TEST REPORT
FROM
RFI LOBAL SERVICES LTD

Test of: AMW
LTE Band 4, 10 MHz Channel Bandwidth

FCC ID: PKTPEMAMW

To: FCC Parts 2.1046, 2.1049, 2.1051, 2.1053, 2.1055, 15.107, 15.109, 15.111, 27.50(d)(4), 27.50(d)(5), 27.53(h) & 27.54

Test Report Serial No.:
RFI-RPT-RP85949JD01D V4.0

Version 4.0 Supersedes All Previous Versions

This Test Report Is Issued Under The Authority Of John Newell, Group Quality Manager:	
Checked By:	Sarah Williams
Signature:	
Date of Issue:	12 September 2012

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Registered in England and Wales. Company number:2117901

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Table of Contents

1. Customer Information

Company Name:	General Dynamics Broadband
Address:	Unit 7 Greenways Business Park Bellinger Close Chippenham Wilts SN15 1BN United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR27
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 27 Subpart C (Miscellaneous Wireless Communication Services)
Specification Reference:	47CFR15.107, 47CFR15.109 and CFR15.111
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2011: Part 15 Subpart B (Unintentional Radiators) – Sections 15.107, 15.109 and 15.111
Site Registration:	209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	13 July 2012 to 08 August 2012

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
15.107	Receiver/Idle Mode AC Conducted Emissions	✓
15.109	Receiver/Idle Mode Radiated Spurious Emissions	✓
15.111 / 2.1051	Receiver/Idle Mode Conducted Spurious Emissions – Main RF Port	✓
15.111 / 2.1051	Receiver/Idle Mode Conducted Spurious Emissions – Diversity RF Port	✓
27.50(d)(4) / 2.1046	Transmitter Carrier Output Power and EIRP	✓
27.50(d)(5)	Transmitter Peak-To-Average Ratio	✓
2.1049	Transmitter Occupied Bandwidth	✓
27.53(h) / 2.1051	Transmitter Conducted Spurious Emissions	✓
27.53(h) / 2.1051	Transmitter Conducted Emissions at Band Edges	✓
27.53(h) / 2.1053	Transmitter Radiated Spurious Emissions	✓
27.53(h) / 2.1053	Transmitter Radiated Emissions at Band Edges	✓
27.54 / 2.1055	Transmitter Frequency Stability	✓

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 for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	FCC KDB 971168 D01 v01 11/30/2010
Title:	Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems
Reference:	FCC Response To Inquiry
Title:	Tracking Number 547443 Date: 28 June 2012

2.4. Deviations from the Test Specification

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

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	General Dynamics Broadband
Model Name or Number:	AMW
Serial Number:	AMWGB84001G12
Hardware Version Number:	Pass 1
Software Version Number:	Release 4
FCC ID:	PKTPEMAMW

Description:	Antenna
Brand Name:	None
Model Name or Number:	OA-LTE-06-03-IPW
Serial Number:	Not marked or stated

3.2. Description of EUT

The equipment under test was a LTE PCI Express Mini Modem.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	LTE	
Type of Equipment	PCI Express mini module	
Channel Bandwidth:	10 MHz	
Modulation Type:	QPSK & 16QAM	
Duty Cycle:	100%	
Antenna Gain:	5.0 dBi	
Power Supply Requirement:	Nominal	3.3 V
	Minimum	3.0 V
	Maximum	3.6 V
Transmit Frequency Range:	Band 4 (1710 MHz to 1755 MHz) Part 27 (1710 MHz to 1755 MHz)	
Transmit Channels Tested:	**EARFCN**	**Channel Frequency (MHz)**
	20000	1715.0
	20175	1732.5
	20350	1750.0
Receive Frequency Range:	Band 4 (2110 MHz to 2155 MHz) Part 27 (2110 MHz to 2155 MHz)	
Receive Channels Tested:	**EARFCN**	**Channel Frequency (MHz)**
	2000	2115.0
	2175	2132.5
	2350	2150.0

3.5. Support Equipment

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

Description:	UE PEM V1 NG Adaptor Board
Brand Name:	IPWireless
Model Name or Number:	AAF Pass3
Serial Number:	AAFK838000V32

Description:	UE PEM V1 NG Adaptor Board – Voltage Variation
Brand Name:	IPWireless
Model Name or Number:	AAF Pass2
Serial Number:	EEMS 022530 0004

Description:	Laptop PC
Brand Name:	Toshiba
Model Name or Number:	PSAAPE-00H00KEN
Serial Number:	67071048Q

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Transmit Mode – the EUT was set to transmit with maximum output power using a 10 MHz channel bandwidth. QPSK and 16QAM modulations were both tested, along with the Resource Blocks set to 1 and 50. For Resource Block setting of 1, testing was carried out on starting block number of 1 and 50.
- Receive Mode – the EUT was set to receive only mode.

4.2. Configuration and Peripherals

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

- The EUT was connected to the UE PEM V1 NG Adaptor Board, for all tests.
- The EUT was controlled from a laptop PC, using bespoke software supplied by the Customer.
- The EUT was connected to a test laptop by using a USB extension cable and the laptop was connected to 120 VAC 60 Hz AC supply.
- The EUT has two U.FL connector ports, the customer supplied two short U.FL to SMA cables, to allow conducted measurements to be performed where necessary.
- The EUT was connected to an Anristu LTE system simulator, operating in a transceiver mode.
- For Resource Block setting of 1, testing was carried out on starting block number of 1 and 50.
- The EUT has a main RF port and a Receiver Diversity port. Transmitter testing was performed on the main RF port which is a transmit and receive port. The diversity port was terminated for all bench testing.
- For radiated emissions testing, the customer supplied two OA-LTE-06-03-IPW antenna's, which were connected to the main and diversity ports. The antenna gain was declared as 5.0 dBi.
- The customer supplied a modified UE PEM V1NG Adaptor Board, which allowed voltage variation directly to the PEM, this was used for Transmitter Frequency Stability Voltage Variation testing only.

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.

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

5.2. Test Results

5.2.1. Receiver/Idle Mode AC Conducted Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	30 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	15.107
Test Method Used:	ANSI C63.4 Section 7

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	49

Note(s):

1. The EUT is a module and can be installed into a host device which is AC powered therefore AC Conducted Emissions testing is required. The EUT was powered from an AC to DC power supply, which was connected to 120 VAC 60 Hz mains.

Receiver/Idle Mode AC Conducted Emissions (continued)

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Live	42.8	66.0	23.2	Complied
0.172	Live	42.2	64.8	22.6	Complied
4.601	Live	16.4	56.0	39.6	Complied
4.988	Live	16.4	56.0	39.6	Complied
5.645	Live	17.7	60.0	42.3	Complied
6.397	Live	19.8	60.0	40.2	Complied
6.729	Live	19.1	60.0	41.0	Complied
11.351	Live	32.5	60.0	27.5	Complied
12.687	Live	20.4	60.0	39.6	Complied
16.049	Live	21.7	60.0	38.3	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.173	Live	18.8	54.8	36.0	Complied
0.173	Live	18.8	54.8	36.0	Complied
4.655	Live	7.1	46.0	38.9	Complied
5.028	Live	8.9	50.0	41.1	Complied
5.487	Live	10.0	50.0	40.0	Complied
7.112	Live	11.8	50.0	38.2	Complied
7.346	Live	12.2	50.0	37.8	Complied
11.382	Live	27.9	50.0	22.1	Complied
12.669	Live	15.5	50.0	34.5	Complied
16.049	Live	17.7	50.0	32.3	Complied

Receiver/Idle Mode AC Conducted Emissions (continued)

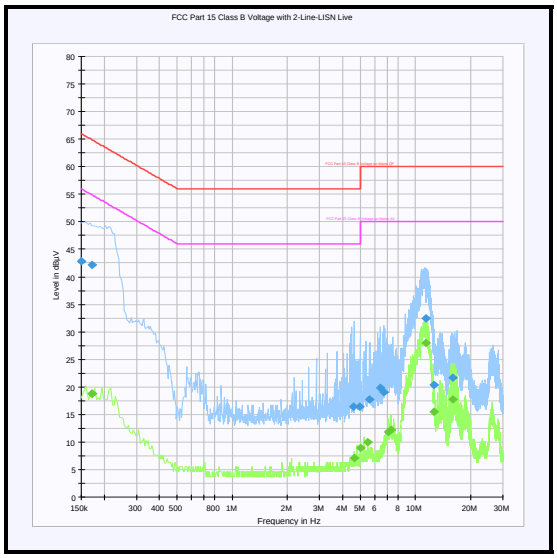
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Neutral	44.9	21.1	66.0	Complied
0.164	Neutral	44.5	20.8	65.3	Complied
0.267	Neutral	28.6	32.6	61.2	Complied
6.558	Neutral	19.8	40.2	60.0	Complied
7.076	Neutral	18.3	41.7	60.0	Complied
11.058	Neutral	34.5	25.5	60.0	Complied
11.387	Neutral	35.7	24.3	60.0	Complied
13.484	Neutral	24.4	35.6	60.0	Complied
15.585	Neutral	25.5	34.5	60.0	Complied
16.409	Neutral	23.2	36.8	60.0	Complied

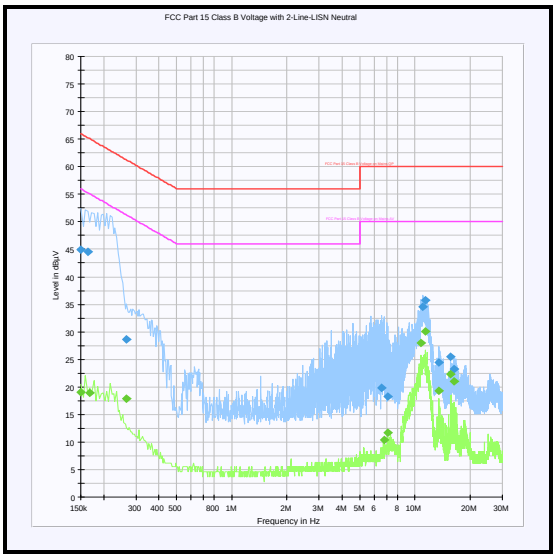
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.150	Neutral	19.0	37.0	56.0	Complied
0.168	Neutral	19.0	36.1	55.1	Complied
0.267	Neutral	17.9	33.3	51.2	Complied
6.774	Neutral	10.4	39.6	50.0	Complied
7.112	Neutral	11.7	38.3	50.0	Complied
10.797	Neutral	27.9	22.1	50.0	Complied
11.382	Neutral	30.1	19.9	50.0	Complied
13.484	Neutral	19.3	30.7	50.0	Complied
15.585	Neutral	22.3	27.7	50.0	Complied
16.404	Neutral	21.0	29.0	50.0	Complied

Receiver/Idle Mode AC Conducted Emissions (continued)



Live



Neutral

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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A649	LISN	ESH3-Z5	19 Feb 2013	12
A1830	Pulse Limiter	ESH3-Z2	25 Feb 2013	12
M1229	Digital Multimeter	179	18 Jun 2013	12
M1379	Test Receiver	ESIB7	20 Oct 2012	12
S0529	DC Power Supply	IPS2302A	Cal Before Use	-

5.2.2. Receiver/Idle Mode Radiated Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	13 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	15.109
Test Method Used:	ANSI C63.4 Section 8
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	45

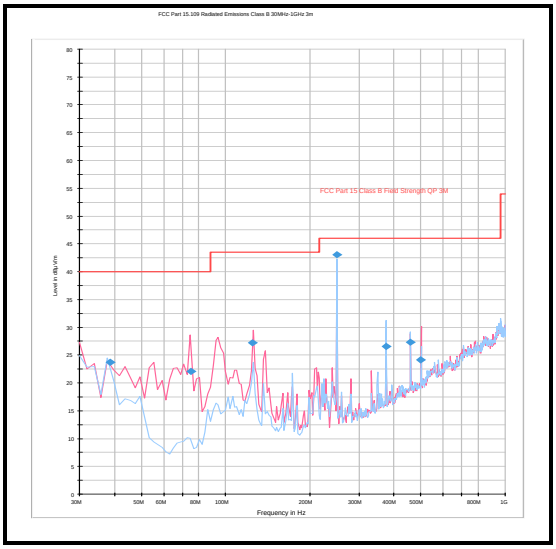
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the Middle of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
38.723	Horizontal	23.7	40.0	16.3	Complied
74.984	Vertical	22.1	40.0	17.9	Complied
125.024	Vertical	27.2	43.5	16.3	Complied
250.001	Horizontal	43.1	46.0	2.9	Complied
375.016	Horizontal	26.6	46.0	19.4	Complied
458.786	Vertical	27.3	46.0	18.7	Complied
500.041	Vertical	24.2	46.0	21.8	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)



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

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
K0001	5m RSE Chamber	Rainford	31 Aug 2012	12
A1834	Attenuator	8491B	29 Jan 2013	12
A553	Antenna	CBL6111A	15 Feb 2013	12
M1273	Test Receiver	ESIB 26	03 Feb 2013	12
G0543	Amplifier	310N	15 Oct 2012	3

Receiver/Idle Mode Radiated Spurious Emissions (continued)

Test Summary:

Test Engineer:	Andrew Edwards	**Test Dates:**	13 July 2012 & 31 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	15.109
Test Method Used:	ANSI C63.4 Section 8
Frequency Range:	1 GHz to 11 GHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	44

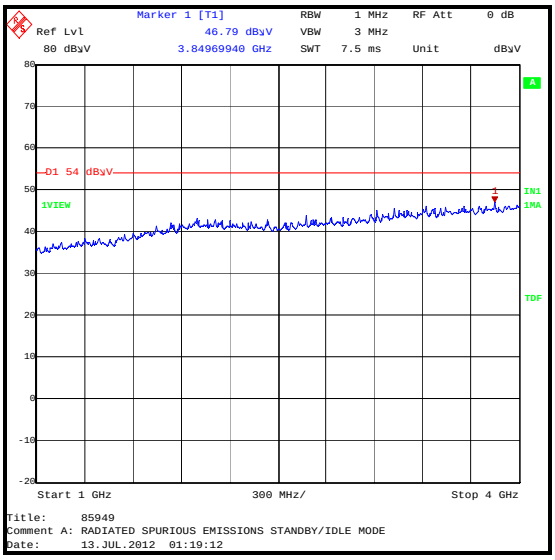
Note(s):

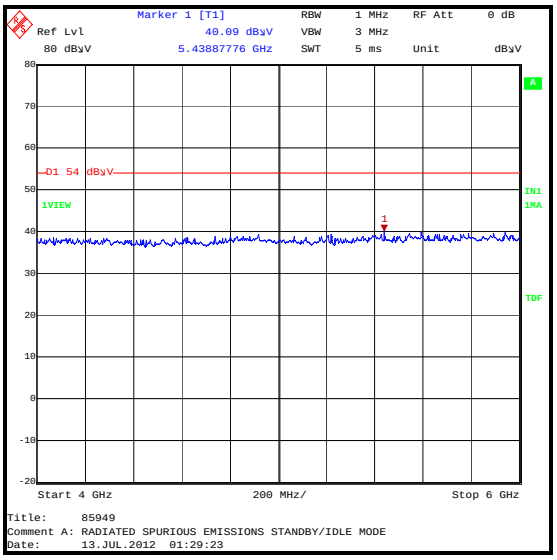
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the Middle of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the Middle of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
3. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

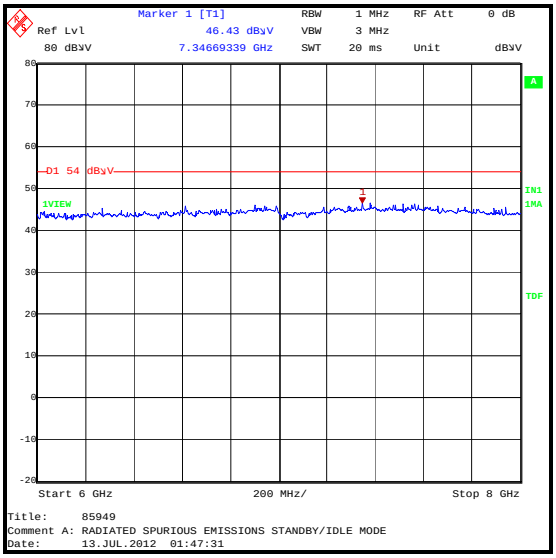
Results:

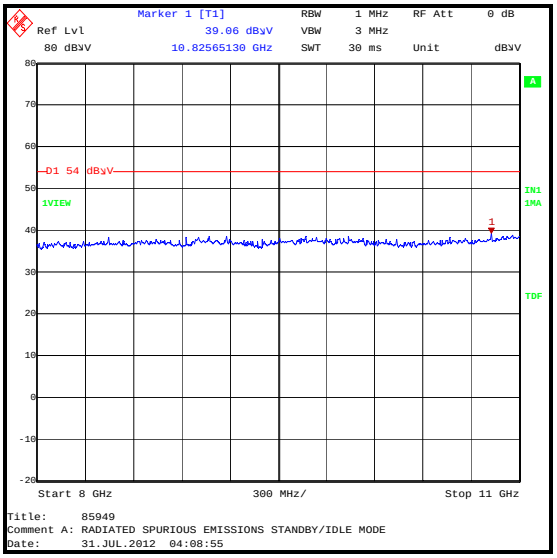
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
3849.699	Vertical	46.8	54.0	7.2	Complied

Receiver/Idle Mode Radiated Spurious Emissions (continued)









Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A253	Antenna	12240-20	09 Oct 2012	12
A254	Antenna	14240-20	09 Oct 2012	12
A255	Antenna	16240-20	09 Oct 2012	12
A1534	Pre Amplifier	8449B	09 Oct 2012	12
A1818	Antenna	3115	09 Oct 2012	12
K0002	3m RSE Chamber	Rainford	09 Oct 2012	12
L1067	Test Receiver	ESIB 40	29 May 2013	12

5.2.3. Receiver/Idle Mode Conducted Spurious Emissions – Main RF Port

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	25 July 2012 & 31 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	15.111 / 2.1051
Test Method Used:	As detailed in ANSI TIA-603-C-2004 section 2.1.2
Frequency Range:	9 kHz to 11 GHz

Environmental Conditions:

Temperature (°C):	26 to 27
Relative Humidity (%):	34 to 36

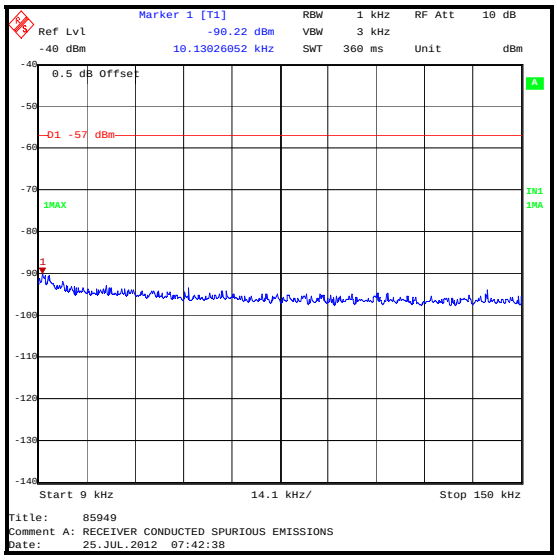
Note(s):

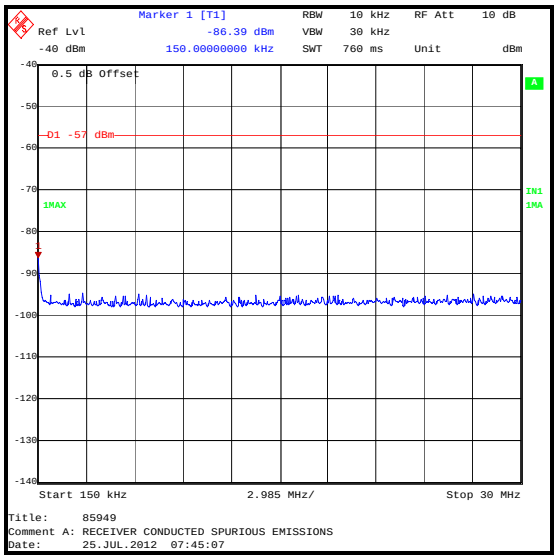
1. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.

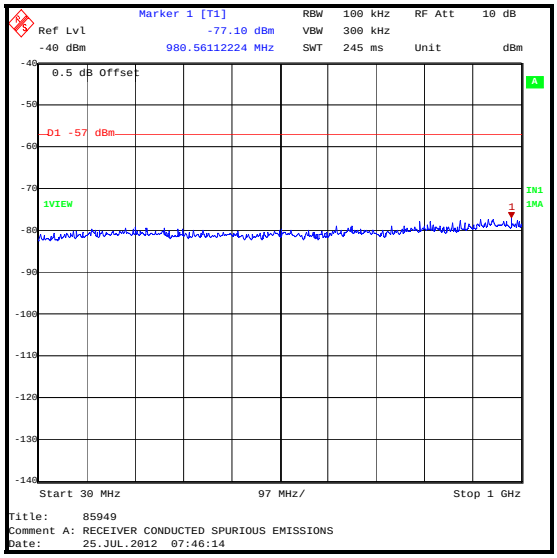
Results:

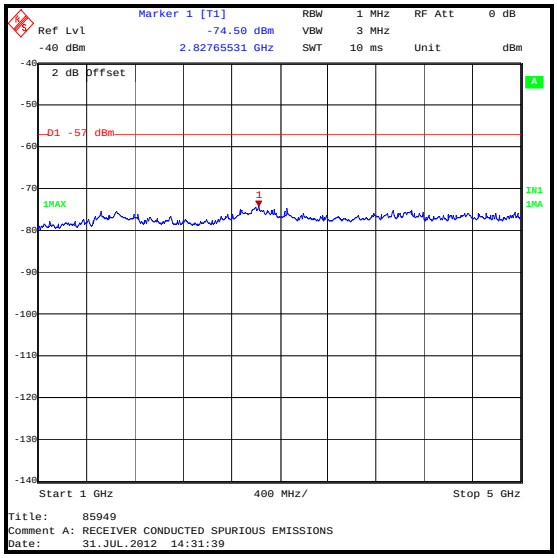
Frequency (MHz)	Level (dBµV/m)	Level (dBµV/m)	Margin (dB)	Result
9661.323	-70.6	-57.0	13.6	Complied

Receive/Idle Mode Conducted Emissions – Main RF Port (continued)

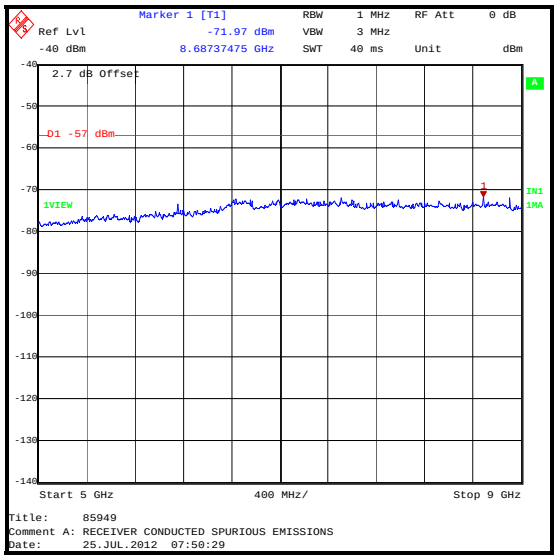


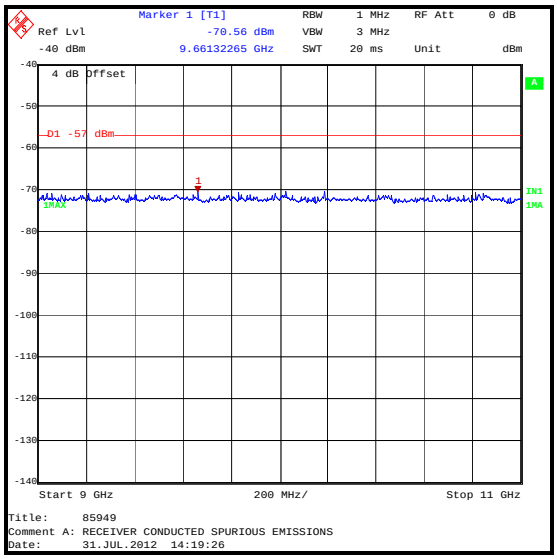






Receive/Idle Mode Conducted Emissions – Main RF Port (continued)





Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
L1067	Test Receiver	ESIB 40	29 May 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.4. Receiver/Idle Mode Conducted Spurious Emissions – Diversity RF Port

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	25 July 2012 & 31 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	15.111 / 2.1051
Test Method Used:	As detailed in ANSI TIA-603-C-2004 section 2.1.2
Frequency Range:	9 kHz to 11 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	34

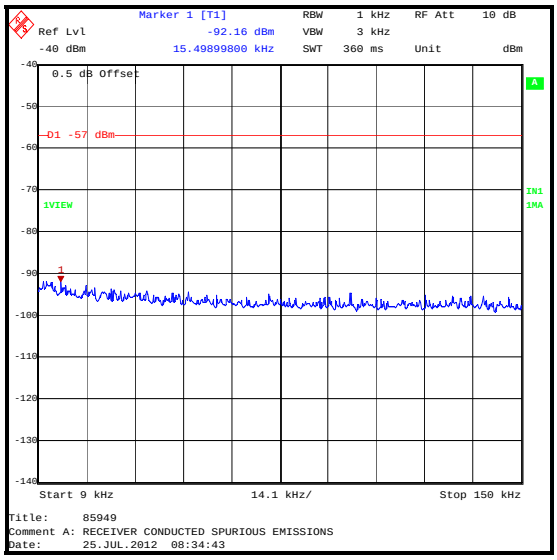
Note(s):

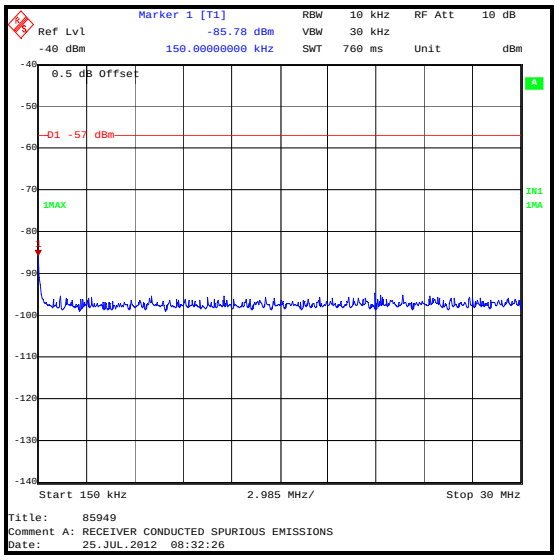
1. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.

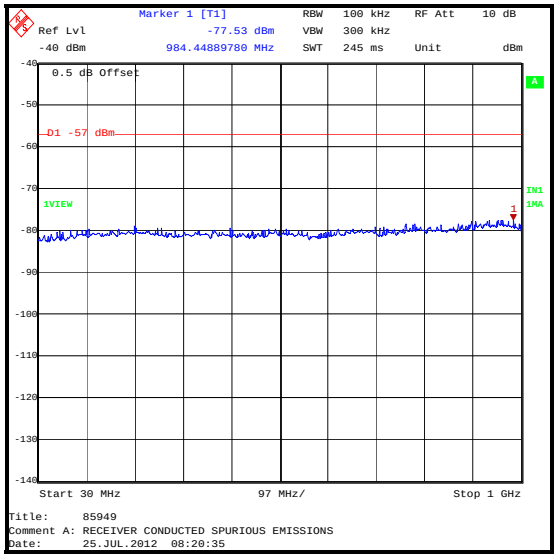
Results:

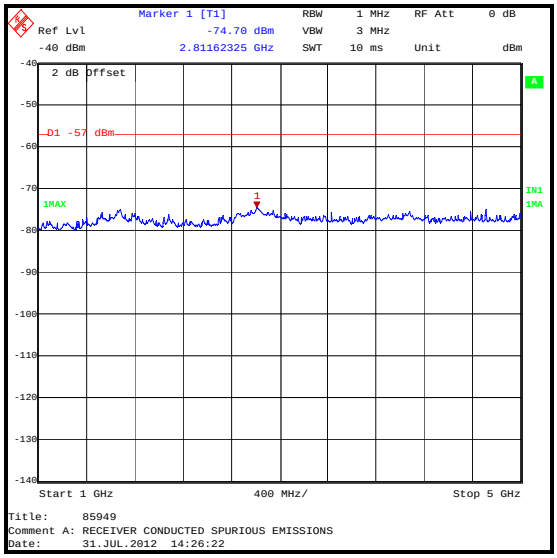
Frequency (MHz)	Level (dBμV/m)	Level (dBμV/m)	Margin (dB)	Result
10867.735	-71.1	-57.0	14.1	Complied

Receive/Idle Mode Conducted Emissions – Diversity RF Port (continued)

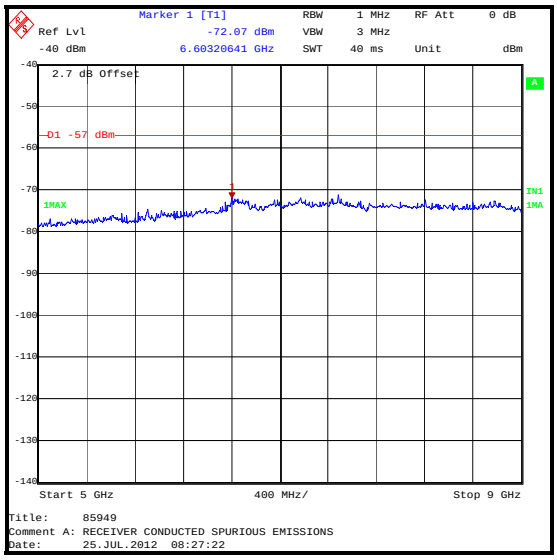


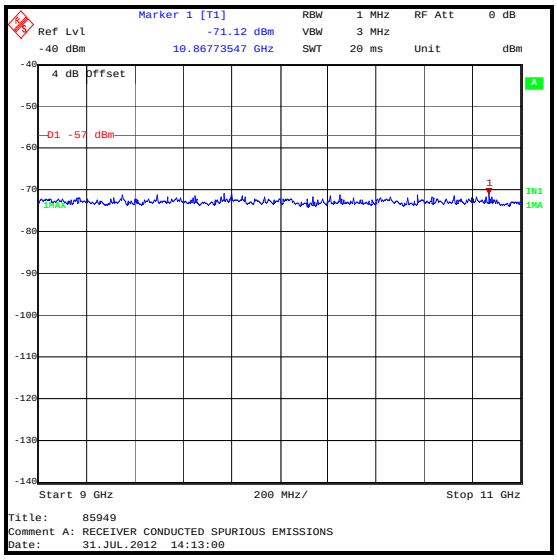






Receive/Idle Mode Conducted Emissions – Diversity RF Port (continued)





Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
L1067	Test Receiver	ESIB 40	29 May 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.5. Transmitter Carrier Output Power and EIRP

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	30 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	2.1046 and 27.50(d)(4)
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.17.2

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	32

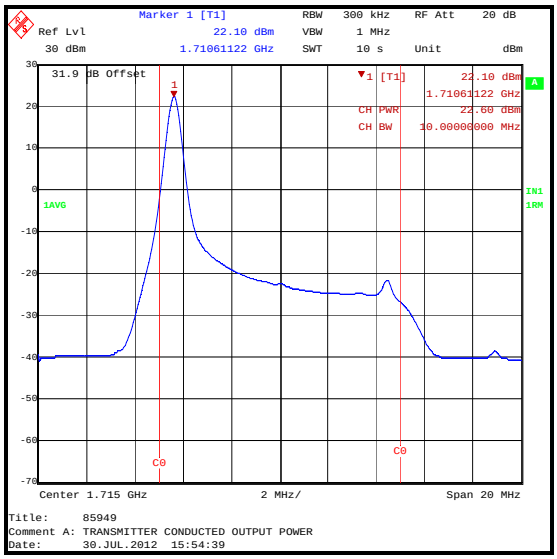
Note(s):

1. The Customer stated a maximum antenna gain of 5.0 dBi.
2. Measurements were performed with the EUT transmitting with QPSK and 16QAM modulation schemes, with Resource Blocks of 1 and 50. For single Resource Blocks, measurements were performed with the starting of blocks 1 and 50.

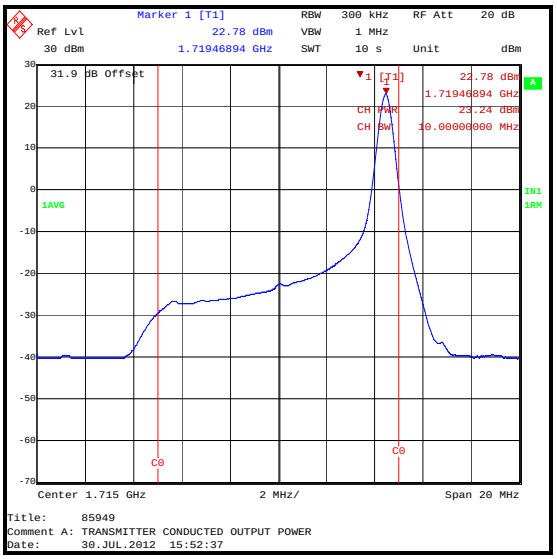
Transmitter Carrier Output Power and EIRP (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel

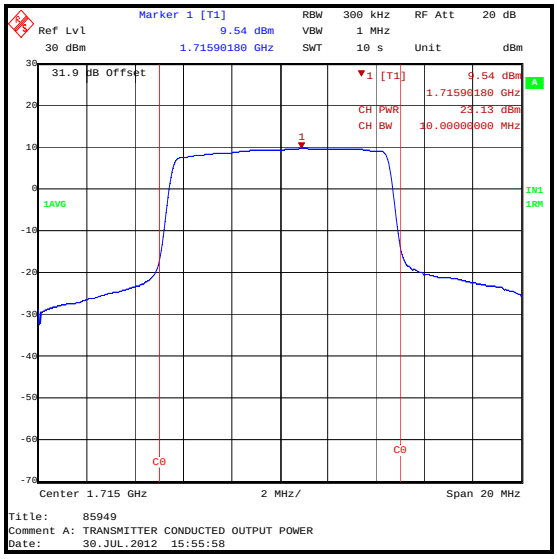
Frequency (MHz)	Modulation	Resource Blocks	Conducted RF Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
1715	QPSK	1 (1)	22.6	5.0	27.6	30.0	2.4	Complied
1715	QPSK	1 (50)	23.2	5.0	28.2	30.0	1.8	Complied
1715	QPSK	50	23.1	5.0	28.1	30.0	1.9	Complied



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

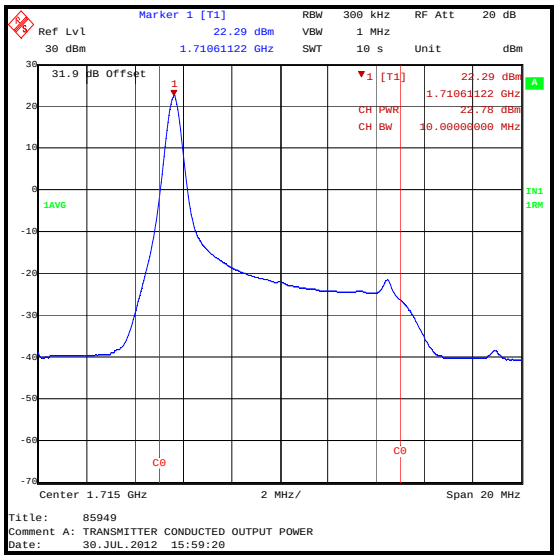


QPSK / 50 Resource Blocks

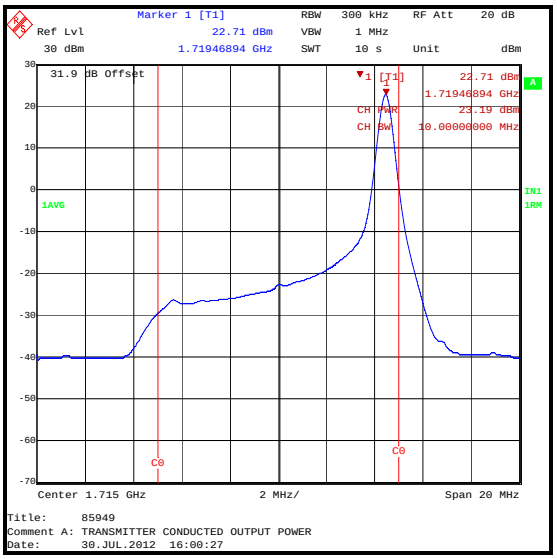
Transmitter Carrier Output Power and EIRP (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel

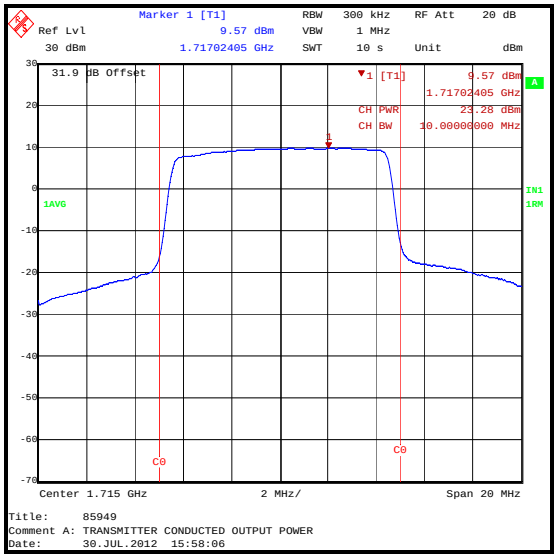
Frequency (MHz)	Modulation	Resource Blocks	Conducted RF Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
1715	16QAM	1 (1)	22.8	5.0	27.8	30.0	2.2	Complied
1715	16QAM	1 (50)	23.2	5.0	28.2	30.0	1.8	Complied
1715	16QAM	50	23.3	5.0	28.3	30.0	1.7	Complied



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)

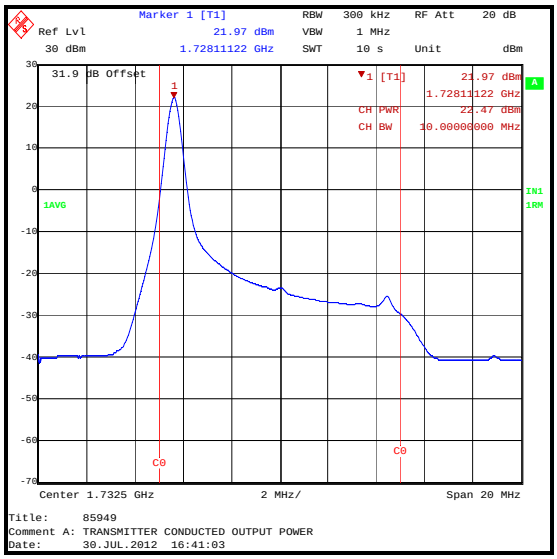


16QAM / 50 Resource Blocks

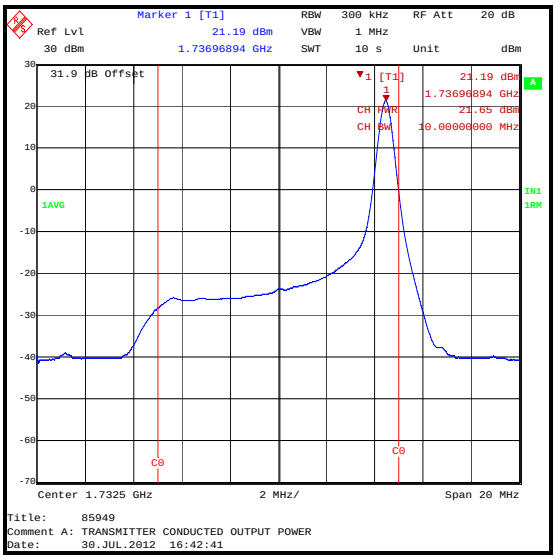
Transmitter Carrier Output Power and EIRP (continued)

Results: 10 MHz Channel Bandwidth / Middle Channel

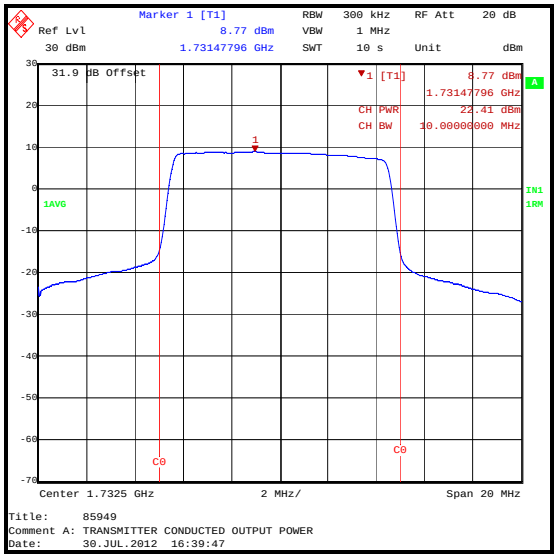
Frequency (MHz)	Modulation	Resource Blocks	Conducted RF Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
1732.5	QPSK	1 (1)	22.5	5.0	27.5	30.0	2.5	Complied
1732.5	QPSK	1 (50)	21.7	5.0	26.7	30.0	3.3	Complied
1732.5	QPSK	50	22.4	5.0	27.4	30.0	2.6	Complied



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

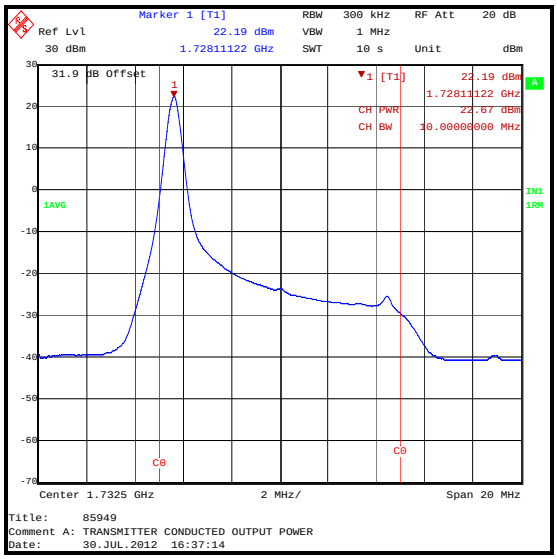


QPSK / 50 Resource Blocks

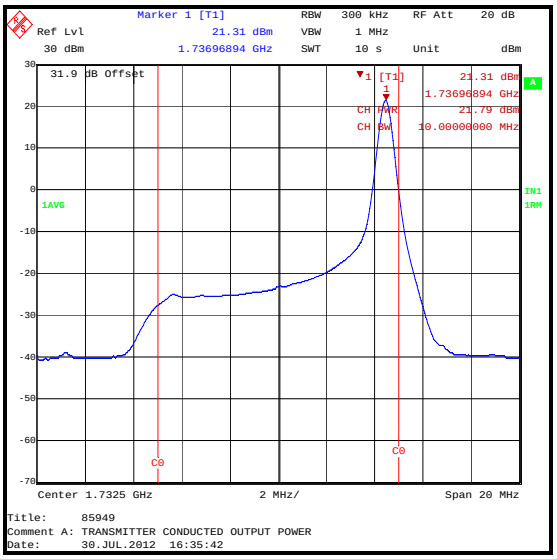
Transmitter Carrier Output Power and EIRP (continued)

Results: 10 MHz Channel Bandwidth / Middle Channel

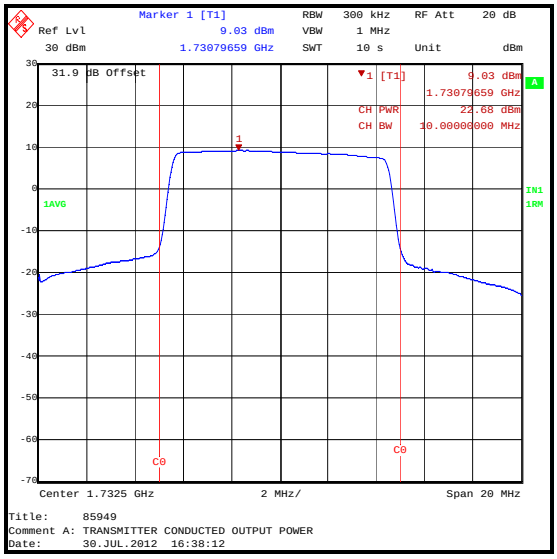
Frequency (MHz)	Modulation	Resource Blocks	Conducted RF Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
1732.5	16QAM	1 (1)	22.7	5.0	27.7	30.0	2.3	Complied
1732.5	16QAM	1 (50)	21.8	5.0	26.8	30.0	3.2	Complied
1732.5	16QAM	50	22.7	5.0	27.7	30.0	2.3	Complied



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)

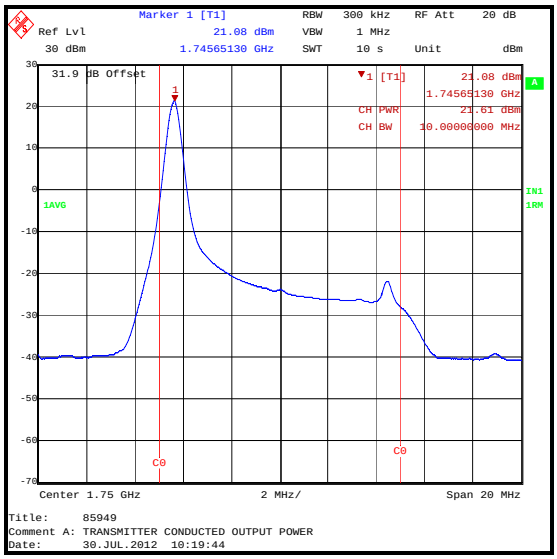


16QAM / 50 Resource Blocks

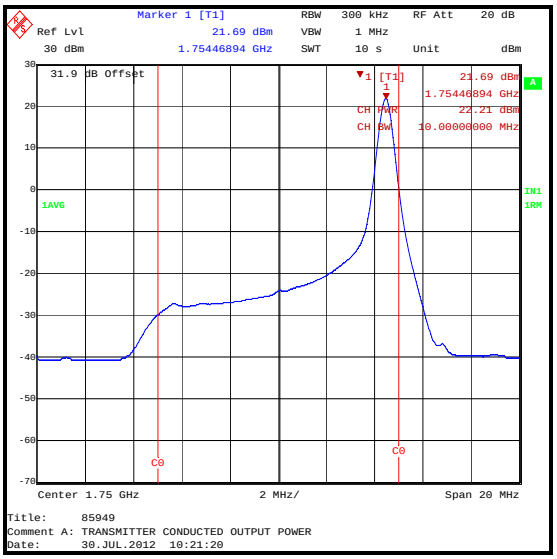
Transmitter Carrier Output Power and EIRP (continued)

Results: 10 MHz Channel Bandwidth / Top Channel

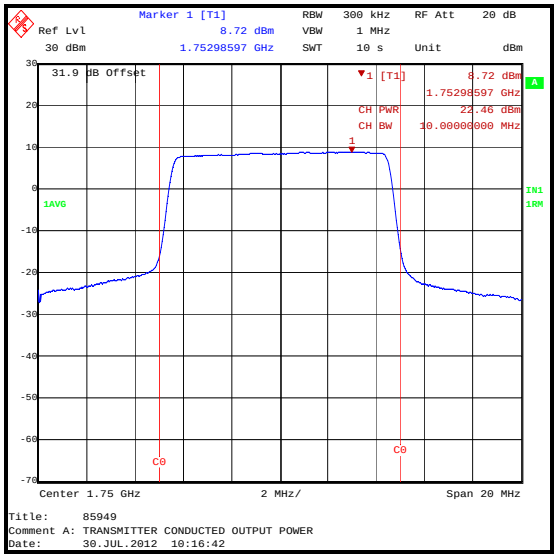
Frequency (MHz)	Modulation	Resource Blocks	Conducted RF Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
1750	QPSK	1 (1)	21.6	5.0	26.6	30.0	3.4	Complied
1750	QPSK	1 (50)	22.2	5.0	27.2	30.0	2.8	Complied
1750	QPSK	50	22.5	5.0	27.5	30.0	2.5	Complied



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

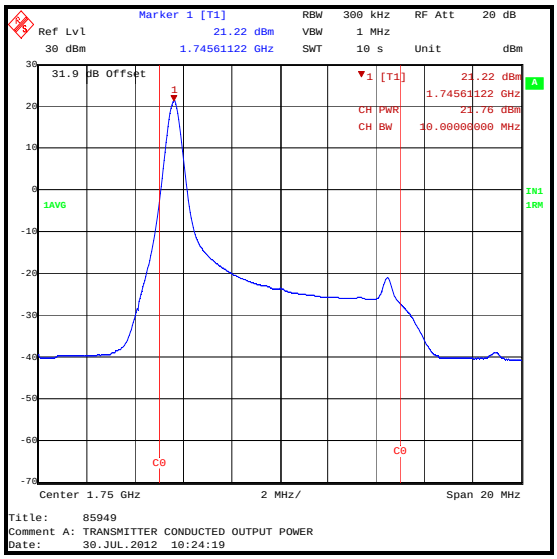


QPSK / 50 Resource Blocks

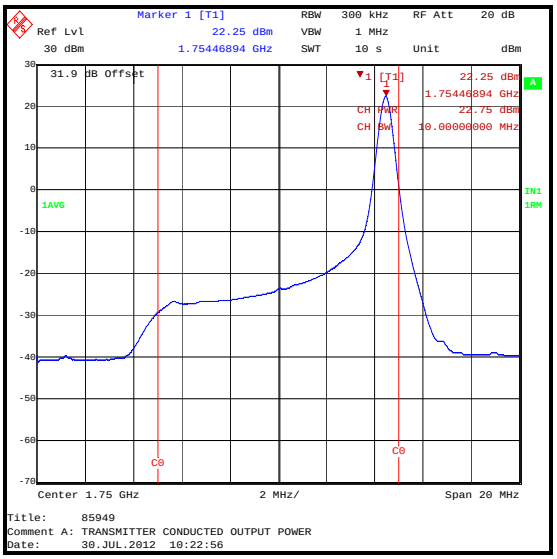
Transmitter Carrier Output Power and EIRP (continued)

Results: 10 MHz Channel Bandwidth / Top Channel

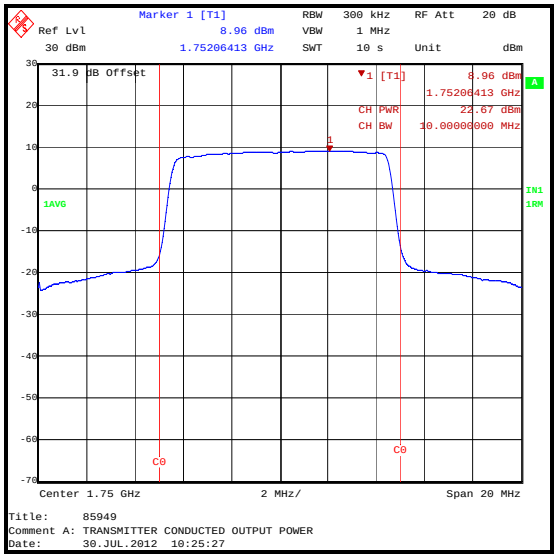
Frequency (MHz)	Modulation	Resource Blocks	Conducted RF Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
1750	16QAM	1 (1)	21.8	5.0	26.8	30.0	3.2	Complied
1750	16QAM	1 (50)	22.8	5.0	27.8	30.0	2.2	Complied
1750	16QAM	50	22.7	5.0	27.7	30.0	2.3	Complied



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)



16QAM / 50 Resource Blocks

Transmitter Carrier Output Power and EIRP (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1368	Directional Coupler	PE2214-10	Cal Before Use	-
A1999	Attenuator	6820.17.B	04 Apr 2013	12
L1017	Test Receiver	ESIB 40	09 Nov 2012	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.6. Transmitter Peak to Average Power Ratio

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	02 August 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	27.50(d)(5)
Test Method Used:	As detailed in FCC KDB 971168

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	42

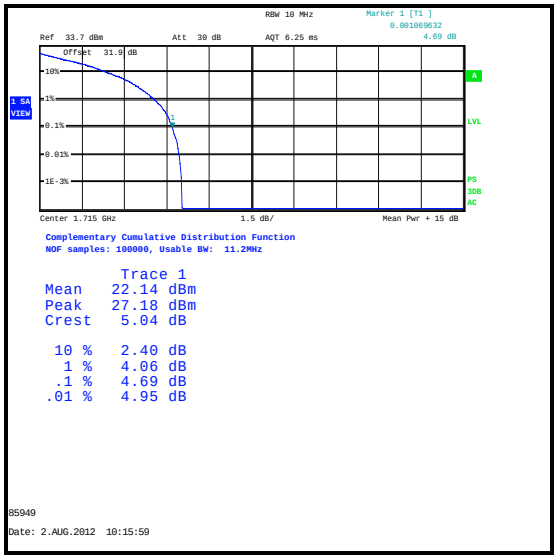
Note(s):

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

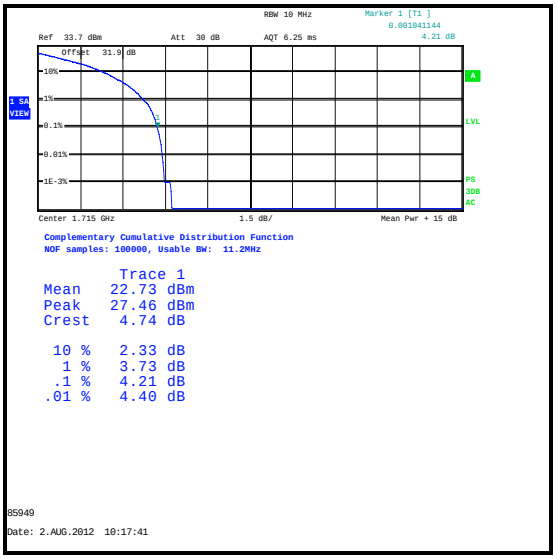
Transmitter Peak to Average Power Ratio (continued)

Results: Bottom Channel

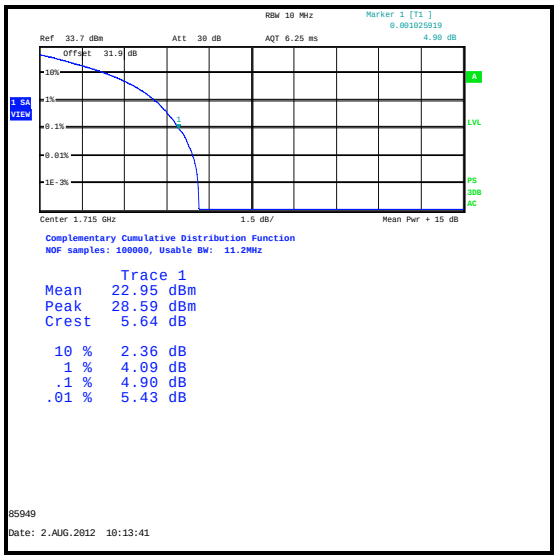
Modulation	Resource Blocks	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
QPSK	1 (1)	4.7	13.0	8.3	Complied
QPSK	1 (50)	4.2	13.0	8.8	Complied
QPSK	50	4.9	13.0	8.1	Complied



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

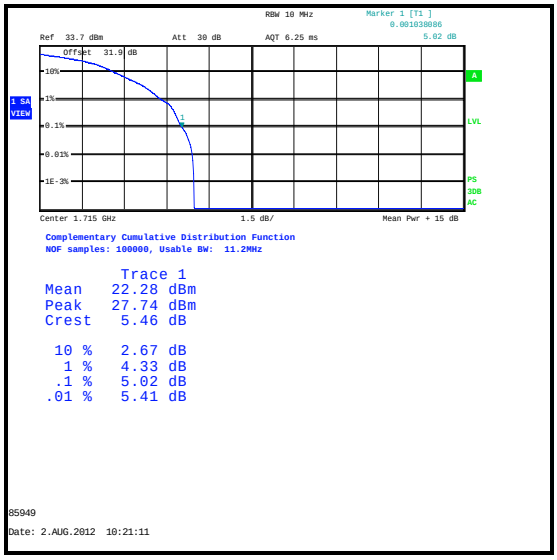


QPSK / 50 Resource Blocks

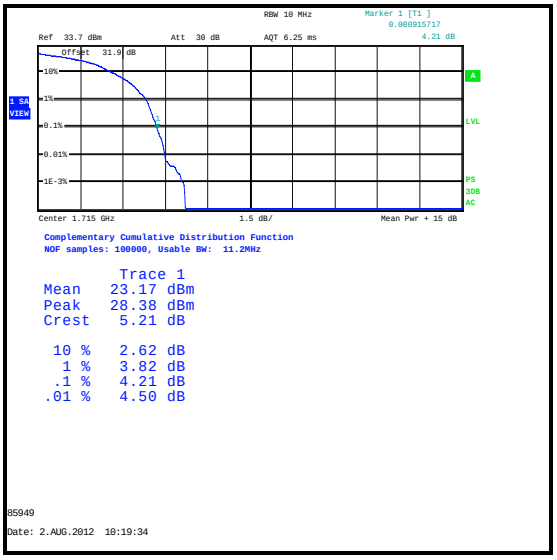
Transmitter Peak to Average Power Ratio (continued)

Results: Bottom Channel

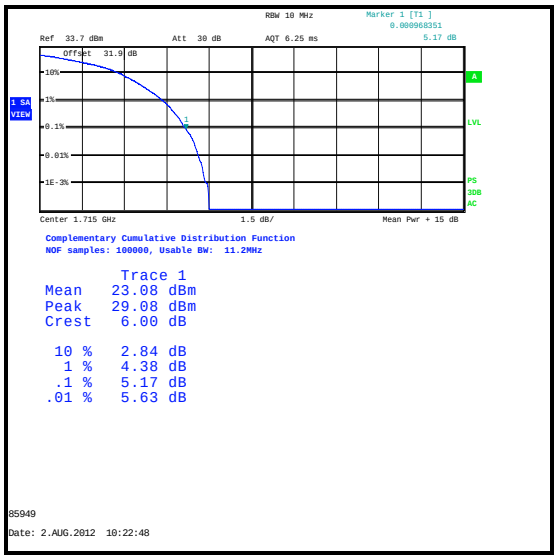
Modulation	Resource Blocks	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
16QAM	1 (1)	5.0	13.0	8.0	Complied
16QAM	1 (50)	4.2	13.0	8.8	Complied
16QAM	50	5.2	13.0	7.8	Complied



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)

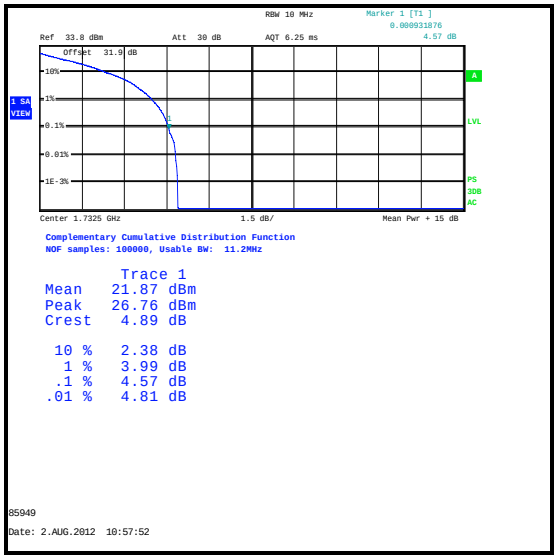


16QAM / 50 Resource Blocks

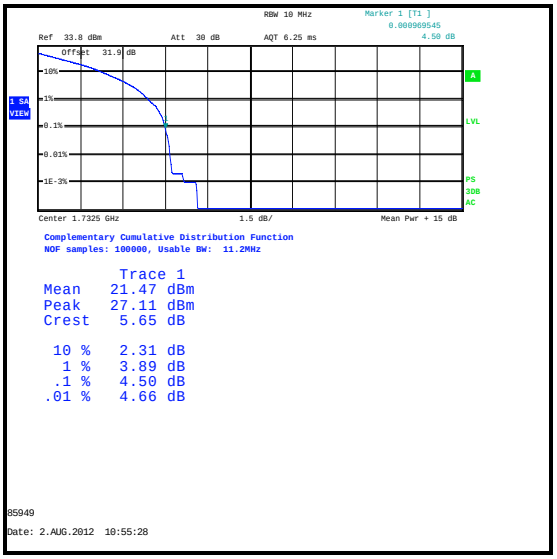
Transmitter Peak to Average Power Ratio (continued)

Results: Middle Channel

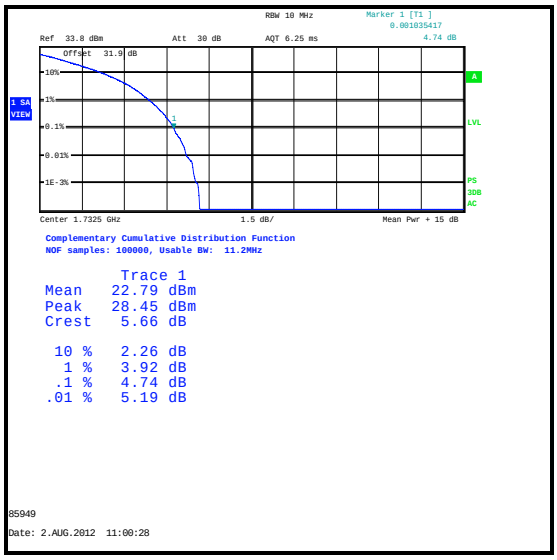
Modulation	Resource Blocks	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
QPSK	1 (1)	4.6	13.0	8.4	Complied
QPSK	1 (50)	4.5	13.0	8.5	Complied
QPSK	50	4.7	13.0	8.3	Complied



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

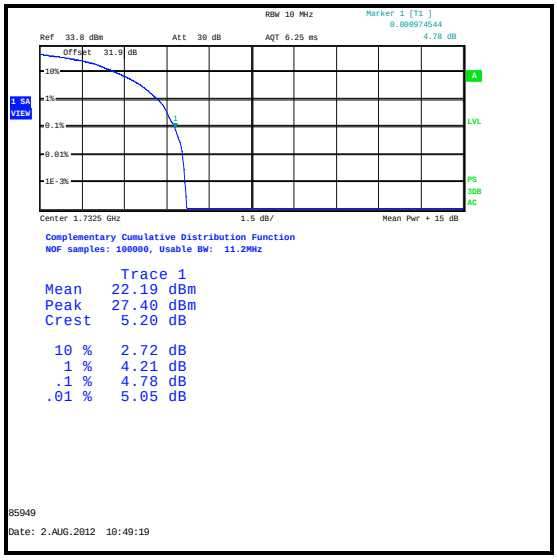


QPSK / 50 Resource Blocks

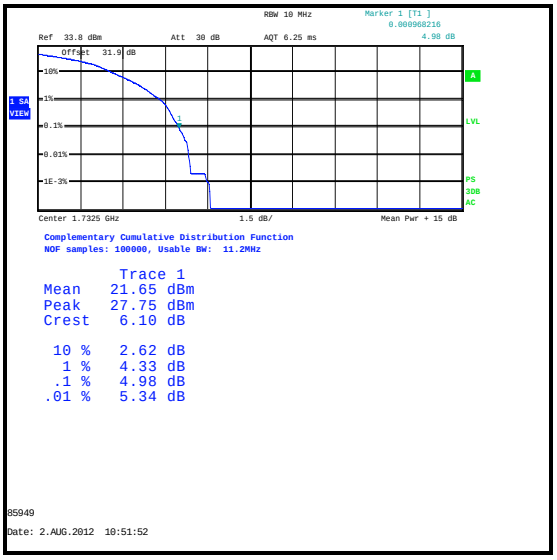
Transmitter Peak to Average Power Ratio (continued)

Results: Middle Channel

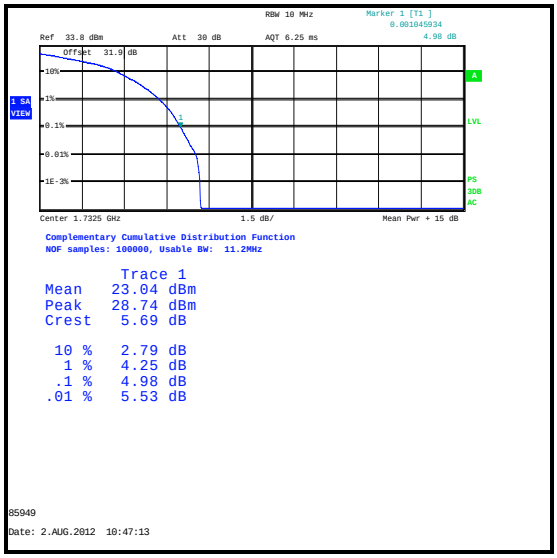
Modulation	Resource Blocks	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
16QAM	1 (1)	4.8	13.0	8.2	Complied
16QAM	1 (50)	5.0	13.0	8.0	Complied
16QAM	50	5.0	13.0	8.0	Complied



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)

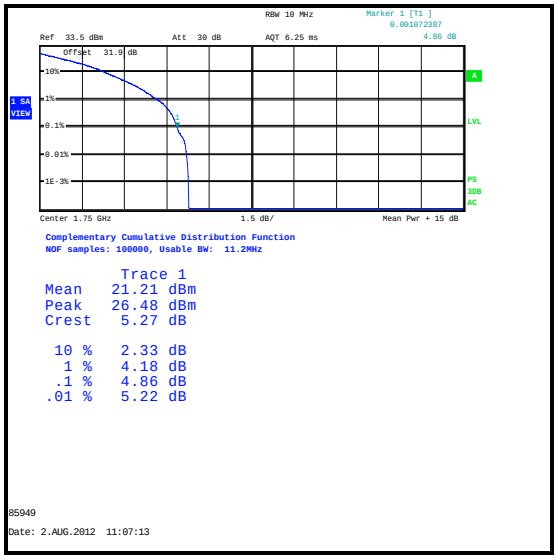


16QAM / 50 Resource Blocks

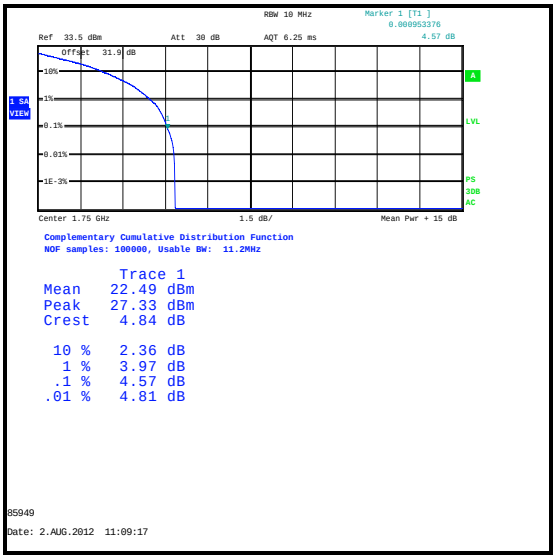
Transmitter Peak to Average Power Ratio (continued)

Results: Top Channel

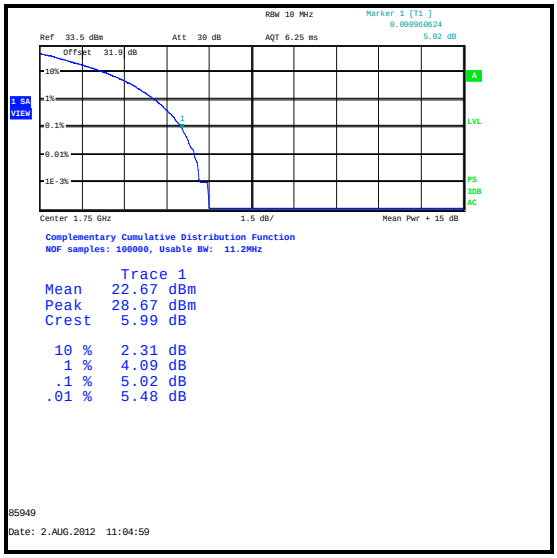
Modulation	Resource Blocks	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
QPSK	1 (1)	4.9	13.0	8.1	Complied
QPSK	1 (50)	4.6	13.0	8.4	Complied
QPSK	50	5.0	13.0	8.0	Complied



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

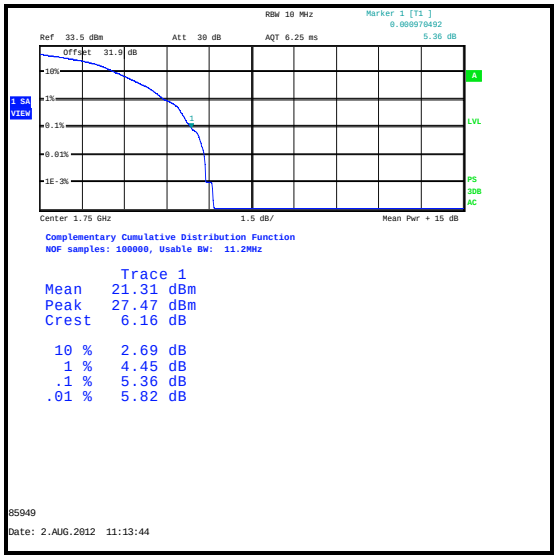


QPSK / 50 Resource Blocks

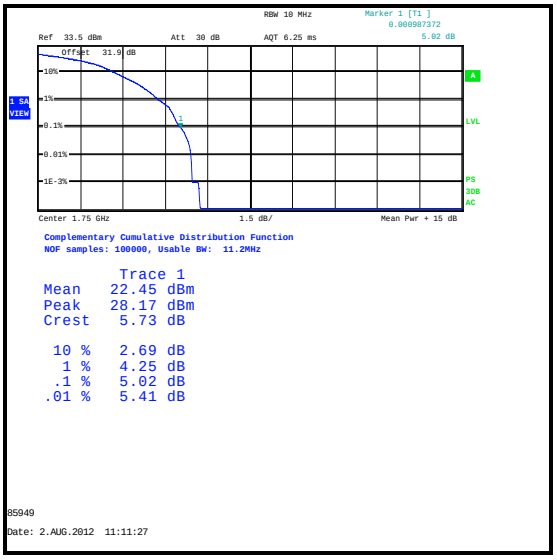
Transmitter Peak to Average Power Ratio (continued)

Results: Top Channel

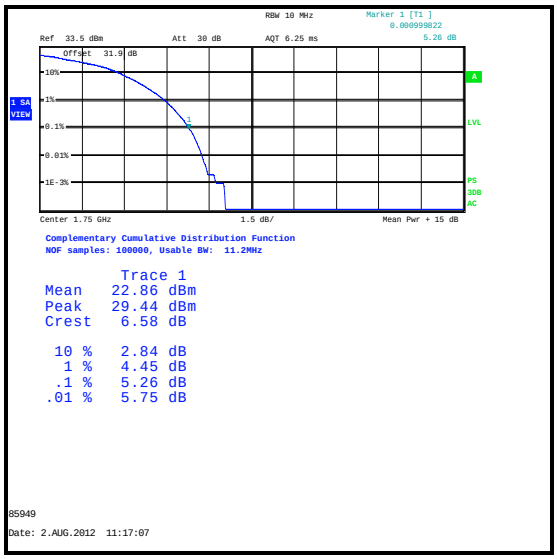
Modulation	Resource Blocks	0.1% PAPR (dB)	PAPR Limit (dB)	Margin (dB)	Result
16QAM	1 (1)	5.4	13.0	7.6	Complied
16QAM	1 (50)	5.0	13.0	8.0	Complied
16QAM	50	5.3	13.0	7.7	Complied



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)



16QAM / 50 Resource Blocks

Transmitter Peak to Average Power Ratio (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1368	Directional Coupler	PE2214-10	Cal Before Use	-
A1999	Attenuator	6820.17.B	04 Apr 2013	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12
M1630	Test Receiver	ESU	06 Feb 2013	12

5.2.7. Transmitter Occupied Bandwidth

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	08 August 2012
Test Sample Serial Number:	AMWGB84001G12		

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):	27
Relative Humidity (%):	44

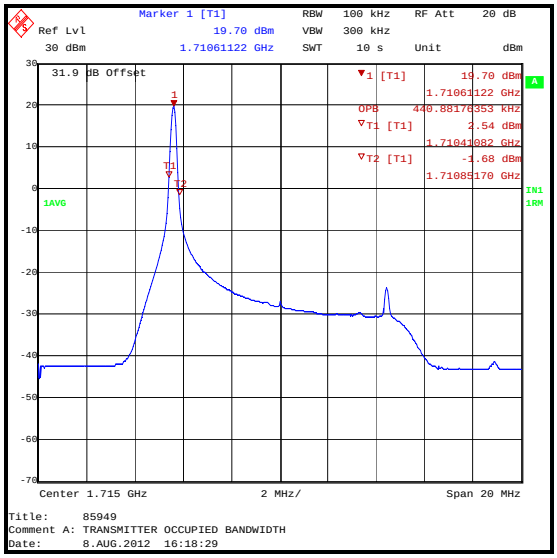
Note(s):

1. In lieu of the test method detailed in ANSI C63.4 Section 13.1.7 the 99% occupied bandwidth was measured using the Occupied Bandwidth function of the test receiver.
2. Measurements were performed with the EUT transmitting with QPSK and 16QAM modulation schemes, with Resource Blocks of 1 and 50. For single Resource Blocks, measurements were performed with the block starting of blocks 1 and 50.

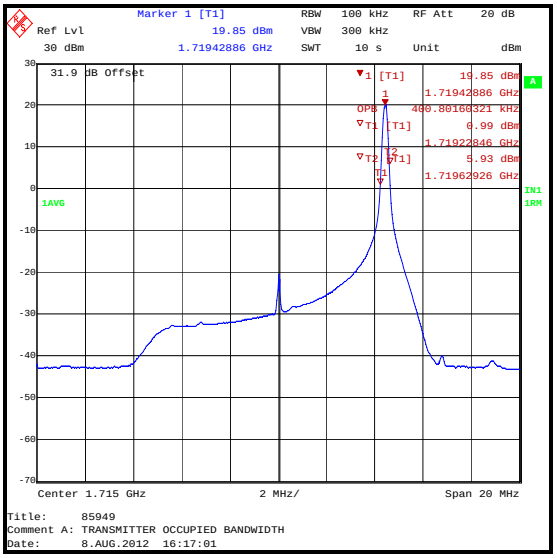
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel

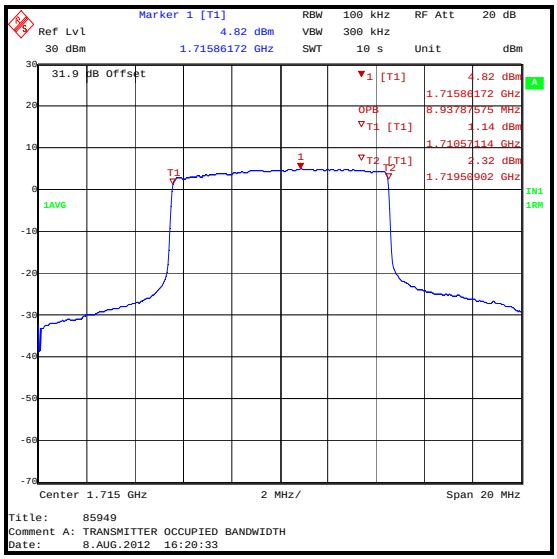
Frequency (MHz)	Modulation	Resource Blocks	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
1715	QPSK	1 (1)	100	300	0.441
1715	QPSK	1 (50)	100	300	0.401
1715	QPSK	50	100	300	8.938



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

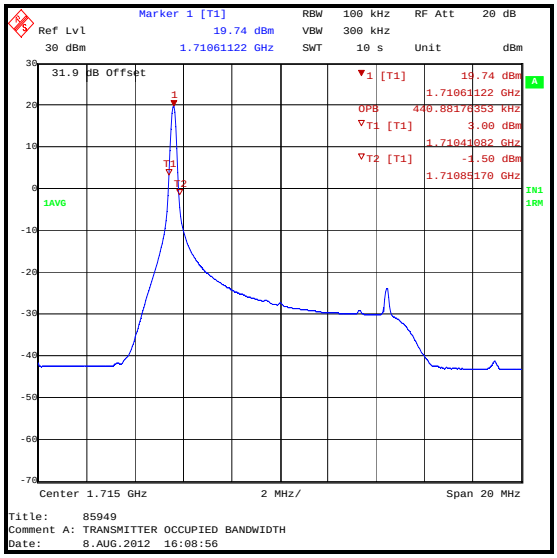


QPSK / 50 Resource Blocks

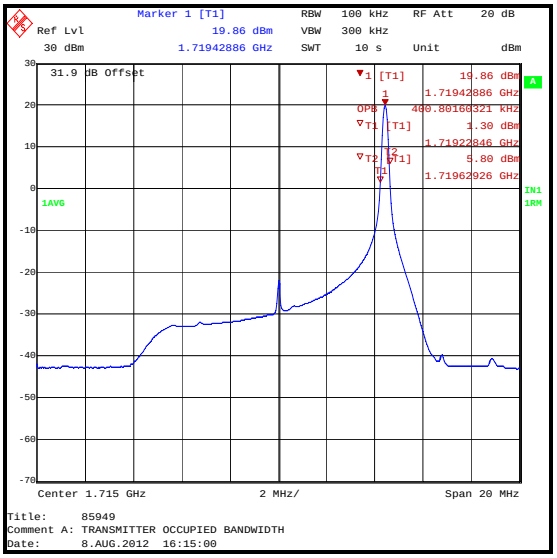
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel

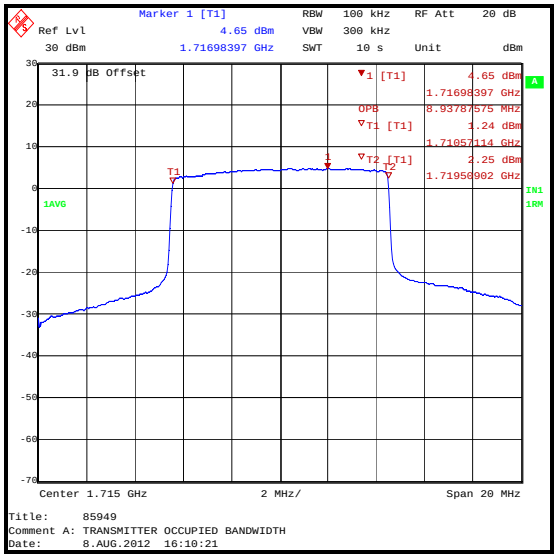
Frequency (MHz)	Modulation	Resource Blocks	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
1715	16QAM	1 (1)	100	300	0.441
1715	16QAM	1 (50)	100	300	0.401
1715	16QAM	50	100	300	8.938



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)

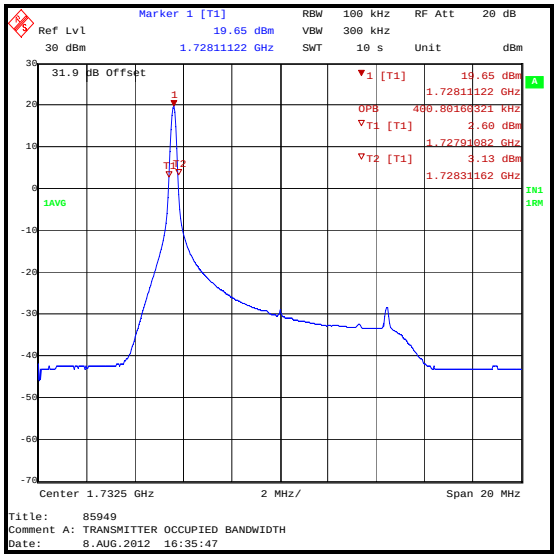


16QAM / 50 Resource Blocks

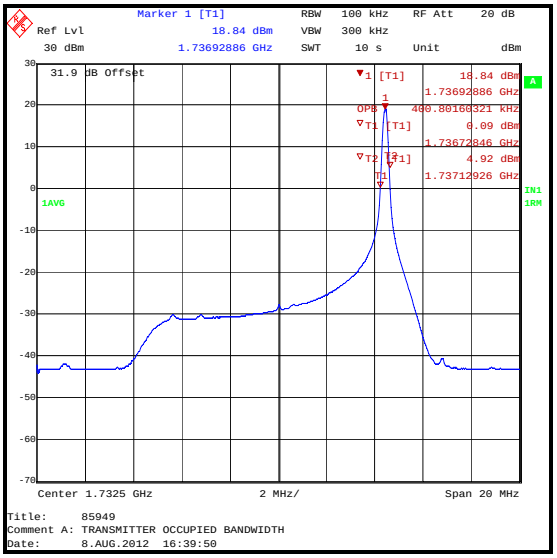
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz Channel Bandwidth / Middle Channel

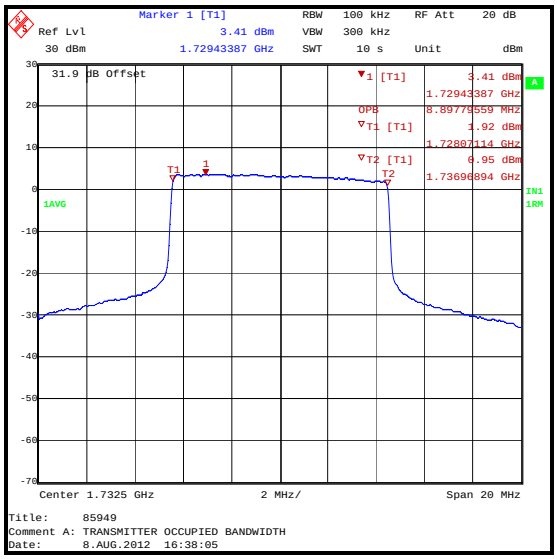
Frequency (MHz)	Modulation	Resource Blocks	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
1732.5	QPSK	1 (1)	100	300	0.401
1732.5	QPSK	1 (50)	100	300	0.401
1732.5	QPSK	50	100	300	8.898



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

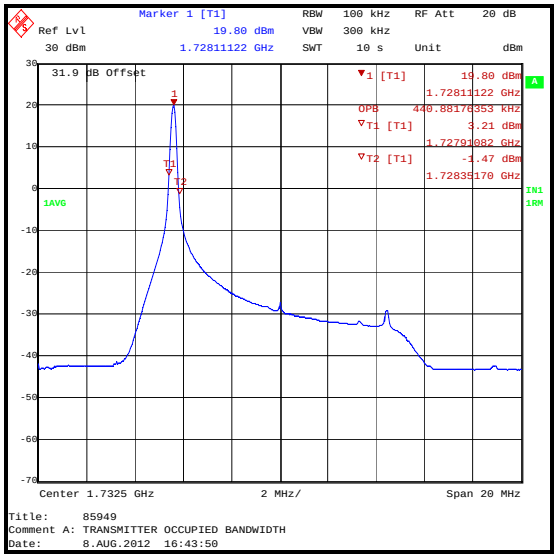


QPSK / 50 Resource Blocks

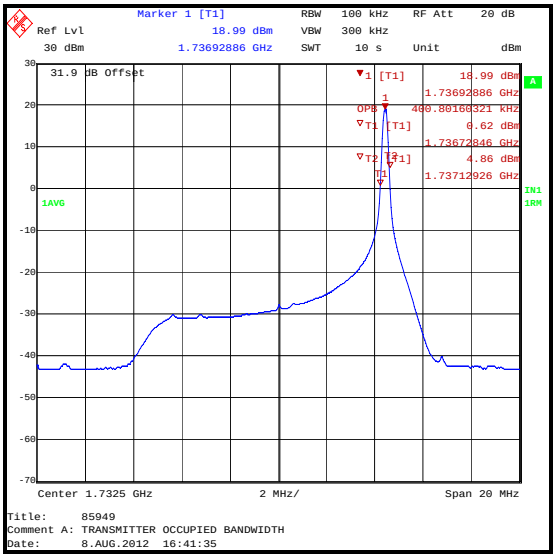
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz Channel Bandwidth / Middle Channel

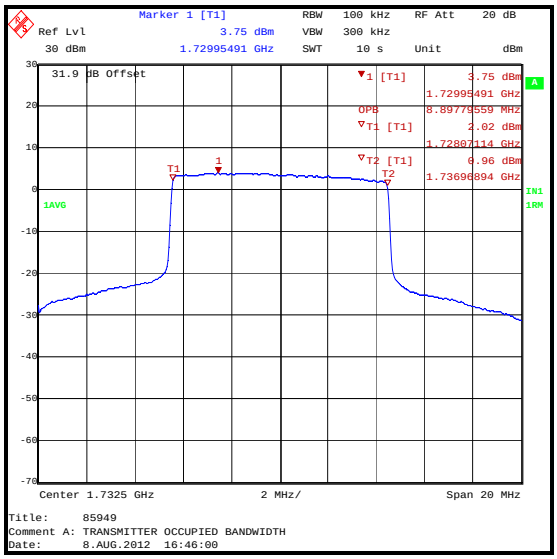
Frequency (MHz)	Modulation	Resource Blocks	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
1732.5	16QAM	1 (1)	100	300	0.441
1732.5	16QAM	1 (50)	100	300	0.401
1732.5	16QAM	50	100	300	8.898



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)

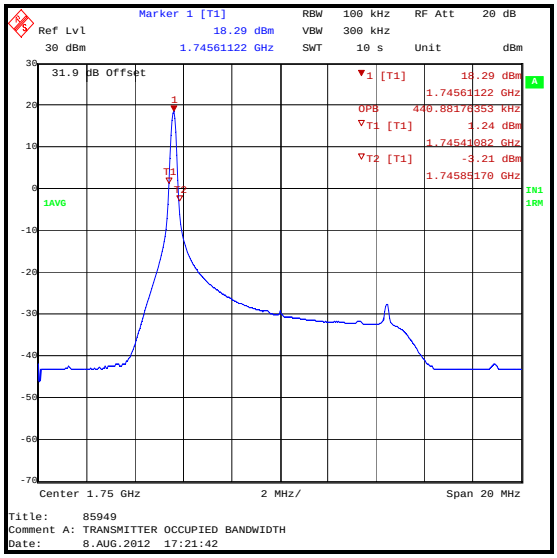


16QAM / 50 Resource Blocks

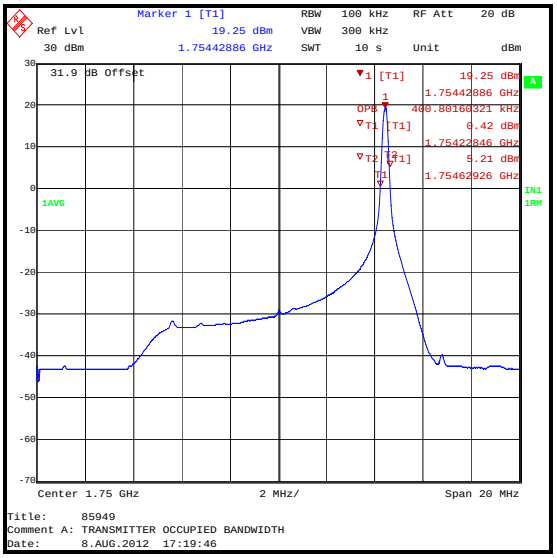
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz Channel Bandwidth / Top Channel

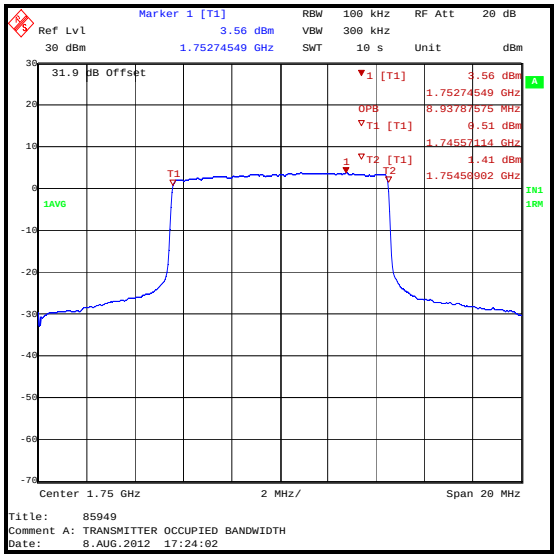
Frequency (MHz)	Modulation	Resource Blocks	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
1750	QPSK	1 (1)	100	300	0.441
1750	QPSK	1 (50)	100	300	0.401
1750	QPSK	50	100	300	8.938



QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50)

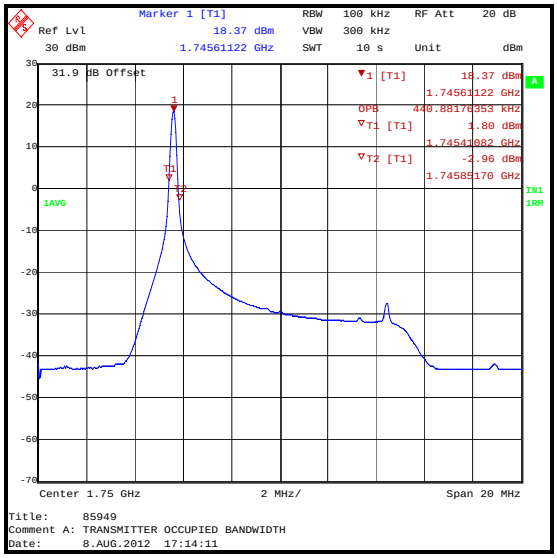


QPSK / 50 Resource Blocks

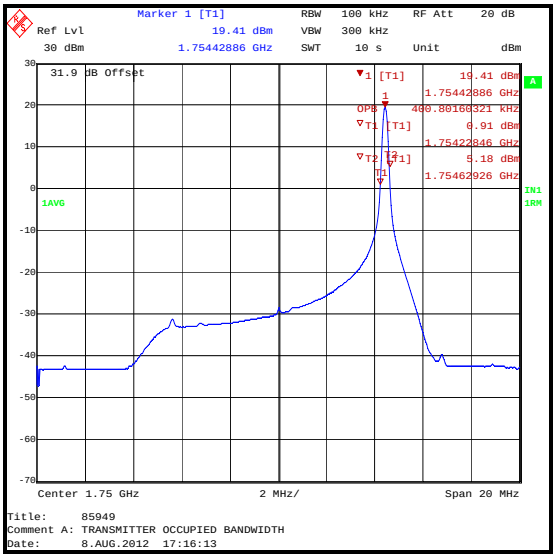
Transmitter Occupied Bandwidth (continued)

Results: 10 MHz Channel Bandwidth / Top Channel

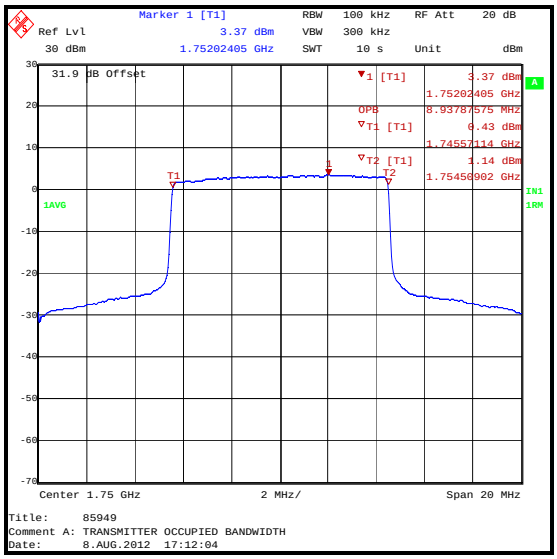
Frequency (MHz)	Modulation	Resource Blocks	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
1750	16QAM	1 (1)	100	300	0.441
1750	16QAM	1 (50)	100	300	0.401
1750	16QAM	50	100	300	8.938



16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50)



16QAM / 50 Resource Blocks

Transmitter Occupied Bandwidth (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1368	Directional Coupler	PE2214-10	Cal Before Use	-
A1999	Attenuator	6820.17.B	04 Apr 2013	12
L1017	Test Receiver	ESIB 40	09 Nov 2012	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.8. Transmitter Conducted Spurious Emissions

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	30 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	2.1051 and 27.53(h)
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 18 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	32

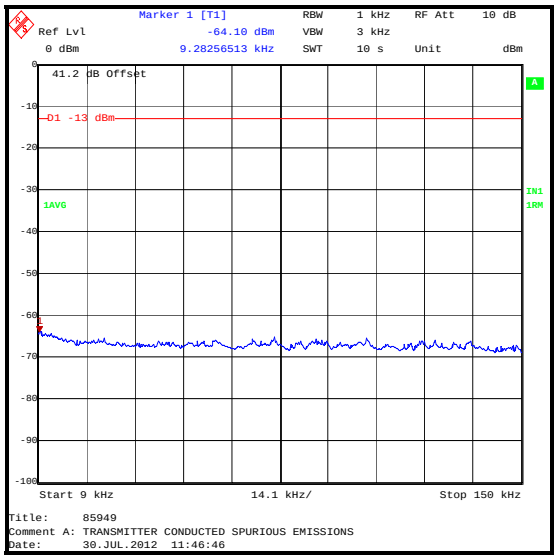
Note(s):

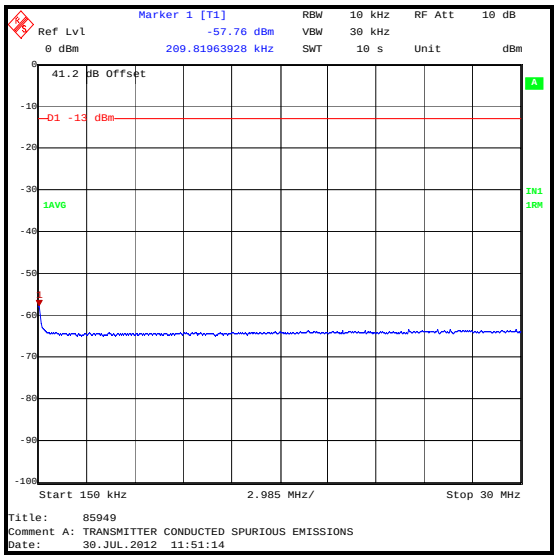
1. The EUT was transmitting using 16QAM Modulation scheme, with Resource Blocks set to 50, as this produced the highest power level and was therefore deemed worst case.
2. The emission seen on the 1 GHz to 5 GHz plot at approximately 1755 MHz is the EUT carrier.
3. All emissions were >20 dB below the applicable limit or below the level of the noise floor of the measuring receiver, therefore the highest level of noise floor is recorded in the table below.

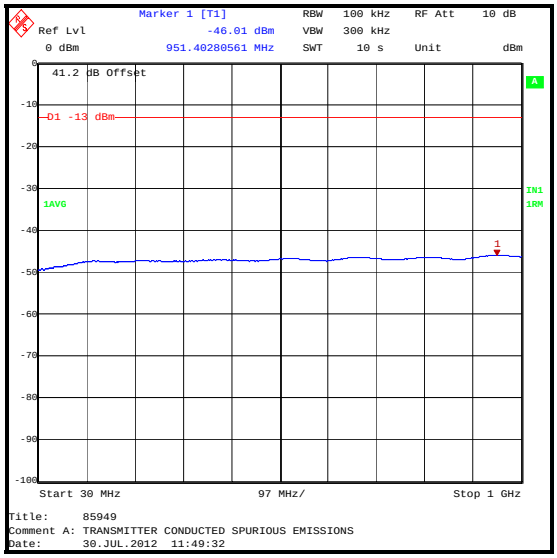
Results: 10 MHz Channel Bandwidth / Top Channel

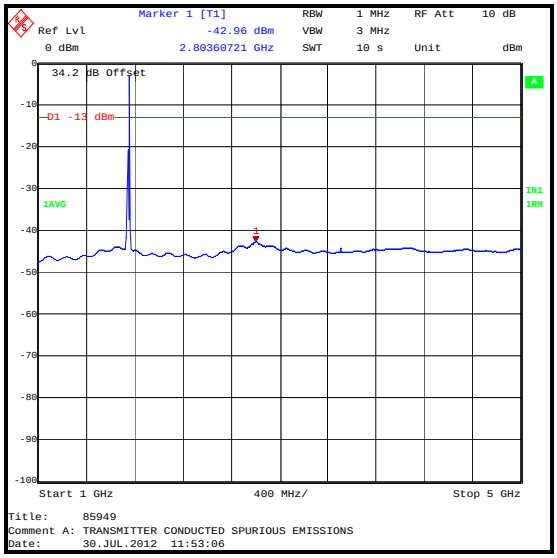
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
6973.948	-38.0	-13.0	25.0	Complied

Transmitter Conducted Spurious Emissions (continued)

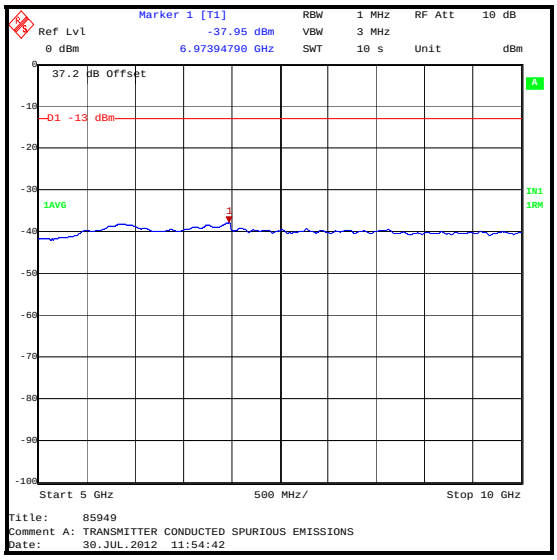


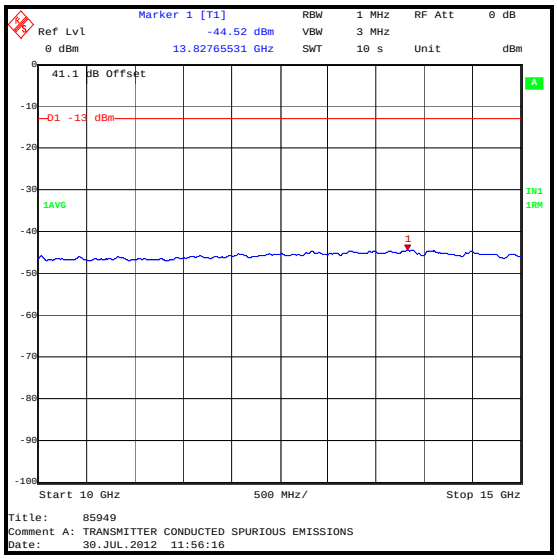


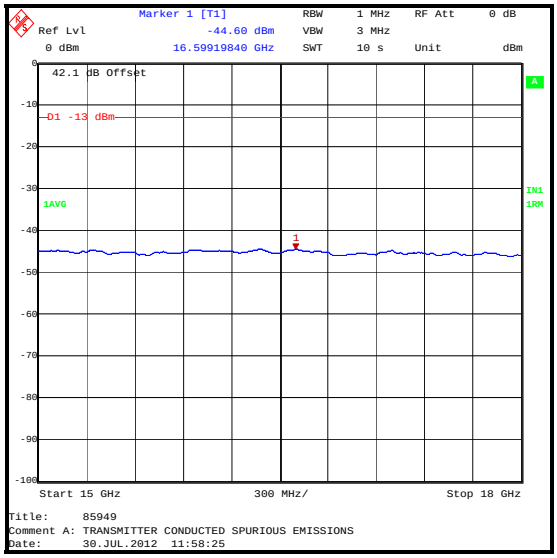




Transmitter Conducted Spurious Emissions (continued)







Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1368	Directional Coupler	PE2214-10	Cal Before Use	-
A1999	Attenuator	6820.17.B	04 Apr 2013	12
L1017	Test Receiver	ESIB 40	09 Nov 2012	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.9. Transmitter Conducted Emissions at Band Edges

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	30 July 2012
Test Sample Serial Number:	AMWGB84001G12		

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

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	32

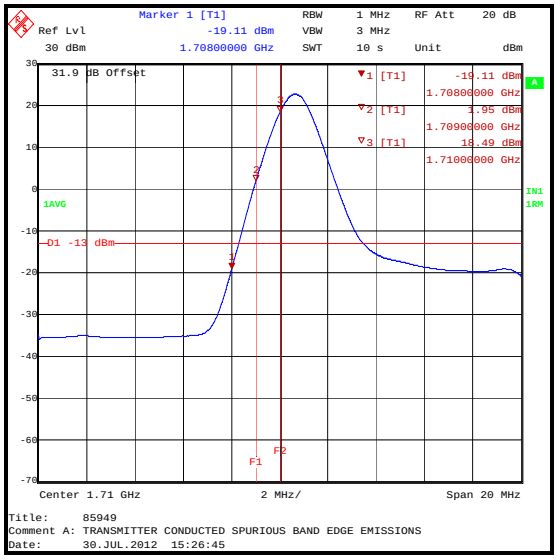
Note(s):

1. Measurements were performed with the EUT transmitting with QPSK and 16QAM modulation schemes, with Resource Blocks of 1 and 50. For single Resource Blocks, measurements were performed with the block starting of blocks 1 and 50.
2. Part 27.53(h)(1) states Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.
    - Plot 1 shows 1 MHz RBW with markers set at ± 1 MHz and ± 2 MHz from the band edge.
    - Plot 2 shows the RBW set to 1% of the occupied bandwidth for the immediate 1 MHz block outside and adjacent of the frequency block. The result for band edge has been taken from this plot.
    - Plot 3 shows ± 1 MHz to ± 2 MHz from the band edge, using the test receivers channel power function. The result from this has also been recorded in the result tables below.

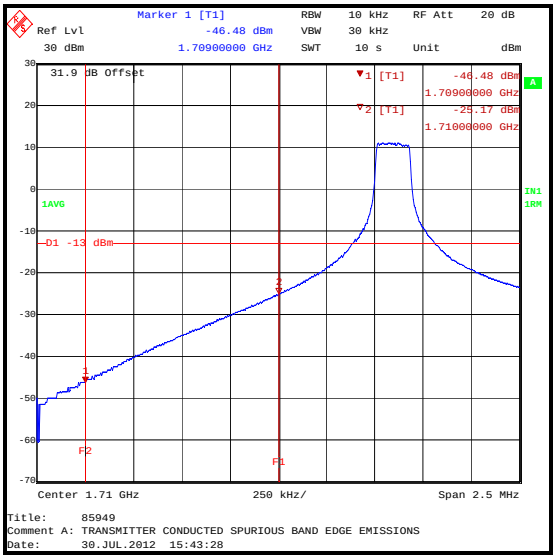
Transmitter Conducted Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel / QPSK

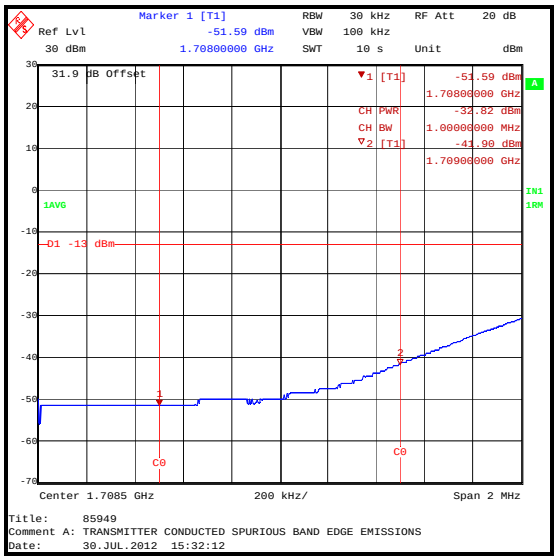
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1710	1 (1)	-25.2	-13.0	12.2	Complied
1708 to 1709	1 (1)	-32.8	-13.0	19.8	Complied
1710	1 (50)	-24.3	-13.0	11.3	Complied
1710	50	-21.6	-13.0	8.6	Complied
1708 to 1709	50	-20.3	-13.0	7.3	Complied



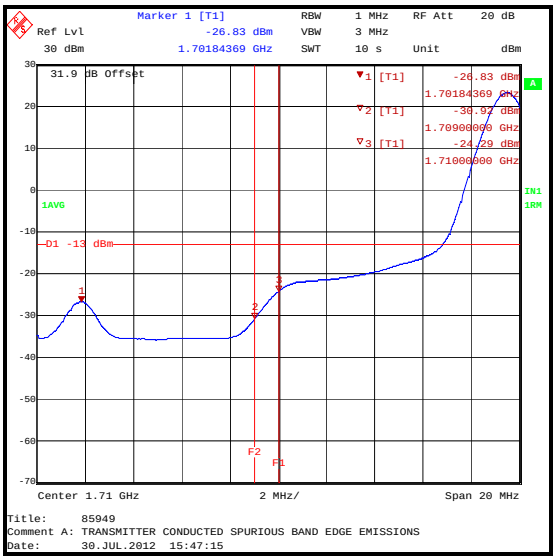
QPSK / 1 Resource Block (Block 1) / Plot 1



QPSK / 1 Resource Block (Block 1) / Plot 2



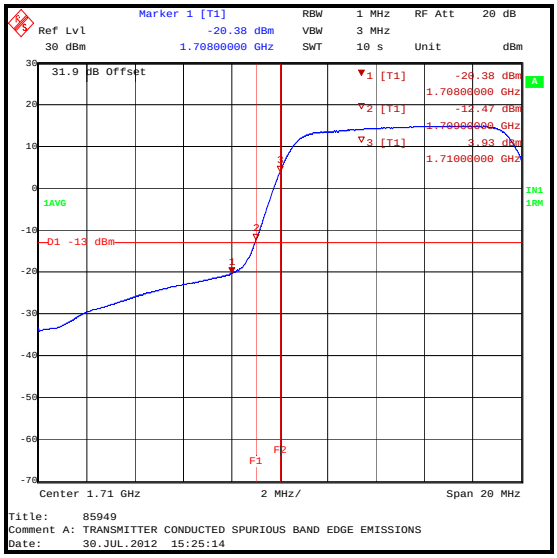
QPSK / 1 Resource Block (Block 1) / Plot 3



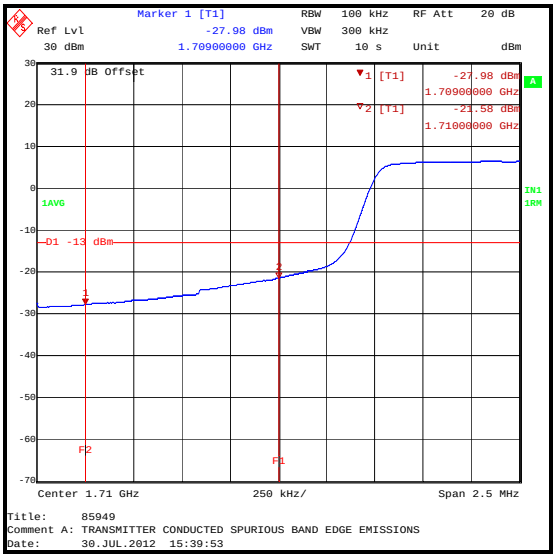
QPSK / 1 Resource Block (Block 50)

Transmitter Conducted Emissions at Band Edges (continued)

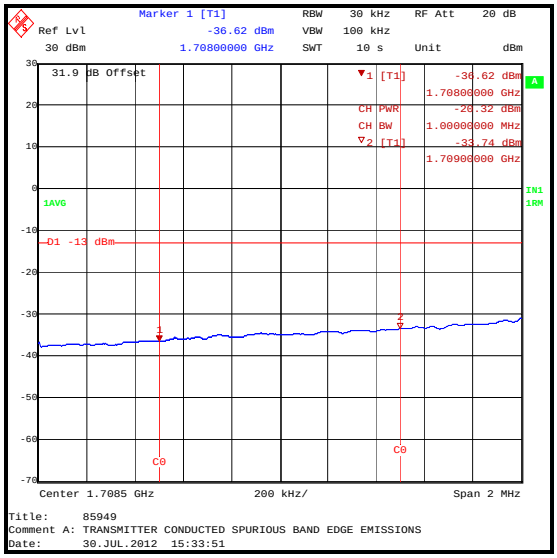
Results: 10 MHz Channel Bandwidth / Bottom Channel / QPSK



QPSK / 50 Resource Blocks / Plot 1



QPSK / 50 Resource Blocks / Plot 2

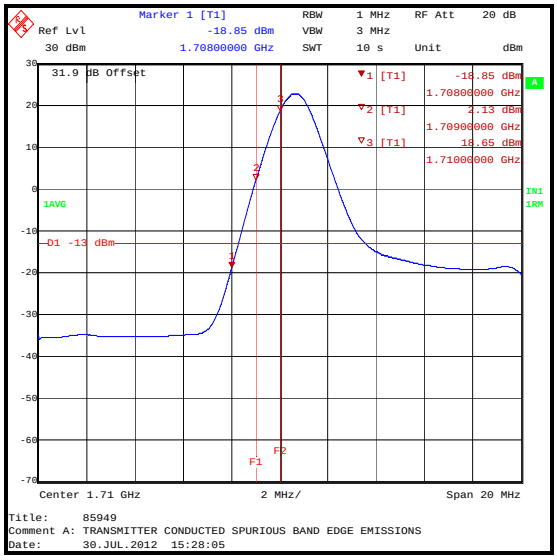


QPSK / 50 Resource Blocks / Plot 3

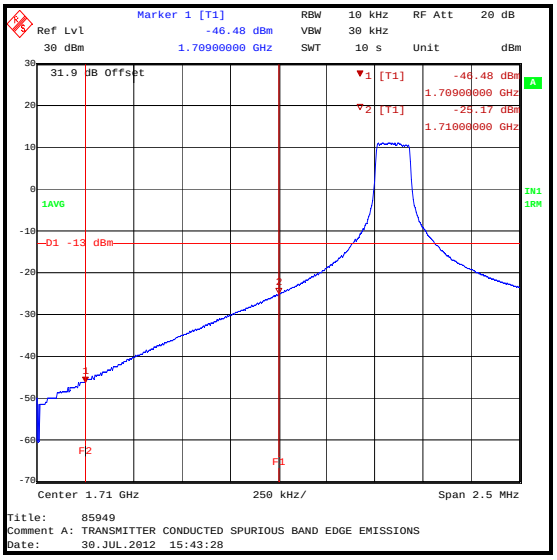
Transmitter Conducted Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel / 16QAM

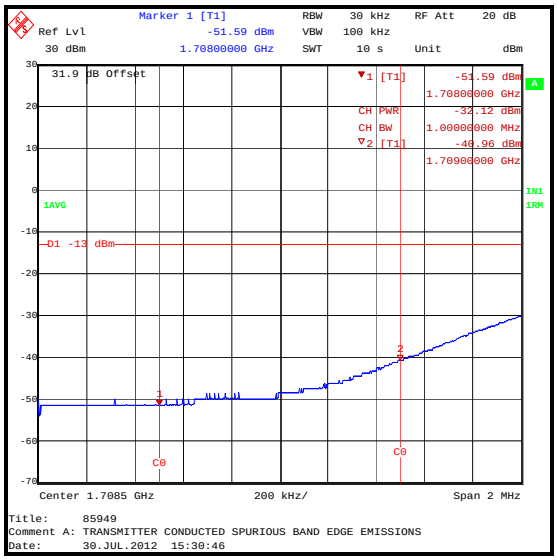
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1710	1 (1)	-25.2	-13.0	12.2	Complied
1708 to 1709	1 (1)	-32.1	-13.0	19.1	Complied
1710	1 (50)	-24.3	-13.0	11.3	Complied
1710	50	-20.7	-13.0	7.7	Complied
1708 to 1709	50	-17.4	-13.0	4.4	Complied



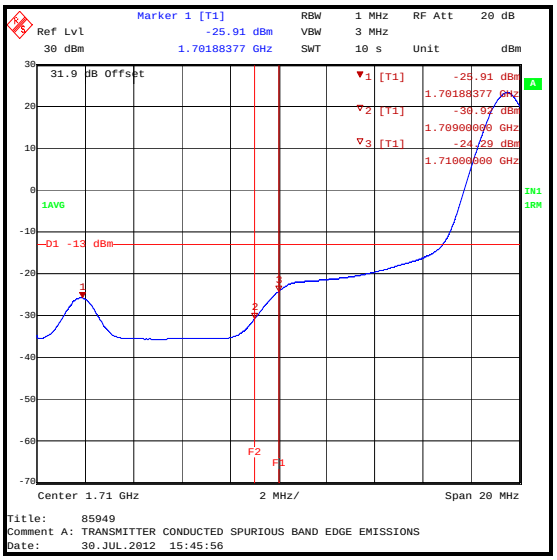
16QAM / 1 Resource Block (Block 1) / Plot 1



16QAM / 1 Resource Block (Block 1) / Plot 2



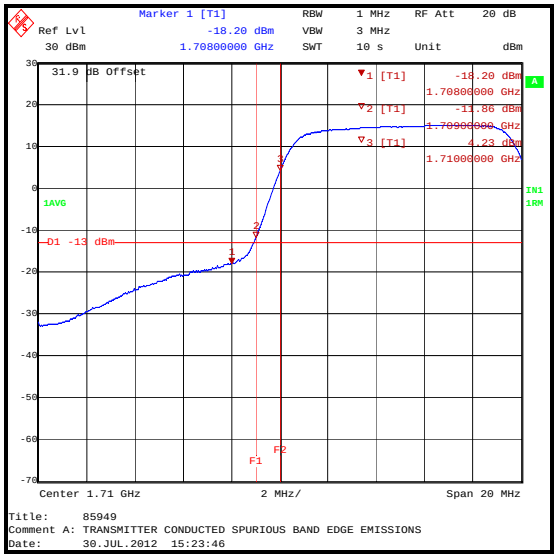
16QAM / 1 Resource Block (Block 1) / Plot 3



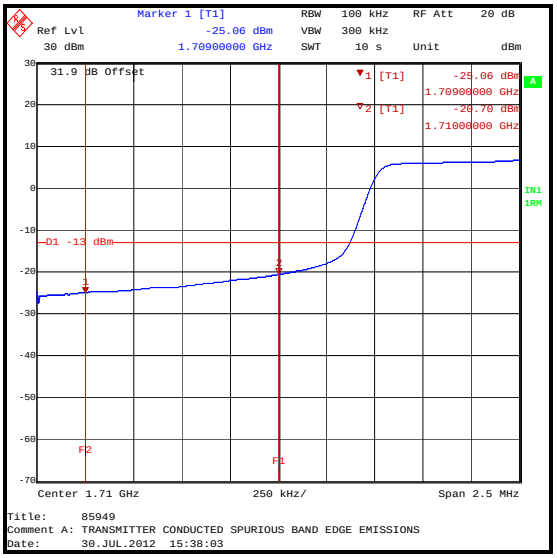
16QAM / 1 Resource Block (Block 50)

Transmitter Conducted Emissions at Band Edges (continued)

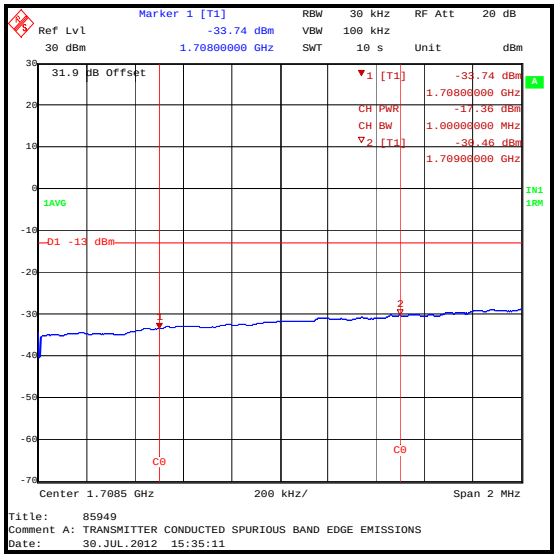
Results: 10 MHz Channel Bandwidth / Bottom Channel / 16QAM



16QAM / 50 Resource Blocks / Plot 1



16QAM / 50 Resource Blocks / Plot 2

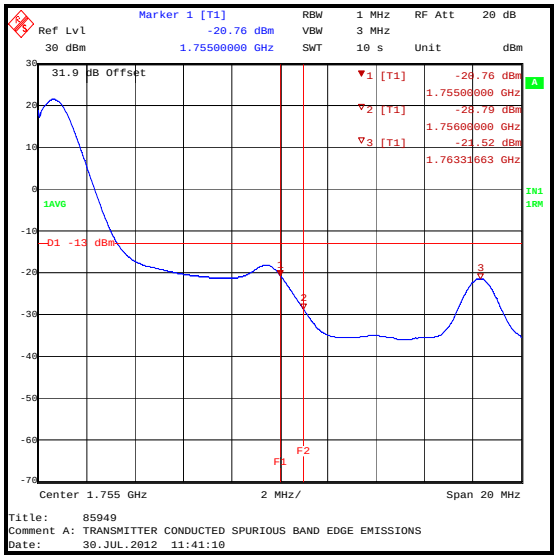


16QAM / 50 Resource Blocks / Plot 3

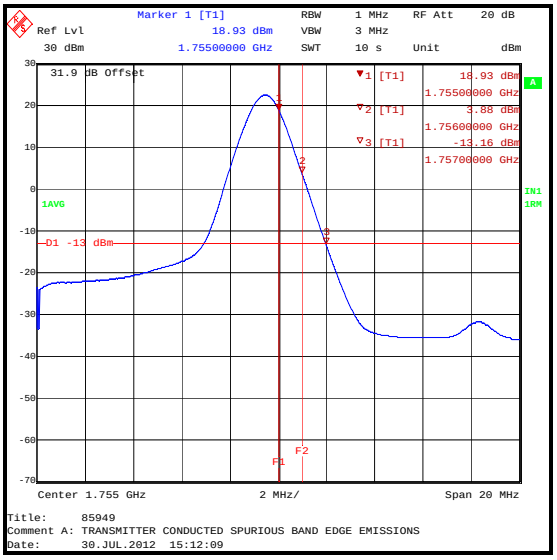
Transmitter Conducted Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Top Channel / QPSK

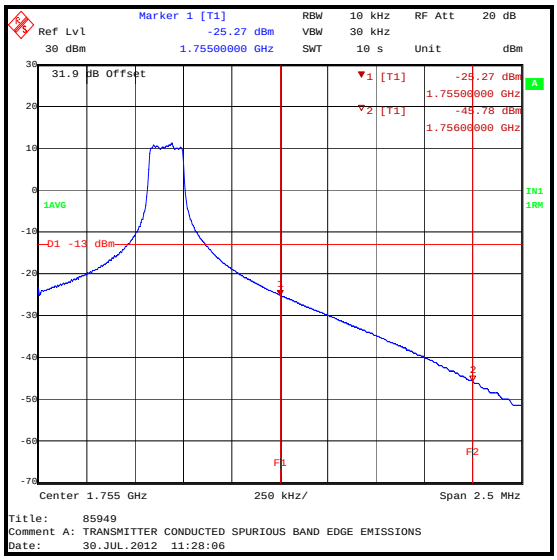
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1755	1 (1)	-20.8	-13.0	7.8	Complied
1755	1 (50)	-25.3	-13.0	12.3	Complied
1756 to 1757	1 (50)	-31.7	-13.0	18.7	Complied
1755	50	-23.1	-13.0	10.1	Complied
1756 to 1757	50	-17.5	-13.0	4.5	Complied



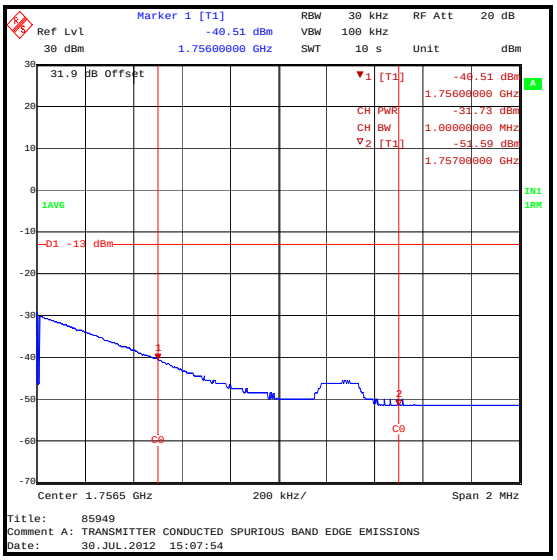
QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50) / Plot 1



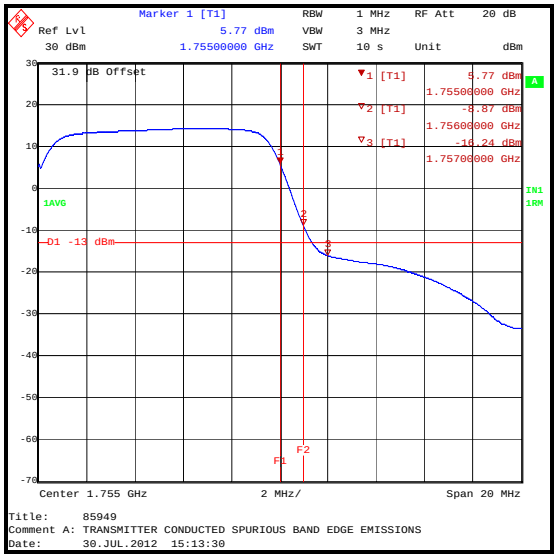
QPSK / 1 Resource Block (Block 50) / Plot 2



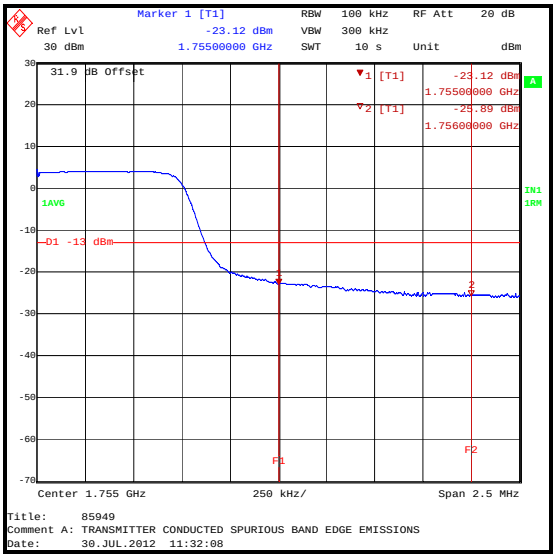
QPSK / 1 Resource Block (Block 50) / Plot 3

Transmitter Conducted Emissions at Band Edges (continued)

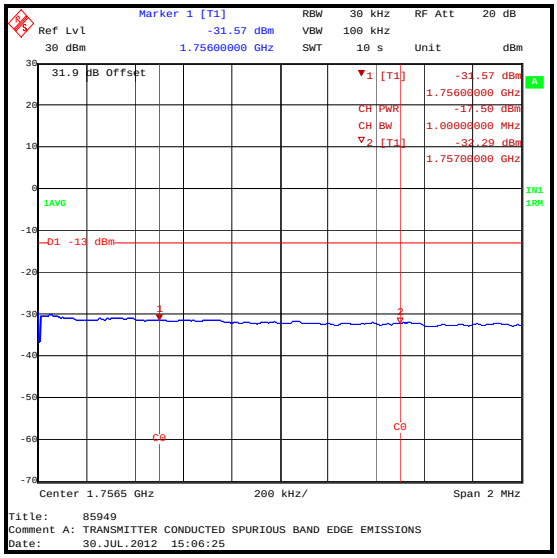
Results: 10 MHz Channel Bandwidth / Top Channel / QPSK



QPSK / 50 Resource Blocks / Plot 1



QPSK / 50 Resource Blocks / Plot 2

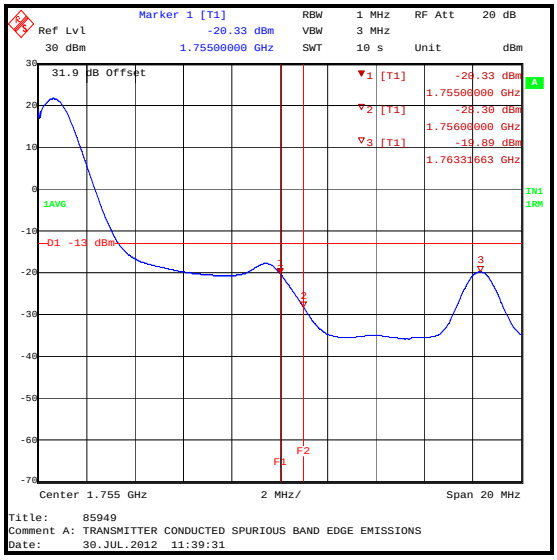


QPSK / 50 Resource Blocks / Plot 3

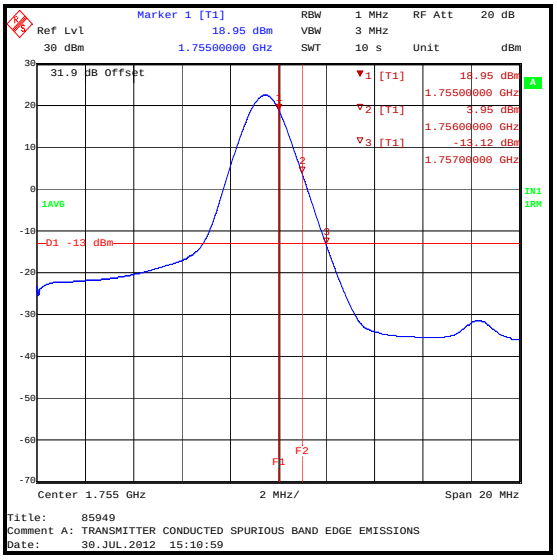
Transmitter Conducted Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Top Channel / 16QAM

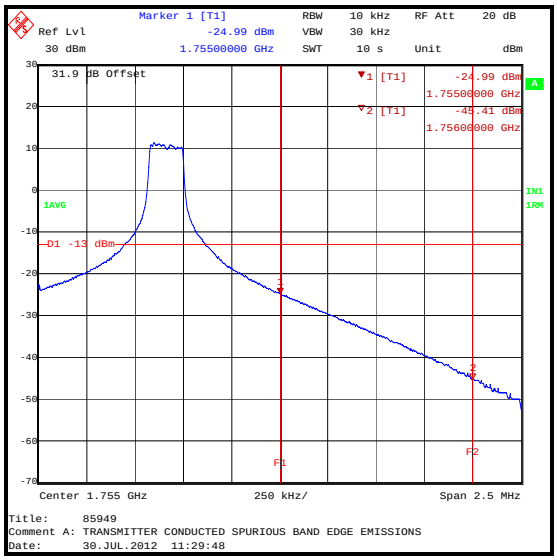
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1755	1 (1)	-20.3	-13.0	7.3	Complied
1755	1 (50)	-25.0	-13.0	12.0	Complied
1756 to 1757	1 (50)	-31.1	-13.0	18.1	Complied
1755	50	-21.9	-13.0	8.9	Complied
1756 to 1757	50	-15.7	-13.0	2.7	Complied



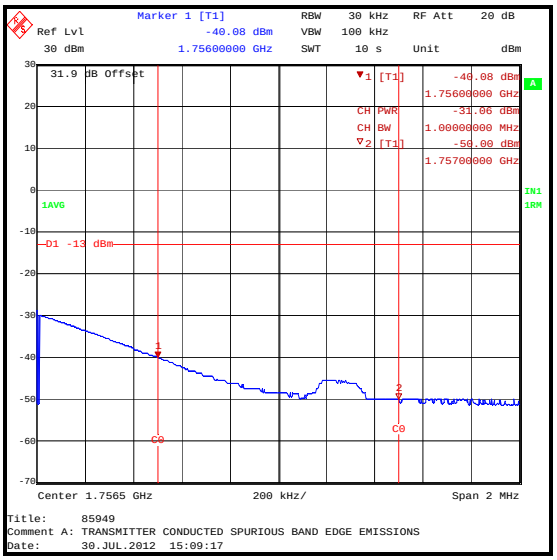
16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50) / Plot 1



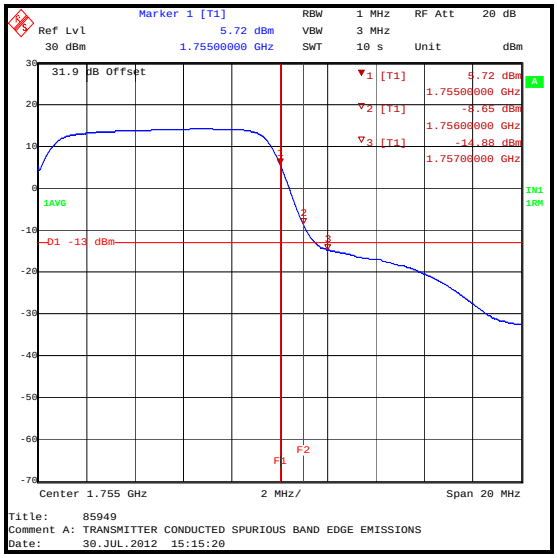
16QAM / 1 Resource Block (Block 1) / Plot 3



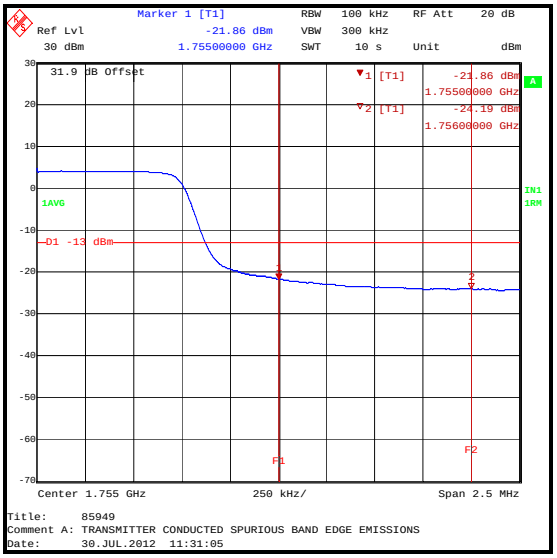
16QAM / 1 Resource Block (Block 50)

Transmitter Conducted Emissions at Band Edges (continued)

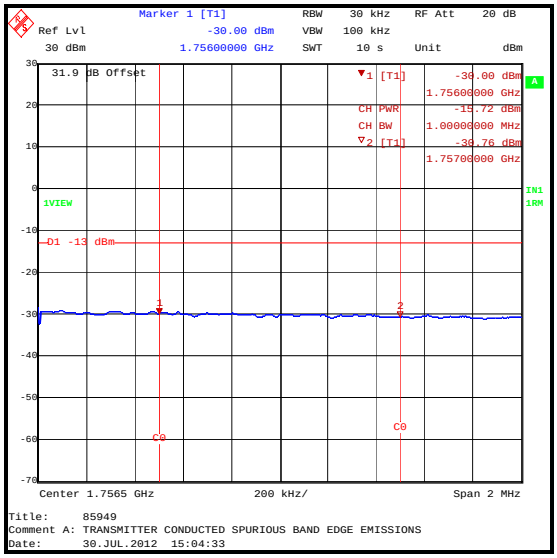
Results: 10 MHz Channel Bandwidth / Top Channel / 16QAM



16QAM / 50 Resource Blocks / Plot 1



16QAM / 50 Resource Blocks / Plot 2



16QAM / 50 Resource Blocks / Plot 3

Transmitter Conducted Emissions at Band Edges (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1368	Directional Coupler	PE2214-10	Cal Before Use	-
A1999	Attenuator	6820.17.B	04 Apr 2013	12
L1017	Test Receiver	ESIB 40	09 Nov 2012	12
M199	Power Meter	NRVS	07 Jun 2013	12
M1021	Signal Generator	1035.5005.02	09 Jan 2013	12
M1267	Thermal Power Sensor	NRV-Z52	07 Jun 2013	12

5.2.10. Transmitter Radiated Spurious Emissions

Test Summary:

Test Engineers:	Nick Steele & Andrew Edwards	**Test Dates:**	14 July 2012 & 31 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	2.1053 and 27.53(h)
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 18 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	42

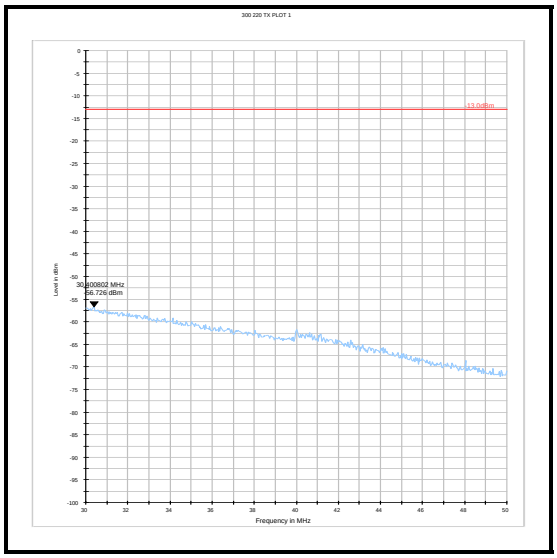
Note(s):

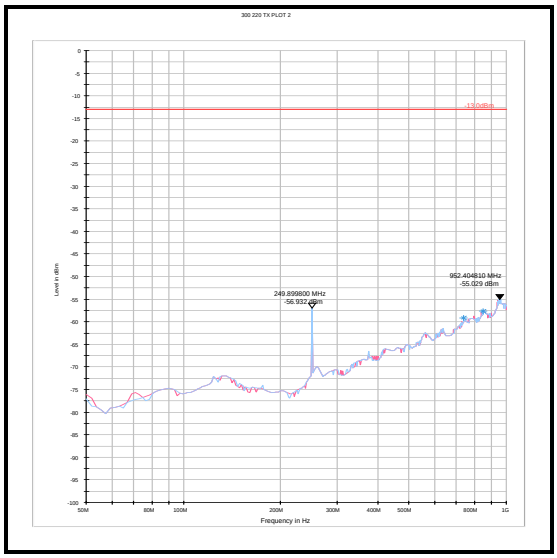
1. The EUT was set to transmit with 16QAM modulation applied with 1/50 Resource Blocks, as this was found to have the highest output power.
2. The emission seen on the 1 GHz to 3 GHz plot at approximately 1750 MHz is the EUT carrier.
3. The emission seen on the 1 GHz to 3 GHz plot at approximately 2150 MHz is the downlink from the LTE test set.
4. All other emissions were at least 20 dB below the specification limit or below the measurement system noise floor.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
6. Pre-scans above 1 GHz were performed in a fully anechoic chamber (RFI Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (RFI Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

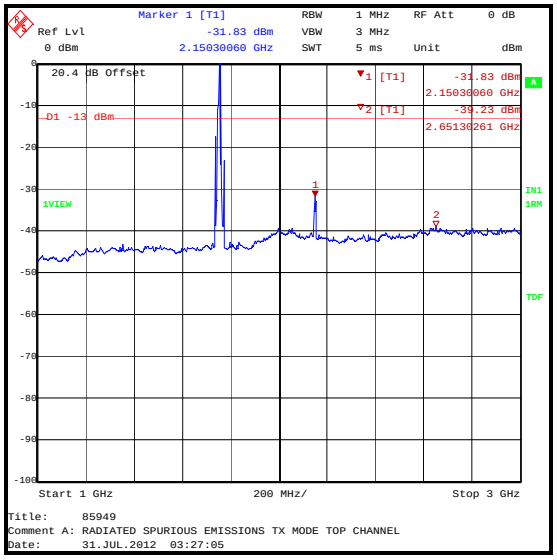
Results:

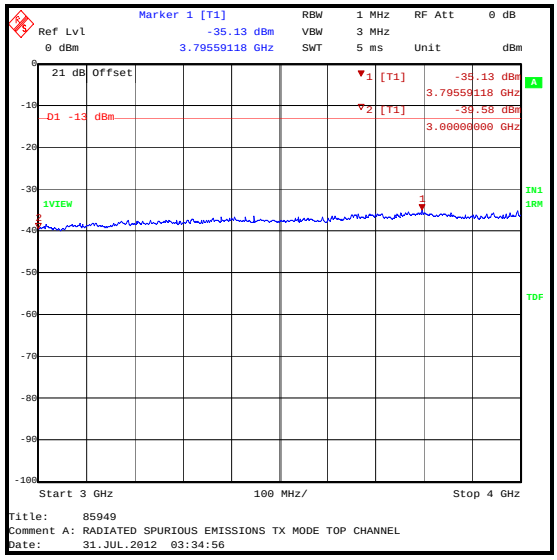
Frequency (MHz)	Antenna Polarisation	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
3795.591	Vertical	-35.1	-13.0	22.1	Complied

Transmitter Radiated Spurious Emissions (continued)

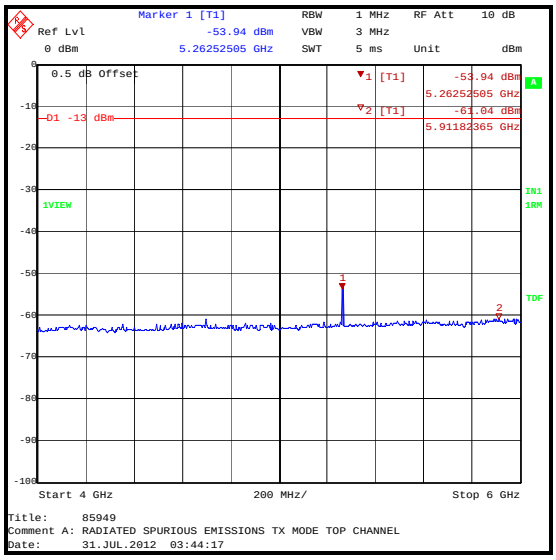


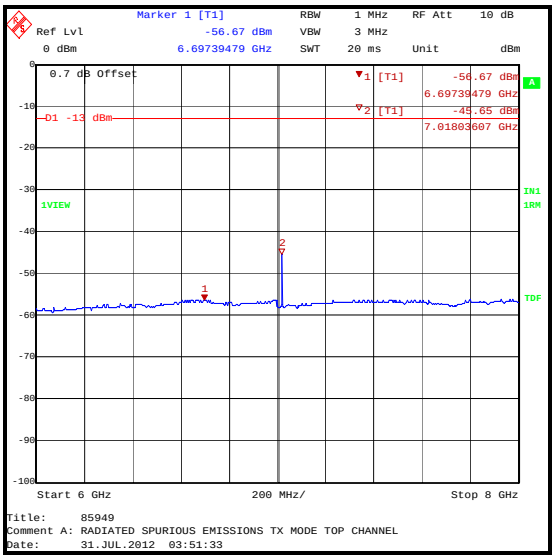


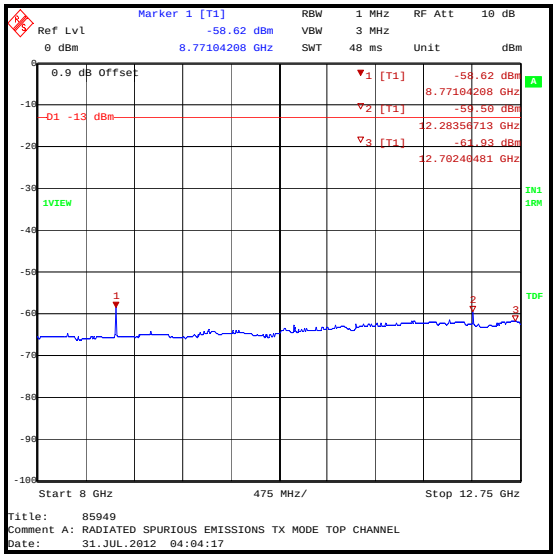


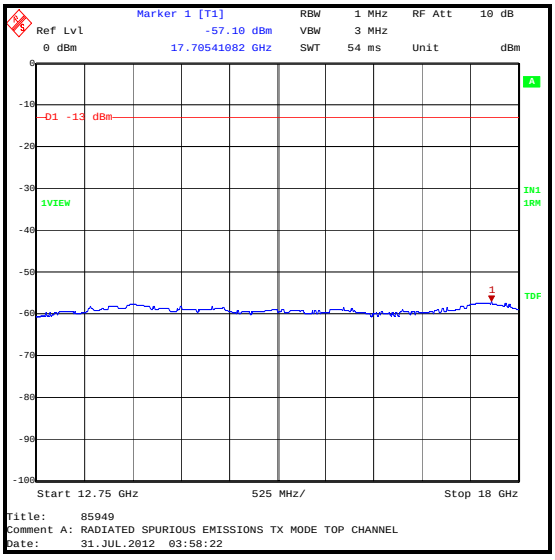


Transmitter Radiated Spurious Emissions (continued)









Transmitter Radiated Spurious Emissions (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1393	Attenuator	6820.17.B	06 Jul 2013	12
A1534	Pre Amplifier	8449B	09 Oct 2012	12
A1818	Antenna	3115	09 Oct 2012	12
A1834	Attenuator	8491B	29 Jan 2013	12
A1975	High Pass Filter	AFH-03000	15 Mar 2013	12
A253	Antenna	12240-20	09 Oct 2012	12
A254	Antenna	14240-20	09 Oct 2012	12
A255	Antenna	16240-20	09 Oct 2012	12
A256	Antenna	18240-20	09 Oct 2012	12
A553	Antenna	CBL6111A	15 Feb 2013	12
G0543	Amplifier	310N	15 Oct 2012	3
K0001	5m RSE Chamber	Rainford	31 Aug 2012	12
K0002	3m RSE Chamber	Rainford	09 Oct 2012	12
L1067	Test Receiver	ESIB 40	29 May 2013	12
M1273	Test Receiver	ESIB 26	03 Feb 2013	12

5.2.11. Transmitter Radiated Emissions at Band Edges

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	02 August 2012
Test Sample Serial Number:	AMWGB84001G12		

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

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	41

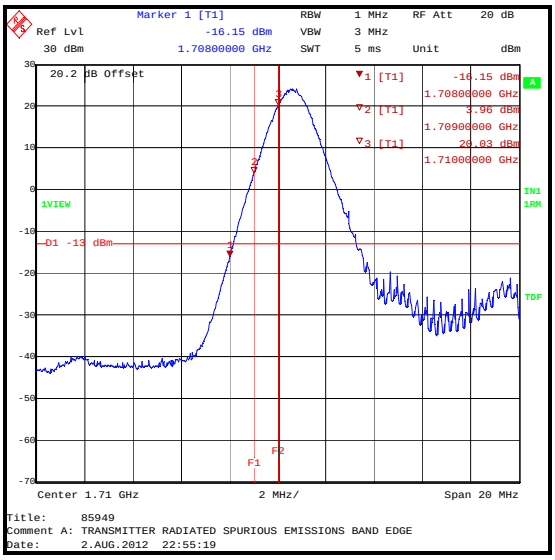
Note(s):

1. Measurements were performed with the EUT transmitting with QPSK and 16QAM modulation schemes, with Resource Blocks of 1 and 50. For single Resource Blocks, measurements were performed with the block starting of blocks 1 and 50.
2. Part 27.53(h)(1) states Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.
   - Plot 1 shows 1 MHz RBW with markers set at ± 1 MHz and ± 2 MHz from the band edge.
   - Plot 2 shows the RBW set to 1% of the occupied bandwidth for the immediate 1 MHz block outside and adjacent of the frequency block. The result for band edge has been taken from this plot.
   - Plot 3 shows ± 1 MHz to ± 2 MHz from the band edge, using the test receivers channel power function. The result from this has also been recorded in the result tables below.

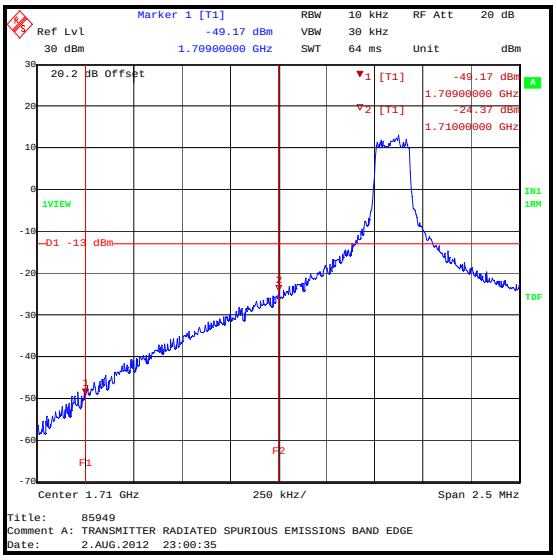
Transmitter Radiated Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel / QPSK

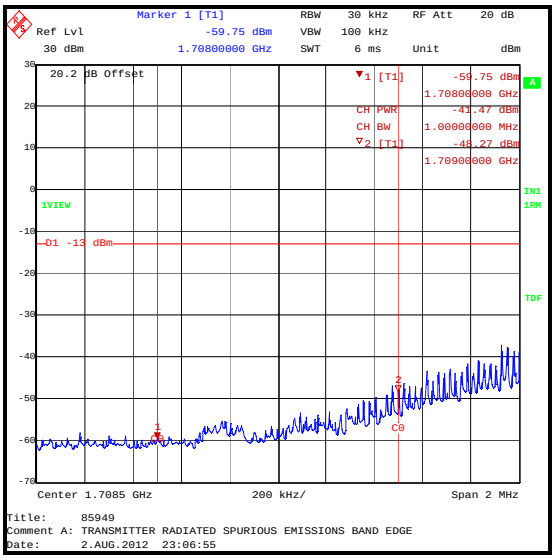
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1710	1 (1)	-24.4	-13.0	11.4	Complied
1708 to 1709	1 (1)	-41.5	-13.0	28.5	Complied
1702.004	1 (50)	-24.5	-13.0	11.5	Complied
1710	1 (50)	-30.2	-13.0	17.2	Complied
1710	50	-22.7	-13.0	9.7	Complied
1708 to 1709	50	-18.0	-13.0	5.0	Complied



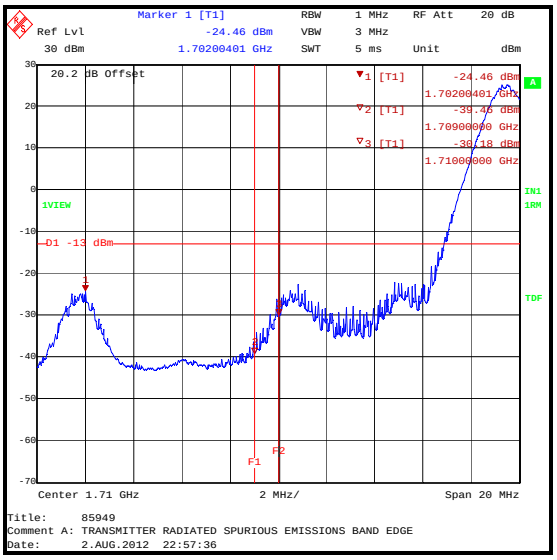
QPSK / 1 Resource Block (Block 1) / Plot 1



QPSK / 1 Resource Block (Block 1) / Plot 2



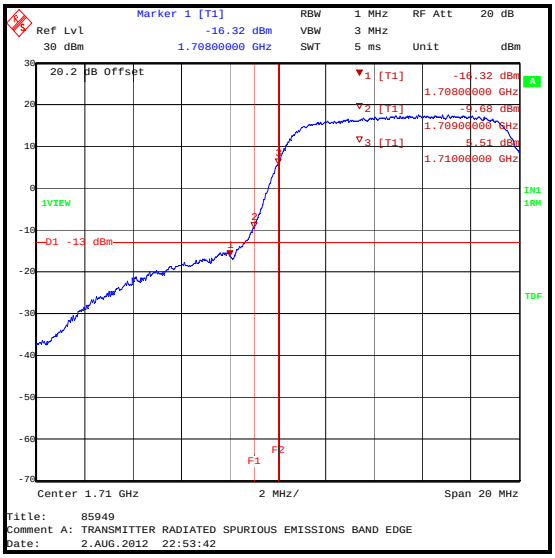
QPSK / 1 Resource Block (Block 1) / Plot 3



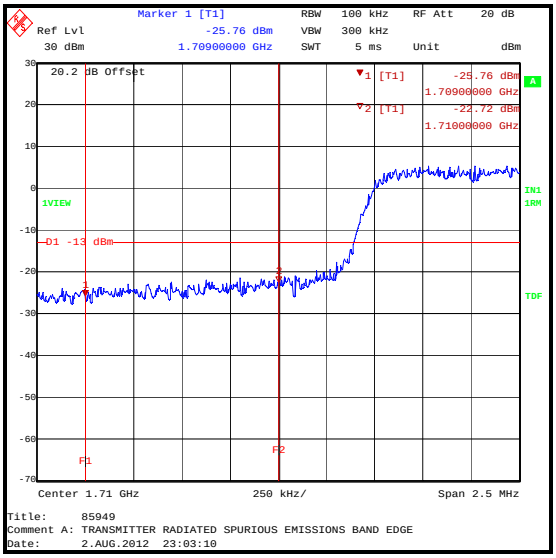
QPSK / 1 Resource Block (Block 50)

Transmitter Radiated Emissions at Band Edges (continued)

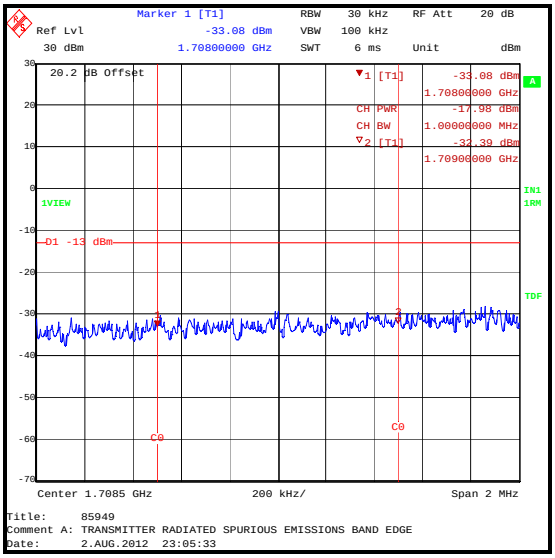
Results: 10 MHz Channel Bandwidth / Bottom Channel / QPSK



QPSK / 50 Resource Blocks / Plot 1



QPSK / 50 Resource Blocks / Plot 2

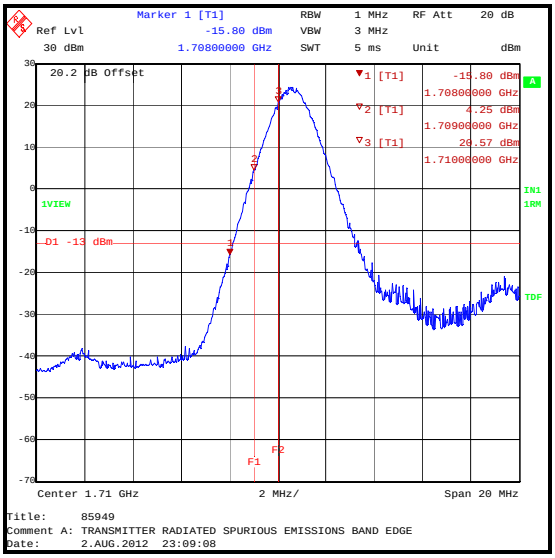


QPSK / 50 Resource Blocks / Plot 3

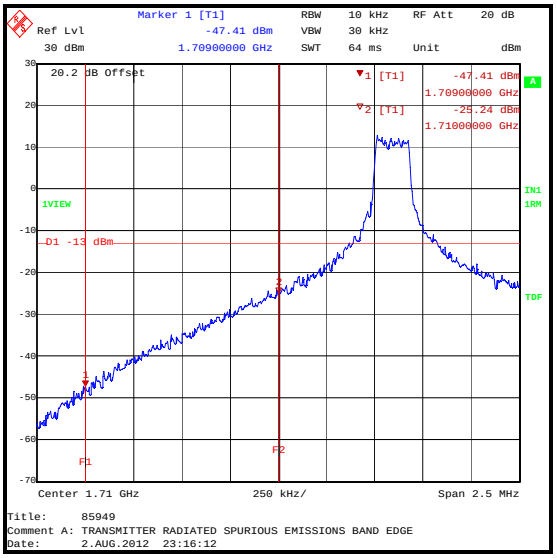
Transmitter Radiated Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Bottom Channel / 16QAM

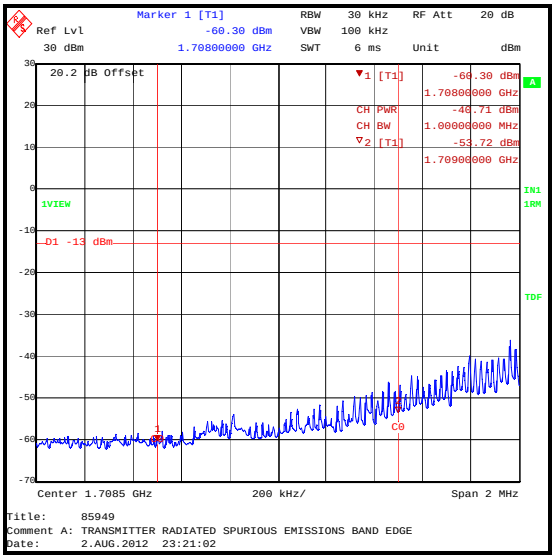
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1710	1 (1)	-25.2	-13.0	12.2	Complied
1708 to 1709	1 (1)	-40.7	-13.0	27.7	Complied
1701.563	1 (50)	-23.0	-13.0	10.0	Complied
1710	1 (50)	-28.6	-13.0	15.6	Complied
1710	50	-20.2	-13.0	7.2	Complied
1708 to 1709	50	-16.0	-13.0	3.0	Complied



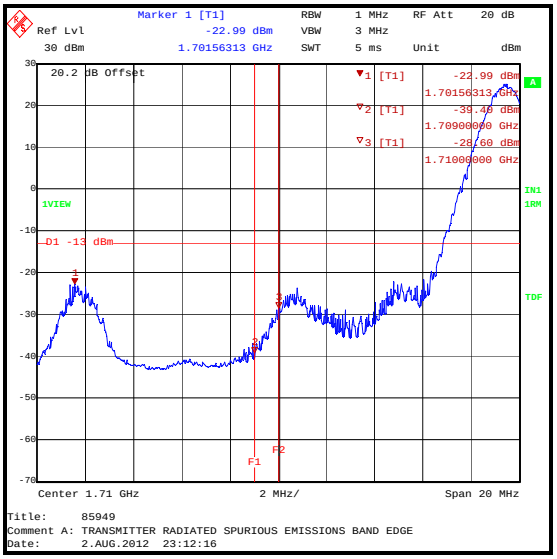
16QAM / 1 Resource Block (Block 1) / Plot 1



16QAM / 1 Resource Block (Block 1) / Plot 2



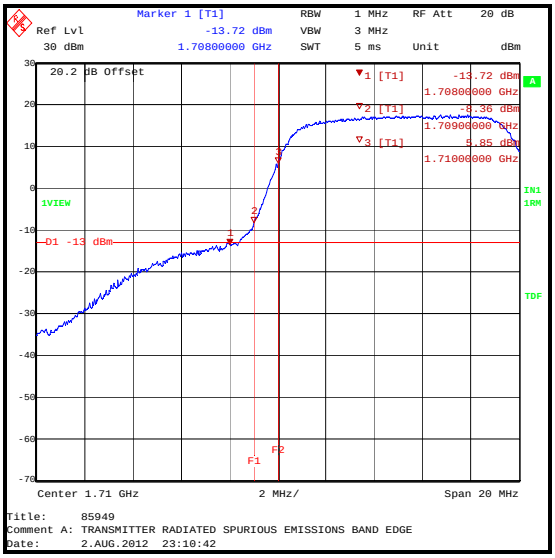
16QAM / 1 Resource Block (Block 1) / Plot 3



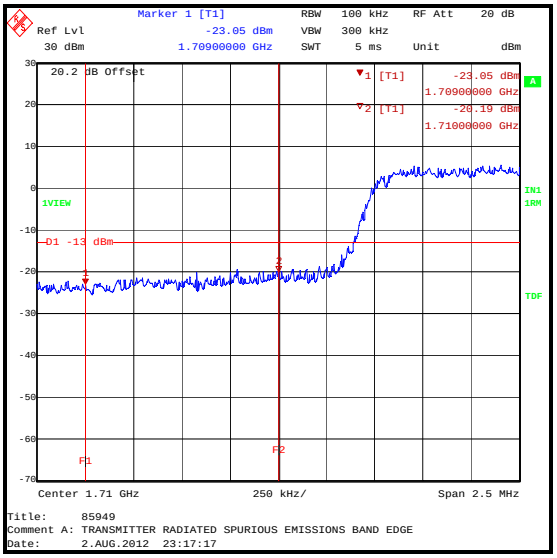
16QAM / 1 Resource Block (Block 50)

Transmitter Radiated Emissions at Band Edges (continued)

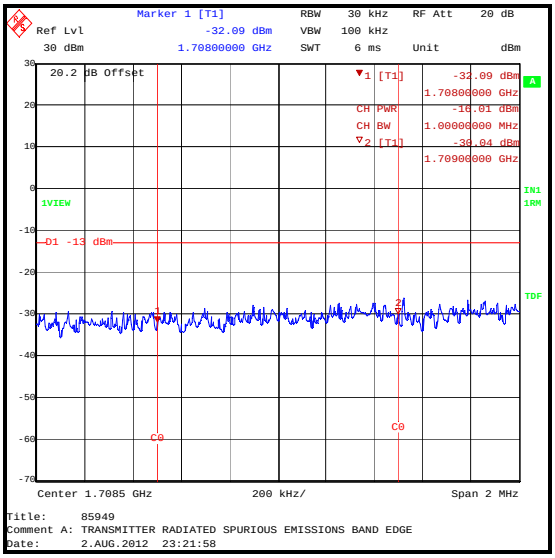
Results: 10 MHz Channel Bandwidth / Bottom Channel / 16QAM



16QAM / 50 Resource Blocks / Plot 1



16QAM / 50 Resource Blocks / Plot 2

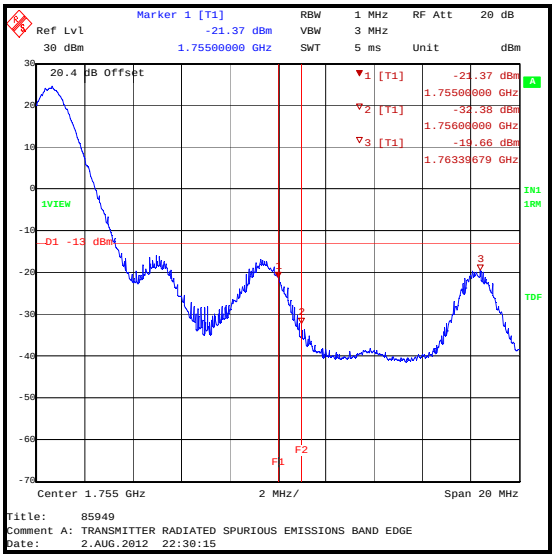


16QAM / 50 Resource Blocks / Plot 3

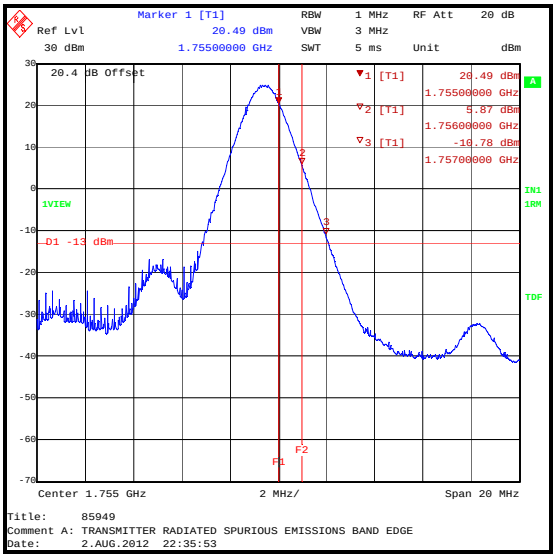
Transmitter Radiated Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Top Channel / QPSK

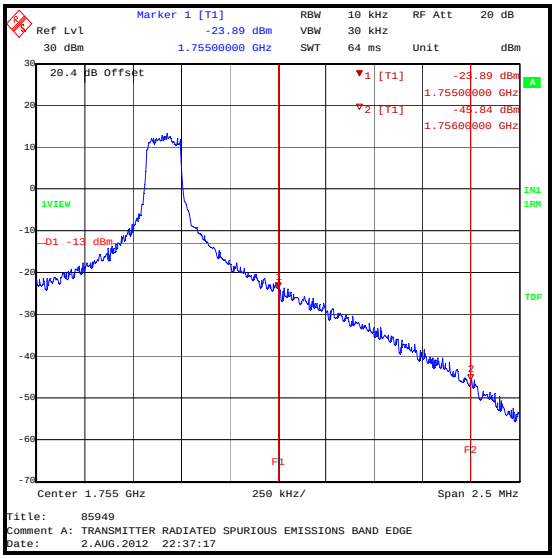
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1755	1 (1)	-21.4	-13.0	8.4	Complied
1763.397	1 (1)	-19.7	-13.0	6.7	Complied
1755	1 (50)	-23.9	-13.0	10.9	Complied
1756 to 1757	1 (50)	-37.5	-13.0	24.5	Complied
1755	50	-23.6	-13.0	10.6	Complied
1756 to 1757	50	-17.5	-13.0	4.5	Complied



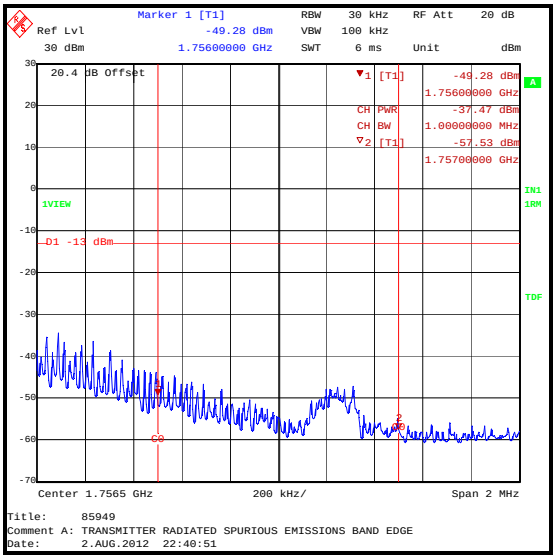
QPSK / 1 Resource Block (Block 1)



QPSK / 1 Resource Block (Block 50) / Plot 1



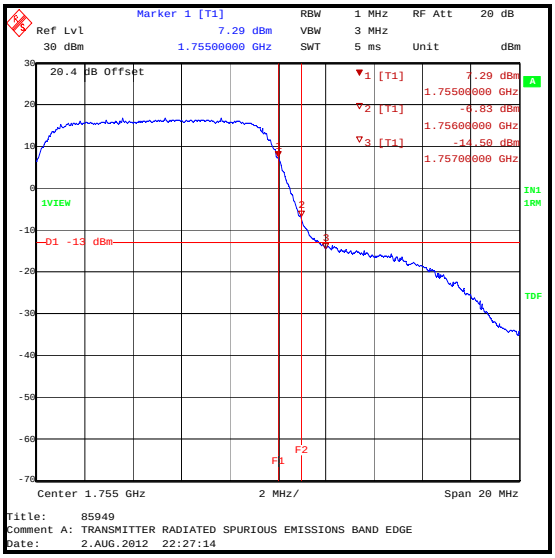
QPSK / 1 Resource Block (Block 1) / Plot 2



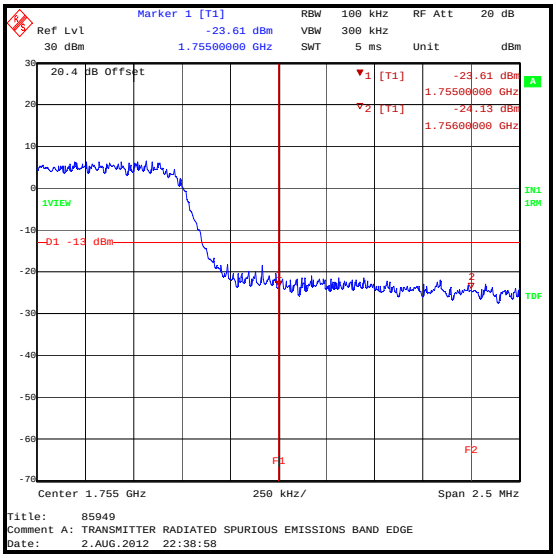
QPSK / 1 Resource Block (Block 50) / Plot 3

Transmitter Radiated Emissions at Band Edges (continued)

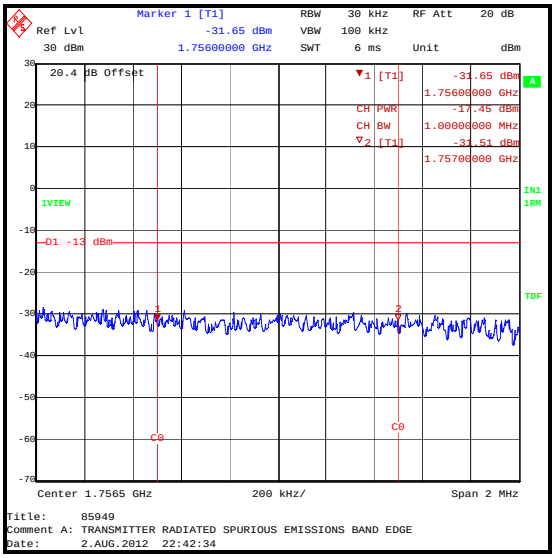
Results: 10 MHz Channel Bandwidth / Top Channel / QPSK



QPSK / 50 Resource Blocks / Plot 1



QPSK / 50 Resource Blocks / Plot 2

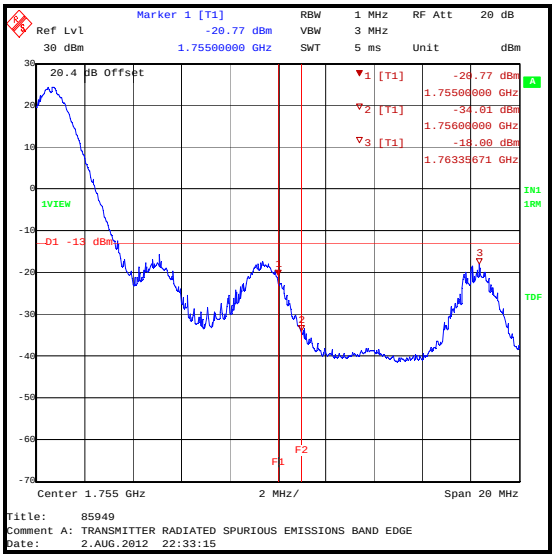


QPSK / 50 Resource Blocks / Plot 3

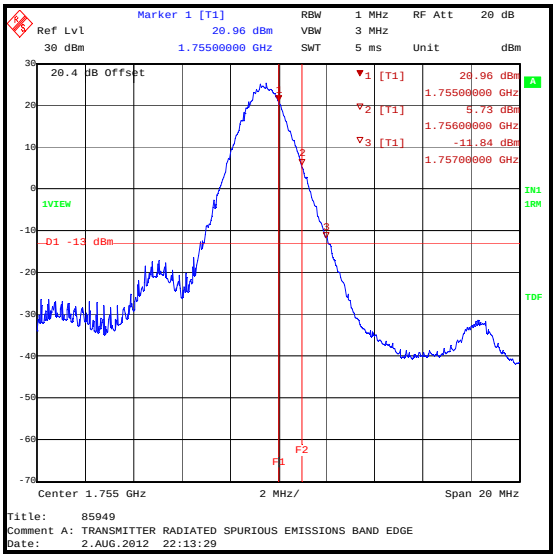
Transmitter Radiated Emissions at Band Edges (continued)

Results: 10 MHz Channel Bandwidth / Top Channel / 16QAM

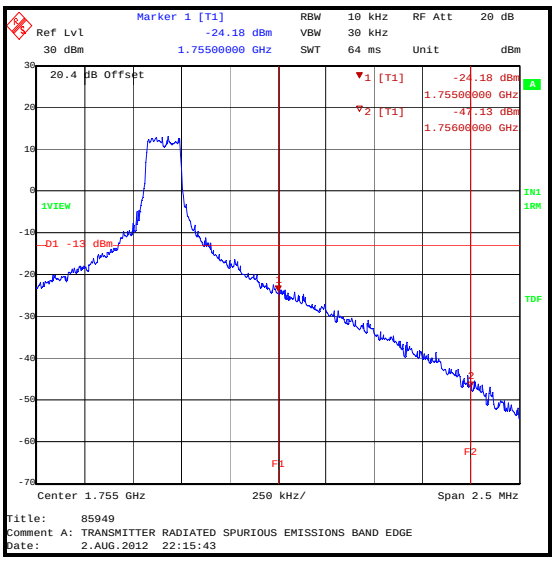
Frequency (MHz)	Resource Blocks	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
1755	1 (1)	-20.8	-13.0	7.8	Complied
1763.357	1 (1)	-18.0	-13.0	5.0	Complied
1755	1 (50)	-24.2	-13.0	11.2	Complied
1756 to 1757	1 (50)	-36.2	-13.0	23.2	Complied
1755	50	-19.7	-13.0	6.7	Complied
1756 to 1757	50	-16.2	-13.0	3.2	Complied



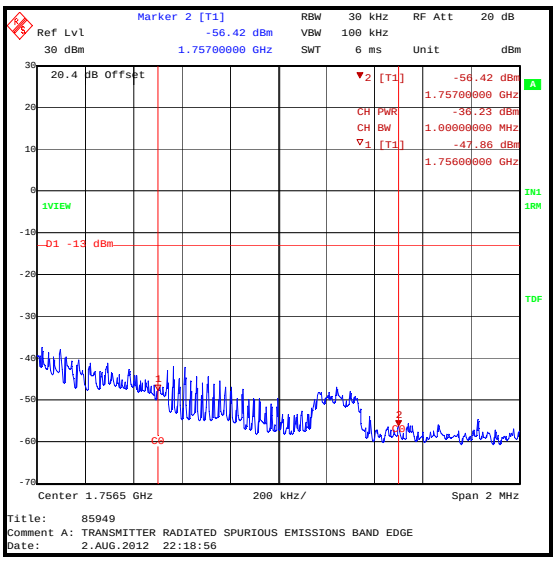
16QAM / 1 Resource Block (Block 1)



16QAM / 1 Resource Block (Block 50) / Plot 1



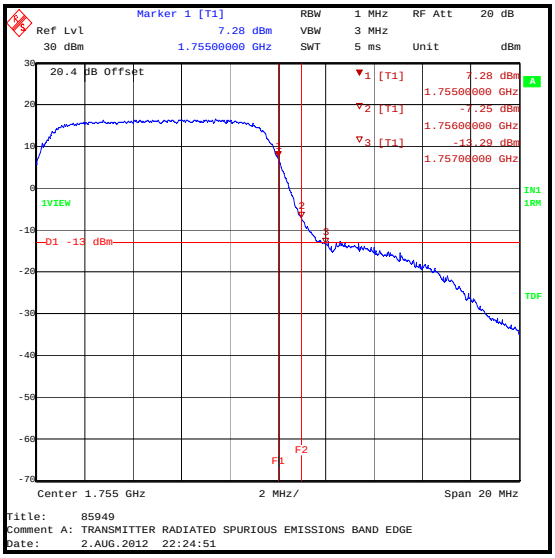
16QAM / 1 Resource Block (Block 1) / Plot 2



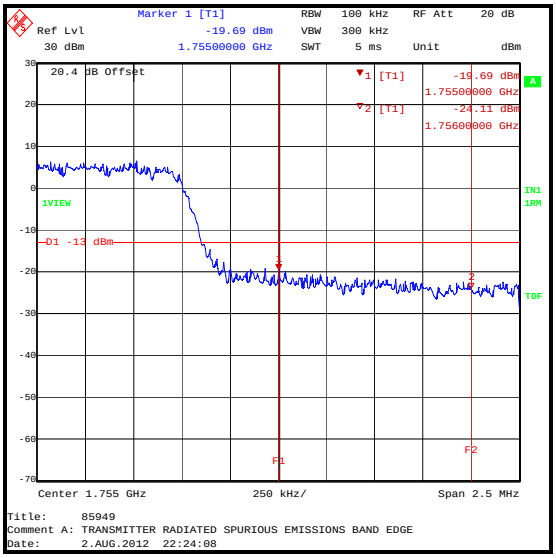
16QAM / 1 Resource Block (Block 50) / Plot 3

Transmitter Radiated Emissions at Band Edges (continued)

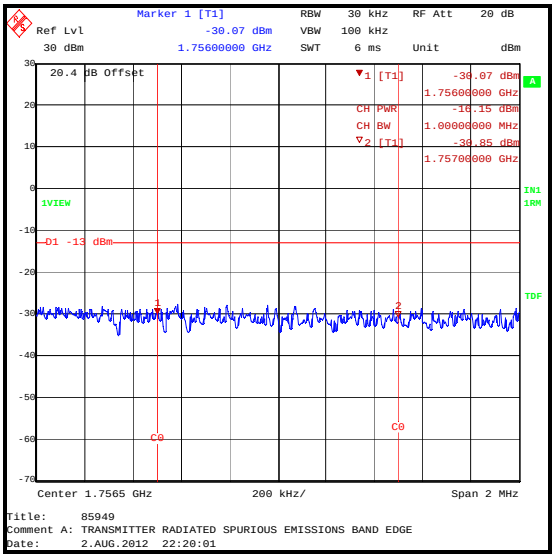
Results: 10 MHz Channel Bandwidth / Top Channel / 16QAM



16QAM / 50 Resource Blocks / Plot 1



16QAM / 50 Resource Blocks / Plot 2



16QAM / 50 Resource Blocks / Plot 3

Transmitter Radiated Emissions at Band Edges (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
A1393	Attenuator	6820.17B	06 Jul 2013	12
A1534	Pre Amplifier	8449B	09 Oct 2012	12
A1818	Antenna	3115	09 Oct 2012	12
L1067	Test Receiver	ESIB 40	29 May 2013	12
K0002	3m RSE Chamber	N/A	09 Oct 2012	12

5.2.12. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	26 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	2.1055 and 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):	25
Ambient Relative Humidity (%):	33

Note(s):

1. Temperature was monitored throughout the test with a calibrated digital thermometer.
2. Measurements were made using the Anristu MT8820C Radio Communications Analyser.
3. The transmit frequency was monitored and stayed within the frequency limits for LTE Band 4 – 1710 MHz to 1755 MHz

Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Bottom Channel

Temperature (°C)	Time after Start-up					
	0 minutes (MHz)	1 minute (MHz)	2 minutes (MHz)	3 minutes (MHz)	4 minutes (MHz)	5 minutes (MHz)
-30	1715.000015	1715.000011	1715.000008	1715.000006	1715.000005	1715.000006
-20	1714.999998	1715.000018	1715.000014	1715.000015	1715.000008	1715.000010
-10	1714.999994	1715.000016	1715.000017	1715.000021	1715.000013	1715.000006
0	1715.000020	1715.000014	1715.000012	1715.000006	1715.000001	1714.999994
10	1714.999997	1714.999999	1715.000006	1715.000009	1715.000010	1715.000007
20	1714.999998	1715.000011	1715.000010	1715.000008	1715.000008	1715.000011
30	1714.999990	1715.000001	1715.000007	1715.000012	1715.000005	1714.999998
40	1714.999991	1715.000001	1715.000007	1715.000015	1715.000012	1715.000009
50	1714.999989	1715.000018	1715.000014	1715.000013	1715.000009	1715.000006

Temperature (°C)	Time after Start-up				
	6 minutes (MHz)	7 minutes (MHz)	8 minutes (MHz)	9 minutes (MHz)	10 minutes (MHz)
-30	1715.000003	1715.000003	1715.000002	1715.000000	1715.000001
-20	1714.999998	1714.999999	1714.999997	1715.000000	1714.999999
-10	1715.000013	1715.000007	1715.000004	1715.000006	1715.000003
0	1714.999998	1715.000002	1715.000000	1714.999999	1715.000000
10	1715.000006	1715.000004	1715.000002	1715.000001	1715.000001
20	1715.000000	1714.999997	1714.999998	1715.000002	1715.000001
30	1715.000003	1714.999998	1715.000001	1715.000000	1715.000000
40	1715.000003	1714.999999	1715.000000	1715.000001	1715.000000
50	1715.000008	1715.000004	1715.000000	1715.000002	1715.000000

Frequency closest to Lower Band Edge (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
1714.999989	1710.0	4.999989	Complied

Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Top Channel

Temperature (°C)	Time after Start-up					
	0 minutes (MHz)	1 minute (MHz)	2 minutes (MHz)	3 minutes (MHz)	4 minutes (MHz)	5 minutes (MHz)
-30	1749.999995	1749.999987	1749.999991	1749.999997	1749.999998	1750.500005
-20	1749.999989	1749.999996	1750.000000	1750.500007	1750.500009	1750.500006
-10	1749.999983	1749.999989	1750.500012	1750.500011	1750.500015	1750.500016
0	1749.999998	1750.500013	1750.500010	1750.500008	1750.500012	1750.500006
10	1750.500014	1750.500016	1750.500016	1750.500012	1750.500007	1750.500009
20	1750.500010	1750.500014	1750.500011	1750.500007	1750.500005	1749.999998
30	1749.999989	1749.999993	1750.500005	1750.500008	1750.500015	1750.500010
40	1749.999995	1749.999998	1750.500007	1750.500012	1750.500010	1750.500007
50	1749.999987	1749.999998	1749.999994	1750.000006	1750.000009	1750.000009

Temperature (°C)	Time after Start-up				
	6 minutes (MHz)	7 minutes (MHz)	8 minutes (MHz)	9 minutes (MHz)	10 minutes (MHz)
-30	1750.500003	1750.500002	1750.999999	1750.500001	1750.500000
-20	1750.500002	1750.500000	1750.500001	1750.500000	1749.999998
-10	1750.500005	1750.500005	1750.500003	1749.999997	1749.999999
0	1750.500002	1749.999998	1749.999999	1750.500000	1750.500000
10	1750.500007	1750.500005	1750.500002	1750.500000	1750.499998
20	1749.999994	1749.999987	1749.999994	1749.999998	1749.999999
30	1750.500008	1749.999996	1749.999999	1750.500001	1750.000000
40	1750.500004	1750.500001	1750.500000	1750.500001	1750.000001
50	1750.000005	1750.000004	1750.000002	1750.000002	1750.000001

Frequency closest to Upper Band Edge(MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
1750.500016	1755.0	4.499984	Complied

Transmitter Frequency Stability (Temperature Variation) (continued)

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
E013	Environmental Chamber	MTH-4200PR	10 Aug 2012	12
L1068	LTE Test Set	MT8820A	15 May 2013	12
M1068	Thermometer	RS55	08 Mar 2013	12
M1229	Digital Multimeter	179	18 Jun 2013	12
S0537	DC Power Supply Unit	EL302D	Cal Before Use	-

5.2.13. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	26 July 2012
Test Sample Serial Number:	AMWGB84001G12		

FCC Part:	2.1055 and 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):	25
Ambient Relative Humidity (%):	33

Note(s):

1. Voltage was monitored throughout the test with a calibrated digital voltmeter.
2. Measurements were made using the Anristu MT8820C Radio Communications Analyser.
3. The transmit frequency was monitored and stayed within the frequency limits for LTE Band 4 – 1710 MHz to 1755 MHz

Results: Bottom Channel

Supply Voltage (VDC)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.0	1715.000006	1710.0	5.000006	Complied
3.6	1715.000005	1710.0	5.000005	Complied

Results: Top Channel

Supply Voltage (VDC)	Measured Frequency (MHz)	Lower Band Edge Limit (MHz)	Margin (MHz)	Result
3.0	1750.500009	1755.0	4.499991	Complied
3.6	1750.500006	1755.0	4.499994	Complied

Test Equipment Used:

RFI ID	Instrument Description	Model Number	Calibration Due	Calibration Interval (Months)
L1068	LTE Test Set	MT8820A	15 May 2013	12
M1229	Digital Multimeter	179	18 Jun 2013	12
S0537	DC Power Supply Unit	EL302D	Cal Before Use	-

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.25 dB
Occupied Bandwidth	1710 MHz to 1755 MHz	95%	±0.92 ppm
Conducted Carrier Output Power	1710 MHz to 1755 MHz	95%	±0.27 dB
Conducted Spurious Emissions	9 kHz to 18 GHz	95%	±2.64 dB
Radiated Spurious Emissions	30 MHz to 18 GHz	95%	±2.94 dB
Frequency Stability	1710 MHz to 1755 MHz	95%	±0.92 ppm

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	**Clause**	**Details**
1.0	-	-	Initial Version
2.0	8	3.4	Remove Antenna Type
2.0	8 & 10	3.4 & 4.2	Update Antenna Gain from 0 dBi to 6.6 dBi
2.0	26 to 32	5.2.5	Update Antenna Gain from 0 dBi to 6.6 dBi and recalculate EIRP – change EIRP limit from 44.8 dBm to 30 dBm
3.0	76	-	Corrected calibration date of L1067 in test equipment list
4.0	8, 10, 26 to 32	3.4, 4.2 & 5.2.5	Update Antenna Gain detail and recalculate EIRP