

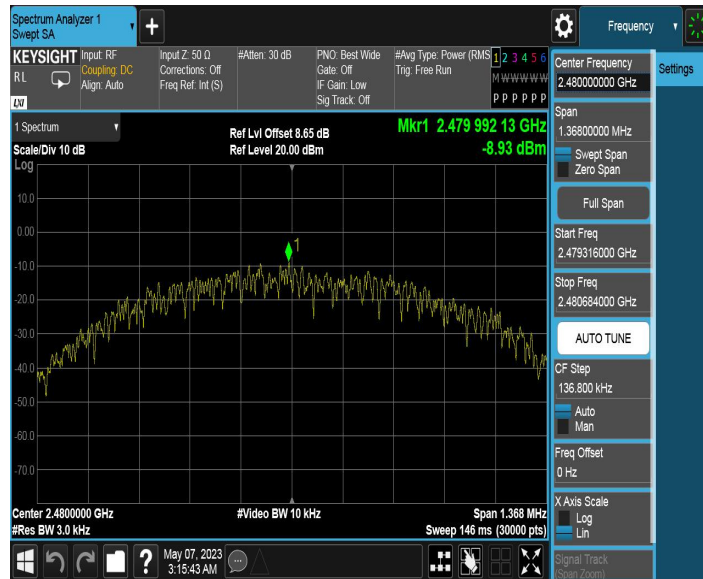
BLE_1M_Ant1_2402



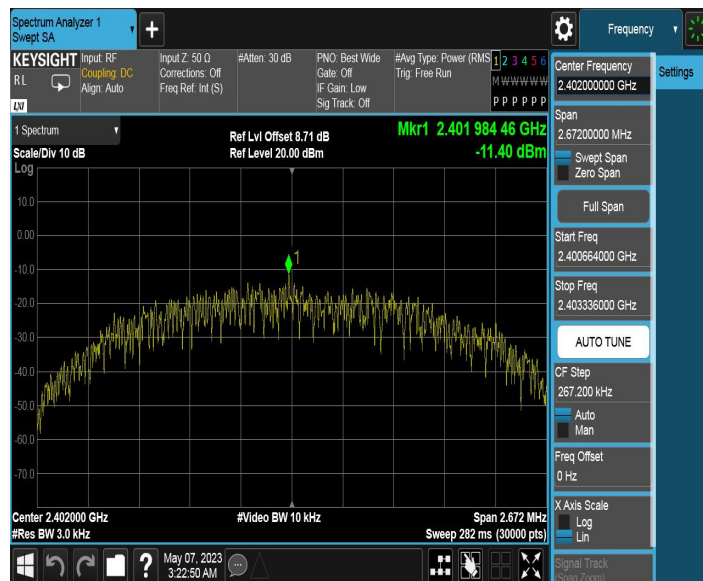
BLE_1M_Ant1_2440



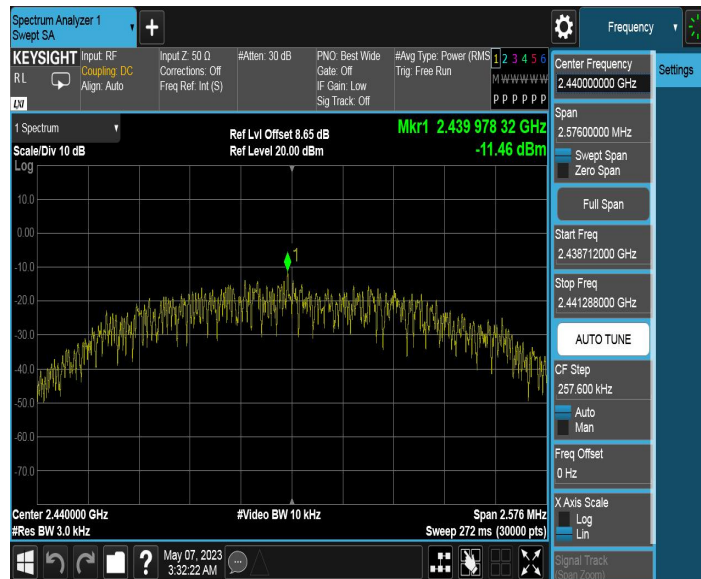
BLE_1M_Ant1_2480



BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2. Test Procedure Used

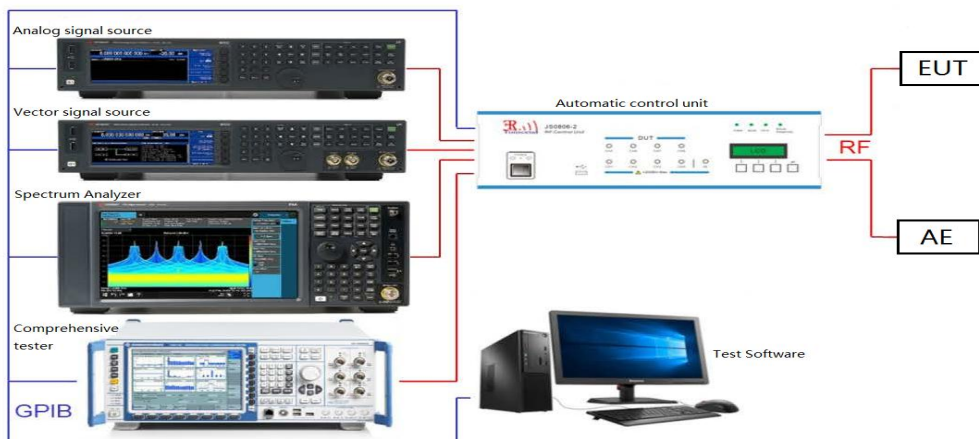
KDB 558074 D01 v05r02 - Section 8.5 & Section 8.6

ANSI C63.10 – Section 11.11&11.12

7.5.3. Test Settintg

- (a) Set the center frequency and span to encompass frequency range to be measured
- (b) RBW = 100kHz
- (c) VBW = 300kHz
- (d) Detector = Peak
- (e) Trace mode = max hold
- (f) Sweep time = auto couple
- (g) The trace was allowed to stabilize

7.5.4. Test Setup



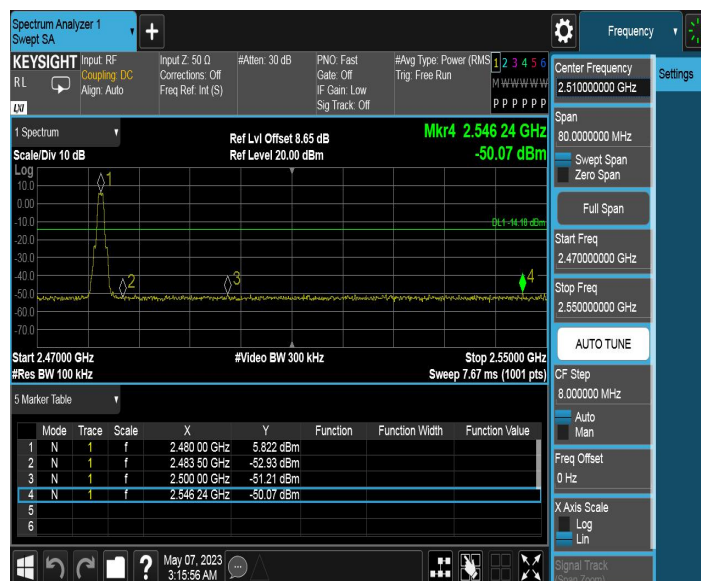
7.5.5. Test Result

Test Mode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	5.52	5.52	---	PASS
			30~1000	5.52	-61.35	≤-14.48	PASS
			1000~26500	5.52	-48.07	≤-14.48	PASS
		2440	Reference	5.74	5.74	---	PASS
			30~1000	5.74	-61.96	≤-14.26	PASS
			1000~26500	5.74	-48.78	≤-14.26	PASS
		2480	Reference	5.76	5.76	---	PASS
			30~1000	5.76	-62.09	≤-14.24	PASS
			1000~26500	5.76	-50.33	≤-14.24	PASS
BLE_2M	Ant1	2402	Reference	4.88	4.88	---	PASS
			30~1000	4.88	-60.73	≤-15.12	PASS
			1000~26500	4.88	-48.84	≤-15.12	PASS
		2440	Reference	4.80	4.80	---	PASS
			30~1000	4.80	-61.64	≤-15.2	PASS
			1000~26500	4.80	-49.34	≤-15.2	PASS
		2480	Reference	5.29	5.29	---	PASS
			30~1000	5.29	-61.7	≤-14.71	PASS
			1000~26500	5.29	-50.59	≤-14.71	PASS

BLE_1M_Ant1_Low_2402



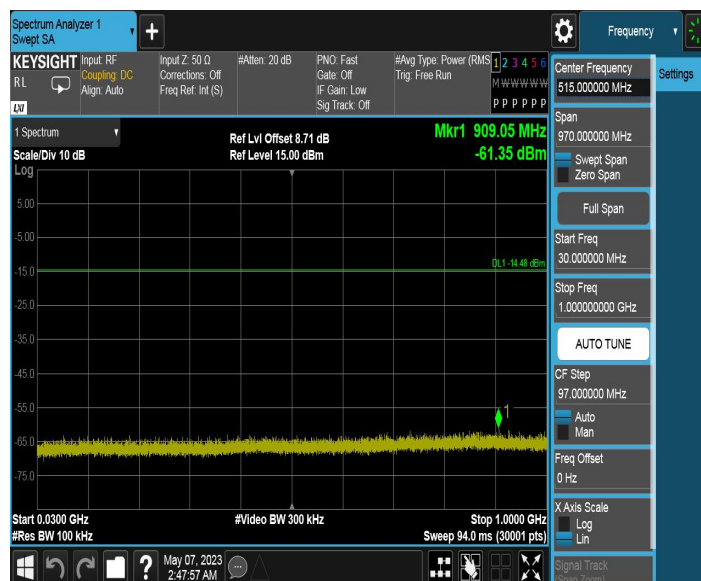
BLE_1M_Ant1_High_2480



BLE_1M_Ant1_2402_0~Reference



BLE_1M_Ant1_2402_30~1000



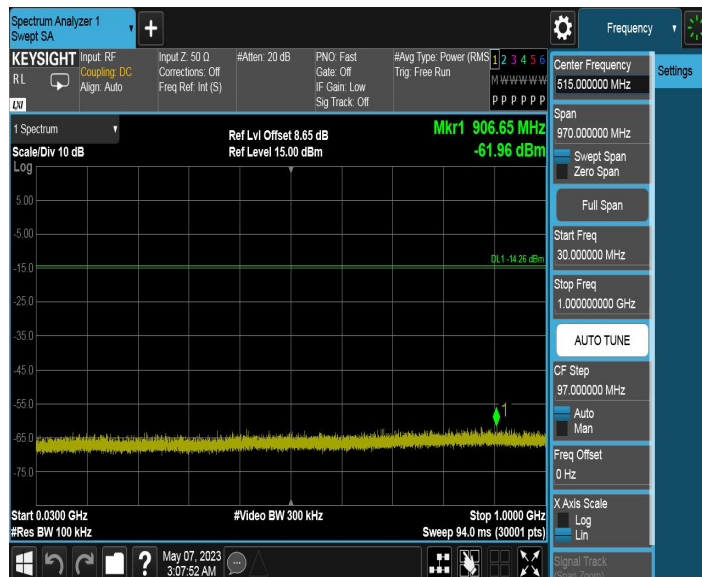
BLE_1M_Ant1_2402_1000~26500



BLE_1M_Ant1_2440_0~Reference



BLE_1M_Ant1_2440_30~1000



BLE_1M_Ant1_2440_1000~26500



BLE_1M_Ant1_2480_0~Reference



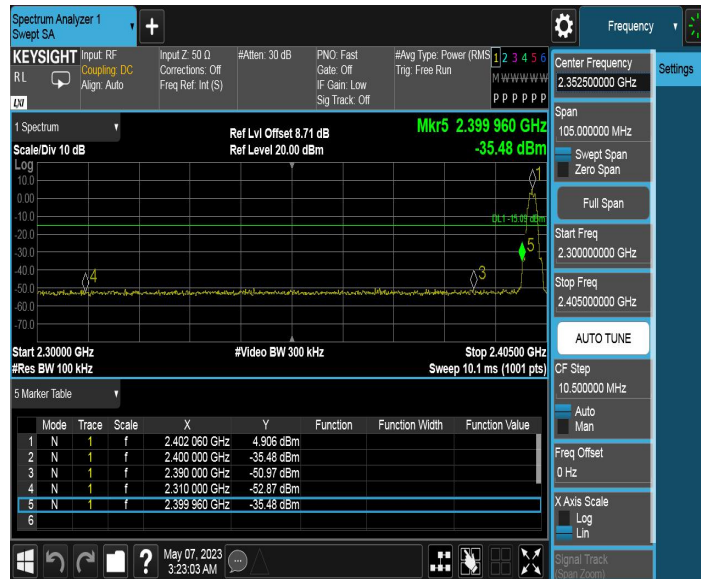
BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500



BLE_2M_Ant1_Low_2402



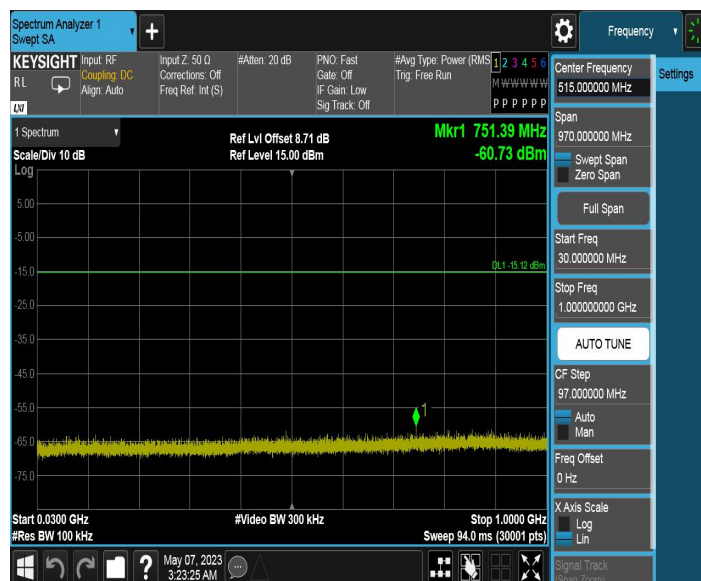
BLE_2M_Ant1_High_2480



BLE_2M_Ant1_2402_0~Reference



BLE_2M_Ant1_2402_30~1000



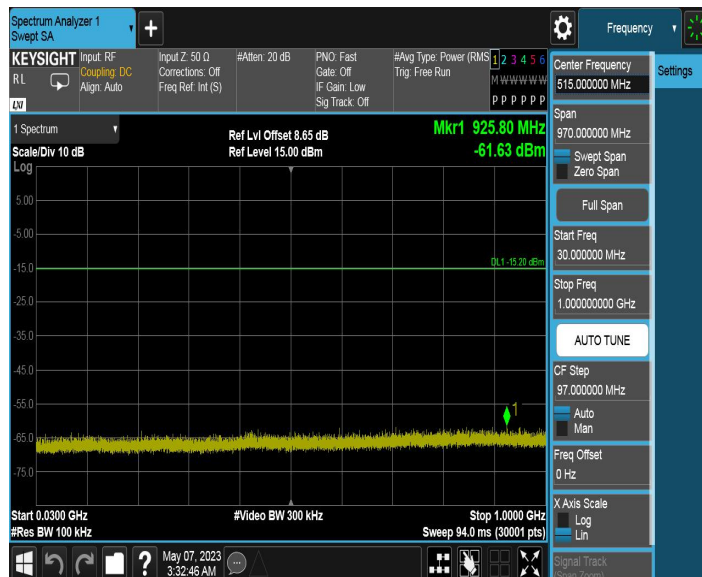
BLE_2M_Ant1_2402_1000~26500



BLE_2M_Ant1_2440_0~Reference



BLE_2M_Ant1_2440_30~1000



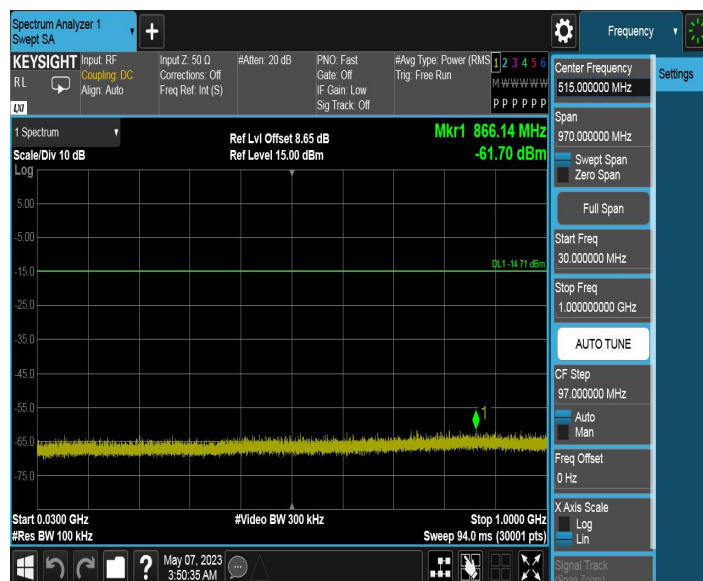
BLE_2M_Ant1_2440_1000~26500



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

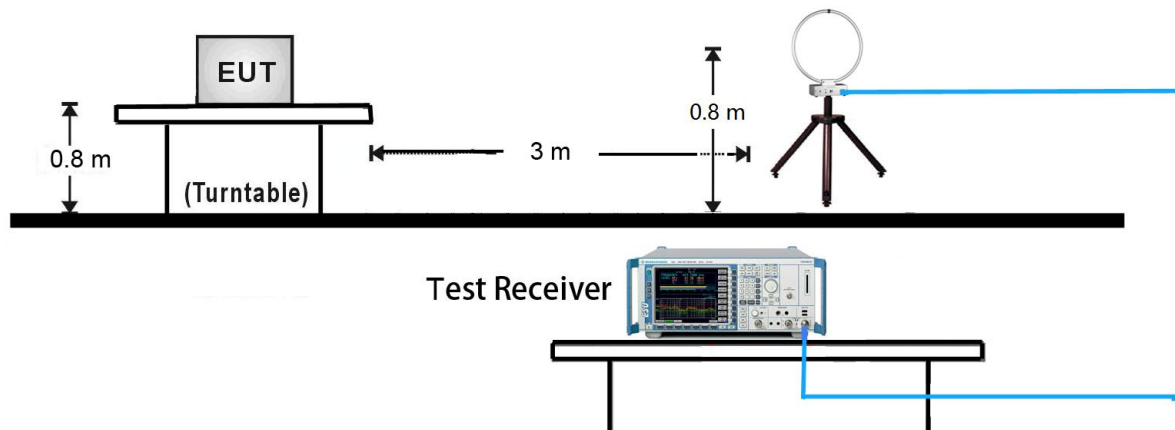
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

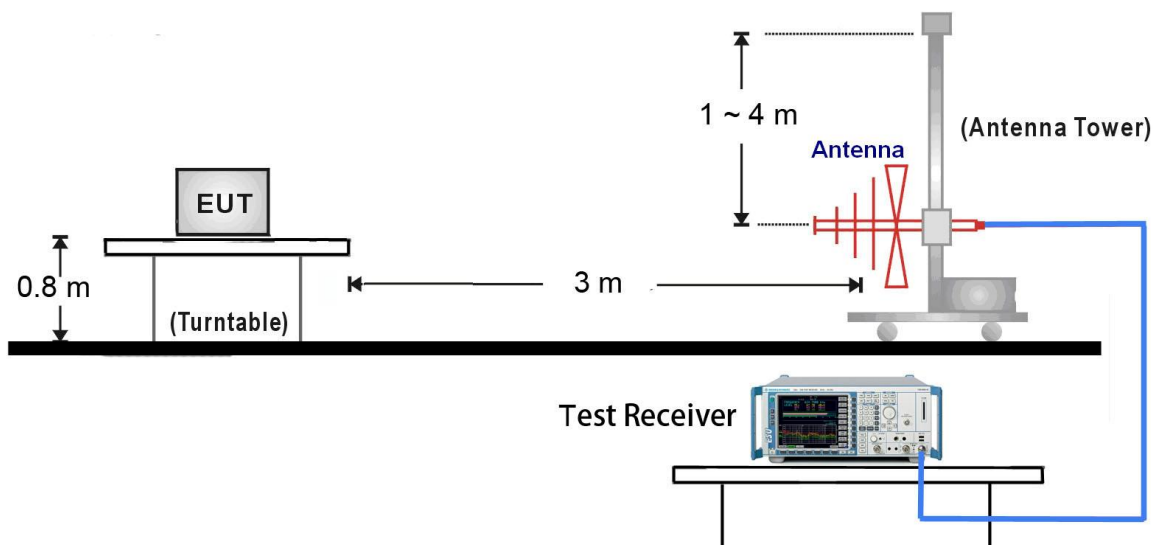
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be $\geq 2 \times \text{span} / \text{RBW}$)
6. Sweep time = auto
7. Trace (RMS)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

7.6.4. Test Setup

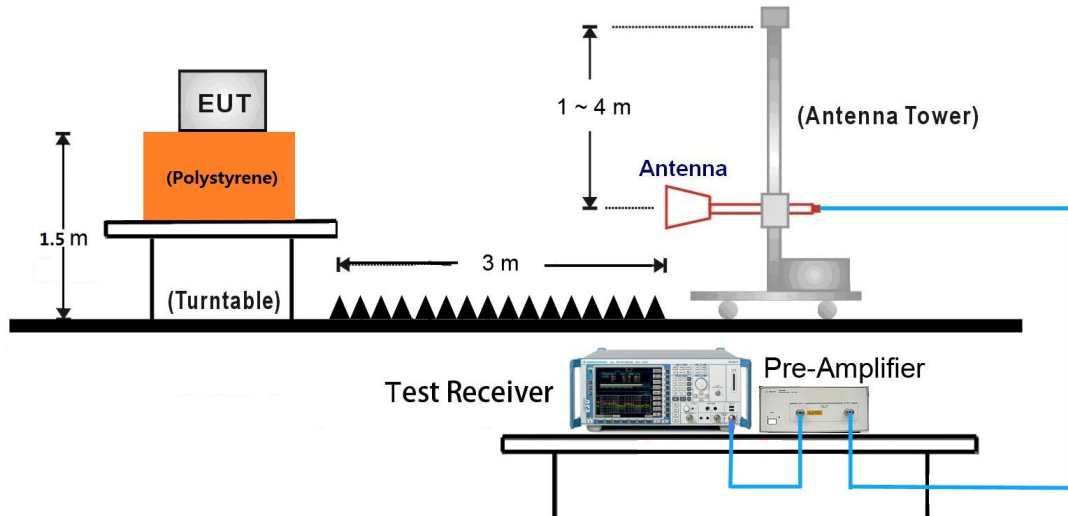
9kHz ~ 30MHz Test Setup:



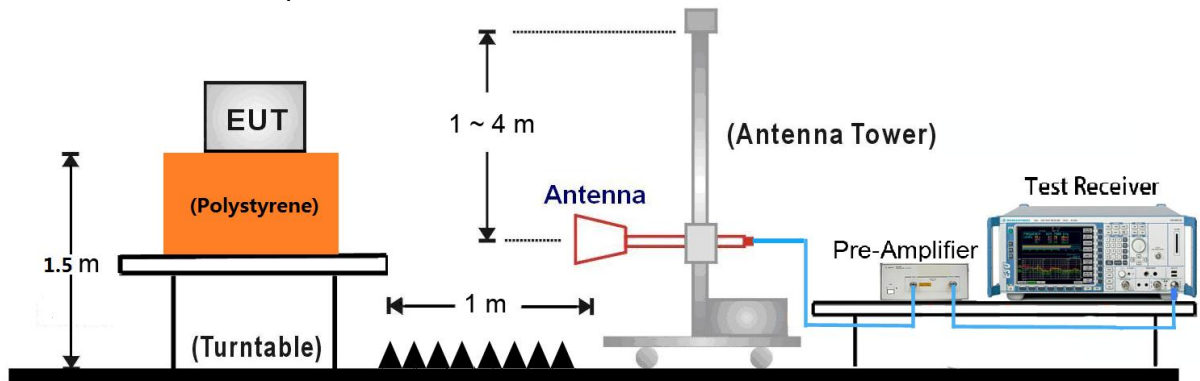
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.6.5. Test Result

Test Mode:	BLE_1M	Test Date:	2023-05-05
Test Channel:	00	Test Engineer:	Amos Xia
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
3925.0000	40.95	4.81	74.00	33.05	Peak	Horizontal
4555.0000	43.54	7.07	74.00	30.46	Peak	Horizontal
5745.0000	46.69	10.20	74.00	27.31	Peak	Horizontal
7785.0000	51.82	15.27	74.00	22.18	Peak	Horizontal
4140.0000	41.83	5.42	74.00	32.17	Peak	Vertical
4555.0000	43.79	7.07	74.00	30.21	Peak	Vertical
6280.0000	46.98	11.75	74.00	27.02	Peak	Vertical
7925.0000	50.82	15.31	74.00	23.18	Peak	Vertical

Test Mode:	BLE_1M	Test Date:	2023-05-05
Test Channel:	19	Test Engineer:	Amos Xia
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
3625.0000	40.83	4.05	74.00	33.17	Peak	Horizontal
4120.0000	42.64	5.38	74.00	31.36	Peak	Horizontal
6340.0000	46.55	12.09	74.00	27.45	Peak	Horizontal
7940.0000	50.37	15.52	74.00	23.63	Peak	Horizontal
3355.0000	40.85	3.70	74.00	33.15	Peak	Vertical
4580.0000	42.95	6.96	74.00	31.05	Peak	Vertical
6210.0000	46.27	11.35	74.00	27.73	Peak	Vertical
8910.0000	51.60	15.90	74.00	22.40	Peak	Vertical

Test Mode:	BLE_1M	Test Date:	2023-05-05
Test Channel:	39	Test Engineer:	Amos Xia
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
3835.0000	40.59	4.61	74.00	33.41	Peak	Horizontal
4760.0000	43.96	6.99	74.00	30.04	Peak	Horizontal
5585.0000	45.43	9.90	74.00	28.57	Peak	Horizontal
7915.0000	51.27	15.16	74.00	22.73	Peak	Horizontal
3265.0000	42.00	3.81	74.00	32.00	Peak	Vertical
4865.0000	42.35	7.16	74.00	31.65	Peak	Vertical
6845.0000	47.93	13.85	74.00	26.07	Peak	Vertical
7955.0000	51.21	15.62	74.00	22.79	Peak	Vertical

Test Mode:	BLE_2M	Test Date:	2023-05-05
Test Channel:	00	Test Engineer:	Amos Xia
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
4305.0000	42.32	6.01	74.00	31.68	Peak	Horizontal
4525.0000	43.03	7.04	74.00	30.97	Peak	Horizontal
6300.0000	46.93	11.89	74.00	27.07	Peak	Horizontal
8185.0000	51.81	15.18	74.00	22.19	Peak	Horizontal
3840.0000	41.44	4.63	74.00	32.56	Peak	Vertical
4505.0000	42.99	6.99	74.00	31.01	Peak	Vertical
6300.0000	47.13	11.89	74.00	26.87	Peak	Vertical
7955.0000	51.81	15.62	74.00	22.19	Peak	Vertical

Test Mode:	BLE_2M	Test Date:	2023-05-05
Test Channel:	19	Test Engineer:	Amos Xia
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 (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3645.0000	41.27	4.08	74.00	32.73	Peak	Horizontal
4800.0000	43.81	7.11	74.00	30.19	Peak	Horizontal
6375.0000	47.03	12.24	74.00	26.97	Peak	Horizontal
7085.0000	48.50	14.31	74.00	25.50	Peak	Horizontal
3685.0000	40.78	4.12	74.00	33.22	Peak	Vertical
4840.0000	43.17	7.09	74.00	30.83	Peak	Vertical
6360.0000	47.26	12.18	74.00	26.74	Peak	Vertical
7945.0000	50.53	15.59	74.00	23.47	Peak	Vertical

Test Mode:	BLE_2M	Test Date:	2023-05-05
Test Channel:	39	Test Engineer:	Amos Xia
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.		

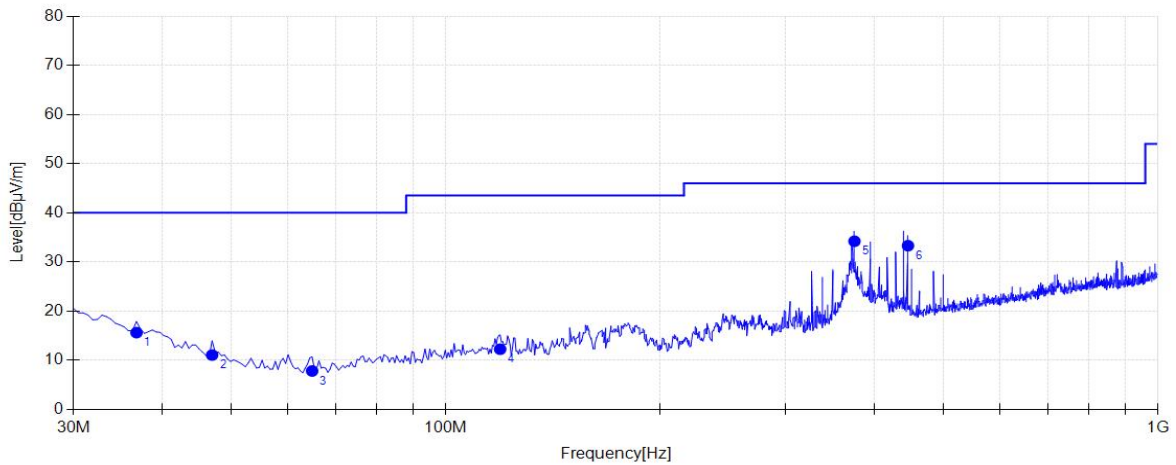
Frequency (MHz)	Level (dBμV/m)	Factor (dB)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
3810.0000	41.44	4.50	74.00	32.56	Peak	Horizontal
4855.0000	42.83	7.11	74.00	31.17	Peak	Horizontal
6835.0000	47.89	13.74	74.00	26.11	Peak	Horizontal
7945.0000	50.74	15.59	74.00	23.26	Peak	Horizontal
3820.0000	41.59	4.55	74.00	32.41	Peak	Vertical
4795.0000	43.48	7.10	74.00	30.52	Peak	Vertical
6190.0000	47.81	11.32	74.00	26.19	Peak	Vertical
7930.0000	50.34	15.38	74.00	23.66	Peak	Vertical

The worst case of Radiated Emission below 1GHz:

30MHz – 1GHz Test Data

EUT:	LED Playback Control Processor	Polarity:	Horizontal
Model:	TU20 Pro	SN:	N/A
Mode:	Transmit at BLE_2M Channel 00	Voltage:	DC 12V
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

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	36.7900	16.27	15.64	40.00	24.36	200	78	Horizontal
2	46.9750	11.07	11.07	40.00	28.93	200	105	Horizontal
3	64.9200	7.67	7.83	40.00	32.17	200	251	Horizontal
4	119.240	11.64	12.26	43.50	31.24	200	300	Horizontal
5	374.835	15.33	34.22	46.00	11.78	100	330	Horizontal
6	445.645	17.44	33.32	46.00	12.68	100	0	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.