

# TESTREPORT

Applicant Name : Reolink Innovation Limited  
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Report Number : SZNS221014-47078E-RF-00  
FCC ID: 2AYHE-2208D

## Test Standard (s)

FCC PART 15.407

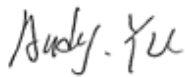
## Sample Description

Product Type: WiFi IP Camera  
Model No.: Reolink TrackMix  
Multiple Model(s) No.: N/A  
Trade Mark: Reolink  
Date Received: 2022/10/14  
Report Date: 2023/01/17

Test Result:	Pass*
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\* In the configuration tested, the EUT complied with the standards above.

## Prepared and Checked By:



Andy Yu  
EMC Engineer

## Approved By:



Candy Li  
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "\*" .

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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Frequency Range	5G Wi-Fi: 5150-5250MHz; 5725-5850MHz
Mode	802.11a/n20
Maximum Conducted Average Output Power	5150-5250 MHz: 13.79dBm 5725-5850 MHz: 13.15dBm
Modulation Technique	OFDM
Antenna Specification*	B1: 3.75dBi, B4 : 4.29dBi (provided by applicant)
Voltage Range	DC7.2V from battery or DC 5.0V from USB
Sample serial number	1MAA-1 for Conducted and Radiated Emissions 1N1S-4 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition

### Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

## Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz- 18GHz	4.98dB
	18GHz- 26.5GHz	5.06dB
	26.5GHz- 40GHz	4.72dB
Temperature		1°C
Humidity		6%
Supply voltages		0.4%

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor  $K$  with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

For 5150-5250MHz Band, 4 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

For 802.11a, 802.11n20 mode: channel 36, 40, 48 were tested.

For 5725-5850MHz Band, 5 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785	/	/

For 802.11a, 802.11n20 mode: channel 149, 157, 165 were tested.

### EUT Exercise Software

“CC3xxxRadioTool-1.0.3.16\*” was used. The software and power level was provided by the manufacturer.

The worst case was performed under:

U-NII	Mode	Data rate	Power Level		
			Low Channel	Middle Channel	High Channel
5150 – 5250MHz	802.11a	6Mbps	0	0	0
	802.11n-HT20	MCS0	0	0	0
5725 – 5850MHz	802.11a	6Mbps	0	0	0
	802.11n-HT20	MCS0	0	0	0

### Duty cycle

Test Result: Pass. Please refer to the Appendix.

### Equipment Modifications

No modification was made to the EUT tested.

### Support Equipment List and Details

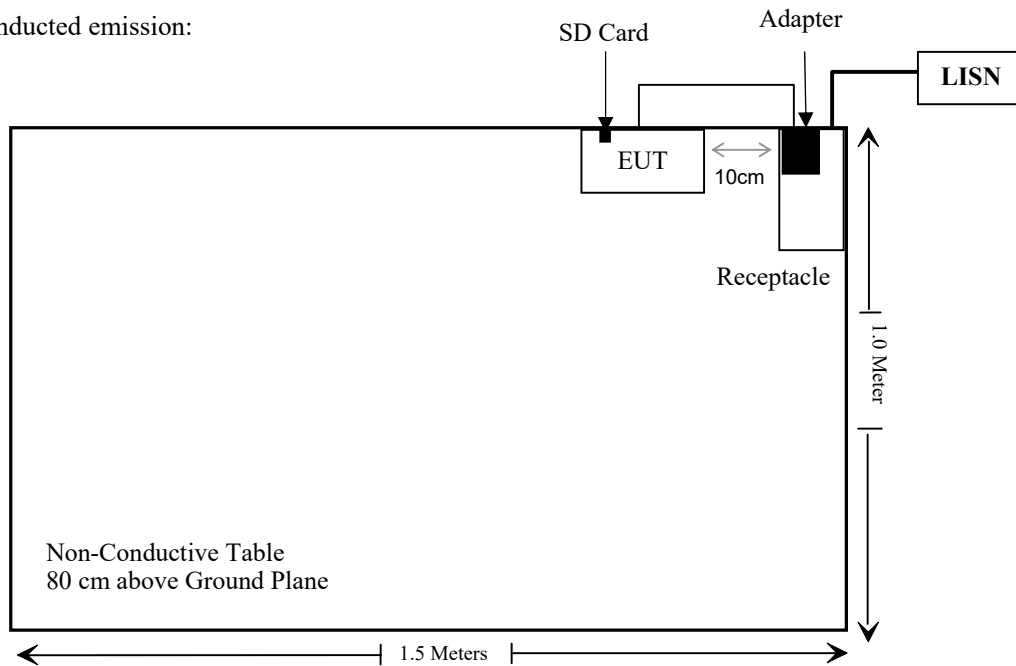
Manufacturer	Description	Model	Serial Number
Unknown	SD Card	Unknown	Unknown
Infinix	Adapter	U100XSA	Unknown
HuaJin	Adapter	HJ-0502000W2-US	Unknown

### External I/O Cable

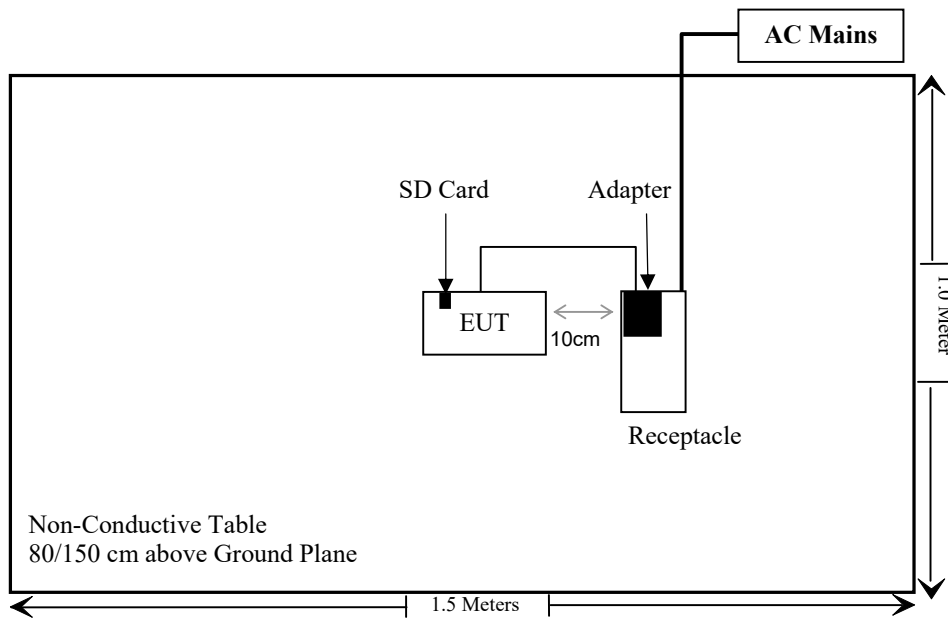
Cable Description	Length (m)	From/Port	To
Un-shielding Detachable USB Cable	1.0	EUT	Adapter

### Block Diagram of Test Setup

For conducted emission:



For radiated emission:





**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§1.1307 (b) (3) & §2.1091	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(9)& §15.207(a)	Conducted Emissions	Compliant
§15.205& §15.209 &§15.407(b)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliant
§15.407(a)	Conducted Transmitter Output Power	Compliant
§15.407 (a)	Power Spectral Density	Compliant
§15.407 (h)	Transmit Power Control (TPC)	Not Applicable
§15.407 (h)	Dynamic Frequency Selection (DFS)	Not Applicable

Not Applicable: the EUT not operate within the DFS frequency bands.

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2022/11/25	2023/11/24
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2022/11/25	2023/11/24
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2022/12/07	2023/12/06
Unknown	RF Coaxial Cable	No.17	N0350	2022/11/25	2023/11/24
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.15	N600	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.16	N650	2022/11/25	2023/11/24
CD	Band Reject Filter	BRM-5.15/5.35g-45	075	2022/11/25	2023/11/24
CD	Band Reject Filter	BRM-5.725/5.875G-45	065	2022/11/25	2023/11/24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/01/19	2023/01/18
Tonscend	RF Control Unit	JS0806-2	19G8060182	2022/10/24	2023/10/23
HP	20dB Attenuator	8491A	53857	2021/12/14	2022/12/13
HP	20dB Attenuator	8491A	53857	2022/11/25	2023/11/24
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Unknown	RF Cable	Unknown	1	Each time	

\* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## FCC §15.407 (f) & §1.1307 (b) (3) & §2.1091- RF Exposure

### Applicable Standard

According to subpart 15.407 (f) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$ .
1.34-30	$3,450 R^2/f^2$ .
30-300	$3.83 R^2$ .
300-1,500	$0.0128 R^2 f$ .
1,500-100,000	$19.2 R^2$ .

R is the minimum separation distance in meters

f = frequency in MHz

### Result

Frequency (MHz)	Tune up conducted power	Antenna Gain		ERP		Evaluation Distance (m)	ERP Limit (W)
	(dBm)	(dBi)	(dBd)	(dBm)	(W)		
2412-2462	19.0	3.12	0.97	19.97	0.093	0.2	0.768
5150-5250	14.0	3.75	1.60	15.60	0.036	0.2	0.768
5725-5850	14.0	4.29	2.14	16.24	0.042	0.2	0.768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.

2. The 2.4GHz wifi and 5GHz wifi cannot transmit at same time.

3. 0dBd=2.15dBi.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

**Result: Compliant.**

## **FCC §15.203 – ANTENNA REQUIREMENT**

### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has one integral antennas arrangement for 5G Wi-Fi, which were permanently attached to the EUT. Please refer to the EUT photos.

Type	Antenna Gain	Impedance	Frequency Range
integral	3.75dBi	50 $\Omega$	5150-5250MHz
	4.29dBi	50 $\Omega$	5725-5850MHz

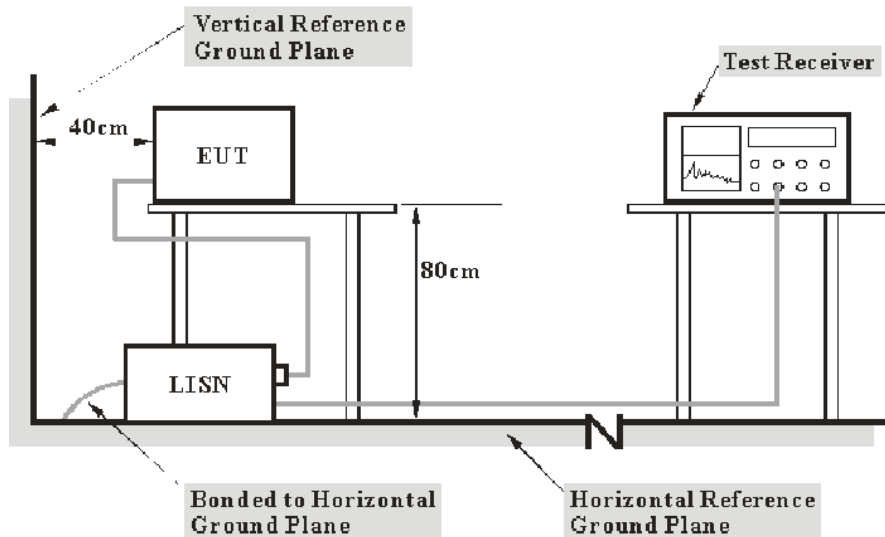
**Result:** Compliant.

## FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207, §15.407(b) (6)

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and Average detection mode.

## Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss. The basic equation is as follows:

$$\text{Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\begin{aligned}\text{Over Limit} &= \text{Level} - \text{Limit} \\ \text{Level} &= \text{Reading level} + \text{Factor}\end{aligned}$$

## Test Data

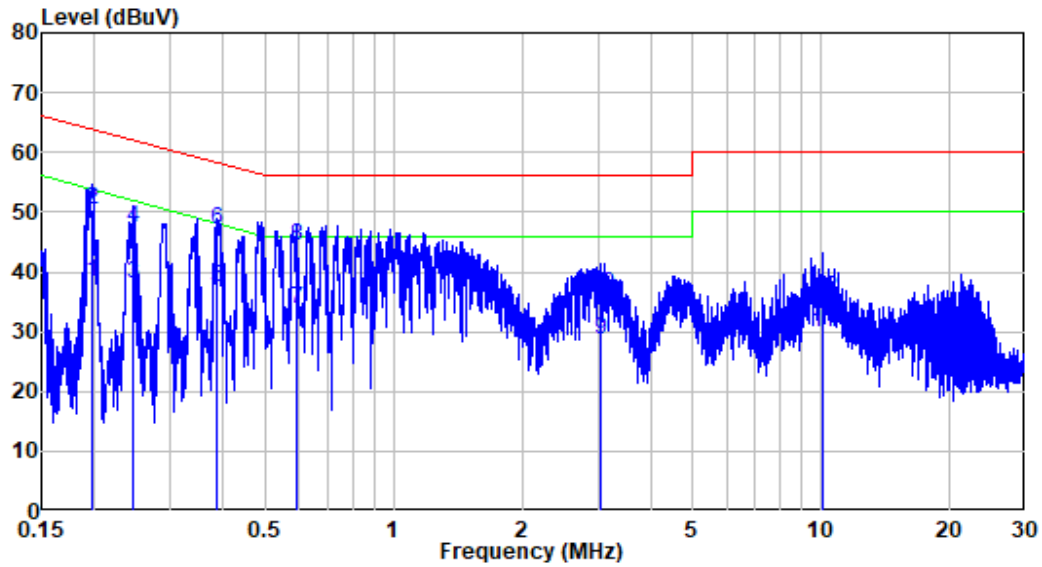
### Environmental Conditions

<b>Temperature:</b>	20°C
<b>Relative Humidity:</b>	74 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Jie Chen on 2022-12-16.*

*EUT operation mode: Transmitting (worst case for 802.11 a 5240MHz)*

**AC 120V/60 Hz, Line**

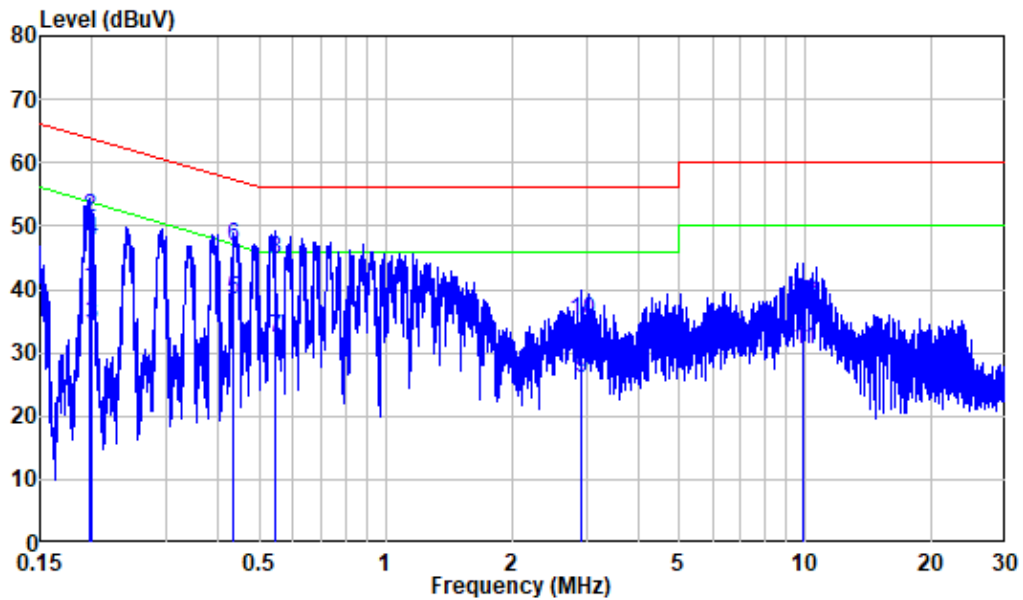


Site : Shielding Room  
 Condition: Line  
 Job No. : SZNS221014-47078E-RF  
 Mode : 5G WIFI  
 Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.198	9.80	28.56	38.36	53.70	-15.34	Average
2	0.198	9.80	40.66	50.46	63.70	-13.24	QP
3	0.246	9.80	28.10	37.90	51.89	-13.99	Average
4	0.246	9.80	37.71	47.51	61.89	-14.38	QP
5	0.386	9.80	27.69	37.49	48.15	-10.66	Average
6	0.386	9.80	37.27	47.07	58.15	-11.08	QP
7	0.591	9.81	24.03	33.84	46.00	-12.16	Average
8	0.591	9.81	34.53	44.34	56.00	-11.66	QP
9	3.039	9.83	18.76	28.59	46.00	-17.41	Average
10	3.039	9.83	26.52	36.35	56.00	-19.65	QP
11	10.059	9.90	20.00	29.90	50.00	-20.10	Average
12	10.059	9.90	25.73	35.63	60.00	-24.37	QP



**AC 120V/60 Hz, Neutral**



Site : Shielding Room  
 Condition: Neutral  
 Job No. : SZNS221014-47078E-RF  
 Mode : 5G WIFI  
 Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.197	9.80	30.40	40.20	53.76	-13.56	Average
2	0.197	9.80	41.56	51.36	63.76	-12.40	QP
3	0.200	9.80	24.54	34.34	53.61	-19.27	Average
4	0.200	9.80	37.96	47.76	63.61	-15.85	QP
5	0.435	9.80	28.40	38.20	47.17	-8.97	Average
6	0.435	9.80	36.93	46.73	57.17	-10.44	QP
7	0.545	9.81	22.49	32.30	46.00	-13.70	Average
8	0.545	9.81	34.89	44.70	56.00	-11.30	QP
9	2.933	9.83	16.26	26.09	46.00	-19.91	Average
10	2.933	9.83	25.12	34.95	56.00	-21.05	QP
11	9.893	10.00	20.47	30.47	50.00	-19.53	Average
12	9.893	10.00	27.87	37.87	60.00	-22.13	QP

## §15.205 & §15.209 & §15.407(B)– UNDESIRABLE EMISSION

### Applicable Standard

FCC §15.407 (b); §15.209; §15.205;

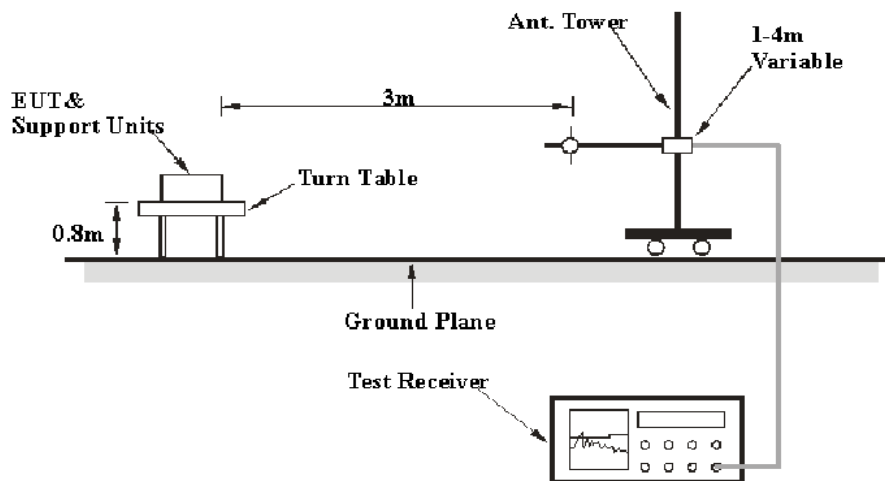
(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

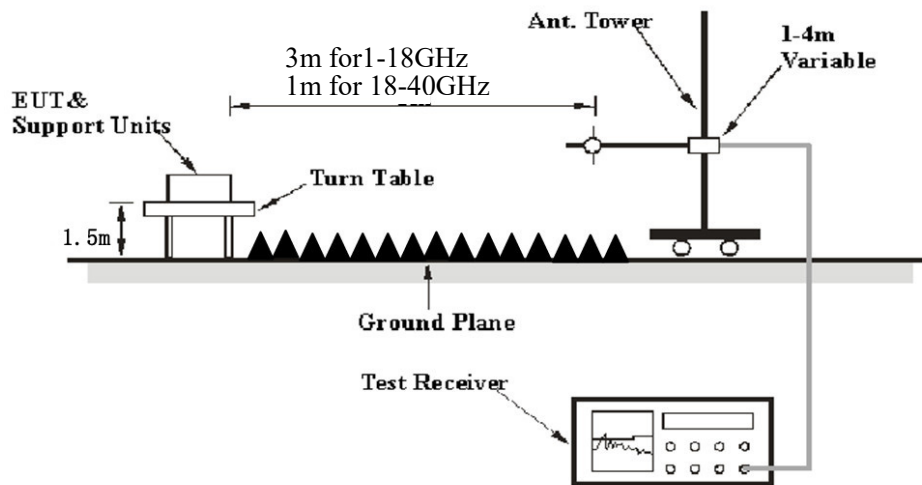
- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
  - (i) 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.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

### EUT Setup

#### Below 1 GHz:



**Above 1 GHz:**

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1MHz	10 Hz <sup>Note 1</sup>	/	Average
	1MHz	> 1/T <sup>Note 2</sup>	/	Average

Note 1: when duty cycle is no less than 98%

Note 2: when duty cycle is less than 98%

**Test Procedure****Radiated Spurious Emission**

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Average detection modes for frequencies above 1GHz.

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified, extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\text{SpecLimit}} = E_{\text{Meas}} + 20 \log \left( \frac{d_{\text{Meas}}}{d_{\text{SpecLimit}}} \right)$$

where

$E_{\text{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dB $\mu$ V/m
$E_{\text{Meas}}$	is the field strength of the emission at the measurement distance, in dB $\mu$ V/m
$d_{\text{Meas}}$	is the measurement distance, in m
$d_{\text{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is  $20 * \log(1/3) = -9.5$  dB, for 18-40GHz range, the limit of 1m distance was added by 9.5dB from limit of 3m to compared with the result measurement at 1m distance.

### Corrected Factor & Margin Calculation

The Corrected Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin/Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin/over limit of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\begin{aligned} \text{Margin/Over limit} &= \text{Corrected Amplitude/Level} - \text{Limit} \\ \text{Corrected Amplitude/Level} &= \text{Reading} + \text{Factor} \end{aligned}$$

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	24~28.8°C
<b>Relative Humidity:</b>	52~56 %
<b>ATM Pressure:</b>	101.0 kPa

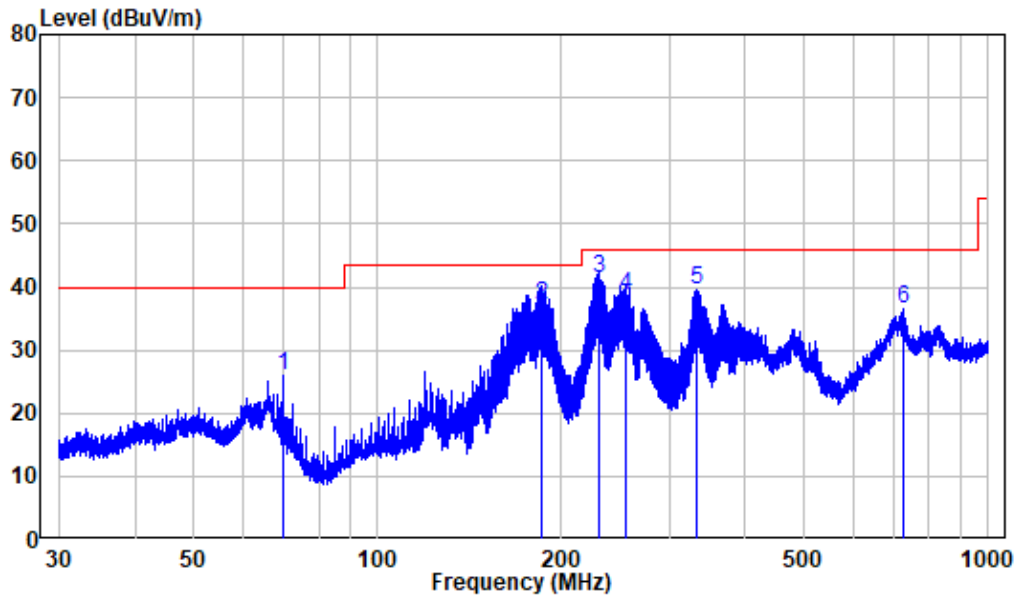
*The testing was performed by Jason Liu on 2022-12-19 for below 1GHz and Jimi Zheng on 2022-12-27 for above 1GHz.*

*EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axes of orientation was recorded)*

**30MHz-1GHz: (worst case for 802.11 a 5240MHz)**

*Note: When the test result of Peak was less than the limit of QP more than 6dB, just the peak value was recorded.*

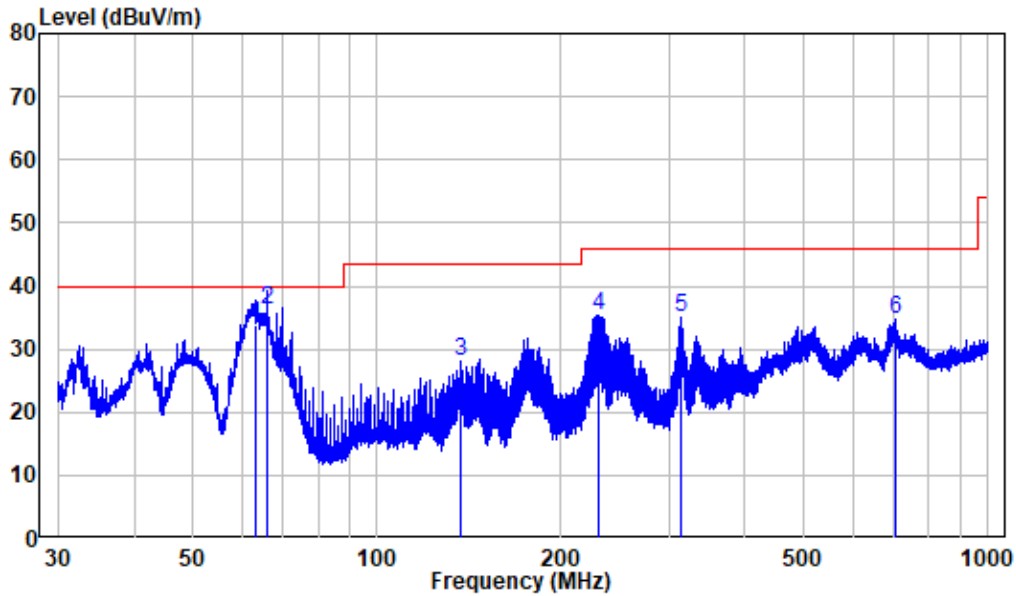
Horizontal



Site : chamber  
 Condition: 3m HORIZONTAL  
 Job No. : SZNS221014-47078E-RF  
 Test Mode: 5G WIFI transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	69.814	-14.70	40.58	25.88	40.00	-14.12	Peak
2	185.300	-12.15	49.31	37.16	43.50	-6.34	QP
3	229.796	-11.12	52.40	41.28	46.00	-4.72	QP
4	255.175	-10.61	49.20	38.59	46.00	-7.41	QP
5	332.810	-7.78	47.40	39.62	46.00	-6.38	Peak
6	728.719	-1.01	37.41	36.40	46.00	-9.60	Peak

Vertical



Site : chamber  
 Condition: 3m VERTICAL  
 Job No. : SZNS221014-47078E-RF  
 Test Mode: 5G WIFI transmitting

	Freq Factor		Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	63.424	-11.94	45.89	33.95	40.00	-6.05	QP
2	65.976	-12.88	49.10	36.22	40.00	-3.78	QP
3	137.119	-15.23	43.36	28.13	43.50	-15.37	Peak
4	229.695	-11.12	46.38	35.26	46.00	-10.74	Peak
5	313.551	-8.77	43.87	35.10	46.00	-10.90	Peak
6	707.010	-1.48	36.05	34.57	46.00	-11.43	Peak

**Above 1GHz:****5150-5250 MHz:**

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11a									
5180 MHz									
4500	64.95	PK	123	2.4	H	-4.72	60.23	74	-13.77
4500	50.88	AV	123	2.4	H	-4.72	46.16	54	-7.84
4500	64.78	PK	33	1.1	V	-4.72	60.06	74	-13.94
4500	51.31	AV	33	1.1	V	-4.72	46.59	54	-7.41
5150	64.76	PK	320	1.5	H	-2.73	62.03	74	-11.97
5150	51.46	AV	320	1.5	H	-2.73	48.73	54	-5.27
5150	65.19	PK	220	1.9	V	-2.73	62.46	74	-11.54
5150	51.05	AV	220	1.9	V	-2.73	48.32	54	-5.68
10360	55.87	PK	272	1.5	H	8.12	63.99	68.2	-4.21
10360	55.73	PK	269	1.5	V	8.12	63.85	68.2	-4.35
5200 MHz									
10400	55.34	PK	155	1	H	8.24	63.58	68.2	-4.62
10400	55.53	PK	280	1	V	8.24	63.77	68.2	-4.43
5240 MHz									
5350	64.10	PK	147	1.4	H	-2.33	61.77	74	-12.23
5350	51.35	AV	147	1.4	H	-2.33	49.02	54	-4.98
5350	64.27	PK	2	2.3	V	-2.33	61.94	74	-12.06
5350	50.98	AV	2	2.3	V	-2.33	48.65	54	-5.35
5460	65.07	PK	236	1.5	H	-2.26	62.81	74	-11.19
5460	51.85	AV	236	1.5	H	-2.26	49.59	54	-4.41
5460	65.18	PK	71	1.7	V	-2.26	62.92	74	-11.08
5460	52.01	AV	71	1.7	V	-2.26	49.75	54	-4.25
10480	55.47	PK	239	1.2	H	8.56	64.03	68.2	-4.17
10480	55.51	PK	47	1.2	V	8.56	64.07	68.2	-4.13

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	PK/Ave		Height (m)	Polar (H/V)				
802.11n20									
5180 MHz									
4500	65.22	PK	303	1.9	H	-4.72	60.50	74	-13.50
4500	51.31	AV	303	1.9	H	-4.72	46.59	54	-7.41
4500	64.63	PK	272	1.7	V	-4.72	59.91	74	-14.09
4500	50.39	AV	272	1.7	V	-4.72	45.67	54	-8.33
5150	64.98	PK	272	2	H	-2.73	62.25	74	-11.75
5150	50.94	AV	272	2	H	-2.73	48.21	54	-5.79
5150	65.26	PK	111	2	V	-2.73	62.53	74	-11.47
5150	50.95	AV	111	2	V	-2.73	48.22	54	-5.78
10360	55.97	PK	11	1.6	H	8.12	64.09	68.2	-4.11
10360	55.36	PK	101	1.6	V	8.12	63.48	68.2	-4.72
5200 MHz									
10400	55.73	PK	322	1.5	H	8.24	63.97	68.2	-4.23
10400	54.68	PK	72	1.5	V	8.24	62.92	68.2	-5.28
5240 MHz									
5350	64.08	PK	303	1.5	H	-2.33	61.75	74	-12.25
5350	50.04	AV	303	1.5	H	-2.33	47.71	54	-6.29
5350	64.05	PK	198	1.2	V	-2.33	61.72	74	-12.28
5350	50.40	AV	198	1.2	V	-2.33	48.07	54	-5.93
5460	65.02	PK	152	1.5	H	-2.26	62.76	74	-11.24
5460	51.09	AV	152	1.5	H	-2.26	48.83	54	-5.17
5460	65.22	PK	241	2.3	V	-2.26	62.96	74	-11.04
5460	50.95	AV	241	2.3	V	-2.26	48.69	54	-5.31
10480	55.22	PK	174	1.3	H	8.56	63.78	68.2	-4.42
10480	56.10	PK	190	1.3	V	8.56	64.66	68.2	-3.54



## 5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	PK/Ave		Height (m)	Polar (H/V)				
802.11a									
5745MHz									
5650	64.46	PK	300	1.6	H	-1.95	62.51	68.2	-5.69
5700	65.21	PK	26	2.2	H	-2.02	63.19	105.2	-42.01
5720	65.31	PK	129	1.9	H	-1.97	63.34	110.8	-47.46
5725	70.38	PK	72	1.7	H	-1.96	68.42	122.2	-53.78
5650	64.60	PK	101	1.5	V	-1.95	62.65	68.2	-5.55
5700	65.65	PK	269	2.2	V	-2.02	63.63	105.2	-41.57
5720	67.62	PK	247	2.5	V	-1.97	65.65	110.8	-45.15
5725	73.55	PK	260	2.4	V	-1.96	71.59	122.2	-50.61
11490	54.85	PK	340	1.9	H	6.63	61.48	74	-12.52
11490	42.67	AV	356	1.9	H	6.63	49.30	54	-4.70
11490	54.67	PK	86	1.4	V	6.63	61.30	74	-12.70
11490	42.75	AV	226	1.4	V	6.63	49.38	54	-4.62
5785MHz									
11570	55.04	PK	301	2.3	H	6.59	61.63	74	-12.37
11570	42.99	AV	191	2.3	H	6.59	49.58	54	-4.42
11570	54.95	PK	123	2	V	6.59	61.54	74	-12.46
11570	42.97	AV	255	2	V	6.59	49.56	54	-4.44
5825MHz									
5850	65.82	PK	313	2.4	H	-1.81	64.01	122.2	-58.19
5855	64.71	PK	164	1.7	H	-1.82	62.89	110.8	-47.91
5875	64.27	PK	320	1.2	H	-1.84	62.43	105.2	-42.77
5925	63.54	PK	114	2.5	H	-1.82	61.72	68.2	-6.48
5850	65.60	PK	133	1.8	V	-1.81	63.79	122.2	-58.41
5855	64.46	PK	105	2	V	-1.82	62.64	110.8	-48.16
5875	63.62	PK	197	2	V	-1.84	61.78	105.2	-43.42
5925	64.41	PK	242	1.5	V	-1.82	62.59	68.2	-5.61
11650	55.13	PK	321	1.9	H	6.77	61.90	74	-12.10
11650	42.43	AV	358	1.9	H	6.77	49.20	54	-4.80
11650	54.80	PK	108	1.5	V	6.77	61.57	74	-12.43
11650	42.39	AV	39	1.5	V	6.77	49.16	54	-4.84

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	PK/Ave		Height (m)	Polar (H/V)				
802.11n20									
5745MHz									
5650	64.33	PK	43	2.2	H	-1.95	62.38	68.2	-5.82
5700	65.49	PK	61	2.1	H	-2.02	63.47	105.2	-41.73
5720	67.06	PK	300	1.4	H	-1.97	65.09	110.8	-45.71
5725	70.59	PK	76	2.3	H	-1.96	68.63	122.2	-53.57
5650	64.34	PK	153	1.9	V	-1.95	62.39	68.2	-5.81
5700	65.26	PK	268	1.6	V	-2.02	63.24	105.2	-41.96
5720	69.02	PK	117	1.1	V	-1.97	67.05	110.8	-43.75
5725	73.58	PK	114	1.8	V	-1.96	71.62	122.2	-50.58
11490	55.25	PK	87	1	H	6.63	61.88	74	-12.12
11490	42.78	AV	61	1	H	6.63	49.41	54	-4.59
11490	55.04	PK	289	1.4	V	6.63	61.67	74	-12.33
11490	42.81	AV	253	1.4	V	6.63	49.44	54	-4.56
5785MHz									
11570	55.14	PK	117	2.2	H	6.59	61.73	74	-12.27
11570	43.05	AV	174	2.2	H	6.59	49.64	54	-4.36
11570	55.40	PK	18	2	V	6.59	61.99	74	-12.01
11570	42.72	AV	67	2	V	6.59	49.31	54	-4.69
5825MHz									
5850	65.75	PK	0	2.1	H	-1.81	63.94	122.2	-58.26
5855	64.92	PK	99	1.5	H	-1.82	63.10	110.8	-47.70
5875	64.13	PK	220	1.5	H	-1.84	62.29	105.2	-42.91
5925	64.07	PK	334	2.2	H	-1.82	62.25	68.2	-5.95
5850	65.88	PK	183	2.4	V	-1.81	64.07	122.2	-58.13
5855	64.59	PK	179	1	V	-1.82	62.77	110.8	-48.03
5875	63.69	PK	1	2.4	V	-1.84	61.85	105.2	-43.35
5925	64.45	PK	348	1.2	V	-1.82	62.63	68.2	-5.57
11650	54.72	PK	176	1.1	H	6.77	61.49	74	-12.51
11650	42.26	AV	166	1.1	H	6.77	49.03	54	-4.97
11650	54.92	PK	235	1.6	V	6.77	61.69	74	-12.31
11650	42.50	AV	109	1.6	V	6.77	49.27	54	-4.73

**Note:**

Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Absolute Level (Corrected Amplitude)= Factor + Reading

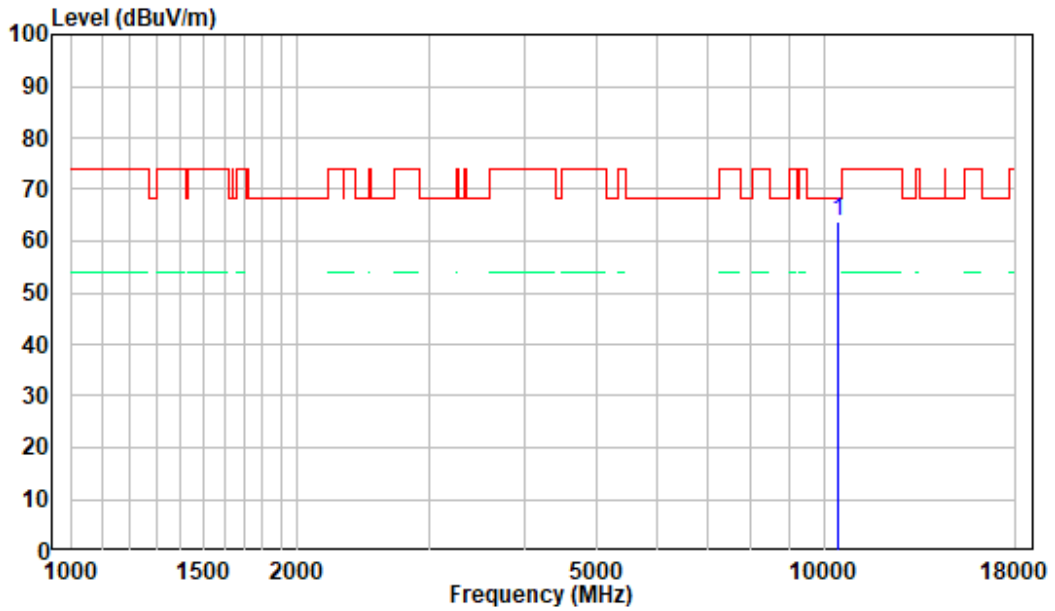
Margin = Absolute Level (Corrected Amplitude) - Limit

The other spurious emission which is 20dB below to the limit or in the noise floor was not recorded.

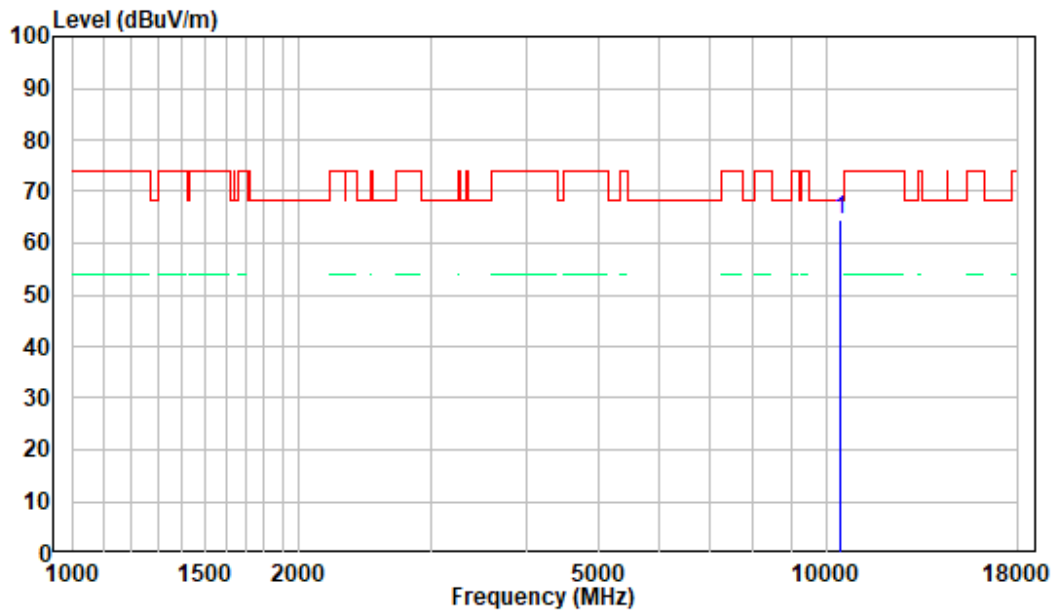
1-18 GHz:

Pre-scan Plots:

802.11n20 5240MHz  
Horizontal



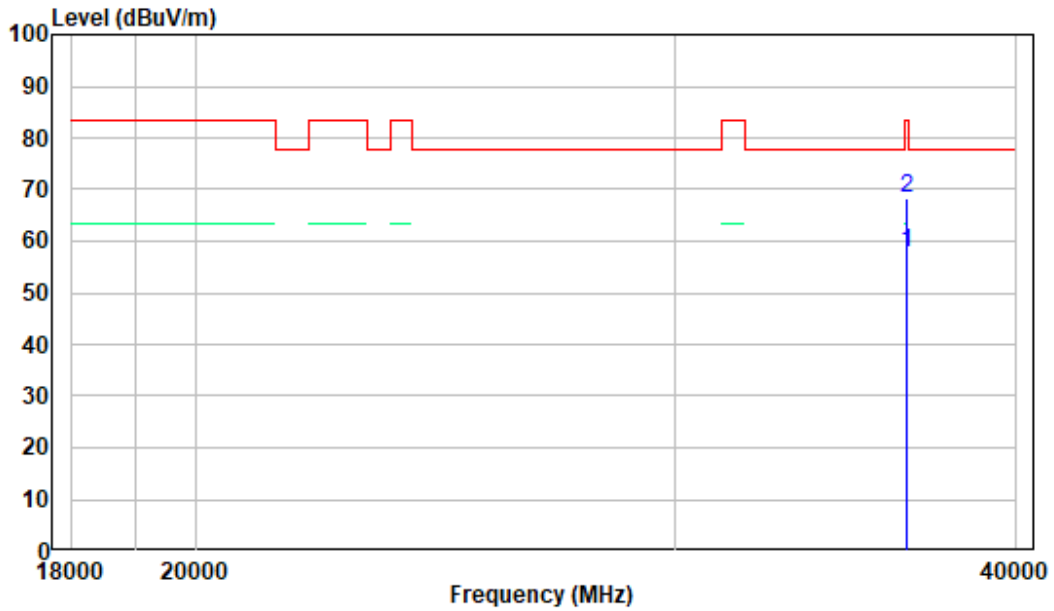
Vertical



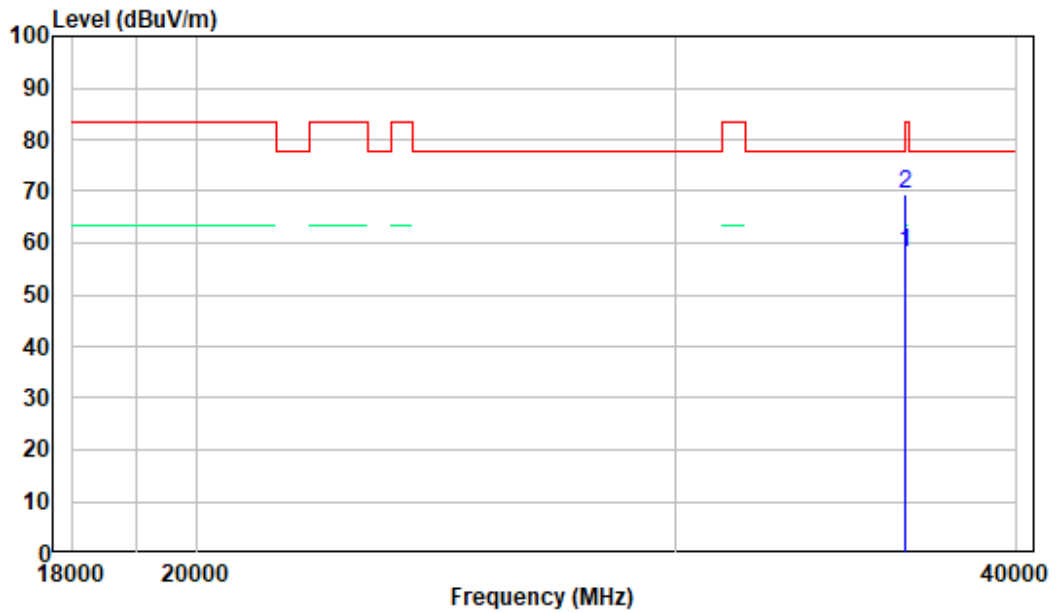
18 -40GHz:

Pre-scan Plots:

802.11n20 5240MHz  
Horizontal



Vertical



## FCC §15.407(a),(e) – 26 dB & 6dB EMISSION BANDWIDTH

### Applicable Standard

The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### Test Procedure

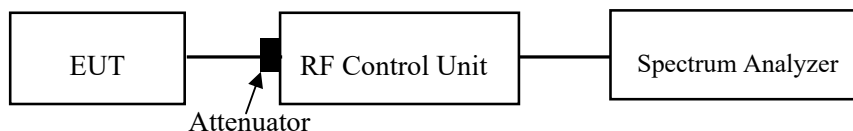
#### 1. Emission Bandwidth (EBW)

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### 2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



**Test Data****Environmental Conditions**

<b>Temperature:</b>	20.5~25.5 °C
<b>Relative Humidity:</b>	51~56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Glenn Jiang on 2022-11-01 and 2023-01-17.*

*EUT operation mode: Transmitting*

**Test Result: Pass**

*Please refer to the Appendix.*

## FCC §15.407(a) – CONDUCTED TRANSMITTER OUTPUT POWER

### Applicable Standard

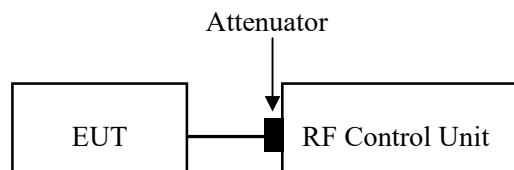
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### Test Procedure

- Place the EUT on a bench and set it in transmitting mode.
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
- Add a correction factor to the display.



Note: the RF control unit has built-in power sensor.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25.5 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Glenn Jiang on 2022-11-01.*

*EUT operation mode: Transmitting*

**Test Result: Pass**

*Please refer to the Appendix.*



## **FCC §15.407(a) - POWER SPECTRAL DENSITY**

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

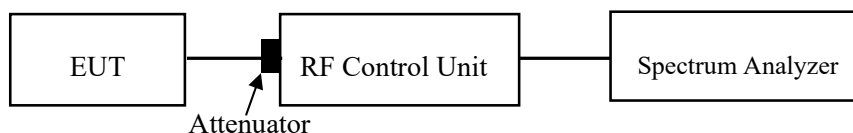
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### **Test Procedure**

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set  $RBW \geq 1/T$ , where T is defined in section II.B.1.a).
- b) Set  $VBW \geq 3 RBW$ .
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log (500 \text{ kHz}/RBW)$  to the measured result, whereas  $RBW (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log (1\text{MHz}/RBW)$  to the measured result, whereas  $RBW (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.



**Test Data****Environmental Conditions**

<b>Temperature:</b>	25.5 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Glenn Jiang on 2022-11-01.*

*EUT operation mode: Transmitting*

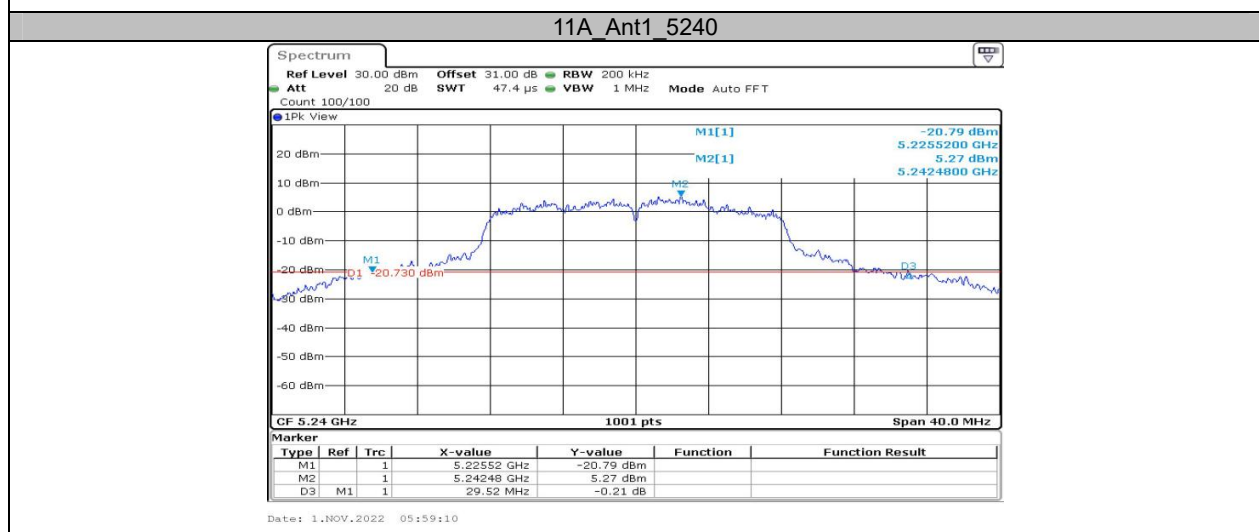
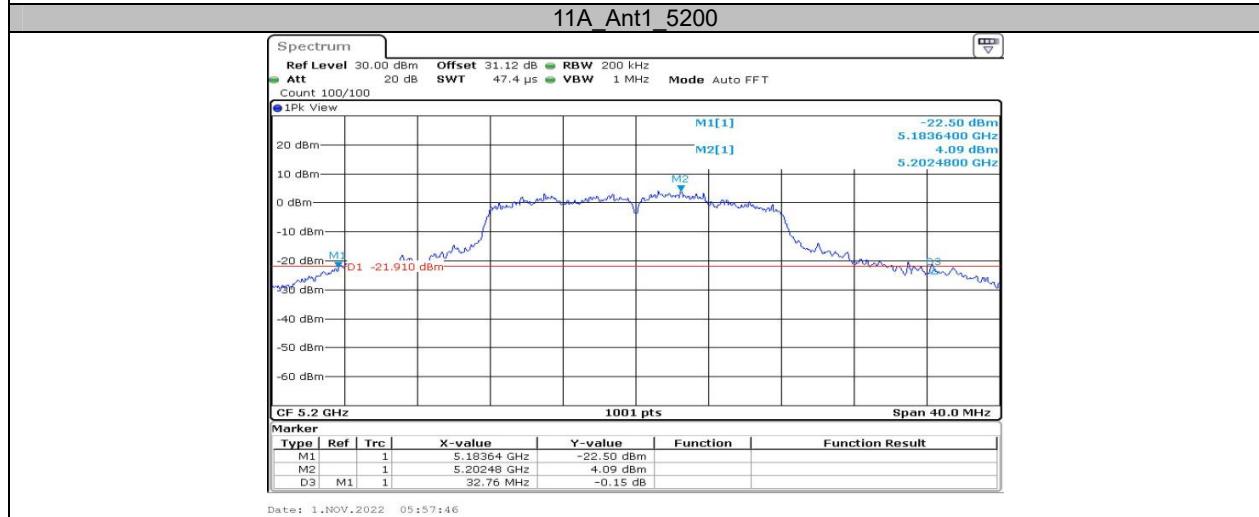
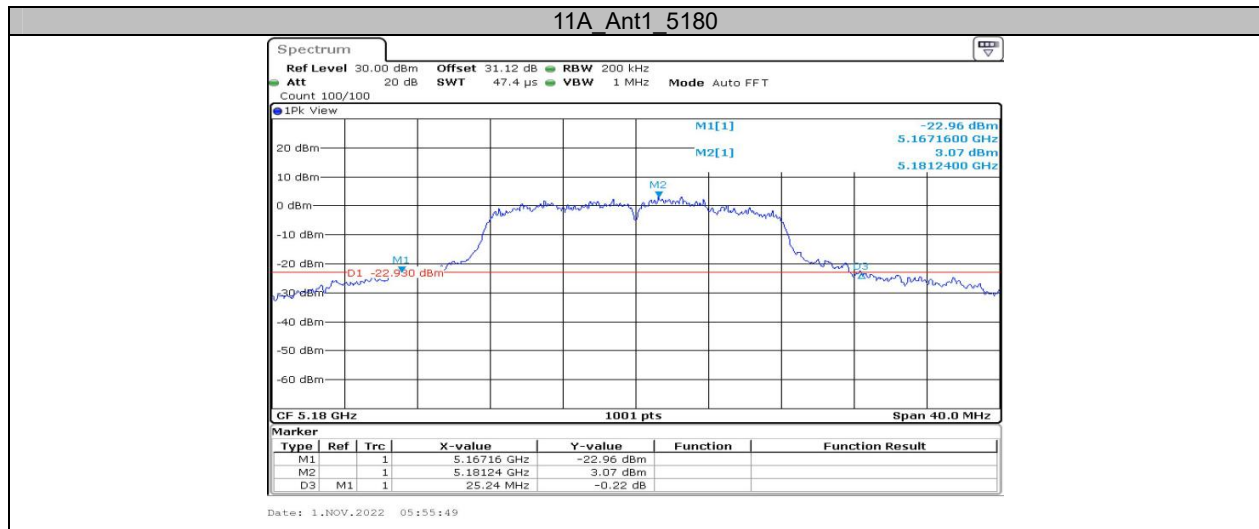
**Test Result: Pass**

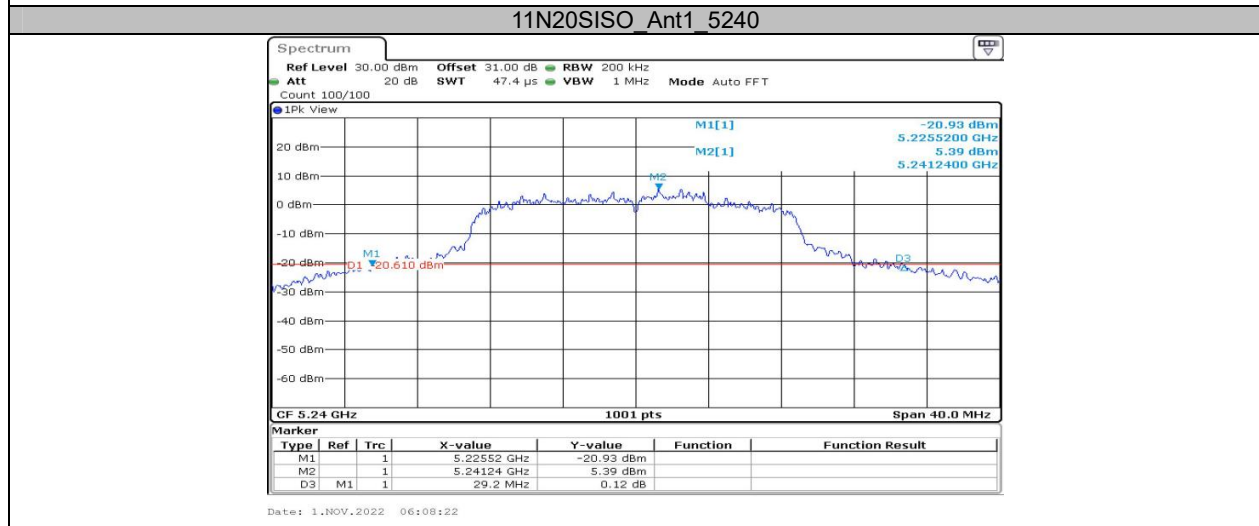
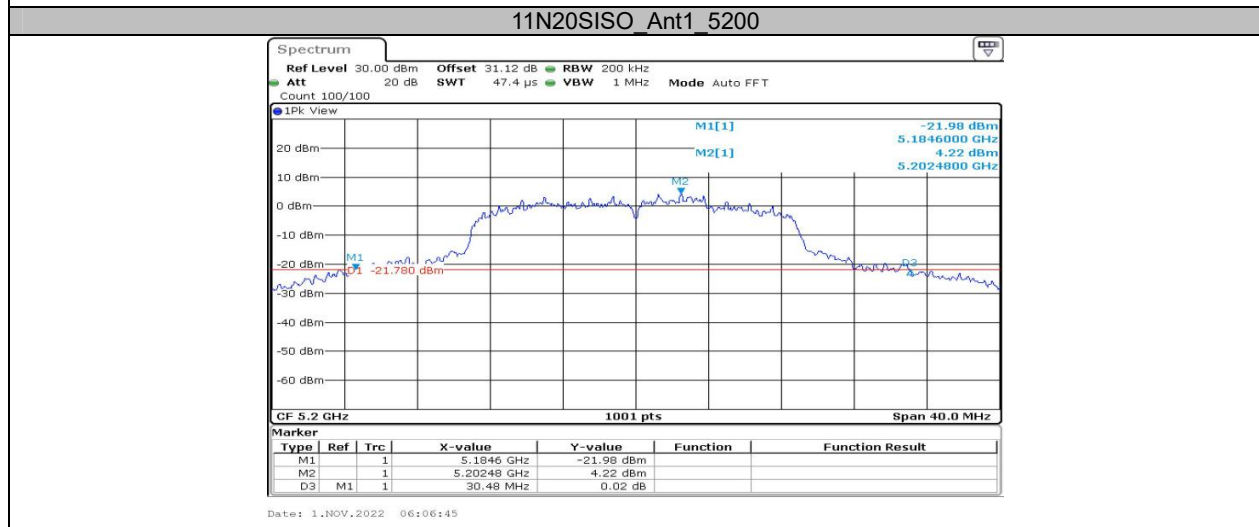
*Please refer to the Appendix.*

**APPENDIX****Appendix A1: Emission Bandwidth  
Test Result**

Test Mode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	25.24	5167.16	5192.40	---	---
		5200	32.76	5183.64	5216.40	---	---
		5240	29.52	5225.52	5255.04	---	---
11N20SISO	Ant1	5180	25.68	5166.72	5192.40	---	---
		5200	30.48	5184.60	5215.08	---	---
		5240	29.20	5225.52	5254.72	---	---

Test Graphs



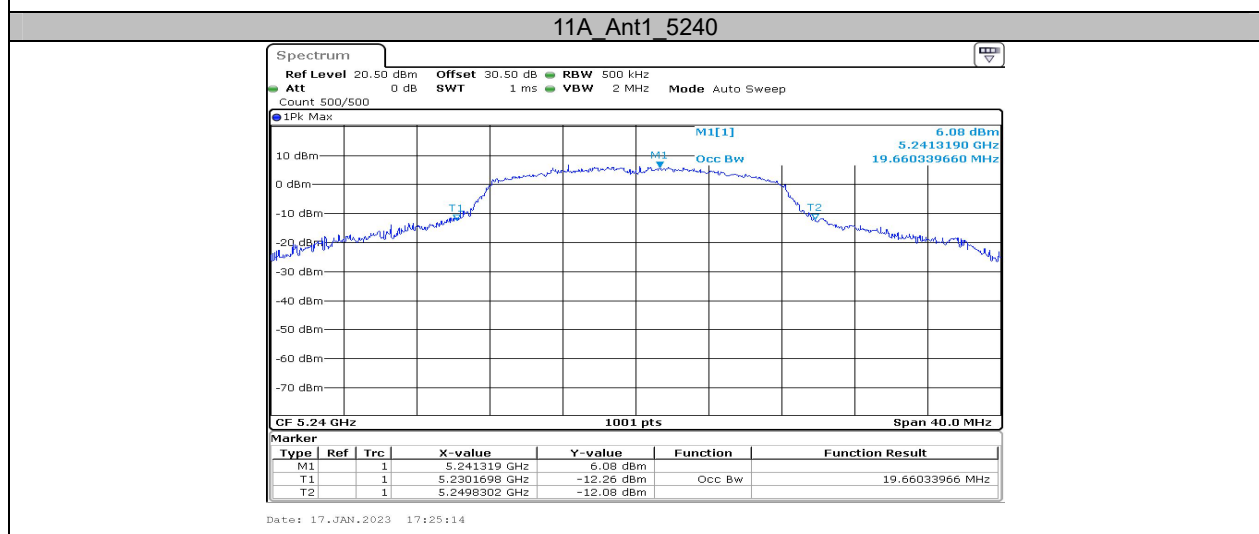
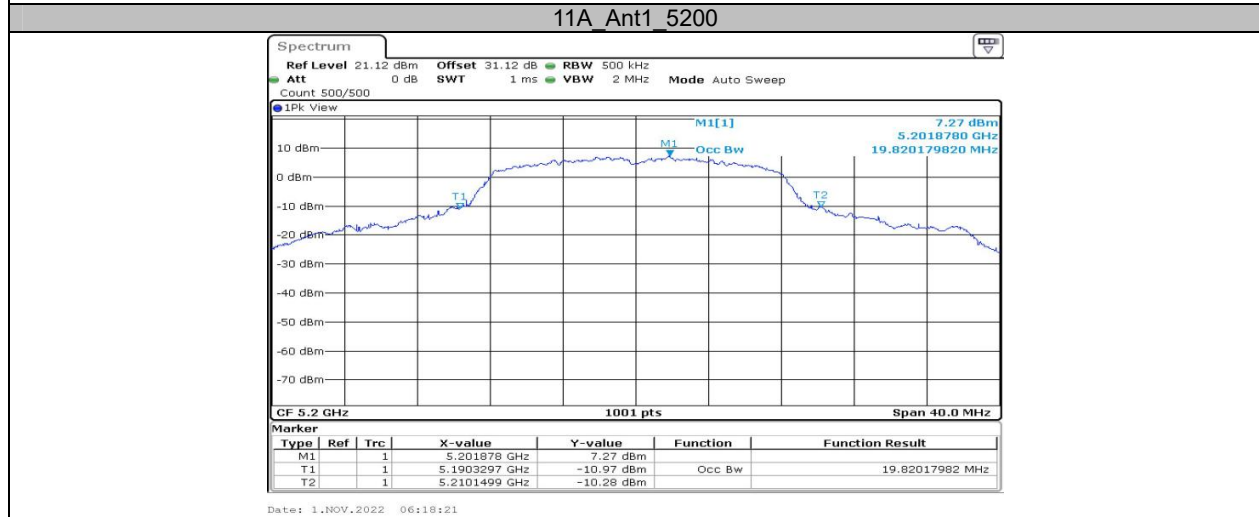
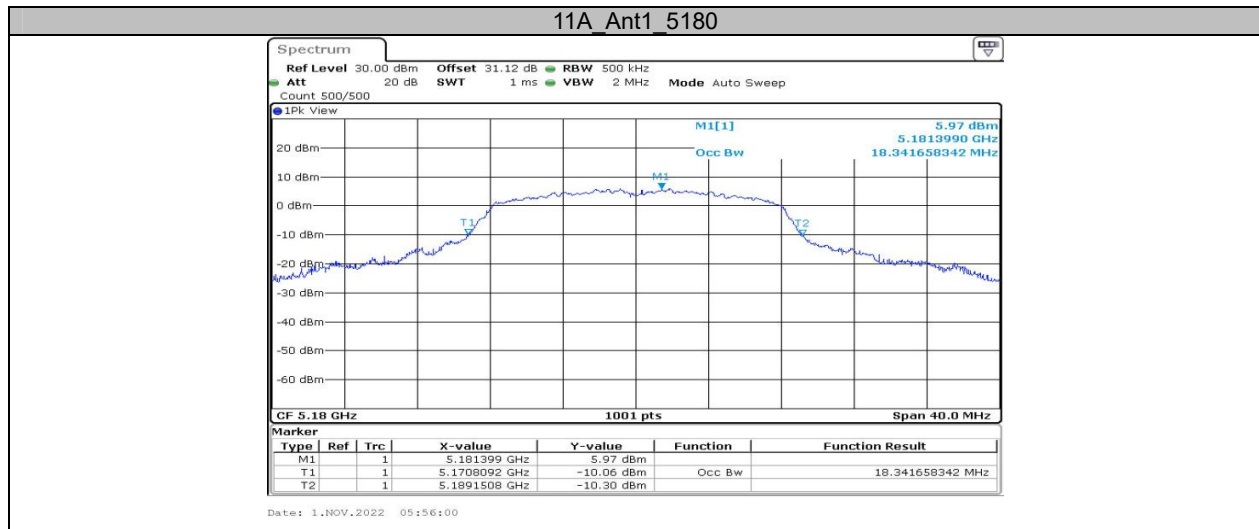


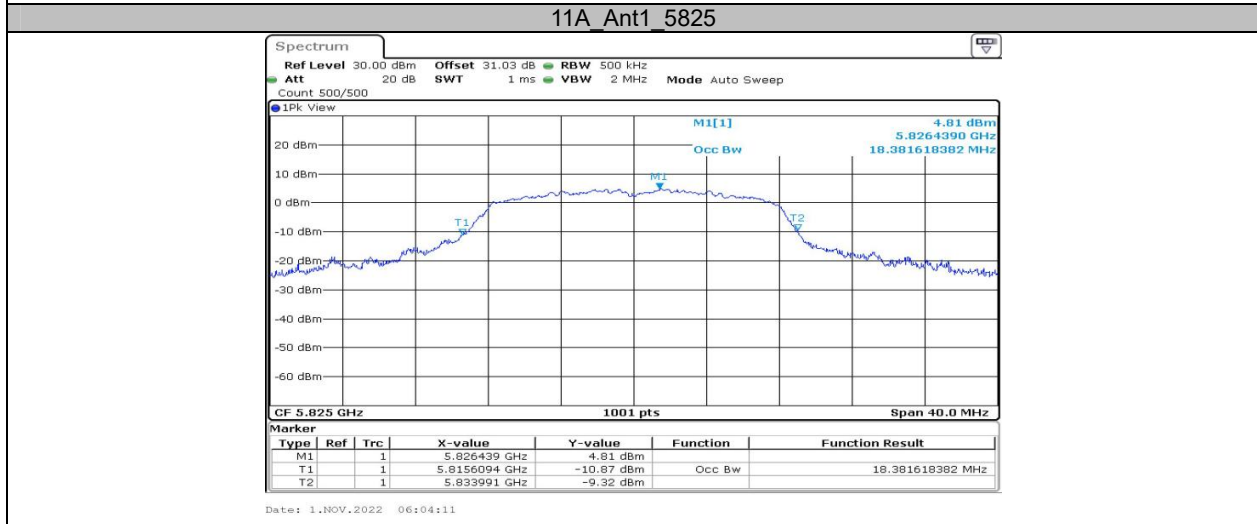
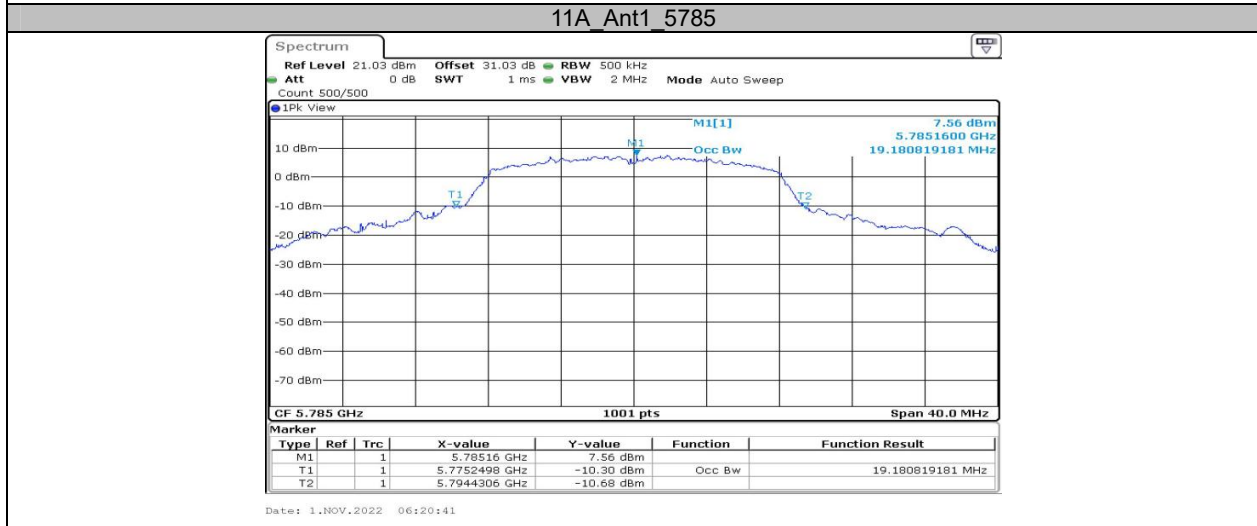
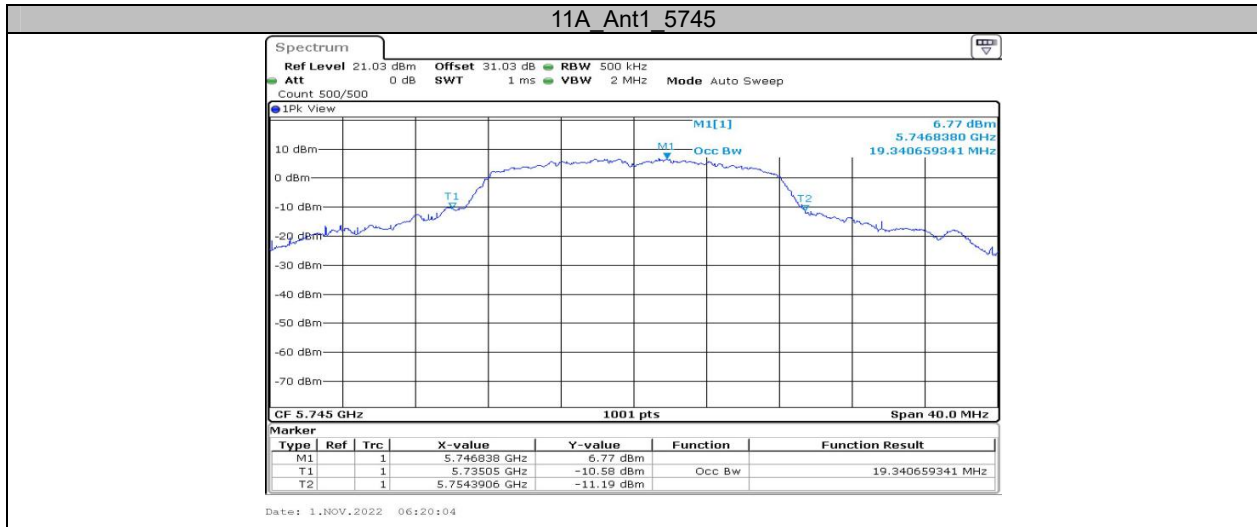
## Appendix A2: Occupied channel bandwidth Test Result

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	18.342	5170.809	5189.151	---	---
		5200	19.82	5190.330	5210.150	---	---
		5240	19.660	5230.170	5249.830	---	---
		5745	19.341	5735.050	5754.391	---	---
		5785	19.181	5775.250	5794.431	---	---
		5825	18.382	5815.609	5833.991	---	---
11N20SISO	Ant1	5180	18.861	5170.649	5189.510	---	---
		5200	19.98	5190.090	5210.070	---	---
		5240	19.421	5230.290	5249.710	---	---
		5745	19.62	5734.970	5754.590	---	---
		5785	19.74	5775.010	5794.750	---	---
		5825	18.861	5815.569	5834.431	---	---

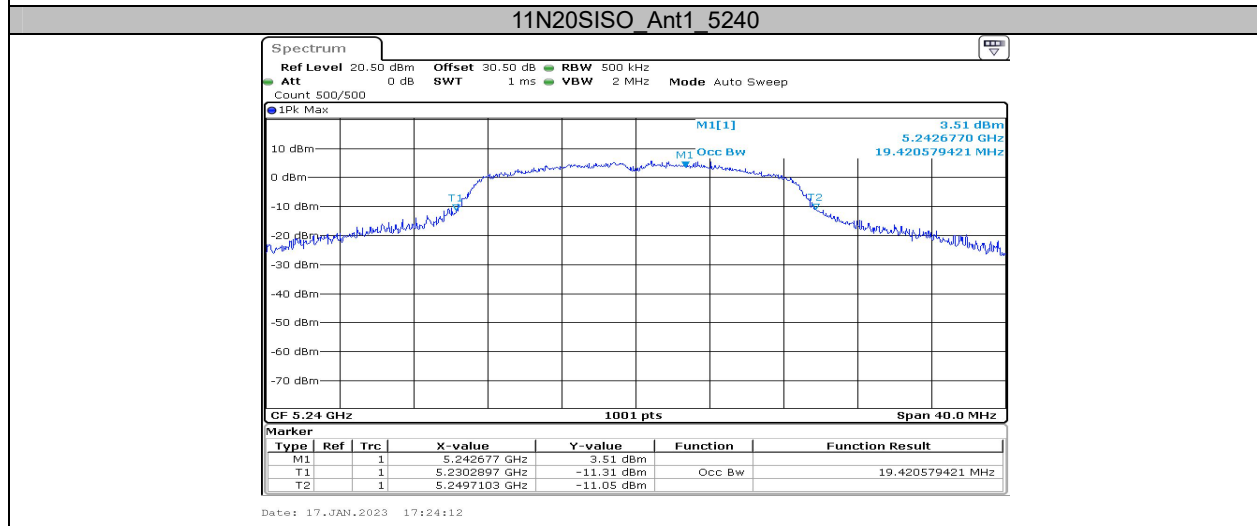
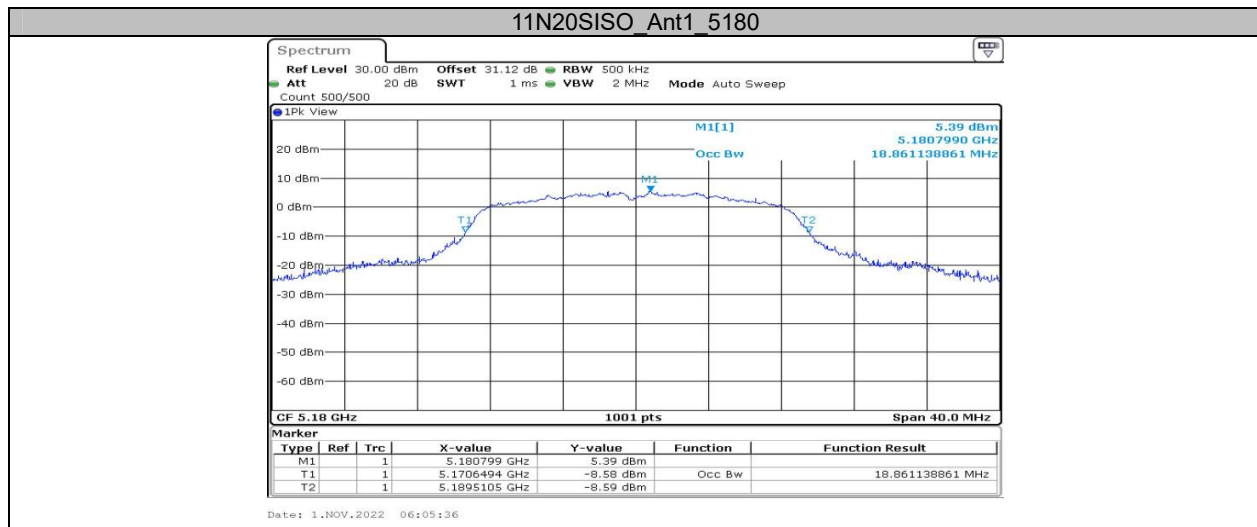
Note: the EUT not operate with any part of OBW fall within 5250-5350MHz and 5470-5725MHz range.

Test Graphs







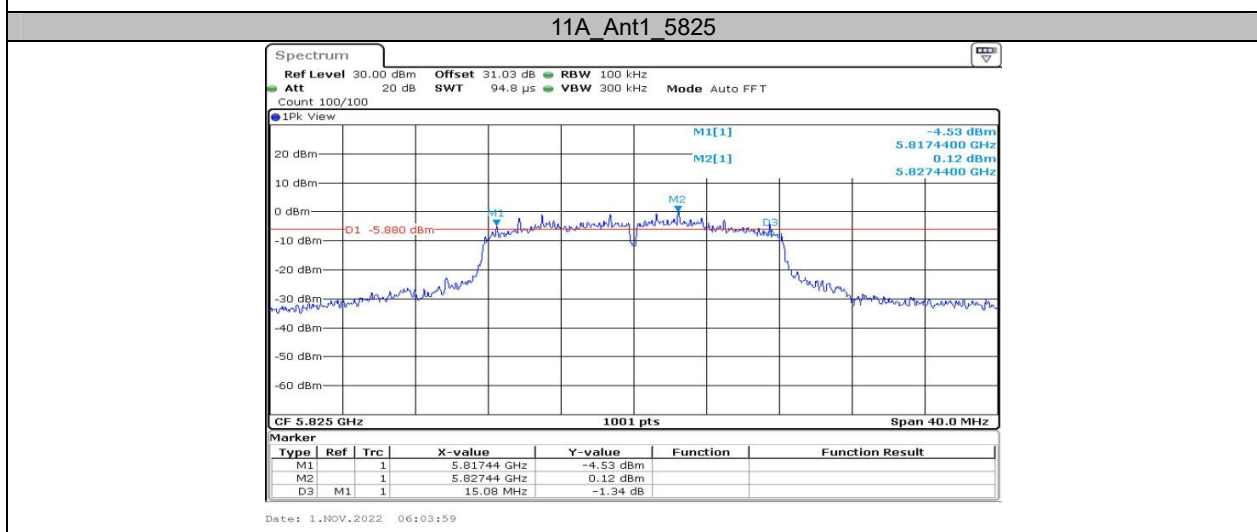
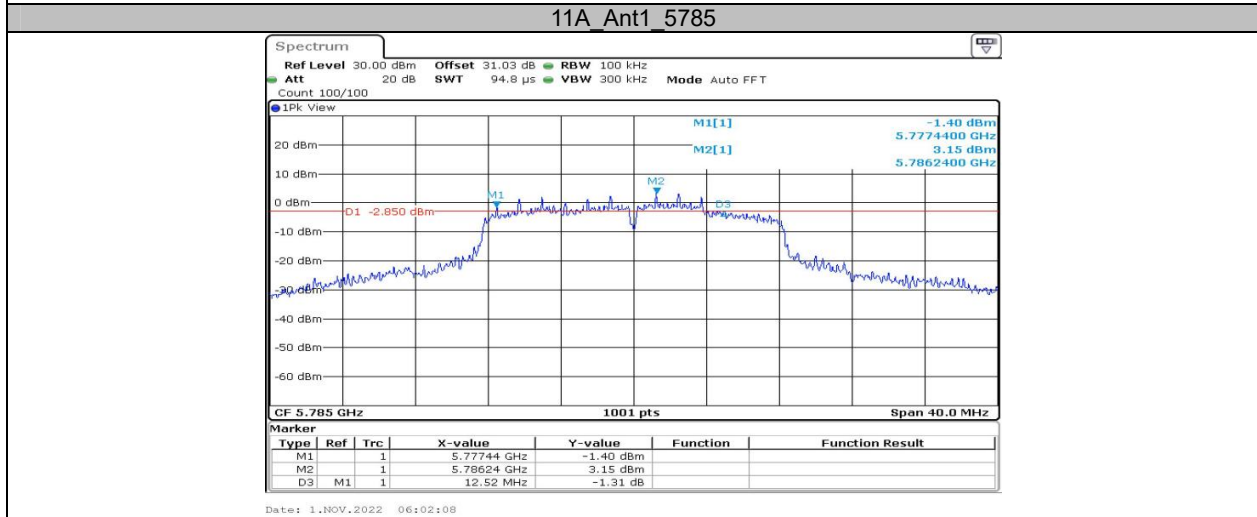
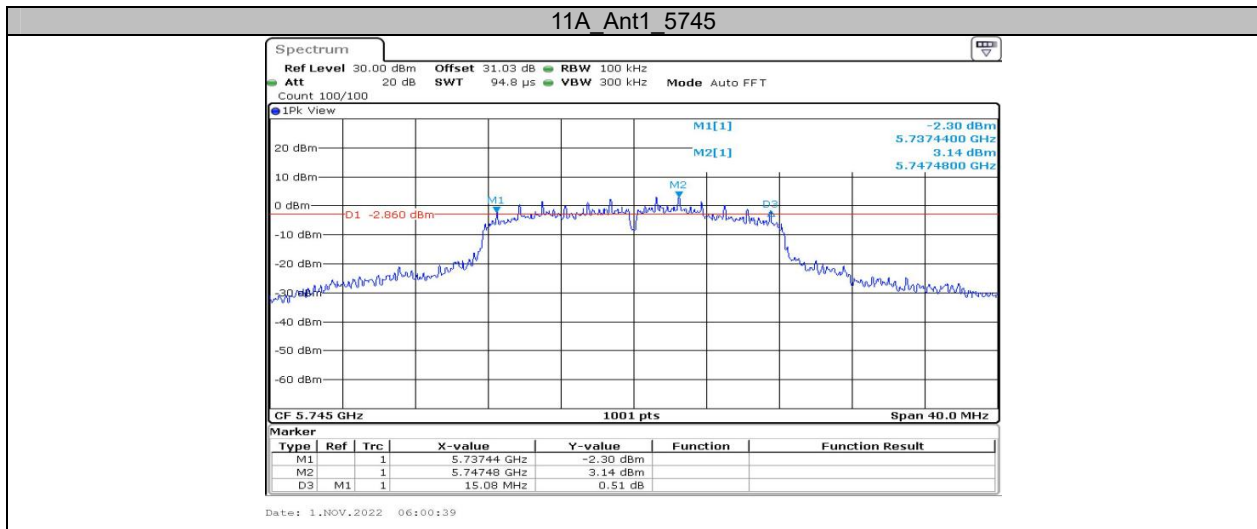




**Appendix A3: Min emission bandwidth  
Test Result B4**

Test Mode	Antenna	Frequency[MHz]	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	15.08	5737.44	5752.52	0.5	PASS
		5785	12.52	5777.44	5789.96	0.5	PASS
		5825	15.08	5817.44	5832.52	0.5	PASS
11N20SISO	Ant1	5745	15.08	5737.44	5752.52	0.5	PASS
		5785	12.60	5777.40	5790.00	0.5	PASS
		5825	14.04	5818.48	5832.52	0.5	PASS

### Test Graphs B4

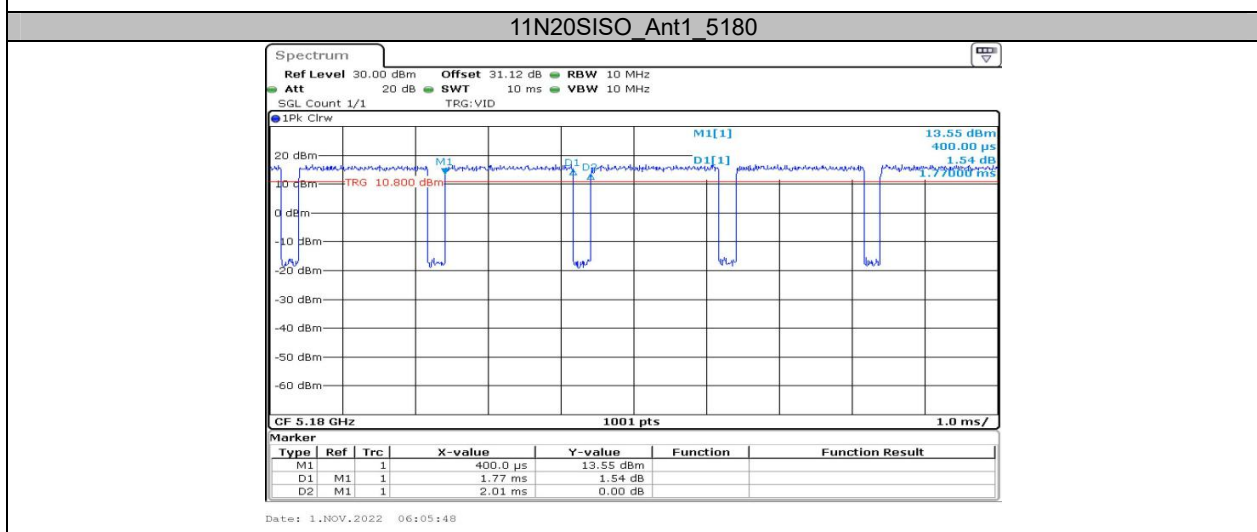
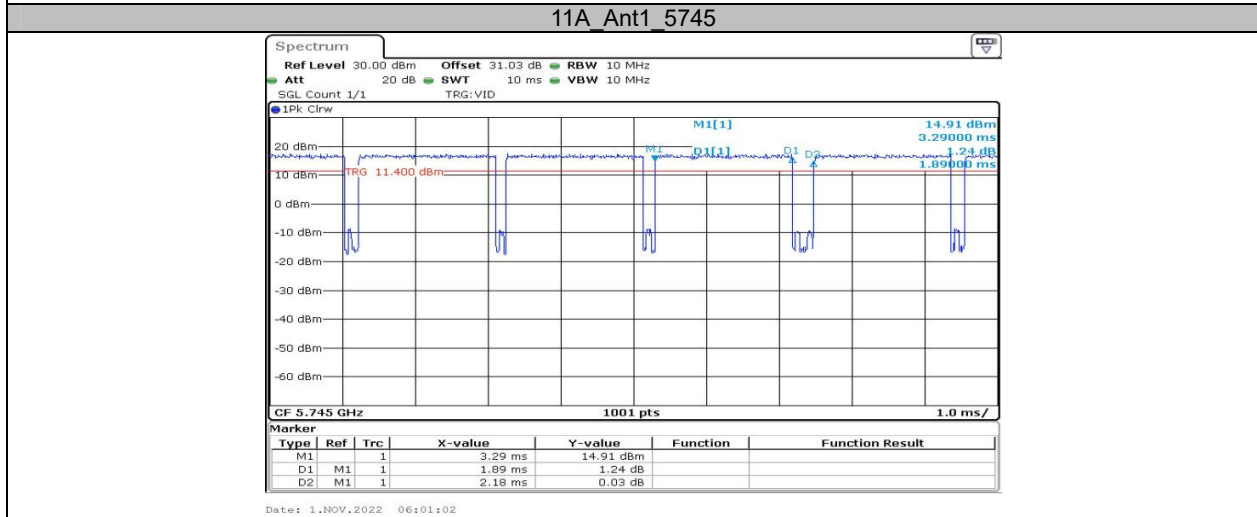
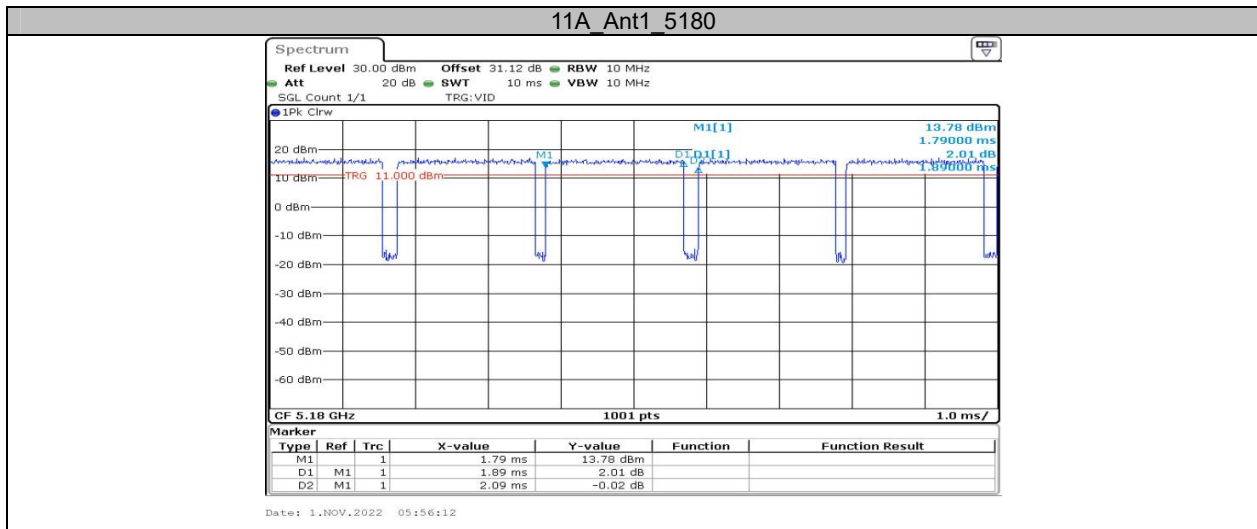


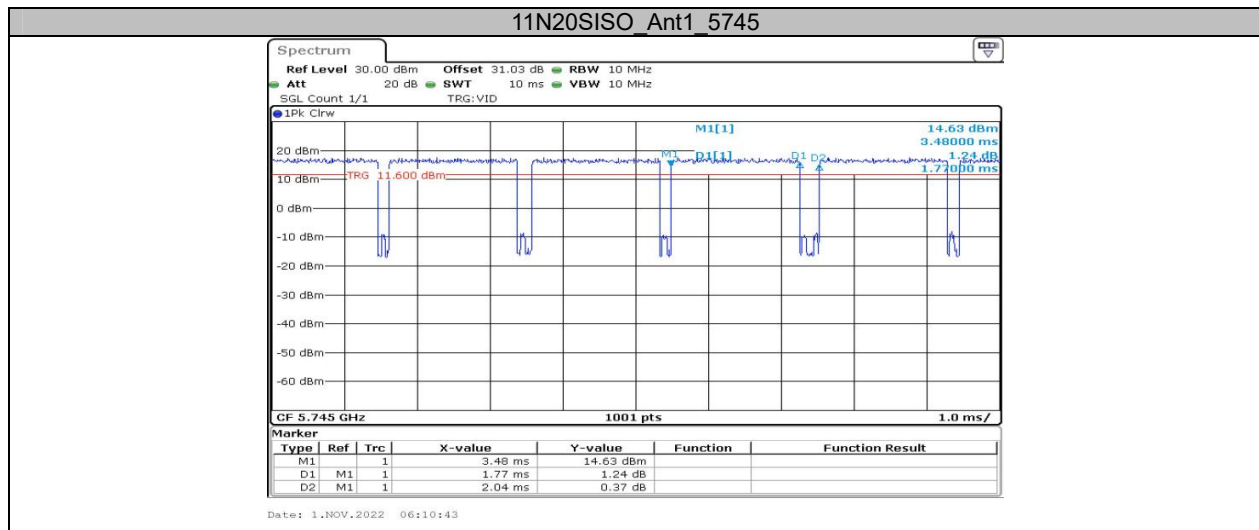


**Appendix B: Duty Cycle  
Test Result**

Test Mode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11A	Ant1	5180	1.89	2.09	90.43
		5745	1.89	2.18	86.70
11N20SISO	Ant1	5180	1.77	2.01	88.06
		5745	1.77	2.04	86.76

### Test Graphs







**Appendix C: Maximum conducted output power  
Test Result**

Test Mode	Antenna	Frequency[MHz]	Result [dBm]	Limit [dBm]	Verdict
11A	Ant1	5180	11.81	≤23.98	PASS
		5200	12.98	≤23.98	PASS
		5240	13.79	≤23.98	PASS
		5745	12.91	≤30.00	PASS
		5785	13.15	≤30.00	PASS
		5825	10.98	≤30.00	PASS
11N20SISO	Ant1	5180	11.50	≤23.98	PASS
		5200	12.85	≤23.98	PASS
		5240	13.70	≤23.98	PASS
		5745	12.66	≤30.00	PASS
		5785	12.95	≤30.00	PASS
		5825	10.88	≤30.00	PASS

Note: The Duty Cycle Factor is compensated in the result.

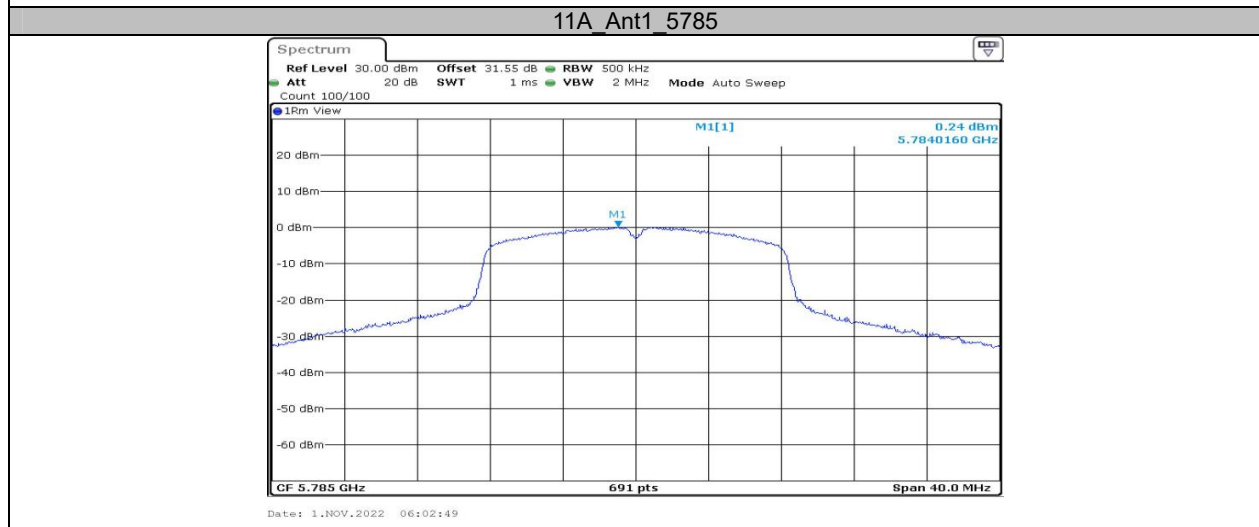
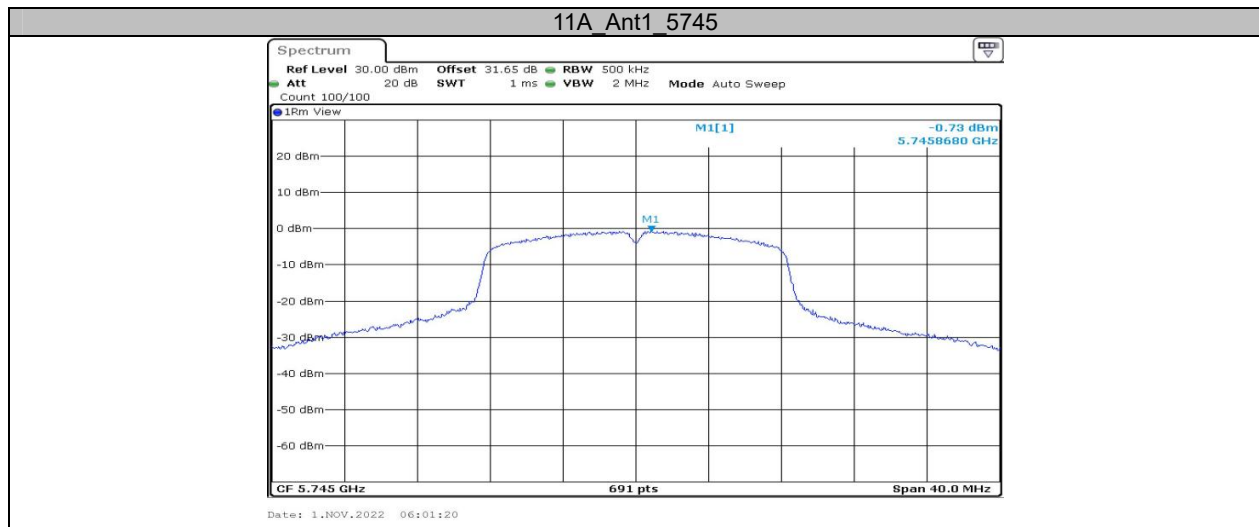
## Appendix D: Maximum power spectral density Test Result

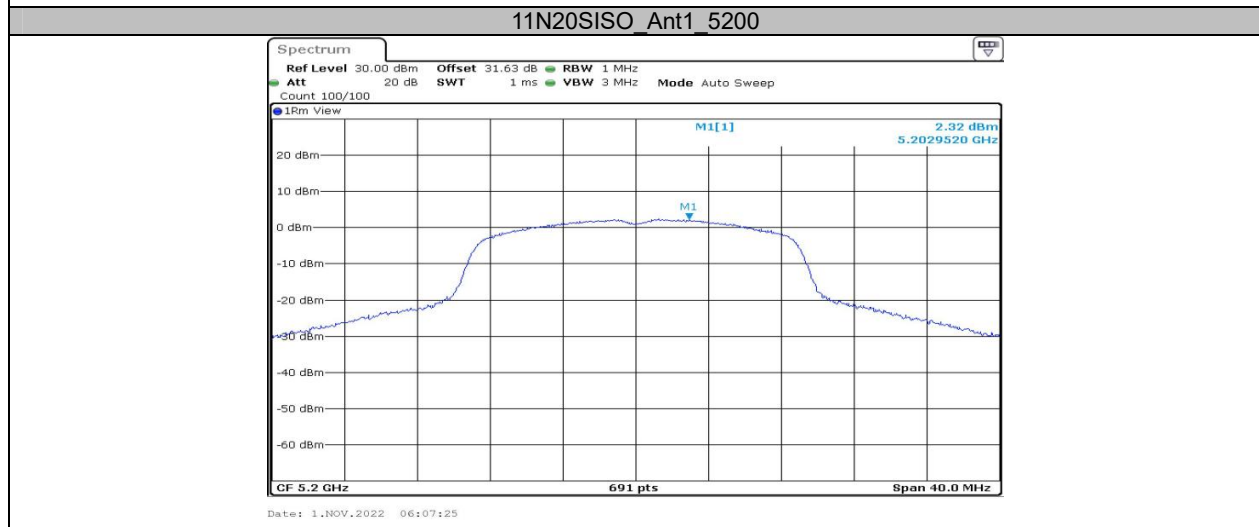
Test Mode	Antenna	Frequency[MHz]	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	1.77	≤11.00	PASS
		5200	2.97	≤11.00	PASS
		5240	3.69	≤11.00	PASS
		5745	-0.73	≤30.00	PASS
		5785	0.24	≤30.00	PASS
		5825	-1.84	≤30.00	PASS
11N20SISO	Ant1	5180	0.92	≤11.00	PASS
		5200	2.32	≤11.00	PASS
		5240	3.2	≤11.00	PASS
		5745	-0.65	≤30.00	PASS
		5785	-0.5	≤30.00	PASS
		5825	-2.28	≤30.00	PASS

Note: 1. The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.  
2. The Duty Cycle Factor is compensated in the graph.

### Test Graphs









\*\*\*\*\* END OF REPORT \*\*\*\*\*