

ANNEX A: Test Result

1. Unwanted Emission

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 coplanar, the others are vertical and horizontal. and the worst case was recorded.

1.1. Bluetooth

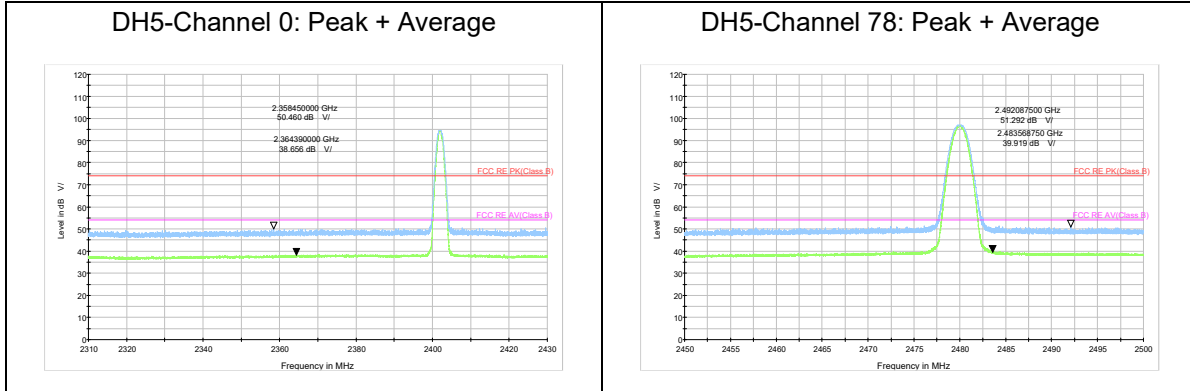
The following graphs display the maximum values of horizontal and vertical by software. Blue trace uses the peak detection, Green trace uses the average detection.

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

The signal beyond the limit is carrier.

The bandage was performed in all mode (DH5, 2DH5 and 3DH5), DH5 was selected as the worse condition. The test data of the worst-case condition was recorded in this report.

F153C:



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. A symbol (dB μ V/m) in the test plot below means (dB μ V/m)
4. The following graphs display the maximum values of horizontal and vertical by software.
5. For below 1GHz

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

For above 1GHz

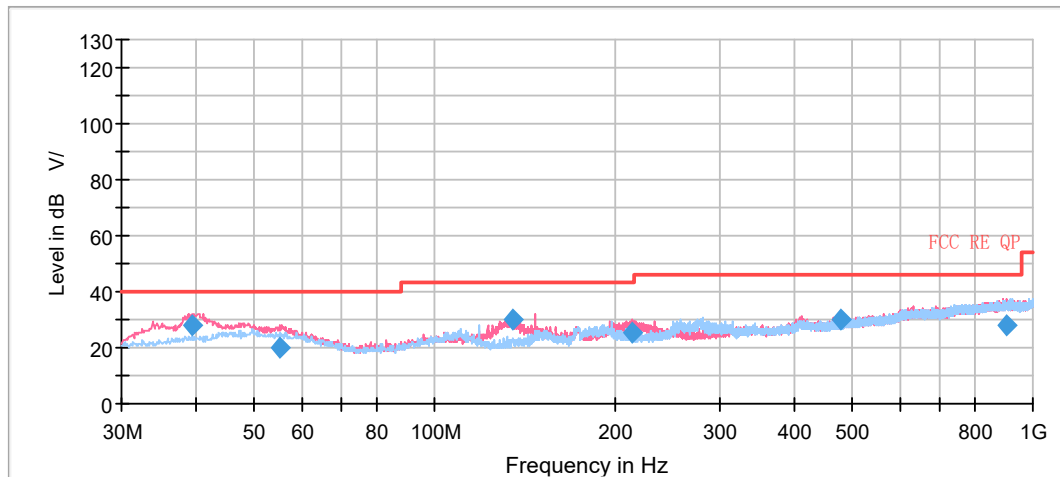
 PK Level @Spectrum Overview H
  PK Level @Spectrum Overview V
  PK Level @Final Results
  PK Limit

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

Continuous TX mode:

F153C:

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.

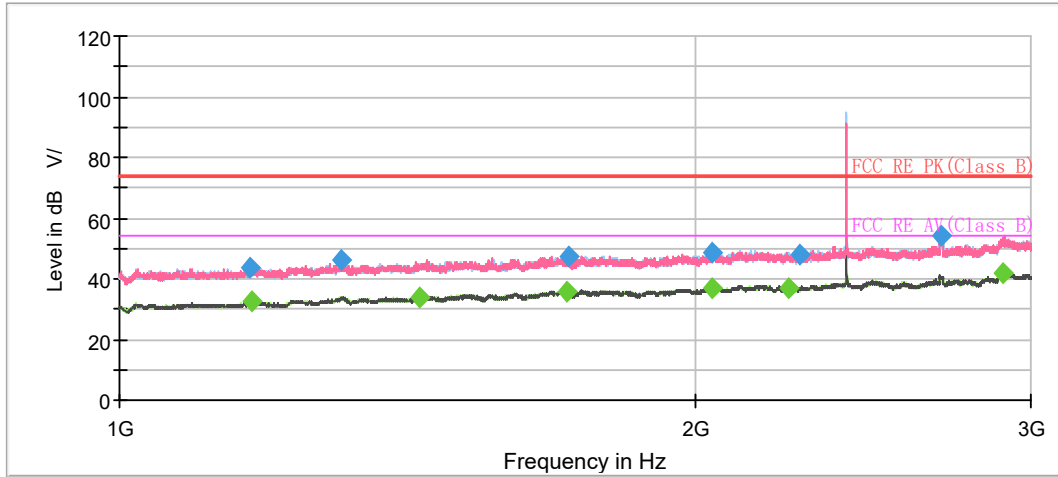


Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
39.336250	27.74	40.00	12.26	101.0	V	352.0	19.7
55.220000	20.21	40.00	19.79	100.0	V	13.0	20.7
135.123750	29.80	43.50	13.70	101.0	V	253.0	15.8
214.421250	25.41	43.50	18.09	196.0	V	191.0	18.6
476.200000	30.26	46.00	15.74	101.0	V	347.0	24.6
902.636250	28.10	46.00	17.90	120.0	V	252.0	31.0

The bandage was performed in all mode (DH5, 2DH5 and 3DH5), DH5 was selected as the worse condition. The test data of the worst-case condition was recorded in this report.

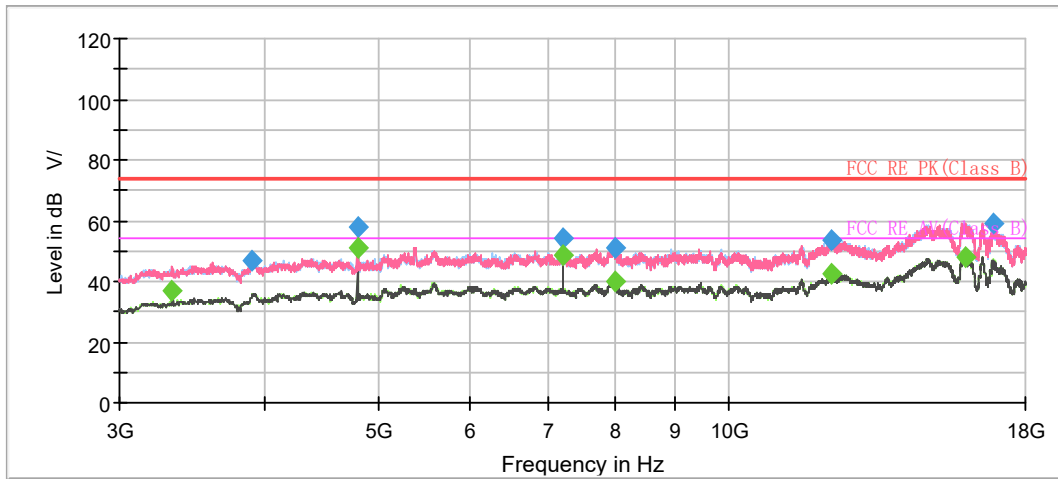
DH5-Channel 0



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

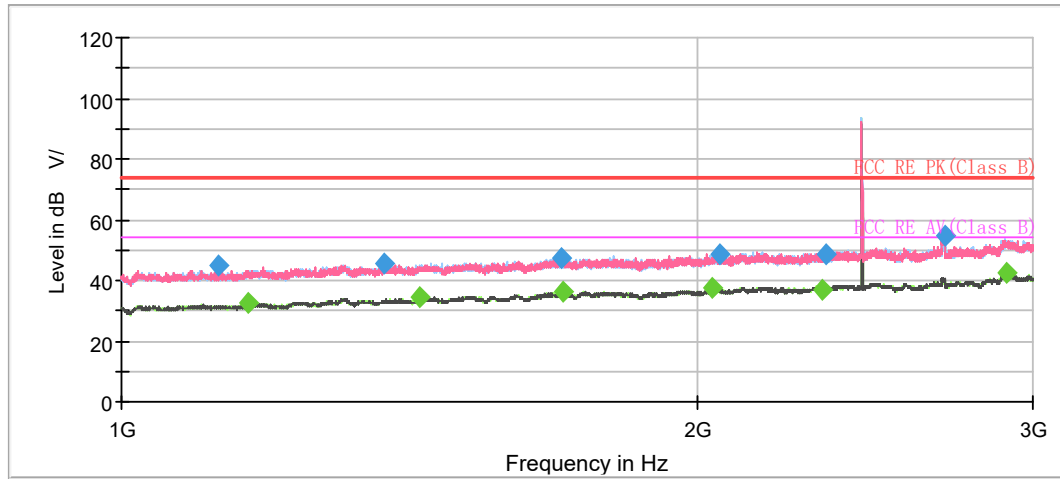
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1169.250000	43.50	---	74.00	30.50	500.0	200.0	H	292.0	-4.4
1171.750000	---	32.42	54.00	21.58	500.0	200.0	V	266.0	-4.3
1306.500000	45.86	---	74.00	28.14	500.0	100.0	H	350.0	-2.2
1435.500000	---	34.08	54.00	19.92	500.0	100.0	H	292.0	-1.8
1713.250000	---	35.66	54.00	18.34	500.0	100.0	H	259.0	0.4
1717.500000	47.39	---	74.00	26.61	500.0	200.0	H	24.0	0.1
2044.500000	48.44	---	74.00	25.56	500.0	200.0	H	168.0	2.5
2045.250000	---	37.07	54.00	16.93	500.0	200.0	H	89.0	2.5
2241.750000	---	36.90	54.00	17.10	500.0	100.0	V	324.0	3.1
2270.500000	48.19	---	74.00	25.81	500.0	200.0	V	135.0	2.9
2694.500000	54.17	---	74.00	19.83	500.0	200.0	V	193.0	5.1
2903.250000	---	42.11	54.00	11.89	500.0	200.0	V	143.0	8.5



Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3331.875000	---	37.21	54.00	16.79	500.0	100.0	V	190.0	-1.1
3901.875000	46.86	---	74.00	27.14	500.0	100.0	H	237.0	3.1
4803.750000	---	51.19	54.00	2.81	500.0	100.0	V	30.0	2.2
4803.750000	58.11	---	74.00	15.89	500.0	100.0	V	30.0	2.2
7205.625000	---	48.50	54.00	5.50	500.0	200.0	H	275.0	7.2
7205.625000	53.99	---	74.00	20.01	500.0	200.0	H	275.0	7.2
7995.000000	---	40.09	54.00	13.91	500.0	100.0	H	357.0	9.9
7996.875000	51.07	---	74.00	22.93	500.0	200.0	H	348.0	9.9
12251.250000	53.58	---	74.00	20.42	500.0	100.0	V	30.0	14.1
12264.375000	---	42.67	54.00	11.33	500.0	100.0	H	340.0	14.4
15997.500000	---	48.20	54.00	5.80	500.0	100.0	V	104.0	20.0
16895.625000	59.36	---	74.00	14.64	500.0	200.0	H	312.0	18.8

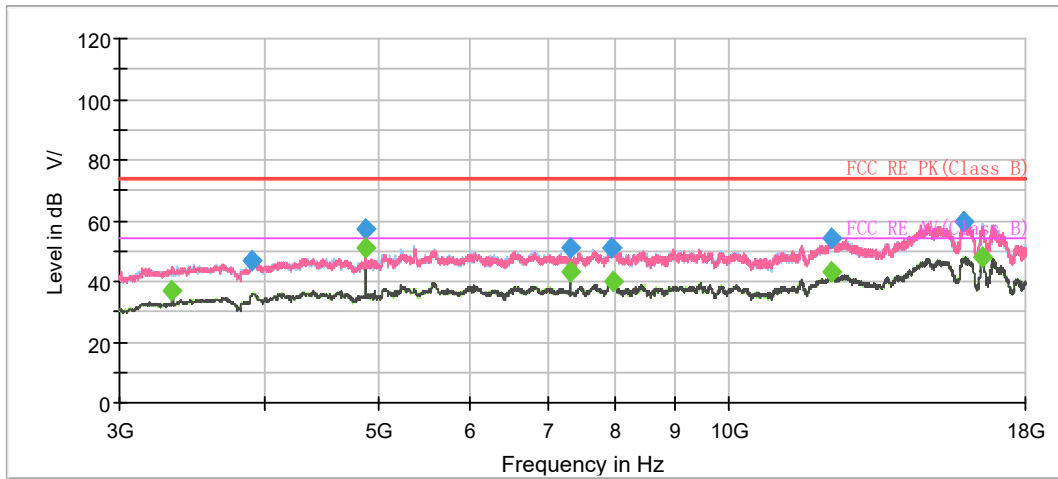
DH5-Channel 39



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

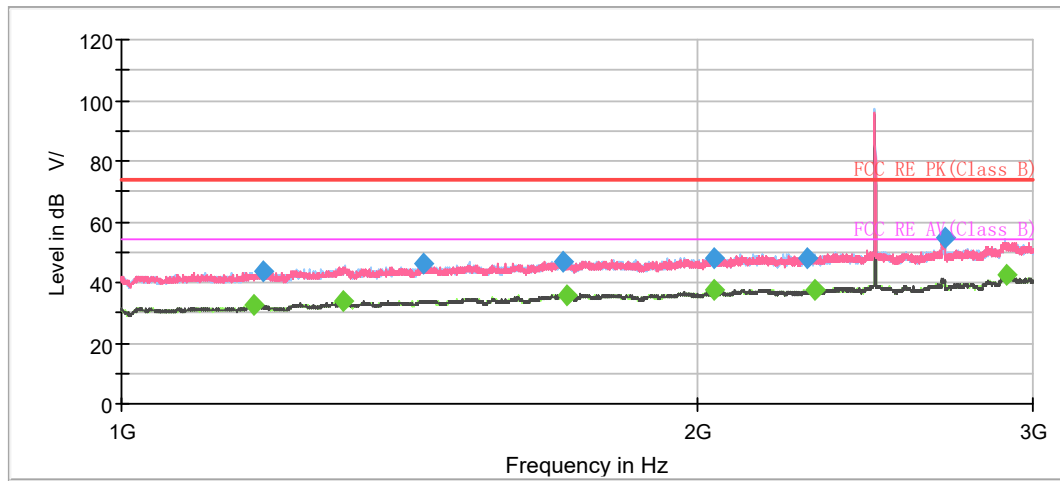
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1124.500000	44.86	---	74.00	29.14	500.0	200.0	V	69.0	-5.3
1166.000000	---	32.44	54.00	21.56	500.0	100.0	V	134.0	-4.6
1373.750000	45.31	---	74.00	28.69	500.0	100.0	H	160.0	-2.3
1432.000000	---	34.32	54.00	19.68	500.0	100.0	V	160.0	-1.9
1700.750000	47.15	---	74.00	26.85	500.0	100.0	H	327.0	0.4
1702.000000	---	36.06	54.00	17.94	500.0	200.0	V	85.0	0.4
2037.000000	---	37.48	54.00	16.52	500.0	200.0	H	152.0	2.4
2055.000000	48.91	---	74.00	25.09	500.0	200.0	V	69.0	2.4
2328.000000	---	37.18	54.00	16.82	500.0	100.0	H	303.0	3.3
2337.500000	48.49	---	74.00	25.51	500.0	200.0	H	327.0	3.4
2700.000000	54.65	---	74.00	19.35	500.0	100.0	V	193.0	5.0
2904.500000	---	42.32	54.00	11.68	500.0	200.0	H	75.0	8.5



Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3331.875000	---	37.04	54.00	16.96	500.0	100.0	V	178.0	-1.1
3901.875000	46.97	---	74.00	27.03	500.0	200.0	V	58.0	3.1
4880.625000	---	50.95	54.00	3.05	500.0	100.0	V	35.0	3.0
4880.625000	57.43	---	74.00	16.57	500.0	100.0	V	35.0	3.0
7321.875000	---	43.25	54.00	10.75	500.0	100.0	H	274.0	5.9
7321.875000	50.94	---	74.00	23.06	500.0	100.0	H	274.0	5.9
7938.750000	51.05	---	74.00	22.95	500.0	200.0	V	296.0	9.9
7968.750000	---	40.05	54.00	13.95	500.0	100.0	V	220.0	9.9
12281.250000	53.99	---	74.00	20.01	500.0	100.0	V	4.0	14.5
12281.250000	---	42.80	54.00	11.20	500.0	100.0	H	72.0	14.5
15946.875000	59.70	---	74.00	14.30	500.0	200.0	H	0.0	19.6
16537.500000	---	47.96	54.00	6.04	500.0	200.0	H	82.0	20.5

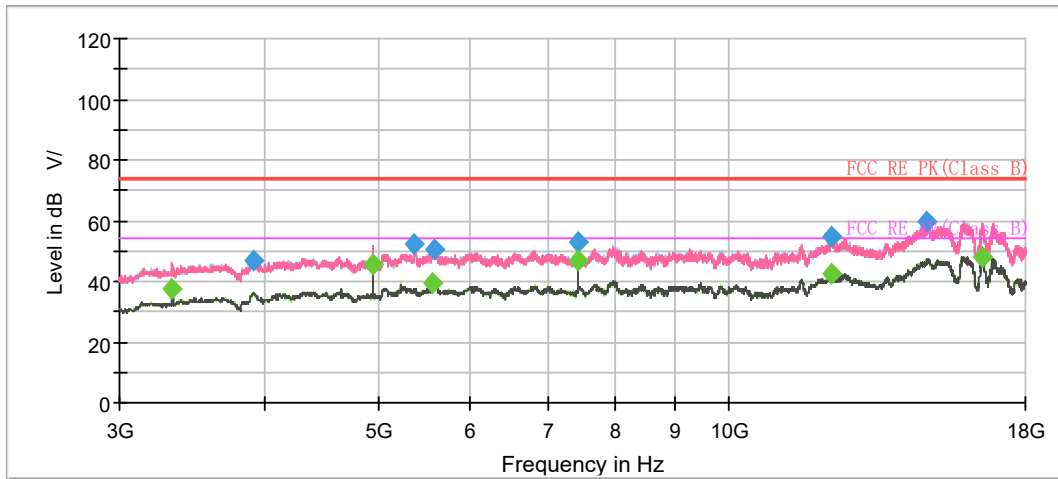
DH5-Channel 78



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1173.250000	---	32.41	54.00	21.59	500.0	100.0	H	0.0	-4.3
1187.000000	43.52	---	74.00	30.48	500.0	200.0	H	0.0	-4.0
1306.750000	---	34.08	54.00	19.92	500.0	100.0	H	2.0	-2.2
1439.750000	46.06	---	74.00	27.94	500.0	200.0	V	41.0	-1.7
1704.750000	47.00	---	74.00	27.00	500.0	200.0	H	192.0	0.4
1712.500000	---	35.98	54.00	18.02	500.0	200.0	V	206.0	0.4
2042.250000	48.28	---	74.00	25.72	500.0	100.0	H	349.0	2.5
2045.000000	---	37.24	54.00	16.76	500.0	200.0	V	198.0	2.5
2287.500000	48.00	---	74.00	26.00	500.0	100.0	V	270.0	3.2
2306.500000	---	37.72	54.00	16.28	500.0	100.0	H	184.0	3.5
2696.500000	54.59	---	74.00	19.41	500.0	200.0	V	198.0	5.1
2905.250000	---	42.30	54.00	11.70	500.0	200.0	V	349.0	8.5



Radiates Emission from 3GHz to 18GHz

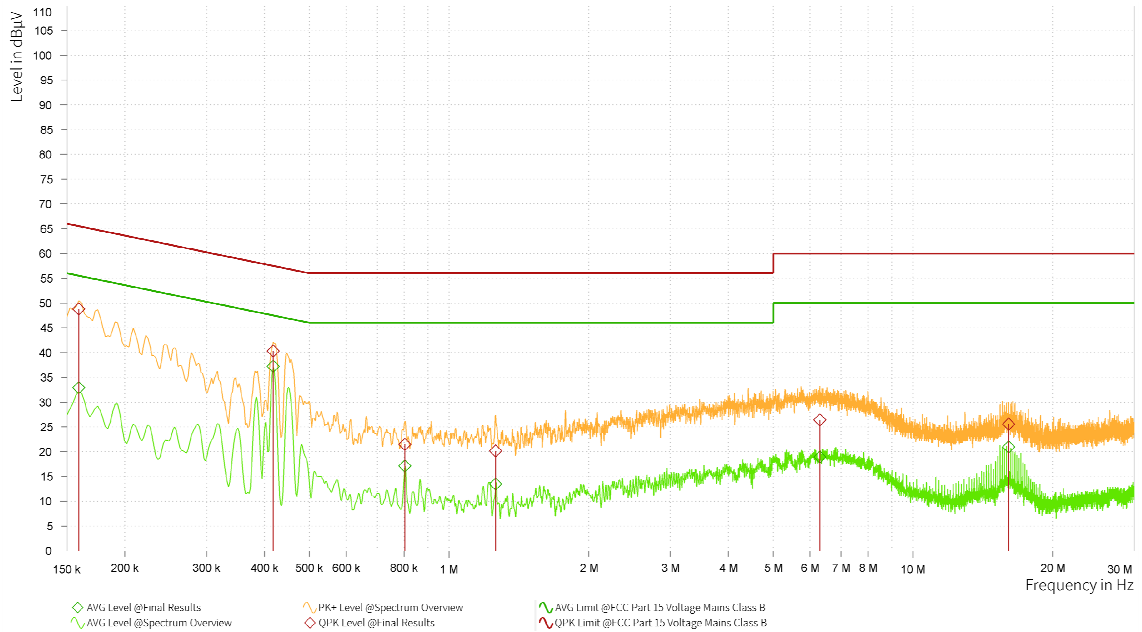
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3331.875000	---	37.30	54.00	16.70	500.0	100.0	V	178.0	-1.1
3909.375000	47.02	---	74.00	26.98	500.0	100.0	V	346.0	3.7
4959.375000	---	45.23	54.00	8.77	500.0	100.0	V	32.0	3.3
5373.750000	52.08	---	74.00	21.92	500.0	100.0	V	47.0	4.6
5580.000000	---	39.55	54.00	14.45	500.0	100.0	H	312.0	7.5
5591.250000	50.33	---	74.00	23.67	500.0	100.0	V	0.0	8.1
7440.000000	52.73	---	74.00	21.27	500.0	200.0	H	281.0	7.3
7440.000000	---	46.53	54.00	7.47	500.0	200.0	H	281.0	7.3
12266.250000	54.58	---	74.00	19.42	500.0	200.0	H	186.0	14.4
12281.250000	---	42.75	54.00	11.25	500.0	100.0	H	135.0	14.5
14823.750000	59.45	---	74.00	14.55	500.0	200.0	V	38.0	19.3
16539.375000	---	47.96	54.00	6.04	500.0	100.0	H	341.0	20.6

2. Conducted Emission

2.1. Bluetooth

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.

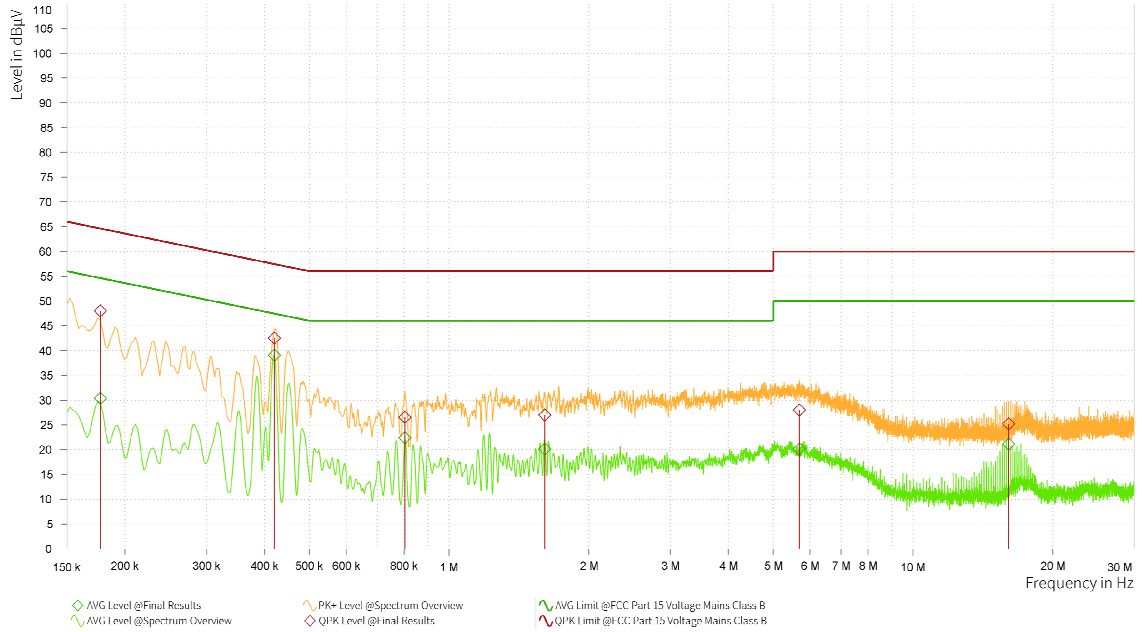
F153C:



Frequency [MHz]	QPK Level [dBμV]	QPK Limit [dBμV]	QPK Margin [dB]	AVG Level [dBμV]	AVG Limit [dBμV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
0.159	48.80	65.52	16.71	32.93	55.52	22.58	20.90	L1	9.000	1.000
0.418	40.32	57.49	17.17	37.23	47.49	10.26	20.86	L1	9.000	1.000
0.803	21.50	56.00	34.50	17.10	46.00	28.90	20.33	L1	9.000	1.000
1.259	20.18	56.00	35.82	13.49	46.00	32.51	19.98	L1	9.000	1.000
6.297	26.44	60.00	33.56	18.90	50.00	31.10	19.40	L1	9.000	1.000
16.087	25.58	60.00	34.42	20.96	50.00	29.04	19.54	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 Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
0.177	47.99	64.63	16.63	30.35	54.63	24.28	21.04	N	9.000	1.000
0.420	42.50	57.45	14.95	39.05	47.45	8.40	20.87	N	9.000	1.000
0.803	26.54	56.00	29.46	22.37	46.00	23.63	20.34	N	9.000	1.000
1.608	26.98	56.00	29.02	20.10	46.00	25.90	19.80	N	9.000	1.000
5.692	27.98	60.00	32.02	20.12	50.00	29.88	19.41	N	9.000	1.000
16.089	25.21	60.00	34.79	21.10	50.00	28.90	19.57	N	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 kHz to 30 MHz