TEST REPORT

Test Report No. : UL-RPT-RP86357JD01A V2.0

Manufacturer	:	connectBlue
Model No.	:	OWS451
FCC ID	:	PVH0941
IC Certification No.	:	5325A-0941
Test Standard(s)	:	FCC Parts 15.107, 15.109, 15.207, 15.209, 15.407(a)(3), 15.407(a)(6), 15.407(b)(4), 15.407(b)(6), 15.407(b)(7), 15.407(g) & Industry Canada RSS-210 A9.2(4); RSS-Gen 4.6.1, 4.7, 4.8, 4.9, 4.10, 7.2.4

1. This test report shall not be reproduced in full or partial, without the written approval of RFI Global Services Ltd trading as UL.
2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 22 May 2012

Checked by:

Sarah Williams
WiSE Laboratory Engineer

Issued by :

pp

John Newell
Group Quality Manager, WiSE
Basingstoke,
UL Verification Services

ilac-MRA UKAS TESTING 0644

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

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Table of Contents

1. Customer Information

Company Name:	connectBlue AB
Address:	Norra Vallgatan 64 3V SE-221 22 Malmo Sweden

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.407
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Section 15.407.
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: 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) 2012: 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 trading as UL, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	04 December 2012 to 18 December 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	✓
Part 15.109	RSS-Gen 4.10	Receiver/Idle Mode Radiated Spurious Emissions	✓
Part 15.207	RSS-Gen 7.2.4	Transmitter AC Conducted Emissions	✓
Part 15.403(i)	N/A	Transmitter 26 dB Emission Bandwidth	✓
N/A	RSS-Gen 4.6.1 / RSS-210 A9.2	Transmitter 99% Emission Bandwidth	✓
Part 15.407(a)(3)	RSS-Gen 4.8 / RSS-210 A9.2(4)	Transmitter Maximum Conducted Output Power (5.725-5.850 GHz band)	✓
N/A	RSS-210 A9.2(4)	Transmitter Maximum Equivalent Isotropically Radiated Power (EIRP) (5.725-5.850 GHz band)	✓
Part 15.407(a)(3)	RSS-210 A9.2(4)	Transmitter Peak Power Spectral Density (5.725-5.850 GHz band)	✓
Part 15.407(a)(6)	N/A	Transmitter Peak Excursion	✓
Part 15.407(b)(4), (b)(6), (b)(7)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A9.2(4)	Transmitter Out of Band Radiated Emissions	✓
Part 15.407(b)(4)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A9.2(4)	Transmitter Band Edge Radiated Emissions	✓
Part 15.407(g)	RSS-Gen 4.7	Transmitter Frequency Stability (Temperature & Voltage Variation)	✓
Part 15.407(h)(1)	RSS-210 A9.2	Transmitter Power Control	Note 1

Key to Results

✓ = Complied ✗ = Did not comply

Note(s):

1. Transmit Power Control was not tested as the maximum EIRP is less than 500 mW (27 dBm).

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices
Reference:	FCC KDB 789033 D01 v01r02 09/26/2012
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	FCC KDB 644545 D02 v01 6/7/2012
Title:	Alternative Guidance for IEEE 802.11ac and Pre-ac Device Emissions Testing

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:	connectBlue
Model Name or Number:	OWS451i (internal antenna)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0270-01-006088

Brand Name:	connectBlue
Model Name or Number:	OWS451x (external antenna connections)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0272-01-000833

Brand Name:	connectBlue
Model Name or Number:	OWS451x (external antenna connections)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_single_tone_release_cw.cbz
Serial Number:	0272-01-000833

3.2. Description of EUT

The module with the model family name cB-0941 is a small size WLAN module intended for OEM integration. The module provides a wireless communication link using IEEE802.11a/b/g/n WLAN.

WLAN is a short-range radio link intended to transmit and receive information between portable and/or fixed electronic devices.

The WLAN module conforms to the standards IEEE 802.11a/b/g/ and 802.11n single stream.

The modules can be operated on 5 frequency bands:

- ISM Band (2412 – 2462 MHz), 11 channels with a separation of 5 MHz
- U-NII band-1 (5180 – 5240 MHz), 4 channels with a separation of 20 MHz
- U-NII band-2 (5260 -5320 MHz), 4 channels with a separation of 20 MHz
- U-NII band-2e (5500 – 5700 MHz), 11 channels with a separation of 20 MHz
- U-NII band-3 (5745 – 5850 MHz), 5 channels with a separation of 20 MHz

The channel bit rate is between 1 Mbps and 65 Mbps depending on which modulation scheme is selected.

It is restricted to function as a DFS client without radar detection in U-NII Bands 2 and 2e.

The module has two antenna ports, one transmit/receive and one receive, or alternatively can be fitted with a PCB antenna. The antenna connectors are not mounted on versions with PCB antenna.

The purpose of this testing was to test operation in U-NII band 3 which has now been implemented.

3.3. Modifications Incorporated in the EUT

The Customer declared that firmware version ows451_pcti_firmware_2.5.0_release.cbz is the standard firmware version (standard end-user is version 2.10) with added functionality and this is used for testing purposes only. Examples of added functionality are continuous transmit and frame bursts on any channel.

An additional modified firmware version ows451_pcti_firmware_2.5.0_single_tone_release_cw.cbz was installed on the EUT during the frequency stability test to enable the EUT to transmit a CW tone. On completion of the Carrier Frequencies test, the default test firmware ows451_pcti_firmware_2.5.0_release.cbz was restored for the remainder of the testing.

The end-user will not be able to access the test mode functions.

3.4. Additional Information Related to Testing

Technology Tested:	IEEE 802.11a/b/g/n		
Type of Unit:	Transceiver		
Modulation:	DSSS/OFDM		
Data rates:	802.11a/g	6, 9, 12, 18, 24, 36 ,48 & 54 Mbps	
	802.11n / 20 MHz channel	6.5, 13, 19.5, 26, 39, 52, 58.5 & 65 Mbps	
Power Supply Requirement(s):	5.0 VDC nominal		
Channel Spacing:	20 MHz		
Transmit & Receive Frequency Band:	5725 MHz to 5850 MHz		
Transmit & Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	149	5745
	Middle	157	5785
	Top	165	5825

3.5. Support Equipment

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

Description:	Interface Board
Brand Name:	connectBlue
Model Name or Number:	OEM Module Adaptor
Serial Number:	OWS 451

Description:	Bench Power Supply 120 VAC 60 Hz to 5 VDC
Brand Name:	connectBlue
Model Name or Number:	cB-8115-01
Serial Number:	Not marked or stated

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude D610
Serial Number:	RFI Asset No. PC 329

3.6. Antenna

The table below lists the antennas that the Customer intends to use with this product when operating in the 5 GHz bands:

Type	Stated Gain (dBi)	Manufacturer	Antenna Name	Used for Testing	Note
Patch SMD	3.0	Fractus	FR05-S1-N-0-104	X	-
Patch	3.0	ProAnt	InSide-WLAN with 10 cm RF cable	X	-
Monopole	3.0	ProAnt	Ex-It WLAN RP-SMA	X	-
Patch	3.0	ProAnt	InSide EPA ProAnt (5GHz)	X	-

X = This antenna was used for testing purposes

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/widest bandwidth on the bottom, middle and top channels as required using the supported data rates/modulation types.
- Continuously transmitting with a CW signal on the bottom or top channel. This configuration was only used for frequency stability tests.

4.2. Configuration and Peripherals

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

- Transmitting in test mode with >99% duty cycle and controlled using a bespoke application on a laptop PC. 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.
- All supported modes and were initially investigated on one channel. The modes that produced the highest power for the 5.725-5.850 GHz band were:
    - 802.11a – 6 Mbps
    - 802.11n HT20 – 6.5 Mbps / MCS0

  Measurements were performed on the required channels dependant on each test case.

  Pre-scan results for all modes are archived on the Company server and available for inspection if required.
- 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 emission measurements were performed using samples 0270-01-006088. Power was supplied from a 120 VAC 60 Hz to 5 VDC power supply. The connectBlue bench power supply was connected to a single phase 120 VAC to 60 Hz supply via a LISN. The 5 VDC output was connected to the OEM Module Adaptor.
- Receiver/idle mode radiated spurious emission measurements were performed using samples 0270-01-006088 and 0272-01-000833 . Power was supplied from a 120 VAC 60 Hz to 5 VDC power supply. The power supply was located outside the test chamber.
- Transmitter radiated spurious emission measurements were performed using samples 0270-01-006088 and 0272-01-000833. Power was supplied from a 120 VAC 60 Hz to 5 VDC power supply. The power supply was located outside the test chamber.
- 26 dB bandwidth and 99% bandwidth tests were performed using sample 0272-01-000833.
- Conducted output power, EIRP and peak power spectral density tests were performed using sample 0272-01-000833.
- The sample with serial number 0272-01-000833 was used for frequency stability tests. Firmware version ows451_pcti_firmware_2.5.0_single_tone_release_cw.cbz.was loaded for frequency stability tests only.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

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

5.2. Test Results

5.2.1. Receiver/Idle Mode AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	12 December 2012
Test Sample Serial Number:	0270-01-006088		

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

Environmental Conditions:

Temperature (°C):	19
Relative Humidity (%):	32

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.371	Live	16.2	58.5	42.3	Complied
0.713	Live	7.5	56.0	48.5	Complied
5.658	Live	15.7	60.0	44.3	Complied
8.678	Live	23.0	60.0	37.0	Complied
9.519	Live	24.1	60.0	35.9	Complied
14.316	Live	31.5	60.0	28.5	Complied
18.641	Live	20.3	60.0	39.7	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.375	Live	11.5	48.4	36.9	Complied
0.762	Live	10.2	46.0	35.8	Complied
5.793	Live	9.9	50.0	40.1	Complied
8.660	Live	17.0	50.0	33.0	Complied
9.587	Live	18.3	50.0	31.7	Complied
14.316	Live	30.4	50.0	19.6	Complied
18.474	Live	14.5	50.0	35.5	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results: Neutral / Quasi Peak

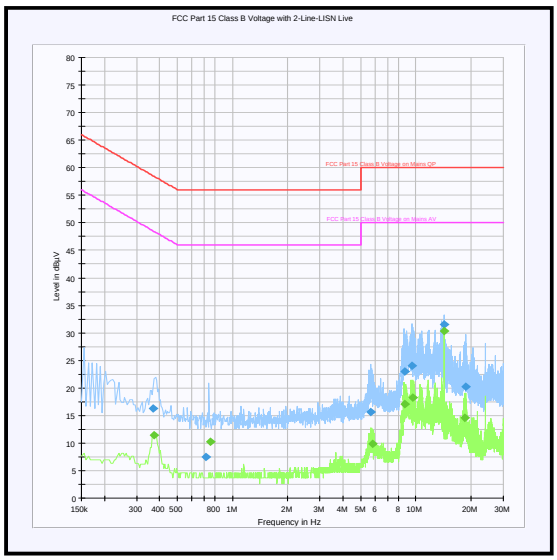
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.182	Neutral	13.9	64.4	50.5	Complied
0.375	Neutral	16.9	58.4	41.5	Complied
5.735	Neutral	15.9	60.0	44.1	Complied
9.434	Neutral	23.2	60.0	36.8	Complied
11.652	Neutral	22.7	60.0	37.3	Complied
14.316	Neutral	31.9	60.0	28.1	Complied

Results: Neutral / Average

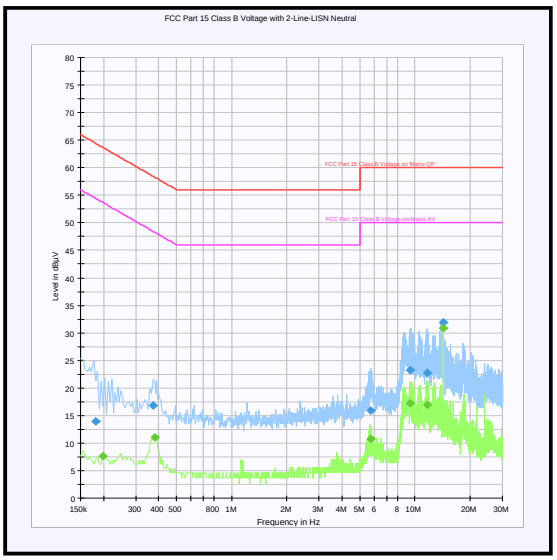
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.200	Neutral	7.6	53.6	46.0	Complied
0.380	Neutral	11.0	48.3	37.3	Complied
5.757	Neutral	10.8	50.0	39.2	Complied
9.443	Neutral	17.2	50.0	32.8	Complied
11.661	Neutral	17.0	50.0	33.0	Complied
14.316	Neutral	30.9	50.0	19.1	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results:



Live



Neutral

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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1263	Test Receiver	ESIB7	04 Apr 2013	12
A1830	Pulse Limiter	ESH3-Z2	25 Feb 2013	12
A649	LISN	ESH3-Z5	19 Feb 2013	12

5.2.2. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	14 December 2012
Test Sample Serial Numbers:	0270-01-006088 & 0272-01-000833		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	28

Note(s):

1. All emissions shown on the pre-scan plot were investigated and found to be ambient or greater than 20 dB below the applicable limits, therefore the highest noise floor level of the measurement system was recorded.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. The power supply was placed outside the test chamber during testing.
4. Tests were performed with all antenna variants.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Internal Antenna / Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
951.100	Vertical	24.8	46.0	21.2	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Results: Inside WLAN Antenna with 10cm RF cable / Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
159.995	Vertical	28.0	43.5	15.5	Complied
432.005	Vertical	28.7	46.0	17.3	Complied
543.990	Horizontal	40.2	46.0	5.8	Complied
559.984	Horizontal	41.6	46.0	4.4	Complied
575.997	Horizontal	38.7	46.0	7.3	Complied
607.975	Horizontal	33.3	46.0	12.7	Complied

Results: WLAN RP-SMA Antenna / Quasi Peak

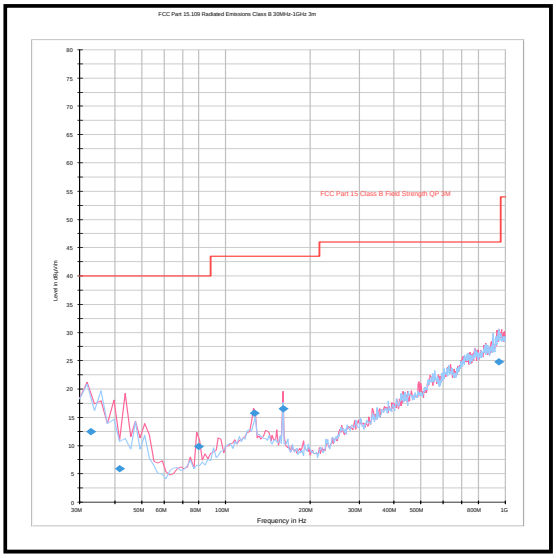
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
79.997	Vertical	21.8	40.0	18.2	Complied
159.995	Vertical	28.4	43.5	15.1	Complied
367.991	Vertical	28.2	46.0	17.8	Complied
592.000	Horizontal	31.2	46.0	14.8	Complied
608.004	Horizontal	35.5	46.0	10.5	Complied
624.007	Horizontal	31.9	46.0	14.1	Complied

Results: EPA ProAnt (5 GHz) Antenna / Quasi Peak

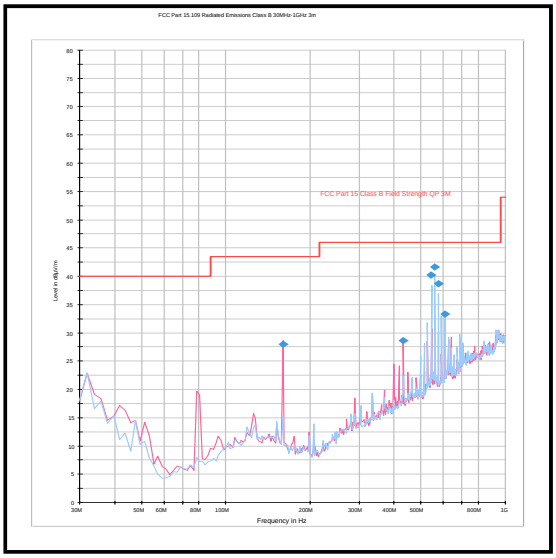
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
79.998	Vertical	21.7	40.0	18.3	Complied
159.995	Vertical	28.3	43.5	15.2	Complied
367.982	Vertical	28.7	46.0	17.3	Complied
431.986	Vertical	34.3	46.0	11.7	Complied
592.000	Horizontal	33.1	46.0	12.9	Complied
607.985	Horizontal	36.4	46.0	9.6	Complied
623.998	Horizontal	34.5	46.0	11.5	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)

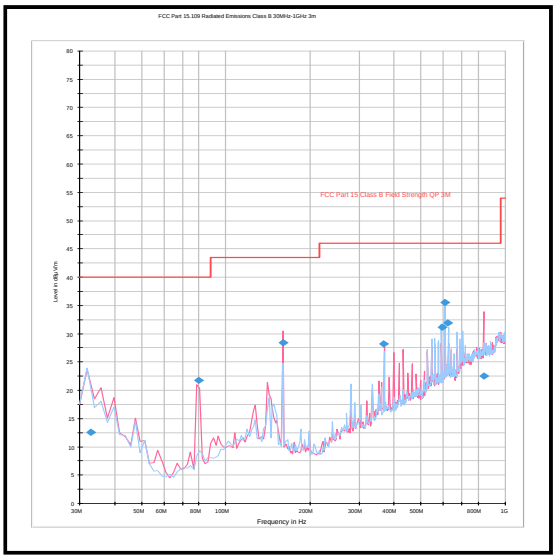
Results: Internal Antenna



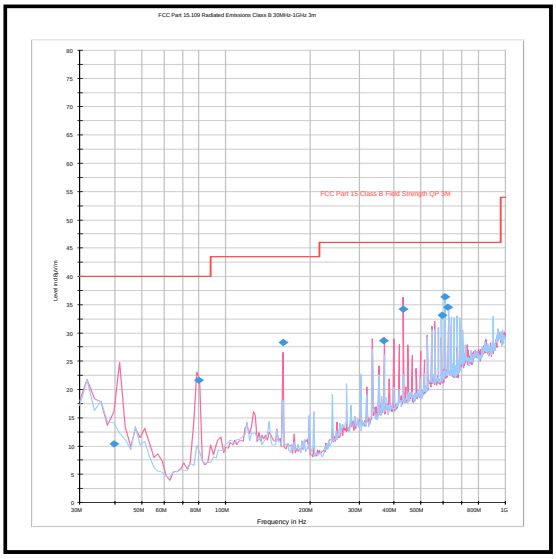
Results: Inside WLAN Antenna with 10cm RF cable



Results: WLAN RP-SMA Antenna



Results: EPA ProAnt (5 GHz) Antenna



Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0001	5m RSE Chamber	N/A	24 Oct 2013	12
M1273	Test Receiver	ESIB 26	08 Feb 2013	12
A1834	Attenuator	8491B	29 Jan 2013	12
G0543	Amplifier	310N	02 Jan 2013	3
A553	Bi-log Antenna	CBL6111A	15 Feb 2013	12

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	10 December 2012 & 11 December 2012
Test Sample Serial Numbers:	0270-01-006088 & 0272-01-000833		

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

Environmental Conditions:

Temperature (°C):	21 to 22
Relative Humidity (%):	30 to 31

Note(s):

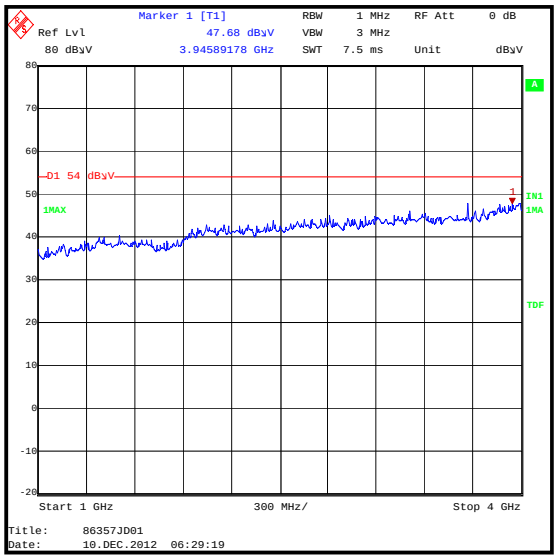
1. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. The peak level was compared to the average limit as opposed to being compared to the peak limit because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

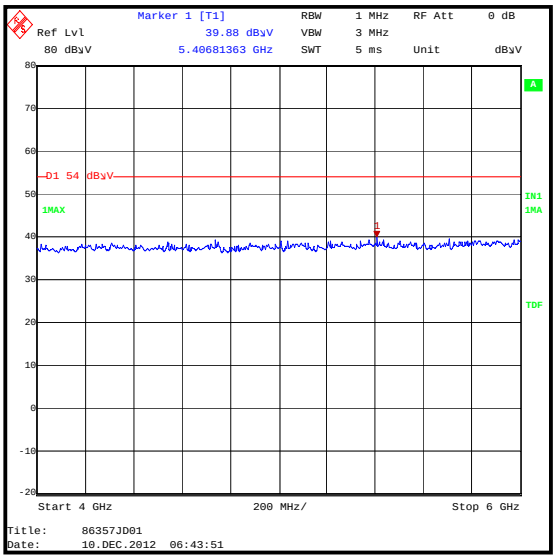
Results:

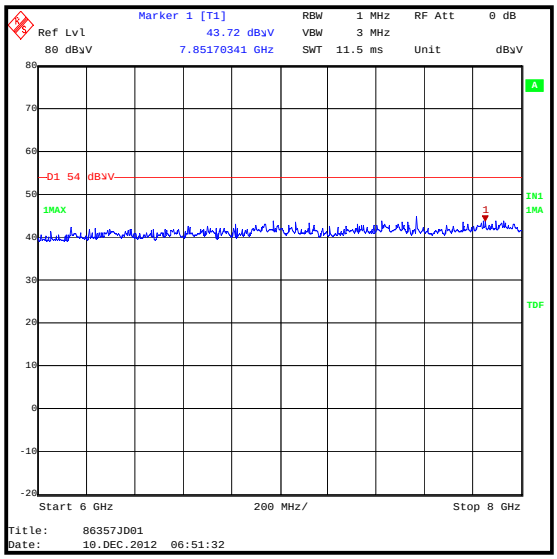
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
17021.543	Vertical	49.1	54.0	4.9	Complied

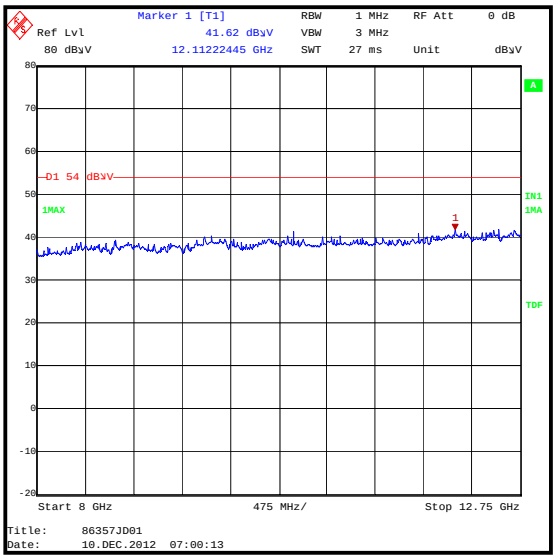
Receiver/Idle Mode Radiated Spurious Emissions (continued)

Results:



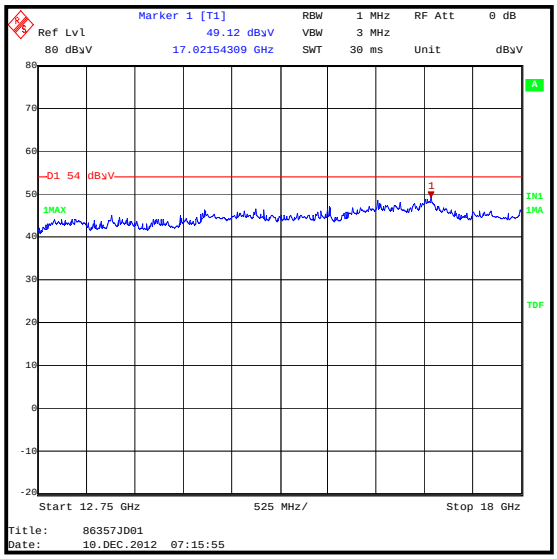


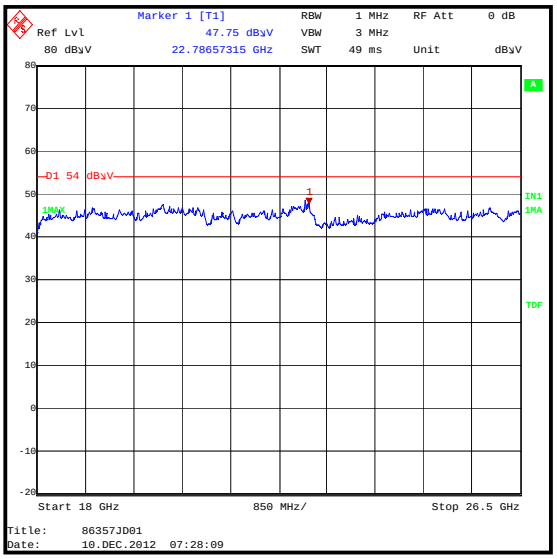


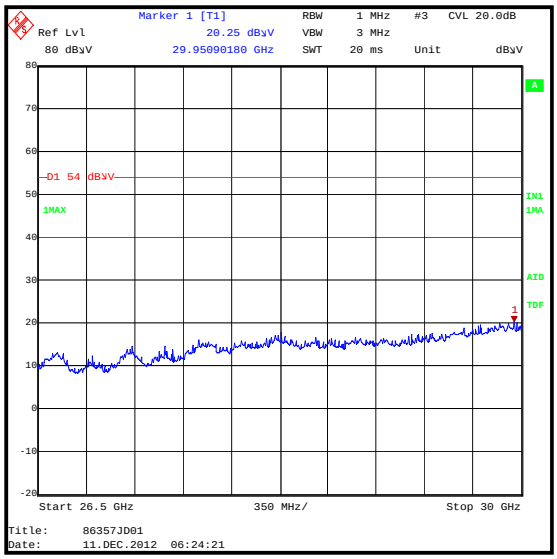


Receiver/Idle Mode Radiated Spurious Emissions (continued)

Results:







Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0002	3m RSE Chamber	N/A	04 Nov 2013	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	04 Nov 2013	12
A1818	Horn Antenna	3115	04 Nov 2013	12
A253	Horn Antenna	12240-20	04 Nov 2013	12
A254	Horn Antenna	14240-20	04 Nov 2013	12
A255	Horn Antenna	16240-20	04 Nov 2013	12
A256	Horn Antenna	18240-20	04 Nov 2013	12
A436	Horn Antenna	20240-20	04 Nov 2013	12
A203	Horn Antenna	22240-20	11 May 2013	36
M1390	Harmonic Mixer	WHMP 28	Calibrated before use	-
A1785	Pre-amplifier	FLNA-28-30	Calibrated before use	-
A366	Isolator	FRR-400	Calibrated before use	-

5.2.3. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	12 December 2012
Test Sample Serial Numbers:	0270-01-006088		

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

Environmental Conditions:

Temperature (°C):	19
Relative Humidity (%):	32

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	16.7	66.0	49.3	Complied
0.191	Live	13.6	64.0	50.4	Complied
0.371	Live	16.2	58.5	42.3	Complied
5.622	Live	14.6	60.0	45.4	Complied
9.258	Live	22.4	60.0	37.6	Complied
11.657	Live	21.7	60.0	38.3	Complied
14.316	Live	31.6	60.0	28.4	Complied
18.434	Live	19.8	60.0	40.2	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	8.2	56.0	47.8	Complied
0.371	Live	11.1	48.5	37.4	Complied
5.694	Live	10.8	50.0	39.2	Complied
9.492	Live	16.6	50.0	33.4	Complied
11.571	Live	16.2	50.0	33.8	Complied
14.316	Live	30.7	50.0	19.3	Complied
18.470	Live	13.9	50.0	36.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: Neutral / Quasi Peak

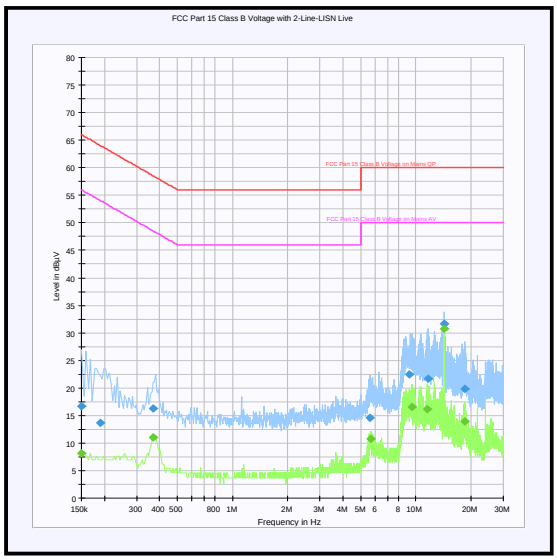
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.168	Neutral	15.0	65.1	50.1	Complied
0.384	Neutral	15.7	58.2	42.5	Complied
5.550	Neutral	13.1	60.0	46.9	Complied
8.777	Neutral	21.3	60.0	38.7	Complied
9.479	Neutral	20.5	60.0	39.5	Complied
14.316	Neutral	31.8	60.0	28.2	Complied
18.348	Neutral	17.6	60.0	42.4	Complied

Results: Neutral / Average

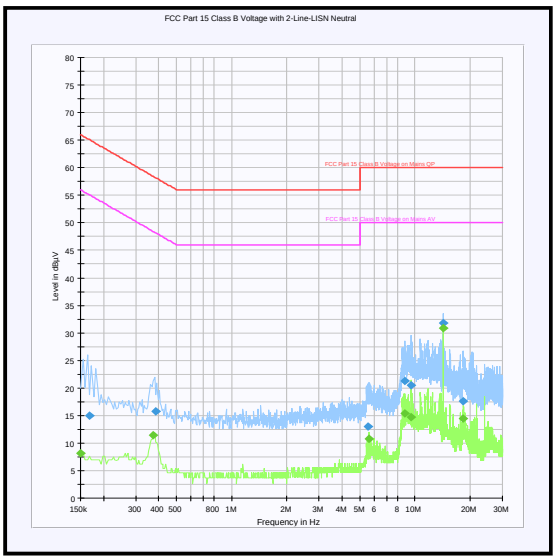
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Neutral	8.2	56.0	47.8	Complied
0.375	Neutral	11.5	48.4	36.9	Complied
5.600	Neutral	10.8	50.0	39.2	Complied
8.781	Neutral	15.3	50.0	34.7	Complied
9.555	Neutral	14.8	50.0	35.2	Complied
14.316	Neutral	30.9	50.0	19.1	Complied
18.366	Neutral	14.4	50.0	35.6	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results:



Live



Neutral

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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1263	Test Receiver	ESIB7	04 Apr 2013	12
A1830	Pulse Limiter	ESH3-Z2	25 Feb 2013	12
A649	LISN	ESH3-Z5	19 Feb 2013	12

5.2.4. Transmitter 26 dB Emission Bandwidth

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	04 December 2012
Test Sample Serial Number:	0272-01-000833		

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

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	28

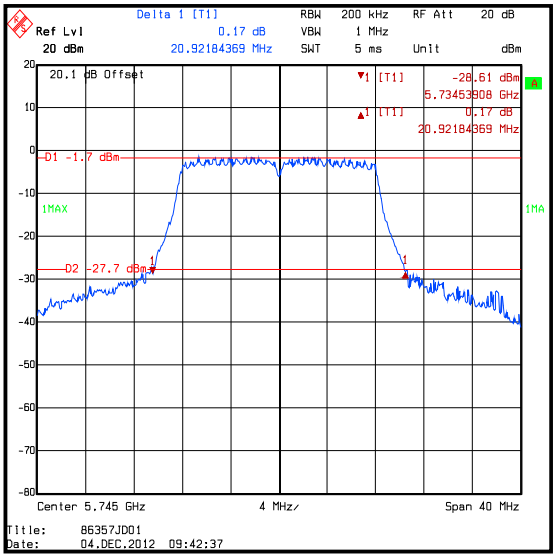
Note(s):

1. The test was performed as a conducted measurement.
2. All configurations supported by the EUT were investigated on the middle channel in accordance with KDB 789033 Section D emission bandwidth test procedure. The data rates that produced the widest bandwidth (worst case when applied to the conducted power limit calculation) have been reported as detailed below:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802.11n 20 MHz channel – BPSK / 6.5 Mbps / / MCS0
3. Final measurements were performed using the above configurations on the bottom, middle and top channels.

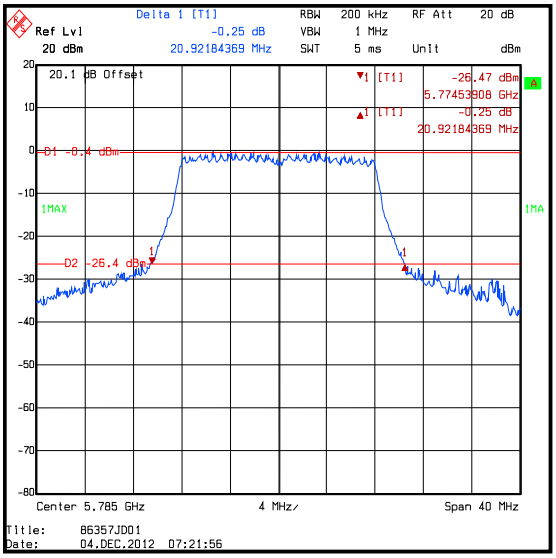
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz

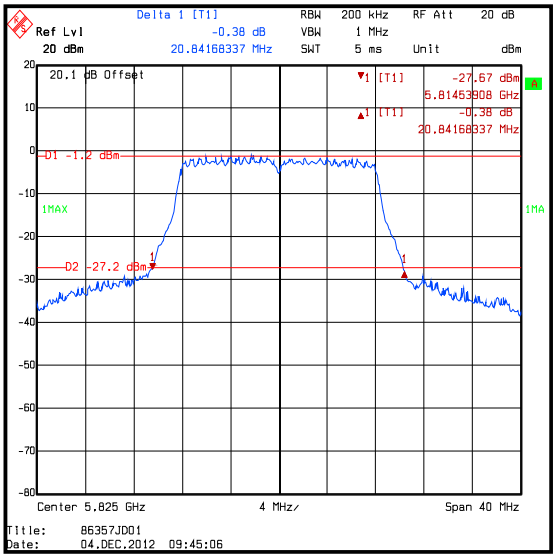
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6	20.922
Middle	5785	BPSK	6	20.922
Top	5825	BPSK	6	20.842



Bottom Channel



Middle Channel

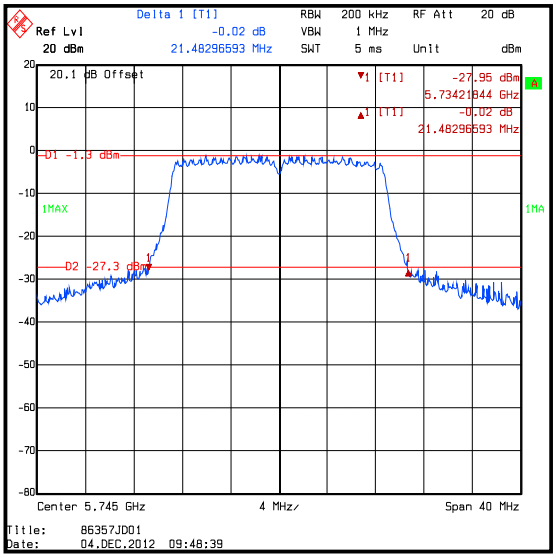


Top Channel

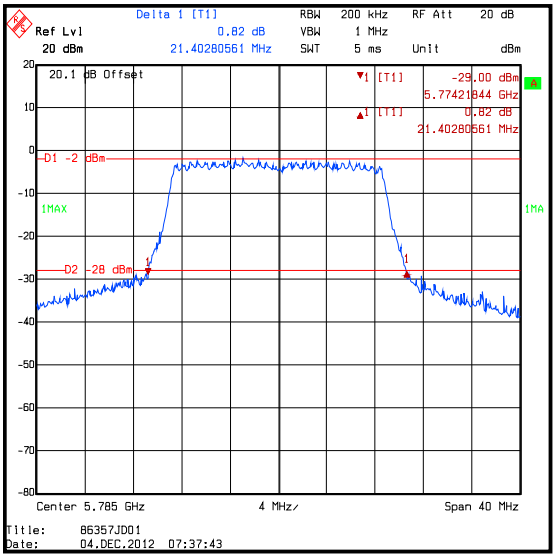
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz

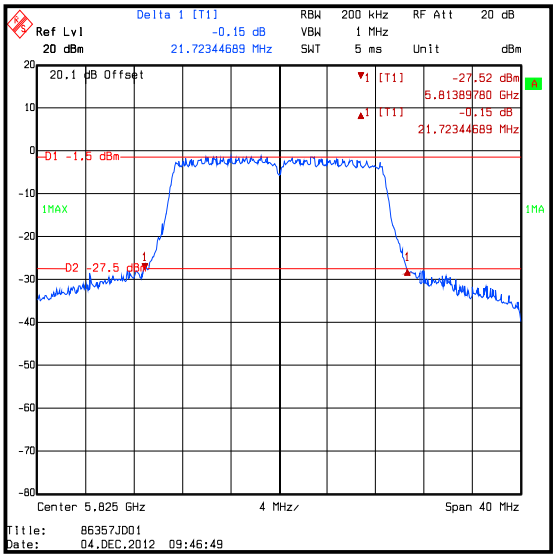
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	21.483
Middle	5785	BPSK	6.5 / 0	21.403
Top	5825	BPSK	6.5 / 0	21.723



Bottom Channel



Middle Channel



Top Channel

Transmitter 26 dB Emission Bandwidth (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M127	Spectrum Analyzer	FSEB 30	13 Aug 2013	12
A2142	Attenuator	AN18-20	25 May 2013	12
M260	Signal Generator	SMP02	14 Jun 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.5. Transmitter 99% Emission Bandwidth

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	04 December 2012
Test Sample Serial Number:	0272-01-000833		

FCC Reference:	N/A
Industry Canada Reference:	RSS-Gen 4.6.1 / RSS-210 A9.2
Test Method Used:	Occupied bandwidth function of a test receiver

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	28

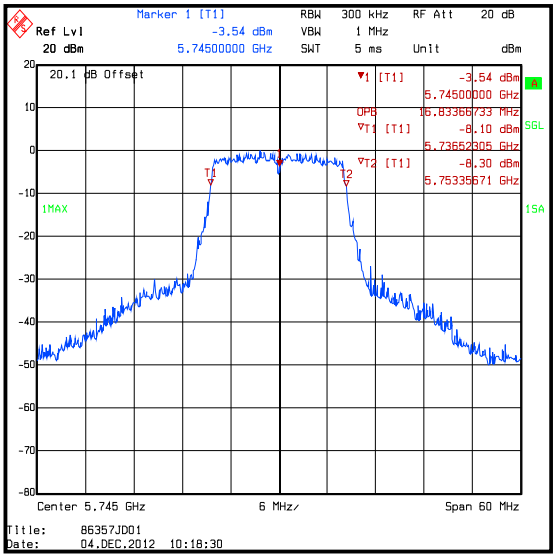
Note(s):

1. Occupied bandwidth (99% bandwidth) was measured using a test receiver occupied bandwidth function with the test receiver set to the appropriate bandwidth according to the channel width under test. Measurement bandwidths were set automatically by the test receiver according to the channel bandwidth under test. The spectrum analyser was left to sweep for a sufficient period of time in order to maximise the level and bandwidth.
2. The data rates that produced the widest bandwidth have been reported as detailed below:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802.11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0
3. Final measurements were performed using the above configurations on the bottom, middle and top channels.

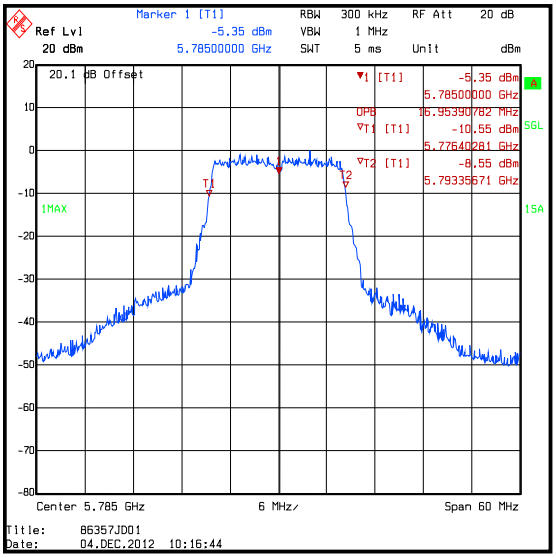
Transmitter 99% Emission Bandwidth (continued)

Results: 802.11a / 20 MHz

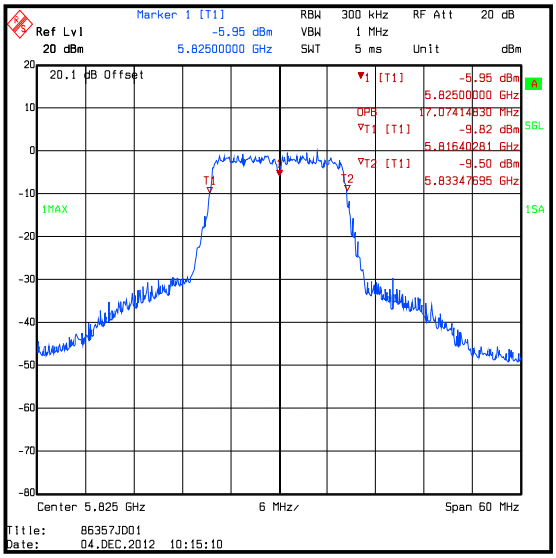
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	99 % Emission Bandwidth (MHz)
Bottom	5745	BPSK	6	16.834
Middle	5785	BPSK	6	16.954
Top	5825	BPSK	6	17.074



Bottom Channel



Middle Channel

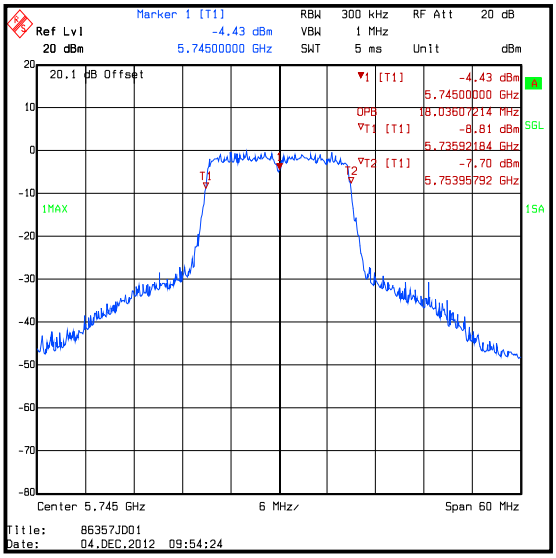


Top Channel

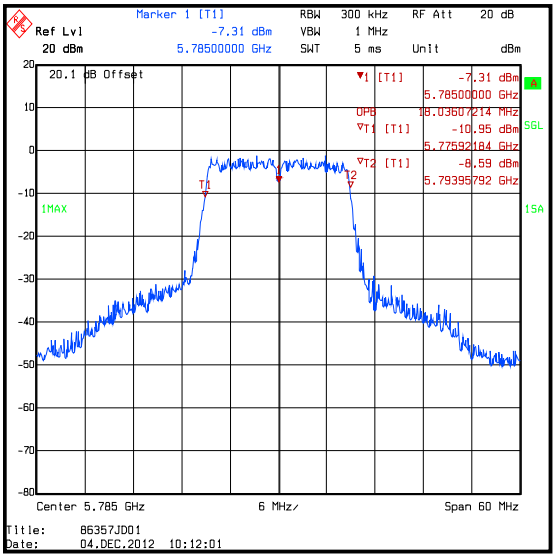
Transmitter 99% Emission Bandwidth (continued)

Results: 802.11n / 20 MHz

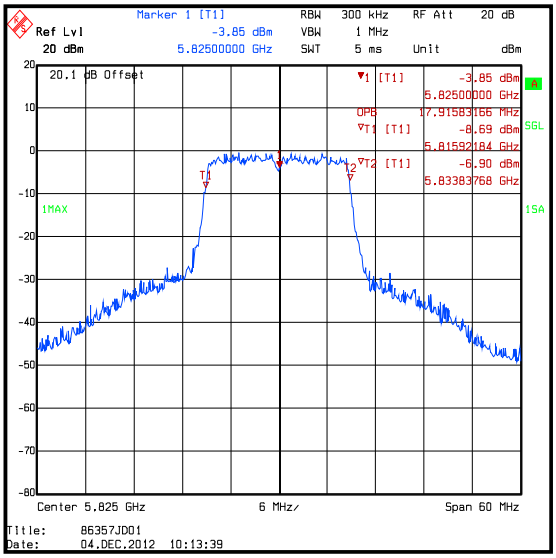
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	18.036
Middle	5785	BPSK	6.5 / 0	18.036
Top	5825	BPSK	6.5 / 0	17.916



Bottom Channel



Middle Channel



Top Channel

Transmitter 99% Emission Bandwidth (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M127	Spectrum Analyzer	FSEB 30	13 Aug 2013	12
A2142	Attenuator	AN18-20	25 May 2013	12
M260	Signal Generator	SMP02	14 Jun 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.6. Transmitter Maximum Conducted Output Power

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	04 December 2012
Test Sample Serial Number:	0272-01-000833		

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)3)b)

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	28

Note(s):

1. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power (worst case) for the 5.725-5.850 GHz band were:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802.11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

    Measurements were then performed on the relevant mode on bottom, middle and top channels.
1. FCC Part 15.407(a)(3) limit is the lesser of 1 W (30.0 dBm) or 17 dBm + 10 $\log_{10}$ B, where B is the previously measured 26 dB emission bandwidth in MHz. The limit for each channel was calculated as below:

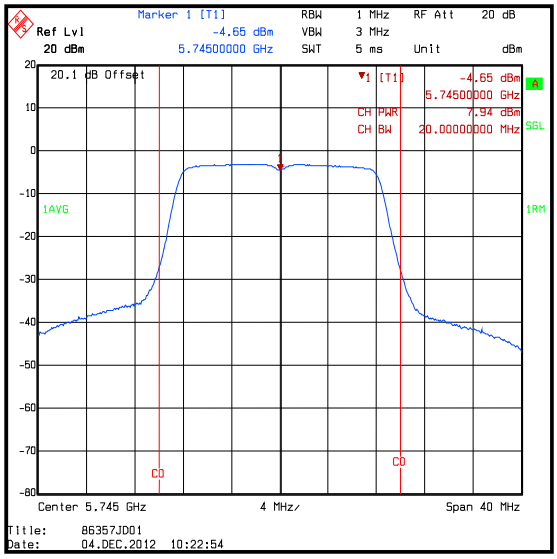
802.11a 20 MHz channel width / Bottom channel = $17\ dBm + 10\ log_{10}\ 20.9 = 30.2\ dBm$
802.11a 20 MHz channel width / Middle channel = $17\ dBm + 10\ log_{10}\ 20.9 = 30.2\ dBm$
802.11a 20 MHz channel width / Top channel = $17\ dBm + 10\ log_{10}\ 20.8 = 30.2\ dBm$
802.11n 20 MHz channel width / Bottom channel = $17\ dBm + 10\ log_{10}\ 21.5 = 30.3\ dBm$
802.11n 20 MHz channel width / Middle channel = $17\ dBm + 10\ log_{10}\ 21.4 = 30.3\ dBm$
802.11n 20 MHz channel width / Top channel = $17\ dBm + 10\ log_{10}\ 21.7 = 30.4\ dBm$

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

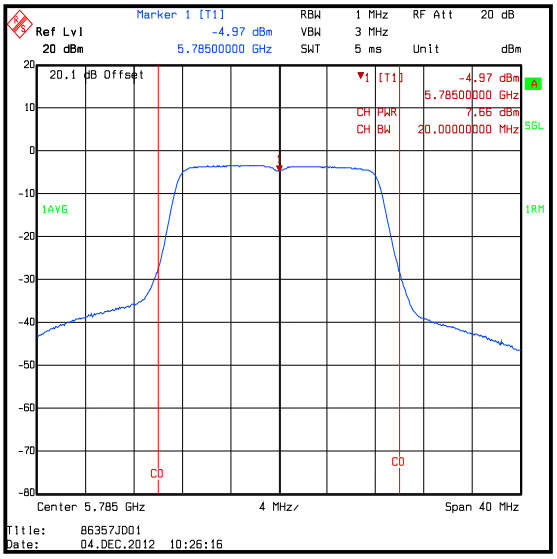
Transmitter Maximum Conducted Output Power (continued)

Results: 802.11a / 20 MHz / 6 Mbps / BPSK

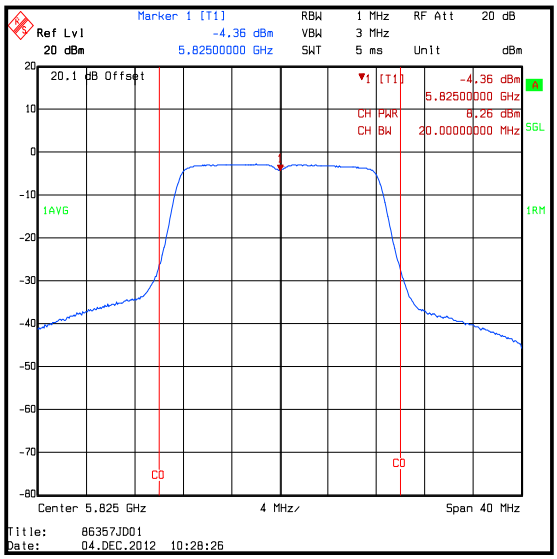
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	7.9	30.0	22.1	Complied
Middle	5785	7.7	30.0	22.3	Complied
Top	5825	8.3	30.0	21.7	Complied



Bottom Channel



Middle Channel

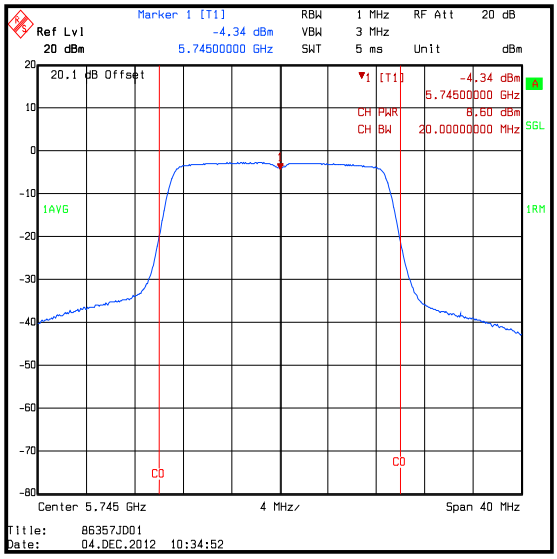


Top Channel

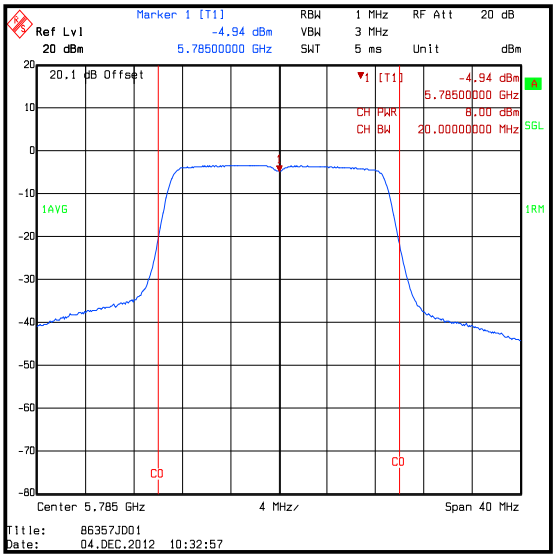
Transmitter Maximum Conducted Output Power (continued)

Results: 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0

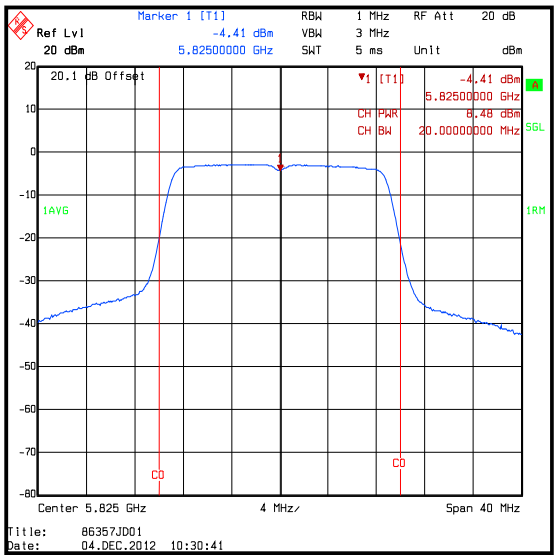
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	8.6	30.0	21.4	Complied
Middle	5785	8.0	30.0	22.0	Complied
Top	5825	8.5	30.0	21.5	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Conducted Output Power (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M127	Spectrum Analyzer	FSEB 30	13 Aug 2013	12
A2142	Attenuator	AN18-20	25 May 2013	12
M260	Signal Generator	SMP02	14 Jun 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.7. Transmitter Maximum Equivalent Isotropically Radiated Power

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	04 December 2012
Test Sample Serial Number:	0272-01-000833		

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

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	28

Note(s):

1. All power tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 789033 D01 C)3)b) Method SA-1.
2. The EUT was transmitting at 100% duty cycle.
3. The Customer declared all antenna gains for all antenna types as 3.0 dBi. The antenna gain was added to the conducted power to calculate the EIRP.
4. The Industry Canada RSS-210 A9.2(4) EIRP limit is the lesser of 4 W (30.0 dBm) or 23 + 10 $\log_{10}$ B, where B is the previously measured 99% emission bandwidth in MHz. The limit for each channel was calculated as below:

5.725-5.85 GHz band

802.11a 20 MHz channel width / Bottom channel = *23 + 10 $\log_{10}$ 16.8 = 35.3 dBm*
802.11a 20 MHz channel width / Middle channel = *23 + 10 $\log_{10}$ 17.0 = 35.3 dBm*
802.11a 20 MHz channel width / Top channel = *23 + 10 $\log_{10}$ 17.1 = 35.3 dBm*
802.11n 20 MHz channel width / Bottom channel = 23 + *10 $\log_{10}$ 18.0 = 35.6 dBm*
802.11n 20 MHz channel width / Middle channel = *23 + 10 $\log_{10}$ 18.0 = 35.6 dBm*
802.11n 20 MHz channel width / Top channel = *23 + 10 $\log_{10}$ 17.9 = 35.5 dBm*

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

5. 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

Results: 802.11a / 20 MHz / 6 Mbps / BPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	7.9	3.0	10.9	30.0	19.1	Complied
Middle	5785	7.7	3.0	10.7	30.0	19.3	Complied
Top	5825	8.3	3.0	11.3	30.0	18.7	Complied

Results: 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	8.6	3.0	11.6	30.0	18.4	Complied
Middle	5785	8.0	3.0	11.0	30.0	19.0	Complied
Top	5825	8.5	3.0	11.5	30.0	18.5	Complied

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M127	Spectrum Analyzer	FSEB 30	13 Aug 2013	12
A2142	Attenuator	AN18-20	25 May 2013	12
M260	Signal Generator	SMP02	14 Jun 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.8. Transmitter Peak Power Spectral Density

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	04 December 2012
Test Sample Serial Numbers:	0272-01-000833		

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)3)b), Method SA-1

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	28

Note(s):

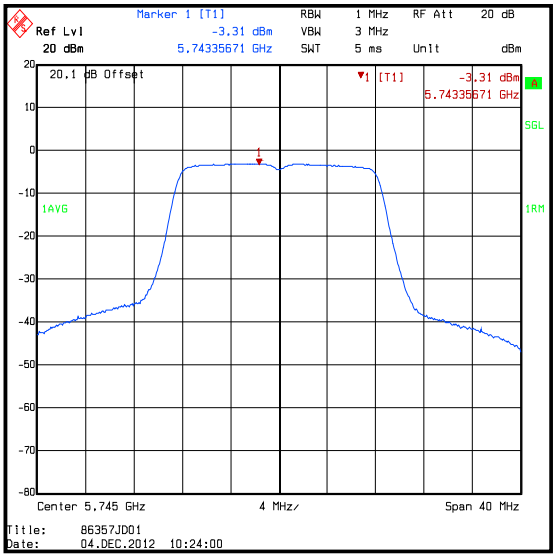
1. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth (worst case) were:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802.11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

    Measurements were then performed on the relevant mode on bottom, middle and top channels.
2. FCC Part 15.407(a)(3) & Industry Canada RSS-210 A9.2(4) limit for PPSD in the 5.725-5.850 GHz operating band is <17 dBm/MHz.

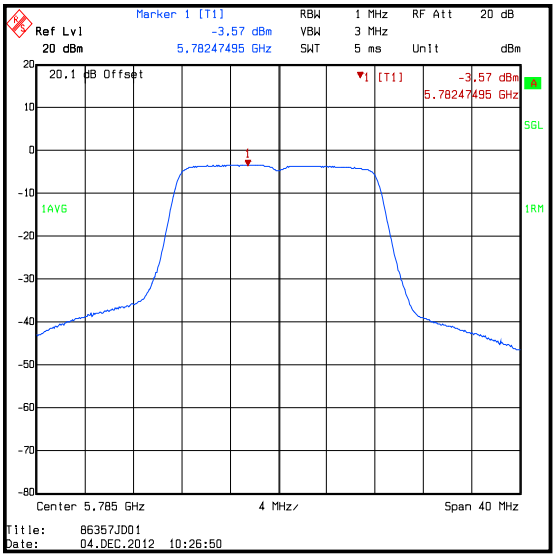
Transmitter Peak Power Spectral Density (continued)

Results: 802.11a / 20 MHz / 6 Mbps / BPSK

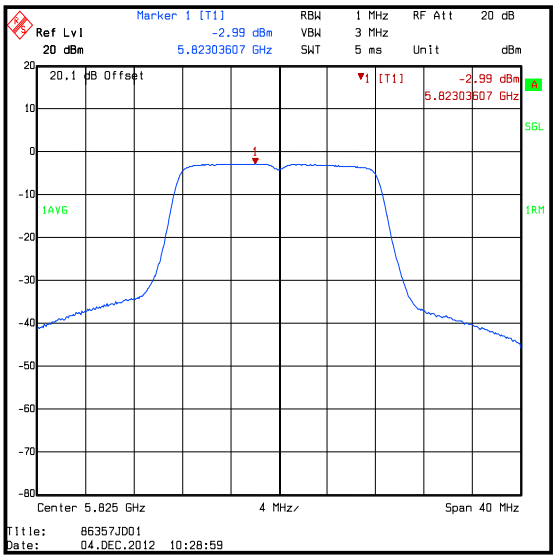
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-3.3	17.0	20.3	Complied
Middle	5785	-3.6	17.0	20.6	Complied
Top	5825	-3.0	17.0	20.0	Complied



Bottom Channel



Middle Channel

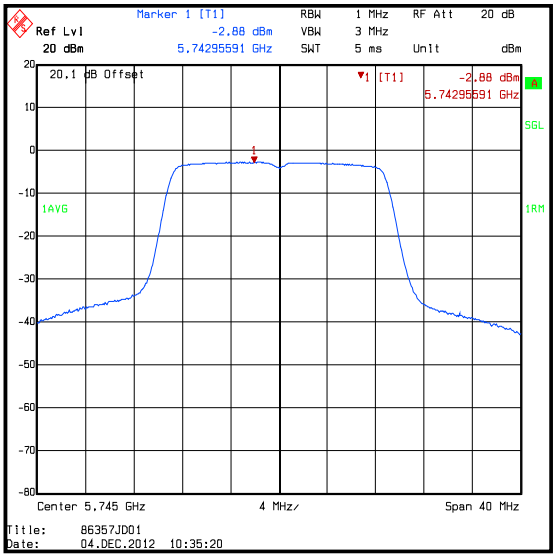


Top Channel

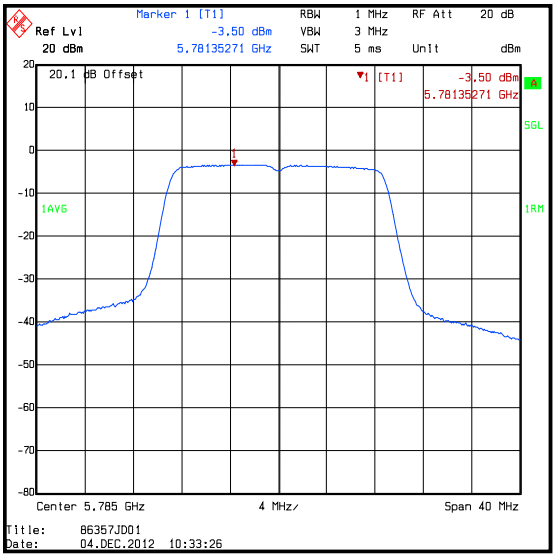
Transmitter Peak Power Spectral Density (continued)

Results: 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0

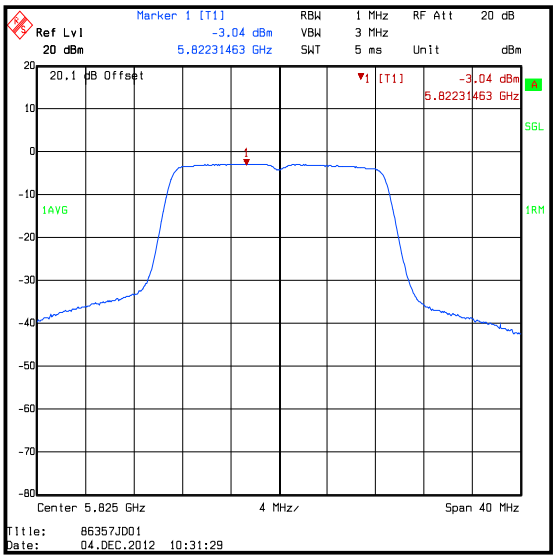
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-2.9	17.0	19.9	Complied
Middle	5785	-3.5	17.0	20.5	Complied
Top	5825	-3.0	17.0	20.0	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Peak Power Spectral Density (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M127	Spectrum Analyzer	FSEB 30	13 Aug 2013	12
A2142	Attenuator	AN18-20	25 May 2013	12
M260	Signal Generator	SMP02	14 Jun 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.9. Transmitter Peak Excursion

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	11 December 2012
Test Sample Serial Number:	0272-01-000833		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	30

Note(s):

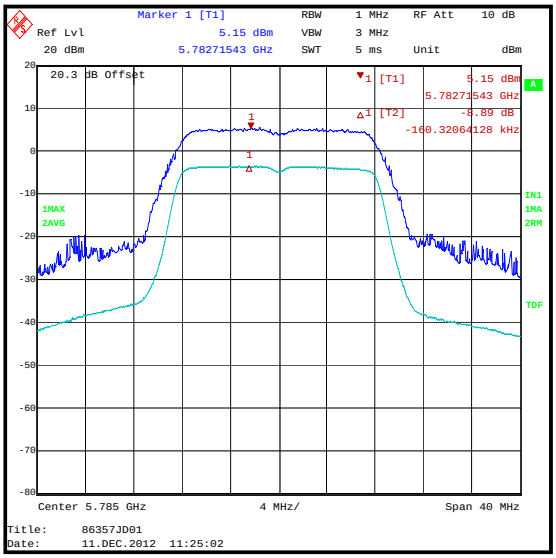
1. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power in the 5.725-5.850 GHz band were:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802. 11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

    Measurements were then performed with the EUT transmitting on the middle channel.
2. 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. A delta marker was placed of at the peak of the second trace. The peak excursion is the delta between the two markers.
3. The highest peak excursion was compared to the limit in order to obtain the margin.
4. The EUT was transmitting at >99% duty cycle.

Transmitter Peak Excursion (continued)

Results: 802.11a / 20 MHz / 6 Mbps / BPSK

Band (GHz)	Middle Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5.725-5.850	5785	8.9	13.0	4.1	Complied

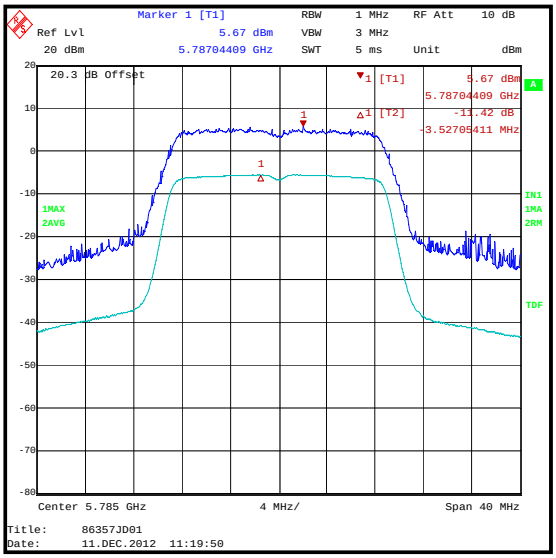


Middle Channel / 5.725-5.850 GHz band

Transmitter Peak Excursion (continued)

Results: 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK

Band (GHz)	Middle Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5.725-5.850	5785	11.4	13.0	1.6	Complied



Middle Channel / 5.725-5.850 GHz band

Transmitter Peak Excursion (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0002	3m RSE Chamber	N/A	04 Nov 2013	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	04 Nov 2013	12
A1396	Attenuator	6810.17.B	06 Jul 2013	12
A253	Horn Antenna	12240-20	04 Nov 2013	12

5.2.10. Transmitter Out of Band Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	14 December 2012
Test Sample Serial Numbers:	0270-01-006088 & 0272-01-000833		

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):	23
Relative Humidity (%):	28

Note(s):

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.
2. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
3. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only. Emissions from all antennas were investigated.
4. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions (continued)

Results: Internal Antenna / Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
126.545	Horizontal	16.2	43.5	27.3	Complied

Results: Internal Antenna / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
906.265	Horizontal	-72.6	-27.0	45.6	Complied

Results: Inside WLAN Antenna with 10cm RF cable / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
559.993	Horizontal	-51.9	-27.0	24.9	Complied

Results: WLAN RP-SMA Antenna / Top Channel / EIRP

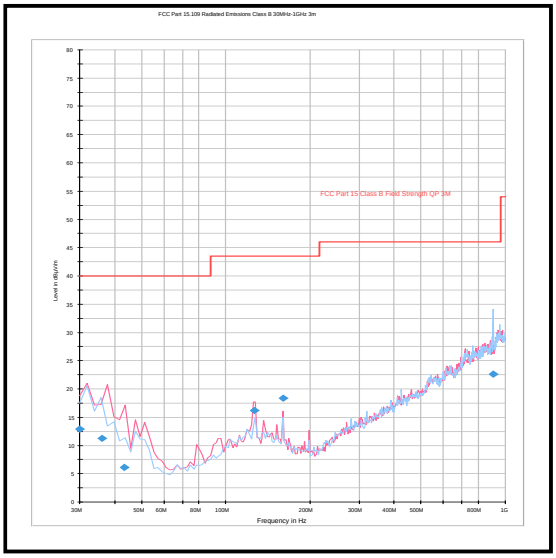
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
607.985	Vertical	-59.4	-27.0	32.4	Complied

Results: EPA ProAnt (5 GHz) Antenna / Top Channel / EIRP

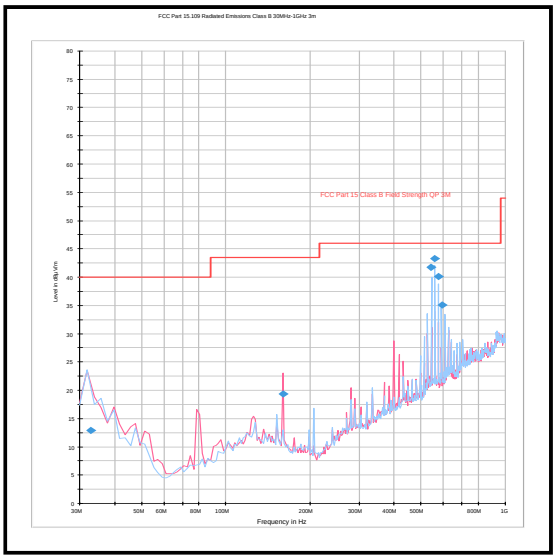
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
431.986	Vertical	-63.3	-27.0	36.3	Complied

Transmitter Out of Band Radiated Emissions (continued)

Results: Internal Antenna / Top Channel

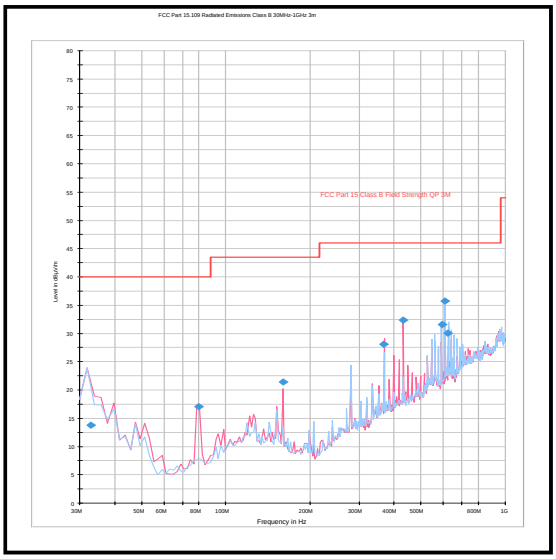


Results: Inside WLAN Antenna with 10cm RF cable / Top Channel

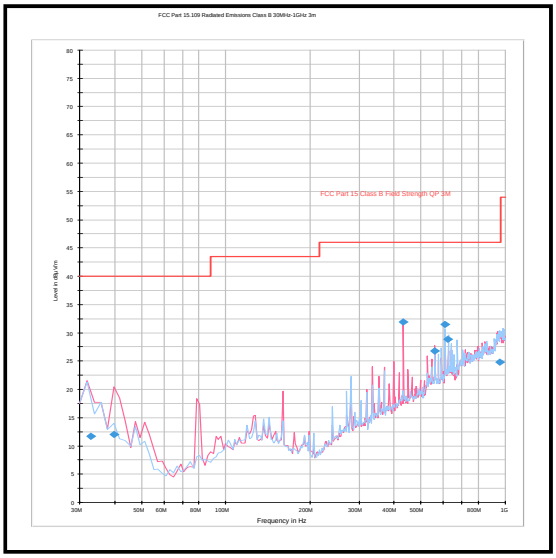


Transmitter Out of Band Radiated Emissions (continued)

Results: WLAN RP-SMA Antenna / Top Channel



Results: EPA ProAnt (5 GHz) Antenna / Top Channel



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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0001	5m RSE Chamber	N/A	24 Oct 2013	12
M1273	Test Receiver	ESIB 26	08 Feb 2013	12
A1834	Attenuator	8491B	29 Jan 2013	12
G0543	Amplifier	310N	02 Jan 2013	03
A553	Bi-log Antenna	CBL6111A	15 Feb 2013	12

Transmitter Out of Band Radiated Emissions (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	10 December 2012 & 11 December 2012
Test Sample Serial Numbers:	0270-01-006088 & 0272-01-000833		

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

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	30 to 31

Note(s):

1. FCC Part 15.407(b)(4) states for transmitters operating in the band 5.725 to 5.825 GHz: all emissions outside of the band will not exceed -17 dBm/MHz e.i.r.p from the band edges to 10 MHz above or below the band edge and -27 dBm/MHz EIRP for frequencies above 10 MHz above or below the band edges. Part(b)(7) states the provisions of 15.205 apply e.g. restricted bands of operation.
2. Industry Canada RSS-210 A9.2(4) states emissions outside the band 5725 to 5825 MHz shall not exceed -17 dBm/MHz e.i.r.p from the band edges to 10 MHz above or below the band edge and -27 dBm/MHz EIRP for frequencies above 10 MHz above or below the band edges.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. All other emissions shown on the pre-scan plots were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
5. The emission shown on the 4 GHz to 6 GHz plot is the EUT fundamental.
6. Measurements were performed across the two restricted bands closest to the bands of operation with the EUT transmitting on the top channel in the 5.725 to 5.85 GHz band. Plots are included in this section of the test report. Peak and average measurements were made.
7. In accordance with FCC KDB 789033 G) Para 1) c) if the peak measurement is below the average limit, then average measurements are not required.
8. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions (continued)

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11497.562	Horizontal	-38.8	-27.0	11.8	Complied
17232.900	Vertical	-44.1	-27.0	17.1	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11497.562	Horizontal	56.4	74.0	17.6	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11497.982	Horizontal	43.2	54.0	10.8	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11570.449	Horizontal	-38.0	-27.0	11.0	Complied
17355.951	Vertical	-42.5	-27.0	15.5	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11570.449	Horizontal	57.2	74.0	16.8	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11571.182	Horizontal	42.6	54.0	11.4	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11651.461	Horizontal	-35.7	-27.0	8.7	Complied
17474.800	Vertical	-37.6	-27.0	10.6	Complied

Transmitter Out of Band Radiated Emissions (continued)

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11651.461	Horizontal	59.5	74.0	14.5	Complied

Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / Field Strength / Average

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11649.236	Horizontal	46.2	54.0	7.8	Complied

Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11484.165	Horizontal	-46.0	-27.0	19.0	Complied
17228.787	Vertical	-38.8	-27.0	11.8	Complied

Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11484.165	Horizontal	49.2	74.0	24.8	Complied

Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11569.597	Horizontal	-45.5	-27.0	18.5	Complied
17362.087	Vertical	-39.8	-27.0	12.8	Complied

Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11569.597	Horizontal	49.7	74.0	24.3	Complied

Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11650.057	Horizontal	-42.8	-27.0	15.8	Complied
17476.578	Vertical	-36.5	-27.0	9.5	Complied

Transmitter Out of Band Radiated Emissions (continued)

Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11650.057	Horizontal	52.4	74.0	21.6	Complied

Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11492.654	Horizontal	-44.8	-27.0	17.8	Complied
17233.602	Vertical	-38.6	-27.0	11.6	Complied

Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11492.654	Horizontal	50.4	74.0	23.6	Complied

Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11574.455	Horizontal	-43.6	-27.0	16.6	Complied
17343.126	Vertical	-39.1	-27.0	12.1	Complied

Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11574.455	Horizontal	51.6	74.0	22.4	Complied

Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11658.168	Horizontal	-42.4	-27.0	15.4	Complied
17465.983	Vertical	-33.6	-27.0	6.6	Complied

Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11658.168	Horizontal	52.8	74.0	21.2	Complied

Transmitter Out of Band Radiated Emissions (continued)

Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11491.702	Horizontal	-45.5	-27.0	18.5	Complied
17237.202	Vertical	-39.0	-27.0	12.0	Complied

Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11491.702	Horizontal	49.7	74.0	24.3	Complied

Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11575.412	Horizontal	-43.9	-27.0	16.9	Complied
17354.509	Vertical	-37.9	-27.0	10.9	Complied

Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / Field Strength / Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11575.412	Horizontal	51.3	74.0	22.7	Complied

Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

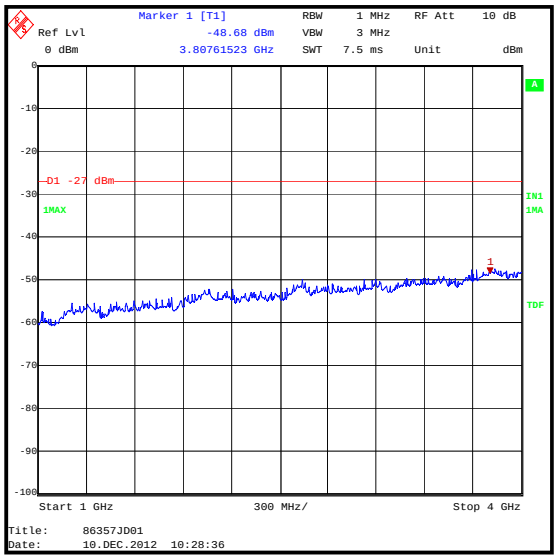
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11656.163	Horizontal	-41.3	-27.0	14.3	Complied
17478.248	Vertical	-33.3	-27.0	6.3	Complied

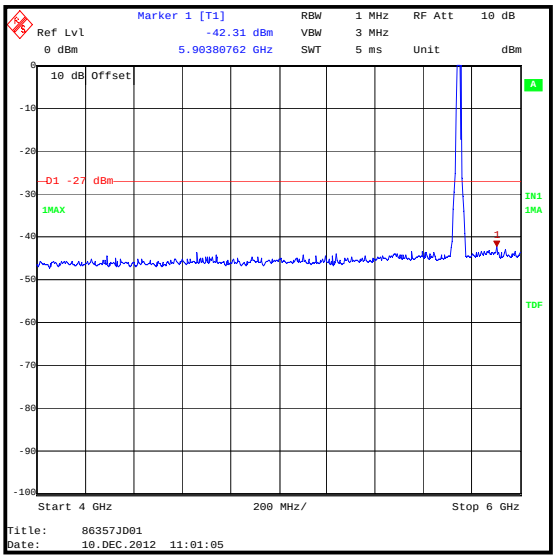
Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / Field Strength / Peak

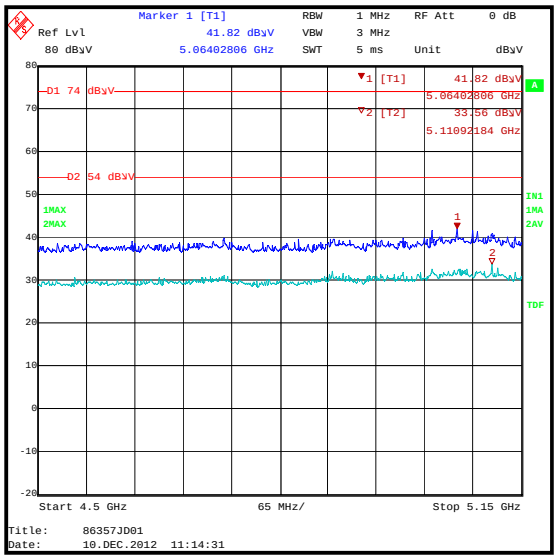
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11656.163	Horizontal	53.9	74.0	20.1	Complied

Transmitter Out of Band Radiated Emissions (continued)

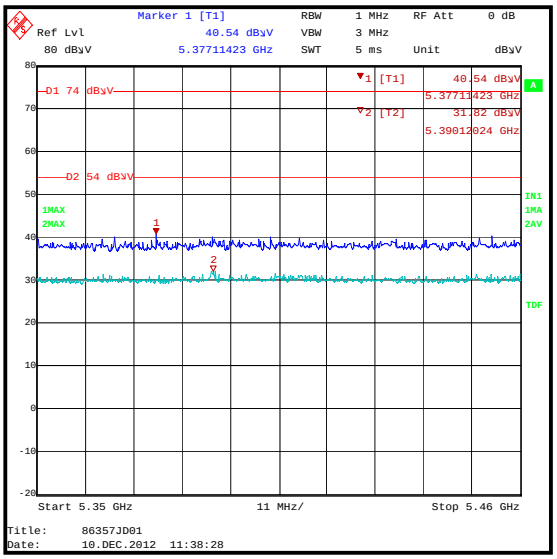
EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0







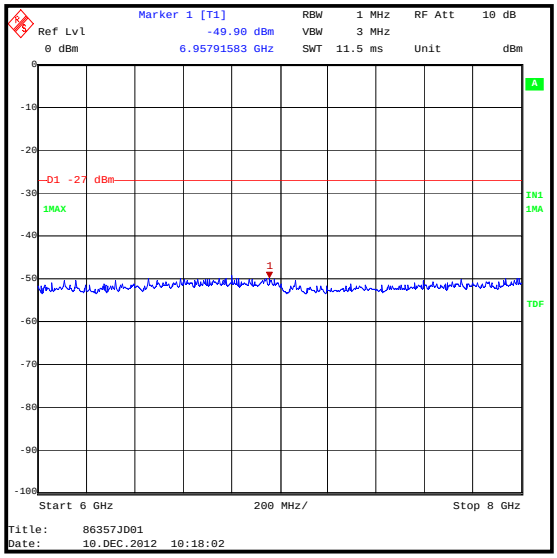
Restricted Band 4.5 GHz to 5.15 GHz

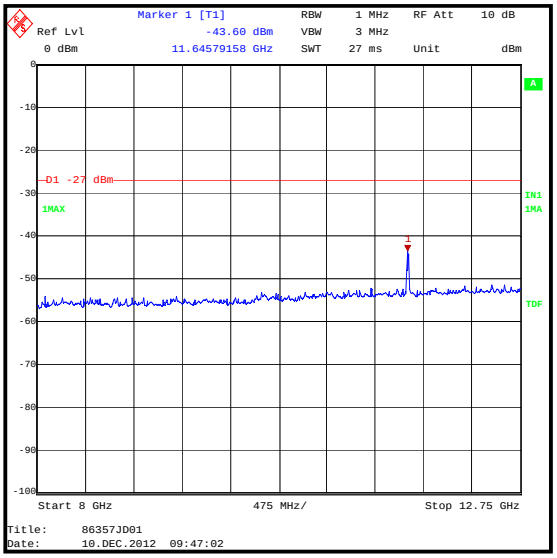


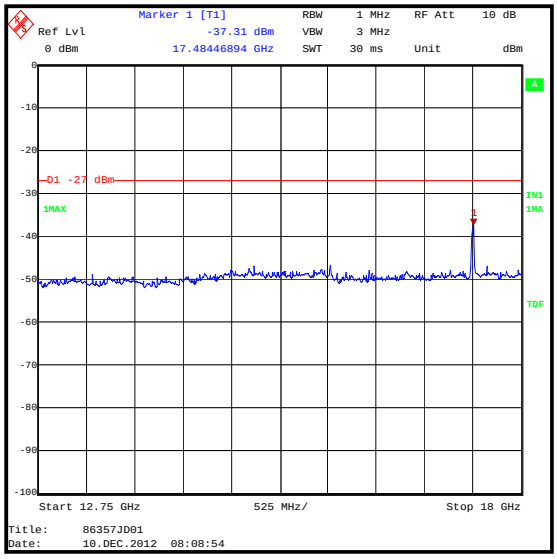
Restricted Band 5.35 GHz to 5.46 GHz

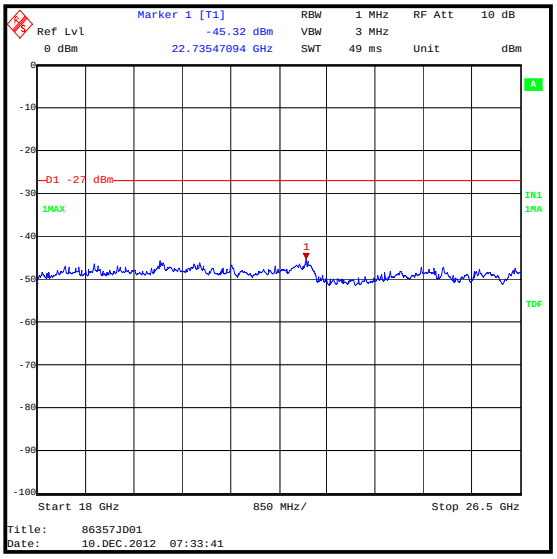
Transmitter Out of Band Radiated Emissions (continued)

EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0



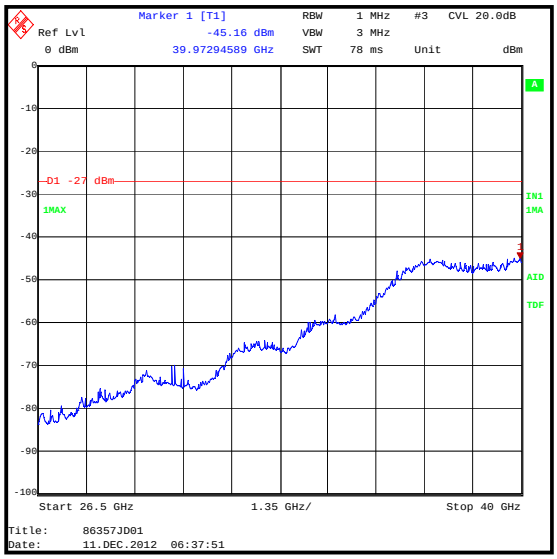






Transmitter Out of Band Radiated Emissions (continued)

EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0



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

Transmitter Out of Band Radiated Emissions (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0002	3m RSE Chamber	N/A	04 Nov 2013	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	04 Nov 2013	12
A1818	Horn Antenna	3115	04 Nov 2013	12
A253	Horn Antenna	12240-20	04 Nov 2013	12
A254	Horn Antenna	14240-20	04 Nov 2013	12
A255	Horn Antenna	16240-20	04 Nov 2013	12
A256	Horn Antenna	18240-20	04 Nov 2013	12
A436	Horn Antenna	20240-20	04 Nov 2013	12
A203	Horn Antenna	22240-20	11 May 2013	36
M1390	Harmonic Mixer	WHMP 28	Calibrated before use	-
A1785	Pre-amplifier	FLNA-28-30	Calibrated before use	-
A366	Isolator	FRR-400	Calibrated before use	-
M1269	Multimeter	179	30 Jul 2013	12

5.2.11. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	10 December 2012 & 11 December 2012
Test Sample Serial Numbers:	0270-01-006088 & 0272-01-000833		

FCC Reference:	Parts 15.407(b)(4), 15.247(d) & 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9 / RSS-210 A9.2(4)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 G)

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	30 to 31

Note(s):

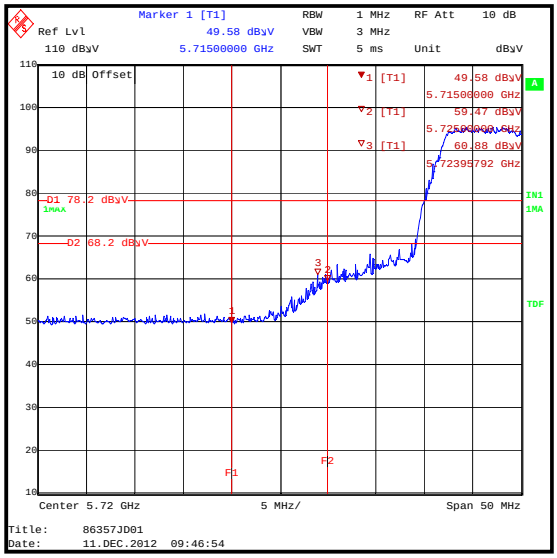
1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth for the 5.725-5.850 GHz band were:
    - 802.11a – BPSK / 6 Mbps
    - 802.11n - BPSK / 6.5 Mbps / MCS0
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 completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm as well 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.
4. The EUT is capable of transmitting on channel 165 at 5825 MHz and therefore operates under Part 15.407 in the U-NII band as well as Part 15.247 in the DTS band. The out of band emission limit at the DTS upper band edge frequency of 5850 MHz is -27 dBm in accordance with FCC document 644545 D02 Alternative Guidance for 802 11ac v01 Page 1, Note 1.

Transmitter Band Edge Radiated Emissions (continued)

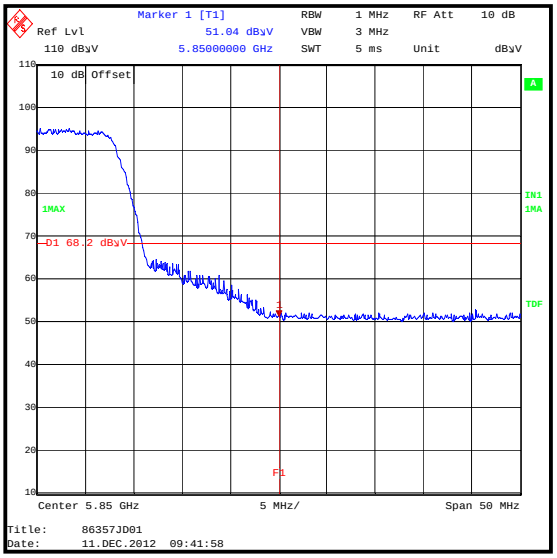
Results: Internal Antenna / 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-45.6	-27.0	18.6	Complied
5723.958	-34.3	-17.0	51.3	Complied
5725	-35.7	-17.0	18.7	Complied
5850	-44.2	-27.0	17.2	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	49.6	68.2	18.6	Complied
5723.958	60.9	78.2	17.3	Complied
5725	59.5	78.2	18.7	Complied
5850	51.0	68.2	17.2	Complied



Lower Band Edge



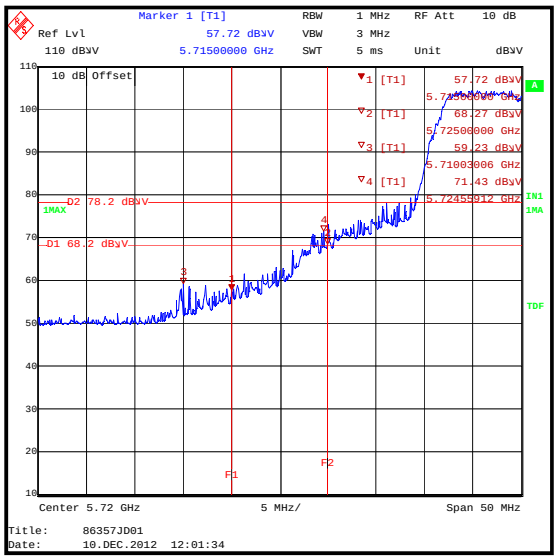
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

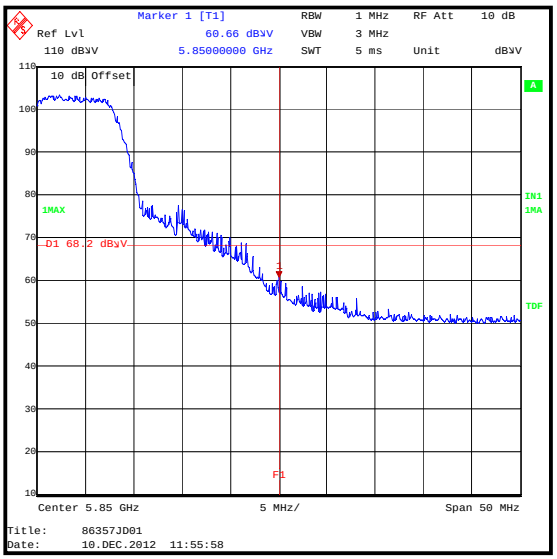
Results: Inside WLAN Antenna with 10cm RF cable / 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5710.030	-36.0	-27.0	9.0	Complied
5715	-37.5	-27.0	10.5	Complied
5724.559	-23.8	-17.0	6.8	Complied
5725	-26.8	-17.0	9.8	Complied
5850	-34.5	-27.0	7.5	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5710.030	59.2	68.2	9.0	Complied
5715	57.7	68.2	10.5	Complied
5724.559	71.4	78.2	6.8	Complied
5725	68.3	78.2	9.9	Complied
5850	60.7	68.2	7.5	Complied



Lower Band Edge



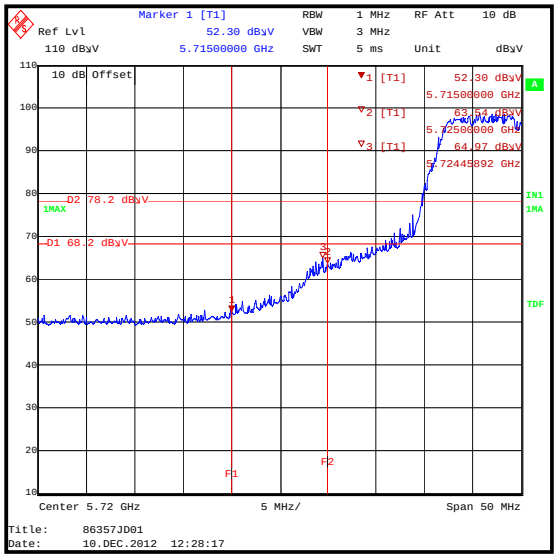
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

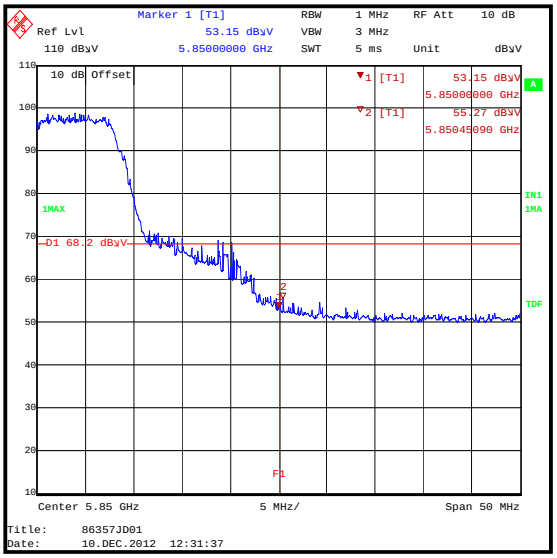
Results: WLAN RP-SMA Antenna / 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-42.9	-27.0	15.9	Complied
5724.459	-30.2	-17.0	13.2	Complied
5725	-31.7	-17.0	14.7	Complied
5850	-42.0	-27.0	15.0	Complied
5850.451	-39.9	-27.0	12.9	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	52.3	68.2	15.9	Complied
5724.459	65.0	78.2	13.2	Complied
5725	63.5	78.2	14.7	Complied
5850	53.2	68.2	15.0	Complied
5850.451	55.3	68.2	12.9	Complied



Lower Band Edge



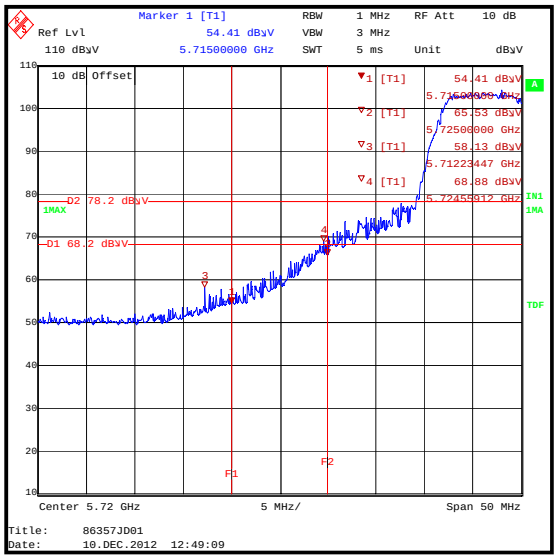
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

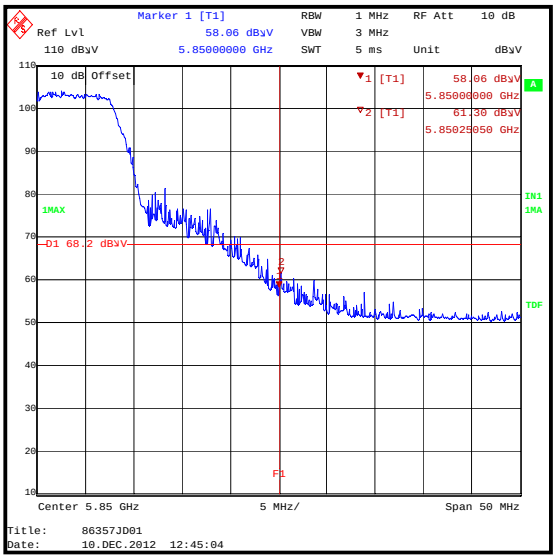
Results: EPA ProAnt (5 GHz) Antenna / 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5712.234	-37.1	-27.0	10.1	Complied
5715	-40.8	-27.0	13.8	Complied
5724.559	-26.3	-17.0	9.3	Complied
5725	-29.7	-17.0	12.7	Complied
5850	-37.1	-27.0	10.1	Complied
5850.251	-33.9	-27.0	6.9	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5712.234	58.1	68.2	10.1	Complied
5715	54.4	68.2	13.8	Complied
5724.559	68.9	78.2	9.3	Complied
5725	65.5	78.2	12.7	Complied
5850	58.1	68.2	10.1	Complied
5850.251	61.3	68.2	6.9	Complied



Lower Band Edge



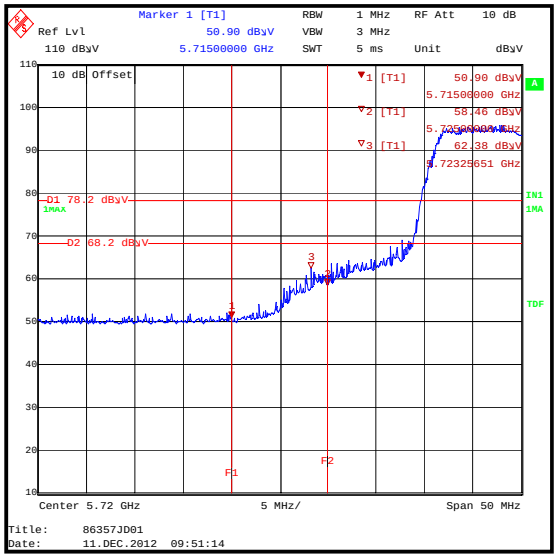
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

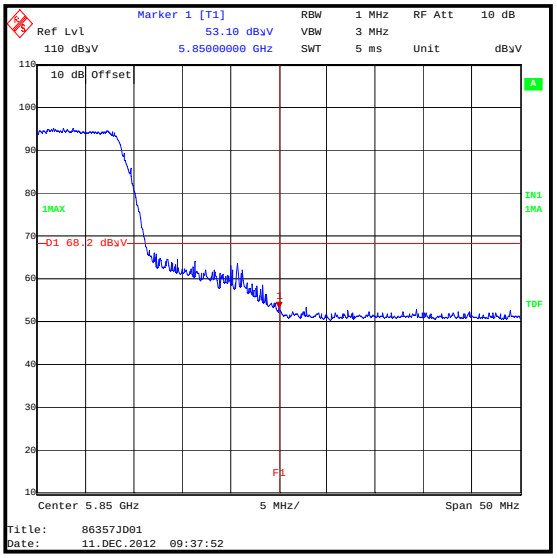
Results: Internal Antenna / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-44.3	-27.0	17.3	Complied
5723.257	-32.8	-17.0	15.8	Complied
5725	-36.7	-17.0	19.7	Complied
5850	-42.1	-27.0	15.1	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	50.9	68.2	17.3	Complied
5723.257	62.4	78.2	15.8	Complied
5725	58.5	78.2	19.7	Complied
5850	53.1	68.2	15.1	Complied



Lower Band Edge



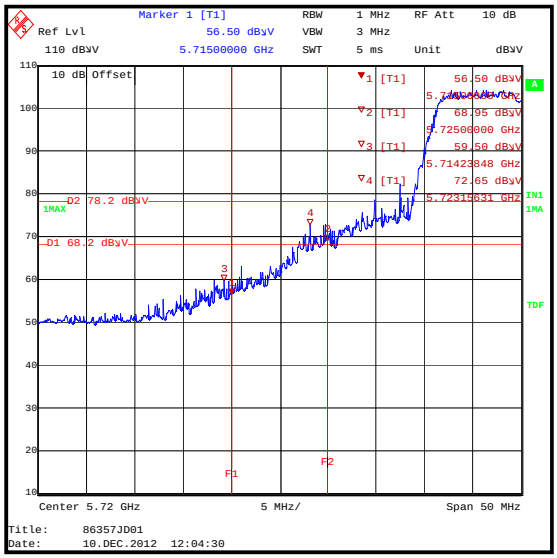
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

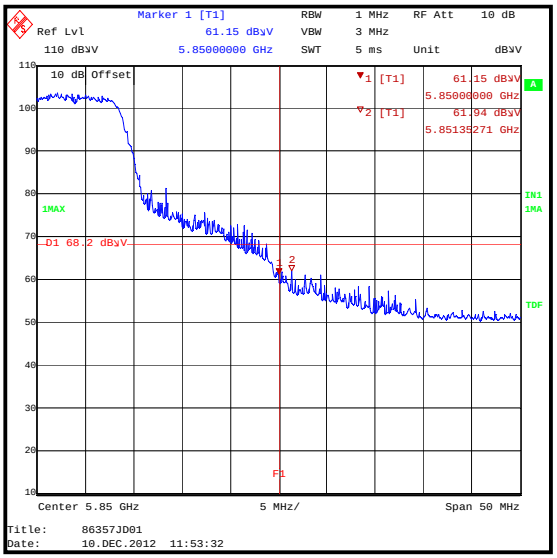
Results: Inside WLAN Antenna with 10cm RF cable / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5714.238	-35.7	-27.0	8.7	Complied
5715	-38.7	-27.0	11.7	Complied
5723.156	-22.5	-17.0	5.5	Complied
5725	-26.2	-17.0	9.2	Complied
5850	-34.0	-27.0	7.0	Complied
5851.353	-33.3	-27.0	6.3	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5714.238	59.5	68.2	8.7	Complied
5715	56.5	68.2	11.7	Complied
5723.156	72.7	78.2	5.5	Complied
5725	69.0	78.2	9.2	Complied
5850	61.2	68.2	7.0	Complied
5851.353	61.9	68.2	6.3	Complied



Lower Band Edge



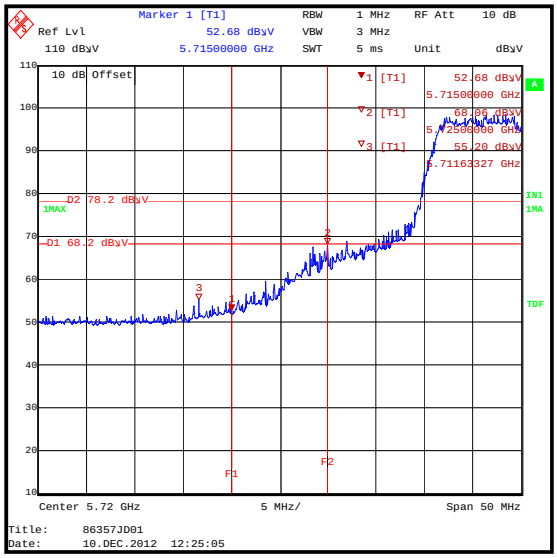
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

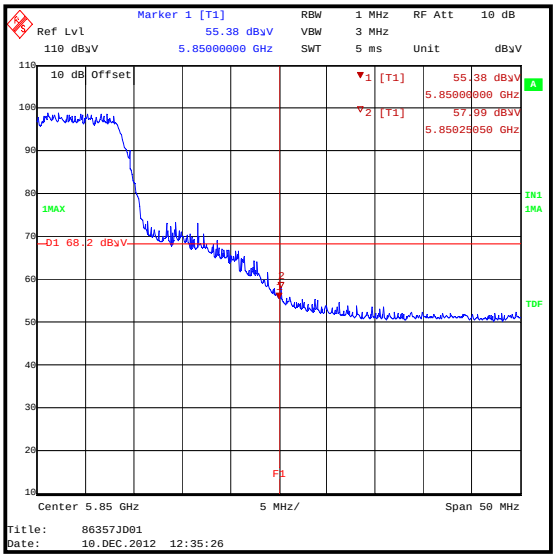
Results: WLAN RP-SMA Antenna / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5711.633	-40.0	-27.0	13.0	Complied
5715	-42.5	-27.0	15.5	Complied
5725	-27.1	-17.0	10.1	Complied
5850	-39.8	-27.0	12.8	Complied
5850.251	-37.2	-27.0	10.2	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5711.633	55.2	68.2	13.0	Complied
5715	52.7	68.2	15.5	Complied
5725	68.1	78.2	10.1	Complied
5850	55.4	68.2	12.8	Complied
5850.251	58.0	68.2	10.2	Complied



Lower Band Edge



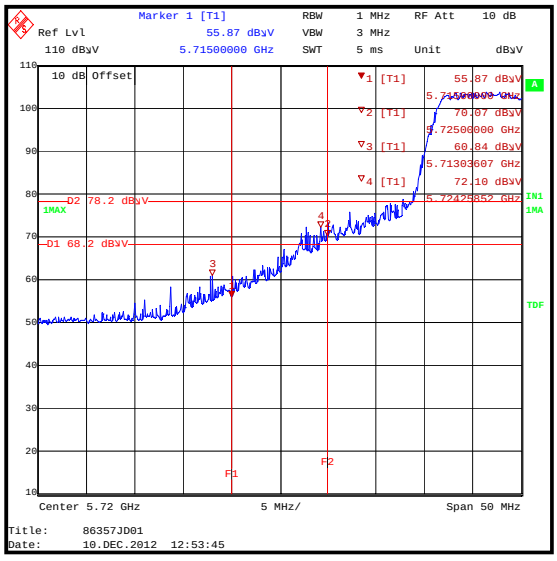
Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

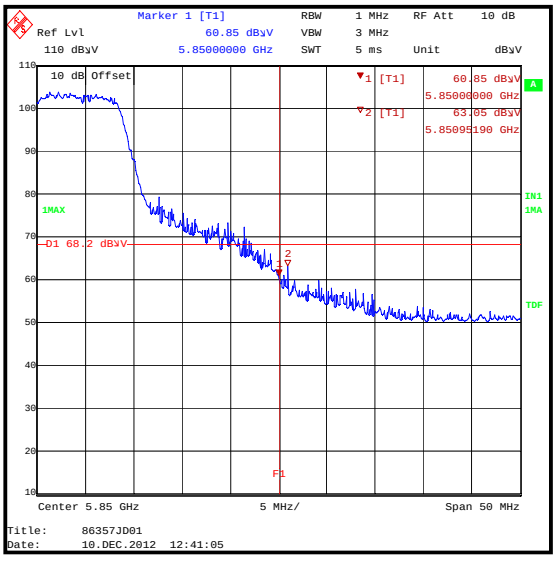
Results: EPA ProAnt (5 GHz) Antenna / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5713.036	-34.4	-27.0	7.4	Complied
5715	-39.3	-27.0	12.3	Complied
5724.259	-23.1	-17.0	6.1	Complied
5725	-25.1	-17.0	8.1	Complied
5850	-34.3	-27.0	7.3	Complied
5850.952	-32.1	-27.0	5.1	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5713.036	60.8	68.2	7.4	Complied
5715	55.9	68.2	12.3	Complied
5724.259	72.1	78.2	6.1	Complied
5725	70.1	78.2	8.1	Complied
5850	60.9	68.2	7.3	Complied
5850.952	63.1	68.2	5.1	Complied



Lower Band Edge



Upper Band Edge

Transmitter Band Edge Radiated Emissions (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0002	3m RSE Chamber	N/A	04 Nov 2013	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	04 Nov 2013	12
A1396	Attenuator	6810.17.B	06 Jul 2013	12
A253	Horn Antenna	12240-20	04 Nov 2013	12

5.2.12. Transmitter Frequency Stability

Test Engineer:	David Doyle	**Test Date:**	18 December 2012
Test Sample Serial Number:	0272-01-000833		

FCC Reference:	Part 15.407(g)
Industry Canada Reference:	RSS-Gen 4.7
Test Method Used:	FCC Part 2.1055 & ANSI C63.10 Section 6.8

Environmental Conditions:

Ambient Temperature (°C):	22
Ambient Relative Humidity (%):	33

Note(s):

1. The Customer provided test firmware version ows451_pcti_firmware_2.5.0_single_tone_release_cw.cbz for the purposes of measuring frequency stability. This firmware enabled a CW test tone at the nominal 802.11 channel/frequency selected in the test application on the support PC. The CW signal was measured using the frequency count function of a spectrum analyser over the required voltage, temperature and channel ranges. The measured frequencies that showed the greatest deviation from the nominal absolute frequency were compared to the parts per million limit to calculate the margin for each channel tested.
2. Bottom and top channels for U-NII band 3 were measured. Tests were performed as conducted measurements.
3. Testing was performed over the declared temperature and voltage ranges supported by the EUT. This includes, but is in excess of the FCC and Industry Canada requirements.
4. Temperatures and voltages were monitored throughout the testing using a calibrated thermometer and voltmeter.

Frequency stability of the EUT with variations in ambient temperature (continued)

Results:

			Time after Start-up			
			0 minutes	2 minutes	5 minutes	10 minutes
Channel	Nominal Frequency (MHz)	Temperature (°C)	Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)
Bottom	5745	-30	5744.988739	5744.992583	5744.994455	5744.991824
Bottom	5745	-20	5744.991932	5744.995425	5744.996599	5744.995078
Bottom	5745	-10	5744.995772	5744.996441	5744.996525	5744.996573
Bottom	5745	0	5744.996417	5744.995711	5744.995667	5744.995760
Bottom	5745	10	5744.995627	5744.994661	5744.994549	5744.994653
Bottom	5745	20	5744.994218	5744.992882	5744.993162	5744.992822
Bottom	5745	30	5744.992088	5744.991327	5744.991423	5744.991074
Bottom	5745	40	5744.990770	5744.991006	5744.990605	5744.991022
Bottom	5745	50	5744.991816	5744.994437	5744.993098	5744.994918
Bottom	5745	60	5744.997387	5745.001559	5745.000104	5745.002008
Bottom	5745	70	5745.010415	5745.017337	5745.013846	5745.018222
Bottom	5745	80	5745.041579	5745.058505	5745.051824	5745.062649
Bottom	5745	85	5745.084694	5745.103360	5745.096719	5745.108275

Frequency stability of the EUT with variations in ambient temperature (continued)

Results:

			Time after Start-up			
			0 minutes	2 minutes	5 minutes	10 minutes
Channel	Nominal Frequency (MHz)	Temperature (°C)	Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)
Top	5825	-30	5824.988214	5824.991128	5824.990631	5824.991461
Top	5825	-20	5824.993826	5824.994928	5824.994164	5824.994922
Top	5825	-10	5824.995182	5824.995363	5824.995054	5824.995106
Top	5825	0	5824.995030	5824.994481	5824.994567	5824.994489
Top	5825	10	5824.993900	5824.993303	5824.993315	5824.993210
Top	5825	20	5824.991980	5824.991719	5824.991547	5824.991379
Top	5825	30	5824.991351	5824.990184	5824.989804	5824.989956
Top	5825	40	5824.989743	5824.989393	5824.989467	5824.989399
Top	5825	50	5824.989764	5824.991886	5824.993204	5824.992102
Top	5825	60	5824.994122	5824.998589	5825.000549	5824.999259
Top	5825	70	5825.012595	5825.012118	5825.015501	5825.013689
Top	5825	80	5825.036166	5825.047876	5825.060377	5825.055707
Top	5825	85	5825.065551	5825.094770	5825.103836	5825.100864

Worse Case Margins:

Channel	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	5745	5745.108275	±20 ppm	18.85	Complied
Top	5825	5825.103836	±20 ppm	17.83	Complied

Frequency stability of the EUT with variations in voltage (continued)

Results (Temperature = 20°C):

Channel	Supply Voltage (VDC)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	3.3	5745	5744.994527	±20 ppm	0.95	Complied
Bottom	5.0	5745	5744.994218	±20 ppm	1.01	Complied
Bottom	5.5	5745	5744.993958	±20 ppm	1.05	Complied
Top	3.3	5825	5824.993006	±20 ppm	1.20	Complied
Top	5.0	5825	5824.991980	±20 ppm	1.38	Complied
Top	5.5	5825	5824.992617	±20 ppm	1.27	Complied

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB7	100330	15 Oct 2013	12
M1642	Thermometer	Fluke	52 II	18890119	21 Feb 2013	12
M1269	Multimeter	Fluke	179	90250210	30 July 2013	12
A2142	Attenuator	Atlantic Microwave	AN18-20	081120-23	25 May 2013	12
E013	Temperature Chamber	Sanyo	ATMOS	None	Calibrated Before Use	N/A
S021	Power supply	Thurlby Thander Instruments	CPX200	061034	Calibrated Before Use	N/A

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 5.85 GHz	95%	±0.28 dB
Peak Power Spectral Density	5.15 GHz to 5.850 GHz	95%	±0.28 dB
Peak Excursion	5.15 GHz to 5.850 GHz	95%	±0.28 dB
26 dB Emission Bandwidth	5.15 GHz to 5.850 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 40 GHz	95%	±2.94 dB
Frequency Stability	5.15 GHz to 5.850 GHz	95%	±0.92 ppm

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Minor admin correction updates

Appendix 1. Test Setup Photographs

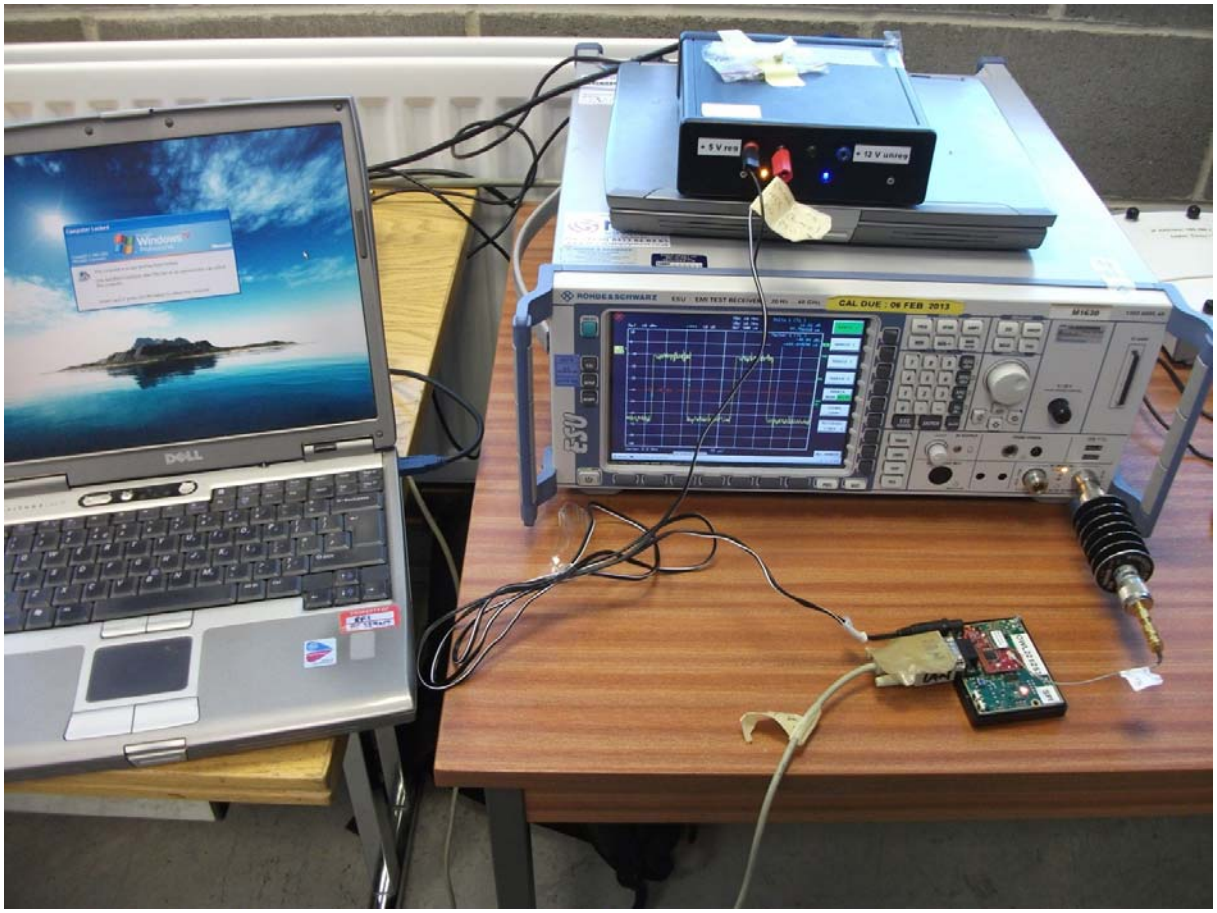


Photo #1. Conducted measurement setup showing RF connection to spectrum analyser, serial connection to laptop PC and DC connection to power supply.

Photo #2. Conducted measurement setup. The red PCB is the connectBlue module. The green PCB is the OEM Module Adaptor. The grey cable is the RF cable connected to the transmitter RF port.