TEST REPORT

Test Report No. : UL-RPT-RP81852JD07A

Manufacturer	:	Aviat Networks
Model No.	:	Eclipse IRU600V3, 5.8GHz, ERM-U53-301
FCC ID	:	VK6-IRU600v3
IC Certification No.	:	4469A-IRU600v3
Test Standard(s)	:	FCC Parts 15.207, 15.209(a), 15.247 (a)(2), (b)(3), (d) & (e), RSS-210 A8.2(a), (b), A8.4(4), A8.5 & RSS-Gen 4.6.1, 4.6.2, 4.8, 4.9 & 7.2.4

1. This test report shall not be reproduced in full or partial, without the written approval of RFI Global Services Ltd trading as UL.
2. The results in this report apply only to the sample(s) tested.
3. This sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 1.0

Date of Issue: 29 November 2012

Checked by:

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Issued by :

pp

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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:	Aviat Networks
Address:	4 Bell Drive, Hamilton International Technology Park Blantyre Glasgow Lanarkshire G72 0FB United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2012: Part 15 Subpart C (Intentional Radiators) - Section 15.247
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, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	31 October 2012 to 19 November 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.207	RSS-Gen 7.2.4	Transmitter AC Conducted Emissions	✓
Part 15.247(a)(2)	RSS-Gen 4.6.2 RSS-210 A8.2(a)	Transmitter 6 dB Bandwidth	✓
N/A	RSS-Gen 4.6.1	Transmitter Occupied Bandwidth	✓
Part 15.247(e)	RSS-210 A8.2(b)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	RSS-Gen 4.8 RSS-210 A8.4(4)	Transmitter Maximum Average Output Power	✓
Part 15.247(d)/ 15.209(a)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Radiated Emissions	✓
Part 15.247(d)	RSS-Gen 4.9 RSS-210 A8.5	Transmitter Band Edge Conducted Emissions	✓

Key to Results

✓ = Complied ✗ = Did not comply

Notes:

1. The customer declared that there is no idle mode and that the EUT goes into transceive mode as soon as it is powered up.

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:	KDB 558074 D01 v02 10/04/2012
Title:	Guidance for Performing Compliance Measurements on Digital Transmission System (DTS) devices operating Under §15.247

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Aviat Networks
Model Name or Number:	Eclipse IRU600V3, 5.8GHz, ERM-U53-301
Serial Number:	FLX1230X040
Hardware Version Number:	001
Software Version Number:	07.00.97
FCC ID:	VK6-IRU600v3
Industry Canada Certification Number:	4469A-IRU600v3

3.2. Description of EUT

The equipment under test was a 5.8 GHz point to point microwave radio transceiver. The EUT had Version 2 filters fitted.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	Microwave Fixed Link System	
Type of Unit:	Transceiver	
Channel Spacing:	5 MHz, 10 MHz, 20 MHz and 30 MHz	
Modulation:	QPSK,16QAM,64QAM,128QAM and 256QAM	
Power Supply Requirement(s):	Nominal	48 V
Maximum Conducted Output Power:	29.3 dBm	
Antenna Gains:	***Parabolic Antenna: (4 ft Tested)***	35 dBi
	***Parabolic Antenna:* (15 ft End product)**	45.9 dBi
	2ft flat panel antenna	28 dBi
Channel Spacing	5 MHz	
Transmit Frequency Range:	5728 MHz to 5847 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5728
	Middle	5769.5
	Top	5847
Receive Frequency Range:	5793 MHz to 5834.5 MHz	
Receive Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5793
	Middle	5834.5
	Top	5782
Channel Spacing	10 MHz	
Transmit Frequency Range:	5730.5 MHz to 5844.5 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5730.5
	Middle	5769.5
	Top	5844.5
Receive Frequency Range:	5779.5 MHz to 5834.5 MHz	
Receive Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5795.5
	Middle	5834.5
	Top	5779.5

Additional Information Related to Testing (continued)

Channel Spacing	20 MHz	
Transmit Frequency Range:	5735.5 MHz to 5839.5 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5735.5
	Middle	5769.5
	Top	5839.5
Receive Frequency Range:	5774.5 MHz to 5834.5 MHz	
Receive Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5800.5
	Middle	5834.5
	Top	5774.5
Channel Spacing	30 MHz	
Transmit Frequency Range:	5740.5 MHz to 5834.5 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5740.5
	Middle	5769.5
	Top	5834.5
Receive Frequency Range:	5769.5 MHz to 5834.5 MHz	
Receive Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	5805.5
	Middle	5834.5
	Top	5769.5

3.5. Support Equipment

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

Description:	4ft parabolic antenna, 35dBi gain
Brand Name:	Andrew Antennas
Model Name or Number:	HP4-57W-P3A/A
Serial Number:	10ACZ10602232

Description:	2ft flat panel antenna, 28dBi
Brand Name:	Radio Frequency Systems
Model Name or Number:	MA0528-28AN
Serial Number:	02205

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	Latitude D610
Serial Number:	RFI Asset Number (PC 8013NT)

Description:	DC Power Supply
Brand Name:	Hewlett Packard
Model Name or Number:	E4356A
Serial Number:	RFI Asset number G0565

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Transceive mode.

4.2. Configuration and Peripherals

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

- The EUT was placed into a continuous transmit mode, with the appropriate modulation scheme enabled, using a bespoke software application which was supplied by the Customer.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power for the different channel bandwidths were:
    - 5 MHz channel bandwidth – 128QAM / 24 Mbps
    - 10 MHz channel bandwidth – QPSK / 11 Mbps
    - 20 MHz channel bandwidth – QPSK / 30 Mbps
    - 30 MHz channel bandwidth – 256QAM / 178 Mbps

  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 widest bandwidth for the different channel bandwidths were:
    - 5 MHz channel bandwidth – 128QAM / 24 Mbps
    - 10 MHz channel bandwidth – 256QAM / 55 Mbps
    - 20 MHz channel bandwidth – QPSK / 30 Mbps
    - 30 MHz channel bandwidth – 256QAM / 178 Mbps

  Measurements were performed on the required channels dependant on each test case.
- For radiated emissions test a smaller 4 foot parabolic antenna of the same type as the 15 foot parabolic dish that would be used in the field was tested. This was done in accordance with FCC OET guidance: 450912 which states a smaller antenna can be used of the same type installed with data being extrapolated up to the specification of the actual antenna.

  The antenna gain for the antenna tested was 35 dBi, the antenna gain for the 15 foot end product is 45.9 dBi, as such, the difference being 10.9 dB. There were no radiated emissions found from the EUT above 1GHz either from the cabinet or the antenna and as such there was no need to add the 10.9 dB correction.

  The radiated emission test was additionally performed on a 2 foot flat panel antenna which had an antenna gain of 28dBi.
- The EUT cannot be aligned over the frequency band of operation directly. In order to achieve the required channel the device is tuned through software and by replacing a filter section. The customer advised that the FCC have agreed that the customer may select channels by switching the filters and tuning of the EUT.
    - Filter, serial number: ELB09410109 was used for all Bottom channel tests.
    - Filter, serial number: ELB10420570 was used for all Middle channel tests.
    - Filter, serial number: ELB10420536 was used for all Top channel tests.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

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

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	19 November 2012
Test Sample Serial Number:	FLX1230X040		

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

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	35

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.560	Live	17.7	60.0	42.3	Complied
13.565	Live	17.5	60.0	42.5	Complied
13.673	Live	18.1	60.0	41.9	Complied
13.686	Live	17.7	60.0	42.3	Complied
13.808	Live	17.3	60.0	42.7	Complied
13.808	Live	17.1	60.0	42.9	Complied
13.857	Live	16.7	60.0	43.3	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.569	Live	9.3	50.0	40.7	Complied
13.673	Live	9.9	50.0	40.1	Complied
13.862	Live	8.8	50.0	41.2	Complied
14.109	Live	29.0	50.0	21.0	Complied
14.424	Live	28.9	50.0	21.1	Complied
15.050	Live	30.2	50.0	19.8	Complied

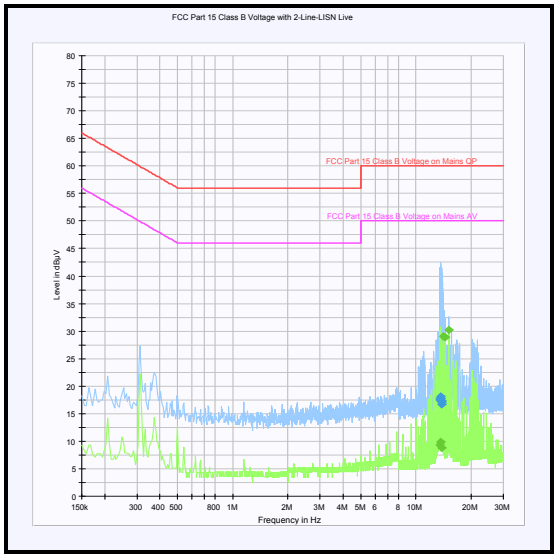
Transmitter AC Conducted Spurious Emissions (continued)

Results: Neutral / Quasi Peak

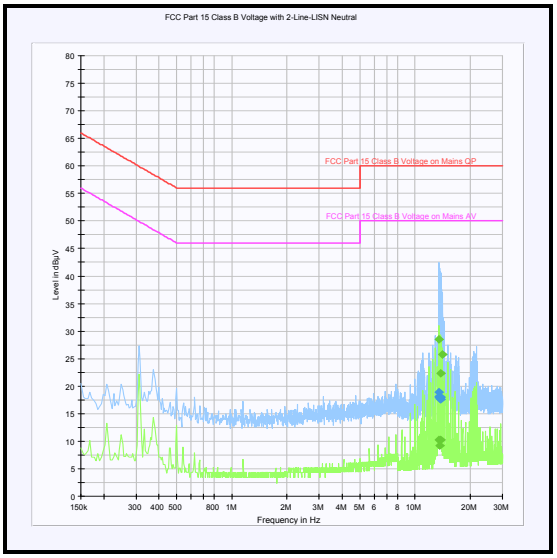
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
13.448	Neutral	18.9	60.0	41.1	Complied
13.565	Neutral	18.2	60.0	41.8	Complied
13.569	Neutral	18.0	60.0	42.0	Complied
13.686	Neutral	17.8	60.0	42.2	Complied
13.740	Neutral	18.0	60.0	42.0	Complied
13.803	Neutral	17.6	60.0	42.4	Complied

Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
13.484	Neutral	28.5	50.0	21.5	Complied
13.565	Neutral	10.2	50.0	39.8	Complied
13.682	Neutral	9.2	50.0	40.8	Complied
13.794	Neutral	22.3	50.0	27.7	Complied
13.862	Neutral	10.3	50.0	39.7	Complied
14.109	Neutral	25.7	50.0	24.3	Complied



Live



Neutral

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

Transmitter AC Conducted Spurious Emissions (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	25 Feb 2013	12
A649	ESH3-Z5	Rohde & Schwarz	ESH3-Z5	825562/008	19 Feb 2013	12
M1263	Test Receiver	Rohde & Schwarz	ESIB 7	100265	15 Oct 2013	12

5.2.2. Transmitter 6 dB Bandwidth

Test Summary:

Test Engineers:	Sandeep Bharat & Sarah Williams	**Test Dates:**	31 October 2012 & 01 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Reference:	Part 15.247(a)(2)
Industry Canada Reference:	RSS-Gen 4.6.2 / RSS-210 A8.2(a)
Test Method Used:	FCC KDB 558074 Section 7.2 Option 1

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	40 to 42

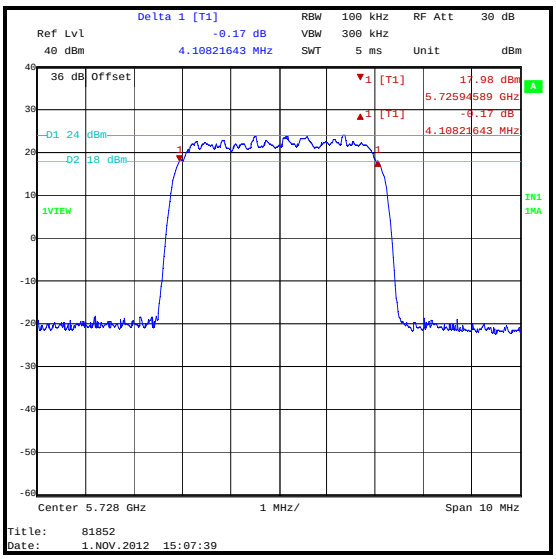
Note(s):

1. All supported modes and channel widths were initially investigated on Top channel. The modes that produced the widest bandwidth (worst case) for the different channel bandwidths were:
    - 5 MHz channel bandwidth – 128QAM / 24 Mbps
    - 10 MHz channel bandwidth – 256QAM / 55 Mbps
    - 20 MHz channel bandwidth – QPSK / 30 Mbps
    - 30 MHz channel bandwidth – 256QAM / 178 Mbps
2. Final measurements were performed using the above configurations on the bottom, middle and top channels.

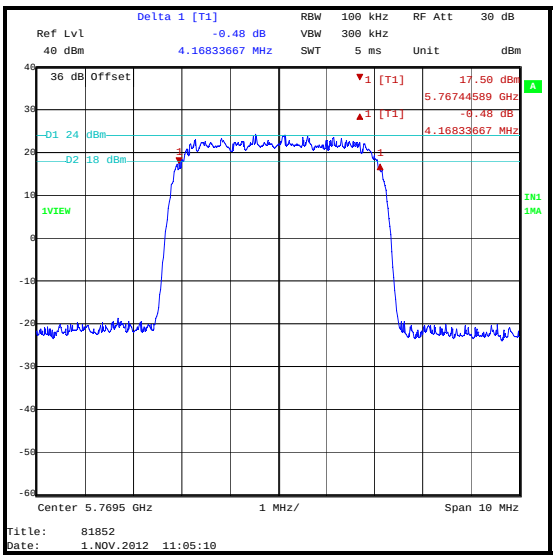
Transmitter 6 dB Bandwidth (continued)

Results: 5 MHz / 128QAM / 24 Mbps

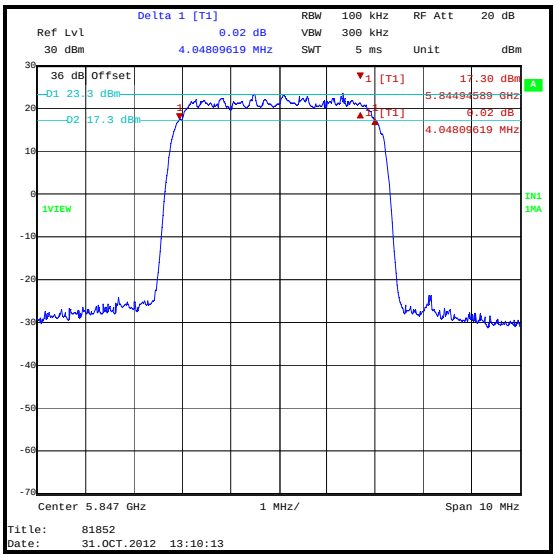
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	4.108	≥0.5	3.608	Complied
Middle	4.168	≥0.5	3.668	Complied
Top	4.048	≥0.5	3.548	Complied



Bottom Channel



Middle Channel

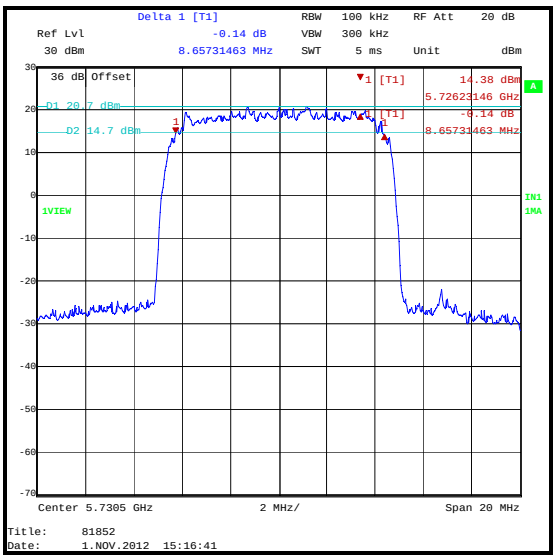


Top Channel

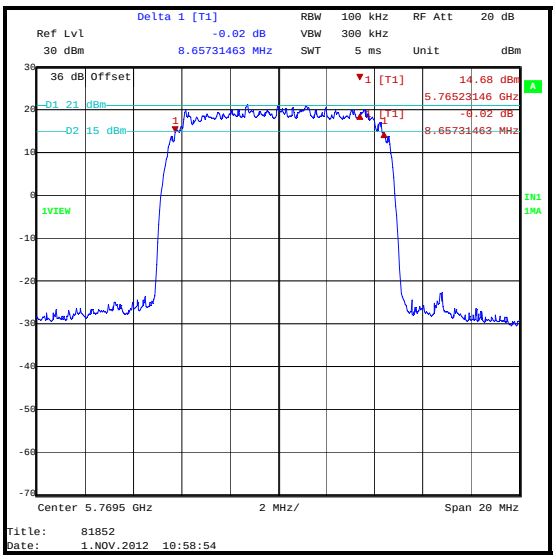
Transmitter 6 dB Bandwidth (continued)

Results: 10 MHz / 256QAM / 55 Mbps

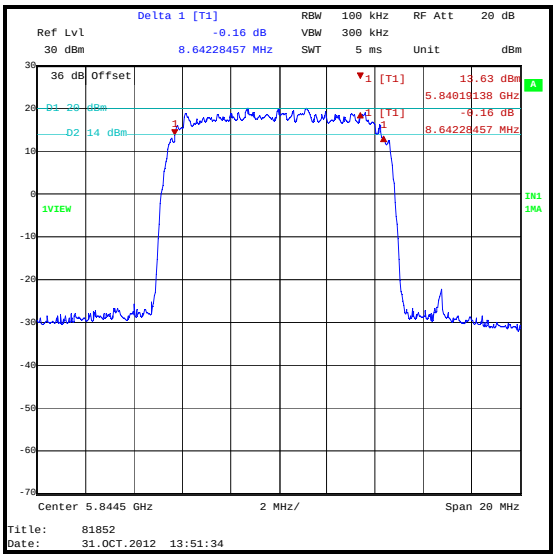
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	8.657	≥0.5	8.157	Complied
Middle	8.657	≥0.5	8.157	Complied
Top	8.642	≥0.5	8.142	Complied



Bottom Channel



Middle Channel

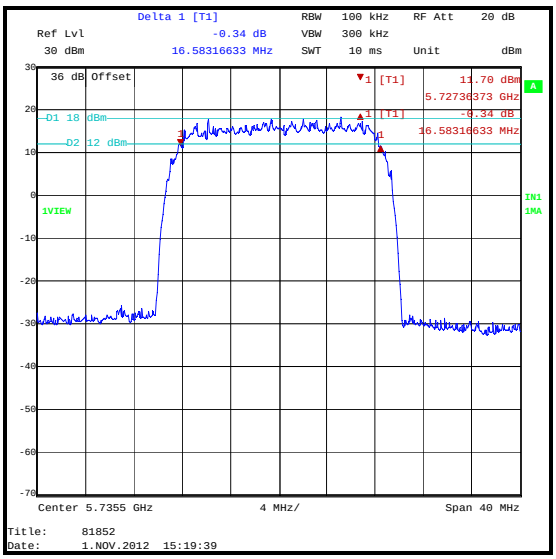


Top Channel

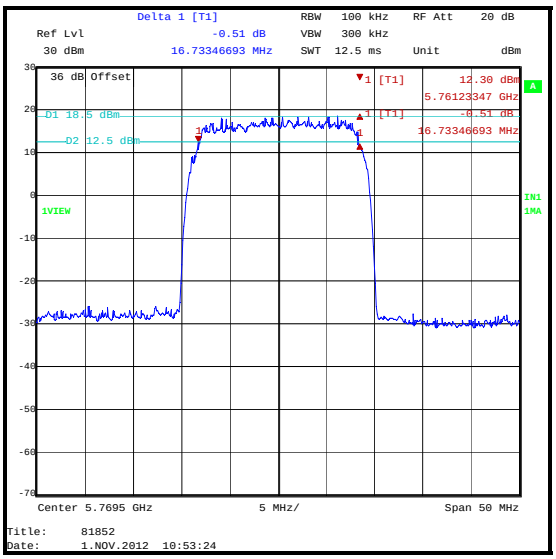
Transmitter 6 dB Bandwidth (continued)

Results: 20 MHz / QPSK / 30 Mbps

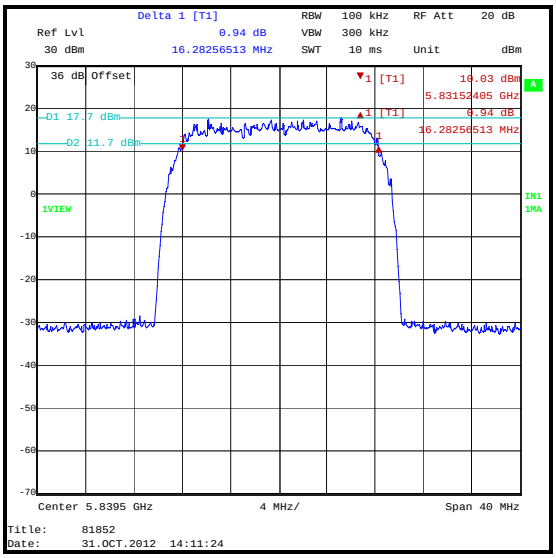
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.583	≥0.5	16.083	Complied
Middle	16.733	≥0.5	16.233	Complied
Top	16.283	≥0.5	15.783	Complied



Bottom Channel



Middle Channel

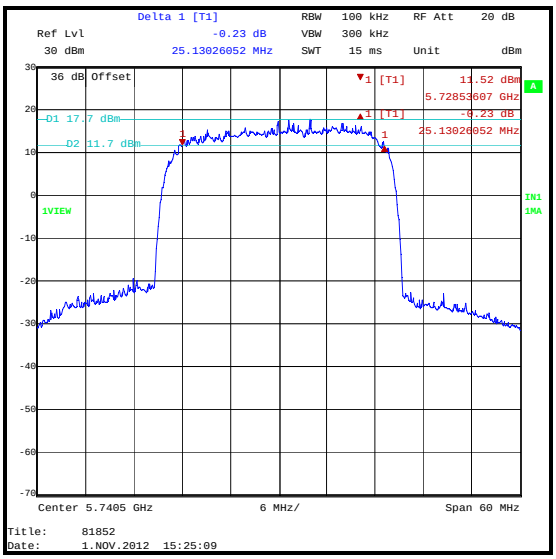


Top Channel

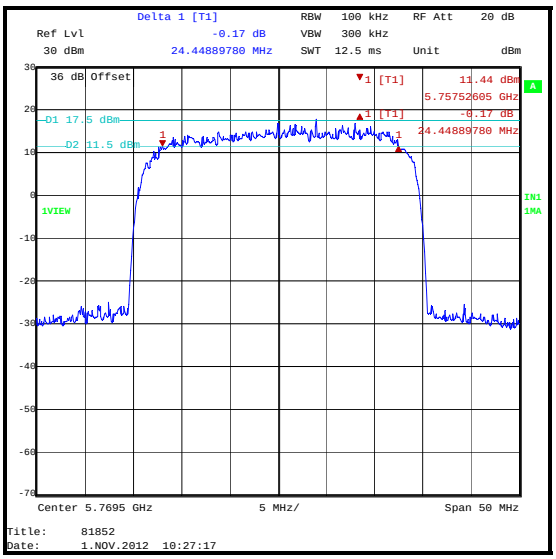
Transmitter 6 dB Bandwidth (continued)

Results: 30 MHz / 256QAM / 178 Mbps

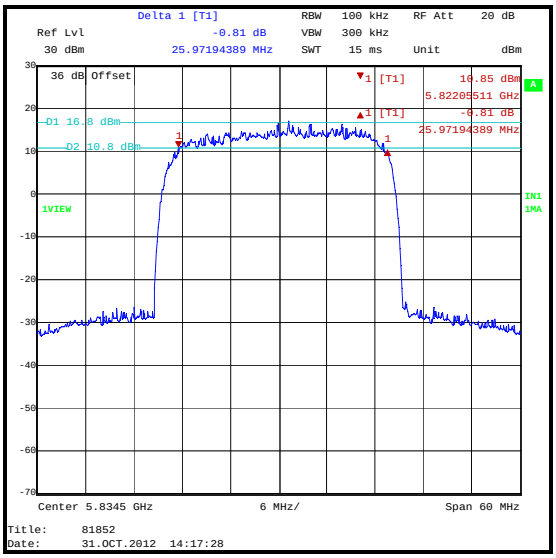
Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	25.130	≥0.5	24.630	Complied
Middle	24.449	≥0.5	23.949	Complied
Top	25.972	≥0.5	25.472	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter 6 dB Bandwidth (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB 7	100330	15 Oct 2013	12
A2000	Attenuator	Huber & Suhner	6830.17.B	301623	03 Apr 2013	12

5.2.3. Transmitter Occupied Bandwidth

Test Summary:

Test Engineers:	Sandeep Bharat & Sarah Williams	**Test Dates:**	31 October 2012 & 01 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Reference:	N/A
Industry Canada Reference:	RSS-Gen 4.6.1
Test Method Used:	Tested using the occupied bandwidth function of a test receiver

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	40 to 42

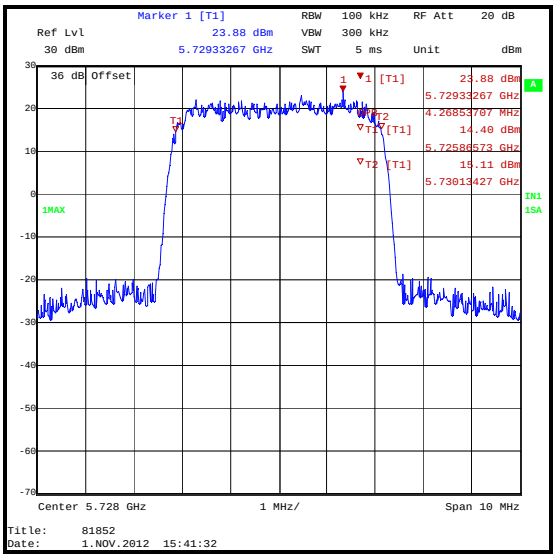
Note(s):

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.
2. All supported modes and channel widths were initially investigated on Top channel. The modes that produced the widest bandwidth (worst case) for the different channel bandwidths were:
    - 5 MHz channel bandwidth – 128QAM / 24 Mbps
    - 10 MHz channel bandwidth – 256QAM / 55 Mbps
    - 20 MHz channel bandwidth – QPSK / 30 Mbps
    - 30 MHz channel bandwidth – 256QAM / 178 Mbps
3. Final measurements were performed using the above configurations on the bottom, middle and top channels.

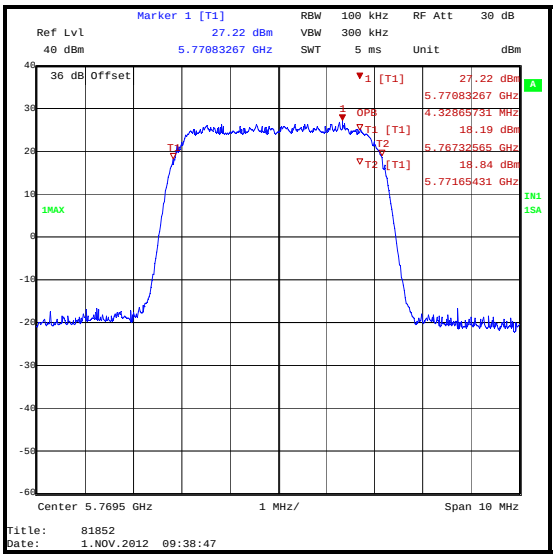
Transmitter Occupied Bandwidth (continued)

Results: 5 MHz / 128QAM / 24 Mbps

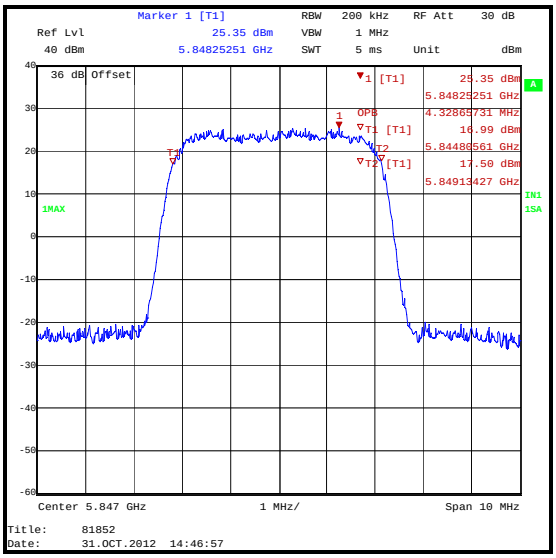
Channel	Occupied Bandwidth (MHz)
Bottom	4.269
Middle	4.329
Top	4.329



Bottom Channel



Middle Channel

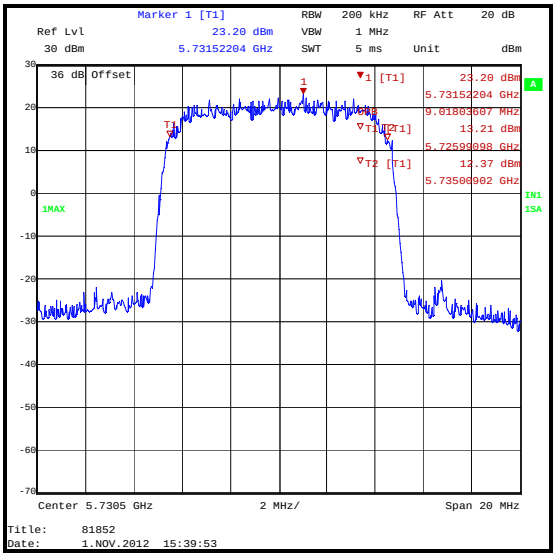


Top Channel

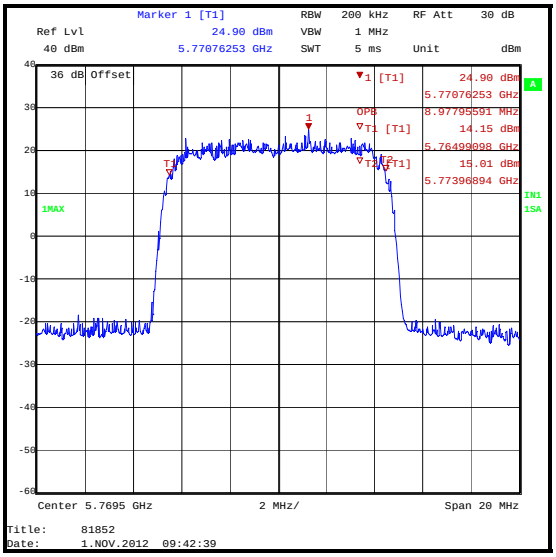
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz / 256QAM / 55 Mbps

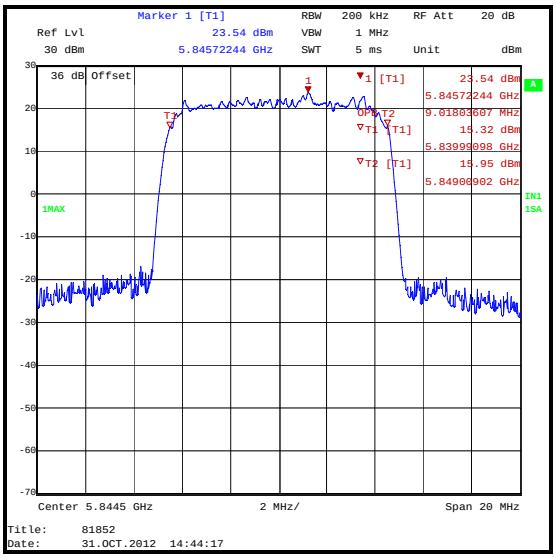
Channel	Occupied Bandwidth (MHz)
Bottom	9.018
Middle	8.978
Top	9.018



Bottom Channel



Middle Channel

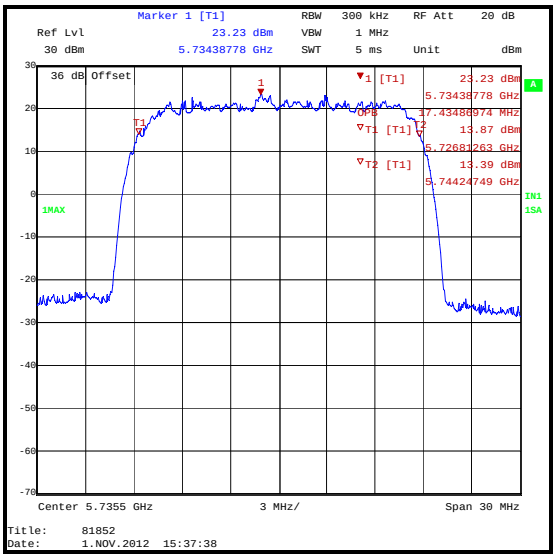


Top Channel

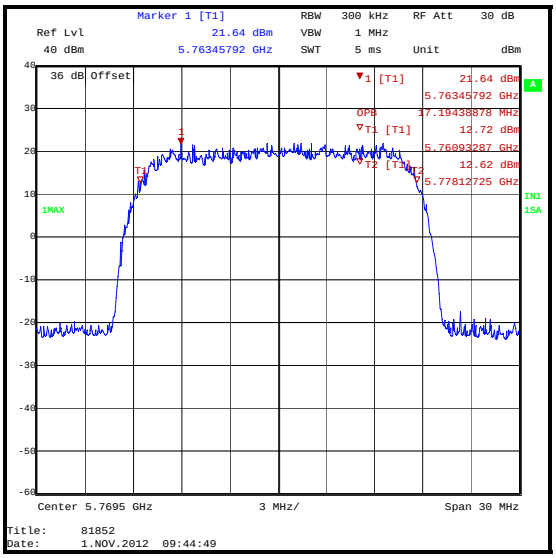
Transmitter Occupied Bandwidth (continued)

Results: 20 MHz / QPSK / 30 Mbps

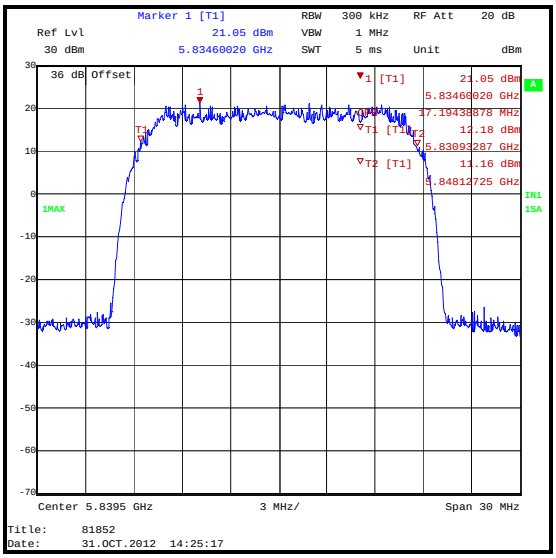
Channel	Occupied Bandwidth (MHz)
Bottom	17.435
Middle	17.194
Top	17.194



Bottom Channel



Middle Channel

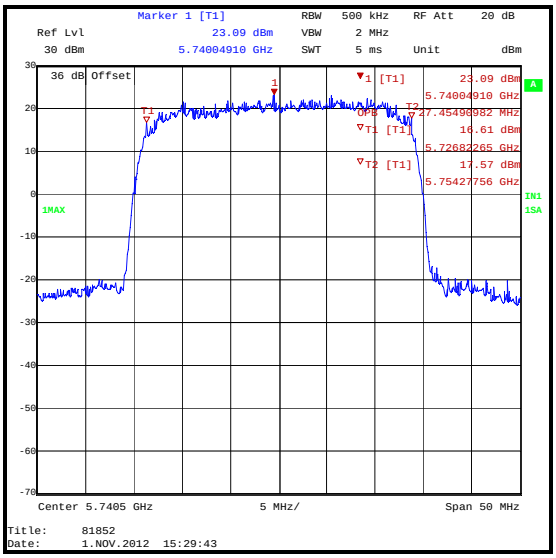


Top Channel

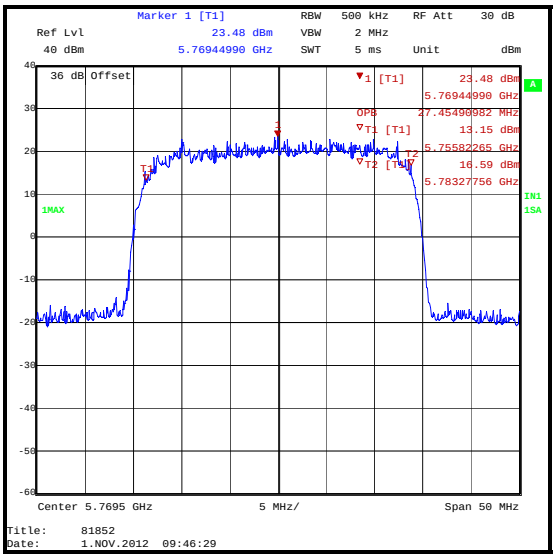
Transmitter Occupied Bandwidth (continued)

Results: 30 MHz / 256QAM / 178 Mbps

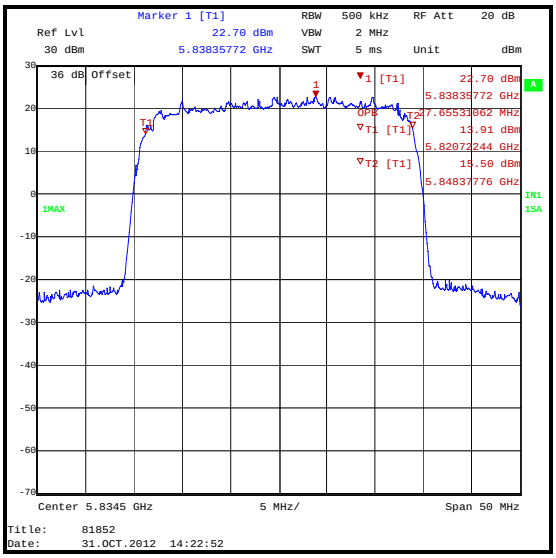
Channel	Occupied Bandwidth (MHz)
Bottom	27.455
Middle	27.455
Top	27.655



Bottom Channel



Middle Channel



Top Channel

Transmitter Occupied Bandwidth (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB 7	100330	15 Oct 2013	12
A2000	Attenuator	Huber & Suhner	6830.17.B	301623	03 Apr 2013	12

5.2.4. Transmitter Power Spectral Density

Test Summary:

Test Engineers:	Sandeep Bharat & Sarah Williams	**Test Dates:**	31 October 2012 & 01 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Reference:	Part 15.247(e)
Industry Canada Reference:	RSS-210 A8.2(b)
Test Method Used:	FCC KDB 558074 Section 9.2 Option 2

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	40 to 42

Note(s):

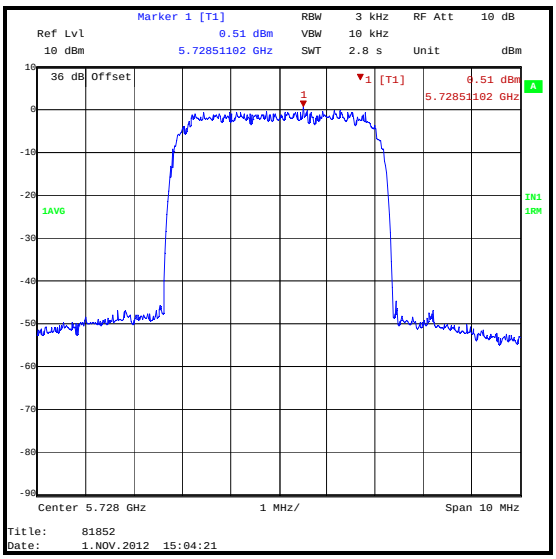
1. Transmitter Power Spectral Density tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.2 Option 2.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power were:
   - 5 MHz channel bandwidth – 128QAM / 24 Mbps
   - 10 MHz channel bandwidth – QPSK / 11 Mbps
   - 20 MHz channel bandwidth – QPSK / 30 Mbps
   - 30 MHz channel bandwidth – 256QAM / 178 Mbps

   Measurements were performed on the required channels.
3. A 30 dB attenuator and RF cable were used to connect the measurement equipment to the EUT. The combined cable and attenuator loss was measured prior to performing the measurements and the loss compensation incorporated into the measurement results.
4. The EUT was transmitting at 100% duty cycle.

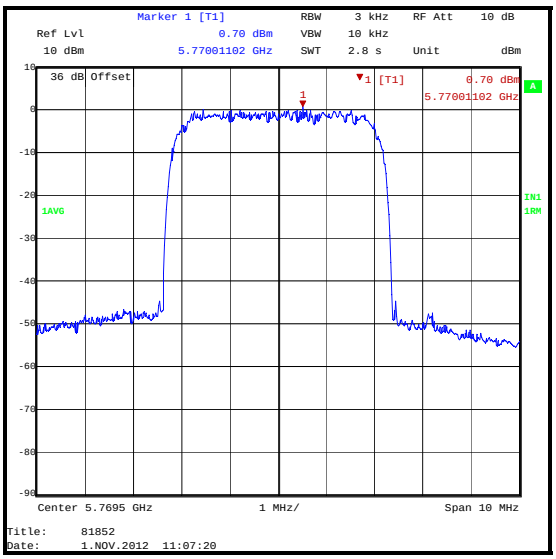
Transmitter Power Spectral Density (continued)

Results 5 MHz / 128QAM / 24 Mbps

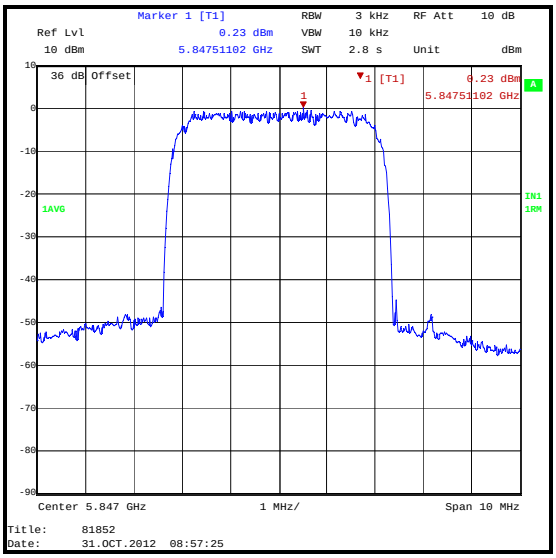
Channel	Output Power (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	0.5	8.0	7.5	Complied
Middle	0.7	8.0	7.3	Complied
Top	0.2	8.0	7.8	Complied



Bottom Channel



Middle Channel

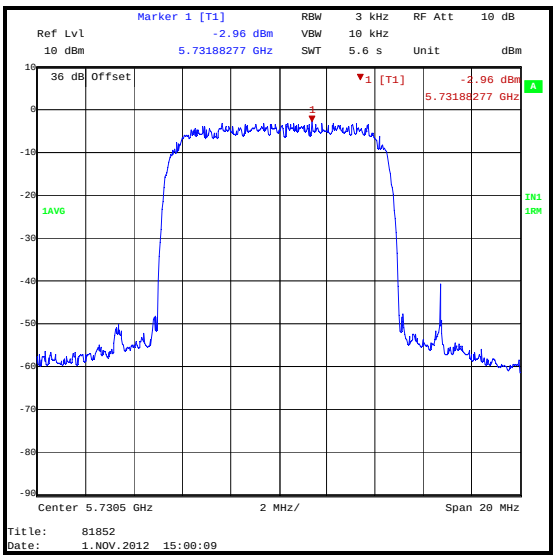


Top Channel

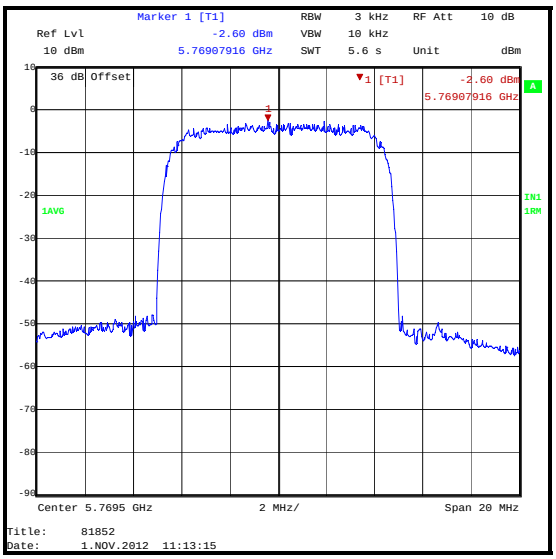
Transmitter Power Spectral Density (continued)

Results 10 MHz / QPSK / 11 Mbps

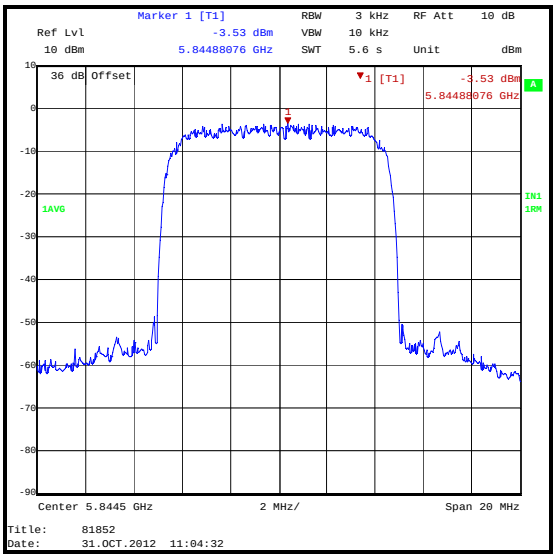
Channel	Output Power (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	-3.0	8.0	11.0	Complied
Middle	-2.6	8.0	10.6	Complied
Top	-3.5	8.0	11.5	Complied



Bottom Channel



Middle Channel

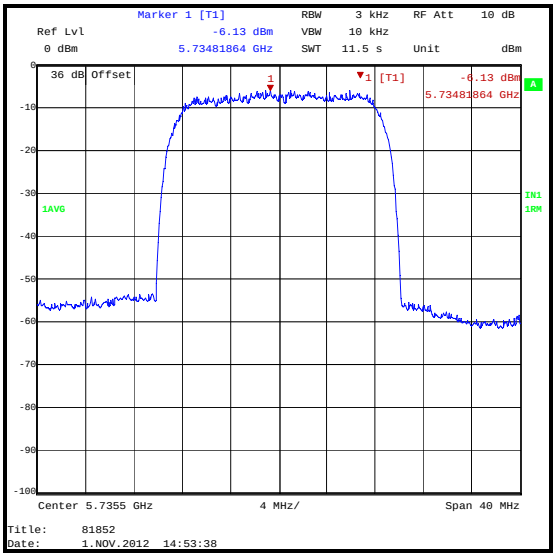


Top Channel

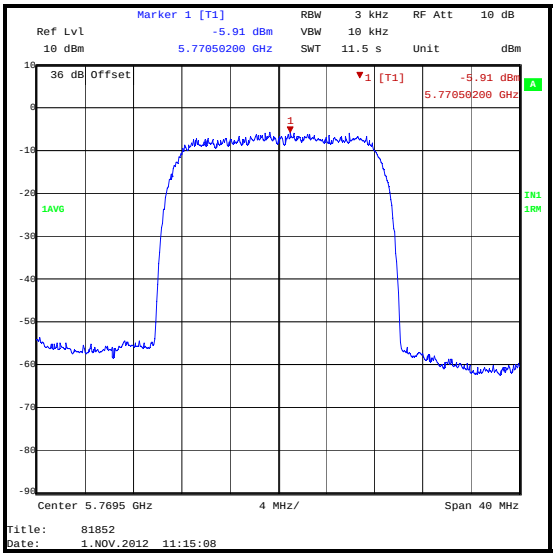
Transmitter Power Spectral Density (continued)

Results 20 MHz / QPSK / 30 Mbps

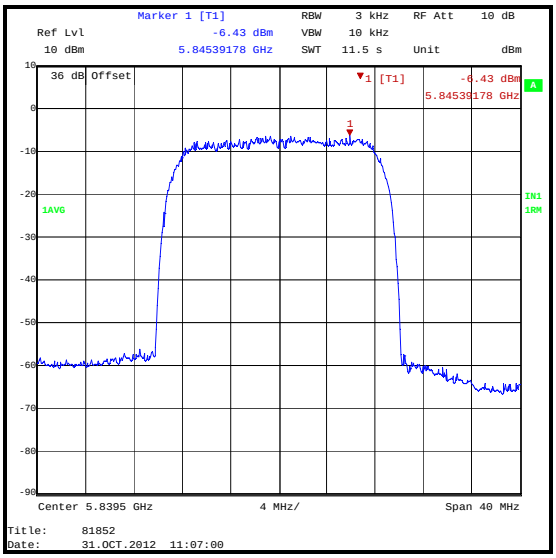
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-6.1	8.0	14.1	Complied
Middle	-5.9	8.0	13.9	Complied
Top	-6.4	8.0	14.4	Complied



Bottom Channel



Middle Channel

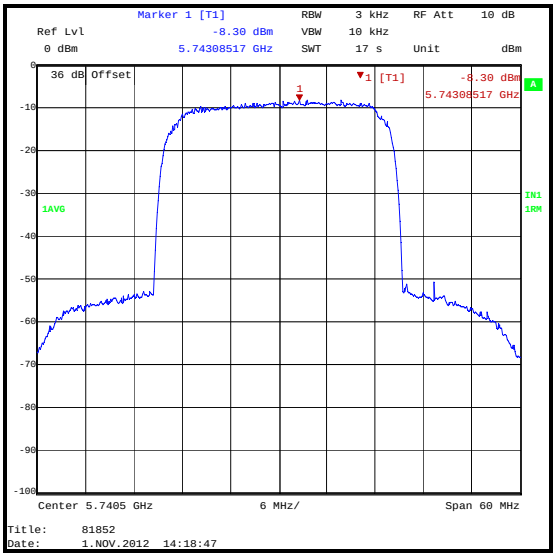


Top Channel

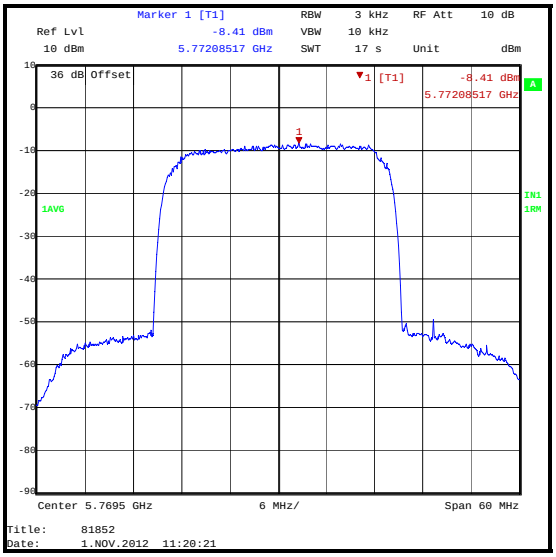
Transmitter Power Spectral Density (continued)

Results 30 MHz / 256QAM / 178 Mbps

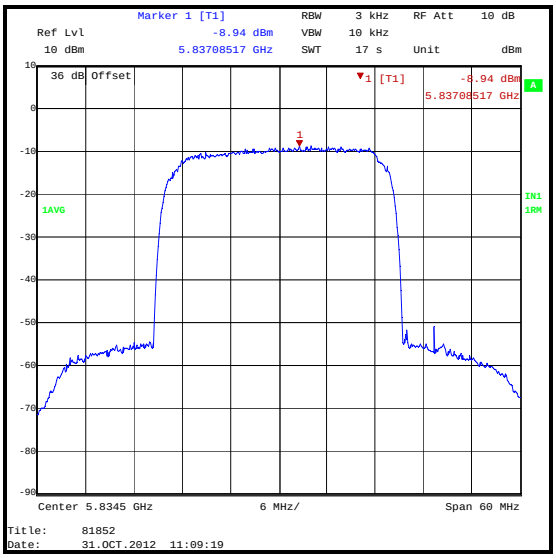
Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-8.3	8.0	16.3	Complied
Middle	-8.4	8.0	16.4	Complied
Top	-8.9	8.0	16.9	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Power Spectral Density (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB 7	100330	15 Oct 2013	12
A2000	Attenuator	Huber & Suhner	6830.17.B	301623	03 Apr 2013	12

5.2.5. Transmitter Maximum Average Output Power

Test Summary:

Test Engineers:	Sandeep Bharat & Sarah Williams	**Test Dates:**	31 October 2012 & 01 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Reference:	Part 15.247(b)(3)
Industry Canada Reference:	RSS-Gen 4.8, RSS-210 A8.4(4)
Test Method Used:	FCC KDB 558074 Section 8.2.1 Option 1

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	40 to 42

Note(s):

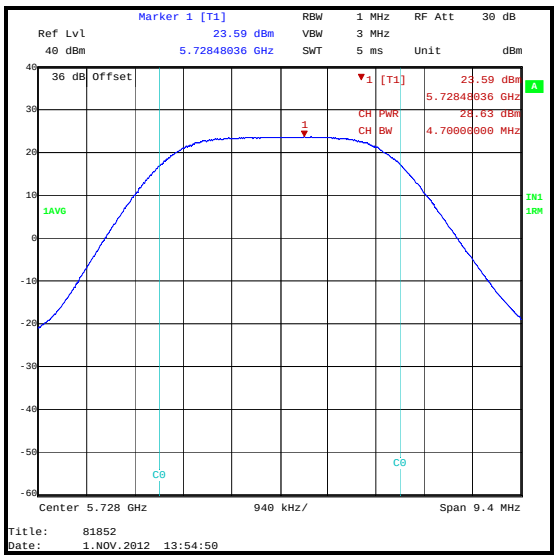
1. Conducted power tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.2.1 Option 1.
2. 26 dB Emission Bandwidth tests were performed to calculate the span and to determine widest bandwidth worst case, the results are available upon request.
3. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power were:
   - 5 MHz channel bandwidth – 128QAM / 24 Mbps
   - 10 MHz channel bandwidth – QPSK / 11 Mbps
   - 20 MHz channel bandwidth – QPSK / 30 Mbps
   - 30 MHz channel bandwidth – 256QAM / 178 Mbps

   Measurements were performed on the required channels.
4. A 30 dB attenuator and RF cable were used to connect the measurement equipment to the EUT. The combined cable and attenuator loss was measured prior to performing the measurements and the loss compensation incorporated into the measurement results.

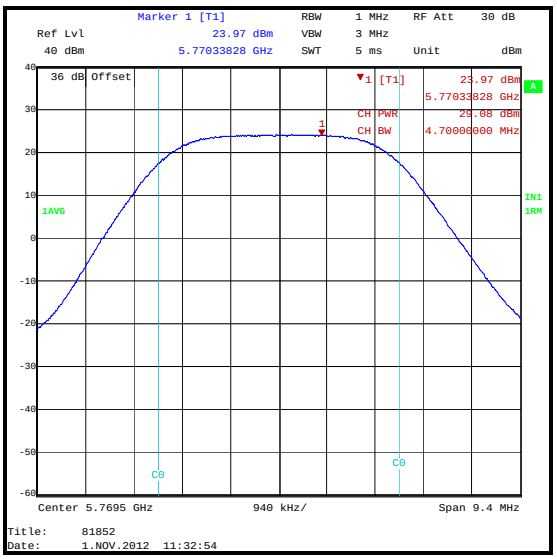
Transmitter Maximum Average Output Power (continued)

Results: 5 MHz / 128QAM / 24 Mbps

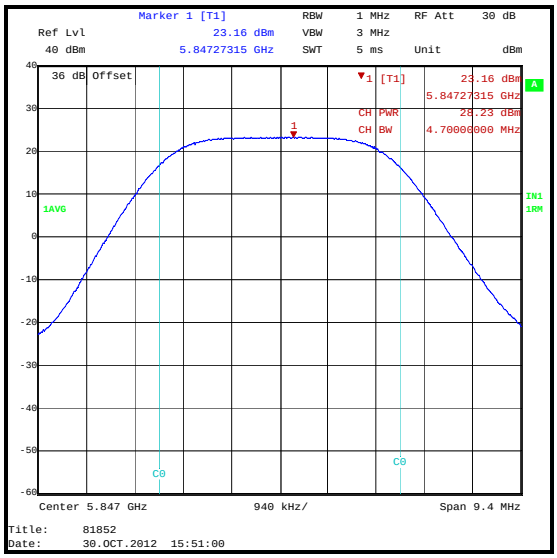
Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	28.6	30.0	1.4	Complied
Middle	29.1	30.0	0.9	Complied
Top	28.2	30.0	1.8	Complied



Bottom Channel



Middle Channel

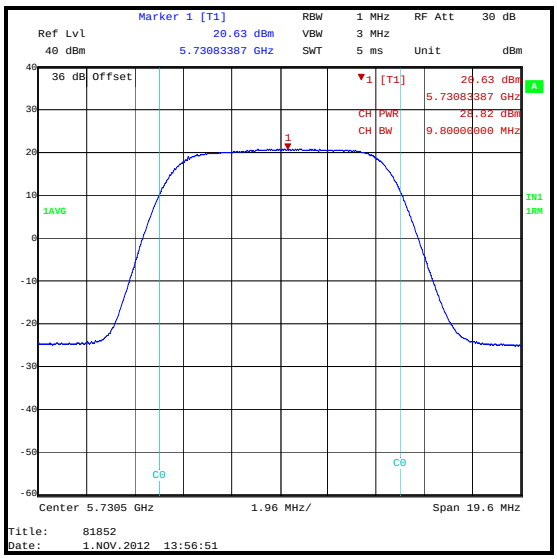


Top Channel

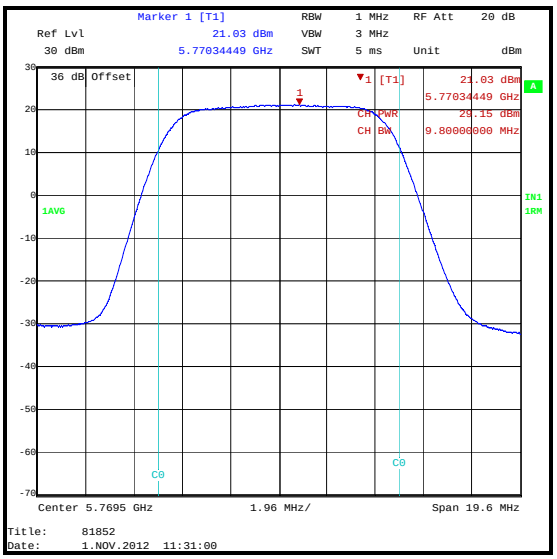
Transmitter Maximum Average Output Power (continued)

Results: 10 MHz / QPSK / 11 Mbps

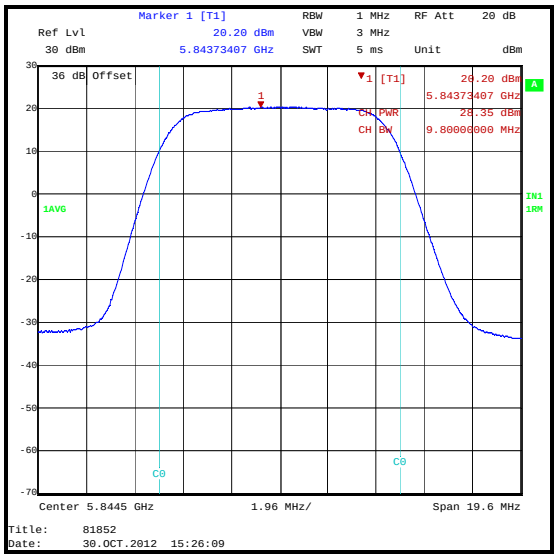
Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	28.8	30.0	1.2	Complied
Middle	29.2	30.0	0.8	Complied
Top	28.4	30.0	1.6	Complied



Bottom Channel



Middle Channel

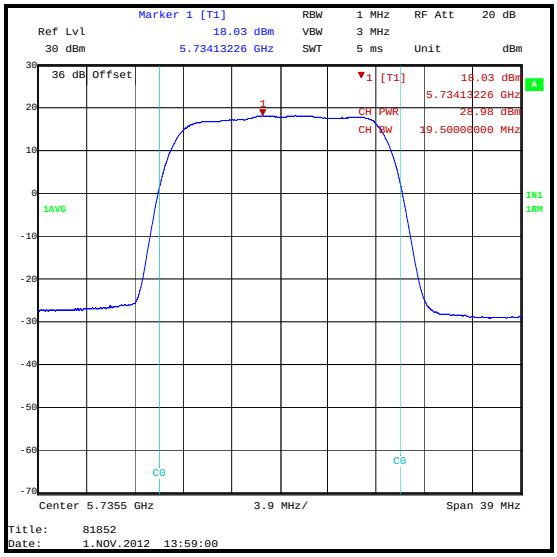


Top Channel

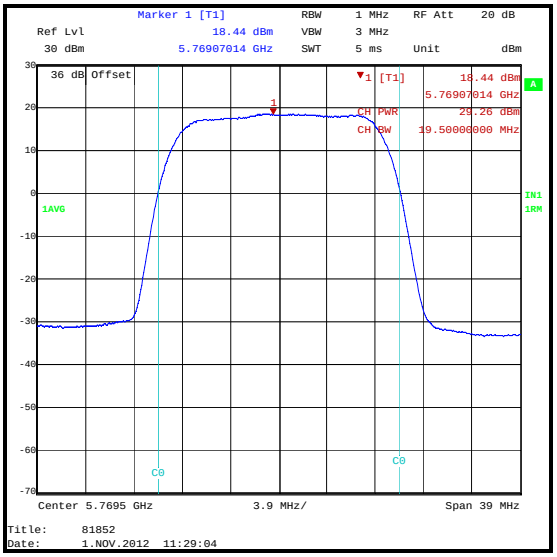
Transmitter Maximum Average Output Power (continued)

Results: 20 MHz / QPSK / 30 Mbps

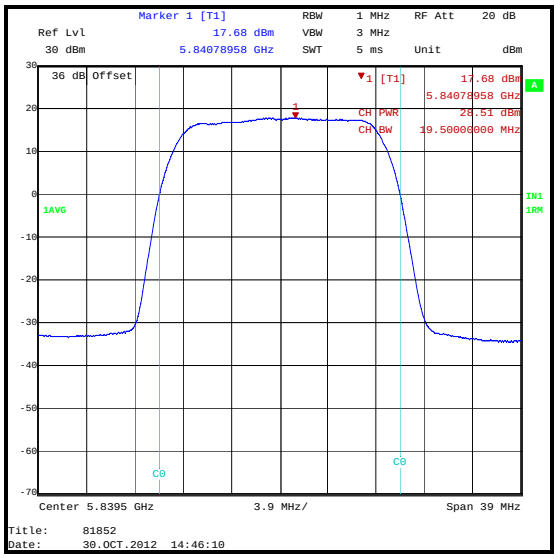
Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	29.0	30.0	1.0	Complied
Middle	29.3	30.0	0.7	Complied
Top	28.5	30.0	1.5	Complied



Bottom Channel



Middle Channel

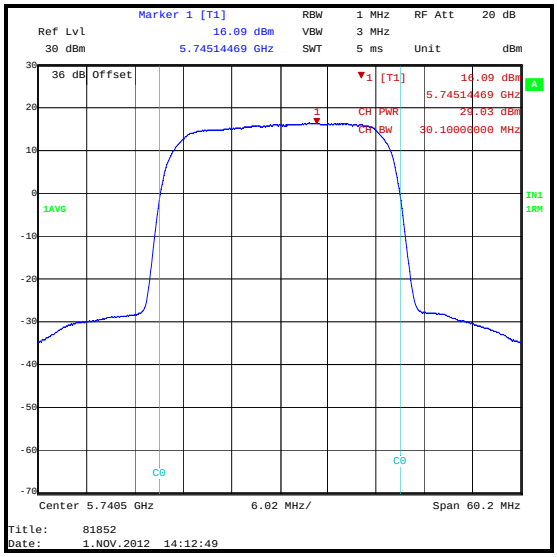


Top Channel

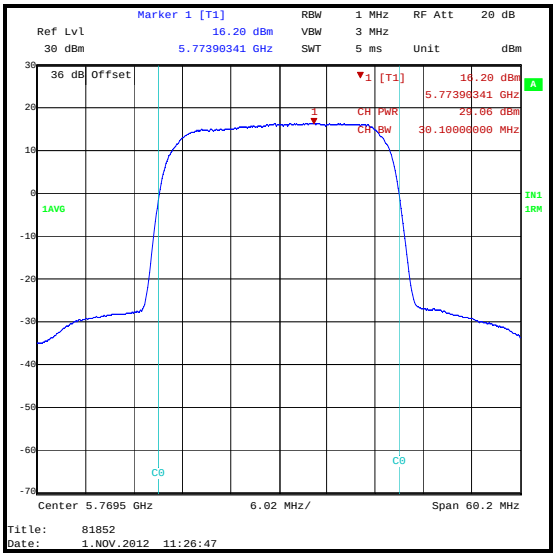
Transmitter Maximum Average Output Power (continued)

Results: 30 MHz / 256QAM / 178 Mbps

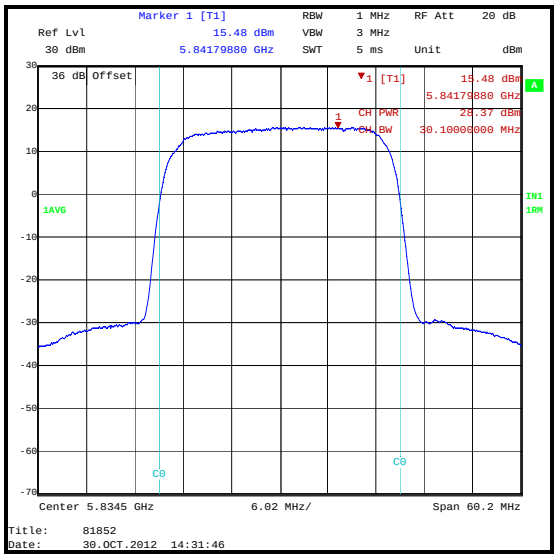
Channel	Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	29.0	30.0	1.0	Complied
Middle	29.1	30.0	0.9	Complied
Top	28.4	30.0	1.6	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Average Output Power (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB 7	100330	15 Oct 2013	12
A2000	Attenuator	Huber & Suhner	6830.17.B	301623	03 Apr 2013	12

5.2.6. Transmitter Radiated Emissions - 4 foot parabolic antenna

Test Summary:

Test Engineers:	Andrew Edwards & Sandeep Bharat	**Test Date:**	14 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Reference:	Part 15.247(d) / 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
Test Method Used:	As detailed in FCC KDB 558074 Section 10.0, ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	37

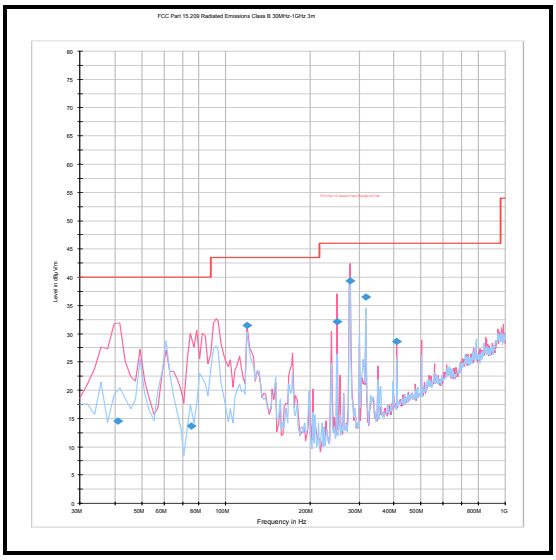
Note(s):

1. Spurious emissions were performed with the EUT transmitting 20 MHz channel width / QPSK / 30 Mbps, as this configuration produced the highest output power and was therefore deemed to be worst case. The EUT was transmitting at >99% duty cycle on the top channel.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
3. All other emissions were at least 20 /30 dB below the appropriate limit or below the noise floor of the measurement system.
4. Measurements 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.
5. The emissions at 41.052 MHz and 317.768 MHz were investigated using a peak detector and found to be in the non restricted band; therefore the -30 dBc was applied instead of 15.209 limits. All emissions in the non restricted band were at least 30 dB from the dBc limit and were therefore not included with the final measurements.
6. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss

Results: Top Channel / 20 MHz / QPSK / 30 Mbps

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
119.164	Vertical	31.5	43.5	12.0	Complied
250.010	Vertical	32.2	46.0	13.8	Complied
278.034	Vertical	39.4	46.0	6.6	Complied
409.092	Vertical	28.6	46.0	17.4	Complied

Transmitter Radiated Emissions (continued)



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

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineers:	Andrew Edwards & Nick Steele	**Test Dates:**	14 November 2012 & 15 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Part:	15.247(d) / 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
Test Method Used:	As detailed in FCC KDB 558074 Section 10.0, ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	25 to 26
Relative Humidity (%):	33 to 37

Note(s):

1. The emission shown at approximately 5839.5 MHz on the 4 GHz to 7 GHz plot is the EUT fundamental.
2. The emissions at 7998 MHz were investigated using a RMS detector and found to be in the non-restricted band; therefore the -30 dBc was applied instead of 15.209 limits, as stated in FCC KDB 558078 Section 10.0 and §15.247(d). This emission in the non-restricted band was at least 30 dB from the dBc limit and therefore not included with the final measurements.
3. No other 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 results table.
4. The pre-scan plots from 12.75-18 GHz were performed at 1.5 metres, the peak and average limits have therefore been adjusted by 6 dB using the formula stated below

   20 Log (d1/d2)

   20 Log (3m / 1.5m) = 6.02 dB
5. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.

Transmitter Radiated Emissions (continued)

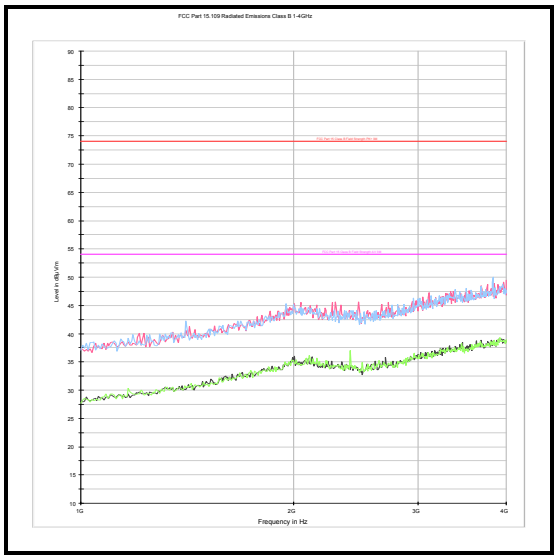
Results: Peak

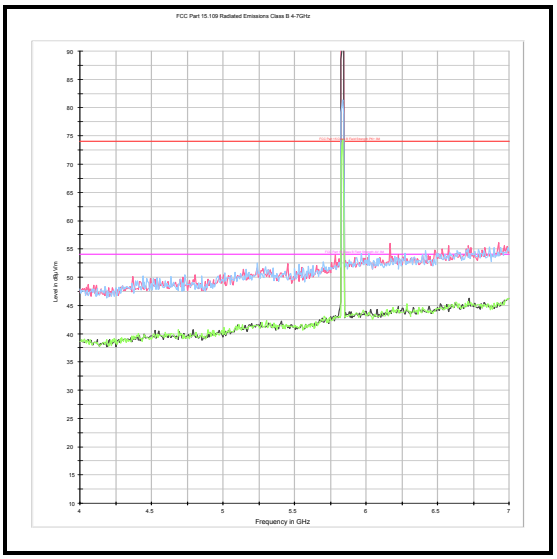
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
17821.142	Vertical	69.9	80.0	10.1	Complied

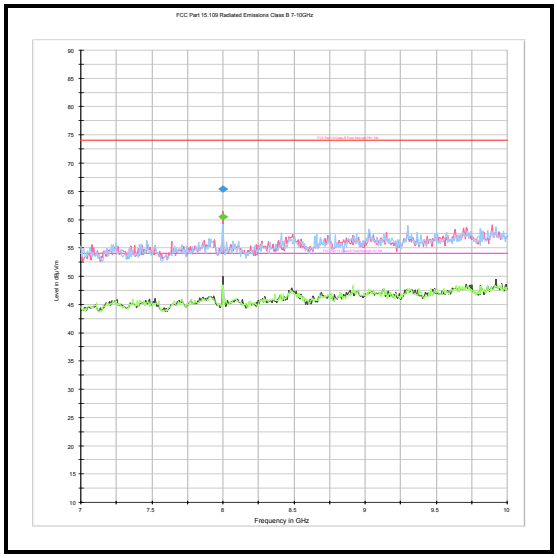
Results: Average

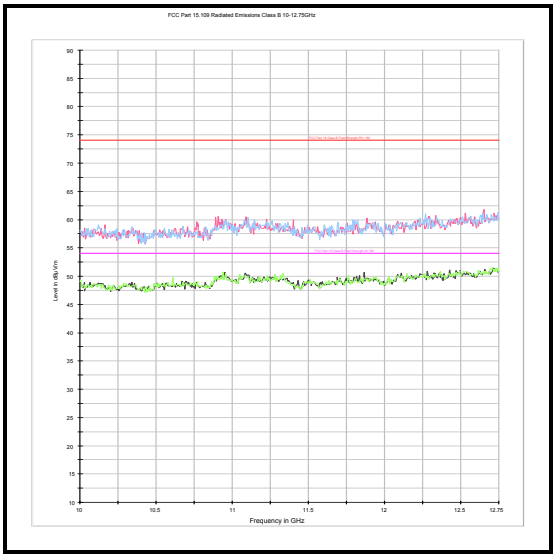
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
17800.100	Vertical	58.7	60.0	1.3	Complied

Transmitter Radiated Emissions (continued)

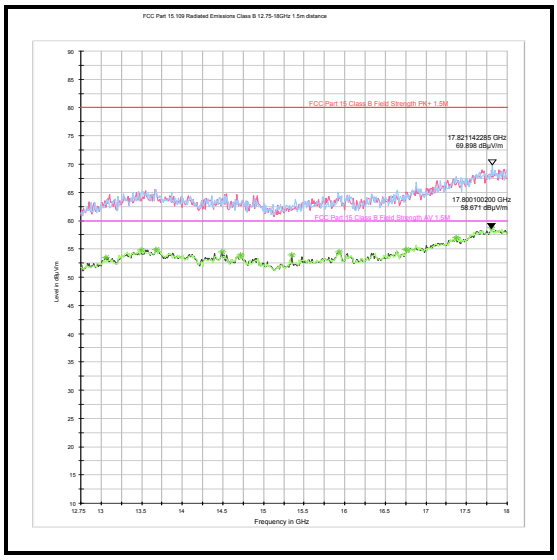


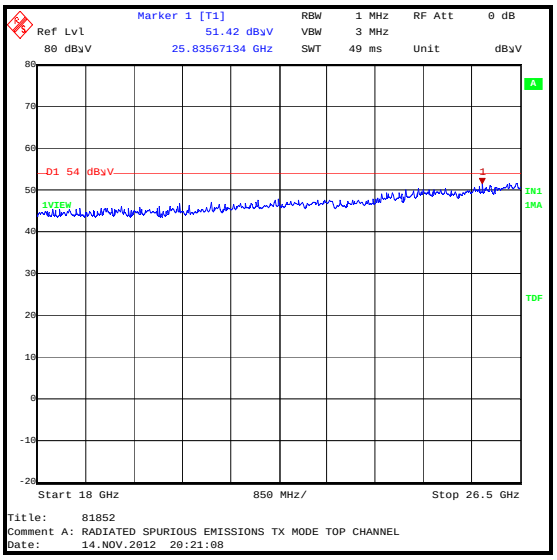


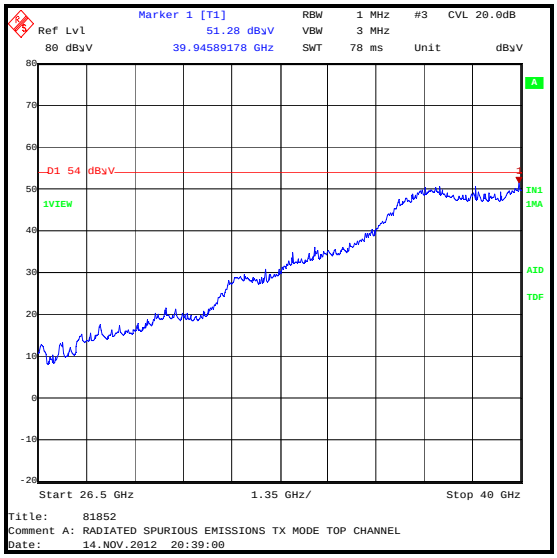




Transmitter Radiated Emissions (continued)







Transmitter Radiated Emissions (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A030	Attenuator	Narda	745-69	01544	Calibrated before use	-
A1227	Pre Amp	Agilent	8449B	3008A01566	02 Jan 2013	3
A1817	Antenna	EMCO	3115	00075694	12 May 2013	12
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A2133	Low Pass Filter	Atlan TecRF	AFL-04000	JFB1006-002	28 Apr 2013	12
A2176	High Pass Filter	Atlan TecRF	AFH-07000	800980	25 May 2013	12
A436	Horn Antenna	Flann	20240-20	330	04 Nov 2013	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A366	Isolator	MRI	FRR-400	169	Calibrated before use	-
A203	Antenna	Flann	22240-20	343	11 May 2013	36
M1390	Harmonic Mixer	Farran Technology	WHMP 28	FTL1677B	Calibrated before use	-
S0537	Power Supply	TTI	EL302D	249928	Calibrated before use	-
M1251	DMM	Fluke	175	89170179	30 Jul 2013	12

5.2.7. Transmitter Radiated Emissions - 2 foot flat panel antenna

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	15 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Part:	15.247(d) / 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
Test Method Used:	As detailed in FCC KDB 558074 Section 10.0, ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	32

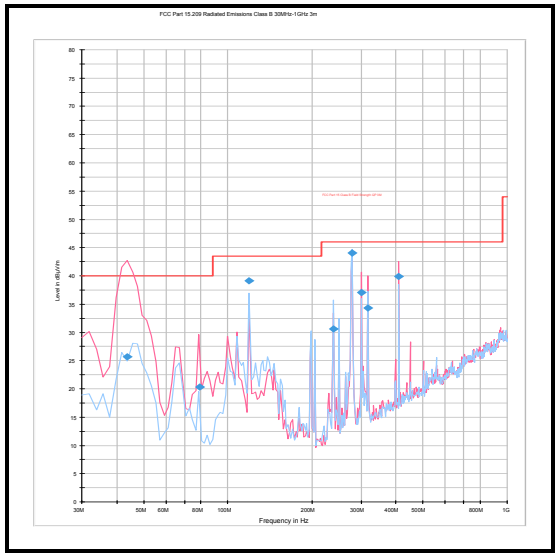
Note(s):

1. Spurious emissions were performed with the EUT transmitting 20 MHz channel width / QPSK / 30 Mbps, as this configuration produced the highest output power and was therefore deemed to be worst case. The EUT was transmitting at >99% duty cycle on the top channel.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.
3. All other emissions were at least 20 /30 dB below the appropriate limit or below the noise floor of the measurement system.
4. Measurements 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.
5. The emissions at 43.785 MHz, 79.448 MHz, 238.309 MHz and 317.748 MHz were investigated using a peak detector and found to be in the non restricted band; therefore the -30 dBc was applied instead of 15.209 limits. All emissions in the non restricted band were at least 30 dB from the dBc limit and were therefore not included with the final measurements.
6. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss

Transmitter Radiated Emissions (continued)

Results: Top Channel / 20 MHz / QPSK / 30 Mbps

Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
119.154	Horizontal	39.1	43.5	4.4	Complied
278.043	Horizontal	44.1	46.0	1.9	Complied
409.092	vertical	39.9	46.0	6.1	Complied



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

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A553	Antenna	Chase	CBL6111A	1593	15 Feb 2013	12
G0543	Amplifier	Sonoma	310N	230801	02 Jan 2013	3
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineers:	Nick Steele & Andrew Edwards	**Test Dates:**	14 November 2012 & 15 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Part:	15.247(d) / 15.209(a)
Industry Canada Reference:	RSS-Gen 4.9, RSS-210 A8.5
Test Method Used:	As detailed in FCC KDB 558074 Section 10.0, ANSI C63.10 Sections 6.3 and 6.6 referencing ANSI C63.4
Frequency Range	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	25 to 27
Relative Humidity (%):	29 to 37

Note(s):

1. The emission at 7998 MHz was investigated using a RMS detector and found to be in the non restricted band; therefore the -30 dBc was applied instead of 15.209 limits as stated in FCC KDB 558078 Section 10.0 and §15.247(d). This emission in the non restricted band was at least 30 dB from the dBc limit, and therefore not included with the final measurements.
2. No other 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 results table.
3. The emission shown at approximately 5839.5 MHz on the 4 GHz to 7 GHz plot is the EUT fundamental.
4. The pre-scan plots 12.75 - 18 GHz were performed at 1.5 metres rather than 3 metres because the noise floor at 3 metres exceeded the average 54 dBμV/m limit. The peak and average limits have been adjusted by 6 dB by using the formula stated below

   20 Log (d1/d2)

   20 Log (3m / 1.5m) = 6.02 dB

5. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.

Transmitter Radiated Emissions (continued)

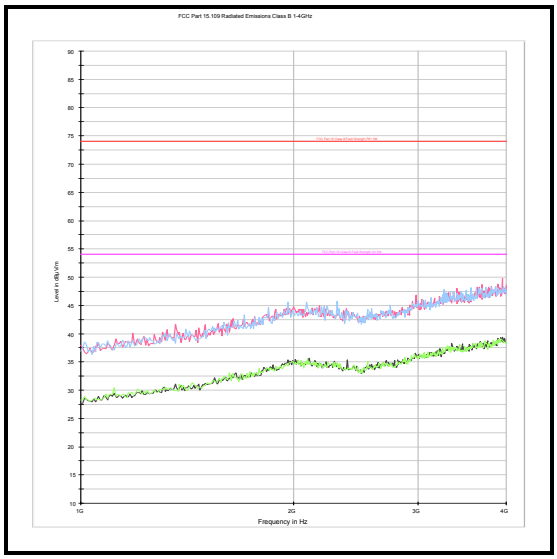
Results: Peak

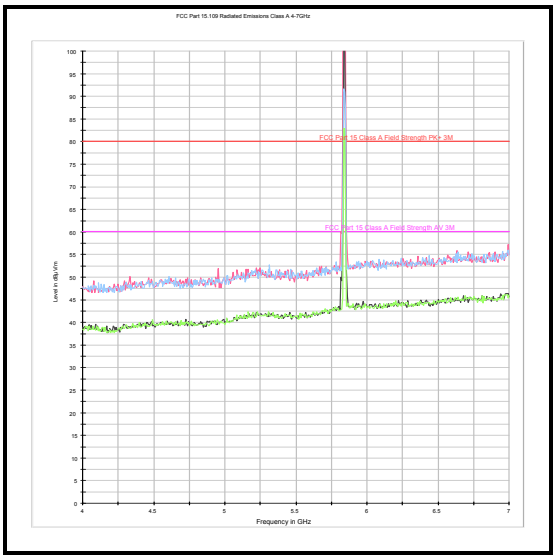
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
17726.453	Vertical	69.4	80.0	10.6	Complied

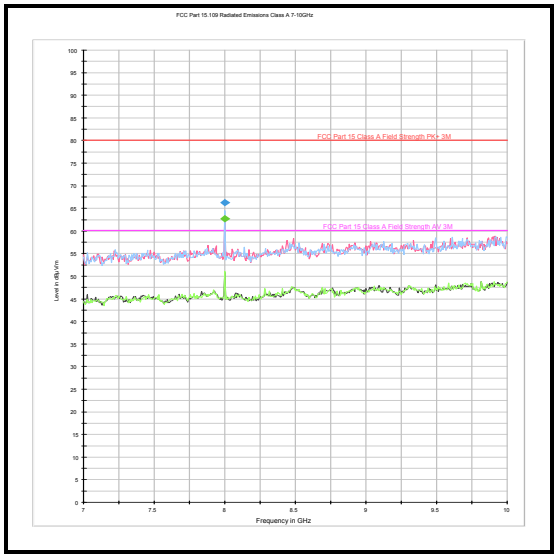
Results: Average

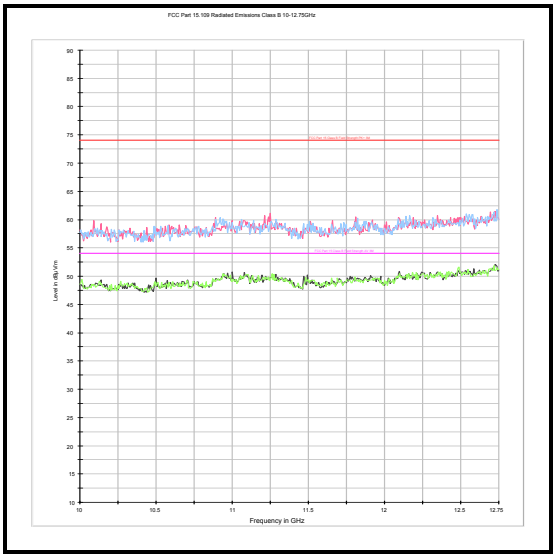
Frequency (MHz)	Antenna Polarity	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
17684.369	Vertical	59.1	60.0	0.9	Complied

Transmitter Radiated Emissions (continued)

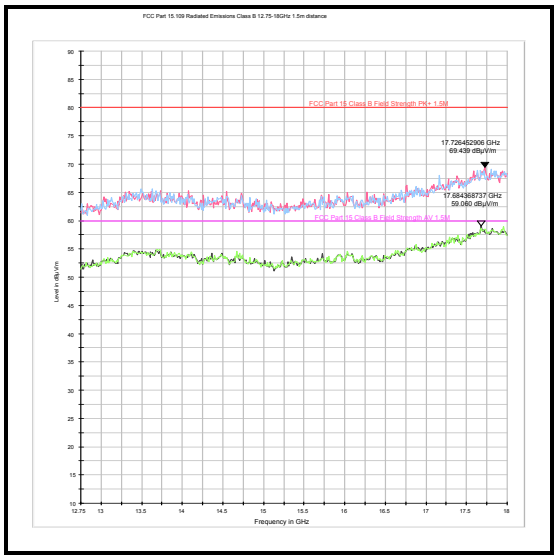


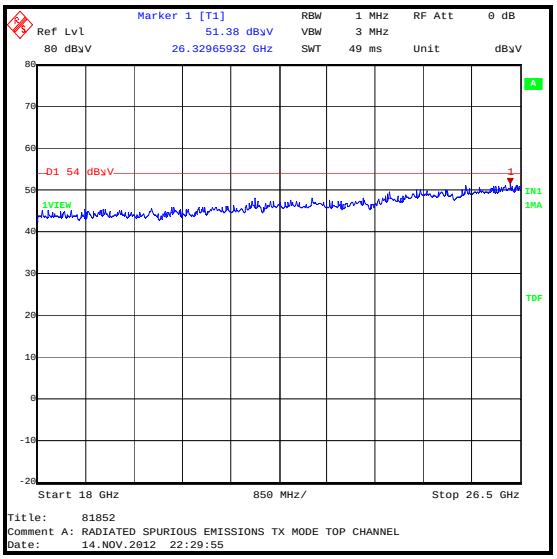


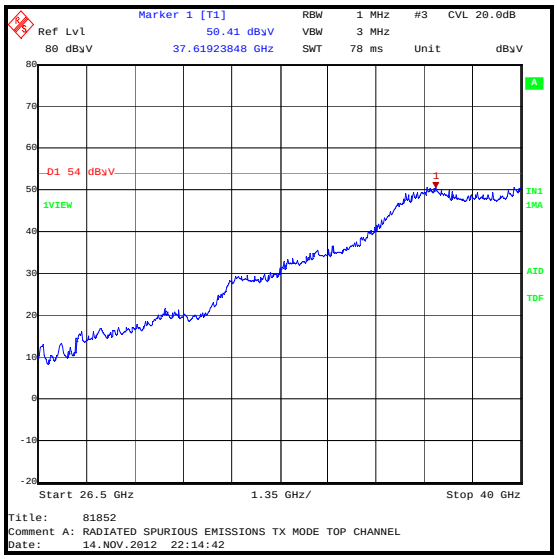




Transmitter Radiated Emissions (continued)







Transmitter Radiated Emissions (continued)

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A030	Attenuator	Narda	745-69	01544	Calibrated Before Use	-
A1227	Pre Amp	Agilent	8449B	3008A01566	02 Jan 2013	3
A1817	Horn Antenna	EMCO	3115	00075694	12 May 2013	12
A1834	Attenuator	Hewlett Packard	8491B	10444	29 Jan 2013	12
A2133	Low Pass Filter	Atlan TecRF	AFL-04000	JFB1006-002	28 Apr 2013	12
A2176	High Pass Filter	Atlan TecRF	AFH-07000	800980	25 May 2013	12
A436	Horn Antenna	Flann	20240-20	330	04 Nov 2013	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	24 Oct 2013	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	14 Aug 2013	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	03 Feb 2013	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	04 Nov 2013	12
A366	Isolator	MRI	FRR-400	169	Calibrated Before Use	-
A203	Antenna	Flann	22240-20	343	11 May 2013	36
M1390	Harmonic Mixer	Farran Technology	WHMP 28	FTL1677B	Calibrated Before Use	-
S0537	Power Supply	TTI	EL302D	249928	Calibrated Before Use	-
M1251	DMM	Fluke	175	89170179	30 Jul 2013	12

5.2.8. Transmitter Band Edge Conducted Emissions

Test Summary:

Test Engineers:	Sandeep Bharat & Sarah Williams	**Test Dates:**	31 October 2012 & 01 November 2012
Test Sample Serial Number:	FLX1230X040		

FCC Reference:	Part 15.247(d)
Industry Canada Reference:	RSS-Gen 4.9 & RSS-210 A8.5
Test Method Used:	FCC KDB 558074 Section 10.2.5

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	40 to 42

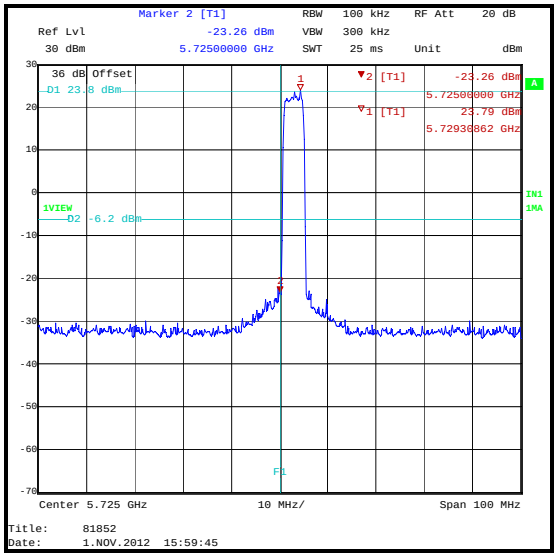
Note(s):

1. The EUT was set to transmit on the bottom channel when performing measurements at the lower band edge and the top channel when performing measurements at the upper band edge.
2. Non-restricted bands are adjacent to the lower and upper band edges and the -30 dBc limit applies. Power spectral density was previously measured using a 100 kHz bandwidth and an average detector. In accordance with FCC KDB 558078 Section 10.0 and §15.247(d), the band edge emissions at 5725 MHz and 5850 MHz were also measured using a 100 kHz bandwidth and average detector. The -30 dBc limit was relative from the peak of the bottom channel carrier.
3. All supported modes and channel widths were initially investigated on one channel. The modes that produced the widest bandwidth were:
    - 5 MHz channel bandwidth – 128QAM / 24 Mbps
    - 10 MHz channel bandwidth – QPSK / 55 Mbps
    - 20 MHz channel bandwidth – QPSK / 30 Mbps
    - 30 MHz channel bandwidth – 256QAM / 178 Mbps
4. A 30 dB attenuator and RF cable were used to connect the measurement equipment to the EUT. The combined cable and attenuator loss was measured prior to performing the measurements and the loss compensation incorporated into the measurement results.
5. *-30 dBc limit.

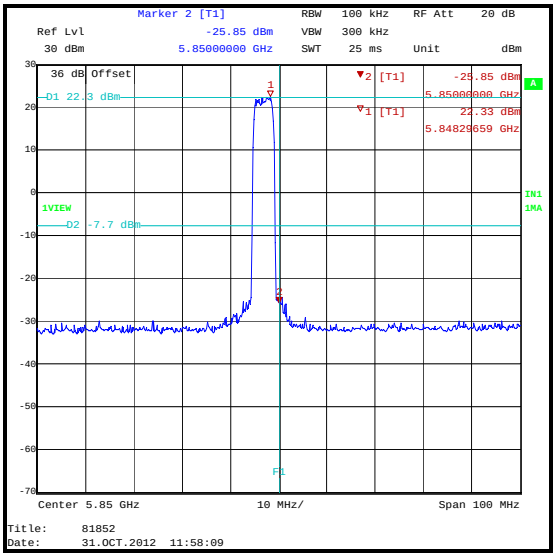
Transmitter Band Edge Conducted Emissions (continued)

Results: 5 MHz / 128QAM / 24 Mbps

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5725.0	-23.3	-6.2*	17.1	Complied
5850.0	-25.9	-7.7*	18.2	Complied



Lower Band Edge Peak Measurement

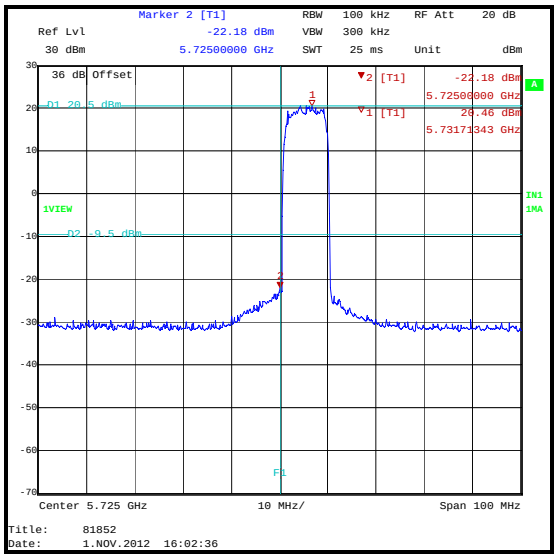


Upper Band Edge Peak Measurement

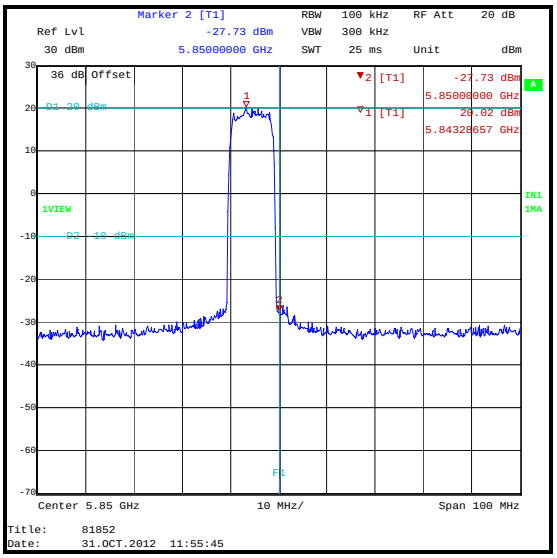
Transmitter Band Edge Conducted Emissions (continued)

Results: 10 MHz / QPSK / 55 Mbps

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5725.0	-22.2	-9.5*	12.7	Complied
5850.0	-27.7	-10.0*	17.7	Complied



Lower Band Edge Peak Measurement

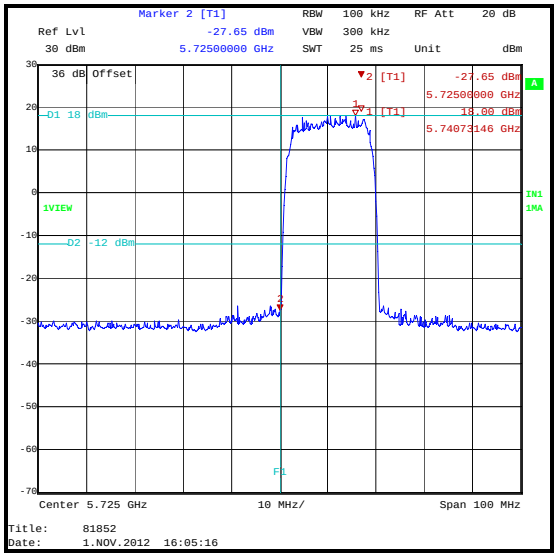


Upper Band Edge Peak Measurement

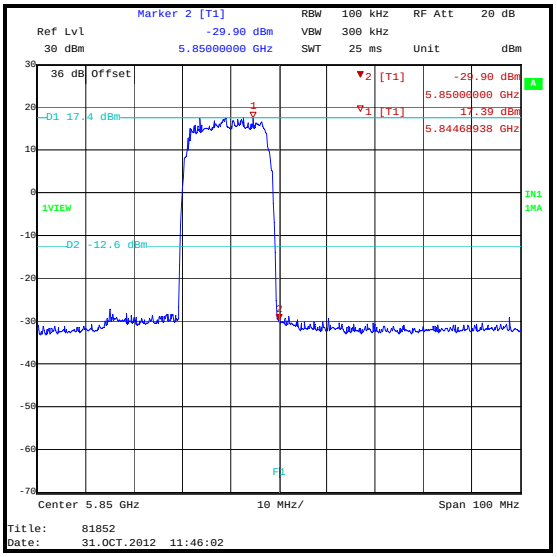
Transmitter Band Edge Conducted Emissions (continued)

Results: 20 MHz / QPSK / 30 Mbps

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5725.0	-27.7	-12.0*	15.7	Complied
5850.0	-29.9	-12.6*	17.3	Complied



Lower Band Edge Peak Measurement

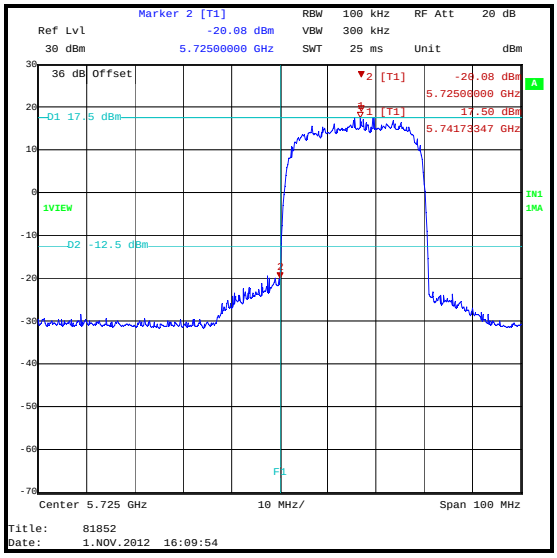


Upper Band Edge Peak Measurement

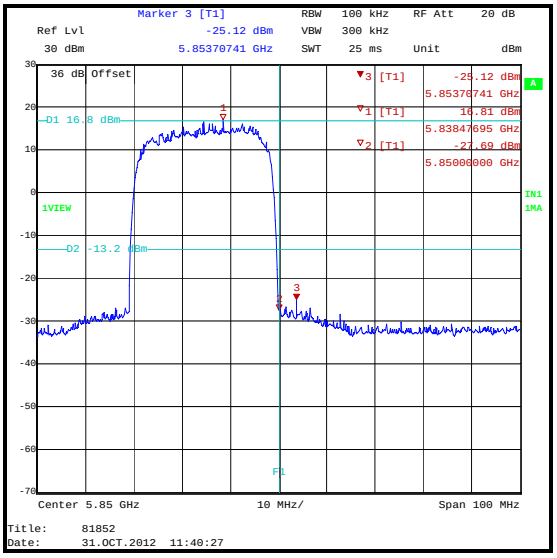
Transmitter Band Edge Conducted Emissions (continued)

Results: 30 MHz / 256QAM / 178 Mbps

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5725.0	-20.1	-12.5*	7.6	Complied
5850.0	-27.7	-13.2*	14.5	Complied
5853.707	-25.1	-13.2*	11.9	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

Test Equipment Used:

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1379	Test Receiver	Rohde & Schwarz	ESIB 7	100330	15 Oct 2013	12
A2000	Attenuator	Huber & Suhner	6830.17.B	301623	03 Apr 2013	12

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value 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
Conducted Maximum Peak Output Power	5.72 GHz to 5.85 GHz	95%	±0.28 dB
Spectral Power Density	5.72 GHz to 5.85 GHz	95%	±0.28 dB
6 dB Bandwidth	5.72 GHz to 5.85 GHz	95%	±0.92 ppm
Occupied Bandwidth	5.72 GHz to 5.85 GHz	95%	±0.92 ppm
Conducted Spurious Emissions	5.72 GHz to 5.85 GHz	95%	±2.62 dB
Radiated Spurious Emissions	30 MHz to 40 GHz	95%	±2.94 dB

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	**Clause**	**Details**
1.0	-	-	Initial Version