

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

Product Name: DOBBY
Brand Name: ZEROTECH
Model No.: DB16-100B
Model Difference: N/A
FCC ID: 2AHCT-DB16-100B
Report No.: E2/2016/50113
Issue Date: Jul. 08, 2016
FCC Rule Part: §15.407
Prepared for: ZEROTECH (Beijing) Intelligence Technology Co., Ltd.
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VERIFICATION OF COMPLIANCE

Applicant: ZEROTECH (Beijing) Intelligence Technology Co., Ltd.
Floor 2-203 , Building No. 9, Zhongguancun Software Park,
Haidian District, Beijing, China

Product Name: DOBBY

Brand Name: ZEROTECH

Model No.: DB16-100B

Model Difference: N/A

FCC ID: 2AHCT-DB16-100B

File Number: E2/2016/50113

Date of Test: May. 30, 2016 ~ Jul. 01, 2016

Date of EUT Received: May. 30, 2016

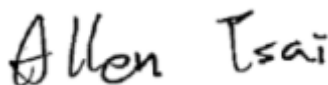
We hereby certify that:

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:**Date:**

Jul. 08, 2016

Jerry Lu / Sr.Engineer**Prepared By:****Date:**

Jul. 08, 2016

Allen Tsai / Engineer**Approved By:****Date:**

Jul. 08, 2016

Jim Chang / Asst. Manager

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Revision History

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E2/2016/50113	Rev.00	Initial creation of document	Jul. 08, 2016

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1. GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	DOBBY	
Brand Name:	ZEROTECH	
Model No.:	DB16-100B	
Model Difference:	N/A	
Product SW version:	N/A	
Radio HW version:	N/A	
DOBBY CHARGER	Model No.: DBC15Q Supplier: ZEROTECH	
Power Supply:	7.6VDC from Rechargeable Battery and 5VDC, 9VDC, 12VDC from adapter.	
	Battery:	Model No.: D150 Supplier: Sunwoda Electronic Co.,Ltd.
	Adapter:	Model No.: DBS15Q Supplier: SHENZHEN DISHENGHUI ELECTRONICS CO.,LTD

WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology
11a	5725-5850	5	11.98 dBm	OFDM
11n_20M	HT20 5725-5850	5	HT: 10.87 dBm	OFDM
11n_40M	HT40 5725-5850	2	HT:9.95 dBm	OFDM

Antenna Designation	UAV Antenna PartI No.: 146153, Supplier: BEIJING VLG WIRELESS TECHNOLOGY CO.,LTD. Antenna (Main) 5GHz Gain: 3.97dBi (5725MHz-5850MHz) Antenna (Aux1) 5GHz Gain: 3.97dBi (5725MHz-5850MHz)
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_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps

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1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting below features.

Product Feature	
Wi-Fi Specification	802.11a/b/g/n/ac

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules

FCC KDB 662911 D01 Multiple Transmitter Output

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.

1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803. (TAF code 0513)

FCC Registration Numbers are: 735305

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 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 placed on a 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 30 MHz. 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 placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. 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 3.8dB, and 10dB attenuator. MIMO mode offset

$$= \text{RF cable loss (dB)} + \text{attenuation factor (dB)} + 10 \log(N_{\text{ANT}}) \text{ dB} = 13.8(\text{dB})$$

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2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

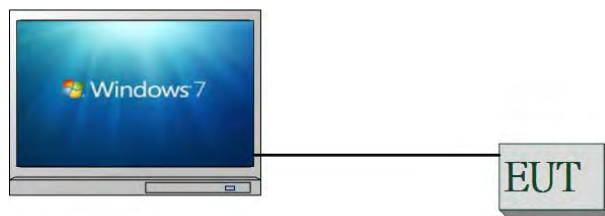


Fig. 2-2 Conducted (Antenna Port) Emission Configuration

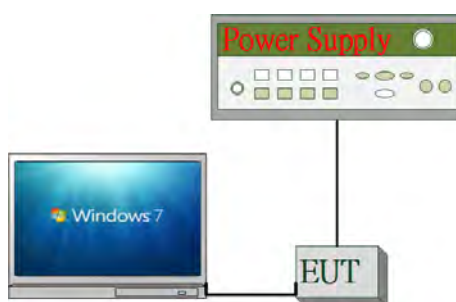


Table 2-1 Equipment Used in Tested System

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.	Notebook	Lenovo	L430	R9-YYG88	N/A	Un-shielded
3.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Un-shielded

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3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	N/A
§15.403(i) §15.407(e)	26 dB & 6dB & 99% 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

4. DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5725 MHz ~5850 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode		802.11 n HT40 Mode, 802.11ac VHT40 Mode	
Channel	Frequency	channel	Frequency
149	5745	151	5755
153	5765	159	5795
157	5785		
161	5805		
165	5825		

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.

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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	5785	149 to 165	157	OFDM	6	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	MIMO
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO

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 E2 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	5745~5825	149 to 165	149,157,165	OFDM	6	MIMO
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB 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)	9kHz-30MHz: +/-2.87dB
	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)	9kHz-30MHz: +/-2.87dB
	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	12/08/2015	12/07/2016
Coaxial Cables	N/A	N30N30-1042-1 50cm	N/A	02/07/2016	02/06/2017
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017
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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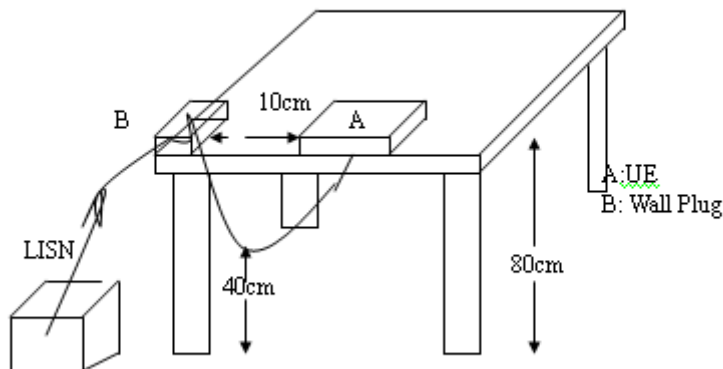
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6.4. Test SET-UP



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

N/A, The device is powered by battery.

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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:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

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	98.57	0.06
802.11n_20	86.50	0.63
802.11n_40	78.60	1.05

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DUTY CYCLE TEST SIGNAL Measurement Result 802.11a



802.11n HT20



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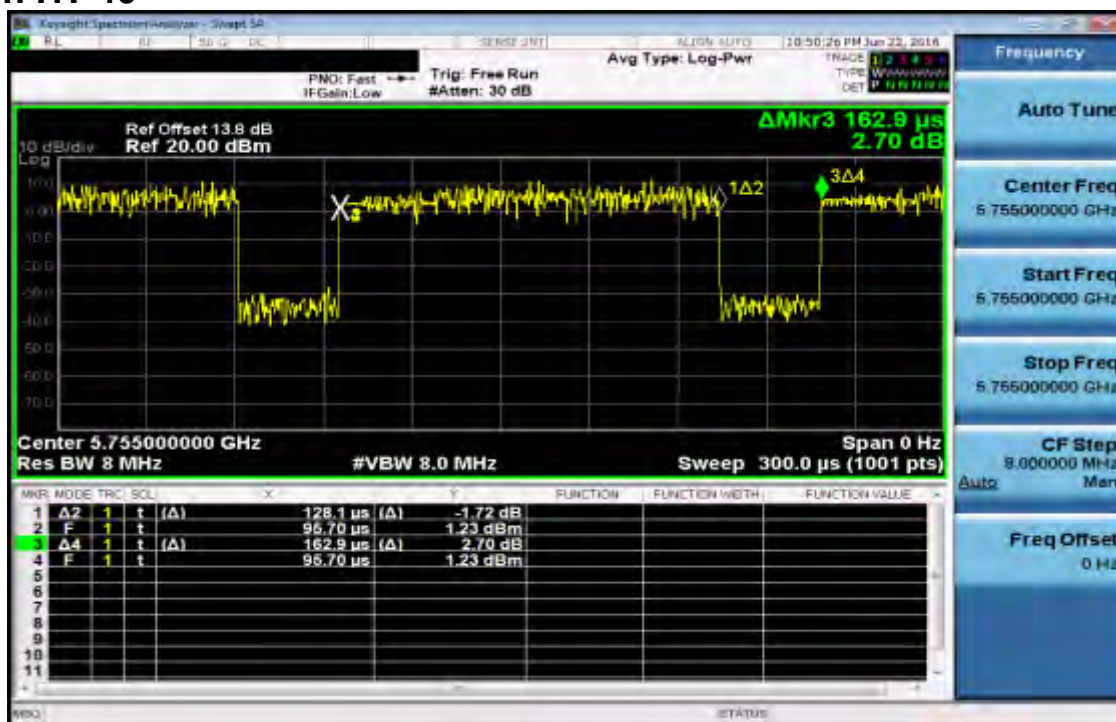
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802.11n HT 40



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8. 26dB & 6dB 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.
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

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNAK	PE8210	RF29	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016

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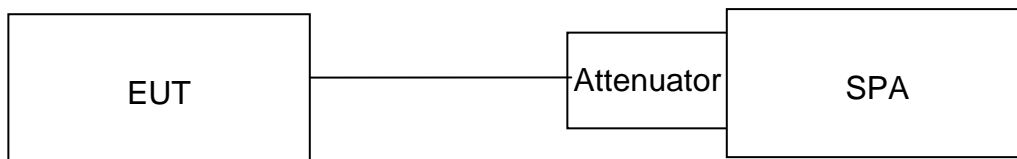
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8.4 Test Set-up



8.5 Measurement Result

26dB and 6dB Bandwidth

802.11a_Main

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	16.11	12.071
5785	16.38	12.142
5825	16.38	12.142

802.11a_Aux1

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	16.35	12.134
5785	16.28	12.117
5825	15.49	11.901

802.11n_HT20_Main

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	16.39	12.146
5785	16.95	12.291
5825	16.78	12.247

802.11n_HT20_Aux1

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.07	12.322
5785	16.93	12.286
5825	16.93	12.288

802.11n_HT40_Main

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	35.74	15.532
5795	35.46	15.497

802.11n_HT40_Aux1

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	35.44	15.494
5795	35.73	15.531

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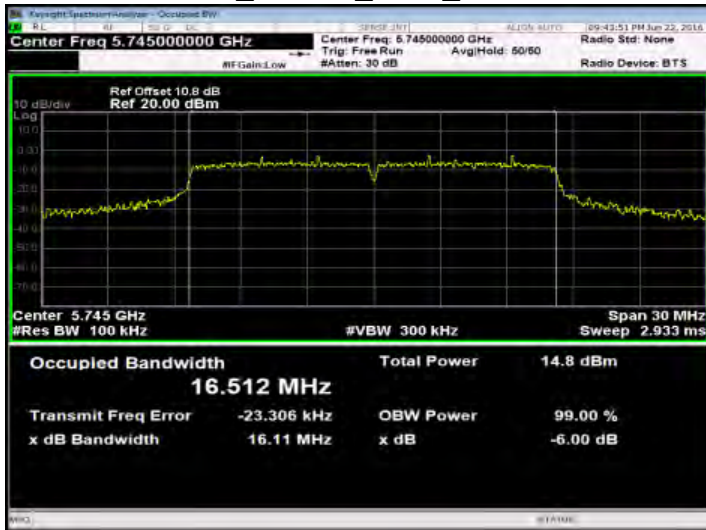
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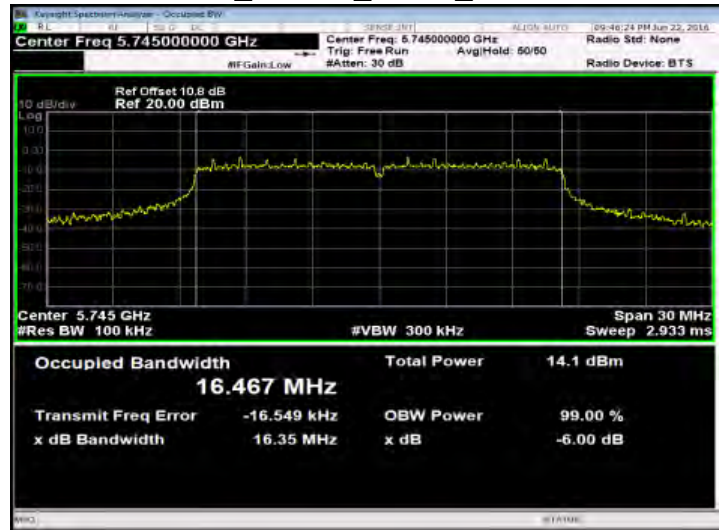
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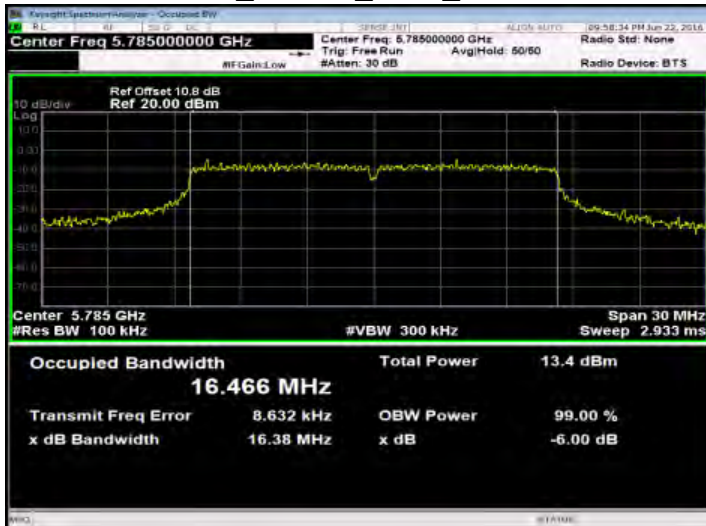
802.11a_20MHz_Main_5745MHz



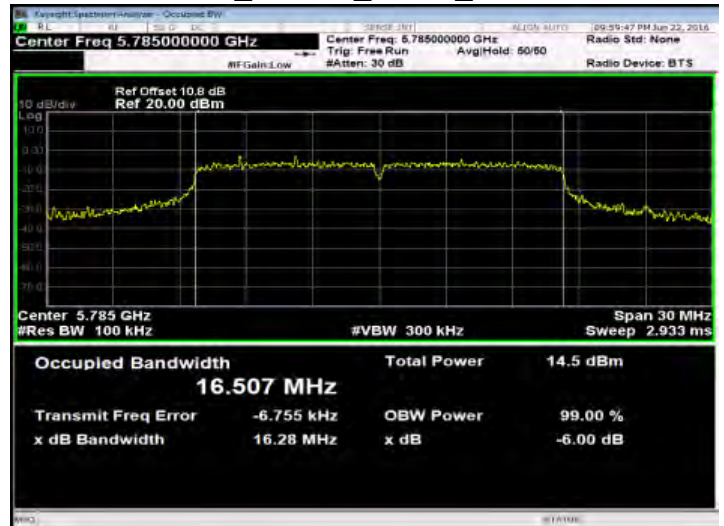
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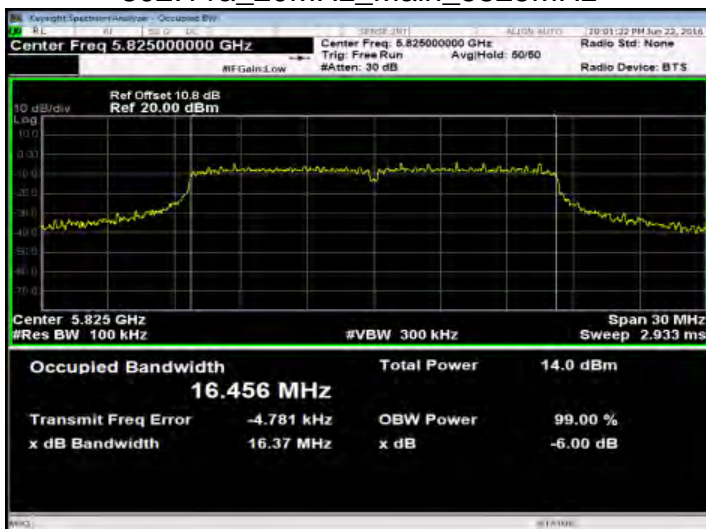
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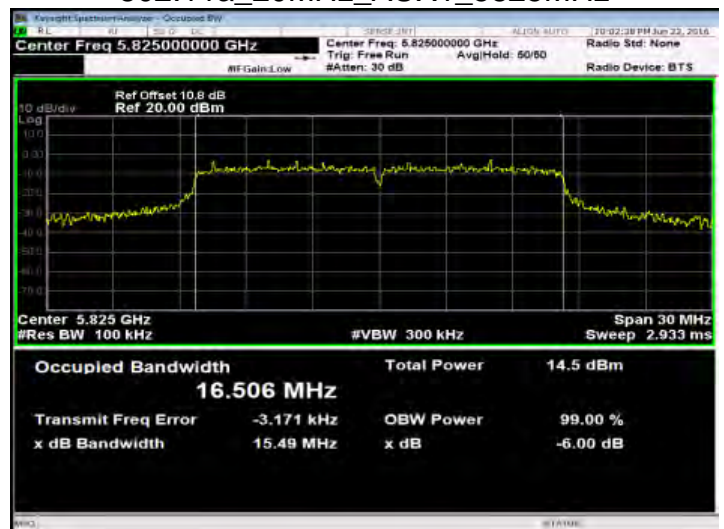
802.11a_20MHz_AUX1_5785MHz



802.11a_20MHz_Main_5825MHz



802.11a_20MHz_AUX1_5825MHz

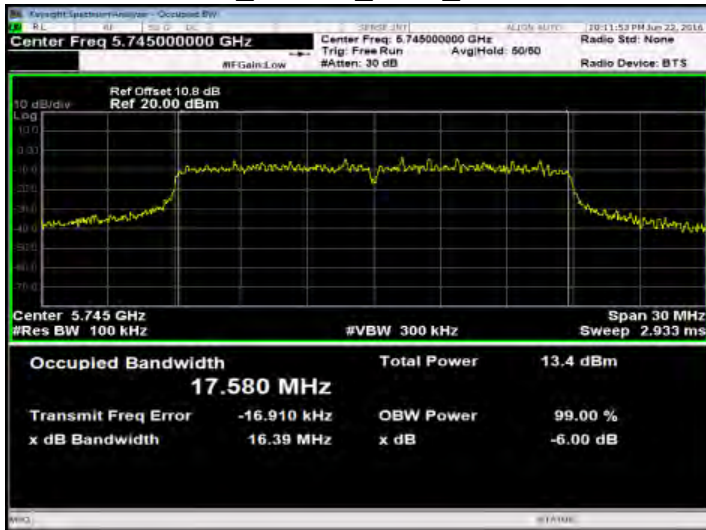


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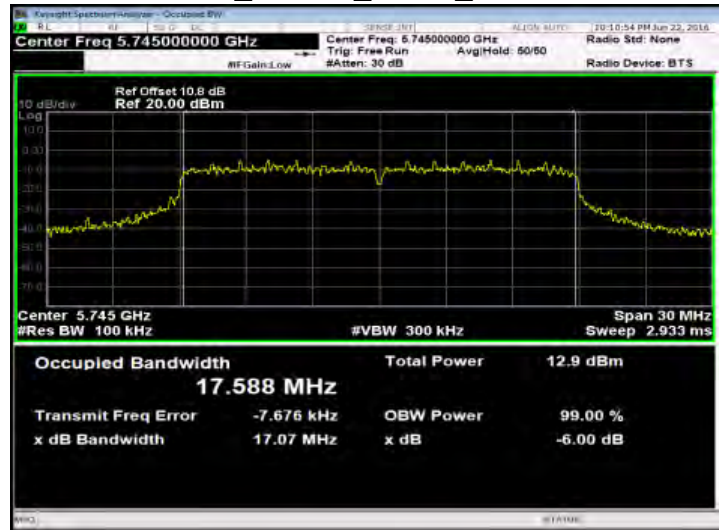
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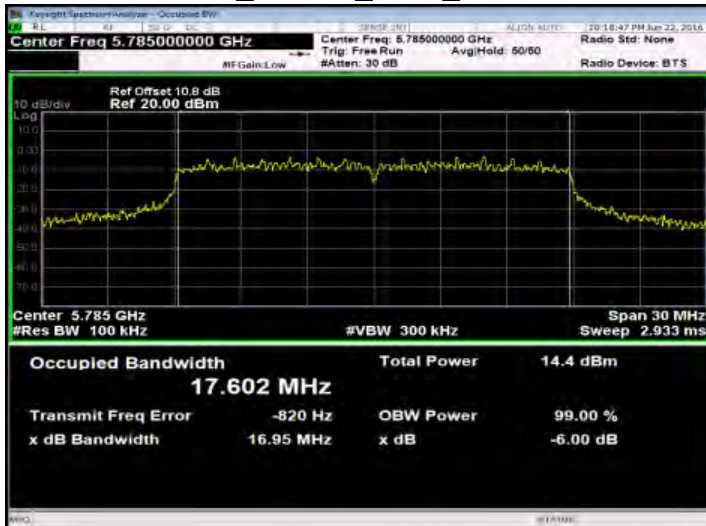
802.11n_20MHz_Main_5745MHz



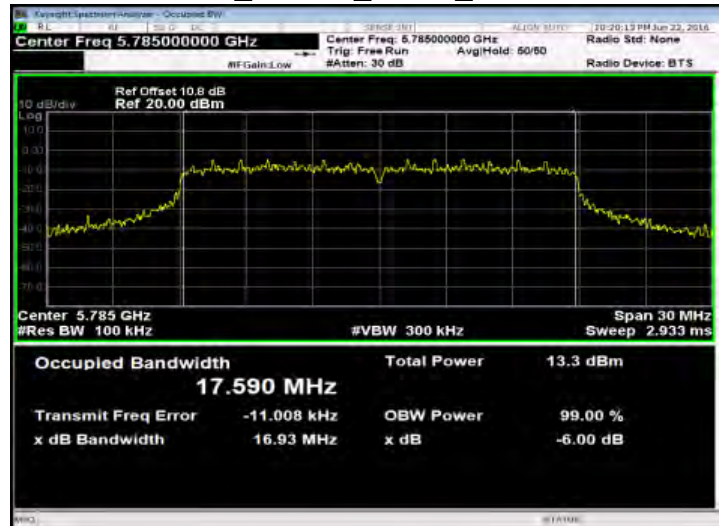
802.11n_20MHz_AUX1_5745MHz



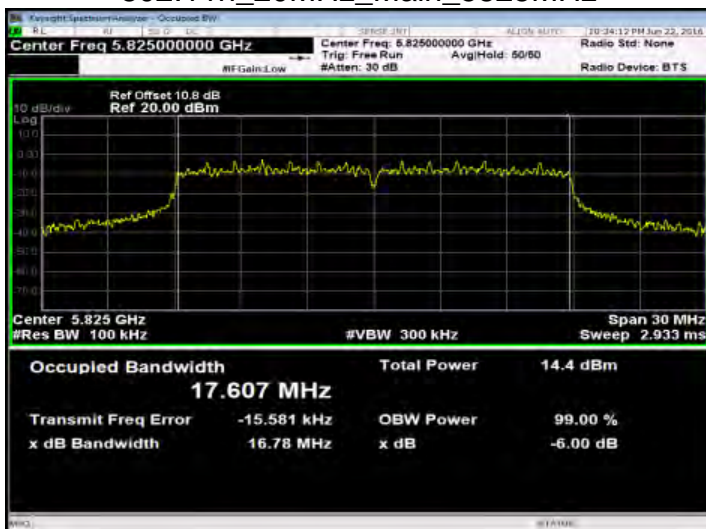
802.11n_20MHz_Main_5785MHz



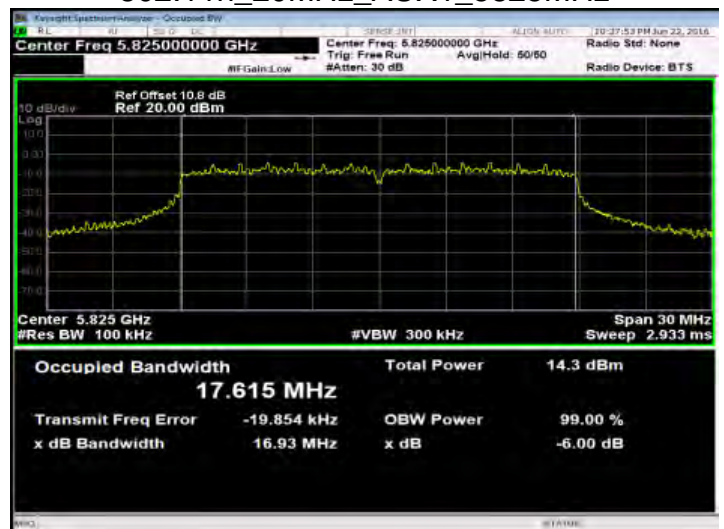
802.11n_20MHz_AUX1_5785MHz



802.11n_20MHz_Main_5825MHz



802.11n_20MHz_AUX1_5825MHz

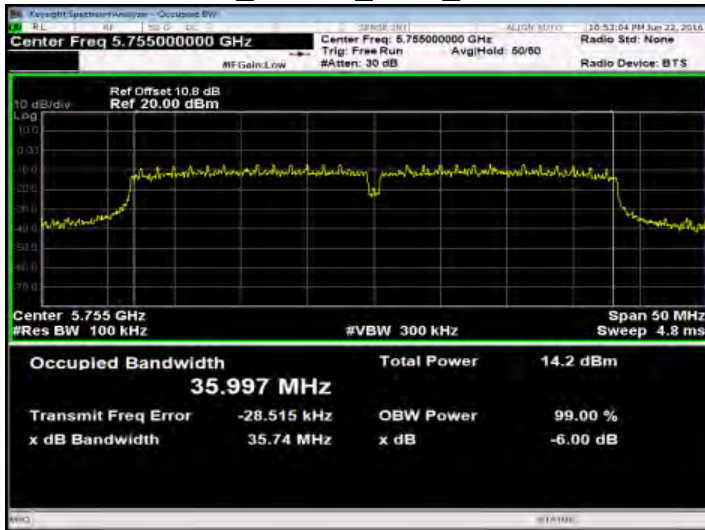


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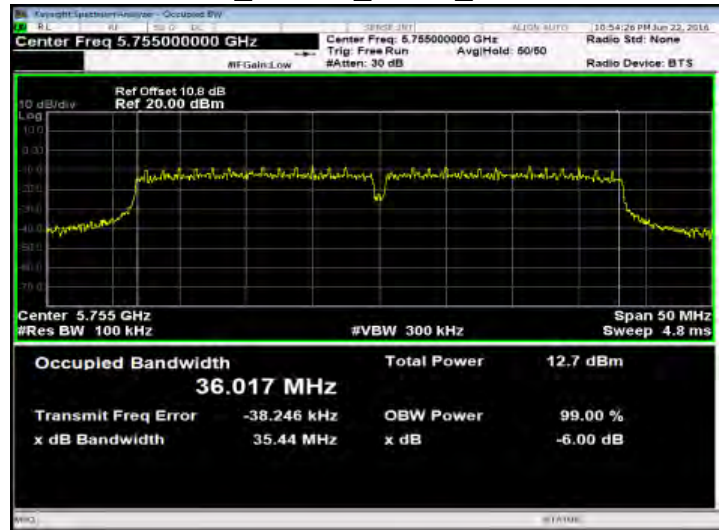
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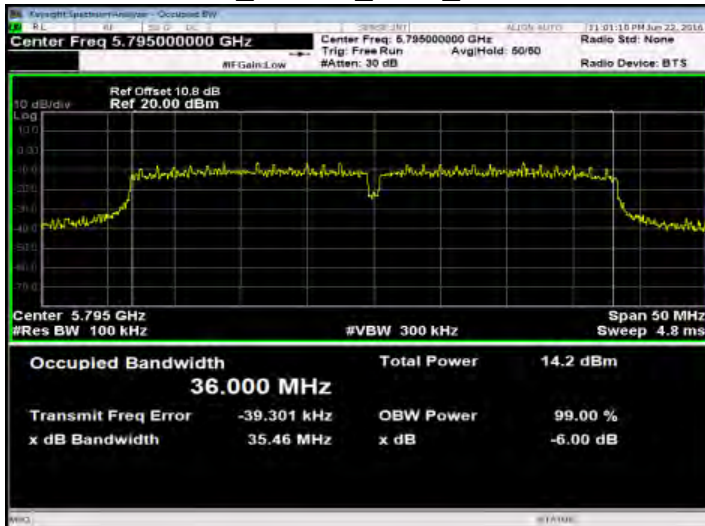
802.11n_40MHz_Main_5755MHz



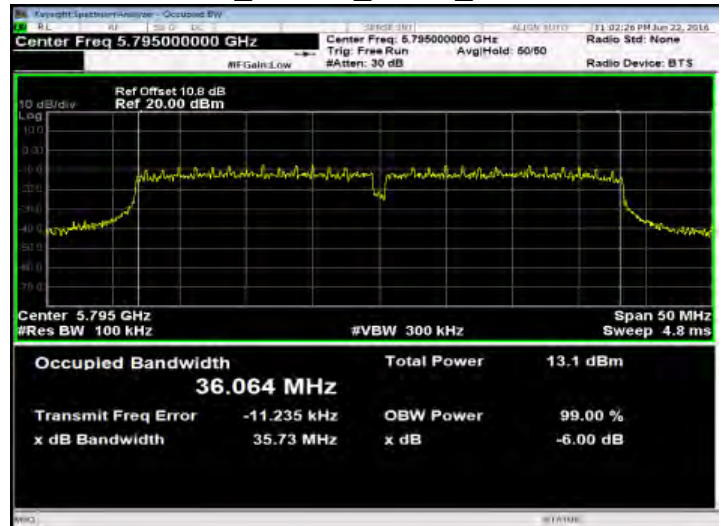
802.11n_40MHz_AUX1_5755MHz



802.11n_40MHz_Main_5795MHz



802.11n_40MHz_AUX1_5795MHz



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9. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Mater device)	1 Watt(30dBm)
		Fixed point-to-point Acess Ponit	1 Watt(30dBm)
	✓	Mobile and portable clinet device	250mW(23.98dBm)
U-NII-2A	✓		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C	✓		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3	✓		1 Watt(30dBm)

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
U-NII-3	$3.97+3.01=6.98\text{dBi}$	$30\text{ dBm} - (6.98 - 6\text{ dBi}) = 29.02\text{dBm}$

Therefore the limit needs to reduce for U-NII-3 band.

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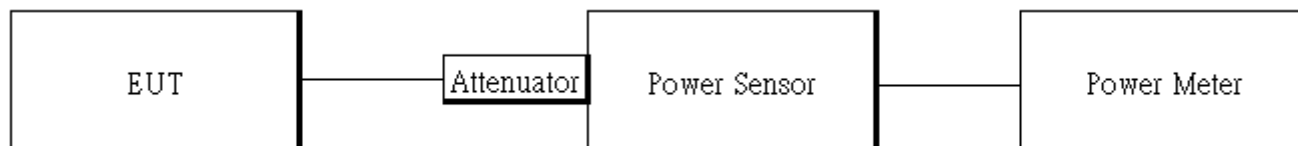
9.2 Measurement Procedure

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 .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add $10 \log(1/\text{duty cycle})$.
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

9.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
DC Block	PASTERNAK	PE8210	RF29	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017

9.4 Test Set-up



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9.5 Measurement Result

Conducted output power (FCC)

802.11a_MIMO

CH	Frequency (MHz)	Data Rate	Avg. Power (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	LIMIT (dBm)	RESULT
			CH 0	CH 1				
149	5745	MCS8	9.29	8.6	11.97	15.736	29.02	PASS
157	5785	MCS8	9.26	8.65	11.98	15.762	29.02	PASS
165	5825	MCS8	9.2	8.66	11.95	15.663	29.02	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. Power (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	LIMIT (dBm)	RESULT
			CH 0	CH 1				
149	5745	MCS8	8.14	7.28	10.74	11.862	29.02	PASS
157	5785	MCS8	8.18	7.52	10.87	12.226	29.02	PASS
165	5825	MCS8	8.01	7.49	10.77	11.935	29.02	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. Power (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	LIMIT (dBm)	RESULT
			CH 0	CH 1				
151	5755	MCS8	7.34	6.14	9.79	9.532	29.02	PASS
159	5795	MCS8	7.25	6.61	9.95	9.890	29.02	PASS

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10. PEAK POWER SPECTRAL DENSITY

10.1 Standard Applicable

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1		Access Point (Mater device)	17dBm/ MHz
		Fixed point-to-point Acess Ponit	
	√	Mobile and portable clinet device	11dBm/ MHz
U-NII-2A	√		11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
U-NII-3	$3.97+3.01=6.98\text{dBi}$	$30\text{ dBm} - (6.98 - 6\text{ dBi}) = 29.02\text{dBm}$

Therefore the limit needs to reduce for U-NII-3 band.

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10.2 Measurement Procedure

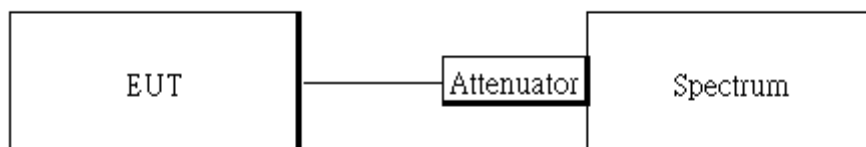
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. **For U-NII1, U-NII-2A, U-NII-2C Band:**
Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
For U-NII-3 Band:
Set RBW=500 kHz, VBW \geq 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
5. Use the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

10.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNAK	PE8210	RF29	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016

10.4 Test Set-up



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10.5 Measurement Result

POWER DENSITY 802.11a MODE			
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5745	4.70	29.02	-24.32
5785	5.40	29.02	-23.62
5825	4.90	29.02	-24.12

POWER DENSITY 802.11n HT20 MODE			
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5745	3.89	29.02	-25.13
5785	5.24	29.02	-23.78
5825	5.07	29.02	-23.95

POWER DENSITY 802.11n HT40 MODE			
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5755	0.99	29.02	-28.03
5795	1.15	29.02	-27.87

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802.11a_20MHz_5745MHz



802.11n_20MHz_5745MHz



802.11a_20MHz_5785MHz



802.11n_20MHz_5785MHz



802.11a_20MHz_5825MHz



802.11n_20MHz_5825MHz



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802.11n_40MHz_5755MHz



802.11n_40MHz_5795MHz



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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 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	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)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

$EIRP = (E \cdot d)^2 / 30$, 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 (dB μ V/m) = 20 log Emission level (dB μ V/m)

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11.2 Measurement Equipment Used

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2015	12/22/2016
Broadband Antenna	TESEQ	CBL 6112D	35240	10/28/2015	10/27/2016
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016
Horn Antenna	Schwarzbeck	BBHA9170	185	07/24/2015	07/23/2016
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2015	12/11/2016
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2015	12/11/2016
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017
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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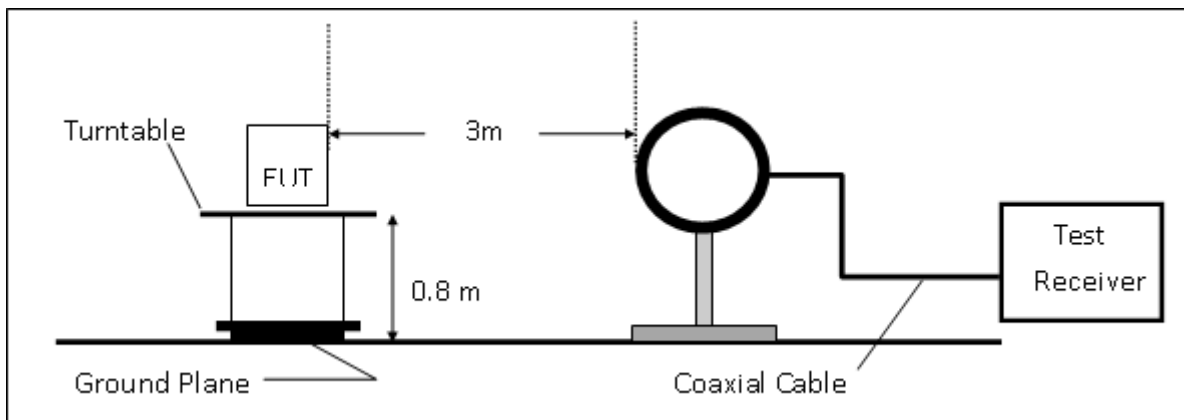
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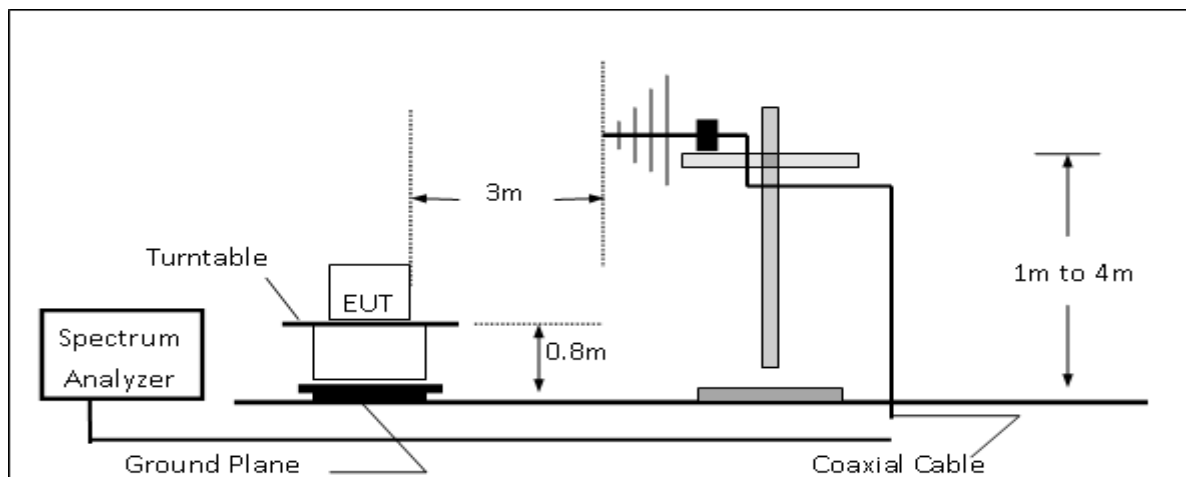
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11.3 Test SET-UP

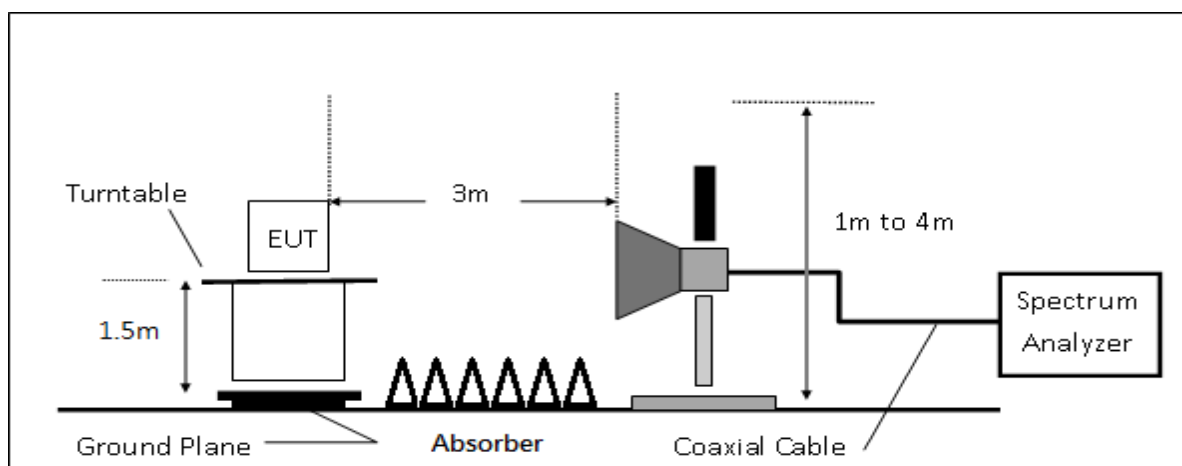
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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 .
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)

Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

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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.

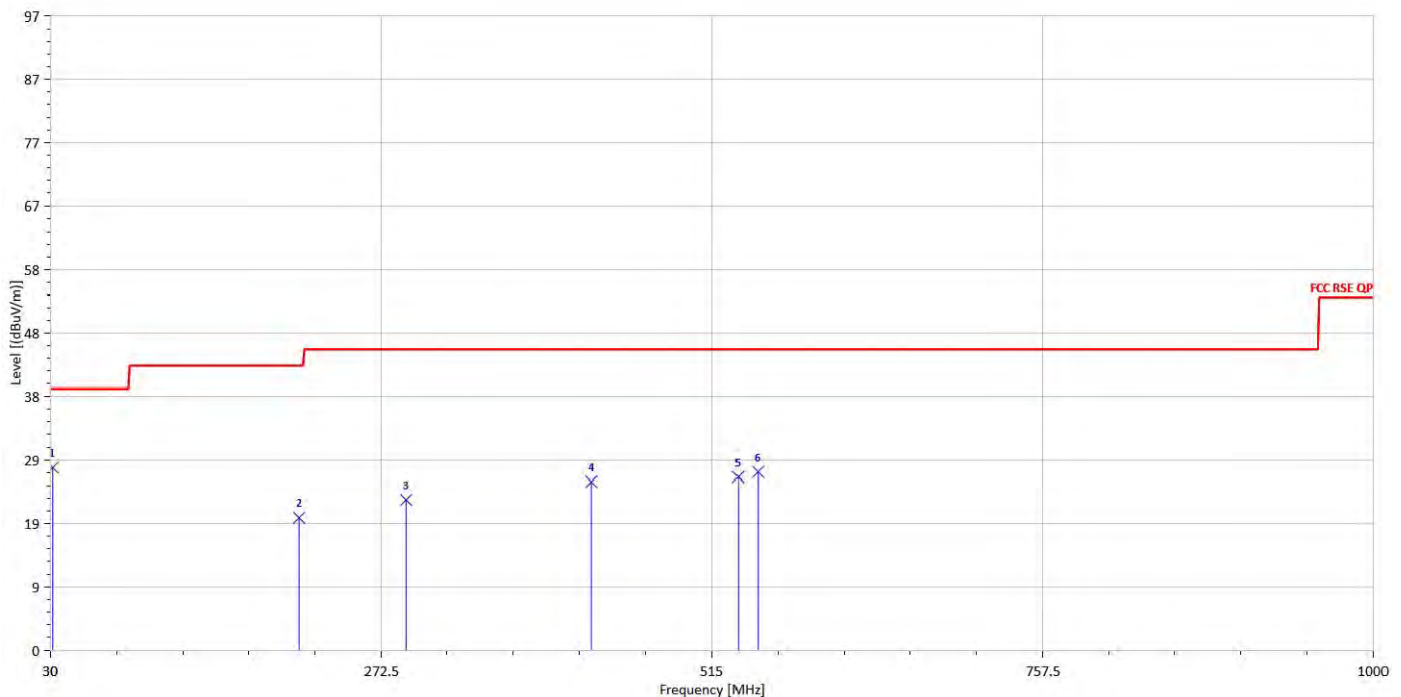
11.7 Measurement Result

Radiated Spurious Emission Measurement Result

Below 1GHz Worst-Case Data:

802.11a, 5725~5850 MHz

Operation Mode :	802.11a	Test Date :	2016/6/22
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	24.3 deg_C/62RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	S	Peak	36.12	-8.22	27.90	40	-12.10
212.36	S	Peak	37.39	-17.11	20.28	43.5	-23.22
290.93	S	Peak	36.32	-13.28	23.04	46	-22.96
426.73	S	Peak	34.91	-9.14	25.77	46	-20.23
534.40	S	Peak	33.83	-7.31	26.51	46	-19.49
548.95	S	Peak	34.50	-7.24	27.25	46	-18.75

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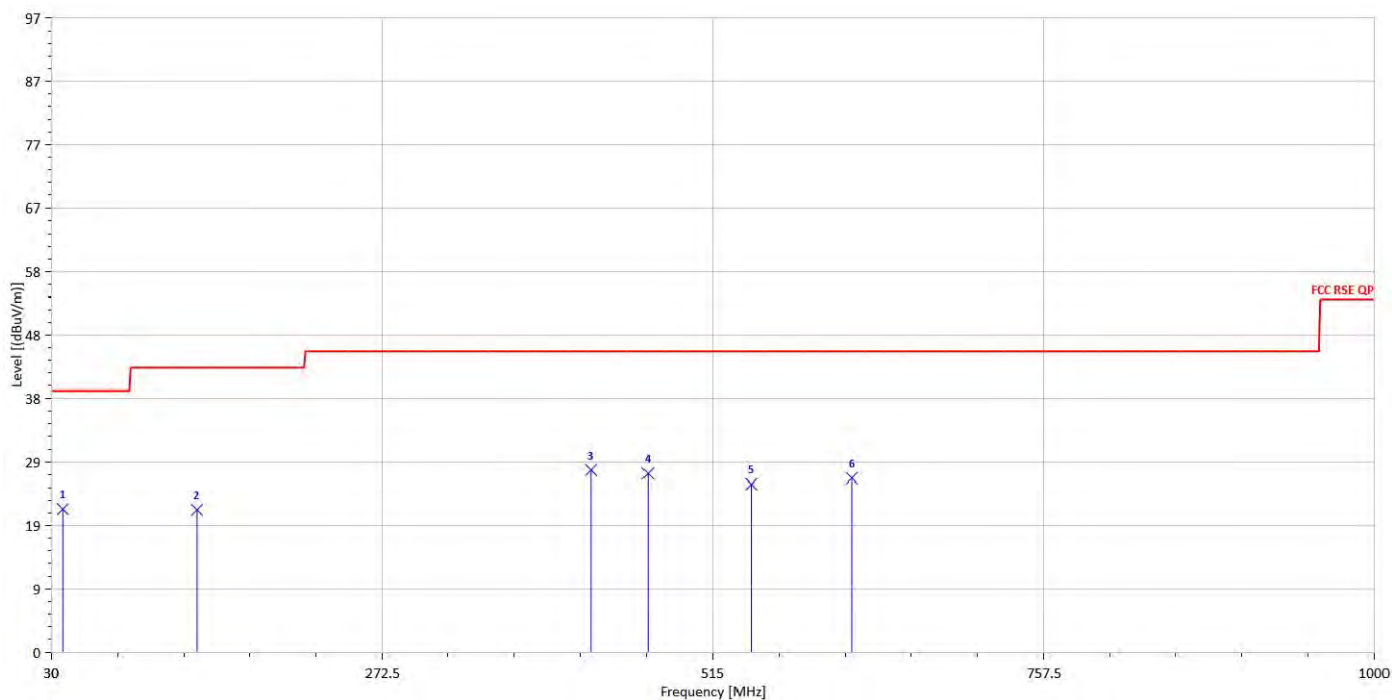
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Operation Mode : 802.11a Test Date : 2016/6/22
 Fundamental Frequency : 5785 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : Tx CH Mid Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
38.73	S	Peak	33.97	-12.04	21.93	40	-18.07
136.70	S	Peak	37.63	-15.82	21.80	43.5	-21.70
425.76	S	Peak	36.90	-9.06	27.84	46	-18.16
467.47	S	Peak	35.05	-7.73	27.32	46	-18.68
543.13	S	Peak	32.92	-7.21	25.71	46	-20.29
616.85	S	Peak	33.21	-6.58	26.63	46	-19.37

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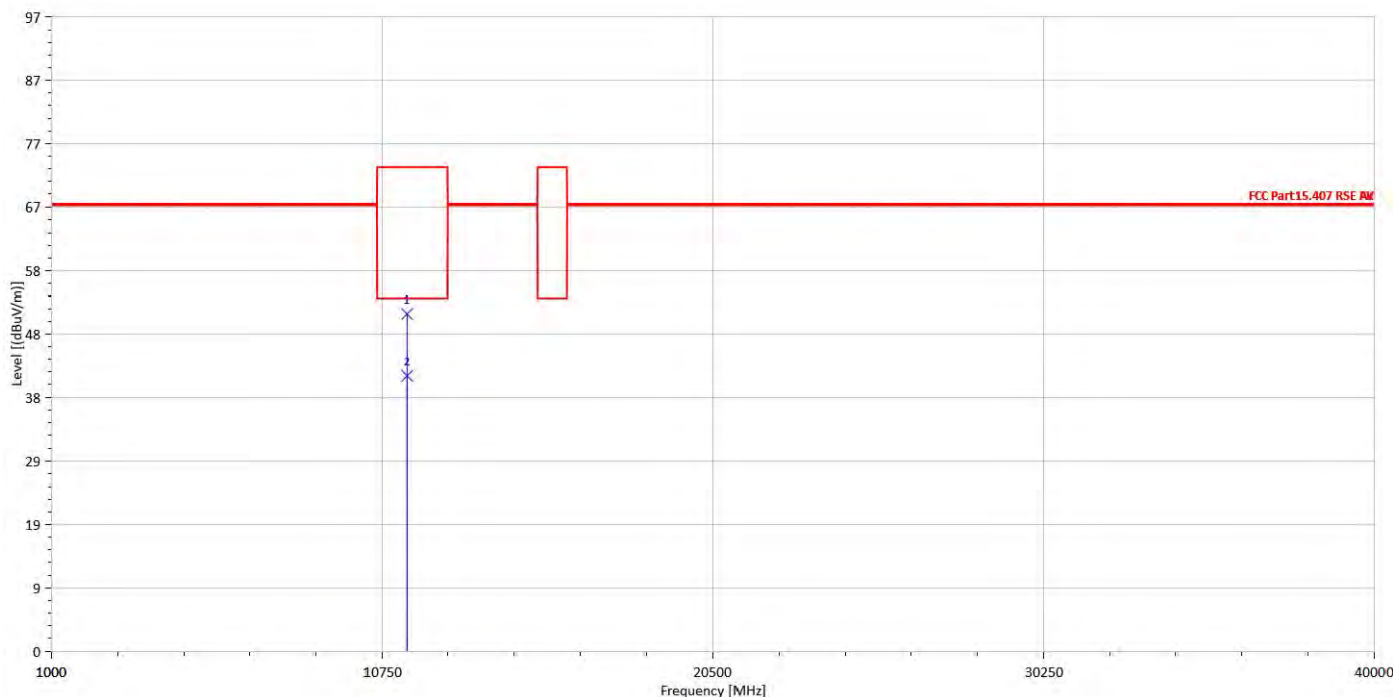
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Above 1GHz Worst-Case Data:

Radiated Spurious Emission Measurement Result 802.11a, 5725~5850 MHz

Operation Mode :	802.11a	Test Date :	2016/6/22
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	24.3 deg_C/62RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11490.00	H	Peak	30.91	20.70	51.62	74	-22.38
11490.00	H	Average	21.37	20.70	42.07	54	-11.93

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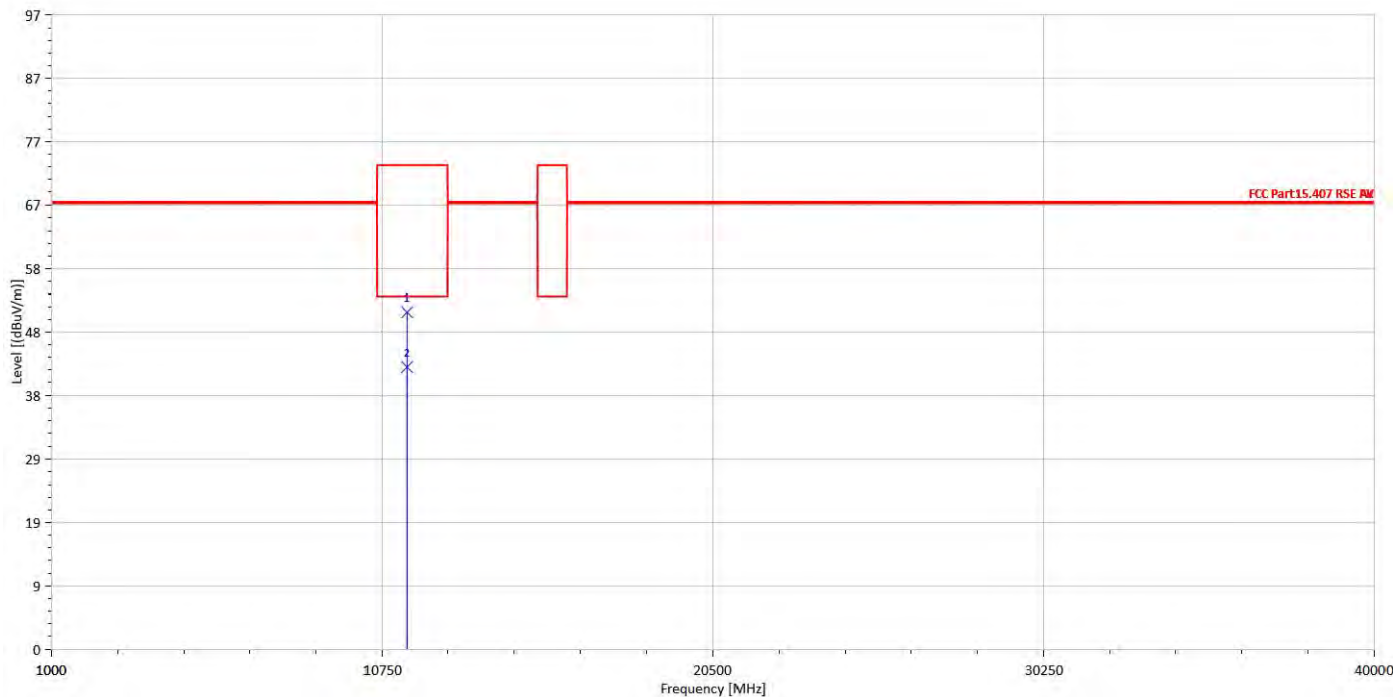
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Operation Mode : 802.11a Test Date : 2016/6/22
Fundamental Frequency : 5745 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Low Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @ 3m dBμV/m	Margin dB
11490.00	H	Peak	30.87	20.70	51.57	74	-22.43
11490.00	H	Average	22.41	20.70	43.11	54	-10.89

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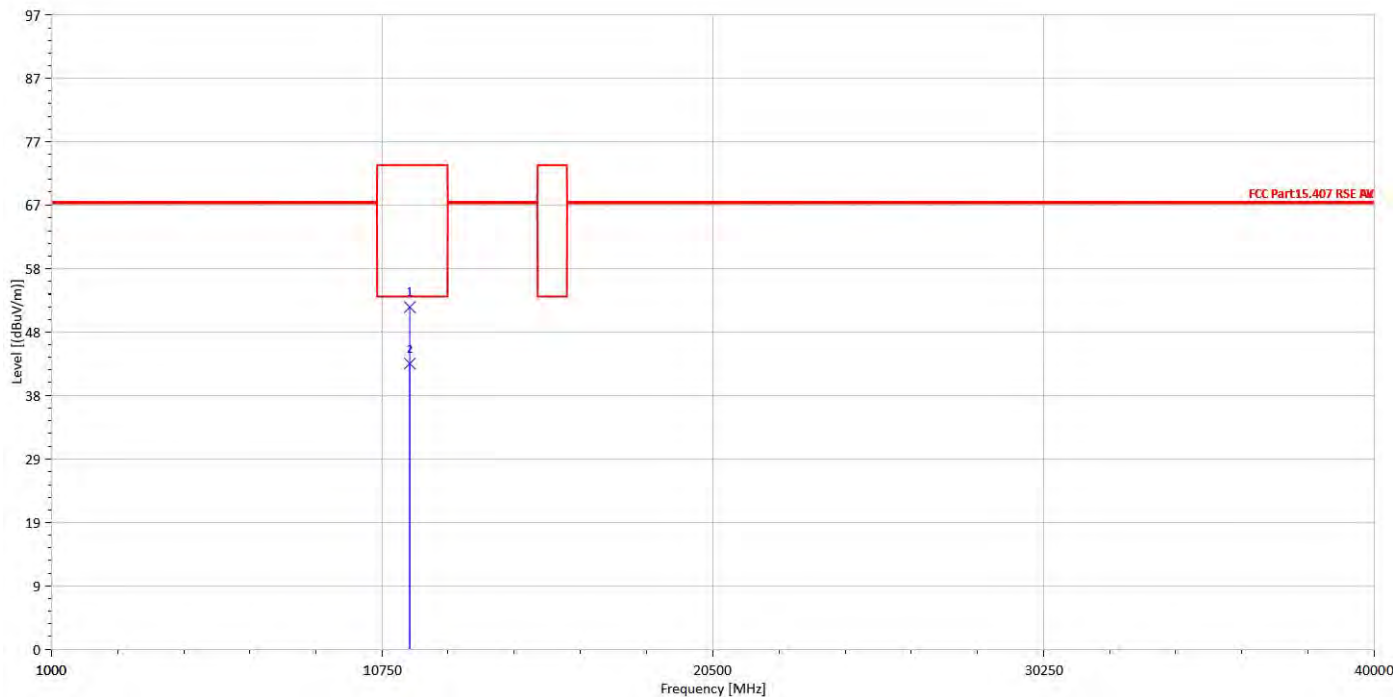
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Operation Mode : 802.11a Test Date : 2016/6/22
Fundamental Frequency : 5785 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Mid Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11570.00	H	Peak	30.92	21.44	52.36	74	-21.64
11570.00	H	Average	22.21	21.44	43.65	54	-10.35

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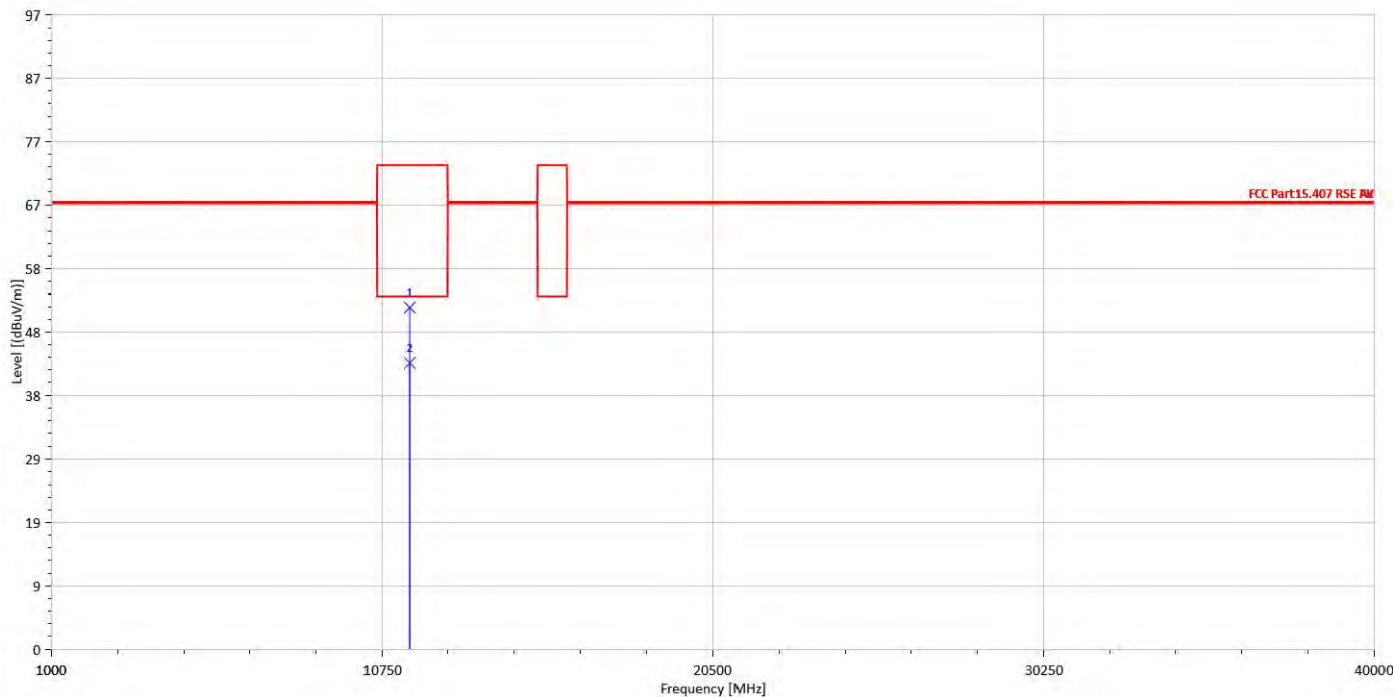
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Operation Mode : 802.11a Test Date : 2016/6/22
Fundamental Frequency : 5785 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Mid Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11570.00	H	Peak	30.85	21.44	52.30	74	-21.70
11570.00	H	Average	22.31	21.44	43.75	54	-10.25

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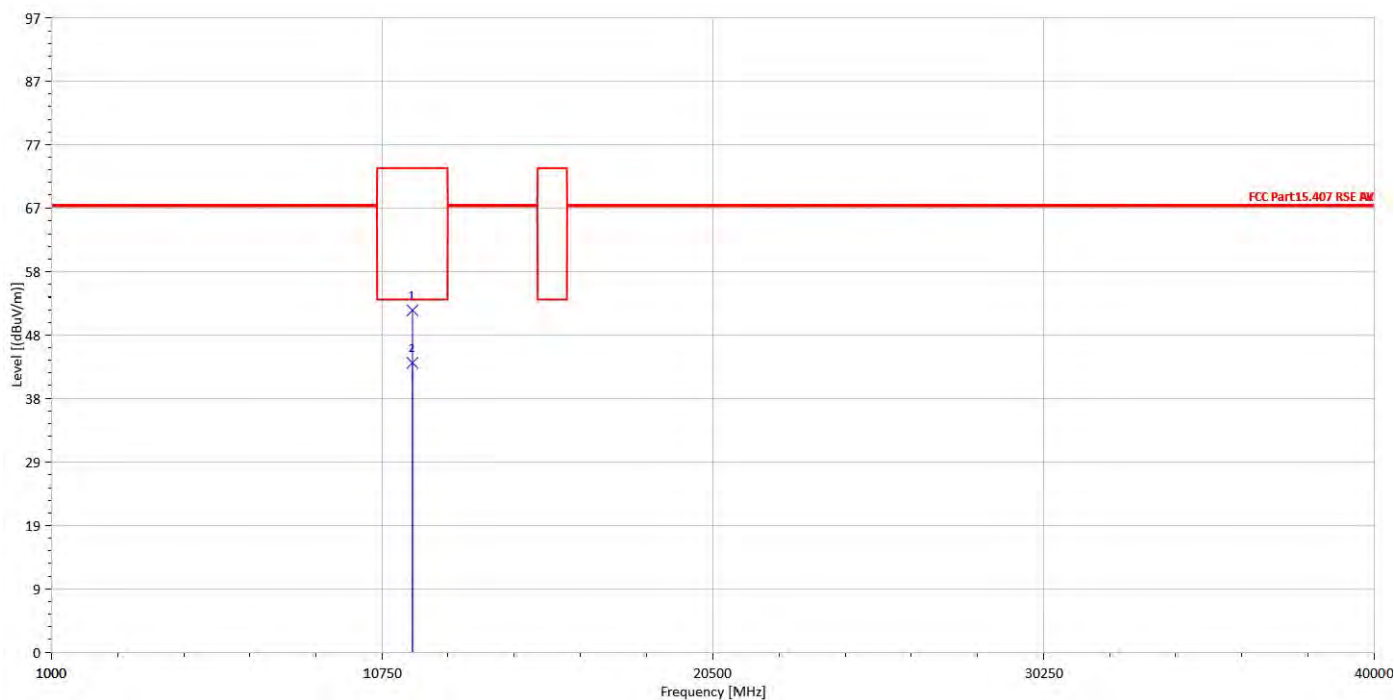
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Operation Mode :	802.11a	Test Date :	2016/6/22
Fundamental Frequency :	5825 MHz	Temp. / Humi. :	24.3 deg_C/62RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11650.00	H	Peak	30.32	22.02	52.34	74	-21.66
11650.00	H	Average	22.21	22.02	44.23	54	-9.77

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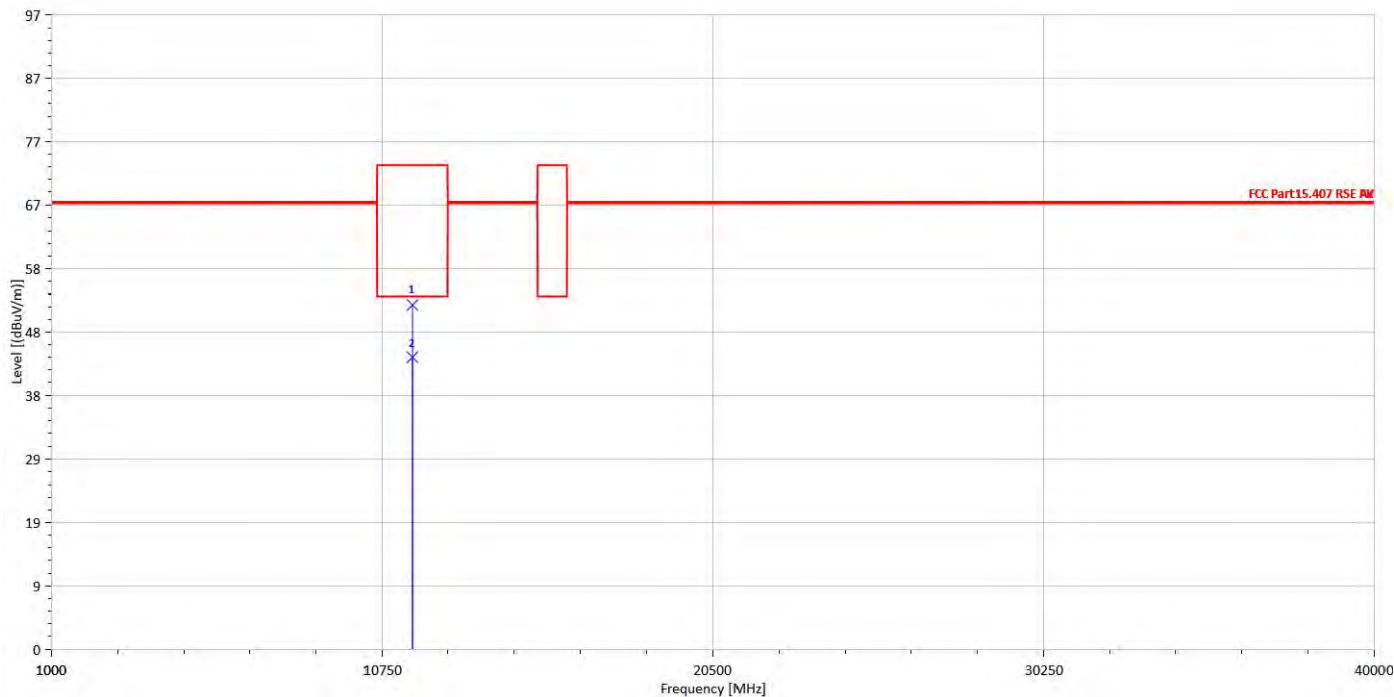
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Operation Mode :	802.11a	Test Date :	2016/6/22
Fundamental Frequency :	5825 MHz	Temp. / Humi. :	24.3 deg_C/62RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11650.00	H	Peak	30.67	22.02	52.69	74	-21.31
11650.00	H	Average	22.61	22.02	44.63	54	-9.37

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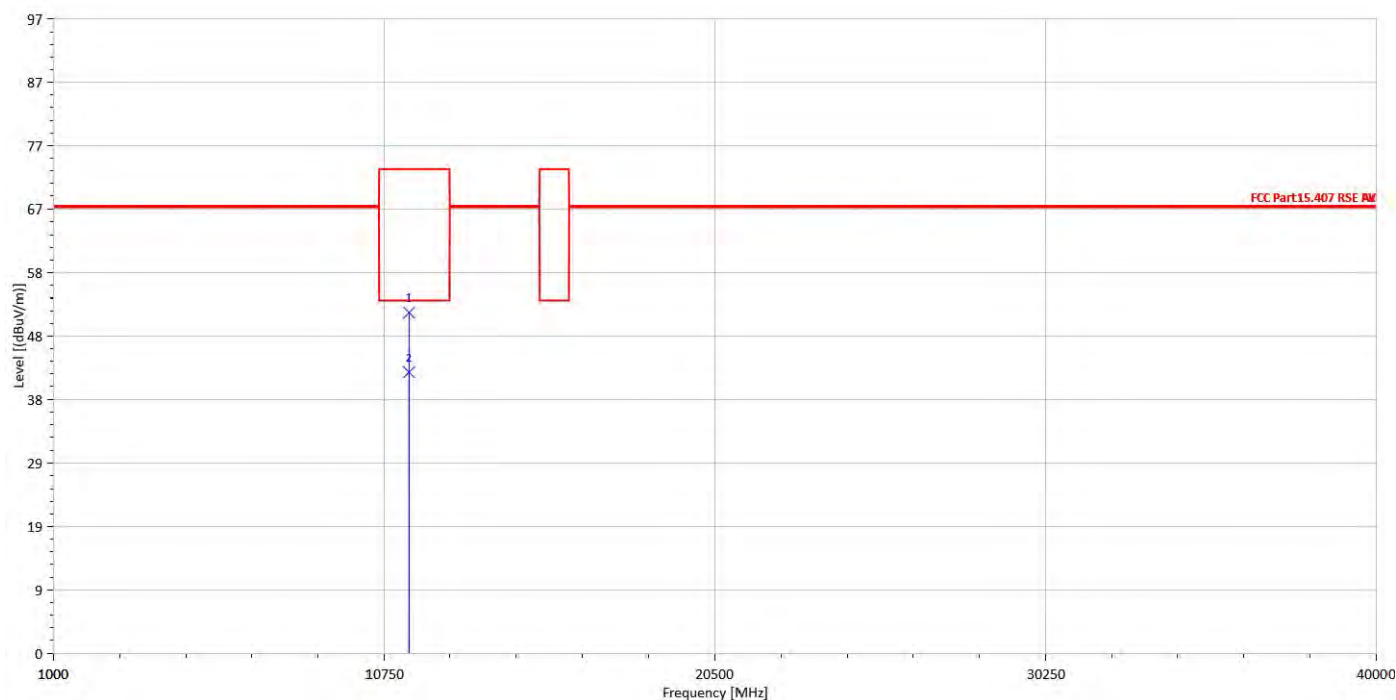
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Radiated Spurious Emission Measurement Result 802.11n HT20, 5725~5850 MHz

Operation Mode :	802.11n20	Test Date :	2016/6/22
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	24.3 deg_C/62RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @ 3m dBμV/m	Margin dB
11490.00	H	Peak	31.44	20.70	52.15	74	-21.85
11490.00	H	Average	22.24	20.70	42.94	54	-11.06

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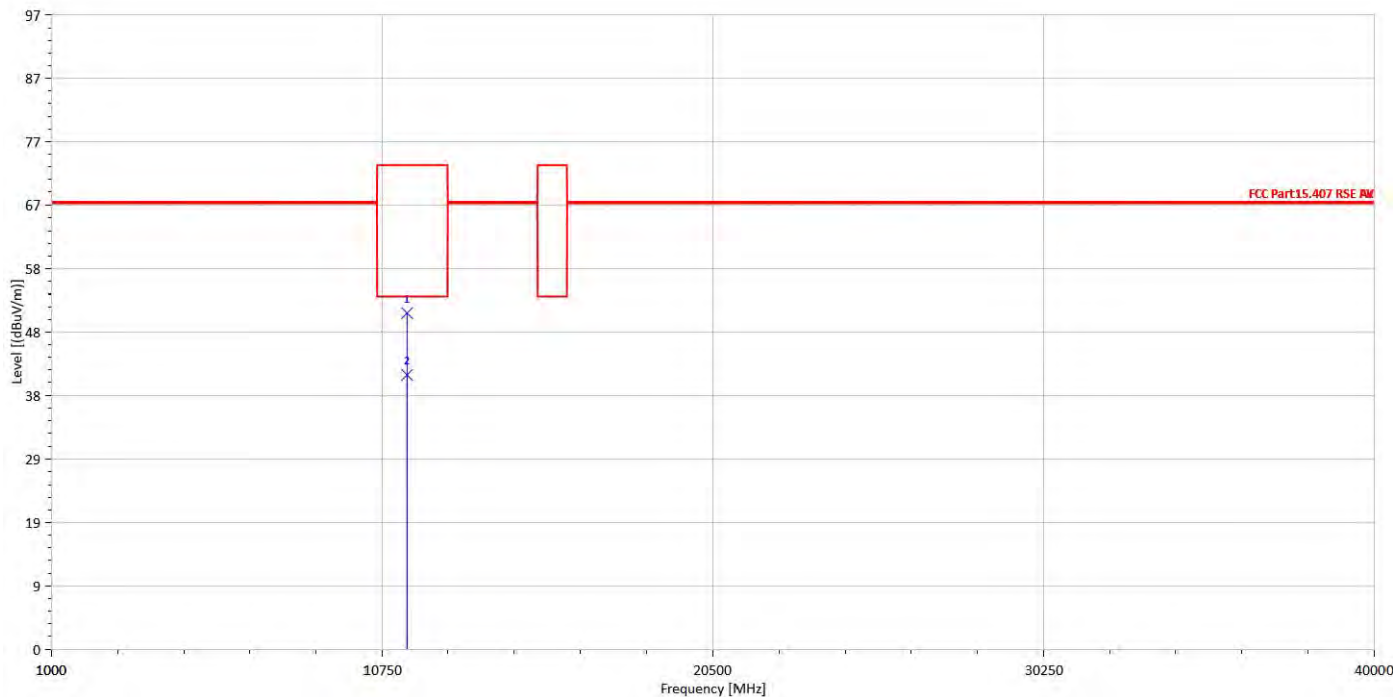
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Operation Mode : 802.11n20 Test Date : 2016/6/22
Fundamental Frequency : 5745 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Low Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11490.00	H	Peak	30.74	20.70	51.44	74	-22.56
11490.00	H	Average	21.20	20.70	41.90	54	-12.10

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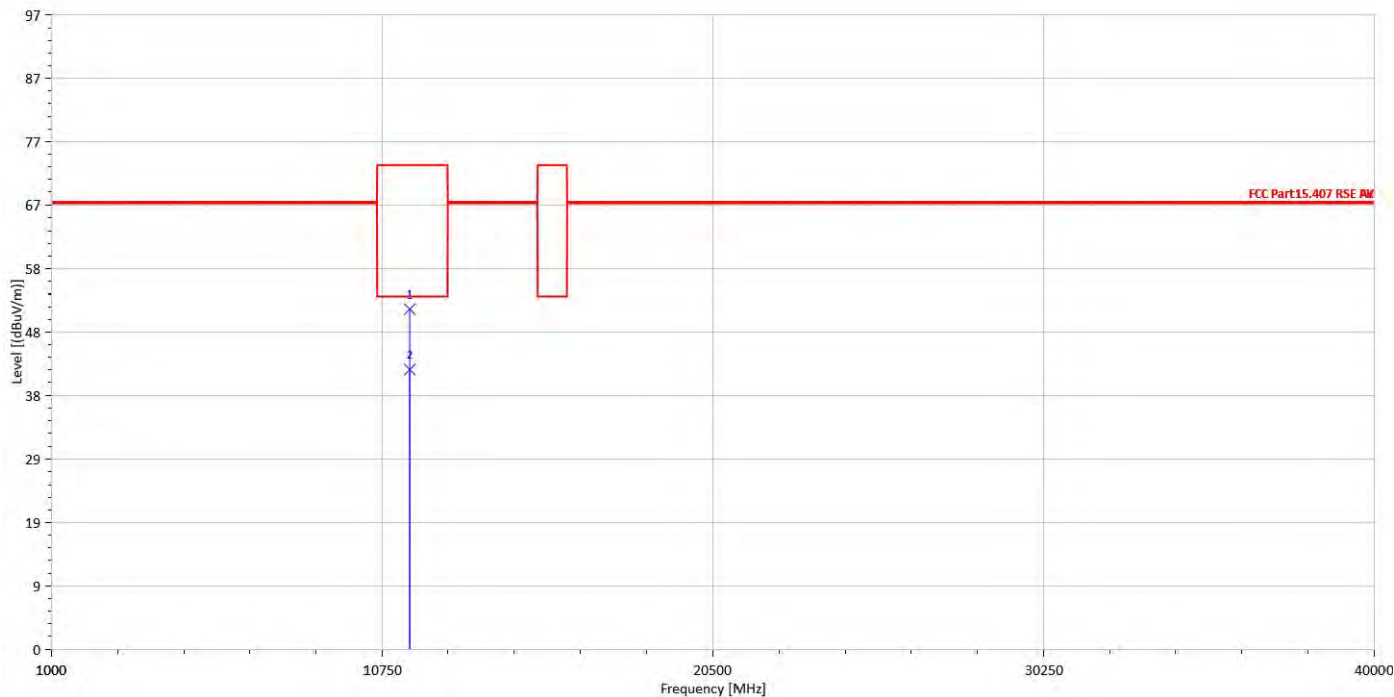
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Operation Mode : 802.11n20 Test Date : 2016/6/22
Fundamental Frequency : 5785 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Mid Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @ 3m dBμV/m	Margin dB
11570.00	H	Peak	30.60	21.44	52.05	74	-21.95
11570.00	H	Average	21.28	21.44	42.72	54	-11.28

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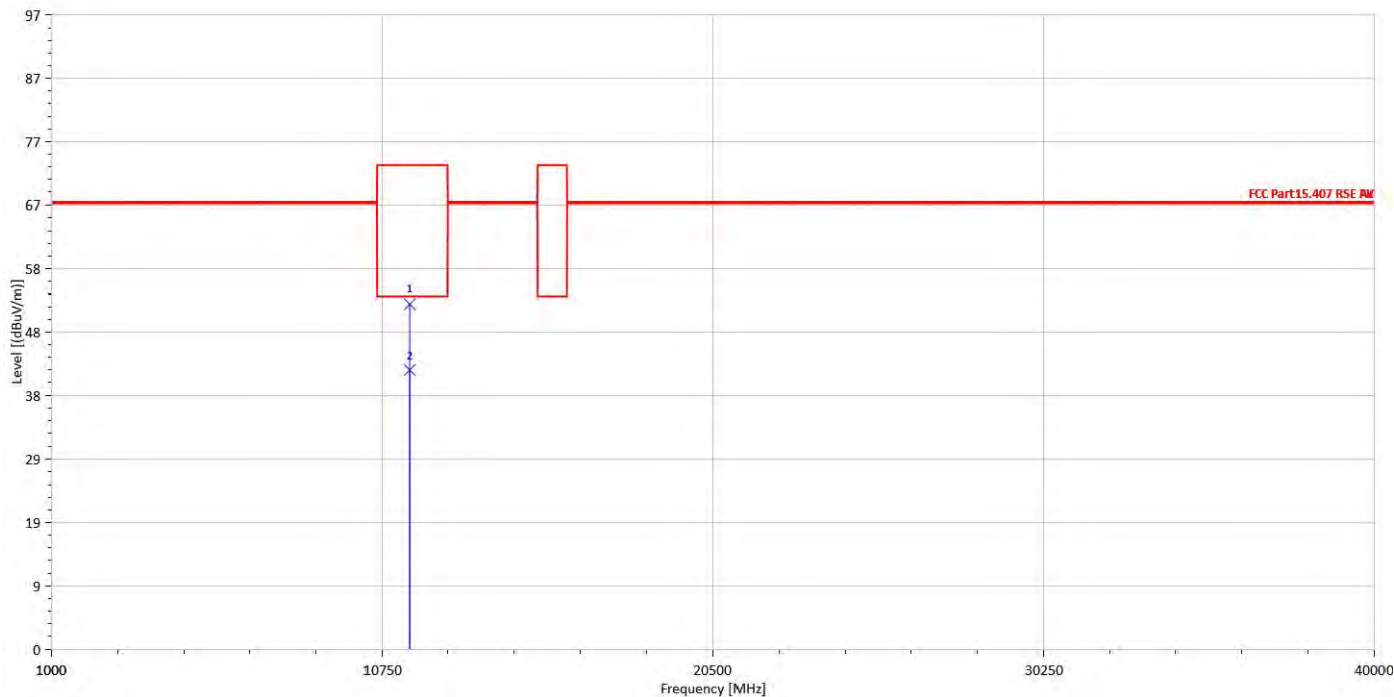
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Operation Mode : 802.11n20 Test Date : 2016/6/22
Fundamental Frequency : 5785 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Mid Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @ 3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
11570.00	H	Peak	31.37	21.44	52.81	74	-21.19
11570.00	H	Average	21.20	21.44	42.64	54	-11.36

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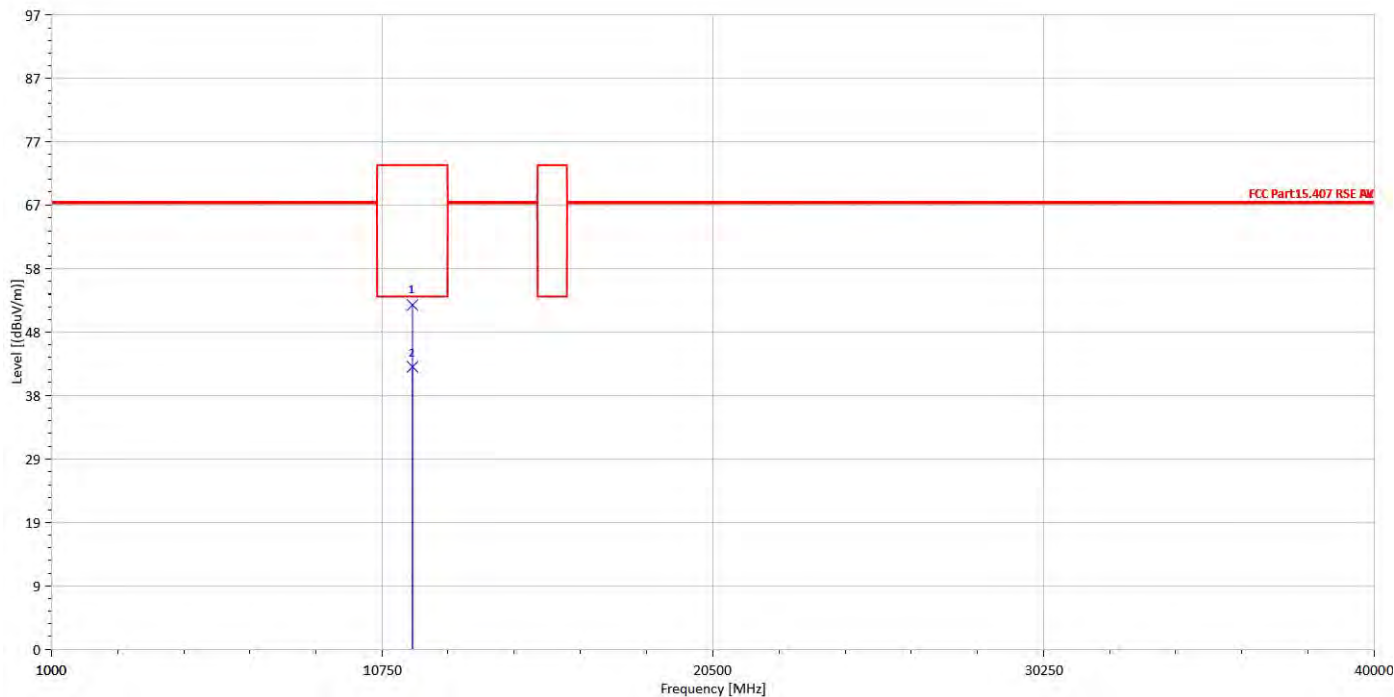
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Operation Mode : 802.11n20 Test Date : 2016/6/22
Fundamental Frequency : 5825 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH High Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11650.00	H	Peak	30.68	22.02	52.70	74	-21.30
11650.00	H	Average	21.13	22.02	43.15	54	-10.85

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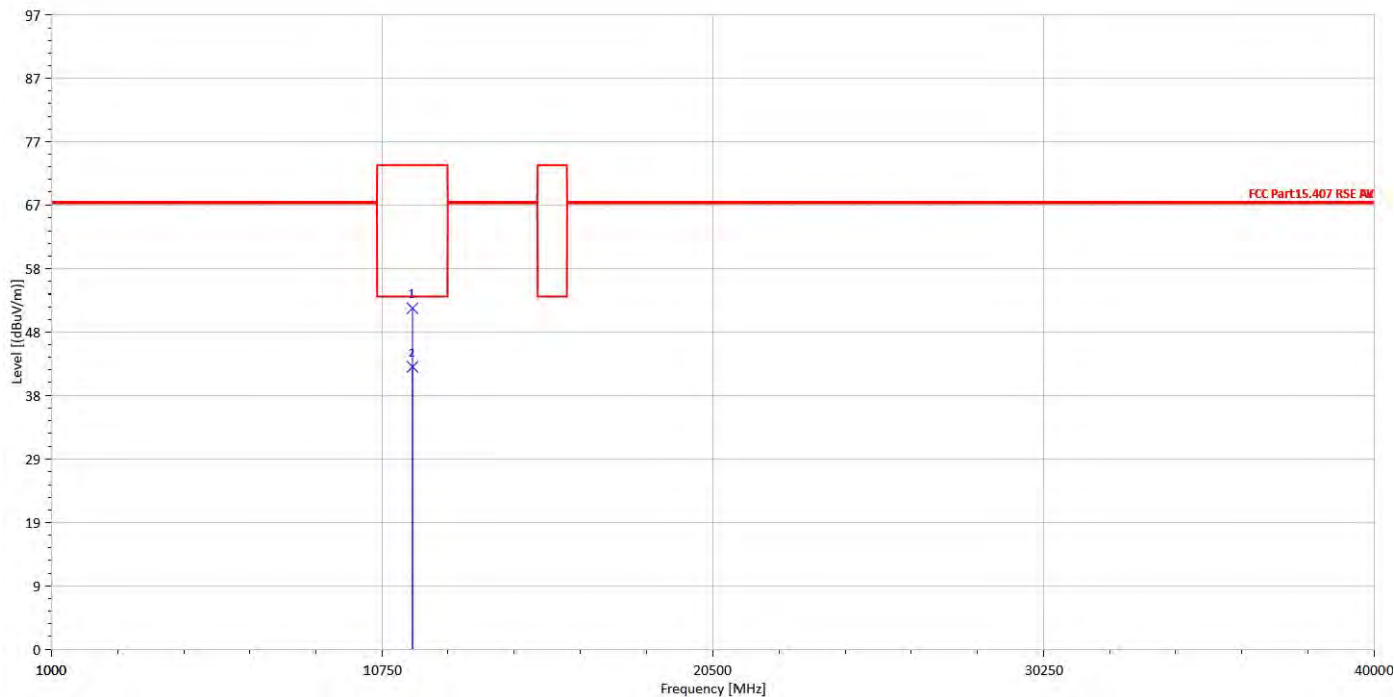
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Operation Mode : 802.11n20 Test Date : 2016/6/22
Fundamental Frequency : 5825 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH High Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11650.00	H	Peak	30.18	22.02	52.20	74	-21.80
11650.00	H	Average	21.13	22.02	43.15	54	-10.85

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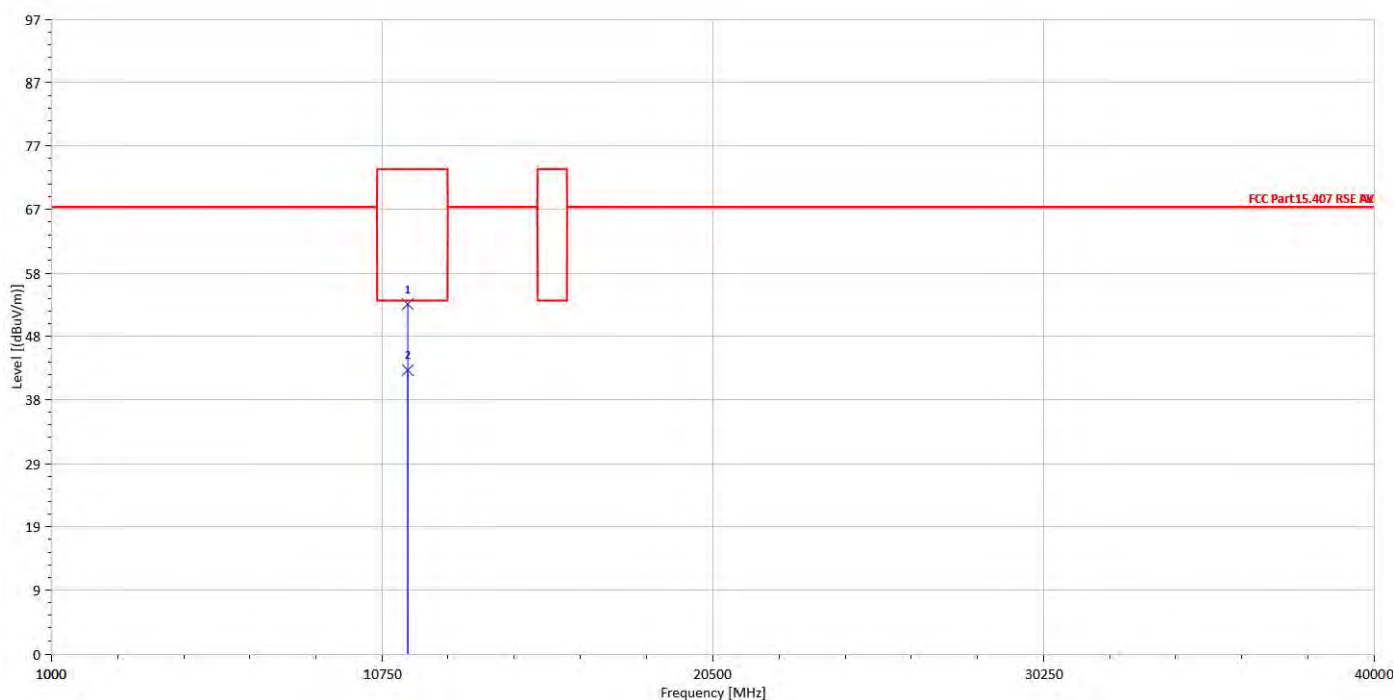
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Radiated Spurious Emission Measurement Result 802.11n HT40, 5725~5850 MHz

Operation Mode :	802.11n40	Test Date :	2016/6/22
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	24.3 deg_C/62 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @ 3m dBμV/m	Margin dB
11510.00	H	Peak	31.29	22.17	53.46	74	-20.54
11510.00	H	Average	21.24	22.17	43.41	54	-10.59

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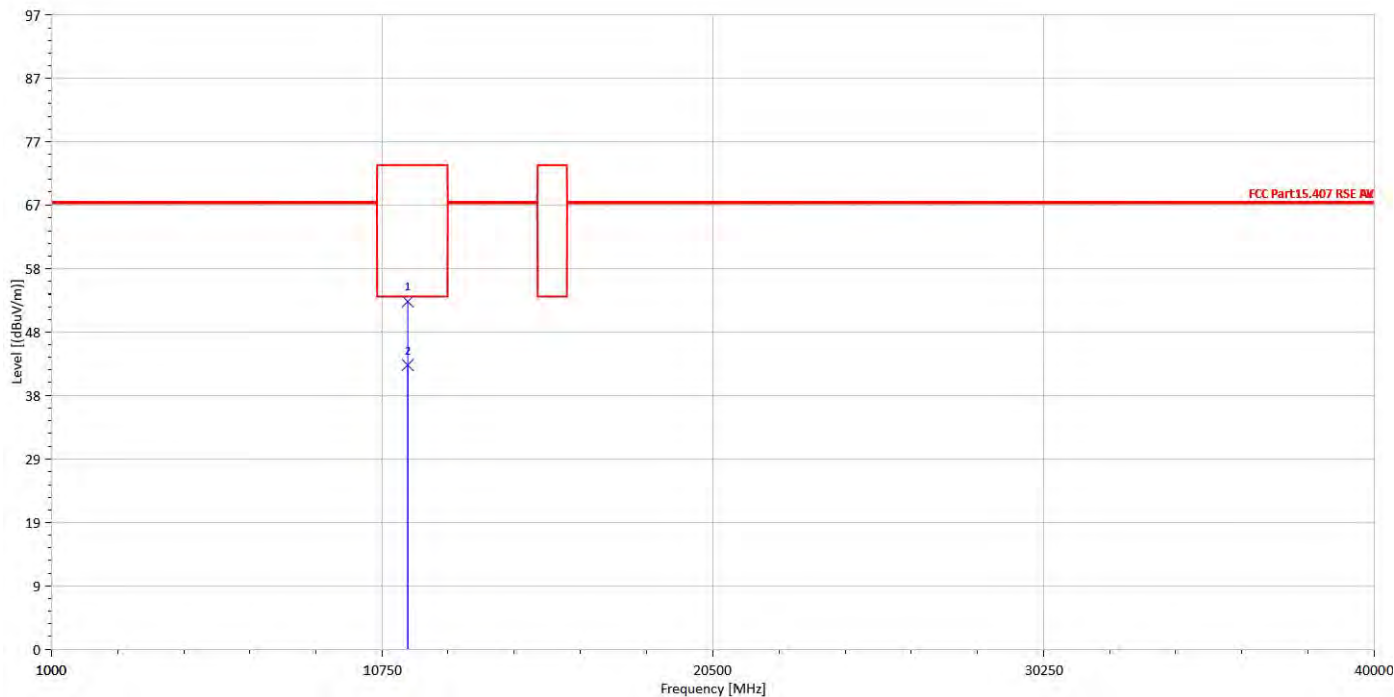
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Operation Mode : 802.11n40 Test Date : 2016/6/22
Fundamental Frequency : 5755 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH Low Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
11510.00	H	Peak	31.07	22.17	53.23	74	-20.77
11510.00	H	Average	21.26	22.17	43.43	54	-10.57

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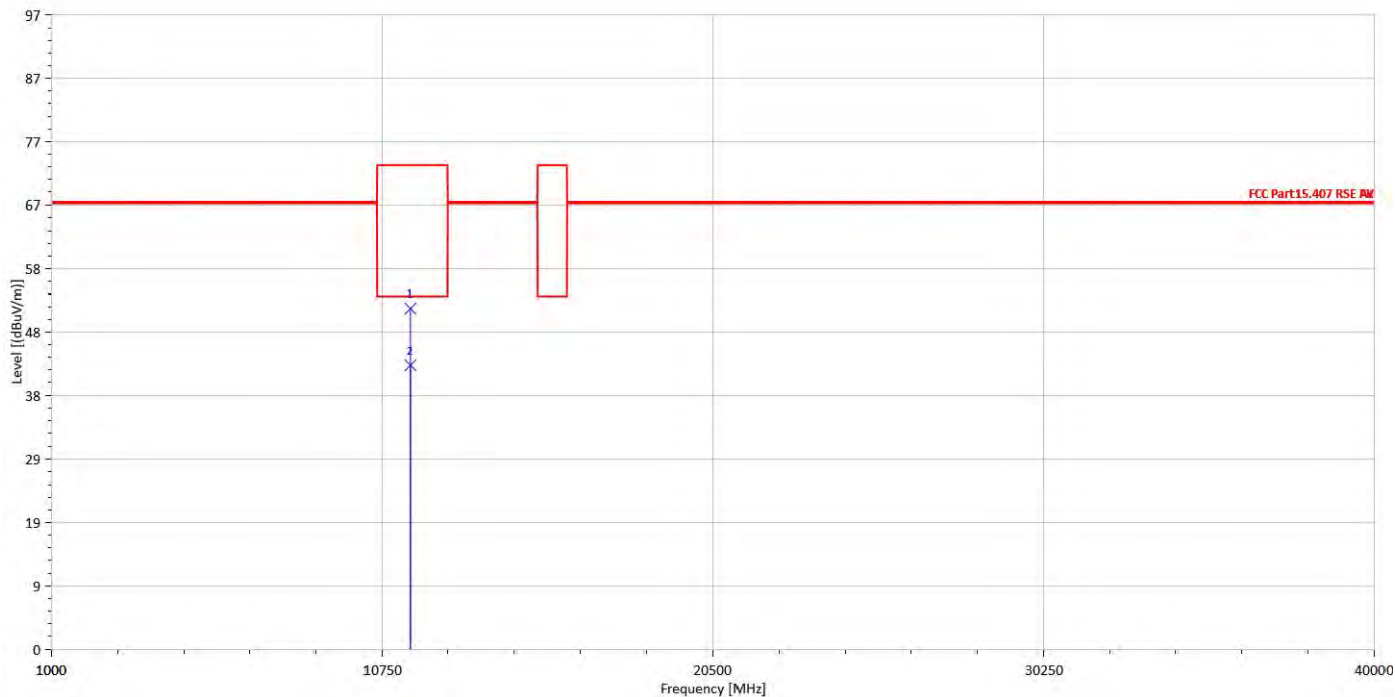
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Operation Mode : 802.11n40 Test Date : 2016/6/22
Fundamental Frequency : 5795 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH High Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@ 3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
11590.00	H	Peak	30.28	21.84	52.12	74	-21.88
11590.00	H	Average	21.56	21.84	43.40	54	-10.60

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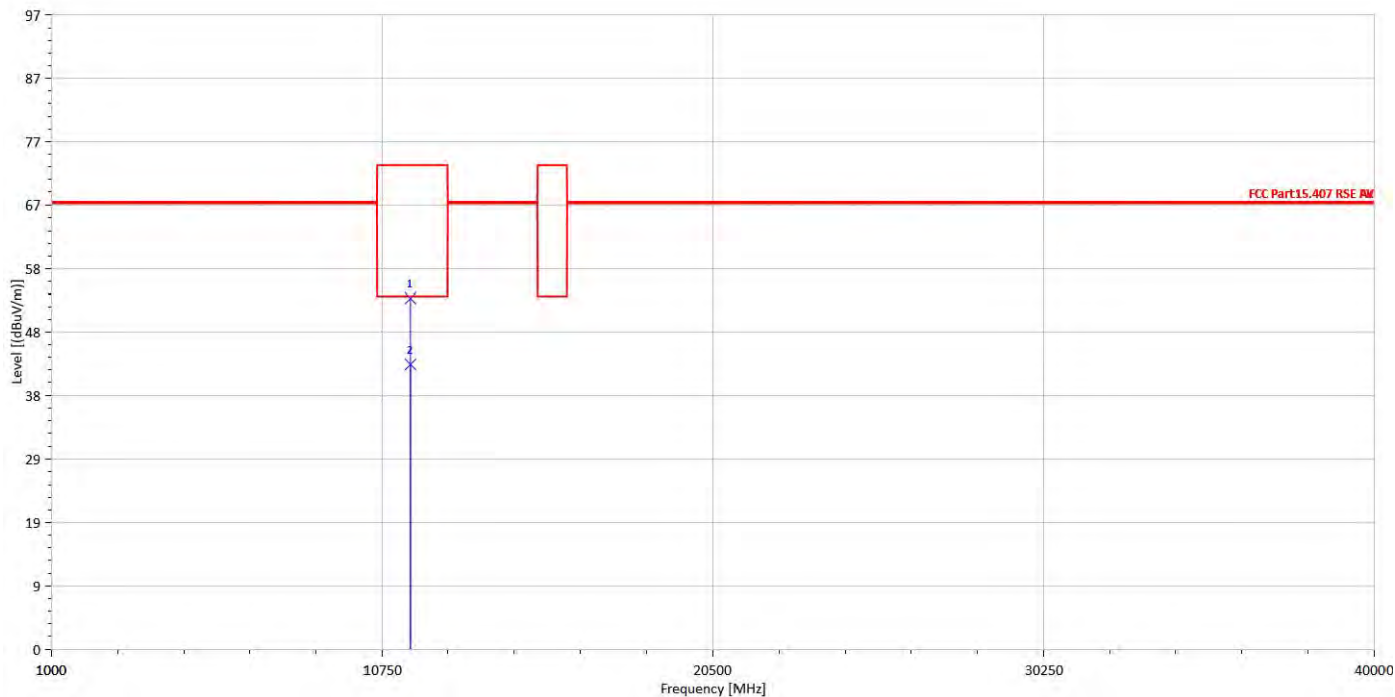
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Fundamental Frequency : 5795 MHz Temp. / Humi. : 24.3 deg_C/62RH
Operation Band : Tx CH High Test Engineer : Ashton
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @ 3m dBμV/m	Margin dB
11590.00	H	Peak	31.85	21.84	53.70	74	-20.30
11590.00	H	Average	21.67	21.84	43.51	54	-10.49

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Band edge falling to restricted band

802.11a mode

Operation Mode : 802.11a Test Date : 2016/6/22
 Fundamental Frequency : 5745 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH Low Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5725.00	E	Peak	62.83	9.30	72.13	122.23	-50.10

Operation Mode : 802.11a Test Date : 2016/6/22
 Fundamental Frequency : 5745 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH Low Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5725.00	E	Peak	65.37	9.30	74.67	122.23	-47.56

Operation Mode : 802.11a Test Date : 2016/6/22
 Fundamental Frequency : 5825 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH High Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5850.00	E	Peak	48.27	9.49	57.75	122.23	-64.48
5850.30	S	Peak	49.83	9.49	59.32	121.5464	-62.22

Operation Mode : 802.11a Test Date : 2016/6/22
 Fundamental Frequency : 5825 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH High Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5850.00	E	Peak	51.71	9.49	61.20	122.23	-61.03
5851.40	S	Peak	52.07	9.51	61.59	119.0382	-57.45

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802.11n20 HT mode

Operation Mode : 802.11n20 Test Date : 2016/6/22
 Fundamental Frequency : 5745 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH Low Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5725.00	E	Peak	60.26	9.30	69.56	122.23	-52.67

Operation Mode : 802.11n20 Test Date : 2016/6/22
 Fundamental Frequency : 5745 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH Low Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5724.50	S	Peak	62.99	9.30	72.29	121.09	-48.80
5725.00	E	Peak	62.85	9.30	72.15	122.23	-50.08

Operation Mode : 802.11n20 Test Date : 2016/6/22
 Fundamental Frequency : 5825 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH High Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5850.00	E	Peak	47.94	9.49	57.43	122.23	-64.80

Operation Mode : 802.11n20 Test Date : 2016/6/22
 Fundamental Frequency : 5825 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH High Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5850.00	E	Peak	49.98	9.49	59.46	122.23	-62.77

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802.11n40 HT mode

Operation Mode : 802.11n40 Test Date : 2016/6/22
 Fundamental Frequency : 5755 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH Low Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5718.40	S	Peak	59.47	9.27	68.75	110.382	-41.64
5725.00	E	Peak	58.85	9.30	68.15	122.23	-54.08

Operation Mode : 802.11n40 Test Date : 2016/6/22
 Fundamental Frequency : 5755 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH Low Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5721.10	S	Peak	62.92	9.29	72.20	113.3382	-41.14
5725.00	E	Peak	62.36	9.30	71.66	122.23	-50.57

Operation Mode : 802.11n40 Test Date : 2016/6/22
 Fundamental Frequency : 5795 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH High Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5850.00	E	Peak	42.19	9.49	51.68	122.23	-70.55

Operation Mode : 802.11n40 Test Date : 2016/6/22
 Fundamental Frequency : 5795 MHz Temp. / Humi. : 24.3 deg_C/62RH
 Operation Band : BE CH High Test Engineer : Ashton
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
5850.00	E	Peak	43.13	9.49	52.62	122.23	-69.61
5853.50	S	Peak	44.26	9.55	53.82	114.25	-60.43

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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

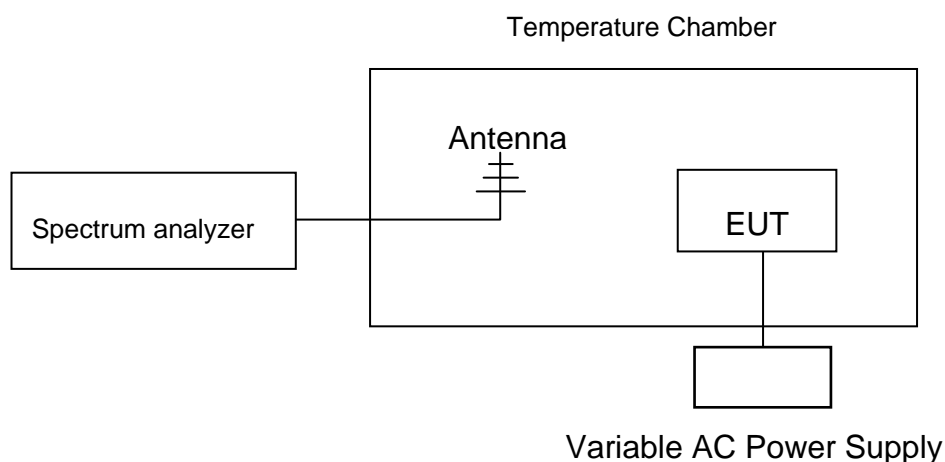
13.1 Standard Applicable

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:

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNAK	PE8210	RF29	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016

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13.5 Measurement Result

Operation Mode	802.11 a	Test Date	2016.06.22
Temperature	:23	Test By	Henry
Humidity	:68 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	8.74V	149	5745	5,744.98257	0.00000303
		157	5785	5,784.98277	0.00000298
		165	5825	5,824.98206	0.00000308
	6.84V	149	5745	5,744.98261	0.00000303
		157	5785	5,784.98276	0.00000298
		165	5825	5,824.98204	0.00000308
25	7.6V	149	5745	5,744.98255	0.00000304
		157	5785	5,784.98277	0.00000298
		165	5825	5,824.98205	0.00000308
40	8.74V	149	5745	5,744.98256	0.00000304
		157	5785	5,784.98281	0.00000297
		165	5825	5,824.98207	0.00000308
	6.84V	149	5745	5,744.98257	0.00000303
		157	5785	5,784.98277	0.00000298
		165	5825	5,824.98205	0.00000308

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Operation Mode	802.11 n_HT40	Test Date	2016.06.22
Temperature	:23	Test By	Henry
Humidity	:68 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	8.74V	151	5755	5,754.97510	0.00000433
		159	5795	5,794.97510	0.00000430
	6.84V	151	5755	5,754.97510	0.00000433
		159	5795	5,794.97510	0.00000430

25	7.6V	151	5755	5,754.97510	0.00000433
		159	5795	5,794.97510	0.00000430
40	8.74V	151	5755	5,755.00000	0.00000000
		159	5795	5,794.97510	0.00000430
	6.84V	151	5755	5,755.00000	0.00000000
		159	5795	5,794.97510	0.00000430

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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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

An embedded-in antenna designs are used.

The antenna is designed with with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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