

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

**Applicant:** Cal-Comp Big Data, Inc.  
5F., No.99, Sec. 5, Nanjing E. Rd., Songshan Dist., Taipei City 10571,  
Taiwan (R.O.C.)

**Product Name:** HiMirror Enterprise Pro

**Brand Name:** HiMirror

**Model No.:** BM700

**Model Difference:** N/A

**FCC ID:** 2AJTF-BM700

**IC ID:** 21978-BM700

**Report Number:** E2/2018/B0023

**FCC Rule Part:** §15.407, Cat: NII

**IC Rule:** RSS-247 issue 2 Feb. 2017

**Issue Date:** Dec. 17, 2018

**Date of Test:** Nov. 05, 2018 ~ Nov. 26, 2018

**Date of EUT Received:** Nov. 05, 2018

**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.

**Tested By:**

*Aken Huang*  
**Aken Huang / Engineer**

**Approved By:**

*Jazz Huang*  
**Jazz Huang / Asst.  
Supervisor**



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## Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/B0023	Rev.00	Initial creation of document	All	Dec. 03, 2018	Yuri Tsai
E2/2018/B0023	Rev.01	Revise limit of conducted output power	32~33	Dec. 17, 2018	Yuri Tsai

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## 1 GENERAL INFORMATION

### 1.1 Product Description

#### General:

Product Name:	HiMirror Enterprise Pro	
Brand Name:	HiMirror	
Model No.:	BM700	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	12Vdc from AC/DC adapter	
	Adapter:	1. Model No.: KSA-36W-120300HU, Supplier: Kuantech (Beihai) Co., Ltd. 2. Model No.: WA-36A12FU, Supplier: Asian Power Devices Inc.

#### FCC WLAN 5GHz:

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (Avg.) (dBm)	Modulation Technology
a	5150~5250	4	13.98	OFDM
n_HT 20M	5150~5250	4	HT: 14.68	OFDM
n_HT 40M	5150~5250	2	HT: 14.49	OFDM
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 – 72.2Mbps 802.11 n_40MHz: 13.5 - 150.0Mbps		

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Wi-Fi 802.11	Frequency Range	Channels	Rated Power (EIRP) (dBm)	Modulation Technology
a	5180~5240	4	17.35	OFDM
n_HT 20M	5180~5240	4	HT: 22.35	OFDM
n_HT 40M	5180~5240	2	HT: 22.16	OFDM
Modulation type		64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only		
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps 802.11 n_40MHz: 13.5 - 150.0Mbps		

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
PCB	Walsin Technology Corporation	BM700	5150~5250	3.37 (Main)
			5150~5250	3.4 (Aux)

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## 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

## 1.3 Test Facility

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

FCC Registration Number and Designation number are: 735305 / TW0002

Canada Registration Number: 4620E-1

## 1.4 Special Accessories

There are no special accessories used while test was conducted.

## 1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

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

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

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

#### 2.3.2 Radiated Emissions

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

### 2.4 Measurement Results Explanation Example

#### For all conducted test items:

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

#### Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

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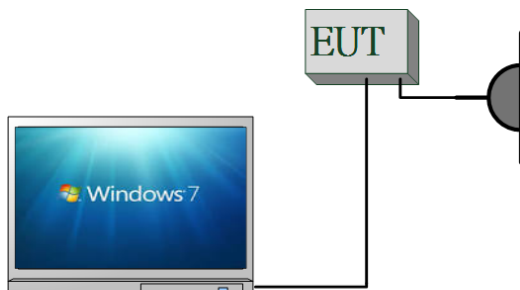
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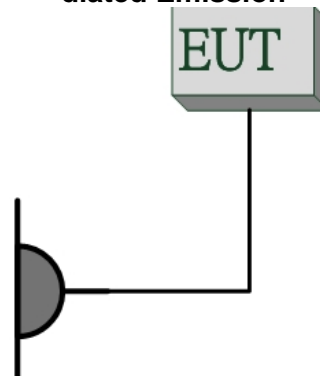
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## 2.5 Configuration of Tested System

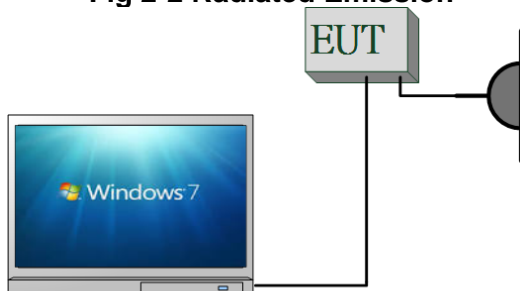
**Fig. 2-1 Conducted (Antenna Port) Emission Configuration**



**Fig 2-3 Conduction (AC Power Line) Radiated Emission**



**Fig 2-2 Radiated 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	L420	S0011721	Shielded	Unshielded

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### 3 SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-247 §6.2.1~4 (1) RSS-Gen §6.6	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~4 (1)	Power Spectral Density	Compliant
§15.205 §15.209 §15.407(b)	RSS-247 §6.2.1~4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.7 RSS- Gen §8.3	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:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
36	5180
40	5200
44	5220
48	5240

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
38	5190
46	5230

### 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:

MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
<b>RADIATED EMISSION TEST (BELOW 1 GHz)</b>						
802.11a	5180~5240	36 to 48	44	OFDM	6	Main
<b>RADIATED EMISSION TEST (ABOVE 1 GHz)</b>						
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

**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:

<b>CONDUCTED TEST</b>						
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

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

### Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	9kHz-30MHz: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

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

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## 6 CONDUCTED EMISSION TEST

### 6.1. Standard Applicable

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

Frequency range MHz	Limits dB(μV)	
	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.
LISN	TESEQ	NNB 51	36076	2018/02/14	2019/02/13
EMI Test Receiver	R&S	ESCI	101343	2018/07/31	2019/07/30
Coaxial Cable	EMC Instru-ments Corp	EMC5D-BM-B M-3000	1401004	2018/05/25	2019/05/24

### 6.3. EUT Setup

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

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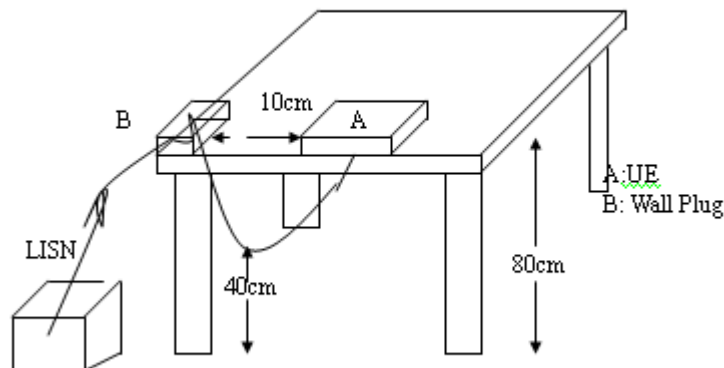
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## 6.4. Test SET-UP



## 6.5. Measurement Procedure

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

## 6.6. Measurement Result

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

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

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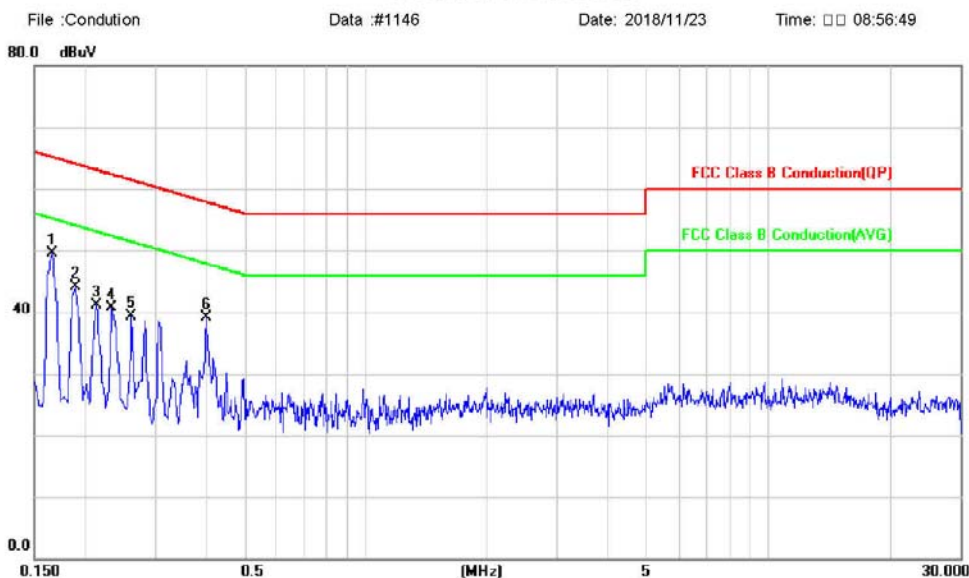
## AC POWER LINE CONDUCTED EMISSION TEST DATA

Site : Conduction Room B  
Limit: FCC Class B Conduction(QP)  
Mode:  
Note:

Phase: **L1**  
Power: AC 120V/60Hz

Temperature: 23 □  
Humidity: 57 %

## Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1660	29.91	19.68	49.59	65.16	-15.57	peak	
2		0.1900	24.39	19.72	44.11	64.04	-19.93	peak	
3		0.2140	21.44	19.76	41.20	63.05	-21.85	peak	
4		0.2340	20.81	19.80	40.61	62.31	-21.70	peak	
5		0.2620	19.51	19.84	39.35	61.37	-22.02	peak	
6		0.4020	19.05	20.07	39.12	57.81	-18.69	peak	

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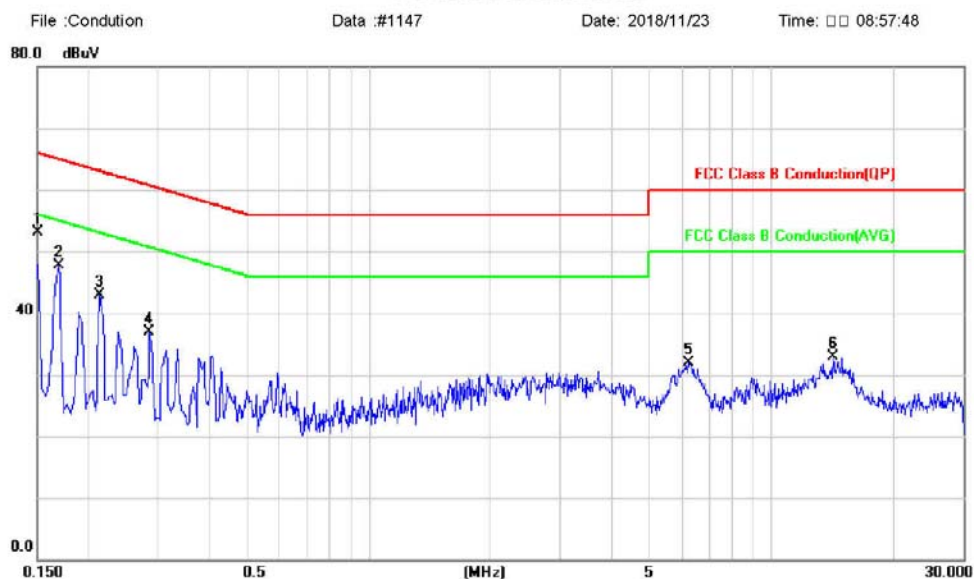
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Site : Conduction Room B Phase: **N** Temperature: 23 °  
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 57 %  
 Mode:  
 Note:

## Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	33.38	19.64	53.02	66.00	-12.98	peak	
2		0.1700	27.97	19.67	47.64	64.96	-17.32	peak	
3		0.2140	23.26	19.74	43.00	63.05	-20.05	peak	
4		0.2860	17.00	19.86	36.86	60.64	-23.78	peak	
5		6.2500	11.86	19.96	31.82	60.00	-28.18	peak	
6		14.2380	12.83	19.99	32.82	60.00	-27.18	peak	

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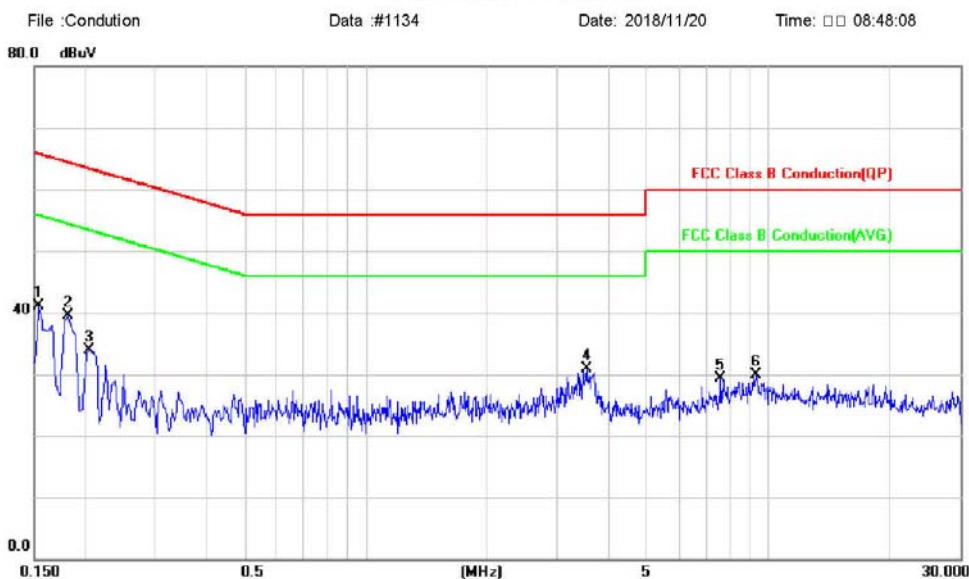


Site : Conduction Room B  
Limit: FCC Class B Conduction(QP)  
Mode:  
Note:

Phase: L1  
Power: AC 120V/60Hz

Temperature: 22 °  
Humidity: 65 %

### Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1540	21.46	19.66	41.12	65.78	-24.66	peak	
2		0.1820	19.87	19.70	39.57	64.39	-24.82	peak	
3		0.2060	14.15	19.75	33.90	63.37	-29.47	peak	
4		3.5380	10.59	20.27	30.86	56.00	-25.14	peak	
5		7.6300	9.32	19.97	29.29	60.00	-30.71	peak	
6		9.3340	9.88	19.95	29.83	60.00	-30.17	peak	

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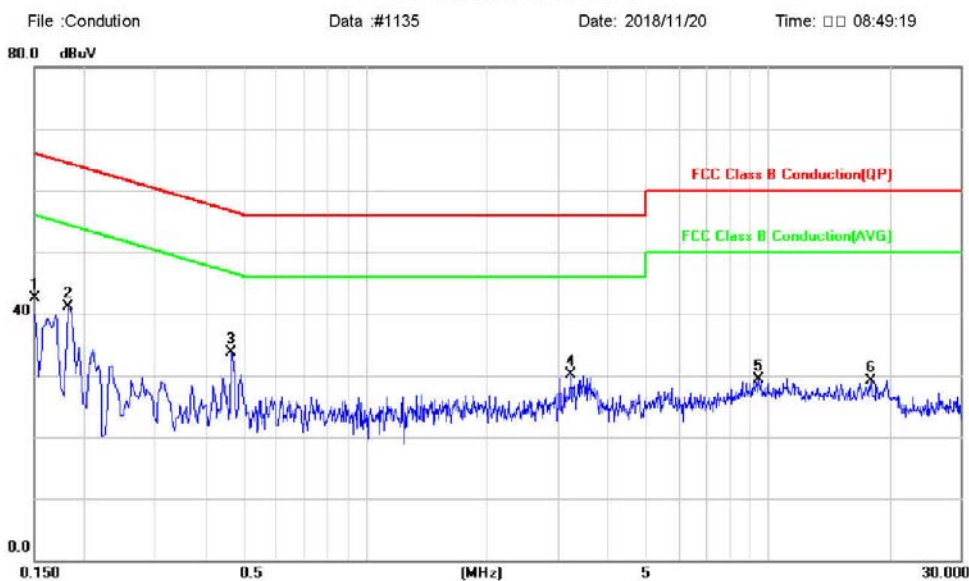


Site : Conduction Room B  
Limit: FCC Class B Conduction(QP)  
Mode:  
Note:

Phase: **N**  
Power: AC 120V/60Hz

Temperature: 22 □  
Humidity: 65 %

### Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	22.80	19.64	42.44	66.00	-23.56	peak	
2		0.1820	21.47	19.69	41.16	64.39	-23.23	peak	
3	*	0.4660	13.45	20.16	33.61	56.58	-22.97	peak	
4		3.2300	9.75	20.30	30.05	56.00	-25.95	peak	
5		9.4740	9.45	19.94	29.39	60.00	-30.61	peak	
6		17.9740	9.12	20.04	29.16	60.00	-30.84	peak	

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## 7 DUTY CYCLE TEST SIGNAL

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

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

### Formula:

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

### Measurement Procedure:

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

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11a	93.43	0.30	0.72	1.00
802.11n_20	87.05	0.60	1.51	2.00
802.11n_40	77.53	1.11	2.97	3.00

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9343) = 0.3$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8705) = 0.6$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.7753) = 1.11$$

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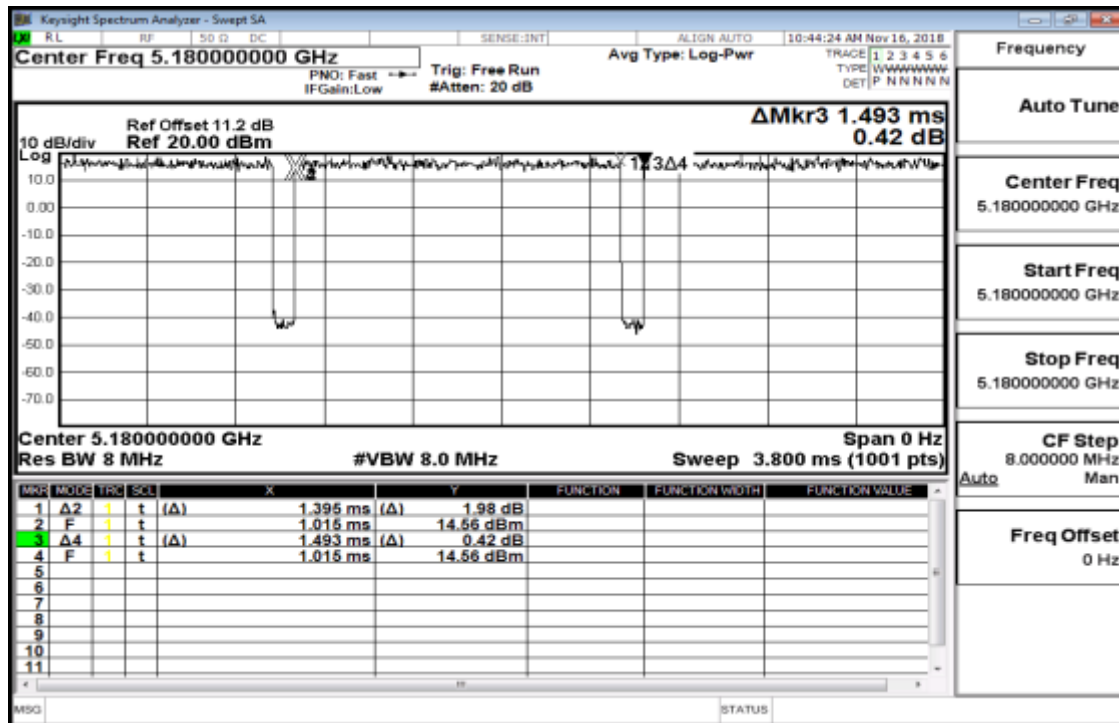
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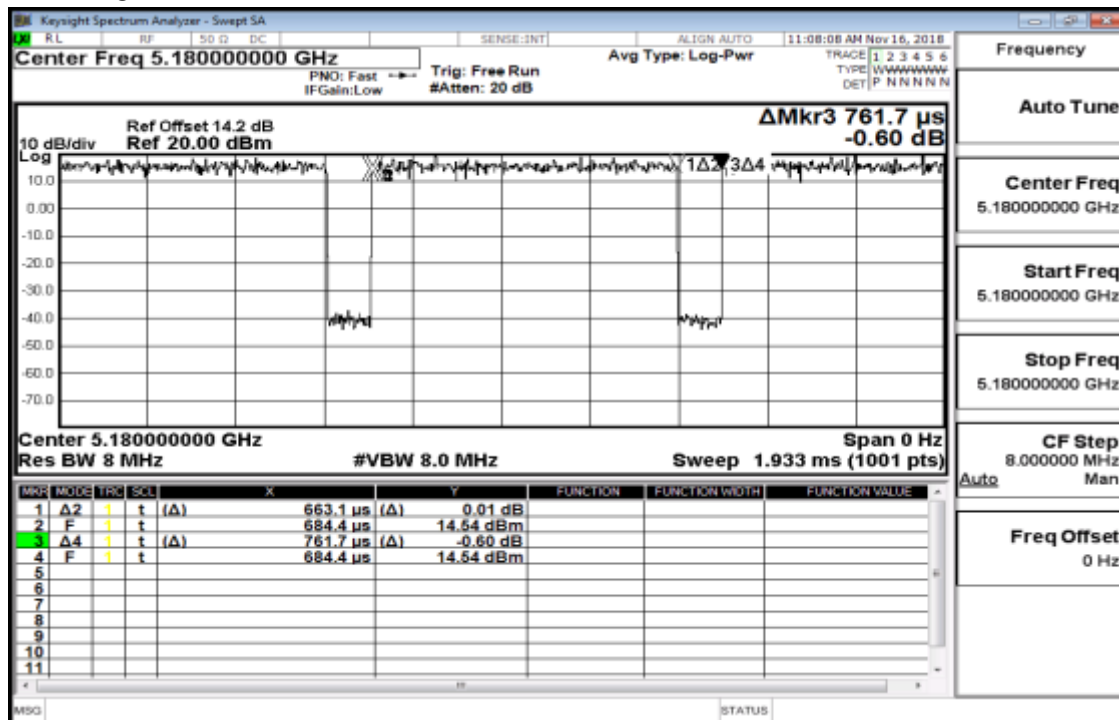
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## DUTY CYCLE TEST SIGNAL Measurement Result

### 802.11a



### 802.11n HT20

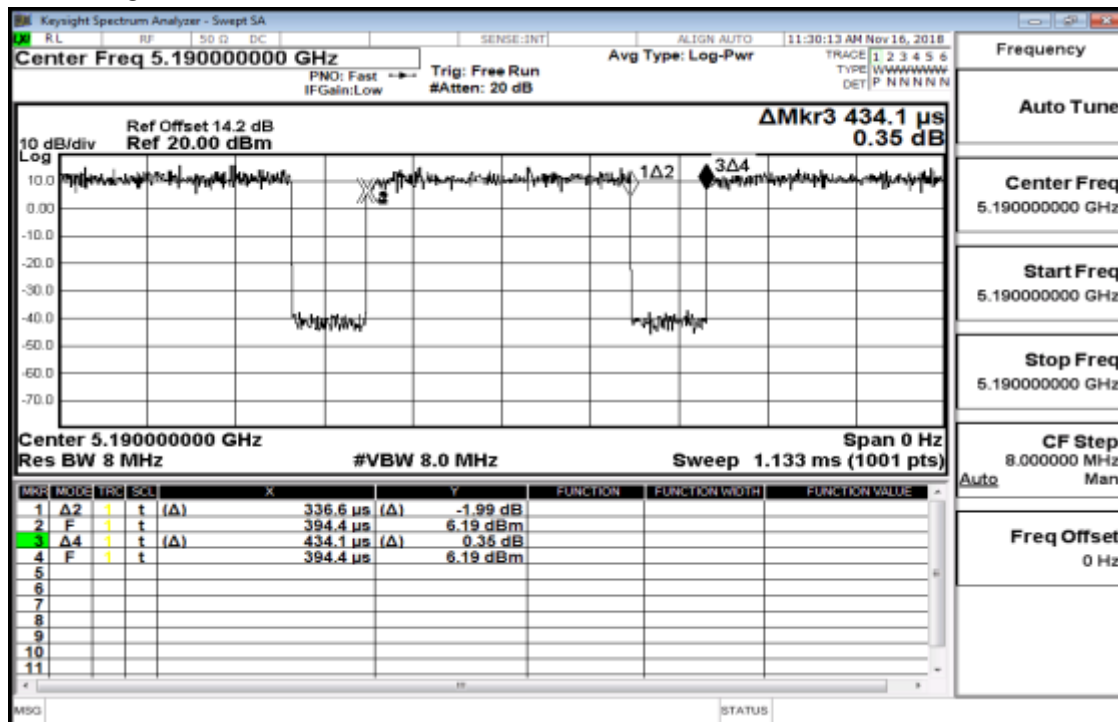


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## 802.11n HT 40



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## 8 26DB & 6DB EMISSION BANDWIDTH MEASUREMENT

### 8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

### 8.2 Measurement Procedure

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

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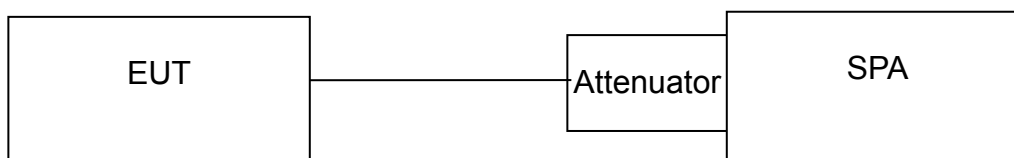
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### 8.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equip-ment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Notebook	Lenovo	L420	S0011721	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19
DC Block	PASTERNAK	PE8210	RF29	2017/12/26	2018/12/25

### 8.4 Test Set-up



### 8.5 Measurement Result

#### 26dB Bandwidth

802.11a\_Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	21.10	13.243
5220	19.49	12.898
5240	22.05	13.434

802.11a\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	29.52	14.701
5220	18.99	12.785
5240	19.47	12.894

802.11n\_HT20\_Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	19.69	12.942
5220	19.71	12.947
5240	19.59	12.920

802.11n\_HT20\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	20.00	13.010
5220	20.08	13.028
5240	19.76	12.958

802.11n\_HT40\_Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	42.02	16.235
5230	44.81	16.514

802.11n\_HT40\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	41.80	16.212
5230	44.36	16.470

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## 99% BW to prove that all signals in band I is no over band I

802.11a\_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.498	12.174
5220	16.457	12.164
5240	16.516	12.179

802.11n\_HT20\_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.449	12.418
5220	17.479	12.425
5240	17.460	12.420

802.11n\_HT40\_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.228	15.590
5230	39.254	15.939

802.11a\_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.728	12.234
5220	16.460	12.164
5240	16.423	12.155

802.11n\_HT20\_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.441	12.416
5220	17.491	12.428
5240	17.464	12.421

802.11n\_HT40\_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.202	15.587
5230	36.226	15.590

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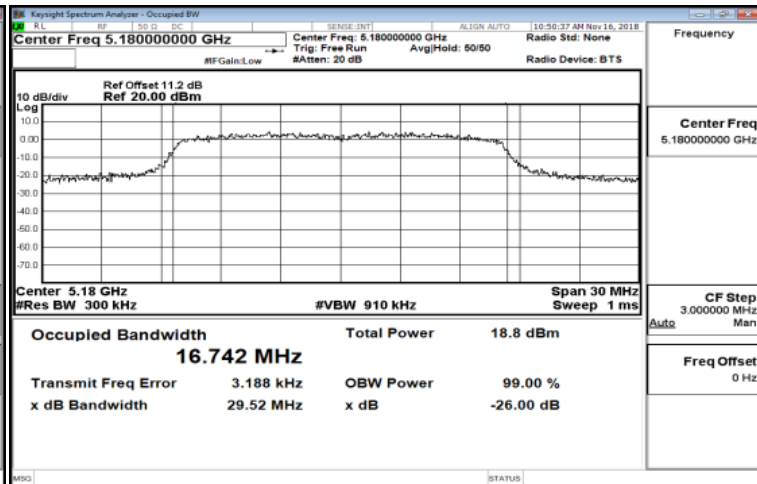
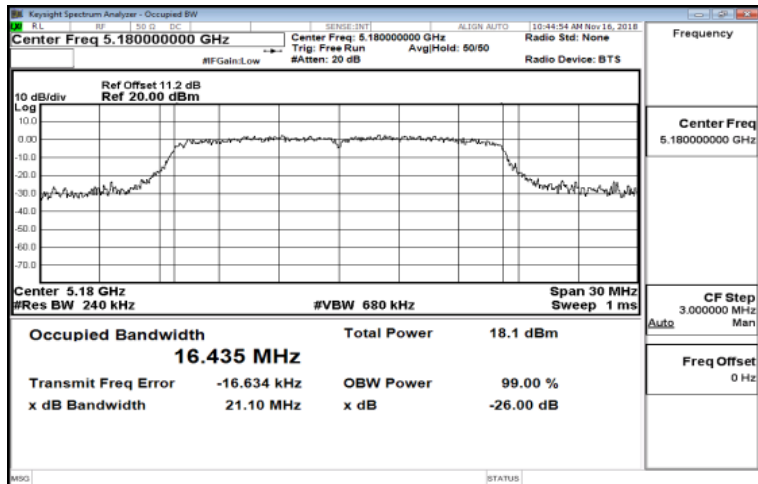
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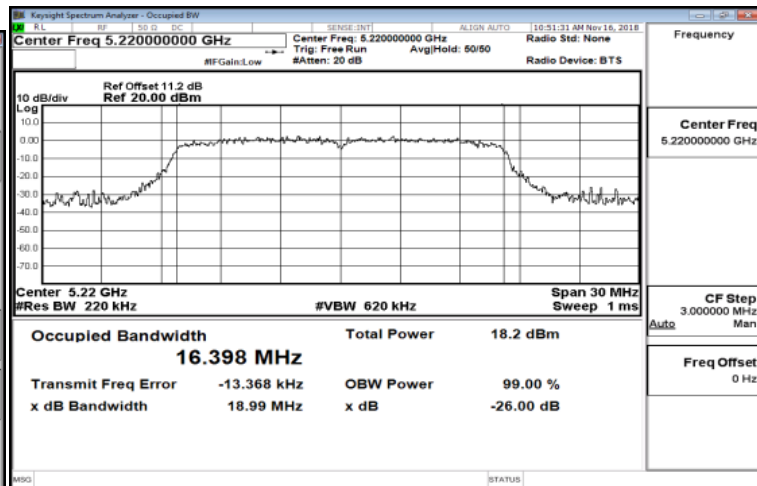
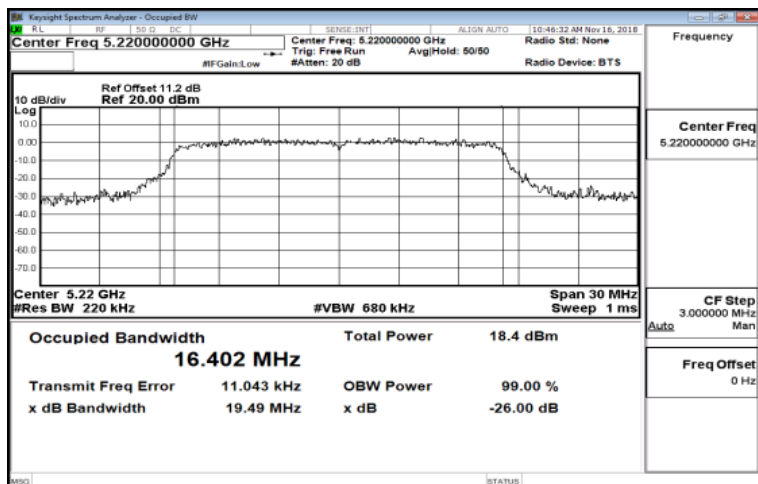
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## 802.11a (Aux)



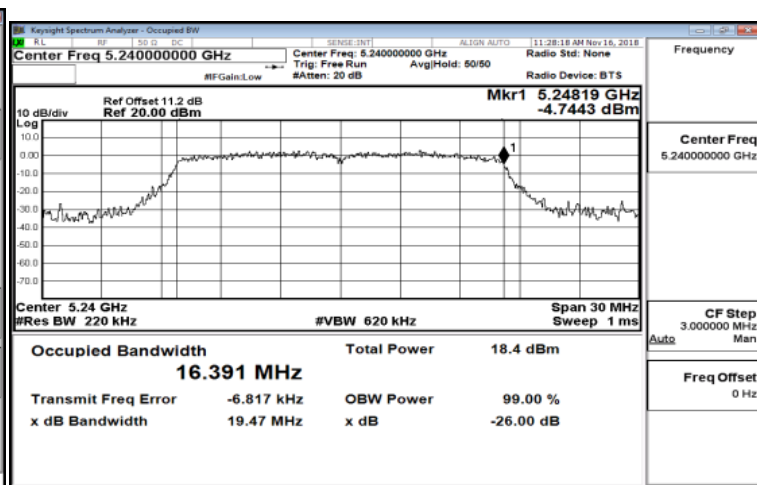
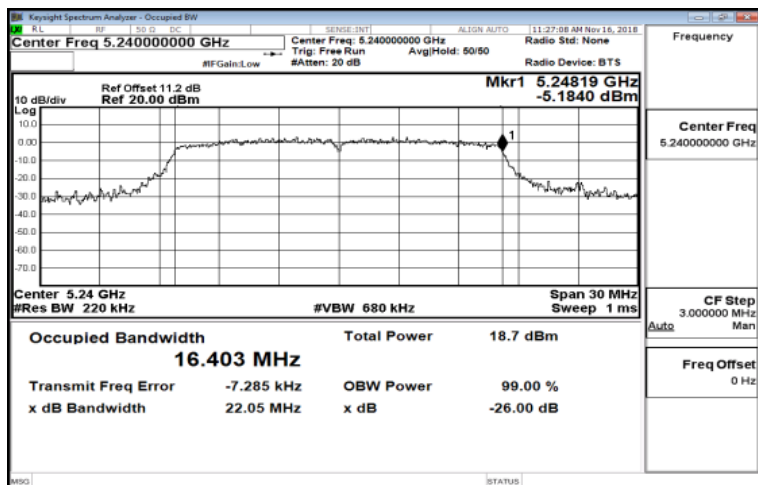
## 802.11a

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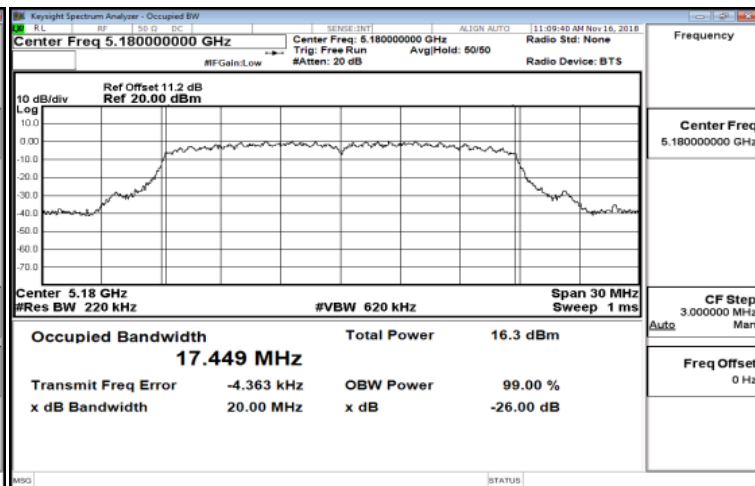
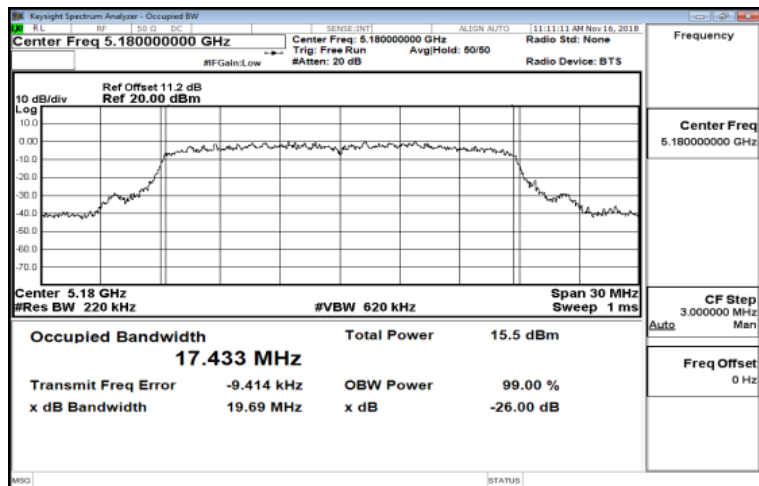
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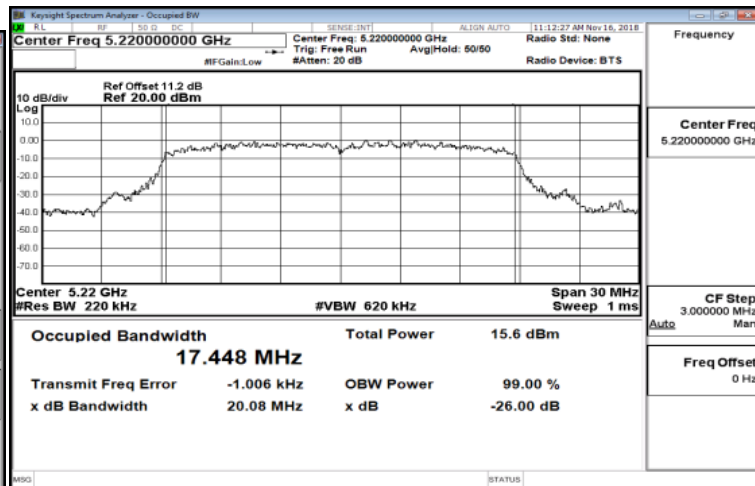
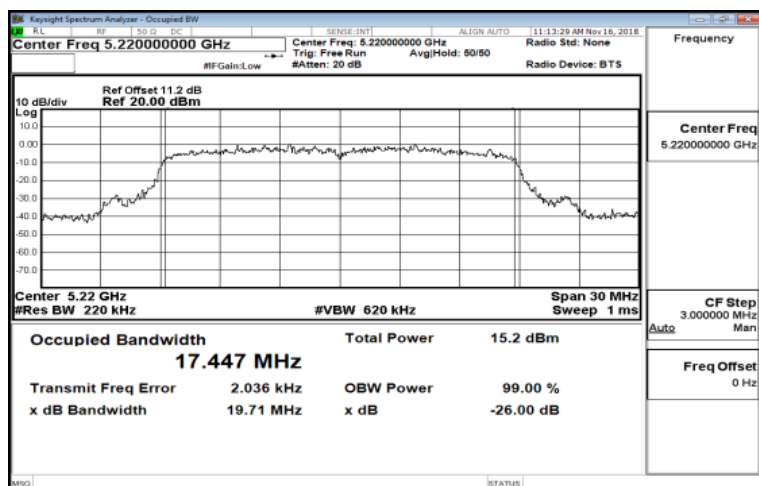
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## 802.11n20 (Aux)



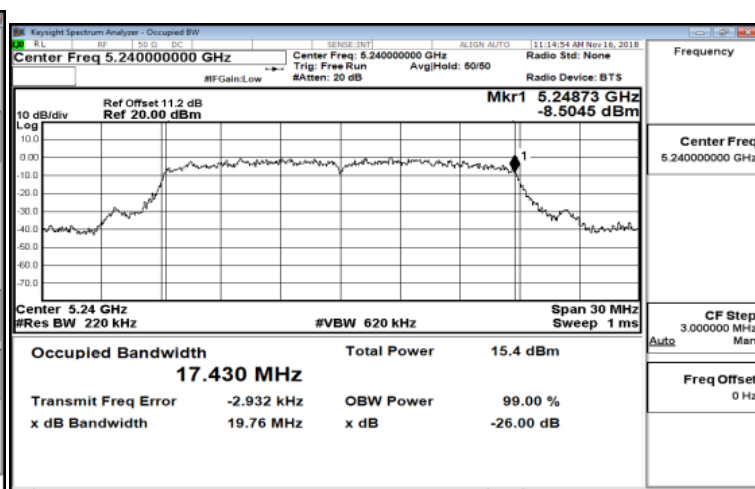
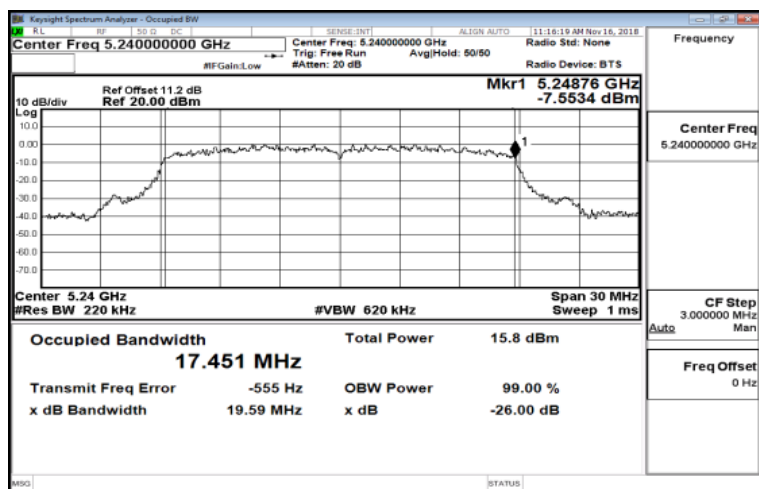
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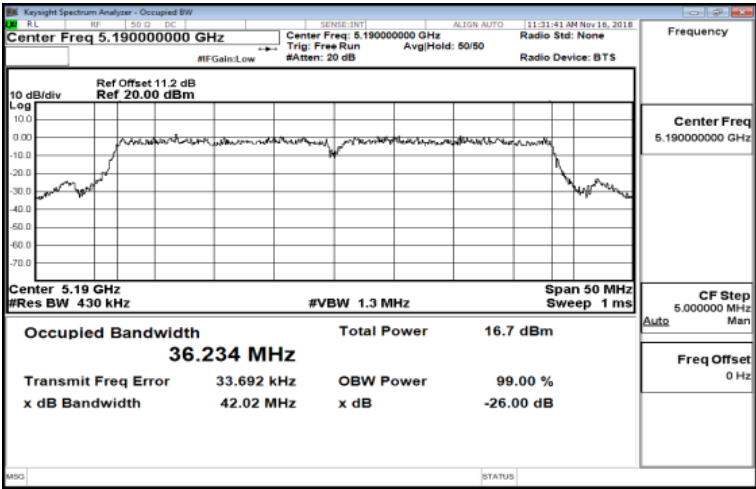


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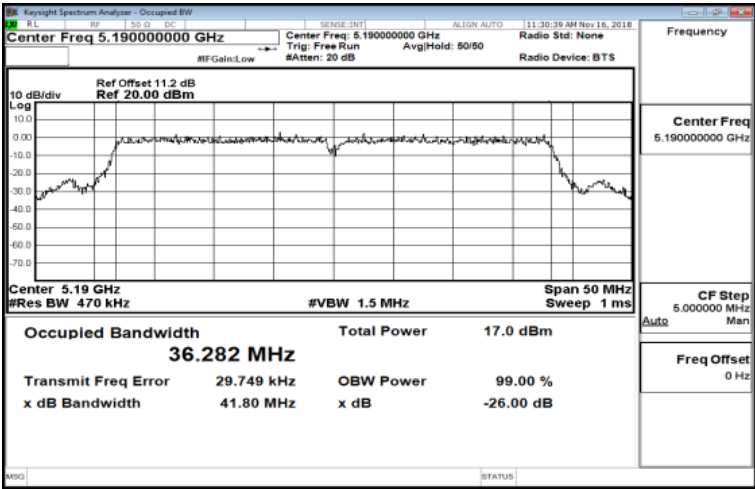
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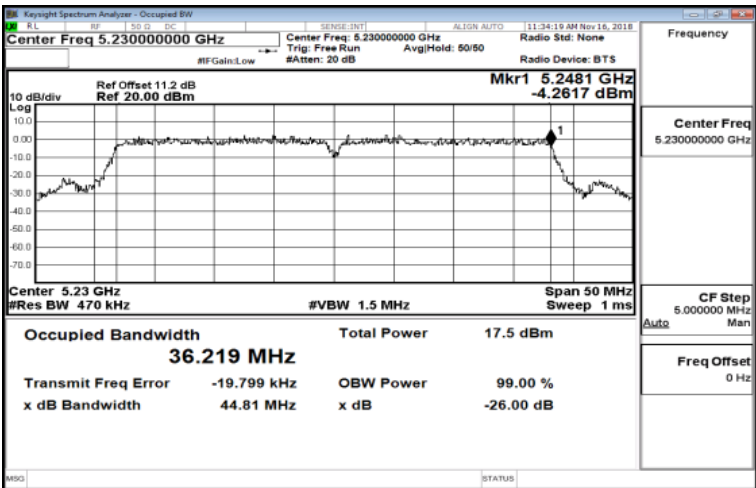
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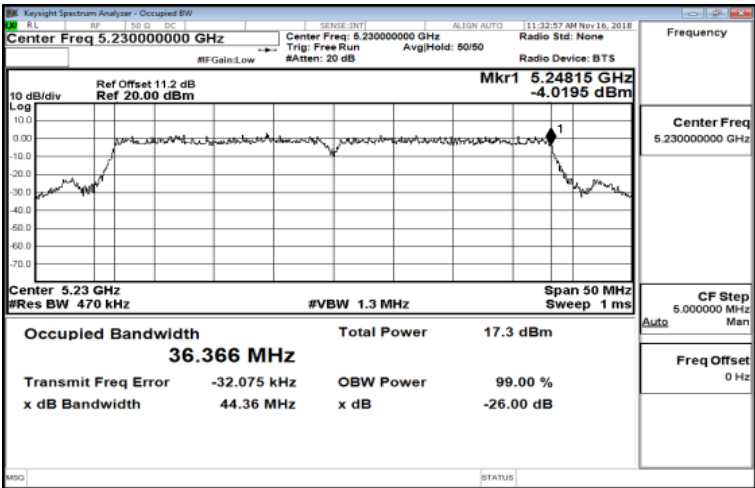
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## 802.11n40



## 802.11n40



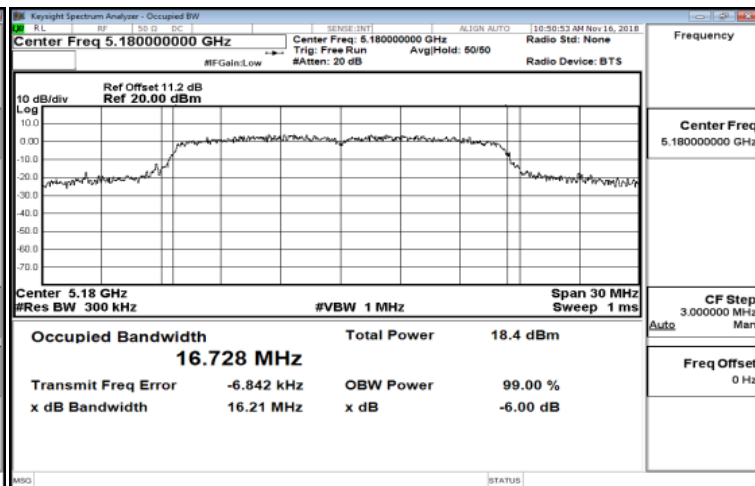
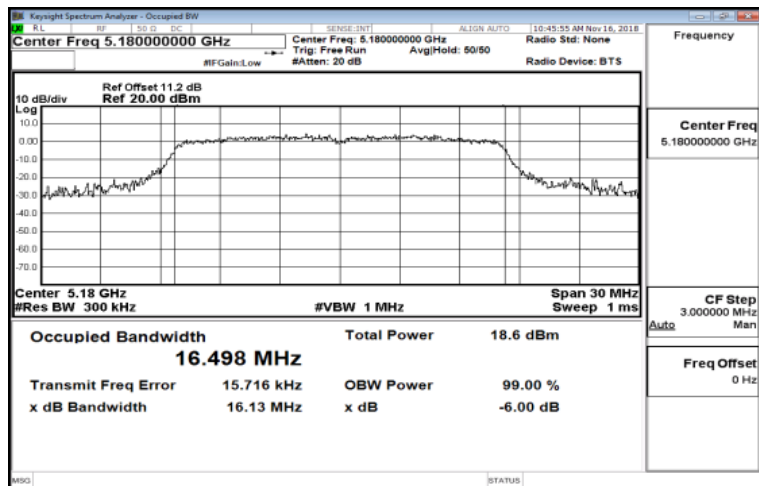
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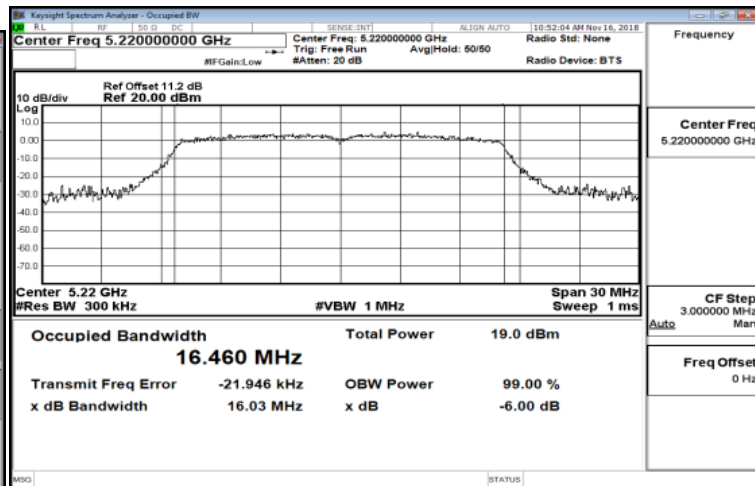
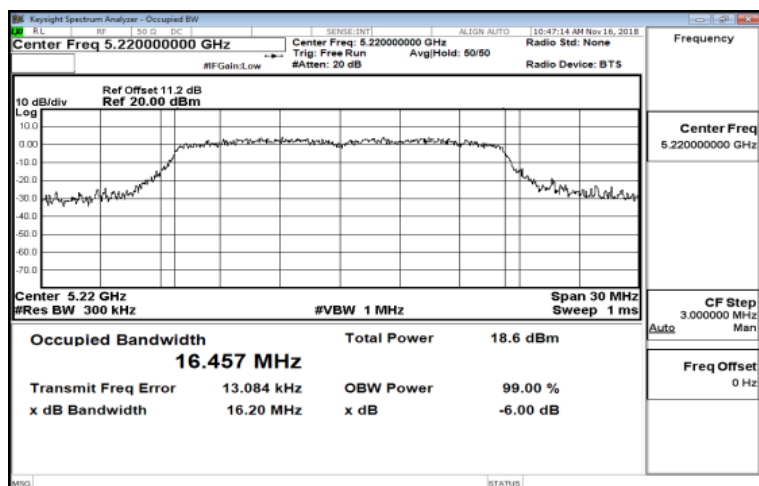
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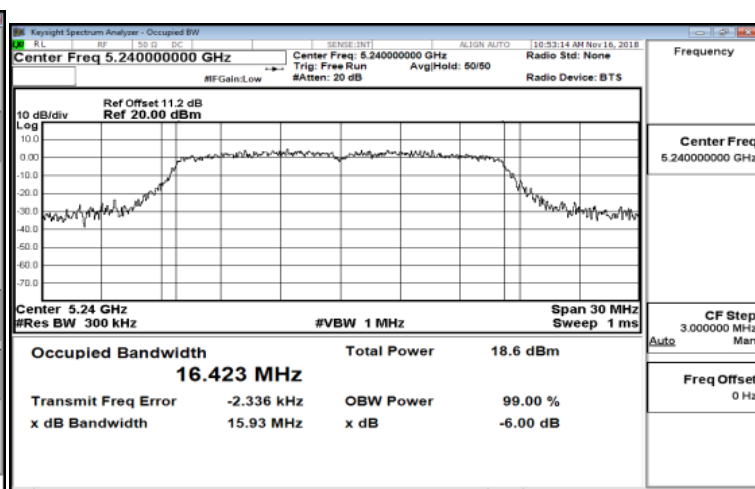
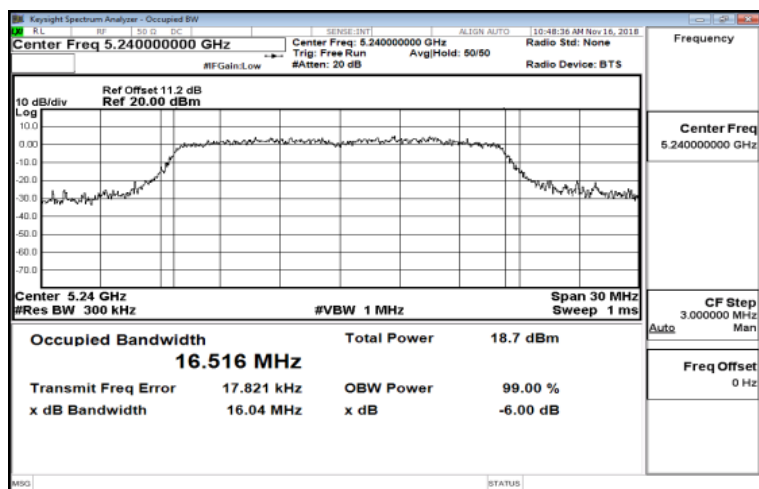
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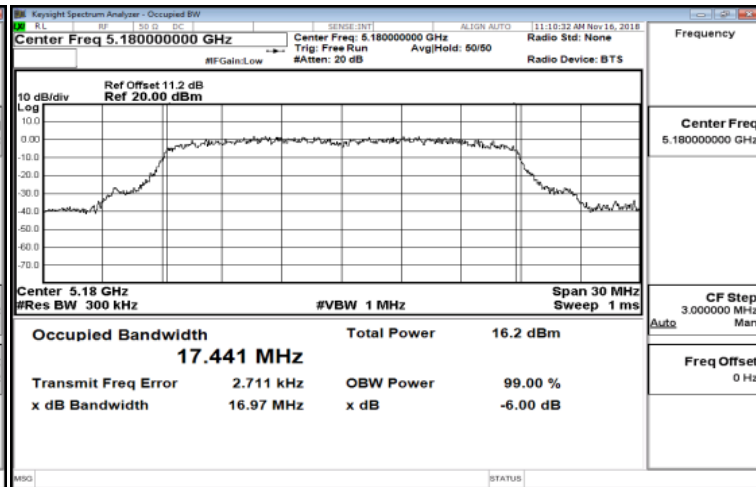
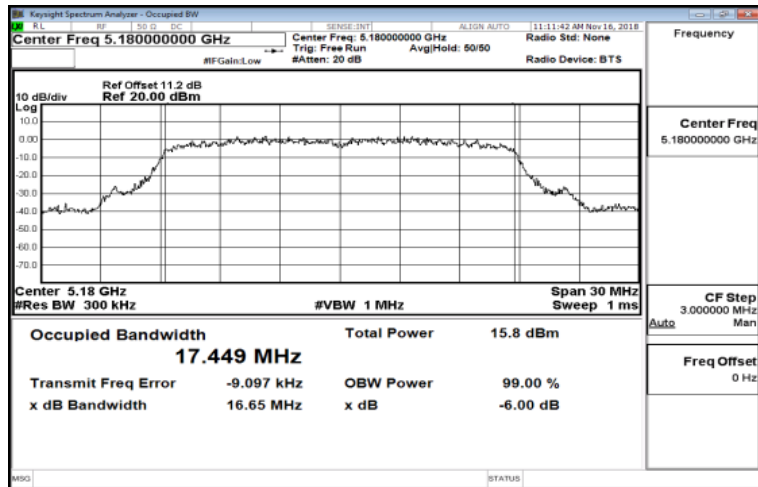
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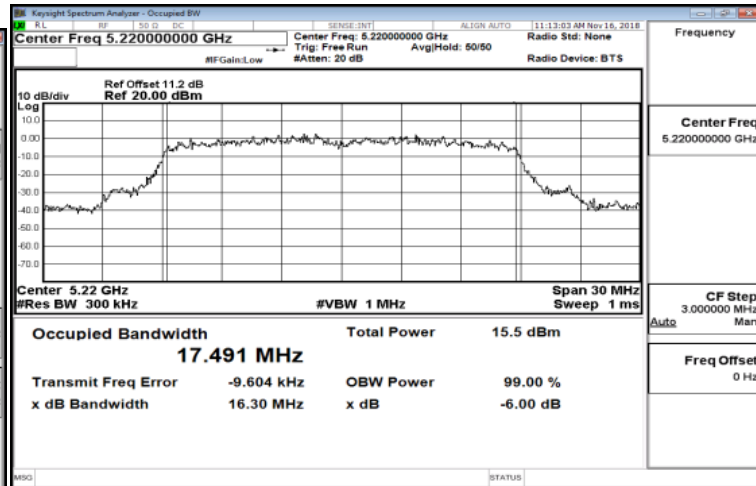
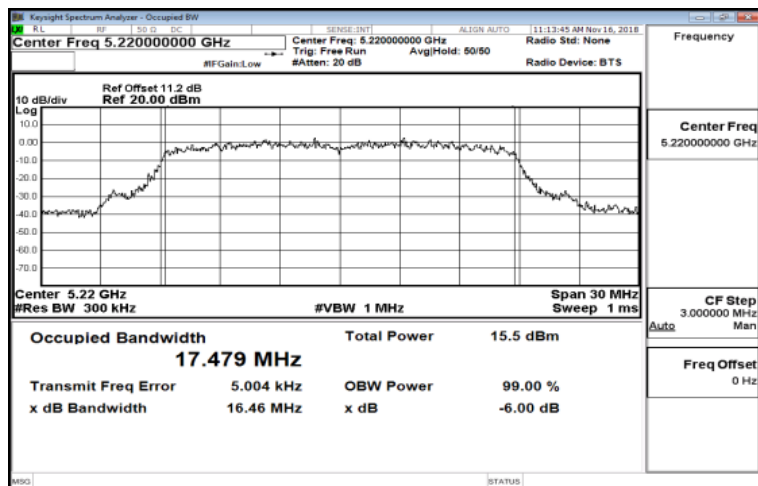
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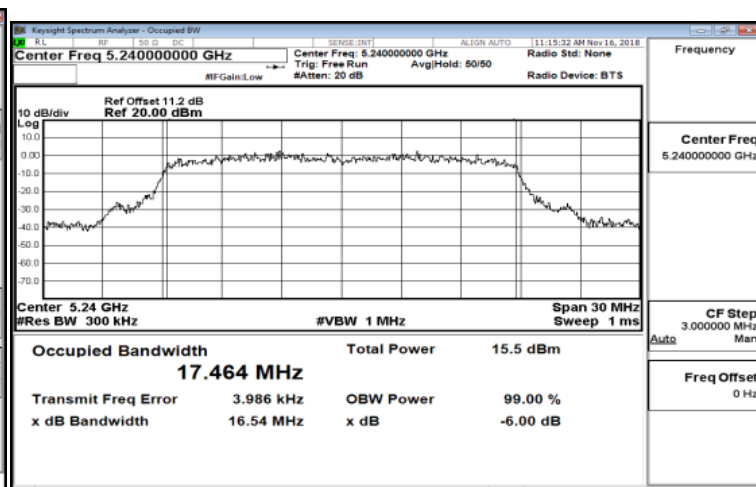
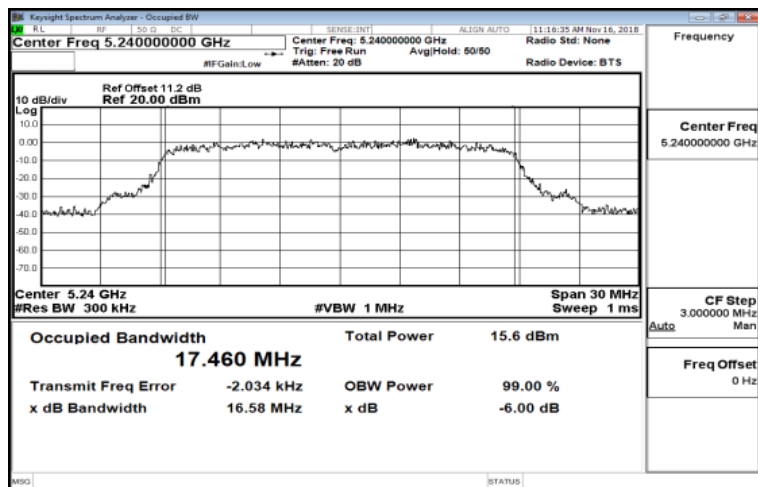
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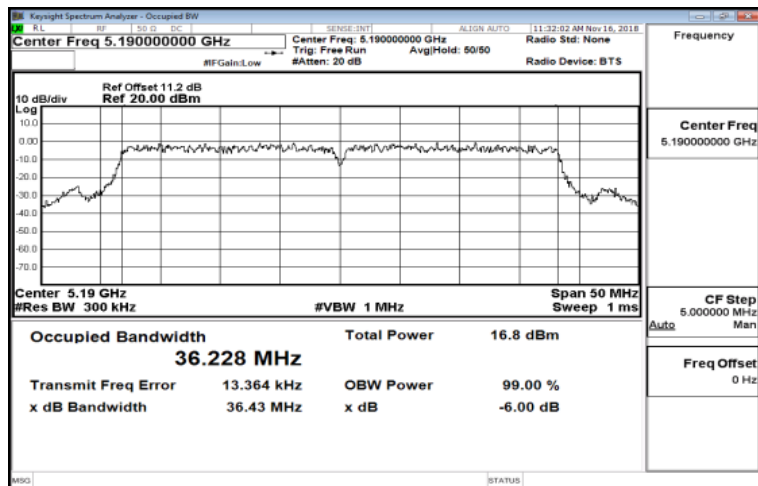
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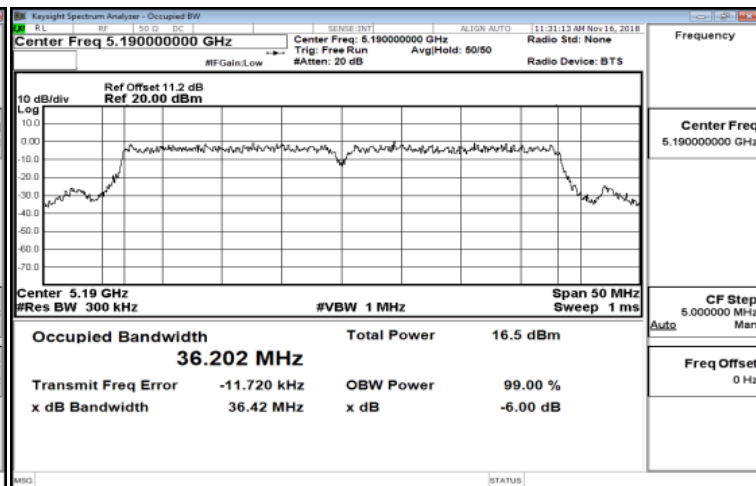
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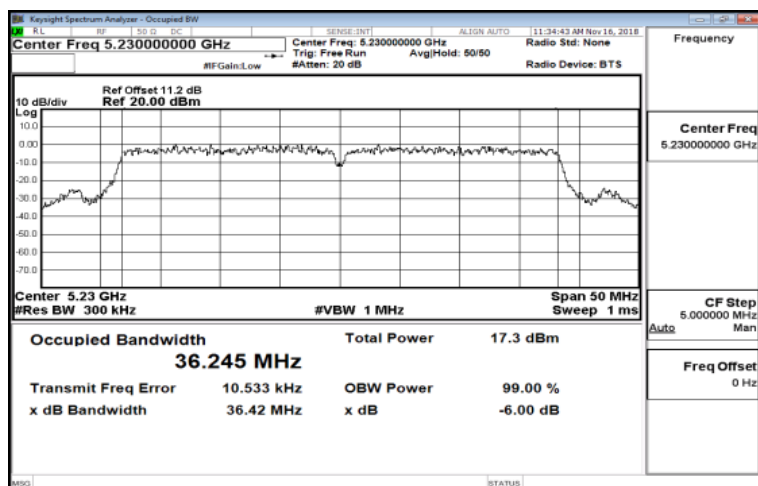
## 99% 802.11n40 (Main)



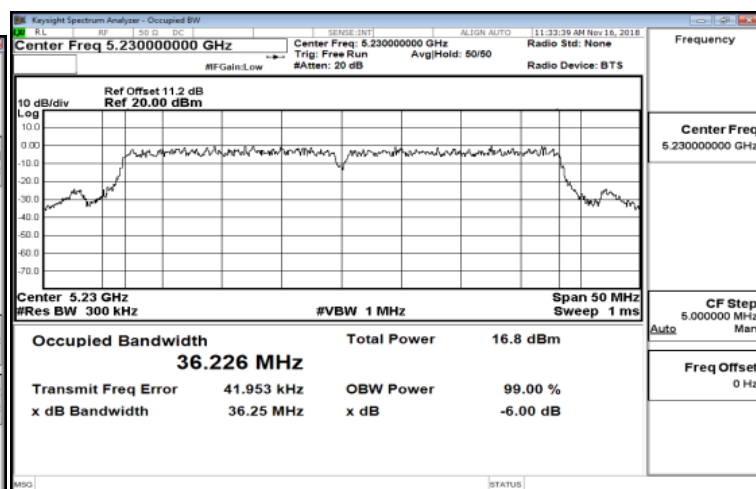
## 802.11n40 (Aux)



## 802.11n40



## 802.11n40



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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 Aecess 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)

### IC

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP shall not exceed 200 mW or $10 + 10 \log_{10} B$ , dBm
5250~5350 MHz	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$ EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$ , dBm
5470-5600 MHz and 5650-5725 MHz	Conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$ EIRP shall not exceed 1.0 W or $17 + 10 \log_{10} B$ , dBm
5725~5850 MHz	Conducted output power shall not exceed 1 W

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

### Note:

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

Directional gain = gain of antenna element +  $10 \log (\# \text{ of TX antenna elements})$

	Effective Legacy Gain (dBi)	Limit
UNII-1	7.67	22.31dBm

Therefore the limit no needs to reduce for the UNII-1, U-NII-2A, U-NII-2C and U-NII-3 band.

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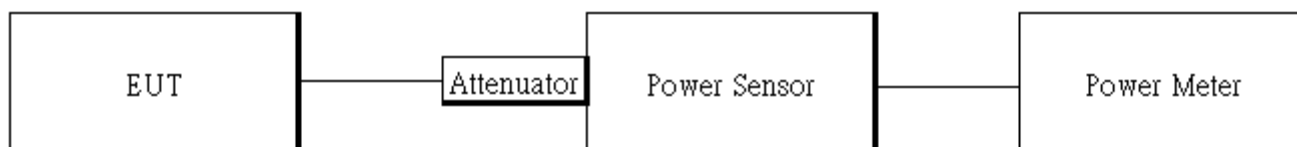
## 9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add  $10 \log(1/\text{duty cycle})$ .
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

## 9.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Notebook	Lenovo	L420	S0011721	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19
DC Block	PASTERNAK	PE8210	RF29	2017/12/26	2018/12/25

## 9.4 Test Set-up



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## 9.5 Measurement Result

### Conducted output power

#### 802.11a\_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	13.90	24.527	23.98	PASS
44	5220	6	13.92	24.641	23.98	PASS
48	5240	6	<b>13.98</b>	24.983	23.98	PASS

#### 802.11a\_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	13.66	23.209	23.98	PASS
44	5220	6	13.77	23.804	23.98	PASS
48	5240	6	13.87	24.359	23.98	PASS

#### 802.11n\_HT20\_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	12.54	17.967	23.98	PASS
44	5220	MCS0	12.65	18.428	23.98	PASS
48	5240	MCS0	12.60	18.217	23.98	PASS

#### 802.11n\_HT20\_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	12.70	18.641	23.98	PASS
44	5220	MCS0	<b>12.78</b>	18.988	23.98	PASS
48	5240	MCS0	12.75	18.857	23.98	PASS

#### 802.11n\_HT20\_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
36	5180	MCS8	10.7	11	14.49	28.106	22.308	PASS
44	5220	MCS8	10.9	11.2	<b>14.68</b>	29.389	22.308	PASS
48	5240	MCS8	10.8	11.1	14.56	28.553	22.308	PASS

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## 802.11n\_HT40\_Ch0

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	11.92	15.549	23.98	PASS
46	5230	MCS0	11.95	15.657	23.98	PASS

## 802.11n\_HT40\_Ch1

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
38	5190	MCS0	11.96	15.693	23.98	PASS
46	5230	MCS0	<b>11.98</b>	15.765	23.98	PASS

## 802.11n\_HT40\_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1				
38	5190	MCS8	10.2	10.5	14.44	27.823	22.308	PASS
46	5230	MCS8	10.3	10.4	<b>14.49</b>	28.135	22.308	PASS

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## Conducted output power (IC)

### EIRP

#### 802.11a\_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	13.90	3.370	17.27	53.291	23.01 or 10+10log(B)= 22.17	PASS
44	5220	13.92	3.370	17.29	53.537	23.01 or 10+10log(B)= 22.16	PASS
48	5240	<b>13.98</b>	3.370	<b>17.35</b>	<b>54.282</b>	23.01 or 10+10log(B)= 22.18	PASS

#### 802.11a\_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	13.66	3.400	17.06	50.775	23.01 or 10+10log(B)= 22.23	PASS
44	5220	13.77	3.400	17.17	52.078	23.01 or 10+10log(B)= 22.16	PASS
48	5240	<b>13.87</b>	3.400	<b>17.27</b>	<b>53.291</b>	23.01 or 10+10log(B)= 22.15	PASS

#### 802.11n\_HT20\_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	12.54	3.370	15.91	39.037	23.01 or 10+10log(B)= 22.42	PASS
44	5220	<b>12.65</b>	3.370	<b>16.02</b>	<b>40.039</b>	23.01 or 10+10log(B)= 22.43	PASS
48	5240	12.60	3.370	15.97	39.580	23.01 or 10+10log(B)= 22.42	PASS

#### 802.11n\_HT20\_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	12.70	3.400	16.10	40.783	23.01 or 10+10log(B)= 22.42	PASS
44	5220	<b>12.78</b>	3.400	<b>16.18</b>	<b>41.541</b>	23.01 or 10+10log(B)= 22.43	PASS
48	5240	12.75	3.400	16.15	41.255	23.01 or 10+10log(B)= 22.42	PASS

#### 802.11n\_HT20\_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	14.49	7.672	22.16	164.439	23.01 or 10+10log(B)= 22.42	PASS
44	5220	<b>14.68</b>	7.672	<b>22.35</b>	<b>171.945</b>	23.01 or 10+10log(B)= 22.43	PASS
48	5240	14.56	7.672	22.23	167.051	23.01 or 10+10log(B)= 22.42	PASS

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## 802.11n\_HT40\_Ch0

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
38	5190	11.92	3.370	15.29	33.783	23.01	or 10+10log(B)= 25.59	PASS
46	5230	<b>11.95</b>	3.370	<b>15.32</b>	<b>34.017</b>	23.01	or 10+10log(B)= 25.94	PASS

## 802.11n\_HT40\_Ch1

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
38	5190	11.96	3.400	15.36	34.332	23.01	or 10+10log(B)= 25.59	PASS
46	5230	<b>11.98</b>	3.400	<b>15.38</b>	<b>34.490</b>	23.01	or 10+10log(B)= 25.59	PASS

## 802.11n\_HT40\_MIMO

CH	Frequency (MHz)	TOTAL POWER (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	REQUIRED LIMIT (dBm)		RESULT
38	5190	14.44	7.672	22.12	162.783	23.01	or 10+10log(B)= 25.59	PASS
46	5230	<b>14.49</b>	7.672	<b>22.16</b>	<b>164.605</b>	23.01	or 10+10log(B)= 25.59	PASS

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## 10 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 Aecess Ponit	
	√	Mobile and portable clinet device	11dBm/ MHz
U-NII-2A			11dBm/ MHz
U-NII-2C			11dBm/ MHz
U-NII-3			30dBm/ 500kHz

### IC

OPERZTION FREQUENCY BAND	LIMIT
5150~5250 MHz	EIRP spectral density 10 dBm / MHz
5250~5350 MHz	11dBm / MHz
5470-5600 MHz and 5650-5725 MHz	11dBm / MHz
5725~5850 MHz	30dBm / 500 kHz

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

	Effective Legacy Gain (dBi)	PSD Limit	
UNII-1	7.67	9.33	dBm/MHz

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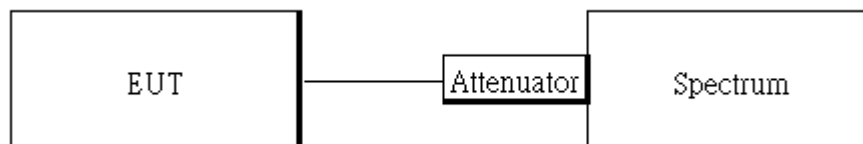
## 10.2 Measurement Procedure

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

## 10.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1326001	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315048	2018/08/09	2019/08/02
Power Sensor	Anritsu	MA2411B	1315049	2018/08/09	2019/08/02
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
Notebook	Lenovo	L420	S0011721	N/A	N/A
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19
DC Block	PASTERNAK	PE8210	RF29	2017/12/26	2018/12/25

## 10.4 Test Set-up



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## 10.5 Measurement Result

POWER DENSITY 802.11a MODE						
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Offset	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	-1.05	11.20	0.30	-0.75	11	-11.75
5220	-0.42	11.20	0.30	-0.12	11	-11.12
5240	0.15	11.20	0.30	0.45	11	-10.55
POWER DENSITY 802.11n HT20 MODE						
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Offset	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	-2.94	14.20	0.60	-2.34	9.33	-11.67
5220	-1.26	14.20	0.60	-0.66	9.33	-9.99
5240	-2.37	14.20	0.60	-1.77	9.33	-11.10
POWER DENSITY 802.11n HT40 MODE						
Frequency (MHz)	PSD W/O Duty Factor (dBm)	Offset	Duty Factor	PSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5190	-3.36	14.20	1.11	-2.25	9.33	-11.58
5230	-8.38	14.20	1.11	-7.27	9.33	-16.60

**Note:**

SISO offset= 11.2

MIMO offset= 14.2

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EIRP spectral density 802.11a MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	-0.75	3.40	2.65	10	-7.35
5220	-0.12	3.40	3.28	10	-6.72
5240	0.45	3.40	3.85	10	-6.15
EIRP spectral density 802.11n HT20 MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	-2.34	7.67	5.33	10	-4.67
5220	-0.66	7.67	7.01	10	-2.99
5240	-1.77	7.67	5.90	10	-4.10
EIRP spectral density 802.11n HT40 MODE					
Freq. (MHz)	PSD (dBm)	Ant. Gain (dBi)	EIRP SD (dBm)	Limit (dBm)	Margin (dB)
5180	-2.25	7.67	5.42	10	-4.58
5220	-7.27	7.67	0.40	10	-9.60

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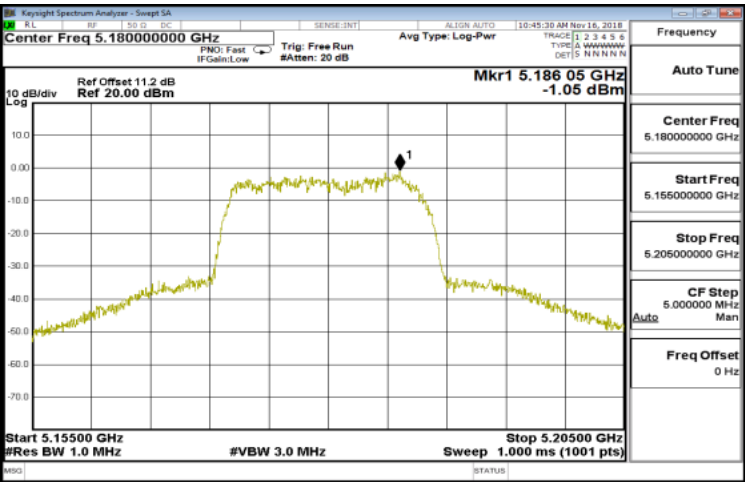
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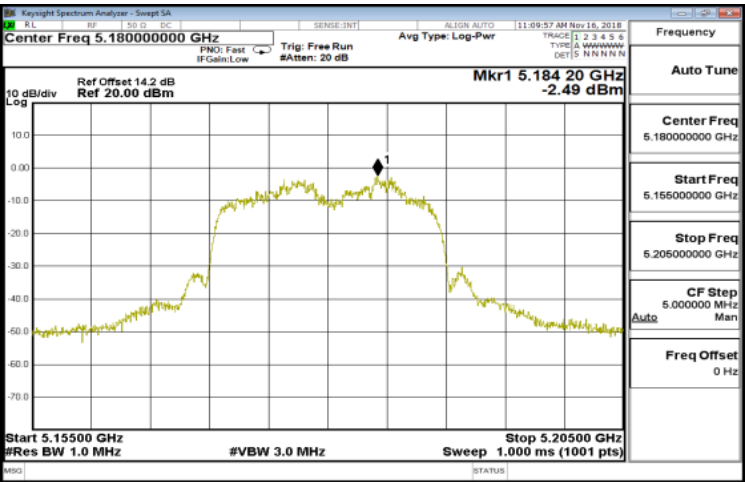
802.11a 5150~5250 MHz

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

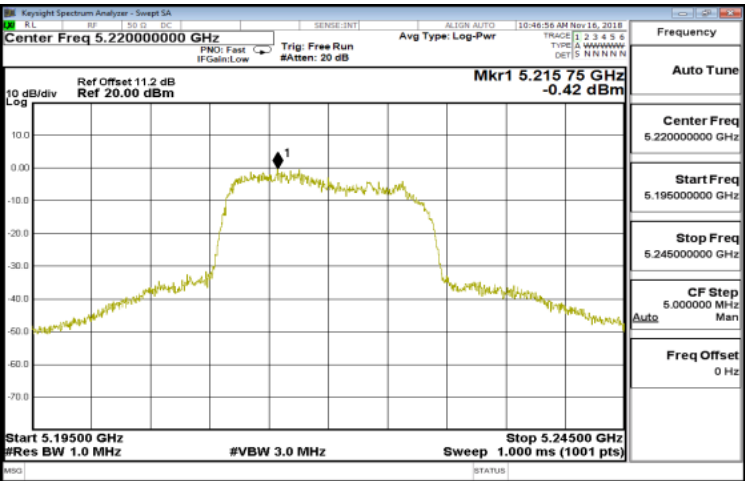


802.11n HT20, 5150~5250 MHz

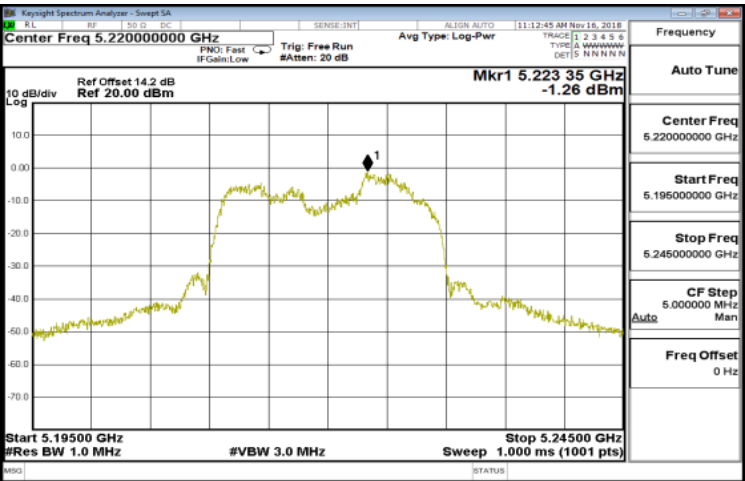
Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



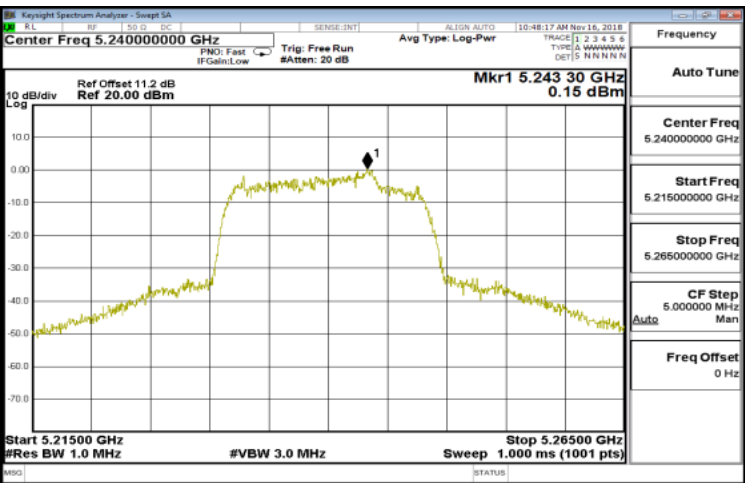
Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)



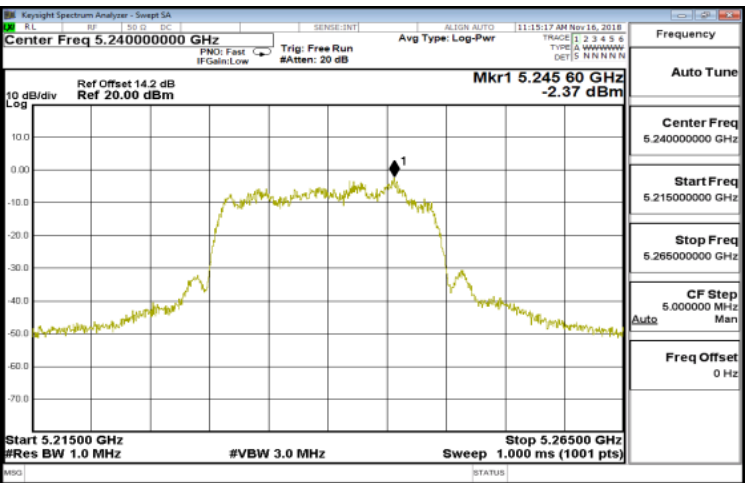
Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)



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



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



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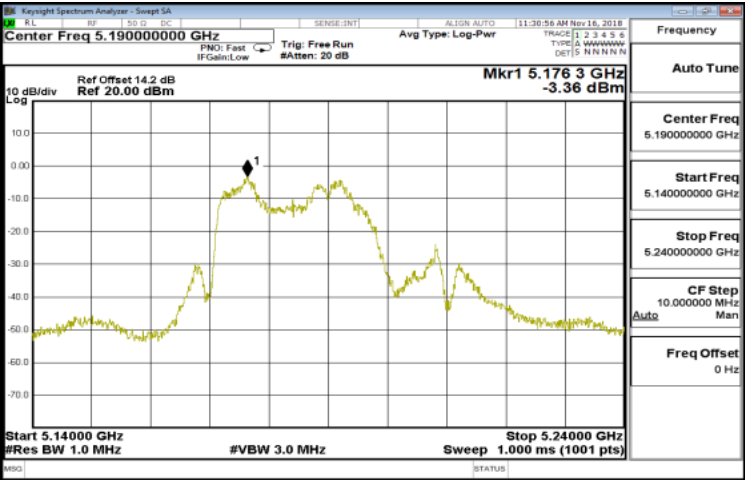
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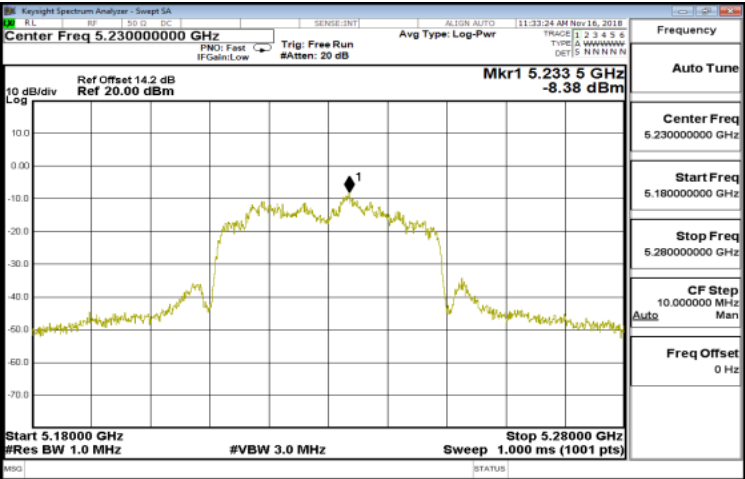


802.11n HT40, 5150~5250 MHz

### Peak Power Spectral Density Data Plot (CH Low 5190 MHz)



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



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## 11 UNDESIRABLE RADIATED EMISSION MEASUREMENT

### 11.1 Standard Applicable

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

1. For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
2. For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBμV/m)	AV 54 (dBμV/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

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

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

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

**Note:**

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

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## 11.2 Measurement Equipment Used

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Broadband Antenna	TESEQ	CBL 6112D	35243	2018/10/30	2019/10/29
Horn Antenna	Schwarzbeck	BBHA9120D	1187	2018/01/04	2019/01/03
Horn Antenna	SCHWAZBECK	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/04/19	2019/04/18
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/4/10
Pre-Amplifier	EMC Instruments	EMC330	980096	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC0011830	980199	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instruments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Marvelous	WATT-218FS-10	RF246	2017/12/26	2018/12/25
Highpass Filter	Micro Tronics	BRM50701-01	G008	2017/12/26	2018/12/25
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25

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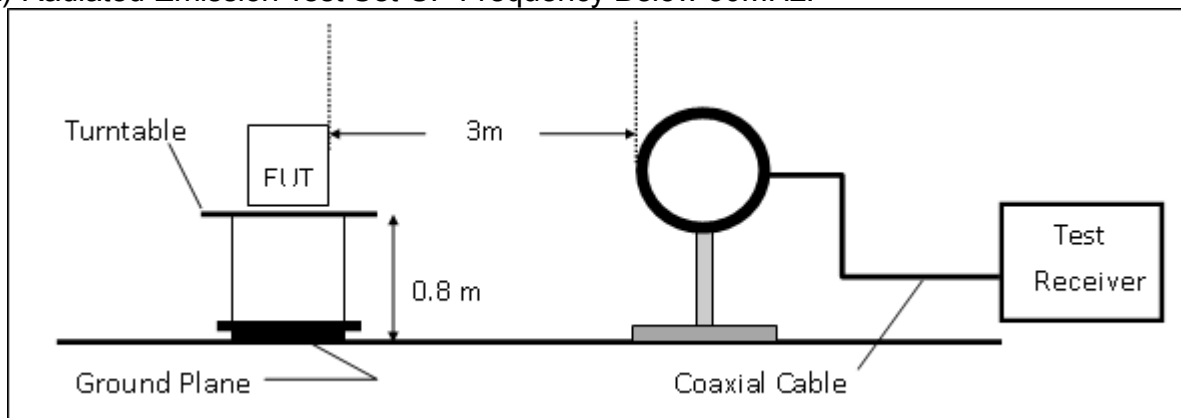
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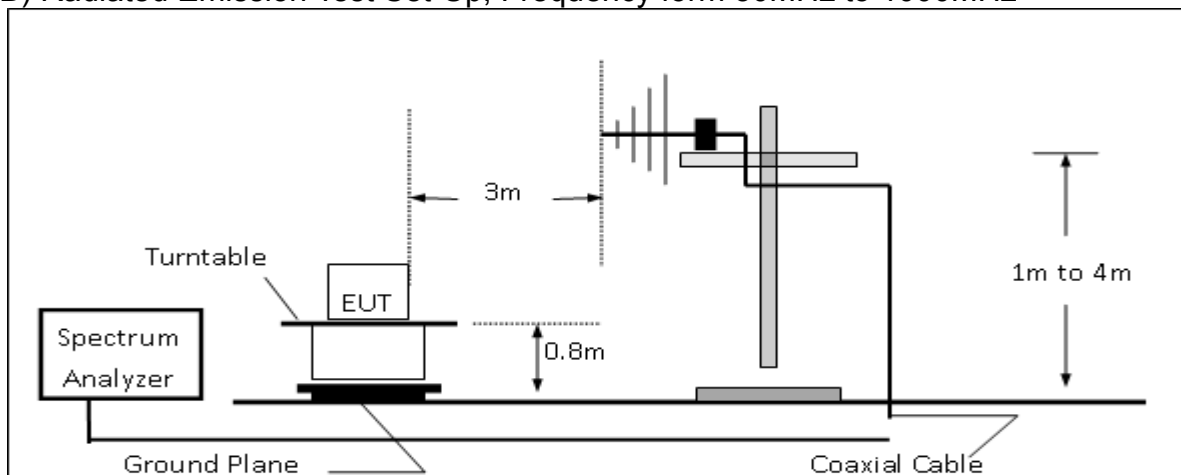
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## 11.3 Test SET-UP

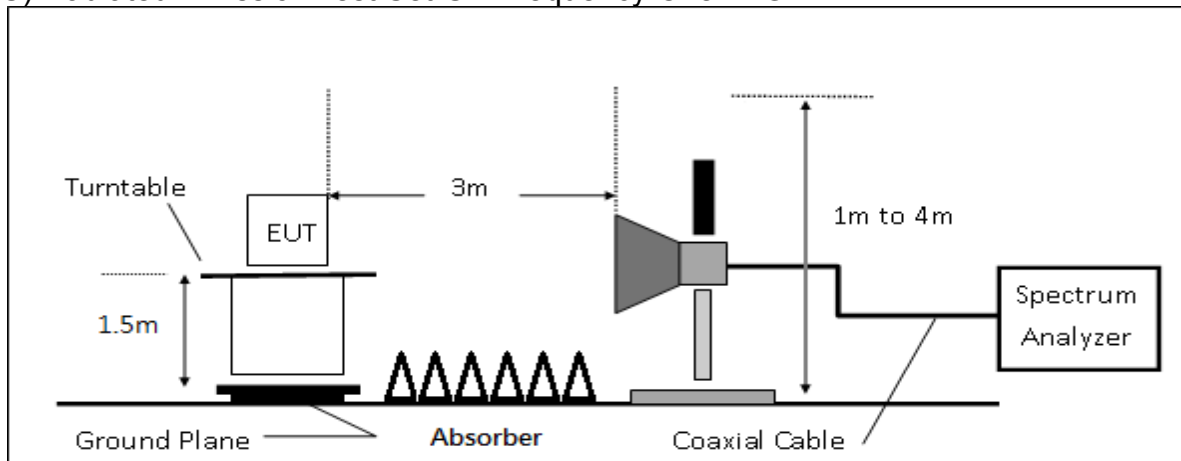
### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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#### 11.4 Measurement Procedure

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

#### 11.5 Field Strength Calculation

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

$$FS = RA + AF + CL - AG$$

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

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

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

#### Note :

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

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

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

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

### 11.7 Measurement Result

Refer to next page for tabular data sheets.

Note: There is a comparison data of both open-field test site and semi-Anechoic, and test result came out very similar.

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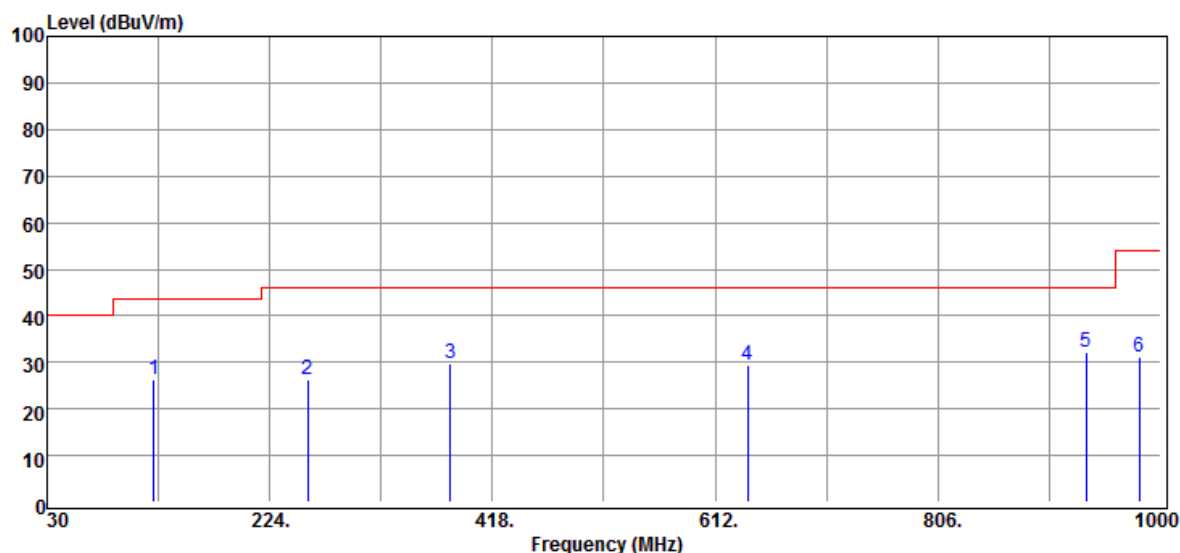


## Radiated Spurious Emission Measurement Result

## Below 1GHz Worst-Case Data:

Operation Mode :802.11a / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz

Test Date :2018-11-20  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
123.12	Peak	38.34	-11.91	26.43	43.50	-17.07
256.98	Peak	36.63	-10.20	26.43	46.00	-19.57
381.14	Peak	36.66	-6.89	29.77	46.00	-16.23
640.13	Peak	31.82	-2.52	29.30	46.00	-16.70
935.01	Peak	30.42	1.79	32.21	46.00	-13.79
981.57	Peak	28.31	2.85	31.16	54.00	-22.84

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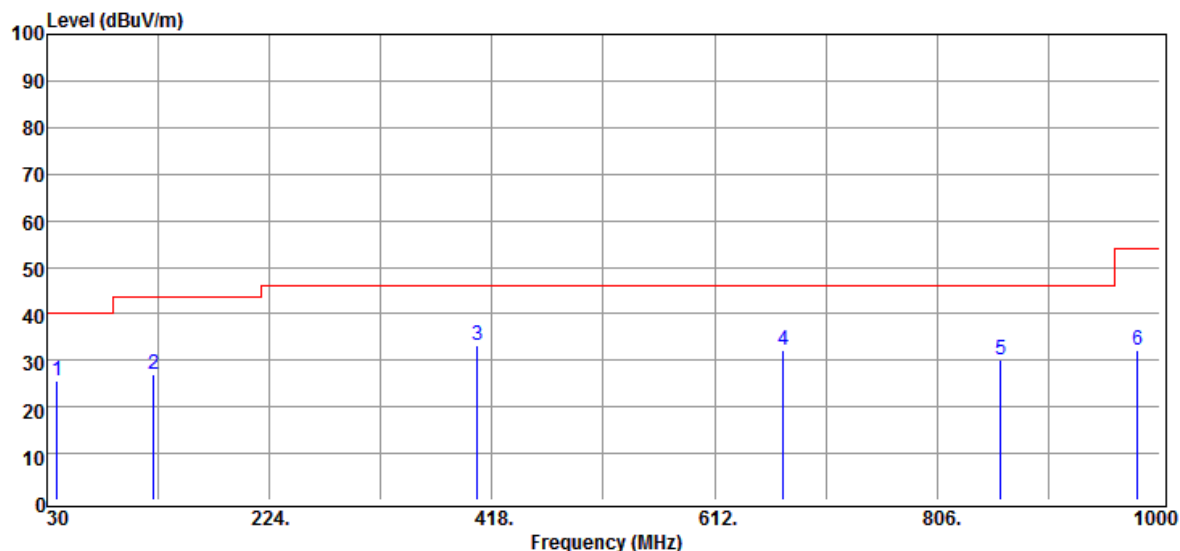
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Operation Mode :802.11a / Band 1  
Test Mode :TX CH MID  
EUT Pol :H Plan  
Test Channel :5220 MHz

Test Date :2018-11-20  
Temp./Humi. :25/60  
Antenna Pol. :HORIZONTAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
38.73	Peak	33.75	-8.07	25.68	40.00	-14.32
123.12	Peak	38.84	-11.91	26.93	43.50	-16.57
405.39	Peak	39.03	-5.97	33.06	46.00	-12.94
672.14	Peak	34.12	-2.00	32.12	46.00	-13.88
861.29	Peak	29.39	0.83	30.22	46.00	-15.78
980.60	Peak	29.39	2.83	32.22	54.00	-21.78

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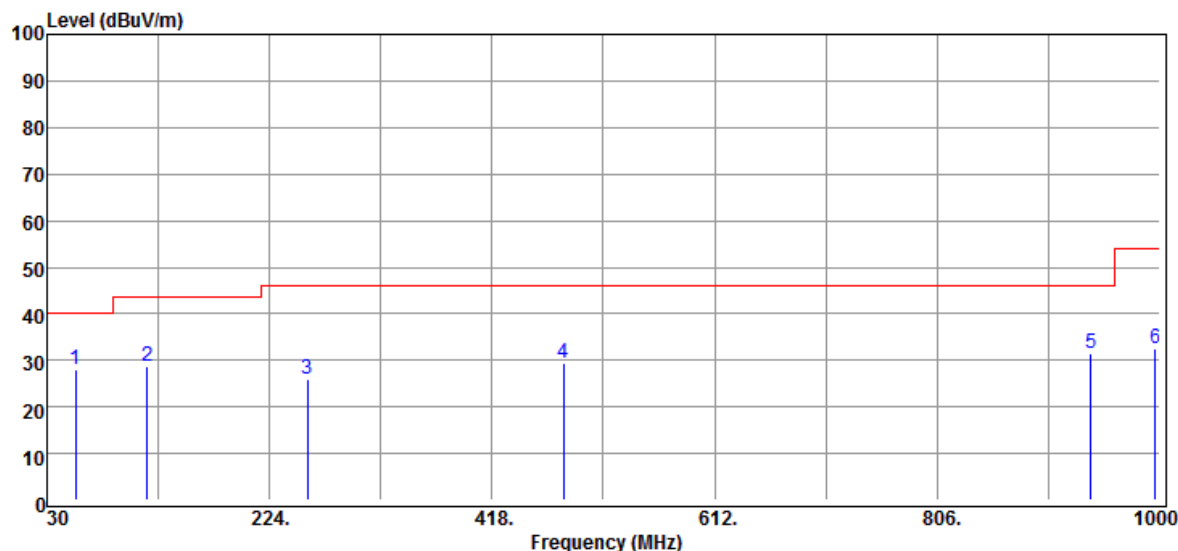
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Operation Mode :802.11n40 / Band 1  
Test Mode :TX CH LOW  
EUT Pol :H Plan  
Test Channel :5190 MHz

Test Date :2018-11-20  
Temp./Humi. :25/60  
Antenna Pol. :VERTICAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
55.22	Peak	46.14	-18.01	28.13	40.00	-11.87
117.30	Peak	41.08	-12.40	28.68	43.50	-14.82
256.98	Peak	36.02	-10.20	25.82	46.00	-20.18
480.08	Peak	34.35	-4.92	29.43	46.00	-16.57
939.86	Peak	29.56	1.88	31.44	46.00	-14.56
996.12	Peak	29.23	3.20	32.43	54.00	-21.57

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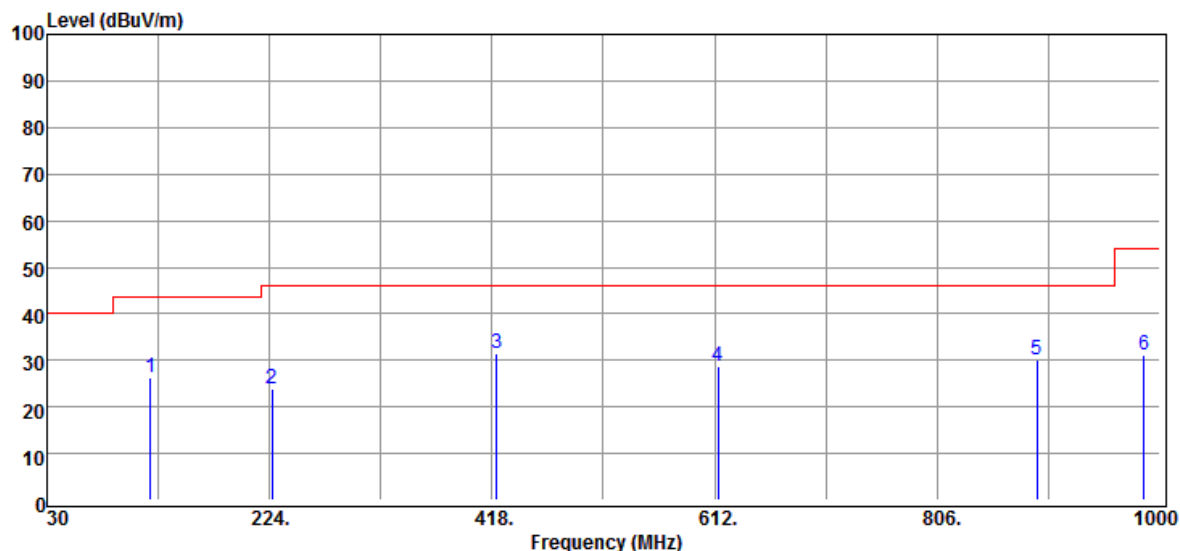
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Operation Mode :802.11n40 / Band 1  
Test Mode :TX CH LOW  
EUT Pol :H Plan  
Test Channel :5190 MHz

Test Date :2018-11-20  
Temp./Humi. :25/60  
Antenna Pol. :HORIZONTAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
120.21	Peak	38.58	-12.12	26.46	43.50	-17.04
225.94	Peak	36.61	-12.65	23.96	46.00	-22.04
421.88	Peak	37.47	-5.85	31.62	46.00	-14.38
614.91	Peak	31.79	-2.96	28.83	46.00	-17.17
893.30	Peak	29.06	1.11	30.17	46.00	-15.83
986.42	Peak	28.26	2.96	31.22	54.00	-22.78

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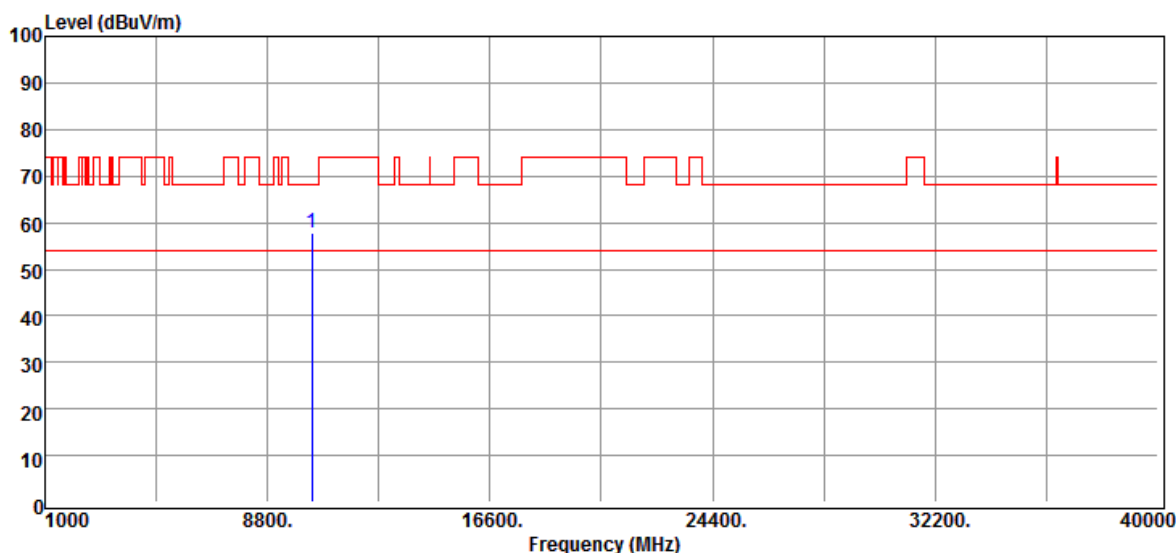
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## Above 1GHz Worst-Case Data:

### Radiated Spurious Emission Measurement Result 802.11a, 5150~5250 MHz

Operation Mode	:802.11a / Band 1	Test Date	:2018-11-21
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5180 MHz	Engineer	:Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10360.00	Peak	31.28	26.61	57.89	68.20	-10.31

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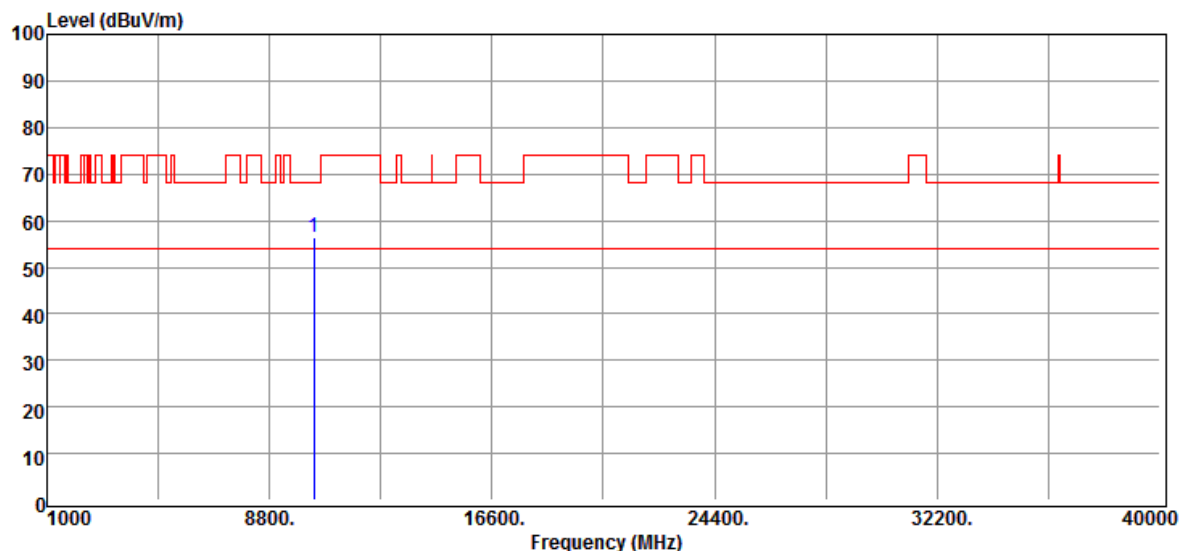
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Operation Mode :802.11a / Band 1  
 Test Mode :TX CH LOW  
 EUT Pol :H Plan  
 Test Channel :5180 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10360.00	Peak	29.90	26.61	56.51	68.20	-11.69

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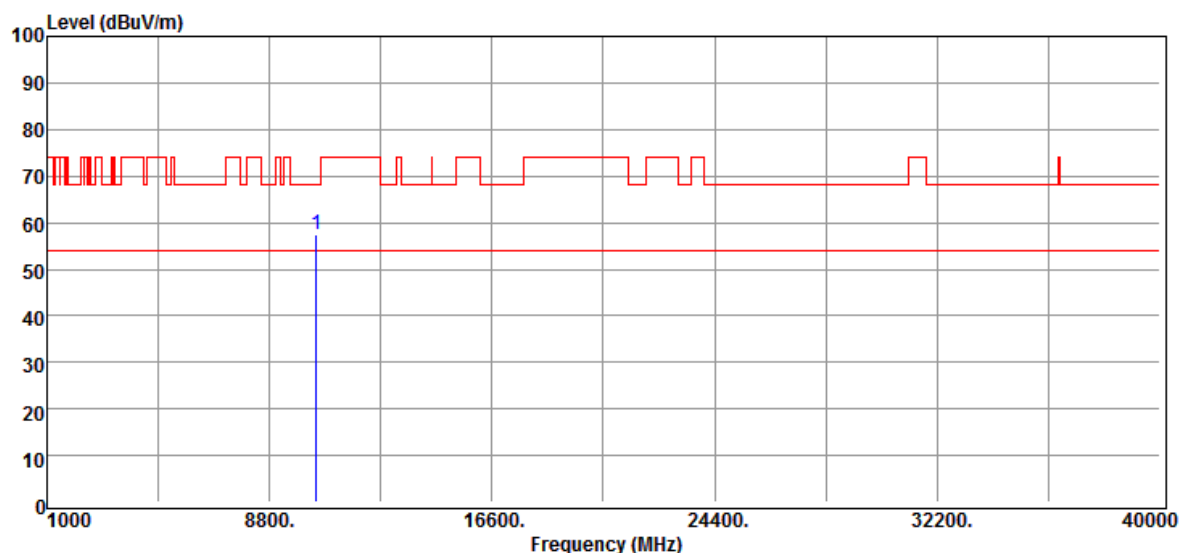
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Operation Mode :802.11a / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10440.00	Peak	30.49	26.98	57.47	68.20	-10.73

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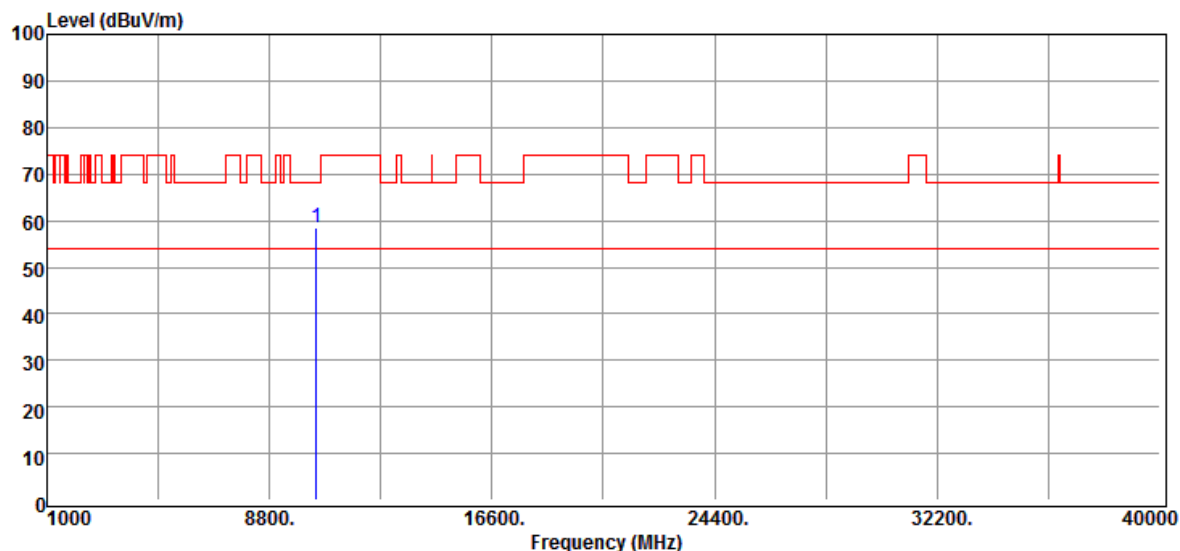
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Operation Mode :802.11a / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10440.00	Peak	31.37	26.98	58.35	68.20	-9.85

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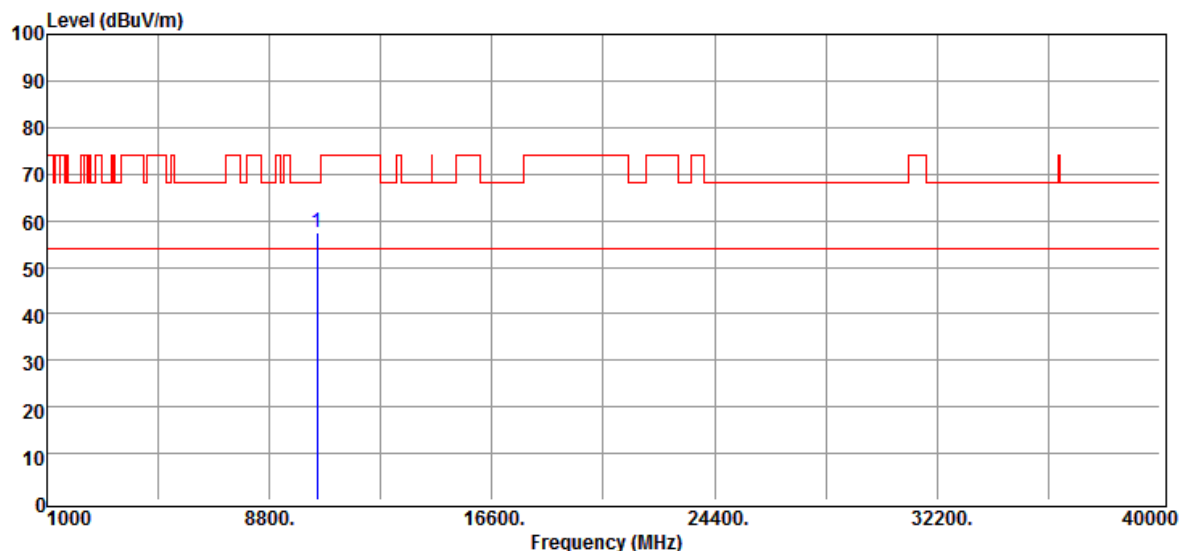
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Operation Mode :802.11a / Band 1  
 Test Mode :TX CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10480.00	Peak	30.32	27.16	57.48	68.20	-10.72

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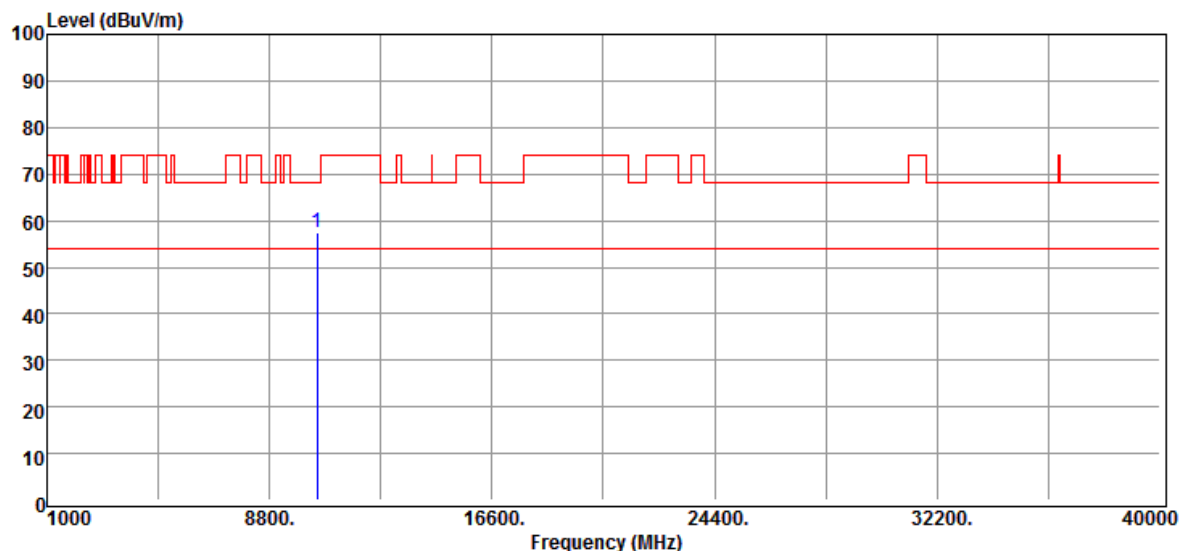
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Operation Mode :802.11a / Band 1  
 Test Mode :TX CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10480.00	Peak	30.34	27.16	57.50	68.20	-10.70

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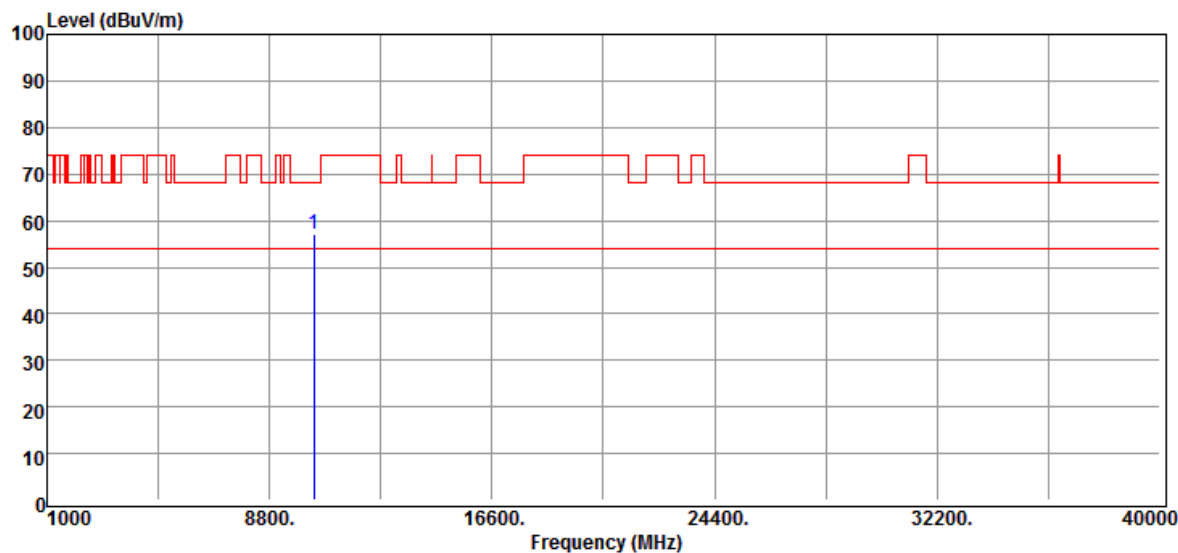
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## Radiated Spurious Emission Measurement Result 802.11n HT20, 5150~5250 MHz

Operation Mode	:802.11n20 / Band 1	Test Date	:2018-11-21
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5180 MHz	Engineer	:Enzo



Freq. MHz	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
10360.00	Peak	30.57	26.61	57.18	68.20	-11.02

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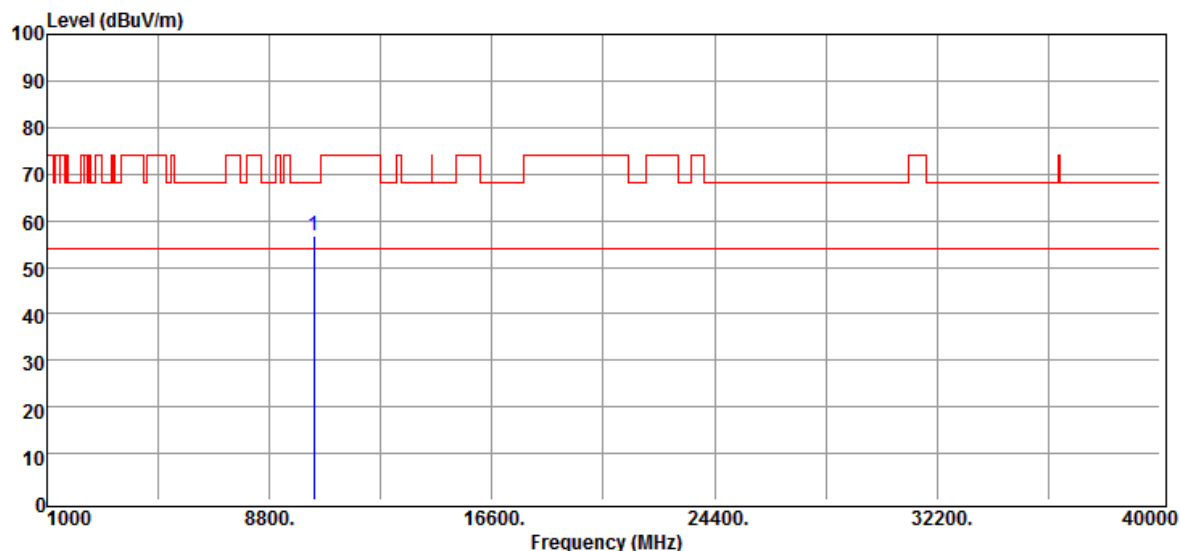
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Operation Mode :802.11n20 / Band 1  
 Test Mode :TX CH LOW  
 EUT Pol :H Plan  
 Test Channel :5180 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10360.00	Peak	29.98	26.61	56.59	68.20	-11.61

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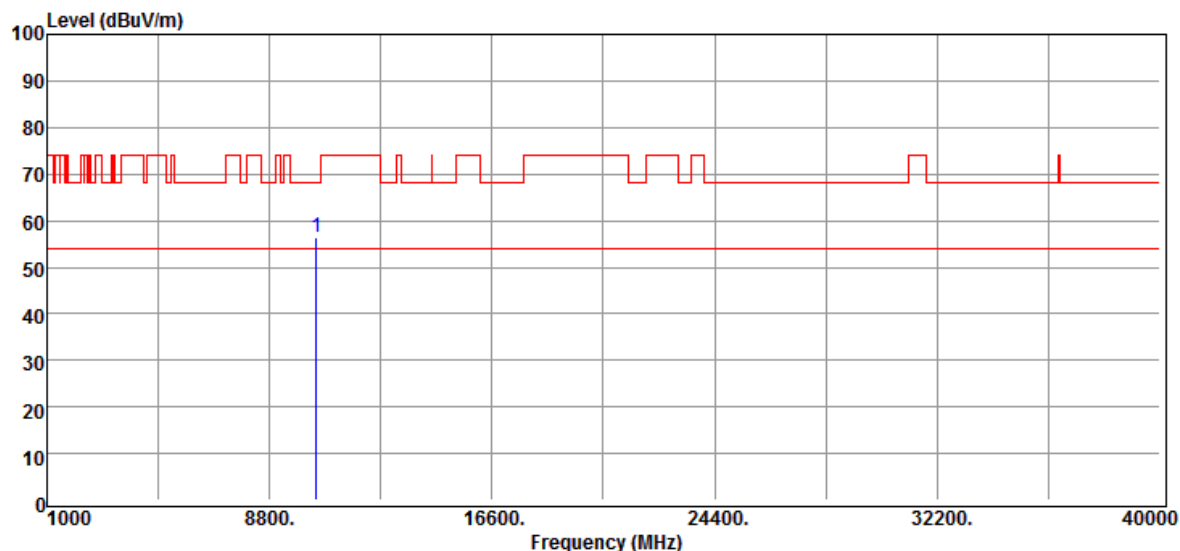
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Operation Mode :802.11n20 / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10440.00	Peak	29.58	26.98	56.56	68.20	-11.64

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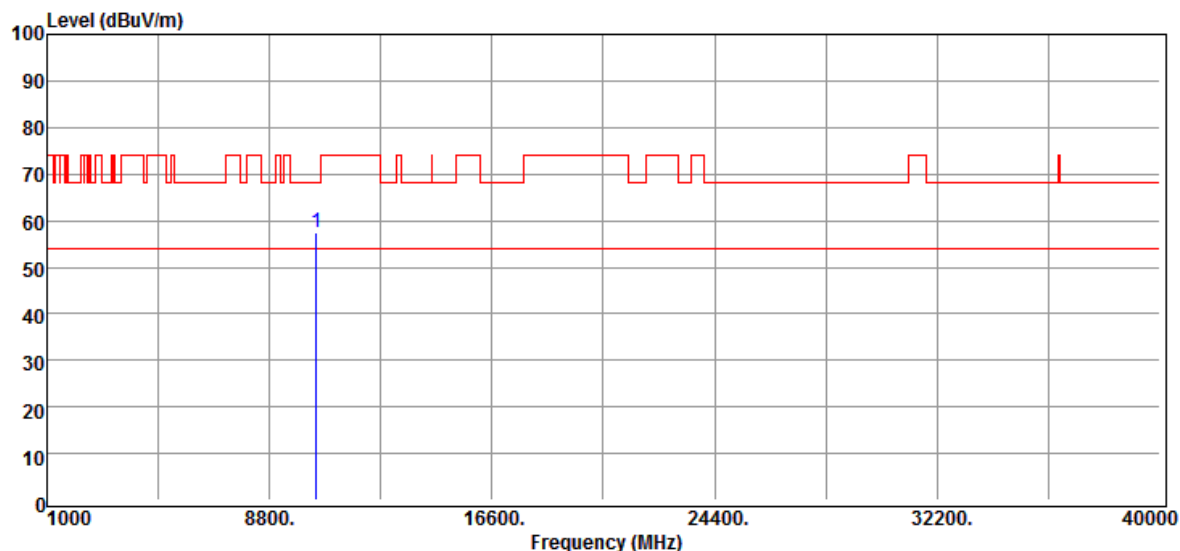
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Operation Mode :802.11n20 / Band 1  
 Test Mode :TX CH MID  
 EUT Pol :H Plan  
 Test Channel :5220 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10440.00	Peak	30.42	26.98	57.40	68.20	-10.80

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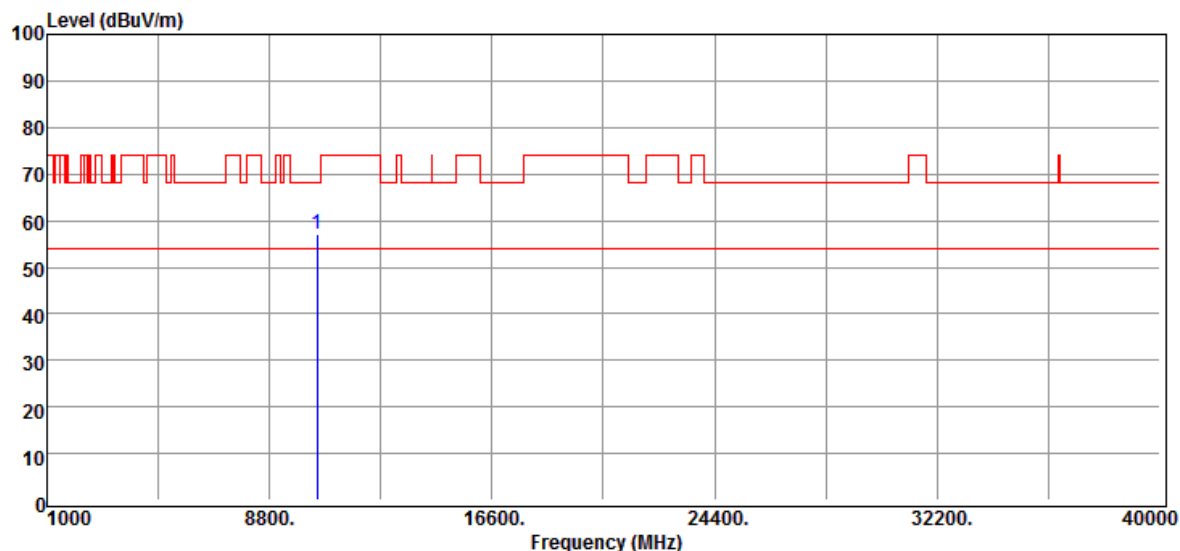
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Operation Mode :802.11n20 / Band 1  
 Test Mode :TX CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10480.00	Peak	29.97	27.16	57.13	68.20	-11.07

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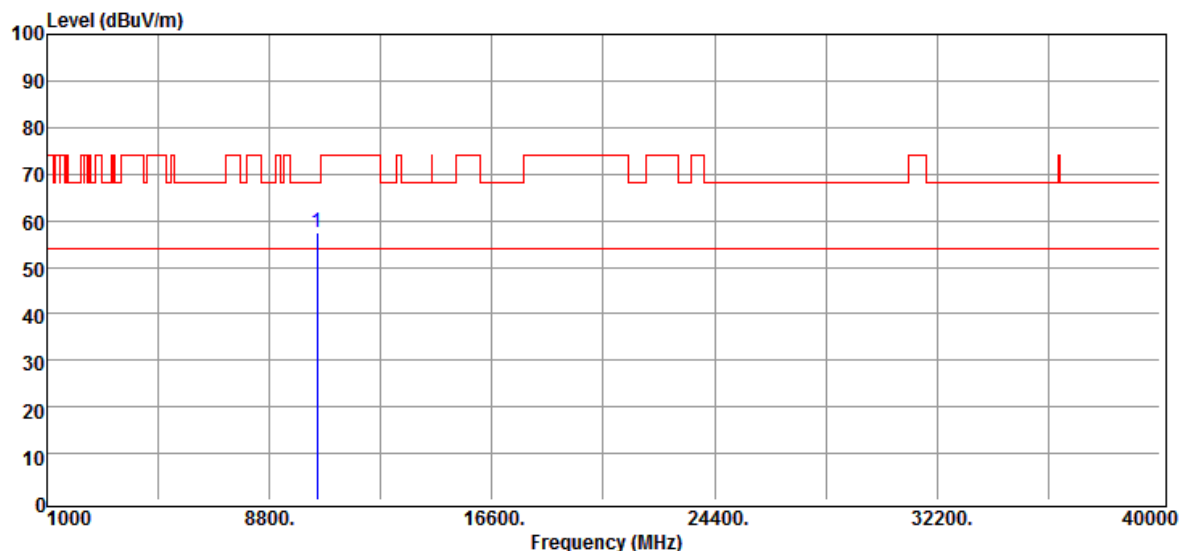
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Operation Mode :802.11n20 / Band 1  
 Test Mode :TX CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10480.00	Peak	30.38	27.16	57.54	68.20	-10.66

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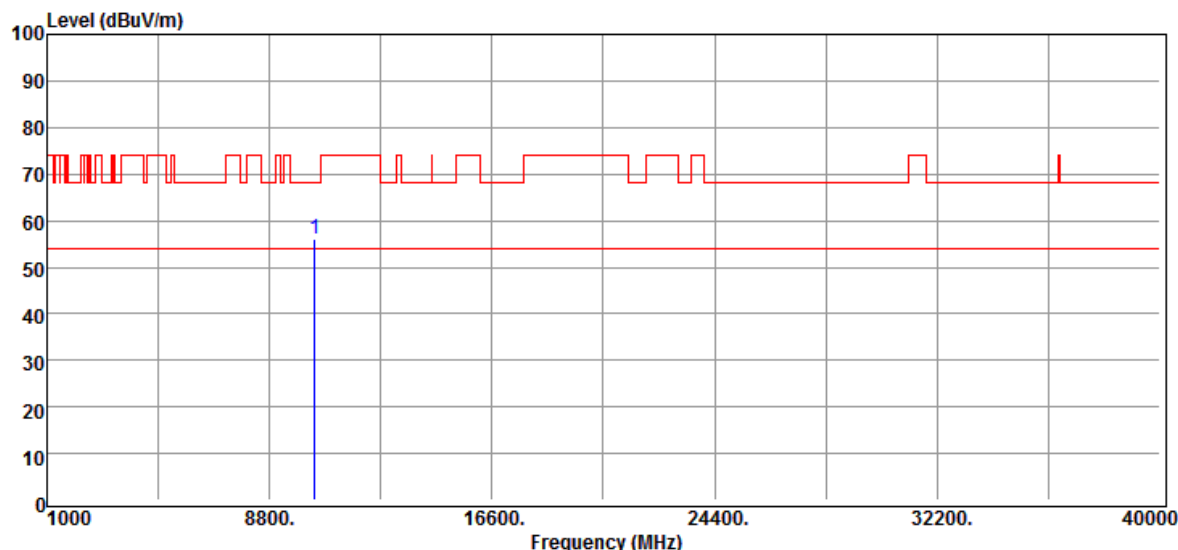
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## Radiated Spurious Emission Measurement Result 802.11n HT40, 5150~5250 MHz

Operation Mode	:802.11n40 / Band 1	Test Date	:2018-11-21
Test Mode	:TX CH LOW	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:5190 MHz	Engineer	:Enzo



Freq. MHz	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
10380.00	Peak	29.44	26.69	56.13	68.20	-12.07

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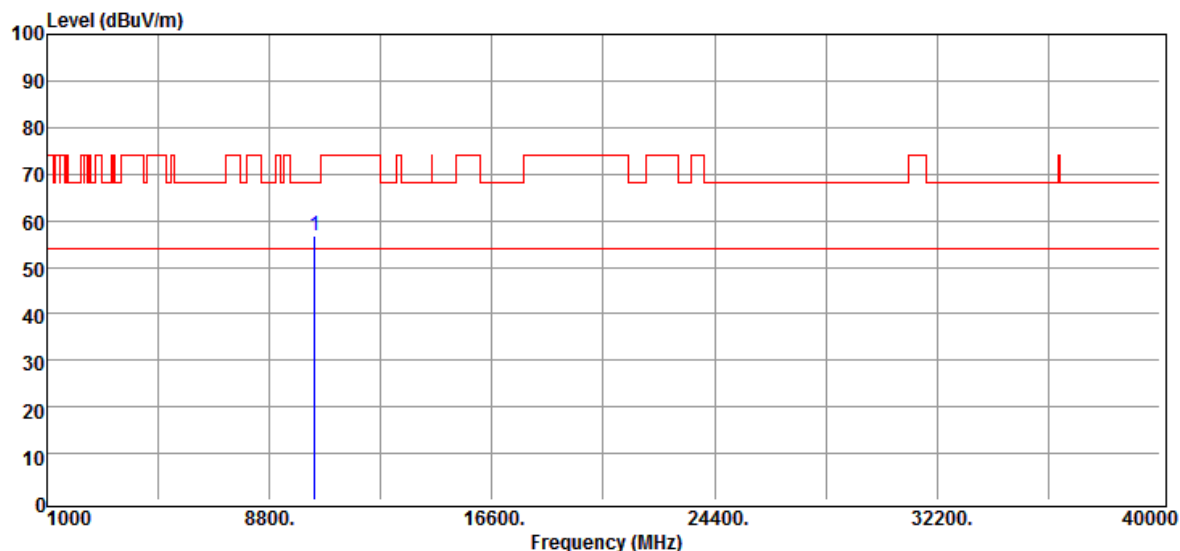
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Operation Mode :802.11n40 / Band 1  
 Test Mode :TX CH LOW  
 EUT Pol :H Plan  
 Test Channel :5190 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10380.00	Peak	30.16	26.69	56.85	68.20	-11.35

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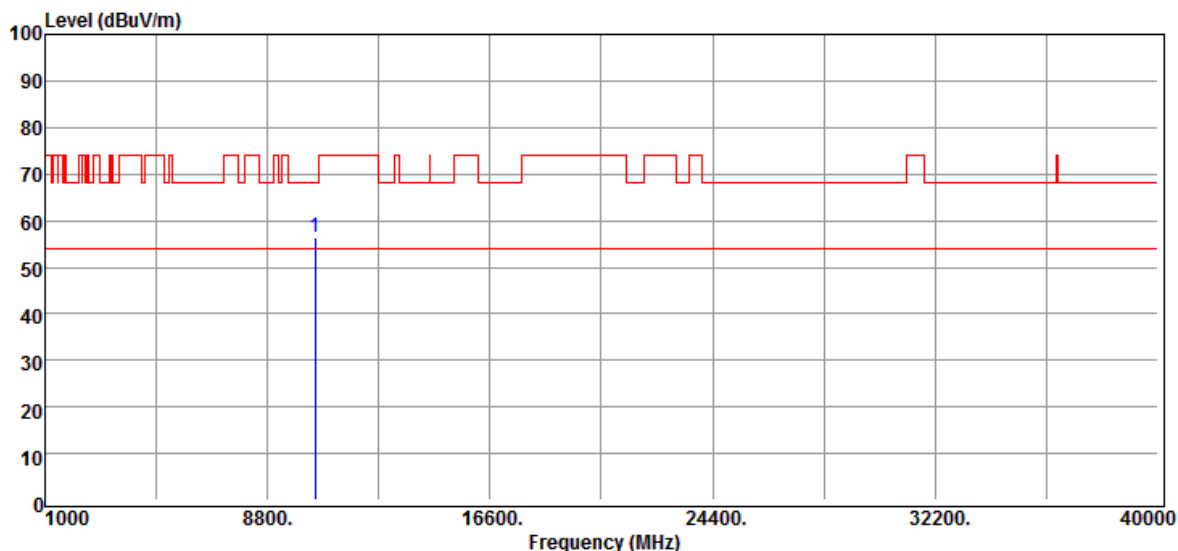
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Operation Mode :802.11n40 / Band 1  
 Test Mode :TX CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5230 MHz

Test Date :2018-11-22  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10460.00	Peak	29.47	27.06	56.53	68.20	-11.67

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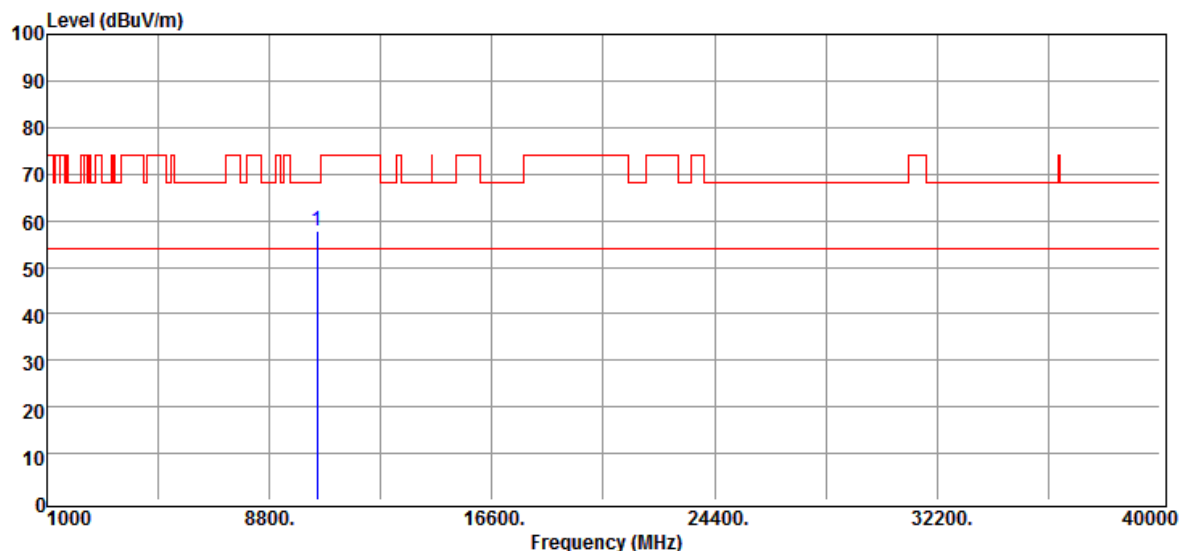
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Operation Mode :802.11n40 / Band 1  
Test Mode :TX CH HIGH  
EUT Pol :H Plan  
Test Channel :5230 MHz

Test Date :2018-11-22  
Temp./Humi. :25/60  
Antenna Pol. :HORIZONTAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
10460.00	Peak	30.87	27.06	57.93	68.20	-10.27

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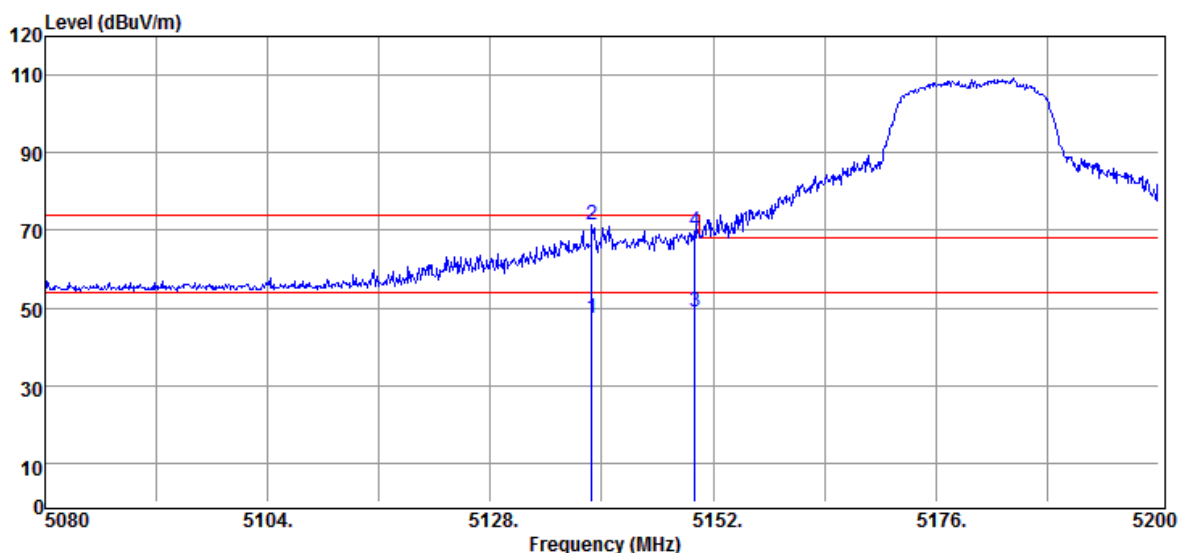
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## Band edge falling to restricted band

### 802.11a mode

Operation Mode :802.11a / Band 1  
Test Mode :BE CH LOW  
EUT Pol :H Plan  
Test Channel :5180MHz

Test Date :2018-11-21  
Temp./Humi. :25/60  
Antenna Pol. :VERTICAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5138.92	Average	33.74	13.60	47.34	54.00	-6.66
5138.92	Peak	57.63	13.60	71.23	74.00	-2.77
5150.00	Average	35.16	13.65	48.81	54.00	-5.19
5150.00	Peak	56.09	13.65	69.74	74.00	-4.26

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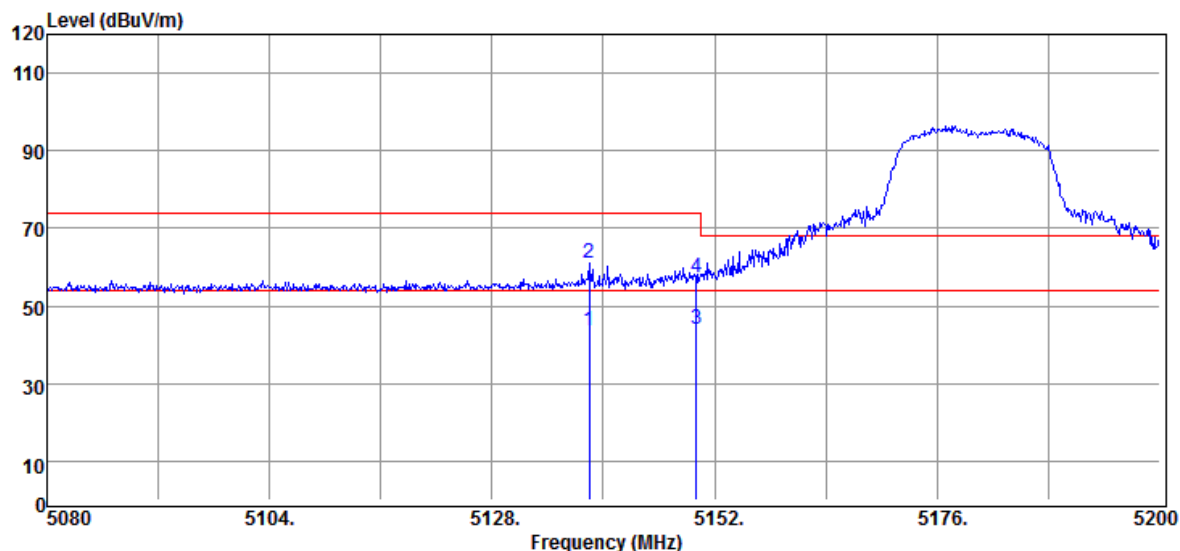
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Operation Mode :802.11a / Band 1  
 Test Mode :BE CH LOW  
 EUT Pol :H Plan  
 Test Channel :5180MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5138.44	Average	30.00	13.60	43.60	54.00	-10.40
5138.44	Peak	47.42	13.60	61.02	74.00	-12.98
5150.00	Average	30.28	13.65	43.93	54.00	-10.07
5150.00	Peak	43.56	13.65	57.21	74.00	-16.79

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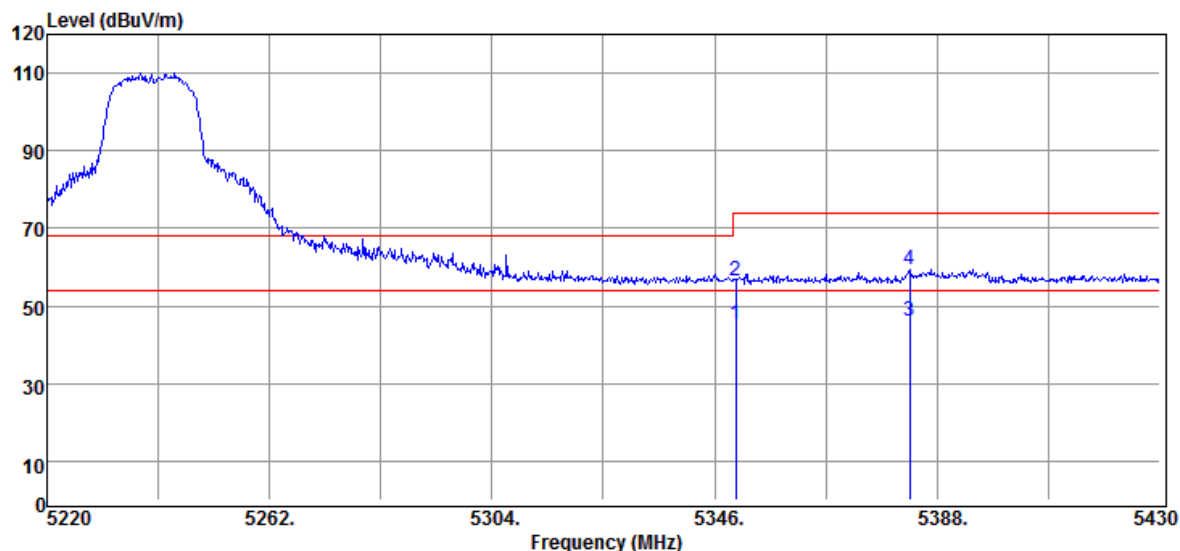
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Operation Mode :802.11a / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5350.00	Average	31.01	14.16	45.17	54.00	-8.83
5350.00	Peak	42.31	14.16	56.47	74.00	-17.53
5382.75	Average	31.83	14.24	46.07	54.00	-7.93
5382.75	Peak	45.34	14.24	59.58	74.00	-14.42

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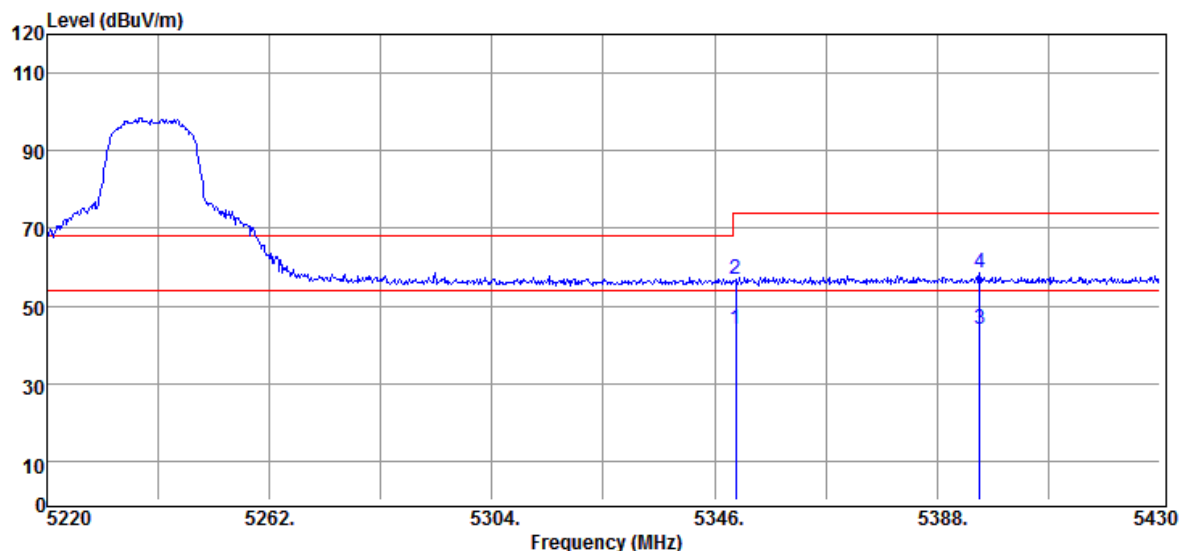
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Operation Mode :802.11a / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5350.00	Average	29.83	14.16	43.99	54.00	-10.01
5350.00	Peak	42.53	14.16	56.69	74.00	-17.31
5395.98	Average	29.88	14.27	44.15	54.00	-9.85
5395.98	Peak	44.09	14.27	58.36	74.00	-15.64

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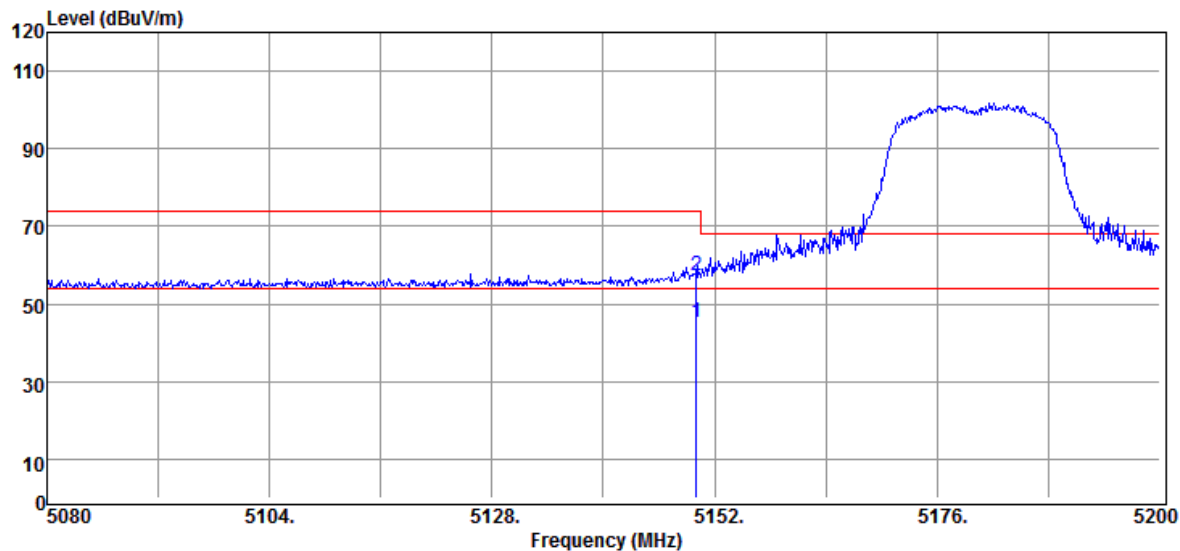
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## 802.11n20 HT mode

Operation Mode :802.11n20 / Band 1  
 Test Mode :BE CH LOW  
 EUT Pol :H Plan  
 Test Channel :5180MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5150.00	Average	31.50	13.65	45.15	54.00	-8.85
5150.00	Peak	43.74	13.65	57.39	74.00	-16.61

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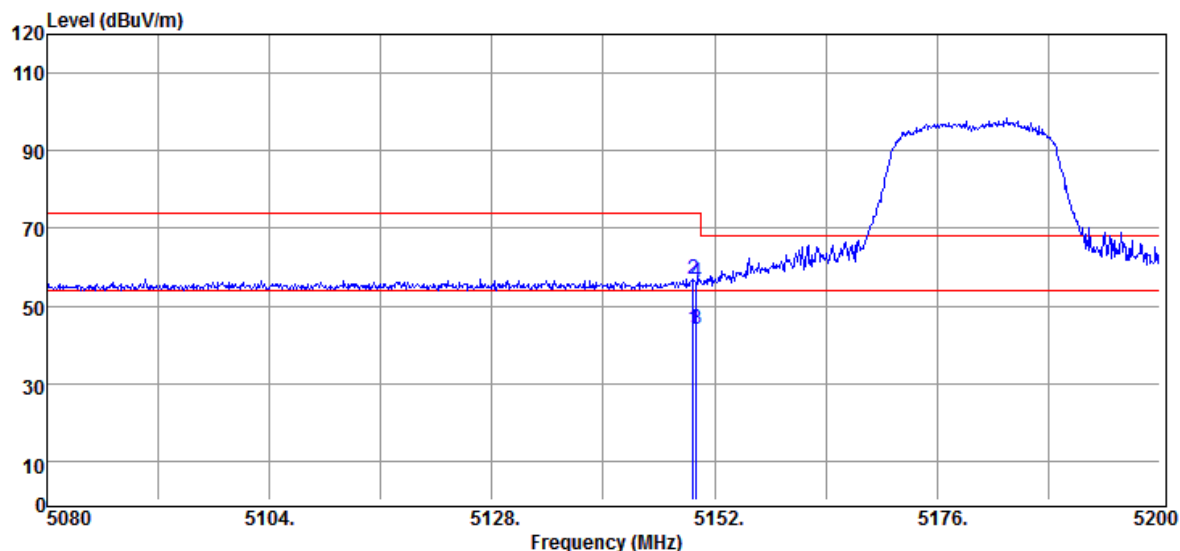
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Operation Mode :802.11n20 / Band 1  
 Test Mode :BE CH LOW  
 EUT Pol :H Plan  
 Test Channel :5180MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5149.72	Average	30.43	13.64	44.07	54.00	-9.93
5149.72	Peak	43.26	13.64	56.90	74.00	-17.10
5150.00	Average	30.42	13.65	44.07	54.00	-9.93
5150.00	Peak	42.22	13.65	55.87	74.00	-18.13

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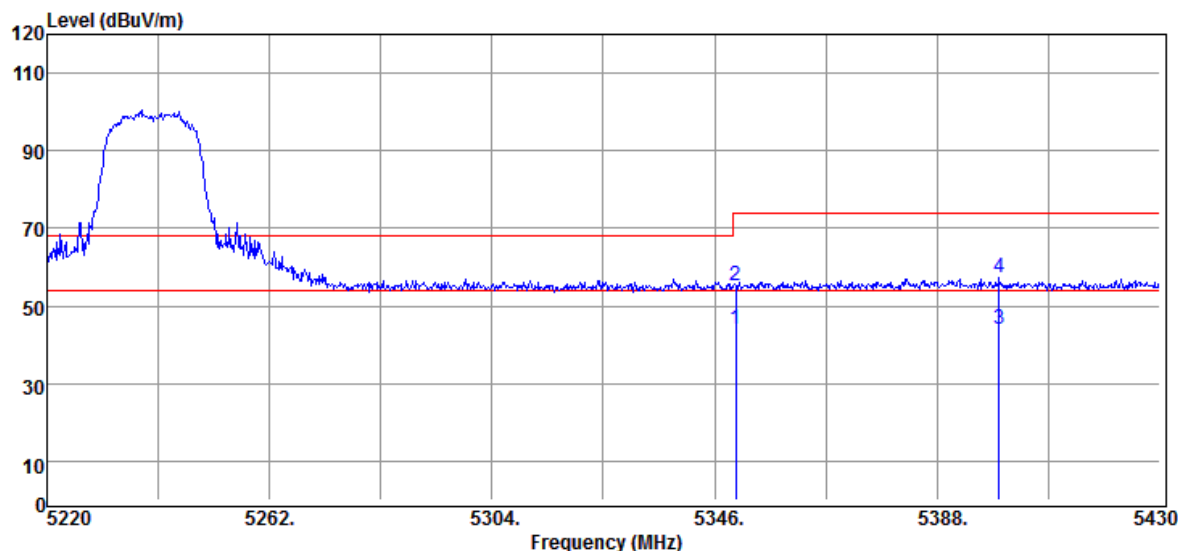
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Operation Mode :802.11n20 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5350.00	Average	29.90	14.16	44.06	54.00	-9.94
5350.00	Peak	41.16	14.16	55.32	74.00	-18.68
5399.76	Average	29.87	14.27	44.14	54.00	-9.86
5399.76	Peak	43.15	14.27	57.42	74.00	-16.58

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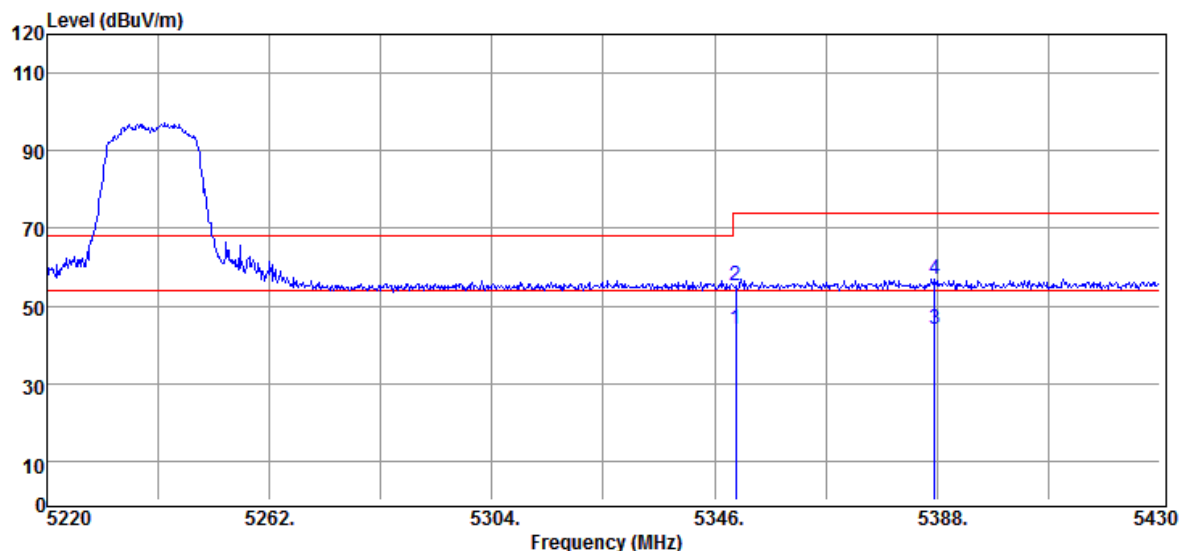
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Operation Mode :802.11n20 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5240 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5350.00	Average	29.75	14.16	43.91	54.00	-10.09
5350.00	Peak	41.01	14.16	55.17	74.00	-18.83
5387.58	Average	29.94	14.25	44.19	54.00	-9.81
5387.58	Peak	42.67	14.25	56.92	74.00	-17.08

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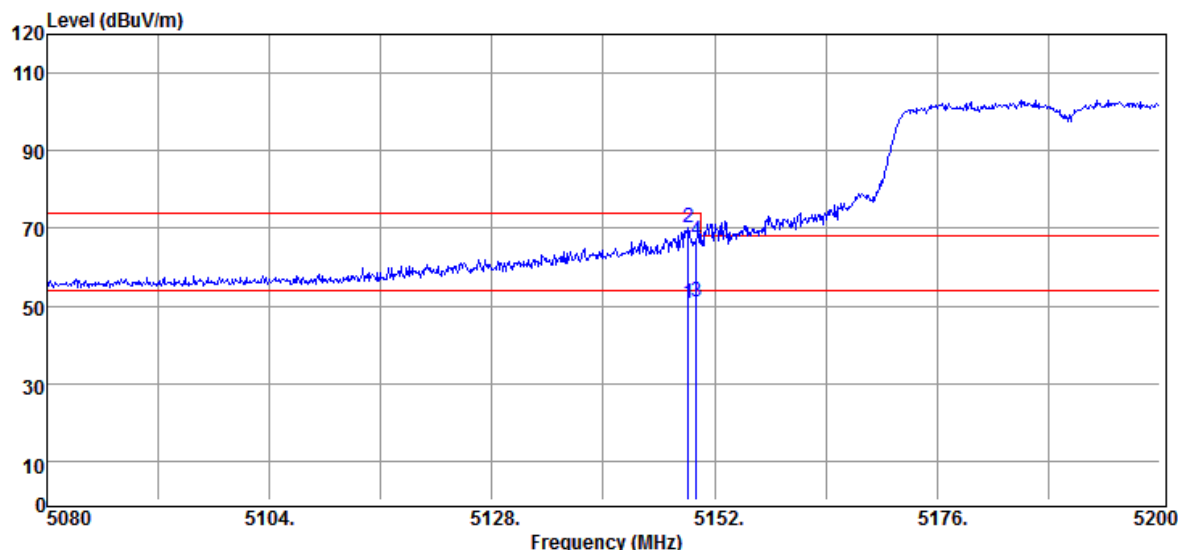
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# 802.11n40 HT mode

Operation Mode :802.11n40 / Band 1  
Test Mode :BE CH LOW  
EUT Pol :H Plan  
Test Channel :5190MHz

Test Date :2018-11-21  
Temp./Humi. :25/60  
Antenna Pol. :VERTICAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5149.12	Average	37.04	13.63	50.67	54.00	-3.33
5149.12	Peak	56.52	13.63	70.15	74.00	-3.85
5150.00	Average	37.24	13.65	50.89	54.00	-3.11
5150.00	Peak	53.20	13.65	66.85	74.00	-7.15

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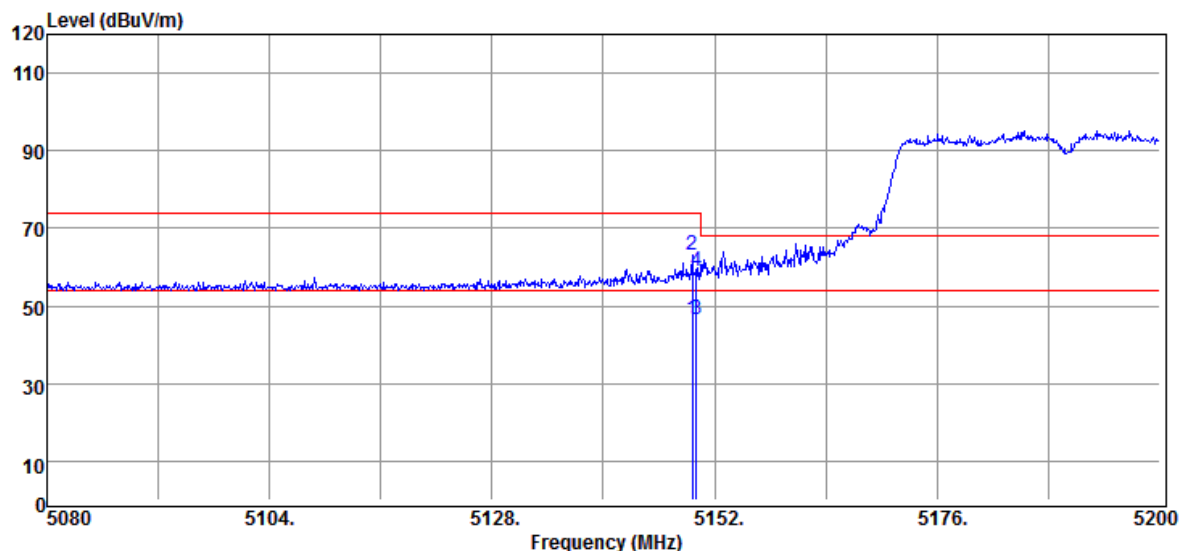
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Operation Mode :802.11n40 / Band 1  
Test Mode :BE CH LOW  
EUT Pol :H Plan  
Test Channel :5190MHz

Test Date :2018-11-21  
Temp./Humi. :25/60  
Antenna Pol. :HORIZONTAL  
Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5149.60	Average	32.78	13.64	46.42	54.00	-7.58
5149.60	Peak	49.68	13.64	63.32	74.00	-10.68
5150.00	Average	32.82	13.65	46.47	54.00	-7.53
5150.00	Peak	45.44	13.65	59.09	74.00	-14.91

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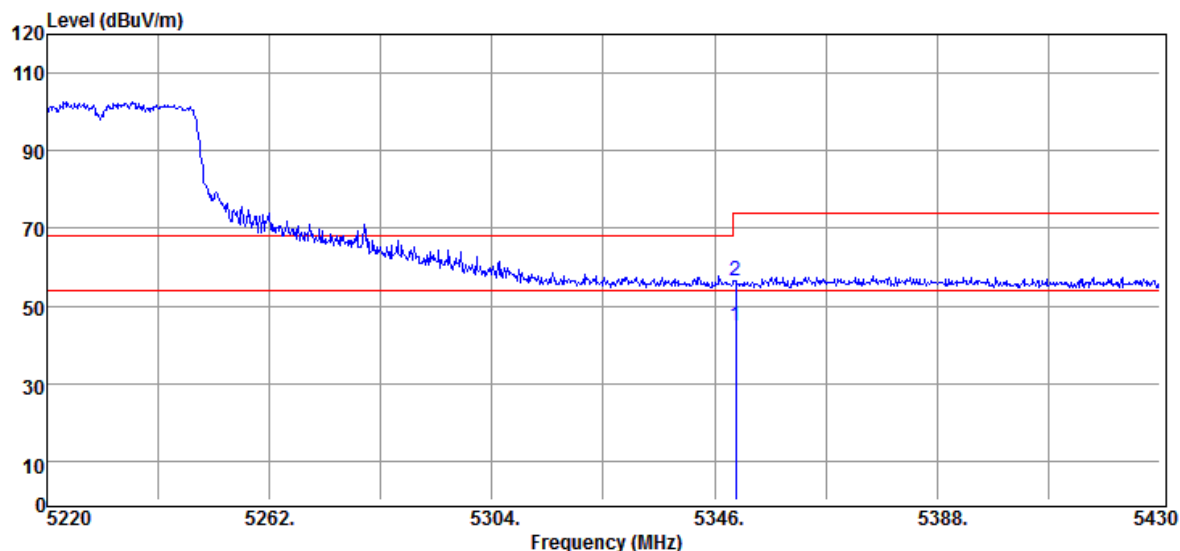
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Operation Mode :802.11n40 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5230 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :VERTICAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5350.00	Average	30.83	14.16	44.99	54.00	-9.01
5350.00	Peak	42.42	14.16	56.58	74.00	-17.42

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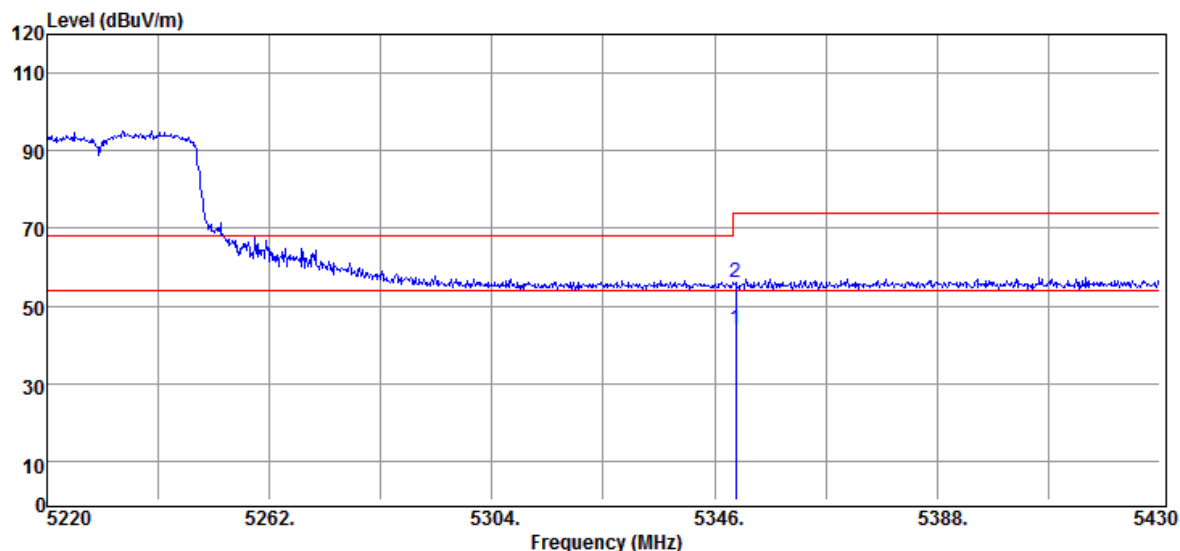
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Operation Mode :802.11n40 / Band 1  
 Test Mode :BE CH HIGH  
 EUT Pol :H Plan  
 Test Channel :5230 MHz

Test Date :2018-11-21  
 Temp./Humi. :25/60  
 Antenna Pol. :HORIZONTAL  
 Engineer :Enzo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
5350.00	Average	29.75	14.16	43.91	54.00	-10.09
5350.00	Peak	41.74	14.16	55.90	74.00	-18.10

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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

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

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## 13 FREQUENCY STABILITY

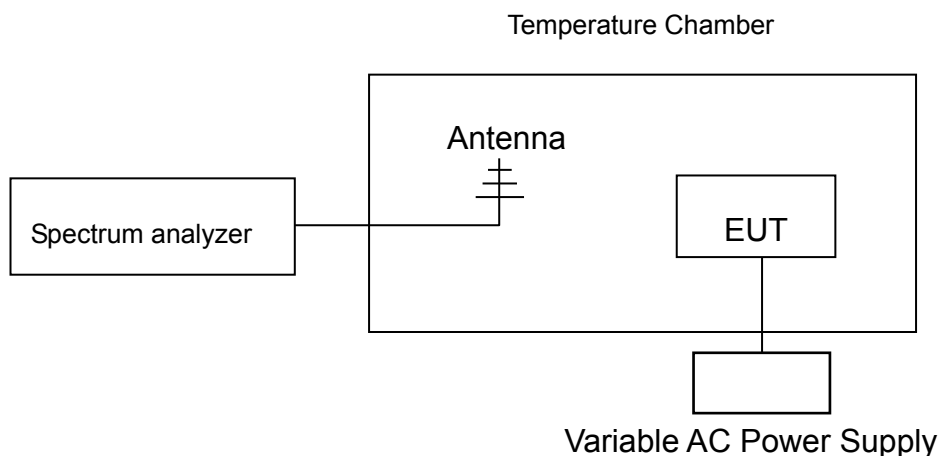
### 13.1 Standard Applicable

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



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### 13.4 Measurement Equipment Used:

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19
Attenuator	Marvelous	MVE2213-10	RF30	2017/12/26	2018/12/25
DC Block	PASTERNAK	PE8210	RF29	2017/12/26	2018/12/25
Notebook	Lenovo	L420	S0011721	N/A	N/A

### 13.5 Measurement Result

#### Startup:

Operation Mode	802.11 a	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	36	5180	5,190.09721	-0.00194927
		44	5220	5,230.02948	-0.00192136
		48	5240	5,270.01843	-0.00572871
	11.4	36	5180	5,190.00313	-0.00193111
		44	5220	5,230.05352	-0.00192596
		48	5240	5,270.09989	-0.00574425
25	12	36	5180	5,190.00356	-0.00193119
		44	5220	5,230.00013	-0.00191573
		48	5240	5,270.01328	-0.00572773
35	12.6	36	5180	5,190.04782	-0.00193973
		44	5220	5,230.04975	-0.00192524
		48	5240	5,270.02423	-0.00572981
	11.4	36	5180	5,190.01407	-0.00193322
		44	5220	5,230.06805	-0.00192875
		48	5240	5,270.04664	-0.00573409

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Operation Mode	802.11 n_HT40	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	38	5190	5,210.05307	-0.00386379
		46	5230	5,290.01655	-0.01147544
	11.4	38	5190	5,210.00729	-0.00385497
		46	5230	5,290.06183	-0.01148410
25	12	38	5190	5,210.08478	-0.00386990
		46	5230	5,290.07572	-0.01148675
35	12.6	38	5190	5,210.02273	-0.00385794
		46	5230	5,290.05904	-0.01148356
	11.4	38	5190	5,210.02950	-0.00385925
		46	5230	5,290.05912	-0.01148358

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**2 Minutes:**

Operation Mode	802.11 a	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	36	5180	5,190.01908	-0.00193419
		44	5220	5,230.02979	-0.00192142
		48	5240	5,270.04024	-0.00573287
	11.4	36	5180	5,190.01325	-0.00193306
		44	5220	5,230.00796	-0.00191723
		48	5240	5,270.04292	-0.00573338
25	12	36	5180	5,190.03429	-0.00193712
		44	5220	5,230.07166	-0.00192944
		48	5240	5,270.08293	-0.00574102
35	12.6	36	5180	5,190.05125	-0.00194040
		44	5220	5,230.01029	-0.00191768
		48	5240	5,270.07967	-0.00574040
	11.4	36	5180	5,190.05052	-0.00194025
		44	5220	5,230.04581	-0.00192448
		48	5240	5,270.01595	-0.00572823

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Operation Mode	802.11 n_HT40	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	38	5190	5,210.00441	-0.00385441
		46	5230	5,290.00730	-0.01147367
	11.4	38	5190	5,210.02401	-0.00385819
		46	5230	5,290.06243	-0.01148421
25	12	38	5190	5,210.04134	-0.00386153
		46	5230	5,290.01468	-0.01147508
35	12.6	38	5190	5,210.07651	-0.00386831
		46	5230	5,290.09527	-0.01149049
	11.4	38	5190	5,210.02570	-0.00385852
		46	5230	5,290.07068	-0.01148579

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### 5 Minutes:

Operation Mode	802.11 a	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	36	5180	5,190.06694	-0.00194342
		44	5220	5,230.05250	-0.00192577
		48	5240	5,270.05913	-0.00573648
	11.4	36	5180	5,190.05037	-0.00194023
		44	5220	5,230.09565	-0.00193403
		48	5240	5,270.01018	-0.00572713
25	12	36	5180	5,190.06419	-0.00194289
		44	5220	5,230.00777	-0.00191720
		48	5240	5,270.04907	-0.00573456
35	12.6	36	5180	5,190.04112	-0.00193844
		44	5220	5,230.00951	-0.00191753
		48	5240	5,270.03809	-0.00573246
	11.4	36	5180	5,190.05085	-0.00194032
		44	5220	5,230.02250	-0.00192002
		48	5240	5,270.01674	-0.00572839

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Operation Mode	802.11 n_HT40	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	38	5190	5,210.04383	-0.00386201
		46	5230	5,290.01263	-0.01147469
	11.4	38	5190	5,210.04711	-0.00386264
		46	5230	5,290.09882	-0.01149117
25	12	38	5190	5,210.05736	-0.00386462
		46	5230	5,290.04022	-0.01147997
35	12.6	38	5190	5,210.04440	-0.00386212
		46	5230	5,290.05748	-0.01148327
	11.4	38	5190	5,210.08670	-0.00387027
		46	5230	5,290.04459	-0.01148080

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### 10 Minutes:

Operation Mode	802.11 a	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	36	5180	5,190.08848	-0.00194758
		44	5220	5,230.09624	-0.00193415
		48	5240	5,270.03878	-0.00573259
	11.4	36	5180	5,190.07289	-0.00194457
		44	5220	5,230.00471	-0.00191661
		48	5240	5,270.09750	-0.00574380
25	12	36	5180	5,190.05363	-0.00194086
		44	5220	5,230.09591	-0.00193408
		48	5240	5,270.09277	-0.00574290
35	12.6	36	5180	5,190.00899	-0.00193224
		44	5220	5,230.02837	-0.00192114
		48	5240	5,270.00269	-0.00572570
	11.4	36	5180	5,190.05351	-0.00194083
		44	5220	5,230.07269	-0.00192963
		48	5240	5,270.00670	-0.00572647

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Operation Mode	802.11 n_HT40	Test Date	2018.11.20
Temperature	:23 °C	Test By	Scott
Humidity	:68 %		

Test Temp.(°C)	Test Voltage(V)	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
5	12.6	38	5190	5,210.03682	-0.00386066
		46	5230	5,290.04093	-0.01148010
	11.4	38	5190	5,210.03978	-0.00386123
		46	5230	5,290.02994	-0.01147800
25	12	38	5190	5,210.05716	-0.00386458
		46	5230	5,290.01865	-0.01147584
35	12.6	38	5190	5,210.04557	-0.00386234
		46	5230	5,290.05397	-0.01148259
	11.4	38	5190	5,210.04128	-0.00386152
		46	5230	5,290.01685	-0.01147550

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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

PCB antenna designs are used.

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

*~ End of Report ~*

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