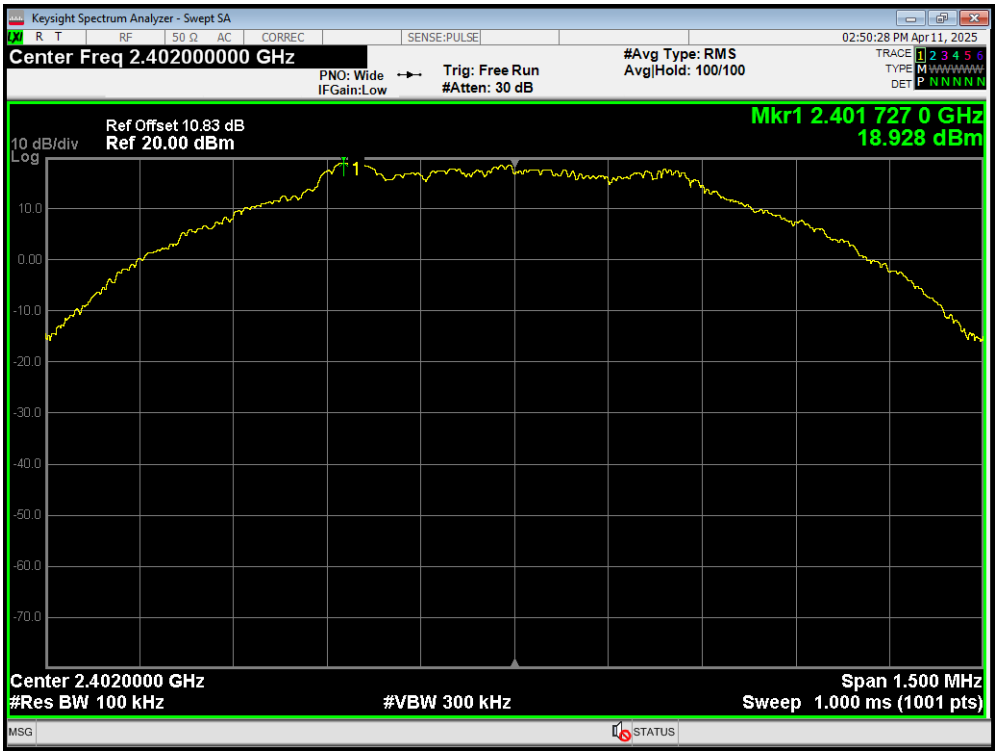
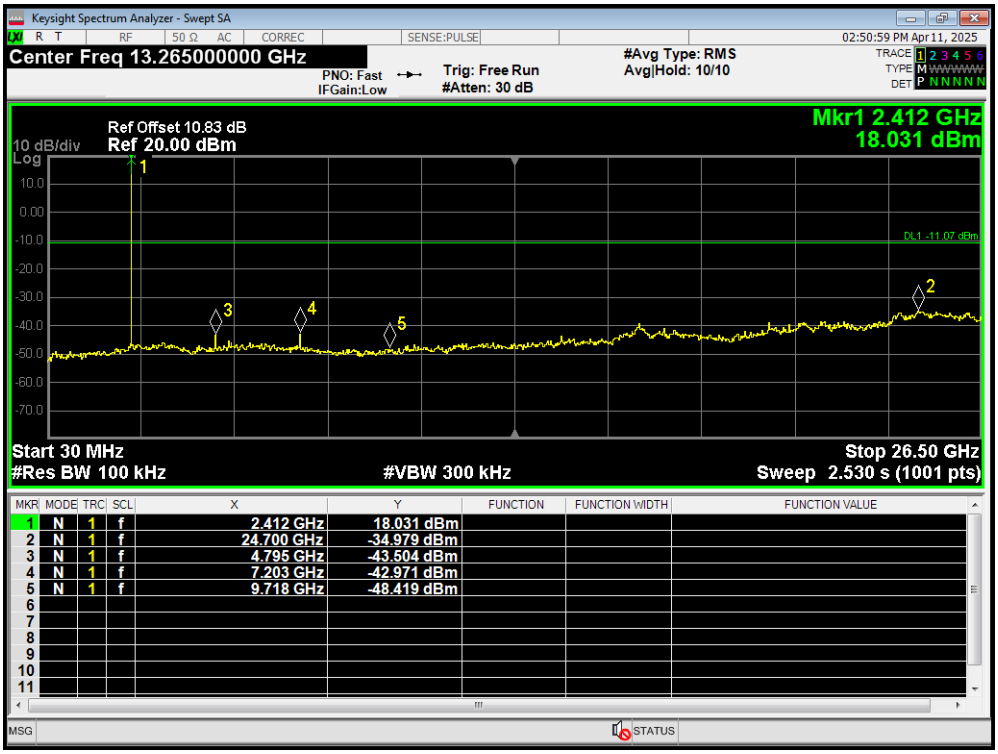
Tx. Spurious Bluetooth LE(S=2) 2402MHz Ref

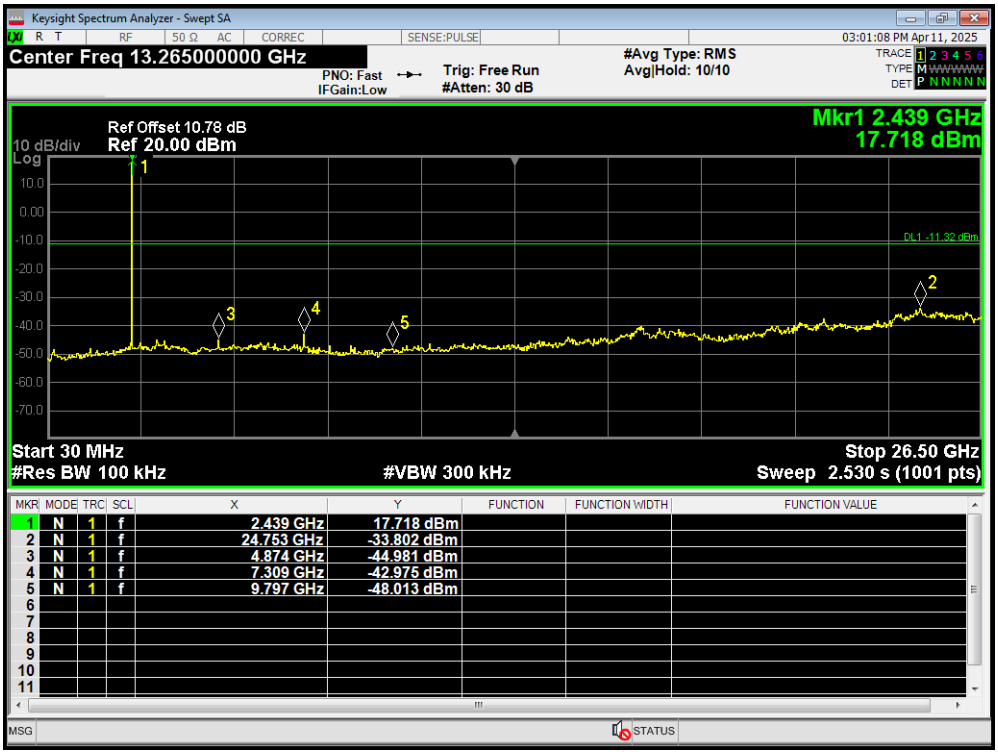


Tx. Spurious Bluetooth LE(S=2) 2402MHz Emission



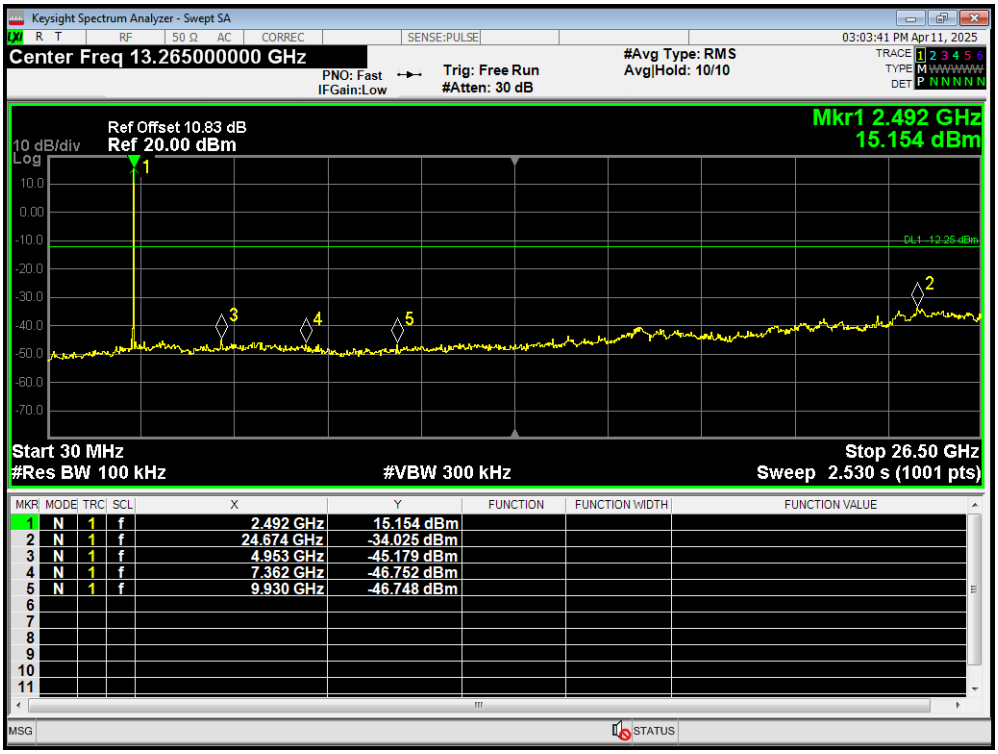
Tx. Spurious Bluetooth LE(S=2) 2440MHz Ref

Tx. Spurious Bluetooth LE(S=2) 2440MHz Emission

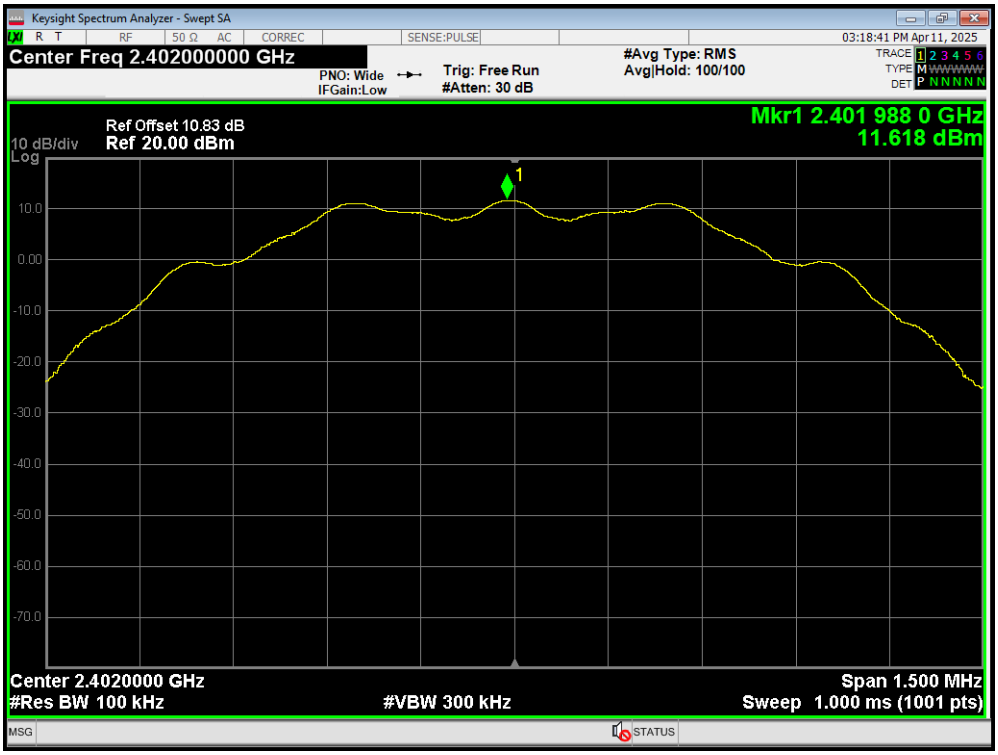


Tx. Spurious Bluetooth LE(S=2) 2480MHz Ref

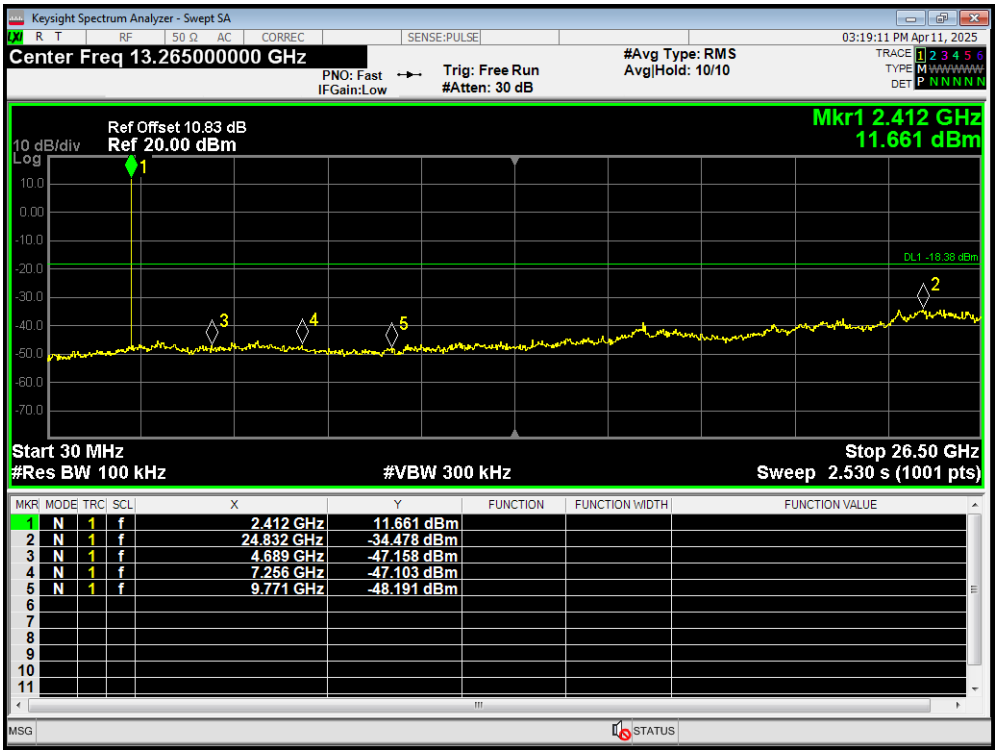
Tx. Spurious Bluetooth LE(S=2) 2480MHz Emission



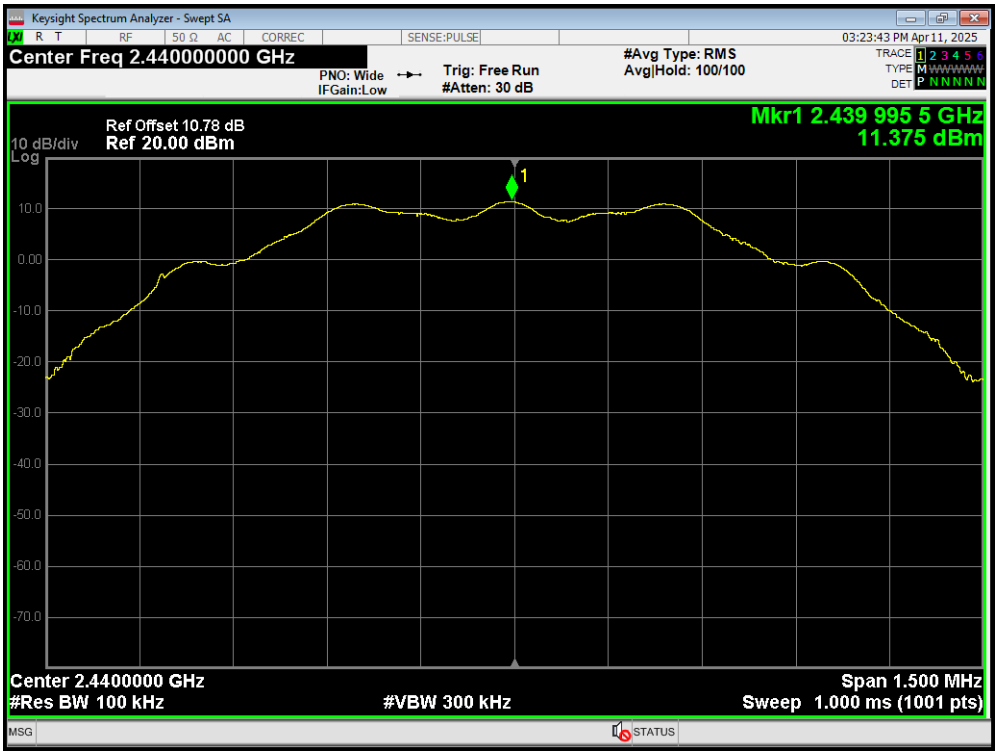
Tx. Spurious Bluetooth LE(S=8) 2402MHz Ref



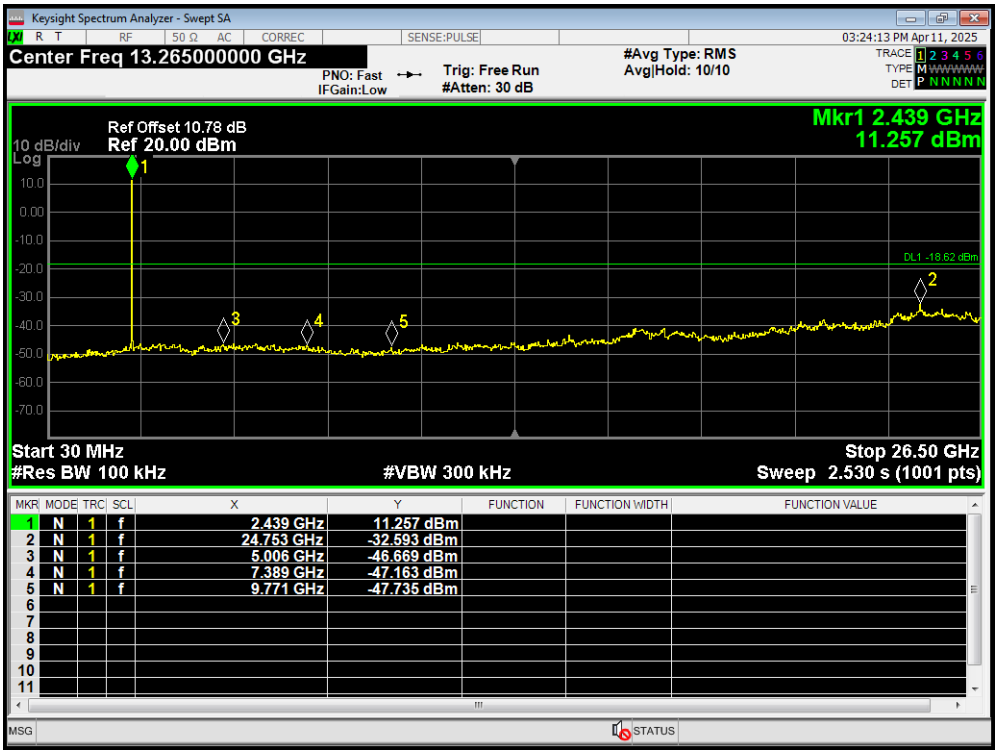
Tx. Spurious Bluetooth LE(S=8) 2402MHz Emission



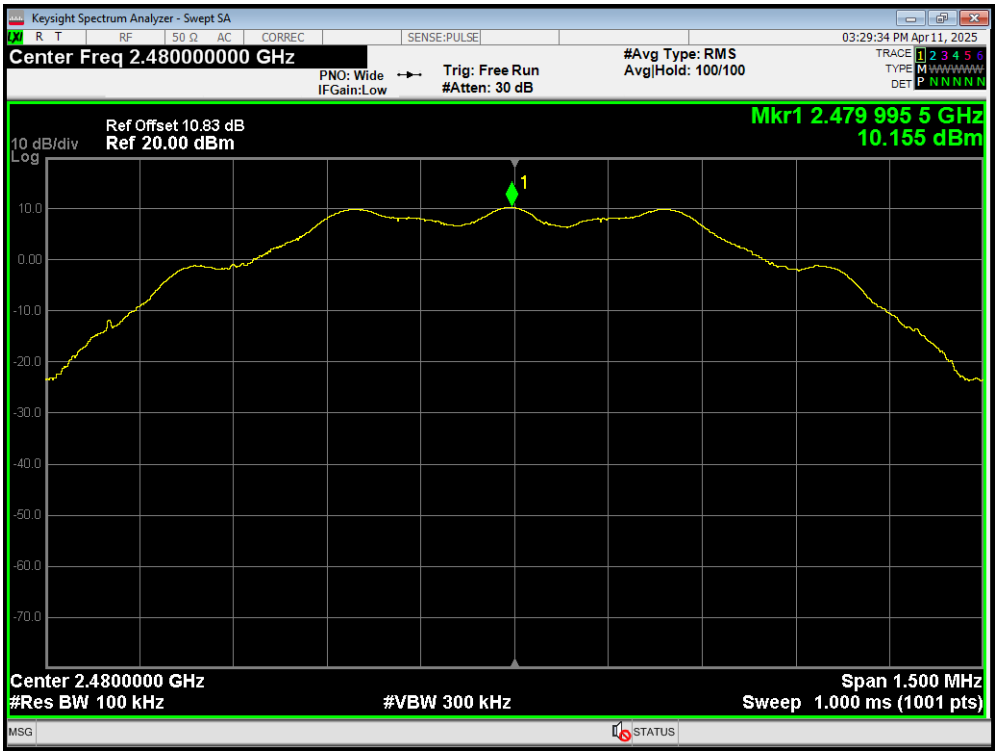
Tx. Spurious Bluetooth LE(S=8) 2440MHz Ref



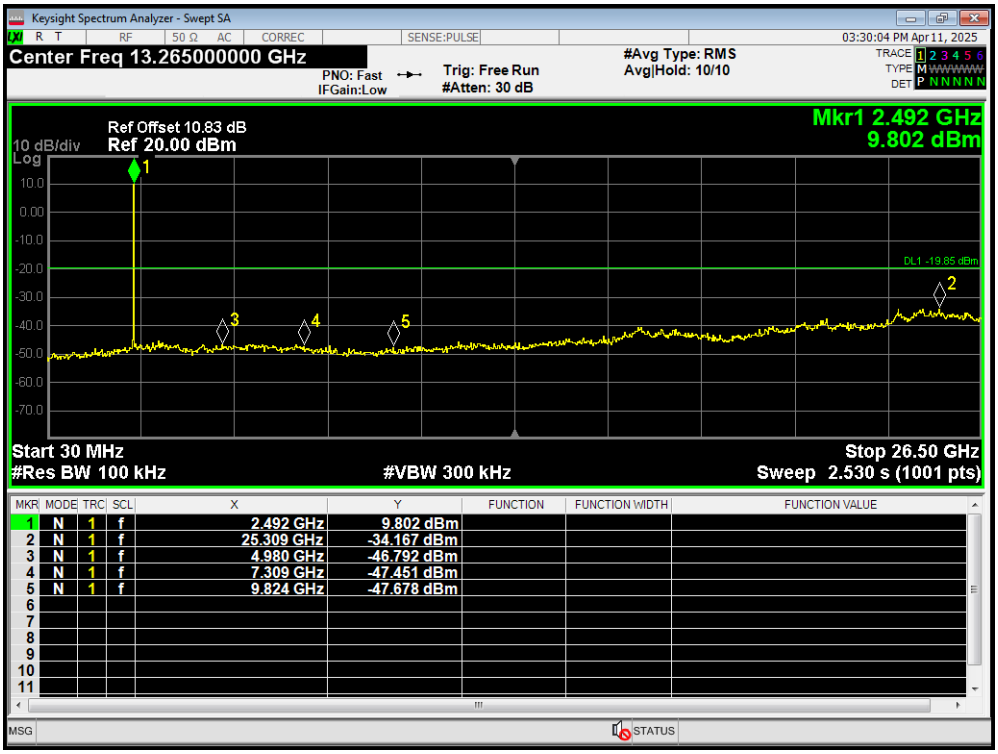
Tx. Spurious Bluetooth LE(S=8) 2440MHz Emission



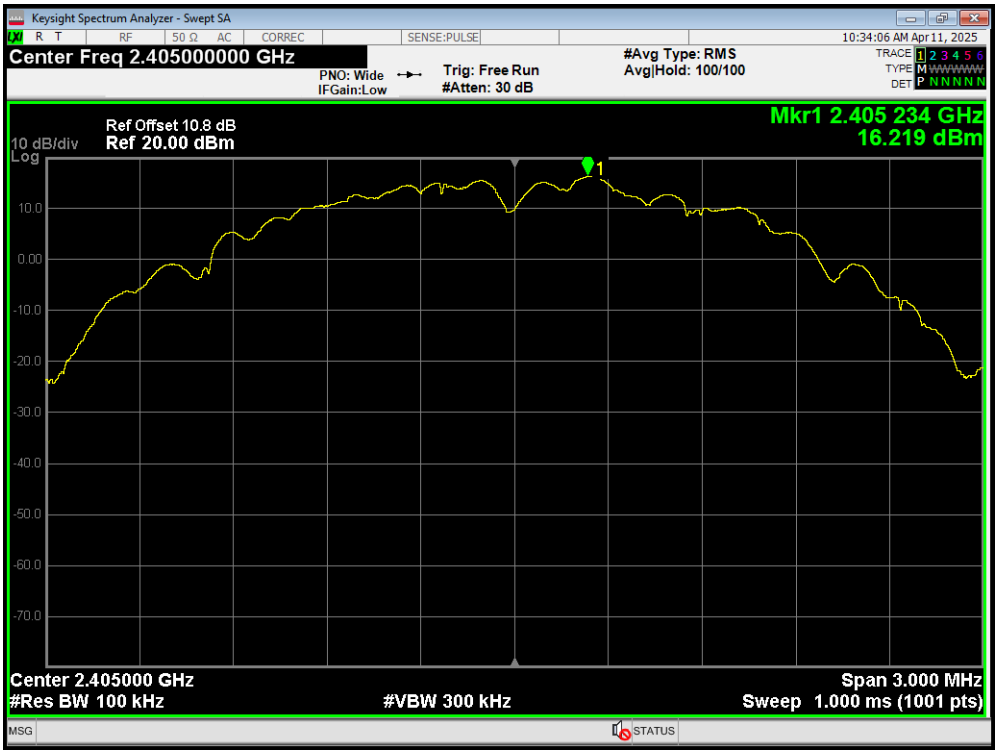
Tx. Spurious Bluetooth LE(S=8) 2480MHz Ref



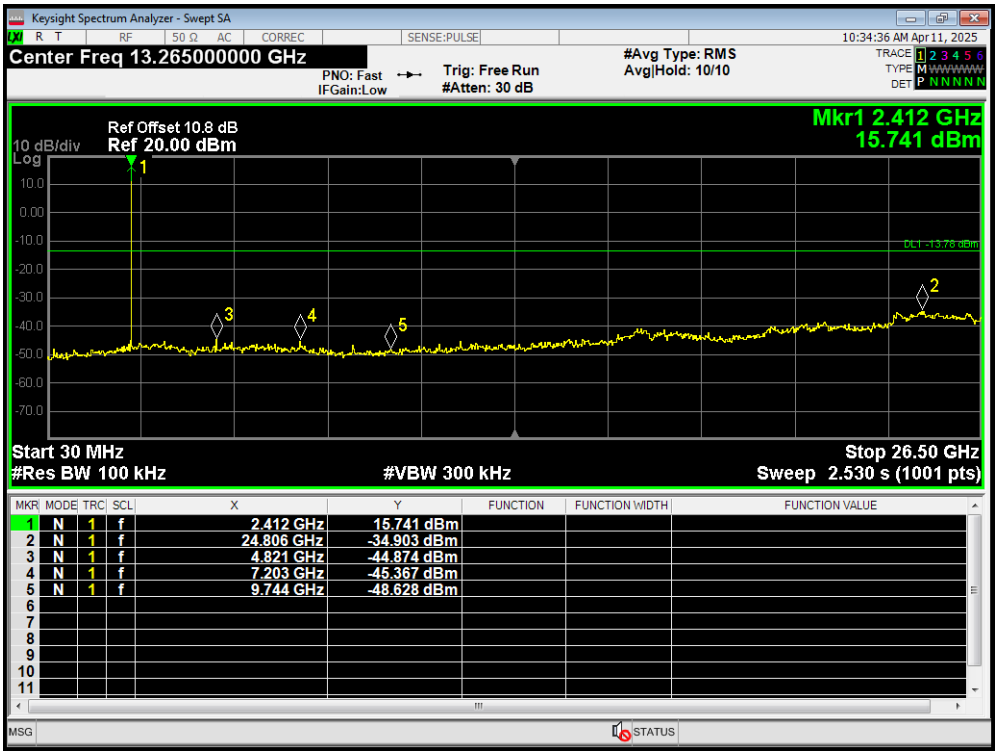
Tx. Spurious Bluetooth LE(S=8) 2480MHz Emission



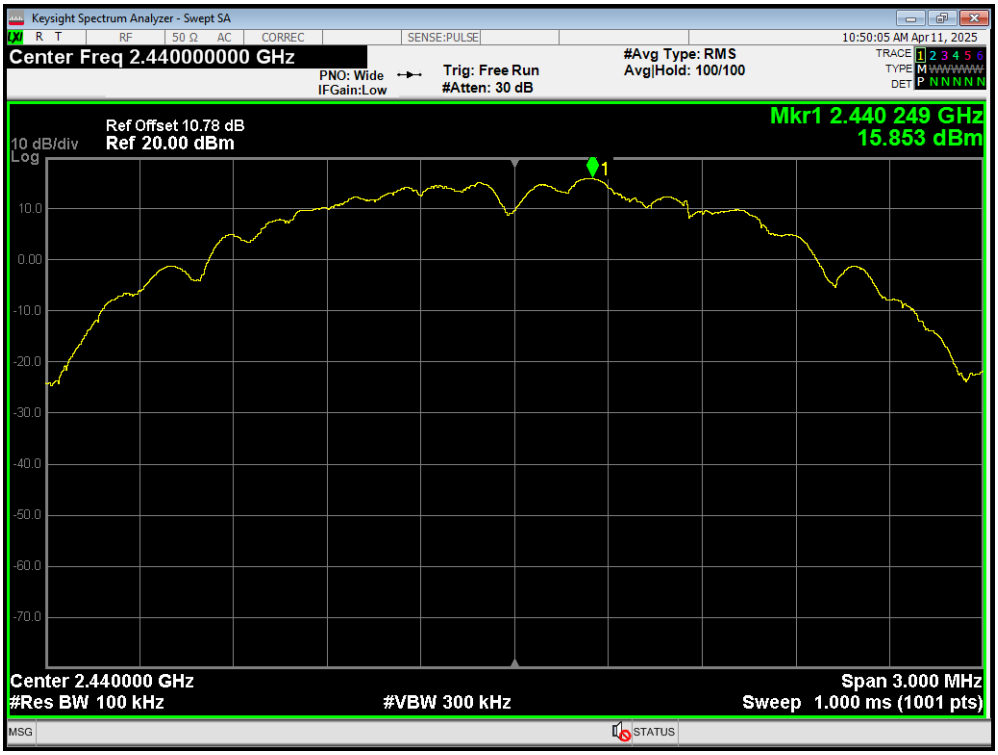
Tx. Spurious Zigbee 2405MHz Ref



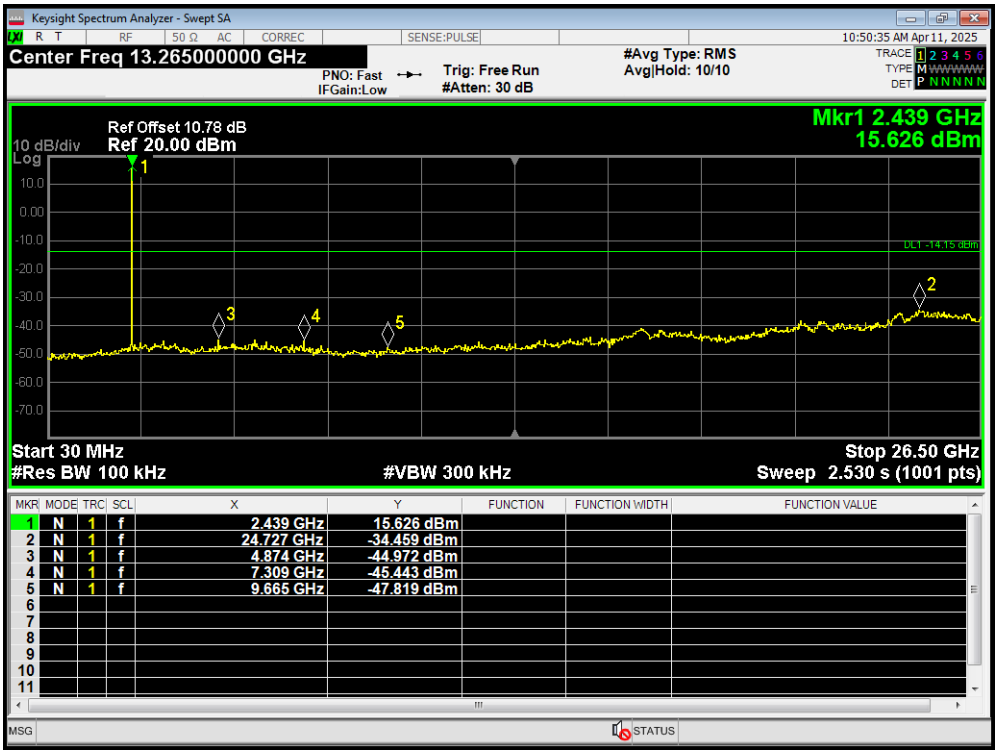
Tx. Spurious Zigbee 2405MHz Emission



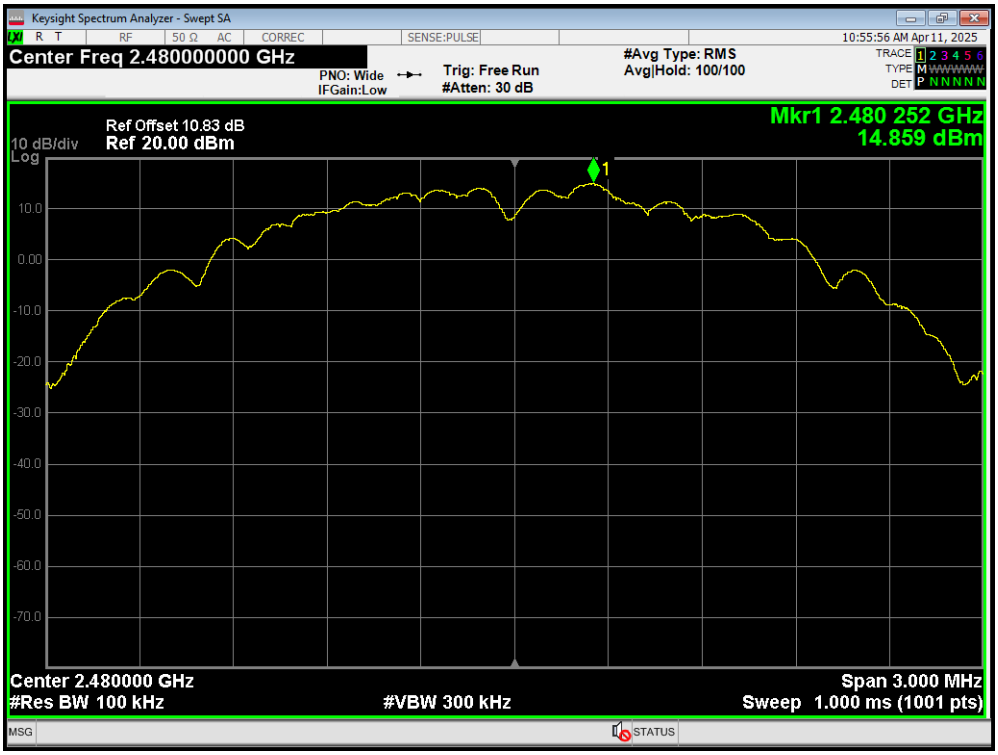
Tx. Spurious Zigbee 2440MHz Ref



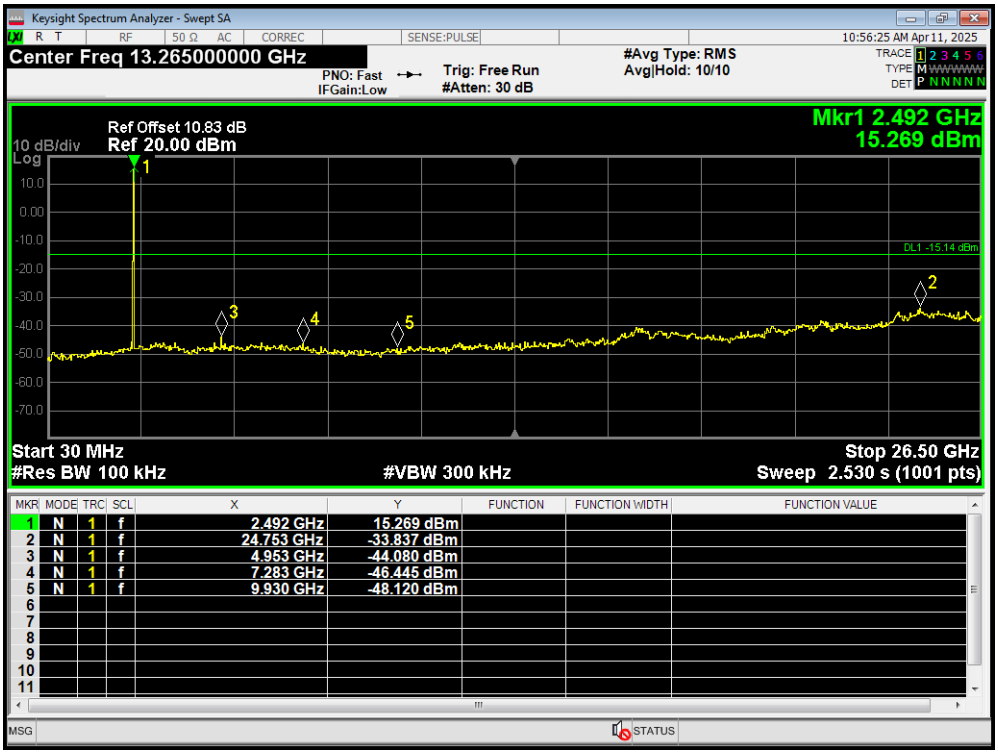
Tx. Spurious Zigbee 2440MHz Emission



Tx. Spurious Zigbee 2480MHz Ref



Tx. Spurious Zigbee 2480MHz Emission



5.6. Unwanted Emission

Ambient Condition

Temperature	Relative humidity
15°C ~ 35°C	20% ~ 80%

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10.
The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna.The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. Sweep the Restricted Band and the emissions less than 20 dB below the permissible value are reported.
The radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

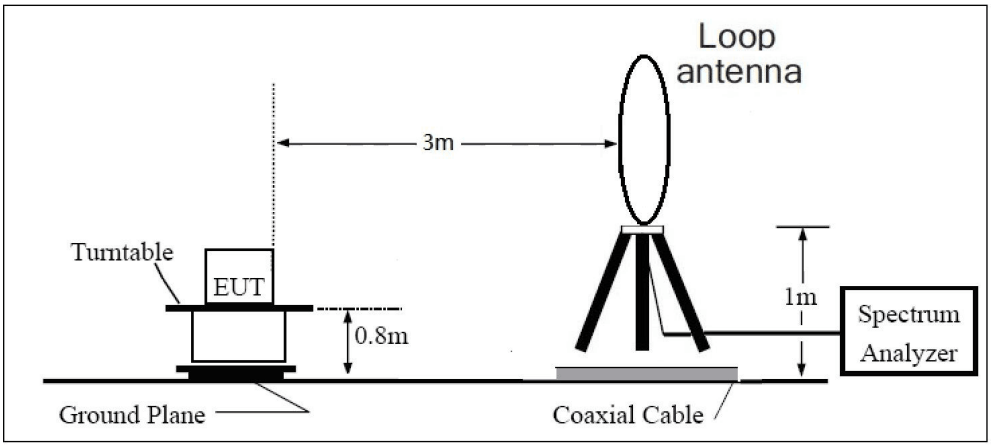
This method refer to ANSI C63.10.
The procedure for peak unwanted emissions measurements above 1000 MHz is as follows:
Set the spectrum analyzer in the following:
9kHz~150 kHz
RBW=200Hz, VBW=1kHz/ Sweep=AUTO
150 kHz~30MHz
RBW=9kHz, VBW=30kHz,/ Sweep=AUTO
Below 1GHz
RBW=100kHz / VBW=300kHz / Sweep=AUTO
a) Peak emission levels are measured by setting the instrument as follows:
Above 1GHz
PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
b) Average emission levels are measured by setting the instrument as follows:
Above 1GHz
AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO
c) Detector: The measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage

averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

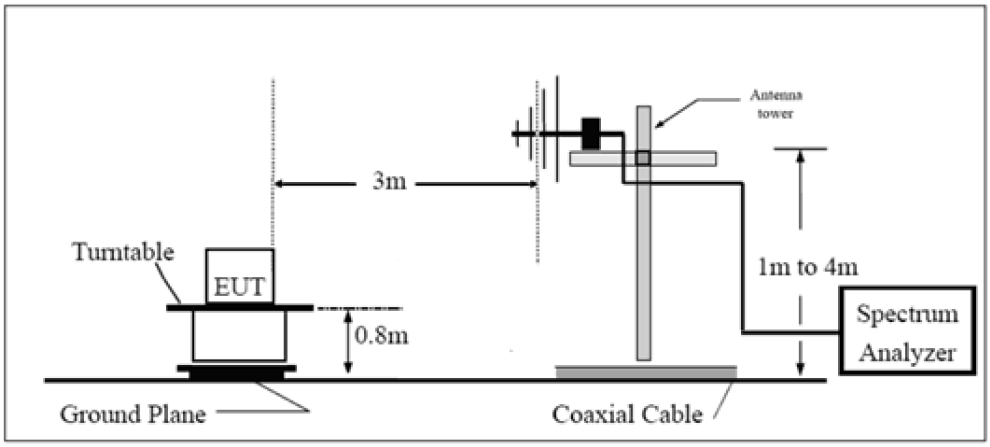
The test is in transmitting mode.

Test Setup

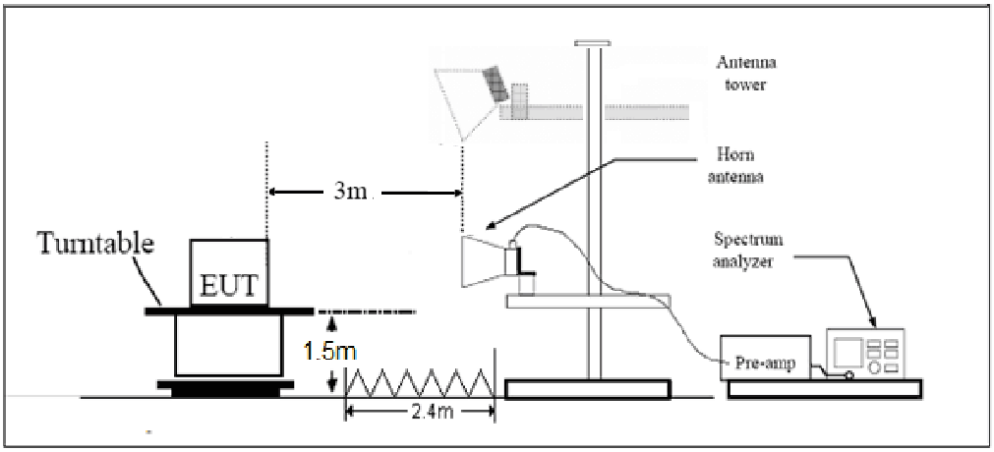
9kHz~ 30MHz



30MHz~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 15.247(d) specifies that “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)).”

Limit in restricted band

Frequency of emission (MHz)	Field strength(μV/m)	Field strength(dBμV/m)
0.009–0.490	2400/F(kHz)	/
0.490–1.705	24000/F(kHz)	/
1.705–30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Peak Limit=74 dBμV/m

Average Limit=54 dBμV/m

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	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	8.025-8.5
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	156.52475-156.52525	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			

Measurement Uncertainty

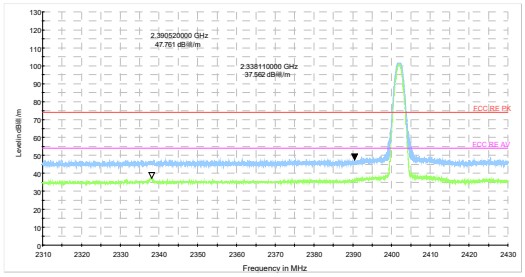
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
9kHz-30MHz	3.55 dB
30MHz-200MHz	4.17 dB
200MHz-1GHz	4.84 dB
1-18GHz	4.35 dB
18-26.5GHz	5.90 dB
26.5GHz~40GHz	5.92 dB

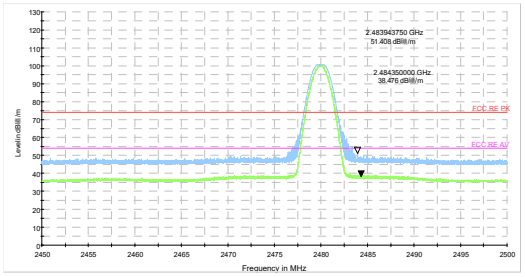
Test Results:

The following graphs display the maximum values of horizontal and vertical by software.
Blue trace uses the peak detection, Green trace uses the average detection.
A symbol (dBµV/m) in the test plot below means (dBµV/m)

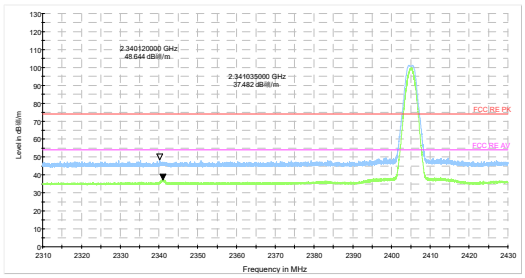
After the pretest, Bluetooth LE (1M) was selected as the worst Mode for Bluetooth LE.



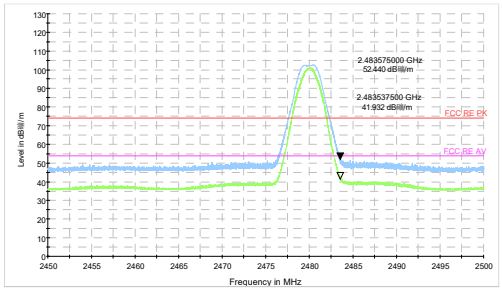
Bluetooth LE (1M) Channel 0 Peak+ Average



Bluetooth LE (1M) Channel 39 Peak+Average



Zigbee Channel 11 Peak+ Average



Zigbee Channel 26 Peak+Average

Result of RE

Test result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier,

The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

Continuous TX mode:

Remark:

1. **Correction Factor = Antenna factor + Insertion loss (cable loss + amplifier gain)**
2. **Margin = Limit – Quasi-Peak/ MAX Peak/ Average**
3. **A symbol (dBµV/m) in the test plot below means (dBµV/m)**
4. **For below 1GHz**

QP Level @Spectrum Overview H QP Level @Spectrum Overview V QP Level @Final Results QP Limit

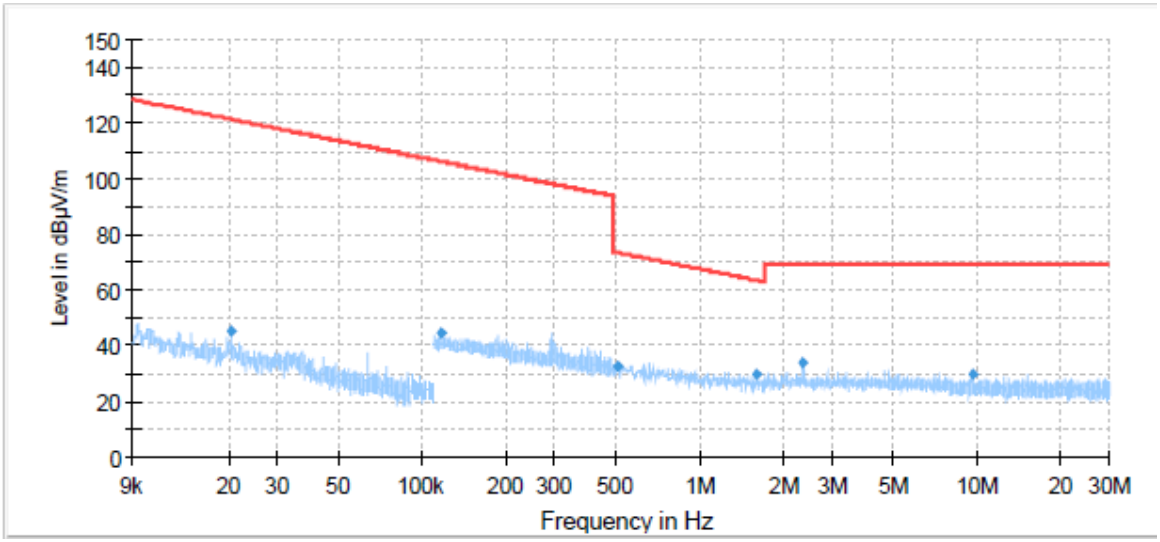
For above 1GHz

PK Level @Spectrum Overview H PK Level @Spectrum Overview V PK Level @Final Results PK Limit

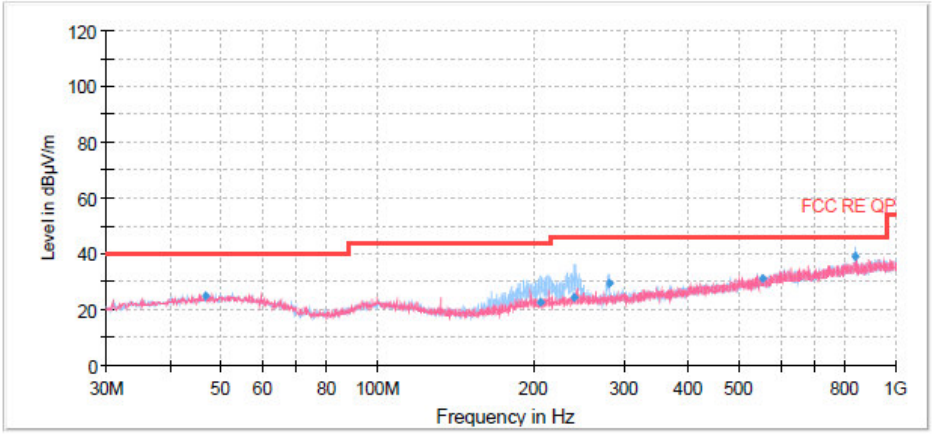
AVG Level @Spectrum Overview H AVG Level @Spectrum Overview V AVG Level @Final Results AVG Limit

Bluetooth LE

During the test, the Radiates Emission from 9kHz to 1GHz was performed in all modes with all channels, Bluetooth LE-Channel 19 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



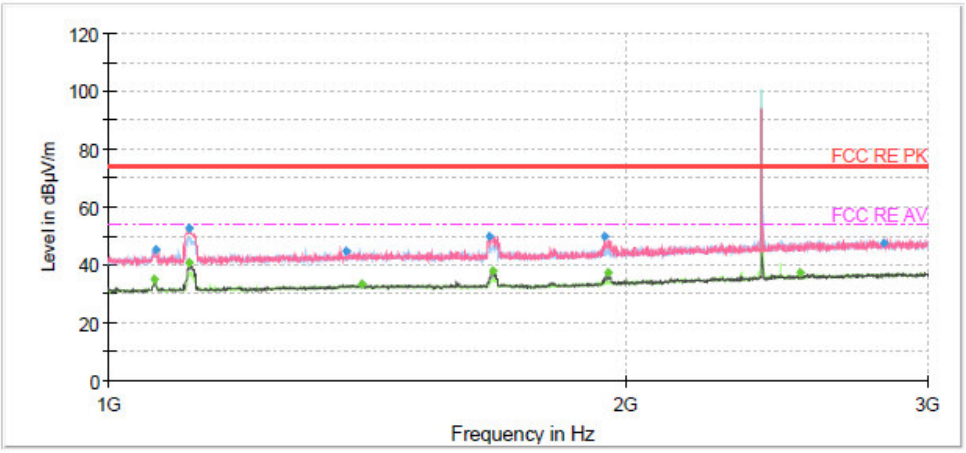
Radiates Emission from 9kHz to 30MHz



Final Result

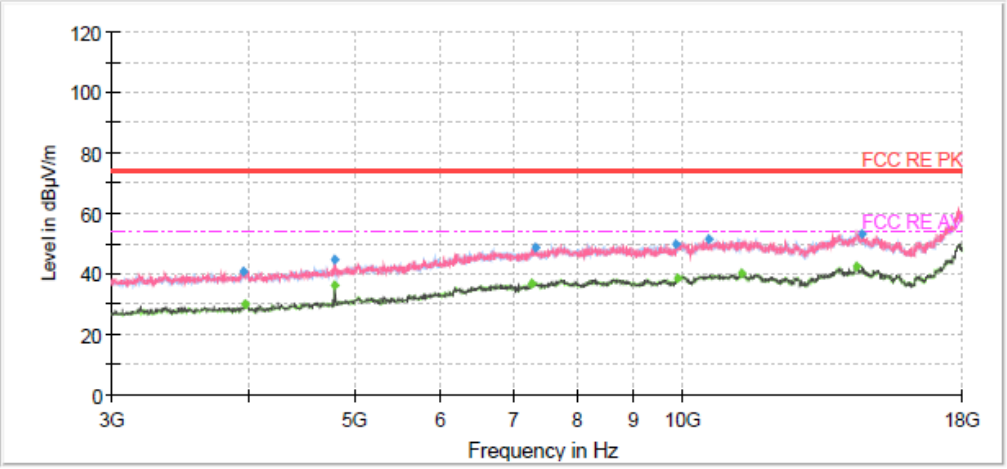
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.73	24.67	40.00	15.33	1000.00	120.000	213.0	H	115.00	20
207.03	22.81	43.50	20.69	1000.00	120.000	185.0	H	1.00	18
240.25	24.29	46.00	21.71	1000.00	120.000	176.0	H	20.00	20
280.14	29.21	46.00	16.79	1000.00	120.000	120.0	H	26.00	20
552.35	30.89	46.00	15.11	1000.00	120.000	112.0	H	28.00	26
834.25	39.09	46.00	6.91	1000.00	120.000	113.0	H	249.00	30

Bluetooth LE-Channel 0



Final Result

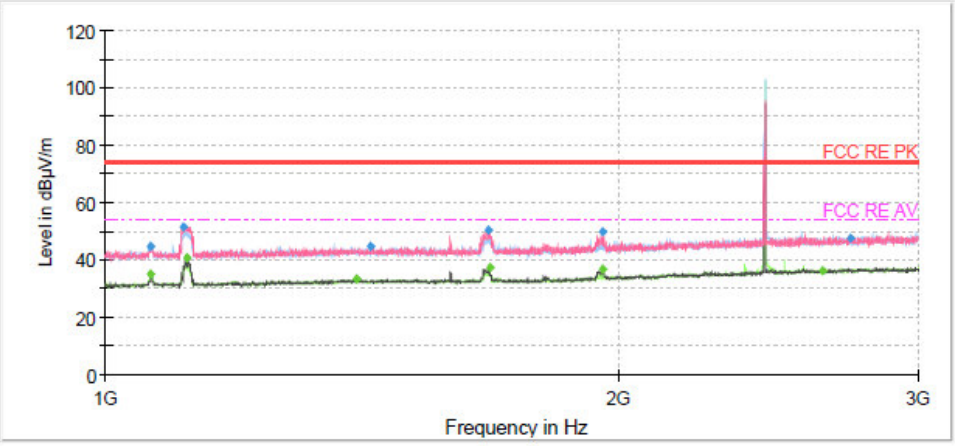
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.00	---	34.98	54.00	19.02	500.00	200.0	H	106.00	-5
1065.50	45.30	---	74.00	28.70	500.00	100.0	V	264.00	-5
1112.75	---	40.80	54.00	13.20	500.00	200.0	V	214.00	-5
1113.25	52.38	---	74.00	21.62	500.00	200.0	V	214.00	-5
1375.00	44.92	---	74.00	29.08	500.00	200.0	V	167.00	-3
1405.75	---	33.44	54.00	20.56	500.00	100.0	V	10.00	-3
1667.25	50.09	---	74.00	23.91	500.00	200.0	V	81.00	-2
1675.25	---	37.86	54.00	16.14	500.00	200.0	V	81.00	-2
1946.75	49.95	---	74.00	24.05	500.00	200.0	V	118.00	0
1952.25	---	37.16	54.00	16.84	500.00	200.0	V	118.00	0
2530.00	---	37.60	54.00	16.40	500.00	100.0	H	259.00	2
2831.00	47.73	---	74.00	26.27	500.00	200.0	H	95.00	3



Final Result

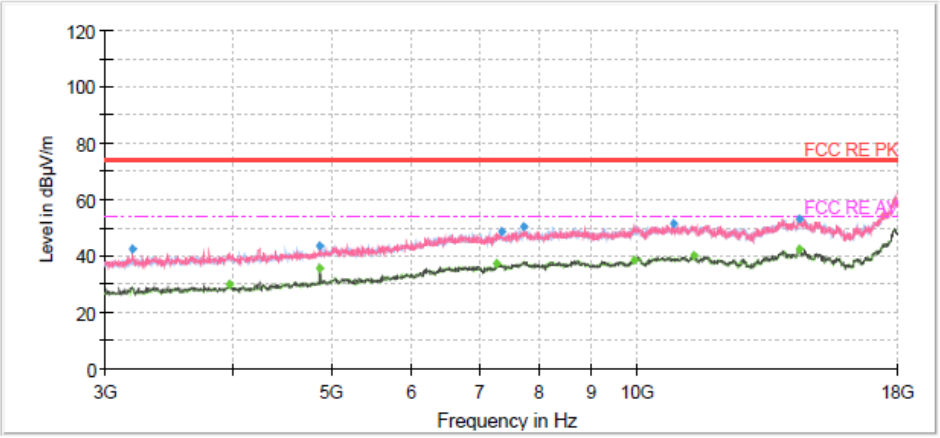
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3963.75	40.83	---	74.00	33.17	500.00	100.0	V	14.00	-4
3965.63	---	29.84	54.00	24.16	500.00	100.0	V	359.00	-3
4803.75	---	36.51	54.00	17.49	500.00	100.0	V	266.00	-2
4803.75	44.51	---	74.00	29.49	500.00	200.0	V	222.00	-2
7276.88	---	37.04	54.00	16.96	500.00	200.0	H	359.00	6
7325.63	48.46	---	74.00	25.54	500.00	100.0	V	313.00	6
9855.00	49.93	---	74.00	24.07	500.00	200.0	V	193.00	7
9898.13	---	38.71	54.00	15.29	500.00	200.0	H	272.00	7
10539.38	51.64	---	74.00	22.36	500.00	100.0	V	238.00	8
11304.38	---	40.15	54.00	13.85	500.00	200.0	V	307.00	9
14426.25	---	42.50	54.00	11.50	500.00	100.0	H	217.00	11
14574.38	53.24	---	74.00	20.76	500.00	200.0	V	222.00	11

Bluetooth LE-Channel 19



Final Result

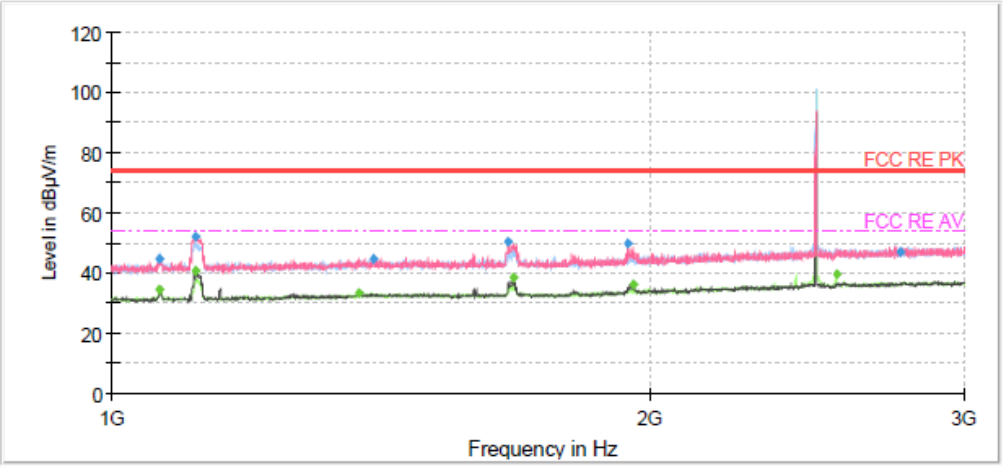
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1061.75	44.98	---	74.00	29.02	500.00	200.0	H	183.00	-5
1062.50	---	34.95	54.00	19.05	500.00	200.0	H	98.00	-5
1110.75	51.73	---	74.00	22.27	500.00	200.0	V	216.00	-5
1116.00	---	40.52	54.00	13.48	500.00	200.0	V	216.00	-5
1403.75	---	33.23	54.00	20.77	500.00	200.0	V	330.00	-3
1432.25	44.57	---	74.00	29.43	500.00	200.0	V	0.00	-3
1677.00	50.22	---	74.00	23.78	500.00	200.0	V	81.00	-2
1680.25	---	37.22	54.00	16.78	500.00	100.0	V	238.00	-2
1959.25	49.78	---	74.00	24.22	500.00	200.0	V	117.00	0
1959.25	---	36.67	54.00	17.33	500.00	200.0	V	117.00	0
2639.00	---	36.02	54.00	17.98	500.00	100.0	H	104.00	2
2735.00	47.77	---	74.00	26.23	500.00	200.0	V	330.00	3



Final Result

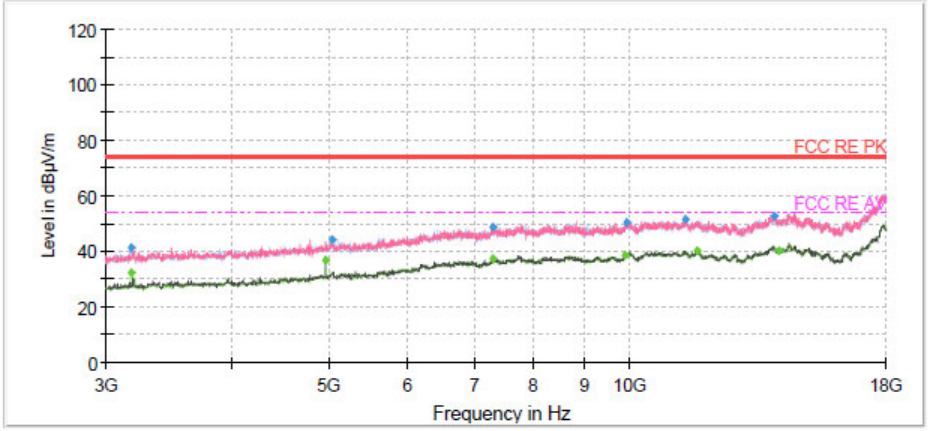
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3191.25	42.24	---	74.00	31.76	500.00	100.0	V	351.00	-6
3965.63	---	29.93	54.00	24.07	500.00	200.0	V	22.00	-3
4878.75	---	35.63	54.00	18.37	500.00	200.0	V	230.00	-1
4878.75	43.51	---	74.00	30.49	500.00	200.0	V	230.00	-1
7275.00	---	37.24	54.00	16.76	500.00	100.0	H	11.00	6
7346.25	48.46	---	74.00	25.54	500.00	200.0	H	330.00	6
7725.00	50.24	---	74.00	23.76	500.00	200.0	V	39.00	7
9901.88	---	38.69	54.00	15.31	500.00	200.0	V	324.00	8
10830.00	51.68	---	74.00	22.32	500.00	200.0	V	105.00	9
11347.50	---	40.33	54.00	13.67	500.00	100.0	V	318.00	9
14394.38	53.45	---	74.00	20.55	500.00	200.0	H	219.00	11
14400.00	---	42.68	54.00	11.32	500.00	200.0	H	266.00	11

Bluetooth LE-Channel 39



Final Result

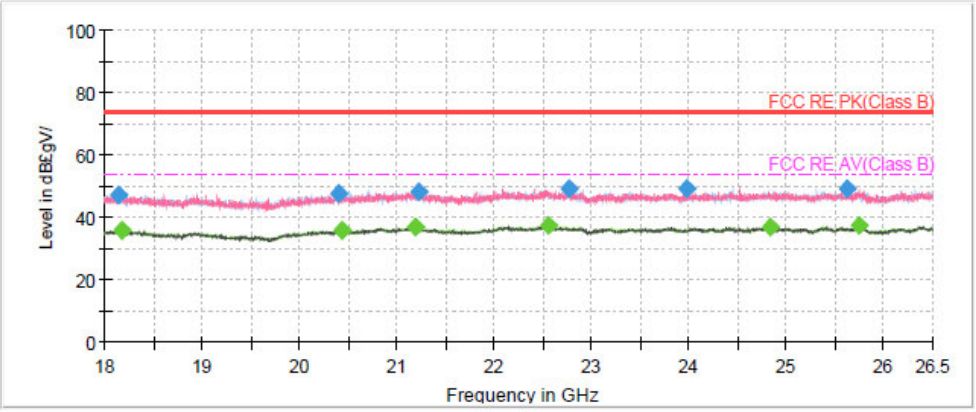
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1062.25	44.85	---	74.00	29.15	500.00	200.0	H	100.00	-5
1062.50	---	34.62	54.00	19.38	500.00	200.0	H	100.00	-5
1114.00	---	40.90	54.00	13.10	500.00	200.0	V	214.00	-5
1114.25	51.86	---	74.00	22.14	500.00	200.0	V	227.00	-5
1376.25	---	33.18	54.00	20.82	500.00	100.0	V	5.00	-3
1402.00	44.50	---	74.00	29.50	500.00	100.0	H	47.00	-3
1667.50	50.42	---	74.00	23.58	500.00	200.0	V	81.00	-2
1676.50	---	38.30	54.00	15.70	500.00	200.0	V	81.00	-2
1946.75	49.57	---	74.00	24.43	500.00	200.0	V	214.00	0
1959.00	---	36.00	54.00	18.00	500.00	200.0	V	227.00	0
2544.25	---	39.43	54.00	14.57	500.00	200.0	H	12.00	2
2765.50	47.22	---	74.00	26.78	500.00	200.0	H	2.00	3



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3180.00	41.49	---	74.00	32.51	500.00	100.0	H	146.00	-6
3183.75	---	32.41	54.00	21.59	500.00	100.0	H	146.00	-6
4959.38	---	37.00	54.00	17.00	500.00	100.0	V	231.00	-1
5047.50	44.06	---	74.00	29.94	500.00	200.0	V	23.00	0
7278.75	---	37.46	54.00	16.54	500.00	100.0	H	42.00	6
7282.50	48.54	---	74.00	25.46	500.00	100.0	V	357.00	6
9896.25	---	38.62	54.00	15.38	500.00	100.0	V	316.00	7
9901.88	50.22	---	74.00	23.78	500.00	100.0	V	316.00	8
11355.00	51.34	---	74.00	22.66	500.00	100.0	V	346.00	9
11668.13	---	40.18	54.00	13.82	500.00	100.0	H	9.00	9
13906.88	52.73	---	74.00	21.27	500.00	100.0	H	52.00	11
14049.38	---	40.43	54.00	13.57	500.00	100.0	H	71.00	11

During the test, the Radiates Emission from 18GHz to 26.5GHz was performed in all modes with all channels, Bluetooth LE-Channel 19 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

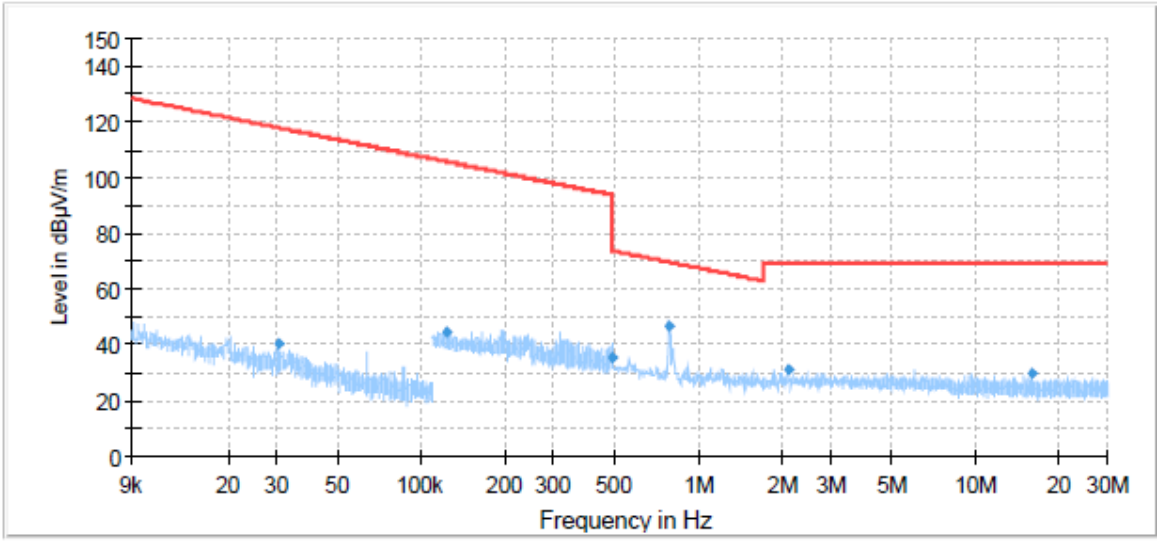


Final_Result

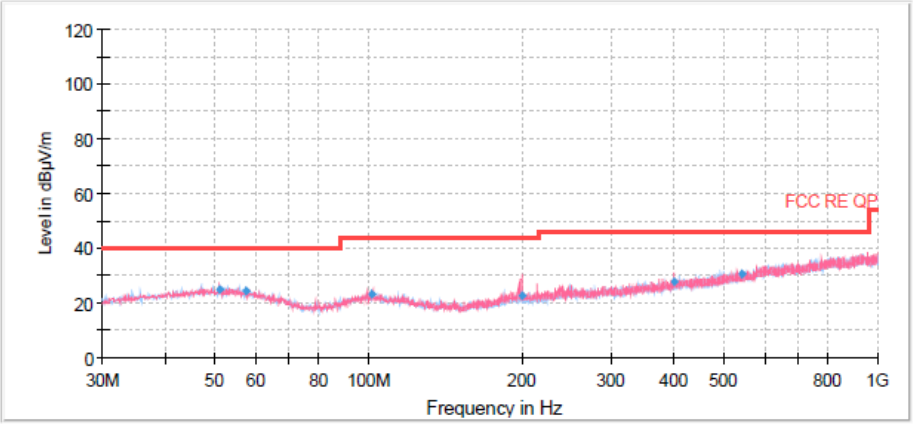
Frequency (MHz)	MaxPeak (dBµgV/m)	Average (dBµgV/m)	Limit (dBµgV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18147.687500	47.30	---	74.00	26.70	500.0	100.0	V	319.0	-5.8
18180.625000	---	35.80	54.00	18.20	500.0	100.0	H	7.0	-5.8
20397.000000	47.80	---	74.00	26.20	500.0	200.0	V	32.0	-5.2
20439.500000	---	35.69	54.00	18.31	500.0	100.0	V	128.0	-5.0
21182.187500	---	36.83	54.00	17.17	500.0	200.0	H	102.0	-4.3
21225.750000	48.35	---	74.00	25.65	500.0	100.0	H	54.0	-4.4
22552.812500	---	37.33	54.00	16.67	500.0	100.0	H	76.0	-3.4
22763.187500	49.23	---	74.00	24.77	500.0	100.0	V	324.0	-3.5
23979.750000	49.19	---	74.00	24.81	500.0	200.0	V	14.0	-3.3
24830.812500	---	37.02	54.00	16.98	500.0	100.0	V	210.0	-2.8
25631.937500	49.22	---	74.00	24.78	500.0	200.0	H	221.0	-2.4
25746.687500	---	37.23	54.00	16.77	500.0	100.0	H	39.0	-2.4

Zigbee

During the test, the Radiates Emission from 9kHz to 1GHz was performed in all modes with all channels, Zigbee -Channel 26 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



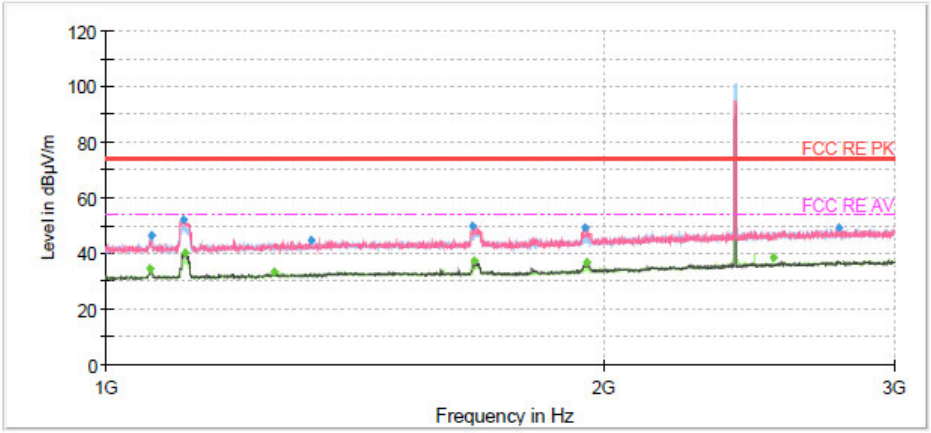
Radiates Emission from 9kHz to 30MHz



Final Result

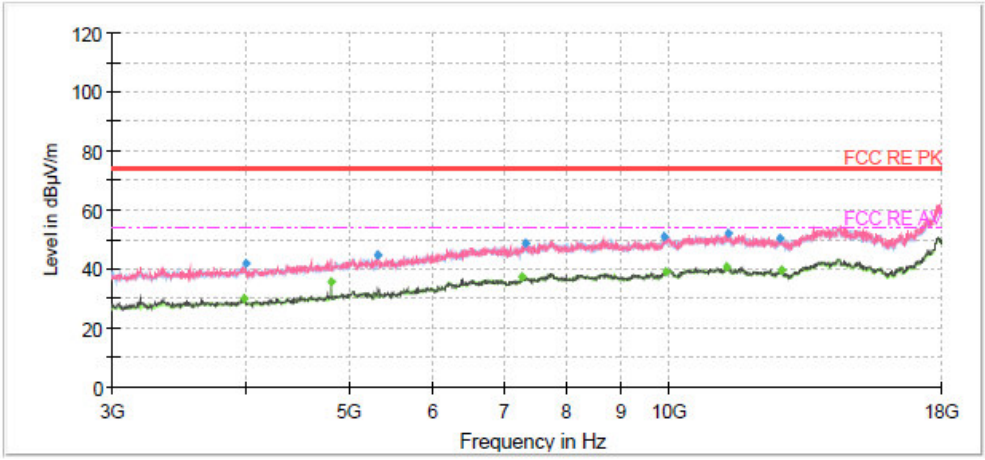
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
51.10	24.77	40.00	15.23	1000.00	120.000	193.0	V	317.00	20
57.65	24.07	40.00	15.93	1000.00	120.000	223.0	H	318.00	19
101.42	23.01	43.50	20.49	1000.00	120.000	210.0	H	258.00	19
199.87	22.76	43.50	20.74	1000.00	120.000	118.0	V	23.00	18
398.24	27.57	46.00	18.43	1000.00	120.000	104.0	V	43.00	23
539.98	30.74	46.00	15.26	1000.00	120.000	122.0	V	1.00	26

Zigbee -Channel 11



Final Result

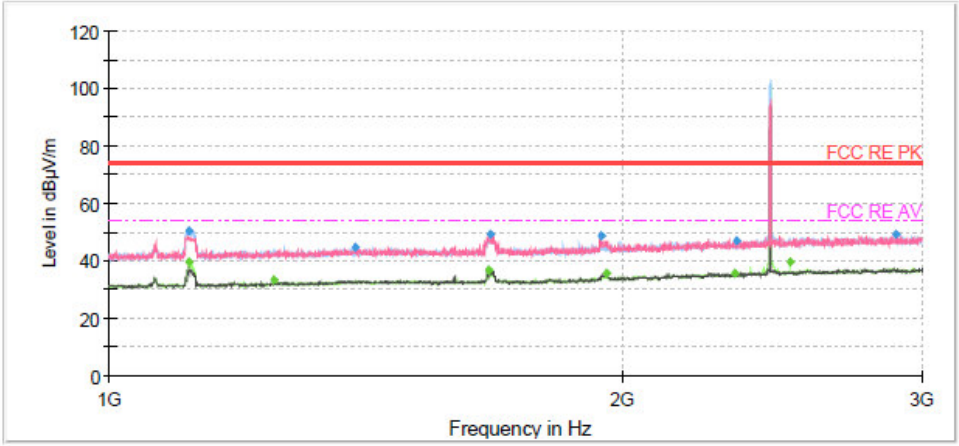
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.75	---	34.71	54.00	19.29	500.00	200.0	H	105.00	-5
1066.50	46.69	---	74.00	27.31	500.00	200.0	H	182.00	-5
1112.50	52.05	---	74.00	21.95	500.00	200.0	V	221.00	-5
1115.50	---	40.13	54.00	13.87	500.00	200.0	V	213.00	-5
1264.50	---	33.36	54.00	20.64	500.00	200.0	H	208.00	-4
1330.25	44.52	---	74.00	29.48	500.00	100.0	H	356.00	-3
1668.25	49.89	---	74.00	24.11	500.00	200.0	V	75.00	-2
1671.00	---	37.19	54.00	16.81	500.00	200.0	V	75.00	-2
1947.75	49.25	---	74.00	24.75	500.00	200.0	V	119.00	0
1953.25	---	36.84	54.00	17.16	500.00	200.0	V	119.00	0
2533.00	---	38.29	54.00	15.71	500.00	100.0	H	201.00	2
2778.00	48.98	---	74.00	25.02	500.00	200.0	H	23.00	3



Final Result

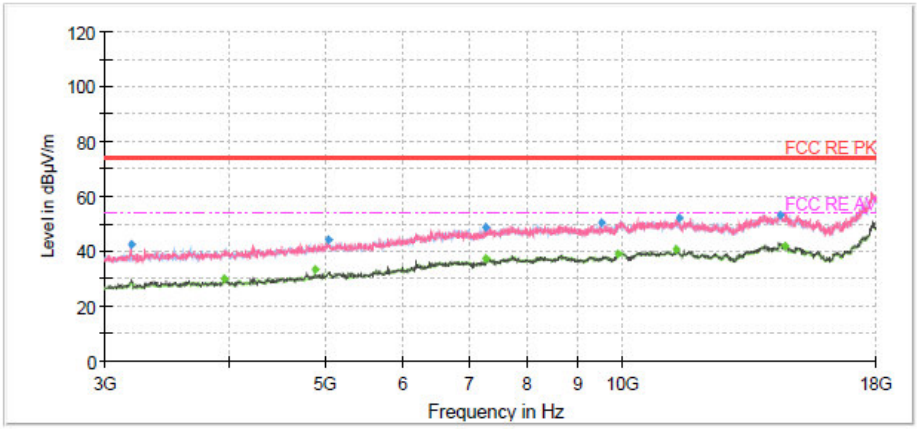
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3982.50	---	30.21	54.00	23.79	500.00	200.0	V	117.00	-4
3999.38	41.91	---	74.00	32.09	500.00	200.0	V	161.00	-4
4809.38	---	35.86	54.00	18.14	500.00	100.0	V	254.00	-2
5311.88	44.58	---	74.00	29.42	500.00	100.0	V	245.00	0
7275.00	---	37.57	54.00	16.43	500.00	200.0	V	34.00	6
7323.75	48.57	---	74.00	25.43	500.00	200.0	V	0.00	6
9885.00	50.96	---	74.00	23.04	500.00	100.0	H	4.00	7
9900.00	---	39.24	54.00	14.76	500.00	100.0	V	226.00	7
11317.50	---	40.96	54.00	13.04	500.00	100.0	V	150.00	9
11349.38	52.07	---	74.00	21.93	500.00	100.0	H	48.00	9
12703.13	50.54	---	74.00	23.46	500.00	100.0	V	359.00	9
12750.00	---	39.72	54.00	14.28	500.00	100.0	V	0.00	9

Zigbee -Channel 19



Final Result

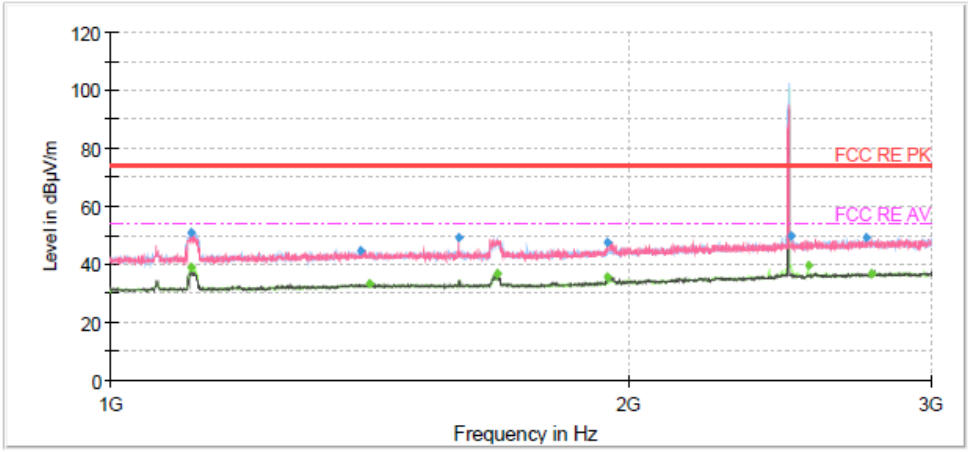
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1113.25	50.54	---	74.00	23.46	500.00	200.0	H	41.00	-5
1114.00	---	39.57	54.00	14.43	500.00	200.0	H	49.00	-5
1249.25	---	33.37	54.00	20.64	500.00	200.0	H	116.00	-4
1394.00	44.50	---	74.00	29.50	500.00	200.0	V	210.00	-3
1669.75	---	36.94	54.00	17.06	500.00	200.0	V	219.00	-2
1673.25	48.98	---	74.00	25.02	500.00	200.0	V	82.00	-2
1946.00	48.84	---	74.00	25.16	500.00	200.0	V	133.00	0
1959.75	---	35.78	54.00	18.22	500.00	200.0	V	116.00	0
2331.00	---	35.43	54.00	18.57	500.00	200.0	H	305.00	1
2335.25	47.03	---	74.00	26.97	500.00	200.0	H	90.00	1
2509.25	---	39.82	54.00	14.18	500.00	100.0	H	198.00	2
2895.00	49.05	---	74.00	24.95	500.00	100.0	V	0.00	3



Final Result

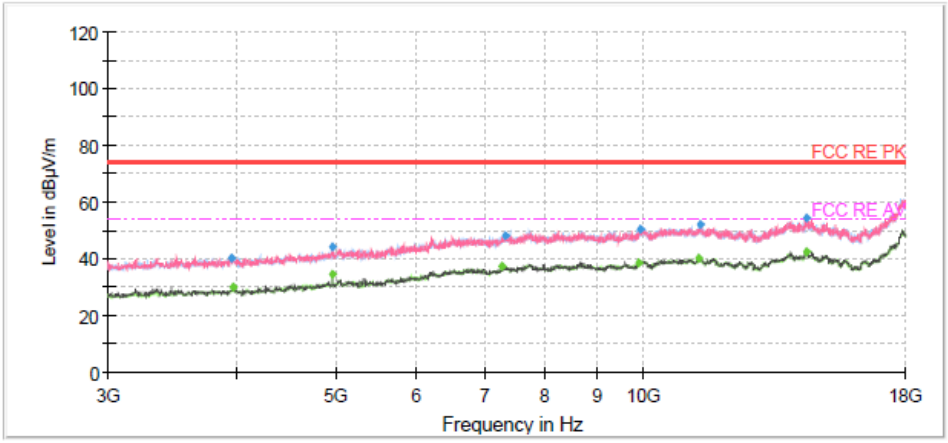
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3185.63	42.56	---	74.00	31.44	500.00	100.0	V	359.00	-6
3963.75	---	30.08	54.00	23.92	500.00	100.0	V	336.00	-4
4890.00	---	33.48	54.00	20.52	500.00	100.0	V	254.00	-1
5047.50	43.90	---	74.00	30.10	500.00	200.0	H	157.00	0
7267.50	48.94	---	74.00	25.07	500.00	200.0	H	266.00	6
7275.00	---	37.30	54.00	16.70	500.00	200.0	H	355.00	6
9511.88	50.12	---	74.00	23.88	500.00	100.0	H	81.00	7
9894.38	---	38.78	54.00	15.22	500.00	100.0	V	254.00	7
11313.75	---	40.59	54.00	13.41	500.00	100.0	V	343.00	9
11407.50	52.12	---	74.00	21.88	500.00	100.0	H	251.00	9
14424.38	53.37	---	74.00	20.63	500.00	100.0	V	282.00	11
14544.38	---	41.77	54.00	12.23	500.00	100.0	V	356.00	11

Zigbee-Channel 26



Final Result

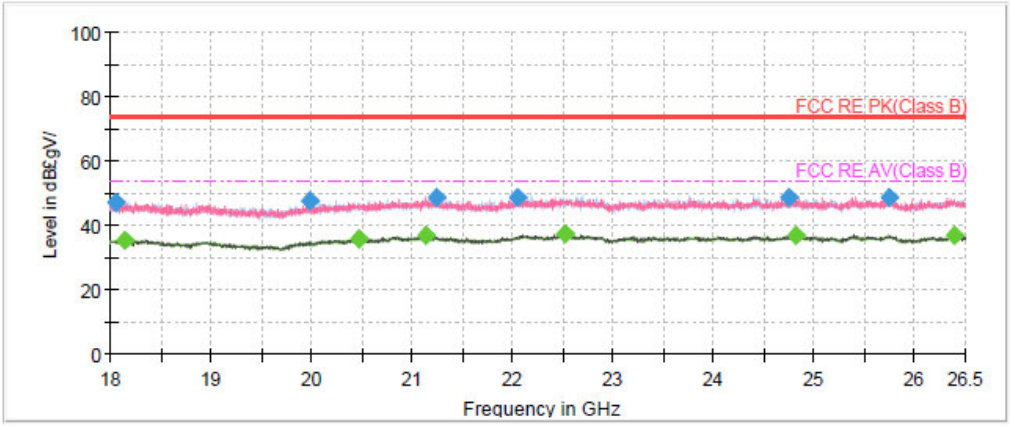
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1114.00	---	39.33	54.00	14.67	500.00	200.0	H	38.00	-5
1115.00	50.79	---	74.00	23.21	500.00	200.0	H	38.00	-5
1397.75	44.86	---	74.00	29.14	500.00	100.0	V	11.00	-3
1415.25	---	33.32	54.00	20.68	500.00	200.0	H	18.00	-3
1594.00	49.07	---	74.00	24.93	500.00	200.0	V	172.00	-2
1679.25	---	37.02	54.00	16.98	500.00	200.0	V	223.00	-2
1945.50	47.72	---	74.00	26.28	500.00	200.0	V	250.00	0
1947.25	---	35.54	54.00	18.46	500.00	200.0	V	125.00	0
2486.50	49.71	---	74.00	24.29	500.00	100.0	H	200.00	2
2544.00	---	39.37	54.00	14.63	500.00	100.0	H	291.00	2
2749.00	49.27	---	74.00	24.73	500.00	200.0	H	72.00	3
2769.25	---	36.61	54.00	17.39	500.00	200.0	H	190.00	3



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3963.75	40.36	---	74.00	33.64	500.00	100.0	V	223.00	-4
3965.63	---	29.96	54.00	24.04	500.00	200.0	V	71.00	-3
4959.38	---	34.69	54.00	19.31	500.00	100.0	V	242.00	-1
4959.38	43.99	---	74.00	30.01	500.00	200.0	V	242.00	-1
7275.00	---	37.27	54.00	16.73	500.00	200.0	V	252.00	6
7308.75	48.12	---	74.00	25.88	500.00	200.0	V	6.00	6
9898.13	---	38.59	54.00	15.41	500.00	200.0	V	0.00	7
9901.88	50.32	---	74.00	23.68	500.00	200.0	H	351.00	8
11317.50	---	40.15	54.00	13.85	500.00	100.0	V	129.00	9
11343.75	52.25	---	74.00	21.75	500.00	200.0	H	6.00	9
14407.50	54.49	---	74.00	19.51	500.00	200.0	V	44.00	11
14426.25	---	42.47	54.00	11.53	500.00	100.0	H	241.00	11

During the test, the Radiates Emission from 18GHz to 26.5GHz was performed in all modes with all channels, Zigbee -Channel 26 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



Final_Result

Frequency (MHz)	MaxPeak (dB£gV/m)	Average (dB£gV/m)	Limit (dB£gV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18053.125000	47.41	---	74.00	26.59	500.0	100.0	V	335.0	-5.7
18139.187500	---	35.48	54.00	18.52	500.0	200.0	H	257.0	-5.8
19989.000000	47.48	---	74.00	26.52	500.0	100.0	V	74.0	-6.4
20471.375000	---	35.70	54.00	18.30	500.0	100.0	H	0.0	-4.8
21137.562500	---	36.70	54.00	17.30	500.0	100.0	V	312.0	-4.2
21239.562500	48.86	---	74.00	25.14	500.0	100.0	H	123.0	-4.4
22056.625000	48.80	---	74.00	25.20	500.0	100.0	H	76.0	-3.8
22529.437500	---	37.20	54.00	16.80	500.0	100.0	V	348.0	-3.4
24746.875000	48.81	---	74.00	25.19	500.0	200.0	H	353.0	-2.7
24820.187500	---	36.82	54.00	17.18	500.0	100.0	H	152.0	-2.7
25753.062500	48.82	---	74.00	25.18	500.0	100.0	V	180.0	-2.4
26396.937500	---	37.09	54.00	16.91	500.0	100.0	V	32.0	-2.2

5.7. Conducted Emission

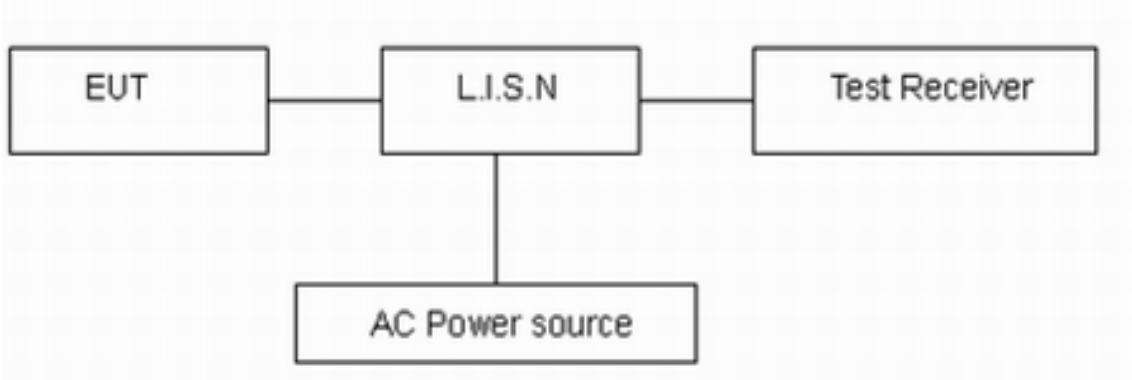
Ambient Condition

Temperature	Relative humidity
15°C ~ 35°C	20% ~ 80%

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz.
The measurement result should include both L line and N line.
The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage 120V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

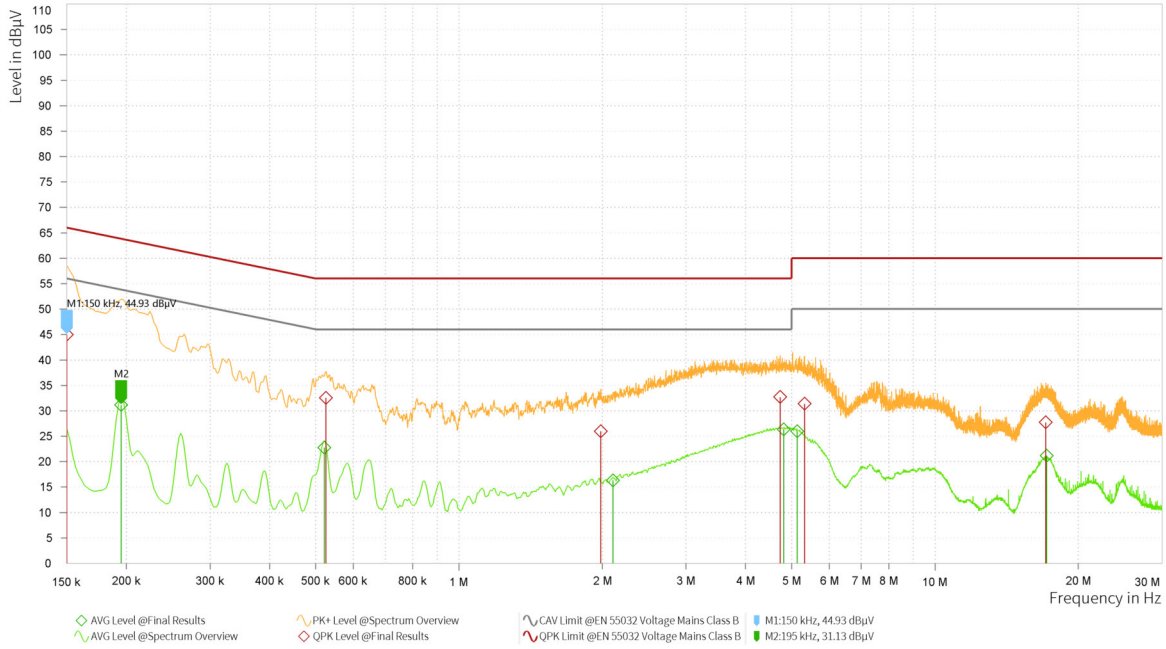
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 2.69 dB.

Test Results:

Bluetooth LE

During the test, the Conducted Emission was performed in all modes with all channels, Bluetooth LE-Channel 19 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

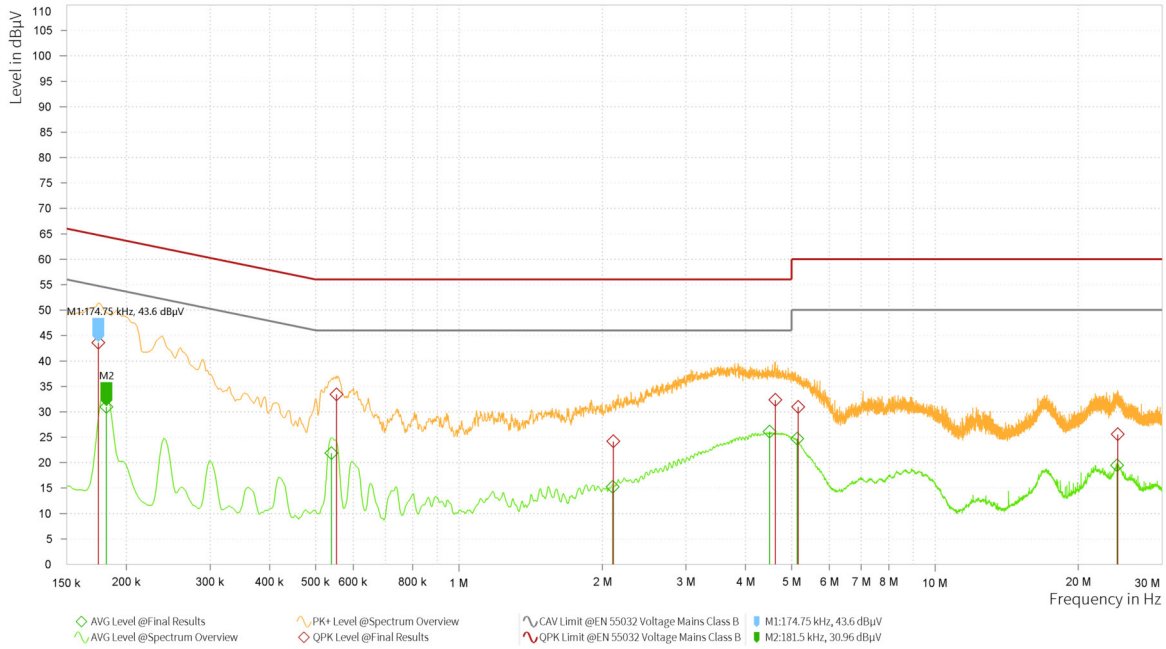


EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0.150	44.93	66.00	21.07				20.90	L1	9.000	1.000
1	0.195				31.13	53.82	22.70	21.02	L1	9.000	1.000
1	0.521				22.75	46.00	23.25	20.76	L1	9.000	1.000
1	0.526	32.55	56.00	23.45				20.75	L1	9.000	1.000
1	1.986	25.96	56.00	30.04				19.65	L1	9.000	1.000
1	2.108				16.29	46.00	29.71	19.62	L1	9.000	1.000
1	4.727	32.70	56.00	23.30				19.41	L1	9.000	1.000
1	4.814				26.34	46.00	19.66	19.40	L1	9.000	1.000
1	5.132				25.96	50.00	24.04	19.40	L1	9.000	1.000
1	5.318	31.36	60.00	28.64				19.40	L1	9.000	1.000
1	17.077	27.70	60.00	32.30				19.57	L1	9.000	1.000
1	17.178				21.18	50.00	28.82	19.57	L1	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

L line Conducted Emission from 150 kHz to 30 MHz



EMI Final Results

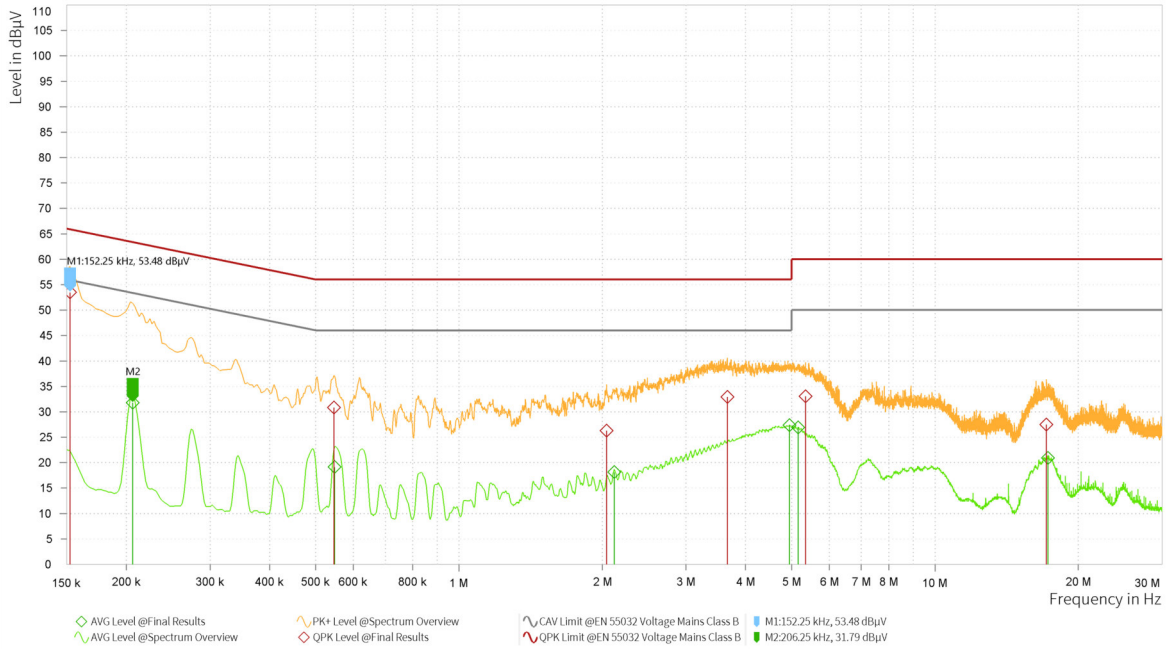
Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0.175	43.60	64.73	21.13				21.04	N	9.000	1.000
1	0.182				30.96	54.42	23.46	21.04	N	9.000	1.000
1	0.539				21.86	46.00	24.14	20.75	N	9.000	1.000
1	0.553	33.42	56.00	22.58				20.73	N	9.000	1.000
1	2.103				15.23	46.00	30.77	19.63	N	9.000	1.000
1	2.110	24.16	56.00	31.84				19.63	N	9.000	1.000
1	4.493				26.08	46.00	19.92	19.42	N	9.000	1.000
1	4.619	32.31	56.00	23.69				19.42	N	9.000	1.000
1	5.132				24.70	50.00	25.30	19.41	N	9.000	1.000
1	5.163	30.97	60.00	29.03				19.41	N	9.000	1.000
1	24.115				19.47	50.00	30.53	19.85	N	9.000	1.000
1	24.194	25.55	60.00	34.45				19.85	N	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 kHz to 30 MHz

Zigbee

During the test, the Conducted Emission was performed in all modes with all channels, Channel 26 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

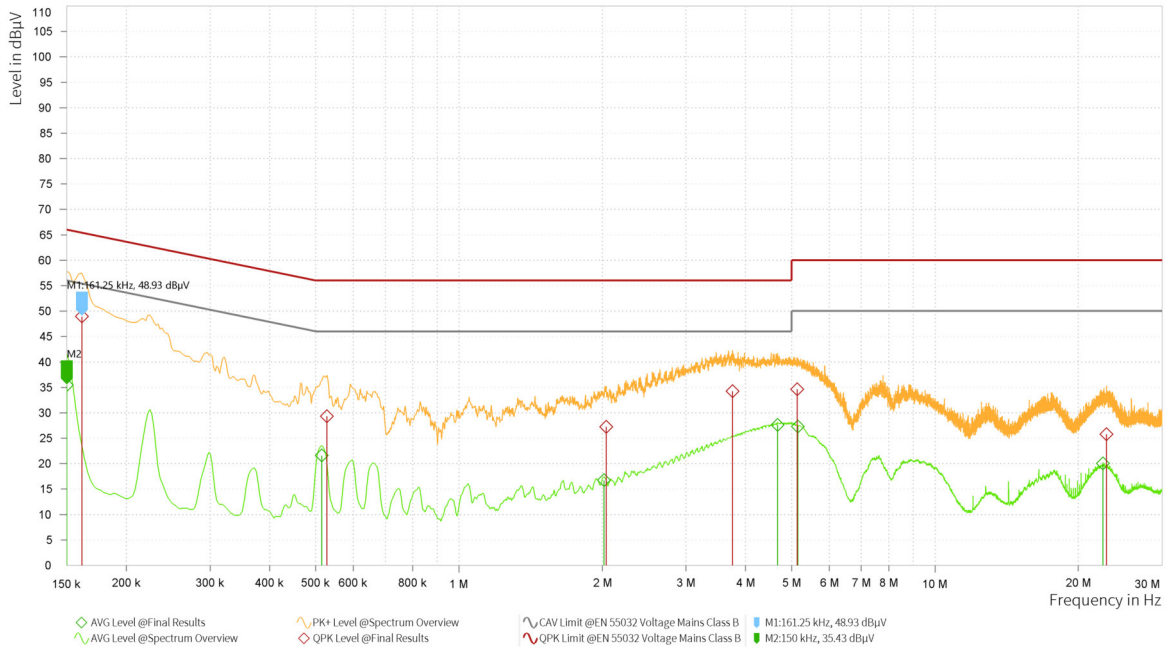


EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0.152	53.48	65.88	12.40				20.90	L1	9.000	1.000
1	0.206				31.79	53.35	21.56	21.01	L1	9.000	1.000
1	0.546	30.83	56.00	25.17				20.73	L1	9.000	1.000
1	0.548				19.13	46.00	26.87	20.73	L1	9.000	1.000
1	2.042	26.29	56.00	29.71				19.64	L1	9.000	1.000
1	2.119				18.10	46.00	27.90	19.62	L1	9.000	1.000
1	3.662	32.90	56.00	23.10				19.44	L1	9.000	1.000
1	4.947				27.36	46.00	18.64	19.40	L1	9.000	1.000
1	5.161				26.91	50.00	23.09	19.40	L1	9.000	1.000
1	5.348	33.03	60.00	26.97				19.40	L1	9.000	1.000
1	17.138	27.47	60.00	32.53				19.57	L1	9.000	1.000
1	17.270				20.90	50.00	29.10	19.57	L1	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

L line Conducted Emission from 150 kHz to 30 MHz



EMI Final Results

Rg	Frequency [MHz]	QPK Level [dBµV]	QPK Limit [dBµV]	QPK Margin [dB]	AVG Level [dBµV]	AVG: CAV Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
1	0.150				35.43	56.00	20.57	20.91	N	9.000	1.000
1	0.161	48.93	65.40	16.47				20.90	N	9.000	1.000
1	0.515				21.59	46.00	24.41	20.77	N	9.000	1.000
1	0.528	29.30	56.00	26.70				20.76	N	9.000	1.000
1	2.018				16.73	46.00	29.27	19.65	N	9.000	1.000
1	2.038	27.23	56.00	28.77				19.65	N	9.000	1.000
1	3.759	34.24	56.00	21.76				19.45	N	9.000	1.000
1	4.670				27.60	46.00	18.40	19.42	N	9.000	1.000
1	5.132	34.61	60.00	25.39				19.41	N	9.000	1.000
1	5.154				27.29	50.00	22.71	19.41	N	9.000	1.000
1	22.538				20.04	50.00	29.96	19.77	N	9.000	1.000
1	22.927	25.77	60.00	34.23				19.78	N	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 kHz to 30 MHz

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Power sensor	R&S	NRP18S	101954	2024-05-07	2025-05-06
Spectrum Analyzer	KEYSIGHT	N9020A	MY51330870	2024-05-07	2025-05-06
EMI Test Receiver	R&S	ESCI3	100948	2024-05-07	2025-05-06
Signal Analyzer	R&S	FSV40	101186	2024-05-07	2025-05-06
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2023-04-16	2026-04-15
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	1023	2023-07-14	2026-07-13
Horn Antenna	SCHWARZBECK	BBHA 9120D	430	2024-07-18	2027-07-17
Amplifier	MWPA.CN	MWLA-010200G40	YQ2103039B01	2024-05-07	2025-05-06
Signal Analyzer	R&S	FSV40	101298	2024-05-07	2025-05-06
Horn Antenna	ETS-Lindgren	3160-09	00102643	2024-09-24	2027-09-23
Amplifier	MicroWave	KLNA-18040050	220826001	2024-05-08	2025-05-07
Software	R&S	EMC32	9.26.01	/	/
Artificial main network	R&S	ENV216	102191	2024-12-02	2026-12-01
EMI Test Receiver	R&S	ESR	101667	2024-05-07	2025-05-06
Software	R&S	EMC32	10.35.10	/	/

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.

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