


# TEST REPORT

Product Name: WiFi module  
FCC ID: 2AL3B-ESP-C12F  
Trademark:   
Model Number: ESP-C12F, ESP-C12F-E, ESP-C20, ESP-C05, EF-ESP-C12F  
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Sample Received Date: Apr. 25, 2023  
Sample tested Date: Apr. 25, 2023 to May. 09, 2023  
Issue Date: May. 09, 2023  
Report No.: CTB230509026RFX  
Test Standards: FCC Part15.247  
ANSI C63.10:2013  
Test Results: PASS  
Remark: This is WIFI-2.4GHz band radio test report.

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Bin Mei / Director

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. “\*” indicates the testing items were fulfilled by subcontracted lab. “#” indicates the items are not in CNAS accreditation scope.

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*(Note: N/A means not applicable)*

1. VERSION

Report No.	Issue Date	Description	Approved
CTB230509026RFX	May. 09, 2023	Original	Valid

## 2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
<b>AC Power Line Conducted Emission</b>	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
<b>Radiated Spurious emissions</b>	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
<b>Band edge and RF Conducted Spurious Emissions</b>	47 CFR Part 15 Subpart C Section 15.247(d)/15.205(a)	ANSI C63.10-2013	PASS
<b>Conducted Peak Output Power</b>	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
<b>6dB Occupied Bandwidth</b>	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
<b>Power Spectral Density</b>	47 CFR Part 15 Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D05v02	PASS
<b>Antenna Requirement</b>	47 CFR Part 15 Subpart C Section 15.203/15.247 (b)	/	PASS
<b>RF Exposure Evaluation</b>	47 CFR Part 15 Subpart C Section 15.247 (i)/1.1310/2.1091	KDB447498D01v06	PASS

Remark:

Test according to ANSI C63.10-2013.

### 3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Item	Uncertainty
Occupancy bandwidth	U=±54.3Hz
Conducted output power Above 1G	U=±1.0dB
Conducted output power below 1G	U=±0.9dB
Power Spectral Density , Conduction	U=±1.0dB
Conduction spurious emissions	U=±2.8dB
Out of band emission	U=±54Hz
3m chamber Radiated spurious emission(9KHz-30MHz)	U=±4.8dB
3m chamber Radiated spurious emission(30MHz-1GHz)	U=±4.3dB
3m chamber Radiated spurious emission(1GHz-18GHz)	U=±4.5dB
3m chamber Radiated spurious emission(18GHz-40GHz)	U=±3.4dB
humidity uncertainty	U=±5.3%
Temperature uncertainty	U=±0.59°C
Supply voltages	U=±3%
Time	U=±5%

#### 4. PRODUCT INFORMATION AND TEST SETUP

##### 4.1 Product Information

Model(s): ESP-C12F, ESP-C12F-E, ESP-C20, ESP-C05, EF-ESP-C12F

Model Description: All the model are the same circuit and RF module, only for model name. Test sample model: ESP-C12F

Wi-Fi Specification: IEEE 802.11b/g/n

Hardware Version: V1.0

Software Version: V1.0

Operation Frequency: WiFi: IEEE 802.11b/g/n 20: 2412-2462MHz/ 11 channel  
IEEE 802.11n 40: 2422-2452MHz/ 7 channel

Max. RF output power: WiFi (2.4G) : 21.353dBm

Type of Modulation: WiFi: DSSS, OFDM, CCK

Antenna installation: WiFi: PCB antenna

Antenna Gain: WiFi (2.4G) : -1.18dBi

Ratings: DC 3.3V powering from PC

##### 4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

##### 4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1	Laptop	DELL	Vostro 5490	N/A	N/A
2	USB serial port	Yue Ho Lian Limited	CH340	N/A	N/A

**Notes:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

#### 4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462		

#### 4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting(802.11b/g/n20)	2412MHz	2437MHz	2462MHz
Transmitting(802.11n40)	2422MHz	2437MHz	2452MHz

NOTE: DutyCycle>98%.

Test mode	Rate
802.11b	11M
802.11g	54M
802.11/n20	65M
802.11/n40	65M

#### 4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(DC):	3.3V
Normal Temperature(°C)	23
Low Temperature(°C)	0
High Temperature(°C)	50

## 5. TEST FACILITY AND TEST INSTRUMENT USED

### 5.1 Test Facility

All measurement facilities used to collect the measurement data are located at 1&2F., Building A, No. 26, Xinh Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

### 5.2 Test Instrument Used

Item	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2023.07.19
2	Power Sensor	Agilent	U2021XA	MY56120032	2023.07.19
3	Power Sensor	Agilent	U2021XA	MY56120034	2023.07.19
4	Communication test set	R&S	CMW500	108058	2023.07.19
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	2023.07.19
6	Signal Generator	Agilent	N5181A	MY50140365	2023.07.19
7	Vector signal generator	Agilent	N5182A	MY47420195	2023.07.19
8	Communication test set	Agilent	E5515C	MY50102567	2023.07.19
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2023.07.19
10	5 GHz Filter	Shenxiang	MSF5150-5850 MS-1155	20181015001	2023.07.19
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	2023.07.19
12	BT&WI-FI Automatic test software	Microwave	MTS8000	Ver. 2.0.0.0	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2023.10.30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2023.07.19
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	/
16	966 chamber	C.R.T.	966	/	2024.08.11
17	Receiver	R&S	ESPI	100362	2023.07.19
18	Amplifier	HP	8447E	2945A02747	2023.07.19
19	Amplifier	Agilent	8449B	3008A01838	2023.07.19
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	2023.07.22



21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	2023.07.22
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	2023.07.23
24	loop antenna	ZHINAN	ZN30900A	GTS534	/
25	40G Horn antenna	A/H/System	SAS-574	588	2024.10.30
26	Amplifier	AEROFLEX	Aeroflex	097	2024.10.30

#### Continuous disturbance

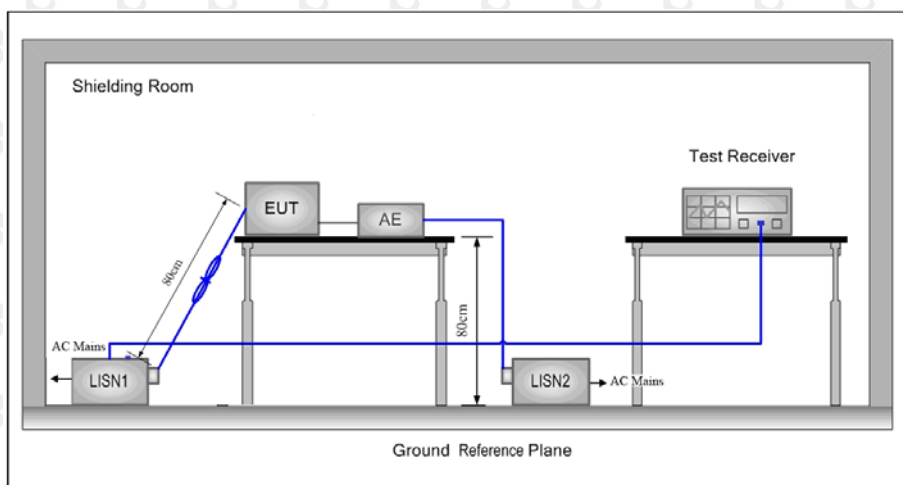
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	ROHDE&SCHWARZ	ESH3-Z5	100318	2023.07.19
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2023.07.19
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	2023.07.19
4	Coaxial cable	ZDECL	Z302S-NJ-SMA J-12M	18091905	2023.07.19
5	ISN	Schwarzbeck	NTFM8158	183	2023.07.19
6	Communication test set	Agilent	E5515C	MY50102567	2023.07.19
7	Communication test set	R&S	CMW500	108058	2023.07.19
8	EZ-EMC	Frad	EMC-con3A1.1	/	/

#### Radiated emission

No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	2023.07.22
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	2023.07.22
3	Amplifier	Agilent	8449B	3008A01838	2023.07.19
4	Amplifier	HP	8447E	2945A02747	2023.07.19
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	2023.07.19
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2023.07.19
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2023.07.19
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2023.07.19
9	Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2023.07.19
10	Communication test set	Agilent	E5515C	MY50102567	2023.07.19
11	Communication test set	R&S	CMW500	108058	2023.07.19
12	EZ-EMC	Frad	EMC-con3A1.1	/	/

## 6. AC POWER LINE CONDUCTED EMISSION

### 6.1 Block Diagram Of Test Setup



### 6.2 Limit

**Table 4 – AC power-line conducted emissions limits**

Frequency (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 <sup>Note 1</sup>	56 to 46 <sup>Note 1</sup>
0.5 - 5	56	46
5 - 30	60	50

**Note 1:** The level decreases linearly with the logarithm of the frequency.

\* Decreasing linearly with the logarithm of the frequency

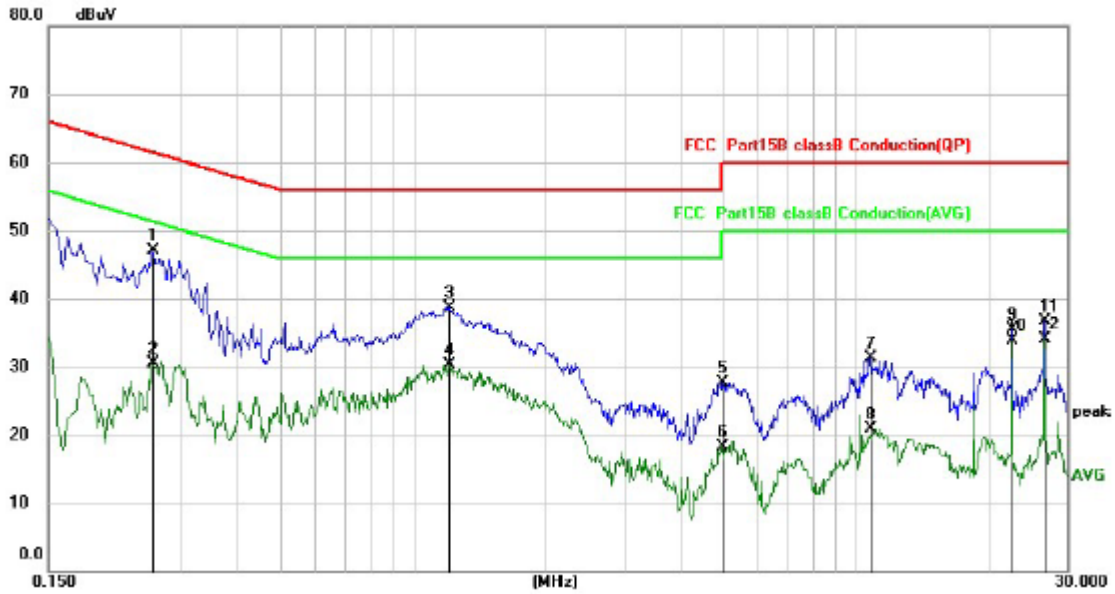
### 6.3 Test procedure

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50 $\Omega$ /50 $\mu$ H + 5 $\Omega$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.

6.4 Test Result

Test Specification: Line  
 AC 120V 60Hz  
 the worst: 802.11b (low channel)

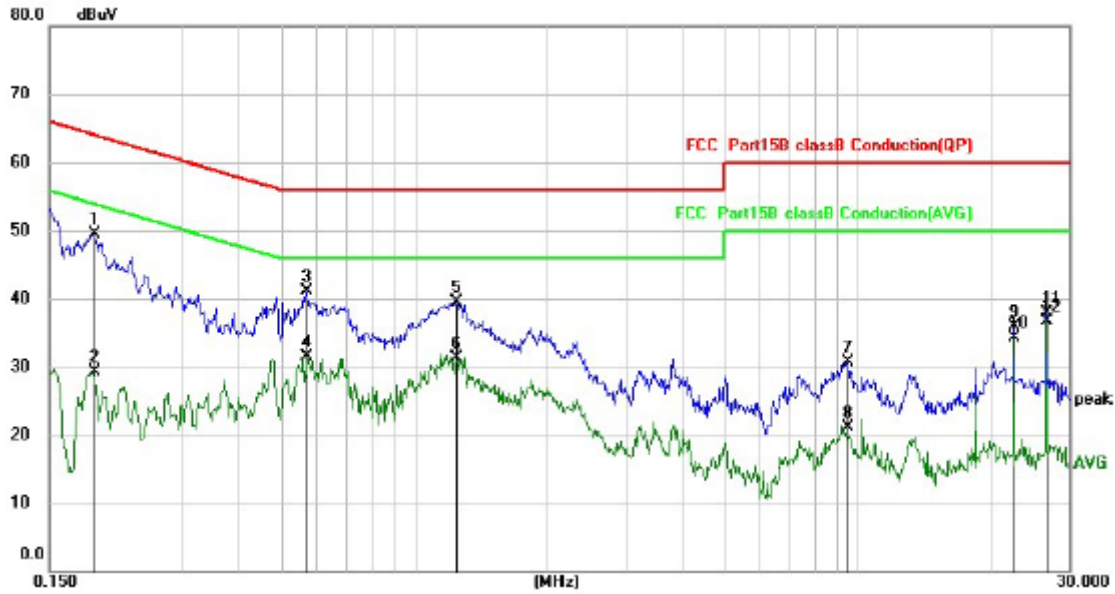


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1	*	0.2580	37.07	10.00	47.07	61.50	-14.43	QP
2		0.2580	20.42	10.00	30.42	51.50	-21.08	AVG
3		1.2058	28.81	9.99	38.80	56.00	-17.20	QP
4		1.2058	20.40	9.99	30.39	46.00	-15.61	AVG
5		4.9939	17.50	10.17	27.67	56.00	-28.33	QP
6		4.9939	8.23	10.17	18.40	46.00	-27.60	AVG
7		10.7500	20.87	10.37	31.24	60.00	-28.76	QP
8		10.7500	10.56	10.37	20.93	50.00	-29.07	AVG
9		22.5300	24.91	10.59	35.50	60.00	-24.50	QP
10		22.5300	23.22	10.59	33.81	50.00	-16.19	AVG
11		26.6260	26.00	10.62	36.62	60.00	-23.38	QP
12		26.6260	23.48	10.62	34.10	50.00	-15.90	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

Test Specification: Neutral  
 AC 120V 60Hz  
 the worst: 802.11b (low channel)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1884	39.54	10.01	49.55	64.11	-14.56	QP
2		0.1884	19.37	10.01	29.38	54.11	-24.73	AVG
3		0.5700	31.13	9.97	41.10	56.00	-14.90	QP
4		0.5700	21.51	9.97	31.48	46.00	-14.52	AVG
5		1.2379	29.56	9.99	39.55	56.00	-16.45	QP
6		1.2379	21.39	9.99	31.38	46.00	-14.62	AVG
7		9.4700	20.33	10.33	30.66	60.00	-29.34	QP
8		9.4700	10.87	10.33	21.20	50.00	-28.80	AVG
9		22.5300	25.29	10.59	35.88	60.00	-24.12	QP
10		22.5300	23.79	10.59	34.38	50.00	-15.62	AVG
11		26.6260	27.28	10.62	37.90	60.00	-22.10	QP
12	*	26.6260	26.16	10.62	36.78	50.00	-13.22	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

## 7. RADIATED SPURIOUS EMISSION

### 7.1 Block Diagram Of Test Setup

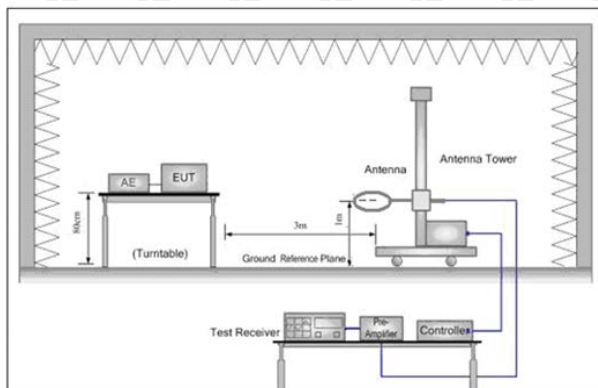


Figure 1. Below 30MHz

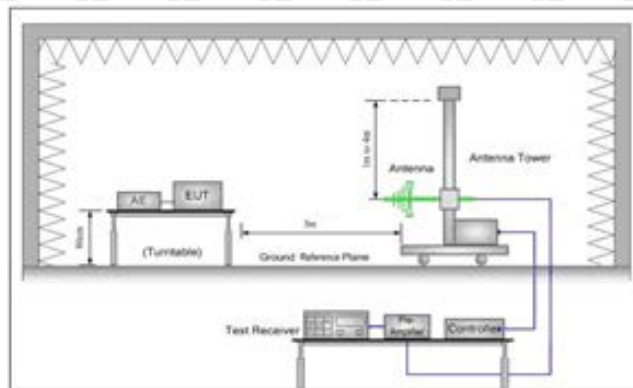


Figure 2. 30MHz to 1GHz

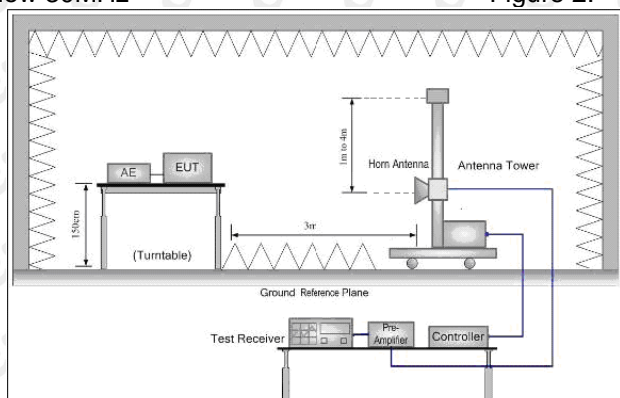


Figure 3. Above 1GHz

### 7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dB $\mu$ V/m )	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

### 7.3 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 chamber. 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 rota table 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:**

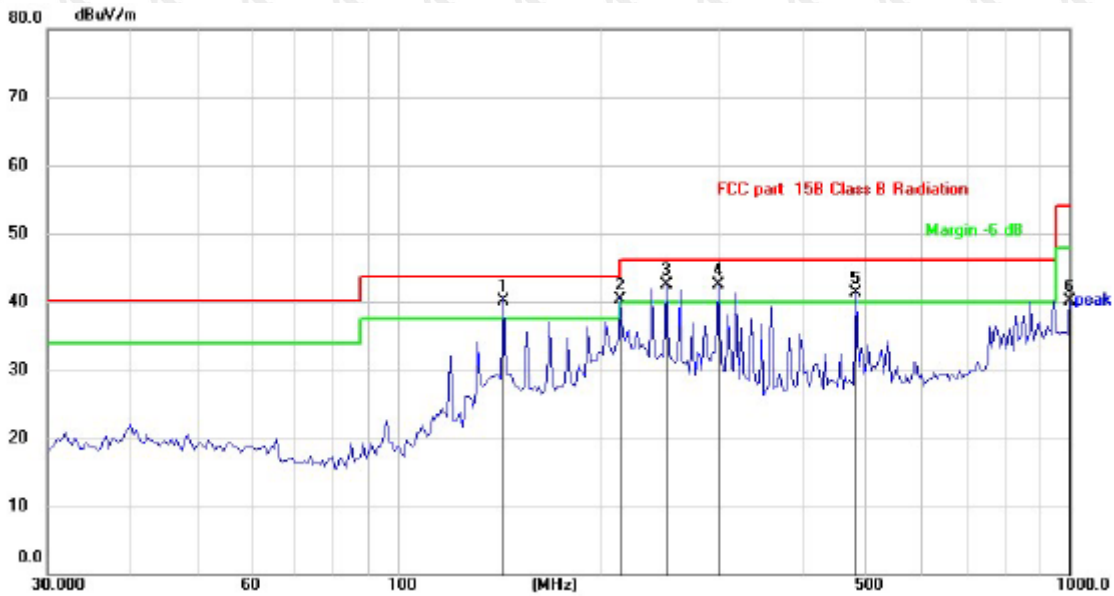
- g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).
- h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- i.Repeat above procedures until all frequencies measured was complete.

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

7.4 Test Result

Below 1GHz Test Results:  
Antenna polarity: H

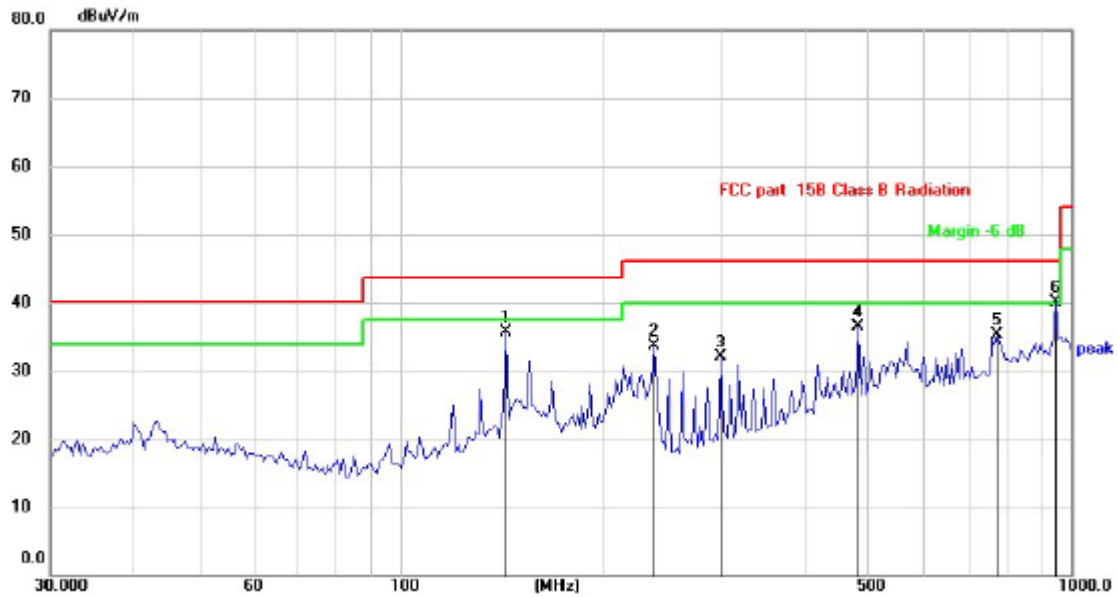


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	!	144.0817	45.67	-5.49	40.18	43.50	-3.32	QP
2	*	215.6453	49.35	-9.07	40.28	43.50	-3.22	QP
3	!	252.5048	50.29	-7.70	42.59	46.00	-3.41	QP
4	!	300.8942	48.04	-5.44	42.60	46.00	-3.40	QP
5	!	483.0615	41.76	-0.42	41.34	46.00	-4.66	QP
6		1000.000	31.94	8.23	40.17	54.00	-13.83	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level



Antenna polarity: V



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		144.0817	41.14	-5.49	35.65	43.50	-7.85	QP
2		239.5669	41.98	-8.30	33.68	46.00	-12.32	QP
3		300.8942	37.58	-5.44	32.14	46.00	-13.86	QP
4		483.0615	36.85	-0.42	36.43	46.00	-9.57	QP
5		775.5167	29.91	5.31	35.22	46.00	-10.78	QP
6	*	948.7608	32.43	7.63	40.06	46.00	-5.94	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

1. The margin of 9K-30MH measurement exceeds 20dB, so the test chart is not included. Test Mode: 802.11b low channel (the worst)
2. All modes have been tested, and the test results show that b-mode data is the worst, only b-mode test chart is put. Test Mode: 802.11b low channel (the worst)
3. After pre-scanning three directions, the report recorded the worst case Test Mode: 802.11b low channel (the worst)

Above 1 GHz Test Results:

LOW CH1 (802.11b Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	65.59	-3.64	61.95	74	-12.05	peak
4824	48.18	-3.64	44.54	54	-9.46	AVG
7236	58.23	-0.95	57.28	74	-16.72	peak
7236	45.38	-0.95	44.43	54	-9.57	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	65.35	-3.64	61.71	74	-12.29	peak
4824	48.46	-3.64	44.82	54	-9.18	AVG
7236	58.69	-0.95	57.74	74	-16.26	peak
7236	44.22	-0.95	43.27	54	-10.73	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

MID CH6 (802.11b Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
4874	65.71	-3.51	62.20	74	-11.80	peak
4874	50.52	-3.51	47.01	54	-6.99	AVG
7311	60.22	-0.82	59.40	74	-14.60	peak
7311	45.61	-0.82	44.79	54	-9.21	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
4874	62.85	-3.51	59.34	74	-14.66	peak
4874	47.27	-3.51	43.76	54	-10.24	AVG
7311	60.38	-0.82	59.56	74	-14.44	peak
7311	45.03	-0.82	44.21	54	-9.79	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

HIGH CH11 (802.11b Mode)/2462

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4924	62.04	-3.43	58.61	74	-15.39	peak
4924	45.89	-3.43	42.46	54	-11.54	AVG
7386	59.18	-0.75	58.43	74	-15.57	peak
7386	45.03	-0.75	44.28	54	-9.72	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
4924	64.95	-3.43	61.52	74	-12.48	peak
4924	47.47	-3.43	44.04	54	-9.96	AVG
7386	57.57	-0.75	56.82	74	-17.18	peak
7386	43.06	-0.75	42.31	54	-11.69	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH1 (802.11g Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
4824	65.37	-3.64	61.73	74	-12.27	peak
4824	48.78	-3.64	45.14	54	-8.86	AVG
7236	59.27	-0.95	58.32	74	-15.68	peak
7236	44.59	-0.95	43.64	54	-10.36	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
4824	63.04	-3.64	59.40	74	-14.60	peak
4824	47.34	-3.64	43.70	54	-10.30	AVG
7236	59.31	-0.95	58.36	74	-15.64	peak
7236	43.80	-0.95	42.85	54	-11.15	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

MID CH6 (802.11g Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	62.65	-3.51	59.14	74	-14.86	peak
4874	49.20	-3.51	45.69	54	-8.31	AVG
7311	57.68	-0.82	56.86	74	-17.14	peak
7311	45.41	-0.82	44.59	54	-9.41	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	63.20	-3.51	59.69	74	-14.31	peak
4874	47.59	-3.51	44.08	54	-9.92	AVG
7311	57.28	-0.82	56.46	74	-17.54	peak
7311	41.59	-0.82	40.77	54	-13.23	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

HIGH CH11 (802.11g Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	63.24	-3.43	59.81	74	-14.19	peak
4924	47.46	-3.43	44.03	54	-9.97	AVG
7386	56.62	-0.75	55.87	74	-18.13	peak
7386	44.13	-0.75	43.38	54	-10.62	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.04	-3.43	58.61	74	-15.39	peak
4924	47.47	-3.43	44.04	54	-9.96	AVG
7386	56.07	-0.75	55.32	74	-18.68	peak
7386	42.17	-0.75	41.42	54	-12.58	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH1 (802.11n/H20 Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	64.02	-3.64	60.38	74	-13.62	peak
4824	46.35	-3.64	42.71	54	-11.29	AVG
7236	59.54	-0.95	58.59	74	-15.41	peak
7236	44.53	-0.95	43.58	54	-10.42	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	65.46	-3.64	61.82	74	-12.18	peak
4824	49.45	-3.64	45.81	54	-8.19	AVG
7236	57.92	-0.95	56.97	74	-17.03	peak
7236	43.51	-0.95	42.56	54	-11.44	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits



MID CH6 (802.11n/H20 Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
4874.00	62.66	-3.51	59.15	74.00	-14.85	peak
4874.00	49.95	-3.51	46.44	54.00	-7.56	AVG
7311.00	58.71	-0.82	57.89	74.00	-16.11	peak
7311.00	44.78	-0.82	43.96	54.00	-10.04	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
4874.00	63.78	-3.51	60.27	74.00	-13.73	peak
4874.00	47.36	-3.51	43.85	54.00	-10.15	AVG
7311.00	59.16	-0.82	58.34	74.00	-15.66	peak
7311.00	41.82	-0.82	41.00	54.00	-13.00	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

HIGH CH11 (802.11n/H20 Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.42	-3.43	58.99	74	-15.01	peak
4924	46.72	-3.43	43.29	54	-10.71	AVG
7386	56.36	-0.75	55.61	74	-18.39	peak
7386	41.69	-0.75	40.94	54	-13.06	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	65.22	-3.43	61.79	74	-12.21	peak
4924	45.10	-3.43	41.67	54	-12.33	AVG
7386	58.24	-0.75	57.49	74	-16.51	peak
7386	41.27	-0.75	40.52	54	-13.48	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

LOW CH3 (802.11n/H40 Mode)/2422

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4844	65.17	-3.63	61.54	74	-12.46	peak
4844	49.44	-3.63	45.81	54	-8.19	AVG
7266	60.23	-0.94	59.29	74	-14.71	peak
7266	44.12	-0.94	43.18	54	-10.82	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,  
Margin = Emission level - Limits

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4844	64.16	-3.63	60.53	74	-13.47	peak
4844	49.12	-3.63	45.49	54	-8.51	AVG
7266	59.39	-0.94	58.45	74	-15.55	peak
7266	45.45	-0.94	44.51	54	-9.49	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,  
Margin = Emission level - Limits

MID CH6 (802.11n/H40 Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	65.03	-3.51	61.52	74	-12.48	peak
4874	49.52	-3.51	46.01	54	-7.99	AVG
7311	60.89	-0.82	60.07	74	-13.93	peak
7311	45.10	-0.82	44.28	54	-9.72	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	62.33	-3.51	58.82	74	-15.18	peak
4874	46.46	-3.51	42.95	54	-11.05	AVG
7311	56.71	-0.82	55.89	74	-18.11	peak
7311	43.31	-0.82	42.49	54	-11.51	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

HIGH CH9 (802.11n/H40 Mode)/2452

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4904	64.18	-3.43	60.75	74	-13.25	peak
4904	49.14	-3.43	45.71	54	-8.29	AVG
7356	58.30	-0.75	57.55	74	-16.45	peak
7356	41.26	-0.75	40.51	54	-13.49	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,  
Margin = Emission level - Limits

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4904	62.88	-3.43	59.45	74	-14.55	peak
4904	45.88	-3.43	42.45	54	-11.55	AVG
7356	56.27	-0.75	55.52	74	-18.48	peak
7356	42.47	-0.75	41.72	54	-12.28	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,  
Margin = Emission level - Limits

Remark :

- (1) Measuring frequencies from 1 GHz to the 25 GHz .
- (2) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed
- (5)Have tested in three orientations for radiated emissions, Only The worst record is in this report

### Restricted bands around fundamental frequency (Radiated)

Operation Mode:

802.11b Mode TX CH Low (2412MHz)

Horizontal

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2390	57.68	-5.81	51.87	74	-22.13	peak
2390	/	-5.81	/	54	/	AVG
2399	64.71	-5.84	58.87	74	-15.13	peak
2399	48.44	-5.84	42.60	54	-11.40	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,  
Margin = Emission level - Limits

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2390	56.76	-5.81	50.95	74	-23.05	peak
2390	/	-5.81	/	54	/	AVG
2399	61.61	-5.84	55.77	74	-18.23	peak
2399	47.25	-5.84	41.41	54	-12.59	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,  
Margin = Emission level - Limits

When the peak value is smaller than the AVG limit, AVG is not reflected.

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.78	-5.65	51.13	74	-22.87	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.99	-5.65	51.34	74	-22.66	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

When the peak value is smaller than the AVG limit, AVG is not reflected.

Operation Mode: 802.11g Mode TX CH Low (2412MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2390	58.03	-5.81	52.22	74	-21.78	peak
2390	/	-5.81	/	54	/	AVG
2399	62.20	-5.84	56.36	74	-17.64	peak
2399	45.82	-5.84	39.98	54	-14.02	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2390	56.69	-5.81	50.88	74	-23.12	peak
2390	/	-5.81	/	54	/	AVG
2399	63.22	-5.84	57.38	74	-16.62	peak
2399	45.48	-5.84	39.64	54	-14.36	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

When the peak value is smaller than the AVG limit, AVG is not reflected.



Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.53	-5.65	51.88	74	-22.12	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	58.02	-5.65	52.37	74	-21.63	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

When the peak value is smaller than the AVG limit, AVG is not reflected.

Operation Mode: 802.11n/H20 Mode TX CH Low (2412MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2390	57.73	-5.81	51.92	74	-22.08	peak
2390	/	-5.81	/	54	/	AVG
2399	63.17	-5.84	57.33	74	-16.67	peak
2399	48.22	-5.84	42.38	54	-11.62	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2390	57.11	-5.81	51.30	74	-22.70	peak
2390	/	-5.81	/	54	/	AVG
2399	59.90	-5.84	54.06	74	-19.94	peak
2399	46.99	-5.84	41.15	54	-12.85	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

When the peak value is smaller than the AVG limit, AVG is not reflected.

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	55.75	-5.65	50.10	74	-23.90	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.34	-5.65	50.69	74	-23.31	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

When the peak value is smaller than the AVG limit, AVG is not reflected.

Operation Mode: 802.11n/H40 Mode TX CH Low (2422MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	58.83	-5.81	53.02	74	-20.98	peak
2390	/	-5.81	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	57.98	-5.81	52.17	74	-21.83	peak
2390	/	-5.81	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

When the peak value is smaller than the AVG limit, AVG is not reflected.

Operation Mode: TX CH High (2452MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.90	-5.65	52.25	74	-21.75	peak
2483.5	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.41	-5.65	50.76	74	-23.24	peak
2483.5	/	-5.65	/	54	/	AVG

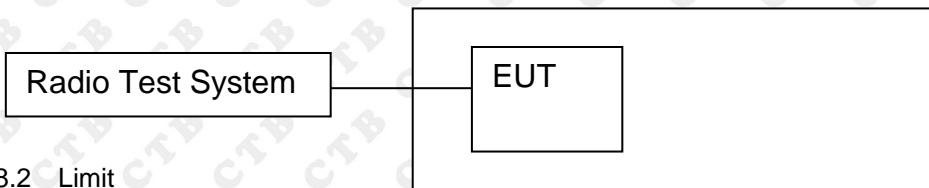
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

When the peak value is smaller than the AVG limit, AVG is not reflected.

**8. BAND EDGE AND RF CONDUCTED SPURIOUS EMISSIONS**

8.1 Block Diagram Of Test Setup



8.2 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

8.3 Test procedure

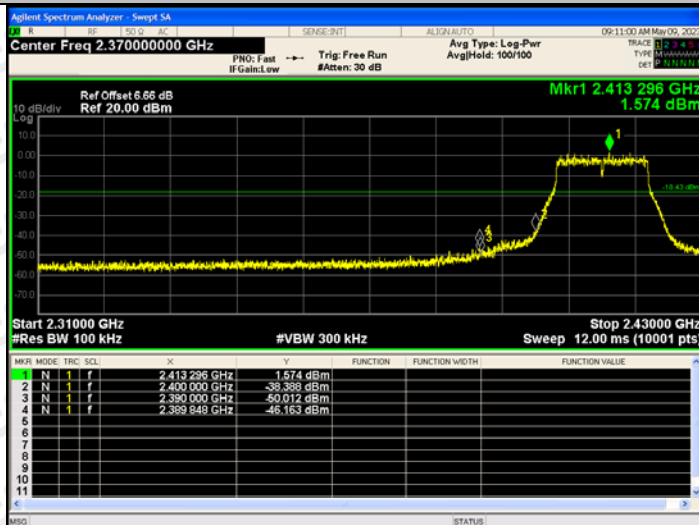
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:  
 Blow 30MHz:  
 RBW = 100kHz, VBW = 300kHz, Sweep = auto  
 Detector function = peak, Trace = max hold  
 Above 30MHz:  
 RBW = 100KHz, VBW = 300KHz, Sweep = auto  
 Detector function = peak, Trace = max hold

8.4 Test Result

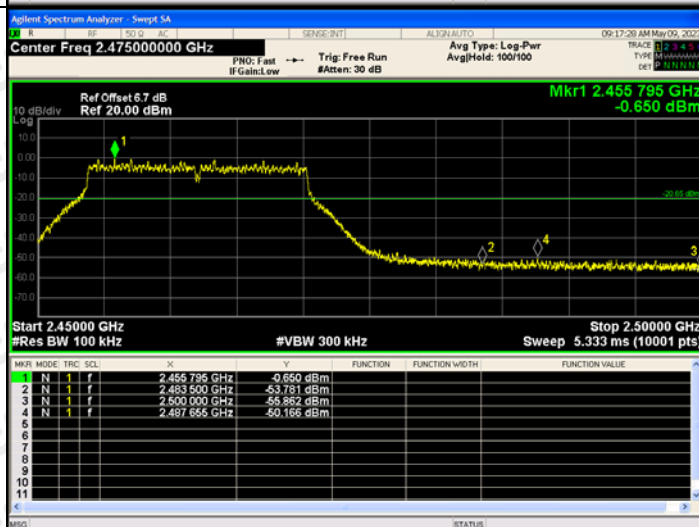


## BAND EDGE Graphs

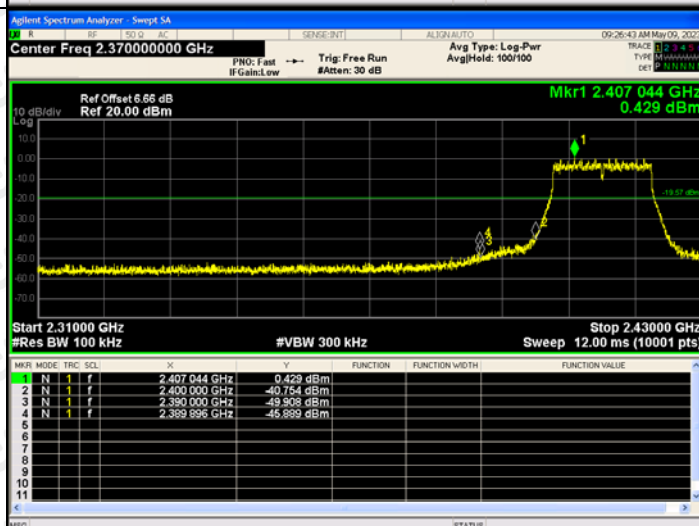
802.11g/LCH



802.11g/HCH

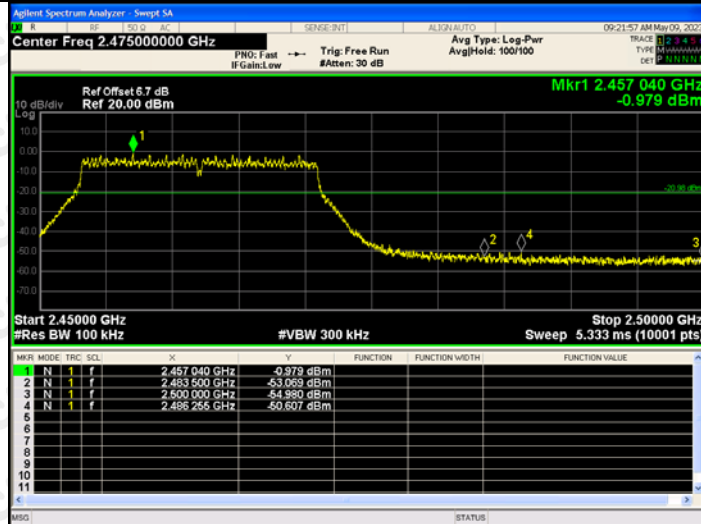


802.11n(HT20)/L  
CH

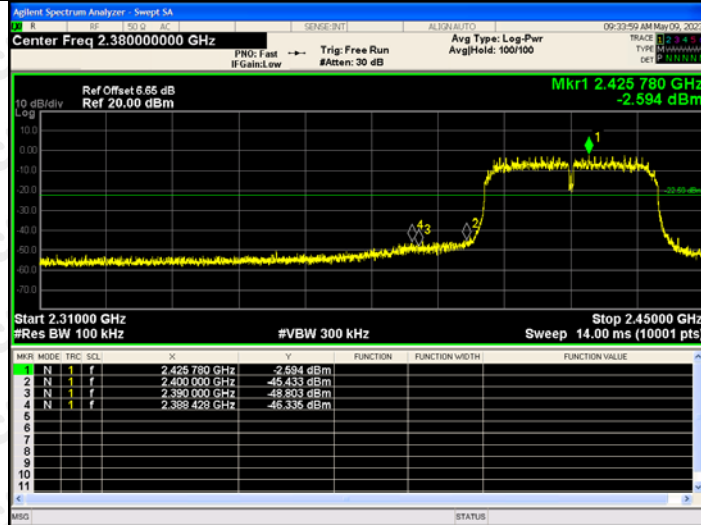




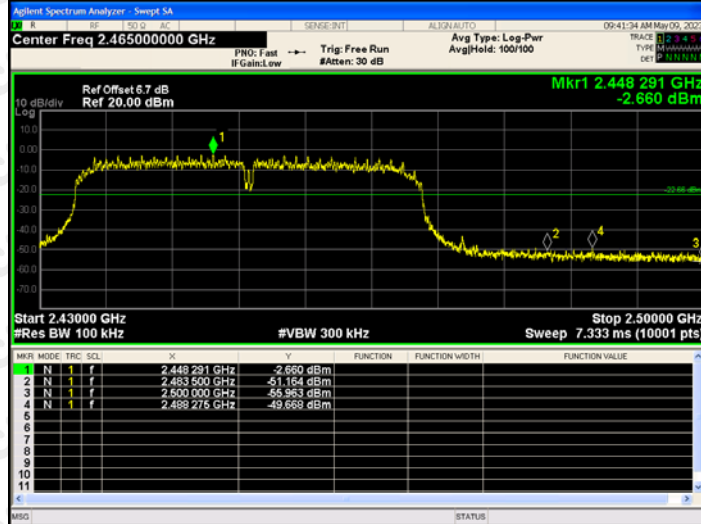
802.11n(HT20)/H  
CH



802.11n(HT40)/L  
CH

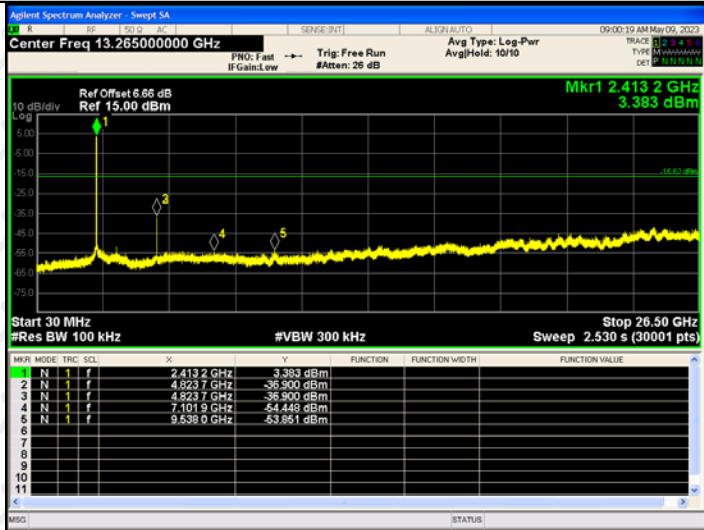


802.11n(HT40)/H  
CH

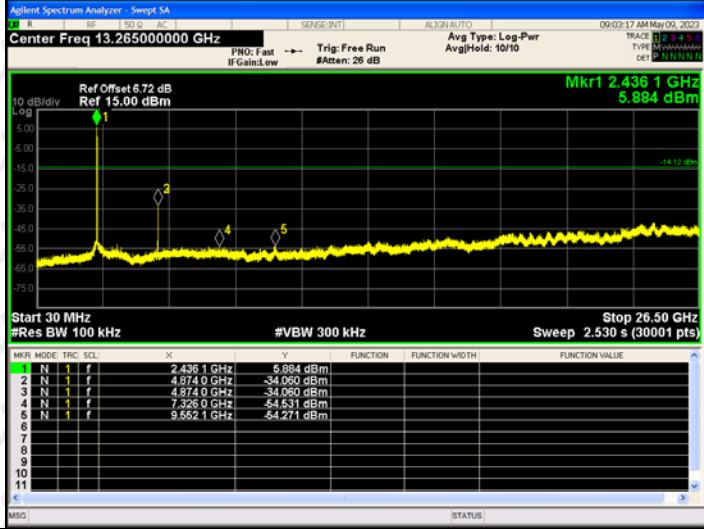


RF Conducted Spurious Emissions Graphs

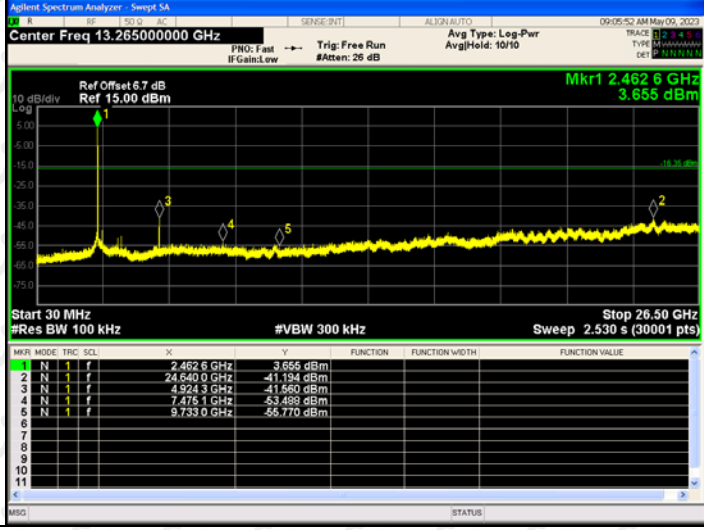
802.11b/LCH



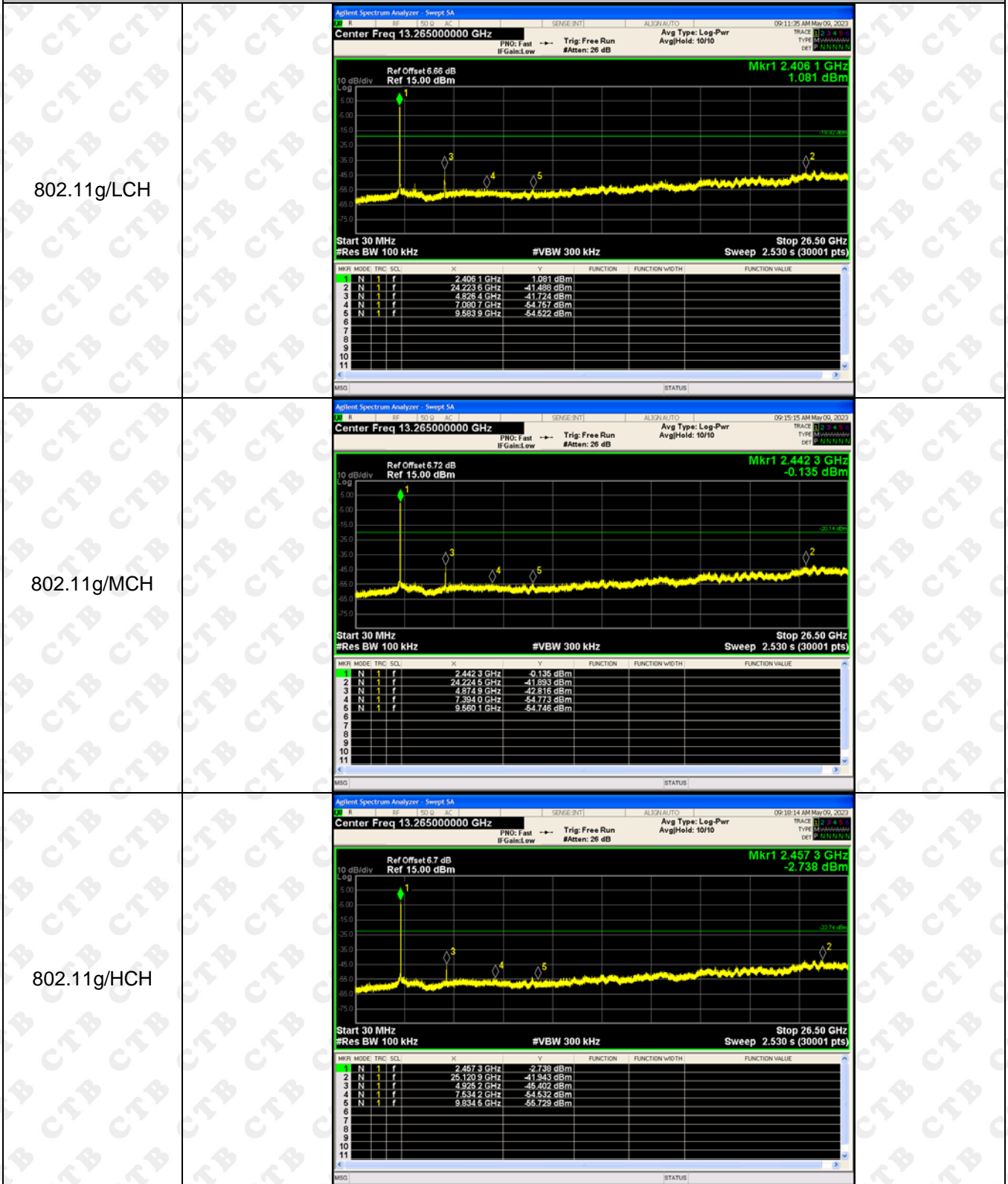
802.11b/MCH



802.11b/HCH

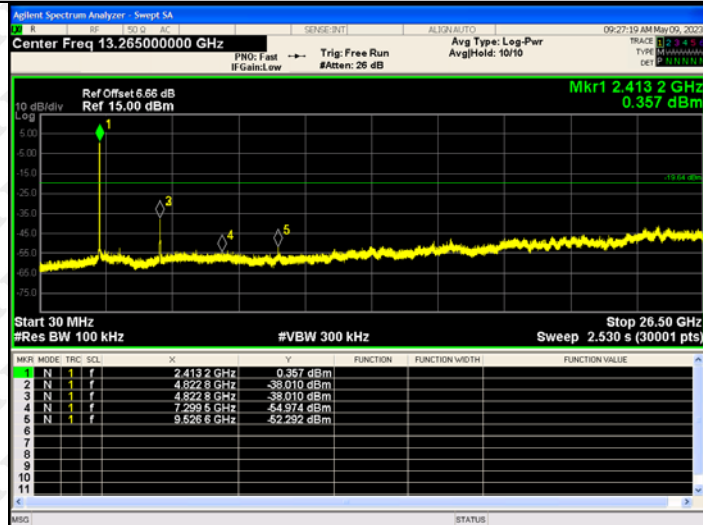


## RF Conducted Spurious Emissions Graphs

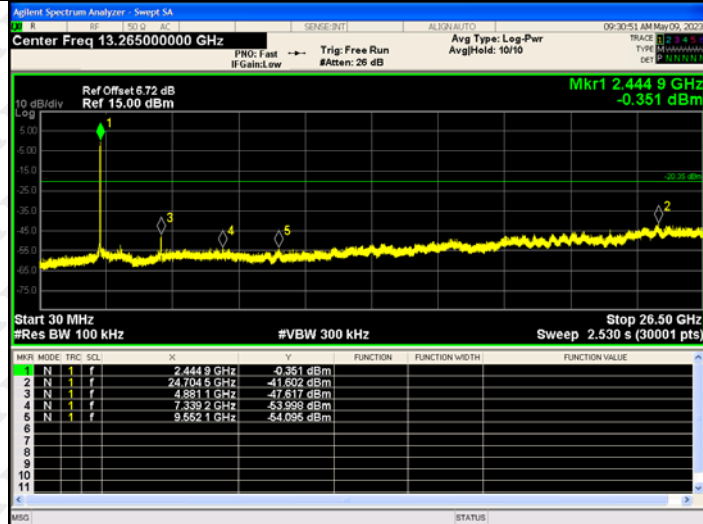


## RF Conducted Spurious Emissions Graphs

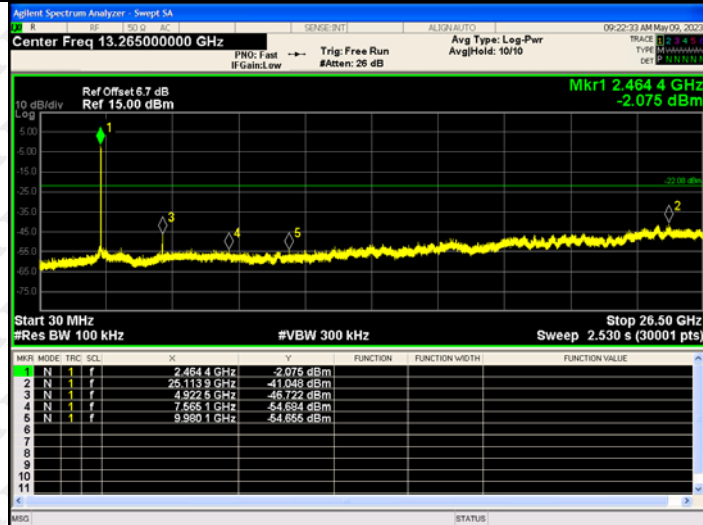
802.11n(HT20)/LCH

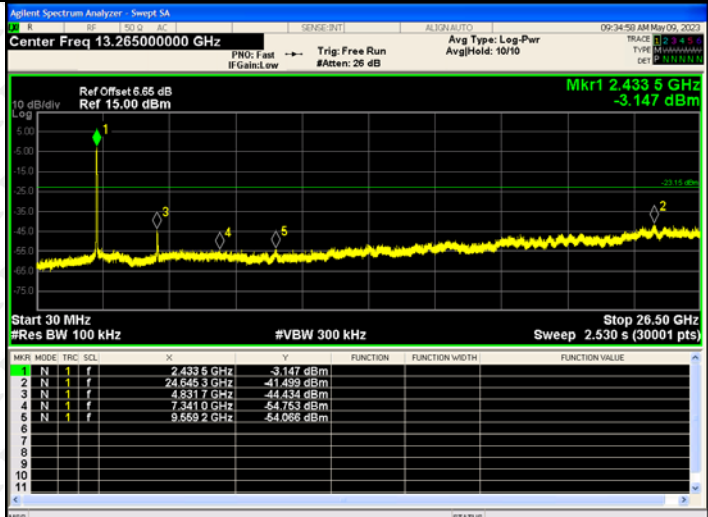
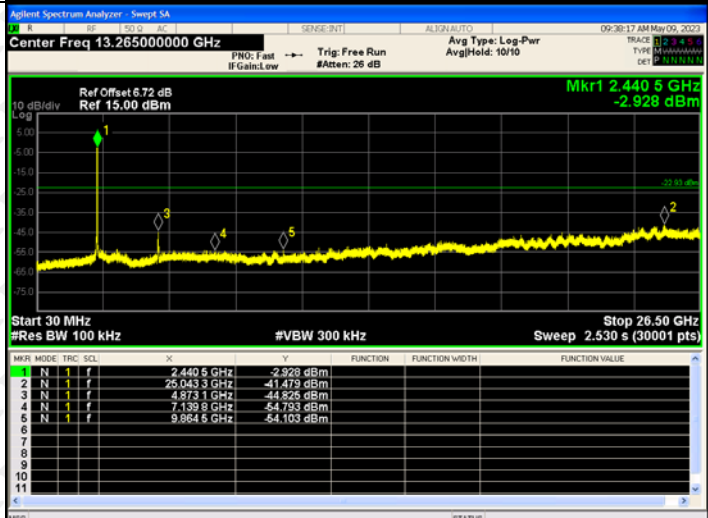


802.11 n(HT20)/MCH



802.11 n(HT20)/HCH



<p>802.11n(HT40)/LCH</p>	 <table border="1"> <thead> <tr> <th>MKR MODE</th> <th>TRC</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.433 5 GHz</td><td></td><td></td><td>-3.147 dBm</td></tr> <tr><td>2</td><td>N</td><td>1</td><td>f</td><td>24.645 3 GHz</td><td></td><td></td><td>-41.499 dBm</td></tr> <tr><td>3</td><td>N</td><td>1</td><td>f</td><td>4.831 7 GHz</td><td></td><td></td><td>-44.434 dBm</td></tr> <tr><td>4</td><td>N</td><td>1</td><td>f</td><td>7.341 0 GHz</td><td></td><td></td><td>-54.763 dBm</td></tr> <tr><td>5</td><td>N</td><td>1</td><td>f</td><td>9.569 2 GHz</td><td></td><td></td><td>-54.086 dBm</td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	MKR MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.433 5 GHz			-3.147 dBm	2	N	1	f	24.645 3 GHz			-41.499 dBm	3	N	1	f	4.831 7 GHz			-44.434 dBm	4	N	1	f	7.341 0 GHz			-54.763 dBm	5	N	1	f	9.569 2 GHz			-54.086 dBm	6								7								8								9								10								11							
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## 9. COUDUCTED OUTPUT POWER

### 9.1 Block Diagram Of Test Setup



### 9.2 Limit

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

### 9.3 Test procedure

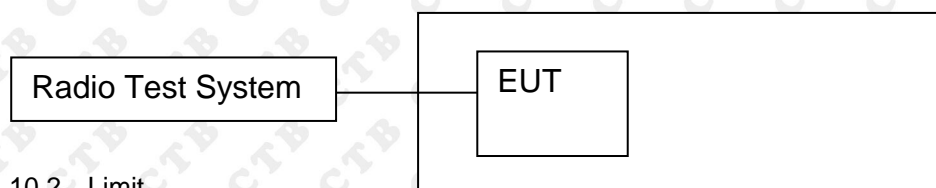
1. The EUT was directly connected to the Power meter

9.4 Test Result

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
802.11b	LCH	21.353	30	PASS
	MCH	21.205	30	PASS
	HCH	19.203	30	PASS
802.11g	LCH	20.071	30	PASS
	MCH	19.595	30	PASS
	HCH	18.097	30	PASS
802.11n(HT20)	LCH	19.611	30	PASS
	MCH	19.003	30	PASS
	HCH	18.391	30	PASS
802.11n(HT40)	LCH	18.629	30	PASS
	MCH	18.223	30	PASS
	HCH	18.592	30	PASS

## 10. 6DB OCCUPIED BANDWIDTH

### 10.1 Block Diagram Of Test Setup



### 10.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

### 10.3 Test procedure

1. Rem1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  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 6 dB relative to the maximum level measured in the fundamental emission.



## 10.4 Test Result

Test Mode	Frequency	6dB Bandwidth (MHz)	Limit(kHz)	Result
802.11b	LCH	8.846	500	PASS
	MCH	9.642	500	PASS
	HCH	8.539	500	PASS
802.11g	LCH	16.488	500	PASS
	MCH	16.47	500	PASS
	HCH	16.482	500	PASS
802.11n(HT20)	LCH	17.74	500	PASS
	MCH	17.699	500	PASS
	HCH	17.707	500	PASS
802.11n(HT40)	LCH	32.732	500	PASS
	MCH	32.728	500	PASS
	HCH	32.661	500	PASS

Test Graph:



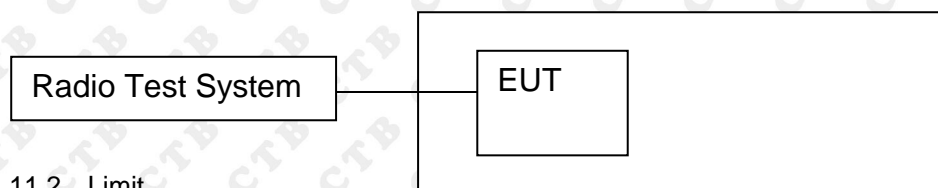
<p>802.11g/LCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.412000000 GHz</p> <p>Center Freq: 2.412000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.66 dB</p> <p>Ref: 26.66 dBm</p> <p>Mkr3 2.42028 GHz</p> <p>-4.1577 dBm</p> <p>Center 2.412 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 30 MHz</p> <p>Sweep 2.933 ms</p> <p>Occupied Bandwidth 16.469 MHz</p> <p>Total Power 19.5 dBm</p> <p>Transmit Freq Error 35.875 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 16.49 MHz</p> <p>x dB -6.00 dB</p>
<p>802.11g/MCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.437000000 GHz</p> <p>Center Freq: 2.437000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.72 dB</p> <p>Ref: 26.72 dBm</p> <p>Mkr3 2.445261 GHz</p> <p>-4.0396 dBm</p> <p>Center 2.437 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 30 MHz</p> <p>Sweep 2.933 ms</p> <p>Occupied Bandwidth 16.474 MHz</p> <p>Total Power 19.0 dBm</p> <p>Transmit Freq Error 26.423 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 16.47 MHz</p> <p>x dB -6.00 dB</p>
<p>802.11g/HCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.462000000 GHz</p> <p>Center Freq: 2.462000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.7 dB</p> <p>Ref: 26.70 dBm</p> <p>Mkr3 2.470253 GHz</p> <p>-5.8703 dBm</p> <p>Center 2.462 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 30 MHz</p> <p>Sweep 2.933 ms</p> <p>Occupied Bandwidth 16.484 MHz</p> <p>Total Power 17.4 dBm</p> <p>Transmit Freq Error 11.999 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 16.48 MHz</p> <p>x dB -6.00 dB</p>

<p>802.11n(HT20)/LC H</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.41200000 GHz</p> <p>Center Freq: 2.41200000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.66 dB</p> <p>Ref: 26.66 dBm</p> <p>Mkr3 2.420907 GHz</p> <p>-5.3319 dBm</p> <p>Center 2.412 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 30 MHz</p> <p>Sweep 2.933 ms</p> <p>Occupied Bandwidth 17.674 MHz</p> <p>Total Power 19.1 dBm</p> <p>Transmit Freq Error 37.363 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 17.74 MHz</p> <p>x dB -6.00 dB</p>
<p>802.11n(HT20)/MC H</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.43700000 GHz</p> <p>Center Freq: 2.43700000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.72 dB</p> <p>Ref: 26.72 dBm</p> <p>Mkr3 2.445884 GHz</p> <p>-5.8484 dBm</p> <p>Center 2.437 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 30 MHz</p> <p>Sweep 2.933 ms</p> <p>Occupied Bandwidth 17.668 MHz</p> <p>Total Power 18.5 dBm</p> <p>Transmit Freq Error 34.020 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 17.70 MHz</p> <p>x dB -6.00 dB</p>
<p>802.11n(HT20)/HC H</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.46200000 GHz</p> <p>Center Freq: 2.46200000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.7 dB</p> <p>Ref: 26.70 dBm</p> <p>Mkr3 2.470877 GHz</p> <p>-7.3510 dBm</p> <p>Center 2.462 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 30 MHz</p> <p>Sweep 2.933 ms</p> <p>Occupied Bandwidth 17.677 MHz</p> <p>Total Power 17.2 dBm</p> <p>Transmit Freq Error 22.976 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 17.71 MHz</p> <p>x dB -6.00 dB</p>

<p>802.11n(HT40)/LC H</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.422000000 GHz</p> <p>Center Freq: 2.422000000 GHz</p> <p>Trig: Free Run</p> <p>Avg Hold: 100 100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.65 dB</p> <p>Ref 26.65 dBm</p> <p>Mkr3 2.438425 GHz</p> <p>-11.143 dBm</p> <p>Center 2.422 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 60 MHz</p> <p>Sweep 5.8 ms</p> <p>Occupied Bandwidth 34.843 MHz</p> <p>Total Power 18.1 dBm</p> <p>Transmit Freq Error 58.760 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 32.73 MHz</p> <p>x dB -6.00 dB</p>
<p>802.11n(HT40)/MC H</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.437000000 GHz</p> <p>Center Freq: 2.437000000 GHz</p> <p>Trig: Free Run</p> <p>Avg Hold: 100 100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.72 dB</p> <p>Ref 26.72 dBm</p> <p>Mkr3 2.453348 GHz</p> <p>-6.4522 dBm</p> <p>Center 2.437 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 60 MHz</p> <p>Sweep 5.8 ms</p> <p>Occupied Bandwidth 34.791 MHz</p> <p>Total Power 18.0 dBm</p> <p>Transmit Freq Error -16.143 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 32.73 MHz</p> <p>x dB -6.00 dB</p>
<p>802.11n(HT40)/HC H</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.452000000 GHz</p> <p>Center Freq: 2.452000000 GHz</p> <p>Trig: Free Run</p> <p>Avg Hold: 100 100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 6.7 dB</p> <p>Ref 26.70 dBm</p> <p>Mkr3 2.468246 GHz</p> <p>-6.4770 dBm</p> <p>Center 2.452 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 60 MHz</p> <p>Sweep 5.8 ms</p> <p>Occupied Bandwidth 34.767 MHz</p> <p>Total Power 18.3 dBm</p> <p>Transmit Freq Error -83.989 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 32.66 MHz</p> <p>x dB -6.00 dB</p>

### 11. POWER SPECTRAL DENSITY

#### 11.1 Block Diagram Of Test Setup



#### 11.2 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

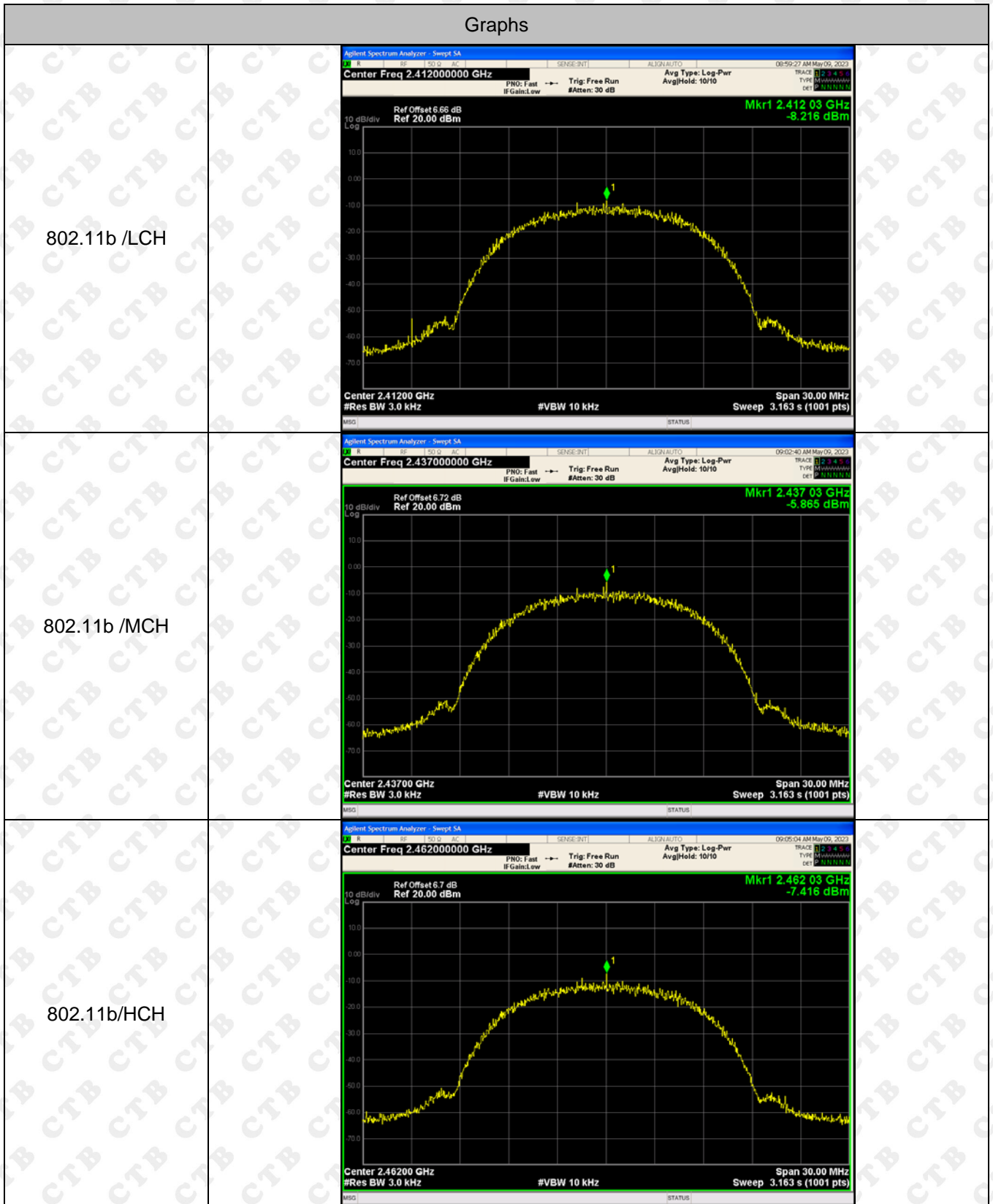
#### 11.3 Test procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
4. Set the VBW  $\geq 3 \times \text{RBW}$ .
5. Detector = PEAK.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

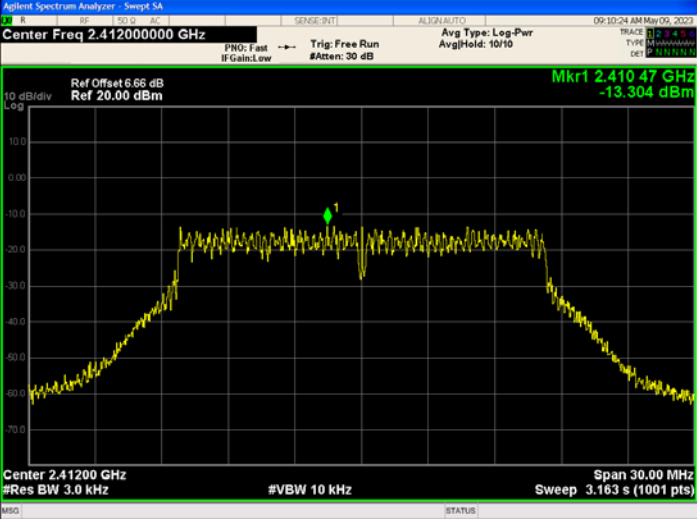
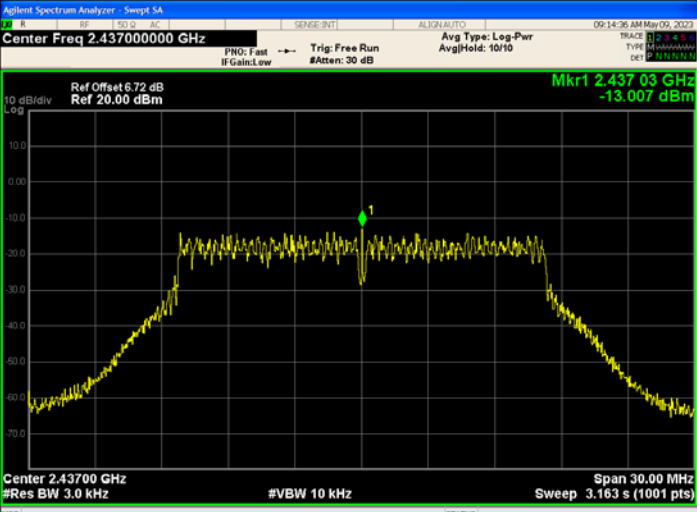
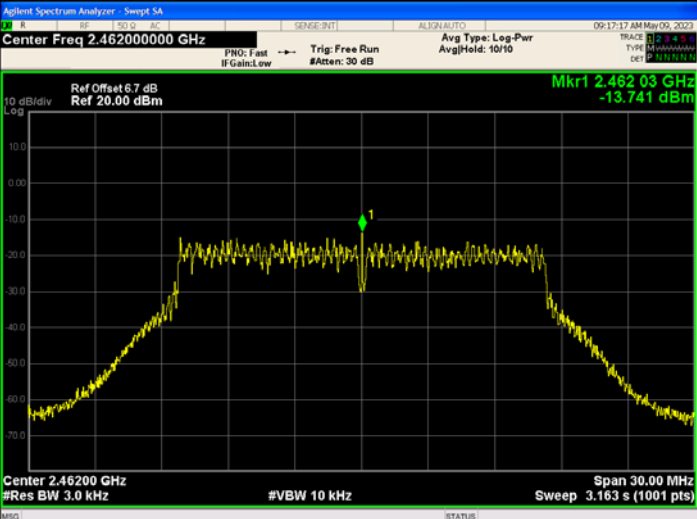
11.4 Test Result

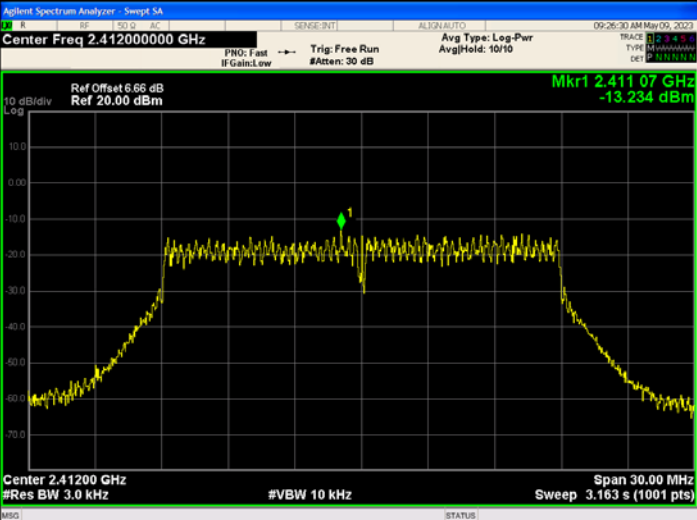
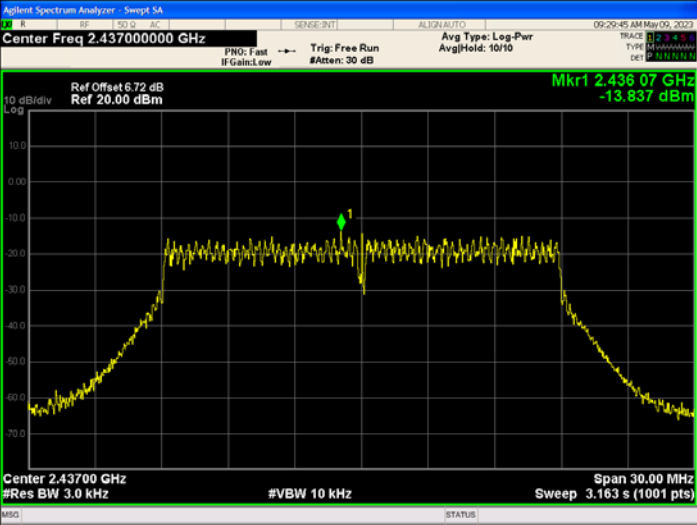
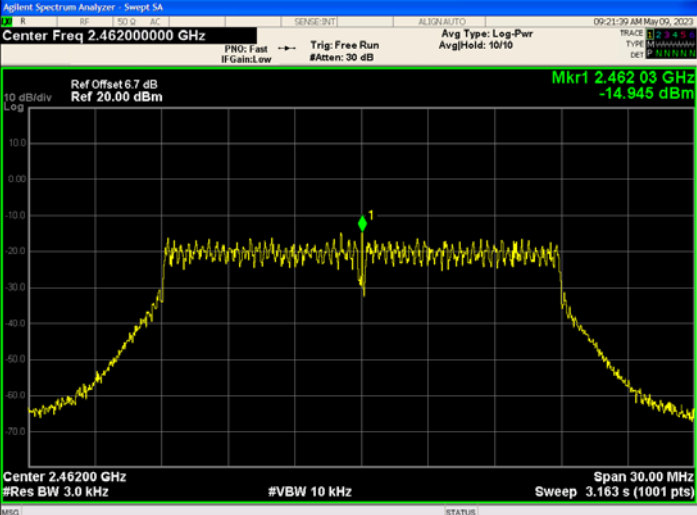
Mode	Channel.	Power Spectral Density [dBm /3KHz]	Limit(8 dBm (in any 3KHz))	Verdict
802.11b	LCH	-8.216	8	PASS
	MCH	-5.865	8	PASS
	HCH	-7.416	8	PASS
802.11g	LCH	-13.304	8	PASS
	MCH	-13.007	8	PASS
	HCH	-13.741	8	PASS
802.11n(H T20)	LCH	-13.234	8	PASS
	MCH	-13.837	8	PASS
	HCH	-14.945	8	PASS
802.11n(H T40)	LCH	-16.445	8	PASS
	MCH	-15.405	8	PASS
	HCH	-14.145	8	PASS

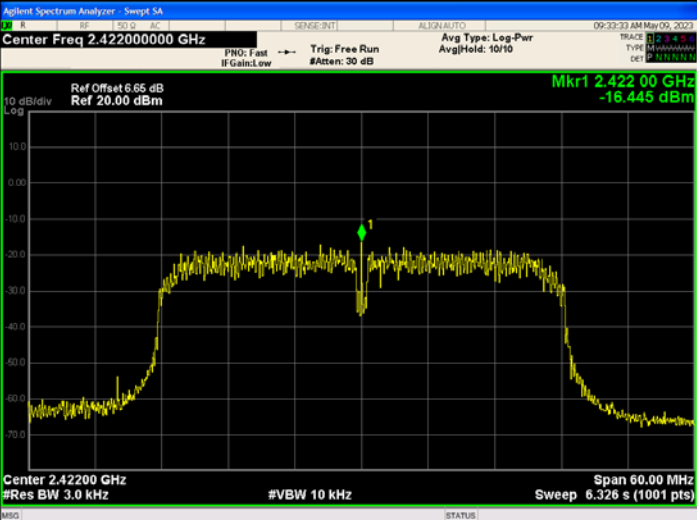
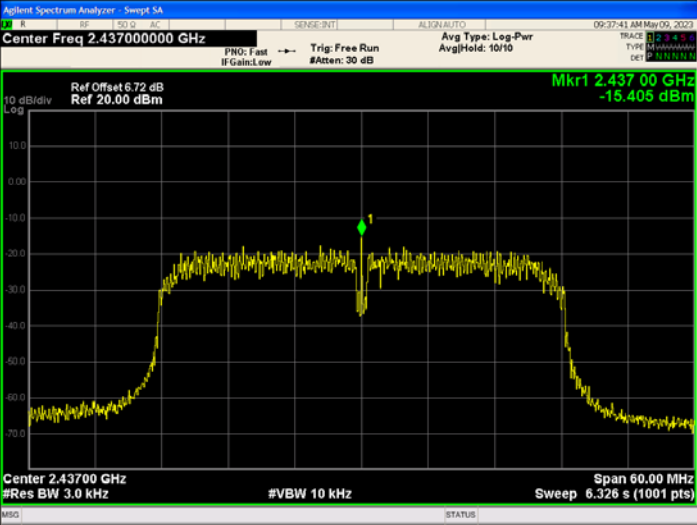
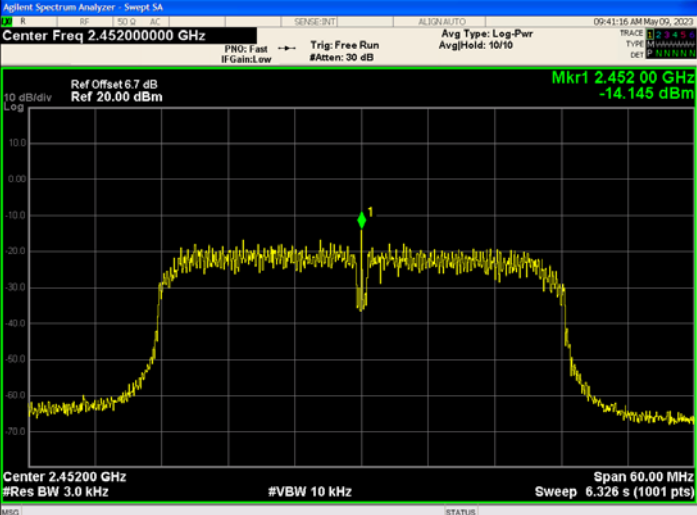
## Test Graph





<p>802.11g/LCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.41200000 GHz          Ref Offset 6.68 dB          Ref 20.00 dBm          Mkr1 2.410 47 GHz          -13.304 dBm          Span 30.00 MHz          Sweep 3.163 s (1001 pts)</p>
<p>802.11g/MCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.43700000 GHz          Ref Offset 6.72 dB          Ref 20.00 dBm          Mkr1 2.437 03 GHz          -13.007 dBm          Span 30.00 MHz          Sweep 3.163 s (1001 pts)</p>
<p>802.11g/HCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.46200000 GHz          Ref Offset 6.7 dB          Ref 20.00 dBm          Mkr1 2.462 03 GHz          -13.741 dBm          Span 30.00 MHz          Sweep 3.163 s (1001 pts)</p>

<p>802.11n(HT20)/LCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.41200000 GHz          Ref Offset 6.68 dB          Ref 20.00 dBm          Mkr1 2.411 07 GHz          -13.234 dBm          Center 2.41200 GHz          #Res BW 3.0 kHz          #VBW 10 kHz          Span 30.00 MHz          Sweep 3.163 s (1001 pts)</p>
<p>802.11n(HT20)/MCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.43700000 GHz          Ref Offset 6.72 dB          Ref 20.00 dBm          Mkr1 2.436 07 GHz          -13.837 dBm          Center 2.43700 GHz          #Res BW 3.0 kHz          #VBW 10 kHz          Span 30.00 MHz          Sweep 3.163 s (1001 pts)</p>
<p>802.11n(HT20)/HCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.46200000 GHz          Ref Offset 6.7 dB          Ref 20.00 dBm          Mkr1 2.462 03 GHz          -14.945 dBm          Center 2.46200 GHz          #Res BW 3.0 kHz          #VBW 10 kHz          Span 30.00 MHz          Sweep 3.163 s (1001 pts)</p>

<p>802.11n(HT40)/LCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.42200000 GHz          Ref Offset 6.65 dB          Ref 20.00 dBm          Mkr1 2.422 00 GHz          -16.445 dBm          Span 60.00 MHz          Sweep 6.326 s (1001 pts)</p>
<p>802.11n(HT40)/MCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.43700000 GHz          Ref Offset 6.72 dB          Ref 20.00 dBm          Mkr1 2.437 00 GHz          -15.405 dBm          Span 60.00 MHz          Sweep 6.326 s (1001 pts)</p>
<p>802.11n(HT40)/HCH</p>	 <p>Agilent Spectrum Analyzer - Sweep SA          Center Freq 2.45200000 GHz          Ref Offset 6.7 dB          Ref 20.00 dBm          Mkr1 2.452 00 GHz          -14.145 dBm          Span 60.00 MHz          Sweep 6.326 s (1001 pts)</p>

## 12. ANTENNA REQUIREMENT

### 15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

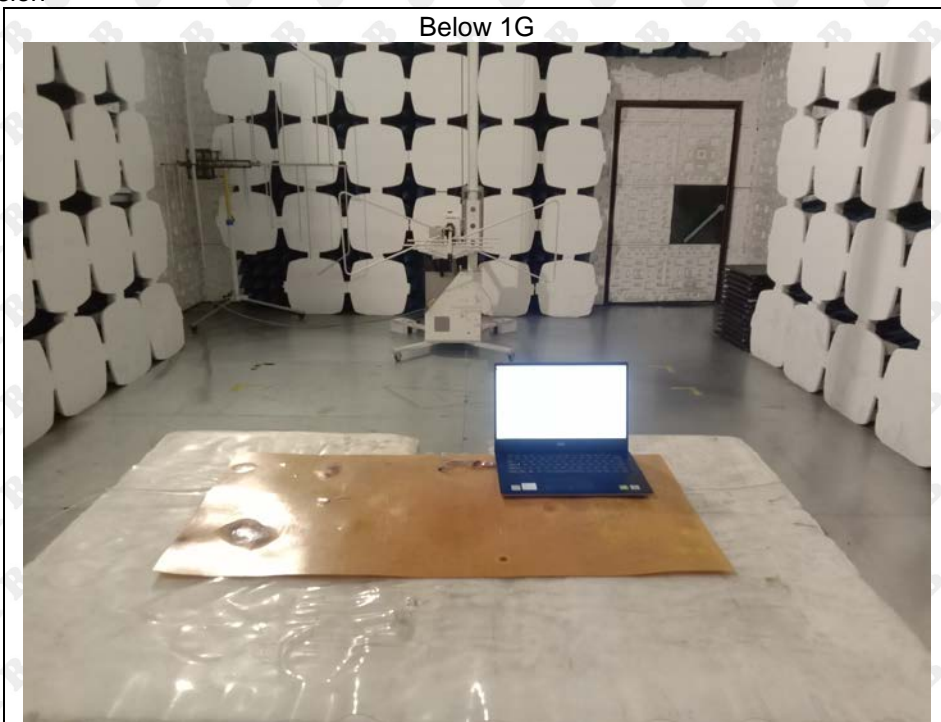
### EUT Antenna:

The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is -1.18dBi.

### 13. EUT TEST SETUP PHOTOGRAPHS

#### Radiated Emission

Below 1G



Above 1G



## Conducted Emission



PC link:



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