

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT OF

**Product Name:** Diagnostic Ultrasound System  
**Brand Name:** Qisda  
**Model No.:** UH100  
**Model Difference:** N/A  
**FCC ID:** VRSUH100N  
**Report No.:** ER/2015/80163  
**Issue Date:** Sep. 25, 2015  
**FCC Rule Part:** §15.407  
**Prepared for:** QISDA CORPORATION  
NO.157, SHAN-YING ROAD, SHAN-TING LI,  
GUEISHAN DIST., TAOYUAN CITY 333,  
TAIWAN, R.O.C.  
**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
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## VERIFICATION OF COMPLIANCE

**Applicant:** QISDA CORPORATION  
NO.157, SHAN-YING ROAD, SHAN-TING LI, GUEISHAN DIST.,  
TAOYUAN CITY 333, TAIWAN, R.O.C.

**Product Name:** Diagnostic Ultrasound System

**Brand Name:** Qisda

**Model No.:** UH100

**Model Difference:** N/A

**FCC ID:** VRSUH100N

**File Number:** ER/2015/80163

**Date of test:** Sep. 01, 2015 ~ Sep. 18, 2015

**Date of EUT Received:** Sep. 01, 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:**

**Date:**

Sep. 25, 2015

**Aken Huang / Engineer**

**Prepared By:**

**Date:**

Sep. 25, 2015

**Violetta Tang / Clerk**

**Approved By:**

**Date:**

Sep. 25, 2015

**Jim Chang / Asst. Manager**

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## Revision History

Report Number	Revision	Description	Issue Date
ER/2015/80163	Rev.00	Initial creation of document	Sep. 25, 2015

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## 1. GENERAL INFORMATION

### 1.1 Product Description

General:

Product Name:	Diagnostic Ultrasound System	
Brand Name:	Qisda	
Model No.:	UH100	
Model Difference:	N/A	
Transducer:	<ol style="list-style-type: none"><li>1. Model No.: C52A, Supplier: Qisda Corporation</li><li>2. Model No.: L115A, Supplier: Qisda Corporation</li><li>3. Model No.: P42A, Supplier: Qisda Corporation</li><li>4. Model No.: E94A, Supplier: Qisda Corporation</li></ol>	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	10.8Vdc form Rechargeable Li-ion Battery or 19V from AC/DC Adapter	
	Battery:	Model No.: QIC3000, Supplier: T-GEE Electronic Co., Ltd.
	Adapter:	Model No.: ATM065-P190, Supplier: Adapter Technology Co., Ltd.

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## WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology	
11a	5150~5250	4	9.79dBm	OFDM	
	5725-5850	5	9.27dBm		
11n	HT20 5150~5250	4	12.68dBm (MIMO Chain 0+1)	OFDM	
	HT20 5725-5850	5	12.53dBm (MIMO Chain 0+1)		
11n	HT40 5150~5250	2	12.26dBm (MIMO Chain 0+1)	OFDM	
	HT40 5725-5850	2	12.01dBm (MIMO Chain 0+1)		
Antenna Designation	PIFA Antenna; Gain: 3.71dBi (Main) / 3.18dBi (Aux) (5150MHz-5250MHz) 4dBi (Main) / 5.02dBi (Aux) (5725MHz-5850MHz)				
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM				
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 – 300Mbps				

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## 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is Bluetooth, WLAN and GPS features, and below is details of information.

Product Feature	
Product Name:	Diagnostic Ultrasound System
Brand Name:	Qisda
Model No.:	UH100
Model Difference:	N/A
FCC ID	VRSUH100N
Bluetooth Version:	V4.0 dual mode
WIFI:	802.11 a/b/g/n
Receiver:	GPS

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

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### 1.3 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 662311 D01 Multiple Transmitter Output

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 o.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan. (TAF code 0513)

FCC Registration Numbers are: 628985

Canada Registration Number: 4620A-5.

### 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 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 placed on a turn table which is 0.8 m above ground plane. 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.

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## 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 2.4dB for a/n\_20, 5.4dB for n\_40 and 10dB attenuator.

Single mode offset

= RF cable loss (dB)+ attenuation factor(dB) +duty factor =12.4(dB)

N20 MIMO mode offset

= RF cable loss (dB)+ attenuation factor(dB)+ 10 log(NANT) dB+duty factor=12.4(dB)

N40 MIMO mode offset

= RF cable loss (dB)+ attenuation factor(dB)+ 10 log(NANT) dB+duty factor=15.4(dB)

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## 2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration

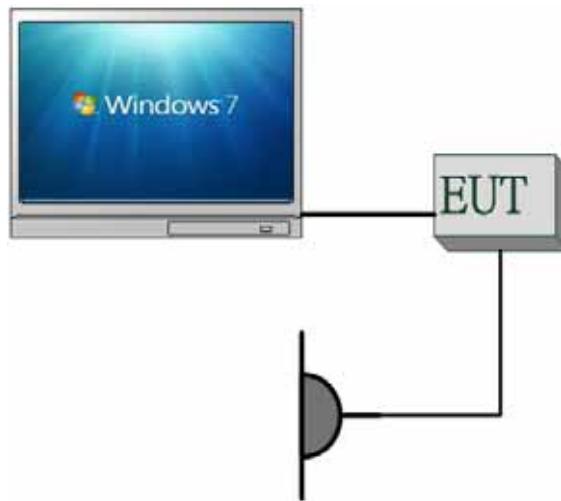


Fig. 2-2 AC Power Line Conducted Emission

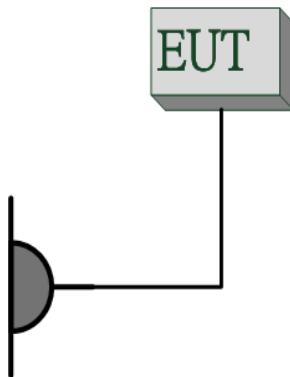


Table 2-1 Equipment Used in Tested System

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.	Notebook	Lenovo	L412	LR-027LM	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 & 6dB 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

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

2 channels are provided for 802.11n\_HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

Operated band in 5725 MHz ~5850 MHz:

5 channels are provided for 802.11a, 802.11n\_HT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz		

2 channels are provided for 802.11n\_HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
151	5755 MHz	159	5795 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.

### 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
802.11a	5745~5825	149 to 165	157	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	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	MAIN
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 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				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	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 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 : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB
Measurement uncertainty (Polarization : <b>Horizontal</b> )	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

According to §15.207, 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.

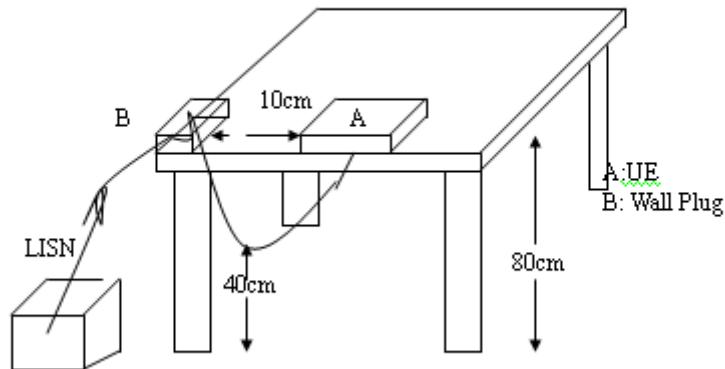
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## 6.4. Test SET-UP



## 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 that closet to the limit

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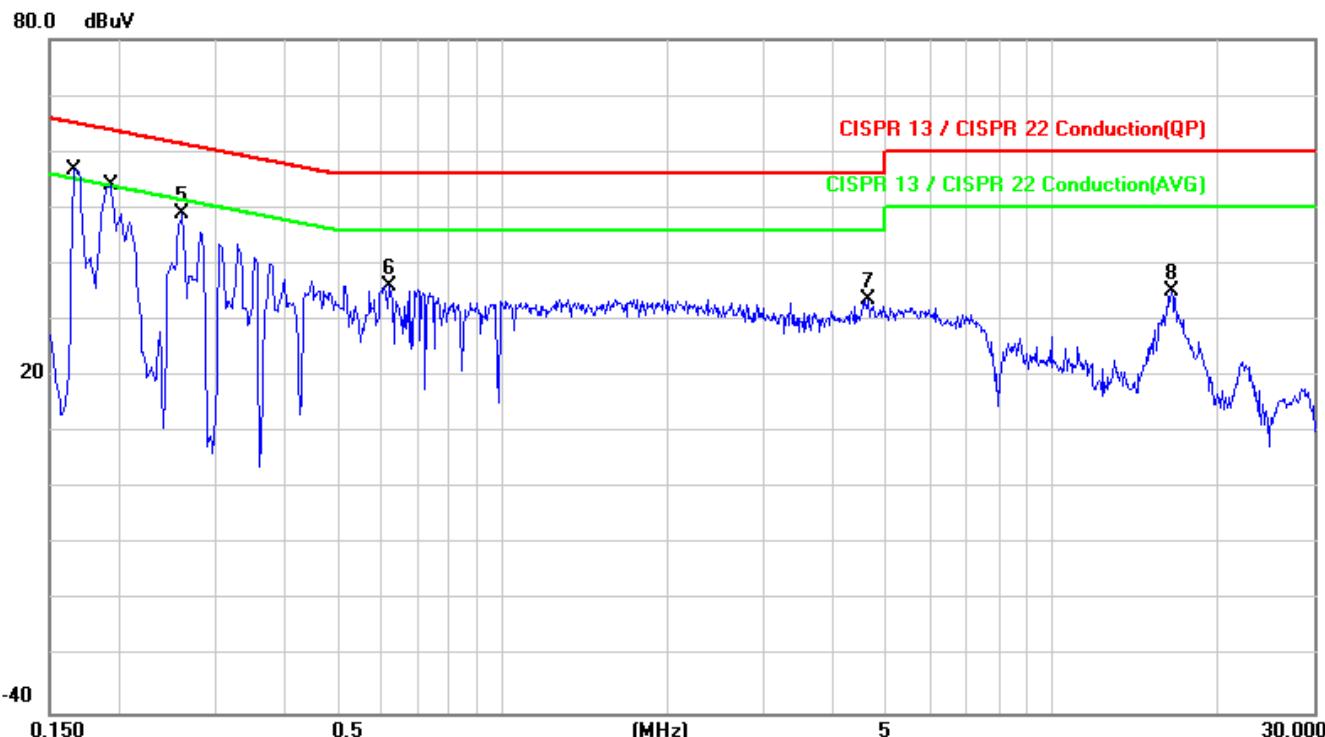
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Sep. 16, 2015
Temperature:	24	Humidity:		Test By:	Aken
				Phase:	L1/N

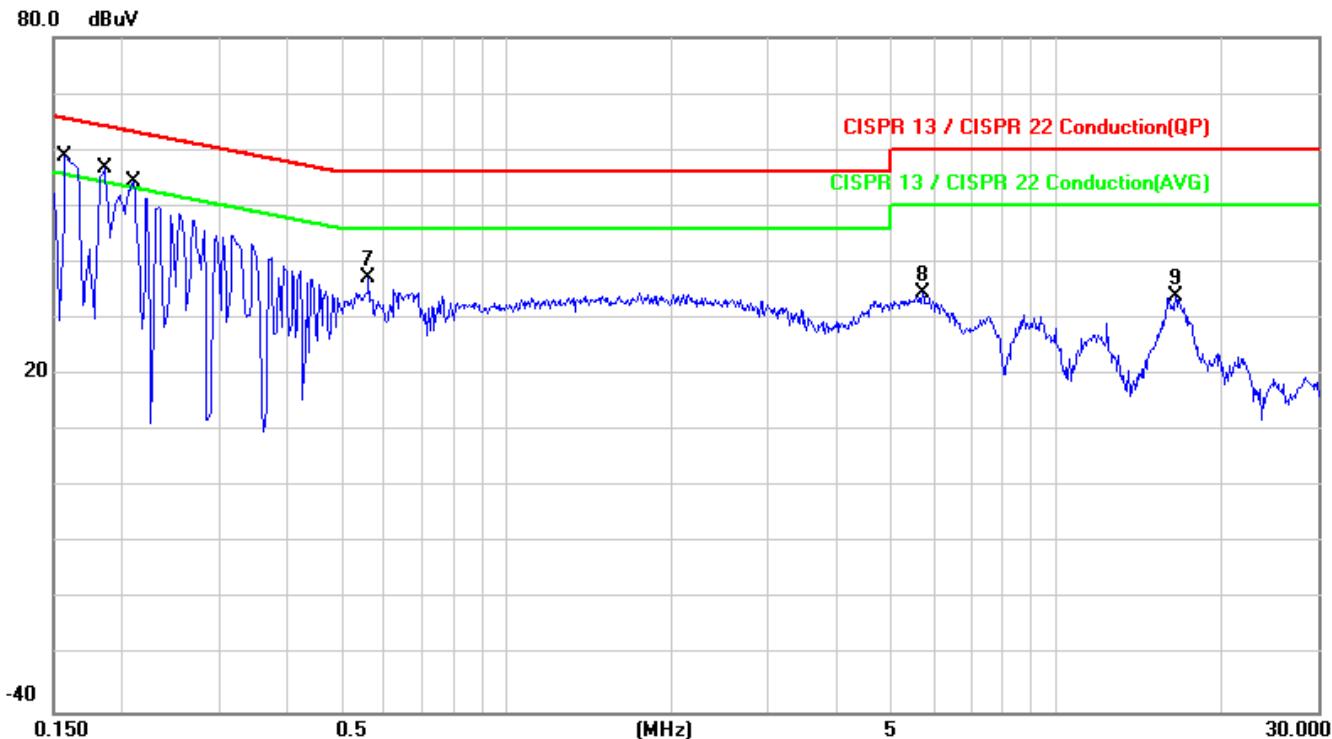


No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
1		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1660	50.70	0.08	50.78	65.16	-14.38	QP	
2		0.1660	21.00	0.08	21.08	55.16	-34.08	AVG	
3		0.1940	49.70	0.07	49.77	63.86	-14.09	QP	
4		0.1940	40.80	0.07	40.87	53.86	-12.99	AVG	
5	*	0.2620	48.87	0.10	48.97	61.37	-12.40	peak	
6		0.6260	35.83	0.26	36.09	56.00	-19.91	peak	
7		4.6300	33.03	0.62	33.65	56.00	-22.35	peak	
8		16.5620	34.66	0.60	35.26	60.00	-24.74	peak	

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No.	Mk.	Freq. <sup>2</sup>	Reading <sup>2</sup>	Factor <sup>2</sup>	Measurement <sup>2</sup>	Limit <sup>2</sup>	Over <sup>2</sup>	Detector <sup>2</sup>	Comment <sup>2</sup>
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1 <sup>2</sup>	*	0.1580 <sup>2</sup>	52.10 <sup>2</sup>	0.14 <sup>2</sup>	52.24 <sup>2</sup>	65.57 <sup>2</sup>	-13.33 <sup>2</sup>	QP <sup>2</sup>	<sup>2</sup>
2 <sup>2</sup>		0.1580 <sup>2</sup>	22.00 <sup>2</sup>	0.14 <sup>2</sup>	22.14 <sup>2</sup>	55.57 <sup>2</sup>	-33.43 <sup>2</sup>	AVG <sup>2</sup>	<sup>2</sup>
3 <sup>2</sup>		0.1860 <sup>2</sup>	49.70 <sup>2</sup>	0.13 <sup>2</sup>	49.83 <sup>2</sup>	64.21 <sup>2</sup>	-14.38 <sup>2</sup>	QP <sup>2</sup>	<sup>2</sup>
4 <sup>2</sup>		0.1860 <sup>2</sup>	35.30 <sup>2</sup>	0.13 <sup>2</sup>	35.43 <sup>2</sup>	54.21 <sup>2</sup>	-18.78 <sup>2</sup>	AVG <sup>2</sup>	<sup>2</sup>
5 <sup>2</sup>		0.2100 <sup>2</sup>	46.80 <sup>2</sup>	0.13 <sup>2</sup>	46.93 <sup>2</sup>	63.21 <sup>2</sup>	-16.28 <sup>2</sup>	QP <sup>2</sup>	<sup>2</sup>
6 <sup>2</sup>		0.2100 <sup>2</sup>	30.80 <sup>2</sup>	0.13 <sup>2</sup>	30.93 <sup>2</sup>	53.21 <sup>2</sup>	-22.28 <sup>2</sup>	AVG <sup>2</sup>	<sup>2</sup>
7 <sup>2</sup>		0.5620 <sup>2</sup>	37.03 <sup>2</sup>	0.29 <sup>2</sup>	37.32 <sup>2</sup>	56.00 <sup>2</sup>	-18.68 <sup>2</sup>	peak <sup>2</sup>	<sup>2</sup>
8 <sup>2</sup>		5.7420 <sup>2</sup>	34.02 <sup>2</sup>	0.67 <sup>2</sup>	34.69 <sup>2</sup>	60.00 <sup>2</sup>	-25.31 <sup>2</sup>	peak <sup>2</sup>	<sup>2</sup>
9 <sup>2</sup>		16.5660 <sup>2</sup>	33.30 <sup>2</sup>	0.63 <sup>2</sup>	33.93 <sup>2</sup>	60.00 <sup>2</sup>	-26.07 <sup>2</sup>	peak <sup>2</sup>	<sup>2</sup>

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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:

	Duty Cycle	Duty Factor (dB)
802.11a	98.2%	0.08
802.11n_20 (MIMO)	96.4%	0.16
802.11n_40 (MIMO)	78.8%	1.03

$$\text{Duty Cycle Factor: } 10 * \log (1/0.982) = 0.08$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.964) = 0.16$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.788) = 1.03$$

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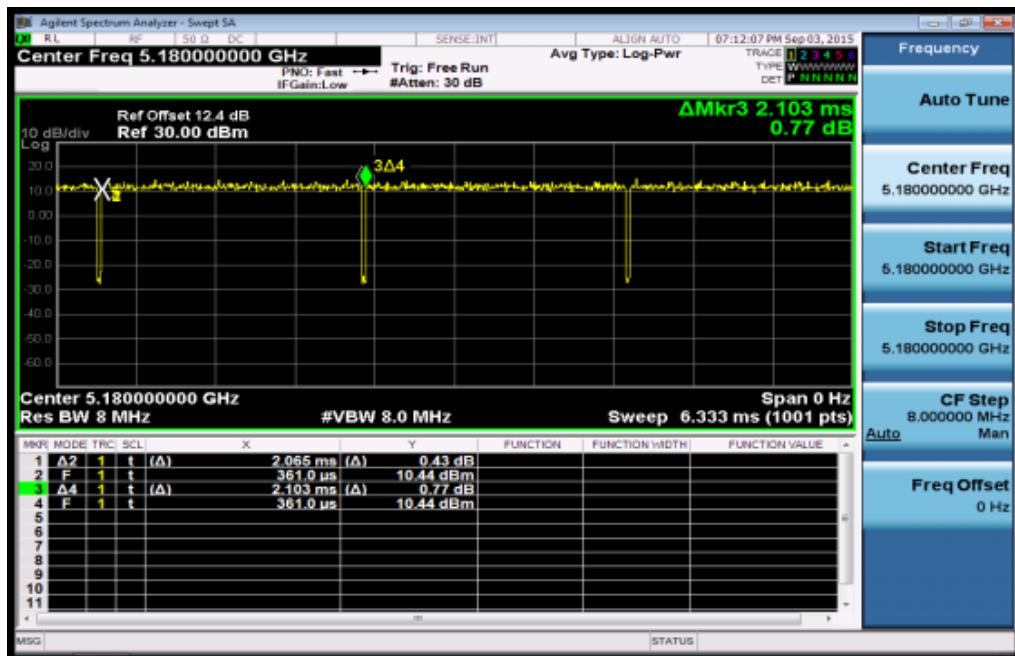
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f (886-2) 2298-0488

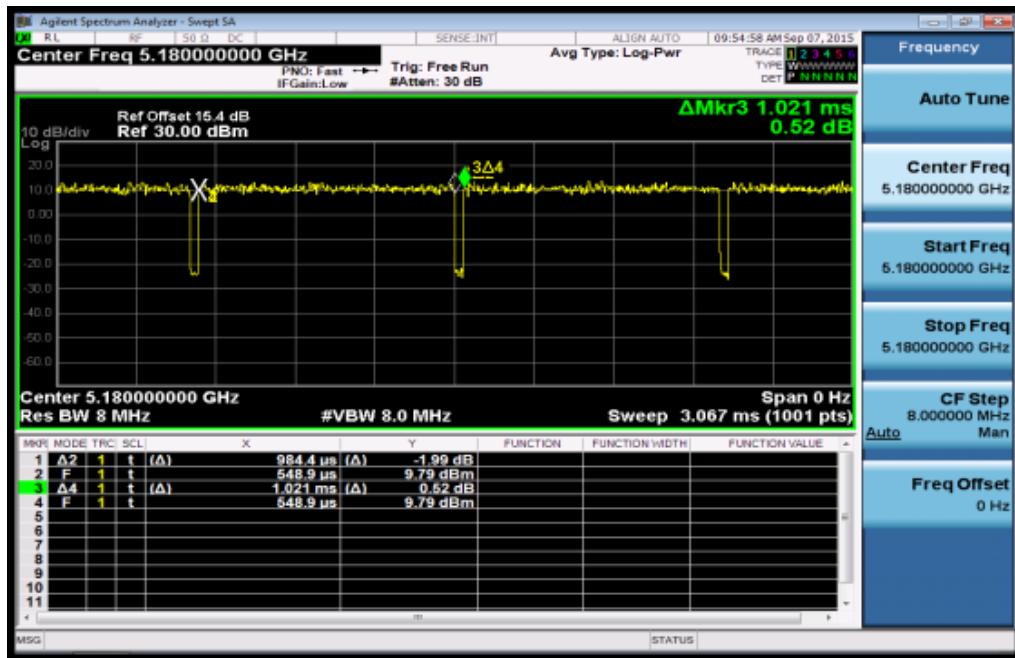
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## DUTY CYCLE TEST SIGNAL Measurement Result 802.11a



## 802.11n HT20



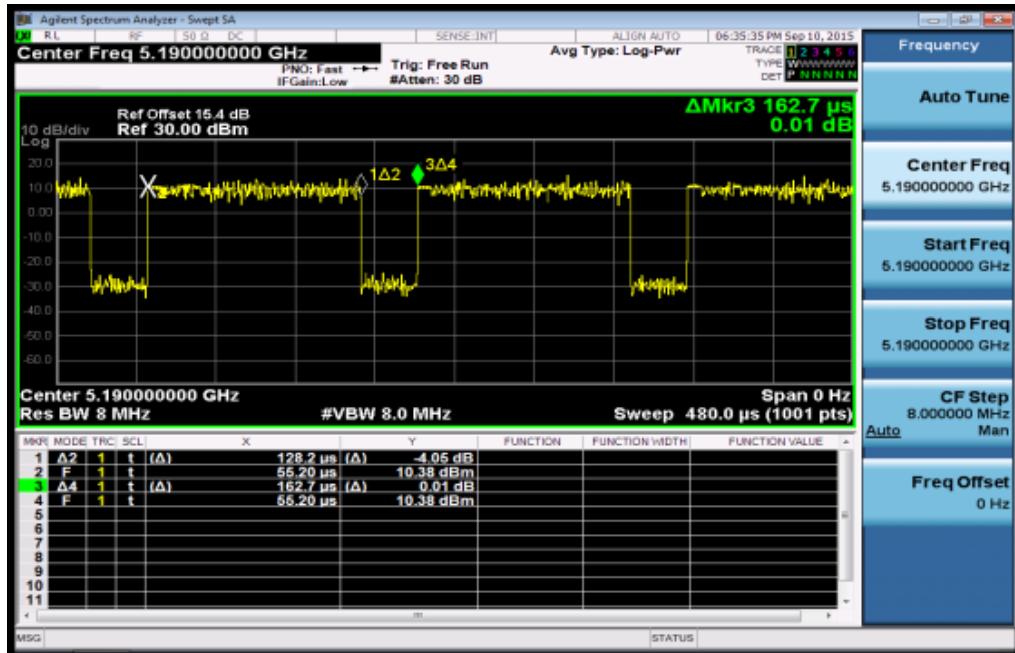
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## 802.11n HT40



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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

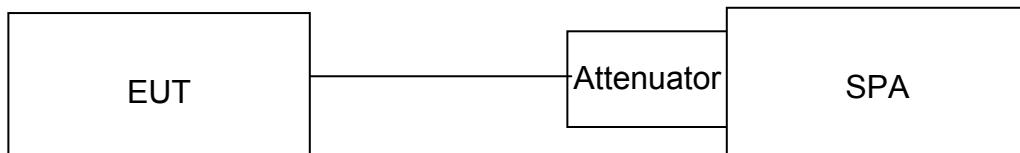
### 8.2 Measurement Procedure

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 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	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016

### 8.4 Test Set-up



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## 8.5 Measurement Result

### 26dB Bandwidth

802.11a

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	19.370	12.87
5220	20.210	13.06
5240	19.840	12.98

802.11n\_HT20 (Main)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.650	13.15
5220	20.610	13.14
5240	20.360	13.09

802.11n\_HT20 (Aux)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.490	13.12
5220	20.840	13.19
5240	20.350	13.09

802.11n \_HT40 (Main)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	45.780	16.61
5230	50.260	17.01

802.11n \_HT40 (Aux)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	45.880	16.62
5230	46.890	16.71

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**6dB Bandwidth (5725 MHz~ 5850 MHz)**

802.11a

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	16.430	12.16
5785	16.200	12.10
5825	16.330	12.13

802.11n\_HT20 (Main)

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.370	12.40
5785	17.410	12.41
5825	17.170	12.35

802.11n\_HT20 (Aux)

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.070	12.32
5785	17.080	12.32
5825	16.980	12.30

802.11n\_HT40 (Main)

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	35.050	15.45
5795	35.310	15.48

802.11n\_HT40 (Aux)

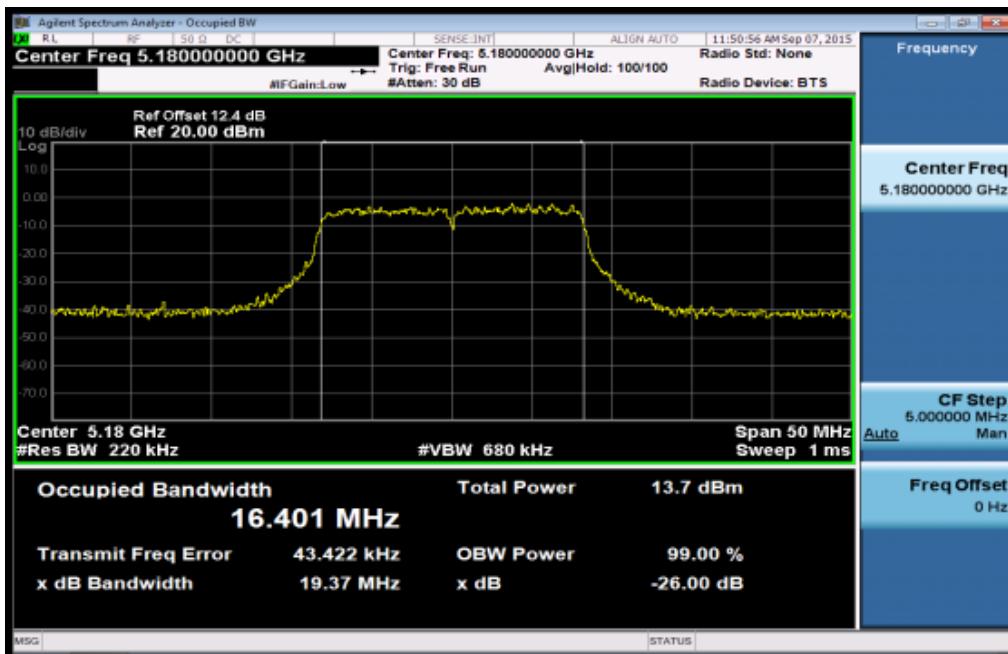
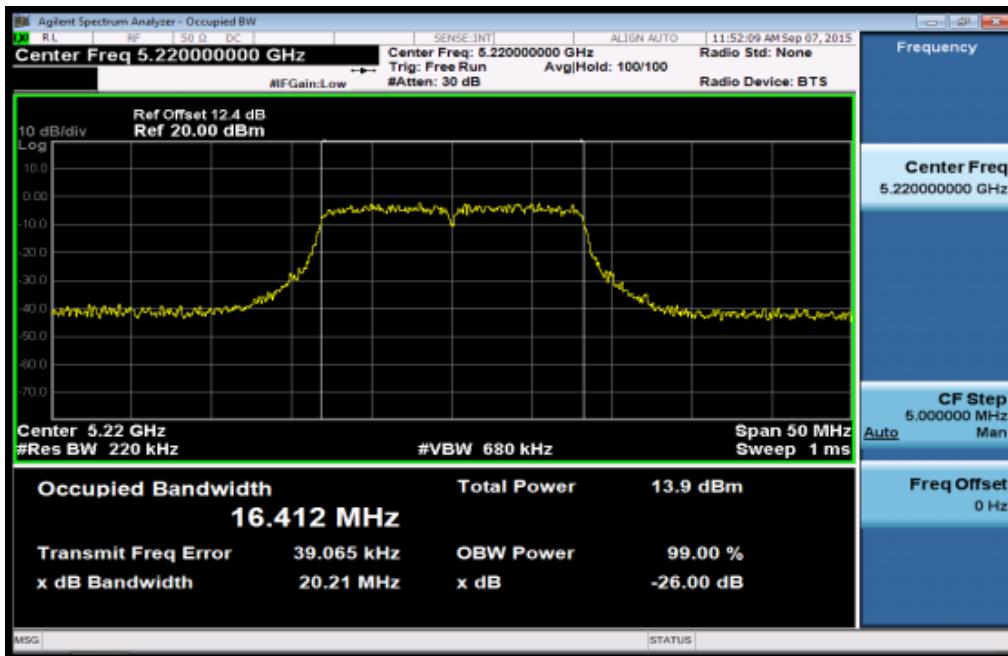
Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	35.480	15.50
5795	35.880	15.55

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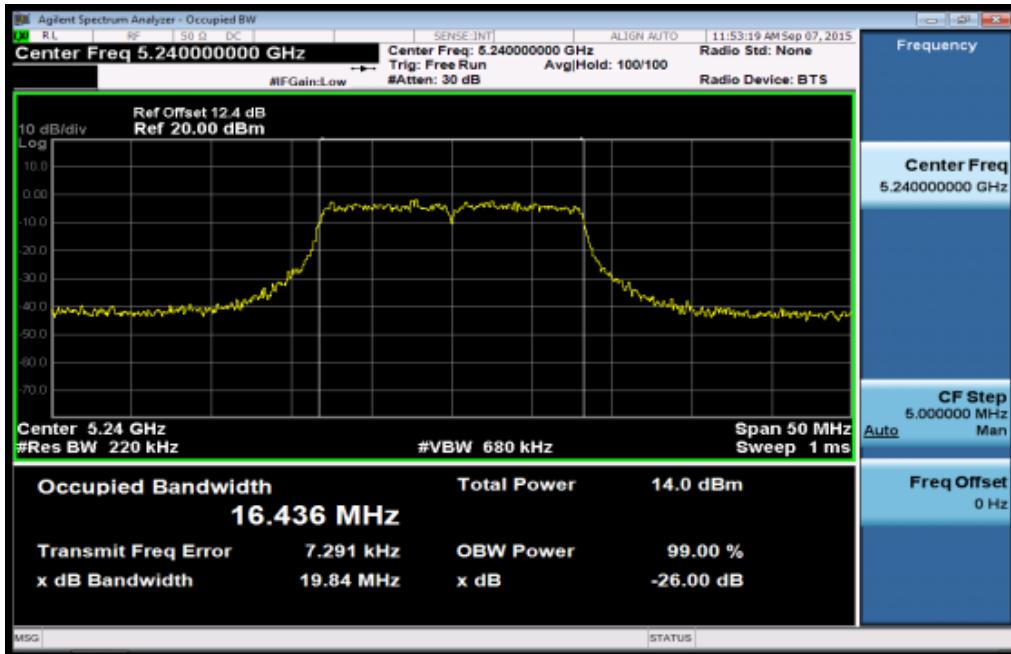
**802.11a, 5150~5250 MHz****26dB Band Width Test Data CH-Low (5180MHz)****26dB Band Width Test Data CH-Mid (5220MHz)**

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

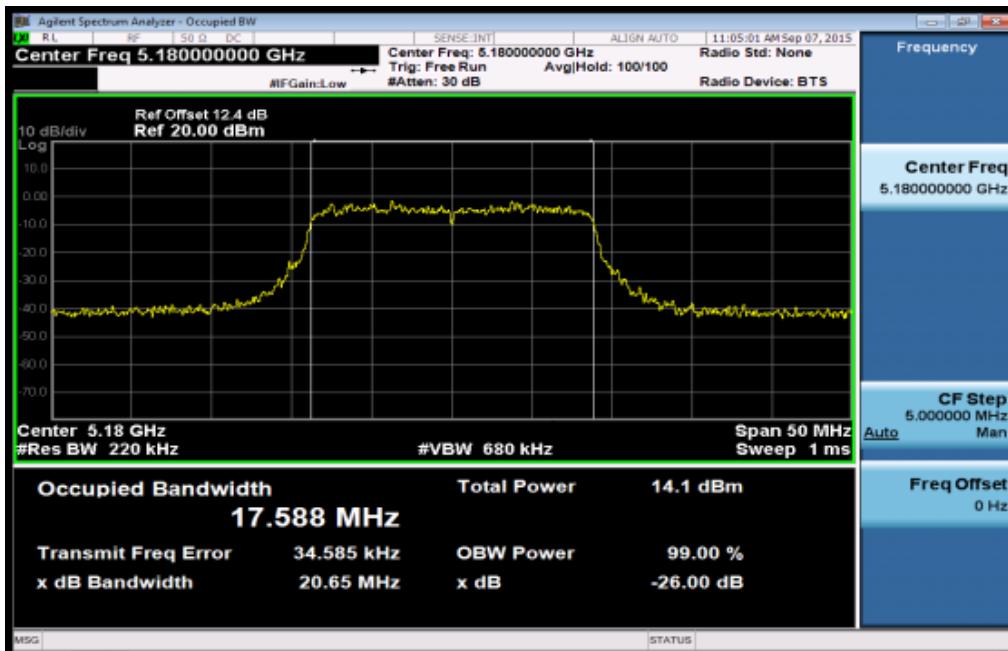
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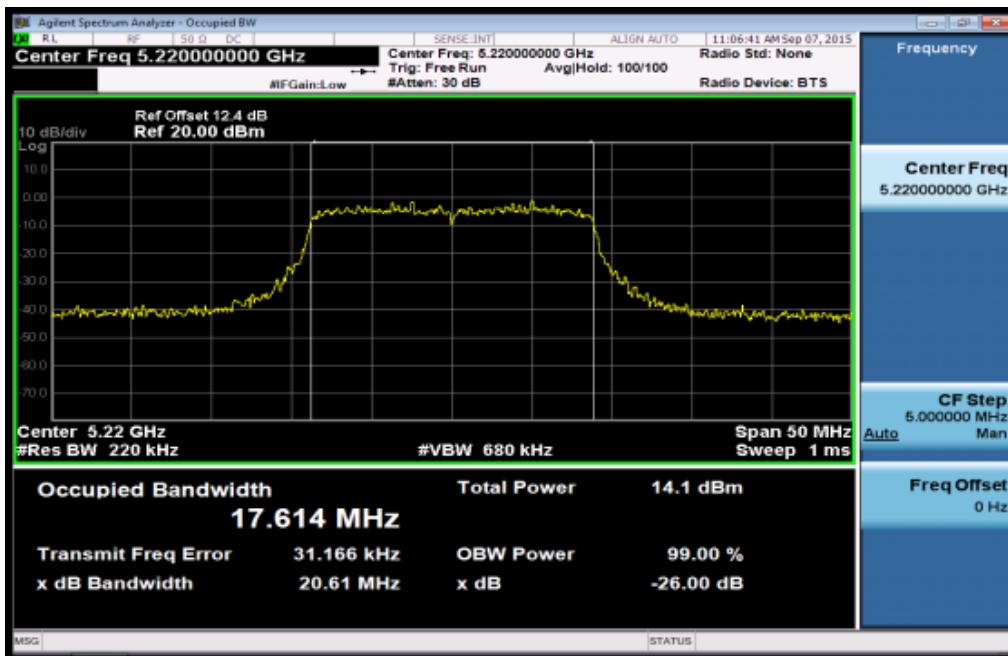
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## 802.11n HT20, 5150~5250 MHz (Main) 26dB Band Width Test Data CH-Low (5180 MHz)



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

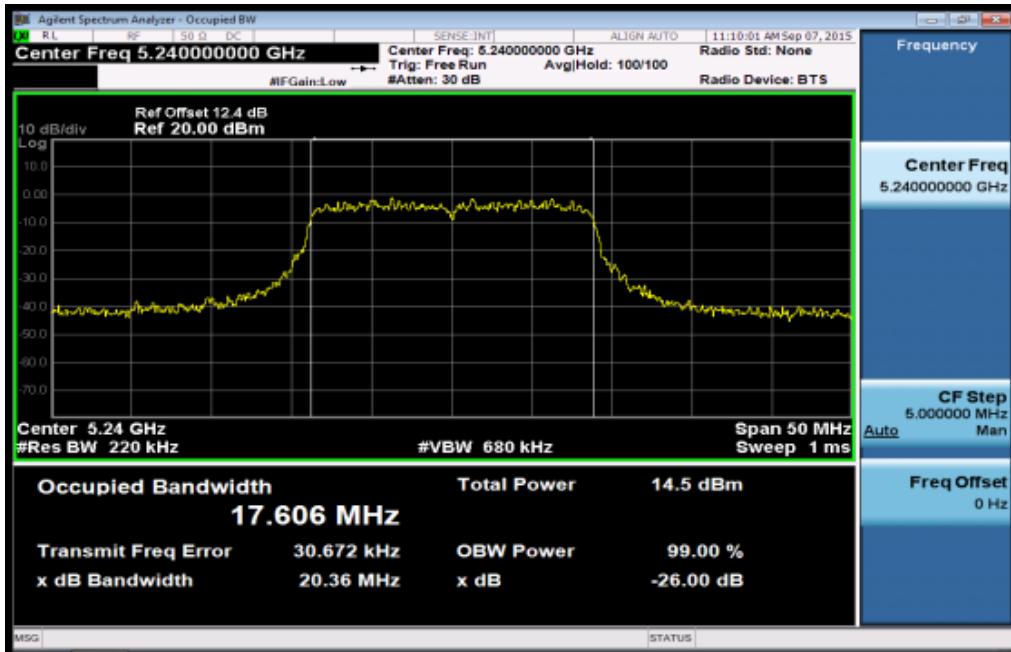


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**26dB Band Width Test Data CH-High (5240 MHz)**

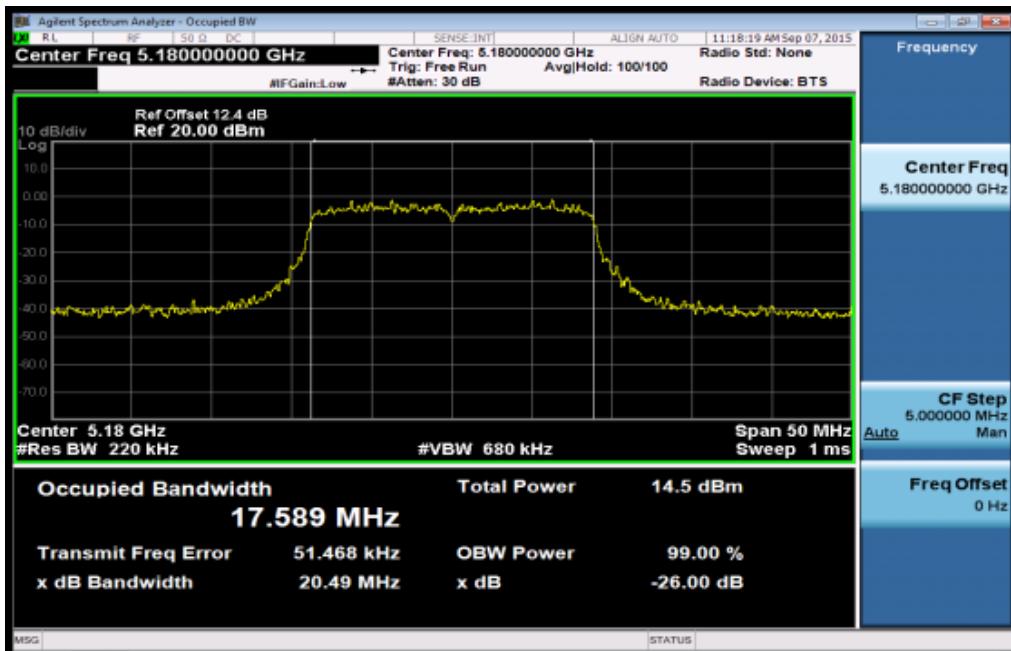
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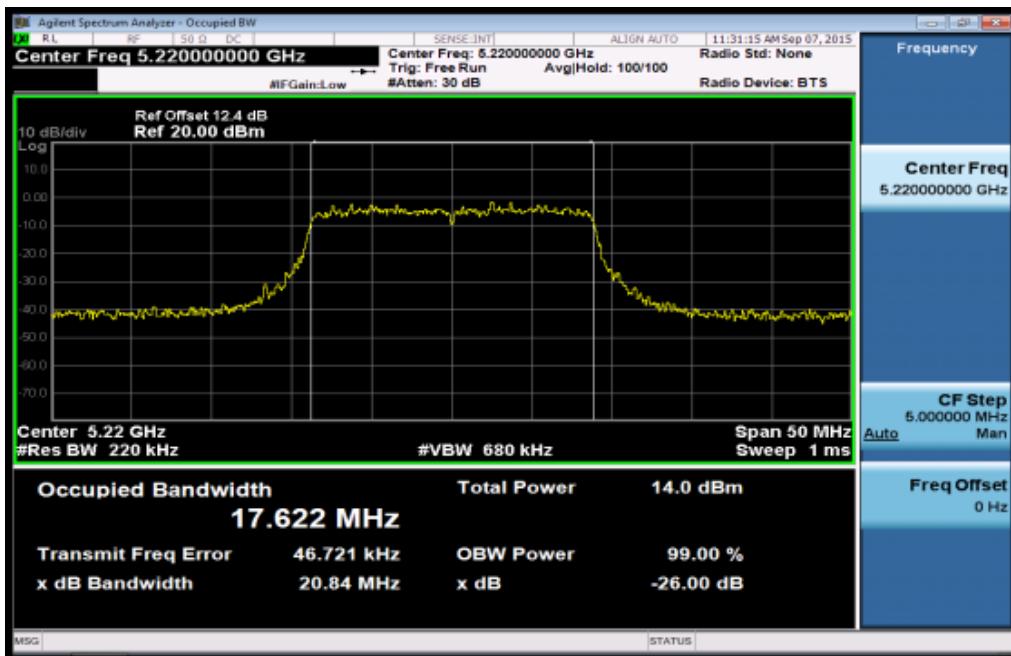
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## 802.11n HT20, 5150~5250 MHz (Aux) 26dB Band Width Test Data CH-Low (5180 MHz)



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

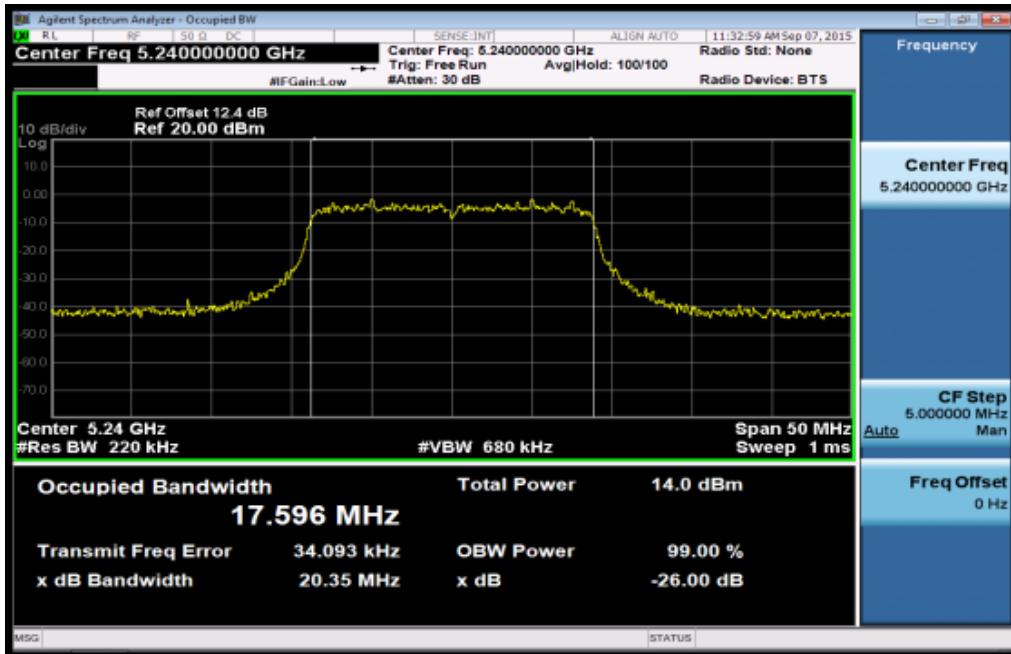


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**26dB Band Width Test Data CH-High (5240 MHz)**

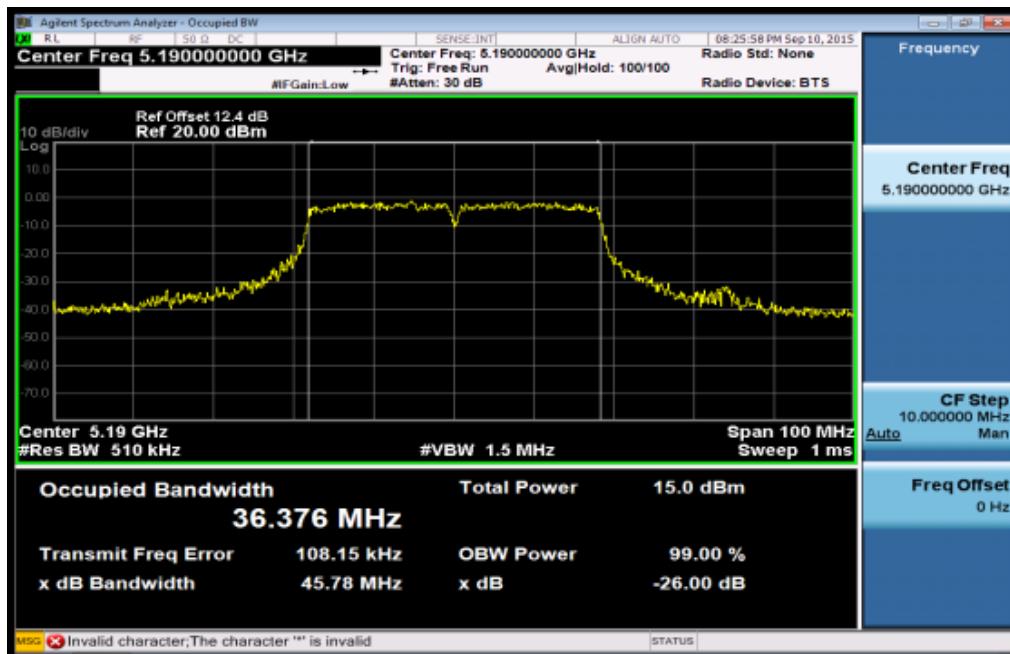
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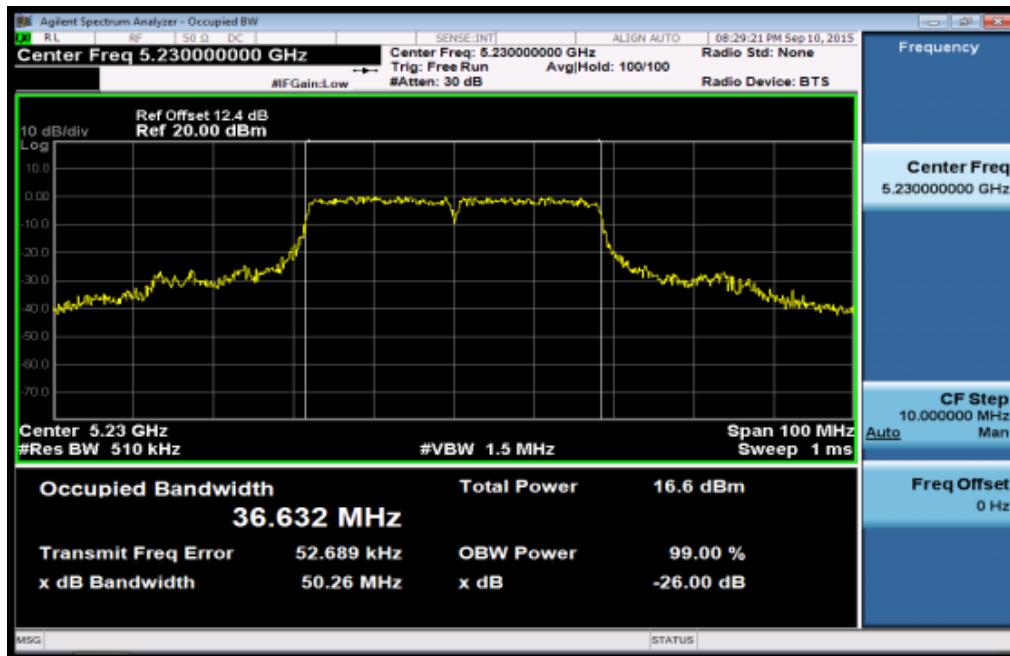
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## 802.11n HT40, 5150~5250 MHz (Main) 26dB Band Width Test Data CH-Low (5190 MHz)



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

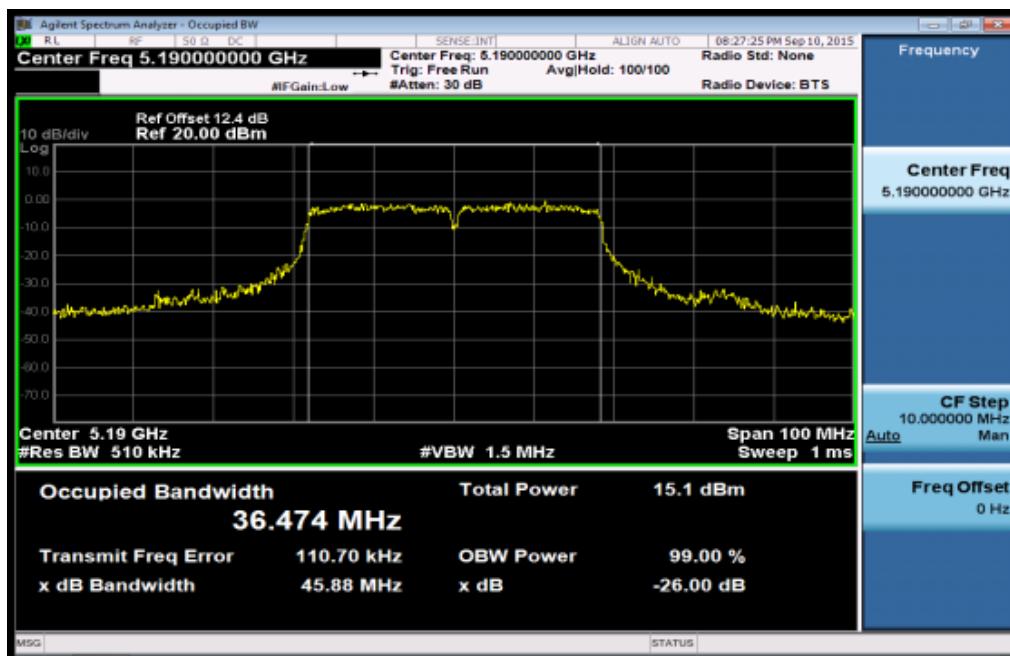


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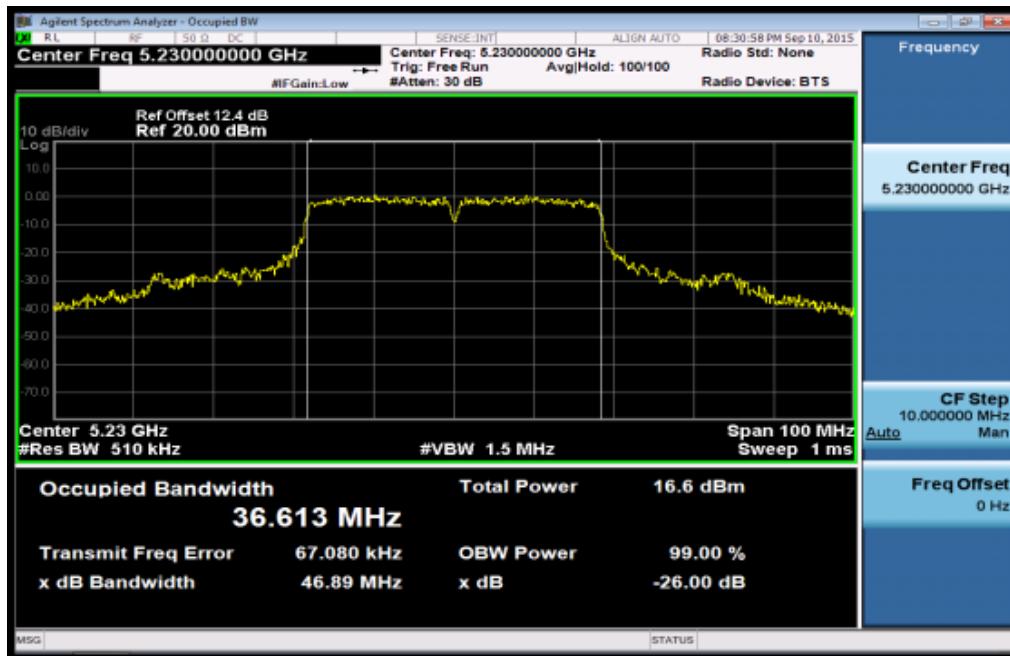
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## 802.11n HT40, 5150~5250 MHz (Aux) 26dB Band Width Test Data CH-Low (5190 MHz)



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



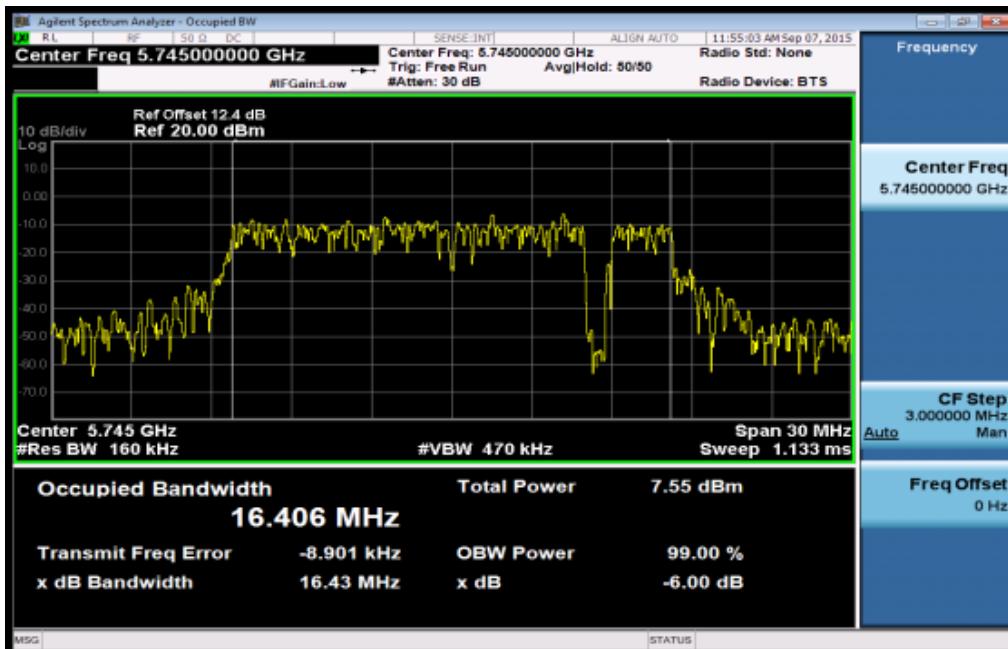
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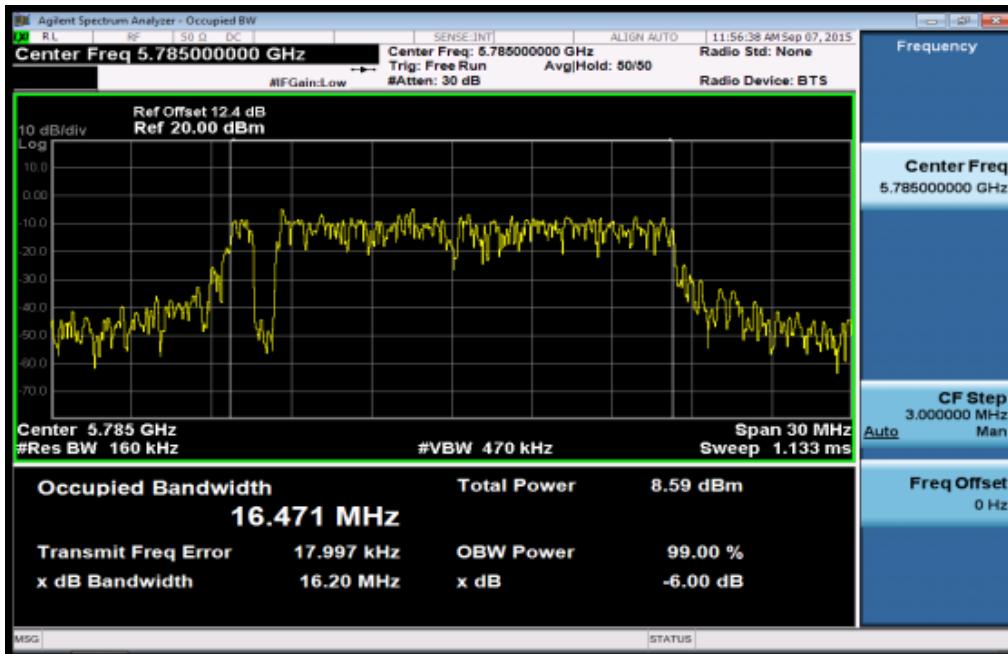
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## 802.11a, 5725~5850 MHz 6dB Band Width Test Data CH-Low (5745 MHz)



## 6dB Band Width Test Data CH-Mid (5785 MHz)

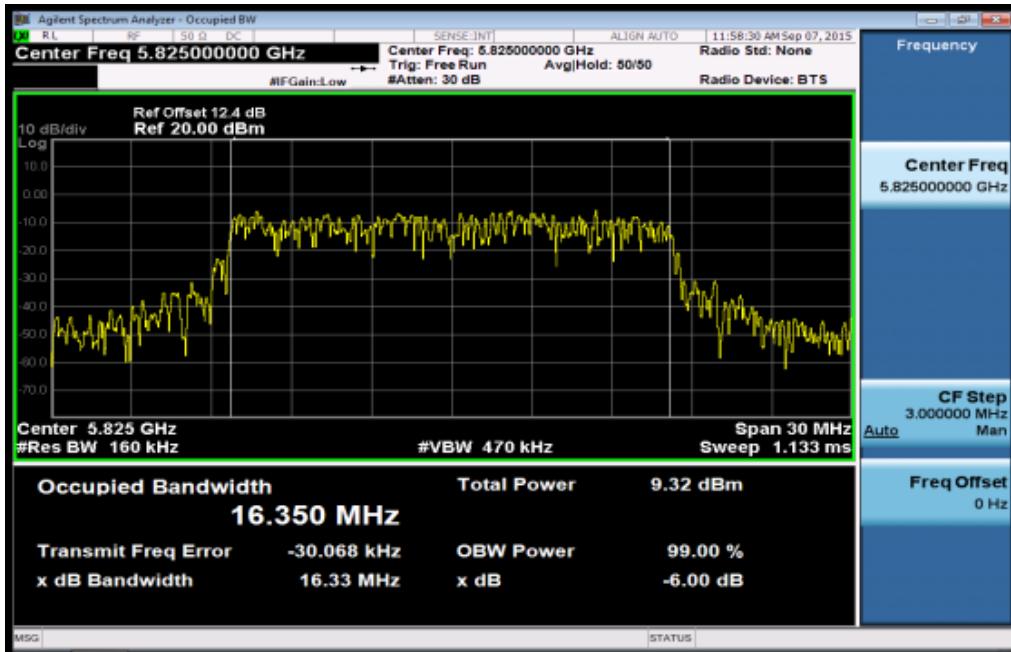


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## 6dB Band Width Test Data CH-High (5825 MHz)



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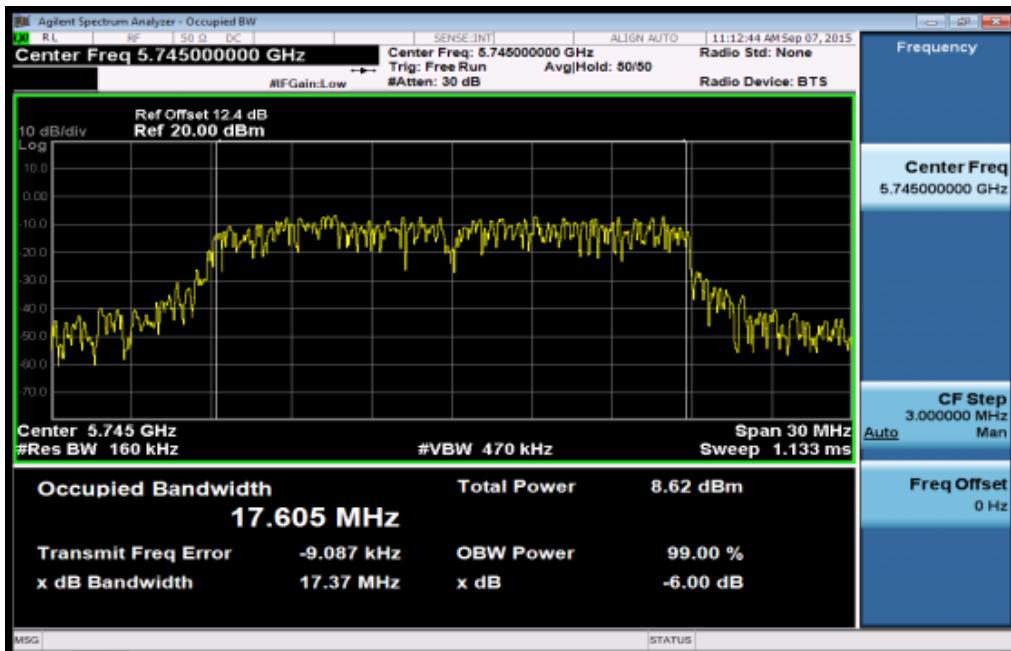
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f (886-2) 2298-0488

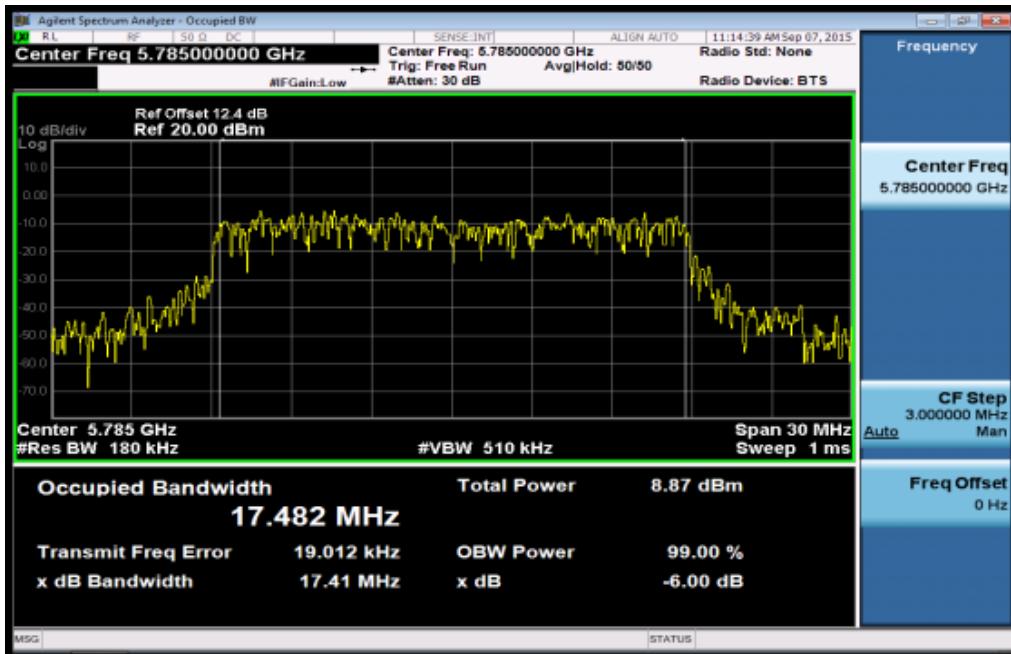
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## 802.11n HT20, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5745 MHz)



## 6dB Band Width Test Data CH-Mid (5785 MHz)

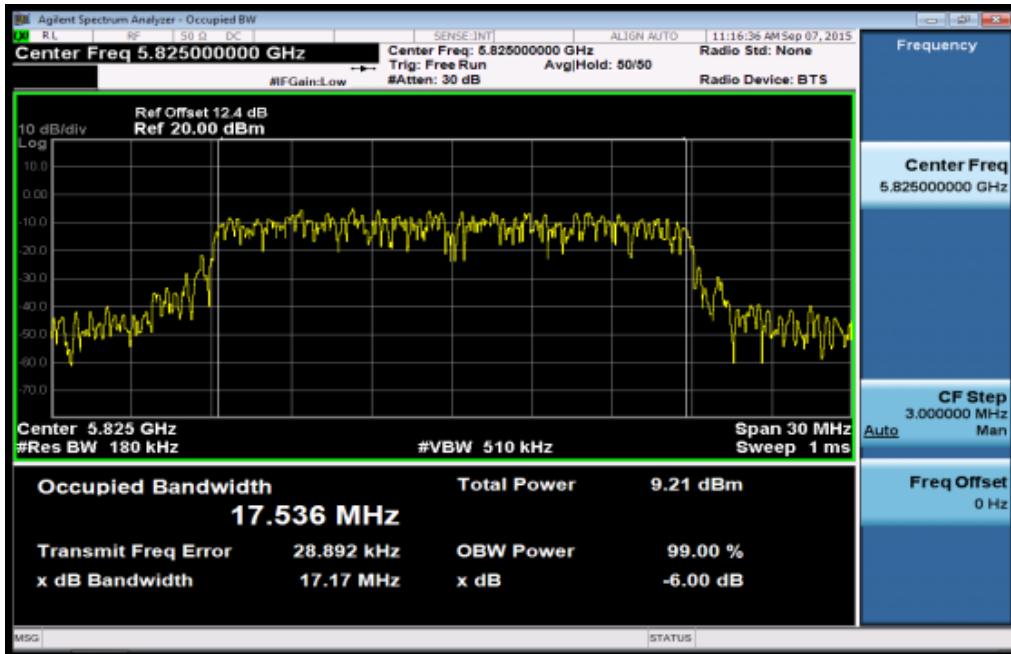


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**6dB Band Width Test Data CH-High (5825 MHz)**

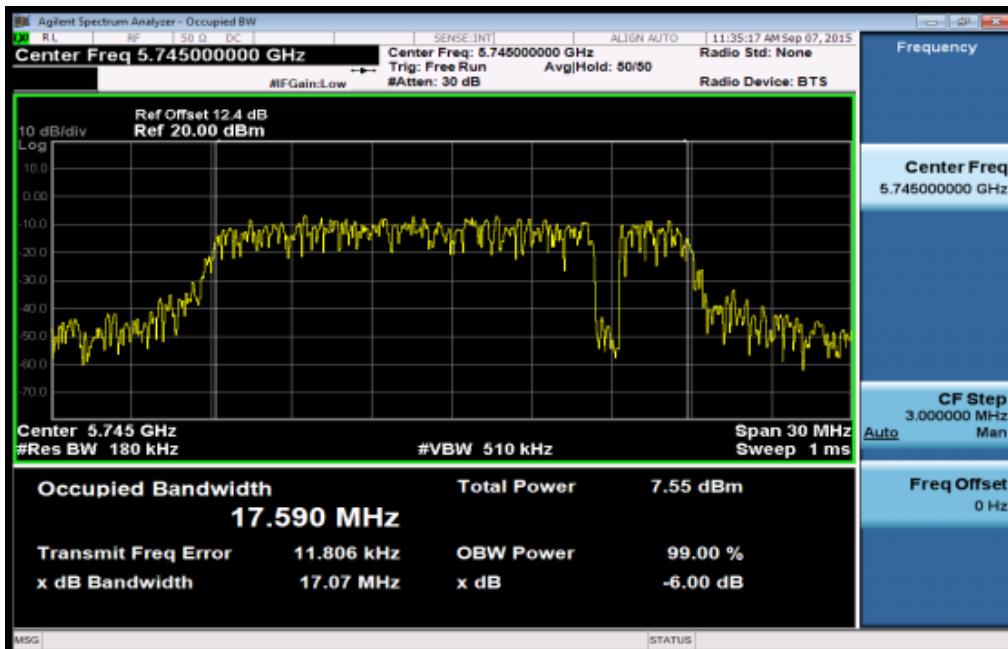
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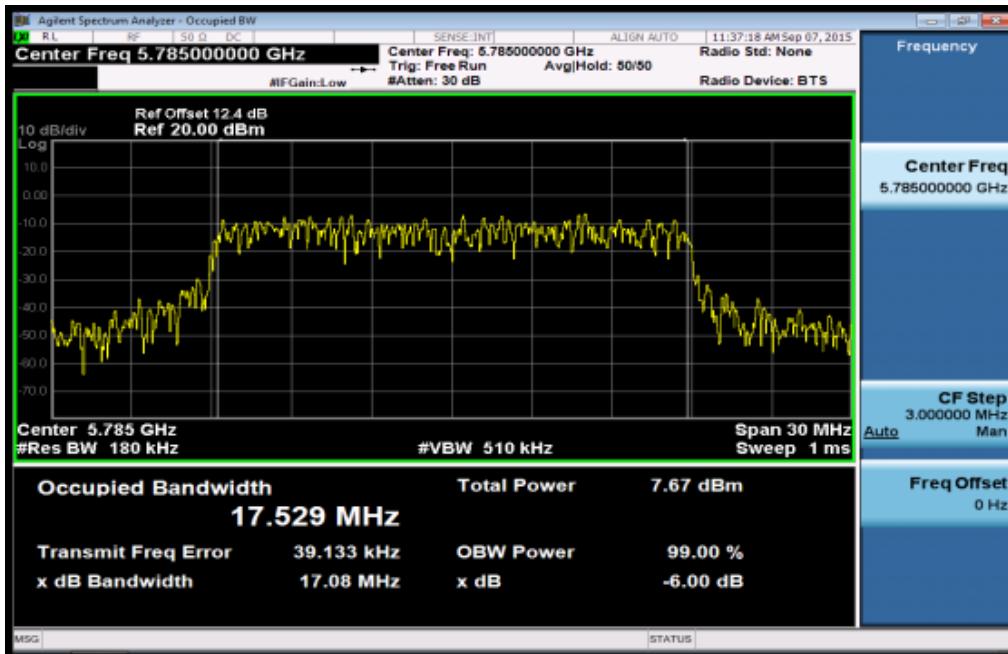
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## 802.11n HT20, 5725~5850 MHz (Aux) 6dB Band Width Test Data CH-Low (5745 MHz)



## 6dB Band Width Test Data CH-Mid (5785 MHz)

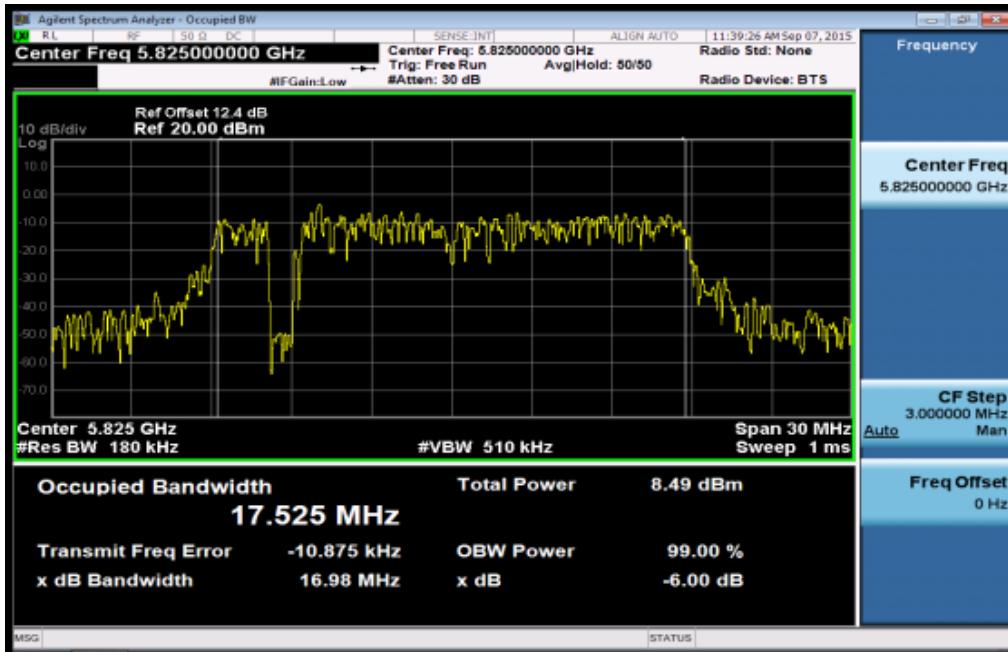


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**6dB Band Width Test Data CH-High (5825 MHz)**

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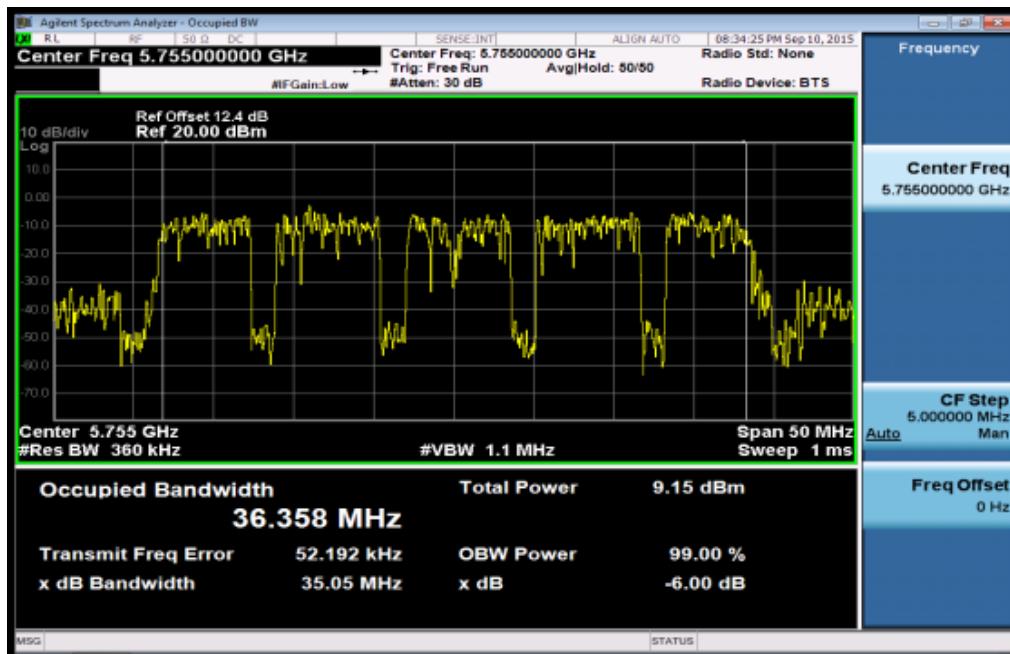
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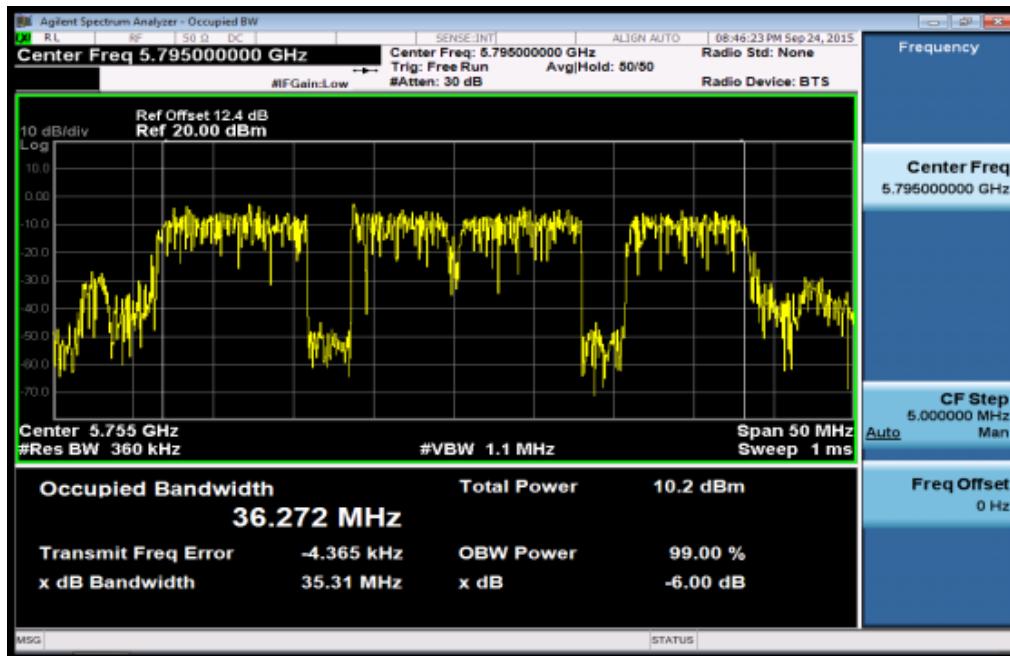
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## 802.11n HT40, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5755 MHz)



## 6dB Band Width Test Data CH-High (5795 MHz)



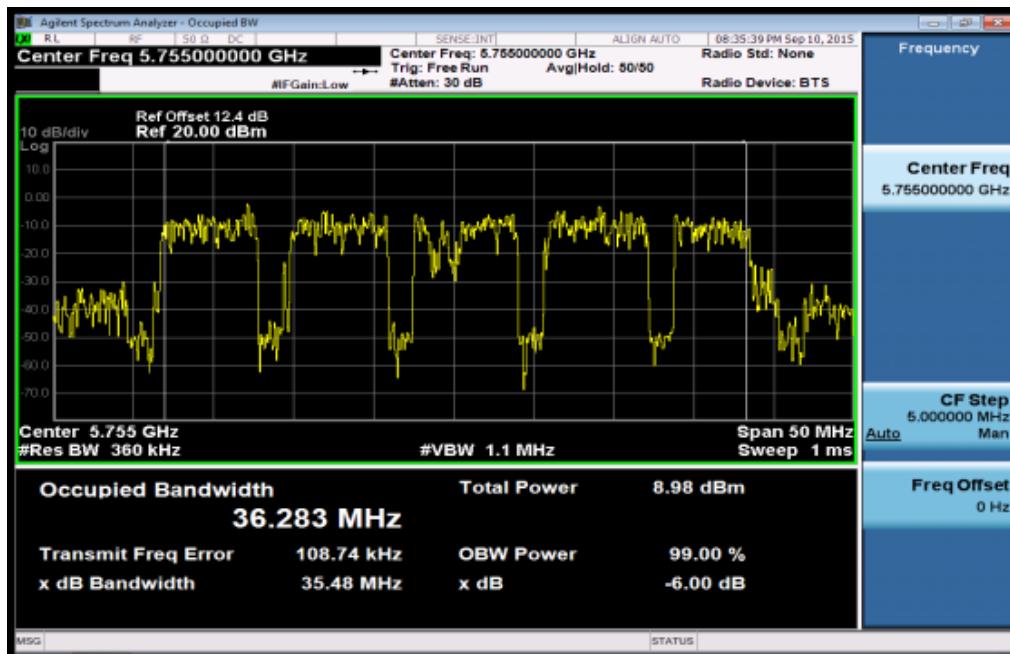
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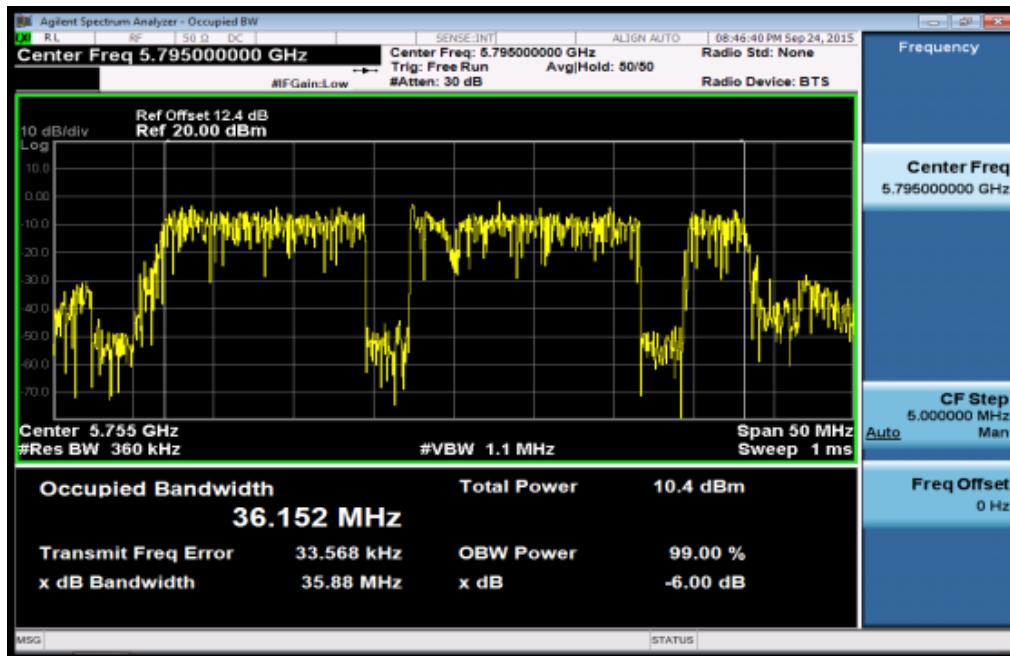
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## 802.11n HT40, 5725~5850 MHz (Aux) 6dB Band Width Test Data CH-Low (5755 MHz)



## 6dB Band Width Test Data CH-High (5795 MHz)



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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 6dBi 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 6dBi.

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

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

Effective Legacy Gain (dBi) = 3.71+3.01=6.72dB

Limit: 23.98dBm – (6.72– 6dBi) = 23.26dBm

Therefore the limit needs to reduce for the U-NII-1 band.

Effective Legacy Gain (dBi) = 5.02+3.01=8.03dB

Limit: 30dBm – (8.03– 6dBi) = 27.97dBm

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

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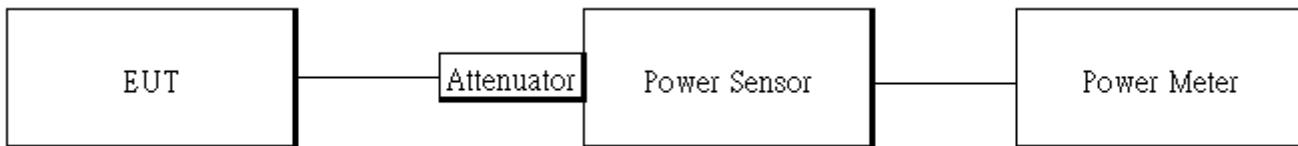
## 9.2 Measurement Procedure

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 v01.
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

Refer to section 8.3 for details.

## 9.4 Test Set-up



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## 9.5 Measurement Result

802.11a

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	<b>9.79</b>	<b>9.528</b>	23.98	PASS
44	5220	8.26	6.699	23.98	PASS
48	5240	7.62	5.781	23.98	PASS
149	5745	7.52	5.649	30	PASS
157	5785	8.63	7.295	30	PASS
165	5825	<b>9.27</b>	<b>8.453</b>	30	PASS

802.11n HT20 (MIMO)

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
		CHAIN 0	CHAIN 1				
36	5180	9.05	10.22	<b>12.68</b>	<b>18.555</b>	23.26	PASS
44	5220	9.48	10.72	13.15	20.675	23.26	PASS
48	5240	8.34	9.44	11.94	15.614	23.26	PASS
149	5745	8.11	9.15	11.67	14.694	27.97	PASS
157	5785	8.47	10.37	<b>12.53</b>	<b>17.920</b>	27.97	PASS
165	5825	9.41	10.89	13.22	21.004	27.97	PASS

802.11n HT40 (MIMO)

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
		CHAIN 0	CHAIN 1				
38	5190	9.62	11.56	13.71	23.484	23.26	PASS
46	5230	8.10	10.15	<b>12.26</b>	<b>16.808</b>	23.26	PASS
151	5755	7.81	9.35	11.66	14.649	27.97	PASS
159	5795	8.29	9.61	<b>12.01</b>	<b>15.886</b>	27.97	PASS

\* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.

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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 6dBi 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 6dBi.

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) = 3.71+3.01=6.72dBi

Limit: 11dBm – (6.72– 6dBi) = 10.28dBm

Therefore the limit needs to reduce for the U-NII-1

Effective Legacy Gain (dBi) = 5.02+3.01=8.03dBi

Limit: 30dBm – (8.03– 6dBi) = 27.97dBm

Therefore the limit needs to reduce for the 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 v01.
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 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:**

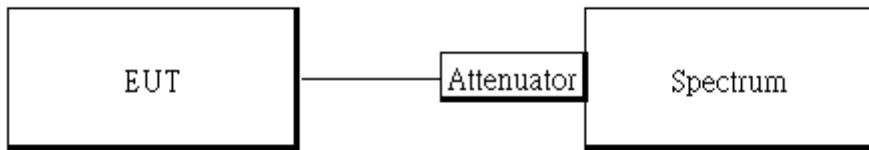
Set RBW=510 kHz, VBW= 3\*RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

5. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add  $10 \log(1/\text{duty cycle})$ .
7. MIMO Mode: offset is set following “measure and add  $10 \log(N)$ ” on spectrum to measure the PSD for MIMO mode. Offset = cable loss +  $10 \log(N)$ , where N is number of transmitting antenna. N=2 for this given application.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

## 10.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016

## 10.4 Test Set-up



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## 10.5 Measurement Result

802.11a

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	-4.33	11.00	-15.33
5220	-3.54	11.00	-14.54
5240	-2.15	11.00	-13.15
5745	-4.06	30.00	-34.06
5785	-4.15	30.00	-34.15
5825	-2.65	30.00	-32.65

802.11n HT20 (MIMO)

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	-0.31	10.28	-10.59
5220	2.66	10.28	-7.62
5240	2.22	10.28	-8.06
5745	3.94	27.97	-24.03
5785	5.61	27.97	-22.36
5825	5.63	27.97	-22.34

802.11n HT40 (MIMO)

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5190	0.03	10.28	-10.25
5230	1.20	10.28	-9.08
5755	2.68	27.97	-25.29
5795	2.36	27.97	-25.61

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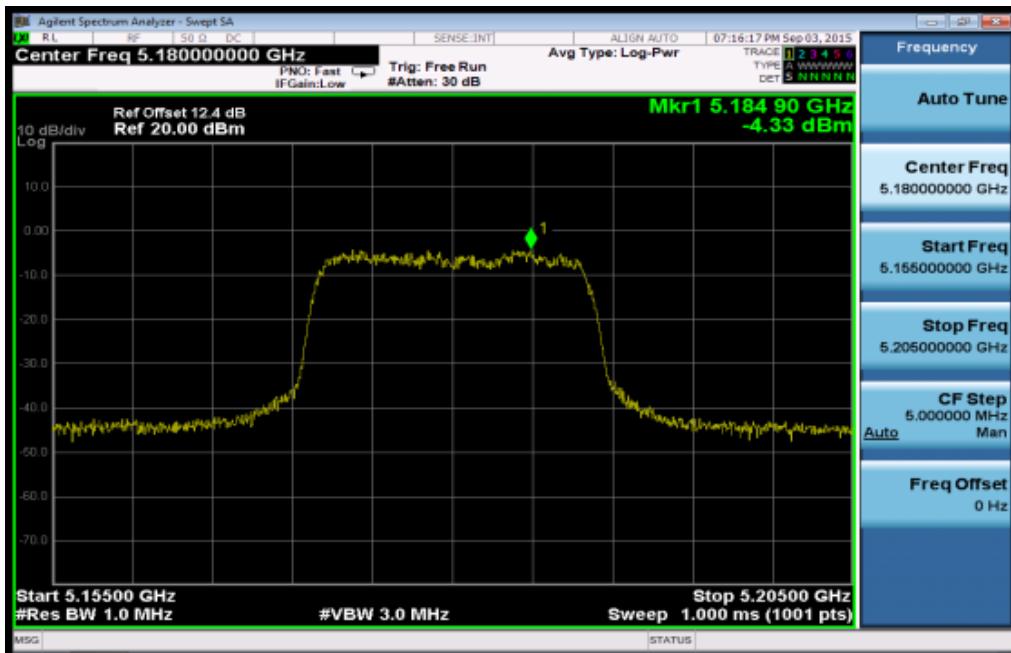
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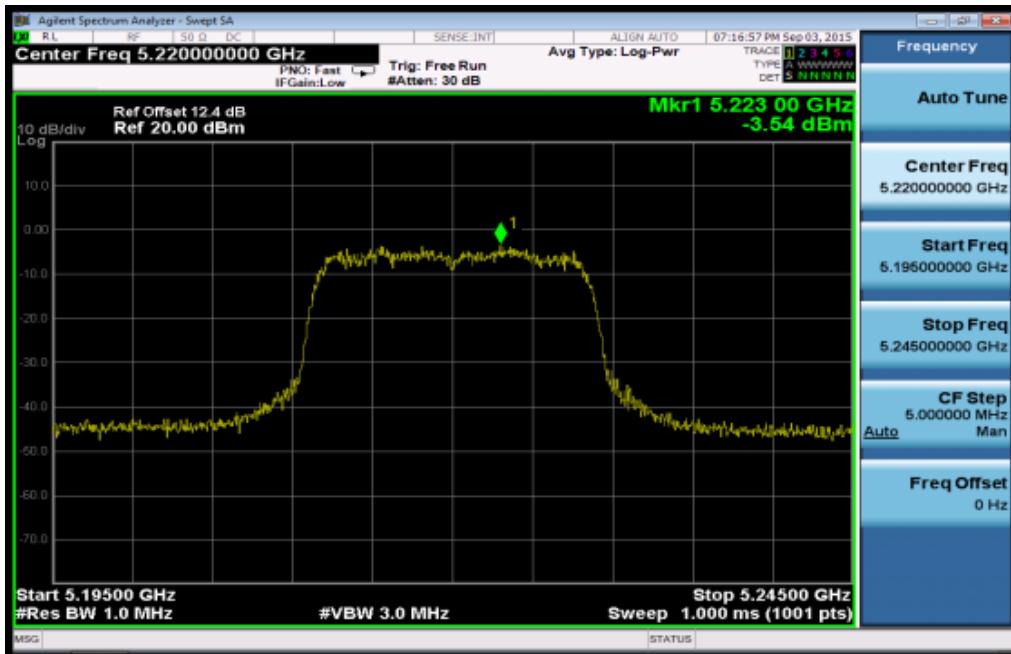
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## 802.11a, 5150~5250 MHz

### Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



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



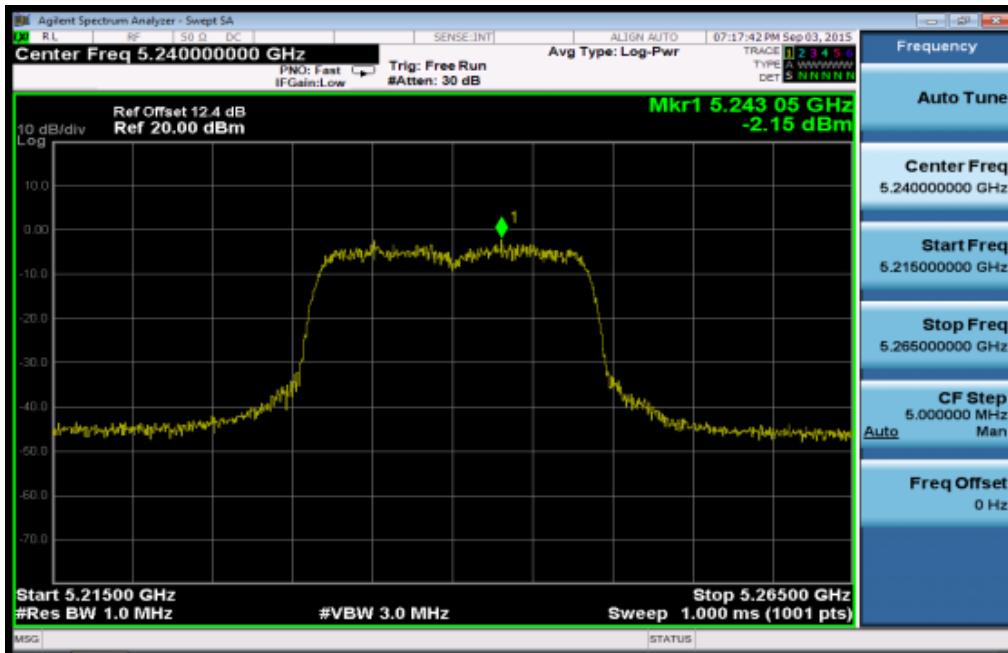
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## Peak Power Spectral Density Data Plot (CH High 5240 MHz)



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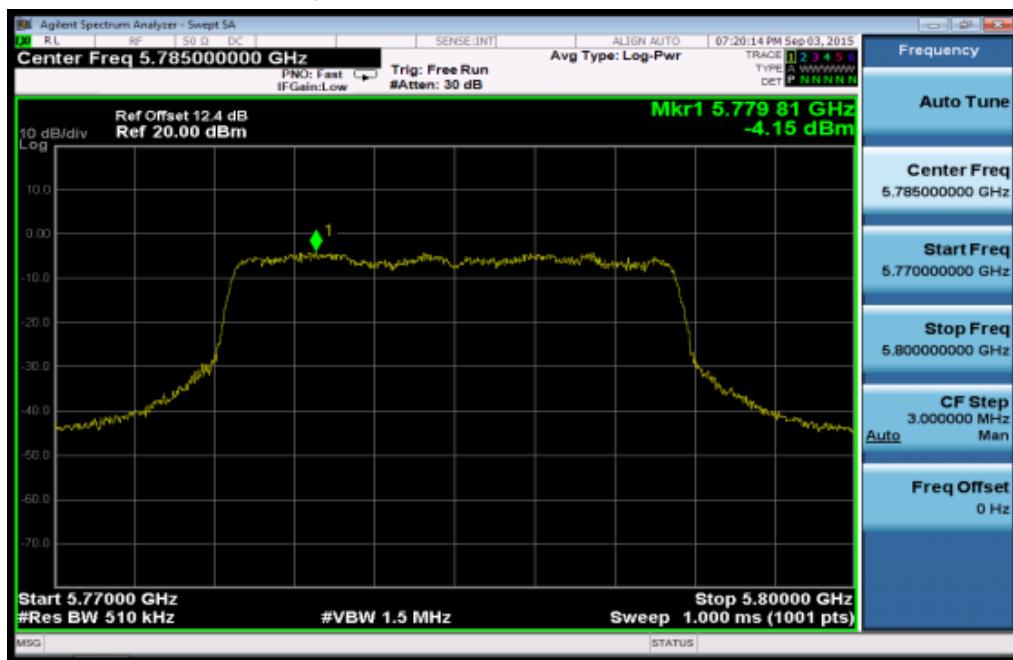
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## 802.11a, 5725~5850 MHz

### Peak Power Spectral Density Data Plot (CH Low 5745 MHz)



### Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)



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## Peak Power Spectral Density Data Plot (CH High 5825 MHz)



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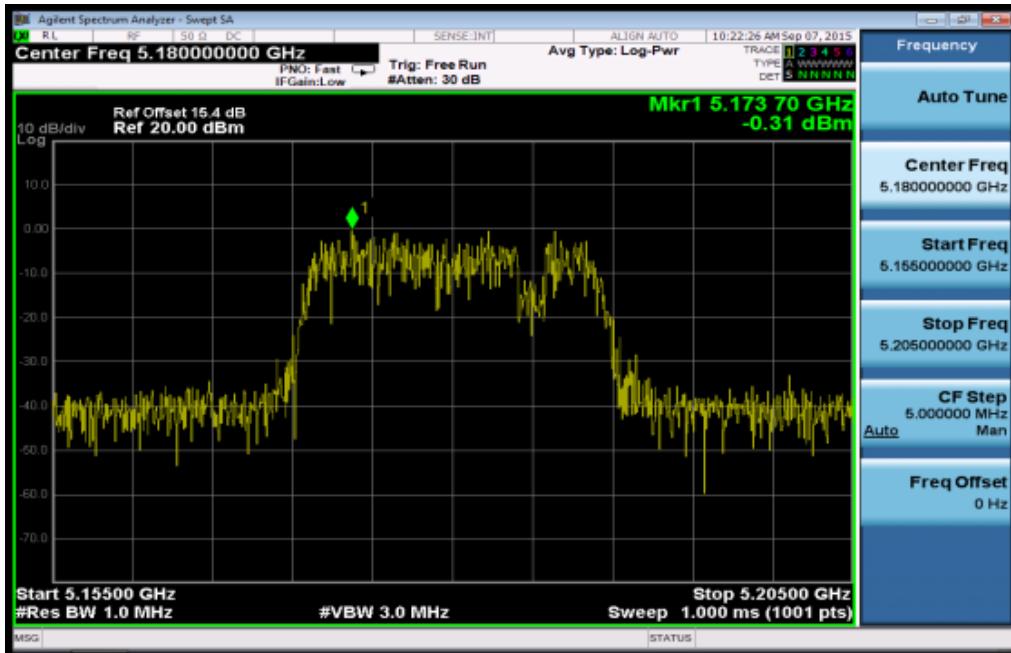
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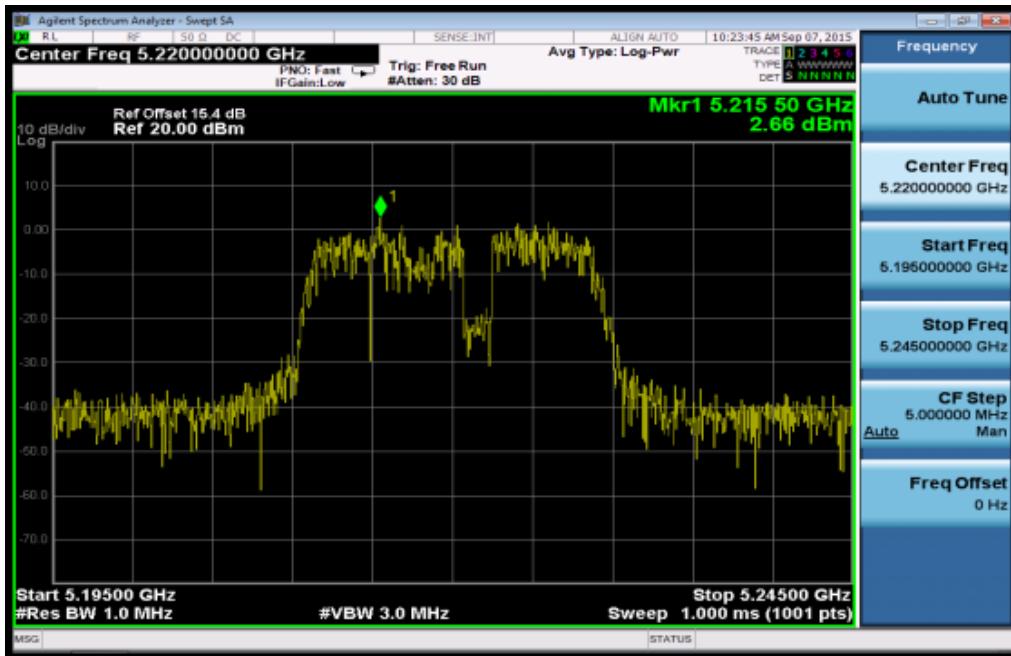
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## 802.11n HT20, 5150~5250 MHz (MIMO) Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



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



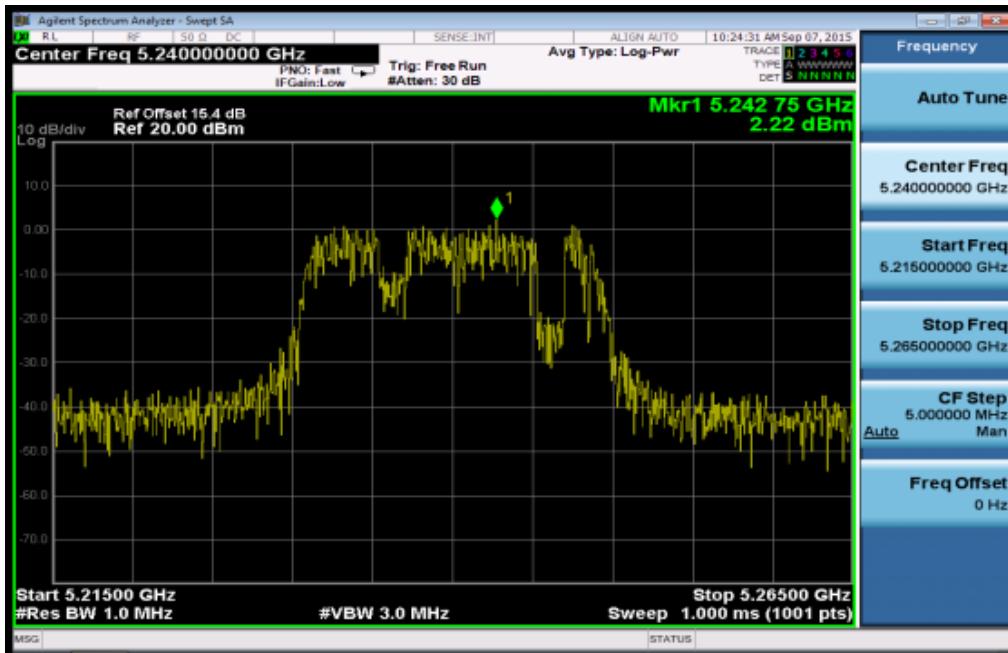
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## Peak Power Spectral Density Data Plot (CH High 5240 MHz)



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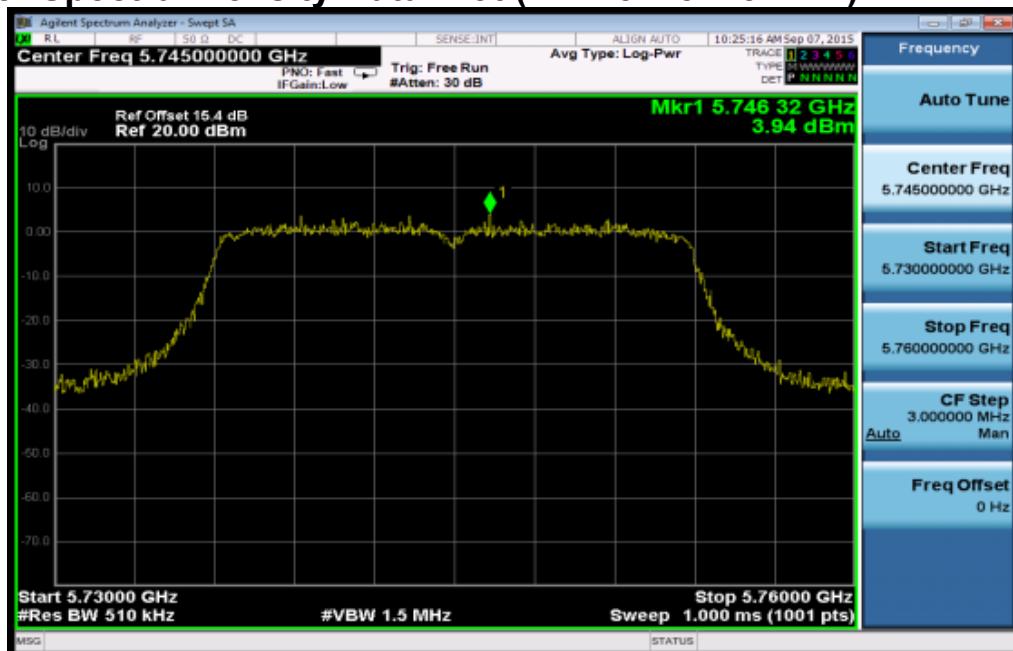
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## 802.11n HT20, 5725~5850 MHz (MIMO) Peak Power Spectral Density Data Plot (CH Low 5745 MHz)



## Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)



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## Peak Power Spectral Density Data Plot (CH High 5825 MHz)



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**802.11n HT40, 5150~5250 MHz (MIMO)  
Peak Power Spectral Density Data Plot (CH Low 5190MHz)****Peak Power Spectral Density Data Plot (CH High 5230MHz)**

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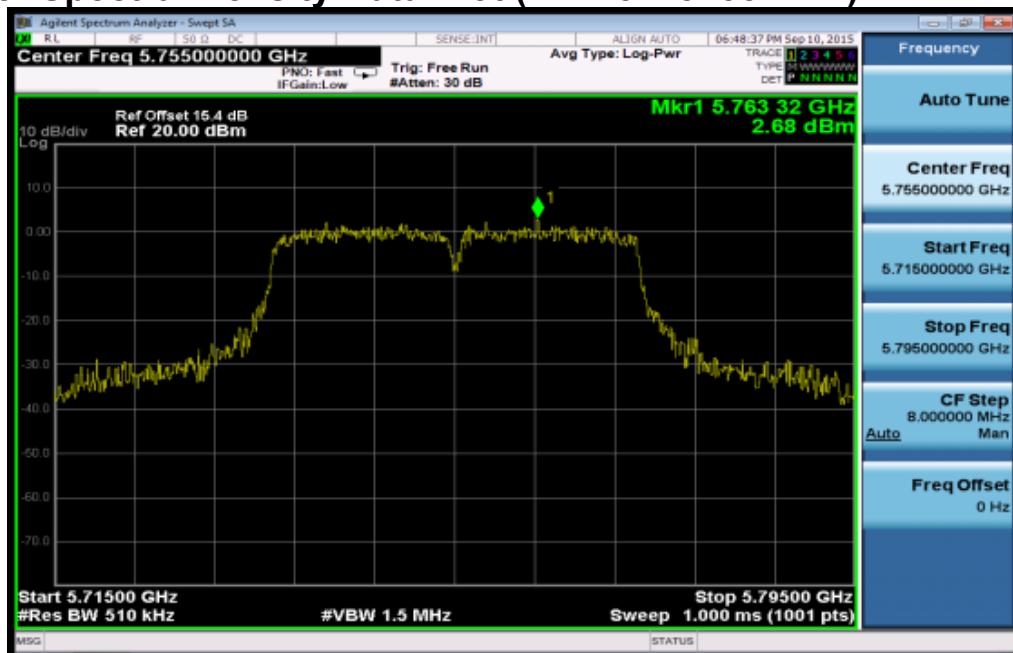
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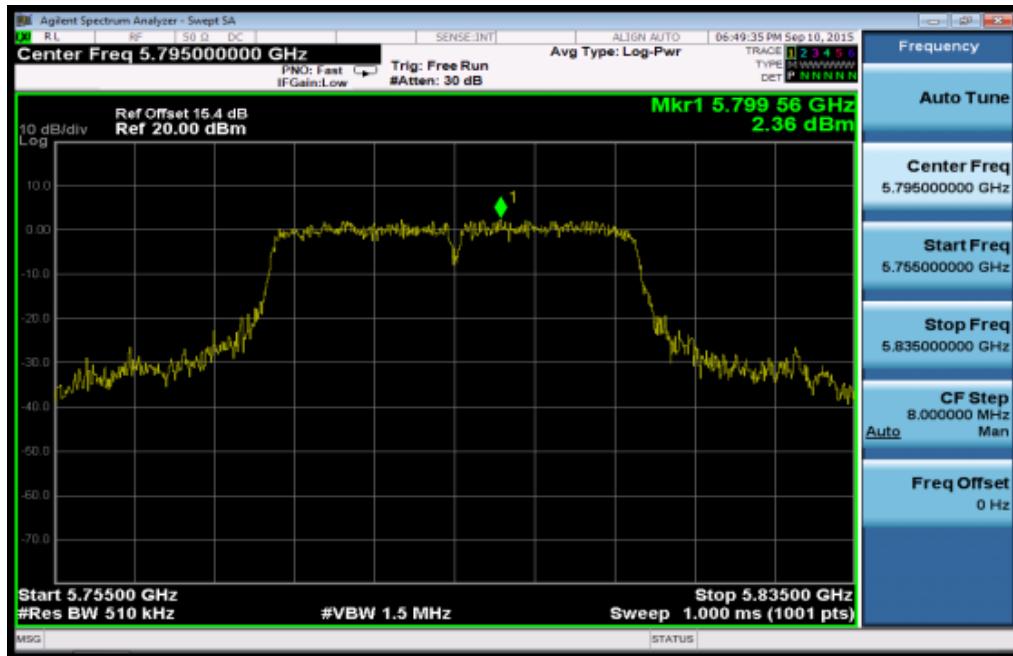
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## 802.11n HT40, 5725~5850 MHz (MIMO) Peak Power Spectral Density Data Plot (CH Low 5755 MHz)



## Peak Power Spectral Density Data Plot (CH High 5795 MHz)



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## 11. UNDESIRABLE RADIATED EMISSION MEASUREMENT1

### 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 (dB $\mu$ V/m)	AV 54 (dB $\mu$ V/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)		
15.407(b)(2)	PK: -27 (dBm/MHz)	PK: 68.3 (dB $\mu$ V/m)
15.407(b)(3)		
15.407(b)(4)	PK: -27 (dBm/MHz) PK: -17 (dBm/MHz)	PK: 68.3 (dB $\mu$ V/m) PK: 78.2 (dB $\mu$ V/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 ( $\text{dB}\mu\text{V}/\text{m}$ ) =  $20 \log \text{Emission level } (\text{dB}\mu\text{V}/\text{m})$

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## 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	ETS-Lindgren	3160-09	00117911	11/13/2014	11/12/2015
Horn Antenna	ETS-Lindgren	3160-10	00117783	11/13/2014	11/12/2015
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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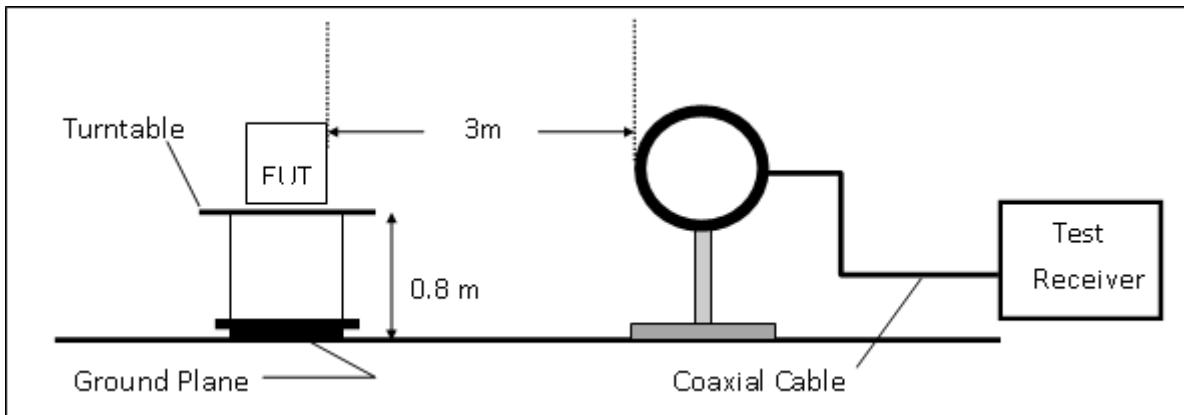
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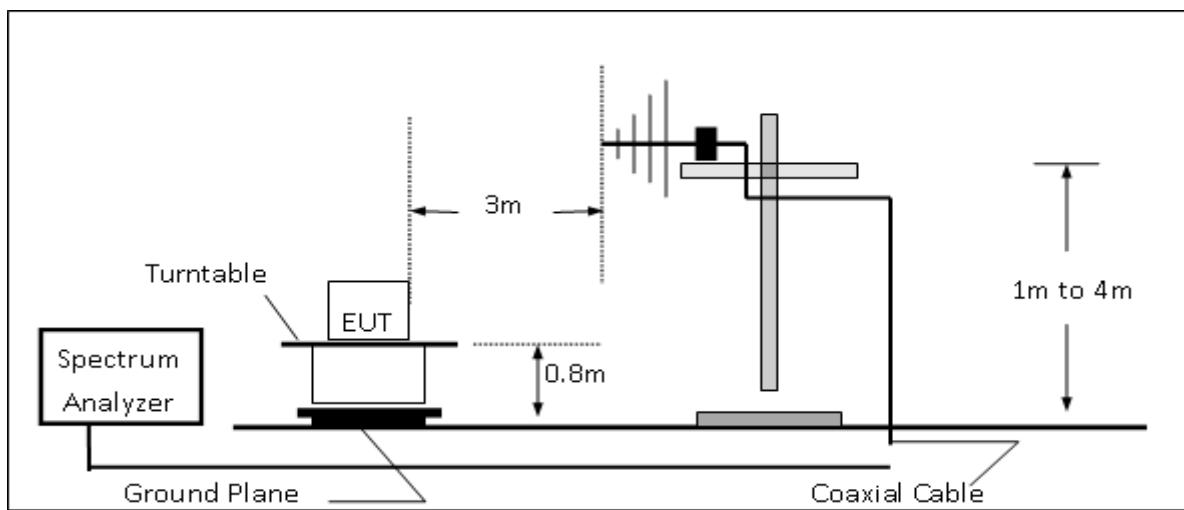
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### 11.3 Test SET-UP

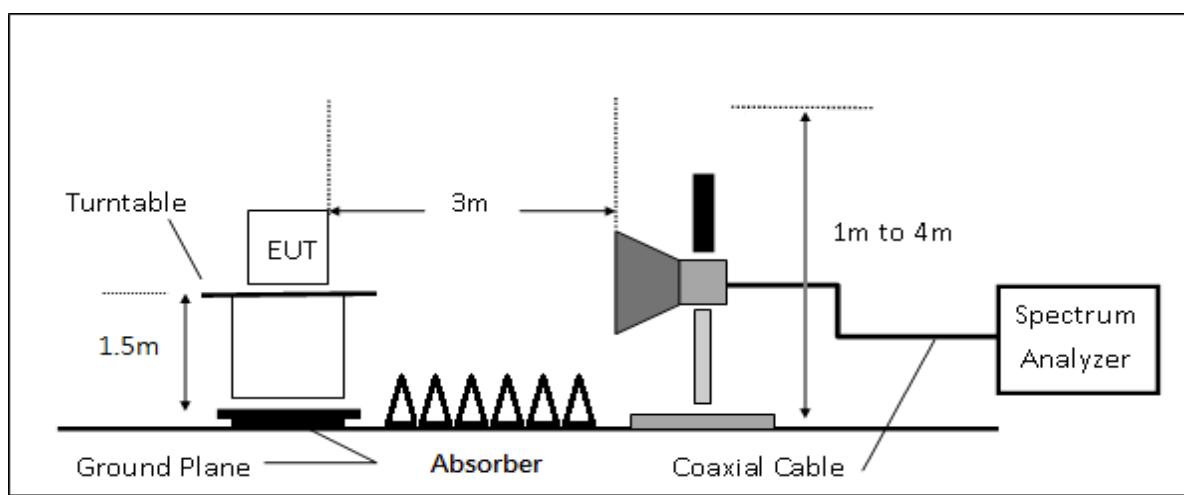
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (B) Radiated Emission Test Set-UP, Frequency from 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 0.8m 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  $\geq$  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(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/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

Refer to attach tabular data sheets.

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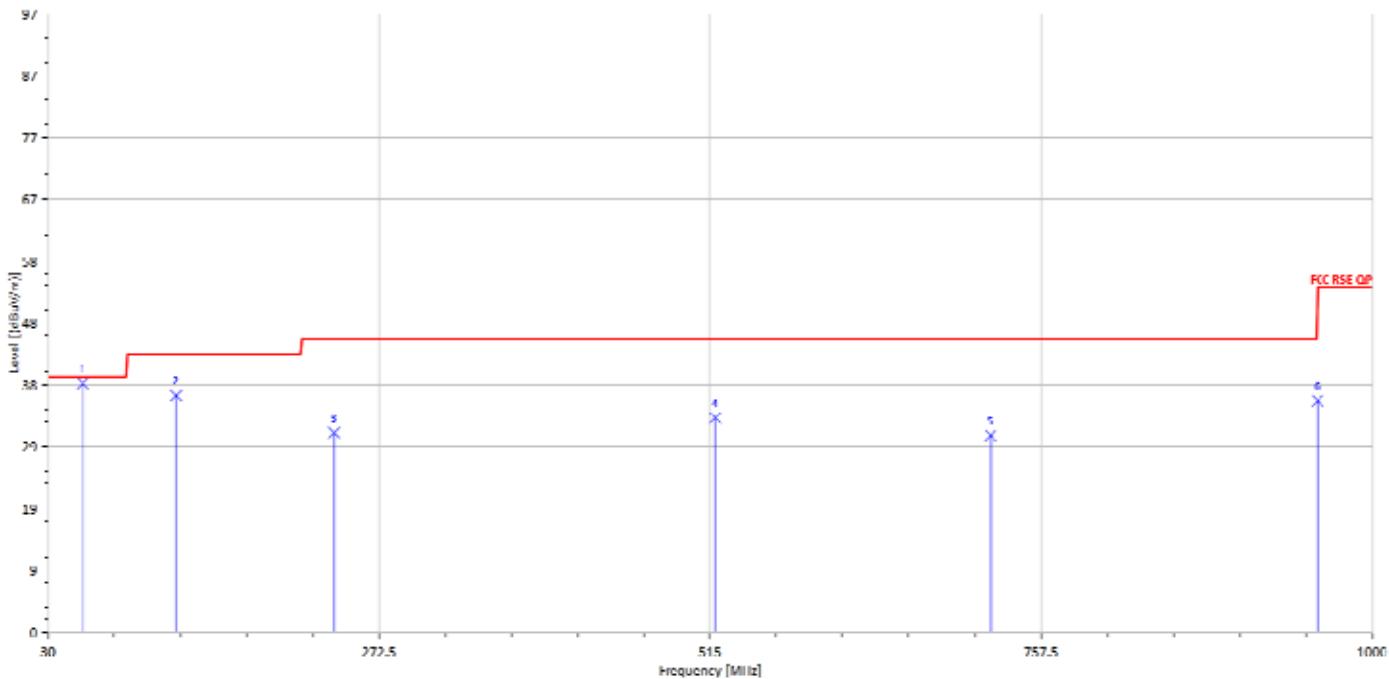
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**Radiated Spurious Emission Measurement Result****Below 1GHz Worst-Case Data:****802.11a, 5150~5250 MHz**

Operation Band	:802.11 a	Test Date	:2015-09-15
Fundamental Frequency	:5220 MHz	Temp./Humi.	:26.5 deg_C / 50 RH
Operation Mode	:TX MID	Engineer	:Ashton
EUT Pol.	:H Plan	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading				
			Level dBµV				
55.61	S	QP	66.14	-27.17	38.97	40	-1.03
124.09	S	Peak	58.49	-21.39	37.10	43.5	-6.40
239.52	S	Peak	52.34	-21.14	31.20	46	-14.80
518.88	S	Peak	47.17	-13.59	33.58	46	-12.42
720.64	S	Peak	41.55	-10.77	30.78	46	-15.22
960.23	S	Peak	43.92	-7.61	36.31	54	-17.69

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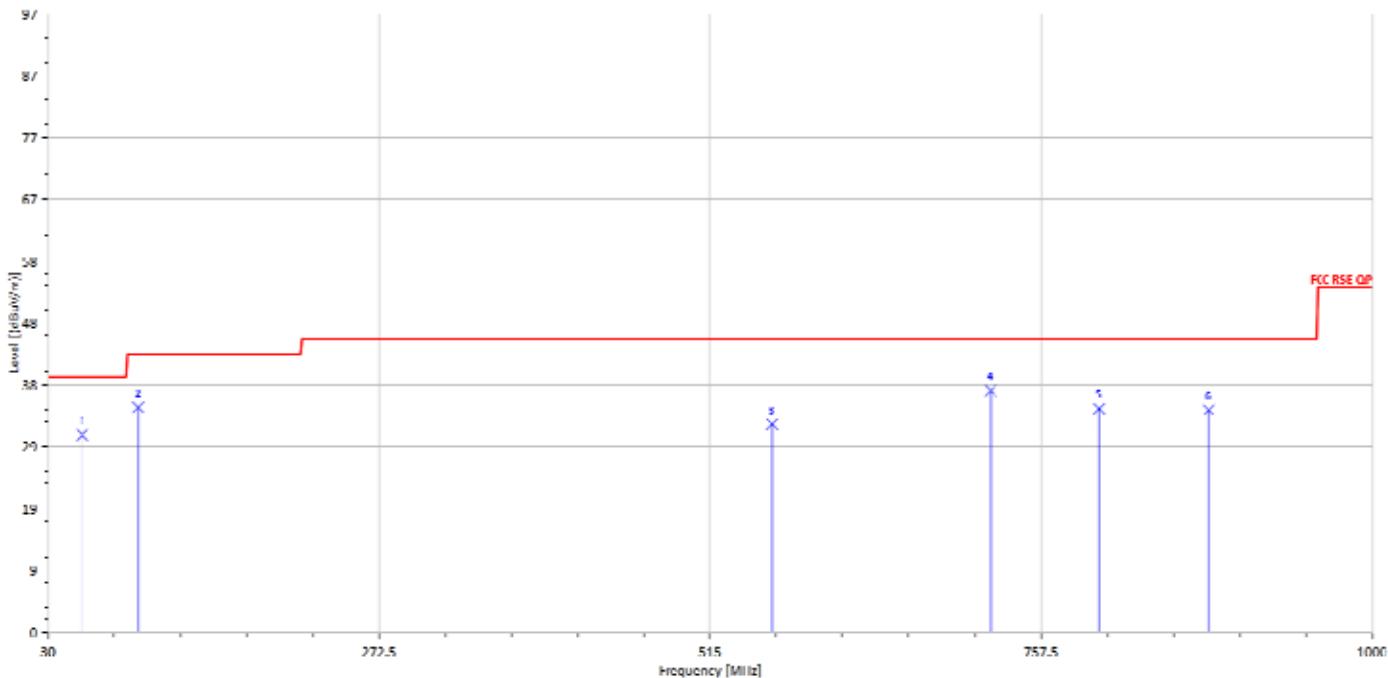
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Operation Band :802.11 a  
Fundamental Frequency :5220 MHz  
Operation Mode :TX MID  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Mode	Reading Level dBµV				
55.22	S	Peak	57.93	-27.06	30.87	40	-9.13	
95.96	S	Peak	59.79	-24.54	35.25	43.5	-8.25	
560.59	S	Peak	45.42	-12.86	32.56	46	-13.44	
720.64	S	Peak	48.62	-10.77	37.85	46	-8.15	
800.18	S	Peak	44.55	-9.49	35.06	46	-10.94	
880.69	S	Peak	43.47	-8.62	34.84	46	-11.16	

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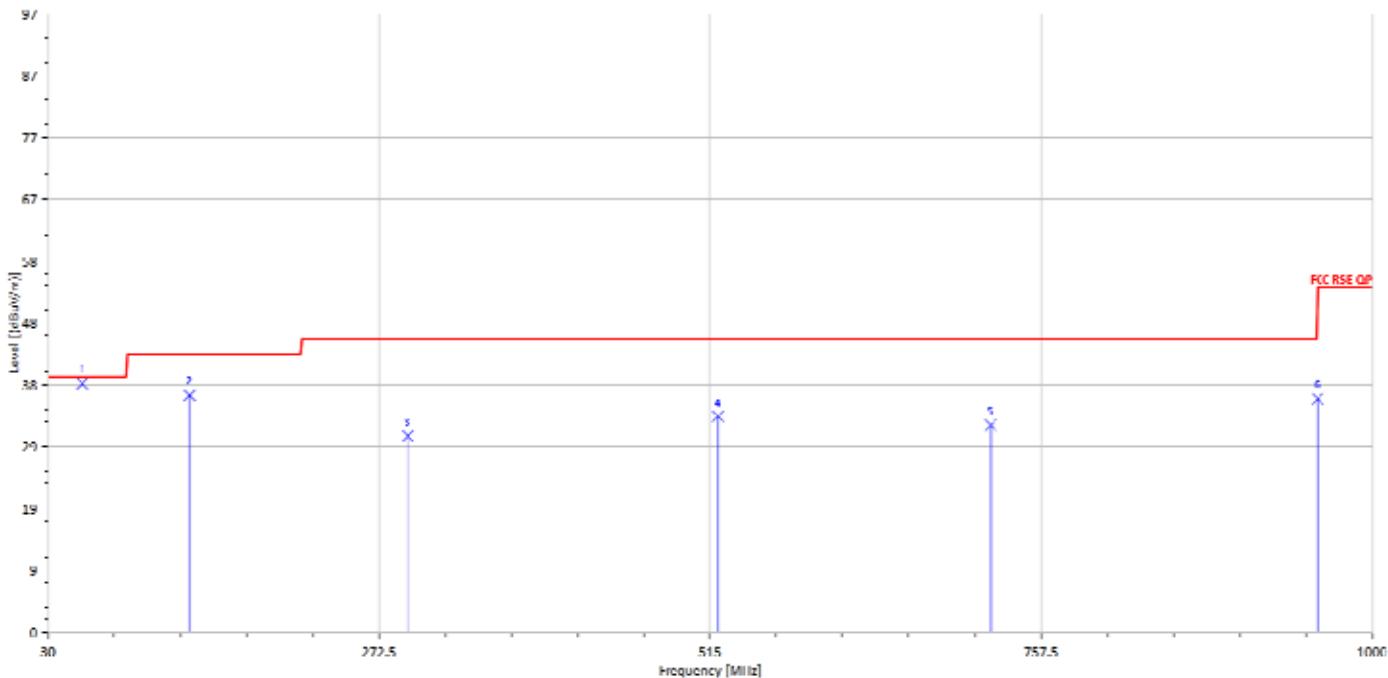
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**802.11a, 5725~5850 MHz**

Operation Band :802.11 a  
Fundamental Frequency :5785 MHz  
Operation Mode :TX MID  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			PK/QP/AV	Reading Level dBµV				
55.25	S	QP		66.01	-27.07	38.94	40	-1.06
133.79	S	Peak		58.54	-21.40	37.14	43.5	-6.36
293.84	S	Peak		50.06	-19.36	30.70	46	-15.30
520.82	S	Peak		47.35	-13.52	33.83	46	-12.17
720.64	S	Peak		43.17	-10.77	32.40	46	-13.60
960.23	S	Peak		44.22	-7.61	36.61	54	-17.39

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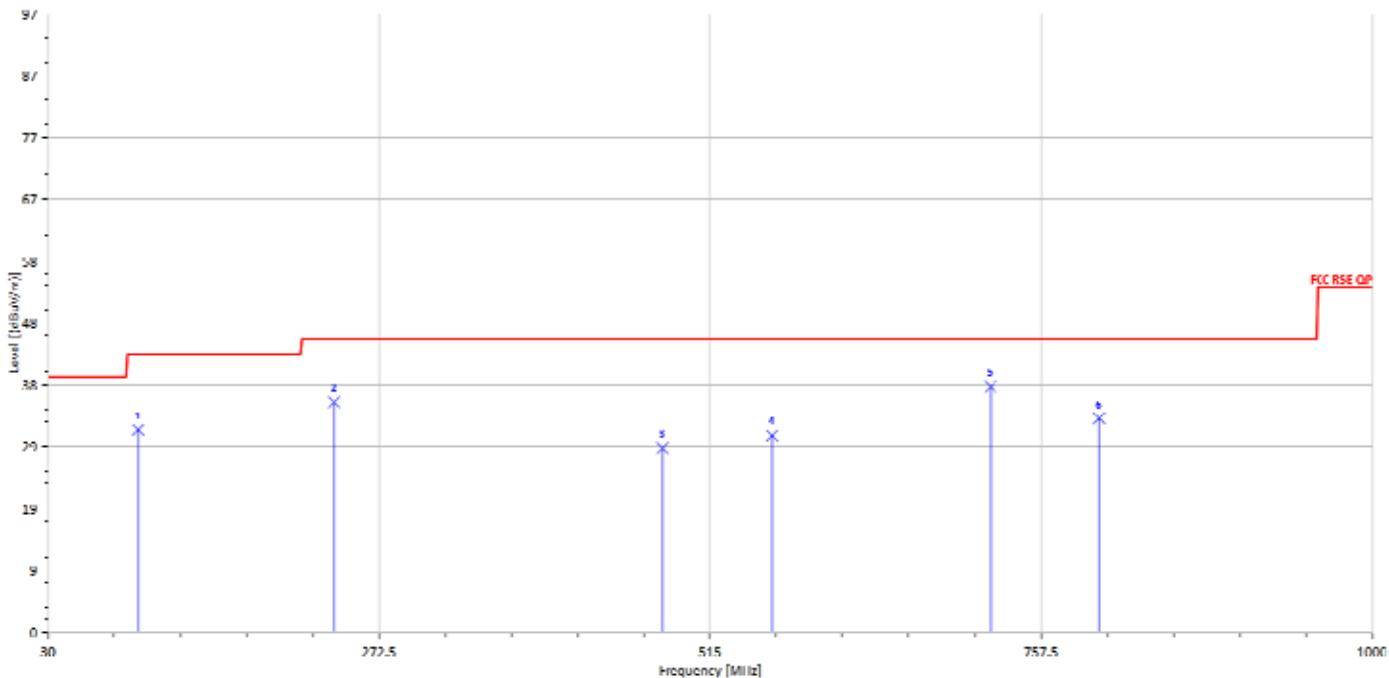
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Operation Band :802.11 a  
 Fundamental Frequency :5785 MHz  
 Operation Mode :TX MID  
 EUT Pol. :H Plan

Test Date :2015-09-15  
 Temp./Humi. :26.5 deg\_C / 50 RH  
 Engineer :Ashton  
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			dBµV				
95.96	S	Peak	56.22	-24.54	31.68	43.5	-11.82
239.52	S	Peak	57.22	-21.14	36.07	46	-9.93
480.08	S	Peak	43.13	-14.30	28.83	46	-17.17
560.59	S	Peak	43.63	-12.86	30.77	46	-15.23
720.64	S	Peak	49.24	-10.77	38.46	46	-7.54
800.18	S	Peak	43.00	-9.49	33.51	46	-12.49

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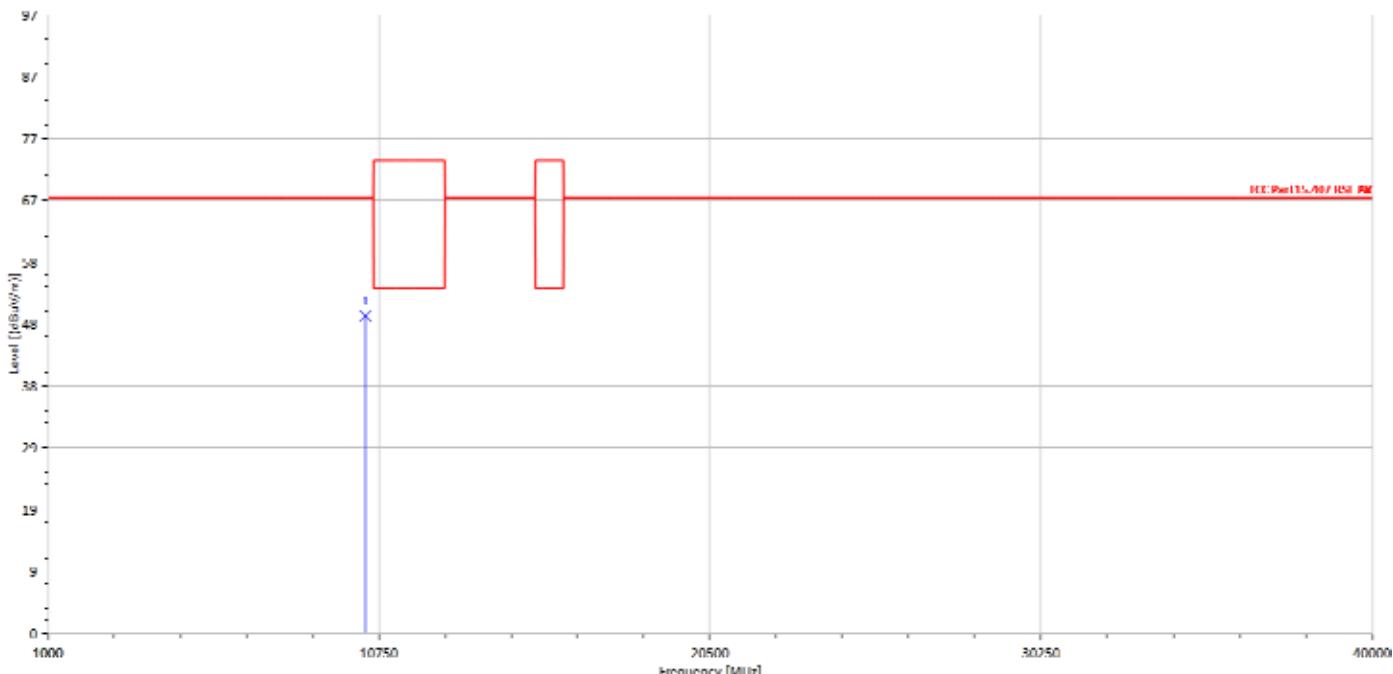
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**Above 1GHz Worst-Case Data:****802.11a, 5150~5250 MHz**

Operation Band	:802.11 a	Test Date	:2015-09-15
Fundamental Frequency	:5180 MHz	Temp./Humi.	:26.5 deg_C / 50 RH
Operation Mode	:TX LOW	Engineer	:Ashton
EUT Pol.	:H Plan	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading Level dBµV				
10360.00	H	Peak	30.76	18.94	49.70	68.3	-18.60

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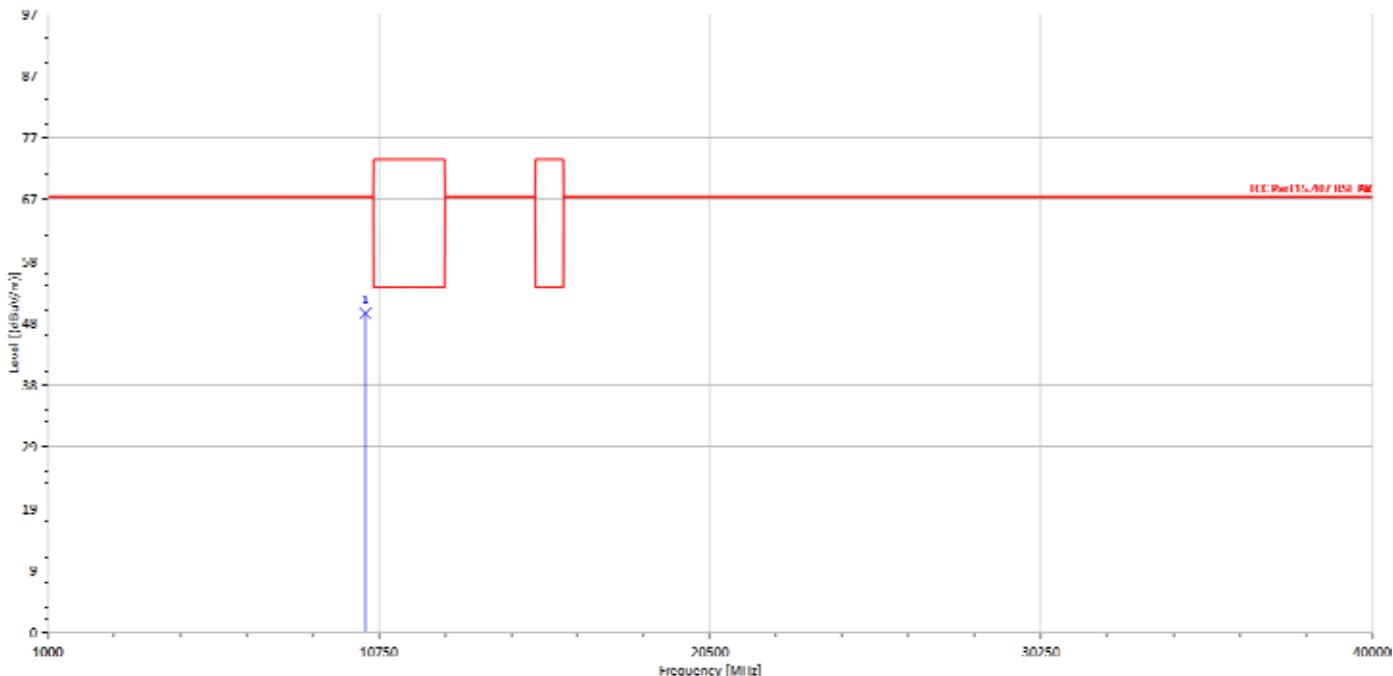
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Operation Band :802.11 a  
Fundamental Frequency :5180 MHz  
Operation Mode :TX LOW  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
						Limit @3m dB $\mu$ V/m	Margin dB
10360.00	H	Peak	31.01	18.94	49.95	68.3	-18.35

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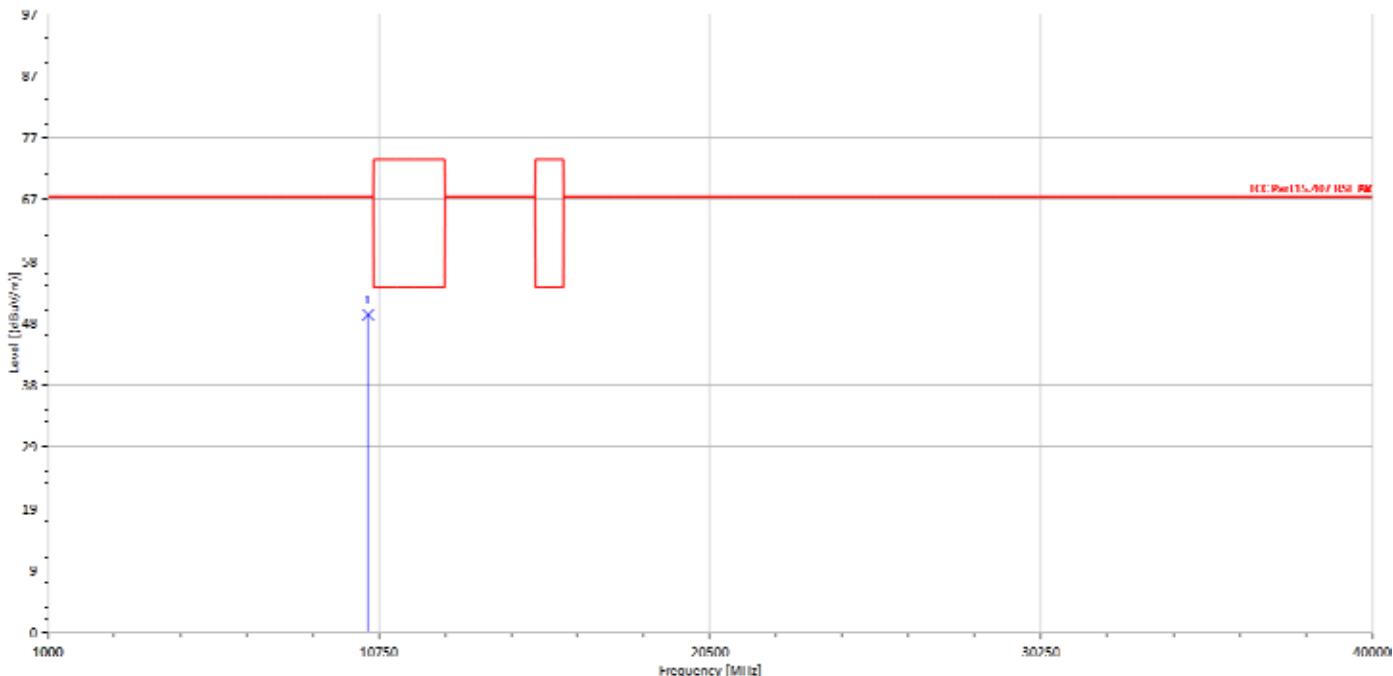
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Operation Band :802.11 a  
Fundamental Frequency :5220 MHz  
Operation Mode :TX MID  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading Level dBµV				
10440.00	H	Peak	30.70	19.03	49.72	68.3	-18.58

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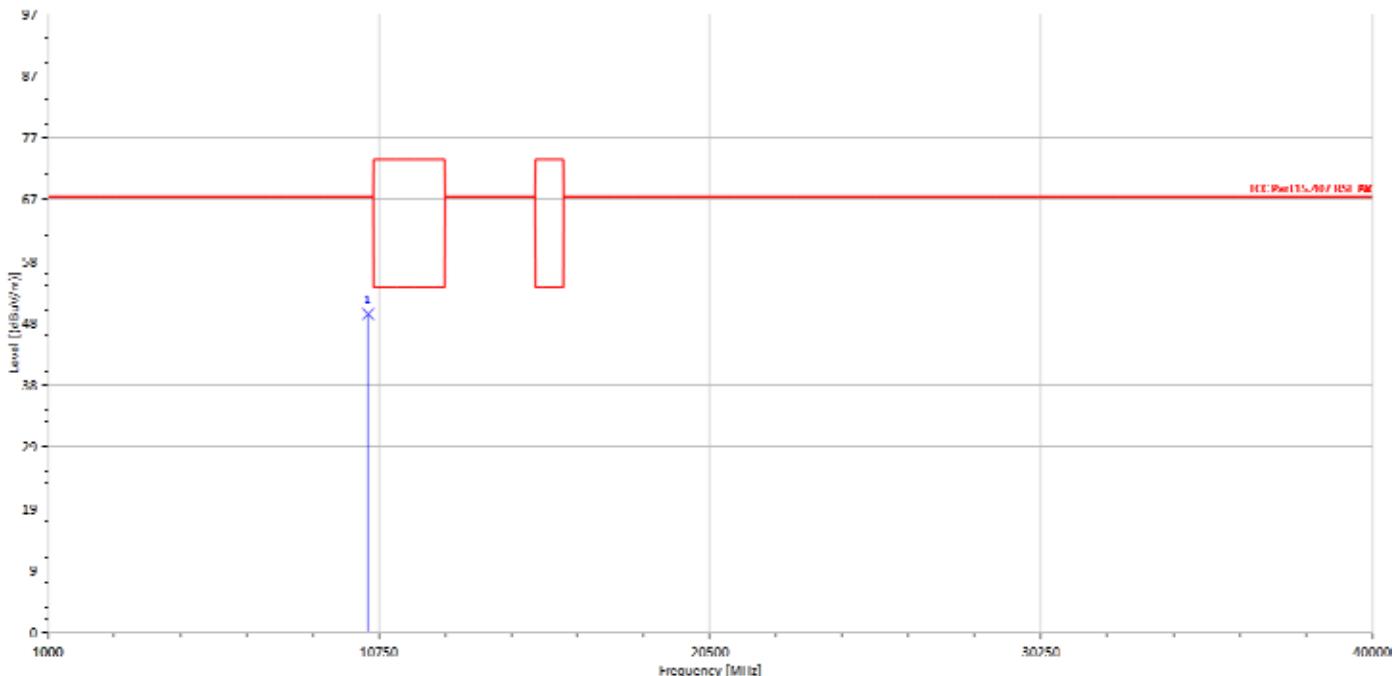
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Operation Band :802.11 a  
Fundamental Frequency :5220 MHz  
Operation Mode :TX MID  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBrV	Factor dB	Actual FS dBrV/m	Limit @3m dBrV/m	Margin dB
						Limit @3m dBrV/m	Margin dB
10440.00	H	Peak	30.82	19.03	49.84	68.3	-18.46

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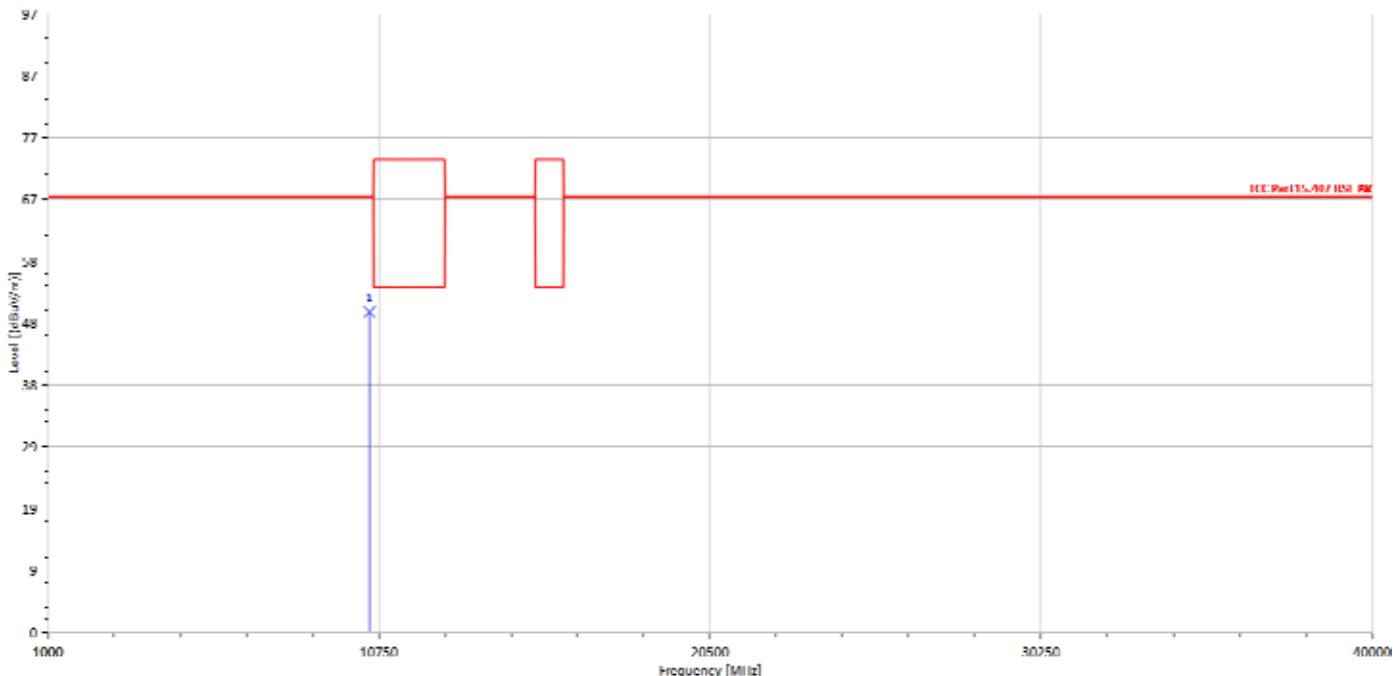
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Operation Band :802.11 a  
Fundamental Frequency :5240 MHz  
Operation Mode :TX HIGH  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor Reading Level	Actual FS	Limit @3m	Margin
			dB $\mu$ V				
10480.00	H	Peak	31.03	19.13	50.16	68.3	-18.14

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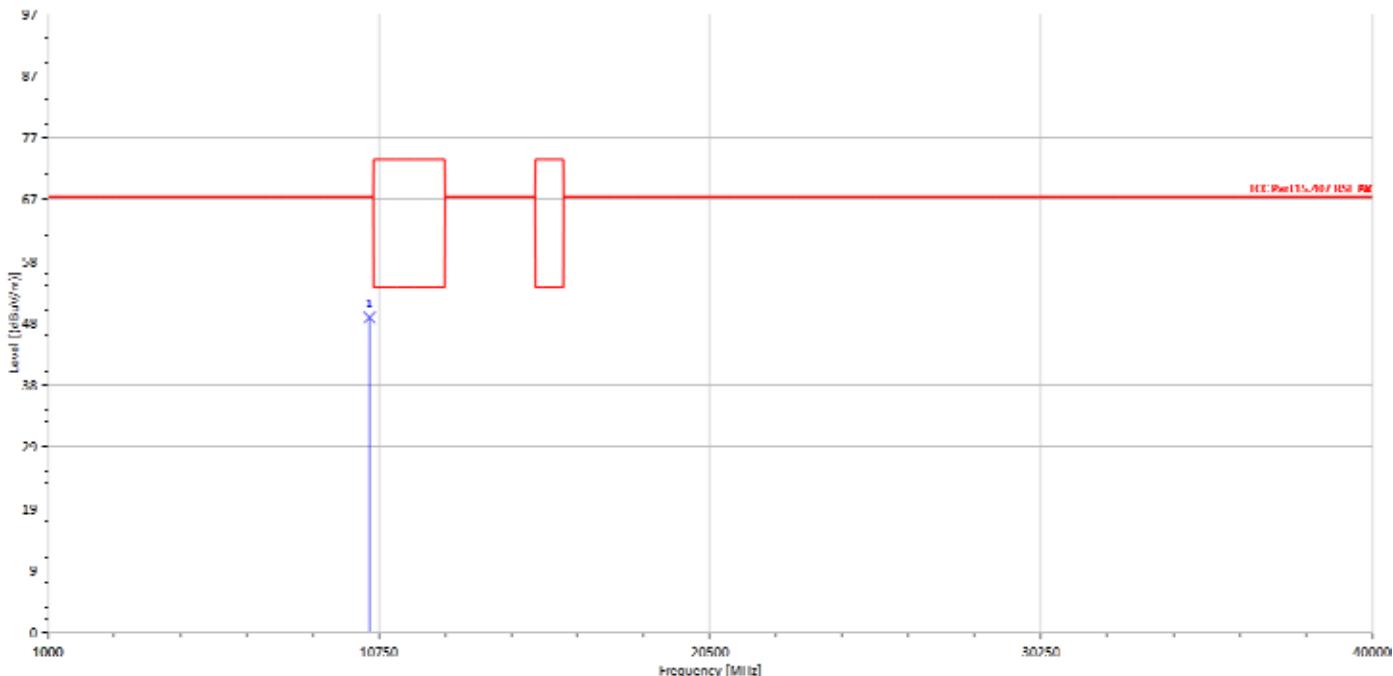
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Operation Band :802.11 a  
Fundamental Frequency :5240 MHz  
Operation Mode :TX HIGH  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading Level dBµV				
10480.00	H	Peak	30.17	19.13	49.30	68.3	-19.00

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**Band edge falling to restricted band**

Operation Band :802.11 a  
Fundamental Frequency :5180 MHz  
Operation Mode :Band Edge LOW  
EUT Pol. :H Plan

Test Date :2015-09-14  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit @3m	Margin
					FS		
5150.00	E	Peak	43.18	11.14	54.32	74	-19.68
5150.00	E	Average	32.02	11.14	43.16	54	-10.84

Operation Band :802.11 a  
Fundamental Frequency :5180 MHz  
Operation Mode :Band Edge LOW  
EUT Pol. :H Plan

Test Date :2015-09-14  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit @3m	Margin
					FS		
5150.00	E	Peak	42.32	11.14	53.46	74	-20.54
5150.00	E	Average	31.93	11.14	43.07	54	-10.93

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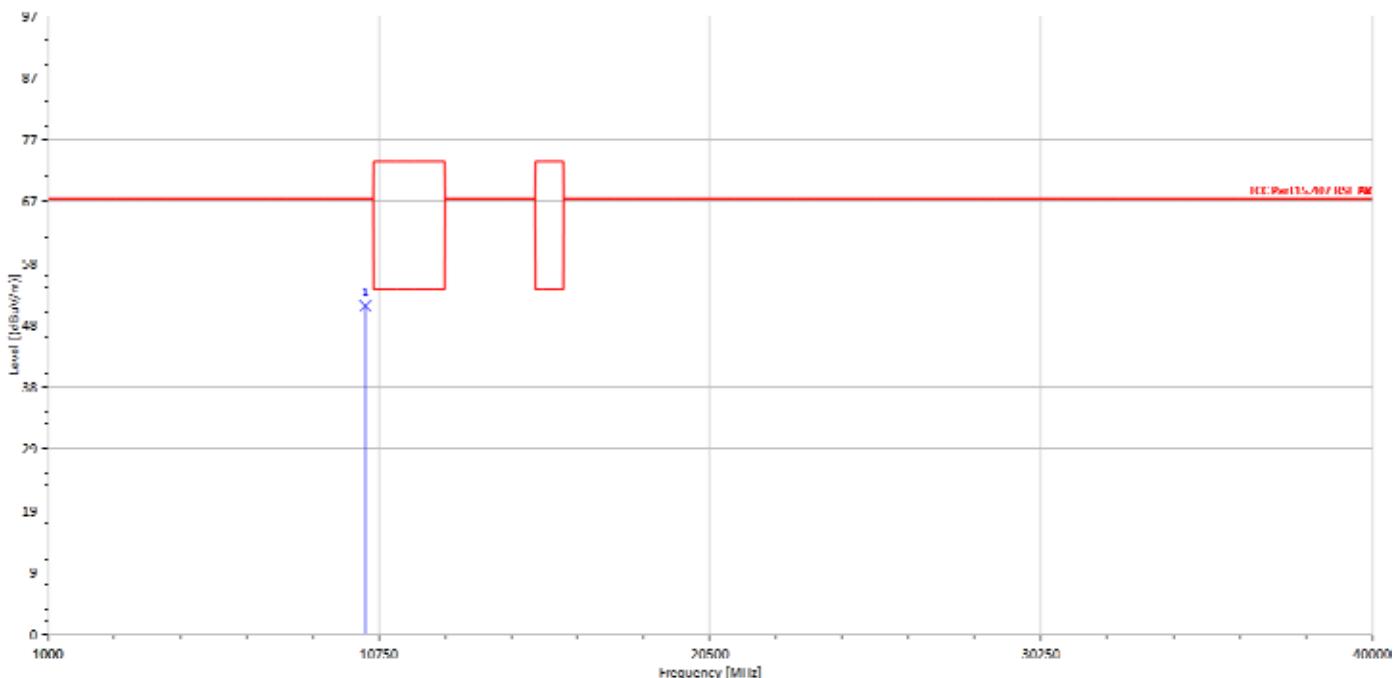
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### Radiated Spurious Emission Measurement Result 802.11n HT20, 5150~5250 MHz (MIMO)

Operation Band	:802.11 n20M	Test Date	:2015-09-15
Fundamental Frequency	:5180 MHz	Temp./Humi.	:26.5 deg_C / 50 RH
Operation Mode	:TX LOW	Engineer	:Ashton
EUT Pol.	:H Plan	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading Level dBµV				
10360.00	H	Peak	32.46	18.94	51.40	68.3	-16.90

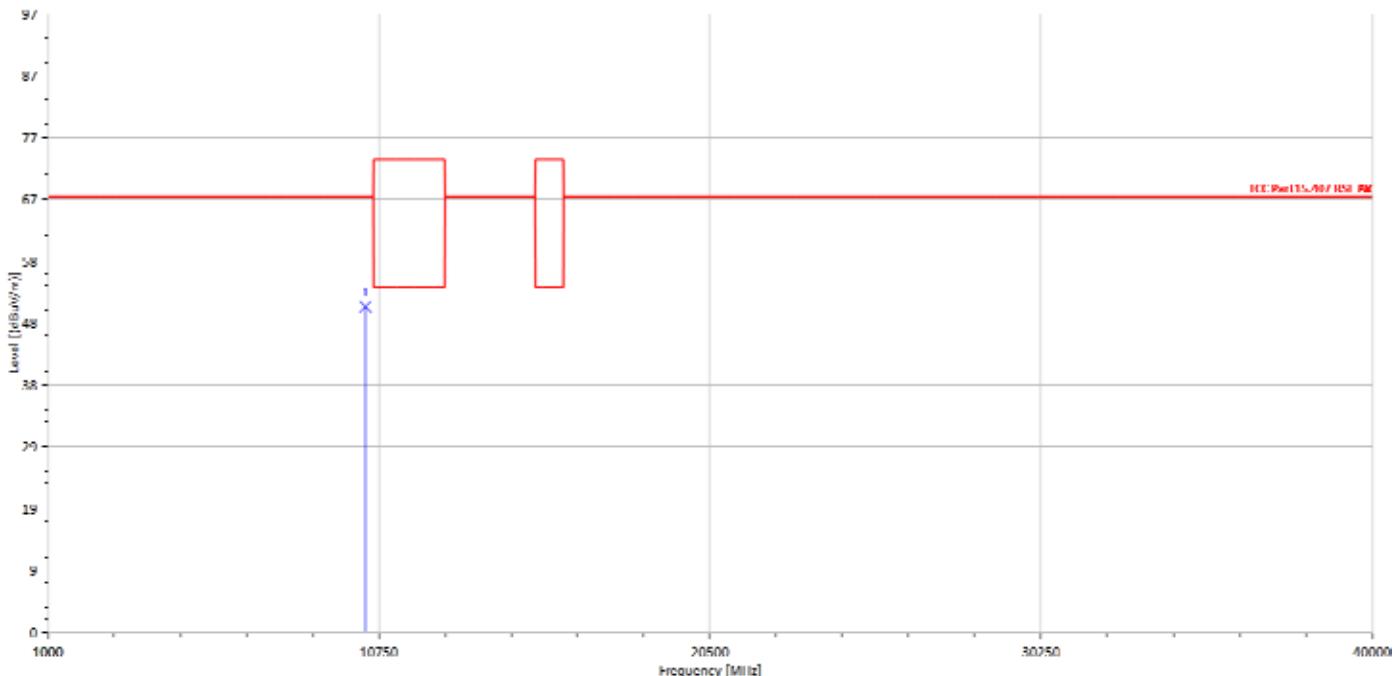
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5180 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX LOW      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
						Limit @3m dB $\mu$ V/m	Margin dB
10360.00	H	Peak	32.04	18.94	50.98	68.3	-17.32

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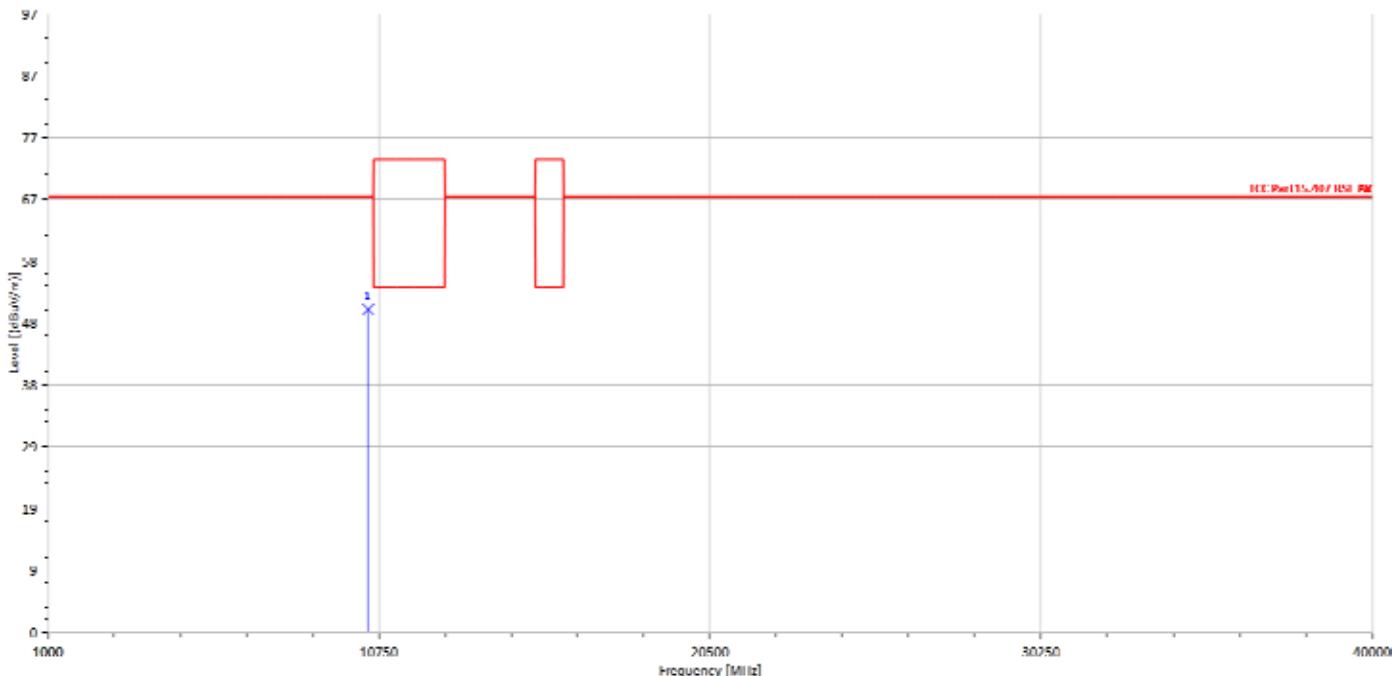
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5220 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX MID      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor Reading Level	Actual FS dB	Limit @3m dBµV/m	Margin dB
			dBµV				
10440.00	H	Peak	31.51	19.03	50.54	68.3	-17.76

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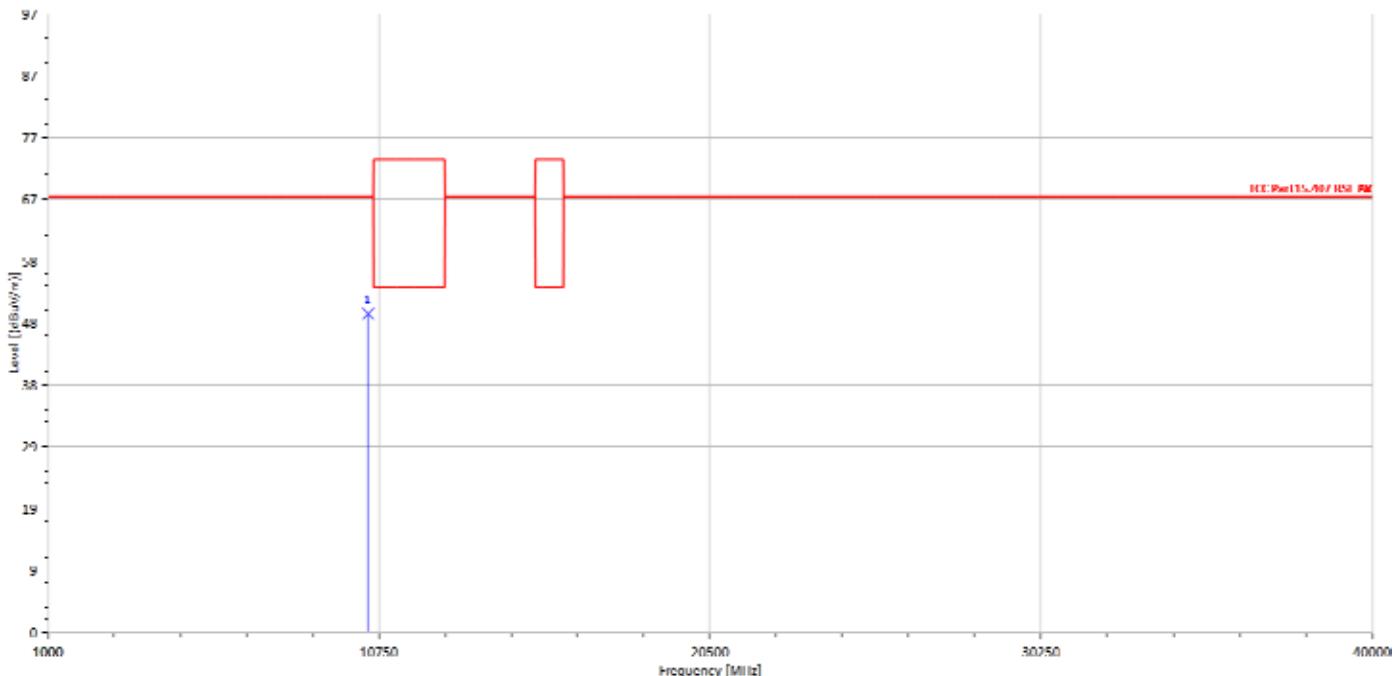
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5220 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX MID      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBrV	Factor dB	Actual FS dBrV/m	Limit @3m dBrV/m	Margin dB
						Limit @3m dBrV/m	Margin dB
10440.00	H	Peak	30.85	19.03	49.88	68.3	-18.42

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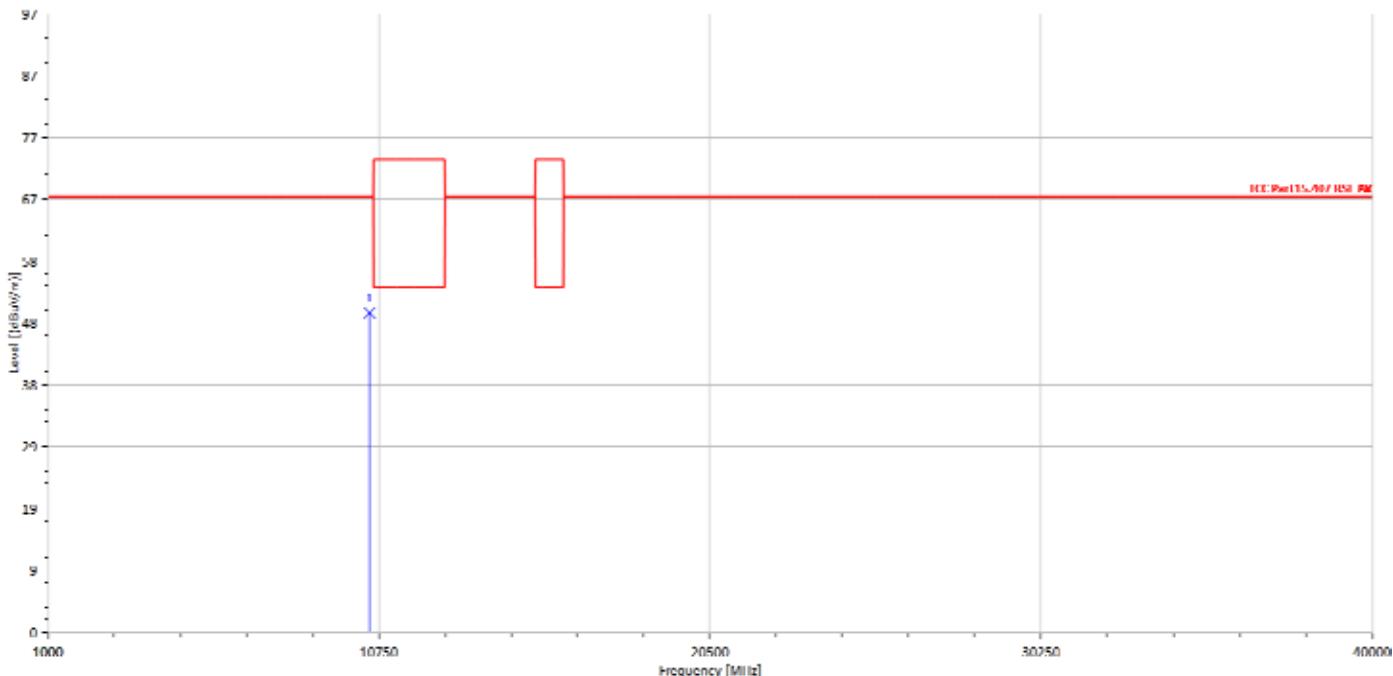
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5240 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
						Margin dB	Margin dB
10480.00	H	Peak	30.90	19.13	50.03	68.3	-18.27

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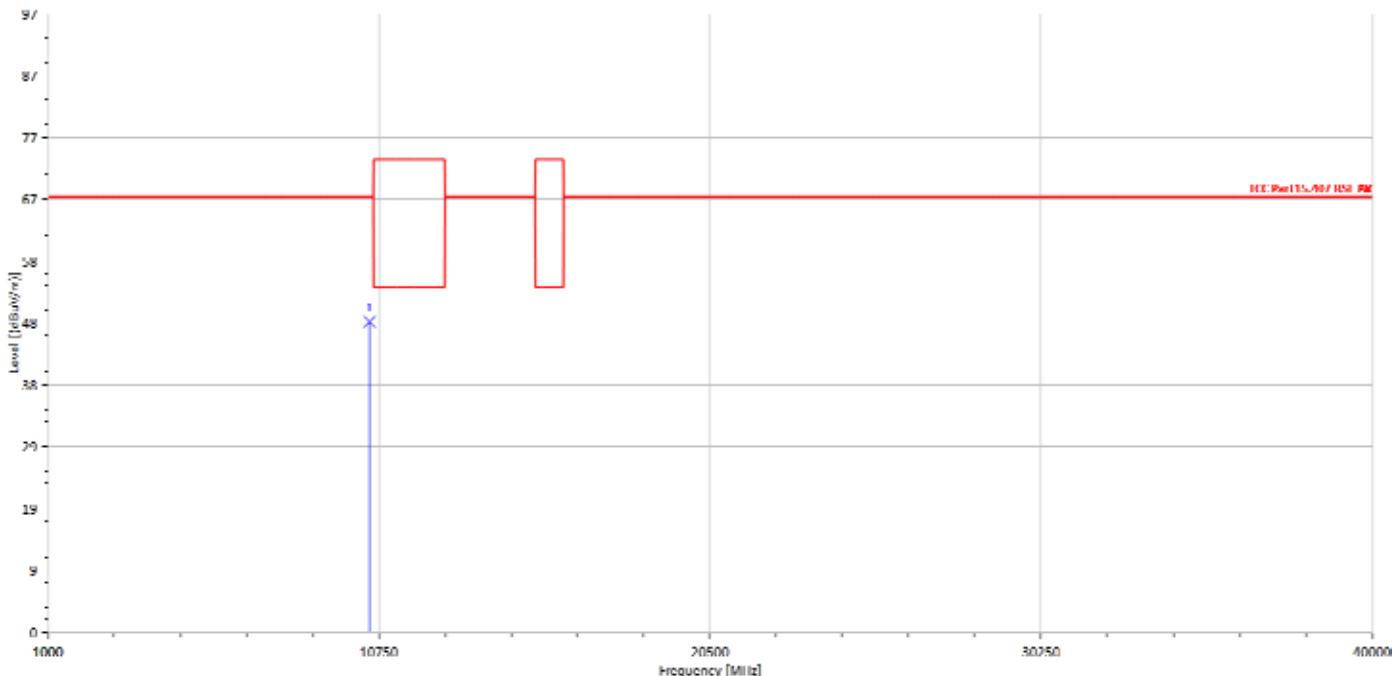
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5240 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor Reading Level	Actual FS dB	Limit @3m dBµV/m	Margin dB
			dBµV				
10480.00	H	Peak	29.52	19.13	48.64	68.3	-19.66

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### Band edge falling to restricted band

Operation Band	:802.11 n20M	Test Date	:2015-09-14
Fundamental Frequency	:5180 MHz	Temp./Humi.	:26.5 deg_C / 50 RH
Operation Mode	:Band Edge LOW	Engineer	:Ashton
EUT Pol.	:H Plan	Measurement Antenna Pol.	:VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor	Actual FS	Limit @3m	Margin dB
			PK/QP/AV			dB $\mu$ V/m	
5150.00	E	Peak	42.87	11.14	54.01	74	-19.99
5150.00	E	Average	31.91	11.14	43.05	54	-10.95

Operation Band	:802.11 n20M	Test Date	:2015-09-14
Fundamental Frequency	:5180 MHz	Temp./Humi.	:26.5 deg_C / 50 RH
Operation Mode	:Band Edge LOW	Engineer	:Ashton
EUT Pol.	:H Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/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.

“---” : denotes Noise Floor.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor	Actual FS	Limit @3m	Margin dB
			PK/QP/AV			dB $\mu$ V/m	
5150.00	E	Peak	42.46	11.14	53.60	74	-20.40
5150.00	E	Average	31.78	11.14	42.92	54	-11.08

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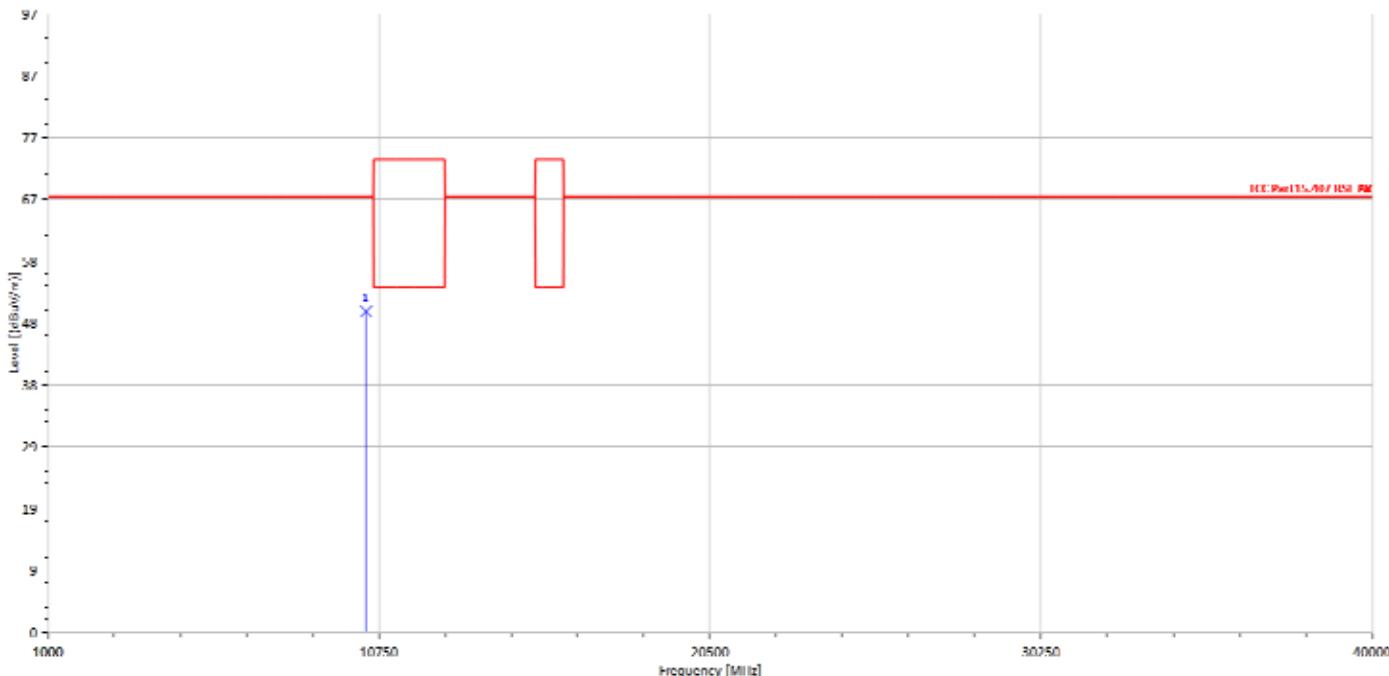
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**Radiated Spurious Emission Measurement Result 802.11n HT40, 5150~5250 MHz (MIMO)**

Operation Band :802.11 n40M Test Date :2015-09-15  
Fundamental Frequency :5190 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
						Limit @3m dB $\mu$ V/m	Margin dB
10380.00	H	Peak	31.21	19.01	50.23	68.3	-18.07

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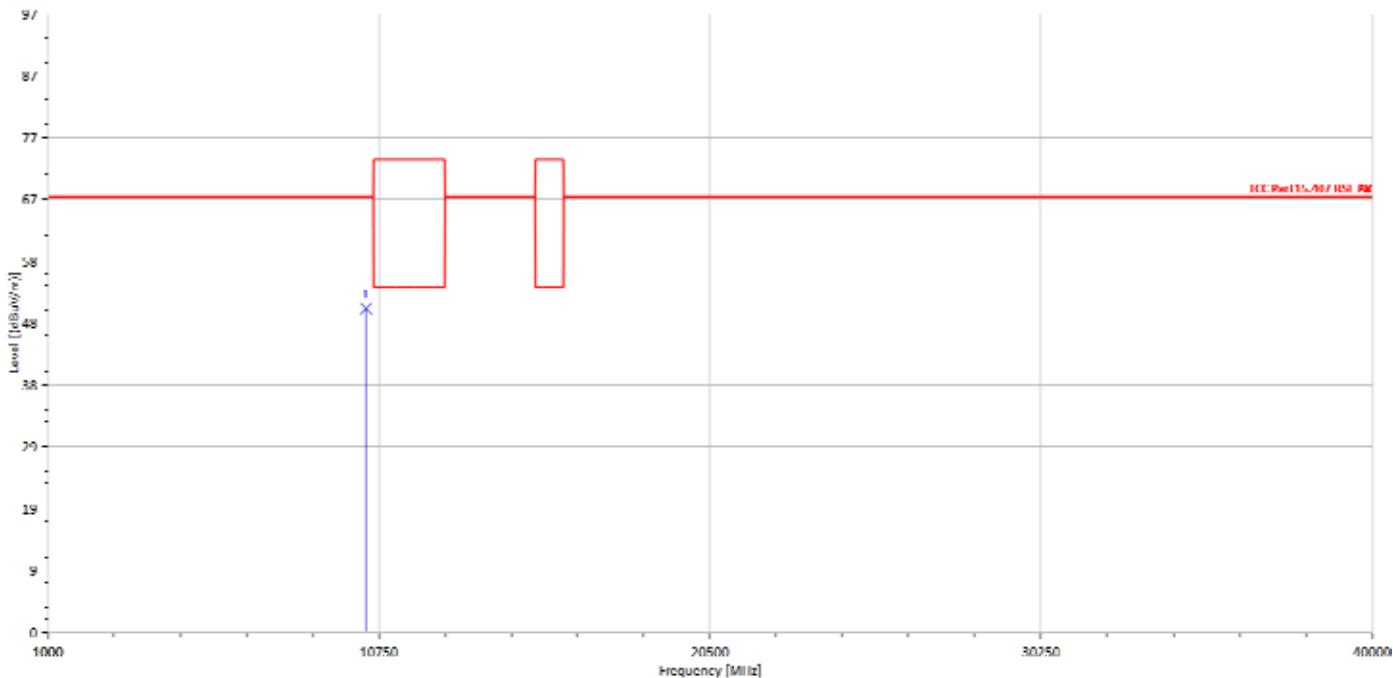
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Operation Band :802.11 n40M      Test Date :2015-09-15  
Fundamental Frequency :5190 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX LOW      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor Reading Level	Actual FS dB	Limit @3m dBµV/m	Margin dB
			dBµV				
10380.00	H	Peak	31.68	19.01	50.69	68.3	-17.61

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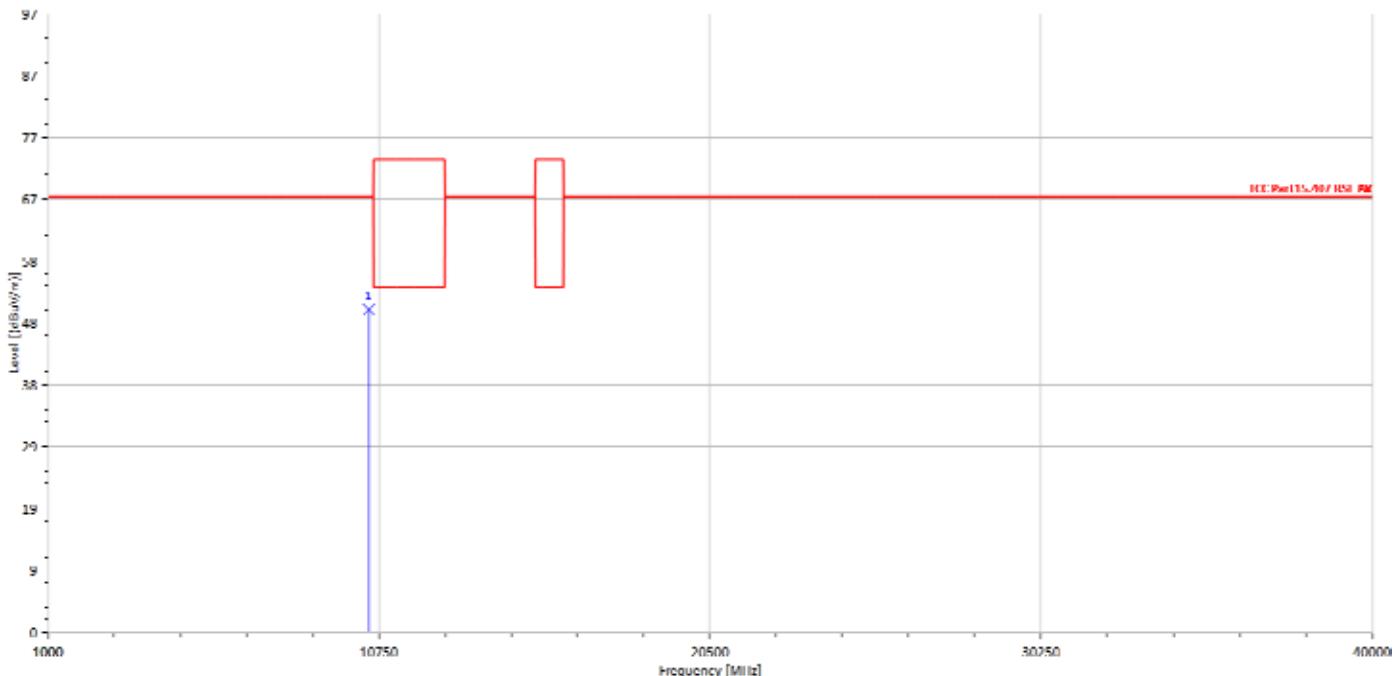
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Operation Band :802.11 n40M      Test Date :2015-09-15  
Fundamental Frequency :5230 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBrV	Factor dB	Actual FS dBrV/m	Limit @3m dBrV/m	Margin dB
						Limit @3m dBrV/m	Margin dB
10460.00	H	Peak	31.42	19.11	50.53	68.3	-17.77

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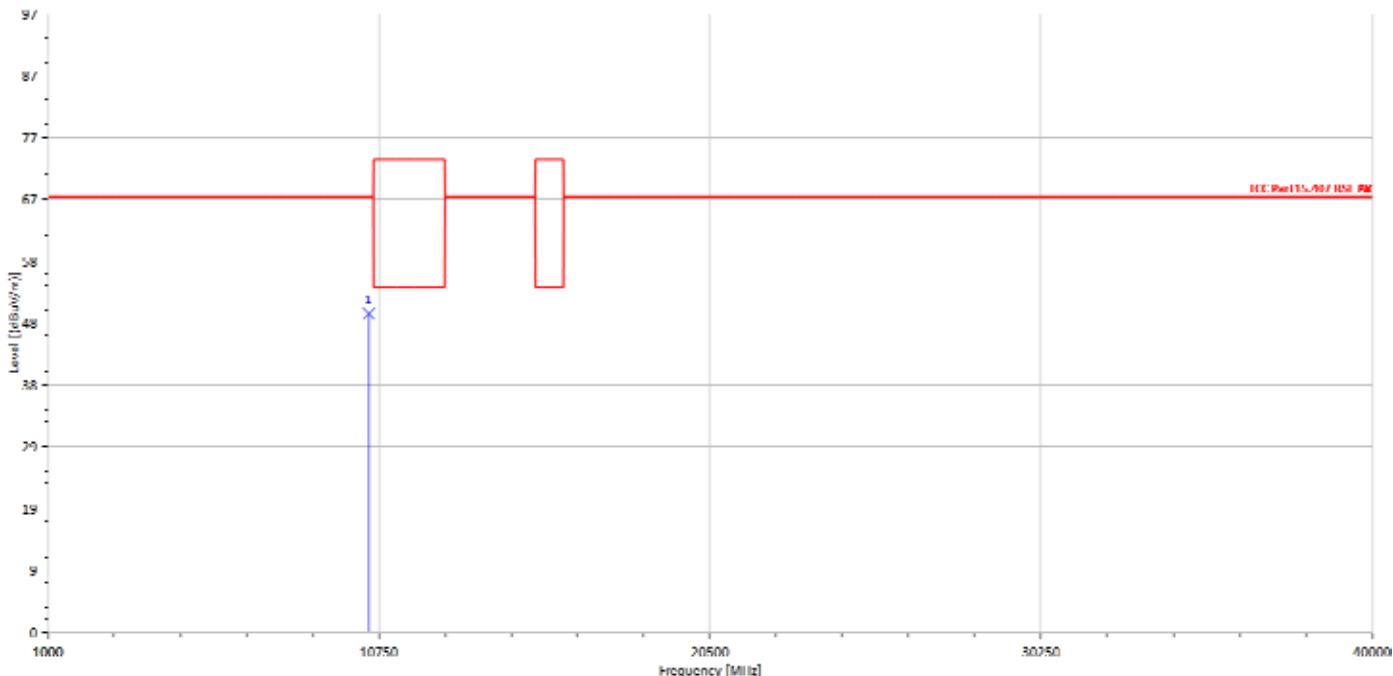
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Operation Band :802.11 n40M      Test Date :2015-09-15  
Fundamental Frequency :5230 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB $\mu$ V	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
						Limit @3m dB $\mu$ V/m	Margin dB
10460.00	H	Peak	30.78	19.11	49.90	68.3	-18.40

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**Band edge falling to restricted band**

Operation Band :802.11 n40M Test Date :2015-09-14  
Fundamental Frequency :5190 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :Band Edge LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor	Actual FS	Limit @3m	Margin
			PK/QP/AV				
5150.00	E	Peak	55.50	11.14	66.64	74	-7.36
5150.00	E	Average	36.12	11.14	47.26	54	-6.74

Operation Band :802.11 n40M Test Date :2015-09-14  
Fundamental Frequency :5190 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :Band Edge LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor	Actual FS	Limit @3m	Margin
			PK/QP/AV				
5150.00	E	Peak	54.97	11.14	66.12	74	-7.88
5150.00	E	Average	35.23	11.14	46.37	54	-7.63

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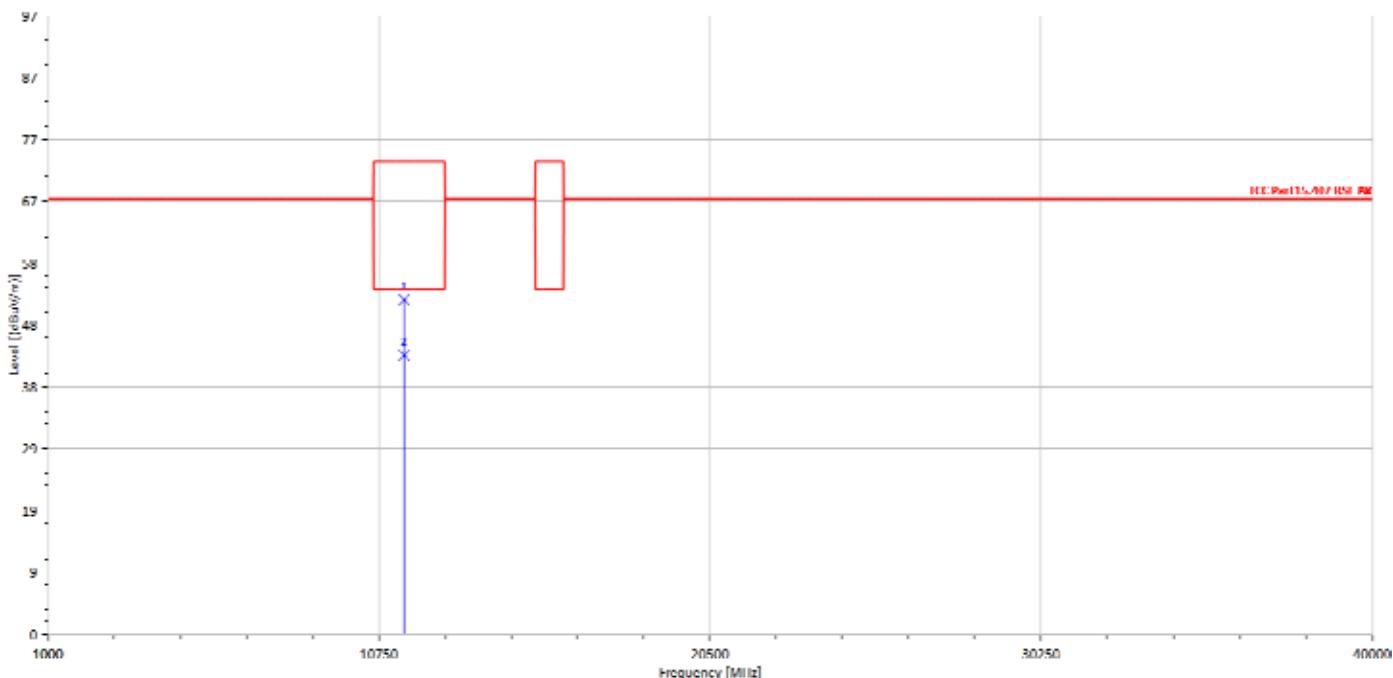
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**Radiated Spurious Emission Measurement Result 802.11a, 5725~5850 MHz**

Operation Band :802.11 a Test Date :2015-09-15  
Fundamental Frequency :5745 MHz Temp./Hum.: 26.5 deg\_C / 50 RH  
Operation Mode :TX LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading Level dBµV				
11490.00	H	Peak	31.26	21.08	52.34	74	-21.66
11490.00	H	Average	22.59	21.08	43.67	54	-10.33

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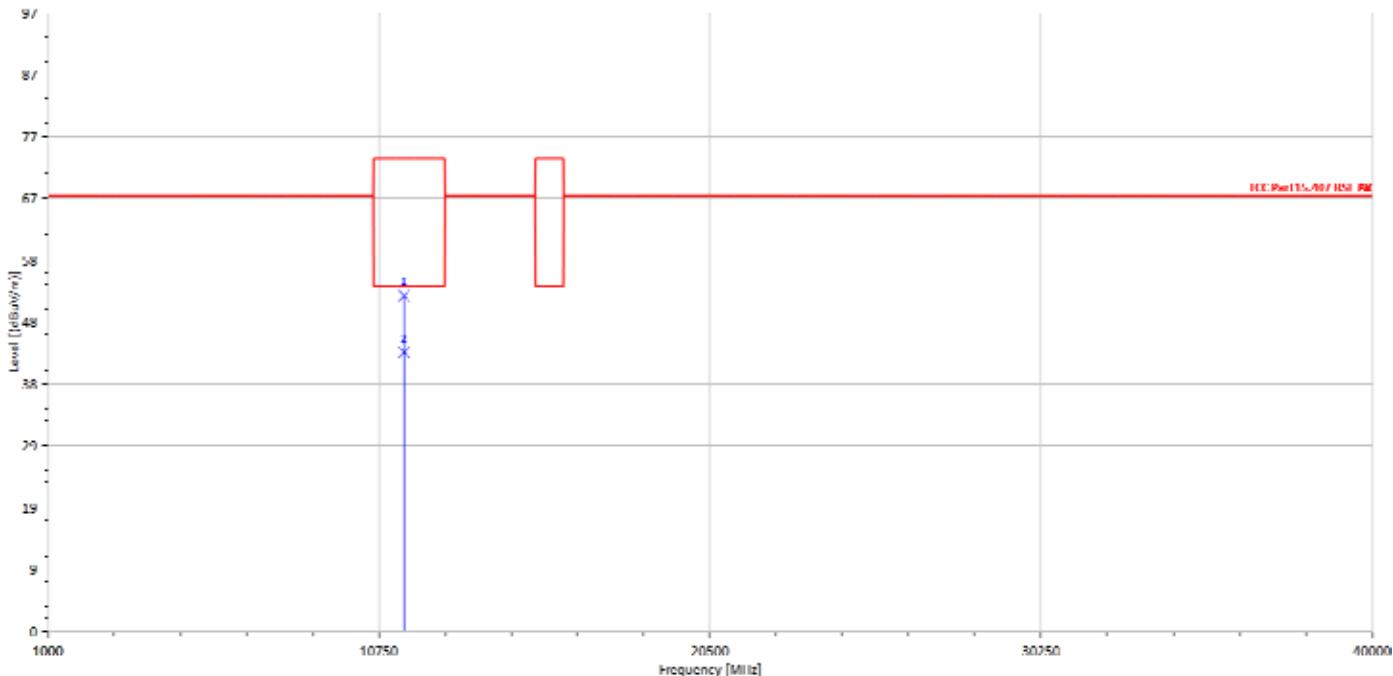
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Operation Band	:802.11 a	Test Date	:2015-09-15
Fundamental Frequency	:5745 MHz	Temp./Humi.	:26.5 deg_C / 50 RH
Operation Mode	:TX LOW	Engineer	:Ashton
EUT Pol.	:H Plan	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading				
11490.00	H	Peak	31.43	21.08	52.51	74	-21.49
11490.00	H	Average	22.59	21.08	43.67	54	-10.33

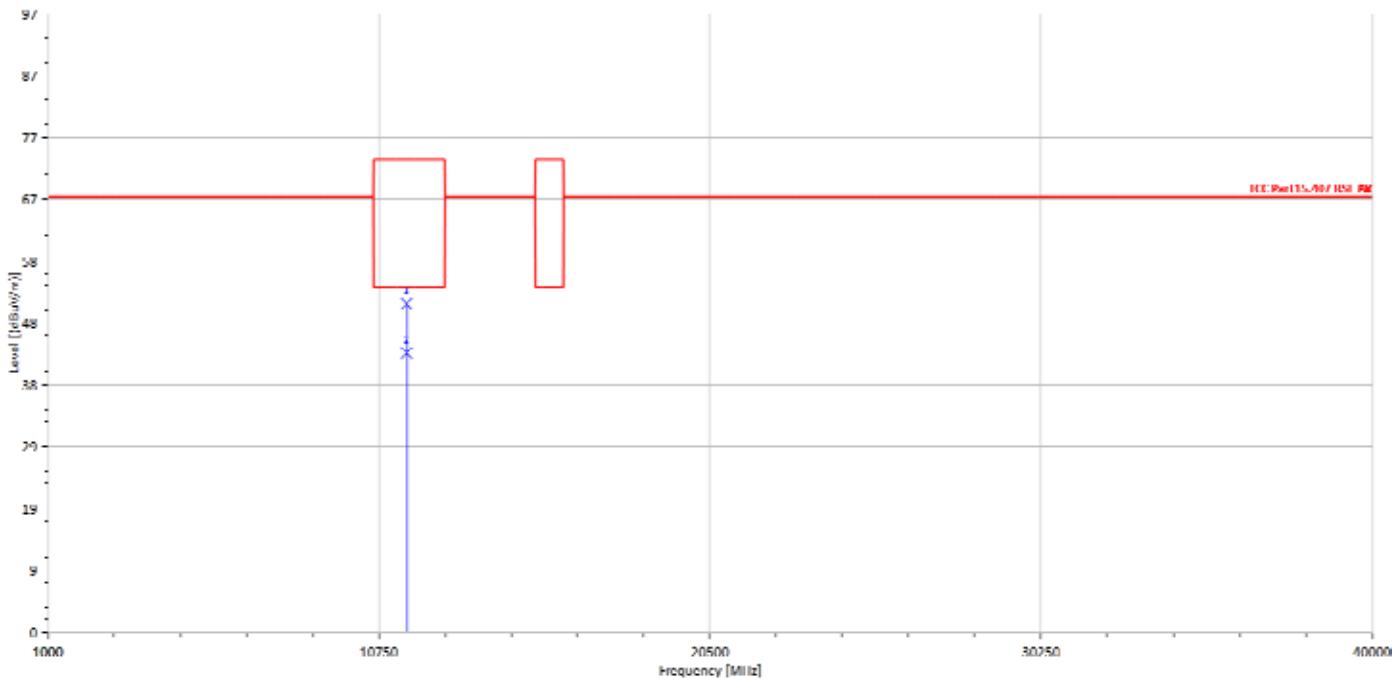
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Operation Band :802.11 a  
Fundamental Frequency :5785 MHz  
Operation Mode :TX MID  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			dBµV					
11570.00	H	Peak	30.29		21.14	51.43	74	-22.57
11570.00	H	Average	22.59		21.14	43.73	54	-10.27

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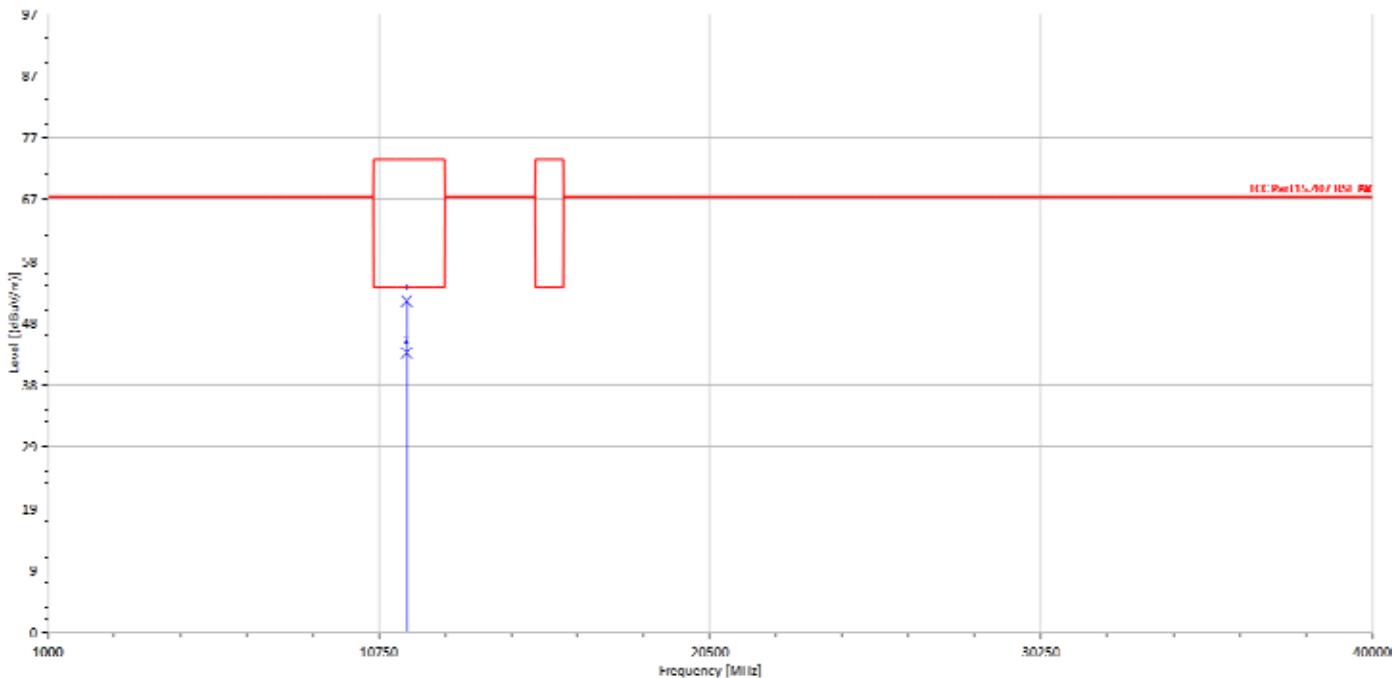
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Operation Band :802.11 a  
Fundamental Frequency :5785 MHz  
Operation Mode :TX MID  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			dBµV					
11570.00	H	Peak	30.72		21.14	51.85	74	-22.15
11570.00	H	Average	22.60		21.14	43.74	54	-10.26

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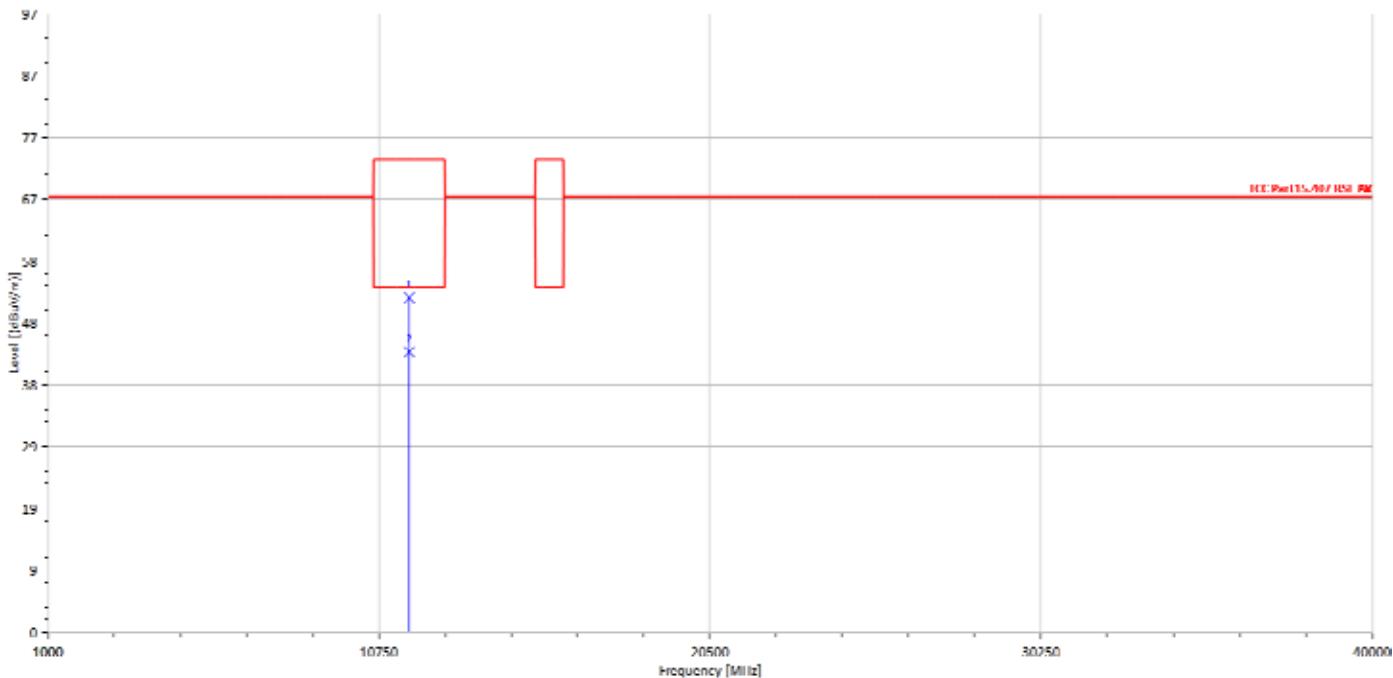
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Operation Band :802.11 a  
Fundamental Frequency :5825 MHz  
Operation Mode :TX HIGH  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			dB $\mu$ V					
11650.00	H	Peak	31.08		21.27	52.36	74	-21.64
11650.00	H	Average	22.61		21.27	43.88	54	-10.12

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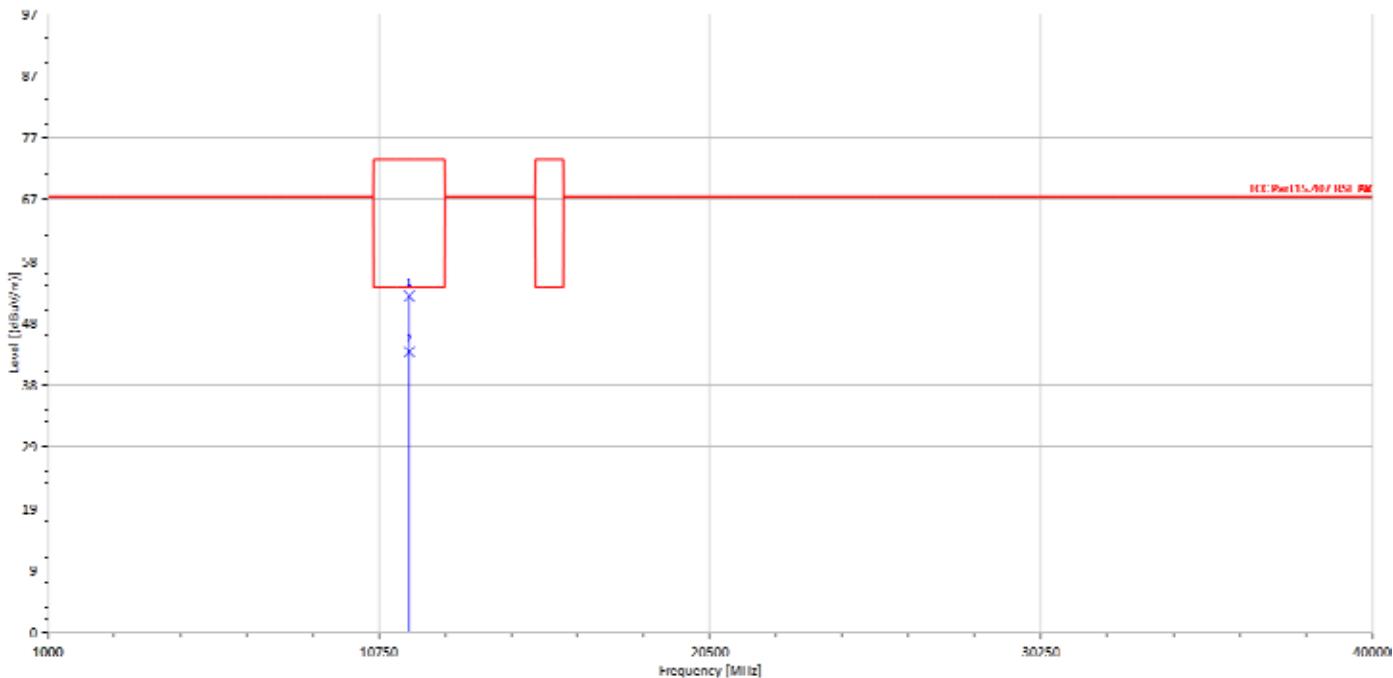
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Operation Band :802.11 a  
Fundamental Frequency :5825 MHz  
Operation Mode :TX HIGH  
EUT Pol. :H Plan

Test Date :2015-09-15  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Spectrum Reading	Level				
11650.00	H	Peak	31.32		21.27	52.60	74	-21.40
11650.00	H	Average	22.63		21.27	43.90	54	-10.10

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**Band edge falling to restricted band**

Operation Band :802.11 a  
Fundamental Frequency :5745 MHz  
Operation Mode :Band Edge LOW  
EUT Pol. :H Plan

Test Date :2015-09-14  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode				
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5725.00	E	Peak	51.32	12.27	63.59	78.2	-14.61

Operation Band :802.11 a  
Fundamental Frequency :5745 MHz  
Operation Mode :Band Edge LOW  
EUT Pol. :H Plan

Test Date :2015-09-14  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode				
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5725.00	E	Peak	47.98	12.27	60.25	78.2	-17.95

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Operation Band :802.11 a  
Fundamental Frequency :5825 MHz  
Operation Mode :Band Edge HIGH  
EUT Pol. :H Plan

Test Date :2015-09-14  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV				
5850.00	E	Peak	43.00	12.61	55.61	78.2	-22.59

Operation Band :802.11 a  
Fundamental Frequency :5825 MHz  
Operation Mode :Band Edge HIGH  
EUT Pol. :H Plan

Test Date :2015-09-14  
Temp./Humi. :26.5 deg\_C / 50 RH  
Engineer :Ashton  
Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV				
5850.00	E	Peak	42.47	12.61	55.08	78.2	-23.12

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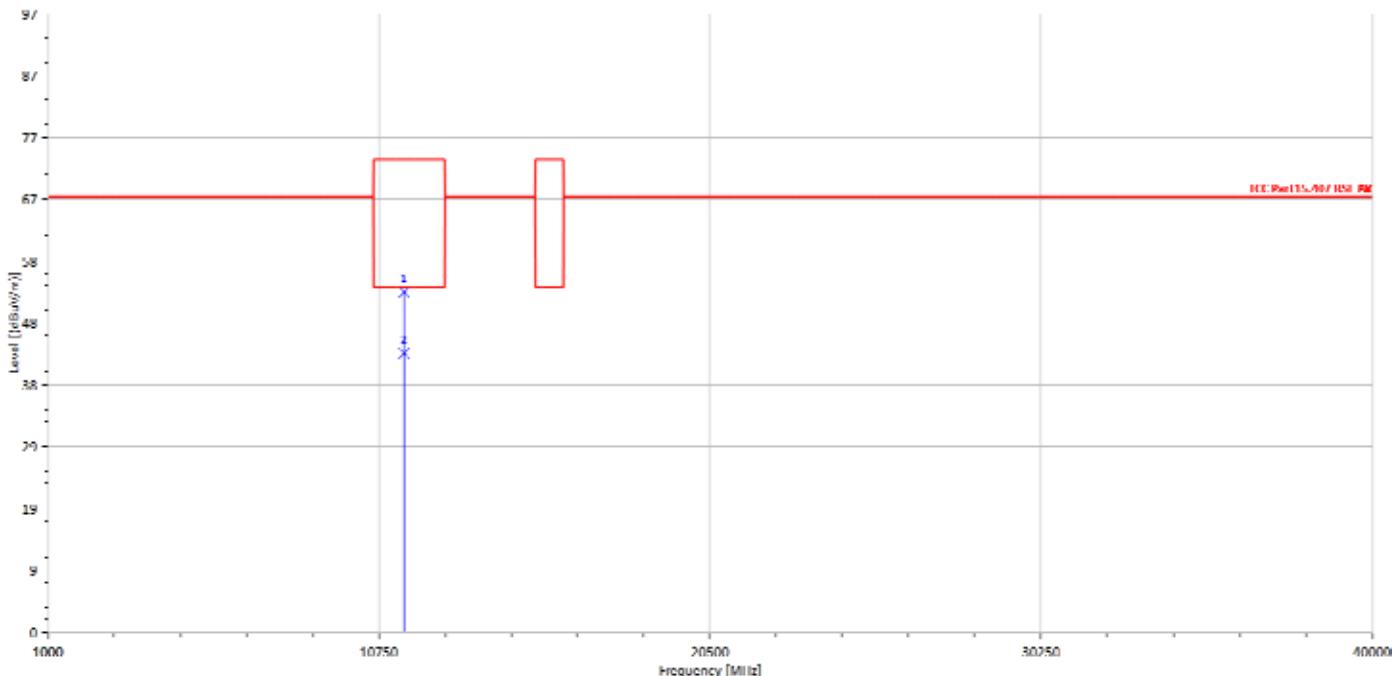
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**Radiated Spurious Emission Measurement Result 802.11n HT20, 5725~5850 MHz (MIMO)**

Operation Band :802.11 n20M Test Date :2015-09-15  
Fundamental Frequency :5745 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum	Factor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading Level dBµV				
11490.00	H	Peak	32.17	21.08	53.25	74	-20.75
11490.00	H	Average	22.60	21.08	43.68	54	-10.32

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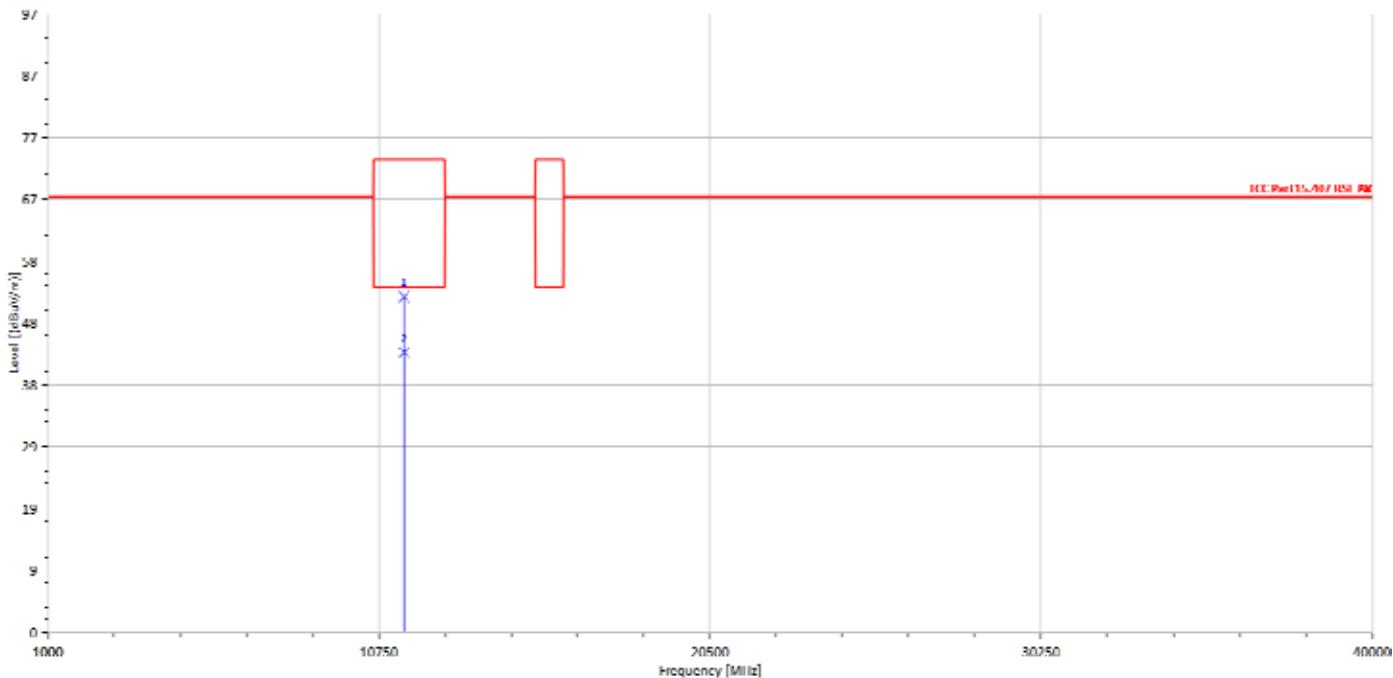
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5745 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX LOW      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Spectrum Reading	Level dBµV				
11490.00	H	Peak	31.43	21.08	52.51	74	-21.49	
11490.00	H	Average	22.73	21.08	43.81	54	-10.19	

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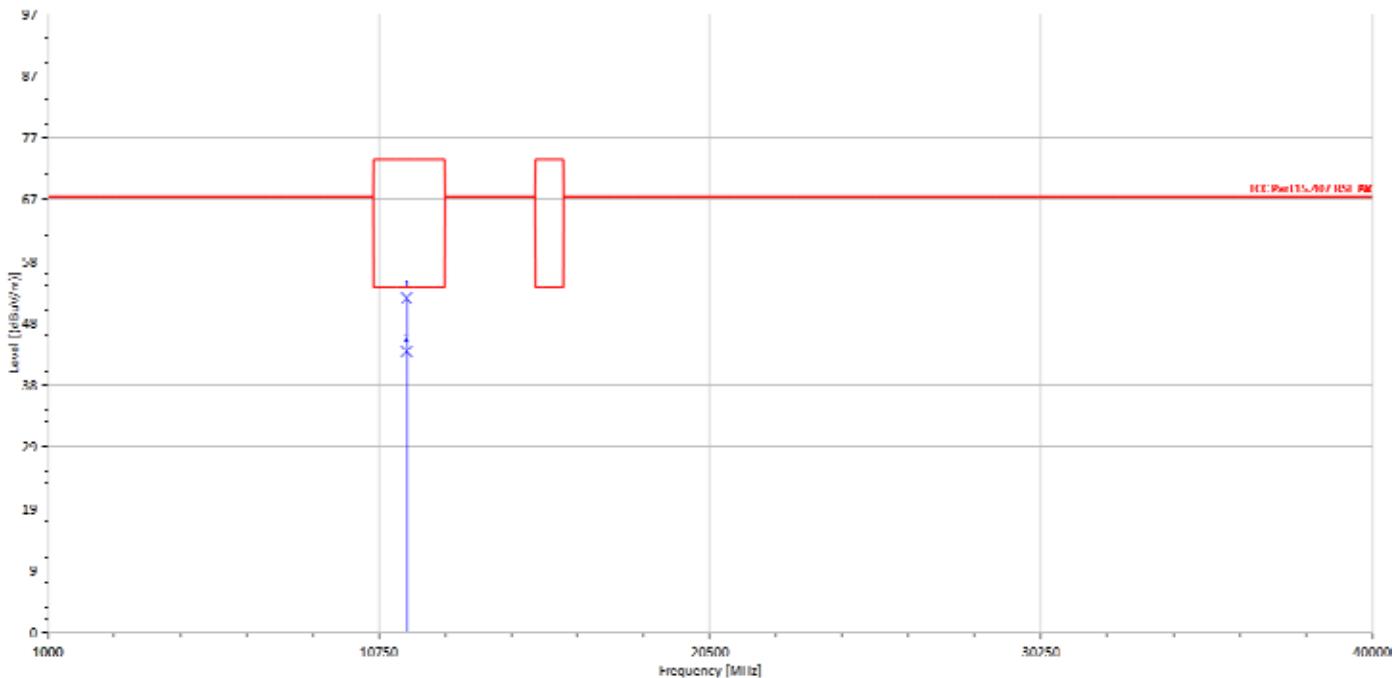
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5785 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX MID      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Spectrum Mode	Reading Level dBµV				
11570.00	H	Peak	31.17	21.14	52.30	74	-21.70	
11570.00	H	Average	22.85	21.14	43.99	54	-10.01	

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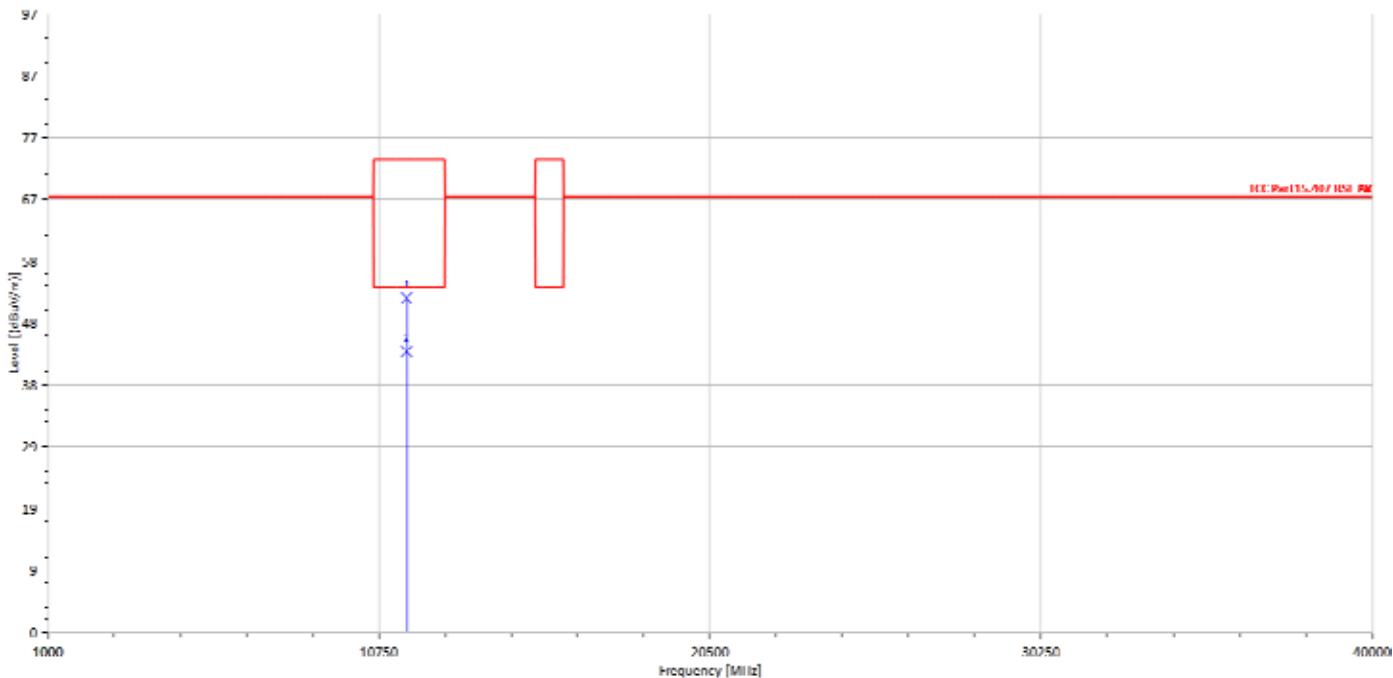
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5785 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX MID      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



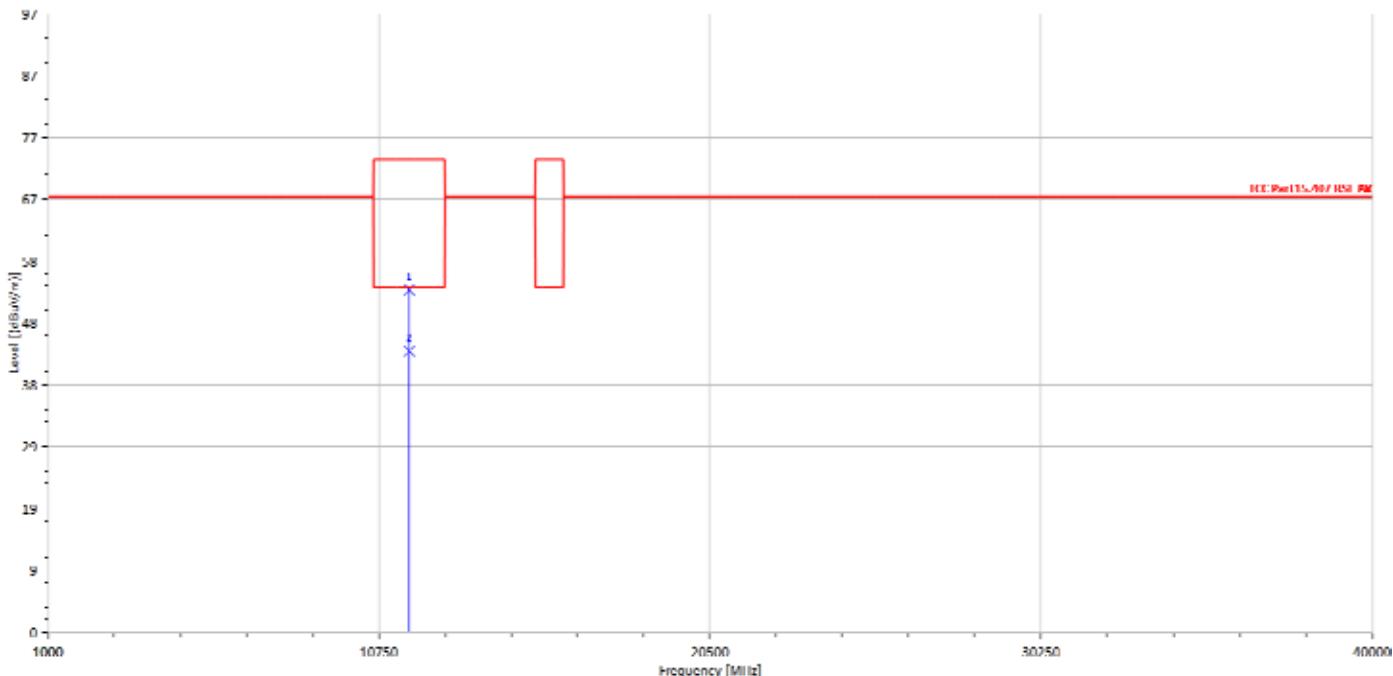
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			dBµV					
11570.00	H	Peak	31.17		21.14	52.31	74	-21.69
11570.00	H	Average	22.83		21.14	43.97	54	-10.03

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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5825 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Reading	Level dBµV				
11650.00	H	Peak	32.32	21.27	53.60	74	-20.40	
11650.00	H	Average	22.77	21.27	44.04	54	-9.96	

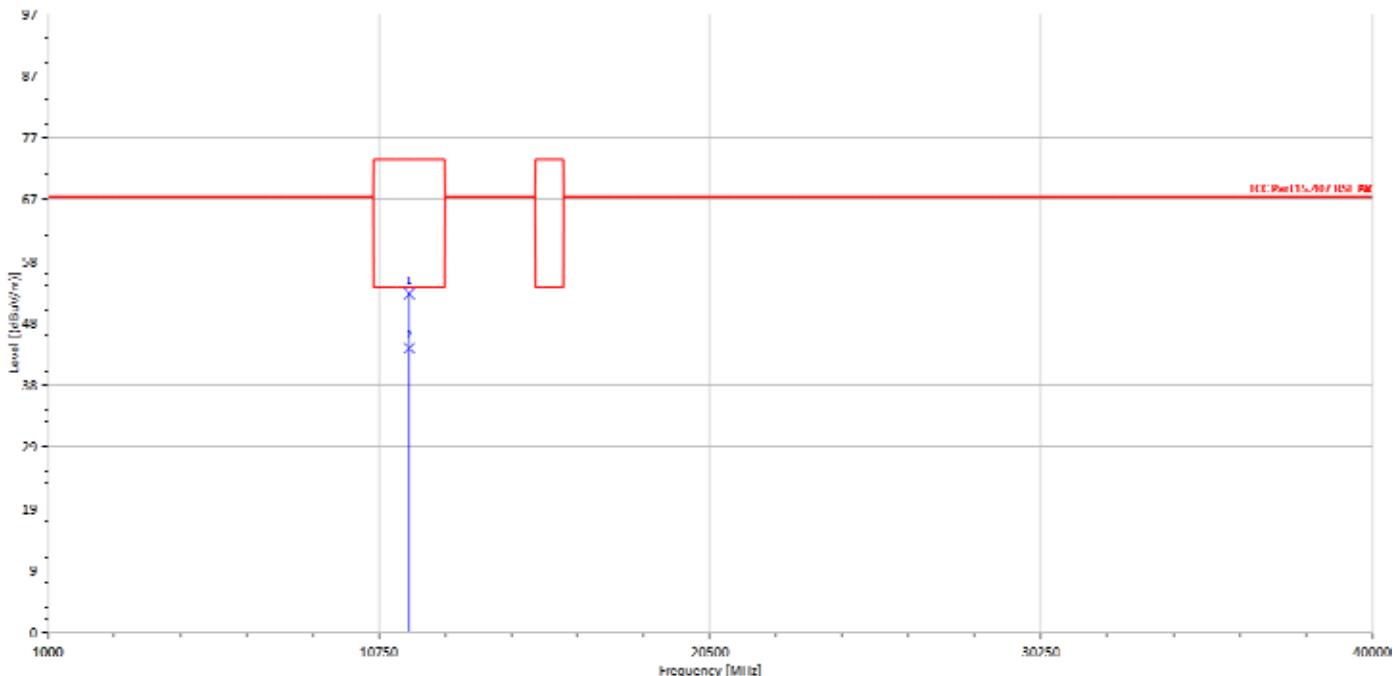
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Operation Band :802.11 n20M      Test Date :2015-09-15  
Fundamental Frequency :5825 MHz      Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Peak	dBµV				
11650.00	H	Peak	31.72		21.27	53.00	74	-21.00
11650.00	H	Average	23.22		21.27	44.49	54	-9.51

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**Band edge falling to restricted band**

Operation Band :802.11 n20M Test Date :2015-09-14  
Fundamental Frequency :5745 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :Band Edge LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode				
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5725.00	E	Peak	52.34	12.27	64.61	78.2	-13.59

Operation Band :802.11 n20M Test Date :2015-09-14  
Fundamental Frequency :5745 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :Band Edge LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode				
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5725.00	E	Peak	49.18	12.27	61.45	78.2	-16.75

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Operation Band :802.11 n20M Test Date :2015-09-14  
Fundamental Frequency :5825 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :Band Edge HIGH Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV				
5850.00	E	Peak	47.58	12.61	60.19	78.2	-18.01

Operation Band :802.11 n20M Test Date :2015-09-14  
Fundamental Frequency :5825 MHz Temp./Humi. :26.5 deg\_C / 50 RH  
Operation Mode :Band Edge HIGH Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum	Factor dB	Actual dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV				
5850.00	E	Peak	44.22	12.61	56.83	78.2	-21.37

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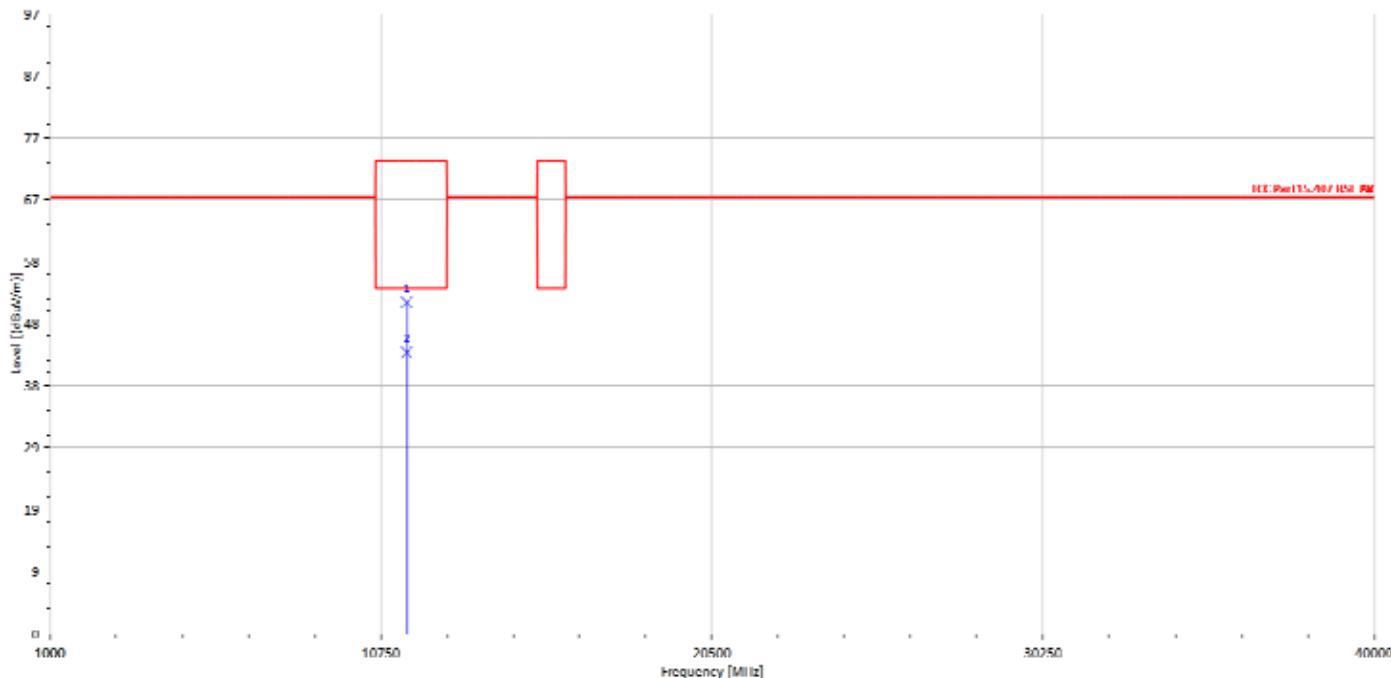
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**Radiated Spurious Emission Measurement Result 802.11n HT40, 5725~5850 MHz (MIMO)**

Operation Band :802.11 n40M Test Date :2015-09-15  
Fundamental Frequency :5755 MHz Temp./Humid. :23deg\_C / 58 RH  
Operation Mode :TX LOW Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Peak	dB $\mu$ V				
11510.00	H	Peak	30.66	21.17	51.83	74	-22.17	
11510.00	H	Average	22.81	21.17	43.98	54	-10.02	

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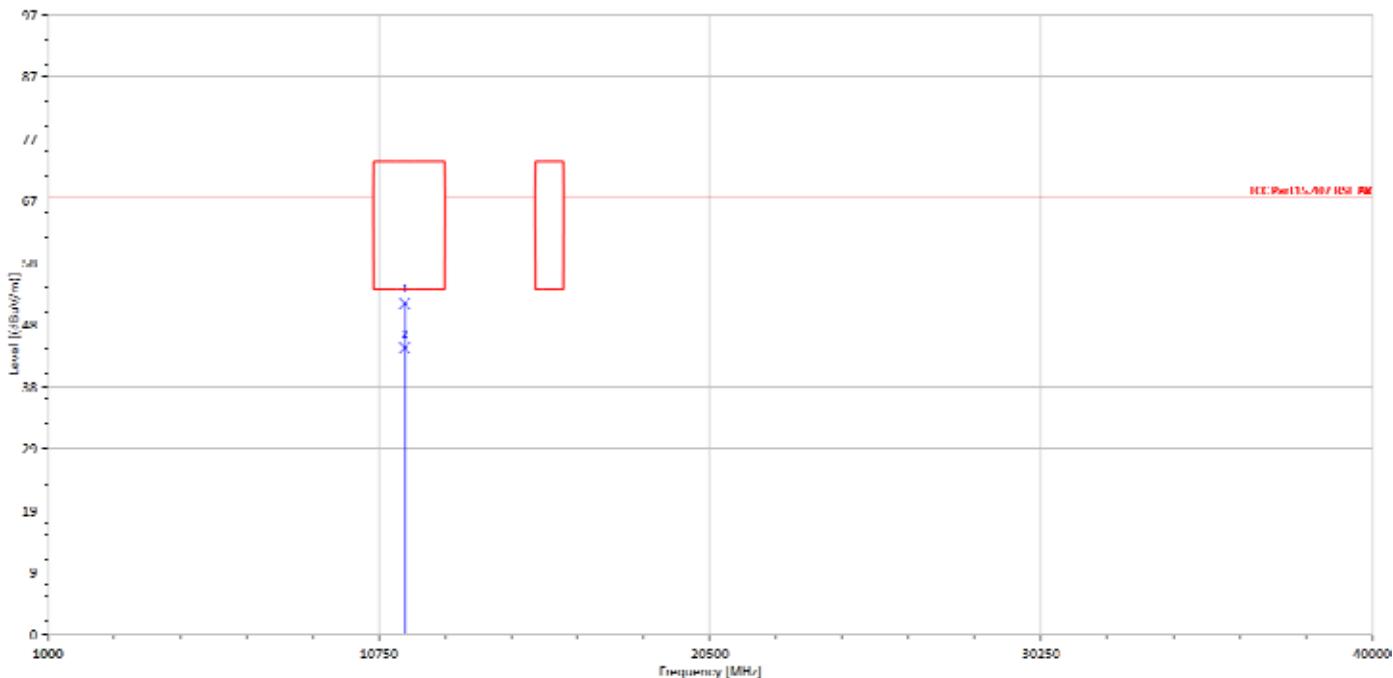
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Operation Band :802.11 n40M      Test Date :2015-09-15  
Fundamental Frequency :5755 MHz      Temp./Humi. :23deg\_C / 58 RH  
Operation Mode :TX LOW      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading	Factor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
						dB	dB
11510.00	H	Peak	30.60	21.17	51.77	74	-22.23
11510.00	H	Average	23.61	21.17	44.78	54	-9.22

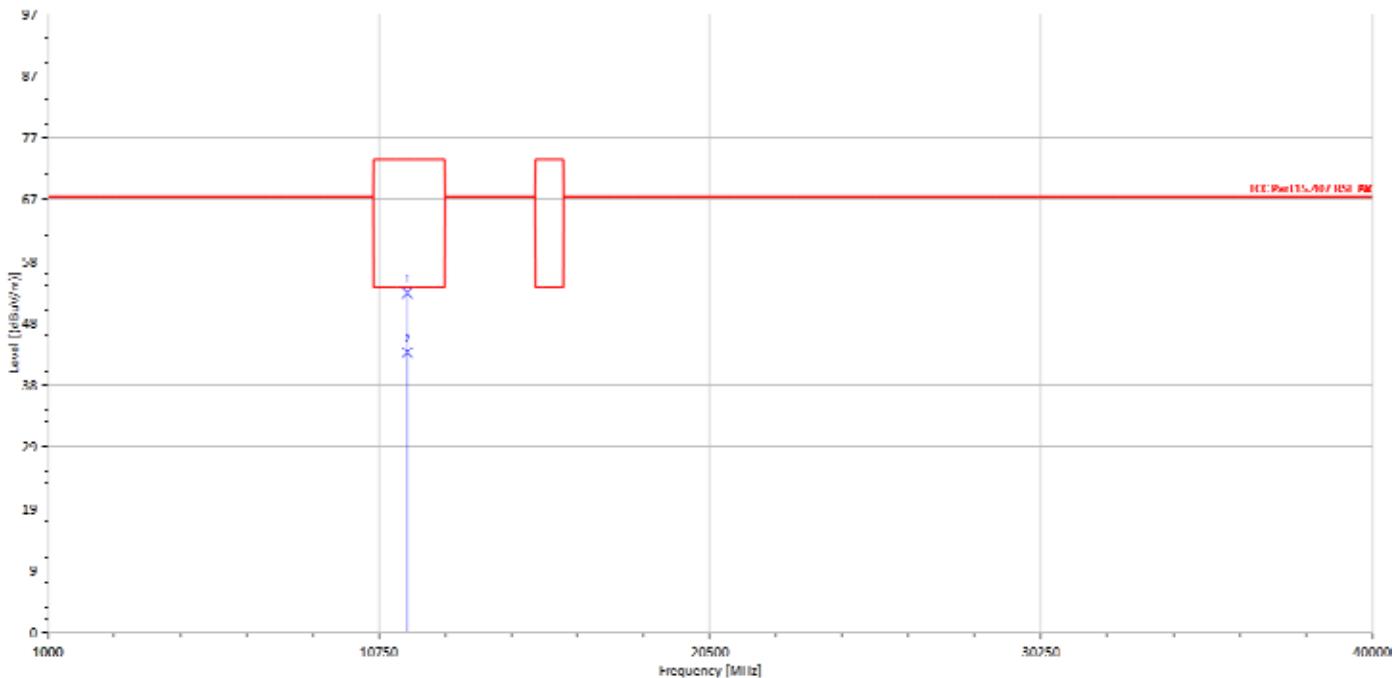
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Operation Band :802.11 n40M      Test Date :2015-09-15  
Fundamental Frequency :5795 MHz      Temp./Humi. :23deg\_C / 58 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			dBµV	dB				
11590.00	H	Peak	31.84	21.28		53.11	74	-20.89
11590.00	H	Average	22.54	21.28		43.82	54	-10.18

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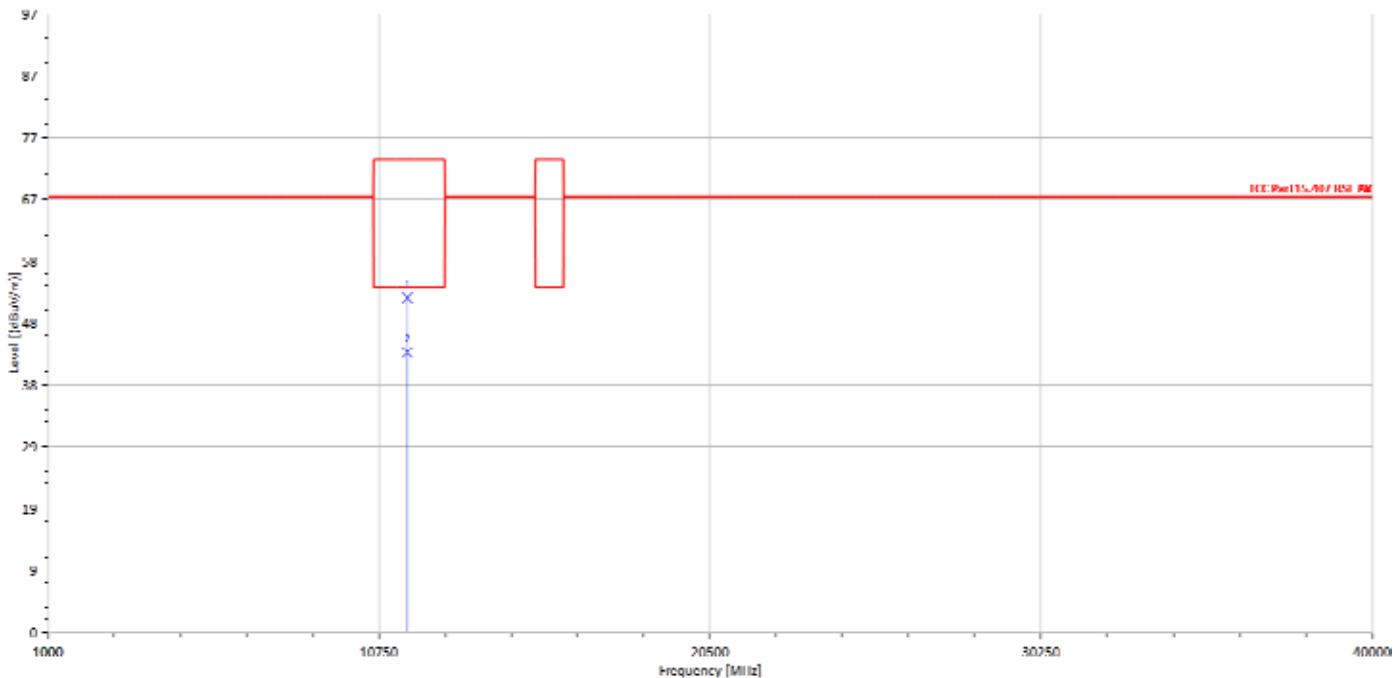
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Operation Band :802.11 n40M      Test Date :2015-09-15  
Fundamental Frequency :5795 MHz      Temp./Humi. :23deg\_C / 58 RH  
Operation Mode :TX HIGH      Engineer :Ashton  
EUT Pol. :H Plan      Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level		Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
			Peak	dBµV				
11590.00	H	Peak	31.07		21.28	52.35	74	-21.65
11590.00	H	Average	22.56		21.28	43.84	54	-10.16

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**Band edge falling to restricted band**

Operation Band :802.11 n40M Test Date :2015-09-14  
 Fundamental Frequency :5755 MHz Temp./Humi. :23deg\_C / 58 RH  
 Operation Mode :Band Edge LOW Engineer :Ashton  
 EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV			dB $\mu$ V/m	
5710.60	S	Peak	55.31	12.32	67.63	68.3	-0.67
5725.00	E	Peak	58.59	12.27	70.86	78.2	-7.34

Operation Band :802.11 n40M Test Date :2015-09-14  
 Fundamental Frequency :5755 MHz Temp./Humi. :23deg\_C / 58 RH  
 Operation Mode :Band Edge LOW Engineer :Ashton  
 EUT Pol. :H Plan Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			PK/QP/AV			dB $\mu$ V/m	
5723.30	S	Peak	57.55	12.28	69.83	78.2	-8.37
5725.00	E	Peak	56.01	12.27	68.28	78.2	-9.92

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Operation Band :802.11 n40M Test Date :2015-09-14  
Fundamental Frequency :5795 MHz Temp./Humi. :23deg\_C / 58 RH  
Operation Mode :Band Edge HIGH Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
						FS	@3m
5850.00	E	Peak	43.06	12.61	55.67	78.2	-22.53
5850.80	S	Peak	44.98	12.62	57.60	78.2	-20.60

Operation Band :802.11 n40M Test Date :2015-09-14  
Fundamental Frequency :5795 MHz Temp./Humi. :23deg\_C / 58 RH  
Operation Mode :Band Edge HIGH Engineer :Ashton  
EUT Pol. :H Plan Measurement Antenna Pol. :HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
						FS	@3m
5850.00	E	Peak	42.52	12.61	55.14	78.2	-23.06
5858.50	S	Peak	43.71	12.69	56.41	78.2	-21.79

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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

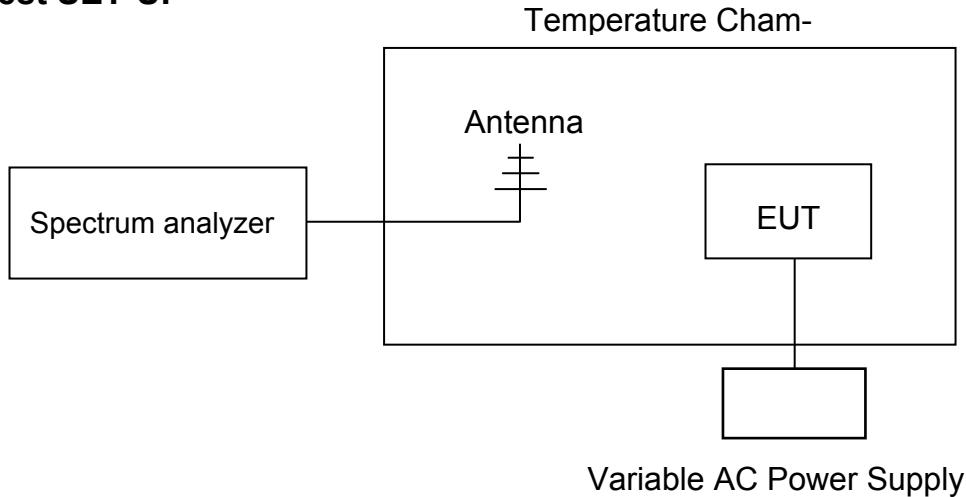
### 13.1 Standard Applicable

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

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2015	01/28/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2015	05/05/2016
AC Power Supply	APW-105N	887592	All Power	N/A	N/A

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### 13.5 Measurement Result

Operation Mode	TX	Test Date	2015.09.12
Temperature	17	Test By	Ashton
Humidity	65 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	12.4V	36	5180.0000	5179.982540	0.0175
		44	5220.0000	5219.975670	0.0243
		48	5240.0000	5239.976100	0.0239
		149	5745.0000	5744.972930	0.0271
		157	5785.0000	5784.973360	0.0266
		165	5825.0000	5824.972750	0.0273
	9.7V	36	5180.0000	5179.981430	0.0186
		44	5220.0000	5219.976150	0.0239
		48	5240.0000	5239.975330	0.0247
		149	5745.0000	5744.972390	0.0276
		157	5785.0000	5784.972390	0.0276
		165	5825.0000	5824.972810	0.0272
25	10.8V	36	5180.0000	5179.980970	0.0190
		44	5220.0000	5219.975090	0.0249
		48	5240.0000	5239.975090	0.0249
		149	5745.0000	5744.972220	0.0278
		157	5785.0000	5784.971850	0.0282
		165	5825.0000	5824.972200	0.0278
40	12.4V	36	5180.0000	5179.979910	0.0201
		44	5220.0000	5219.974690	0.0253
		48	5240.0000	5239.973930	0.0261
		149	5745.0000	5744.971550	0.0285
		157	5785.0000	5784.970280	0.0297
		165	5825.0000	5824.970880	0.0291
	9.7V	36	5180.0000	5179.979420	0.0206
		44	5220.0000	5219.974390	0.0256
		48	5240.0000	5239.974780	0.0252
		149	5745.0000	5744.970880	0.0291
		157	5785.0000	5784.970940	0.0291
		165	5825.0000	5824.970420	0.0296

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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 design is used.

The antenna connector is designed with unique type RF connector 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 power limit.

*~ End of Report ~*

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