

# TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: StarMAX 8200-26

To: FCC Part 27: 2008 Subpart C

**Test Report Serial No:**  
RFI/RPT2/RP75353JD07B

**Supersedes Test Report Serial No:**  
RFI/RPT1/RP75353JD07A

**This Test Report Is Issued Under The Authority  
Of Brian Watson, Operations Director:**



<b>Checked By:</b>	Nigel Davison
<b>Signature:</b>	
<b>Date of Issue:</b>	18 December 2009

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## **1. Customer Information**

<b>Company Name:</b>	Harris Stratex Networks
<b>Address:</b>	4 Bell Drive Hamilton International Technology Park Blantyre, Lanarkshire Scotland G72 0FB

## 2. Summary of Testing

### 2.1. General Information

<b>Specification Reference:</b>	47CFR27
<b>Specification Title:</b>	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 27 Subpart C (Miscellaneous Wireless Communication Services)
<b>Site Registration:</b>	FCC: 209735
<b>Location of Testing:</b>	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH, England
<b>Test Dates:</b>	16 October 2009 to 27 November 2009

### 2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Port Type	Result
FCC Part 15.107	Idle Mode AC Conducted Spurious Emissions	AC Mains	✓
FCC Part 15.109	Idle Mode Radiated Spurious Emissions	Enclosure	✓
FCC Part 15.207	Transmitter AC Conducted Spurious Emissions	AC Mains	✓
FCC Part 2.1046 FCC Part 27.50	Transmitter Carrier Output Power	Antenna Terminals	✓
FCC Part 27.50	Transmitter Equivalent Isotropic Radiated Power (EIRP)	Enclosure	✓
FCC Part 2.1049	Transmitter Occupied Bandwidth	Antenna Terminals	✓
FCC Part 27.53	26 dB Bandwidth	Antenna Terminals	✓
FCC Part 2.1055 FCC Part 27.54	Transmitter Frequency Stability (Temperature Variation)	Antenna Terminals	✓
FCC Part 2.1055 FCC Part 27.54	Transmitter Frequency Stability (Voltage Variation)	Antenna Terminals	✓
FCC Part 2.1051 FCC Part 27.53	Transmitter Conducted Emissions	Antenna Terminals	✓
FCC Part 2.1051 FCC Part 27.53	Transmitter Band Edge Conducted Emissions	Antenna Terminals	✓
FCC Part 2.1051 FCC Part 27.53	Transmitter Radiated Spurious Emissions	Enclosure	✓
FCC Part 2.1051 FCC Part 27.53	Transmitter Band Edge Radiated Emissions	Enclosure	✓
<b>Key to Results</b>			
✓ = 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
<b>Reference:</b>	ANSI C63.4 (2003)
<b>Title:</b>	American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

### **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>Description:</b>	Base Station – Outdoor Unit
<b>Brand Name:</b>	Harris Stratex Networks
<b>Product:</b>	StarMAX 8200-26
<b>Model Name or Number:</b>	8200-26-10-01
<b>Serial Number:</b>	T00000104P0929T
<b>Unit Code:</b>	AX01101T26350200000-100 REV.B
<b>Hardware Version:</b>	Carrier board : 0 ODU 2 hardware type: DPD-CDRS-CPRI-1-WiMax
<b>Software Version:</b>	Carrier board : 3.6.3 ODU 2 software version: 6328 ODU 2 software build: 3263
<b>FCC ID Number:</b>	VPX-8200-26A

<b>Description:</b>	Base Station – Indoor Unit
<b>Brand Name:</b>	Harris Stratex Networks
<b>Product:</b>	StarMAX 6100
<b>OEM Code:</b>	6112-00-00-001
<b>Serial Number:</b>	MLI18180801817
<b>Hardware Version:</b>	StarMAX Chassis: PTZ6010BA0A0 ACB Board: 402-0008-045
<b>Software Version:</b>	System software version: 4.1.1.1 Kernel: 4.1.1.1 Application: 4.1.1.1

<b>Description:</b>	Omnidirectional antenna
<b>Brand Name:</b>	Doradus
<b>Antenna Code:</b>	OMNI
<b>Frequency Range:</b>	2.6 GHz
<b>Polarity:</b>	Vertical
<b>Gain:</b>	13.0 dBi

<b>Description:</b>	Sectorised antenna
<b>Brand Name:</b>	PCTEL
<b>Model Name or Number:</b>	SP2327-18XP60NUF
<b>Frequency Range:</b>	2.3 – 2.7 GHz
<b>3 dB Beamwidth:</b>	60°
<b>Gain:</b>	18 dBi
<b>Serial Number:</b>	460148

<b>Description:</b>	Fibre optic cable
<b>Brand Name:</b>	Huber & Suhner
<b>Model Name or Number:</b>	0309 374170
<b>Serial Number:</b>	Not marked or stated
<b>Cable Length and Type:</b>	10 metre / 2 core
<b>Connected to Port:</b>	Optical1 on ODU and F02 on IDU

<b>Description:</b>	Power cable
<b>Brand Name:</b>	LiCY-OZ
<b>Model Name or Number:</b>	Not marked or stated
<b>Serial Number:</b>	Not marked or stated
<b>Cable Length and Type:</b>	10 metre / 2 core + earth
<b>Connected to Port:</b>	-48V DCin on ODU and F4AL on IDU

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

The equipment under test was a radio Base Station operating in the 2.5 to 2.6 GHz band. The equipment operates according to WiMax IEEE 802.16e -2005. The EUT comprises of an indoor unit (IDU) and an outdoor unit (ODU). The IDU is normally mounted inside a cabinet or building on the radio site. The ODU is tower mounted. Both units communicate with each other over a fibre optic link.

### **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 802.16e - 2005						
<b>Category of Equipment:</b>	Transceiver						
<b>Type of Equipment</b>	Base Station						
<b>Intended Operating Environment:</b>	Residential, Commercial & Industrial						
<b>Highest Internally Generated Clock or Oscillator Frequency:</b>	2.7 GHz						
<b>Modulation Type:</b>	QPSK		16QAM		64QAM		
<b>Coding Scheme:</b>	1/2	3/4	1/2	3/4	2/3	3/4	5/6
<b>Duty Cycle</b>	60%						
<b>Channel Spacing:</b>	5 MHz, 10 MHz						
<b>Antenna Connection Type:</b>	Two, external N type						
<b>Antenna Type:</b>	Omni directional and cross polarised directional						
<b>Antenna Gain:</b>	13 dBi (Omni directional) and 18 dBi (directional)						
<b>Power Supply Requirement:</b>	Nominal	V					
	Minimum	V					
	Maximum	V					
<b>Tested Temperature Range:</b>	Minimum	-30°C					
	Maximum	+50°C					
<b>Transmit Frequency Range:</b>	2583 MHz to 2690 MHz						
<b>Transmit Channels Tested:</b>	<b>Channel Bandwidth (MHz)</b>	<b>Bottom Channel Frequency (MHz)</b>	<b>Centre Channel Frequency (MHz)</b>	<b>Top Channel Frequency (MHz)</b>			
	5	2585.5	2636.5	2687.5			
	10	2588.0	2636.0	2685.0			
<b>Receive Frequency Range:</b>	2583 MHz to 2690 MHz						
<b>Receive Channels Tested:</b>	<b>Channel Bandwidth (MHz)</b>	<b>Bottom Channel Frequency (MHz)</b>	<b>Centre Channel Frequency (MHz)</b>	<b>Top Channel Frequency (MHz)</b>			
	5	2585.5	2636.5	2687.5			
	10	2588.0	2636.0	2685.0			

### **3.5. Port Identification**

<b>Port</b>	<b>Description</b>	<b>Type</b>	<b>Applicable</b>
1	ODU – Antenna Port 1	N-Type	Yes
2	ODU – Antenna Port 2	N-Type	Yes
3	ODU – Fibre Optic	Custom	No
4	ODU - -48 V DC Input	Twin Core	Yes
5	IDU – 10x Ethernet Port	CAT5/CAT6	No
6	IDU - -48 V DC Input	Twin Core	Yes
7	IDU – 4x Fibre Optic Ports	Twin Fibre	No

### **3.6. Support Equipment**

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

<b>Description:</b>	PC for NMS Server and IP Packet Generator for Base Station
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	OPTIPLEX GX620
<b>Serial Number:</b>	PC393NT
<b>Cable Length and Type:</b>	CAT5 Ethernet Cable > 3 Metre
<b>Connected to Port:</b>	Base Station via Netgear Router

<b>Description:</b>	Network Router
<b>Brand Name:</b>	Netgear
<b>Model Name or Number:</b>	DG834 v4
<b>Serial Number:</b>	1PL596BD001A4
<b>Cable Length and Type:</b>	2x CAT5 Ethernet Cables >3 Metres
<b>Connected to Port:</b>	Base Station [M Eth Port + D Eth Port] NMS Server + IP Packet Generator PC

<b>Description:</b>	Subscriber Unit
<b>Brand Name:</b>	Harris Stratex Networks
<b>Model Name or Number:</b>	WiMAX 3160 16e Outdoor SS
<b>Code:</b>	3160-25-12-01
<b>Serial Number:</b>	TSS40340900031
<b>MAC Address:</b>	00:02:73:00:12:2F
<b>Cable Length and Type:</b>	Air Link / Simulated Air Link
<b>Connected to Port:</b>	Antenna Port

<b>Description:</b>	Power Block and Communications for Subscriber Unit
<b>Brand Name:</b>	PowerDsine
<b>Model Name or Number:</b>	PowerDsine 3001
<b>Part Number:</b>	PD-3001/AC
<b>Serial Number:</b>	R08126050010732901
<b>Cable Length and Type:</b>	2x CAT5 Ethernet Cable + IEC Lead
<b>Connected to Port:</b>	Subscriber Unit, IP Packet Generator PC + AC Mains

<b>Description:</b>	IP Packet Generator PC for Subscriber Unit
<b>Brand Name:</b>	Dell
<b>Model Name or Number:</b>	OPTIPLEX GX620
<b>Serial Number:</b>	PC460NT
<b>Cable Length and Type:</b>	CAT5 Ethernet Cable >3 Metre
<b>Connected to Port:</b>	Subscriber Unit

<b>Description:</b>	Regulated DC power supply
<b>Brand Name:</b>	Kikusui
<b>Model Name or Number:</b>	PWR1600L
<b>Serial Number:</b>	LD002491
<b>Cable Length and Type:</b>	3 metre / 3 core
<b>Connected to Port:</b>	-48 VDC IN on ODU and F4AL on IDU

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

### **4.1. Operating Modes**

The EUT was tested in the following operating modes, unless otherwise stated:

- Idle mode with the transmitter turned off
- Transmit mode operating at maximum output power with a modulated carrier operating with maximum packet transmission on the downlink.

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

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

The indoor unit F02 port was connected to the outdoor unit Optical 1 port by fibre optic cables. The indoor unit M.ETH and D.ETH Ethernet ports were connected to the NMS PC by Ethernet cable via a hub. The indoor unit and outdoor unit were powered by the -48 VDC power supply.

- **Radiated Testing**

- Idle Mode – The EUT was connected to a -48 V DC power supply. The power supply input was connected to a 120 VAC 60 Hz supply. The transmitter was turned off within the base station via the management software.
- Transmitting Mode – The EUT was connected to a -48 V DC power supply. The power supply input was connected to a 120 VAC 60 Hz supply. Both the indoor and outdoor unit were connected via fibre optic cable. The indoor unit was connected to an NMS server and IP packet generator PC via a network router.
- The IP packet generator PC provided IP data which was sent on the downlink to the indoor unit at the maximum data rate allowed for each specific modulation / coding scheme. The outdoor unit was connected by a radio link to the subscriber unit and an active link was maintained throughout all testing.

- **Conducted Testing**

- Idle Mode – The EUT was connected to a -48 V DC power supply. The power supply input was connected to a 120 VAC 60 Hz supply. Both the indoor and outdoor unit were connected via fibre optic cable. The transmitter was turned off within the base station via the management software.
- Transmitting Mode – The EUT was connected to a -48 V DC power supply. The power supply input was connected to a 120 VAC 60 Hz supply. The IP packet generator PC provided IP data which was sent to the indoor unit (IDU) at the maximum data rate allowed for each specific modulation / coding scheme. The outdoor unit was connected via an attenuator and cable assembly to the subscriber unit and an active link was maintained throughout all testing.
- The IP packet generator PC provided IP data which was sent on the downlink to the indoor unit at the maximum data rate allowed for each specific modulation / coding scheme. The outdoor unit was connected by a radio link to the subscriber unit and an active link was maintained throughout all 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. Measurement Uncertainty* for details.

## **5.2. Test Results**

### **5.2.1. Idle Mode AC Conducted Spurious Emissions**

#### **Test Summary:**

<b>FCC Part:</b>	FCC 15.107
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 7 and relevant annexes

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	34

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

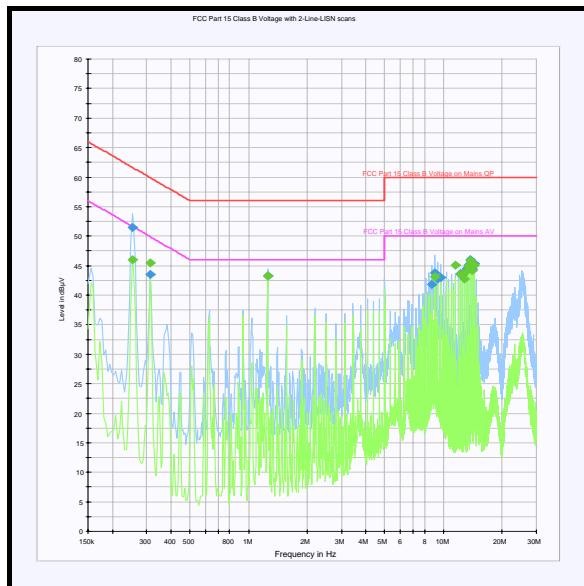
1. -48 VDC power to the EUT was provided from a power supply with 120 VAC 60 Hz input. The 120 VAC 60 Hz input voltage to the power supply was provided through a LISN.
2. The EUT outdoor unit ANT 1 port was connected to a Subscriber Station through suitable RF cables and attenuators. A communication link between EUT and Subscriber Station was established. The EUT transmitter was turned off.
3. The EUT outdoor unit ANT 2 port was terminated in a dummy load.

**Idle Mode AC Conducted Spurious Emissions (continued)****Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Quasi Peak Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.253500	Live 1	51.5	61.6	10.1	Complied
0.312000	Live 1	43.5	59.9	16.4	Complied
1.252500	Live 1	43.2	56.0	12.8	Complied
8.754000	Live 1	41.9	60.0	18.1	Complied
9.064500	Live 1	43.8	60.0	16.2	Complied
9.379500	Live 1	42.7	60.0	17.3	Complied
9.690000	Live 1	43.1	60.0	16.9	Complied
12.192000	Live 1	43.7	60.0	16.3	Complied
13.128000	Live 1	44.4	60.0	15.6	Complied
13.443000	Live 1	45.1	60.0	14.9	Complied
13.753500	Live 1	45.9	60.0	14.1	Complied
14.068500	Neutral	44.4	60.0	15.6	Complied
14.379000	Neutral	45.3	60.0	14.7	Complied

**Results: Average Detector Measurements**

Frequency (MHz)	Line	Average Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.253500	Live 1	45.9	51.6	5.7	Complied
0.312000	Live 1	45.5	49.9	4.4	Complied
1.252500	Live 1	43.3	46.0	2.7	Complied
9.064500	Live 1	43.2	50.0	6.8	Complied
11.566500	Neutral	45.1	50.0	4.9	Complied
12.192000	Live 1	43.5	50.0	6.5	Complied
12.502500	Live 1	43.4	50.0	6.6	Complied
12.817500	Live 1	42.7	50.0	7.3	Complied
13.128000	Live 1	44.1	50.0	5.9	Complied
13.443000	Live 1	44.9	50.0	5.1	Complied
13.753500	Live 1	45.9	50.0	4.1	Complied
14.068500	Neutral	44.2	50.0	5.8	Complied
14.379000	Neutral	45.1	50.0	4.9	Complied

**Idle Mode AC Conducted Spurious Emissions (continued)**

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

### **5.2.2. Idle Mode Radiated Spurious Emissions**

#### **Test Summary:**

<b>FCC Part:</b>	FCC 15.109
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes
<b>Frequency Range:</b>	30 MHz – 1000 MHz

#### **Environmental Conditions:**

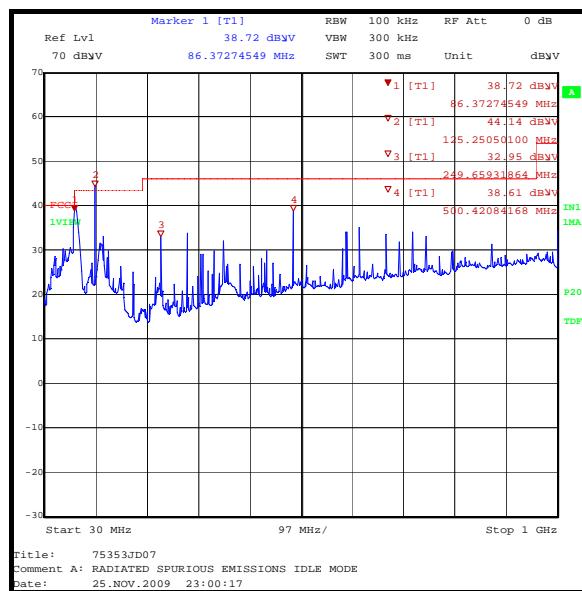
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	27

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

1. The outdoor unit was mounted vertically on a metal pole using the supplied brackets in accordance with the Customer's Base Station Installation Manual. This represents a typical user configuration. The centre of the outdoor unit was at a height of 1.5 metres above the chamber floor and directly in line with the measurement antenna. The outdoor unit was positioned in the centre of the anechoic chamber turntable. The indoor unit was positioned on the chamber floor directly below the outdoor unit and all interconnecting cables run vertically down the pole between both units. Surplus cable was bundled and cable tied.
2. Earthing points on the indoor unit and outdoor unit were connected by earth strap to the metal of the test chamber.
3. -48 VDC supply to the EUT during the test was provided by a 120 VAC 60 Hz power supply located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor.
4. The ANT1 port was connected via RF cables and attenuators to a Subscriber Station located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor. A BS-SS link was established and packet data sent on the downlink at the maximum data rate. The ANT2 port was terminated into a suitable 50 Ohm load.
5. The EUT was configured to transmit at maximum power on the top channel at 2687.5 MHz. The EUT transmitter was then turned off and the test performed.
6. The EUT was rotated through 360°. Measurements were made with the test system antenna in the horizontal and vertical planes. The highest level was recorded.
7. Pre-scans were performed with a peak detector as this was known to be the worst case.
8. Final measurements were performed with a quasi-peak detector.

**Idle Mode Radiated Spurious Emissions (continued)****Results:**

Frequency (MHz)	Antenna Polarity	Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Result
92.444	Vertical	37.9	43.5	5.6	Complied
124.972	Vertical	42.3	43.5	1.2	Complied
249.974	Vertical	28.9	46.0	17.1	Complied
349.989	Horizontal	30.0	46.0	16.0	Complied
368.236	Horizontal	23.5	46.0	22.5	Complied
499.981	Horizontal	39.3	46.0	6.7	Complied

**Idle Mode Radiated Spurious Emissions (continued)**

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

**Idle Mode Radiated Spurious Emissions (continued)****Test Summary:**

<b>FCC Part:</b>	FCC 15.109
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 8 and relevant annexes
<b>Frequency Range:</b>	1 GHz to 13.5 GHz

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	26

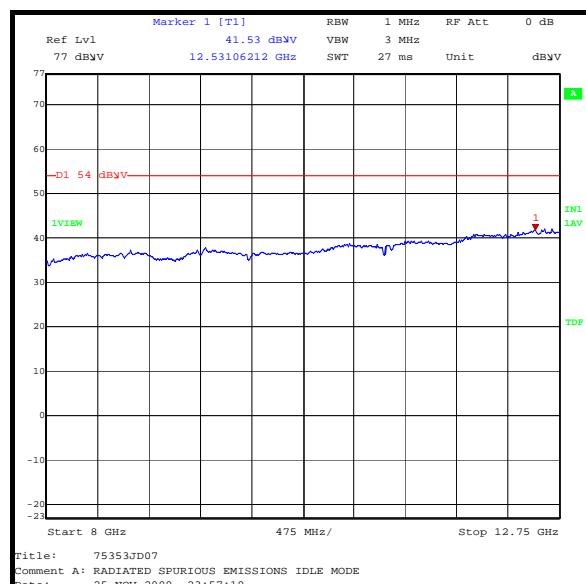
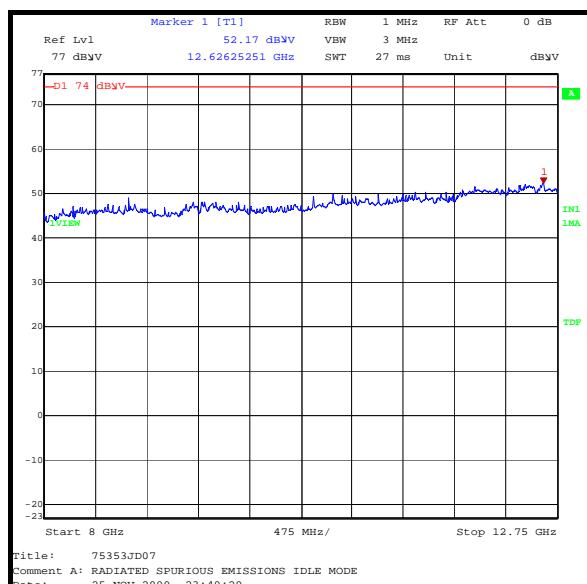
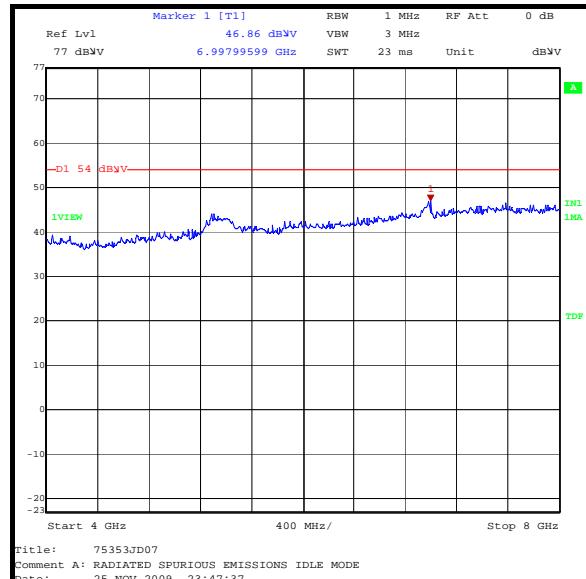
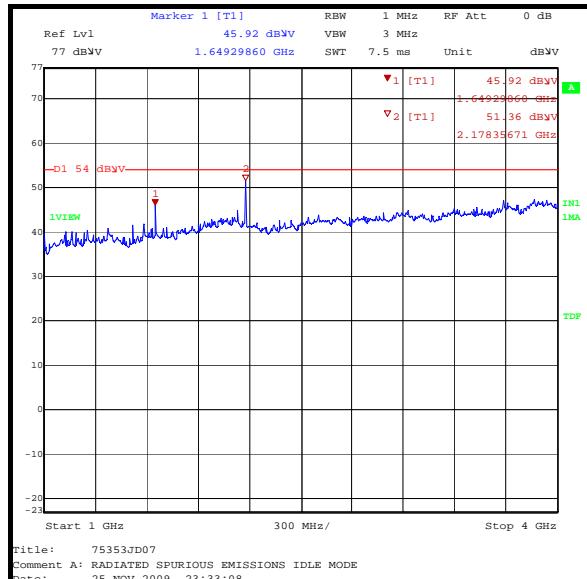
**Note(s):**

1. The outdoor unit was mounted vertically on a metal pole using the supplied brackets in accordance with the Customer's Base Station Installation Manual. This represents a typical user configuration. The centre of the outdoor unit was at a height of 1.5 metres above the chamber floor and directly in line with the measurement antenna. The outdoor unit was positioned in the centre of the anechoic chamber turntable. The indoor unit was positioned on the chamber floor directly below the outdoor unit and all interconnecting cables run vertically down the pole between both units. Surplus cable was bundled and cable tied.
2. Earthing points on the indoor unit and outdoor unit were connected by earth strap to the metal of the test chamber.
3. -48 VDC supply to the EUT during the test was provided by a 120 VAC 60 Hz power supply located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor.
4. The ANT1 port was connected via RF cables and attenuators to a Subscriber Station located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor. A BS-SS link was established and packet data sent on the downlink at the maximum data rate. The ANT2 port was terminated into a suitable 50 Ohm load.
5. The EUT was configured to transmit at maximum power on the FCC top channel of 2687.5 MHz as this is the highest operational frequency. The EUT transmitter was then turned off and the test performed.
6. The EUT was rotated through 360°. Measurements were made with the test system antenna in the horizontal and vertical planes. The highest level was recorded.
7. Pre-scans were performed with a peak detector against the average limit as this was known to be the worst case. Tests were repeated with an average detector against average limit across some frequency ranges as the peak detector caused the noise floor to be close to or above the average limit.

**Results: Highest Peak Level**

Frequency (GHz)	Antenna Polarity	Detector Level (dB $\mu$ V)	Transducer Factor (dB)	Actual Level (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Result
1650.027	Horizontal	44.6	-3.1	41.5	54.0	12.5	Complied
2178.015	Horizontal	43.7	-0.3	43.4	54.0	10.6	Complied

### Idle Mode Radiated Spurious Emissions (continued)

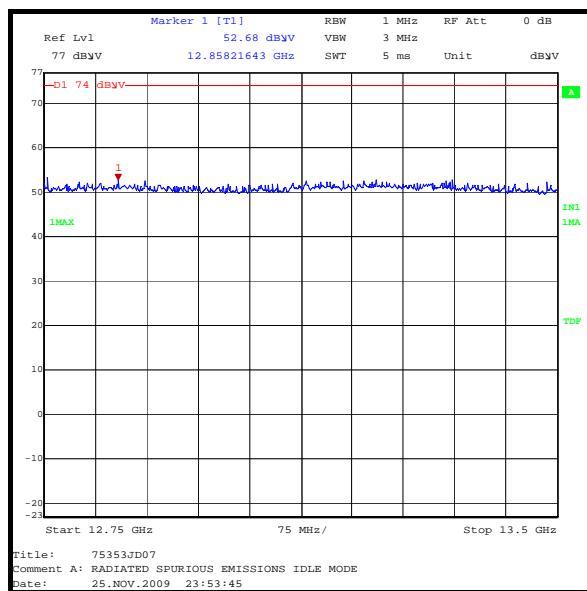


Peak detector

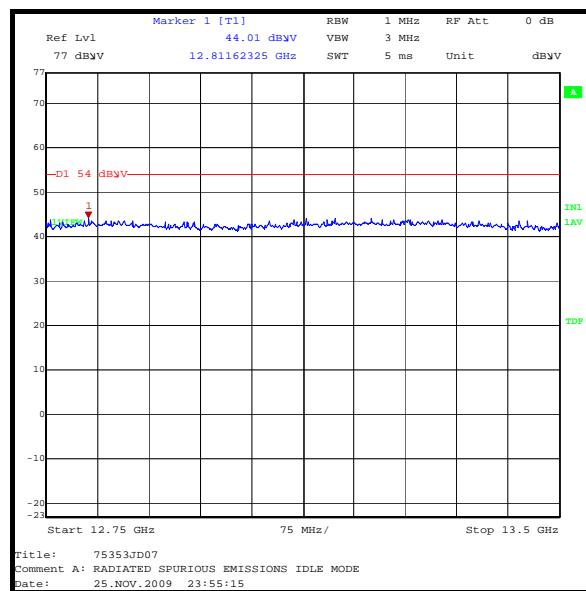
Average detector

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

### Idle Mode Radiated Spurious Emissions (continued)



Peak detector



Average detector

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

### **5.2.3. Transmitter AC Conducted Spurious Emissions**

#### **Test Summary:**

<b>FCC Part:</b>	FCC 15.207
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 7 and relevant annexes

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	21
<b>Relative Humidity (%):</b>	35

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

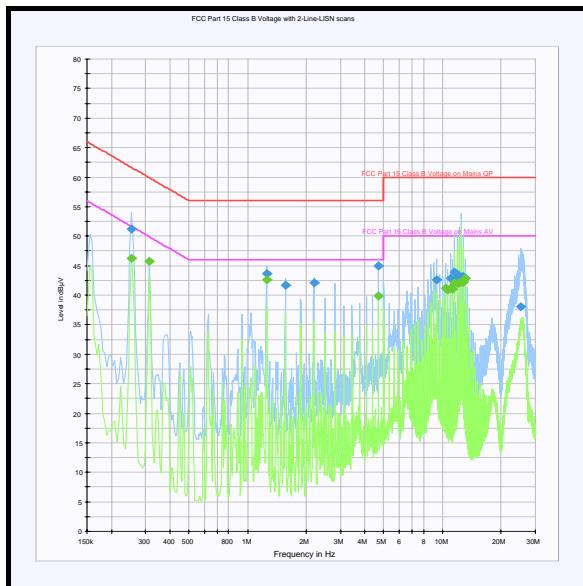
1. -48 VDC power to the EUT was provided from a power supply with 120 VAC 60 Hz input. The 120 VAC 60 Hz input voltage to the power supply was provided through a LISN.
2. The EUT outdoor unit ANT 1 port was connected to a Subscriber Station through suitable RF cables and attenuators. A communication link between EUT and Subscriber Station was established and packets sent on the downlink in order to force the EUT to maximum power.
3. The EUT outdoor unit ANT 2 port was terminated in a dummy load.
4. The EUT was transmitting at maximum power on the 5 MHz top channel using QPSK 1/2 modulation during the test.

#### **Results: Quasi Peak Detector Measurements**

Frequency (MHz)	Line	Quasi Peak Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.253500	Live 1	51.2	61.6	10.4	Complied
1.252500	Live 1	43.7	56.0	12.3	Complied
1.563000	Live 1	41.7	56.0	14.3	Complied
2.188500	Neutral	42.1	56.0	13.9	Complied
4.690500	Neutral	44.9	56.0	11.1	Complied
9.379500	Live 1	42.6	60.0	17.4	Complied
10.941000	Live 1	42.9	60.0	17.1	Complied
11.566500	Live 1	43.9	60.0	16.1	Complied
11.877000	Neutral	43.0	60.0	17.0	Complied
12.192000	Neutral	43.2	60.0	16.8	Complied
12.502500	Neutral	43.1	60.0	16.9	Complied
12.817500	Neutral	43.1	60.0	16.9	Complied
25.138500	Neutral	38.0	60.0	22.0	Complied

**Transmitter AC Conducted Spurious Emissions (continued)****Results: Average Detector Measurements**

Frequency (MHz)	Line	Average Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Result
0.253500	Live 1	46.2	51.6	5.4	Complied
0.312000	Live 1	45.8	49.9	4.1	Complied
1.252500	Live 1	42.6	46.0	3.4	Complied
4.690500	Neutral	39.9	46.0	6.1	Complied
10.315500	Live 1	41.2	50.0	8.8	Complied
10.626000	Live 1	40.9	50.0	9.1	Complied
10.941000	Live 1	41.2	50.0	8.8	Complied
11.251500	Live 1	41.0	50.0	9.0	Complied
11.566500	Neutral	42.1	50.0	7.9	Complied
11.877000	Neutral	41.9	50.0	8.1	Complied
12.192000	Neutral	42.0	50.0	8.0	Complied
12.502500	Neutral	42.2	50.0	7.8	Complied
12.817500	Neutral	42.2	50.0	7.8	Complied
13.128000	Neutral	42.8	50.0	7.2	Complied

**Transmitter AC Conducted Spurious Emissions (continued)**

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

#### **5.2.4. Transmitter Carrier Output Power**

##### **Test Summary:**

<b>FCC Part:</b>	FCC 2.1046, FCC Part 27.50(h)(1)
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.1 & 2.2.17

##### **Environmental Conditions:**

<b>Temperature (°C):</b>	21 to 23
<b>Relative Humidity (%):</b>	41 to 42

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

1. Power measurements were made using a calibrated Agilent N1912A power meter and N1921A wideband power sensor. WiMax configuration was selected on the power meter. The power meter was configured to perform a gated measurement across the EUT transmit burst. A client/server session was established between the PCs connected to the EUT and Subscriber Station. Packets were sent from PC connected to the BS to the PC connected to the SS at the maximum packet rate supported by the modulation scheme under test.
2. The effective isotropic radiated power (EIRP) was calculated by adding the Client's stated antenna gain to the measured conducted RF output power. The omnidirectional antenna stated gain is +13 dBi. The sectorised antenna stated gain is +18 dBi and antenna beam width is 60 degrees.
3. Occupied bandwidths used to calculate the above limits were obtained from the measured values shown in the occupied bandwidth section of this report.
4. Measurements were performed with the EUT transmitting all supported modulation types on the ANT1 port. Some additional testing was performed with QPSK 1/2 and 64QAM 5/6 to show compliance on the ANT2 port.
5. The EUT bottom channel lies within the MBS, centre and top channels lie within the UBS.
6. Part 27.50 (h)(1) limit for omnidirectional antennas is calculated as  $33+10 \log (\text{Occupied Bandwidth}/Y)$  dBW. (where Y is 6 MHz for channels in the MBS and 5.5 MHz for channels in the UBS).
7. Part 27.50 (h)(1) limit for non-omnidirectional antennas is calculated as  $33+10 \log (\text{Occupied Bandwidth}/Y) + 10 \log (360 / \text{Antenna Beamwidth})$  dBW. (where Y is 6 MHz for channels in the MBS and 5.5 MHz for channels in the UBS).

**Note(s) (continued):**

8. Calculations of limits when the EUT is transmitting a 5 MHz channel are shown below:

*Omnidirectional antenna in the MBS:*

$$33 + ((10 \log (4.629 / 6.0)) = 31.9 \text{ dBW EIRP}$$

*Omnidirectional antenna in the UBS:*

$$33 + ((10 \log (4.629 / 5.5)) = 32.3 \text{ dBW EIRP}$$

*Sectorised antenna in the MBS:*

$$33 + 10 \log (4.629 / 6.0) + 10 \log (360 / 60) = 39.7 \text{ dBW EIRP}$$

*Sectorised antenna in the UBS:*

$$33 + 10 \log (4.629 / 5.5) + 10 \log (360 / 60) = 40.0 \text{ dBW EIRP}$$

9. Calculations of limits when the EUT is transmitting a 10 MHz channel are shown below:

*Omnidirectional antenna in the MBS:*

$$33 + ((10 \log (9.298 / 6.0)) = 34.9 \text{ dBW EIRP}$$

*Omnidirectional antenna in the UBS:*

$$33 + ((10 \log (9.298 / 5.5)) = 35.3 \text{ dBW EIRP}$$

*Sectorised antenna in the MBS:*

$$33 + 10 \log (9.298 / 6.0) + 10 \log (360 / 60) = 42.7 \text{ dBW EIRP}$$

*Sectorised antenna in the UBS:*

$$33 + 10 \log (9.298 / 5.5) + 10 \log (360 / 60) = 43.1 \text{ dBW EIRP}$$

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 5 MHz Channel Width / ANT1 port / Bottom channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2585.5	39.0	13.0	52.0	22.0	31.9	9.9	Complied
QPSK 3/4	2585.5	39.0	13.0	52.0	22.0	31.9	9.9	Complied
16QAM 1/2	2585.5	38.9	13.0	51.9	21.9	31.9	10.0	Complied
16QAM 3/4	2585.5	38.9	13.0	51.9	21.9	31.9	10.0	Complied
64QAM 2/3	2585.5	39.1	13.0	52.1	22.1	31.9	9.8	Complied
64QAM 3/4	2585.5	39.0	13.0	52.0	22.0	31.9	9.9	Complied
64QAM 5/6	2585.5	39.1	13.0	52.1	22.1	31.9	9.8	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2585.5	39.0	18.0	57.0	27.0	39.7	12.7	Complied
QPSK 3/4	2585.5	39.0	18.0	57.0	27.0	39.7	12.7	Complied
16QAM 1/2	2585.5	38.9	18.0	56.9	26.9	39.7	12.8	Complied
16QAM 3/4	2585.5	38.9	18.0	56.9	26.9	39.7	12.8	Complied
64QAM 2/3	2585.5	39.1	18.0	57.1	27.1	39.7	12.6	Complied
64QAM 3/4	2585.5	39.0	18.0	57.0	27.0	39.7	12.7	Complied
64QAM 5/6	2585.5	39.1	18.0	57.1	27.1	39.7	12.6	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 5 MHz Channel Width / ANT2 port / Bottom channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2585.5	38.8	13.0	51.8	21.8	31.9	10.1	Complied
64QAM 5/6	2585.5	38.8	13.0	51.8	21.8	31.9	10.1	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2585.5	38.8	18.0	56.8	26.8	39.7	12.9	Complied
64QAM 5/6	2585.5	38.8	18.0	56.8	26.8	39.7	12.9	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 5 MHz Channel Width / ANT1 port / Centre channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
QPSK 3/4	2636.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
16QAM 1/2	2636.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
16QAM 3/4	2636.5	39.2	13.0	52.2	22.2	32.3	10.1	Complied
64QAM 2/3	2636.5	39.3	13.0	52.3	22.3	32.3	10.0	Complied
64QAM 3/4	2636.5	39.3	13.0	52.3	22.3	32.3	10.0	Complied
64QAM 5/6	2636.5	39.3	13.0	52.3	22.3	32.3	10.0	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
QPSK 3/4	2636.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
16QAM 1/2	2636.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
16QAM 3/4	2636.5	39.2	18.0	57.2	27.2	40.0	12.8	Complied
64QAM 2/3	2636.5	39.3	18.0	57.3	27.3	40.0	12.7	Complied
64QAM 3/4	2636.5	39.3	18.0	57.3	27.3	40.0	12.7	Complied
64QAM 5/6	2636.5	39.3	18.0	57.3	27.3	40.0	12.7	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 5 MHz Channel Width / ANT2 port / Centre channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
64QAM 5/6	2636.5	39.3	13.0	52.3	22.3	32.3	10.0	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
64QAM 5/6	2636.5	39.3	18.0	57.3	27.3	40.0	12.7	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 5 MHz Channel Width / ANT1 port / Top channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2687.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
QPSK 3/4	2687.5	39.0	13.0	52.0	22.0	32.3	10.3	Complied
16QAM 1/2	2687.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
16QAM 3/4	2687.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
64QAM 2/3	2687.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied
64QAM 3/4	2687.5	38.9	13.0	51.9	21.9	32.3	10.4	Complied
64QAM 5/6	2687.5	39.1	13.0	52.1	22.1	32.3	10.2	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2687.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
QPSK 3/4	2687.5	39.0	18.0	57.0	27.0	40.0	13.0	Complied
16QAM 1/2	2687.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
16QAM 3/4	2687.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
64QAM 2/3	2687.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied
64QAM 3/4	2687.5	38.9	18.0	56.9	26.9	40.0	13.1	Complied
64QAM 5/6	2687.5	39.1	18.0	57.1	27.1	40.0	12.9	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 5 MHz Channel Width / ANT2 port / Top channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2687.5	38.9	13.0	51.9	21.9	32.3	10.4	Complied
64QAM 5/6	2687.5	38.9	13.0	51.9	21.9	32.3	10.4	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2687.5	38.9	18.0	56.9	26.9	40.0	13.1	Complied
64QAM 5/6	2687.5	38.9	18.0	56.9	26.9	40.0	13.1	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 10 MHz Channel Width / ANT1 port / Bottom channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2588	39.1	13.0	52.1	22.1	34.9	12.8	Complied
QPSK 3/4	2588	39.1	13.0	52.1	22.1	34.9	12.8	Complied
16QAM 1/2	2588	39.2	13.0	52.2	22.2	34.9	12.7	Complied
16QAM 3/4	2588	39.1	13.0	52.1	22.1	34.9	12.8	Complied
64QAM 2/3	2588	39.3	13.0	52.3	22.3	34.9	12.6	Complied
64QAM 3/4	2588	39.0	13.0	52.0	22.0	34.9	12.9	Complied
64QAM 5/6	2588	39.1	13.0	52.1	22.1	34.9	12.8	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2588	39.1	18.0	57.1	27.1	42.7	15.6	Complied
QPSK 3/4	2588	39.1	18.0	57.1	27.1	42.7	15.6	Complied
16QAM 1/2	2588	39.2	18.0	57.2	27.2	42.7	15.5	Complied
16QAM 3/4	2588	39.1	18.0	57.1	27.1	42.7	15.6	Complied
64QAM 2/3	2588	39.3	18.0	57.3	27.3	42.7	15.4	Complied
64QAM 3/4	2588	39.0	18.0	57.0	27.0	42.7	15.7	Complied
64QAM 5/6	2588	39.1	18.0	57.1	27.1	42.7	15.6	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 10 MHz Channel Width / ANT2 port / Bottom channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2588	39.0	13.0	52.0	22.0	34.9	12.9	Complied
64QAM 5/6	2588	39.0	13.0	52.0	22.0	34.9	12.9	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2588	39.0	18.0	57.0	27.0	42.7	15.7	Complied
64QAM 5/6	2588	39.0	18.0	57.0	27.0	42.7	15.7	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 10 MHz Channel Width / ANT1 port / Centre channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636	38.9	13.0	51.9	21.9	35.3	13.4	Complied
QPSK 3/4	2636	38.9	13.0	51.9	21.9	35.3	13.4	Complied
16QAM 1/2	2636	38.9	13.0	51.9	21.9	35.3	13.4	Complied
16QAM 3/4	2636	38.9	13.0	51.9	21.9	35.3	13.4	Complied
64QAM 2/3	2636	39.0	13.0	52.0	22.0	35.3	13.3	Complied
64QAM 3/4	2636	38.9	13.0	51.9	21.9	35.3	13.4	Complied
64QAM 5/6	2636	39.0	13.0	52.0	22.0	35.3	13.3	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636	38.9	18.0	56.9	26.9	43.1	16.2	Complied
QPSK 3/4	2636	38.9	18.0	56.9	26.9	43.1	16.2	Complied
16QAM 1/2	2636	38.9	18.0	56.9	26.9	43.1	16.2	Complied
16QAM 3/4	2636	38.9	18.0	56.9	26.9	43.1	16.2	Complied
64QAM 2/3	2636	39.0	18.0	57.0	27.0	43.1	16.1	Complied
64QAM 3/4	2636	38.9	18.0	56.9	26.9	43.1	16.2	Complied
64QAM 5/6	2636	39.0	18.0	57.0	27.0	43.1	16.1	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 10 MHz Channel Width / ANT2 port / Centre channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636	39.4	13.0	52.4	22.4	35.3	12.9	Complied
64QAM 5/6	2636	38.9	13.0	51.9	21.9	35.3	13.4	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2636	39.4	18.0	57.4	27.4	43.1	15.7	Complied
64QAM 5/6	2636	38.9	18.0	56.9	26.9	43.1	16.2	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 10 MHz Channel Width / ANT1 port / Top channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied
QPSK 3/4	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied
16QAM 1/2	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied
16QAM 3/4	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied
64QAM 2/3	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied
64QAM 3/4	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied
64QAM 5/6	2685	39.1	13.0	52.1	22.1	35.3	13.2	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied
QPSK 3/4	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied
16QAM 1/2	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied
16QAM 3/4	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied
64QAM 2/3	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied
64QAM 3/4	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied
64QAM 5/6	2685	39.1	18.0	57.1	27.1	43.1	16.0	Complied

**Transmitter Output Power and (EIRP Limitations) (continued)****Results: 10 MHz Channel Width / ANT2 port / Top channel**

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2685	38.9	13.0	51.9	21.9	35.3	13.4	Complied
64QAM 5/6	2685	38.9	13.0	51.9	21.9	35.3	13.4	Complied

Modulation	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
QPSK 1/2	2685	38.9	18.0	56.9	26.9	43.1	16.2	Complied
64QAM 5/6	2685	38.9	18.0	56.9	26.9	43.1	16.2	Complied

**5.2.5. Transmitter Equivalent Isotropic Radiated Power (EIRP)****Test Summary:**

<b>FCC Part:</b>	FCC 27.50(h)(2)
<b>Test Method Used:</b>	As detailed in ANSI TIA-603-C-2004 Section 2.2.1 & 2.2.17

**Environmental Conditions:**

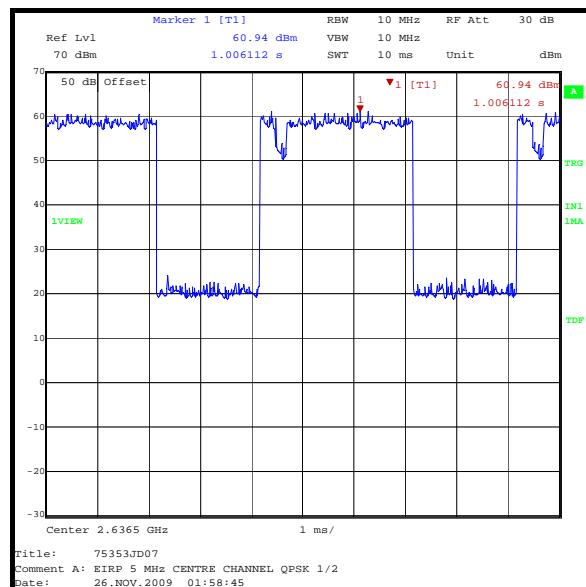
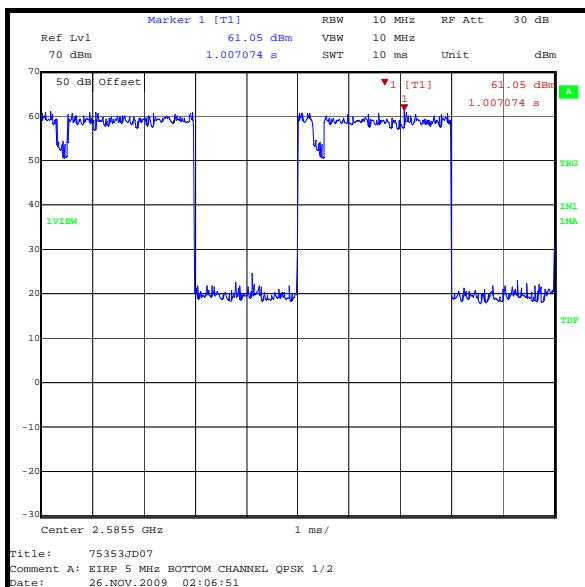
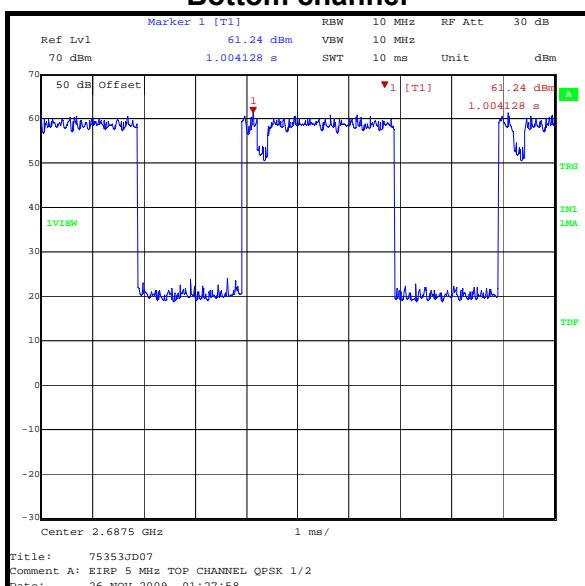
<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	27

**Note(s):**

1. Testing was performed with the sectorised antenna only as this has the highest gain (18 dBi) and is cross polarised.
2. The antenna was mounted vertically on a metal pole using the supplied brackets. The Base Station outdoor unit was also fitted on the metal pole using the supplied brackets in accordance with the Customer's Base Station Installation Manual. The Base Station outdoor unit was positioned below the antenna. This represents a typical user configuration. The centre of the EUT antenna was at a height of 1.5 metres above the chamber floor and directly in line with the measurement antenna. The EUT antenna was positioned in the centre of the anechoic chamber turntable. The Base Station indoor unit was positioned on the chamber floor directly below the outdoor unit and all interconnecting cables run vertically down the pole between both units. Surplus cable was bundled and cable tied. The BS outdoor unit ANT1 and ANT2 ports were connected to both ports on the sectorised antenna using short RF cables with an insertion loss of 0.2 dB.
3. Earthing points on the indoor unit and outdoor unit were connected by earth strap to the metal structure of the test chamber.
4. -48 VDC supply to the EUT during the test was provided by a 120 VAC 60 Hz power supply located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor.
5. A Subscriber Station was located outside the anechoic chamber and a suitable support antenna placed inside the anechoic chamber. Interconnecting cables between Subscriber Station and support antenna were run through access points in the chamber wall and floor. A BS-SS link over the radio path was established and packet data sent on the downlink at the maximum data rate to drive the BS to the maximum output power.
6. EIRP was measured with the spectrum analyser span set to 0 Hz in order to perform the measurement in the time domain. The purpose of this was to avoid any additive effect of the power from the Subscriber Station transmitting on the same frequency in close proximity.
7. 50 dB attenuation was used at the input of the spectrum analyser due to high RF levels. This was compensated for by use of a 50 dB RF level offset shown on each plot. All previously measured site attenuation was incorporated into a transducer factor which was enabled on the spectrum analyser.
8. Measurements were made with the EUT transmitting a 5 MHz channel with QPSK 1/2 modulation only as previous testing confirmed similar conducted power with all modulation types.
9. The measurement distance was 3 metres.
10. FCC EIRP limits were calculated in the Transmitter Carrier Output Power section of this report.

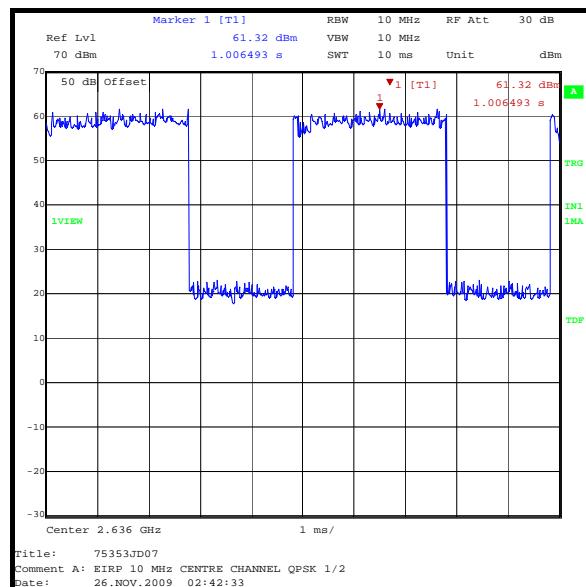
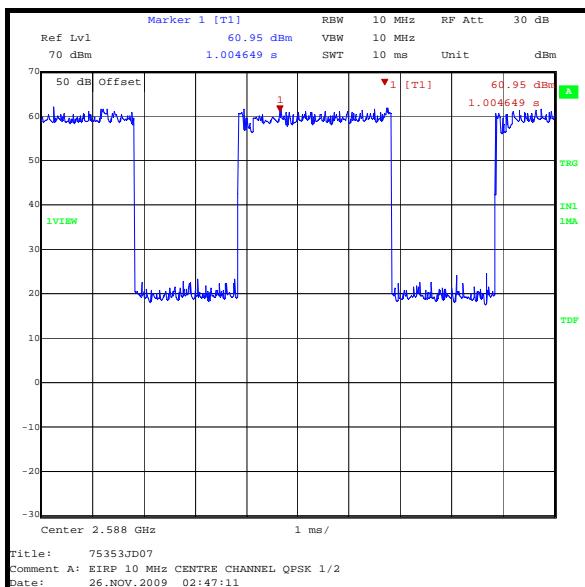
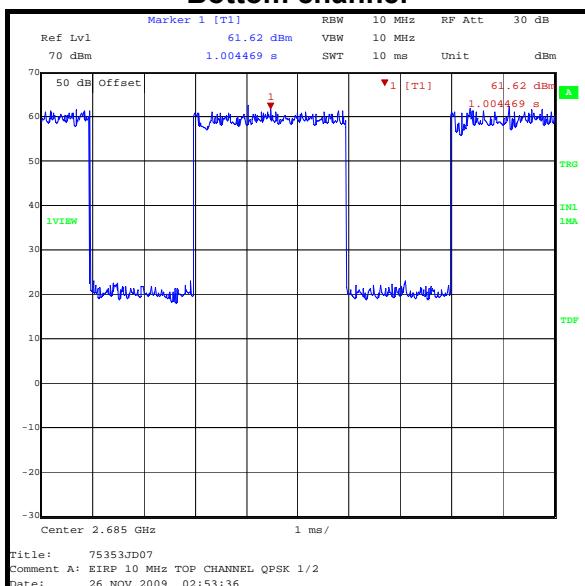
**Transmitter Equivalent Isotropic Radiated Power (continued)****Results: FCC / 5 MHz Bandwidth / QPSK1/2**

Channel	Frequency (MHz)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
Bottom	2585.5	31.1	39.7	8.6	Complied
Centre	2636.5	30.9	40.0	9.1	Complied
Top	2687.5	31.2	40.0	8.8	Complied

**Bottom channel****Top channel****Centre channel**

**Transmitter Equivalent Isotropic Radiated Power (continued)****Results: FCC / 10 MHz Bandwidth / QPSK1/2**

Channel	Frequency (MHz)	EIRP (dBW)	Limit EIRP (dBW)	Margin (dB)	Result
Bottom	2588.0	31.0	42.7	11.7	Complied
Centre	2636.0	31.3	43.1	11.8	Complied
Top	2685.0	31.6	43.1	11.5	Complied

**Bottom channel****Centre channel****Top channel**

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

<b>FCC Part:</b>	FCC 2.1049
<b>Test Method Used:</b>	The occupied bandwidth was measured by using the channel bandwidth function of the measurement spectrum analyser.

**Environmental Conditions:**

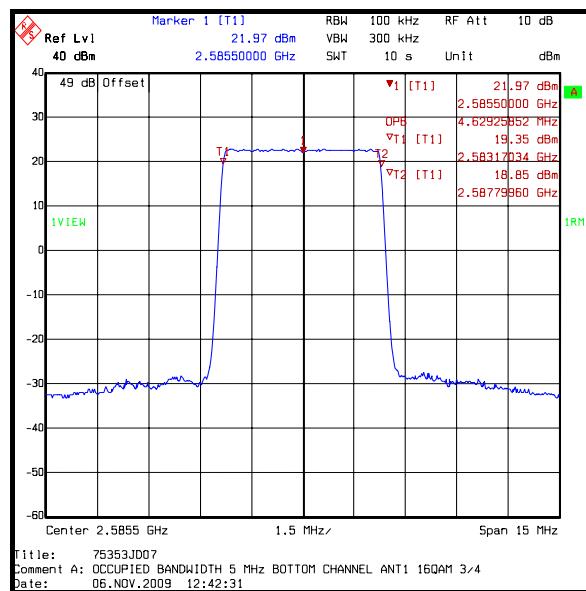
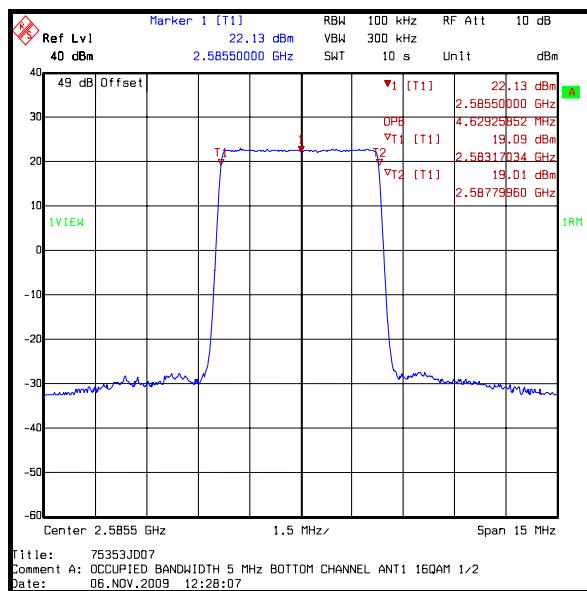
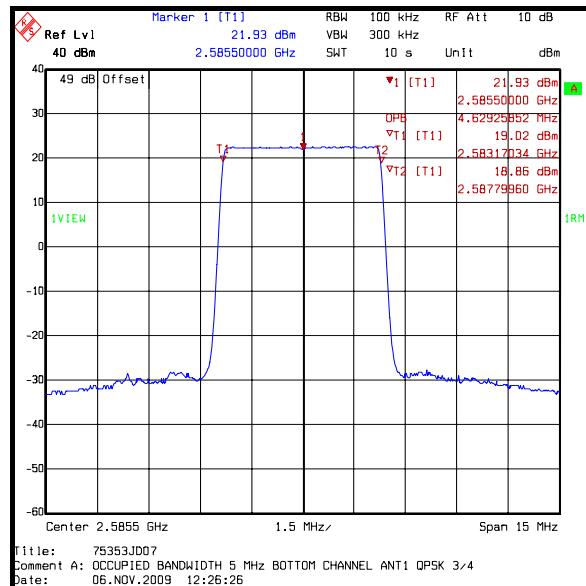
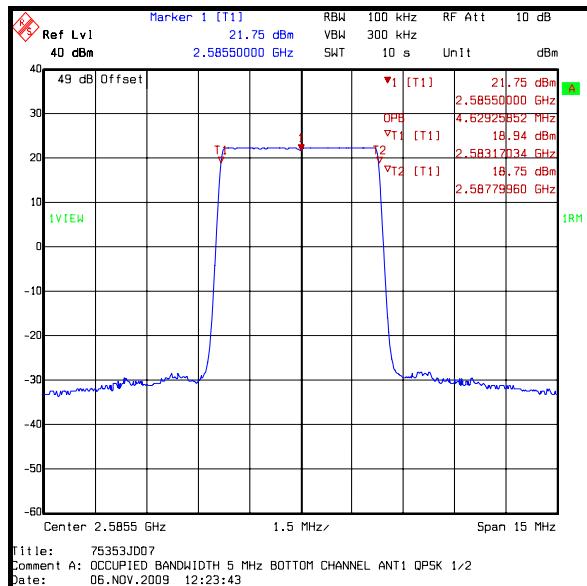
<b>Temperature (°C):</b>	21 to 23
<b>Relative Humidity (%):</b>	36 to 42

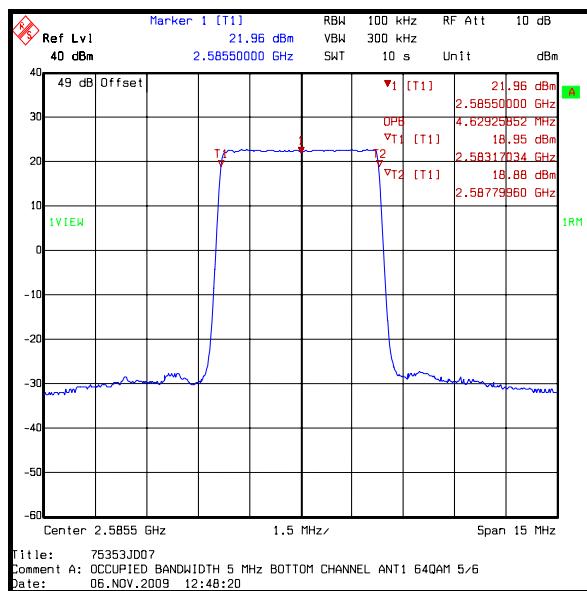
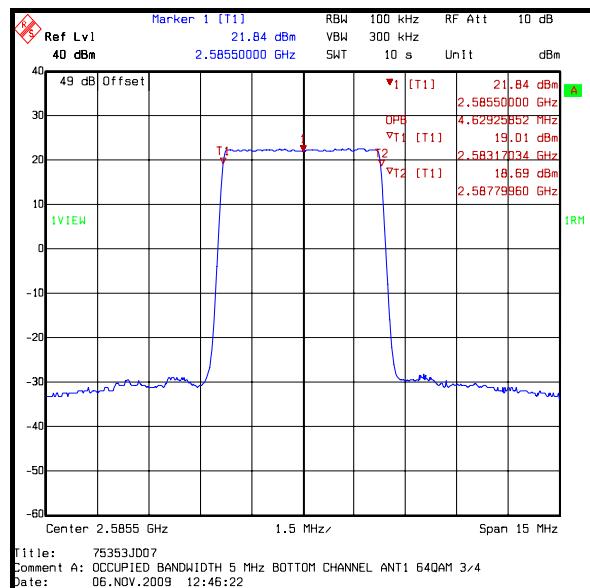
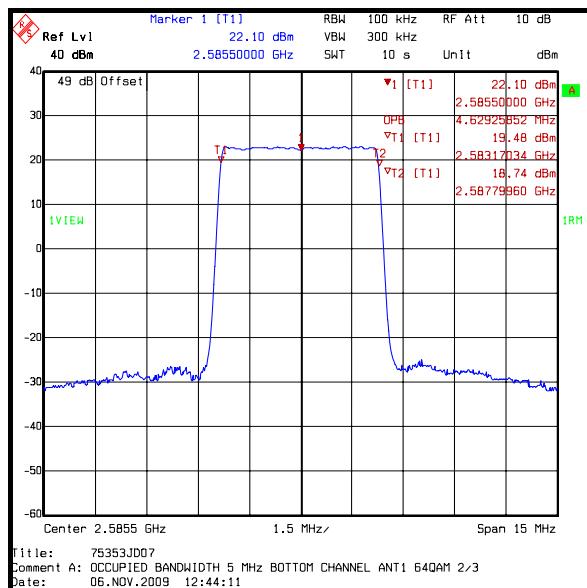
**Note(s):**

1. The EUT was configured to transmit at a maximum power on both supported channel bandwidths.
2. Packet data transmission was increased on the downlink until the EUT maximum power and bandwidth had been obtained. Measurements were performed at this point.
3. All modulation types were tested on the ANT1 port. Comparison tests using QPSK 1/2 and 64QAM 5/6 modulation were performed on the ANT2 port.
4. The 99% occupied bandwidth was measured using the occupied bandwidth function of a spectrum analyser. The measurement bandwidths were set automatically by the spectrum analyser based on the EUT 5 MHz and 10 MHz channel widths.

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****Results: 5 MHz Bandwidth / Bottom channel / 2585.5 MHz:**

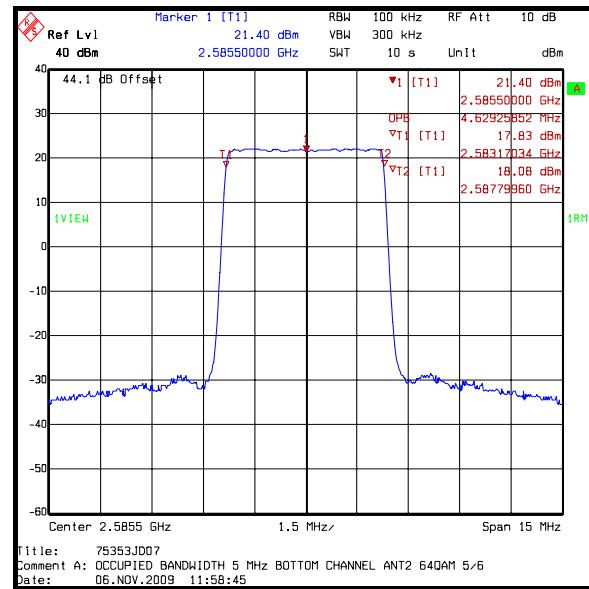
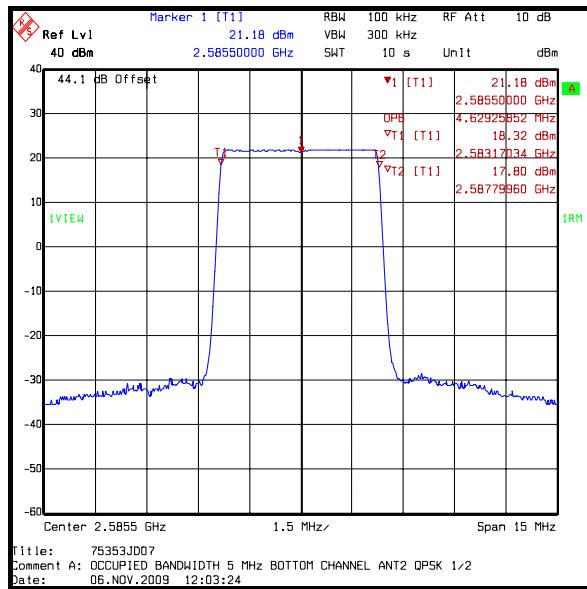
Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK 1/2	ANT1	100	300	4.629258
QPSK 3/4	ANT1	100	300	4.629258
16QAM 1/2	ANT1	100	300	4.629258
16QAM 3/4	ANT1	100	300	4.629258
64QAM 2/3	ANT1	100	300	4.629258
64QAM 3/4	ANT1	100	300	4.629258
64QAM 5/6	ANT1	100	300	4.629258
QPSK 1/2	ANT2	100	300	4.629258
64QAM 5/6	ANT2	100	300	4.629258

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Bottom channel / 2585.5 MHz / ANT1 Port:**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Bottom channel / 2585.5 MHz / ANT1 Port:**

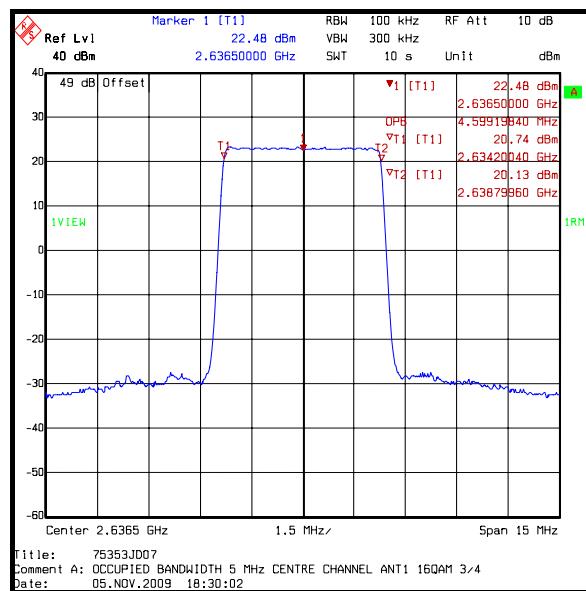
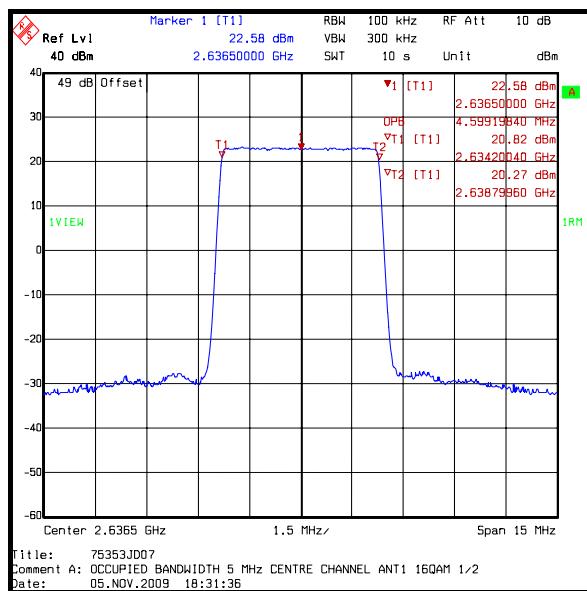
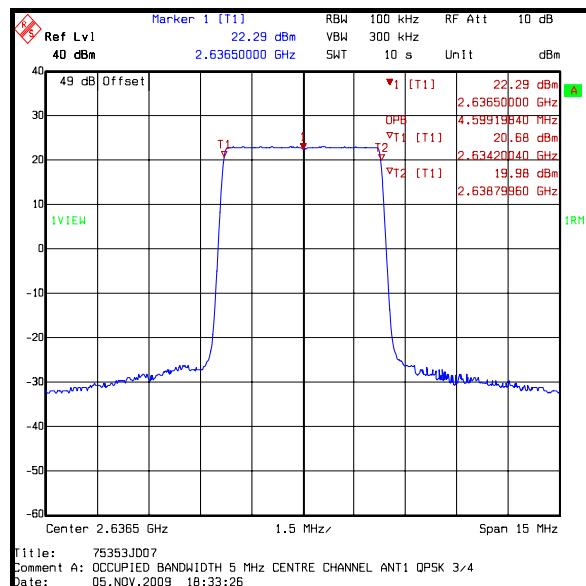
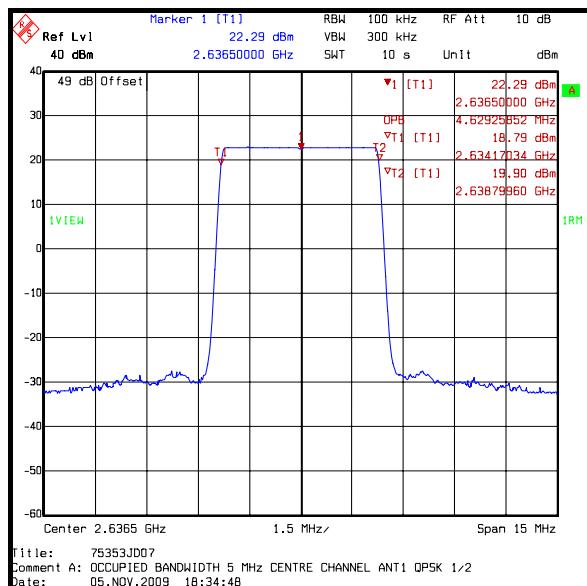
## Transmitter Occupied Bandwidth: Part 2.1049 (continued)

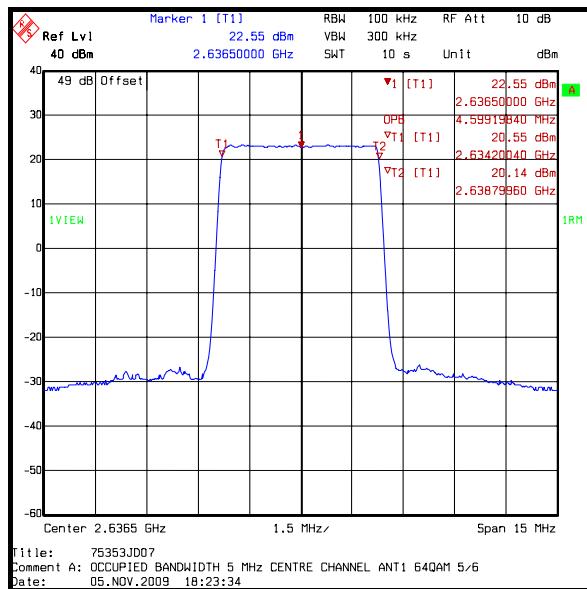
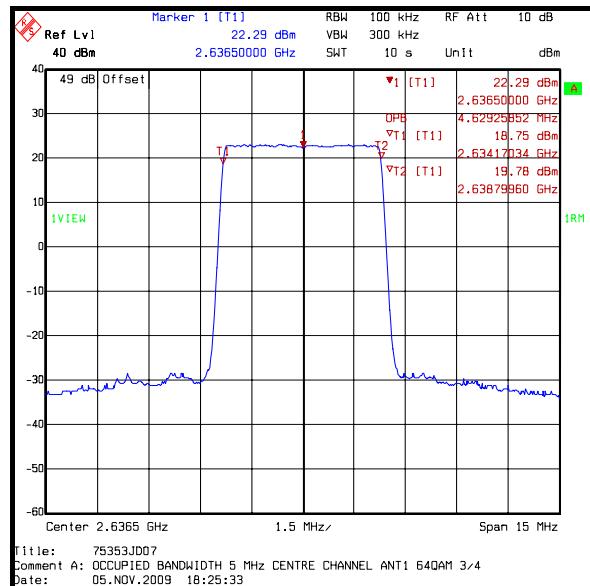
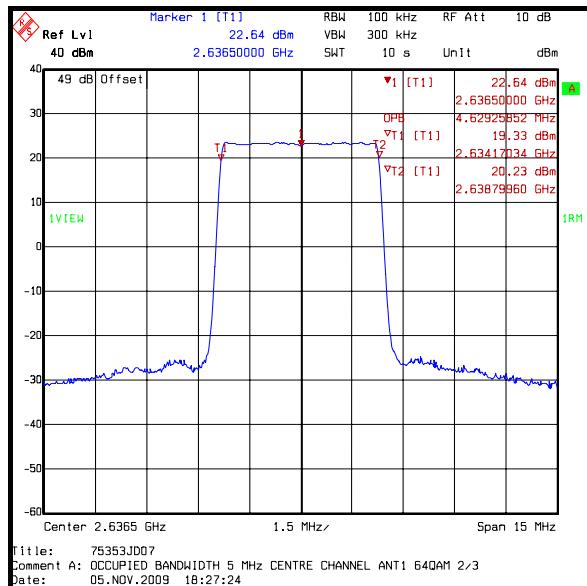
### 5 MHz Bandwidth / Bottom channel / 2585.5 MHz / ANT2 Port:



**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****Results: 5 MHz Bandwidth / Centre channel / 2636.5 MHz**

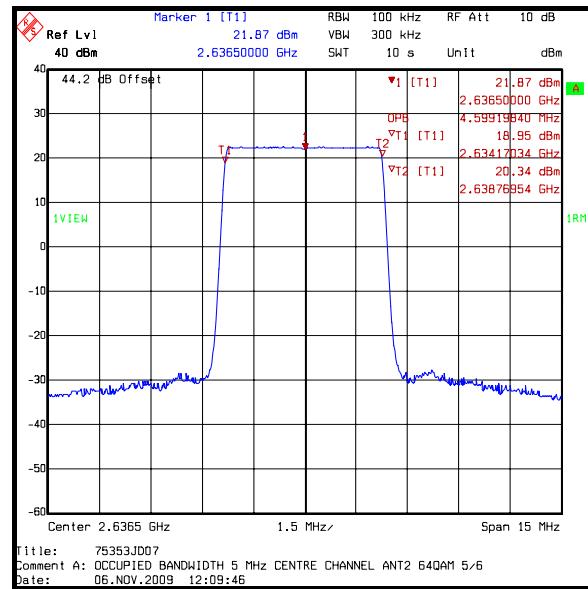
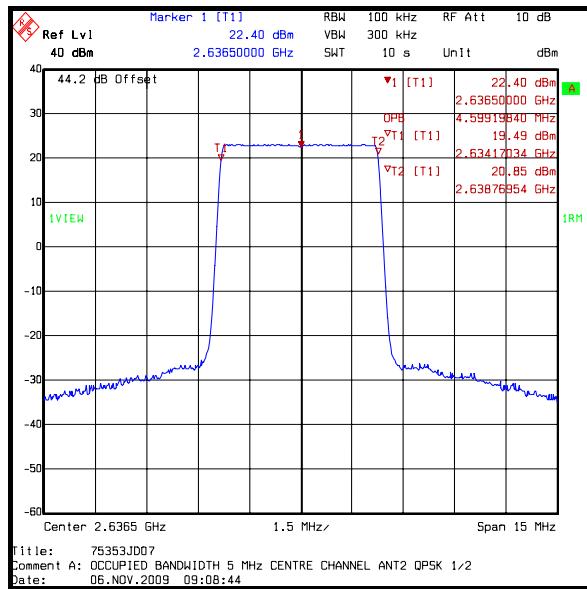
Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK 1/2	ANT1	100	300	4.629258
QPSK 3/4	ANT1	100	300	4.599198
16QAM 1/2	ANT1	100	300	4.599198
16QAM 3/4	ANT1	100	300	4.599198
64QAM 2/3	ANT1	100	300	4.629258
64QAM 3/4	ANT1	100	300	4.629258
64QAM 5/6	ANT1	100	300	4.599198
QPSK 1/2	ANT2	100	300	4.599198
64QAM 5/6	ANT2	100	300	4.599198

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Centre channel / 2636.5 MHz / ANT1 Port:**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Centre channel / 2636.5 MHz / ANT1 Port:**

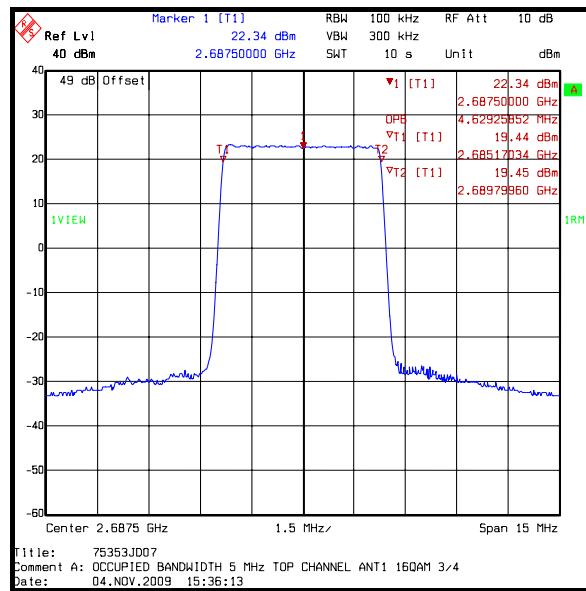
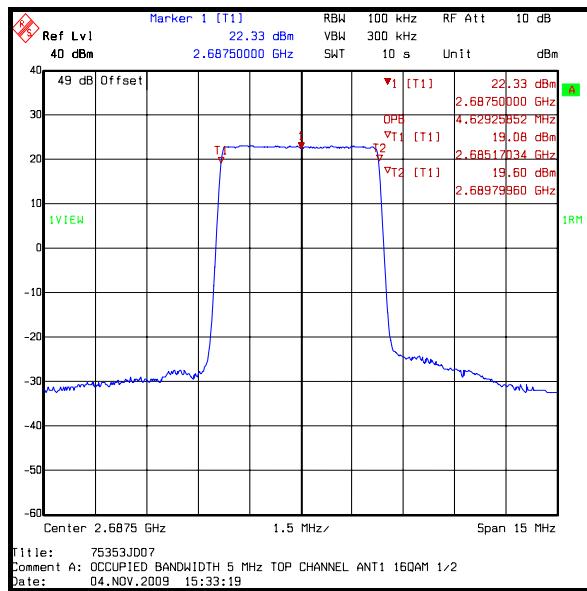
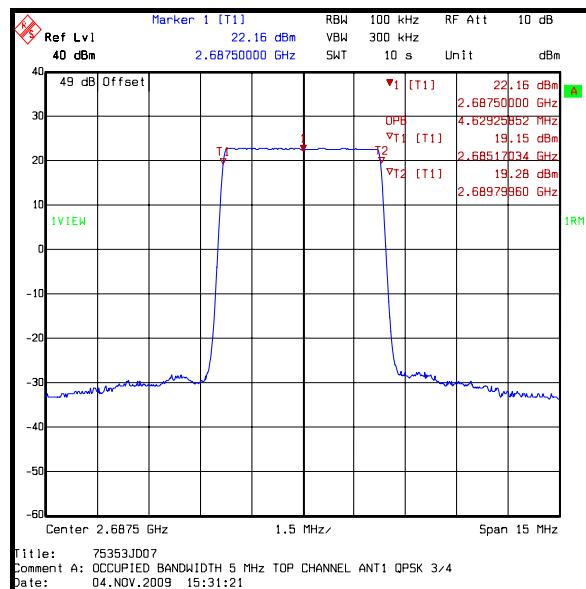
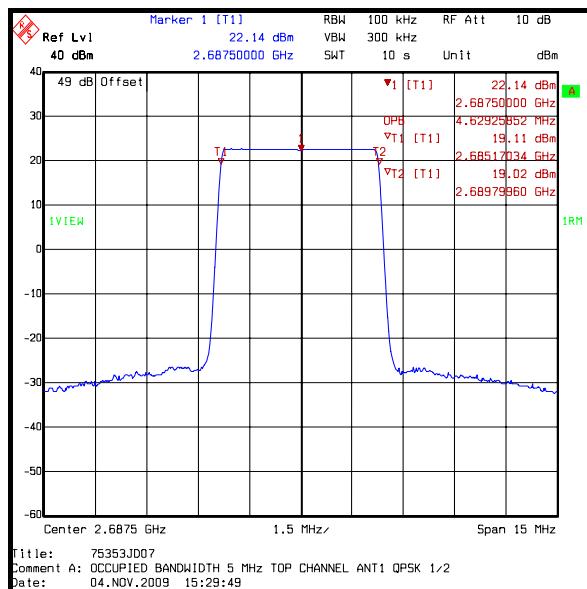
## Transmitter Occupied Bandwidth: Part 2.1049 (continued)

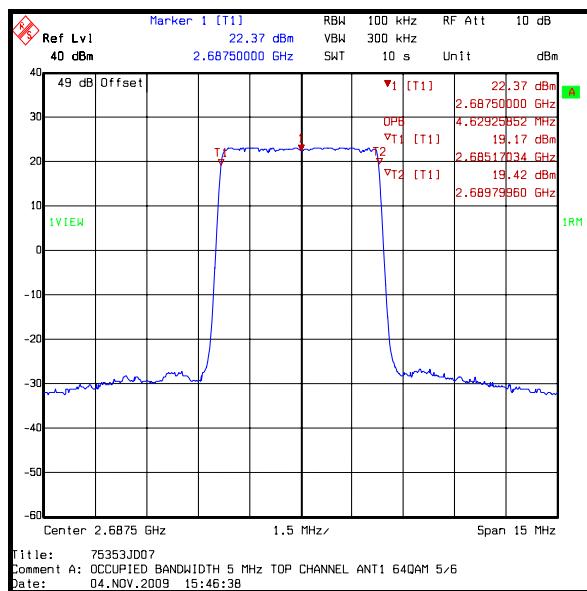
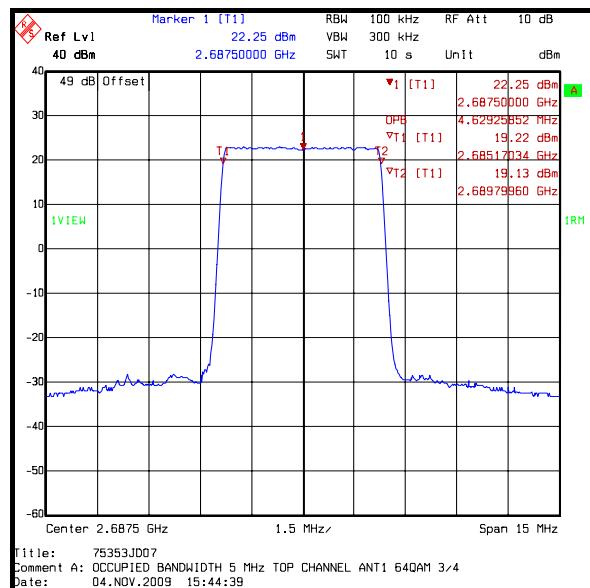
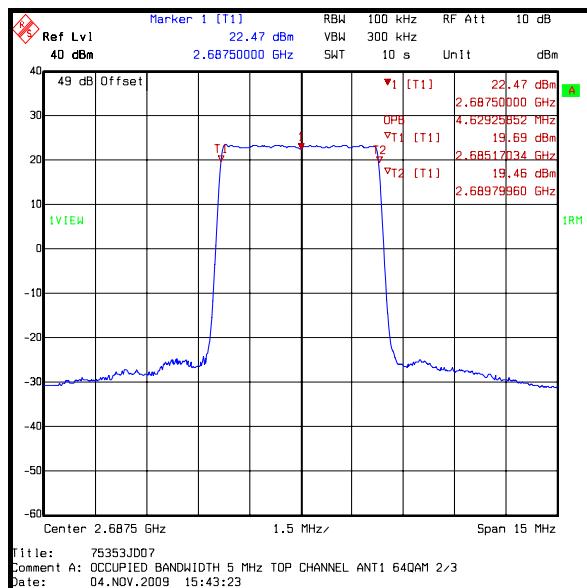
### 5 MHz Bandwidth / Centre channel / 2636.5 MHz / ANT2 Port:

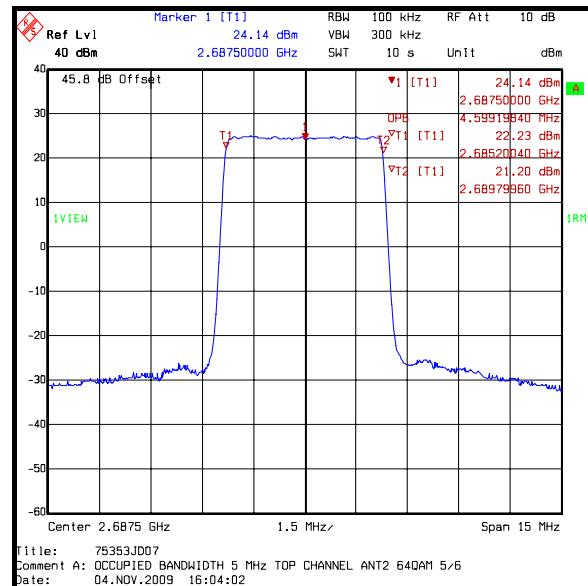
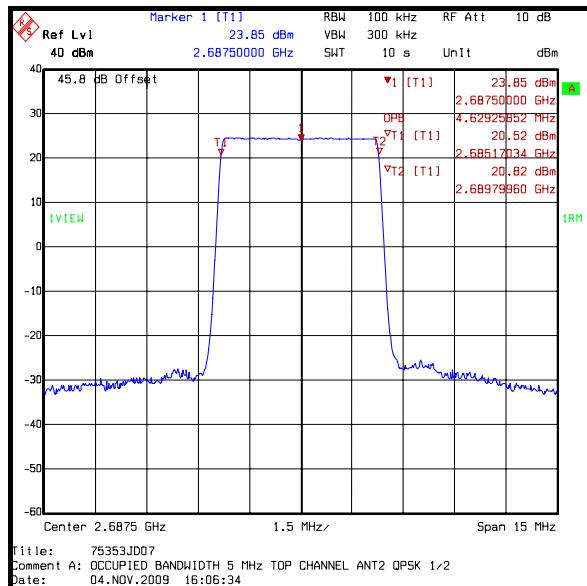


**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****Results: 5 MHz Bandwidth / Top channel / 2687.5 MHz:**

Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK 1/2	ANT1	100	300	4.629258
QPSK 3/4	ANT1	100	300	4.629258
16QAM 1/2	ANT1	100	300	4.629258
16QAM 3/4	ANT1	100	300	4.629258
64QAM 2/3	ANT1	100	300	4.629258
64QAM 3/4	ANT1	100	300	4.629258
64QAM 5/6	ANT1	100	300	4.629258
QPSK 1/2	ANT2	100	300	4.629258
64QAM 5/6	ANT2	100	300	4.599198

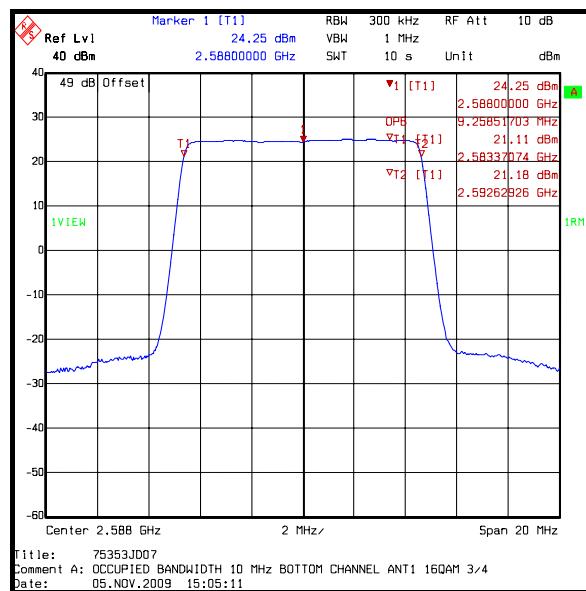
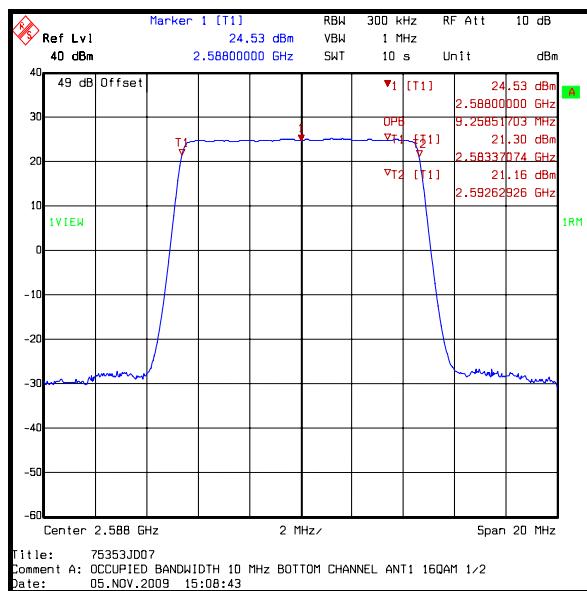
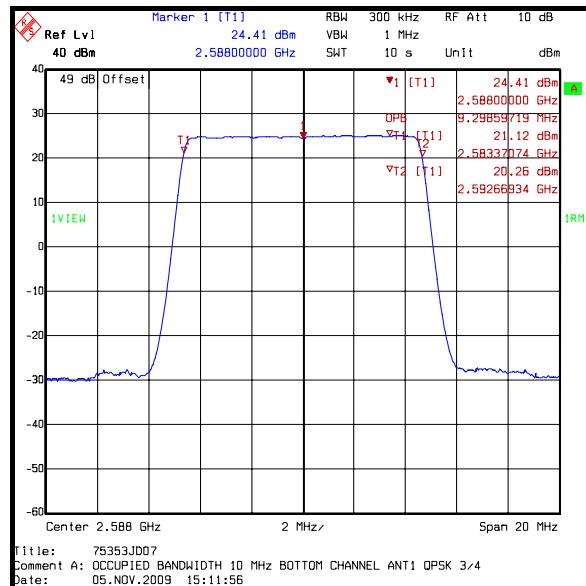
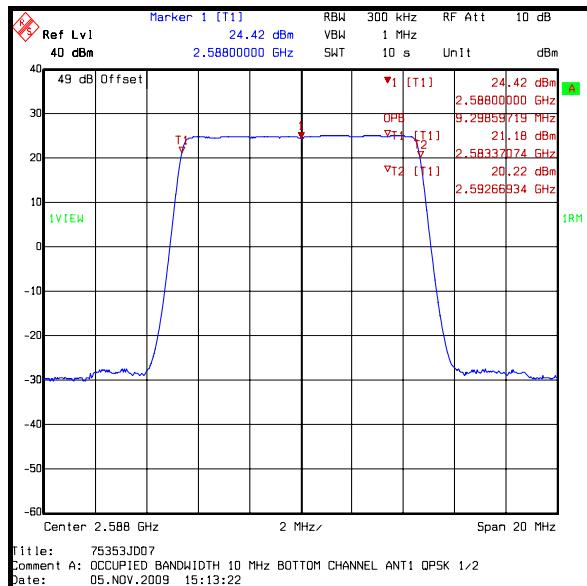
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Top channel / 2687.5 MHz / ANT1 Port:**

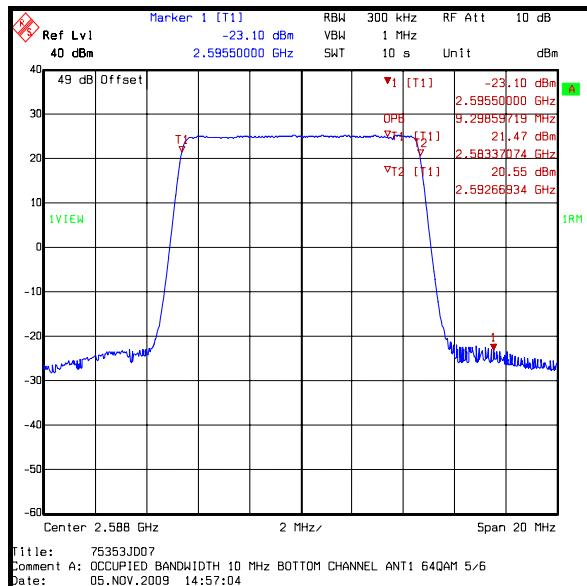
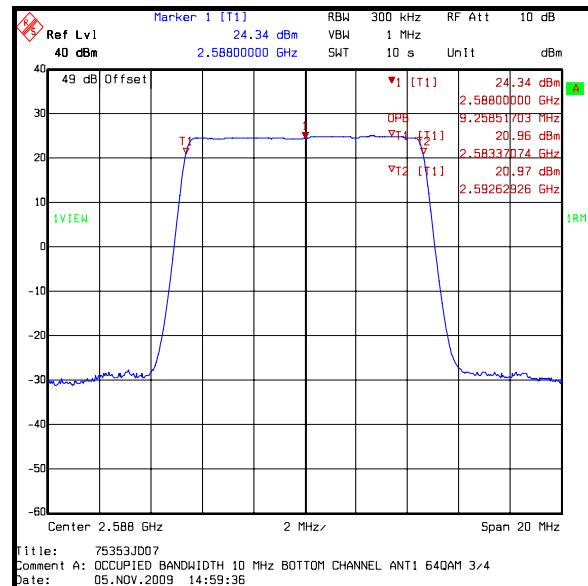
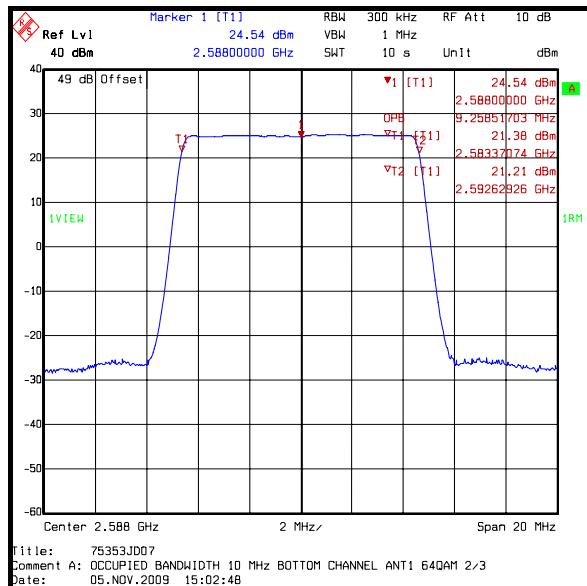
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Top channel / 2687.5 MHz / ANT1 Port:**

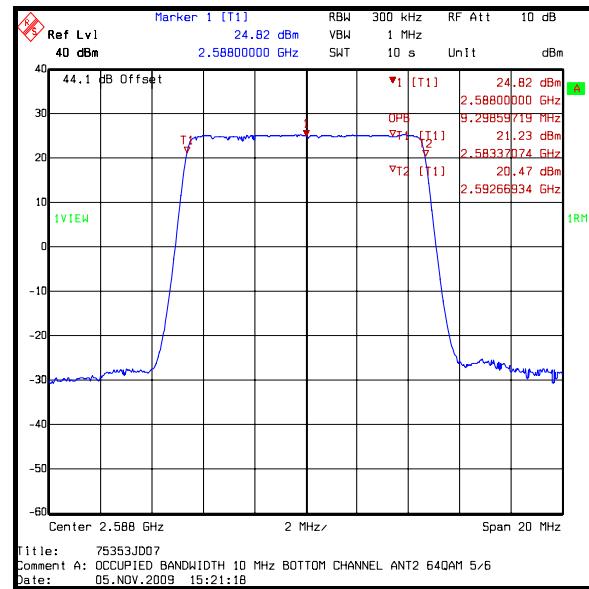
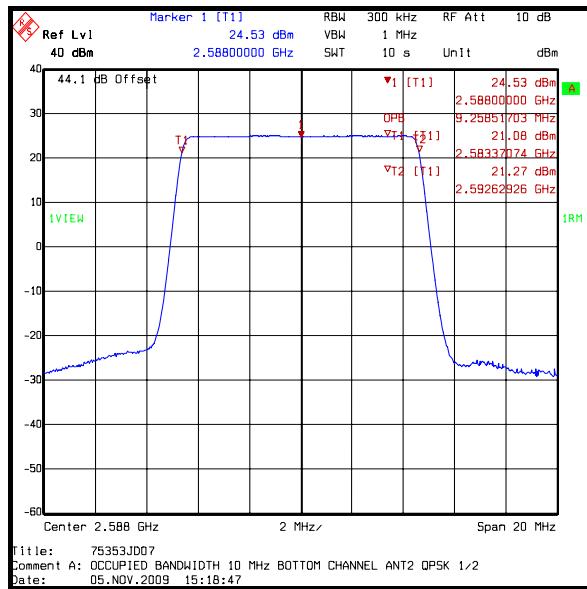
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****5 MHz Bandwidth / Top channel / 2687.5 MHz / ANT2 Port**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****Results: 10 MHz Bandwidth / Bottom channel / 2588 MHz**

Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK 1/2	ANT1	300	1000	9.298597
QPSK 3/4	ANT1	300	1000	9.298597
16QAM 1/2	ANT1	300	1000	9.258517
16QAM 3/4	ANT1	300	1000	9.258517
64QAM 2/3	ANT1	300	1000	9.258517
64QAM 3/4	ANT1	300	1000	9.258517
64QAM 5/6	ANT1	300	1000	9.298597
QPSK 1/2	ANT2	300	1000	9.258517
64QAM 5/6	ANT2	300	1000	9.298597

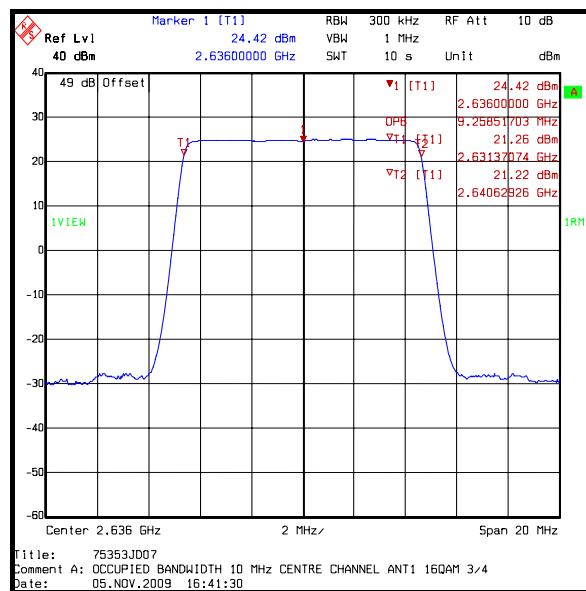
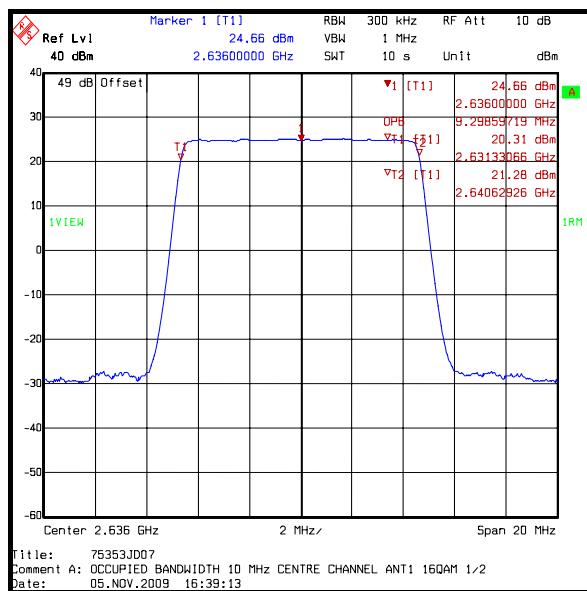
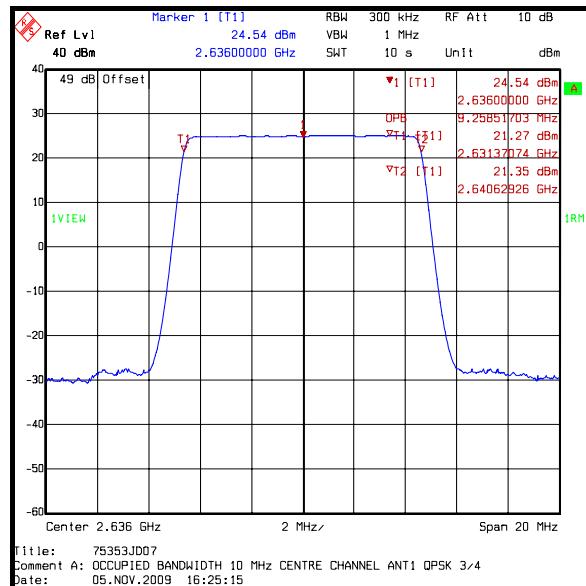
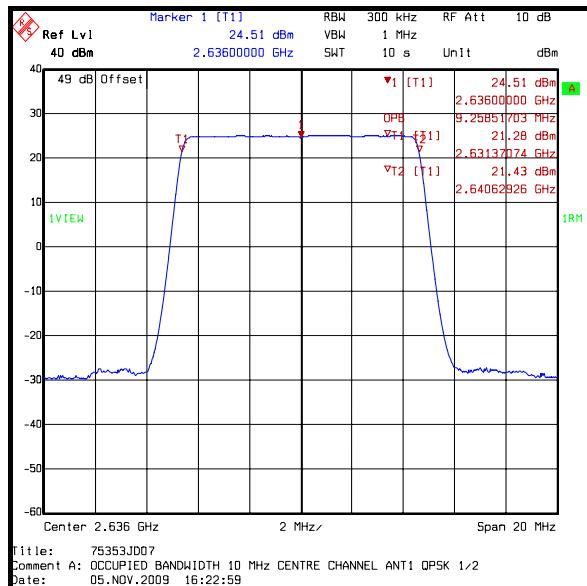
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Bottom channel / 2588 MHz / ANT1 Port**

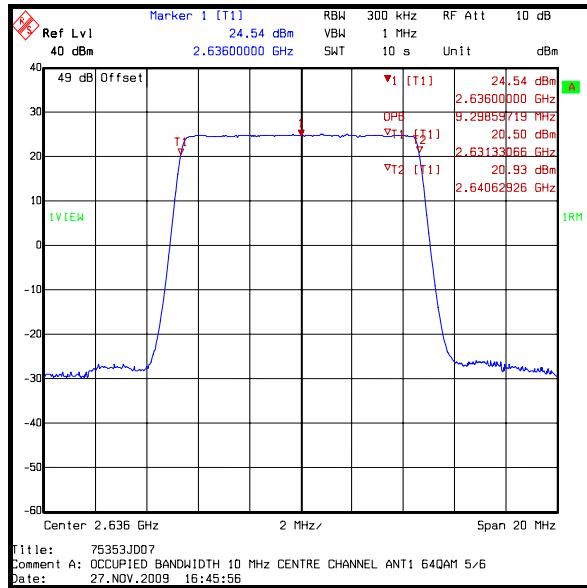
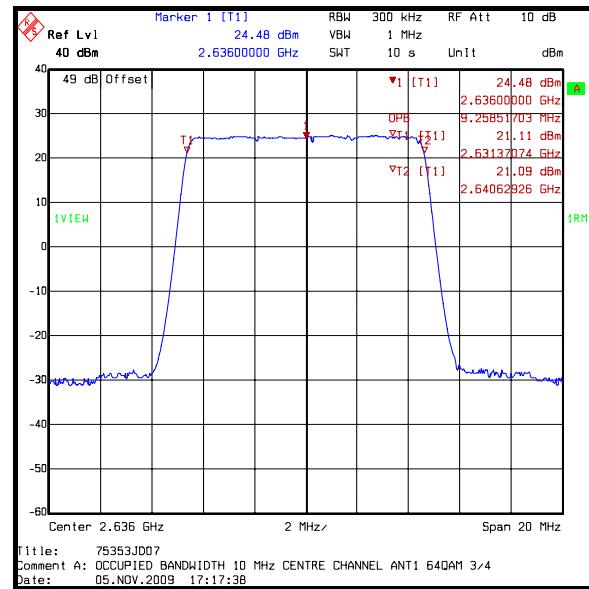
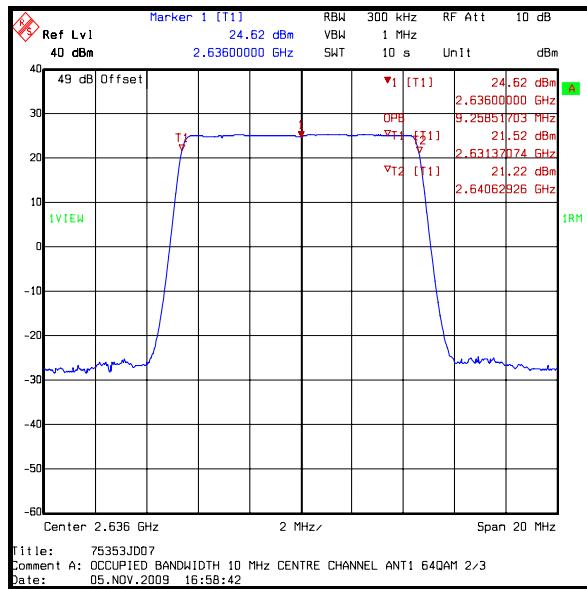
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Bottom channel / 2588 MHz / ANT1 Port**

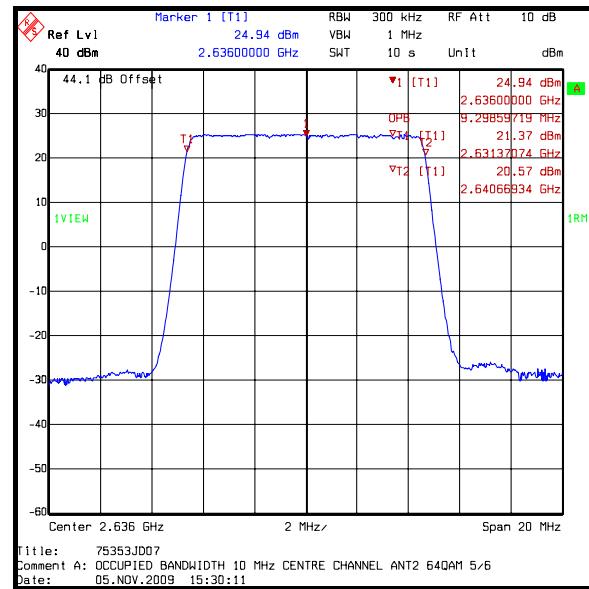
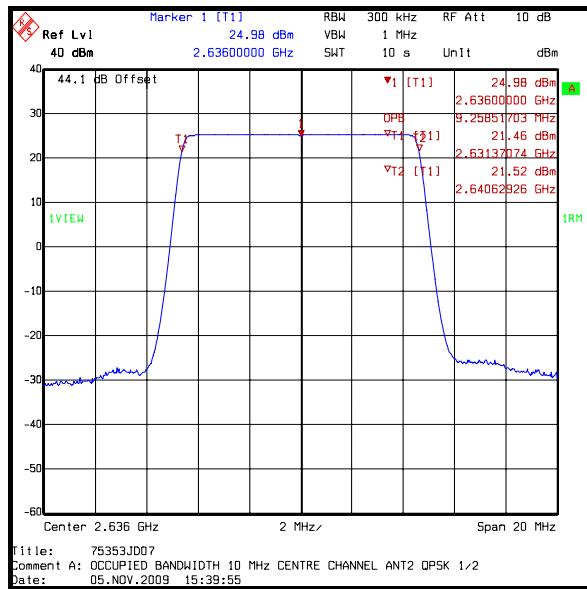
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Bottom channel / 2588 MHz / ANT2 Port**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****Results: 10 MHz Bandwidth / Centre channel / 2636 MHz:**

Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK 1/2	ANT1	300	1000	9.298517
QPSK 3/4	ANT1	300	1000	9.298517
16QAM 1/2	ANT1	300	1000	9.298597
16QAM 3/4	ANT1	300	1000	9.298517
64QAM 2/3	ANT1	300	1000	9.298517
64QAM 3/4	ANT1	300	1000	9.298517
64QAM 5/6	ANT1	300	1000	9.298597
QPSK 1/2	ANT2	300	1000	9.258517
64QAM 5/6	ANT2	300	1000	9.298597

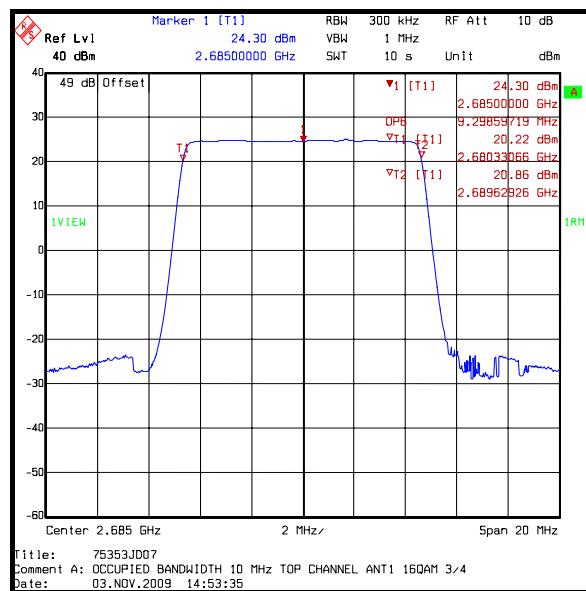
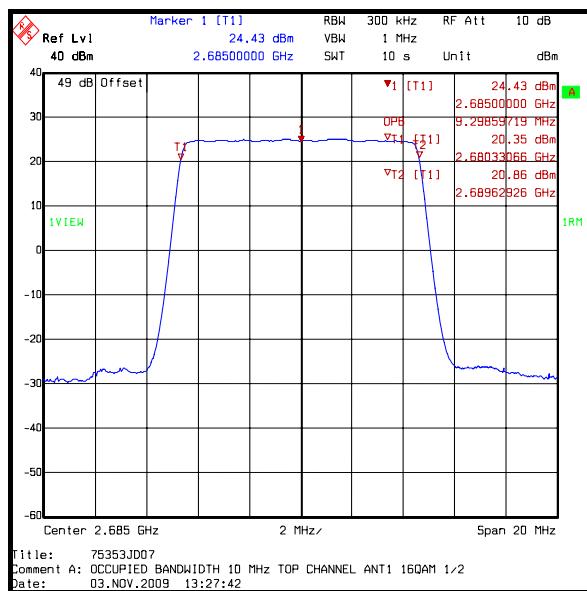
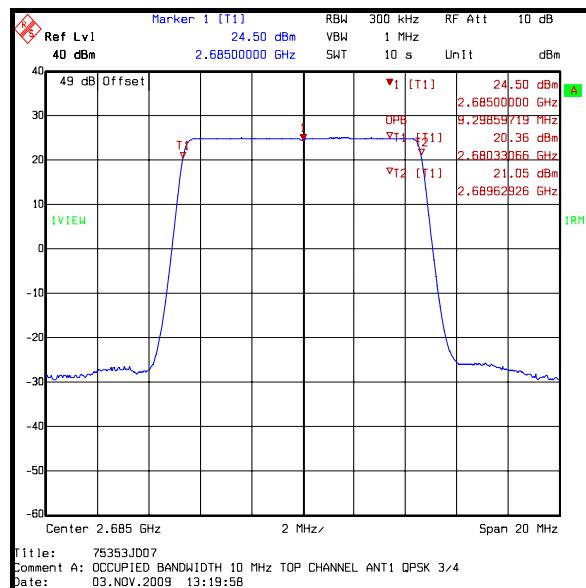
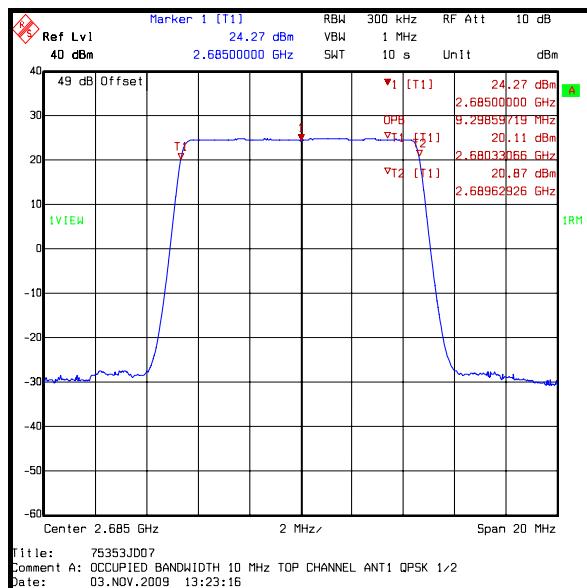
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Centre channel / 2636 MHz / ANT1 Port**

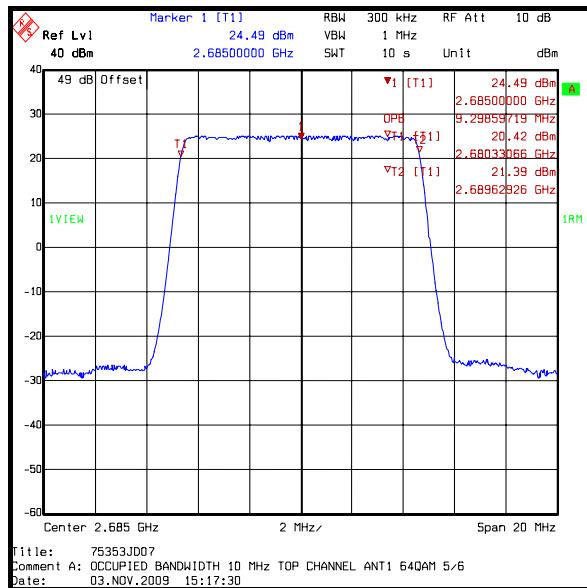
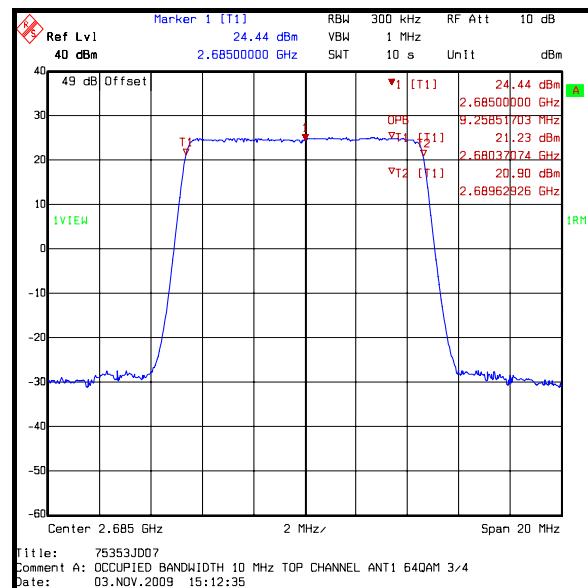
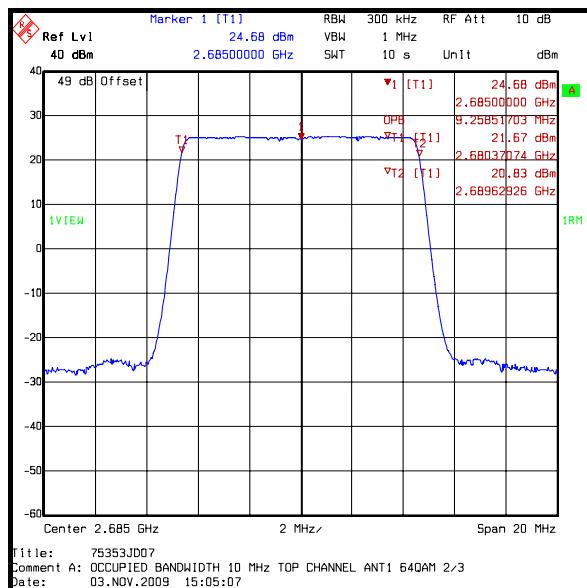
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Centre channel / 2636 MHz / ANT1 Port**

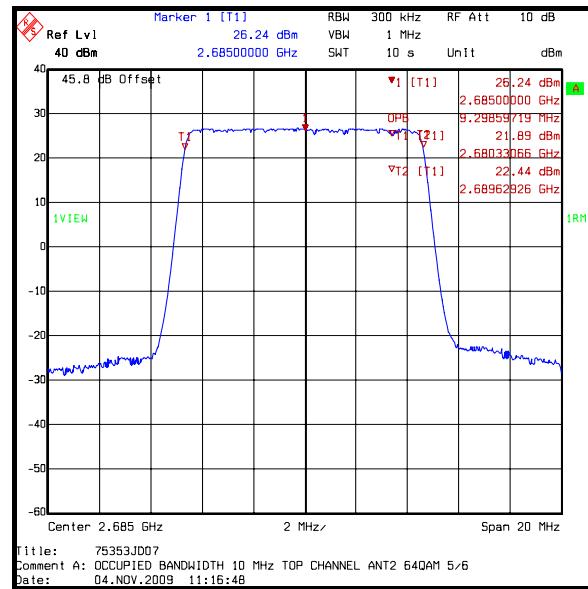
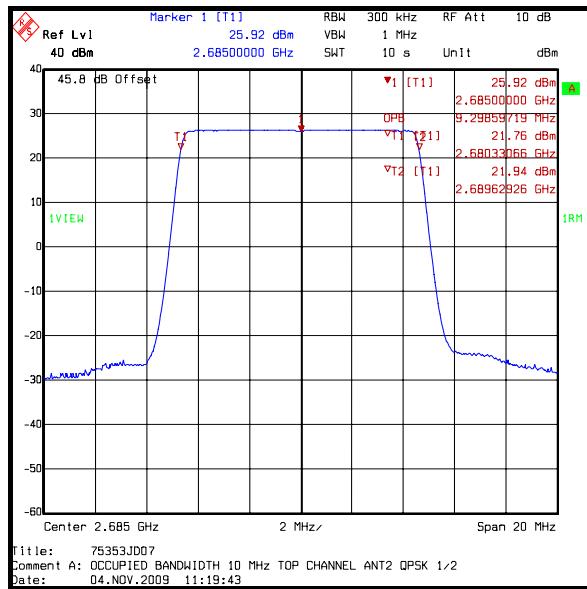
**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Centre channel / 2636 MHz / ANT2 Port**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****Results: 10 MHz Bandwidth / Top channel / 2685 MHz:**

Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK 1/2	ANT1	300	1000	9.298597
QPSK 3/4	ANT1	300	1000	9.298597
16QAM 1/2	ANT1	300	1000	9.298597
16QAM 3/4	ANT1	300	1000	9.298597
64QAM 2/3	ANT1	300	1000	9.298517
64QAM 3/4	ANT1	300	1000	9.298517
64QAM 5/6	ANT1	300	1000	9.298597
QPSK 1/2	ANT2	300	1000	9.298597
64QAM 5/6	ANT2	300	1000	9.298597

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Top channel / 2685 MHz / ANT1 Port**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Top channel / 2685 MHz / ANT1 Port**

**Transmitter Occupied Bandwidth: Part 2.1049 (continued)****10 MHz Bandwidth / Top channel / 2685 MHz / ANT2 Port**

**5.2.7. Transmitter 26dB Bandwidth****Test Summary:**

<b>FCC Part:</b>	27.53(m)(6)
<b>Test Method Used:</b>	As detailed in ANSI C63.4 Section 13.1.7 and relevant annexes.

**Environmental Conditions:**

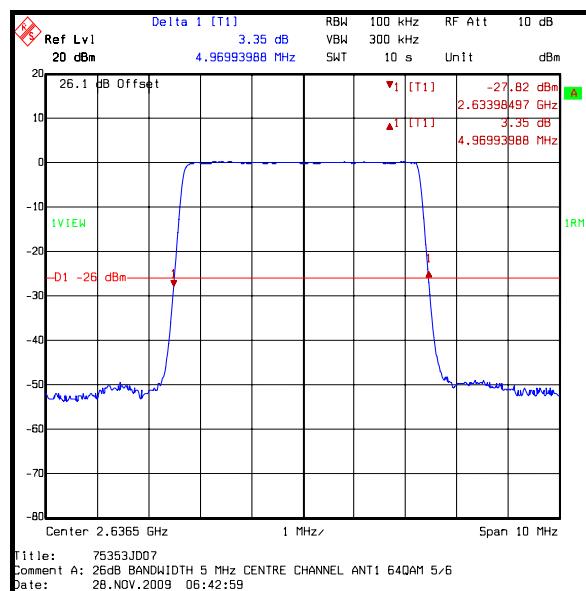
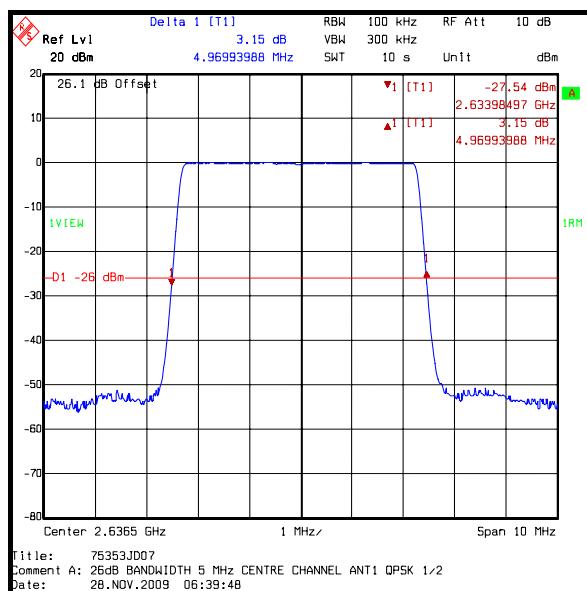
<b>Temperature (°C):</b>	22
<b>Relative Humidity (%):</b>	39

**Note(s):**

1. The EUT was configured to transmit at a maximum power on both supported channel bandwidths.
2. Packet data transmission was increased on the downlink until the EUT maximum power and bandwidth had been obtained. Measurements were performed at this point.
3. Measurement bandwidth was set to >1% of the emission bandwidth. Video bandwidth was set to three times the emission bandwidth or as close to three times the emission bandwidth as the spectrum analyser allows.
4. 20 dB bandwidth tests were previously performed on all modulation types and all channels. No noticeable difference was observed in the 20 dB bandwidth on any channel or modulation type. Therefore 6dB bandwidth tests were only performed on the centre channels using QPSK 1/2 and 64QAM 5/6 modulation.

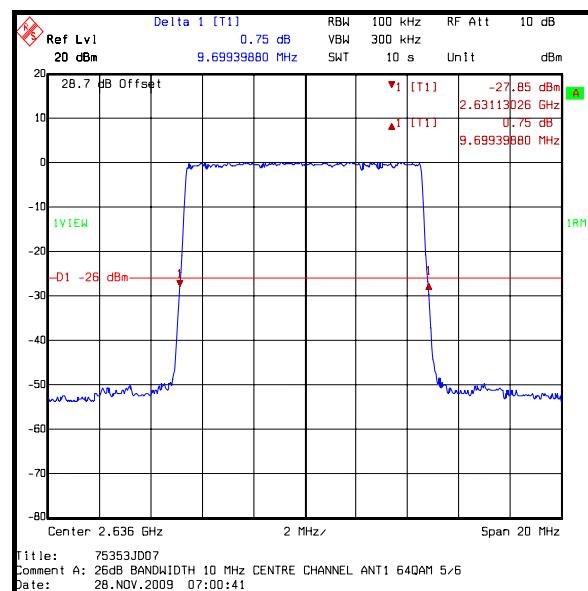
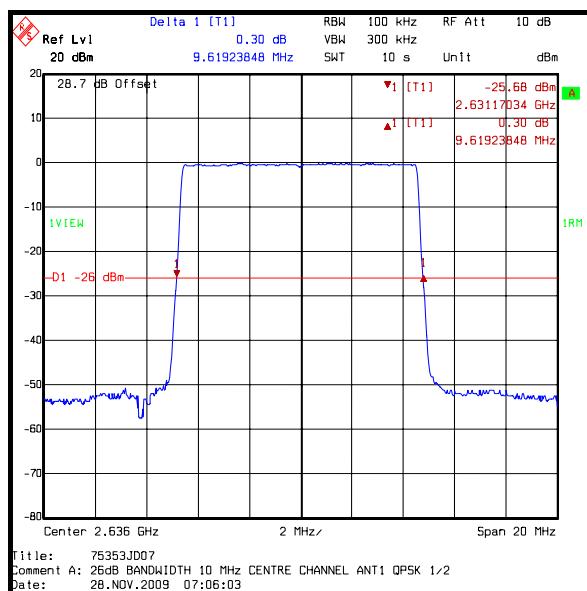
**Transmitter 26dB Bandwidth (continued)****Results: 5 MHz Channel Bandwidth / Centre channel / 2636.5 MHz / ANT1 Port**

Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	26dB Bandwidth (MHz)
QPSK 1/2	ANT1	100	300	4.969940
64QAM 5/6	ANT1	100	300	4.969940



**Transmitter 26dB Bandwidth (continued)****Results: 10 MHz Channel Bandwidth / Centre channel / 2545 MHz / ANT1 Port**

Modulation	Port	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	26 dB Bandwidth (MHz)
QPSK 1/2	ANT1	100	300	9.619238
64QAM 5/6	ANT1	100	300	9.699399



**5.2.8. Transmitter Frequency Stability (Temperature Variation)****Test Summary:**

<b>FCC Part:</b>	FCC 2.1055(a)(1) and FCC 27.54
<b>Test Method Used:</b>	FCC 2.1055(a)(1) – Centre frequency was measured and compared to the upper or lower authorised frequency band. The margin to the limit was recorded

**Environmental Conditions:**

<b>Temperature Variation (°C):</b>	23
<b>Relative Humidity (%):</b>	54

**Limits:**

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

**Results:**

Temperature (°C)	Measured Frequency (MHz) at -20 dB edge	Band Edge (MHz)	△ Upper -20 dB edge to upper Band edge point (kHz)	Result
-30	2689.751753	2690	248.247	Complied
-20	2689.752348	2690	247.652	Complied
-10	2689.752326	2690	247.674	Complied
0	2689.752764	2690	247.236	Complied
10	2689.752120	2690	247.880	Complied
20	2689.752484	2690	247.516	Complied
30	2689.753892	2690	246.108	Complied
40	2689.754454	2690	245.546	Complied
50	2689.754547	2690	245.453	Complied

**5.2.9. Transmitter Frequency Stability (Voltage Variation)****Test Summary:**

<b>FCC Part:</b>	FCC 2.1055 and FCC 27.54
<b>Test Method Used:</b>	FCC 2.1055(a)(1) – Centre frequency was measured and compared to the upper or lower authorised frequency band. The margin to the limit was recorded

**Environmental Conditions:**

<b>Temperature Variation (°C):</b>	23
<b>Relative Humidity (%):</b>	42

**Results:**

<b>Supply voltage (VDC)</b>	<b>Measured Frequency (MHz) at -20 dB edge</b>	<b>Band Edge (MHz)</b>	<b>Δ Upper -20 dB edge to upper Band edge point (kHz)</b>	<b>Result</b>
-40.5	2689.752574	2690	247.426	Complied
-48	2689.752484	2690	247.516	Complied
-55.5	2689.753012	2690	246.988	Complied

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

<b>FCC Part:</b>	FCC 2.1051 and FCC Part 27.53(m)
<b>Test Method Used:</b>	FCC Part 27.53(m)(6) & EIA/TIA-6030C 2.2.13.1, 2.2.13.2(d)

**Environmental Conditions:**

<b>Temperature (°C):</b>	21 to 24
<b>Relative Humidity (%):</b>	36 to 45

**Note(s):**

1. Measurements were made on the ANT1 and ANT2 ports. Individual attenuators and directional couplers were connected to both ports. The through paths of both directional couplers were connected to a subscriber station main and diversity ports by cables and additional attenuation. The coupled path of each directional coupler was connected to the measurement equipment by suitable RF cables. The path loss between antenna ports and measurement equipment was used as an RF level offset on the measurement equipment.
2. Pre-scans were performed with a peak detector. The EUT was transmitting a 5 MHz channel and QPSK 1/2 modulation at maximum power with packet data transmitted on the downlink at the maximum supported rate. All modulation types were checked on both EUT RF ports and both supported channel widths.
3. Final measurements were performed using appropriate RF attenuators and filters where required.
4. Any other emissions shown on the pre-scan plots were investigated and found to be >20dB below the applicable limit or below the level of the measurement system noise floor.

**Limits:**

Frequency Range	Applicable limit	Limit (dBm)
30 MHz to 26.9 GHz	$43 + 10 \log (P)$	-13.0

**Transmitter Conducted Emissions (continued)****Results: Bottom Channel (10 MHz Bandwidth)**

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5179.707415	-43.0	-13.0	20.0	Complied

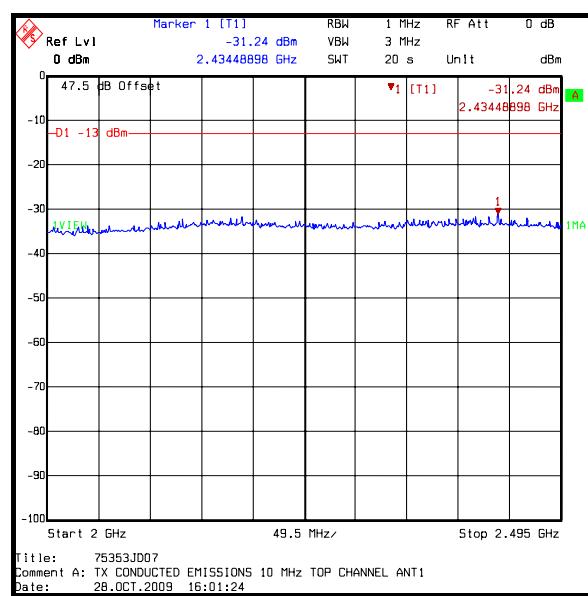
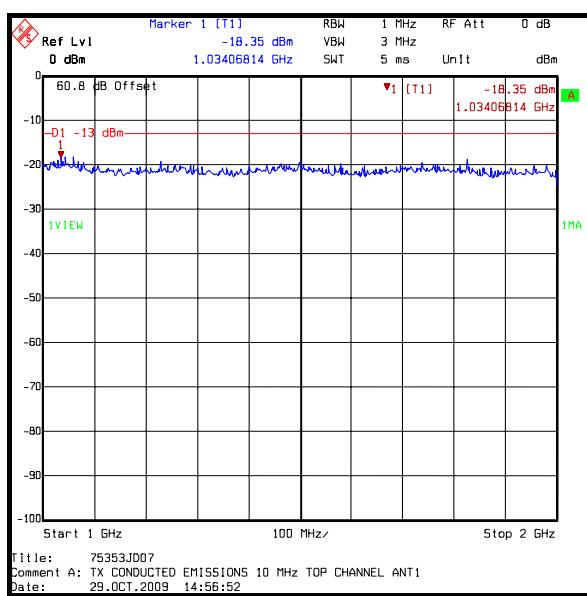
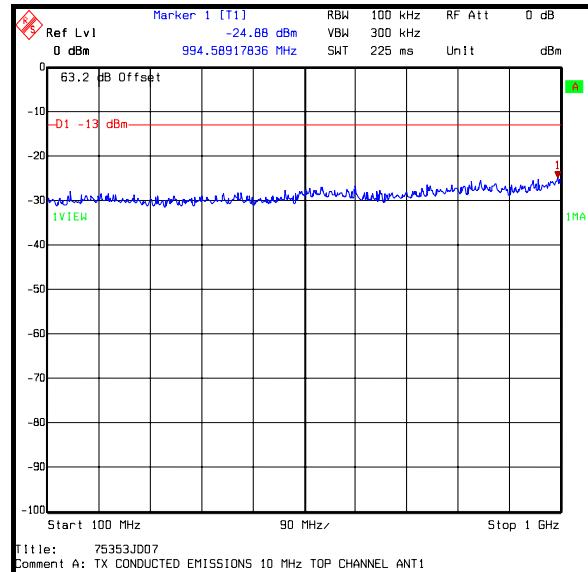
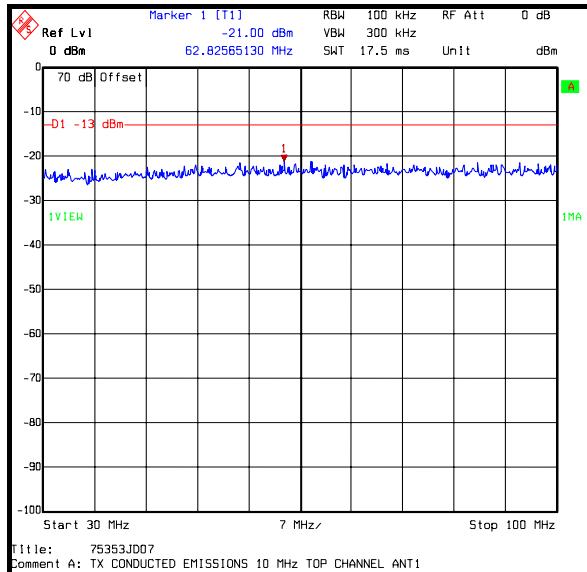
**Results: Centre Channel (10 MHz Bandwidth)**

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5267.691383	-39.7	-13.0	26.7	Complied

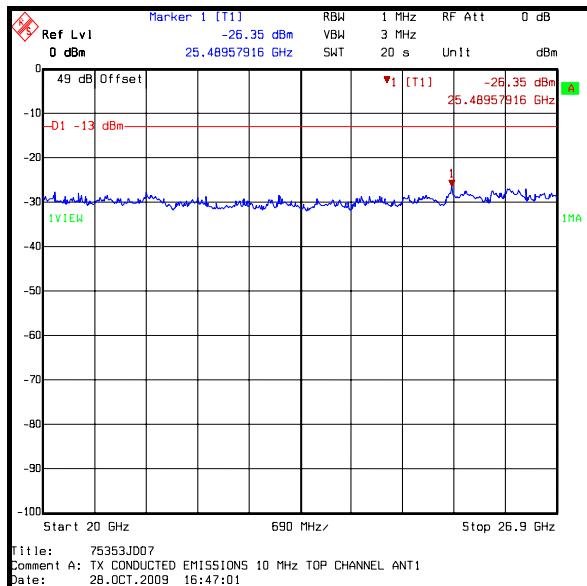
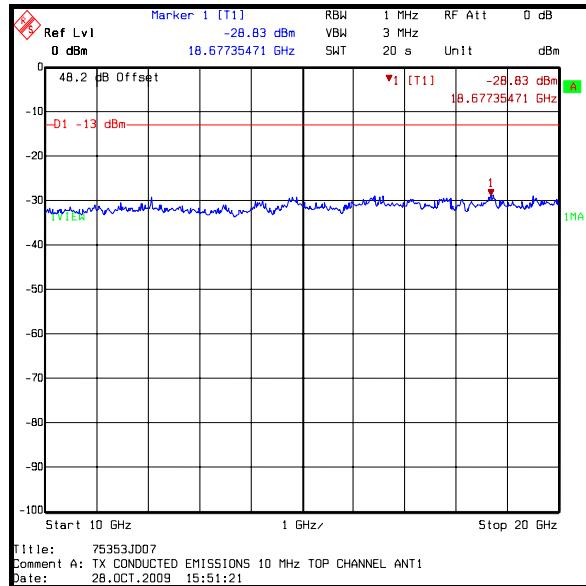
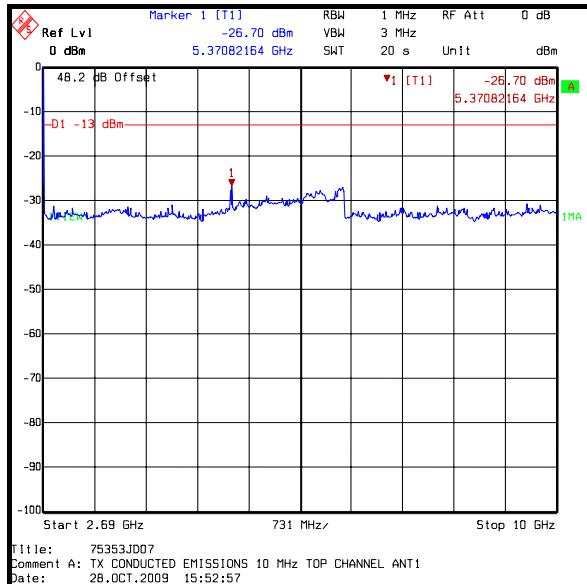
**Results: Top Channel (10 MHz Bandwidth)**

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5366.042082	-41.9	-13.0	28.9	Complied

## Transmitter Conducted Emissions (continued)

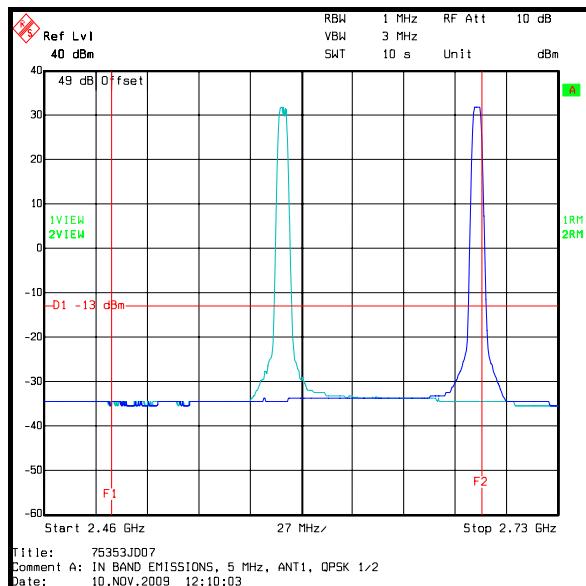


## Transmitter Conducted Emissions (continued)



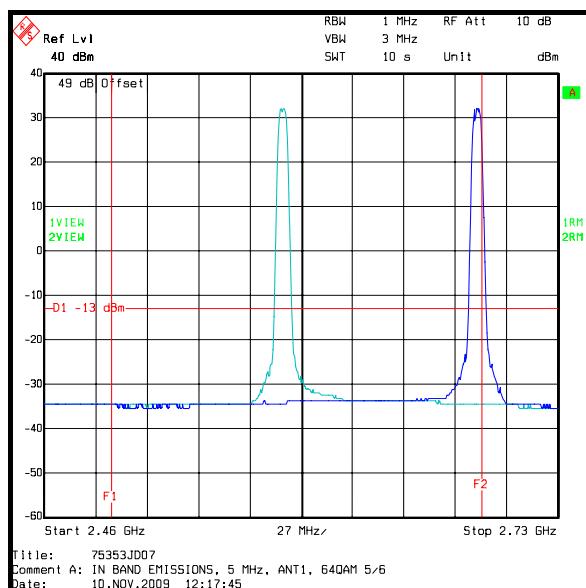
**Transmitter Conducted Emissions (continued)****Results: In band emissions 5 MHz channel width / ANT1 Port / QPSK 1/2**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 5 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2585.5 MHz and the test repeated with the EUT transmitting on the top channel at 2687.5 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



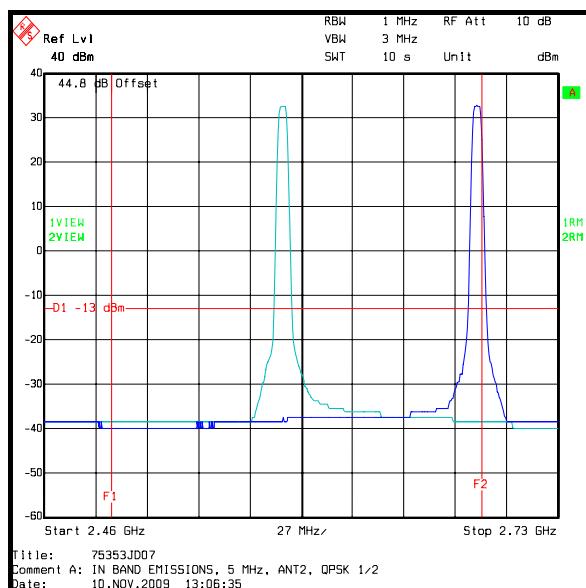
**Transmitter Conducted Emissions (continued)****Results: In band emissions 5 MHz channel width / ANT1 Port / 64QAM 5/6**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 5 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2585.5 MHz and the test repeated with the EUT transmitting on the top channel at 2687.5 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



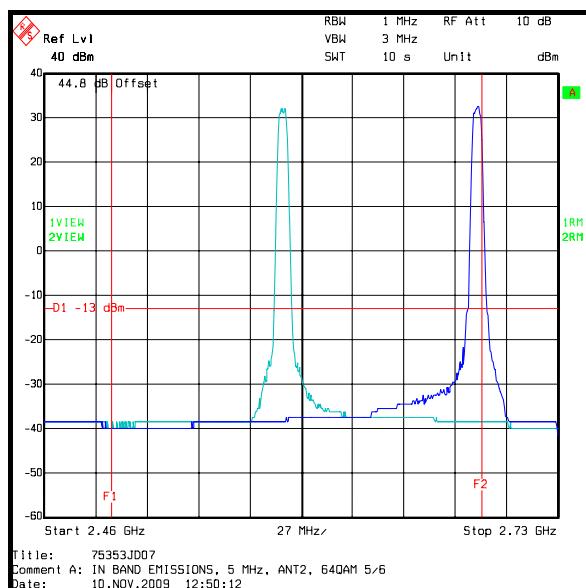
**Transmitter Conducted Emissions (continued)****Results: In band emissions 5 MHz channel width / ANT2 Port / QPSK 1/2**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 5 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2585.5 MHz and the test repeated with the EUT transmitting on the top channel at 2687.5 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



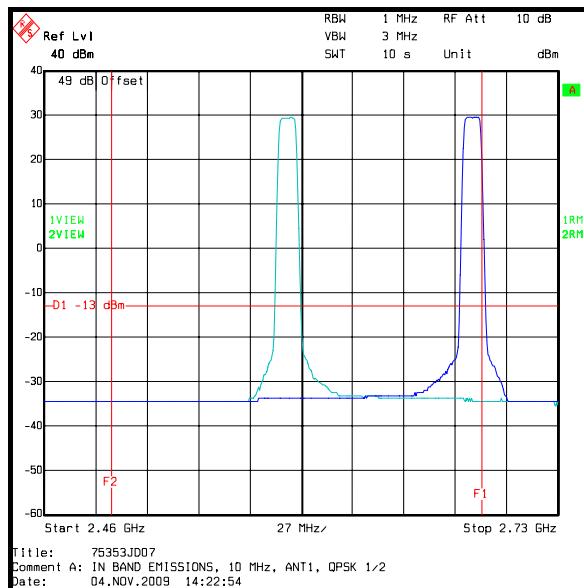
**Transmitter Conducted Emissions (continued)****Results: In band emissions 5 MHz channel width / ANT2 Port / 64QAM 5/6**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 5 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2585.5 MHz and the test repeated with the EUT transmitting on the top channel at 2687.5 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



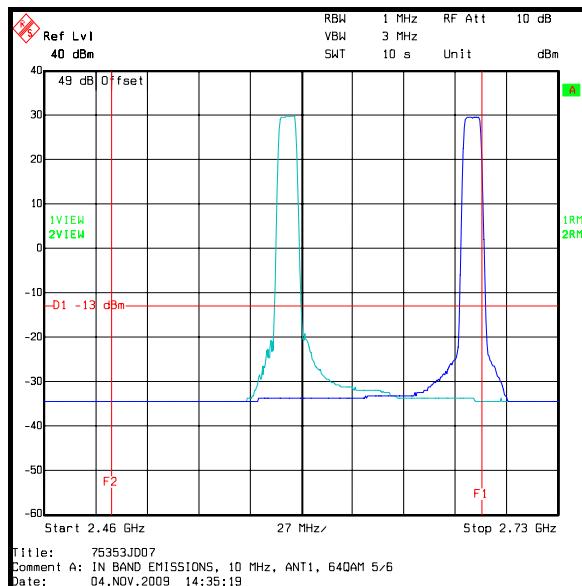
**Transmitter Conducted Emissions (continued)****Results: In band emissions 10 MHz channel width / ANT1 Port / QPSK 1/2**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 10 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2588 MHz and the test repeated with the EUT transmitting on the top channel at 2685 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



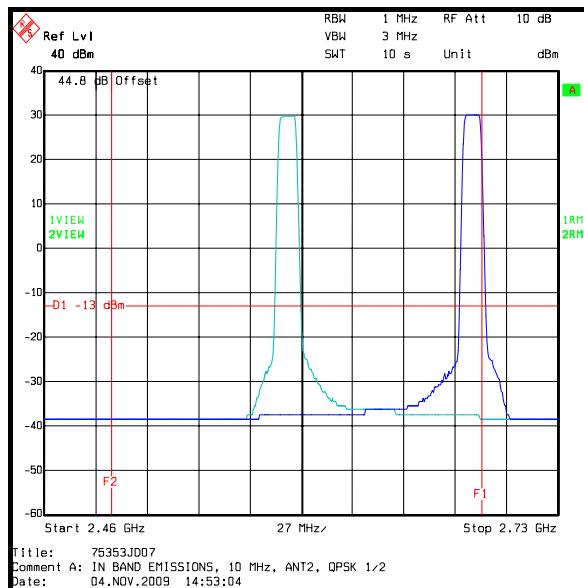
**Transmitter Conducted Emissions (continued)****Results: In band emissions 10 MHz channel width / ANT1 Port / 64QAM 5/6**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 10 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2588 MHz and the test repeated with the EUT transmitting on the top channel at 2685 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



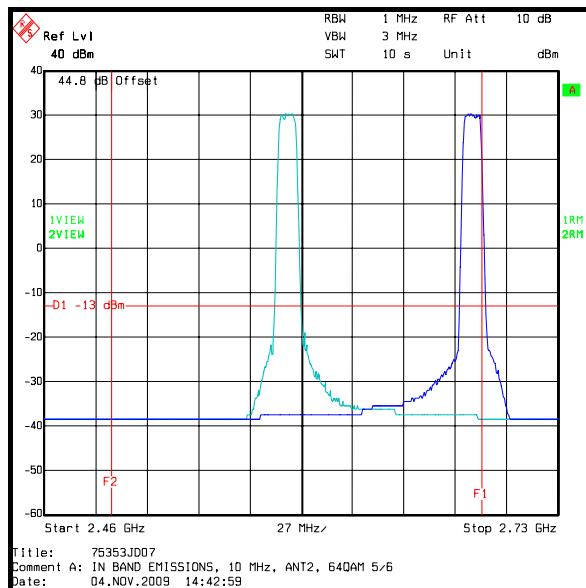
**Transmitter Conducted Emissions (continued)****Results: In band emissions 10 MHz channel width / ANT2 Port / QPSK 1/2**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 10 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2588 MHz and the test repeated with the EUT transmitting on the top channel at 2685 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



**Transmitter Conducted Emissions (continued)****Results: In band emissions 10 MHz channel width / ANT2 Port / 64QAM 5/6**

The plot below shows the in band emissions with the EUT transmitting on the top and bottom channels using a 10 MHz channel bandwidth. One test was performed with the EUT transmitting on the bottom channel at 2588 MHz and the test repeated with the EUT transmitting on the top channel at 2685 MHz. Both traces were overlaid on the same plot. Frequency lines were placed on the band edges at 2495 MHz and 2690 MHz. The limit line shown on the plots only applies out of band.



### **5.2.11. Transmitter Conducted Emissions at Band Edges**

#### **Test Summary:**

<b>FCC Part:</b>	FCC 2.1051 and FCC Part 27.53
<b>Test Method Used:</b>	ANSI TIA-603-C-2004 referencing FCC CFR Part 2

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	21 to 24
<b>Relative Humidity (%):</b>	35 to 38

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

1. Measurements were made on the ANT1 and ANT2 ports. Individual attenuators and directional couplers were connected to both ports. The through paths of both directional couplers were connected to a subscriber station main and diversity ports by cables and additional attenuation. The coupled path of each directional coupler was connected to the measurement equipment by suitable RF cables. The path loss between antenna ports and measurement equipment was used as an RF level offset on the measurement equipment.
2. The EUT was configured to transmit at maximum power on the top and bottom channels.
3. All modulation types were tested on the ANT1 port. In addition, QPSK 1/2 and 64QAM 5/6 modulations were tested on the ANT2 port in order to show compliance on both ports.
4. Measurements were made with the EUT transmitting a 5 MHz channel and repeated with a 10 MHz channel.
5. The band edge limit is calculated as follows;  $43 + 10\log(P)$  where P is the transmitter power in Watts.
6. Where the bottom or top channel is adjacent to the band edge, additional measurements were made in the 1 MHz band immediately outside and adjacent to the band edge. Measurements in the 1 MHz band were made using the channel power function of a spectrum analyser. Measurement bandwidths were set automatically by the spectrum analyser. Some of the plots show the fundamental emission over the band edge limit, this was on account of the large analyser resolution bandwidth and not the EUT. This is where the channel power function of the analyser helped by properly integrating across the required bandwidth.

#### **Limits:**

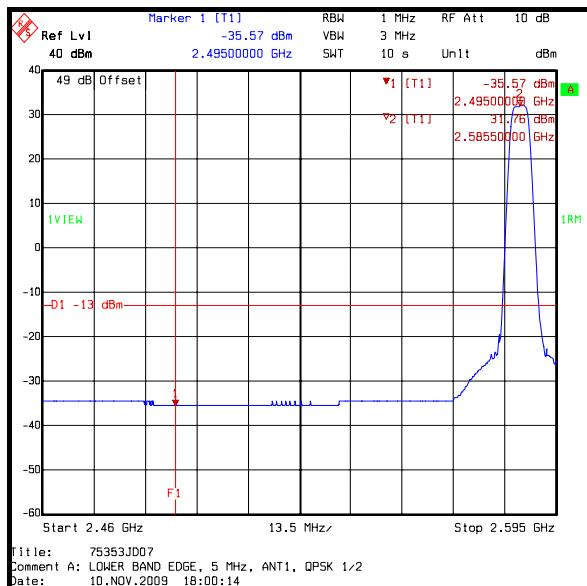
<b>Frequency Range</b>	<b>Applicable limit</b>	<b>Limit (dBm)</b>
30 MHz to 26.9 GHz	$43 + 10 \log(P)$	-13.0

**Transmitter Conducted Emissions at Band Edges (continued)****Results: 5 MHz Bandwidth / Lower Band Edge**

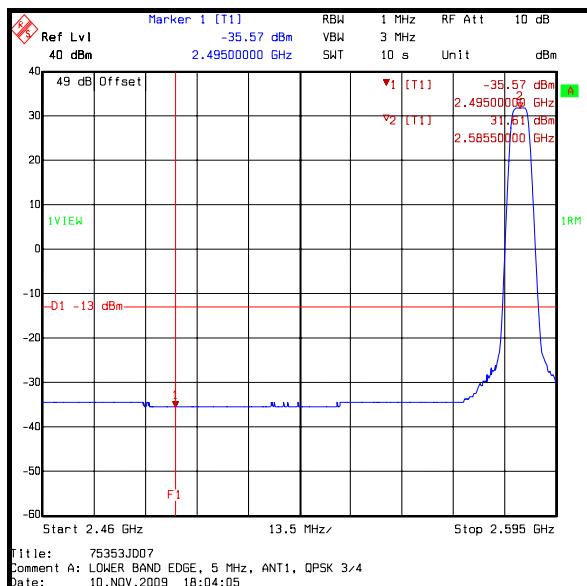
Modulation	Port	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	ANT1	-35.6	-13.0	22.6	Complied
QPSK 3/4	ANT1	-35.6	-13.0	22.6	Complied
16QAM 1/2	ANT1	-35.6	-13.0	22.6	Complied
16QAM 3/4	ANT1	-35.6	-13.0	22.6	Complied
64QAM 2/3	ANT1	-35.6	-13.0	22.6	Complied
64QAM 3/4	ANT1	-35.6	-13.0	22.6	Complied
64QAM 5/6	ANT1	-35.6	-13.0	22.6	Complied
QPSK 1/2	ANT2	-40.0	-13.0	27.0	Complied
64QAM 5/6	ANT2	-40.0	-13.0	27.0	Complied

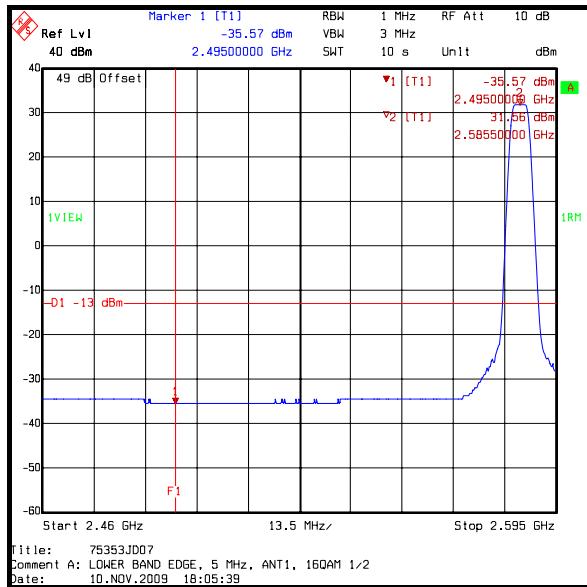
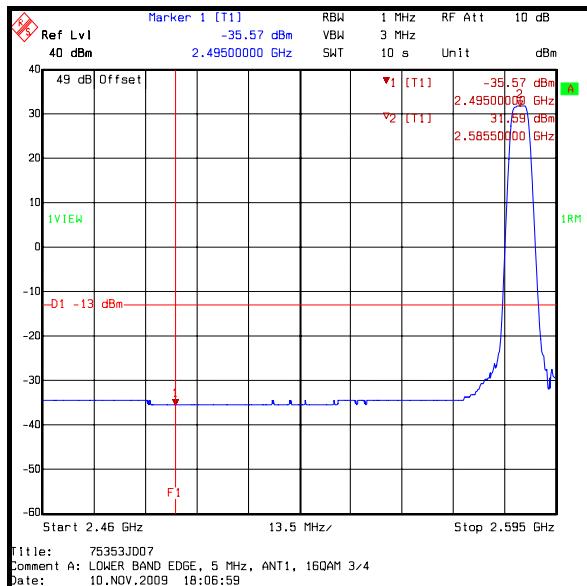
### Transmitter Conducted Emissions at Band Edges (continued)

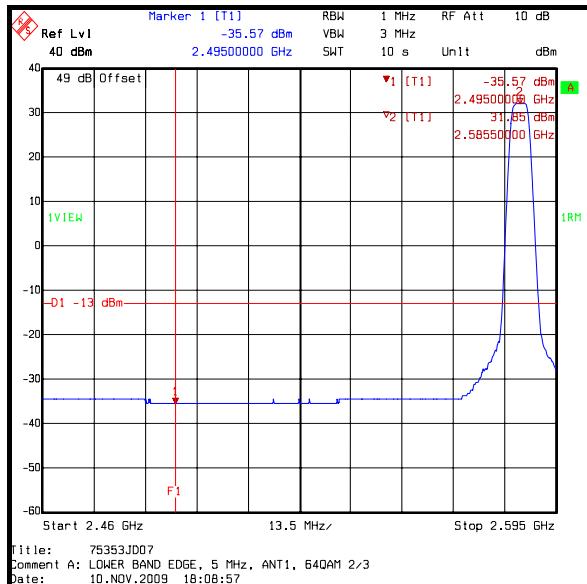
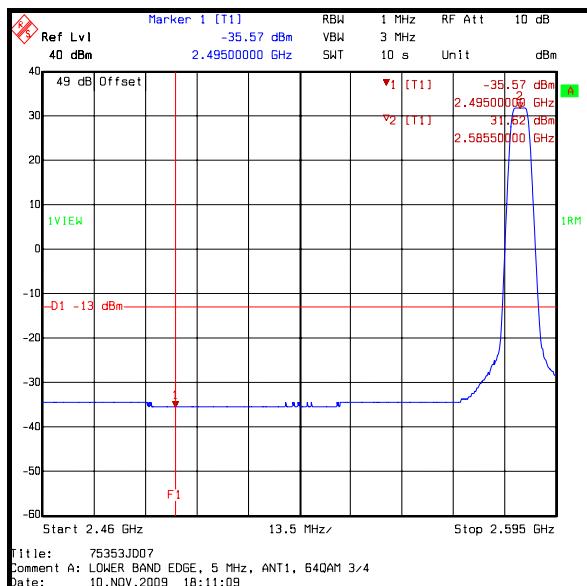
#### 5 MHz Bandwidth / Lower Band Edge / QPSK 1/2 / ANT1 Port

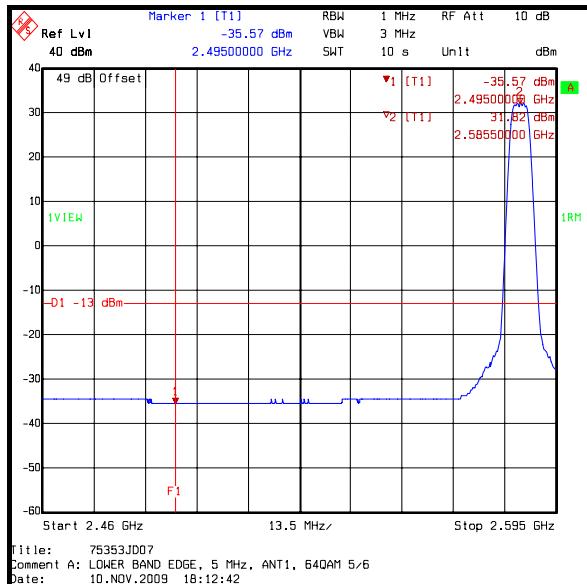
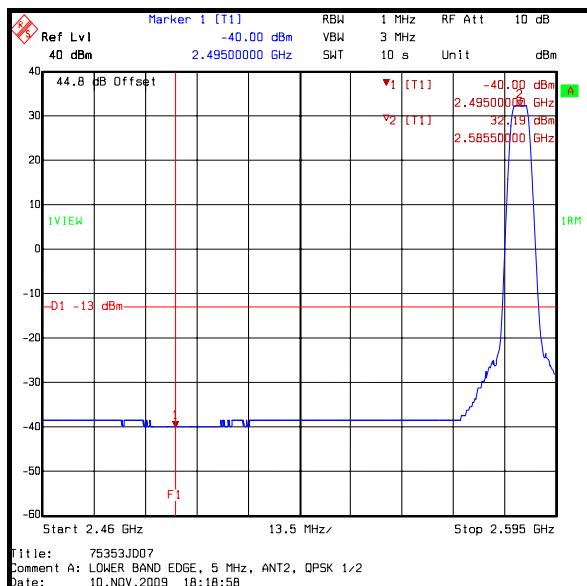


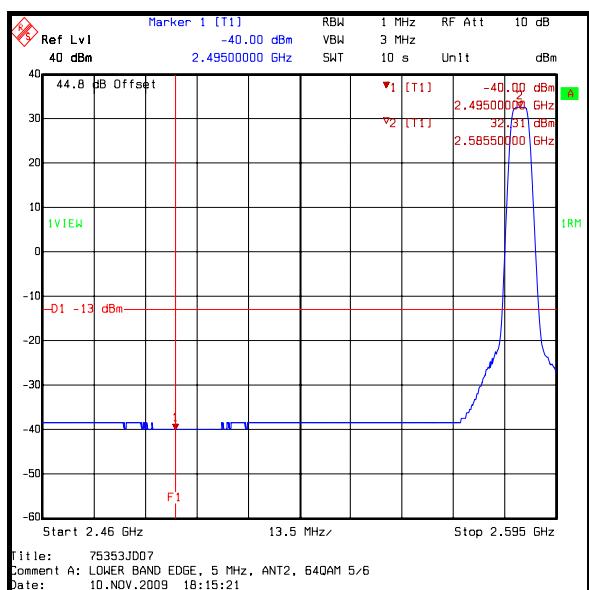
#### 5 MHz Bandwidth / Lower Band Edge / QPSK 3/4 / ANT1 Port



**Transmitter Conducted Emissions at Band Edges (continued)****5 MHz Bandwidth / Lower Band Edge / 16QAM 1/2 / ANT1 Port****5 MHz Bandwidth / Lower Band Edge / 16QAM 3/4 / ANT1 Port**

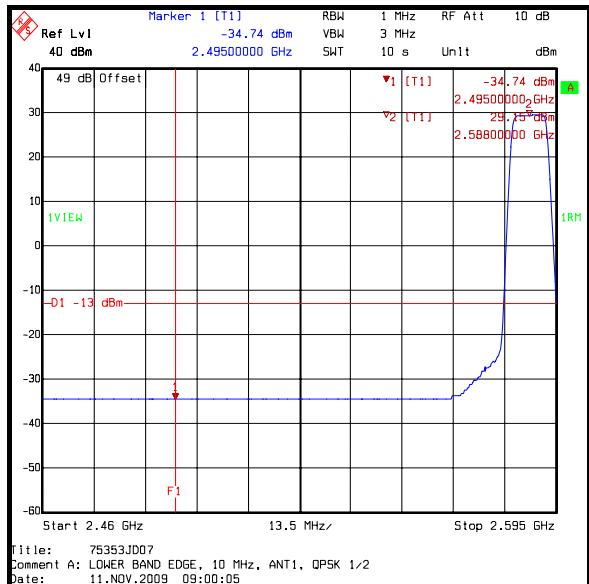
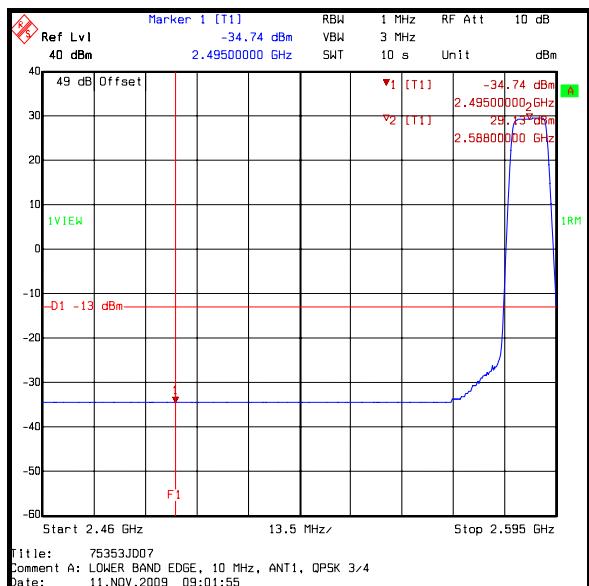
**Transmitter Conducted Emissions at Band Edges (continued)****5 MHz Bandwidth / Lower Band Edge / 64QAM 2/3 / ANT1 Port****5 MHz Bandwidth / Lower Band Edge / 64QAM 3/4 / ANT1 Port**

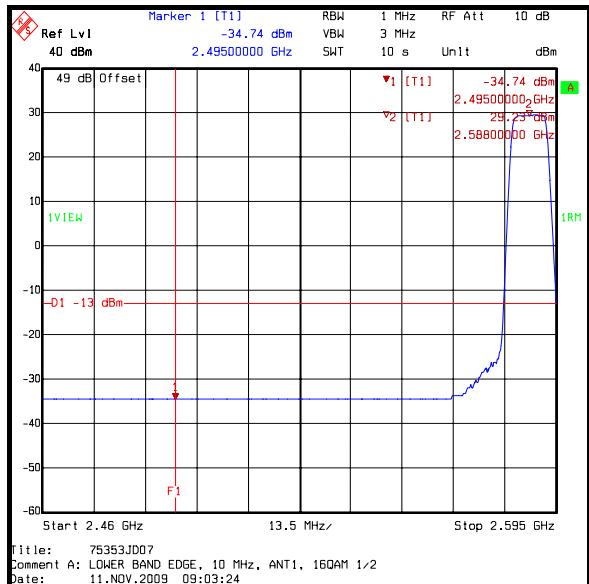
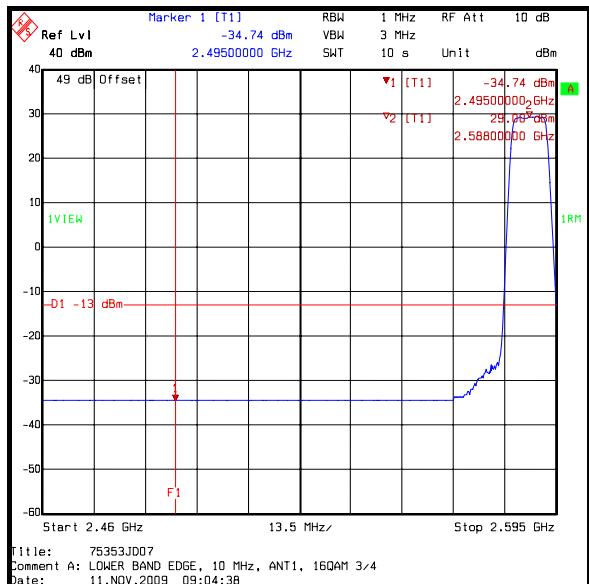
**Transmitter Conducted Emissions at Band Edges (continued)****5 MHz Bandwidth / Lower Band Edge / 64QAM 5/6 / ANT1 Port****5 MHz Bandwidth / Lower Band Edge / QPSK 1/2 / ANT2 Port**

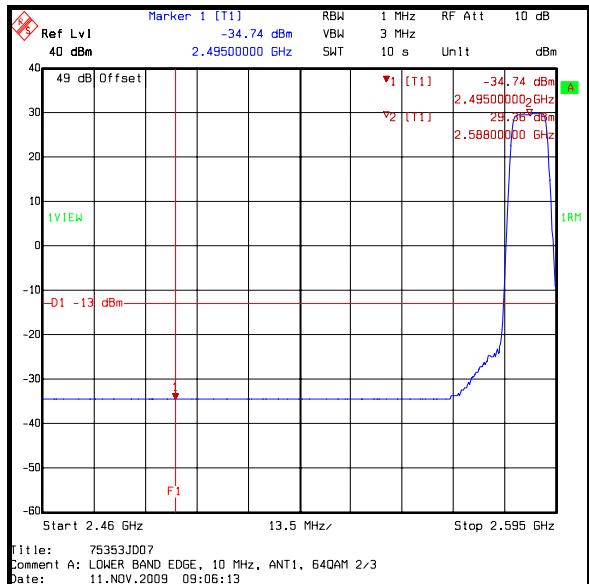
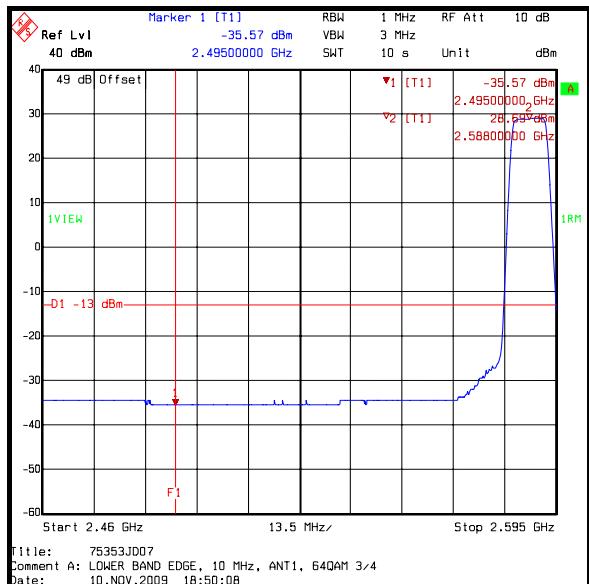
**Transmitter Conducted Emissions at Band Edges (continued)****5 MHz Bandwidth / Lower Band Edge / 64QAM 5/6 / ANT2 Port**

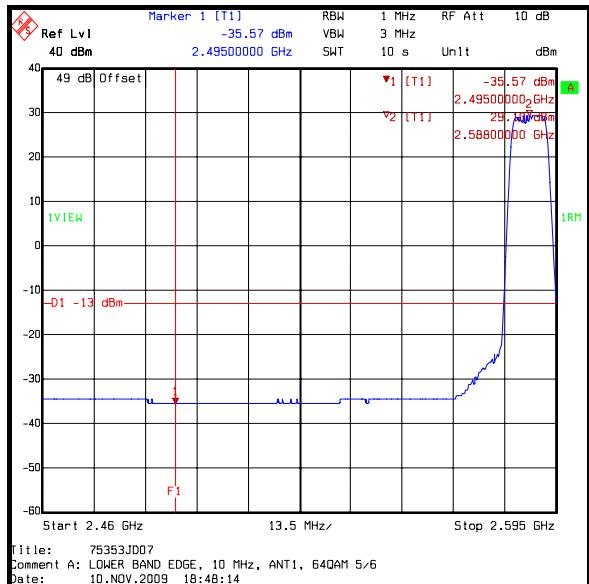
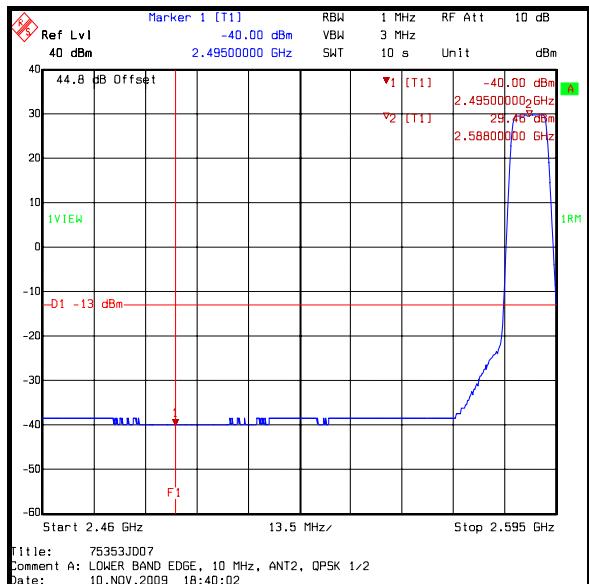
**Transmitter Conducted Emissions at Band Edges (continued)****Results: 10 MHz Bandwidth / Lower Band Edge**

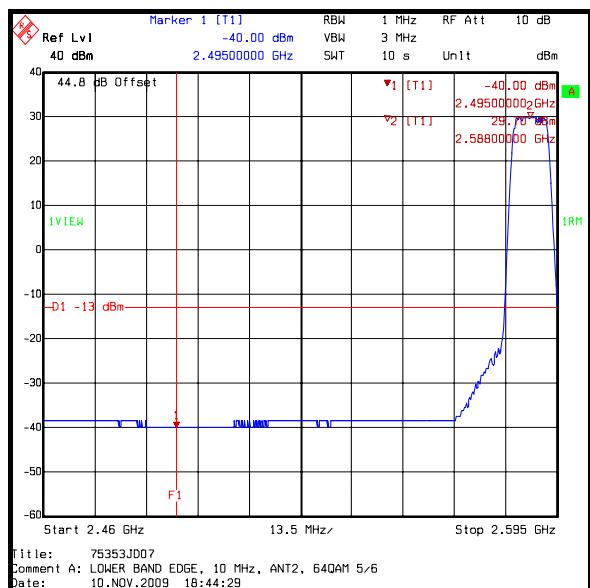
Modulation	Port	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	ANT1	-34.7	-13.0	21.7	Complied
QPSK 3/4	ANT1	-34.7	-13.0	21.7	Complied
16QAM 1/2	ANT1	-34.7	-13.0	21.7	Complied
16QAM 3/4	ANT1	-34.7	-13.0	21.7	Complied
64QAM 2/3	ANT1	-34.7	-13.0	21.7	Complied
64QAM 3/4	ANT1	-35.6	-13.0	22.6	Complied
64QAM 5/6	ANT1	-35.6	-13.0	22.6	Complied
QPSK 1/2	ANT2	-40.0	-13.0	27.0	Complied
64QAM 5/6	ANT2	-40.0	-13.0	27.0	Complied

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Lower Band Edge / QPSK 1/2 / ANT1 Port****10 MHz Bandwidth / Lower Band Edge / QPSK 3/4 / ANT1 Port**

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Lower Band Edge / 16QAM 1/2 / ANT1 Port****10 MHz Bandwidth / Lower Band Edge / 16QAM 3/4 / ANT1 Port**

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Lower Band Edge / 64QAM 2/3 / ANT1 Port****10 MHz Bandwidth / Lower Band Edge / 64QAM 3/4 / ANT1 Port**

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Lower Band Edge / 64QAM 5/6 / ANT1 Port****10 MHz Bandwidth / Lower Band Edge / QPSK 1/2 / ANT2 Port**

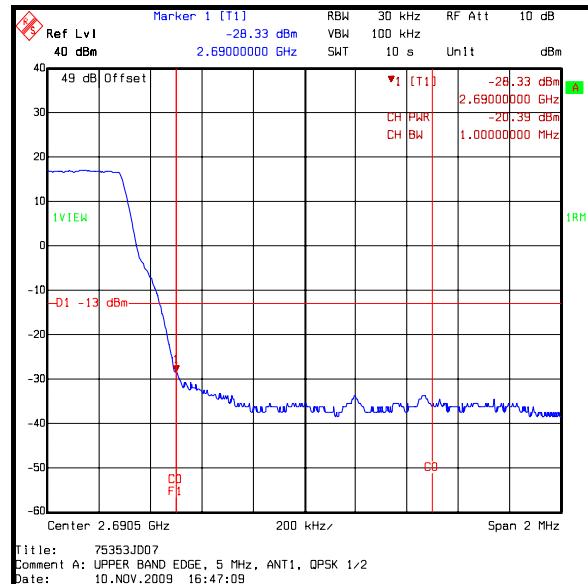
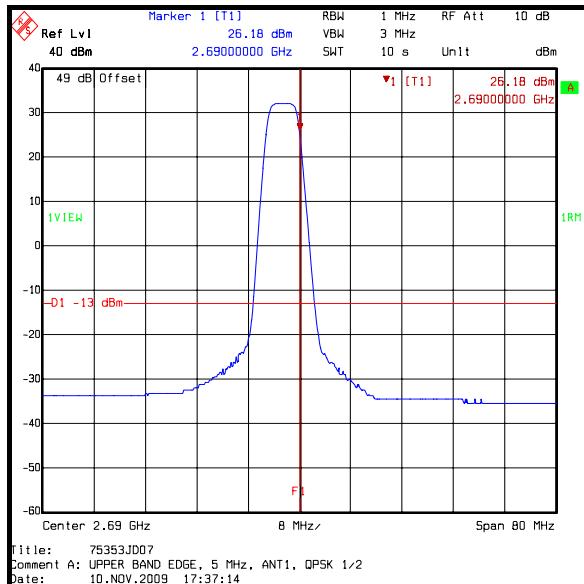
**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Lower Band Edge / 64QAM 5/6 / ANT2 Port**

**Transmitter Conducted Emissions at Band Edges (continued)****Results: 5 MHz Bandwidth / Upper Band Edge**

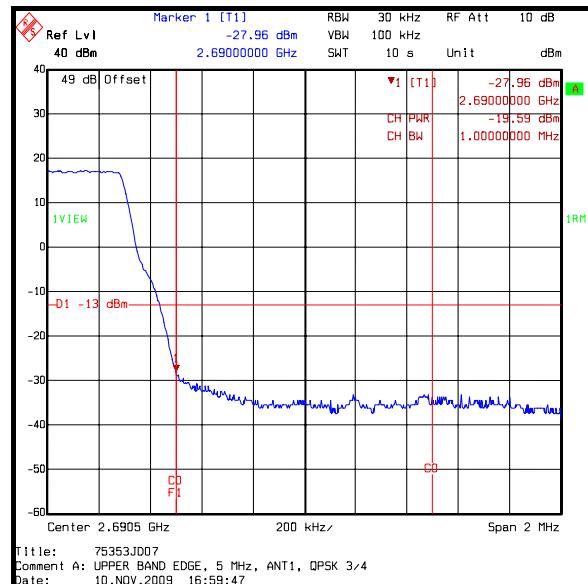
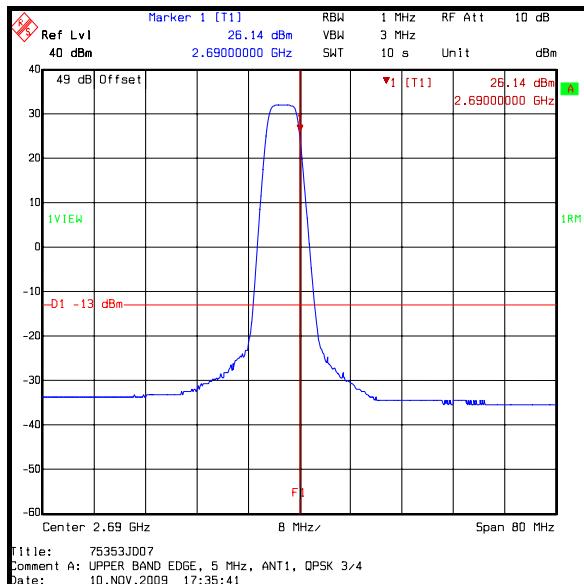
Modulation	Port	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	ANT1	-20.4	-13.0	7.4	Complied
QPSK 3/4	ANT1	-19.6	-13.0	6.6	Complied
16QAM 1/2	ANT1	-19.2	-13.0	6.2	Complied
16QAM 3/4	ANT1	-19.6	-13.0	6.6	Complied
64QAM 2/3	ANT1	-17.1	-13.0	4.1	Complied
64QAM 3/4	ANT1	-19.4	-13.0	6.4	Complied
64QAM 5/6	ANT1	-17.8	-13.0	4.8	Complied
QPSK 1/2	ANT2	-18.1	-13.0	5.1	Complied
64QAM 5/6	ANT2	-17.2	-13.0	4.2	Complied

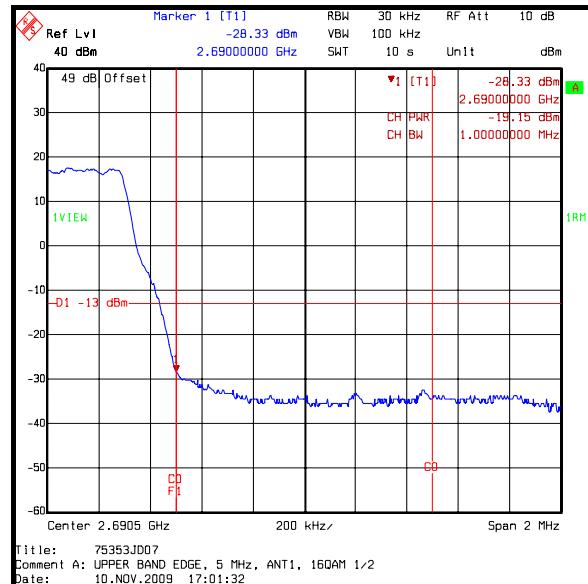
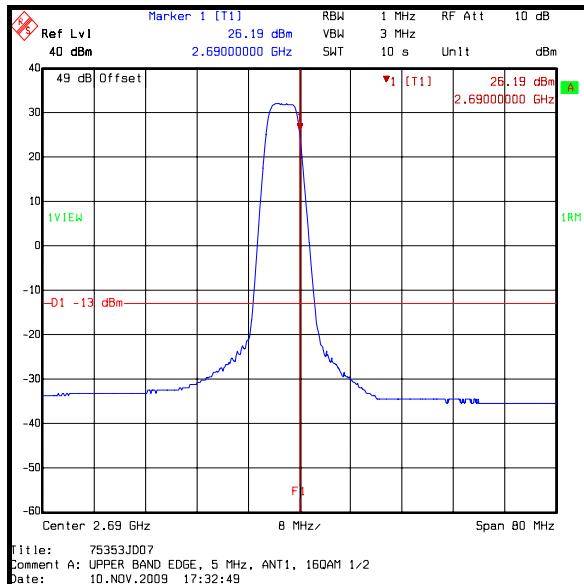
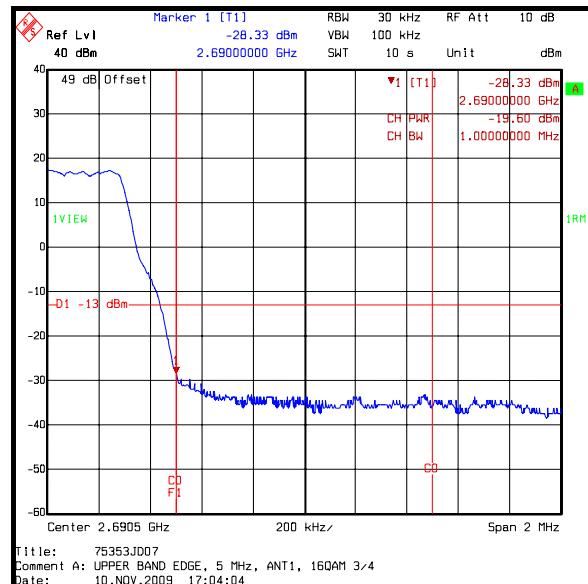
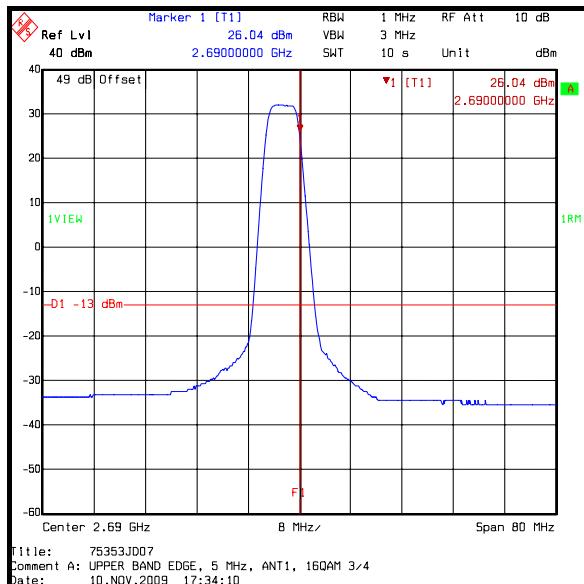
### Transmitter Conducted Emissions at Band Edges (continued)

#### 5 MHz Bandwidth / Upper Band Edge / QPSK 1/2 / ANT1 Port



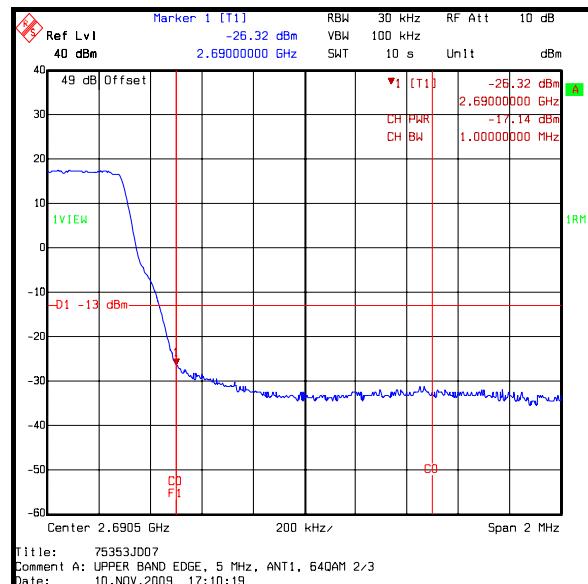
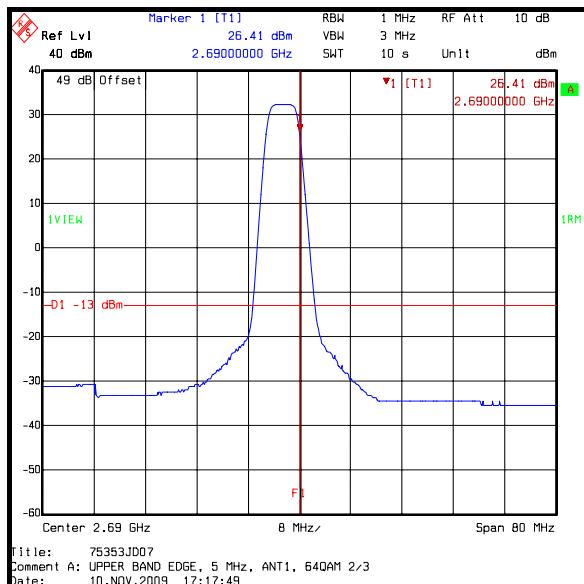
#### 5 MHz Bandwidth / Upper Band Edge / QPSK 3/4 / ANT1 Port



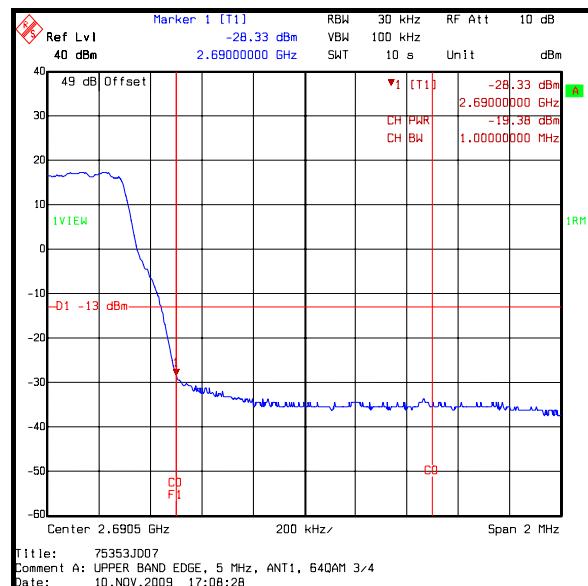
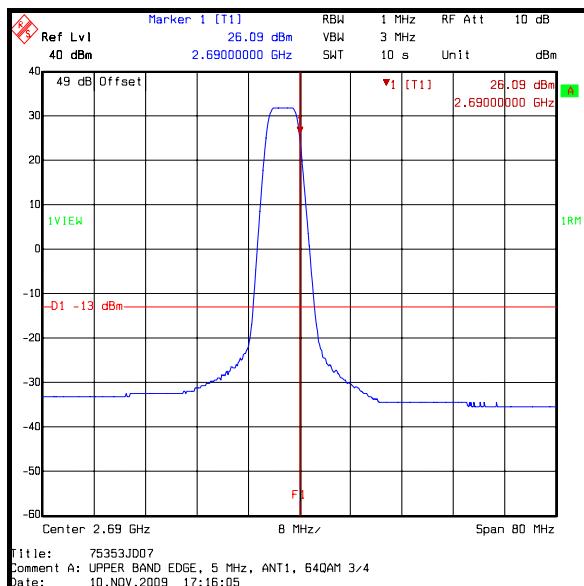
**Transmitter Conducted Emissions at Band Edges (continued)****5 MHz Bandwidth / Upper Band Edge / 16QAM 1/2 / ANT1 Port****5 MHz Bandwidth / Upper Band Edge / 16QAM 3/4 / ANT1 Port**

## Transmitter Conducted Emissions at Band Edges (continued)

### 5 MHz Bandwidth / Upper Band Edge / 64QAM 2/3 / ANT1 Port

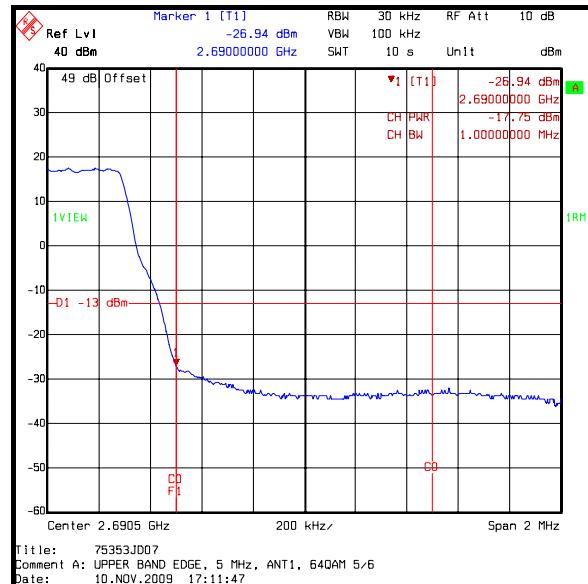
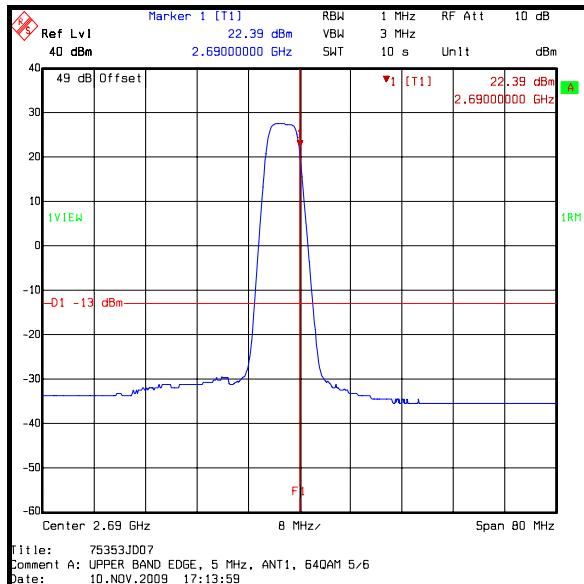


### 5 MHz Bandwidth / Upper Band Edge / 64QAM 3/4 / ANT1 Port

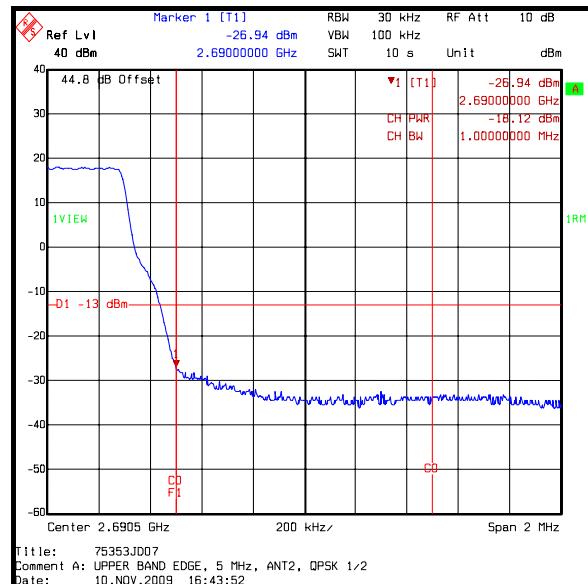
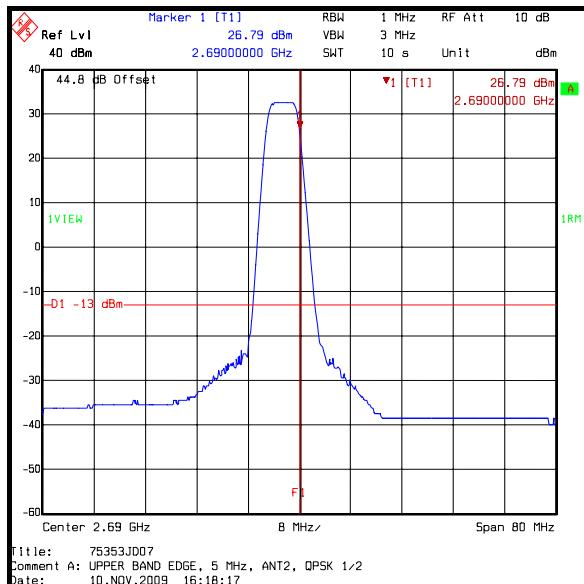


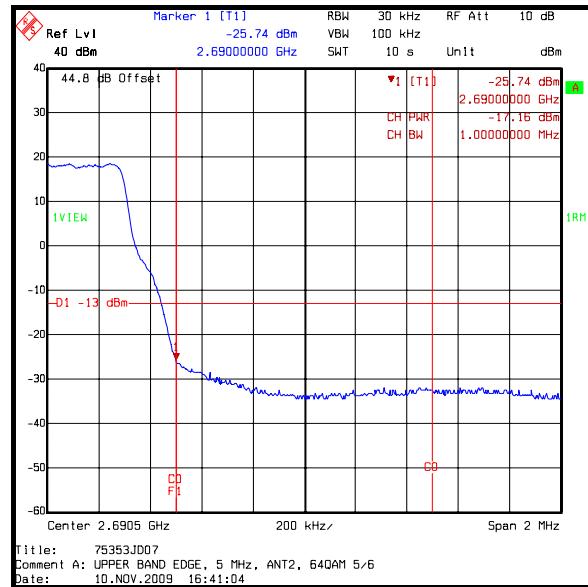
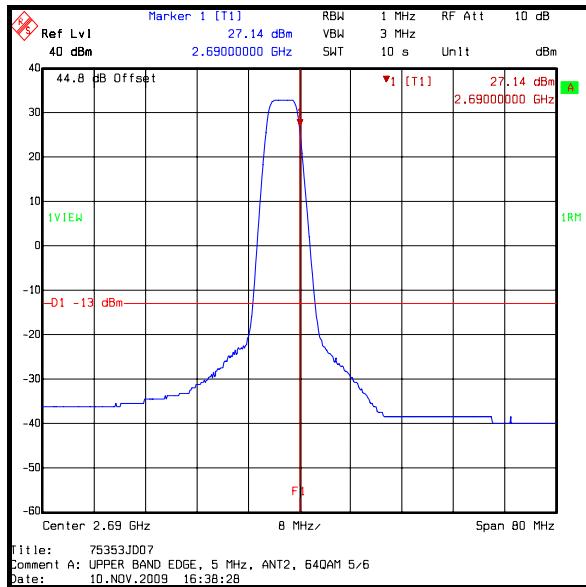
## Transmitter Conducted Emissions at Band Edges (continued)

### 5 MHz Bandwidth / Upper Band Edge / 64QAM 5/6 / ANT1 Port



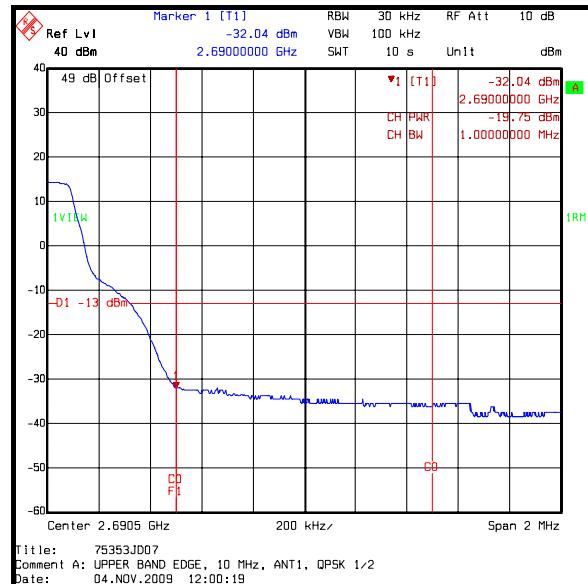
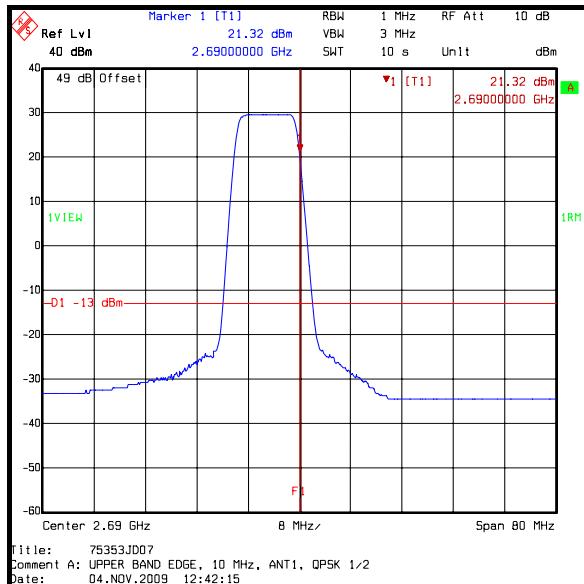
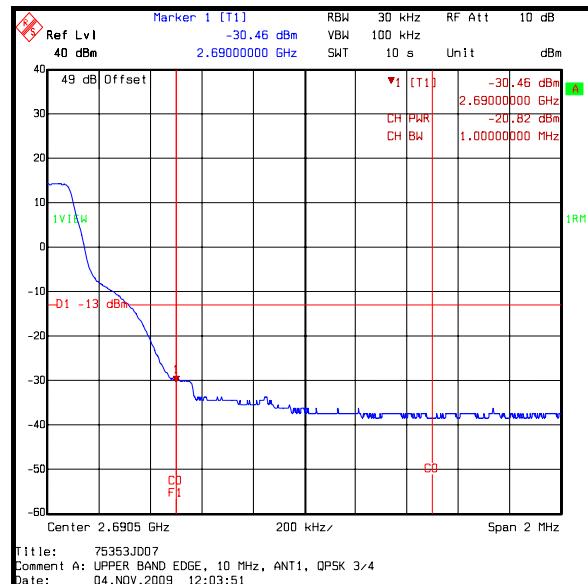
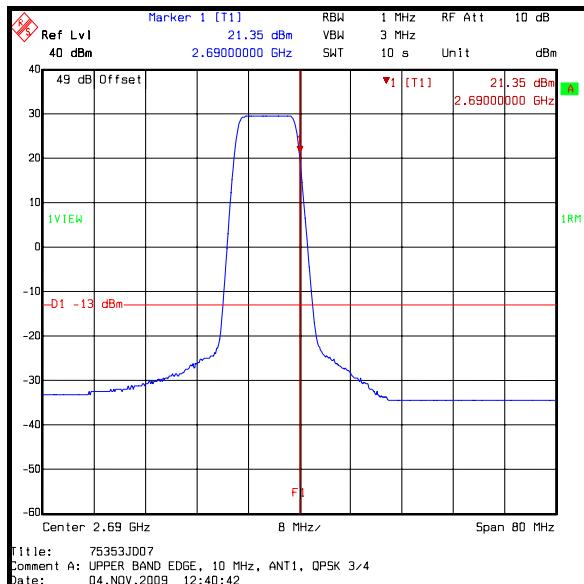
### 5 MHz Bandwidth / Upper Band Edge / QPSK 1/2 / ANT2 Port

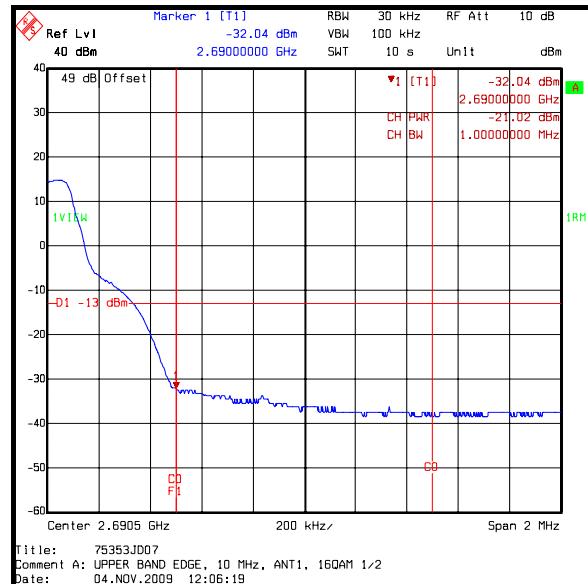
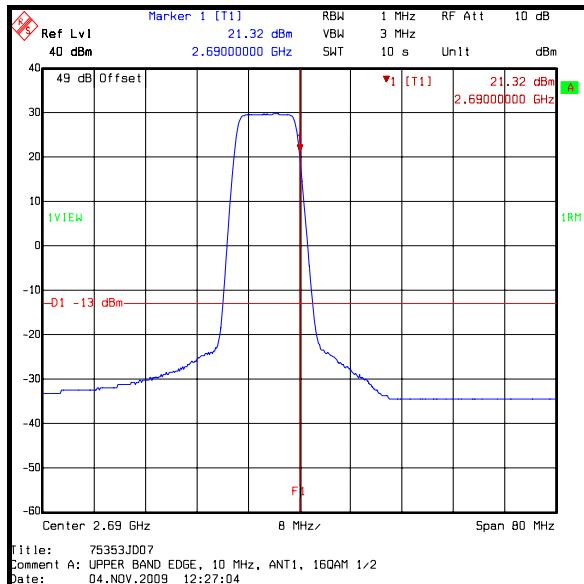
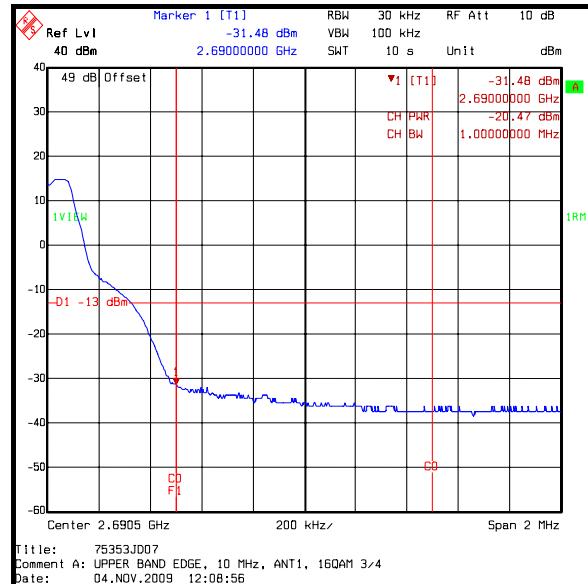
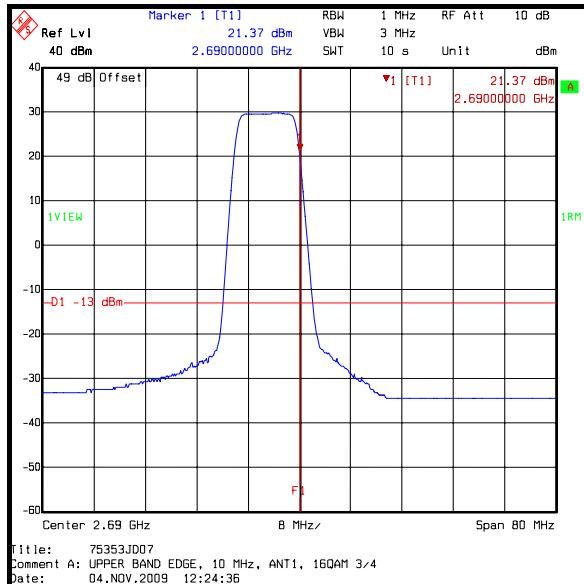


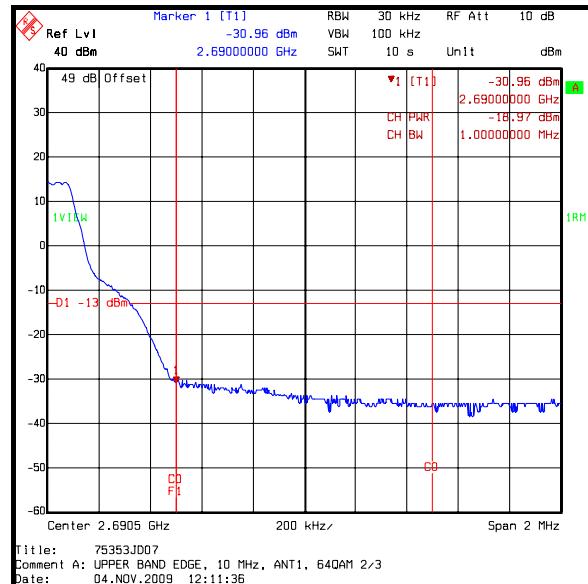
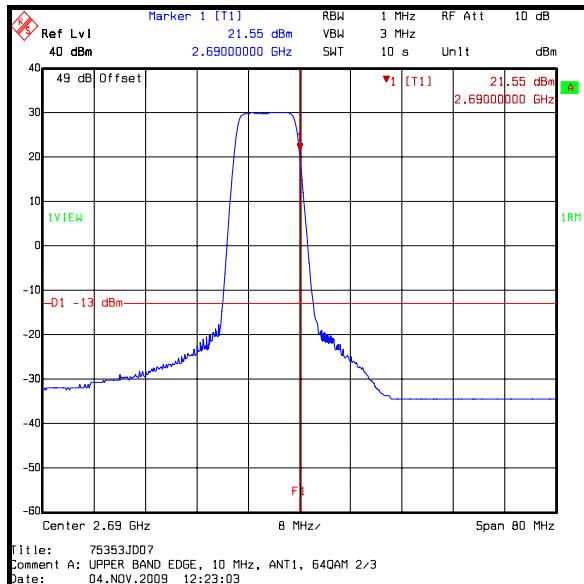
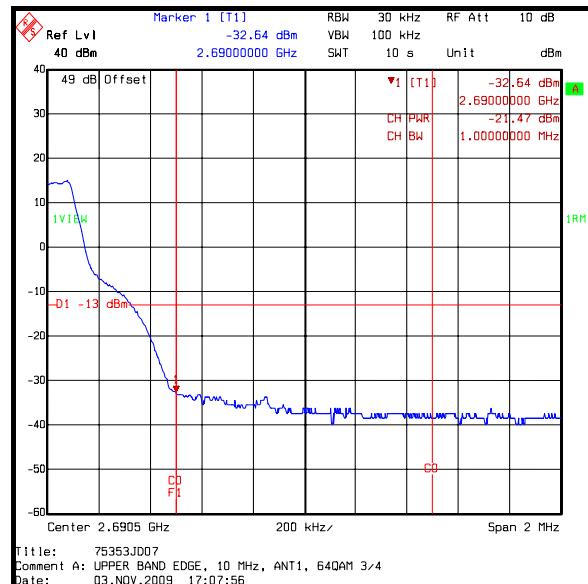
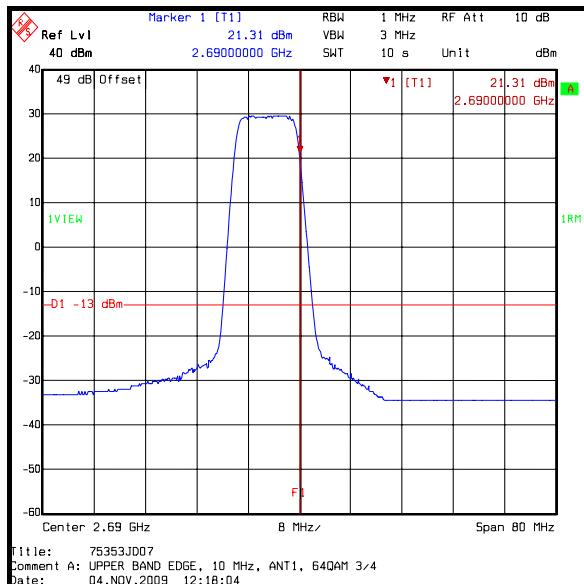
**Transmitter Conducted Emissions at Band Edges (continued)****5 MHz Bandwidth / Upper Band Edge / 64QAM 5/6 / ANT2 Port**

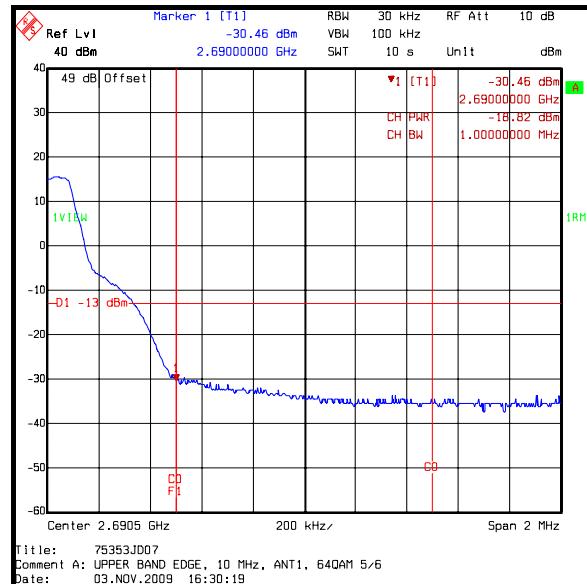
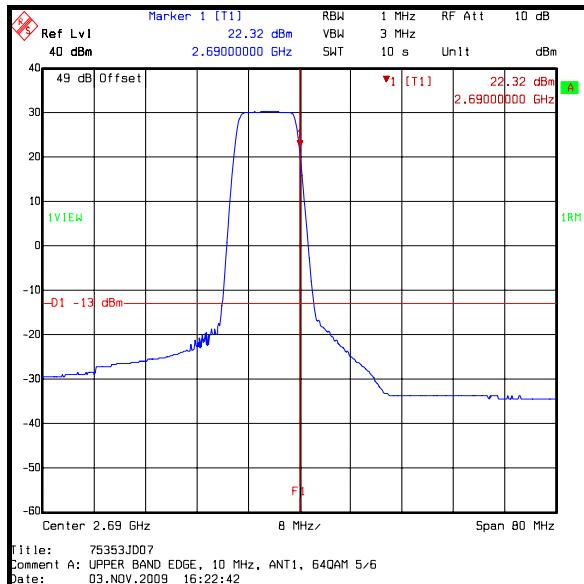
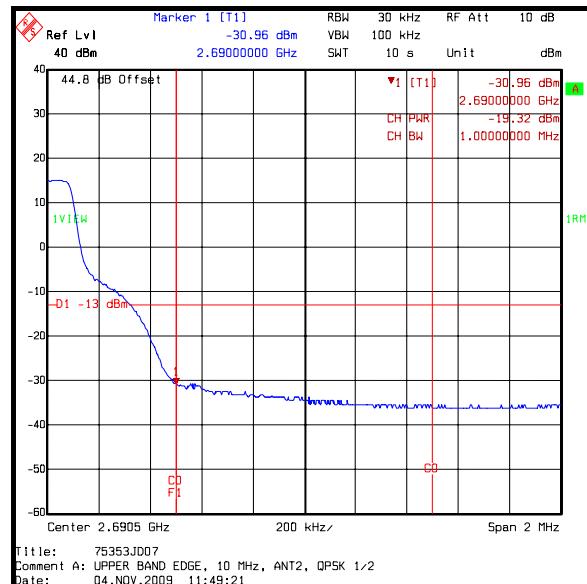
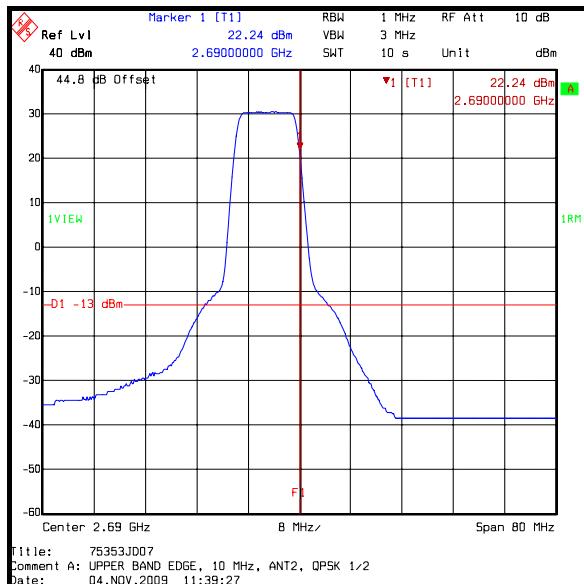
**Transmitter Conducted Emissions at Band Edges (continued)****Results: 10 MHz Bandwidth / Upper Band Edge**

Modulation	Port	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	ANT1	-19.8	-13.0	6.8	Complied
QPSK 3/4	ANT1	-20.8	-13.0	7.8	Complied
16QAM 1/2	ANT1	-21.0	-13.0	8.0	Complied
16QAM 3/4	ANT1	-20.5	-13.0	7.5	Complied
64QAM 2/3	ANT1	-19.0	-13.0	6.0	Complied
64QAM 3/4	ANT1	-21.5	-13.0	8.5	Complied
64QAM 5/6	ANT1	-18.8	-13.0	5.8	Complied
QPSK 1/2	ANT2	-19.3	-13.0	6.3	Complied
64QAM 5/6	ANT2	-18.7	-13.0	5.7	Complied

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Upper Band Edge / QPSK 1/2 / ANT1 Port****10 MHz Bandwidth / Upper Band Edge / QPSK 3/4 / ANT1 Port**

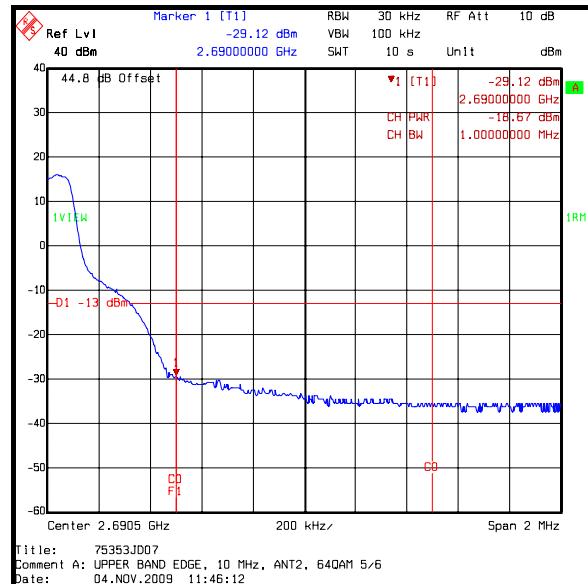
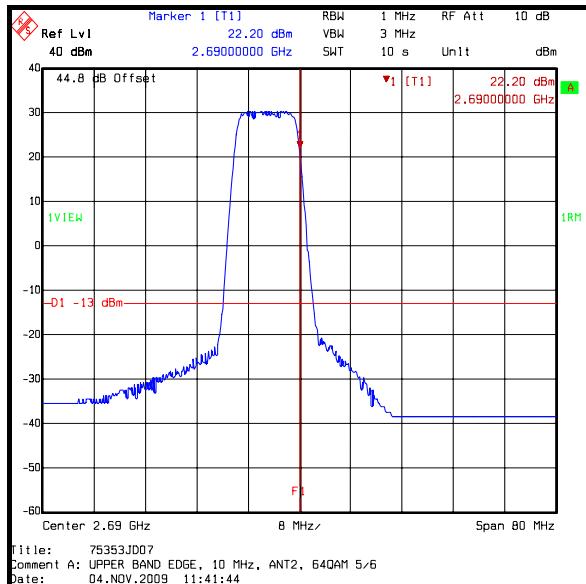
**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Upper Band Edge / 16QAM 1/2 / ANT1 Port****10 MHz Bandwidth / Upper Band Edge / 16QAM 3/4 / ANT1 Port**

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Upper Band Edge / 64QAM 2/3 / ANT1 Port****10 MHz Bandwidth / Upper Band Edge / 64QAM 3/4 / ANT1 Port**

**Transmitter Conducted Emissions at Band Edges (continued)****10 MHz Bandwidth / Upper Band Edge / 64QAM 5/6 / ANT1 Port****10 MHz Bandwidth / Upper Band Edge / QPSK 1/2 / ANT2 Port**

## Transmitter Conducted Emissions at Band Edges (continued)

### 10 MHz Bandwidth / Upper Band Edge / 64QAM 5/6 / ANT2 Port



### **5.2.12. Transmitter Radiated Emissions**

#### **Test Summary:**

<b>FCC Part:</b>	FCC 2.1051 and FCC Part 27.53(m)(2)
<b>Test Method Used:</b>	FCC Part 27.53(m)(6) and EIA/TIA-603-C 2.2.12.1, 2.2.12.2(b)

#### **Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	27

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

1. The outdoor unit was mounted vertically on a metal pole using the supplied brackets in accordance with the Customer's Base Station Installation Manual. This represents a typical user configuration. The centre of the outdoor unit was at a height of 1.5 metres above the chamber floor and directly in line with the measurement antenna. The outdoor unit was positioned in the centre of the anechoic chamber turntable. The indoor unit was positioned on the chamber floor directly below the outdoor unit and all interconnecting cables run vertically down the pole between both units. Surplus cable was bundled and cable tied.
2. Earthing points on the indoor unit and outdoor unit were connected by earth strap to the metal structure of the test chamber.
3. -48 VDC supply to the EUT during the test was provided by a 120 VAC 60 Hz power supply located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor.
4. The ANT1 port was connected via RF cables and attenuators to a Subscriber Station located outside the anechoic chamber. Interconnecting cables were run through access points in the chamber wall and floor. A BS-SS link was established and packet data sent on the downlink at the maximum data rate. The ANT2 port was terminated into a suitable 50 Ohm load.
5. The EUT was configured to transmit at maximum power on the top channel at 2687.5 MHz as this is the highest operational frequency.
6. Measurements were made with the EUT transmitting QPSK 1/2 modulation on a 5 MHz channel..
7. The EUT was rotated through 360°. Measurements were made with the test system antenna in the horizontal and vertical planes. The highest level was recorded.
8. Pre-scans were performed with a peak detector as this was known to be the worst case.
9. No spurious emissions were observed above the noise floor of the test system or within 20 dB of the limit, therefore the highest noise floor level was recorded.

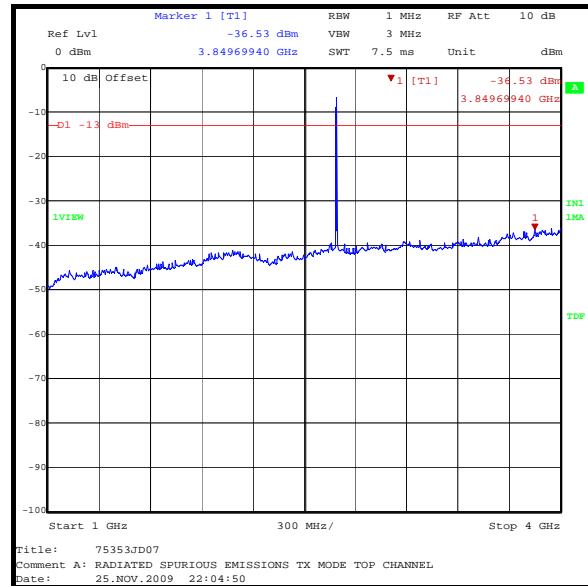
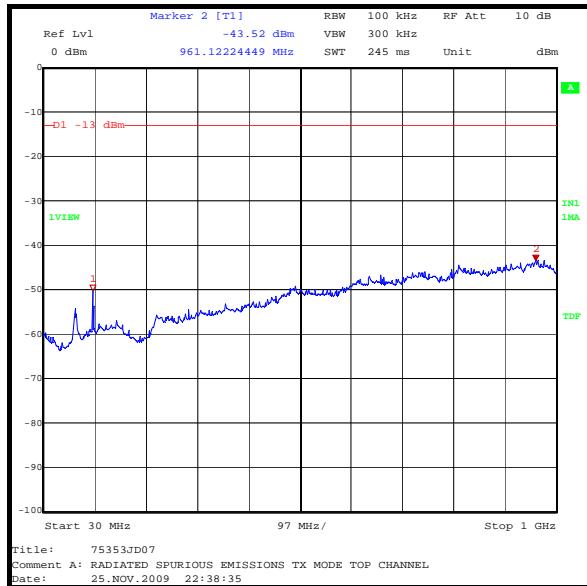
#### **Limits:**

Frequency Range	Applicable limit	Limit (dBm)
30 MHz to 26900 MHz	$43 + 10 \log (P)$	-13

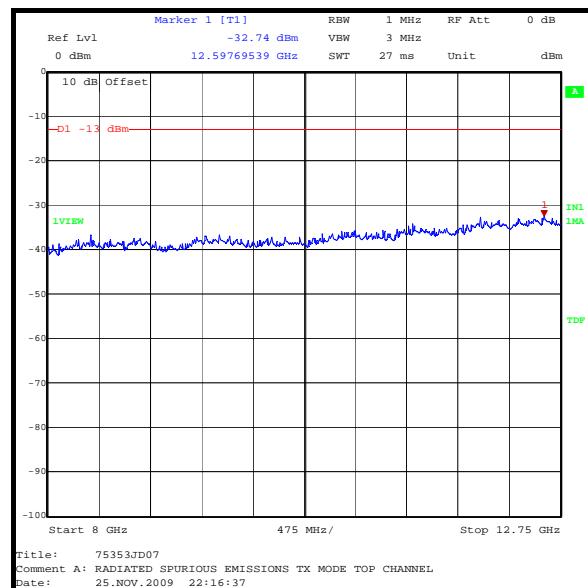
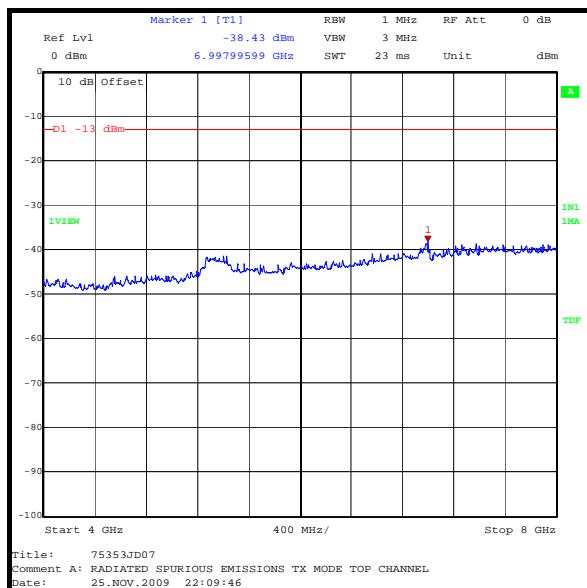
#### **Results:**

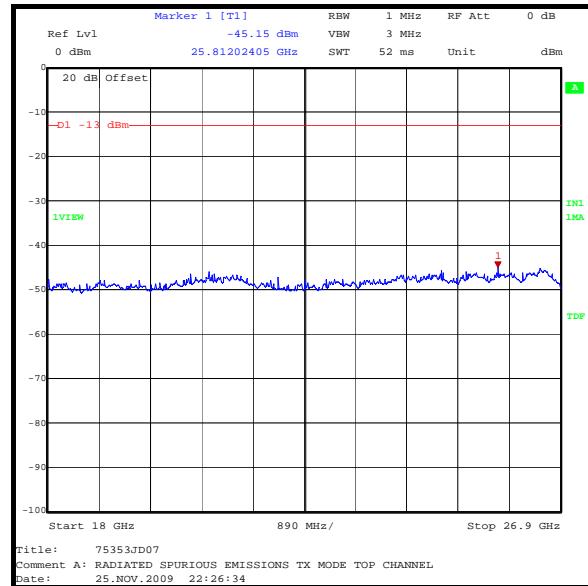
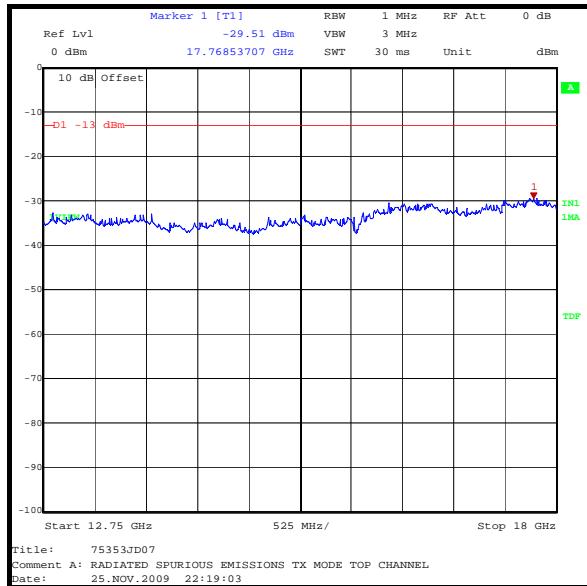
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
17768.537	-29.5	-13.0	16.5	Complied

## Transmitter Radiated Emissions (continued)



NOTE: The carrier is shown on the above pre-scan plot



**Transmitter Radiated Emissions (continued)**

**5.2.13. Transmitter Radiated Emissions at Band Edges****Test Summary:**

<b>FCC Part:</b>	FCC 2.1051 and FCC Part 27.53
<b>Test Method Used:</b>	FCC Part 27.53(m)(6) and EIA/TIA-603-C 2.2.12.1, 2.2.12.2(b)

**Environmental Conditions:**

<b>Temperature (°C):</b>	25
<b>Relative Humidity (%):</b>	26 to 28

**Note(s):**

1. The EUT was positioned as stated in the radiated spurious emissions section of this report.
2. The EUT was configured to transmit at maximum power on the top or bottom channels.
3. Measurements were made with the EUT transmitting QPSK 1/2 modulation on a 5 MHz channel and repeated with a 10 MHz channel. Conducted band edge measurements were previously performed on all modulation types and minimal differences were observed between each type.
4. Tests were performed with the EUT configured for operation on the FCC frequency range of 2583 MHz to 2690 MHz using the Customer declared bottom and top channels.
5. The band edge limit is calculated according to FCC Part 27.53 (m)(2) as follows;  $43 + 10\log(P)$  where P is the transmitter power in Watts.
6. The EUT was rotated through 360°. Measurements were made with the test system antenna in the horizontal and vertical planes. The highest level was recorded.

**Transmitter Radiated Emissions at Band Edges (continued)****Results: 5 MHz Bandwidth / Lower Band Edge**

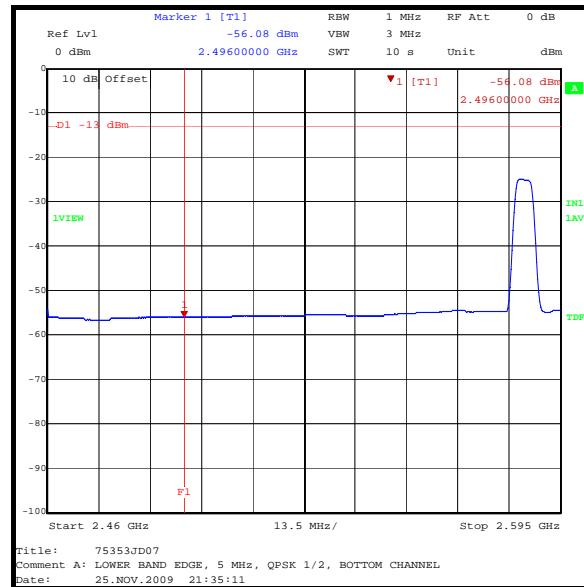
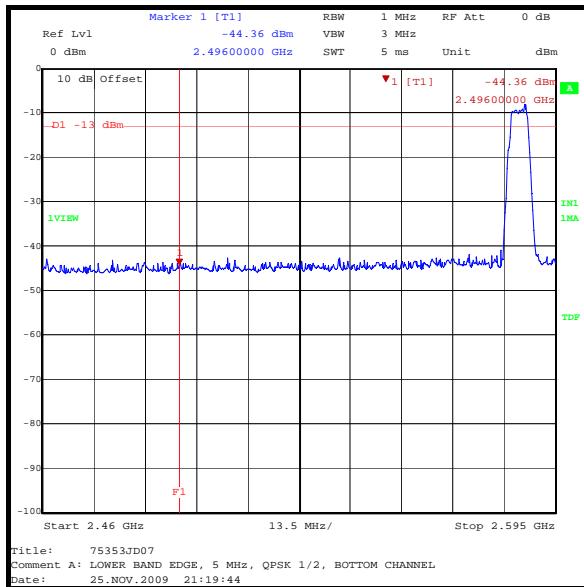
Modulation	Detector	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	Peak	-44.4	-13.0	31.4	Complied
QPSK 1/2	Average	-56.1	-13.0	43.1	Complied

**Results: 5 MHz Bandwidth / Upper Band Edge**

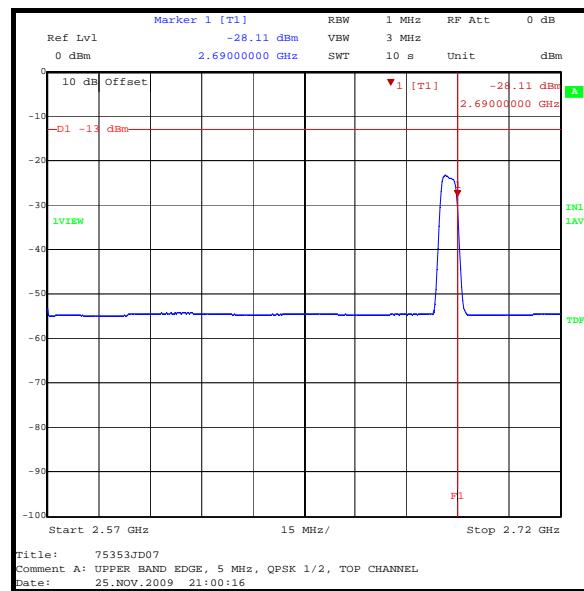
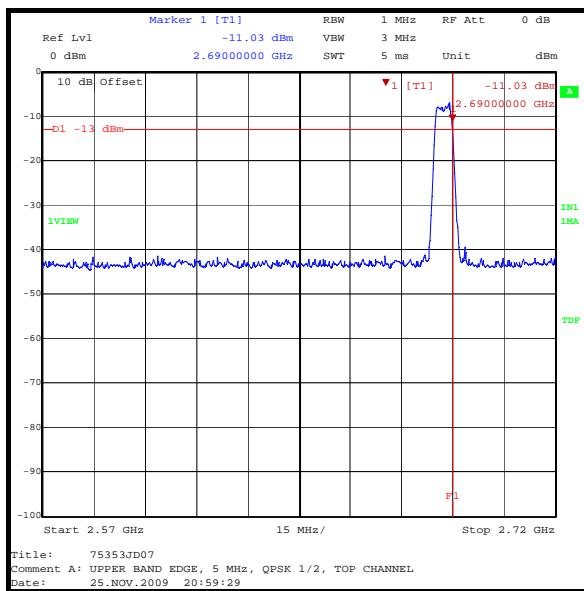
Modulation	Detector	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	Peak	-44.8	-13.0	31.8	Complied
QPSK 1/2	Average	-56.0	-13.0	43.0	Complied

## Transmitter Radiated Emissions at Band Edges (continued)

## Results: 5 MHz Bandwidth

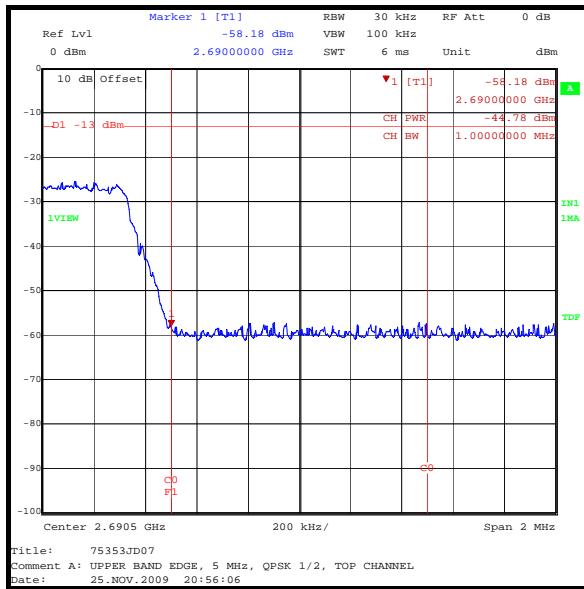


## Peak detector

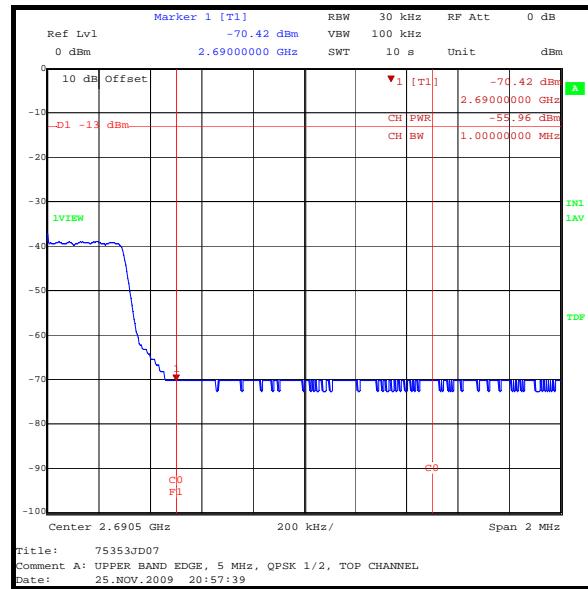


## Peak detector

## Average detector

**Transmitter Radiated Emissions at Band Edges (continued)****Results: 5 MHz Bandwidth**

Peak detector



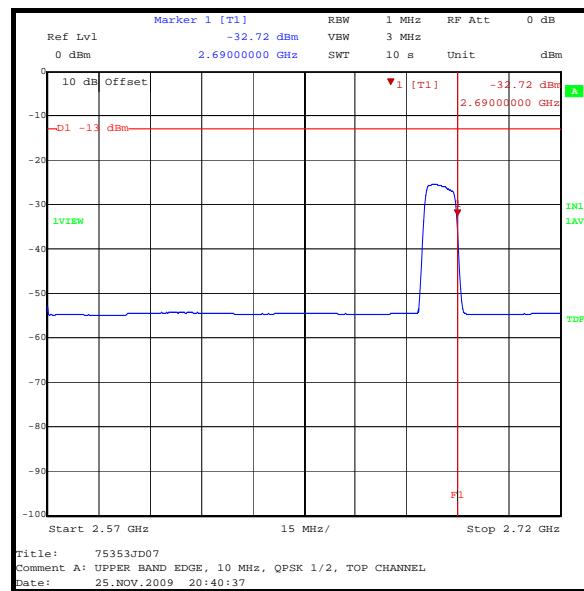
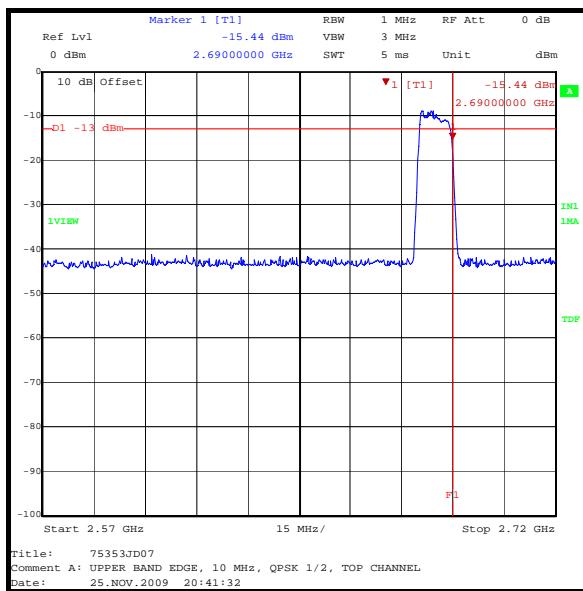
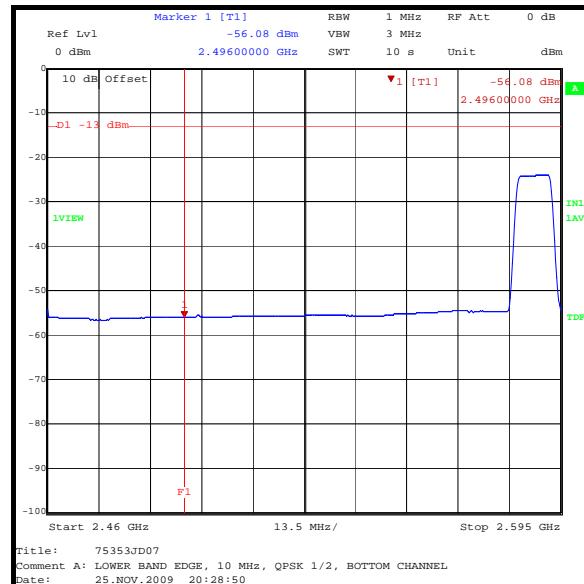
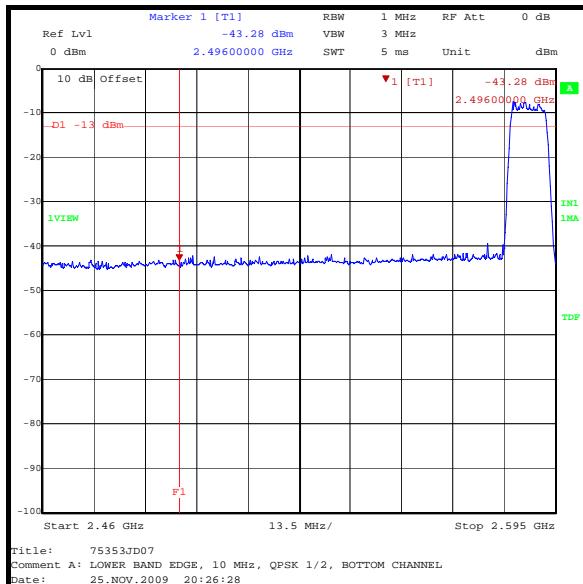
Average detector

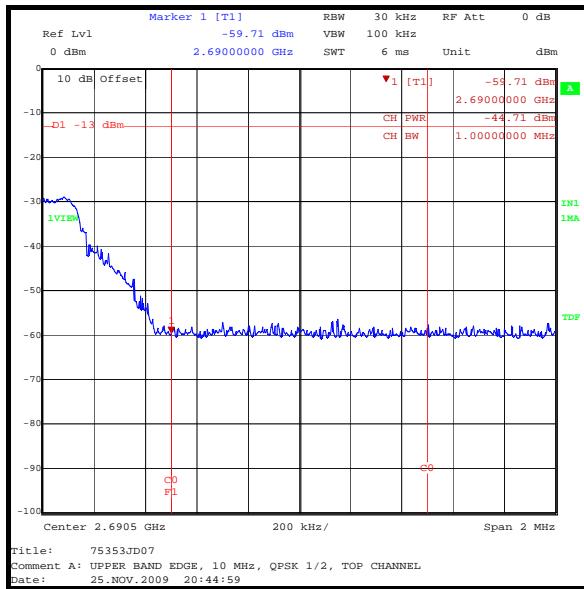
**Transmitter Radiated Emissions at Band Edges (continued)****Results: 10 MHz Bandwidth / Lower Band Edge**

Modulation	Detector	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	Peak	-43.3	-13.0	30.3	Complied
QPSK 1/2	Average	-56.1	-13.0	43.1	Complied

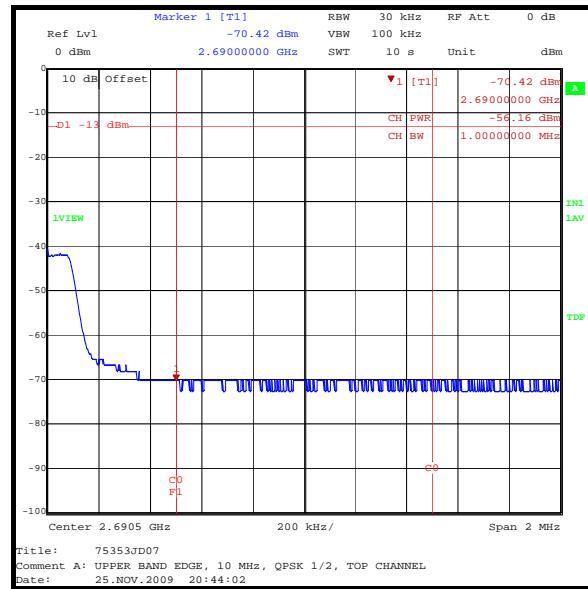
**Results: 10 MHz Bandwidth / Upper Band Edge**

Modulation	Detector	Emission Level (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
QPSK 1/2	Peak	-44.7	-13.0	31.7	Complied
QPSK 1/2	Average	-56.2	-13.0	43.2	Complied

**Transmitter Radiated Emissions at Band Edges (continued)****10 MHz Bandwidth**

**Transmitter Radiated Emissions at Band Edges (continued)****10 MHz Bandwidth**

Peak detector



Average detector

## **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 30.0 MHz	95%	±3.25 dB
Conducted Carrier Output Power	2583 MHz to 2690 MHz	95%	±1.2 dB
Carrier Output Power (EIRP)	2583 MHz to 2690 MHz	95%	±1.78 dB
Occupied Bandwidth	2583 MHz to 2690 MHz	95%	±0.92 ppm
Conducted Emissions Antenna Port	30 MHz to 26.9 GHz	95%	±1.2 dB
Frequency Stability	2583 MHz to 2690 MHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±5.26 dB
Radiated Spurious Emissions	1 GHz to 26.9 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.

## Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (months)
A1249	Coaxial Coupler	Narda	252888	0955-0125	Calibrated before use	-
A126	CDN	RFI Ltd Basingstoke	801-AF4	None	Calibration not required	-
A1368	Directional Coupler	Pasternack Enterprises.	PE2214-10	None	Calibrated before use	-
A1391	Attenuator	HUBER + SUHNER AG	757987	6810.17.B	Calibrated before use	-
A1392	Attenuator	HUBER + SUHNER AG	757456	6820.17.B	Calibrated before use	-
A1399	Attenuator	Weinschel Associates	WA46-10	A126	Calibrated before use	-
A1418	Attenuator	HP	N/A	CSC21296	Calibrated before use	-
A1490	Attenuator	Weinschel Corp	23-30-34	BH9156	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1537	Dual Directional Coupler	Hewlett Packard	778D	1144A05122	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	27 Nov 2009	12
A1830	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100668	05 Jan 2009	12
A193	Aerial Low Pass Filter	Aerial Facilities	LP-110-4N	15821B	Calibration not required	-
A490	Antenna	Chase	CBL6111A	1590	13 Jan 2009	12
A649	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	825562/008	19 Mar 2009	12
C1028	Coaxial Cable	Rosenberger	FA210B-1-010M-30X30	FA00C 7588	04 May 2009	12
C1125	Cable	Rosenberger	FA147a1020002 02	1704 34842-02	Calibrated before use	-
C1169	Cable	Microcoax	n/a	n/a	Calibrated before use	-
C1263	Cable	Rosenberger	FA210A1020005 050	49316-01	Calibrated before use	-
C151	Cable	Rosenberger	UFA210A-1-1181-70x70	None	Calibrated before use	-
E0513	Environmental Chamber	TAS	LT600 Series 3	23900506	Calibration not required	-

K0001	5m Semi-Anechoic Chamber	Rainford EMC	N/A	N/A	04 May 2009	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2009	12
K0005	Site Reference 4429	RFI Global Services Ltd	N/A	N/A	Calibration not required	-
K0008	Site Reference 4422	RFI Global Services Ltd	N/A	N/A	Calibration not required	-
L0998	Agilent N1912A Power Meter	Agilent	N1912A	MY45100213	28 Oct 2009	12
LD002491	PWR1600L PSU input = 120VDC	Kikusui	N/A	N/A	Calibrated before use	-
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	12
M1242	Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986/022	09 Dec 2008	12
M1249	Thermometer	Fluke	52II	88800049	01 Jul 2009	12
M1251	Digital Multimeter	Fluke	175	89170179	23 Jun 2009	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	22 Apr 2009	12
M1273	Test Receiver	Rhode & Schwarz	ESIB 26	100275	01 Apr 2009	12
M1379	Test Receiver	Rohde and Schwarz	ESIB7	100330	20 Aug 2009	12
M166	Thermometer/Barometer/Hygrometer	EuroCom	None	None	30 Apr 2009	12
M259	SME03 Signal Generator	Rohde & Schwarz	1038.6002.03	827758/021	Calibrated before use	-

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