ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

Product Name:	**AC 600 Wireless PCIe Card**
Brand Name:	**Loopcomm**
Marketing Name:	**AC 600 Wireless PCIe Card**
Model No.:	**LP-8014**
Model Difference:	**N/A**
FCC ID:	**VYTLP-8014**
Report No.:	**E2/2015/B0011**
Issue Date:	**Nov. 25, 2015**
FCC Rule Part:	**§15.407**
Prepared for:	**Loopcomm Technology, Inc. 6F., No.236, Bo'ai St., Shulin Dist., New Taipei City 23845, Taiwan**
Prepared by:	**SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333**

Testing Laboratory
0513

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VERIFICATION OF COMPLIANCE

Applicant:	Loopcomm Technology, Inc. 6F., No.236, Bo'ai St., Shulin Dist., New Taipei City 23845, Taiwan
Product Name:	AC 600 Wireless PCIe Card
Brand Name:	Loopcomm
Marketing Name:	AC 600 Wireless PCIe Card
Model No.:	LP-8014
Model Difference:	N/A
FCC ID:	VYTLP-8014
File Number:	E2/2015/B0011
Date of test:	Nov. 09, 2015 ~ Nov. 18, 2015
Date of EUT Received:	Nov. 09, 2015

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Aken Huang	***Date:***	Nov. 25, 2015
	Aken Huang / Engineer		
Prepared By:	Violetta Tang	***Date:***	Nov. 25, 2015
	Violetta Tang / Engineer		
Approved By:	Jim Chang	***Date:***	Nov. 25, 2015
	Jim Chang / Asst. Manager		

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Revision History

Report Number	Revision	Description	Issue Date
E2/2015/B0011	Rev.00	Initial creation of document	Nov. 25, 2015

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1. GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	AC 600 Wireless PCIe Card
Brand Name:	Loopcomm
Marketing Name:	AC 600 Wireless PCIe Card
Model No.:	LP-8014
Model Difference:	N/A
Product SW/HW version:	1.0 / 1.0
Radio SW/HW version:	N/A / N/A
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	3.3Vdc

WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology
11a	5150~5250	4	16.70dBm	OFDM
11n / ac_20M	HT20 / VHT20 5150~5250	4	HT: 16.60dBm (Worst Case)	OFDM
11n / ac_40M	HT40 / VHT40 5150~5250	2	HT: 12.90dBm (Worst Case)	OFDM
11ac_80M	VHT80 5150~5250	1	8.10dBm	OFDM
Antenna Designation		Dipole Antenna, Gain: 2.76dBi (5150MHz-5250MHz)		
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only		
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n/ac_20MHz: 6.5 – 72.2Mbps 802.11 n/ac_40MHz: 13.5 – 135Mbps 802.11 ac_80MHz: 29.3 – 292.5Mbps		

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules v01

FCC KDB 644545 D03 Guidance for IEEE 802.11ac v01

ANSI C63.10:2013

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333. (TAF code 0513)

FCC Registration Numbers are: 628985

Canada Registration Number: 4620A-5

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss 0.9dB, and 10dB attenuator. *SISO mode offset = RF cable loss (dB)+ attenuation factor(dB)=10.9(dB)

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & Conducted Emission

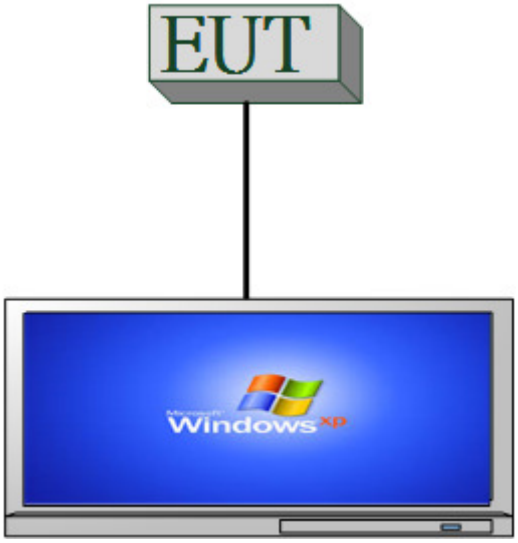

Fig. 2-3 AC Power Line Conducted Emission

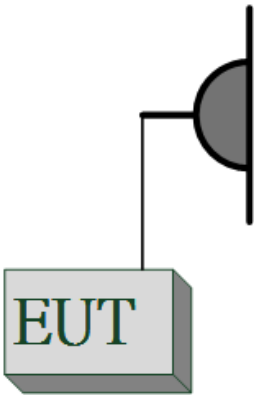

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	PC	Lenovo	6138-C16	R8VVFEG	N/A	N/A

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3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	26 dB Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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4. DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

4 channels are provided for 802.11a, 802.11n_HT20, 802.11ac_VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n_HT40, 802.11ac_VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac_VHT80

CHANNEL	FREQUENCY
42	5210 MHz

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.
4. The given UE is pre-scanned among 802.11n and ac modes, and 802.11n yields the highest reading that generates the highest emission. Therefore, 802.11n as the mode of test configuration is chosen to carry out the relevantly mandatory test items.

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	44	OFDM	6	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS0	MAIN
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS0	MAIN
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MAIN

Note:
The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11n_HT20 802.11ac_VHT20				OFDM	MCS0	MAIN
802.11n_HT40 802.11ac_VHT40	5190~5230	38 to 46	38,46	OFDM	MCS0	MAIN
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MAIN

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : **Horizontal**)	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6. CONDUCTED EMISSION TEST

6.1. Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note
1.The lower limit shall apply at the transition frequencies
2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2. Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2014	12/11/2015
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	01/06/2015	01/07/2016
LISN	Schwarzbeck	NSLK 8127	8127-648	06/09/2015	06/08/2016
LISN	Rolf-Heine	NNB-2/16Z	99012	03/04/2015	03/03/2016
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

6.3. EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

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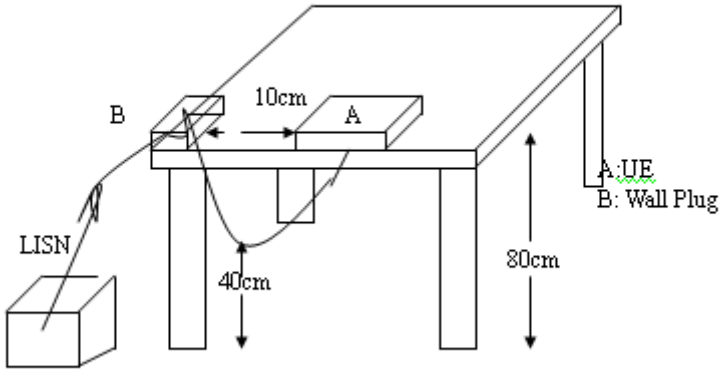
6.4. Test SET-UP



6.5. Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6. Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode	Test Date:	Nov. 13, 2015
Temperature:	22		

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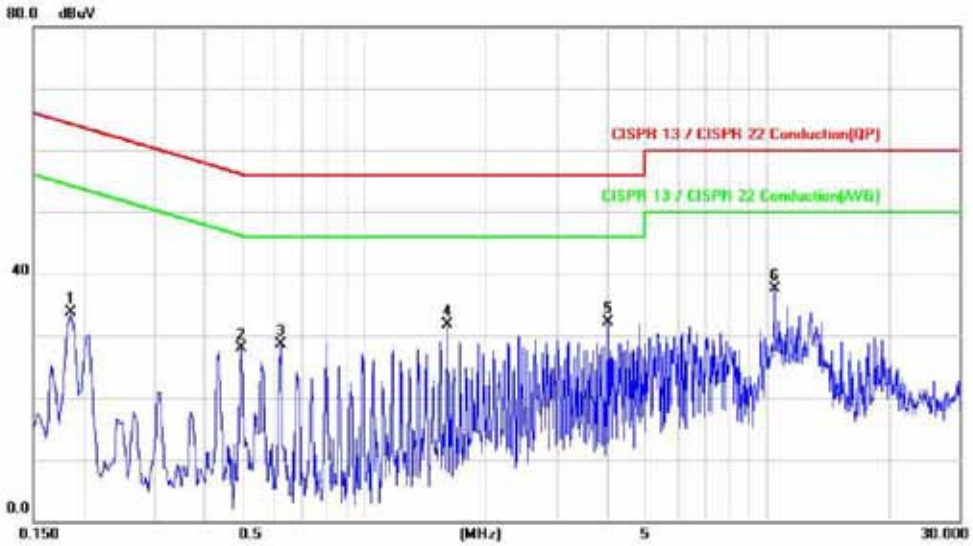
Site : Conduction Room
Limit: CISPR 13 / CISPR 22 Conduction(QP)
Mode:
Note:

Phase: N
Power: AC 120V/60Hz

Temperature: 22 ℃
Humidity: 72 %

Conducted Emission

File :Condution Data :#262 Date: 2015/11/13 Time: 下午 06:20:30



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1860	33.61	0.13	33.74	64.21	-30.47	peak	
2		0.4940	27.58	0.28	27.86	56.10	-28.24	peak	
3		0.6180	28.30	0.30	28.60	56.00	-27.40	peak	
4		1.6060	31.24	0.56	31.80	56.00	-24.20	peak	
5		4.0140	31.41	0.66	32.07	56.00	-23.93	peak	
6	*	10.4340	36.71	0.74	37.45	60.00	-22.55	peak	

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7. DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)
802.11a	100.00	0.00
802.11n_20	100.00	0.00
802.11n_40	100.00	0.00
802.11ac_80	100.00	0.00

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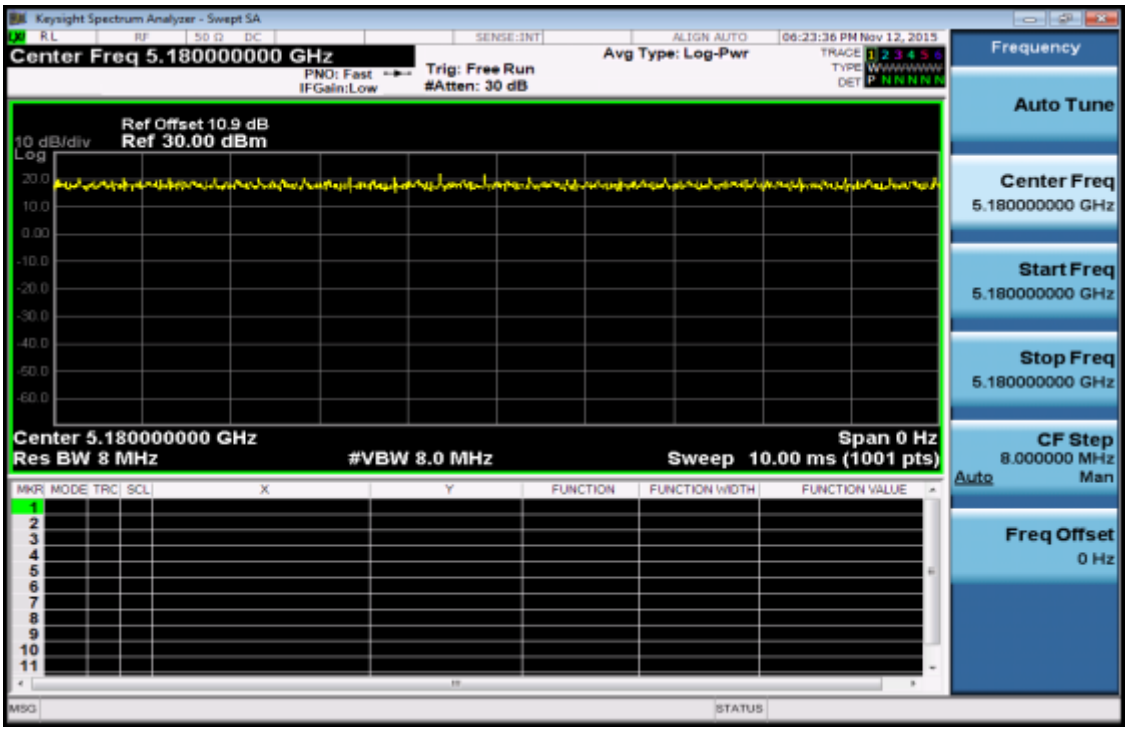
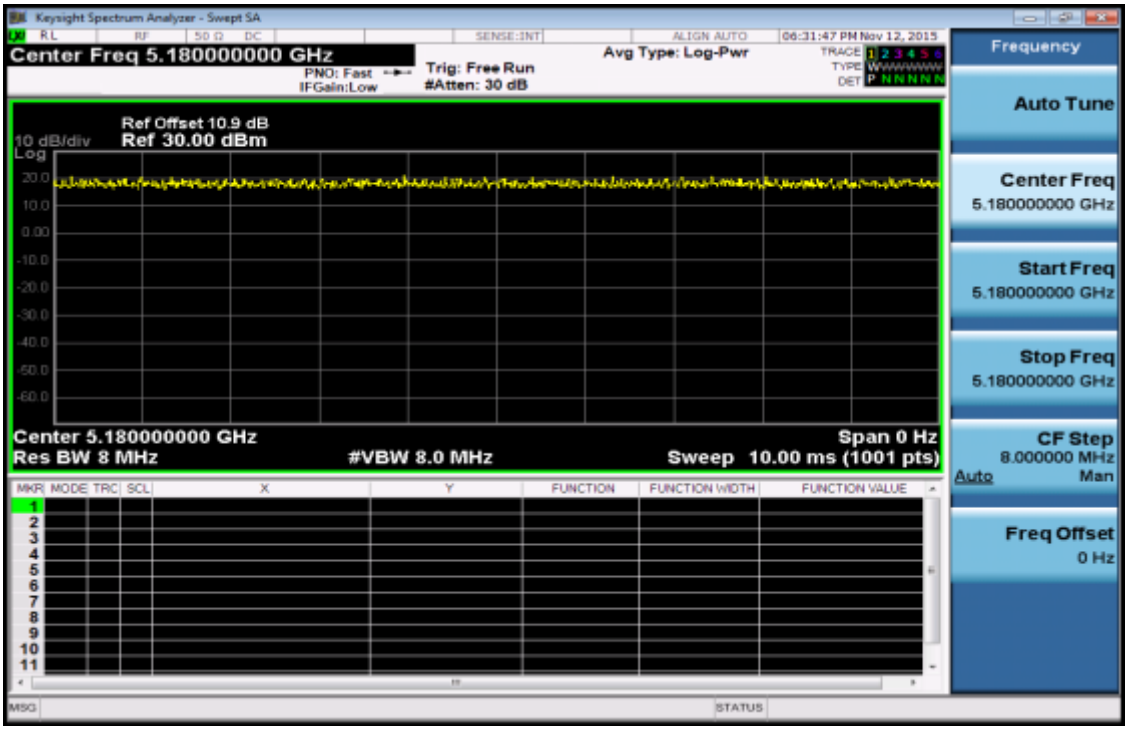
DUTY CYCLE TEST SIGNAL Measurement Result

802.11a



802.11n HT20



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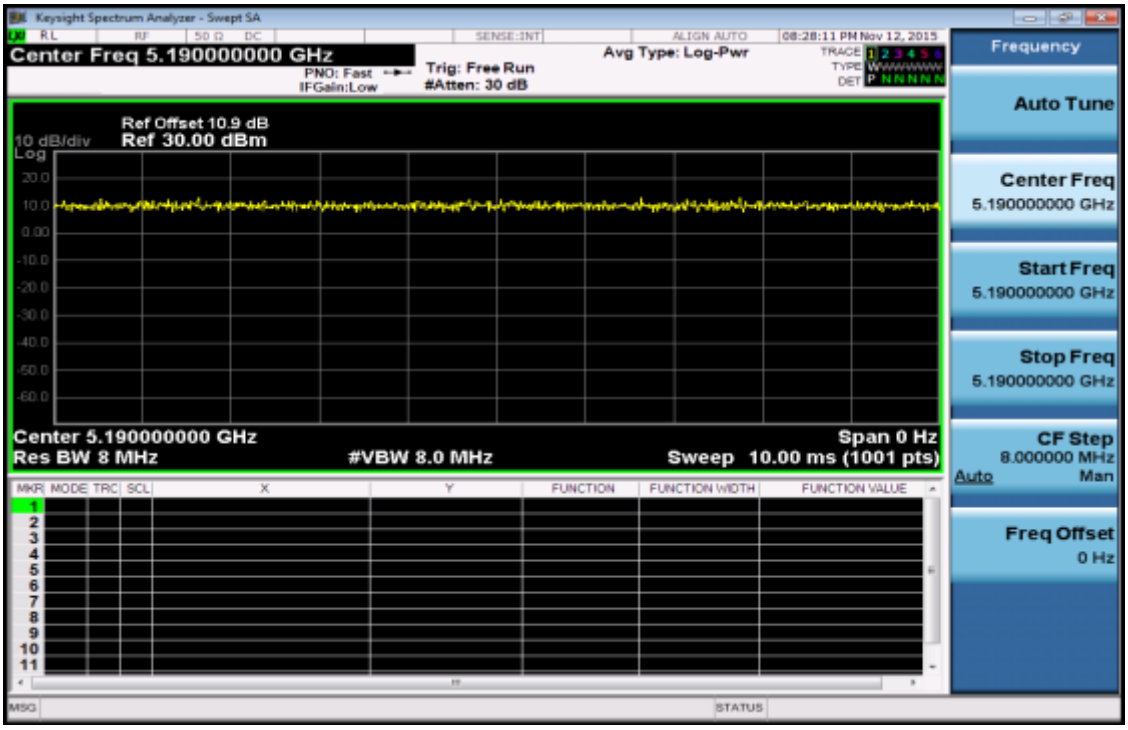
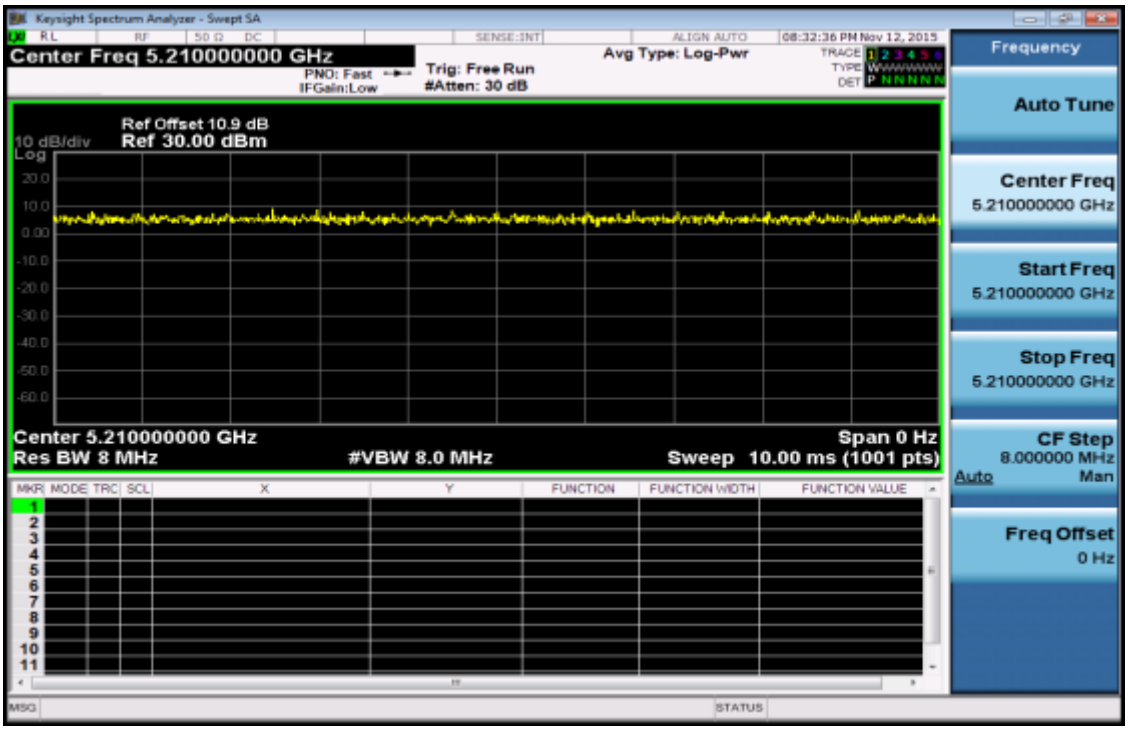
802.11 n HT 40



802.11 ac VHT 80



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8. 26dB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

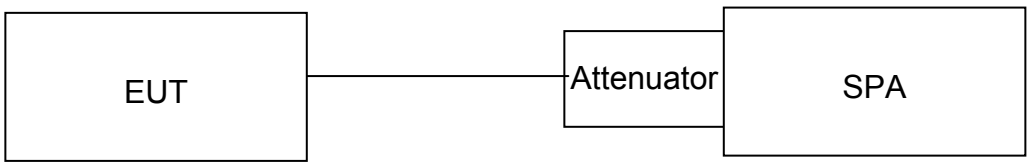
8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
   a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
   b. Mark the peak frequency and –26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
   a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto
   b. Mark the peak frequency and –6dB (upper and lower) frequency.
6. Repeat above procedures until all test default channel measured were complete.

8.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2015	04/13/2016
Signal Generator	R&S	SMU200A	105303	12/22/2014	12/21/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
Splitter	Marvelous	MVE8576	RF37	12/19/2014	12/18/2015
Splitter	Marvelous	MVE8576	RF38	12/19/2014	12/18/2015
Attenuator	WOKEN	6SR1211	RF41	12/19/2014	12/18/2015

8.4 Test Set-up



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8.5 Measurement Result

802.11a_Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.40	13.096
5220	21.58	13.341
5240	22.56	13.533

802.11n_HT20_Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	21.30	13.284
5220	21.19	13.261
5240	21.59	13.343

802.11n _HT40_Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	42.69	16.303
5230	41.82	16.214

802.11ac _VHT80_Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5210	81.11	19.091

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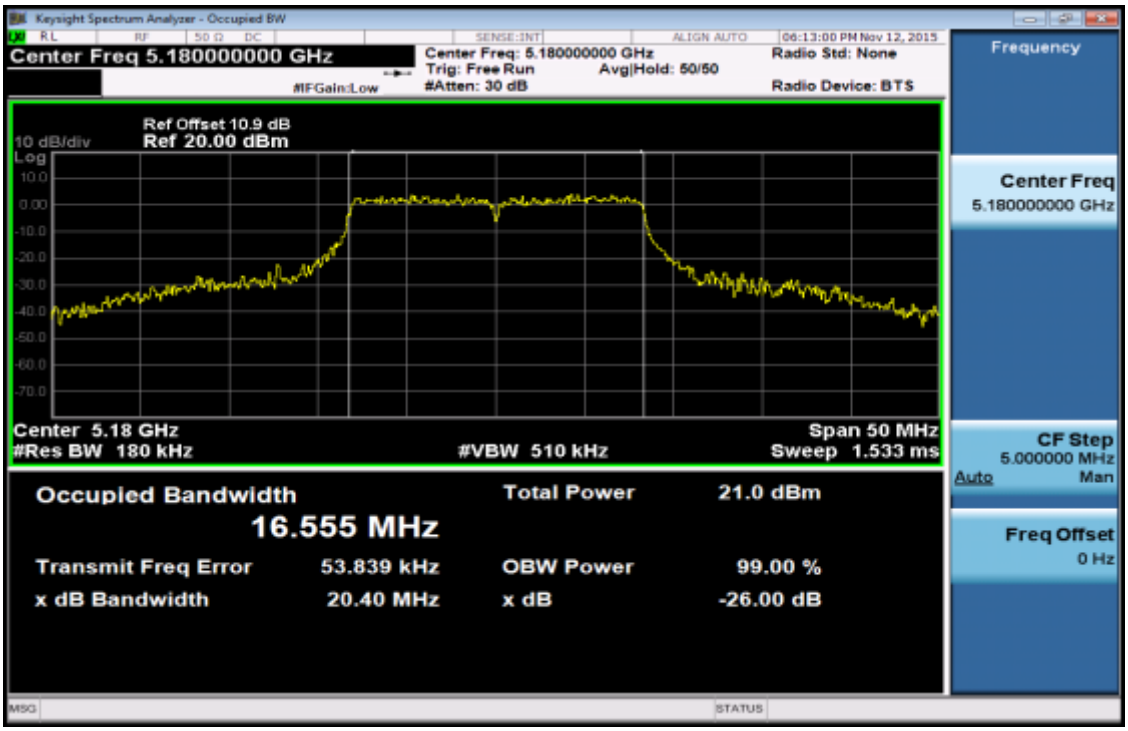
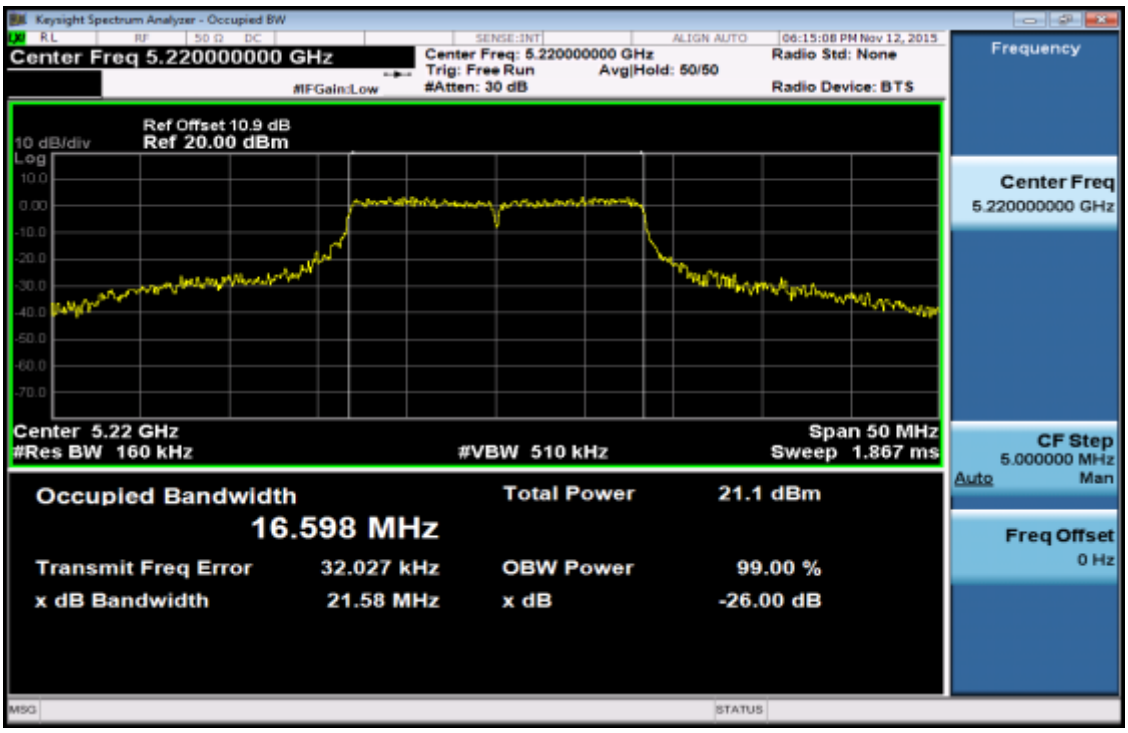
802.11a, 5150~5250 MHz
26dB Band Width Test Data CH-Low (5180MHz)



26dB Band Width Test Data CH-Mid (5220MHz)



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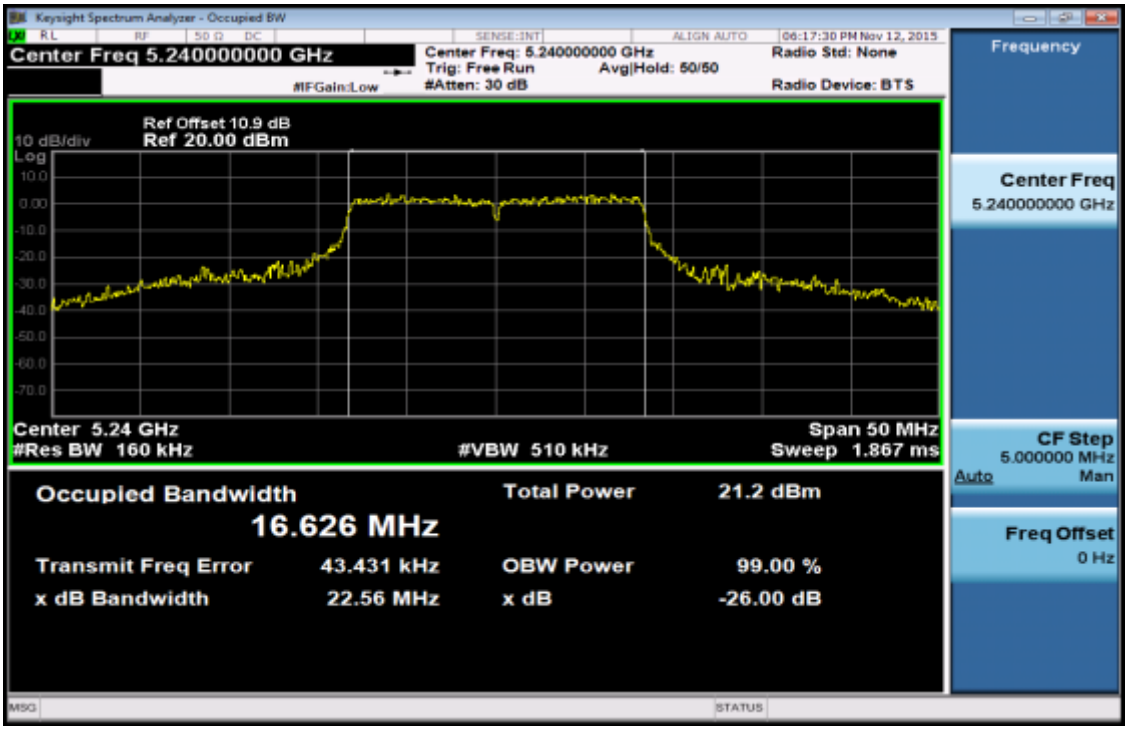
26dB Band Width Test Data CH-High (5240MHz)



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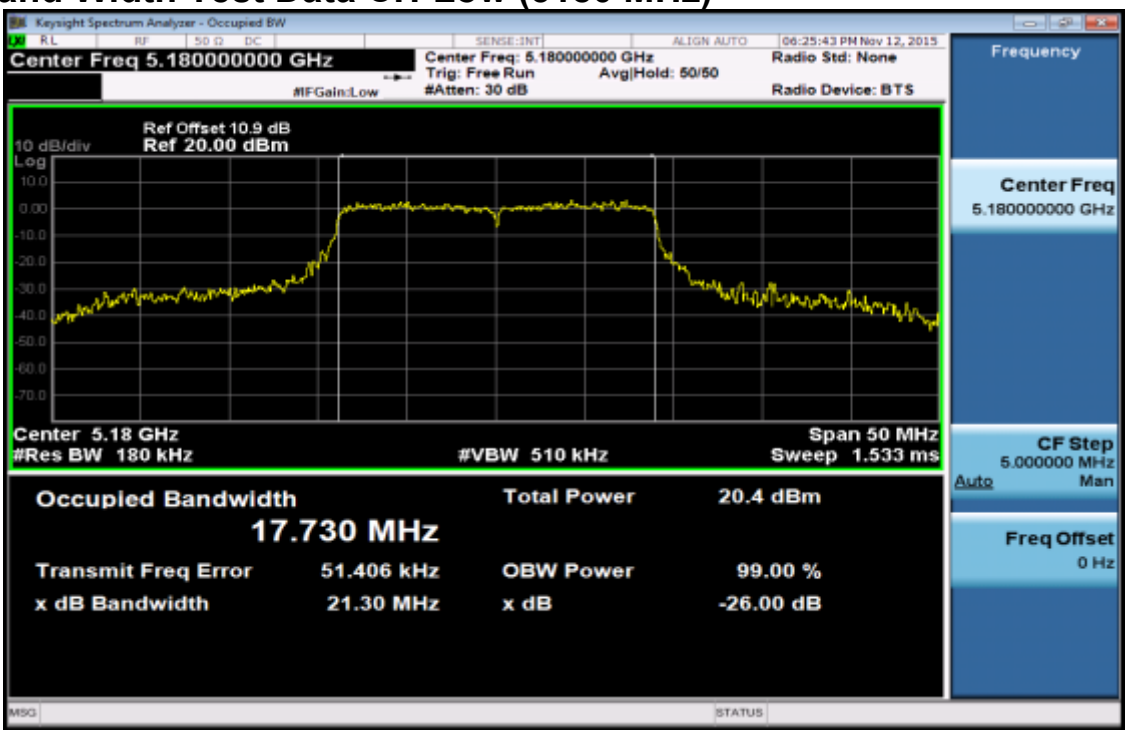
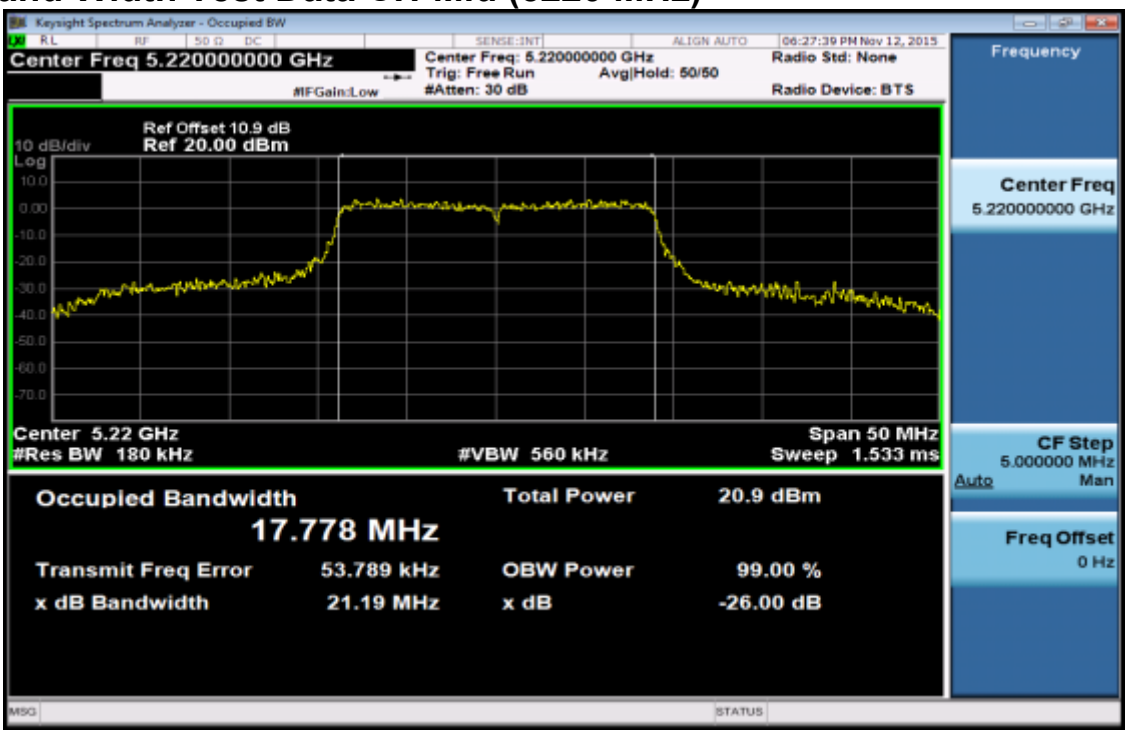
802.11n HT20, 5150~5250 MHz
26dB Band Width Test Data CH-Low (5180 MHz)



26dB Band Width Test Data CH-Mid (5220 MHz)



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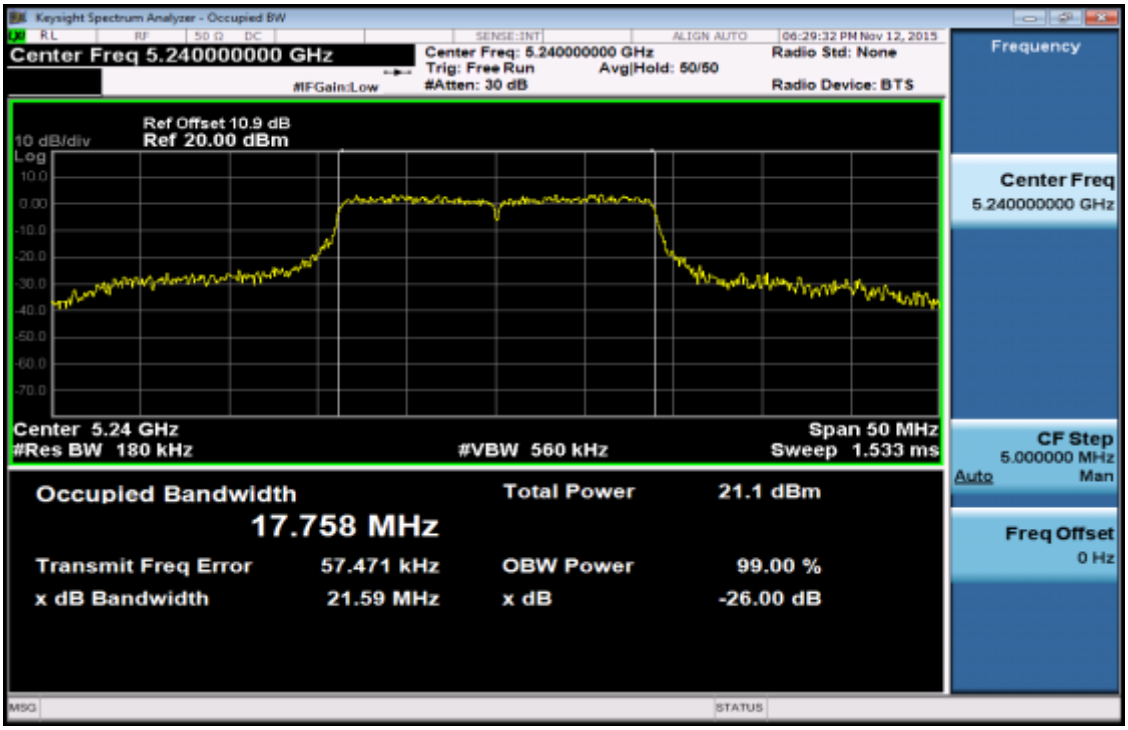
26dB Band Width Test Data CH-High (5240 MHz)



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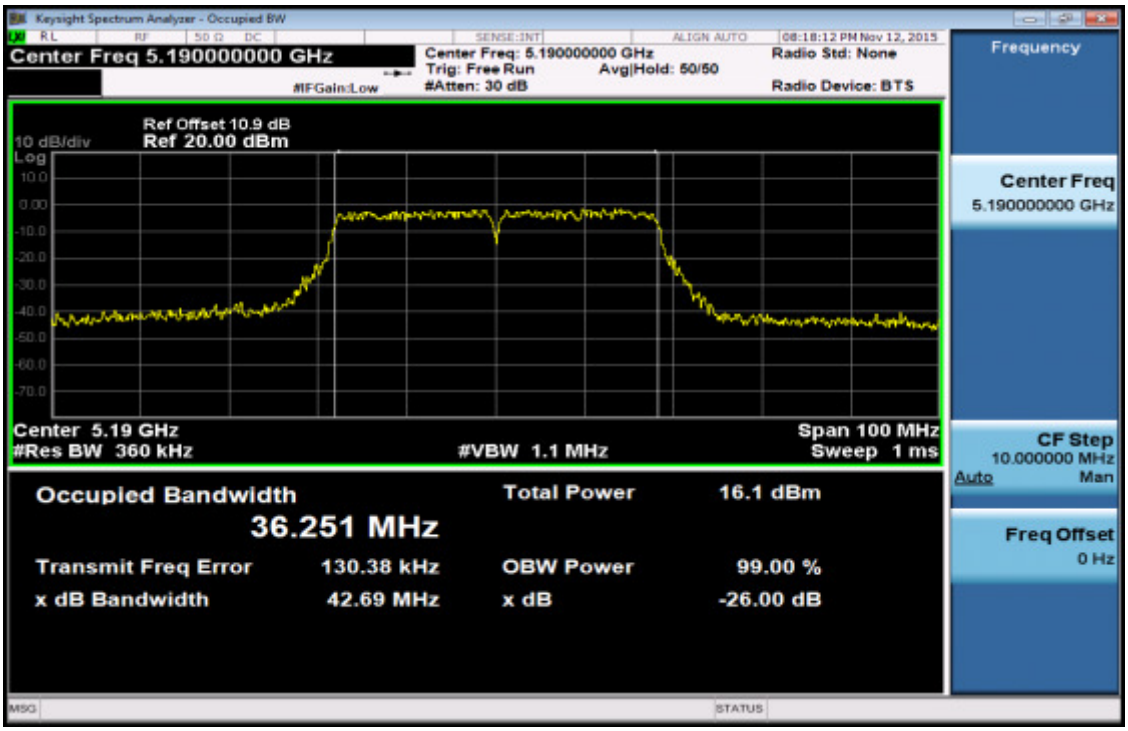
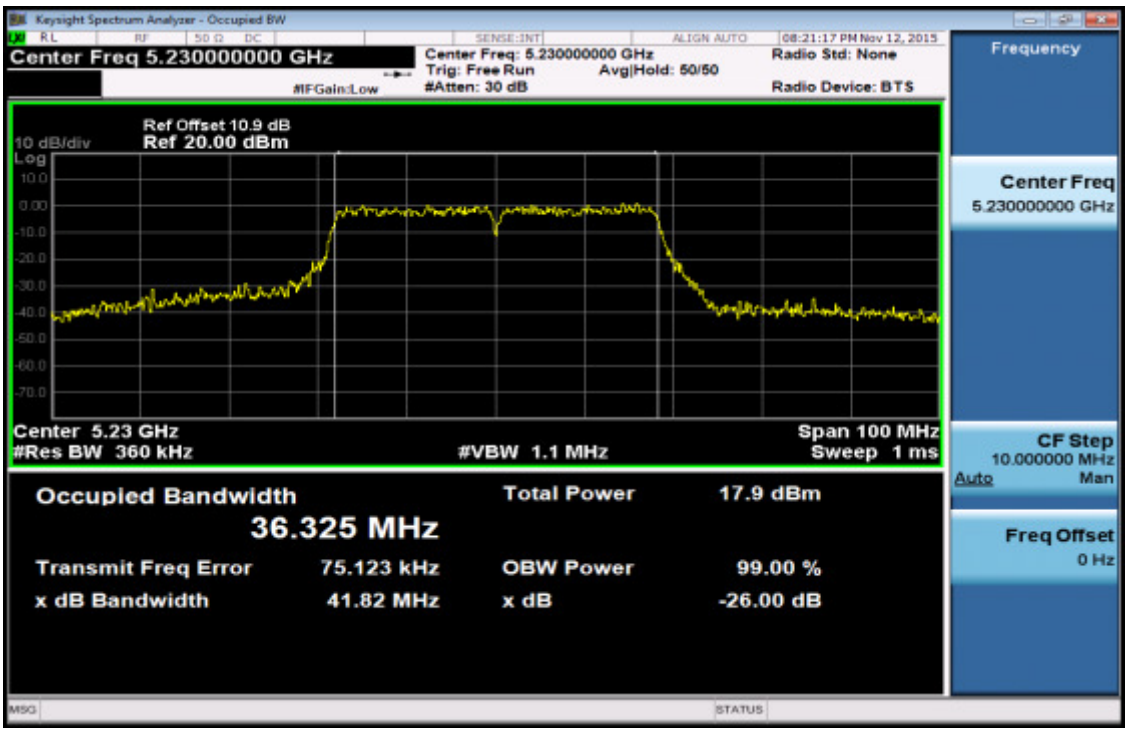
802.11n HT40, 5150~5250 MHz
26dB Band Width Test Data CH-Low (5190 MHz)



26dB Band Width Test Data CH-High (5230 MHz)



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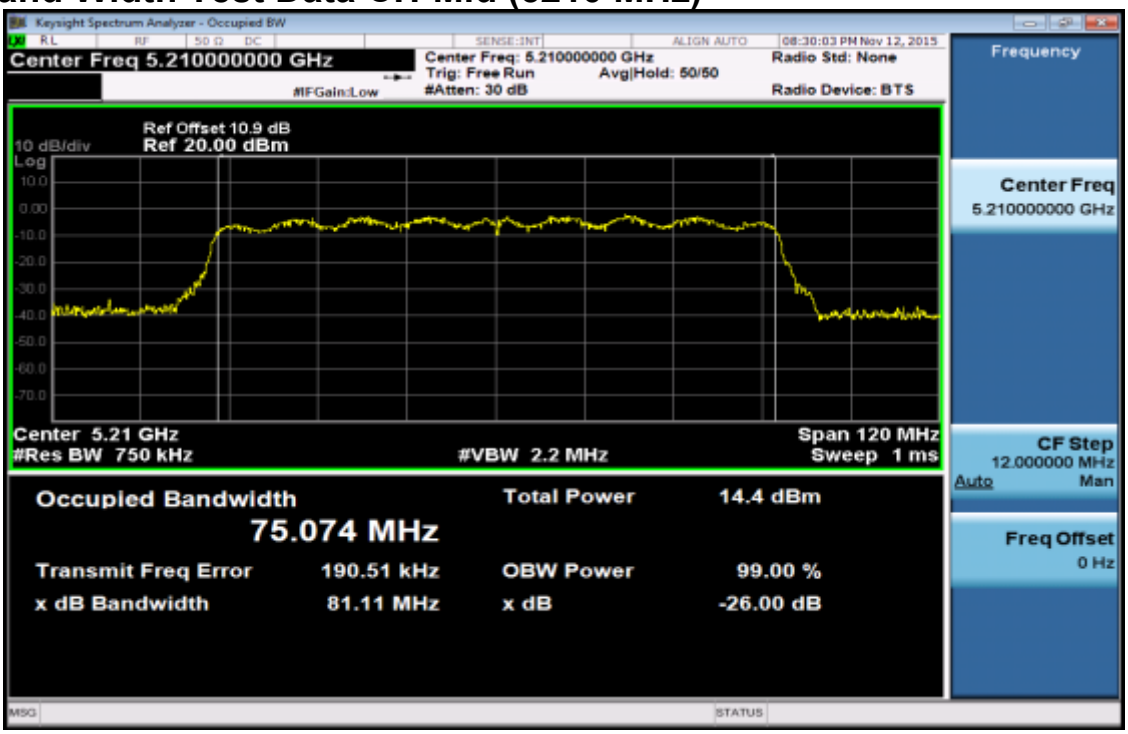
802.11ac VHT80, 5150~5250 MHz
26dB Band Width Test Data CH-Mid (5210 MHz)



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9. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

OPERZTION Band	EUT CATEGORY	LIMIT
U-NII-1		

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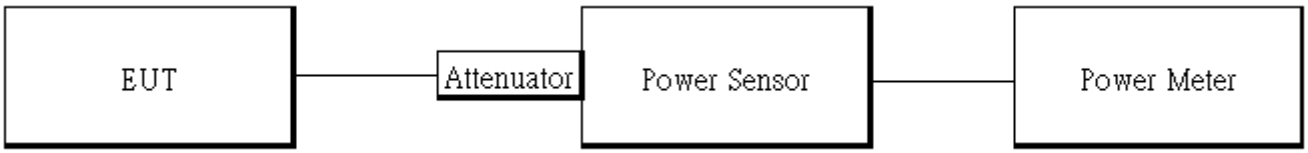
9.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2015	04/13/2016
Signal Generator	R&S	SMU200A	105303	12/22/2014	12/21/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
Splitter	Marvelous	MVE8576	RF37	12/19/2014	12/18/2015
Splitter	Marvelous	MVE8576	RF38	12/19/2014	12/18/2015
Attenuator	WOKEN	6SR1211	RF41	12/19/2014	12/18/2015

9.4 Test Set-up



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9.5 Measurement Result

802.11a_Main

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	16.45	44.157	23.98	PASS
44	5220	16.50	44.668	23.98	PASS
48	5240	**16.70**	46.774	23.98	PASS

802.11n_HT20_Main

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	16.15	41.210	23.98	PASS
44	5220	16.40	43.652	23.98	PASS
48	5240	**16.60**	45.709	23.98	PASS

802.11ac_VHT20_Main

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	16.12	40.926	23.98	PASS
44	5220	16.34	43.053	23.98	PASS
48	5240	**16.56**	45.290	23.98	PASS

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802.11n_HT40_Main

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	10.75	11.885	23.98	PASS
46	5230	**12.90**	19.498	23.98	PASS

802.11ac_VHT40_Main

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	10.55	11.350	23.98	PASS
46	5230	**12.79**	19.011	23.98	PASS

802.11ac_VHT80_Main

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
42	5210	8.10	6.457	23.98	PASS

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10. PEAK POWER SPECTRAL DENSITY

10.1 Standard Applicable

OPERZTION Band	EUT CATEGORY	LIMIT
U-NII-1		

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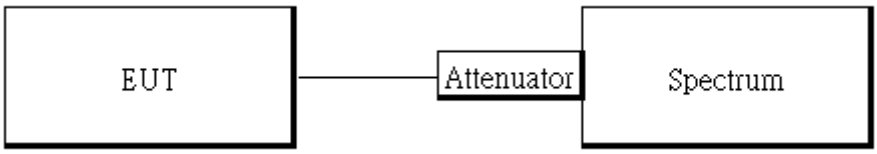
10.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2015	04/13/2016
Signal Generator	R&S	SMU200A	105303	12/22/2014	12/21/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
Splitter	Marvelous	MVE8576	RF37	12/19/2014	12/18/2015
Splitter	Marvelous	MVE8576	RF38	12/19/2014	12/18/2015
Attenuator	WOKEN	6SR1211	RF41	12/19/2014	12/18/2015

10.4 Test Set-up



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10.5 Measurement Result

POWER DENSITY 802.11a MODE				
Frequency (MHz)	PPSD (dBm)	Offset	Limit (dBm)	Margin (dB)
5180	3.07	10.90	17	-13.93
5220	3.18	10.90	17	-13.82
5240	3.43	10.90	17	-13.57

POWER DENSITY 802.11n HT20 MODE				
Frequency (MHz)	PPSD (dBm)	Offset	Limit (dBm)	Margin (dB)
5180	2.27	10.90	17	-14.73
5220	3.16	10.90	17	-13.84
5240	2.84	10.90	17	-14.16

POWER DENSITY 802.11n HT40 MODE				
Frequency	PPSD	Offset	Limit	Margin
5190	-5.7	10.90	17	-22.70
5230	-3.86	10.90	17	-20.86

POWER DENSITY 802.11ac VHT80 MODE				
Frequency (MHz)	PPSD (dBm)	Offset	Limit (dBm)	Margin (dB)
5210	-9.62	10.90	17	-26.62

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802.11a 5150~5250 MHz
Peak Power Spectral Density Data Plot (CH Low 5180 MHz)

Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

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Peak Power Spectral Density Data Plot (CH High 5240 MHz)

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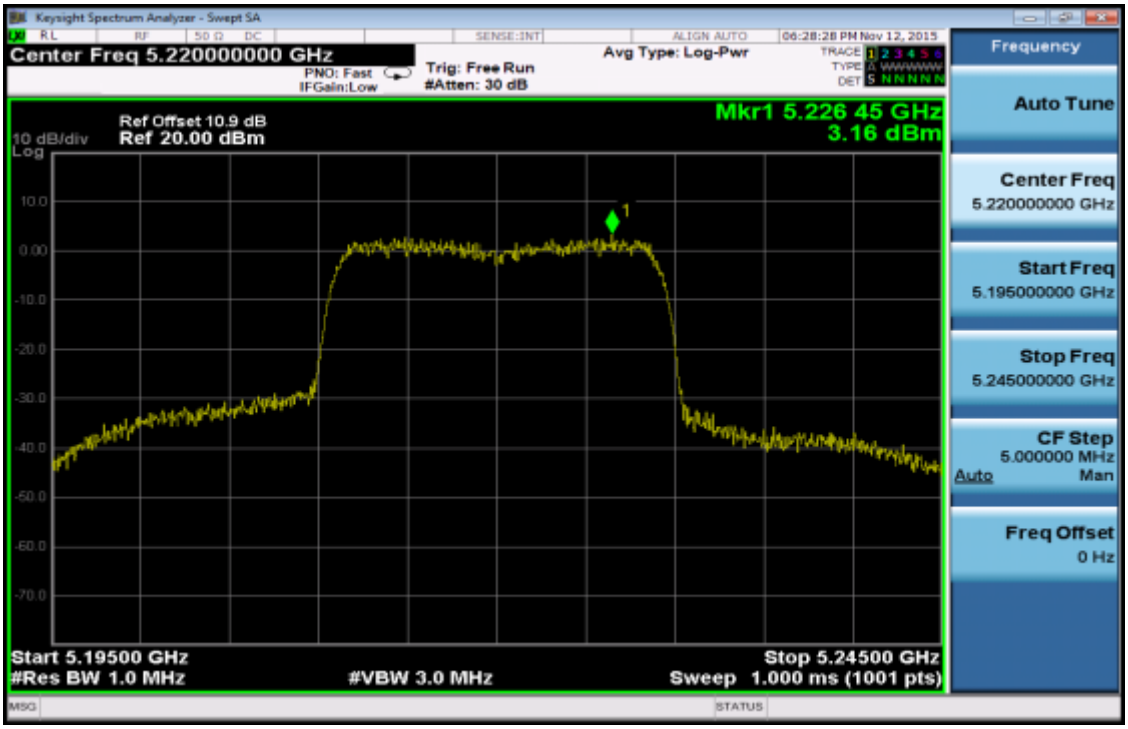
802.11n HT20, 5150~5250 MHz
Peak Power Spectral Density Data Plot (CH Low 5180 MHz)

Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)



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Peak Power Spectral Density Data Plot (CH High 5240 MHz)

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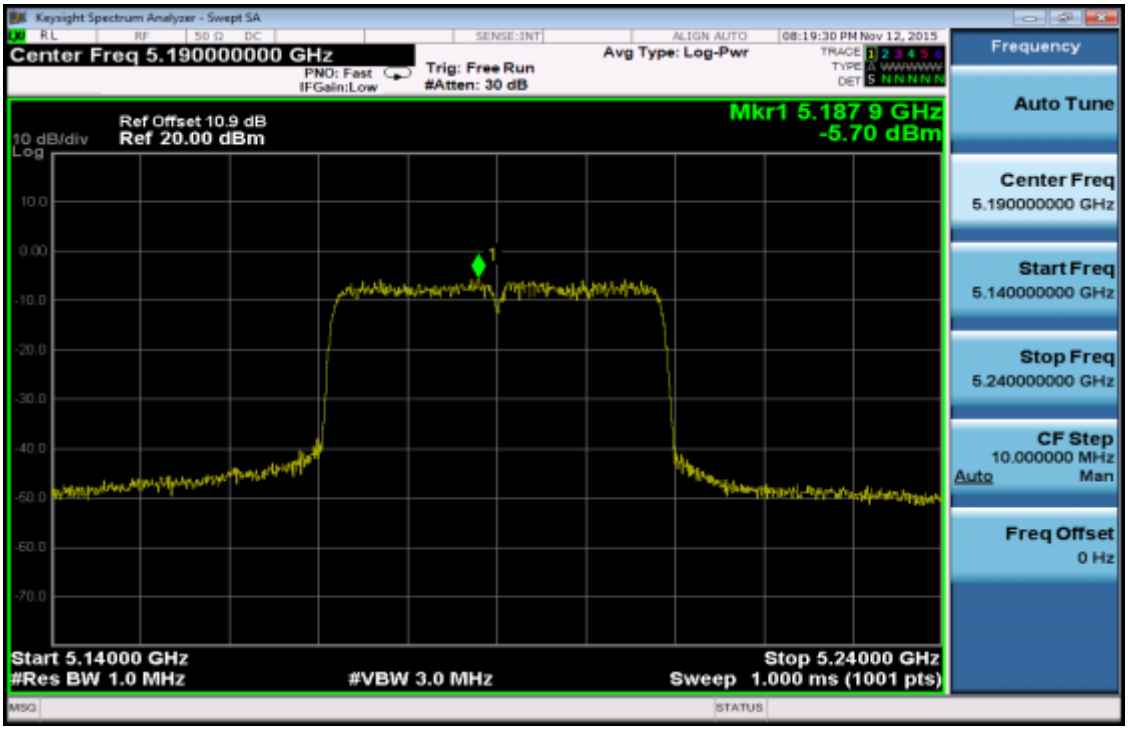
802.11n HT40, 5150~5250 MHz
Peak Power Spectral Density Data Plot (CH Low 5190 MHz)



Peak Power Spectral Density Data Plot (CH High 5230 MHz)

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802.11ac VHT80, 5150~5250 MHz
Peak Power Spectral Density Data Plot (CH Mid 5210 MHz)

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11. UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

1. 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 e.i.r.p. of −27 dBm/MHz.
2. 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 e.i.r.p. of −27 dBm/MHz.
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 e.i.r.p. of −27 dBm/MHz.
4. For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules v01	FIELD STRENGTH AT 3m	
	PK: 74 (dBμV/m)	AV 54 (dBμV/m)
APPLICABLE TO	**EIRP LIMIT**	**FIELD STRENGTH AT 3m**
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)	PK: -27 (dBm/MHz) PK: -17 (dBm/MHz)	PK: 68.3 (dBμV/m) PK: 78.2 (dBμV/m)

EIRP = ((E*d)^2) / 30, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

11.2 Measurement Equipment Used

SGS 966 Chamber No.C					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EMI Test Receiver	R&S	ESU 40	100363	04/09/2015	04/08/2016
Loop Antenna	ETS-Lindgren	6502	00143303	12/09/2014	12/08/2015
Broadband Antenna	TESEQ	CBL 6112D	35240	12/05/2014	12/04/2015
Horn Antenna	ETS-Lindgren	3117	00143272	12/08/2014	12/07/2015
Horn Antenna	Schwarzbeck	BBHA9170	185	07/25/2015	07/24/2016
Pre Amplifier	EMC Instruments	EMC330	980096	12/19/2014	12/18/2015
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-18	10204	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-26	100780	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-40	100356	12/19/2014	12/18/2015
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF27	12/19/2014	12/18/2015
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2015	05/03/2016
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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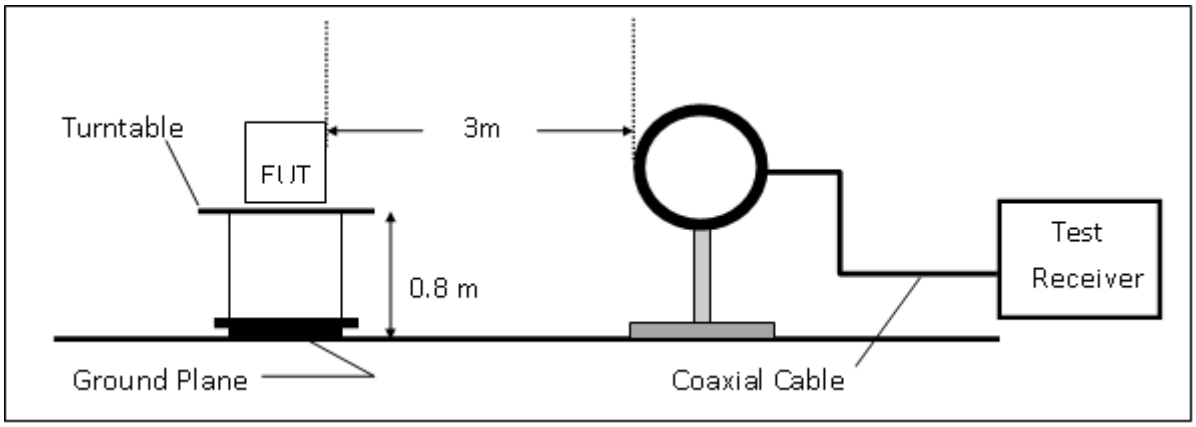
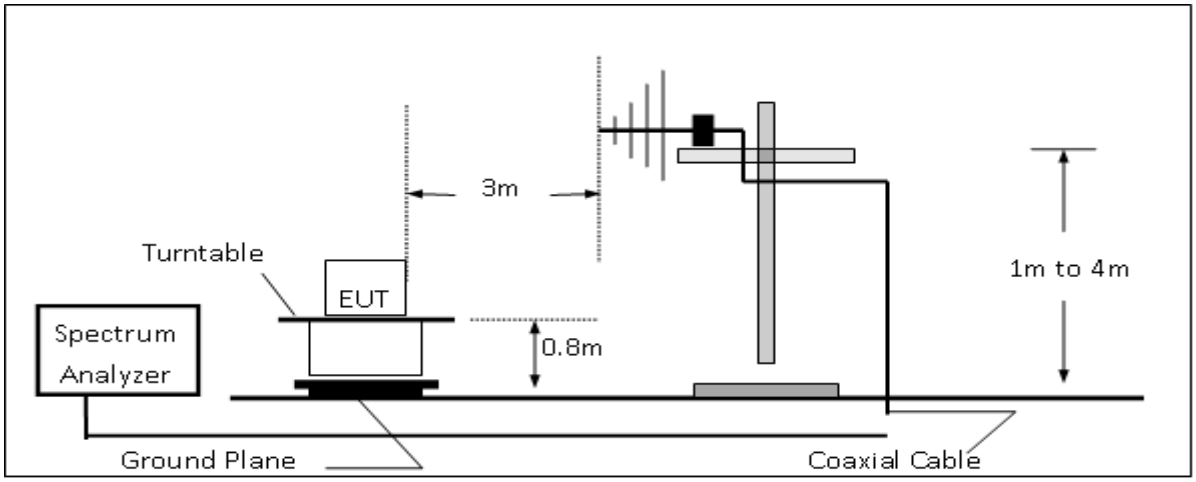
11.3 Test SET-UP

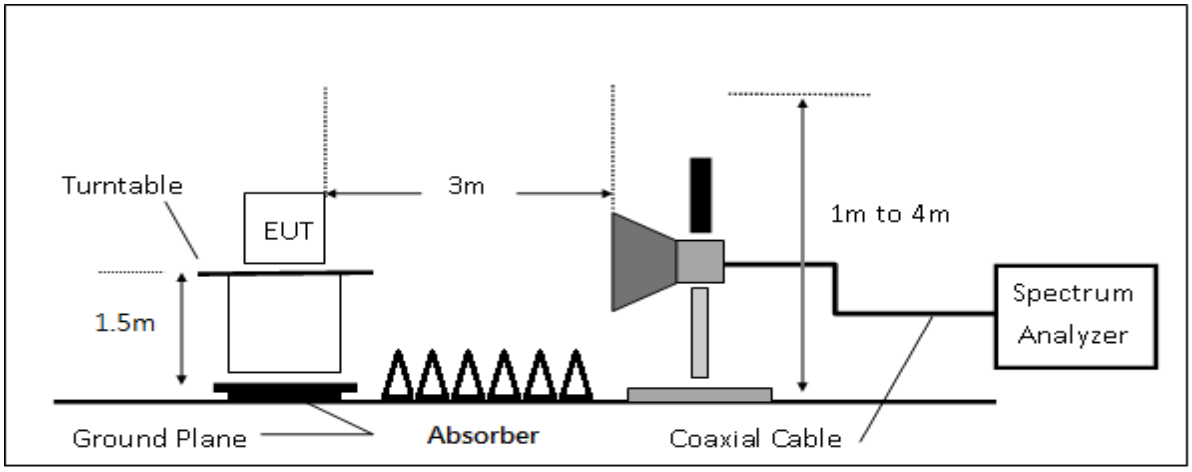
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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11.4 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
3. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
4. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
5. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all frequency measured were complete.

11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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Note :

"**F**" : denotes Fundamental Frequency. ; "**H**" : denotes Harmonic Frequency.

"**E**" : denotes Band Edge Frequency. ; "**S**" : denotes Spurious Frequency.

11.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

11.7 Measurement Result

Refer to attach tabular data sheets.

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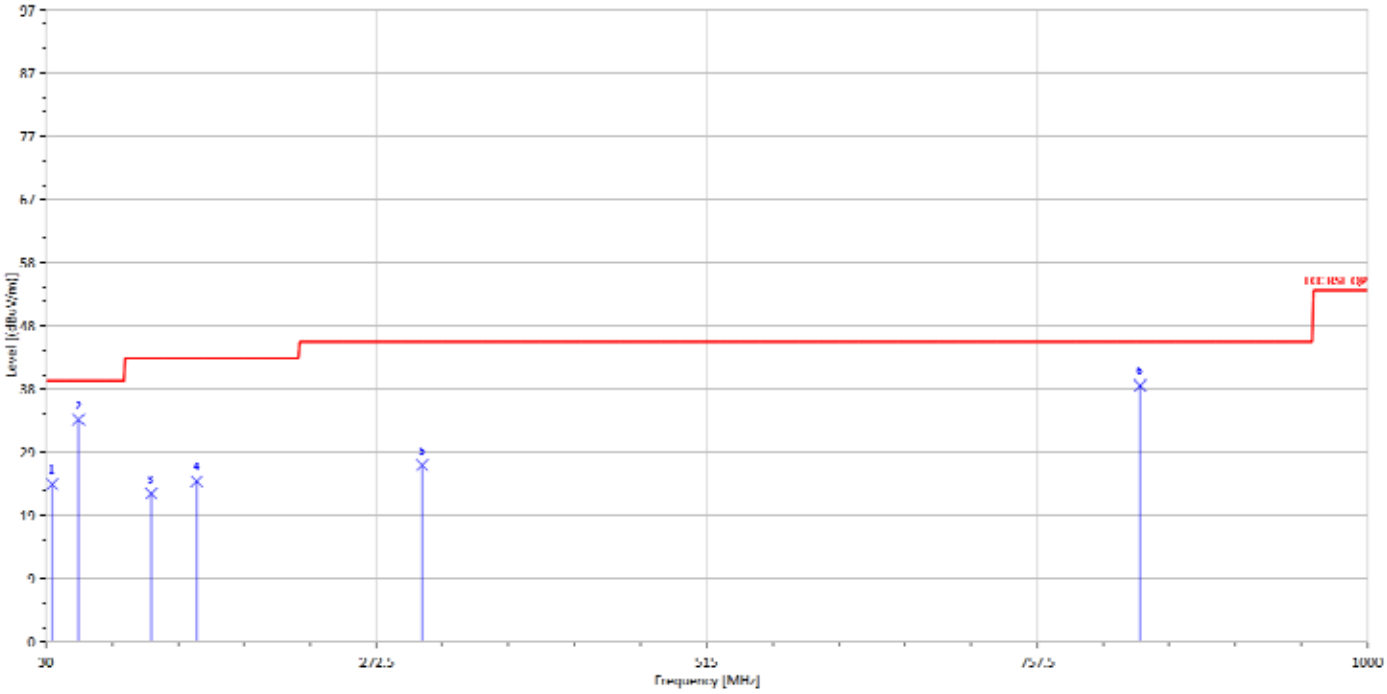
Radiated Spurious Emission Measurement Result
Below 1GHz Worst-Case Data:
802.11a 5150~5250 MHz

Operation Mode :	802.11a	Test Date :	2015/11/13
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
34.85	S	Peak	44.94	-15.75	24.19	40	-15.81
54.25	S	Peak	60.88	-26.79	34.09	40	-5.91
107.60	S	Peak	50.43	-22.68	22.75	43.5	-20.75
140.58	S	Peak	46.36	-21.70	24.65	43.5	-18.85
306.45	S	Peak	46.02	-18.99	27.02	46	-18.98
833.16	S	Peak	48.42	-9.10	39.33	46	-6.67

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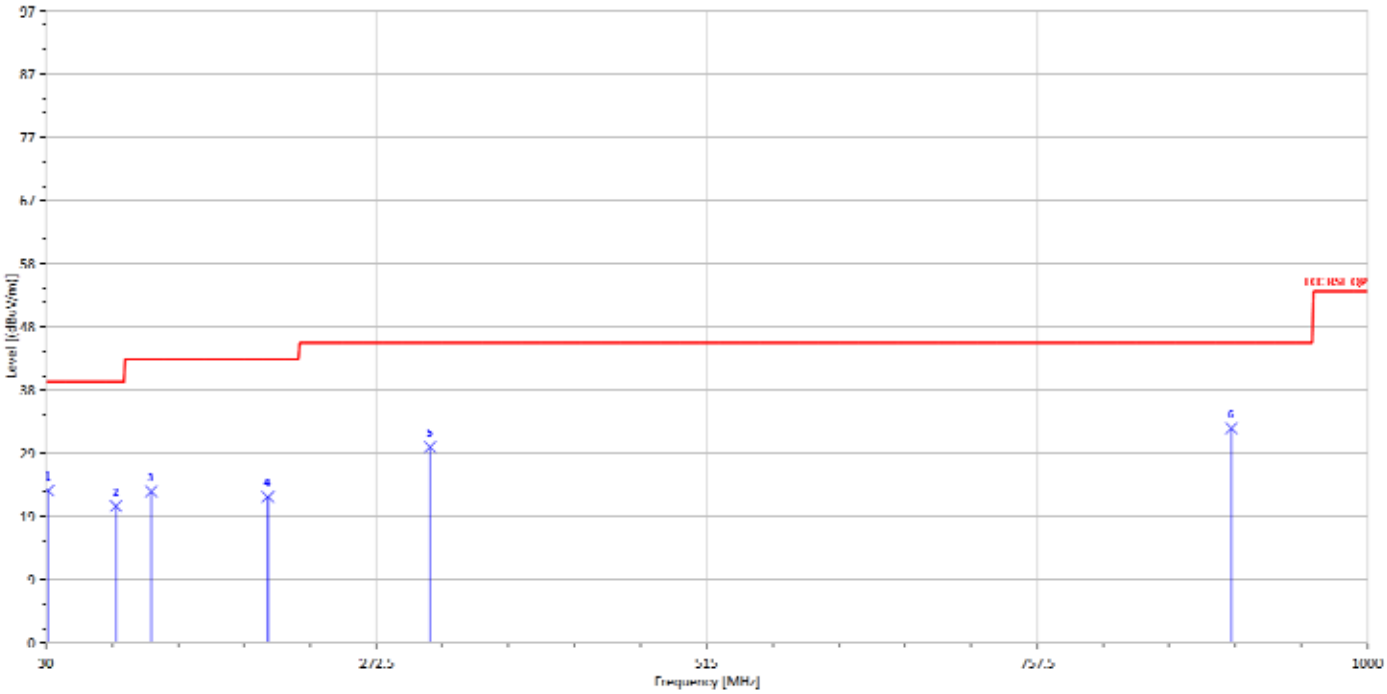
Operation Mode :	802.11a	Test Date :	2015/11/13
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	37.51	-14.17	23.35	40	-16.65
81.41	S	Peak	47.66	-26.71	20.95	40	-19.05
107.60	S	Peak	45.93	-22.68	23.24	43.5	-20.26
192.96	S	Peak	46.30	-23.91	22.39	43.5	-21.11
312.27	S	Peak	48.64	-18.66	29.97	46	-16.03
900.09	S	Peak	41.07	-8.17	32.90	46	-13.10

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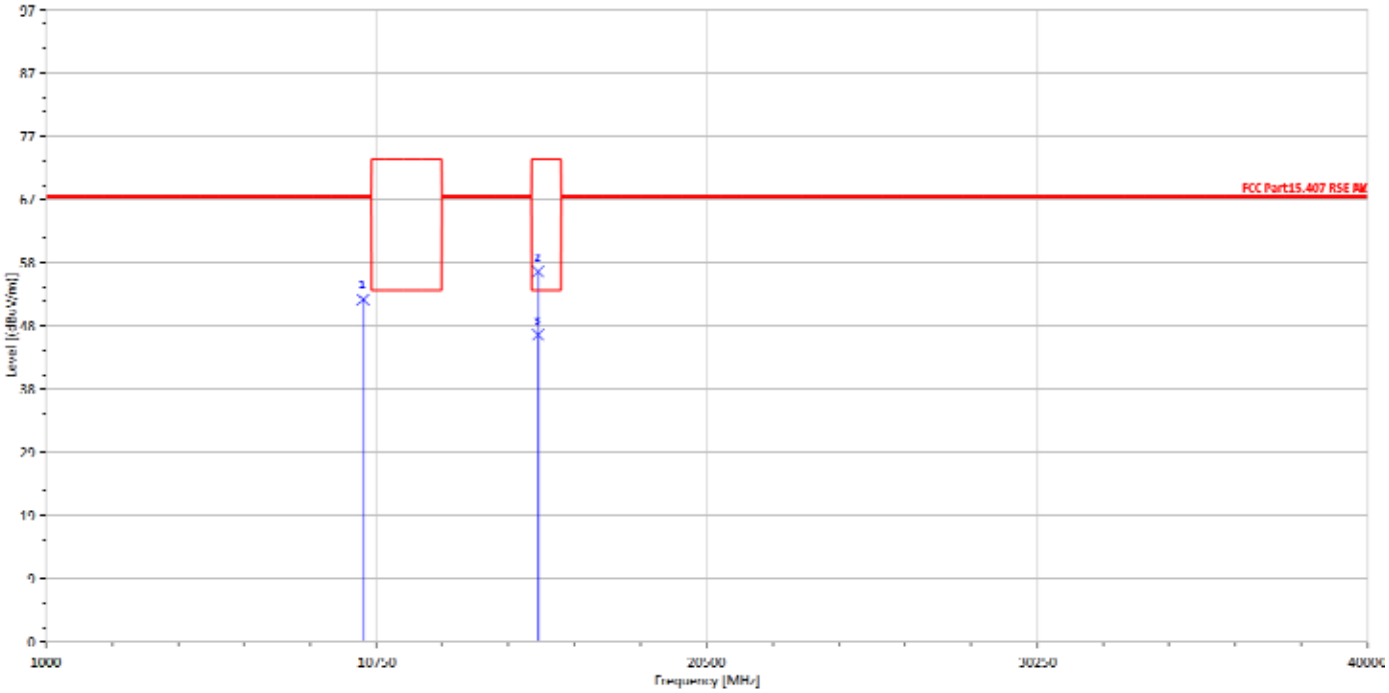
Above 1GHz Worst-Case Data:
802.11a, 5150~5250 MHz

Operation Mode :	802.11a	Test Date :	2015/11/11
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	H	Peak	33.62	18.94	52.56	68.3	-15.74
15540.00	H	Peak	30.94	25.80	56.74	74	-17.26
15540.00	H	Average	21.29	25.80	47.09	54	-6.91

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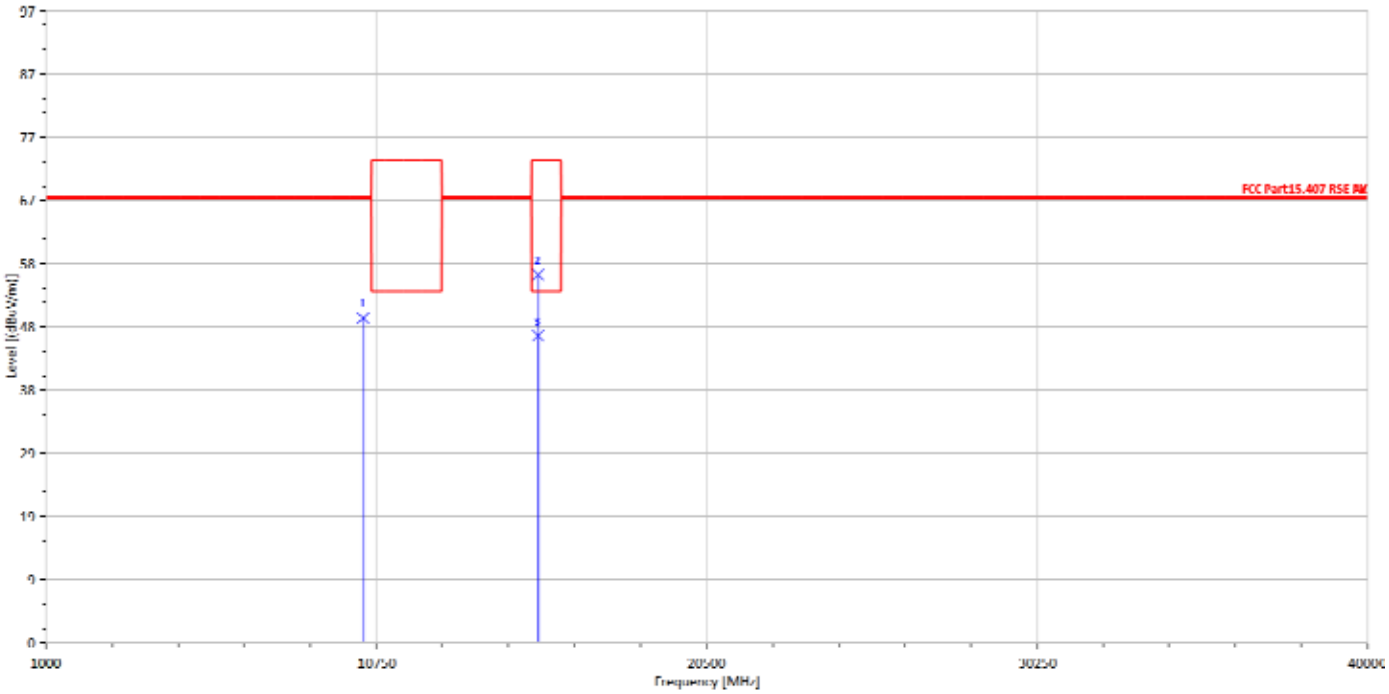
Operation Mode :	802.11a	Test Date :	2015/11/11
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	H	Peak	30.90	18.94	49.84	68.3	-18.46
15540.00	H	Peak	30.62	25.80	56.42	74	-17.58
15540.00	H	Average	21.31	25.80	47.11	54	-6.89

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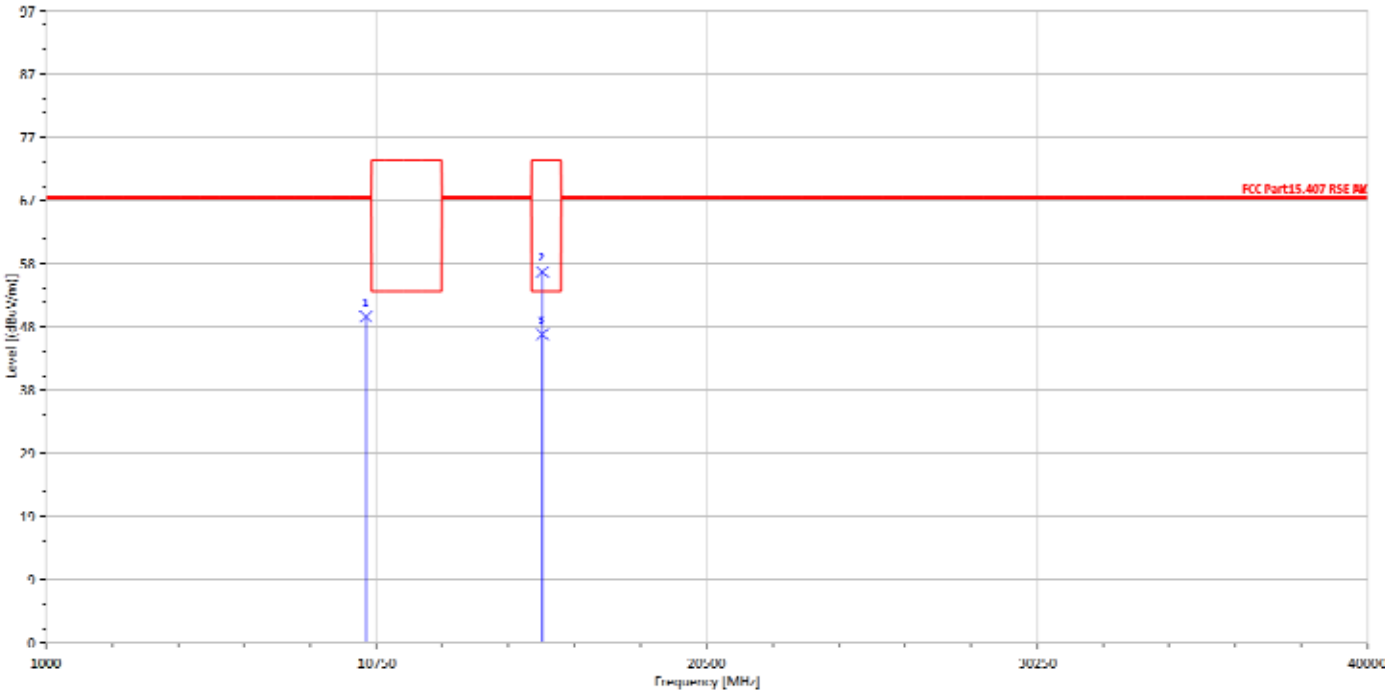
Operation Mode :	802.11a	Test Date :	2015/11/11
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	H	Peak	31.04	19.03	50.06	68.3	-18.24
15660.00	H	Peak	30.80	26.06	56.87	74	-17.13
15660.00	H	Average	21.26	26.06	47.32	54	-6.68

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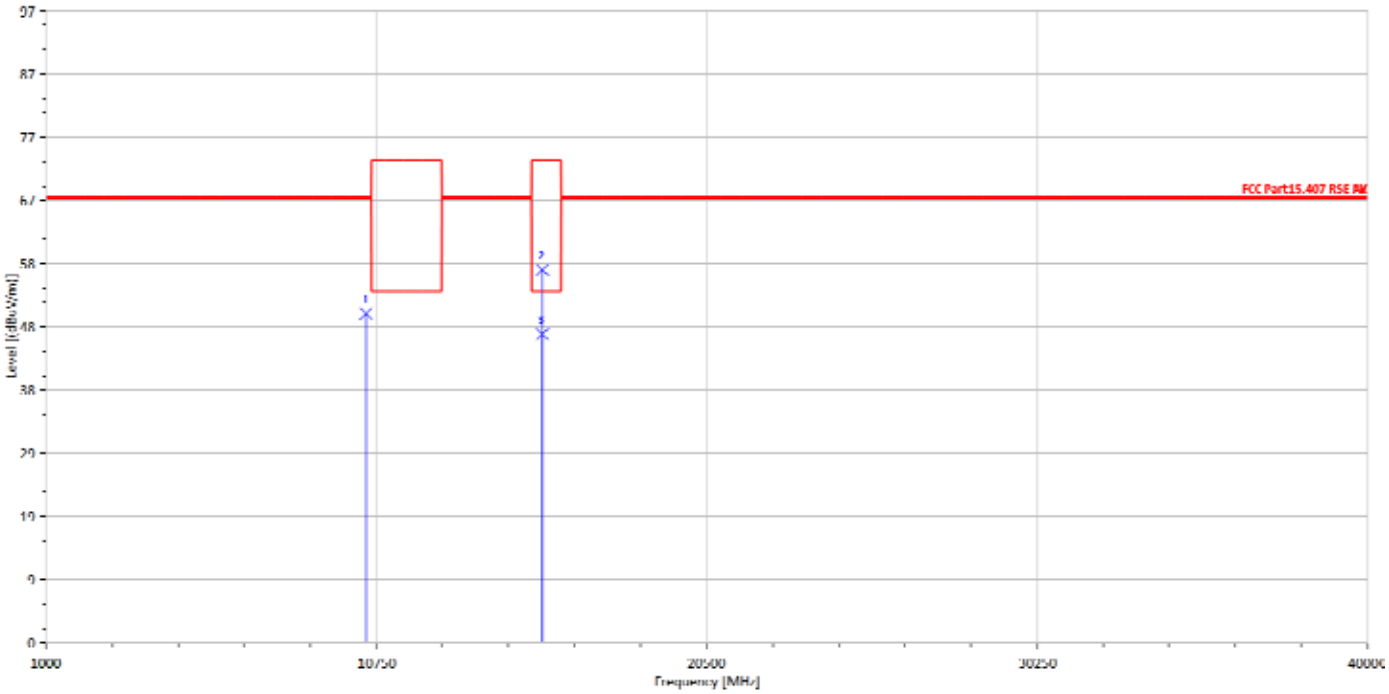
Operation Mode :	802.11a	Test Date :	2015/11/11
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	H	Peak	31.52	19.03	50.54	68.3	-17.76
15660.00	H	Peak	31.12	26.06	57.18	74	-16.82
15660.00	H	Average	21.30	26.06	47.36	54	-6.64

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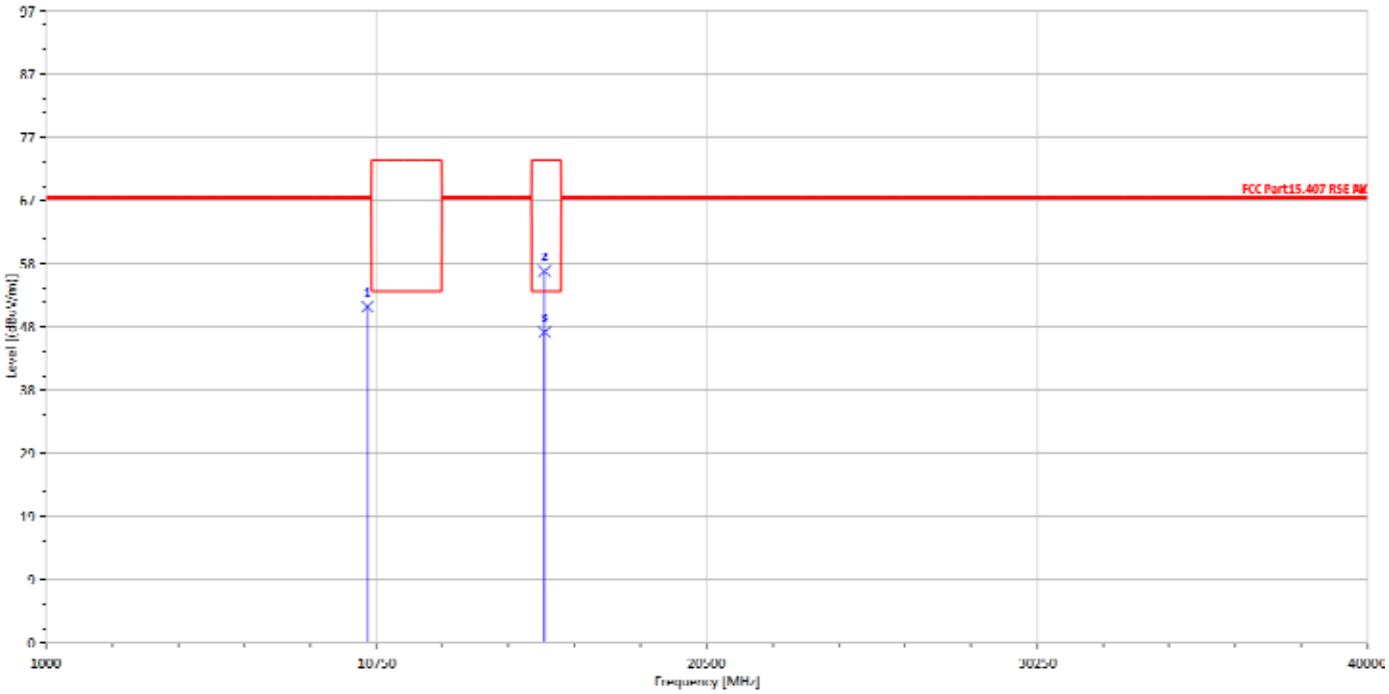
Operation Mode :	802.11a	Test Date :	2015/11/11
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	H	Peak	32.47	19.13	51.60	68.3	-16.70
15720.00	H	Peak	30.85	26.13	56.98	74	-17.02
15720.00	H	Average	21.53	26.13	47.66	54	-6.34

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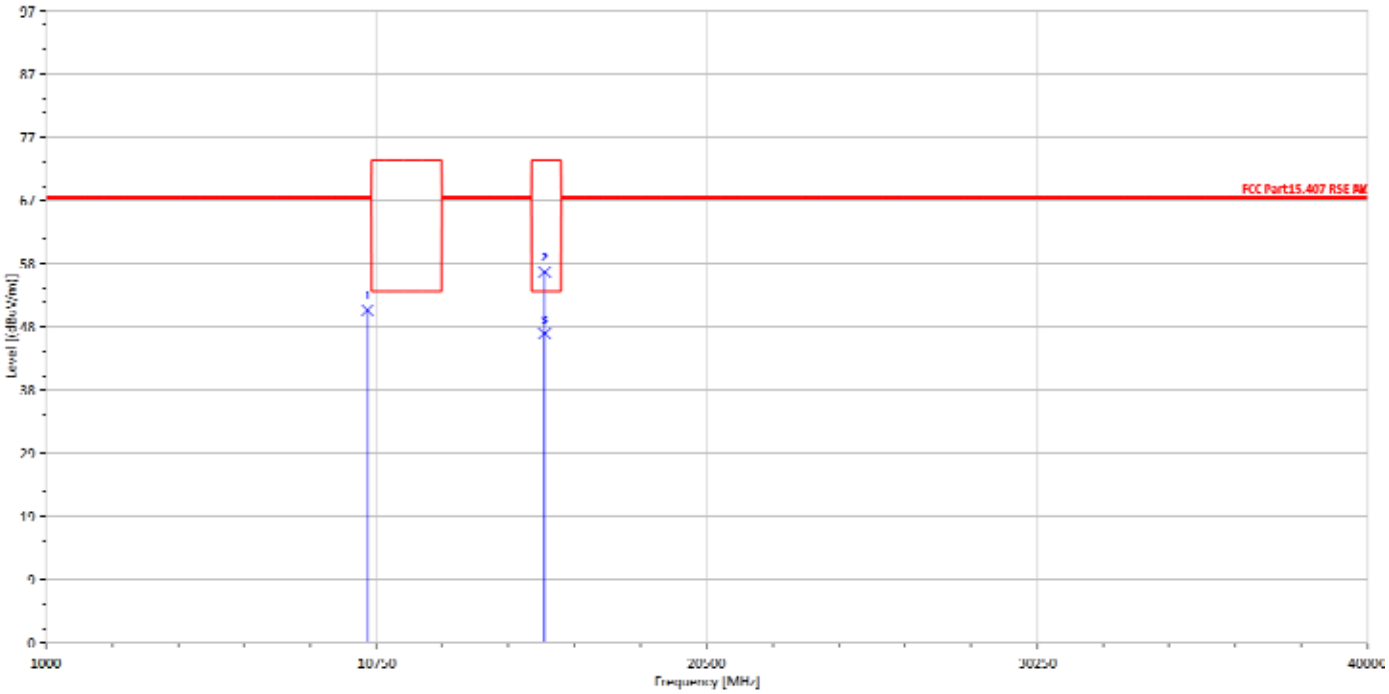
Operation Mode :	802.11a	Test Date :	2015/11/11
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	H	Peak	31.94	19.13	51.07	68.3	-17.23
15720.00	H	Peak	30.71	26.13	56.84	74	-17.16
15720.00	H	Average	21.32	26.13	47.45	54	-6.55

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Band edge falling to restricted band

Operation Mode :	802.11a	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	E	Peak	55.29	11.14	66.44	74	-7.56
5150.00	E	Average	38.73	11.14	49.87	54	-4.13

Operation Mode :	802.11a	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5146.48	S	Peak	45.25	11.16	56.41	74	-17.59
5146.48	S	Average	32.17	11.16	43.33	54	-10.67
5150.00	E	Peak	43.71	11.14	54.85	74	-19.15
5150.00	E	Average	32.24	11.14	43.38	54	-10.62

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Operation Mode :	802.11a	Test Date :	2015/11/10
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	44.25	11.30	55.55	74	-18.45
5350.00	E	Average	33.20	11.30	44.50	54	-9.50
5395.40	S	Peak	47.18	11.22	58.40	74	-15.60
5395.40	S	Average	33.80	11.22	45.02	54	-8.98

Operation Mode :	802.11a	Test Date :	2015/11/10
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	42.97	11.30	54.27	74	-19.73
5350.00	E	Average	32.18	11.30	43.48	54	-10.52

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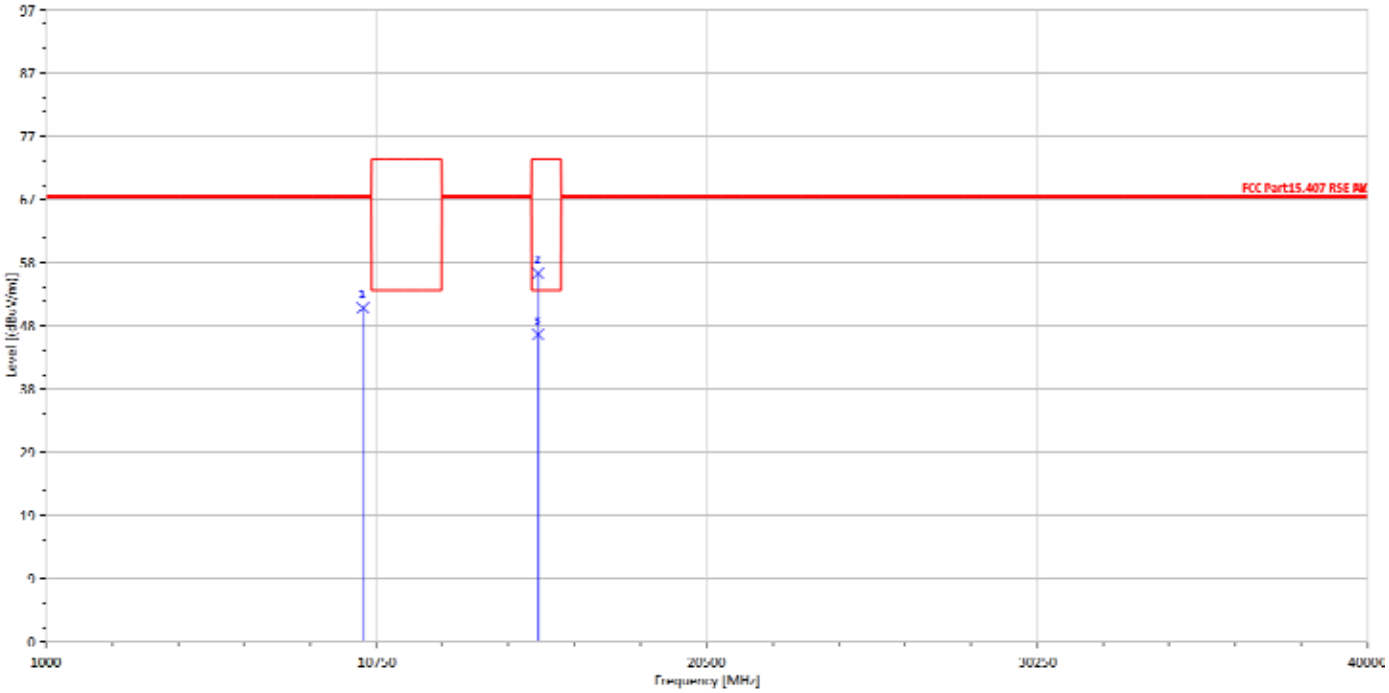
Radiated Spurious Emission Measurement Result
802.11n HT20, 5150~5250 MHz

Operation Mode :	802.11n20	Test Date :	2015/11/11
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	H	Peak	32.33	18.94	51.27	68.3	-17.03
15540.00	H	Peak	30.68	25.80	56.48	74	-17.52
15540.00	H	Average	21.35	25.80	47.15	54	-6.85

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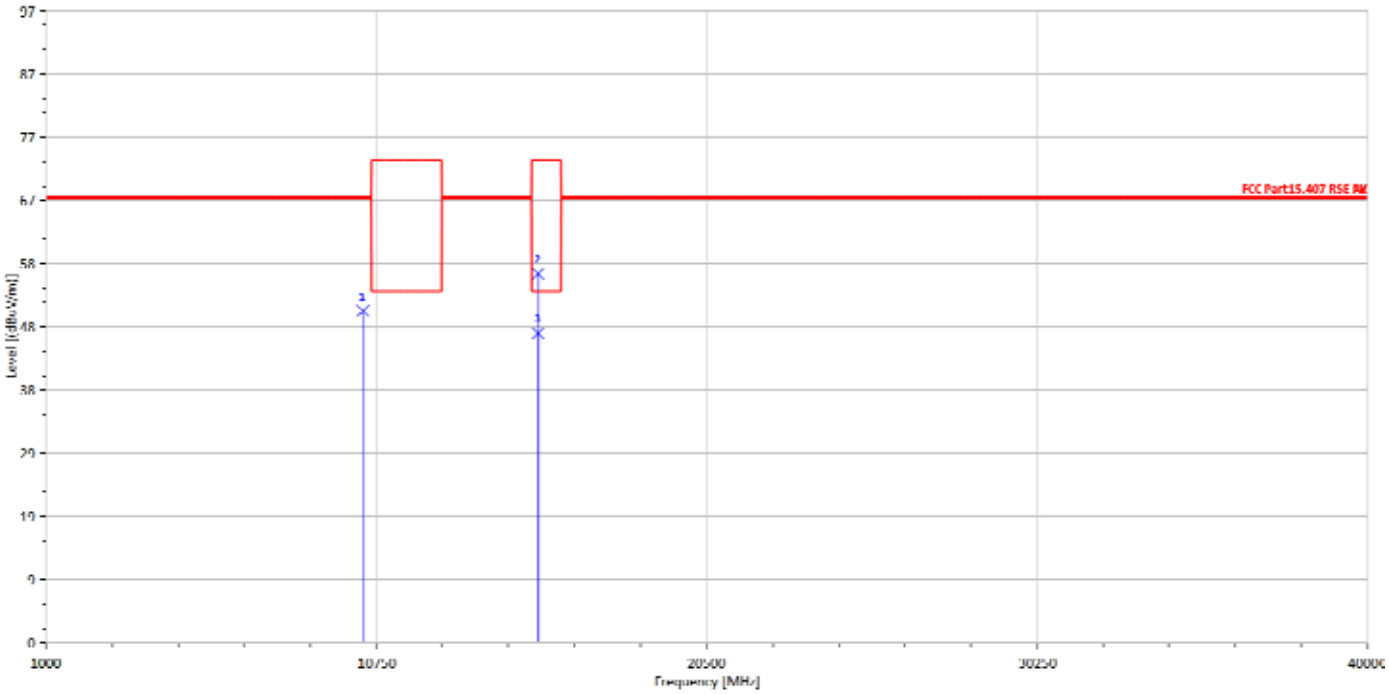
Operation Mode :	802.11n20	Test Date :	2015/11/11
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	H	Peak	32.01	18.94	50.95	68.3	-17.35
15540.00	H	Peak	30.79	25.80	56.59	74	-17.41
15540.00	H	Average	21.69	25.80	47.49	54	-6.51

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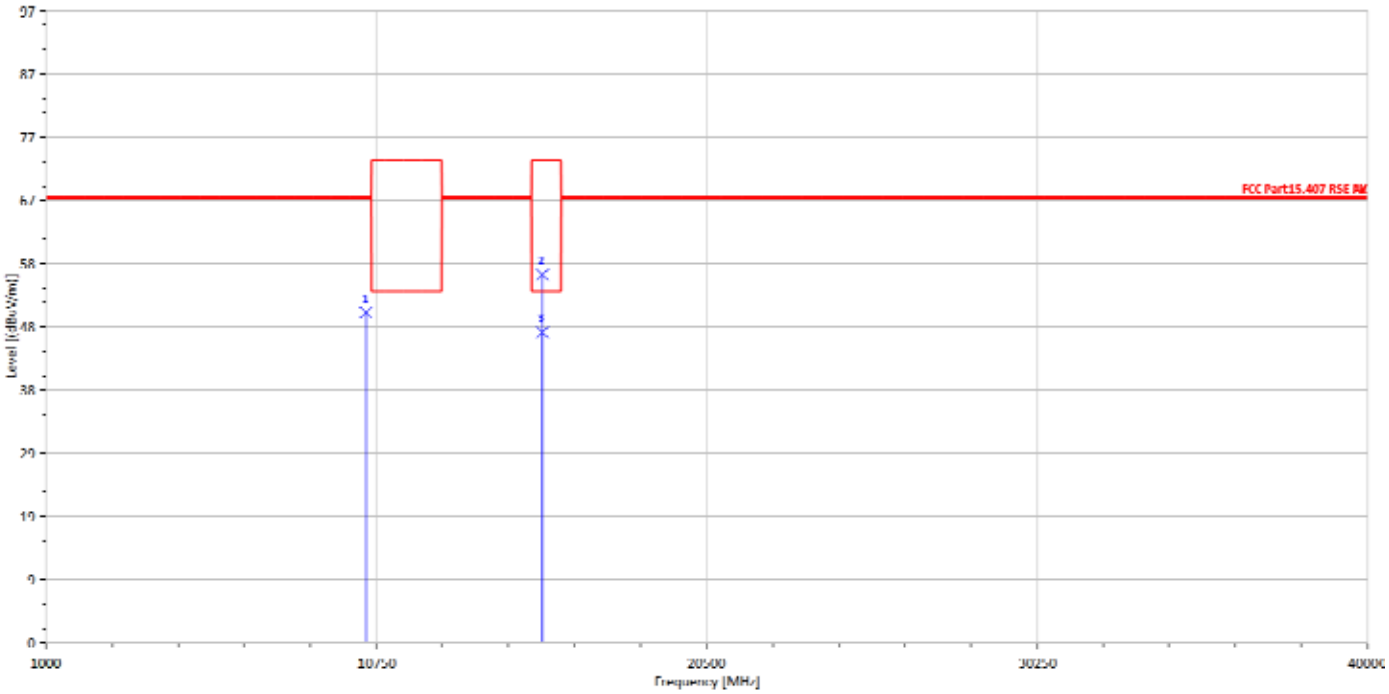
Operation Mode :	802.11n20	Test Date :	2015/11/11
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	H	Peak	31.68	19.03	50.70	68.3	-17.60
15660.00	H	Peak	30.38	26.06	56.44	74	-17.56
15660.00	H	Average	21.58	26.06	47.64	54	-6.36

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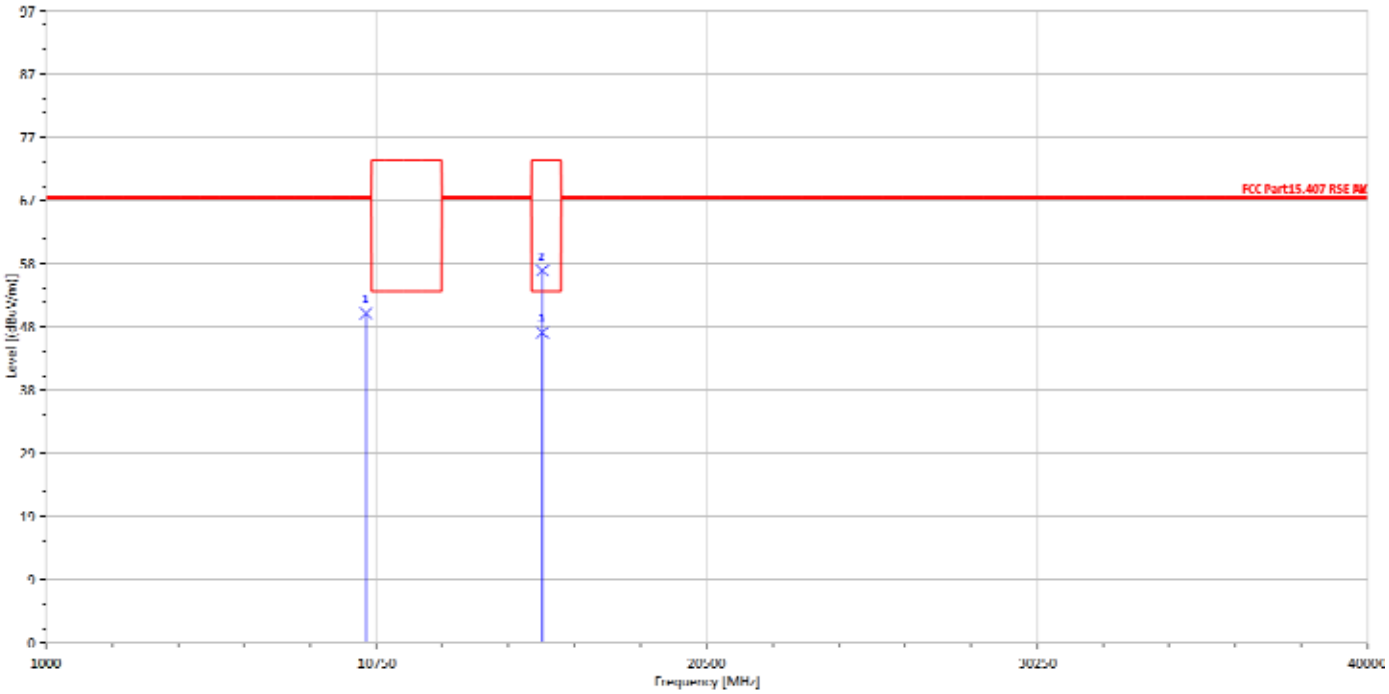
Operation Mode :	802.11n20	Test Date :	2015/11/11
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	H	Peak	31.56	19.03	50.58	68.3	-17.72
15660.00	H	Peak	31.01	26.06	57.07	74	-16.93
15660.00	H	Average	21.53	26.06	47.59	54	-6.41

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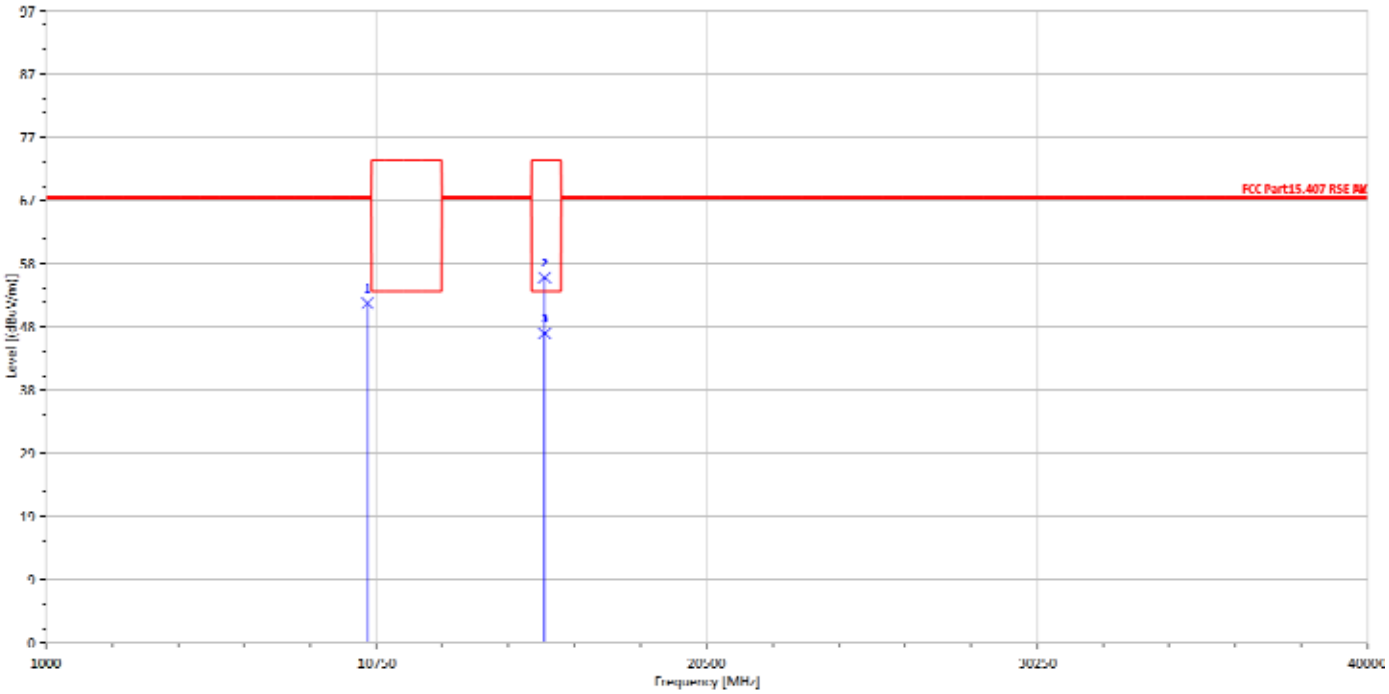
Operation Mode :	802.11n20	Test Date :	2015/11/11
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	H	Peak	33.02	19.13	52.14	68.3	-16.16
15720.00	H	Peak	29.87	26.13	56.00	74	-18.00
15720.00	H	Average	21.33	26.13	47.46	54	-6.54

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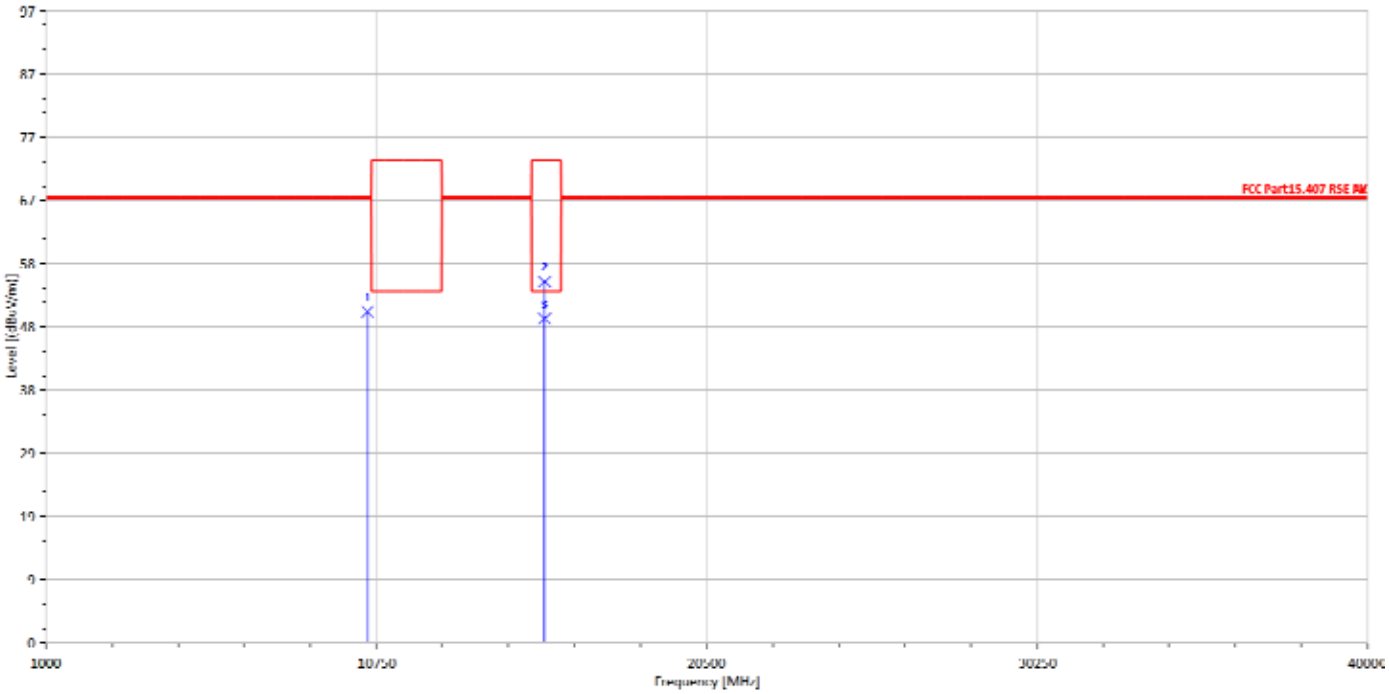
Operation Mode :	802.11n20	Test Date :	2015/11/11
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	H	Peak	31.71	19.13	50.83	68.3	-17.47
15720.00	H	Peak	29.21	26.13	55.34	74	-18.66
15720.00	H	Average	23.63	26.13	49.76	54	-4.24

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Band edge falling to restricted band

Operation Mode :	802.11n20	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	E	Peak	57.10	11.14	68.24	74	-5.76
5150.00	E	Average	38.58	11.14	49.72	54	-4.28

Operation Mode :	802.11n20	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	E	Peak	43.21	11.14	54.35	74	-19.65
5150.00	E	Average	31.79	11.14	42.93	54	-11.07

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Operation Mode :	802.11n20	Test Date :	2015/11/10
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	44.46	11.30	55.76	74	-18.24
5350.00	E	Average	33.12	11.30	44.42	54	-9.58
5360.40	S	Peak	46.36	11.30	57.66	74	-16.34
5360.40	S	Average	33.78	11.30	45.08	54	-8.92

Operation Mode :	802.11n20	Test Date :	2015/11/10
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5349.94	E	Peak	43.08	11.30	54.38	74	-19.62
5349.94	E	Average	32.04	11.30	43.34	54	-10.66

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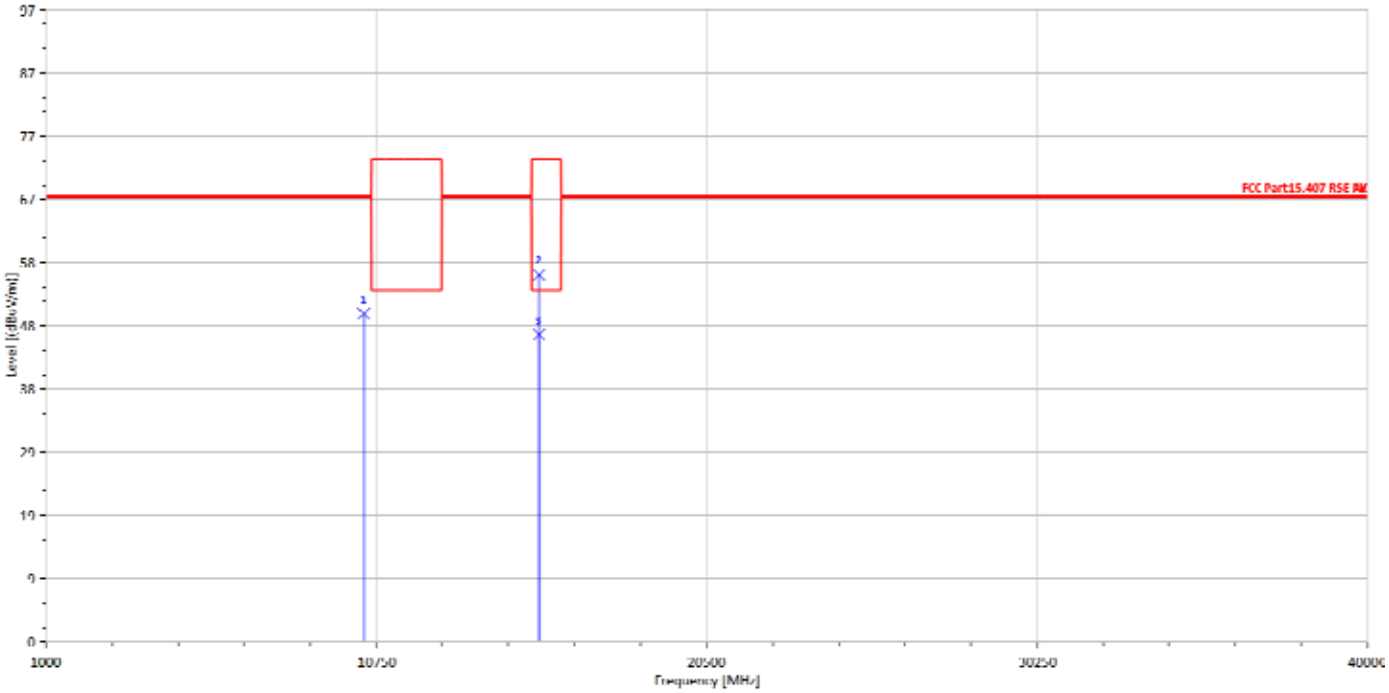
Radiated Spurious Emission Measurement Result
802.11n HT40, 5150~5250 MHz

Operation Mode :	802.11n40	Test Date :	2015/11/11
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10380.00	H	Peak	31.36	19.01	50.37	68.3	-17.93
15570.00	H	Peak	30.45	25.80	56.26	74	-17.74
15570.00	H	Average	21.33	25.80	47.13	54	-6.87

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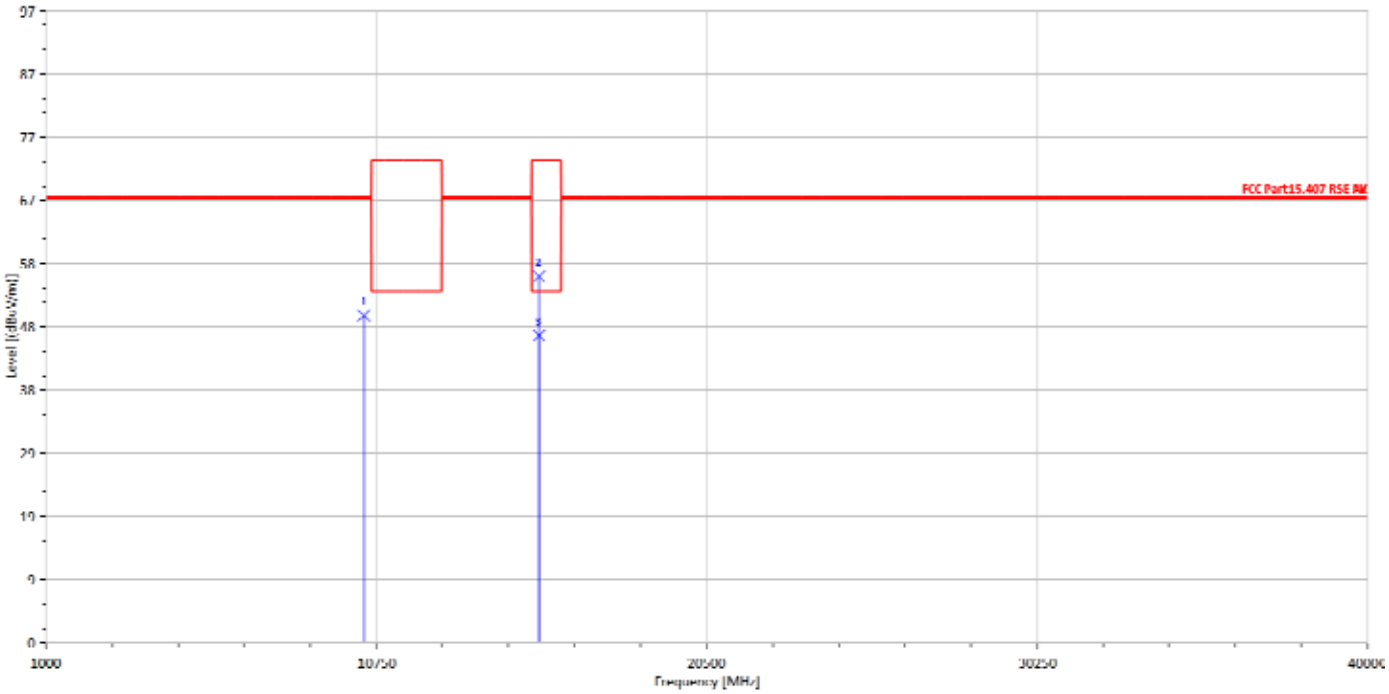
Operation Mode :	802.11n40	Test Date :	2015/11/11
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10380.00	H	Peak	31.24	19.01	50.25	68.3	-18.05
15570.00	H	Peak	30.36	25.80	56.16	74	-17.84
15570.00	H	Average	21.34	25.80	47.14	54	-6.86

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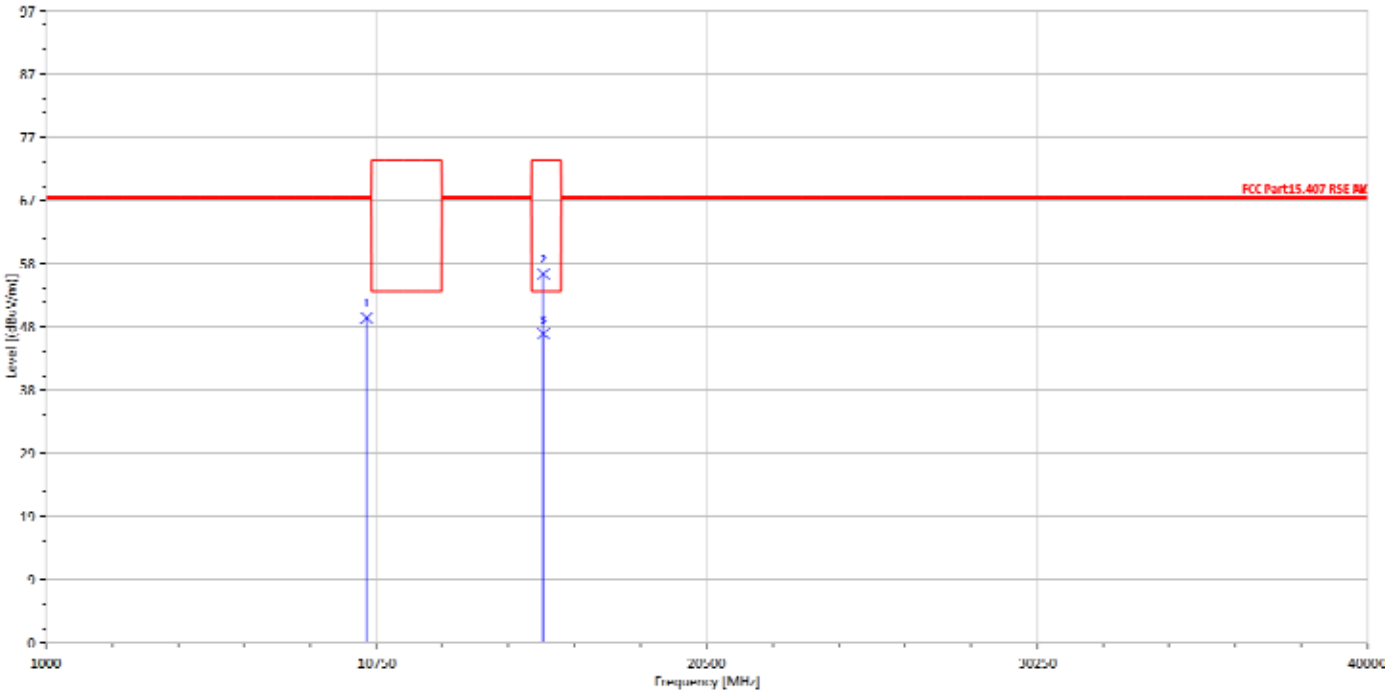
Operation Mode :	802.11n40	Test Date :	2015/11/11
Fundamental Frequency :	5230 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10460.00	H	Peak	30.76	19.11	49.88	68.3	-18.42
15690.00	H	Peak	30.49	26.05	56.53	74	-17.47
15690.00	H	Average	21.38	26.05	47.43	54	-6.57

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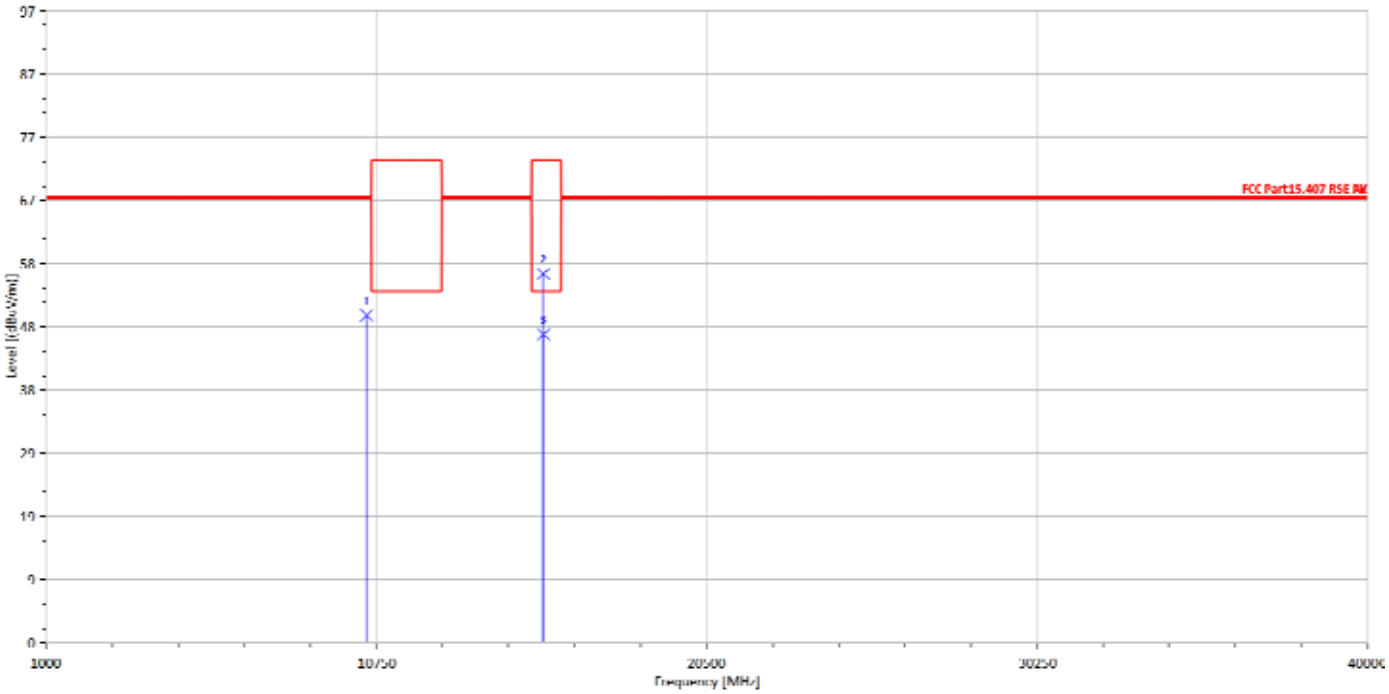
Operation Mode :	802.11n40	Test Date :	2015/11/11
Fundamental Frequency :	5230 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10460.00	H	Peak	31.17	19.11	50.28	68.3	-18.02
15690.00	H	Peak	30.53	26.05	56.57	74	-17.43
15690.00	H	Average	21.27	26.05	47.32	54	-6.68

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Band edge falling to restricted band

Operation Mode :	802.11n40	Test Date :	2015/11/10
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	E	Peak	56.68	11.14	67.82	74	-6.18
5150.00	E	Average	41.45	11.14	52.59	54	-1.41

Operation Mode :	802.11n40	Test Date :	2015/11/10
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	E	Peak	43.88	11.14	55.02	74	-18.98
5150.00	E	Average	32.42	11.14	43.56	54	-10.44

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Operation Mode :	802.11n40	Test Date :	2015/11/10
Fundamental Frequency :	5230 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	45.76	11.30	57.06	74	-16.94
5350.00	E	Average	33.15	11.30	44.45	54	-9.55

Operation Mode :	802.11n40	Test Date :	2015/11/10
Fundamental Frequency :	5230 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	43.00	11.30	54.30	74	-19.70
5350.00	E	Average	32.12	11.30	43.42	54	-10.58

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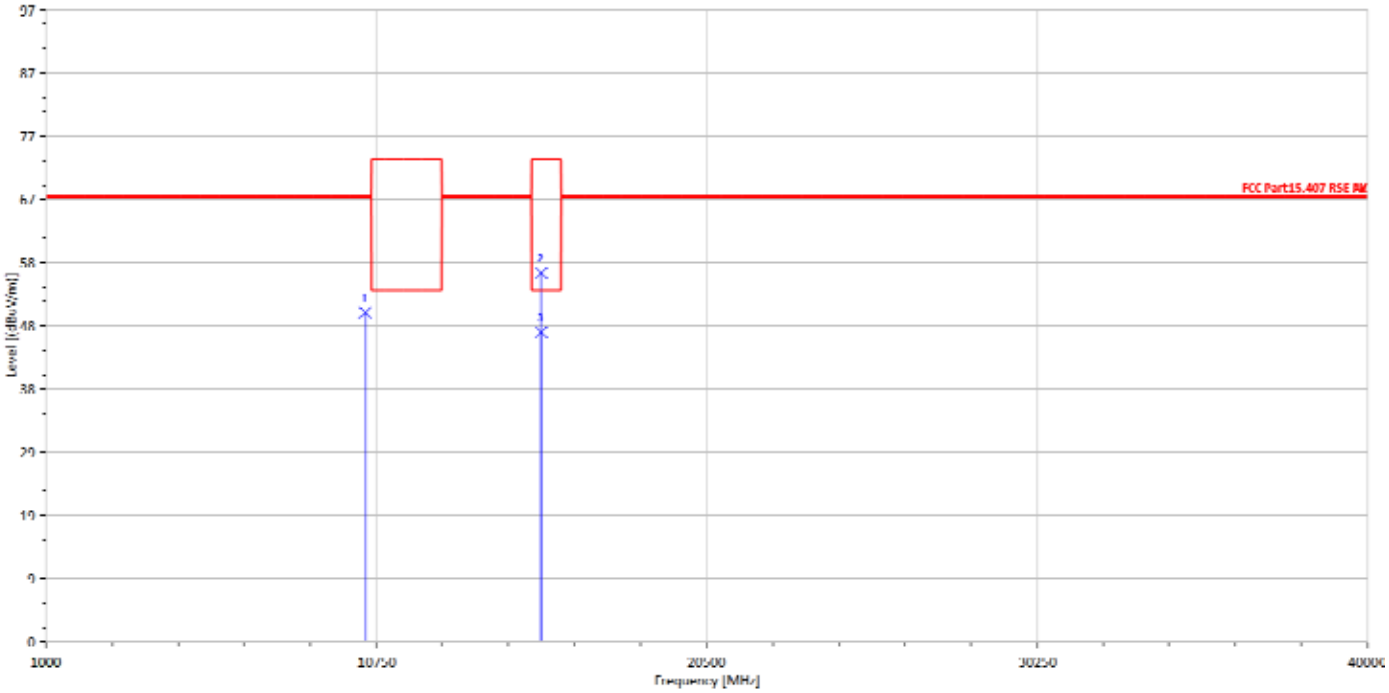
Radiated Spurious Emission Measurement Result
802.11ac VHT80, 5150~5250 MHz

Operation Mode :	802.11ac80	Test Date :	2015/11/11
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10420.00	H	Peak	31.58	18.96	50.54	68.3	-17.76
15630.00	H	Peak	30.57	25.97	56.54	74	-17.46
15630.00	H	Average	21.53	25.97	47.50	54	-6.50

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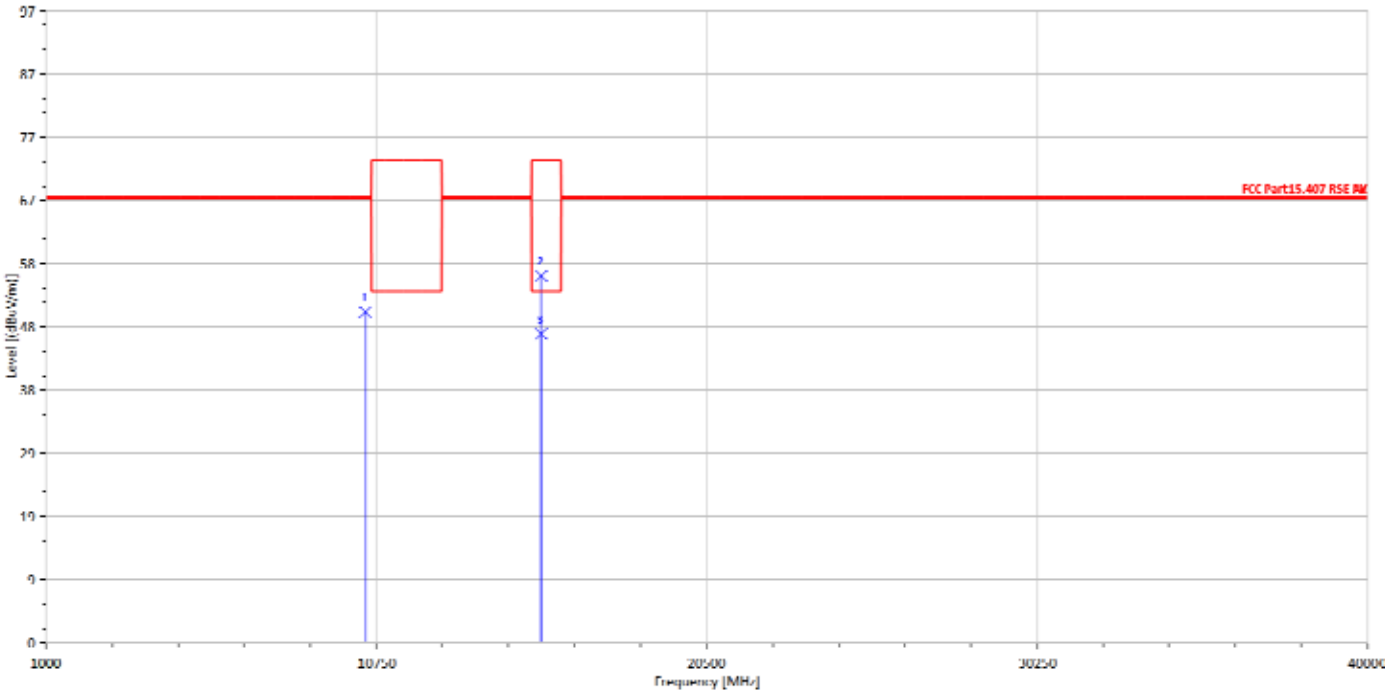
Operation Mode :	802.11ac80	Test Date :	2015/11/11
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10420.00	H	Peak	31.83	18.96	50.79	68.3	-17.51
15630.00	H	Peak	30.28	25.97	56.25	74	-17.75
15630.00	H	Average	21.43	25.97	47.40	54	-6.60

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Band edge falling to restricted band

Operation Mode :	802.11ac80	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5130.10	S	Peak	57.24	11.23	68.47	74	-5.53
5130.10	S	Average	39.34	11.23	50.57	54	-3.43
5150.00	E	Peak	54.96	11.14	66.10	74	-7.90
5150.00	E	Average	41.33	11.14	52.47	54	-1.53

Operation Mode :	802.11ac80	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5146.40	S	Peak	45.11	11.16	56.26	74	-17.74
5146.40	S	Average	32.28	11.16	43.44	54	-10.56
5150.00	E	Peak	43.10	11.14	54.24	74	-19.76
5150.00	E	Average	32.20	11.14	43.34	54	-10.66

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Operation Mode :	802.11ac80	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	46.07	11.30	57.37	74	-16.63
5350.00	E	Average	33.42	11.30	44.72	54	-9.28

Operation Mode :	802.11ac80	Test Date :	2015/11/10
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	23.9 deg_C/ 62 RH
Operation Band :	BE CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	E	Peak	42.90	11.30	54.20	74	-19.80
5350.00	E	Average	32.18	11.30	43.48	54	-10.52

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12. TRANSMISSION IN THE ABSENCE OF DATA

12.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

12.2 Result

No non-compliance noted:

Refer to the theory of operation.

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13. FREQUENCY STABILITY

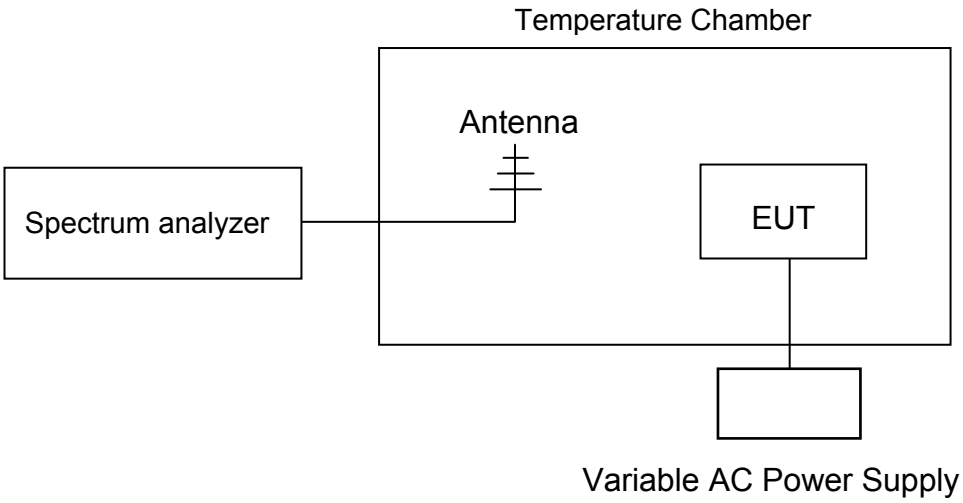
13.1 Standard Applicable

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

13.2 Measurement Procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

13.3 Test SET-UP



13.4 Measurement Equipment Used

Please refer to section 8.3 for the plot.

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13.5 Measurement Result

Operation Mode	802.11 a	Test Date	2015.11.13
Temperature	:17		

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Operation Mode	802.11 n_HT40	Test Date	2015.11.13
Temperature	:17		

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14. ANTENNA REQUIREMENT

14.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

According to §15.407, If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

14.2 Antenna Connected Construction

A dipole antenna design is used.

The antenna is designed with permanent attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

~ End of Report ~

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