TEST REPORT

Test Report No. : UL-RPT-RP10012646JD07A

Manufacturer	:	Bang & Olufsen a/s
Type No.	:	AW-AU397
FCC ID	:	TTUAW-AU397
Technology	:	WLAN (802.11 a/n)
Test Standard(s)	:	FCC Parts 15.207, 15.209(a), 15.403(i) & 15.407

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 1.0.

Date of Issue: 26 June 2014

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Issued by :

pp
John Newell
Quality Manager,
UL VS LTD

0644

This laboratory is accredited by UKAS. The tests reported herein have been performed in accordance with its terms of accreditation.

UL VS LTD

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1. Customer Information

Company Name:	Bang & Olufsen a/s
Address:	Peter Bangs Vej 15 7600 Struer Denmark

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.407 and 47CFR15.403
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart E (Unlicensed National Information Infrastructure Devices) – Sections 15.403 and 15.407
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	19 December 2013 to 25 February 2014

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.403(i)	Transmitter 26 dB Emission Bandwidth	✓
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.407(a)(1)	Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band)	✓
Part 15.407(a)(2)	Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)	✓
Part 15.407(a)(3)	Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)	✓
Part 15.407(a)(1)	Transmitter Peak Power Spectral Density (5.15-5.25 GHz band)	✓
Part 15.407(a)(2)	Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)	✓
Part 15.407(a)(3)	Transmitter Peak Power Spectral Density (5.725-5.85 GHz band)	✓
Part 15.407(a)(6)	Transmitter Peak Excursion	✓
Part 15.407(b)/ 15.209(a)	Transmitter Out of Band Radiated Emissions	✓
Part 15.407(b)/ 15.209(a)	Transmitter Band Edge Radiated Emissions	✓
Part 15.407(g)	Transmitter Frequency Stability (Temperature & Voltage Variation)	Note 2
Part 15.407(h)(1)	Transmitter Power Control	Note 3
Key to Results ✓ = Complied ✗ = Did not comply		

Note(s):

1. Duty cycle was measured and found to be >98%, therefore no plots have been included within this report.
2. Frequency stability is better than 20 ppm which ensures that the signal remains in the allocated bands under all operational conditions stated in the user manual.
3. Transmit Power Control was not tested as the maximum EIRP is less than 500 mW (27 dBm).
4. Results for DFS testing are recorded in UL VS LTD report UL-RPT-RP10012646JD07C.
5. U-NII test procedures and limits were applied for operations in the frequency band 5.725-5.850 GHz in accordance with FCC KDB 644545 D02 to demonstrate compliance with Part 15.247 requirements in that band.

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices
Reference:	KDB 789033 D01 General UNII Test Procedures Old Rules v01r04 June 6, 2014
Title:	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E
Reference:	KDB 644545 D02 v01 6/7/2012
Title:	Alternative Guidance for IEEE 802.11ac and Pre-ac Device Emissions Testing
Reference:	KDB 662911 D01 v02r01 October 31, 2013
Title:	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

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 specifications identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Bang & Olufsen
MAC Address:	240A646DE213
Hardware Version Number:	5-PP001942 1213 V05
Software Version Number:	USB8797-14.69.11.p179-M3X14348-GPL-(FP69)
FCC ID:	TTUAW-AU397

Brand Name:	Tyco
Description:	Antenna
Model Name or Number:	UAM

Brand Name:	Bang & Olufsen
Description:	Antenna
Model Name or Number:	V100

3.2. Description of EUT

The equipment under test (EUT) was an IEEE 802.11 a/b/g/n 2x2 MIMO WLAN and *Bluetooth*® module.

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:	WLAN (IEEE 802.11a,n) / U-NII		
Type of Unit:	Transceiver		
Modulation:	BPSK, QPSK, 16QAM & 64QAM		
Data rates:	802.11a	6, 9, 12, 18, 24, 36 ,48 & 54 Mbit/s	
	802.11n HT20	MCS0 to MCS15 (2 spatial streams)	
	802.11n HT40	MCS0 to MCS15 (2 spatial streams)	
Power Supply Requirement(s):	Nominal	5.0 VDC via 120 VAC 60 Hz adaptor	
Antenna Gains by Operating Band:		**UAM Antenna**	**V100 Antenna**
	5.15 to 5.25 GHz	3.0 dBi	4.5 dBi
	5.25 to 5.35 GHz	3.0 dBi	3.8 dBi
	5.47 to 5.725 GHz	3.0 dBi	2.6 dBi
	5.725 to 5.85 GHz	3.0 dBi	1.9 dBi
Maximum Conducted Output Power:	20 MHz Channel	16.9 dBm	
	40 MHz Channel	17.1 dBm	

Additional Information Related to Testing (continued)

Channel Spacing:	20 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	36	5180
	Middle	40	5200
	Top	48	5240
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	52	5260
	Middle	56	5280
	Top	64	5320
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	100	5500
	Middle	116	5580
	Top	140	5700
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	149	5745
	Middle	157	5785
	Top	165	5825

Additional Information Related to Testing (continued)

Channel Spacing:	40 MHz		
Transmit Frequency Band:	5150 MHz to 5250 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	38	5190
	Top	46	5230
Transmit Frequency Band:	5250 MHz to 5350 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	54	5270
	Top	62	5310
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	102	5510
	Middle	110	5550
	Top	134	5670
Transmit Frequency Band:	5725 MHz to 5850 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	151	5755
	Top	159	5795

3.5. Support Equipment

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

Description:	Laptop PC
Brand Name:	Lenovo
Model Name or Number:	ThinkPad X61
Serial Number:	L3-C6073 07/12

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	D610
Serial Number:	UL Asset No. PC378NT

Description:	Test Jig
Brand Name:	AzureWave
Model Name or Number:	1213 adaptor
Serial Number:	Not marked or stated

Description:	AC to DC adaptor
Brand Name:	Goobay
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Router
Brand Name:	Linksys
Model Name or Number:	WAG54G
Serial Number:	CF610E100799

Description:	2 x 2 metre USB cables
Brand Name:	Not Marked or stated
Model Name or Number:	Not Marked or stated
Serial Number:	Not Marked or stated

3.6. Antenna

The table below lists the antennas that the manufacturer intends to use with this product:

Type	Stated Gain (dBi)	Manufacturer	Antenna Model / Part No.	Used for Testing	Notes
Stamped Metal	3.0	Tyco	UAM / 1513472-5	X	1 & 2
PCB	4.5	Bang & Olufsen	V100 / 6143988	X	1 & 2

X = This antenna was used for testing purposes

Note(s):

1. The stated antenna gains are the highest gains for the frequency range 5150 MHz to 5850 MHz.
2. Transmitter Radiated Emissions and Transmitter Radiated Band Edge Emissions were tested on both antennas.

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Continuously transmitting with a modulated carrier at maximum power on the bottom, middle and top channels as required using the supported data rates/modulation types.

4.2. Configuration and Peripherals

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

- The EUT was inserted onto the supplied test jig, the test jig was powered via 120 VAC 60 Hz to 5 VDC power supply, using the Goobay AC to DC adaptor. The test jig then supplies the EUT with the required 3.3 VDC.
- The Lenovo ThinkPad X61 laptop PC was connected to the EUT via a USB cable. The EUT was initialised using a software application supplied by the manufacturer. Once initialised, the EUT was controlled by the Dell D610 laptop PC, which was connected to the ThinkPad X61 via a Linksys access point using a software application supplied by the manufacturer. The application was used to enable continuous transmission and to select the test channels as required.
- The EUT has two RF ports, both are transmit/receive RF ports (labelled as Port 0 and Port 1) and for 802.11n the EUT supports MIMO. Conducted measurements were performed on Port 0 and Port 1. For 802.11n, power related measurements have been summed.
- 802.11n MSC 0 to 7 is correlated and CDD. Antennas are not cross polarised.
- RF cables and attenuators connecting the test equipment to the EUT ports were calibrated before use and the calibration data incorporated into the conducted measurement results.
- All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and widest bandwidth for all bands were:
    - Highest power
        - 802.11a – QPSK / 12 Mbit/s
        - 802.11n HT20 – BPSK / 13 Mbit/s / MCS8
        - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
    - Highest power spectral density
        - 802.11a – QPSK / 12 Mbit/s
        - 802.11n HT20 – BPSK / 13 Mbit/s / MCS8
        - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
    - Widest bandwidth
        - 802.11a – QPSK / 12 Mbit/s
        - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0
        - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2

    Pre-scan results for all modes are archived on the UL VS LTD IT server and available for inspection if required.

Configuration and Peripherals (continued)

- RF cables and attenuators connecting the test equipment to the EUT were calibrated before use and the calibration data incorporated into the conducted measurement results.
- The duty cycle was measured on all data rates and was found to be >98% in all cases.
- Transmitter spurious emissions were performed with the EUT transmitting 802.11g 20 MHz channel bandwidth with one spatial stream and a data rate of 12 Mbit/s. This was found to be the worst case modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest transmit output power level, it was deemed to be the worst case.

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.

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

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	19 December 2013
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.207
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	41

Note(s):

1. The EUT was inserted onto the supplied test jig, the test jig was powered via 120 VAC 60 Hz to 5 VDC power supply, using the Goobay AC to DC adaptor via a LISN.
2. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
3. A pulse limiter was fitted between the LISN and the test receiver.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.605	Live	51.3	56.0	4.7	Complied
0.821	Live	51.1	56.0	4.9	Complied
0.875	Live	50.7	56.0	5.3	Complied
1.091	Live	51.4	56.0	4.6	Complied
1.307	Live	50.8	56.0	5.2	Complied
2.994	Live	47.3	56.0	8.7	Complied
4.466	Live	47.1	56.0	8.9	Complied
4.682	Live	39.9	56.0	16.1	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.330	Live	43.6	49.5	5.9	Complied
0.443	Live	40.5	47.0	6.5	Complied
0.497	Live	39.8	46.1	6.3	Complied
0.605	Live	42.2	46.0	3.8	Complied
0.659	Live	38.1	46.0	7.9	Complied
0.821	Live	40.5	46.0	5.5	Complied
1.037	Live	39.2	46.0	6.8	Complied
1.041	Live	39.7	46.0	6.3	Complied
1.091	Live	38.6	46.0	7.4	Complied
1.257	Live	38.7	46.0	7.3	Complied

Transmitter AC Conducted Spurious Emissions (continued)

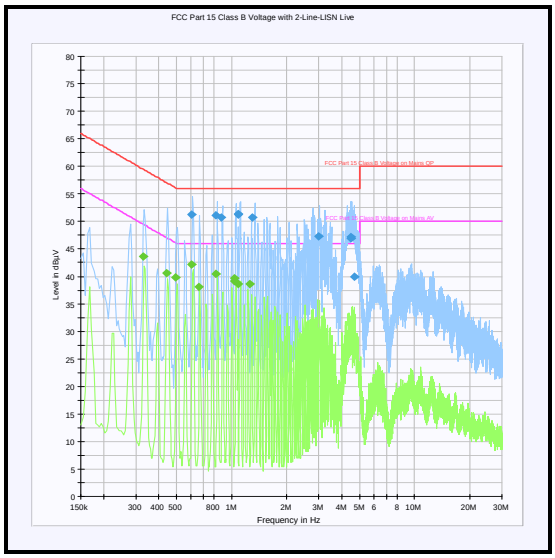
Results: Neutral / Quasi Peak

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.330	Neutral	50.6	59.5	8.9	Complied
0.929	Neutral	48.5	56.0	7.5	Complied
1.095	Neutral	49.7	56.0	6.3	Complied
2.684	Neutral	49.4	56.0	6.6	Complied
3.944	Neutral	49.7	56.0	6.3	Complied
4.110	Neutral	51.4	56.0	4.6	Complied
4.272	Neutral	51.9	56.0	4.1	Complied
4.326	Neutral	51.8	56.0	4.2	Complied
4.380	Neutral	51.3	56.0	4.7	Complied
4.430	Neutral	49.4	56.0	6.6	Complied

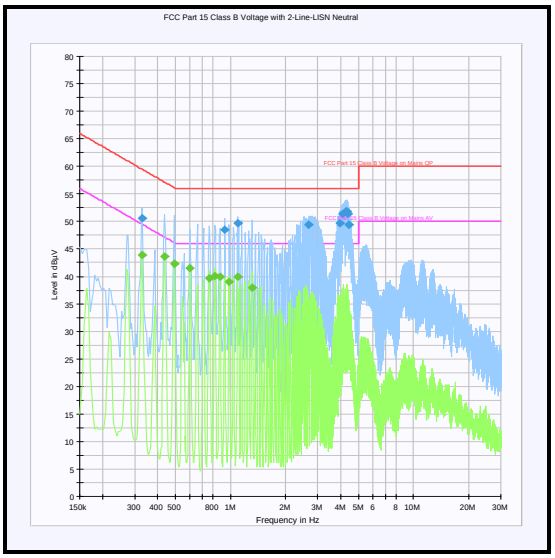
Results: Neutral / Average

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.330	Neutral	43.9	49.5	5.6	Complied
0.438	Neutral	43.7	47.1	3.4	Complied
0.492	Neutral	42.3	46.1	3.8	Complied
0.600	Neutral	41.5	46.0	4.5	Complied
0.767	Neutral	39.6	46.0	6.4	Complied
0.821	Neutral	40.1	46.0	5.9	Complied
0.875	Neutral	39.9	46.0	6.1	Complied
0.983	Neutral	39.0	46.0	7.0	Complied
1.095	Neutral	40.0	46.0	6.0	Complied
1.311	Neutral	38.0	46.0	8.0	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live



Neutral

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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1625	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	09 Jan 2014	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	29 Apr 2014	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	19 Feb 2014	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	14 Oct 2014	12

5.2.2. Transmitter 26 dB Emission Bandwidth

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	31 December 2013
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.403(i)
Test Method Used:	As detailed in FCC KDB 789033 Section C)

Environmental Conditions:

Temperatures (°C):	23
Relative Humidity (%):	36

Note(s):

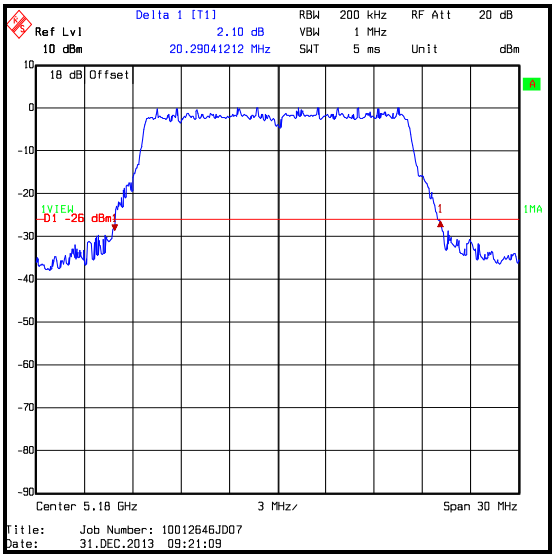
1. All configurations supported by the EUT were investigated on the one channel in accordance with KDB 789033 Section C Emission bandwidth test procedure. The data rates that produced the widest bandwidth and therefore deemed worst case were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Final measurements were performed in each supported operating band using the above configurations on the bottom, middle and top channels on both ports.
3. Plots for all data rates are archived on the UL VS LTD IT server and available for inspection upon request.
4. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.
5. For the power measurements in this report, the highest power output level was recorded when the EUT was configured as:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2

    Emission bandwidth plots for 802.11n HT20 have been included as ‘Reference plots’ at the end of this Section and the results used for calculations in Section 5.2.4.

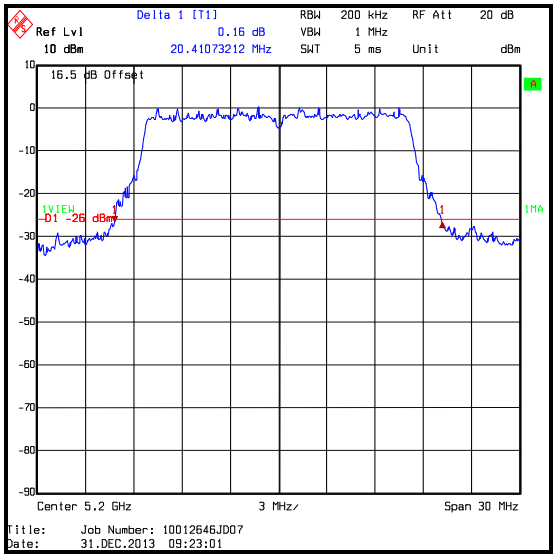
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.15-5.25 GHz band / Port 0

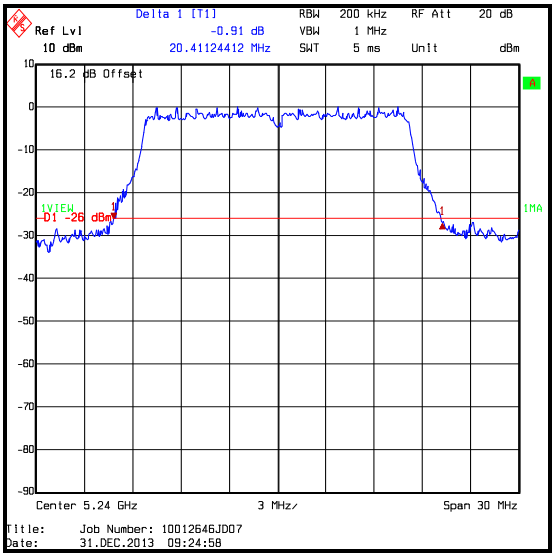
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s	26 dB Emission Bandwidth (MHz)
Bottom	5180	QPSK	12	20.290
Middle	5200	QPSK	12	20.411
Top	5240	QPSK	12	20.411



Bottom Channel



Middle Channel

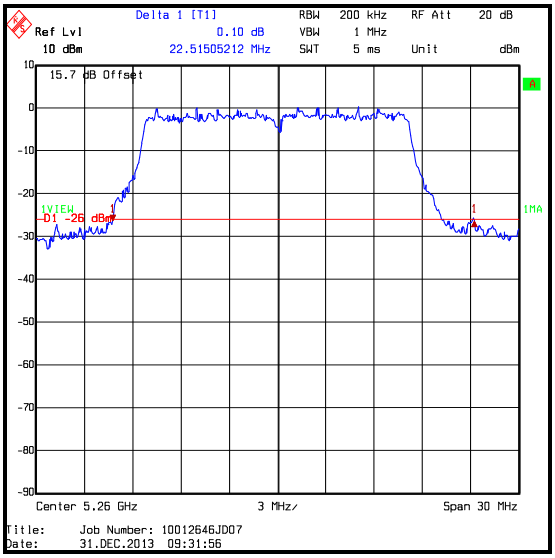


Top Channel

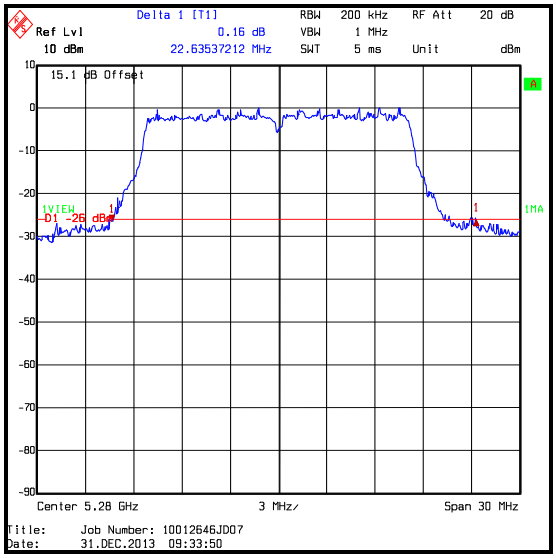
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.25-5.35 GHz band / Port 0

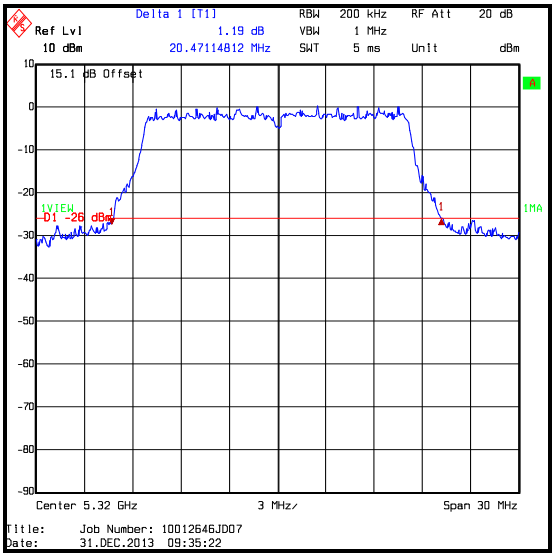
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s	26 dB Emission Bandwidth (MHz)
Bottom	5260	QPSK	12	22.515
Middle	5280	QPSK	12	22.635
Top	5320	QPSK	12	20.471



Bottom Channel



Middle Channel

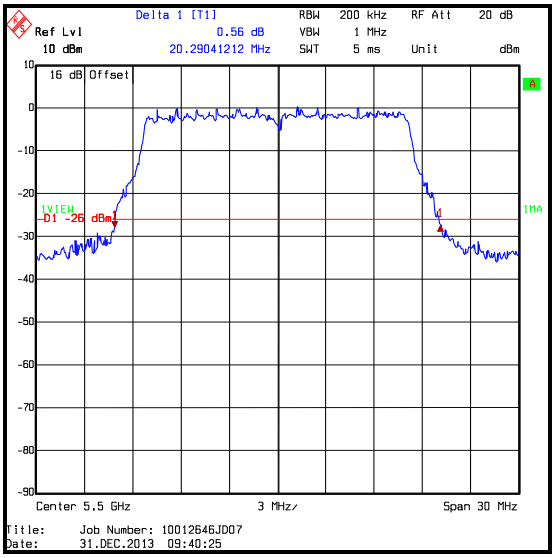


Top Channel

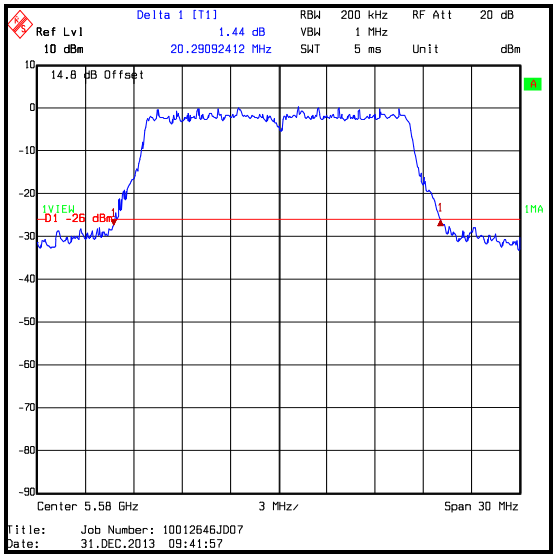
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.47-5.725 GHz band / Port 0

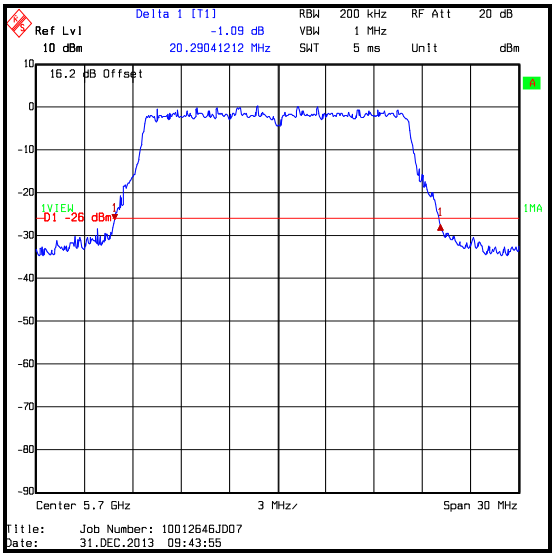
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s	26 dB Emission Bandwidth (MHz)
Bottom	5500	QPSK	12	20.290
Middle	5580	QPSK	12	20.291
Top	5700	QPSK	12	20.290



Bottom Channel



Middle Channel

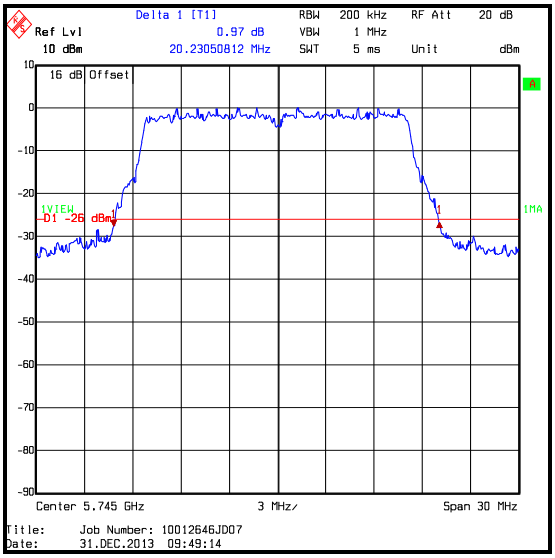


Top Channel

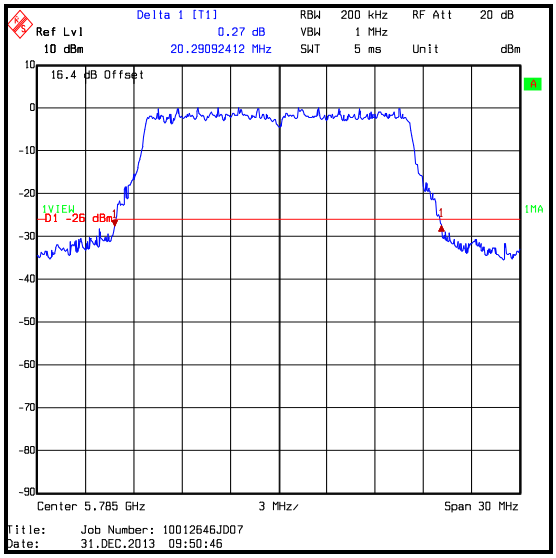
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11a / 20 MHz / 5.725-5.85 GHz band / Port 0

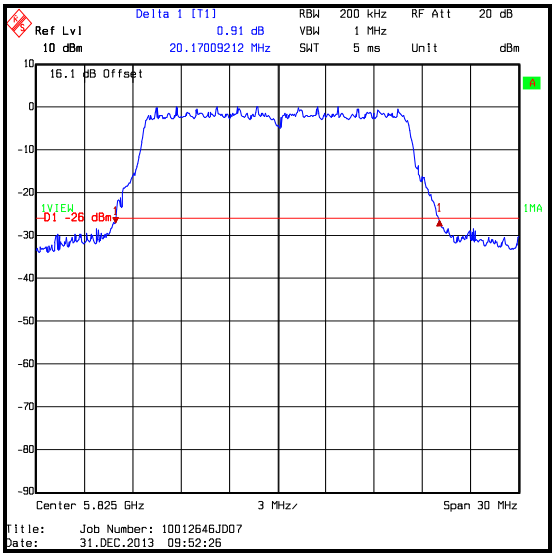
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s	26 dB Emission Bandwidth (MHz)
Bottom	5745	QPSK	12	20.231
Middle	5785	QPSK	12	20.291
Top	5825	QPSK	12	20.170



Bottom Channel



Middle Channel

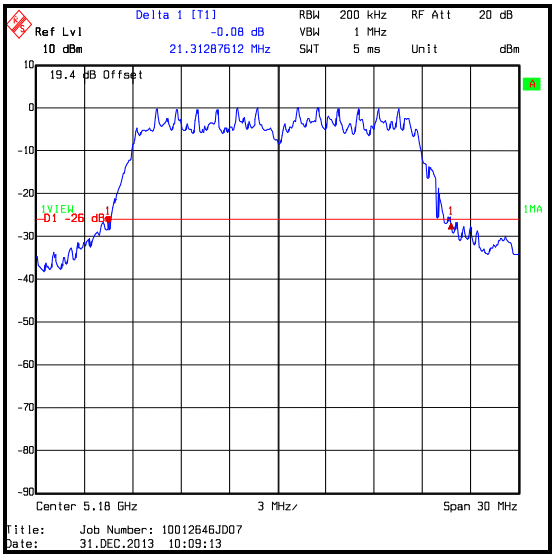


Top Channel

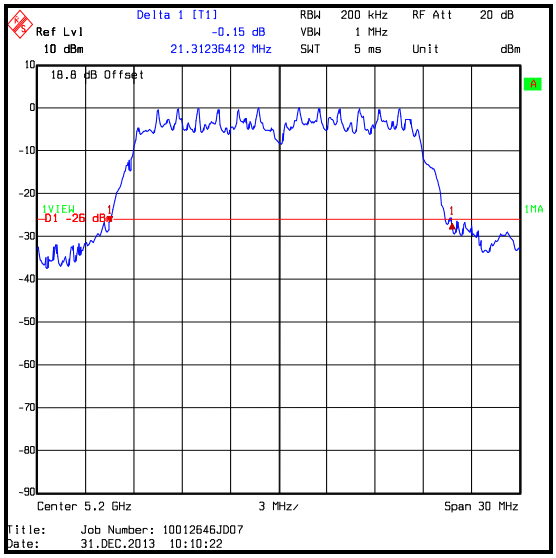
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.15-5.25 GHz band / Port 0

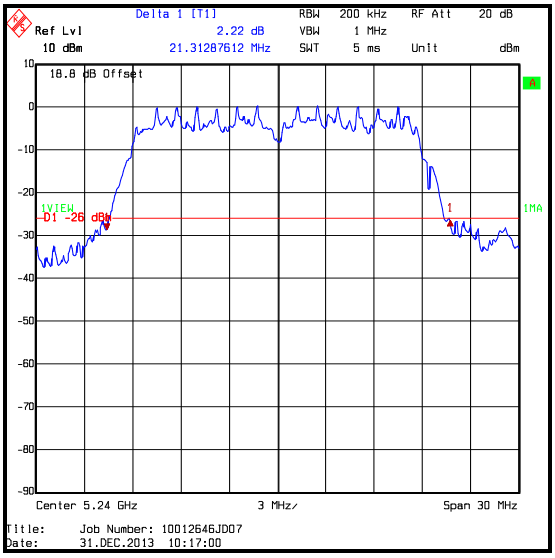
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	21.313
Middle	5200	BPSK	6.5 / 0	21.312
Top	5240	BPSK	6.5 / 0	21.313



Bottom Channel



Middle Channel

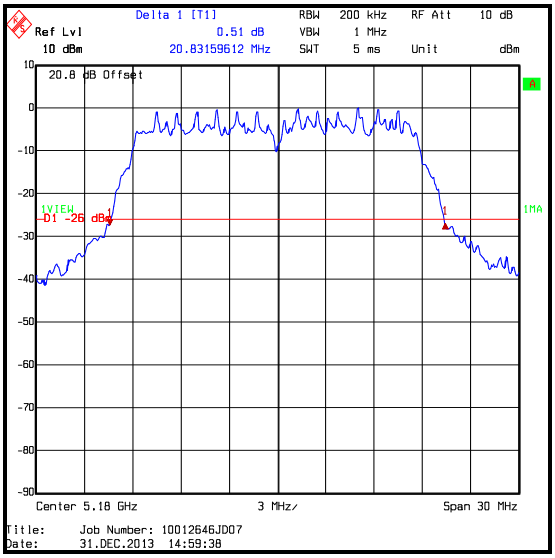


Top Channel

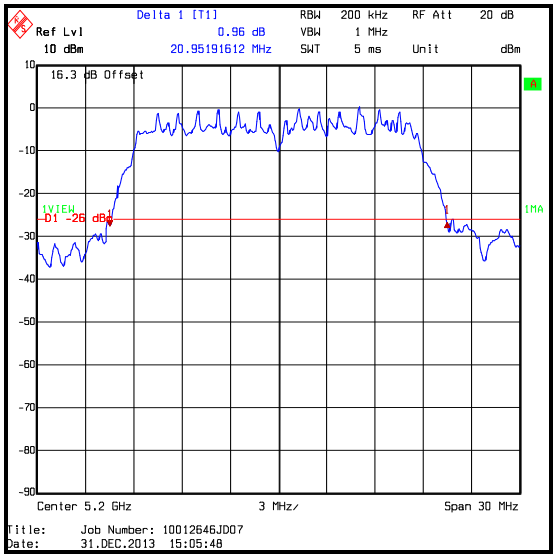
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.15-5.25 GHz band / Port 1

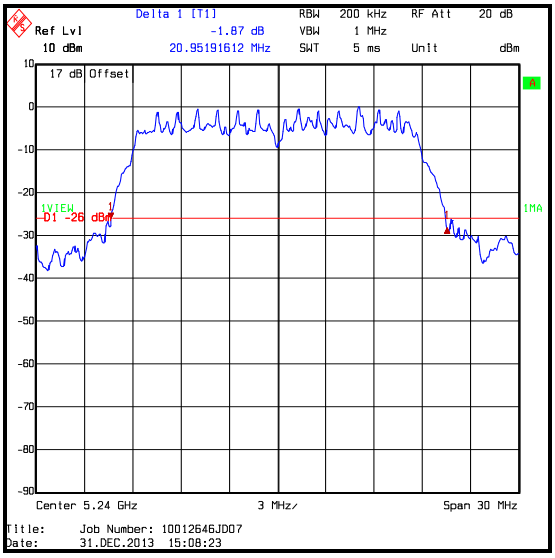
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	6.5 / 0	20.832
Middle	5200	BPSK	6.5 / 0	20.952
Top	5240	BPSK	6.5 / 0	20.952



Bottom Channel



Middle Channel

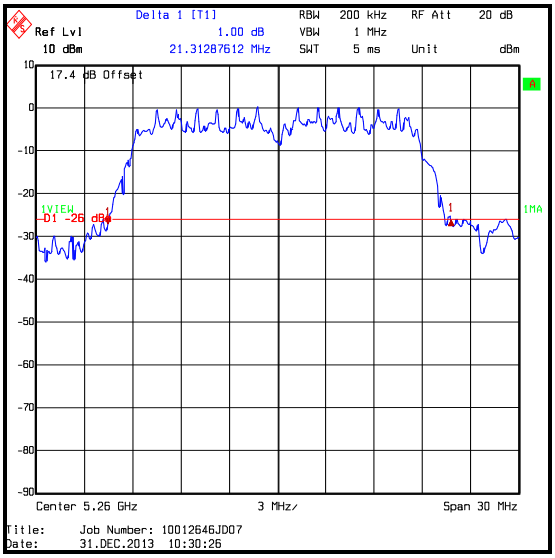


Top Channel

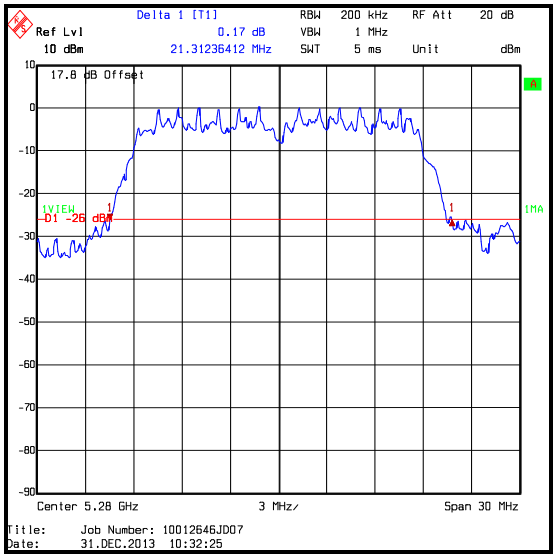
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band / Port 0

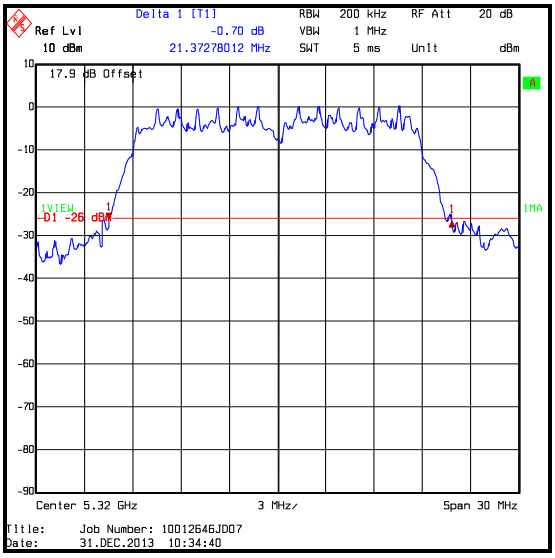
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	21.313
Middle	5280	BPSK	6.5 / 0	21.312
Top	5320	BPSK	6.5 / 0	21.373



Bottom Channel



Middle Channel

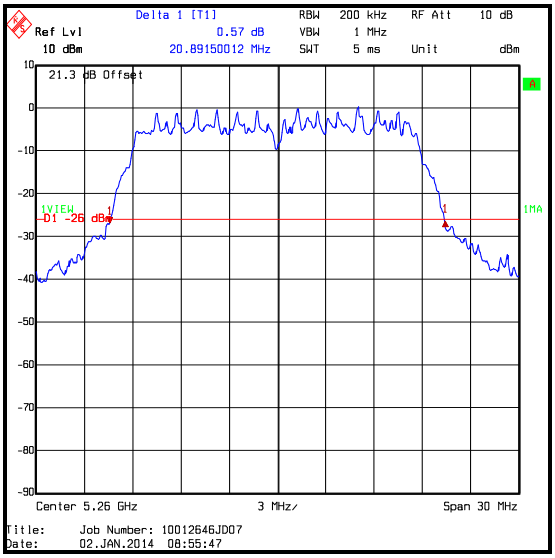


Top Channel

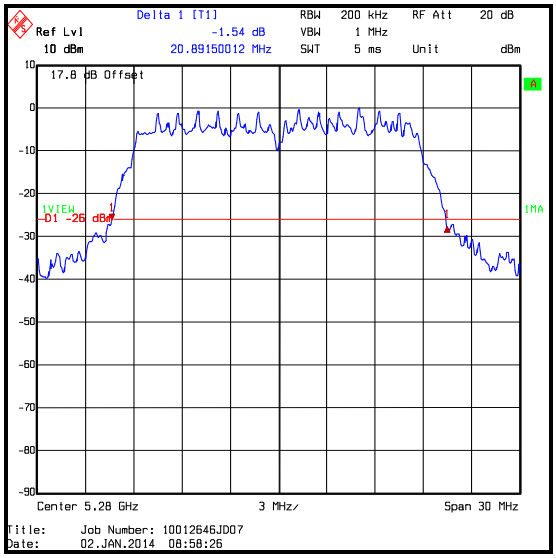
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band / Port 1

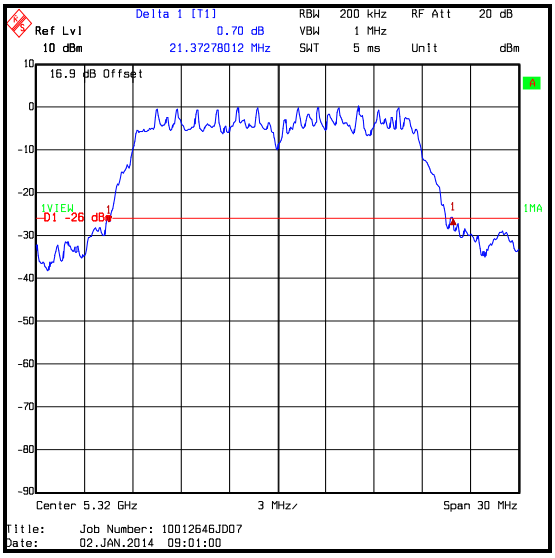
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	6.5 / 0	20.892
Middle	5280	BPSK	6.5 / 0	20.892
Top	5320	BPSK	6.5 / 0	21.373



Bottom Channel



Middle Channel

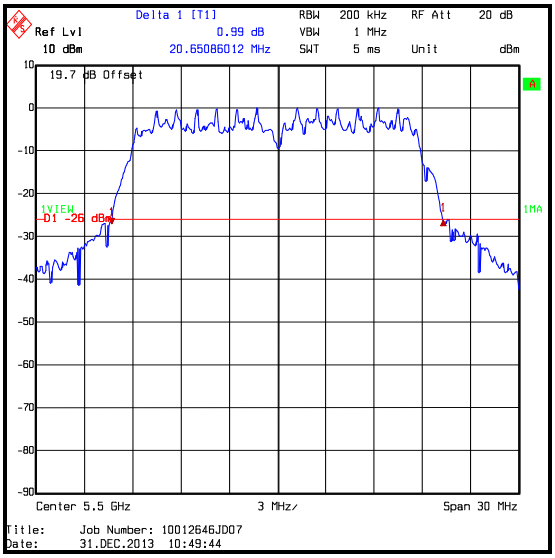


Top Channel

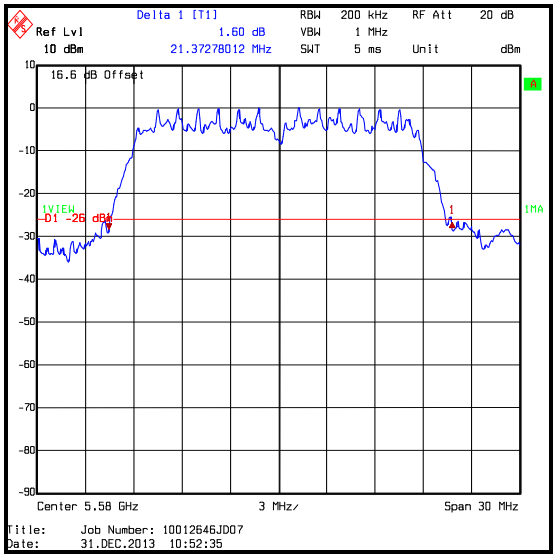
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band / Port 0

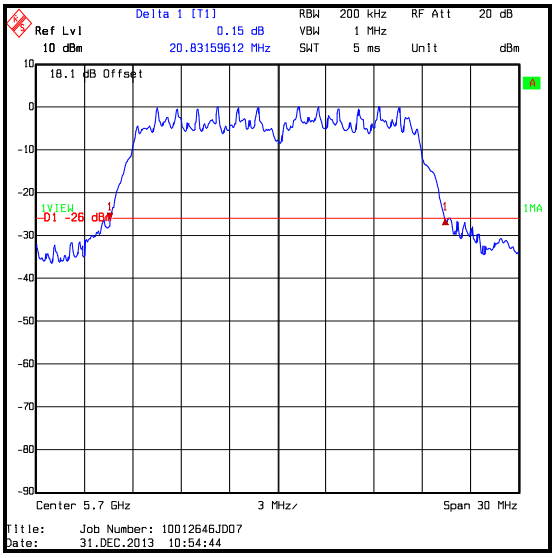
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	20.650
Middle	5580	BPSK	6.5 / 0	21.373
Top	5700	BPSK	6.5 / 0	20.832



Bottom Channel



Middle Channel

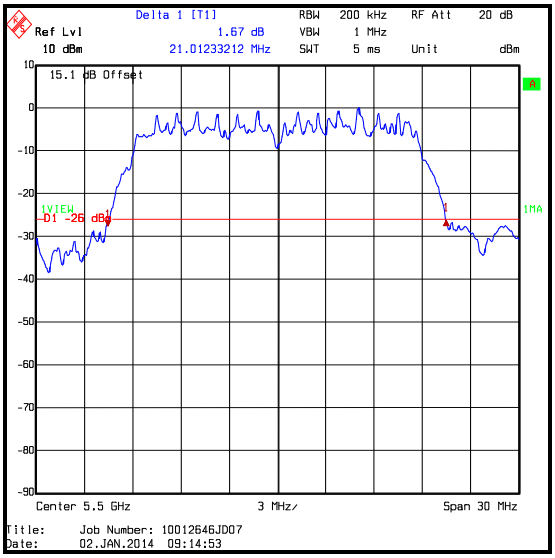


Top Channel

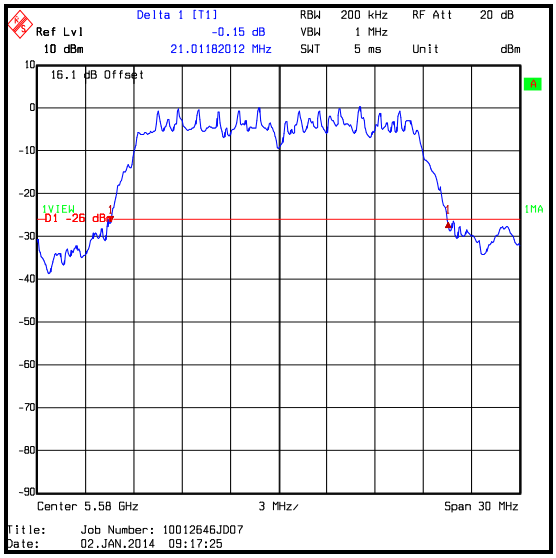
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band / Port 1

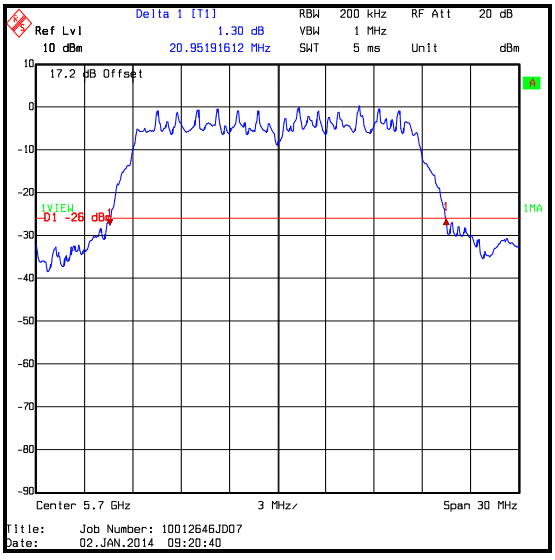
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	6.5 / 0	21.012
Middle	5580	BPSK	6.5 / 0	21.012
Top	5700	BPSK	6.5 / 0	20.952



Bottom Channel



Middle Channel

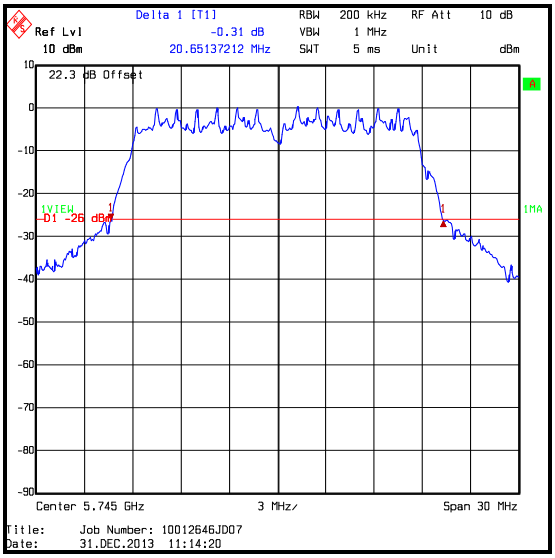


Top Channel

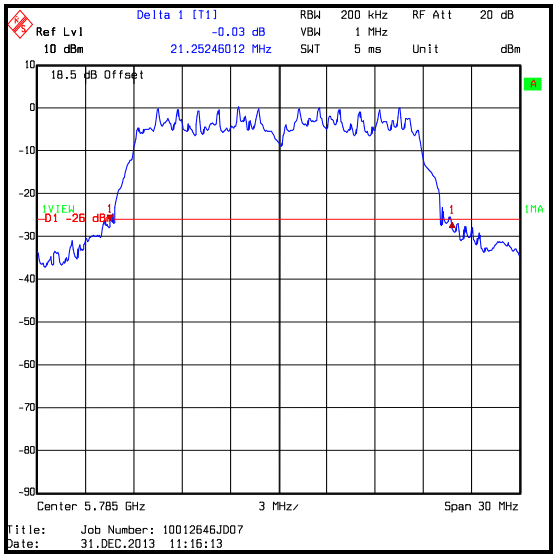
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.85 GHz band / Port 0

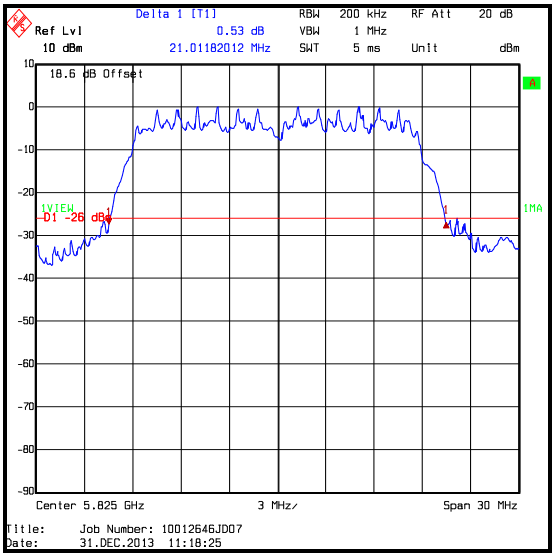
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	20.651
Middle	5785	BPSK	6.5 / 0	21.252
Top	5825	BPSK	6.5 / 0	21.012



Bottom Channel



Middle Channel

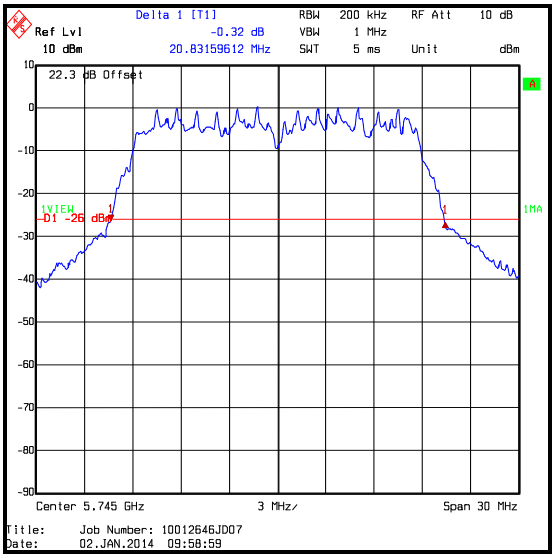


Top Channel

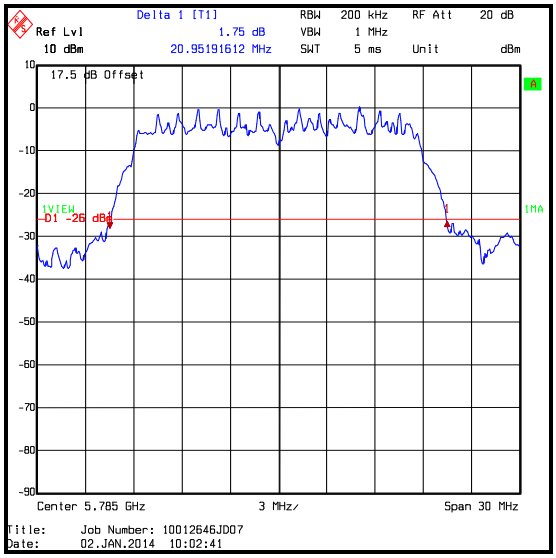
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.85 GHz band / Port 1

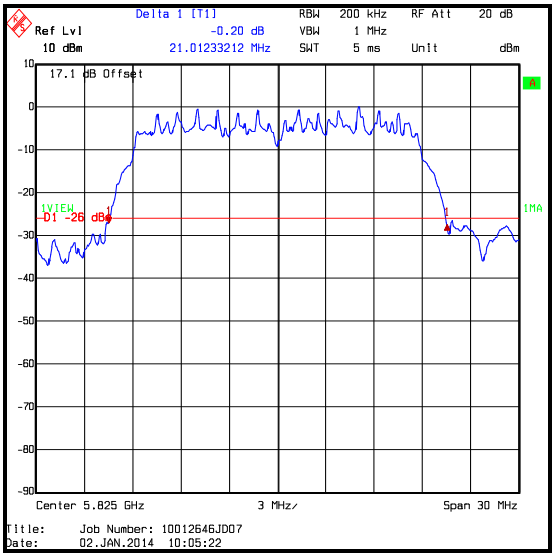
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	6.5 / 0	20.832
Middle	5785	BPSK	6.5 / 0	20.952
Top	5825	BPSK	6.5 / 0	21.012



Bottom Channel



Middle Channel

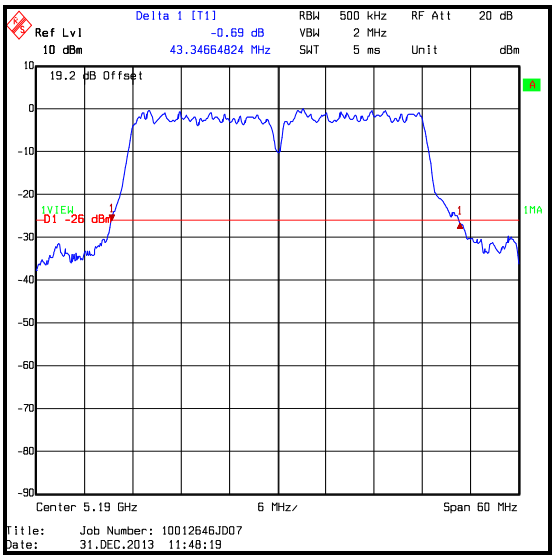


Top Channel

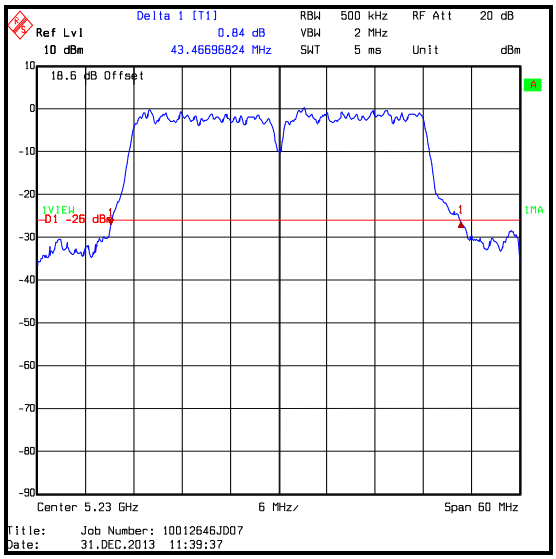
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band / Port 0

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	QPSK	40.5 / 2	43.347
Top	5230	QPSK	40.5 / 2	43.467



Bottom Channel

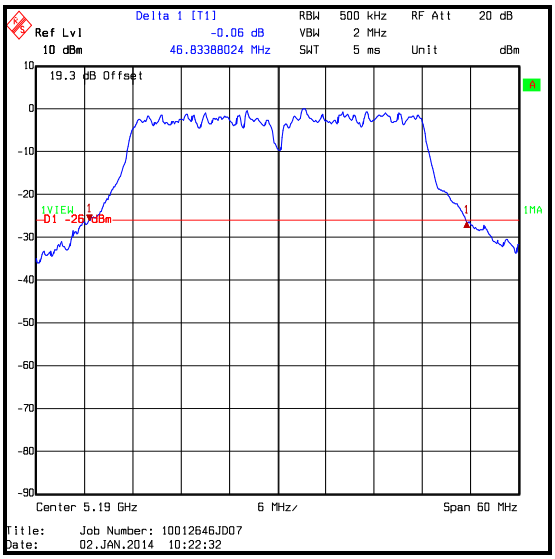


Top Channel

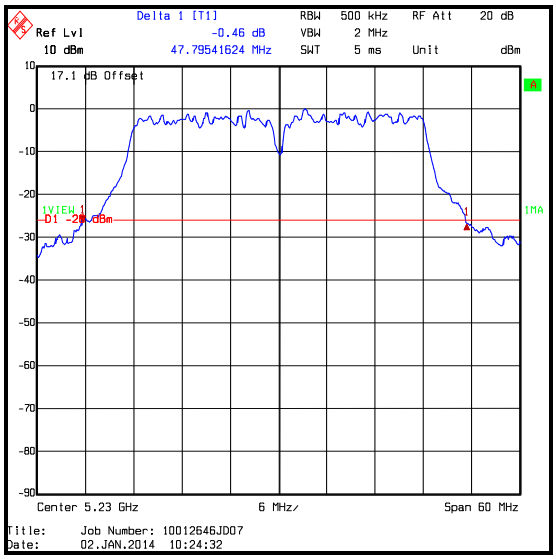
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.15-5.25 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5190	QPSK	40.5 / 2	46.834
Top	5230	QPSK	40.5 / 2	47.795



Bottom Channel

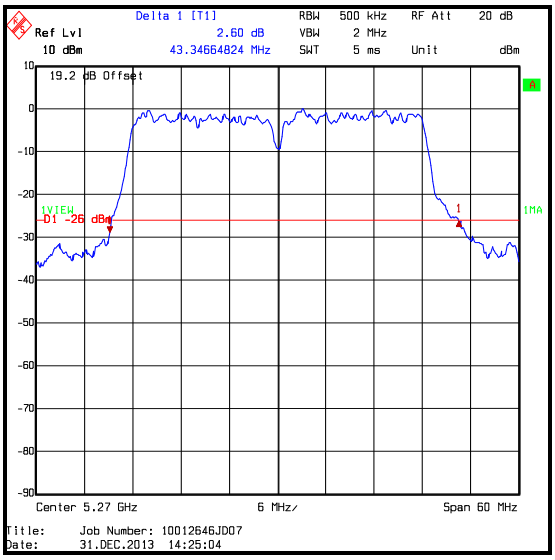


Top Channel

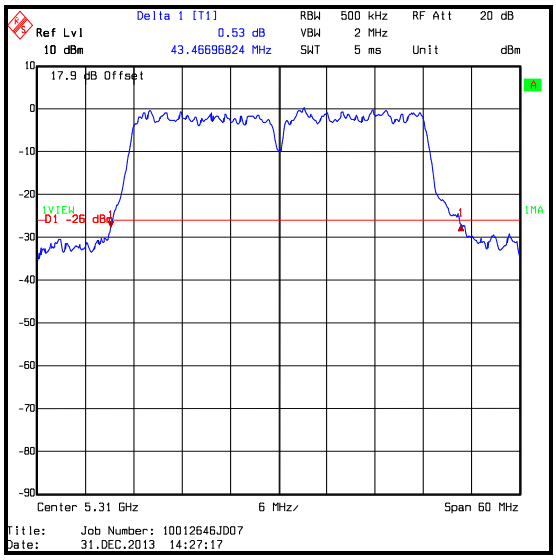
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.25-5.35 GHz band / Port 0

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	QPSK	40.5 / 2	43.347
Top	5310	QPSK	40.5 / 2	43.467



Bottom Channel

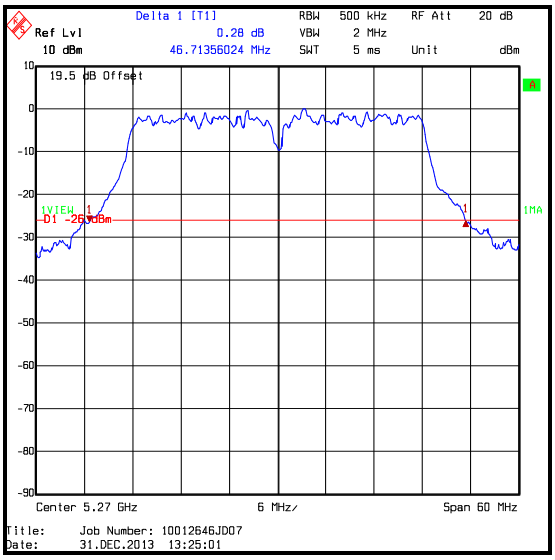


Top Channel

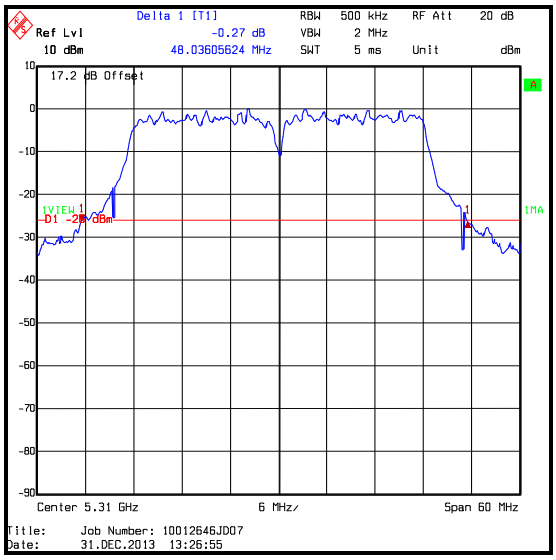
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.25-5.35 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5270	QPSK	40.5 / 2	46.714
Top	5310	QPSK	40.5 / 2	48.036



Bottom Channel

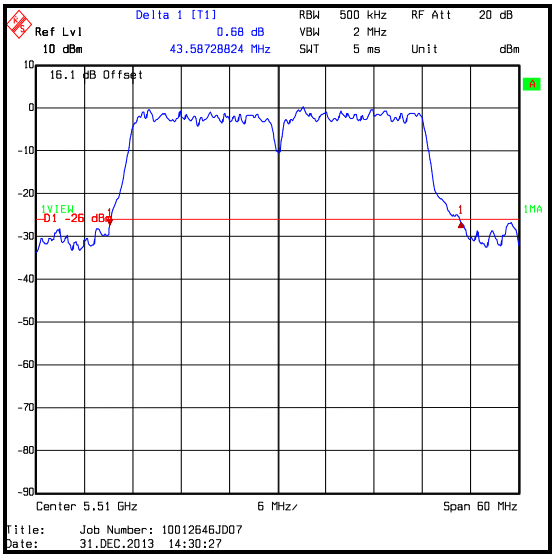


Top Channel

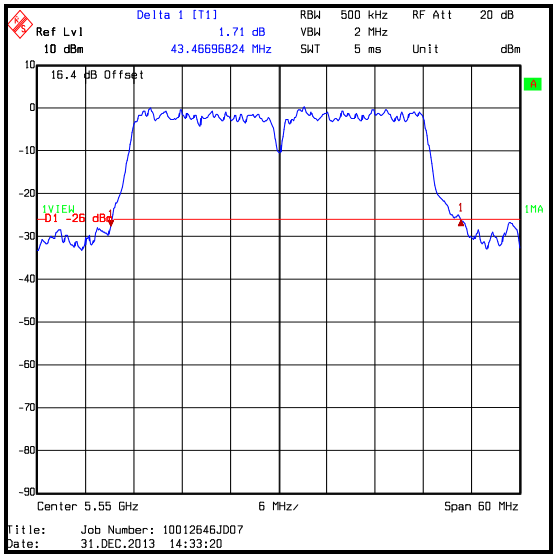
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.47-5.725 GHz band / Port 0

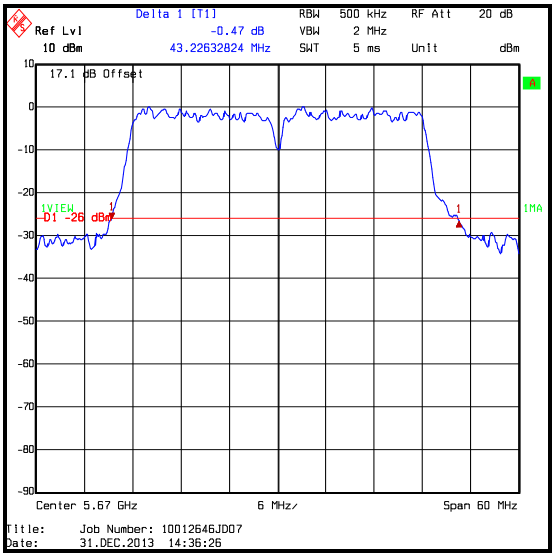
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	QPSK	40.5 / 2	43.587
Middle	5550	QPSK	40.5 / 2	43.467
Top	5670	QPSK	40.5 / 2	43.226



Bottom Channel



Middle Channel

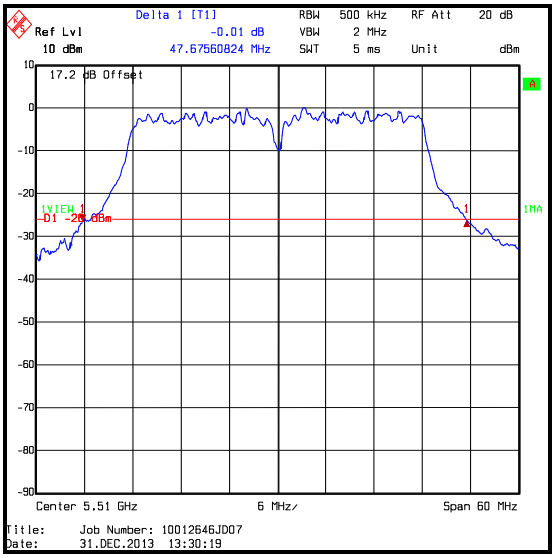


Top Channel

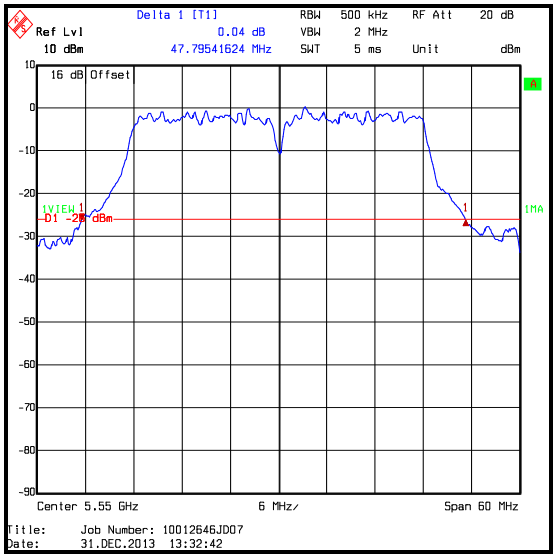
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.47-5.725 GHz band / Port 1

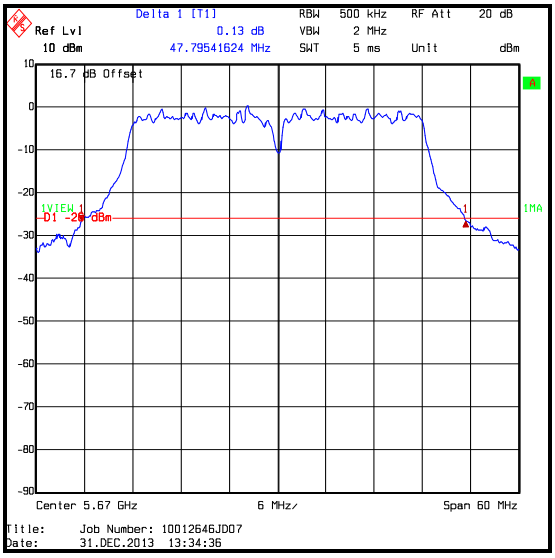
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5510	QPSK	40.5 / 2	47.676
Middle	5550	QPSK	40.5 / 2	47.795
Top	5670	QPSK	40.5 / 2	47.795



Bottom Channel



Middle Channel

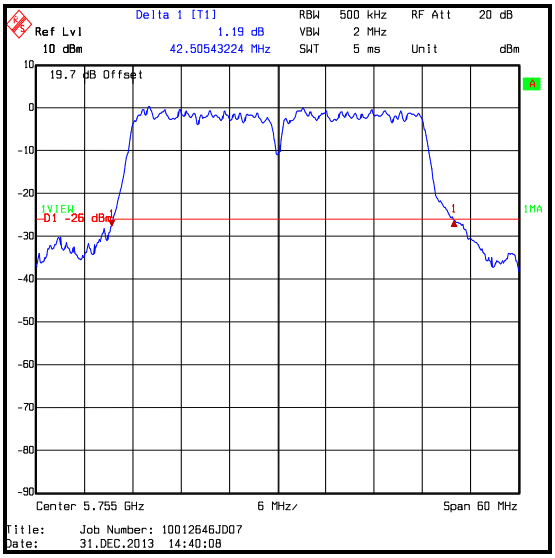


Top Channel

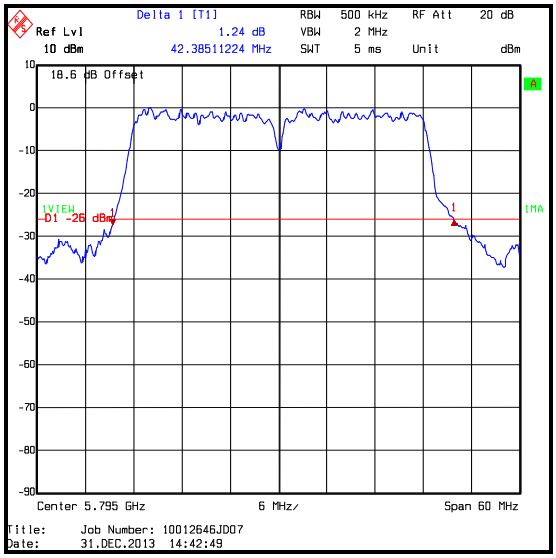
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.725-5.85 GHz band / Port 0

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	QPSK	40.5 / 2	42.505
Top	5795	QPSK	40.5 / 2	42.385



Bottom Channel

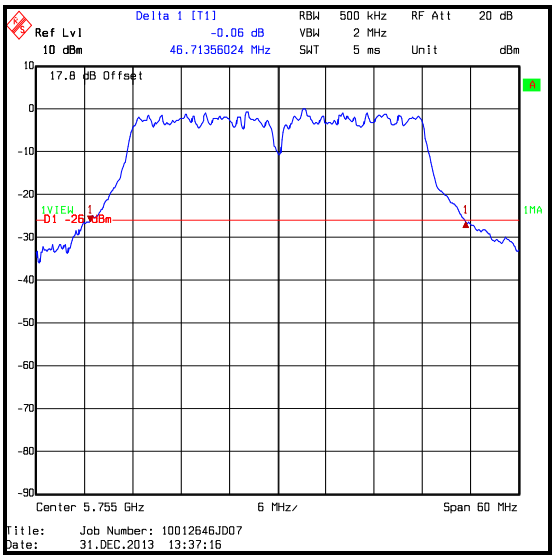


Top Channel

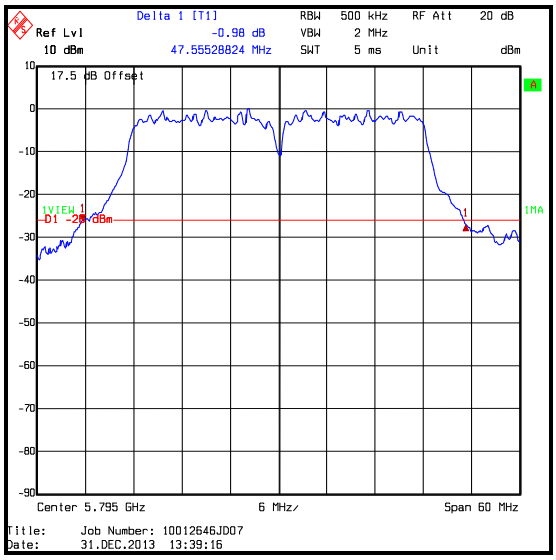
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 40 MHz / 5.725-5.85 GHz band / Port 1

Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5755	QPSK	40.5 / 2	46.714
Top	5795	QPSK	40.5 / 2	47.555



Bottom Channel

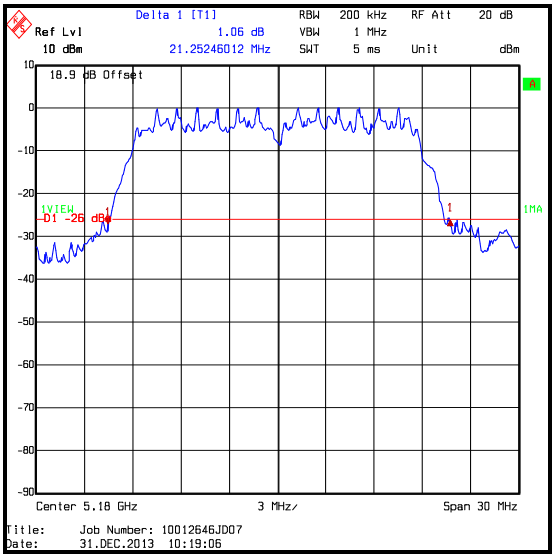


Top Channel

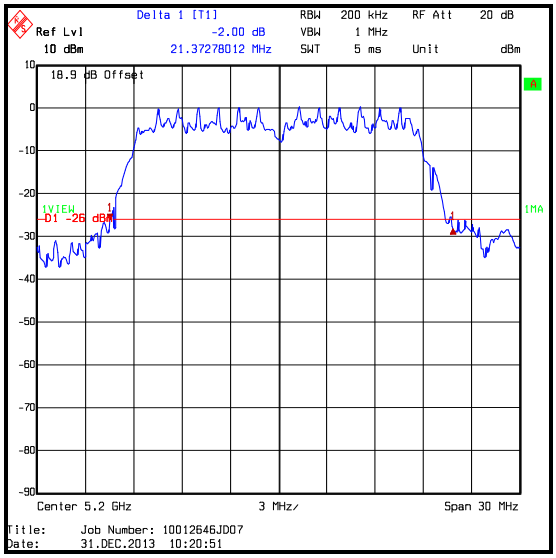
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.15-5.25 GHz band / Port 0 (Reference Plots)

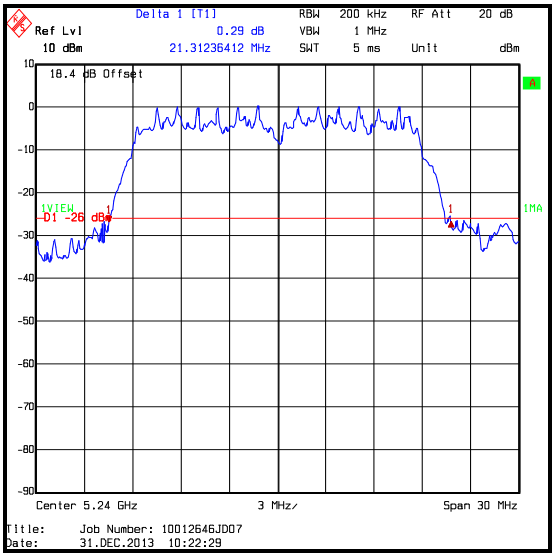
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	13 / 8	21.252
Middle	5200	BPSK	13 / 8	21.373
Top	5240	BPSK	13 / 8	21.312



Bottom Channel



Middle Channel

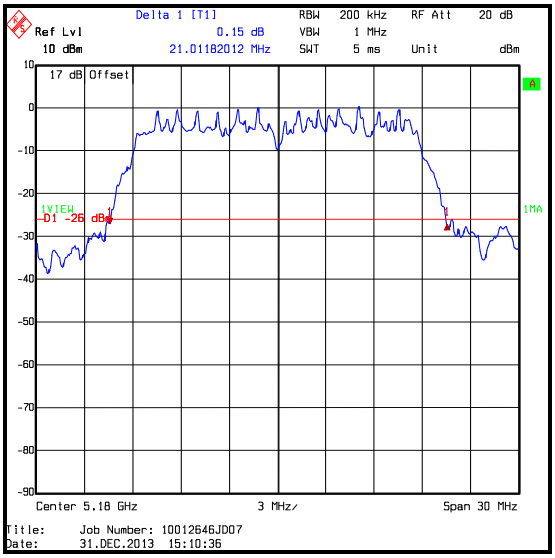


Top Channel

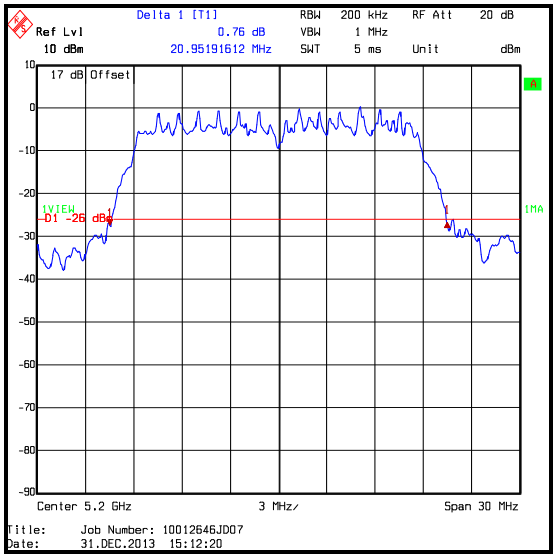
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.15-5.25 GHz band / Port 1 (Reference Plots)

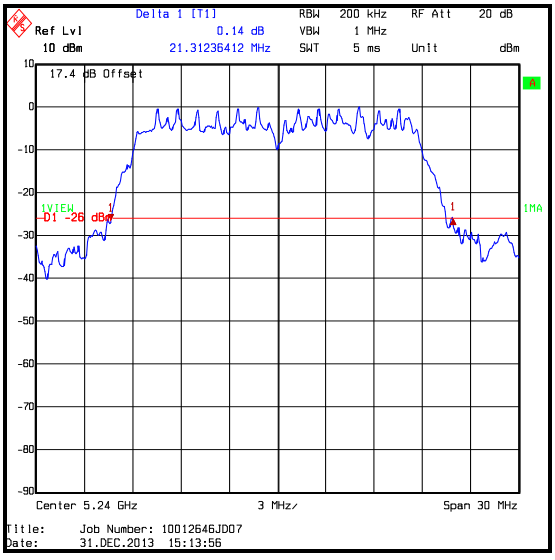
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5180	BPSK	13 / 8	21.012
Middle	5200	BPSK	13 / 8	20.952
Top	5240	BPSK	13 / 8	21.312



Bottom Channel



Middle Channel

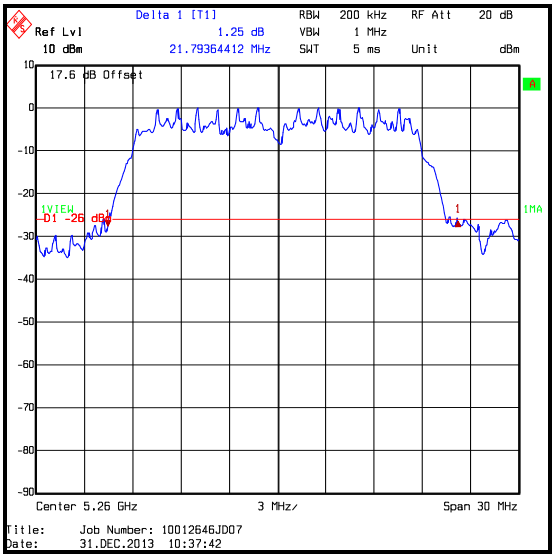


Top Channel

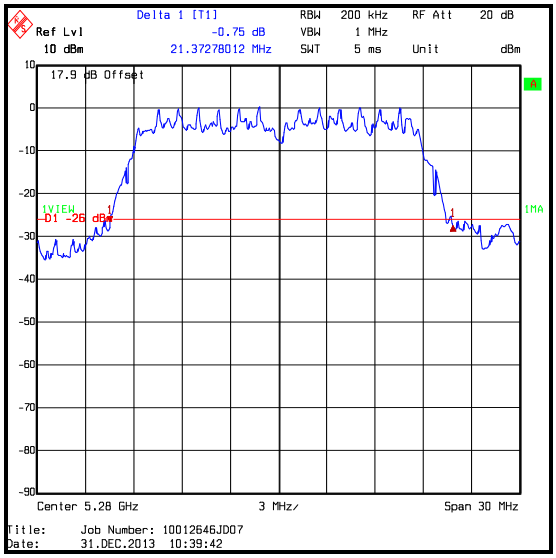
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band / Port 0 (Reference Plots)

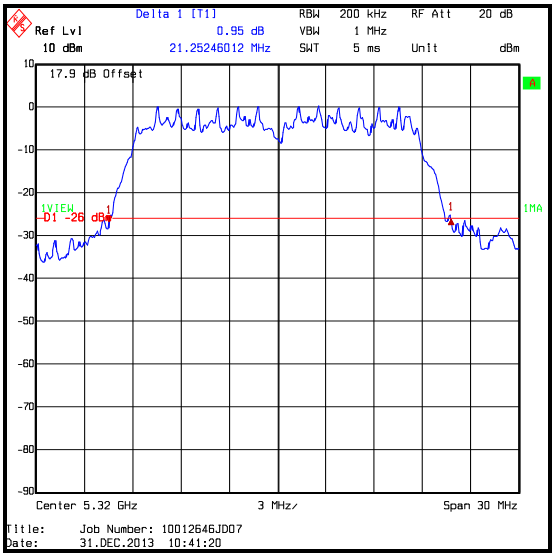
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	13 / 8	21.794
Middle	5280	BPSK	13 / 8	21.373
Top	5320	BPSK	13 / 8	21.252



Bottom Channel



Middle Channel

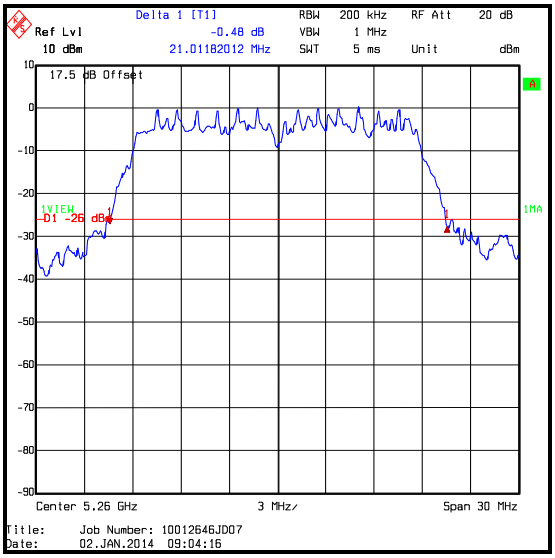


Top Channel

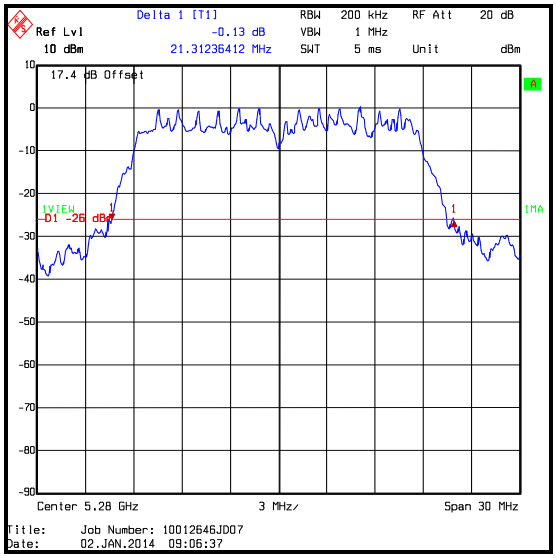
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.25-5.35 GHz band / Port 1 (Reference Plots)

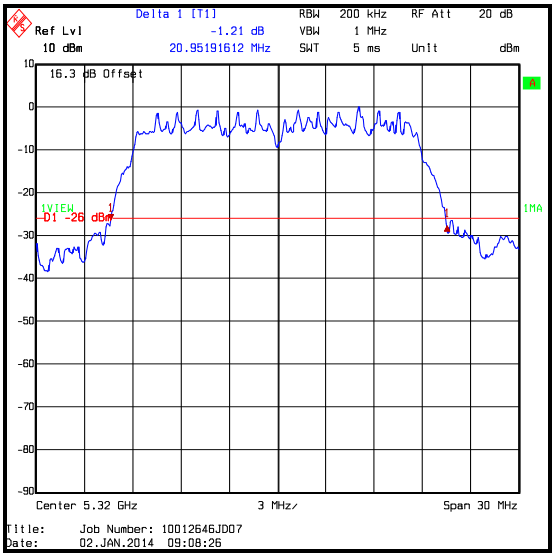
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5260	BPSK	13 / 8	21.012
Middle	5280	BPSK	13 / 8	21.312
Top	5320	BPSK	13 / 8	20.952



Bottom Channel



Middle Channel

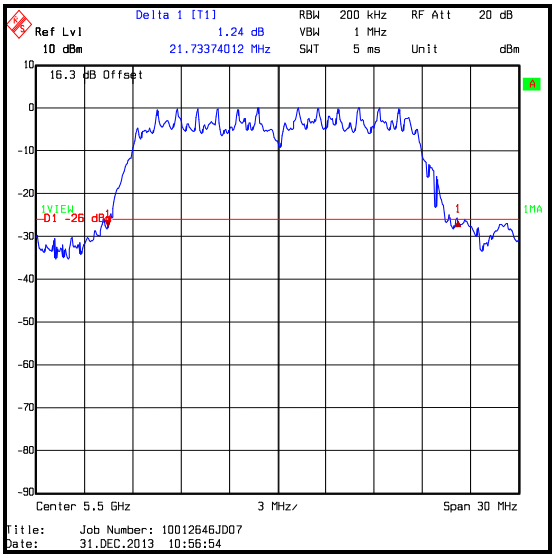


Top Channel

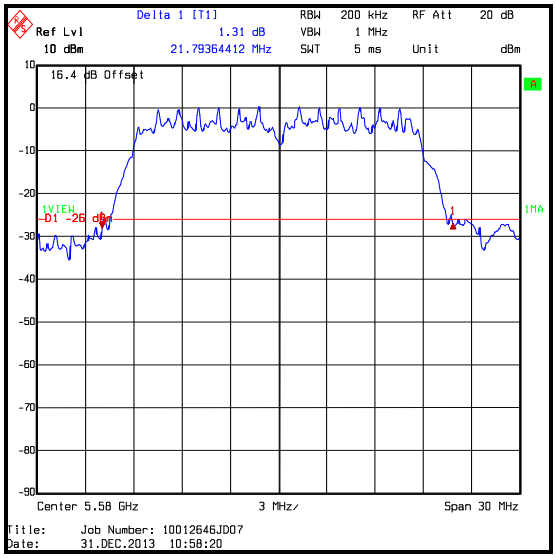
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band / Port 0 (Reference Plots)

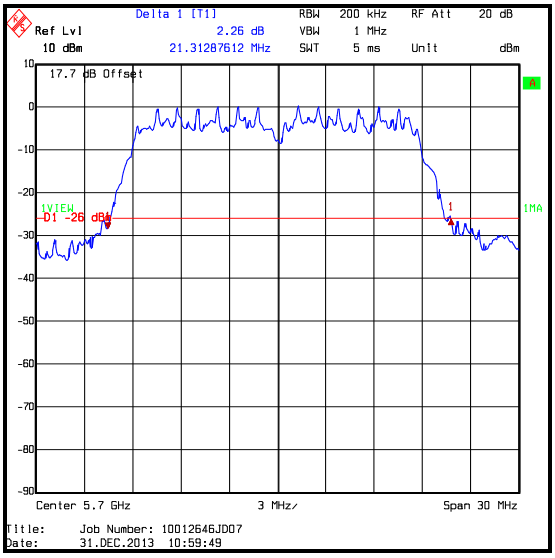
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	13 / 8	21.734
Middle	5580	BPSK	13 / 8	21.794
Top	5700	BPSK	13 / 8	21.313



Bottom Channel



Middle Channel

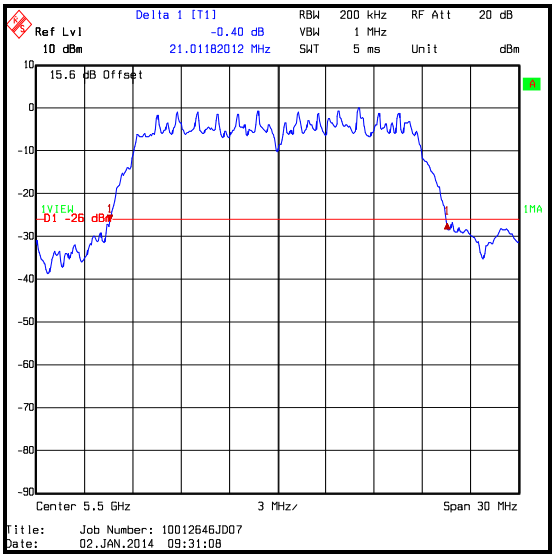


Top Channel

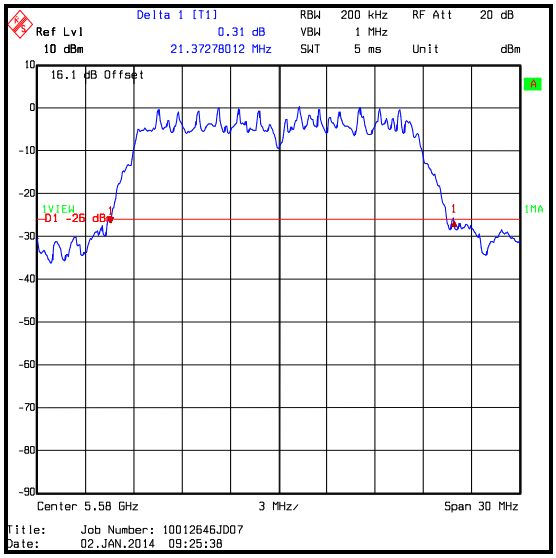
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.47-5.725 GHz band / Port 1 (Reference Plots)

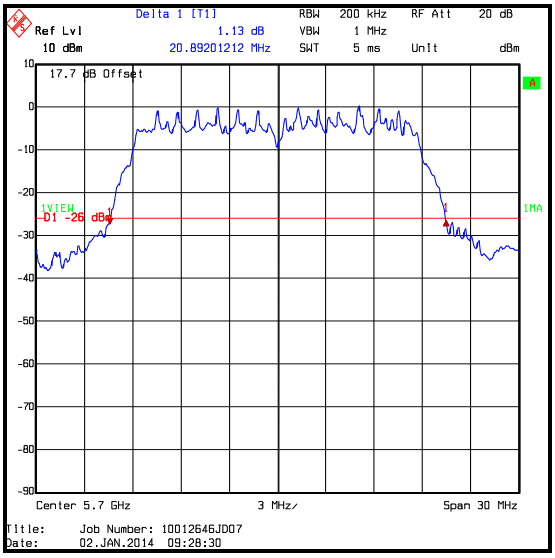
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5500	BPSK	13 / 8	21.012
Middle	5580	BPSK	13 / 8	21.373
Top	5700	BPSK	13 / 8	20.892



Bottom Channel



Middle Channel

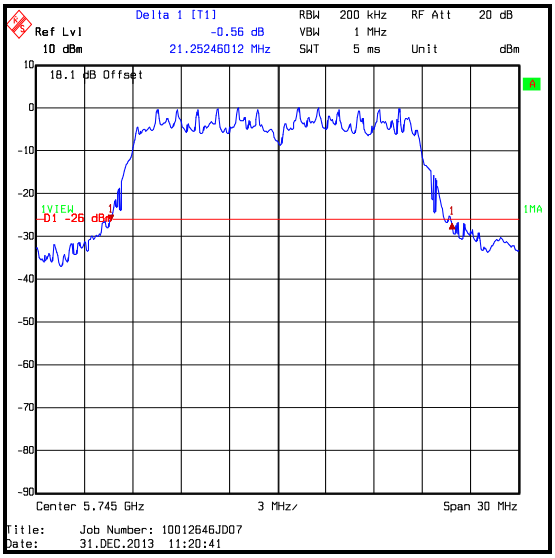


Top Channel

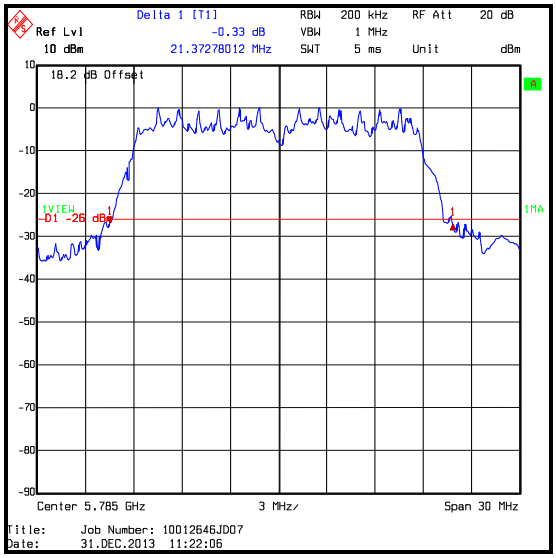
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.85 GHz band / Port 0 (Reference Plots)

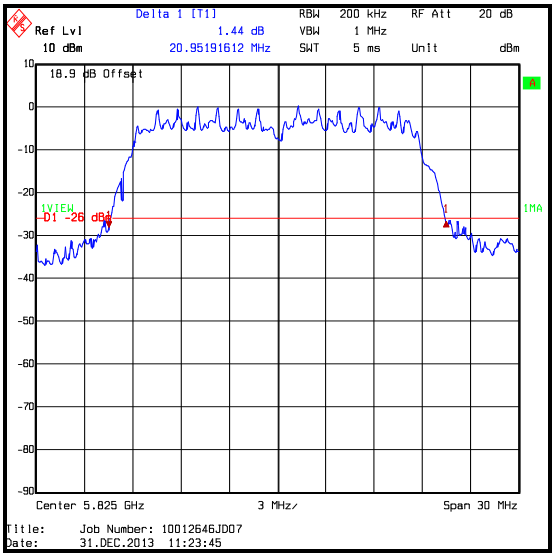
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	13 / 8	21.252
Middle	5785	BPSK	13 / 8	21.373
Top	5825	BPSK	13 / 8	20.952



Bottom Channel



Middle Channel

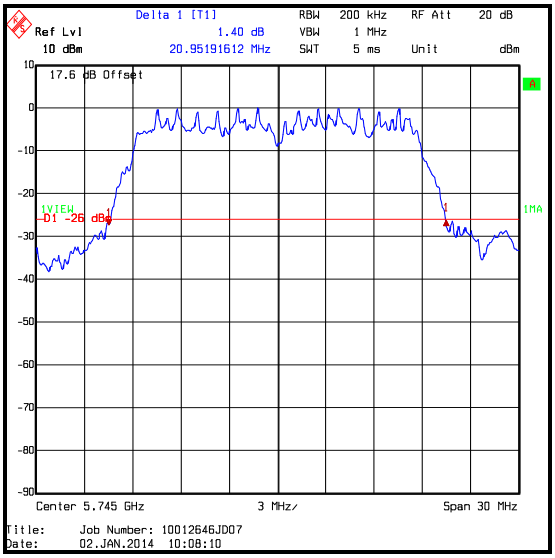


Top Channel

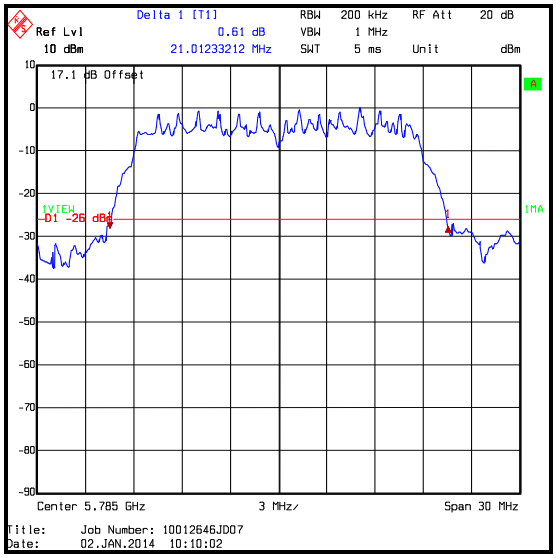
Transmitter 26 dB Emission Bandwidth (continued)

Results: 802.11n / 20 MHz / 5.725-5.85 GHz band / Port 1 (Reference Plots)

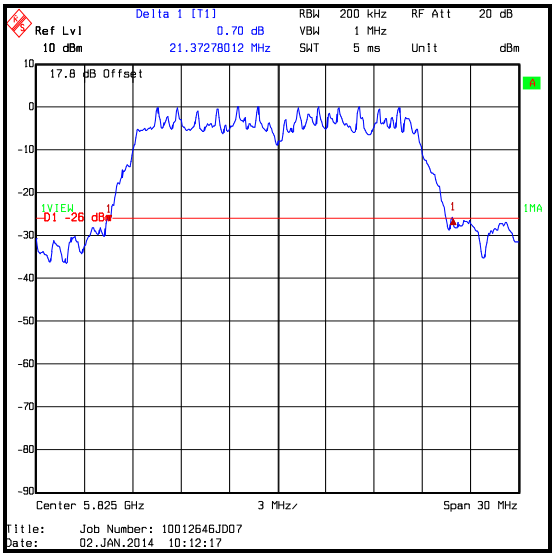
Channel	Frequency (MHz)	Modulation scheme	Data Rate Mbit/s / MCS	26 dB Emission Bandwidth (MHz)
Bottom	5745	BPSK	13 / 8	20.952
Middle	5785	BPSK	13 / 8	21.012
Top	5825	BPSK	13 / 8	21.373



Bottom Channel



Middle Channel



Top Channel

Transmitter 26 dB Emission Bandwidth (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1998	Attenuator	Huber & Suhner	6820.17B	07101	05 Apr 2014	12

5.2.3. Transmitter Maximum Conducted Output Power

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	31 December 2013 & 02 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(1)
Test Method Used:	As detailed in FCC KDB 789033 D01 Section E)2)b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	36

Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (Continued)

Note(s):

1. All conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 789033 E)2)b) Method SA-1.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and therefore deemed worst case were:
   - o 802.11a – QPSK / 12 Mbit/s
   - o 802.11n HT20 – BPSK / 13 Mbit/s / MCS8
   - o 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2

   Measurements were then performed in these modes on bottom, middle and top channels in all operating bands.
3. For 802.11a, power was measured on both ports, port 0 produced the highest power and was therefore deemed worst case. Results for Port 0 are recorded in the tables below.
4. For 802.11n, conducted power was measured on both ports and then combined using the measure-and-sum method stated in FCC KDB 662911.
5. The EUT was transmitting at >98% duty cycle.The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 4.5 dBi for the frequency range 5.15 GHz to 5.25 GHz. In 802.11n mode, the data streams from each port are correlated from MCS0 up to MCS7. For these data rates, the directional antenna gain has been calculated in accordance with KDB 662911 D01 Section F)2)a)(i):

   $$\textit{Directional gain} = G_{ANT} + 10\log(N_{ANT})\ \textit{dBi}$$

   $$\textit{Directional gain for UAM antenna} = 3.0 + 10\log(2) = 6\ \textit{dBi}$$

   $$\textit{Directional gain for V100 antenna} = 4.5 + 10\log(2) = 7.5\ \textit{dBi}$$
6. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.
7. The Part 15.407(a)(1) limit is the lesser of 50 mW (17.0 dBm) or 4 dBm + 10 $\log_{10}$ B, where B is the previously measured 26 dB emission bandwidth in MHz. The limit for each channel was calculated using the narrowest ports emission bandwidth as this would be closest to the fixed limit:

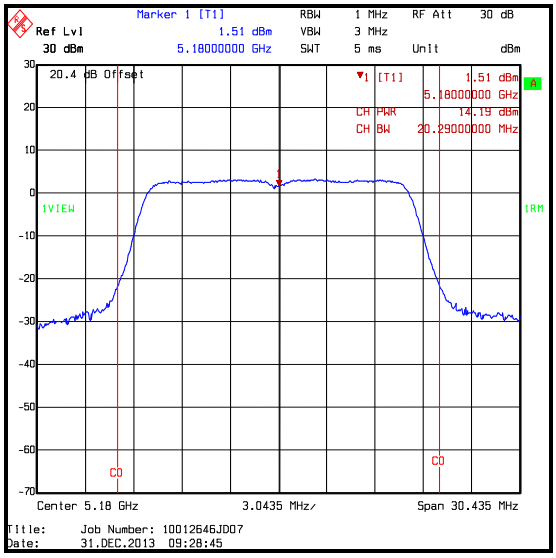
   802.11a 20 MHz channel width / Bottom channel = $4\ dBm + 10\log_{10} 20.3 = 17.1\ dBm$
   802.11a 20 MHz channel width / Middle channel = $4\ dBm + 10\log_{10} 20.4 = 17.1\ dBm$
   802.11a 20 MHz channel width / Top channel = $4\ dBm + 10\log_{10} 20.4 = 17.1\ dBm$
   802.11n 20 MHz channel width / Bottom channel = $4\ dBm + 10\log_{10} 21.0 = 17.2\ dBm$
   802.11n 20 MHz channel width / Middle channel = $4\ dBm + 10\log_{10} 21.0 = 17.2\ dBm$
   802.11n 20 MHz channel width / Top channel = $4\ dBm + 10\log_{10} 21.3 = 17.3\ dBm$
   802.11n 40 MHz channel width / Bottom channel = $4\ dBm + 10\log_{10} 43.3 = 20.4\ dBm$
   802.11n 40 MHz channel width / Top channel = $4\ dBm + 10\log_{10} 43.5 = 20.4\ dBm$

   Therefore the lesser of the two limits is the fixed limit of 50 mW (17 dBm). This was applied to the results, except in case of 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2 signals, which were correlated and therefore have an effective V100 antenna gain of 7.5 dBi between 5.15 GHz & 5.25 GHz. According to Part 15.407(a)(1), the limit has to be reduced by the amount in dB the antenna gain exceeds 6 dBi. Therefore a limit of 17 – 1.5 = 15.5 dBm was applied to this configuration.

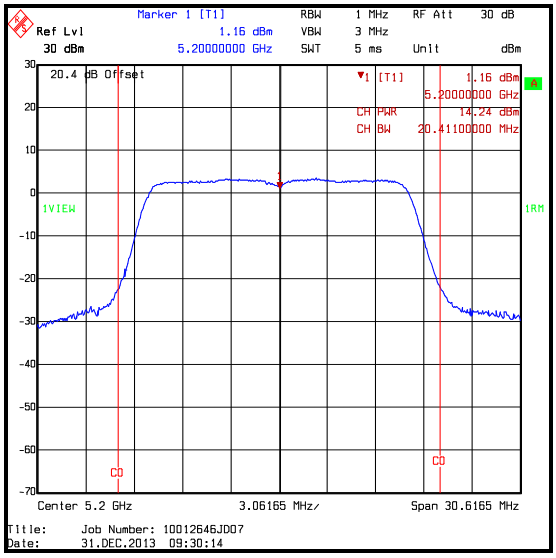
Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (Continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

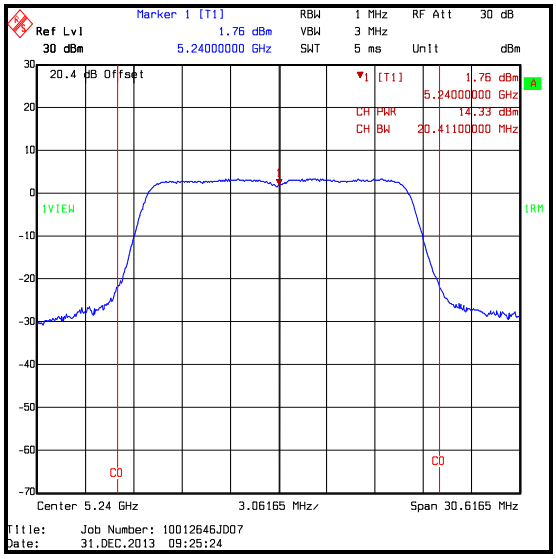
Channel	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	14.2	17.0	2.8	Complied
Middle	14.2	17.0	2.8	Complied
Top	14.3	17.0	2.7	Complied



Bottom Channel



Middle Channel



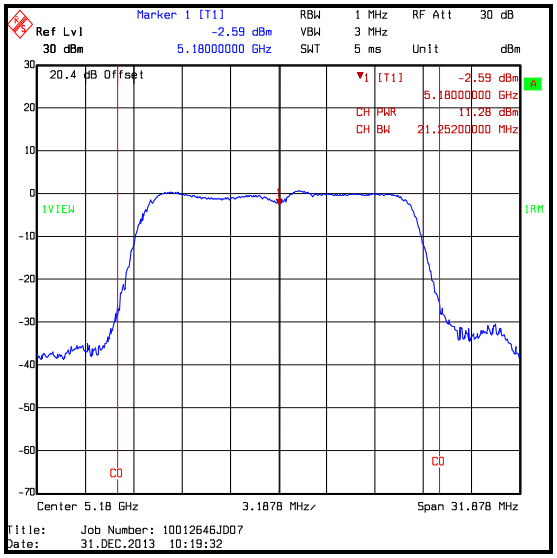
Top Channel

Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (Continued)

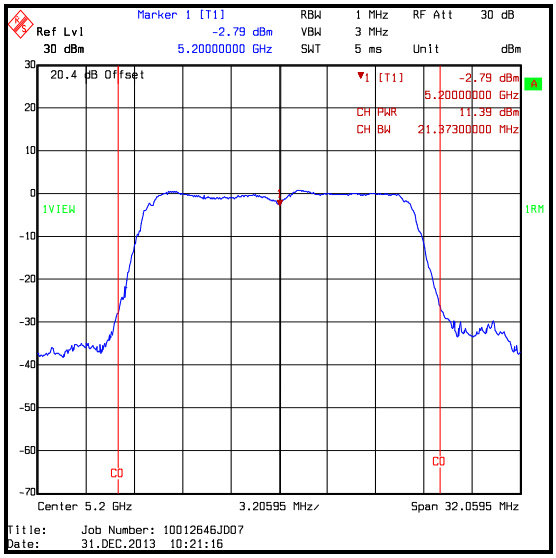
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	11.3	12.8	15.1	17.0	1.9	Complied
Middle	11.4	12.5	15.0	17.0	2.0	Complied
Top	11.8	12.3	15.1	17.0	1.9	Complied

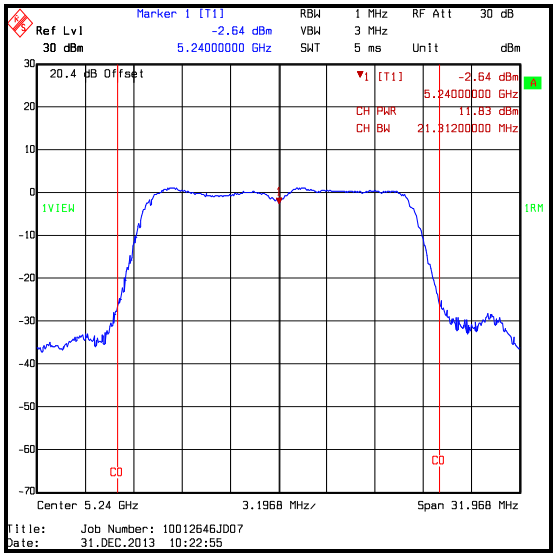
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 0



Bottom Channel



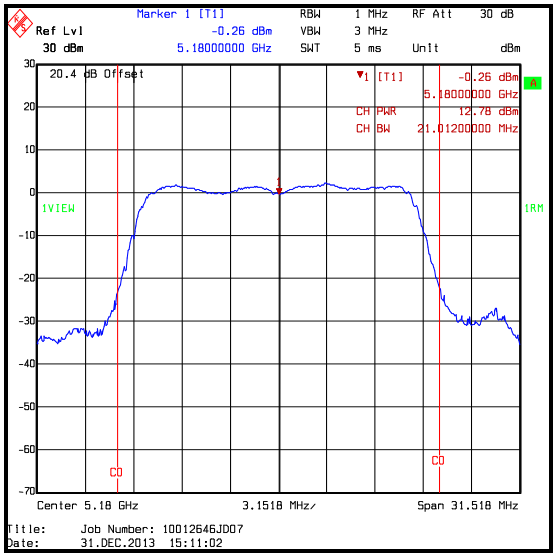
Middle Channel



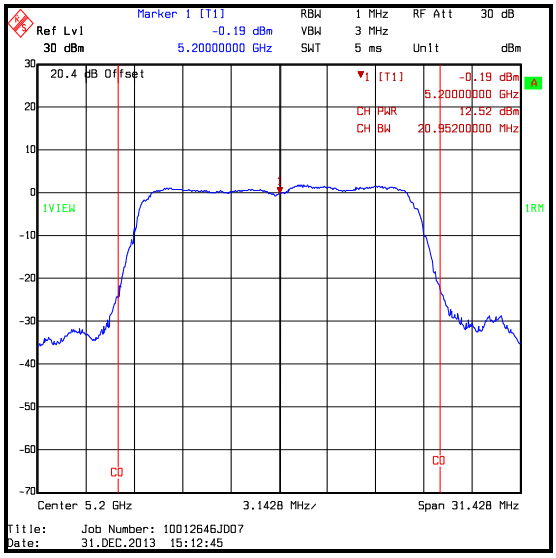
Top Channel

Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (Continued)

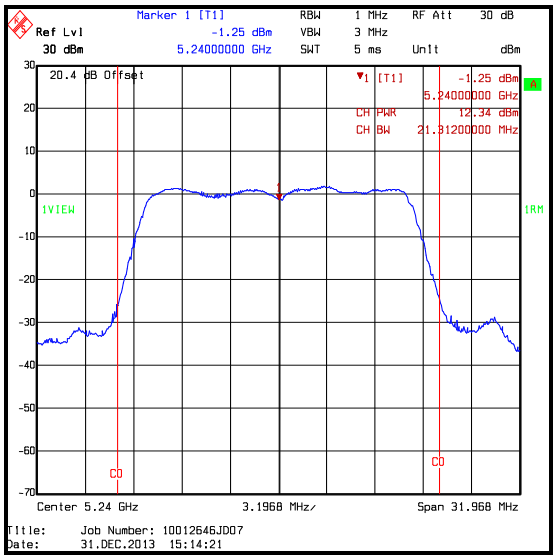
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 1



Bottom Channel



Middle Channel



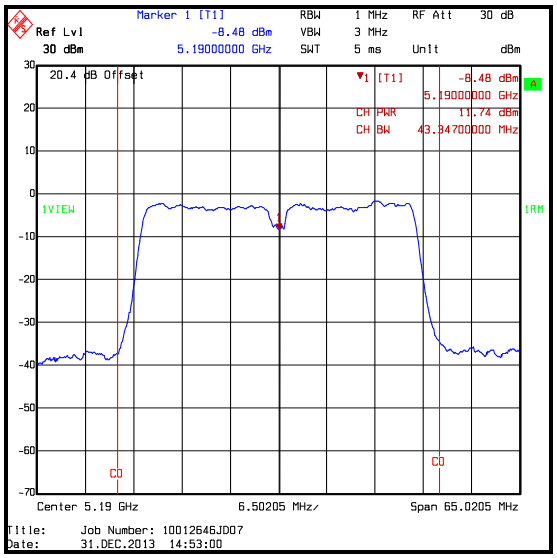
Top Channel

Transmitter Maximum Conducted Output Power (5.15-5.25 GHz band) (Continued)

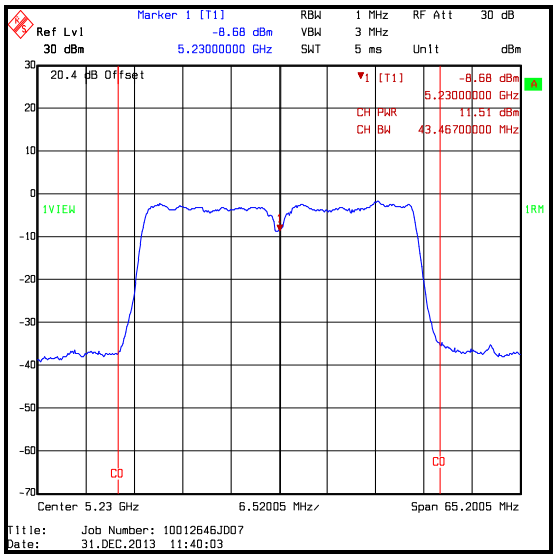
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	11.7	10.2	14.0	15.5	1.5	Complied
Top	11.5	12.5	15.0	15.5	0.5	Complied

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Port 0

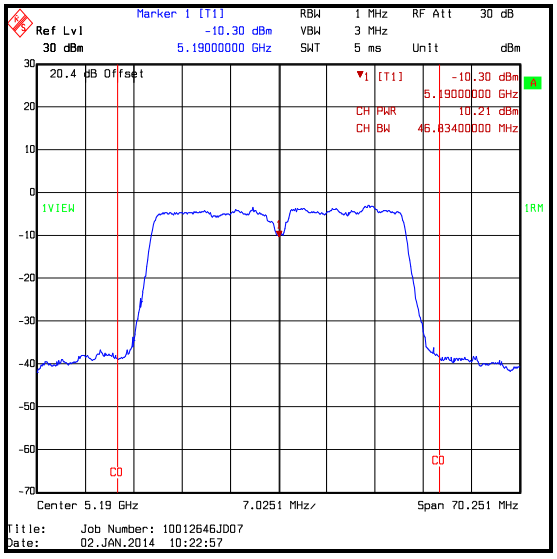


Bottom Channel

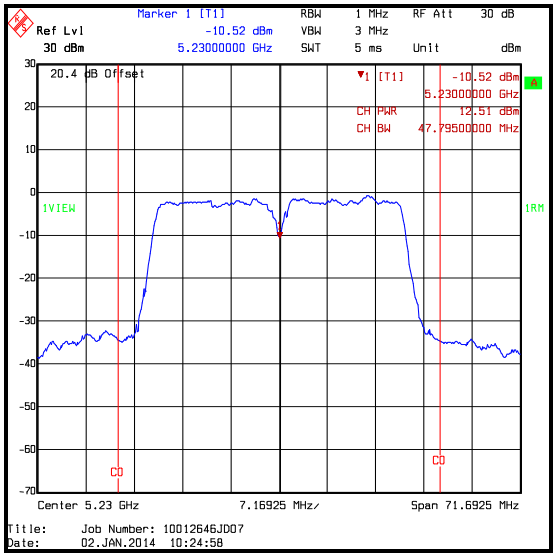


Top Channel

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Port 1



Bottom Channel



Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands)

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	31 December 2013 & 02 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(2)
Test Method Used:	As detailed in FCC KDB 789033 D01 Section E)2)b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	36 to 39

Note(s):

1. The FCC Part 15.407(a)(2) limit is the lesser of 250 mW (24.0 dBm) or 11 dBm + 10 $\log_{10}$ B, where B is the previously measured 26 dB emission bandwidth in MHz. The limit for each channel was calculated as below:

5.25-5.35 GHz band

802.11a 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 22.5 = 24.5 dBm*
802.11a 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 22.6 = 24.5 dBm*
802.11a 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 20.5 = 24.1 dBm*
802.11n 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 21.0 = 24.2 dBm*
802.11n 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 21.3 = 24.3 dBm*
802.11n 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 21.0 = 24.2 dBm*
802.11n 40 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 43.3 = 27.4 dBm*
802.11n 40 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 43.5 = 27.4 dBm*

5.47-5.725 GHz band

802.11a 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 20.3 = 24.1 dBm*
802.11a 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 20.3 = 24.1 dBm*
802.11a 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 20.3 = 24.1 dBm*
802.11n 20 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 21.0 = 24.2 dBm*
802.11n 20 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 21.4 = 24.3 dBm*
802.11n 20 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 20.9 = 24.2 dBm*
802.11n 40 MHz channel width / Bottom channel = *11 dBm + 10 $\log_{10}$ 43.6 = 27.4 dBm*
802.11n 40 MHz channel width / Middle channel = *11 dBm + 10 $\log_{10}$ 43.5 = 27.4 dBm*
802.11n 40 MHz channel width / Top channel = *11 dBm + 10 $\log_{10}$ 43.2 = 27.4 dBm*

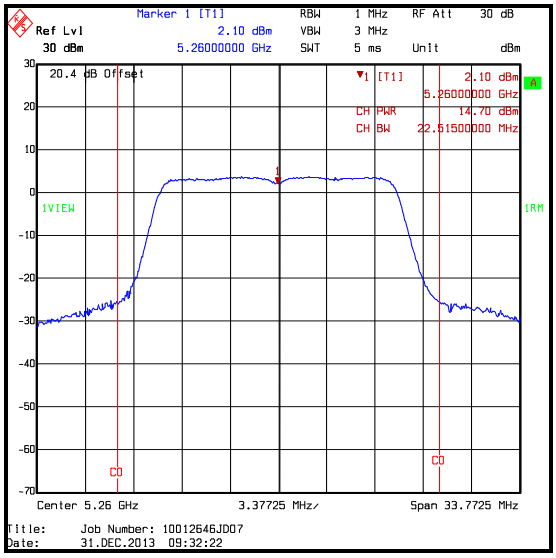
The lesser of the two limits is the fixed limit of 250 mW (24.0 dBm). This was applied to the results.

2. The EUT was transmitting at >98% duty cycle.
3. The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 3.8 dBi for the frequency range 5.25 GHz to 5.35 GHz.
4. The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 2.6 dBi for the frequency range 5.47 GHz to 5.725 GHz.
5. As 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2 signals were correlated, an effective V100 antenna gain of 6.8 dBi applies between 5.25 GHz & 5.35 GHz. According to Part 15.407(a)(2), the limit has to be reduced by the amount in dB the antenna gain exceeds 6 dBi. Therefore a limit of 24 – 0.8 = 23.2 dBm was applied to this configuration.

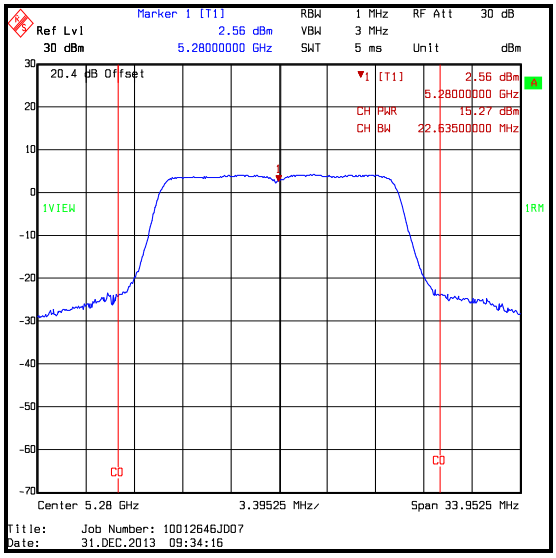
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / 5.25-5.35 GHz band

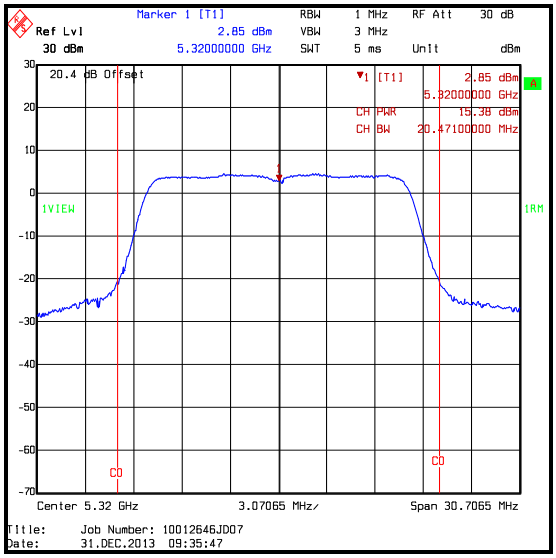
Channel	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	14.7	24.0	9.3	Complied
Middle	15.3	24.0	8.7	Complied
Top	15.4	24.0	8.6	Complied



Bottom Channel



Middle Channel



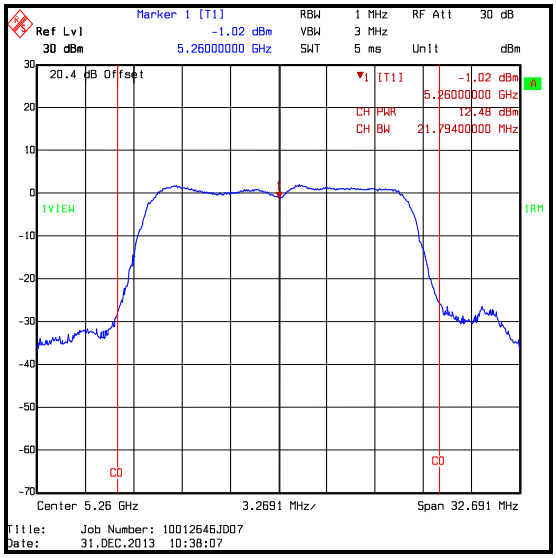
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

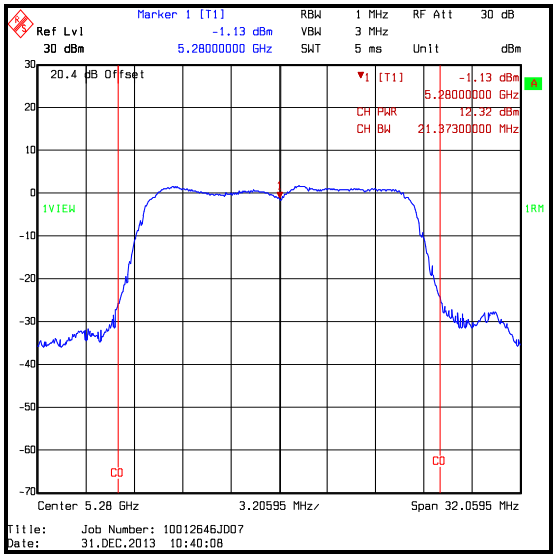
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.25-5.35 GHz band

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	12.5	12.5	15.5	24.0	8.5	Complied
Middle	12.3	12.6	15.5	24.0	8.5	Complied
Top	12.4	13.2	15.8	24.0	8.2	Complied

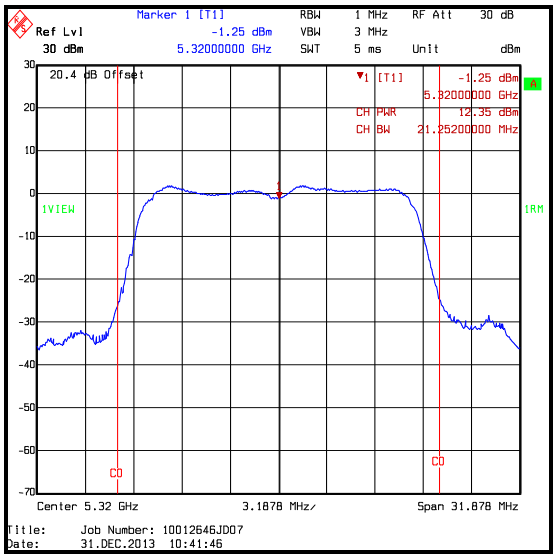
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.25-5.35 GHz band / Port 0



Bottom Channel



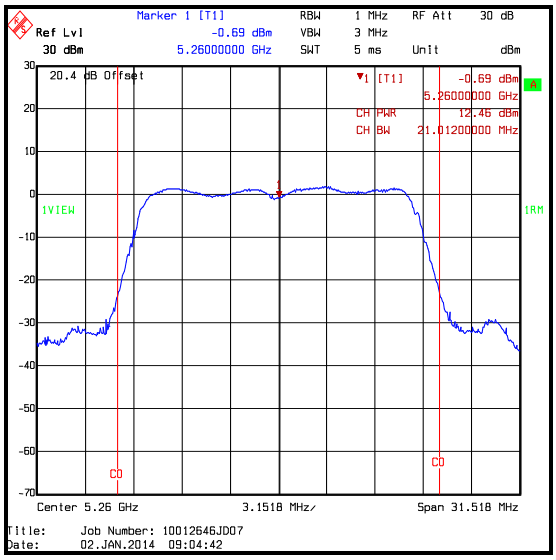
Middle Channel



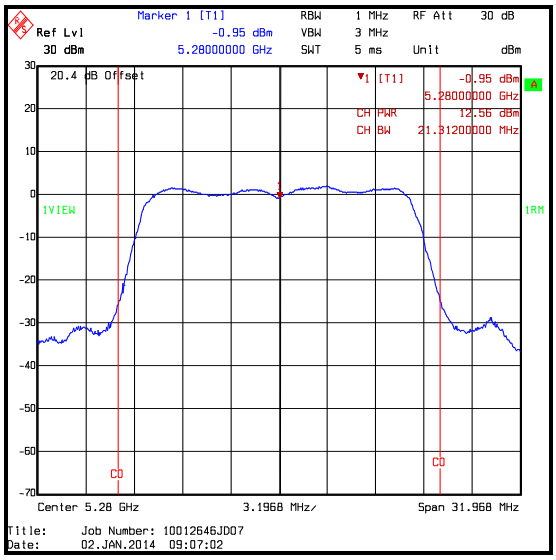
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

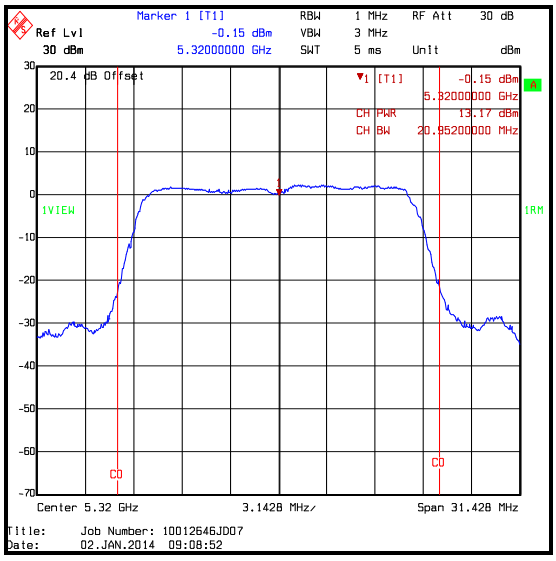
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.25-5.35 GHz band / Port 1



Bottom Channel



Middle Channel



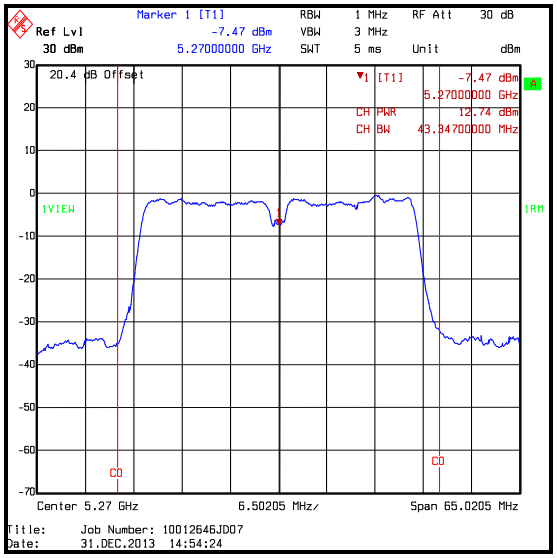
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

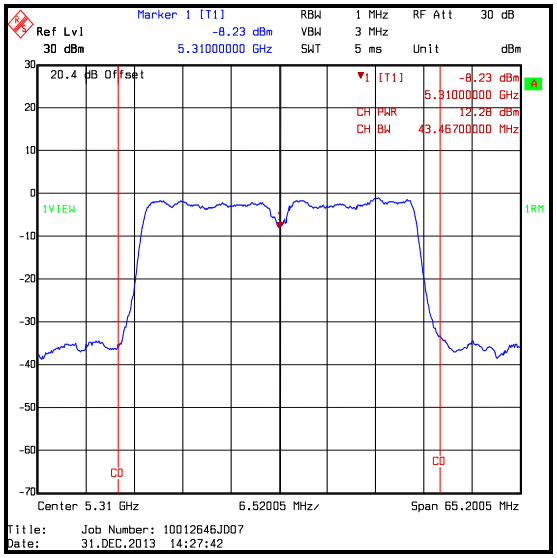
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.25-5.35 GHz band

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	12.7	10.3	14.7	23.2	8.5	Complied
Top	12.3	12.7	15.5	23.2	7.7	Complied

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.25-5.35 GHz band / Port 0

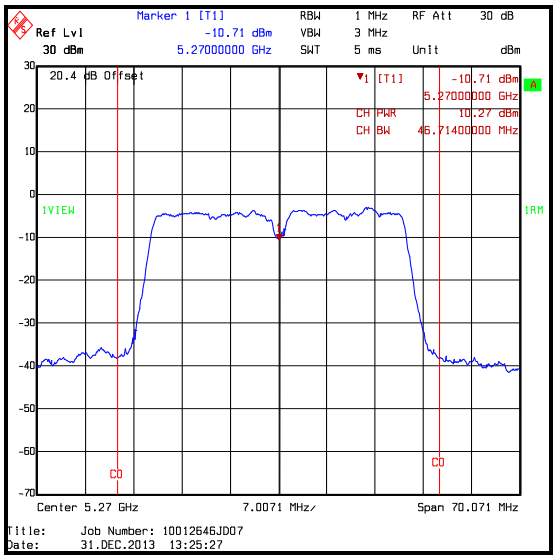


Bottom Channel

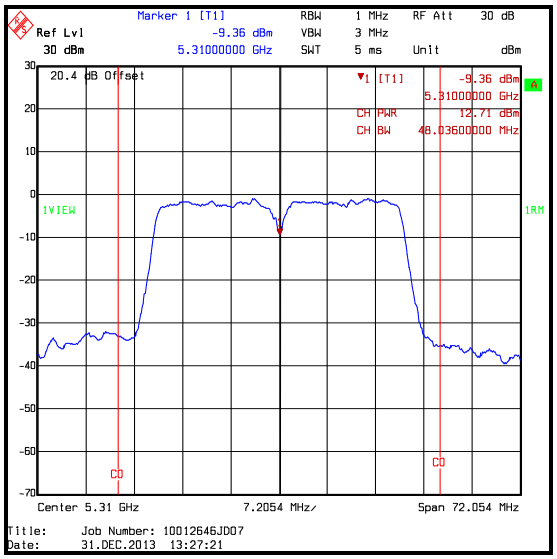


Top Channel

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.25-5.35 GHz band / Port 1



Bottom Channel

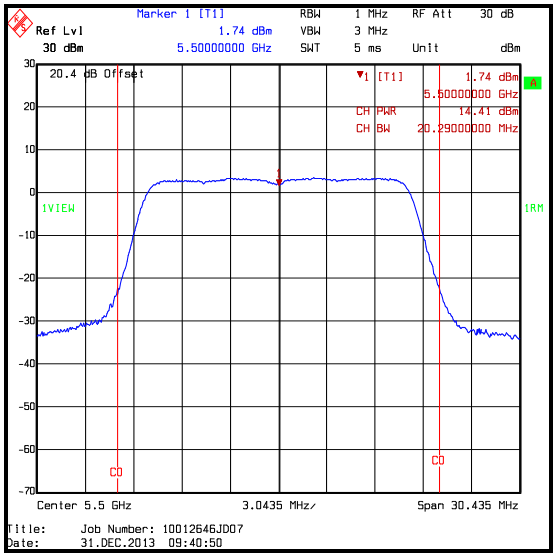


Top Channel

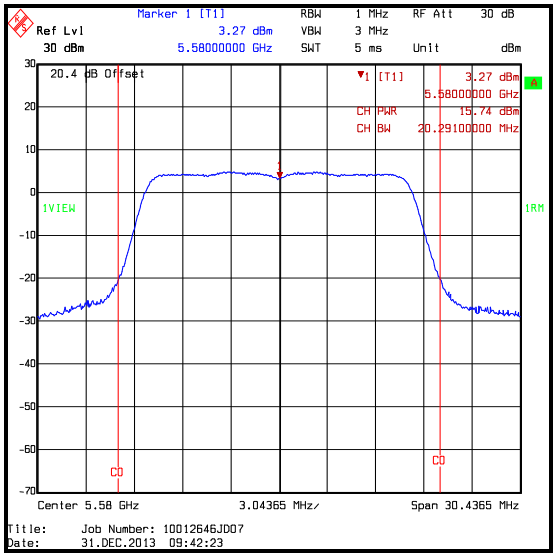
Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / 5.47-5.725 GHz band

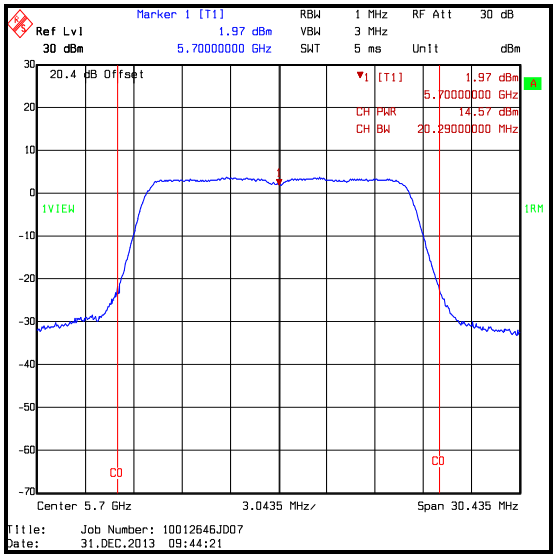
Channel	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	14.4	24.0	9.6	Complied
Middle	15.7	24.0	8.3	Complied
Top	14.6	24.0	9.4	Complied



Bottom Channel



Middle Channel



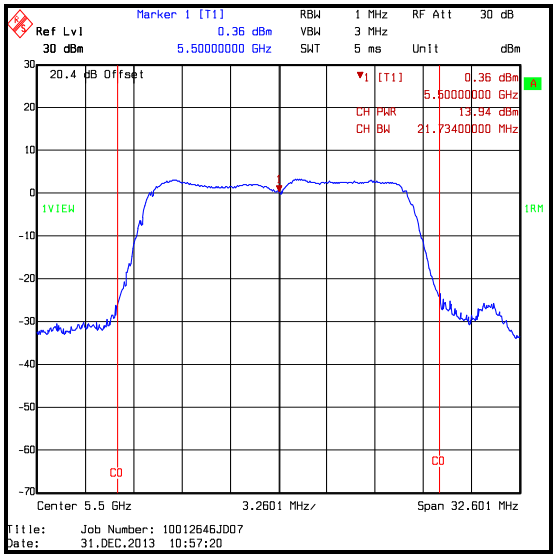
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

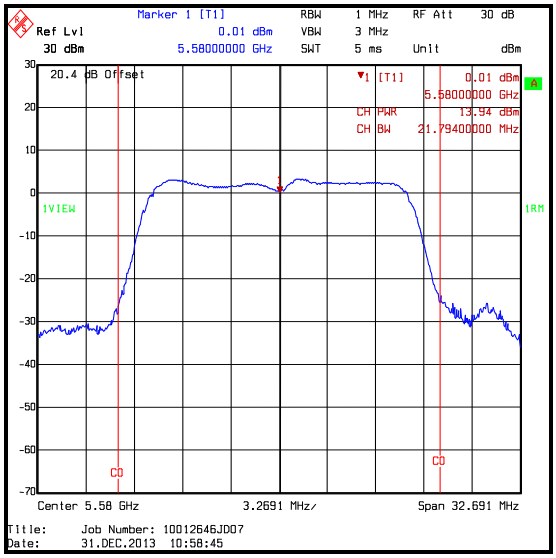
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.47-5.725 GHz band

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	13.9	13.8	16.9	24.0	7.1	Complied
Middle	13.9	13.9	16.9	24.0	7.1	Complied
Top	12.6	12.2	15.4	24.0	8.6	Complied

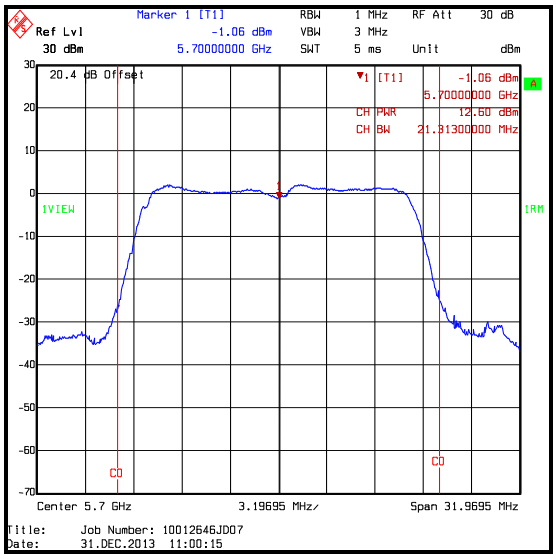
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.47-5.725 GHz band / Port 0



Bottom Channel



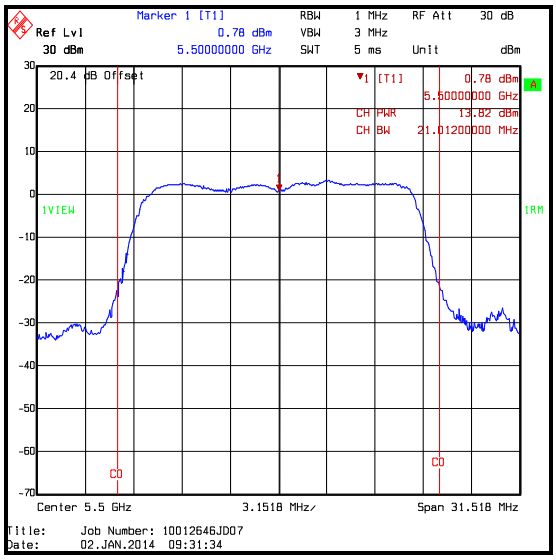
Middle Channel



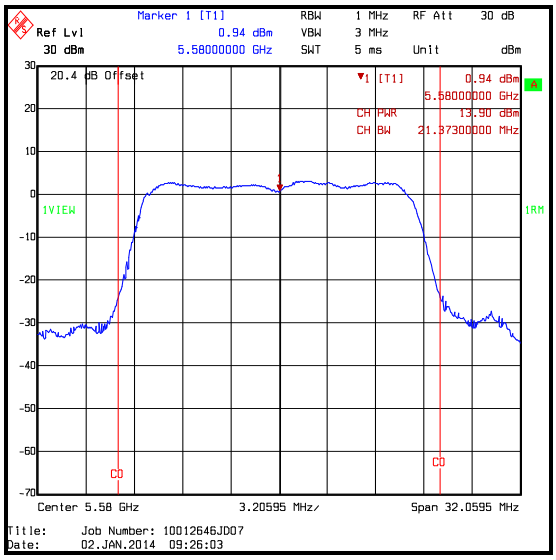
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

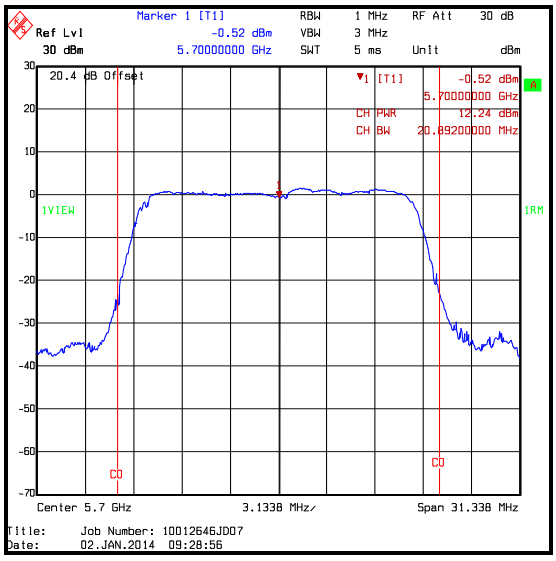
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.47-5.725 GHz band / Port 1



Bottom Channel



Middle Channel



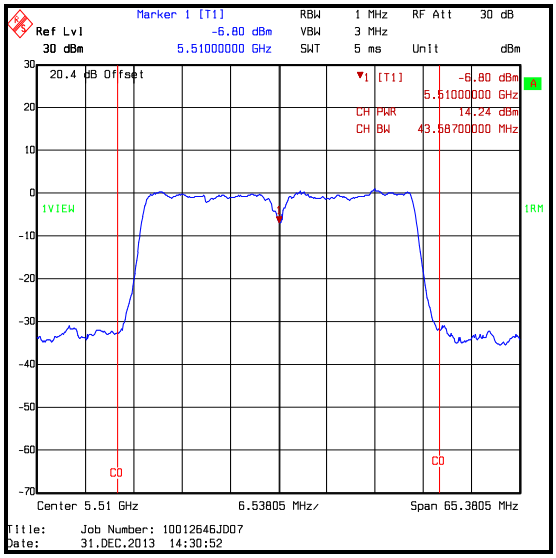
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

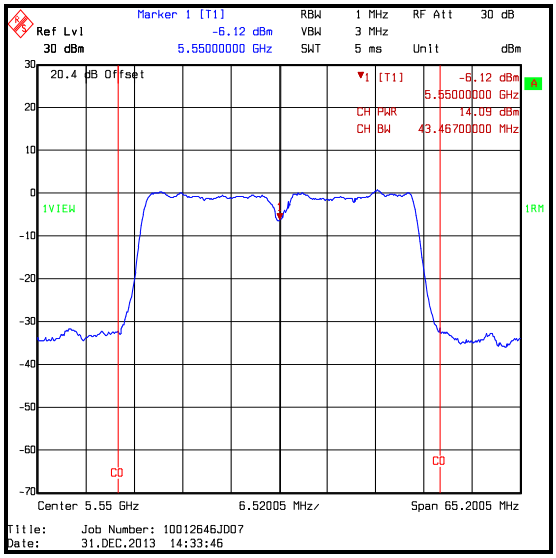
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.47-5.725 GHz band

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	14.2	12.6	16.5	24.0	7.5	Complied
Middle	14.1	14.0	17.1	24.0	6.9	Complied
Top	13.5	13.3	16.4	24.0	7.6	Complied

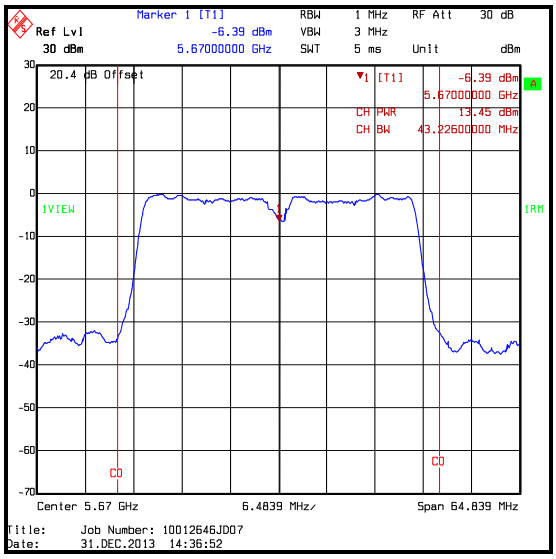
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.47-5.725 GHz band / Port 0



Bottom Channel



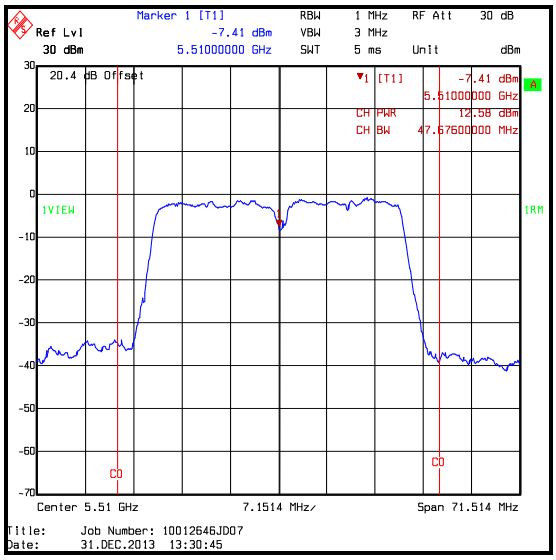
Middle Channel



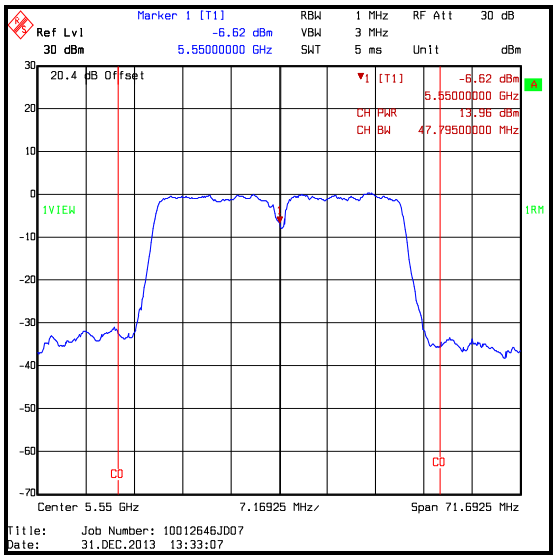
Top Channel

Transmitter Maximum Conducted Output Power (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

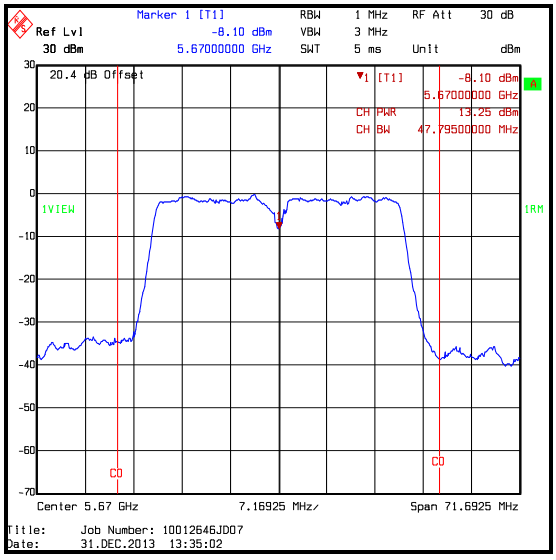
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.47-5.725 GHz band / Port 1



Bottom Channel



Middle Channel



Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band)

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	31 December 2013 & 02 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(3)
Test Method Used:	As detailed in FCC KDB 789033 D01 Section E)2)b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	36 to 40

Note(s):

1. The FCC Part 15.407(a)(3) limit is the lesser of 1 W (30.0 dBm) or 17 dBm + 10 $\log_{10}$ B, where B is the previously measured 26 dB emission bandwidth in MHz. The limit for each channel was calculated as below:

802.11a 20 MHz channel width / Bottom channel = *17 dBm + 10 $\log_{10}$ 20.2 = 30.1 dBm*
802.11a 20 MHz channel width / Middle channel = *17 dBm + 10 $\log_{10}$ 20.3 = 30.1 dBm*
802.11a 20 MHz channel width / Top channel = *17 dBm + 10 $\log_{10}$ 20.2 = 30.1 dBm*
802.11n 20 MHz channel width / Bottom channel = *17 dBm + 10 $\log_{10}$ 21.0 = 30.2 dBm*
802.11n 20 MHz channel width / Middle channel = *17 dBm + 10 $\log_{10}$ 21.0 = 30.2 dBm*
802.11n 20 MHz channel width / Top channel = *17 dBm + 10 $\log_{10}$ 21.0 = 30.2 dBm*
802.11n 40 MHz channel width / Bottom channel = *17 dBm + 10 $\log_{10}$ 42.5 = 33.3 dBm*
802.11n 40 MHz channel width / Top channel = *17 dBm + 10 $\log_{10}$ 42.4 = 33.3 dBm*

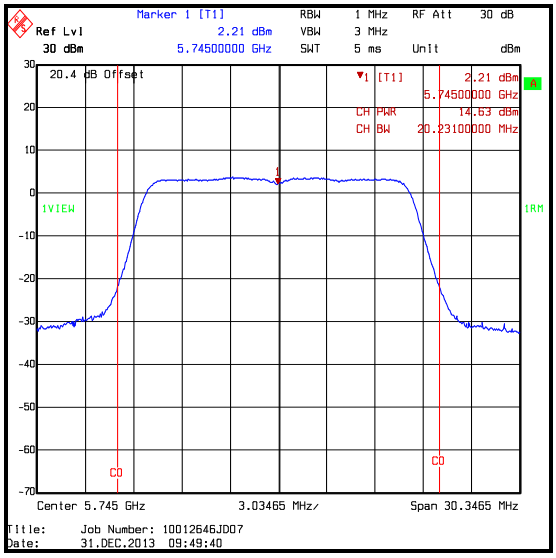
The lesser of the two limits is the fixed limit of 1 W (30.0 dBm). This was applied to the results.

2. The EUT was transmitting at >98% duty cycle.
3. The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 1.9 dBi for the frequency range 5.725 GHz to 5.85 GHz.

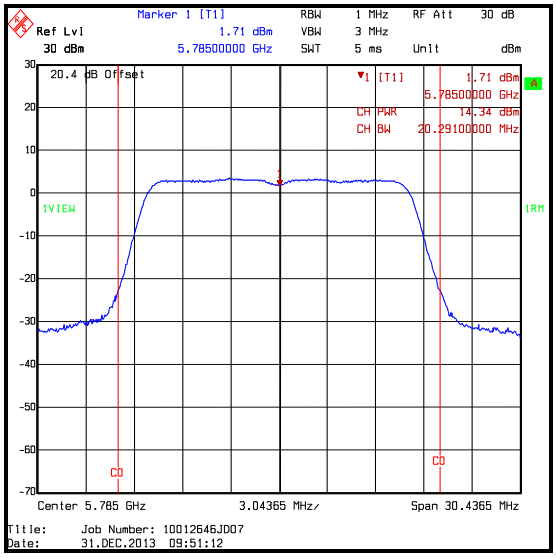
Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

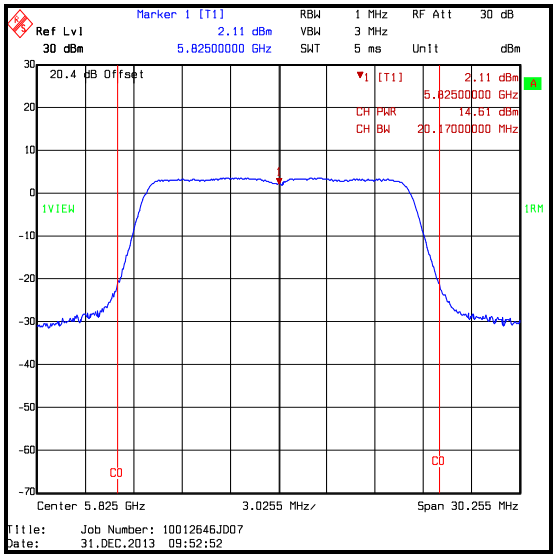
Channel	Conducted Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	14.6	30.0	15.4	Complied
Middle	14.3	30.0	15.7	Complied
Top	14.6	30.0	15.4	Complied



Bottom Channel



Middle Channel



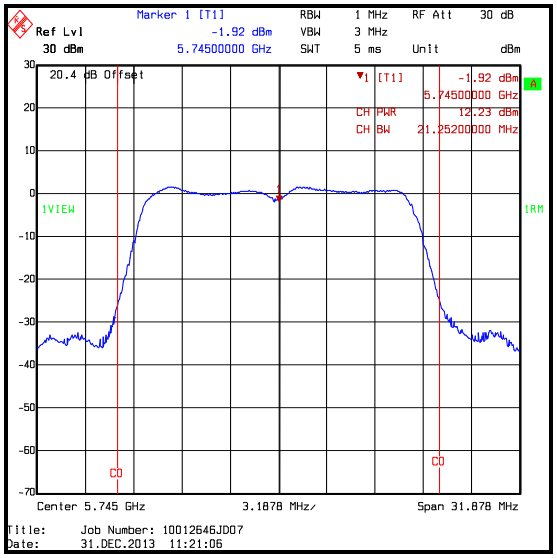
Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)

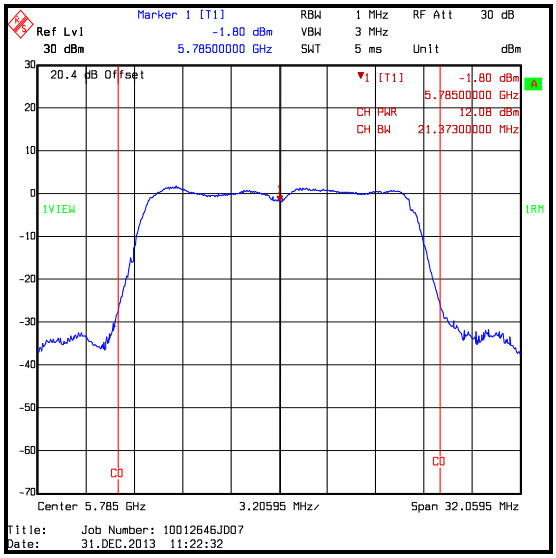
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	12.2	12.5	15.4	30.0	14.6	Complied
Middle	12.1	12.4	15.3	30.0	14.7	Complied
Top	11.3	12.5	15.0	30.0	15.0	Complied

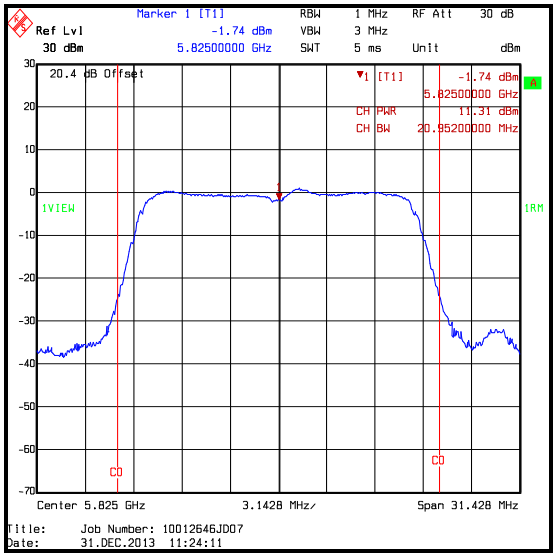
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 0



Bottom Channel



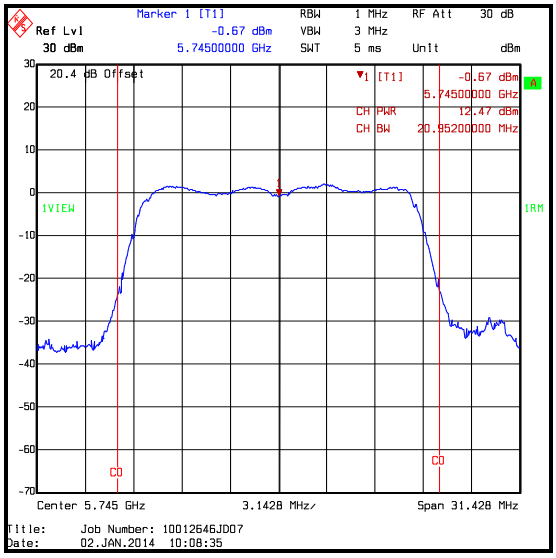
Middle Channel



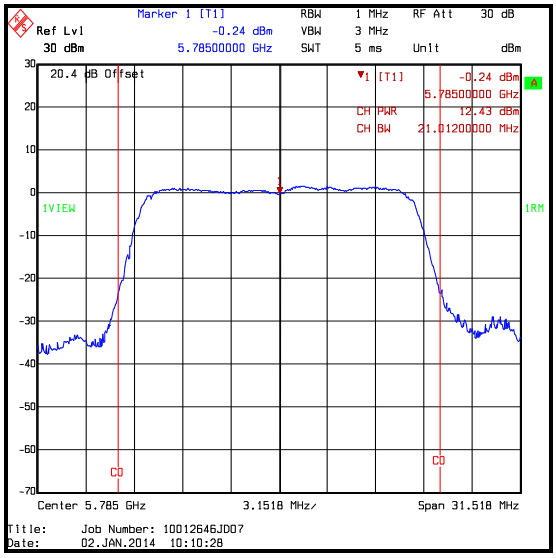
Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)

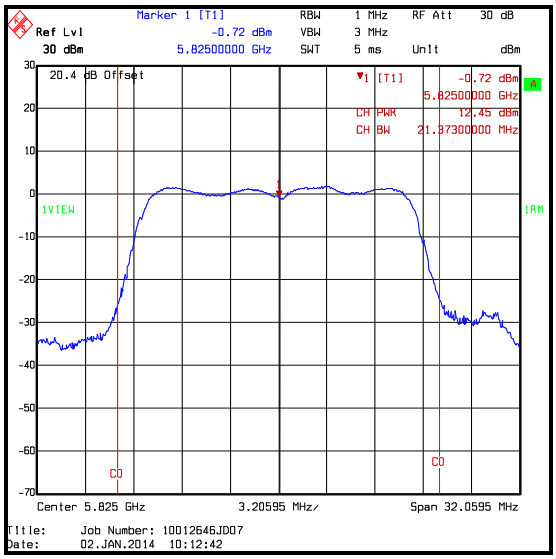
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 1



Bottom Channel



Middle Channel



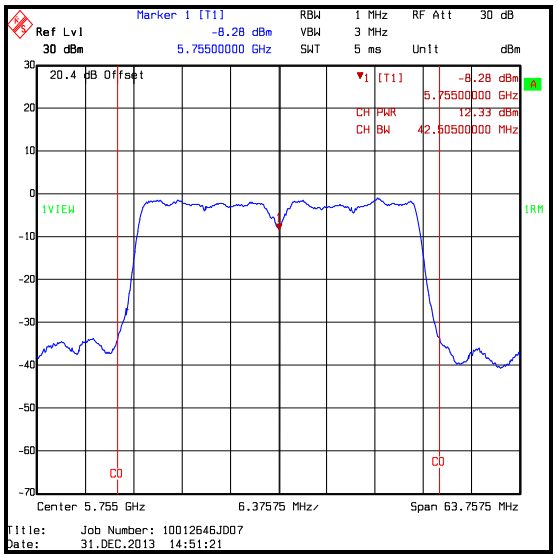
Top Channel

Transmitter Maximum Conducted Output Power (5.725-5.85 GHz band) (continued)

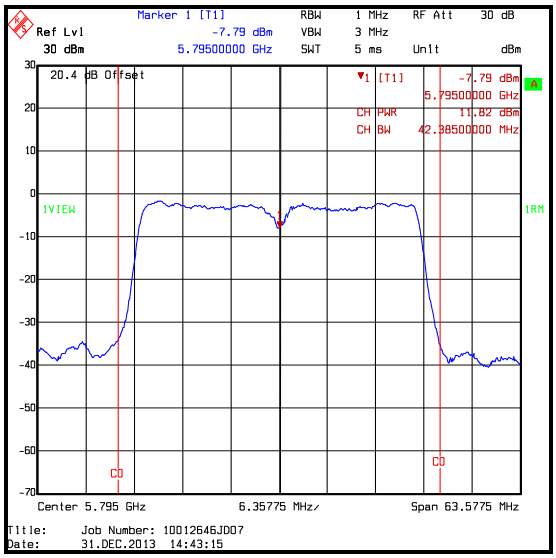
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Channel	Conducted Peak Power Port 0 (dBm)	Conducted Peak Power Port 1 (dBm)	Combined Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	11.6	11.8	14.7	30.0	15.3	Complied
Top	11.5	12.5	15.0	30.0	15.0	Complied

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Port 0

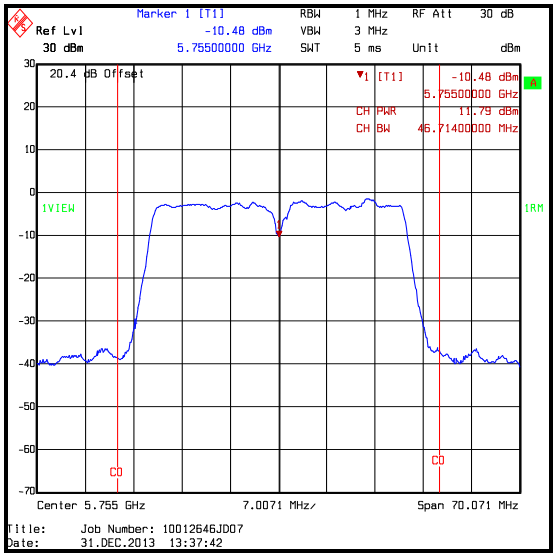


Bottom Channel

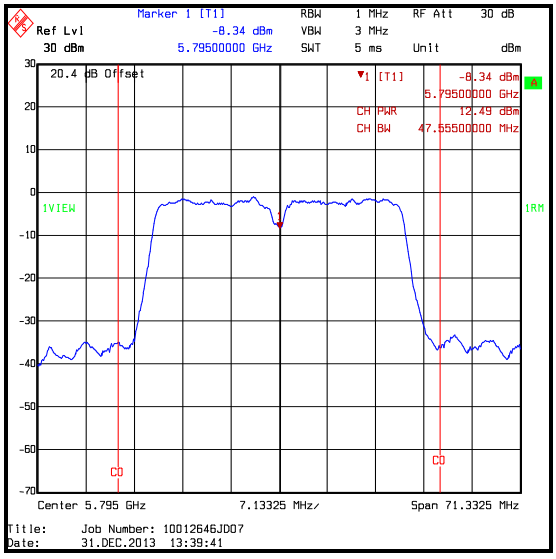


Top Channel

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Port 1



Bottom Channel



Top Channel

Transmitter Maximum Conducted Output Power (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1998	Attenuator	Huber & Suhner	6820.17B	07101	05 Apr 2014	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	15 May 2014	12
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	14 May 2014	12
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	25 Jun 2014	12

5.2.4. Transmitter Peak Power Spectral Density

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	31 December 2013 & 02 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(1)
Test Method Used:	As detailed in FCC KDB 789033 F) referencing KDB 789033 E)2)b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	36 to 40

Note(s):

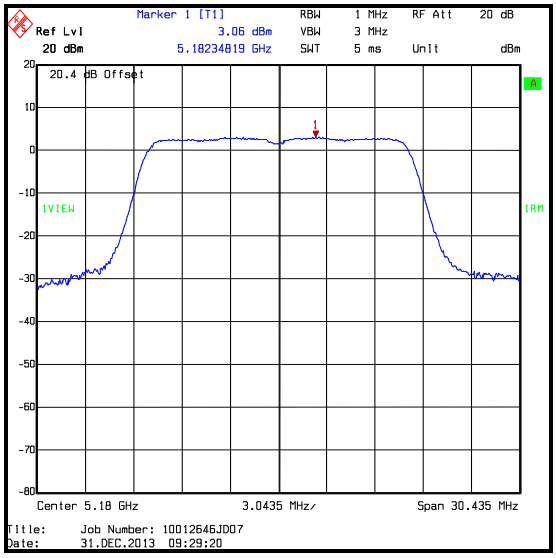
1. Transmitter Peak Power Spectral Density tests in all bands were performed using a test receiver in accordance with FCC KDB 789033 E)2)b) Method SA-1.
2. All supported modes and channel widths were initially investigated on one channel. The modes that produced the highest power and therefore deemed worst case were:
   - o 802.11a – QPSK / 12 Mbit/s
   - o 802.11n HT20 – BPSK / 13 Mbit/s / MCS8
   - o 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2

   Measurements were then performed in these modes on bottom, middle and top channels in all operating bands.
3. For 802.11a, power was measured on both ports, port 0 was found to produce the highest power and was therefore deemed worst case. Results for Port 0 are recorded in the tables below.
4. For 802.11n, power was measured on both ports and then combined using the measure-and-sum method stated in FCC KDB 662911 D01.
5. The EUT was transmitting at >98% duty cycle.
6. The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 4.5 dBi for the frequency range 5.15 GHz to 5.25 GHz.
7. In the case of 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2 signals which were correlated, an effective V100 antenna gain of 7.5 dBi applies between 5.15 GHz & 5.25 GHz. According to 15.407(a)(1), the limit has to be reduced by the amount in dB the antenna gain exceeds 6 dBi. Therefore a limit of 4 – 1.5 = 2.5 dBm/MHz was applied to this mode.
8. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.

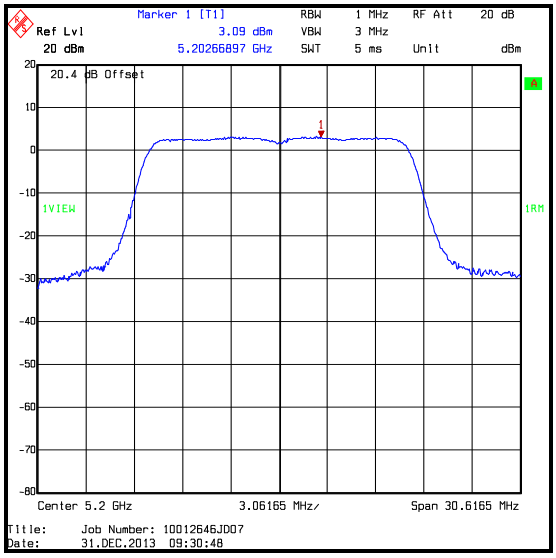
Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

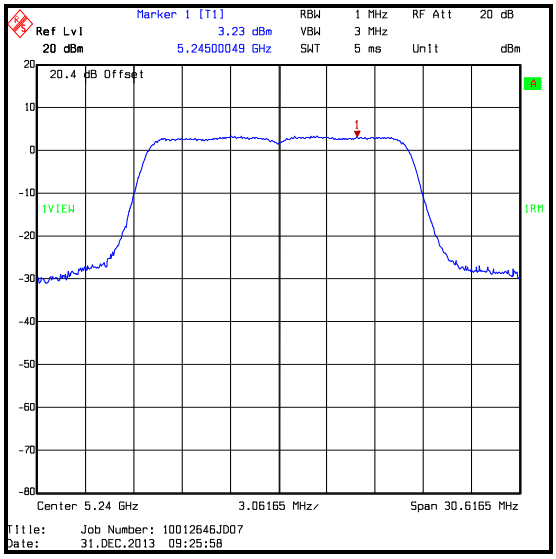
Channel	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	3.1	4.0	0.9	Complied
Middle	3.1	4.0	0.9	Complied
Top	3.2	4.0	0.8	Complied



Bottom Channel



Middle Channel



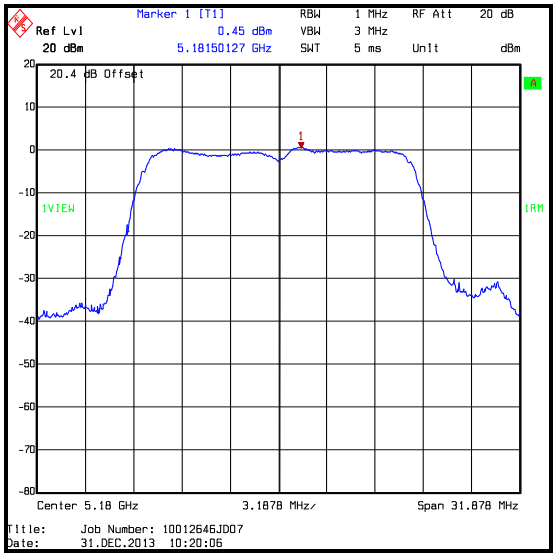
Top Channel

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

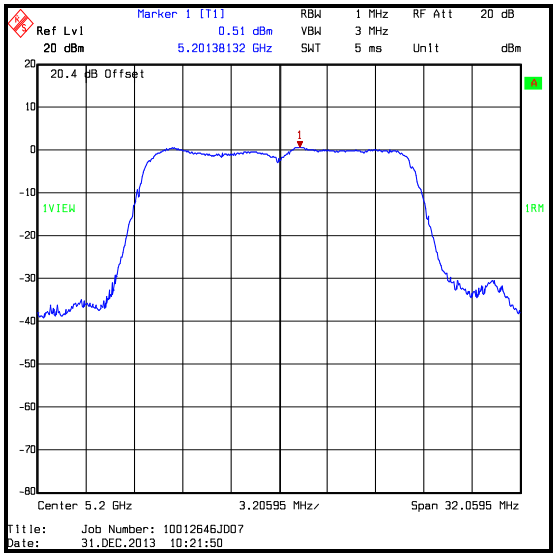
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	0.5	1.1	3.8	4.0	0.2	Complied
Middle	0.5	1.2	3.9	4.0	0.1	Complied
Top	0.4	0.8	3.6	4.0	0.4	Complied

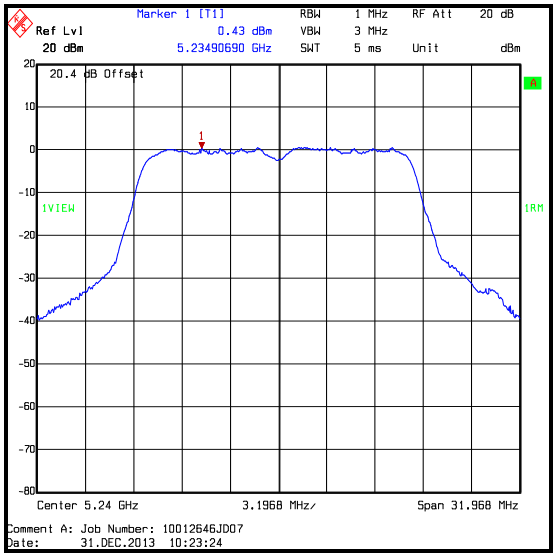
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 0



Bottom Channel



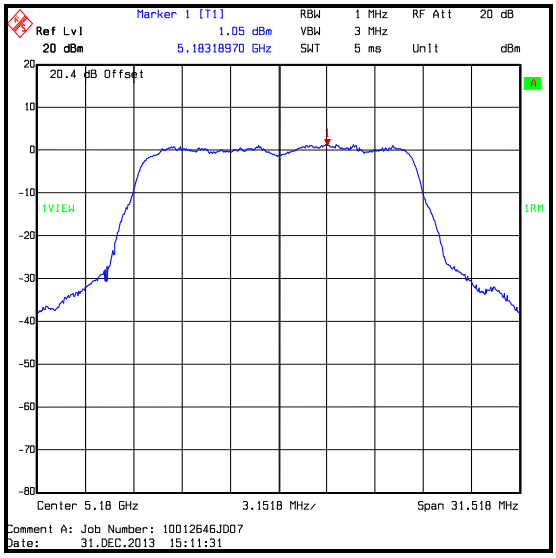
Middle Channel



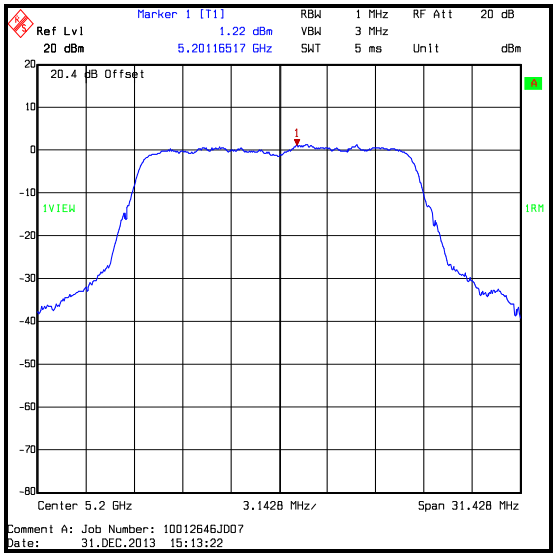
Top Channel

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

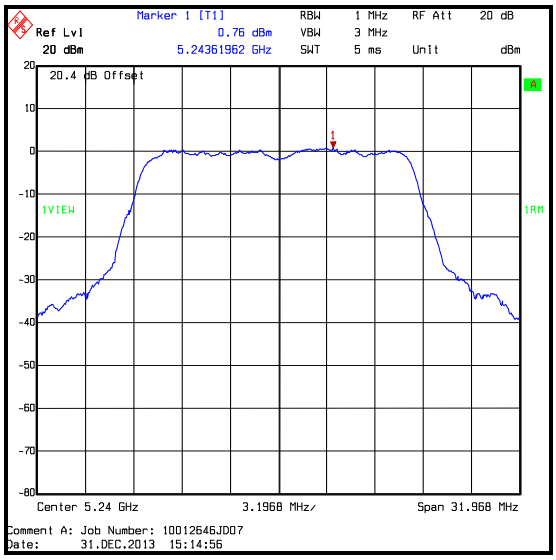
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 1



Bottom Channel



Middle Channel



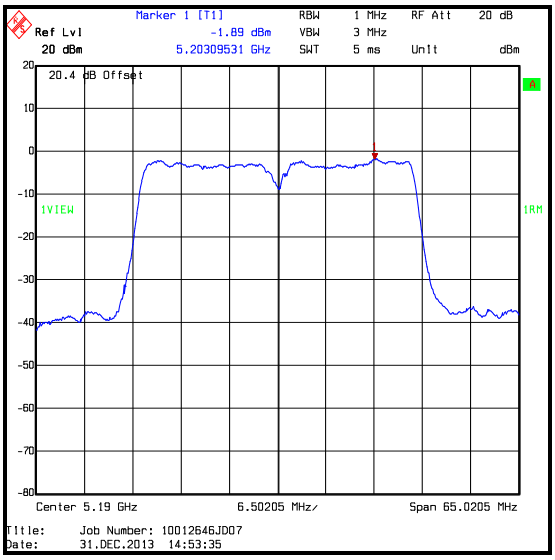
Top Channel

Transmitter Peak Power Spectral Density (5.15-5.25 GHz band) (continued)

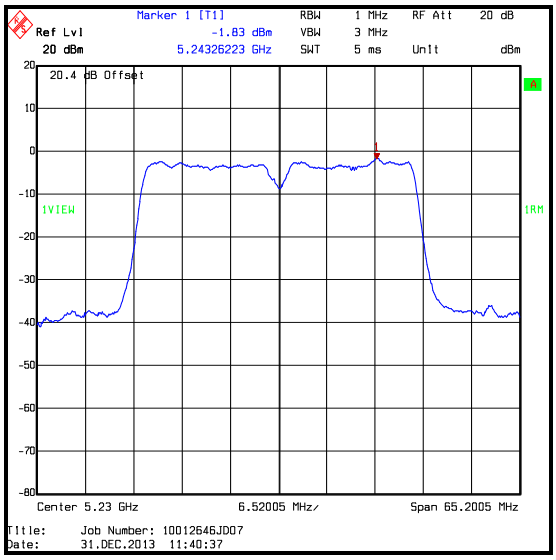
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	-1.9	-3.4	0.4	2.5	2.1	Complied
Top	-1.8	-0.9	1.7	2.5	0.8	Complied

Results: Port 0

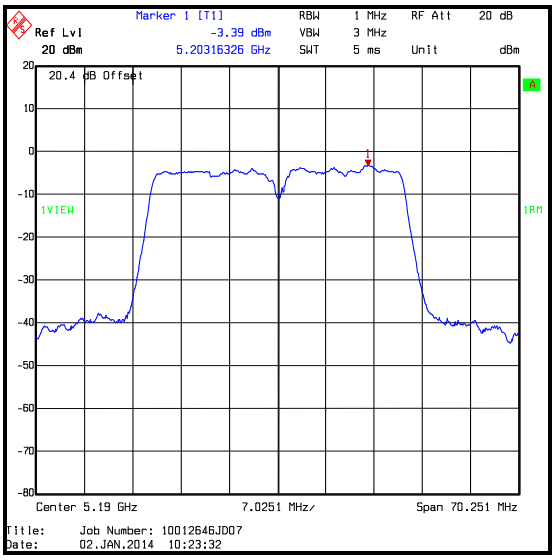


Bottom Channel

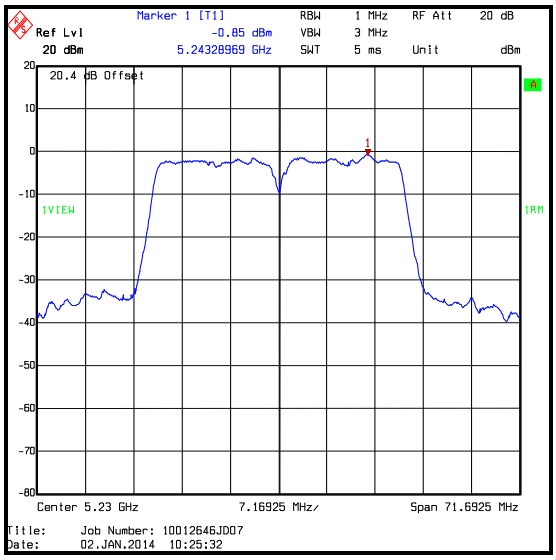


Top Channel

Results: Port 1



Bottom Channel



Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands)

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	31 December 2013 & 02 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(2)
Test Method Used:	As detailed in FCC KDB 789033 F) referencing KDB 789033 E)2)b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	36 to 40

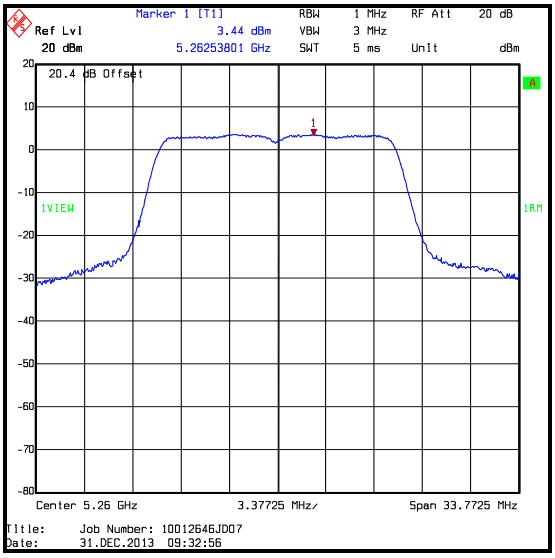
Note(s):

1. FCC Part 15.407(a)(2) limit for PPSD in the 5.25-5.35 GHz and 5.47-5.725 GHz operating bands is <11 dBm/MHz.
2. The EUT was transmitting at >98% duty cycle.
3. The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 3.8 dBi for the frequency range 5.25 GHz to 5.35 GHz.
4. The antenna The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 2.6 dBi for the frequency range 5.47 GHz to 5.725 GHz.
5. In the case of 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2 signals which were correlated, an effective V100 antenna gain of 6.8 dBi applies between 5.25 GHz & 5.35 GHz. According to Part 15.407(a)(2), the limit has to be reduced by the amount in dB the antenna gain exceeds 6 dBi. Therefore the limit applied was 11 – 0.8 = 10.2 dBm/MHz.

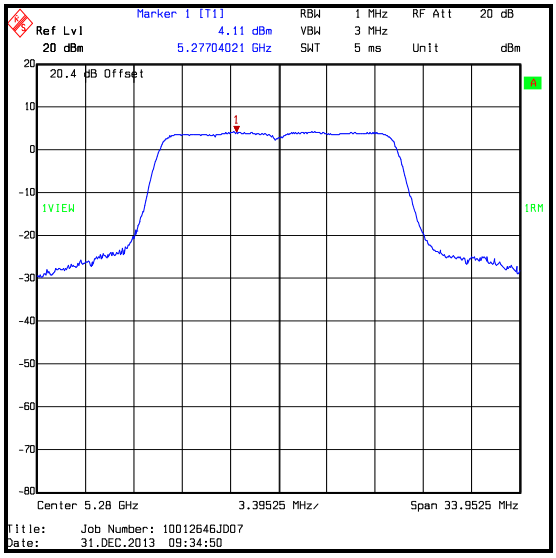
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / 5.25-5.35 GHz band

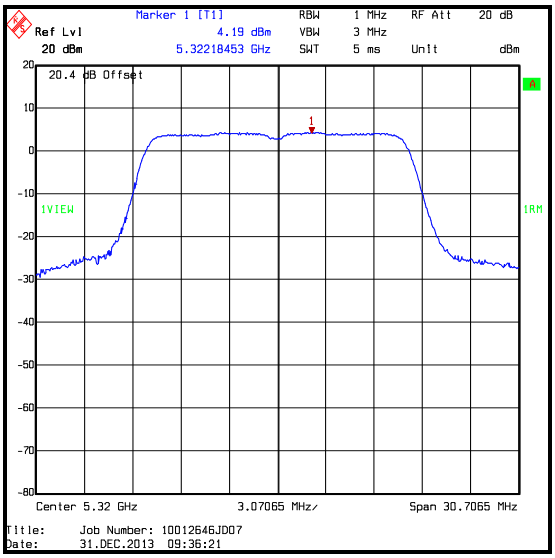
Channel	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	3.4	11.0	7.6	Complied
Middle	4.1	11.0	6.9	Complied
Top	4.2	11.0	6.8	Complied



Bottom Channel



Middle Channel



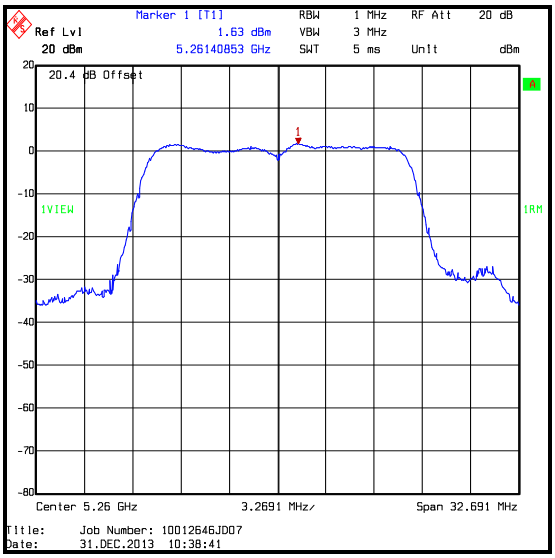
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

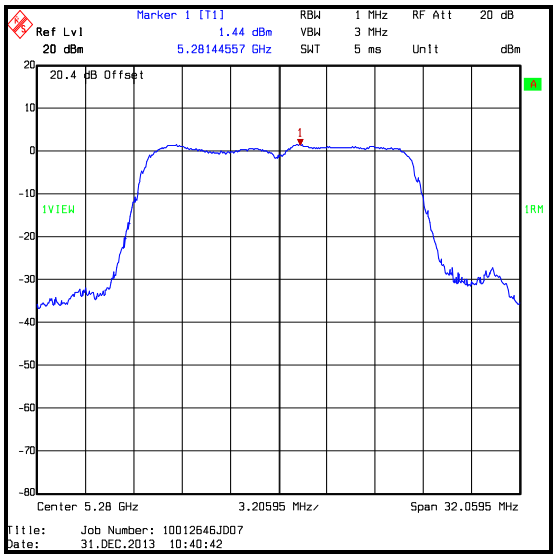
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.25-5.35 GHz band

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	1.6	1.6	4.6	11.0	6.4	Complied
Middle	1.4	1.6	4.5	11.0	6.5	Complied
Top	1.5	2.1	4.8	11.0	6.2	Complied

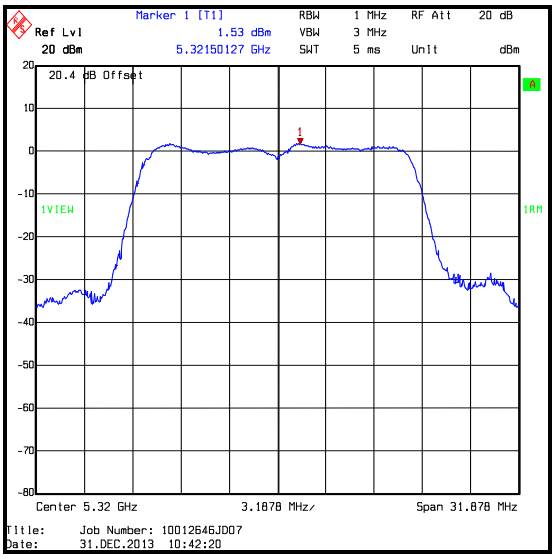
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.25-5.35 GHz band / Port 0



Bottom Channel



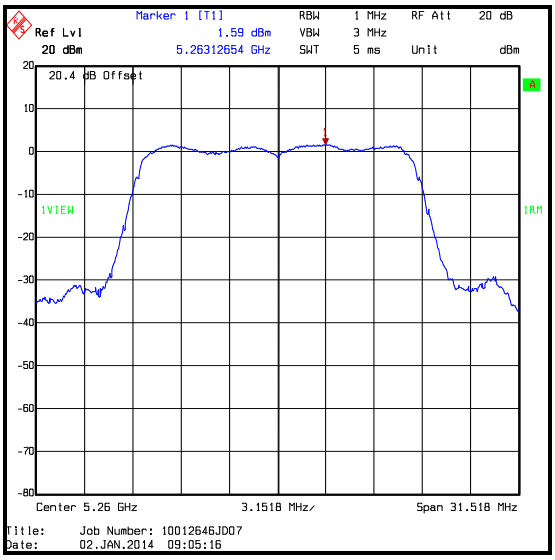
Middle Channel



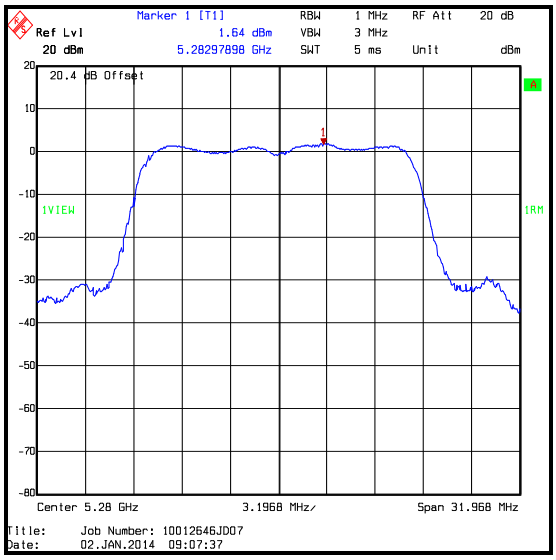
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

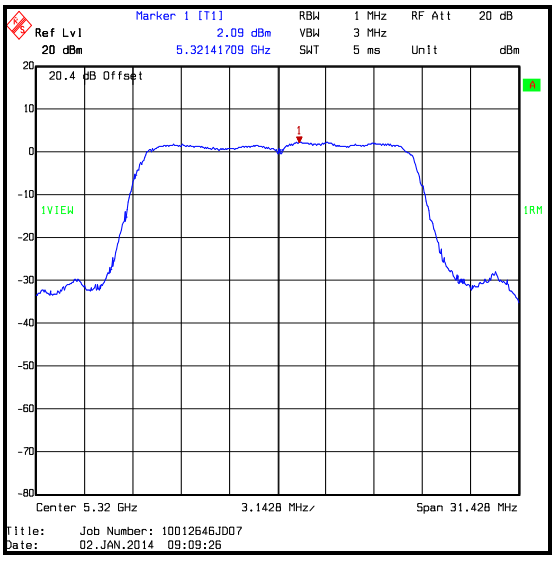
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.25-5.35 GHz band / Port 1



Bottom Channel



Middle Channel



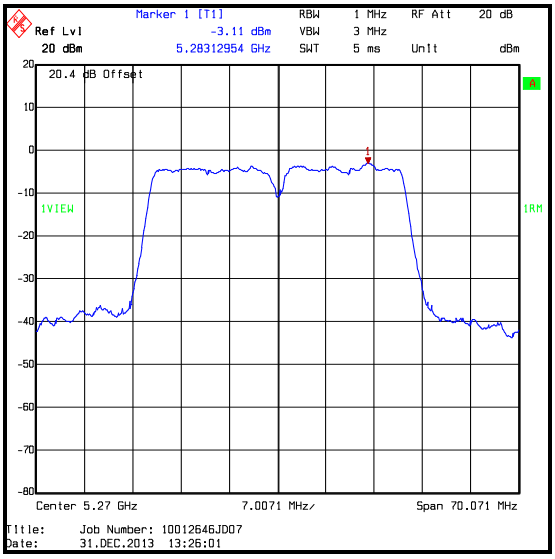
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

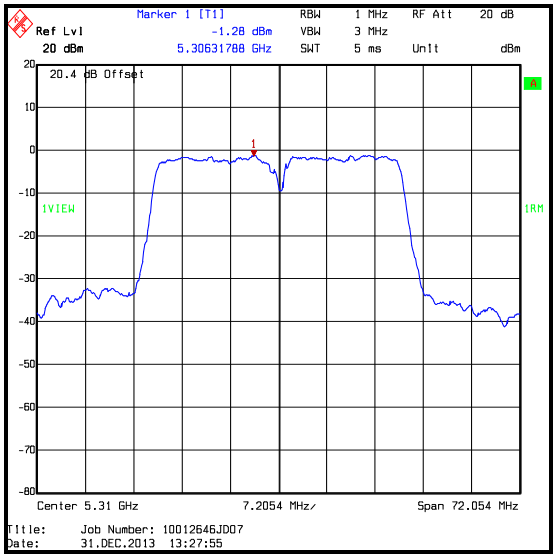
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.25-5.35 GHz band

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	-3.1	-0.8	1.2	10.2	9.0	Complied
Top	-1.3	-1.1	1.8	10.2	8.4	Complied

Results: Port 0

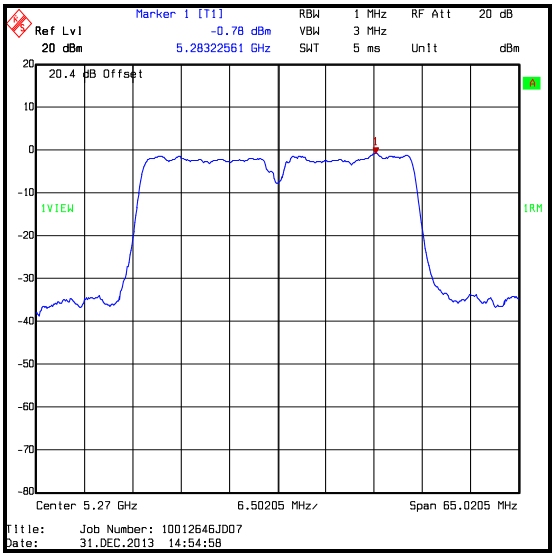


Bottom Channel

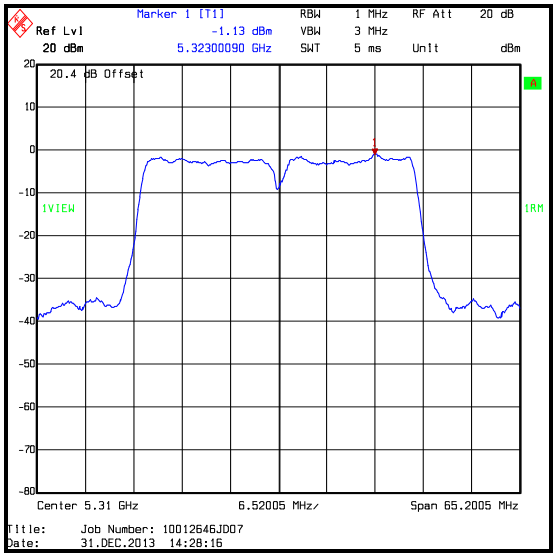


Top Channel

Results: Port 1



Bottom Channel

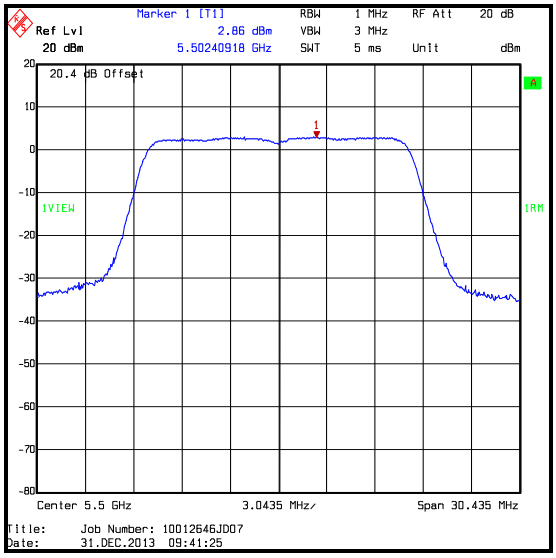


Top Channel

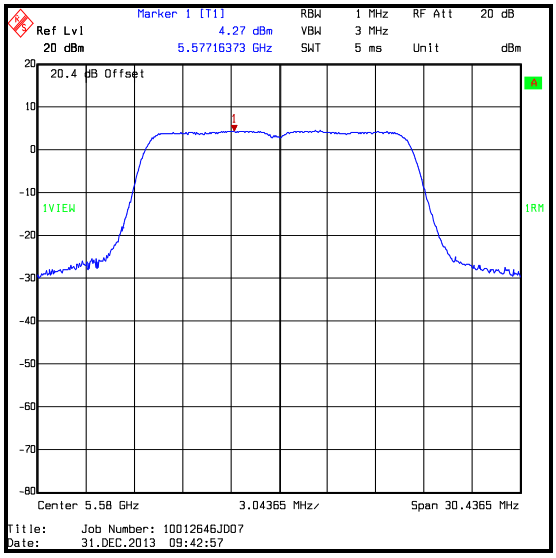
Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / 5.47-5.725 GHz band

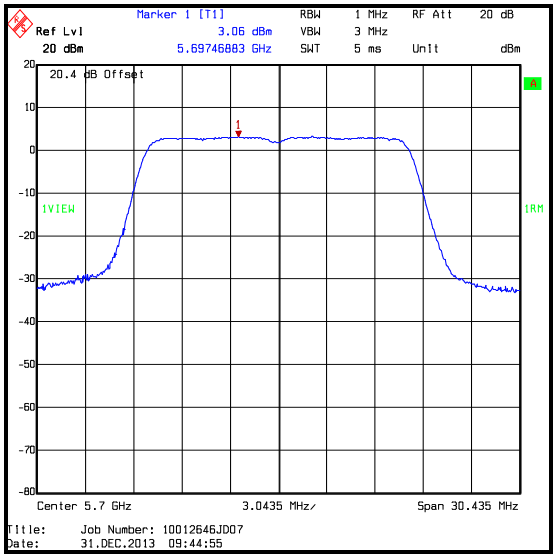
Channel	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	2.9	11.0	8.1	Complied
Middle	4.3	11.0	6.7	Complied
Top	3.1	11.0	7.9	Complied



Bottom Channel



Middle Channel



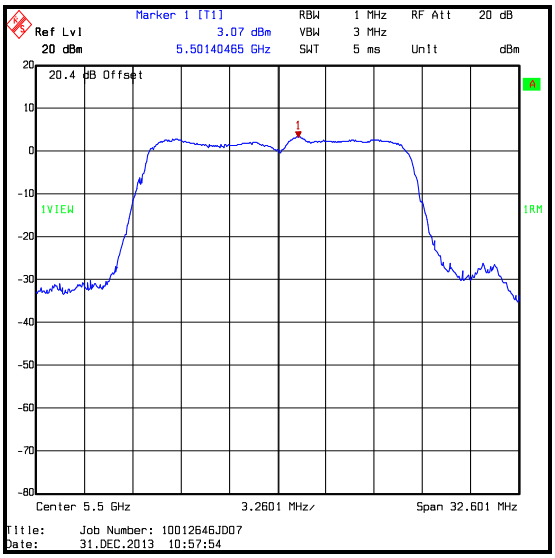
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

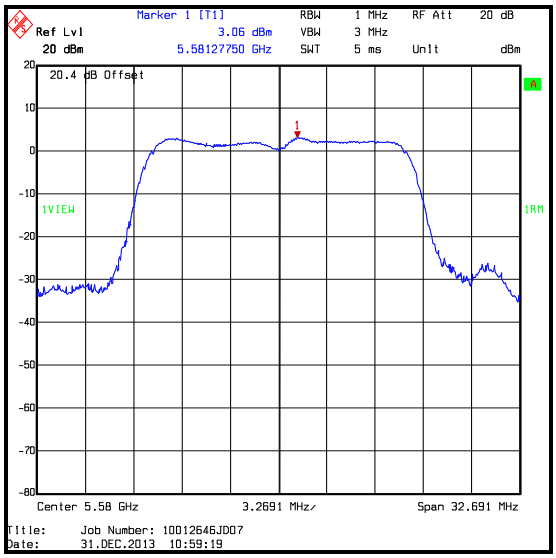
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.47-5.725 GHz band

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	3.1	2.9	6.0	11.0	5.0	Complied
Middle	3.1	2.8	6.0	11.0	5.0	Complied
Top	1.7	1.2	4.5	11.0	6.5	Complied

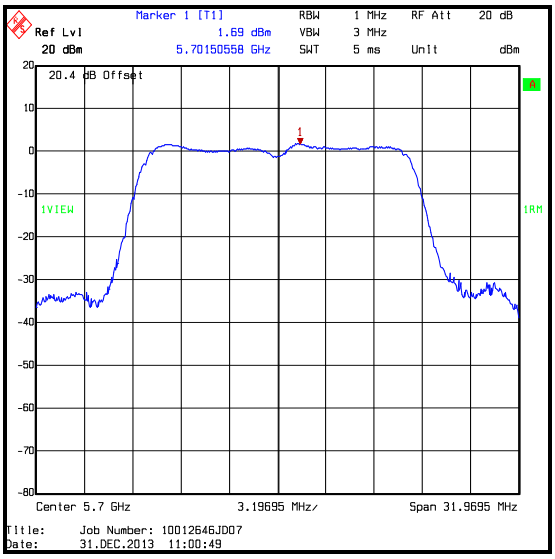
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.47-5.725 GHz band / Port 0



Bottom Channel



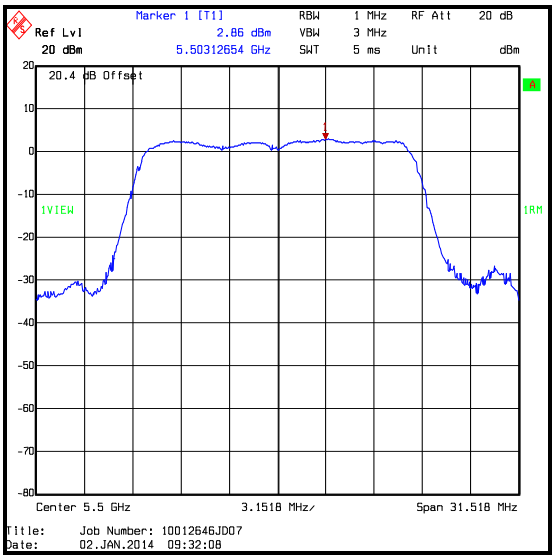
Middle Channel



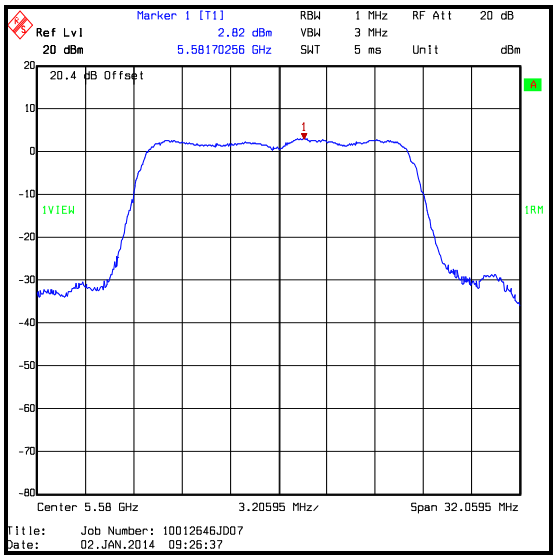
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

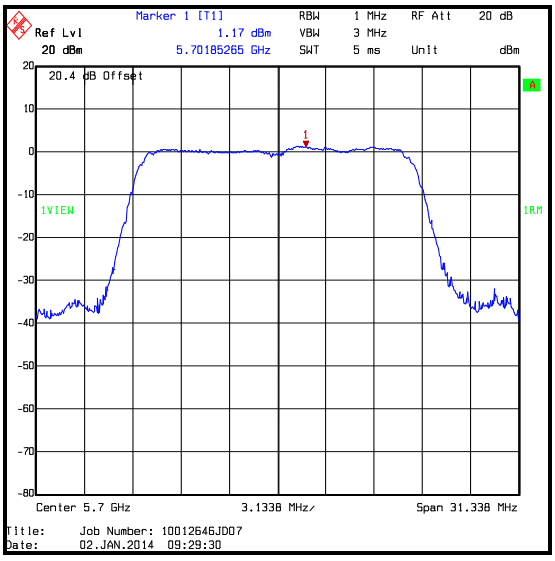
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / 5.47-5.725 GHz band / Port 0



Bottom Channel



Middle Channel



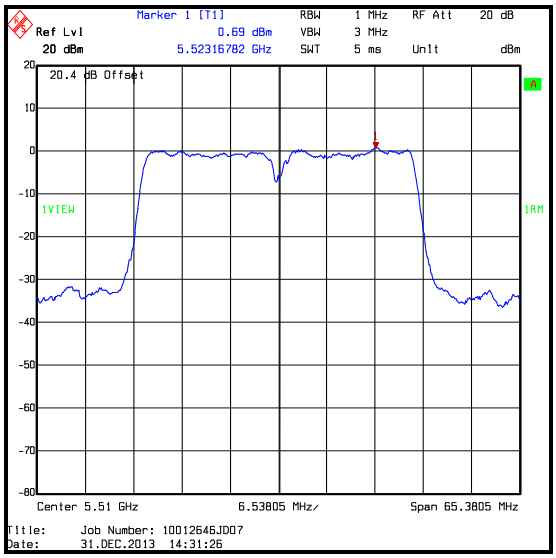
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

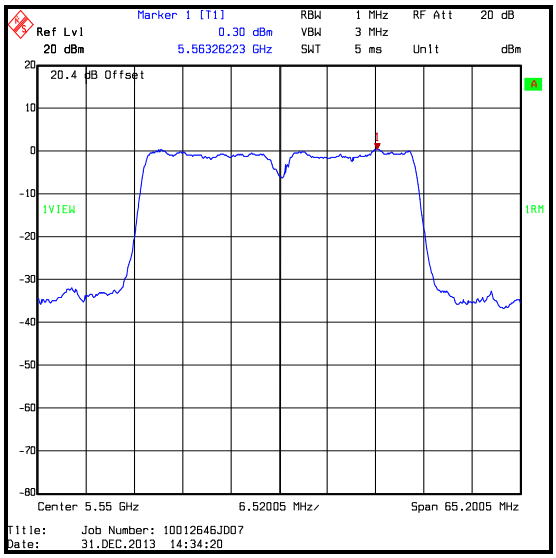
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.47-5.725 GHz band

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	0.7	-1.3	2.8	11.0	8.2	Complied
Middle	0.3	-0.1	3.1	11.0	7.9	Complied
Top	-0.4	-0.6	2.5	11.0	8.5	Complied

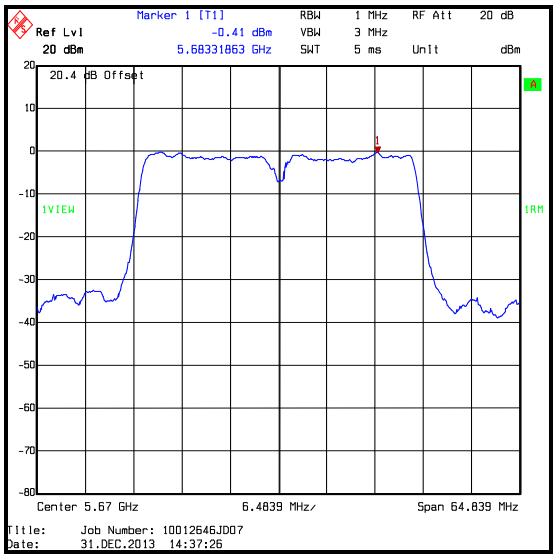
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.47-5.725 GHz band / Port 0



Bottom Channel



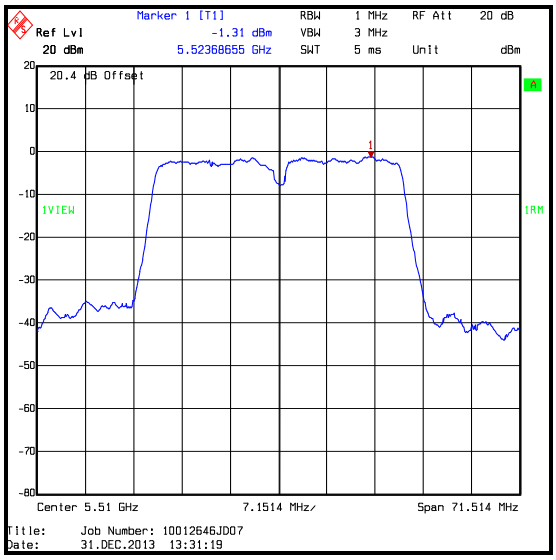
Middle Channel



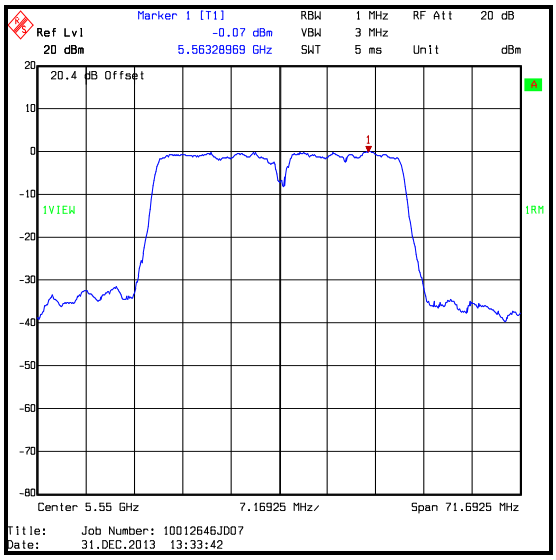
Top Channel

Transmitter Peak Power Spectral Density (5.25-5.35 GHz & 5.47-5.725 GHz bands) (continued)

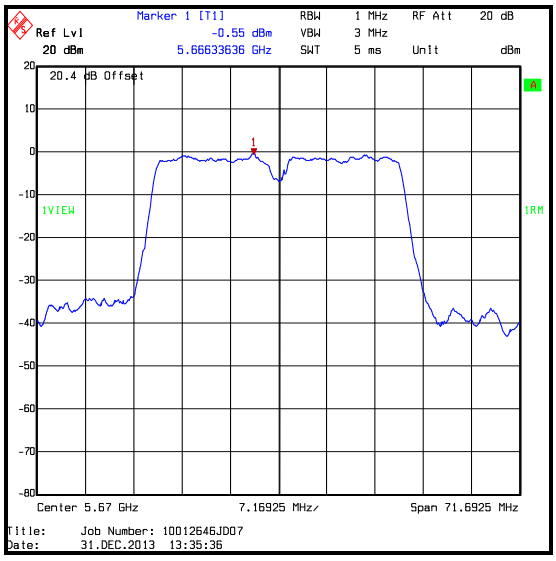
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / 5.47-5.725 GHz band / Port 1



Bottom Channel



Middle Channel



Top Channel

Transmitter Peak Power Spectral Density (5.725-5.85 GHz band)

Test Summary:

Test Engineer:	Nick Steele	**Test Dates:**	31 December 2013 & 02 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(3)
Test Method Used:	As detailed in FCC KDB 789033 F) referencing KDB 789033 E)2)b)

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	36 to 40

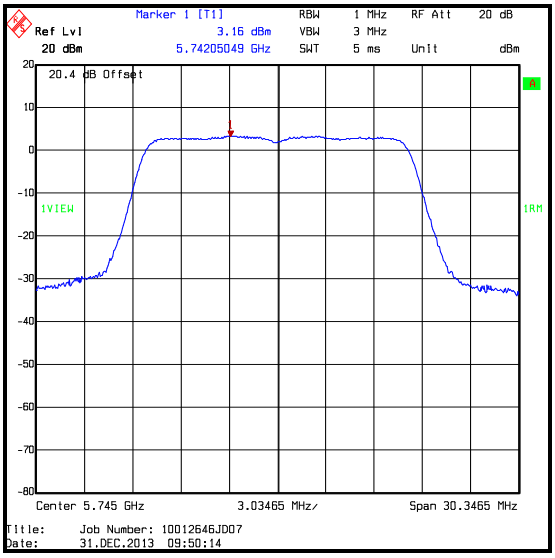
Note(s):

1. FCC Part 15.407(a)(3) limit for PPSD in the 5.725-5.85 GHz operating band is <17 dBm/MHz.
2. The EUT was transmitting at >98% duty cycle.
3. The UAM antenna has a gain of 3.0 dBi and the V100 antenna has a gain of 1.9 dBi for the frequency range 5.725 GHz to 5.85 GHz.

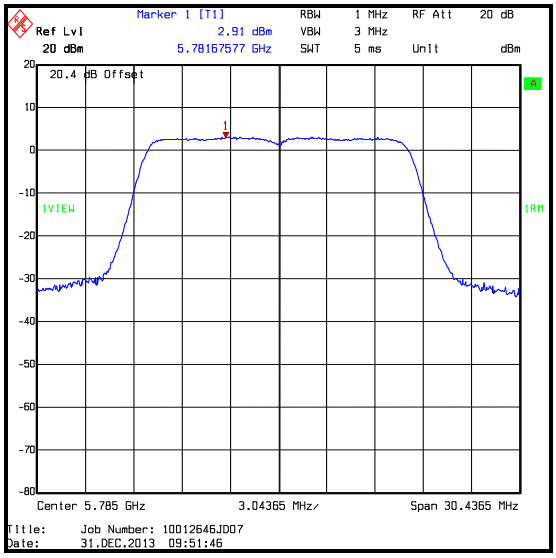
Transmitter Peak Power Spectral Density (5.725-5.85 GHz band) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

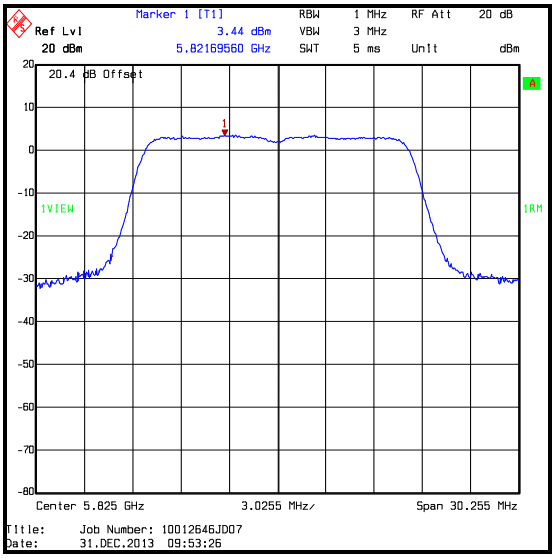
Channel	PPSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	3.2	17.0	13.8	Complied
Middle	2.9	17.0	14.1	Complied
Top	3.4	17.0	13.6	Complied



Bottom Channel



Middle Channel



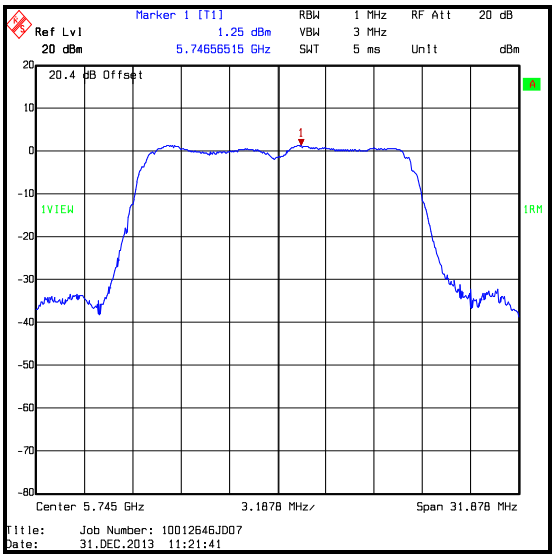
Top Channel

Transmitter Peak Power Spectral Density (5.725-5.85 GHz band) (continued)

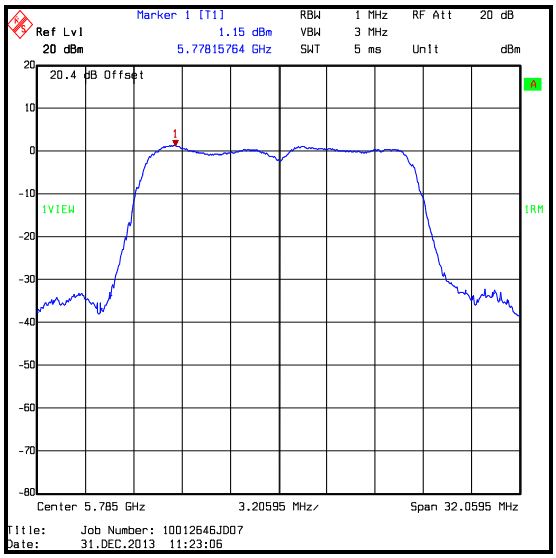
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	1.3	1.7	4.5	17.0	12.5	Complied
Middle	1.2	1.4	4.3	17.0	12.7	Complied
Top	0.4	1.4	3.9	17.0	13.1	Complied

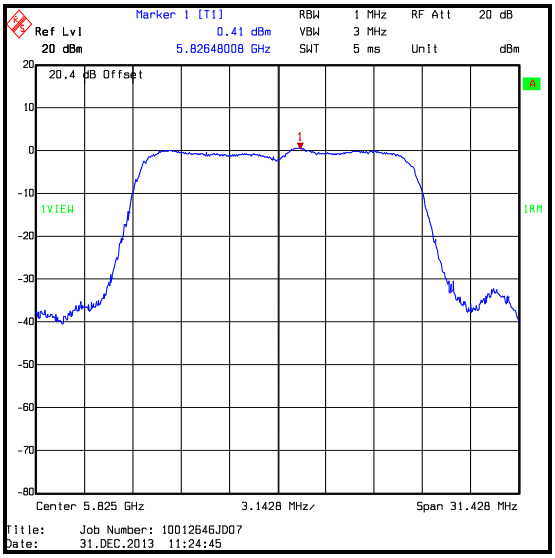
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 0



Bottom Channel



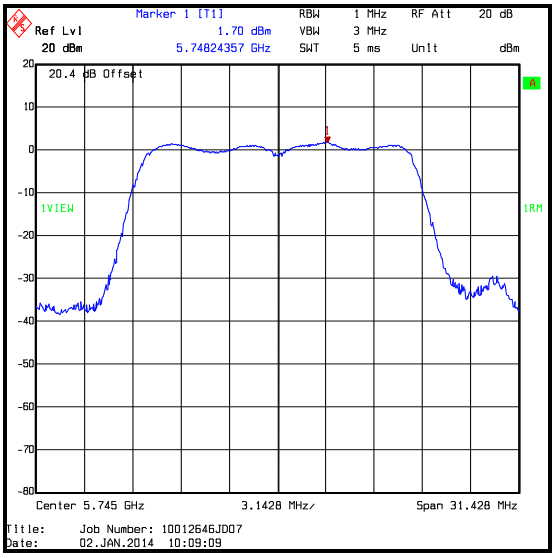
Middle Channel



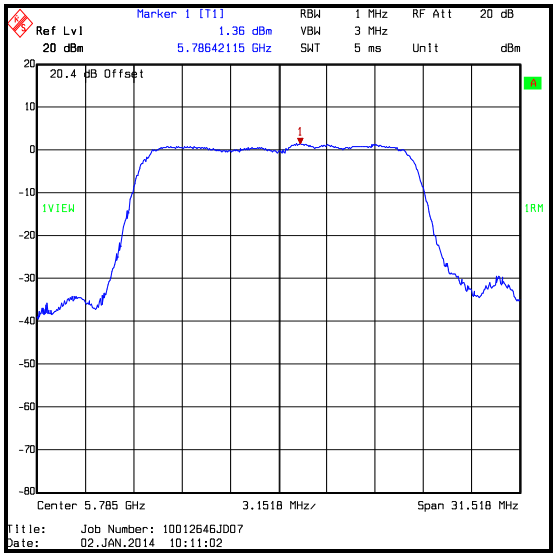
Top Channel

Transmitter Peak Power Spectral Density (5.725-5.85 GHz band) (continued)

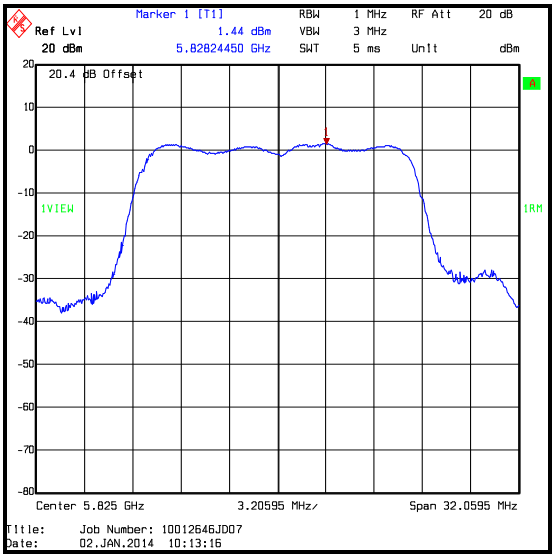
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Port 1



Bottom Channel



Middle Channel



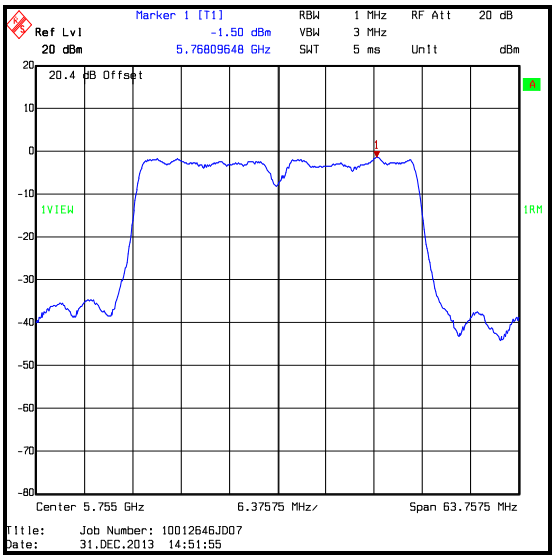
Top Channel

Transmitter Peak Power Spectral Density (5.725-5.85 GHz band) (continued)

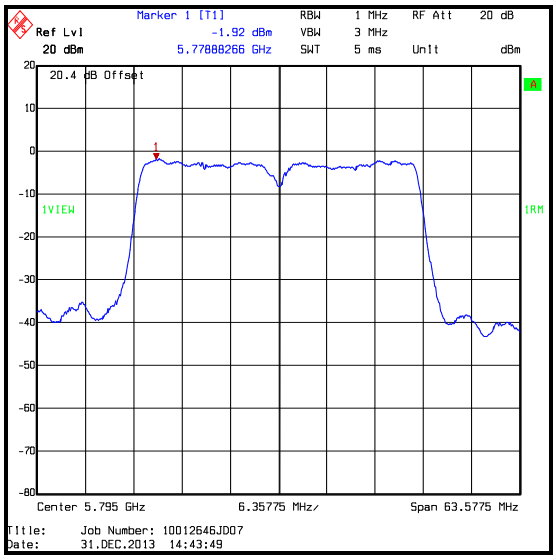
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Channel	PPSD at Port 0 (dBm /MHz)	PPSD at Port 1 (dBm /MHz)	Combined PSD (dBm /MHz)	Limit (dBm /MHz)	Margin (dB)	Result
Bottom	-1.5	-2.0	1.3	17.0	15.7	Complied
Top	-1.9	-1.4	1.4	17.0	15.6	Complied

Results: Port 0

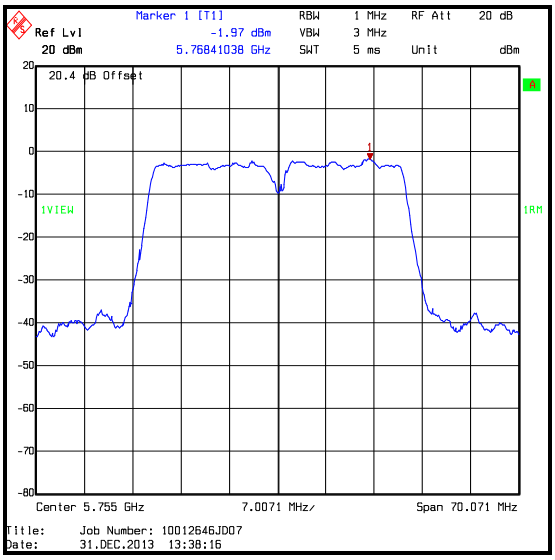


Bottom Channel

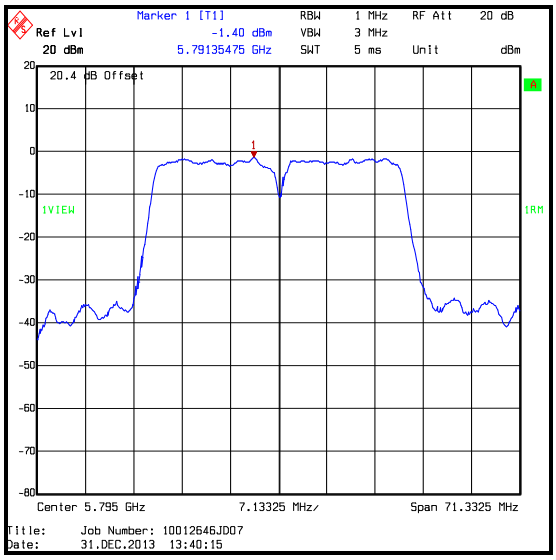


Top Channel

Results: Port 1



Bottom Channel



Top Channel

Transmitter Peak Power Spectral Density (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1998	Attenuator	Huber & Suhner	6820.17B	07101	05 Apr 2014	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	15 May 2014	12
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	14 May 2014	12
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	25 Jun 2014	12

5.2.5. Transmitter Peak Excursion

Test Summary:

Test Engineer:	Nick Steele	**Test Date:**	08 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Part 15.407(a)(6)
Test Method Used:	As detailed in FCC KDB 789033 and Notes below

Environmental Conditions:

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

Note(s):

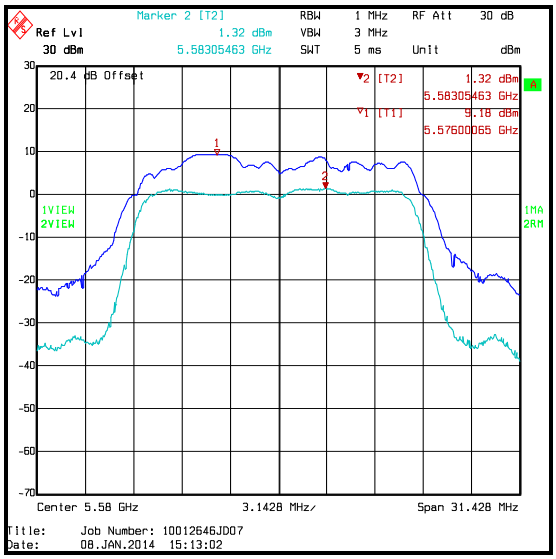
1. In accordance with FCC KDB 789033 Section G)1)b), the following modes were tested to cover all modulation types and bandwidth modes:
    - BPSK:
        - 802.11n HT20 / 6.5 Mbit/s / MCS0
        - 802.11n HT40 / 13.5 Mbit/s / MCS0
    - QPSK:
        - 802.11n HT20 / 19.5 Mbit/s / MCS2
        - 802.11n HT40 / 40.5 Mbit/s / MCS2
    - 16QAM:
        - 802.11n HT20 / 39 Mbit/s / MCS4
        - 802.11n HT40 / 81 Mbit/s / MCS4
    - 64QAM:
        - 802.11n HT20 / 65 Mbit/s / MCS7
        - 802.11n HT40 / 135 Mbit/s / MCS7

    Measurements were performed in these modes on middle channels of the 5470 MHz to 5725 MHz band.
2. The peak measurement (first trace) was performed in accordance with FCC KDB 789033 G)3) using a peak detector. The second measurement (trace 2) was performed in accordance with FCC KDB 789033 F) and FCC KDB 789033 E)2)b) Method SA-1 using an RMS detector. A marker was placed at the peak of the first trace. A marker was placed of at the peak of the second trace. The difference between the two markers was calculated.

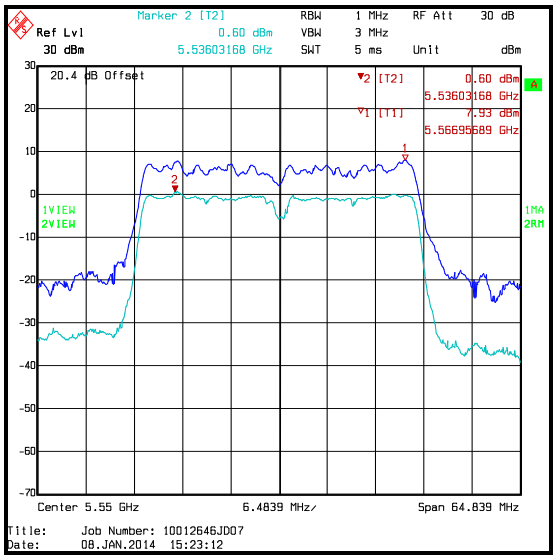
Transmitter Peak Excursion (continued)

Results: BPSK

Middle Frequency (MHz)	Channel Bandwidth (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5580	20	7.9	13.0	5.1	Complied
5550	40	7.3	13.0	5.7	Complied



20 MHz / MCS0

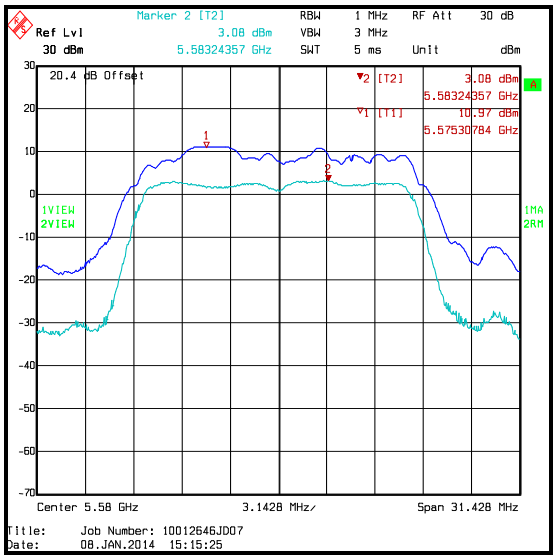


40 MHz / MCS0

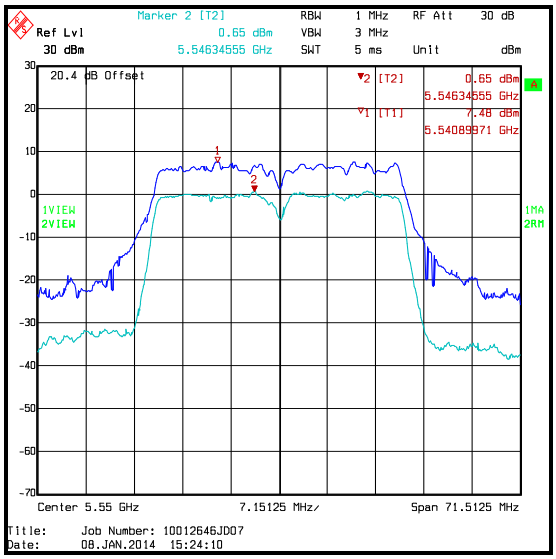
Transmitter Peak Excursion (continued)

Results: QPSK

Middle Frequency (MHz)	Channel Bandwidth (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5580	20	7.9	13.0	5.1	Complied
5550	40	6.8	13.0	6.2	Complied



20 MHz / MCS2

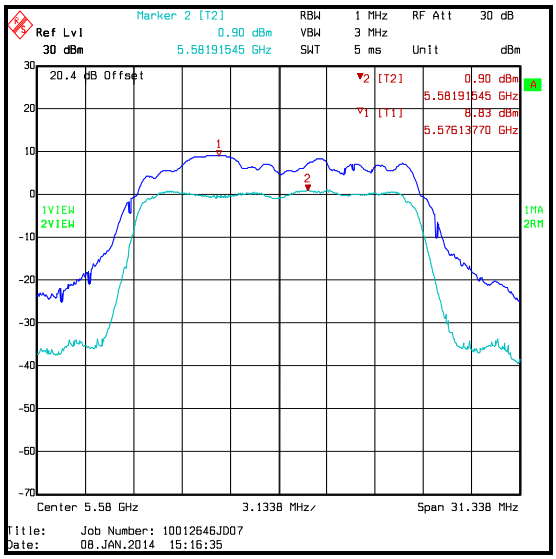


40 MHz / MCS2

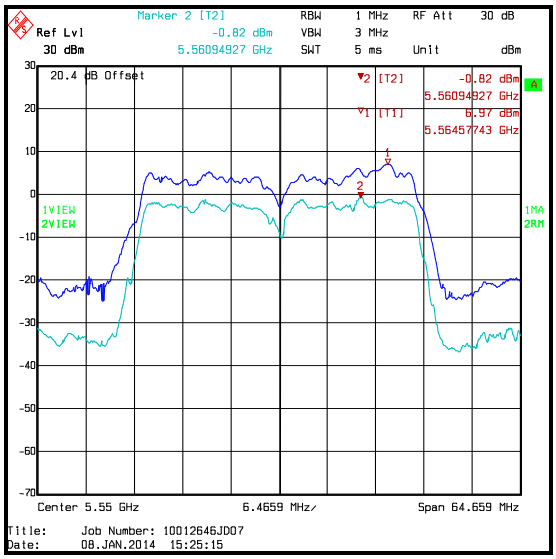
Transmitter Peak Excursion (continued)

Results: 16QAM

Middle Frequency (MHz)	Channel Bandwidth (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5580	20	7.9	13.0	5.1	Complied
5550	40	7.8	13.0	5.2	Complied



20 MHz / MCS4

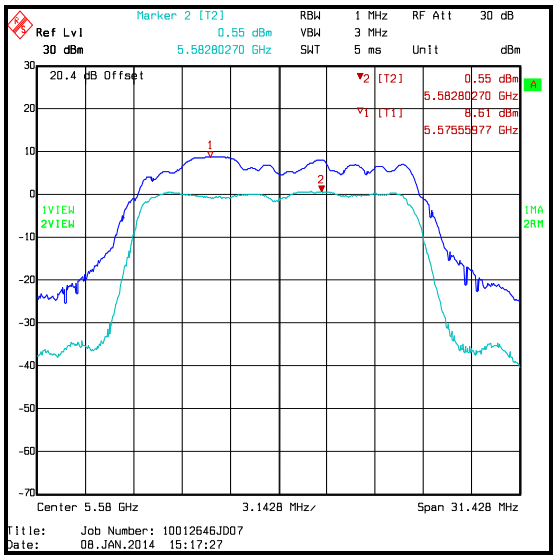


40 MHz / MCS4

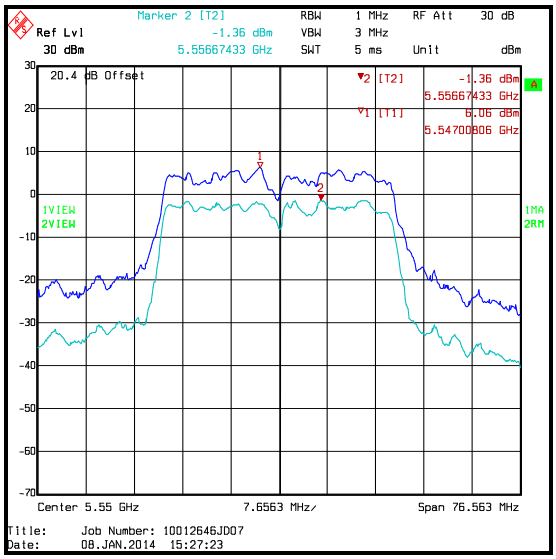
Transmitter Peak Excursion (continued)

Results: 64QAM

Middle Frequency (MHz)	Channel Bandwidth (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)	Result
5580	20	8.0	13.0	5.0	Complied
5550	40	7.4	13.0	5.6	Complied



20 MHz / MCS7



40 MHz / MCS7

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016	19 Aug 2014	12
A1998	Attenuator	Huber & Suhner	6820.17B	07101	05 Apr 2014	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	15 May 2014	12
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	14 May 2014	12
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	25 Jun 2014	12

5.2.6. Transmitter Out of Band Radiated Emissions – UAM Antenna

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	25 February 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Parts 15.407(b)(3),(6),(7) & 15.209(a)
Test Method Used:	FCC KDB 789033 H) & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	34

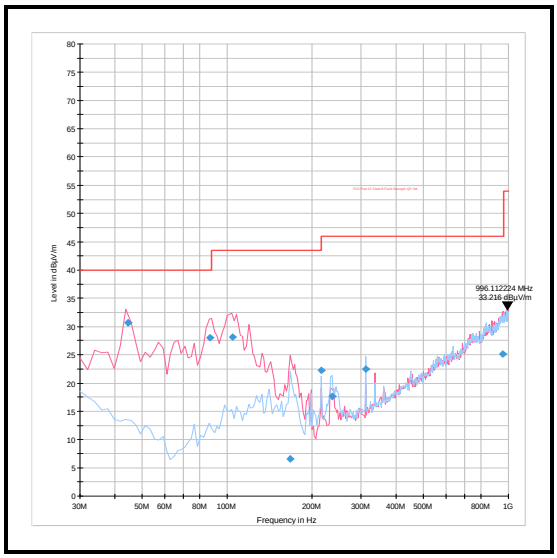
Note(s):

1. Measurements below 1 GHz were limited to the 5.47-5.725 GHz band, the EUT was transmitting with a data rate of 13.0 Mbit/s / MCS8 (802.11n HT20) as it produced the highest conducted output power and was therefore deemed worst case.
2. Pre-scans with the EUT transmitting on the top channel were measured according to FCC Part 15.407(b)(3) which states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band shall not exceed -27 dBm/MHz. Part(b)(6) states unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Part(b)(7) states the provisions of 15.205 apply, i.e. restricted bands of operation.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. 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.
5. All emissions were investigated and determined to be either in the non-restricted bands or greater than 20 dB below the appropriate limit. Therefore only the highest measured noise floor level was recorded in the table below.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Transmitter Out of Band Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

Results: BPSK / 13.0 Mbit/s / MCS8 / Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
996.112	Vertical	33.2	54.0	20.8	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
M1273	Test Receiver	Rohde &Schwarz	ESIB 26	100275	11 Feb 2015	12
A490	Antenna	Chase	CBL6111A	1590	18 Apr 2014	12
A1834	Attenuator	Hewlett Packard	8941B	10444	15 Nov 2014	12
G0543	Amplifier	Sonoma	310N	230801	18 May 2014	3

Transmitter Out of Band Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

Test Summary:

Test Engineers:	Sandeep Bharat & David Doyle	**Test Dates:**	23 December 2013 to 10 January 2014
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Part 15.407(b)(3),(7) & 15.209(a)
Test Method Used:	FCC KDB 789033 H) & ANSI C63.10 Sections 6.3 and 6.6 and Notes below
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	38 to 42

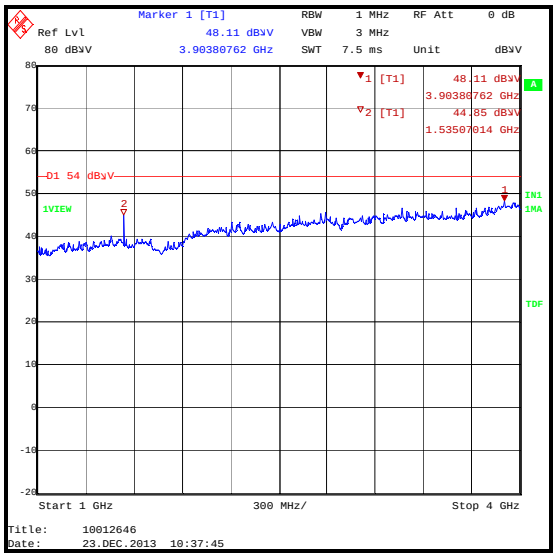
Note(s):

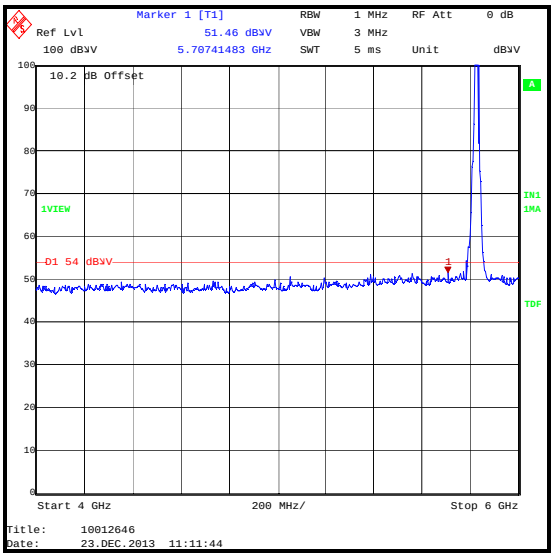
1. FCC Part 15.407(b)(3) states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply, i.e. restricted bands of operation.
2. The emission seen at approximately 1536 MHz was investigated and was seen to remain unchanged irrespective of whether the EUT was transmitting or not and did not change with channel / band / data rate used. No other spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. 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.
3. Pre-scans were performed with the EUT transmitting on the top channel in the 5.47 to 5.725 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emission seen for each band.
4. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
5. The emission shown on the 4 GHz to 6 GHz plot is the EUT fundamental.
6. Measurements were performed across the two restricted bands closest to the bands of operation with the EUT transmitting on the top channel in the 5.47 to 5.725 GHz band. Plots are included in this section of the test report. Peak and average measurements were made. No emissions were observed above the noise floor of the measurements system in either restricted band.
7. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

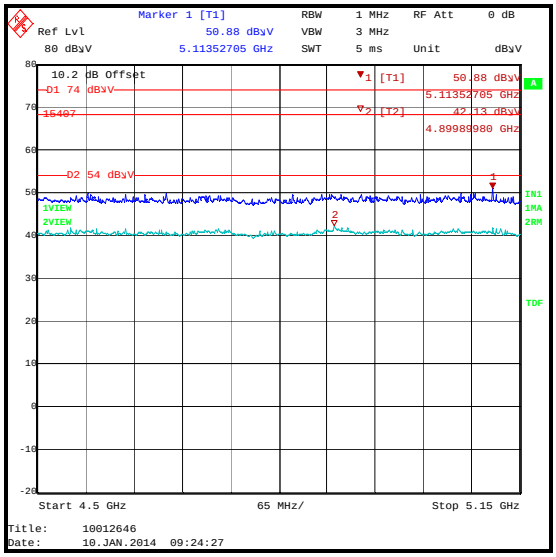
Transmitter Out of Band Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

Results:

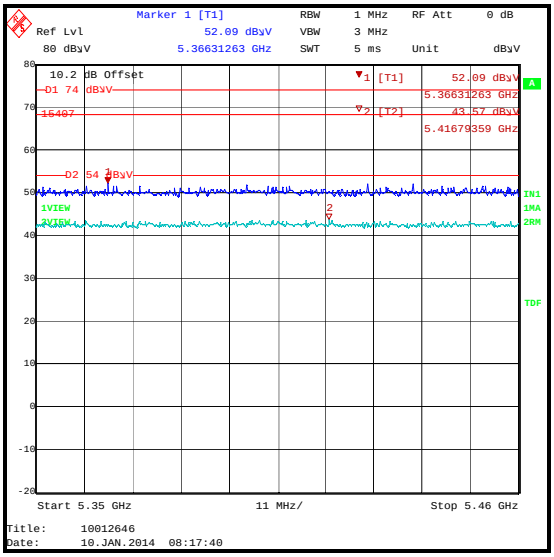
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
39848.558	Horizontal	52.0	54.0	2.0	Complied





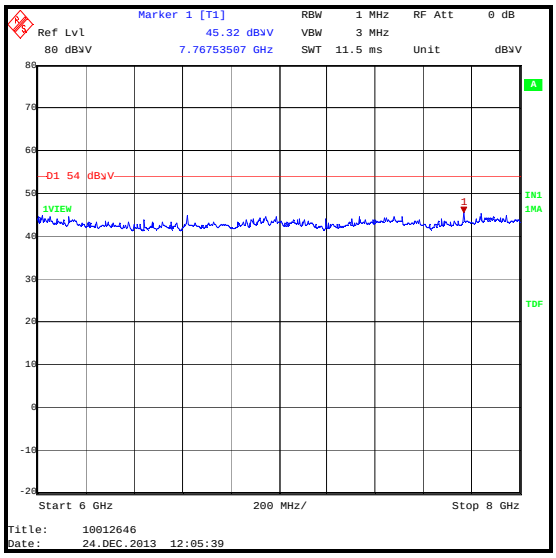


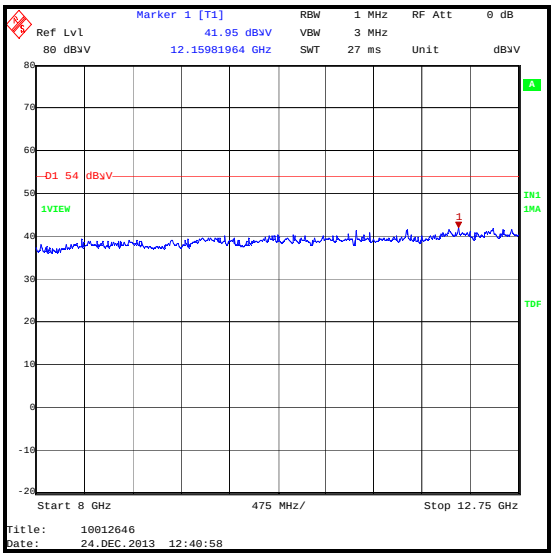
Restricted Band 4.5 GHz to 5.15 GHz

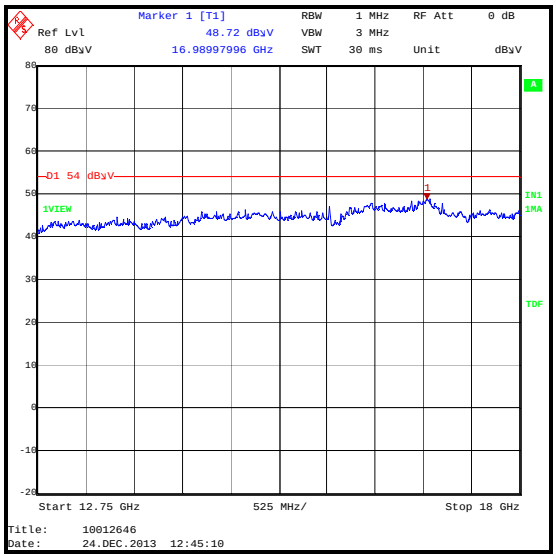


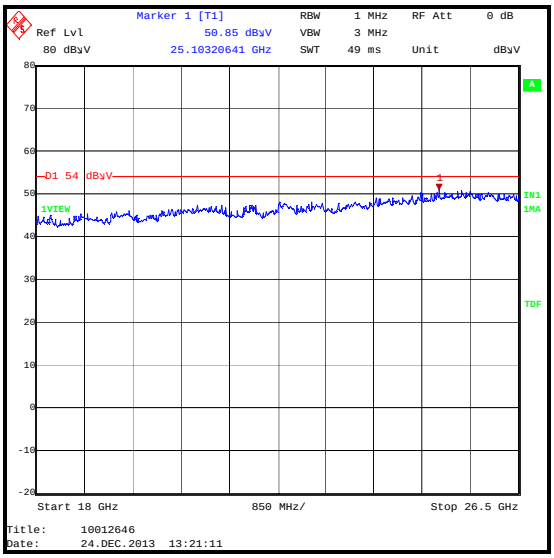
Restricted Band 5.35 GHz to 5.46 GHz

Transmitter Out of Band Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

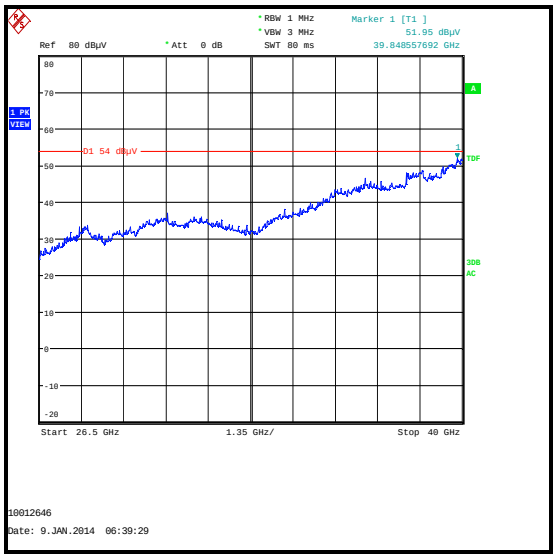








Transmitter Out of Band Radiated Emissions – UAM Antenna (5.47-5.725 GHz operation) (continued)



Test Equipment Used

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A254	Antenna	Flann Microwave	14240-20	139	14 Nov 2014	12
A255	Antenna	Flann Microwave	16240-20	519	14 Nov 2014	12
A256	Antenna	Flann Microwave	18240-20	400	14 Nov 2014	12
A436	Antenna	Flann Microwave	20240-20	330	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	10 May 2014	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	01 Oct 2014	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	14 Nov 2014	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12
A203	Antenna	Flann Microwave	22240-20	343	19 May 2016	36
M1630	Test Receiver	Rohde & Schwarz	ESU 40	100233	07 Feb 2014	12

5.2.7. Transmitter Out of Band Radiated Emissions – V100 Antenna

Test Summary:

Test Engineer:	Mark Percival	**Test Date:**	30 January 2014
Test Sample MAC Address:	240A646DE213		

FCC Reference:	Parts 15.407(b)(3),(6),(7) & 15.209(a)
Test Method Used:	FCC KDB 789033 H) & ANSI C63.10 Sections 6.3 and 6.5
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	36

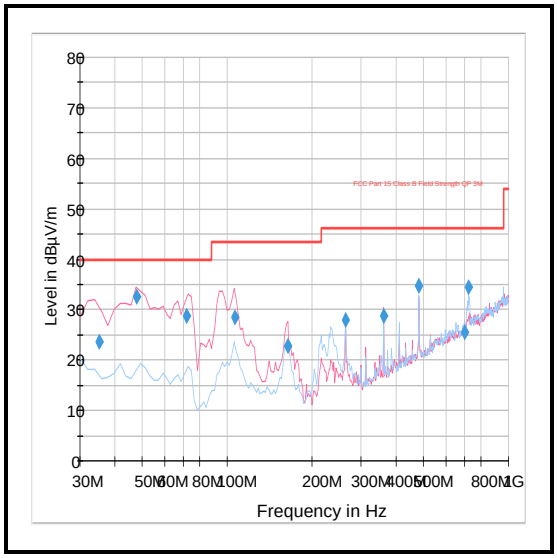
Note(s):

1. Measurements below 1 GHz were limited to the 5.47-5.725 GHz band, the EUT was transmitting with a data rate of 13.0 Mbit/s / MCS8 (802.11n HT20) as it produced the highest conducted output power and was therefore deemed worst case.
2. Pre-scans with the EUT transmitting on the top channel were measured according to FCC Part 15.407(b)(3) which states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band shall not exceed -27 dBm/MHz. Part(b)(6) states unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Part(b)(7) states the provisions of 15.205 apply, i.e. restricted bands of operation.
3. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
4. 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.
5. All spurious emissions shown on the prescan plot were final measured and found to be non-restricted bands. The emission with the highest level was compared to the restricted band limit (worst case) to obtain the margin.
6. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: BPSK / 13.0 Mbit/s / MCS8 / Top Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
47.923	Vertical	32.6	40.0	7.4	Complied

Transmitter Out of Band Radiated Emissions (5.47-5.725 GHz band operation) (continued)



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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
M1273	Test Receiver	Rohde &Schwarz	ESIB 26	100275	07 Feb 2014	12
A490	Antenna	Chase	CBL6111A	1590	09 Apr 2014	12
A1834	Attenuator	Hewlett Packard	8941B	10444	15 Nov 2014	12
G0543	Amplifier	Sonoma	310N	230801	15 Feb 2014	3

Transmitter Out of Band Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

Test Summary:

Test Engineers:	Sandeep Bharat & David Doyle	**Test Dates:**	07 January 2014 to 10 January 2014
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Part 15.407(b)(3),(7) & 15.209(a)
Test Method Used:	FCC KDB 789033 H) & ANSI C63.10 Sections 6.3 and 6.6
Frequency Range:	1 GHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22 to 23
Relative Humidity (%):	38 to 42

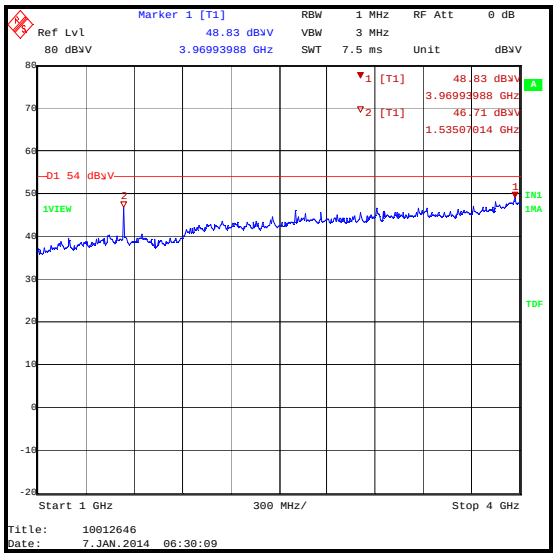
Note(s):

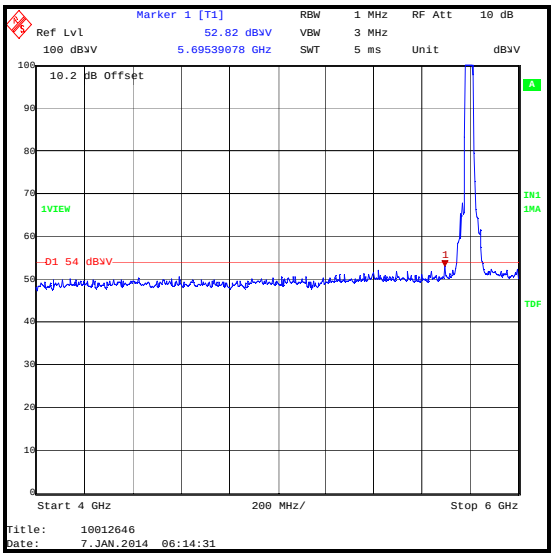
1. FCC Part 15.407(b)(3) states for transmitters operating in the band 5.47 to 5.725 GHz: all emissions outside of the band will not exceed -27 dBm/MHz. Part(b)(7) states the provisions of 15.205 apply i.e. restricted bands of operation.
2. The emission seen at approximately 1536 MHz was investigated and was seen to remain unchanged irrespective of whether the EUT was transmitting or not and did not change with channel / band / data rate used. No other spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below. 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.
3. Pre-scans were performed with the EUT transmitting on the top channel in the 5.47 to 5.725 GHz band. An inquiry was made to the FCC and the response was pre-scans could be performed in the band with the highest conducted output power and all final measurements should be performed on any emission seen for each band.
4. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
5. The emission shown on the 4 GHz to 6 GHz plot is the EUT fundamental.
6. Measurements were performed across the two restricted bands closest to the bands of operation with the EUT transmitting on the top channel in the 5.47 to 5.725 GHz band. Plots are included in this section of the test report. Peak and average measurements were made. No emissions were observed above the noise floor of the measurements system in either restricted band.
7. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

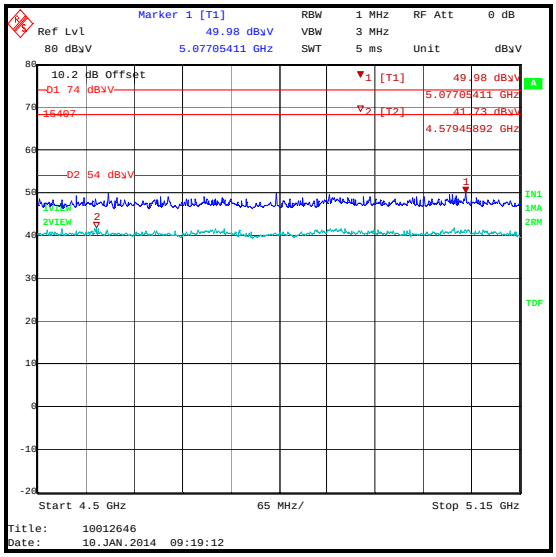
Transmitter Out of Band Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

Results:

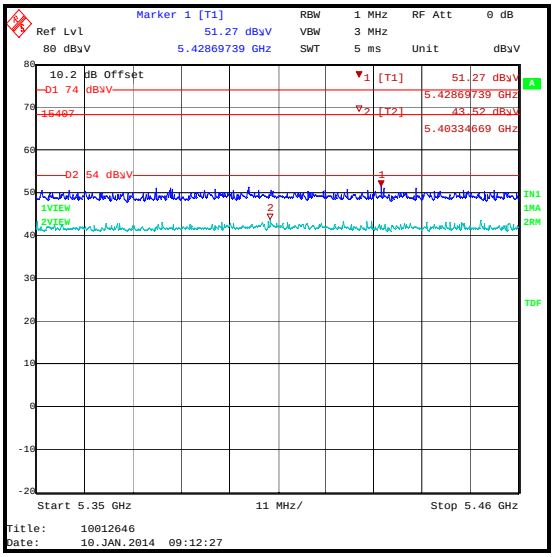
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
39978.365	Horizontal	52.5	54.0	1.5	Complied





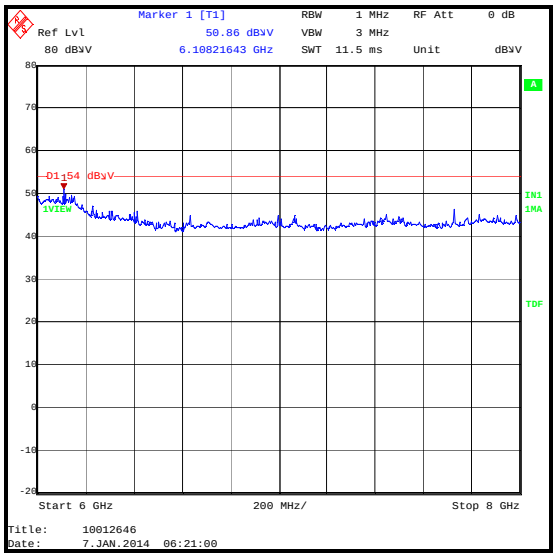


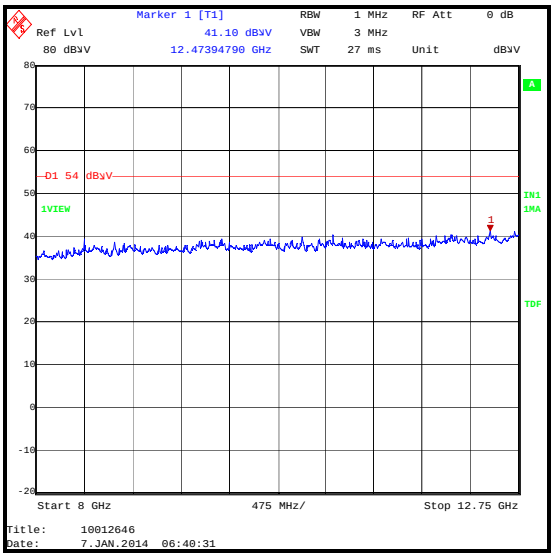
Restricted Band 4.5 GHz to 5.15 GHz

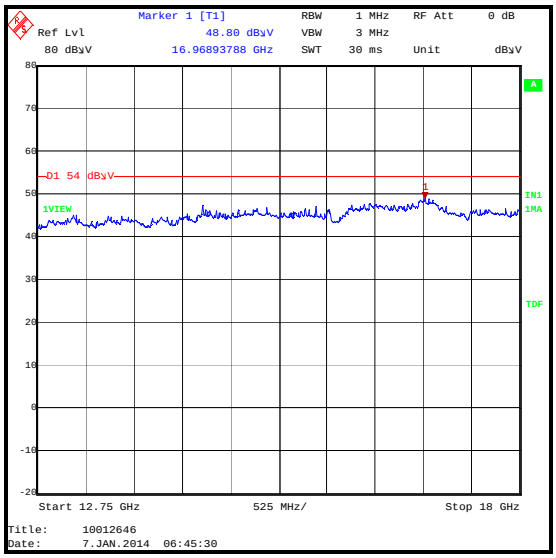


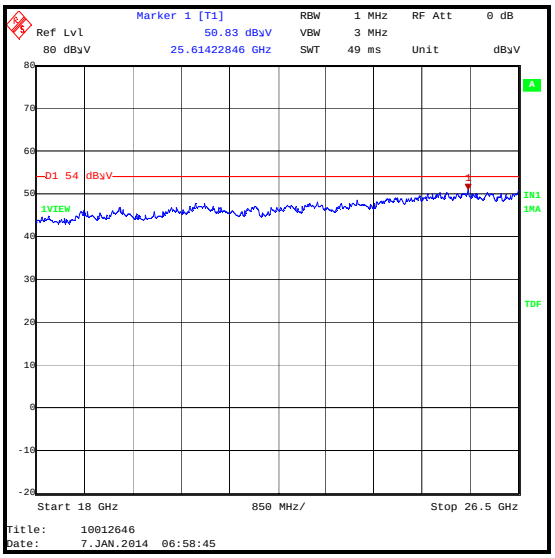
Restricted Band 5.35 GHz to 5.46 GHz

Transmitter Out of Band Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

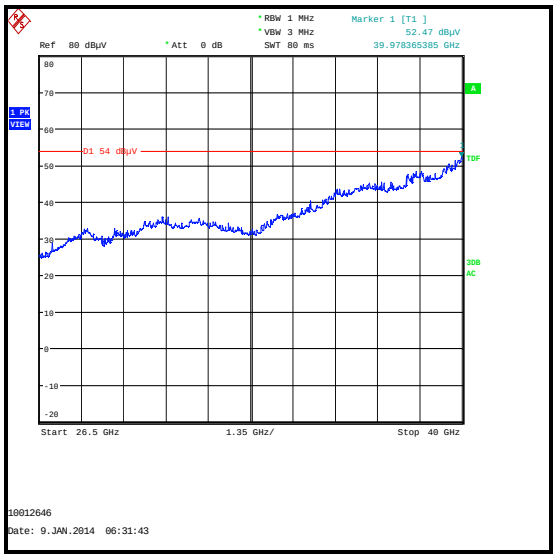








Transmitter Out of Band Radiated Emissions – V100 Antenna (5.47-5.725 GHz operation) (continued)



Test Equipment Used

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A254	Antenna	Flann Microwave	14240-20	139	14 Nov 2014	12
A255	Antenna	Flann Microwave	16240-20	519	14 Nov 2014	12
A256	Antenna	Flann Microwave	18240-20	400	14 Nov 2014	12
A436	Antenna	Flann Microwave	20240-20	330	14 Nov 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	10 May 2014	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	01 Oct 2014	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	14 Nov 2014	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	24 May 2014	12
A203	Antenna	Flann Microwave	22240-20	343	19 May 2016	36
M1630	Test Receiver	Rohde & Schwarz	ESU 40	100233	07 Feb 2014	12

5.2.8.Transmitter Band Edge Radiated Emissions – UAM Antenna

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	23 December 2013
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(1),15.407(b)(2), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 (H)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	38

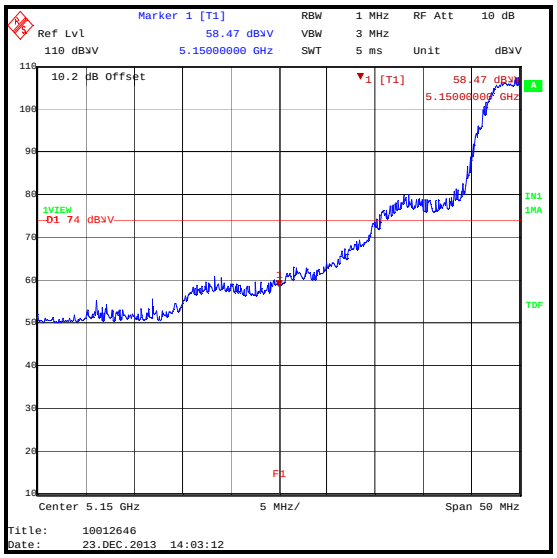
Note(s):

1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
4. In accordance with FCC Parts 15.407(b)(1) and 15.407(b)(2), band edge measurements have only been performed on the lower and upper edges of the contiguous bands 5.15-5.35 GHz which are covered in this section and the next one.
5. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.

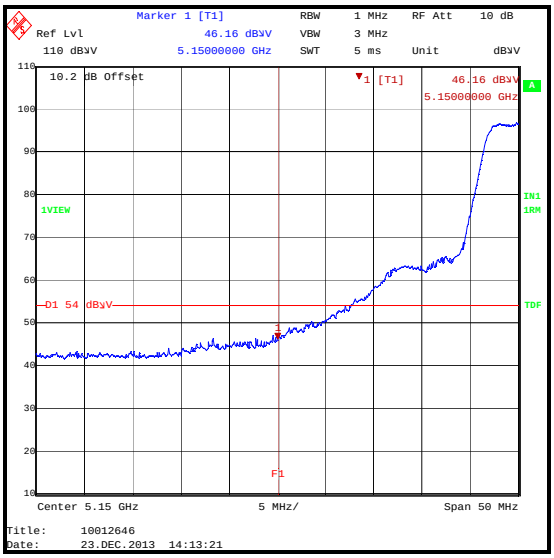
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	58.5	74.0	15.5	Complied
5150	46.2	54.0	7.8	Complied



Lower Band Edge Peak Measurement

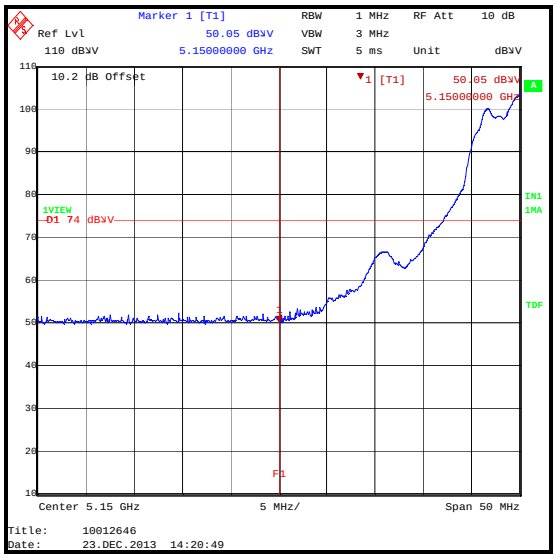


Lower Band Edge Average Measurement

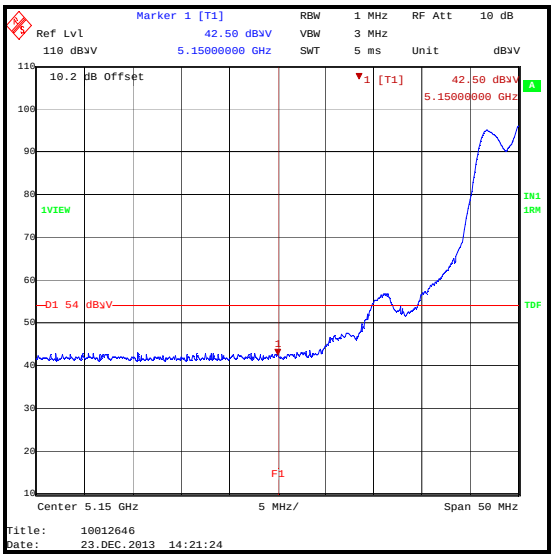
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	50.1	74.0	23.9	Complied
5150	42.5	54.0	11.5	Complied



Lower Band Edge Peak Measurement

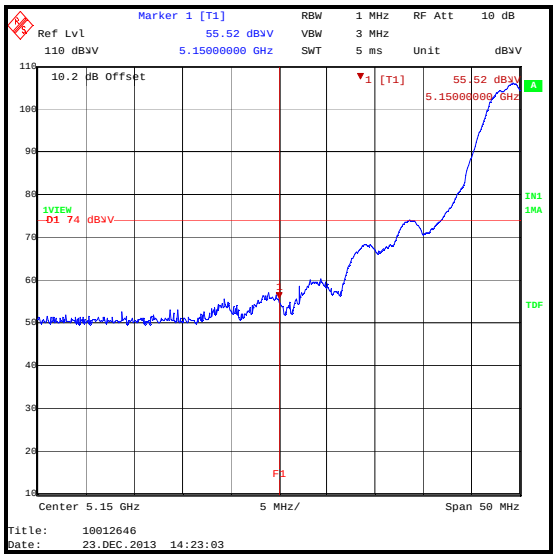


Lower Band Edge Average Measurement

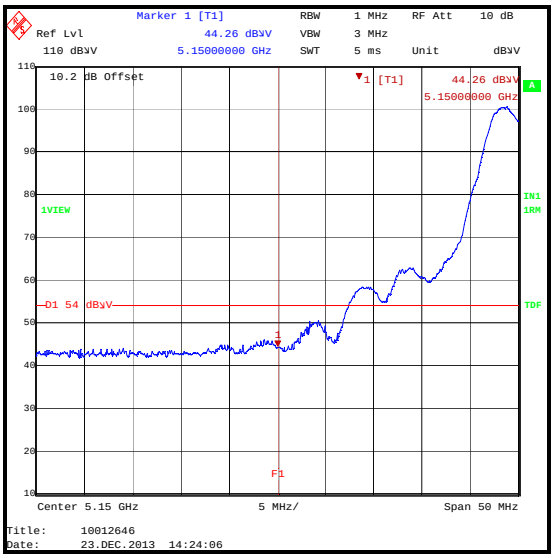
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	55.5	74.0	18.5	Complied
5150	44.3	54.0	9.7	Complied



Lower Band Edge Peak Measurement

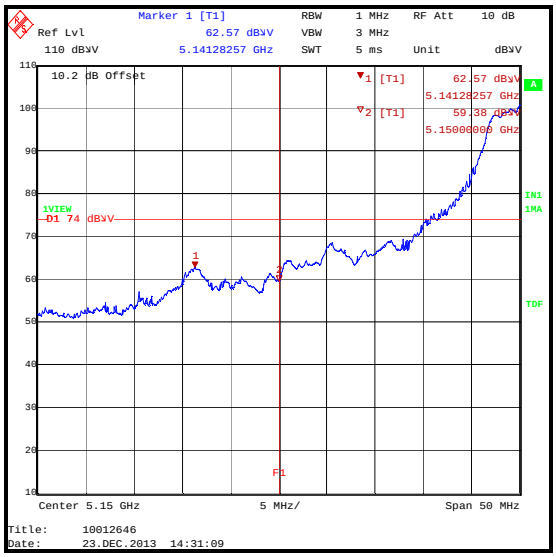


Lower Band Edge Average Measurement

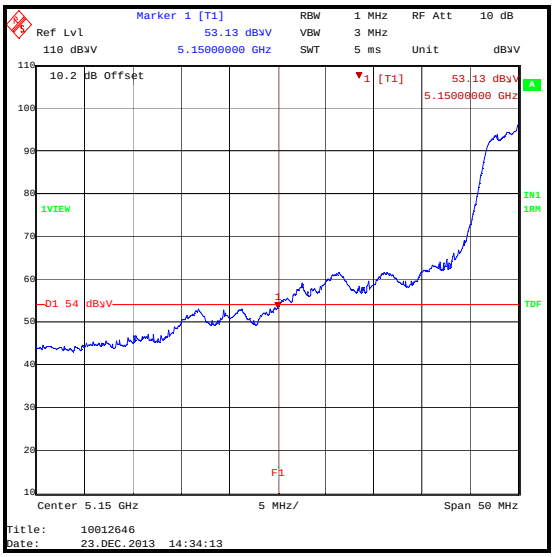
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5141.283	62.6	74.0	11.4	Complied
5150	59.4	74.0	14.6	Complied
5150	53.3	54.0	0.7	Complied



Lower Band Edge Peak Measurement



Lower Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions (5.25-5.35 GHz band)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	23 December 2013
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(1), 15.407(b)(2), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 (H)

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	38

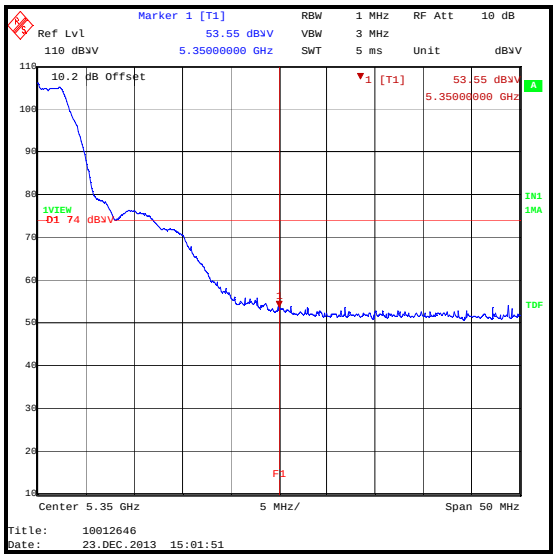
Note(s):

1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
4. In accordance with FCC Parts 15.407(b)(1) and 15.407(b)(2), band edge measurements have only been performed on the lower and upper edges of the contiguous bands 5.15-5.35 GHz.
5. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
6. In accordance with FCC KDB 789033 Section H)1)c), if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.

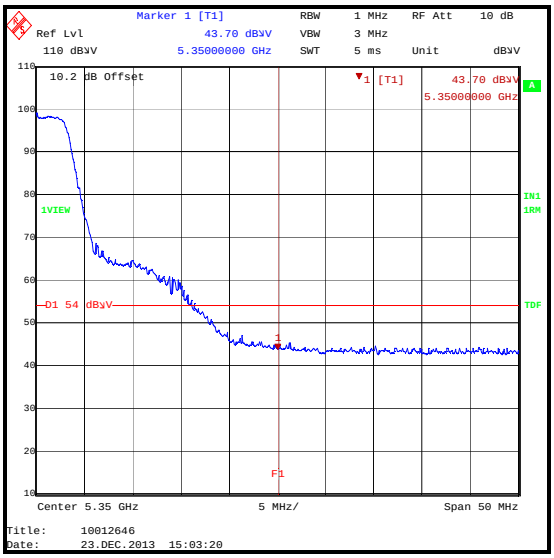
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	53.6	74.0	20.4	Complied
5350	43.7	54.0	10.3	Complied



Upper Band Edge Peak Measurement

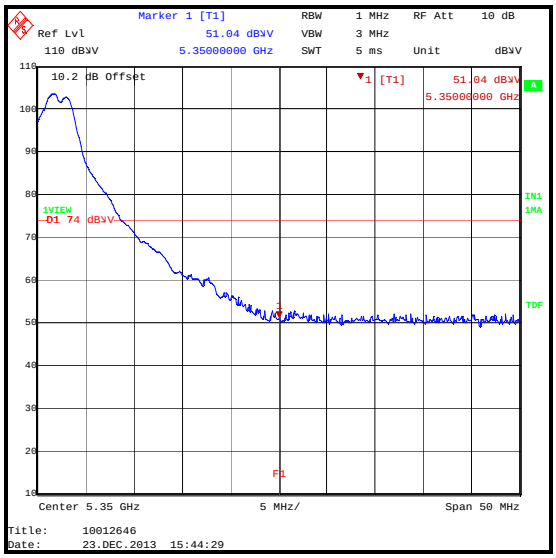


Upper Band Edge Average Measurement

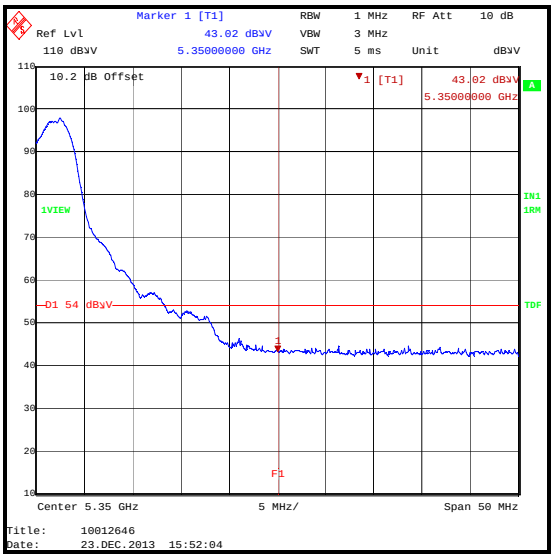
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	51.0	74.0	23.0	Complied
5350	43.0	54.0	11.0	Complied



Upper Band Edge Peak Measurement

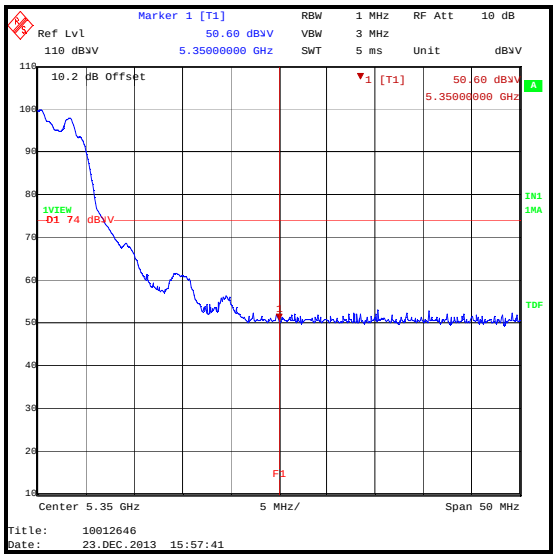


Upper Band Edge Average Measurement

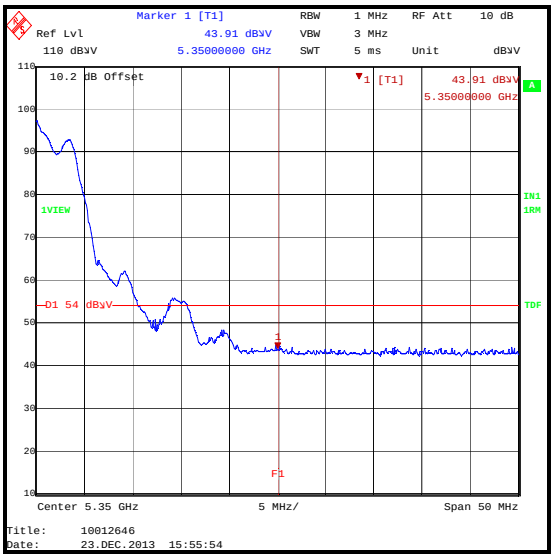
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	50.6	74.0	23.4	Complied
5350	43.9	54.0	10.1	Complied



Upper Band Edge Peak Measurement

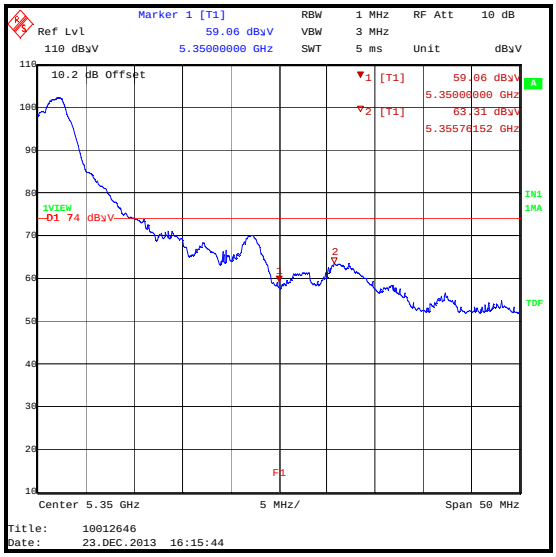


Upper Band Edge Average Measurement

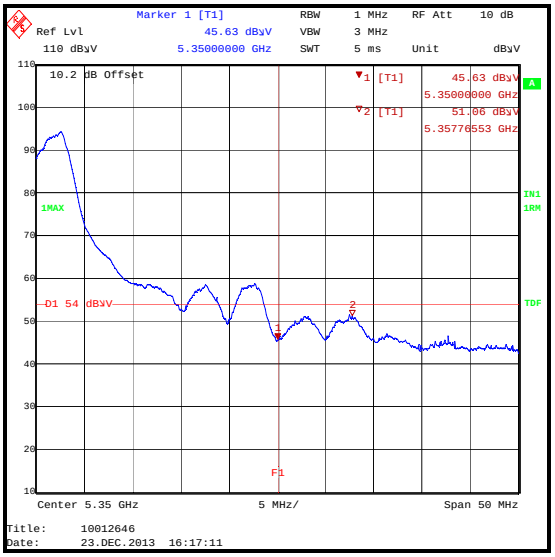
Transmitter Band Edge Radiated Emissions – UAM Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	59.1	74.0	14.9	Complied
5355.762	63.3	74.0	10.7	Complied
5350	45.6	54.0	81.4	Complied
5357.766	51.1	54.0	2.9	Complied



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.47-5.725 GHz band)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	24 December 2013
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(3), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 H)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	45

Note(s):

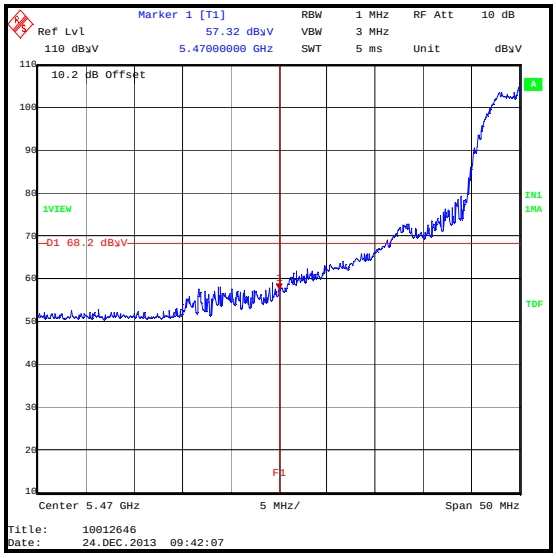
1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation with the EUT transmitting on the bottom and top channels within 5.47-5.725 GHz band, the results are included in the transmitter 5.47-5.725 GHz band radiated spurious emissions section of this test report.
4. For completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm and also as field strength in dBµV/m. Measured field strength was converted to EIRP in accordance with FCC KDB 789033 H)2)d)(i) using a conversion factor of 95.2.

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

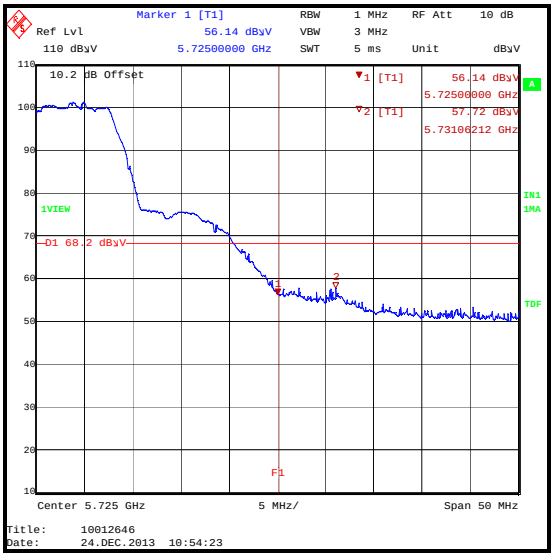
Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-37.9	-27.0	10.9	Complied
5725	-39.1	-27.0	12.1	Complied
5731.062	-37.5	-27.0	10.5	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	57.3	68.2	10.9	Complied
5725	56.1	68.2	12.1	Complied
5731.062	57.7	68.2	10.5	Complied



Lower Band Edge Peak Measurement



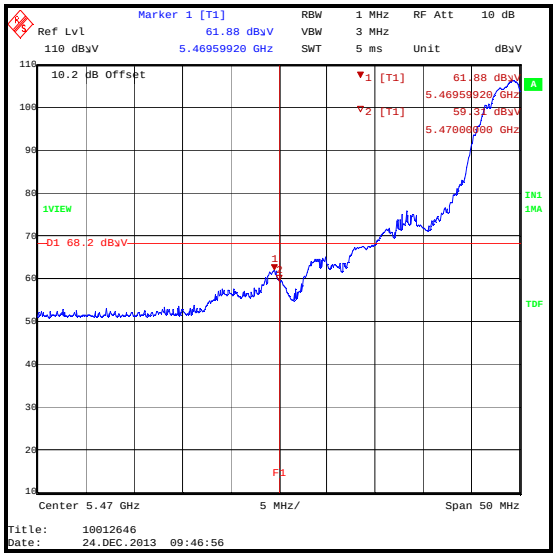
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

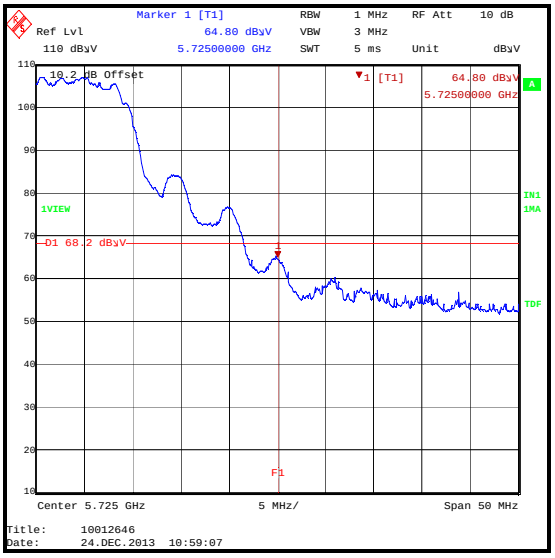
Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5469.599	-33.3	-27.0	6.3	Complied
5470	-35.9	-27.0	8.9	Complied
5725	-30.4	-27.0	3.4	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5469.599	61.9	68.2	6.3	Complied
5470	59.3	68.2	8.9	Complied
5725	64.8	68.2	3.4	Complied



Lower Band Edge Peak Measurement



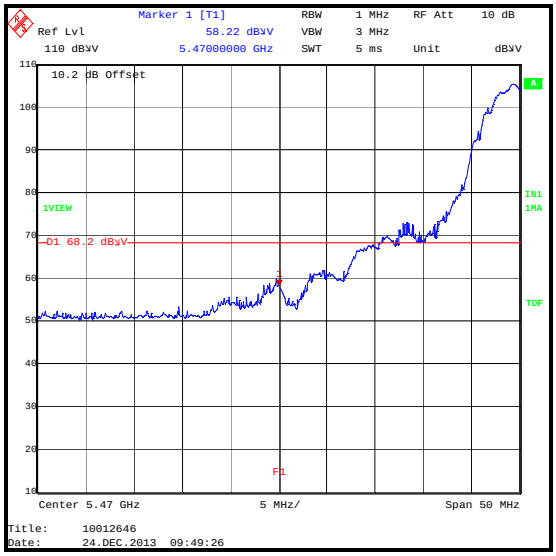
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

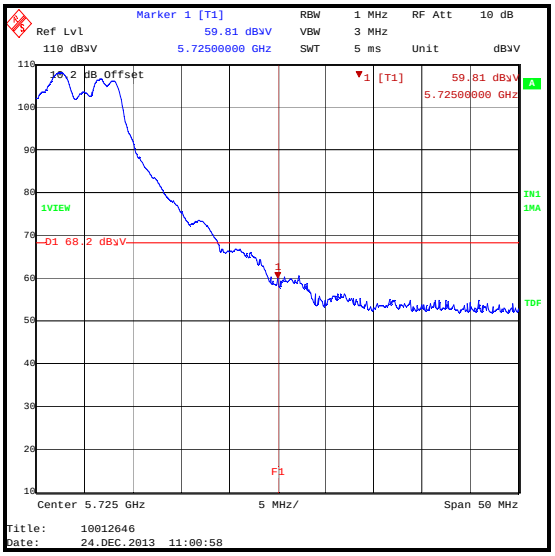
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-37.0	-27.0	10.0	Complied
5725	-35.4	-27.0	8.4	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	58.2	68.2	10.0	Complied
5725	59.8	68.2	8.4	Complied



Lower Band Edge Peak Measurement



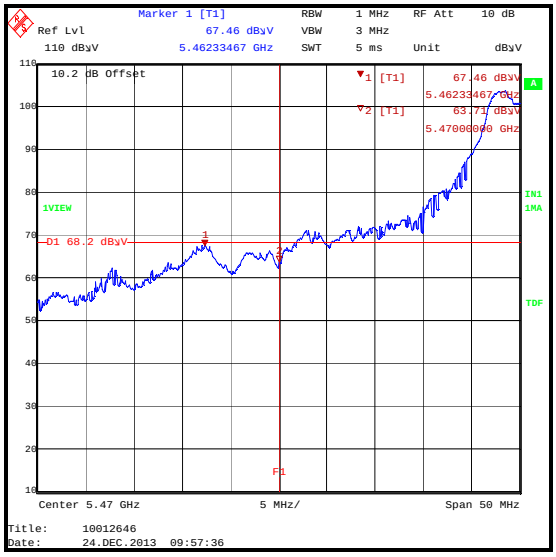
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.47-5.725 GHz band operation) (continued)

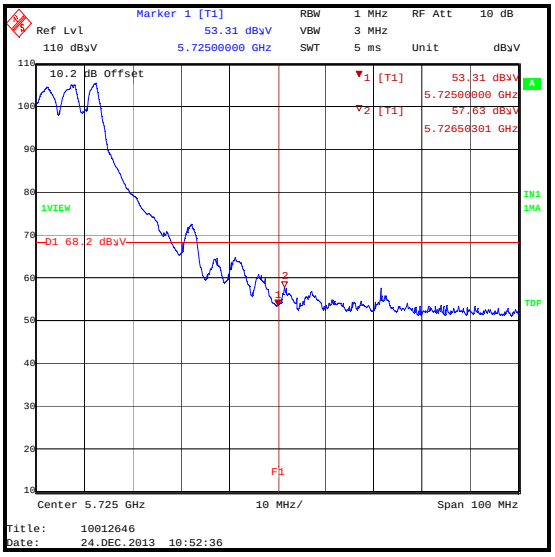
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5462.335	-27.7	-27.0	0.7	Complied
5470	-31.5	-27.0	4.5	Complied
5725	-41.9	-27.0	14.9	Complied
5726.503	-37.6	-27.0	10.6	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5462.335	67.5	68.2	0.7	Complied
5470	63.7	68.2	4.5	Complied
5725	53.3	68.2	14.9	Complied
5726.503	57.6	68.2	10.6	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.725-5.85 GHz band)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	24 December 2013
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(4), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 H)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	45

Note(s):

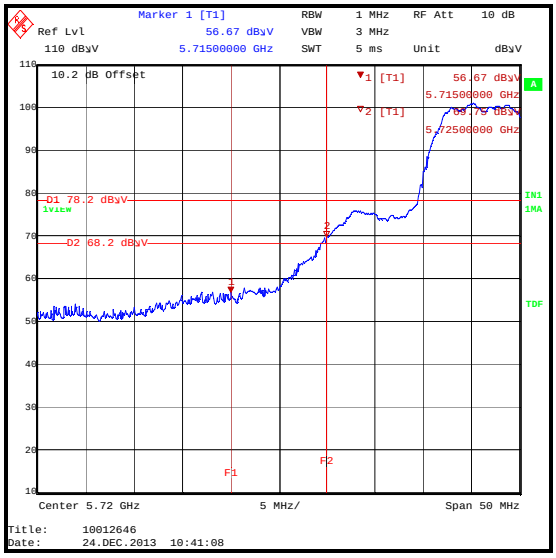
1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. The EUT is capable of transmitting on channel 165 at 5825 MHz and therefore operates under Part 15.407 in the UNII band as well as Part 15.247 in the DTS band. The out of band emission limit at the DTS upper band edge frequency of 5850 MHz is -27 dBm in accordance with FCC KDB 644545 D02 Page1, Note 1 and Section D.
4. For completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm and also as field strength in dBµV/m. Measured field strength was converted to EIRP in accordance with FCC KDB 789033 H)2)d)(i) using a conversion factor of 95.2

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.725-5.85 GHz band operation) (continued)

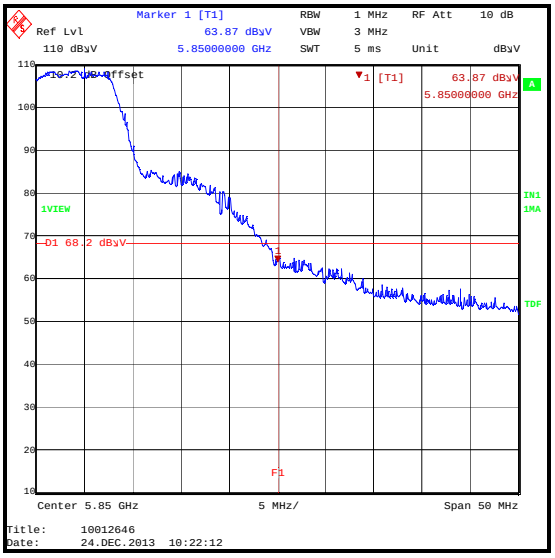
Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-38.5	-27.0	11.5	Complied
5725	-25.4	-17.0	8.4	Complied
5850	-31.3	-27.0	4.3	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	56.7	68.2	11.5	Complied
5725	69.8	78.2	8.4	Complied
5850	63.9	68.2	4.3	Complied



Lower Band Edge Peak Measurement



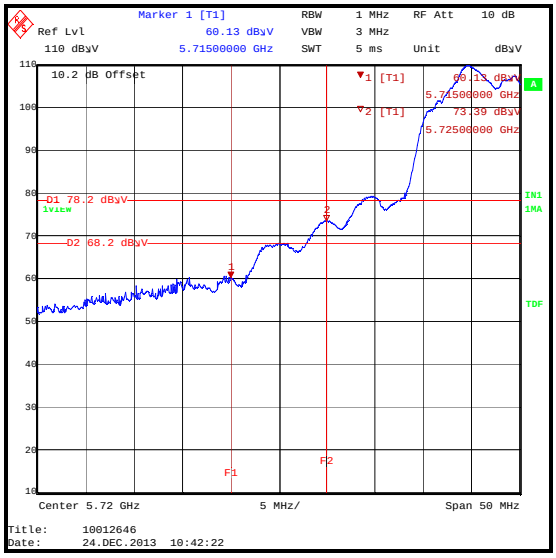
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.725-5.85 GHz band operation) (continued)

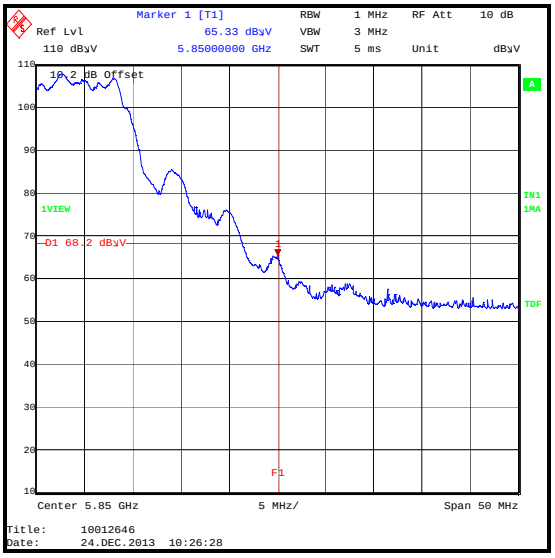
Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	35.1	-27.0	8.1	Complied
5725	21.8	-17.0	4.8	Complied
5850	29.9	-27.0	2.9	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	60.1	68.2	8.1	Complied
5725	73.4	78.2	4.8	Complied
5850	65.3	68.2	2.9	Complied



Lower Band Edge Peak Measurement



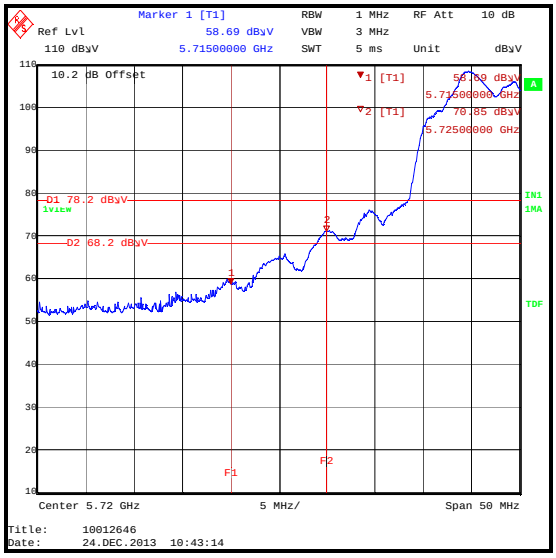
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.725-5.85 GHz band operation) (continued)

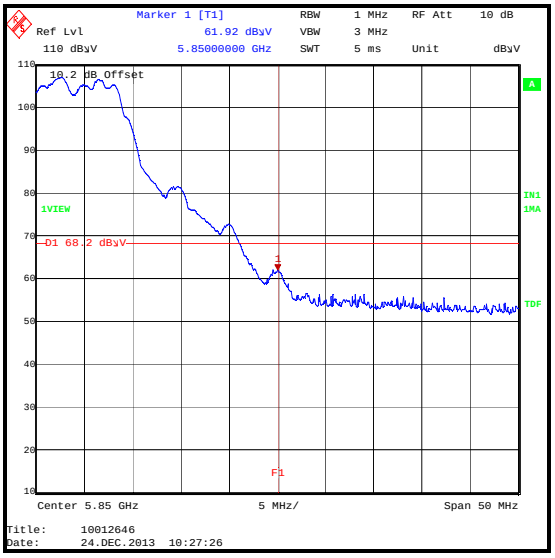
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-36.5	-27.0	9.5	Complied
5725	-24.3	-17.0	7.3	Complied
5850	-33.3	-27.0	6.3	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	58.7	68.2	9.5	Complied
5725	70.9	78.2	7.3	Complied
5850	61.9	68.2	6.3	Complied



Lower Band Edge Peak Measurement



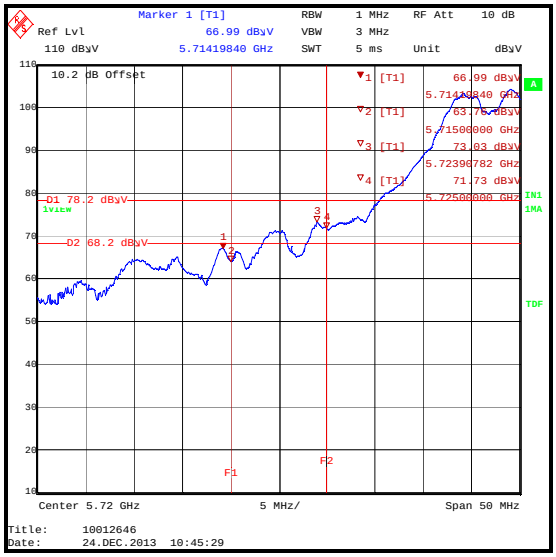
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (5.725-5.85 GHz band operation) (continued)

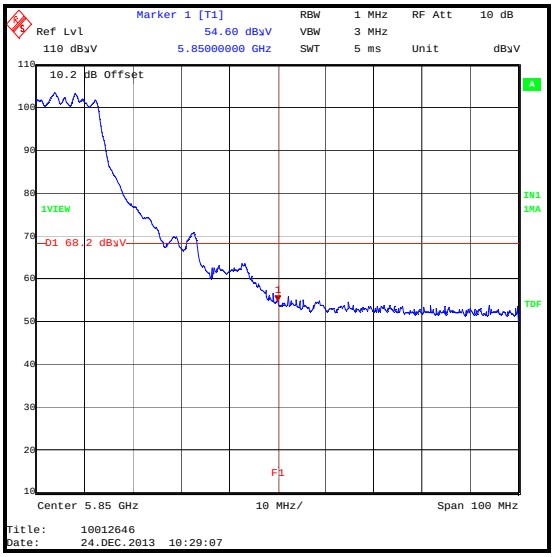
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5714.198	-28.2	-27.0	1.2	Complied
5715	-31.4	-27.0	4.4	Complied
5723.908	-22.2	-17.0	5.2	Complied
5725	-23.5	-17.0	6.5	Complied
5850	-40.6	-27.0	13.6	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5714.198	67.0	68.2	1.2	Complied
5715	63.8	68.2	4.4	Complied
5723.908	73.0	78.2	5.2	Complied
5725	71.7	78.2	6.5	Complied
5850	54.6	68.2	13.6	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – UAM Antenna (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	14 Nov 2014	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	01 Oct 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	10 May 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12

5.2.9.Transmitter Band Edge Radiated Emissions – V100 Antenna

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	06 January 2014
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(1),15.407(b)(2), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 (H)

Environmental Conditions:

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

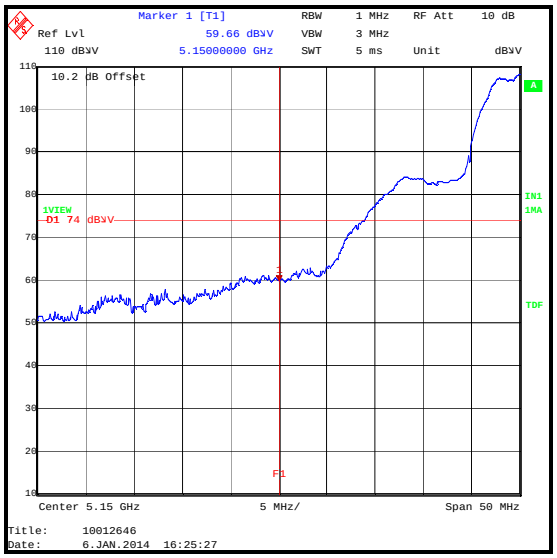
Note(s):

1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
4. In accordance with FCC Parts 15.407(b)(1) and 15.407(b)(2), band edge measurements have only been performed on the lower and upper edges of the contiguous bands 5.15-5.35 GHz.
5. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
6. In accordance with FCC KDB 789033 Section H)1)c), if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.

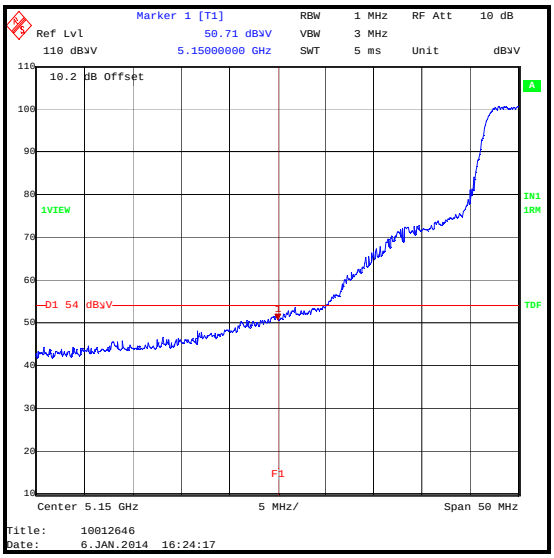
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	59.7	74.0	14.3	Complied
5150	50.7	54.0	3.3	Complied



Lower Band Edge Peak Measurement

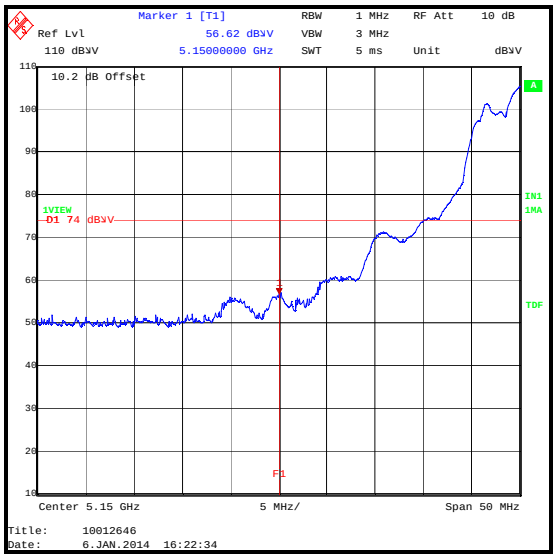


Lower Band Edge Average Measurement

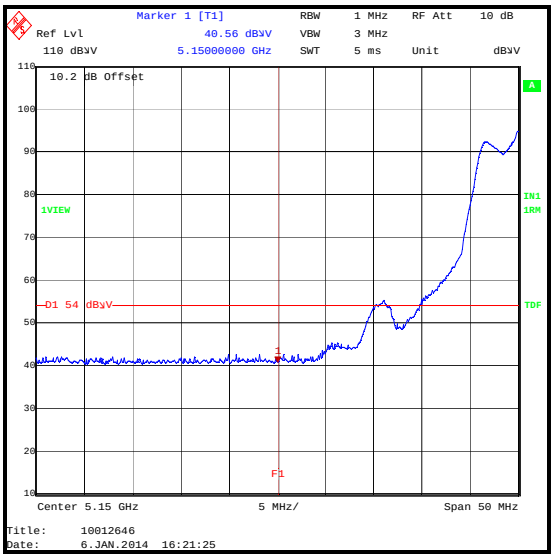
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	56.6	74.0	17.4	Complied
5150	46.6	54.0	7.4	Complied



Lower Band Edge Peak Measurement

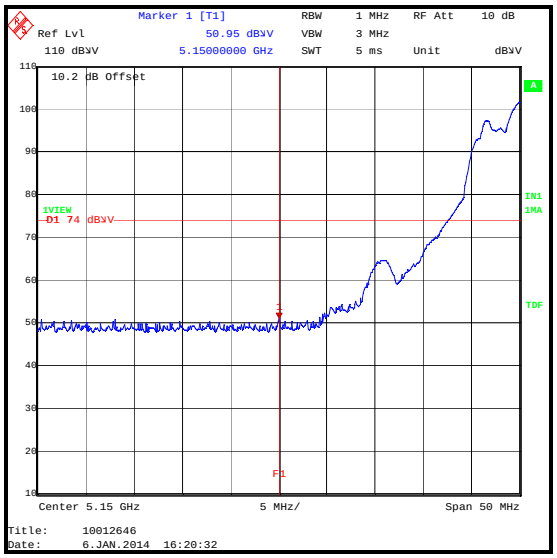


Lower Band Edge Average Measurement

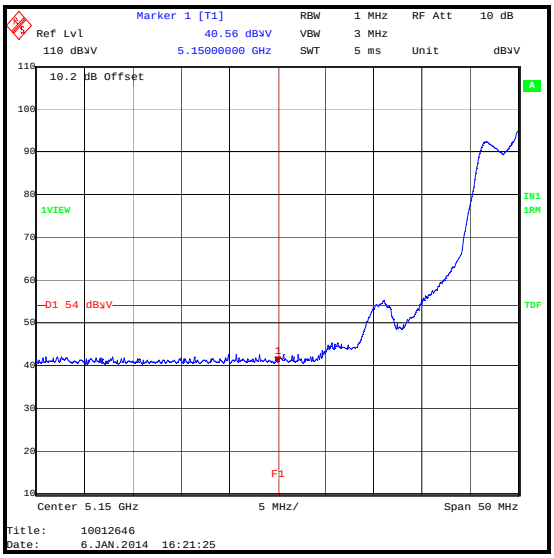
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5150	51.0	74.0	23.0	Complied
5150	40.6	54.0	13.4	Complied



Lower Band Edge Peak Measurement

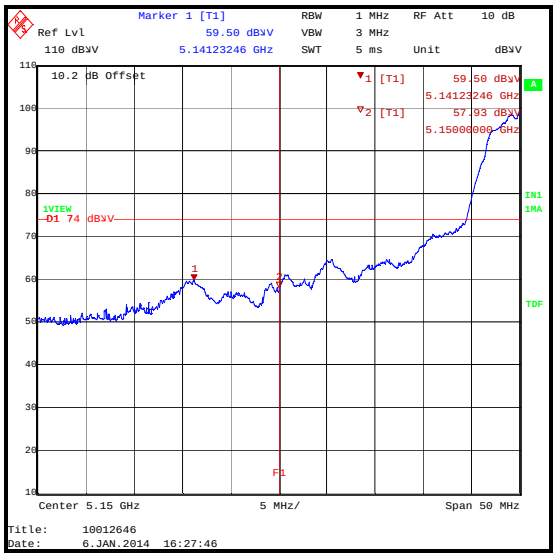


Lower Band Edge Average Measurement

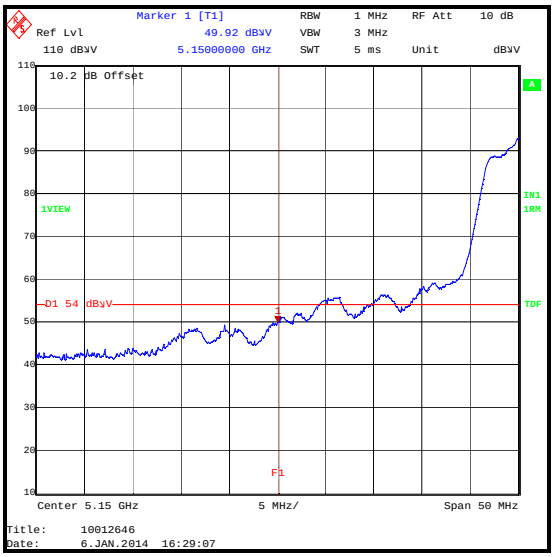
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.15-5.25 GHz band operation) (continued)

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5141.232	59.5	74.0	14.5	Complied
5150	57.9	74.0	16.1	Complied
5150	49.9	54.0	4.1	Complied



Lower Band Edge Peak Measurement



Lower Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions - V100 Antenna (5.25-5.35 GHz band)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	06 January 2014
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(1), 15.407(b)(2), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 (H)

Environmental Conditions:

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

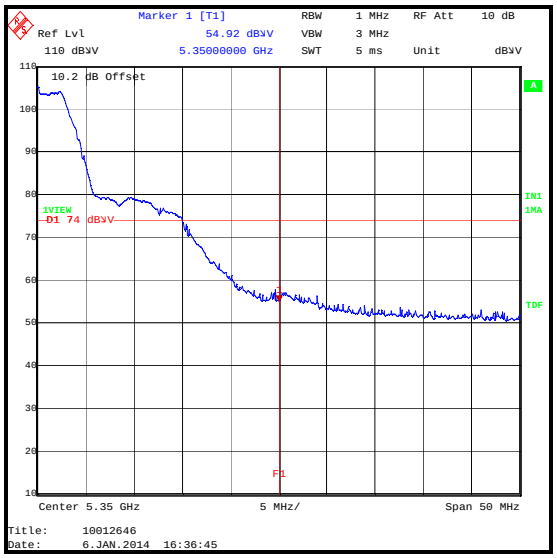
Note(s):

1. An inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also above the upper band edge at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply.
4. In accordance with FCC Parts 15.407(b)(1) and 15.407(b)(2), band edge measurements have only been performed on the lower and upper edges of the contiguous bands 5.15-5.35 GHz.
5. Field strength measurements using peak and average detectors were performed in the restricted bands below 5.15 GHz and above 5.35 GHz. Field strength and EIRP results were found to be compliant with the restricted band limits and Part 15.407 out-of-band limits.
6. In accordance with FCC KDB 789033 Section H)1)c), if the peak measurement is below the average limit, it is not necessary to perform a separate average measurement.

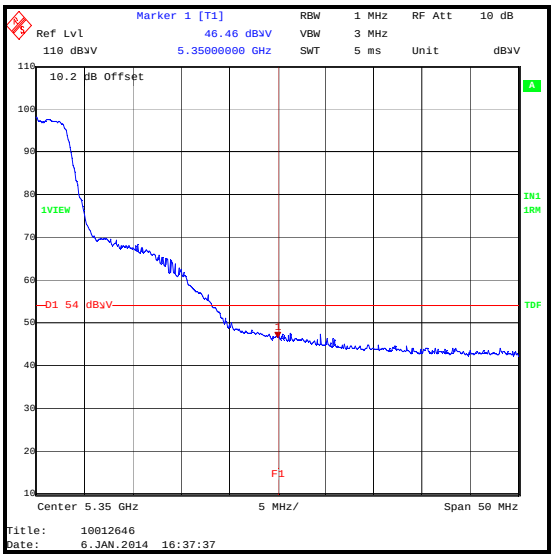
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	54.9	74.0	19.1	Complied
5350	46.5	54.0	7.5	Complied



Upper Band Edge Peak Measurement

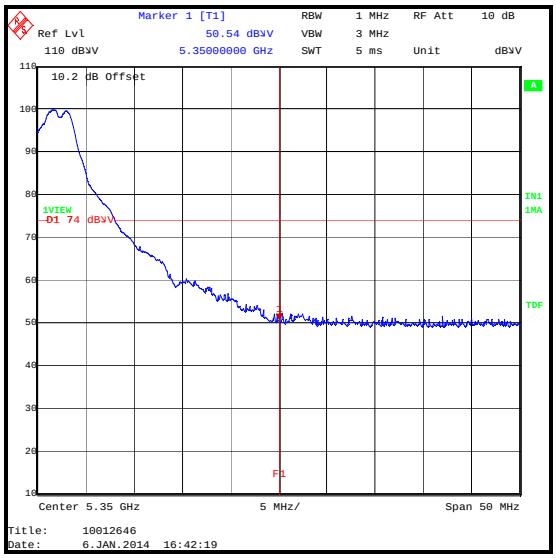


Upper Band Edge Average Measurement

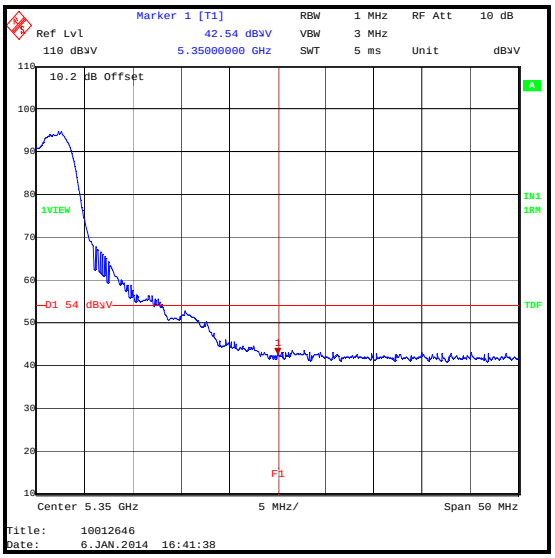
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	50.5	74.0	23.5	Complied
5350	42.5	54.0	11.5	Complied



Upper Band Edge Peak Measurement

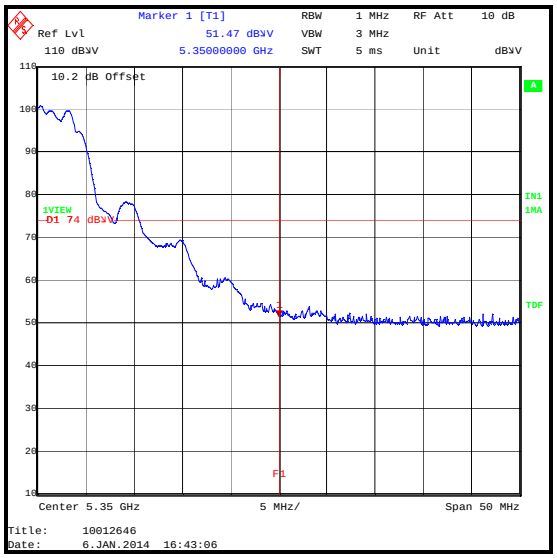


Upper Band Edge Average Measurement

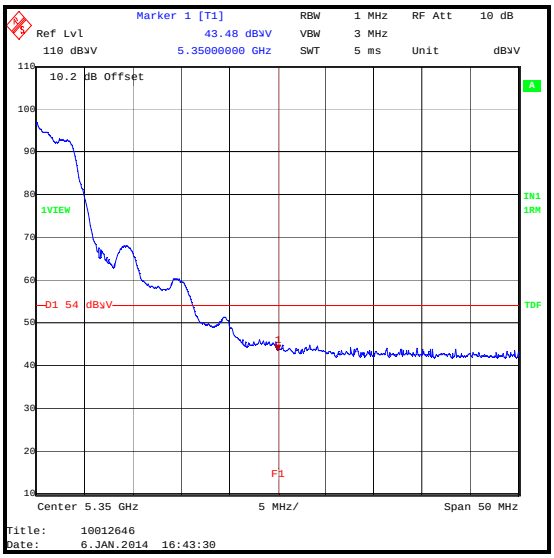
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	51.5	74.0	22.5	Complied
5350	43.5	54.0	10.5	Complied



Upper Band Edge Peak Measurement

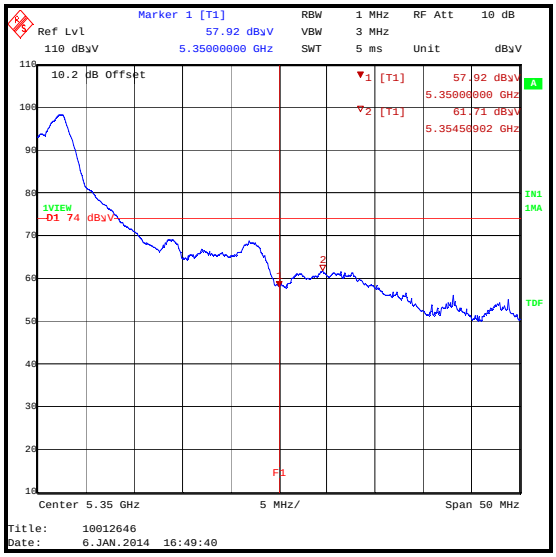


Upper Band Edge Average Measurement

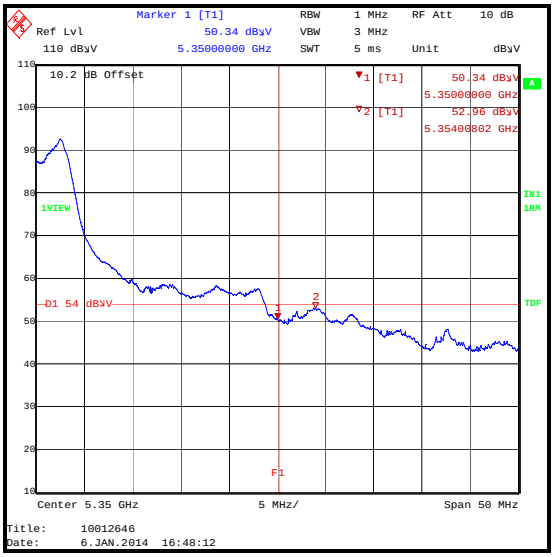
Transmitter Band Edge Radiated Emissions – V100 Antenna (5.25-5.35 GHz band operation) (continued)

Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5350	57.9	74.0	16.1	Complied
5354.509	61.7	74.0	12.3	Complied
5350	50.3	54.0	3.7	Complied
5354.008	53.0	54.0	1.0	Complied



Upper Band Edge Peak Measurement



Upper Band Edge Average Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.47-5.725 GHz band)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	06 January 2014
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(3), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 H)

Environmental Conditions:

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

Note(s):

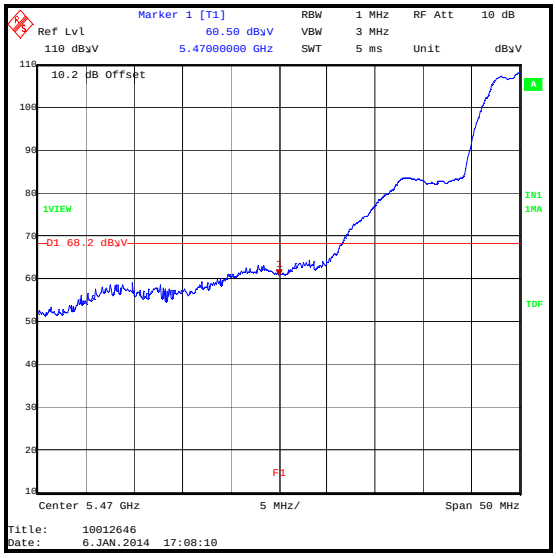
1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz. However, there are restricted bands of operation below the lower band edge at 4.5-5.15 GHz and also at 5.35-5.46 GHz therefore the provisions of FCC Part 15.205 apply. Tests were performed in these restricted bands of operation with the EUT transmitting on the bottom and top channels within 5.47-5.725 GHz band, the results are included in the transmitter 5.47-5.725 GHz band radiated spurious emissions section of this test report.
4. For completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm and also as field strength in dBµV/m. Measured field strength was converted to EIRP in accordance with FCC KDB 789033 H)2)d)(i) using a conversion factor of 95.2.

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

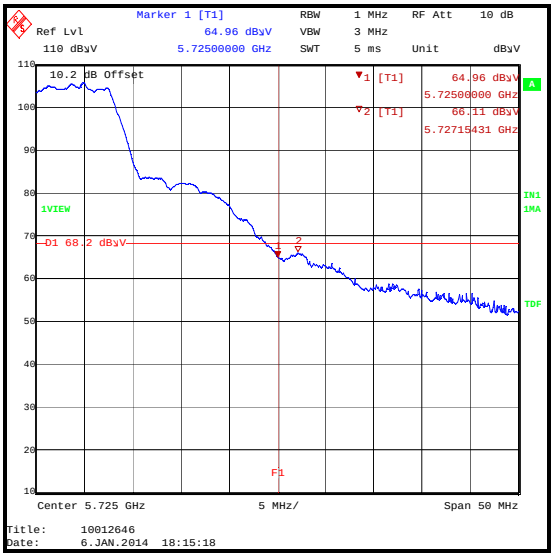
Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5470	-34.7	-27.0	7.7	Complied
5725	-30.2	-27.0	3.2	Complied
5731.062	-29.1	-27.0	2.1	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5470	60.5	68.2	7.7	Complied
5725	65.0	68.2	3.2	Complied
5727.154	66.1	68.2	2.1	Complied



Lower Band Edge Peak Measurement



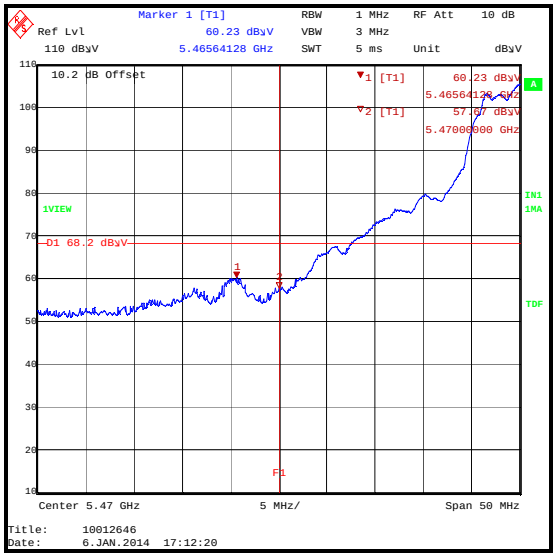
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

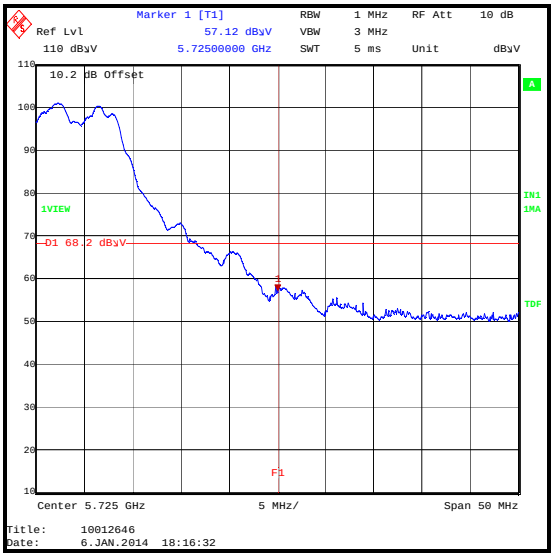
Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5465.641	-35.0	-27.0	8.0	Complied
5470	-37.5	-27.0	10.5	Complied
5725	-38.1	-27.0	11.1	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5465.641	60.2	68.2	8.0	Complied
5470	57.7	68.2	10.5	Complied
5725	57.1	68.2	11.1	Complied



Lower Band Edge Peak Measurement



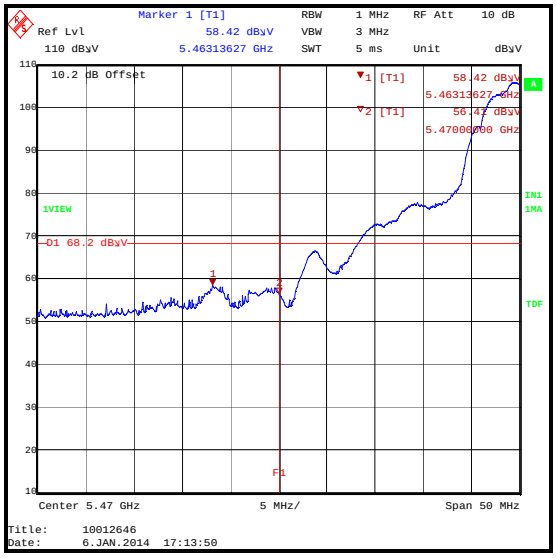
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

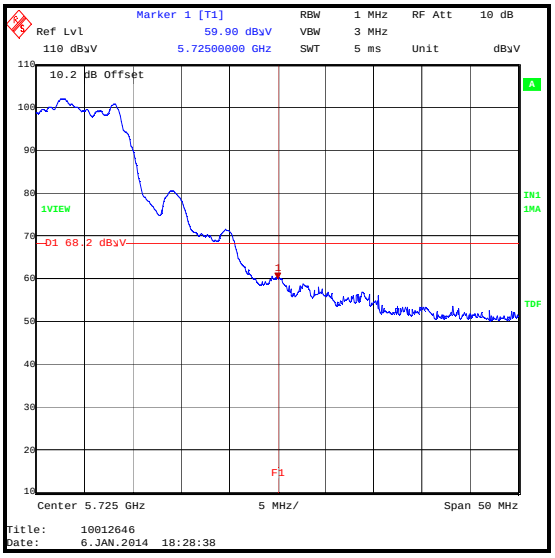
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5463.136	-36.8	-27.0	9.8	Complied
5470	-38.8	-27.0	11.8	Complied
5725	-35.2	-27.0	8.2	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5463.136	58.4	68.2	9.8	Complied
5470	56.4	68.2	11.8	Complied
5725	60.0	68.2	8.2	Complied



Lower Band Edge Peak Measurement



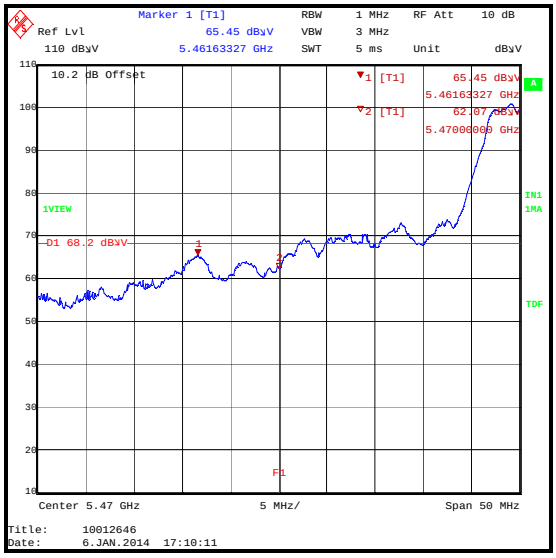
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.47-5.725 GHz band operation) (continued)

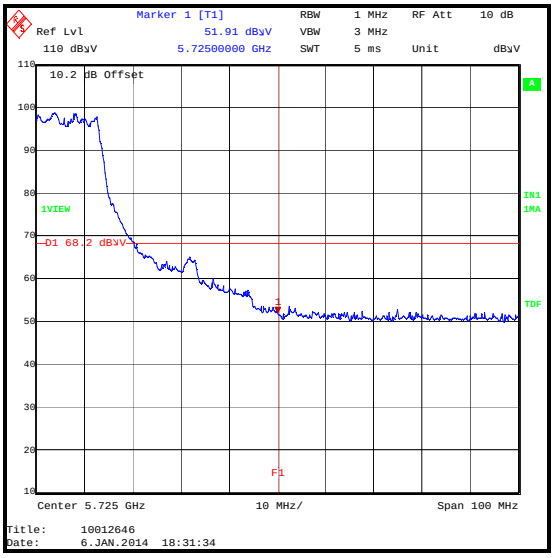
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5461.633	-29.7	-27.0	2.7	Complied
5470	-33.1	-27.0	6.1	Complied
5725	-43.3	-27.0	16.3	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5461.633	65.5	68.2	2.7	Complied
5470	62.1	68.2	6.1	Complied
5725	51.9	68.2	16.3	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.725-5.85 GHz band)

Test Summary:

Test Engineer:	Sandeep Bharat	**Test Date:**	06 January 2014
Test Sample MAC Address:	240A649FC557		

FCC Reference:	Parts 15.407(b)(4), 15.407(b)(7), 15.205 & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.9.2 & FCC KDB 789033 H)

Environmental Conditions:

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

Note(s):

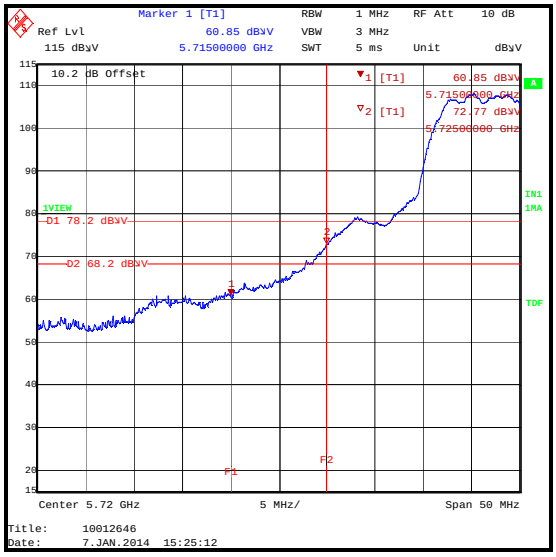
1. An Inquiry was made to the FCC and the response confirmed band edge measurements need only be performed in the EUT modes that produce the highest power and the widest bandwidths. The modes that produced the highest power and widest bandwidth were:
    - 802.11a – QPSK / 12 Mbit/s
    - 802.11n HT20 – BPSK / 6.5 Mbit/s / MCS0 & BPSK / 13 Mbit/s / MCS8
    - 802.11n HT40 – QPSK / 40.5 Mbit/s / MCS2
2. Lower band edge measurements were performed with the EUT transmitting on the bottom channel. Upper band edge measurements were performed with the EUT transmitting on the top channel.
3. The EUT is capable of transmitting on channel 165 at 5825 MHz and therefore operates under Part 15.407 in the UNII band as well as Part 15.247 in the DTS band. The out of band emission limit at the DTS upper band edge frequency of 5850 MHz is -27 dBm in accordance with FCC KDB 644545 D02 Page1, Note 1 and Section D.
4. For completeness, results are also shown as EIRP measured at a distance of 3 metres in dBm and also as field strength in dBµV/m. Measured field strength was converted to EIRP in accordance with FCC KDB 789033 H)2)d)(i) using a conversion factor of 95.2

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.725-5.85 GHz band operation) (continued)

Results: 802.11a / 20 MHz / QPSK / 12 Mbit/s / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-34.3	-27.0	7.3	Complied
5725	-22.4	-17.0	5.4	Complied
5850	-31.0	-27.0	4.0	Complied
5855.661	-29.4	-27.0	2.4	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	60.9	68.2	7.3	Complied
5725	72.8	78.2	5.4	Complied
5850	64.2	68.2	4.0	Complied
5855.661	65.8	68.2	2.4	Complied



Lower Band Edge Peak Measurement

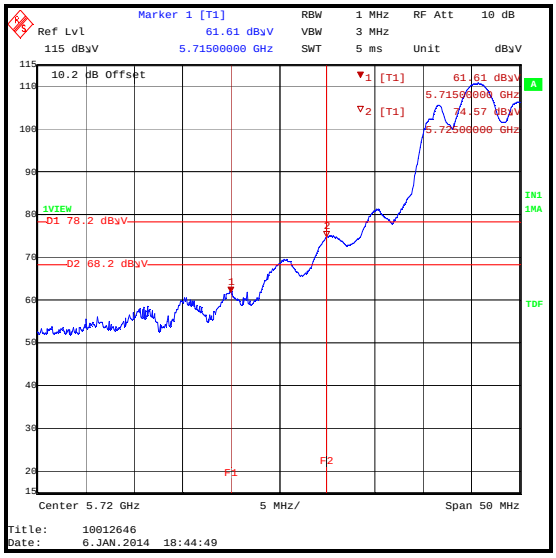
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.725-5.85 GHz band operation) (continued)

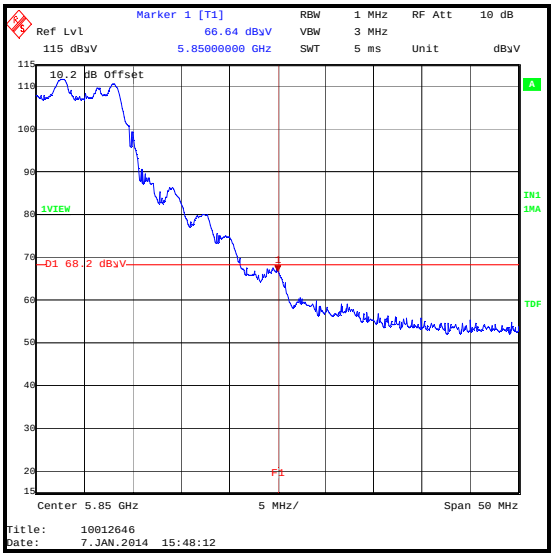
Results: 802.11n / 20 MHz / BPSK / 6.5 Mbit/s / MCS0 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-33.6	-27.0	6.6	Complied
5725	-20.6	-17.0	3.6	Complied
5850	-28.6	-27.0	1.6	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	61.6	68.2	6.6	Complied
5725	74.6	78.2	3.6	Complied
5850	66.6	68.2	1.6	Complied



Lower Band Edge Peak Measurement



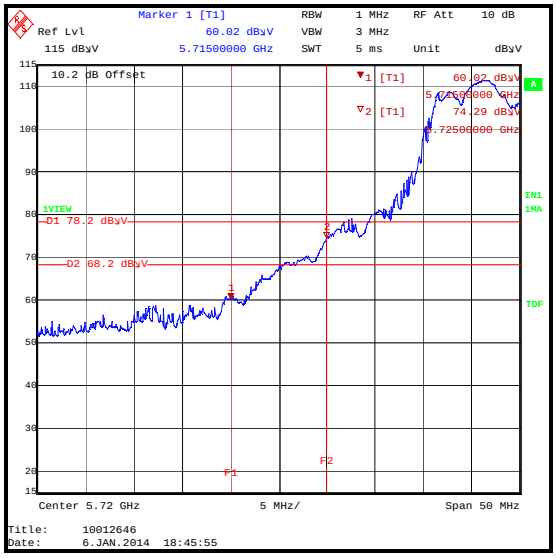
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.725-5.85 GHz band operation) (continued)

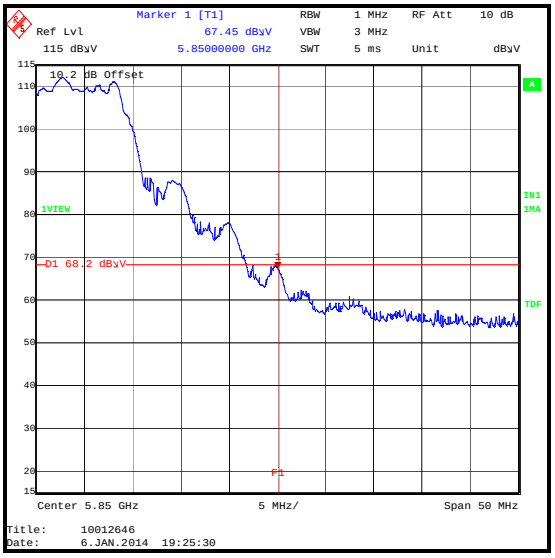
Results: 802.11n / 20 MHz / BPSK / 13 Mbit/s / MCS8 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5715	-35.2	-27.0	8.2	Complied
5725	-20.9	-17.0	3.9	Complied
5850	-27.7	-27.0	0.7	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5715	60.0	68.2	8.2	Complied
5725	74.3	78.2	3.9	Complied
5850	67.5	68.2	0.7	Complied



Lower Band Edge Peak Measurement



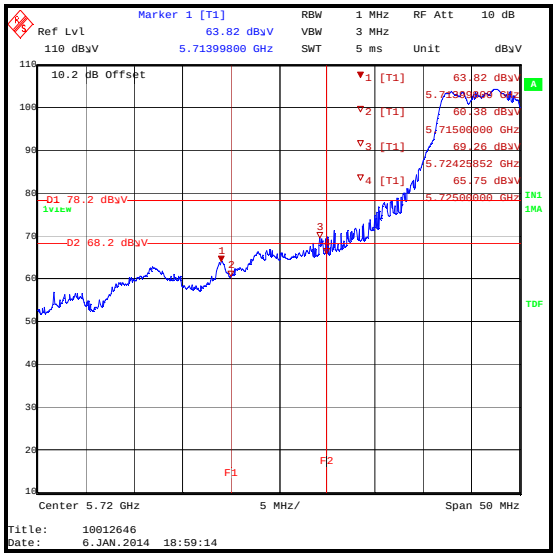
Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (5.725-5.85 GHz band operation) (continued)

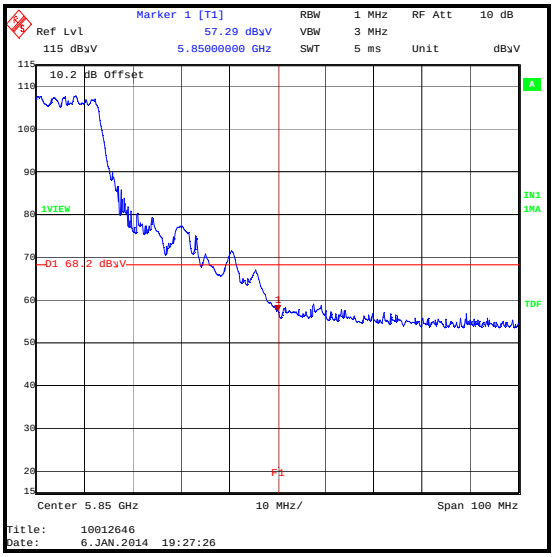
Results: 802.11n / 40 MHz / QPSK / 40.5 Mbit/s / MCS2 / Peak

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
5713.999	-31.4	-27.0	4.4	Complied
5715	-34.8	-27.0	7.8	Complied
5724.258	-25.9	-17.0	8.9	Complied
5725	-29.4	-17.0	12.4	Complied
5850	-37.9	-27.0	10.9	Complied

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
5713.999	63.8	68.2	4.4	Complied
5715	60.4	68.2	7.8	Complied
5724.258	69.3	78.2	8.9	Complied
5725	65.8	78.2	12.4	Complied
5850	57.3	68.2	10.9	Complied



Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement

Transmitter Band Edge Radiated Emissions – V100 Antenna (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	24 May 2014	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	14 Nov 2014	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046K	01 Oct 2014	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	10 May 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12

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%	±4.69 dB
Maximum Conducted Output Power	5.15 GHz to 5.850 GHz	95%	±1.13 dB
Peak Power Spectral Density	5.15 GHz to 5.850 GHz	95%	±1.13 dB
Peak Excursion	5.15 GHz to 5.850 GHz	95%	±1.13 dB
26 dB Emission Bandwidth	5.15 GHz to 5.850 GHz	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.94 dB

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

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version

---END OF REPORT---