



TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: QRF4001-SDIO SD2067

To: FCC Part 15.247: 2008 Subpart C

Test Report Serial No:
RFI/RPT2/RP74814JD05A

Supersedes Test Report Serial No:
RFI/RPT1/RP74814JD05A

This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:	
	
Checked By:	Nigel Davison
	
Date of Issue:	22 April 2009

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields.

This report may not be reproduced other than in full, except with the prior written approval of RFI Global Services Ltd. The results in this report apply only to the sample(s) tested.

RFI Global Services Ltd

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

Registered in England and Wales. Company number: 2117901

This page has been left intentionally blank.

Table of Contents

1. Customer Information 4

2. Summary of Testing 5

3. Equipment Under Test (EUT) 7

4. Operation and Monitoring of the EUT during Testing 10

5. Measurements, Examinations and Derived Results 11

6. Measurement Uncertainty 54

Appendix 1. Test Equipment Used 55

1. Customer Information











Company Name:	TDK Electronics Ireland Ltd
Address:	WPAN Module Group 3022 Lake Drive, City West Business Campus Dublin 24

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 15 Subpart C (Radio Frequency Devices) - Section 15.247
Specification Reference:	47CFR15.107 and 47CFR15.109
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 15 Subpart B (Radio Frequency Devices) - Sections 15.107 and 15.109
Site Registration:	FCC: 209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	14 March to 16 March 2009

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Port Type	Result
FCC Part 15.107	Standby AC Conducted Emissions	AC Mains	
FCC Part 15.109	Standby Radiated Spurious Emissions	Antenna	
FCC Part 15.247(a)(2)	Transmitter 6 dB Bandwidth	Antenna	
FCC Part 2.1049	Transmitter 20 dB Bandwidth	Antenna	
FCC Part 15.247(e)	Transmitter Peak Power Spectral Density	Antenna	
FCC Part 15.247(b)(3)	Transmitter Maximum Peak Output Power (EIRP)	Antenna	
FCC Part 15.247(d) & 15.209(a)	Transmitter Radiated Emissions	Antenna	
FCC Part 15.247(d) & 15.209(a)	Transmitter Band Edge Radiated Emissions	Antenna	
Key to Results  = Complied  = Did not comply			

2.3. Methods and Procedures

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

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

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Description:	SDIO Demonstrator
Brand Name:	QRF4001-SDIO
Model Name or Number:	SD2067
Part Number:	SDIO_5_PP4
Serial Number:	695.372
MAC ID:	008098-986C0352
Hardware Version Number:	SdioV4.0
Software Version Number:	Unitest V5.0
FCC ID Number:	W3RQRF4001SDIO

3.2. Description of EUT

The equipment under test was a SDIO demonstrator for QFR4001 WLAN Module. The equipment has 802.11 b/g technologies operating in the 2.4 GHz band.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	802.11 b/g		
Power Supply Requirement:	3.3 V DC		
Type of Unit:	Transceiver		
Modulation Type:	BPSK, QPSK, CCK, 16QAM, 64QAM		
Data Rate:	802.11b (DSSS): 1, 2, 5.5, 11 Mbps 802.11g (OFDM): 6, 9, 12, 18, 24, 36, 48, 54 Mbps		
Maximum RF Power Output:	16 dBm (802.11b); 13 dBm (802.11g)		
Transmit Frequency Range:	2412 MHz to 2462 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	2412	1
	Middle	2437	6
	Top	2462	11
Receive Frequency Range:	2412 MHz to 2462 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	2412	1
	Middle	2437	6
	Top	2462	11

3.5. Support Equipment

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

Description:	USB to SPI Converter
Model Name or Number:	CSR plc – 1324 USB <> SPI Converter
Serial Number:	10159

Description:	SPI Voltage Level Shifter
Model Name or Number:	SPI4001
Serial Number:	None Stated
Hardware Version Number:	V2.0

Description:	CSR UniFI Test PC Software Suite
Model Name or Number:	Unitest V5.0
Serial Number:	N/A
Software Version Number:	V5.0

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 operating at maximum output power with a modulated carrier. The highest data rate per modulation scheme was tested and the modulations / data rates tested were:
 - 9 Mbps – BPSK
 - 18 Mbps – QPSK
 - 11 Mbps – CCK
 - 36 Mbps – 16QAM
 - 54 Mbps – 64QAM
- Standby mode the EUT was not transmitting for all testing. The receiver was set to wait for a beacon signal from a 802.11 access point.

4.2. Configuration and Peripherals

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

- Transceiver mode: A support laptop was connected to the communications interface board, which in turn, was connected to the EUT. The EUT was put through the different modulation schemes available, and the worse case selected for each test case. The EUT was powered by a 3.0 to 3.3 V DC bench supply, in addition, the communications interface board was powered by a 5 V DC supply from the support laptop via a USB cable, which also provided the communications interface directly to the EUT.
- Standby mode: The support laptop set the EUT into standby mode searching for a beacon from a wireless 802.11 access point. The transmitter of the EUT was not operational at any time whilst in this mode. The EUT was powered by a 3.0 to 3.3 V DC bench supply, in addition, the communications interface board was powered by a 5 V DC supply from the support laptop via the USB cable, which also provided the communications interface directly to the EUT.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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

5.2. Test Results**5.3. Standby AC Conducted Spurious Emissions****Test Summary:**

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

Environmental Conditions:

Temperature Range (°C):	24
Relative Humidity Range (%):	40

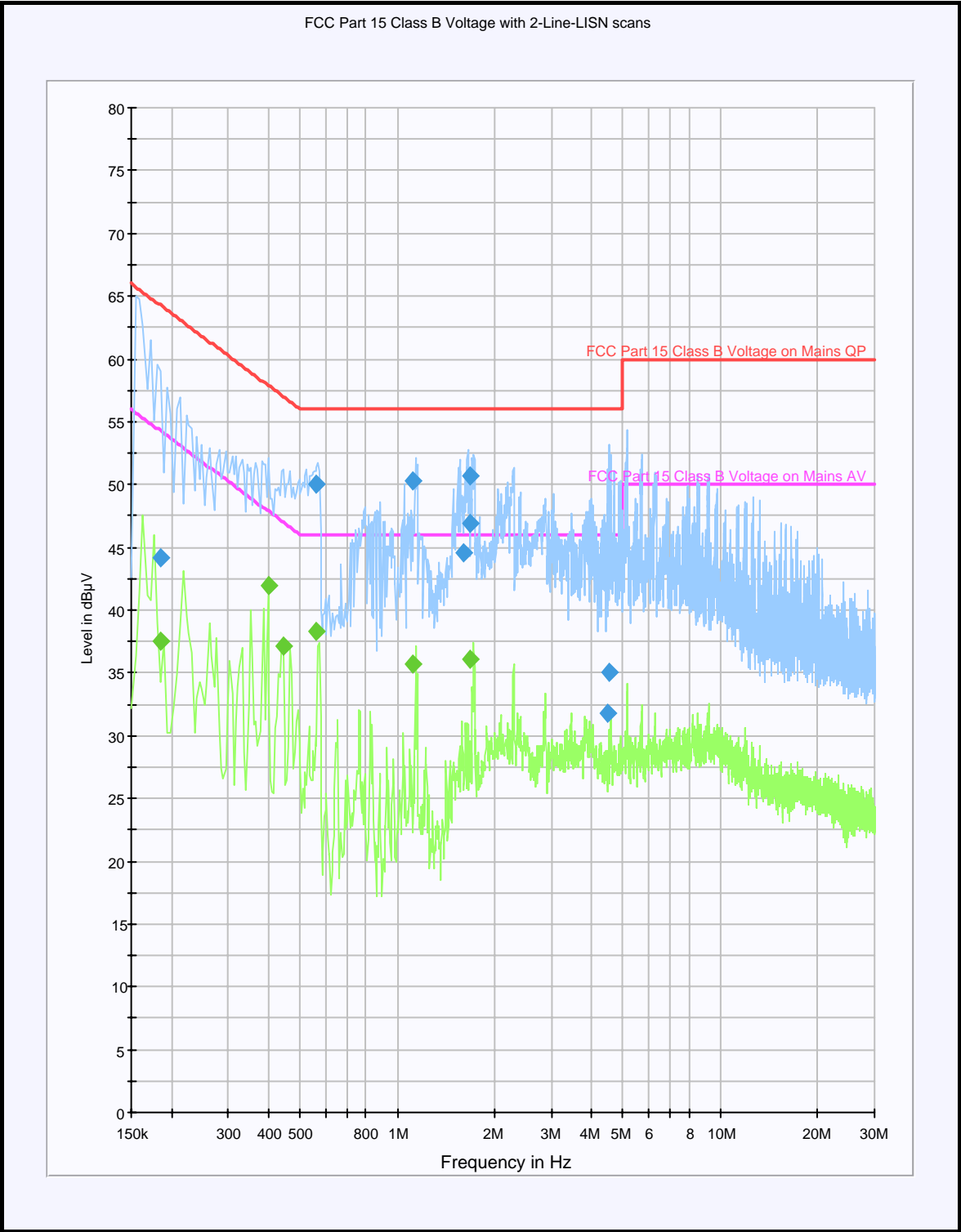
Results: Quasi Peak Detector Measurements

Frequency (MHz)	Line	Quasi Peak Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.186000	Neutral	44.2	64.2	20.0	Complied
0.559500	Live 1	50.1	56.0	5.9	Complied
1.117500	Live 1	50.3	56.0	5.7	Complied
1.603500	Live 1	44.5	56.0	11.5	Complied
1.680000	Live 1	50.6	56.0	5.4	Complied
1.684500	Live 1	47.0	56.0	9.0	Complied
4.501500	Live 1	31.8	56.0	24.2	Complied
4.515000	Live 1	35.0	56.0	21.0	Complied

Results: Average Detector Measurements

Frequency (MHz)	Line	Average Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.186000	Neutral	37.6	54.2	16.6	Complied
0.397500	Neutral	42.0	47.9	5.9	Complied
0.442500	Neutral	37.2	47.0	9.8	Complied
0.559500	Live 1	38.3	46.0	7.7	Complied
1.117500	Live 1	35.7	46.0	10.4	Complied
1.675500	Live 1	36.1	46.0	9.9	Complied

Standby AC Conducted Spurious Emissions (continued)



5.4. Standby Radiated Spurious Emissions**Test Summary:**

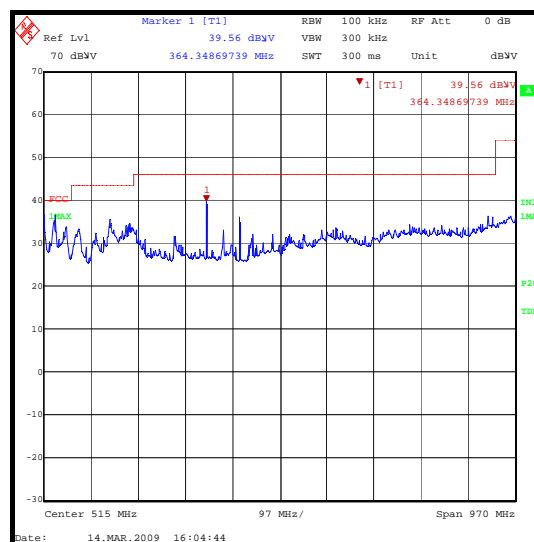
FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	30 to 1000 MHz

Environmental Conditions:

Temperature Range (°C):	24
Relative Humidity Range (%):	29

Results:

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
30.942	Vertical	24.7	40.0	15.3	Complied
53.327	Vertical	25.9	40.0	14.1	Complied
166.072	Vertical	20.2	43.5	23.3	Complied
364.349	Vertical	36.8	47.0	10.2	Complied
400.001	Vertical	25.1	47.0	21.9	Complied
432.385	Vertical	31.5	47.0	15.5	Complied



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

Standby Radiated Spurious Emissions (continued)**Test Summary:**

FCC Part:	15.109
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes
Frequency Range:	1 to 12.75 GHz

Environmental Conditions:

Temperature Range (°C):	24
Relative Humidity Range (%):	29

Results: Highest Peak Level

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
12.445	Vertical	41.2	12.8	54.0	74.0	20.0	Complied

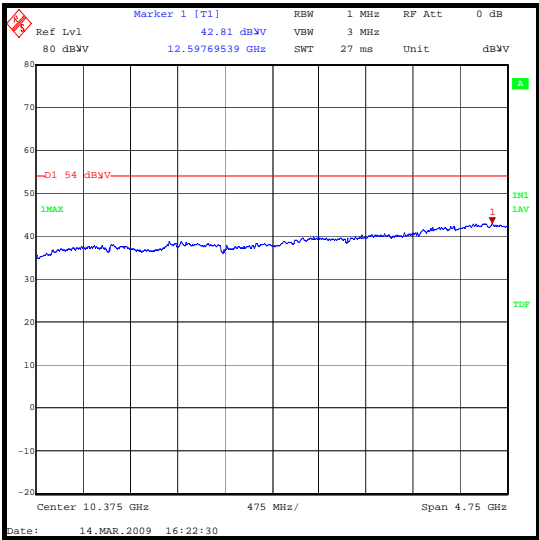
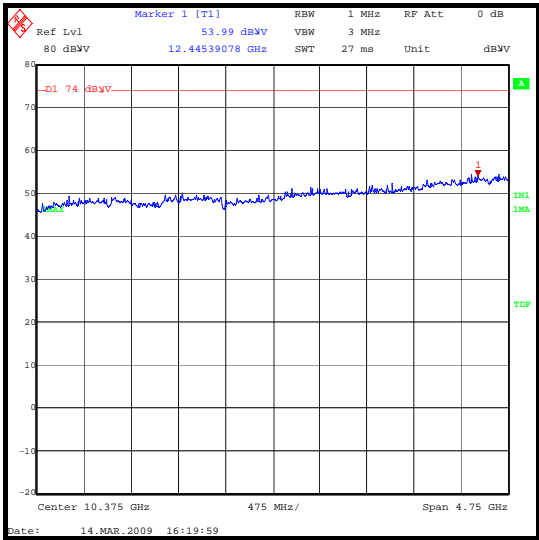
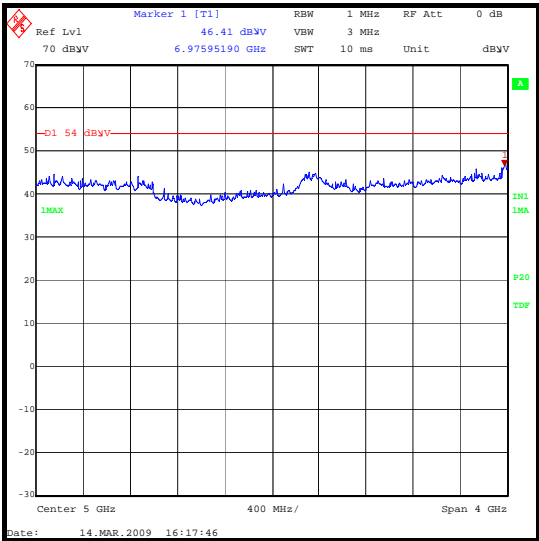
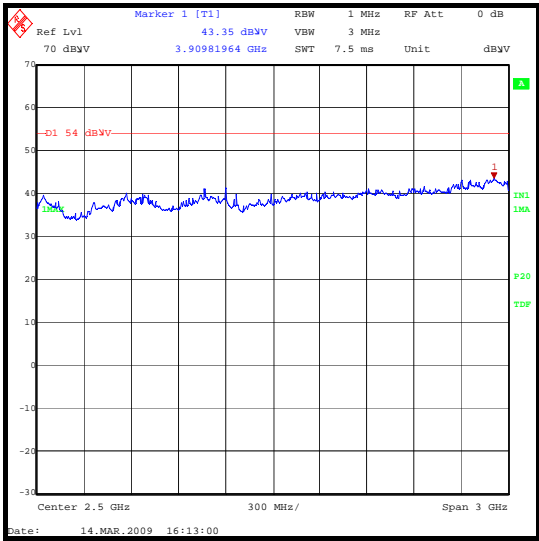
Results: Highest Average Level

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
12.598	Vertical	30.0	12.8	42.8	54.0	11.2	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.

Standby Radiated Spurious Emissions (continued)



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

5.5. Transmitter 6 dB Bandwidth:**Test Summary:**

FCC Part:	15.247(a)(2)
Test Method Used:	FCC CFR Part 2

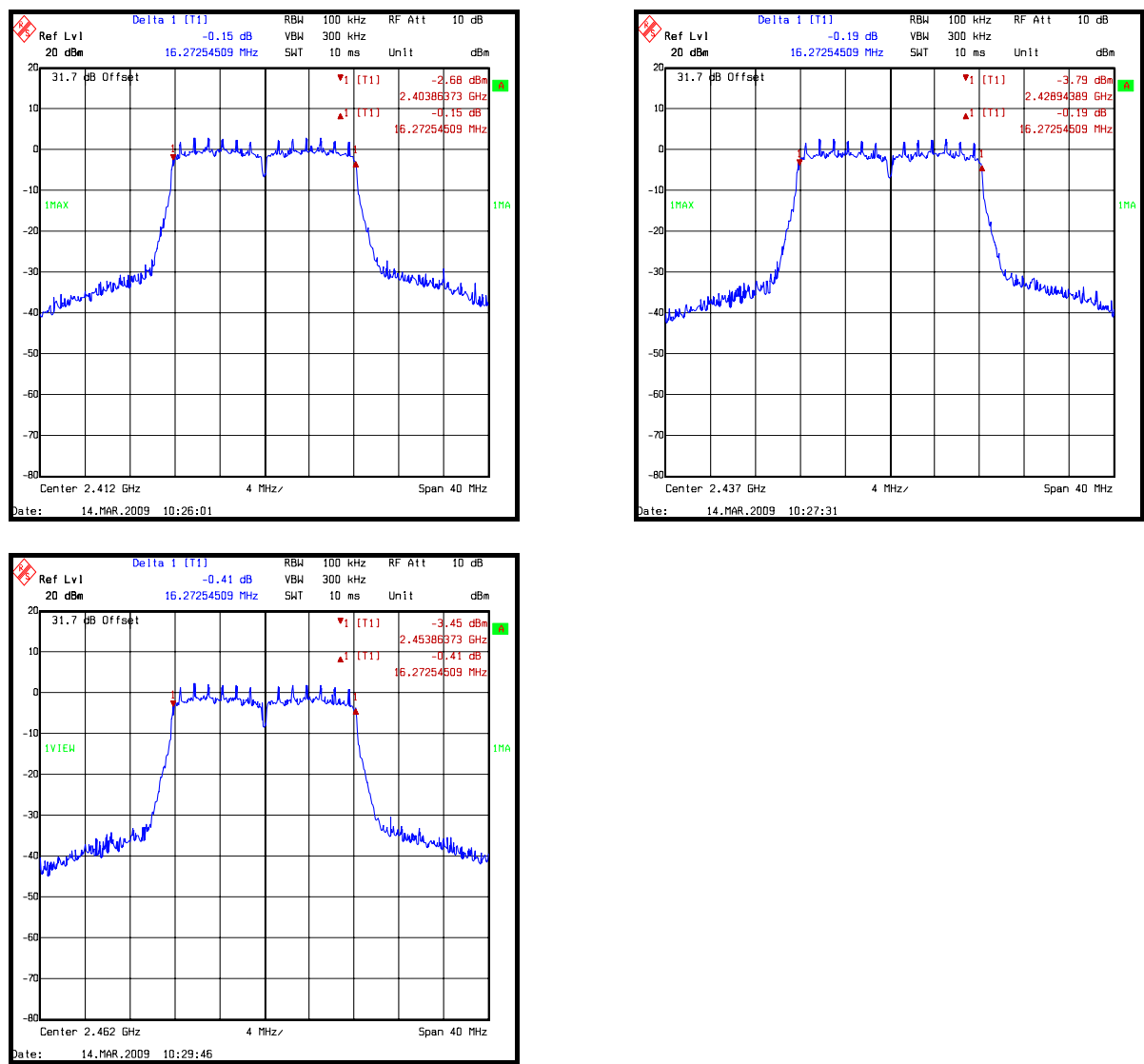
Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 9 Mbps - BPSK

Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.273	≥ 0.5	15.773	Complied
Middle	16.273	≥ 0.5	15.773	Complied
Top	16.273	≥ 0.5	15.773	Complied

Transmitter 6 dB Bandwidth (continued)



Transmitter Minimum 6 dB Bandwidth (continued)**Test Summary:**

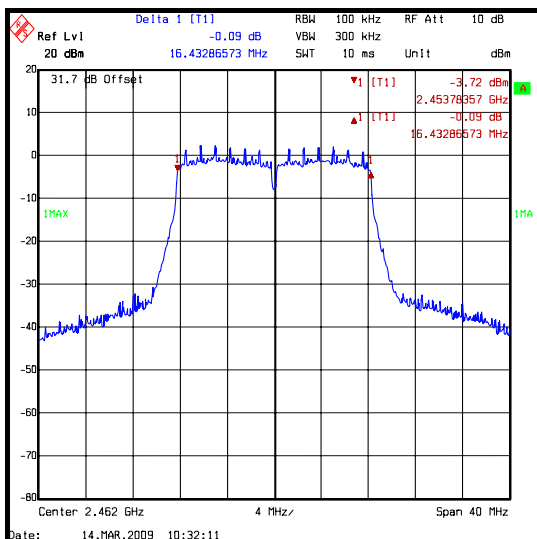
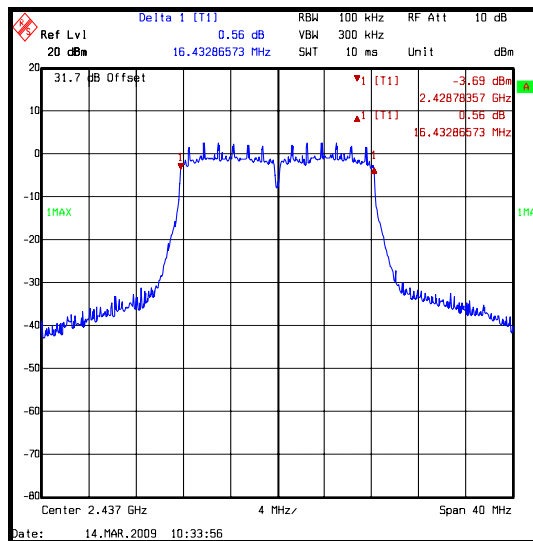
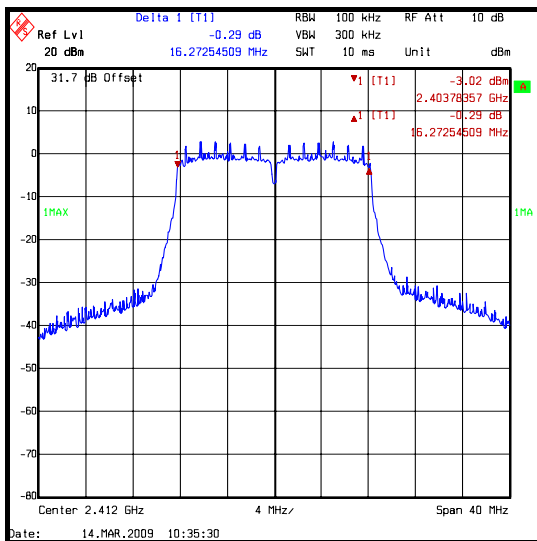
FCC Part:	15.247(a)(2)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 18 Mbps - QPSK

Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.273	≥ 0.5	15.773	Complied
Middle	16.433	≥ 0.5	15.933	Complied
Top	16.433	≥ 0.5	15.933	Complied



Transmitter Minimum 6 dB Bandwidth (continued)**Test Summary:**

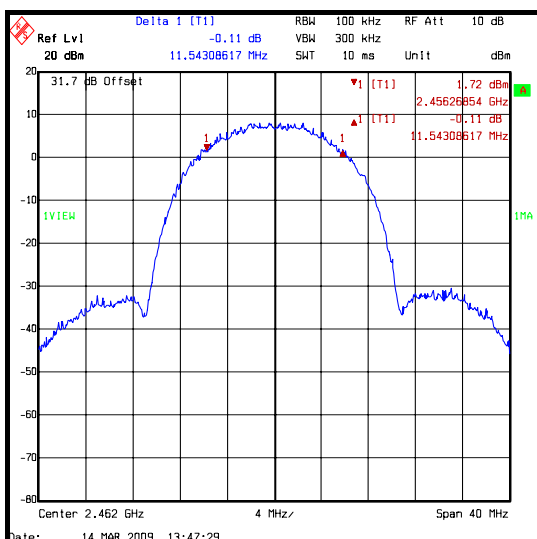
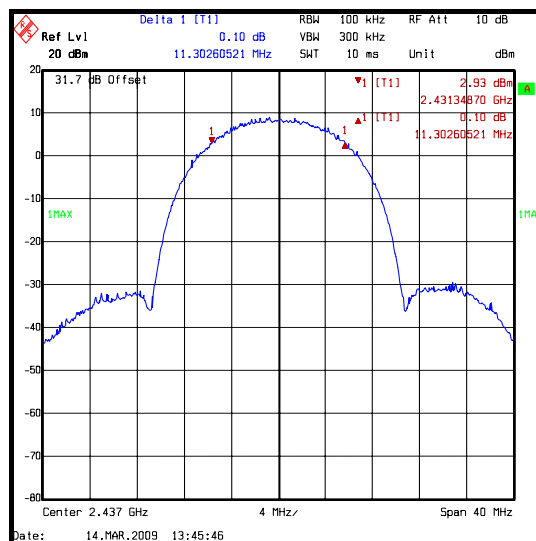
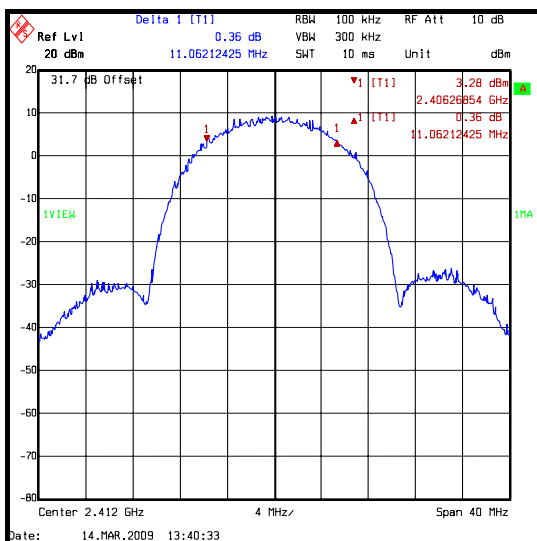
FCC Part:	15.247(a)(2)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 11 Mbps - CCK

Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	11.062	≥ 0.5	10.562	Complied
Middle	11.302	≥ 0.5	10.802	Complied
Top	11.543	≥ 0.5	11.043	Complied



Transmitter Minimum 6 dB Bandwidth (continued)**Test Summary:**

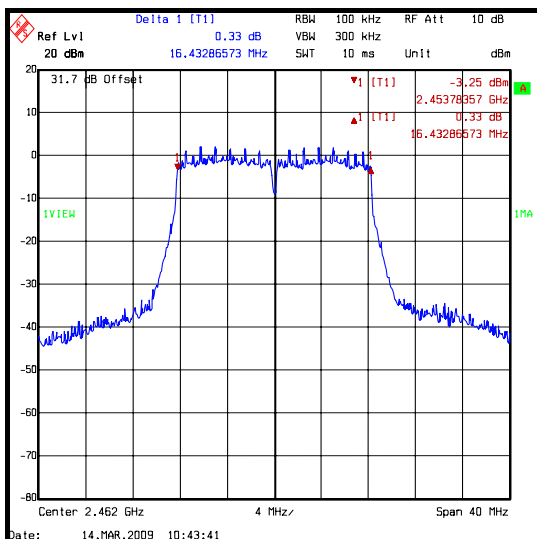
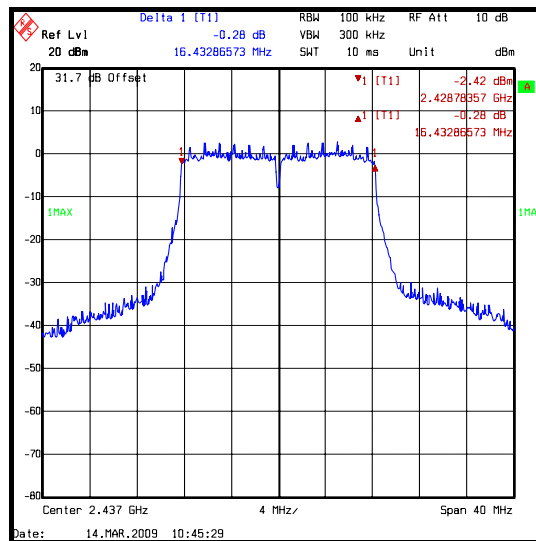
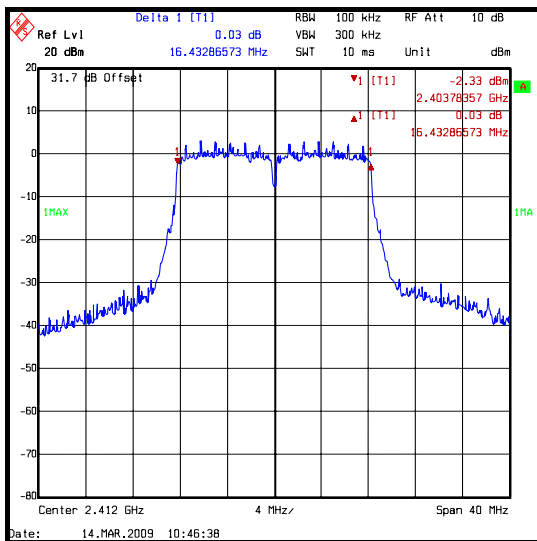
FCC Part:	15.247(a)(2)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 36 Mbps – 16QAM

Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.433	≥ 0.5	15.933	Complied
Middle	16.433	≥ 0.5	15.933	Complied
Top	16.433	≥ 0.5	15.933	Complied



Transmitter Minimum 6 dB Bandwidth (continued)**Test Summary:**

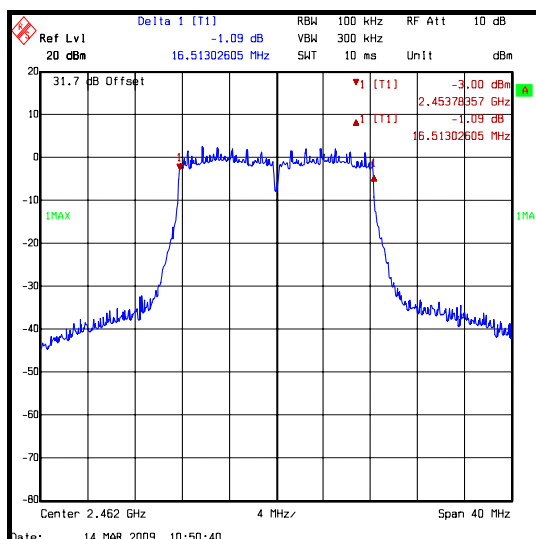
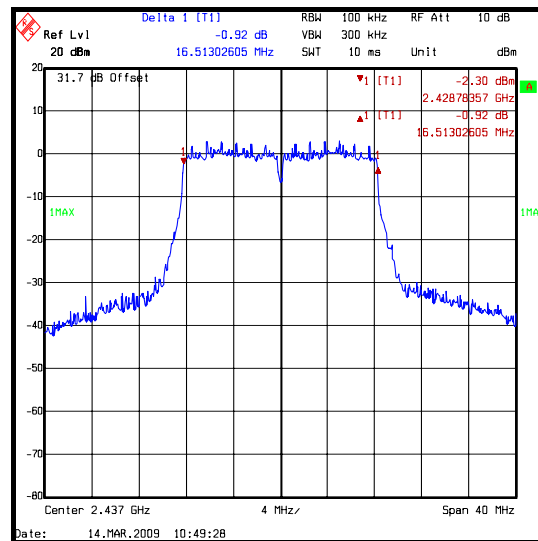
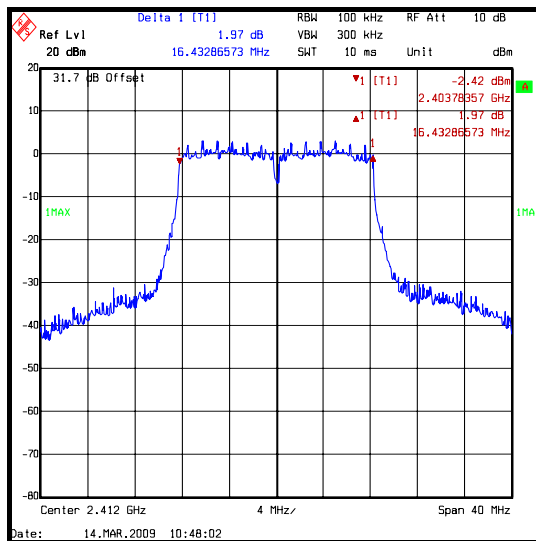
FCC Part:	15.247(a)(2)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 54 Mbps – 64QAM

Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	16.433	≥ 0.5	15.933	Complied
Middle	16.513	≥ 0.5	16.013	Complied
Top	16.513	≥ 0.5	16.013	Complied



5.6. Transmitter 20 dB Bandwidth**Test Summary:**

FCC Part:	2.1049
Test Method Used:	As detailed in ANSI C63.4 Section 13 and relevant annexes

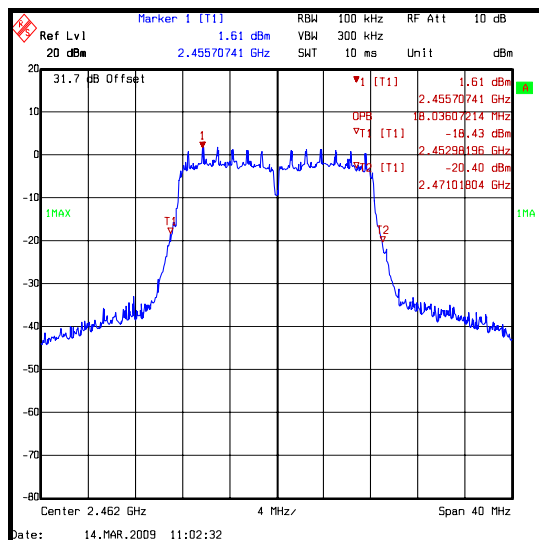
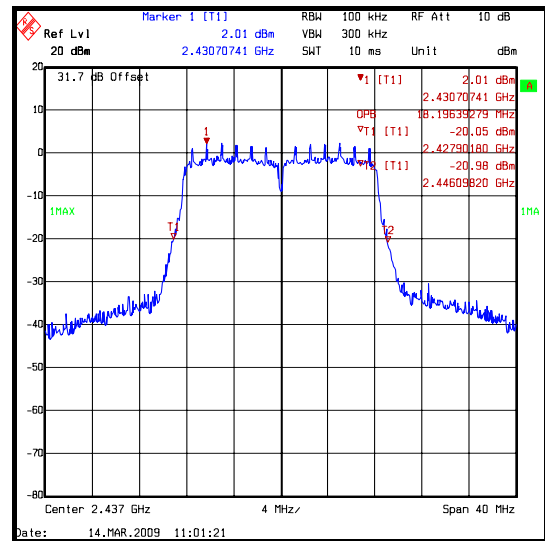
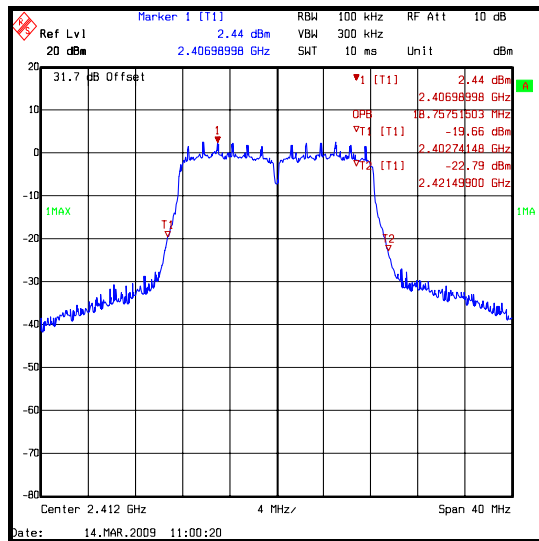
Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 9 Mbps - BPSK

Channel	20 dB Bandwidth (kHz)
Bottom	18757.515
Middle	18276.553
Top	18196.393

Transmitter 20 dB Bandwidth (continued)



Transmitter 20 dB Bandwidth (continued)**Test Summary:**

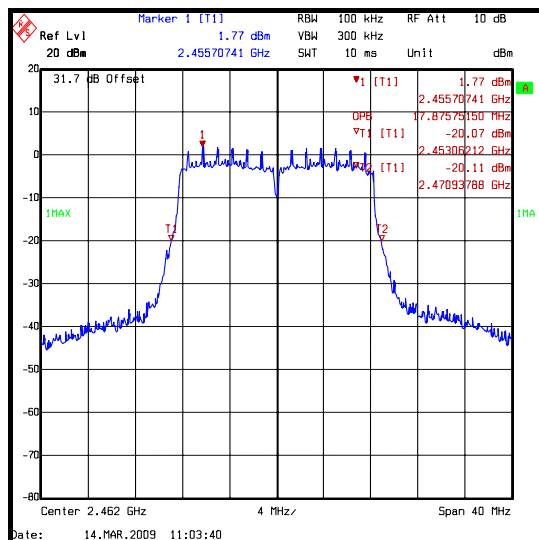
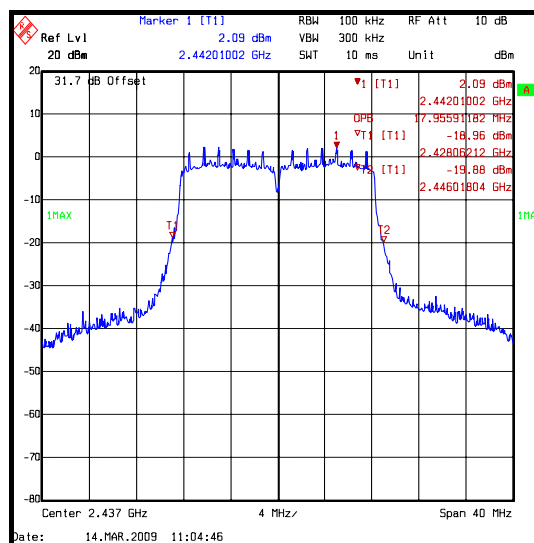
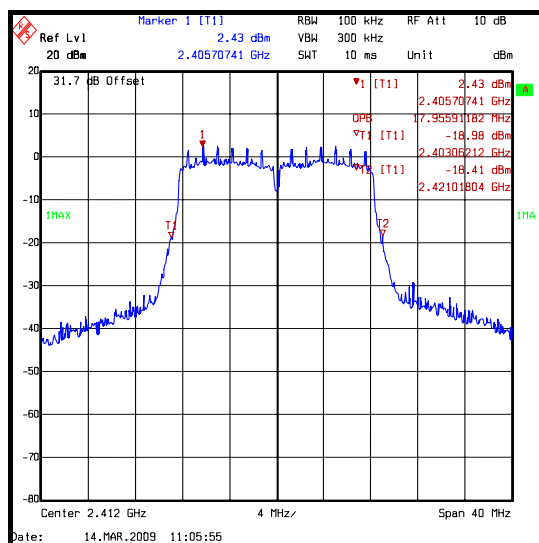
FCC Part:	2.1049
Test Method Used:	As detailed in ANSI C63.4 Section 13 and relevant annexes

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 18 Mbps - QPSK

Channel	20 dB Bandwidth (kHz)
Bottom	17955.912
Middle	17955.912
Top	17875.752



Transmitter 20 dB Bandwidth (continued)**Test Summary:**

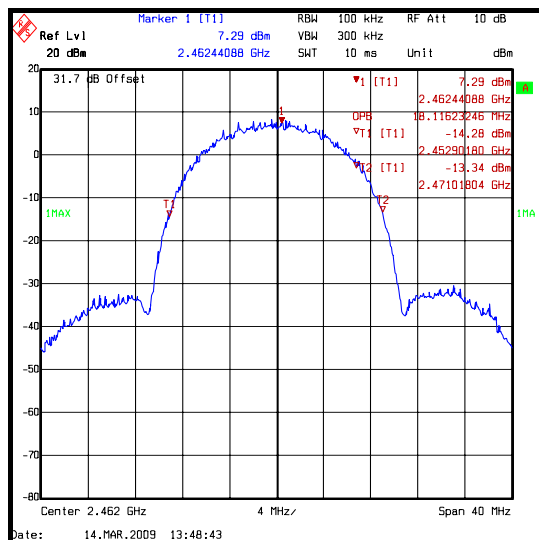
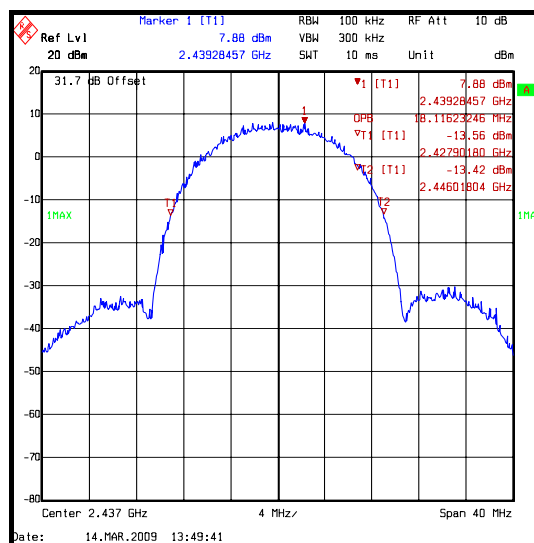
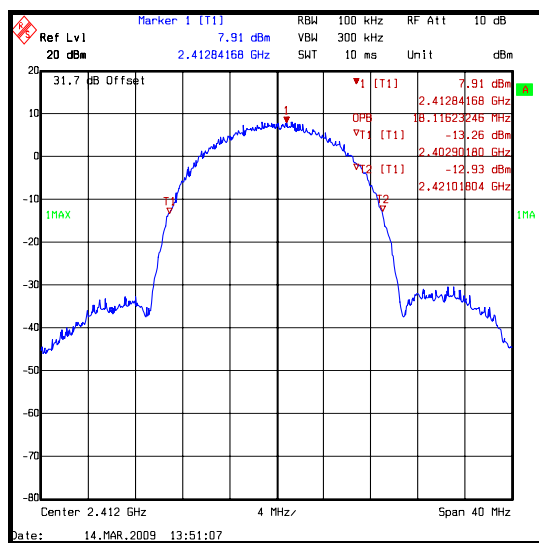
FCC Part:	2.1049
Test Method Used:	As detailed in ANSI C63.4 Section 13 and relevant annexes

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 11 Mbps - CCK

Channel	20 dB Bandwidth (kHz)
Bottom	18116.233
Middle	18116.233
Top	18116.233



Transmitter 20 dB Bandwidth (continued)

Test Summary:

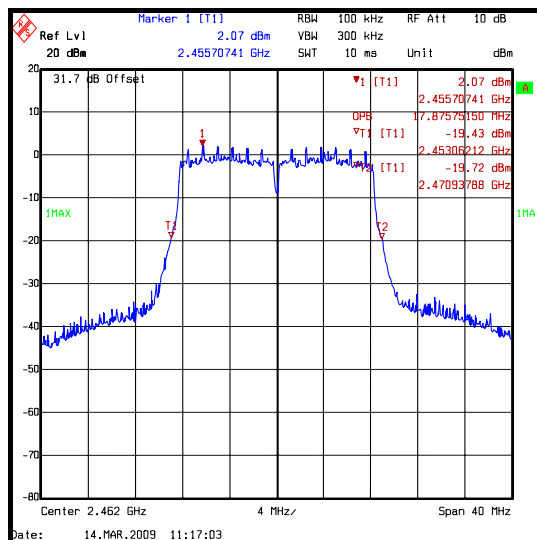
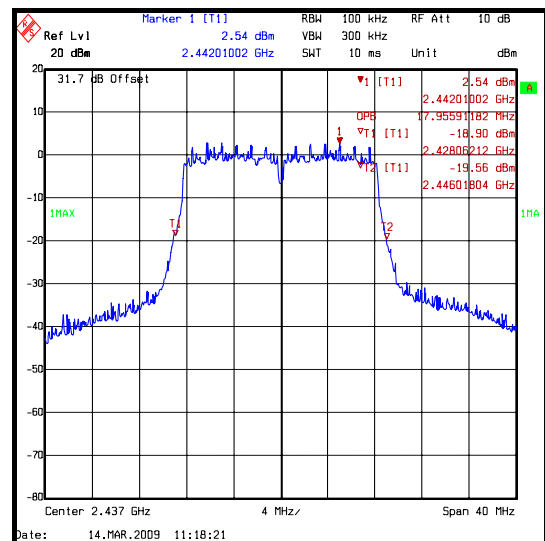
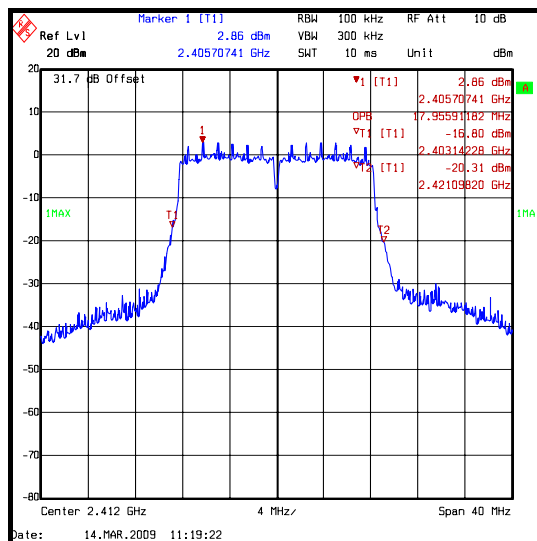
FCC Part:	2.1049
Test Method Used:	As detailed in ANSI C63.4 Section 13 and relevant annexes

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 36 Mbps – 16QAM

Channel	20 dB Bandwidth (kHz)
Bottom	18036.072
Middle	17955.912
Top	17875.752



Transmitter 20 dB Bandwidth (continued)**Test Summary:**

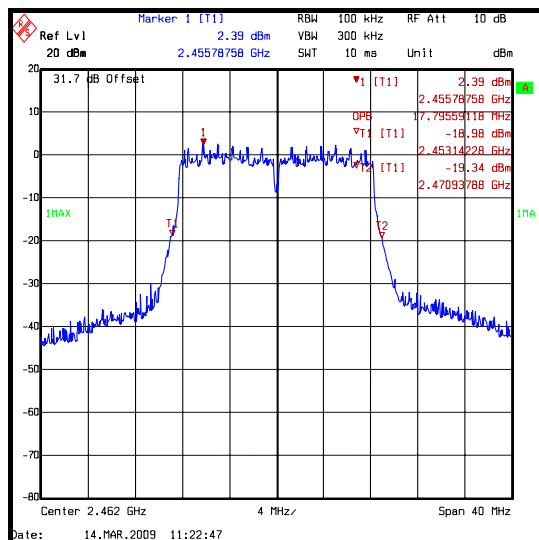
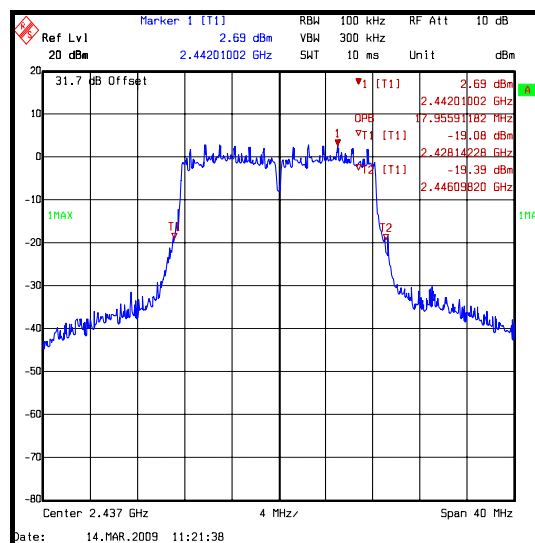
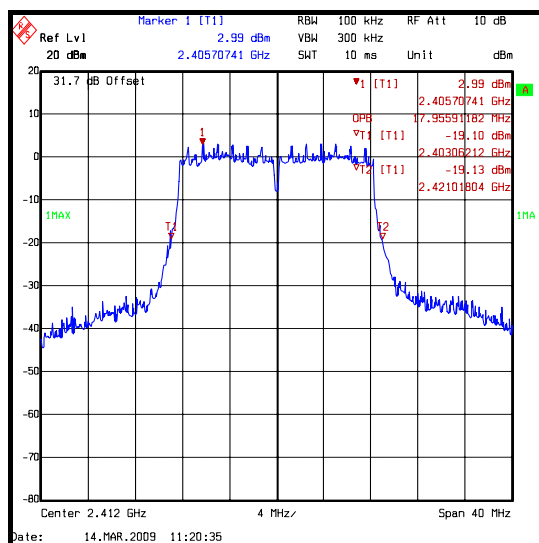
FCC Part:	2.1049
Test Method Used:	As detailed in ANSI C63.4 Section 13 and relevant annexes

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 54 Mbps – 64QAM

Channel	20 dB Bandwidth (kHz)
Bottom	17955.912
Middle	17955.912
Top	17795.592



5.7. Transmitter Peak Power Spectral Density

Test Summary:

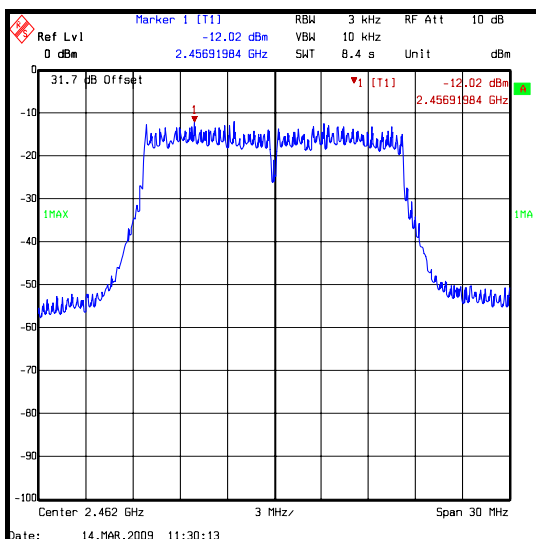
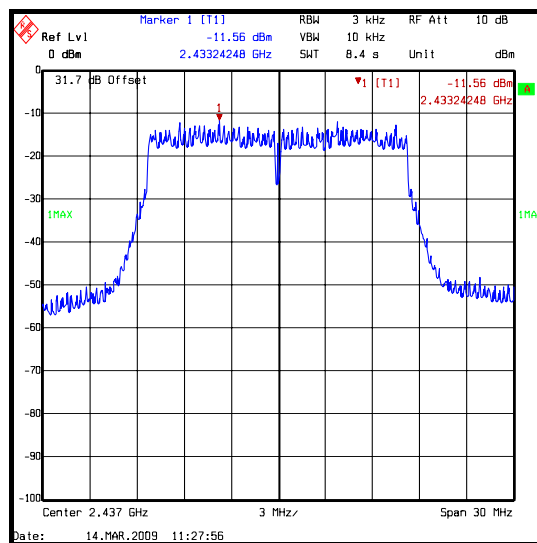
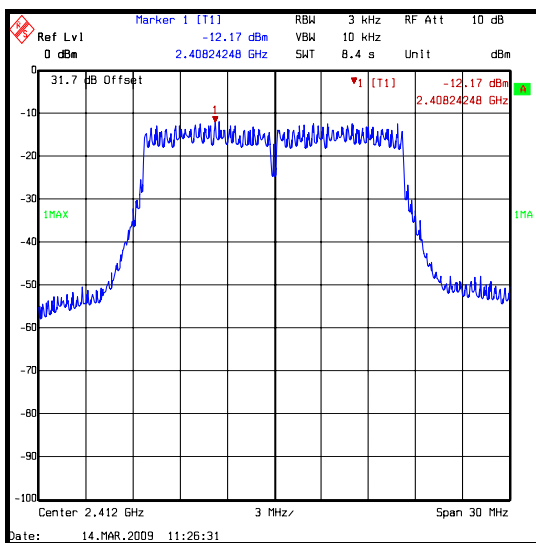
FCC Part:	15.247(e)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 9 Mbps - BPSK

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-12.2	8.0	20.2	Complied
Middle	-11.6	8.0	19.6	Complied
Top	-12.0	8.0	20.0	Complied



Transmitter Peak Power Spectral Density (continued)**Test Summary:**

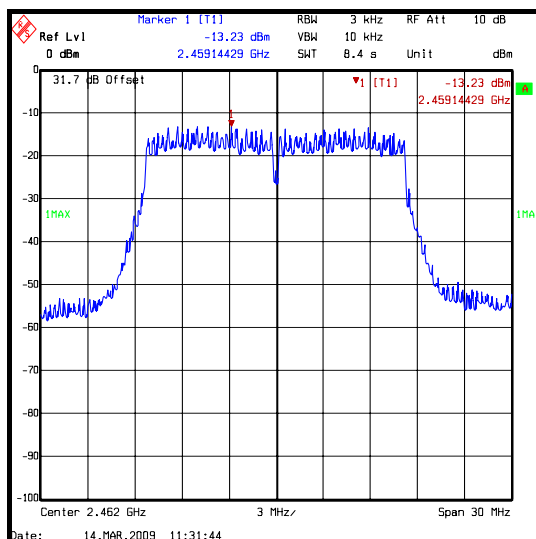
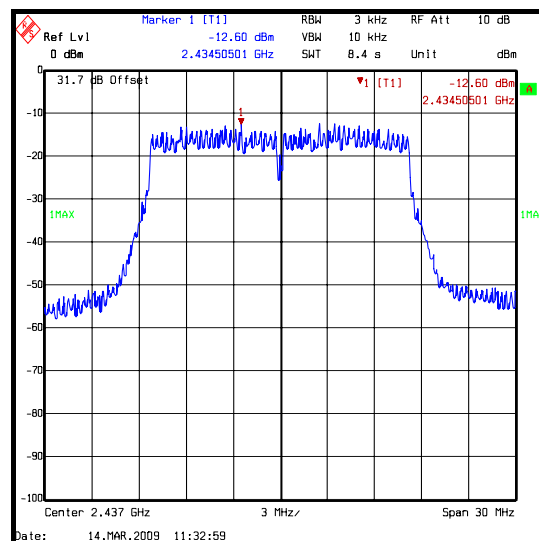
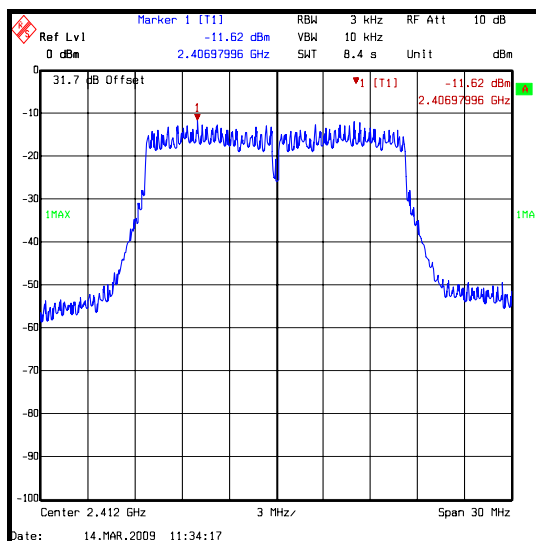
FCC Part:	15.247(e)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 18 Mbps - QPSK

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-11.6	8.0	19.6	Complied
Middle	-12.6	8.0	20.6	Complied
Top	-13.2	8.0	21.2	Complied



Transmitter Peak Power Spectral Density (continued)**Test Summary:**

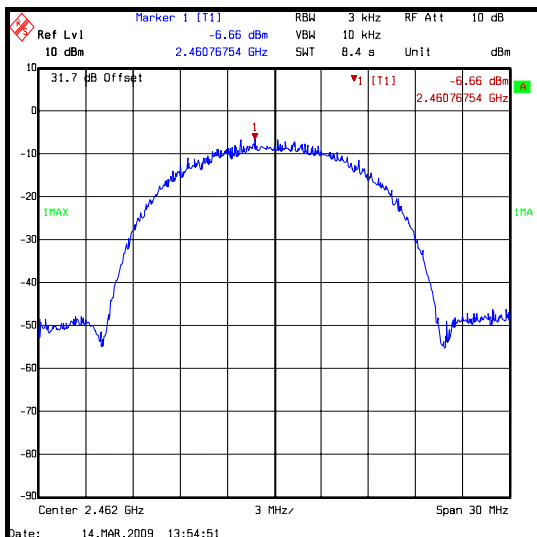
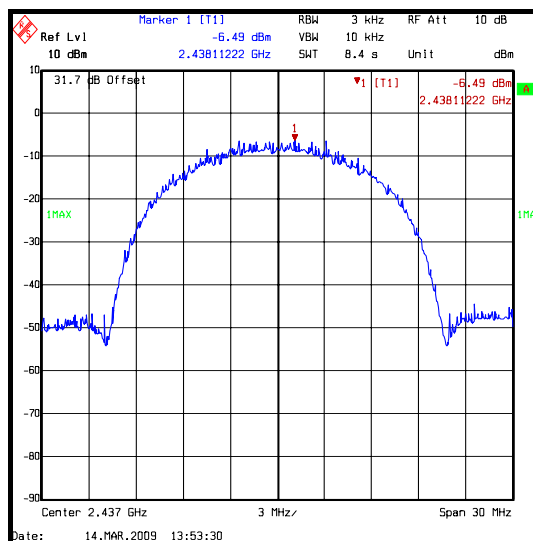
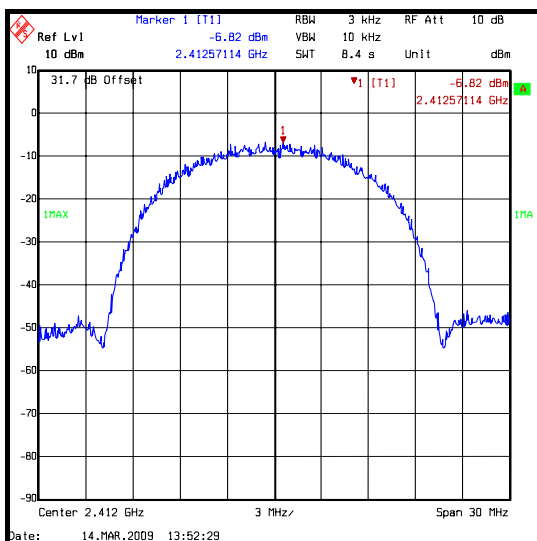
FCC Part:	15.247(e)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 11 Mbps - CCK

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-6.8	8.0	14.8	Complied
Middle	-6.5	8.0	14.5	Complied
Top	-6.7	8.0	14.7	Complied



Transmitter Peak Power Spectral Density (continued)**Test Summary:**

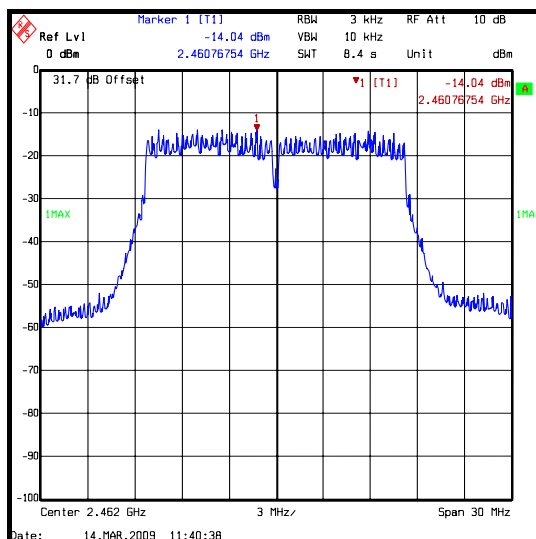
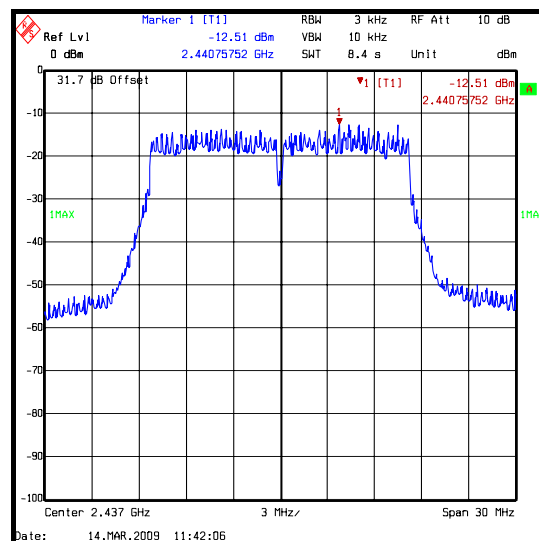
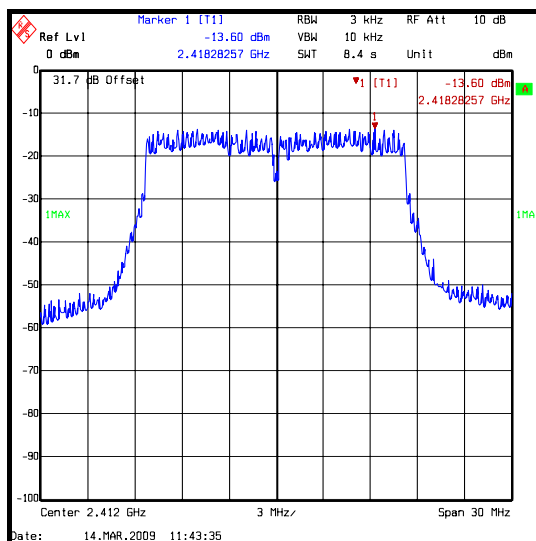
FCC Part:	15.247(e)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 36 Mbps – 16QAM

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-13.6	8.0	21.6	Complied
Middle	-12.5	8.0	20.5	Complied
Top	-14.0	8.0	22.0	Complied



Transmitter Peak Power Spectral Density (continued)**Test Summary:**

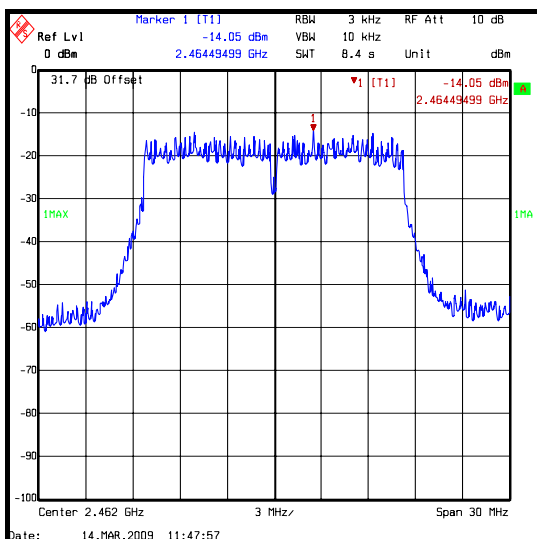
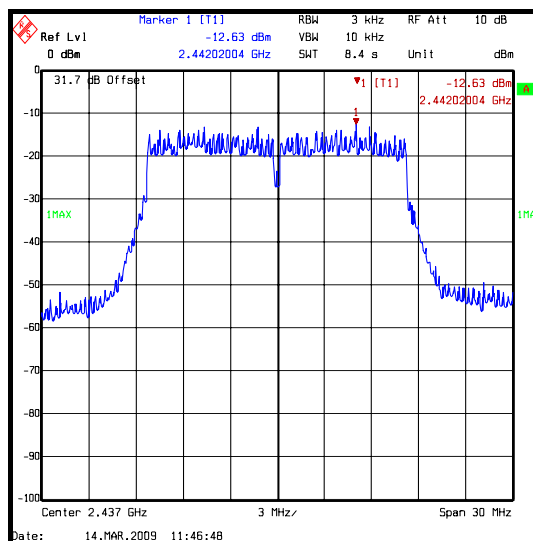
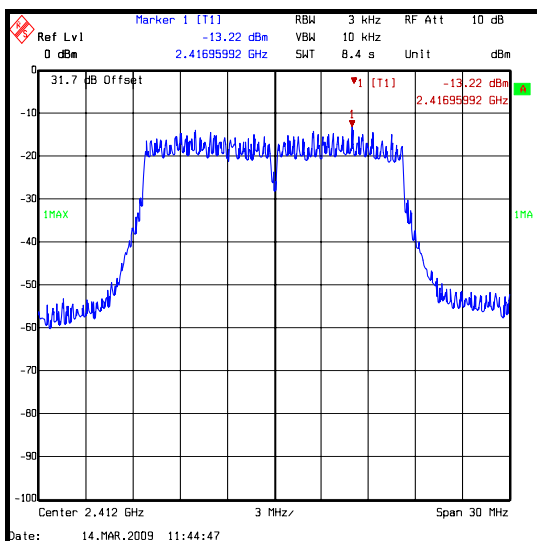
FCC Part:	15.247(e)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 54 Mbps – 64QAM

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-13.2	8.0	21.2	Complied
Middle	-12.6	8.0	20.6	Complied
Top	-14.1	8.0	22.1	Complied



5.8. Transmitter Maximum Peak Output Power (EIRP)**Test Summary:**

FCC Part:	15.247(b)(3)
Test Method Used:	ANSI TIA-603-C-2004 and FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 9 Mbps - BPSK

Channel	Voltage (V)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	102	13.8	30.0	16.2	Complied
Bottom	138	13.8	30.0	16.2	Complied
Middle	102	13.7	30.0	16.3	Complied
Middle	138	13.7	30.0	16.3	Complied
Top	102	13.2	30.0	16.8	Complied
Top	138	13.2	30.0	16.8	Complied

Transmitter Maximum Peak Output Power (EIRP) (continued)**Test Summary:**

FCC Part:	15.247(b)(3)
Test Method Used:	ANSI TIA-603-C-2004 and FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 18 Mbps - QPSK

Channel	Voltage (V)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	102	13.3	30.0	16.7	Complied
Bottom	138	13.3	30.0	16.7	Complied
Middle	102	13.1	30.0	16.9	Complied
Middle	138	13.1	30.0	16.9	Complied
Top	102	12.8	30.0	17.2	Complied
Top	138	12.8	30.0	17.2	Complied

Transmitter Maximum Peak Output Power (EIRP) (continued)**Test Summary:**

FCC Part:	15.247(b)(3)
Test Method Used:	ANSI TIA-603-C-2004 and FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 11 Mbps - CCK

Channel	Voltage (V)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	102	18.3	30.0	11.7	Complied
Bottom	138	18.3	30.0	11.7	Complied
Middle	102	18.1	30.0	11.9	Complied
Middle	138	18.1	30.0	11.9	Complied
Top	102	18.4	30.0	11.6	Complied
Top	138	18.4	30.0	11.6	Complied

Transmitter Maximum Peak Output Power (EIRP) (continued)**Test Summary:**

FCC Part:	15.247(b)(3)
Test Method Used:	ANSI TIA-603-C-2004 and FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 36 Mbps – 16QAM

Channel	Voltage (V)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	102	12.7	30.0	17.3	Complied
Bottom	138	12.7	30.0	17.3	Complied
Middle	102	12.6	30.0	17.4	Complied
Middle	138	12.6	30.0	17.4	Complied
Top	102	12.2	30.0	17.8	Complied
Top	138	12.2	30.0	17.8	Complied

Transmitter Maximum Peak Output Power (EIRP) (continued)**Test Summary:**

FCC Part:	15.247(b)(3)
Test Method Used:	ANSI TIA-603-C-2004 and FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

Results: 54 Mbps – 64QAM

Channel	Voltage (V)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	102	12.3	30.0	17.7	Complied
Bottom	138	12.3	30.0	17.7	Complied
Middle	102	12.2	30.0	17.8	Complied
Middle	138	12.2	30.0	17.8	Complied
Top	102	11.8	30.0	18.2	Complied
Top	138	11.8	30.0	18.2	Complied

5.9. Transmitter Radiated Emissions

Test Summary:

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.4 Section 8
Frequency Range	30 to 1000 MHz

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	29

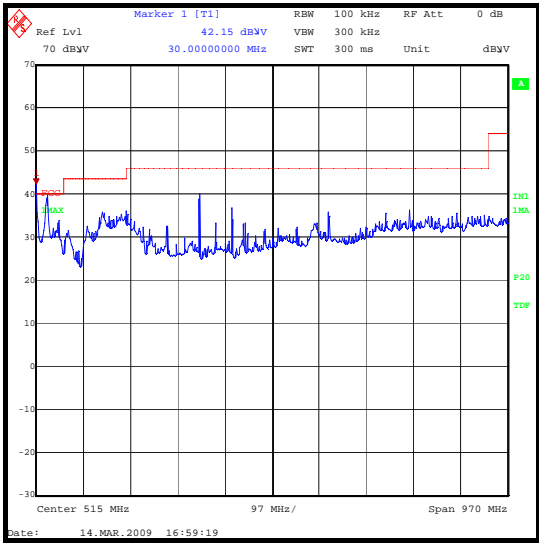
Results: Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
30.942	Vertical	31.4	40.0	8.6	Complied
49.439	Vertical	30.6	40.0	9.4	Complied
204.669	Vertical	23.4	43.5	20.1	Complied
366.293	Vertical	30.8	47.0	16.2	Complied
400.001	Vertical	22.9	47.0	24.1	Complied
432.384	Vertical	26.0	47.0	21.0	Complied
630.661	Vertical	21.7	47.0	25.3	Complied
797.836	Vertical	25.5	47.0	21.5	Complied

Note(s):

1. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the top channel only.

Transmitter Radiated Emissions (continued)



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

Transmitter Radiated Emissions (continued)**Test Summary:**

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.4 Section 8
Frequency Range	1 to 26 GHz (emissions occurring in the restricted bands)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Results: Highest Peak Level - Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.824	Vertical	53.2	-1.8	51.4	74.0	22.6	Complied
7.236	Horizontal	50.4	6.6	57.0	74.0	17.0	Complied

Results: Highest Average Level - Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.824	Vertical	34.6	-1.8	32.8	54.0	21.2	Complied
7.236	Horizontal	36.6	6.6	43.2	54.0	10.8	Complied

Results: Highest Peak Level - Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.874	Horizontal	52.5	-1.8	50.7	74.0	23.3	Complied
7.311	Horizontal	49.2	6.6	55.8	74.0	18.2	Complied

Results: Highest Average Level - Middle Channel

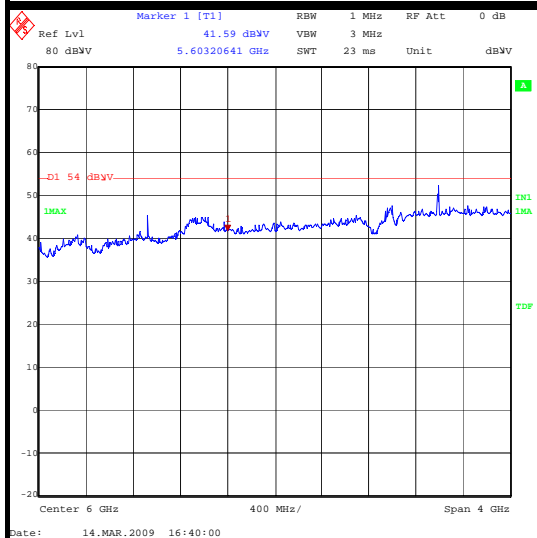
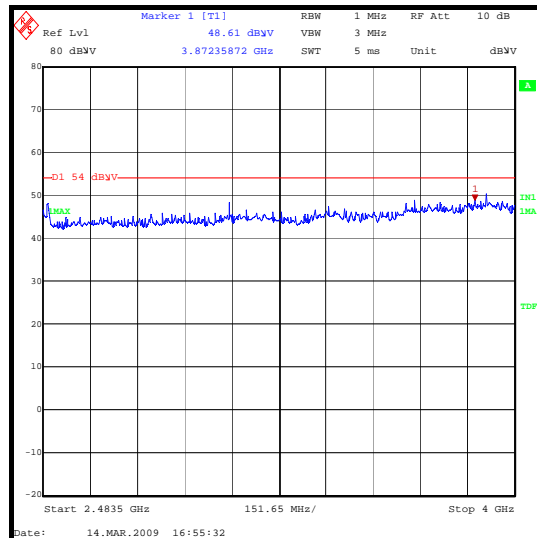
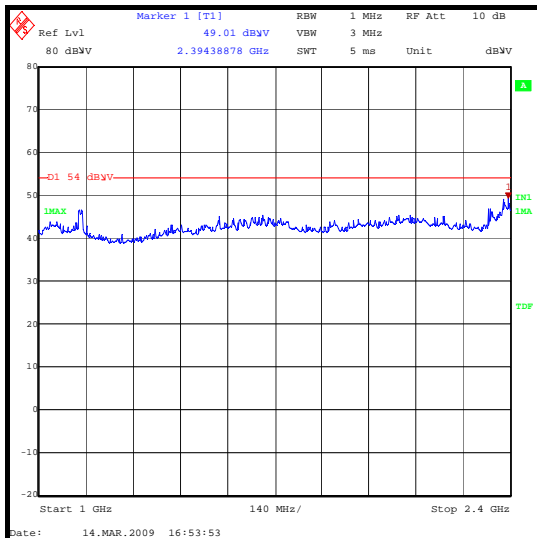
Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.874	Horizontal	33.8	-1.8	32.0	54.0	22.0	Complied
7.311	Horizontal	37.1	6.6	43.7	54.0	10.3	Complied

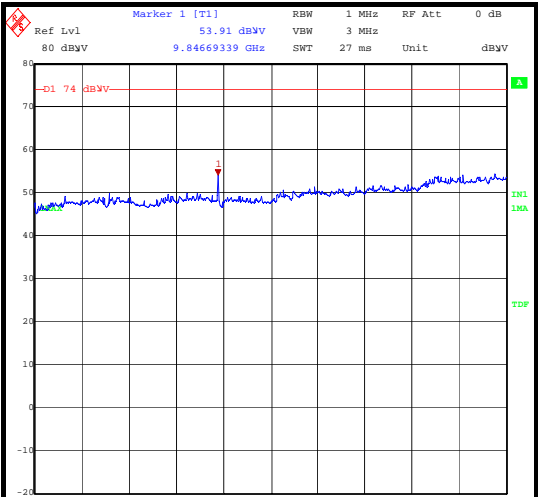
Results: Highest Peak Level - Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.924	Vertical	51.3	-1.8	49.5	74.0	24.5	Complied
7.386	Horizontal	48.7	6.6	55.3	74.0	18.7	Complied

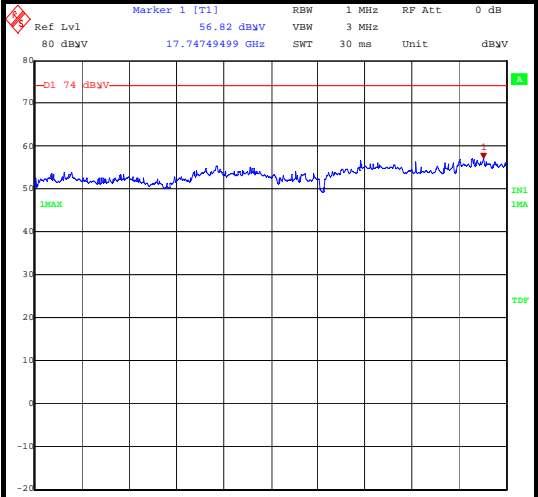
Transmitter Radiated Emissions (continued)**Results: Highest Average Level - Top Channel**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.924	Vertical	32.8	-1.8	31.0	54.0	23.0	Complied
7.386	Horizontal	36.1	6.6	42.7	54.0	11.3	Complied

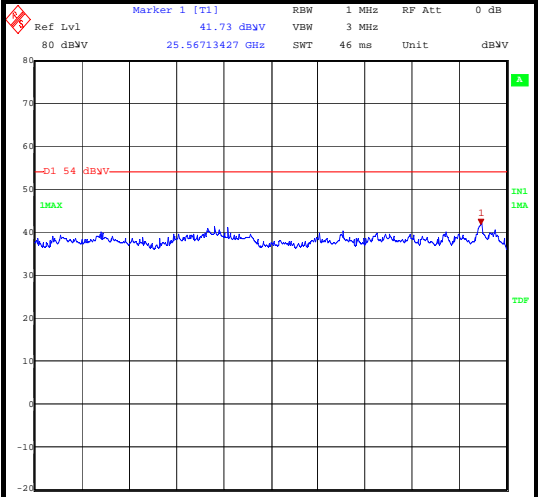




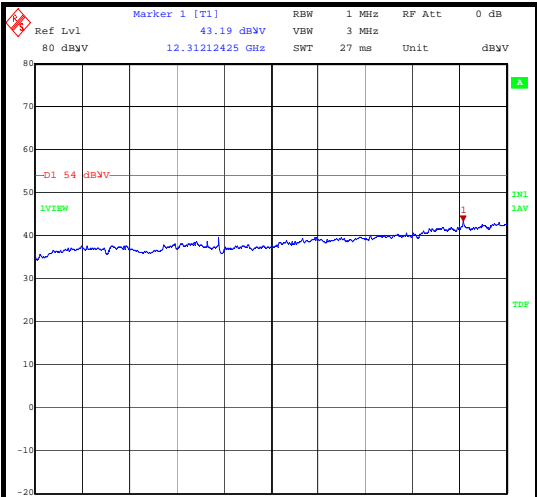
Date: 14.MAR.2009 16:37:25



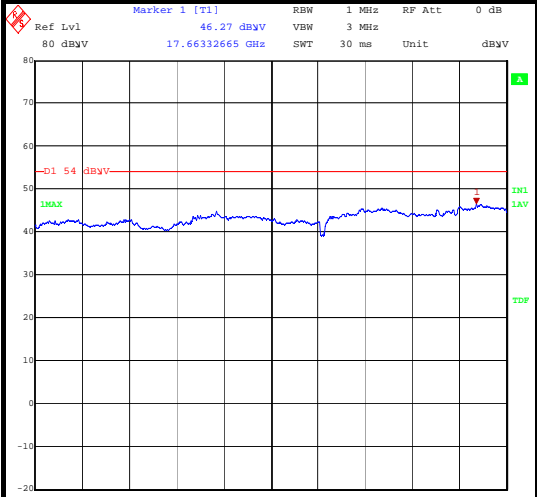
Date: 14.MAR.2009 16:33:03



Date: 16.MAR.2009 18:55:18



Date: 14.MAR.2009 16:38:53



Date: 14.MAR.2009 16:33:33

5.10. Transmitter Band Edge Radiated Emissions

Test Summary:

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

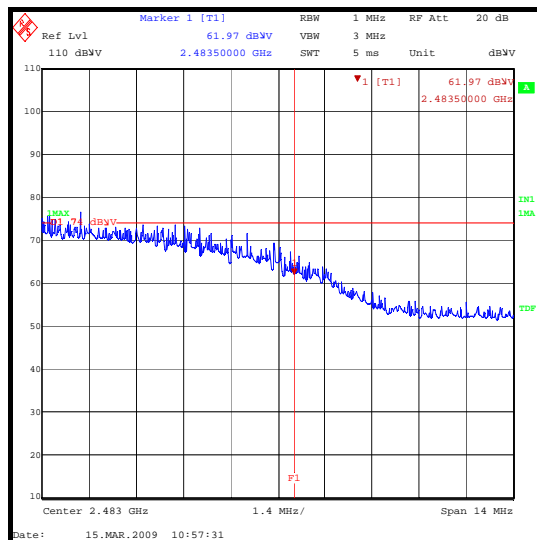
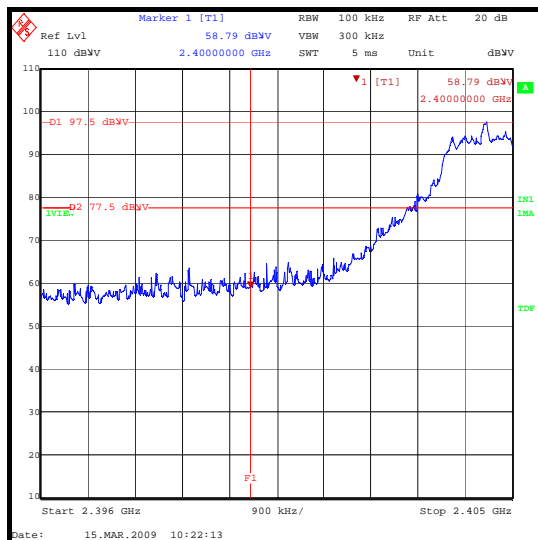
Temperature (°C):	22
Relative Humidity (%):	34

Results: 9 Mbps – BPSK. Peak Power Level

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400	Horizontal	59.0	-0.2	58.8	77.5*	18.7	Complied
2483.5	Horizontal	63.6	-0.2	63.4	74.0	10.6	Complied

*Note: -20 dBc limit

** Note: **Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands**



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

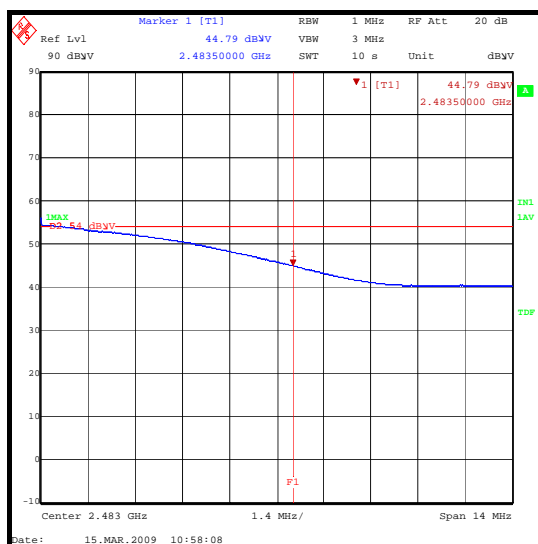
FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Results: 9 Mbps – BPSK. Average Power Level

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	45.0	-0.2	44.8	54.0	9.2	Complied



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

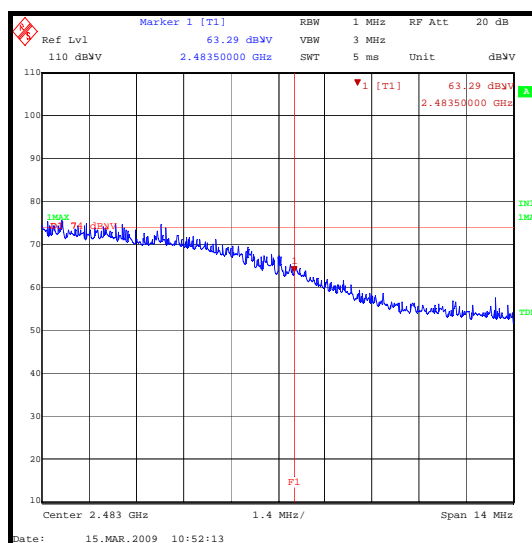
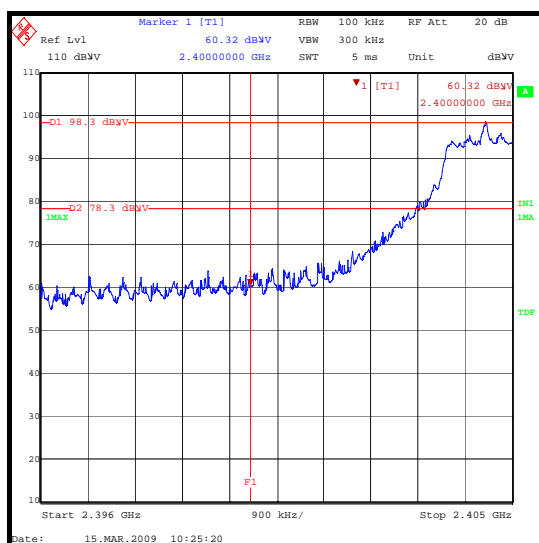
Temperature (°C):	22
Relative Humidity (%):	34

Results: 18 Mbps – QPSK. Peak Power Level

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400	Horizontal	60.5	-0.2	60.3	78.3*	18.0	Complied
2483.5	Horizontal	63.6	-0.2	63.4	74.0	10.6	Complied

*Note: -20 dBc limit

** Note: **Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands.**



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

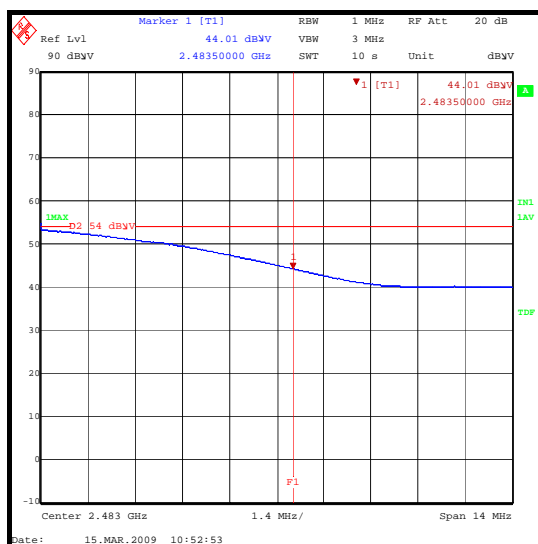
FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Results: 18 Mbps – QPSK. Average Power Level

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	44.2	-0.2	44.0	54.0	10.0	Complied



Transmitter Band Edge Radiated Emissions (continued)

Test Summary:

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

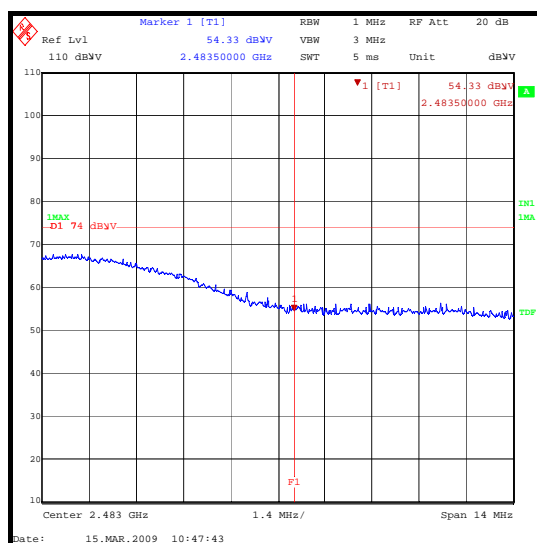
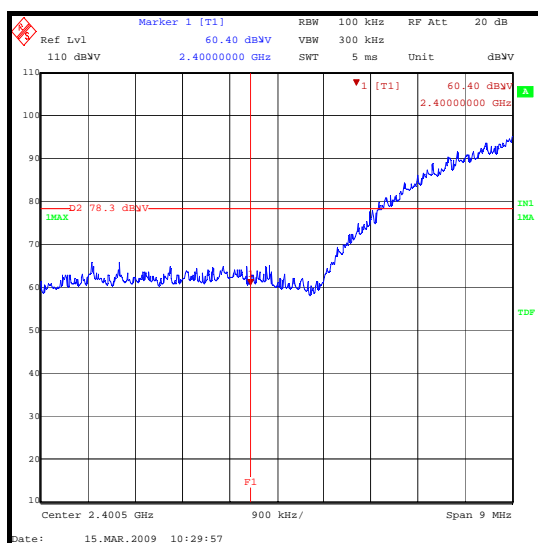
Temperature (°C):	22
Relative Humidity (%):	34

Results: 11 Mbps – CCK. Peak Power Level

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400	Horizontal	60.6	-0.2	60.4	78.3*	17.9	Complied
2483.5	Horizontal	54.8	-0.2	54.6	74.0	19.4	Complied

**Note: -20 dBc limit*

**** Note: Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands.**



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

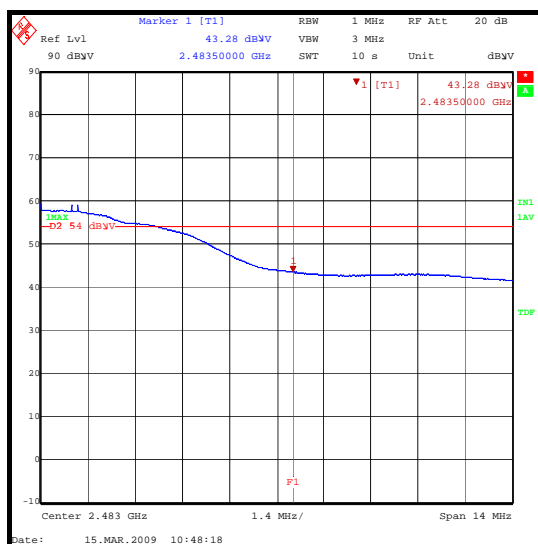
FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Results: 11 Mbps – CCK. Average Power Level

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	43.5	-0.2	43.3	54.0	10.7	Complied



Transmitter Band Edge Radiated Emissions (continued)

Test Summary:

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

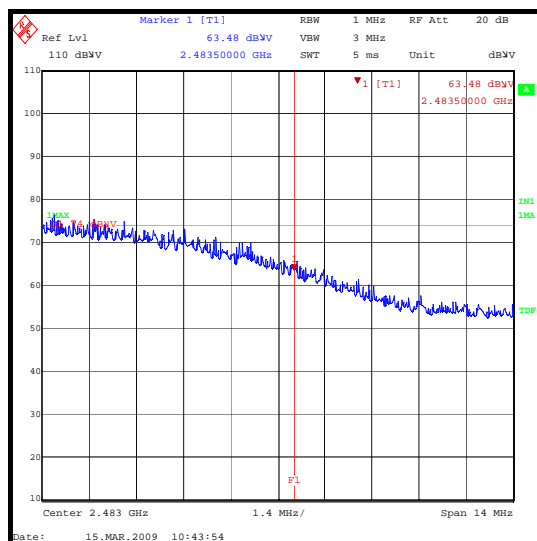
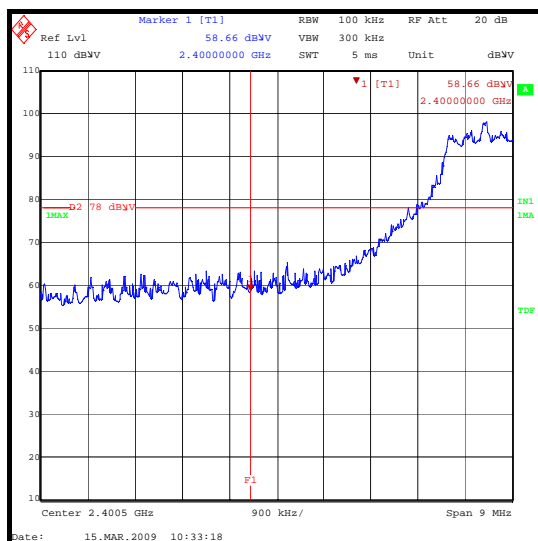
Temperature (°C):	22
Relative Humidity (%):	34

Results: 36 Mbps – 16QAM. Peak Power Level

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400	Horizontal	58.9	-0.2	58.7	78.0*	19.3	Complied
2483.5	Horizontal	63.7	-0.2	63.5	74.0	10.5	Complied

**Note: -20 dBc limit*

**** Note: Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands.**



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

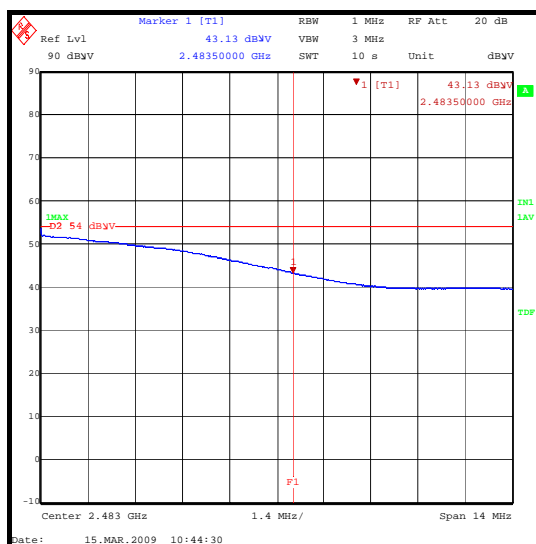
FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Results: 36 Mbps – 16QAM. Average Power Level

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Transducer Factor (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2483.5	Horizontal	43.3	-0.2	43.1	54.0	10.9	Complied



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

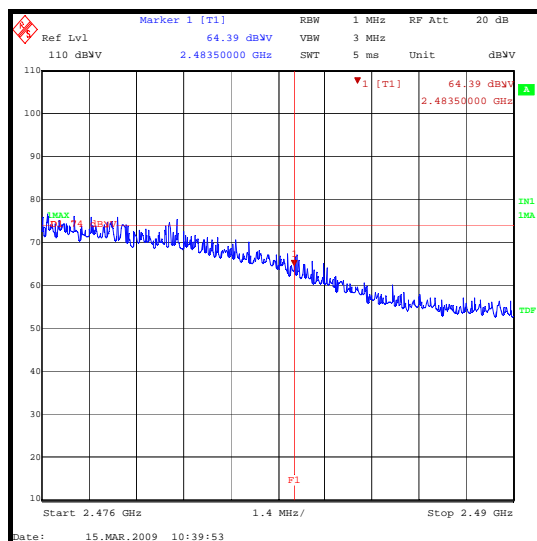
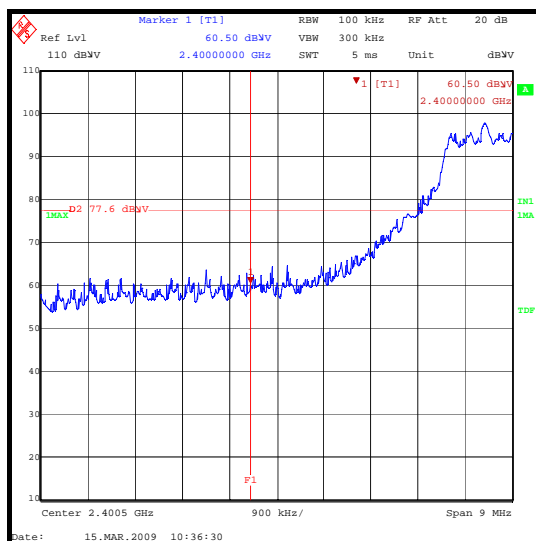
Temperature (°C):	22
Relative Humidity (%):	34

Results: 54 Mbps – 64QAM. Peak Power Level

Frequency (MHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2400	Horizontal	60.7	-0.2	60.5	77.6*	17.1	Complied
2483.5	Horizontal	64.6	-0.2	64.4	74.0	9.6	Complied

*Note: -20 dBc limit

** Note: **Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands.**



Transmitter Band Edge Radiated Emissions (continued)**Test Summary:**

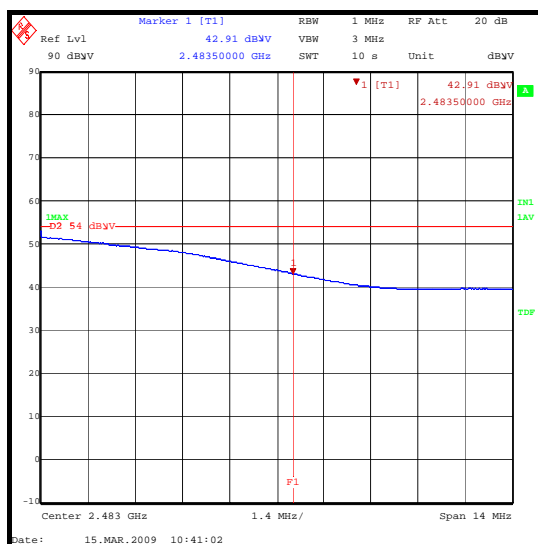
FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	FCC CFR Part 2

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Results: 54 Mbps – 64QAM. Average Power Level

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2483.5	Horizontal	43.1	-0.2	42.9	54.0	11.1	Complied



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%	±3.72 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±4.64 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 dB
20 dB Bandwidth	30 MHz to 4000 MHz	95%	±11.4 ppm
Transmitter Peak Power Spectral Density	1 GHz to 26.5 GHz	95%	±2.94 dB
Transmitter Maximum Peak Output Power	30 MHz to 4000 MHz	95%	±2.94 dB

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

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1299	Antenna	Schaffner	CBL6143	5094	28 Jul 2008	12
A1737	Attenuator	Atlantic Microwave	BBS40-20	R4722	Calibrated before use	-
A1738	Attenuator	Atlantic Microwave	BBS40-10	R1379	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	25 Oct 2008	12
C1171	Cable	Microcoax	None	None	Calibrated before use	12
K0002	Site Reference 4421	Rainford EMC	N/A	N/A	26 Aug 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
M1435	Power Meter	Hewlett Packard	437B	3125U14631	03 Jun 2008	12
M208	Thermometer/ Hygrometer	RS Components Ltd	RS212-124	M208-RS212-124	19 Apr 2007	-
M283	Power Sensor	Hewlett Packard	8487A	3318A03241	27 Oct 2008	12

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