TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: IPWireless 700 MHz V5 Node B Model: AFB/VT

To: FCC Part 27: 2009 Subpart C

Test Report Serial No:
RFI-RPT-RP76943JD01A V2.0

Version 2.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of Brian Watson, COO Payments and Consultancy:	 pp
Checked By:	A. Henriques
Signature:	
Date of Issue:	01 July 2010

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1. Customer Information

Company Name:	IPWireless (UK) Ltd
Address:	Unit 7 Greenways Business Park Bellinger Close Chippenham Wiltshire SN15 1BN

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR27
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2009: Part 27 Subpart C (Miscellaneous Wireless Communication Services)
Site Registration:	209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	01 June 2010 to 23 June 2010

2.2. Summary of Test Results (Sub Band A, B & C)

FCC Reference (47CFR)	Measurement	Result
Part 27.50	Transmitter Carrier Output Power and Effective Radiated Power (ERP)	✓
Part 2.1049	Transmitter Occupied Bandwidth	✓
Part 27.54	Frequency Stability (Temperature & Voltage Variation)	✓
Part 27.53	Transmitter Conducted Emissions - Channel Edge	✓
Part 27.53	Transmitter Conducted Emissions	✓
Part 27.53	Transmitter Conducted Emissions at Band Edges	✓
Part 27.53	Transmitter Radiated Spurious Emissions	✓
Part 27.53	Transmitter Radiated Emissions at Band Edges	✓
Additional Testing Requirements for Sub Band B & C		
Part 27.53	Transmitter Conducted Emission Limitations	✓
Part 27.53	Transmitter Radiated Spurious Emission Limitations	✓

Key to Results

✓ **= Complied** ✗ **= Did not comply**

2.3. Methods and Procedures

Reference:	ANSI/TIA-603-C-2004
Title:	Land Mobile Communications Equipment, Measurements and performance Standards
Reference:	ANSI C63.4 (2009)
Title:	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)

Description:	Radio Shelf
Brand Name:	IPWireless
Model Name or Number:	AFB
Serial Number:	AFBJ15001130
FCC ID Number:	PKTNODEBAFB1

Description:	Digital Shelf
Brand Name:	IPWireless
Model Name or Number:	VT
Serial Number:	VT1J736009517

Description:	Sector card 2 (part of VT Digital Shelf)
Brand Name:	IPWireless
Model Name or Number:	Sector card
Serial Number:	VU1J73700RV17

3.2. Description of EUT

The equipment under test was a W-CDMA Wireless Base Station comprising a radio shelf and a digital shelf intended for mounting into a 19” rack. Both shelves are connected together to create a Node B. The equipment utilizes Frequency Division Duplex technology.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Power Supply Requirement:	-48.0 V DC ±15%	
Type of Unit:	FDD Wireless base station transceiver	
Modulation Type:	QPSK, 16QAM, 64QAM	
Duty Cycle:	100%	
Antenna Ports:	Two x 7/16 female. Marked ANT 1 and ANT 2	
Antenna Gain:	Up to +20 dBi (stated)	
Chip Rate:	3.84 Mcps	
Channel Bandwidth:	5.0 MHz	
Sub Band A		
Transmit Frequency Range:	728 MHz to 746 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	731.0
	Top	743.0
Receive Frequency Range:	698 MHz to 716 MHz	
Sub Band B		
Transmit Frequency Range:	746 MHz to 758 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Bottom	748.5
	Top	755.5
Receive Frequency Range:	776 MHz to 787 MHz	
Sub Band C		
Transmit Frequency Range:	758 MHz to 763 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Single	760.5
Receive Frequency Range:	788 MHz to 793 MHz	

3.5. Support Equipment

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

Description:	DC Power supply
Brand Name:	Agilent
Model Name or Number:	E4356A
Serial Number:	MY41000617

Description:	Sector card 1 (part of VT Digital Shelf)
Brand Name:	IPWireless
Model Name or Number:	Sector card
Serial Number:	VU1J73700RQ17

Description:	Sector card 2 (part of VT Digital Shelf)
Brand Name:	IPWireless
Model Name or Number:	Sector card
Serial Number:	VU1J73700RV17

Description:	Sector card 3 (part of VT Digital Shelf)
Brand Name:	IPWireless
Model Name or Number:	Sector card
Serial Number:	VU1J73700RW17

Description:	30 dB RF attenuator
Brand Name:	NARDA
Model Name or Number:	776C-30
Serial Number:	522

Description:	Laptop PC
Brand Name:	Sony
Model Name or Number:	Vaio VGN-BX195VT
Serial Number:	None Stated

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:

- Transmitting and receiving simultaneously.
- Operating on the bottom or top channel, as per each test case requirement.
- Constantly transmitting the maximum of 15 timeslots at full power (+40 dBm) with a chip rate of 3.84 Mcps.
- No tests were performed in receive/idle mode as the device is constantly transmitting.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- The radio shelf and digital shelf connected together as required and powered from a bench DC power supply.
- Three sector cards were fitted to the digital shelf. Sector 2 card was connected to the radio shelf via the fibre optic cables. Sector 1 and 3 cards were not used during the testing and were only fitted in order to fill the card slots. This is a standard configuration of the EUT.
- The laptop PC was connected to the Ethernet port on the digital shelf by a CAT5 cable. A bespoke application on the laptop PC was used to configure the RF parameters of the EUT as required.
- RF Conducted emission tests - One RF port was connected to the measurement equipment using previously calibrated RF cables, filters and attenuators. The unused RF port was terminated with suitable loads or attenuators. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.
- RF Radiated emission/case radiation tests - Both RF ports were terminated with suitable loads or attenuators. The EUT was connected to a suitable bench power supply powered from a 120 VAC 60 Hz mains supply and the output set to -48 VDC. Most ports on the EUT were terminated and the client stated that un-terminated ports were either inoperative or disabled.
- For conducted and radiated emissions out of band testing, preliminary checks were made on all three modulation schemes and the mode which exhibited the highest emissions profile (i.e. 64QAM) was scanned across the required measurement frequency range. Where an emission was detected final emission measurements were performed on all three modulation schemes.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

5.2. Test Results - Sub Band A

5.2.1. Transmitter Carrier Output Power and Effective Radiated Power (ERP)

Test Summary:

FCC Part:	27.50(c)(1)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.1

Environmental Conditions:

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

Results: Antenna Port 1

Modulation	Frequency (MHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
QPSK	731.0	37.8	20	57.8	60.0	2.2	Complied
QPSK	743.0	38.0	20	58.0	60.0	2.0	Complied
16QAM	731.0	37.7	20	57.7	60.0	2.3	Complied
16QAM	743.0	38.0	20	58.0	60.0	2.0	Complied
64QAM	731.0	37.7	20	57.7	60.0	2.3	Complied
64QAM	743.0	38.0	20	58.0	60.0	2.0	Complied

Results: Antenna Port 2

Modulation	Frequency (MHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
QPSK	731.0	37.7	20	57.7	60.0	2.3	Complied
QPSK	743.0	38.2	20	58.2	60.0	1.8	Complied
16QAM	731.0	37.9	20	57.9	60.0	2.1	Complied
16QAM	743.0	38.3	20	58.3	60.0	1.7	Complied
64QAM	731.0	38.1	20	58.1	60.0	1.9	Complied
64QAM	743.0	38.4	20	58.4	60.0	1.6	Complied

Note(s):

1. Measurements were performed with the EUT transmitting on all supported modulation types on the Antenna Port 1 and Antenna Port 2.

5.2.2. Transmitter Occupied Bandwidth

Test Summary:

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

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	32

Results: Antenna Port 1

Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK	731.0	100	300	4.118
QPSK	743.0	100	300	4.118
16QAM	731.0	100	300	4.118
16QAM	743.0	100	300	4.118
64QAM	731.0	100	300	4.118
64QAM	743.0	100	300	4.118

Results: Antenna Port 2

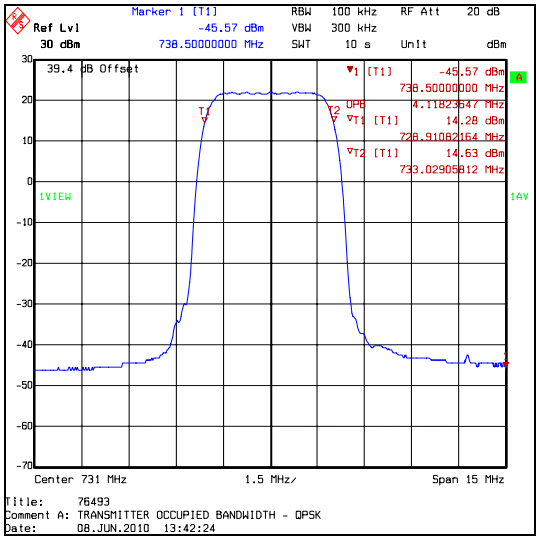
Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK	731.0	100	300	4.118
QPSK	743.0	100	300	4.118
16QAM	731.0	100	300	4.118
16QAM	743.0	100	300	4.118
64QAM	731.0	100	300	4.118
64QAM	743.0	100	300	4.118

Note(s):

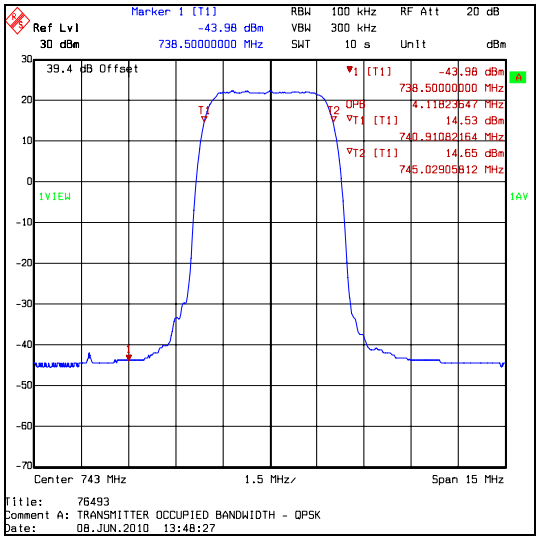
1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.
2. Measurements were performed with the EUT transmitting on all supported modulation types on the Antenna Port 1 and Antenna Port 2.

Transmitter Occupied Bandwidth (continued)

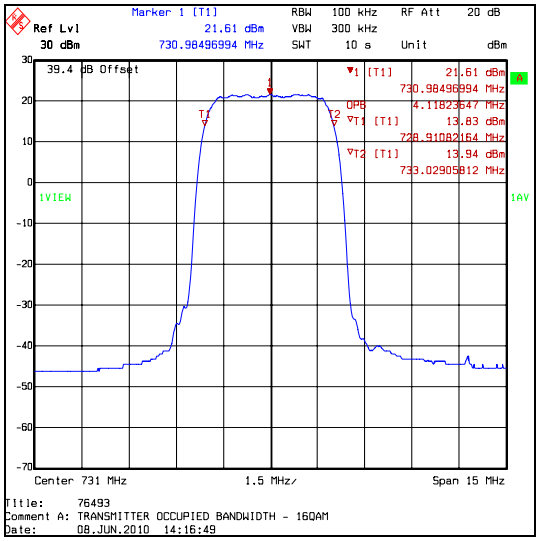
Antenna Port 1



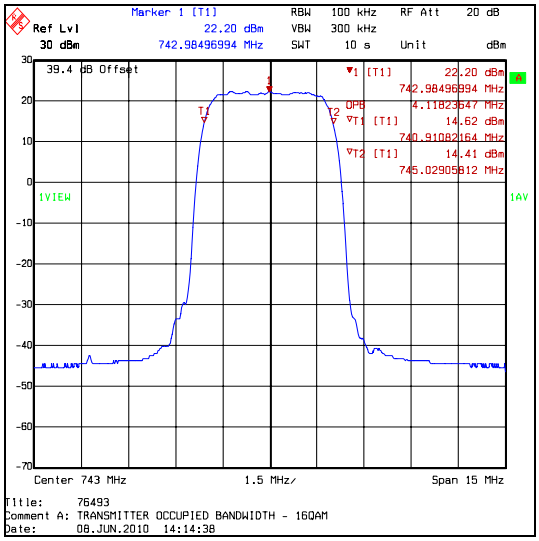
QPSK



QPSK



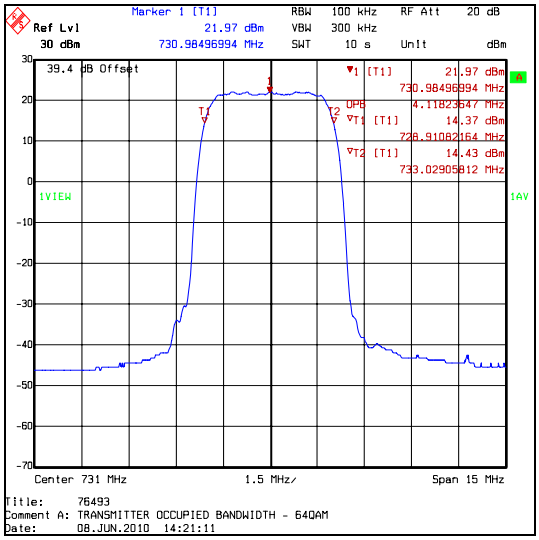
16QAM



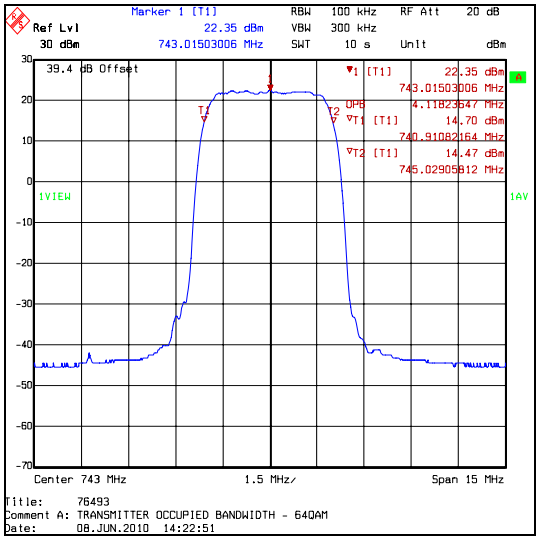
16QAM

Transmitter Occupied Bandwidth (continued)

Antenna Port 1



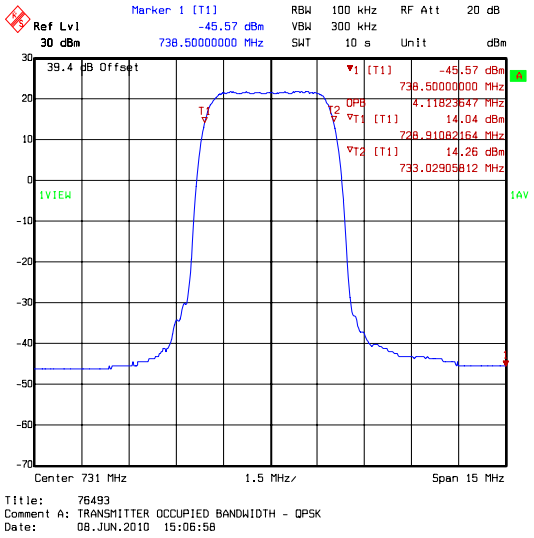
64QAM



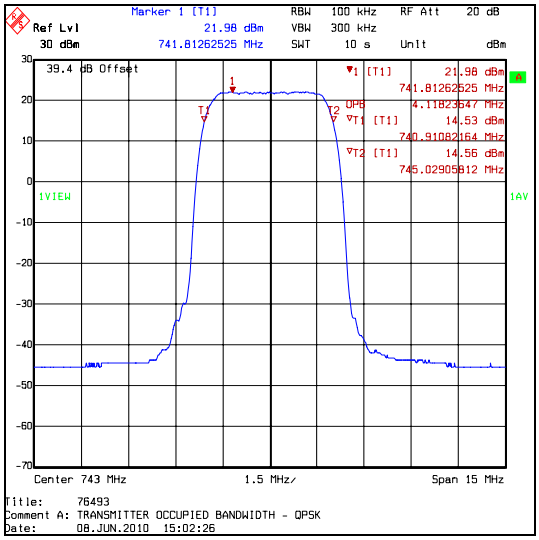
64QAM

Transmitter Occupied Bandwidth (continued)

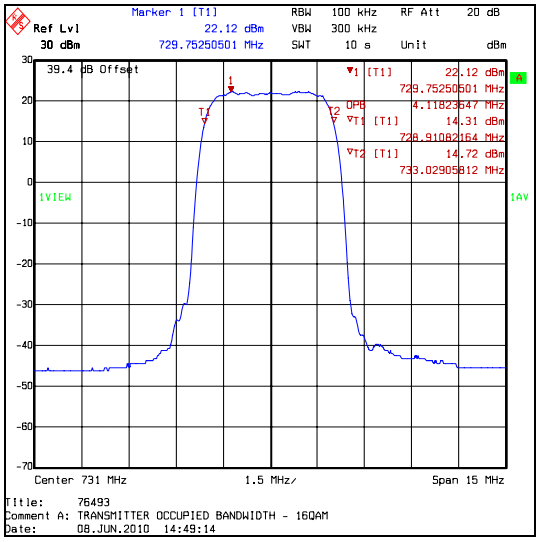
Antenna Port 2



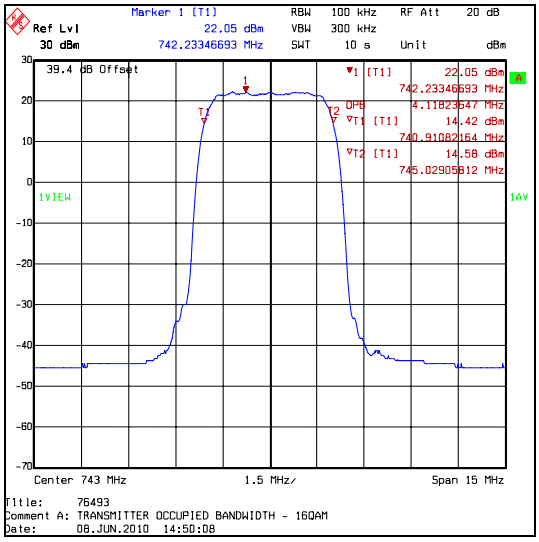
QPSK



QPSK



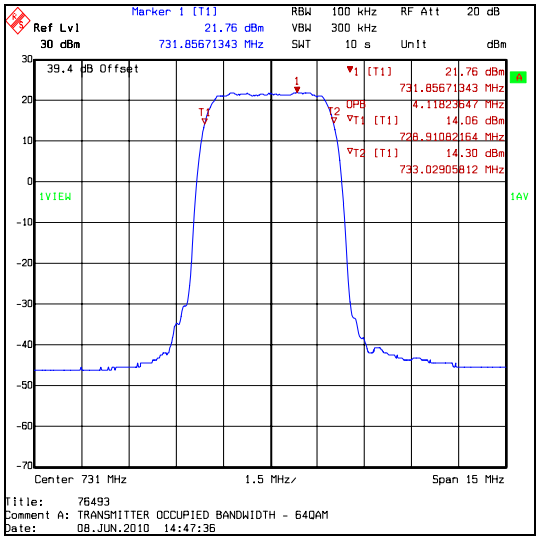
16QAM



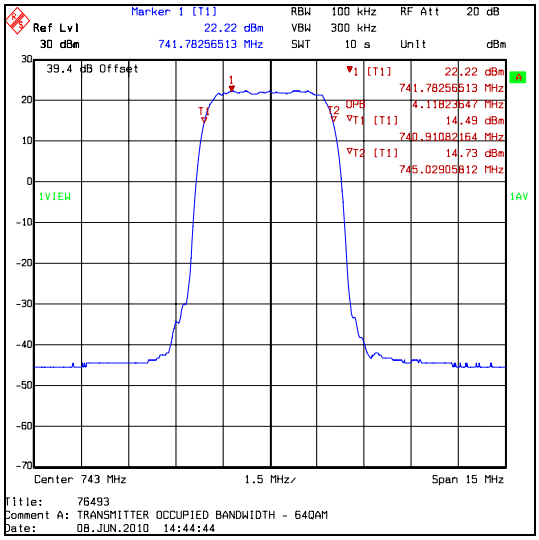
16QAM

Transmitter Occupied Bandwidth (continued)

Antenna Port 2



64QAM



64QAM

5.2.3. Transmitter Frequency Stability - Temperature

Test Summary:

FCC Part:	27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

Environmental Conditions:

Temperature (°C):	29
Relative Humidity (%):	36

Results: Sub Band A / Bottom Channel 731.0 MHz / Port 2

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	730.999802	198
-20	730.999919	81
-10	730.999914	86
0	730.999914	86
10	730.999914	86
20	730.999914	86
30	730.999914	86
40	730.999914	86
50	730.999914	86

Transmitter Frequency Stability - Temperature (continued)

Results: Sub Band A / Top Channel 743.0 MHz / Port 2

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	742.999797	203
-20	742.999909	81
-10	742.999914	86
0	742.999914	86
10	742.999914	86
20	742.999914	86
30	742.999914	86
40	742.999914	86
50	742.999914	86

5.2.4. Transmitter Frequency Stability - Voltage Variation

Test Summary:

FCC Part:	27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

Environmental Conditions:

Ambient Temperature (°C):	20
Relative Humidity (%):	43

Results: Sub Band A / Bottom Channel 731.0 MHz / Port 2

Supply Voltage (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-40.8	730.999914	86
-48.0	730.999914	86
-55.2	730.999914	86

Results: Sub Band A / Top Channel 743.0 MHz / Port 2

Supply Voltage (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-40.8	742.999914	86
-48.0	742.999914	86
-55.2	742.999914	86

5.2.5. Transmitter Conducted Emissions – Channel Edge

Test Summary:

FCC Part:	27.53(g)
Test Method Used	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051

Environmental Conditions:

Temperature (°C):	30
Relative Humidity (%):	27

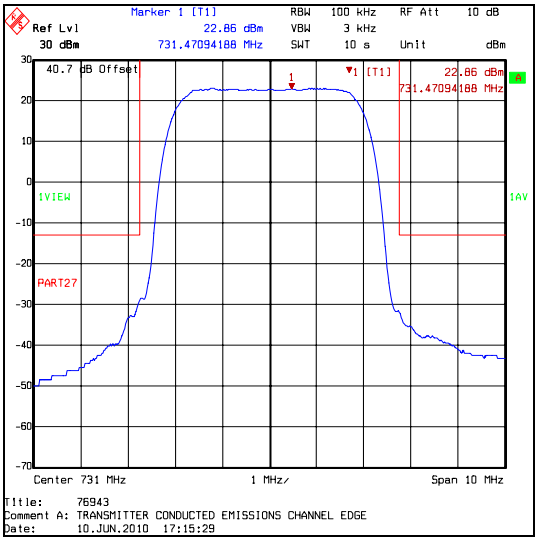
Note(s):

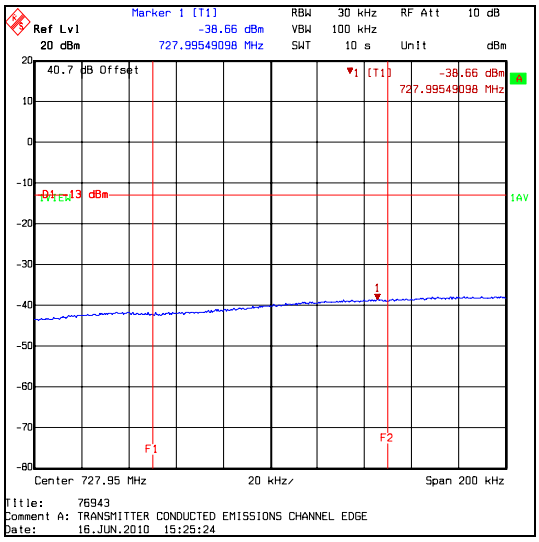
1. It can be seen on the main mask plot that the emission is close to the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. As stated in FCC Part 27.53(g), a resolution bandwidth of 30 kHz was used in the 100 kHz bands immediately outside and adjacent to the frequency block to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.
2. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

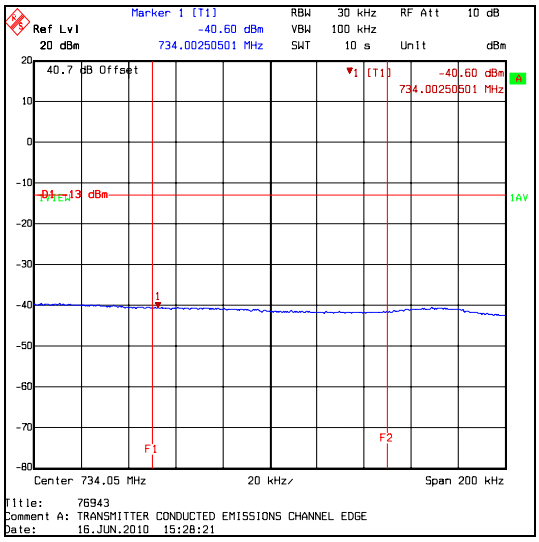
Results: Sub Band A / Bottom Channel 731.0 MHz / QPSK / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
727.955	-38.7	-13.0	25.7	Complied
734.003	-40.6	-13.0	27.6	Complied

Transmitter Conducted Emissions – Channel Edge (continued)



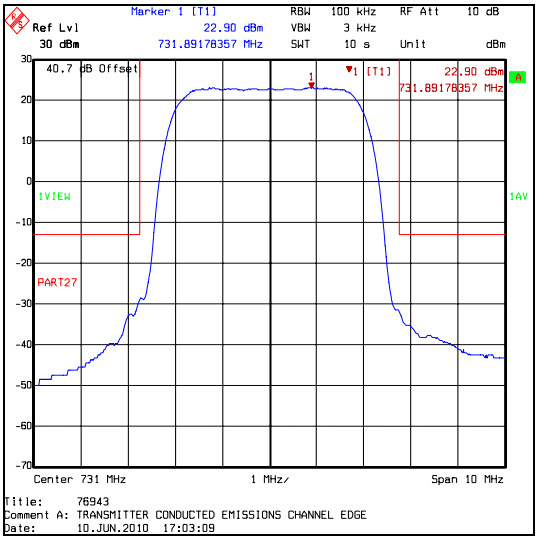


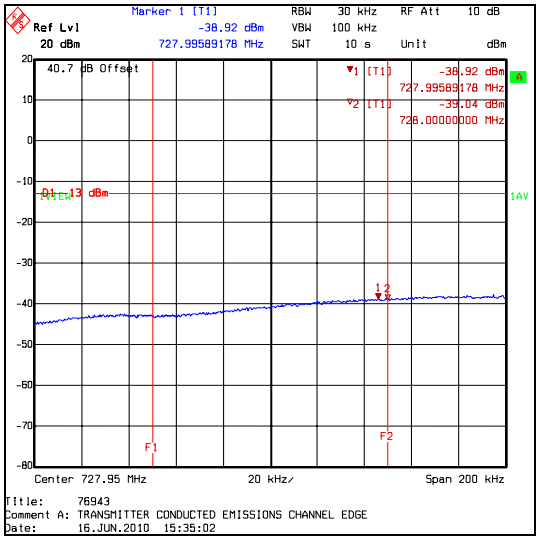


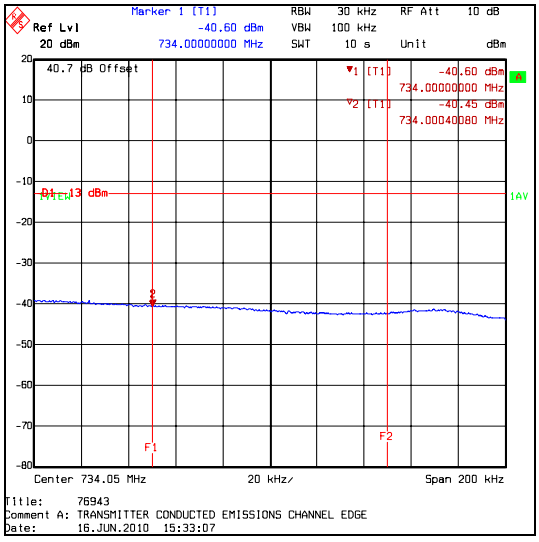
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band A / Bottom Channel 731.0 MHz / 16QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
727.996	-38.9	-13.0	25.9	Complied
734.000	-40.5	-13.0	27.5	Complied



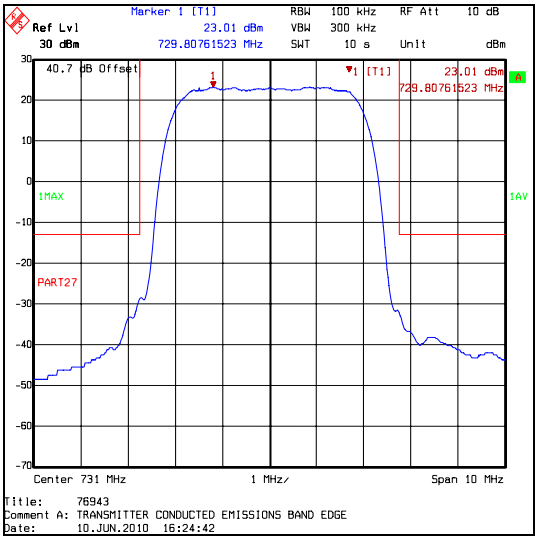


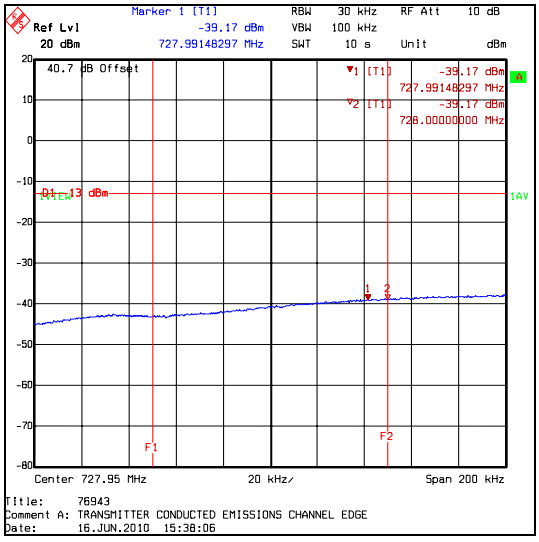


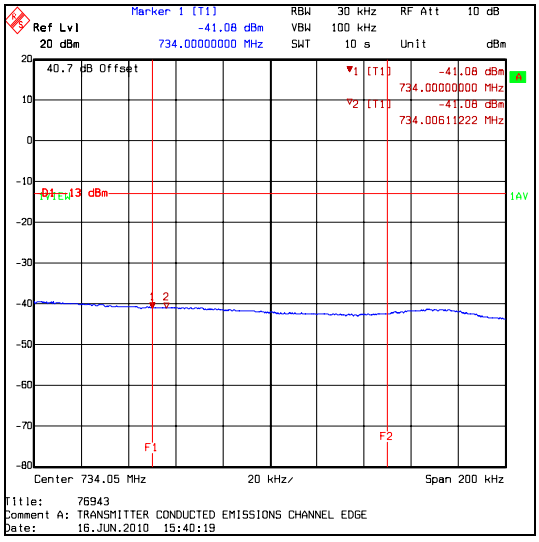
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band A / Bottom Channel 731.0 MHz / 64QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
727.991	-39.2	-13.0	26.2	Complied
734.006	-41.1	-13.0	28.1	Complied



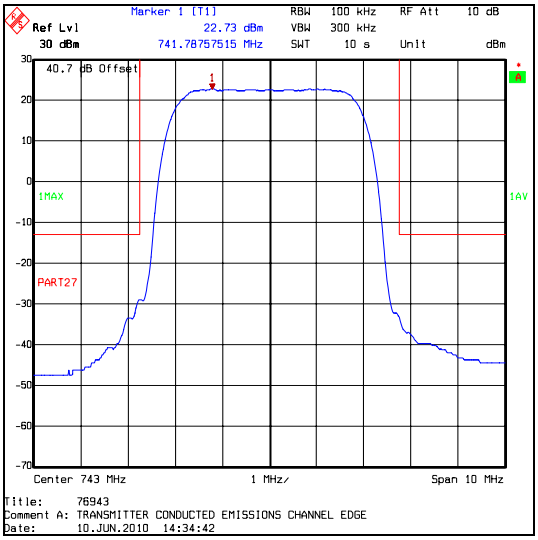


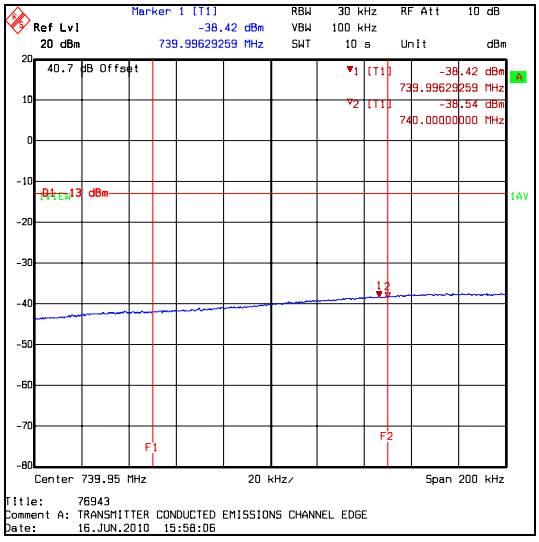


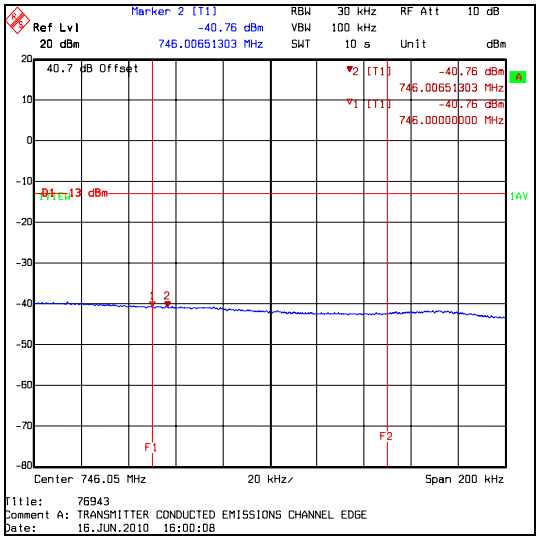
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band A / Top Channel 743.0 MHz / QPSK / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
739.996	-38.4	-13.0	25.2	Complied
746.007	-40.8	-13.0	27.8	Complied



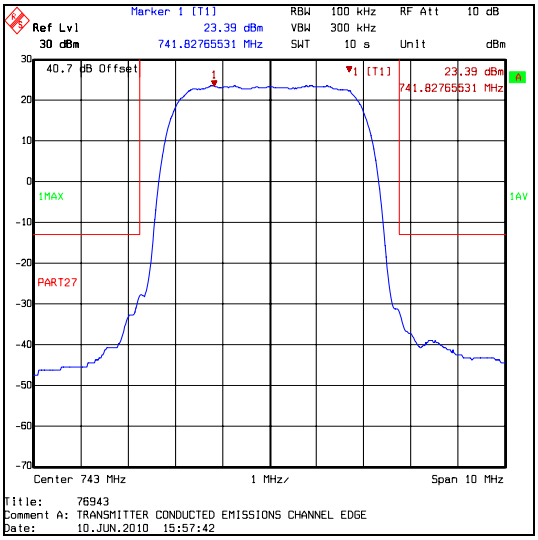


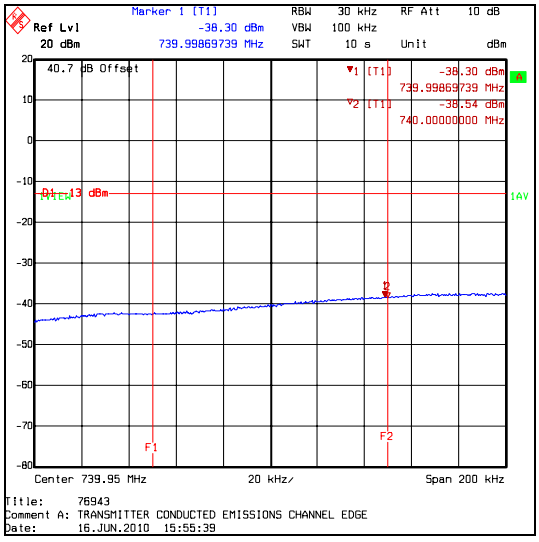


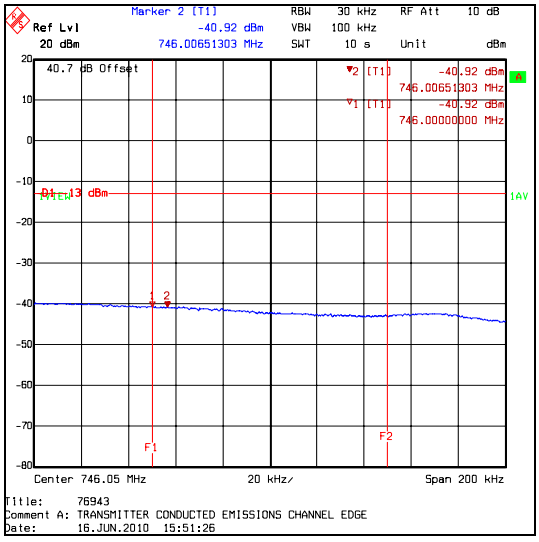
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band A / Top Channel 743.0 MHz / 16QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
739.999	-38.3	-13.0	25.3	Complied
746.007	-40.9	-13.0	27.9	Complied



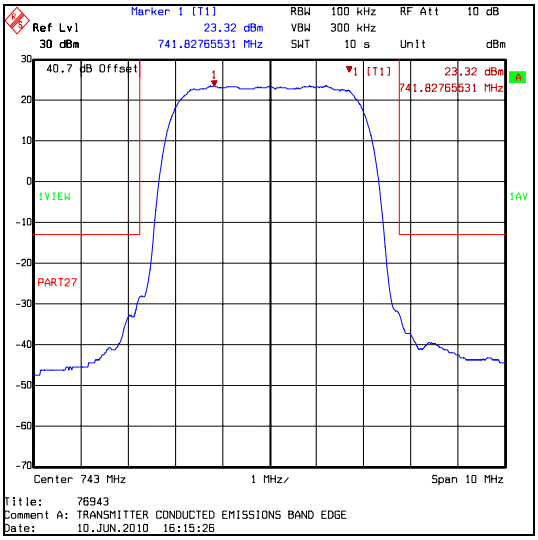


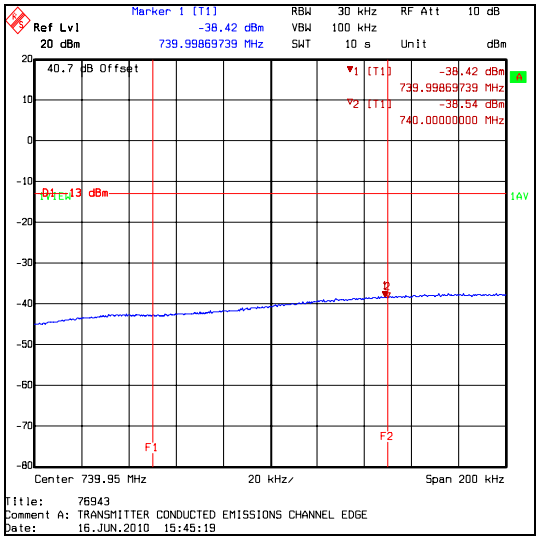


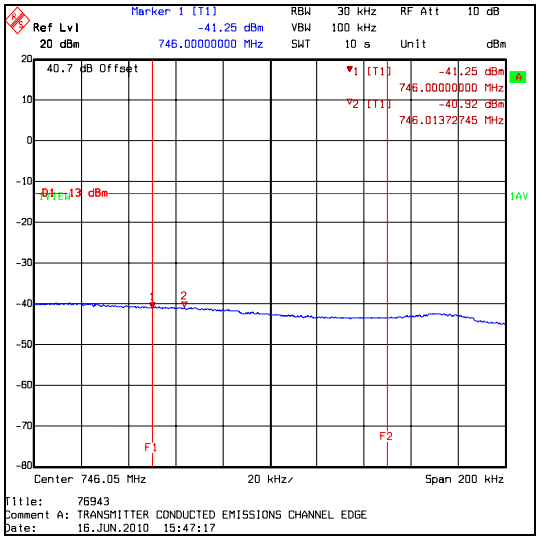
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band A / Top Channel 743.0 MHz / 64QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
739.999	-38.4	-13.0	25.4	Complied
746.014	-40.9	-13.0	27.9	Complied







5.2.6. Transmitter Conducted Emissions

Test Summary:

FCC Part:	27.53(g)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	9 kHz to 10 GHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	23

Results: Sub Band A / Bottom Channel 731.0 MHz / Port 2

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1463.818	-26.3	-13.0	13.3	Complied
16QAM	1463.819	-26.1	-13.0	13.1	Complied
64QAM	1463.850	-26.1	-13.0	13.1	Complied

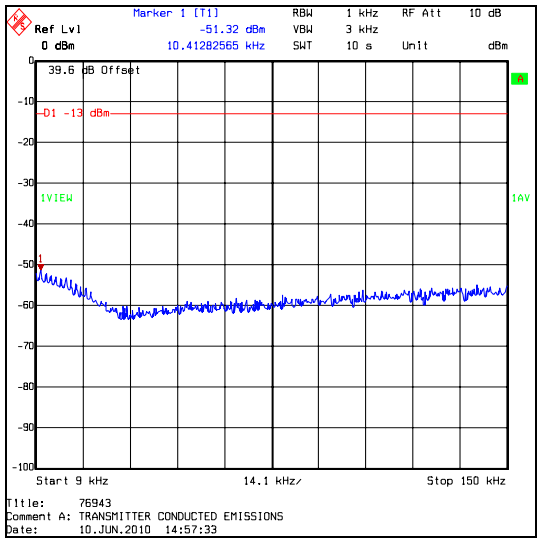
Results: Sub Band A / Top Channel 743.0 MHz / Port 2

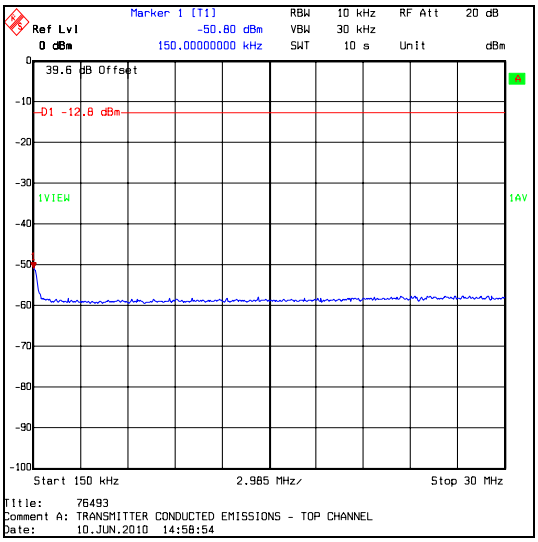
Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1484.077	-27.1	-13.0	14.1	Complied
16QAM	1484.077	-26.8	-13.0	13.8	Complied
64QAM	1484.109	-26.8	-13.0	13.8	Complied

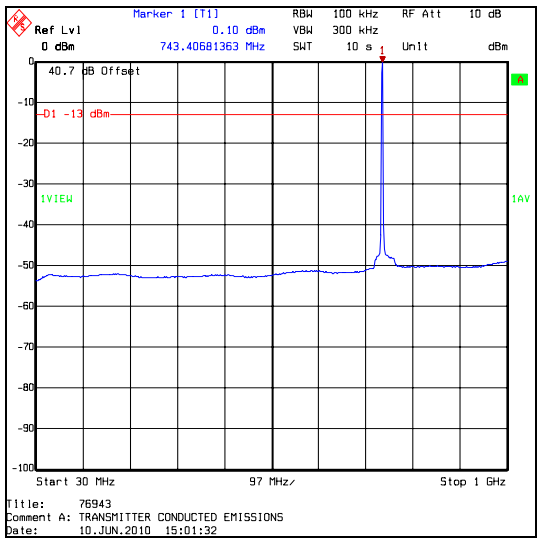
Note(s):

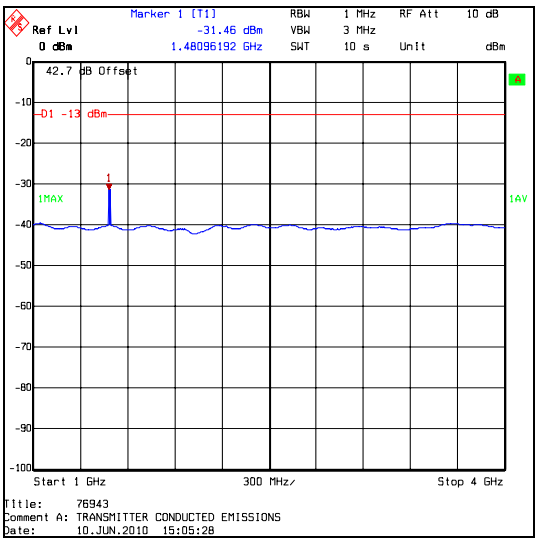
1. The emissions shown at approximately 760.902 MHz on the 30 MHz to 1 GHz plot is the carrier
2. All other emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.
3. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

Transmitter Conducted Emissions (continued)

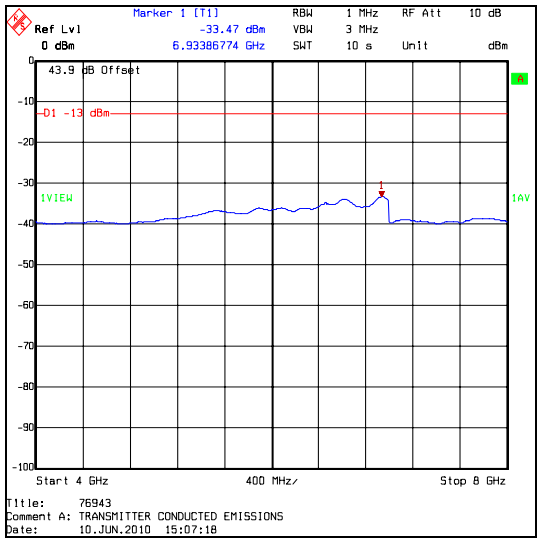


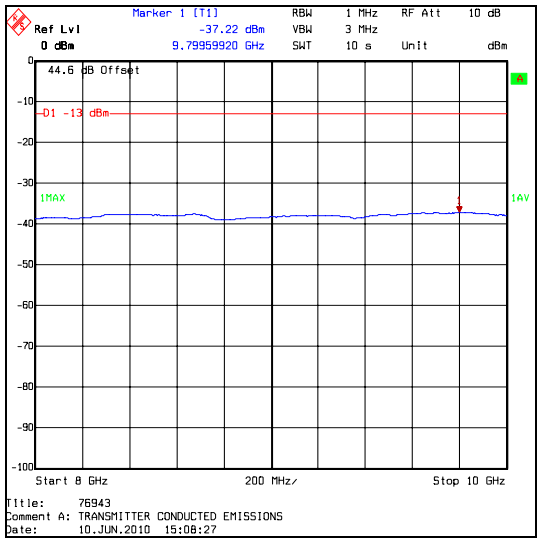






Transmitter Conducted Emissions (continued)





5.2.7. Transmitter Conducted Emissions at Band Edges

Test Summary:

FCC Part:	27.53(g)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	33

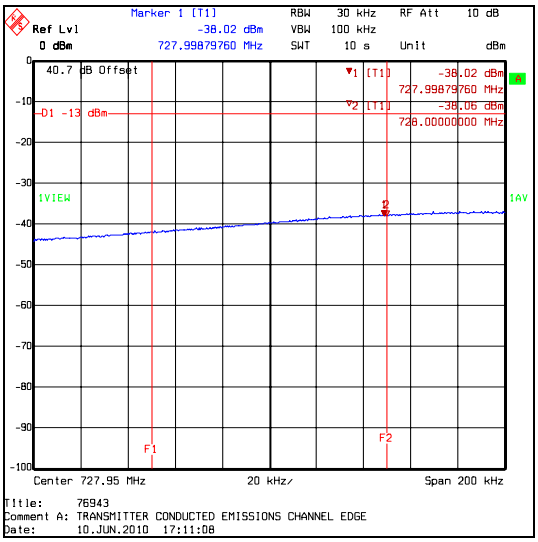
Results: Sub Band A Port 2

Modulation	Frequency of 100 kHz strip adjacent to block edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
QPSK	728.0	-38.0	-13.0	25.0	Complied
QPSK	746.0	-41.5	-13.0	28.5	Complied
16QAM	728.0	-38.3	-13.0	25.3	Complied
16QAM	746.0	-42.3	-13.0	29.7	Complied
64QAM	728.0	-38.1	-13.0	25.1	Complied
64QAM	746.0	-42.6	-13.0	29.4	Complied

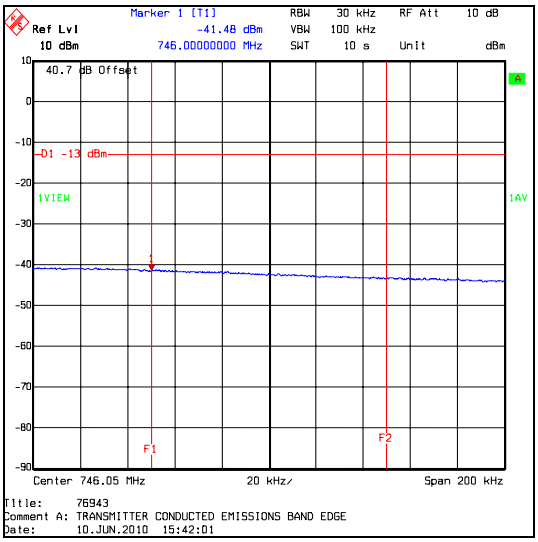
Note(s):

1. As stated in FCC Part 27.53(g) a resolution bandwidth of 30 kHz was used in the 100 kHz bands immediately outside and adjacent to the frequency block to demonstrate compliance and this can be seen on the plots below.
2. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

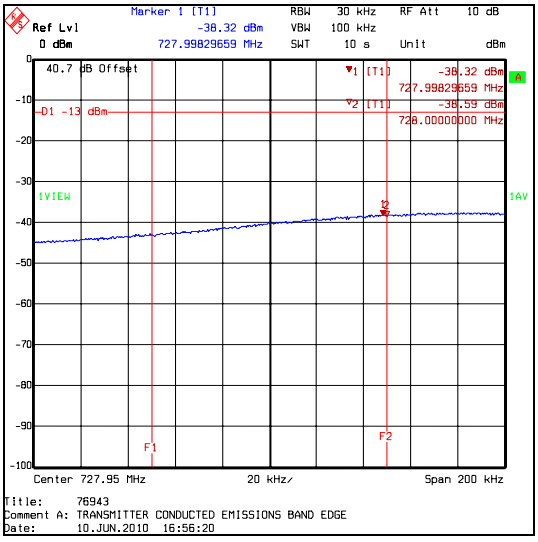
Transmitter Conducted Emissions at Band Edges (continued)



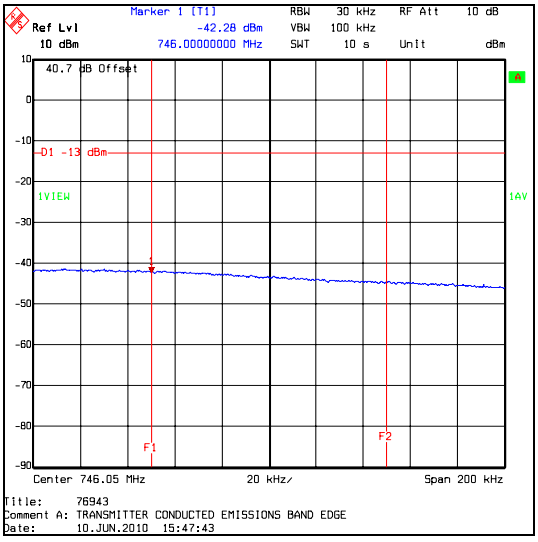
QPSK – Lower Band Edge



QPSK – Upper Band Edge

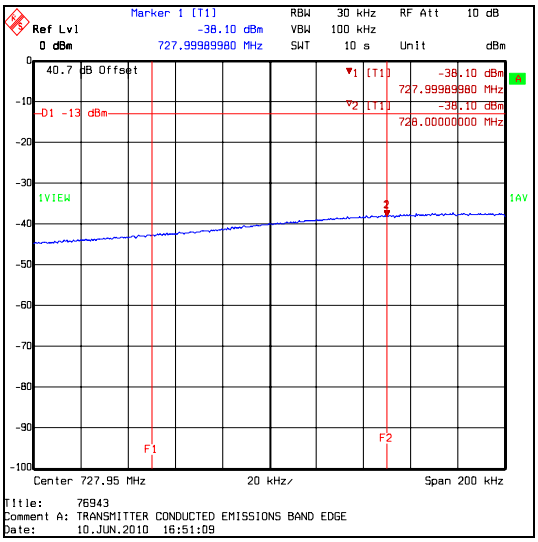


16QAM – Lower Band Edge

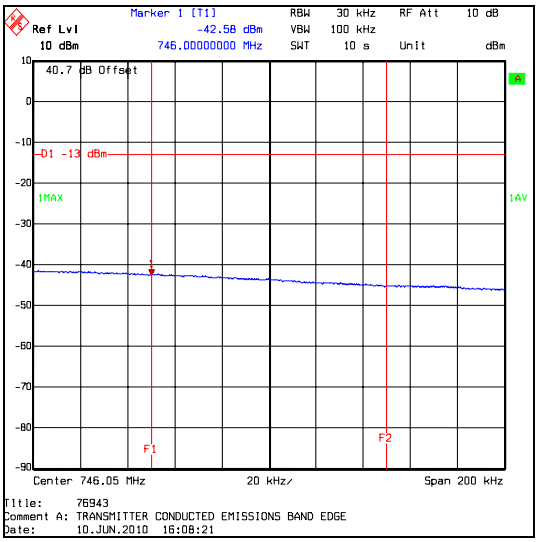


16QAM – Upper Band Edge

Transmitter Conducted Emissions at Band Edges (continued)



64QAM – Lower Band Edge



64QAM – Upper Band Edge

5.2.8. Transmitter Radiated Spurious Emissions

Test Summary:

FCC Part:	27.53(g)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	30 MHz to 10 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	33

Results: Sub Band A / Bottom Channel

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

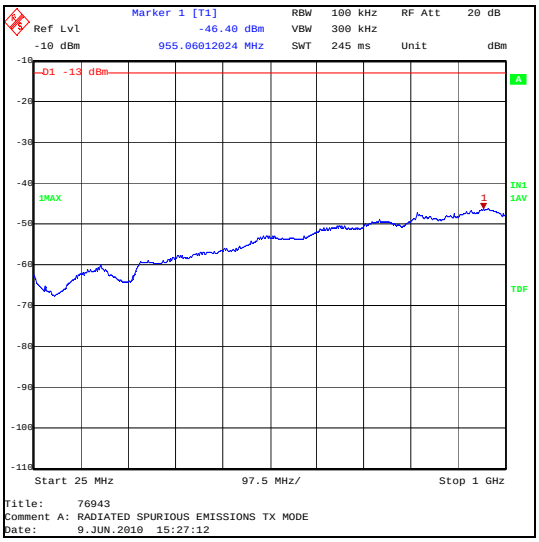
Results: Sub Band A / Top Channel

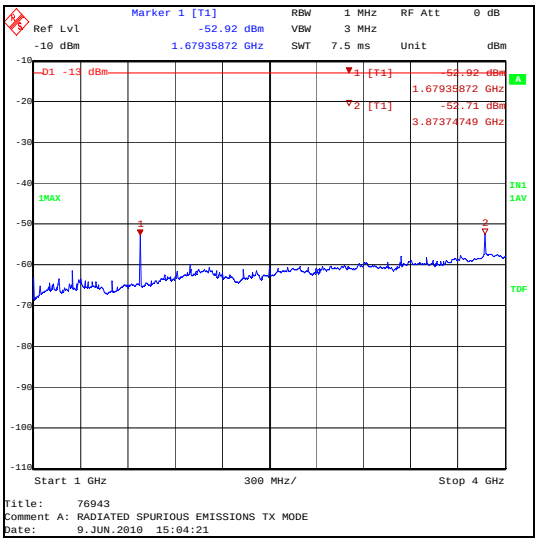
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

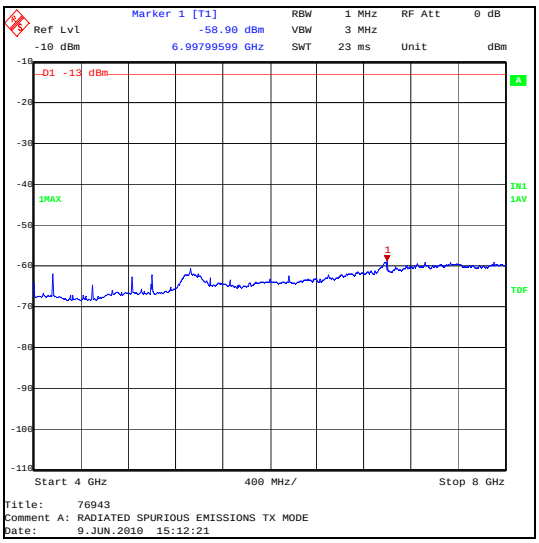
Note(s):

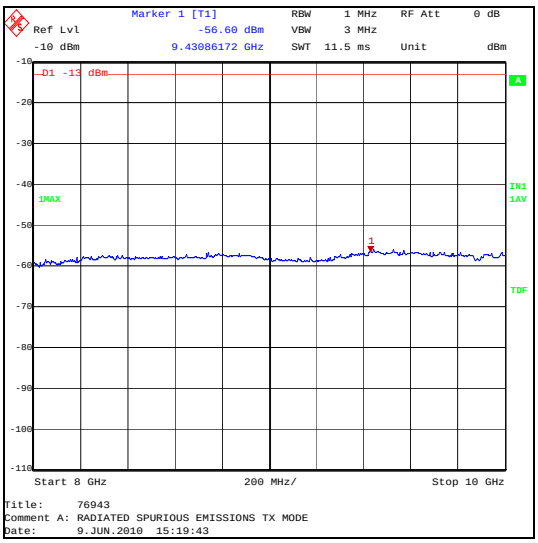
1. All emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.

Transmitter Radiated Spurious Emissions (continued)









5.2.9. Transmitter Radiated Spurious Emissions at Band Edges

Test Summary:

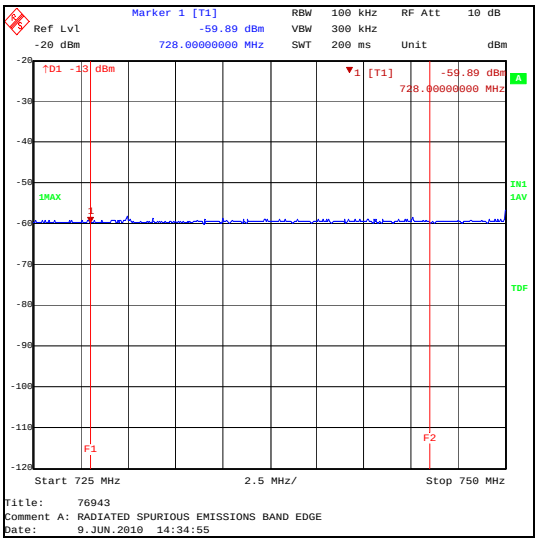
FCC Part:	27.53(g)
Test Method Used:	As described in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Part 2.1053

Environmental Conditions:

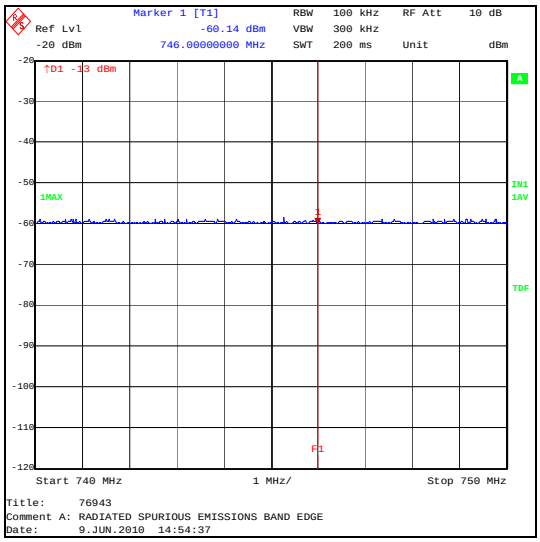
Temperature (°C):	29
Relative Humidity (%):	27

Results: Sub Band A

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	728.0	-59.9	-13.0	46.9	Complied
QPSK	746.0	-60.1	-13.0	47.1	Complied
16QAM	728.0	-59.9	-13.0	46.9	Complied
16QAM	746.0	-59.1	-13.0	46.1	Complied
64QAM	728.0	-59.9	-13.0	46.9	Complied
64QAM	746.0	-59.6	-13.0	46.6	Complied

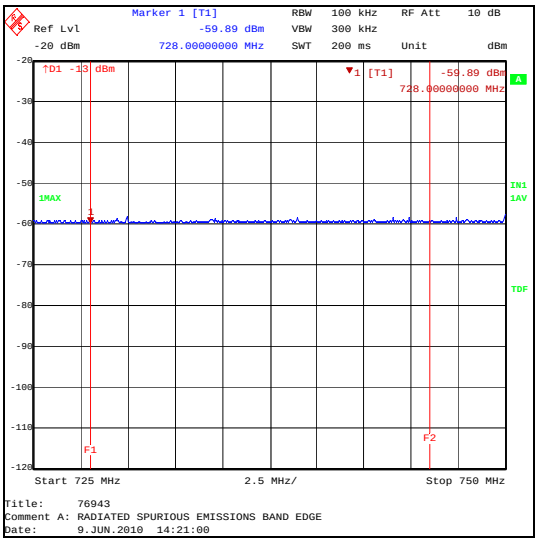


QPSK – Lower Band Edge

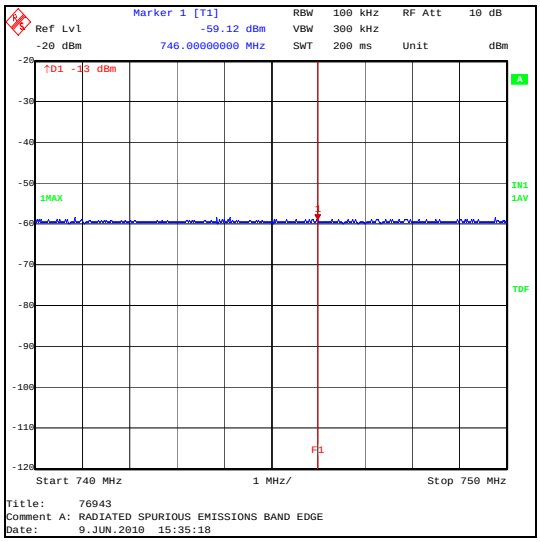


QPSK – Upper Band Edge

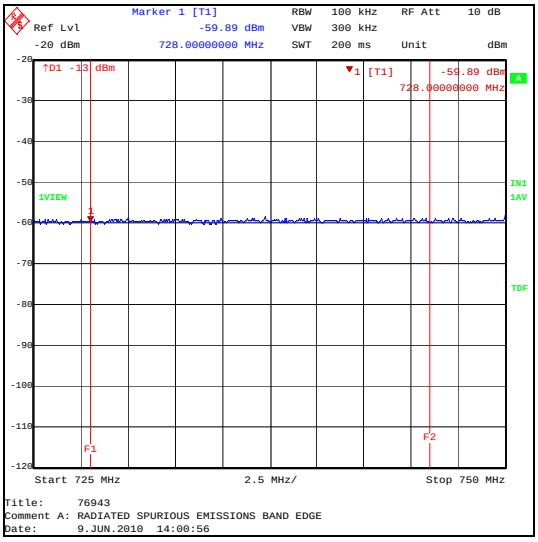
Transmitter Radiated Emissions at Band Edges (continued)



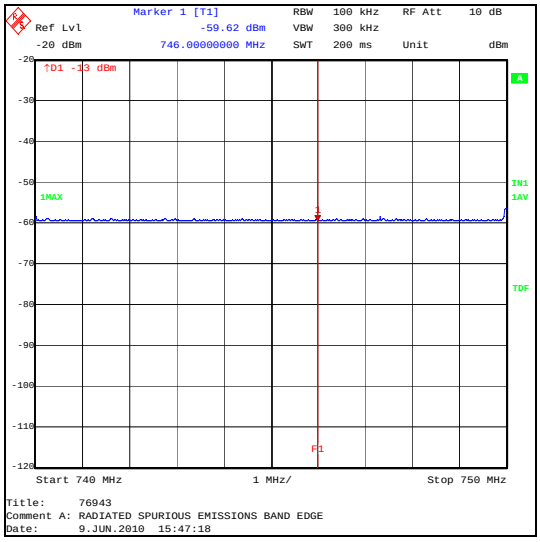
16QAM – Lower Band Edge



16QAM – Upper Band Edge



64QAM – Lower Band Edge



64QAM – Upper Band Edge

5.3. Test Results – Sub Band B

5.3.1. Transmitter Carrier Output Power and Effective Radiated Power (ERP)

Test Summary:

FCC Part:	27.50(b)(1)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.1

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	32

Results: Antenna Port 1

Modulation	Frequency (MHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
QPSK	748.5	38.0	20	58.0	60.0	2.0	Complied
QPSK	755.5	37.8	20	57.8	60.0	2.2	Complied
16QAM	748.5	38.0	20	58.0	60.0	2.0	Complied
16QAM	755.5	38.0	20	58.0	60.0	2.0	Complied
64QAM	748.5	37.8	20	57.8	60.0	2.2	Complied
64QAM	755.5	37.7	20	57.7	60.0	2.3	Complied

Results: Antenna Port 2

Modulation	Frequency (MHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
QPSK	748.5	38.2	20	58.2	60.0	1.8	Complied
QPSK	755.5	38.4	20	58.4	60.0	1.6	Complied
16QAM	748.5	38.3	20	58.3	60.0	1.7	Complied
16QAM	755.5	38.3	20	58.3	60.0	1.7	Complied
64QAM	748.5	38.3	20	58.3	60.0	1.7	Complied
64QAM	755.5	38.2	20	58.2	60.0	1.8	Complied

Note(s):

1. Measurements were performed with the EUT transmitting on all supported modulation types on the Antenna Port 1 and Antenna Port 2.

5.3.2. Transmitter Occupied Bandwidth

Test Summary:

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

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	35

Results: Antenna Port 1

Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK	748.5	100	300	4.118
QPSK	755.5	100	300	4.118
16QAM	748.5	100	300	4.118
16QAM	755.5	100	300	4.118
64QAM	748.5	100	300	4.118
64QAM	755.5	100	300	4.118

Results: Antenna Port 2

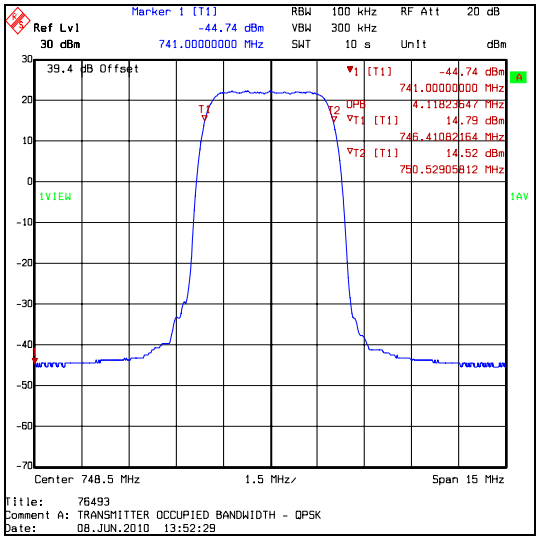
Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK	748.5	100	300	4.118
QPSK	755.5	100	300	4.118
16QAM	748.5	100	300	4.118
16QAM	755.5	100	300	4.118
64QAM	748.5	100	300	4.118
64QAM	755.5	100	300	4.118

Note(s):

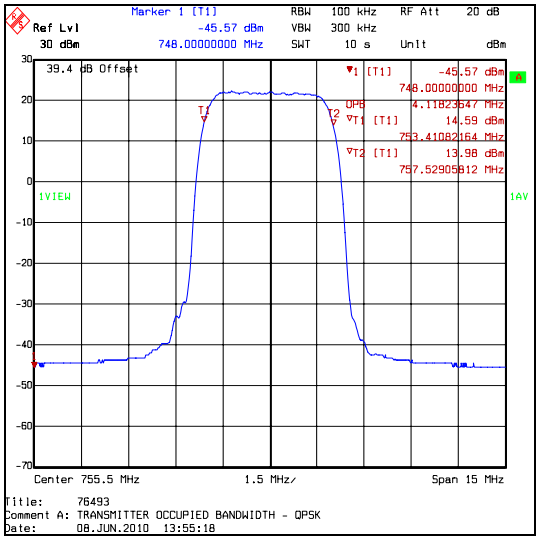
1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.
2. Measurements were performed with the EUT transmitting on all supported modulation types on the Antenna Port 1 and Antenna Port 2.

Transmitter Occupied Bandwidth (continued)

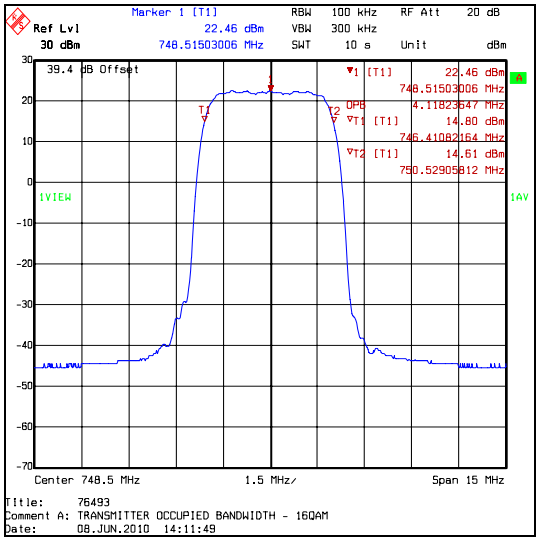
Antenna Port 1



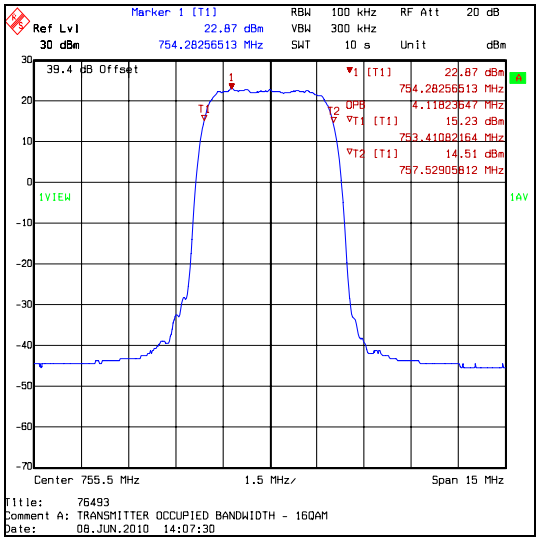
QPSK



QPSK



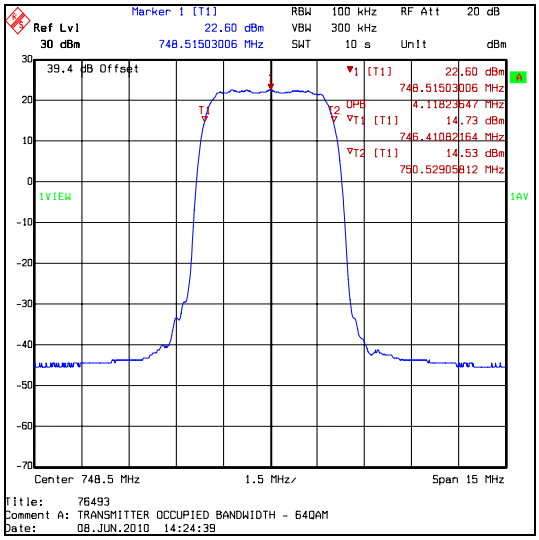
16QAM



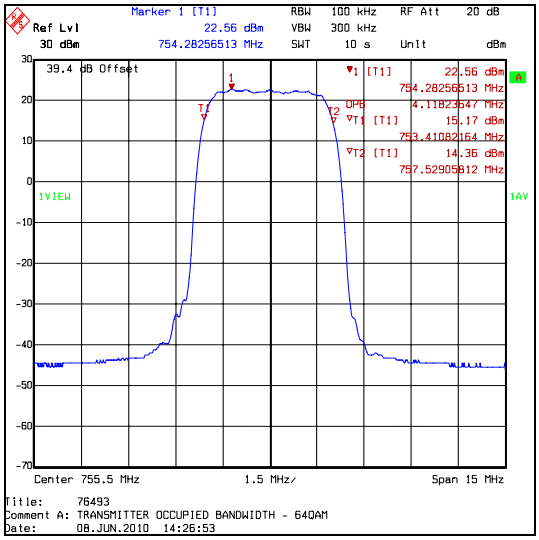
16QAM

Transmitter Occupied Bandwidth (continued)

Antenna Port 1



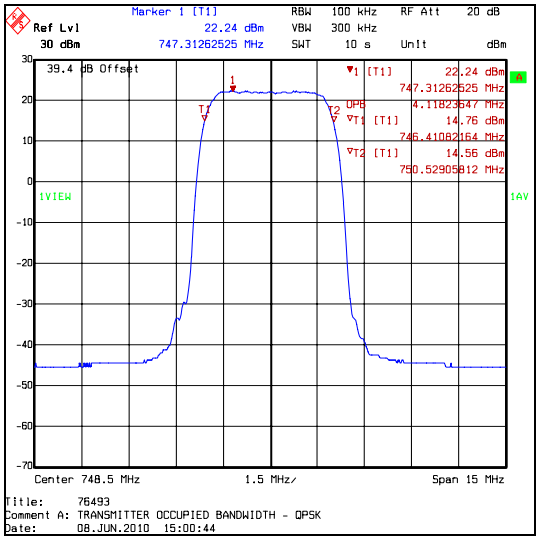
64QAM



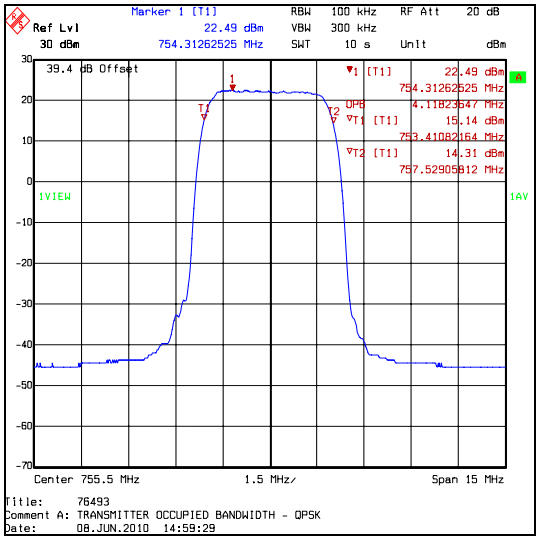
64QAM

Transmitter Occupied Bandwidth (continued)

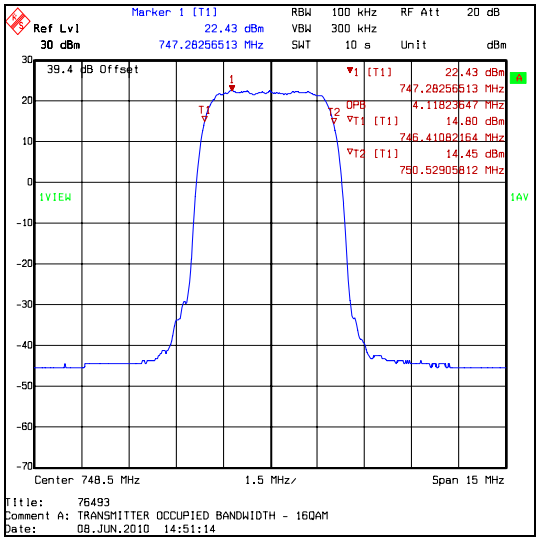
Antenna Port 2



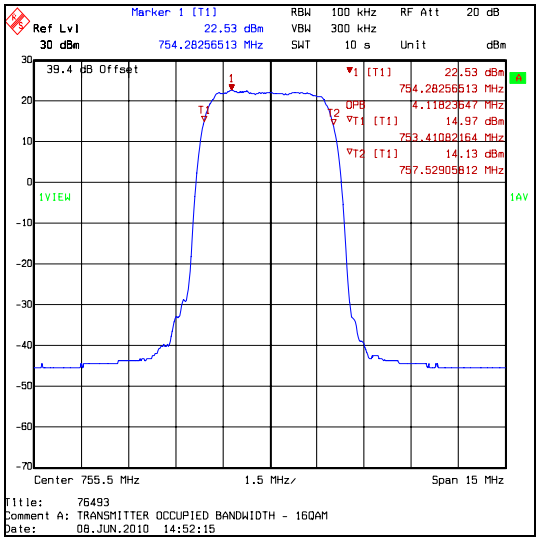
QPSK



QPSK



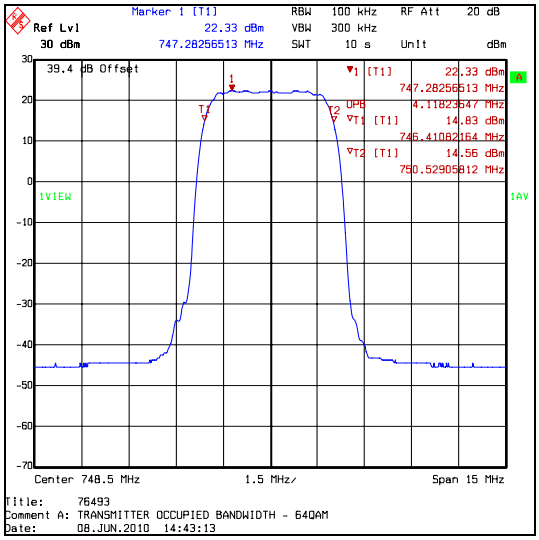
16QAM



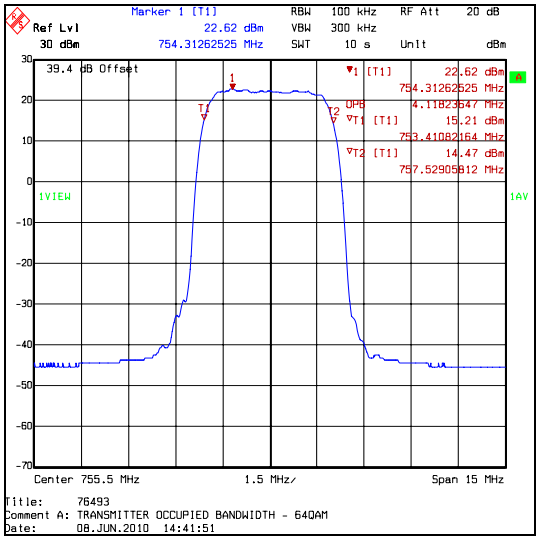
16QAM

Transmitter Occupied Bandwidth (continued)

Antenna Port 2



64QAM



64QAM

5.3.3. Transmitter Frequency Stability - Temperature

Test Summary:

FCC Part:	27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	43

Results: Sub Band B / Bottom Channel 748.5 MHz / Port 2

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	748.499797	203
-20	748.499909	91
-10	748.499909	91
0	748.499909	91
10	748.499910	90
20	748.499910	90
30	748.499909	91
40	748.499910	90
50	748.499914	86

Transmitter Frequency Stability - Temperature – (continued)

Results: Sub Band B / Top Channel 755.5 MHz / Port 2

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	755.499797	203
-20	755.499909	91
-10	755.499910	90
0	755.499909	91
10	755.499909	91
20	755.499910	90
30	755.499910	90
40	755.499910	90
50	755.499910	90

5.3.4. Transmitter Frequency Stability - Voltage Variation

Test Summary:

FCC Part:	27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

Environmental Conditions:

Ambient Temperature (°C):	20
Relative Humidity (%):	43

Results: Sub Band B / Bottom Channel 748.5 MHz / Port 2

Supply Voltage (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-40.8	748.499909	91
-48.0	748.499909	91
-55.2	748.499909	91

Results: Sub Band B / Top Channel 755.5 MHz / Port 2

Supply Voltage (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-40.8	755.499910	90
-48.0	755.499910	90
-55.2	755.499910	90

5.3.5. Transmitter Conducted Emissions – Channel Edge

Test Summary:

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	31

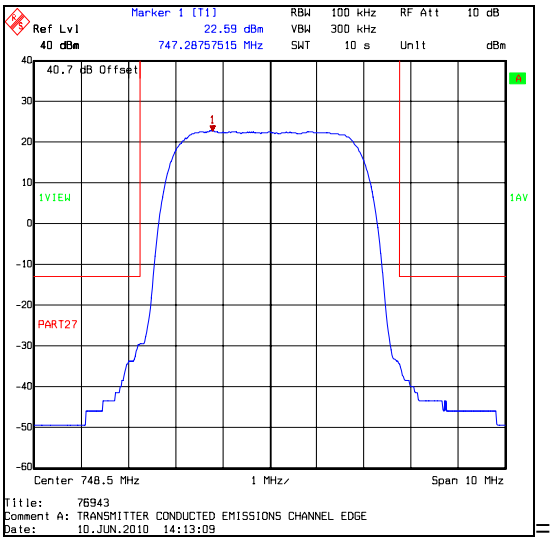
Note(s):

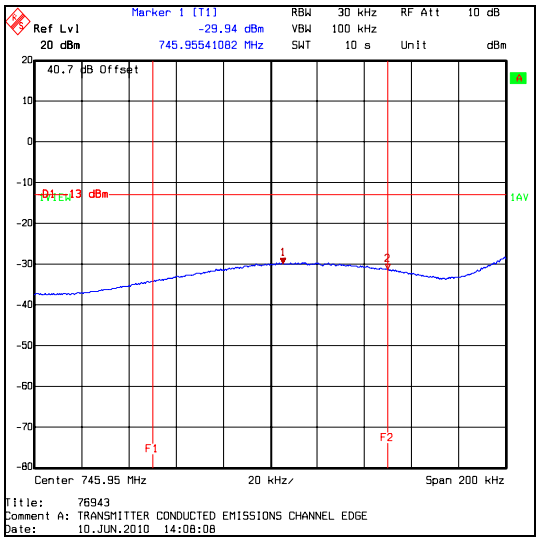
1. It can be seen on the main mask plot that the emission is close to the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. As stated in FCC Part 27.53(c)(5), a resolution bandwidth of 30 kHz was used in the 100 kHz bands immediately outside and adjacent to the frequency block to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.
2. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

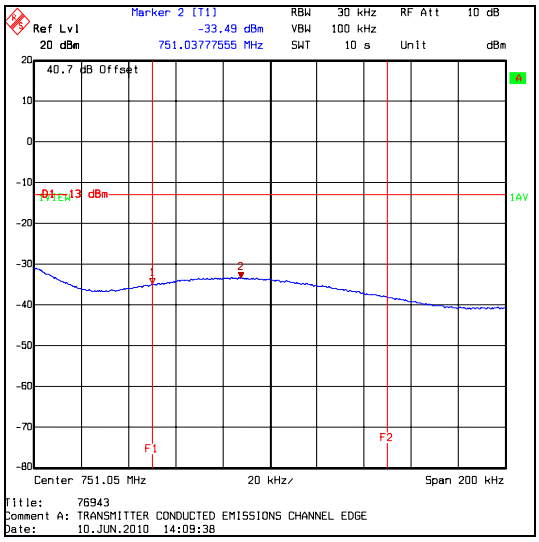
Results: Sub Band B / Bottom Channel 748.5 MHz / QPSK / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
746.069	-29.9	-13.0	16.9	Complied
751.037	-33.5	-13.0	20.5	Complied

Transmitter Conducted Emissions – Channel Edge (continued)



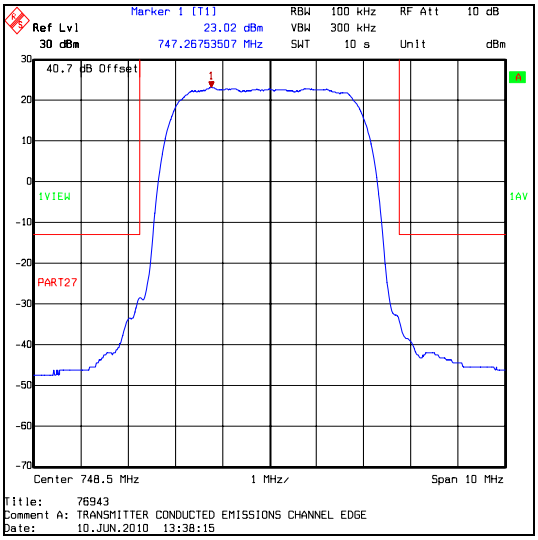


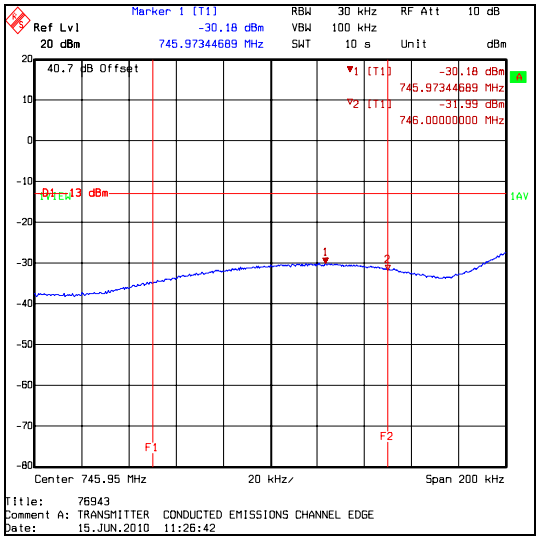


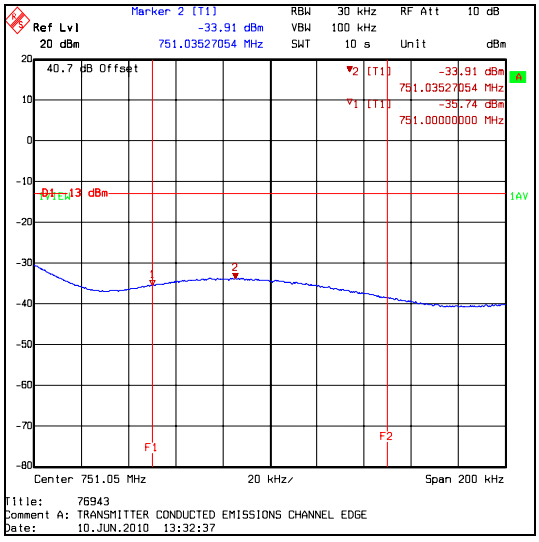
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band B / Bottom Channel 748.5 MHz / 16QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
745.973	-30.2	-13.0	17.2	Complied
751.035	-33.9	-13.0	20.9	Complied



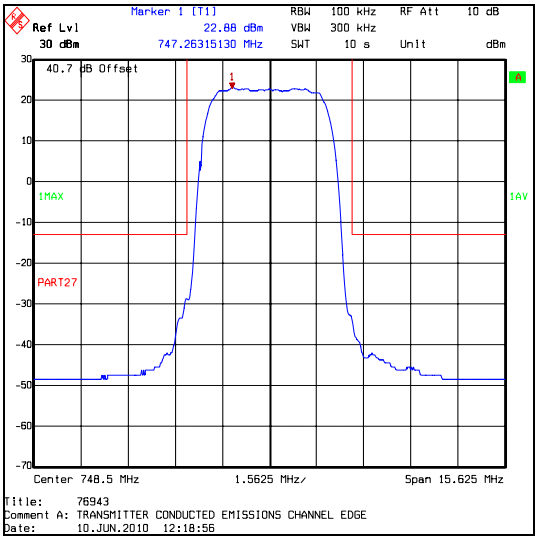


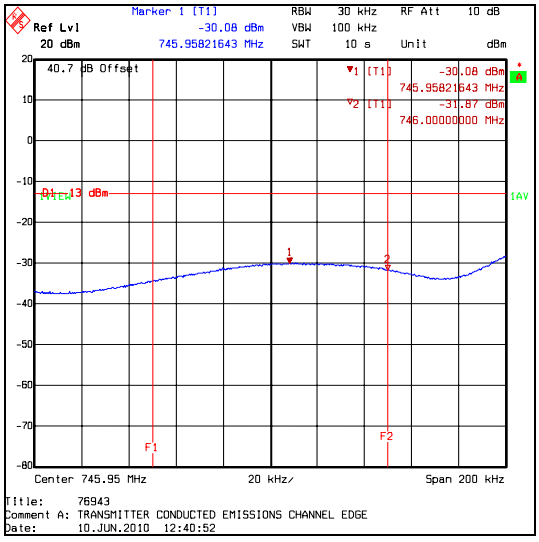


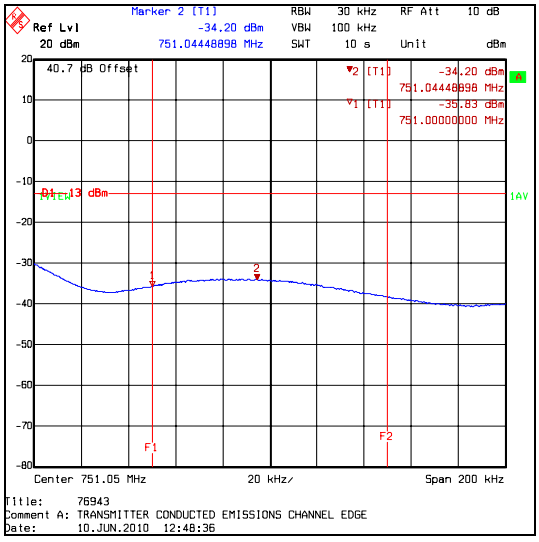
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band B / Bottom Channel 748.5 MHz / 64QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
745.958	-30.1	-13.0	17.1	Complied
751.197	-34.2	-13.0	21.2	Complied



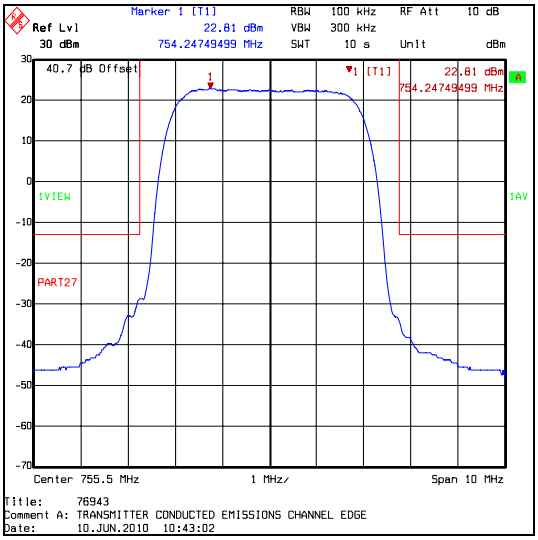


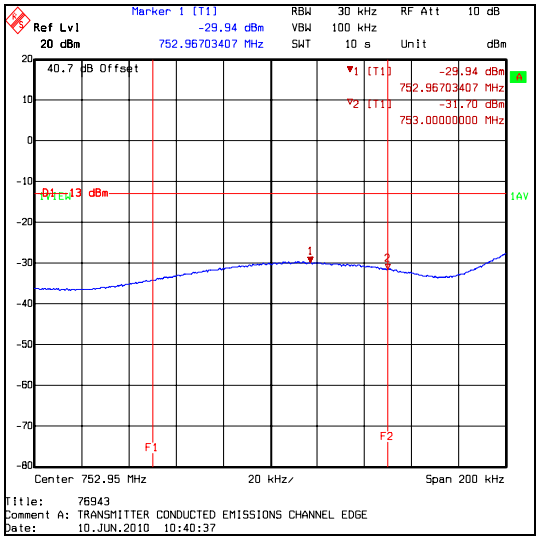


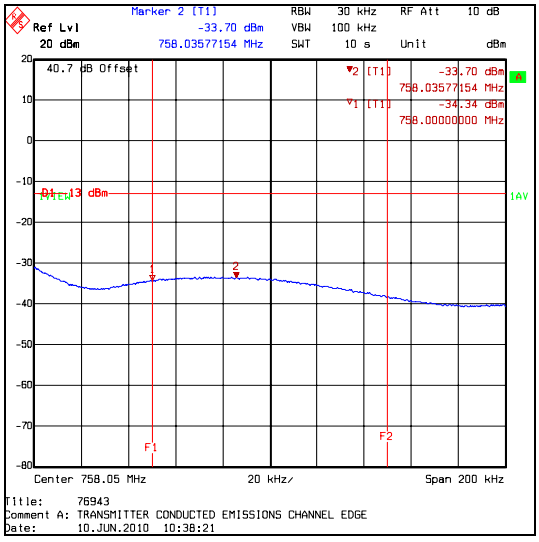
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band B / Top Channel 755.5 MHz / QPSK / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
752.974	-29.9	-13.0	16.9	Complied
758.036	-33.7	-13.0	20.7	Complied



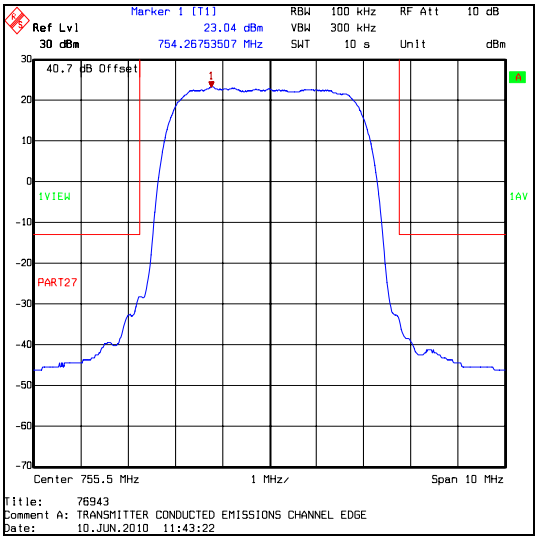


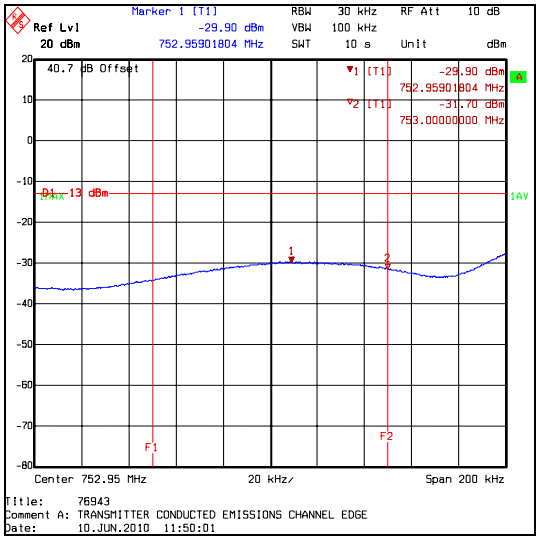


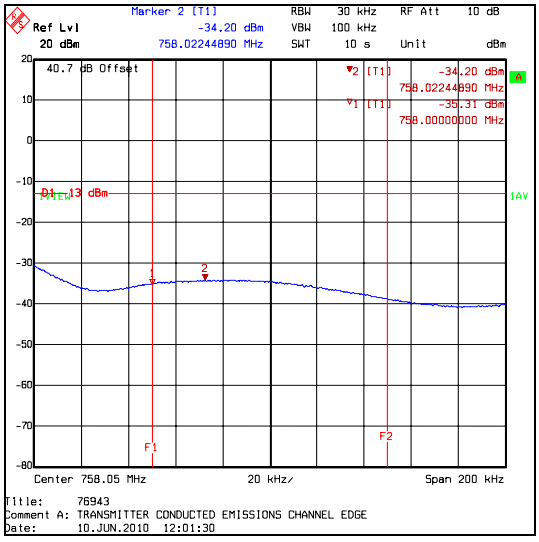
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band B / Top Channel 755.5 MHz / 16QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
752.959	-29.9	-13.0	16.9	Complied
758.032	-34.1	-13.0	21.1	Complied



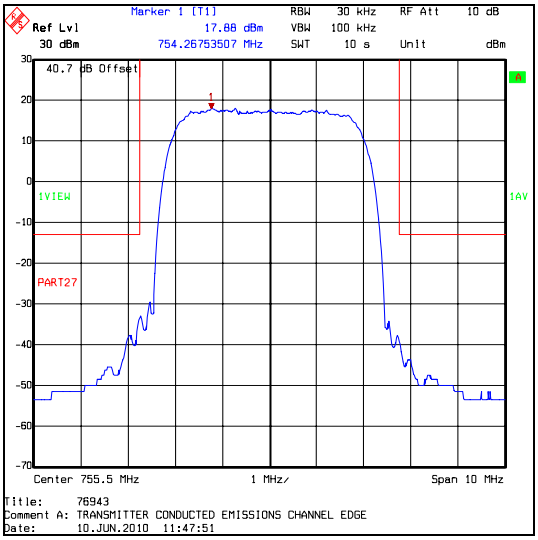


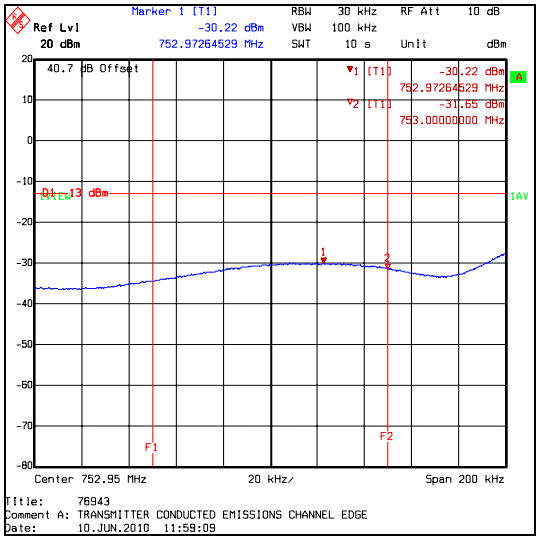


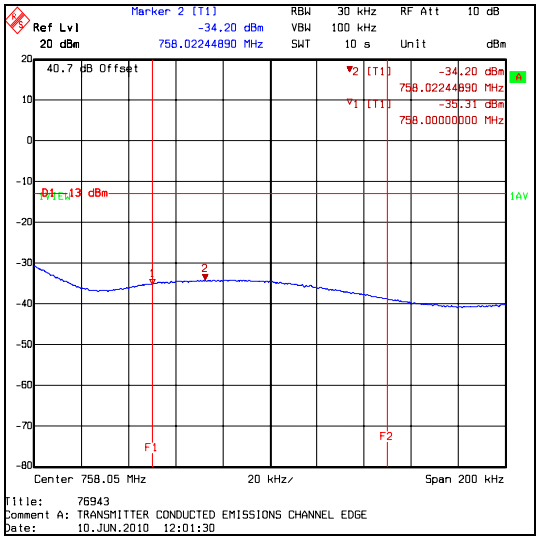
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band B / Top Channel 755.5 MHz / 64QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
752.973	-30.2	-13.0	17.2	Complied
758.022	-34.2	-13.0	21.2	Complied







5.3.6. Transmitter Conducted Emissions

Test Summary:

FCC Part:	27.53(c)(1)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	9 kHz to 10 GHz

Environmental Conditions:

Temperature (°C):	25 to 26
Relative Humidity (%):	23 to 32

Results: Sub Band B / Bottom Channel 748.5 MHz / Port 2

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1495.162	-29.5	-13.0	16.5	Complied
16QAM	1495.162	-28.9	-13.0	15.9	Complied
64QAM	1495.162	-29.2	-13.0	16.2	Complied

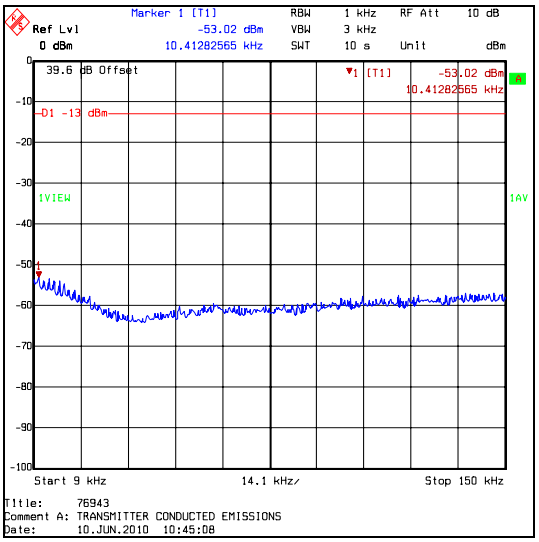
Results: Sub Band B / Top Channel 755.5 MHz / Port 2

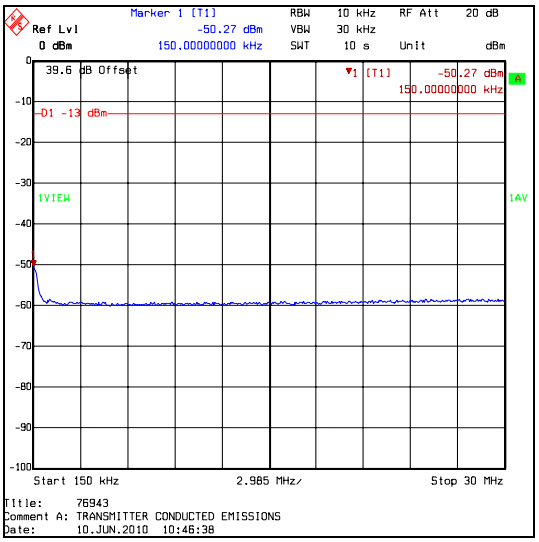
Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1511.022	-31.3	-13.0	18.3	Complied
16QAM	1511.022	-31.9	-13.0	18.9	Complied
64QAM	1511.022	-29.8	-13.0	16.8	Complied

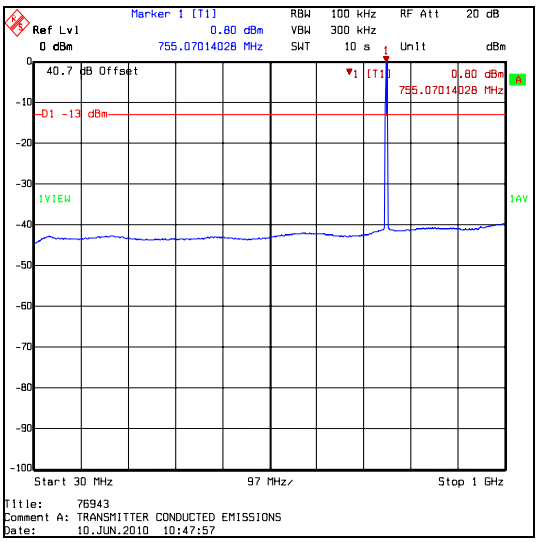
Note(s):

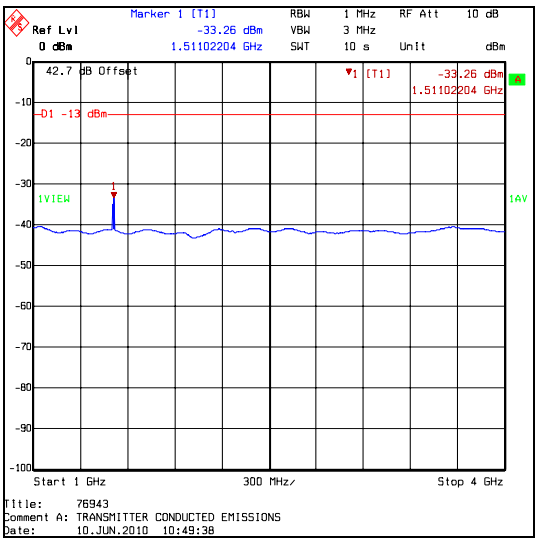
1. The emissions shown at approximately 760.902 MHz on the 30 MHz to 1 GHz plot is the carrier
2. All other emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.
3. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

Transmitter Conducted Emissions (continued)

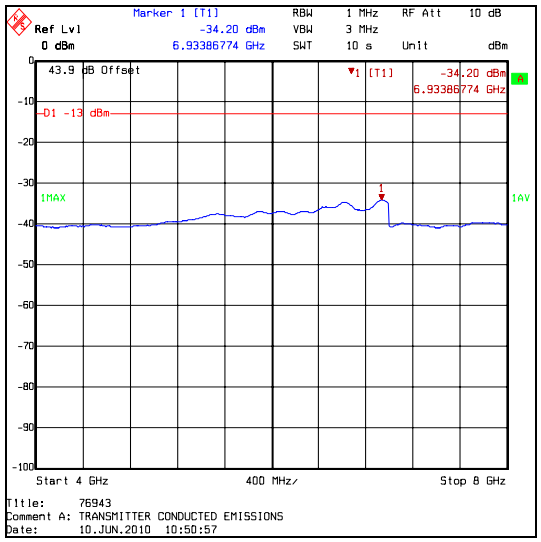


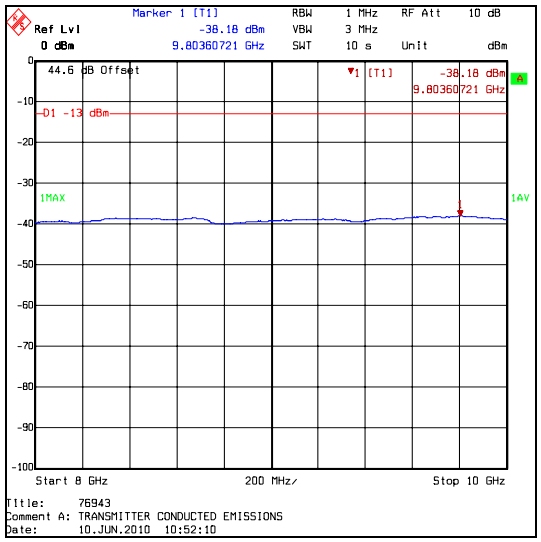






Transmitter Conducted Emissions (continued)





5.3.7. Transmitter Conducted Emissions at Band Edges

Test Summary:

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

Environmental Conditions:

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

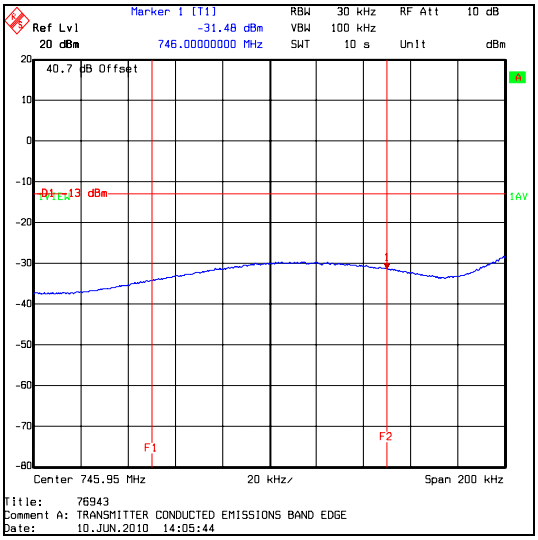
Results: Sub Band B / Port 2

Modulation	Frequency of 100 kHz strip adjacent to block edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
QPSK	746.0	-31.5	-13.0	18.5	Complied
QPSK	758.0	-34.6	-13.0	21.6	Complied
16QAM	746.0	-31.8	-13.0	18.8	Complied
16QAM	758.0	-35.2	-13.0	22.2	Complied
64QAM	746.0	-32.0	-13.0	19.0	Complied
64QAM	758.0	-35.4	-13.0	22.4	Complied

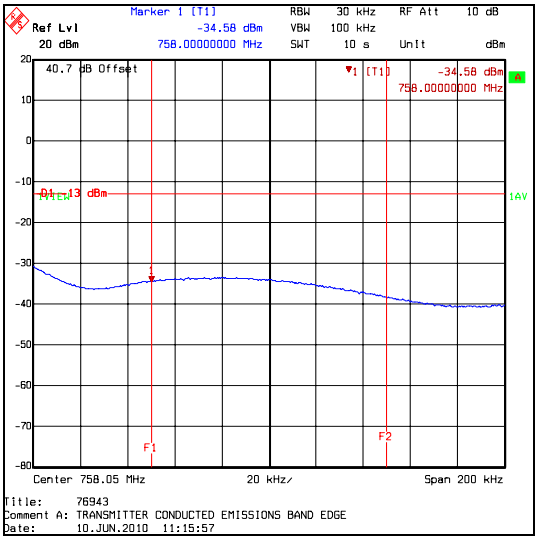
Note(s):

1. As stated in FCC Part 27.53(c)(5), a resolution bandwidth of 30 kHz was used in the 100 kHz bands immediately outside and adjacent to the frequency block to demonstrate compliance.
2. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

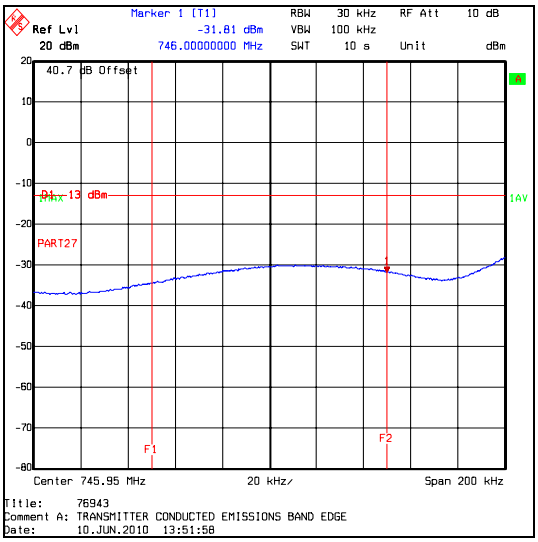
Transmitter Conducted Emissions at Band Edges (continued)



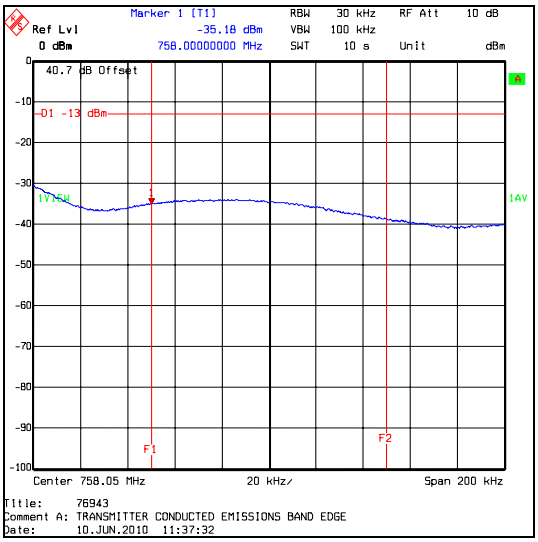
QPSK – Lower Band Edge



QPSK – Upper Band Edge

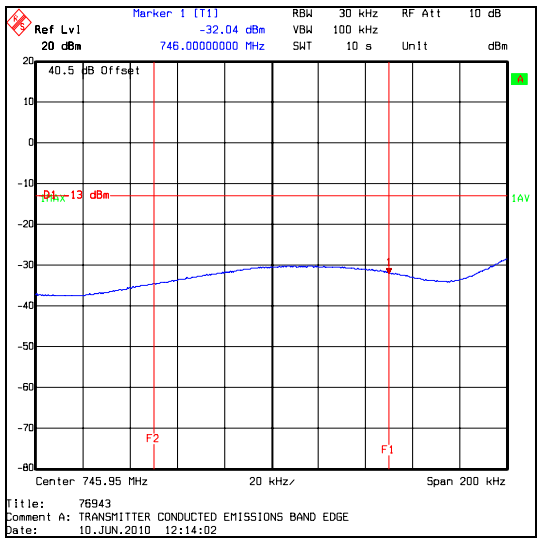


16QAM – Lower Band Edge

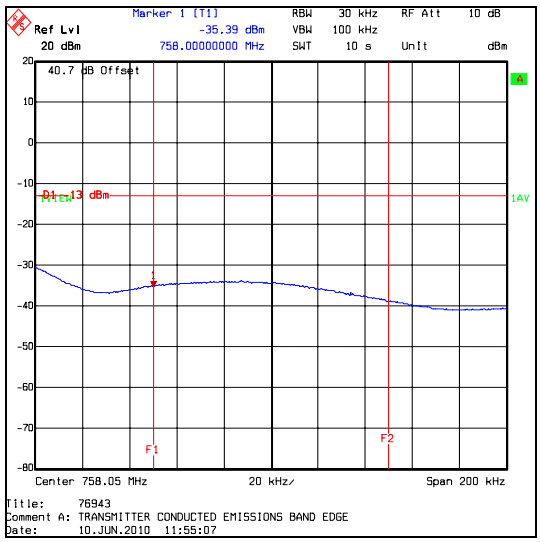


16QAM – Upper Band Edge

Transmitter Conducted Emissions at Band Edges (continued)



64QAM – Lower Band Edge



64QAM – Upper Band Edge

5.3.8. Transmitter Radiated Spurious Emissions

Test Summary:

FCC Part:	27.53(c)(1)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	30 MHz to 10 GHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	28

Results: Sub Band B / Bottom Channel 748.5 MHz

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

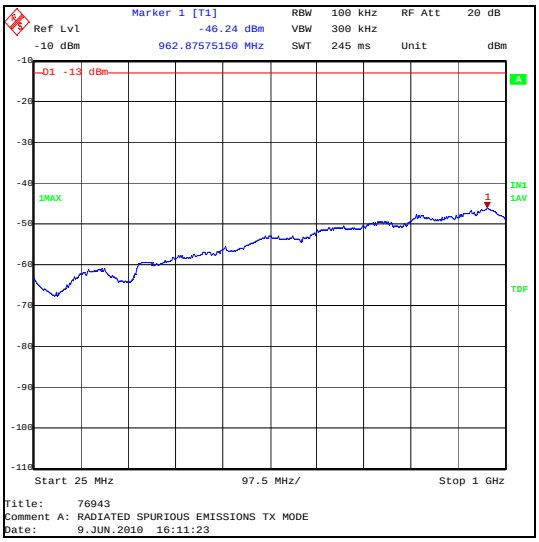
Results: Sub Band B / Top Channel 755.5 MHz

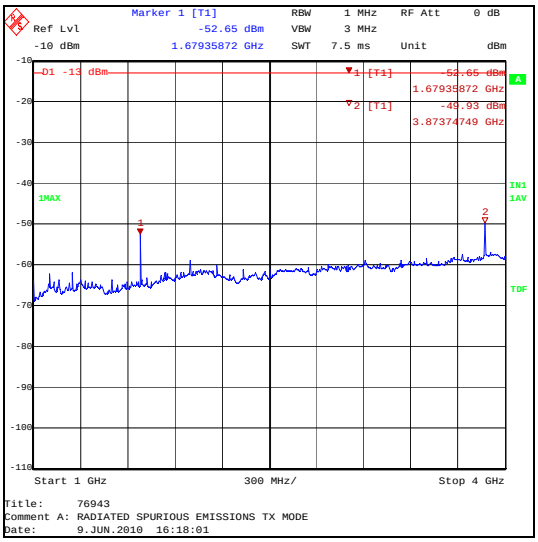
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1				

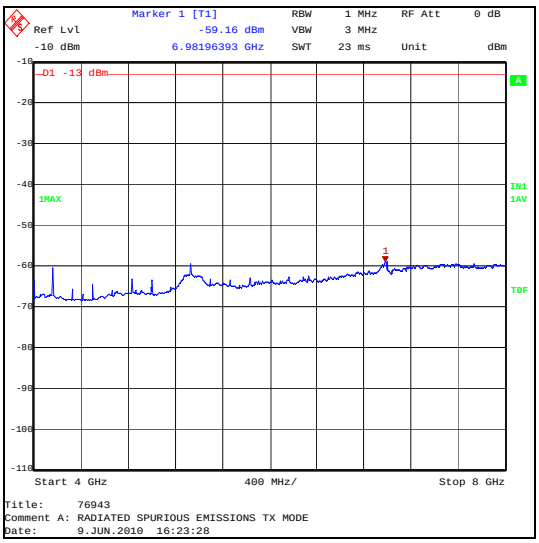
Note(s):

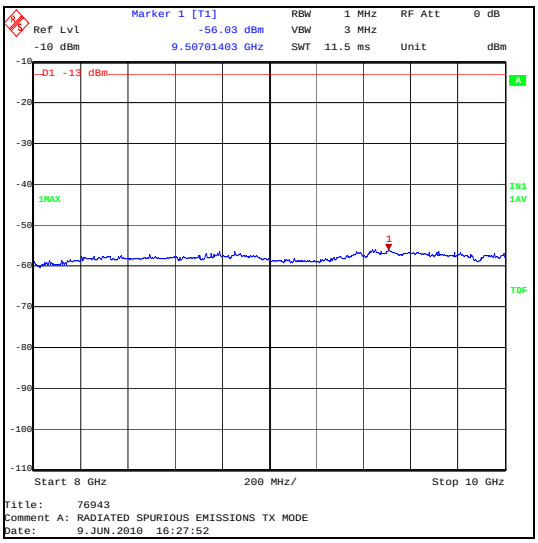
1. All emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.

Transmitter Radiated Spurious Emissions (continued)









5.3.9. Transmitter Radiated Spurious Emissions at Band Edges

Test Summary:

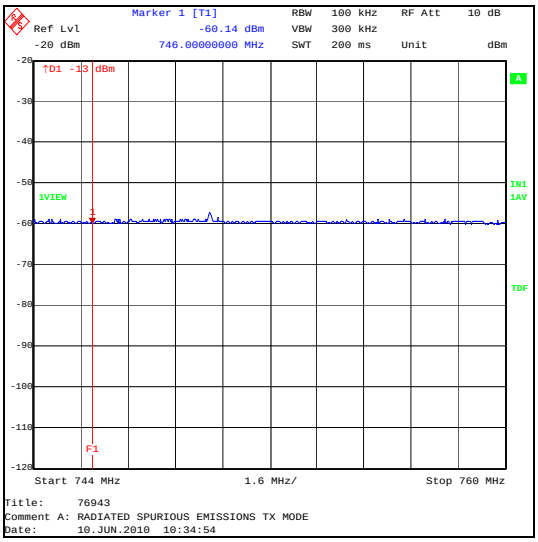
FCC Part:	27.53(c)(1)
Test Method Used:	As described in ANSI TIA-603-C-2004 Section 2.2.12 referencing FCC CFR Part 2.1053

Environmental Conditions:

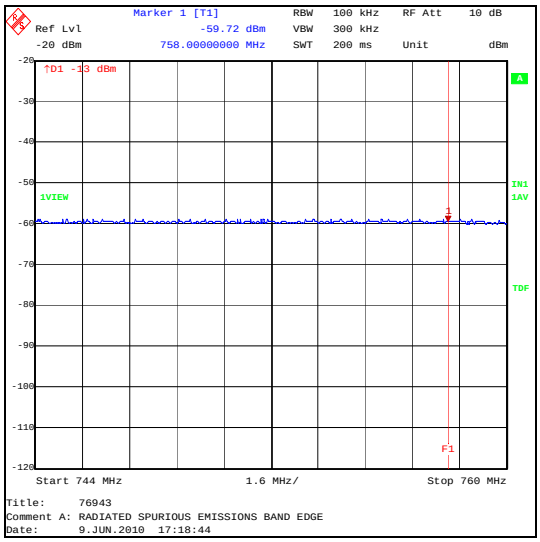
Temperature (°C):	28
Relative Humidity (%):	29

Results: Sub Band B

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	746.0	-60.1	-13.0	47.1	Complied
QPSK	758.0	-59.7	-13.0	46.7	Complied
16QAM	746.0	-59.6	-13.0	46.6	Complied
16QAM	758.0	-59.7	-13.0	46.7	Complied
64QAM	746.0	-60.1	-13.0	47.1	Complied
64QAM	758.0	-59.7	-13.0	46.7	Complied

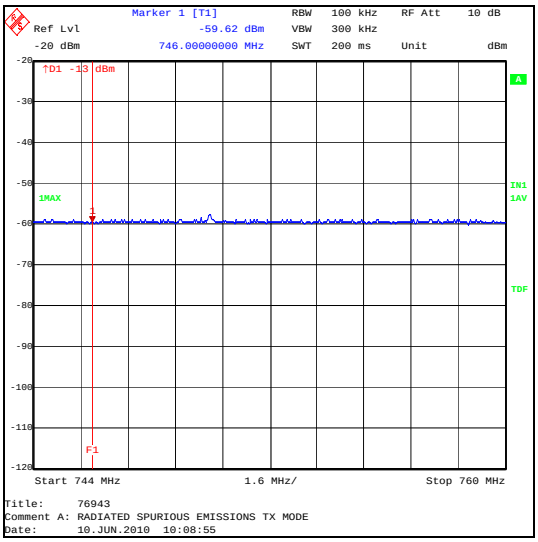


QPSK – Lower Band Edge

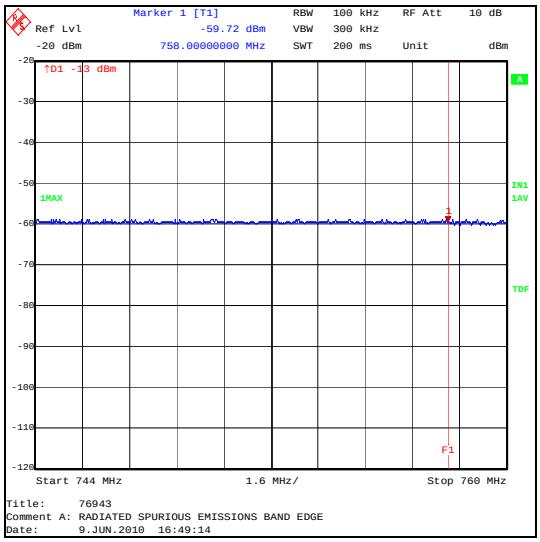


QPSK – Upper Band Edge

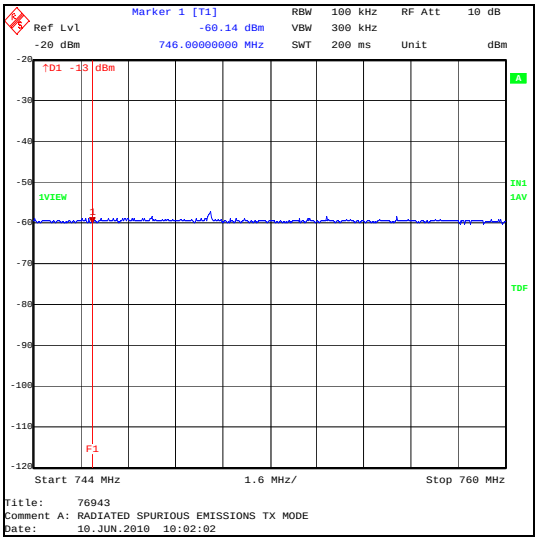
Transmitter Radiated Emissions at Band Edges (continued)



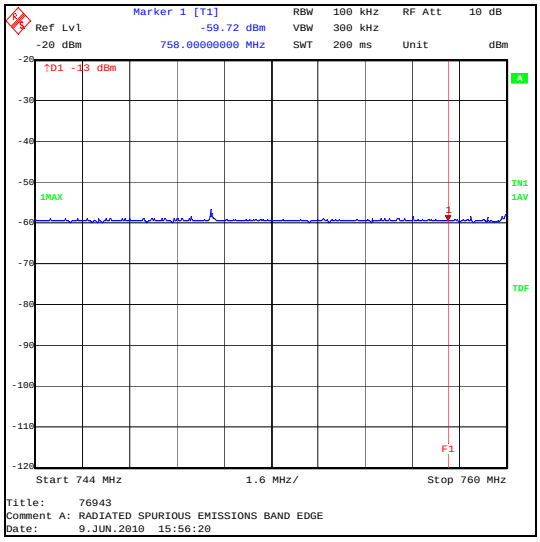
16QAM – Lower Band Edge



16QAM – Upper Band Edge



64QAM – Lower Band Edge



64QAM – Upper Band Edge

5.3.10. Transmitter Conducted Emissions – Emission Limitations

Test Summary:

FCC Part:	27.53(c)(3)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	763 MHz to 775 MHz & 793 MHz to 805 MHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	33

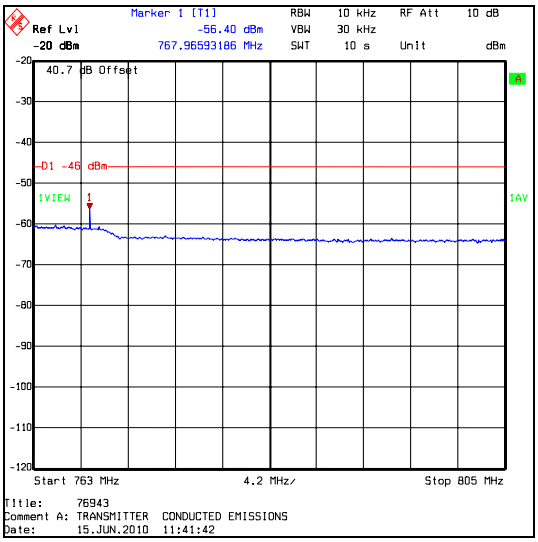
Note(s):

1. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

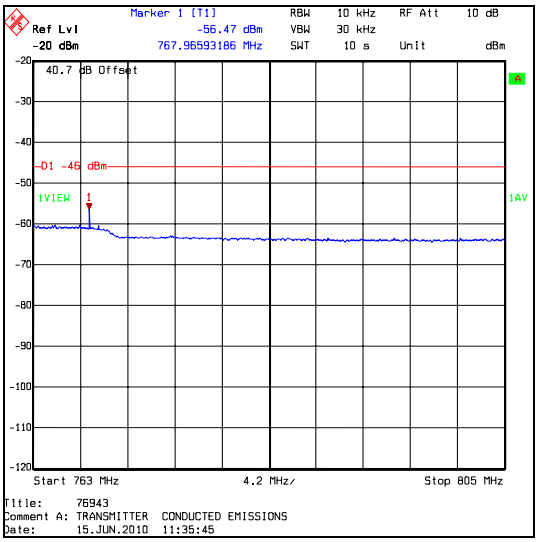
Results: Sub Band B / Bottom Channel 748.5 MHz / Port 2

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	767.966	-56.4	-46.0	10.4	Complied
16QAM	767.966	-56.5	-46.0	10.5	Complied
64QAM	767.966	-56.5	-46.0	10.5	Complied

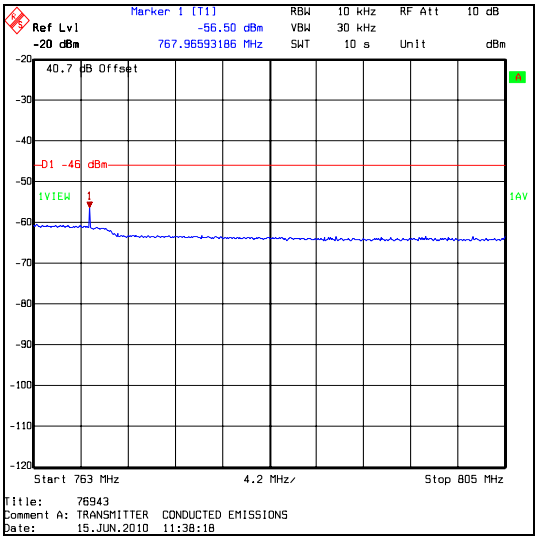
Transmitter Conducted Emissions – Emission Limitations (continued)



QPSK



16QAM

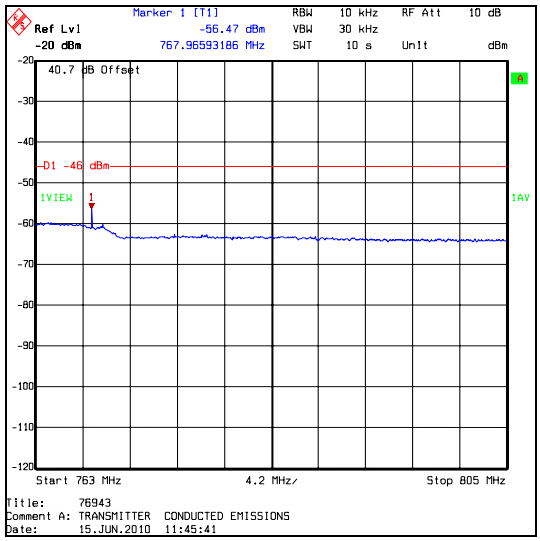


64QAM

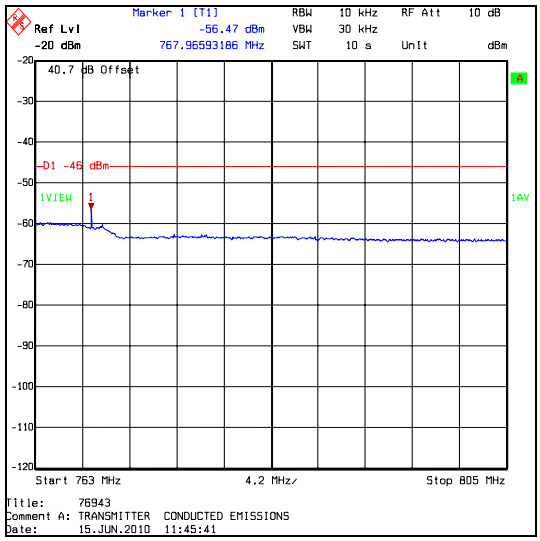
Transmitter Conducted Emissions – Emission Limitations (continued)

Results: Sub Band B / Top Channel 755.5 MHz / Port 2

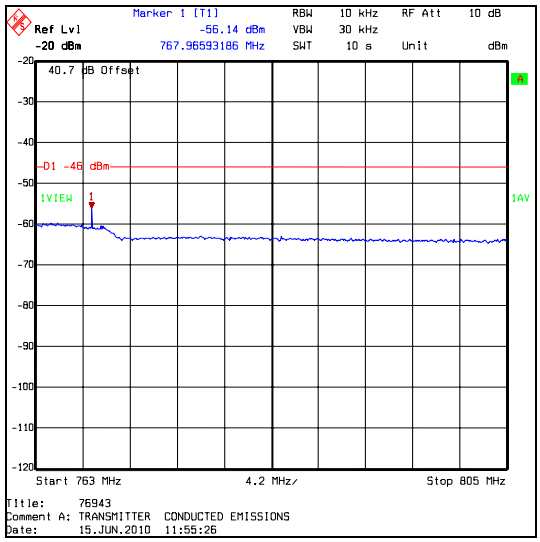
Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	767.966	-56.5	-46.0	10.5	Complied
16QAM	767.966	-56.5	-46.0	10.5	Complied
64QAM	767.966	-56.1	-46.0	10.1	Complied



QPSK



16QAM



64QAM

5.3.11. Transmitter Conducted Emissions – Emission Limitations

Test Summary:

FCC Part:	27.53(f)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	1559 MHz to 1610 MHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	33

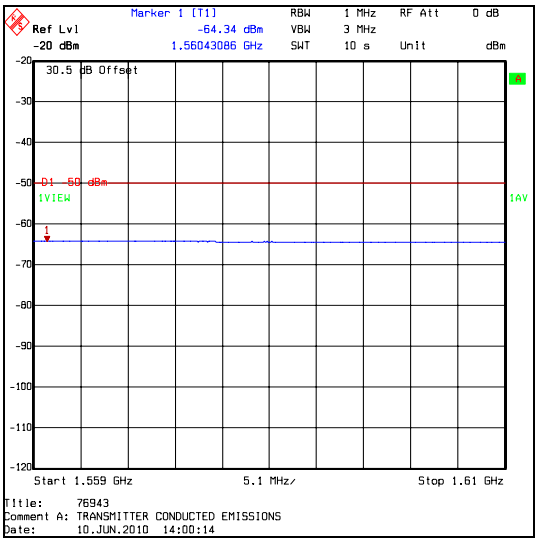
Note(s):

1. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

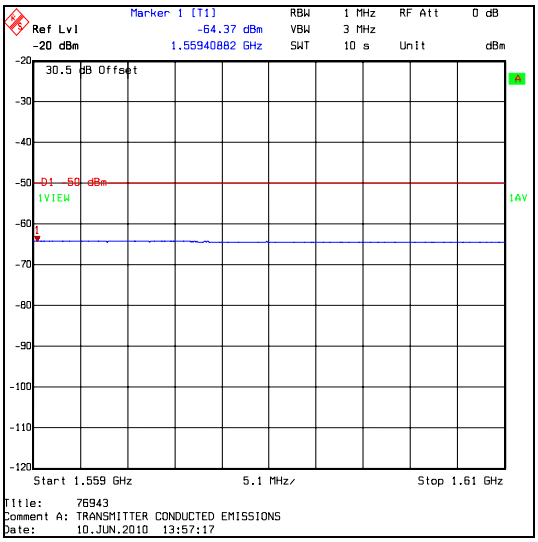
Results: Sub Band B / Bottom Channel 748.5 MHz / Port 2

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1560.431	-64.3	-50.0	14.3	Complied
16QAM	1559.409	-64.4	-50.0	14.4	Complied
64QAM	1561.249	-64.4	-50.0	14.4	Complied

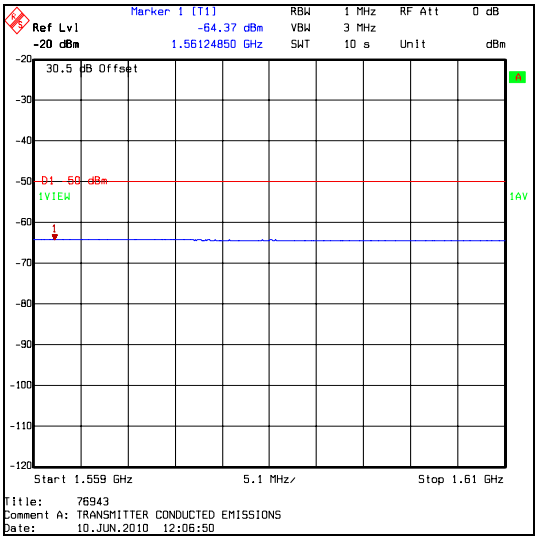
Transmitter Conducted Emissions – Emission Limitations (continued)



QPSK



16QAM

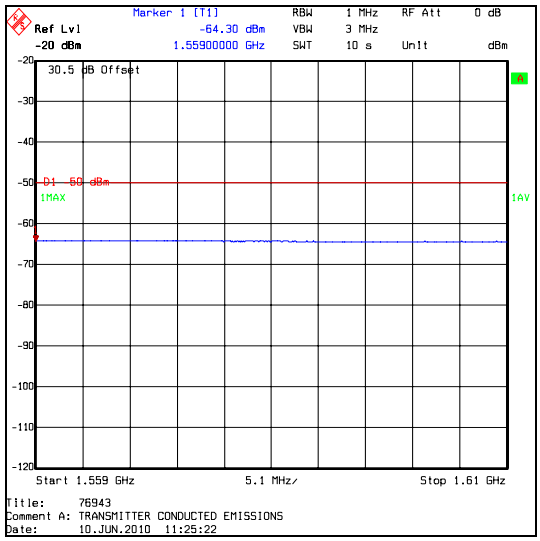


64QAM

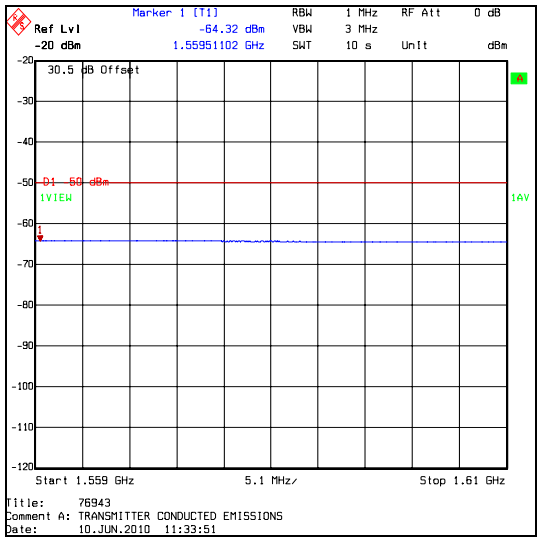
Transmitter Conducted Emissions – Emission Limitations (continued)

Results: Sub Band B / Top Channel 755.5 MHz / Port 2

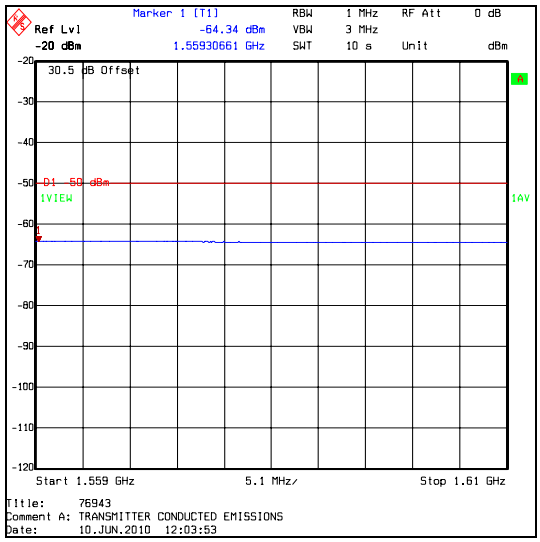
Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1559.000	-64.3	-50.0	14.3	Complied
16QAM	1559.511	-64.3	-50.0	14.3	Complied
64QAM	1559.307	-64.3	-50.0	14.3	Complied



QPSK



16QAM



64QAM

5.3.12. Transmitter Radiated Spurious Emissions – Emission Limitations

Test Summary:

FCC Part:	27.53(c)(3)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	763 MHz to 775 MHz & 793 MHz to 805 MHz

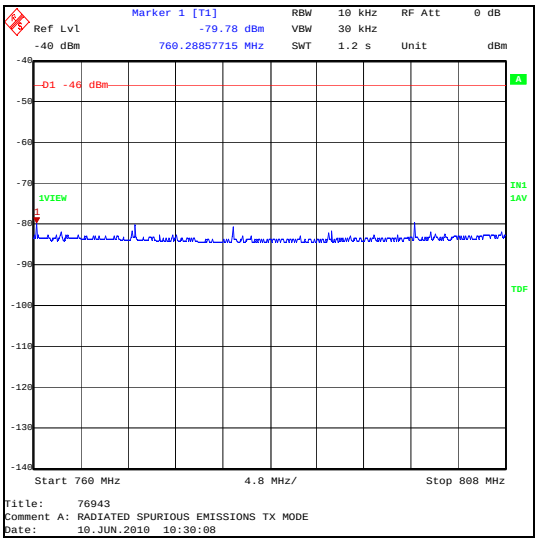
Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	30

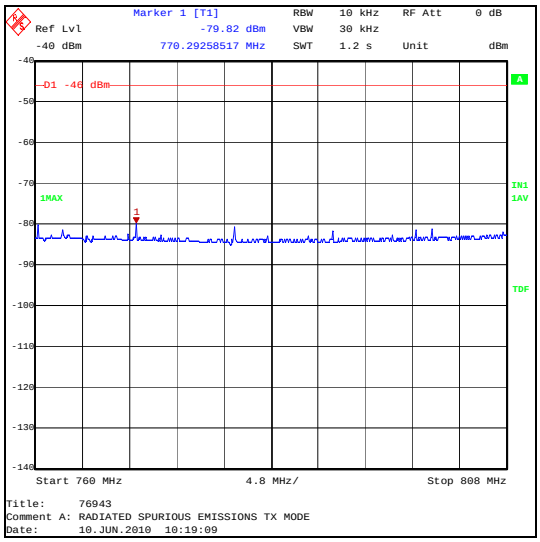
Results: Sub Band B / Bottom Channel 748.5 MHz

Modulation	Freq (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	760.289	-79.8	-46.0	33.8	Complied
16QAM	770.293	-79.8	-46.0	33.8	Complied
64QAM	760.289	-79.8	-46.0	33.8	Complied

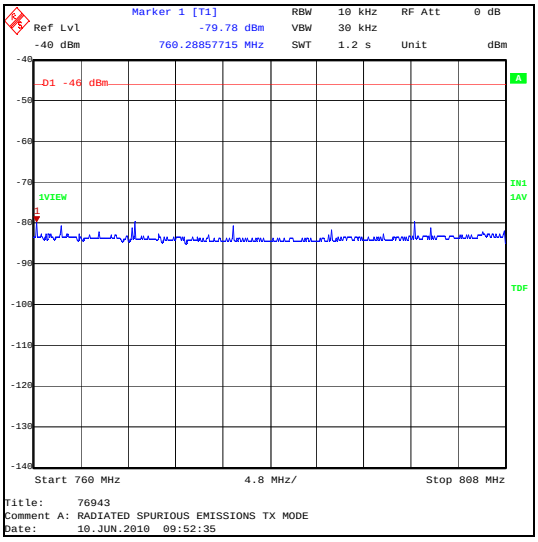
Transmitter Radiated Spurious Emissions – Emission Limitations (continued)



QPSK



16QAM

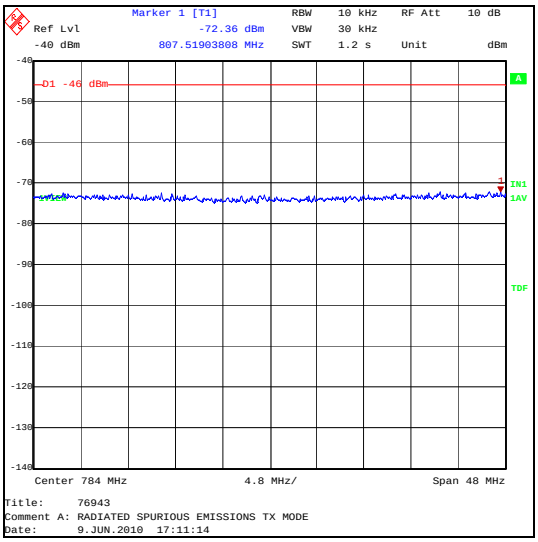


64QAM

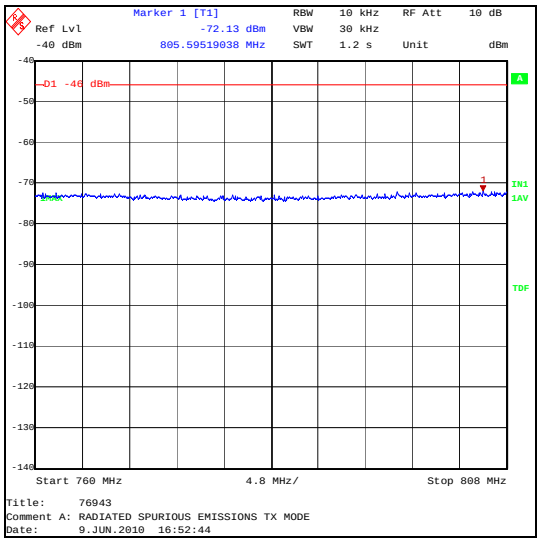
Transmitter Radiated Spurious Emissions – Emission Limitations (continued)

Results: Sub Band B / Top Channel 755.5 MHz

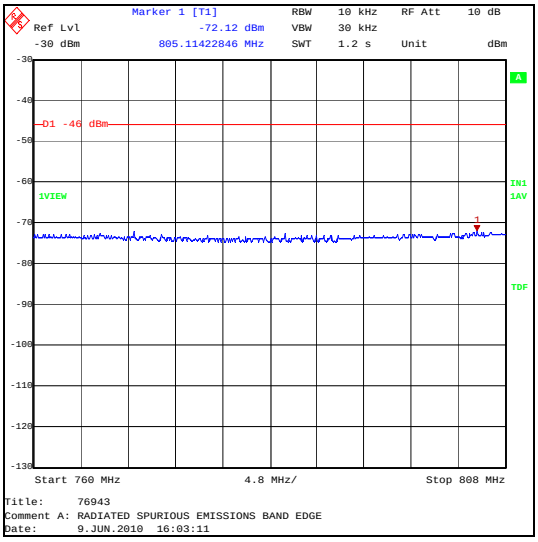
Modulation	Freq (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	807.519	-72.4	-46.0	26.4	Complied
16QAM	805.595	-72.1	-46.0	26.1	Complied
64QAM	805.114	-72.1	-46.0	26.1	Complied



QPSK



16QAM



64QAM

5.3.13. Transmitter Radiated Spurious Emissions – Emission Limitations

Test Summary:

FCC Part:	27.53(f)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	1559 MHz to 1610 MHz

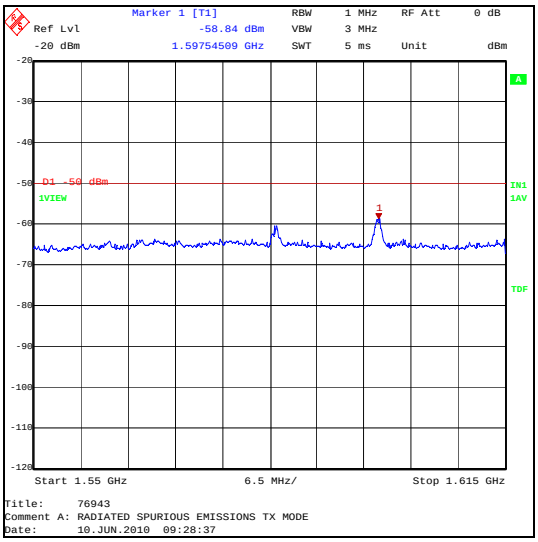
Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	30

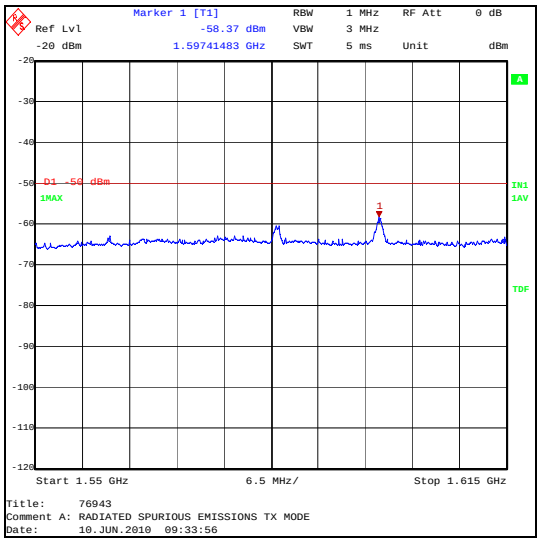
Results: Sub Band B / Bottom Channel 748.5 MHz

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1597.545	-58.8	-50.0	8.8	Complied
16QAM	1597.415	-58.4	-50.0	8.4	Complied
64QAM	1597.675	-58.6	-50.0	8.6	Complied

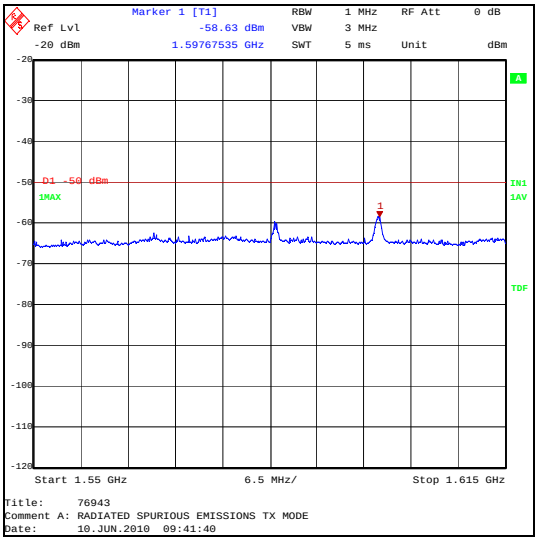
Transmitter Radiated Spurious Emissions – Emission Limitations (continued)



QPSK



16QAM

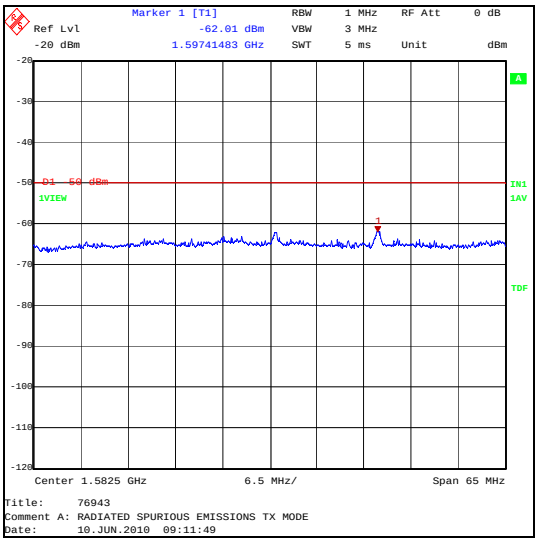


64QAM

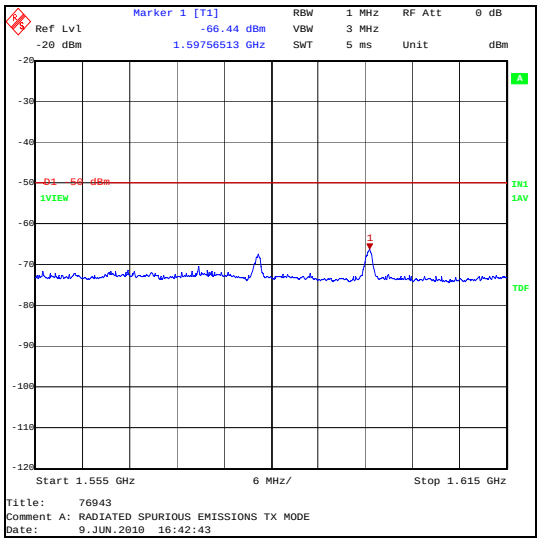
Transmitter Radiated Spurious Emissions – Emission Limitations (continued)

Results: Sub Band B / Top Channel 755.5 MHz

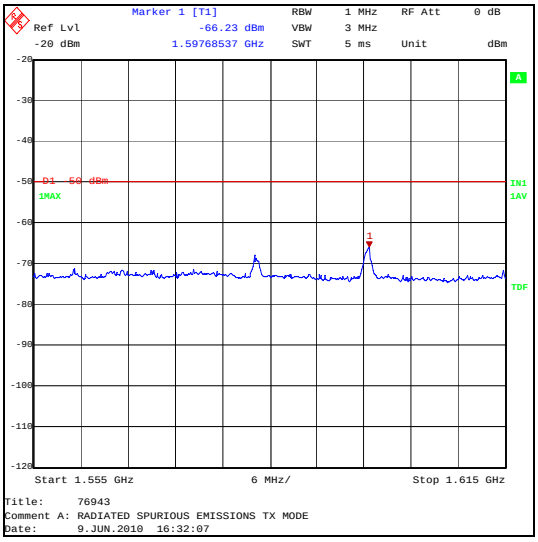
Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1597.415	-62.0	-50.0	12.0	Complied
16QAM	1597.565	-66.4	-50.0	16.4	Complied
64QAM	1597.685	-66.2	-50.0	16.2	Complied



QPSK



16QAM



64QAM

5.4. Test Results – Sub Band C

5.4.1. Transmitter Carrier Output Power and Effective Radiated Power (ERP)

Test Summary:

FCC Part:	2.1046 and 27.50(b)(1)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.1

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	32

Results: Antenna Port 1

Modulation	Frequency (MHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
QPSK	760.5	37.9	20	57.9	60.0	2.1	Complied
16QAM	760.5	37.9	20	57.9	60.0	2.1	Complied
64QAM	760.5	37.5	20	57.5	60.0	2.5	Complied

Results: Antenna Port 2

Modulation	Frequency (MHz)	Conducted RF Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	Limit ERP (dBm)	Margin (dB)	Result
QPSK	760.5	38.4	20	58.4	60.0	1.6	Complied
16QAM	760.5	38.6	20	58.6	60.0	1.4	Complied
64QAM	760.5	38.6	20	58.6	60.0	1.4	Complied

Note(s):

1. Measurements were performed with the EUT transmitting on all supported modulation types on the Antenna Port 1 and Antenna Port 2.

5.4.2. Transmitter Occupied Bandwidth

Test Summary:

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

Environmental Conditions:

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

Results: Antenna Port 1

Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK	760.5	100	300	4.118
16QAM	760.5	100	300	4.118
64QAM	760.5	100	300	4.118

Results: Antenna Port 2

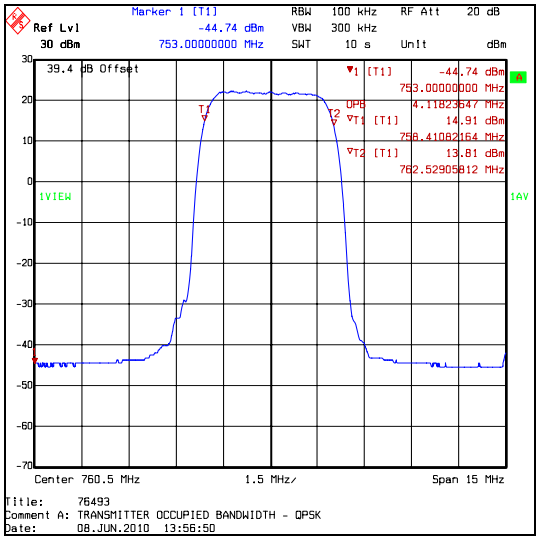
Modulation	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
QPSK	760.5	100	300	4.118
16QAM	760.5	100	300	4.118
64QAM	760.5	100	300	4.118

Note(s):

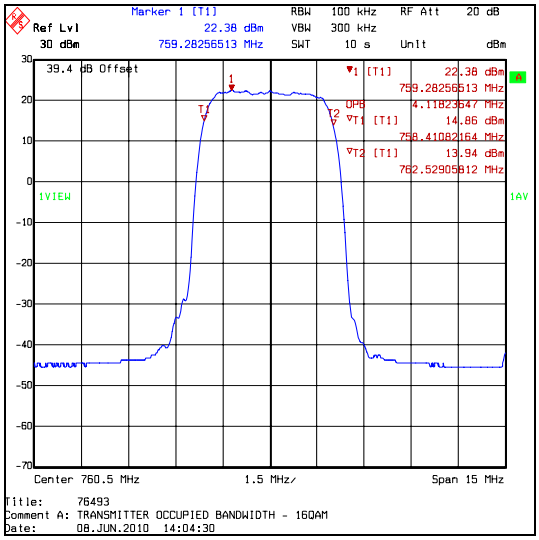
1. In lieu of the test method detailed in ANSI C63.4 Section 13.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the spectrum analyser.
2. Measurements were performed with the EUT transmitting on all supported modulation types on the Antenna Port 1 and Antenna Port 2.

Transmitter Occupied Bandwidth (continued)

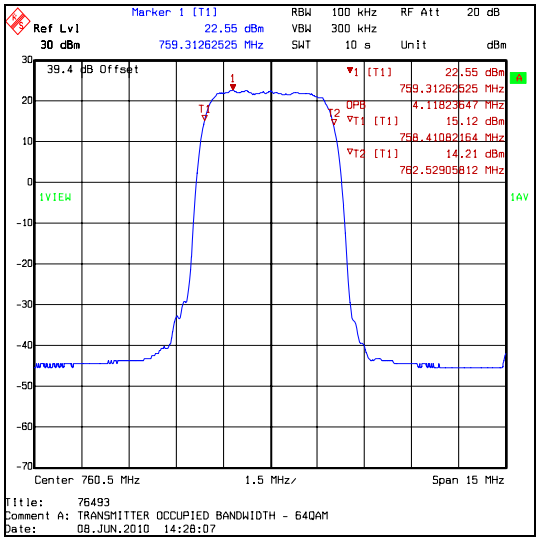
Antenna Port 1



QPSK



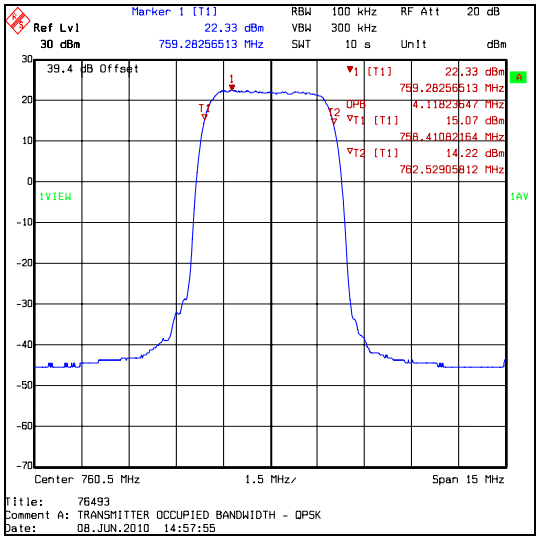
16QAM



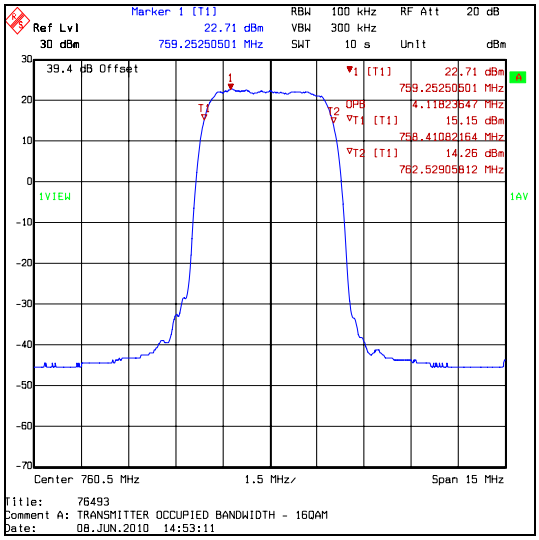
64QAM

Transmitter Occupied Bandwidth (continued)

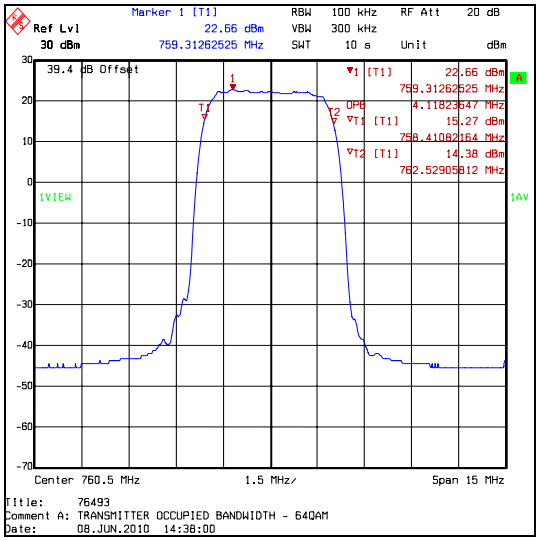
Antenna Port 2



QPSK



16QAM



64QAM

5.4.3. Transmitter Frequency Stability - Temperature

Test Summary:

FCC Part:	27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	43

Results: Sub Band C / Single Channel 760.5 MHz / Port 2

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	760.499792	208
-20	760.499909	91
-10	760.499909	91
0	760.499910	90
10	760.499914	86
20	760.499909	91
30	760.499910	90
40	760.499910	90
50	760.499909	91

5.4.4. Transmitter Frequency Stability - Voltage Variation

Test Summary:

FCC Part:	27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.2 referencing FCC CFR Part 2.1055

Environmental Conditions:

Ambient Temperature (°C):	20
Relative Humidity (%):	43

Results: Sub Band C / Single Channel 760.5 MHz / Port 2

Supply Voltage (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-40.8	760.499910	90
-48.0	760.499910	90
-55.2	760.499910	90

5.4.5. Transmitter Conducted Emissions – Channel Edge

Test Summary:

FCC Part:	27.53(d)(3)
Test Method Used	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	30

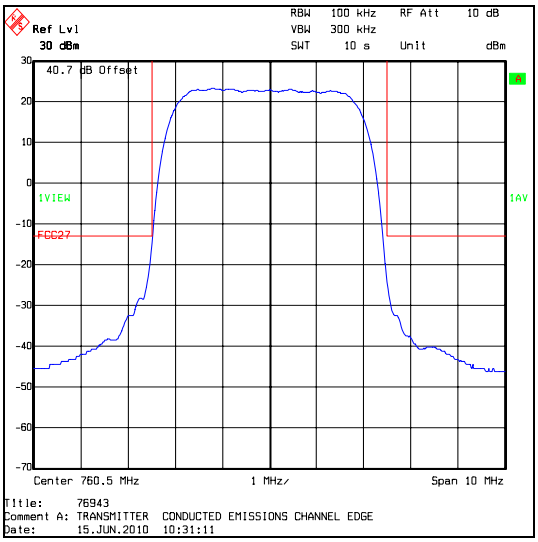
Note(s):

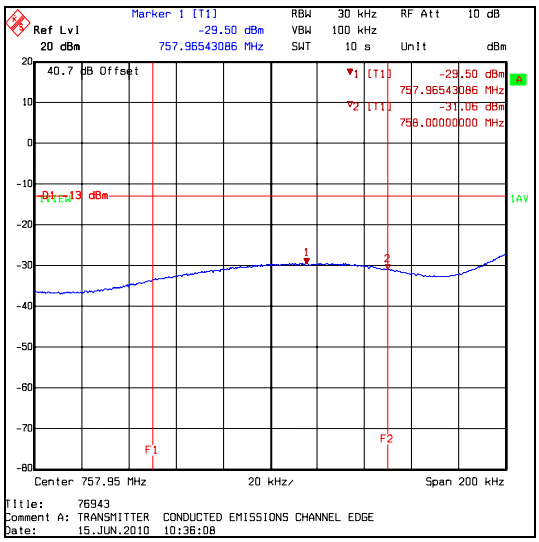
1. It can be seen on the main mask plot that the emission is close to the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. As stated in FCC Part 27.53(d)(5), a resolution bandwidth of 30 kHz was used in the 100 kHz bands immediately outside and adjacent to the frequency block to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.
2. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

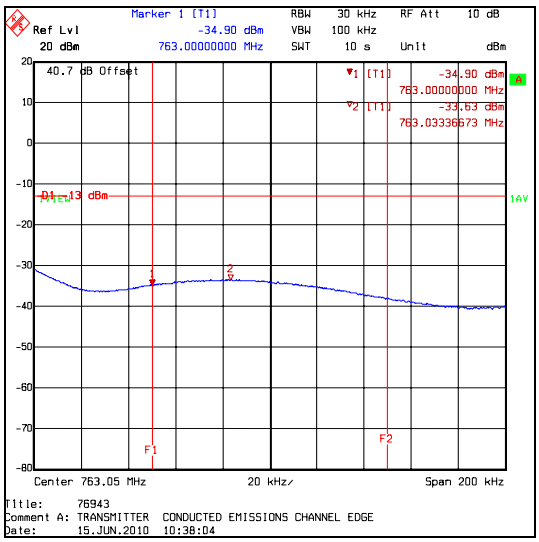
Results: Sub Band C / Single Channel 760.5 MHz / QPSK / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
757.965	-29.5	-13.0	16.5	Complied
763.033	-33.6	-13.0	20.6	Complied

Transmitter Conducted Emissions – Channel Edge (continued)



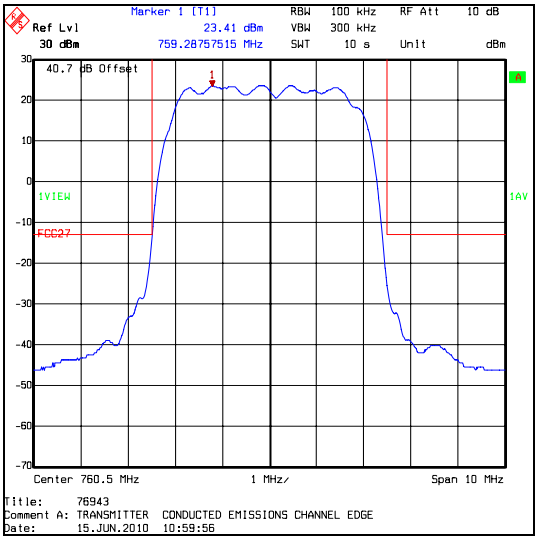


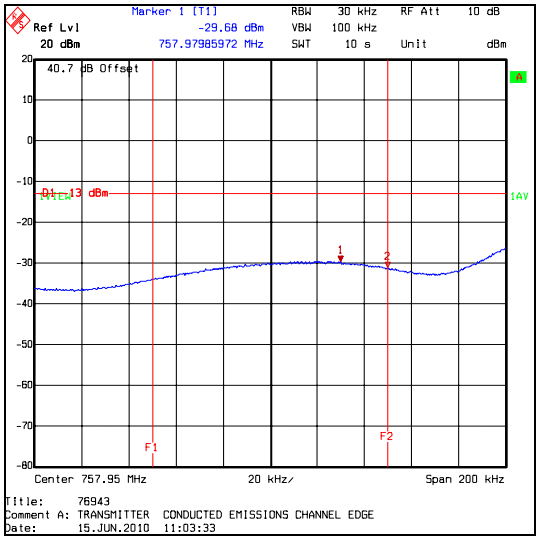


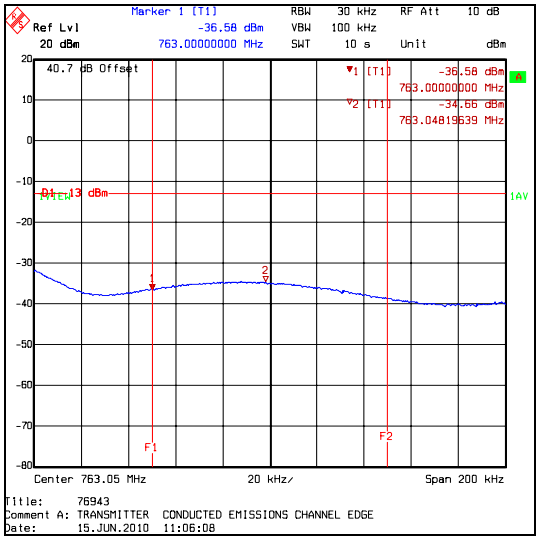
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band C / Single Channel 760.5 MHz / 16QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
757.980	-29.7	-13.0	16.7	Complied
763.048	-34.7	-13.0	21.7	Complied



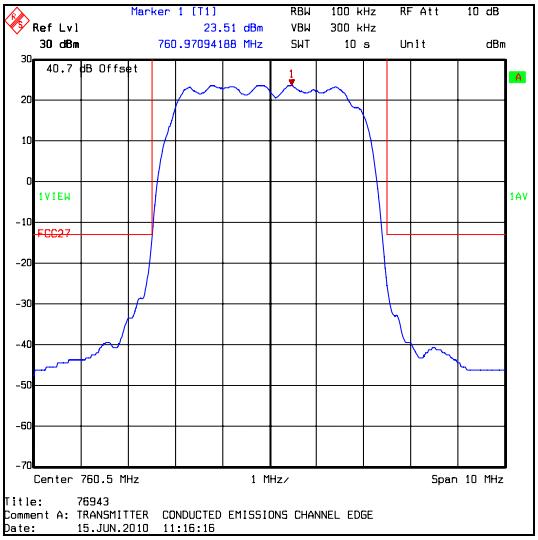


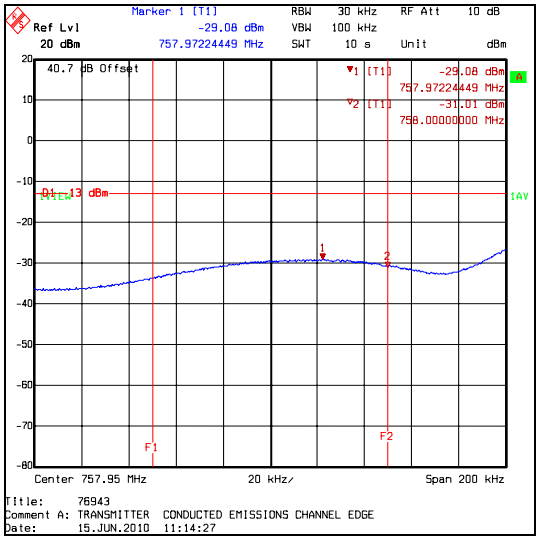


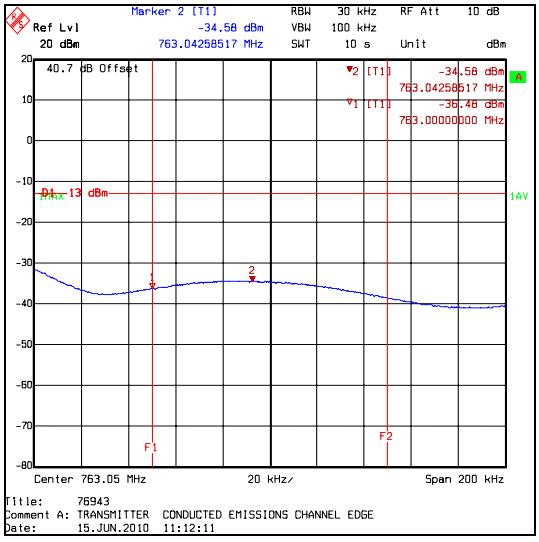
Transmitter Conducted Emissions – Channel Edge (continued)

Results: Sub Band C / Single Channel 760.5 MHz / 64QAM / Port 2

Frequency of 100 kHz strip adjacent to channel edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
757.972	-29.1	-13.0	16.1	Complied
763.043	-34.6	-13.0	21.6	Complied







5.4.6. Transmitter Conducted Emissions

Test Summary:

FCC Part:	27.53(d)(3)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	9 kHz to 10 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	31

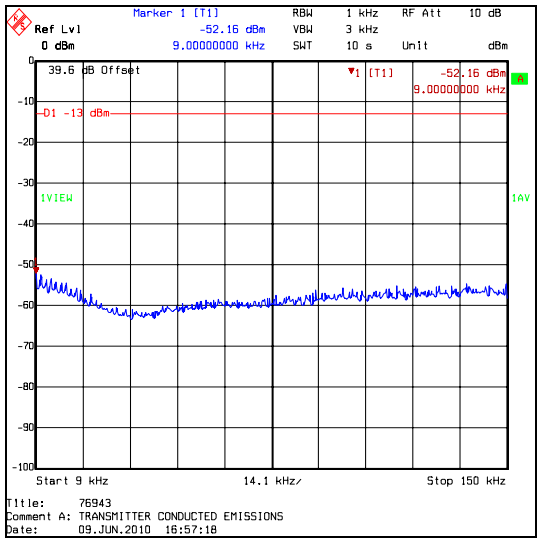
Results: Sub Band C / Single Channel 760.5 MHz / Port 2

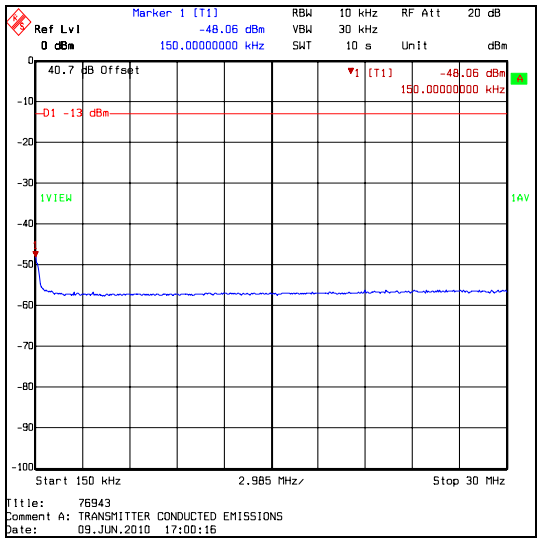
Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1517.034	-32.3	-13.0	19.3	Complied
16QAM	1517.034	-32.4	-13.0	19.4	Complied
64QAM	1517.034	-32.1	-13.0	19.1	Complied

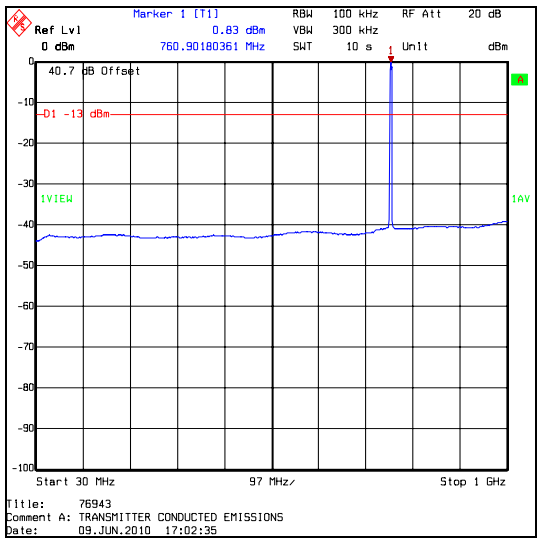
Note(s):

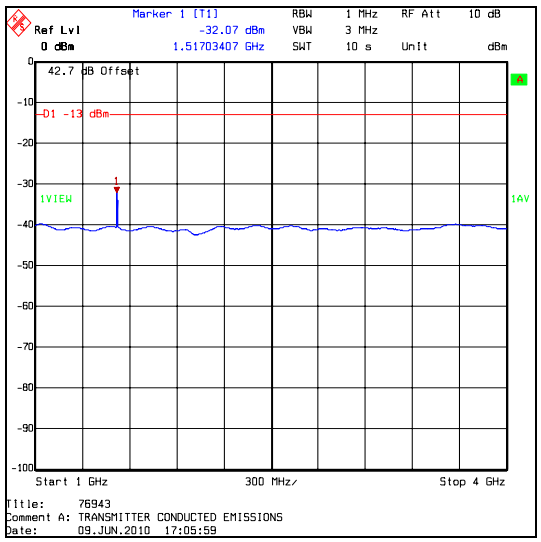
1. The emissions shown at approximately 760.902 MHz on the 30 MHz to 1 GHz plot is the carrier
2. All other emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.
3. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

Transmitter Conducted Emissions (continued)

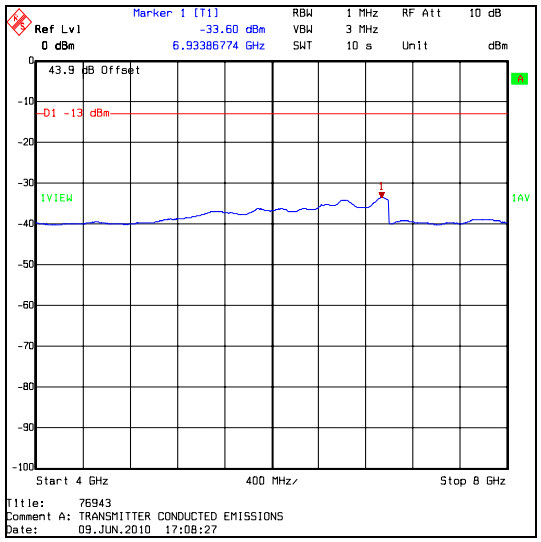


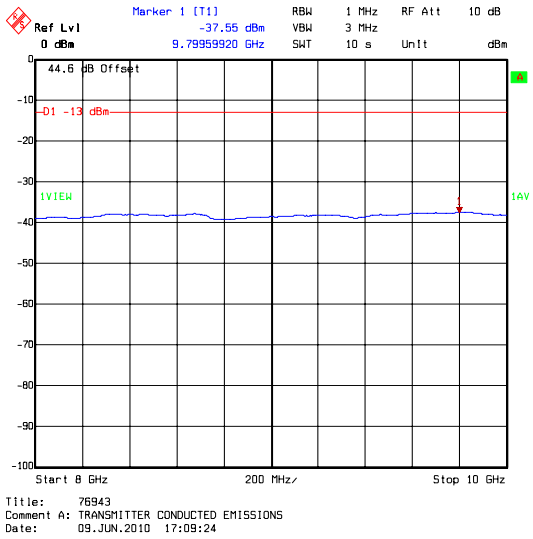






Transmitter Conducted Emissions (continued)





5.4.7. Transmitter Conducted Emissions at Band Edges

Test Summary:

FCC Part:	27.53(d)(3)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051

Environmental Conditions:

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

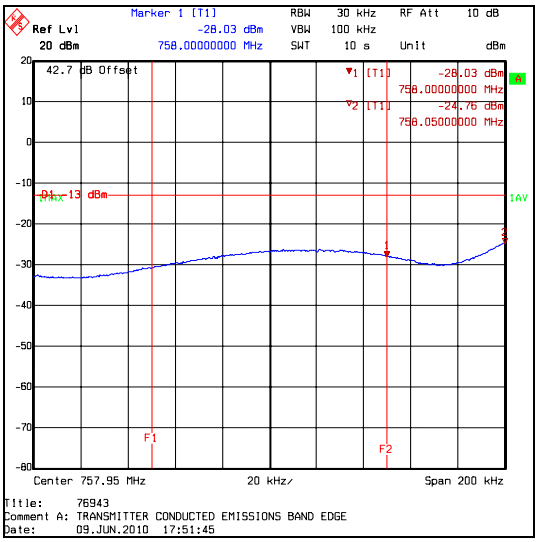
Results: Sub Band C / Single Channel 760.5 MHz / Port 2

Modulation	Frequency of 100 kHz strip adjacent to block edge (MHz)	Level in 100 kHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
QPSK	758.0	-28.0	-13.0	15.0	Complied
QPSK	763.0	-32.3	-13.0	19.3	Complied
16QAM	758.0	-30.9	-13.0	17.9	Complied
16QAM	763.0	-35.0	-13.0	22.0	Complied
64QAM	758.0	-31.0	-13.0	18.0	Complied
64QAM	763.0	-35.1	-13.0	22.1	Complied

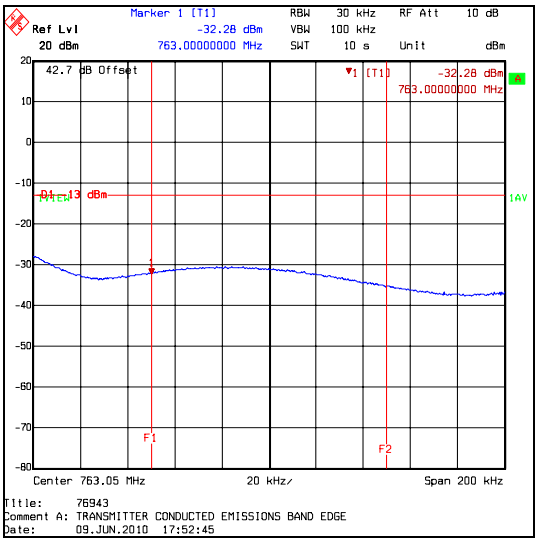
Note(s):

1. As stated in FCC Part 27.53(d)(5), a resolution bandwidth of 30 kHz was used in the 100 kHz bands immediately outside and adjacent to the frequency block to demonstrate compliance.
2. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

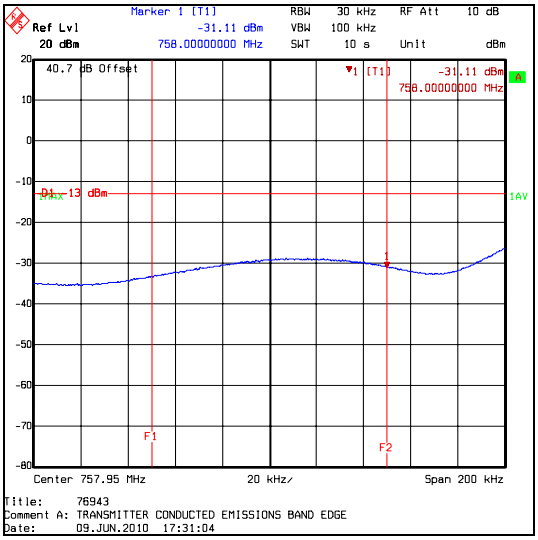
Transmitter Conducted Emissions at Band Edges (continued)



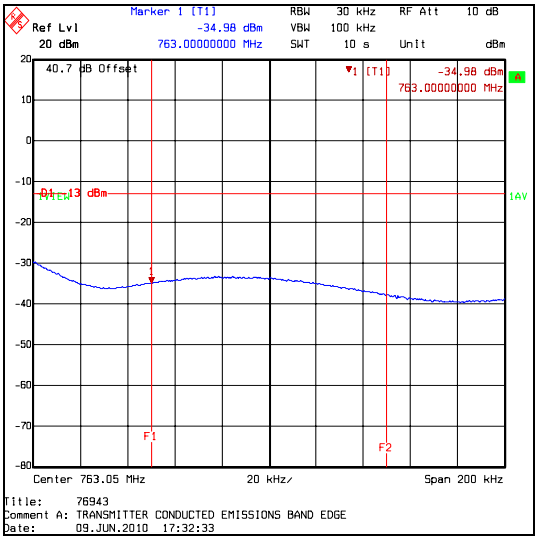
QPSK – Lower Band Edge



QPSK – Upper Band Edge

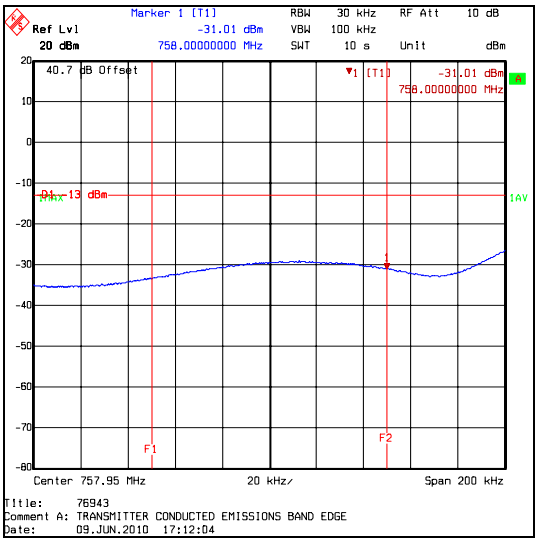


16QAM – Lower Band Edge

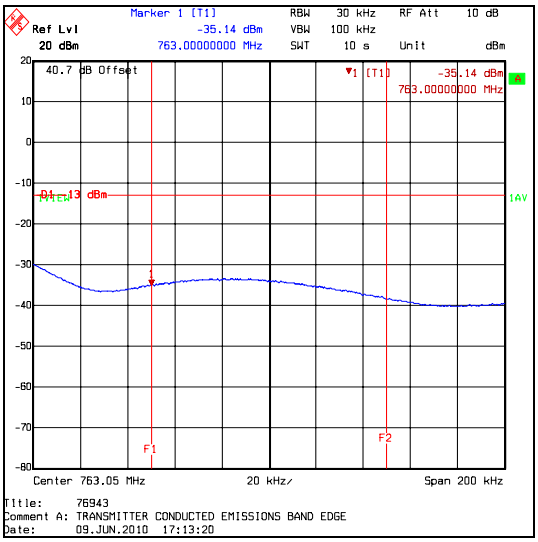


16QAM – Upper Band Edge

Transmitter Conducted Emissions at Band Edges (continued)



64QAM – Lower Band Edge



64QAM – Upper Band Edge

5.4.8. Transmitter Radiated Spurious Emissions

Test Summary:

FCC Part:	27.53(d)(3)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	30 MHz to 10 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	33

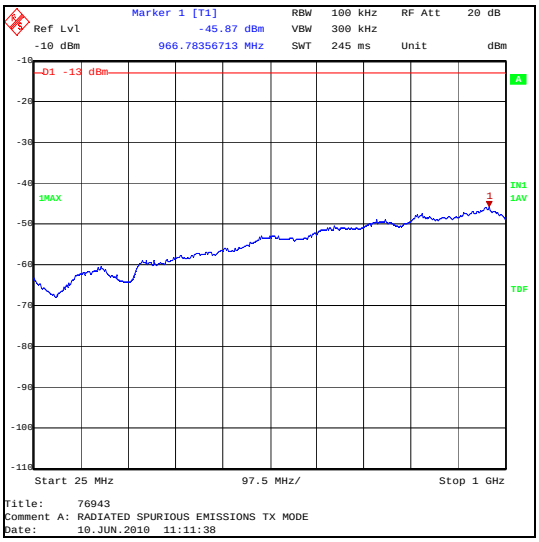
Results: Sub Band C / Single Channel 760.5 MHz

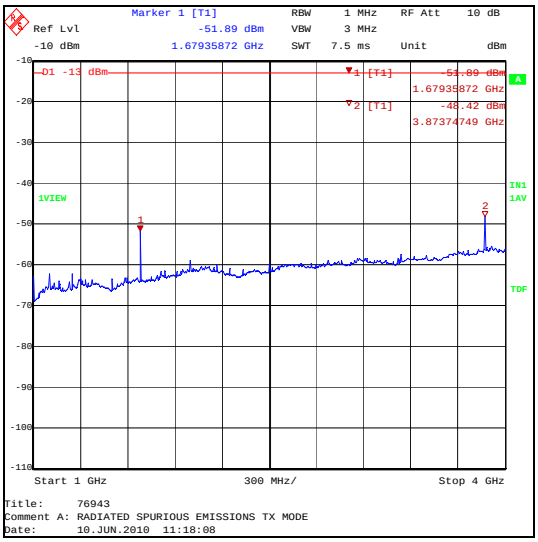
Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
Note 1					

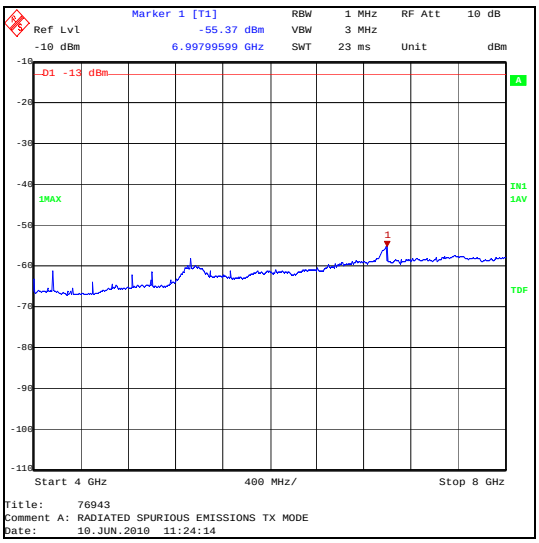
Note(s):

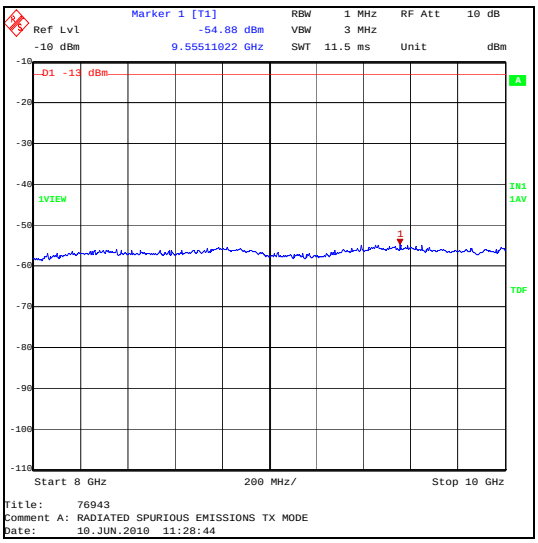
1. All emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver.

Transmitter Radiated Spurious Emissions (continued)









5.4.9. Transmitter Radiated Spurious Emissions at Band Edges

Test Summary:

FCC Part:	27.53(d)(3)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053

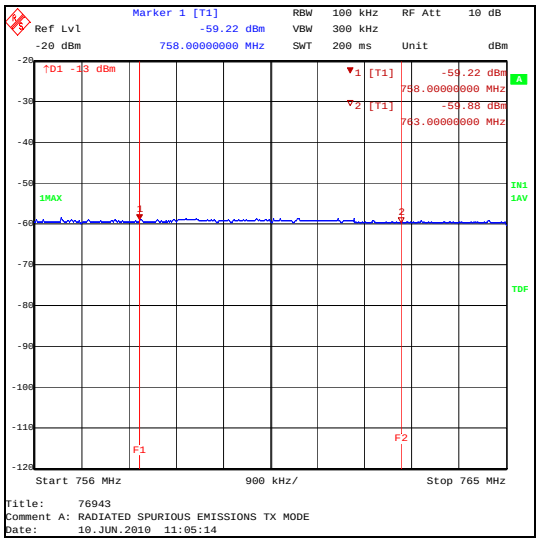
Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	30

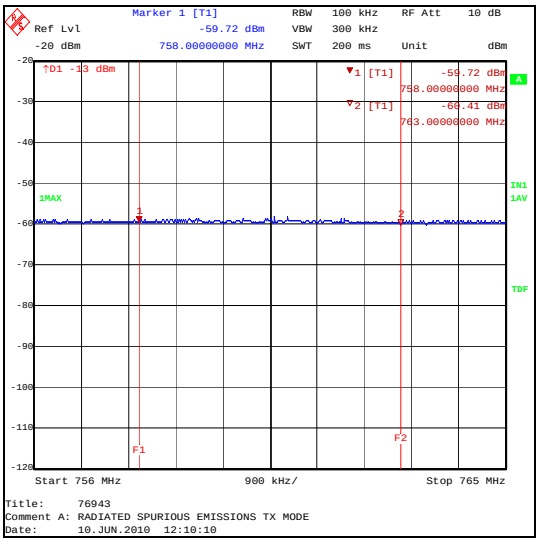
Results: Sub Band C

Modulation	Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	758.0	-59.7	-13.0	46.7	Complied
QPSK	763.0	-59.9	-13.0	46.9	Complied
16QAM	758.0	-59.7	-13.0	46.7	Complied
16QAM	763.0	-60.4	-13.0	47.4	Complied
64QAM	758.0	-59.7	-13.0	46.7	Complied
64QAM	763.0	-59.9	-13.0	46.9	Complied

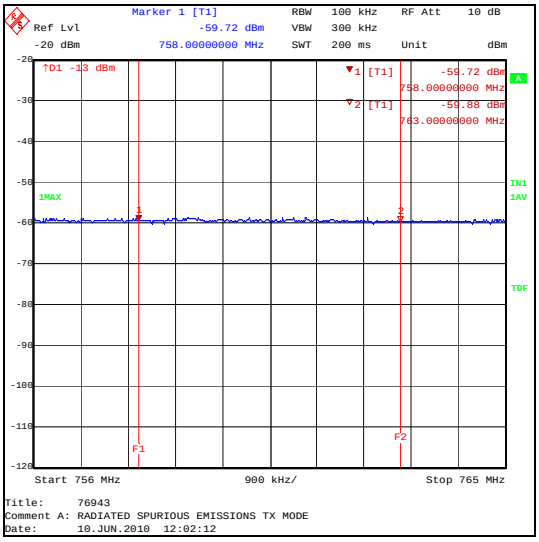
Transmitter Radiated Emissions at Band Edges (continued)



QPSK



16QAM



64QAM

5.4.10. Transmitter Conducted Emissions – Emission Limitations

Test Summary:

FCC Part:	27.53(d)(1)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	769 to 805 MHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	33

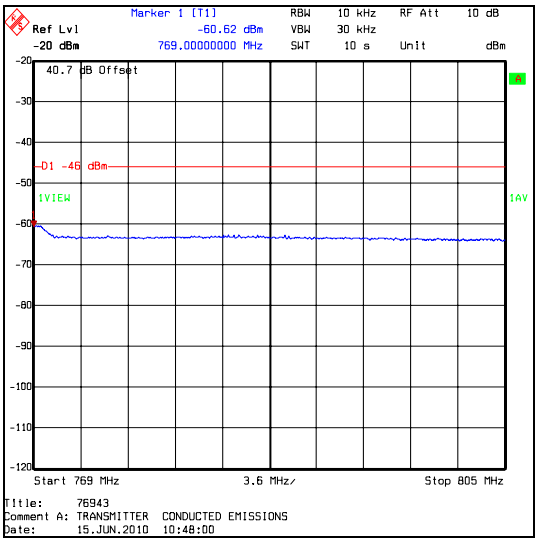
Results: Sub Band C / Single Channel 760.5 MHz / Port 2

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	769.000000	-60.6	-46.0	14.6	Complied
16QAM	769.000000	-59.4	-46.0	13.4	Complied
64QAM	769.000000	-59.8	-46.0	13.8	Complied

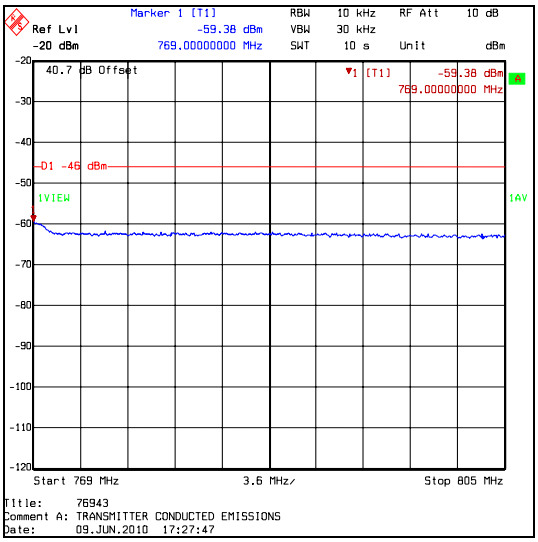
Note(s):

1. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

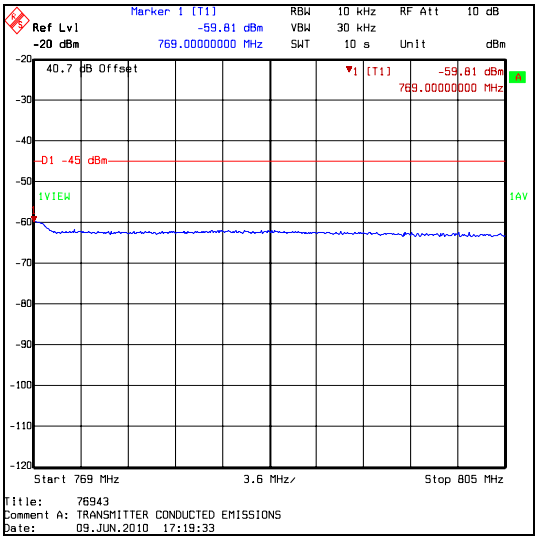
Transmitter Conducted Emissions – Emission Limitations (continued)



QPSK



16QAM



64QAM

Transmitter Conducted Emissions – Emission Limitations (continued)

Test Summary:

FCC Part:	27.53(f)
Test Method Used:	As detailed in ANSI TIA-603.C-2004 Section 2.2.13 referencing FCC Part 2.1051
Frequency Range:	1559 MHz to 1610 MHz

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	34

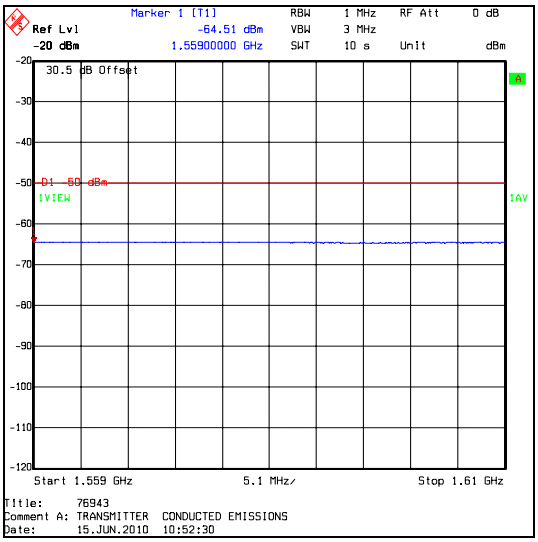
Results: Sub Band C / Single Channel 760.5 MHz / Port 2

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1559.000	-64.5	-50.0	14.5	Complied
16QAM	1559.102	-63.6	-50.0	13.6	Complied
64QAM	1562.168	-63.6	-50.0	13.6	Complied

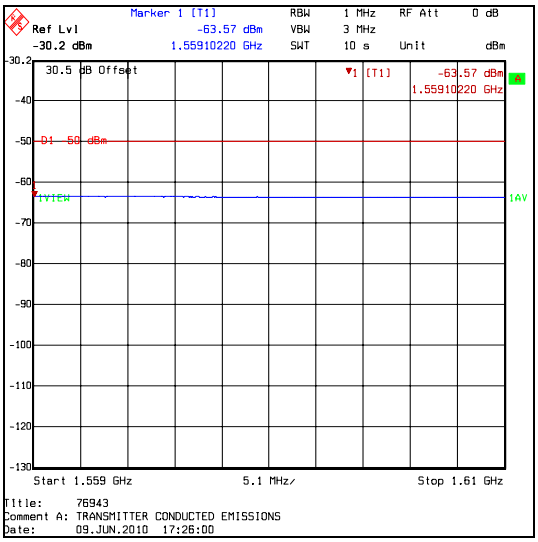
Note(s):

1. Preliminary testing was performed on both antenna ports with the worse case port being selected for measurements.

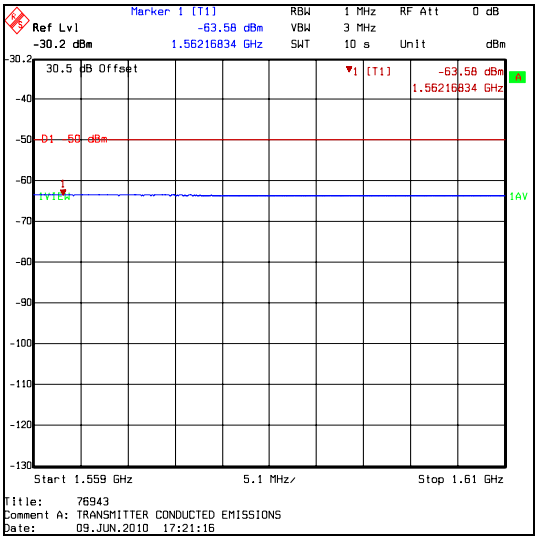
Transmitter Conducted Emissions – Emission Limitations (continued)



QPSK



16QAM



64QAM

Transmitter Radiated Spurious Emissions – Emission Limitations (continued)

Test Summary:

FCC Part:	27.53(d)(1)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	769 MHz to 805 MHz

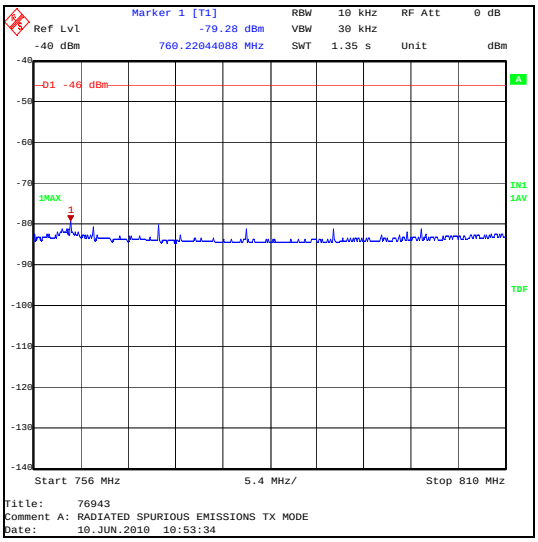
Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	30

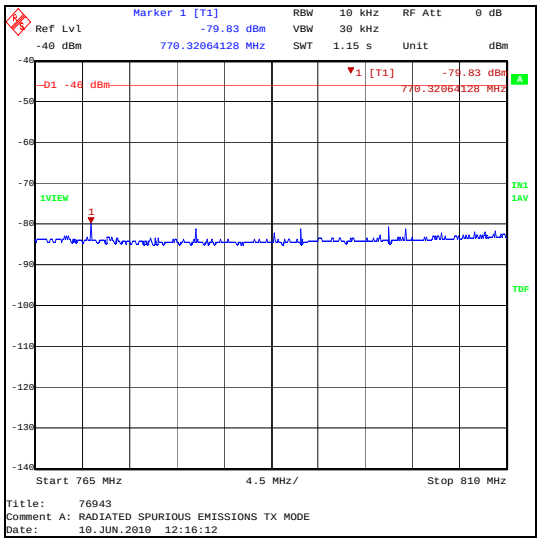
Results: Sub Band C / Single Channel 760.5 MHz

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	770.321	-79.8	-46.0	33.8	Complied
16QAM	770.321	-79.8	-46.0	33.8	Complied
64QAM	770.321	-79.8	-46.0	33.8	Complied

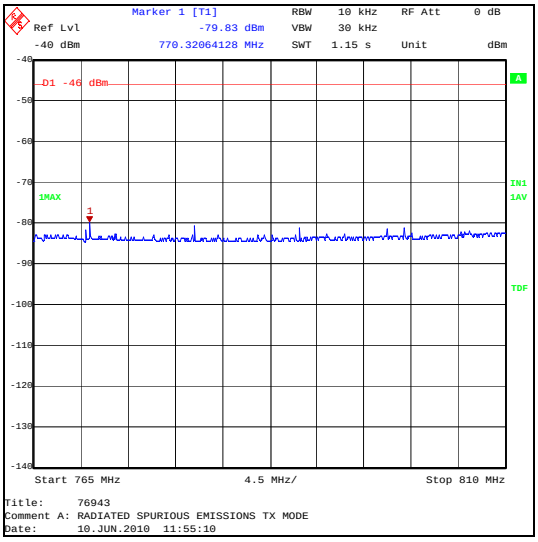
Transmitter Radiated Spurious Emissions – Emission Limitations (continued)



QPSK



16QAM



64QAM

Transmitter Radiated Spurious Emissions – Emission Limitations (continued)

Test Summary:

FCC Part:	27.53(f)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12. referencing FCC Part 2.1053
Frequency Range:	1559 MHz to 1610 MHz

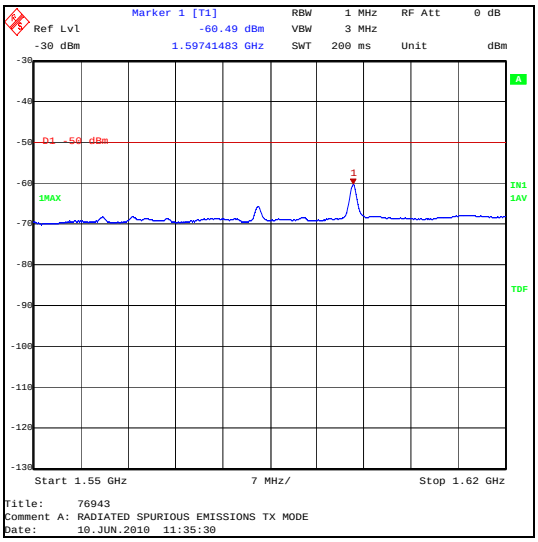
Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	33

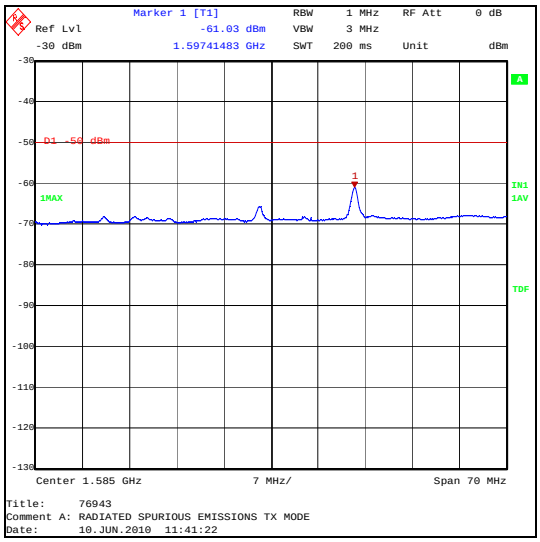
Results: Sub Band C / Single Channel 760.5 MHz

Modulation	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
QPSK	1597.415	-60.5	-50.0	10.5	Complied
16QAM	1597.415	-61.0	-50.0	11.0	Complied
64QAM	1597.415	-59.9	-50.0	9.9	Complied

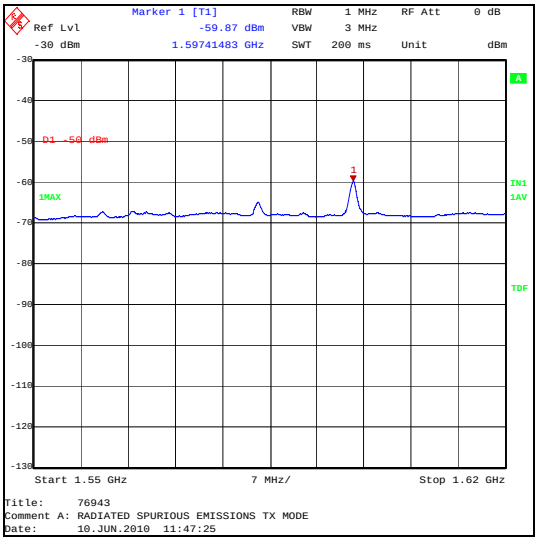
Transmitter Radiated Spurious Emissions – Emission Limitations (continued)



QPSK



16QAM



64QAM

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
Conducted Carrier Output Power	Not applicable	95%	±0.27 dB
Occupied Bandwidth	Not applicable	95%	±0.92 ppm
Conducted Spurious Emissions	9 kHz to 10 GHz	95%	±2.64 dB
Frequency Stability	Not applicable	95%	±0.92 ppm
Radiated Spurious Emissions	30 GHz to 10 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 Calibration Due	Cal. Interval (Months)
A1392	Attenuator	Huber + Suhner	757456	6820.17.B	Calibrated before use	-
A1396	Attenuator	Huber + Suhner	757987	6810.17.B	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	27 Nov 2010	12
A288	Antenna	Chase	CBL6111A	1589	16 Mar 2011	12
E0516	Environmental Chamber	TAS	LT1000	23880706	Calibrated before use	-
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2010	12
M122	Digital Voltmeter	Fluke	77	64910017	23 Jun 2010	12
M1068	Thermometer	Iso-Tech	RS55	93102884	01 Oct 2010	12
M1124	Test Receiver	Rohde & Schwarz	ESI26	100046K	22 Apr 2011	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	18 Mar 2011	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	10 Jul 2010	12

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