	46.8	74.0	27.2	Complied

Results: 20 MHz Channel / 64QAM / MCS15 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	30.8	54.0	23.2	Complied
5350	31.5	54.0	22.5	Complied
5389.530	31.8	54.0	22.2	Complied

ISSUE DATE: 06 JULY 2012

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

Results: 20 MHz Channel / 64QAM / MCS15



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

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

Results: 40 MHz Channel / BPSK / MCS8 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5148.497	47.6	74.0	26.4	Complied
5150	46.5	74.0	27.5	Complied
5350	45.0	74.0	29.0	Complied
5360.571	46.6	74.0	27.4	Complied

Results: 40 MHz Channel / BPSK / MCS8 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	32.6	54.0	21.4	Complied
5350	31.8	54.0	22.2	Complied
5366.082	31.9	54.0	22.1	Complied

ISSUE DATE: 06 JULY 2012

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

Results: 40 MHz Channel / BPSK / MCS 8



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

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

Results: 40 MHz Channel / 64QAM / MCS15 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5149.699	45.2	74.0	28.8	Complied
5150	44.2	74.0	29.8	Complied
5350	44.1	74.0	29.9	Complied
5401.754	47.7	74.0	26.3	Complied

Results: 40 MHz Channel / 64QAM / MCS15 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	31.2	54.0	22.8	Complied
5350	31.5	54.0	22.5	Complied
5389.228	31.8	54.0	22.2	Complied

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

Results: 40 MHz Channel / 64QAM / MCS15



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band)

Test Summary:

Test Engineer:	Nick Steele	Test Dates:	16 February 2012 & 17 February 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(2), 15.407(b)(7), 15.205 & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(2)
Test Method Used:	ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	21

- FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012) confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. Transmitter power in all modes was previously measured and BPSK / MCS8 was found to have the highest power output. Occupied bandwidth in all modes was previously measured and 64QAM / MCS15 was found to have the widest bandwidth. Band edge testing was performed in both modes on both supported channel widths.
- 2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
- For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
- Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.

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

Results:	<u>20 MHz</u>	Channel /	<u> BPSK /</u>	MCS8 /	Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5133.517	44.8	74.0	29.2	Complied
5150	44.0	74.0	30.0	Complied
5350	50.0	74.0	24.0	Complied
5355.261	50.8	74.0	23.2	Complied

Results: 20 MHz Channel / BPSK / MCS8 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	30.6	54.0	23.4	Complied
5350	35.2	54.0	18.8	Complied
5352.154	35.5	54.0	18.5	Complied

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<u>Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)</u> <u>Results: 20 MHz Channel / BPSK / MCS8</u>



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average
Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)

Results: 20 MHz Channel / 64QAM / MCS15 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5149.249	44.9	74.0	29.1	Complied
5150	43.4	74.0	30.6	Complied
5350	47.8	74.0	26.2	Complied
5350.351	48.9	74.0	25.1	Complied

Results: 20 MHz Channel / 64QAM / MCS15 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	30.2	54.0	23.8	Complied
5350	35.2	54.0	18.8	Complied
5352.154	35.5	54.0	18.5	Complied

ISSUE DATE: 06 JULY 2012

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

Results: 20 MHz Channel / 64QAM / MCS15



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

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

Results: 40 MHz Channel / BPSK / MCS8 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5146.142	45.1	74.0	28.9	Complied
5150	43.7	74.0	30.3	Complied
5350	55.0	74.0	19.0	Complied

Results: 40 MHz Channel / BPSK / MCS8 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	30.7	54.0	23.3	Complied
5350	37.7	54.0	16.3	Complied

<u>Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)</u> <u>Results: 40 MHz Channel / BPSK / MCS8</u>



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

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

Results: 40 MHz Channel / 64QAM / MCS15 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5103.635	44.8	74.0	29.2	Complied
5150	43.4	74.0	30.6	Complied
5350	49.3	74.0	24.7	Complied
5356.573	50.1	74.0	23.9	Complied

Results: 40 MHz Channel / 64QAM / MCS15 / Average

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	30.4	54.0	23.6	Complied
5350	34.5	54.0	19.5	Complied

<u>Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band operation) (continued)</u> <u>Results: 40 MHz Channel / 64QAM / MCS15</u>



Lower Band Edge Peak



Lower Band Edge Average



Upper Band Edge Peak



Upper Band Edge Average

Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band)

Test Summary:

Test Engineers:	Nick Steele	Test Date:	17 February 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(3), 15.407(b)(7), 15.205 & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(3)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 G)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	21

Note(s):

- FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012) confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. Transmitter power in all modes was previously measured and BPSK / MCS8 was found to have the highest power output. Occupied bandwidth in all modes was previously measured and 64QAM / MCS15 was found to have the widest bandwidth. Band edge testing was performed in both modes on both supported channel widths.
- 2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
- 3. For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation with the EUT transmitting on the bottom and top channels within 5.47-5.725 GHz band, the results are included in the transmitter 5.47-5.725 GHz band radiated spurious emissions section of this test report.
- 4. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
- For completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm and also as field strength in dBµV/m. Measured field strength was converted to EIRP in accordance with FCC KDB 789033G)3)d)(iii) using a conversion factor of 95.2.

<u>Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)</u> <u>Results: 20 MHz Channel / BPSK / MCS8 / Peak</u>

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5467.545	-40.1	-27.0	13.1	Complied
5470	-43.1	-27.0	16.1	Complied
5725	-43.3	-27.0	16.3	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5467.545	55.1	68.2	13.1	Complied
5470	52.1	68.2	16.1	Complied
5725	51.9	68.2	16.3	Complied

Results: 20 MHz Channel / 64QAM / MCS15 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5448.307	-46.3	-27.0	19.3	Complied
5470	-49.0	-27.0	22.0	Complied
5725	-50.8	-27.0	23.8	Complied
5746.994	-48.6	-27.0	21.6	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5448.307	48.9	68.2	19.3	Complied
5470	46.2	68.2	22.0	Complied
5725	44.4	68.2	23.8	Complied
5746.994	46.6	68.2	21.6	Complied

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







Lower Band Edge Peak Measurement

Upper Band Edge Peak Measurement

Results: 20 MHz Channel / 64QAM / MCS15 / Peak



Lower Band Edge



Upper Band Edge

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

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5468.246	-41.0	-27.0	14.0	Complied
5470	-42.6	-27.0	15.6	Complied
5725	-48.8	-27.0	21.8	Complied
5725.902	-48.2	-27.0	21.2	Complied

Results: 40 MHz Channel / BPSK / MCS8 / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5468.246	54.2	68.2	14.0	Complied
5470	52.6	68.2	15.6	Complied
5725	46.4	68.2	21.8	Complied
5725.902	47.0	68.2	21.2	Complied

Results: 40 MHz Channel / 64QAM / MCS15 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5467.345	-44.6	-27.0	17.6	Complied
5470	-46.5	-27.0	19.5	Complied
5725	-50.8	-27.0	23.8	Complied
5743.988	-48.7	-27.0	21.7	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5467.345	50.6	68.2	17.6	Complied
5470	48.7	68.2	19.5	Complied
5725	44.4	68.2	23.8	Complied
5743.988	46.5	68.2	21.7	Complied

<u>Transmitter Band Edge Radiated Emissions (5.47-5.725 GHz band operation) (continued)</u> <u>Results: 40 MHz Channel / BPSK / MCS8 / Peak</u>



Lower Band Edge



Results: 40 MHz Channel / 64QAM / MCS15 / Peak









Transmitter Band Edge Radiated Emissions (5.725-5.825 GHz band)

Test Summary:

Test Engineer:	Nick Steele	Test Date:	01 March 2012
Test Sample Serial No.:	22582545		

FCC Reference:	Parts 15.407(b)(4) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(4)
Test Method Used:	FCC KDB 789033 G)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	33

Note(s):

- FCC Response to Inquiry (Tracking Number 917954 / Date: 14th February 2012) confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. Transmitter power in all modes was previously measured and BPSK / MCS8 was found to have the highest power output. Occupied bandwidth in all modes was previously measured and 64QAM / MCS15 was found to have the widest bandwidth. Band edge testing was performed in both modes on both supported channel widths.
- 2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
- 3. Emissions from the band edges to 10 MHz above or below the band edges did not exceed -17 dBm/MHz EIRP.
- For completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm and also as field strength in dBµV/m. Measured field strength was converted to EIRP in accordance with FCC KDB 789033G)3)d)(iii) using a conversion factor of 95.2.

<u>Transmitter Band Edge Radiated Emissions (5.725-5.825 GHz band operation) (continued)</u> <u>Results: 20 MHz Channel / BPSK / MCS8</u>

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-39.4	-27.0	12.4	Complied
5725	-32.0	-17.0	15.0	Complied
5825	-30.1	-17.0	13.1	Complied
5835	-39.6	-27.0	12.6	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	55.8	68.2	12.4	Complied
5725	63.2	78.2	15.0	Complied
5825	65.1	78.2	13.1	Complied
5835	55.6	68.2	12.6	Complied

Results: 20 MHz Channel / 64QAM / MCS15

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-42.5	-27.0	15.5	Complied
5725	-35.2	-17.0	18.2	Complied
5825	-35.6	-17.0	18.6	Complied
5835	-41.6	-27.0	14.6	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	52.7	68.2	15.5	Complied
5725	60.0	78.2	18.2	Complied
5825	59.6	78.2	18.6	Complied
5835	53.6	68.2	14.6	Complied

<u>Transmitter Band Edge Radiated Emissions (5.725-5.825 GHz band operation) (continued)</u> <u>Results: 20 MHz Channel / BPSK / MCS8 / Peak</u>



Lower Band Edge





Lower Band Edge





Results: 20 MHz Channel / 64QAM / MCS15 / Peak

<u>Transmitter Band Edge Radiated Emissions (5.725-5.825 GHz band operation) (continued)</u> <u>Results: 40 MHz Channel / BPSK / MCS 8</u>

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-31.1	-27.0	4.1	Complied
5725	-26.6	-17.0	9.6	Complied
5825	-28.8	-17.0	11.8	Complied
5835	-35.3	-27.0	8.3	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	64.1	68.2	4.1	Complied
5725	68.6	78.2	9.6	Complied
5825	66.4	78.2	11.8	Complied
5835	59.9	68.2	8.3	Complied

Results: 40 MHz Channel / 64QAM / MCS 15

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-37.3	-27.0	10.3	Complied
5725	-33.4	-17.0	16.4	Complied
5825	-32.2	-17.0	15.2	Complied
5835	-37.1	-27.0	10.1	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	57.9	68.2	10.3	Complied
5725	61.8	78.2	16.4	Complied
5825	63.0	78.2	15.2	Complied
5835	58.1	68.2	10.1	Complied

<u>Transmitter Band Edge Radiated Emissions (5.725-5.825 GHz band operation) (continued)</u> <u>Results: 40 MHz Channel / BPSK / MCS8 / Peak</u>



Lower Band Edge



RBW 1 MHz Ref Lvl 110 dByV RF Att dF 57.93 dBWV 5.71500000 GHz VBW SWT 3 MHz 5 ms Unit dbyv 10.1 dB Offs ▼1 [T1] 57.93 dByV 00 GH 7260 Δ. 63 08 dBy 3 man Mer , da Center 5.72 GHz 5 MHz/ Span 50 MHz ttle: 84552 mmment A: TRANSMITTER RADIATED BAND EDGE EMISSIONS ate: 1.MAR.2012 17:27:10

Lower Band Edge





Results: 40 MHz Channel / 64QAM / MCS15 / Peak

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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.25 dB
Maximum Conducted Output Power	5.15 GHz to 5.825 GHz	95%	±0.27 dB
Peak Power Spectral Density	5.15 GHz to 5.825 GHz	95%	±0.27 dB
Peak Excursion	5.15 GHz to 5.825 GHz	95%	±0.27 dB
99% / 26 dB Emission Bandwidth	5.15 GHz to 5.825 GHz	95%	±0.92 ppm
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.

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (months)
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	02 Jun 2012	12
A1396	Attenuator	Huber & Suhner	757987	6810.17.B	08 Jul 2012	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	09 Oct 2012	12
A1785	Low Noise Amplifier	Farran Technology	FLNA-28-30	FTL 6483	Calibrated Before Use	-
A1818	Antenna	EMCO	3115	00075692	09 Oct 2012	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	12
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A1998	Attenuator	Huber & Suhner	6820.17.B	07101	Calibrated Before Use	-
A1999	Attenuator	Huber & Suhner	6820.17.B	07101	18 Mar 2012	12
A2001	Attenuator	Huber & Suhner	6830.17.B	07031	Calibrated Before Use	-
A203	Antenna	Flann Microwave	22240-20	343	11 May 2013	36
A254	Antenna	Flann Microwave	14240-20	139	09 Oct 2012	12
A255	Antenna	Flann Microwave	16240-20	519	09 Oct 2012	12
A256	Antenna	Flann Microwave	18240-20	400	09 Oct 2012	12
A259	Antenna	Chase	CBL6111	1513	26 Mar 2012	12
A436	Antenna	Flann	20240-20	330	09 Oct 2012	12
A490	Antenna	Chase	CBL6111A	1590	11 Apr 2012	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
E0513	Environmental Chamber	TAS	LT600 Series 3	23900506	Calibrated Before Use	-
G088	Power Supply Unit	Thurlby Thandar	CPX200	100700	Calibrated Before Use	-
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	29 May 2012	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	09 Oct 2012	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESI26	100046K	29 Jun 2012	12
M1251	DMM	Fluke	179	87640015	21 Jun 2012	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	12 Dec 2012	12
M1249	Thermometer	Fluke	5211	88800049	15 Nov 2012	12
M1251	DMM	Fluke	175	89170179	29 Jul 2012	12

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Туре No.	Serial No.	Date Calibration	Cal. Interval (months)
M1252	Signal Generator	Hewlett Packard	83640A	3119A00489	05 Oct 2012	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	13 Jul 2012	12
M1267	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	100155	17 May 2012	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	08 Nov 2012	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12
M1390	Harmonic Mixer	Farran Technology	WHMP 28	FTL1677B	Calibrated before use	-
M1590	ESU 26	Rohde & Schwarz	ESU26	100239	15 Jun 2012	12
M1630	ESU 40	Rohde & Schwarz	ESU40	100233	06 Feb 2013	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 May 2012	12
S011	Power Supply	Instek	PR-3010H	9401270	Calibrated before use	-
S0537	EL302D Dual Power Supply	ТТІ	EL302D	249928	Calibrated before use	-

NB In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was in calibration at the time of test.

Appendix 2. Test Setup Photographs



Photo #1. Test setup for conducted measurements on Video Engine. Video Engine is the black box on top of the spectrum analyser.



Photo #2. 802.11 module location within Video Engine shown in red. Antenna ports shown at bottom left.



Photo #3. Close up photo of EUT module within Video Engine. The three antenna ports are shown on the right hand side of the 802.11 module.



Photo #4. Rear of TV showing location of EUT module.