

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 lie-down position (X axis) and the loop antenna is vertical, the others are vertical and horizontal. and the worst case was recorded.

1. Unwanted Emission

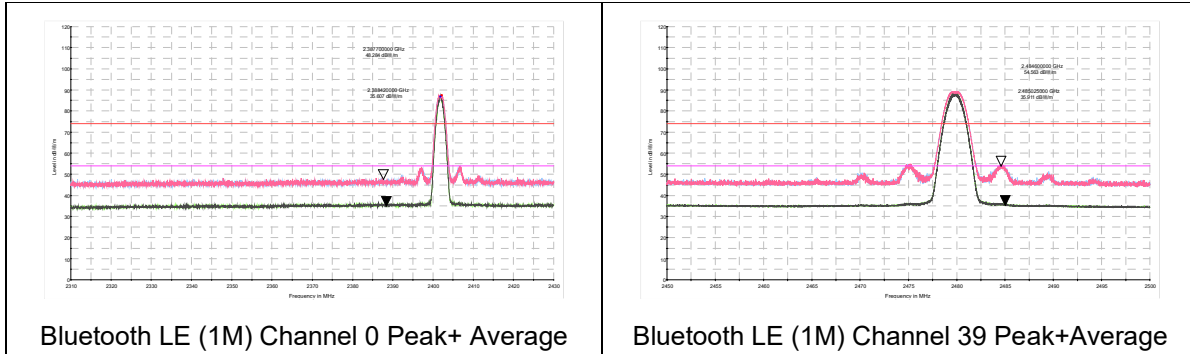
1.1. Bluetooth LE

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.



Result of RE

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier.
The Radiates Emission from 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**

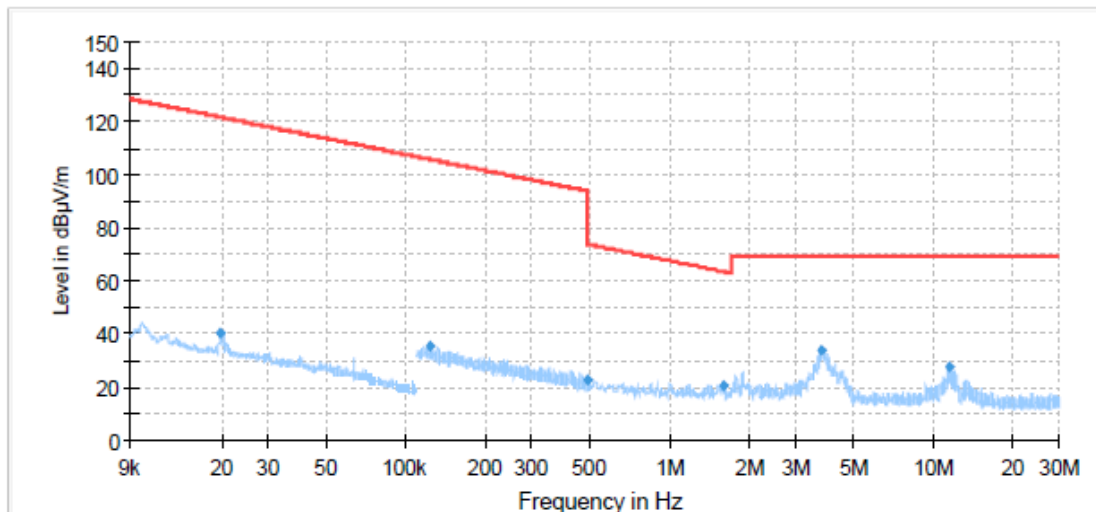
 QP Level @Spectrum Overview H
  QP Level @Spectrum Overview V
  QP Level @Final Results
  QP Limit

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

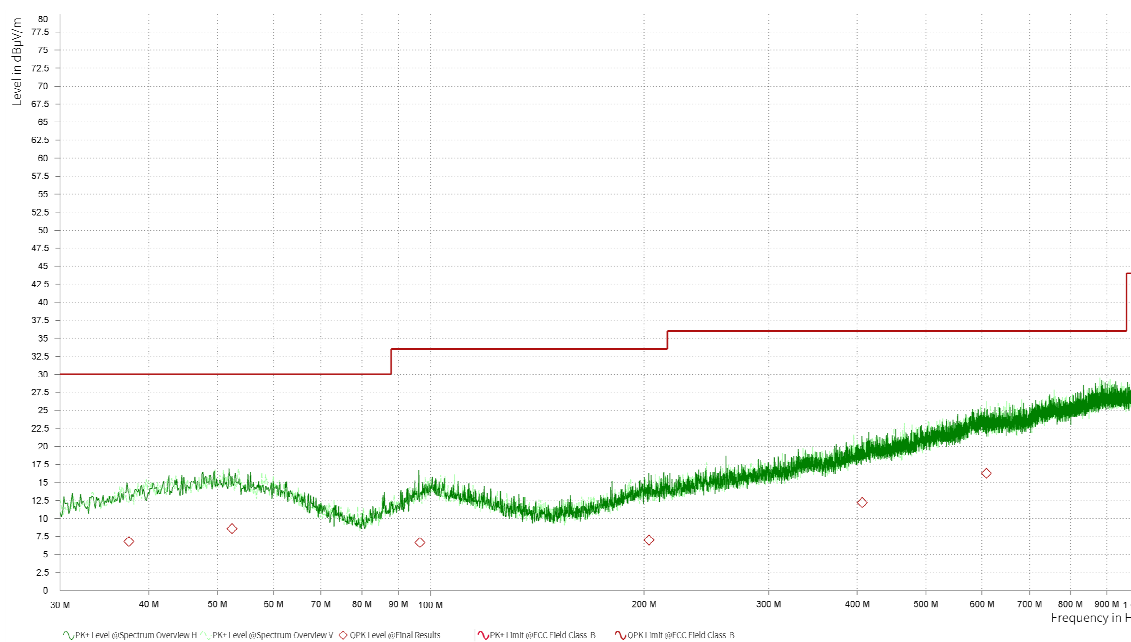
Continuous TX mode:

During the test, the Radiates Emission from 9kHz 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 9kHz to 30MHz

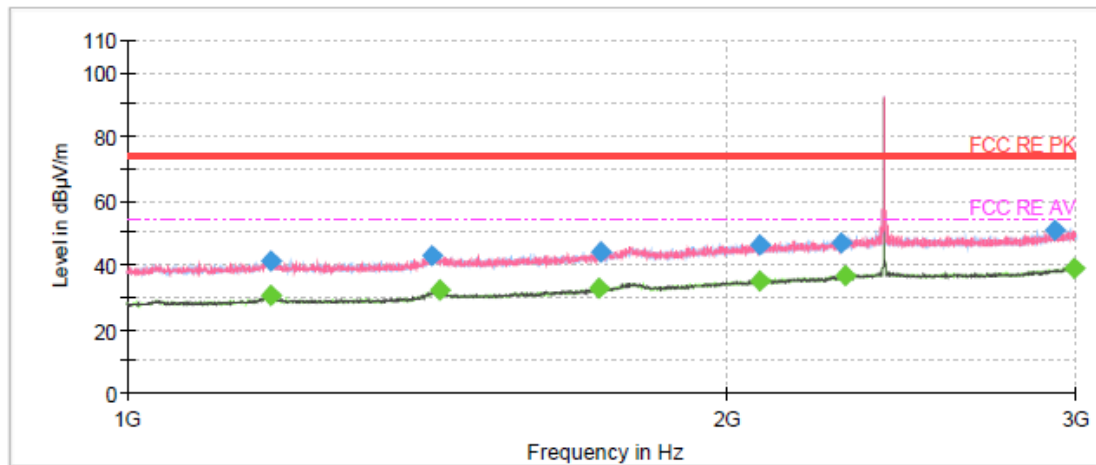
Spectrum Overview H/V



Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Meas. Time [s]
37.503	6.77	30.00	23.23	-9.96	H	202.5	2.18	120.000	1.000
52.455	8.54	30.00	21.46	-8.30	H	162	1.17	120.000	1.000
96.599	6.64	33.50	26.86	-10.29	H	146.4	1.92	120.000	1.000
203.229	7.01	33.50	26.49	-9.70	H	346.4	2.22	120.000	1.000
406.455	12.16	36.00	23.84	-4.62	H	66.9	1.02	120.000	1.000
608.460	16.26	36.00	19.74	-0.85	V	63.6	1.20	120.000	1.000

Radiates Emission from 30MHz to 1GHz

Bluetooth LE-Channel 0

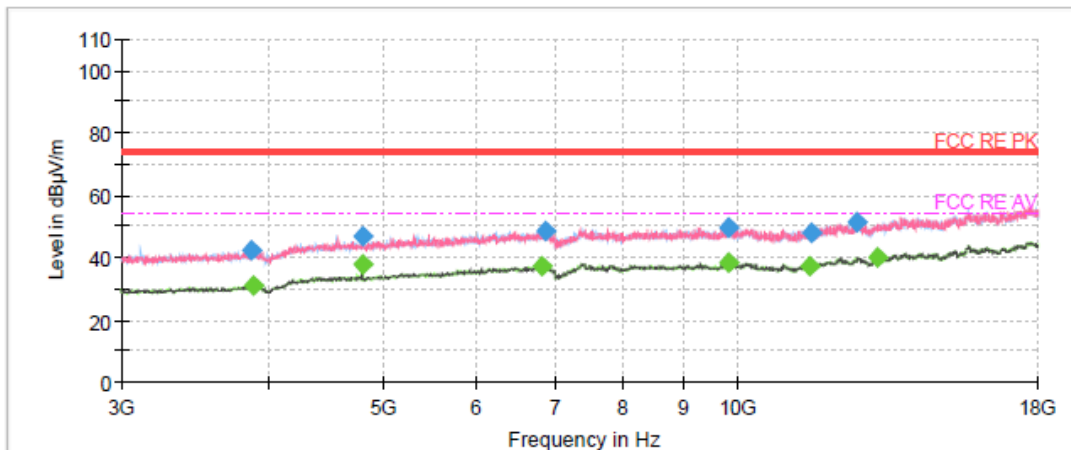


Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1179.750000	41.22	---	74.00	32.78	500.0	100.0	V	160.0	-6
1181.750000	---	30.36	54.00	23.64	500.0	200.0	H	29.0	-6
1423.250000	42.87	---	74.00	31.13	500.0	100.0	H	340.0	-4
1437.000000	---	31.88	54.00	22.12	500.0	100.0	H	266.0	-4
1726.250000	---	32.70	54.00	21.30	500.0	100.0	V	57.0	-2
1730.750000	44.23	---	74.00	29.77	500.0	200.0	H	105.0	-2
2079.500000	46.46	---	74.00	27.54	500.0	200.0	V	264.0	0
2079.750000	---	34.91	54.00	19.09	500.0	100.0	H	331.0	0
2284.750000	46.71	---	74.00	27.29	500.0	200.0	V	320.0	1
2295.000000	---	36.41	54.00	17.59	500.0	200.0	H	0.0	1
2925.500000	50.76	---	74.00	23.24	500.0	200.0	H	217.0	3
2995.750000	---	38.99	54.00	15.01	500.0	100.0	V	3.0	3

Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

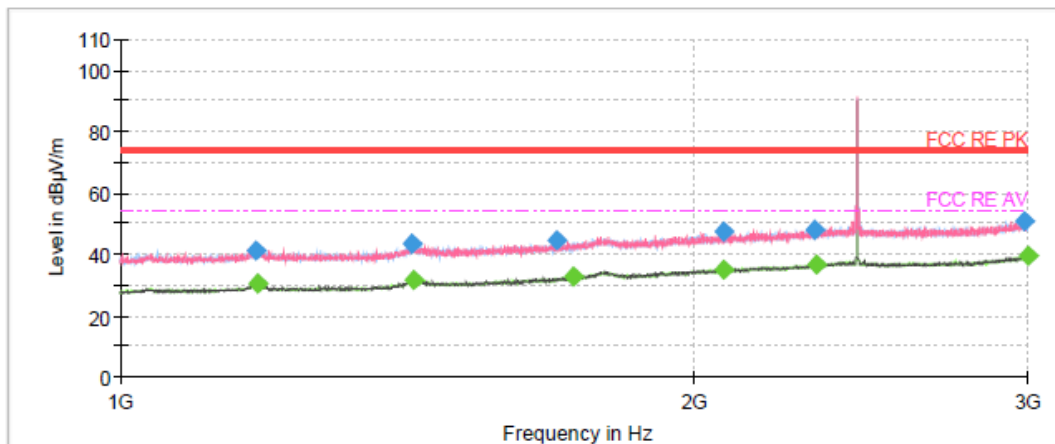


Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3871.875000	42.20	---	74.00	31.80	500.0	100.0	V	131.0	-5
3883.125000	---	31.04	54.00	22.96	500.0	200.0	V	248.0	-5
4801.875000	46.75	---	74.00	27.25	500.0	100.0	V	223.0	-2
4803.750000	---	37.63	54.00	16.37	500.0	200.0	V	208.0	-2
6832.500000	---	37.50	54.00	16.50	500.0	200.0	H	296.0	1
6881.250000	48.57	---	74.00	25.43	500.0	200.0	V	0.0	1
9817.500000	---	38.10	54.00	15.90	500.0	200.0	H	0.0	3
9821.250000	49.86	---	74.00	24.14	500.0	200.0	H	9.0	3
11516.250000	---	37.25	54.00	16.75	500.0	200.0	H	91.0	3
11561.250000	48.03	---	74.00	25.97	500.0	100.0	V	2.0	3
12648.750000	51.60	---	74.00	22.40	500.0	100.0	H	273.0	5
13151.250000	---	40.13	54.00	13.87	500.0	100.0	V	234.0	5

Radiates Emission from 3GHz to 18GHz

Bluetooth LE-Channel 19

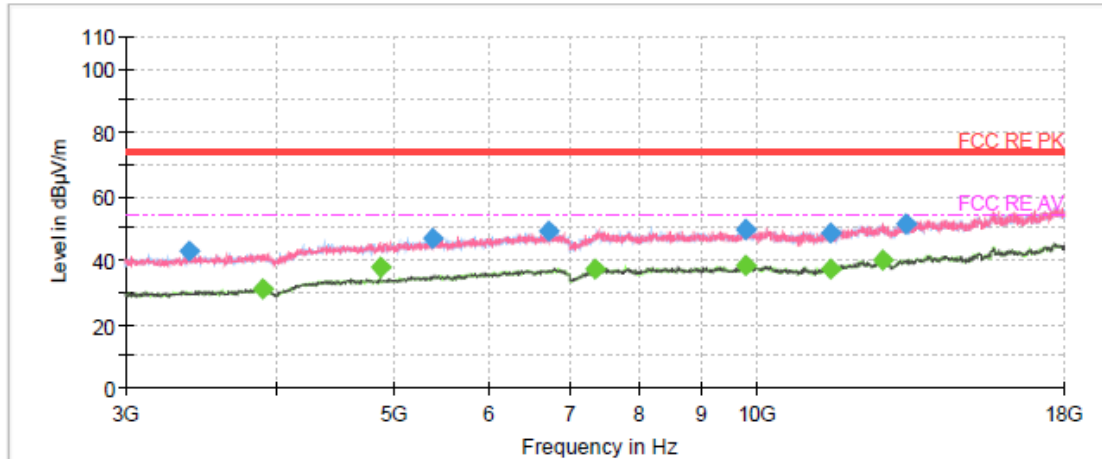


Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1179.000000	41.36	---	74.00	32.64	500.0	200.0	H	160.0	-6
1181.750000	---	30.35	54.00	23.65	500.0	100.0	H	322.0	-6
1424.000000	43.23	---	74.00	30.77	500.0	100.0	V	11.0	-4
1427.250000	---	31.81	54.00	22.19	500.0	100.0	H	313.0	-4
1696.750000	44.41	---	74.00	29.59	500.0	200.0	H	188.0	-2
1731.500000	---	32.49	54.00	21.51	500.0	100.0	V	282.0	-2
2074.250000	---	35.11	54.00	18.89	500.0	100.0	V	20.0	0
2075.250000	47.26	---	74.00	26.74	500.0	200.0	V	211.0	0
2316.000000	47.84	---	74.00	26.16	500.0	200.0	V	221.0	1
2324.000000	---	36.94	54.00	17.06	500.0	200.0	V	144.0	1
2986.750000	50.94	---	74.00	23.06	500.0	200.0	H	0.0	3
2997.000000	---	39.23	54.00	14.77	500.0	100.0	V	11.0	3

Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

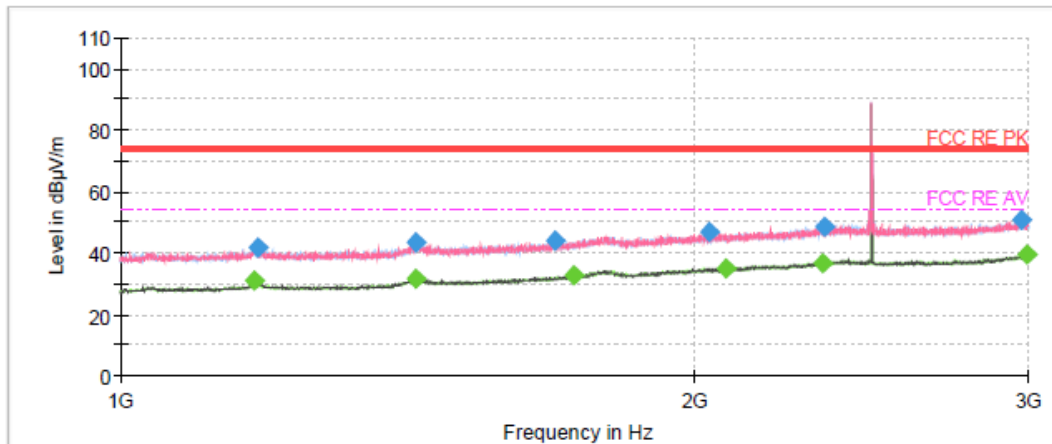


Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3386.250000	42.62	---	74.00	31.38	500.0	100.0	V	172.0	-6
3890.625000	---	31.01	54.00	22.99	500.0	100.0	H	310.0	-5
4878.750000	---	37.86	54.00	16.14	500.0	200.0	V	217.0	-2
5390.625000	46.56	---	74.00	27.44	500.0	200.0	V	34.0	-1
6721.875000	48.87	---	74.00	25.13	500.0	100.0	H	0.0	1
7344.375000	---	37.34	54.00	16.66	500.0	200.0	V	268.0	2
9806.250000	49.61	---	74.00	24.39	500.0	200.0	H	2.0	3
9810.000000	---	38.21	54.00	15.79	500.0	200.0	H	2.0	3
11501.250000	---	37.32	54.00	16.68	500.0	200.0	H	244.0	3
11514.375000	48.76	---	74.00	25.24	500.0	200.0	V	328.0	3
12705.000000	---	40.10	54.00	13.90	500.0	100.0	V	232.0	5
13310.625000	51.50	---	74.00	22.50	500.0	100.0	V	306.0	5

Radiates Emission from 3GHz to 18GHz

Bluetooth LE-Channel 39

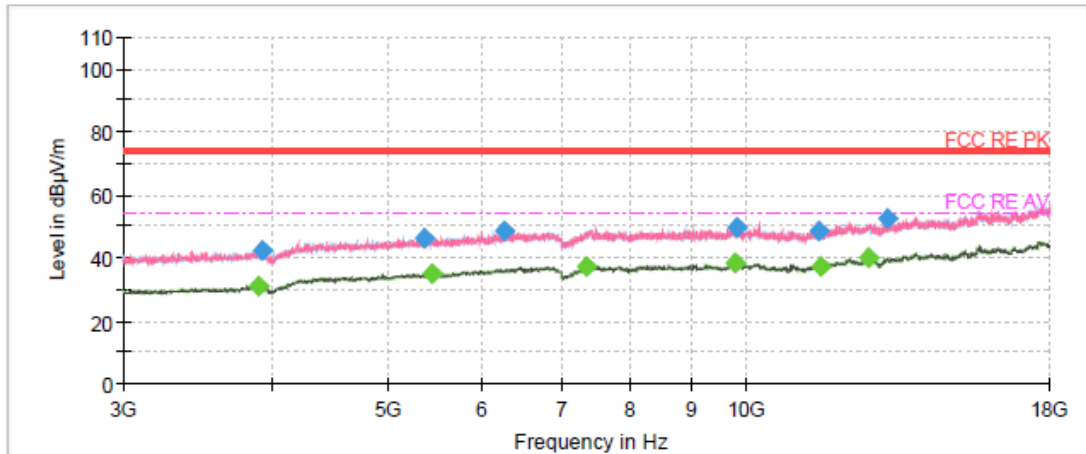


Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1176.750000	---	30.75	54.00	23.25	500.0	100.0	V	264.0	-6
1180.250000	41.85	---	74.00	32.15	500.0	100.0	V	68.0	-6
1428.750000	43.38	---	74.00	30.62	500.0	200.0	H	105.0	-4
1429.500000	---	31.75	54.00	22.25	500.0	200.0	V	11.0	-4
1690.750000	43.79	---	74.00	30.21	500.0	100.0	H	339.0	-2
1729.750000	---	32.61	54.00	21.39	500.0	100.0	H	357.0	-2
2040.500000	46.69	---	74.00	27.31	500.0	100.0	H	339.0	0
2077.750000	---	35.12	54.00	18.88	500.0	100.0	V	151.0	0
2335.750000	---	36.63	54.00	17.37	500.0	200.0	H	170.0	1
2340.750000	48.40	---	74.00	25.60	500.0	200.0	H	189.0	1
2974.750000	50.57	---	74.00	23.43	500.0	100.0	V	339.0	3
2994.500000	---	39.22	54.00	14.78	500.0	200.0	V	199.0	3

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)
3896.250000	---	31.05	54.00	22.95	500.0	100.0	H	223.0	-5
3926.250000	42.48	---	74.00	31.52	500.0	100.0	H	233.0	-5
5370.000000	46.46	---	74.00	27.54	500.0	200.0	H	236.0	-1
5450.625000	---	35.00	54.00	19.00	500.0	200.0	V	73.0	0
6262.500000	48.38	---	74.00	25.62	500.0	100.0	H	123.0	0
7348.125000	---	37.46	54.00	16.54	500.0	100.0	H	223.0	2
9802.500000	---	38.57	54.00	15.43	500.0	200.0	H	276.0	3
9840.000000	49.46	---	74.00	24.54	500.0	200.0	H	337.0	3
11538.750000	48.30	---	74.00	25.70	500.0	200.0	H	256.0	3
11570.625000	---	37.39	54.00	16.61	500.0	200.0	V	140.0	3
12688.125000	---	40.31	54.00	13.69	500.0	200.0	V	6.0	5
13149.375000	52.27	---	74.00	21.73	500.0	200.0	V	168.0	5

Radiates Emission from 3GHz to 18GHz

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]
0.339	46.35	59.23	12.87	44.34	49.23	4.89	20.93	L1	9.000	1.000
0.674	44.02	56.00	11.98	39.87	46.00	6.13	20.60	L1	9.000	1.000
1.331	19.89	56.00	36.11	14.95	46.00	31.05	19.93	L1	9.000	1.000
3.480	14.12	56.00	41.88	8.97	46.00	37.03	19.45	L1	9.000	1.000
9.128	14.86	60.00	45.14	9.67	50.00	40.33	19.41	L1	9.000	1.000
20.164	14.81	60.00	45.19	9.66	50.00	40.34	19.66	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]
0.344	44.46	59.12	14.65	43.33	49.12	5.78	20.94	N	9.000	1.000
0.688	38.78	56.00	17.22	35.10	46.00	10.90	20.59	N	9.000	1.000
1.043	21.39	56.00	34.61	14.74	46.00	31.26	20.14	N	9.000	1.000
3.273	13.91	56.00	42.09	8.87	46.00	37.13	19.47	N	9.000	1.000
9.116	14.99	60.00	45.01	9.57	50.00	40.43	19.43	N	9.000	1.000
21.311	15.34	60.00	44.66	10.03	50.00	39.97	19.73	N	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 kHz to 30 MHz