FCC TEST REPORT

FCC ID: EF400212

IC: 1078A-00212

Product	:	Wireless Transmitter
Model Name	:	SC-WIR-TX
Additional model	:	SC-WIR-RX, PAS-WIR-RX, PAS-WIR-TX
Brand	:	N/A
Report No.	:	PTC20110303604E-FC02
Prepared for		
Nortek Security & Control LLC		
5919 Sea Otter Place, STE 100, Carlsbad CA 92010, United States		
Prepared by		
Precise Testing & Certification Co., Ltd.		
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		

1 Test Result Certification

Applicant's name	:	Nortek Security & Control LLC
Address	:	5919 Sea Otter Place, STE 100, Carlsbad CA 92010, United States
Manufacture's name	:	Nortek Security & Control LLC
Address	:	5919 Sea Otter Place, STE 100, Carlsbad CA 92010, United States
Product name	:	Wireless Transmitter
Model name	:	SC-WIR-TX
Additional model	:	SC-WIR-RX, PAS-WIR-RX, PAS-WIR-TX
Standards	:	FCC CFR47 Part 15 Section 15.407 RSS-247 Issue 2: February 2017 RSS-Gen Issue 5 April 2018
Test procedure	:	ANSI C63.10:2013
Test Date	:	Oct. 21, 2020 ~ Feb. 05, 2021
Date of Issue	:	Feb. 05, 2021
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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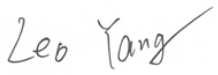
Test Engineer:



Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

Contents

2 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207 RSS-Gen Section 8.8	PASS
Radiated Spurious Emissions	15.205(a); 15.209; 15.247(d) RSS-247 Section 3.3 RSS-Gen 8.9	PASS
26dB&99% Bandwidth	15.407(a) RSS-247 Section 6.2	PASS
Peak Output Power	15.407(a) (iv) RSS-247 Section 6.2.1.1	PASS
Power Spectral Density	15.407 (iv) RSS-247 Section 6.2.1.1	PASS
Conducted Band Edge	15.407 (b)(1) RSS-247 Section 6.2.1.2 RSS-Gen 8.10	PASS
Frequency Stability	15.407 (g) RSS-Gen Section 8.11	PASS
Antenna Requirement	15.203 RSS-Gen Section 8.3	PASS

Remark: N/A

2.1 Test Site

Precise Testing & Certification Co., Ltd.

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

3 General Information

3.1 General Description of E.U.T.

Product Name	:	Wireless Transmitter
Model Name	:	SC-WIR-TX
Additional model	:	SC-WIR-RX, PAS-WIR-RX, PAS-WIR-TX (All models have same circuits diagram of Bluetooth module PCB, RF Chip constructionl; All models have same circuits diagram of Power; Only the model name is different)
PMN	:	Wireless Transmitter
HVIN	:	SC-WIR-TX, PAS-WIR-TX
Sample ID	:	PTC20110303604E-1#
Operating frequency	:	5180 ~ 5240MHz
Numbers of Channel	:	3
Antenna Type	:	PCB Antenna
Antenna Gain	:	ANT A: 2.4dBi; ANT B: 2.4 dBi
Directional Gain	:	2.4+10*log(2)=5.41dBi
Type of Modulation	:	QPSK(DSSS)
Power supply	:	DC 5V/0.55A
Adpapter	:	Model: GQ07-050055-DX Input: 100-240V~ 50/60Hz 0.3A Output: DC 5V/0.55A

3.2 Channel List

Channel List	
Channel	Frequency
1	5180MHz
2	5210MHz
3	5240MHz

Note: 1. Test of channel was included the lowest 5180MHz, middle 5210MHz and highest frequency 5240MHz in highest data rate and to perform the test, then record on this report.
2. Switch the high, medium and low emission signals by touching the switch.

4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-30GHz	Aug. 21, 2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug. 21, 2021
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug. 21, 2021
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug. 21, 2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2021
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug. 21, 2021
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 21, 2021
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Aug. 21, 2021
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Aug. 21, 2021
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Aug. 21, 2021
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 21, 2021
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 21, 2021
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Aug. 21, 2021
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Aug. 21, 2021
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 21, 2021
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 21, 2021

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2021
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	9KHz-300MHz	Aug. 21, 2021
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Aug. 21, 2021
Test software					
E3	Audix	6.101223a	N/A	N/A	E3

4.2 Description of Support Units

Equipment	Model No.	Series No.
/	/	/

4.3 Measurement Uncertainty

Parameter	**Uncertainty**
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	

5 Conducted Emission

5.1 Conducted Power Line Emission Limit

For unintentional device, according to § 15.207&RSS-Gen Section 8.8 Line Conducted Emission Limits is as following

Frequency	Limit (dBuV)	
MHz	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	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.		

5.2 EUT Operation

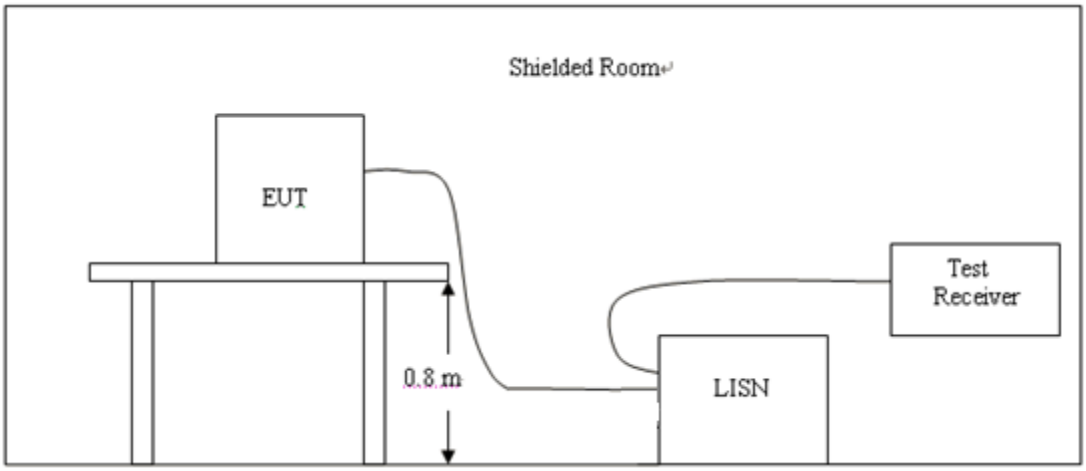
Operating Environment :

Temperature : 23.5 °C

Humidity : 51.1 % RH

Atmospheric Pressure : 101.2kPa

5.3 Test Setup



5.4 Test Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.

2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

5. All support equipments received AC power from a second LISN, if any.

6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

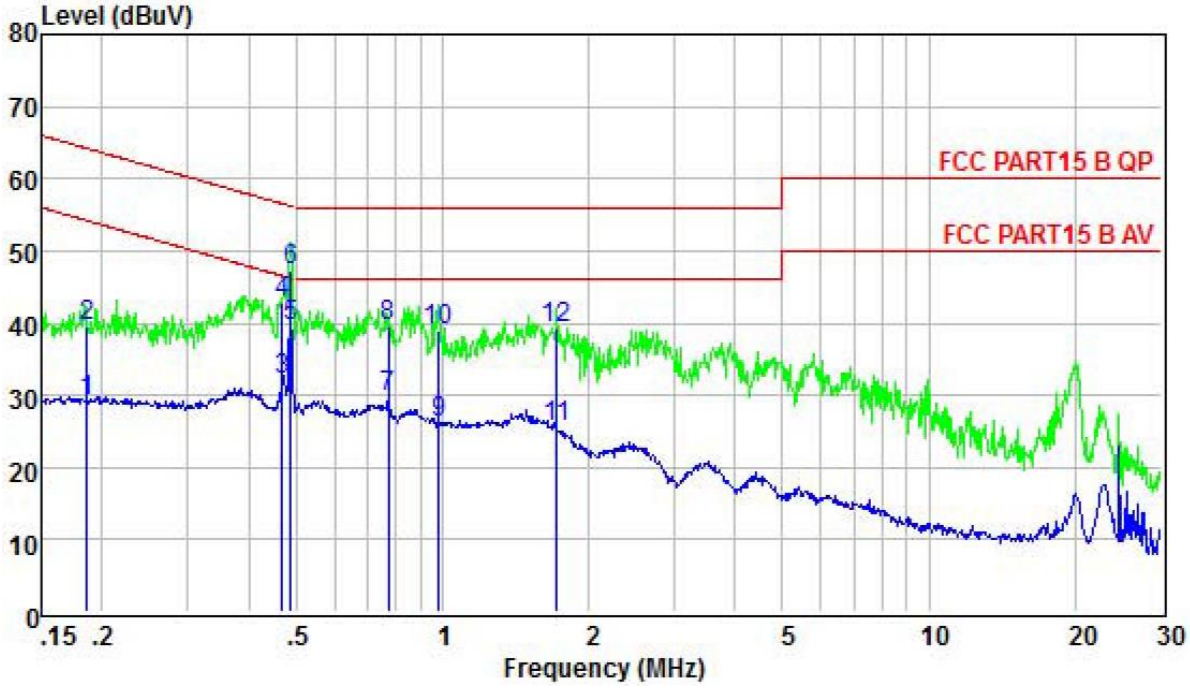
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

5.5 Summary of Test Results

Pass

Remark:
1. We tested at Low, Middle, and High channe at the antenna single and antenna combination. and recored the worst data at Low channel of Antenna A in the report.

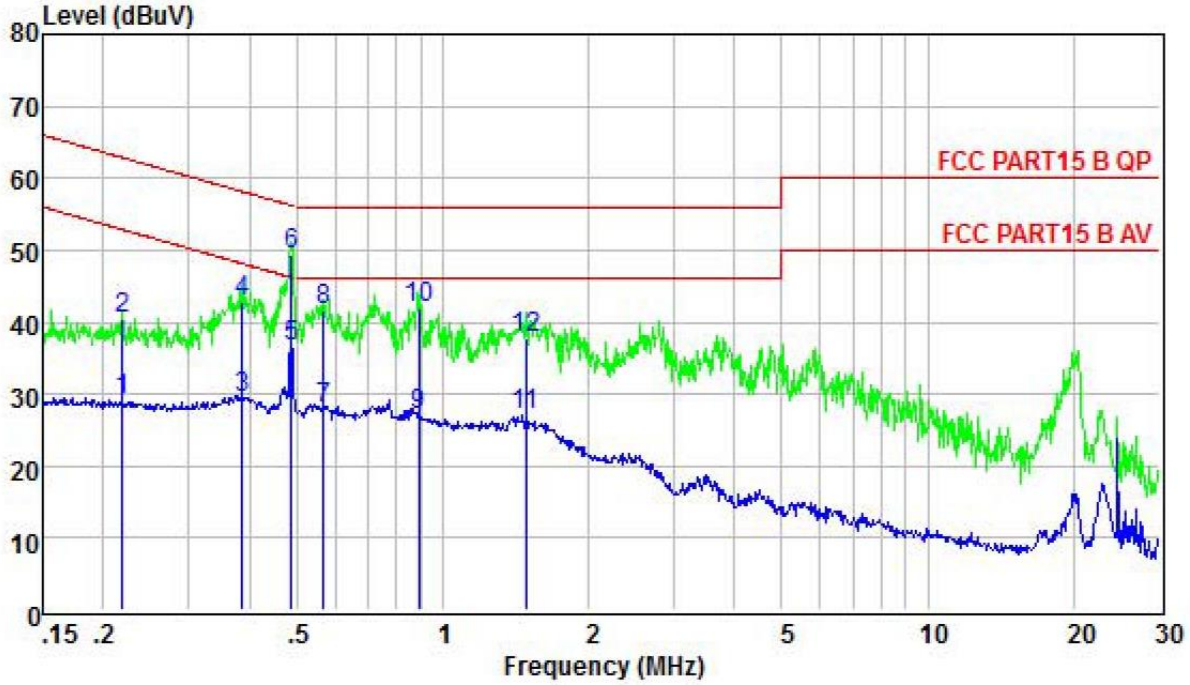
Phase: Line (Low Channel for ANT A)



	Freq	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dB	
1	0.19	29.12	9.46	0.01	54.20	-25.08	Average
2	0.19	39.46	9.46	0.01	64.20	-24.74	QP
3	0.47	32.25	9.49	0.01	46.54	-14.29	Average
4	0.47	42.76	9.49	0.01	56.54	-13.78	QP
5	0.49	39.46	9.49	0.01	46.19	-6.73	Average
6	0.49	47.26	9.49	0.01	56.19	-8.93	QP
7	0.78	29.84	9.50	0.01	46.00	-16.16	Average
8	0.78	39.66	9.50	0.01	56.00	-16.34	QP
9	0.98	26.04	9.51	0.01	46.00	-19.96	Average
10	0.98	38.84	9.51	0.01	56.00	-17.16	QP
11	1.72	25.45	9.53	0.01	46.00	-20.55	Average
12	1.72	39.20	9.53	0.01	56.00	-16.80	QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

Phase: Neutral (Low Channel for ANT A)



	Freq	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dB	
1	0.22	29.01	9.38	0.01	52.88	-23.87	Average
2	0.22	40.44	9.38	0.01	62.88	-22.44	QP
3	0.39	29.41	9.41	0.01	48.12	-18.71	Average
4	0.39	42.88	9.41	0.01	58.12	-15.24	QP
5	0.49	36.69	9.41	0.01	46.19	-9.50	Average
6	0.49	49.26	9.41	0.01	56.19	-6.93	QP
7	0.57	27.92	9.42	0.01	46.00	-18.08	Average
8	0.57	41.69	9.42	0.01	56.00	-14.31	QP
9	0.89	26.99	9.43	0.01	46.00	-19.01	Average
10	0.89	41.88	9.43	0.01	56.00	-14.12	QP
11	1.48	27.08	9.44	0.01	46.00	-18.92	Average
12	1.48	37.89	9.44	0.01	56.00	-18.11	QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

6 Radiated Spurious Emissions

Test Requirement	:	FCC CFR47 Part 15 Section 15.209, RSS-247 Section 3.3 & RSS-Gen Section 8.9
Test Method	:	ANSI C63.10:2013
Test Result	:	PASS
Measurement Distance	:	3m
Limit	:	See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

6.1 EUT Operation

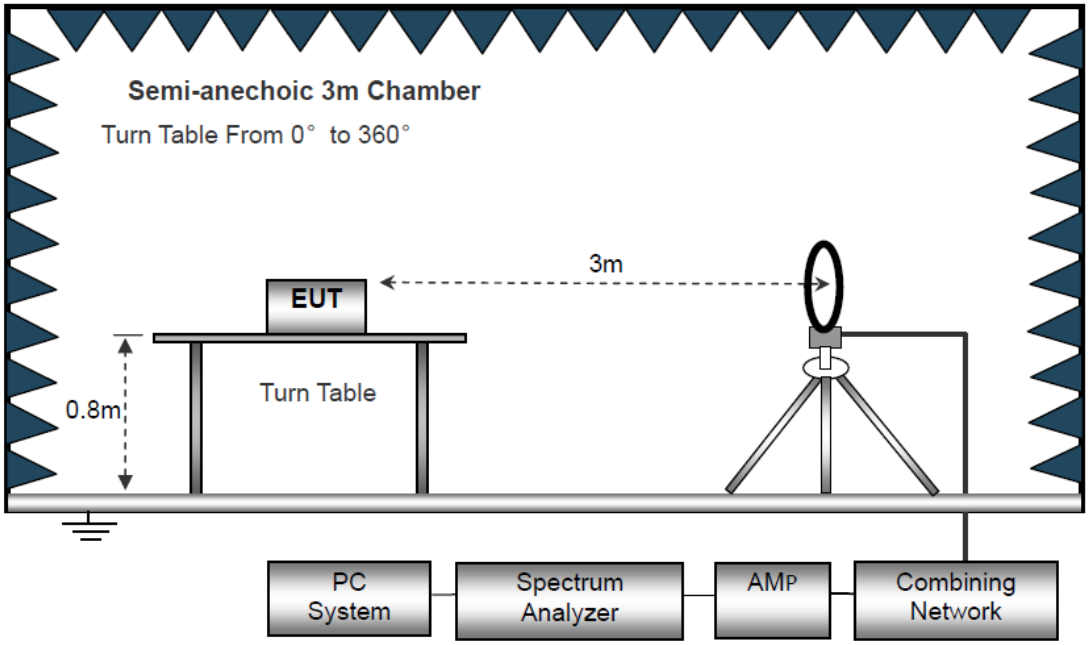
Operating Environment :

Temperature	:	23.5 °C
Humidity	:	51.1 % RH
Atmospheric Pressure	:	101.2kPa

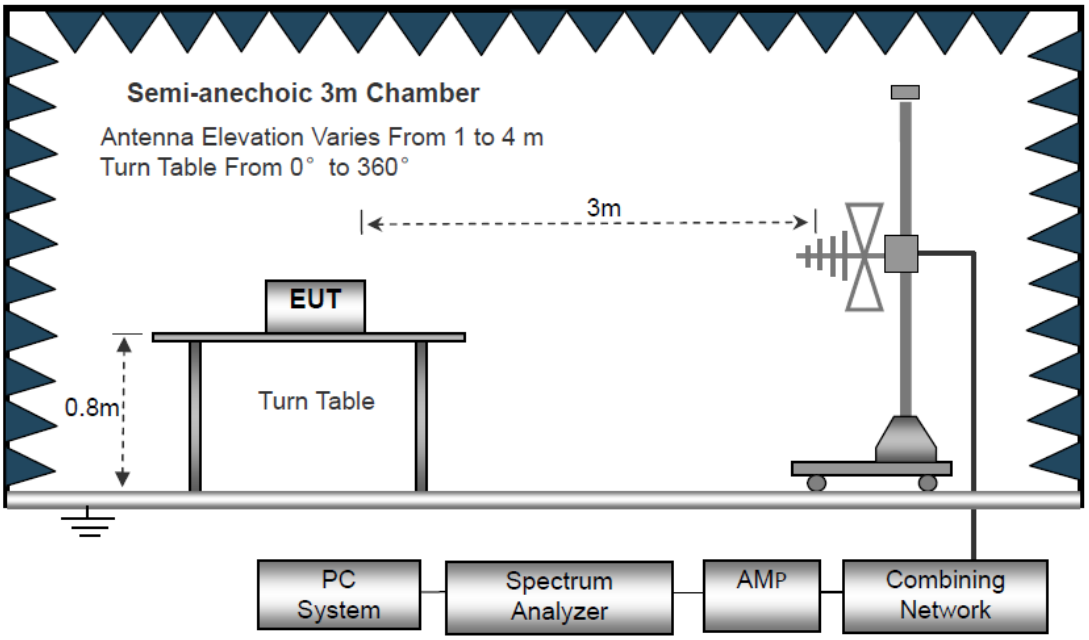
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

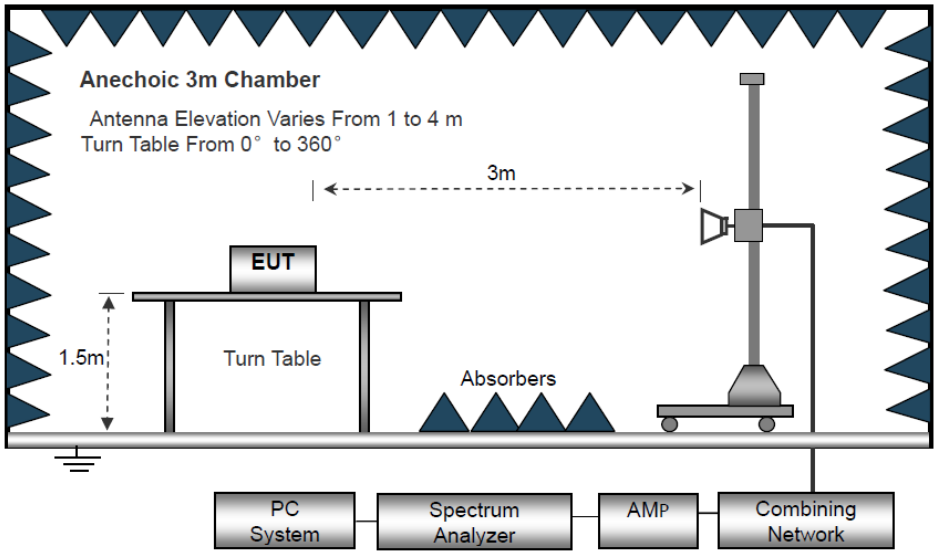
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

Receiver Setup	Frequency	Detector	RBW	VBW	Remark
	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

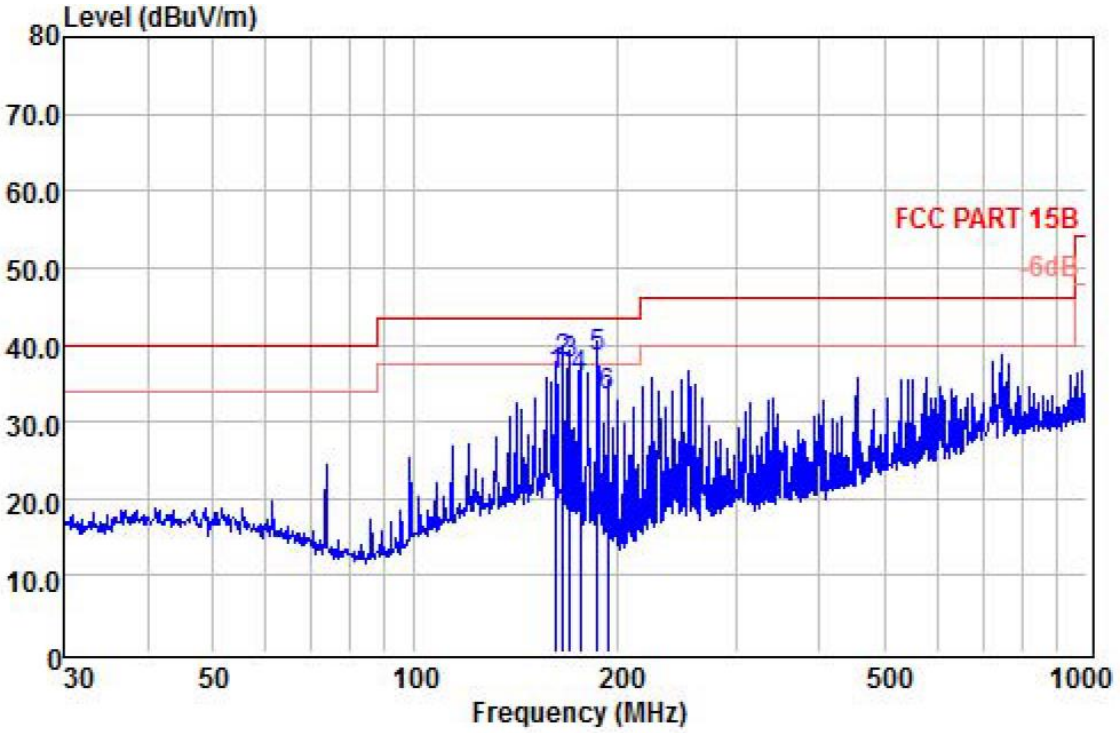
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Pass

Remark:
We tested at Low, Middle, and High channe at the antenna single and antenna combination.
and recored the worst data at Low channel of Antenna A in the report.

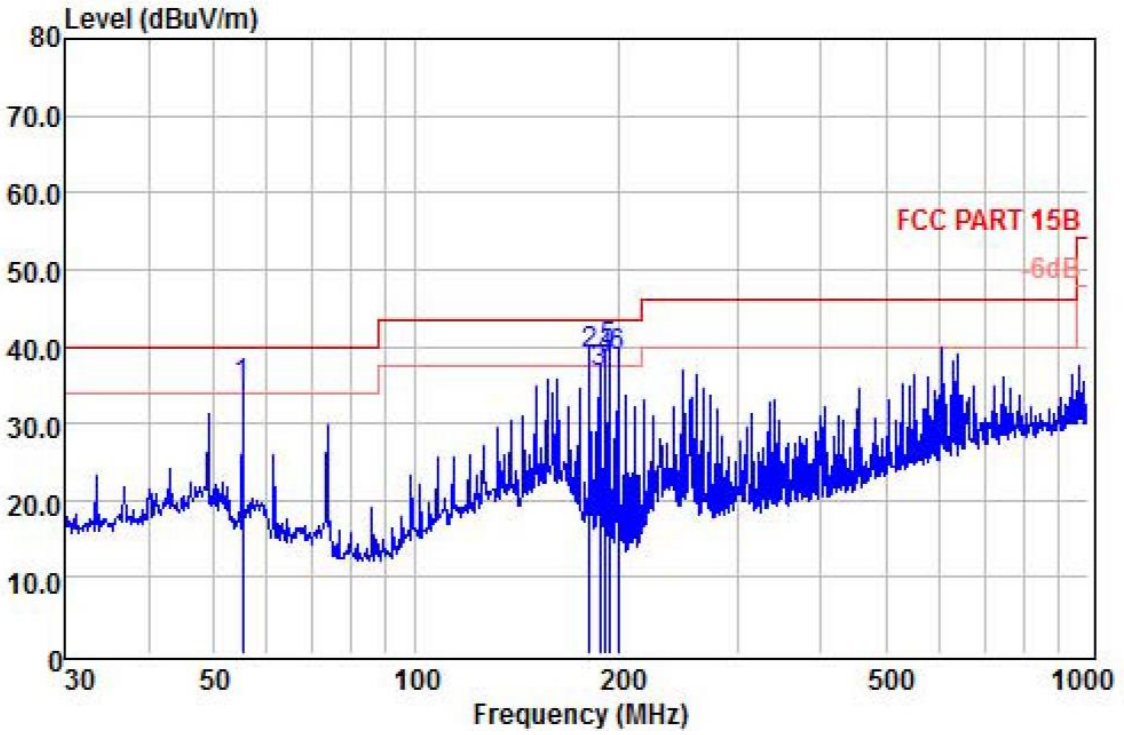
Polarization: Horizontal (Low Channel for ANT A)



		Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1		162.61	19.81	15.19	0.86	35.86	43.50	-7.64	QP
2	!	166.07	22.16	14.69	0.86	37.71	43.50	-5.79	QP
3		170.19	22.38	14.12	0.87	37.37	43.50	-6.13	QP
4		176.27	21.67	13.29	0.87	35.83	43.50	-7.67	QP
5	!	187.10	25.81	11.63	0.87	38.31	43.50	-5.19	QP
6		193.77	21.96	10.56	0.88	33.40	43.50	-10.10	QP

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Polarization: Vertical (Low Channel for ANT A)



		Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	!	55.22	21.55	12.86	0.41	34.82	40.00	-5.18	QP
2	!	181.28	25.36	12.59	0.87	38.82	43.50	-4.68	QP
3		187.75	24.17	11.52	0.87	36.56	43.50	-6.94	QP
4	!	191.75	26.68	10.88	0.88	38.44	43.50	-5.06	QP
5	!	193.77	28.00	10.56	0.88	39.44	43.50	-4.06	QP
6	!	199.99	28.25	9.60	0.88	38.73	43.50	-4.77	QP

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Test Frequency 1GHz-25GHz: Record the worst test data for Antenna B in report

GFSK Low Channel (5180MHz)								
Detector: Peak Value								
Frequency (MHz)	Reading Level (dBuV)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity (H/V)
5150.00	40.42	36.21	5.27	34.35	47.55	74.00	-26.45	V
10360.00	30.57	37.11	7.73	34.51	40.90	74.00	-33.10	V
15540.00	30.41	39.31	9.23	34.81	44.14	74.00	-29.86	V
5150.00	41.49	36.21	5.27	34.35	48.62	74.00	-25.38	H
10360.00	32.26	37.11	7.73	34.51	42.59	74.00	-31.41	H
15540.00	29.77	39.31	9.23	34.81	43.50	74.00	-30.50	H
Detector: Average Value								
5150.00	28.89	36.21	5.27	34.35	36.02	54.00	-17.98	V
10360.00	19.54	37.11	7.73	34.51	29.87	54.00	-24.13	V
15540.00	18.55	39.31	9.23	34.81	32.28	54.00	-21.72	V
5150.00	31.43	36.21	5.27	34.35	38.56	54.00	-15.44	H
10360.00	21.62	37.11	7.73	34.51	31.95	54.00	-22.05	H
15540.00	18.19	39.31	9.23	34.81	31.92	54.00	-22.08	H
GFSK Middle Channel (5210MHz)								
Detector: Peak Value								
Frequency (MHz)	Reading Level (dBuV)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity (H/V)
10420.00	30.74	37.12	7.74	34.51	41.09	74.00	-32.91	V
15630.00	30.15	39.34	9.24	34.81	43.92	74.00	-30.08	V
10420.00	32.27	37.12	7.73	34.51	42.61	74.00	-31.39	H
15630.00	29.75	39.33	9.23	34.81	43.50	74.00	-30.50	H
Detector: Average Value								
10420.00	19.77	37.12	7.74	34.51	30.12	54.00	-23.88	V
15630.00	18.82	39.34	9.24	34.81	32.59	54.00	-21.41	V
10420.00	21.67	37.12	7.73	34.51	32.01	54.00	-21.99	H
15630.00	18.38	39.33	9.23	34.81	32.13	54.00	-21.87	H

GFSK High Channel (5240MHz)								
Detector: Peak Value								
Frequency (MHz)	Reading Level (dBuV)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polarity (H/V)
10480.00	30.79	37.13	7.75	34.51	41.16	74.00	-32.84	V
15720.00	30.38	39.34	9.25	34.81	44.16	74.00	-29.84	V
10480.00	32.47	37.13	7.75	34.51	42.84	74.00	-31.16	H
15720.00	29.51	39.34	9.25	34.81	43.29	74.00	-30.71	H
Detector: Average Value								
10480.00	19.52	37.13	7.75	34.51	29.89	54.00	-24.11	V
15720.00	18.89	39.34	9.25	34.81	32.67	54.00	-21.33	V
10480.00	21.64	37.13	7.75	34.51	32.01	54.00	-21.99	H
15720.00	18.35	39.34	9.25	34.81	32.13	54.00	-21.87	H

Note: 1. Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission Level = Reading + Factor

Margin=Emission Level-Limit

7 Occupied Bandwidth

7.1 Test Limit

15.407(e), RSS-247 Section 5.2 & RSS-Gen Section 6.7				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	5180-5240	PASS

7.2 Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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.

7.3 Measurement Equipment Used

Same as Radiated Emission Measurement.

7.4 Test Result

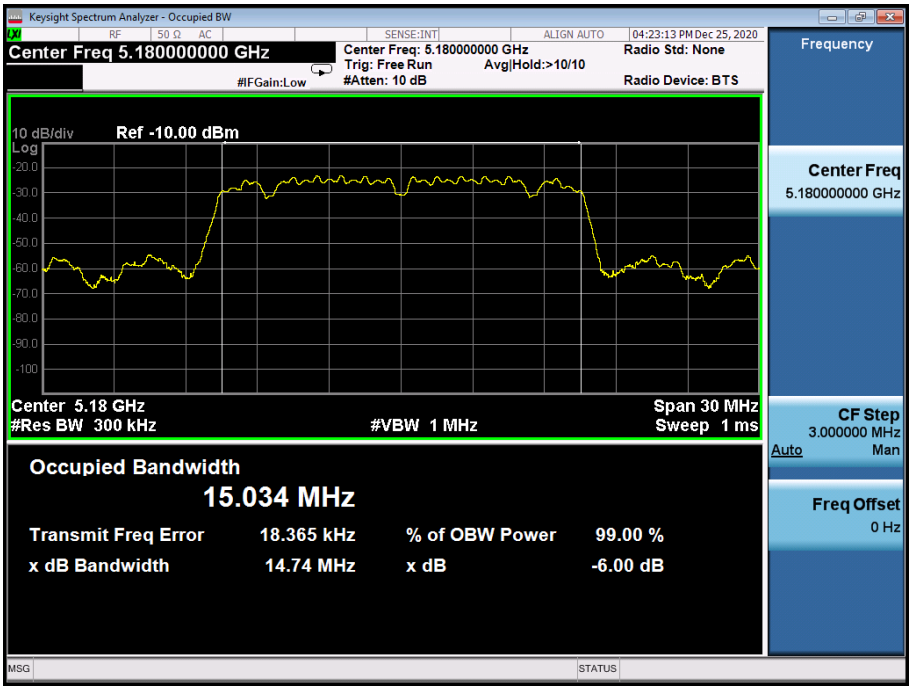
PASS

	ANT A		
Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
5180	16.27	15.034	PASS
5210	16.27	15.036	PASS
5240	16.28	15.048	PASS

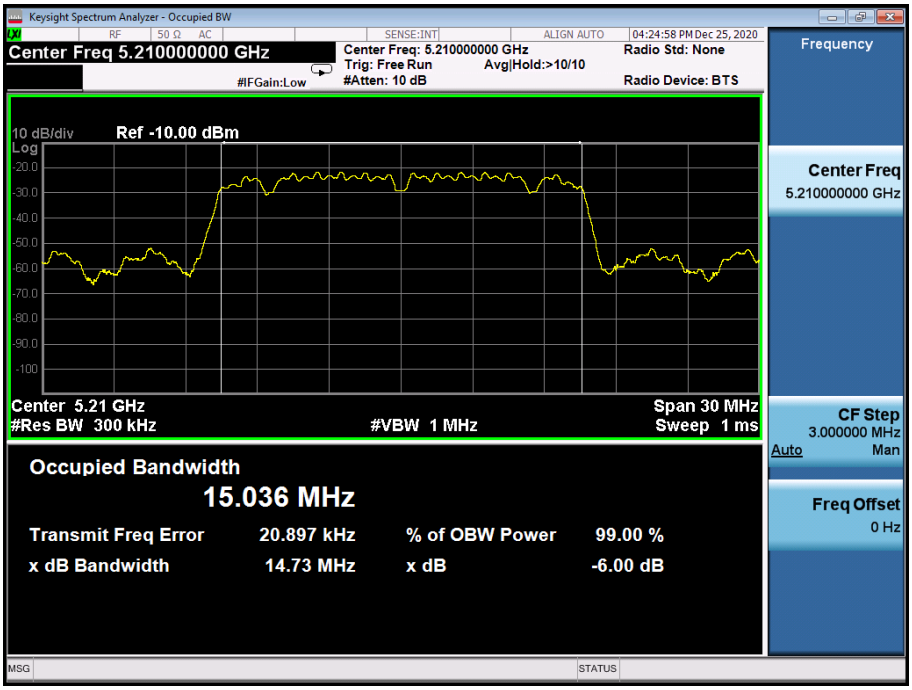
	ANT B		
Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
5180	16.26	15.036	PASS
5210	16.27	15.037	PASS
5240	16.27	15.046	PASS

99% Bandwidth for ANT A

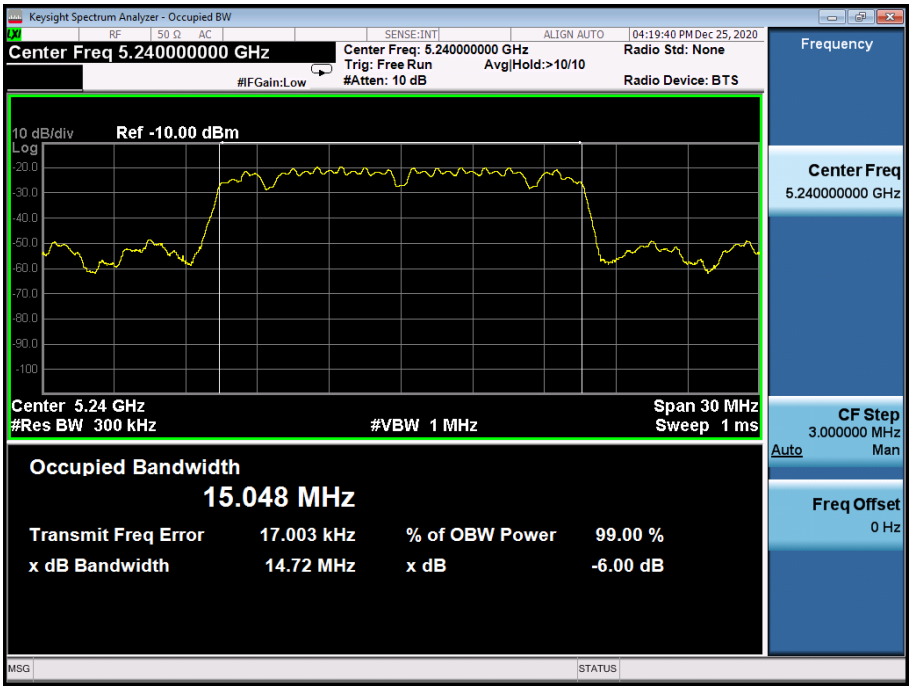
5180MHz



5210MHz

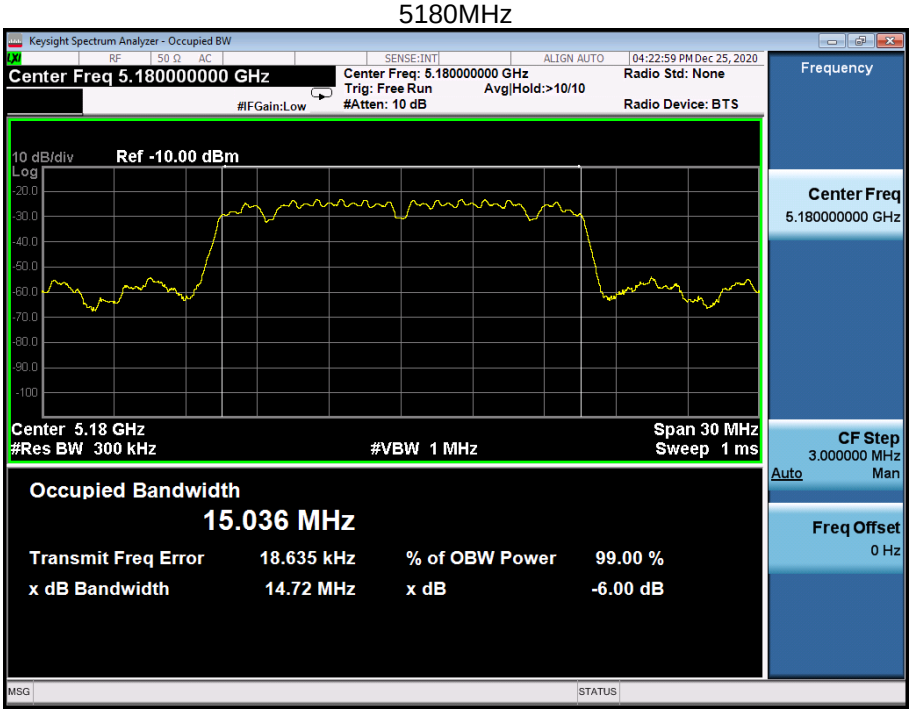


5240MHz

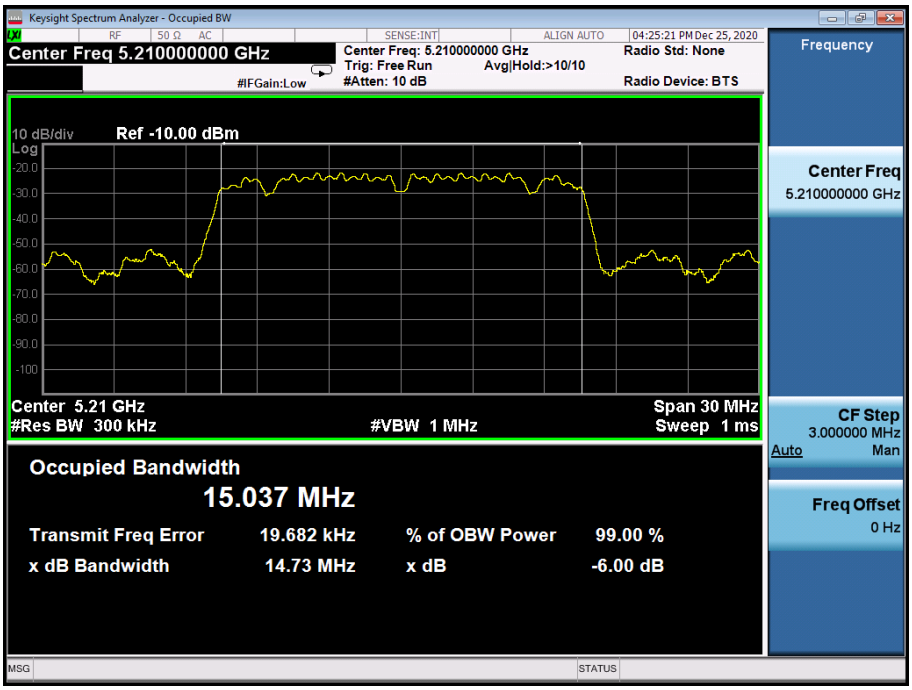


99% Bandwidth for ANT B

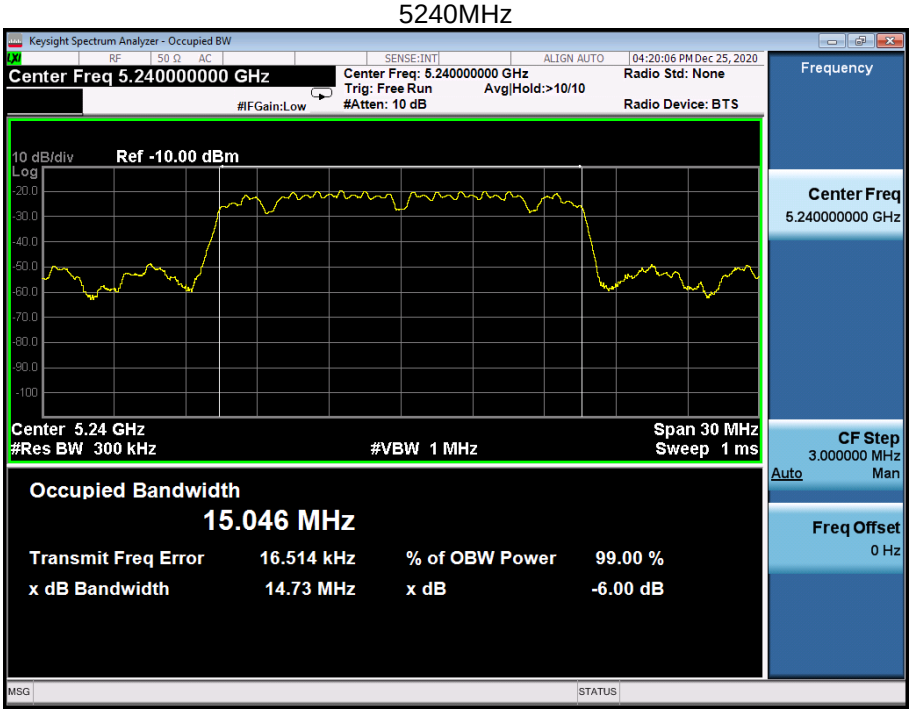
5180MHz



5210MHz

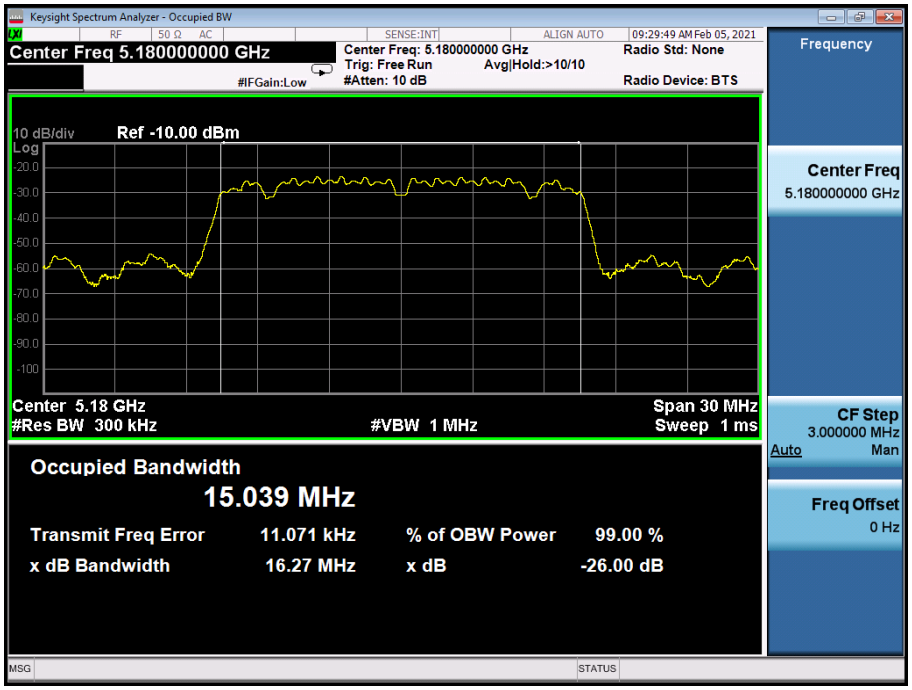


5240MHz

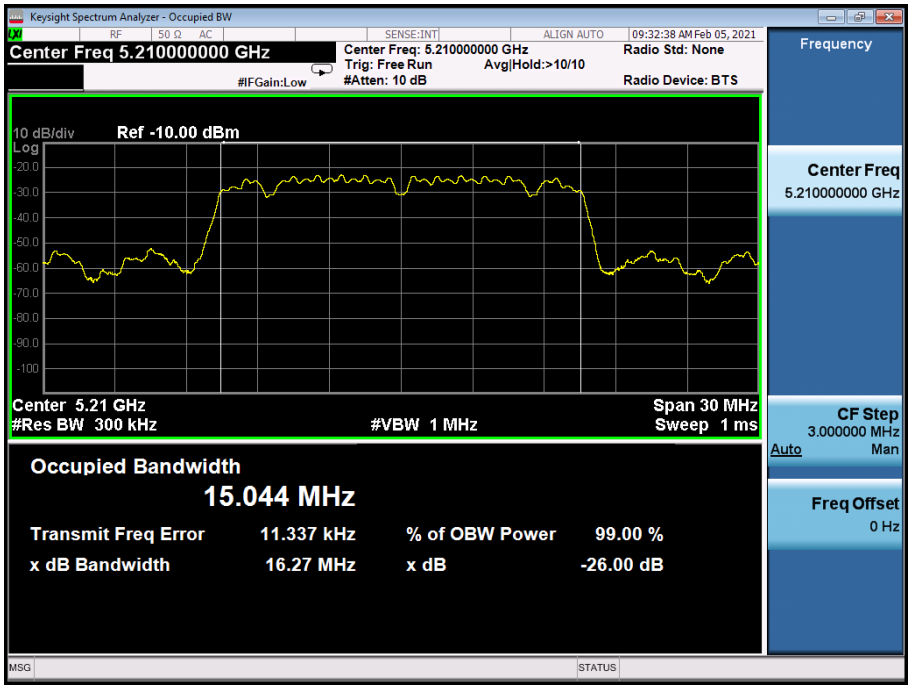


26 Bandwidth for ANT A

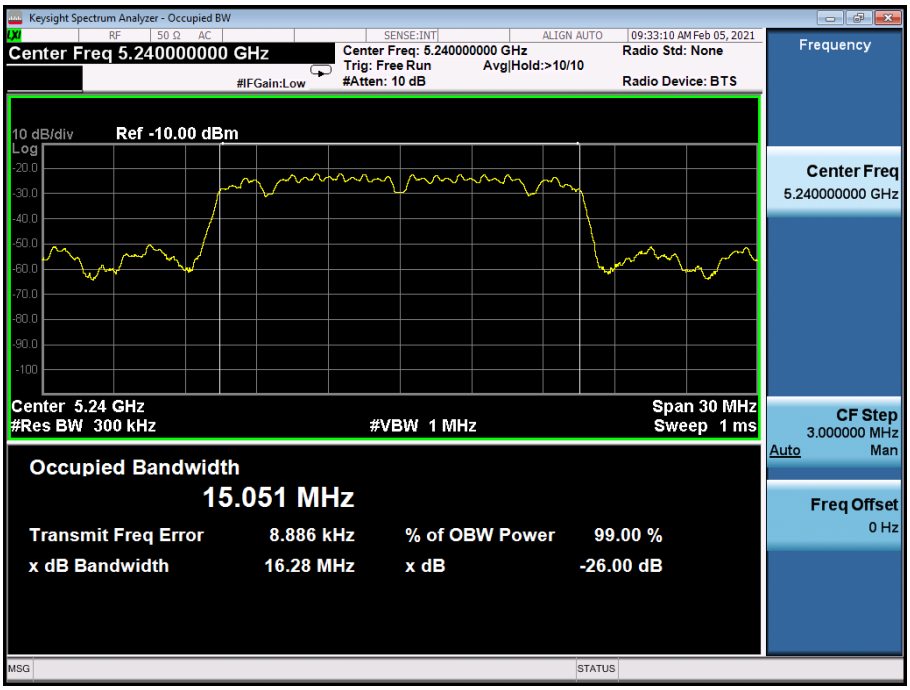
5180MHz



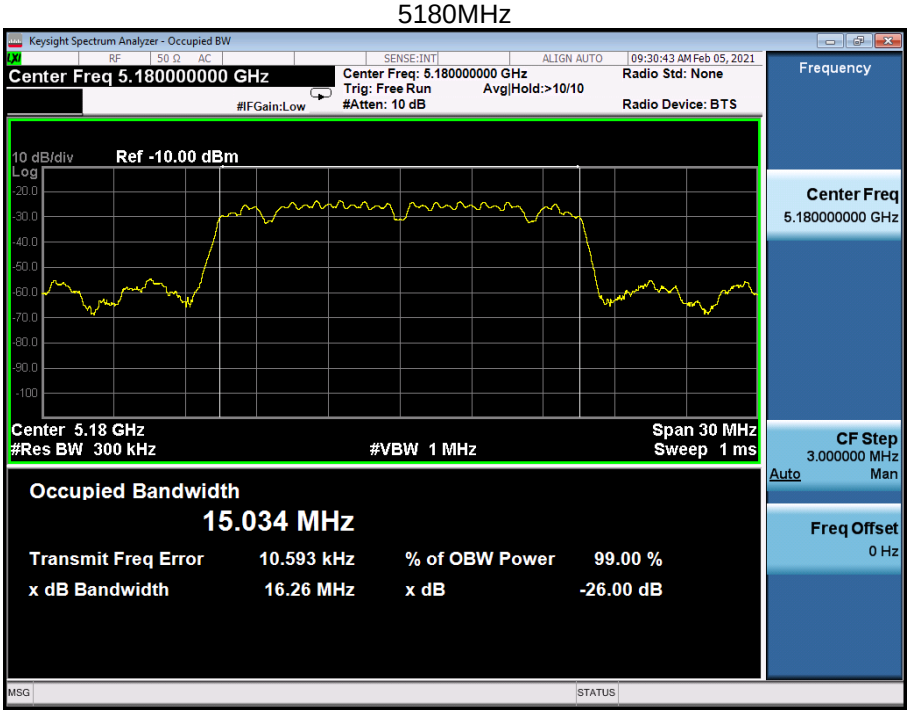
5210MHz



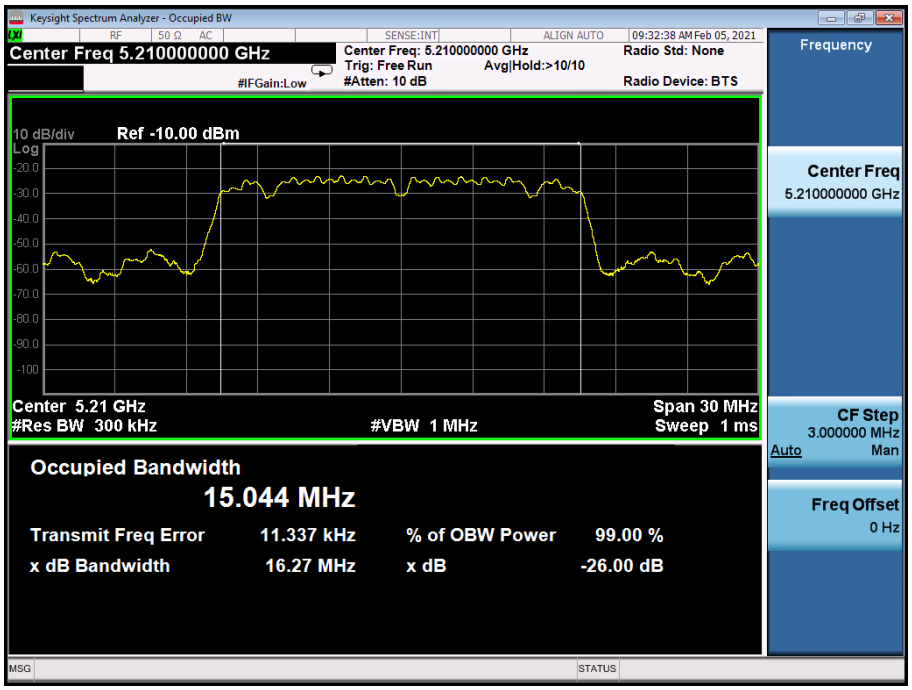
5240MHz



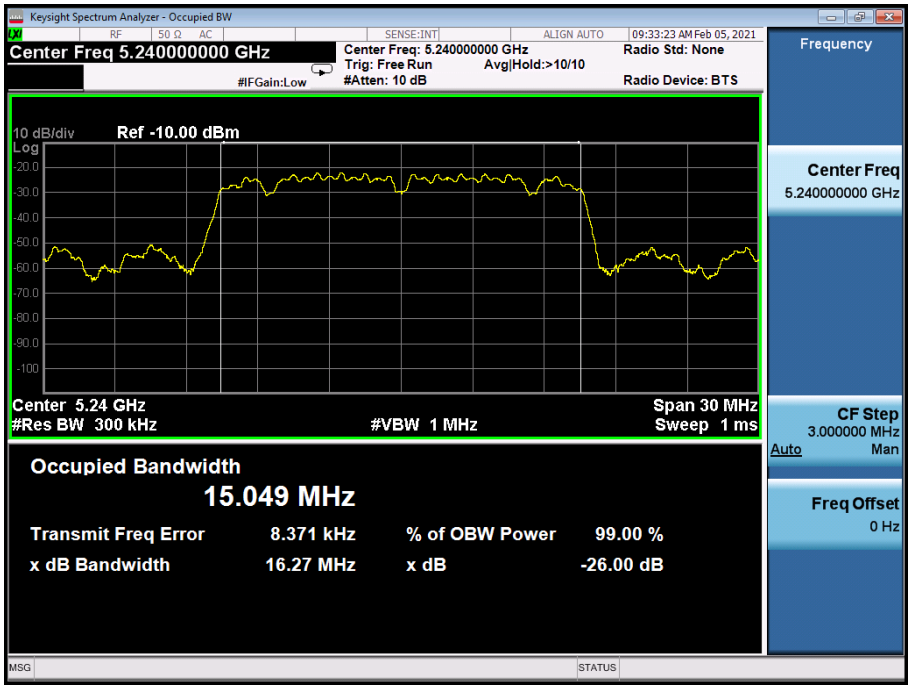
26 Bandwidth for ANT B
5180MHz



5210MHz



5240MHz



8 Peak Output Power

8.1 Test Limit

15.407(a)(iv)			
Test Item	Limit	Frequency Range (MHz)	Result
Peak Output Power	250mW(24dBm)	5150-5250	PASS
RSS-247 Section 6.2.1.1			
Test Item	Limit	Frequency Range (MHz)	Result
Peak Output Power(e.i.r.p)	200 mW or 10 + 10 $\log_{10}$B, dBm	5150-5250	PASS

8.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The EUT was directly connected to the Power meter.

8.3 Measurement Equipment Used

Same as Radiated Emission Measurement.

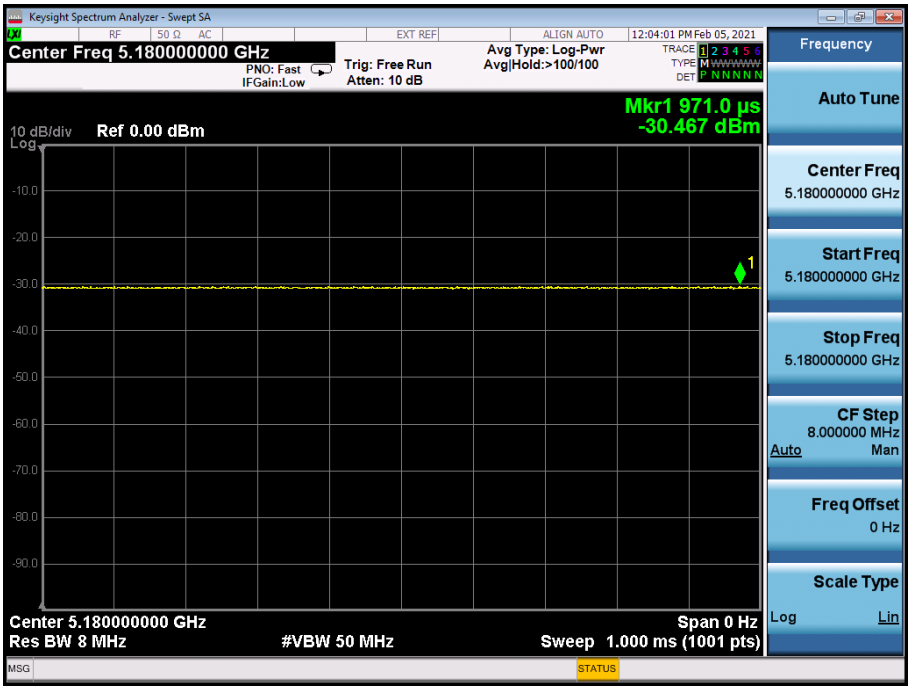
8.4 Test Result

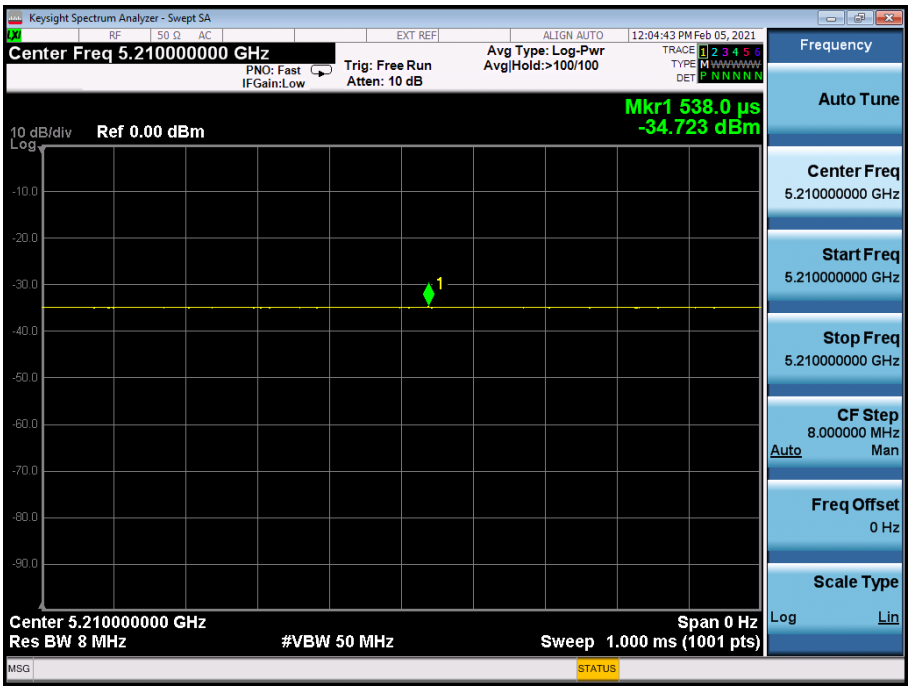
PASS

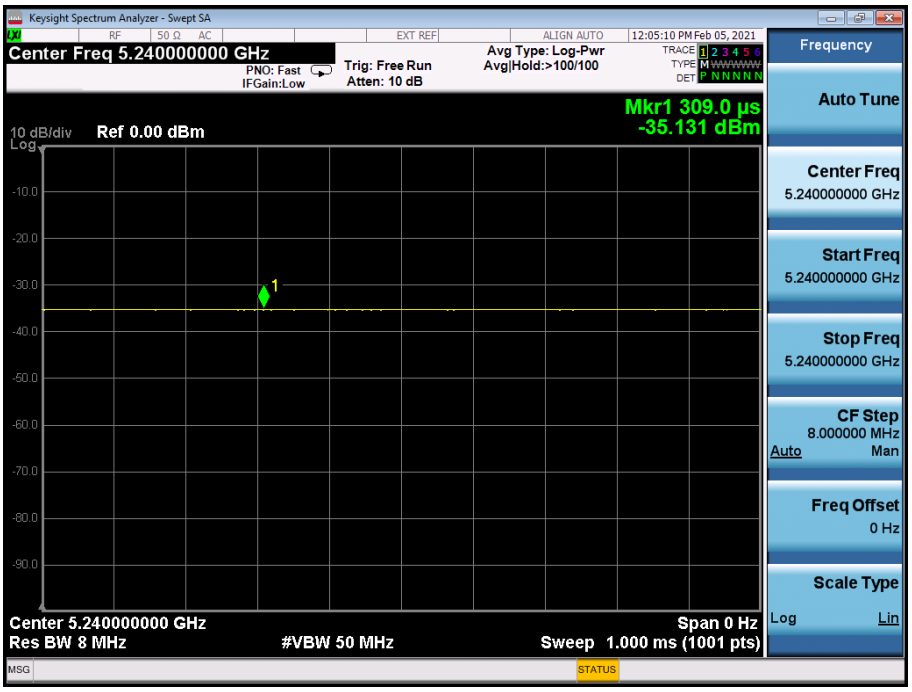
ANT A				
Type	Channel	Peak Output power (dBm)	Limit (dBm)	Result
QPSK	1	3.414	24.0	Pass
	2	3.274		
	3	3.985		
ANT B				
Type	Channel	Peak Output power (dBm)	Limit (dBm)	Result
QPSK	1	3.257	24.0	Pass
	2	3.554		
	3	4.025		

MIMO

Type	Channel	Peak Output power (dBm)		Total Peak Output power (dBm)	Total Peak Output power (EIRP)	Limit (dBm)	Result
		ANT A	ANT B	ANT A+ ANT B	ANT A+ ANT B		
QPSK	1	3.414	3.257	6.35	11.76	24.0	Pass
	2	3.274	3.554	6.43	11.84		
	3	3.985	4.025	**7.02**	**12.43**		
NOTE: During the test the EUT is in 100% duty cycle transmitting.							


Keysight Spectrum Analyzer - Swept SA
RF 50 Ω AC
EXT REF
ALIGN AUTO
12:04:01 PM Feb 05, 2021
Center Freq 5.180000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Mkr1 971.0 µs
-30.467 dBm
10 dB/div
Log
Ref 0.00 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
Center 5.180000000 GHz
Res BW 8 MHz
#VBW 50 MHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
5.180000000 GHz
Start Freq
5.180000000 GHz
Stop Freq
5.180000000 GHz
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin


Keysight Spectrum Analyzer - Swept SA
RF 50 Ω AC
EXT REF
ALIGN AUTO
12:04:43 PM Feb 05, 2021
Center Freq 5.210000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Mkr1 538.0 µs
-34.723 dBm
10 dB/div
Log
Ref 0.00 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
Center 5.210000000 GHz
Res BW 8 MHz
#VBW 50 MHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
5.210000000 GHz
Start Freq
5.210000000 GHz
Stop Freq
5.210000000 GHz
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin


Keysight Spectrum Analyzer - Swept SA
RF
50 Ω AC
EXT REF
ALIGN AUTO
12:05:10 PM Feb 05, 2021
Center Freq 5.240000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Mkr1 309.0 µs
-35.131 dBm
10 dB/div
Log
Ref 0.00 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
1
Center 5.240000000 GHz
Res BW 8 MHz
#VBW 50 MHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
5.240000000 GHz
Start Freq
5.240000000 GHz
Stop Freq
5.240000000 GHz
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

9 Power Spectral Density

9.1 Test Limit

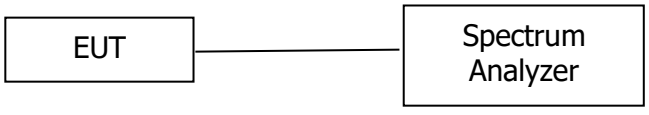
15.407(a)(iv)			
Test Item	Limit	Frequency Range (MHz)	Result
Power Spectral Density	11 dBm (in any 1.0 MHz)	5150-5250	PASS
RSS-247 Section 6.2.1.1			
Test Item	Limit	Frequency Range (MHz)	Result
Power Spectral Density(e.i.r.p)	10 dBm (in any 1.0 MHz)	5150-5250	PASS

9.2 Test Procedure

Methods refer to FCC KDB 789033
1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”.
2) Use the peak search function on the instrument to find the peak of the spectrum.
3) The result is the PPSD.
4) The above procedures make use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz “provided that the measured power is integrated to show the total power over the measurement bandwidth” (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth

9.3 Measurement Equipment Used

Same as Radiated Emission Measurement



9.4 Test Result

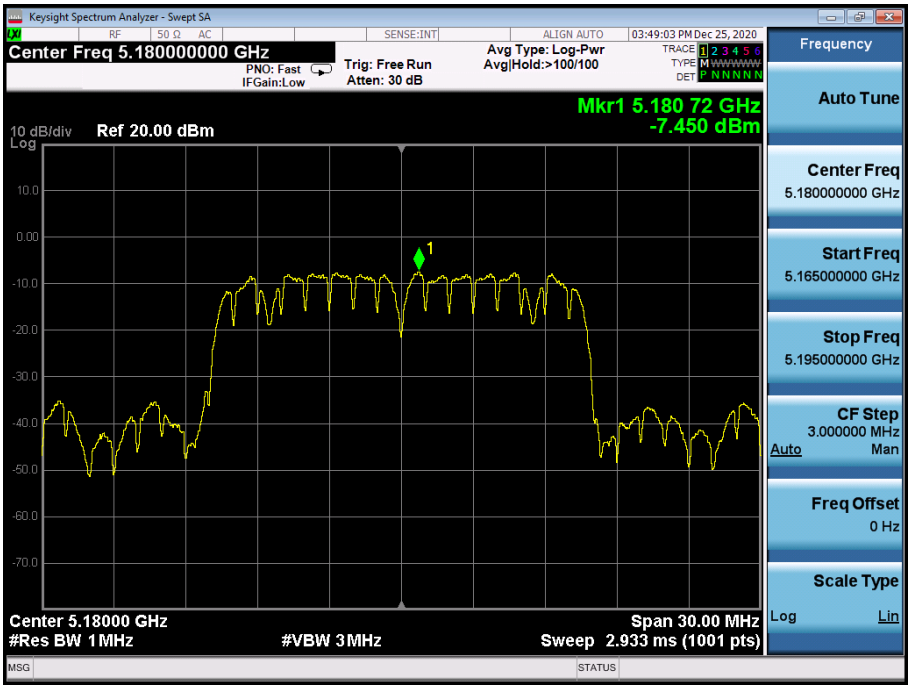
PASS

ANT A				
Type	Channel	Power Spectral Density	Limit (dBm/1.0MHz))	Result
QPSK	1	-7.45	10	Pass
	2	-8.81		
	3	-8.38		

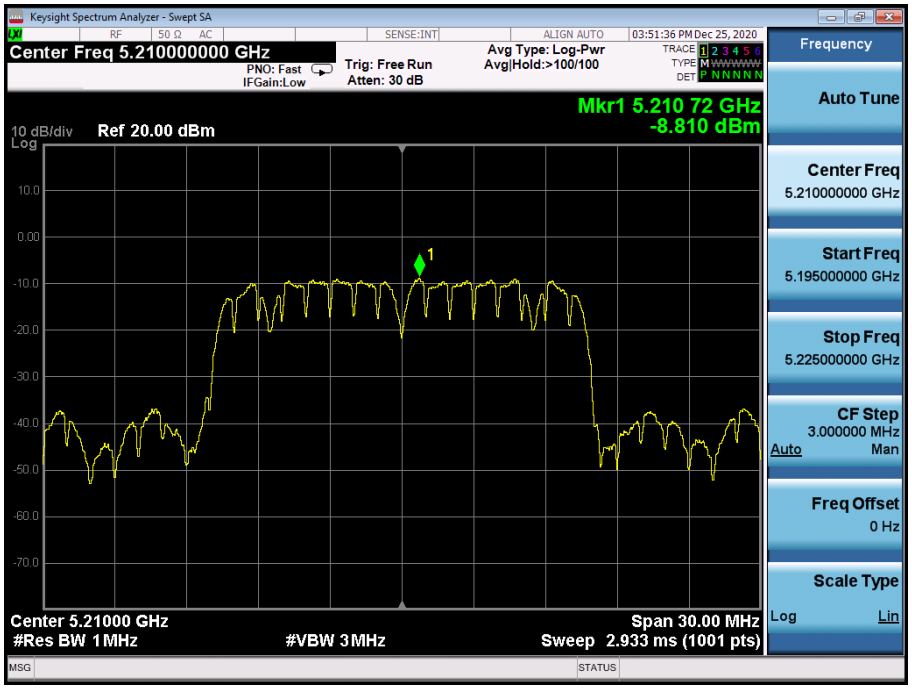
ANT B				
Type	Channel	Power Spectral Density	Limit (dBm/1.0MHz)	Result
QPSK	1	-7.46	10	Pass
	2	-9.59		
	3	-8.28		

Type	Channel	Power Spectral Density		Total Power Spectral Density	Spectral Density(EIRP)	Limit (dBm/1.0MHz)	Result
		ANT A	ANT B	ANT A+ ANT B	ANT A+ ANT B		
QPSK	1	-7.45	-7.46	**-4.44**	0.97	10	Pass
	2	-8.81	-9.59	-6.17	-0.76		
	3	-8.38	-8.28	-5.32	**0.09**		

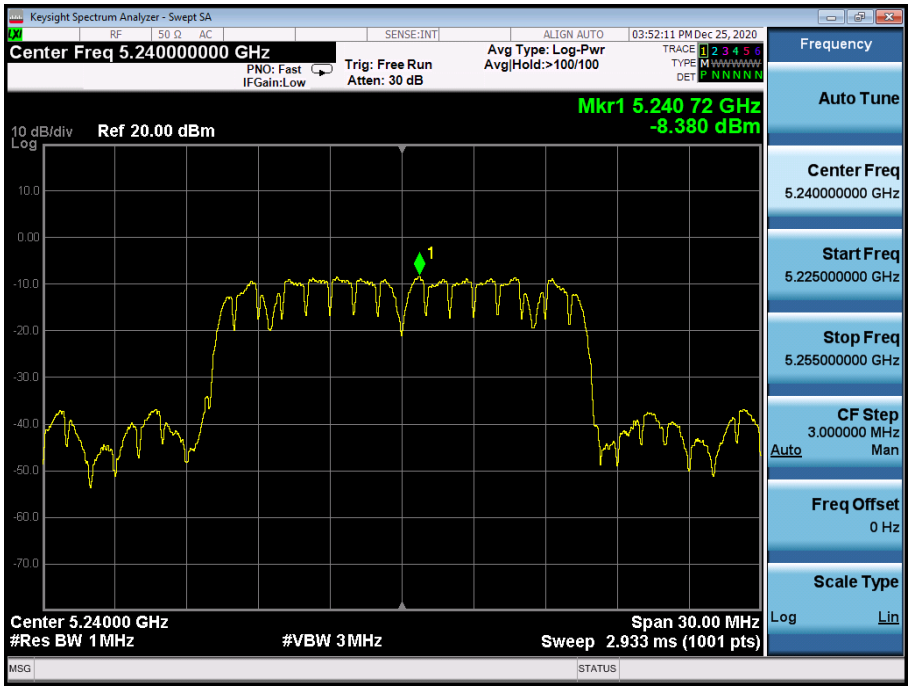
ANT A
5180MHz



5210MHz

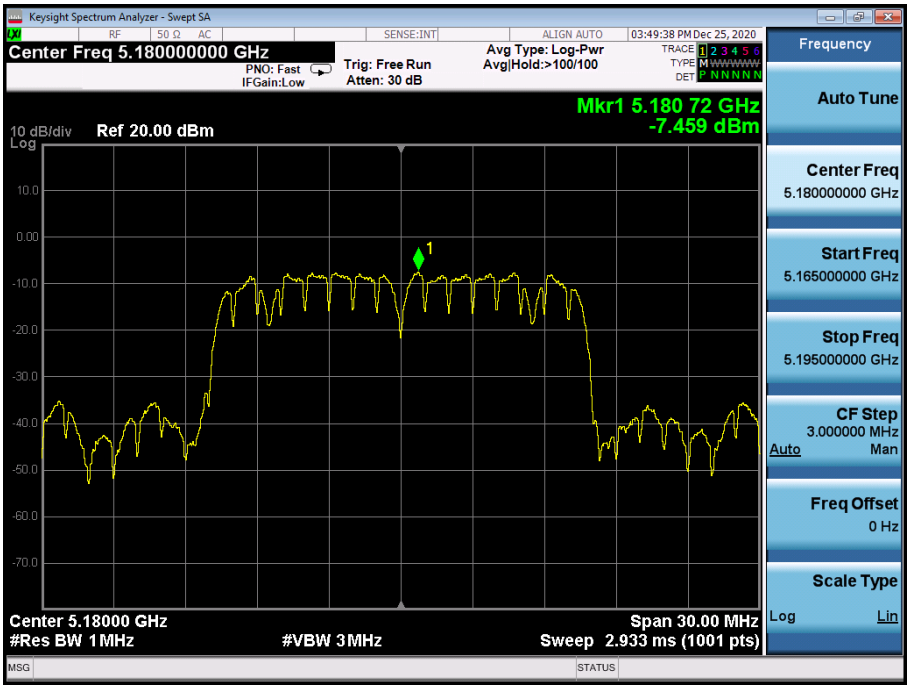


5240MHz

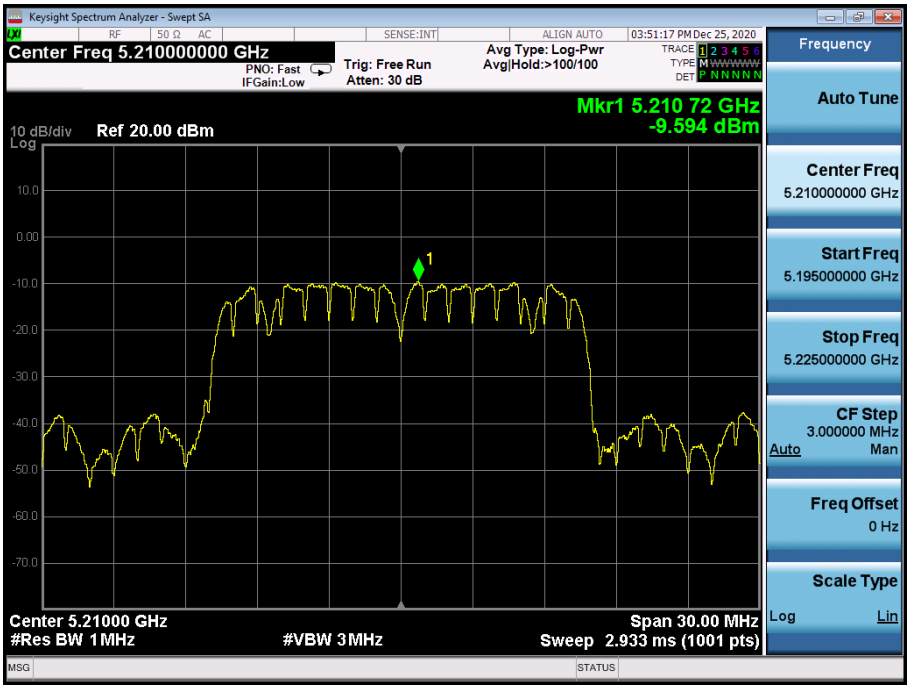


ANT B

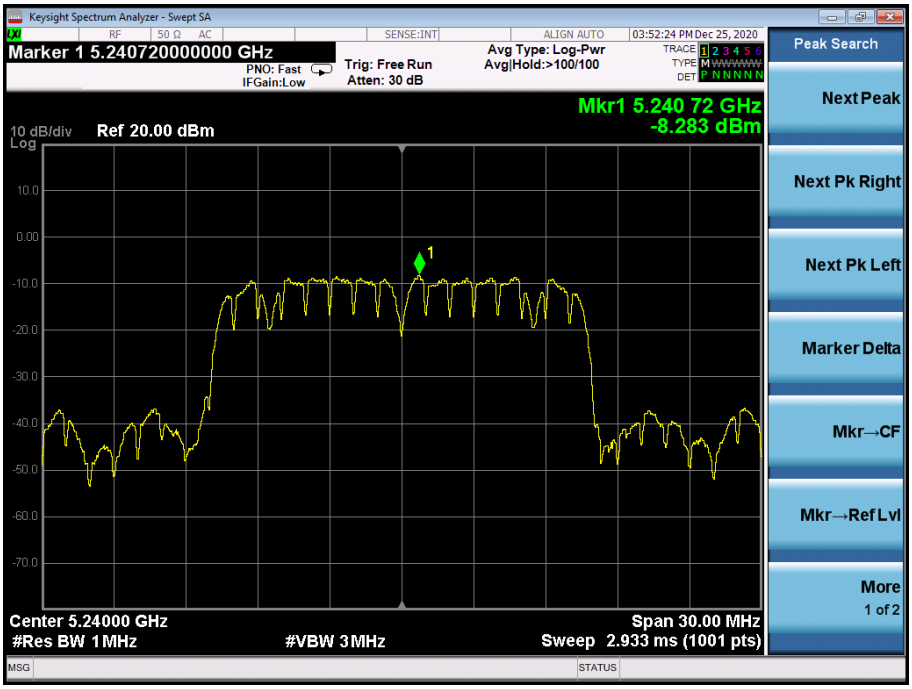
5180MHz



5210MHz

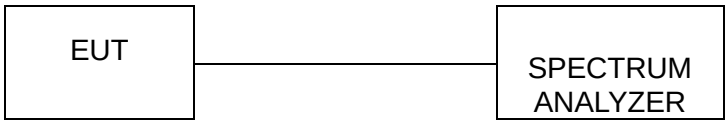


5240MHz


Keysight Spectrum Analyzer - Swept SA
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:52:24 PM Dec 25, 2020
Marker 1 5.240720000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Mkr1 5.240 72 GHz
-8.283 dBm
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 5.24000 GHz
#Res BW 1 MHz
#VBW 3 MHz
Span 30.00 MHz
Sweep 2.933 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

10 Conducted Band Edge

10.1 Test Setup



10.2 Test Procedure

1.The EUT was directly connected to the Spectrum,the power level was set to the maximum level.
2.Set the RBW = 1MHz.
3.Set the VBW ≥ 3MHz
4.Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5.Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).
6.Set detector = power averaging (rms).
7.Sweep time = auto couple.
8.Trace mode = max hold.
9.Allow trace to fully stabilize.

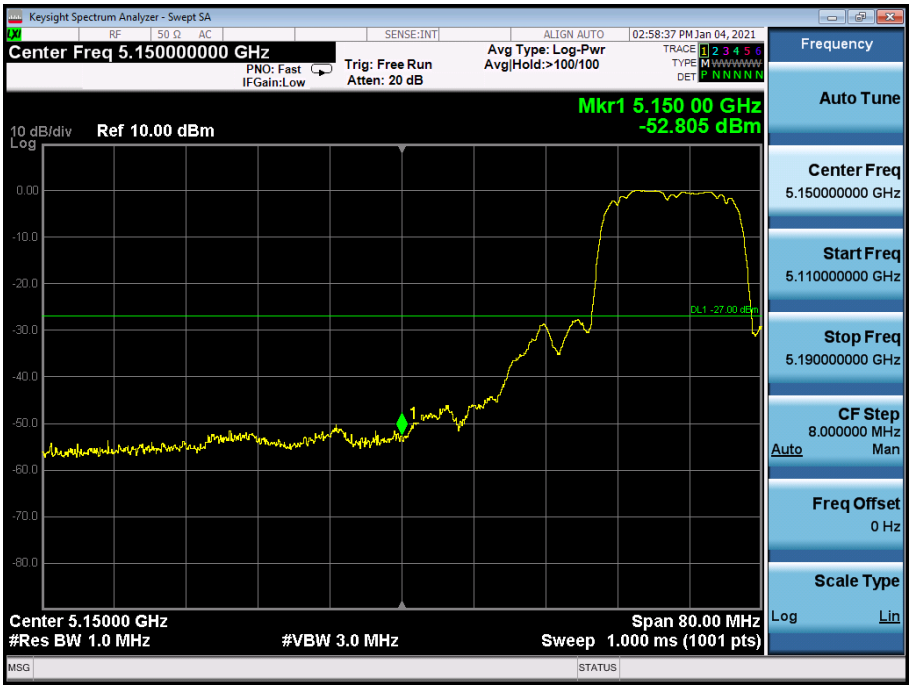
10.3 Limit

For transmitters with operating frequencies in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.

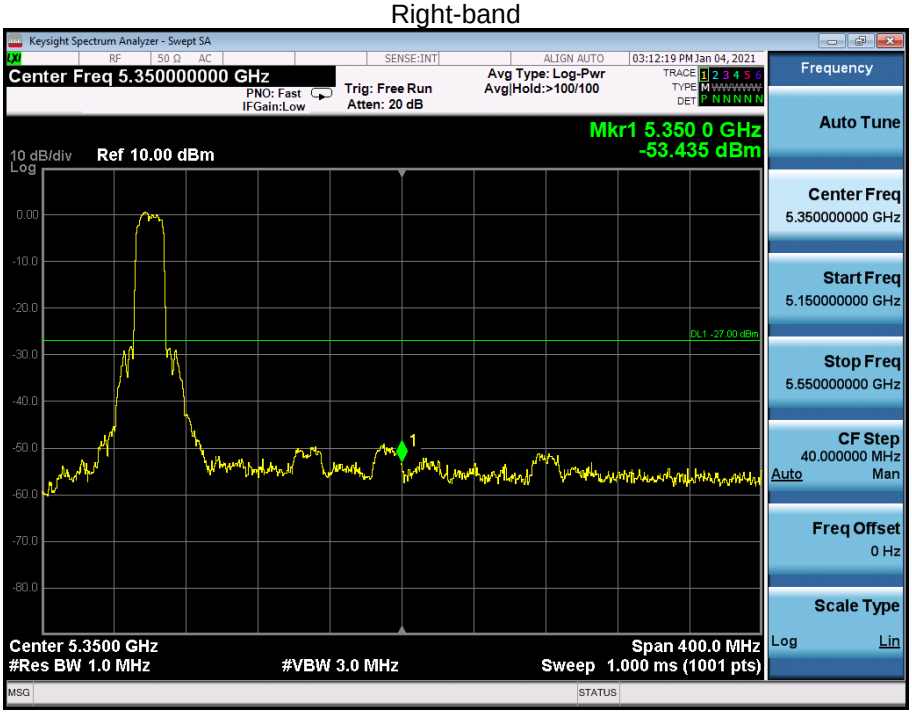
10.4 Test Result

PASS

ANT A
Left-band

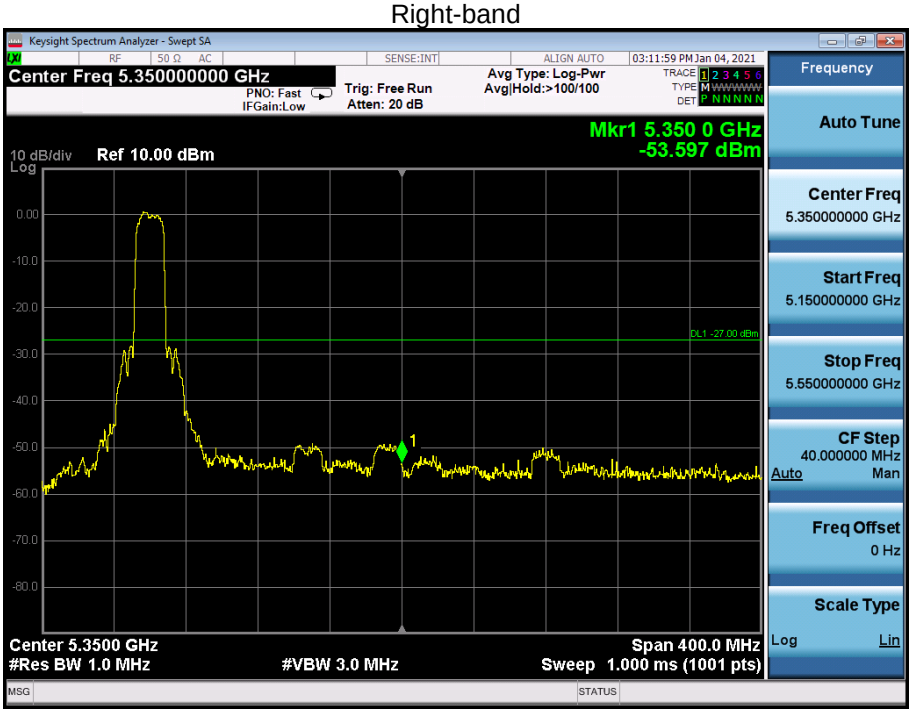


Right-band



ANT B
Left-band

Right-band



11 Frequency Stability

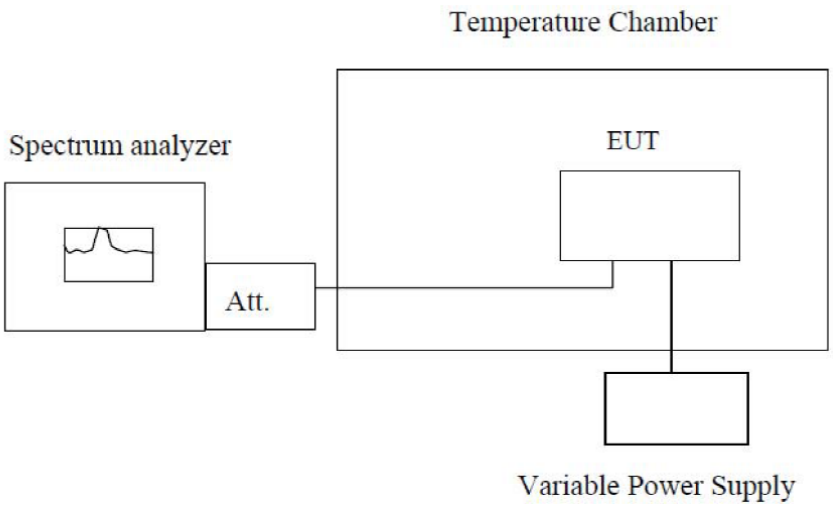
11.1 Test Limit

For 15.407(g): Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.
For RSS-Gen Section 8.11: If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In addition, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-602 MHz, unless otherwise indicated.

11.2 Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 106 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -30°C~50°C.

11.3 Test Setup



11.4 Test Result

PASS

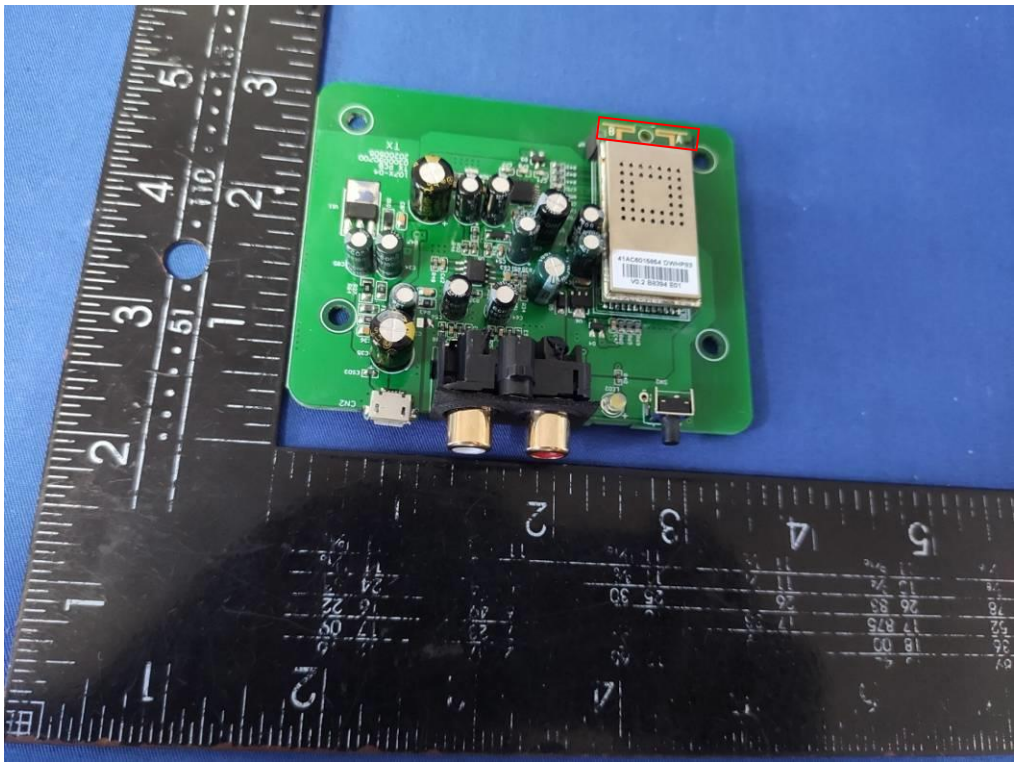
12 Antenna Requirement

12.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.
For RSS-Gen Section 8.3: A transmitter can only be sold or operated with antennas with which it was approved. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power

12.2 Antenna Connected Construction

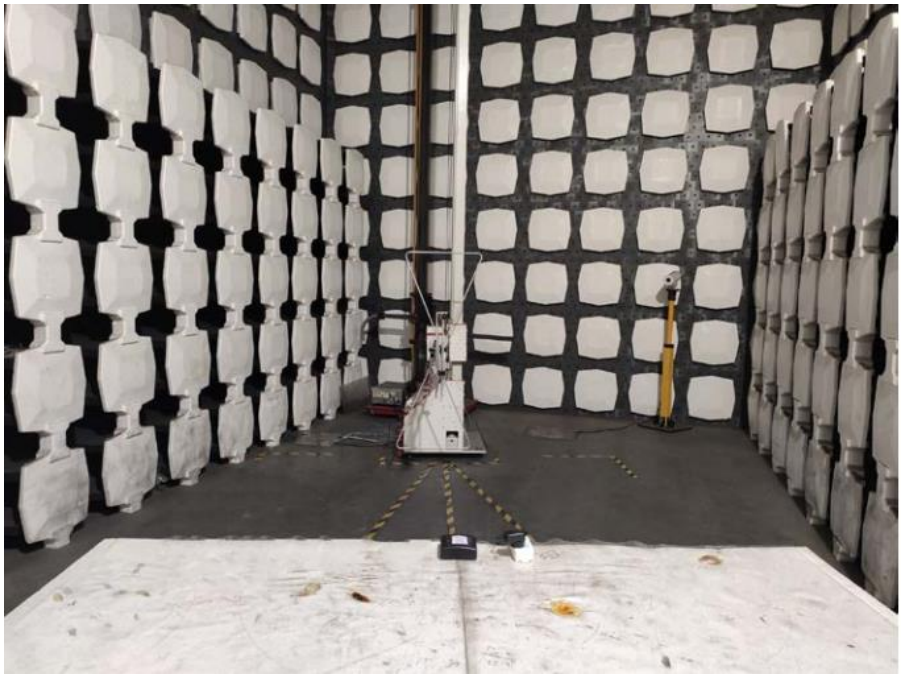
The antenna used in this product is an PCB Antenna, The directional gains of antenna used for transmitting is 2.4 dBi



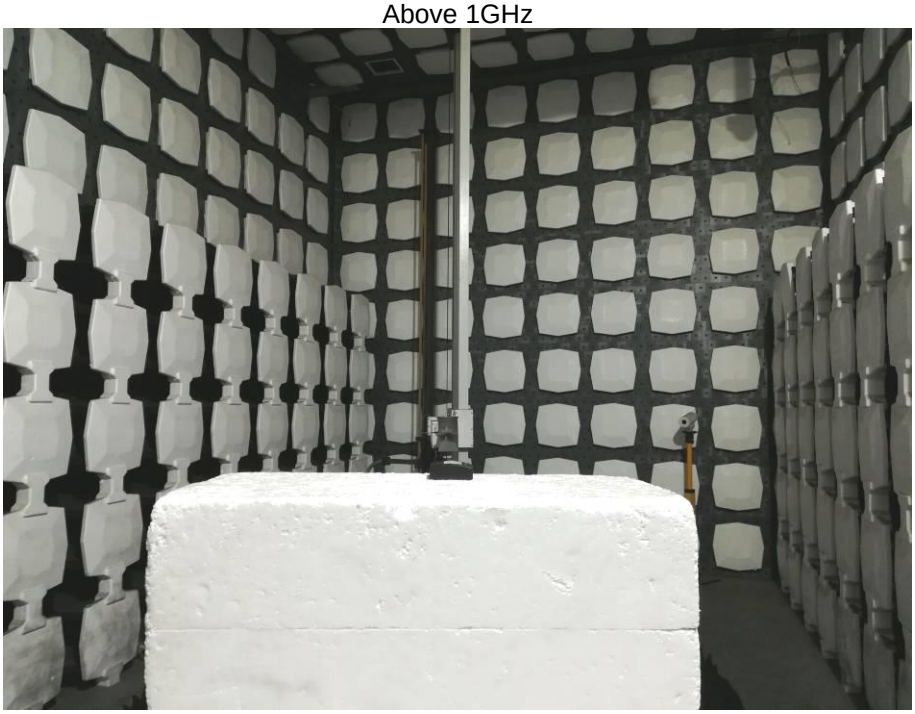
13 Test Setup

Radiated Spurious Emissions

Below 1000MHz



Above 1GHz



Conducted Emissions

---------- End of Report ----------