

ANNEX A: Test Result

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the loop antenna is vertical, the others are vertical and horizontal. and the worst case was recorded.

1. Unwanted Emission

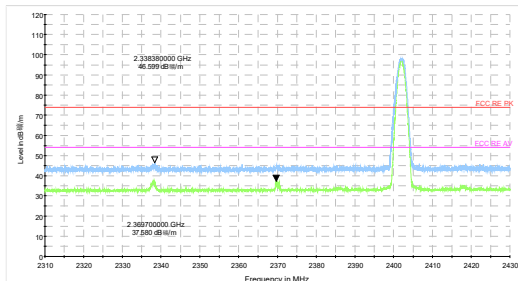
1.1. Bluetooth LE

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.

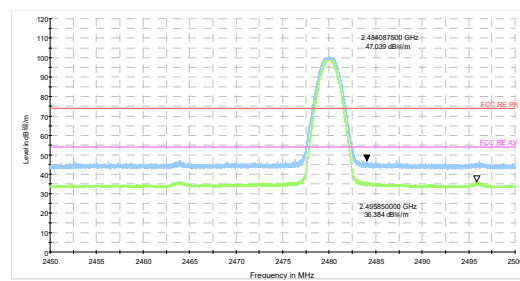
A symbol ($\text{dB}_{\text{dBm}}/\text{m}$) in the test plot below means ($\text{dB}\mu\text{V}/\text{m}$)

The signal beyond the limit is carrier.

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

Result of RE

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier. The Radiates Emission from 9kHz to 30MHz and 18GHz to 26.5GHz are more than 20dB below the limit are not reported.

Remark:

1. **Correction Factor = Antenna factor + Insertion loss (cable loss + amplifier gain)**
2. **Margin = Limit – Quasi-Peak/ MAX Peak/ Average**
3. **The following graphs display the maximum values of horizontal and vertical by software.**
4. **For below 1GHz**

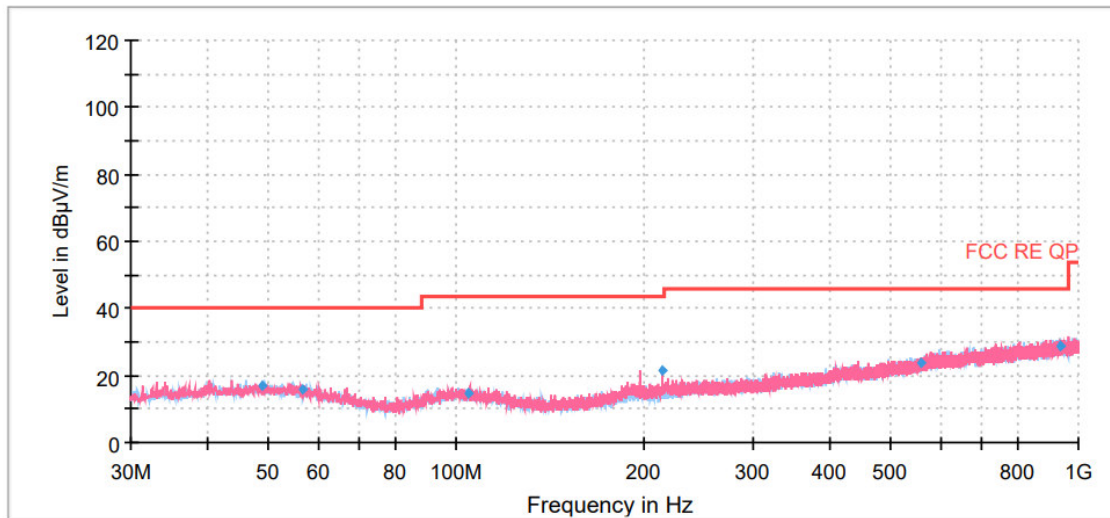
 QP Level @Spectrum Overview H
  QP Level @Spectrum Overview V
  QP Level @Final Results
  QP Limit

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

Continuous TX mode:

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels. The test data of the worst-case condition was recorded in this report.

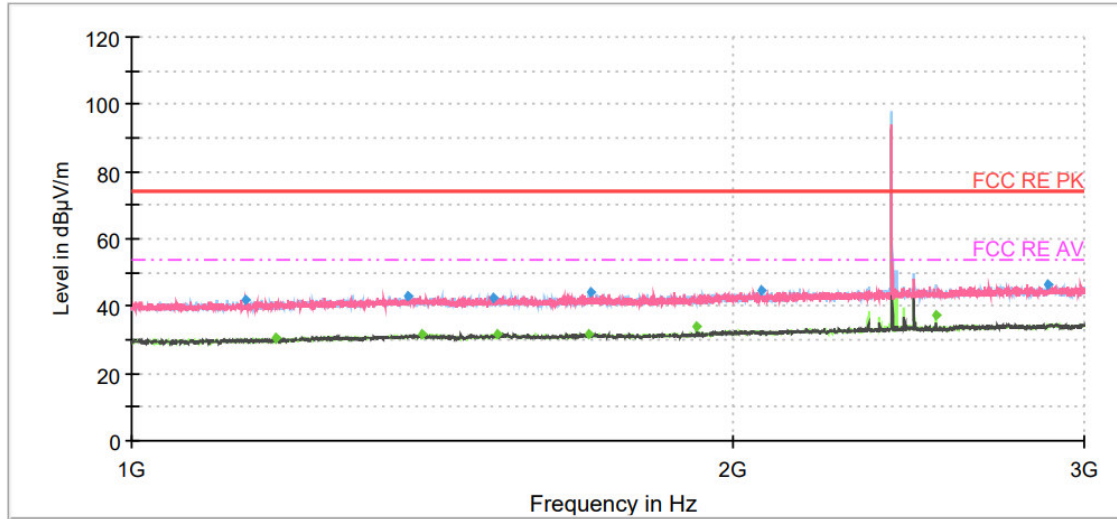


Radiates Emission from 30MHz to 1GHz

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
48.61	16.72	40.00	23.28	1000.00	125.0	H	352.00	20
56.75	15.73	40.00	24.27	1000.00	175.0	H	63.00	19
104.78	14.68	43.50	28.82	1000.00	100.0	V	134.00	18
214.49	21.68	43.50	21.82	1000.00	225.0	V	26.00	18
557.52	23.58	46.00	22.42	1000.00	108.0	V	108.00	26
935.38	29.00	46.00	17.00	1000.00	199.0	H	171.00	31

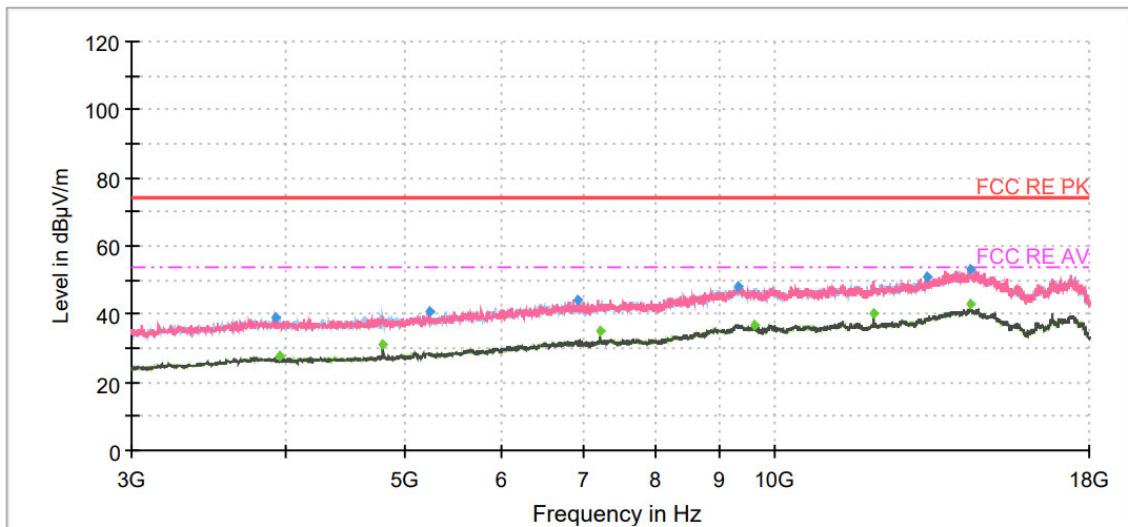
Bluetooth LE-Channel 0



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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)
1141.50	42.02	---	74.00	31.98	500.00	200.0	V	355.00	-6
1180.00	---	30.42	54.00	23.58	500.00	200.0	V	227.00	-6
1376.50	42.99	---	74.00	31.01	500.00	100.0	H	0.00	-5
1398.50	---	31.58	54.00	22.42	500.00	100.0	V	47.00	-4
1516.50	42.20	---	74.00	31.80	500.00	100.0	V	3.00	-4
1523.75	---	31.54	54.00	22.46	500.00	200.0	V	302.00	-4
1693.75	---	31.93	54.00	22.07	500.00	200.0	H	55.00	-3
1697.25	43.95	---	74.00	30.05	500.00	100.0	V	56.00	-3
1919.75	---	33.77	54.00	20.23	500.00	100.0	H	58.00	-3
2066.00	44.98	---	74.00	29.02	500.00	100.0	H	352.00	-2
2530.00	---	37.54	54.00	16.46	500.00	100.0	H	86.00	0
2876.00	46.29	---	74.00	27.71	500.00	100.0	H	299.00	1

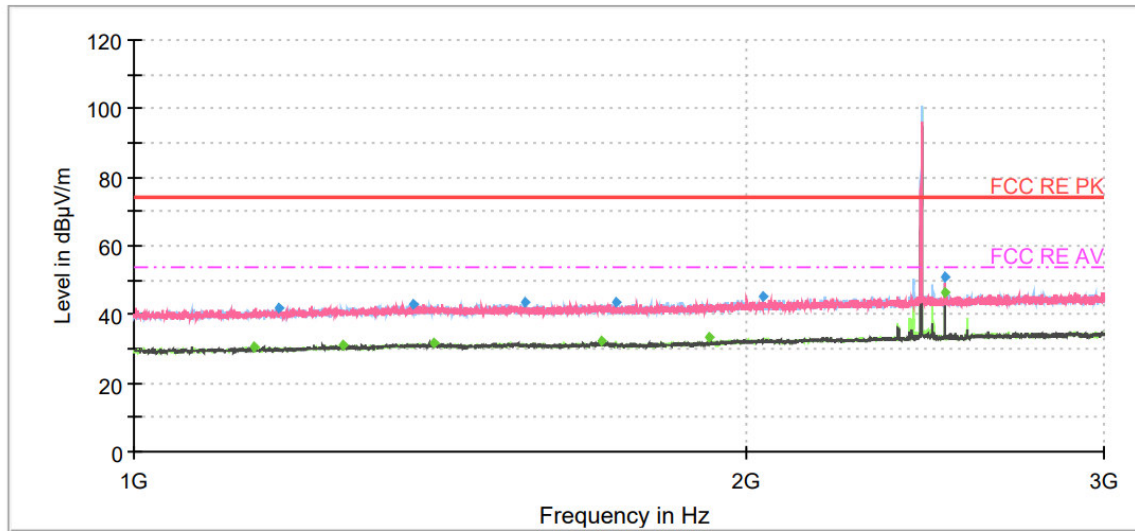


Radiates Emission from 3GHz to 18GHz

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)
3933.75	38.85	---	74.00	35.15	500.00	200.0	V	348.00	-7
3954.38	---	27.60	54.00	26.40	500.00	200.0	V	358.00	-7
4803.75	---	31.32	54.00	22.68	500.00	200.0	H	88.00	-4
5242.50	40.74	---	74.00	33.26	500.00	100.0	V	288.00	-3
6911.25	44.22	---	74.00	29.78	500.00	100.0	V	12.00	0
7205.63	---	34.86	54.00	19.14	500.00	100.0	H	283.00	0
9343.13	48.02	---	74.00	25.98	500.00	100.0	V	8.00	5
9609.38	---	36.88	54.00	17.12	500.00	200.0	V	358.00	5
12009.38	---	40.28	54.00	13.72	500.00	100.0	V	72.00	6
13275.00	50.71	---	74.00	23.29	500.00	200.0	V	336.00	7
14398.13	52.94	---	74.00	21.06	500.00	100.0	V	0.00	9
14413.13	---	43.24	54.00	10.76	500.00	100.0	V	354.00	9

Bluetooth LE-Channel 19

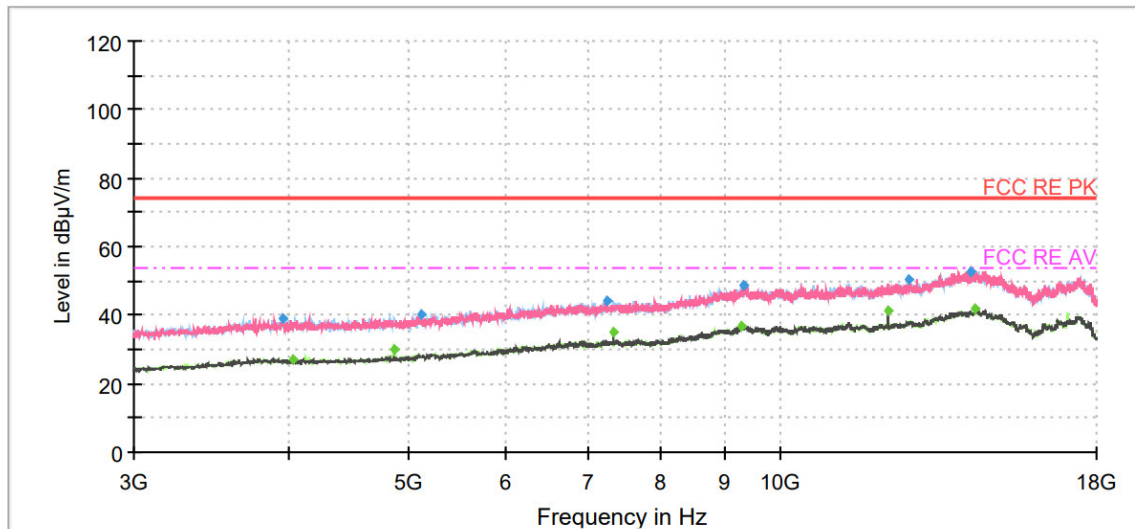


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

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)
1145.75	---	30.44	54.00	23.56	500.00	200.0	V	0.00	-6
1178.50	42.04	---	74.00	31.96	500.00	200.0	H	40.00	-6
1267.75	---	30.86	54.00	23.14	500.00	200.0	H	359.00	-5
1371.00	43.11	---	74.00	30.89	500.00	100.0	V	113.00	-5
1403.25	---	31.86	54.00	22.14	500.00	200.0	H	7.00	-4
1555.25	43.33	---	74.00	30.67	500.00	200.0	H	340.00	-4
1696.25	---	32.08	54.00	21.92	500.00	100.0	H	335.00	-3
1724.75	43.73	---	74.00	30.27	500.00	100.0	V	85.00	-3
1919.75	---	33.22	54.00	20.78	500.00	100.0	H	350.00	-3
2039.25	45.17	---	74.00	28.83	500.00	100.0	V	50.00	-2
2503.75	51.05	---	74.00	22.95	500.00	100.0	H	94.00	0
2504.25	---	46.51	54.00	7.49	500.00	200.0	H	252.00	0

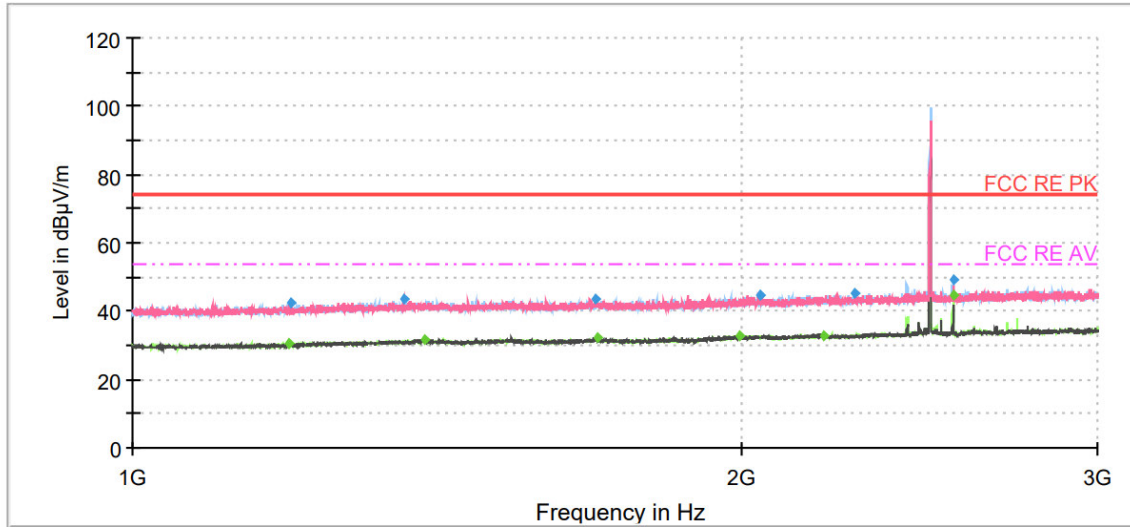


Radiates Emission from 3GHz to 18GHz

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)
3952.50	38.93	---	74.00	35.07	500.00	100.0	V	131.00	-7
4031.25	---	27.31	54.00	26.69	500.00	200.0	V	342.00	-6
4878.75	---	29.72	54.00	24.28	500.00	100.0	H	286.00	-4
5126.25	40.08	---	74.00	33.92	500.00	200.0	H	20.00	-4
7235.63	44.22	---	74.00	29.78	500.00	100.0	V	1.00	0
7320.00	---	35.33	54.00	18.67	500.00	100.0	H	286.00	0
9301.88	---	36.90	54.00	17.10	500.00	200.0	H	3.00	5
9316.88	48.45	---	74.00	25.55	500.00	100.0	V	14.00	5
12200.63	---	41.13	54.00	12.87	500.00	100.0	V	70.00	6
12699.38	50.54	---	74.00	23.46	500.00	200.0	H	35.00	6
14210.63	52.87	---	74.00	21.13	500.00	100.0	V	244.00	9
14360.63	---	41.61	54.00	12.39	500.00	200.0	V	348.00	9

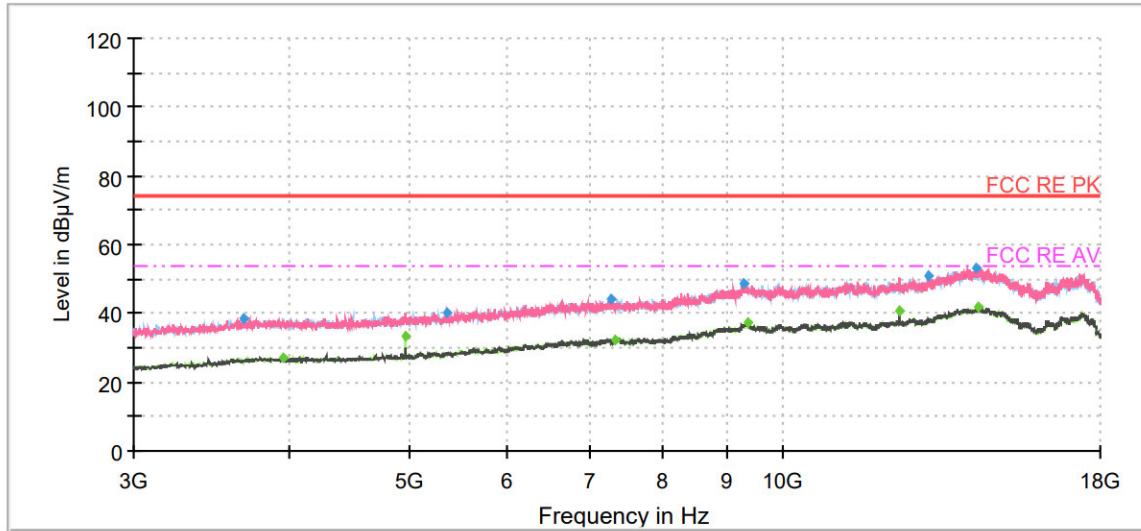
Bluetooth LE-Channel 39



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

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)
1194.00	---	30.70	54.00	23.30	500.00	100.0	H	0.00	-6
1198.00	42.33	---	74.00	31.67	500.00	100.0	H	12.00	-6
1360.75	43.59	---	74.00	30.41	500.00	100.0	V	151.00	-5
1394.50	---	31.75	54.00	22.25	500.00	200.0	V	141.00	-4
1692.25	43.79	---	74.00	30.21	500.00	100.0	V	1.00	-3
1696.00	---	31.99	54.00	22.01	500.00	100.0	H	224.00	-3
1997.50	---	33.05	54.00	20.95	500.00	200.0	V	156.00	-2
2044.50	44.59	---	74.00	29.41	500.00	200.0	H	303.00	-2
2198.75	---	33.04	54.00	20.96	500.00	100.0	H	102.00	-1
2277.00	45.02	---	74.00	28.98	500.00	100.0	V	304.00	-1
2544.00	---	44.61	54.00	9.39	500.00	100.0	H	72.00	0
2544.25	48.98	---	74.00	25.02	500.00	100.0	H	72.00	0



Radiates Emission from 3GHz to 18GHz

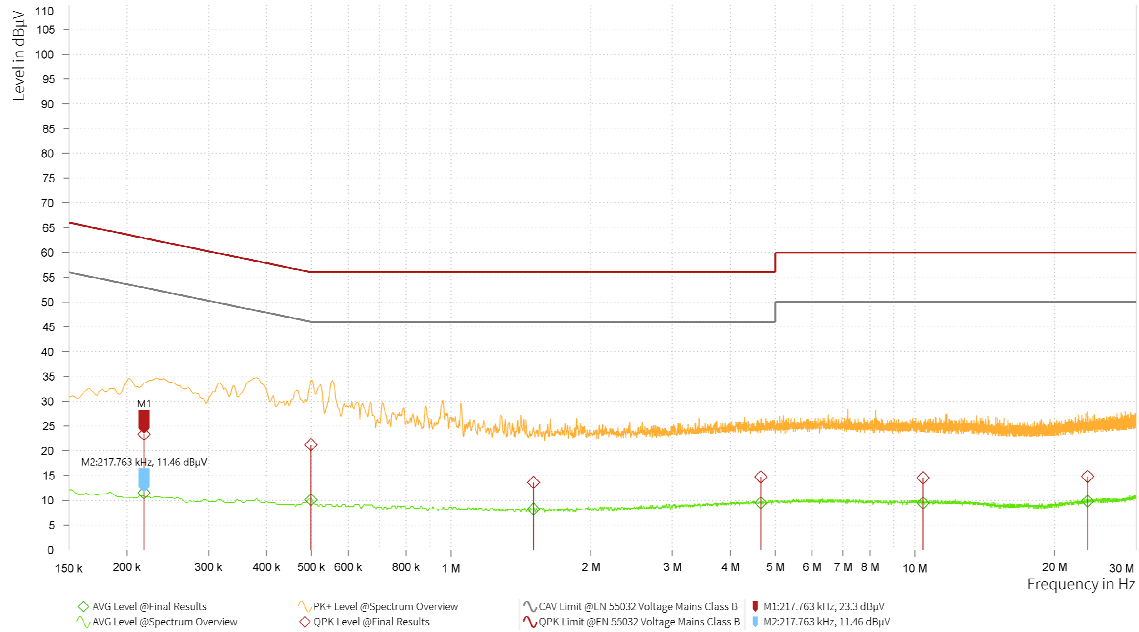
Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3682.50	38.37	---	74.00	35.63	500.00	100.0	H	343.00	-7
3954.38	---	27.30	54.00	26.70	500.00	100.0	H	356.00	-7
4959.38	---	33.36	54.00	20.64	500.00	100.0	H	267.00	-4
5370.00	40.32	---	74.00	33.68	500.00	200.0	V	355.00	-3
7267.50	44.24	---	74.00	29.76	500.00	100.0	V	199.00	0
7316.25	---	32.53	54.00	21.47	500.00	100.0	H	267.00	0
9300.00	48.40	---	74.00	25.60	500.00	100.0	V	15.00	5
9358.13	---	37.10	54.00	16.90	500.00	200.0	V	206.00	5
12399.38	---	40.86	54.00	13.14	500.00	100.0	V	62.00	6
13065.00	50.83	---	74.00	23.17	500.00	100.0	V	0.00	7
14272.50	53.01	---	74.00	20.99	500.00	200.0	V	0.00	9
14356.88	---	41.95	54.00	12.05	500.00	100.0	V	89.00	9

2. Conducted Emission

2.1. Bluetooth LE

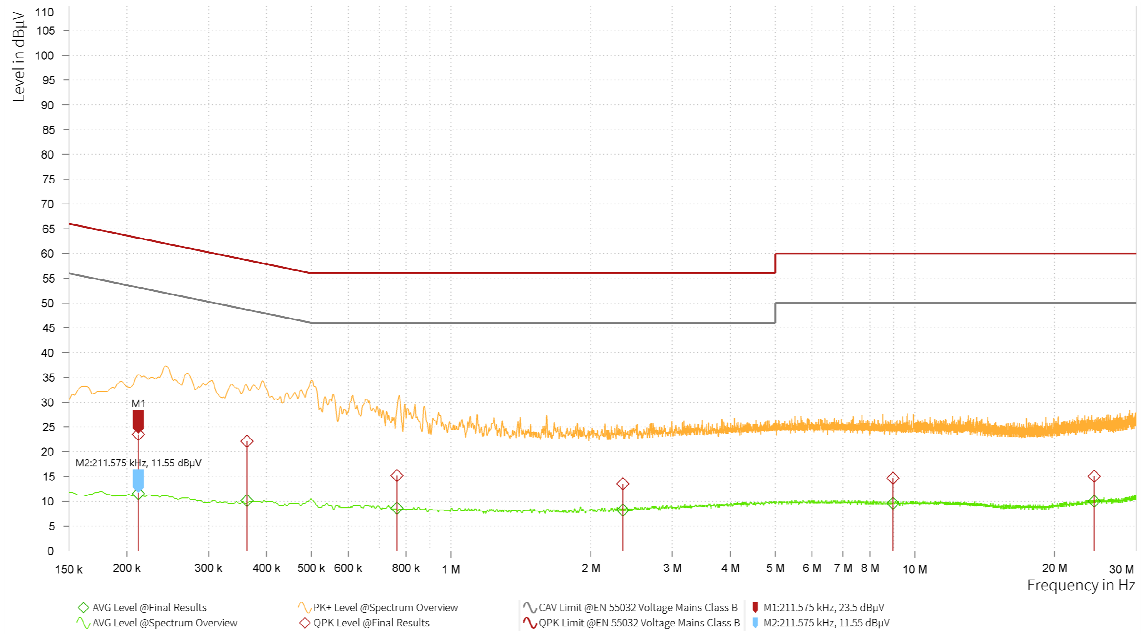
During the test, the Conducted Emission was performed in all modes with all channels. The test data of the worst-case condition was recorded in this report.



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]
0.218	23.30	62.90	39.60	11.46	52.90	41.44	21.00	L1	9.000	1.000
0.499	21.20	56.02	34.83	10.12	46.02	35.91	20.78	L1	9.000	1.000
1.506	13.62	56.00	42.38	8.20	46.00	37.80	19.84	L1	9.000	1.000
4.655	14.72	56.00	41.28	9.47	46.00	36.53	19.41	L1	9.000	1.000
10.421	14.52	60.00	45.48	9.44	50.00	40.56	19.42	L1	9.000	1.000
23.577	14.82	60.00	45.18	9.83	50.00	40.17	19.77	L1	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

L line Conducted Emission from 150 kHz to 30 MHz



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]
0.212	23.50	63.14	39.65	11.55	53.14	41.59	21.02	N	9.000	1.000
0.363	22.13	58.66	36.53	10.15	48.66	38.51	20.92	N	9.000	1.000
0.764	15.20	56.00	40.80	8.60	46.00	37.40	20.37	N	9.000	1.000
2.347	13.52	56.00	42.48	8.21	46.00	37.79	19.58	N	9.000	1.000
8.969	14.65	60.00	45.35	9.57	50.00	40.43	19.42	N	9.000	1.000
24.379	15.06	60.00	44.94	10.03	50.00	39.97	19.85	N	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 kHz to 30 MHz