# 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:**

Steven White
WiSE Project Lead

**Issued by :**

pp

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

0644

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

**RFI Global Services Ltd trading as UL**

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# 1. Customer Information

| | |
|---|---|
| **Company Name:** | Aviat Networks |
| **Address:** | 4 Bell Drive,<br>Hamilton International Technology Park<br>Blantyre<br>Glasgow<br>Lanarkshire<br>G72 0FB<br>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<br>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<br>RSS-210 A8.4(4) | Transmitter Maximum Average Output Power | ✓ |
| Part 15.247(d)/ 15.209(a) | RSS-Gen 4.9<br>RSS-210 A8.5 | Transmitter Radiated Emissions | ✓ |
| Part 15.247(d) | RSS-Gen 4.9<br>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 |

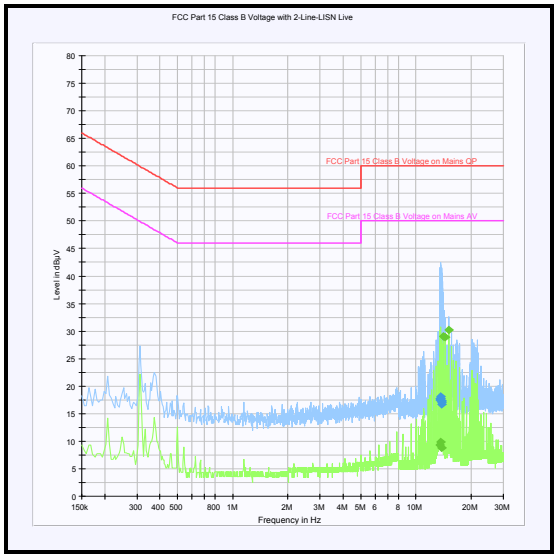
## Transmitter AC Conducted Spurious Emissions (continued)

### Results: Neutral / Quasi Peak

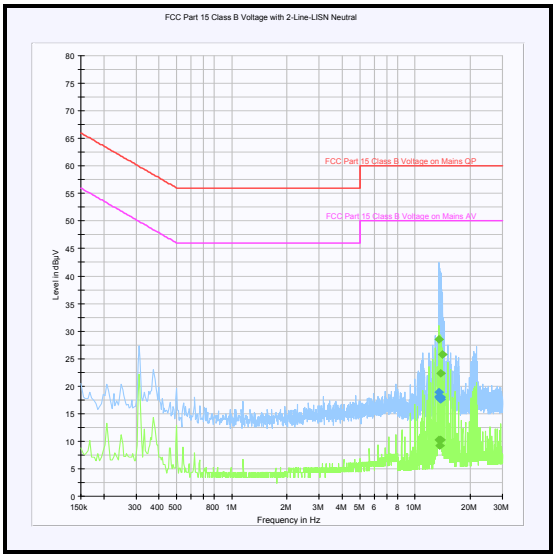
| Frequency (MHz) | Line | Level (dBµV) | Limit (dBµV) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 13.448 | Neutral | 18.9 | 60.0 | 41.1 | Complied |
| 13.565 | Neutral | 18.2 | 60.0 | 41.8 | Complied |
| 13.569 | Neutral | 18.0 | 60.0 | 42.0 | Complied |
| 13.686 | Neutral | 17.8 | 60.0 | 42.2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

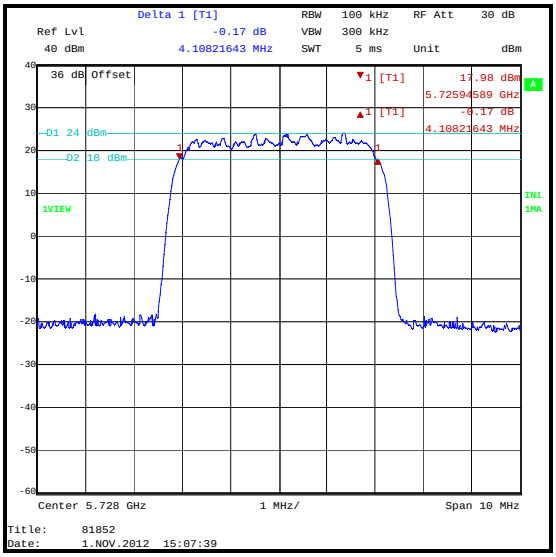
### Note(s):

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.

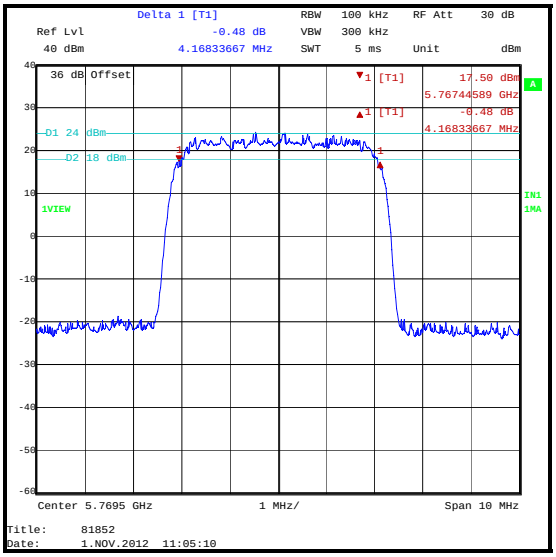
## Transmitter 6 dB Bandwidth (continued)

## Results: 5 MHz / 128QAM / 24 Mbps

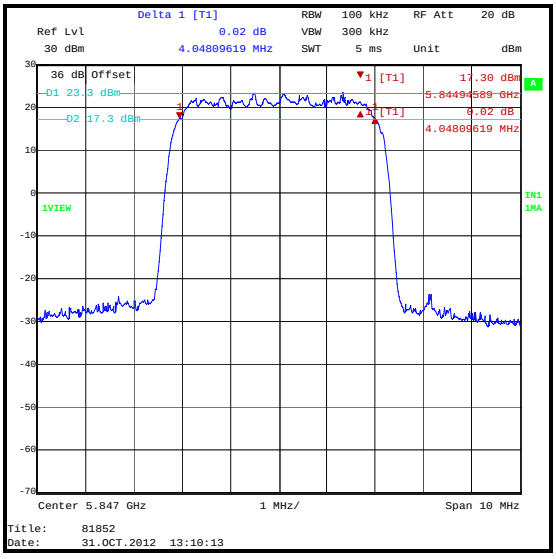
| Channel | 6 dB Bandwidth (MHz) | Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|
| Bottom | 4.108 | ≥0.5 | 3.608 | Complied |
| Middle | 4.168 | ≥0.5 | 3.668 | Complied |
| Top | 4.048 | ≥0.5 | 3.548 | Complied |




**Bottom Channel**




**Middle Channel**

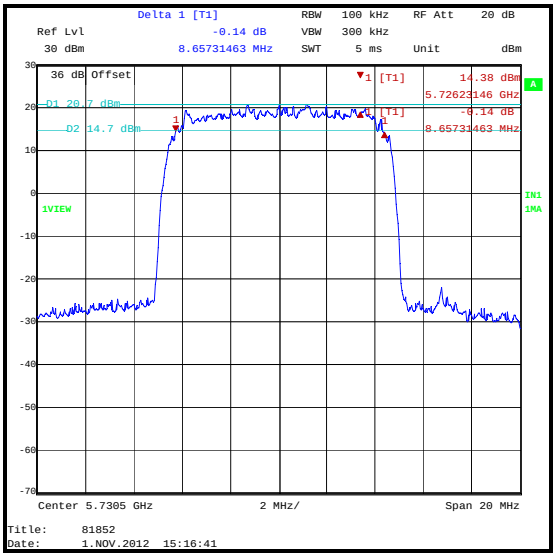



**Top Channel**

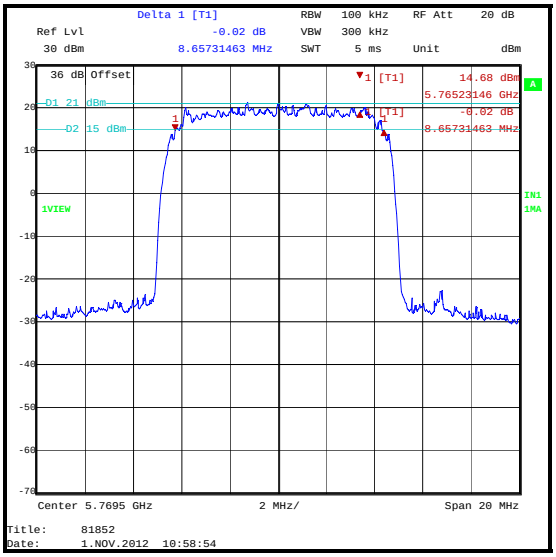
## Transmitter 6 dB Bandwidth (continued)

## Results: 10 MHz / 256QAM / 55 Mbps

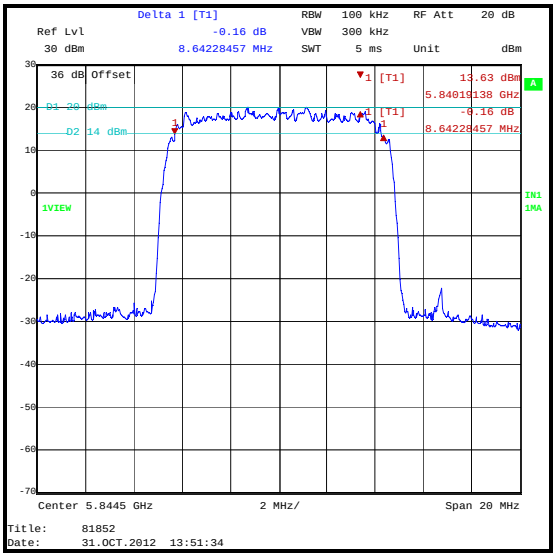
| Channel | 6 dB Bandwidth (MHz) | Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|
| Bottom | 8.657 | ≥0.5 | 8.157 | Complied |
| Middle | 8.657 | ≥0.5 | 8.157 | Complied |
| Top | 8.642 | ≥0.5 | 8.142 | Complied |




**Bottom Channel**




**Middle Channel**

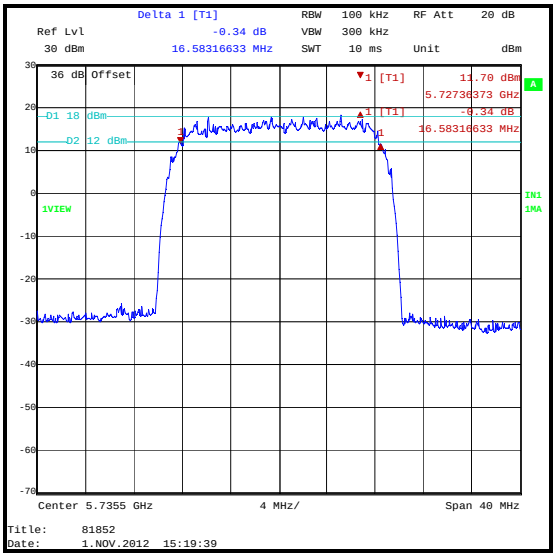



**Top Channel**

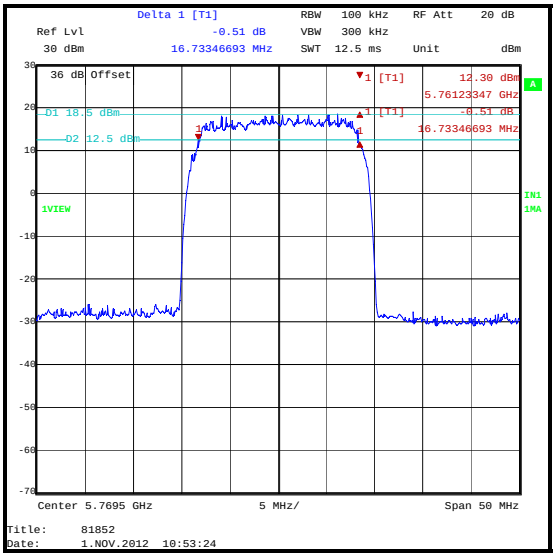
## Transmitter 6 dB Bandwidth (continued)

## Results: 20 MHz / QPSK / 30 Mbps

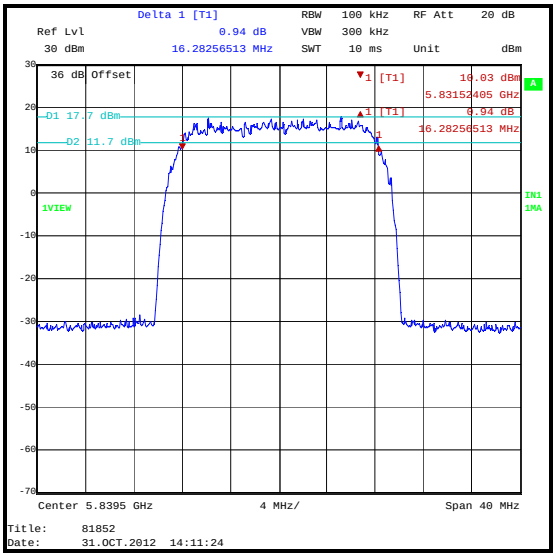
| Channel | 6 dB Bandwidth (MHz) | Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|
| Bottom | 16.583 | ≥0.5 | 16.083 | Complied |
| Middle | 16.733 | ≥0.5 | 16.233 | Complied |
| Top | 16.283 | ≥0.5 | 15.783 | Complied |




**Bottom Channel**




**Middle Channel**

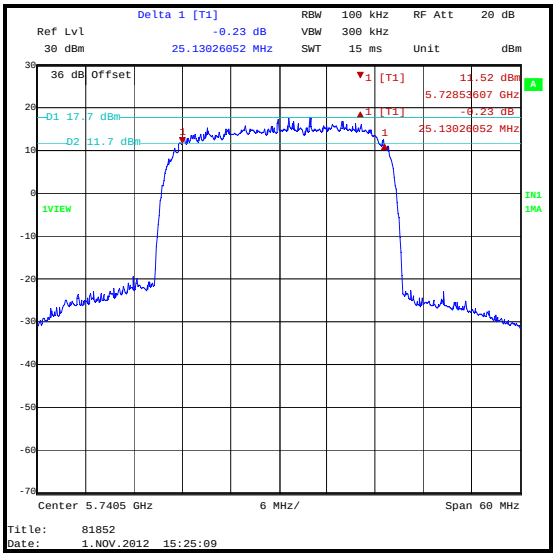



**Top Channel**

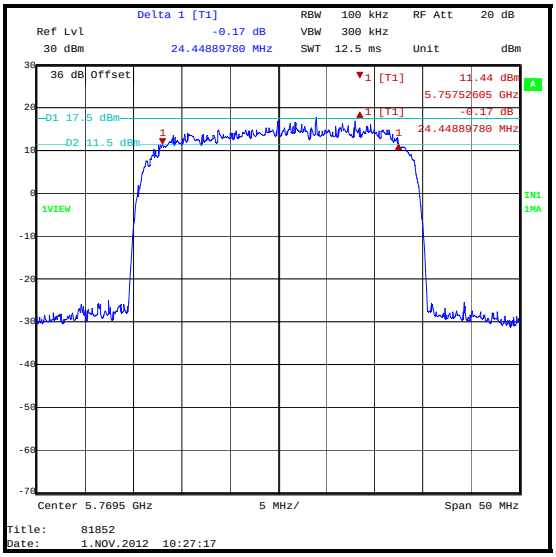
## Transmitter 6 dB Bandwidth (continued)

## Results: 30 MHz / 256QAM / 178 Mbps

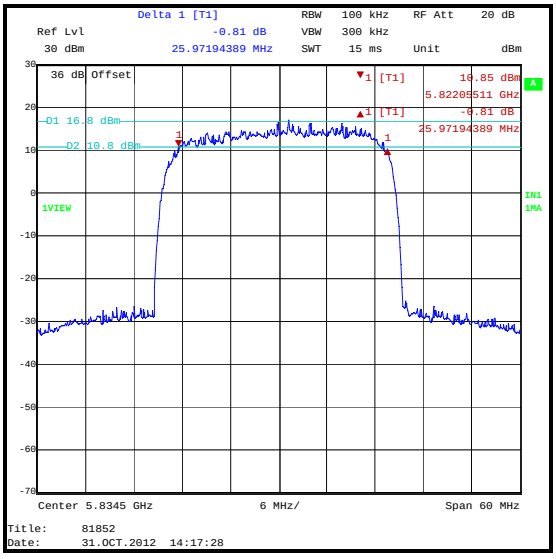
| Channel | 6 dB Bandwidth (MHz) | Limit (MHz) | Margin (MHz) | Result |
|---|---|---|---|---|
| Bottom | 25.130 | ≥0.5 | 24.630 | Complied |
| Middle | 24.449 | ≥0.5 | 23.949 | Complied |
| Top | 25.972 | ≥0.5 | 25.472 | Complied |




**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 |

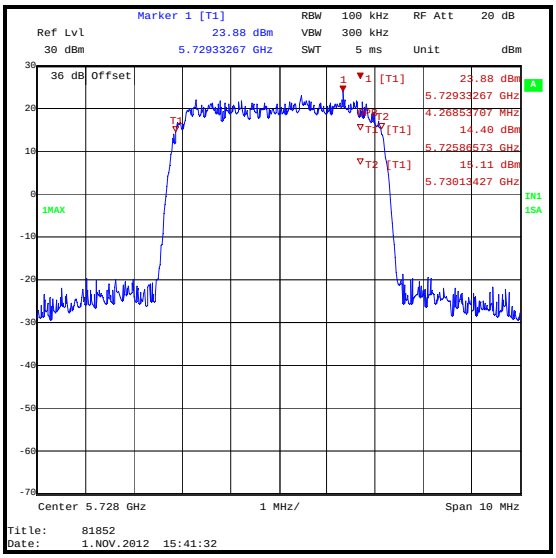
### Note(s):

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.

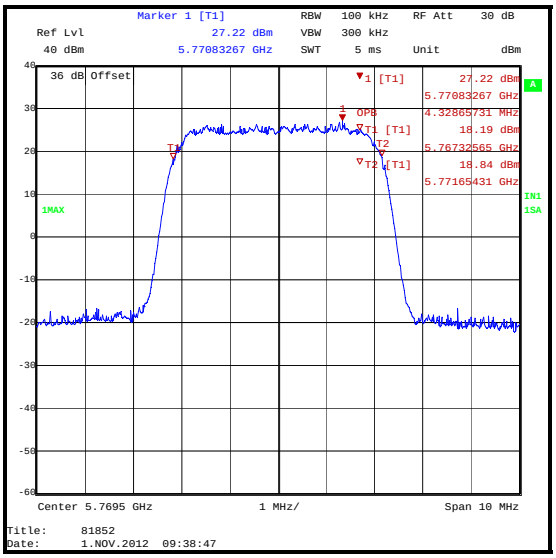
## Transmitter Occupied Bandwidth (continued)

## Results: 5 MHz / 128QAM / 24 Mbps

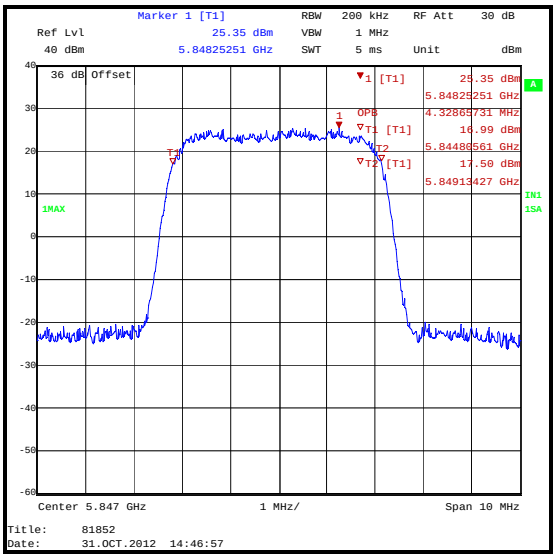
| Channel | Occupied Bandwidth (MHz) |
|---|---|
| Bottom | 4.269 |
| Middle | 4.329 |
| Top | 4.329 |




**Bottom Channel**




**Middle Channel**

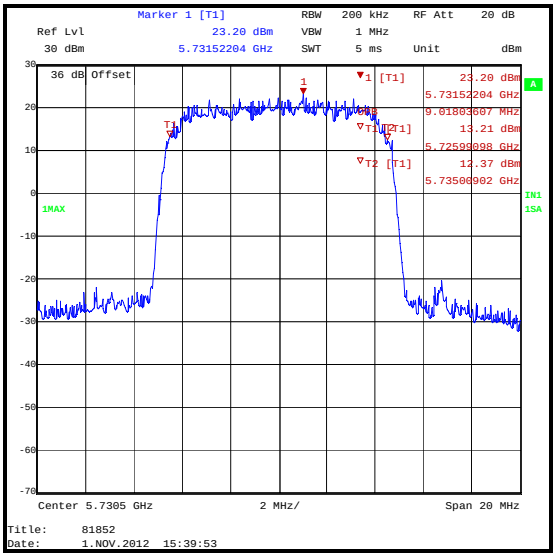



**Top Channel**

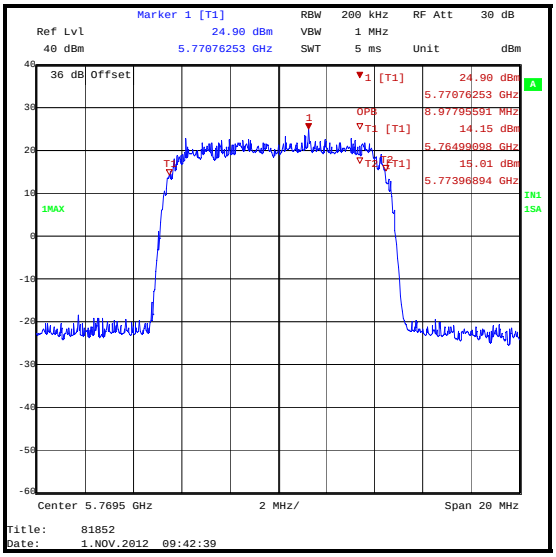
## Transmitter Occupied Bandwidth (continued)

## Results: 10 MHz / 256QAM / 55 Mbps

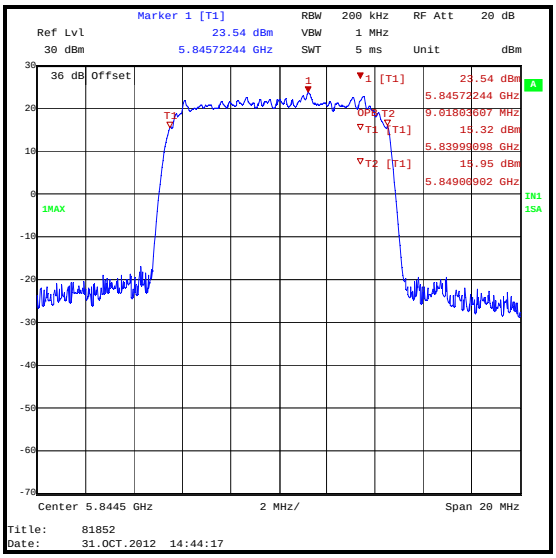
| Channel | Occupied Bandwidth (MHz) |
|---|---|
| Bottom | 9.018 |
| Middle | 8.978 |
| Top | 9.018 |




**Bottom Channel**




**Middle Channel**

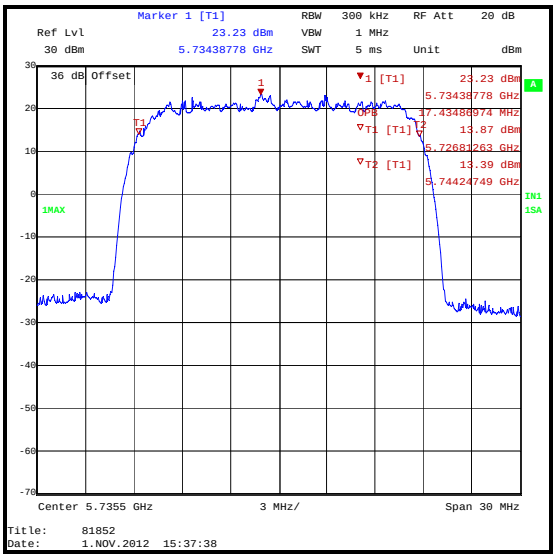



**Top Channel**

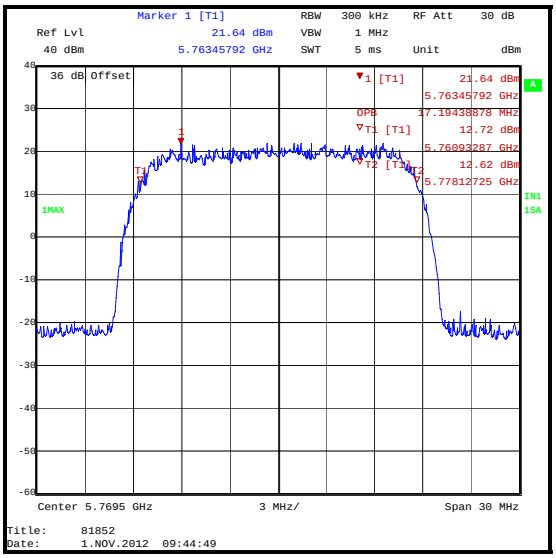
## Transmitter Occupied Bandwidth (continued)

## Results: 20 MHz / QPSK / 30 Mbps

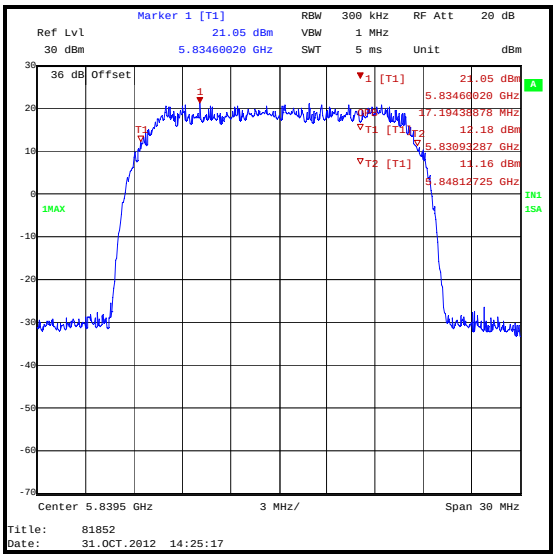
| Channel | Occupied Bandwidth (MHz) |
|---|---|
| Bottom | 17.435 |
| Middle | 17.194 |
| Top | 17.194 |




**Bottom Channel**




**Middle Channel**

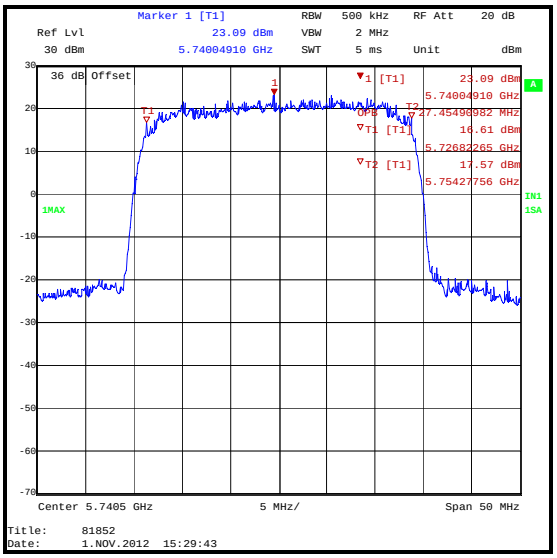



**Top Channel**

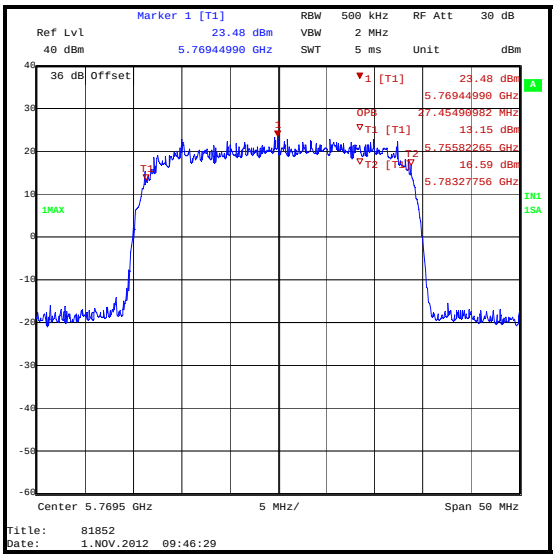
## Transmitter Occupied Bandwidth (continued)

## Results: 30 MHz / 256QAM / 178 Mbps

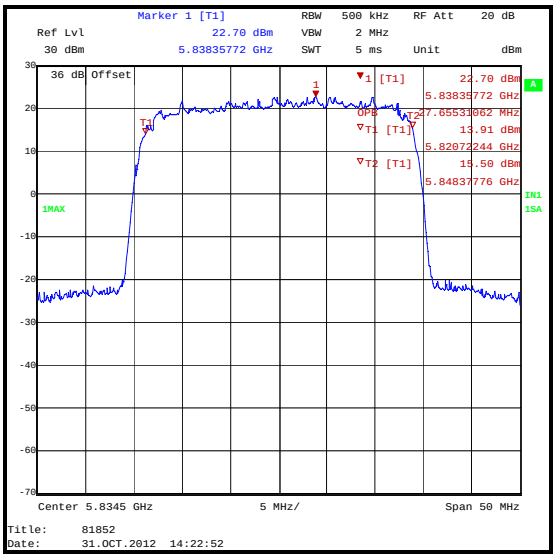
| Channel | Occupied Bandwidth (MHz) |
|---|---|
| Bottom | 27.455 |
| Middle | 27.455 |
| Top | 27.655 |




**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):

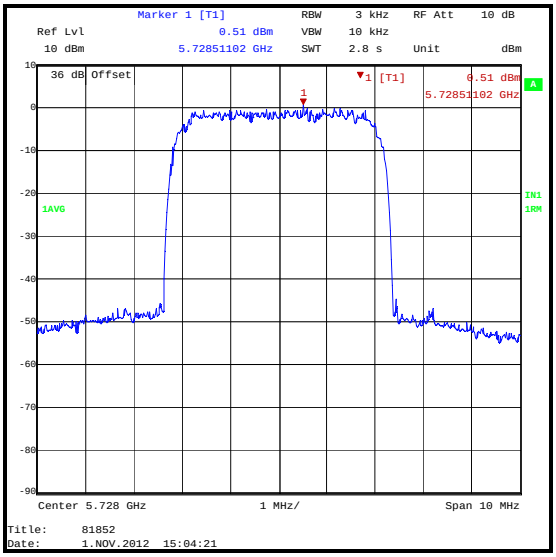
1. Transmitter Power Spectral Density tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.2 Option 2.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power were:
    - 5 MHz channel bandwidth – 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.

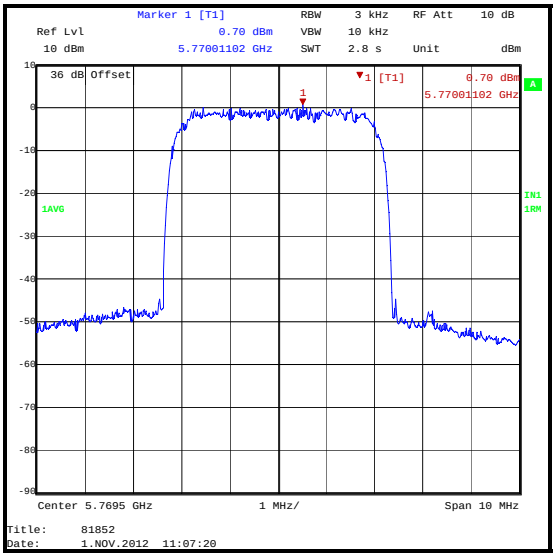
## Transmitter Power Spectral Density (continued)

## Results 5 MHz / 128QAM / 24 Mbps

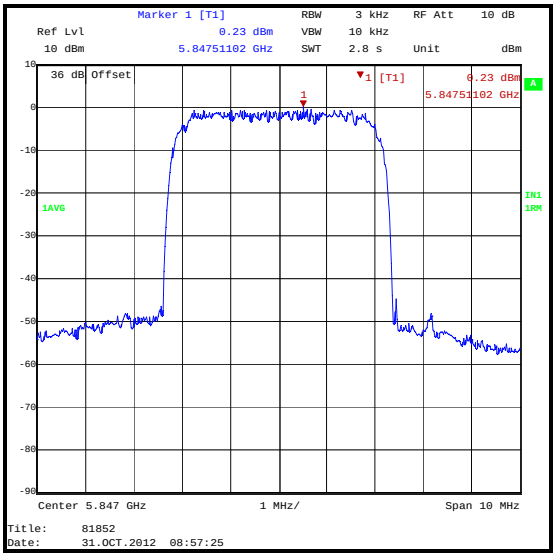
| Channel | Output Power (dBm / 3 kHz) | Limit (dBm / 3 kHz) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | 0.5 | 8.0 | 7.5 | Complied |
| Middle | 0.7 | 8.0 | 7.3 | Complied |
| Top | 0.2 | 8.0 | 7.8 | Complied |




**Bottom Channel**




**Middle Channel**

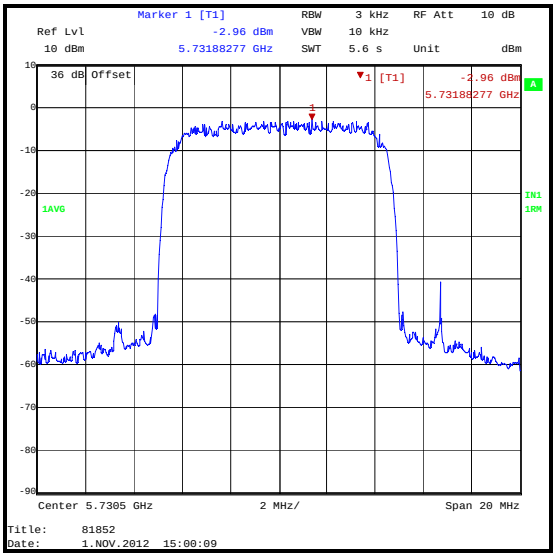



**Top Channel**

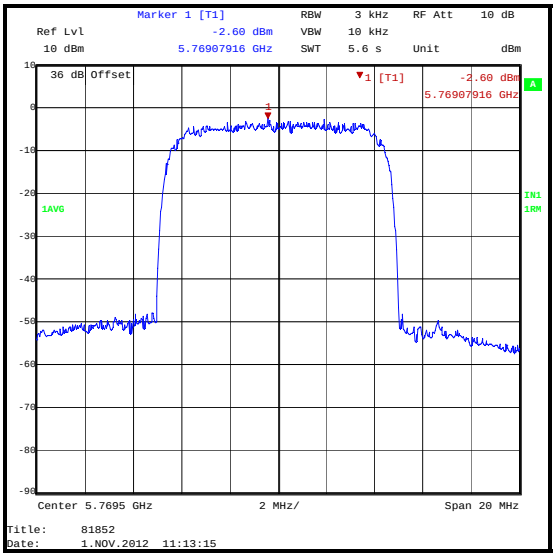
## Transmitter Power Spectral Density (continued)

## Results 10 MHz / QPSK / 11 Mbps

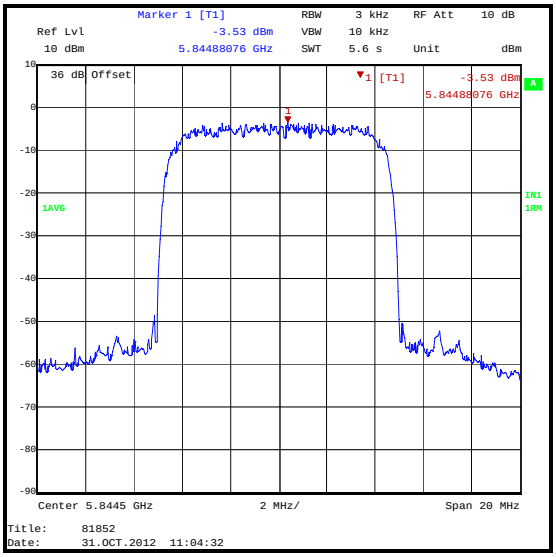
| Channel | Output Power (dBm / 3 kHz) | Limit (dBm / 3 kHz) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | -3.0 | 8.0 | 11.0 | Complied |
| Middle | -2.6 | 8.0 | 10.6 | Complied |
| Top | -3.5 | 8.0 | 11.5 | Complied |




**Bottom Channel**




**Middle Channel**

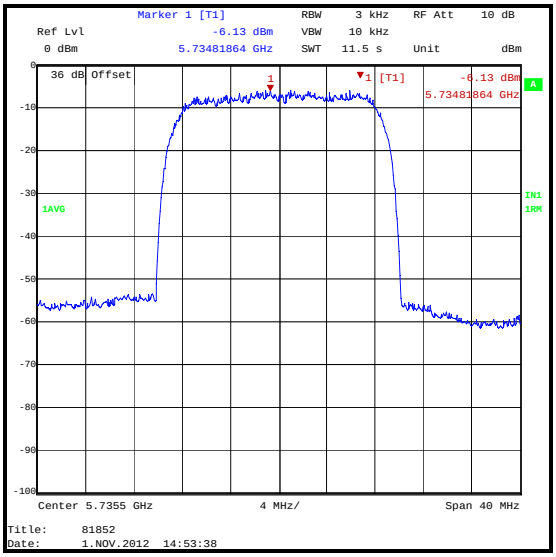



**Top Channel**

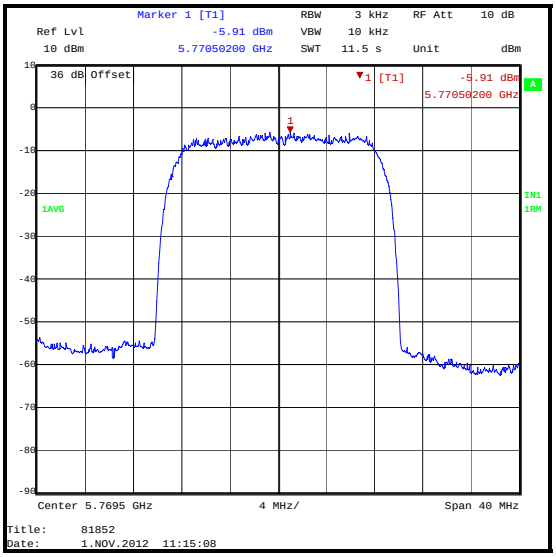
## Transmitter Power Spectral Density (continued)

## Results 20 MHz / QPSK / 30 Mbps

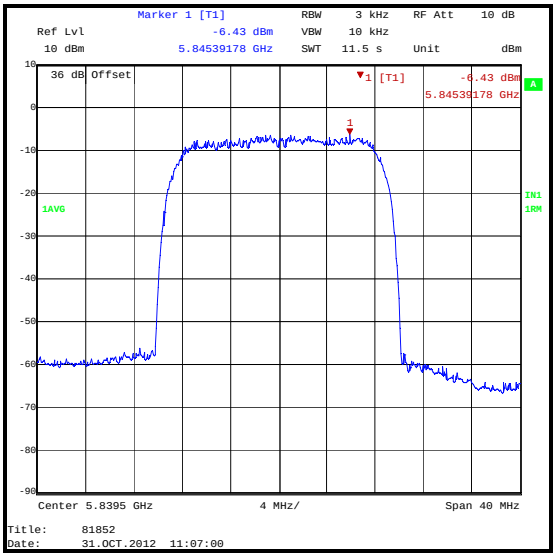
| Channel | Output Power (dBm/3 kHz) | Limit (dBm/3 kHz) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | -6.1 | 8.0 | 14.1 | Complied |
| Middle | -5.9 | 8.0 | 13.9 | Complied |
| Top | -6.4 | 8.0 | 14.4 | Complied |




**Bottom Channel**




**Middle Channel**

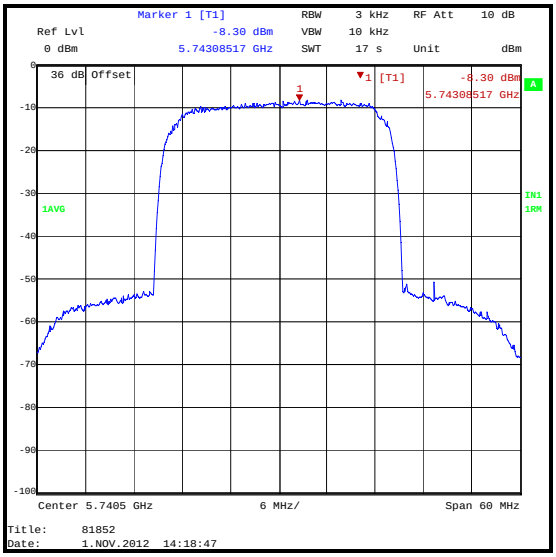



**Top Channel**

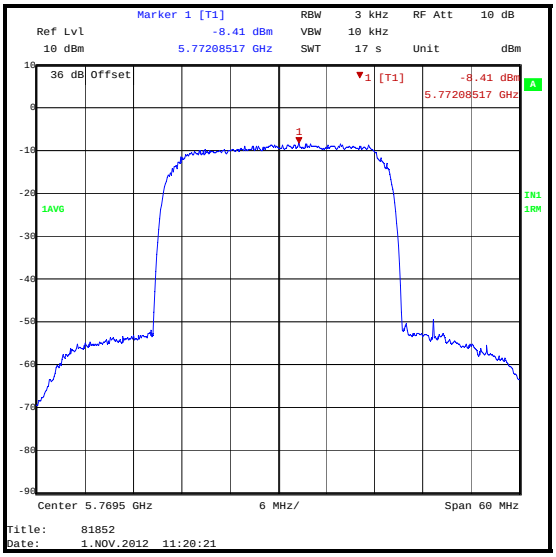
## Transmitter Power Spectral Density (continued)

## Results 30 MHz / 256QAM / 178 Mbps

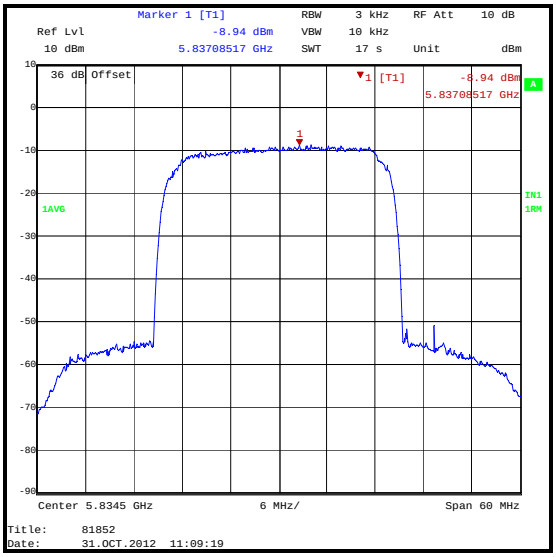
| Channel | Output Power (dBm/3 kHz) | Limit (dBm/3 kHz) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | -8.3 | 8.0 | 16.3 | Complied |
| Middle | -8.4 | 8.0 | 16.4 | Complied |
| Top | -8.9 | 8.0 | 16.9 | Complied |




**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):

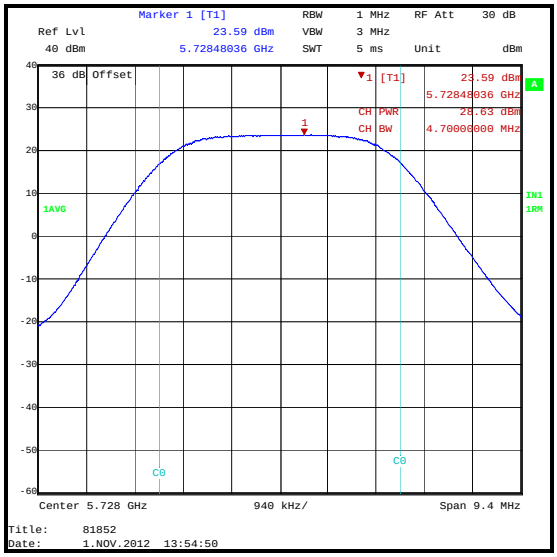
1. Conducted power tests in all bands were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.2.1 Option 1.
2. 26 dB Emission Bandwidth tests were performed to calculate the span and to determine widest bandwidth worst case, the results are available upon request.
3. All 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.

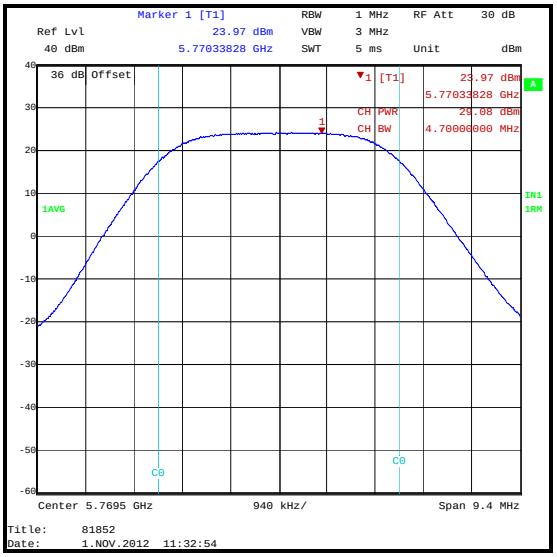
## Transmitter Maximum Average Output Power (continued)

## Results: 5 MHz / 128QAM / 24 Mbps

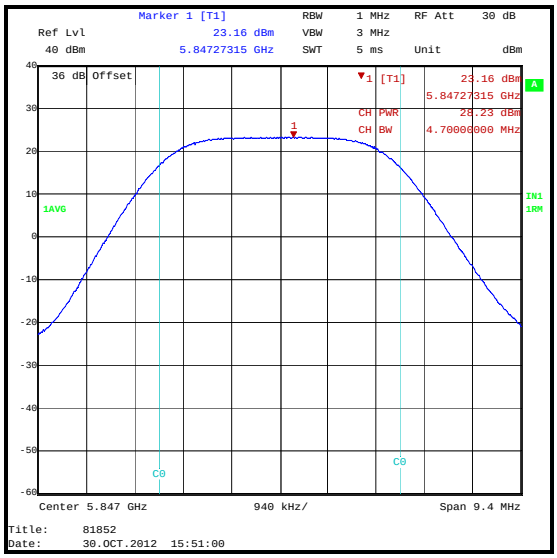
| Channel | Power (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | 28.6 | 30.0 | 1.4 | Complied |
| Middle | 29.1 | 30.0 | 0.9 | Complied |
| Top | 28.2 | 30.0 | 1.8 | Complied |




**Bottom Channel**




**Middle Channel**

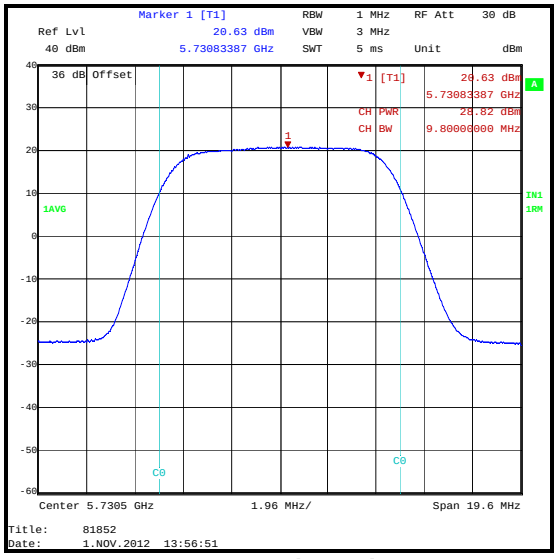



**Top Channel**

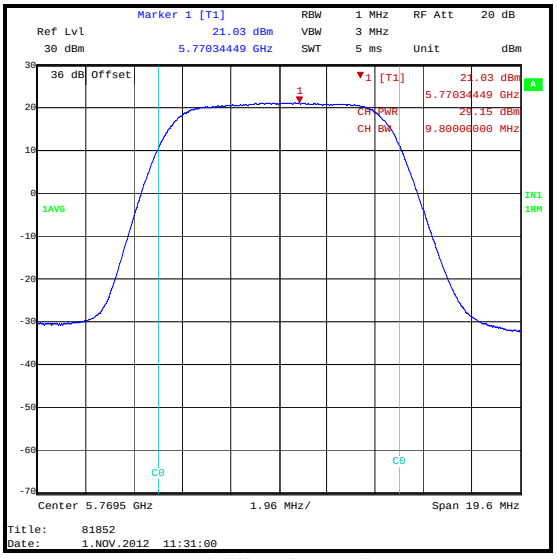
## Transmitter Maximum Average Output Power (continued)

## Results: 10 MHz / QPSK / 11 Mbps

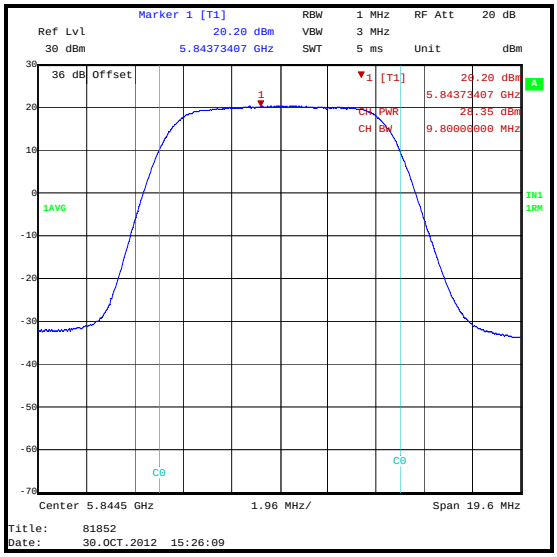
| Channel | Power (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | 28.8 | 30.0 | 1.2 | Complied |
| Middle | 29.2 | 30.0 | 0.8 | Complied |
| Top | 28.4 | 30.0 | 1.6 | Complied |




**Bottom Channel**




**Middle Channel**

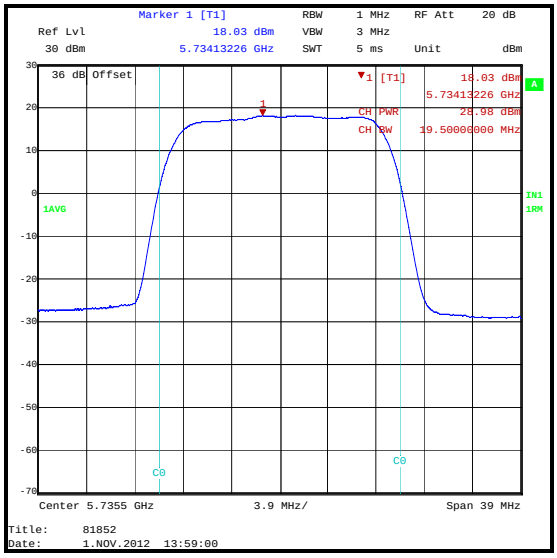



**Top Channel**

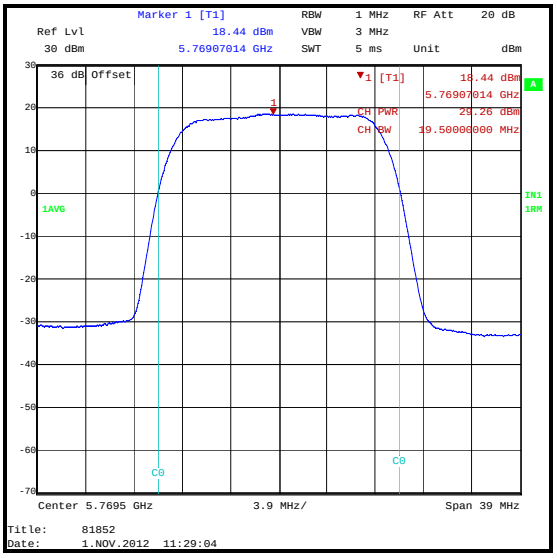
## Transmitter Maximum Average Output Power (continued)

## Results: 20 MHz / QPSK / 30 Mbps

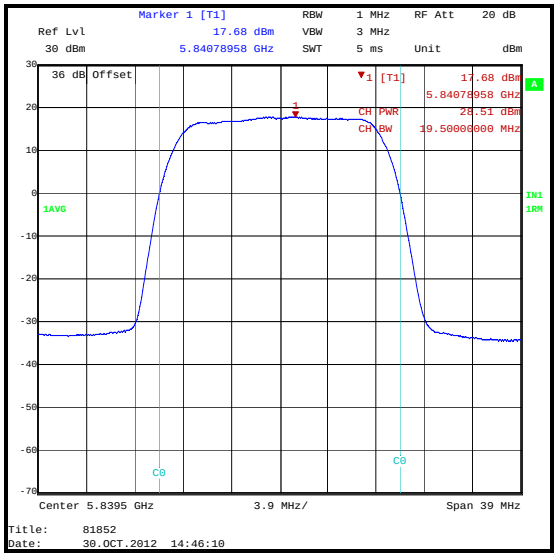
| Channel | Power (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | 29.0 | 30.0 | 1.0 | Complied |
| Middle | 29.3 | 30.0 | 0.7 | Complied |
| Top | 28.5 | 30.0 | 1.5 | Complied |




**Bottom Channel**




**Middle Channel**

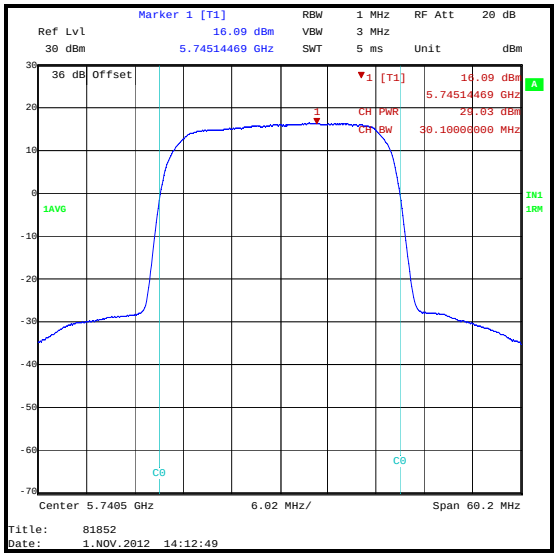



**Top Channel**

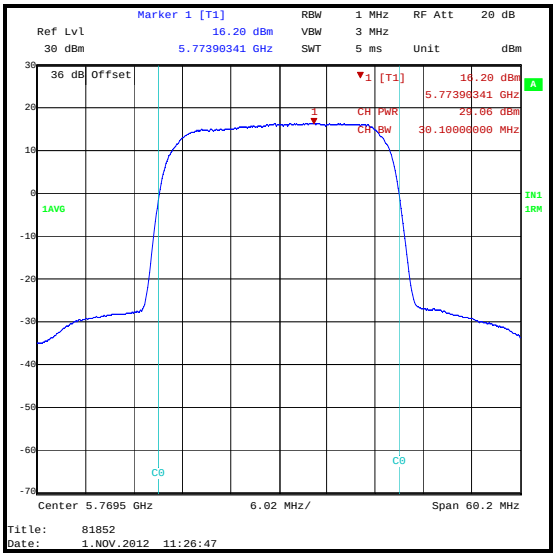
## Transmitter Maximum Average Output Power (continued)

## Results: 30 MHz / 256QAM / 178 Mbps

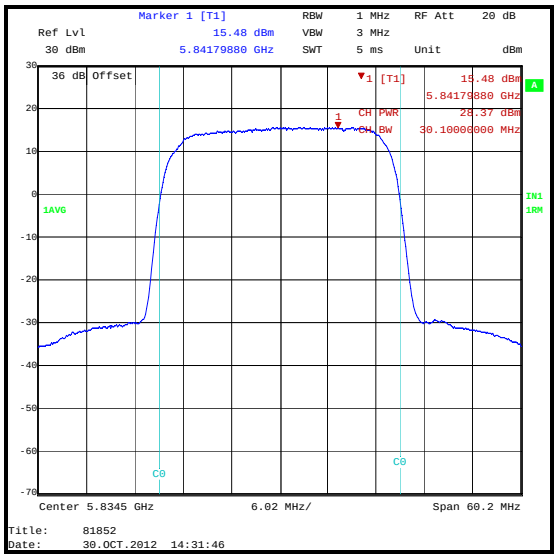
| Channel | Power (dBm) | Limit (dBm) | Margin (dB) | Result |
|---|---|---|---|---|
| Bottom | 29.0 | 30.0 | 1.0 | Complied |
| Middle | 29.1 | 30.0 | 0.9 | Complied |
| Top | 28.4 | 30.0 | 1.6 | Complied |




**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,<br>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 |

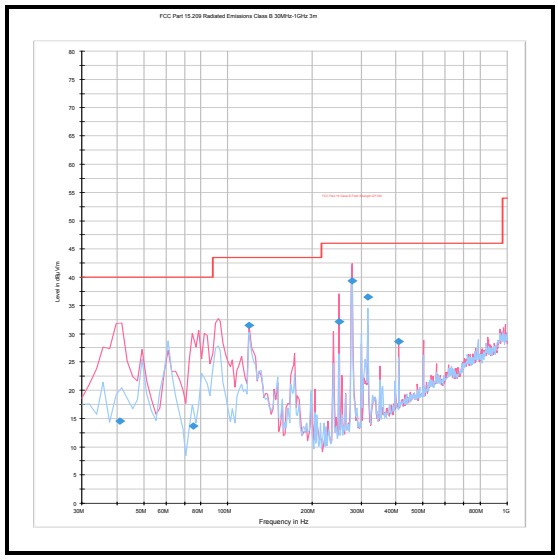
### Note(s):

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,<br>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)

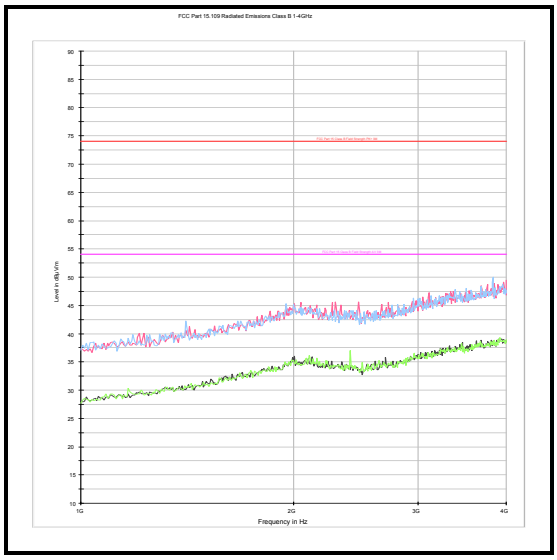
### Results: Peak

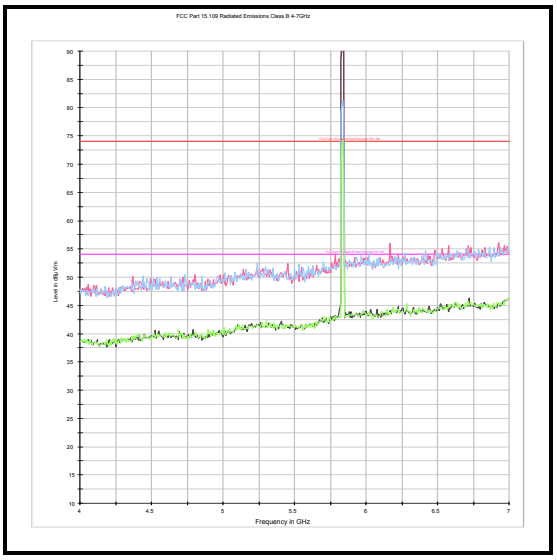
| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 17821.142 | Vertical | 69.9 | 80.0 | 10.1 | Complied |

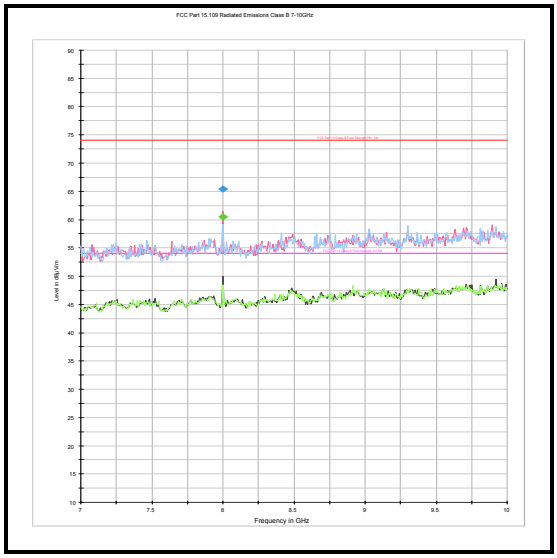
### Results: Average

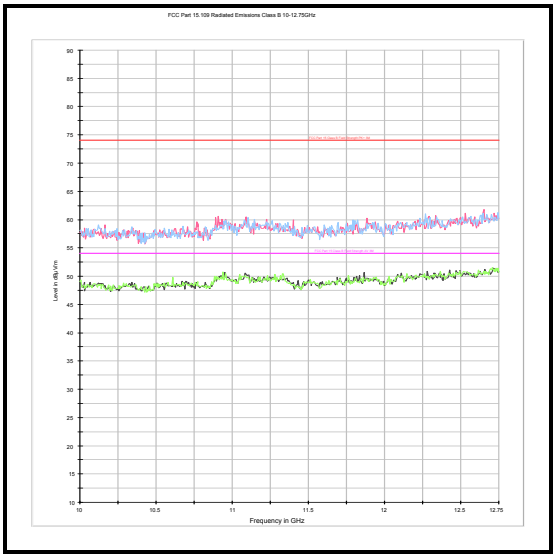
| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 17800.100 | Vertical | 58.7 | 60.0 | 1.3 | Complied |

## Transmitter Radiated Emissions (continued)

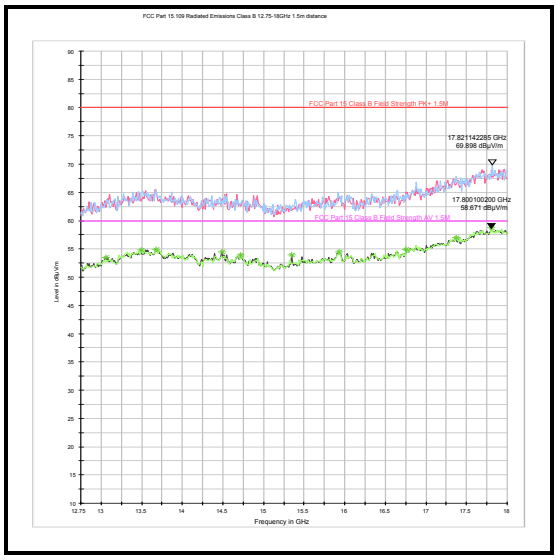


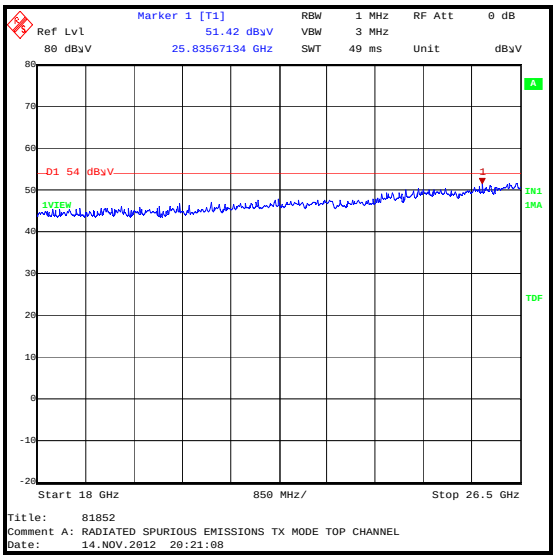



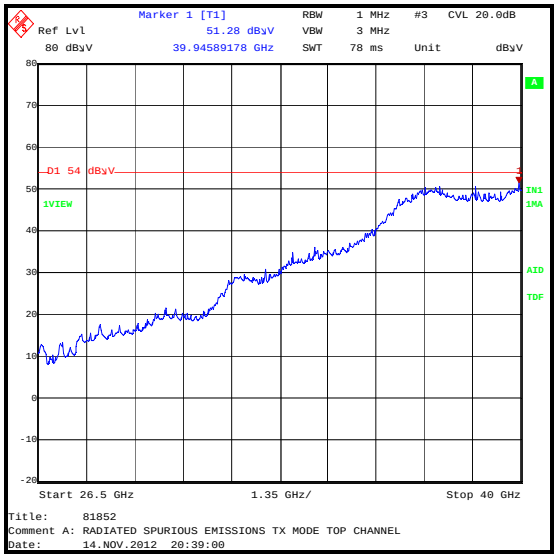



## Transmitter Radiated Emissions (continued)



## 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,<br>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 |

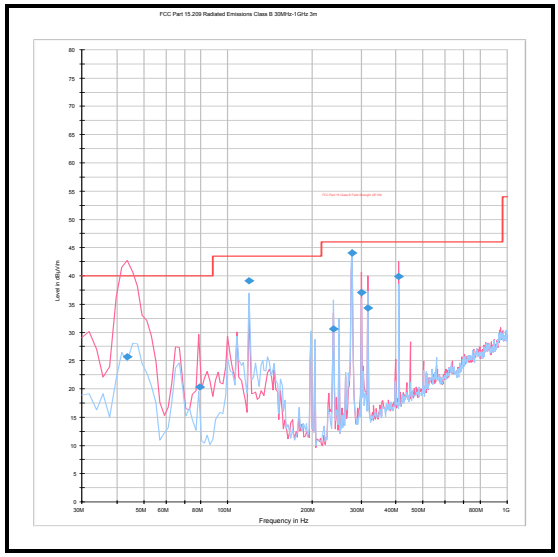
### Note(s):

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)

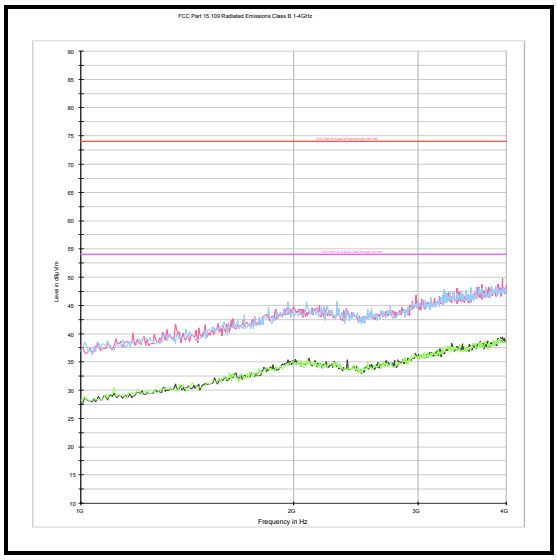
### Results: Peak

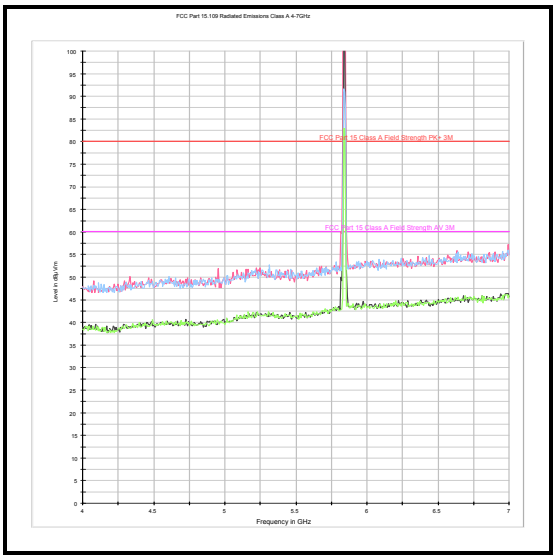
| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 17726.453 | Vertical | 69.4 | 80.0 | 10.6 | Complied |

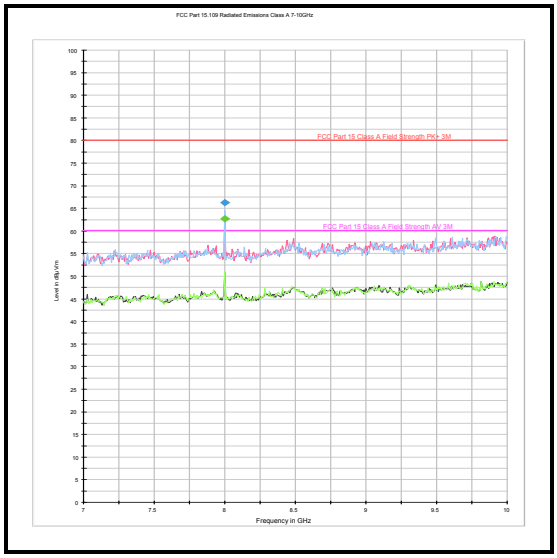
### Results: Average

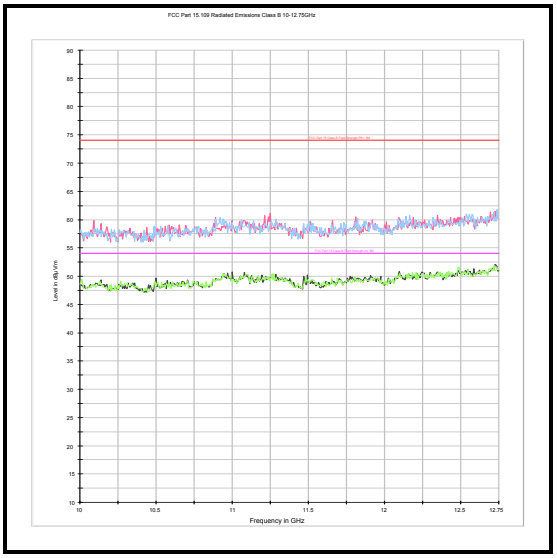
| Frequency (MHz) | Antenna Polarity | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 17684.369 | Vertical | 59.1 | 60.0 | 0.9 | Complied |

## Transmitter Radiated Emissions (continued)

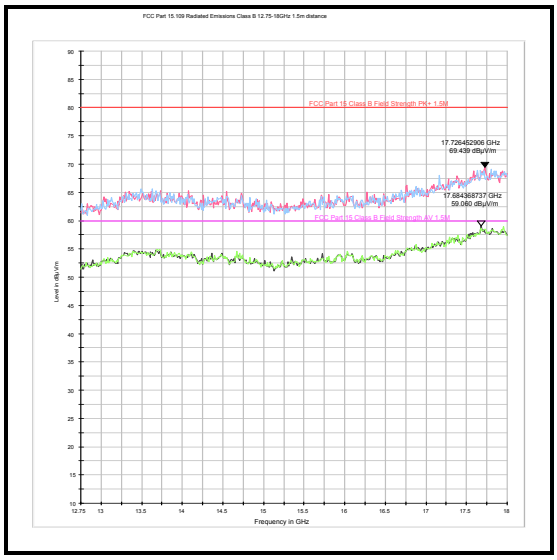


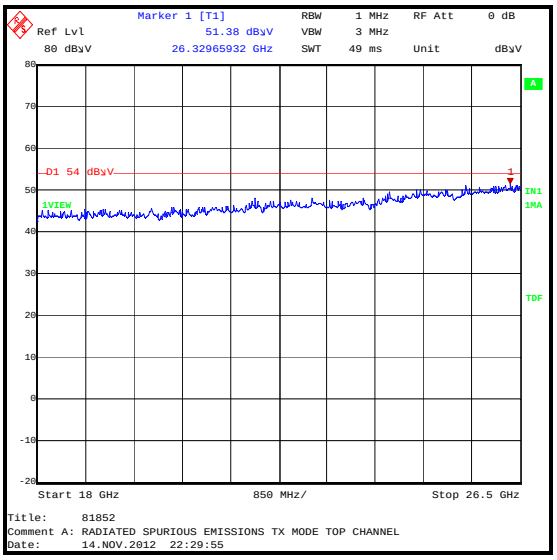



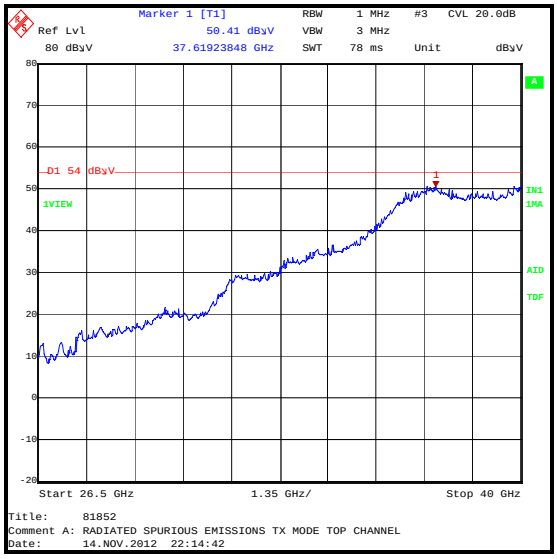



## Transmitter Radiated Emissions (continued)



## 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 |

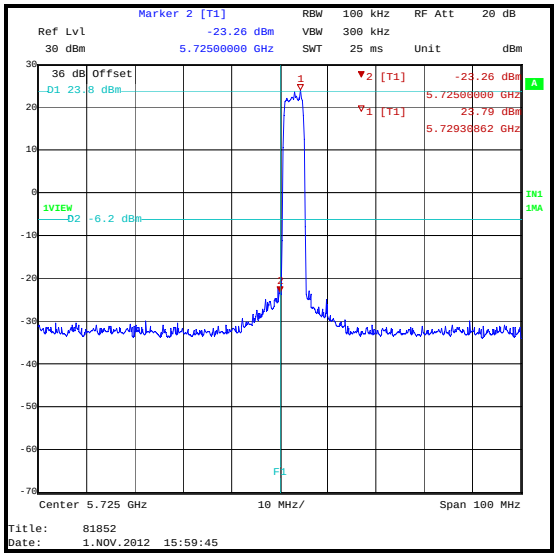
### Note(s):

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.

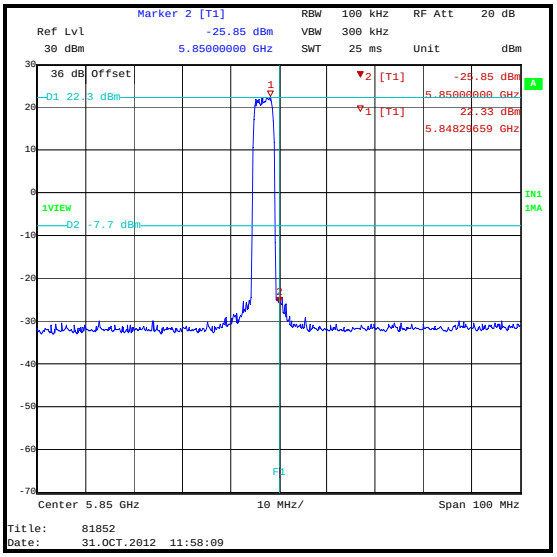
## Transmitter Band Edge Conducted Emissions (continued)

## 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**

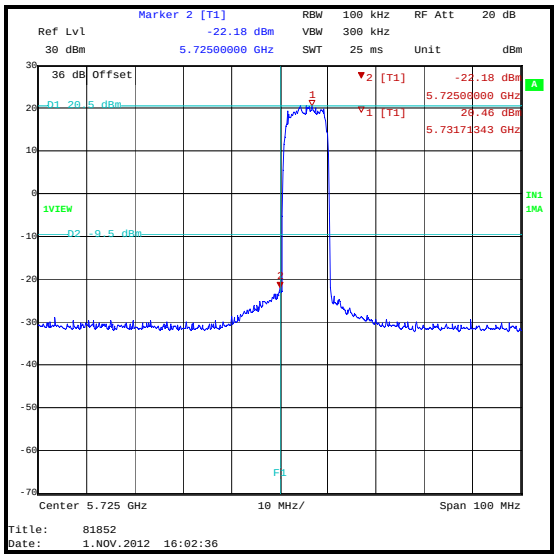



**Upper Band Edge Peak Measurement**

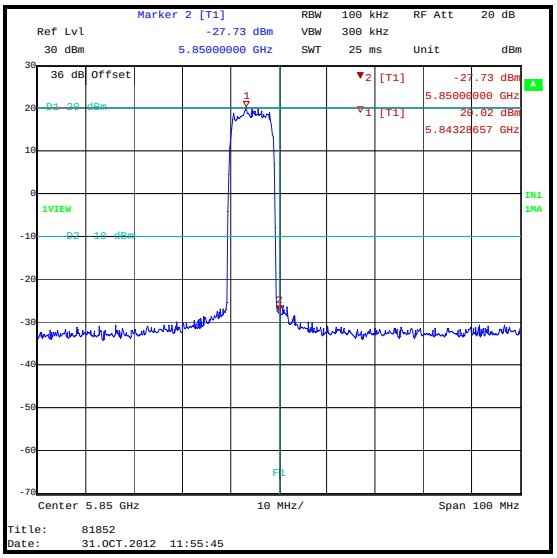
## Transmitter Band Edge Conducted Emissions (continued)

## 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**

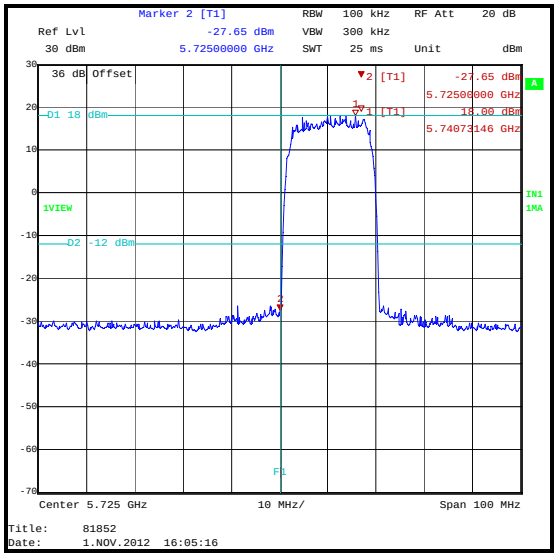



**Upper Band Edge Peak Measurement**

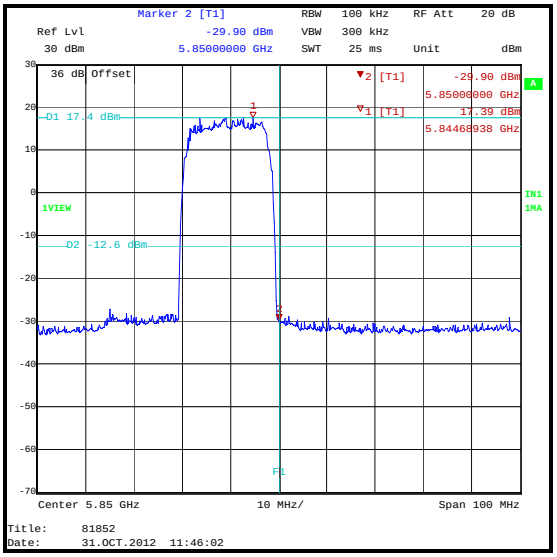
## Transmitter Band Edge Conducted Emissions (continued)

## 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**

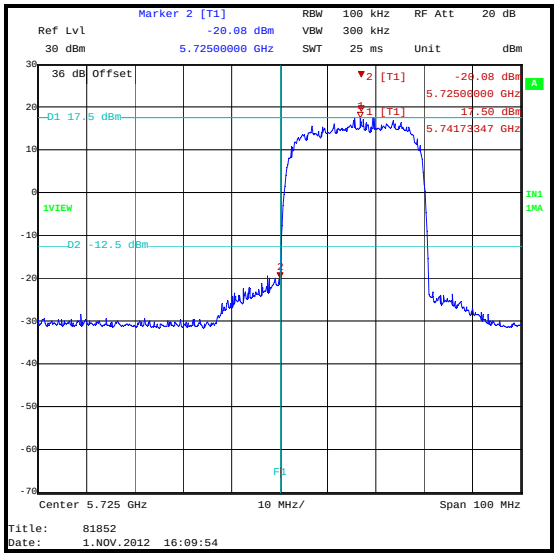



**Upper Band Edge Peak Measurement**

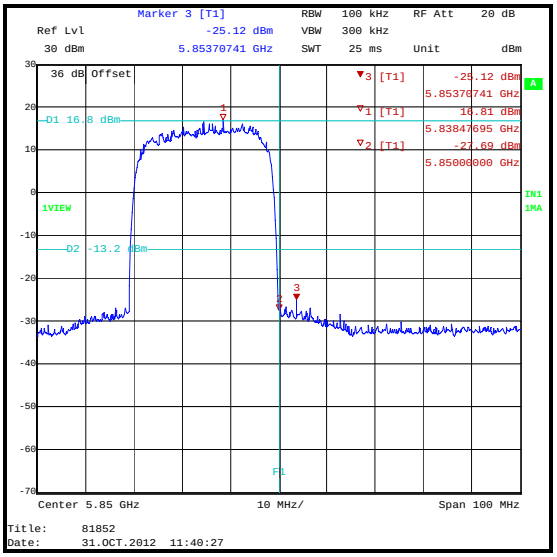
## Transmitter Band Edge Conducted Emissions (continued)

## 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 |