7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2. Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

7.6.3. Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold

7. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

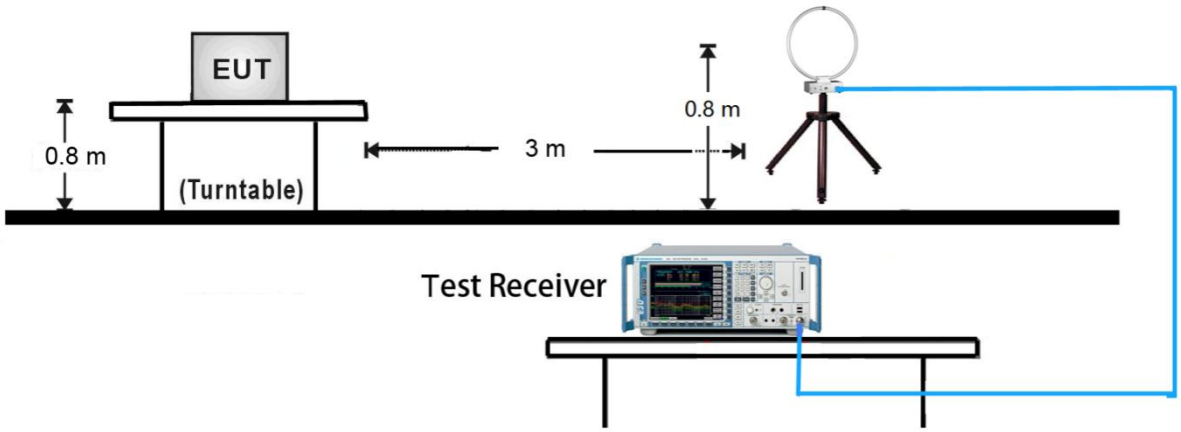
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

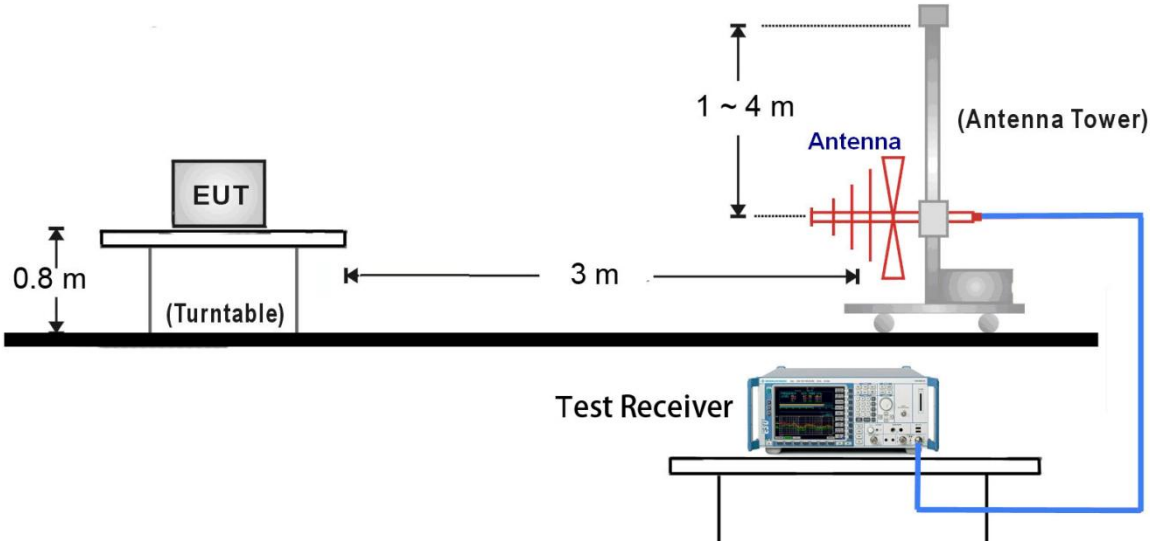
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be ≥ 2 x span / RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

7.6.4. Test Setup

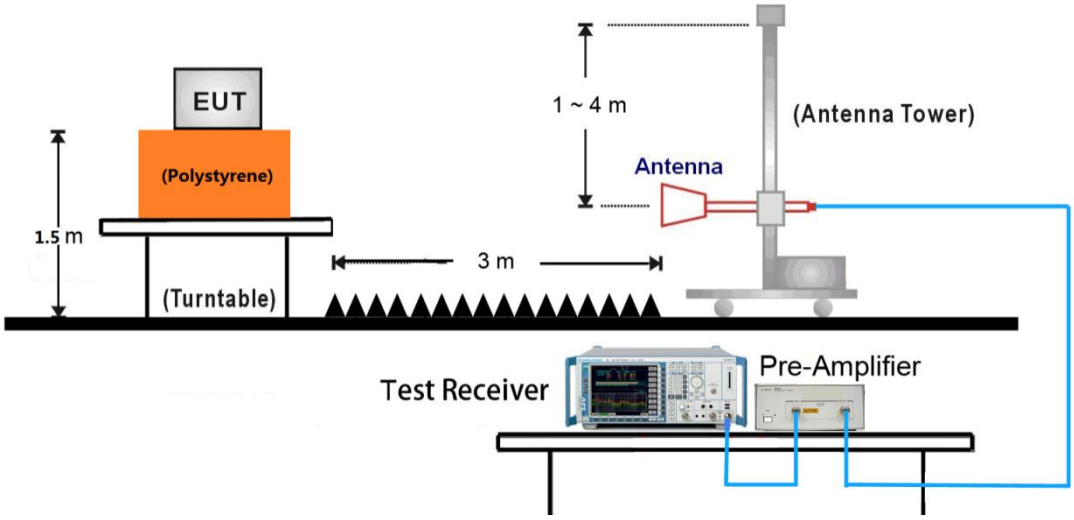
9kHz ~ 30MHz Test Setup:



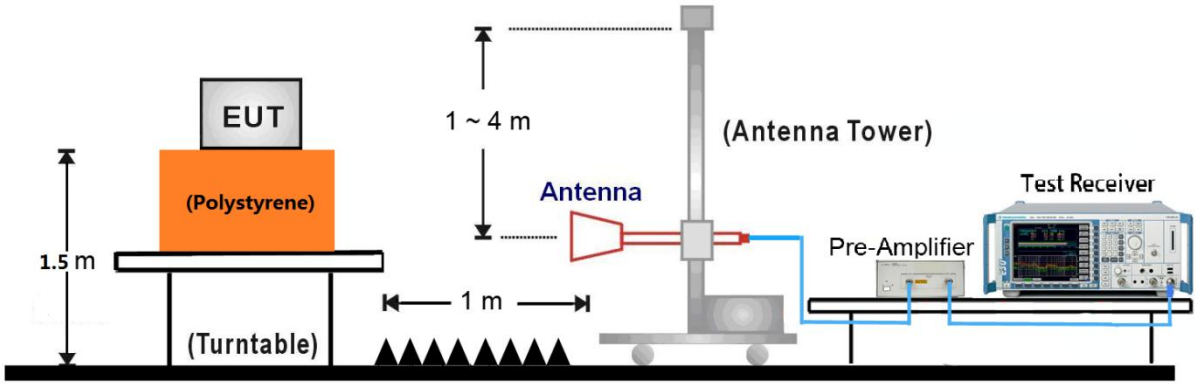
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~25GHz Test Setup:



7.6.5. Test Result

Test Mode:	802.11b	Test Date:	2023-08-17
Test Channel:	2412	Test Engineer:	Guangze Ding
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. 3. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1136.0000	37.17	-15.57	74.00	36.83	Peak	Horizontal
1963.3333	37.13	-14.47	74.00	36.87	Peak	Horizontal
7471.3333	44.38	-3.04	74.00	29.62	Peak	Horizontal
13313.6667	46.19	-0.73	74.00	27.81	Peak	Horizontal
1124.6667	37.36	-15.57	74.00	36.64	Peak	Vertical
4870.3333	40.10	-7.51	74.00	33.90	Peak	Vertical
8332.6667	45.67	-2.81	74.00	28.33	Peak	Vertical
14084.3333	47.75	0.86	74.00	26.25	Peak	Vertical

Test Mode:	802.11b	Test Date:	2023-08-17
Test Channel:	2437	Test Engineer:	Guangze Ding
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. 3. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1362.6667	36.41	-15.66	74.00	37.59	Peak	Horizontal
2365.6667	38.79	-12.37	74.00	35.21	Peak	Horizontal
5420.0000	40.01	-6.11	74.00	33.99	Peak	Horizontal
7471.3333	43.95	-3.04	74.00	30.05	Peak	Horizontal
1323.0000	38.48	-15.65	74.00	35.52	Peak	Vertical
2297.6667	38.91	-12.74	74.00	35.09	Peak	Vertical
5533.3333	40.10	-5.86	74.00	33.90	Peak	Vertical
8321.3333	45.54	-2.83	74.00	28.46	Peak	Vertical

Test Mode:	802.11b	Test Date:	2023-08-17
Test Channel:	2462	Test Engineer:	Guangze Ding
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. 3. This is the worst case of Radiated Emission for 1-18GHz.		

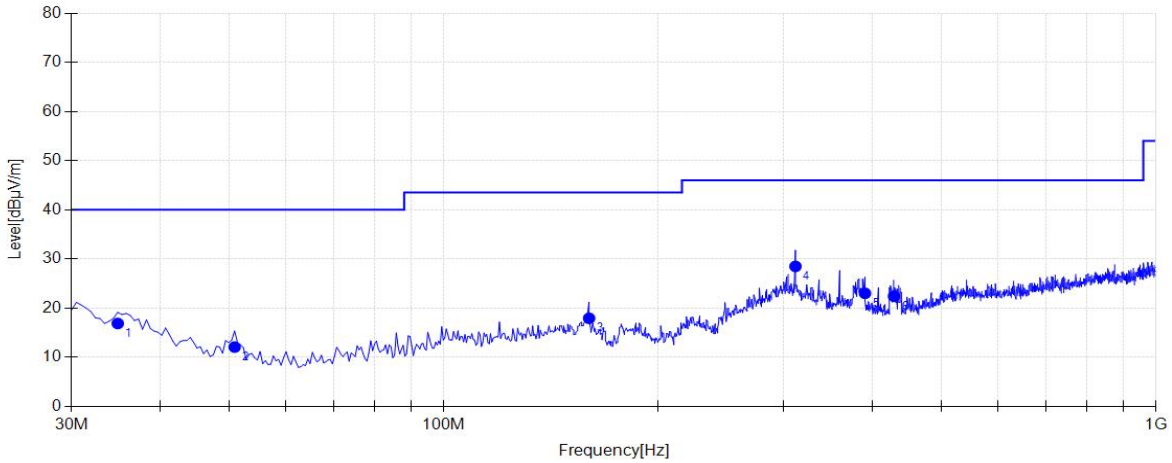
Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1742.3333	37.40	-15.06	74.00	36.60	Peak	Horizontal
3595.3333	38.57	-10.26	74.00	35.43	Peak	Horizontal
4626.6667	40.05	-7.69	74.00	33.95	Peak	Horizontal
7318.3333	44.62	-3.23	74.00	29.38	Peak	Horizontal
2552.6667	39.53	-11.50	74.00	34.47	Peak	Vertical
3397.0000	38.24	-10.45	74.00	35.76	Peak	Vertical
4513.3333	39.39	-7.77	74.00	34.61	Peak	Vertical
7567.6667	44.91	-3.04	74.00	29.09	Peak	Vertical

The worst case of Radiated Emission below 1GHz:

30MHz – 1GHz Test Data

EUT:	Matter Plug Module	Polarity:	Horizontal
Model:	TRWB6	S/N:	/
Mode:	Transmit by 802.11b at Channel 2412MHz	Voltage:	DC3.3V
Environment:	Temp: 22℃; Humi:52%	Engineer:	Guangze Ding

Test Graph

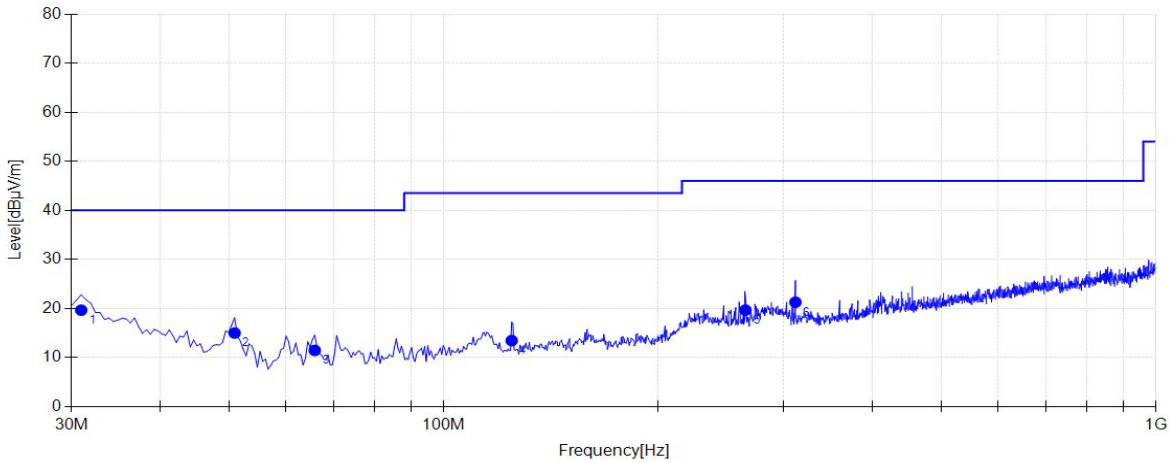


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	34.8500	17.34	16.88	40.00	23.12	155	243	Horizontal
2	50.8550	9.41	12.08	40.00	27.92	155	250	Horizontal
3	159.9800	10.65	17.94	43.50	25.56	155	4	Horizontal
4	311.7850	14.46	28.50	46.00	17.50	155	256	Horizontal
5	390.3550	16.06	23.02	46.00	22.98	155	339	Horizontal
6	428.6700	17.34	22.43	46.00	23.57	155	332	Horizontal

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

EUT:	Matter Plug Module	Polarity:	Vertical
Model:	TRWB6	S/N:	/
Mode:	Transmit by 802.11b at Channel 2412MHz	Voltage:	DC3.3V
Environment:	Temp: 22℃; Humi:52%	Engineer:	Guangze Ding

Test Graph



Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.9700	19.32	19.66	40.00	20.34	155	153	Vertical
2	50.8550	9.41	15.00	40.00	25.00	155	235	Vertical
3	65.8900	8.00	11.47	40.00	28.53	155	317	Vertical
4	124.5750	11.79	13.47	43.50	30.03	155	126	Vertical
5	265.2250	12.64	19.69	46.00	26.31	155	290	Vertical
6	311.7850	14.46	21.29	46.00	24.71	155	11	Vertical

Note 1: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

7.7. Restricted Band Edge Measurement

7.7.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.25 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.7.2. Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

7.7.3. Test Setting

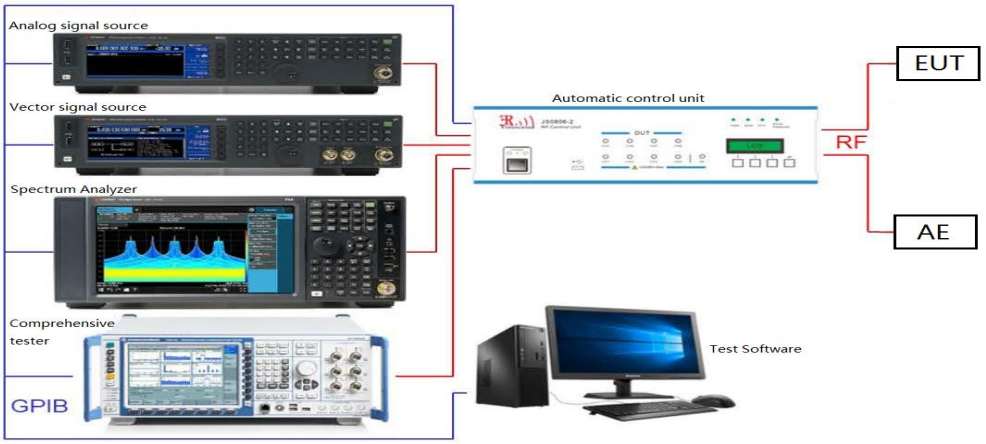
Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be ≥ 2 x span / RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

7.7.4. Test Setup



7.7.5. Test Result

Test Mode	Antenna	Channel	Detector	Freq [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
11B	Ant1	2412	AV	2310.000	-48.32	≤-41.20	46.88	≤54	PASS
			AV	2389.700	-46.8	≤-41.20	48.40	≤54	PASS
			AV	2390.000	-47.07	≤-41.20	48.13	≤54	PASS
			Peak	2310.000	-38.75	≤-21.20	56.45	≤74	PASS
			Peak	2336.530	-36.55	≤-21.20	58.65	≤74	PASS
			Peak	2390.000	-38.33	≤-21.20	56.87	≤74	PASS
		2462	AV	2483.500	-47.5	≤-41.20	47.70	≤54	PASS
			AV	2488.840	-47.16	≤-41.20	48.04	≤54	PASS
			AV	2500.000	-47.63	≤-41.20	47.57	≤54	PASS
			Peak	2483.500	-38.69	≤-21.20	56.51	≤74	PASS
			Peak	2499.950	-36.78	≤-21.20	58.42	≤74	PASS
			Peak	2500.000	-36.78	≤-21.20	58.42	≤74	PASS
11G	Ant1	2412	AV	2310.000	-47.66	≤-41.20	47.54	≤54	PASS
			AV	2389.310	-46.82	≤-41.20	48.38	≤54	PASS
			AV	2390.000	-47.06	≤-41.20	48.14	≤54	PASS
			Peak	2310.000	-38.85	≤-21.20	56.35	≤74	PASS
			Peak	2384.760	-35.72	≤-21.20	59.48	≤74	PASS
			Peak	2390.000	-38.19	≤-21.20	57.01	≤74	PASS
		2462	AV	2483.500	-47.28	≤-41.20	47.92	≤54	PASS
			AV	2483.560	-47.03	≤-41.20	48.17	≤54	PASS
			AV	2500.000	-47.47	≤-41.20	47.73	≤54	PASS
			Peak	2483.500	-37.59	≤-21.20	57.61	≤74	PASS
			Peak	2484.990	-35.78	≤-21.20	59.42	≤74	PASS
			Peak	2500.000	-38.34	≤-21.20	56.86	≤74	PASS
11N20 SISO	Ant1	2412	AV	2310.000	-48.01	≤-41.20	47.19	≤54	PASS
			AV	2389.570	-46.56	≤-41.20	48.64	≤54	PASS
			AV	2390.000	-46.79	≤-41.20	48.41	≤54	PASS
			Peak	2310.000	-39.25	≤-21.20	55.95	≤74	PASS
			Peak	2344.070	-35.94	≤-21.20	59.26	≤74	PASS
			Peak	2390.000	-38.05	≤-21.20	57.15	≤74	PASS
		2462	AV	2483.500	-46.98	≤-41.20	48.22	≤54	PASS
			AV	2484.110	-47.04	≤-41.20	48.16	≤54	PASS
			AV	2500.000	-47.56	≤-41.20	47.64	≤54	PASS

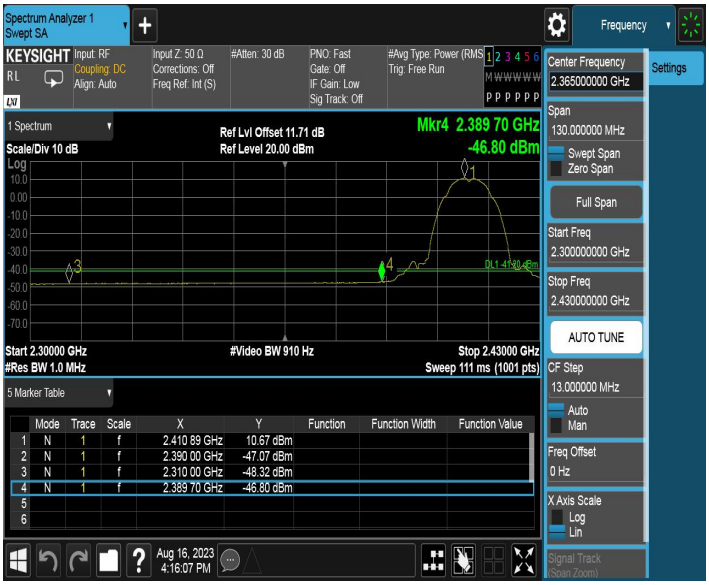
			Peak	2483.500	-37.88	≤-21.20	57.32	≤74	PASS
			Peak	2492.690	-36.92	≤-21.20	58.28	≤74	PASS
			Peak	2500.000	-37.46	≤-21.20	57.74	≤74	PASS

Note：

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

Test Graphs

11B_Ant1_Low_2412_AV

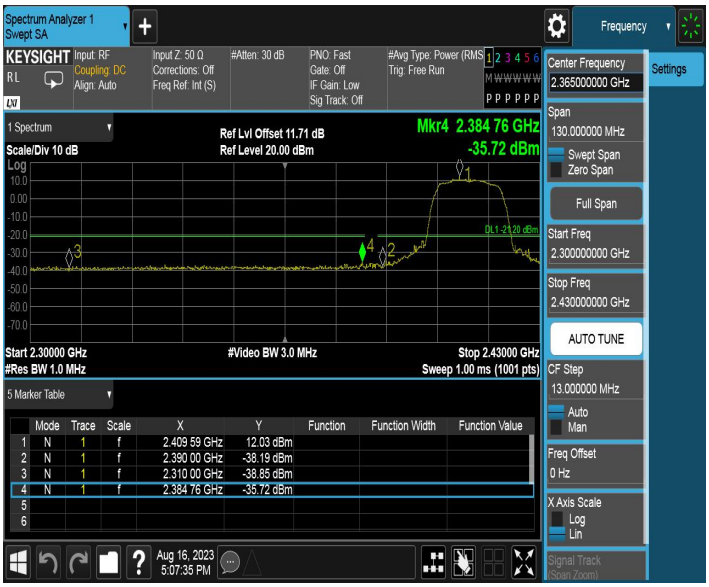


11B_Ant1_Low_2412_Peak

11B_Ant1_High_2462_AV


11B_Ant1_High_2462_Peak


11G_Ant1_Low_2412_AV

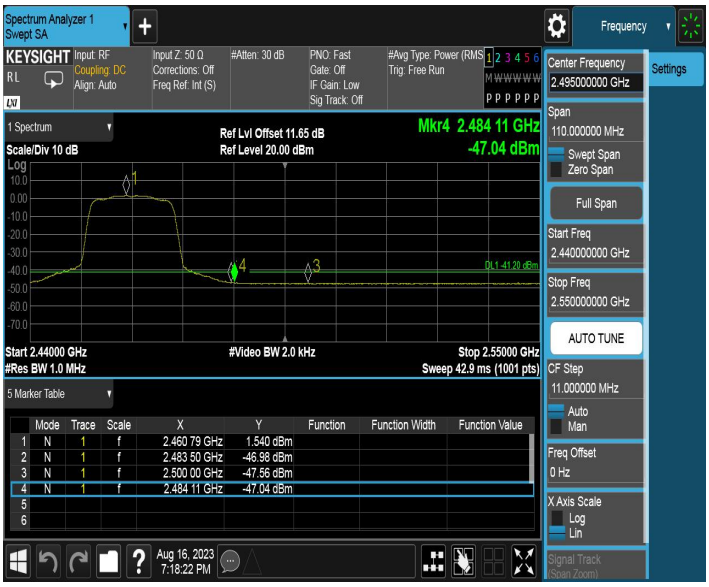

11G_Ant1_Low_2412_Peak


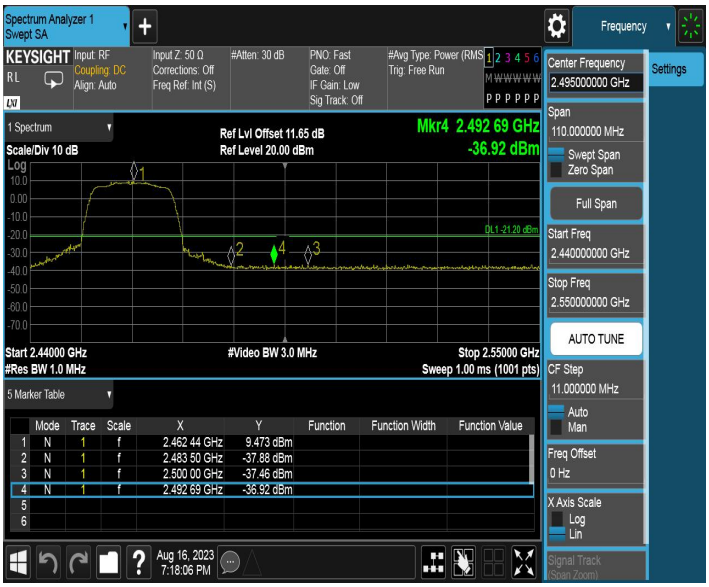
11G_Ant1_High_2462_AV

11G_Ant1_High_2462_Peak

11N20SISO_Ant1_Low_2412_AV


11N20SISO_Ant1_Low_2412_Peak


11N20SISO_Ant1_High_2462_AV


11N20SISO_Ant1_High_2462_Peak


7.8. AC Conducted Emissions Measurement

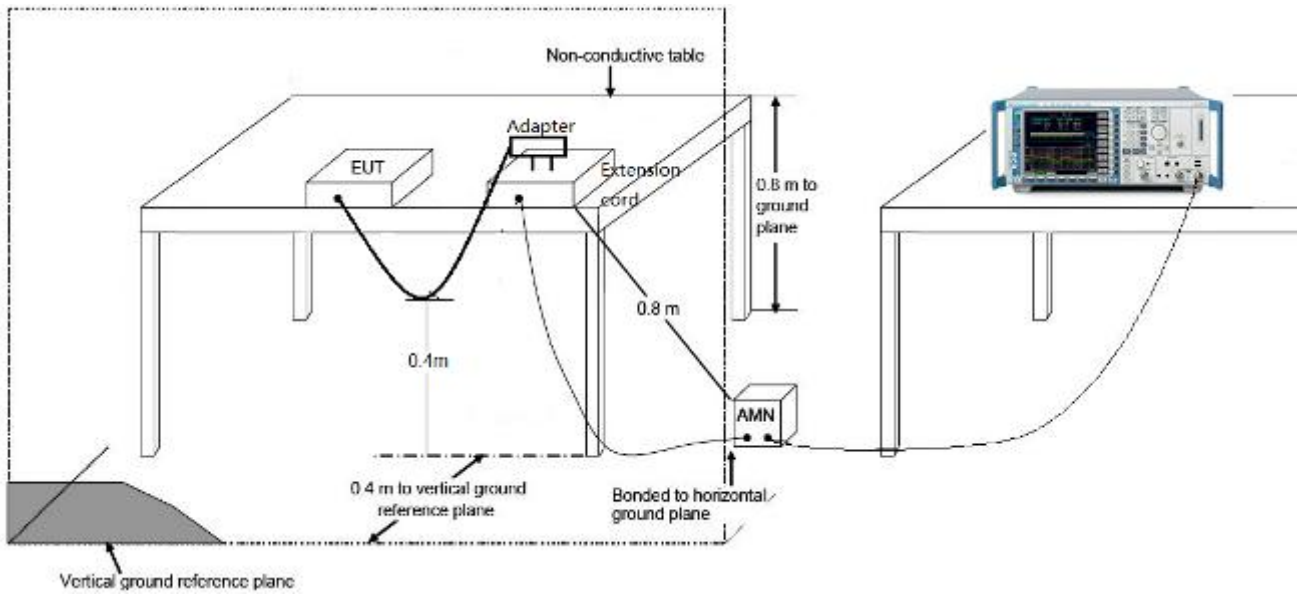
7.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

7.8.2. Test Setup



7.8.3. Test Result

Not Applicable, The EUT is powered only by DC 3.3V.

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Matter Plug Module** is in compliance with Part 15C of the FCC Rules.

The End