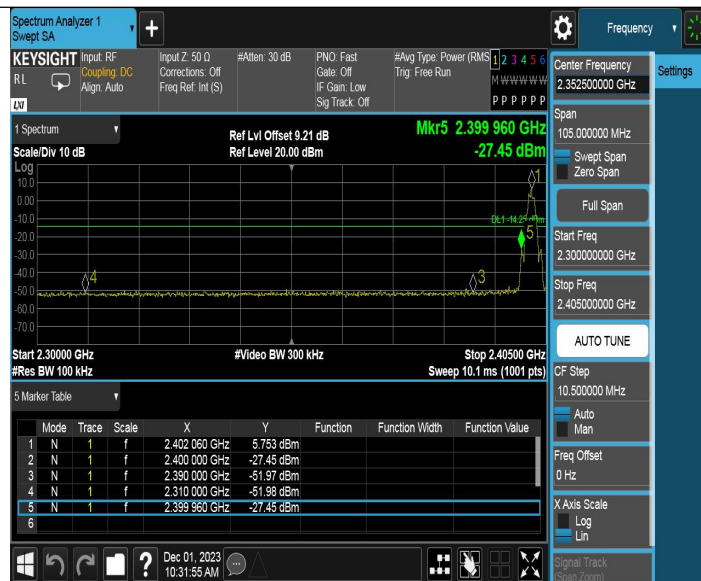




BLE_2M_Ant1_High_2480

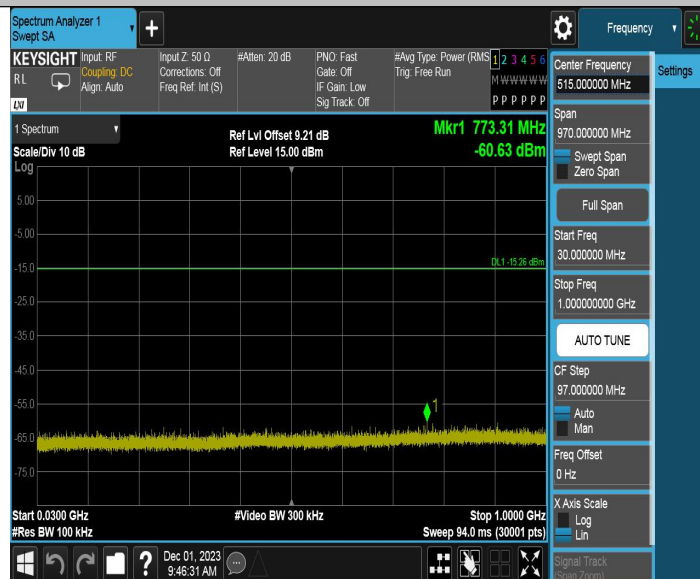


Test Graphs of Out-of-Band Emissions

BLE_1M_Ant1_2402_0~Reference



BLE_1M_Ant1_2402_30~1000



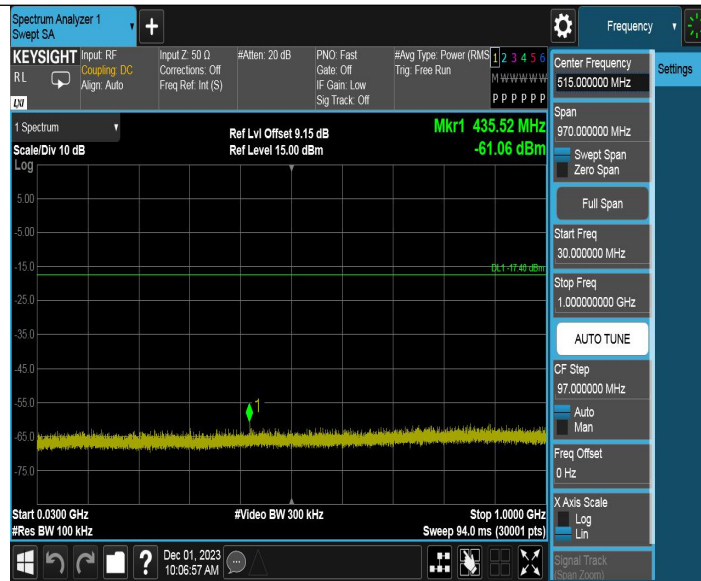
BLE_1M_Ant1_2402_1000~26500



BLE_1M_Ant1_2440_0~Reference



BLE_1M_Ant1_2440_30~1000



BLE_1M_Ant1_2440_1000~26500



BLE_1M_Ant1_2480_0~Reference



BLE_1M_Ant1_2480_30~1000



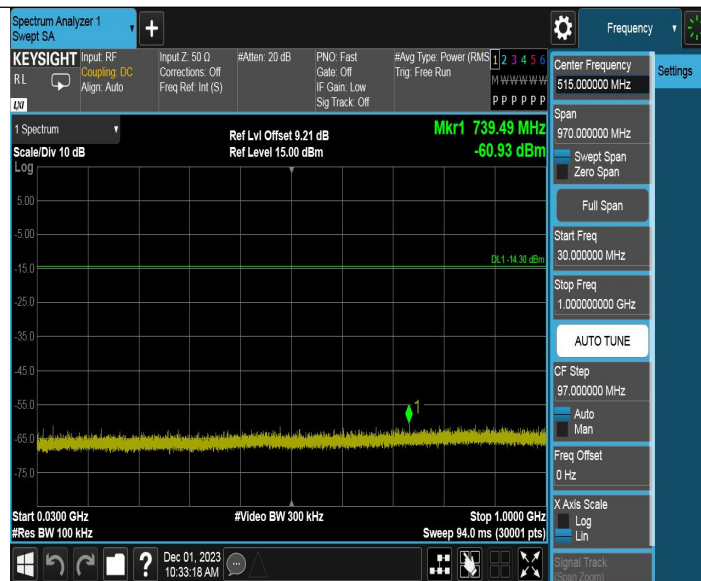
BLE_1M_Ant1_2480_1000~26500



BLE_2M_Ant1_2402_0~Reference



BLE_2M_Ant1_2402_30~1000



BLE_2M_Ant1_2402_1000~26500



BLE_2M_Ant1_2440_0~Reference



BLE_2M_Ant1_2440_30~1000



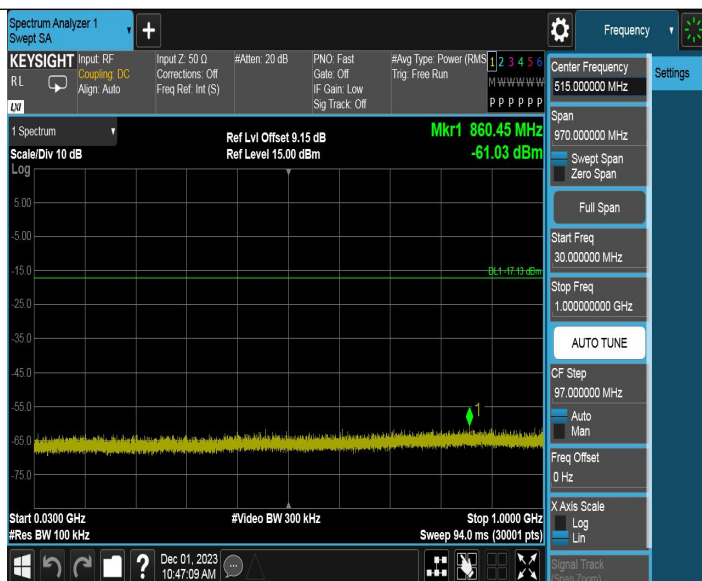
BLE_2M_Ant1_2440_1000~26500



BLE_2M_Ant1_2480_0~Reference



BLE_2M_Ant1_2480_30~1000



BLE_2M_Ant1_2480_1000~26500



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

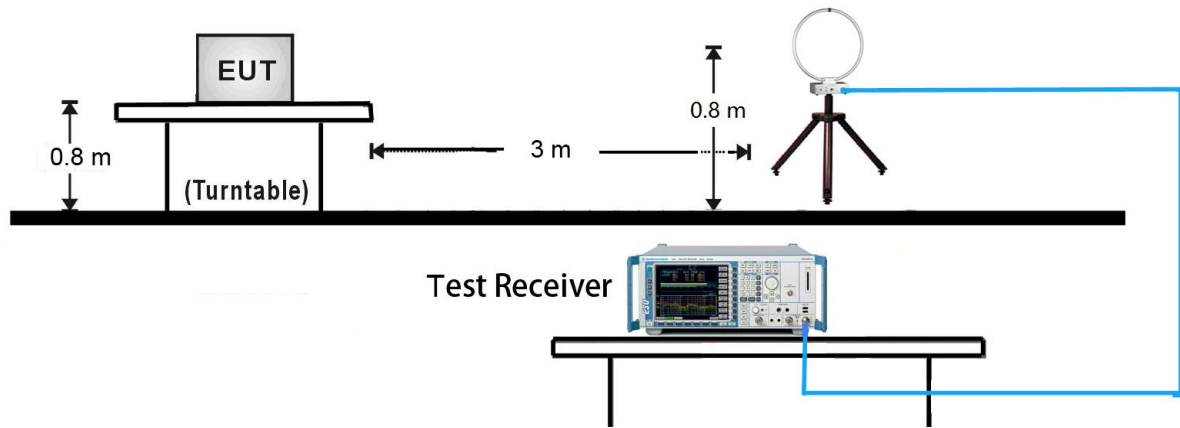
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

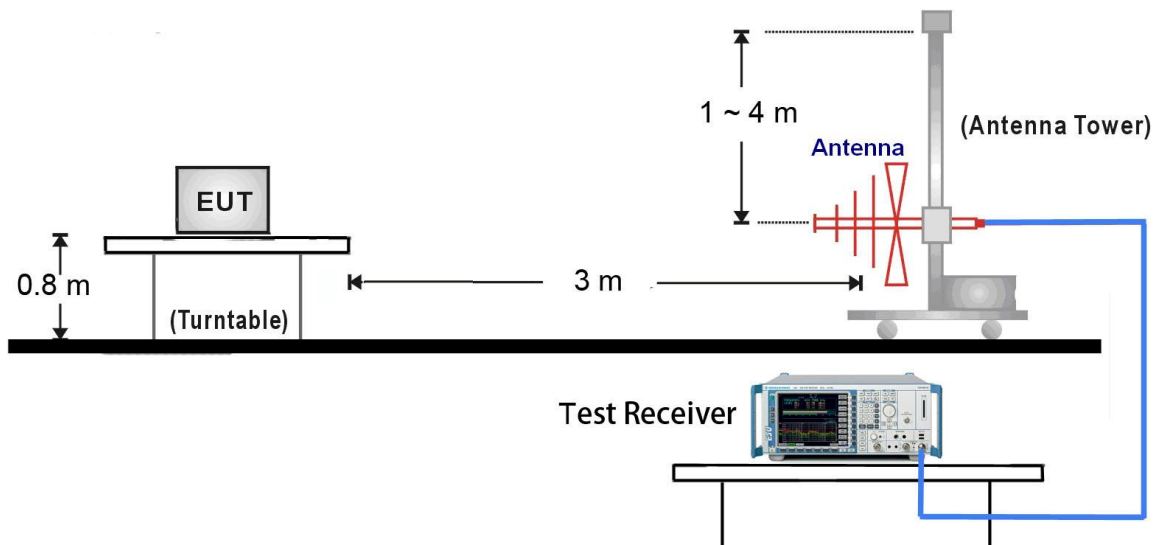
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be $\geq 2 \times \text{span} / \text{RBW}$)
6. Sweep time = auto
7. Trace (RMS)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

7.6.4. Test Setup

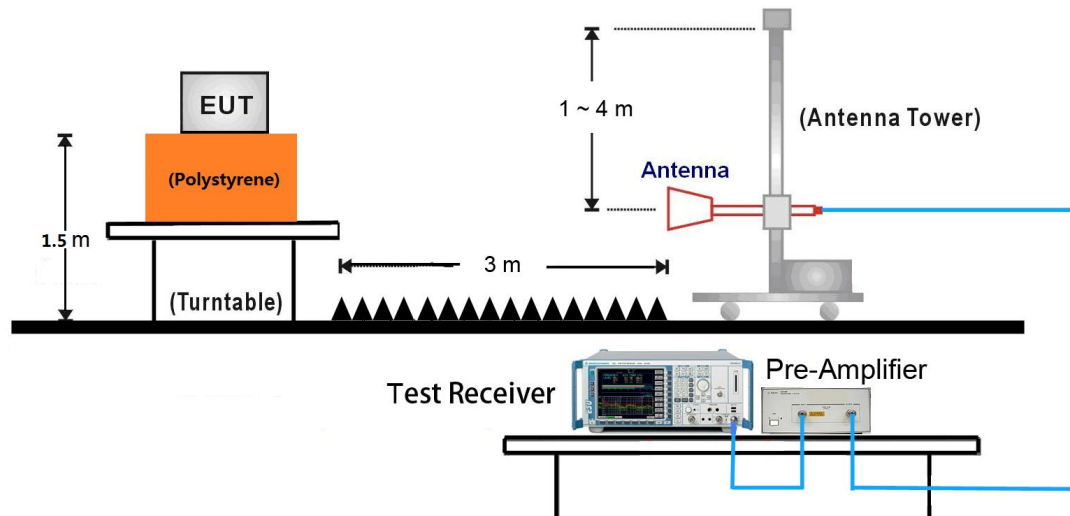
9kHz ~ 30MHz Test Setup:



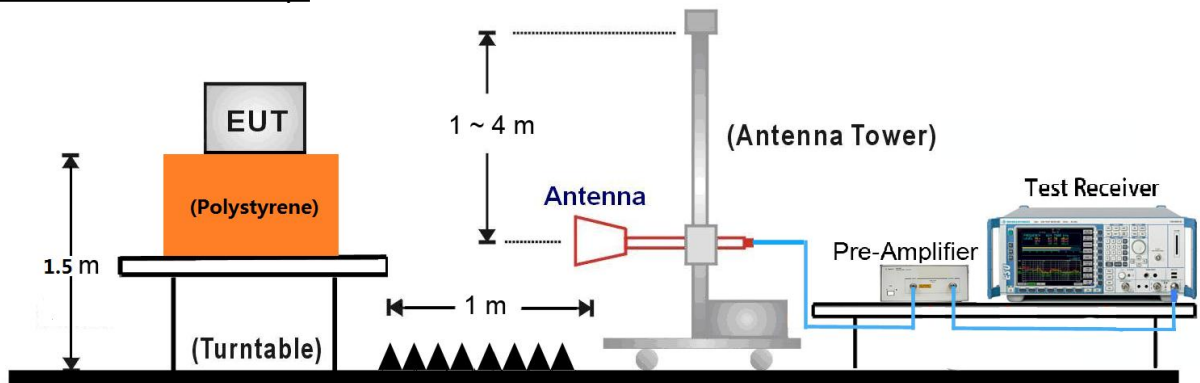
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.6.5. Test Result

Test Mode:	BLE_1M	Test Date:	2023-11-13
Test Channel:	00	Test Engineer:	Guangze Ding
Remark:	Average measurement was not performed if peak level lower than average limit. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
1913.0000	40.40	-11.56	74.00	33.60	Peak	Horizontal
2430.0000	36.16	-7.94	54.00	17.84	Peak	Horizontal
2848.0000	43.78	-6.98	74.00	30.22	Peak	Horizontal
3095.5000	36.05	-6.42	54.00	17.95	Peak	Horizontal
5438.5000	46.61	0.05	74.00	27.39	Peak	Horizontal
6483.5000	42.45	3.39	54.00	11.55	Peak	Horizontal
1511.5000	40.15	-13.44	74.00	33.85	Peak	Vertical
1555.5000	32.77	-13.27	54.00	21.23	Peak	Vertical
3409.0000	43.49	-6.08	74.00	30.51	Peak	Vertical
3832.5000	36.32	-4.56	54.00	17.68	Peak	Vertical
6357.0000	49.45	3.09	74.00	24.55	Peak	Vertical
6445.0000	42.82	3.50	54.00	11.18	Peak	Vertical

Test Mode:	BLE_1M	Test Date:	2023-11-13
Test Channel:	39	Test Engineer:	Guangze Ding
Remark:	Average measurement was not performed if peak level lower than average limit. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

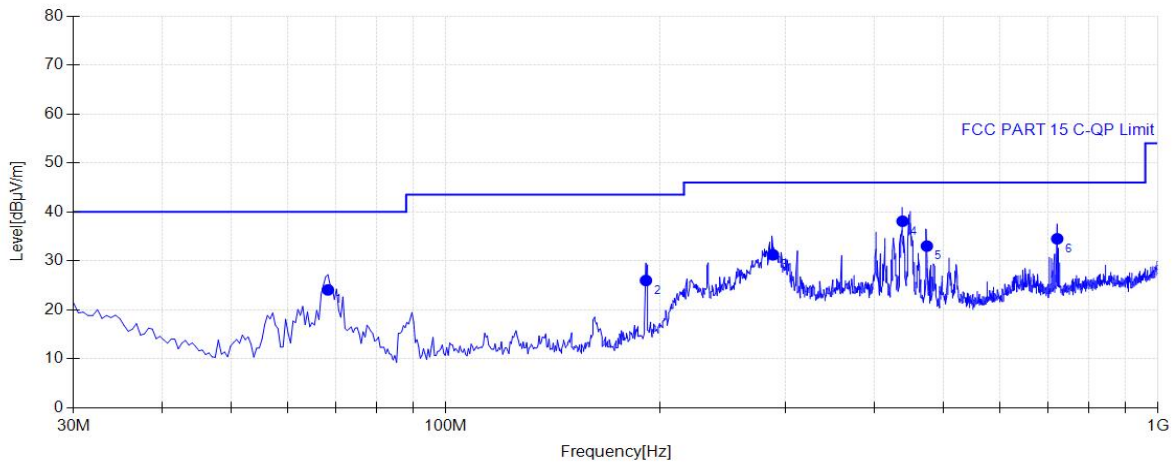
Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
2023.0000	32.92	-11.08	54.00	21.08	Peak	Horizontal
2067.0000	40.83	-10.85	74.00	33.17	Peak	Horizontal
3200.0000	44.77	-6.36	74.00	29.23	Peak	Horizontal
3337.5000	36.04	-6.25	54.00	17.96	Peak	Horizontal
5108.5000	44.82	-1.51	74.00	29.18	Peak	Horizontal
6170.0000	41.22	1.97	54.00	12.78	Peak	Horizontal
1935.0000	41.79	-11.47	74.00	32.21	Peak	Vertical
2078.0000	33.52	-10.77	54.00	20.48	Peak	Vertical
4415.5000	44.29	-2.89	74.00	29.71	Peak	Vertical
4503.5000	37.19	-2.40	54.00	16.81	Peak	Vertical
6439.5000	42.55	3.45	54.00	11.45	Peak	Vertical
7023.2500	50.43	2.51	74.00	23.57	Peak	Vertical

The worst case of Radiated Emission below 1GHz:

30MHz – 1GHz Test Data

EUT:	2.4GHz Wi-Fi/BLE Module	Polarity:	Horizontal
Model:	EMC6069-P	SN:	N/A
Mode:	Transmit at BLE_1M Channel 00	Voltage:	DC 3.3V
Environment:	Temp: 18°C; Humi:31%	Engineer:	Guangze Ding

Test Graph



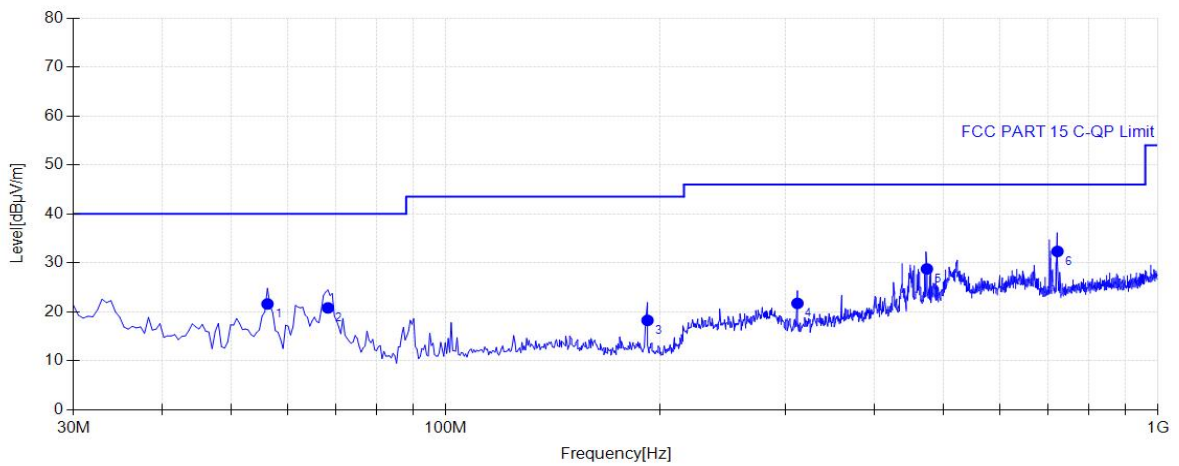
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	68.3150	8.13	24.08	40.00	15.92	100	316	Horizontal
2	191.020	10.14	26.01	43.50	17.49	100	17	Horizontal
3	288.020	13.23	31.25	46.00	14.75	100	254	Horizontal
4	437.885	17.16	38.10	46.00	7.90	100	220	Horizontal
5	473.775	18.24	33.03	46.00	12.97	100	50	Horizontal
6	722.095	22.21	34.51	46.00	11.49	100	295	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:	2.4GHz Wi-Fi/BLE Module	Polarity:	Vertical
Model:	EMC6069-P	SN:	N/A
Mode:	Transmit at BLE_1M Channel 00	Voltage:	DC 3.3V
Environment:	Temp: 18°C; Humi:31%	Engineer:	Guangze Ding

Test Graph

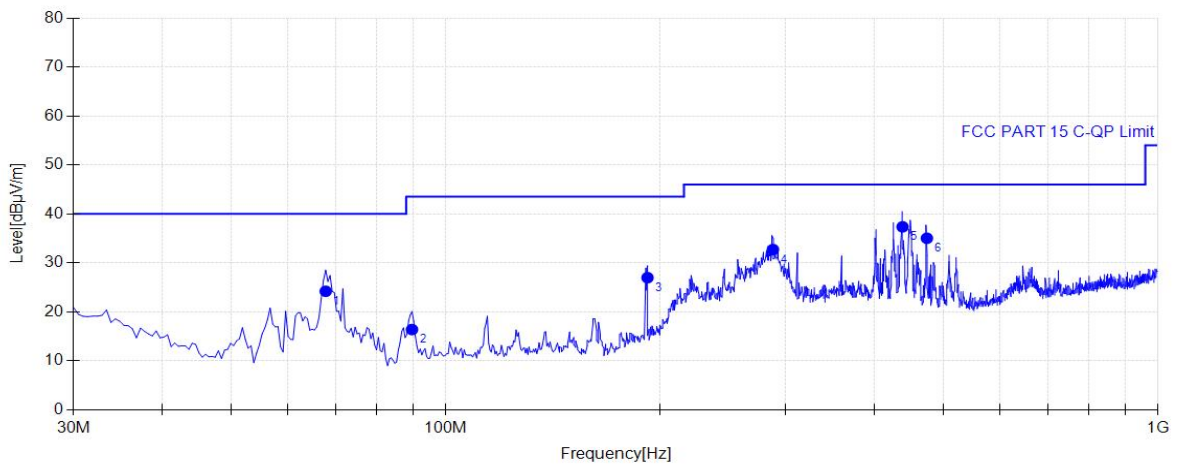


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	56.1900	7.65	21.62	40.00	18.38	100	256	Vertical
2	68.3150	8.13	20.82	40.00	19.18	100	51	Vertical
3	191.990	10.09	18.27	43.50	25.23	100	99	Vertical
4	311.785	14.02	21.74	46.00	24.26	100	4	Vertical
5	473.775	18.24	28.77	46.00	17.23	100	147	Vertical
6	722.580	22.22	32.35	46.00	13.65	100	167	Vertical

30MHz – 1GHz Test Data

EUT:	2.4GHz Wi-Fi/BLE Module	Polarity:	Horizontal
Model:	EMC6069-P	SN:	N/A
Mode:	Transmit at BLE_1M Channel 39	Voltage:	DC 3.3V
Environment:	Temp: 18°C; Humi:31%	Engineer:	Guangze Ding

Test Graph



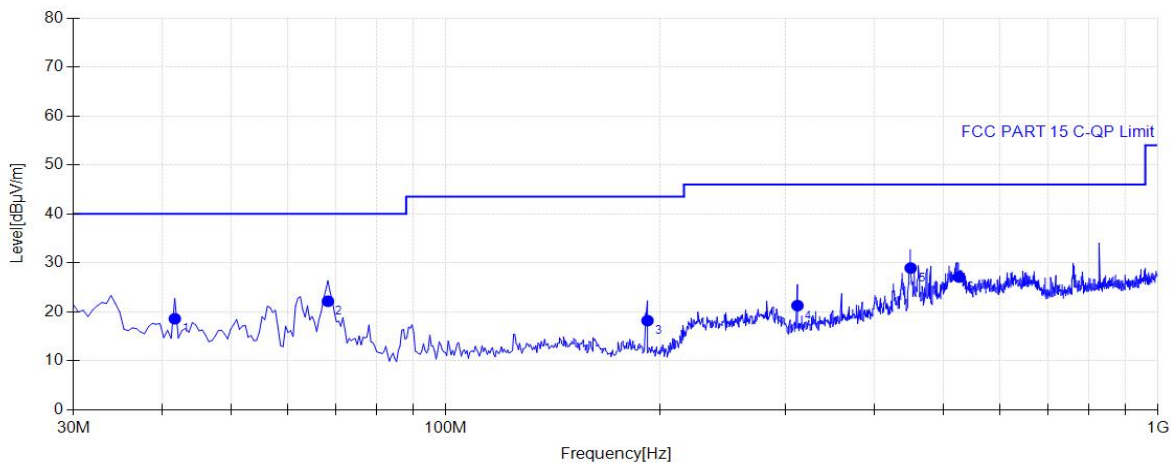
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	67.8300	8.04	24.21	40.00	15.79	100	179	Horizontal
2	89.6550	9.95	16.40	43.50	27.10	100	179	Horizontal
3	191.990	10.09	26.99	43.50	16.51	100	3	Horizontal
4	288.020	13.23	32.74	46.00	13.26	100	276	Horizontal
5	437.885	17.16	37.37	46.00	8.63	100	34	Horizontal
6	473.775	18.24	35.04	46.00	10.96	100	261	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:	2.4GHz Wi-Fi/BLE Module	Polarity:	Vertical
Model:	EMC6069-P	SN:	N/A
Mode:	Transmit at BLE_1M Channel 39	Voltage:	DC 3.3V
Environment:	Temp: 18°C; Humi:31%	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	41.6400	13.57	18.60	40.00	21.40	100	105	Vertical
2	68.3150	8.13	22.17	40.00	17.83	100	98	Vertical
3	191.990	10.09	18.22	43.50	25.28	100	132	Vertical
4	311.785	14.02	21.29	46.00	24.71	100	10	Vertical
5	449.525	17.59	28.95	46.00	17.05	100	256	Vertical
6	525.670	19.30	27.12	46.00	18.88	100	188	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

For RSS-Gen Section 8.10 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.009 - 0.110	240 - 285	9.0 - 9.2
2.1735 - 2.1905	322 - 335.4	9.3 - 9.5
3.020 - 3.026	399.9 - 410	10.6 - 12.7
4.125 - 4.128	608 - 614	13.25 - 13.4
4.17725 - 4.17775	960 - 1427	14.47 - 14.5
4.20725 - 4.20775	1435 - 1626.5	15.35 - 16.2
5.677 - 5.683	1645.5 - 1646.5	17.7 - 21.4
6.215 - 6.218	1660 - 1710	22.01 - 23.12
6.26775 - 6.26825	1718.8 -1722.2	23.6 - 24.0
6.31175 - 6.31225	2200 - 2300	31.2 - 31.8
8.291 - 8.294	2310 -2390	36.43 - 36.5
8.362 - 8.366	2655 - 2900	Above 38.6
8.37625 - 8.38675	3260 - 3267	--
8.41425 - 8.41475	3332 -3339	
12.29 - 12.293	334.5 - 3358	
12.51975 - 12.52025	3500 - 4400	
12.57675 - 12.57725	4500 - 5150	
13.36 -13.41	5350 - 5460	
16.42 - 16.423	7250 - 7750	
16.69475 - 16.69525	8025 - 8500	
16.80425 - 16.80475	--	
25.5 - 25.67		
37.5 - 38.25		
73 - 74.6		
74.8 - 75.2		
108 - 138		
156.52475 - 156.525225		
156.7 - 156.9		

All out of band emissions appearing in a restricted band as specified in Section 8.10 of the RSS-Gen

must not exceed the limits shown in Table per Section 8.9.

RSS-Gen Section 8.9		
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

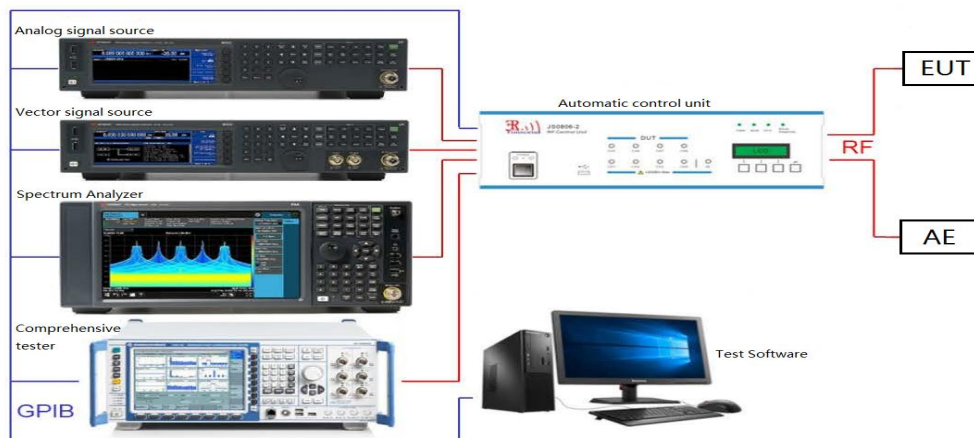
Peak Field Strength Measurements

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 $\geq 2 \times \text{span} / \text{RBW}$)
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
BLE_1M	Ant1	2402	AV	2310.000	-48.42	≤-41.20	46.78	≤54	PASS
			AV	2387.675	-47.05	≤-41.20	48.15	≤54	PASS
			AV	2390.000	-47.43	≤-41.20	47.77	≤54	PASS
			Peak	2310.000	-39.34	≤-21.20	55.86	≤74	PASS
			Peak	2342.525	-37.11	≤-21.20	58.09	≤74	PASS
			Peak	2390.000	-38.69	≤-21.20	56.51	≤74	PASS
		2480	AV	2483.500	-45.92	≤-41.20	49.28	≤54	PASS
			AV	2483.520	-45.92	≤-41.20	49.28	≤54	PASS
			AV	2500.000	-47.72	≤-41.20	47.48	≤54	PASS
			Peak	2483.500	-37.84	≤-21.20	57.36	≤74	PASS
			Peak	2492.160	-36.61	≤-21.20	58.59	≤74	PASS
			Peak	2500.000	-38.14	≤-21.20	57.06	≤74	PASS
BLE_2M	Ant1	2402	AV	2310.000	-47.51	≤-41.20	47.69	≤54	PASS
			AV	2385.785	-46.91	≤-41.20	48.29	≤54	PASS
			AV	2390.000	-46.98	≤-41.20	48.22	≤54	PASS
			Peak	2310.000	-38.79	≤-21.20	56.41	≤74	PASS
			Peak	2366.990	-37.14	≤-21.20	58.06	≤74	PASS
			Peak	2390.000	-38.2	≤-21.20	57.00	≤74	PASS
		2480	AV	2483.500	-45.1	≤-41.20	50.10	≤54	PASS
			AV	2483.520	-45.1	≤-41.20	50.10	≤54	PASS
			AV	2500.000	-47.58	≤-41.20	47.62	≤54	PASS
			Peak	2483.500	-37.59	≤-21.20	57.61	≤74	PASS
			Peak	2483.600	-35.8	≤-21.20	59.40	≤74	PASS
			Peak	2500.000	-39.65	≤-21.20	55.55	≤74	PASS

Note:

- The Antenna Gain is compensated in the graph.
- 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





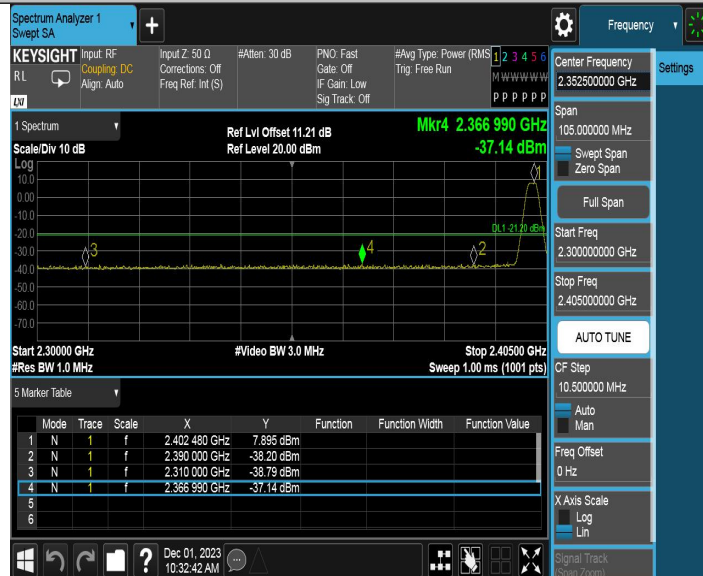
BLE_1M_Ant1_High_2480_Peak



BLE_2M_Ant1_Low_2402_AV



BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV



BLE_2M_Ant1_High_2480_Peak



7.8. AC Conducted Emissions Measurement

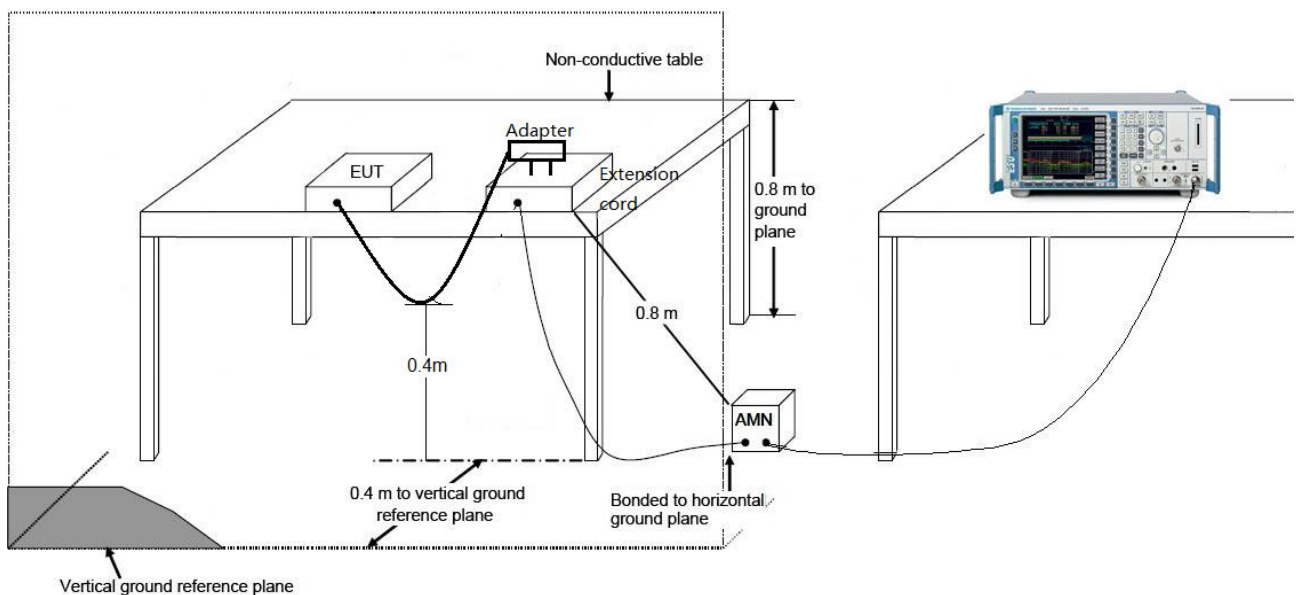
7.8.1. Test Limit

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 **2.4GHz Wi-Fi/BLE Module** is in compliance with Part 15C of the FCC Rules.

_____ The End _____