

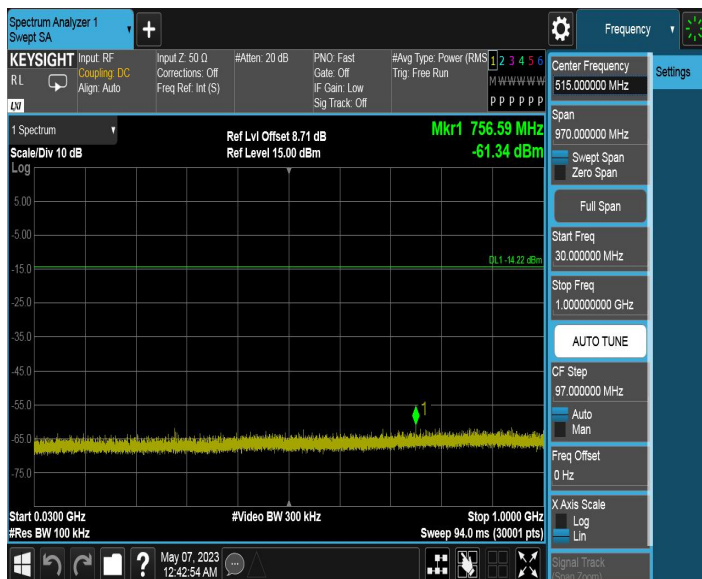
DH5_Ant1_2480_1000~26500



2DH5_Ant1_2402_0~Reference



2DH5_Ant1_2402_30~1000



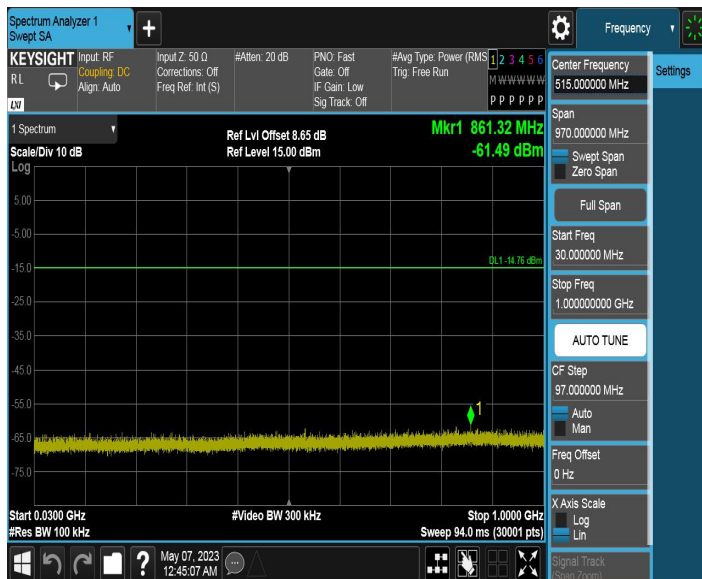
2DH5_Ant1_2402_1000~26500



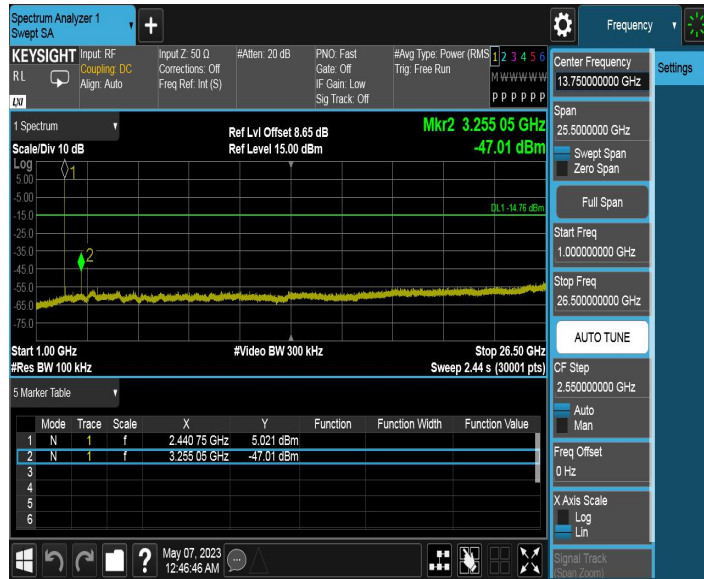
2DH5_Ant1_2441_0~Reference



2DH5_Ant1_2441_30~1000



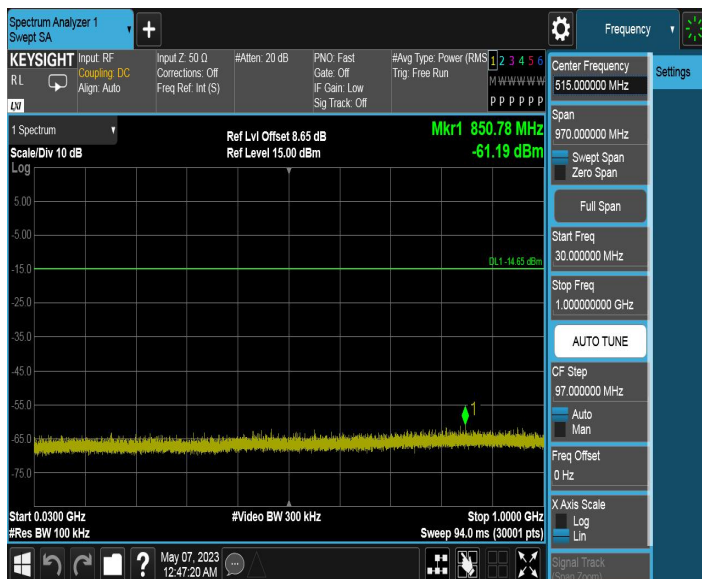
2DH5_Ant1_2441_1000~26500



2DH5_Ant1_2480_0~Reference



2DH5_Ant1_2480_30~1000



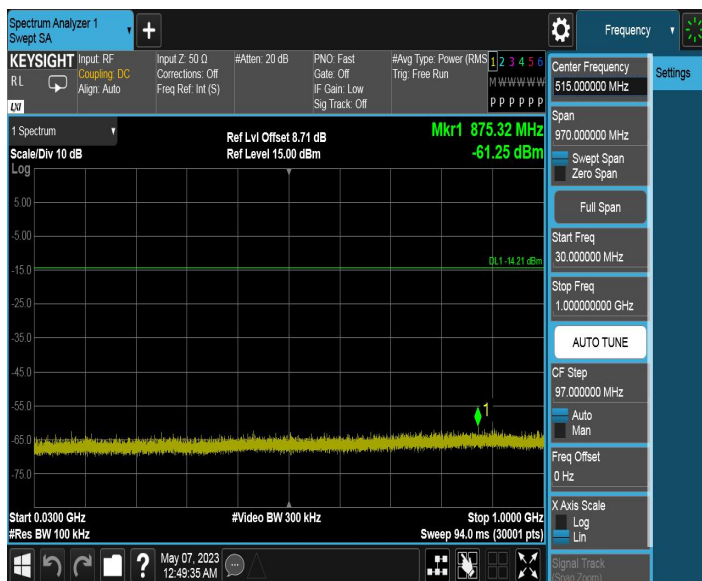
2DH5_Ant1_2480_1000~26500



3DH5_Ant1_2402_0~Reference



3DH5_Ant1_2402_30~1000



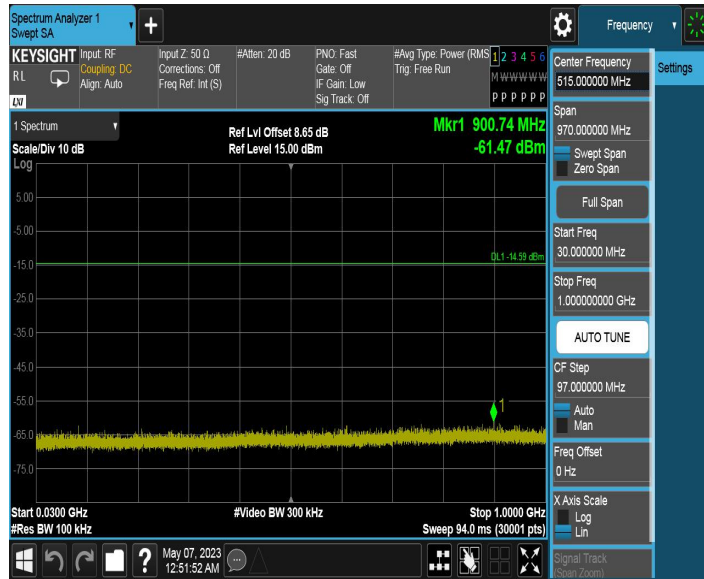
3DH5_Ant1_2402_1000~26500



3DH5_Ant1_2441_0~Reference



3DH5_Ant1_2441_30~1000



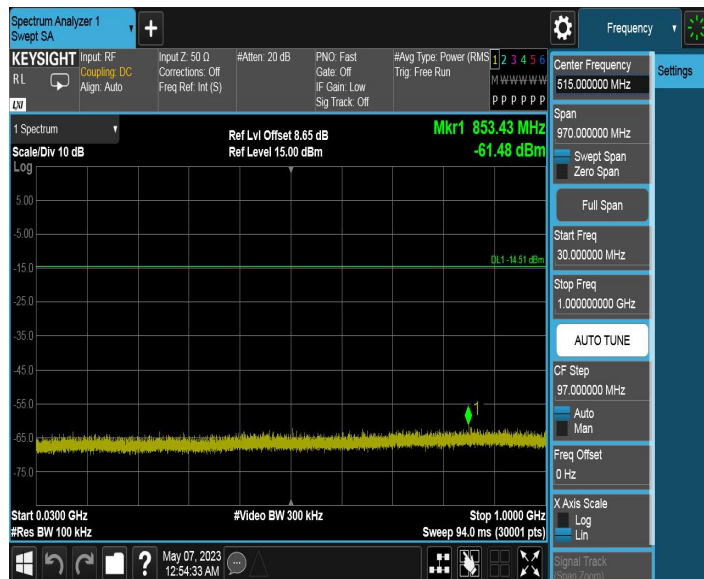
3DH5_Ant1_2441_1000~26500



3DH5_Ant1_2480_0~Reference



3DH5_Ant1_2480_30~1000



3DH5_Ant1_2480_1000~26500



7.9. Radiated Spurious Emission Measurement

7.9.1. 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

7.9.2. Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

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

7.9.3. Test Setting

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. 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

Peak Measurements above 1GHz

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 Measurements above 1GHz (Method VB)

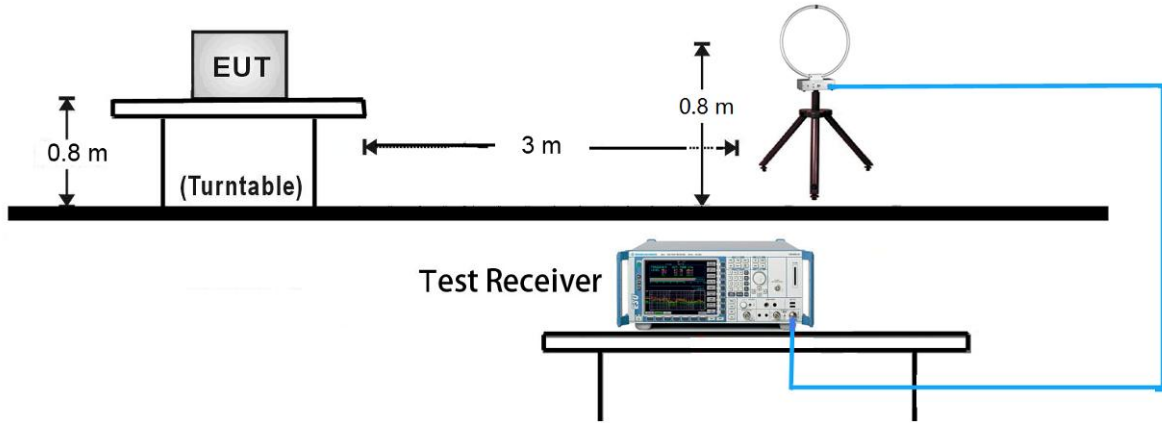
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto

6. Trace mode = max hold

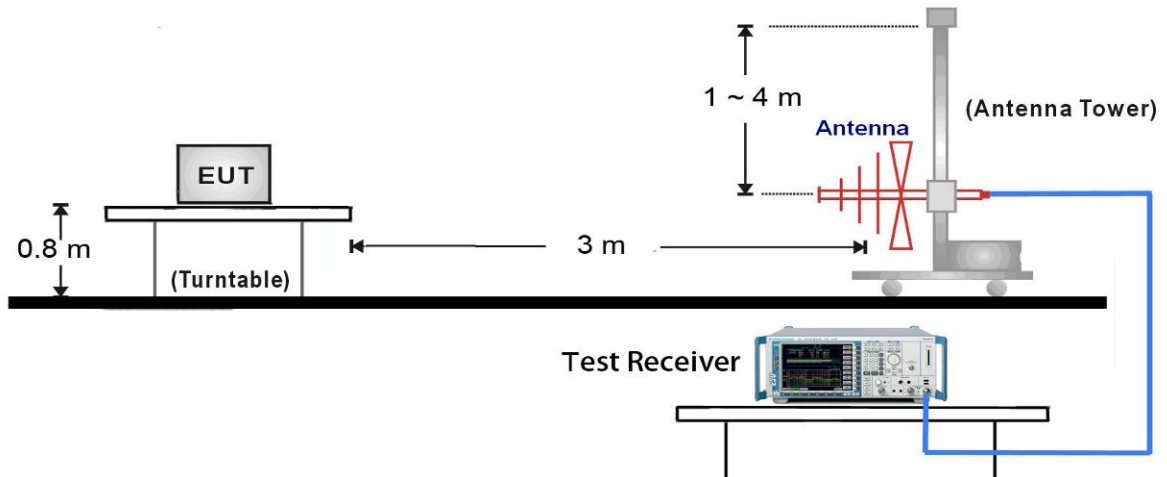
7. Trace was allowed to stabilize

7.9.4. Test Setup

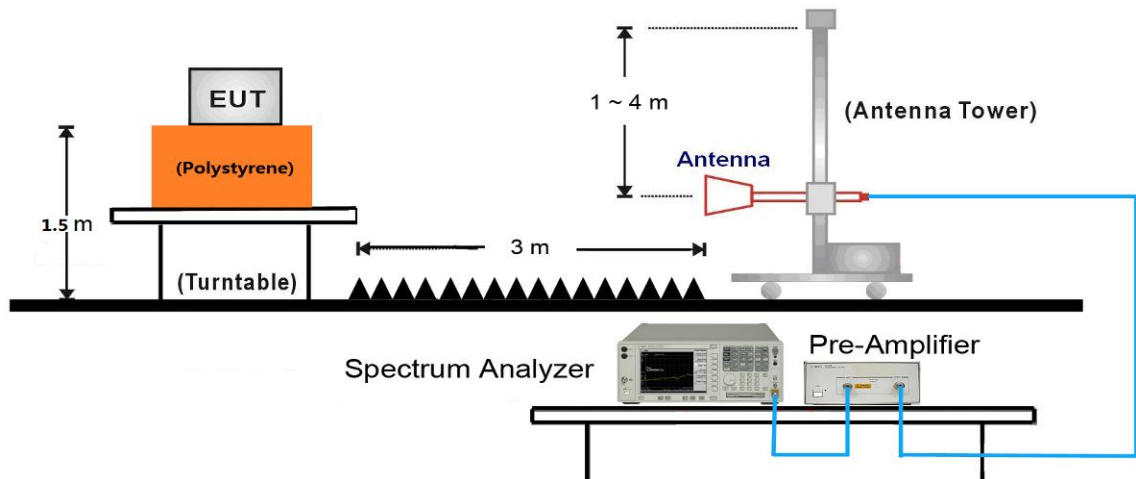
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 25GHz Test Setup:



7.9.5. Test Result

Test Mode:	DH5 - Ant 1	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
4010.0000	42.05	5.15	74.00	31.95	Peak	Horizontal
4995.0000	42.97	7.62	74.00	31.03	Peak	Horizontal
6855.0000	47.55	13.92	74.00	26.45	Peak	Horizontal
8975.0000	52.63	15.77	74.00	21.37	Peak	Horizontal
3870.0000	40.42	4.70	74.00	33.58	Peak	Vertical
4830.0000	42.95	7.10	74.00	31.05	Peak	Vertical
6120.0000	46.20	11.19	74.00	27.80	Peak	Vertical
7840.0000	50.93	15.13	74.00	23.07	Peak	Vertical

Test Mode:	DH5 - Ant 1	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3810.0000	40.09	4.50	74.00	33.91	Peak	Horizontal
4805.0000	42.96	7.11	74.00	31.04	Peak	Horizontal
6435.0000	46.68	12.20	74.00	27.32	Peak	Horizontal
7960.0000	50.63	15.58	74.00	23.37	Peak	Horizontal
3810.0000	40.88	4.50	74.00	33.12	Peak	Vertical
4890.0000	42.96	7.27	74.00	31.04	Peak	Vertical
6230.0000	47.03	11.44	74.00	26.97	Peak	Vertical
7945.0000	51.14	15.59	74.00	22.86	Peak	Vertical

Test Mode:	DH5 - Ant 1	Test Date:	2023-05-05
Test Channel:	78	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3875.0000	40.57	4.70	74.00	33.43	Peak	Horizontal
5010.0000	43.16	7.64	74.00	30.84	Peak	Horizontal
6635.0000	46.23	13.00	74.00	27.77	Peak	Horizontal
8895.0000	51.93	15.95	74.00	22.07	Peak	Horizontal
3790.0000	41.10	4.41	74.00	32.90	Peak	Vertical
4740.0000	43.17	6.97	74.00	30.83	Peak	Vertical
6790.0000	48.06	13.33	74.00	25.94	Peak	Vertical
7965.0000	51.57	15.54	74.00	22.43	Peak	Vertical

Test Mode:	2DH5 - Ant 1	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3645.0000	39.85	4.08	74.00	34.15	Peak	Horizontal
4635.0000	42.67	6.87	74.00	31.33	Peak	Horizontal
5995.0000	45.83	10.72	74.00	28.17	Peak	Horizontal
7960.0000	50.73	15.58	74.00	23.27	Peak	Horizontal
3950.0000	40.55	4.90	74.00	33.45	Peak	Vertical
4845.0000	42.64	7.09	74.00	31.36	Peak	Vertical
7020.0000	48.86	14.16	74.00	25.14	Peak	Vertical
8970.0000	51.53	15.76	74.00	22.47	Peak	Vertical

Test Mode:	2DH5 - Ant 1	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3905.0000	40.73	4.75	74.00	33.27	Peak	Horizontal
4975.0000	43.31	7.48	74.00	30.69	Peak	Horizontal
7045.0000	49.66	14.16	74.00	24.34	Peak	Horizontal
8885.0000	52.32	15.95	74.00	21.68	Peak	Horizontal
3860.0000	41.01	4.69	74.00	32.99	Peak	Vertical
4780.0000	43.02	7.05	74.00	30.98	Peak	Vertical
6295.0000	47.27	11.86	74.00	26.73	Peak	Vertical
7970.0000	51.13	15.50	74.00	22.87	Peak	Vertical

Test Mode:	2DH5 - Ant 1	Test Date:	2023-05-05
Test Channel:	78	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
4000.0000	41.28	5.14	74.00	32.72	Peak	Horizontal
4925.0000	43.05	7.31	74.00	30.95	Peak	Horizontal
6340.0000	47.65	12.09	74.00	26.35	Peak	Horizontal
7910.0000	50.96	15.09	74.00	23.04	Peak	Horizontal
4000.0000	40.86	5.14	74.00	33.14	Peak	Vertical
4815.0000	42.43	7.10	74.00	31.57	Peak	Vertical
6040.0000	47.16	10.91	74.00	26.84	Peak	Vertical
8910.0000	51.90	15.90	74.00	22.10	Peak	Vertical

Test Mode:	3DH5 - Ant 1	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3800.0000	40.55	4.46	74.00	33.45	Peak	Horizontal
4915.0000	42.45	7.31	74.00	31.55	Peak	Horizontal
6400.0000	47.54	12.34	74.00	26.46	Peak	Horizontal
8045.0000	51.27	15.31	74.00	22.73	Peak	Horizontal
3890.0000	40.48	4.72	74.00	33.52	Peak	Vertical
4695.0000	43.38	6.96	74.00	30.62	Peak	Vertical
6545.0000	47.88	12.55	74.00	26.12	Peak	Vertical
7985.0000	51.12	15.37	74.00	22.88	Peak	Vertical

Test Mode:	3DH5 - Ant 1	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. This is the worst case of Radiated Emission for 1-18GHz.		

Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3935.0000	40.67	4.85	74.00	33.33	Peak	Horizontal
4890.0000	43.30	7.27	74.00	30.70	Peak	Horizontal
6415.0000	46.85	12.28	74.00	27.15	Peak	Horizontal
7900.0000	51.03	14.95	74.00	22.97	Peak	Horizontal
3990.0000	40.67	5.09	74.00	33.33	Peak	Vertical
4995.0000	42.92	7.62	74.00	31.08	Peak	Vertical
6945.0000	48.02	14.01	74.00	25.98	Peak	Vertical
7965.0000	51.10	15.54	74.00	22.90	Peak	Vertical

Test Mode:	3DH5 - Ant 1	Test Date:	2023-05-05
Test Channel:	78	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. This is the worst case of Radiated Emission for 1-18GHz.		

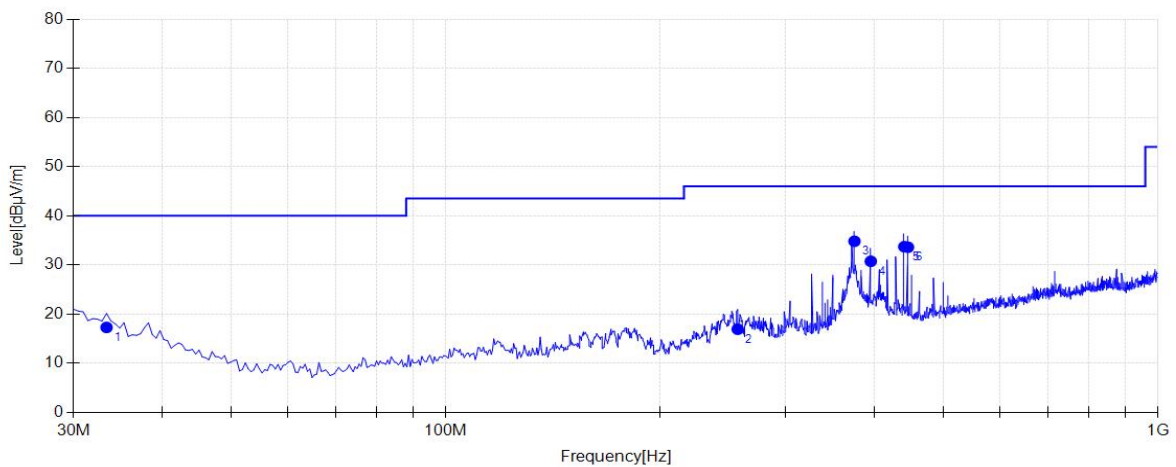
Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
3835.0000	40.96	4.61	74.00	33.04	Peak	Horizontal
4845.0000	43.15	7.09	74.00	30.85	Peak	Horizontal
6650.0000	46.62	13.07	74.00	27.38	Peak	Horizontal
8990.0000	52.45	15.80	74.00	21.55	Peak	Horizontal
3945.0000	40.72	4.88	74.00	33.28	Peak	Vertical
4845.0000	44.70	7.09	74.00	29.30	Peak	Vertical
6335.0000	47.21	12.07	74.00	26.79	Peak	Vertical
7960.0000	51.33	15.58	74.00	22.67	Peak	Vertical

The Worst Case of Radiated Emission below 1GHz:

EUT:	LED Playback Control Processor	Polarity:	Horizontal
Model:	TU20 Pro	SN:	N/A
Mode:	Transmit by 3DH5 at Channel 2402MHz	Voltage:	DC 12V
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

Start of Test:2023-05-05 11:08:01

Test Graph



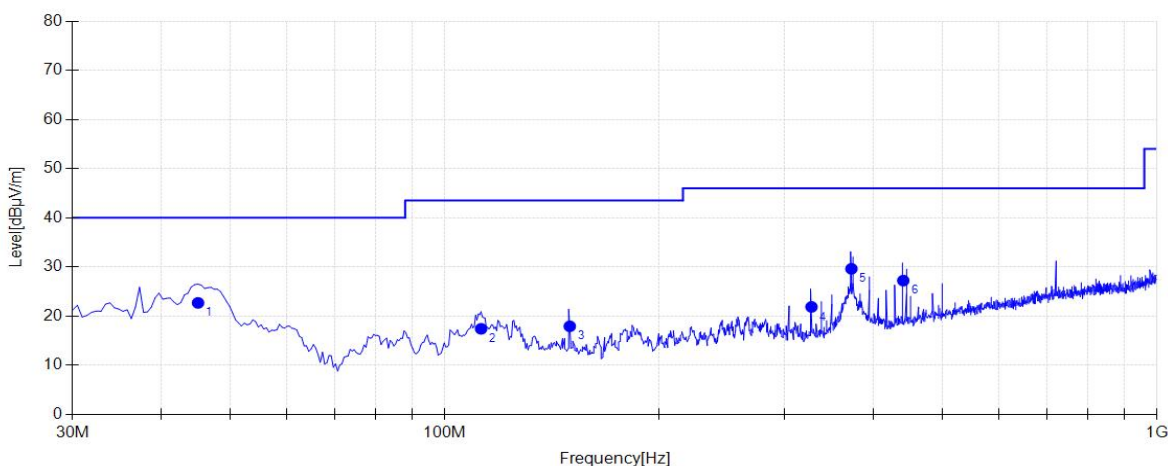
Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.3950	17.99	17.30	40.00	22.70	100	157	Horizontal
2	256.980	11.88	16.93	46.00	29.07	100	207	Horizontal
3	374.835	15.33	34.83	46.00	11.17	100	336	Horizontal
4	395.205	15.66	30.76	46.00	15.24	100	1	Horizontal
5	440.310	17.24	33.72	46.00	12.28	100	356	Horizontal
6	445.645	17.44	33.61	46.00	12.39	100	350	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:	LED Playback Control	Polarity:	Vertical
Model:	TU20 Pro	SN:	N/A
Mode:	Transmit by 3DH5 at Channel 2402MHz	Voltage:	DC 12V
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

Start of Test:2023-05-05 11:10:05

Test Graph



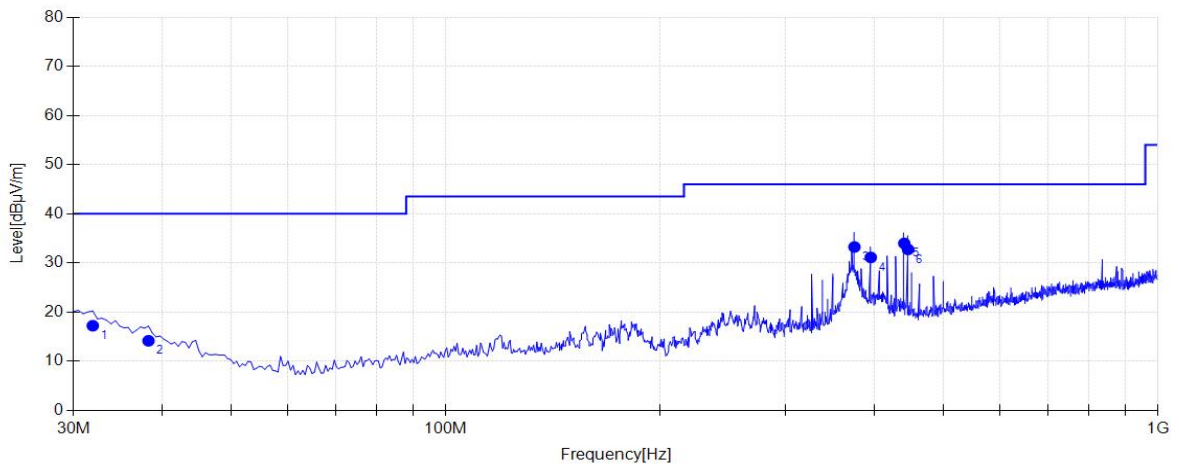
Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	45.0350	12.06	22.70	40.00	17.30	100	148	Vertical
2	112.450	11.50	17.43	43.50	26.07	100	354	Vertical
3	149.795	10.84	17.93	43.50	25.57	200	46	Vertical
4	327.305	14.39	21.88	46.00	24.12	200	227	Vertical
5	372.410	15.29	29.63	46.00	16.37	200	206	Vertical
6	440.310	17.24	27.23	46.00	18.77	200	206	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.

EUT:	LED Playback Control Processor	Polarity:	Horizontal
Model:	TU20 Pro	SN:	N/A
Mode:	Transmit by 3DH5 at Channel 2480MHz	Voltage:	DC 12V
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

Start of Test:2023-05-05 11:12:24

Test Graph



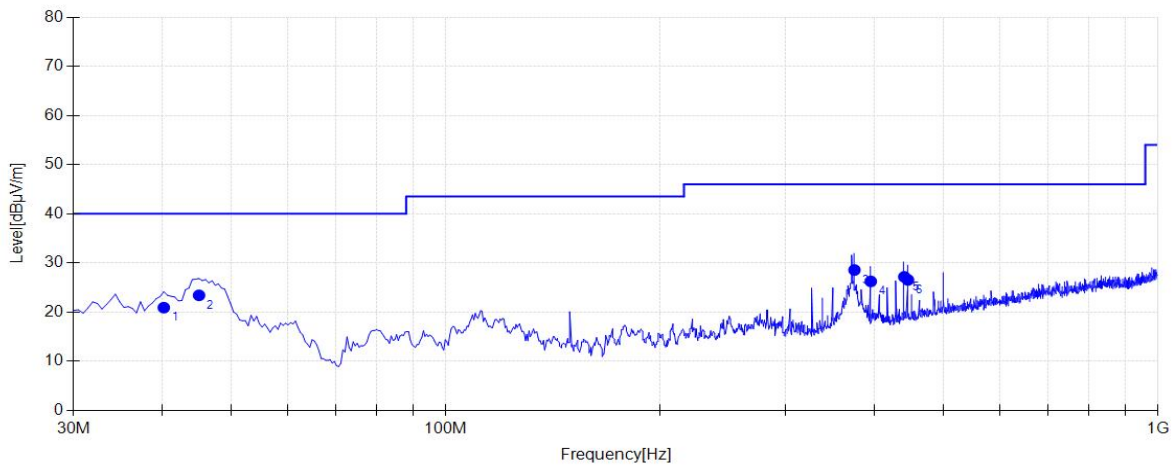
Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.9400	18.73	17.24	40.00	22.76	100	157	Horizontal
2	38.2450	15.53	14.17	40.00	25.83	100	337	Horizontal
3	374.835	15.33	33.25	46.00	12.75	100	356	Horizontal
4	395.205	15.66	31.13	46.00	14.87	100	330	Horizontal
5	440.310	17.24	33.98	46.00	12.02	100	351	Horizontal
6	445.645	17.44	32.76	46.00	13.24	100	351	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:	LED Playback Control	Polarity:	Vertical
Model:	TU20 Pro	SN:	N/A
Mode:	Transmit by 3DH5 at Channel 2480MHz	Voltage:	DC 12V
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia

Start of Test:2023-05-05 11:14:27

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	40.1850	14.54	20.92	40.00	19.08	100	36	Vertical
2	45.0350	12.06	23.42	40.00	16.58	100	216	Vertical
3	374.835	15.33	28.57	46.00	17.43	200	220	Vertical
4	395.205	15.66	26.25	46.00	19.75	200	240	Vertical
5	440.310	17.24	27.18	46.00	18.82	200	220	Vertical
6	445.645	17.44	26.55	46.00	19.45	200	179	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.

7.10. Radiated Restricted Band Edge Measurement

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

7.10.1. Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

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

7.10.2. Test Setting

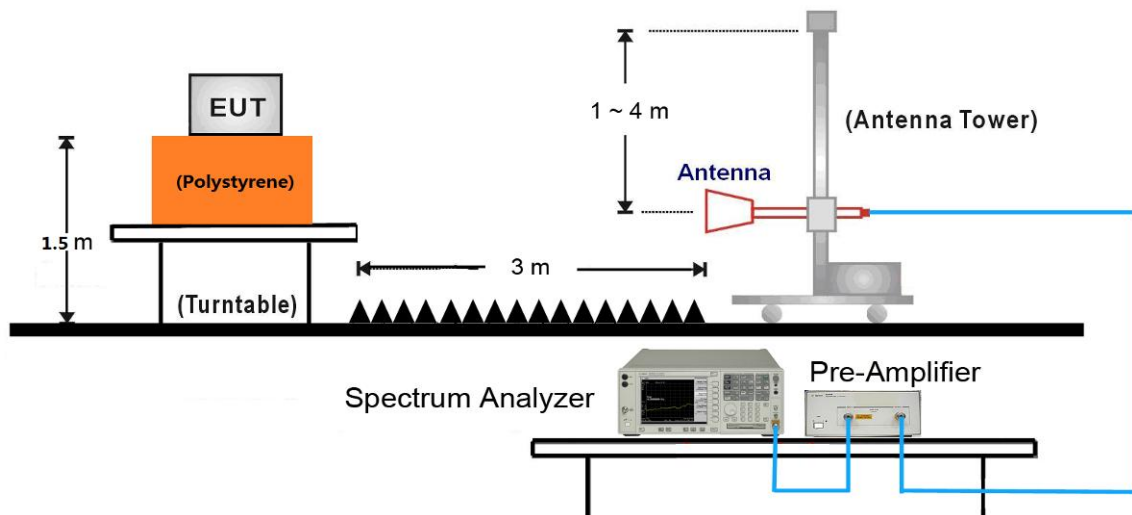
Peak Field Strength Measurements

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 Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

7.10.3. Test Setup

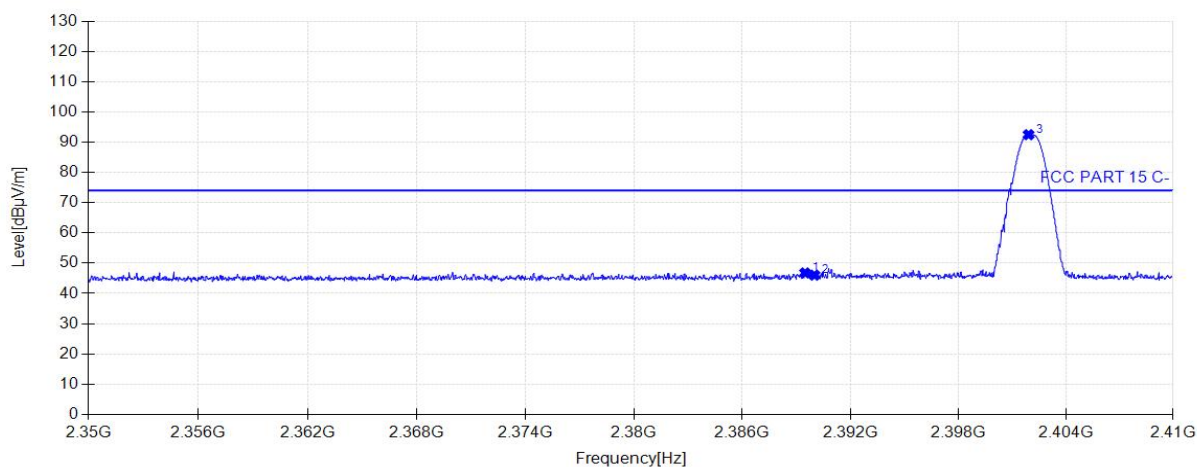


7.10.4. Test Result

Project Information			
EUT:	LED Playback Control	Model:	TU20 Pro
SN:	N/A	Voltage:	DC 12V
Environment:	Temp: 22°C; Humi:52%	Engineer:	Amos Xia
Remark:	Transmit by DH5 at Channel 2402MHz		

Start of Test:2023-05-05 09:13:49

Test Graph



Suspected Data List

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2389.48	46.78	32.74	74.00	27.22	160	107	Horizontal
2	2390.00	46.04	32.74	74.00	27.96	160	141	Horizontal
3	2401.93	92.47	32.80	74.00	-18.47	160	230	Horizontal