

# TEST REPORT FROM RFI GLOBAL SERVICES LTD



Test of: Airsynergy SYN2-CN-00-U40-000

FCC ID: O2J-235AS

To: FCC Parts 2.1046; 2.1049; 2.1051; 2.1053; 27.50 & 27.53

**Test Report Serial No:**  
RFI-RPT-RP82269JD02A V2.0

**Version 2.0 supersedes all previous versions**

<b>This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:</b>	
	pp 
<b>Checked By:</b>	Nick Hooper
<b>Signature:</b>	
<b>Date of Issue:</b>	30 August 2011

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**RFI Global Services Ltd**

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG  
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001  
Email: [info@rfi-global.com](mailto:info@rfi-global.com) Website: [www.rfi-global.com](http://www.rfi-global.com)

Registered in England and Wales. Company number:2117901

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## **1. Customer Information**











<b>Company Name:</b>	Airspan Communications Ltd.
<b>Address:</b>	Capital Point 33 Bath Road Slough Berkshire SL1 3UF United Kingdom

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	47CFR27
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 27 Subpart C (Miscellaneous Wireless Communication Services)
<b>Specification Reference:</b>	Customer Test Plan
<b>Specification Title:</b>	SC_AIR_TP04_A_august-2011
<b>Site Registration:</b>	209735
<b>Location of Testing:</b>	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
<b>Test Dates:</b>	08 August 2011 to 09 August 2011

### 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 27.50(a)(ii) / 2.1046	Power Limits and Duty Cycle	
Part 27.50(a)(1) / 2.1046	Average Power Spectral Density	
Part 27.50(a)(1)(B)	Peak to Average Power Ratio	
Part 2.1049	Transmitter Occupied Bandwidth	
Part 27.53(a)(1) / 2.1051	Transmitter Conducted Emissions	
Part 27.53(a)(1) / 2.1051	Transmitter Conducted Emissions at Band Edges	
Part 27.53(a)(1) / 2.1053	Transmitter Radiated Spurious Emissions	
Part 27.53(a)(1) / 2.1053	Transmitter Radiated Emissions at Band Edges	
Key to Results		
 = Complied  = Did not comply		

### 2.3. Methods and Procedures

<b>Reference:</b>	ANSI/TIA-603-C-2004
<b>Title:</b>	Land Mobile Communications Equipment, Measurements and performance Standards

### 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)**

<b>Brand Name:</b>	Airspan
<b>Model Name or Number:</b>	Airsynergy SYN2-CN-00-U40-000, P/N 902-03-205
<b>Serial Number:</b>	9B2312FFFF23 - baseband board
<b>Hardware Version Number:</b>	Synergy2 revA
<b>FCC ID Number:</b>	O2J-235AS

<b>Description:</b>	RF Filter for Port 1
<b>Brand Name:</b>	WeverCom
<b>Model Name or Number:</b>	WVC-2311D2354-12M02B
<b>Serial Number:</b>	S11050005

<b>Description:</b>	RF Filter for Port 2
<b>Brand Name:</b>	WeverCom
<b>Model Name or Number:</b>	WVC-2311D2354-12M02B
<b>Serial Number:</b>	S11050007

<b>Description:</b>	RF Cable #1 - 1.25 metres
<b>Brand Name:</b>	Andrew
<b>Model Name or Number:</b>	Sureflex L4NRA-PNMNF-1M25
<b>Serial Number:</b>	05ACZ10906995

<b>Description:</b>	RF Cable #2 - 1.25 metres
<b>Brand Name:</b>	Andrew
<b>Model Name or Number:</b>	Sureflex L4NRA-PNMNF-1M25
<b>Serial Number:</b>	05ACZ10906961

#### **3.2. Description of EUT**

The equipment under test was a Airsynergy P2P WiMax Base Station operating in the 2.3 GHz frequency band. The Base Station was connected to two RF Filters via two RF cables, both 1.25 metres in length.

#### **3.3. Modifications Incorporated in the EUT**

No modifications were applied to the EUT during testing.

**3.4. Additional Information Related to Testing**

<b>Tested Technology:</b>	WiMAX	
<b>Type of Equipment</b>	Base Station	
<b>Modulation Type:</b>	QPSK3/4 and 64QAM3/4	
<b>Declared Duty Cycle:</b>	5 MHz: 59% 10 MHz: 60%	
<b>Antenna Gain:</b>	18.0 dBi	
<b>Channel Bandwidth:</b>	3.5 MHz	
<b>Transmit Frequency Range:</b>	2315 MHz to 2360 MHz	
<b>Transmit Channels Tested:</b>	<b>Channel ID</b>	<b>Channel Frequency (MHz)</b>
	Block C	2317.1
	Block D	2347.9

### **3.5. Support Equipment**

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

<b>Description:</b>	Laptop
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	Latitude
<b>Serial Number:</b>	Airspan 005853

<b>Description:</b>	120 VAC 60 Hz to 48 VDC PSU
<b>Brand Name:</b>	Powerbox
<b>Model Name or Number:</b>	PBUS-LUV-54V/100W-SN-QNA
<b>Serial Number:</b>	S1125CV000566

<b>Description:</b>	POE Connection box
<b>Brand Name:</b>	Airspan
<b>Model Name or Number:</b>	Not Stated
<b>Serial Number:</b>	Not Stated

<b>Description:</b>	Ethernet Router
<b>Brand Name:</b>	Dlink
<b>Model Name or Number:</b>	DGS-1005D
<b>Serial Number:</b>	DRSB92000451



## **4. Operation and Monitoring of the EUT during Testing**

### **4.1. Operating Modes**

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

- Transmit Mode - The EUT was set to transmit with maximum output power on the bottom and top channels as detailed in the Customer's Test Plan.
- Operating on the bottom or lower top channel, as detailed in the Customer's Test Plan.

### **4.2. Configuration and Peripherals**

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

- The EUT was controlled from a laptop PC using software supplied by the Customer.
- The EUT supports MIMO on two RF ports. Measurements were performed on each port as required.
- A 50 Ohm load was fitted to both RF ports on the EUT during radiated spurious emission testing.

## **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* for Measurement Uncertainty details.

## **5.2. Test Results**

### **5.2.1. Transmitter Carrier Output Power (EIRP)**

#### **Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	09 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFF23		

<b>FCC Part:</b>	2.1046 and 27.50(a)(ii)
<b>Test Method Used:</b>	As detailed in FCC KDB 971168

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	35

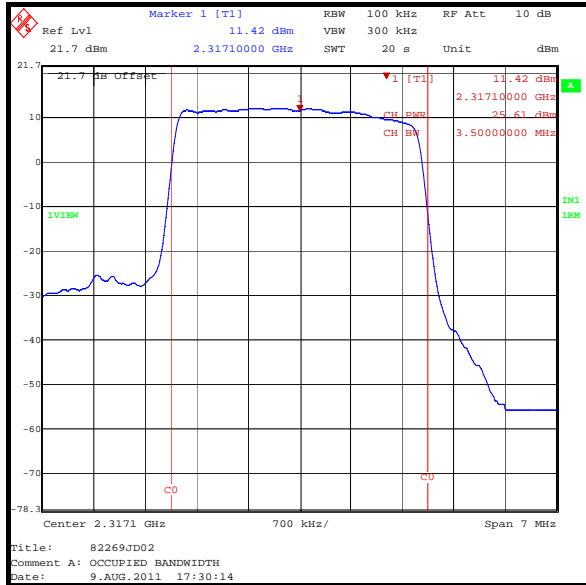
#### **Note(s):**

1. Measurements were performed with the EUT transmitting on the bottom and top channels using 64QAM3/4 modulation in accordance with the Customer's Test Plan.
2. The conducted maximum output power from each RF filter antenna port was measured using a spectrum analyser channel power function in conjunction with an RMS detector. The results for each port were linearly summed. The antenna gain was added to the summed conducted output power to calculate the EIRP.

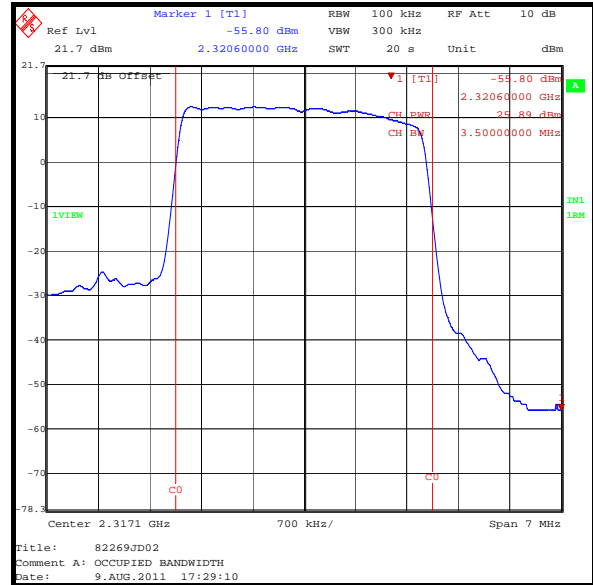
**Transmitter Carrier Output Power (EIRP) (continued)**

**Results: Bottom Channel / 2317.1 MHz / 3.5 MHz Channel / 64QAM3/4**

Port 1 Conducted Power (dBm)	Port 2 Conducted Power (dBm)	Summed Conducted Power (dBm)	Antenna Gain (dBi)	Antenna Gain + Summed Power (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
25.6	25.9	28.8	18.0	46.8	63.0	16.2	Complied



**64QAM3/4 / Port 1**

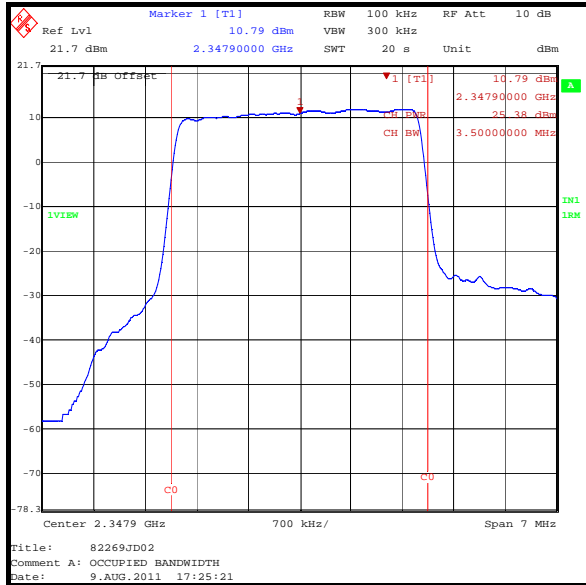


**64QAM3/4 / Port 2**

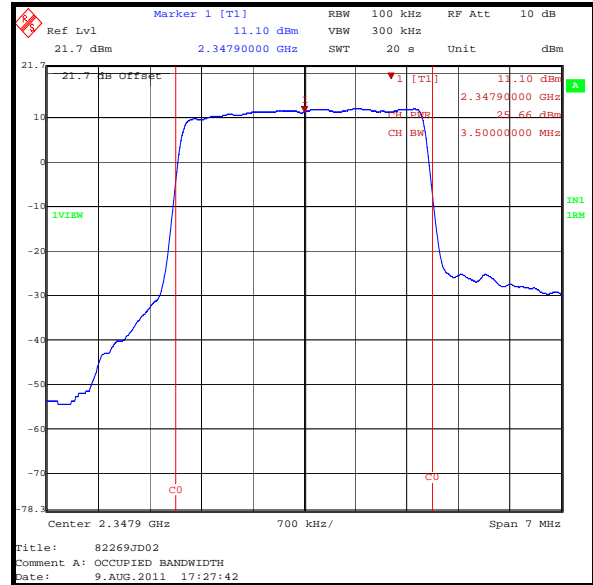
**Transmitter Carrier Output Power (EIRP) (continued)**

**Results: Top Channel / 2347.9 MHz / 3.5 MHz Channel / 64QAM3/4**

Port 1 Conducted Power (dBm)	Port 2 Conducted Power (dBm)	Summed Conducted Power (dBm)	Antenna Gain (dBi)	Antenna Gain + Summed Power (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
25.4	25.7	28.6	18.0	46.6	63.0	16.4	Complied



**64QAM3/4 / Port 1**



**64QAM3/4 / Port 2**

**5.2.2. Transmitter Average Power Spectral Density****Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	09 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFFF23		

<b>FCC Parts:</b>	2.1046 and 27.50(a)(1)(A)
<b>Test Method Used:</b>	As detailed in FCC KDB 971168

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	35

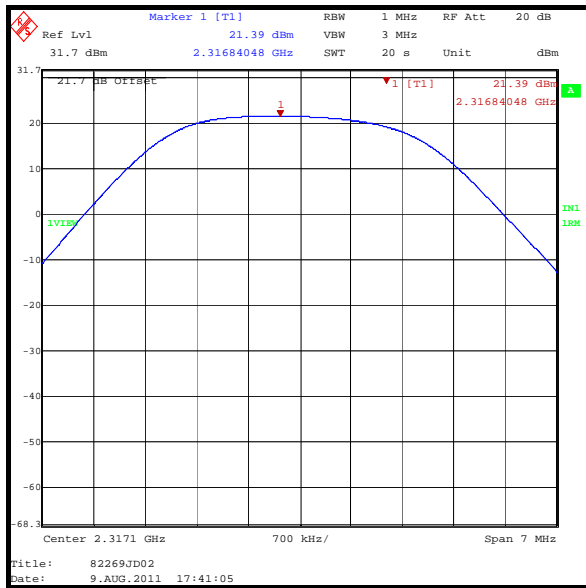
**Note(s):**

1. Measurements were performed with the EUT transmitting on the bottom and top channels using 64QAM3/4 modulation in accordance with the Customer's Test Plan.
2. The conducted maximum output power in 1 MHz from each RF filter antenna port was measured using a spectrum analyser with an RMS detector. The results for each port were linearly summed. The antenna gain was added to the summed conducted output power to calculate the EIRP Power Spectral Density.

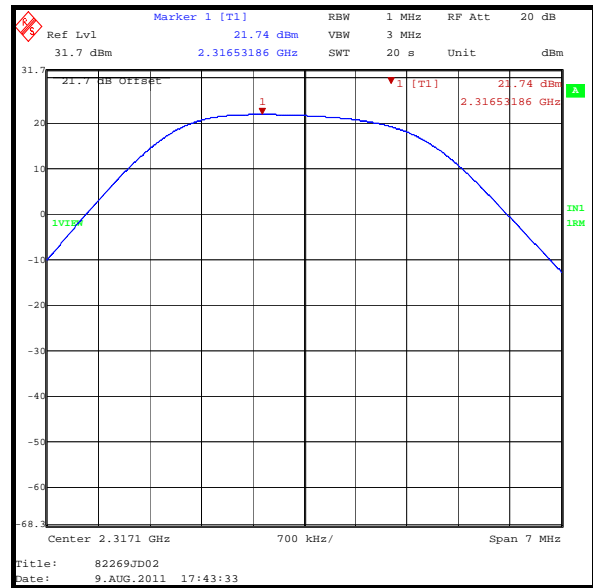
**Transmitter Average Power Spectral Density (continued)**

**Results: Bottom Channel / 2317.1 MHz / 3.5 MHz Channel / 64QAM3/4**

Port 1 Conducted Power (dBm)	Port 2 Conducted Power (dBm)	Summed Conducted Power (dBm)	Antenna Gain (dBi)	Antenna Gain + Summed Power (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
21.4	21.7	24.6	18.0	42.6	56.0	13.4	Complied



**64QAM3/4 / Port 1**

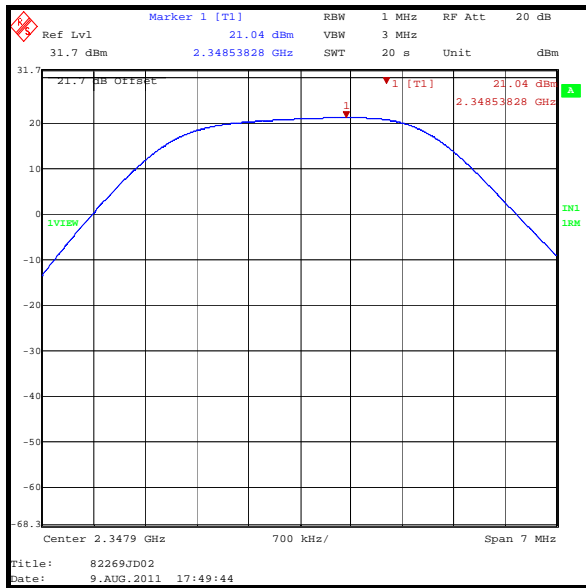


**64QAM3/4 / Port 2**

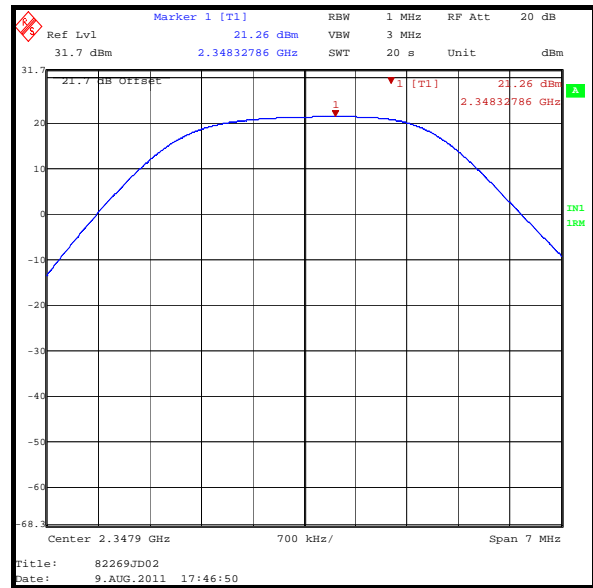
**Transmitter Average Power Spectral Density (continued)**

**Results: Top Channel / 2347.9 MHz / 3.5 MHz Channel / 64QAM3/4**

Port 1 Conducted Power (dBm)	Port 2 Conducted Power (dBm)	Summed Conducted Power (dBm)	Antenna Gain (dBi)	Antenna Gain + Summed Power (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
21.0	21.3	24.2	18.0	42.2	56.0	13.8	Complied



**64QAM3/4 / Port 1**



**64QAM3/4 / Port 2**



**5.2.3. Transmitter Peak to Average Power Ratio**

**Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	09 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFF23		

<b>FCC Part:</b>	27.50(a)(1)(B)
<b>Test Method Used:</b>	As detailed in FCC KDB 971168

**Environmental Conditions:**

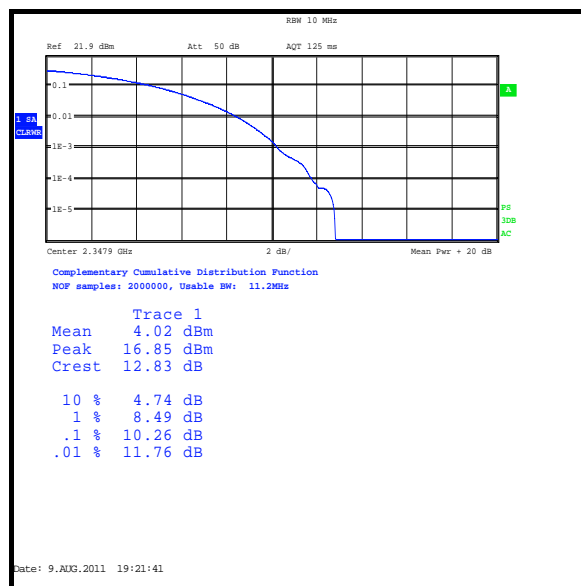
<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	35

**Results: Antenna Port 1**

Modulation	Frequency (MHz)	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
64QAM3/4	2347.9	10.3	13.0	2.7	Complied

**Note(s):**

1. Measurements were performed using the CCDF function of a calibrated Rohde & Schwarz ESU test receiver.



**64QAM3/4 Top Channel**

**5.2.4. Transmitter Occupied Bandwidth****Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	09 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFF23		

<b>FCC Part:</b>	2.1049
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.7 and relevant annexes referencing FCC CFR Part 2.1049 (see note below)

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	35

**Results: Antenna Port 1**

Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK3/4	2371.1	100	300	3.283
64QAM3/4	2371.1	100	300	3.283
64QAM3/4	2347.9	100	300	3.304

**Results: Antenna Port 2**

Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK3/4	2371.1	100	300	3.262
64QAM3/4	2371.1	100	300	3.262
64QAM3/4	2347.9	100	300	3.304

**Note(s):**

1. Measurements were performed on the bottom channel using QPSK3/4 and 64QAM3/4 modulation and on the top channel using 64QAM3/4 modulation only. Tests were performed on the antenna ports of both RF filters.
2. The Customer provided a trigger on the EUT. Measurements were made using an RMS detector in conjunction with external gating on the spectrum analyser provided by TDD OUT SYNC signal from the EUT serial port.

**Transmitter Occupied Bandwidth (continued)**

**Antenna Port 1**



**QPSK Bottom Channel**



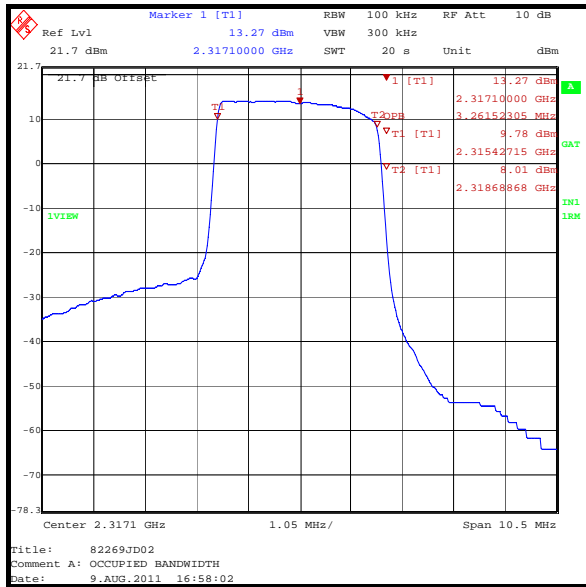
**64QAM3/4 Bottom Channel**



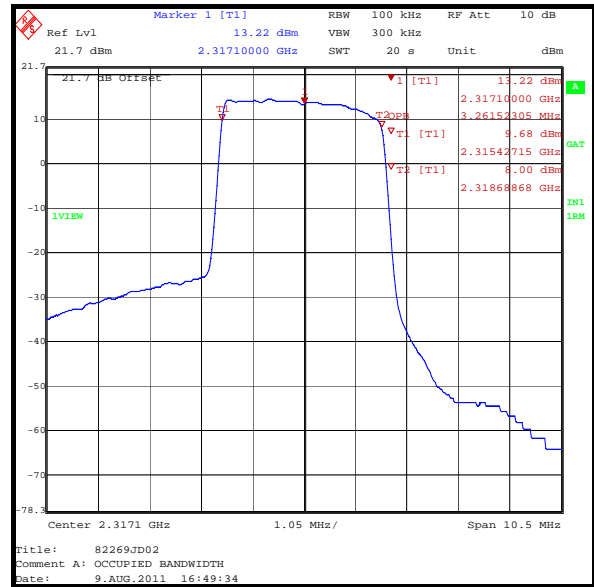
**64QAM3/4 Top Channel**

**Transmitter Occupied Bandwidth (continued)**

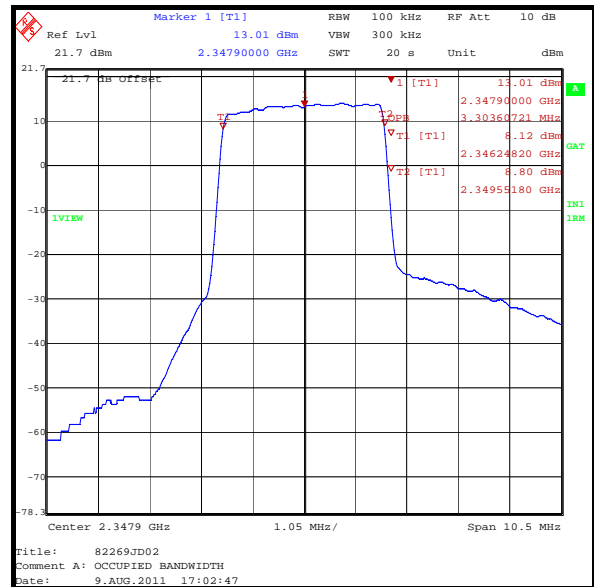
**Antenna Port 2**



**QPSK Bottom Channel**



**64QAM3/4 Bottom Channel**



**64QAM3/4 Top Channel**

**5.2.5. Transmitter Conducted Emissions****Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	09 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFF23		

<b>FCC Part:</b>	27.53(a)(1)
<b>Test Method Used:</b>	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
<b>Frequency Range:</b>	9 kHz to 23.5 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	27
<b>Relative Humidity (%):</b>	35

**Results: Top Channel / 2347.9 MHz / Port 1**

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
64QAM3/4	7045.431	-78.2	-45.0	33.2	Complied

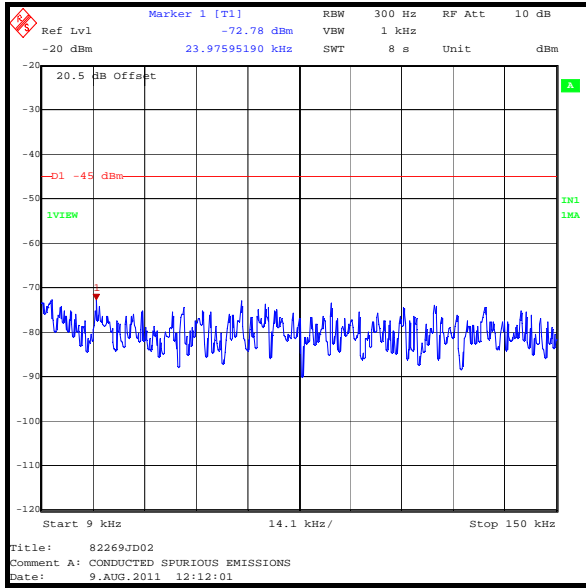
**Results: Top Channel / 2347.9 MHz / Port 2**

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
64QAM3/4	7042.345	-71.3	-45.0	26.3	Complied

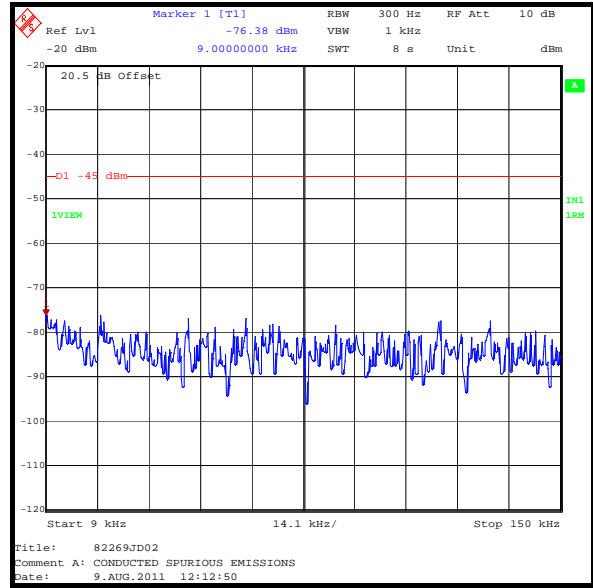
**Note(s):**

1. Pre-scans were performed with the EUT transmitting at maximum power on the top channel and the measurement equipment connected to RF filter on antenna Port 1 of the EUT.
2. Final measurements were performed on both antenna ports.
3. Final measurements on the spurious emission at the 3<sup>rd</sup> harmonic were made using an RMS detector in conjunction with external gating on the spectrum analyser provided by TDD OUT SYNC signal from the EUT serial port.
4. All other emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.
5. Measurements were performed with a peak detector and then repeated with an RMS detector across the required frequency range.

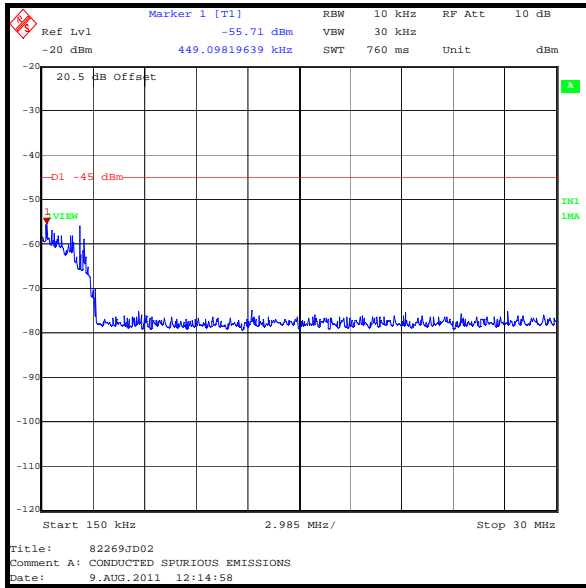
**Transmitter Conducted Emissions (continued)**



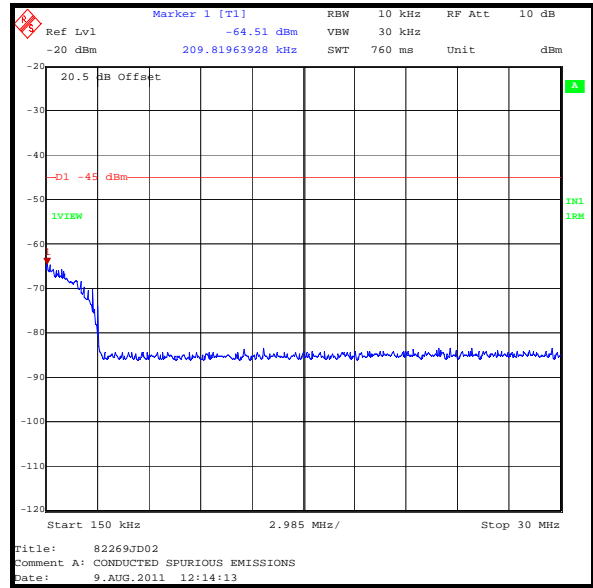
**Peak detector**



**RMS detector**

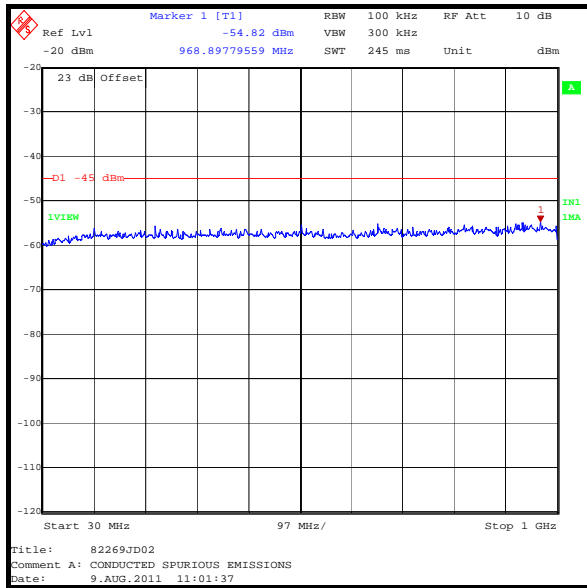


**Peak detector**

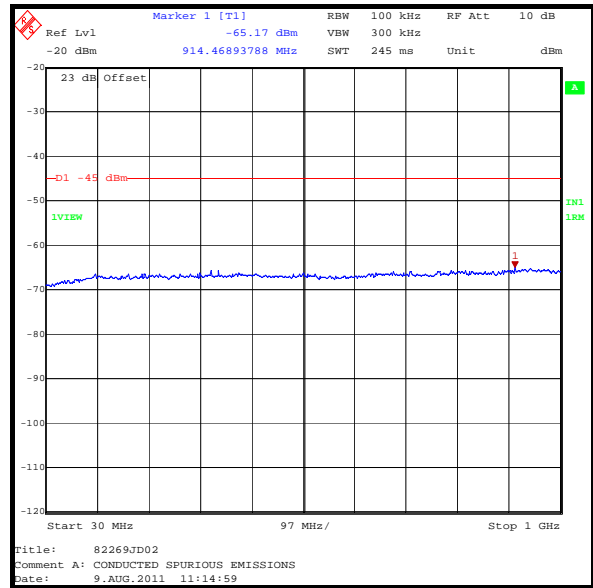


**RMS detector**

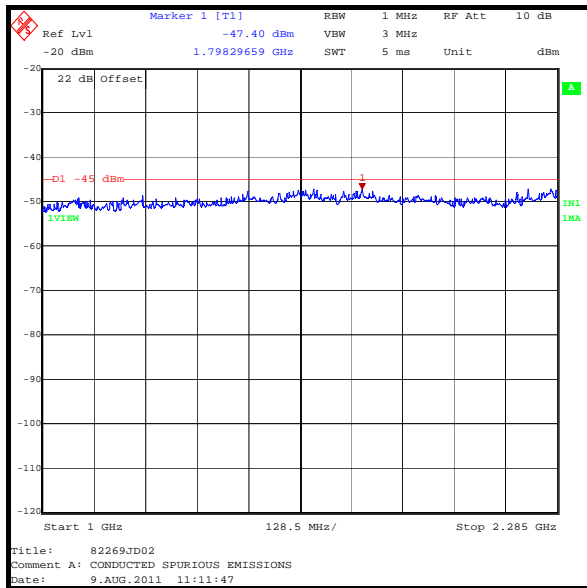
**Transmitter Conducted Emissions (continued)**



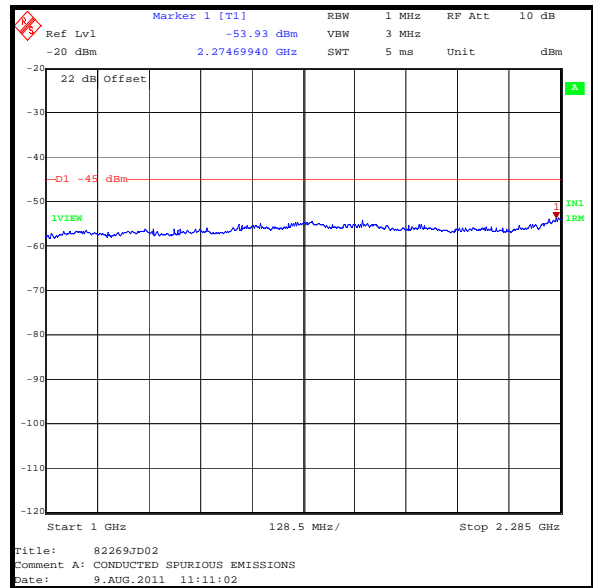
**Peak detector**



**RMS detector**

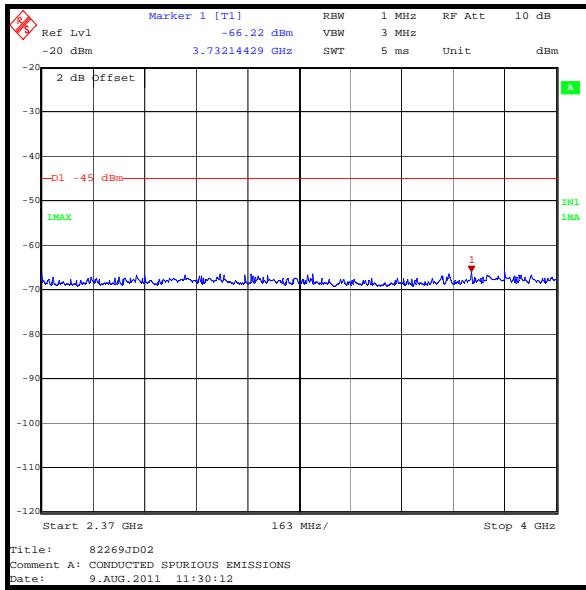


**Peak detector**

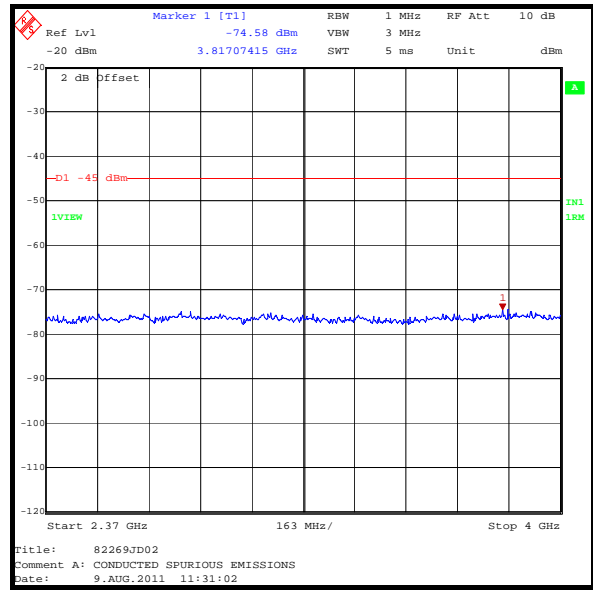


**RMS detector**

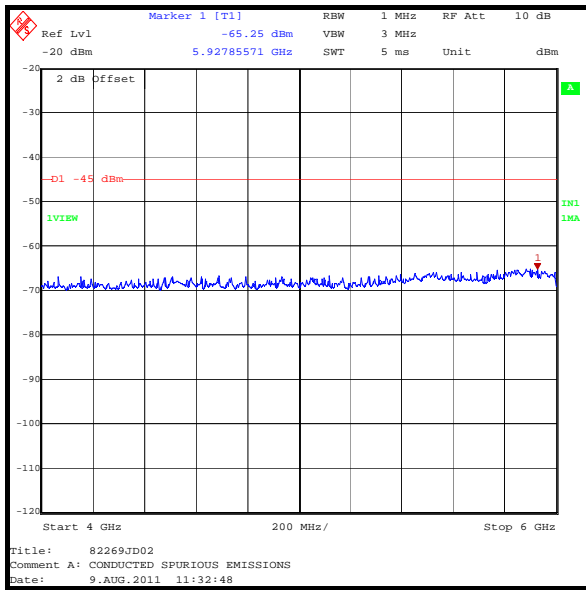
### Transmitter Conducted Emissions (continued)



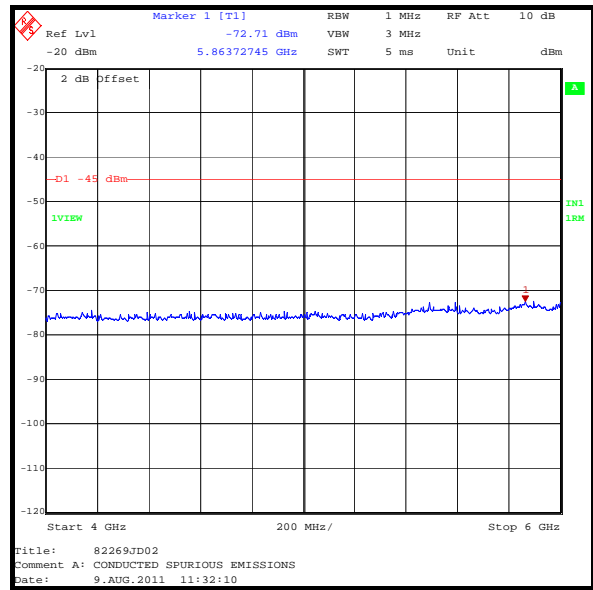
Peak detector



RMS detector



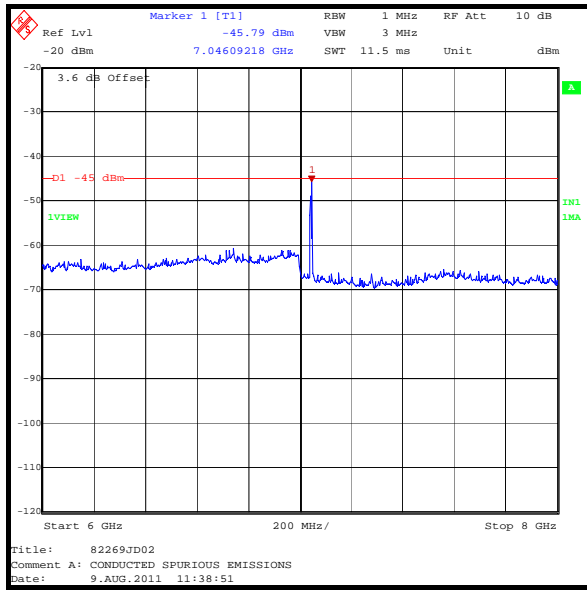
Peak detector



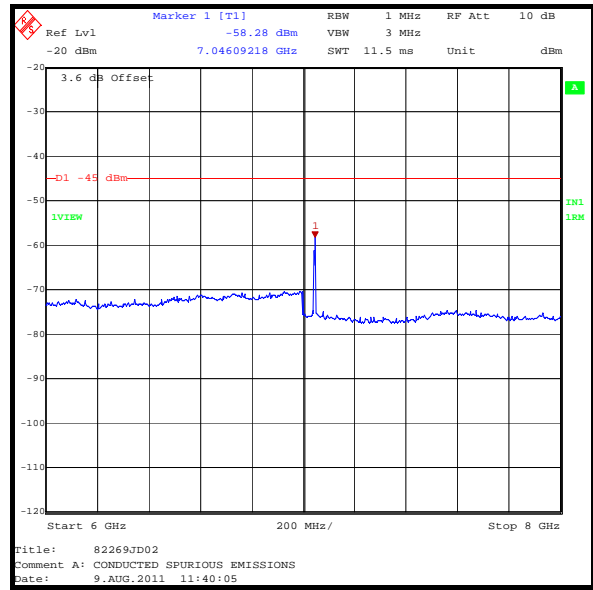
RMS detector



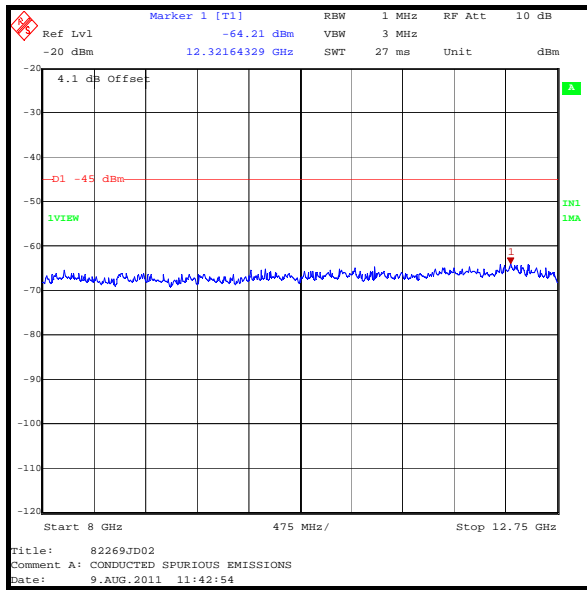
### Transmitter Conducted Emissions (continued)



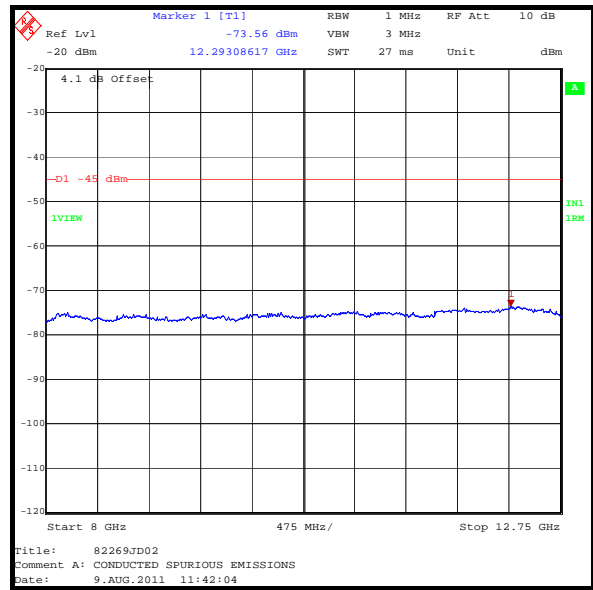
Peak detector



RMS detector

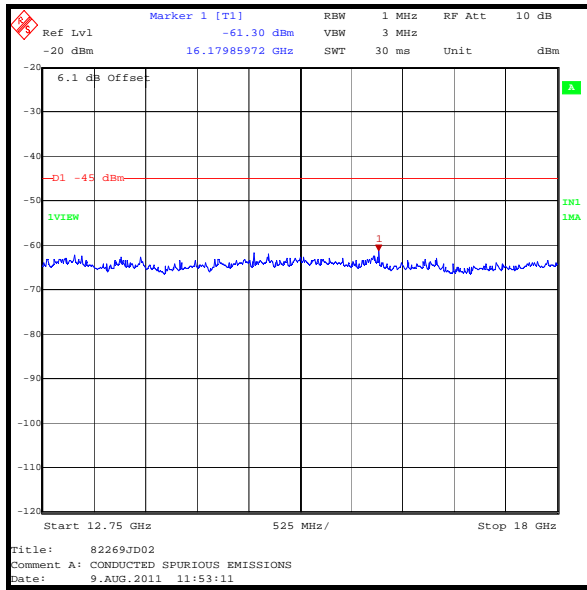


Peak detector

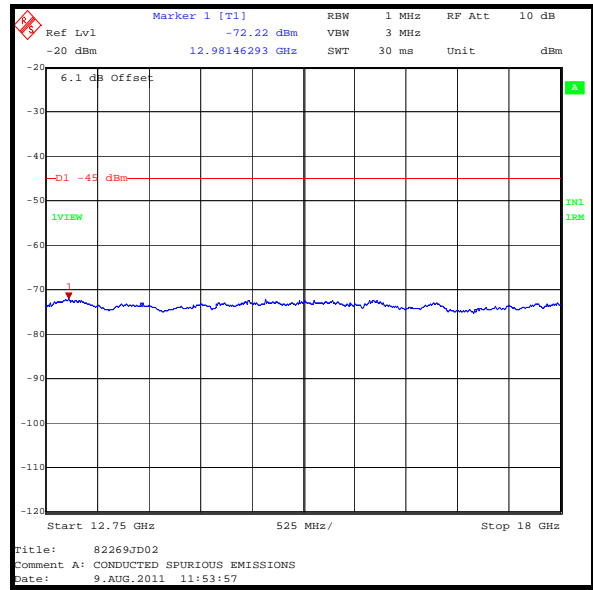


RMS detector

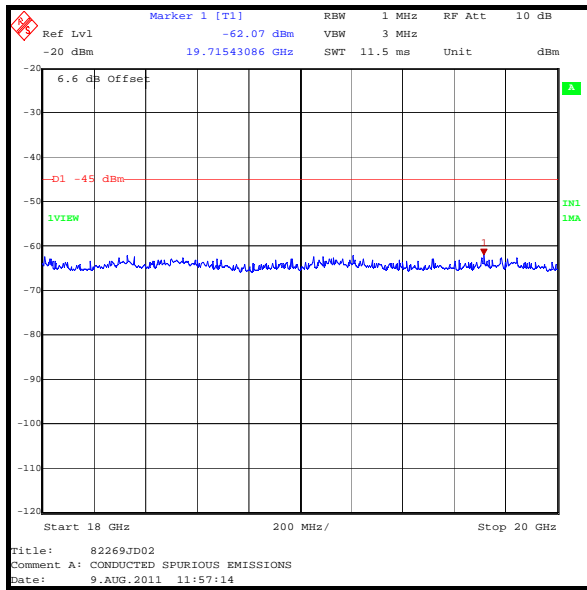
**Transmitter Conducted Emissions (continued)**



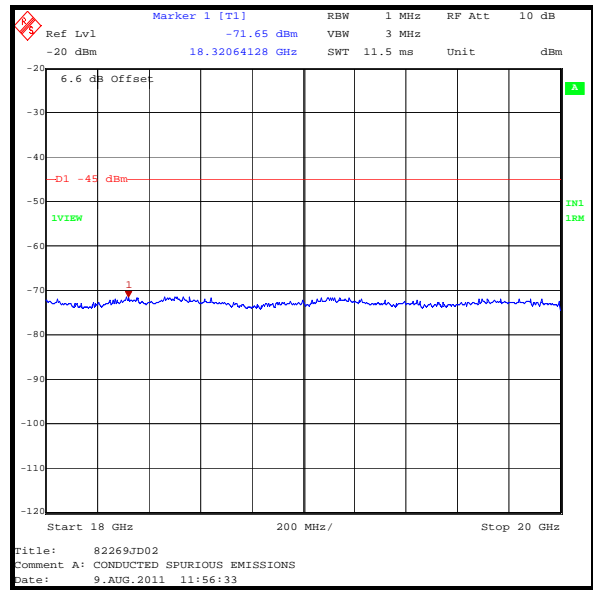
**Peak detector**



**RMS detector**

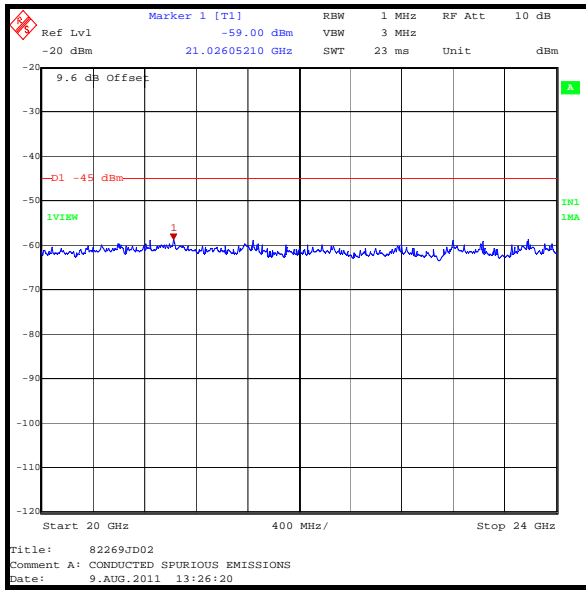


**Peak detector**

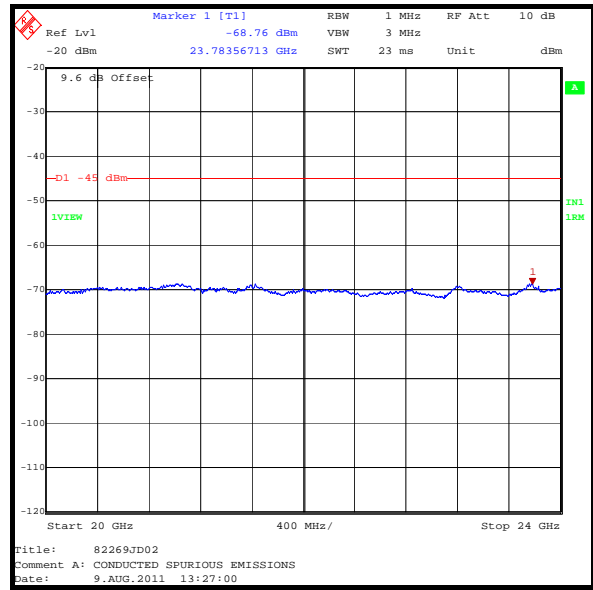


**RMS detector**

**Transmitter Conducted Emissions (continued)**



**Peak detector**



**RMS detector**

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

**5.2.6. Transmitter Conducted Emissions at Band Edges****Test Summary:**

<b>Test Engineer:</b>	Ian Watch	<b>Test Date:</b>	09 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFFF23		

<b>FCC Part:</b>	27.53(a)(1)
<b>Test Method Used:</b>	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051

**Environmental Conditions:**

<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	35

**Results: Port 1 / 64QAM3/4 / 3.5 MHz channel**

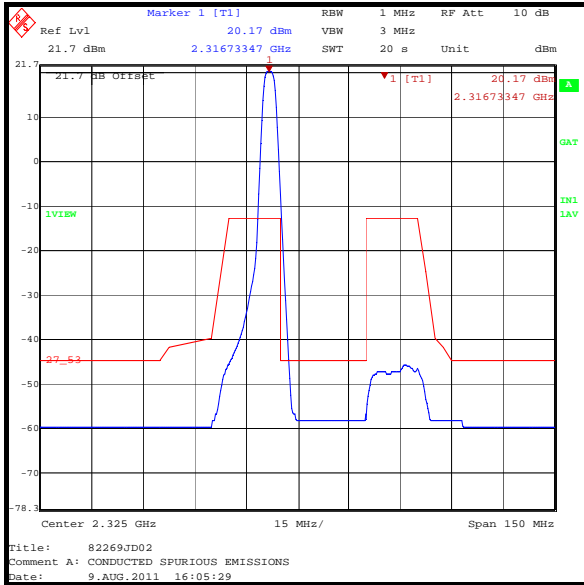
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2320.00	-47.9	-45.0	2.9	Complied
2315.35	-17.5	-13.0	4.5	Complied
2318.85	-26.8	-13.0	13.8	Complied

**Note(s):**

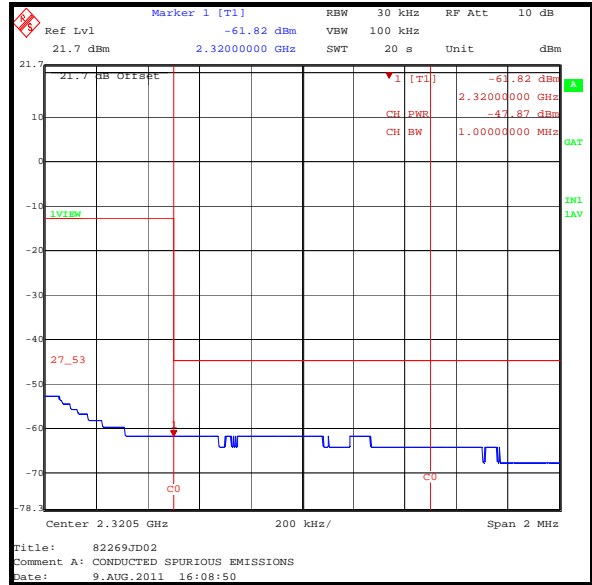
1. Tests were initially performed with a 1 MHz measurement bandwidth. Where the band edge limit was exceeded using a 1 MHz measurement bandwidth, the EUT was retested using the channel power function of a spectrum analyser centred on the 1 MHz block adjacent to and immediately outside the band edges. The channel power test was repeated from 1 MHz to 6 MHz away from band edge in order to further prove compliance. The measurement bandwidths were set automatically by the spectrum analyser.
2. The Customer requested that this test was performed with the EUT using 64QAM3/4 modulation scheme only on both antenna ports.
3. Final measurements on the band edges were made using an RMS detector in conjunction with external gating on the spectrum analyser provided by TDD OUT SYNC signal from the EUT serial port.

**Transmitter Conducted Emissions at Band Edges (continued)**

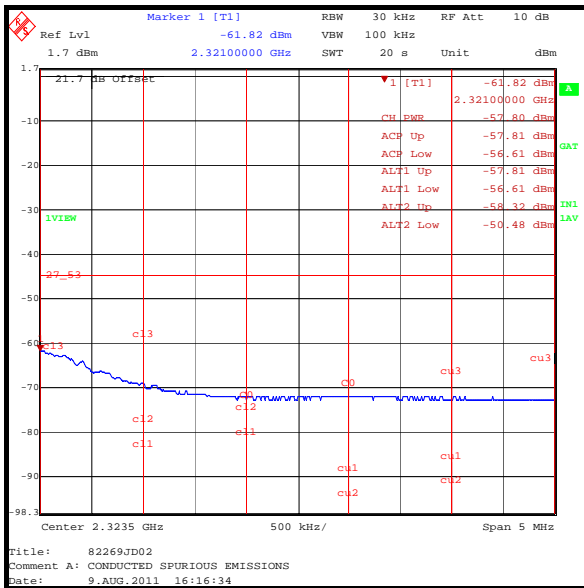
**Results: Port 1 / 64QAM3/4 / 3.5 MHz channel**



**Bottom Channel**



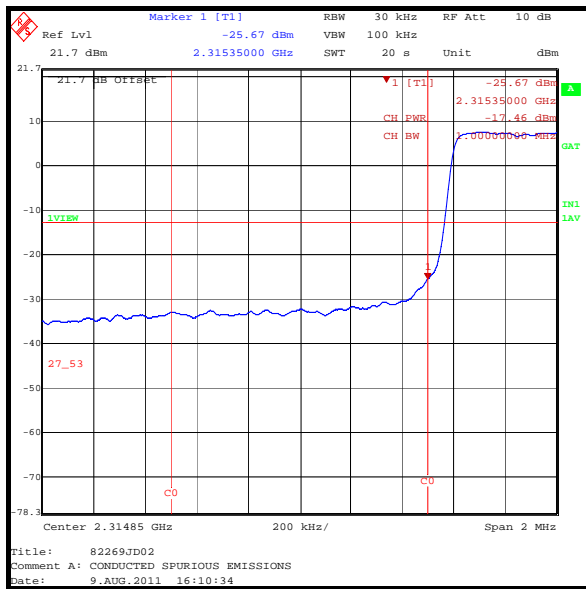
**Bottom Channel / Upper band edge +1 MHz**



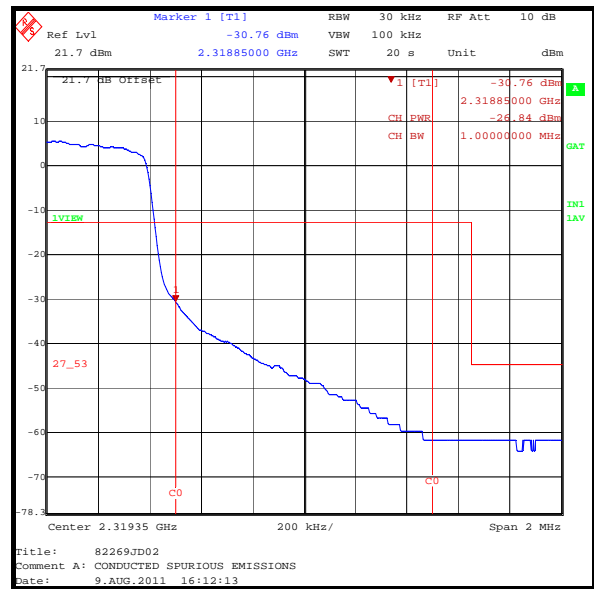
**Bottom Channel / Upper band edge +1 MHz to +6 MHz**

### Transmitter Conducted Emissions at Band Edges (continued)

#### Results: Port 1 / 64QAM3/4 / 3.5 MHz channel



Bottom Channel / Licensed band lower edge



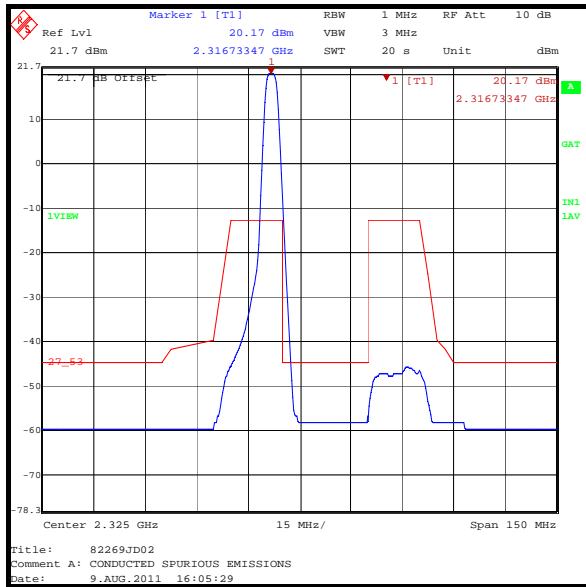
Bottom Channel / Licensed band upper edge

**Transmitter Conducted Emissions at Band Edges (continued)****Results: Port 2 / 64QAM3/4 / 3.5 MHz channel**

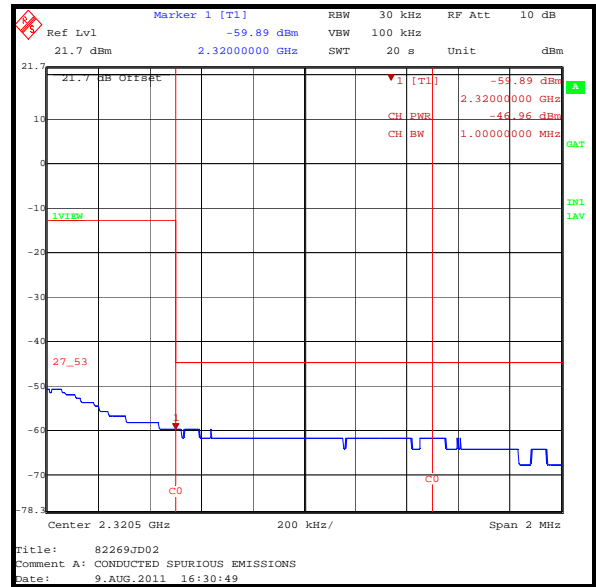
<b>Frequency (MHz)</b>	<b>Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
2320.00	-47.0	-45.0	2.0	Complied
2315.35	-17.2	-13.0	4.2	Complied
2318.85	-27.9	-13.0	14.9	Complied

**Transmitter Conducted Emissions at Band Edges (continued)**

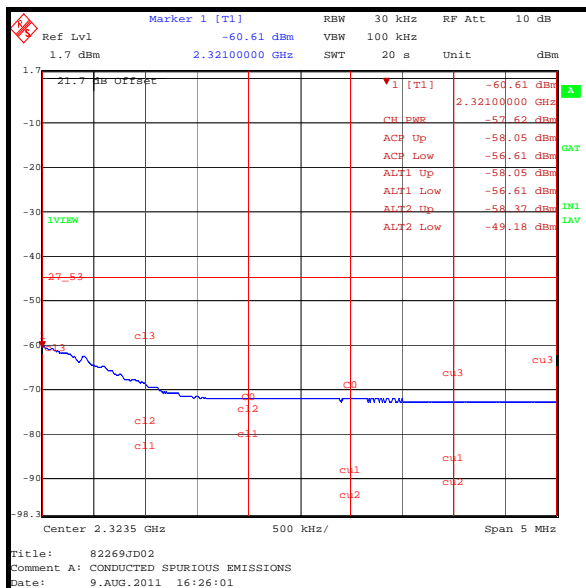
**Results: Port 2 / 64QAM3/4 / 3.5 MHz channel**



**Bottom Channel**



**Bottom Channel / Upper band edge +1 MHz**

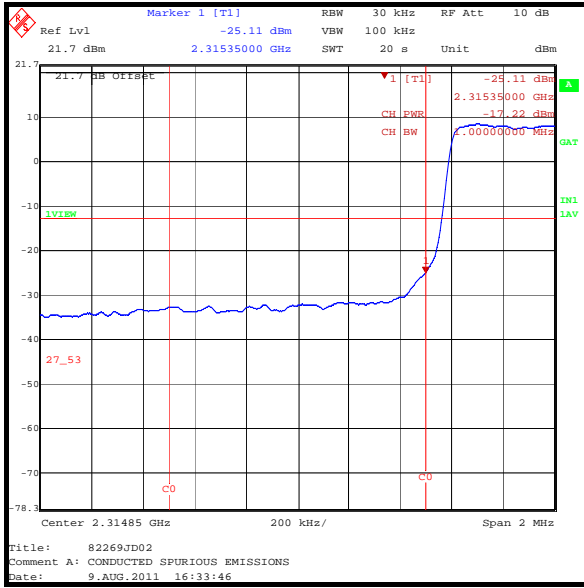


**Bottom Channel / Upper band edge +1 MHz to +6 MHz**

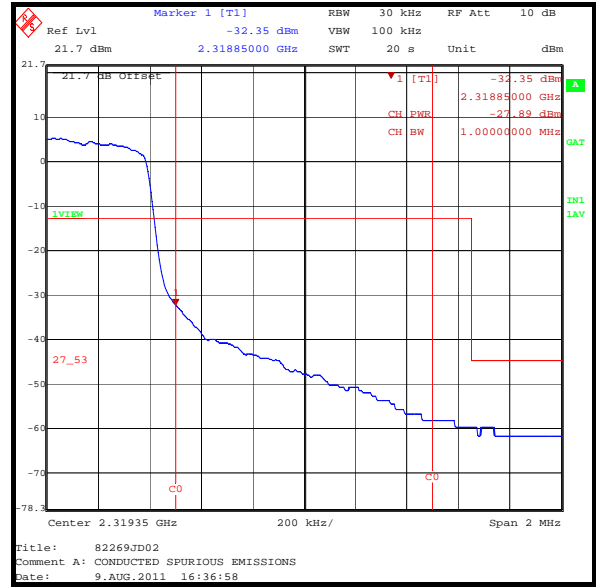


### Transmitter Conducted Emissions at Band Edges (continued)

#### Port 2 / 64QAM / 3.5 MHz channel



Bottom Channel / Licensed band lower edge



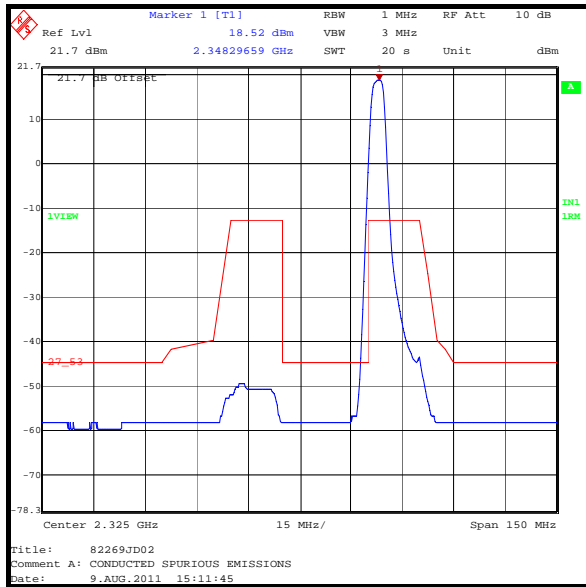
Bottom Channel / Licensed band upper edge

**Transmitter Conducted Emissions at Band Edges (continued)****Results: Port 1 / 64QAM3/4 / 3.5 MHz channel**

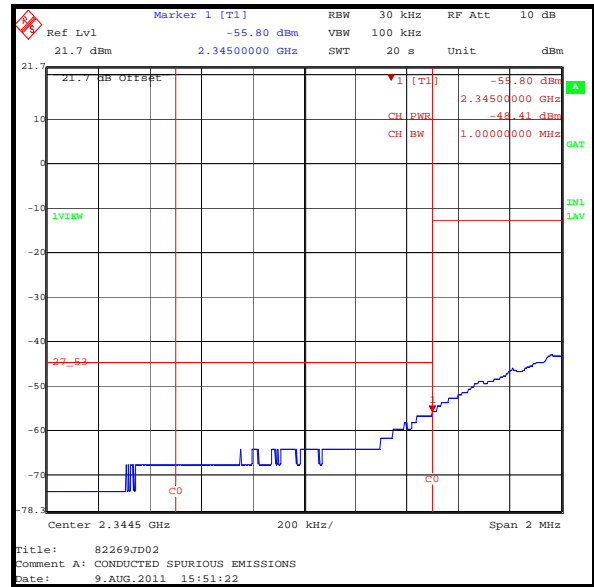
<b>Frequency (MHz)</b>	<b>Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
2345.00	-48.4	-45.0	3.4	Complied
2346.15	-23.1	-13.0	10.1	Complied
2349.65	-17.1	-13.0	4.1	Complied

**Transmitter Conducted Emissions at Band Edges (continued)**

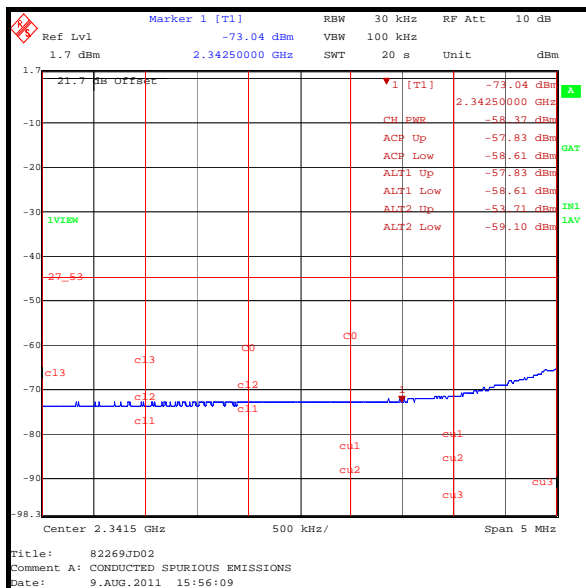
**Results: Port 1 / 64QAM3/4 / 3.5 MHz channel**



Top Channel



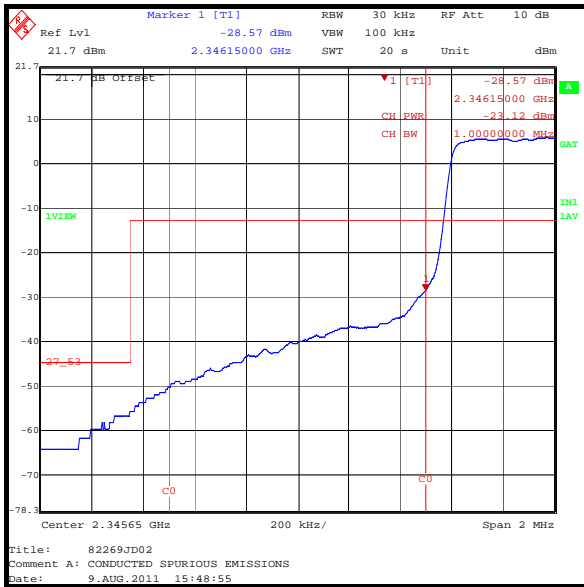
Top Channel / Lower band edge -1 MHz



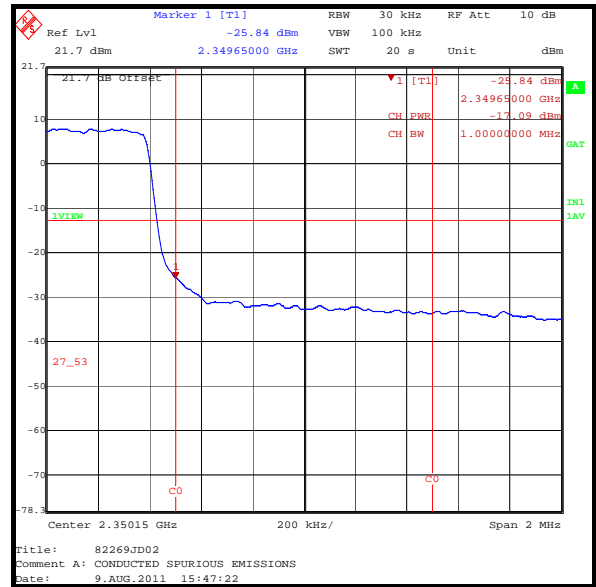
Top Channel / Lower band edge -1 MHz to -6 MHz

**Transmitter Conducted Emissions at Band Edges (continued)**

**Results: Port 1 / 64QAM3/4 / 3.5 MHz channel**



**Top Channel / Licensed band lower edge.**



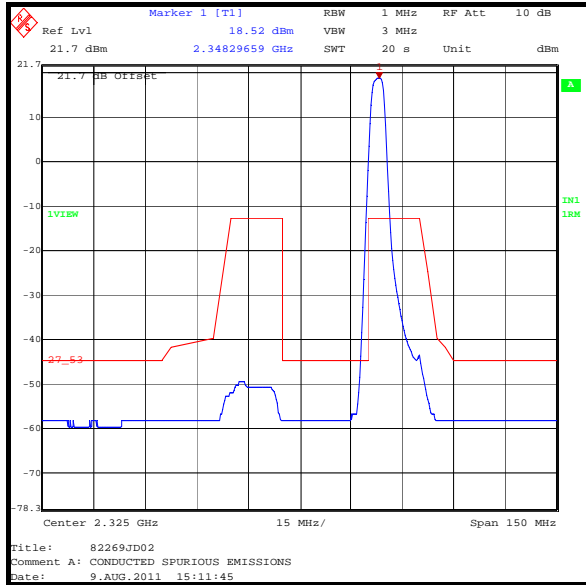
**Top Channel / Licensed band upper edge**

**Transmitter Conducted Emissions at Band Edges (continued)****Results: Port 2 / 64QAM3/4 / 3.5 MHz channel**

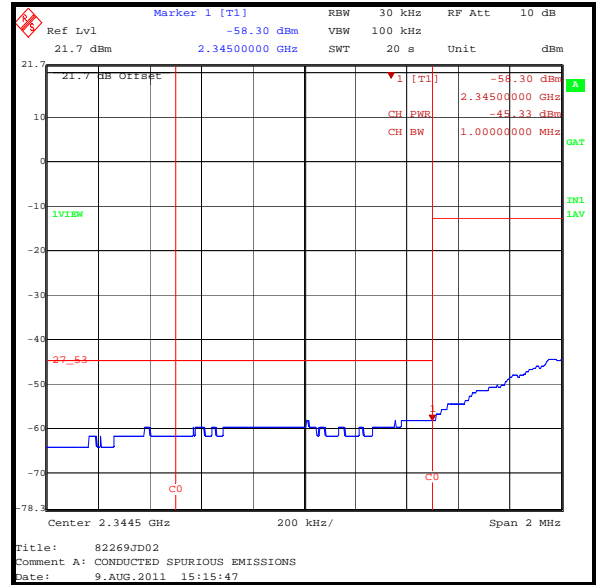
<b>Frequency (MHz)</b>	<b>Emission Level (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>	<b>Result</b>
2345.00	-45.3	-45.0	0.3	Complied
2346.15	-23.4	-13.0	10.4	Complied
2349.65	-16.2	-13.0	3.2	Complied

### Transmitter Conducted Emissions at Band Edges (continued)

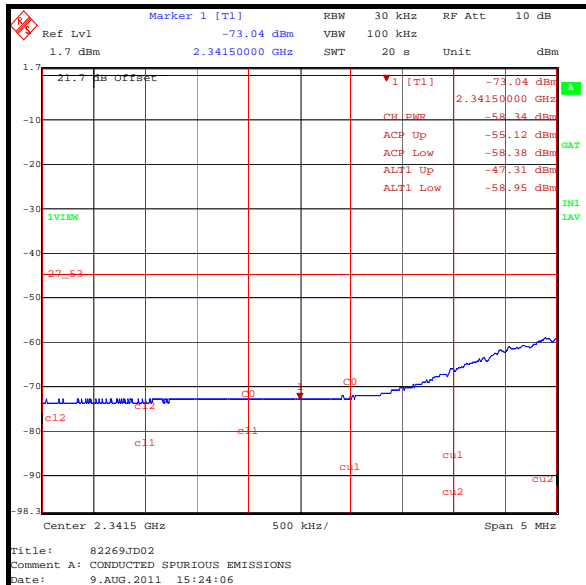
#### Results: Port 2 / 64QAM3/4 / 3.5 MHz channel



Top Channel



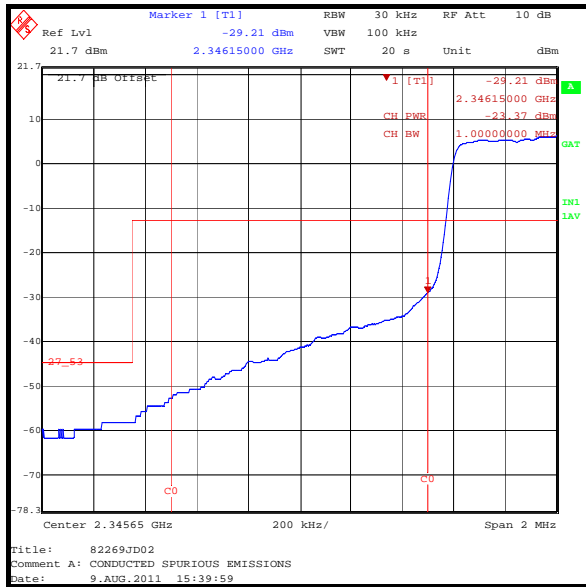
Top Channel / Lower band edge -1 MHz



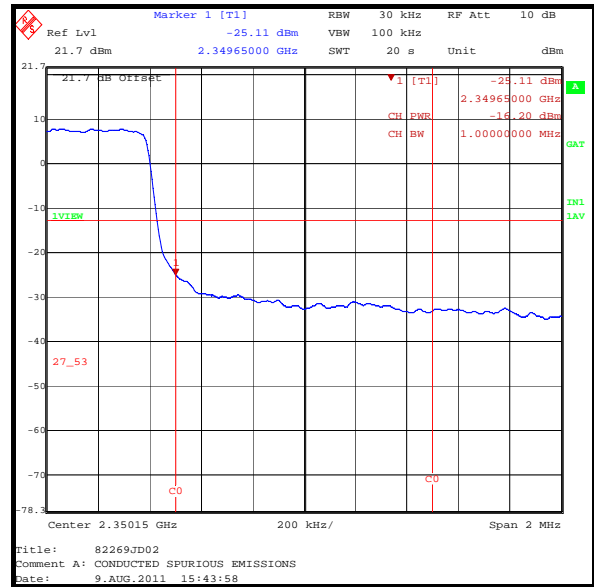
Top Channel / Lower band edge -1 MHz to -6 MHz

### Transmitter Conducted Emissions at Band Edges (continued)

#### Results: Port 2 / 64QAM3/4 / 3.5 MHz channel



Top Channel / Licensed band lower edge



Top Channel / Licensed band upper edge

**5.2.6.1. Transmitter Radiated Spurious Emissions****Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	08 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFF23		

<b>FCC Part:</b>	27.53(a)(1) & 2.1053
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
<b>Frequency Range:</b>	30 MHz to 23.5 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	22

**Results: Bottom Channel**

Frequency (MHz)	Antenna Polarisation	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1200.033	Vertical	-55.0	-45.0	10.0	Complied
1333.380	Vertical	-45.1	-45.0	0.1	Complied
6953.626	Vertical	-52.9	-45.0	7.9	Complied
9271.591	Horizontal	-57.5	-45.0	12.5	Complied

**Results: Top Channel**

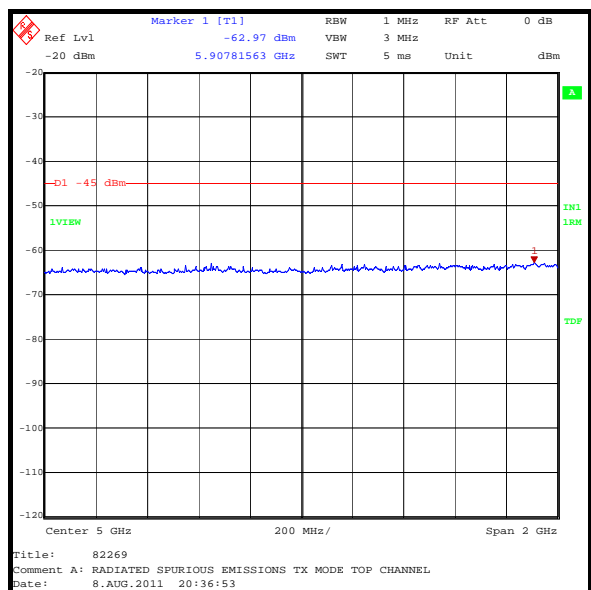
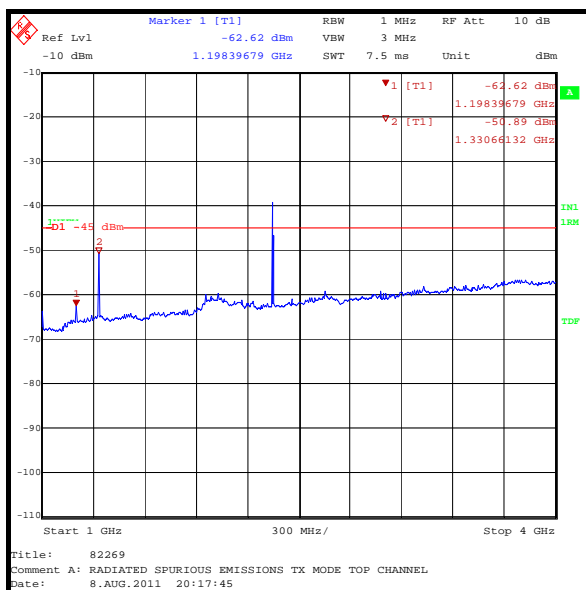
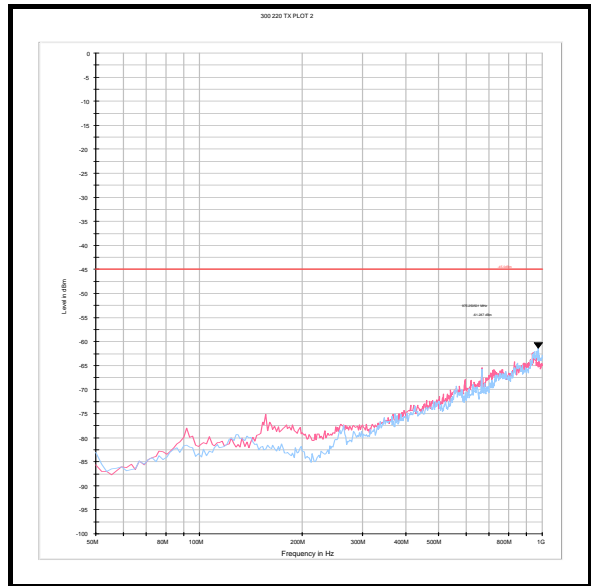
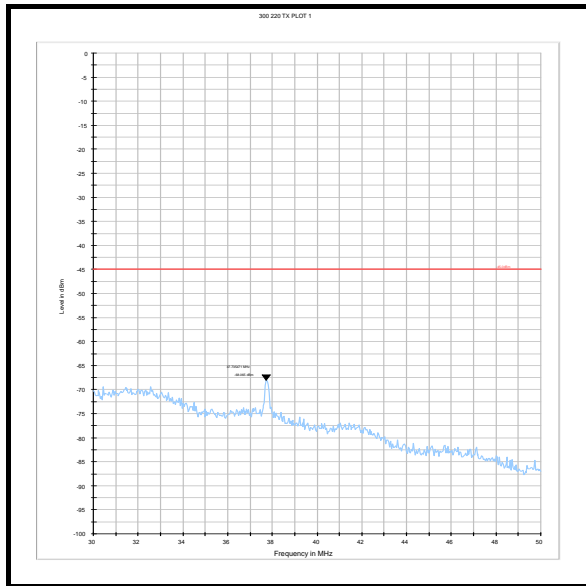
Frequency (MHz)	Antenna Polarisation	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1200.033	Vertical	-55.0	-45.0	10.0	Complied
1333.380	Vertical	-45.1	-45.0	0.1	Complied
7046.186	Vertical	-54.9	-45.0	9.9	Complied
9391.304	Horizontal	-59.3	-45.0	14.3	Complied



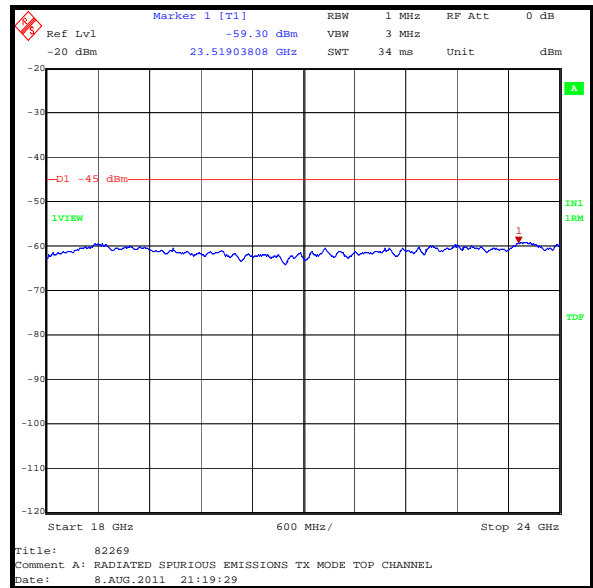
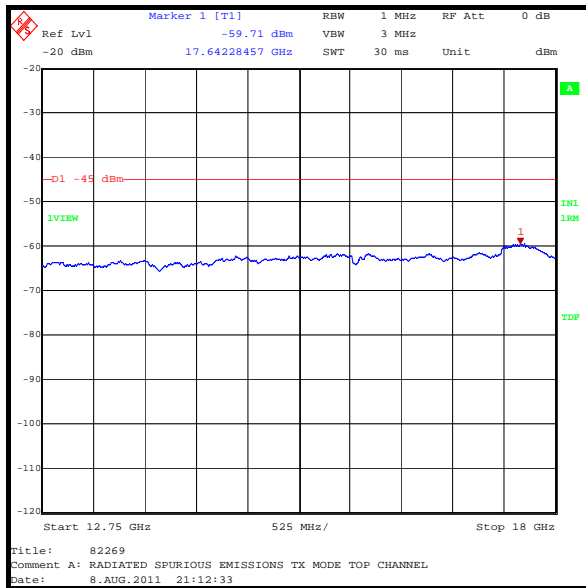
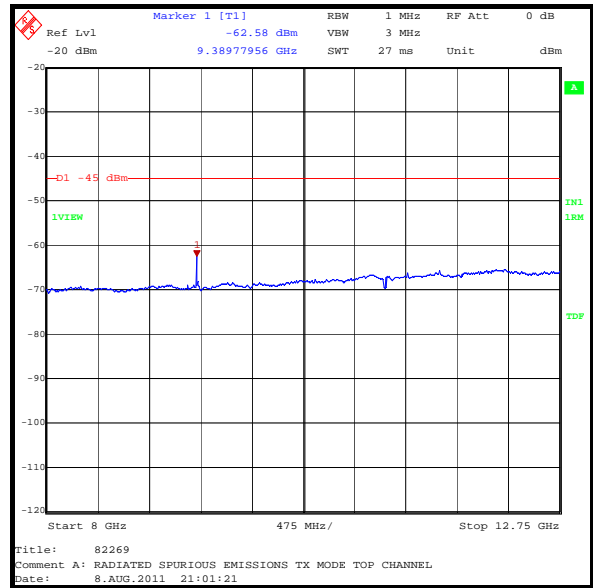
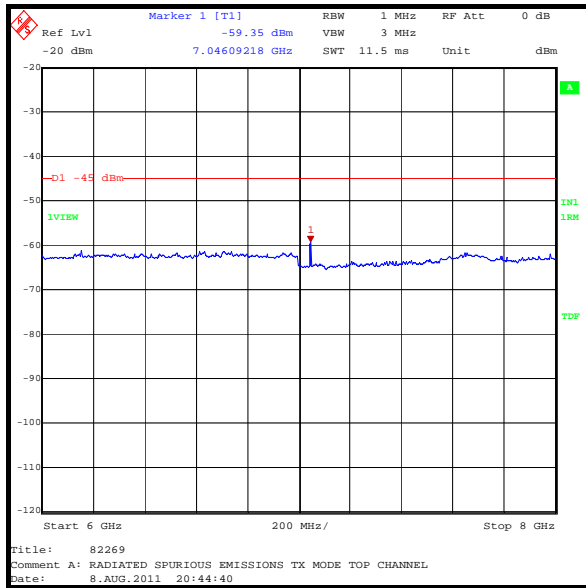
**Transmitter Radiated Spurious Emissions (continued)****Note(s):**

1. The EUT was set to transmit with 64QAM3/4 modulation applied as this was found to have the highest output power.
2. Both RF filter ports were terminated into 50 Ohm loads during the test.
3. The emission seen on the 1 GHz to 4 GHz plot at approximately 2.3 GHz is the EUT carrier.
4. All other emissions were at least 20 dB below the specification limit or below the measurement system noise floor.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

### Transmitter Radiated Spurious Emissions (continued)



### Transmitter Radiated Spurious Emissions (continued)



**5.2.7. Transmitter Radiated Spurious Emissions at Band Edges****Test Summary:**

<b>Test Engineer:</b>	Nick Steele	<b>Test Date:</b>	08 August 2011
<b>Test Sample Serial No:</b>	9B2312FFFF23		

<b>FCC Part:</b>	27.53(a)(1) & 2.1053
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053

**Environmental Conditions:**

<b>Temperature (°C):</b>	28
<b>Relative Humidity (%):</b>	22

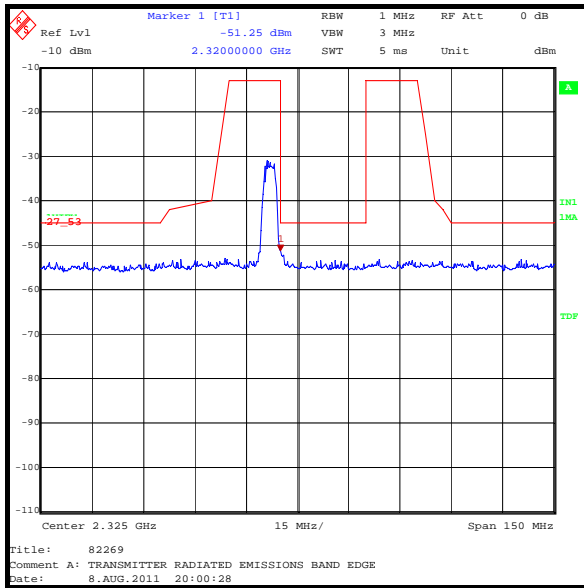
**Results:**

Frequency (MHz)	Antenna Polarisation	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2320.0	Vertical	-51.3	-45.0	6.3	Complied
2345.0	Vertical	-49.9	-45.0	4.9	Complied

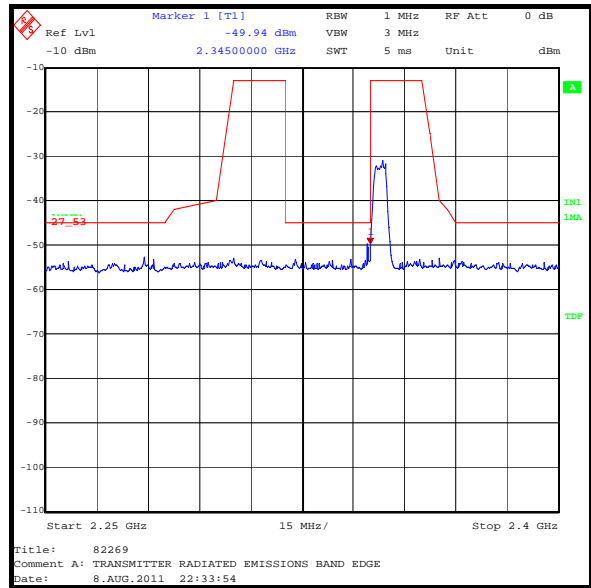
**Note(s):**

1. The EUT was set to transmit with 64QAM3/4 modulation applied as this was found to have the highest output power.
2. Both RF filter ports were terminated into 50 Ohm loads during the test.
3. Measurements were not performed at the outer band edges as pre-scans indicated only the measurement system noise floor was present.

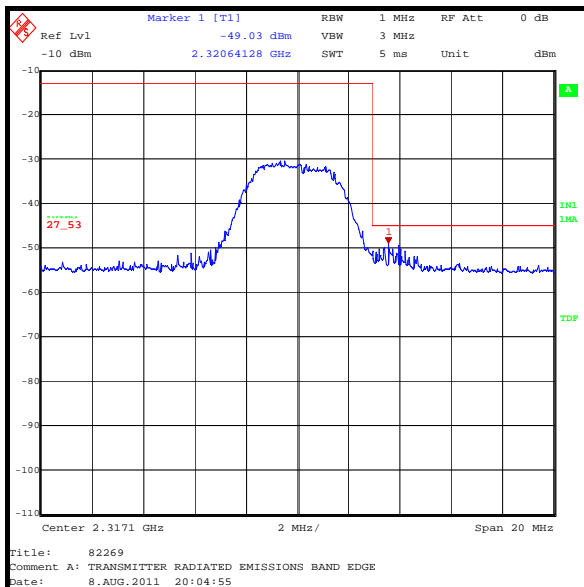
**Transmitter Radiated Emissions at Band Edges (continued)**



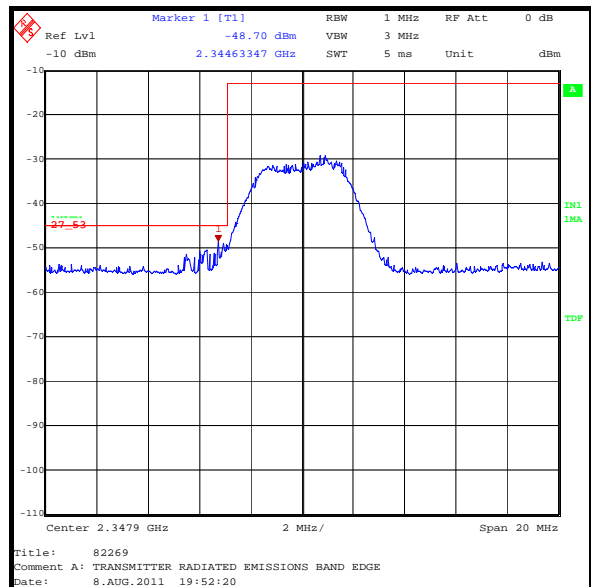
**Bottom Channel**



**Top Channel**



**Bottom Channel**



**Top Channel**

## **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".

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level (%)</b>	<b>Calculated Uncertainty</b>
Conducted Spurious Emissions	9 kHz to 24 GHz	95%	±2.64 dB
Peak to Average Power Ratio	2315 MHz to 2350 MHz	95%	±0.2 dB
Radiated Spurious Emissions	30 MHz to 24 GHz	95%	±2.94 dB
Conducted Carrier Output Power	2315 MHz to 2350 MHz	95%	±0.27 dB
Occupied Bandwidth	2315 MHz to 2350 MHz	95%	±0.92 ppm

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

## Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1391	Attenuator	Huber & Suhner	757987	6810.17.B	09 Feb 2012	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	20 Jun 2012	12
A1818	Antenna	EMCO	3115	00075692	05 Sep 2011	12
A1834	Attenuator	Hewlett Packard	8491B	10444	26 Jul 2012	12
A1975	RF Filter	AtlanTecRF	AFH-03000	090424010	29 Dec 2011	12
A1980	RF Filter	Atlan TecRF	AFH-06000	09110900303	28 Feb 2012	12
A253	Antenna	Flann	12240-20	128	05 Sep 2011	12
A254	Antenna	Flann	14240-20	139	05 Sep 2011	12
A255	Antenna	Flann	16240-20	519	05 Sep 2011	12
A256	Antenna	Flann	18240-20	400	05 Sep 2011	12
A436	Antenna	Flann	20240-20	330	05 Sep 2011	12
A553	Antenna	Chase	CBL6111A	1593	26 Mar 2012	12
G085	Sig. Gen.	Hewlett Packard	83650L	3614A00104	09 Nov 2012	24
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	29 May 2012	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2011	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	04 Feb 2012	12
M1435	Power Meter	Hewlett Packard	437B	3125U14631	19 Jul 2012	12
M1590	Test Receiver	Rohde & Schwarz	ESU26	100239	15 Jun 2012	12
M260	Sig. Gen.	Rohde & Schwarz	SMP02	829076/008	04 May 2012	12

**NB** In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.