

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



## INTENTIONAL RADIATOR CERTIFICATION CLASS II PERMISSIVE CHANGE TEST REPORT

**Applicant:** silex technology, Inc.  
2-3-1 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0237,  
Japan

**Product Name:** SX-PCEAC2

**Brand Name:** silex technology, Inc.

**Model No.:** SX-PCEAC2

**Model Difference:** N/A

**Report Number:** ER/2017/C0087-01

**FCC ID:** N6C-SXPCEAC2

**Issue Date:** Aug. 26, 2021

**Date of Test:** Jul. 20, 2021 ~ Aug. 02, 2021

**Date of EUT Received:** Jul. 09, 2021

Jet Lu

Approved By \_\_\_\_\_

Jet Lu

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. 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 comply with FCC rule part §15.407.

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

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## Revision History

Report Number	Revision	Description	Issue Date	Revised By
ER/2017/C0087	00	Initial creation of document	Jun. 01, 2018	Yuri Tsai
ER/2017/C0087-01	01	Decrease output power and this change only include the antenna which model number is H2B1PC1A1C(AA258). Provide power and RSE data.	Aug. 26, 2021	Susan Lin

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## Contents

1	GENERAL INFORMATION .....	4
2	SYSTEM TEST CONFIGURATION .....	8
3	SUMMARY OF TEST RESULT .....	11
4	DESCRIPTION OF TEST MODES .....	12
5	MEASUREMENT UNCERTAINTY .....	15
6	CONDUCTED EMISSION TEST .....	16
7	DUTY CYCLE TEST SIGNAL .....	20
8	MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT .....	22
9	UNDESIRABLE RADIATED EMISSION MEASUREMENT .....	27
10	ANTENNA REQUIREMENT .....	69

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name:	SX-PCEAC2
Brand Name:	silex technology, Inc.
Model No.:	SX-PCEAC2
Model Difference:	N/A
Hardware Version:	JW204670
Firmware Version:	Ver.4
Class II Permissive change:	To decrease the output power of WLAN 5GHz by SW.
EUT Series No.:	84253F69BAA5
Power Supply:	DC 3.3V

### 1.2 Modulation & Data Rate

Modulation type:	64QAM, 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 a: 6.5 - 54 Mbps
	802.11 n_20MHz: 6.5 - 144.4 Mbps

### 1.3 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (GHz)	Length	Gain (dBi)	Loss	Total	Worst Antenna Gain
PCB	Unictron	H2B1PC1A1C(AA258)	5GHz	150mm	4.4	2.3	2.1	V

**Note:**

1. Pre-scanned was done on the above antennas, measurements were demonstrated by using the antenna with the highest gain as the worst case scenarios.
2. Antenna information is provided by the applicant.

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## 1.4 FCC

### WLAN 5 GHz

Wi-Fi	Frequency Range	Channels	Rated Power(Avg) (dBm) (Worst Case)	Modulation Technology
a n_HT 20M	5180~5240	4	16.23 dBm	OFDM
	5260~5320	4	17.26 dBm	OFDM

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## 1.5 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

ANSI C63.10:2013

## 1.6 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
<b>Note:</b> Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.				

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## 1.7 Special Accessories

There are no special accessories used while test was conducted.

## 1.8 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 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. The two LISNs provide 50uH/50 ohm 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 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

#### 2.3.3 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this 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

### 2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m\*9m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

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

### 2.4.2 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.

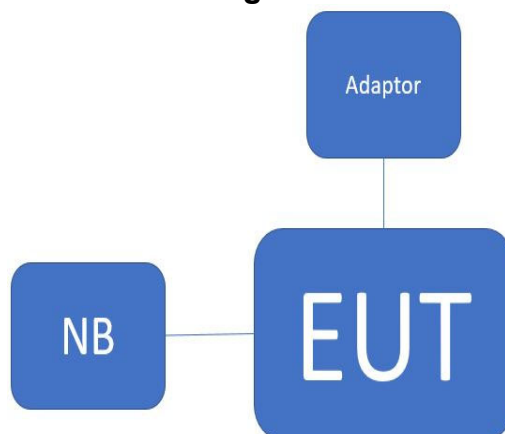
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## 2.5 Configuration of Tested System

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



**Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Adapter	DELL	LA90PM130	CN-05GT3K-LOC00-85M-4B9B-A02	N/A	N/A
3.	Notebook	DELL	Latitude 5590	B0JXHR2	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
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.205 §15.209 §15.407(b)	Undesirable Radiated Emissions	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operating Frequencies

#### Operated band in 5150 MHz ~5250 MHz:

20 M	
CH	Freq (MHz)
36	5180
40	5200
44	5220
48	5240

#### Operated band in 5250 MHz ~5350 MHz:

20 M	
CH	Freq (MHz)
52	5260
56	5280
60	5300
64	5320

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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. The given UE is pre-scanned among below modes.

Modulation	Transmission Chain				Single Transmission Spatial	Multiple Transmission Spatial
<input checked="" type="checkbox"/> 802.11 a	<input checked="" type="checkbox"/> Ch0	<input checked="" type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> 1TX	<input checked="" type="checkbox"/> 2TX
<input checked="" type="checkbox"/> 802.11 n	<input checked="" type="checkbox"/> Ch0	<input checked="" type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> SISO	<input checked="" type="checkbox"/> MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

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#### 4.2.1 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	2TX
	5260~5320	52 to 64	60			

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	2TX
	5260~5320	52 to 64	52,60,64			
802.11n_HT20	5180~5240	36 to 48	36,44,48	OFDM	MCS8	MIMO
	5260~5320	52 to 64	52,60,64			

#### Note:

The field strength of radiation emission was measured as EUT three orthogonal planes, E1 / E2 / H, are positioned to pre-scan the emission generating the highest one. The worst position is tested and recorded.

#### 4.2.2 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	2TX
	5260~5320	52 to 64	52,60,64			
802.11n_HT20	5180~5240	36 to 48	36,44,48	OFDM	MCS8	MIMO
	5260~5320	52 to 64	52,60,64			

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.34 dB
Emission Bandwidth	+/- 1.53 Hz
The Maximum Output Power Measurement	+/- 1 dB
Peak Power Spectral Density Measurement	+/- 1.53 dB
Frequency Stability	+/- 1.53 Hz
Temperature	+/- 0.4 °C
Humidity	+/- 3.5 %
DC / AC Power Source	+/- 1 %

Radiated Spurious Emission Measurement Uncertainty			
Polarization: Vertical	+/-	2.64 dB	9kHz~30MHz
	+/-	4.93 dB	30MHz - 1000MHz
	+/-	4.81 dB	1GHz - 18GHz
	+/-	4.52 dB	18GHz - 40GHz
Polarization: Horizontal	+/-	2.64 dB	9kHz~30MHz
	+/-	4.45 dB	30MHz - 1000MHz
	+/-	4.81 dB	1GHz - 18GHz
	+/-	4.52 dB	18GHz - 40GHz

### Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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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 (dBuV)	
	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

Radiated Emission Test Site: Conduction 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI	101338	03/22/2021	03/21/2022
LISN	SCHWARZBECK	NSLK 8127	8127-465	04/09/2021	04/08/2022
LISN	SCHWARZBECK	NSLK 8127	8127-473	08/10/2020	08/09/2021
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2020	12/06/2021
Test Software	audix	e3	Ver. 6.11-20180413	N.C.R	N.C.R

### 6.3 EUT Setup

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

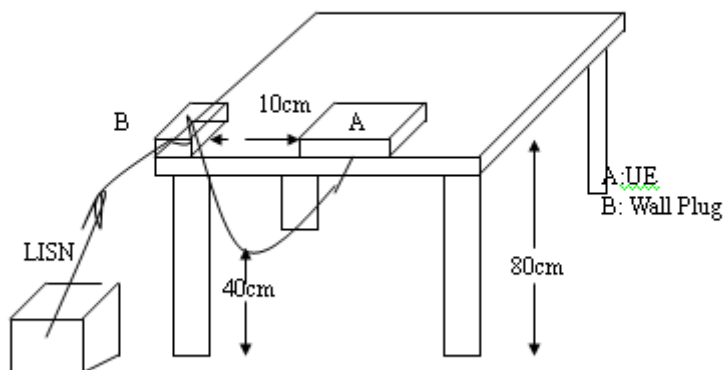
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## 6.4 Test SET-UP



## 6.5 Measurement Procedure

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

## 6.6 Measurement Result

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

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

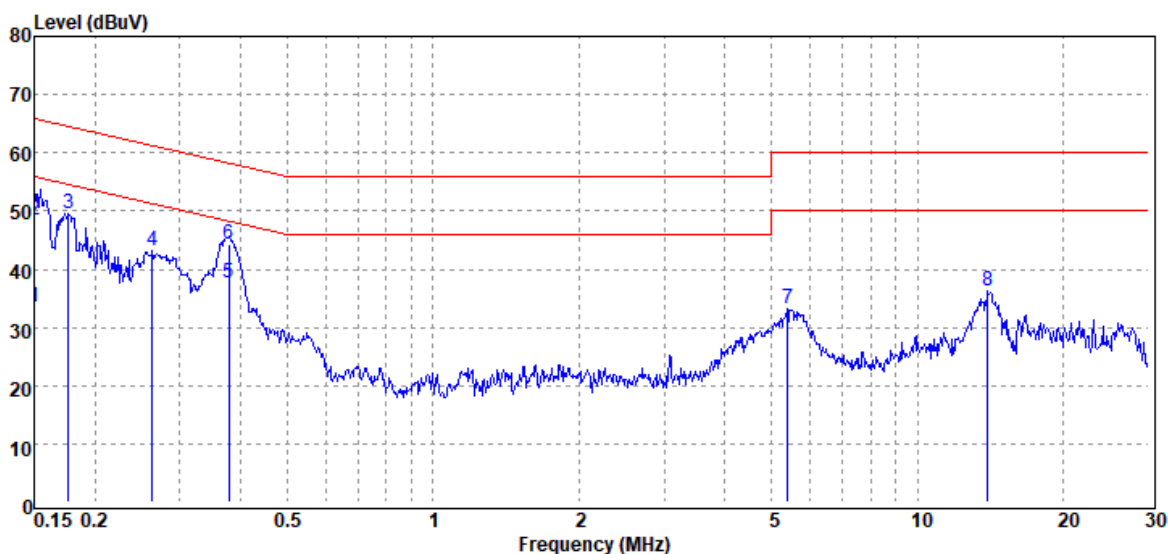
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:ER-2017-C0087-01	Test Site	:Conduction 1
Test Mode	:WLAN 5G	Test Date	:2021-07-22
Power	:AC 120V/60Hz	Temp./Humi.	:23.6/65
Probe	:L	Engineer	:Nick Lin
Note:	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Average	33.41	0.04	33.45	56.00	-22.55
0.15	QP	48.41	0.04	48.45	66.00	-17.55
0.18	Peak	49.47	0.04	49.51	64.64	-15.13
0.26	Peak	43.15	0.04	43.19	61.34	-18.15
0.38	Average	37.62	0.10	37.72	48.30	-10.58
0.38	QP	44.22	0.10	44.32	58.30	-13.98
5.39	Peak	32.73	0.57	33.30	60.00	-26.70
13.99	Peak	35.21	1.00	36.21	60.00	-23.79

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**Report Number** :ER-2017-C0087-01

**Test Site** :Conduction 1

**Test Mode** :WLAN 5G

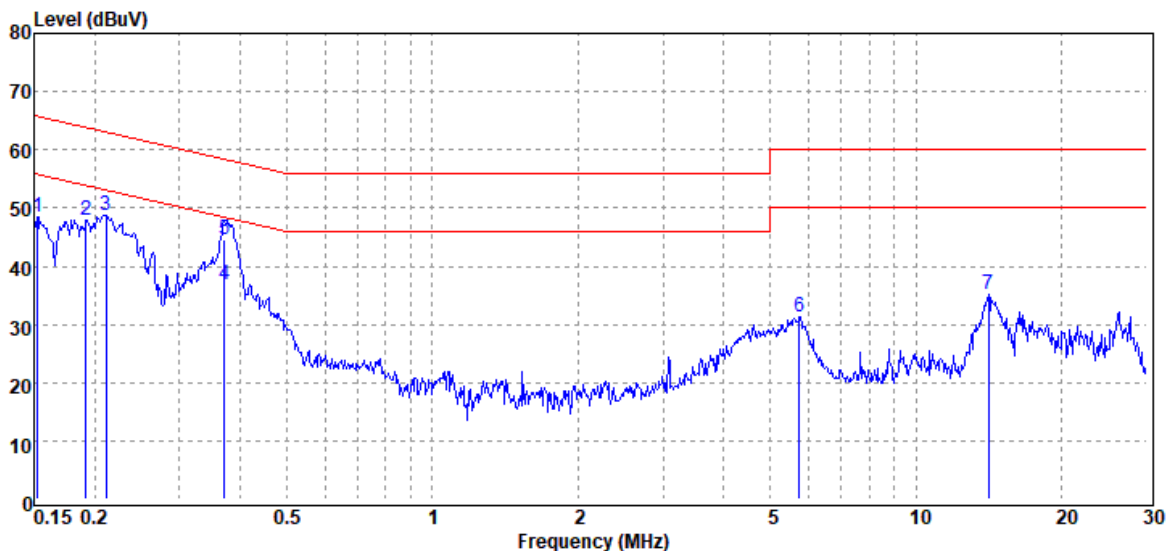
**Test Date** :2021-07-22

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

**Temp./Humi.** :23.6/65

**Probe** :N

**Engineer** :Nick Lin

**Note:** :


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Peak	48.41	0.11	48.52	65.87	-17.35
0.19	Peak	47.91	0.11	48.02	63.93	-15.91
0.21	Peak	48.66	0.11	48.77	63.14	-14.37
0.37	Average	36.74	0.15	36.89	48.47	-11.58
0.37	QP	44.51	0.15	44.66	58.47	-13.81
5.74	Peak	30.74	0.52	31.26	60.00	-28.74
14.14	Peak	34.10	0.93	35.03	60.00	-24.97

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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.

### 7.1 Measurement Procedure:

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

Duty Cycle:

Mode	Duty Cycle (%) =Ton / (Ton+Toff)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11a	93.00	0.32	0.48	1.00
802.11n_20	91.00	0.41	0.52	1.00

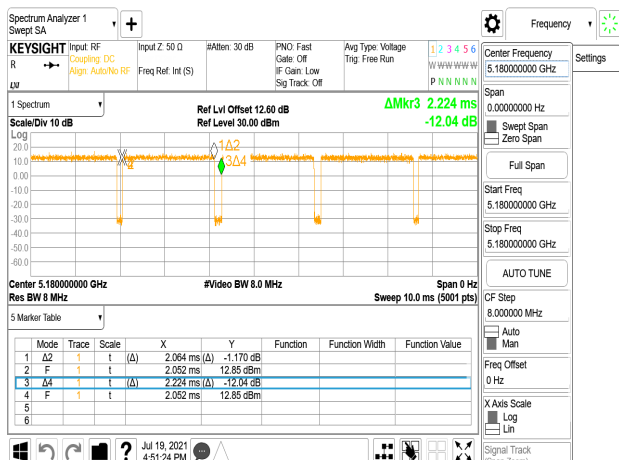
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## 7.2 DUTY CYCLE TEST SIGNAL MEASUREMENT RESULT

802.11a\_20MHz\_Chain0\_5180MHz



802.11n\_20MHz\_Chain0\_5180MHz



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## 8 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable

#### FCC

Band	EUT CATEGORY		LIMIT			
			Conducted Output Power	EIRP	TPC	Antenna Directional Gain Requirements
U-NII-1	<input type="checkbox"/>	Fixed point-to-point	1 Watt(30dBm)	Not required	Not required	23dBi
	<input type="checkbox"/>	Out door AP	1 Watt(30dBm)	Elevation angle above 30 degrees 125mW (21dBm)	Not required	6dBi
	<input checked="" type="checkbox"/>	Other	250mW(23.98dBm)	Not required	Not required	6dBi
U-NII-2A	<input checked="" type="checkbox"/>	Other	250mW(23.98dBm) or 11dBm+10 log B	Not required	When EIRP >500mW	6dBi
U-NII-2C	<input type="checkbox"/>	Other	250mW(23.98dBm) or 11dBm+10 log B	Not required	At least 6dB below EIRP 1W (30dBm)	6dBi
U-NII-3	<input type="checkbox"/>	Other	1 Watt(30dBm)	Not required	Not required	6dBi
	<input type="checkbox"/>	Fixed point-to-point	1 Watt(30dBm)	Not required	Not required	Not required

If transmitting antennas of directional gain greater than the antenna requirements column, the Maximum transmit power shall be reduced by the amount in dB that the direction-al gain of the antenna.

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### Note:

As per section F. 2). e). (ii) of FCC KDB 662911 D01

If antenna gains are not equal and each transmit antenna is driven by only one spatial stream, directional gain may be calculated by either of the following formulas.

$$\bullet \quad \text{DirectionalGain} = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

NSS = the number of independent spatial streams of data;

NANT = the total number of antennas

$g_{j,k} = 10^{G_k/20}$  if the kth antenna is being fed by spatial stream j, or zero if it is not;

$G_k$  is the gain in dBi of the kth antenna.

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

## 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 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.

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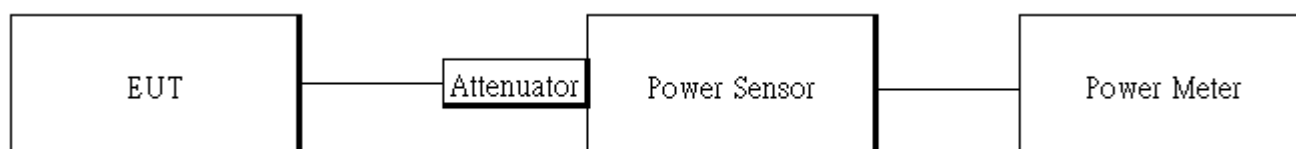
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### 8.3 Measurement Equipment Used

Conducted Emission Test Site: Conducted 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60240503	12/11/2020	12/10/2021
Attenuator	Mini-Circuit	BW-S10W2+	4	12/16/2020	12/15/2021
DC Block	Mini-Circuits	BLK-18-S+	1	12/16/2020	12/15/2021
Coaxial Cable	Woken	00100A1F1A196S	N/A	N/A	N/A
Power Meter	Anritsu	ML2496A	1804001	03/02/2021	03/01/2022
Power Sensor	Anritsu	MA2411B	1726104	03/02/2021	03/01/2022
Power Sensor	Anritsu	MA2411B	1726107	03/02/2021	03/01/2022

### 8.4 Test Set-up



### 8.5 Measurement Result

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power limits are the lesser of 250 mW (23.98dBm) or 11 dBm + 10 log B

1. Where B is the 26 dB emission bandwidth in megahertz for FCC compliance.

#### 8.5.1 Conducted output power

##### 802.11a\_Ch0

CH	Frequency (MHz)	Data Rate	Power set	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	13	13.48	22.260	23.98	PASS
44	5220	6	13	13.36	21.653	23.98	PASS
48	5240	6	13	13.41	21.904	23.98	PASS
52	5260	6	14	14.34	27.134	23.98	PASS
60	5300	6	14	14.27	26.700	23.98	PASS
64	5320	6	14	14.18	26.153	23.98	PASS

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## 802.11a\_Ch1

CH	Frequency (MHz)	Data Rate	Power set	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	13	13.43	22.005	23.98	PASS
44	5220	6	13	13.33	21.504	23.98	PASS
48	5240	6	13	13.39	21.803	23.98	PASS
52	5260	6	14	14.02	25.207	23.98	PASS
60	5300	6	14.5	14.12	25.794	23.98	PASS
64	5320	6	14.5	14.00	25.091	23.98	PASS

## 802.11a\_2TX

CH	Frequency (MHz)	Data Rate	Power set	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
				CH 0	CH 1				
36	5180	6	13	13.01	12.79	16.23	41.946	23.98	PASS
44	5220	6	13	12.8	12.57	16.01	39.921	23.98	PASS
48	5240	6	13	12.87	12.59	16.06	40.343	23.98	PASS
52	5260	6	15	14.04	13.73	17.21	52.641	23.98	PASS
60	5300	6	15	14.36	13.31	17.19	52.386	23.98	PASS
64	5320	6	15.5	14.22	13.15	17.04	50.621	23.98	PASS

## 802.11n\_HT20\_Ch0

CH	Frequency (MHz)	Data Rate	Power set	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	13	13.43	22.027	23.98	PASS
44	5220	MCS0	13	13.37	21.725	23.98	PASS
48	5240	MCS0	13	13.29	21.328	23.98	PASS
52	5260	MCS0	14.5	14.30	26.913	23.98	PASS
60	5300	MCS0	14.5	14.46	27.923	23.98	PASS
64	5320	MCS0	14.5	14.34	27.162	23.98	PASS

## 802.11n\_HT20\_Ch1

CH	Frequency (MHz)	Data Rate	Power set	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	13.5	13.10	20.415	23.98	PASS
44	5220	MCS0	13.5	13.31	21.427	23.98	PASS
48	5240	MCS0	13.5	13.02	20.043	23.98	PASS
52	5260	MCS0	14.5	14.29	26.851	23.98	PASS
60	5300	MCS0	15	14.37	27.350	23.98	PASS
64	5320	MCS0	15	14.04	25.349	23.98	PASS

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## 802.11n\_HT20\_MIMO

CH	Frequency (MHz)	Data Rate	Power set	Avg. POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
				CH 0	CH 1				
36	5180	MCS8	13	13.04	12.39	16.15	41.182	23.98	PASS
44	5220	MCS8	13.5	12.89	12.41	16.08	40.518	23.98	PASS
48	5240	MCS8	13.5	12.98	12.5	<b>16.17</b>	41.367	23.98	PASS
52	5260	MCS8	15.5	14.01	13.6	17.23	52.841	23.98	PASS
60	5300	MCS8	15.5	14.07	13.57	17.25	53.053	23.98	PASS
64	5320	MCS8	15.5	14.26	13.38	<b>17.26</b>	53.237	23.98	PASS

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## 9 UNDESIRABLE RADIATED EMISSION MEASUREMENT

### 9.1 Standard Applicable

#### 9.1.1 Band Edge

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	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.2 (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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### 9.1.2 Spurious Emission

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.

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## 9.2 Measurement Equipment Used

Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/11/2020	12/10/2021
Horn Antenna	SCHWARZBECK	BBHA9120D	1441	10/16/2020	10/15/2021
Bi-log Antenna	SCHWARZBECK	VULB9168	378	08/06/2020	08/05/2021
Loop Antenna	ETS.LINDGREN	6502	148045	10/19/2020	10/18/2021
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/27/2021	04/26/2022
EMI Test Receiver	R&S	ESCI	101338	03/22/2021	03/21/2022
Pre-Amplifier	HP	8449B	3008A00578	12/16/2020	12/15/2021
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2020	10/26/2021
Pre-Amplifier	HP	8447D	2944A07676	12/16/2020	12/15/2021
Attenuator	Mini-Circuit	BW-S10W2+	4	12/16/2020	12/15/2021
Filter 5150-5350 MHz	Micro-Tronics	BRM50703	1	12/16/2020	12/15/2021
High Pass Filter	WI	WHKX7.0/18G-8SS	45	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2636/2	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 104	340057/4	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 104PEA	800052/2	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2621/2	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2617/2	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY2630/2	12/16/2020	12/15/2021
Coaxial Cable	Huber Suhner	SUCOFLEX 102	MY22962/2	12/16/2020	12/15/2021
Site Cal	SGS	SAC III chamber	N/A	01/01/2021	12/31/2021
Test Software	audix	e3	Ver. 6.11-20180413	N.C.R	N.C.R

**Note: N.C.R refers to Not Calibrated Required**

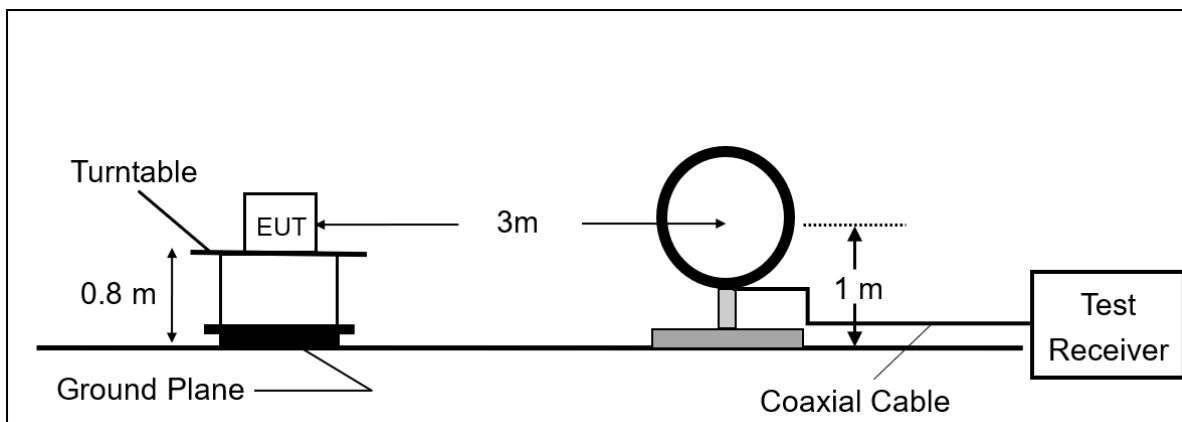
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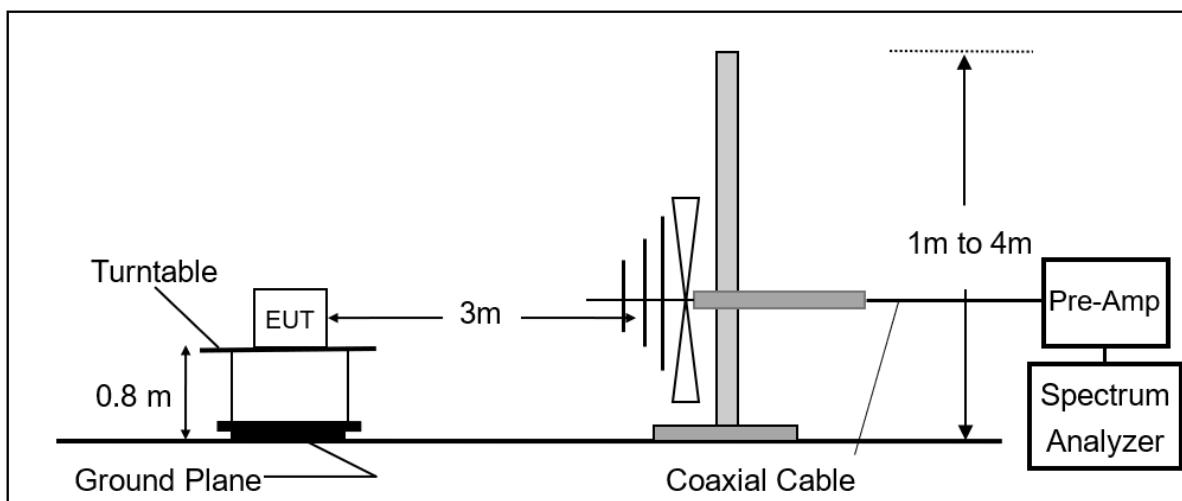
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## 9.3 Test SET-UP

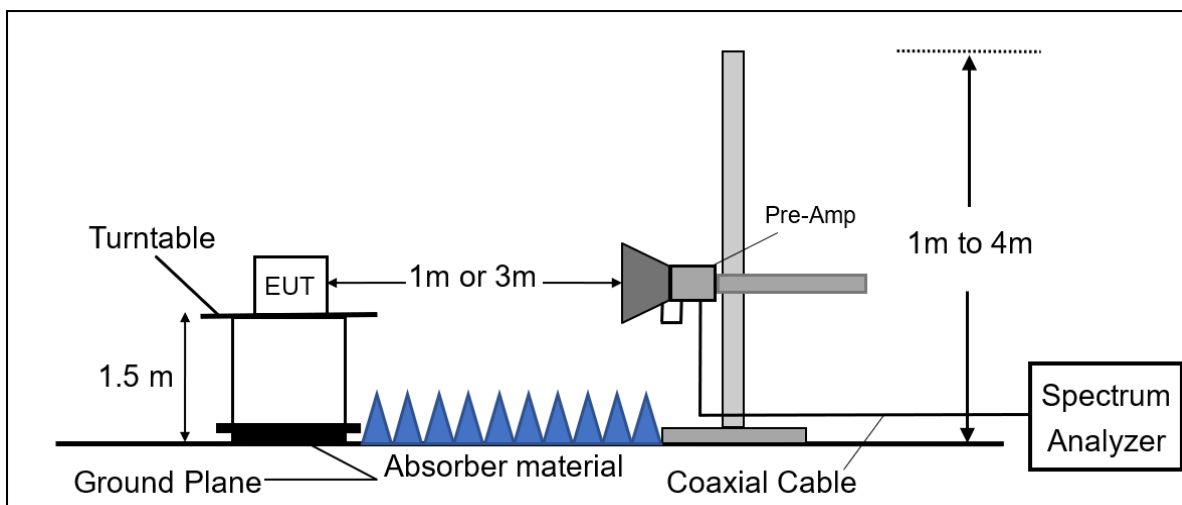
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



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



(C) Radiated Emission Test Set-Up, Frequency Above 1GHz



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## 9.4 Measurement Procedure

1. The testing follows FCC KDB 789033 D02.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=100 kHz and VBW=300 kHz for Peak Detector (PK) at frequency between 30MHz and 1 GHz
6. Use receiver mode as RBW=120 kHz for Quasi-peak (QP) at frequency between 30MHz and 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Maximum Emission Measurements 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 Emission Measurements at frequency above 1 GHz.
9. When 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.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
12. Repeat above procedures until all frequency measured were complete.

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## 9.5 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

*The limit of the emission level is expressed in dBuV/m, which converts  $20 \cdot \log(uV/m)$*

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

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

## 9.6 Test Results of Radiated Spurious Emissions from 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.

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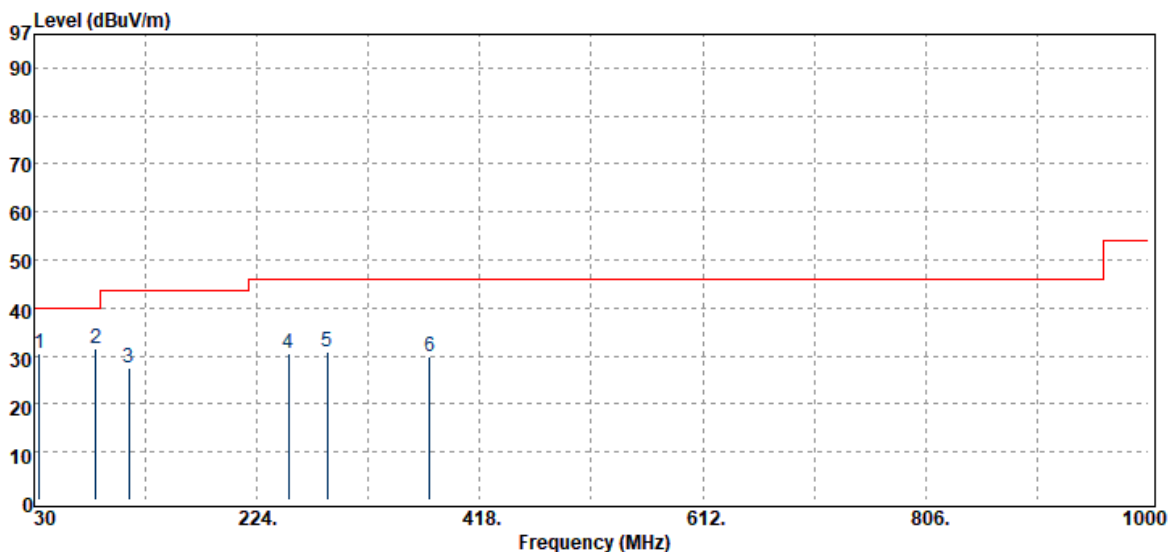
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## 9.7 Radiated Spurious Emission Measurement Result

### 9.7.1 Below 1GHz Worst-Case Data:

Report Number	:ER-2017-C0087-01	Test Site	:SAC 3
Operation Mode	:802.11a	Test Date	:2021-07-21
Test Frequency	:5220 MHz	Temp./Humi.	:26.6/50
Test Mode	:Tx CH Mid	Antenna Pol.	:VERTICAL
EUT Pol	:H Plane	Engineer	:Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
34.85	Peak	40.12	-9.44	30.68	40.00	-9.32
83.35	QP	45.05	-13.38	31.67	40.00	-8.33
112.45	Peak	38.41	-11.03	27.38	43.50	-16.12
251.16	Peak	39.12	-8.72	30.40	46.00	-15.60
285.11	Peak	38.06	-7.06	31.00	46.00	-15.00
374.35	Peak	35.29	-5.31	29.98	46.00	-16.02

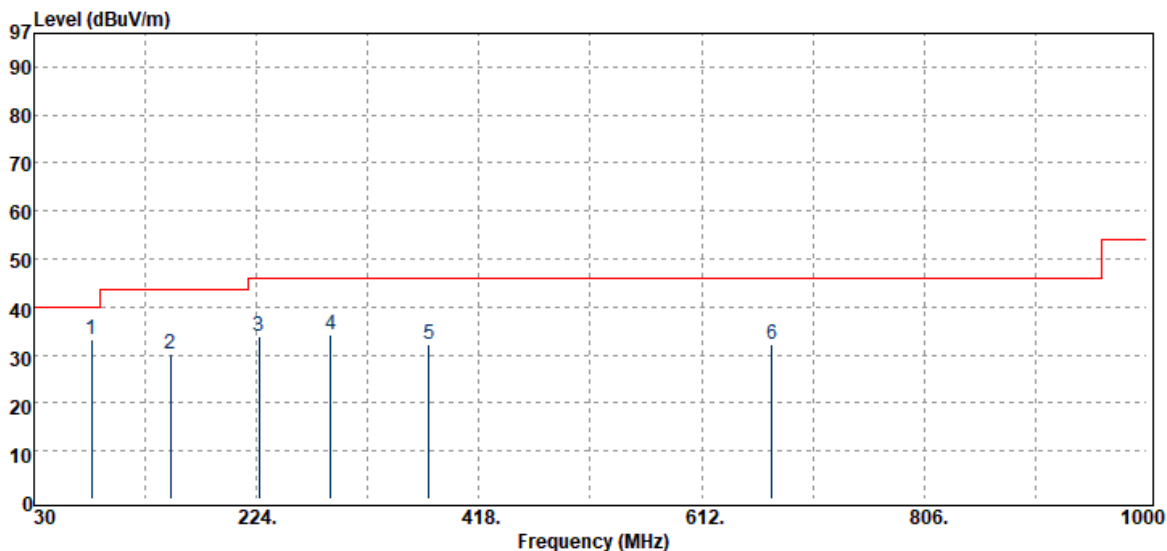
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5220 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
80.44	Peak	46.21	-12.86	33.35	40.00	-6.65
149.31	Peak	38.37	-8.12	30.25	43.50	-13.25
225.94	Peak	44.07	-10.32	33.75	46.00	-12.25
288.99	Peak	41.17	-6.88	34.29	46.00	-11.71
374.35	Peak	37.63	-5.31	32.32	46.00	-13.68
673.11	Peak	31.93	0.42	32.35	46.00	-13.65

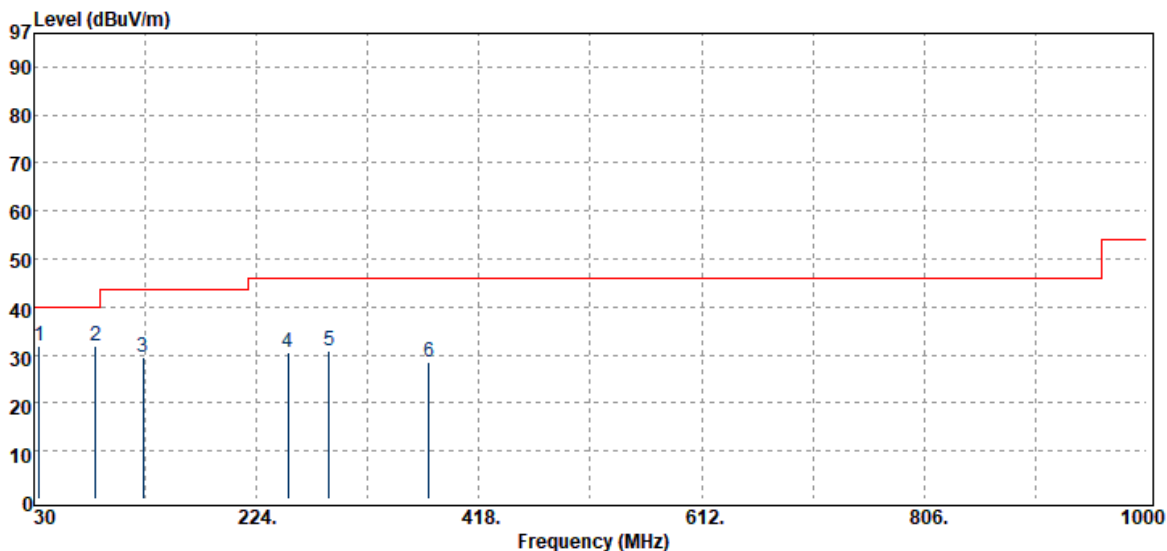
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 Test Frequency :5300 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
34.85	Peak	41.22	-9.44	31.78	40.00	-8.22
83.35	QP	45.12	-13.38	31.74	40.00	-8.26
125.06	Peak	38.85	-9.47	29.38	43.50	-14.12
251.16	Peak	39.11	-8.72	30.39	46.00	-15.61
287.05	Peak	37.81	-6.97	30.84	46.00	-15.16
374.35	Peak	33.93	-5.31	28.62	46.00	-17.38

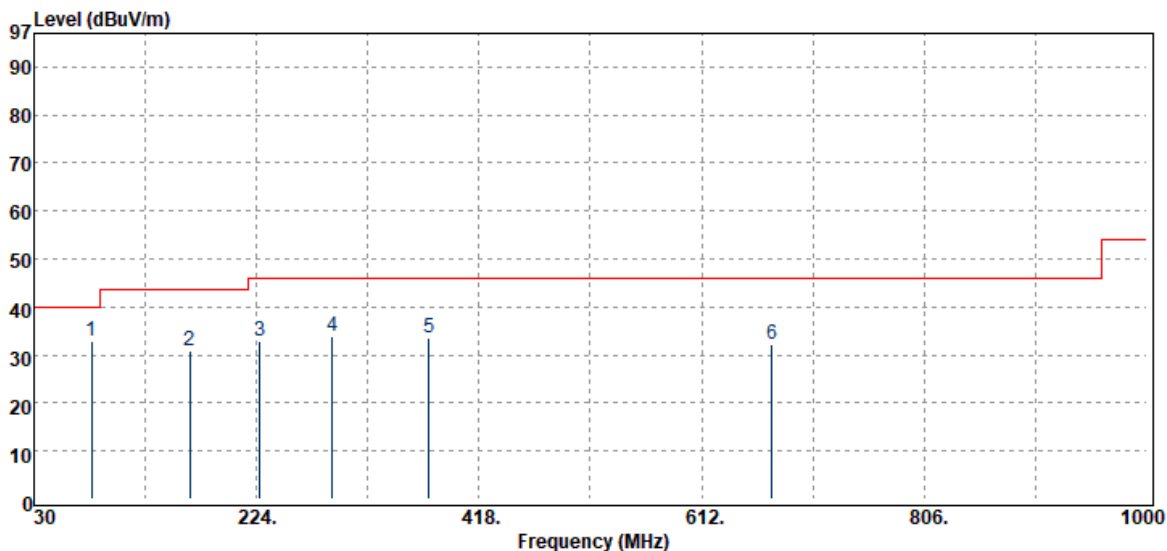
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 Test Frequency :5300 MHz  
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 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
80.44	Peak	45.66	-12.86	32.80	40.00	-7.20
165.80	Peak	39.00	-8.16	30.84	43.50	-12.66
226.91	Peak	43.17	-10.18	32.99	46.00	-13.01
289.96	Peak	40.90	-6.84	34.06	46.00	-11.94
374.35	Peak	38.86	-5.31	33.55	46.00	-12.45
673.11	Peak	31.73	0.42	32.15	46.00	-13.85

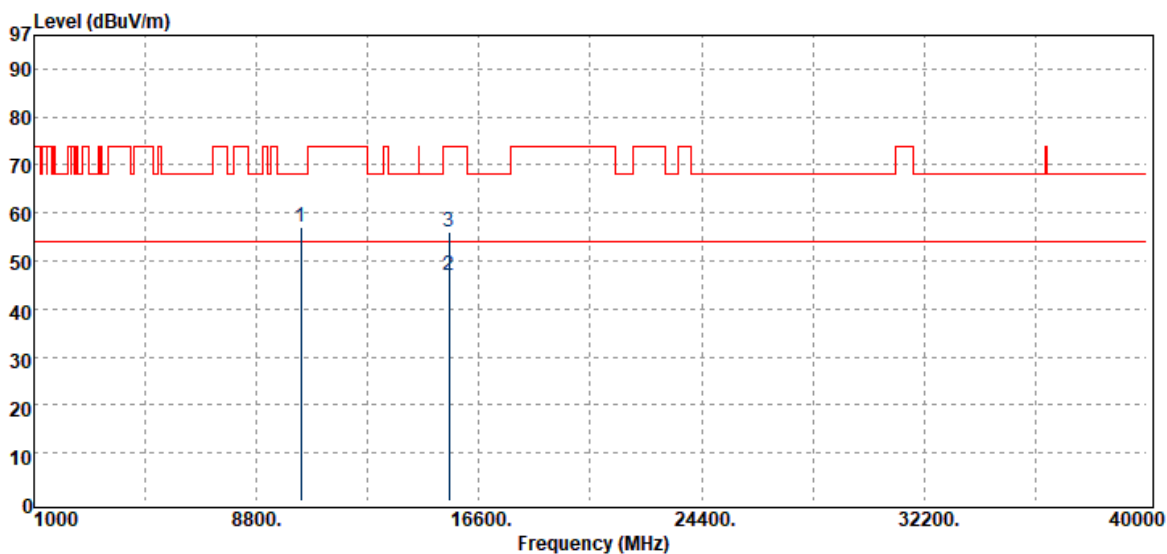
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## 9.7.2 Above 1GHz Worst-Case Data:

Report Number	:ER-2017-C0087-01	Test Site	:SAC 3
Operation Mode	:802.11a	Test Date	:2021-07-21
Test Frequency	:5180 MHz	Temp./Humi.	:26.6/50
Test Mode	:Tx CH Low	Antenna Pol.	:VERTICAL
EUT Pol	:H Plane	Engineer	:Nick Lin



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	35.73	21.21	56.94	68.20	-11.26
15540.00	Average	23.67	23.35	47.02	54.00	-6.98
15540.00	Peak	32.81	23.35	56.16	74.00	-17.84

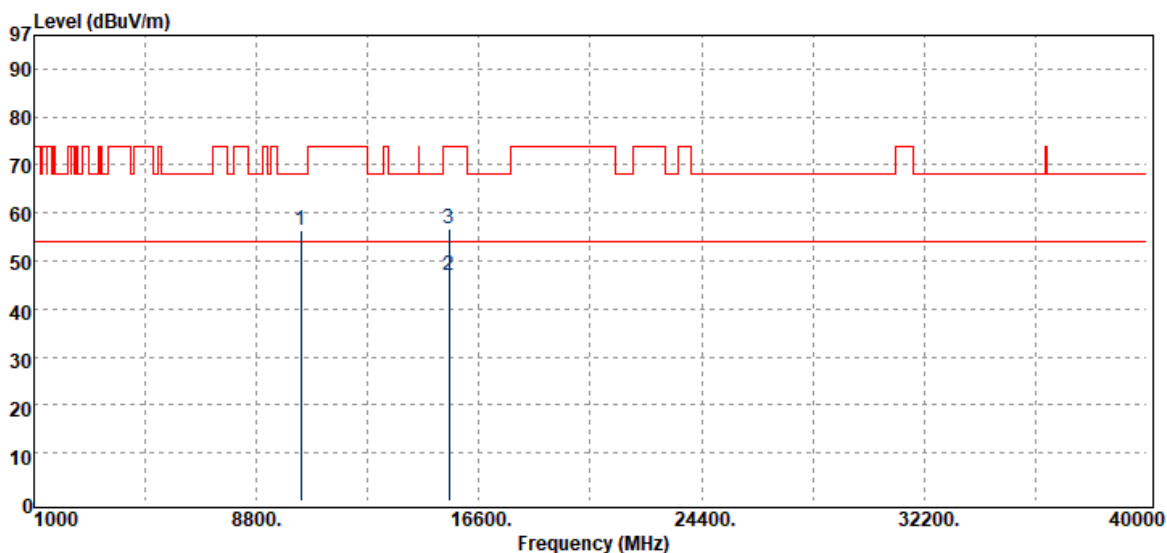
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5180 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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	35.07	21.21	56.28	68.20	-11.92
15540.00	Average	23.63	23.35	46.98	54.00	-7.02
15540.00	Peak	33.53	23.35	56.88	74.00	-17.12

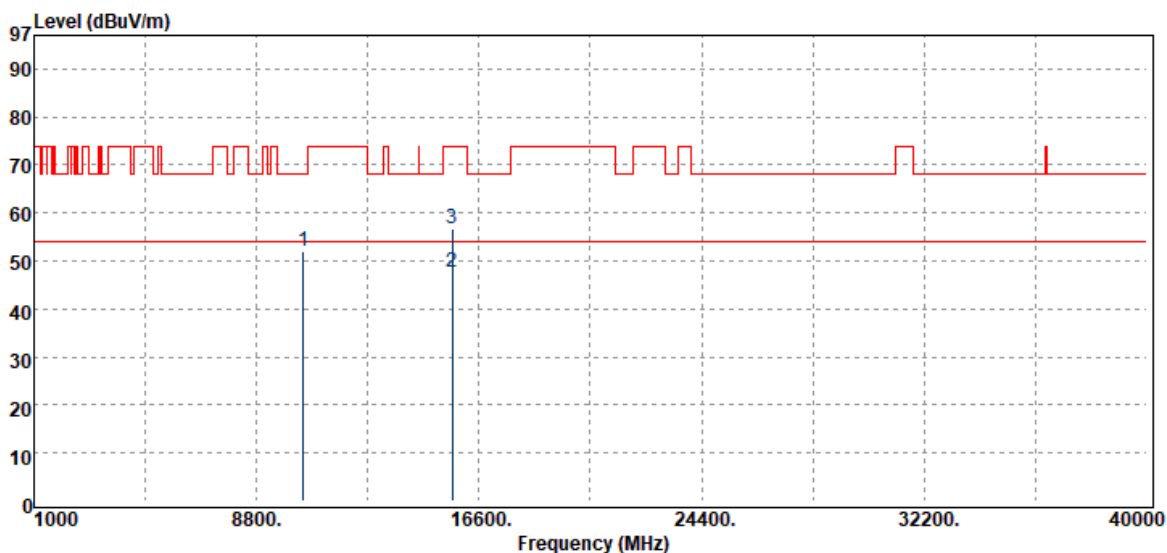
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5220 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	Peak	33.72	18.39	52.11	68.20	-16.09
15660.00	Average	23.75	24.07	47.82	54.00	-6.18
15660.00	Peak	32.76	24.07	56.83	74.00	-17.17

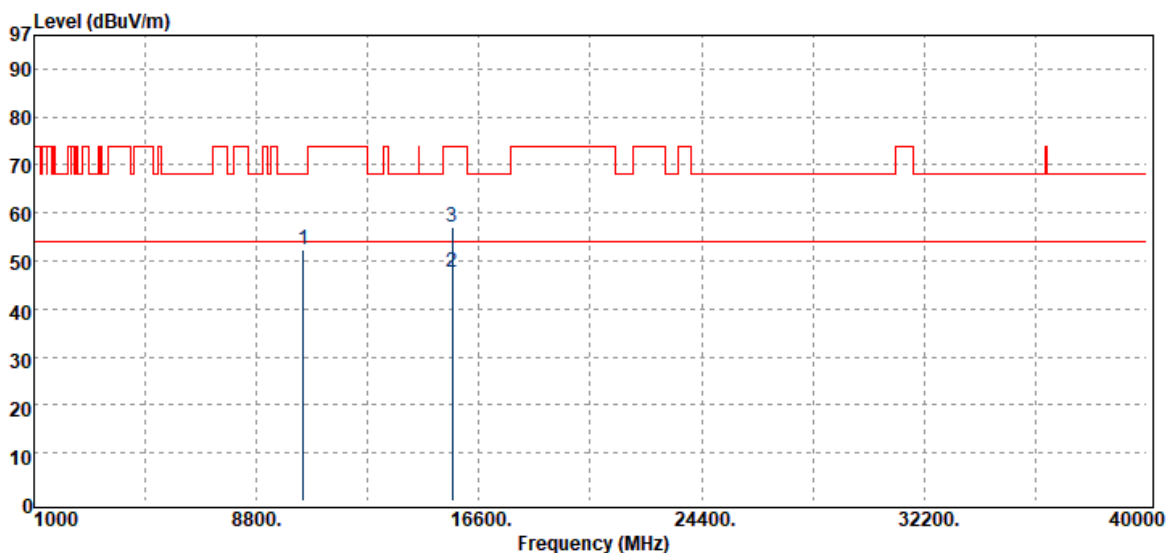
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5220 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	Peak	33.82	18.39	52.21	68.20	-15.99
15660.00	Average	23.66	24.07	47.73	54.00	-6.27
15660.00	Peak	32.98	24.07	57.05	74.00	-16.95

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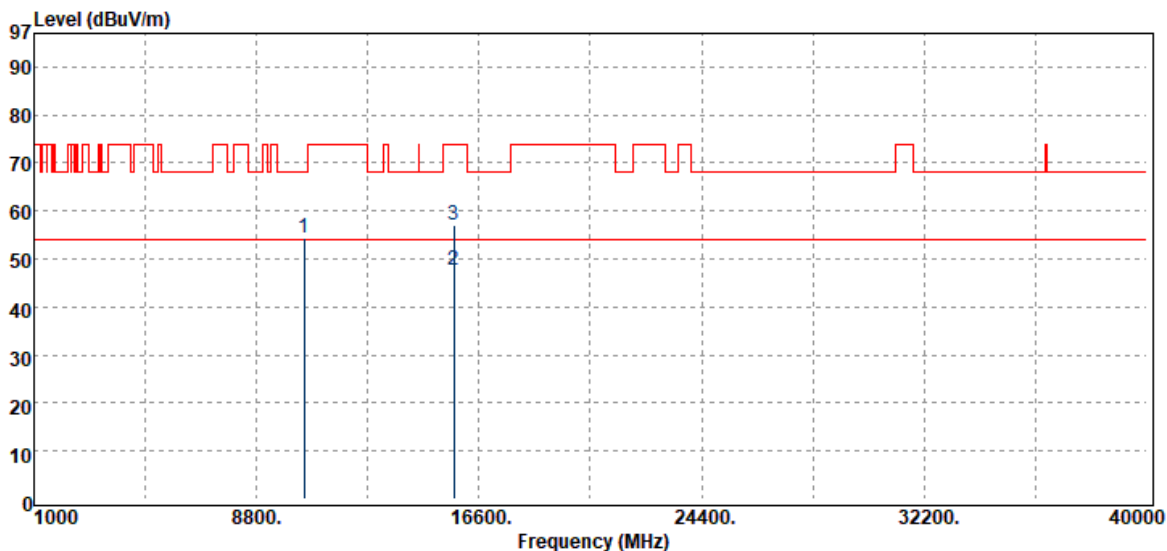
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5240 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	35.04	19.27	54.31	68.20	-13.89
15720.00	Average	23.85	23.75	47.60	54.00	-6.40
15720.00	Peak	33.36	23.75	57.11	74.00	-16.89

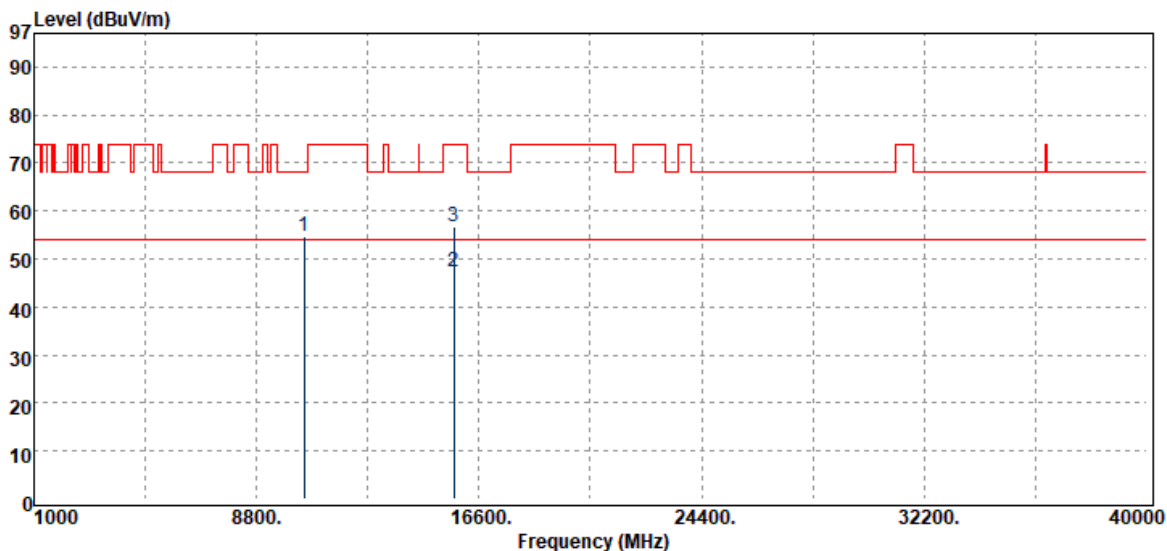
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5240 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	35.51	19.27	54.78	68.20	-13.42
15720.00	Average	23.71	23.75	47.46	54.00	-6.54
15720.00	Peak	33.00	23.75	56.75	74.00	-17.25

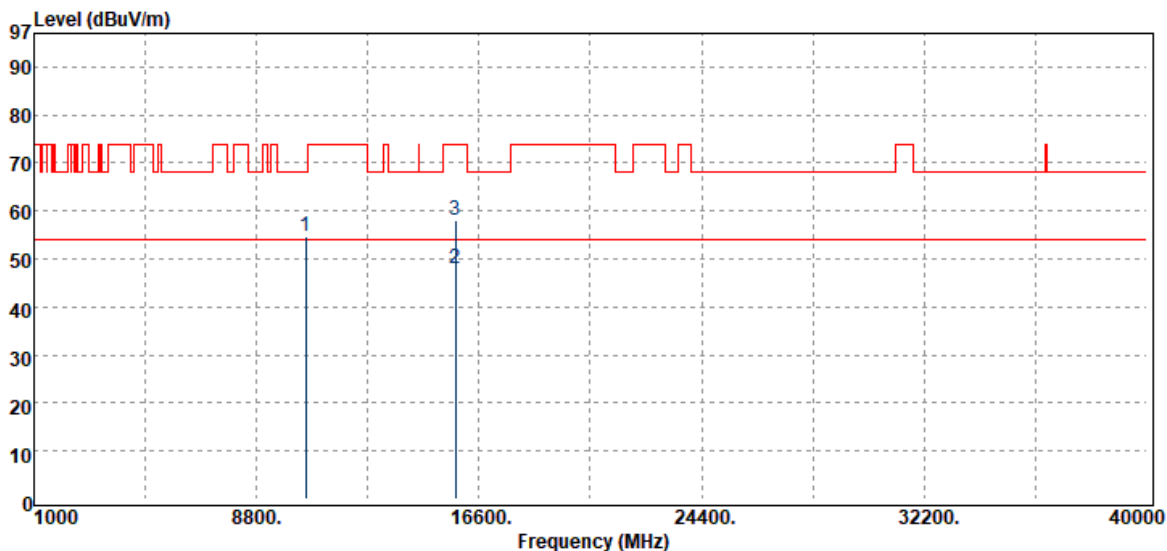
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5260 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10520.00	Peak	34.55	20.21	54.76	68.20	-13.44
15780.00	Average	23.88	24.28	48.16	54.00	-5.84
15780.00	Peak	33.78	24.28	58.06	74.00	-15.94

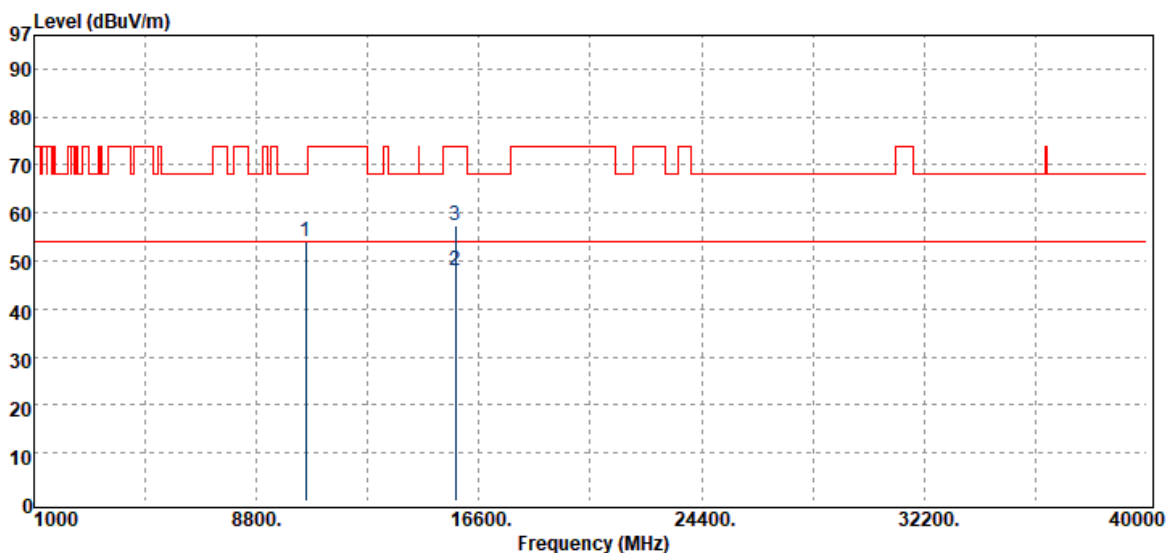
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5260 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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
10520.00	Peak	33.96	20.21	54.17	68.20	-14.03
15780.00	Average	23.86	24.28	48.14	54.00	-5.86
15780.00	Peak	33.26	24.28	57.54	74.00	-16.46

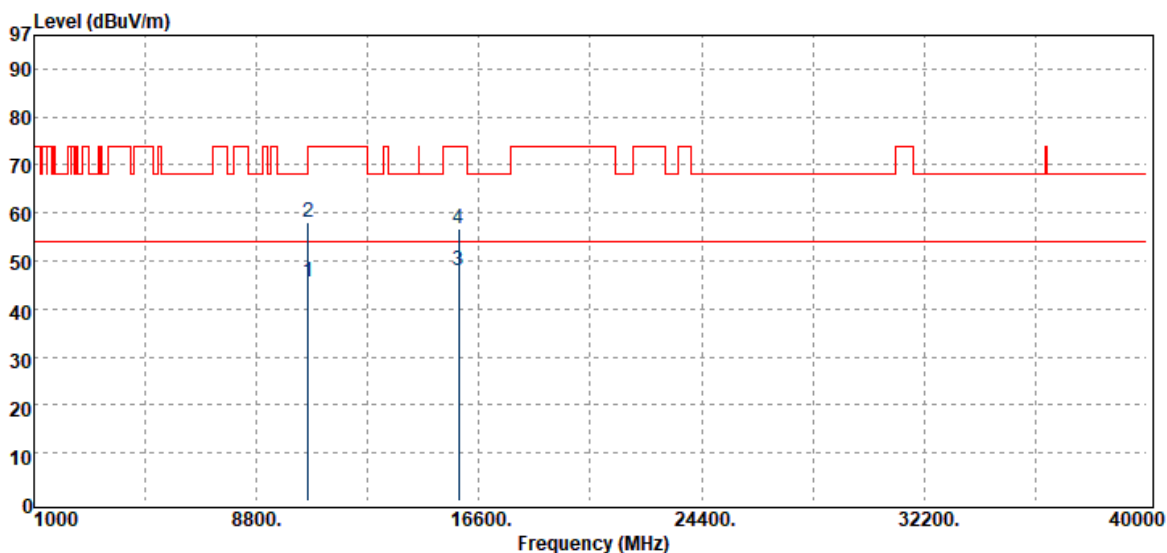
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5300 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



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
10600.00	Average	24.74	20.78	45.52	54.00	-8.48
10600.00	Peak	37.14	20.78	57.92	74.00	-16.08
15900.00	Average	23.55	24.38	47.93	54.00	-6.07
15900.00	Peak	32.40	24.38	56.78	74.00	-17.22

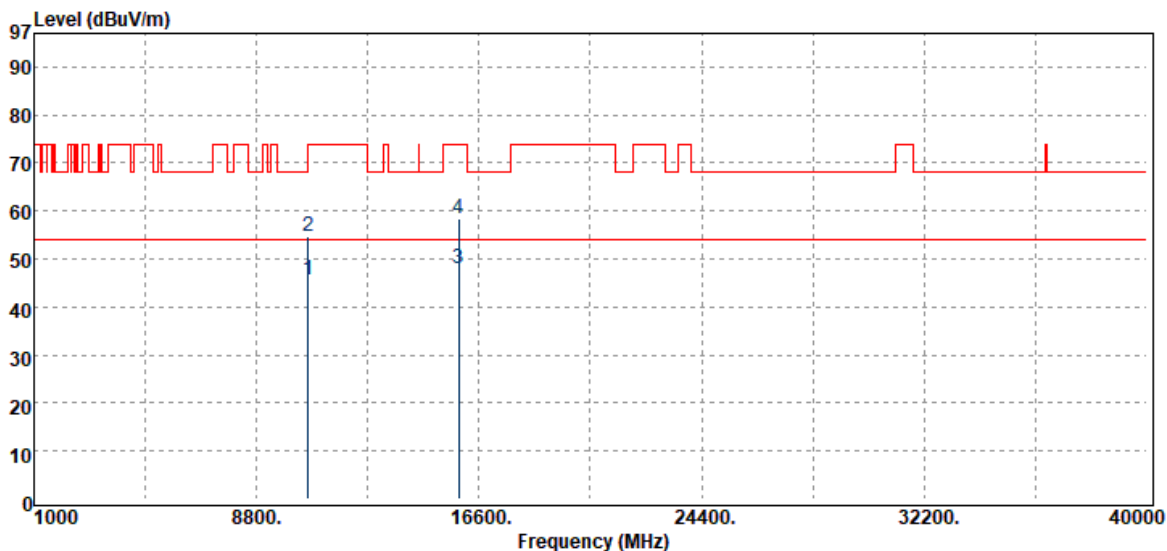
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5300 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10600.00	Average	24.88	20.78	45.66	54.00	-8.34
10600.00	Peak	33.99	20.78	54.77	74.00	-19.23
15900.00	Average	23.67	24.38	48.05	54.00	-5.95
15900.00	Peak	34.01	24.38	58.39	74.00	-15.61

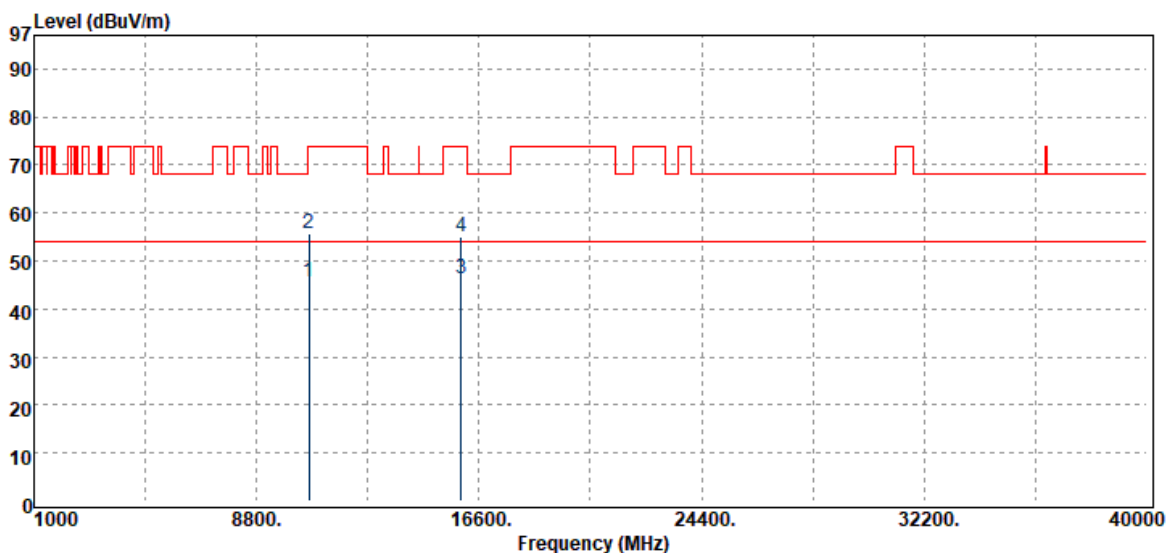
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5320 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10640.00	Average	24.82	20.69	45.51	54.00	-8.49
10640.00	Peak	34.98	20.69	55.67	74.00	-18.33
15960.00	Average	23.35	22.82	46.17	54.00	-7.83
15960.00	Peak	32.38	22.82	55.20	74.00	-18.80

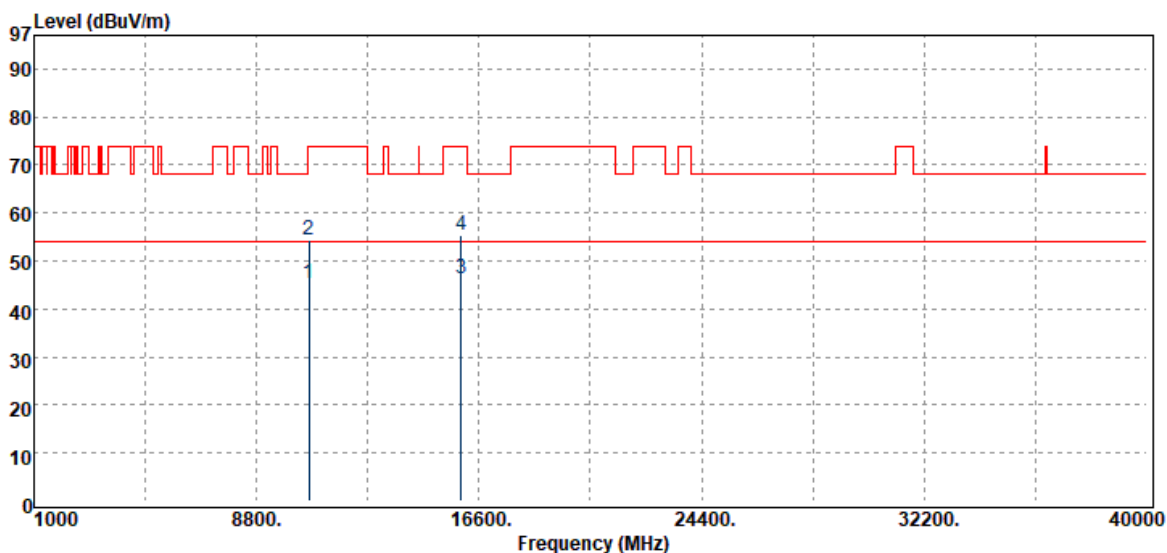
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5320 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10640.00	Average	24.77	20.69	45.46	54.00	-8.54
10640.00	Peak	33.71	20.69	54.40	74.00	-19.60
15960.00	Average	23.34	22.82	46.16	54.00	-7.84
15960.00	Peak	32.70	22.82	55.52	74.00	-18.48

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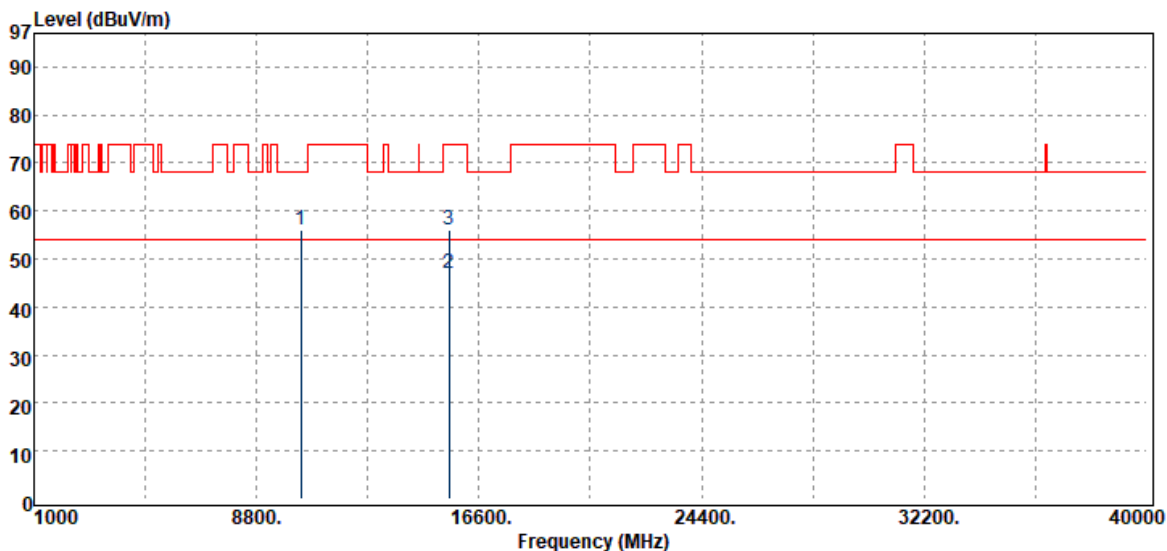
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5180 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



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	35.00	21.21	56.21	68.20	-11.99
15540.00	Average	23.63	23.35	46.98	54.00	-7.02
15540.00	Peak	32.76	23.35	56.11	74.00	-17.89

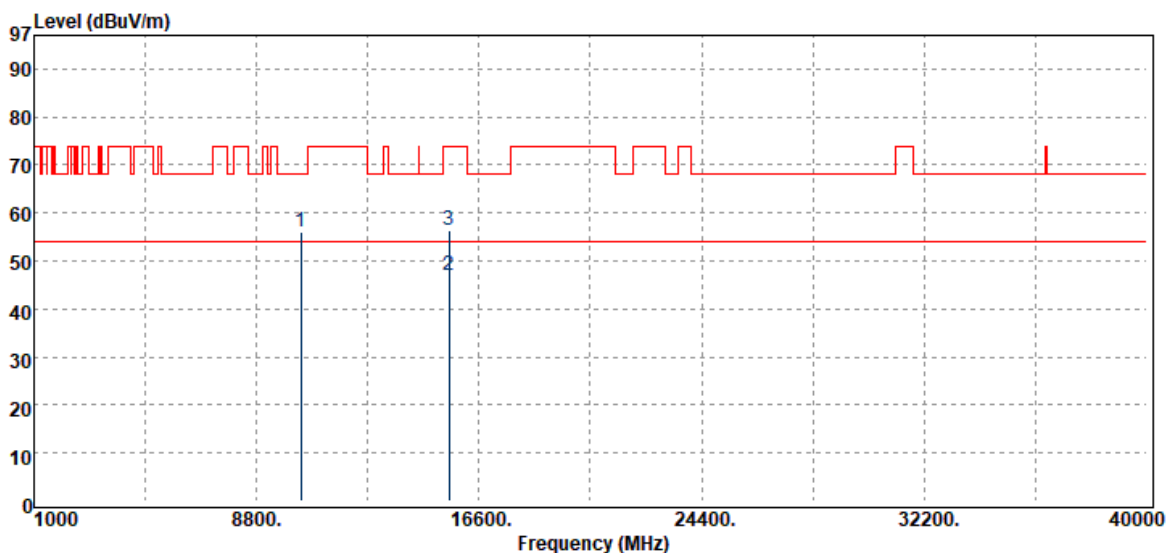
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5180 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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	34.77	21.21	55.98	68.20	-12.22
15540.00	Average	23.70	23.35	47.05	54.00	-6.95
15540.00	Peak	32.89	23.35	56.24	74.00	-17.76

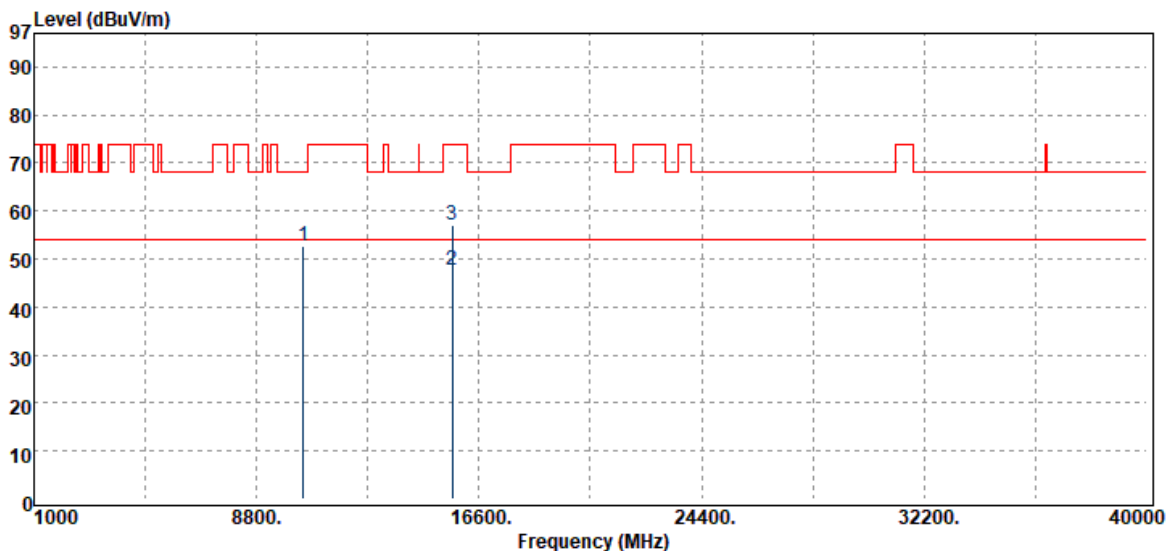
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5220 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10440.00	Peak	34.32	18.39	52.71	68.20	-15.49
15660.00	Average	23.67	24.07	47.74	54.00	-6.26
15660.00	Peak	33.13	24.07	57.20	74.00	-16.80

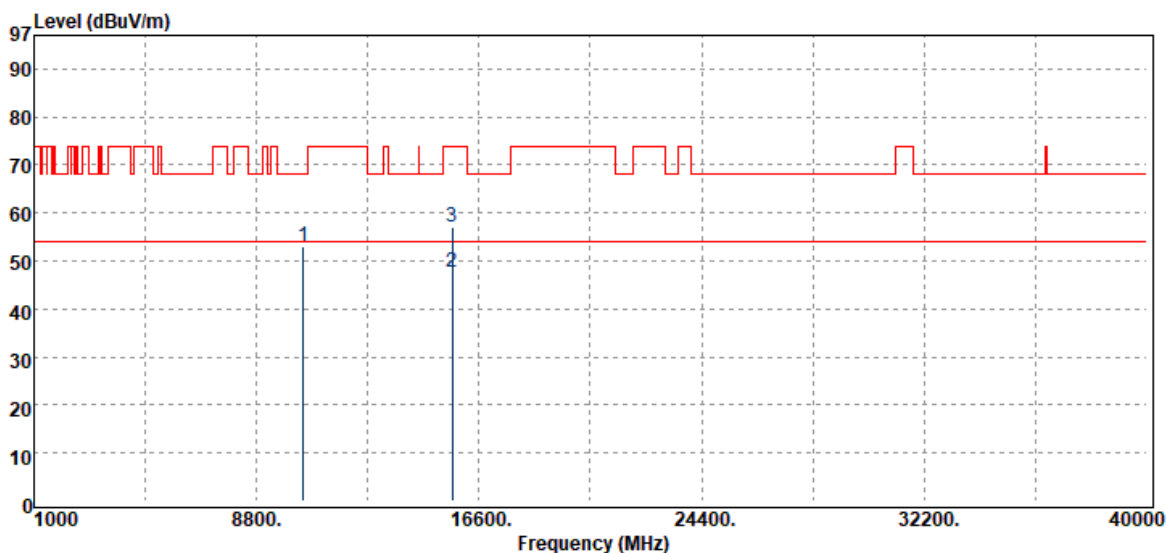
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5220 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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
10440.00	Peak	34.56	18.39	52.95	68.20	-15.25
15660.00	Average	23.66	24.07	47.73	54.00	-6.27
15660.00	Peak	33.07	24.07	57.14	74.00	-16.86

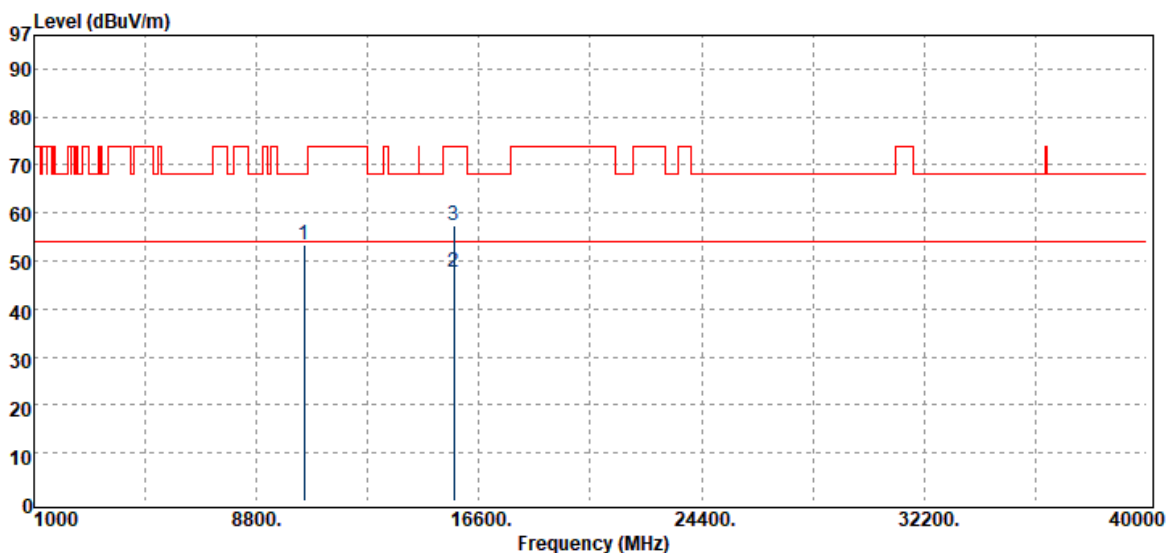
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5240 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	34.19	19.27	53.46	68.20	-14.74
15720.00	Average	23.89	23.75	47.64	54.00	-6.36
15720.00	Peak	33.59	23.75	57.34	74.00	-16.66

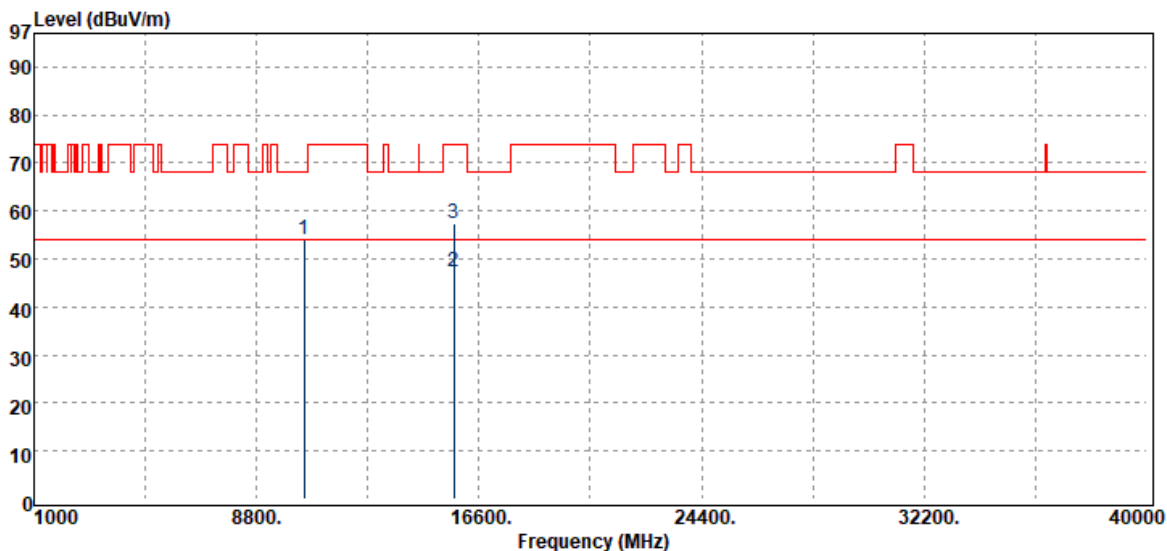
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5240 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10480.00	Peak	34.76	19.27	54.03	68.20	-14.17
15720.00	Average	23.69	23.75	47.44	54.00	-6.56
15720.00	Peak	33.65	23.75	57.40	74.00	-16.60

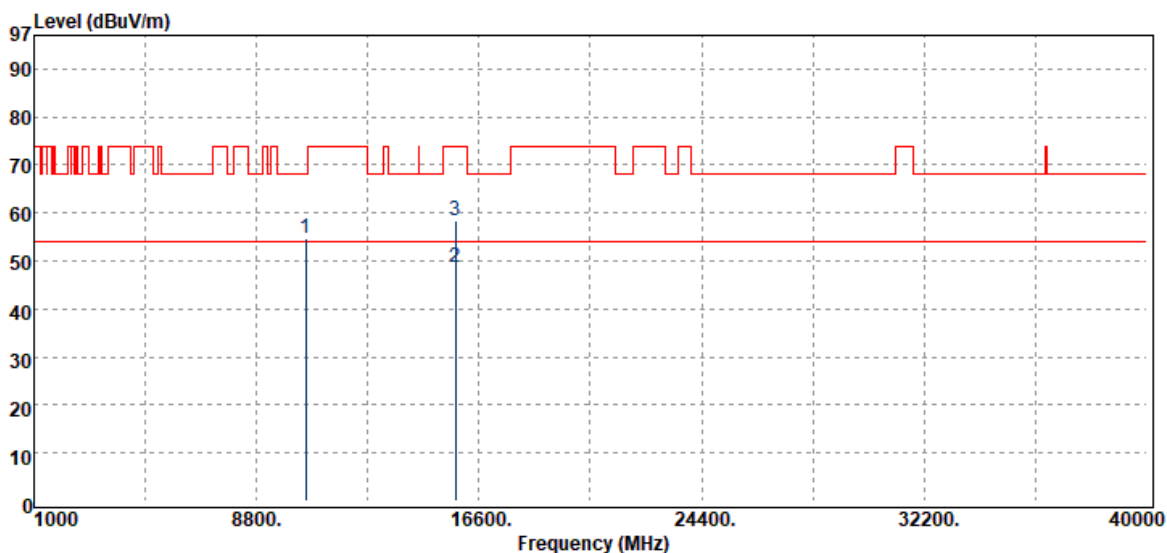
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5260 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10520.00	Peak	34.63	20.21	54.84	68.20	-13.36
15780.00	Average	24.35	24.28	48.63	54.00	-5.37
15780.00	Peak	34.00	24.28	58.28	74.00	-15.72

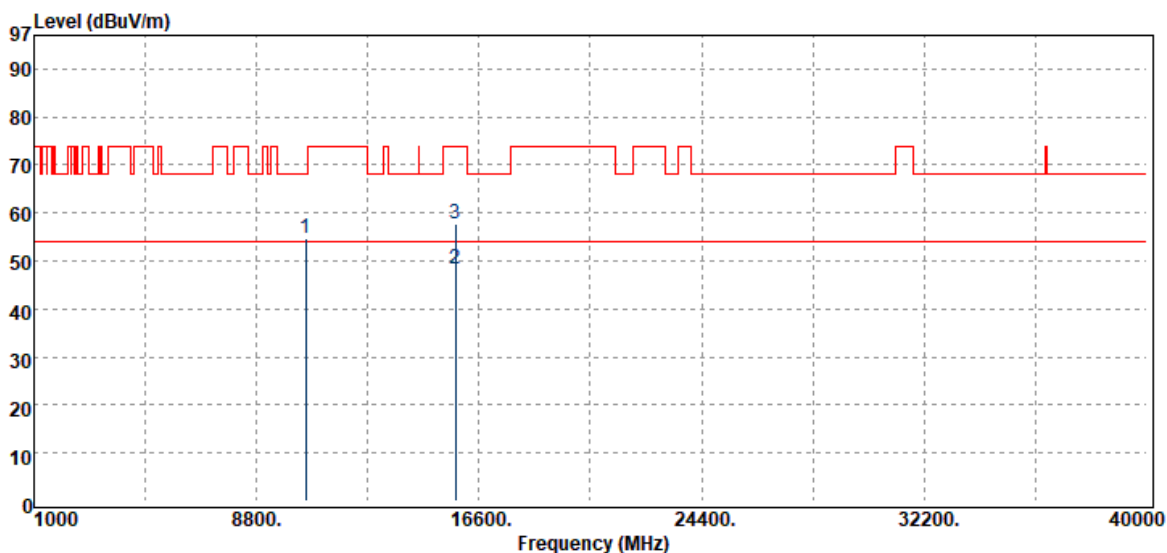
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5260 MHz  
 Test Mode :Tx CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10520.00	Peak	34.48	20.21	54.69	68.20	-13.51
15780.00	Average	24.15	24.28	48.43	54.00	-5.57
15780.00	Peak	33.30	24.28	57.58	74.00	-16.42

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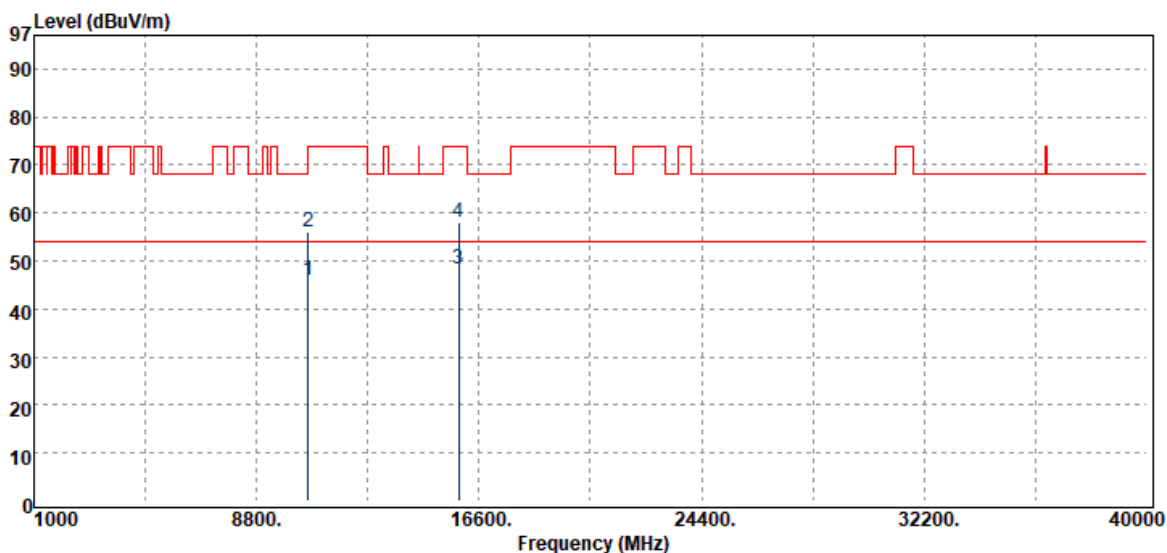
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5300 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10600.00	Average	25.25	20.78	46.03	54.00	-7.97
10600.00	Peak	35.25	20.78	56.03	74.00	-17.97
15900.00	Average	23.88	24.38	48.26	54.00	-5.74
15900.00	Peak	33.66	24.38	58.04	74.00	-15.96

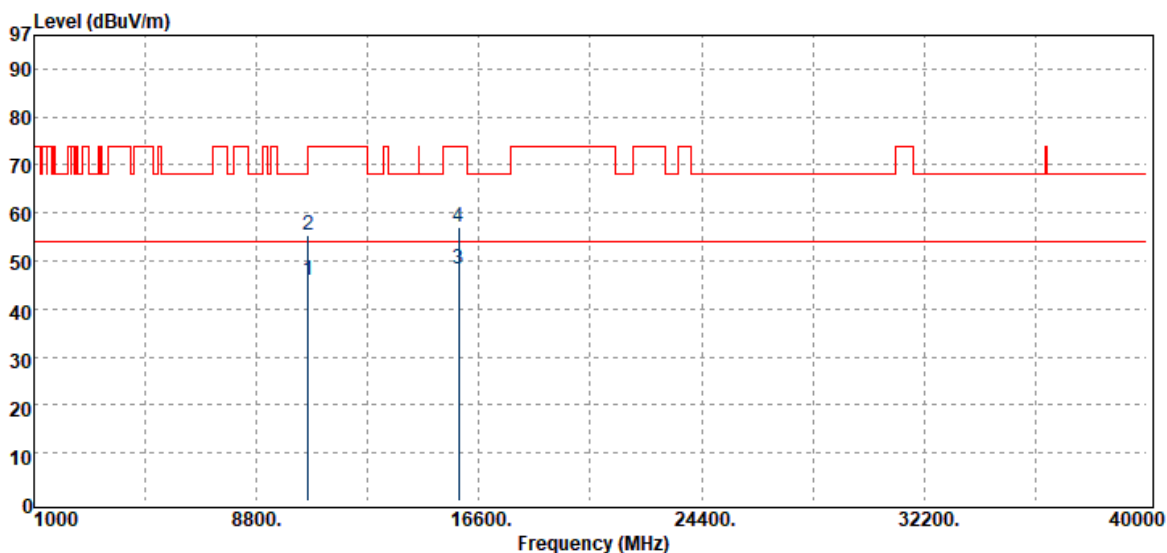
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5300 MHz  
 Test Mode :Tx CH Mid  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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
10600.00	Average	25.13	20.78	45.91	54.00	-8.09
10600.00	Peak	34.51	20.78	55.29	74.00	-18.71
15900.00	Average	24.06	24.38	48.44	54.00	-5.56
15900.00	Peak	32.81	24.38	57.19	74.00	-16.81

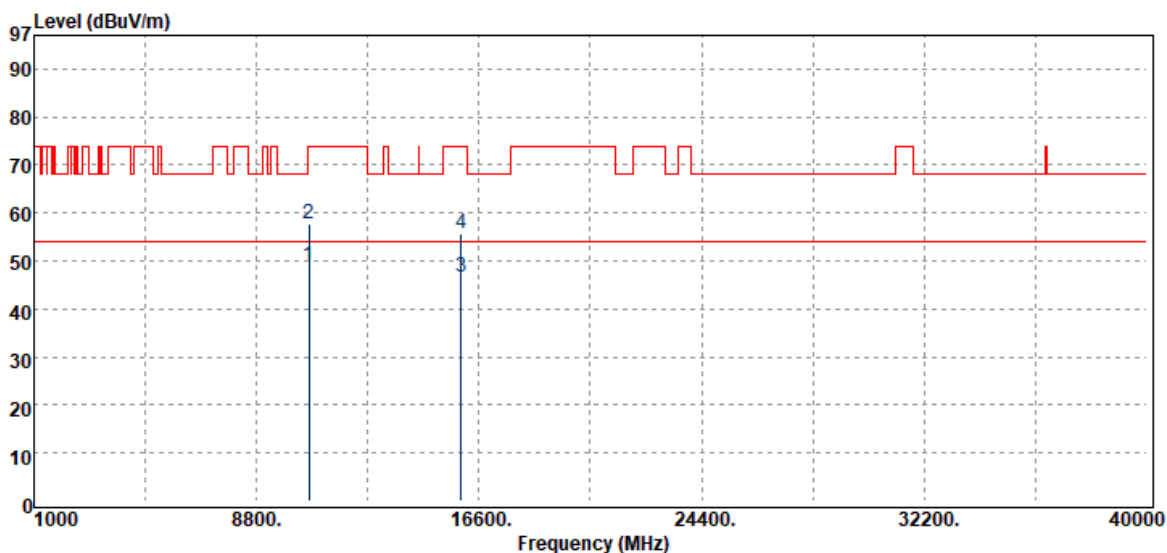
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5320 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



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
10640.00	Average	28.32	20.69	49.01	54.00	-4.99
10640.00	Peak	36.88	20.69	57.57	74.00	-16.43
15960.00	Average	23.70	22.82	46.52	54.00	-7.48
15960.00	Peak	32.91	22.82	55.73	74.00	-18.27

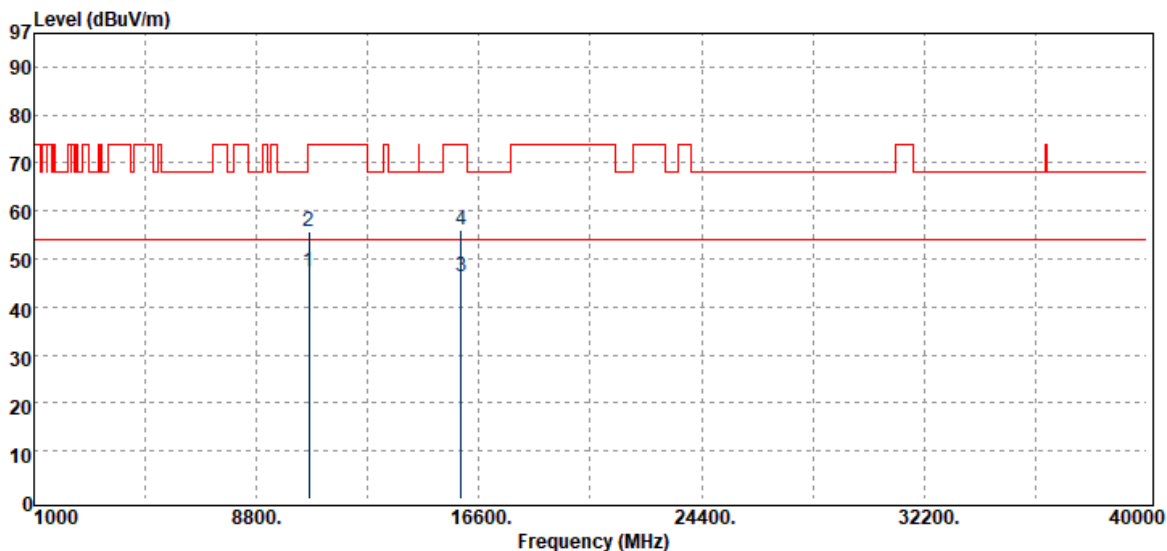
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5320 MHz  
 Test Mode :Tx CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-21  
 Temp./Humi. :26.6/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10640.00	Average	26.54	20.69	47.23	54.00	-6.77
10640.00	Peak	35.04	20.69	55.73	74.00	-18.27
15960.00	Average	23.62	22.82	46.44	54.00	-7.56
15960.00	Peak	33.11	22.82	55.93	74.00	-18.07

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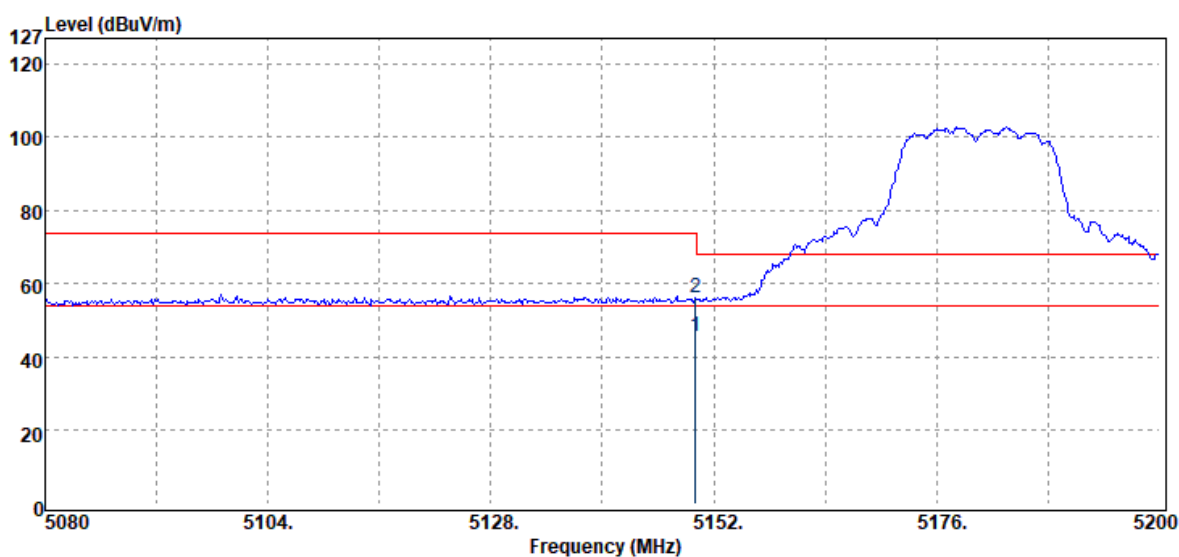
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### 9.7.3 Band edge falling to restricted band

Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5180 MHz  
 Test Mode :Bandedge CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



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	37.16	8.53	45.69	54.00	-8.31
5150.00	Peak	47.69	8.53	56.22	74.00	-17.78

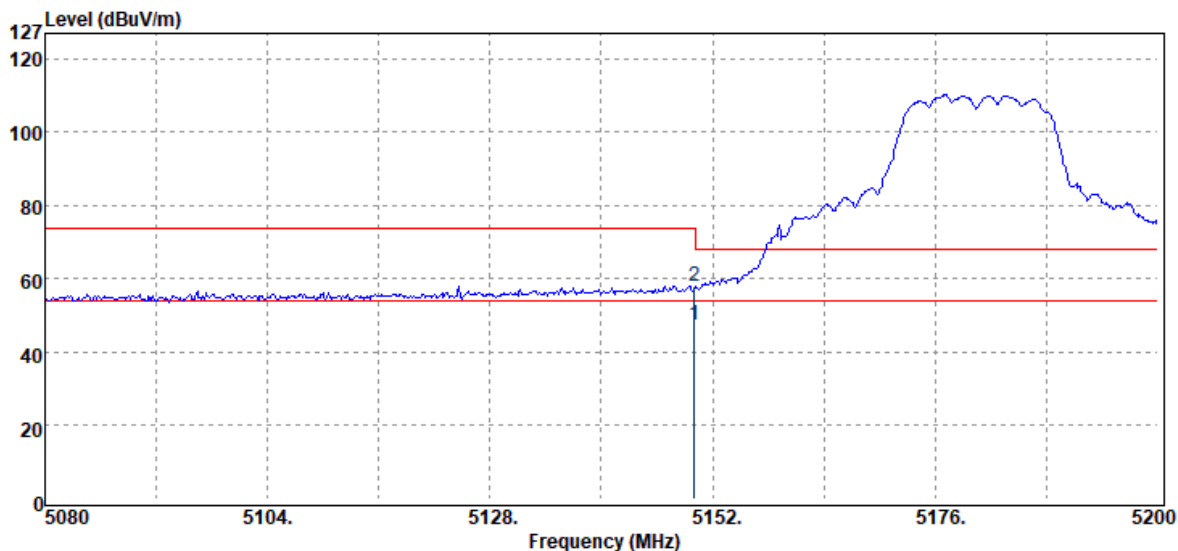
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5180 MHz  
 Test Mode :Bandedge CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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	38.99	8.53	47.52	54.00	-6.48
5150.00	Peak	49.38	8.53	57.91	74.00	-16.09

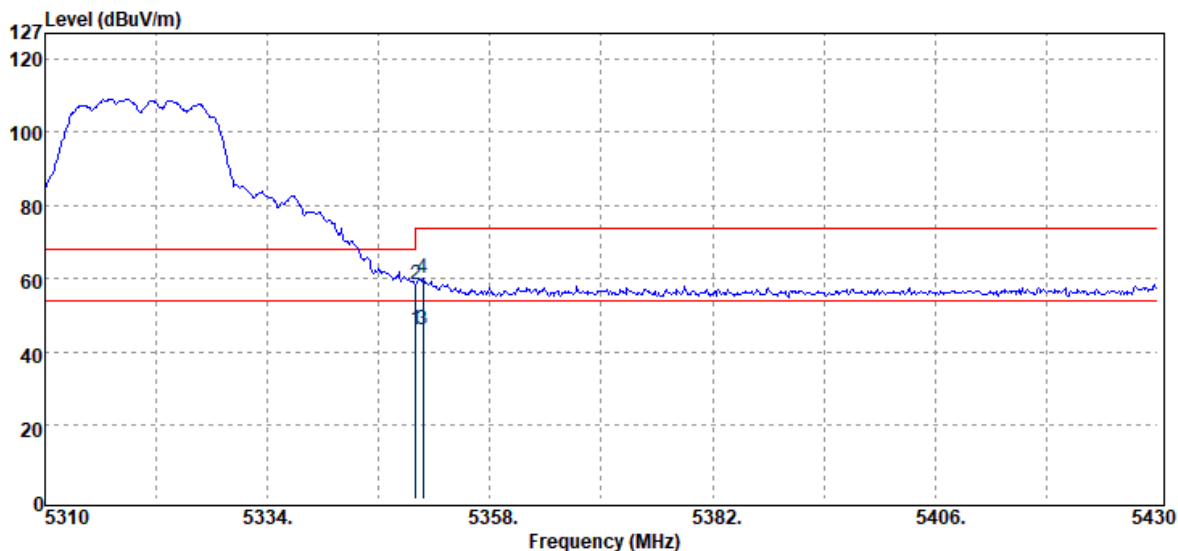
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5320 MHz  
 Test Mode :Bandedge CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	37.53	8.77	46.30	54.00	-7.70
5350.00	Peak	49.72	8.77	58.49	74.00	-15.51
5350.80	Average	37.53	8.76	46.29	54.00	-7.71
5350.80	Peak	51.23	8.76	59.99	74.00	-14.01

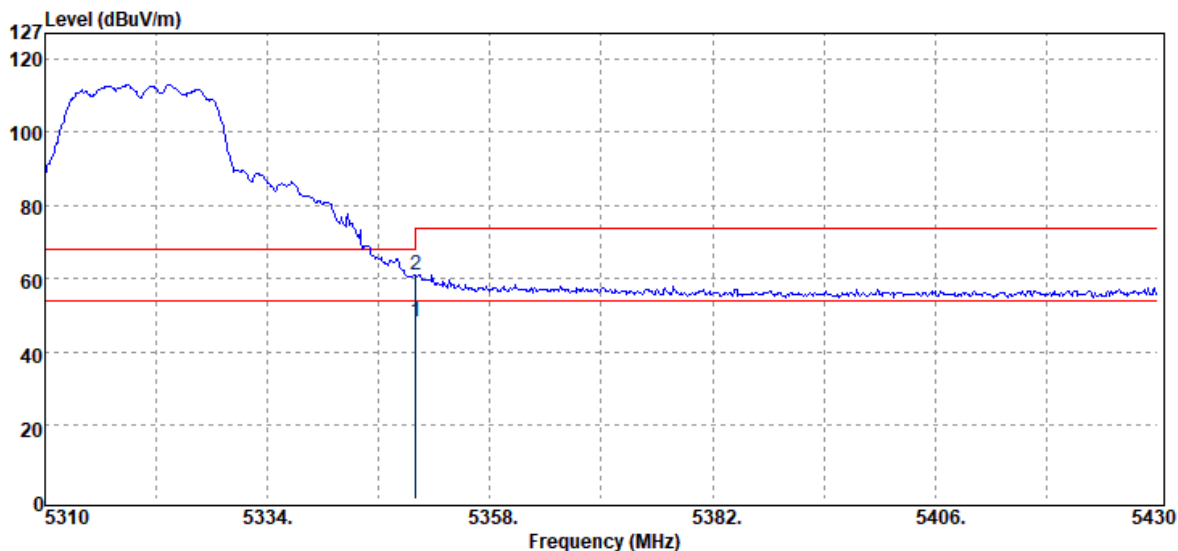
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11a  
 Test Frequency :5320 MHz  
 Test Mode :Bandedge CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	39.44	8.77	48.21	54.00	-5.79
5350.00	Peak	52.29	8.77	61.06	74.00	-12.94

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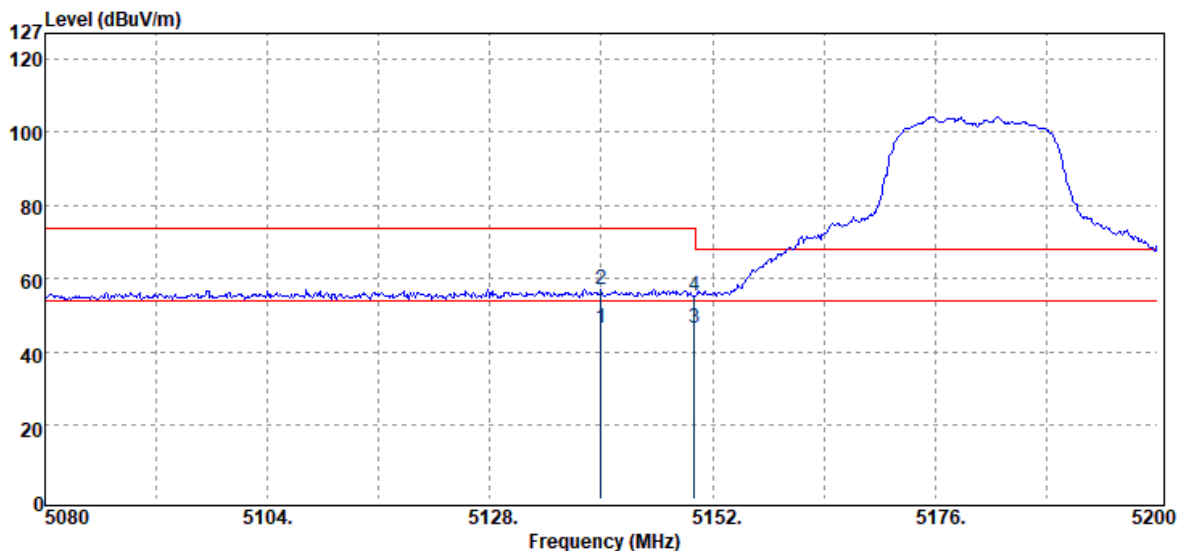
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5180 MHz  
 Test Mode :Bandedge CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5140.00	Average	37.87	8.55	46.42	54.00	-7.58
5140.00	Peak	48.51	8.55	57.06	74.00	-16.94
5150.00	Average	37.99	8.53	46.52	54.00	-7.48
5150.00	Peak	47.03	8.53	55.56	74.00	-18.44

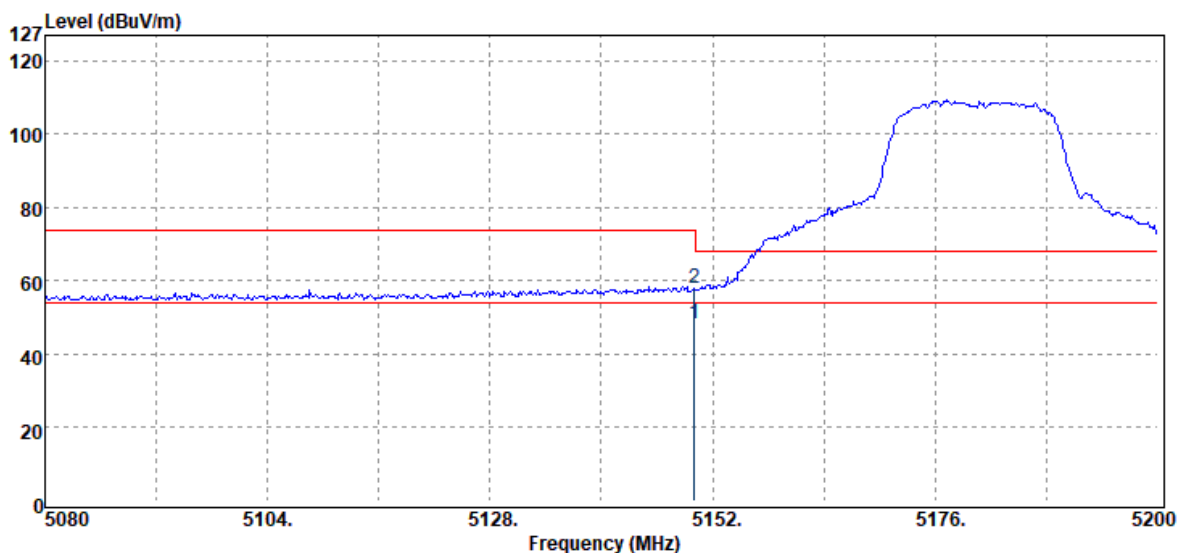
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5180 MHz  
 Test Mode :Bandedge CH Low  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



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	39.82	8.53	48.35	54.00	-5.65
5150.00	Peak	49.38	8.53	57.91	74.00	-16.09

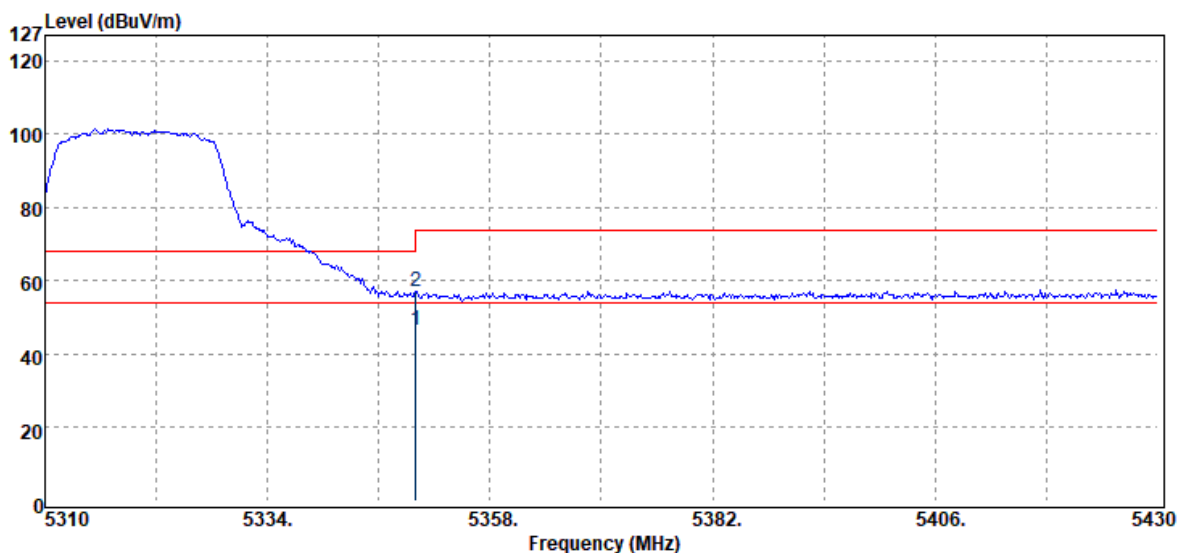
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 Operation Mode :802.11n20  
 Test Frequency :5320 MHz  
 Test Mode :Bandedge CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :VERTICAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	37.77	8.77	46.54	54.00	-7.46
5350.00	Peak	48.24	8.77	57.01	74.00	-16.99

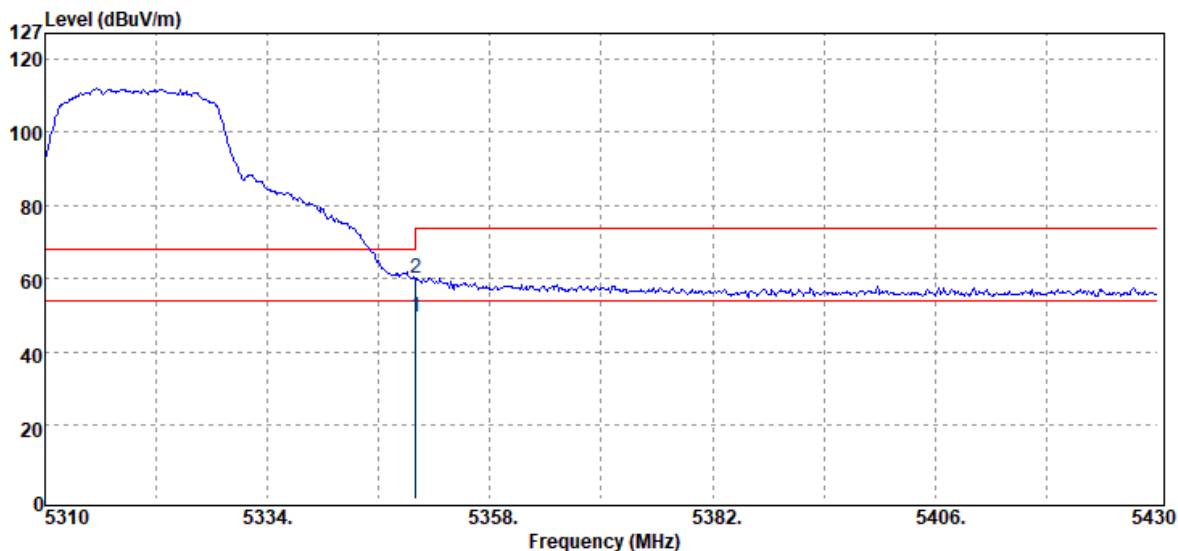
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Report Number :ER-2017-C0087-01  
 Operation Mode :802.11n20  
 Test Frequency :5320 MHz  
 Test Mode :Bandedge CH High  
 EUT Pol :H Plane

Test Site :SAC 3  
 Test Date :2021-07-20  
 Temp./Humi. :27.8/50  
 Antenna Pol. :HORIZONTAL  
 Engineer :Nick Lin



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
5350.00	Average	41.00	8.77	49.77	54.00	-4.23
5350.00	Peak	51.43	8.77	60.20	74.00	-13.80

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## 10 ANTENNA REQUIREMENT

### 10.1 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.

### 10.2 Antenna Connected Construction

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

*~ End of Report ~*

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