FCC Part 15C Test Report
FCC ID:2AUPL-M31

Applicant:	Shenzhen Embstar Technology Co., Ltd.
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Manufacturer:	Shenzhen Embstar Technology Co., Ltd.
Address:	Room 208, Building B, No. 133 Longsheng Road, Longxin Community, Baolong Street, Longgang District, Shenzhen, Guangdong, China
EUT:	Wifi AP Module
Trade Mark:	N/A
Model Number:	M31
Date of Receipt:	Sep. 03, 2021
Test Date:	Sep. 03, 2021 – Sep. 27, 2021
Date of Report:	Sep. 27, 2021
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
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Applicable Standards:	FCC PART 15 C 15.247 ANSI C63.10:2014
Test Result:	Pass
Report Number:	DL-20210915029-1E

Prepared (Test Engineer):	Pxing Huang
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Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.205	Band Edge Emission	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(d)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±2.56dB
2	RF power,conducted	±0.42dB
3	Spurious emissions,conducted	±2.76dB
4	All emissions,radiated(<1G)	±3.65dB
5	All emissions,radiated(>1G)	±4.89dB
	Temperature	±0.5℃
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	Wifi AP Module
Trademark	N/A
Model No.:	M31
Model Difference	N/A
Operation Frequency:	2412~2462 MHz for 802.11b/g/nHT20 2422~2452 MHz for 802.11nHT40
Channel numbers:	11 Channels for 802.11b/g/n(HT20) 7 channels for 802.11nHT40
Channel separation:	5MHz
Modulation technology:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n(20): DSSS (CCK, DQPSK,DBPSK)+OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Rate of Transmitter	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 150Mbps
Antenna Type:	Ipex antenna
Antenna gain:	2dBi
Power Supply:	DC 3.3V
Note:	The MIMO mode only support external Ipex antenna1 and Ipex antenna2 the 802.11n mode, the Directional Gain=2dBi+10log(2)=5.0dBi.

Note:

1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.The EUT's all information provided by client.

2. Channel List(802.11b/g/nHT20)

Channel	Frequency (GHz)	Channel	Frequency (GHz)
01	2.412	07	2.442
02	2.417	08	2.447
03	2.422	09	2.452
04	2.427	10	2.457
05	2.432	11	2.462
06	2.437		

Channel List(802.11nHT40)

Channel	Frequency (GHz)	Channel	Frequency (GHz)
03	2.422	07	2.442
04	2.427	08	2.447
05	2.432	09	2.452
06	2.437		

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	802.11b CH1/ CH6/ CH11
Mode 2	802.11g CH1/ CH6/ CH11
Mode 3	802.11nHT20 CH1/ CH6/ CH11
Mode 4	802.11nHT40 CH3/ CH6/ CH09
Mode 5	Link Mode
For Conducted Emission	
Final Test Mode	Description
Mode 5	Link Mode
For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11b CH1/ CH6/ CH11
Mode 2	802.11g CH1/ CH6/ CH11
Mode 3	802.11nHT20 CH1/ CH6/ CH11
Mode 4	802.11nHT40 CH3/ CH6/ CH09

Note: 1. The measurements are performed at the highest, middle, lowest available channels.
2. During the test, the duty cycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test

Conducted Spurious Emission Test

2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Max output power Setting				
Test software Version	Test program: AXDN-0002.0			
Mode	802.11b	802.11g	802.11n HT20	802.11n HT40
Data Rate	1Mbps	1Mbps	MSC0	MSC0
Power Setting of Softwave	60	60	60	66

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4408B	MY50140780	Dec. 07, 2020	Dec. 06, 2021
2	Test Receiver (9kHz-7GHz)	R&S	ESRP7	101393	Dec. 07, 2020	Dec. 06, 2021
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB9162	00306	Dec. 07, 2020	Dec. 06, 2021
4	Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA9120D	02139	Dec. 07, 2020	Dec. 06, 2021
5	Horn Antenna (18GHz-40GHz)	A.H. Systems	SAS-574	588	Dec. 07, 2020	Dec. 06, 2021
6	Amplifier (9KHz-6GHz)	Schwarzbeck	BBV9743B	00153	Dec. 07, 2020	Dec. 06, 2021
7	Amplifier (1GHz-18GHz)	EMEC	EM01G8GA	00270	Dec. 07, 2020	Dec. 06, 2021
8	Amplifier (18GHz-40GHz)	Quanjuda	DLE-161	97	Dec. 07, 2020	Dec. 06, 2021
9	Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Dec. 07, 2020	Dec. 06, 2021
10	RF cables1 (9kHz-1GHz)	ChengYu	966	004	Dec. 07, 2020	Dec. 06, 2021
11	RF cables2 (1GHz-40GHz)	ChengYu	966	003	Dec. 07, 2020	Dec. 06, 2021
12	Antenna connector	Florida RF Labs	N/A	RF 01#	Dec. 07, 2020	Dec. 06, 2021
13	Power probe	KEYSIGHT	U2021XA	MY55210018	Dec. 07, 2020	Dec. 06, 2021
14	Signal Analyzer 9kHz-26.5GHz	Agilent	N9020A	MY55370280	Dec. 07, 2020	Dec. 06, 2021
15	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	Dec. 07, 2020	Dec. 06, 2021
16	D.C. Power Supply	LongWei	PS-305D	010964729	Dec. 07, 2020	Dec. 06, 2021

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	843 Shielded Room	ChengYu	843 Room	843	Nov. 25, 2019	Nov. 24, 2022
2	EMI Receiver	R&S	ESR	101421	Dec. 07, 2020	Dec. 06, 2021
3	LISN	R&S	ENV216	102417	Dec. 07, 2020	Dec. 06, 2021
4	843 Cable 1#	ChengYu	CE Cable	001	Dec. 07, 2020	Dec. 06, 2021

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		S andard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

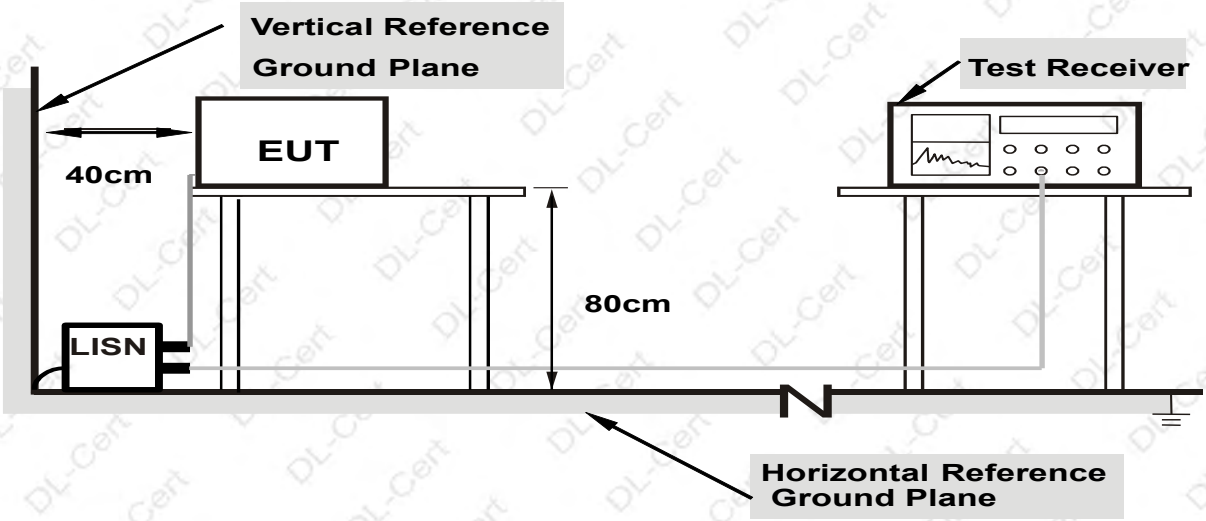
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



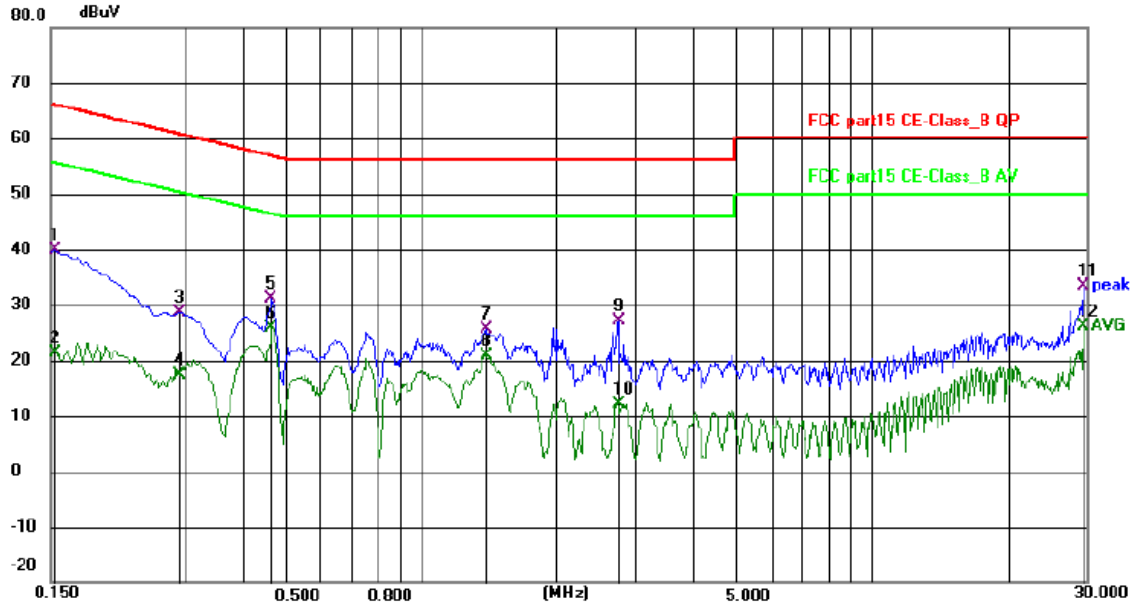
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 5

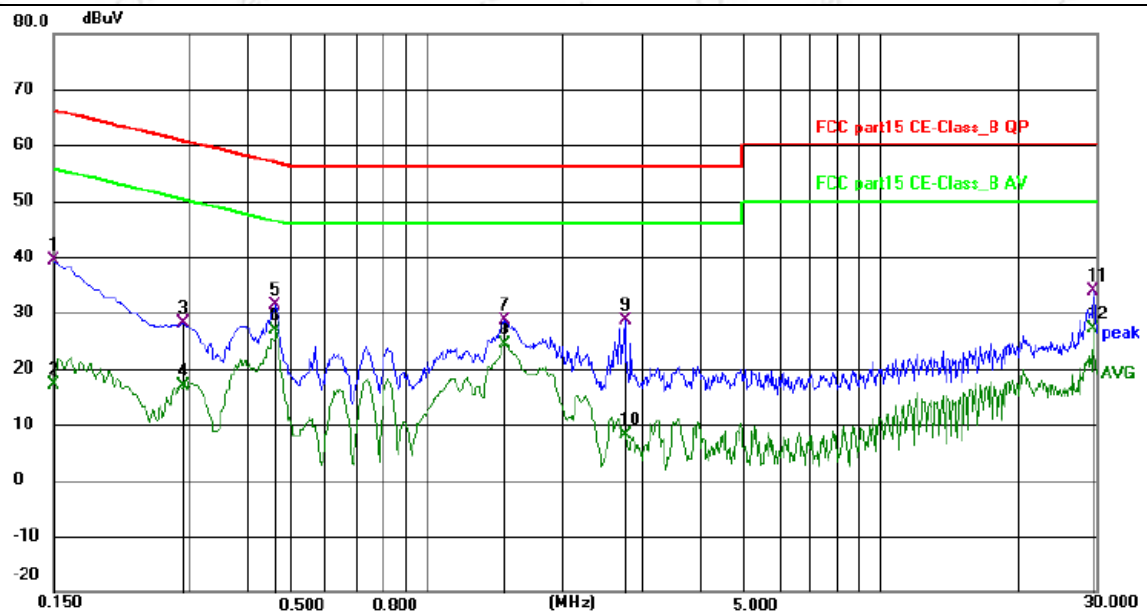


Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1544	29.19	10.59	39.78	65.76	25.98	QP	P	
2	0.1544	10.89	10.59	21.48	55.76	34.28	AVG	P	
3	0.2895	19.34	9.25	28.59	60.54	31.95	QP	P	
4	0.2895	8.06	9.25	17.31	50.54	33.23	AVG	P	
5	0.4650	21.72	9.34	31.06	56.60	25.54	QP	P	
6 *	0.4650	16.56	9.34	25.90	46.60	20.70	AVG	P	
7	1.3919	15.97	9.67	25.64	56.00	30.36	QP	P	
8	1.3919	11.28	9.67	20.95	46.00	25.05	AVG	P	
9	2.7375	18.11	9.05	27.16	56.00	28.84	QP	P	
10	2.7375	2.96	9.05	12.01	46.00	33.99	AVG	P	
11	29.4990	22.40	10.88	33.28	60.00	26.72	QP	P	
12	29.4990	15.17	10.88	26.05	50.00	23.95	AVG	P	

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 5



Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1500	28.81	10.53	39.34	66.00	26.66	QP	P	
2	0.1500	6.69	10.53	17.22	56.00	38.78	AVG	P	
3	0.2895	19.04	9.20	28.24	60.54	32.30	QP	P	
4	0.2895	7.74	9.20	16.94	50.54	33.60	AVG	P	
5	0.4650	21.76	9.50	31.26	56.60	25.34	QP	P	
6 *	0.4650	17.36	9.50	26.86	46.60	19.74	AVG	P	
7	1.4819	18.93	9.77	28.70	56.00	27.30	QP	P	
8	1.4819	14.56	9.77	24.33	46.00	21.67	AVG	P	
9	2.7375	18.75	9.98	28.73	56.00	27.27	QP	P	
10	2.7375	-1.94	9.98	8.04	46.00	37.96	AVG	P	
11	29.5125	22.98	10.95	33.93	60.00	26.07	QP	P	
12	29.5125	16.11	10.95	27.06	50.00	22.94	AVG	P	

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).

h. Test the EUT in the lowest channel, the middle channel, the Highest channel

Note:

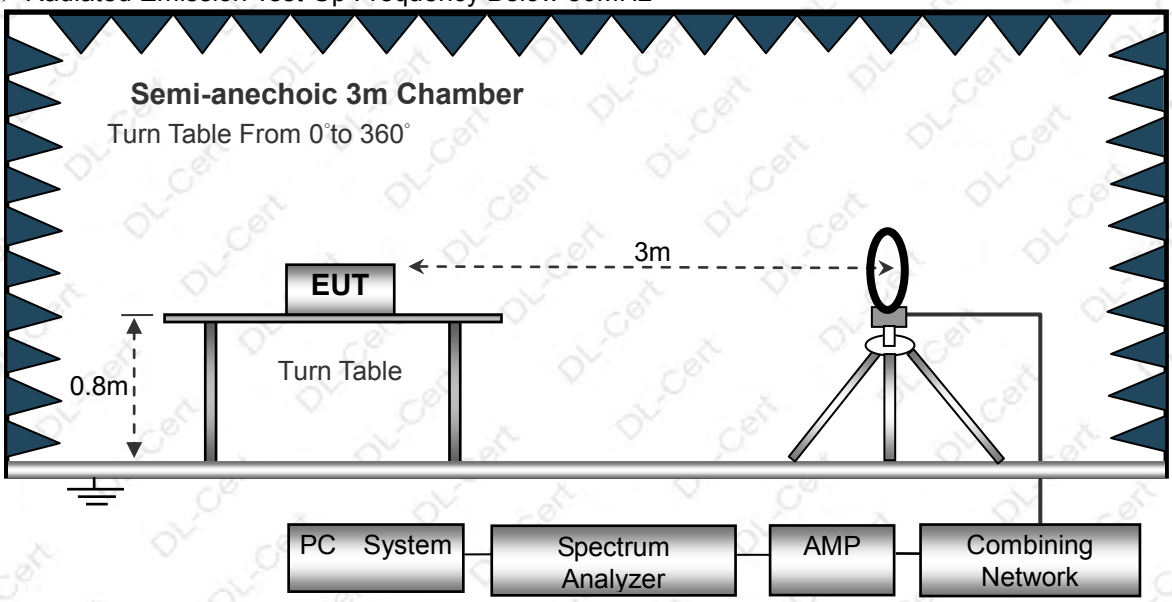
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

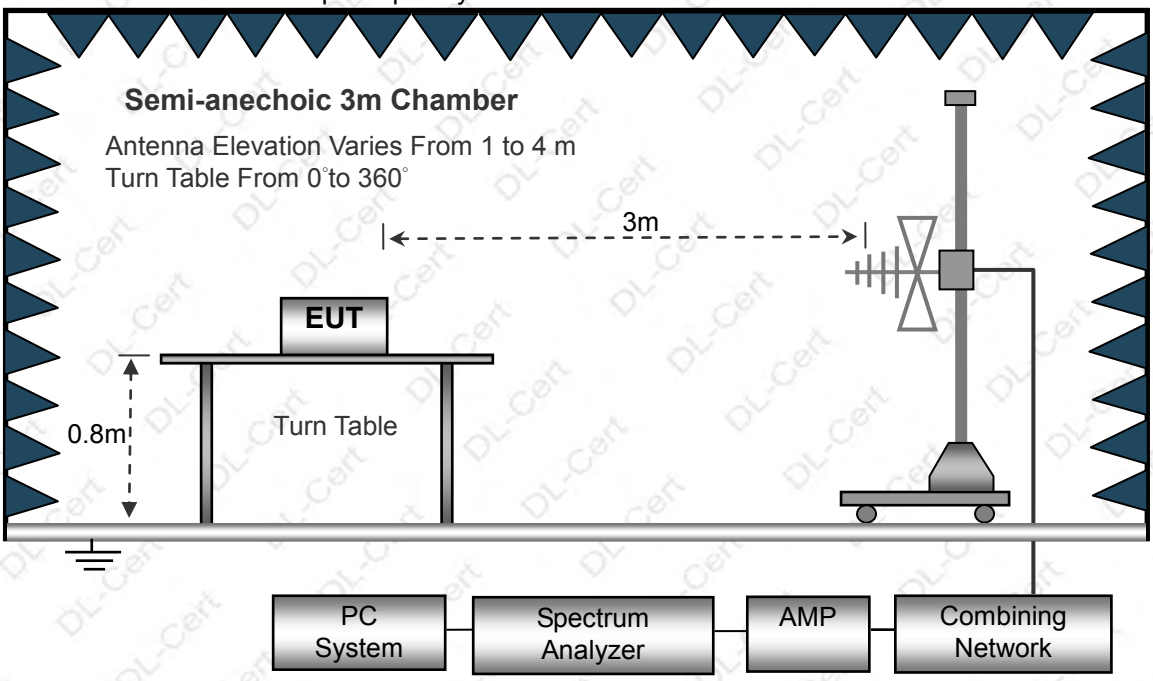
No deviation

3.2.4 TEST SETUP

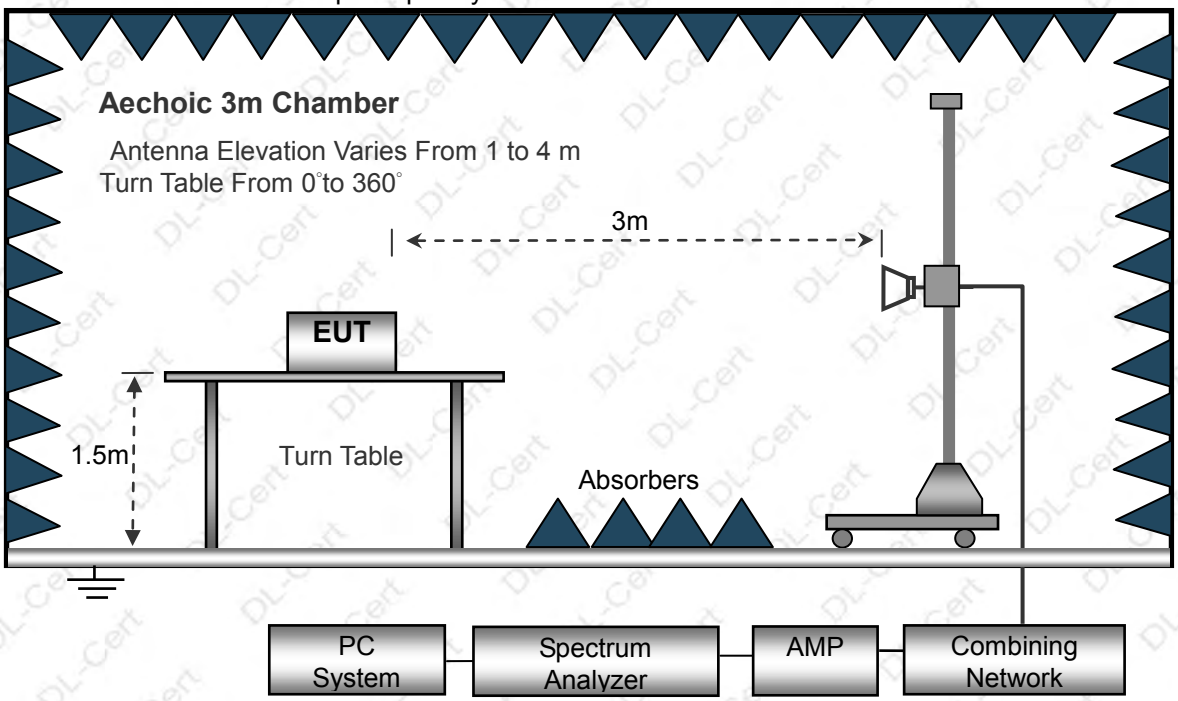
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



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



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	20℃	Relative Humidtity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.3V
Test Mode :	Mode 5	Polarization :	--

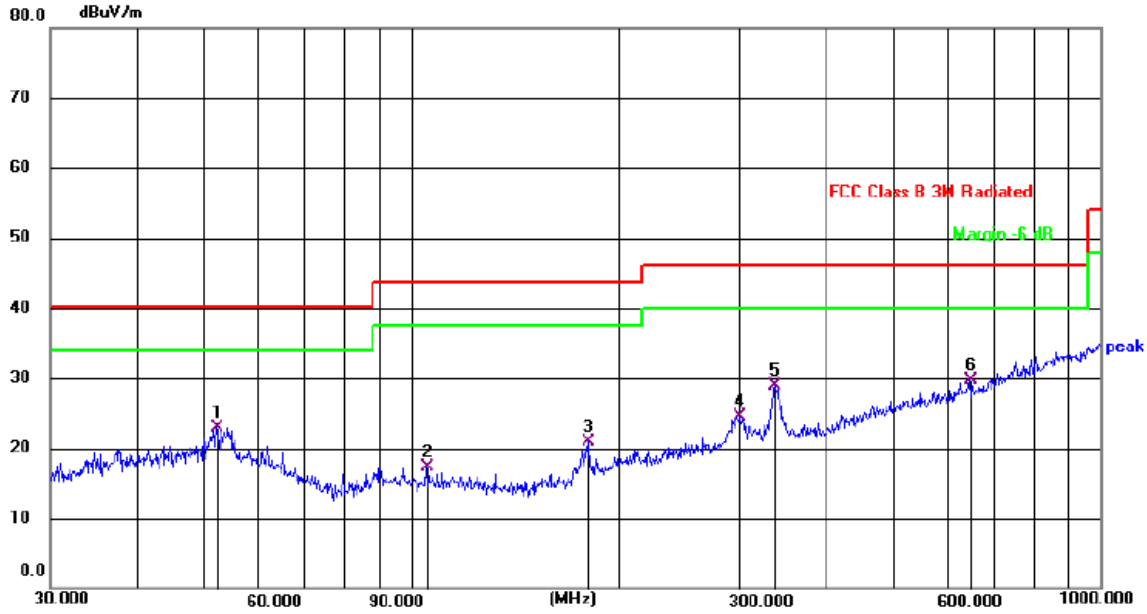
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 3.3V		
Test Mode :	Mode 5		



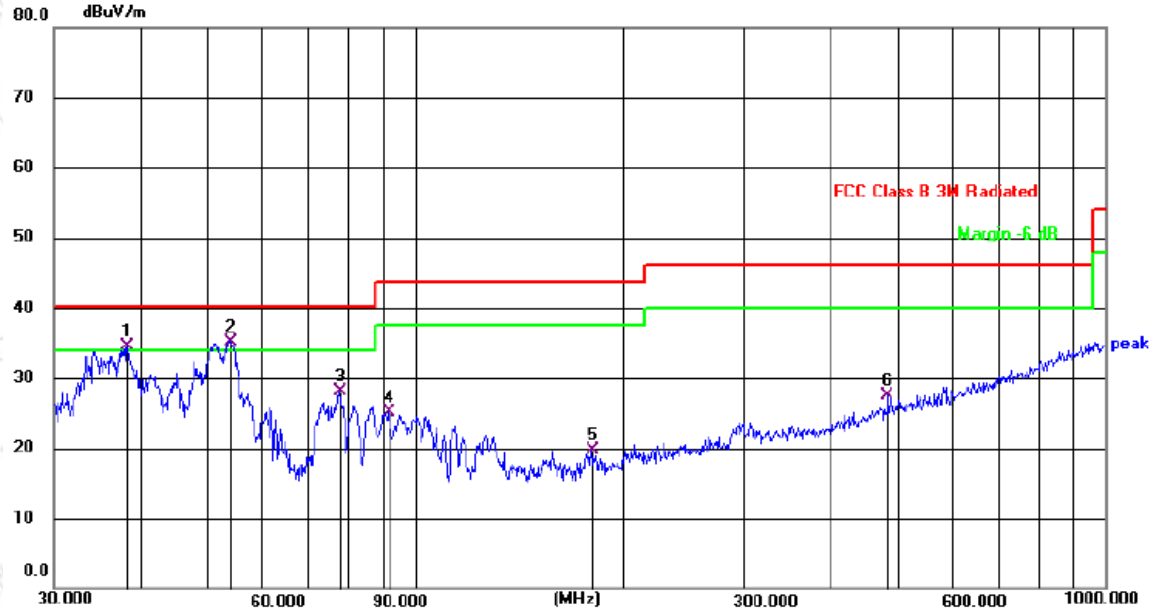
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		52.2079	36.36	-13.49	22.87	40.00	17.13	QP
2		105.2718	35.00	-17.70	17.30	43.50	26.20	QP
3		181.2834	38.07	-17.24	20.83	43.50	22.67	QP
4		300.3672	37.02	-12.49	24.53	46.00	21.47	QP
5		337.2155	40.76	-11.91	28.85	46.00	17.15	QP
6	*	645.1195	35.33	-5.72	29.61	46.00	16.39	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 3.3V		
Test Mode :	Mode 5		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	38.3462	49.07	-14.58	34.49	40.00	5.51	QP
2	*	53.8818	48.84	-13.64	35.20	40.00	4.80	QP
3		77.5928	47.06	-18.92	28.14	40.00	11.86	QP
4		91.4949	42.29	-17.27	25.02	43.50	18.48	QP
5		180.0165	37.03	-17.32	19.71	43.50	23.79	QP
6		483.9094	36.06	-8.51	27.55	46.00	18.45	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

3.2.8 TEST RESULTS (1GHZ~25GHZ)

802.11b
We test all antenna's data, the data only show the antenna1 worst mode.

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	4824	67.32	50.65	6.88	31.29	54.84	74	-19.16	PK
V	4824	55.15	50.65	6.88	31.29	42.67	54	-11.33	AV
V	7236	66.55	49.98	7.16	36.63	60.36	74	-13.64	PK
V	7236	54.34	49.98	7.16	36.63	48.15	54	-5.85	AV
V	16087	48.35	51.53	11.34	41.52	49.68	74	-24.32	PK
H	4824	66.72	50.65	6.88	31.29	54.24	74	-19.76	PK
H	4824	55.48	50.65	6.88	31.29	43	54	-11	AV
H	7236	69.53	49.98	7.16	36.63	63.34	74	-10.66	PK
H	7236	53.65	49.98	7.16	36.63	47.46	54	-6.54	AV
H	16087	48.83	51.53	11.34	41.52	50.16	74	-23.84	PK
operation frequency:2437									
V	4874	67.15	50.67	6.89	31.38	54.75	74	-19.25	PK
V	4874	55.16	50.67	6.89	31.38	42.76	54	-11.24	AV
V	7311	69.38	50.02	7.24	36.63	63.23	74	-10.77	PK
V	7311	53.34	50.02	7.24	36.63	47.19	54	-6.81	AV
V	16087	48.24	51.53	11.34	41.52	49.57	74	-24.43	PK
H	4874	66.56	50.67	6.89	31.38	54.16	74	-19.84	PK
H	4874	55.23	50.67	6.89	31.38	42.83	54	-11.17	AV
H	7311	69.54	50.02	7.24	36.63	63.39	74	-10.61	PK
H	7311	53.53	50.02	7.24	36.63	47.38	54	-6.62	AV
H	16087	48.45	51.53	11.34	41.52	49.78	74	-24.22	PK
operation frequency:2462									
V	4924	68.35	50.79	6.83	31.36	55.75	74	-18.25	PK
V	4924	55.55	50.79	6.83	31.36	42.95	54	-11.05	AV
V	7386	69.33	50.11	7.25	36.58	63.05	74	-10.95	PK
V	7386	53.34	50.11	7.25	36.58	47.06	54	-6.94	AV
V	16087	49.34	51.53	11.34	41.52	50.67	74	-23.33	PK
H	4924	67.25	50.79	6.83	31.36	54.65	74	-19.35	PK
H	4924	55.23	50.79	6.83	31.36	42.63	54	-11.37	AV
H	7386	67.34	50.11	7.25	36.58	61.06	74	-12.94	PK
H	7386	55.32	50.11	7.25	36.58	49.04	54	-4.96	AV
H	16087	49.45	51.53	11.34	41.52	50.78	74	-23.22	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11g

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	4824	67.46	50.65	6.88	31.29	54.98	74	-19.02	PK
V	4824	55.73	50.65	6.88	31.29	43.25	54	-10.75	AV
V	7236	66.35	49.98	7.16	36.63	60.16	74	-13.84	PK
V	7236	53.46	49.98	7.16	36.63	47.27	54	-6.73	AV
V	16087	49.33	51.53	11.34	41.52	50.66	74	-23.34	PK
H	4824	69.25	50.65	6.88	31.29	56.77	74	-17.23	PK
H	4824	56.53	50.65	6.88	31.29	44.05	54	-9.95	AV
H	7236	66.55	49.98	7.16	36.63	60.36	74	-13.64	PK
H	7236	54.16	49.98	7.16	36.63	47.97	54	-6.03	AV
H	16087	47.73	51.53	11.34	41.52	49.06	74	-24.94	PK
operation frequency:2437									
V	4874	67.14	50.67	6.89	31.38	54.74	74	-19.26	PK
V	4874	55.33	50.67	6.89	31.38	42.93	54	-11.07	AV
V	7311	66.56	50.02	7.24	36.63	60.41	74	-13.59	PK
V	7311	55.92	50.02	7.24	36.63	49.77	54	-4.23	AV
V	16087	48.45	51.53	11.34	41.52	49.78	74	-24.22	PK
H	4874	66.33	50.67	6.89	31.38	53.93	74	-20.07	PK
H	4874	55.75	50.67	6.89	31.38	43.35	54	-10.65	AV
H	7311	65.25	50.02	7.24	36.63	59.1	74	-14.9	PK
H	7311	53.42	50.02	7.24	36.63	47.27	54	-6.73	AV
H	16087	48.44	51.53	11.34	41.52	49.77	74	-24.23	PK
operation frequency:2462									
V	4924	67.56	50.79	6.83	31.36	54.96	74	-19.04	PK
V	4924	55.24	50.79	6.83	31.36	42.64	54	-11.36	AV
V	7386	66.25	50.11	7.25	36.58	59.97	74	-14.03	PK
V	7386	54.43	50.11	7.25	36.58	48.15	54	-5.85	AV
V	16087	46.54	51.53	11.34	41.52	47.87	74	-26.13	PK
H	4924	66.44	50.79	6.83	31.36	53.84	74	-20.16	PK
H	4924	54.35	50.79	6.83	31.36	41.75	54	-12.25	AV
H	7386	65.36	50.11	7.25	36.58	59.08	74	-14.92	PK
H	7386	55.43	50.11	7.25	36.58	49.15	54	-4.85	AV
H	16087	47.76	51.53	11.34	41.52	49.09	74	-24.91	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11n HT20

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	4824	66.74	50.65	6.88	31.29	54.26	74	-19.74	PK
V	4824	55.36	50.65	6.88	31.29	42.88	54	-11.12	AV
V	7236	66.24	49.98	7.16	36.63	60.05	74	-13.95	PK
V	7236	53.29	49.98	7.16	36.63	47.1	54	-6.9	AV
V	16087	46.14	51.53	11.34	41.52	47.47	74	-26.53	PK
H	4824	66.46	50.65	6.88	31.29	53.98	74	-20.02	PK
H	4824	55.53	50.65	6.88	31.29	43.05	54	-10.95	AV
H	7236	64.34	49.98	7.16	36.63	58.15	74	-15.85	PK
H	7236	54.42	49.98	7.16	36.63	48.23	54	-5.77	AV
H	16087	47.33	51.53	11.34	41.52	48.66	74	-25.34	PK
operation frequency:2437									
V	4874	66.73	50.67	6.89	31.38	54.33	74	-19.67	PK
V	4874	54.34	50.67	6.89	31.38	41.94	54	-12.06	AV
V	7311	65.53	50.02	7.24	36.63	59.38	74	-14.62	PK
V	7311	53.43	50.02	7.24	36.63	47.28	54	-6.72	AV
V	16087	47.65	51.53	11.34	41.52	48.98	74	-25.02	PK
H	4874	65.35	50.67	6.89	31.38	52.95	74	-21.05	PK
H	4874	53.33	50.67	6.89	31.38	40.93	54	-13.07	AV
H	7311	65.08	50.02	7.24	36.63	58.93	74	-15.07	PK
H	7311	53.25	50.02	7.24	36.63	47.1	54	-6.9	AV
H	16087	46.66	51.53	11.34	41.52	47.99	74	-26.01	PK
operation frequency:2462									
V	4924	67.33	50.79	6.83	31.36	54.73	74	-19.27	PK
V	4924	54.21	50.79	6.83	31.36	41.61	54	-12.39	AV
V	7386	64.35	50.11	7.25	36.58	58.07	74	-15.93	PK
V	7386	53.35	50.11	7.25	36.58	47.07	54	-6.93	AV
V	16087	48.55	51.53	11.34	41.52	49.88	74	-24.12	PK
H	4924	67.36	50.79	6.83	31.36	54.76	74	-19.24	PK
H	4924	54.41	50.79	6.83	31.36	41.81	54	-12.19	AV
H	7386	65.32	50.11	7.25	36.58	59.04	74	-14.96	PK
H	7386	54.35	50.11	7.25	36.58	48.07	54	-5.93	AV
H	16087	47.66	51.53	11.34	41.52	48.99	74	-25.01	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11n HT40

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2422									
V	4844	66.73	50.67	6.89	31.32	54.27	74	-19.73	PK
V	4844	55.55	50.67	6.89	31.32	43.09	54	-10.91	AV
V	7266	66.23	50.01	7.15	36.62	59.99	74	-14.01	PK
V	7266	53.28	50.01	7.15	36.62	47.04	54	-6.96	AV
V	16087	46.54	51.53	11.34	41.52	47.87	74	-26.13	PK
H	4844	66.56	50.67	6.89	31.32	54.1	74	-19.9	PK
H	4844	55.45	50.67	6.89	31.32	42.99	54	-11.01	AV
H	7266	64.46	50.01	7.15	36.62	58.22	74	-15.78	PK
H	7266	54.35	50.01	7.15	36.62	48.11	54	-5.89	AV
H	16087	47.48	51.53	11.34	41.52	48.81	74	-25.19	PK
operation frequency:2437									
V	4874	66.66	50.67	6.89	31.38	54.26	74	-19.74	PK
V	4874	54.54	50.67	6.89	31.38	42.14	54	-11.86	AV
V	7311	65.52	50.02	7.24	36.63	59.37	74	-14.63	PK
V	7311	53.36	50.02	7.24	36.63	47.21	54	-6.79	AV
V	16087	47.75	51.53	11.34	41.52	49.08	74	-24.92	PK
H	4874	65.36	50.67	6.89	31.38	52.96	74	-21.04	PK
H	4874	53.45	50.67	6.89	31.38	41.05	54	-12.95	AV
H	7311	65.04	50.02	7.24	36.63	58.89	74	-15.11	PK
H	7311	53.43	50.02	7.24	36.63	47.28	54	-6.72	AV
H	16087	46.85	51.53	11.34	41.52	48.18	74	-25.82	PK
operation frequency:2452									
V	4904	67.34	50.76	6.81	31.31	54.7	74	-19.3	PK
V	4904	54.36	50.76	6.81	31.31	41.72	54	-12.28	AV
V	7356	64.44	50.08	7.21	36.52	58.09	74	-15.91	PK
V	7356	53.45	50.08	7.21	36.52	47.1	54	-6.9	AV
V	16087	48.56	51.53	11.34	41.52	49.89	74	-24.11	PK
H	4904	67.45	50.76	6.81	31.31	54.81	74	-19.19	PK
H	4904	54.55	50.76	6.81	31.31	41.91	54	-12.09	AV
H	7356	65.33	50.08	7.21	36.52	58.98	74	-15.02	PK
H	7356	54.43	50.08	7.21	36.52	48.08	54	-5.92	AV
H	16087	47.52	51.53	11.34	41.52	48.85	74	-25.15	PK

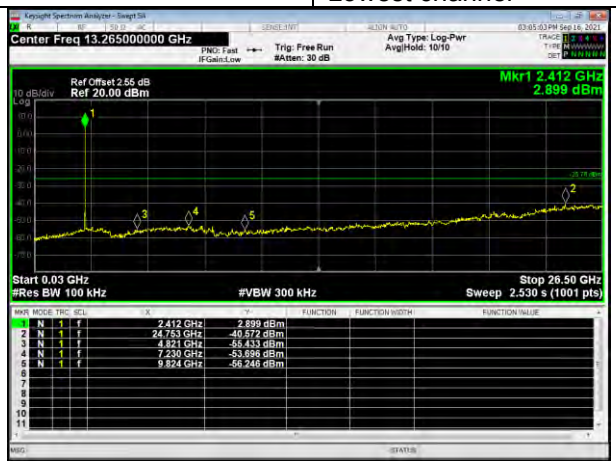
Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For Conducted

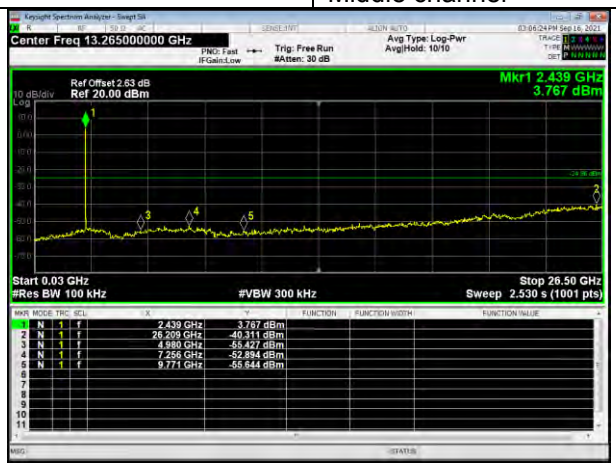
During the test, pre-scan the all modulation, and found the antenna1 802.11b mode which it is worse case.

Test channel:	Lowest channel



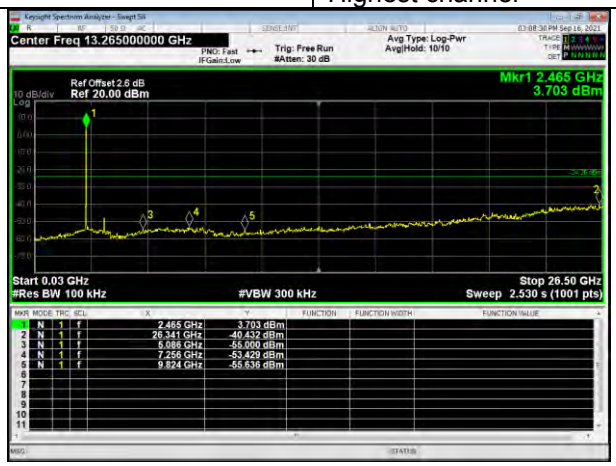
0.03Hz~25GHz

Test channel:	Middle channel



0.03GHz~25GHz

Test channel:	Highest channel



0.03GHz~25GHz

3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel,the Highest channel

Note:

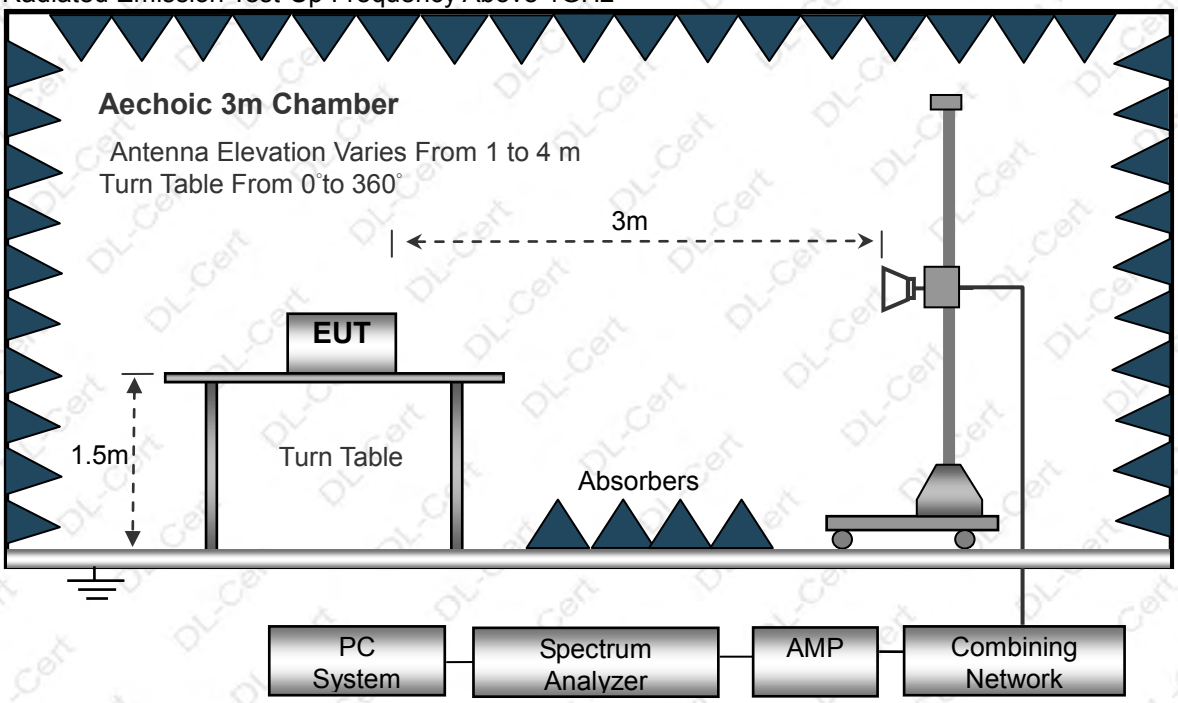
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.6 TEST RESULT

802.11b
We test all antenna's data, the data only show the antenna1 worst mode.

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	2390	76.36	52.12	2.73	27.38	54.35	74	-19.65	PK
V	2390	65.25	52.12	2.73	27.38	43.24	54	-10.76	AV
V	2400	76.48	52.16	2.78	27.41	54.51	74	-19.49	PK
V	2400	64.56	52.16	2.78	27.41	42.59	54	-11.41	AV
H	2390	76.52	52.12	2.73	27.38	54.51	74	-19.49	PK
H	2390	65.38	52.12	2.73	27.38	43.37	54	-10.63	AV
H	2400	76.29	52.16	2.78	27.41	54.32	74	-19.68	PK
H	2400	65.27	52.16	2.78	27.41	43.3	54	-10.7	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2462									
V	2483.5	76.45	52.23	2.86	27.44	54.52	74	-19.48	PK
V	2483.5	65.56	52.23	2.86	27.44	43.63	54	-10.37	AV
V	2500	76.28	52.26	2.88	27.49	54.39	74	-19.61	PK
V	2500	64.57	52.26	2.88	27.49	42.68	54	-11.32	AV
H	2483.5	76.59	52.23	2.86	27.44	54.66	74	-19.34	PK
H	2483.5	65.47	52.23	2.86	27.44	43.54	54	-10.46	AV
H	2500	76.28	52.26	2.88	27.49	54.39	74	-19.61	PK
H	2500	65.59	52.26	2.88	27.49	43.7	54	-10.3	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11g

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	2390	76.27	52.12	2.73	27.38	54.26	74	-19.74	PK
V	2390	65.48	52.12	2.73	27.38	43.47	54	-10.53	AV
V	2400	76.59	52.16	2.78	27.41	54.62	74	-19.38	PK
V	2400	64.57	52.16	2.78	27.41	42.6	54	-11.4	AV
H	2390	76.59	52.12	2.73	27.38	54.58	74	-19.42	PK
H	2390	65.24	52.12	2.73	27.38	43.23	54	-10.77	AV
H	2400	76.54	52.16	2.78	27.41	54.57	74	-19.43	PK
H	2400	65.63	52.16	2.78	27.41	43.66	54	-10.34	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2462									
V	2483.5	76.48	52.23	2.86	27.44	54.55	74	-19.45	PK
V	2483.5	65.49	52.23	2.86	27.44	43.56	54	-10.44	AV
V	2500	76.34	52.26	2.88	27.49	54.45	74	-19.55	PK
V	2500	65.25	52.26	2.88	27.49	43.36	54	-10.64	AV
H	2483.5	76.84	52.23	2.86	27.44	54.91	74	-19.09	PK
H	2483.5	65.56	52.23	2.86	27.44	43.63	54	-10.37	AV
H	2500	76.34	52.26	2.88	27.49	54.45	74	-19.55	PK
H	2500	65.57	52.26	2.88	27.49	43.68	54	-10.32	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11n HT20

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	2390	76.16	52.12	2.73	27.38	54.15	74	-19.85	PK
V	2390	65.28	52.12	2.73	27.38	43.27	54	-10.73	AV
V	2400	77.24	52.16	2.78	27.41	55.27	74	-18.73	PK
V	2400	65.33	52.16	2.78	27.41	43.36	54	-10.64	AV
H	2390	77.25	52.12	2.73	27.38	55.24	74	-18.76	PK
H	2390	65.46	52.12	2.73	27.38	43.45	54	-10.55	AV
H	2400	76.74	52.16	2.78	27.41	54.77	74	-19.23	PK
H	2400	65.36	52.16	2.78	27.41	43.39	54	-10.61	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2462									
V	2483.5	77.27	52.23	2.86	27.44	55.34	74	-18.66	PK
V	2483.5	65.38	52.23	2.86	27.44	43.45	54	-10.55	AV
V	2500	76.85	52.26	2.88	27.49	54.96	74	-19.04	PK
V	2500	65.36	52.26	2.88	27.49	43.47	54	-10.53	AV
H	2483.5	77.24	52.23	2.86	27.44	55.31	74	-18.69	PK
H	2483.5	65.85	52.23	2.86	27.44	43.92	54	-10.08	AV
H	2500	76.57	52.26	2.88	27.49	54.68	74	-19.32	PK
H	2500	66.36	52.26	2.88	27.49	44.47	54	-9.53	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

802.11n HT40

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2422									
V	2390	76.52	52.12	2.73	27.38	54.51	74	-19.49	PK
V	2390	65.46	52.12	2.73	27.38	43.45	54	-10.55	AV
V	2400	77.47	52.16	2.78	27.41	55.5	74	-18.5	PK
V	2400	65.36	52.16	2.78	27.41	43.39	54	-10.61	AV
H	2390	77.45	52.12	2.73	27.38	55.44	74	-18.56	PK
H	2390	65.36	52.12	2.73	27.38	43.35	54	-10.65	AV
H	2400	76.63	52.16	2.78	27.41	54.66	74	-19.34	PK
H	2400	65.24	52.16	2.78	27.41	43.27	54	-10.73	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2452									
V	2483.5	77.74	52.23	2.86	27.44	55.81	74	-18.19	PK
V	2483.5	65.36	52.23	2.86	27.44	43.43	54	-10.57	AV
V	2500	76.41	52.26	2.88	27.49	54.52	74	-19.48	PK
V	2500	65.63	52.26	2.88	27.49	43.74	54	-10.26	AV
H	2483.5	77.37	52.23	2.86	27.44	55.44	74	-18.56	PK
H	2483.5	65.49	52.23	2.86	27.44	43.56	54	-10.44	AV
H	2500	76.42	52.26	2.88	27.49	54.53	74	-19.47	PK
H	2500	66.39	52.26	2.88	27.49	44.5	54	-9.5	AV

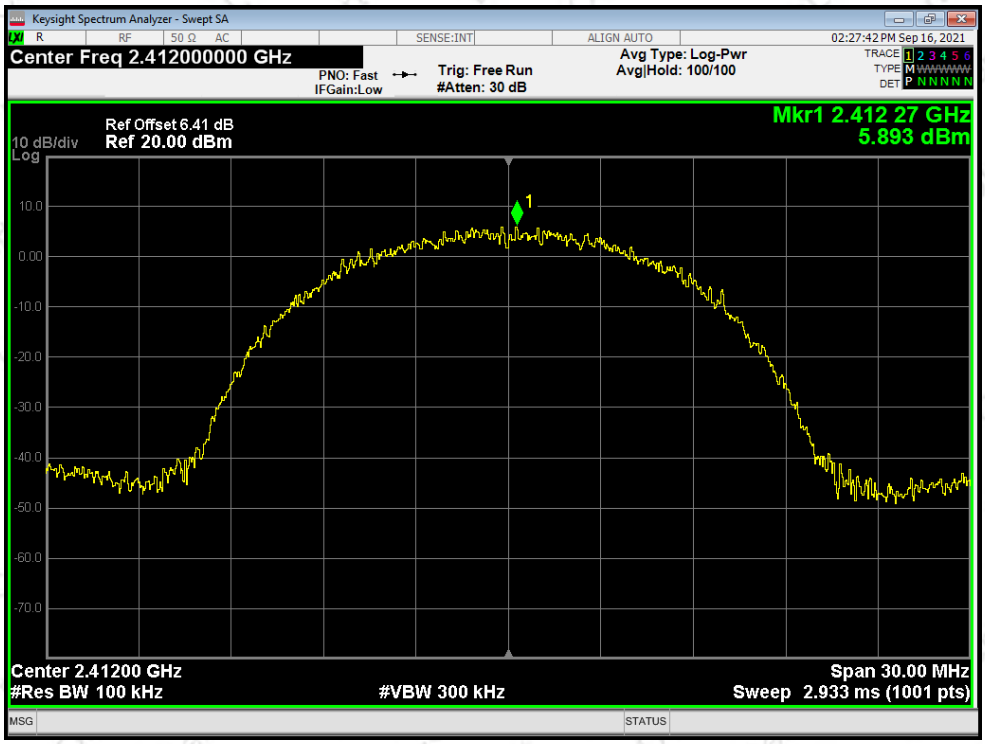
Remark:

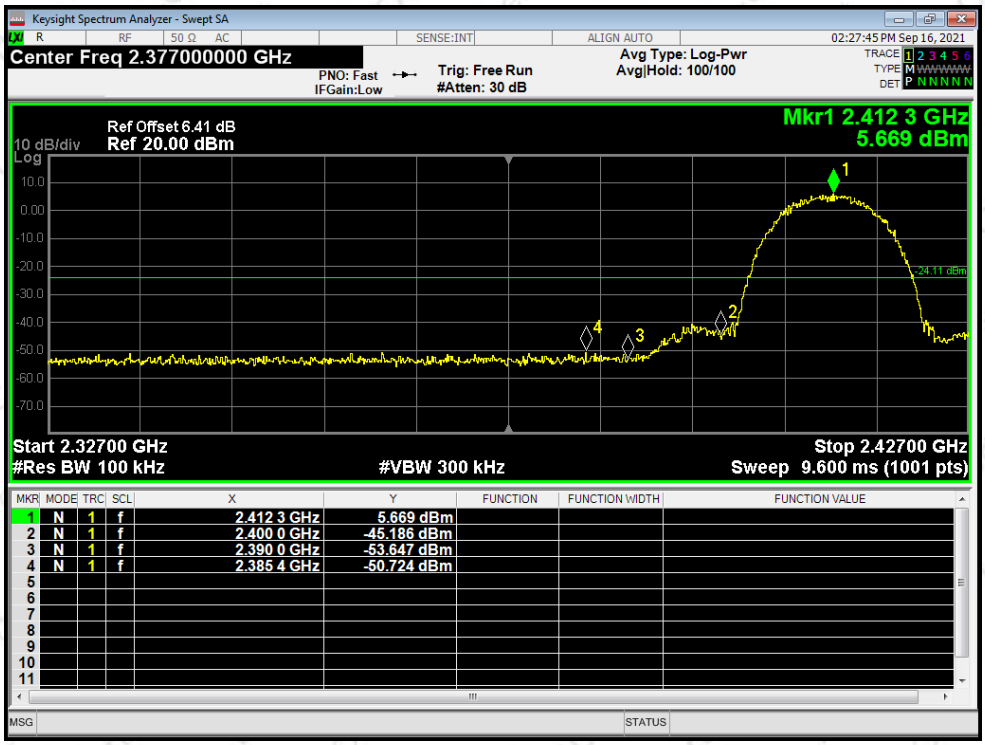
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For Conducted

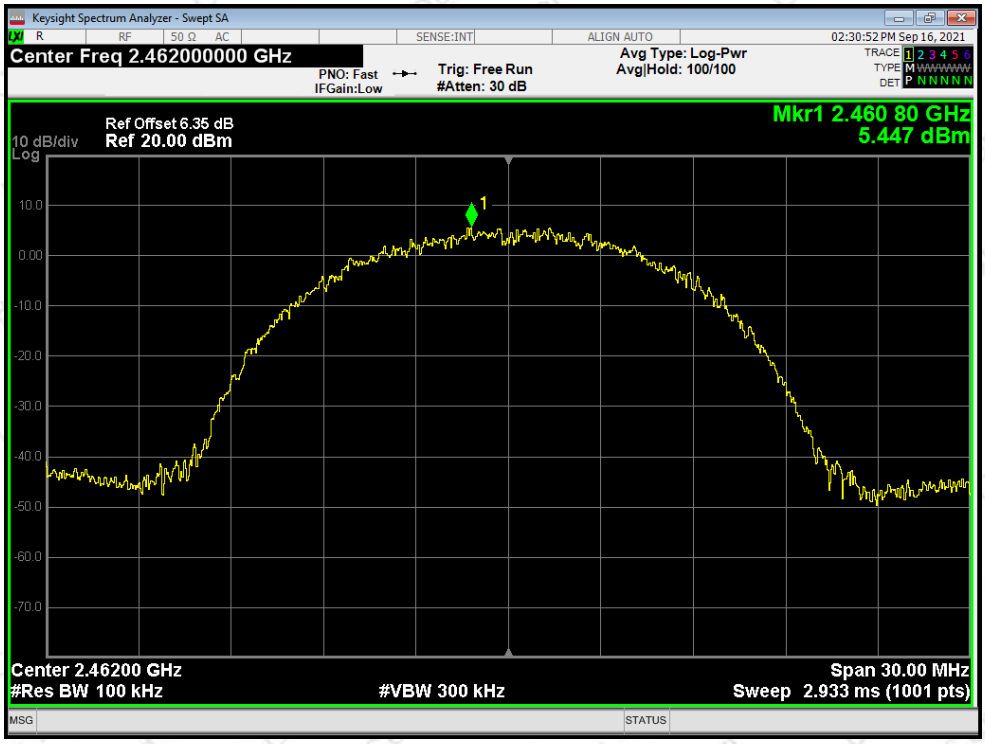
We test all antenna's data, the data only show the antenna1 worst mode.

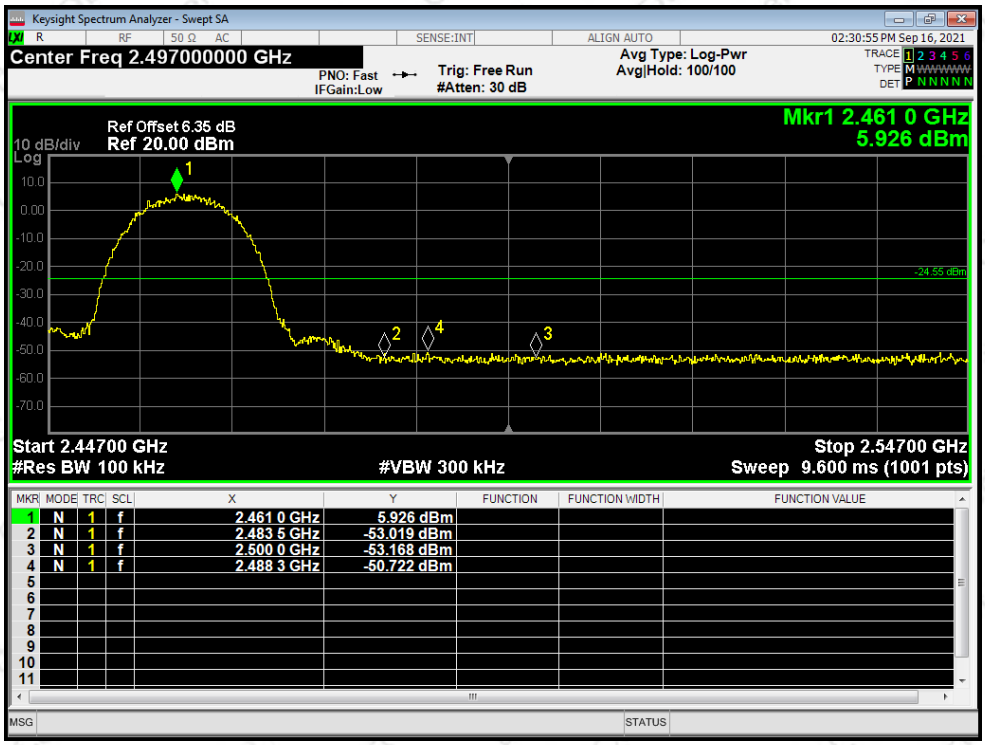
802.11b



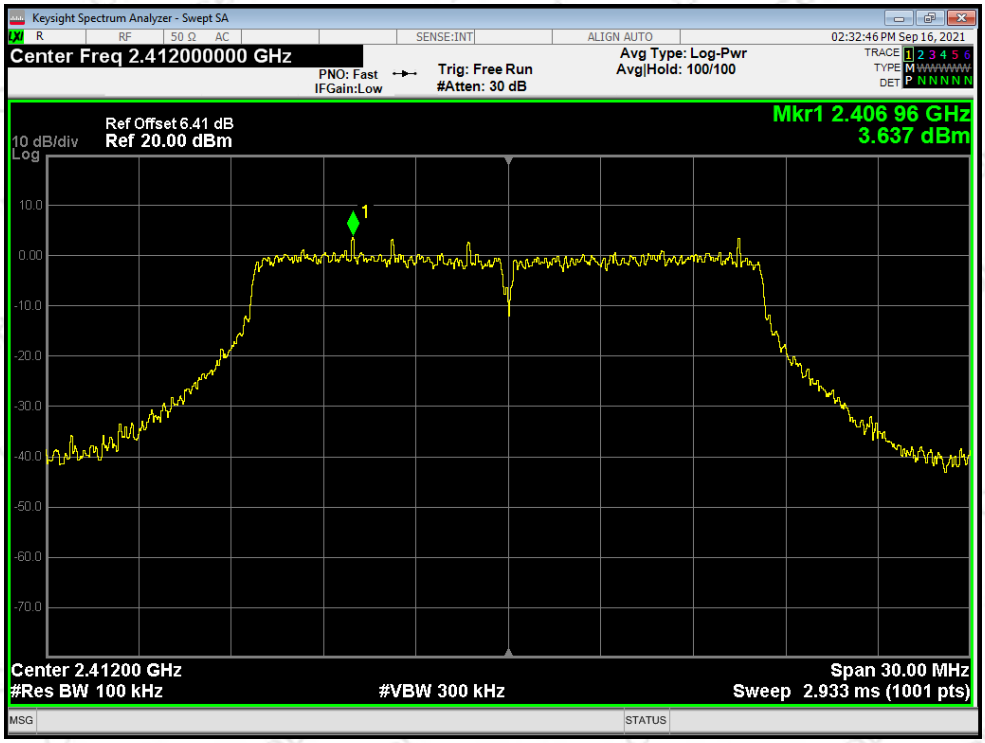


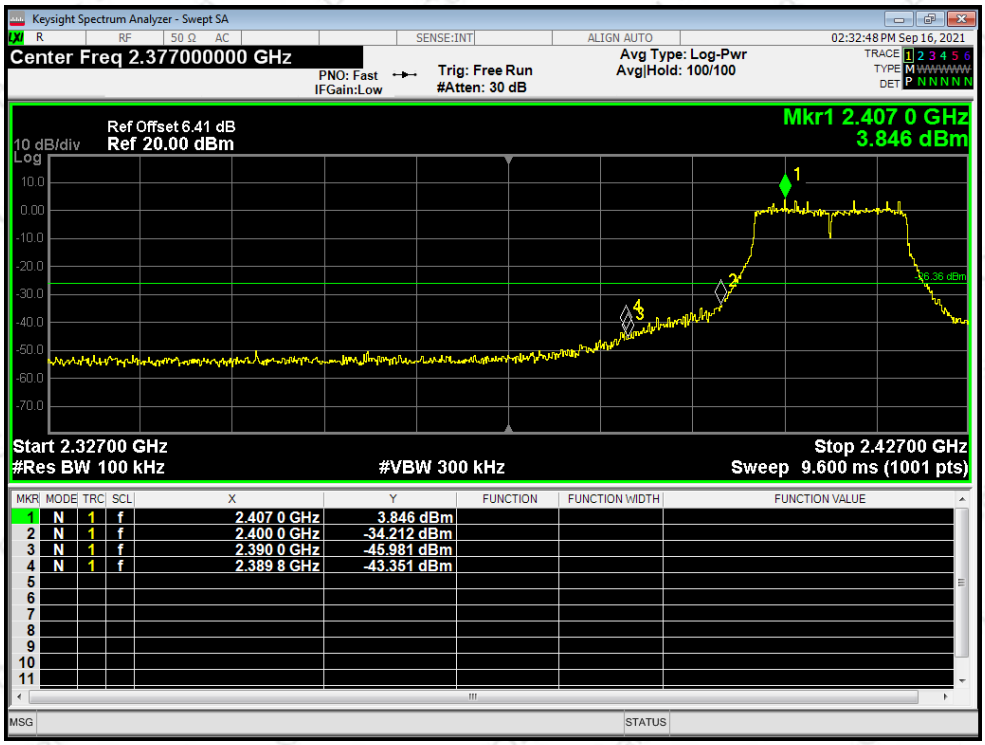
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.412 3 GHz	5.669 dBm			
2	N	1	f	2.400 0 GHz	-45.186 dBm			
3	N	1	f	2.390 0 GHz	-53.647 dBm			
4	N	1	f	2.385 4 GHz	-50.724 dBm			
5								
6								
7								
8								
9								
10								
11								

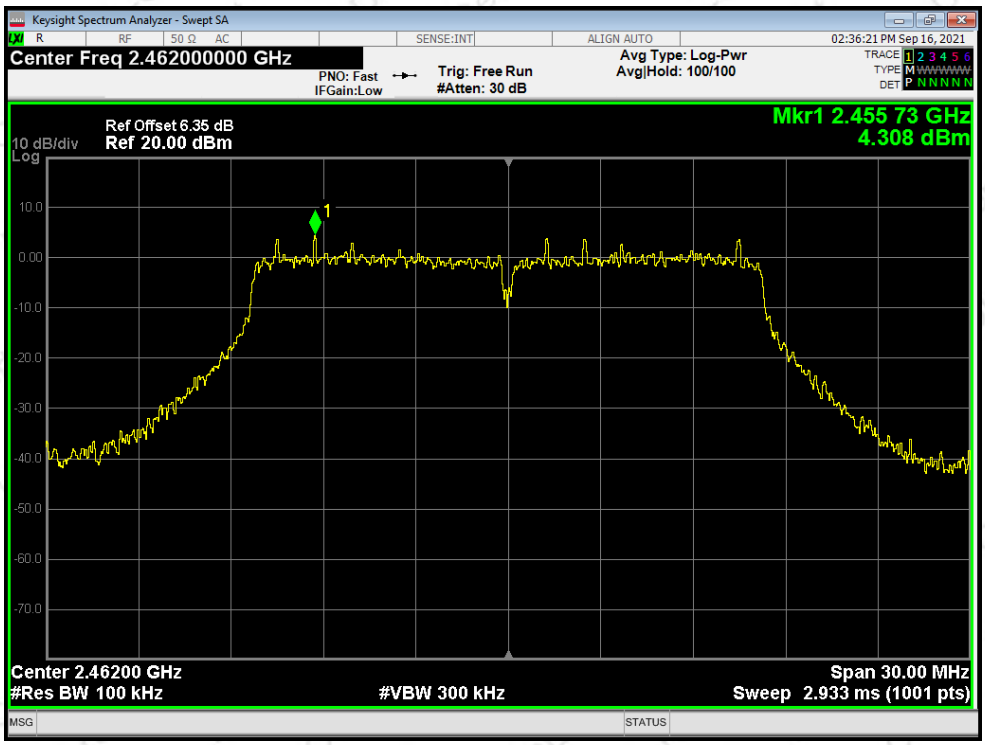

Keysight Spectrum Analyzer - Swept SA
R RF 50 Ω AC SENSE:INT ALIGN AUTO 02:30:52 PM Sep 16, 2021
Center Freq 2.462000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWWW
DET P N N N N N
Ref Offset 6.35 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.460 80 GHz
5.447 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.46200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30.00 MHz
Sweep 2.933 ms (1001 pts)
MSG
STATUS

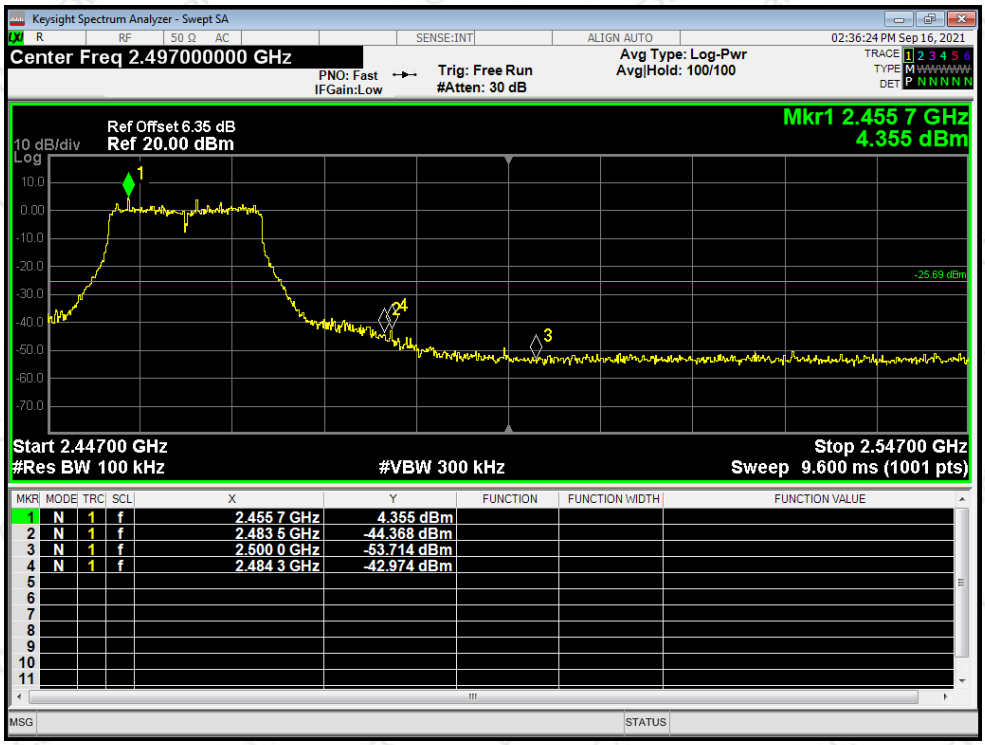

Keysight Spectrum Analyzer - Swept SA
R RF 50 Ω AC SENSE:INT ALIGN AUTO 02:30:55 PM Sep 16, 2021
Center Freq 2.497000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWWW
DET P N N N N N
Ref Offset 6.35 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.461 0 GHz
5.926 dBm
-24.55 dBm
Start 2.44700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.54700 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.461 0 GHz 5.926 dBm
2 N 1 f 2.483 5 GHz -53.019 dBm
3 N 1 f 2.500 0 GHz -53.168 dBm
4 N 1 f 2.488 3 GHz -50.722 dBm
MSG
STATUS

802.11g

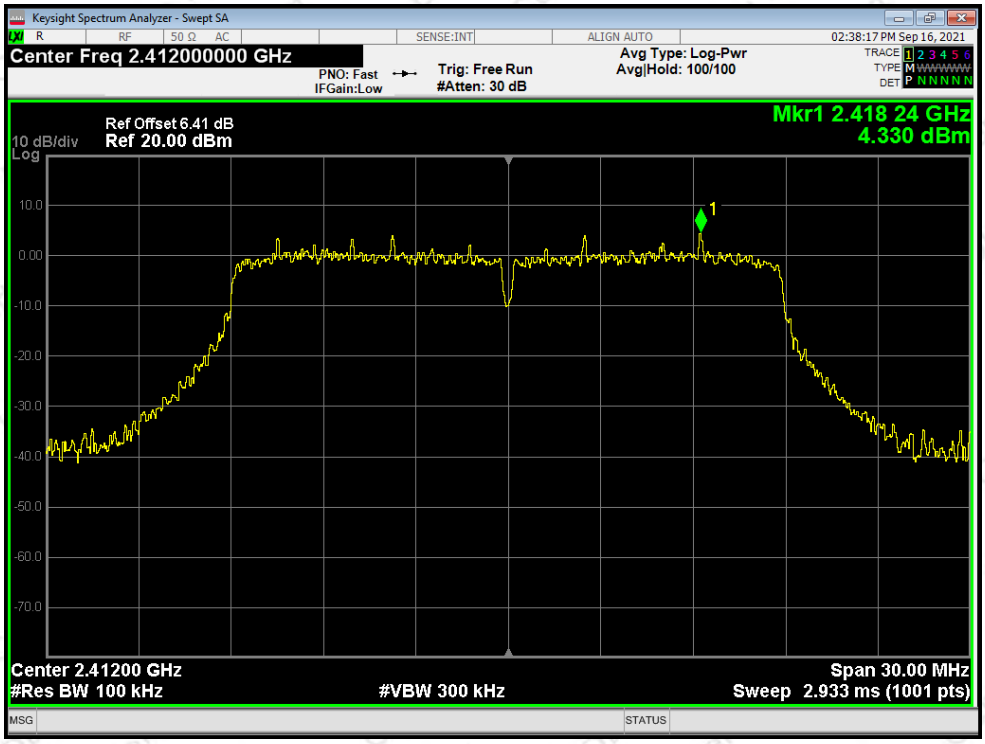

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.412000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:32:46 PM Sep 16, 2021
Ref Offset 6.41 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.406 96 GHz
3.637 dBm
Center 2.41200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30.00 MHz
Sweep 2.933 ms (1001 pts)

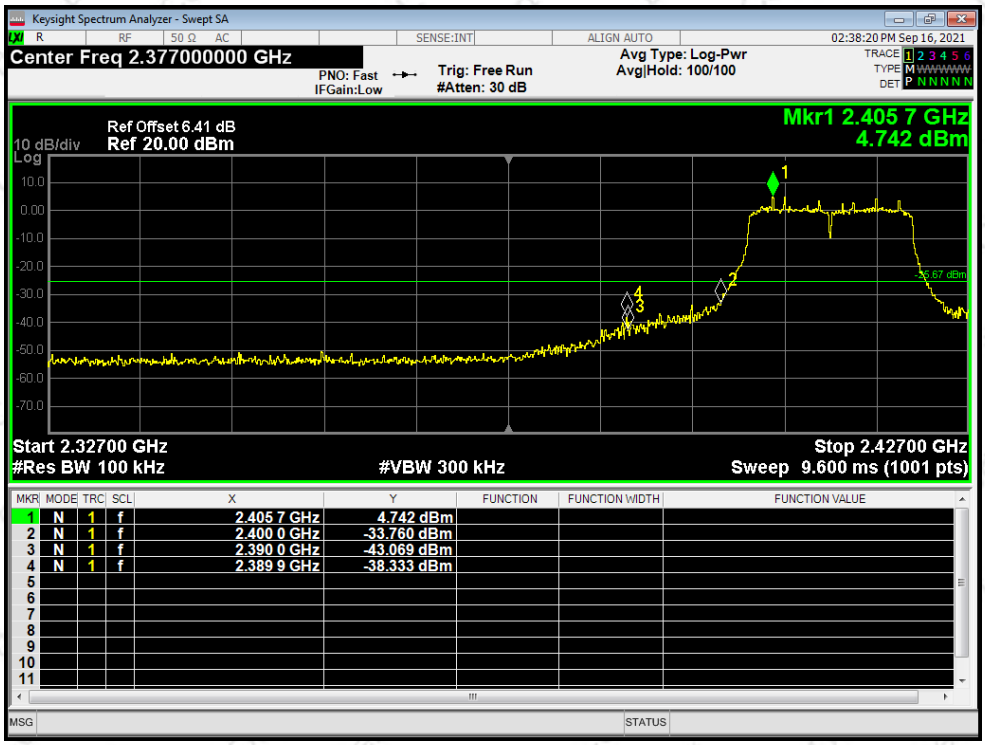

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.377000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:32:48 PM Sep 16, 2021
Ref Offset 6.41 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.407 0 GHz
3.846 dBm
-16.36 dBm
Start 2.32700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.42700 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.407 0 GHz 3.846 dBm
2 N 1 f 2.400 0 GHz -34.212 dBm
3 N 1 f 2.390 0 GHz -45.981 dBm
4 N 1 f 2.389 8 GHz -43.351 dBm

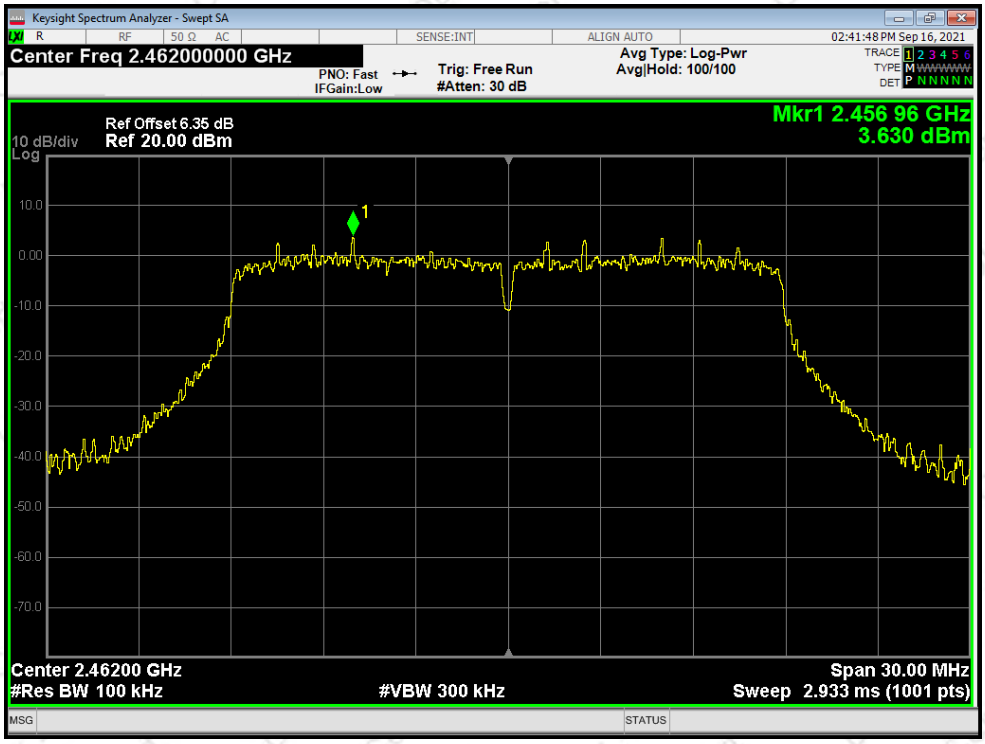

Keysight Spectrum Analyzer - Swept SA
02:36:21 PM Sep 16, 2021
Center Freq 2.462000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
Ref Offset 6.35 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.455 73 GHz
4.308 dBm
Center 2.46200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30.00 MHz
Sweep 2.933 ms (1001 pts)

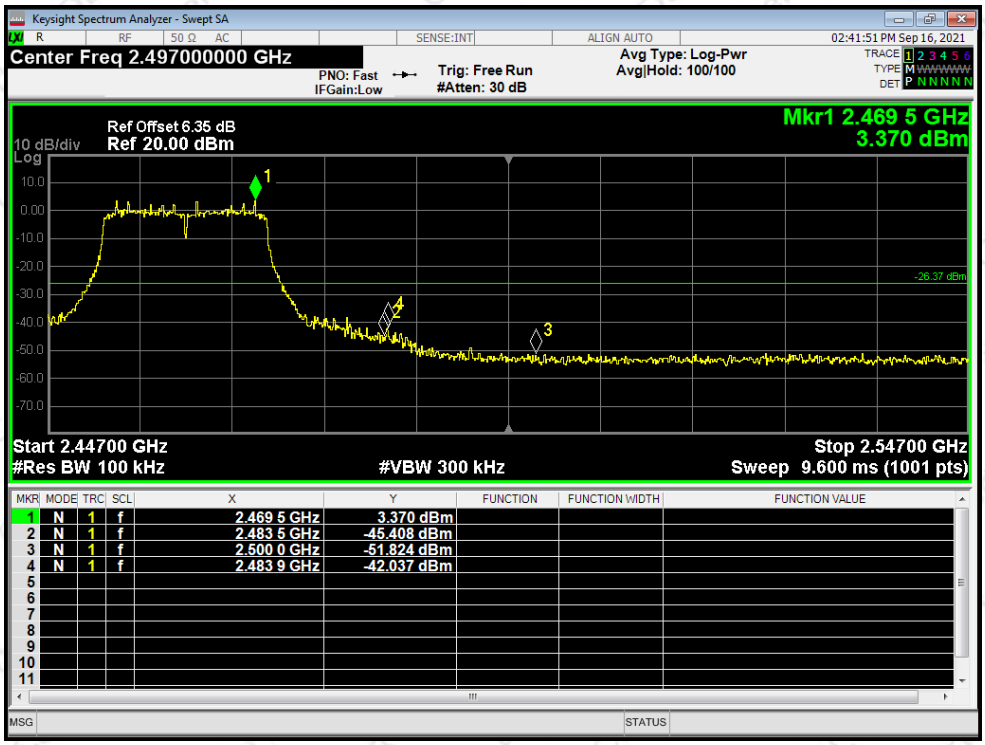

Keysight Spectrum Analyzer - Swept SA
02:36:24 PM Sep 16, 2021
Center Freq 2.497000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
Ref Offset 6.35 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.455 7 GHz
4.355 dBm
-25.69 dBm
Start 2.44700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.54700 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.455 7 GHz 4.355 dBm
2 N 1 f 2.483 5 GHz -44.368 dBm
3 N 1 f 2.500 0 GHz -53.714 dBm
4 N 1 f 2.484 3 GHz -42.974 dBm

802.11n HT20

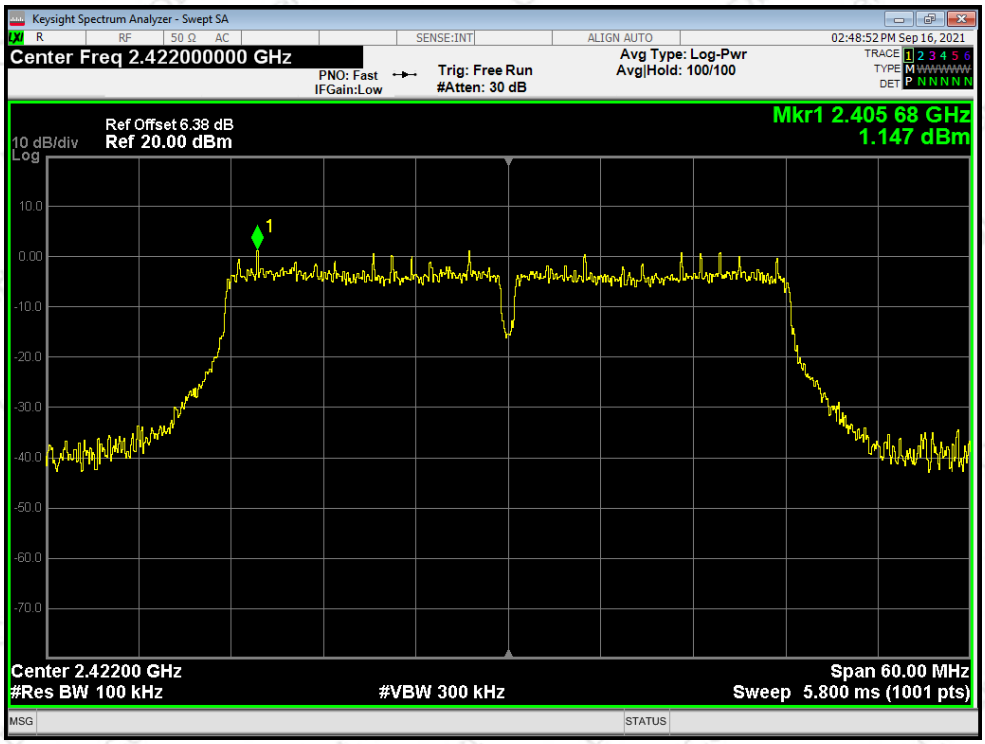

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.412000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:38:17 PM Sep 16, 2021
Ref Offset 6.41 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.418 24 GHz
4.330 dBm
Center 2.41200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30.00 MHz
Sweep 2.933 ms (1001 pts)

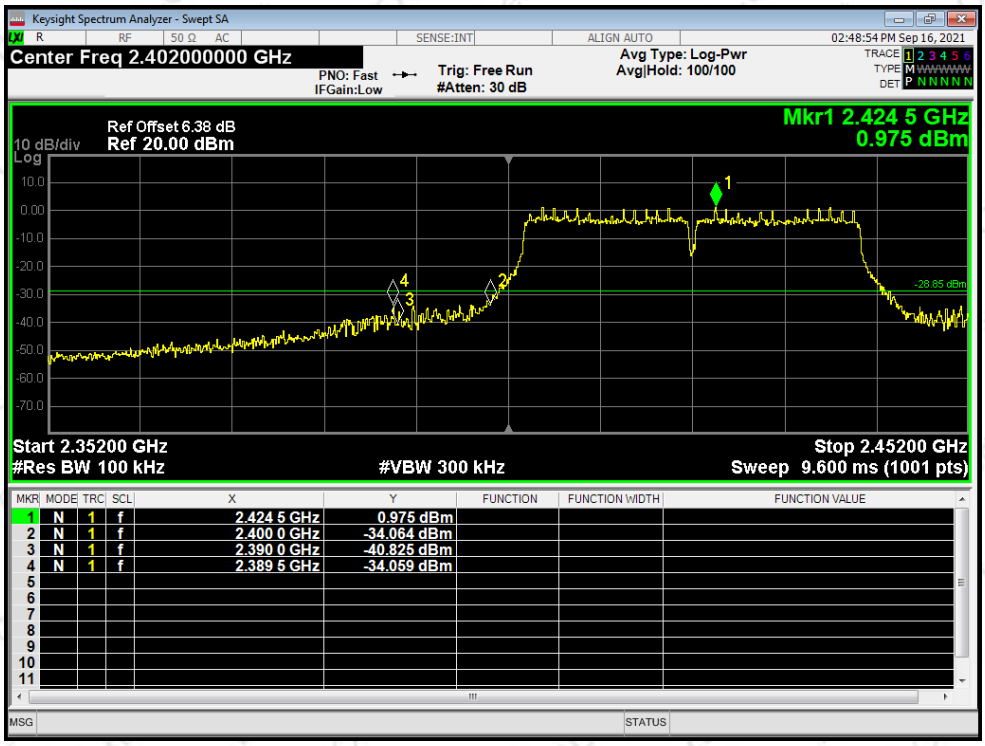

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.377000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:38:20 PM Sep 16, 2021
Ref Offset 6.41 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.405 7 GHz
4.742 dBm
Start 2.32700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.42700 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.405 7 GHz 4.742 dBm
2 N 1 f 2.400 0 GHz -33.760 dBm
3 N 1 f 2.390 0 GHz -43.069 dBm
4 N 1 f 2.389 9 GHz -38.333 dBm


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.462000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:41:48 PM Sep 16, 2021
Ref Offset 6.35 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.456 96 GHz
3.630 dBm
Center 2.46200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 30.00 MHz
Sweep 2.933 ms (1001 pts)

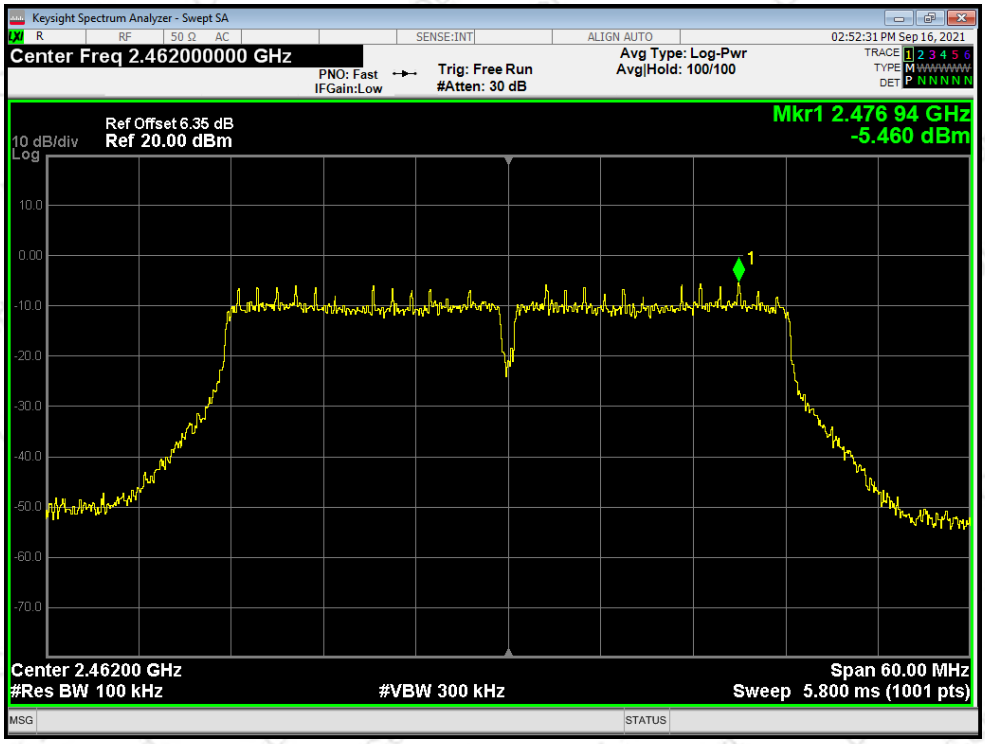

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.497000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:41:51 PM Sep 16, 2021
Ref Offset 6.35 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.469 5 GHz
3.370 dBm
-26.37 dBm
Start 2.44700 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.54700 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.469 5 GHz 3.370 dBm
2 N 1 f 2.483 5 GHz -45.408 dBm
3 N 1 f 2.500 0 GHz -51.824 dBm
4 N 1 f 2.483 9 GHz -42.037 dBm

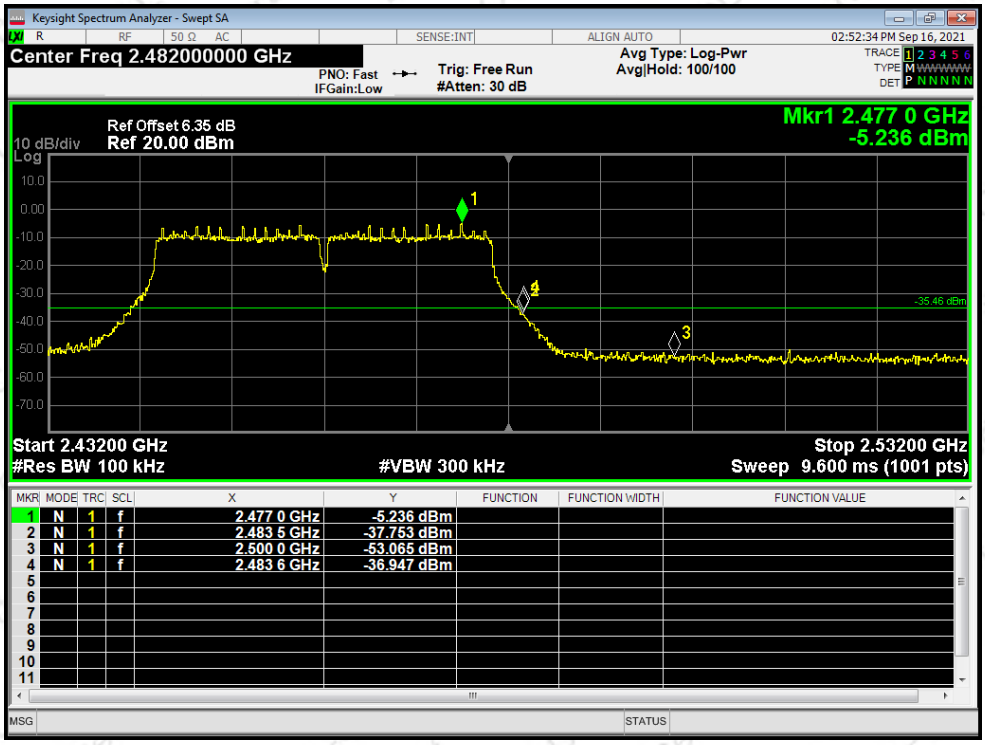
802.11n HT40





MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.424 5 GHz	0.975 dBm			
2	N	1	f	2.400 0 GHz	-34.064 dBm			
3	N	1	f	2.390 0 GHz	-40.825 dBm			
4	N	1	f	2.389 5 GHz	-34.059 dBm			
5								
6								
7								
8								
9								
10								
11								





MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.477 0 GHz	-5.236 dBm			
2	N	1	f	2.483 5 GHz	-37.753 dBm			
3	N	1	f	2.500 0 GHz	-53.065 dBm			
4	N	1	f	2.483 6 GHz	-36.947 dBm			
5								
6								
7								
8								
9								
10								
11								

4. AVERAGE OUTPUT POWER

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(3)	Average Output Power	1 watt or 30dBm	2400-2483.5	PASS

4.1.1 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

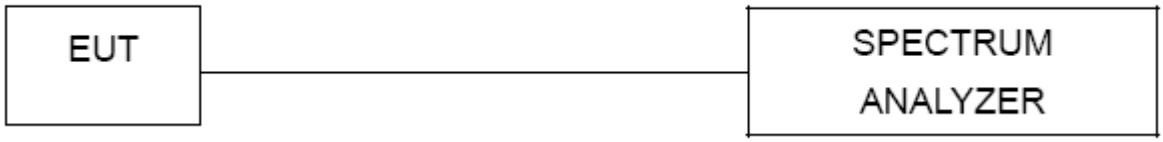
Detector function = peak

Trace = max hold

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION CONDITIONS

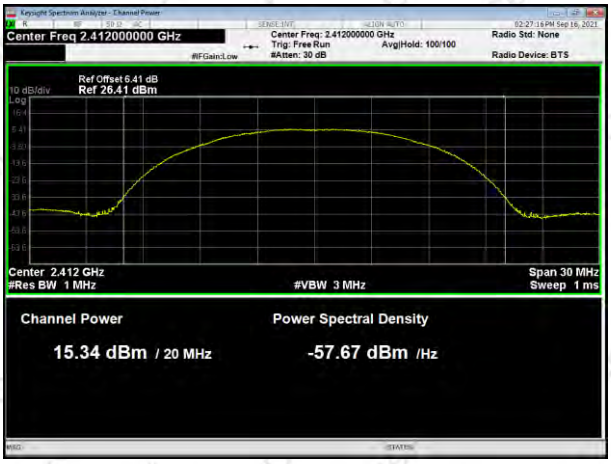
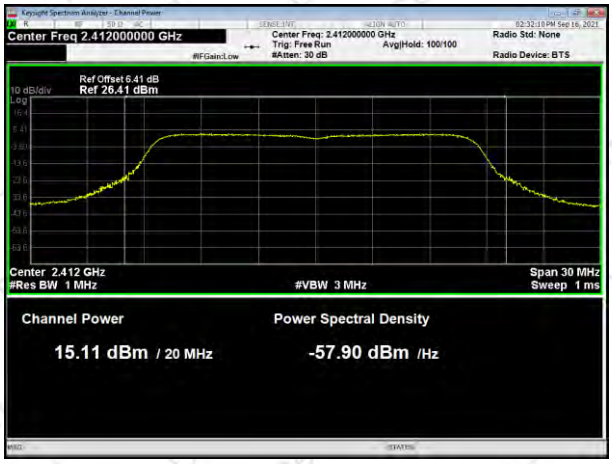
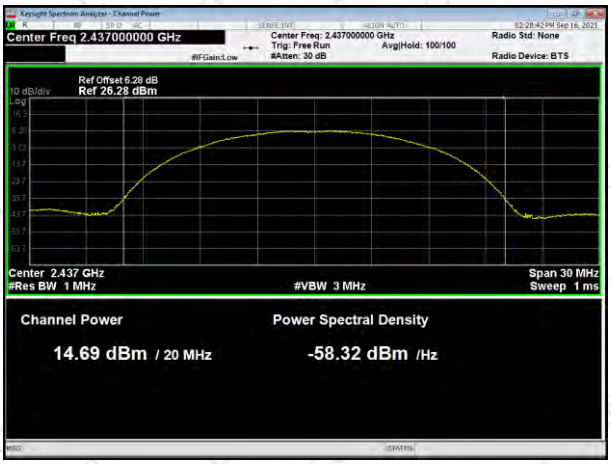
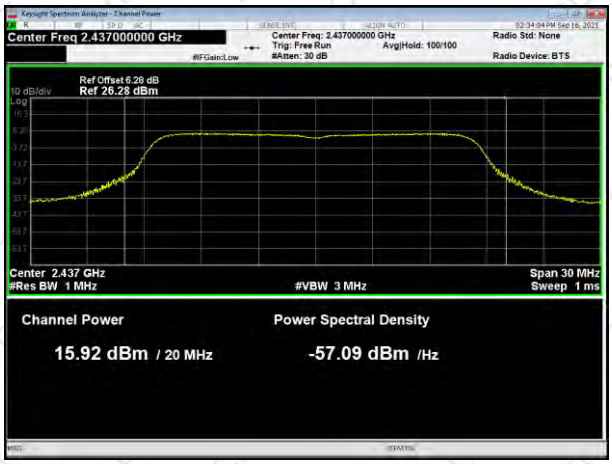
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage :	AC 120V/60HZ

Mode	Frequency (MHz)	Maximum Conducted Output Power(PK) (dBm)		ANT1&ANT2 MIMO Maximum Conducted Output Power (dBm)	LIMIT dBm
		Antenna1	Antenna2		
802.11b	2412	15.337	13.524	/	30
	2437	14.694	14.343	/	30
	2462	15.217	14.449	/	30
802.11g	2412	15.107	12.698	/	30
	2437	15.921	14.007	/	30
	2462	15.177	14.275	/	30
802.11n20	2412	15.658	13.886	17.872	30
	2437	16.494	16.002	19.265	30
	2462	14.645	14.473	17.570	30
802.11n40	2422	15.229	13.604	17.502	30
	2437	15.897	15.569	18.746	30
	2452	13.475	8.428	14.657	8.428

Antenna1:

802.11b	802.11g
	
2412MHz	2412MHz
	
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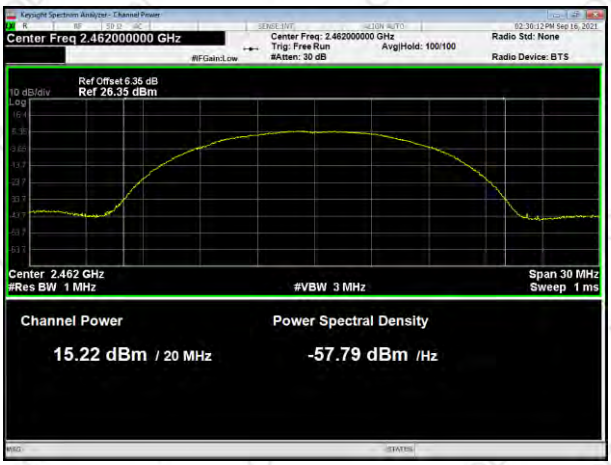
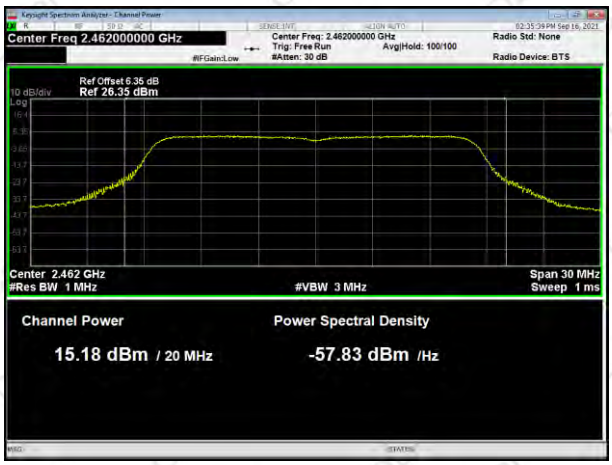
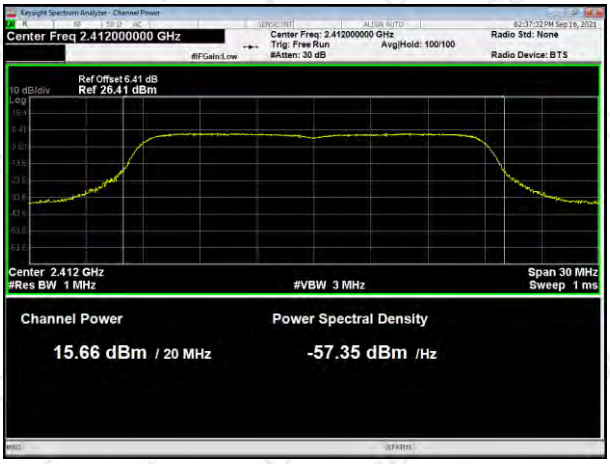
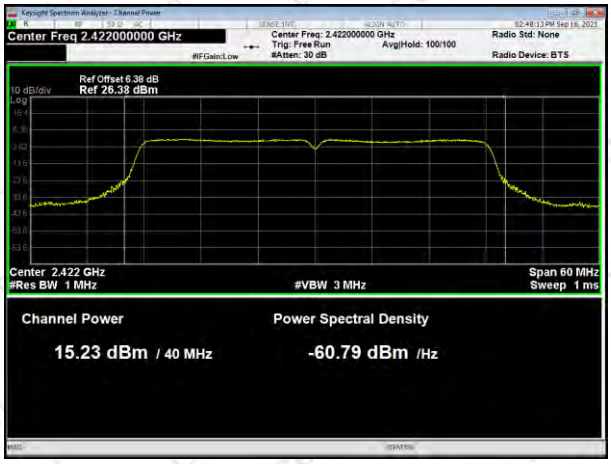
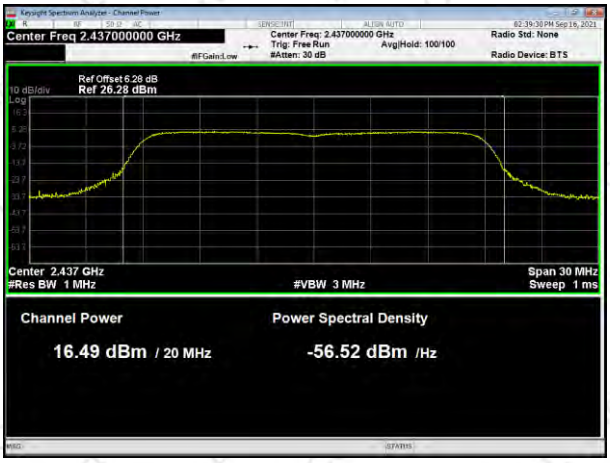
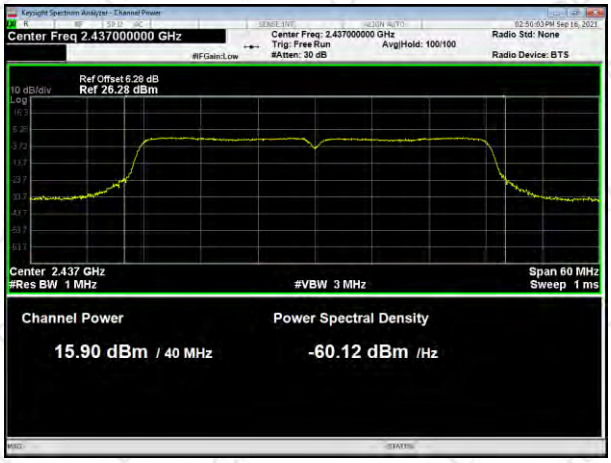
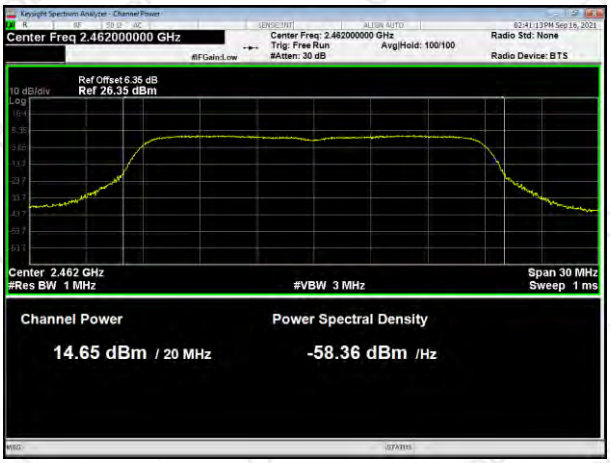
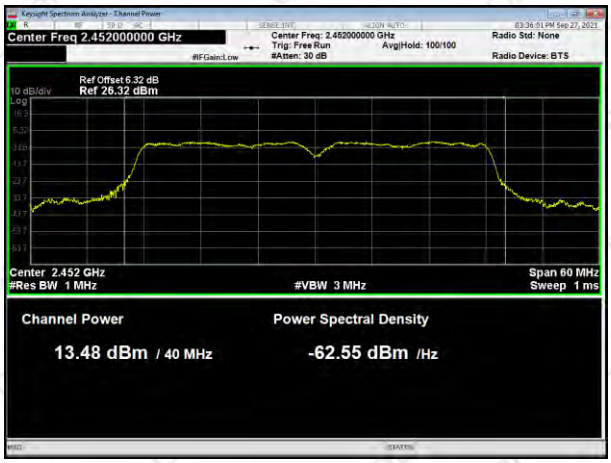
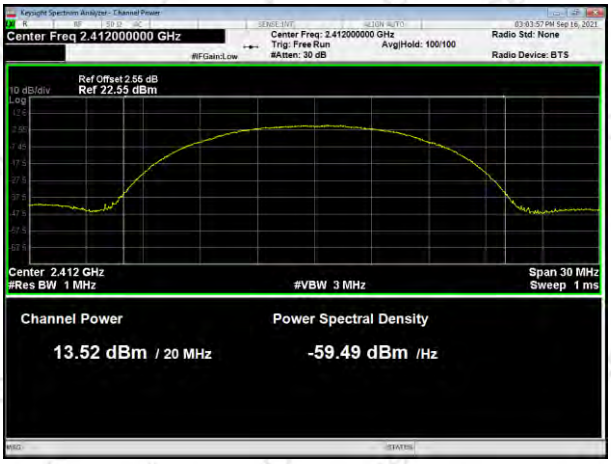
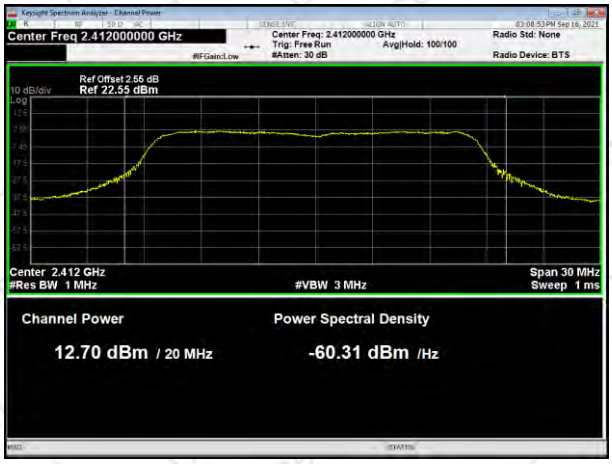
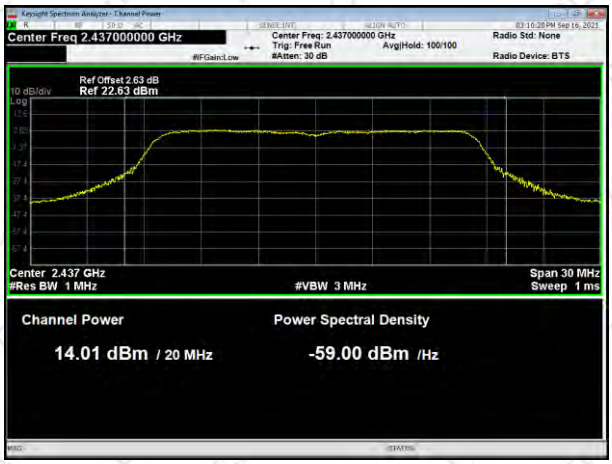
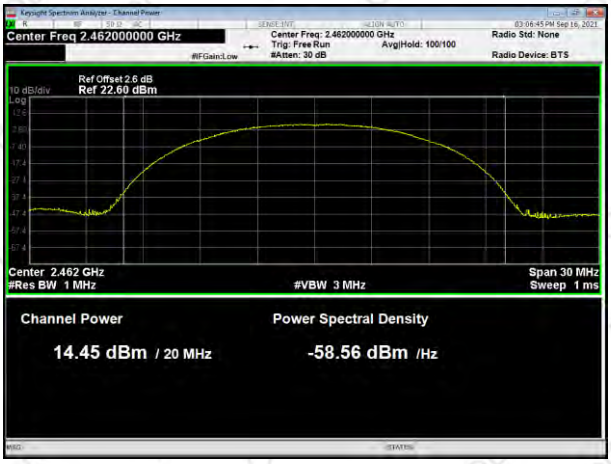
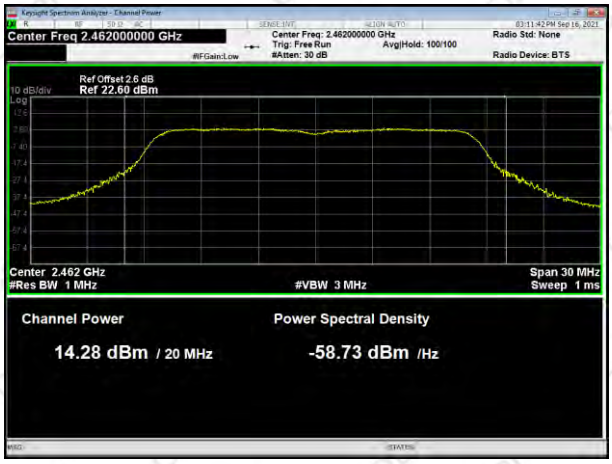
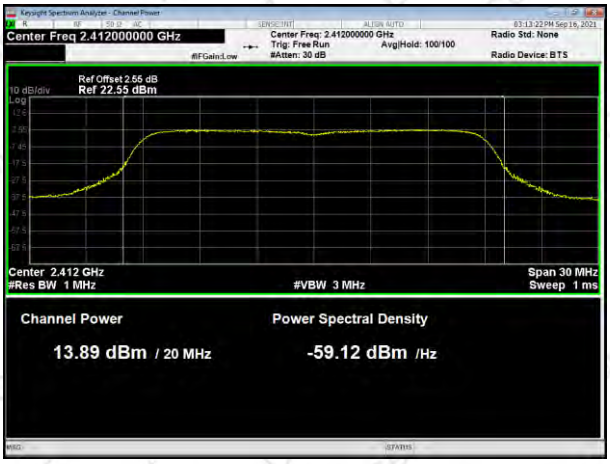
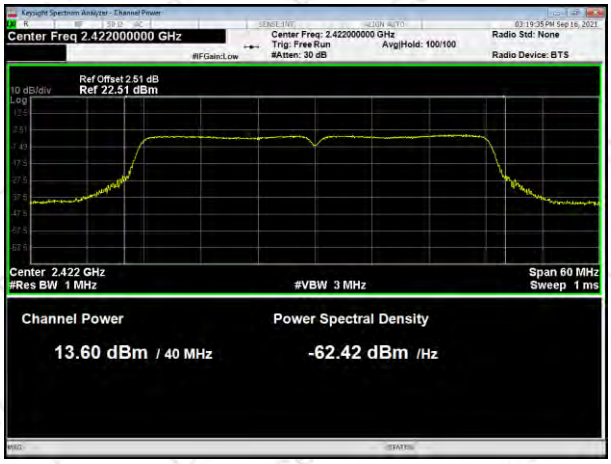
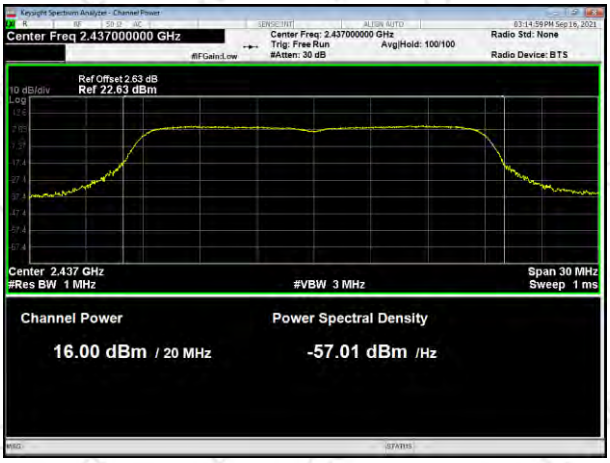
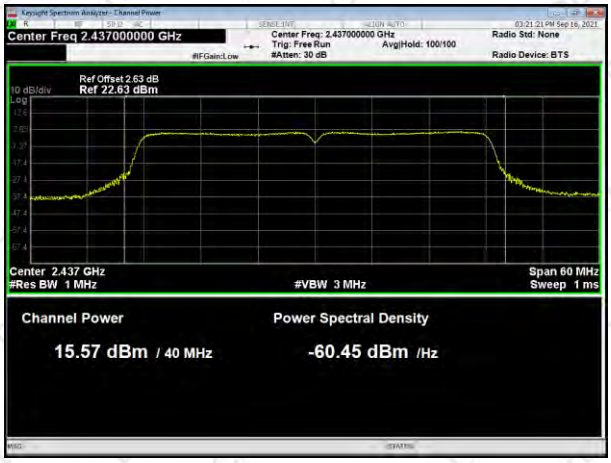
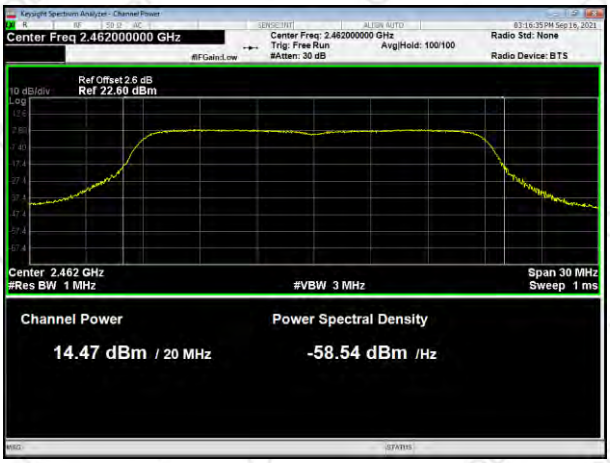
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

Antenna2:

802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 3kHz
VB	VBW ≥ 3RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

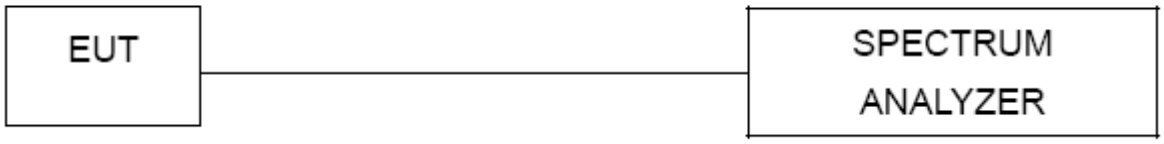
5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



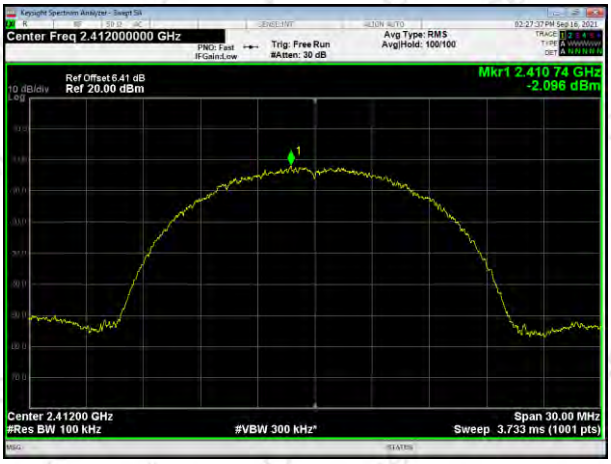
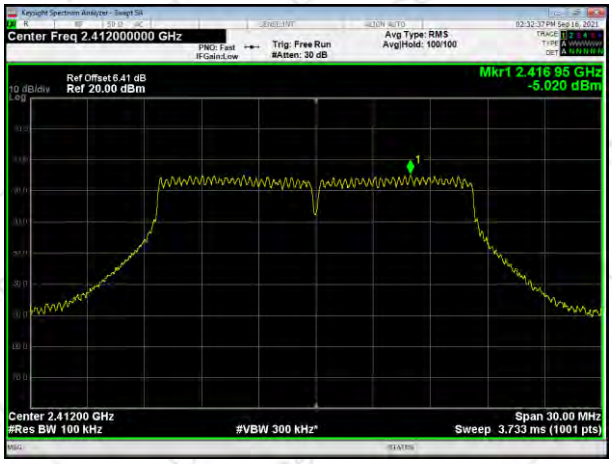
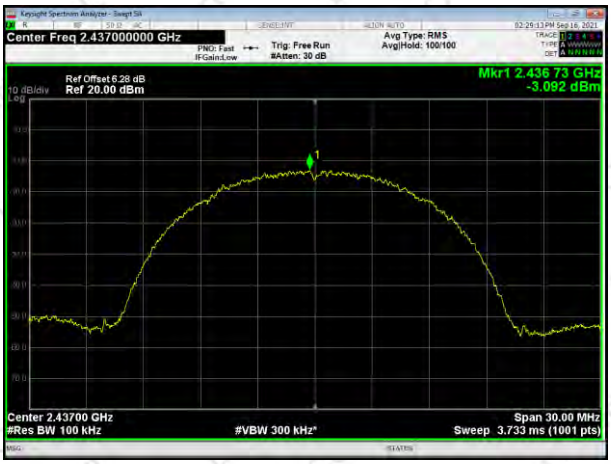
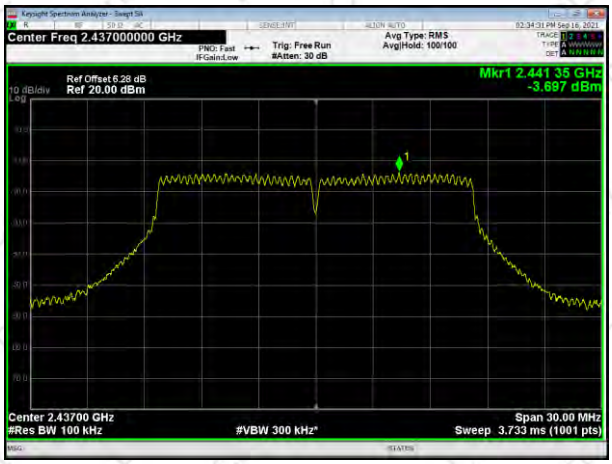
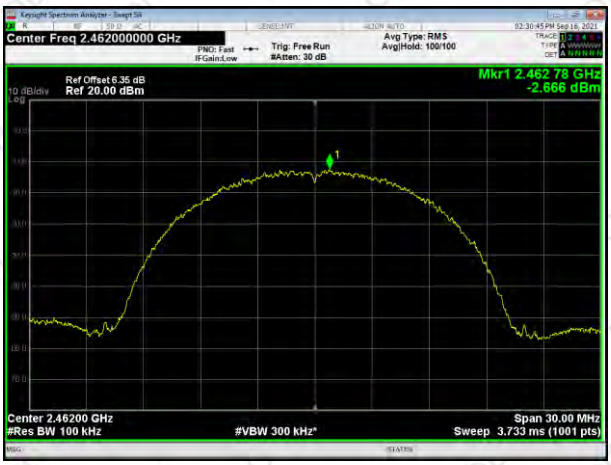
5.1.4 EUT OPERATION CONDITIONS

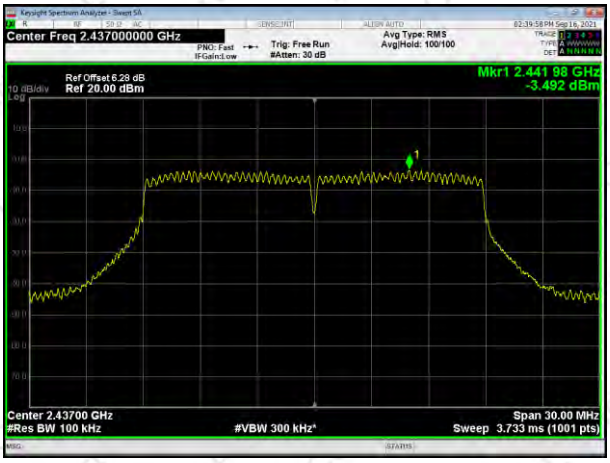
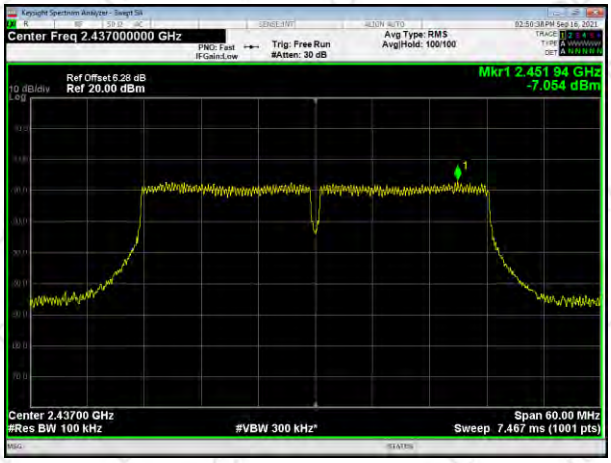
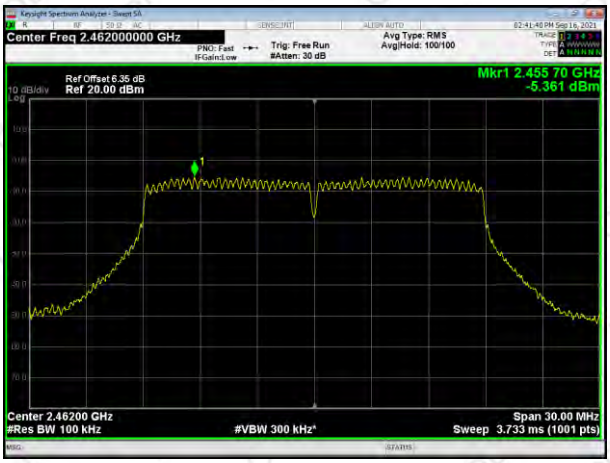
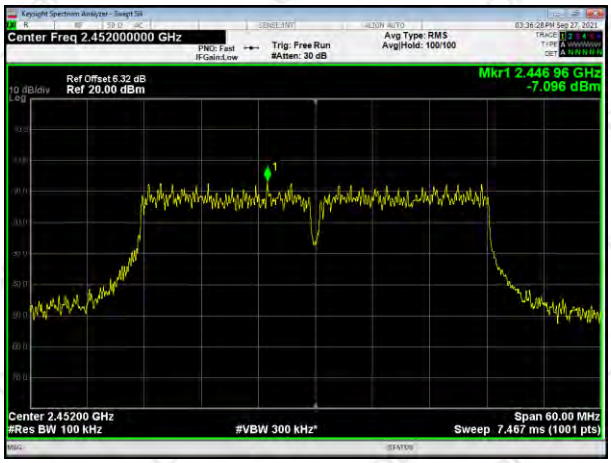
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

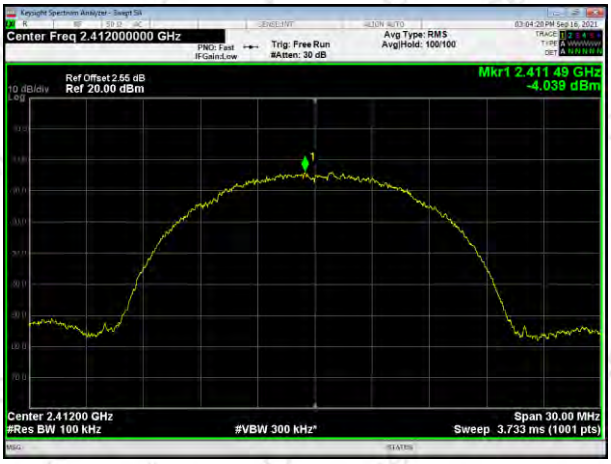
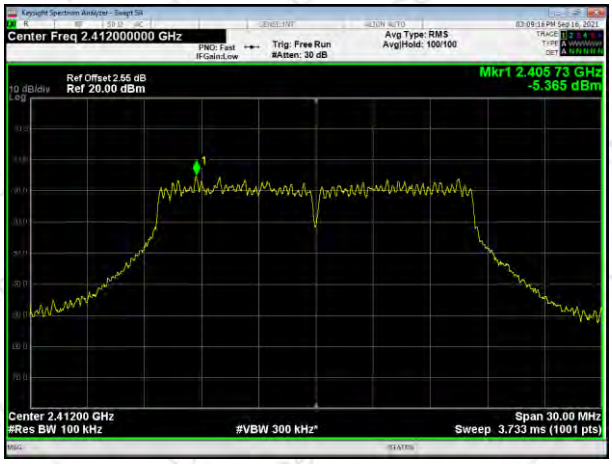
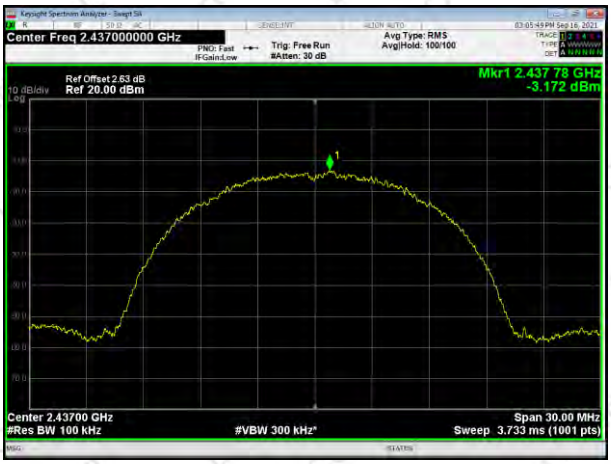
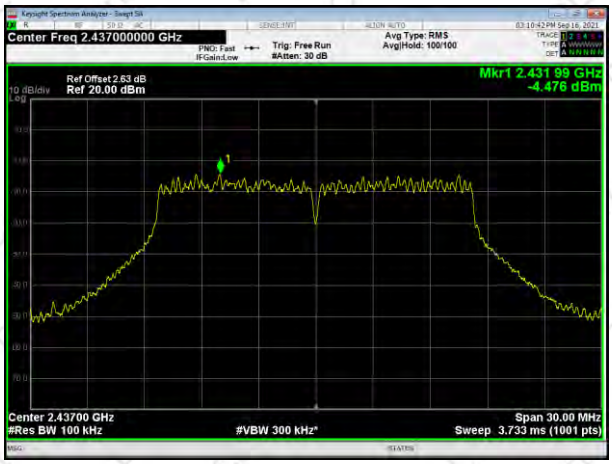
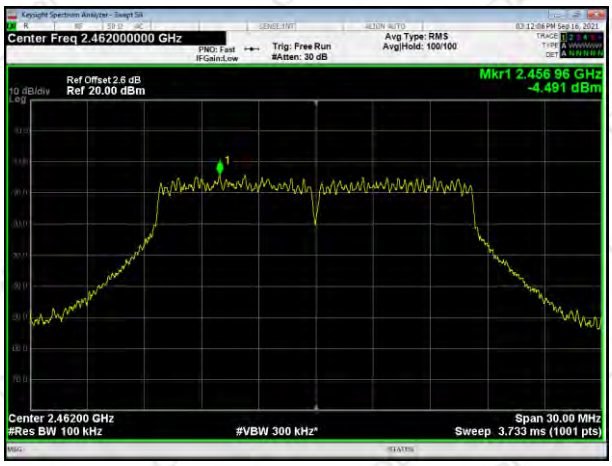
	Frequency	Reading Level(dBm)		ANT1&ANT2 MIMO Power Spectral Density (dBm)	Limit (dBm)	Result
		ANT1	ANT2			
802.11b	2412 MHz	-2.096	-4.039	/	<8	PASS
	2437 MHz	-3.092	-3.172	/	<8	PASS
	2462 MHz	-2.666	-2.786	/	<8	PASS
802.11g	2412 MHz	-5.02	-5.365	/	<8	PASS
	2437 MHz	-3.697	-4.476	/	<8	PASS
	2462 MHz	-4.767	-4.491	/	<8	PASS
802.11n (20MHz)	2412 MHz	-4.384	-6.203	-1.453	<8	PASS
	2437 MHz	-3.492	-3.385	0.003	<8	PASS
	2462 MHz	-5.361	-4.945	-2.068	<8	PASS
802.11n (40MHz)	2422 MHz	-8.052	-9.174	-4.933	<8	PASS
	2437 MHz	-7.054	-7.394	-4.025	<8	PASS
	2452 MHz	-7.096	-14.305	-5.750	<8	PASS

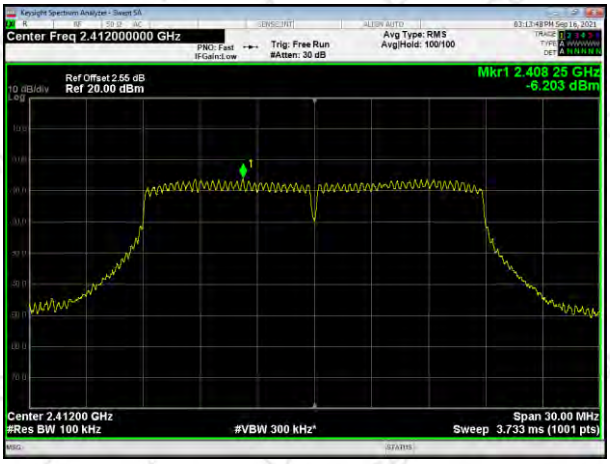
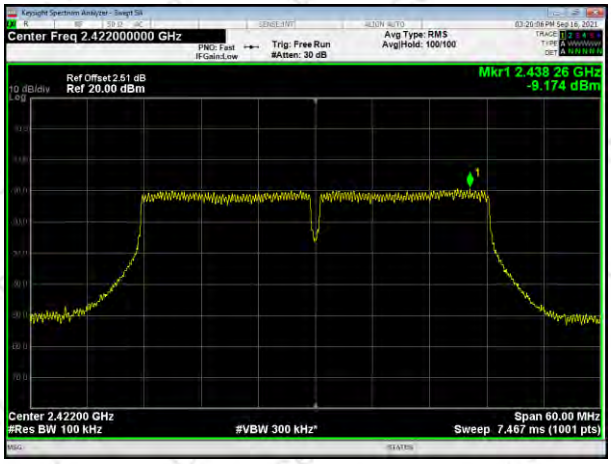
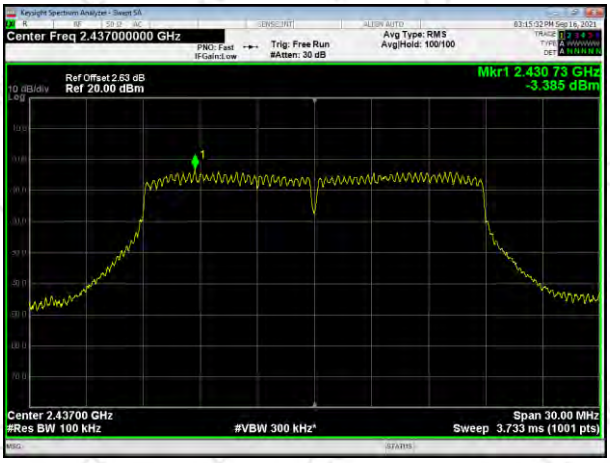
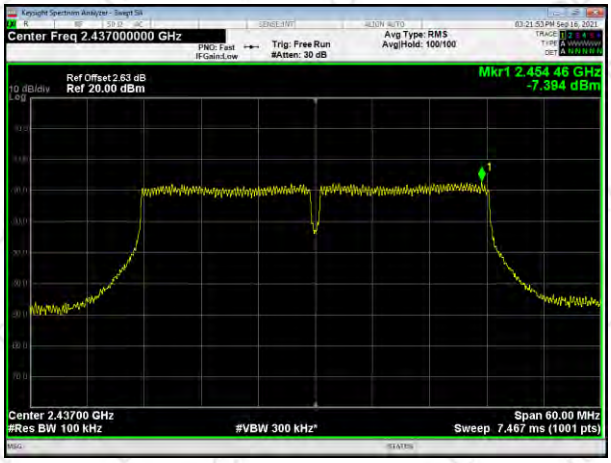
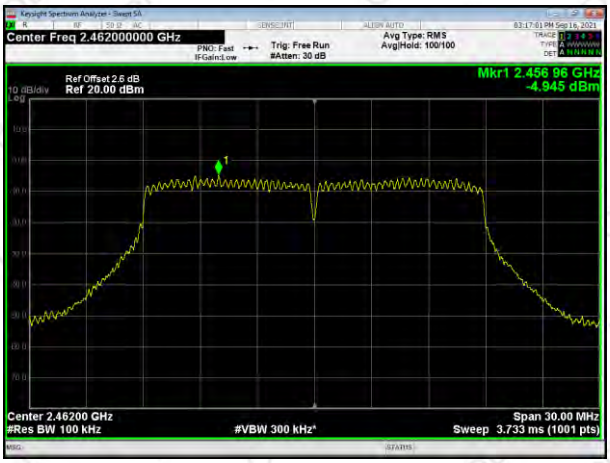
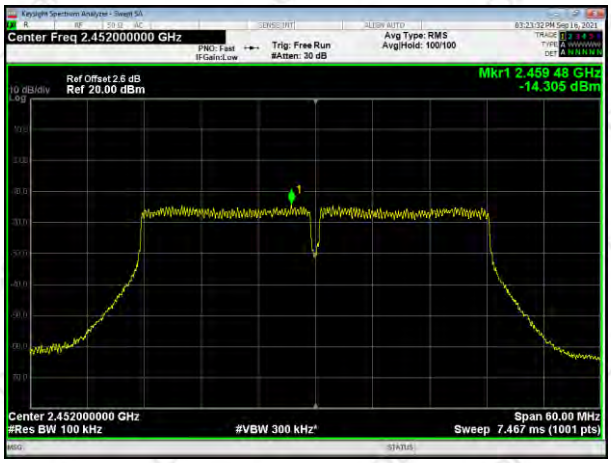
Antenna1:

802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

Antenna2:

802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
	
2437MHz	2437MHz
	
2462MHz	2452MHz

6. 6DB BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range(MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

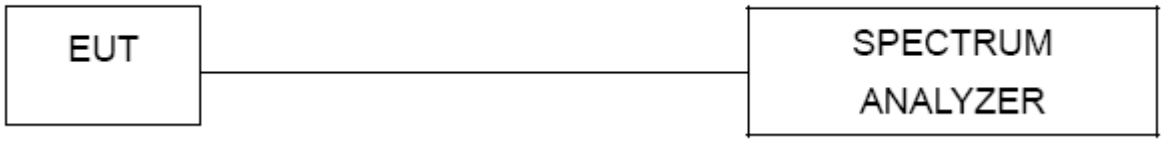
6.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 20 dB relative to the maximum level measured in the fundamental emission.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

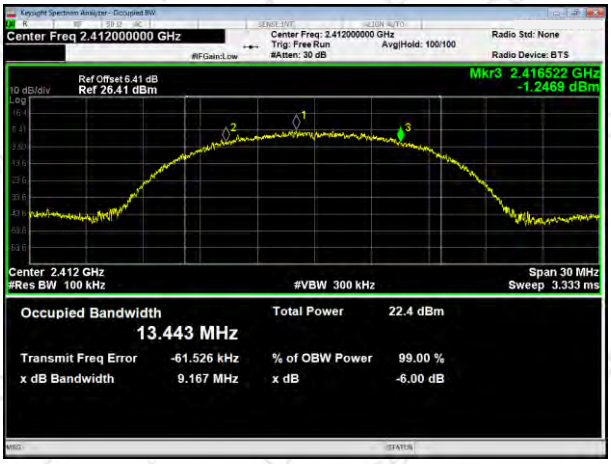
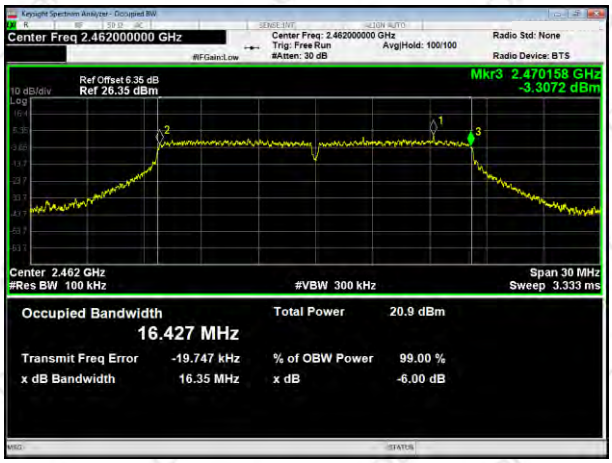
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

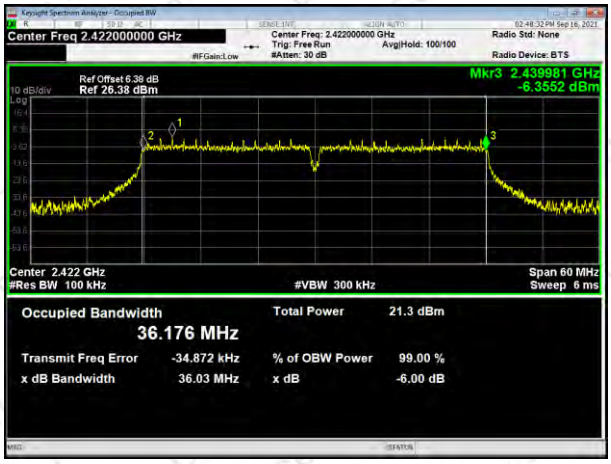
6.1.5 TEST RESULTS

Antenna	Test CH	Channel Bandwidth (MHz)				Limit(KHz)	Result
		802.11b	802.11g	802.11n(HT20)	802.11n(HT40)		
Ant1	Lowest	9.167	16.309	17.084	36.032	>500	Pass
	Middle	9.150	16.316	17.528	36.294		
	Highest	8.927	16.355	16.828	35.58		
Ant2	Lowest	8.132	16.397	17.045	36.014		
	Middle	8.831	16.124	17.178	35.790		
	Highest	8.917	16.380	16.807	36.053		

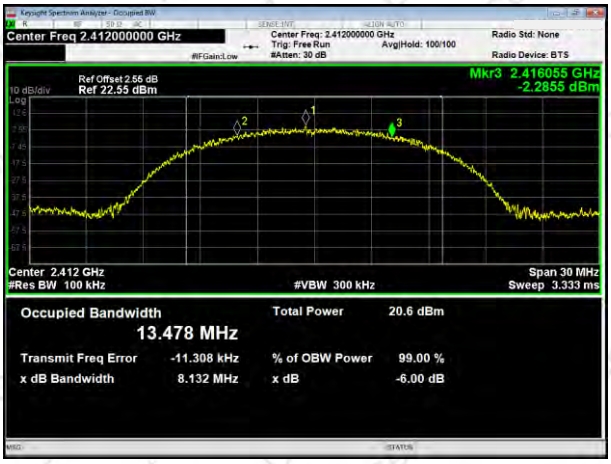
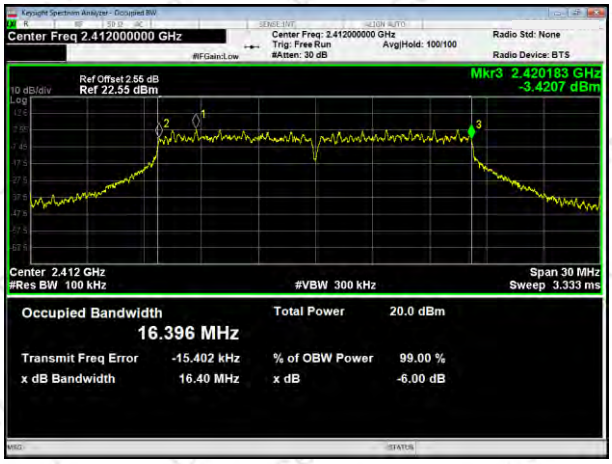
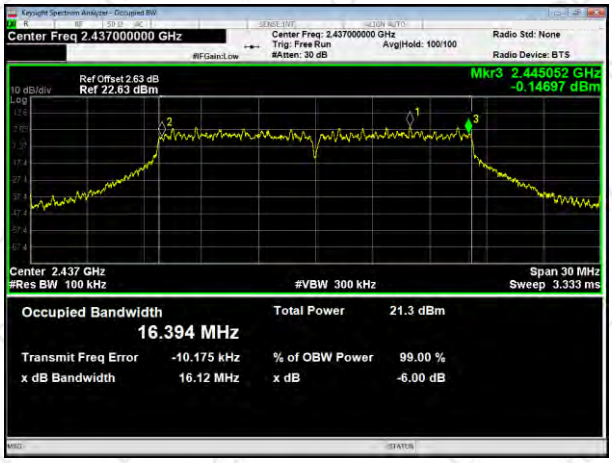
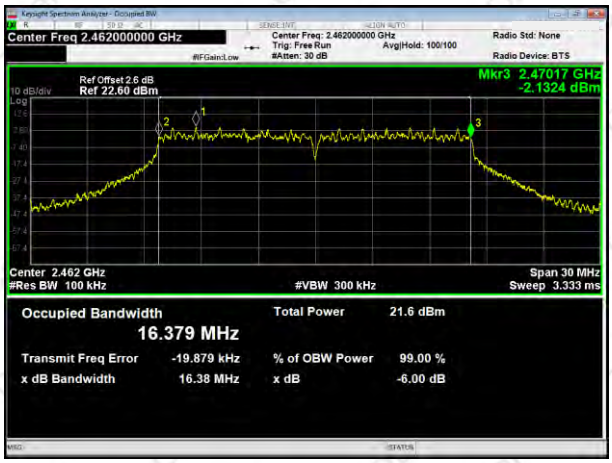
Antenna	Test CH	99% Occupy Bandwidth (MHz)				Result
		802.11b	802.11g	802.11n(HT20)	802.11n(HT40)	
Ant1	Lowest	13.443	16.421	17.579	36.176	Pass
	Middle	13.416	16.434	17.582	36.206	
	Highest	13.401	16.427	17.571	36.110	
Ant2	Lowest	13.478	16.396	17.586	36.192	
	Middle	13.347	16.394	17.591	36.157	
	Highest	13.405	16.379	17.571	36.145	

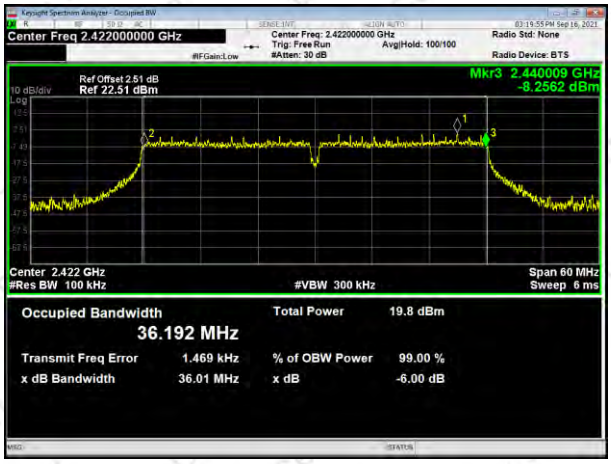
Antenna1:

802.11b	802.11g
	
2412MHz	2412MHz
2437MHz	2437MHz
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
2437MHz	2437MHz
2462MHz	2452MHz

Antenna2:

802.11b	802.11g
	
2412MHz	2412MHz
	
2437MHz	2437MHz
	
2462MHz	2462MHz

802.11n HT20	802.11n HT40
	
2412MHz	2422MHz
2437MHz	2437MHz
2462MHz	2452MHz

7. ANTENNA REQUIREMENT

7.1 STANDARD REQUIREMENT

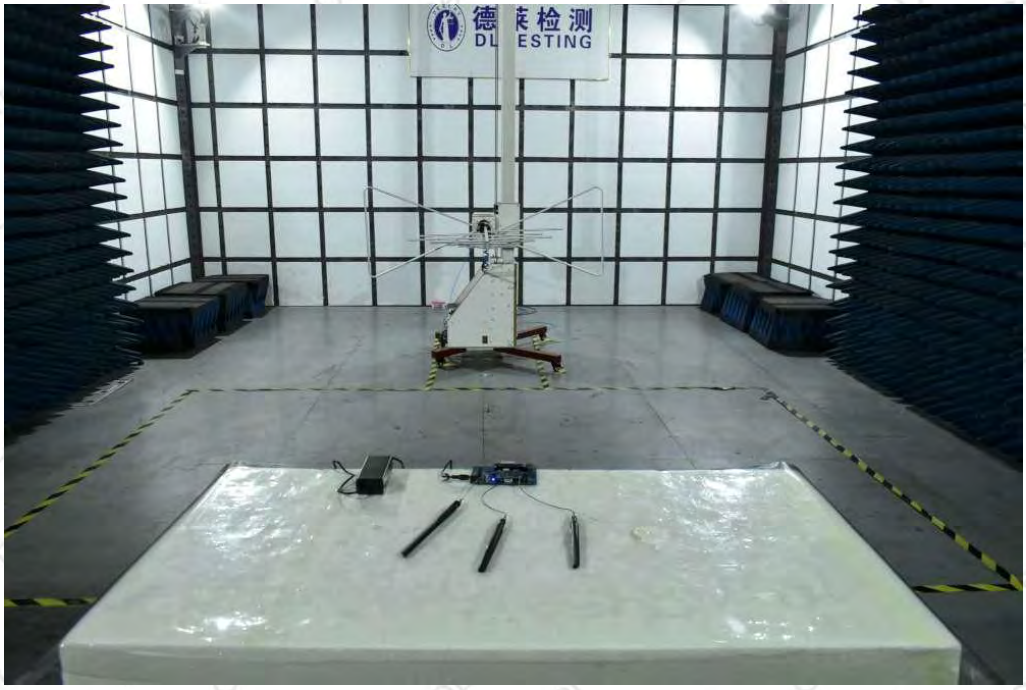
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

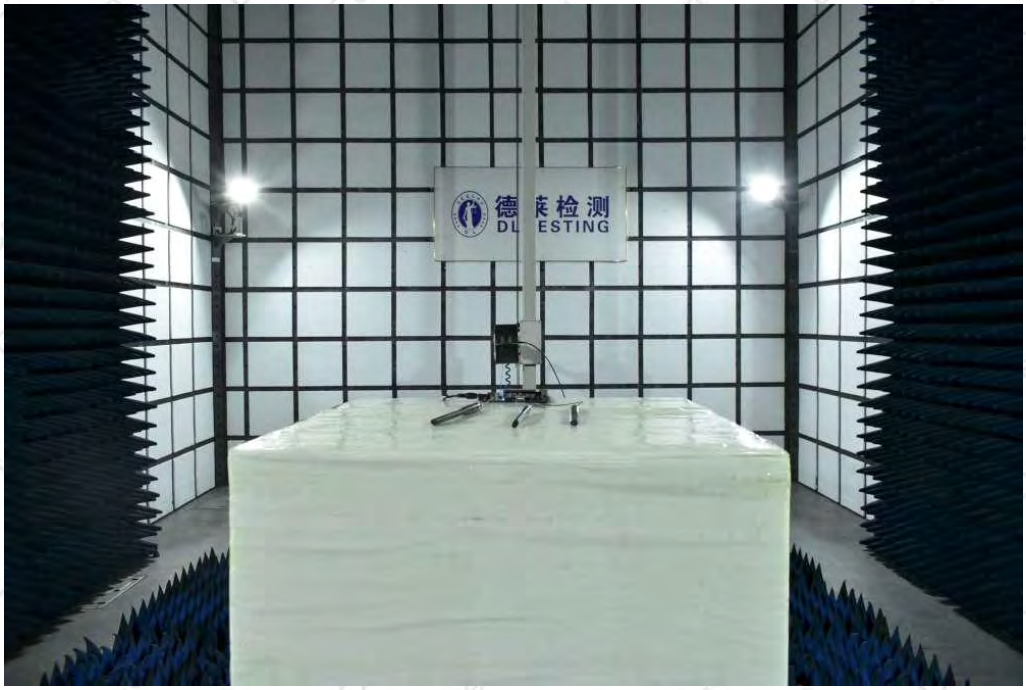
7.2 EUT ANTENNA

The EUT antenna is Ipex antenna, It comply with the standard requirement.

8. TEST SEUUP PHOTO

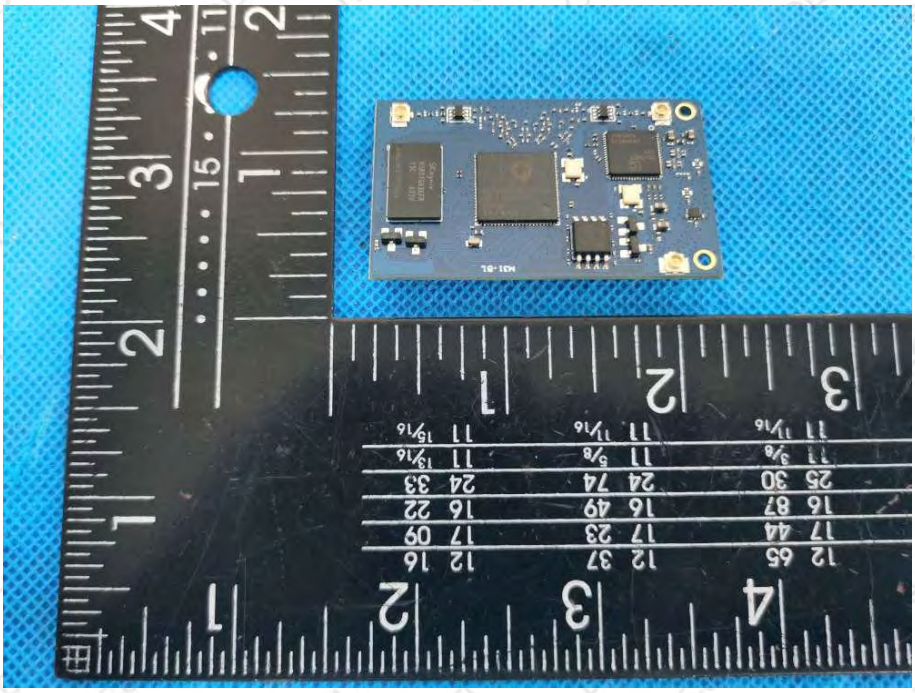
Radiated Measurement Photos

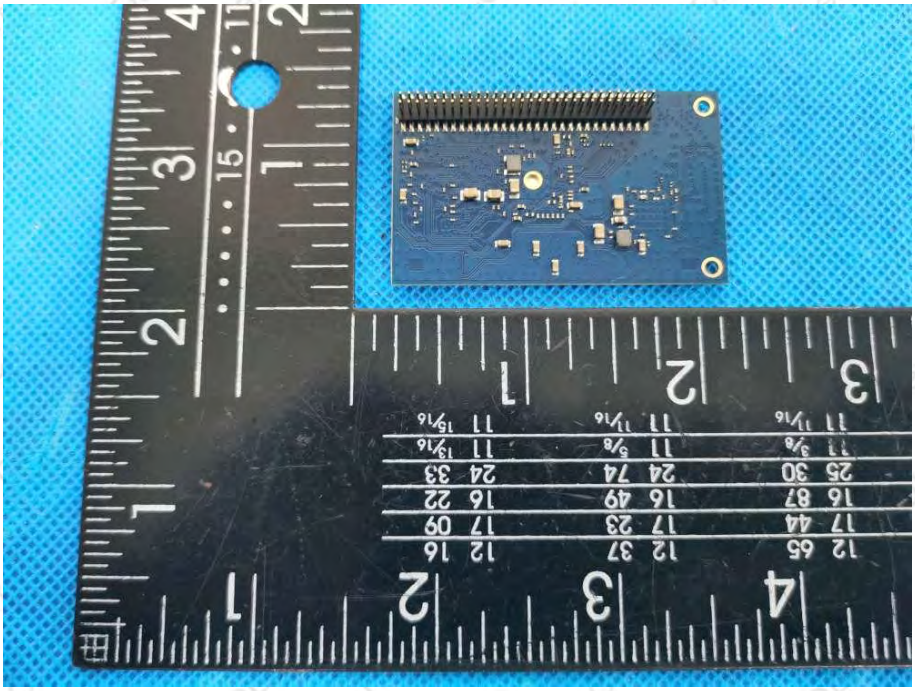


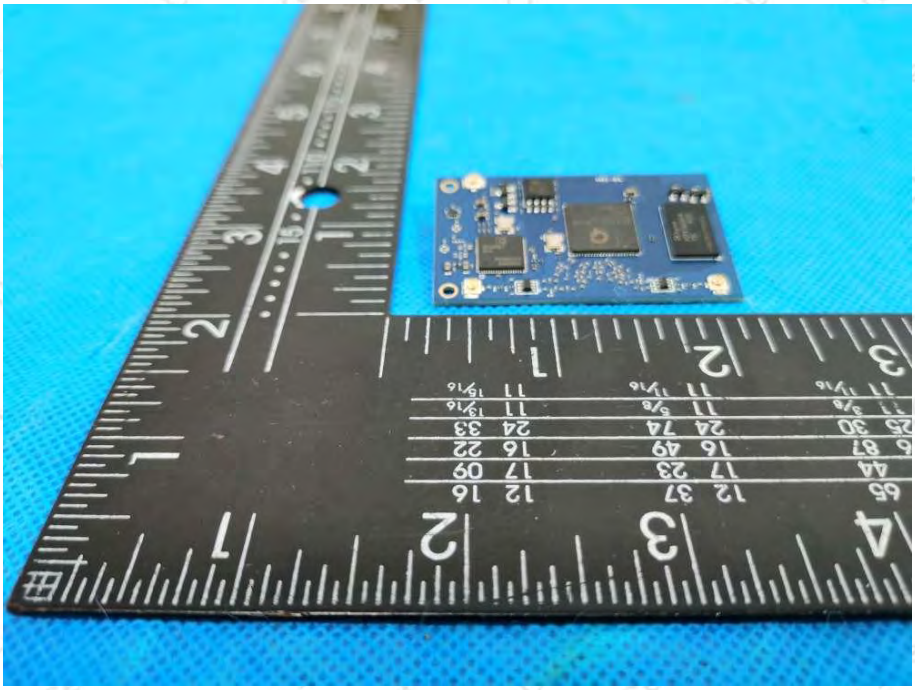


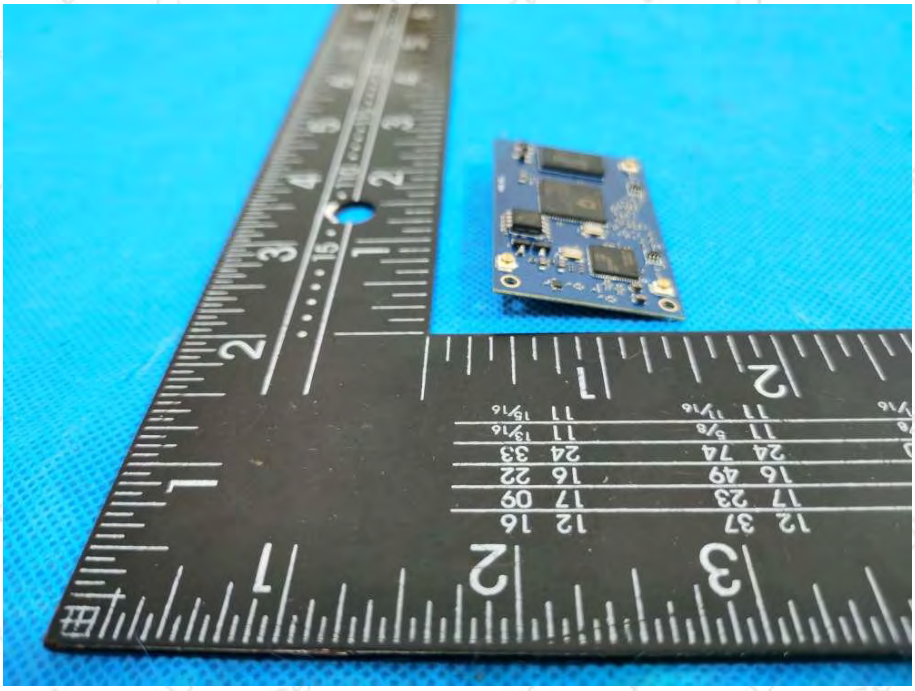
Conducted Measurement Photos

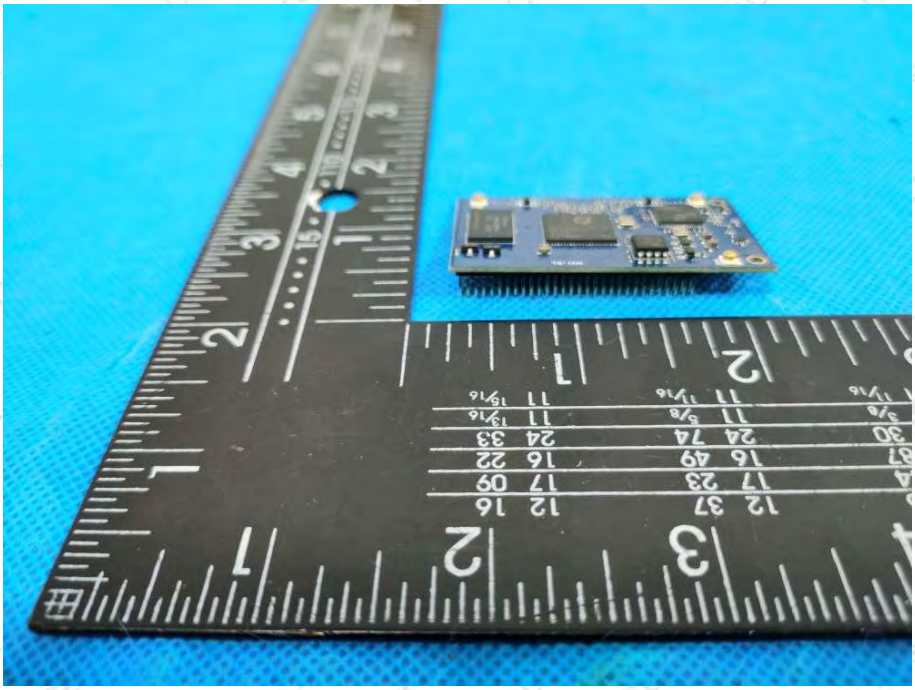
9. EUT PHOTO

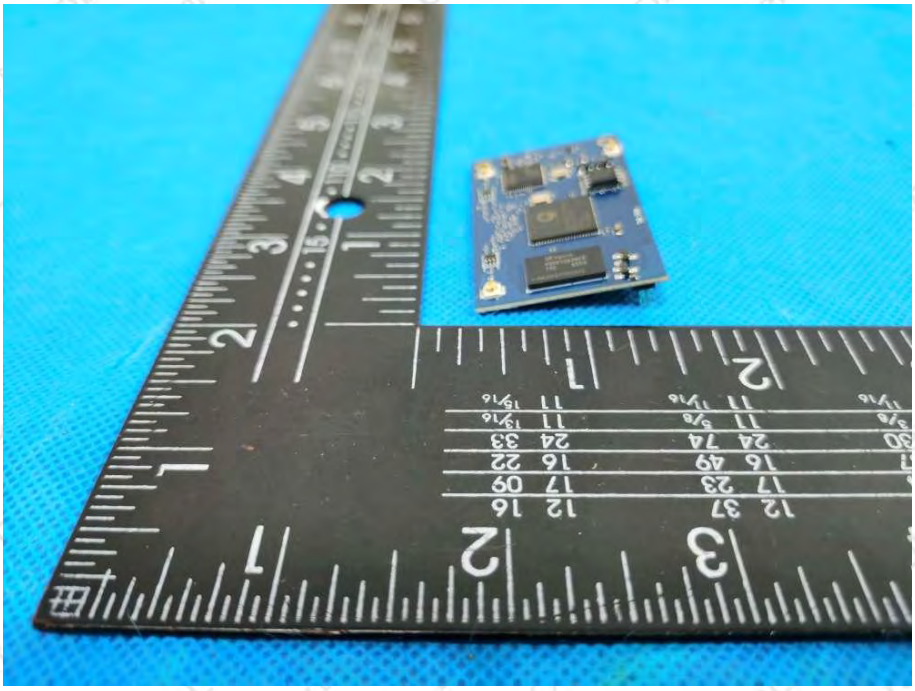


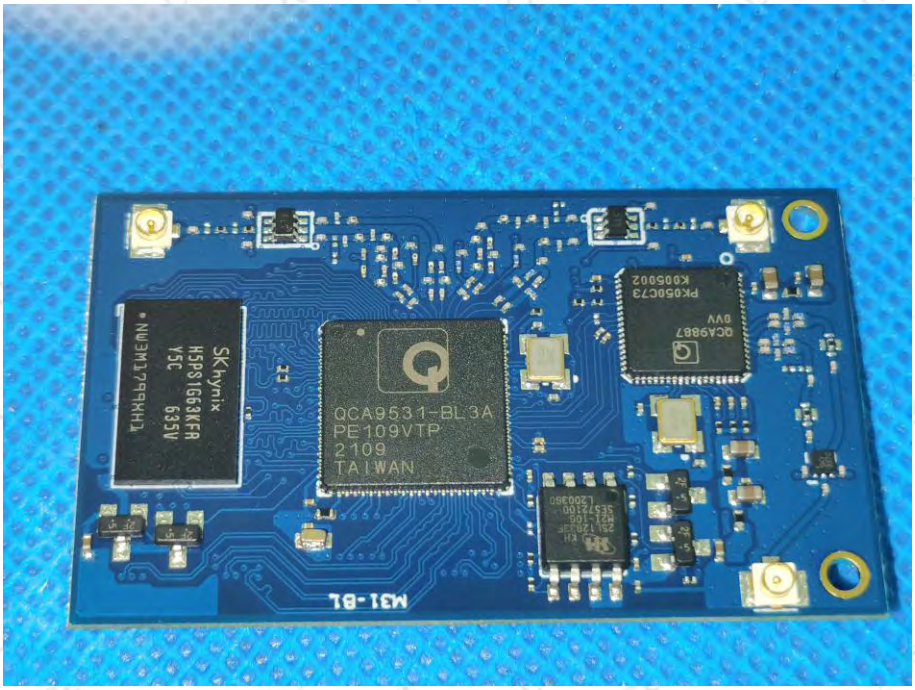












※※※※※ **END OF REPORT** ※※※※※