Report On

FCC Testing of the Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 15E

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00214

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REPORT ON

FCC Testing of the
Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 15E

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December 2014

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DATED 19 December 2014

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15E. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Toubella T Guy G Lawler

Product Service

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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 15E

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS to the requirements of FCC CFR 47 Part 15E.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Model Number(s)	SHV31
Serial Number(s)	IMEI 004401115316073 IMEI 004401115315992
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15E (2013)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10329 20 October 2014
Start of Test	15 November 2014
Finish of Test	19 December 2014
Name of Engineer(s)	J Tuckwell M Toubella T Guy G Lawler
Related Document(s)	789033 D02 General UNII Test Procedures New Rules v01 ETSI TR 100 028: 2001

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15E is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
802.11(a)				
2.1	15.207	AC Line Conducted Emissions	Pass	
2.2	15.407 (a)	26 dB Bandwidth	Pass	
2.3	15.407 (a)(1)(2)(3)	Power Limits	Pass	
2.4	15.407 (a)(5)	Peak Power Spectral Density	Pass	
2.5	15.407 (b)(1)(2)(3)(4)(6)(7)	Undesirable Emission Limits	Pass	
2.6	2.1055 and 15.407 (g)	Frequency Stability	Pass	
802.11(n) - 5 GHz 20 MHz BW				
2.2	15.407 (a)	26 dB Bandwidth	Pass	
2.3	15.407 (a)(1)(2)(3)	Power Limits	Pass	
2.4	15.407 (a)(5)	Peak Power Spectral Density	Pass	
2.5	15.407 (b)(1)(2)(3)(4)(6)(7)	Undesirable Emission Limits	Pass	
2.6	2.1055 and 15.407 (g)	Frequency Stability	Pass	

Product Service

Section	Spec Clause	Test Description	Result	Comments/Base Standard
802.11(n) - 5 GHz 40 MHz BW				
2.2	15.407 (a)	26 dB Bandwidth	Pass	
2.3	15.407 (a)(1)(2)(3)	Power Limits	Pass	
2.4	15.407 (a)(5)	Peak Power Spectral Density	Pass	
2.5	15.407 (b)(1)(2)(3)(4)(6)(7)	Undesirable Emission Limits	Pass	
2.6	2.1055 and 15.407 (g)	Frequency Stability	Pass	
802.11(ac) - 5 GHz 20 MHz BW				
2.2	15.407 (a)	26 dB Bandwidth	Pass	
2.3	15.407 (a)(1)(2)(3)	Power Limits	Pass	
2.4	15.407 (a)(5)	Peak Power Spectral Density	Pass	
2.5	15.407 (b)(1)(2)(3)(4)(6)(7)	Undesirable Emission Limits	Pass	
2.6	2.1055 and 15.407 (g)	Frequency Stability	Pass	
802.11(ac) - 5 GHz 40 MHz BW				
2.2	15.407 (a)	26 dB Bandwidth	Pass	
2.3	15.407 (a)(1)(2)(3)	Power Limits	Pass	
2.4	15.407 (a)(5)	Peak Power Spectral Density	Pass	
2.5	15.407 (b)(1)(2)(3)(4)(6)(7)	Undesirable Emission Limits	Pass	
2.6	2.1055 and 15.407 (g)	Frequency Stability	Pass	

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Section	Spec Clause	Test Description	Result	Comments/Base Standard
802.11(ac) - 5 GHz 80 MHz BW				
2.2	15.407 (a)	26 dB Bandwidth	Pass	
2.3	15.407 (a)(1)(2)(3)	Power Limits	Pass	
2.4	15.407 (a)(5)	Peak Power Spectral Density	Pass	
2.5	15.407 (b)(1)(2)(3)(4)(6)(7)	Undesirable Emission Limits	Pass	
2.6	2.1055 and 15.407 (g)	Frequency Stability	Pass	

1.3 PRODUCT TECHNICAL DESCRIPTION

Please refer to the SHV31 Model Description Form.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

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SECTION 2

TEST DETAILS

FCC Testing of the
Sharp SHV31 Dual-band UMTS (FDDI, FDDV) & Quad-band GSM (GSM850/GSM900/DCS1800/PCS1900) & Quad-band LTE (B1,B3, B17, B26) & AXGP (TDD41) multi mode cellular phone with Bluetooth, ANT+, WLAN, SRD (NFC, FeliCa) and GPS
In accordance with FCC CFR 47 Part 15E

2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15E, Clause 15.207

2.1.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315992 - Modification State 0

2.1.3 Date of Test

19 December 2014

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

A test environment and testing arrangement meeting the specification of ANSI C63.4 was used during all testing. The Equipment Under Test (EUT) was set upon a non-conducting platform at an elevation of 80 cm above a horizontal reference ground plane. A vertical reference ground plane was situated 40 cm from the EUT and bonded to the horizontal reference ground plane.

The EUT was powered by a Line Impedance Stabilization Network (LISN), whereby emissions measurements of the current-carrying conductors were made through this LISN. The LISN was bonded to the horizontal reference ground plane with a separation distance greater than 80 cm from the EUT. A mains supply cable of 1 m length was used to supply mains power to the EUT from the LISN.

A preliminary emissions scan was conducted for each current-carrying conductor of the EUT, using a peak detector over a frequency range of 150 kHz to 30 MHz. At least six of the greatest peak emissions, frequency positions were selected from each preliminary emissions scan for further evaluation as final measuring points.

Final measurement points were measured using quasi-peak and average detectors. All final measurements were assessed against the emission limits in Clause 15.207 of FCC CFR 47 FCC Part 15.

2.1.6 Environmental Conditions

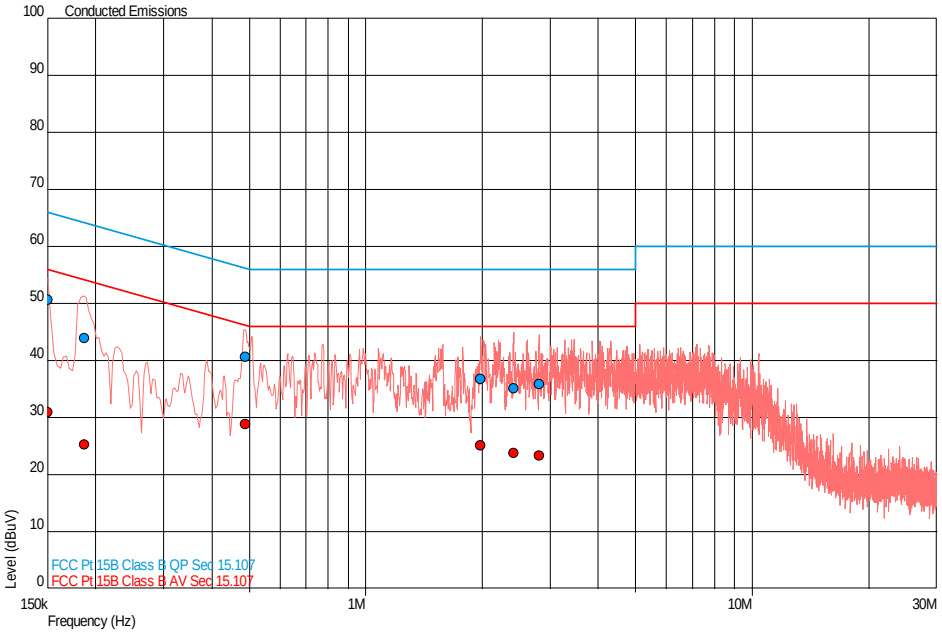
Ambient Temperature	21.0°C
Relative Humidity	39.0%

Product Service

2.1.7 Test Results

802.11(ac) - 5 GHz 40 MHz BW

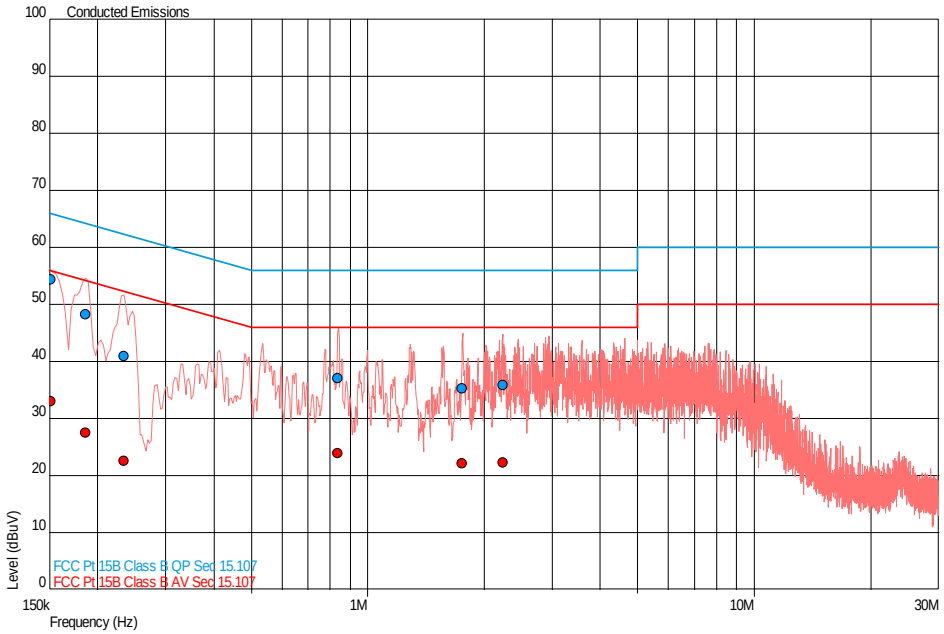
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.150	50.7	66.0	-15.3	31.0	56.0	-25.0
0.187	44.0	64.2	-20.2	25.3	54.2	-28.9
0.488	40.7	56.2	-15.5	28.9	46.2	-17.3
1.983	36.7	56.0	-19.3	25.2	46.0	-20.8
2.414	35.1	56.0	-20.9	23.8	46.0	-22.2
2.810	35.9	56.0	-20.1	23.4	46.0	-22.6

Product Service

Neutral Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.151	54.4	66.0	-11.5	33.1	56.0	-22.9
0.186	48.2	64.2	-16.0	27.5	54.2	-26.7
0.234	41.0	62.3	-21.3	22.6	52.3	-29.7
0.836	37.1	56.0	-18.9	24.0	46.0	-22.0
1.754	35.4	56.0	-20.6	22.1	46.0	-23.9
2.235	35.9	56.0	-20.1	22.3	46.0	-23.7

2.2 26 dB BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 15E, Clause 15.407 (a)

2.2.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115316073 - Modification State 0

2.2.3 Date of Test

10 December 2014

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15.407 (a) and KDB 789033.

The EUT was transmitting at maximum power, for bottom, middle and top channels on the data rate pre-determined to give the highest level of average output power. The EUT was connected to a spectrum analyser via a cable and attenuator. The Analyser settings were adjusted to an RBW of at least 1% of the emission bandwidth with a video bandwidth of 3 x RBW. The analyser was configured with peak detector and trace set to max hold. The peak point of the trace was measured and the markers positioned to give the -26 dBc points of the displayed spectrum.

The plots on the following pages show the resultant display from the Spectrum Analyser.

2.2.6 Environmental Conditions

Ambient Temperature	23.1 - 24.1°C
Relative Humidity	28.2 - 37.1%

Product Service

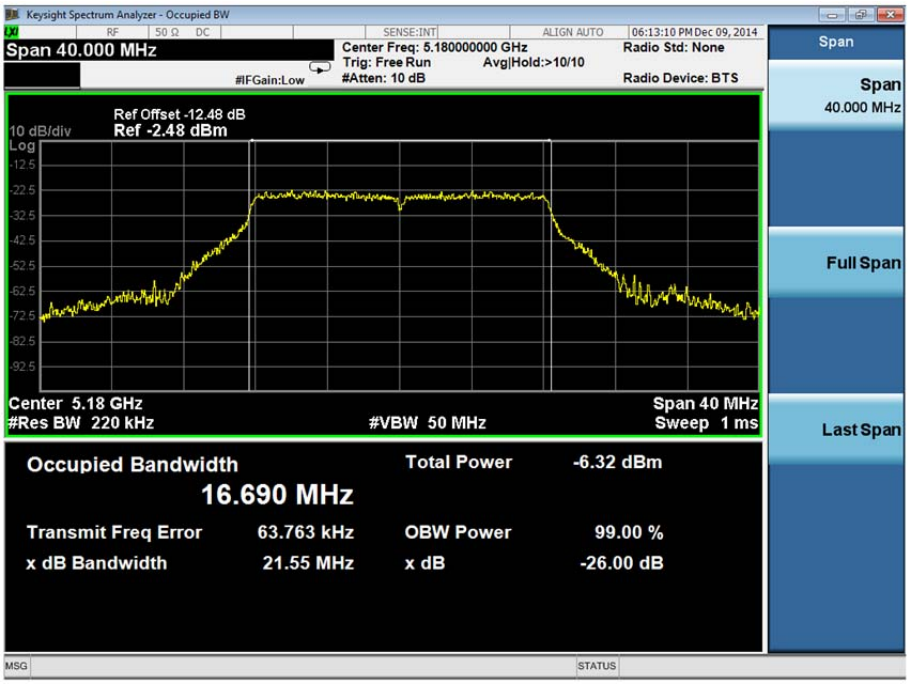
2.2.7 Test Results

802.11(a)

Frequency Band 1

5180 MHz

26 dB Bandwidth (MHz)	21.55



5200 MHz

26 dB Bandwidth (MHz)	21.59

5240 MHz

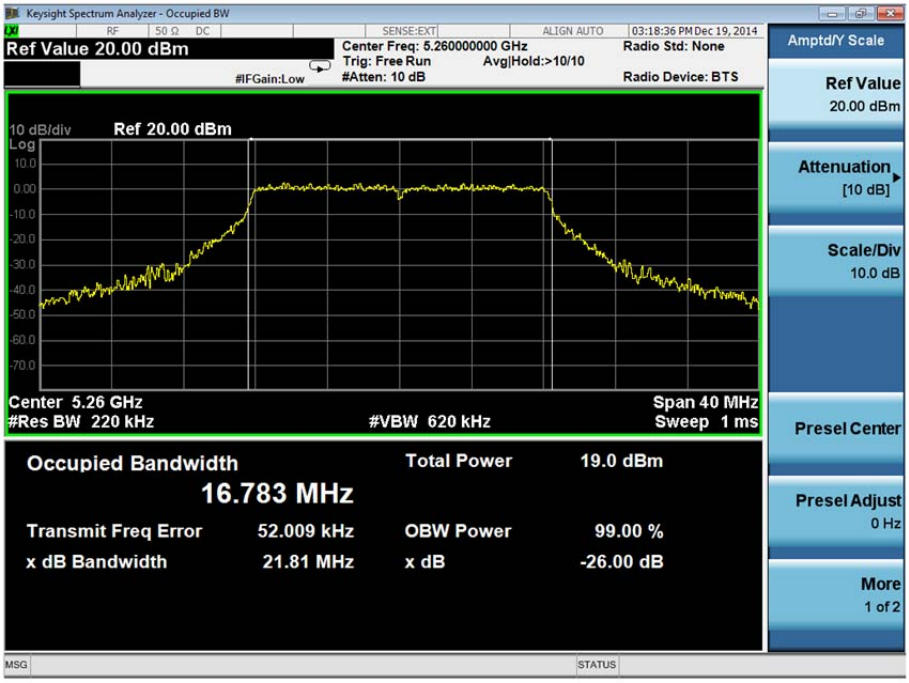
26 dB Bandwidth (MHz)	21.55

The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 6 Mbps.

Frequency Band 2

5260 MHz

26 dB Bandwidth (MHz)	21.81



Product Service

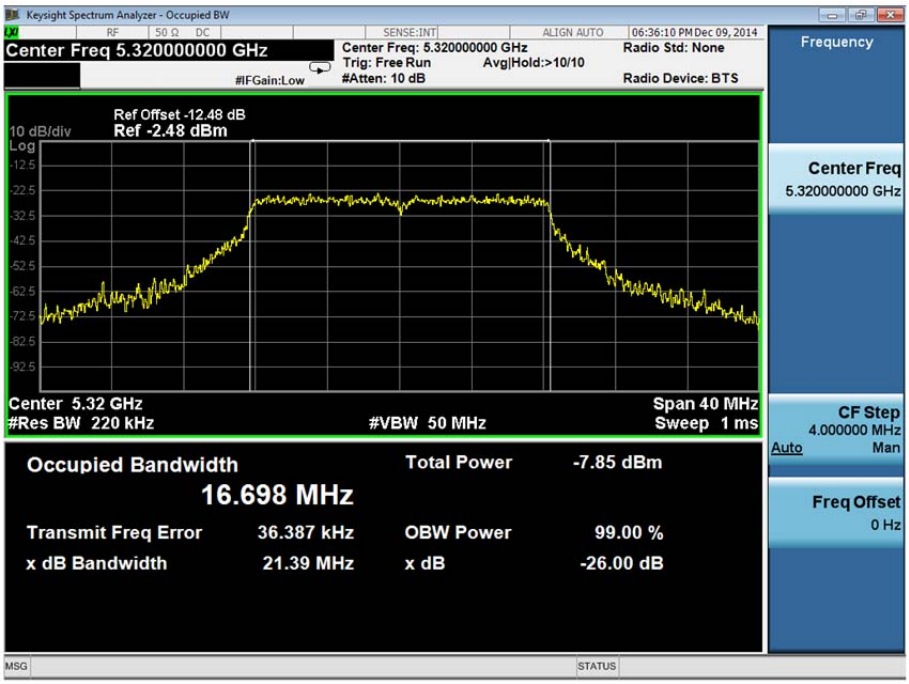
5300 MHz

26 dB Bandwidth (MHz)	20.24

Product Service

5320 MHz

26 dB Bandwidth (MHz)	21.39



The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 6 Mbps.

Frequency Band 3

5500 MHz

26 dB Bandwidth (MHz)	20.60

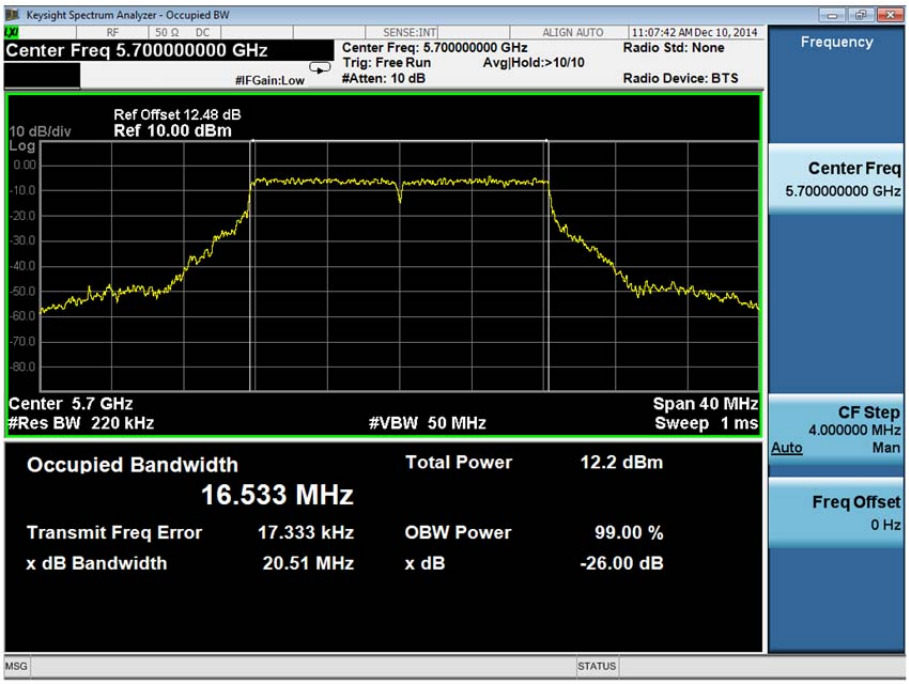
5600 MHz

26 dB Bandwidth (MHz)	20.52

Product Service

5700 MHz

26 dB Bandwidth (MHz)	20.51



The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 6 Mbps.

Limit

Not specified.

802.11(ac) - 5 GHz 20 MHz BW

Frequency Band 1

5180 MHz

26 dB Bandwidth (MHz)	21.19

5200 MHz

26 dB Bandwidth (MHz)	20.67

Product Service

5240 MHz

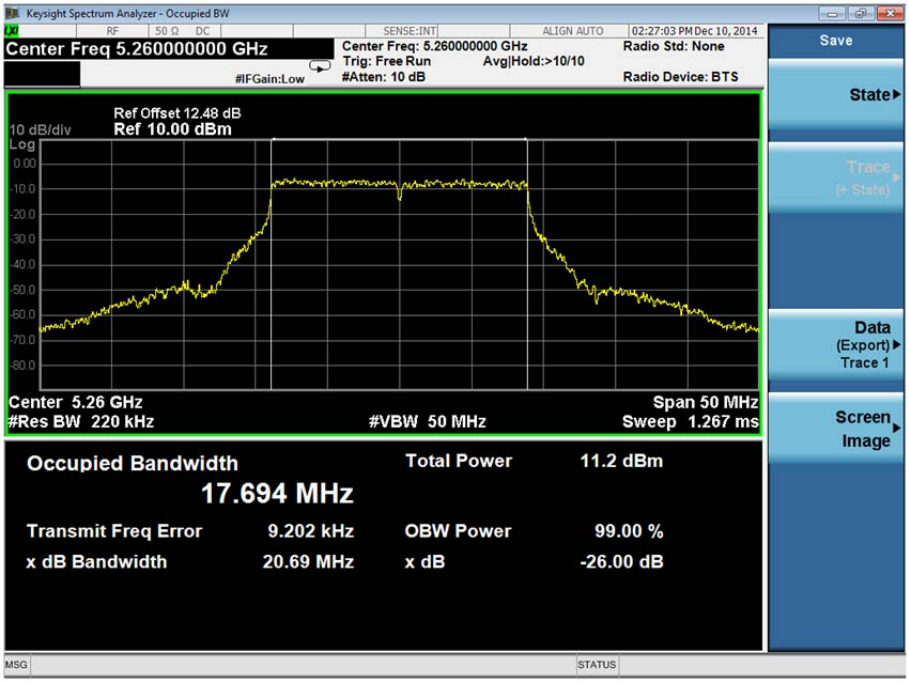
26 dB Bandwidth (MHz)	20.98

The test was performed on the worst case data rate for 802.11(ac) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Frequency Band 2

5260 MHz

26 dB Bandwidth (MHz)	20.69



5300 MHz

26 dB Bandwidth (MHz)	21.27

5320 MHz

26 dB Bandwidth (MHz)	21.46

The test was performed on the worst case data rate for 802.11(ac) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Product Service

Frequency Band 3

5500 MHz

26 dB Bandwidth (MHz)	20.99

5600 MHz

26 dB Bandwidth (MHz)	20.84

5700 MHz

26 dB Bandwidth (MHz)	20.67

The test was performed on the worst case data rate for 802.11(ac) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Limit

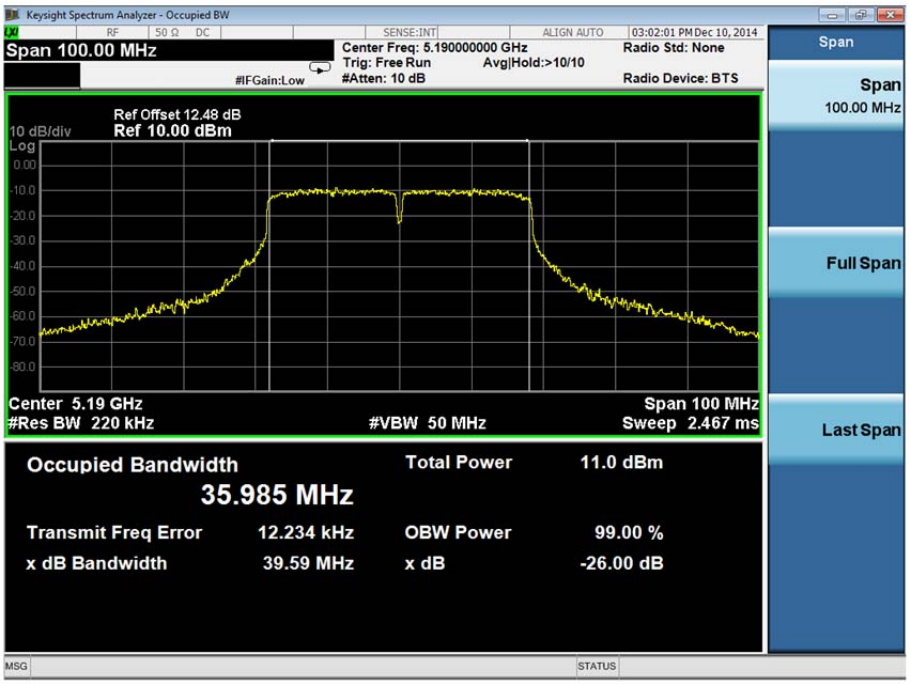
Not specified.

802.11(ac) - 5 GHz 40 MHz BW

Frequency Band 1

5190 MHz

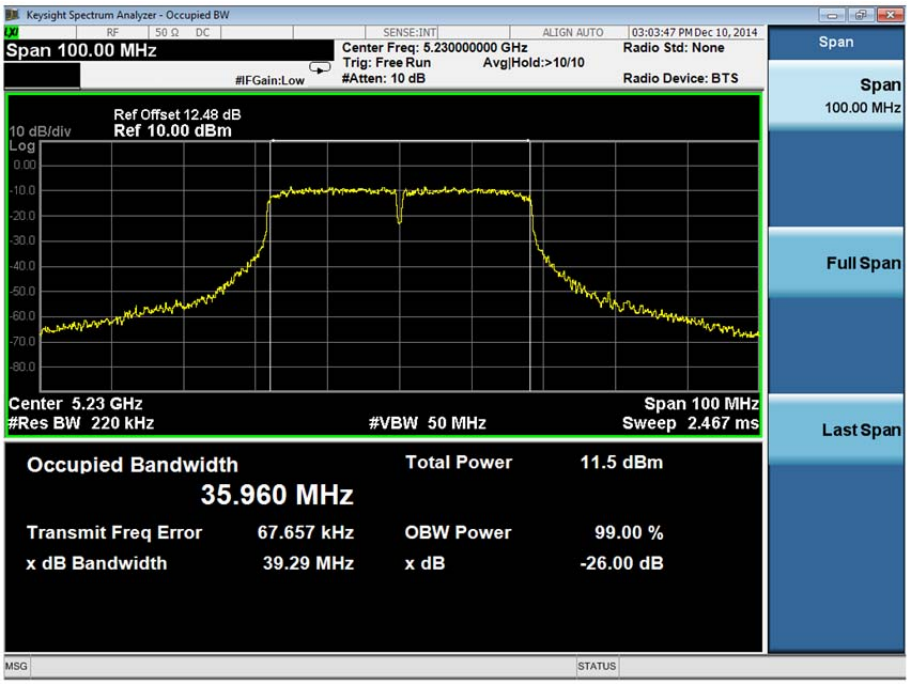
26 dB Bandwidth (MHz)	39.59



Product Service

5230 MHz

26 dB Bandwidth (MHz)	39.29

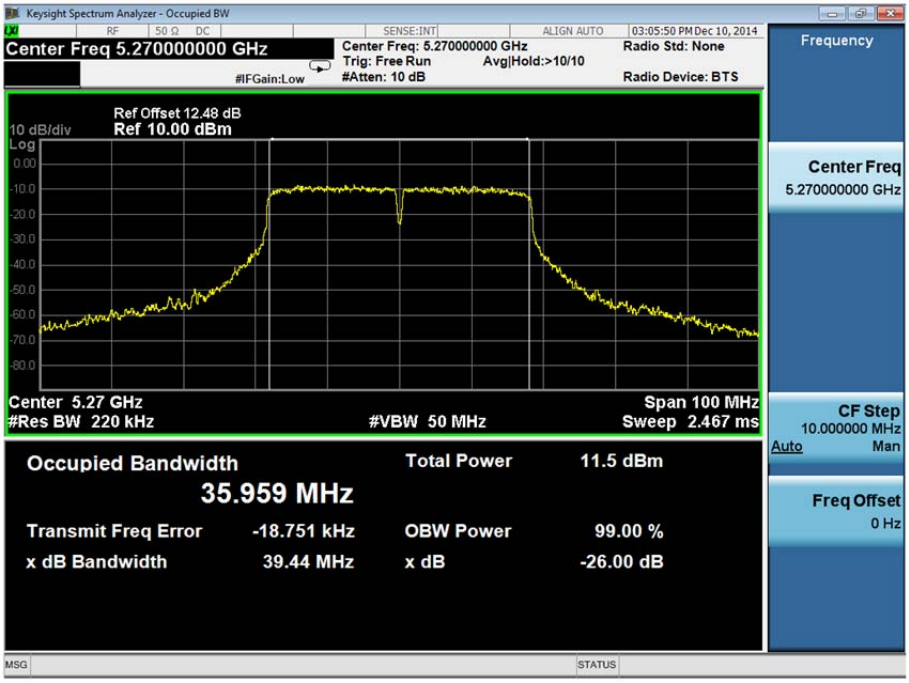


The test was performed on the worst case data rate for 802.11(ac) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Frequency Band 2

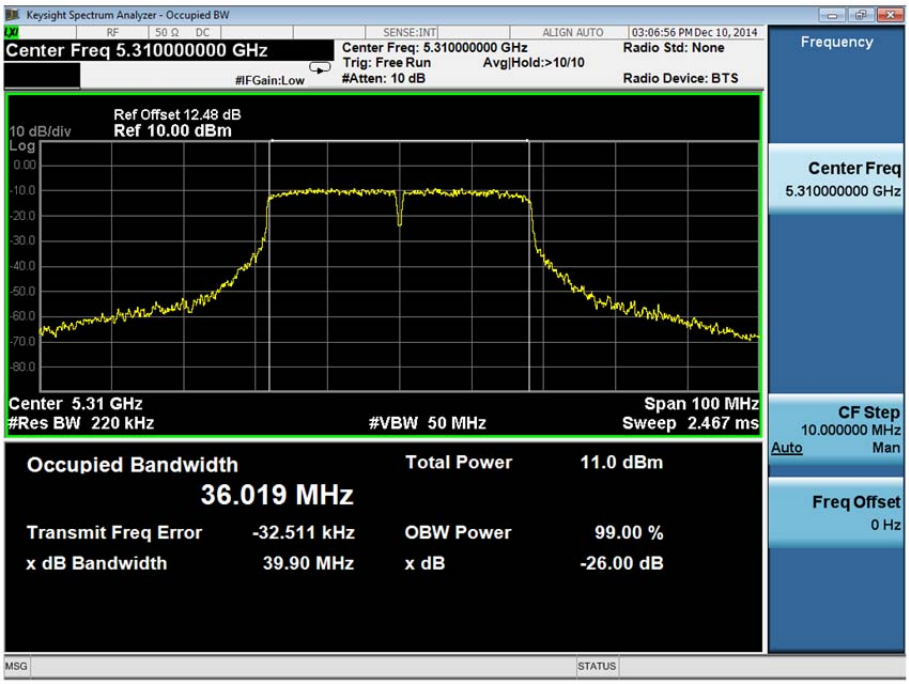
5270 MHz

26 dB Bandwidth (MHz)	39.44



5310 MHz

26 dB Bandwidth (MHz)	39.90

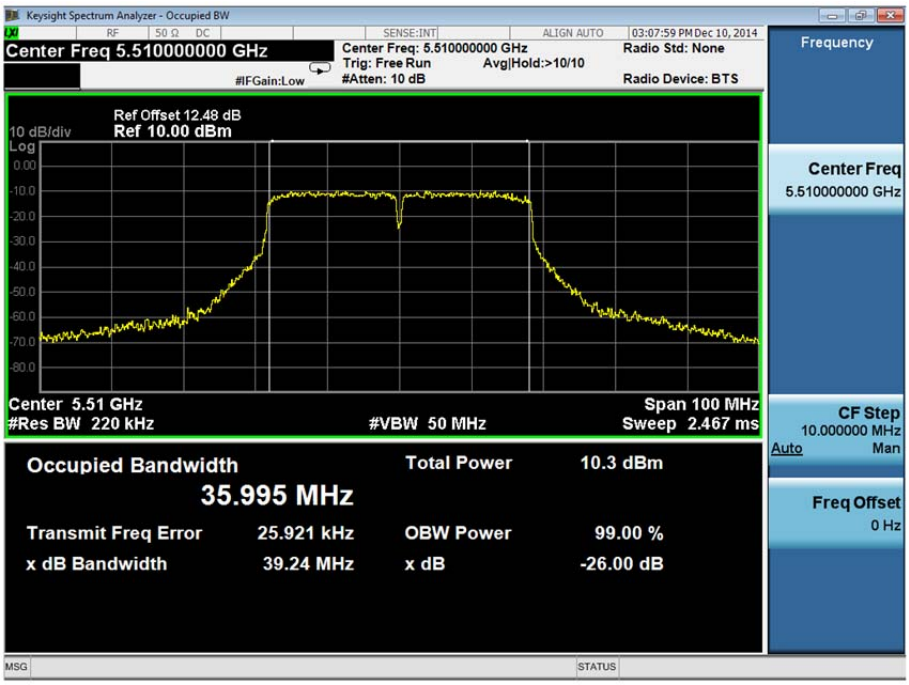


The test was performed on the worst case data rate for 802.11(ac) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Frequency Band 3

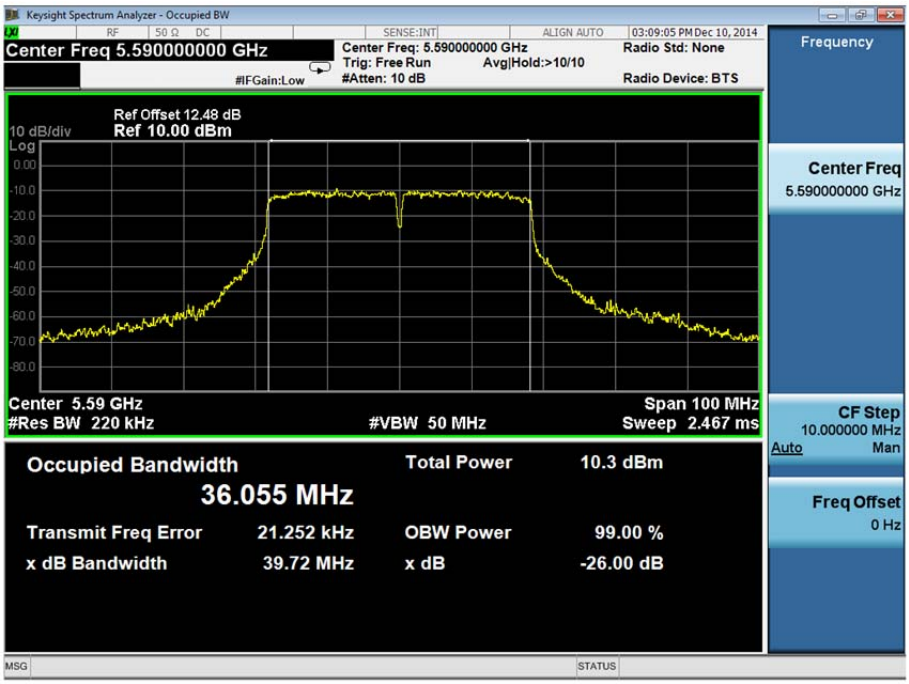
5510 MHz

26 dB Bandwidth (MHz)	39.24



5590 MHz

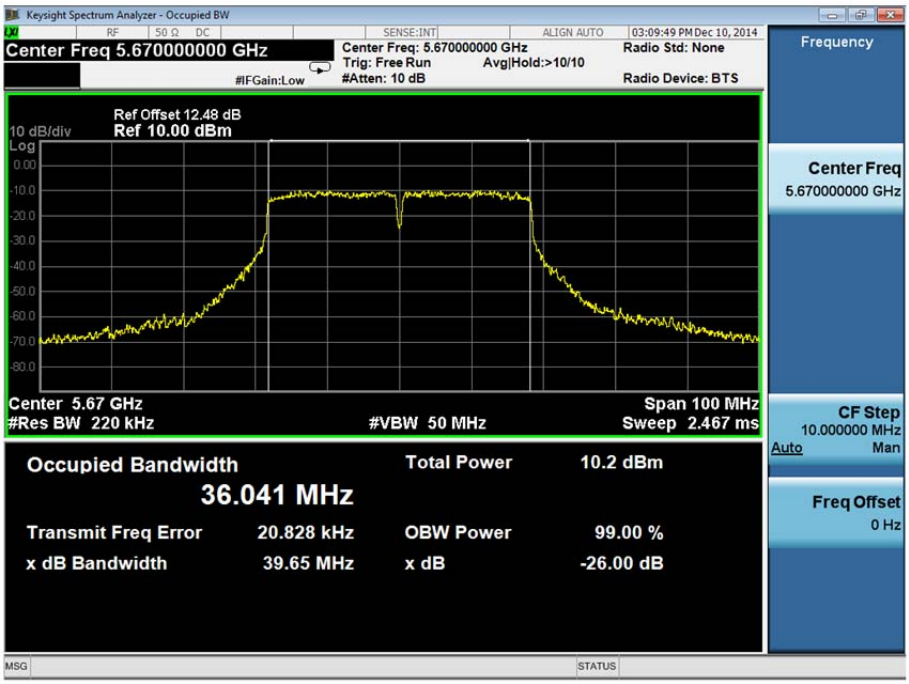
26 dB Bandwidth (MHz)	39.72



Product Service

5670 MHz

26 dB Bandwidth (MHz)	39.65



The test was performed on the worst case data rate for 802.11(ac) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Limit

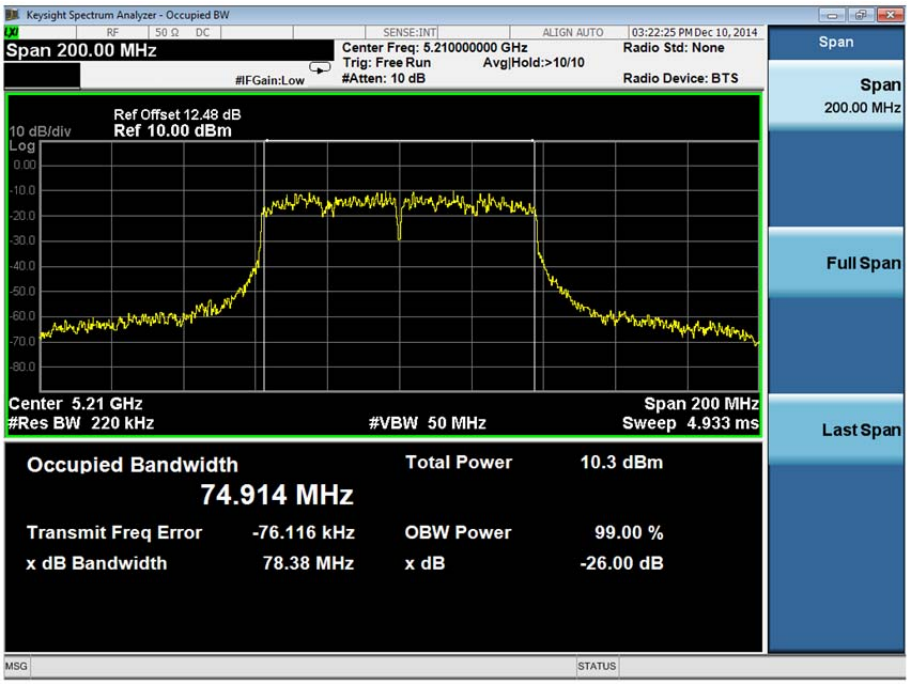
Not specified.

802.11(ac) - 5 GHz 80 MHz BW

Frequency Band 1

5210 MHz

26 dB Bandwidth (MHz)	78.38

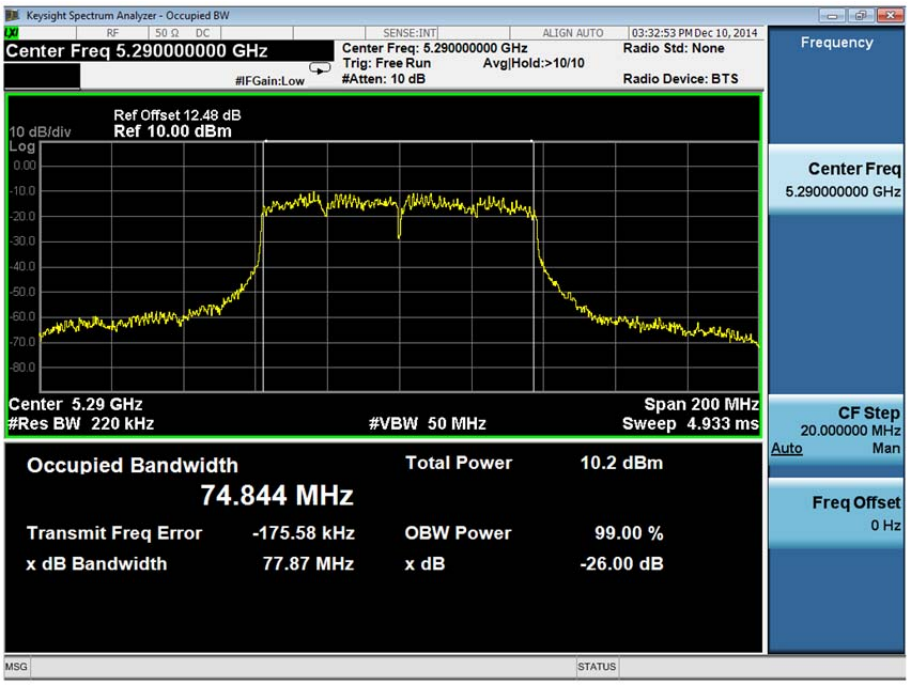


The test was performed on the worst case data rate for 802.11(ac) - 80 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS5.

Frequency Band 2

5290 MHz

26 dB Bandwidth (MHz)	77.87



The test was performed on the worst case data rate for 802.11(ac) - 80 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS5.

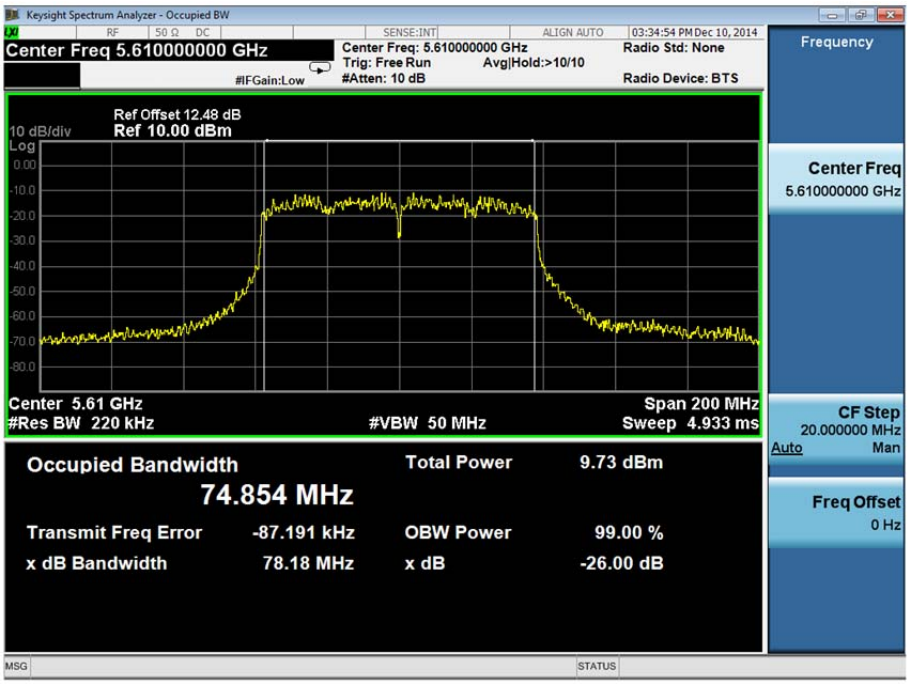
Frequency Band 3

5530 MHz

26 dB Bandwidth (MHz)	78.40

5610 MHz

26 dB Bandwidth (MHz)	78.18



The test was performed on the worst case data rate for 802.11(ac) - 80 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS5.

Limit

Not specified.

802.11(n) - 5 GHz 20 MHz BW

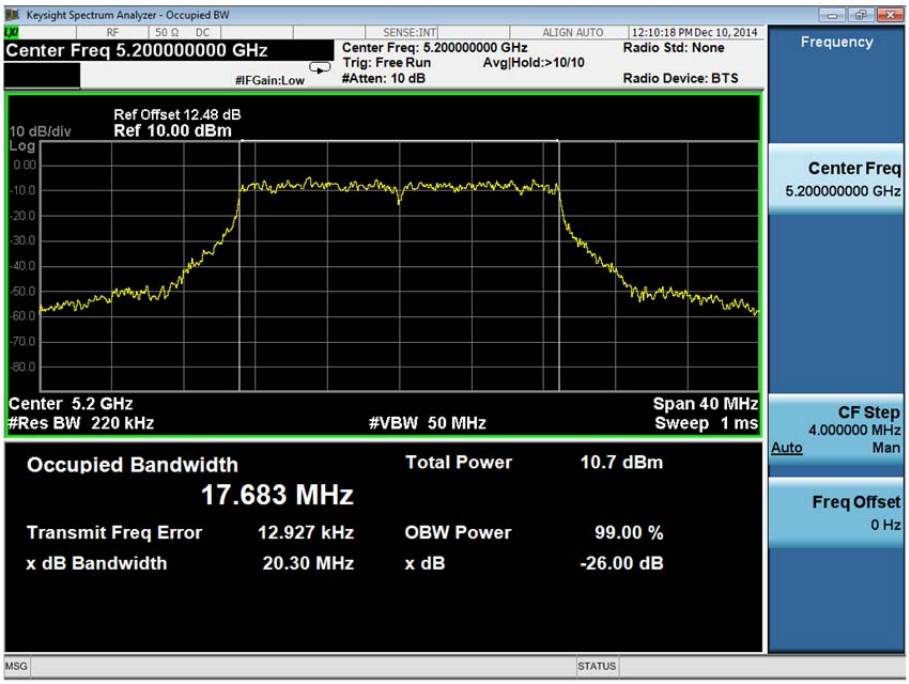
Frequency Band 1

5180 MHz

26 dB Bandwidth (MHz)	20.32

5200 MHz

26 dB Bandwidth (MHz)	20.30



5240 MHz

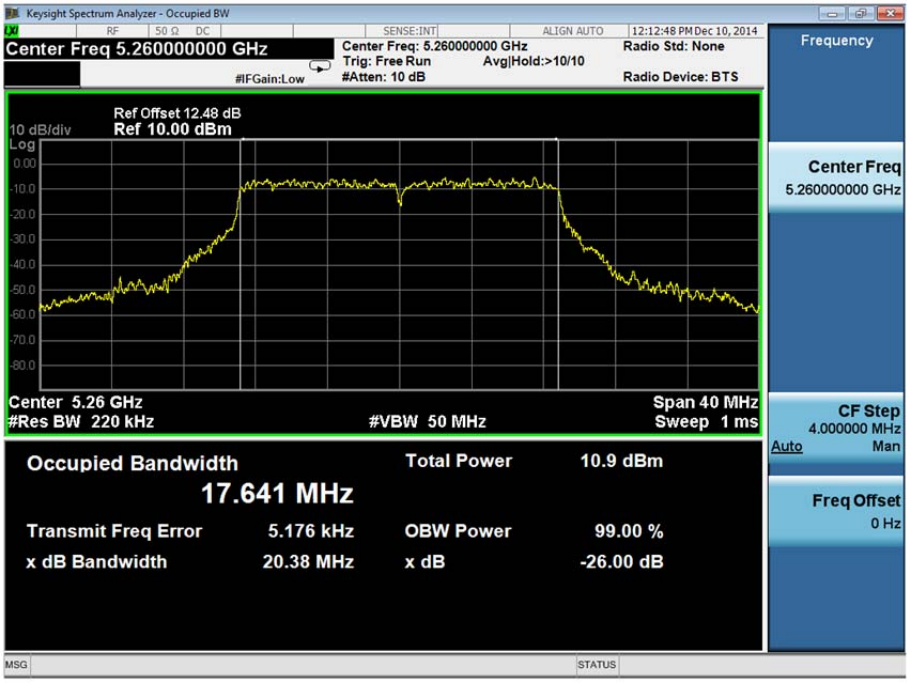
26 dB Bandwidth (MHz)	20.46

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS7.

Frequency Band 2

5260 MHz

26 dB Bandwidth (MHz)	20.38



5300 MHz

26 dB Bandwidth (MHz)	20.75

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5320 MHz

26 dB Bandwidth (MHz)	20.31

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS7.

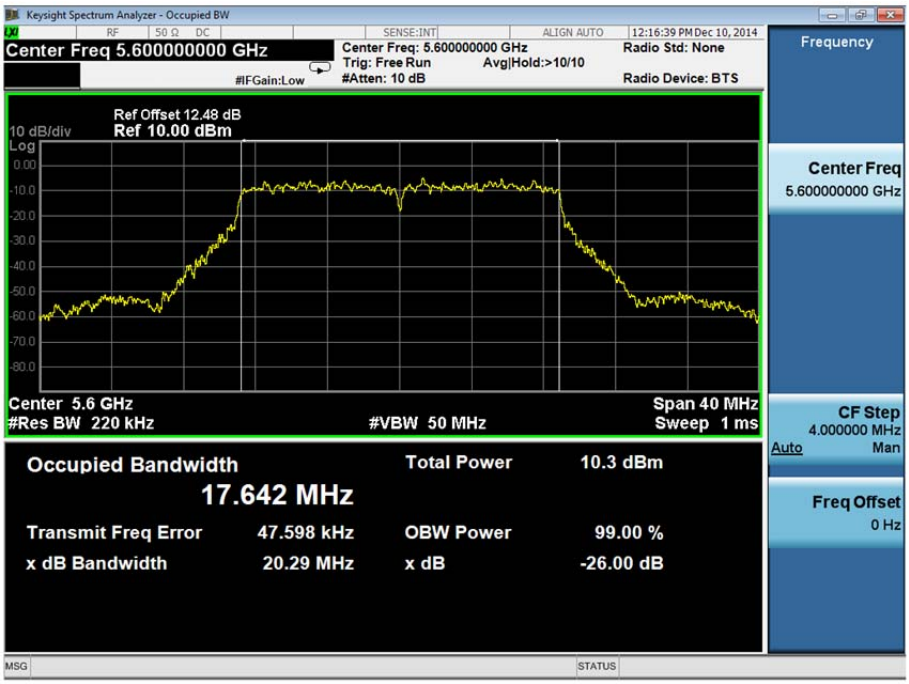
Frequency Band 3

5500 MHz

26 dB Bandwidth (MHz)	20.51

5600 MHz

26 dB Bandwidth (MHz)	20.29



5700 MHz

26 dB Bandwidth (MHz)	20.32

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS7.

Limit

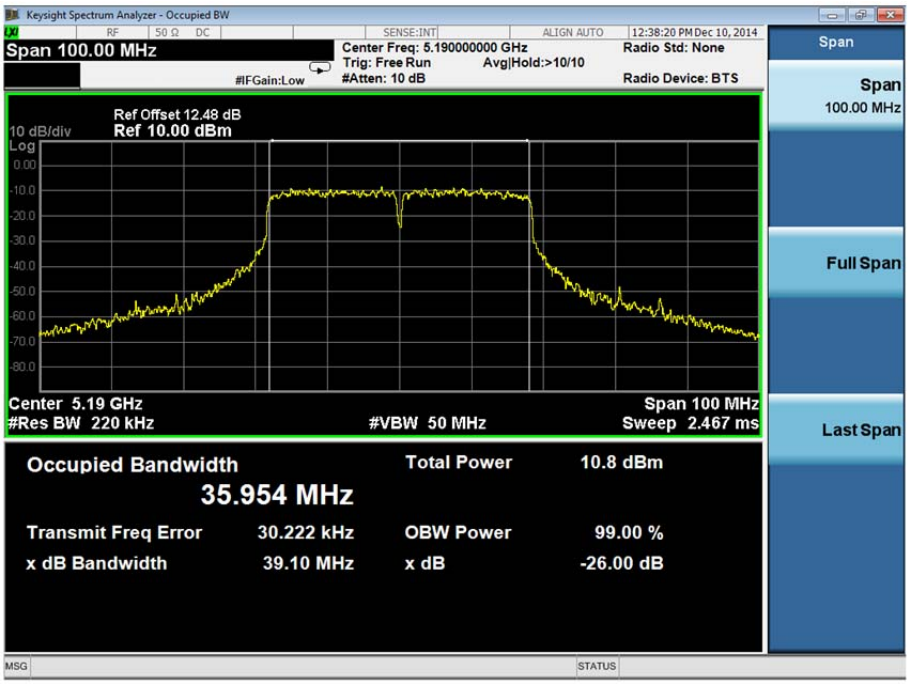
Not specified.

802.11(n) - 5 GHz 40 MHz BW

Frequency Band 1

5190 MHz

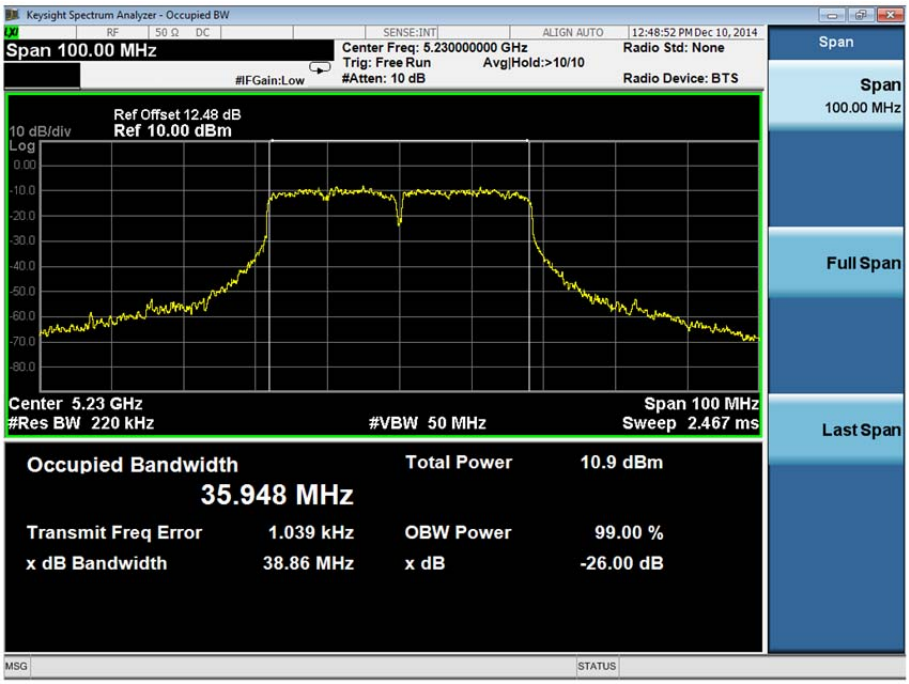
26 dB Bandwidth (MHz)	39.10



Product Service

5230 MHz

26 dB Bandwidth (MHz)	38.86

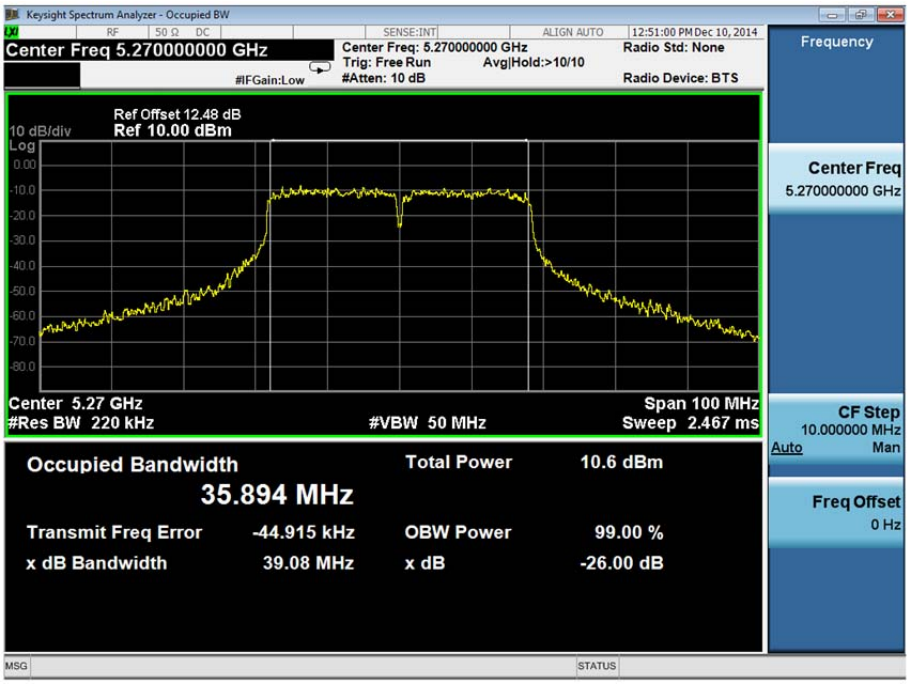


The test was performed on the worst case data rate for 802.11(n) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS3.

Frequency Band 2

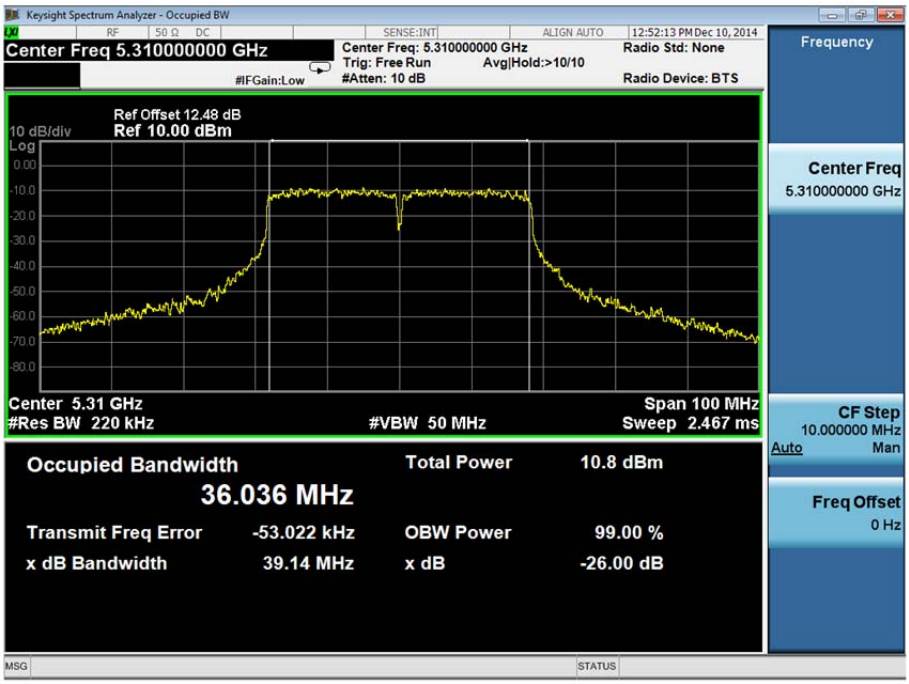
5270 MHz

26 dB Bandwidth (MHz)	39.08



5310 MHz

26 dB Bandwidth (MHz)	39.14

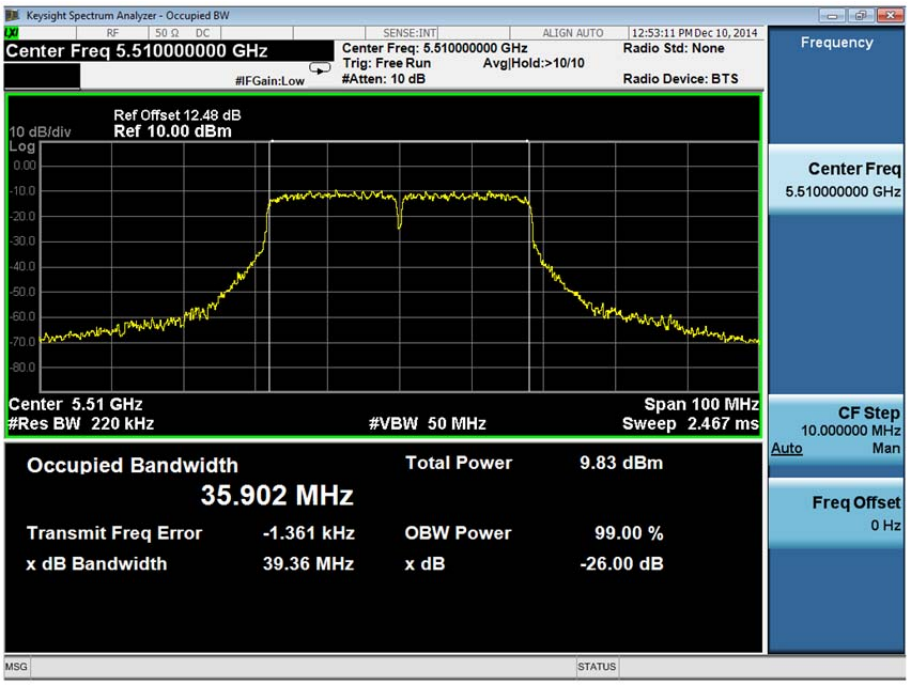


The test was performed on the worst case data rate for 802.11(n) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS3.

Frequency Band 3

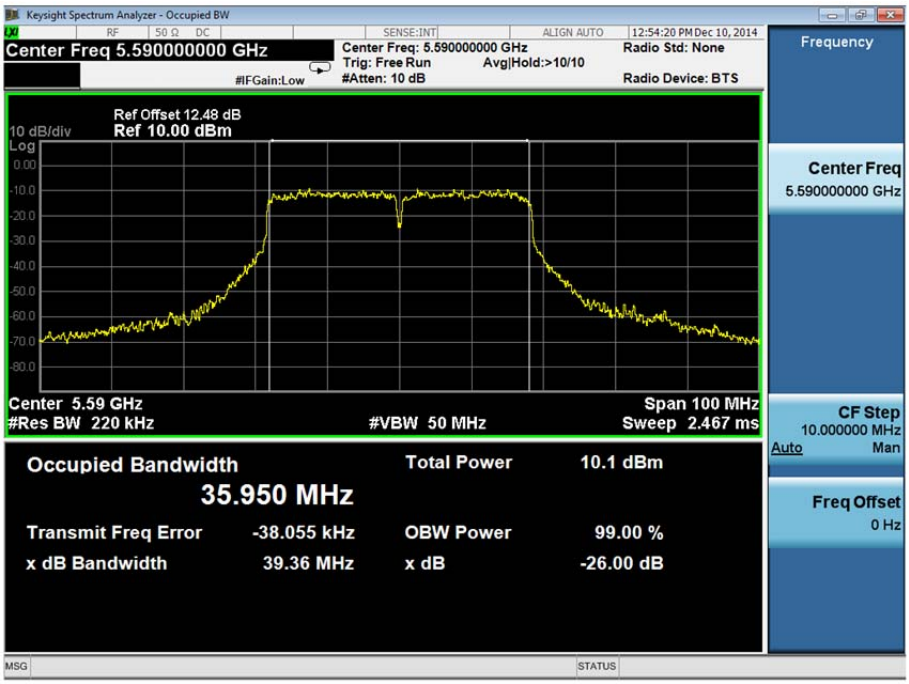
5510 MHz

26 dB Bandwidth (MHz)	39.36



5590 MHz

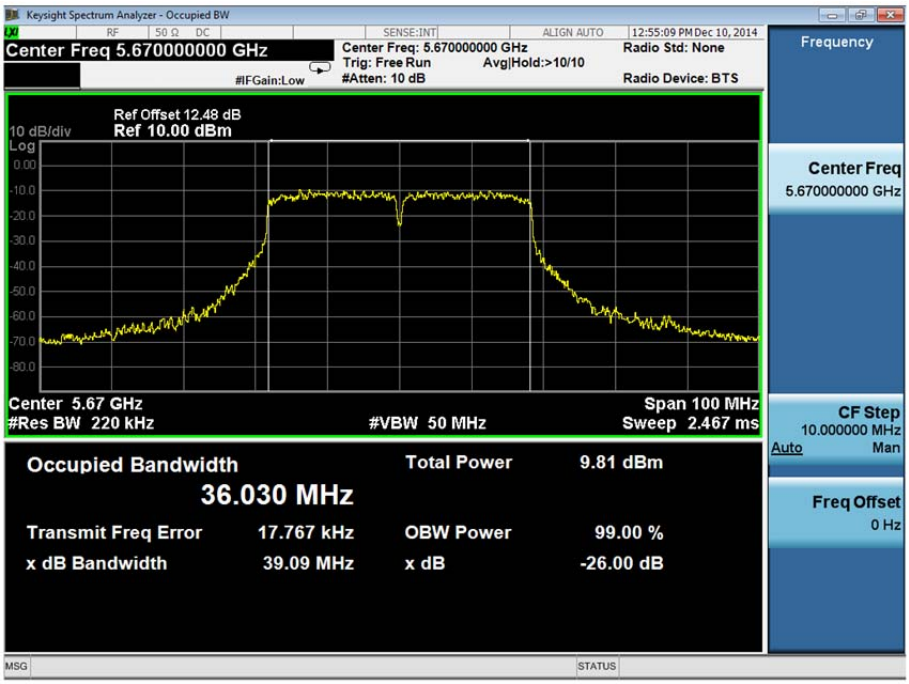
26 dB Bandwidth (MHz)	39.36



Product Service

5670 MHz

26 dB Bandwidth (MHz)	39.09



The test was performed on the worst case data rate for 802.11(n) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS3.

Limit

Not specified.

2.3 POWER LIMITS

2.3.1 Specification Reference

FCC CFR 47 Part 15E, Clause 15.407 (a)(1)(2)(3)

2.3.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115315992 - Modification State 0

2.3.3 Date of Test

15 November 2014, 17 November 2014, 7 December 2014 & 14 December 2014

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

Conducted measurements were performed in accordance with KDB 789033 D02 General UNII Test Procedures New Rules v01 clause 3a.

For conducted measurements the EUT was connected to a power meter via a cable and attenuator. The path loss was calibrated using a vector network analyser and entered as a reference level offset for each frequency to be investigated. The EUT was configured to transmit continuously at the data rate determined to give the highest average output power from preliminary test results. The average power was then recorded as shown in the tables below.

2.3.6 Environmental Conditions

Ambient Temperature	19.5 - 24.3°C
Relative Humidity	30.0 - 48.4%

2.3.7 Test Results

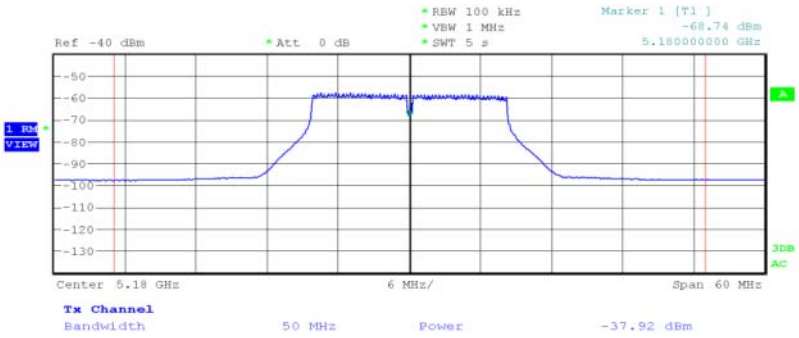
802.11(a)

Radiated

Frequency Band 1

5180 MHz

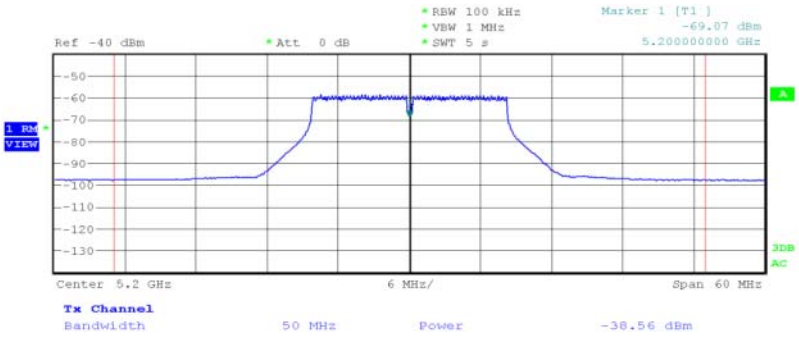
EIRP (dBm)	EIRP (mW)
14.55	28.51



Date: 6.DEC.2014 23:47:03

5200 MHz

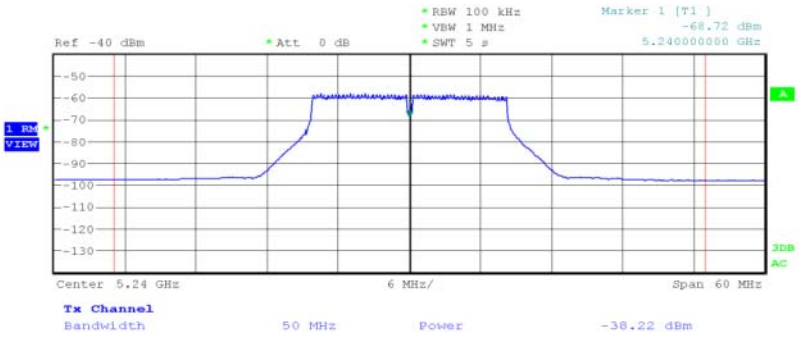
EIRP (dBm)	EIRP (mW)
13.48	22.28



Date: 6.DEC.2014 23:54:12

5240 MHz

EIRP (dBm)	EIRP (mW)
13.92	24.66



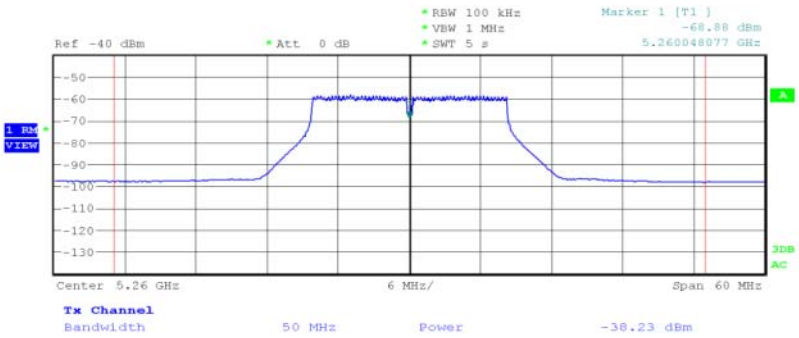
Date: 6.DEC.2014 23:58:05

Radiated

Frequency Band 2

5260 MHz

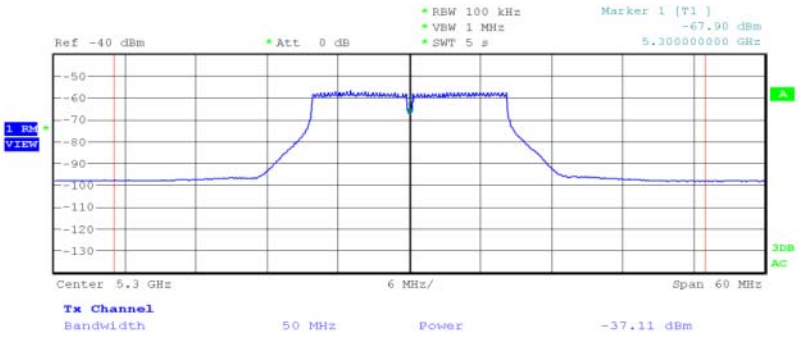
EIRP (dBm)	EIRP (mW)
14.50	28.18



Date: 7.DEC.2014 00:02:50

5300 MHz

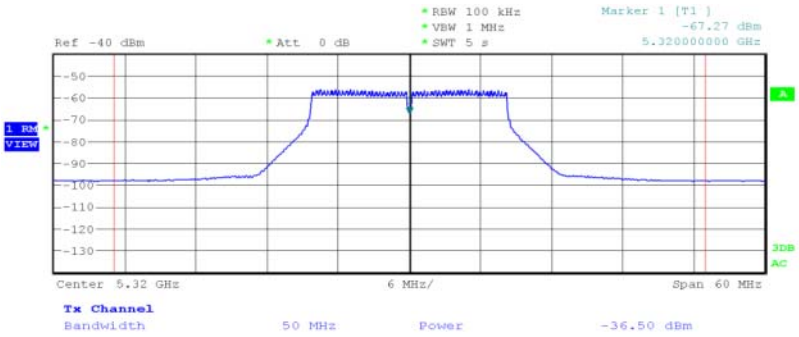
EIRP (dBm)	EIRP (mW)
14.59	28.75



Date: 7.DEC.2014 01:14:26

5320 MHz

EIRP (dBm)	EIRP (mW)
15.54	35.81



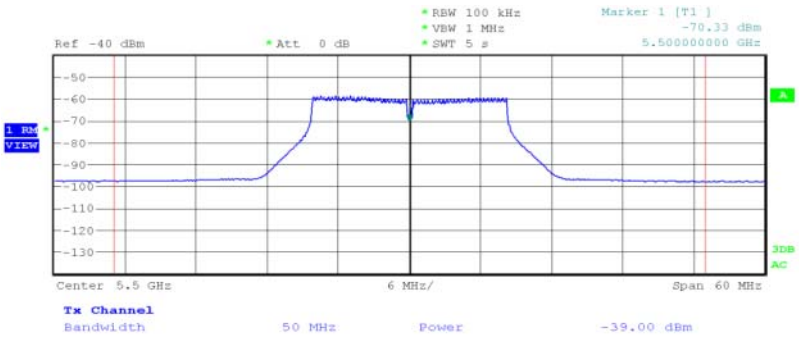
Date: 7.DEC.2014 00:14:57

Radiated

Frequency Band 3

5500 MHz

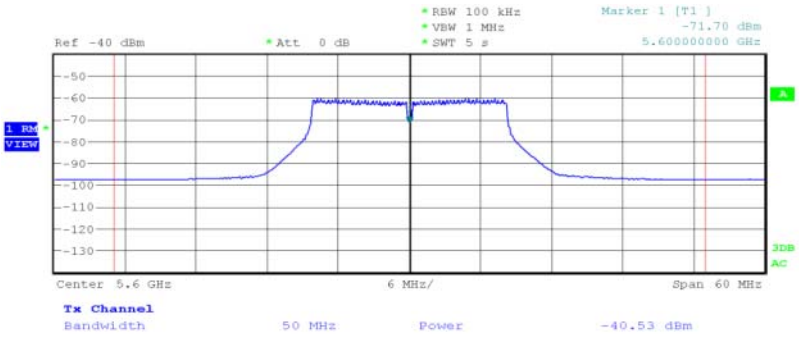
EIRP (dBm)	EIRP (mW)
13.51	22.45



Date: 7.DEC.2014 00:20:58

5600 MHz

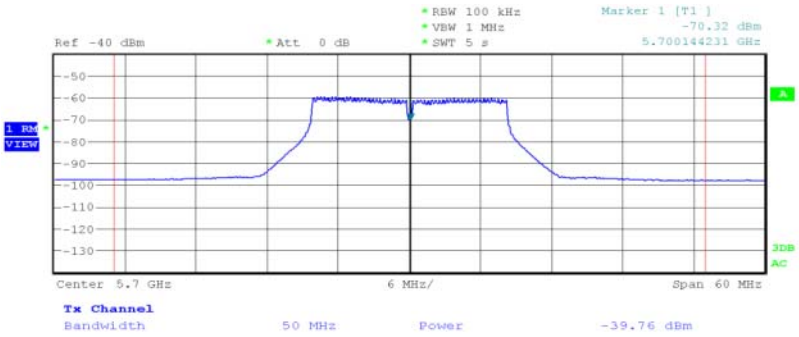
EIRP (dBm)	EIRP (mW)
12.46	17.62



Date: 7.DEC.2014 00:28:49

5700 MHz

EIRP (dBm)	EIRP (mW)
13.00	19.96



Date: 7.DEC.2014 00:34:04

Limit for Radiated

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 200 mW or 10 dBm + 10 log B
5250 to 5350	Lesser of 1 W or 17 dBm + 10 log B
5470 to 5725	Lesser of 1 W or 17 dBm + 10 log B
5725 to 5825	Lesser of 4 W or 23 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

It is acceptable to have an antenna with up to 6 dBi gain, without reducing the conducted output power.

Conducted

Frequency Band 1

5180 MHz

EIRP (dBm)	EIRP (mW)
14.06	25.47

5200 MHz

EIRP (dBm)	EIRP (mW)
13.68	23.33

5240 MHz

EIRP (dBm)	EIRP (mW)
13.67	23.28

The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 9 Mbps.

Conducted

Frequency Band 2

5260 MHz

EIRP (dBm)	EIRP (mW)
13.73	23.60

5300 MHz

EIRP (dBm)	EIRP (mW)
13.51	22.44

5320 MHz

EIRP (dBm)	EIRP (mW)
13.56	22.70

The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 9 Mbps.

Product Service

Conducted

Frequency Band 3

5500 MHz

EIRP (dBm)	EIRP (mW)
13.29	21.33

5600 MHz

EIRP (dBm)	EIRP (mW)
13.38	21.78

5700 MHz

EIRP (dBm)	EIRP (mW)
12.82	19.14

The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 9 Mbps.

Limit for Conducted

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 50 mW or 4 dBm + 10 log B
5250 to 5350	Lesser of 250 mW or 11 dBm + 10 log B
5470 to 5725	Lesser of 250 mW or 11 dBm + 10 log B
5725 to 5825	Lesser of 1 W or 17 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

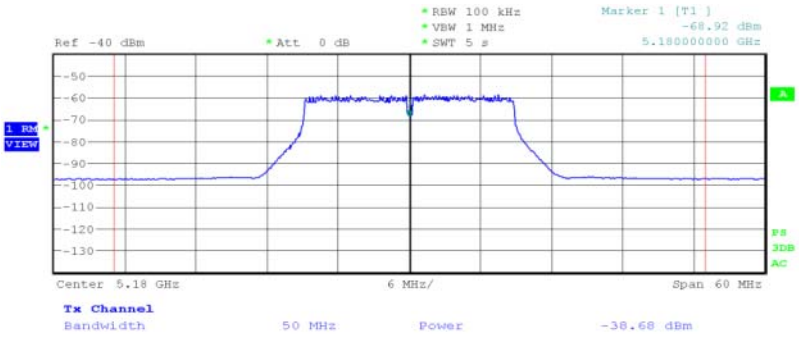
802.11(ac) - 5 GHz 20 MHz BW

Radiated

Frequency Band 1

5180 MHz

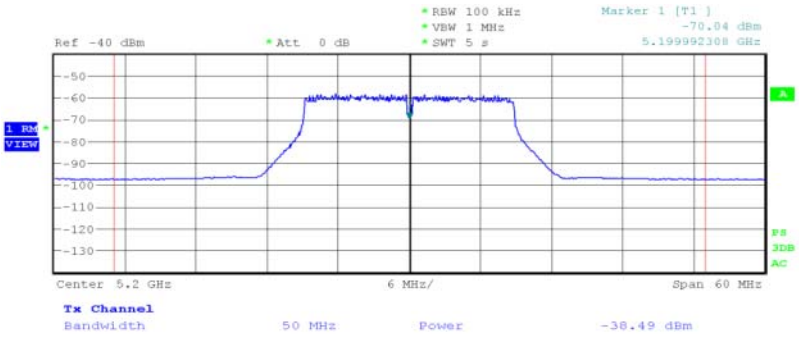
EIRP (dBm)	EIRP (mW)
13.92	24.66



Date: 28.NOV.2014 01:26:06

5200 MHz

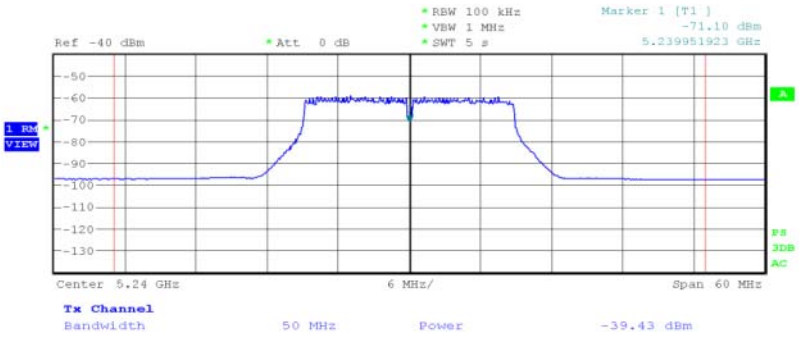
EIRP (dBm)	EIRP (mW)
13.67	23.27



Date: 28.NOV.2014 01:59:09

5240 MHz

EIRP (dBm)	EIRP (mW)
14.10	25.70



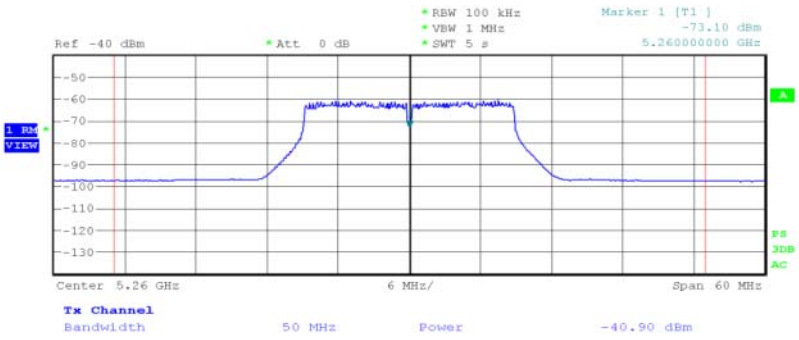
Date: 28.NOV.2014 02:05:26

Radiated

Frequency Band 2

5260 MHz

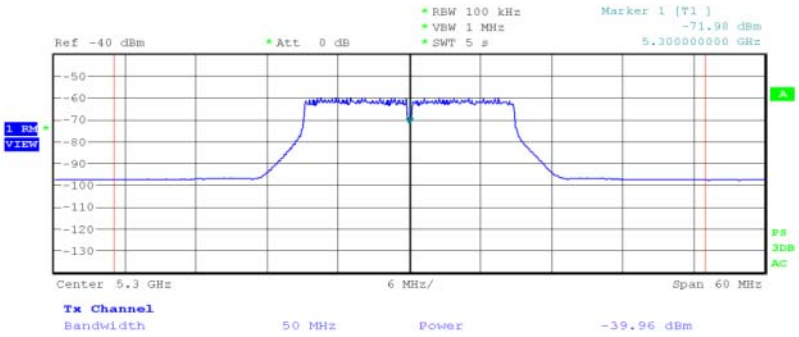
EIRP (dBm)	EIRP (mW)
14.49	28.12



Date: 28.NOV.2014 02:13:56

5300 MHz

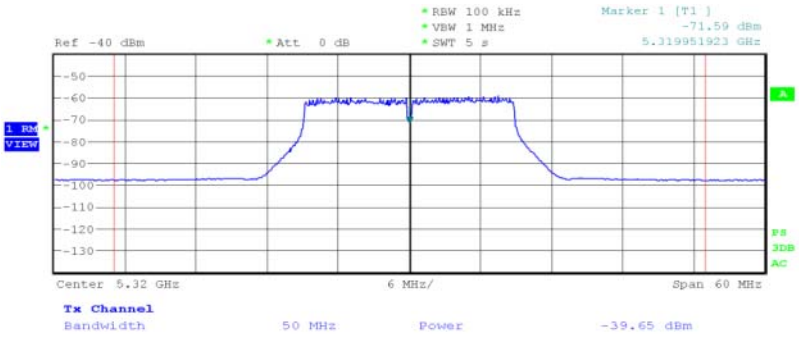
EIRP (dBm)	EIRP (mW)
14.28	28.12



Date: 28.NOV.2014 02:32:17

5320 MHz

EIRP (dBm)	EIRP (mW)
14.41	27.61



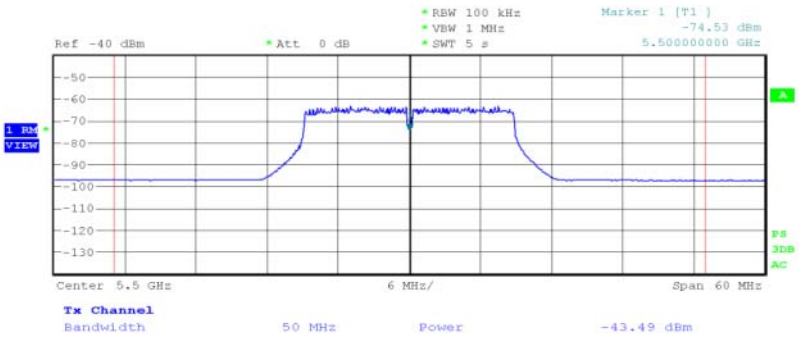
Date: 28.NOV.2014 02:37:31

Radiated

Frequency Band 3

5500 MHz

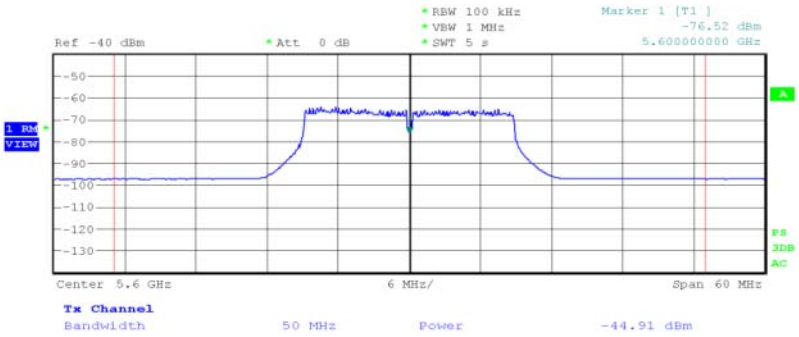
EIRP (dBm)	EIRP (mW)
12.69	18.57



Date: 28.NOV.2014 02:47:57

5600 MHz

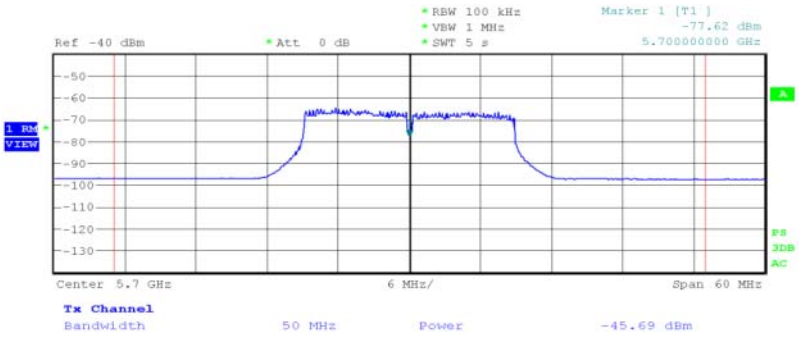
EIRP (dBm)	EIRP (mW)
11.83	15.24



Date: 28.NOV.2014 02:53:03

5700 MHz

EIRP (dBm)	EIRP (mW)
12.54	17.94



Date: 28.NOV.2014 03:00:58

Limit for Radiated

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 200 mW or 10 dBm + 10 log B
5250 to 5350	Lesser of 1 W or 17 dBm + 10 log B
5470 to 5725	Lesser of 1 W or 17 dBm + 10 log B
5725 to 5825	Lesser of 4 W or 23 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

It is acceptable to have an antenna with up to 6 dBi gain, without reducing the conducted output power.

Conducted

Frequency Band 1

5180 MHz

EIRP (dBm)	EIRP (mW)
12.45	17.58

5200 MHz

EIRP (dBm)	EIRP (mW)
12.42	17.46

5240 MHz

EIRP (dBm)	EIRP (mW)
12.23	16.71

The test was performed on the worst case data rate for 802.11(ac) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 2

5260 MHz

EIRP (dBm)	EIRP (mW)
12.04	16.00

5300 MHz

EIRP (dBm)	EIRP (mW)
11.90	15.49

5320 MHz

EIRP (dBm)	EIRP (mW)
11.65	14.62

The test was performed on the worst case data rate for 802.11(ac) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 3

5500 MHz

EIRP (dBm)	EIRP (mW)
11.74	14.93

5600 MHz

EIRP (dBm)	EIRP (mW)
11.60	14.55

5700 MHz

EIRP (dBm)	EIRP (mW)
11.40	13.80

The test was performed on the worst case data rate for 802.11(ac) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Limit for Conducted

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 50 mW or 4 dBm + 10 log B
5250 to 5350	Lesser of 250 mW or 11 dBm + 10 log B
5470 to 5725	Lesser of 250 mW or 11 dBm + 10 log B
5725 to 5825	Lesser of 1 W or 17 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

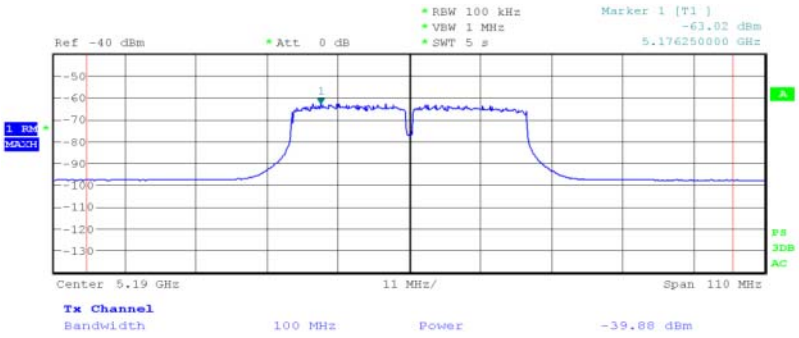
802.11(ac) - 5 GHz 40 MHz BW

Radiated

Frequency Band 1

5190 MHz

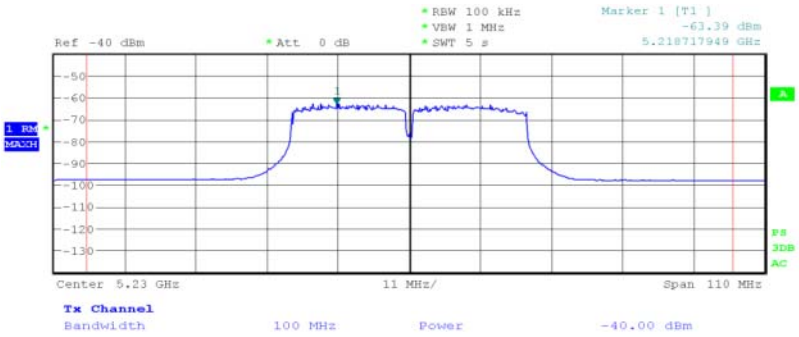
EIRP (dBm)	EIRP (mW)
14.55	28.51



Date: 30.NOV.2014 14:04:57

5230 MHz

EIRP (dBm)	EIRP (mW)
14.24	26.55



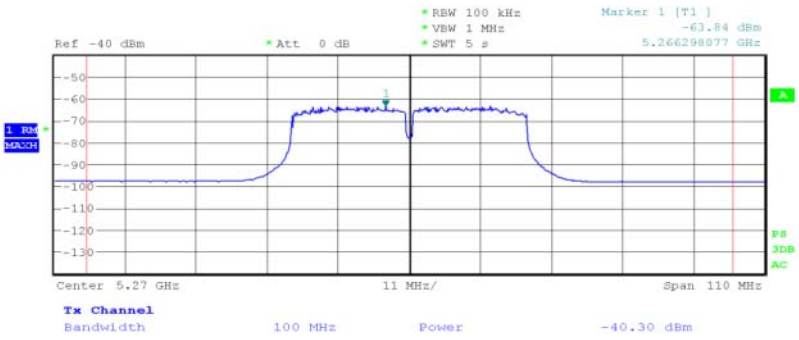
Date: 30.NOV.2014 14:19:08

Radiated

Frequency Band 2

5270 MHz

EIRP (dBm)	EIRP (mW)
14.52	28.31

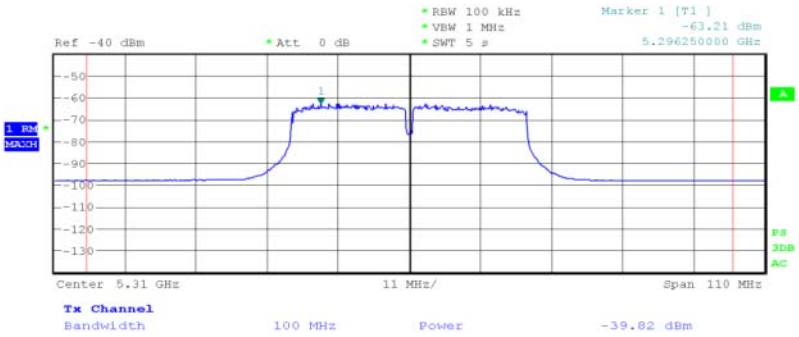


Date: 30.NOV.2014 14:25:37

Product Service

5310 MHz

EIRP (dBm)	EIRP (mW)
14.34	27.06



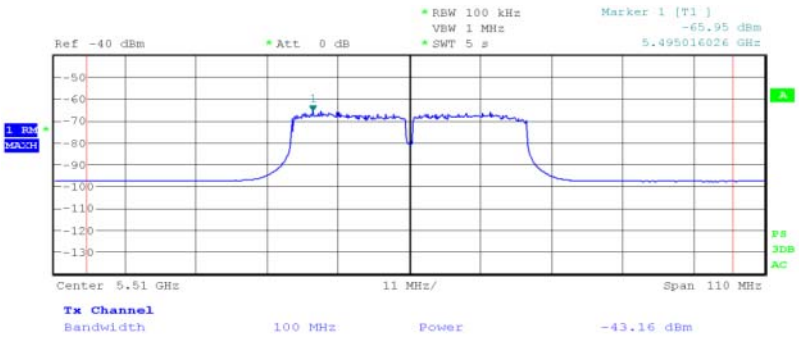
Date: 30.NOV.2014 14:33:48

Radiated

Frequency Band 3

5510 MHz

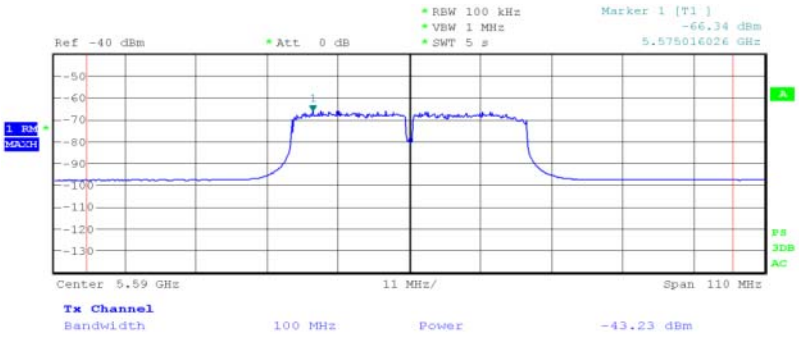
EIRP (dBm)	EIRP (mW)
14.53	28.38



Date: 30.NOV.2014 14:54:13

5590 MHz

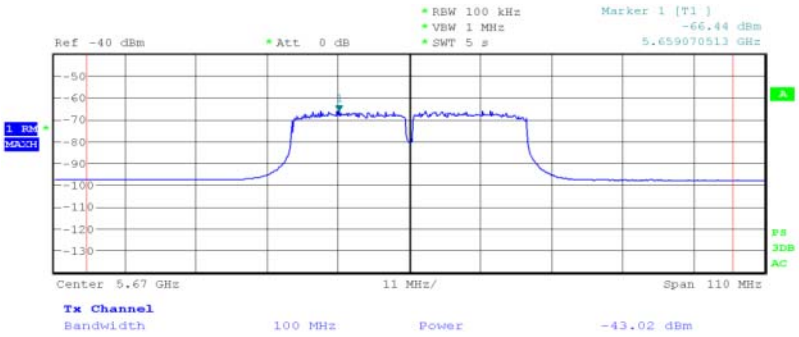
EIRP (dBm)	EIRP (mW)
15.66	36.81



Date: 30.NOV.2014 15:21:06

5670 MHz

EIRP (dBm)	EIRP (mW)
14.86	30.62



Limit for Radiated

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 200 mW or 10 dBm + 10 log B
5250 to 5350	Lesser of 1 W or 17 dBm + 10 log B
5470 to 5725	Lesser of 1 W or 17 dBm + 10 log B
5725 to 5825	Lesser of 4 W or 23 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

It is acceptable to have an antenna with up to 6 dBi gain, without reducing the conducted output power.

Conducted

Frequency Band 1

5190 MHz

EIRP (dBm)	EIRP (mW)
11.89	15.45

5230 MHz

EIRP (dBm)	EIRP (mW)
11.91	15.52

The test was performed on the worst case data rate for 802.11(ac) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS1.

Conducted

Frequency Band 2

5270 MHz

EIRP (dBm)	EIRP (mW)
12.10	16.22

5310 MHz

EIRP (dBm)	EIRP (mW)
11.80	15.14

The test was performed on the worst case data rate for 802.11(ac) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS1.

Conducted

Frequency Band 3

5510 MHz

EIRP (dBm)	EIRP (mW)
11.30	13.40

5590 MHz

EIRP (dBm)	EIRP (mW)
11.51	14.16

5670 MHz

EIRP (dBm)	EIRP (mW)
10.68	11.69

The test was performed on the worst case data rate for 802.11(ac) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS1.

Limit for Conducted

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 50 mW or 4 dBm + 10 log B
5250 to 5350	Lesser of 250 mW or 11 dBm + 10 log B
5470 to 5725	Lesser of 250 mW or 11 dBm + 10 log B
5725 to 5825	Lesser of 1 W or 17 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

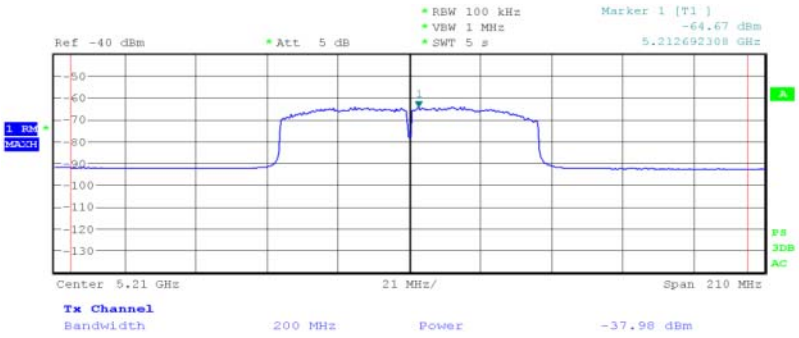
802.11(ac) - 5 GHz 80 MHz BW

Radiated

Frequency Band 1

5210 MHz

EIRP (dBm)	EIRP (mW)
12.12	16.29



Date: 14.DEC.2014 11:07:50

Radiated

Frequency Band 2

5290 MHz

EIRP (dBm)	EIRP (mW)
14.27	26.73

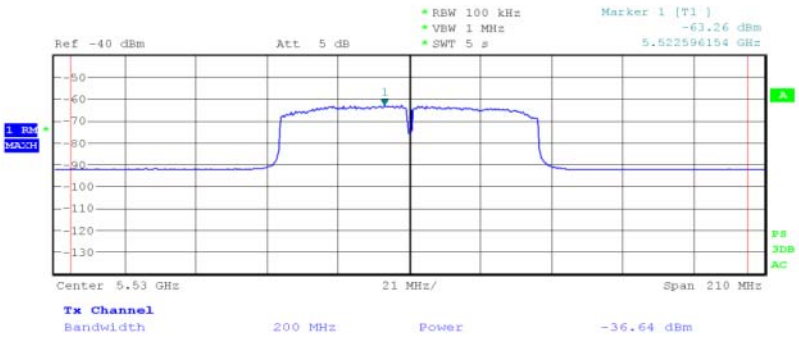
Date: 14.DEC.2014 11:15:36

Radiated

Frequency Band 3

5530 MHz

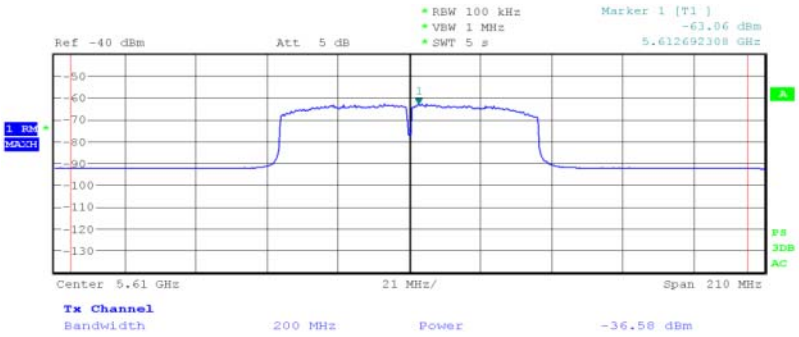
EIRP (dBm)	EIRP (mW)
14.56	28.58



Date: 14.DEC.2014 11:26:01

5610 MHz

EIRP (dBm)	EIRP (mW)
13.83	24.15



Date: 14.DEC.2014 11:34:36

Limit for Radiated

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 200 mW or 10 dBm + 10 log B
5250 to 5350	Lesser of 1 W or 17 dBm + 10 log B
5470 to 5725	Lesser of 1 W or 17 dBm + 10 log B
5725 to 5825	Lesser of 4 W or 23 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

It is acceptable to have an antenna with up to 6 dBi gain, without reducing the conducted output power.

Conducted

Frequency Band 1

5210 MHz

EIRP (dBm)	EIRP (mW)
11.68	14.72

The test was performed on the worst case data rate for 802.11(ac) - 80 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 2

5290 MHz

EIRP (dBm)	EIRP (mW)
11.75	14.96

The test was performed on the worst case data rate for 802.11(ac) - 80 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 3

5530 MHz

EIRP (dBm)	EIRP (mW)
11.04	12.71

5610 MHz

EIRP (dBm)	EIRP (mW)
11.45	13.96

The test was performed on the worst case data rate for 802.11(ac) - 80 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Limit for Conducted

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 50 mW or 4 dBm + 10 log B
5250 to 5350	Lesser of 250 mW or 11 dBm + 10 log B
5470 to 5725	Lesser of 250 mW or 11 dBm + 10 log B
5725 to 5825	Lesser of 1 W or 17 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

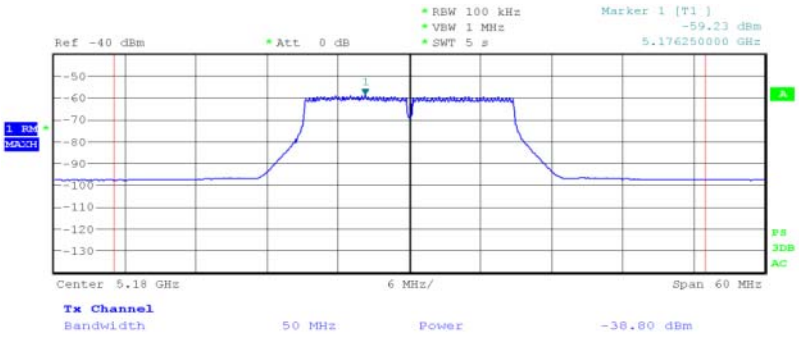
802.11(n) - 5 GHz 20 MHz BW

Radiated

Frequency Band 1

5180 MHz

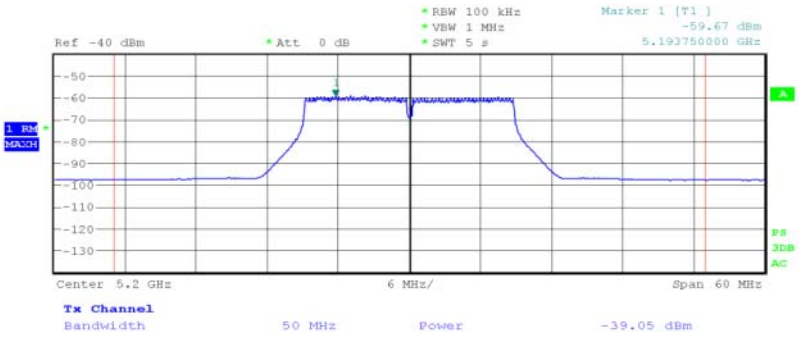
EIRP (dBm)	EIRP (mW)
13.20	20.89



Date: 30.NOV.2014 11:05:55

5200 MHz

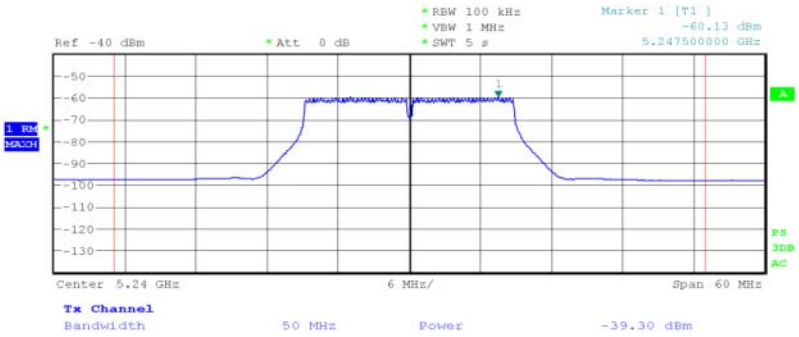
EIRP (dBm)	EIRP (mW)
13.31	21.42



Date: 30.NOV.2014 11:17:46

5240 MHz

EIRP (dBm)	EIRP (mW)
13.46	22.18



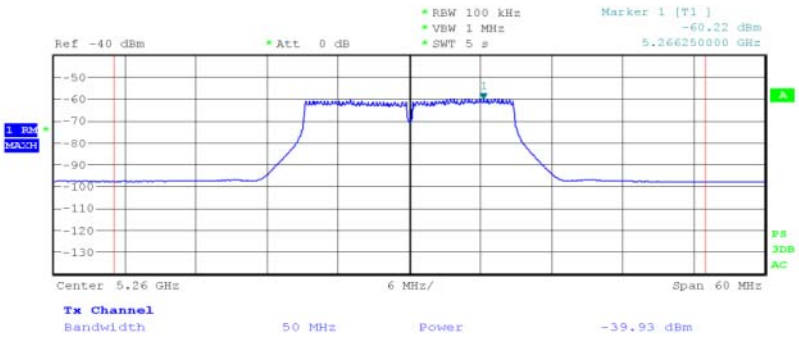
Date: 30.NOV.2014 11:22:06

Radiated

Frequency Band 2

5260 MHz

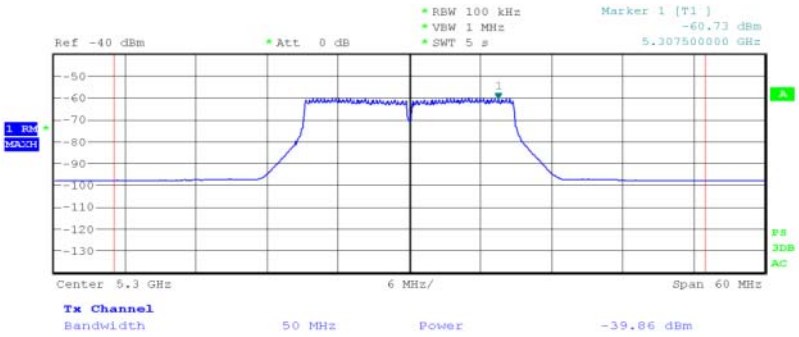
EIRP (dBm)	EIRP (mW)
14.17	26.12



Date: 30.NOV.2014 11:27:57

5300 MHz

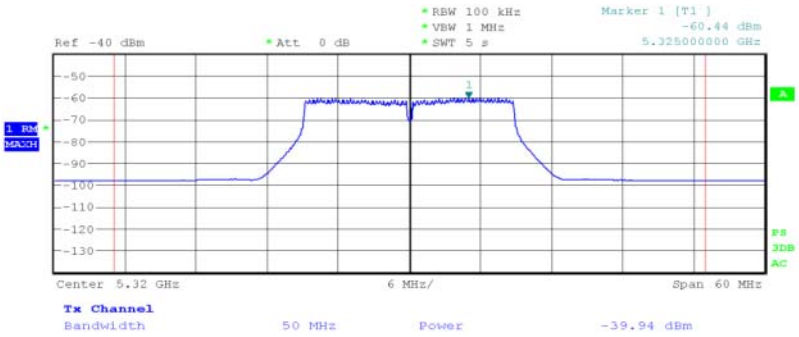
EIRP (dBm)	EIRP (mW)
14.40	26.12



Date: 30.NOV.2014 11:32:40

5320 MHz

EIRP (dBm)	EIRP (mW)
13.84	24.21



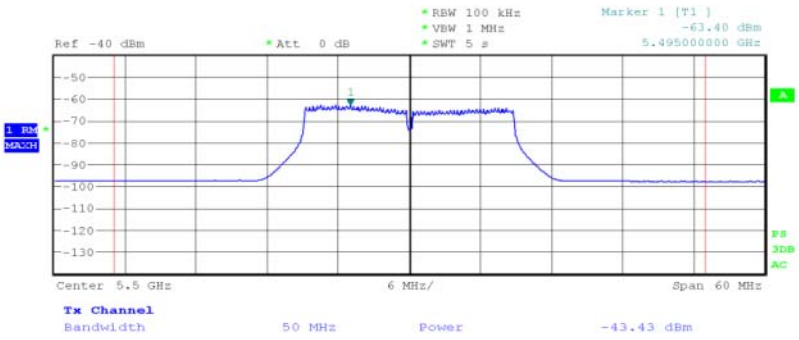
Date: 30.NOV.2014 11:38:34

Radiated

Frequency Band 3

5500 MHz

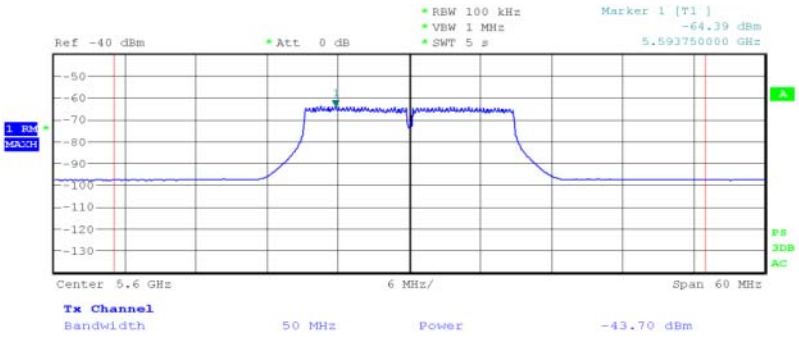
EIRP (dBm)	EIRP (mW)
11.97	15.75



Date: 30.NOV.2014 11:53:24

5600 MHz

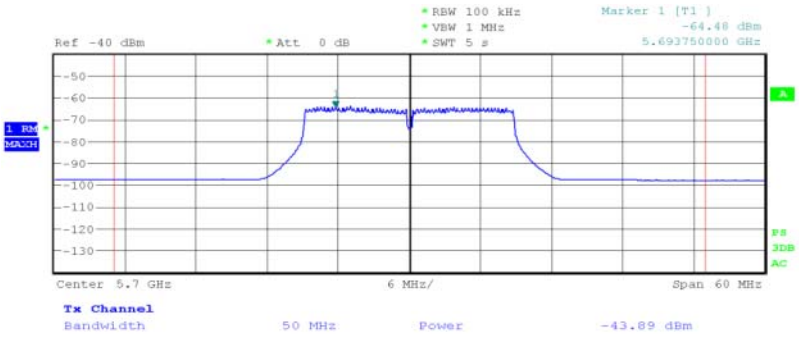
EIRP (dBm)	EIRP (mW)
11.93	15.60



Date: 30.NOV.2014 12:17:34

5700 MHz

EIRP (dBm)	EIRP (mW)
13.10	20.43



Date: 30.NOV.2014 12:08:36

Limit for Radiated

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 200 mW or 10 dBm + 10 log B
5250 to 5350	Lesser of 1 W or 17 dBm + 10 log B
5470 to 5725	Lesser of 1 W or 17 dBm + 10 log B
5725 to 5825	Lesser of 4 W or 23 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

It is acceptable to have an antenna with up to 6 dBi gain, without reducing the conducted output power.

Conducted

Frequency Band 1

5180 MHz

EIRP (dBm)	EIRP (mW)
12.31	17.02

5200 MHz

EIRP (dBm)	EIRP (mW)
12.15	16.41

5240 MHz

EIRP (dBm)	EIRP (mW)
12.21	16.63

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 2

5260 MHz

EIRP (dBm)	EIRP (mW)
12.31	17.02

5300 MHz

EIRP (dBm)	EIRP (mW)
12.16	16.44

5320 MHz

EIRP (dBm)	EIRP (mW)
11.82	15.21

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 3

5500 MHz

EIRP (dBm)	EIRP (mW)
11.84	15.28

5600 MHz

EIRP (dBm)	EIRP (mW)
11.76	15.00

5700 MHz

EIRP (dBm)	EIRP (mW)
11.57	14.35

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Limit for Conducted

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 50 mW or 4 dBm + 10 log B
5250 to 5350	Lesser of 250 mW or 11 dBm + 10 log B
5470 to 5725	Lesser of 250 mW or 11 dBm + 10 log B
5725 to 5825	Lesser of 1 W or 17 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

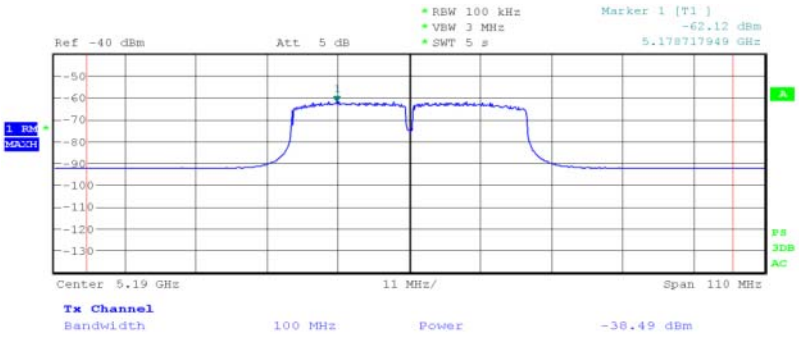
802.11(n) - 5 GHz 40 MHz BW

Radiated

Frequency Band 1

5190 MHz

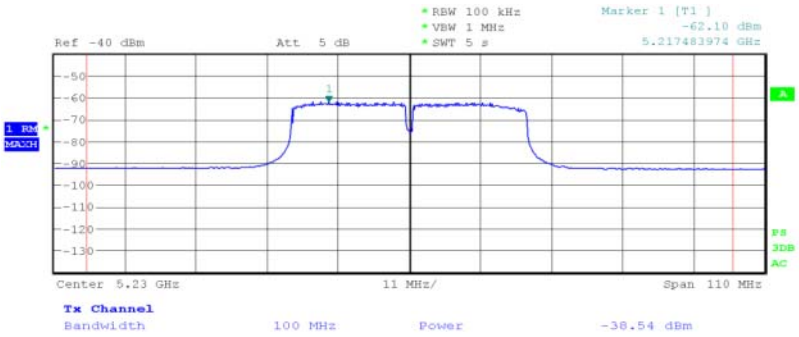
EIRP (dBm)	EIRP (mW)
13.47	22.23



Date: 14.DEC.2014 08:46:12

5230 MHz

EIRP (dBm)	EIRP (mW)
12.44	17.54



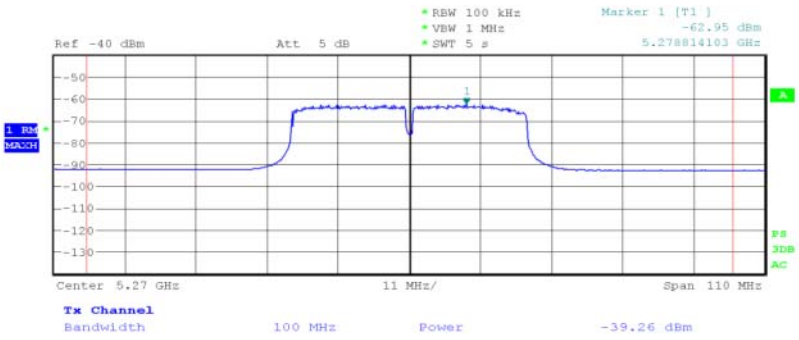
Date: 14.DEC.2014 08:50:19

Radiated

Frequency Band 2

5270 MHz

EIRP (dBm)	EIRP (mW)
12.18	16.52

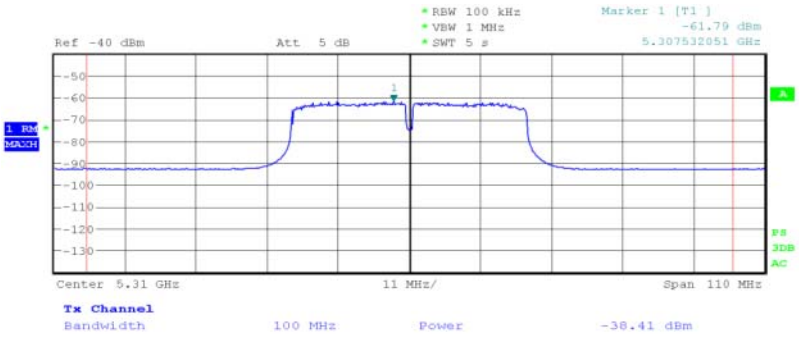


Date: 14.DEC.2014 08:55:57

Product Service

5310 MHz

EIRP (dBm)	EIRP (mW)
13.16	20.70



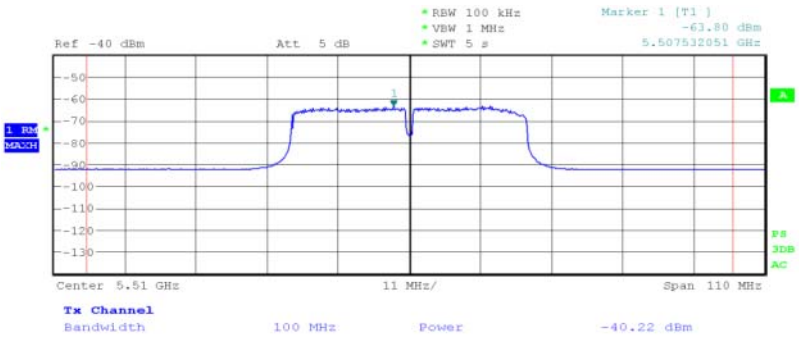
Date: 14.DEC.2014 09:01:20

Radiated

Frequency Band 3

5510 MHz

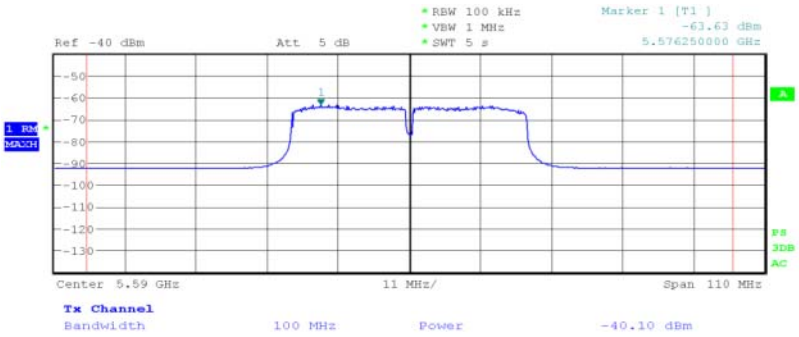
EIRP (dBm)	EIRP (mW)
11.27	13.40



Date: 14.DEC.2014 09:07:57

5590 MHz

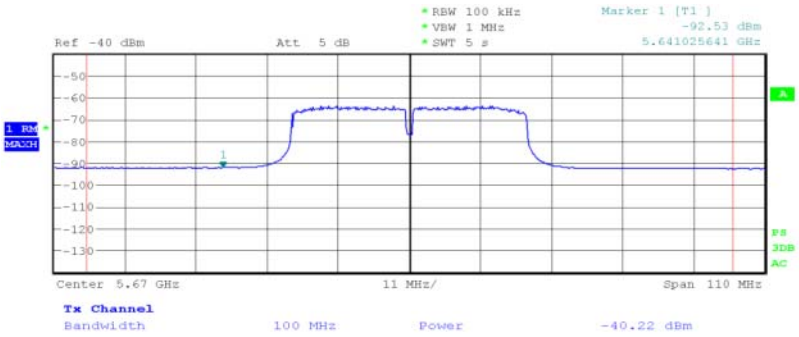
EIRP (dBm)	EIRP (mW)
11.99	15.81



Date: 14.DEC.2014 09:17:32

5670 MHz

EIRP (dBm)	EIRP (mW)
11.48	14.06



Date: 14.DEC.2014 09:35:44

Limit for Radiated

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 200 mW or 10 dBm + 10 log B
5250 to 5350	Lesser of 1 W or 17 dBm + 10 log B
5470 to 5725	Lesser of 1 W or 17 dBm + 10 log B
5725 to 5825	Lesser of 4 W or 23 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

It is acceptable to have an antenna with up to 6 dBi gain, without reducing the conducted output power.

Conducted

Frequency Band 1

5190 MHz

EIRP (dBm)	EIRP (mW)
12.26	16.83

5230 MHz

EIRP (dBm)	EIRP (mW)
12.12	16.33

The test was performed on the worst case data rate for 802.11(n) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 2

5270 MHz

EIRP (dBm)	EIRP (mW)
12.15	16.41

5310 MHz

EIRP (dBm)	EIRP (mW)
12.08	16.14

The test was performed on the worst case data rate for 802.11(n) - 20 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Conducted

Frequency Band 3

5510 MHz

EIRP (dBm)	EIRP (mW)
11.81	15.17

5590 MHz

EIRP (dBm)	EIRP (mW)
11.78	15.07

5670 MHz

EIRP (dBm)	EIRP (mW)
10.81	12.05

The test was performed on the worst case data rate for 802.11(n) - 40 MHz BW modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was MCS0.

Limit for Conducted

Frequency Band (MHz)	FCC Limit
5150 to 5250	Lesser of 50 mW or 4 dBm + 10 log B
5250 to 5350	Lesser of 250 mW or 11 dBm + 10 log B
5470 to 5725	Lesser of 250 mW or 11 dBm + 10 log B
5725 to 5825	Lesser of 1 W or 17 dBm + 10 log B

Note: “B” = 26 dB Bandwidth.

2.4 PEAK POWER SPECTRAL DENSITY

2.4.1 Specification Reference

FCC CFR 47 Part 15E, Clause 15.407 (a)(5)

2.4.2 Equipment Under Test and Modification State

SHV31 S/N: IMEI 004401115316073 - Modification State 0

2.4.3 Date of Test

11 December 2014

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15.407 (a) and KDB 789033.

The EUT was transmitted at maximum power for bottom, middle and top channels on the data rate pre-determined to give the highest level of average output power. The EUT was connected to a spectrum analyser via an attenuator and cable. The Analyser settings were adjusted to display the resultant trace on screen. The analyser settings were configured with an RBW of 1 MHz and video bandwidth of 3 x RBW. The trace was set to average using an RMS detector and the maximum value was recorded.

2.4.6 Environmental Conditions

Ambient Temperature	24.1°C
Relative Humidity	28.2%

Product Service

2.4.7 Test Results

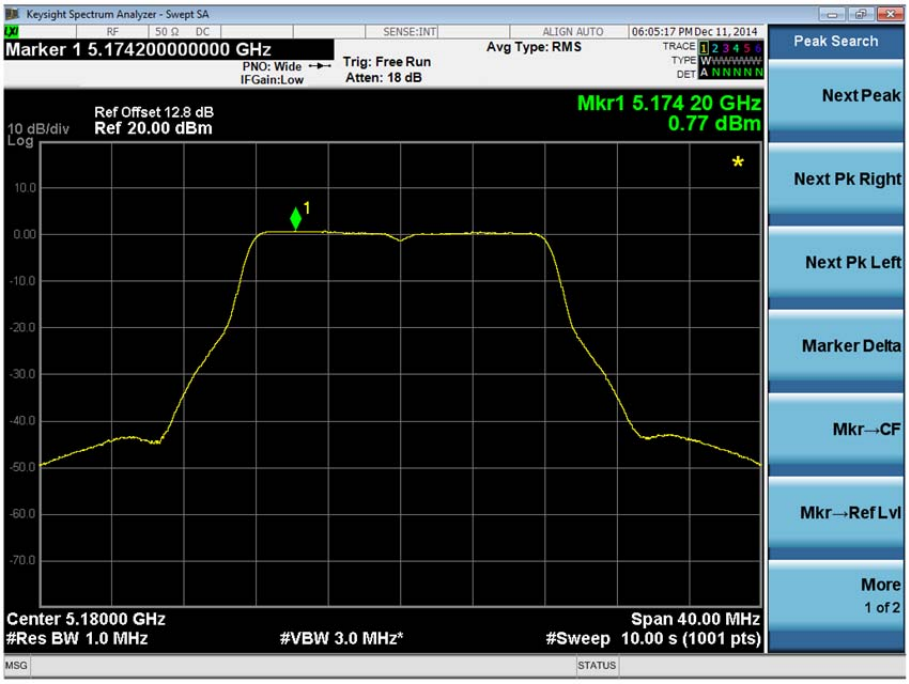
802.11(a)

Frequency Band 1

5180 MHz

Modulation: QPSK

Peak Power Spectral Density (dBm)	0.77



5200 MHz

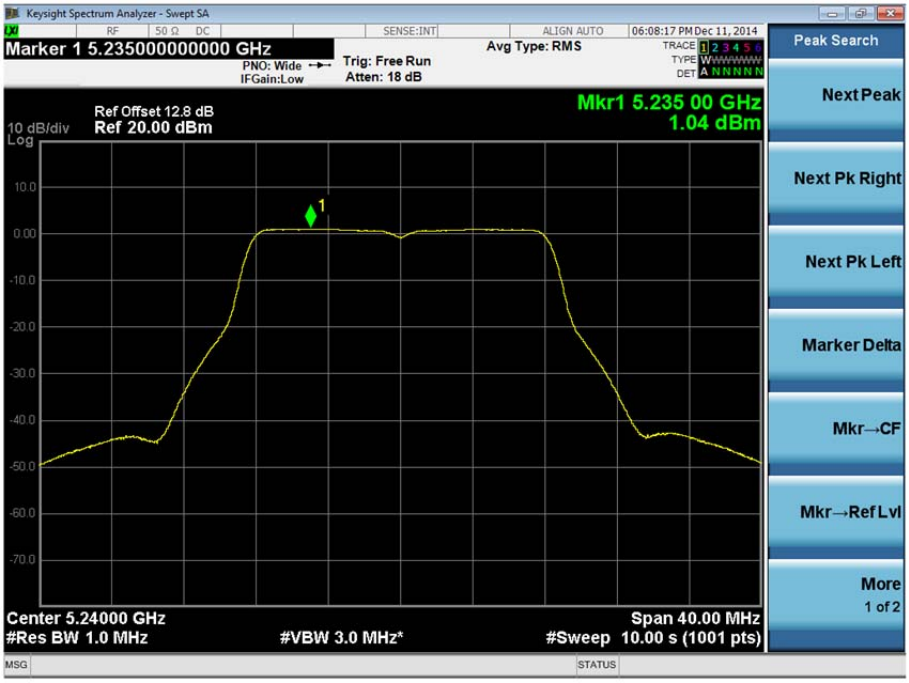
Modulation: QPSK

Peak Power Spectral Density (dBm)	0.64

5240 MHz

Modulation: QPSK

Peak Power Spectral Density (dBm)	1.04



The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 9 Mbps.

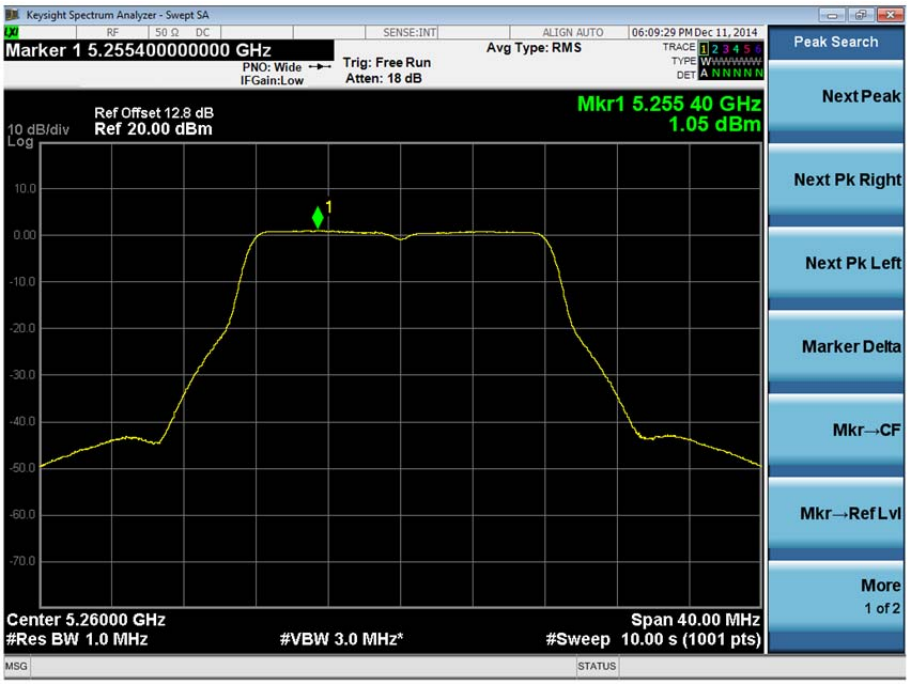
Product Service

Frequency Band 2

5260 MHz

Modulation: QPSK

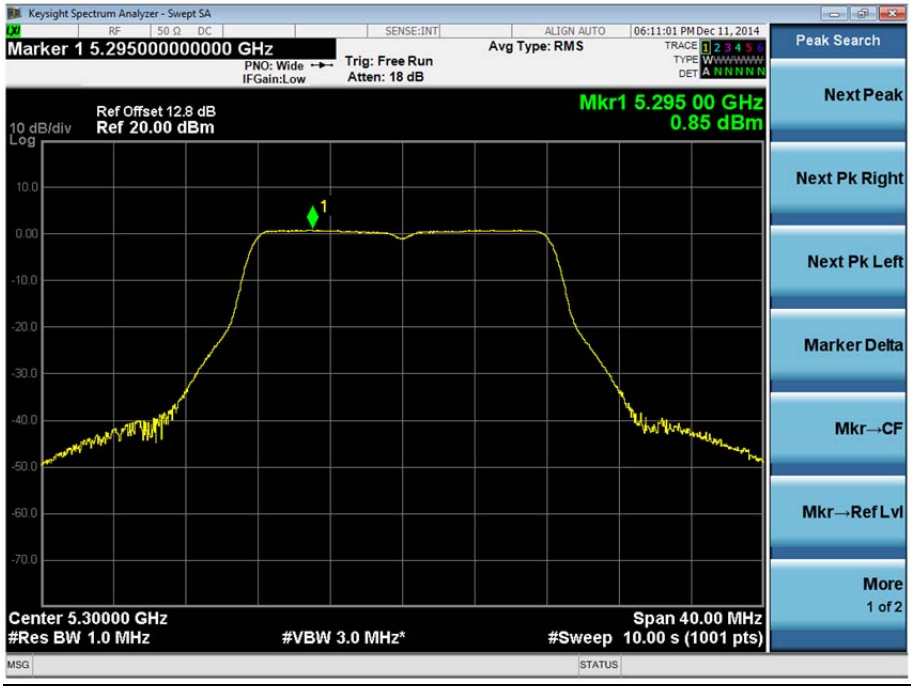
Peak Power Spectral Density (dBm)	1.05



5300 MHz

Modulation: QPSK

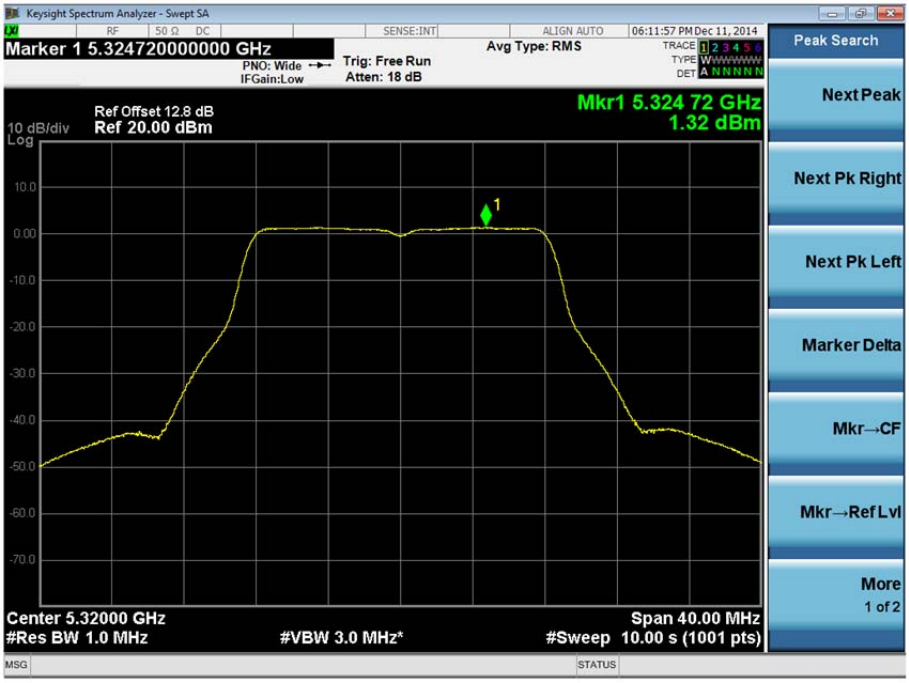
Peak Power Spectral Density (dBm)	0.85



5320 MHz

Modulation: QPSK

Peak Power Spectral Density (dBm)	1.32



The test was performed on the worst case data rate for 802.11(a) modulation. The worst case was deemed as the data rate which produced the highest level of conducted average power. This data rate was 9 Mbps.

Product Service

Frequency Band 3

5500 MHz

Modulation: QPSK

Peak Power Spectral Density (dBm)	-0.14