TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: TD-CDMA PCI-E Mini Module, Model: AAU

To: FCC Part 27: 2008 Subpart C

Test Report Serial No:
RFI/RPT2/RP75541JD01A

Supersedes Test Report Serial No:
RFI/RPT1/RP75541JD01A

This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director: 	
Checked By:	Nigel Davison
Signature: 	
Date of Issue:	28 August 2009

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1. Customer Information

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

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR27
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 27 Subpart C (Miscellaneous Wireless Communication Services)
Site Registration:	FCC: 209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	03 August 2009 to 11 August 2009

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Port Type	Result
FCC Part 15.109	Receive/Idle Mode Spurious Emissions	Antenna Terminals	✓
FCC Part 2.1051	Receive/Idle Mode Conducted Spurious Emissions Main RF Port	Antenna Terminals	✓
FCC Part 2.1051	Receive/Idle Mode Conducted Spurious Emissions Diversity RF Port	Antenna Terminals	✓
FCC Part 2.1046, FCC Part 27.50	Transmitter Conducted Carrier Output Power	Antenna Terminals	✓
FCC Part 27.54	Frequency Stability (Temperature Variation)	Antenna Terminals	✓
FCC Part 27.54	Frequency Stability (Voltage Variation)	Antenna Terminals	✓
FCC Part 2.1049	Occupied Bandwidth	Antenna Terminals	✓
FCC Part 2.1051, FCC Part 27.53	Conducted Emissions	Antenna Terminals	✓
FCC Part 2.1051, FCC Part 27.53	Radiated Spurious Emissions	Enclosure	✓

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 (2003)
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

Testing at voltage extremes was carried out at V_{nom} and V_{nom} ±9% at the request of the customer and not Vnom and Vnom ±15% as required by the Standard. This is because the EUT complies with the PCI Express Standard which specifies the ±9% tolerance. A breakout point for the power supply was provided by the customer on adapter board (Serial No. EEMS 022630 0004) in order to vary the supply to the EUT as this is normally provided from the PCI Express interface on the standard adapter board (Serial No. AAFK85100G240).

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Description:	TD-CDMA PCI-E Mini Module
Brand Name:	IPWireless
Model Name or Number:	AAU
Serial Number:	AAUA930000D37
IMEI Number:	357163020001207
Hardware Version Number:	Version 1
Software Version Number:	None Stated
FCC ID Number:	PKTPEMAAU1

3.2. Description of EUT

The equipment under test was a PCI-E mini-module.

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:	3.3 V DC ± 9%		
Equipment Category:	Module		
Type of Unit:	PCI Express mini module		
Chip Rate:	7.68 Mcps		
Declared Channel Bandwidth:	11 MHz		
Duty Cycle:	80%		
Highest generated frequency:	3.6 GHz		
Antenna Gain:	+9 dBi (stated)		
Transmit Frequency Range:	2496 MHz to 2690 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	12507	2501.4
	Middle	12965	2593.0
	Top	13420	2684.6
Receive Frequency Range:	2496 MHz to 2690 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	12507	2501.4
	Middle	12965	2593.0
	Top	13420	2684.6

3.5. Support Equipment

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

Description:	Adaptor board
Brand Name:	IPWireless
Model Name or Number:	AAF
Serial Number:	AAFK85100G240

Description:	Adaptor board
Brand Name:	IPWireless
Model Name or Number:	AAF
Serial Number:	EEMS 022630 0004

Description:	Laptop PC
Brand Name:	Toshiba
Model Name or Number:	PSAAPE-00H00KEN
Serial Number:	670709710
Cable Length and Type:	1.5 metres / USB
Connected to Port:	USB

Description:	USB cable
Cable Length and Type:	1.8 metre / multi core
Connected to Port:	USB

Description:	Bench power supply
Brand Name:	TTI
Model Name or Number:	CPX200
Serial Number:	163296
Cable Length and Type:	3 metres / 2 core
Connected to Port:	Power

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- The EUT operates across the FCC Part 27 band from 2496 MHz to 2690 MHz.
- TD-CDMA idle mode on all 15 timeslots. Both RF ports terminated with antennas and RF cables supplied by the customer.
- TD-CDMA traffic mode on all 15 timeslots at full power (+24dBm). Both RF ports terminated with antennas supplied by the customer.
- For radiated emissions testing, the EUT was mounted in and powered by the adapter board, the adapter board was powered from a bench supply at a nominal voltage of 12VDC and the adaptor board voltage regulator reduces this to 3.3 volts which is the normal supply voltage to the EUT.
- No AC conducted tests were performed as the EUT is a DC powered module.
- The Customer configured the EUT so that residual carrier breakthrough was present at the centre of the carrier in order to make frequency measurements.

4.2. Configuration and Peripherals

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

- The EUT was mounted on an adaptor board and all the testing was performed in this configuration.
- The adaptor board was powered from a bench power supply supplied by the Customer
- Connected to a laptop PC via the USB or Ethernet port on the adaptor board. A bespoke application on the laptop PC was used to configure the EUT during the testing via the adaptor board.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

5.2. Test Results

5.2.1. Receive/Idle Mode Radiated Emissions

Test Summary:

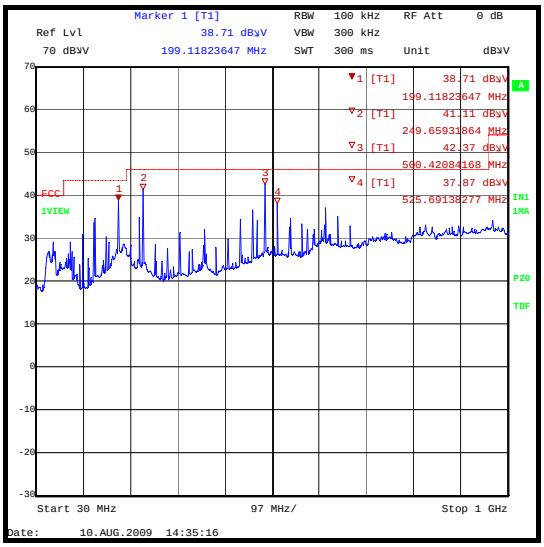
FCC Part:	FCC Part 15.109
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	30 MHz to 1 GHz

Environmental Conditions:

Temperature Range (°C):	27
Relative Humidity Range (%):	34

Results: TD-CDMA

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
199.988115	Horizontal	39.0	43.5	4.5	Complied
249.995310	Horizontal	43.2	46.0	2.8	Complied
500.008193	Vertical	42.0	46.0	4.0	Complied
525.025955	Vertical	38.2	46.0	7.8	Complied
625.025607	Vertical	38.7	46.0	7.3	Complied



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

Receive/Idle Mode Radiated Emissions

Test Summary:

FCC Part:	FCC Part 15.109
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	1 GHz to 26.5 GHz

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	34

Results: TD-CDMA Highest Peak Level

Frequency (GHz)	Antenna Polarity	Detector level (dBμV)	Antenna factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
17.705	Vertical	40.0	16.6	56.6	74.0	17.4	Complied

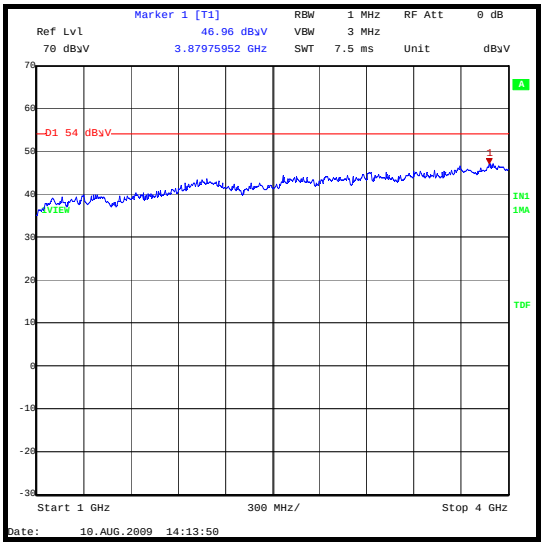
Results: TD-CDMA Highest Average Level

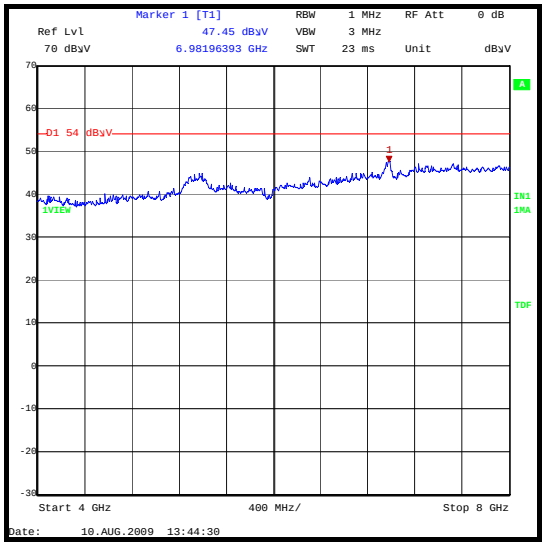
Frequency (GHz)	Antenna Polarity	Detector level (dBμV)	Antenna factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
17.790	Vertical	28.8	17.1	45.9	54.0	8.1	Complied

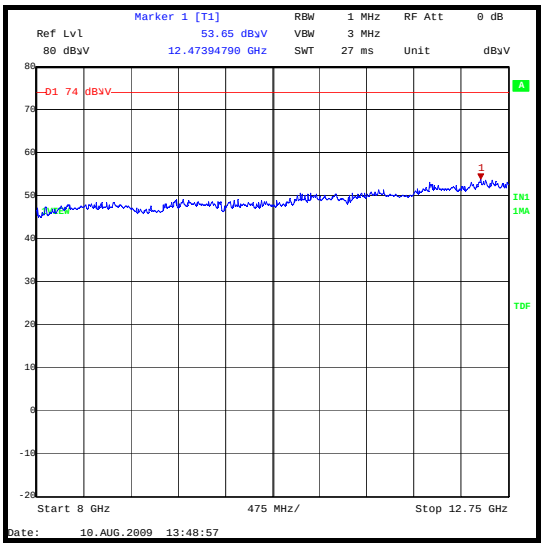
Note(s):

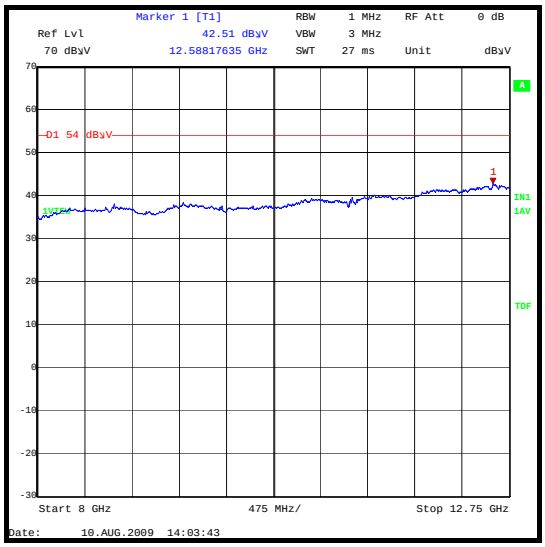
1. All pre-scans were performed with a peak detector against average limits apart from measurements made in the range of 8 to 18 GHz where pre-scans were performed with peak and average detectors and the applicable limit applied. This was due to the noise floor exceeding the average limit when using a peak detector.
2. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak and average noise floor reading of the measuring receiver was recorded as shown in the table above.

Receive/Idle Mode Radiated Emissions (continued)



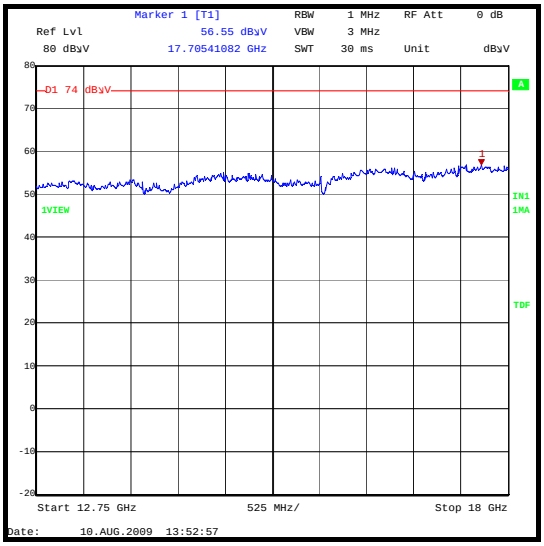


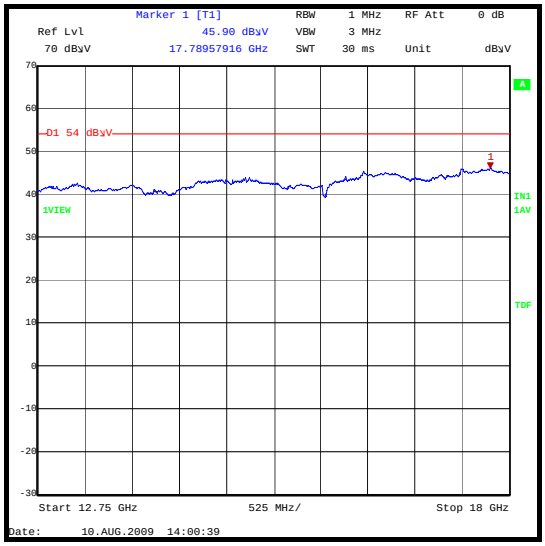


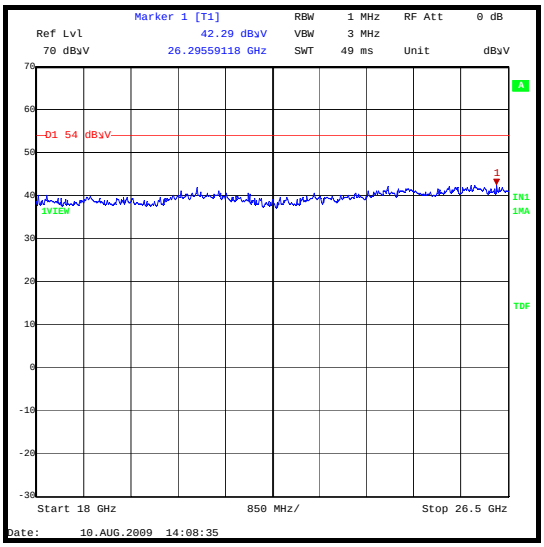


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Receive/Idle Mode Radiated Emissions (continued)







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

5.2.2. Receive/Idle Mode Conducted Emissions

Test Summary:

FCC Part:	FCC Part 2.1051
Test Method Used:	As detailed in ANSI TIA-603-C-2004
Frequency Range:	9 kHz to 26.5 GHz

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	34

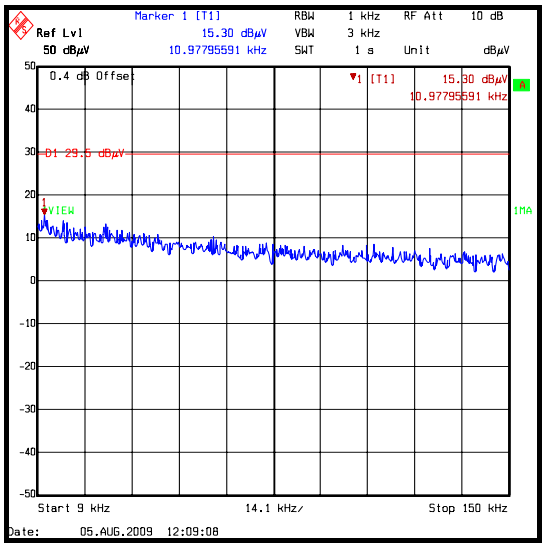
Results: Main RF Port

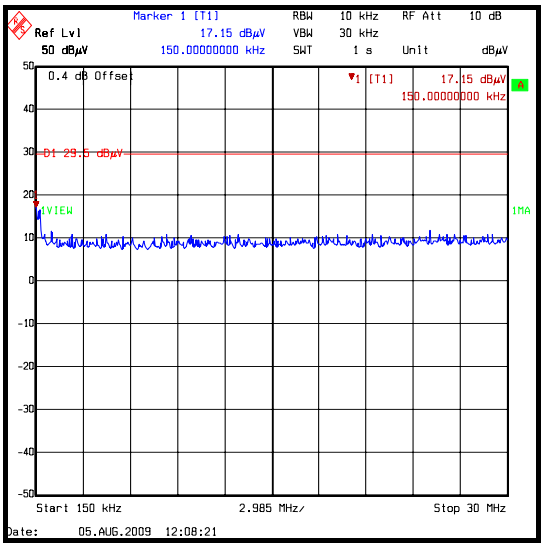
Frequency (GHz)	Actual Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
26.208	43.8	54.0	10.2	Complied

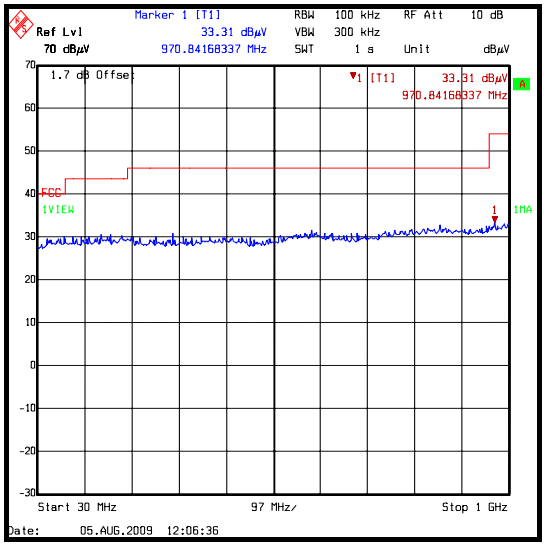
Note(s):

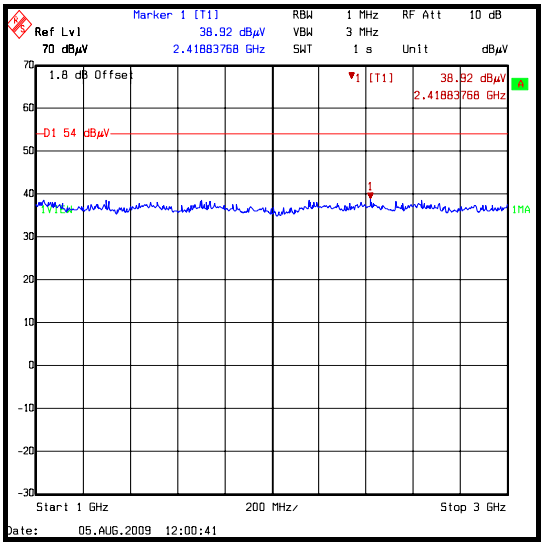
1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

Receive/Idle Mode Conducted Emissions (continued)









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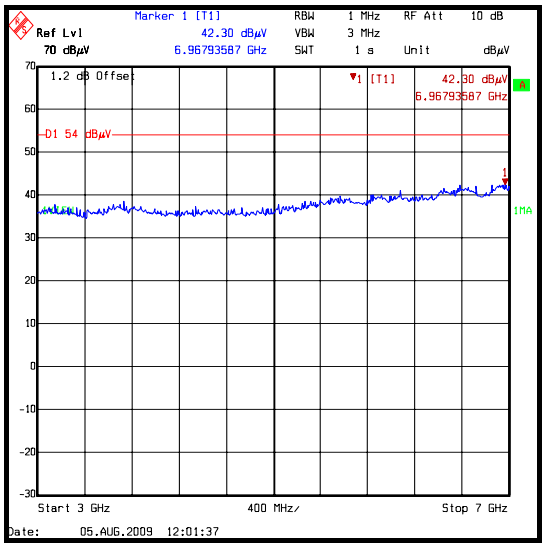
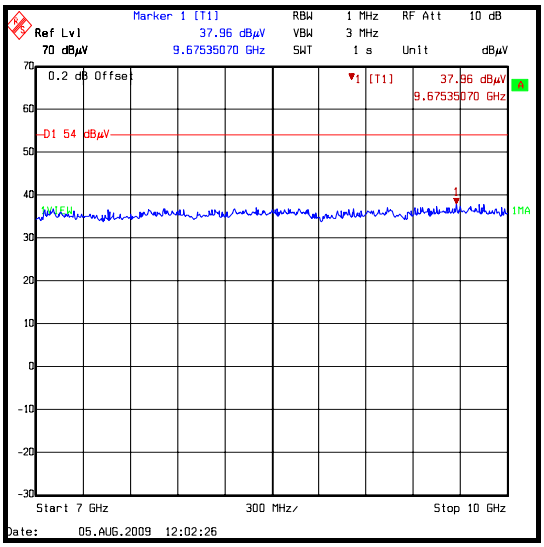
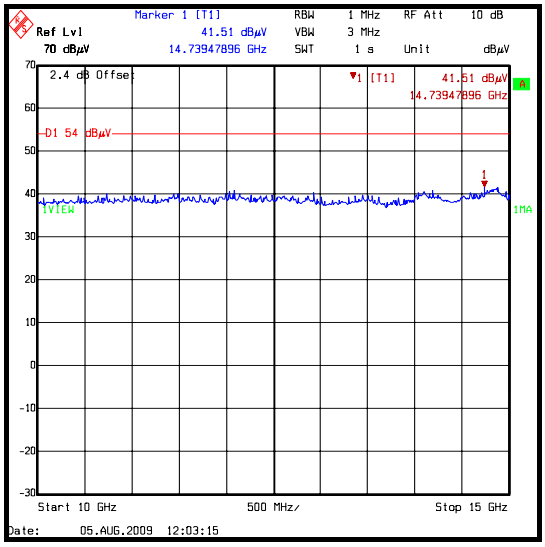
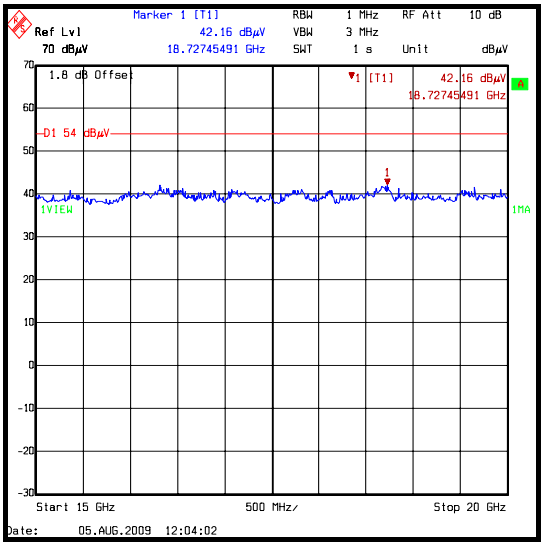
Receive/Idle Mode Conducted Emissions (continued)









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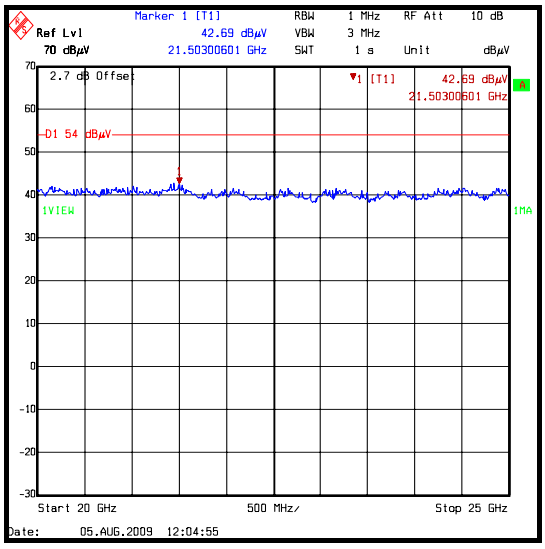
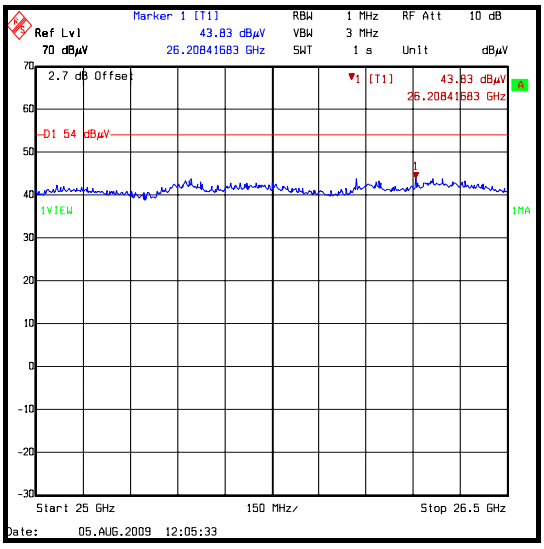
Receive/Idle Mode Conducted Emissions (continued)





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

5.2.3. Receive/Idle Mode Conducted Emissions

Test Summary:

FCC Part:	FCC Part 2.1051
Test Method Used:	As detailed in ANSI TIA-603-C-2004
Frequency Range:	9 kHz to 26.5 GHz

Environmental Conditions:

Temperature (°C):	19
Relative Humidity (%):	49

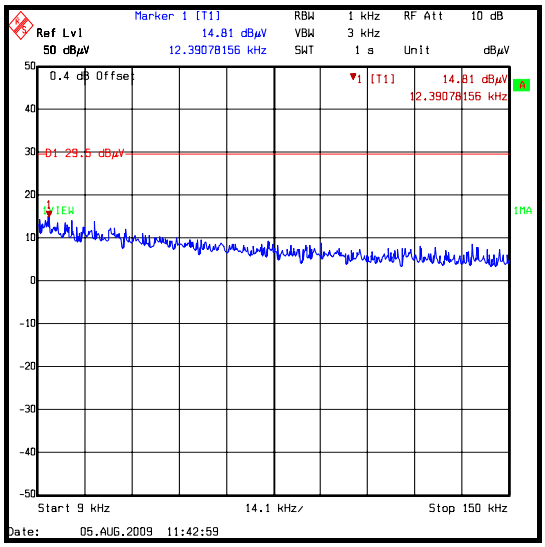
Results: Diversity RF Port

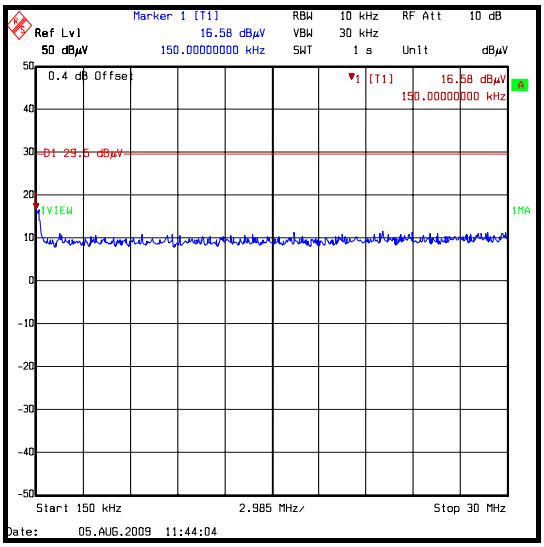
Frequency (GHz)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
25.490	43.7	54.0	10.3	Complied

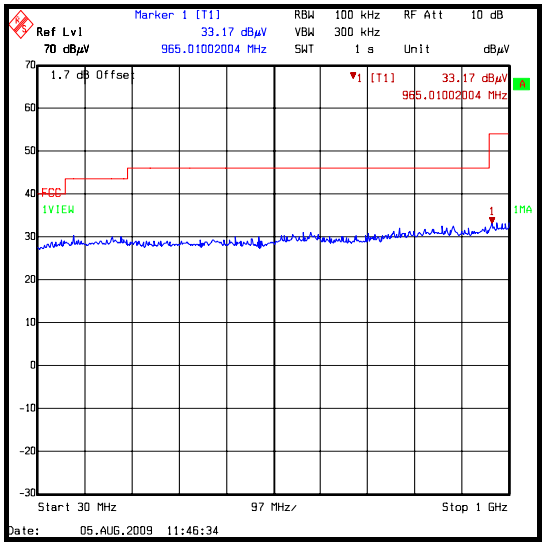
Note(s):

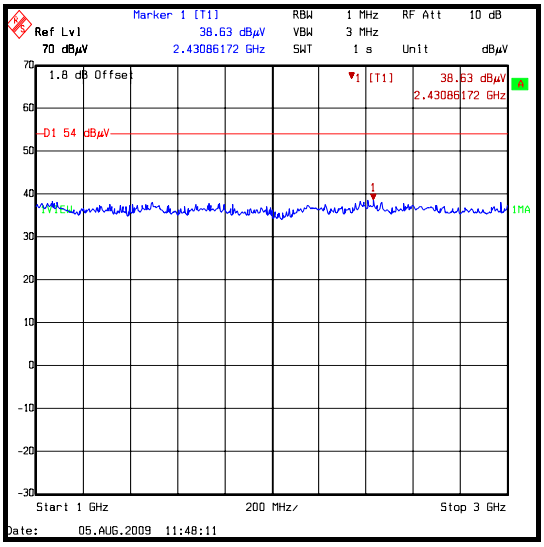
1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

Receive/Idle Mode Conducted Emissions (continued)



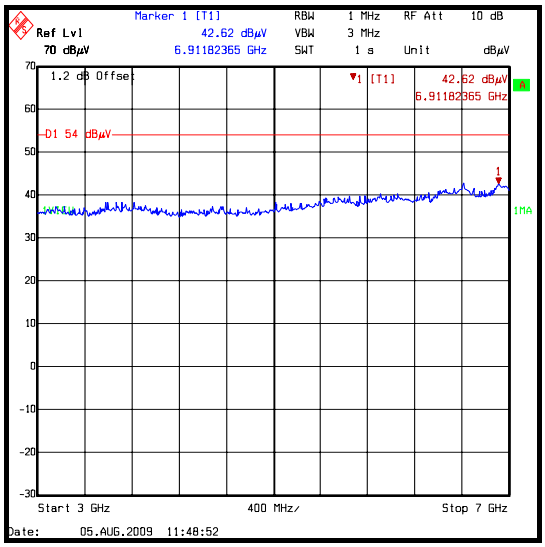


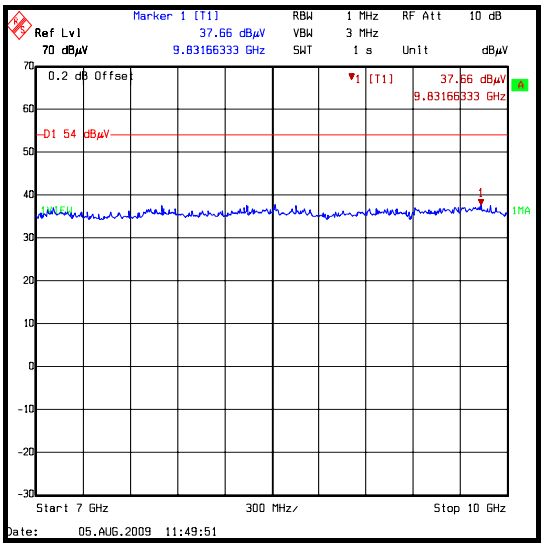


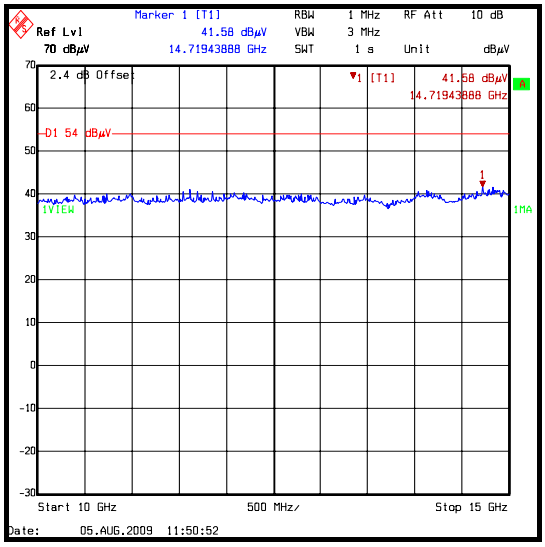


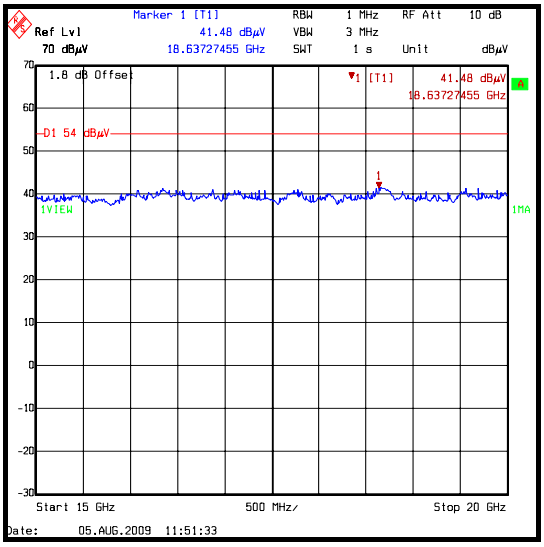
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Receive/Idle Mode Conducted Emissions (continued)



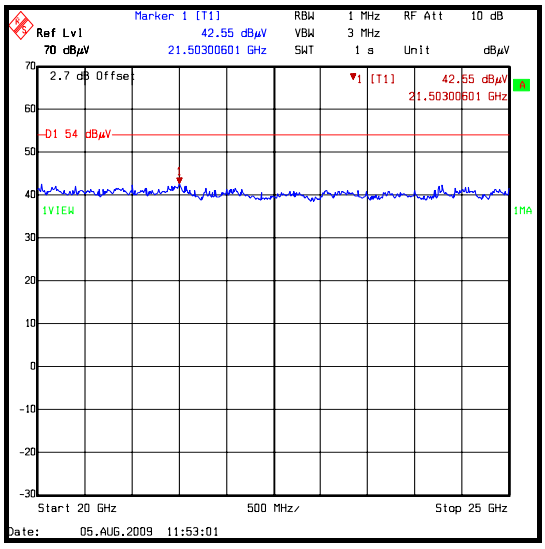


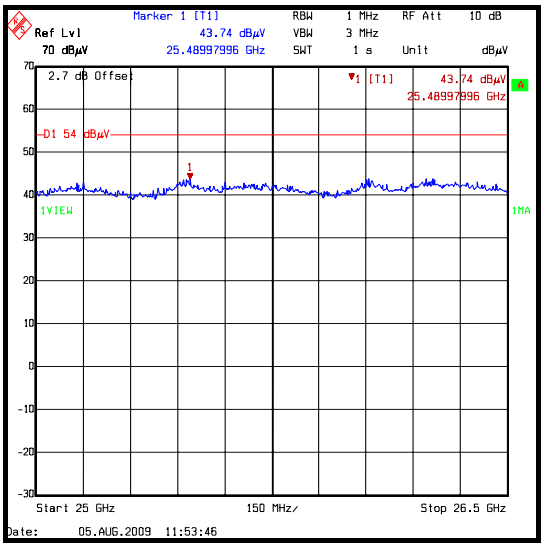




Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Receive/Idle Mode Conducted Emissions (continued)





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

5.2.4. Transmitter Conducted Carrier Output Power

Test Summary:

FCC Part:	FCC 2..1046 and FCC Part 27.50(h)(2)
Test Method Used:	As detailed in ANSI TIA-603-C-2004

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	34

Results: QPSK

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
12507	2501.4	23.6	9.0	32.6	33.0	0.4	Complied
12965	2593.0	23.4	9.0	32.4	33.0	0.6	Complied
13420	2684.6	23.6	9.0	32.6	33.0	0.4	Complied

Results: 16QAM

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
12507	2501.4	23.9	9.0	32.9	33.0	0.1	Complied
12965	2593.0	23.6	9.0	32.6	33.0	0.4	Complied
13420	2684.6	23.6	9.0	32.6	33.0	0.4	Complied

Results: 64QAM

Channel	Frequency (MHz)	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Result
12507	2501.4	23.9	9.0	32.9	33.0	0.1	Complied
12965	2593.0	23.7	9.0	32.7	33.0	0.3	Complied
13420	2684.6	23.6	9.0	32.6	33.0	0.4	Complied

5.2.5. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

FCC Part:	FCC 27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004

Environmental Conditions:

Temperature (°C):	19
Relative Humidity (%):	49

Results: 2501.4 MHz

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	2501.398290	-1710
-20	2501.399224	-776
-10	2501.400039	39
0	2501.400397	397
10	2501.400144	144
20	2501.399757	-243
30	2501.399895	-105
40	2501.400551	551
50	2501.400859	859

Results: 2593 MHz

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	2592.998939	-1061
-20	2592.999186	-814
-10	2593.000047	47
0	2593.000416	416
10	2593.000136	136
20	2592.999742	-258
30	2592.999932	-68
40	2593.000560	560
50	2593.000905	905

Transmitter Frequency Stability (Temperature Variation) (continued)

Results: 2684.6 MHz

Temp (ºC)	Measured Frequency (MHz)	Frequency Error (Hz)
-30	2684.598187	-1813
-20	2684.599172	-828
-10	2684.600054	54
0	2684.600439	439
10	2684.600141	141
20	2684.599741	-259
30	2684.599951	-49
40	2684.600591	591
50	2684.600945	945

Note(s):

1. Tested at 12V DC from a bench PSU applied to the power connector on the adaptor board. The adaptor board voltage regulator reduces this to 3.3V which is the normal supply voltage to the EUT.

5.2.6. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

FCC Part:	FCC 27.54
Test Method Used:	As detailed in ANSI TIA-603-C-2004

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	41

Results: 2501.4 MHz

Supply Voltage (VDC)	Measured Frequency (MHz)	Frequency Error (Hz)
3.0	2501.400081	81
3.3	2501.399694	-306
3.6	2501.400029	29

Results: 2593 MHz

Supply Voltage (VDC)	Measured Frequency (MHz)	Frequency Error (Hz)
3.0	2593.000096	96
3.3	2592.999643	-357
3.6	2592.999963	-37

Results: 2684.6 MHz

Supply Voltage (VDC)	Measured Frequency (MHz)	Frequency Error (Hz)
3.0	2684.600122	122
3.3	2684.599760	-240
3.6	2684.599884	-116

Note(s):

1. Tested over the range 3V to 3.6 VDC supplied from a bench PSU applied to two power cables connected directly to the EUT power supply input.

5.2.7. Transmitter Occupied Bandwidth

Test Summary:

FCC Part:	FCC 2.1049
Test Method Used:	As detailed in ANSI TIA-603-C-2004

Environmental Conditions:

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

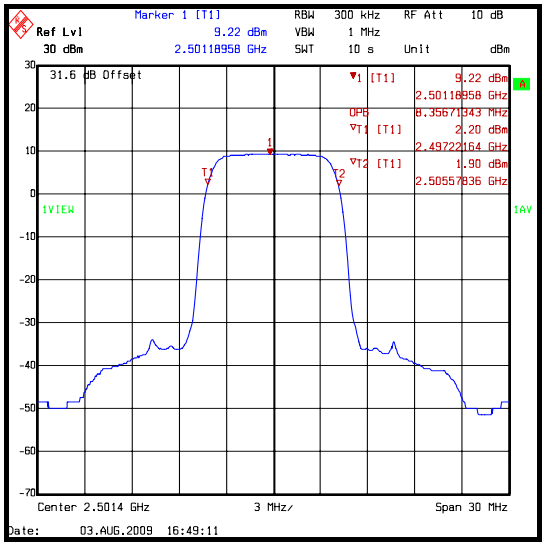
Results: QPSK

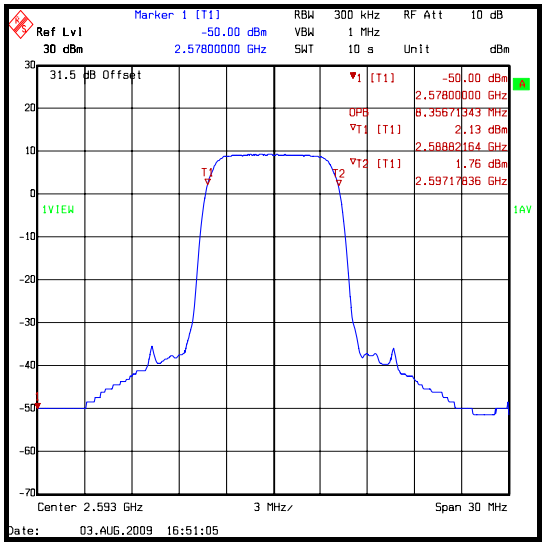
Channel Number	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
12507	2501.4	300	1000	8.357
12965	2593.0	300	1000	8.357
13423	2684.6	300	1000	8.417

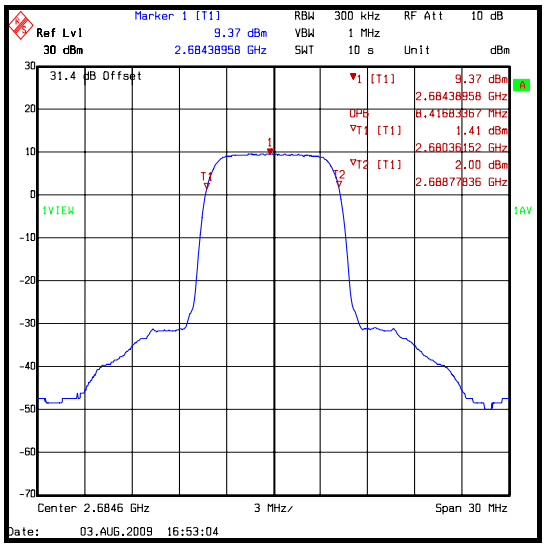
Note(s):

1. The 99% occupied bandwidth was measured using the occupied bandwidth function of the spectrum analyser.

Transmitter Occupied Bandwidth (continued)







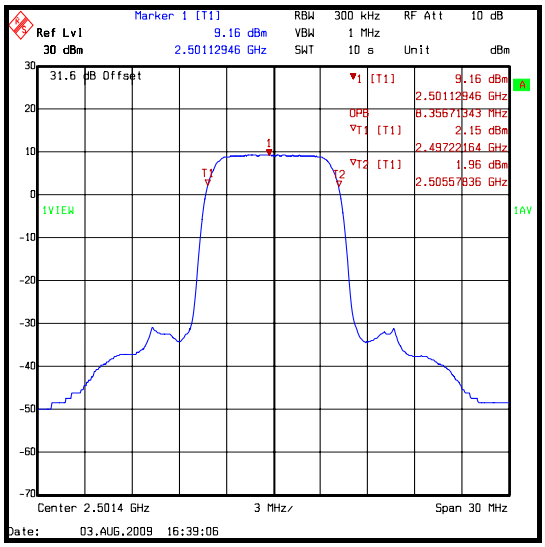
Transmitter Occupied Bandwidth (continued)

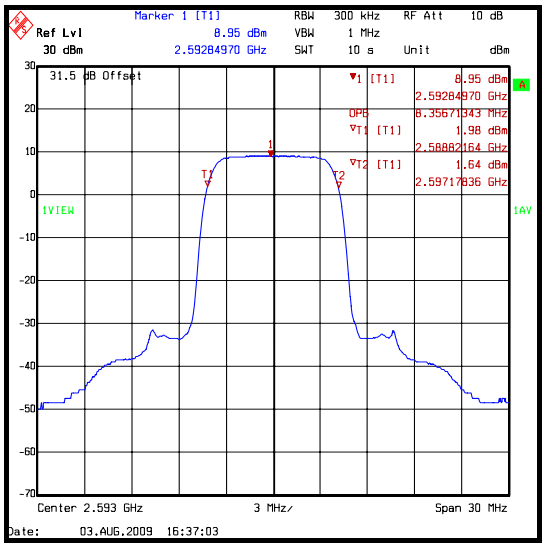
Results: 16QAM

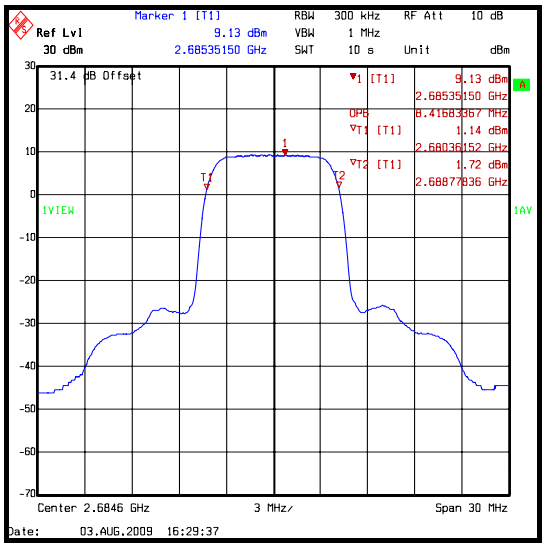
Channel Number	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
12507	2501.4	300	1000	8.357
12965	2593.0	300	1000	8.357
13423	2684.6	300	1000	8.417

Note(s):

1. The 99% occupied bandwidth was measured using the occupied bandwidth function of the spectrum analyser.







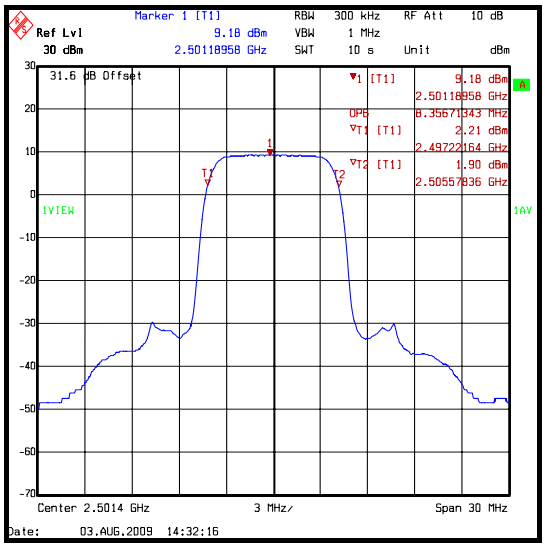
Transmitter Occupied Bandwidth (continued)

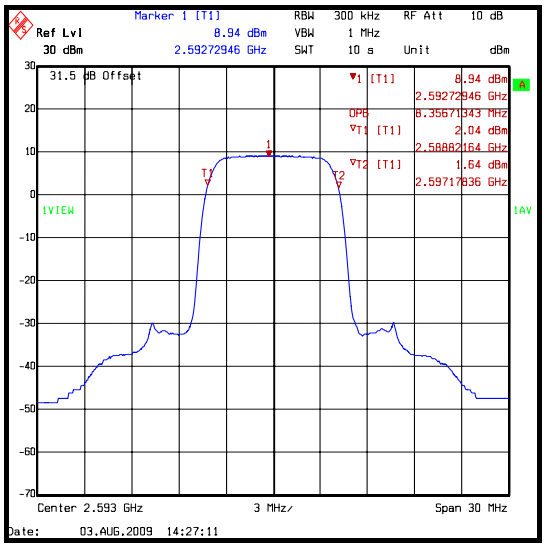
Results: 64QAM

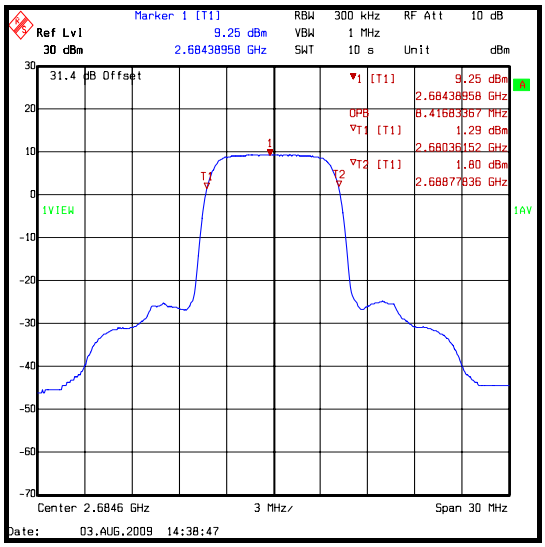
Channel Number	Frequency (MHz)	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	Occupied Bandwidth (MHz)
12507	2501.4	300	1000	8.357
12965	2593.0	300	1000	8.357
13423	2684.6	300	1000	8.417

Note(s):

1. The 99% occupied bandwidth was measured using the occupied bandwidth function of the spectrum analyser.







5.2.8. Transmitter Conducted Emissions - Channel Edge

Test Summary:

FCC Part:	FCC Part 2.1051 and FCC Part 27.53
Test Method Used:	As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2

Environmental Conditions:

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

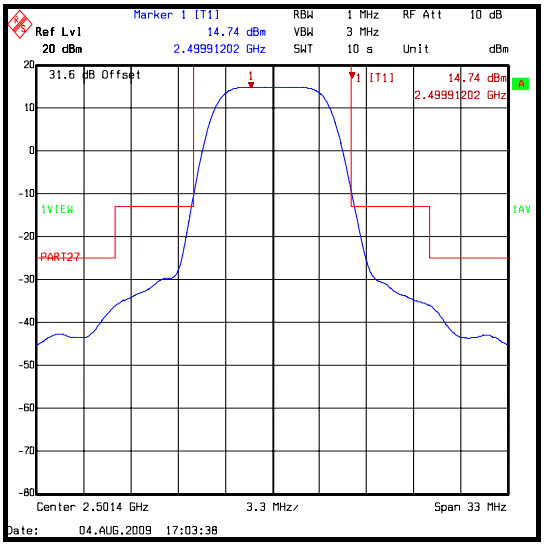
Note(s):

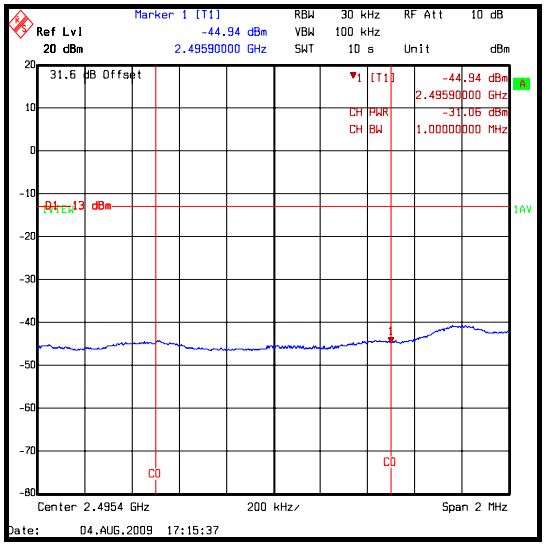
1. It can be seen on the main mask plots that the emission goes through the limit line. This is on account of the analyser bandwidth being too great to make an accurate measurement. The analyser Integration function was thus used to demonstrate compliance and this can be seen on the two plots accompanying the mask plot.

Results: Bottom Channel / QPSK

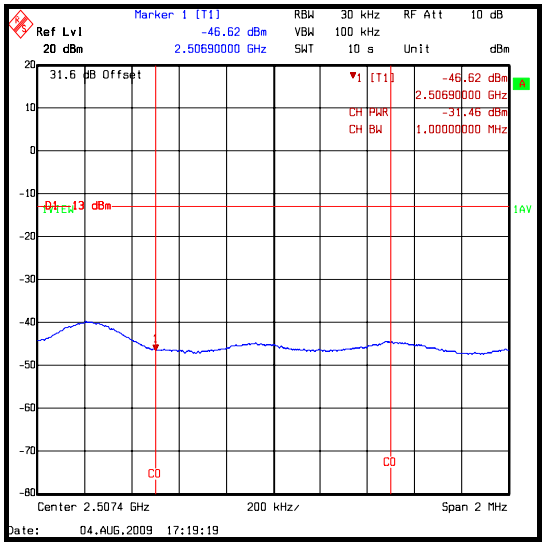
Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
2495.9	-44.9	-13.0	31.9	Complied
2506.9	-46.6	-13.0	33.6	Complied

Transmitter Conducted Emissions - Channel Edge (continued)





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

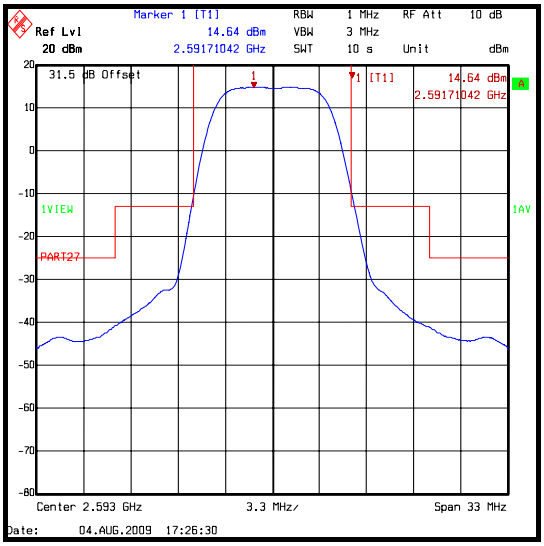


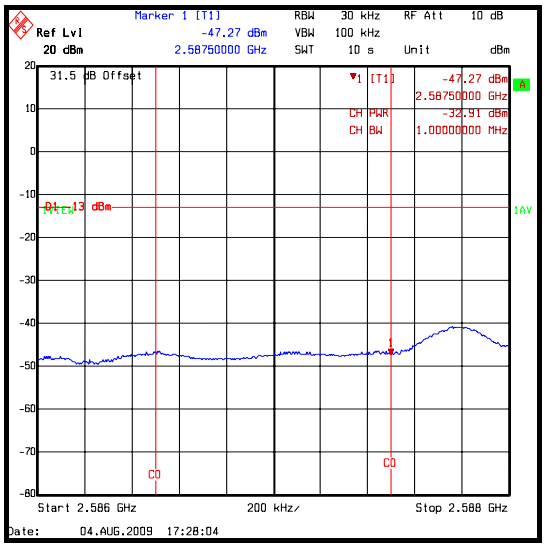
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (Continued)

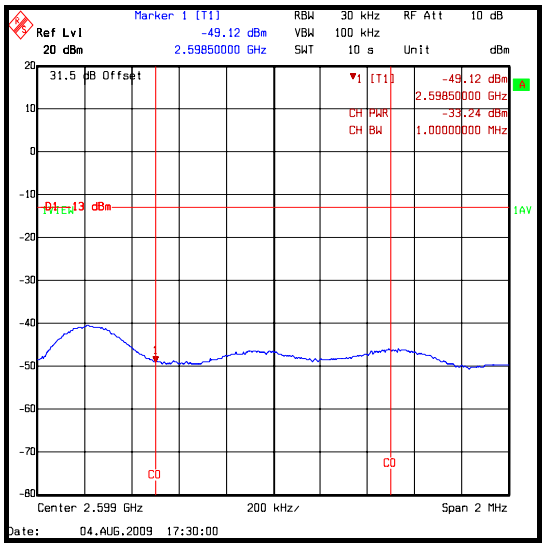
Results: Middle channel / QPSK

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
2587.5	-47.3	-13.0	34.3	Complied
2598.5	-49.1	-13.0	36.1	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

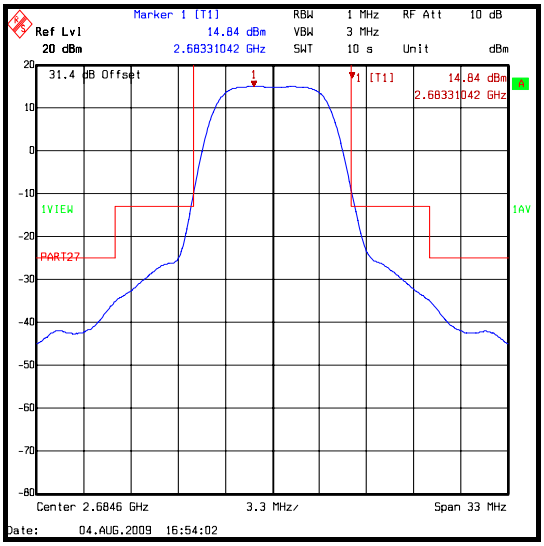


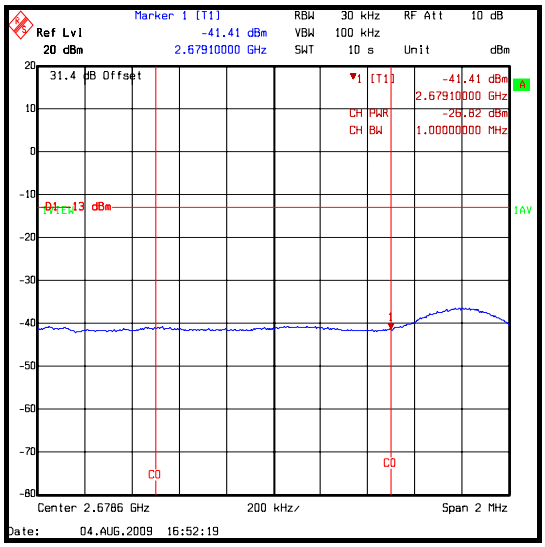
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

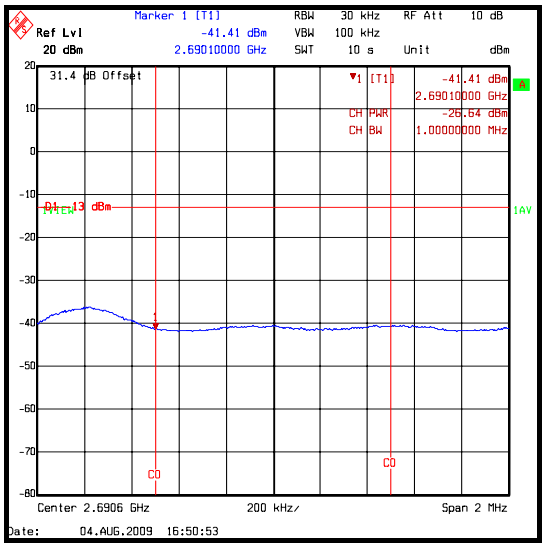
Results: Top channel / QPSK

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
2679.1	-41.4	-13.0	28.4	Complied
2690.1	-41.4	-13.0	28.4	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

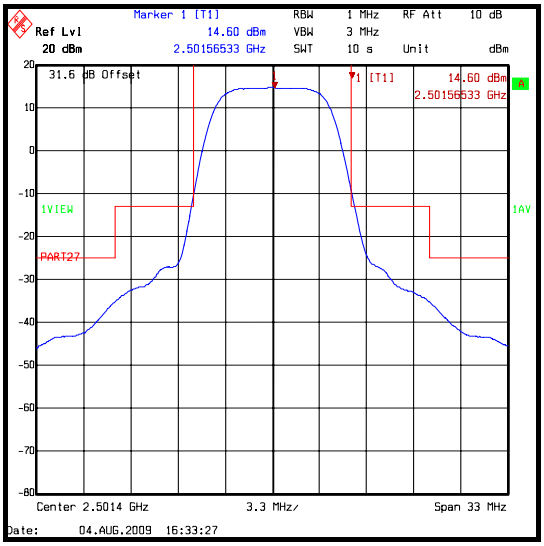


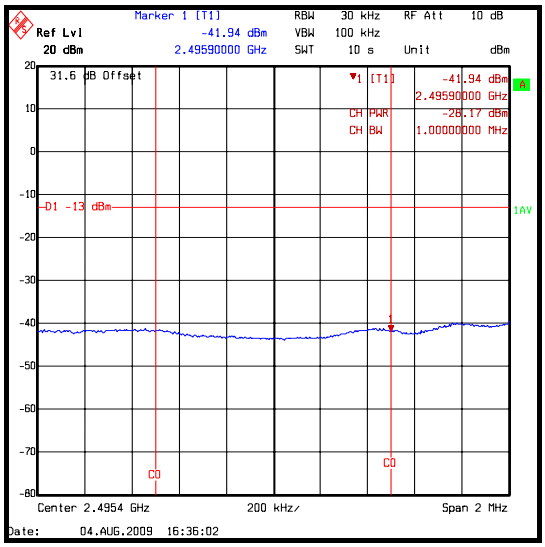
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

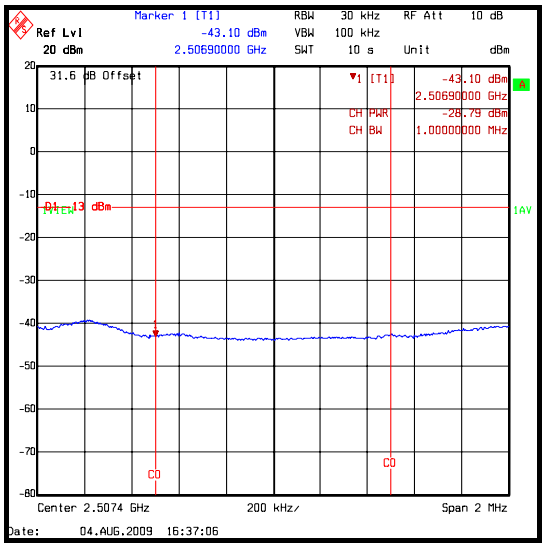
Results: Bottom channel / 16QAM

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
2495.9	-41.9	-13.0	28.9	Complied
2506.9	-43.1	-13.0	30.1	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

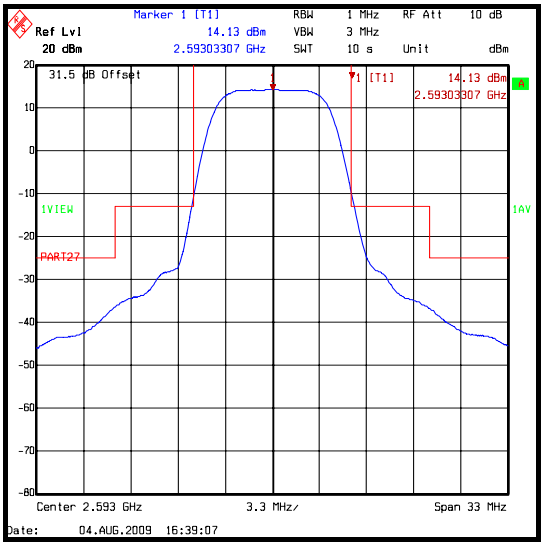


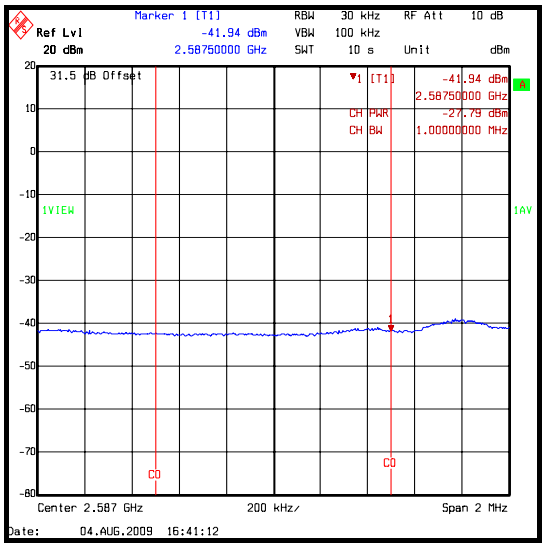
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

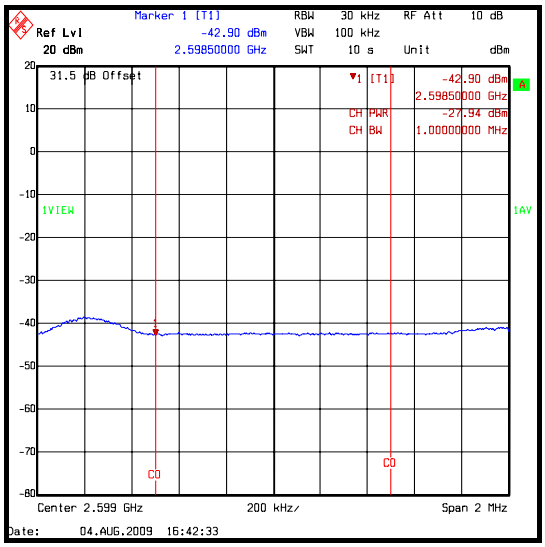
Results: Middle channel / 16QAM

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band Edge Limit (dBm)	Margin (dB)	Result
2587.5	-41.9	-13.0	28.9	Complied
2598.5	-42.9	-13.0	29.9	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

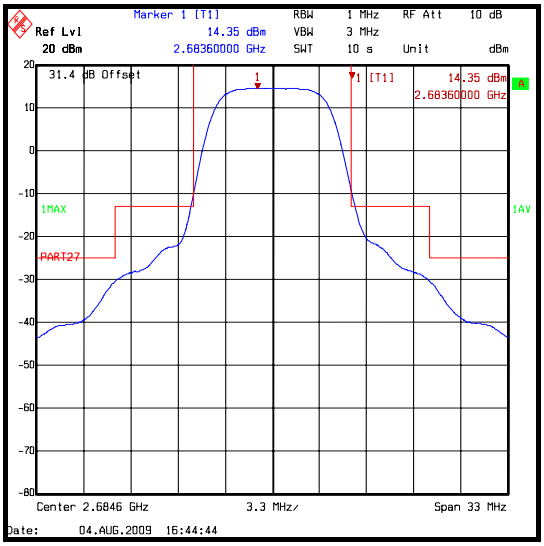


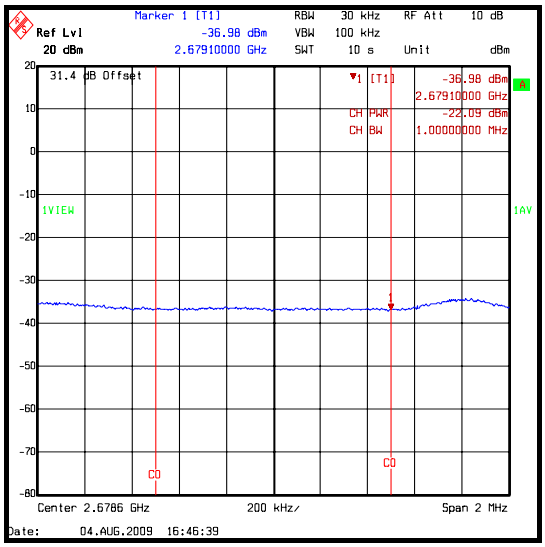
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

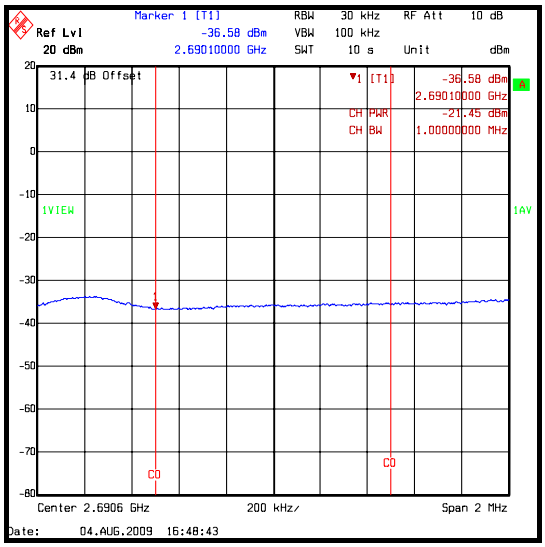
Results: Top channel / 16QAM

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
2679.1	-37.0	-13.0	24.0	Complied
2690.1	-36.6	-13.0	23.6	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

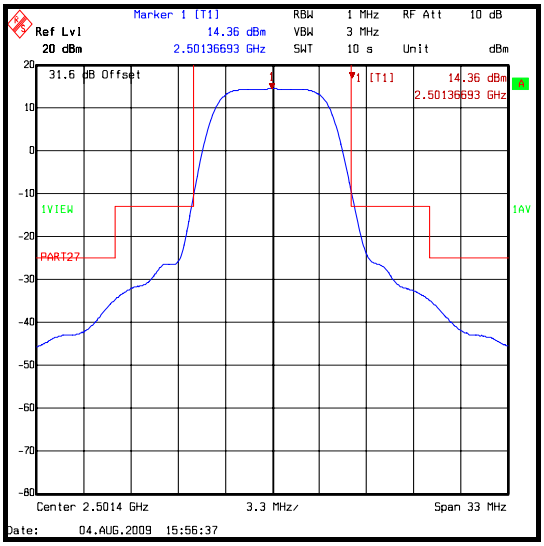


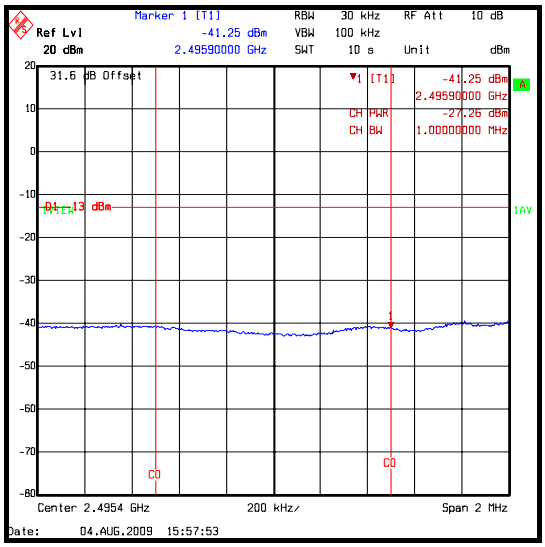
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

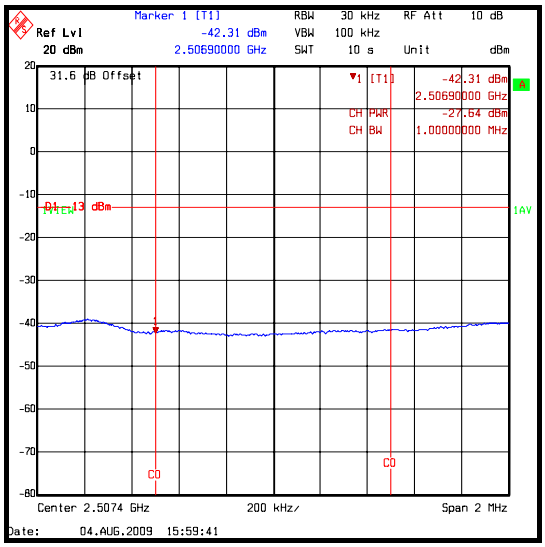
Results: Bottom channel / 64QAM

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
2495.9	-41.3	-13.0	28.3	Complied
2506.9	-42.3	-13.0	29.3	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

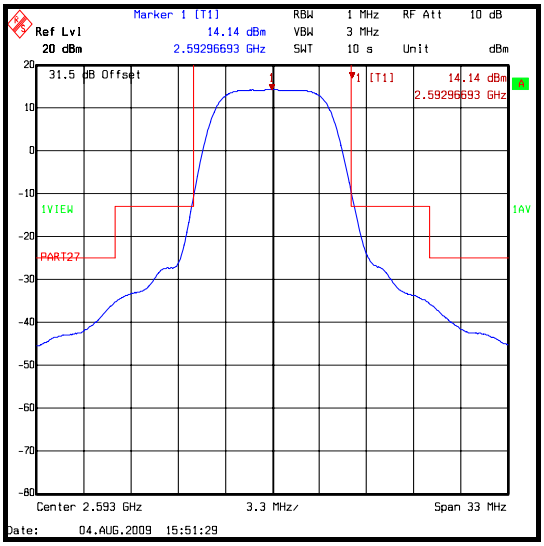


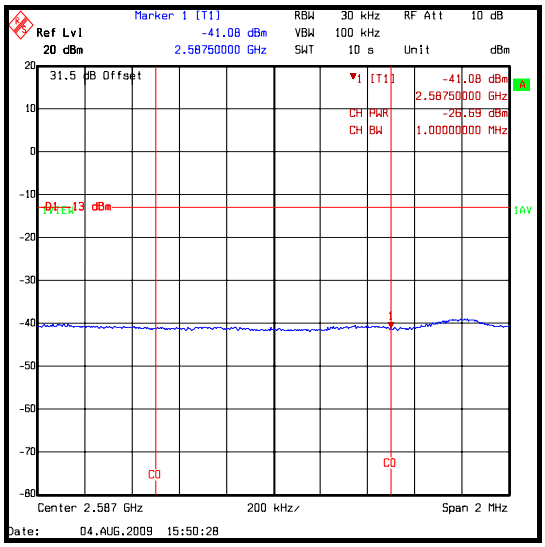
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

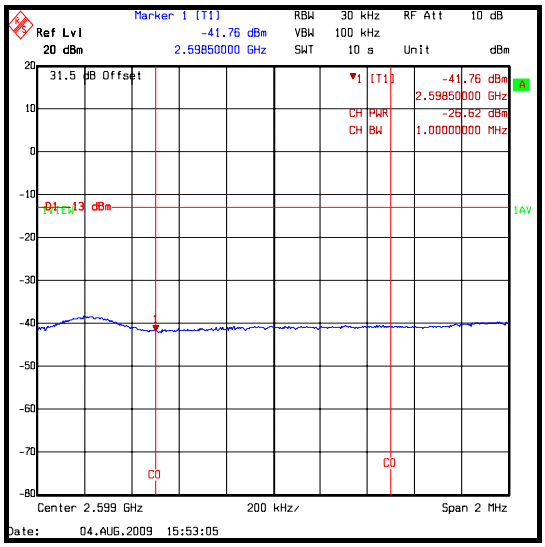
Results: Middle channel / 64QAM

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
2587.5	-41.1	-13.0	28.1	Complied
2598.5	-41.8	-13.0	28.8	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.

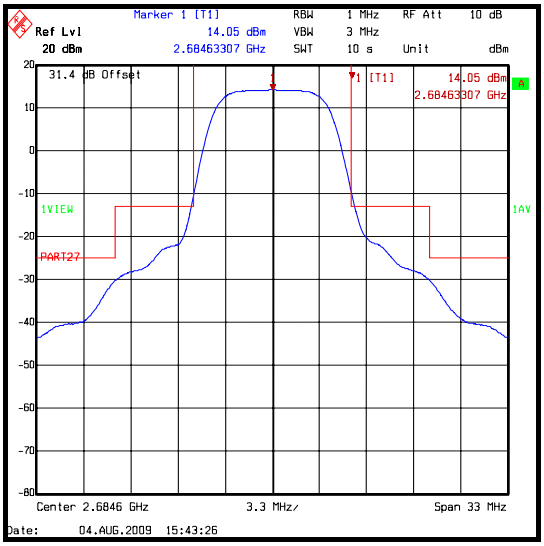


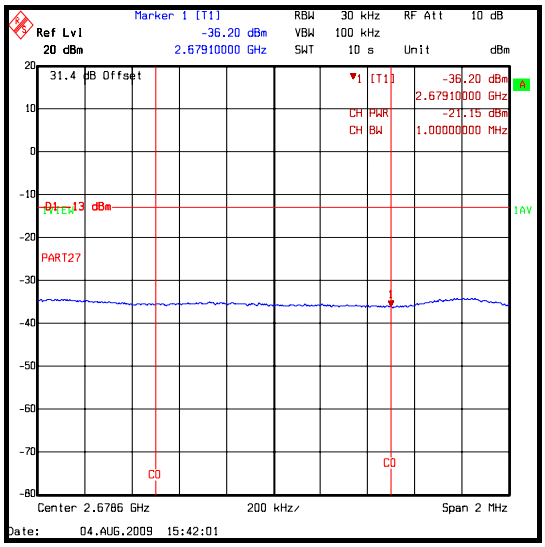
1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

Transmitter Conducted Emissions - Channel Edge (continued)

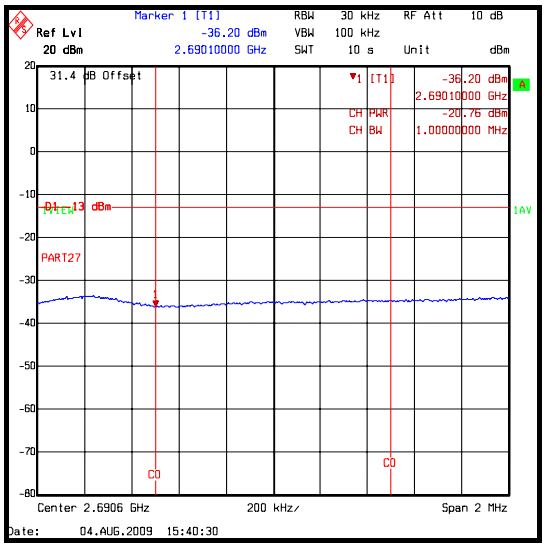
Results: Top channel / 64QAM

Frequency of 1 MHz strip adjacent to channel edge	Level in 1 MHz strip adjacent to block edge (dBm)	Band edge limit (dBm)	Margin (dB)	Result
2679.1	-36.2	-13.0	23.2	Complied
2690.1	-36.2	-13.0	23.2	Complied





1 MHz strip below channel centre freq -5.5 MHz measured using the spectrum analyser Channel Power function.



1 MHz strip above channel centre freq +5.5 MHz measured using the spectrum analyser Channel Power function.

5.2.9. Transmitter Conducted Emissions

Test Summary:

FCC Part:	FCC 2.1051 and FCC Part 27.53
Test Method Used:	As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	34

Results: QPSK Bottom Channel 2501.4 MHz

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
4999.219420	-33.5	-25.0	8.5	Complied
7510.383270	-45.9	-25.0	20.9	Complied

Results: QPSK Middle Channel 2593 MHz:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5189.850160	-31.0	-25.0	6.0	Complied
7772.870740	-44.9	-25.0	19.9	Complied

Results: QPSK Top Channel 2684.6 MHz:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5365.712420	-37.0	-25.0	12.0	Complied
8047.804610	-42.8	-25.0	17.8	Complied

Transmitter Conducted Emissions (continued)

Results: 16QAM Bottom Channel 2501.4 MHz:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
4999.124850	-32.6	-25.0	7.6	Complied
7510.825850	-45.9	-25.0	20.9	Complied

Results: 16QAM Middle Channel 2593 MHz:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5189.675150	-30.3	-25.0	5.3	Complied
7772.544350	-44.7	-25.0	19.7	Complied

Results: 16QAM Top Channel 2684.6 MHz:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5365.474550	-36.5	-25.0	11.5	Complied
8047.654310	-42.6	-25.0	17.6	Complied

Transmitter Conducted Emissions (continued)

Results: 64QAM Bottom Channel 2501.4 MHz:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
4999.12485	-32.7	-25.0	7.7	Complied
7510.66970	-46.2	-25.0	21.2	Complied

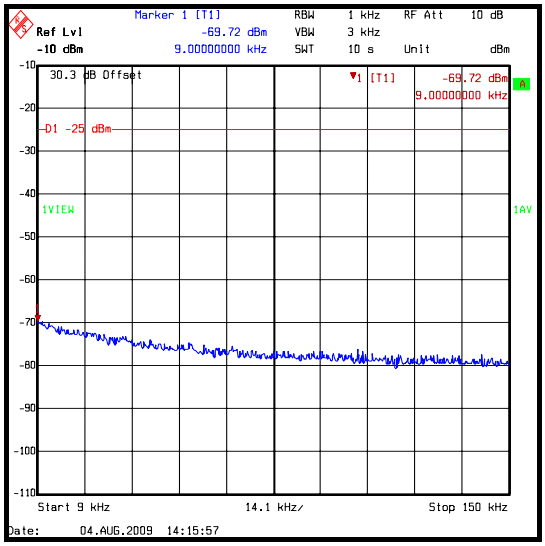
Results: 64QAM Middle Channel 2593 MHz:

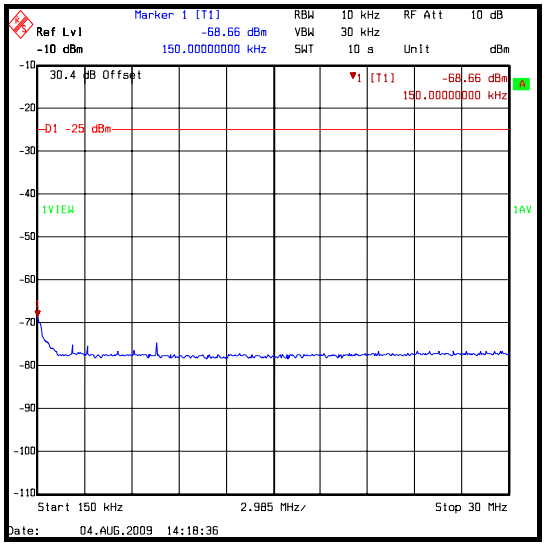
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5189.675150	-30.4	-25.0	5.4	Complied
7772.443800	-45.0	-25.0	20.0	Complied

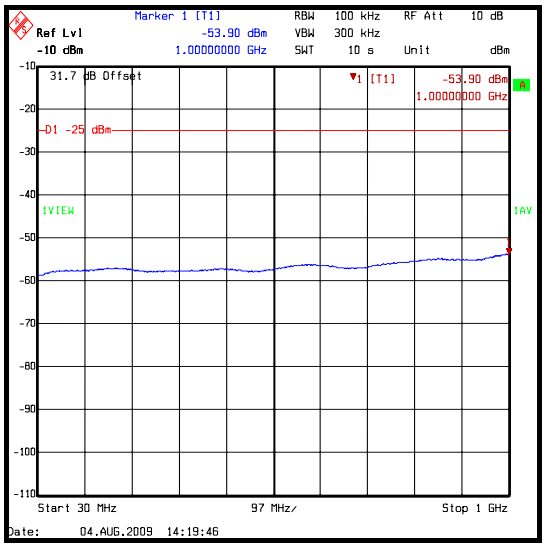
Results: 64QAM Top Channel 2684.6 MHz:

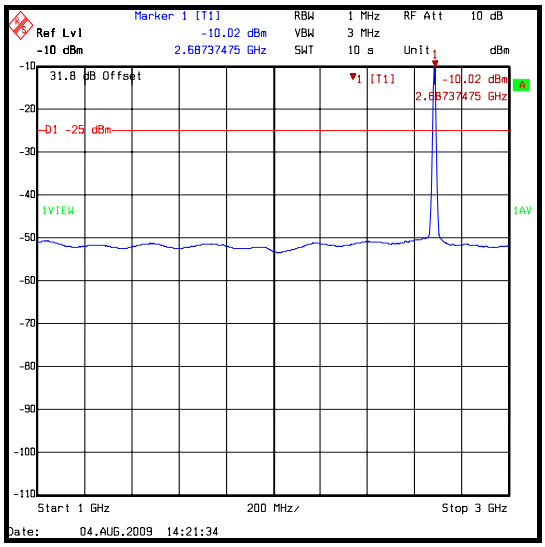
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5365.524650	-36.6	-25.0	11.6	Complied
8047.701400	-42.8	-25.0	17.8	Complied

Transmitter Conducted Emissions (continued)

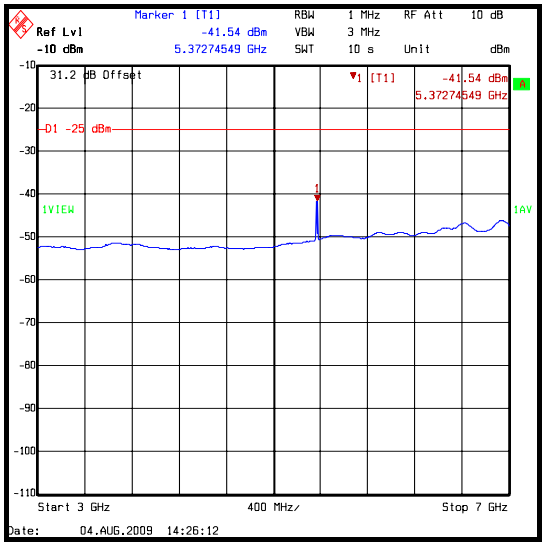


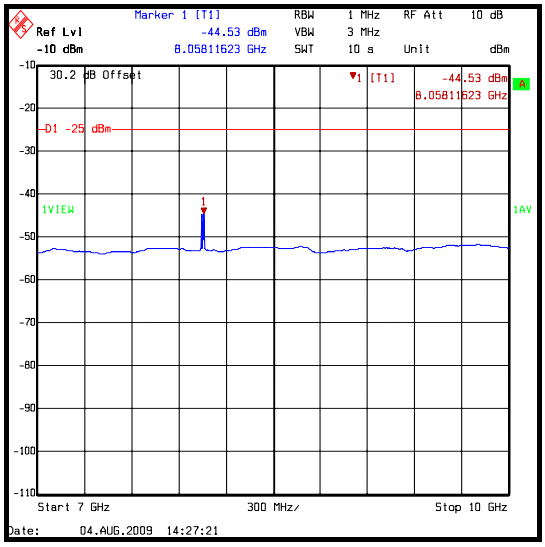


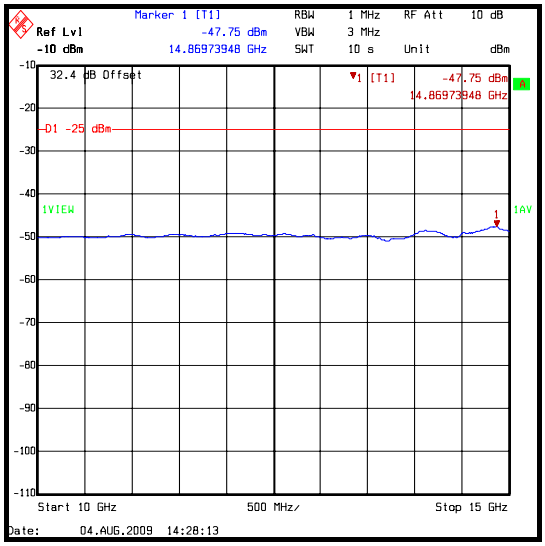


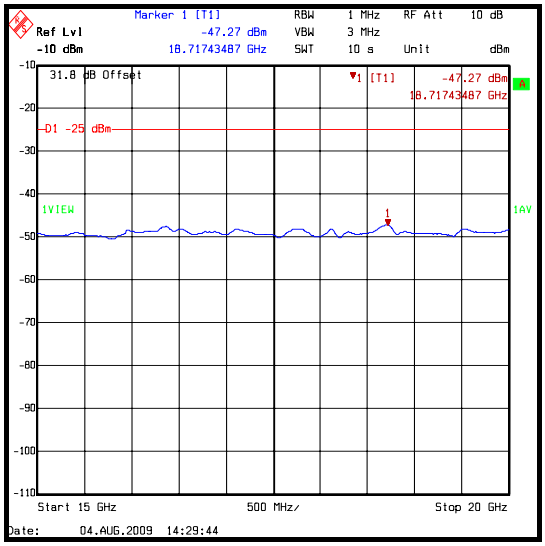


Transmitter Conducted Emissions (continued)

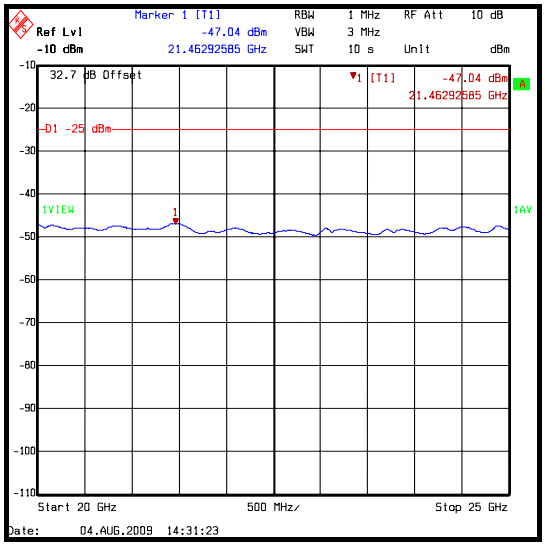


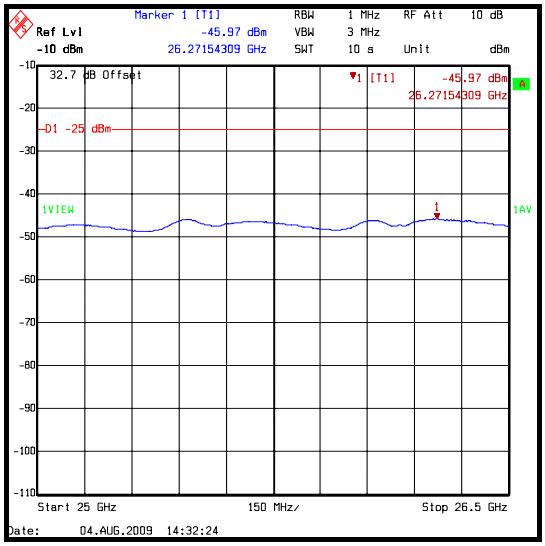


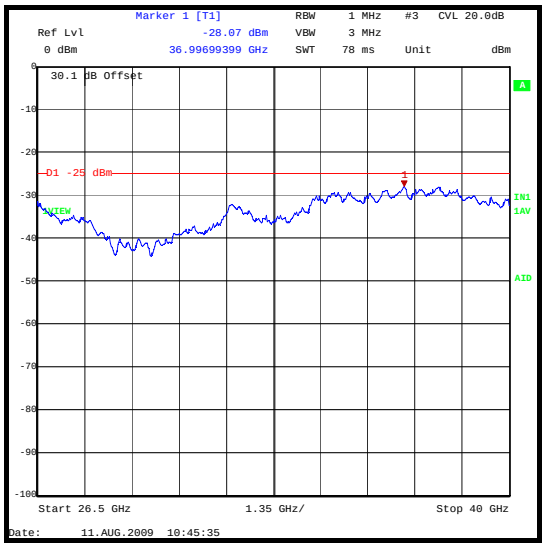




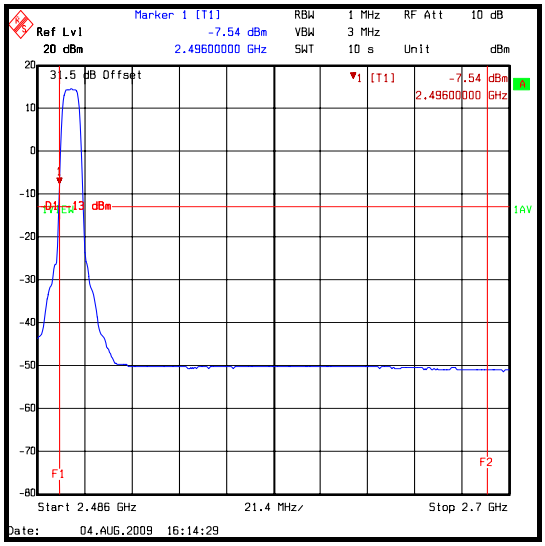
Transmitter Conducted Emissions (continued)



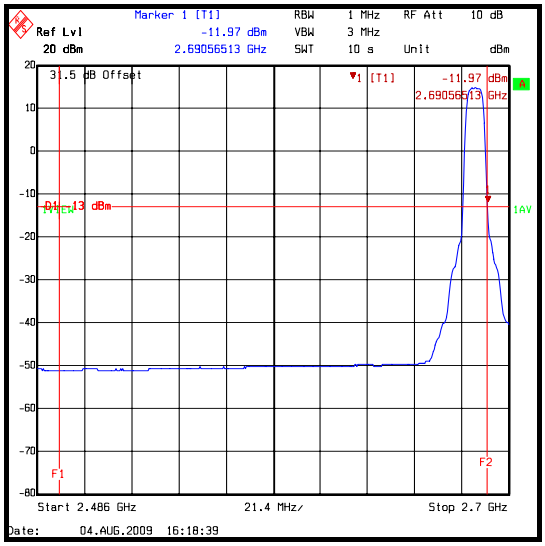




Transmitter Conducted Emissions (continued)



In-Band Bottom Channel



In-Band Top Channel

Note(s):

1. The emission shown at approximately 2687.375 MHz on the 1 GHz to 3 GHz plot is the carrier.

5.2.10. Transmitter Conducted Emissions at Band Edges

Test Summary:

FCC Part:	FCC Part 2.1051, FCC Part 27.53
Test Method Used:	ANSI TIA-603-C-2004 referencing FCC CFR Parts 2.

Environmental Conditions:

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

Results: QPSK 1 MHz strip below the lower band edge

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2495 to 2496	-31.3	-13.0	18.3	Complied

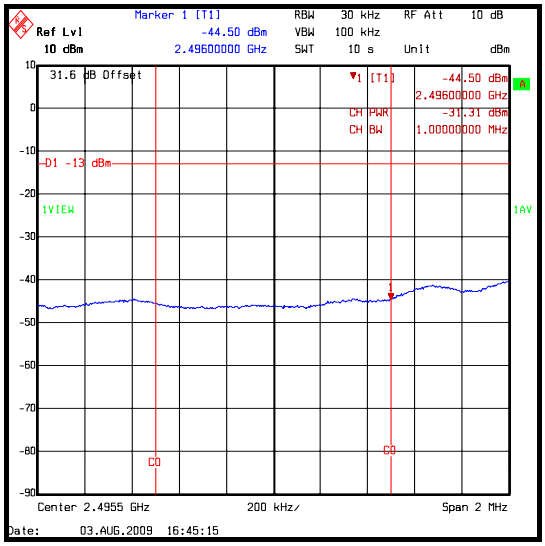
Results: QPSK 1 MHz strip above the upper band edge

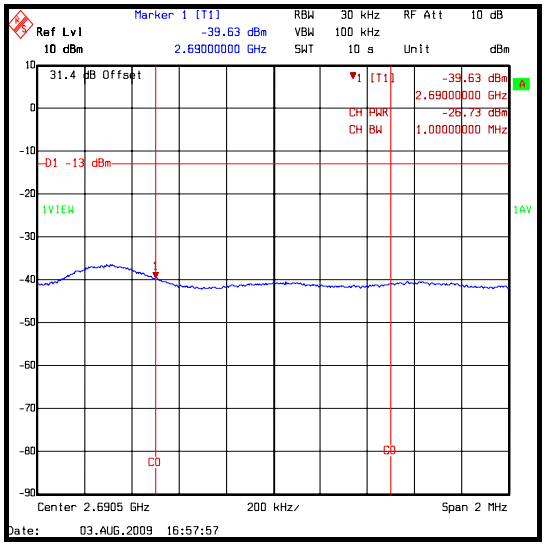
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690 to 2691	-26.7	-13.0	13.7	Complied

Note(s):

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.

Transmitter Conducted Emissions at Band Edges (continued)





Transmitter Conducted Emissions at Band Edges (continued)

Results: 16QAM 1 MHz strip below the lower band edge

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2495 to 2496	-28.6	-13.0	29.8	Complied

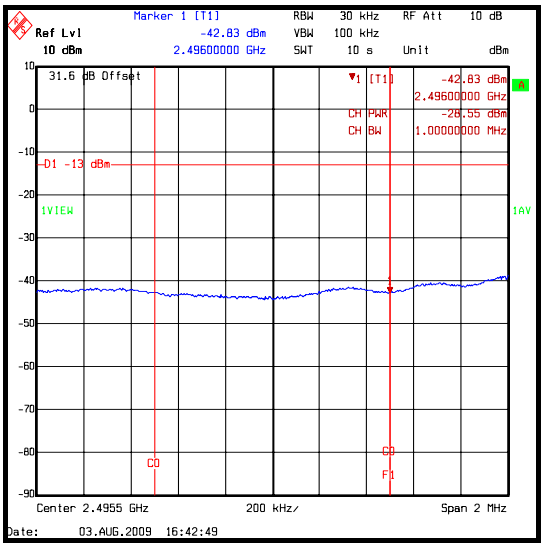
Results: 16QAM 1 MHz strip above the upper band edge

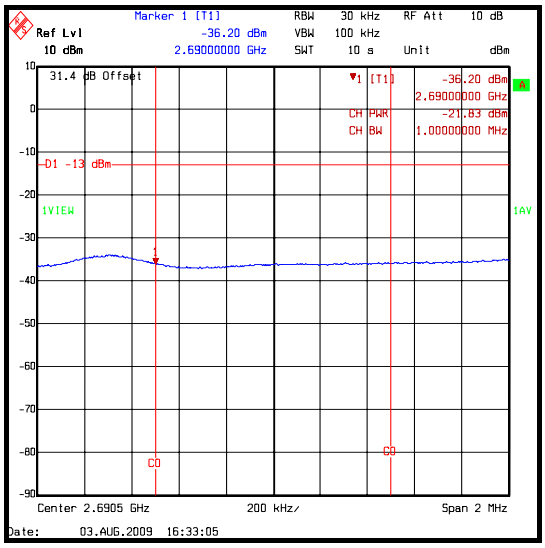
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690 to 2691	-21.8	-13.0	8.8	Complied

Note(s):

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.

Transmitter Conducted Emissions at Band Edges (continued)





Transmitter Conducted Emissions at Band Edges (continued)

Results: 64QAM 1 MHz strip below the lower band edge

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2495 to 2496	-27.3	-13.0	14.3	Complied

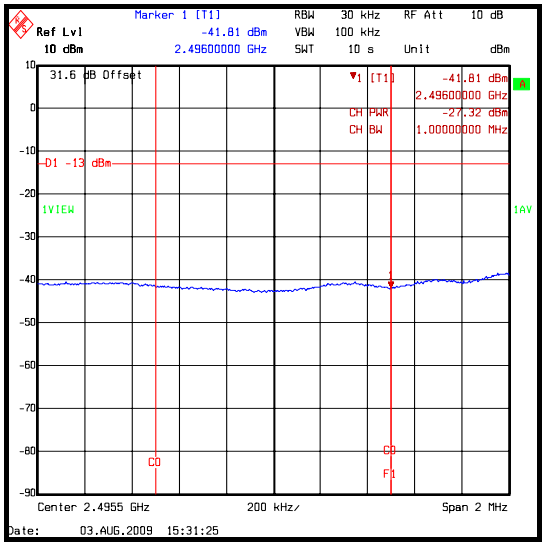
Results: 64QAM 1 MHz strip above the upper band edge

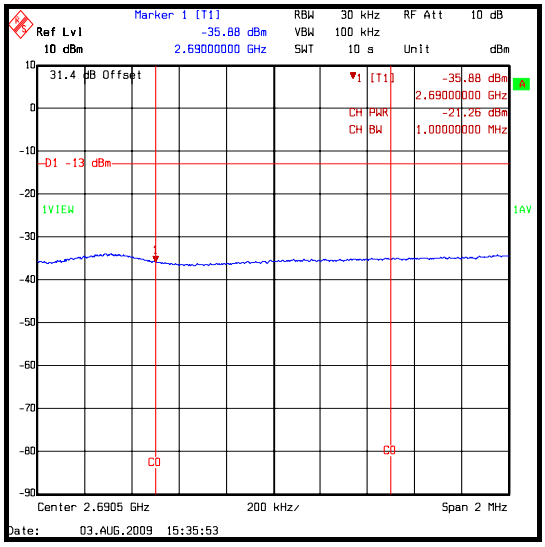
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690 to 2691	-21.3	-13.0	8.3	Complied

Note(s):

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.

Transmitter Conducted Emissions at Band Edges (continued)





5.2.11. Transmitter Radiated Emissions

Test Summary:

FCC Part:	FCC 2.1051 and FCC Part 27.53
Test Method Used:	As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	34

Results: QPSK Bottom Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5006.41723	-32.4	-25.0	7.4	Complied
7510.04669	-45.7	-25.0	20.7	Complied

Results: QPSK Middle Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5189.55110	-37.7	-25.0	12.7	Complied
7773.40882	-47.4	-25.0	22.4	Complied

Results: QPSK Top Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5365.67009	-30.7	-25.0	5.7	Complied
8048.43182	-44.1	-25.0	19.1	Complied

Transmitter Radiated Emissions (continued)

Results: 16QAM Bottom Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5006.51052	-31.8	-25.0	6.8	Complied
7510.27214	-45.8	-25.0	20.8	Complied

Results: 16QAM Middle Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5189.75752	-36.2	-25.0	11.2	Complied
7772.52705	-46.7	-25.0	21.7	Complied

Results: 16QAM Top Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5365.48758	-30.1	-25.0	5.1	Complied
8060.21420	-44.0	-25.0	19.0	Complied

Transmitter Radiated Emissions (continued)

Results: 64QAM Bottom Channel:

Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5006.49739	-31.7	-25.0	6.7	Complied
7510.54108	-46.0	-25.0	21.0	Complied

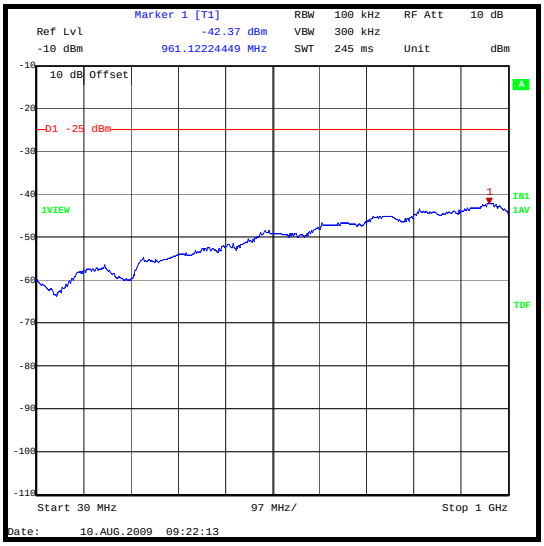
Results: 64QAM Middle Channel:

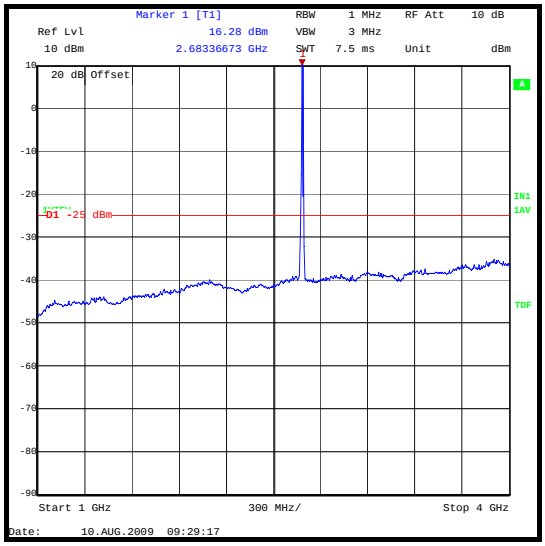
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5182.20817	-36.3	-25.0	11.3	Complied
7772.52705	-46.6	-25.0	21.6	Complied

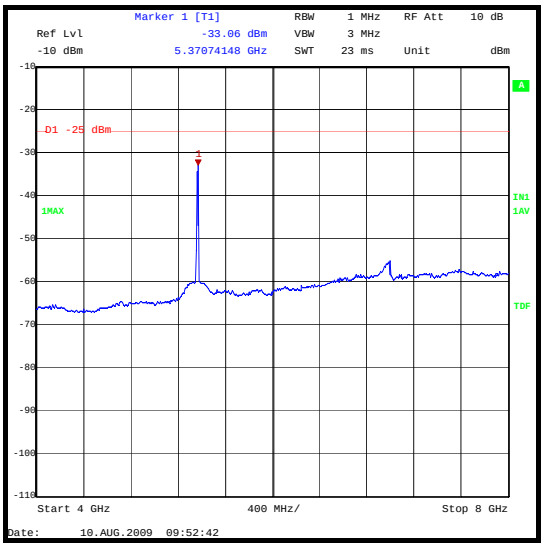
Results: 64QAM Top Channel:

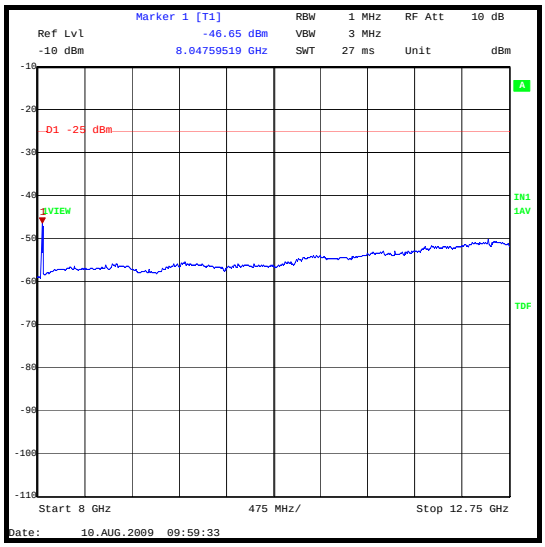
Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
5365.40268	-29.5	-25.0	4.5	Complied
8060.07034	-42.6	-25.0	17.6	Complied

Transmitter Radiated Emissions (continued)

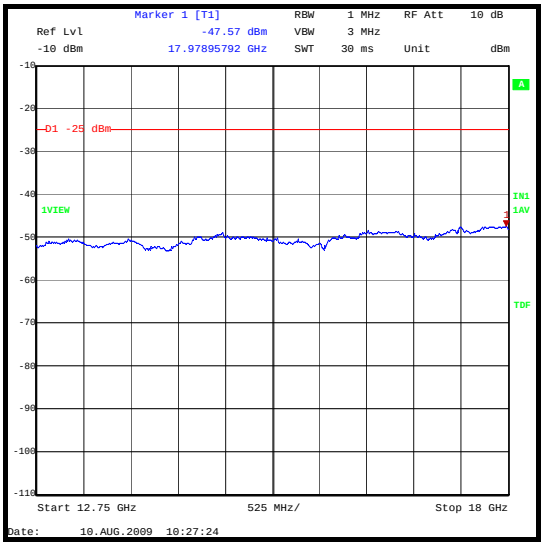


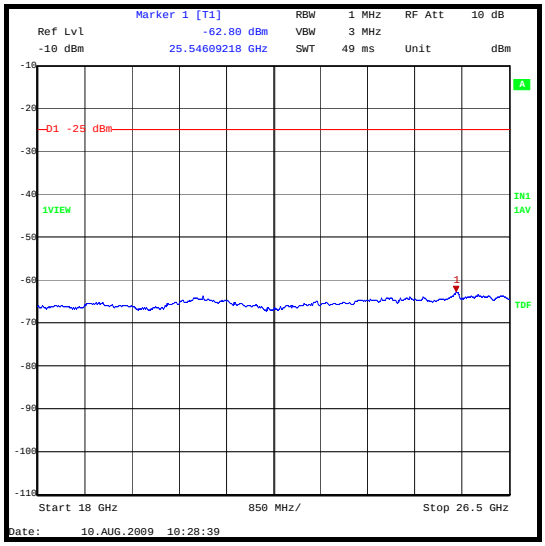


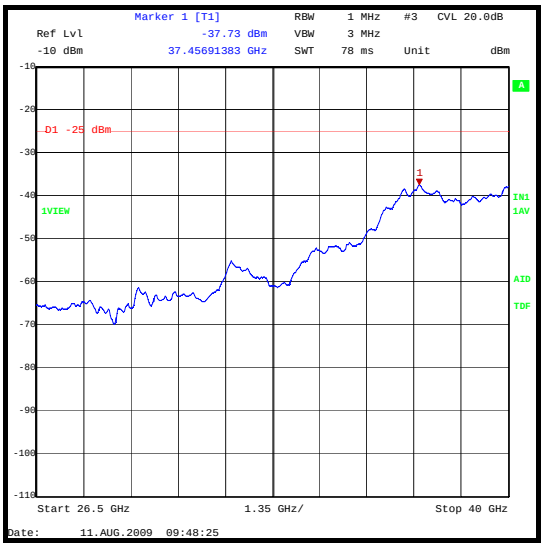




Transmitter Radiated Emissions (continued)







5.2.12. Transmitter Radiated Emissions at Band Edges

Test Summary:

FCC Part:	FCC Part 2.1051 and FCC Part 27.53
Test Method Used:	As detailed in ANSI TIA-603-C-2004 referencing FCC Part 2

Environmental Conditions:

Temperature (°C):	19
Relative Humidity (%):	48

Results: QPSK 1 MHz strip below the lower band edge

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
2495 to 2496	-28.6	-13.0	15.6	Complied

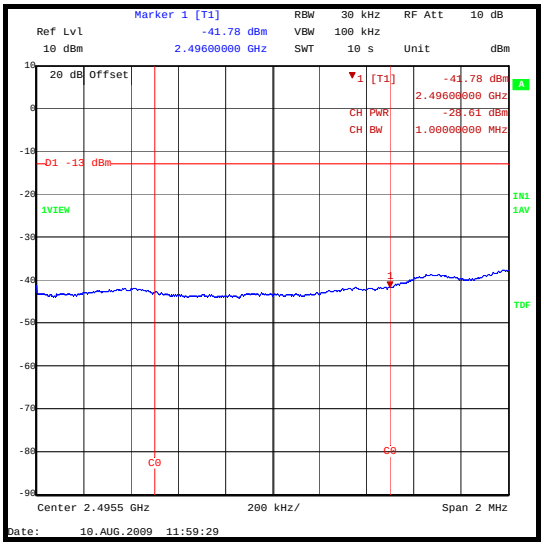
Results: QPSK 1 MHz strip above the upper band edge

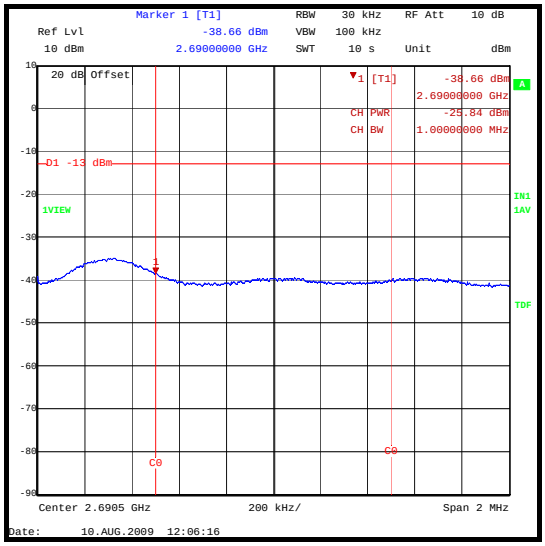
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690 to 2691	-25.8	-13.0	12.8	Complied

Note(s):

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.

Transmitter Radiated Emissions at Band Edges (continued)





Transmitter Radiated Emissions at Band Edges (continued)

Results: 16QAM 1 MHz strip below the lower band edge

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
2495 to 2496	-26.2	-13.0	13.2	Complied

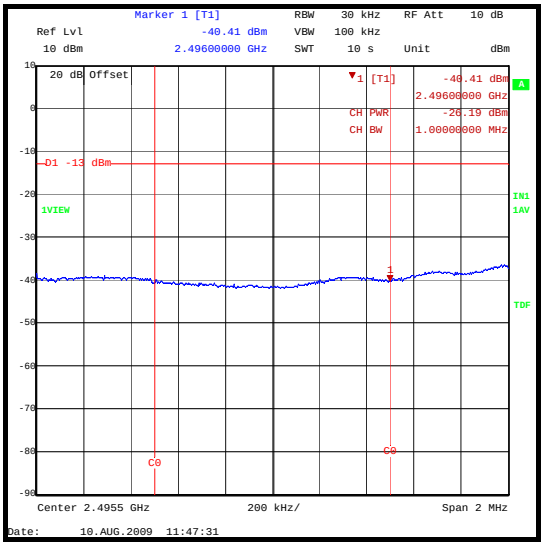
Results: 16QAM 1 MHz strip above the upper band edge

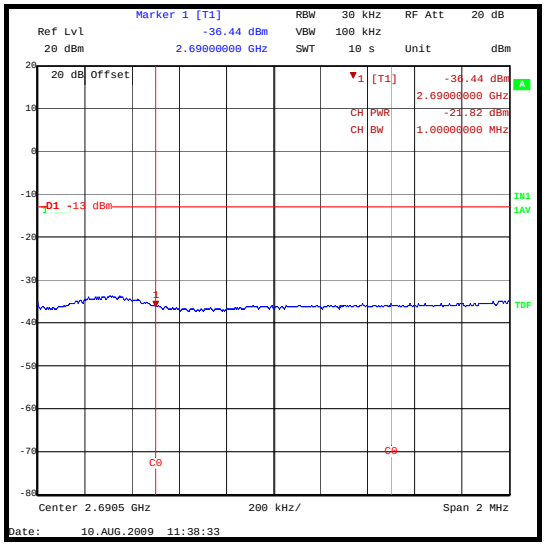
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690 to 2691	-21.8	-13.0	8.8	Complied

Note(s):

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.

Transmitter Radiated Emissions at Band Edges (continued)





Transmitter Radiated Emissions at Band Edges (continued)

Results: 64QAM 1 MHz strip below the lower band edge

Frequency (MHz)	Spurious Emission (dBm)	Limit (dBm)	Margin (dB)	Result
2495 to 2496	25.5	-13.0	12.5	Complied

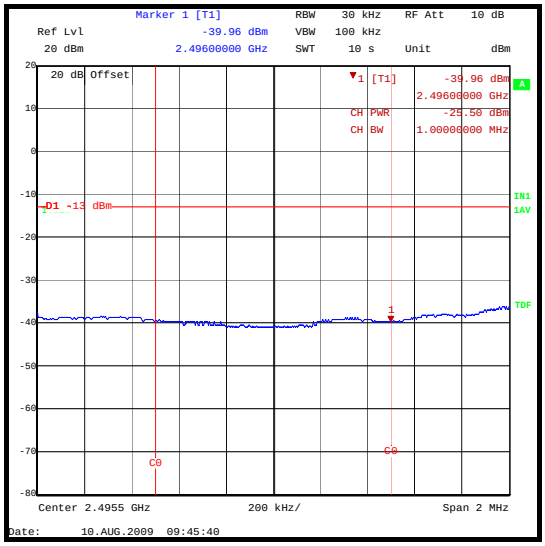
Results: 64QAM 1 MHz strip above the upper band edge

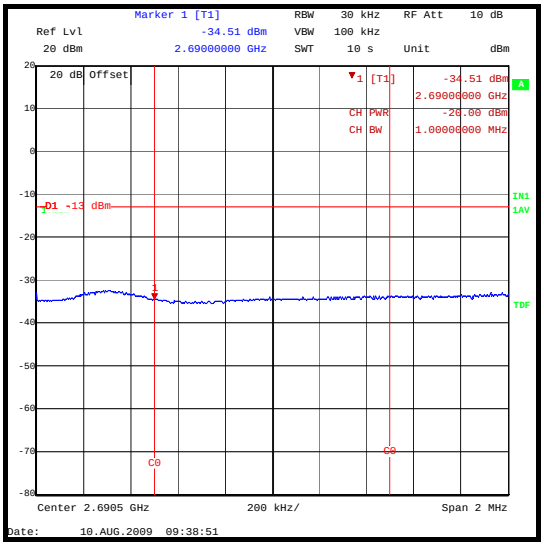
Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2690 to 2691	-20.0	-13.0	7.0	Complied

Note(s):

1. Measured with a 1 MHz resolution bandwidth and also using the channel power function of the spectrum analyser.

Transmitter Radiated Emissions at Band Edges (continued)





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**
Occupied Bandwidth	Not applicable	95%	± 0.12 %
Conducted Emissions	9 kHz to 26 GHz	95%	± 1.2 dB
Effective Isotropic Radiated Power (EIRP)	Not applicable	95%	±2.94 dB
Occupied Bandwidth	824 to 849 MHz	95%	±11.4 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 5.26 dB
Radiated Spurious Emissions	1 GHz to 26 GHz	95%	± 1.78 dB

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

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1391	Attenuator	HUBER + SUHNER AG	757987	6810.17.B	Calibrated before use	-
A1392	Attenuator	HUBER + SUHNER AG	757456	6820.17.B	Calibrated before use	-
A1494	Attenuator	MCL	MCL BW -230W2	9935	Calibrated before use	-
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A174	Waveguide Transition	Flann Microwave Ltd	22094-KF20	211	Calibration not required	-
A1818	Antenna	EMCO	3115	00075692	25 Oct 2008	12
A288	Antenna	Chase	CBL6111A	1589	13 March 2009	12
A366	Isolator	MRI	FRR-400	169	Calibration not required	-
C1190	Cable	Rosenburg	FA210A1015M3030	27141-05	Calibrated before use	-
E012	Screened Room	Ray Proof	None	None	Calibrated before use	-
K0002	Site Reference 4421	Rainford EMC	N/A	N/A	Calibrated before use	-
K0004	Site Reference 4428	RFI Global Services Ltd	N/A	N/A	Calibrated before use	-
M1068	Thermometer	Iso-Tech	RS55	93102884	09 Jul 2008	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	12
M1242	Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986/022	09 Dec 2008	12
M1252	Signal Generator	HP	83640A	3119A00489	02 Oct 2008	12
M1347	Digital Multimeter	Fluke	73III	90680080	Calibration not required	-
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	14 May 2009	12

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