TEST REPORT

Test Report No. : UL-RPT-RP86779JD03A V3.0

Manufacturer	:	connectBlue
Model No.	:	cB-0926-02 & cB-0926-03
FCC ID	:	PVH0926
IC Certification No.	:	5325A-0926
Test Standard(s)	:	FCC Part 15.407: 2012 & Industry Canada RSS-210 Issue 8 December 2010, RSS-Gen Issue 3 December 2010

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2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 3.0 supersedes all previous versions.

Date of Issue: 22 May 2013

Checked by:

Sarah Williams
WiSE Laboratory Engineer

Issued by :

pp

John Newell
Group Quality Manager, WiSE
Basingstoke,
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This laboratory is accredited by UKAS. The tests reported herein have been performed in accordance with its' terms of accreditation.

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1. Customer Information

Company Name:	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:	08 October 2012 to 13 November 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)(2)	RSS-Gen 4.8 / RSS-210 A9.2(2)	Transmitter Maximum Conducted Output Power (5.25-5.35 GHz band)	✓
Part 15.407(a)(2)	RSS-Gen 4.8 / RSS-210 A9.2(3)	Transmitter Maximum Conducted Output Power (5.47-5.725 GHz band)	✓
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-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)	✓
N/A	RSS-Gen 4.8 / RSS-210 A9.2(4)	Transmitter Maximum Equivalent Isotropically Radiated Power (EIRP) (5.725-5.850 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 band)	✓
Part 15.407(a)(2)	RSS-210 A9.2(2) & A9.2(3)	Transmitter Peak Power Spectral Density (5.47-5.725 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)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A9.2(2),(3) & (4)	Transmitter Out of Band Radiated Emissions	✓
Part 15.407(b)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A9.2(2),(3) & (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. DFS test results can be found in test report UL-RPT-RP86779JD03B.

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:	cB-0926-02 (SPI interface & internal antenna)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0213-01-000347

Brand Name:	connectBlue
Model Name or Number:	cB-0926-02 (SPI interface & external antenna connections)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0216-01-001552

Brand Name:	connectBlue
Model Name or Number:	cB-0926-02 (SPI interface & external antenna connections)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release_cw.cbz
Serial Number:	0216-01-001552

Brand Name:	connectBlue
Model Name or Number:	cB-0926-02 (SPI interface & external antenna connections)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0216-01-001503

Brand Name:	connectBlue
Model Name or Number:	cB-0926-03 (SDIO interface & internal antenna)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0217-01-000019

Identification of Equipment Under Test (continued)

Brand Name:	connectBlue
Model Name or Number:	cB-0926-03 (SDIO interface & external antenna connections)
Hardware Version:	2.10
Software Version:	ows451_pcti_firmware_2.5.0_release.cbz
Serial Number:	0219-01-001126

3.2. Description of EUT

The module with the model family name cB-0926 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 bands 2, 2e and 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_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:	5250 MHz to 5350 MHz		
Transmit & Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	52	5260
	Middle	56	5280
	Top	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
	Top	140	5700
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:	OWL SDIO

Description:	Interface Board
Brand Name:	connectBlue
Model Name or Number:	OEM Module Adaptor
Serial Number:	OWL221/253 SPI

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 5.25-5.35, 5.47-5.725 & 5.725-5.850 GHz bands were:
    - 802.11a – 6 Mbps
    - 802.11n HT20 – 6.5 Mbps / MCS0

  Measurements were performed on the required channels dependant on each test case.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth for 5.25-5.35, 5.47-5.725 & 5.725-5.850 GHz bands were:
    - 802.11a – 6 Mbps
    - 802.11n HT20 – 6.5 Mbps / MCS0

  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 0213-01-000347 (SPI module) & 0217-01-000019 (SDIO module). 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 0213-01-000347 (SPI module) & 0217-01-000019 (SDIO module). 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 0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module). 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 0216-01-001552 (SPI module).
- Conducted output power, EIRP and peak power spectral density tests were performed using samples 0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module).
- The sample with serial number 0216-01-001552 was used for frequency stability tests. Firmware version ows451_pcti_firmware_2.5.0_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 Dates:**	08 October 2012 & 18 October 2012
Test Sample Serial Numbers:	0213-01-000347 (SPI module) & 0217-01-000019 (SDIO module)		

FCC Reference:	Part 15.107(a)
Test Method Used:	ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	21 to 23
Relative Humidity (%):	46 to 48

Results: SPI Module / Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	26.3	66.0	39.7	Complied
0.263	Live	21.4	61.4	40.0	Complied
2.616	Live	8.7	56.0	47.3	Complied
20.702	Live	17.3	60.0	42.7	Complied
23.996	Live	15.9	60.0	44.1	Complied
25.058	Live	26.0	60.0	34.0	Complied

Results: SPI Module / Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	22.5	56.0	33.5	Complied
0.222	Live	17.7	52.7	35.0	Complied
2.630	Live	6.2	46.0	39.8	Complied
20.756	Live	10.1	50.0	39.9	Complied
23.897	Live	11.1	50.0	38.9	Complied
25.058	Live	24.6	50.0	25.4	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results: SPI Module / Neutral / Quasi Peak

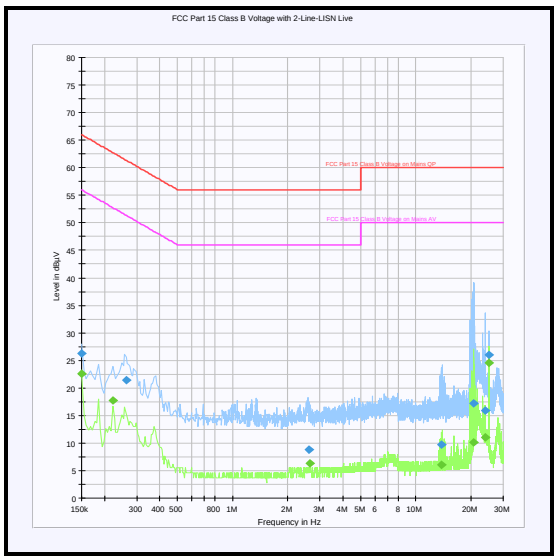
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.267	Neutral	19.4	61.2	41.8	Complied
0.384	Neutral	16.0	58.2	42.2	Complied
0.992	Neutral	8.7	56.0	47.3	Complied
20.193	Neutral	18.2	60.0	41.8	Complied
20.702	Neutral	16.7	60.0	43.3	Complied
25.058	Neutral	23.9	60.0	36.1	Complied

Results: SPI Module / Neutral / Average

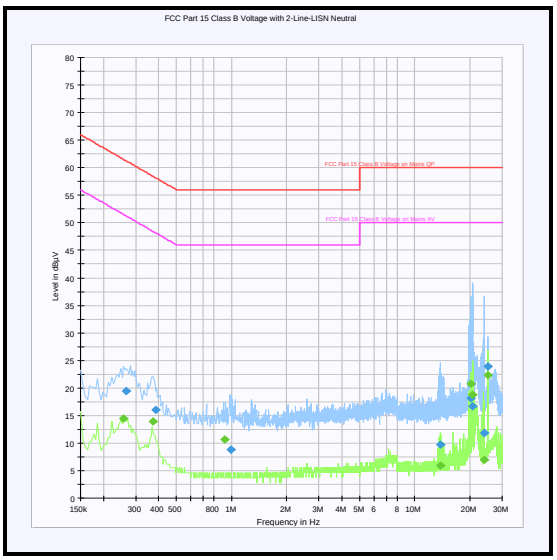
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.258	Neutral	14.5	51.5	37.0	Complied
0.375	Neutral	13.9	48.4	34.5	Complied
0.920	Neutral	10.7	46.0	35.3	Complied
20.256	Neutral	20.7	50.0	29.3	Complied
20.684	Neutral	18.7	50.0	31.3	Complied
25.058	Neutral	22.3	50.0	27.7	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results: SPI Module



Live



Neutral

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

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results: SDIO Module / Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.209	Live	16.9	63.3	46.4	Complied
0.353	Live	16.9	58.9	42.0	Complied
6.981	Live	10.9	60.0	49.1	Complied
17.241	Live	10.4	60.0	49.6	Complied
20.819	Live	11.0	60.0	49.0	Complied
26.610	Live	20.1	60.0	39.9	Complied

Results: SDIO Module / Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.258	Live	8.8	51.5	42.7	Complied
0.375	Live	11.1	48.4	37.3	Complied
7.130	Live	6.5	50.0	43.5	Complied
17.277	Live	6.1	50.0	43.9	Complied
20.760	Live	6.3	50.0	43.7	Complied
26.610	Live	15.7	50.0	34.3	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results: SDIO Module / Neutral / Quasi Peak

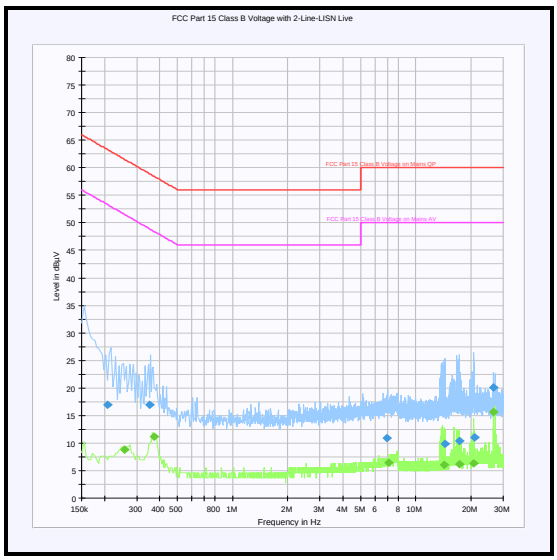
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.380	Neutral	20.1	58.3	38.3	Complied
0.389	Neutral	20.3	58.1	37.8	Complied
3.791	Neutral	11.6	56.0	44.4	Complied
4.556	Neutral	11.6	56.0	44.4	Complied
17.313	Neutral	10.8	60.0	49.2	Complied
20.702	Neutral	10.9	60.0	49.1	Complied

Results: SDIO Module / Neutral / Average

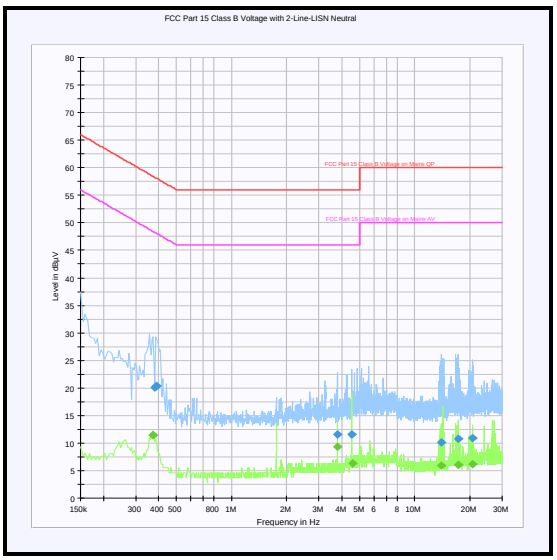
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.375	Neutral	11.5	48.4	36.9	Complied
0.375	Neutral	11.5	48.4	36.9	Complied
3.795	Neutral	9.3	46.0	36.7	Complied
13.965	Neutral	5.9	50.0	44.1	Complied
17.210	Neutral	6.0	50.0	44.0	Complied
20.778	Neutral	6.1	50.0	43.9	Complied

Receiver/Idle Mode AC Conducted Spurious Emissions (continued)

Results: SPI Module



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:**	25 October 2012
Test Sample Serial Numbers:	0213-01-000347 (SPI module) & 0217-01-000019 (SDIO module)		

FCC Reference:	Part 15.109
Industry Canada Reference:	RSS-Gen 7.2.4
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 (%):	46

Note(s):

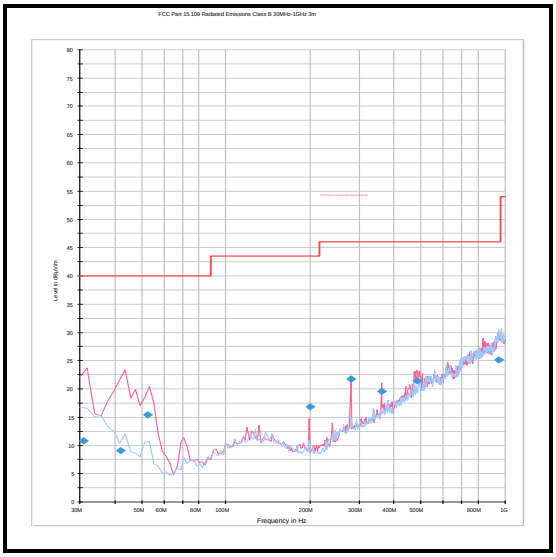
1. All emissions shown on the pre-scan plot were investigated and found to be ambient or greater than 20 dB below the applicable limits, therefore the highest noise floor level of the measurement system was recorded.
2. Pre-scans were performed on SPI and SDIO variants. Identical results were observed, SPI 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. 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: SPI Module / Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
949.367	Horizontal	25.1	46.0	20.9	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Results: SPI Module



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	03 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

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	19 October 2012
Test Sample Serial Number:	0213-01-000347 (SPI module)		

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):	23
Relative Humidity (%):	42

Note(s):

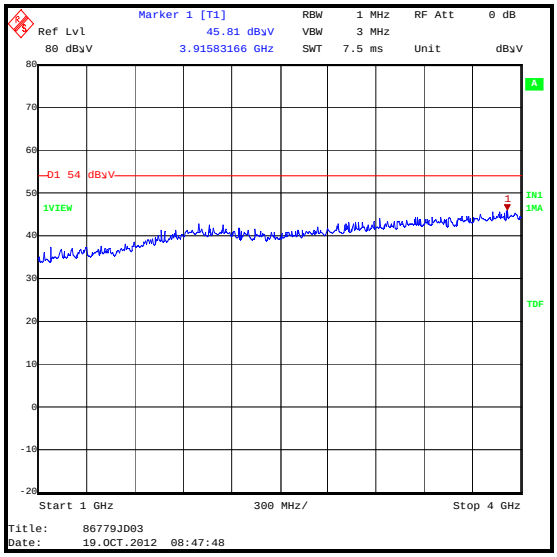
1. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
2. Pre-scans were performed on SPI and SDIO variants. Identical results were observed, SPI 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.

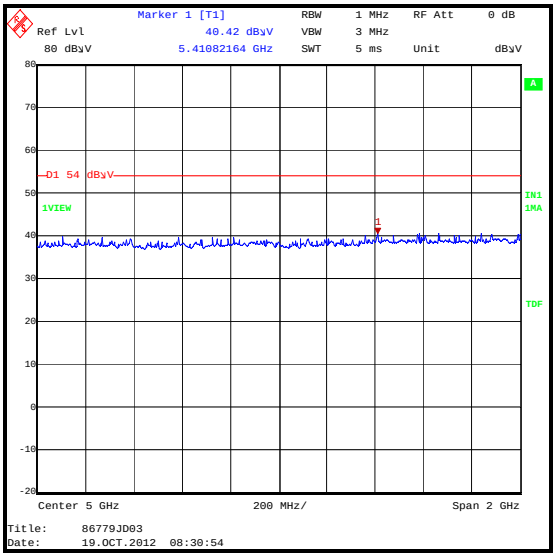
Results: SPI Module

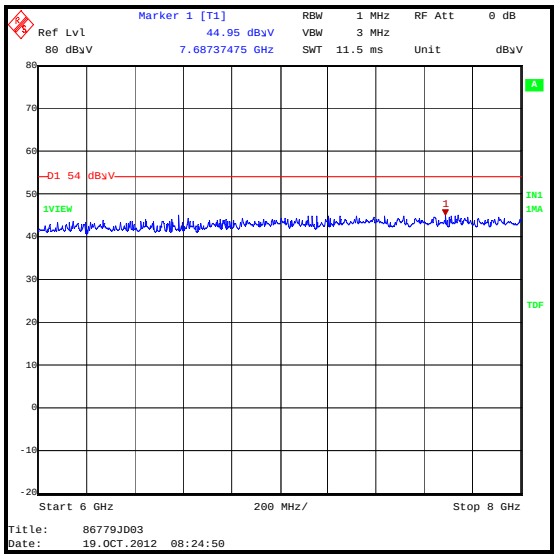
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
25937.876	Vertical	50.3	54.0	3.7	Complied

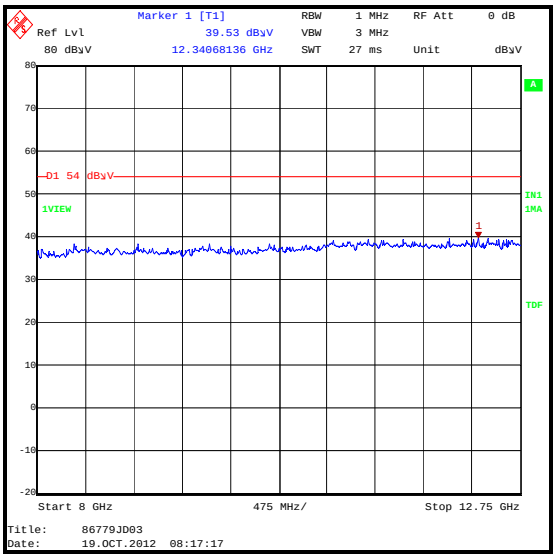
Receiver/Idle Mode Radiated Spurious Emissions (continued)

Results: SPI Module



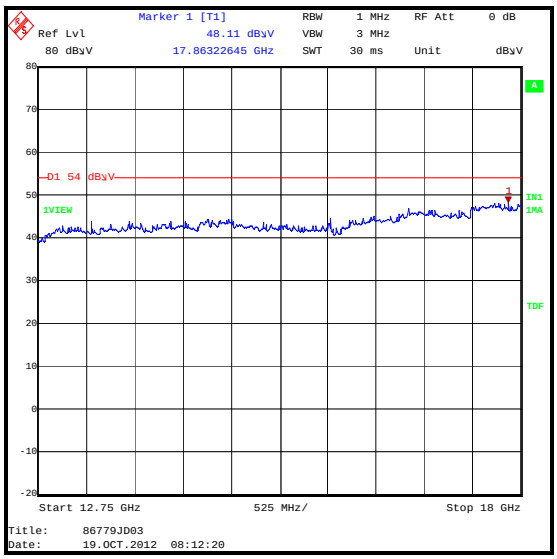


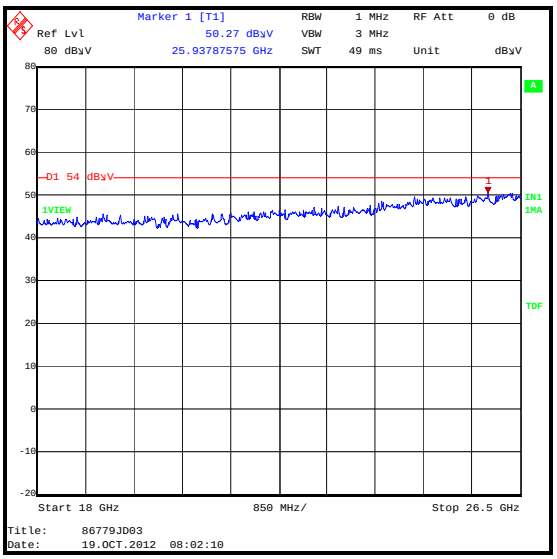


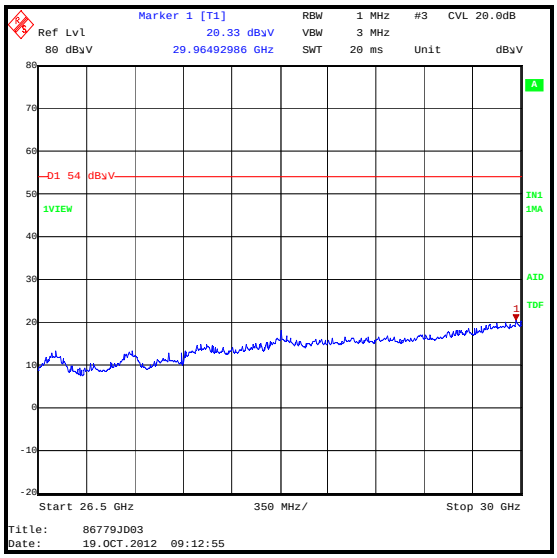


Receiver/Idle Mode Radiated Spurious Emissions (continued)

Results: SPI Module







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	30 Oct 2012	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	30 Oct 2012	12
A1818	Horn Antenna	3115	30 Oct 2012	12
A253	Horn Antenna	12240-20	30 Oct 2012	12
A254	Horn Antenna	14240-20	30 Oct 2012	12
A255	Horn Antenna	16240-20	30 Oct 2012	12
A256	Horn Antenna	18240-20	30 Oct 2012	12
A436	Horn Antenna	20240-20	30 Oct 2012	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:**	10 October 2012 & 18 October 2012
Test Sample Serial Numbers:	0213-01-000347 (SPI module) & 0217-01-000019 (SDIO module)		

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):	22 to 23
Relative Humidity (%):	46 to 48

Results: SPI Module / Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.850	Live	32.0	56.0	24.0	Complied
3.377	Live	37.1	56.0	18.9	Complied
3.534	Live	37.0	56.0	19.0	Complied
3.593	Live	37.5	56.0	18.5	Complied
3.602	Live	37.2	56.0	18.8	Complied
3.723	Live	37.1	56.0	18.9	Complied
3.926	Live	34.8	56.0	21.2	Complied
3.993	Live	32.4	56.0	23.6	Complied

Results: SPI Module / Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.531	Live	26.6	46.0	19.4	Complied
3.012	Live	29.3	46.0	16.7	Complied
3.395	Live	33.8	46.0	12.2	Complied
3.543	Live	31.6	46.0	14.4	Complied
3.633	Live	29.7	46.0	16.3	Complied
3.939	Live	27.0	46.0	19.0	Complied
4.034	Live	25.7	46.0	20.3	Complied
4.254	Live	26.6	46.0	19.4	Complied
4.425	Live	22.5	46.0	23.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: SPI Module / Neutral / Quasi Peak

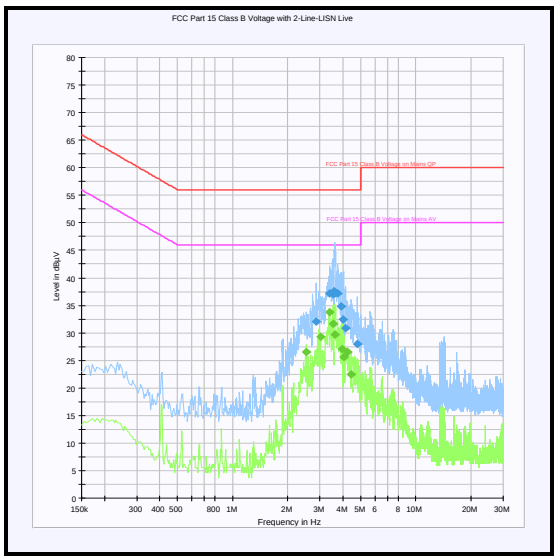
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.204	Neutral	43.4	63.4	20.0	Complied
0.542	Neutral	30.0	56.0	26.0	Complied
0.614	Neutral	30.1	56.0	25.9	Complied
0.866	Neutral	32.1	56.0	23.9	Complied
0.929	Neutral	32.3	56.0	23.7	Complied
1.046	Neutral	30.9	56.0	25.1	Complied
1.127	Neutral	31.7	56.0	24.3	Complied
1.257	Neutral	29.6	56.0	26.4	Complied
2.234	Neutral	29.7	56.0	26.3	Complied
3.723	Neutral	35.4	56.0	20.6	Complied

Results: SPI Module / Neutral / Average

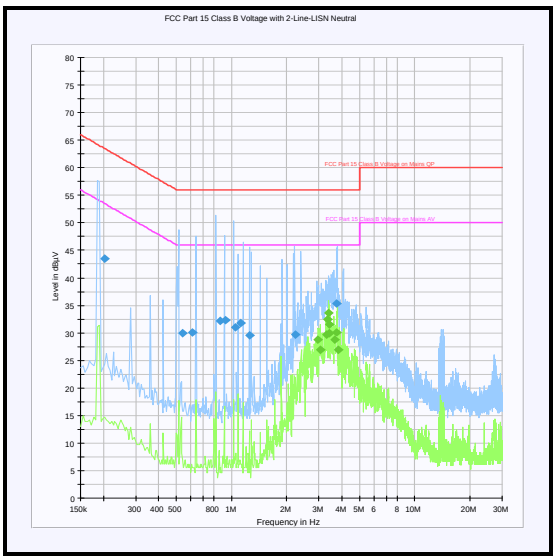
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.967	Neutral	28.7	46.0	17.3	Complied
3.044	Neutral	27.0	46.0	19.0	Complied
3.300	Neutral	29.7	46.0	16.3	Complied
3.350	Neutral	32.5	46.0	13.5	Complied
3.395	Neutral	33.6	46.0	12.4	Complied
3.431	Neutral	31.5	46.0	14.5	Complied
3.431	Neutral	30.0	46.0	16.0	Complied
3.647	Neutral	28.8	46.0	17.2	Complied
3.732	Neutral	30.0	46.0	16.0	Complied
3.840	Neutral	26.9	46.0	19.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: SPI Module



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Results: SDIO Module / Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.216	Live	30.5	56.0	25.5	Complied
2.418	Live	34.4	56.0	21.6	Complied
2.949	Live	32.6	56.0	23.4	Complied
3.552	Live	38.2	56.0	17.8	Complied
3.692	Live	38.0	56.0	18.0	Complied
3.728	Live	38.2	56.0	17.8	Complied

Results: SDIO Module / Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.013	Live	18.6	46.0	27.4	Complied
2.193	Live	22.2	46.0	23.8	Complied
2.283	Live	23.6	46.0	22.4	Complied
2.310	Live	24.6	46.0	21.4	Complied
2.405	Live	25.8	46.0	20.2	Complied
2.481	Live	25.9	46.0	20.1	Complied
2.531	Live	27.3	46.0	18.7	Complied
2.999	Live	24.1	46.0	21.9	Complied
3.521	Live	29.8	46.0	16.2	Complied
3.656	Live	28.9	46.0	17.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: SDIO Module / Neutral / Quasi Peak

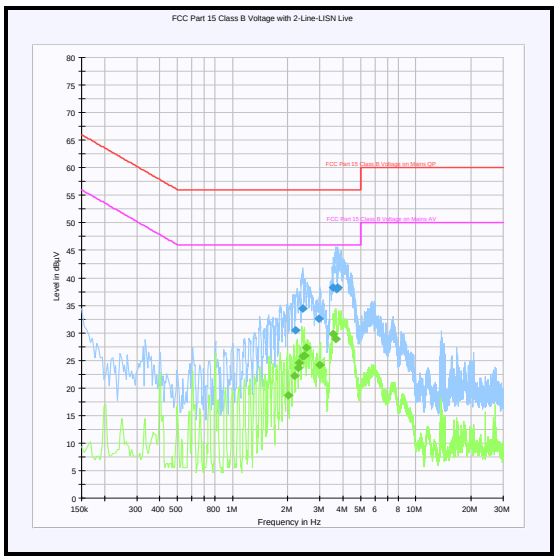
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.843	Neutral	27.6	56.0	28.4	Complied
0.974	Neutral	26.0	56.0	30.0	Complied
1.235	Neutral	26.0	56.0	30.0	Complied
3.480	Neutral	36.4	56.0	19.6	Complied
3.553	Neutral	37.6	56.0	18.4	Complied
3.670	Neutral	37.8	56.0	18.2	Complied
3.687	Neutral	37.8	56.0	18.2	Complied
3.809	Neutral	35.3	56.0	20.7	Complied
3.903	Neutral	35.6	56.0	20.4	Complied
3.948	Neutral	34.6	56.0	21.4	Complied

Results: SDIO Module / Neutral / Average

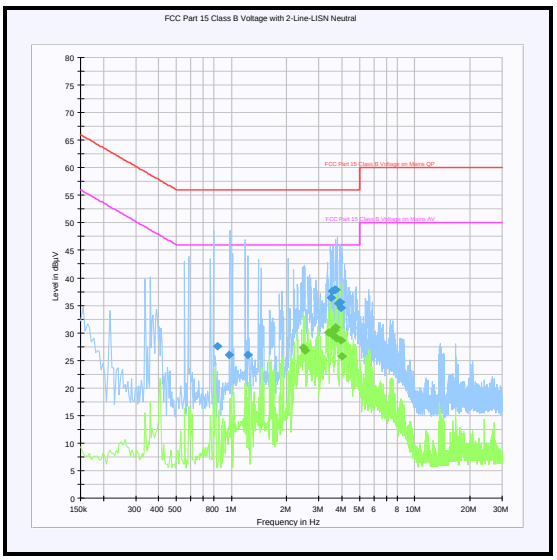
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
2.481	Neutral	27.3	46.0	18.7	Complied
2.531	Neutral	26.8	46.0	19.2	Complied
3.386	Neutral	30.1	46.0	15.9	Complied
3.521	Neutral	30.3	46.0	15.7	Complied
3.570	Neutral	29.6	46.0	16.4	Complied
3.656	Neutral	30.5	46.0	15.5	Complied
3.687	Neutral	31.0	46.0	15.0	Complied
3.723	Neutral	29.0	46.0	17.0	Complied
3.962	Neutral	28.6	46.0	17.4	Complied
3.984	Neutral	25.7	46.0	20.3	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: SDIO Module



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:**	10 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	38

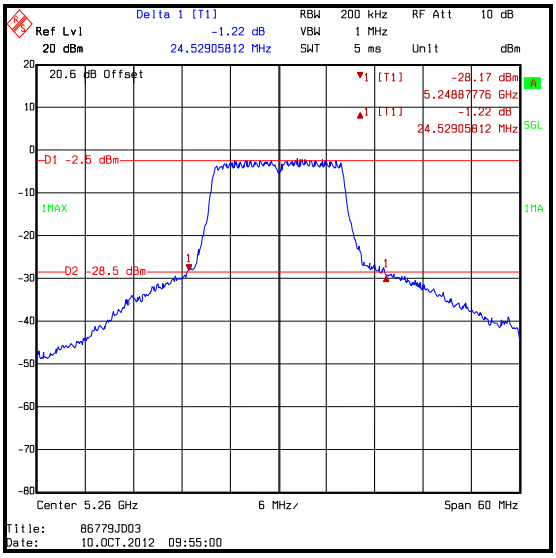
Note(s):

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 in each supported operating band using the above configurations on the bottom, middle and top channels for the SPI module. The SDIO module was spot checked on various channels and data rates and results were consistent with the SPI module, therefore only SPI module results have been reported.

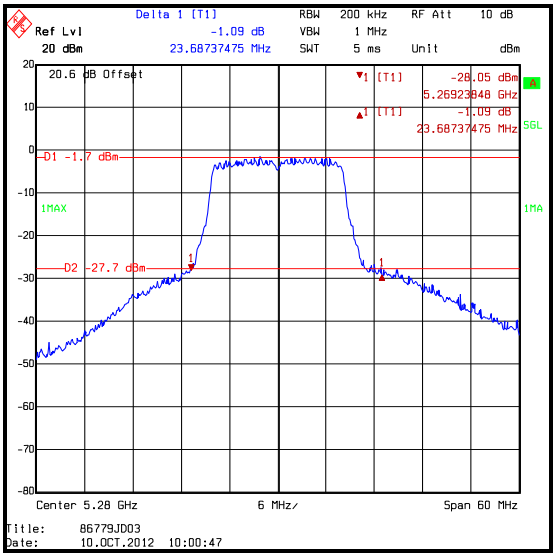
Transmitter 26 dB Emission Bandwidth (continued)

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

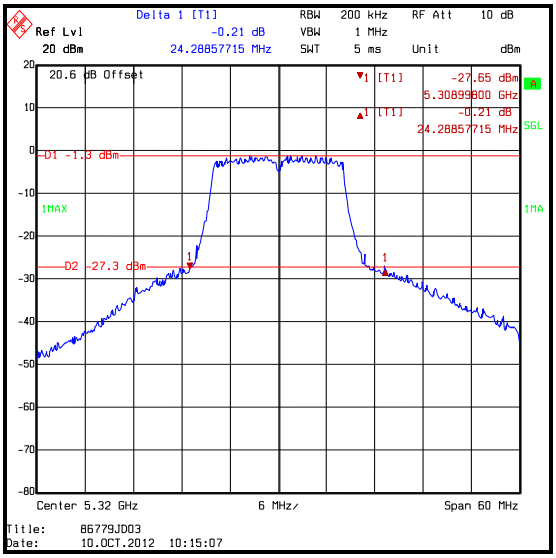
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6	24.529
Middle	5280	BPSK	6	23.687
Top	5320	BPSK	6	24.289



Bottom Channel



Middle Channel

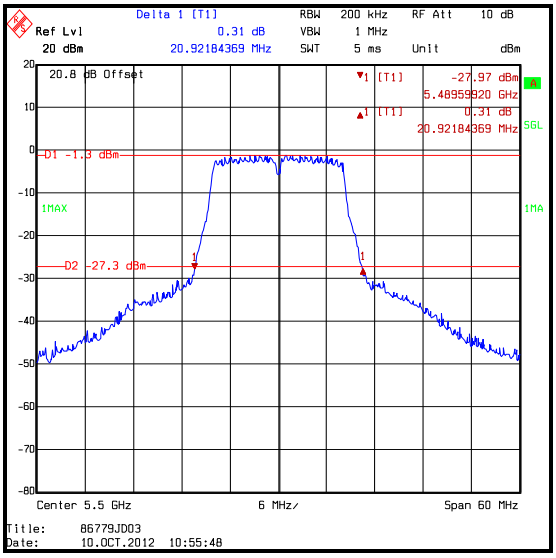


Top Channel

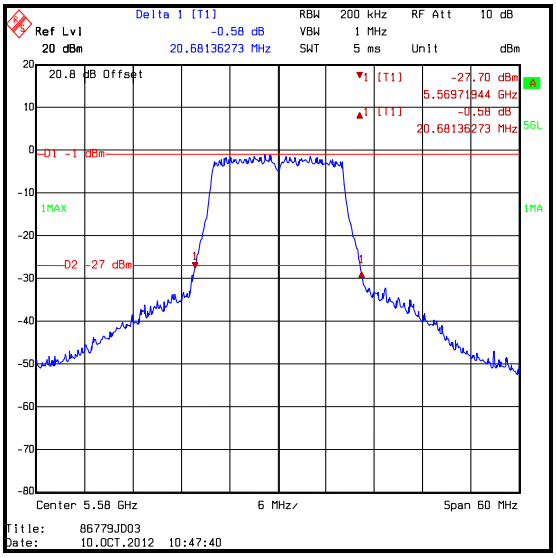
Transmitter 26 dB Emission Bandwidth (continued)

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

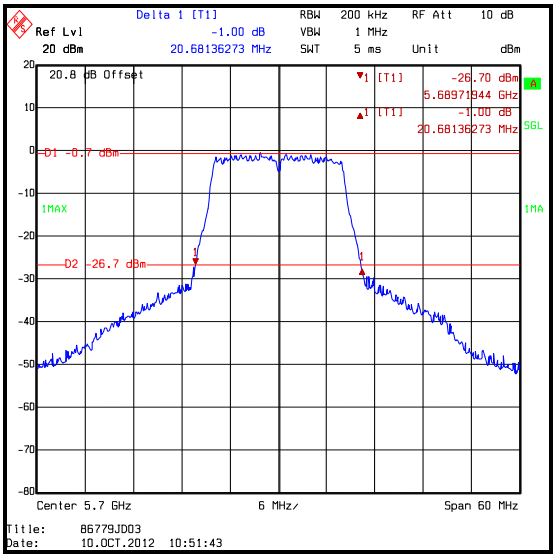
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6	20.922
Middle	5580	BPSK	6	20.681
Top	5700	BPSK	6	20.681



Bottom Channel



Middle Channel

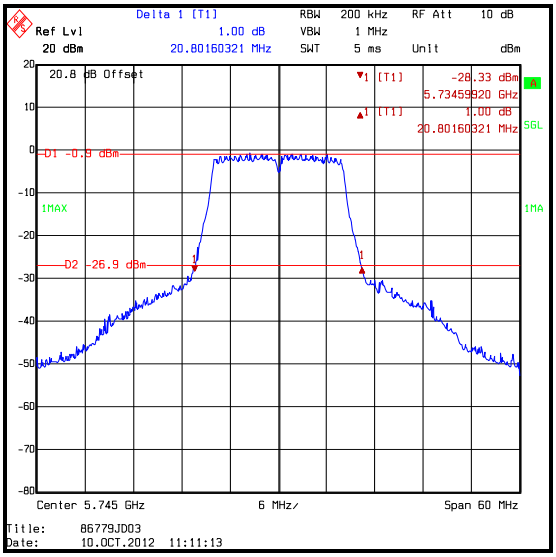


Top Channel

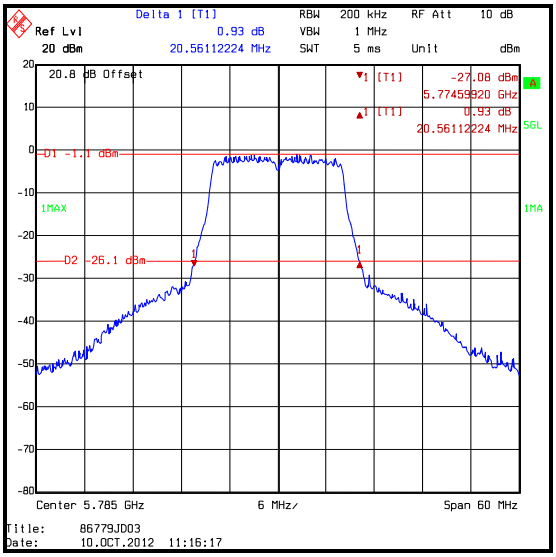
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.725-5.850 GHz band

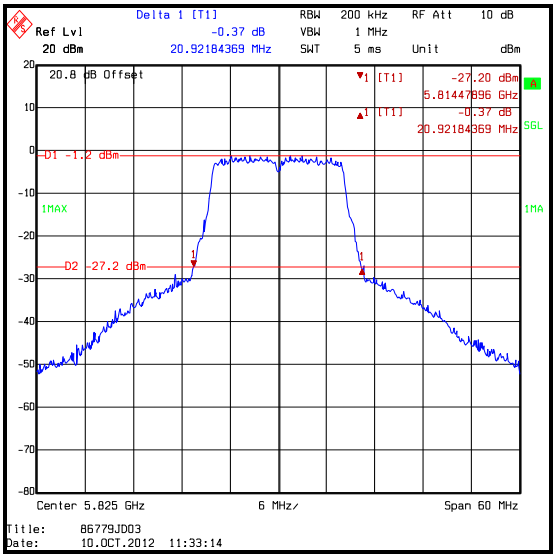
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6	20.802
Middle	5785	BPSK	6	20.561
Top	5825	BPSK	6	20.922



Bottom Channel



Middle Channel

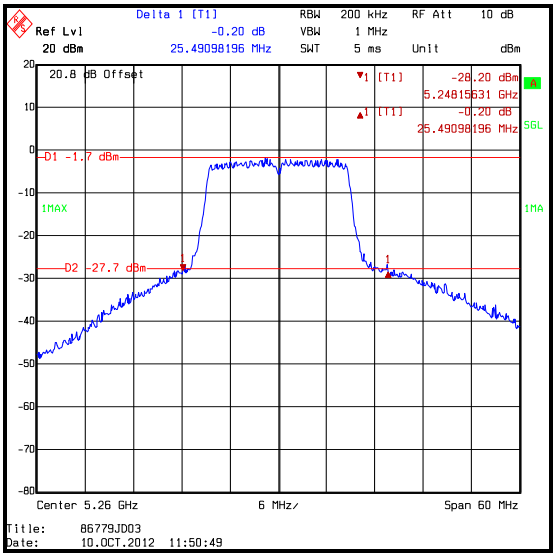


Top Channel

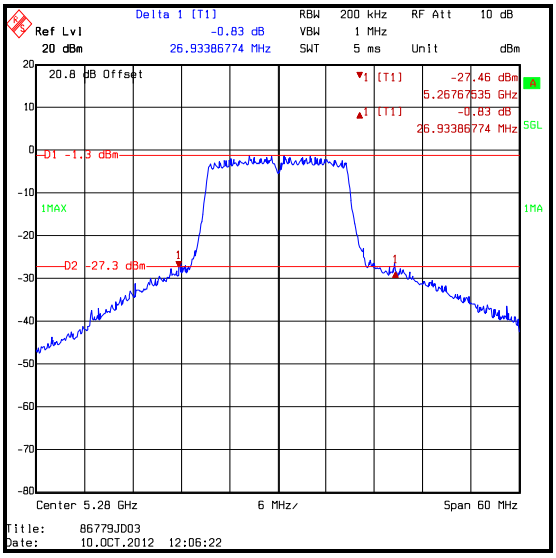
Transmitter 26 dB Emission Bandwidth (continued)

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

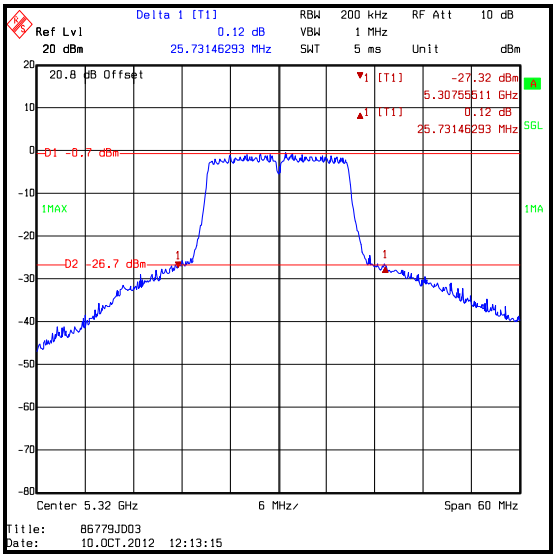
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	25.491
Middle	5280	BPSK	6.5 / 0	26.934
Top	5320	BPSK	6.5 / 0	25.731



Bottom Channel



Middle Channel

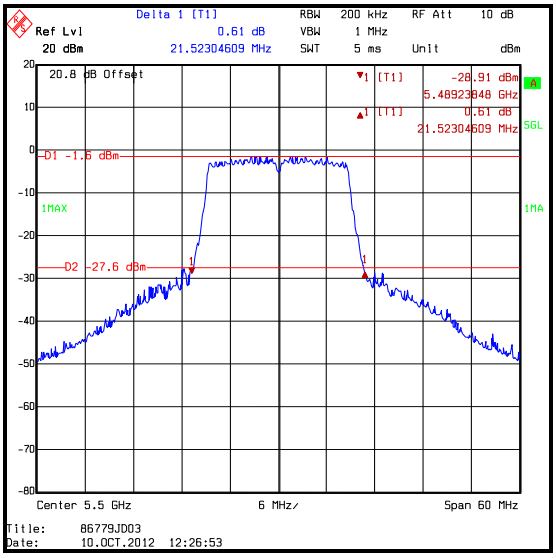


Top Channel

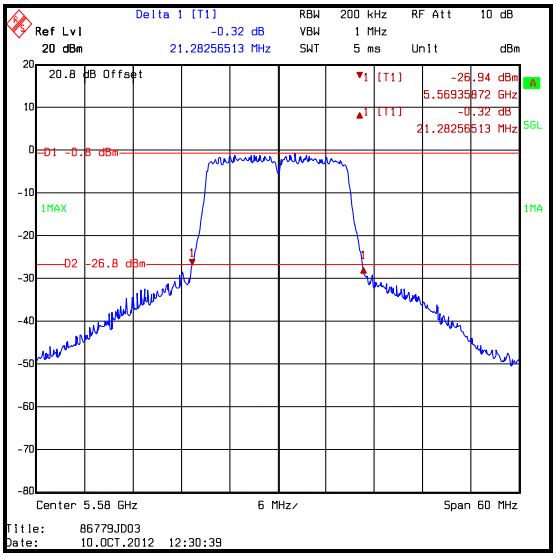
Transmitter 26 dB Emission Bandwidth (continued)

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

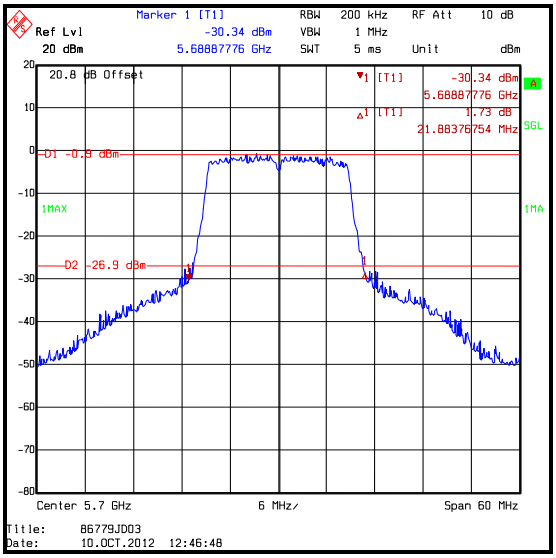
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	21.523
Middle	5580	BPSK	6.5 / 0	21.283
Top	5700	BPSK	6.5 / 0	21.884



Bottom Channel



Middle Channel

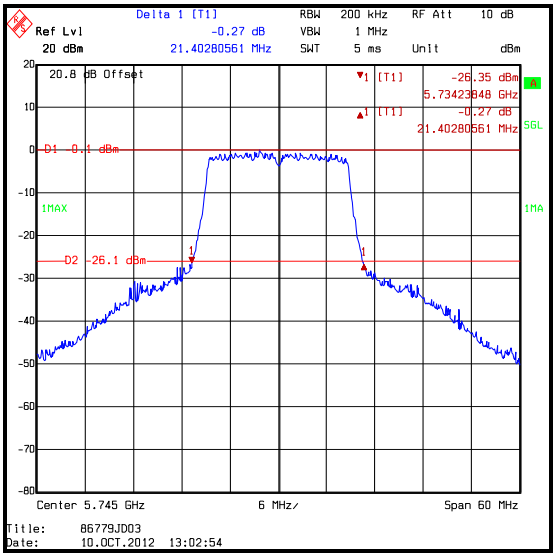


Top Channel

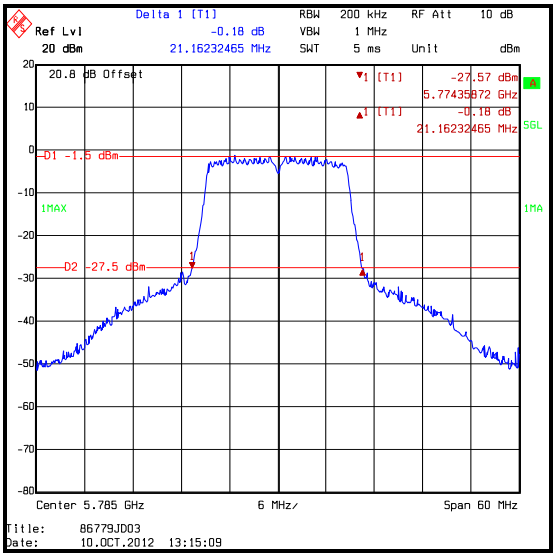
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.850 GHz band

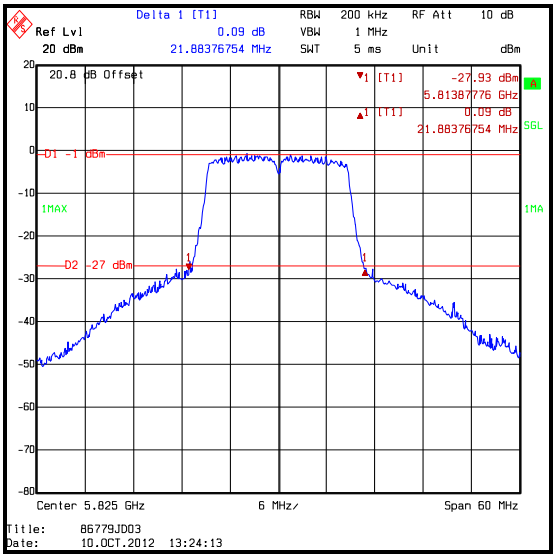
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	21.403
Middle	5785	BPSK	6.5 / 0	21.162
Top	5825	BPSK	6.5 / 0	21.884



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)
M1242	Test Receiver	FSEM30	24 Nov 2012	12
A2143	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:**	10 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	38

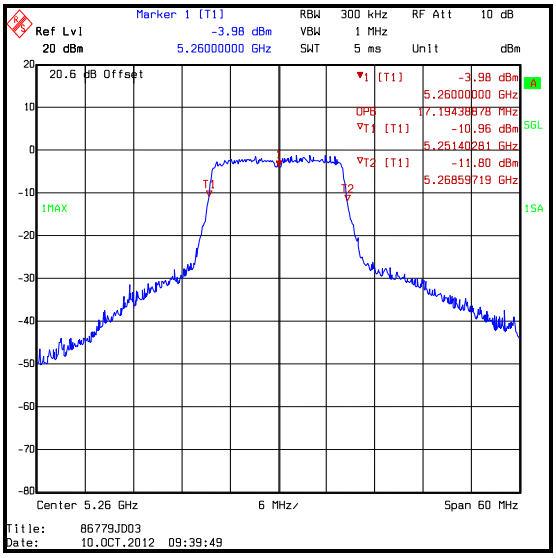
Note(s):

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 in each supported operating band using the above configurations on the bottom, middle and top channels for the SPI module. The SDIO module was spot checked on various channels and data rates and results were consistent with the SPI module, therefore only SPI module results have been reported.

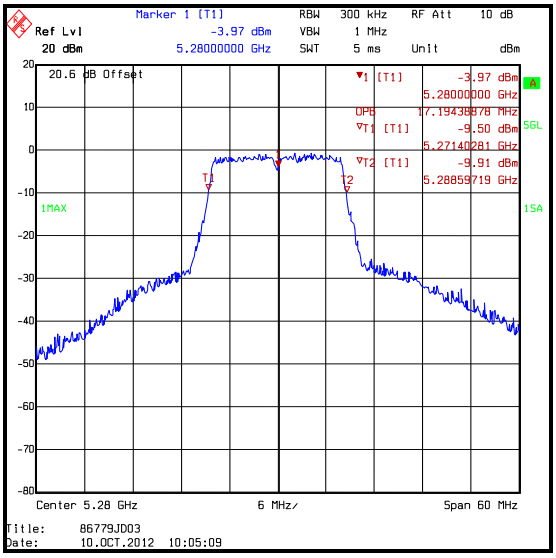
Transmitter 99% Emission Bandwidth (continued)

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

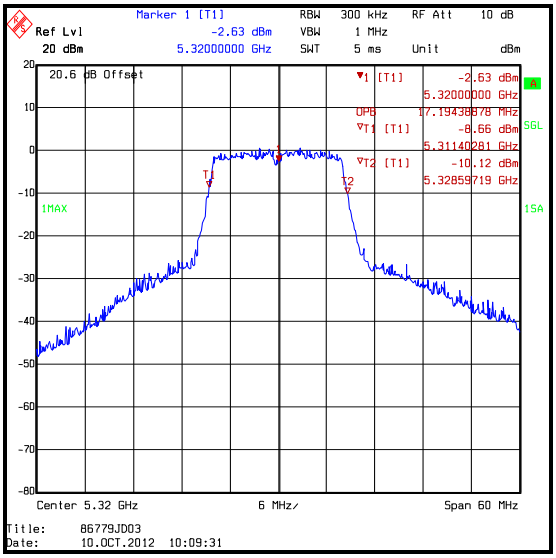
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	99 % Emission Bandwidth (MHz)
Bottom	5260	BPSK	6	17.194
Middle	5280	BPSK	6	17.194
Top	5320	BPSK	6	17.194



Bottom Channel



Middle Channel

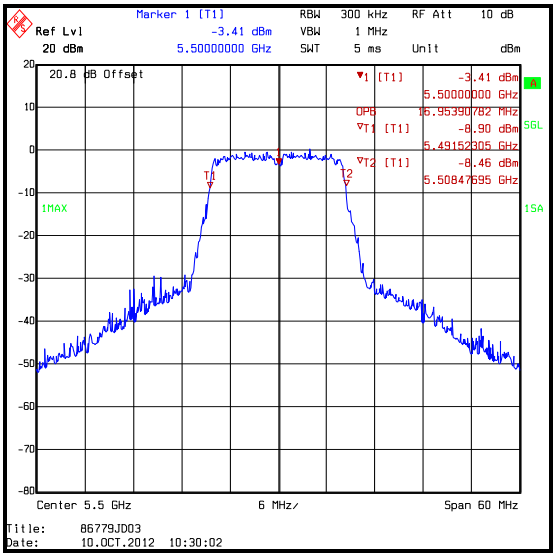


Top Channel

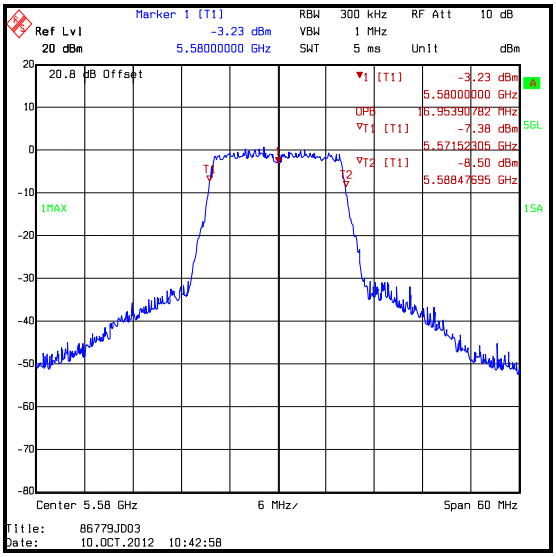
Transmitter 99% Emission Bandwidth (continued)

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

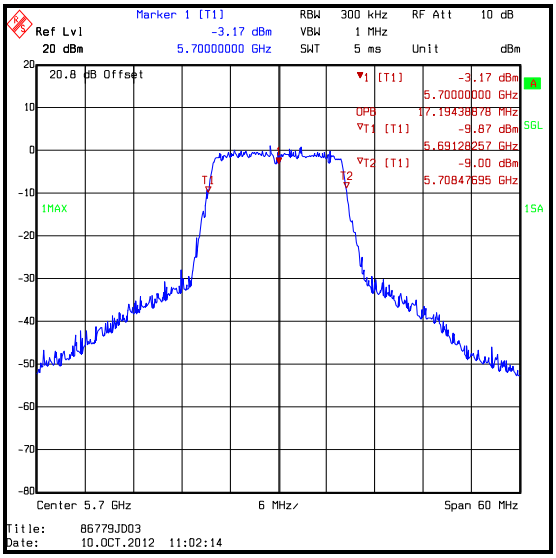
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	99 % Emission Bandwidth (MHz)
Bottom	5500	BPSK	6	16.954
Middle	5580	BPSK	6	16.954
Top	5700	BPSK	6	17.194



Bottom Channel



Middle Channel

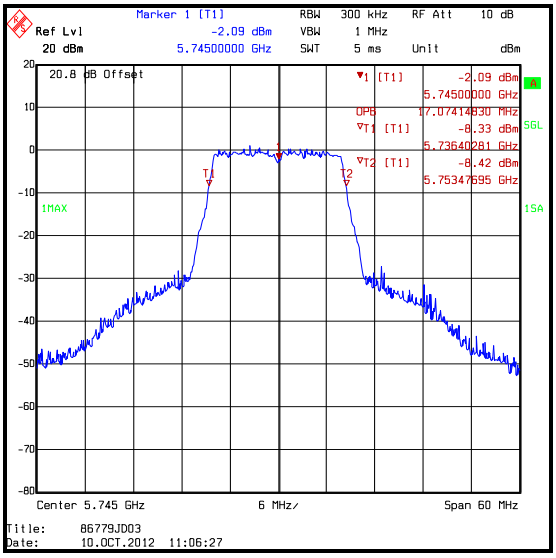


Top Channel

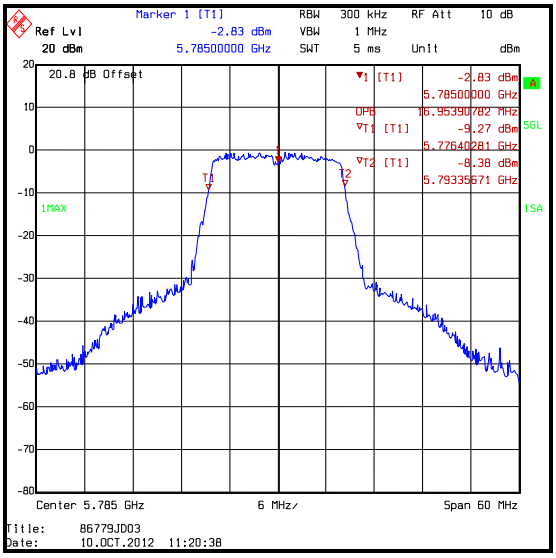
Transmitter 99% Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.725-5.850 GHz band

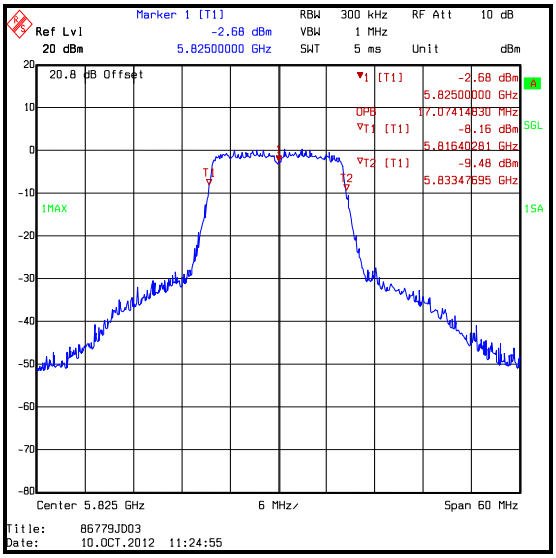
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps	99 % Emission Bandwidth (MHz)
Bottom	5745	BPSK	6	17.074
Middle	5785	BPSK	6	16.954
Top	5825	BPSK	6	17.074



Bottom Channel



Middle Channel

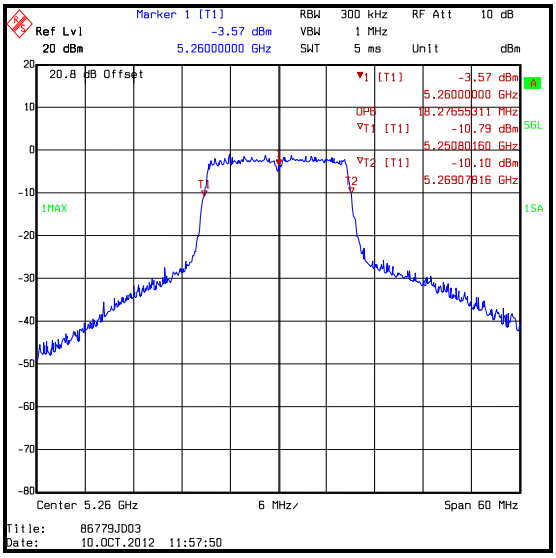


Top Channel

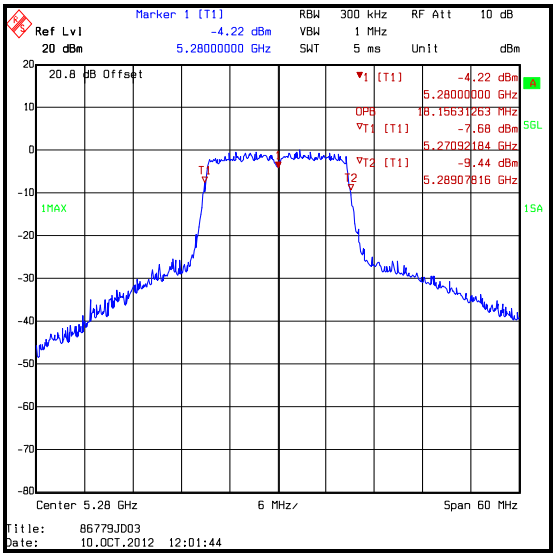
Transmitter 99% Emission Bandwidth (continued)

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

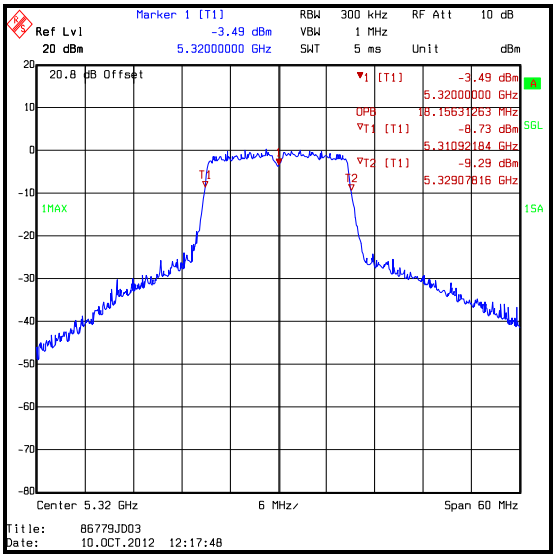
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	18.277
Middle	5280	BPSK	6.5 / 0	18.156
Top	5320	BPSK	6.5 / 0	18.156



Bottom Channel



Middle Channel

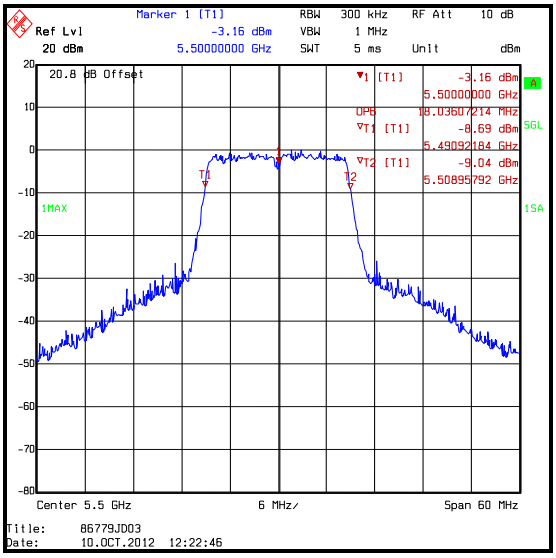


Top Channel

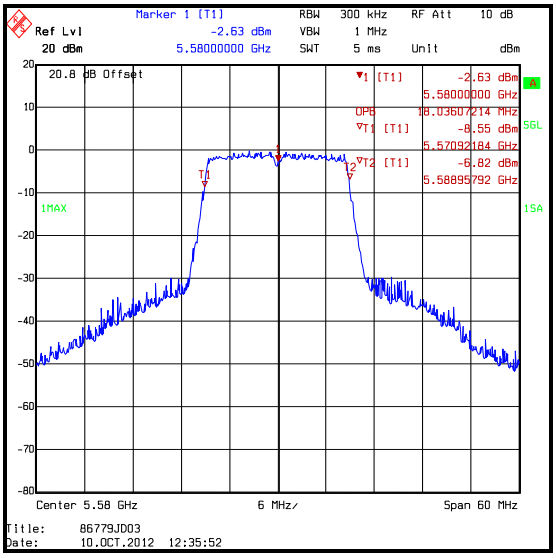
Transmitter 99% Emission Bandwidth (continued)

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

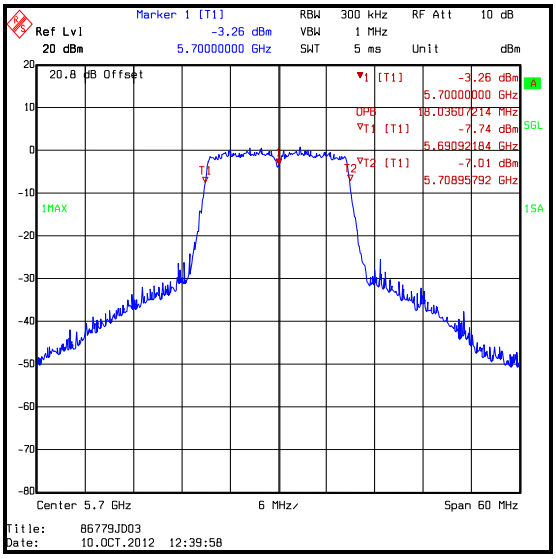
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	18.036
Middle	5580	BPSK	6.5 / 0	18.036
Top	5700	BPSK	6.5 / 0	18.036



Bottom Channel



Middle Channel

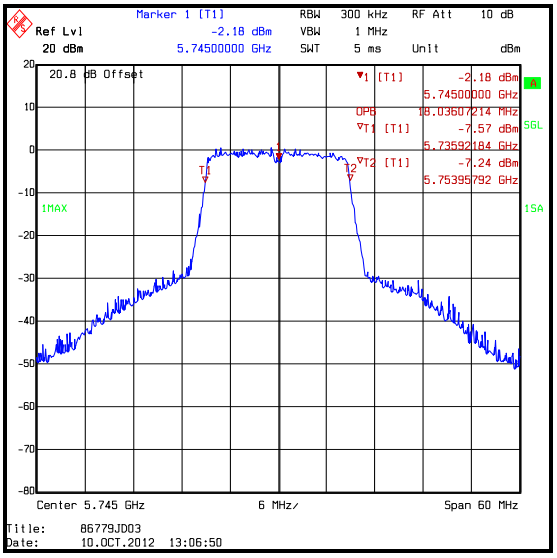


Top Channel

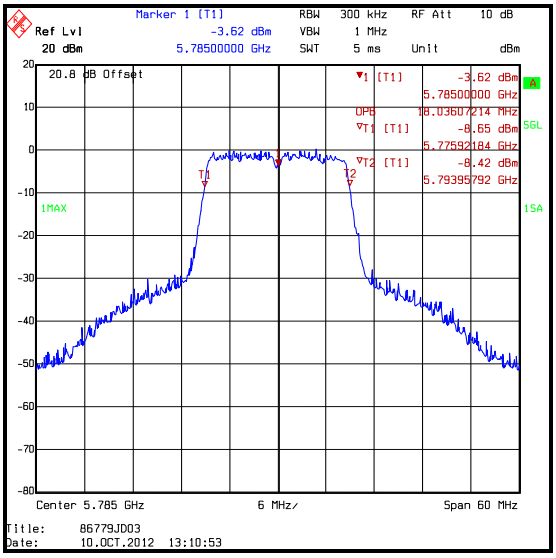
Transmitter 99% Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.850 GHz band

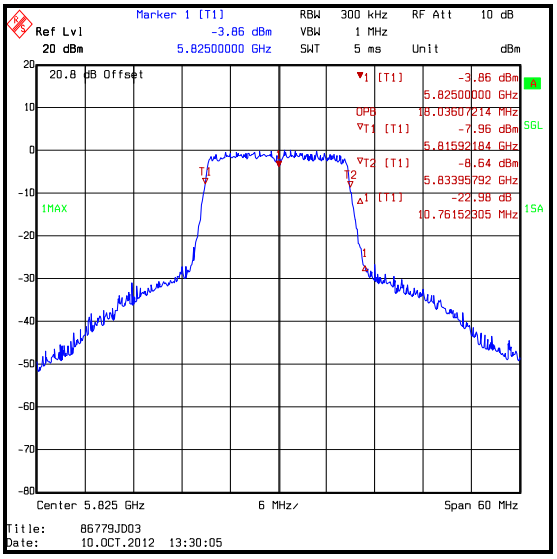
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbps / MCS	99 % Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	18.036
Middle	5785	BPSK	6.5 / 0	18.036
Top	5825	BPSK	6.5 / 0	18.036



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)
M1242	Test Receiver	FSEM30	24 Nov 2012	12
A2143	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:**	11 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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)3)b)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	37

Note(s):

1. All conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 789033 D01 C)3)b) Method SA-1.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power (worst case) were:
   - o 802.11a 20 MHz channel – BPSK / 6 Mbps
   - o 802.11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

   Measurements were then performed on the relevant mode on bottom, middle and top channels on both module types.
3. The FCC Part 15.407(a)(2) limit is the lesser of 250 mW (24.0 dBm) or 11 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:

5.25-5.35 GHz band

802.11a 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 24.5 = 24.9 dBm*
802.11a 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 23.7 = 24.7 dBm*
802.11a 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 24.3 = 24.9 dBm*
802.11n 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 25.5 = 25.1 dBm*
802.11n 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 26.9 = 25.3 dBm*
802.11n 20 MHz channel width / top channel = *11 dBm + 10 $\log_{10}$ 25.7 = 25.1 dBm*

5.47-5.725 GHz band

802.11a 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 20.9 = 24.2 dBm*
802.11a 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 20.7 = 24.2 dBm*
802.11a 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 20.7 = 24.2 dBm*
802.11n 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 21.5 = 24.3 dBm*
802.11n 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 21.3 = 24.3 dBm*
802.11n 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 21.9 = 24.4 dBm*

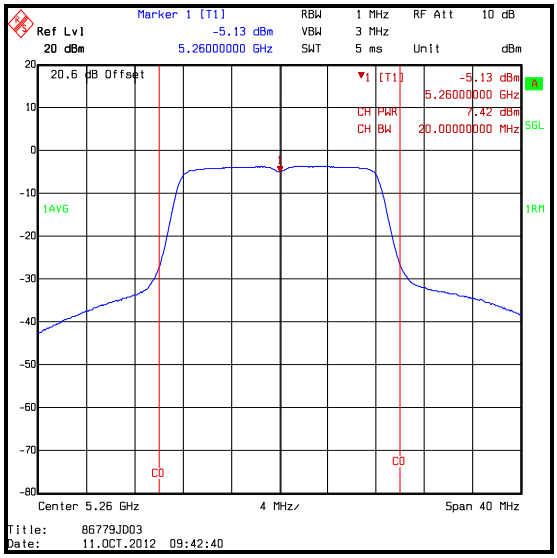
The lesser of the two limits is the fixed limit of 250 mW (24.0 dBm). This was applied to the results.

4. Measurements were performed on both module types in each supported operating band using the above configurations on the bottom, middle and top channels.

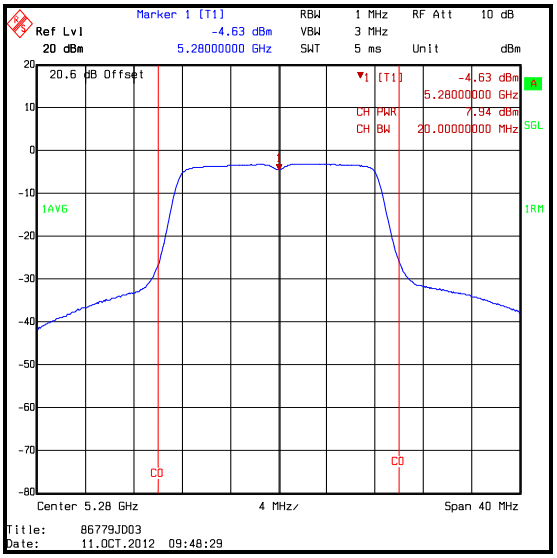
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SPI Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.25-5.35 GHz band

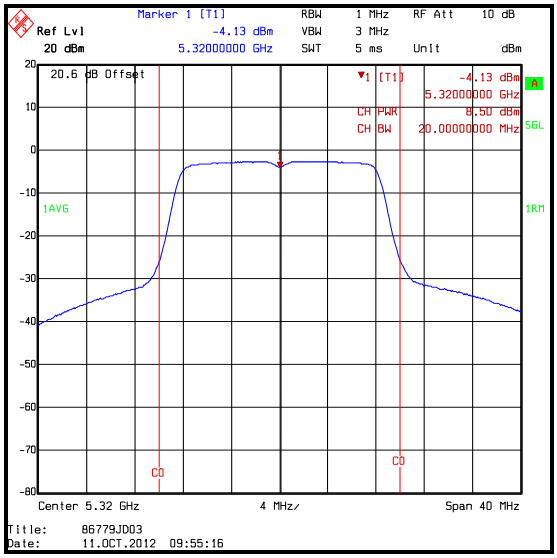
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	7.4	24.0	16.6	Complied
Middle	5280	7.9	24.0	16.1	Complied
Top	5320	8.5	24.0	15.5	Complied



Bottom Channel



Middle Channel

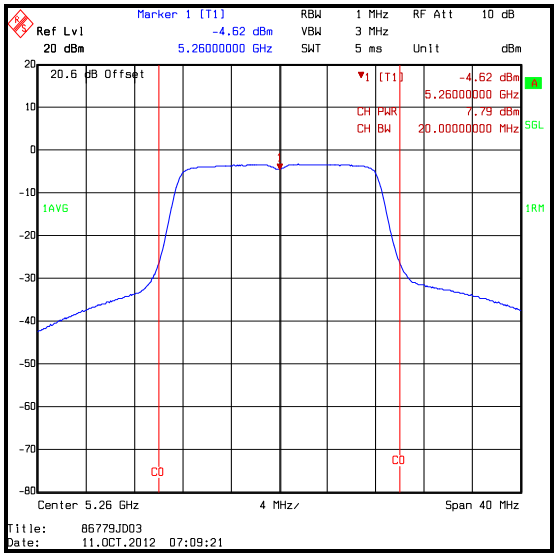


Top Channel

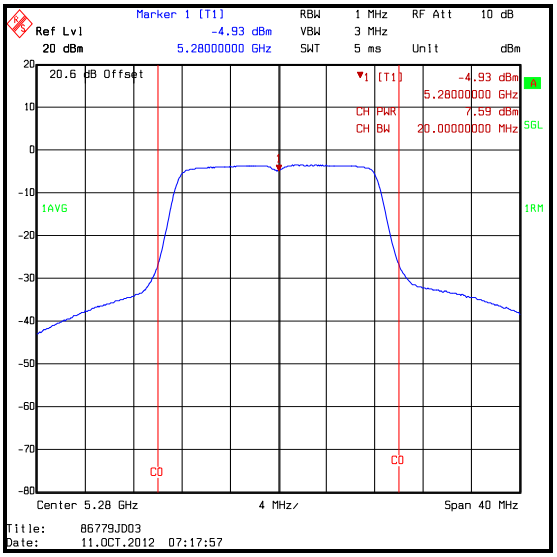
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.25-5.35 GHz band

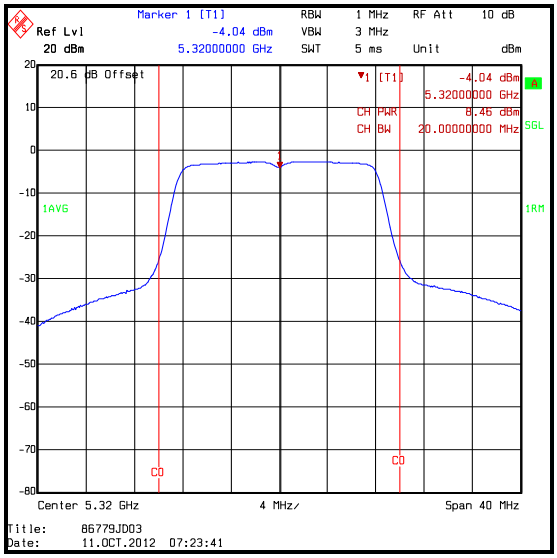
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	7.8	24.0	16.2	Complied
Middle	5280	7.6	24.0	16.4	Complied
Top	5320	8.5	24.0	15.5	Complied



Bottom Channel



Middle Channel

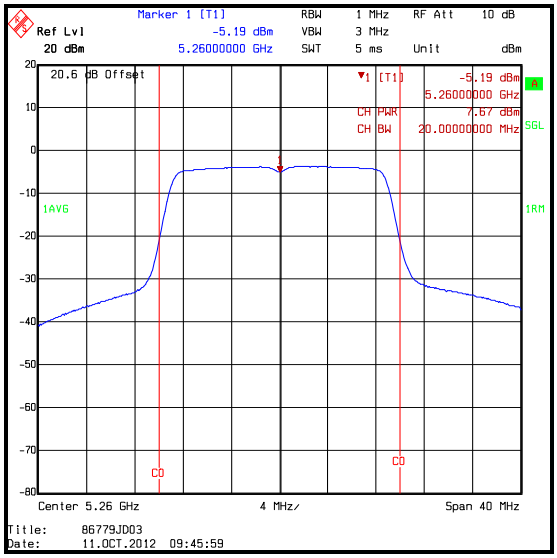


Top Channel

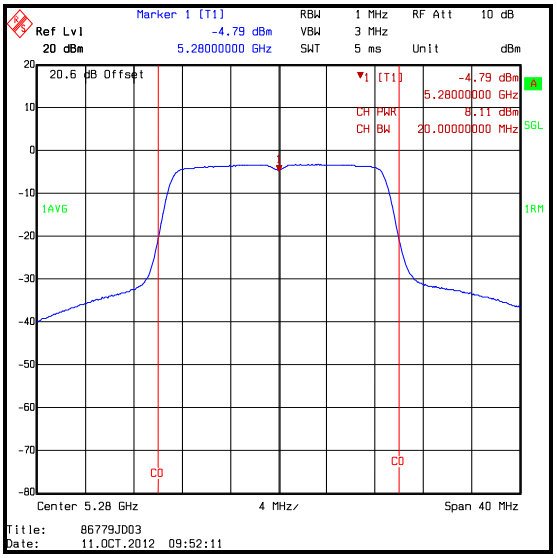
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.25-5.35 GHz band

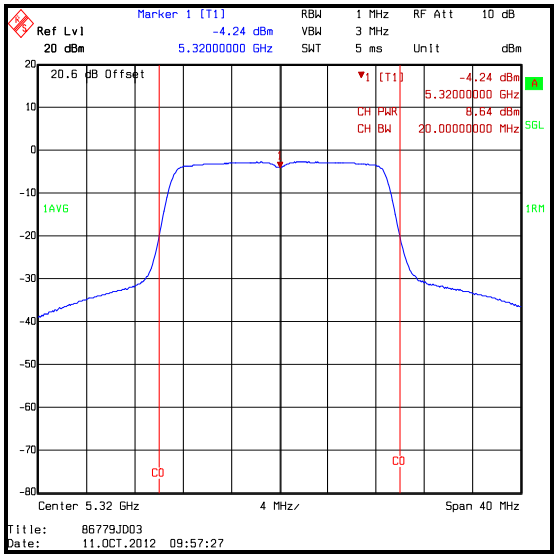
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	7.7	24.0	16.3	Complied
Middle	5280	8.1	24.0	15.9	Complied
Top	5320	8.6	24.0	15.4	Complied



Bottom Channel



Middle Channel

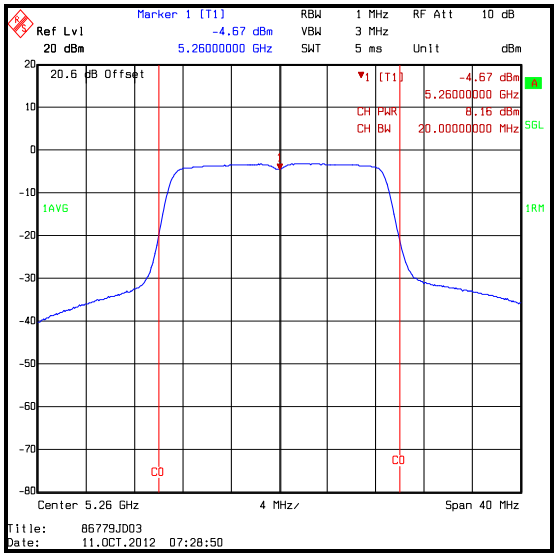


Top Channel

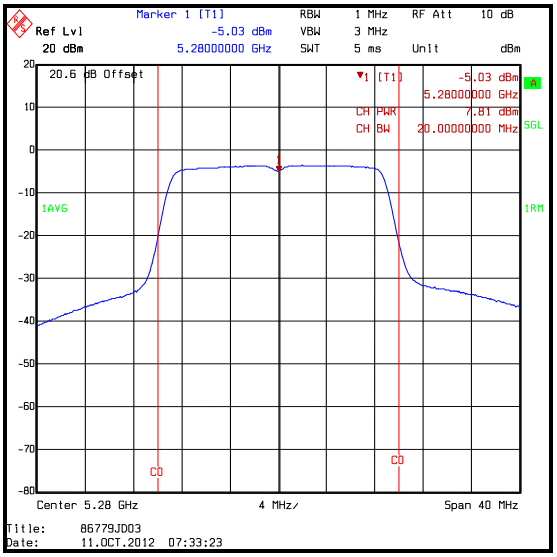
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.25-5.35 GHz band

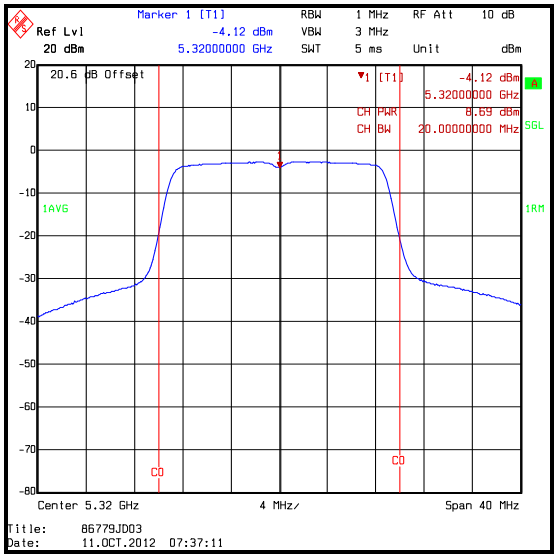
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	8.2	24.0	15.8	Complied
Middle	5280	7.8	24.0	16.2	Complied
Top	5320	8.7	24.0	15.3	Complied



Bottom Channel



Middle Channel

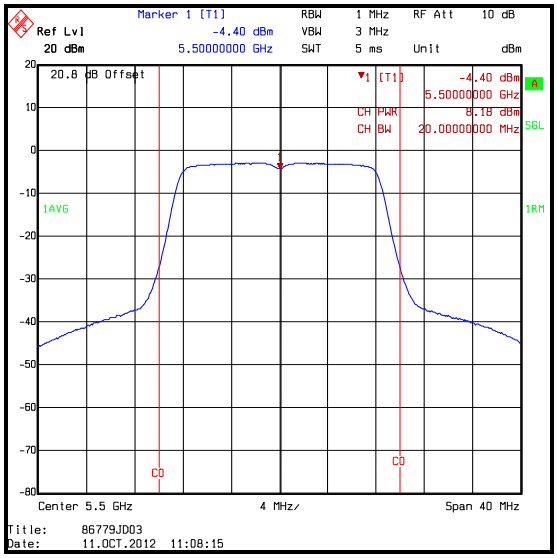


Top Channel

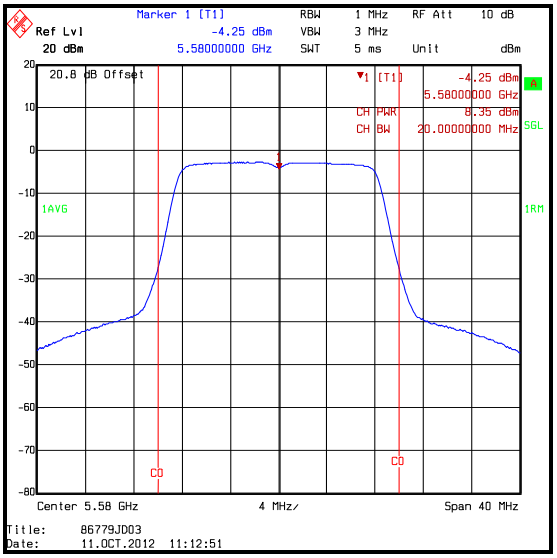
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SPI Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.47-5.725 GHz band

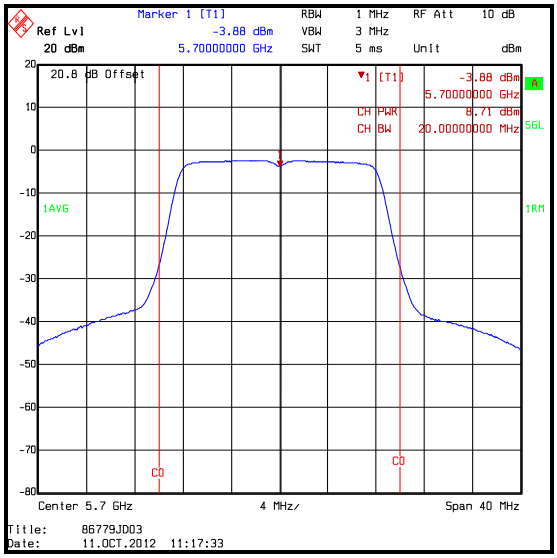
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.2	24.0	15.8	Complied
Middle	5580	8.4	24.0	15.6	Complied
Top	5700	8.7	24.0	15.3	Complied



Bottom Channel



Middle Channel

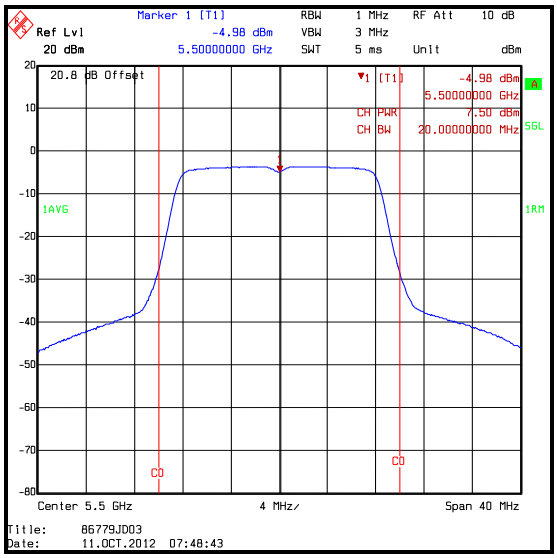


Top Channel

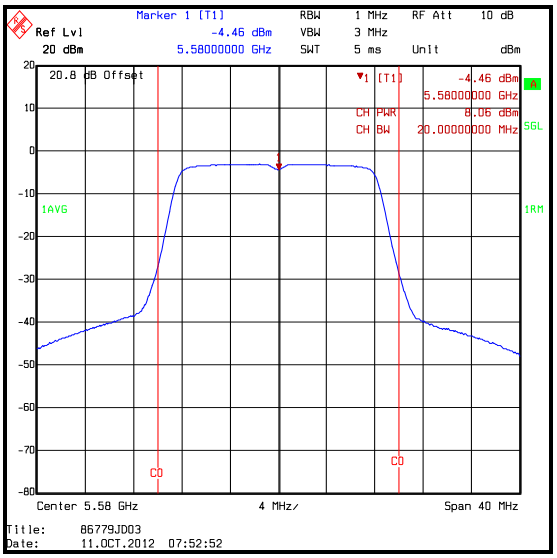
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.47-5.725 GHz band

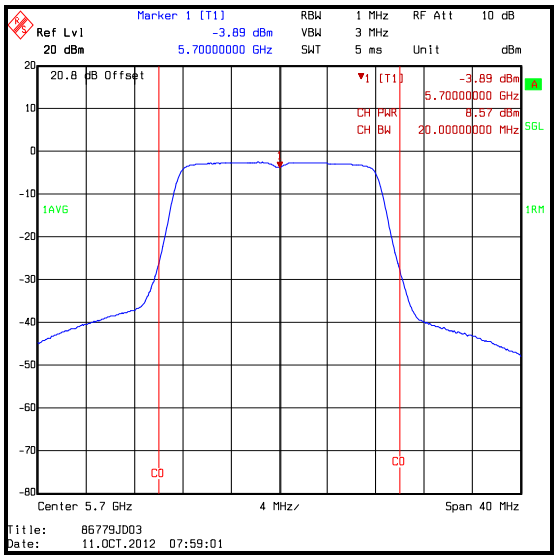
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	7.5	24.0	16.5	Complied
Middle	5580	8.1	24.0	15.9	Complied
Top	5700	8.6	24.0	15.4	Complied



Bottom Channel



Middle Channel

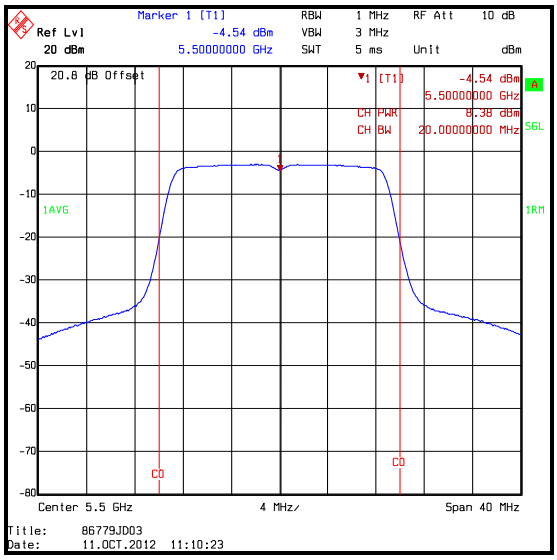


Top Channel

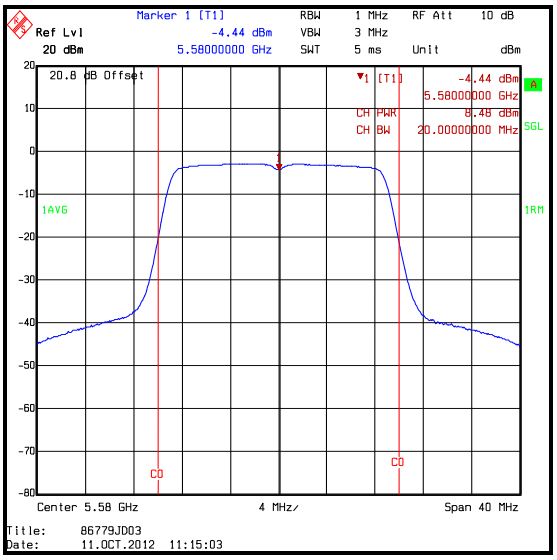
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.47-5.725 GHz band

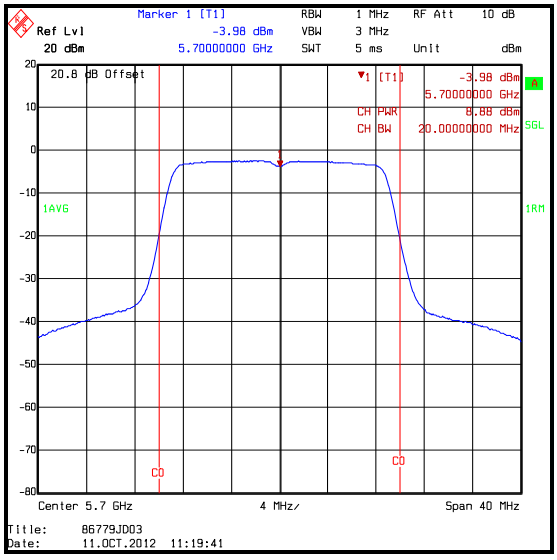
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.4	24.0	15.6	Complied
Middle	5580	8.5	24.0	15.5	Complied
Top	5700	8.9	24.0	15.1	Complied



Bottom Channel



Middle Channel

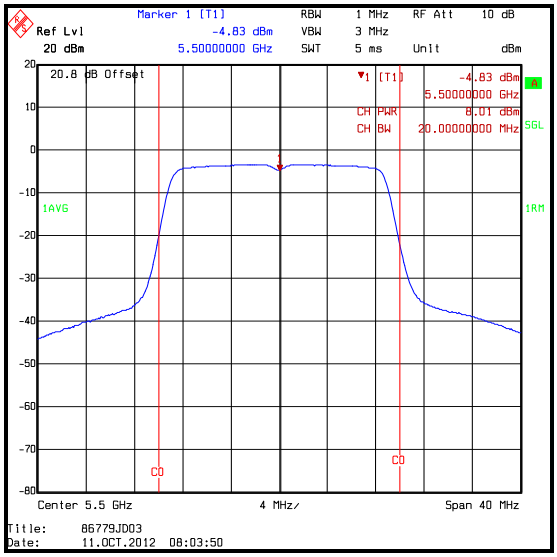


Top Channel

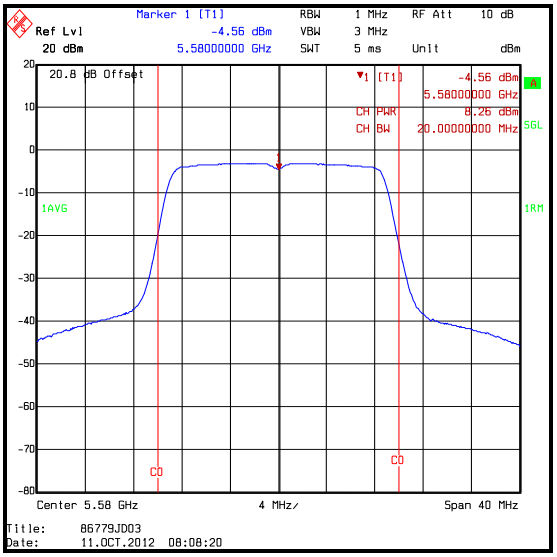
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.47-5.725 GHz band

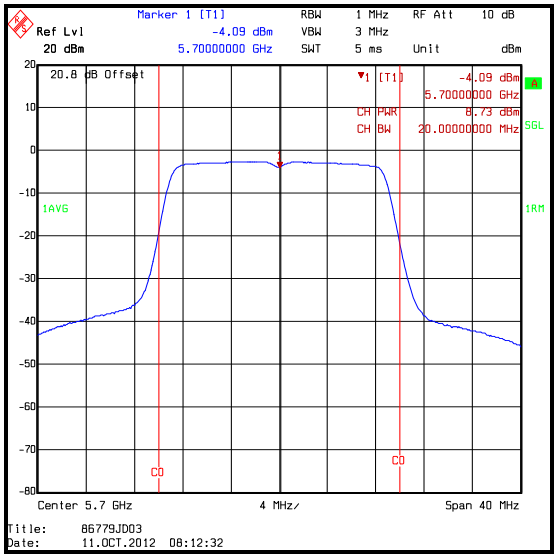
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.0	24.0	16.0	Complied
Middle	5580	8.3	24.0	15.7	Complied
Top	5700	8.7	24.0	15.3	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.850 GHz band)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	11 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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):	24
Relative Humidity (%):	37

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:
    - o 802.11a 20 MHz channel – BPSK / 6 Mbps
    - o 802.11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

    Measurements were then performed on the relevant mode on bottom, middle and top channels on both module types.
2. 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:

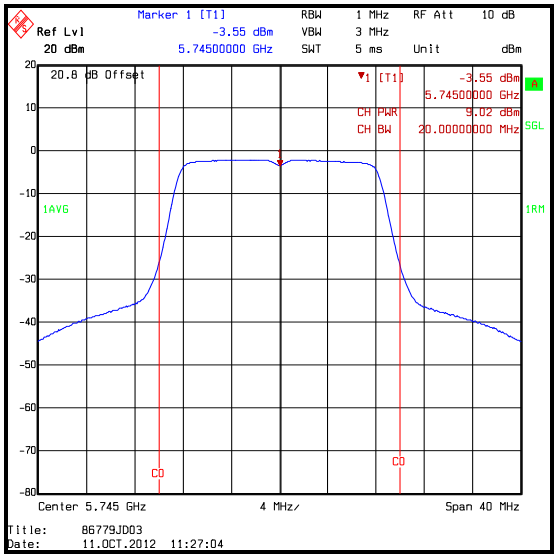
802.11a 20 MHz channel width / Bottom channel = $17\ dBm + 10\ log_{10}\ 20.8 = 30.2\ dBm$
802.11a 20 MHz channel width / Middle channel = $17\ dBm + 10\ log_{10}\ 20.6 = 30.1\ dBm$
802.11a 20 MHz channel width / Top channel = $17\ dBm + 10\ log_{10}\ 20.9 = 30.2\ dBm$
802.11n 20 MHz channel width / Bottom channel = $17\ dBm + 10\ log_{10}\ 21.4 = 30.3\ dBm$
802.11n 20 MHz channel width / Middle channel = $17\ dBm + 10\ log_{10}\ 21.2 = 30.3\ dBm$
802.11n 20 MHz channel width / Top channel = $17\ dBm + 10\ log_{10}\ 21.9 = 30.4\ dBm$

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

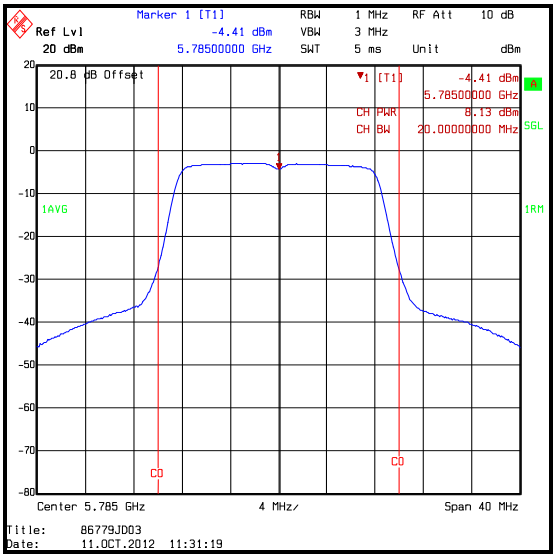
Transmitter Maximum Conducted Output Power (5.725-5.850 GHz band) (continued)

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

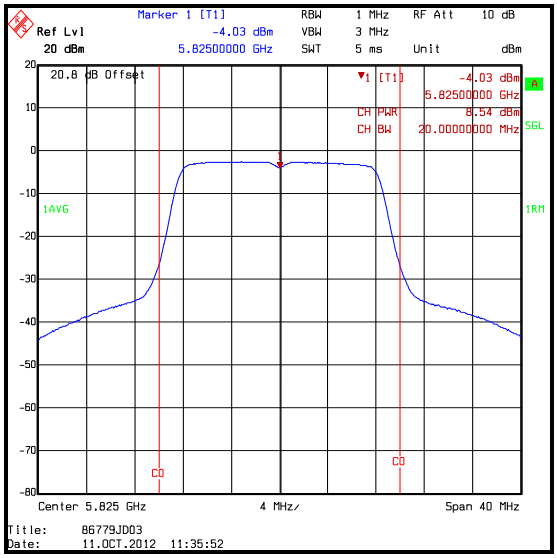
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.0	30.0	21.0	Complied
Middle	5785	8.1	30.0	21.9	Complied
Top	5825	8.5	30.0	21.5	Complied



Bottom Channel



Middle Channel

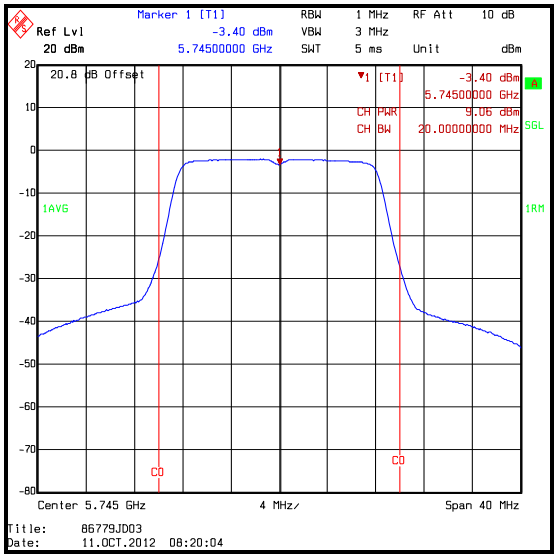


Top Channel

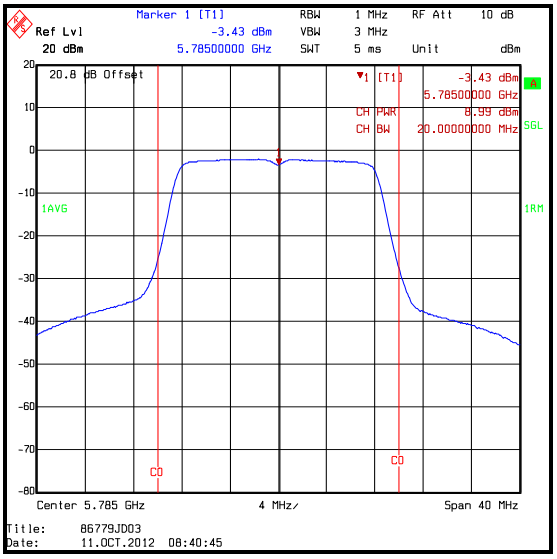
Transmitter Maximum Conducted Output Power (5.725-5.850 GHz band) (continued)

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

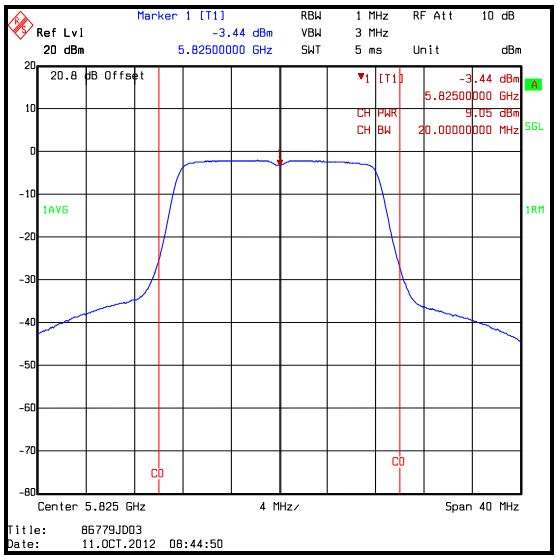
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.1	30.0	20.9	Complied
Middle	5785	9.0	30.0	21.0	Complied
Top	5825	9.1	30.0	20.9	Complied



Bottom Channel



Middle Channel

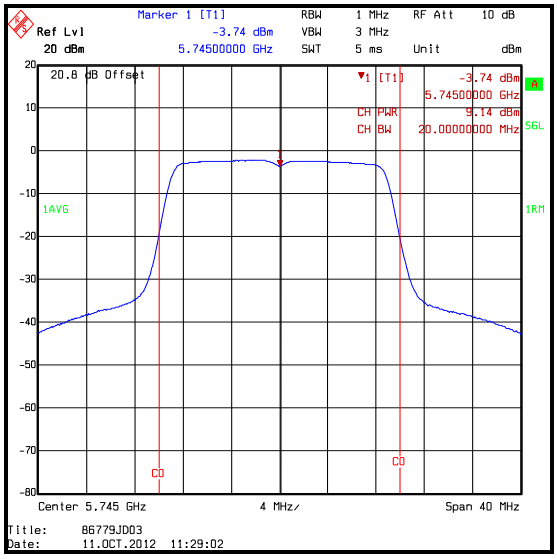


Top Channel

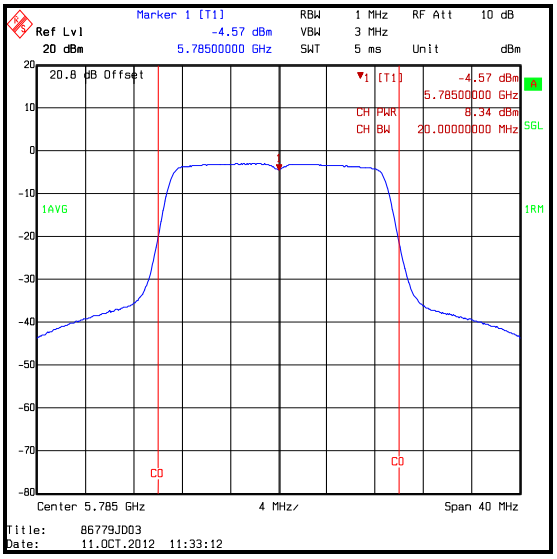
Transmitter Maximum Conducted Output Power (5.725-5.850 GHz band) (continued)

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

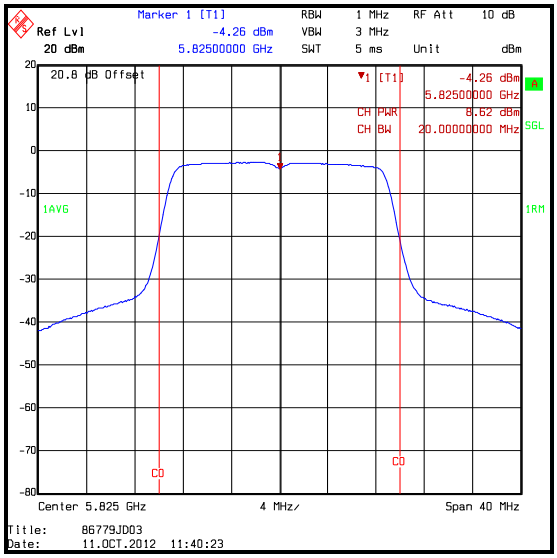
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.1	30.0	20.9	Complied
Middle	5785	8.3	30.0	21.7	Complied
Top	5825	8.6	30.0	21.4	Complied



Bottom Channel



Middle Channel

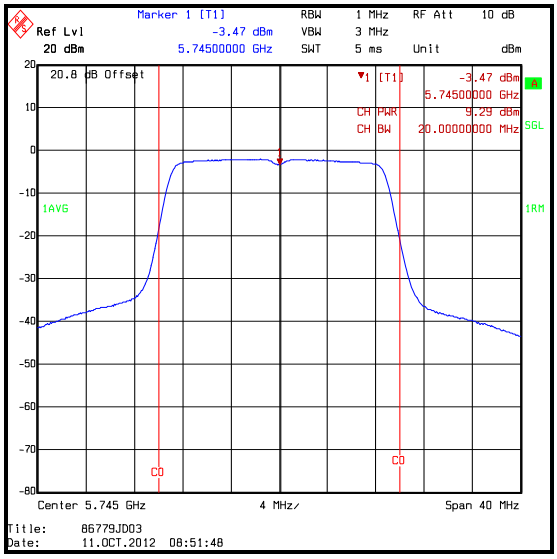


Top Channel

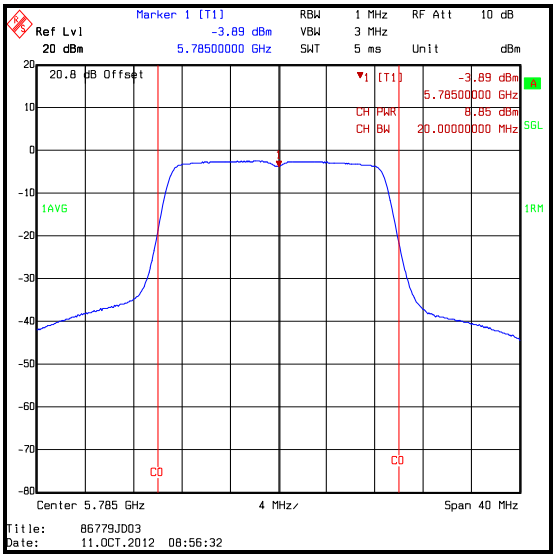
Transmitter Maximum Conducted Output Power (5.725-5.850 GHz band) (continued)

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

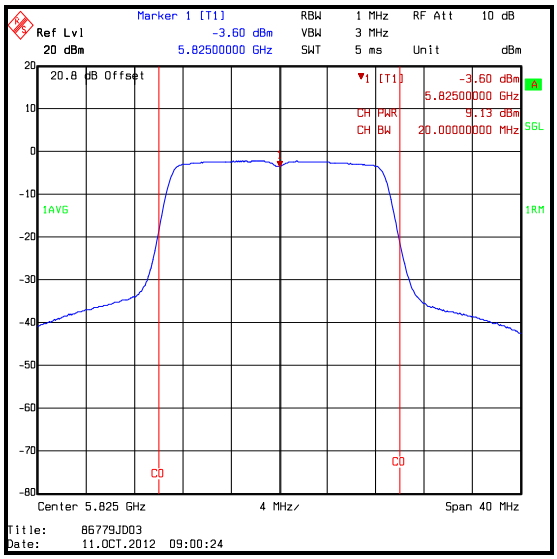
Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.3	30.0	20.7	Complied
Middle	5785	8.9	30.0	21.1	Complied
Top	5825	9.1	30.0	20.9	Complied



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)
M1242	Test Receiver	FSEM30	24 Nov 2012	12
A2143	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:**	11 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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):	24
Relative Humidity (%):	37

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 the highest antenna gain for all antenna types as 3.0 dBi in all supported operating bands. The antenna gain was added to the conducted power to calculate the EIRP.
4. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power (worst case) for band 5.725-5.850 GHz 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 on both modules.

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

Notes:

5. 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 $\log_{10}$ B, where B is the previously measured 99% emission bandwidth in MHz. The limit for each channel was calculated as below:

5.25-5.35 GHz band

802.11a 20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 17.2 = 29.4$ dBm
802.11a 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 17.2 = 29.4$ dBm
802.11a 20 MHz channel width / Top channel = $17 + 10 \log_{10} 17.2 = 29.4$ dBm
802.11n 20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 18.3 = 29.6$ dBm
802.11n 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 18.2 = 29.6$ dBm
802.11n 20 MHz channel width / Top channel = $17 + 10 \log_{10} 18.2 = 29.6$ dBm

5.47-5.725 GHz band

802.11a 20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 17.0 = 29.3$ dBm
802.11a 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 17.0 = 29.3$ dBm
802.11a 20 MHz channel width / Top channel = $17 + 10 \log_{10} 17.2 = 29.4$ dBm
802.11n 20 MHz channel width / Bottom channel = $17 + 10 \log_{10} 18.0 = 29.6$ dBm
802.11n 20 MHz channel width / Middle channel = $17 + 10 \log_{10} 18.0 = 29.6$ dBm
802.11n 20 MHz channel width / Top channel = $17 + 10 \log_{10} 18.0 = 29.6$ dBm

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

6. 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 / SPI Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	7.4	3.0	10.4	29.4	19.0	Complied
Middle	5300	7.9	3.0	10.9	29.4	18.5	Complied
Top	5320	8.5	3.0	11.5	29.4	17.9	Complied

Results: Industry Canada RSS-210 / SDIO Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	7.8	3.0	10.8	29.4	18.6	Complied
Middle	5300	7.6	3.0	10.6	29.4	18.8	Complied
Top	5320	8.5	3.0	11.5	29.4	17.9	Complied

Results: Industry Canada RSS-210 / SPI / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	7.7	3.0	10.7	29.6	18.9	Complied
Middle	5300	8.1	3.0	11.1	29.6	18.5	Complied
Top	5320	8.6	3.0	11.6	29.6	18.0	Complied

Results: Industry Canada RSS-210 / SDIO / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK / 5.25-5.35 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5260	8.2	3.0	11.2	29.6	18.4	Complied
Middle	5300	7.8	3.0	10.8	29.6	18.8	Complied
Top	5320	8.7	3.0	11.7	29.6	17.9	Complied

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

Results: Industry Canada RSS-210 / SPI / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.2	3.0	11.2	29.3	18.1	Complied
Middle	5600	8.4	3.0	11.4	29.3	17.9	Complied
Top	5700	8.7	3.0	11.7	29.4	17.7	Complied

Results: Industry Canada RSS-210 / SDIO / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	7.5	3.0	10.5	29.3	18.8	Complied
Middle	5600	8.1	3.0	11.1	29.3	18.2	Complied
Top	5700	8.6	3.0	11.6	29.4	17.8	Complied

Results: Industry Canada RSS-210 / SPI / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.4	3.0	11.4	29.6	18.2	Complied
Middle	5600	8.5	3.0	11.5	29.6	18.1	Complied
Top	5700	8.9	3.0	11.9	29.6	17.7	Complied

Results: Industry Canada RSS-210 / SDIO / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK / 5.47-5.725 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5500	8.0	3.0	11.0	29.6	18.6	Complied
Middle	5600	8.3	3.0	11.3	29.6	18.3	Complied
Top	5700	8.7	3.0	11.7	29.6	17.9	Complied

Transmitter Maximum Equivalent Isotropically Radiated Power (5.725-5.85 GHz bands)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	11 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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):	24
Relative Humidity (%):	37

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 the highest antenna gain for all antenna types as 3.0 dBi in all supported operating bands. The antenna gain was added to the conducted power to calculate the EIRP.
4. The Industry Canada RSS-210 A9.2(3) 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 = $23 + 10 \log_{10} 17.1 = 35.3$ 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 = $23 + 10 \log_{10} 18.1 = 35.6$ dBm
802.11n 20 MHz channel width / Middle channel = $23 + 10 \log_{10} 18.1b = 35.6$ dBm
802.11n 20 MHz channel width / Top channel = $23 + 10 \log_{10} 18.1 = 35.6$ 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 (5.725-5.85 GHz bands) (continued)

Results: Industry Canada RSS-210 / SPI / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.725-5.85 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.0	3.0	12.0	30.0	18.0	Complied
Middle	5785	8.1	3.0	11.1	30.0	18.9	Complied
Top	5825	8.5	3.0	11.5	30.0	18.5	Complied

Results: Industry Canada RSS-210 / SDIO / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.725-5.85 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.1	3.0	12.1	30.0	17.9	Complied
Middle	5785	9.0	3.0	12.0	30.0	18.0	Complied
Top	5825	9.1	3.0	12.1	30.0	17.9	Complied

Results: Industry Canada RSS-210 / SPI / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK / 5.725-5.85 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.1	3.0	12.1	30.0	17.9	Complied
Middle	5785	8.3	3.0	11.3	30.0	18.7	Complied
Top	5825	8.6	3.0	11.6	30.0	18.4	Complied

Results: Industry Canada RSS-210 / SDIO / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / BPSK / 5.725-5.85 GHz band

Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	5745	9.3	3.0	12.3	30.0	17.7	Complied
Middle	5785	8.9	3.0	11.9	30.0	18.1	Complied
Top	5825	9.1	3.0	12.1	30.0	17.9	Complied

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
M1242	Test Receiver	FSEM30	24 Nov 2012	12
A2143	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:**	11 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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)3)b), Method SA-1

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	37

Note(s):

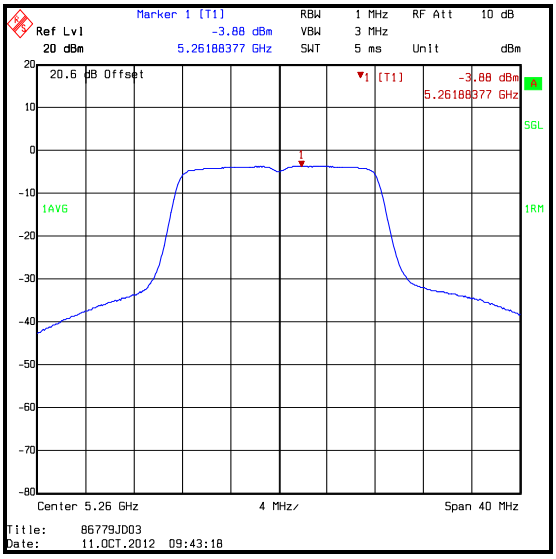
1. Transmitter Peak Power Spectral Density tests in all bands were performed using a test receiver in accordance with FCC KDB 789033 D01 C)3)b) Method SA-1.
2. The EUT was transmitting at 100% duty cycle.
2. All supported modes and channel widths were initially investigated on one channel. The modes 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 on both modules.
7. FCC Part 15.407(a)(2) & Industry Canada RSS-210 A9.2(2)&(3) limit for PPSD in the 5.25-5.35 GHz and 5.47-5.725 GHz operating bands is <11 dBm/MHz.

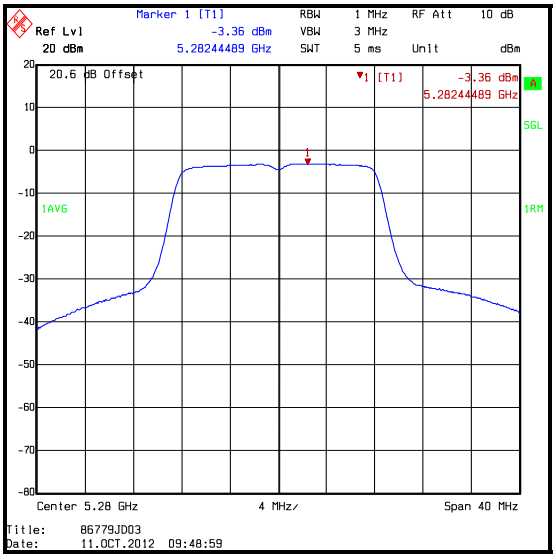
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SPI Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.25-5.35 GHz band

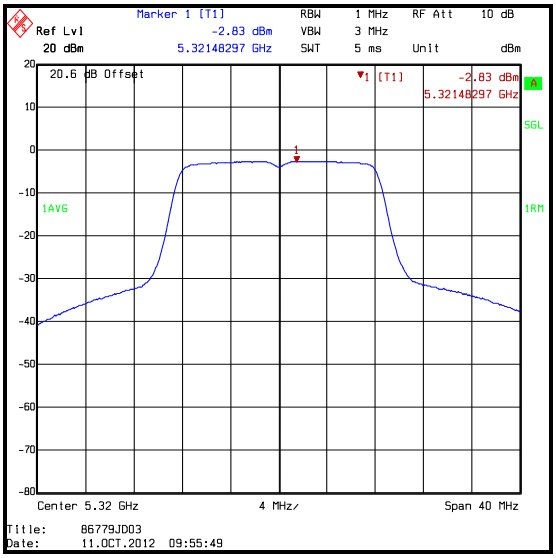
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	-3.9	11.0	14.9	Complied
Middle	5280	-3.4	11.0	14.4	Complied
Top	5320	-2.8	11.0	13.8	Complied



Bottom Channel



Middle Channel

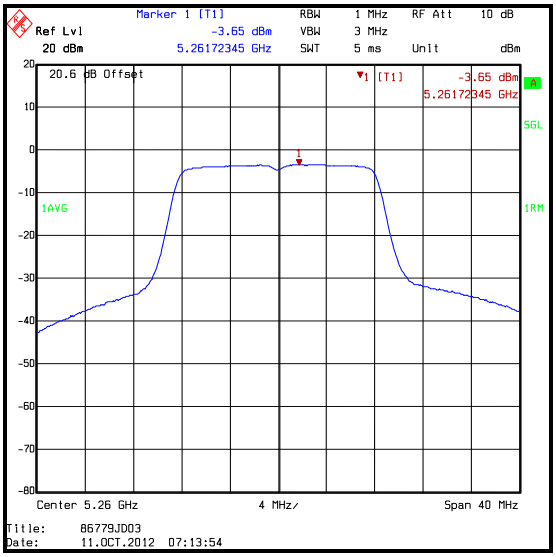


Top Channel

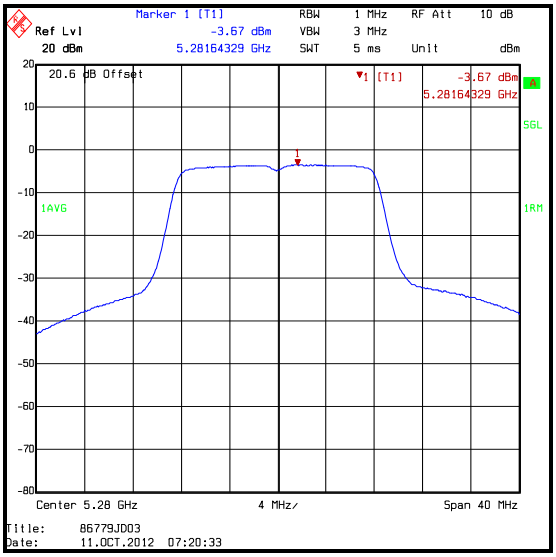
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.25-5.35 GHz band

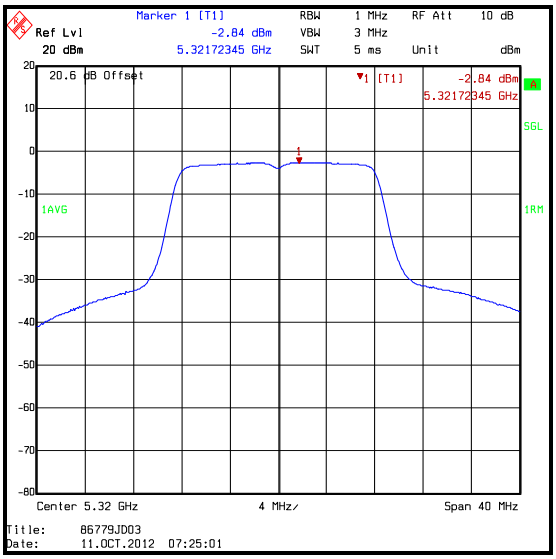
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	-3.7	11.0	14.7	Complied
Middle	5280	-3.7	11.0	14.7	Complied
Top	5320	-2.8	11.0	13.8	Complied



Bottom Channel



Middle Channel

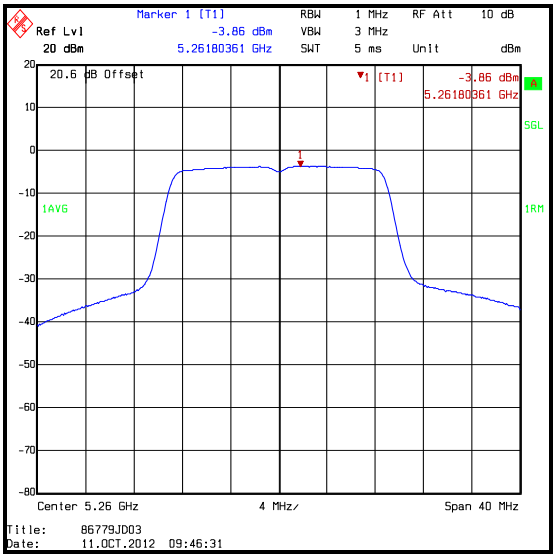


Top Channel

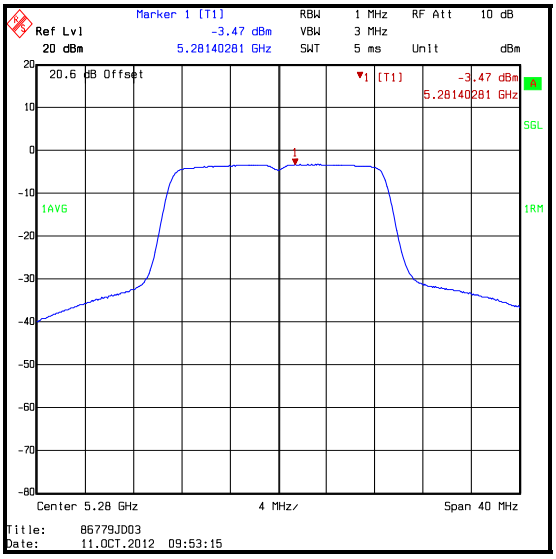
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.25-5.35 GHz band

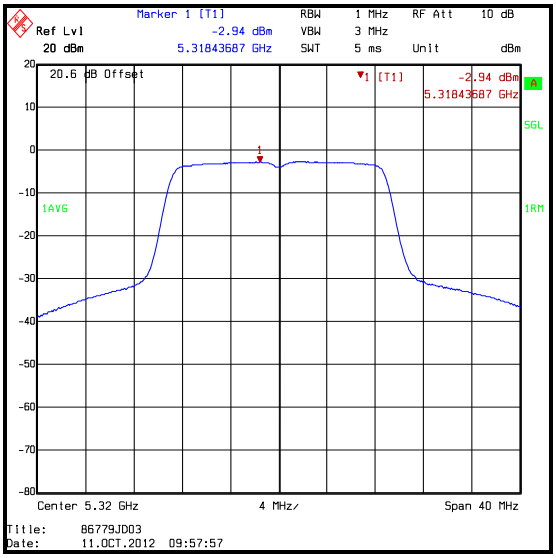
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	-3.9	11.0	14.9	Complied
Middle	5280	-3.5	11.0	14.5	Complied
Top	5320	-2.9	11.0	13.9	Complied



Bottom Channel



Middle Channel

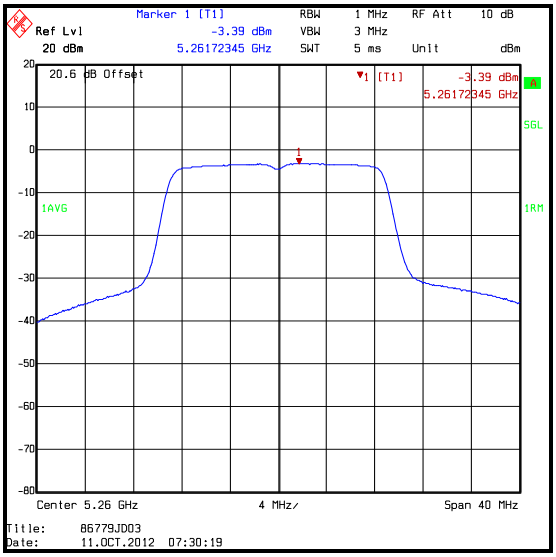


Top Channel

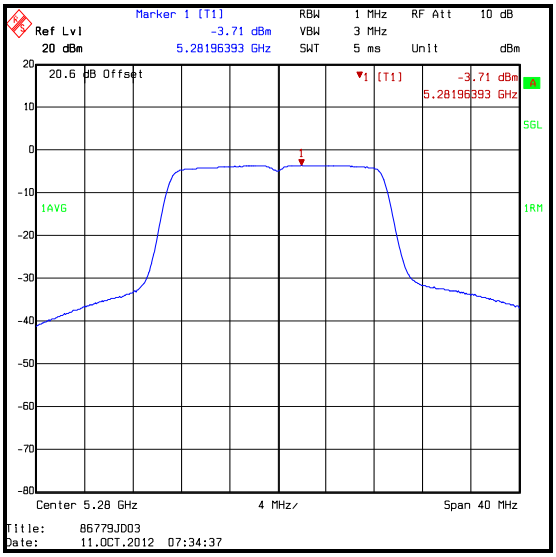
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.25-5.35 GHz band

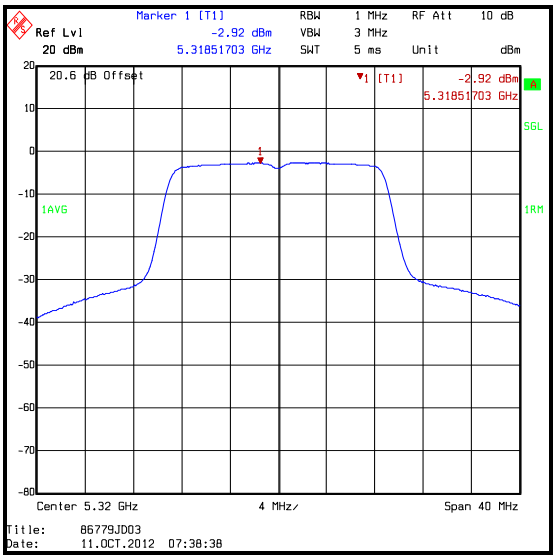
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5260	-3.4	11.0	14.4	Complied
Middle	5280	-3.7	11.0	14.7	Complied
Top	5320	-2.9	11.0	13.9	Complied



Bottom Channel



Middle Channel

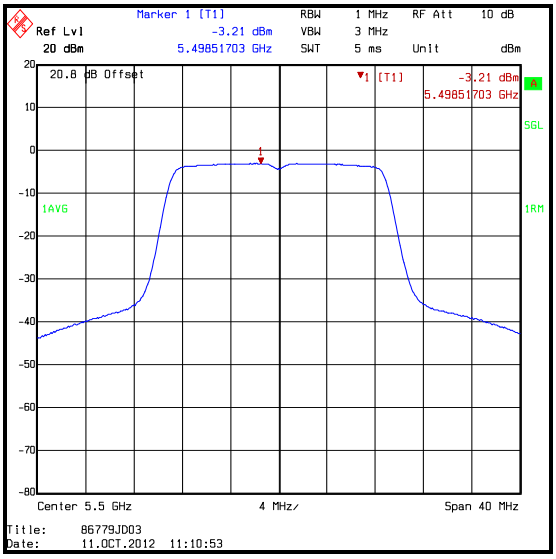


Top Channel

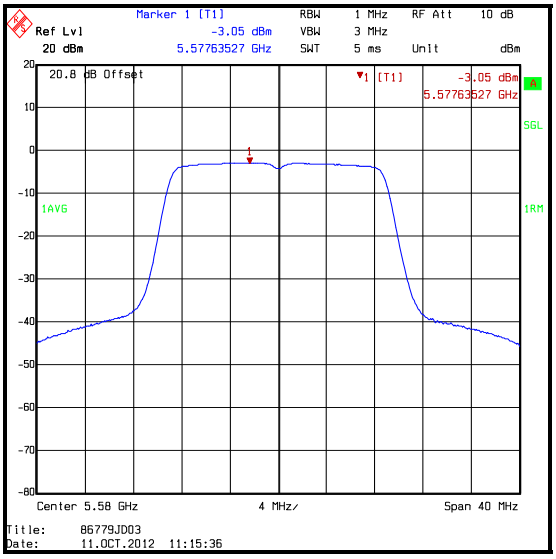
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SPI Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.47-5.725 GHz band

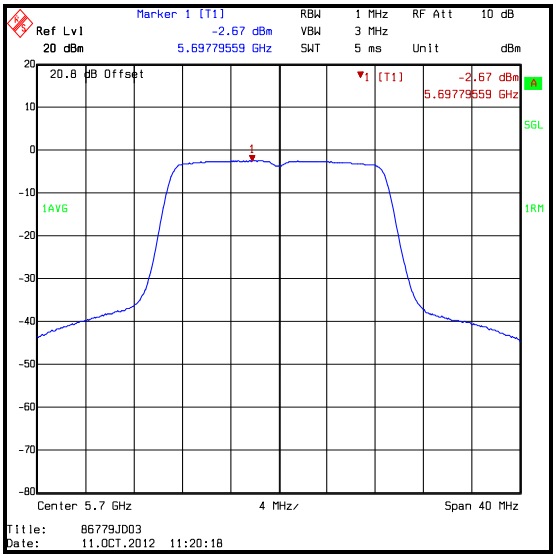
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-3.2	11.0	14.2	Complied
Middle	5580	-3.1	11.0	14.1	Complied
Top	5700	-2.7	11.0	13.7	Complied



Bottom Channel



Middle Channel

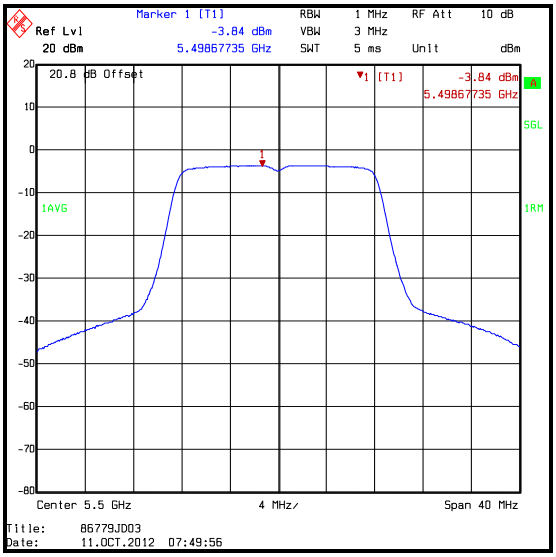


Top Channel

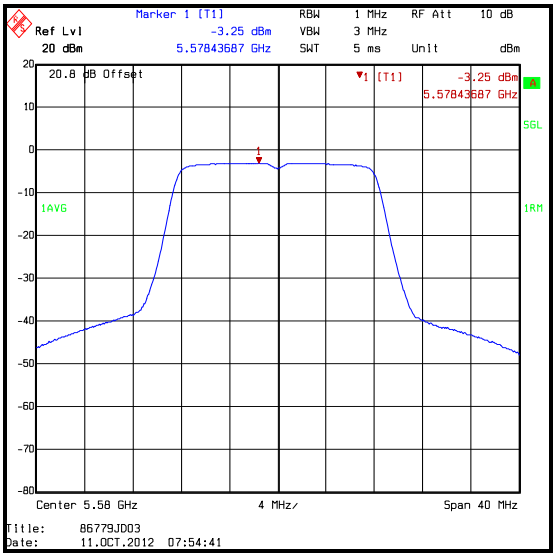
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / BPSK / 5.47-5.725 GHz band

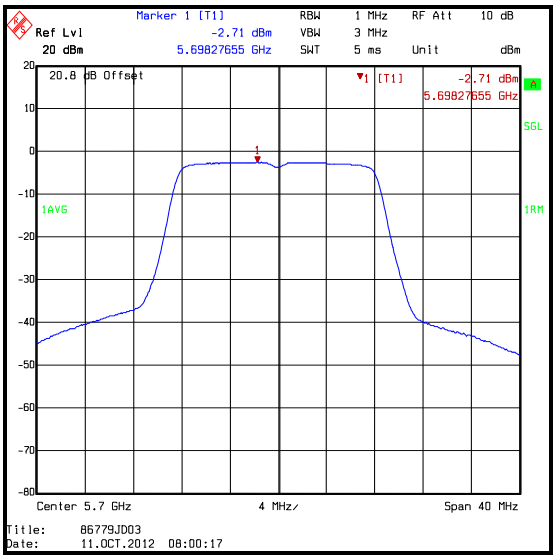
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-3.8	11.0	14.8	Complied
Middle	5580	-3.3	11.0	14.3	Complied
Top	5700	-2.7	11.0	13.7	Complied



Bottom Channel



Middle Channel

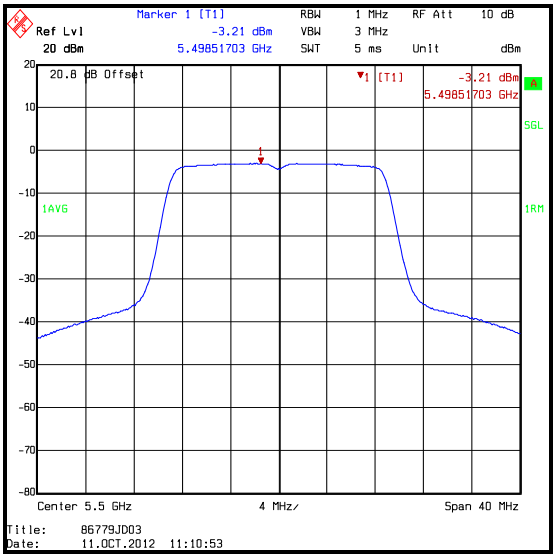


Top Channel

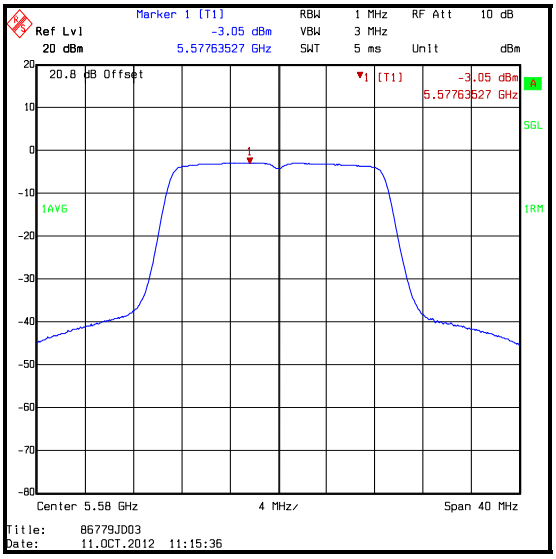
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.47-5.725 GHz band

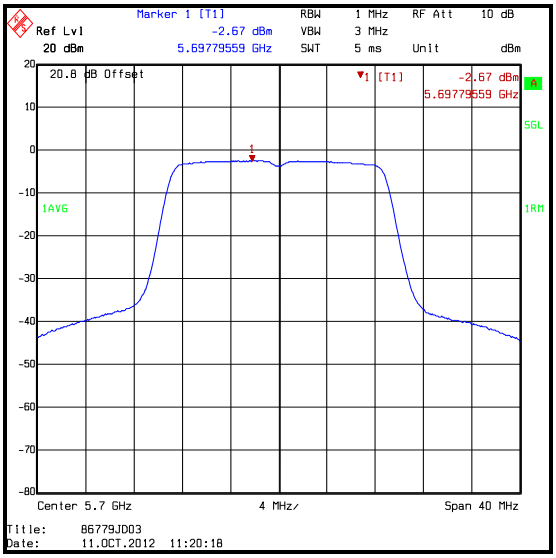
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-3.2	11.0	14.2	Complied
Middle	5580	-3.1	11.0	14.1	Complied
Top	5700	-2.7	11.0	13.7	Complied



Bottom Channel



Middle Channel

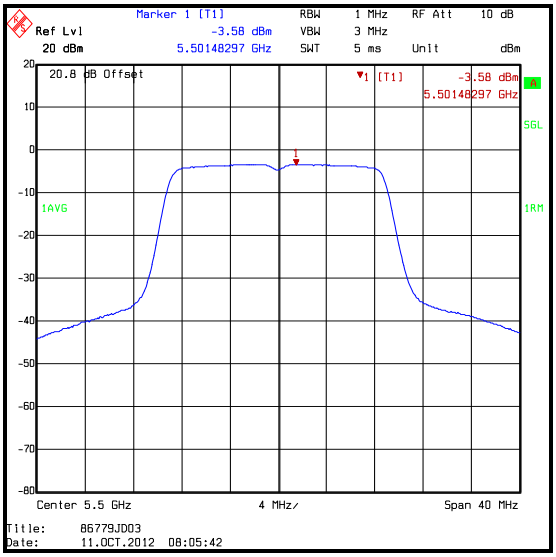


Top Channel

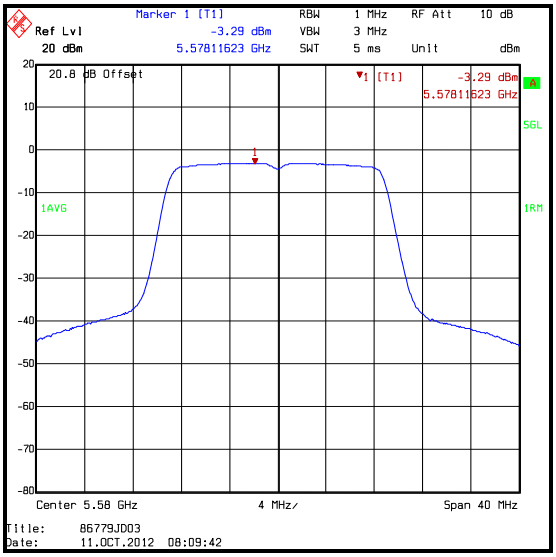
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 bands) (continued)

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / 5.47-5.725 GHz band

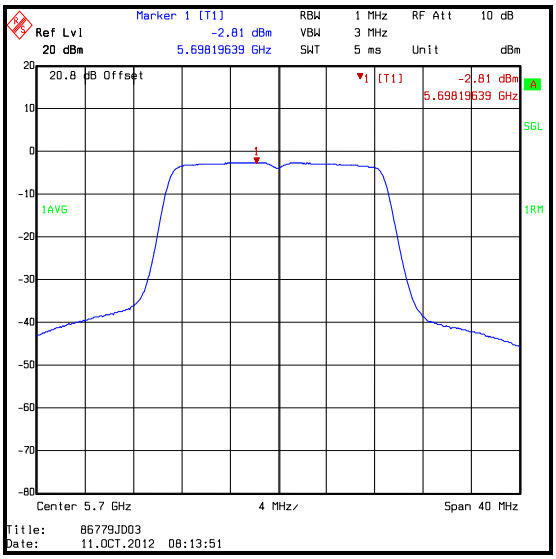
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5500	-3.6	11.0	14.6	Complied
Middle	5580	-3.3	11.0	14.3	Complied
Top	5700	-2.8	11.0	13.8	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Peak Power Spectral Density (5.725-5.850 GHz band)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	11 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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):	24
Relative Humidity (%):	37

Note(s):

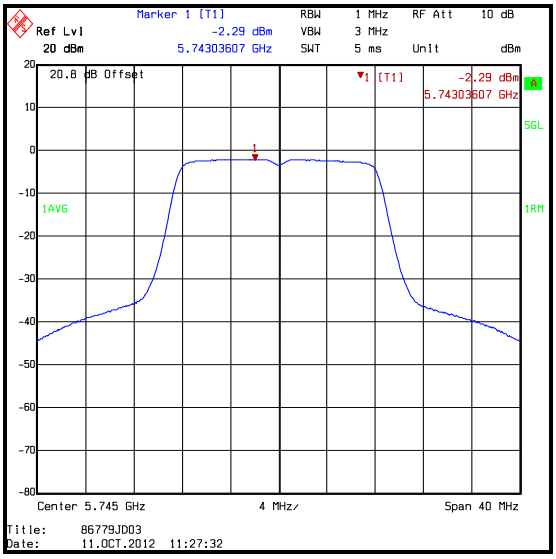
1. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth (worst case) were:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802.11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

    Measurements were then performed on the relevant mode on bottom, middle and top channels on both modules.
3. 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.

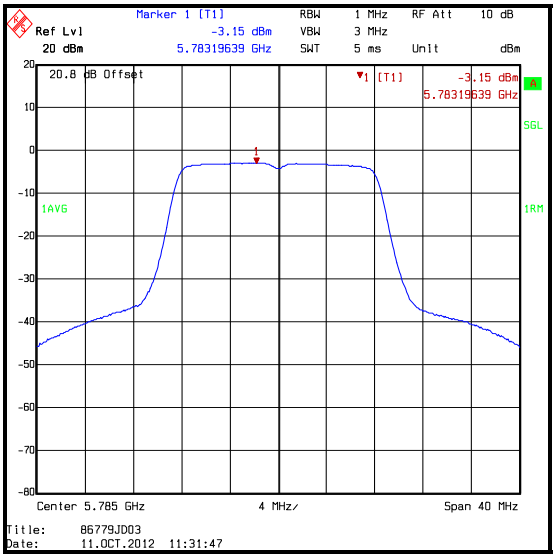
Transmitter Peak Power Spectral Density (5.725-5.850 GHz band) (continued)

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

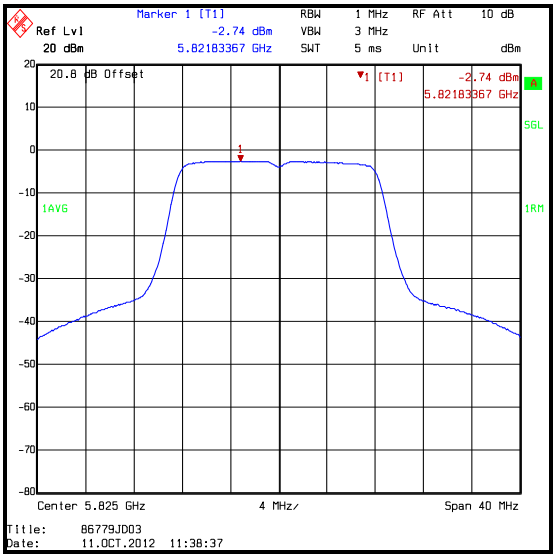
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-2.3	17.0	19.3	Complied
Middle	5785	-3.2	17.0	20.2	Complied
Top	5825	-2.7	17.0	19.7	Complied



Bottom Channel



Middle Channel

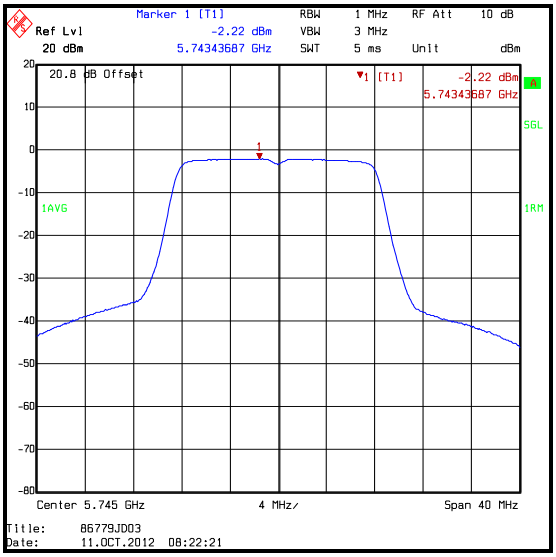


Top Channel

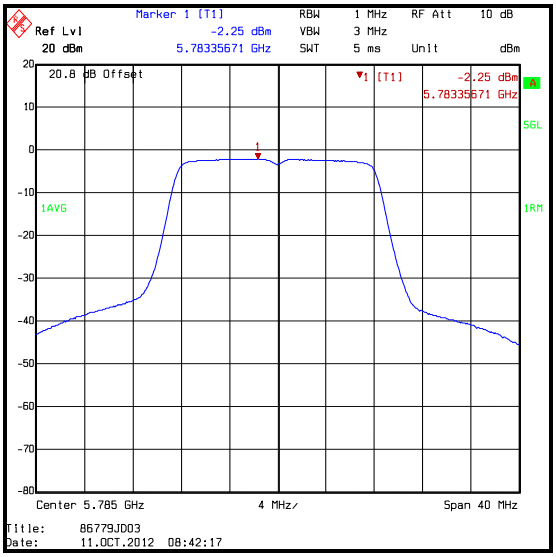
Transmitter Peak Power Spectral Density (5.725-5.850 GHz band) (continued)

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

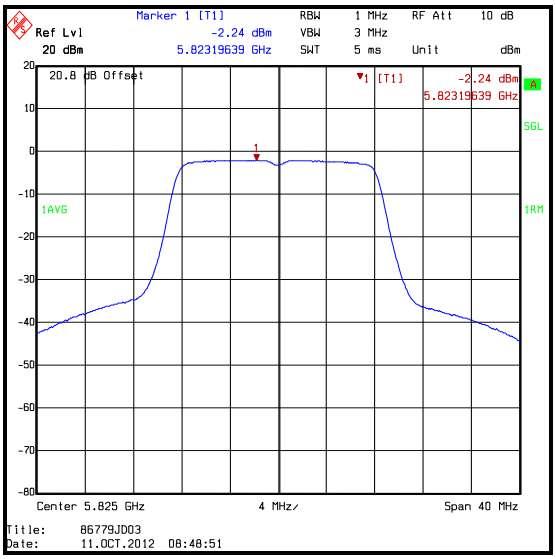
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-2.2	17.0	19.2	Complied
Middle	5785	-2.3	17.0	19.3	Complied
Top	5825	-2.2	17.0	19.2	Complied



Bottom Channel



Middle Channel

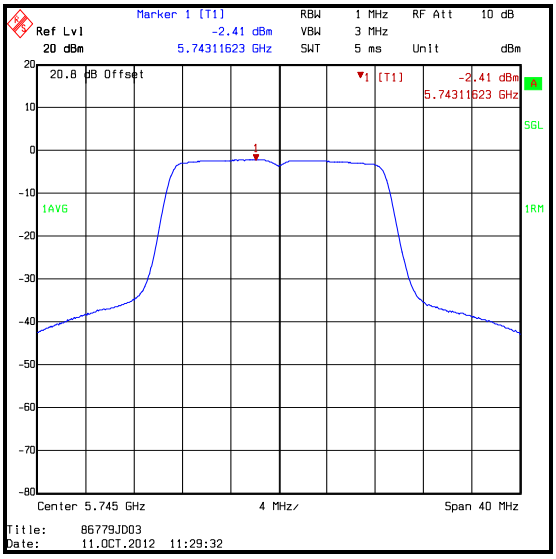


Top Channel

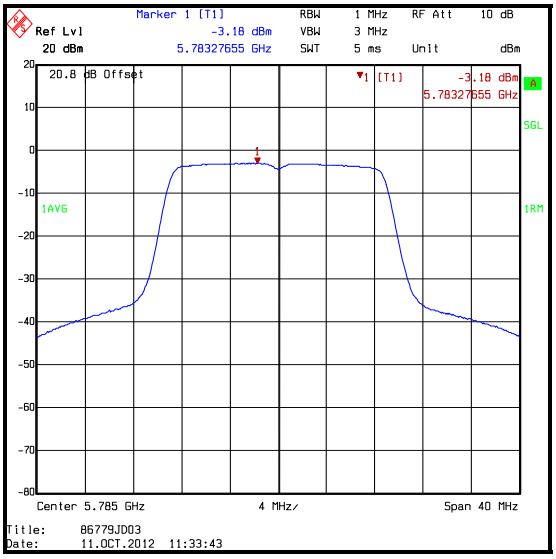
Transmitter Peak Power Spectral Density (5.725-5.850 GHz band) (continued)

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

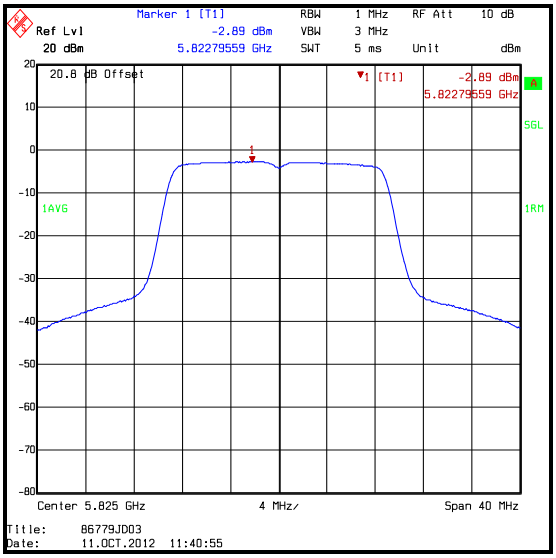
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-2.4	17.0	19.4	Complied
Middle	5785	-3.2	17.0	20.2	Complied
Top	5825	-2.9	17.0	19.9	Complied



Bottom Channel



Middle Channel

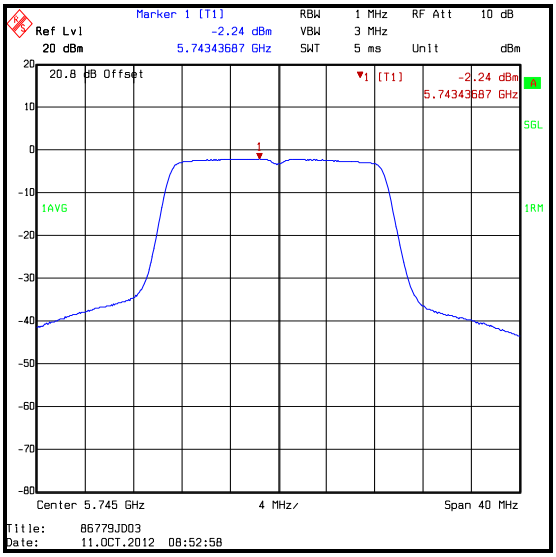


Top Channel

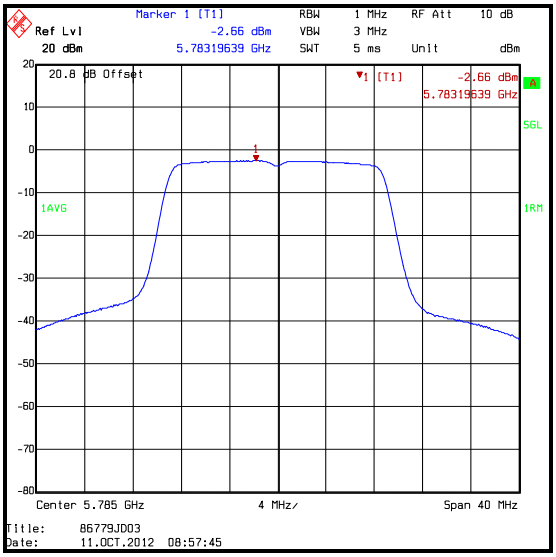
Transmitter Peak Power Spectral Density (5.725-5.850 GHz band) (continued)

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

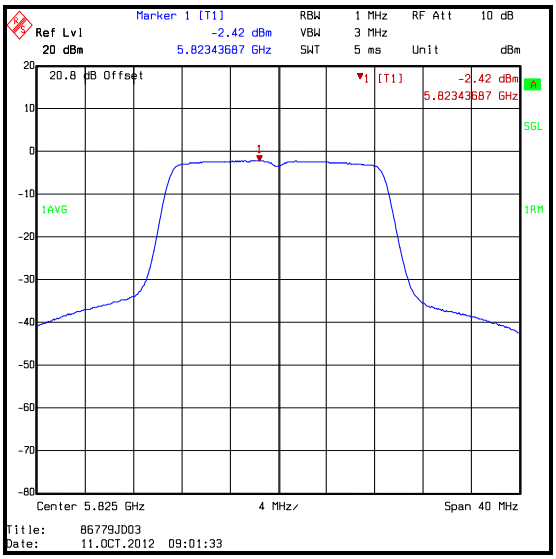
Channel	Frequency (MHz)	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	5745	-2.2	17.0	19.2	Complied
Middle	5785	-2.7	17.0	19.7	Complied
Top	5825	-2.4	17.0	19.4	Complied



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)
M1242	Test Receiver	FSEM30	24 Nov 2012	12
A2143	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 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	37

Note(s):

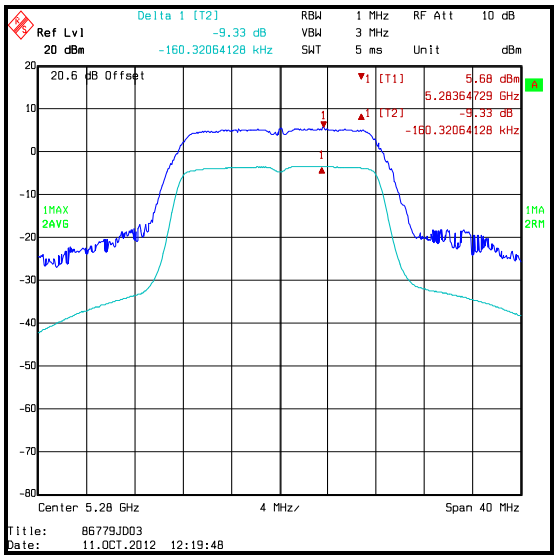
1. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power for the 5.25-5.35, 5.47-5.725 & 5.725-5.850 GHz bands were:
    - 802.11a 20 MHz channel – BPSK / 6 Mbps
    - 802. 11n 20 MHz channel – BPSK / 6.5 Mbps / MCS0

    Measurements were then performed with the EUT transmitting on the centre channel of each operating band.
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.

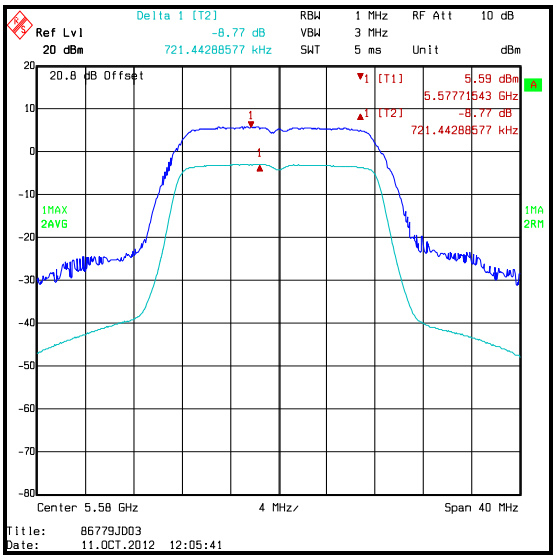
Transmitter Peak Excursion (continued)

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

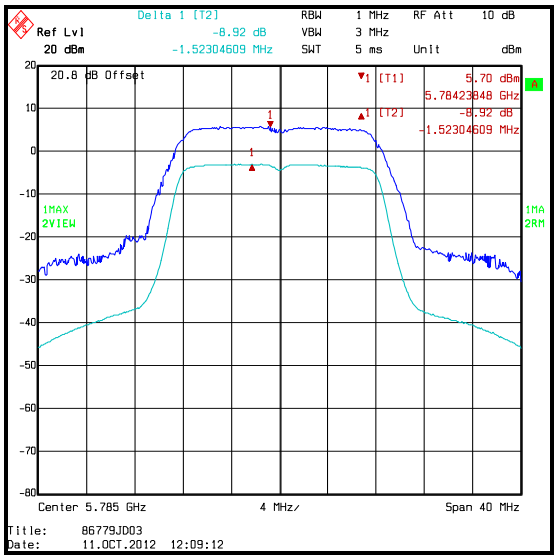
Band (GHz)	Middle Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5.25-5.35	5280	9.3	13.0	3.7	Complied
5.47-5.725	5580	8.8	13.0	4.2	Complied
5.725-5.850	5785	8.9	13.0	4.1	Complied



Middle Channel / 5.25-5.35 GHz band



Middle Channel / 5.47-5.725 GHz band

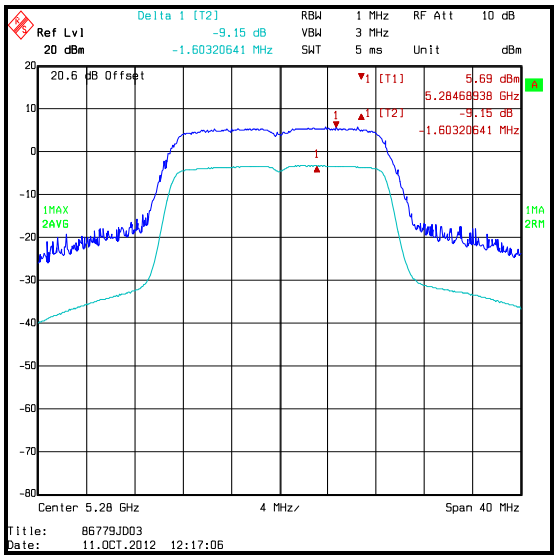


Middle Channel / 5.725-5.850 GHz band

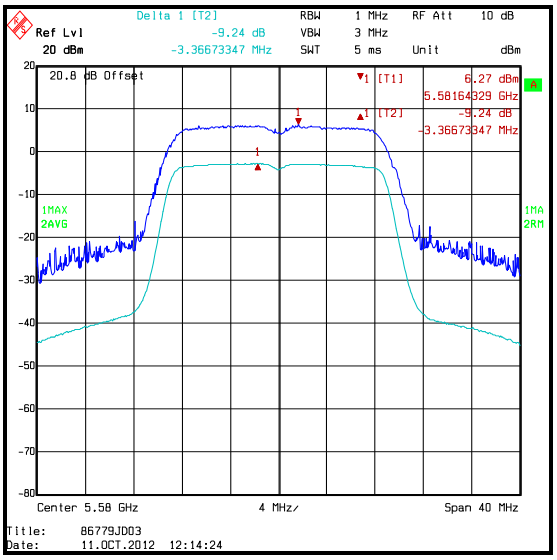
Transmitter Peak Excursion (continued)

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

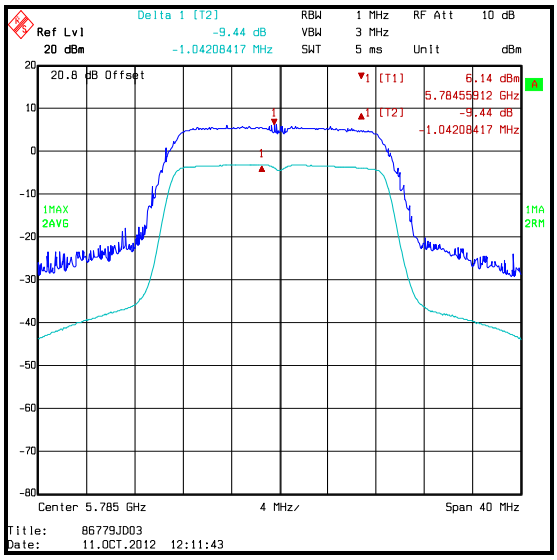
Band (GHz)	Middle Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5.25-5.35	5280	9.2	13.0	3.8	Complied
5.47-5.725	5580	9.2	13.0	3.8	Complied
5.725-5.850	5785	9.4	13.0	3.6	Complied



Middle Channel / 5.25-5.35 GHz band



Middle Channel / 5.47-5.725 GHz band



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)
M1242	Test Receiver	FSEM30	24 Nov 2012	12
A2143	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

5.2.10. Transmitter Out of Band Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	29 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

FCC Reference:	Parts 15.407(b)(1),(6),(7) & 15.209(a)
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):	21
Relative Humidity (%):	37

Note(s):

1. Pre-scans with the EUT transmitting on the top channel were performed 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.
2. 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 measurements were 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. Emissions from all antennas were initially investigated. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and therefore used for final measurements.
5. Pre-scans were performed with SDIO and SPI modules. The SPI module was found to radiate the highest emissions levels and results are recorded in the following tables. Results for the SDIO module are archived on the Company IT server and available for inspection if required.
6. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
7. 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.

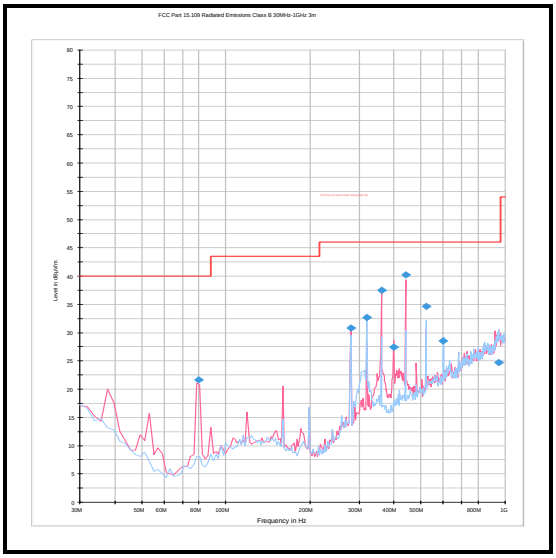
Transmitter Out of Band Radiated Emissions (5.25-5.35 GHz band operation) (continued)

Results: SPI Module / Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
279.987	Vertical	30.8	46.0	15.2	Complied
400.007	Vertical	27.5	46.0	18.5	Complied

Results: SPI Module / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
439.982	Vertical	-54.9	-27.0	27.9	Complied



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

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

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI) & 0219-01-001126 (SDIO)		

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

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	44

Note(s):

1. FCC Part 15.407(b)(2) states for devices operating in the 5.25 to 5.35 GHz band that generate emissions in the 5.15 to 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 to 5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15 to 5.25 GHz band. Part 15.407(b)(7) states the provisions of 15.205 apply, e.g. restricted bands of operation.
2. Industry Canada RSS-210 A9.2(2) states emissions outside the band 5250 to 5350 MHz shall not exceed -27 dBm/MHz EIRP.
3. Pre-scans were performed on the 5.47-5.725 GHz band as it produced the highest conducted output power. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emission seen for each band. Emissions from all antennas were initially investigated. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and therefore used for final measurements.
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.

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

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10516.092	Horizontal	-42.0	-27.0	15.0	Complied
15775.511	Horizontal	-34.0	-27.0	7.0	Complied

Results: SPI Module / 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
15775.511	Horizontal	61.2	74.0	12.8	Complied

Results: SPI Module / 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
15789.287	Horizontal	45.6	54.0	8.4	Complied

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10562.345	Horizontal	-40.3	-27.0	13.3	Complied
15841.830	Horizontal	-33.6	-27.0	6.6	Complied

Results: SPI Module / 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
15841.830	Horizontal	61.6	74.0	12.4	Complied

Results: SPI Module / 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
15839.427	Horizontal	46.3	54.0	7.7	Complied

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10640.782	Horizontal	-38.6	-27.0	11.6	Complied
15961.185	Horizontal	-35.2	-27.0	8.2	Complied

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

Results: SPI Module / 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
10640.782	Horizontal	56.6	74.0	17.4	Complied
15961.185	Horizontal	61.0	74.0	13.0	Complied

Results: SPI Module / 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
15967.327	Horizontal	43.2	54.0	10.8	Complied

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

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10524.990	Horizontal	-41.1	-27.0	14.1	Complied
15775.611	Horizontal	-40.7	-27.0	13.7	Complied

Results: SDIO Module / 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
15775.611	Horizontal	54.5	74.0	19.5	Complied

Results: SDIO Module / 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
15776.185	Horizontal	41.9	54.0	12.1	Complied

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10563.788	Horizontal	-39.5	-27.0	12.5	Complied
15839.579	Horizontal	-38.8	-27.0	11.8	Complied

Results: SDIO Module / 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
15839.579	Horizontal	56.4	74.0	17.6	Complied

Results: SDIO Module / 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
15838.092	Horizontal	43.2	54.0	10.8	Complied

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10645.711	Horizontal	-39.7	-27.0	12.7	Complied
15962.345	Horizontal	-38.0	-27.0	11.0	Complied

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

Results: SDIO Module / 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
10645.711	Horizontal	55.5	74.0	18.5	Complied
15962.345	Horizontal	57.2	74.0	16.8	Complied

Results: SDIO Module / 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
10639.699	Horizontal	43.8	54.0	10.2	Complied
15933.472	Horizontal	42.4	54.0	11.6	Complied

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

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	29 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

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):	21
Relative Humidity (%):	37

Note(s):

1. 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, e.g. restricted bands of operation.
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 initially investigated. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and therefore used for final measurements.
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.

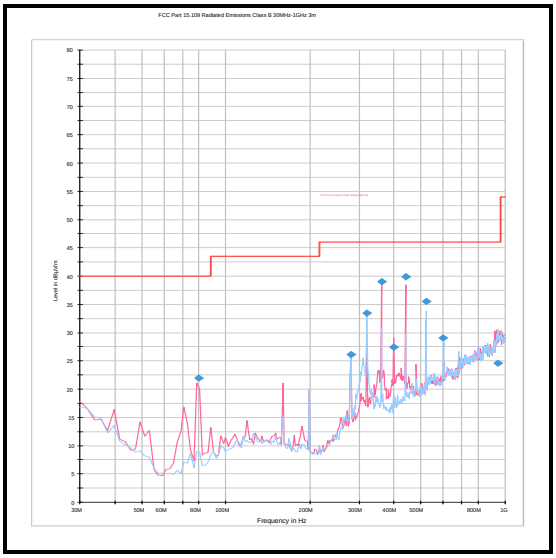
Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)

Results: Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
279.978	Horizontal	26.2	46.0	19.8	Complied
399.998	Vertical	27.4	46.0	18.6	Complied

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
439.982	Vertical	-55.3	-27.0	28.3	Complied



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

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

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	44

Note(s):

1. FC 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 e.g. restricted bands of operation.
2. Industry Canada RSS-210 A9.2(3) states emissions outside the band 5470 to 5725 MHz shall not exceed -27 dBm/MHz EIRP.
3. Pre-scans were performed on the 5.47-5.725 GHz band as it produced the highest conducted output power. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emission seen for each band. Emissions from all antennas were initially investigated. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and therefore used for final measurements.
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-scans 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. 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.
9. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

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

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
10997.295	Horizontal	-36.9	-27.0	9.9	Complied
16497.230	Horizontal	-41.4	-27.0	14.4	Complied

Results: SPI Module / 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
10997.295	Horizontal	58.3	74.0	15.7	Complied

Results: SPI Module / 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
10999.459	Horizontal	46.0	54.0	8.0	Complied

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11154.048	Horizontal	-39.3	-27.0	12.3	Complied
16738.436	Horizontal	-42.0	-27.0	15.0	Complied

Results: SPI Module / 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
11154.048	Horizontal	55.9	74.0	18.1	Complied

Results: SPI Module / 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
11160.180	Horizontal	42.0	54.0	12.0	Complied

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

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11400.661	Horizontal	-43.4	-27.0	16.4	Complied
17099.995	Horizontal	-41.4	-27.0	14.4	Complied

Results: SPI Module / 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
11400.661	Horizontal	51.8	74.0	22.2	Complied

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

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11004.148	Horizontal	-43.8	-27.0	16.8	Complied
16493.928	Horizontal	-37.4	-27.0	10.4	Complied

Results: SDIO Module / 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
11004.148	Horizontal	51.4	74.0	22.6	Complied

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11158.617	Horizontal	-40.5	-27.0	13.5	Complied
16749.078	Horizontal	-37.3	-27.0	10.3	Complied

Results: SDIO Module / 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
11158.617	Horizontal	54.7	74.0	19.3	Complied

Results: SDIO Module / 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
11158.978	Horizontal	41.7	54.0	12.3	Complied

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

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11397.415	Horizontal	-42.6	-27.0	15.6	Complied
16401.864	Horizontal	-39.5	-27.0	12.5	Complied

Results: SDIO Module / 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
11397.415	Horizontal	52.6	74.0	21.4	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	26 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

FCC Reference:	Parts 15.407(b)(4),(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):	23
Relative Humidity (%):	39

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 initially investigated. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and therefore used for final measurements.
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.

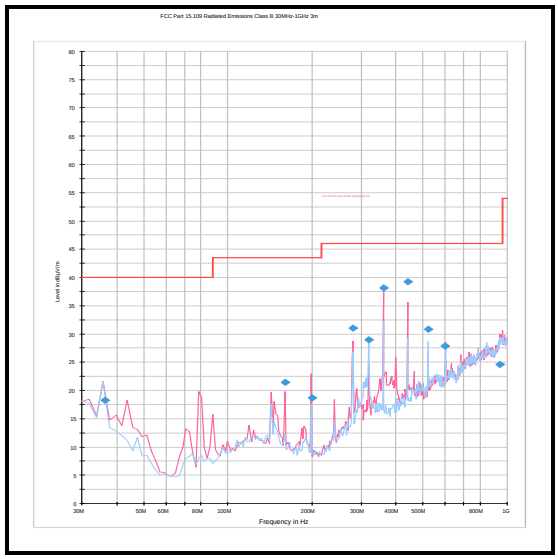
Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: Top Channel / Field Strength

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
279.978	Vertical	31.0	46.0	15.0	Complied

Results: Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
439.982	Vertical	-55.9	-27.0	28.9	Complied



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

Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	17 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	44

Note(s):

1. FCC Part 15.407(b)(4) states for transmitters operating in the band 5.725 to 5.850 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. 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 5470 to 5725 MHz shall not exceed -27 dBm/MHz EIRP.
3. Pre-scans were performed on the 5.725-5.850 GHz band as it produced the highest conducted output power. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emission seen for each band. Emissions from all antennas were initially investigated. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and used for final measurements.
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 plots 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 5.725 to 5.85 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. 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.
9. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11483.808	Horizontal	-43.4	-27.0	16.4	Complied
17226.827	Horizontal	-42.8	-27.0	15.8	Complied

Results: SPI Module / 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
11483.808	Horizontal	51.8	74.0	22.2	Complied

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11564.289	Horizontal	-41.6	-27.0	14.6	Complied
17353.613	Horizontal	-42.8	-27.0	15.8	Complied

Results: SPI Module / 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
11564.289	Horizontal	53.6	74.0	20.4	Complied

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11648.978	Horizontal	-42.1	-27.0	15.1	Complied
17473.044	Horizontal	-41.5	-27.0	14.5	Complied

Results: SPI Module / 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
11648.978	Horizontal	53.1	74.0	20.9	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Bottom Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11491.503	Horizontal	-40.7	-27.0	13.7	Complied
17225.922	Vertical	-34.1	-27.0	7.1	Complied

Results: SDIO Module / 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
11491.503	Horizontal	54.5	74.0	19.5	Complied

Results: SDIO Module / 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
11490.060	Horizontal	41.3	54.0	12.7	Complied

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Middle Channel / EIRP

Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11576.433	Horizontal	-42.6	-27.0	15.6	Complied
17357.224	Vertical	-32.9	-27.0	5.9	Complied

Results: SDIO Module / 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
11576.433	Horizontal	52.6	74.0	21.4	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / EIRP

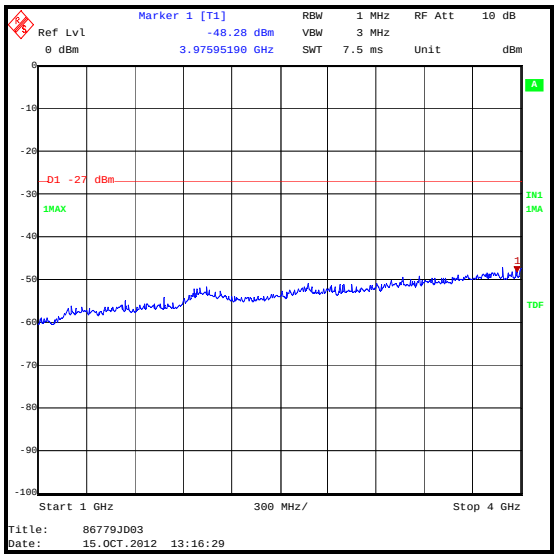
Frequency (MHz)	Antenna Polarity	Level (dBm)	Limit (dBm)	Margin (dB)	Result
11651.271	Horizontal	-43.4	-27.0	16.4	Complied
17474.940	Vertical	-30.7	-27.0	3.7	Complied

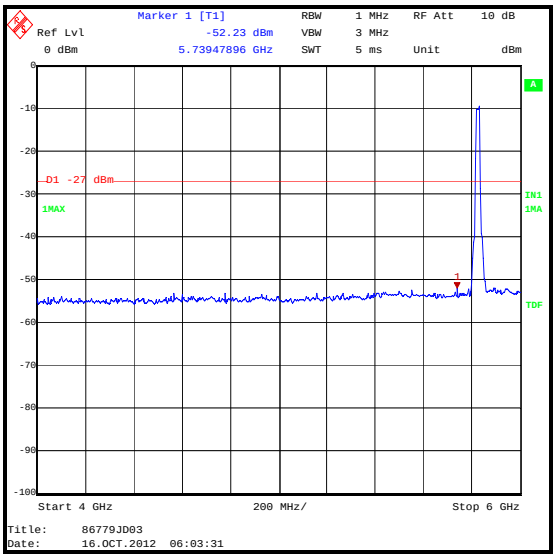
Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0 / Top Channel / Field Strength / Peak

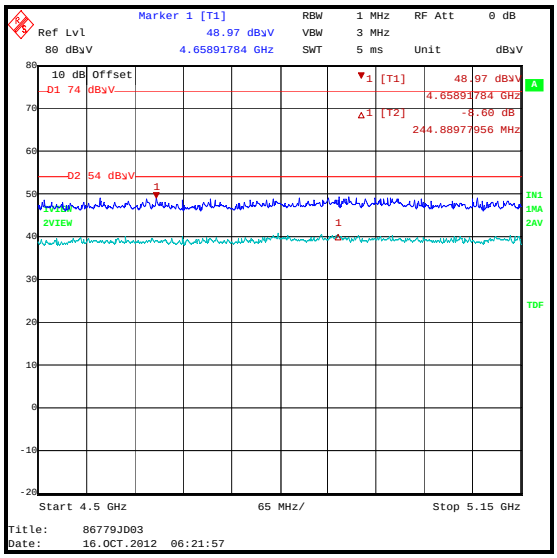
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
11651.271	Horizontal	51.8	74.0	22.2	Complied

Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

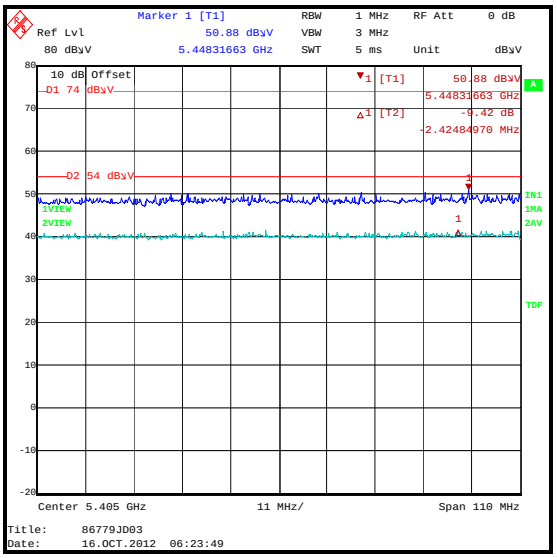
SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0







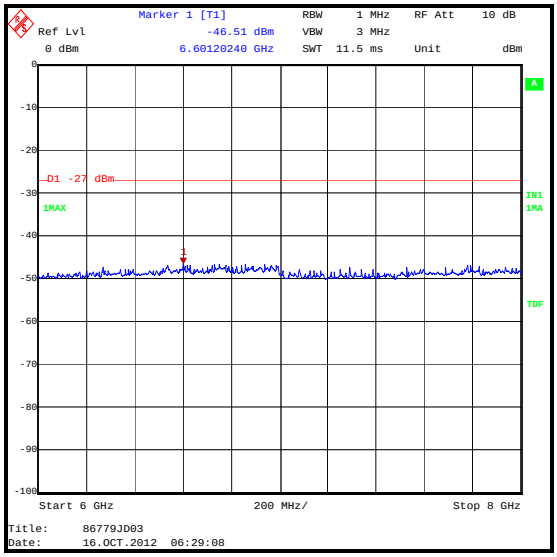
Restricted Band 4.5 GHz to 5.15 GHz

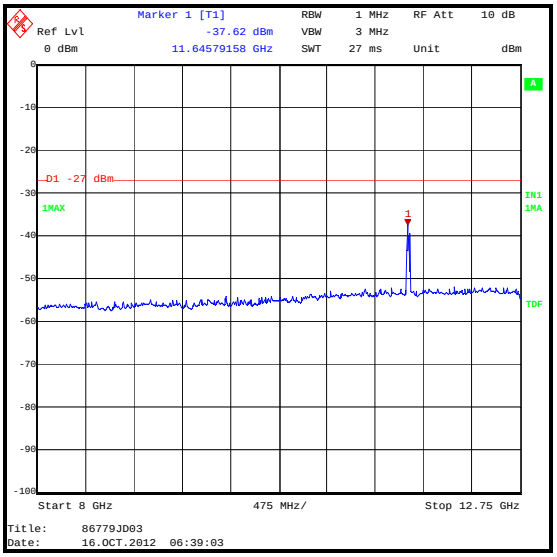


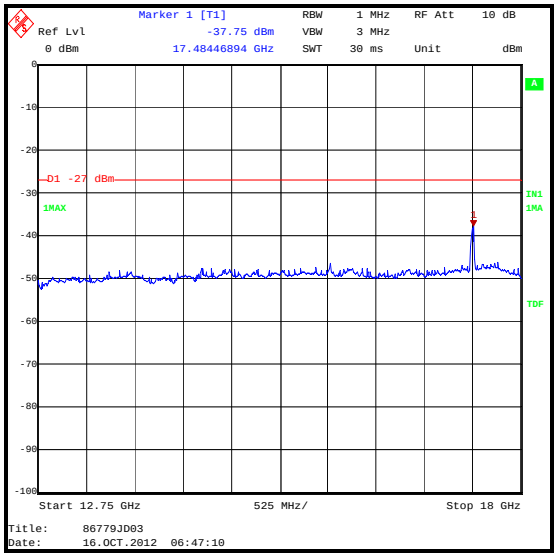
Restricted Band 5.35 GHz to 5.46 GHz

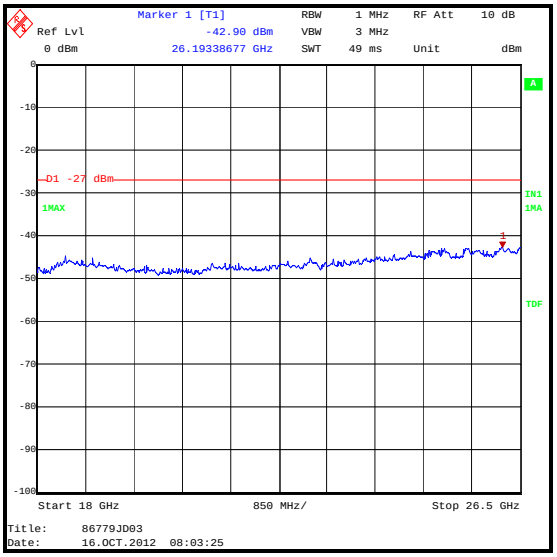
Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0



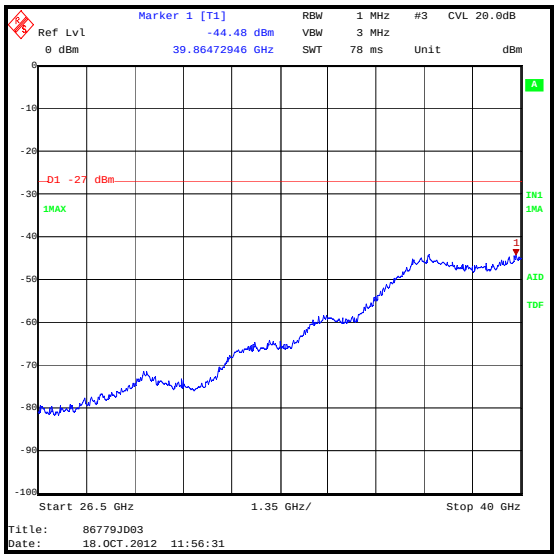






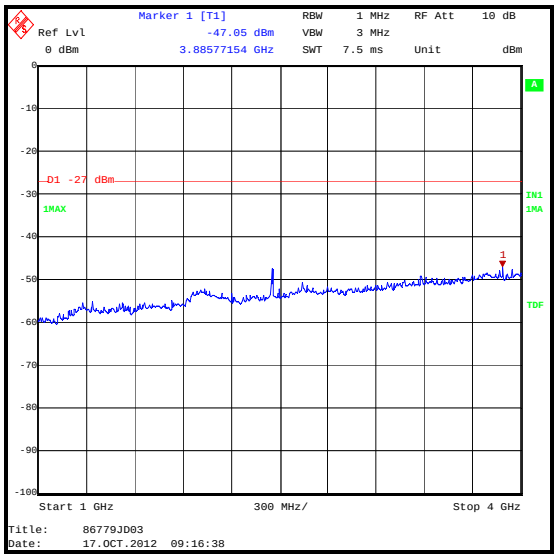
Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

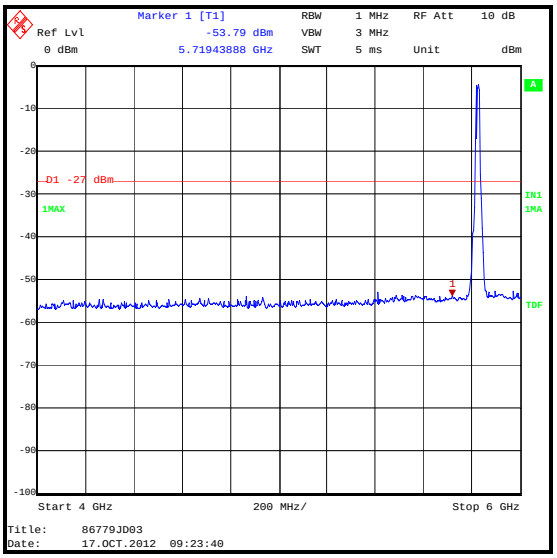
SPI Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0

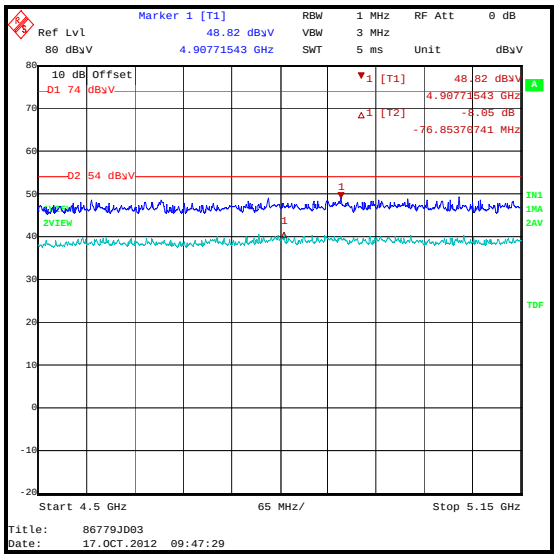


Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

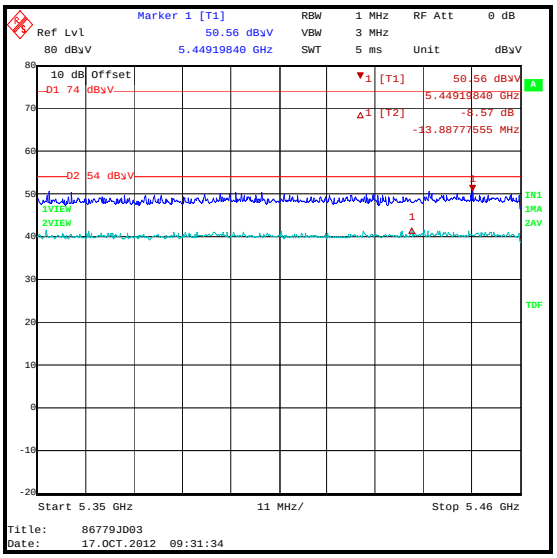
SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0







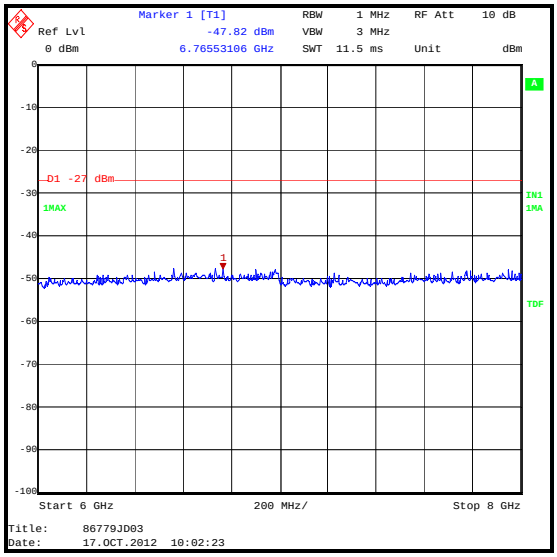
Restricted Band 4.5 GHz to 5.15 GHz

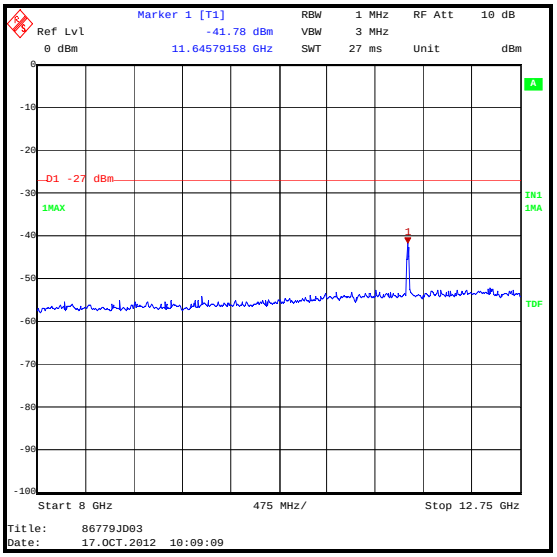


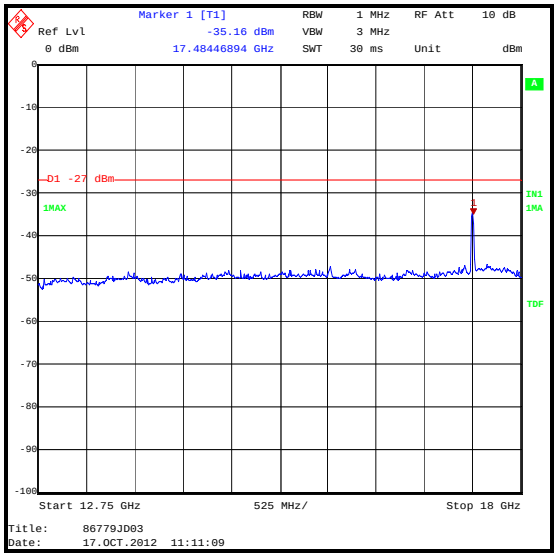
Restricted Band 5.35 GHz to 5.46 GHz

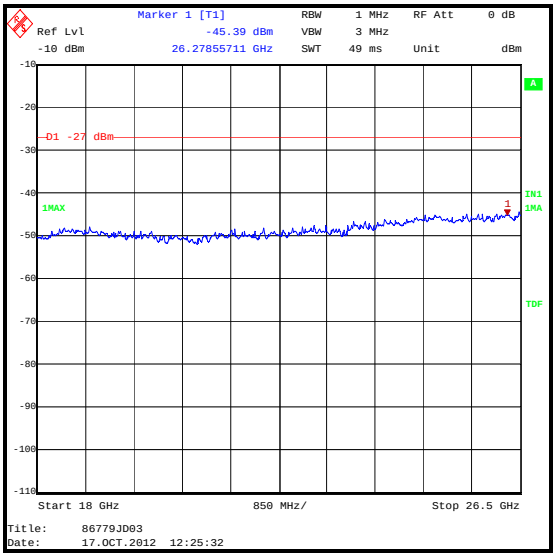
Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / BPSK / MCS0



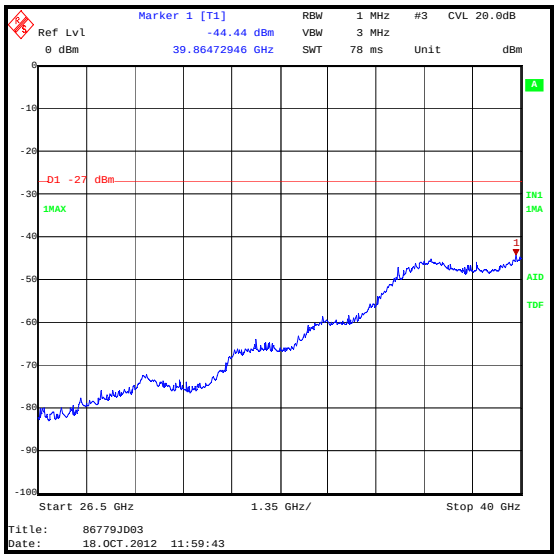






Transmitter Out of Band Radiated Emissions (5.725-5.850 GHz band operation) (continued)

SDIO Module / 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)
K0001	5 m RSE Chamber	N/A	24 Oct 2013	12
K0002	3m RSE Chamber	N/A	30 Oct 2012	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	30 Oct 2012	12
A1818	Horn Antenna	3115	30 Oct 2012	12
A253	Horn Antenna	12240-20	30 Oct 2012	12
A254	Horn Antenna	14240-20	30 Oct 2012	12
A255	Horn Antenna	16240-20	30 Oct 2012	12
A256	Horn Antenna	18240-20	30 Oct 2012	12
A436	Horn Antenna	20240-20	30 Oct 2012	12
A203	Horn Antenna	22240-20	11 May 2013	36
A553	Bi-log Antenna	CBL6111A	15 Feb 2013	12
A1834	Attenuator	8491B	29 Jan 2013	12
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
M1273	Test Receiver	ESIB 26	03 Feb 2013	12

5.2.10.1. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	24 October 2012
Test Sample Serial Number:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	50

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 5.25-5.35 GHz band were:
    - 802.11a – BPSK / 6 Mbps
    - 802.11n BPSK / 6.5 Mbps / MCS0

    Band edge testing was performed in all 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. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and used for band edge measurements.
4. The measurement span was increased to 250 MHz when measuring the bottom channel in order to show the carrier and lower band edge on the same plot.
5. 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.
6. 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: SPI Module / 802.11a / 20 MHz / 6 Mbps / Peak

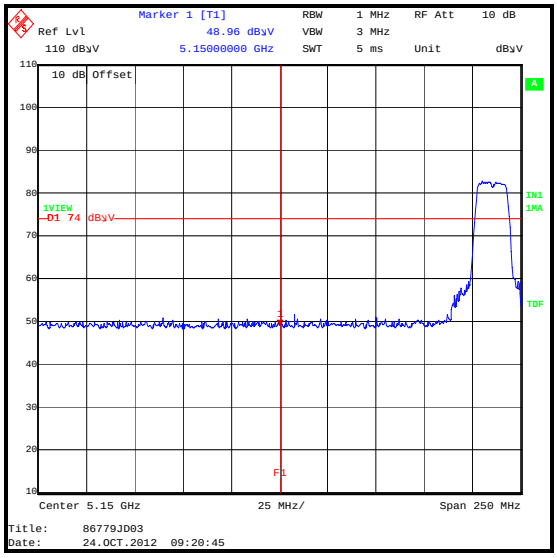
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	49.0	74.0	25.0	Complied
5350	51.7	74.0	22.3	Complied

Results: SPI Module / 802.1a / 20 MHz / 6 Mbps / Average

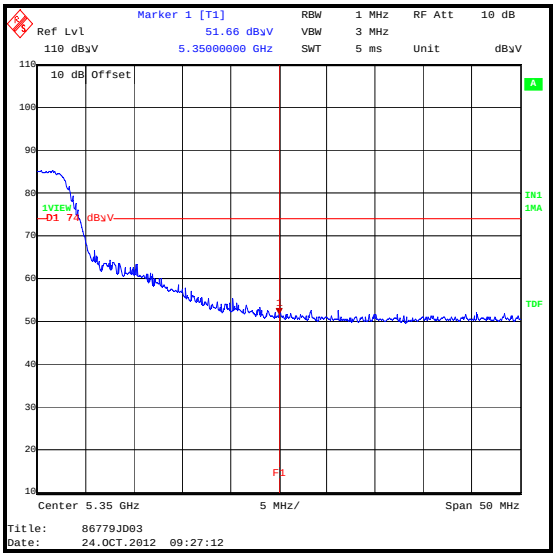
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	38.5	54.0	15.5	Complied
5350	39.5	54.0	14.5	Complied

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

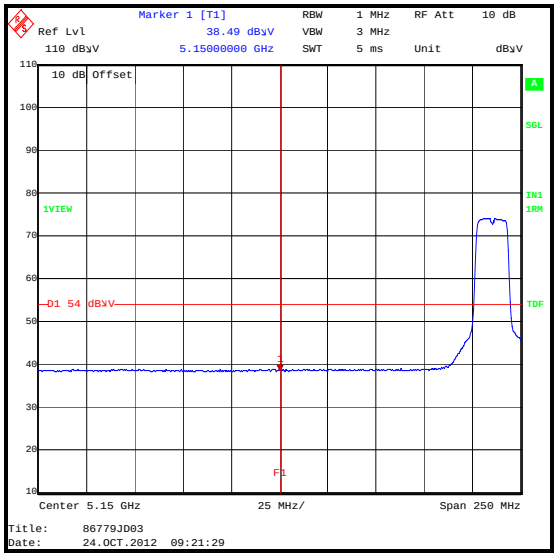
Results: SPI Module / 802.11a / 20 MHz / 6 Mbps



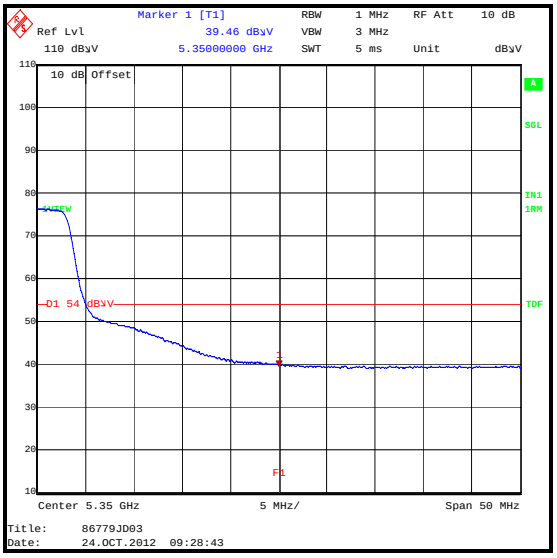
Lower Band Edge / Peak



Upper Band Edge / Peak



Lower Band Edge / Average



Upper Band Edge / Average

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

Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / Peak

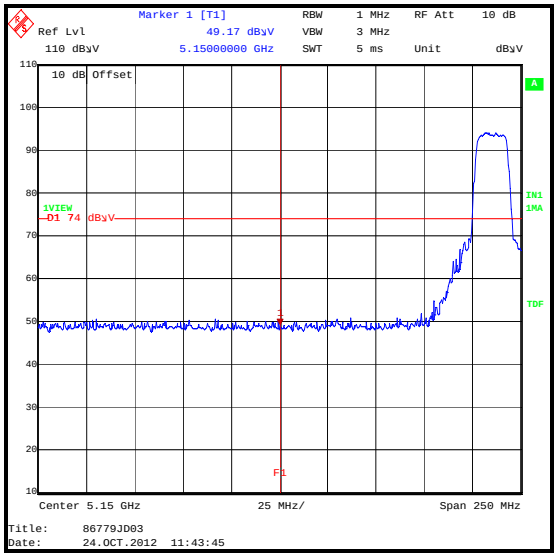
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	49.2	74.0	24.8	Complied
5350	62.5	74.0	11.5	Complied

Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / Average

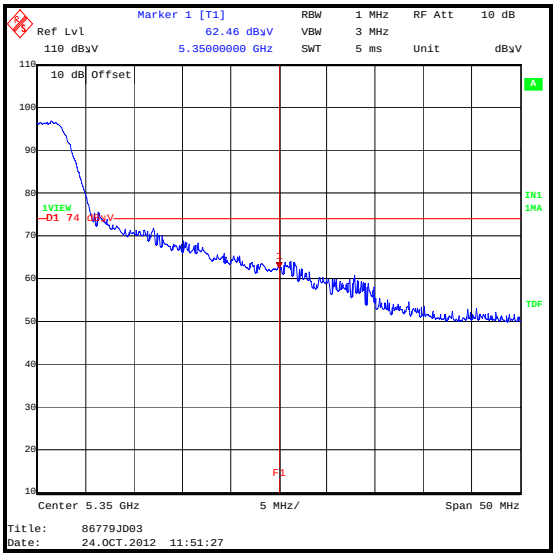
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	38.3	54.0	15.7	Complied
5350	44.2	54.0	9.8	Complied

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

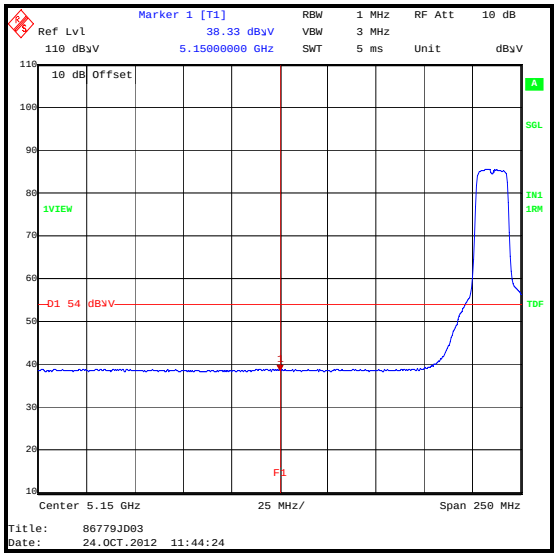
Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps



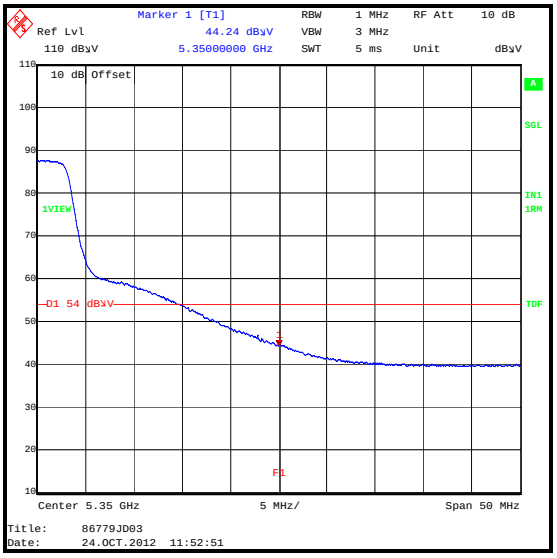
Lower Band Edge / Peak



Upper Band Edge / Peak



Lower Band Edge / Average



Upper Band Edge / Average

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

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

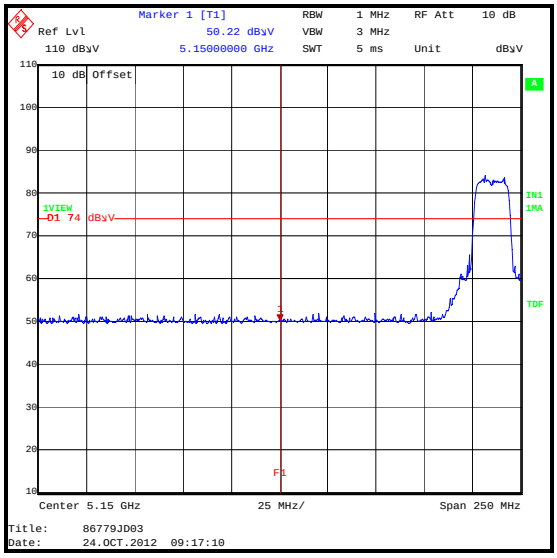
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	50.2	74.0	23.8	Complied
5350	51.4	74.0	22.6	Complied

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Average

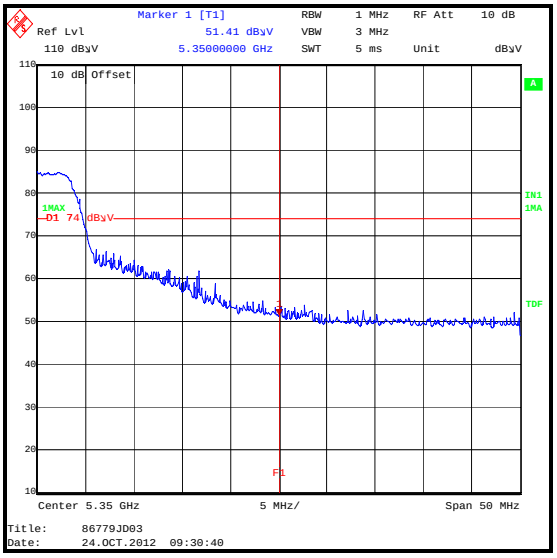
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	38.4	54.0	15.6	Complied
5350	40.4	54.0	13.6	Complied

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

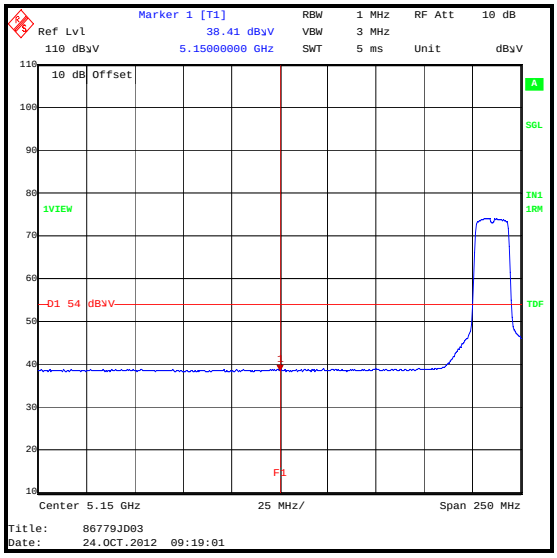
Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0



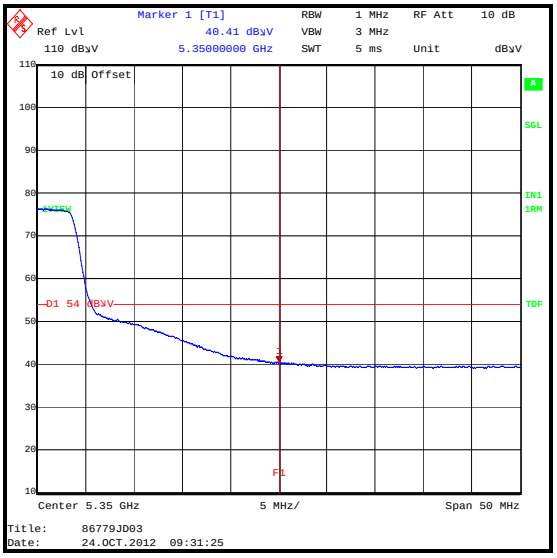
Lower Band Edge / Peak



Upper Band Edge / Peak



Lower Band Edge / Average



Upper Band Edge / Average

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

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

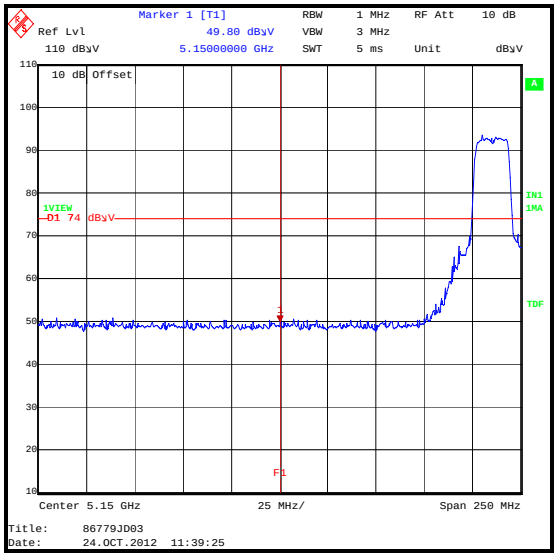
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	49.8	74.0	24.2	Complied
5350	60.8	74.0	13.2	Complied

Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Average

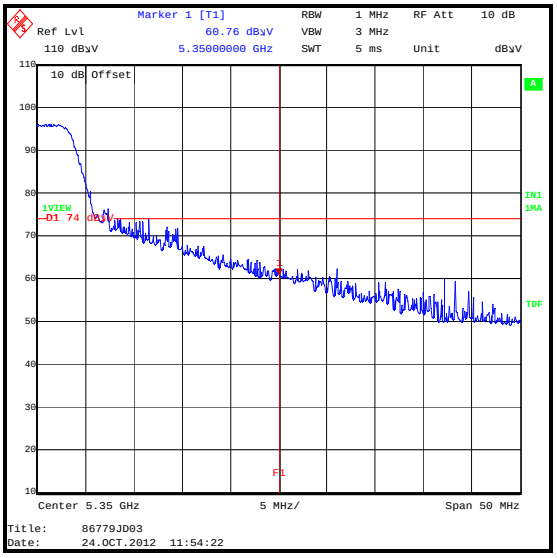
Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5150	38.6	54.0	15.4	Complied
5350	47.1	54.0	6.9	Complied

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

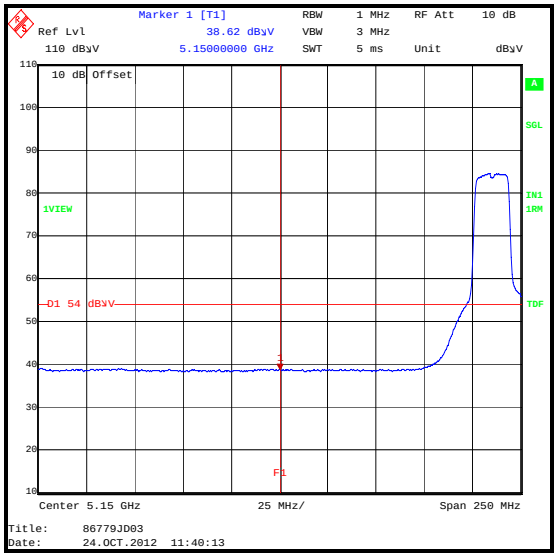
Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0



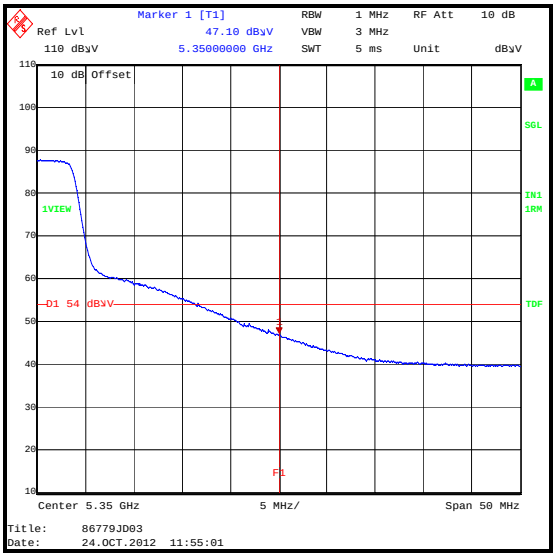
Lower Band Edge / Peak



Upper Band Edge / Peak



Lower Band Edge / Average



Upper Band Edge / Average

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

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	24 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	50

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 5.47-5.725 GHz band were:
2. 802.11a – BPSK / 6 Mbps
3. 802.11n - BPSK / 6.5 Mbps / MCS0

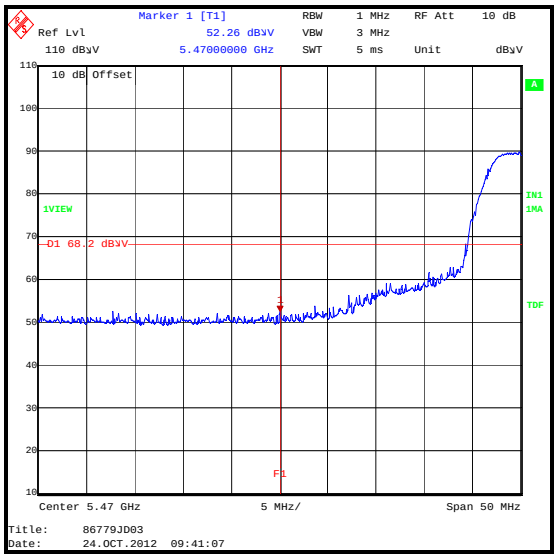
   Band edge testing was performed in all modes on both supported channel widths.
4. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
5. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and used for band edge measurements.
6. 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 the 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.
7. 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.
8. 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.

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

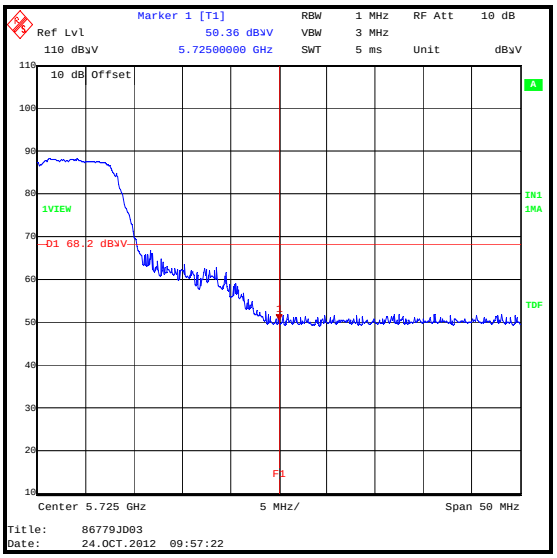
Results: SPI Module / 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-42.9	-27.0	15.9	Complied
5725	-44.8	-27.0	17.8	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	52.3	68.2	15.9	Complied
5725	50.4	68.2	17.8	Complied



Lower Band Edge



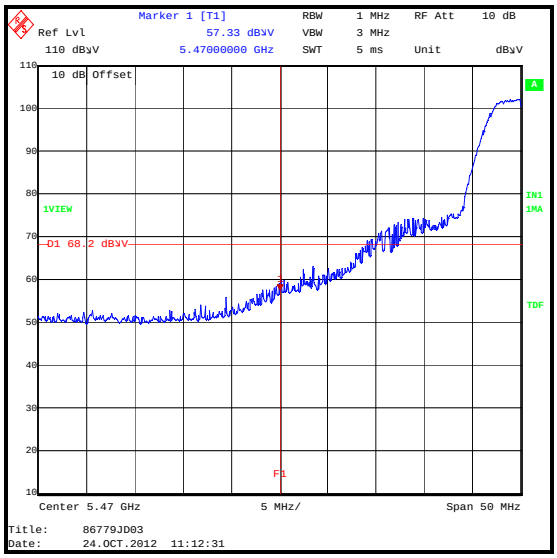
Upper Band Edge

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

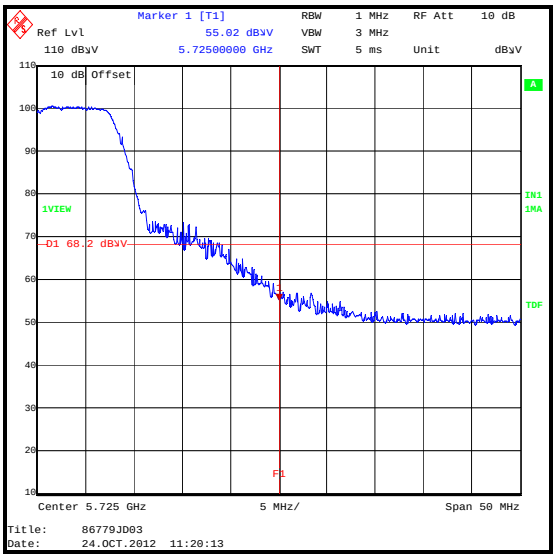
Results: SDIO Module / 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-37.9	-27.0	10.9	Complied
5725	-40.2	-27.0	13.2	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	57.3	68.2	10.9	Complied
5725	55.0	68.2	13.2	Complied



Lower Band Edge



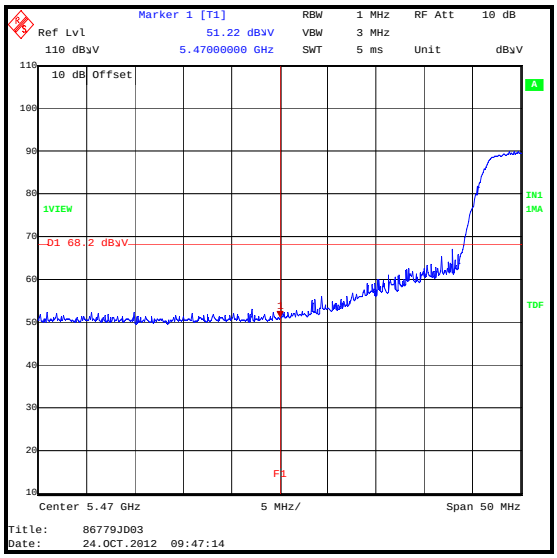
Upper Band Edge

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

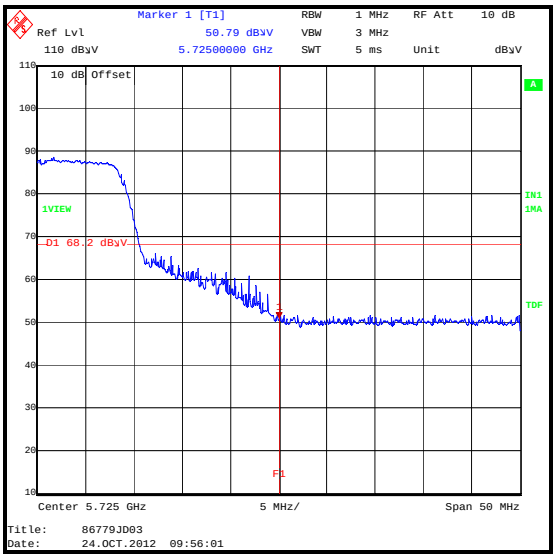
Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-44.0	-27.0	17.0	Complied
5725	-44.4	-27.0	17.4	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	51.2	68.2	17.0	Complied
5725	50.8	68.2	17.4	Complied



Lower Band Edge



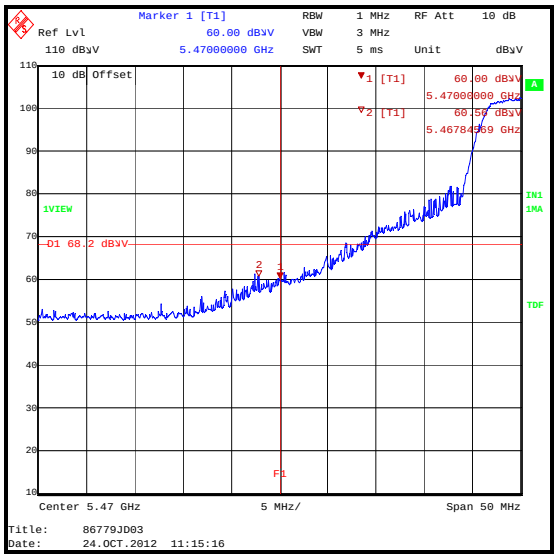
Upper Band Edge

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

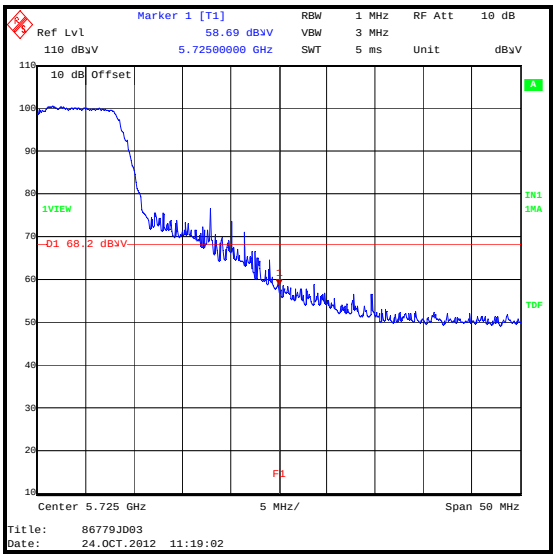
Results: SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-35.2	-27.0	8.2	Complied
5725	-36.5	-27.0	9.5	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	60.0	68.2	8.2	Complied
5725	58.7	68.2	9.5	Complied



Lower Band Edge



Upper Band Edge

Transmitter Band Edge Radiated Emissions (5.725-5.850 GHz band)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	19 October 2012
Test Sample Serial Numbers:	0216-01-001552 (SPI module) & 0219-01-001126 (SDIO module)		

FCC Reference:	Parts 15.407(b)(4), 15.247(d) & 15.209(a)
Industry Canada Reference:	RSS-210 A9.2(4) & RSS-210 A8.5
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 G)

Environmental Conditions:

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

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:
2. 802.11a – BPSK / 6 Mbps
3. 802.11n - BPSK / 6.5 Mbps / MCS0
4. 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.
5. The Ex-It WLAN RP-SMA antenna was found to radiate the highest emission levels and used for band edge measurements.
6. 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.
7. 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 (5.725-5.850 GHz band operation) (continued)

Results: SPI Module 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-44.5	-27.0	17.5	Complied
5725	-38.9	-17.0	21.9	Complied
5850	-43.8	-27.0	16.8	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	50.7	68.2	17.5	Complied
5725	56.3	78.2	21.9	Complied
5850	51.4	68.2	16.8	Complied

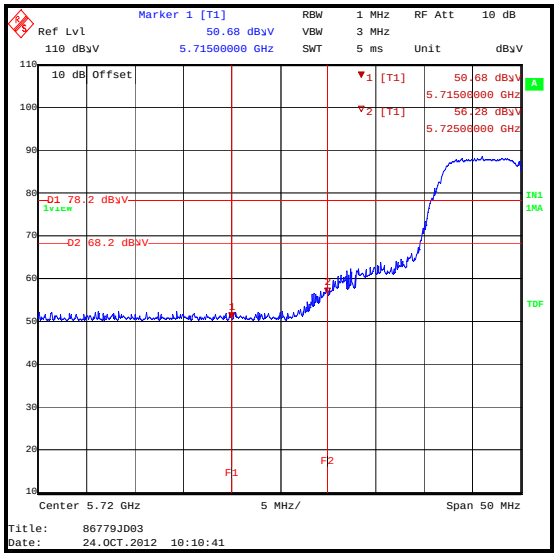
SDIO Module 802.11a / 20 MHz / 6 Mbps / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-37.1	-27.0	10.1	Complied
5725	-27.6	-17.0	10.6	Complied
5850	-36.1	-27.0	9.1	Complied

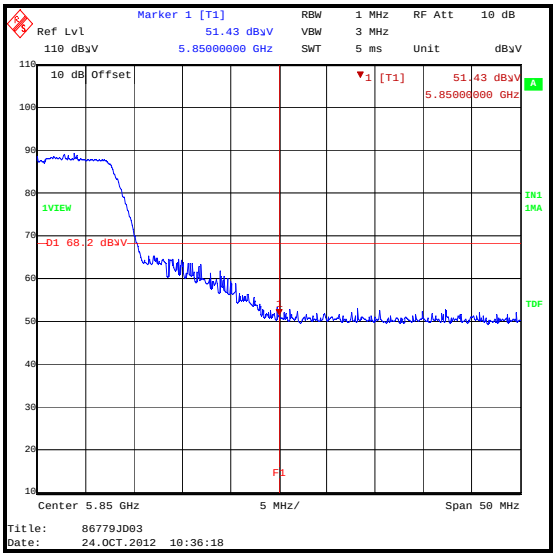
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	58.1	68.2	10.1	Complied
5725	67.6	78.2	10.6	Complied
5850	59.1	68.2	9.1	Complied

Transmitter Band Edge Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: SPI Module / 802.11a / 20 MHz / 6 Mbps / Peak

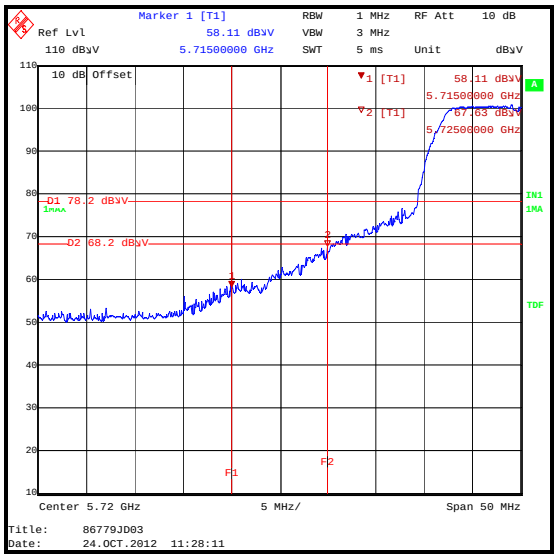


Lower Band Edge

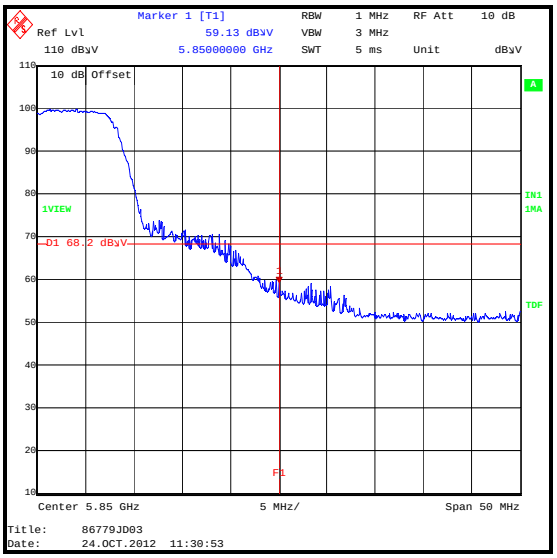


Upper Band Edge

SDIO Module / 802.11a / 20 MHz / 6 Mbps / Peak



Lower Band Edge



Upper Band Edge

Transmitter Band Edge Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-44.8	-27.0	17.8	Complied
5724.358	-33.3	-27.0	6.3	Complied
5725	-37.6	-17.0	20.6	Complied
5850	-40.9	-27.0	13.9	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	50.4	68.2	17.8	Complied
5724.358	61.9	68.2	6.3	Complied
5725	57.6	78.2	20.6	Complied
5850	54.3	68.2	13.9	Complied

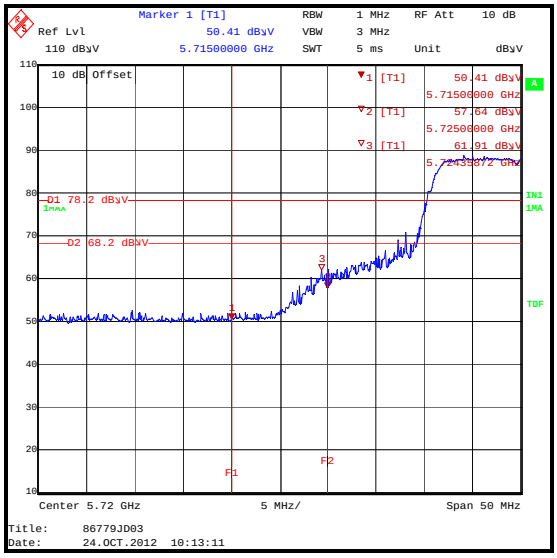
SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-34.8	-27.0	7.8	Complied
5725	-24.1	-17.0	7.1	Complied
5850	-36.5	-27.0	9.5	Complied

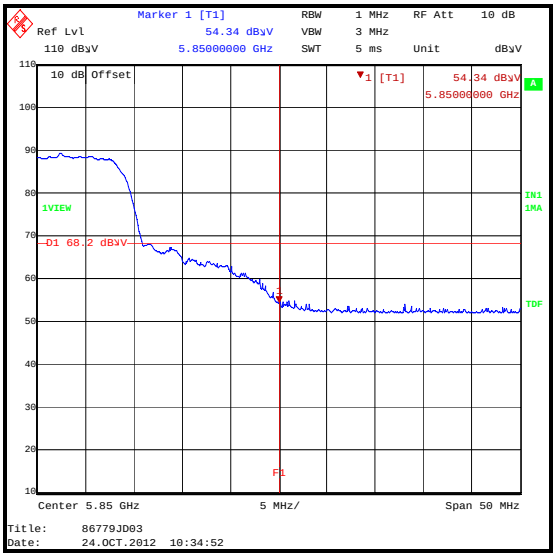
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	60.4	68.2	7.8	Complied
5725	71.1	78.2	7.1	Complied
5850	58.7	68.2	9.5	Complied

Transmitter Band Edge Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Results: SPI Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak

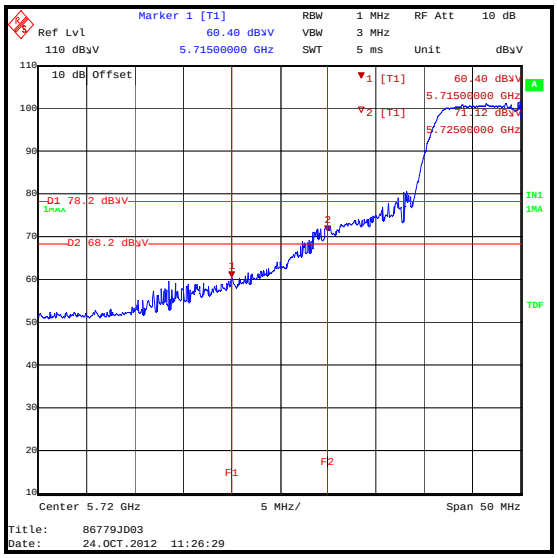


Lower Band Edge

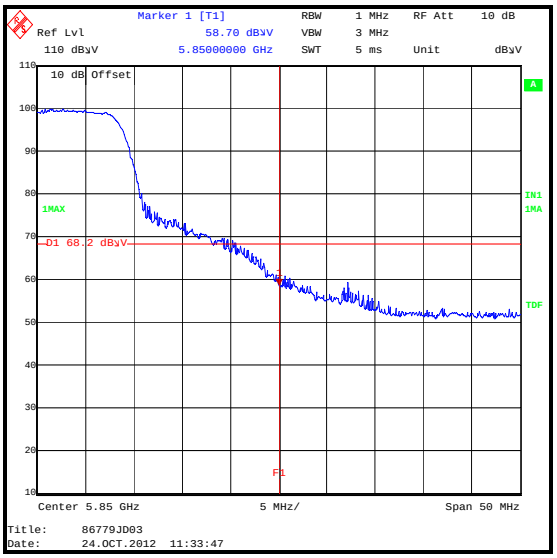


Upper Band Edge

SDIO Module / 802.11n / 20 MHz / 6.5 Mbps / MCS0 / Peak



Lower Band Edge



Upper Band Edge

Transmitter Band Edge Radiated Emissions (5.725-5.850 GHz band operation) (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0001	5 m RSE Chamber	N/A	24 Oct 2013	12
K0002	3m RSE Chamber	N/A	30 Oct 2012	12
M1124	Test Receiver	ESIB 26	14 Aug 2013	12
A1534	Pre Amplifier	8449B	30 Oct 2012	12
A1396	Attenuator	6810.17.B	06 Jul 2013	12
A253	Horn Antenna	12240-20	30 Oct 2012	12

5.2.11. Transmitter Frequency Stability

Test Engineers:	David Doyle & Ben Mercer	**Test Dates:**	12 November 2012 & 13 November 2012
Test Sample Serial Number:	0216-01-001552 (SPI module)		

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):	23 to 26
Ambient Relative Humidity (%):	39 to 47

Note(s):

1. The Customer provided test firmware version ows451_pcti_firmware_2.5.0_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 bands 2,2e and 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 (5.250-5.350 GHz band operation) (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	5260	-30	5259.955940	5259.980177	5259.982180	5259.982751
Bottom	5260	-20	5259.977746	5259.987444	5259.987466	5259.987779
Bottom	5260	-10	5259.986776	5259.982694	5259.980477	5259.980474
Bottom	5260	0	5259.984859	5259.969595	5259.967485	5259.967639
Bottom	5260	10	5259.974062	5259.954057	5259.951410	5259.951911
Bottom	5260	20	5259.964356	5259.938769	5259.934690	5259.934933
Bottom	5260	30	5259.946623	5259.924088	5259.922529	5259.922788
Bottom	5260	40	5259.926458	5259.918253	5259.918363	5259.918550
Bottom	5260	50	5259.918230	5259.924020	5259.921130	5259.924020
Bottom	5260	60	5259.927640	5259.942840	5259.937050	5259.947900
Bottom	5260	70	5259.928676	5259.983071	5259.994652	5259.994171
Bottom	5260	80	5259.956331	5260.047383	5260.055434	5260.045488
Bottom	5260	85	5259.974949	5260.086398	5260.104663	5260.103498

Frequency stability of the EUT with variations in ambient temperature (5.250-5.350 GHz band operation) (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	5320	-30	5319.968318	5319.982000	5319.979559	5319.980274
Top	5320	-20	5319.987453	5319.987086	5319.987032	5319.987656
Top	5320	-10	5319.986961	5319.981028	5319.981845	5319.981671
Top	5320	0	5319.982188	5319.967803	5319.969583	5319.969727
Top	5320	10	5319.971892	5319.950954	5319.952855	5319.953020
Top	5320	20	5319.950835	5319.934651	5319.936217	5319.936814
Top	5320	30	5319.941681	5319.922001	5319.922862	5319.923034
Top	5320	40	5319.923573	5319.917438	5319.916913	5319.917492
Top	5320	50	5319.916790	5319.921130	5319.920410	5319.921130
Top	5320	60	5319.921850	5319.937050	5319.937050	5319.939220
Top	5320	70	5319.939985	5319.992196	5319.983372	5319.985014
Top	5320	80	5319.970460	5320.049496	5320.041939	5320.045415
Top	5320	85	5319.999269	5320.099451	5320.091200	5320.088994

Worse Case Margins:

Channel	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	5260	5260.104663	±20 ppm	19.90	Complied
Top	5320	5320.099451	±20 ppm	18.69	Complied

Frequency stability of the EUT with variations in voltage (5.250-5.350 GHz band operation) (continued)

Results (Temperature = 20°C):

Channel	Supply Voltage (VDC)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	3.3	5260	5259.954986	±20 ppm	8.56	Complied
Bottom	5.0	5260	5259.964356	±20 ppm	6.78	Complied
Bottom	5.5	5260	5259.951158	±20 ppm	9.29	Complied
Top	3.3	5320	5319.952352	±20 ppm	8.96	Complied
Top	5.0	5320	5319.950835	±20 ppm	9.24	Complied
Top	5.5	5320	5319.949392	±20 ppm	9.51	Complied

Frequency stability of the EUT with variations in ambient temperature (5.470-5.725 GHz band operation) (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	5500	-30	5499.960412	5499.977903	5499.978665	5499.978585
Bottom	5500	-20	5499.984623	5499.986908	5499.986627	5499.986956
Bottom	5500	-10	5499.984808	5499.982139	5499.981678	5499.981596
Bottom	5500	0	5499.978547	5499.970845	5499.970373	5499.969961
Bottom	5500	10	5499.964966	5499.953911	5499.953660	5499.953060
Bottom	5500	20	5499.948378	5499.936350	5499.934742	5499.935283
Bottom	5500	30	5499.934597	5499.921973	5499.921184	5499.921066
Bottom	5500	40	5499.919862	5499.914491	5499.914346	5499.914174
Bottom	5500	50	5499.919680	5499.916060	5499.917510	5499.918230
Bottom	5500	60	5499.919680	5499.937050	5499.935600	5499.936320
Bottom	5500	70	5499.940902	5499.977601	5499.980407	5499.979029
Bottom	5500	80	5499.979813	5500.063276	5500.037199	5500.046598
Bottom	5500	85	5500.005545	5500.086056	5500.083938	5500.083354

Frequency stability of the EUT with variations in ambient temperature (5.470-5.725 GHz band operation) (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	5700	-30	5699.959605	5699.980079	5699.978484	5699.977270
Top	5700	-20	5699.979984	5699.986044	5699.986157	5699.986083
Top	5700	-10	5699.984209	5699.979440	5699.981160	5699.980873
Top	5700	0	5699.977868	5699.965786	5699.969384	5699.968832
Top	5700	10	5699.965975	5699.947545	5699.952176	5699.952225
Top	5700	20	5699.940654	5699.929631	5699.933022	5699.933539
Top	5700	30	5699.933506	5699.916560	5699.918789	5699.918565
Top	5700	40	5699.916317	5699.911289	5699.911181	5699.911557
Top	5700	50	5699.911720	5699.916060	5699.913890	5699.913890
Top	5700	60	5699.914620	5699.937050	5699.934880	5699.931980
Top	5700	70	5699.938570	5699.990007	5699.974952	5699.976396
Top	5700	80	5699.956118	5700.056382	5700.037911	5700.053920
Top	5700	85	5700.013371	5700.104891	5700.081132	5700.080256

Worse Case Margins:

Channel	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	5500	5500.086056	±20 ppm	15.65	Complied
Top	5700	5700.104891	±20 ppm	18.40	Complied

Frequency stability of the EUT with variations in voltage (5.470-5.725 GHz band operation) (continued)

Results (Temperature = 20°C):

Channel	Supply Voltage (VDC)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	3.3	5500	5499.950012	±20 ppm	9.09	Complied
Bottom	5.0	5500	5499.948378	±20 ppm	9.39	Complied
Bottom	5.5	5500	5499.946695	±20 ppm	9.69	Complied
Top	3.3	5700	5699.952452	±20 ppm	8.34	Complied
Top	5.0	5700	5699.940654	±20 ppm	10.41	Complied
Top	5.5	5700	5699.945922	±20 ppm	9.49	Complied

Frequency stability of the EUT with variations in ambient temperature (5.725-5.850 GHz band operation) (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	5744.960561	5744.978783	5744.978526	5744.978423
Bottom	5745	-20	5744.979694	5744.987058	5744.986789	5744.986795
Bottom	5745	-10	5744.985156	5744.981495	5744.981331	5744.981619
Bottom	5745	0	5744.978698	5744.968172	5744.969700	5744.969798
Bottom	5745	10	5744.966741	5744.953713	5744.952909	5744.952278
Bottom	5745	20	5744.948455	5744.932585	5744.933598	5744.933417
Bottom	5745	30	5744.931128	5744.918682	5744.918805	5744.918272
Bottom	5745	40	5744.916787	5744.911359	5744.911230	5744.911354
Bottom	5745	50	5744.911720	5744.912450	5744.913170	5744.914620
Bottom	5745	60	5744.916060	5744.937770	5744.935600	5744.930540
Bottom	5745	70	5744.941980	5744.980117	5744.975536	5744.977855
Bottom	5745	80	5744.976248	5745.042460	5745.038736	5745.059555
Bottom	5745	85	5745.014831	5745.086255	5745.087857	5745.083665

Frequency stability of the EUT with variations in ambient temperature (5.725-5.850 GHz band operation) (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	5824.960727	5824.979300	5824.976443	5824.975875
Top	5825	-20	5824.978270	5824.985448	5824.985263	5824.985684
Top	5825	-10	5824.983706	5824.978739	5824.979826	5824.980239
Top	5825	0	5824.976983	5824.964426	5824.967636	5824.967963
Top	5825	10	5824.964752	5824.946557	5824.950303	5824.949600
Top	5825	20	5824.949912	5824.928170	5824.931315	5824.931814
Top	5825	30	5824.928778	5824.914588	5824.916510	5824.916638
Top	5825	40	5824.914674	5824.909042	5824.909004	5824.908919
Top	5825	50	5824.912603	5824.914620	5824.915340	5824.911720
Top	5825	60	5824.917510	5824.936320	5824.941390	5824.930540
Top	5825	70	5824.940238	5824.988842	5824.973754	5824.975536
Top	5825	80	5824.976186	5825.054091	5825.040450	5825.063218
Top	5825	85	5825.008844	5825.104631	5825.085319	5825.079799

Worse Case Margins:

Channel	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	5745	5745.087857	±20 ppm	15.29	Complied
Top	5825	5825.104631	±20 ppm	17.96	Complied

Frequency stability of the EUT with variations in voltage (5.725-5.850 GHz band operation) (continued)

Results (Temperature = 20°C):

Channel	Supply Voltage (VDC)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Limit (ppm)	Margin (ppm)	Result
Bottom	3.3	5745	5744.949264	±20 ppm	8.83	Complied
Bottom	5.0	5745	5744.948455	±20 ppm	8.97	Complied
Bottom	5.5	5745	5744.945457	±20 ppm	9.49	Complied
Top	3.3	5825	5824.946347	±20 ppm	9.21	Complied
Top	5.0	5825	5824.949912	±20 ppm	8.60	Complied
Top	5.5	5825	5824.942310	±20 ppm	9.90	Complied

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
L1075	Spectrum Analyser	Rohde & Schwarz	FSV30	101169	31 Aug 2013	12
M1249	Thermometer	Fluke	52 II	88800049	30 Mar 2013	12
M1269	Multimeter	Fluke	179	90250210	30 July 2013	12
A2051	Attenuator	Atlantic Microwave	WA54-03-12	A2051	07 June 2013	12
A2052	Attenuator	Atlantic Microwave	WA54-03-12	A2052	07 June 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%	±0.27 dB
Peak Excursion	5.15 GHz to 5.850 GHz	95%	±0.27 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	9	3.3	Added recently received information from the Customer regarding the software/firmware versions
3.0	-	-	Minor admin correction updates

Appendix 1. Test Setup Photographs

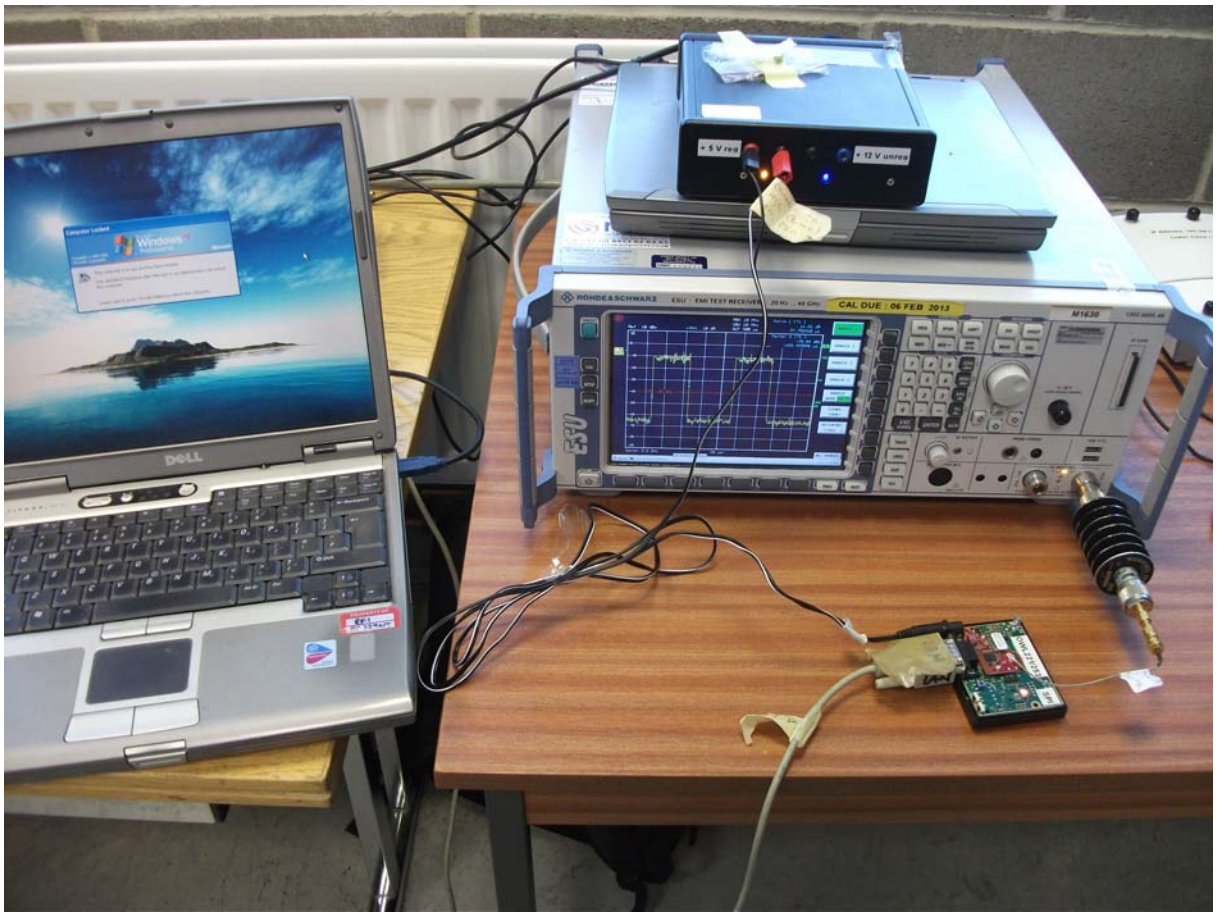


Photo #1. Conducted measurement setup showing RF connection to spectrum analyser, serial connection to laptop PC and DC connection to power supply.

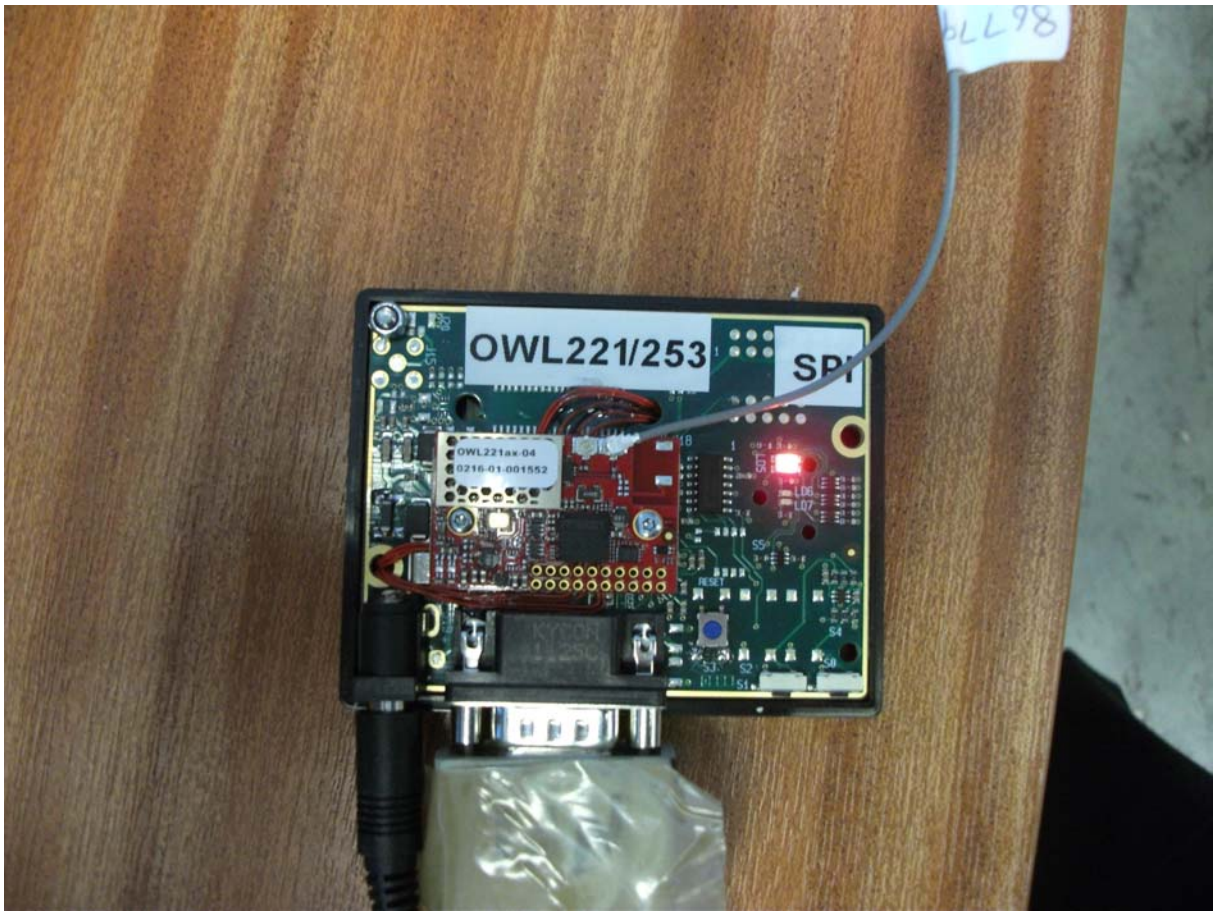


Photo #2. Conducted measurement setup. The red PCB is the connectBlue module. The green PCB is the OEM Module Adaptor. The grey cable is the RF cable connected to the transmitter RF port.