

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 (Y axis) and the loop antenna is coplanar, the others are vertical and horizontal. and the worst case was recorded.

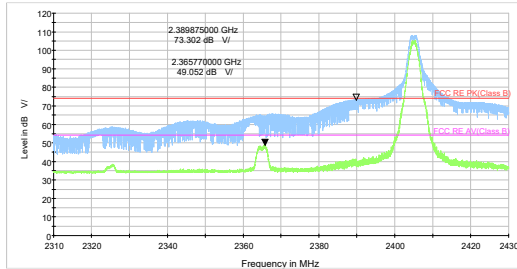
1. Unwanted Emission

1.1. Zigbee

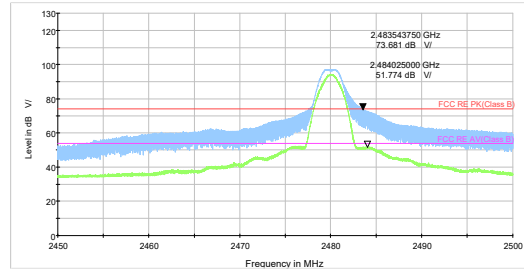
The following graphs display the maximum values of horizontal and vertical by software. Blue trace uses the peak detection, Green trace uses the average detection.

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

The signal beyond the limit is carrier.



Zigbee Channel 11 Peak+ Average



Zigbee Channel 26 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. A symbol ($\text{dB } \mu\text{V/m}$) in the test plot below means ($\text{dB}\mu\text{V/m}$)
4. The following graphs display the maximum values of coaxial and coplanar for 9k-30MHz; horizontal and vertical for above 30MHz by software.
5. For below 1GHz

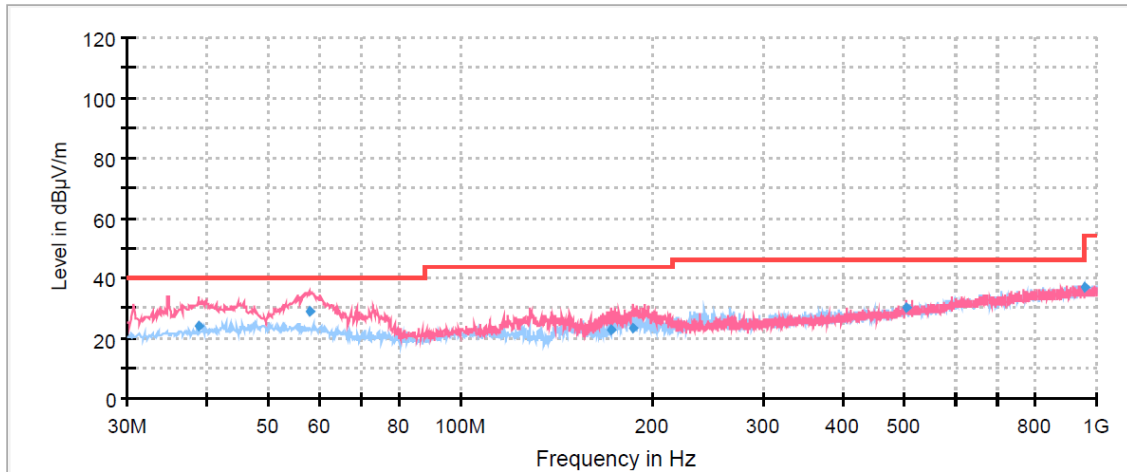
 QP Level @Spectrum Overview H
  QP Level @Spectrum Overview V
  QP Level @Final Results
  QP Limit

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:

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 (**Zigbee-Channel 11**) was recorded in this report.

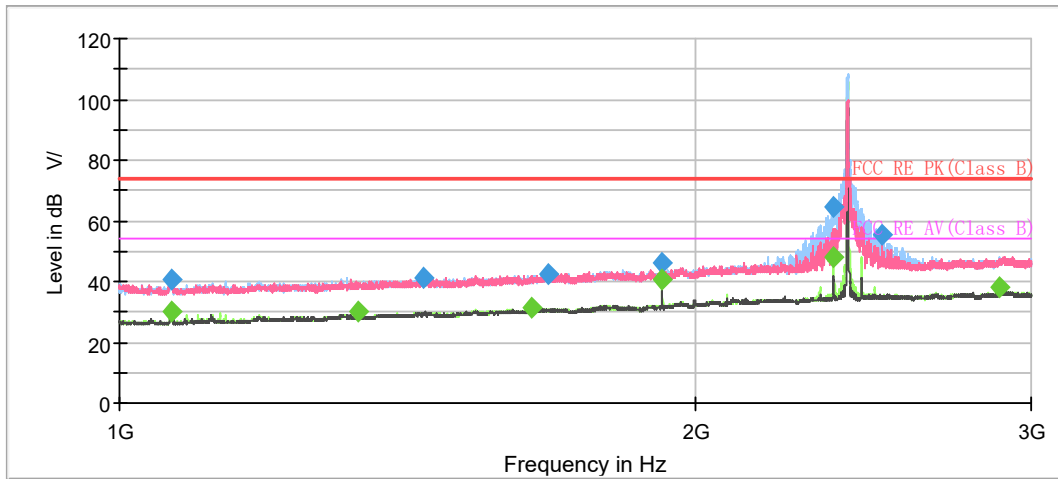


Radiates Emission from 30MHz to 1GHz

Final Result

Frequency (MHz)	QuasiPeak (dB $\mu\text{V/m}$)	Limit (dB $\mu\text{V/m}$)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
38.85	23.79	40.00	16.21	1000.00	100.0	V	0.00	19
57.89	28.66	40.00	11.34	1000.00	100.0	V	43.00	19
172.23	22.71	43.50	20.79	1000.00	100.0	V	20.00	16
187.38	23.27	43.50	20.23	1000.00	100.0	V	201.00	18
502.75	29.88	46.00	16.12	1000.00	100.0	V	358.00	25
959.50	37.05	46.00	8.95	1000.00	100.0	H	44.00	31

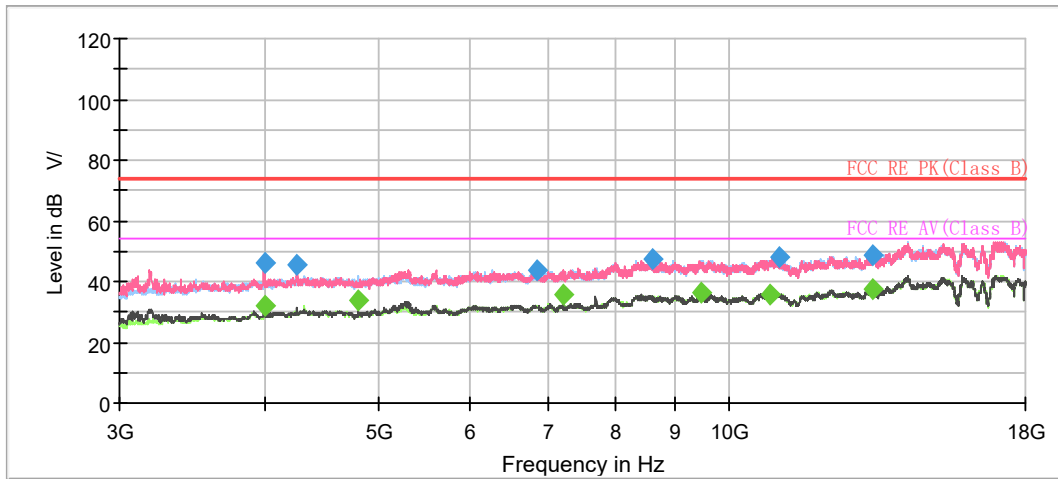
Zigbee-Channel 11



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

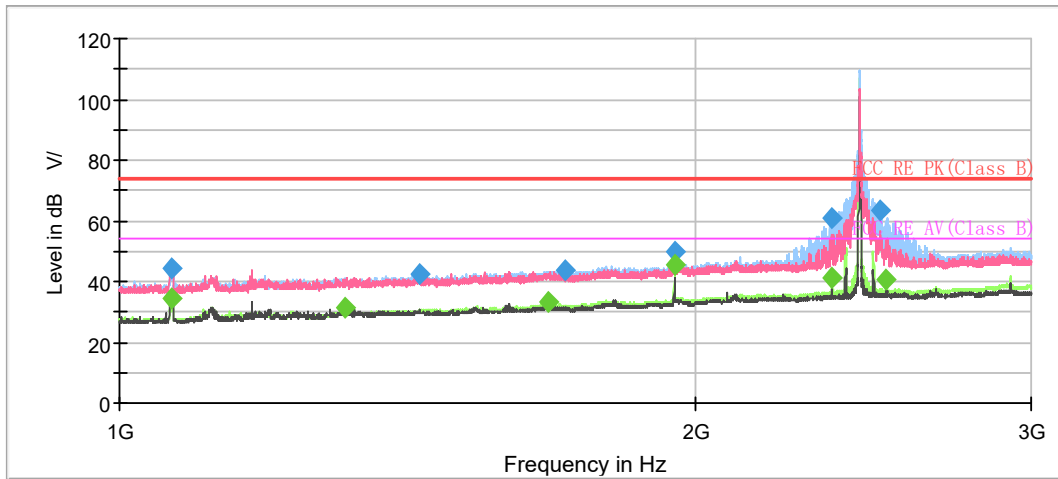
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.750000	40.82	---	74.00	33.18	500.0	200.0	V	198.0	-16.0
1064.500000	---	30.36	54.00	23.64	500.0	200.0	V	198.0	-16.0
1333.750000	---	30.35	54.00	23.65	500.0	100.0	V	172.0	-13.6
1440.750000	41.29	---	74.00	32.71	500.0	200.0	V	150.0	-12.6
1644.250000	---	31.66	54.00	22.34	500.0	100.0	H	83.0	-11.1
1677.250000	42.70	---	74.00	31.30	500.0	200.0	V	211.0	-10.7
1924.000000	46.26	---	74.00	27.74	500.0	100.0	H	298.0	-9.6
1924.000000	---	40.62	54.00	13.38	500.0	100.0	H	298.0	-9.6
2364.500000	64.44	---	74.00	9.56	500.0	100.0	H	322.0	-6.1
2366.000000	---	47.84	54.00	6.16	500.0	100.0	H	352.0	-6.1
2505.500000	55.09	---	74.00	18.91	500.0	100.0	H	0.0	-5.4
2887.000000	---	37.97	54.00	16.03	500.0	100.0	H	328.0	-3.6



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)
3995.625000	---	32.13	54.00	21.87	500.0	100.0	V	179.0	-10.1
3995.625000	45.85	---	74.00	28.15	500.0	100.0	V	179.0	-10.1
4256.250000	45.24	---	74.00	28.76	500.0	100.0	V	192.0	-9.1
4809.375000	---	33.73	54.00	20.27	500.0	100.0	H	331.0	-9.1
6845.625000	43.85	---	74.00	30.15	500.0	200.0	H	236.0	-2.8
7215.000000	---	35.93	54.00	18.07	500.0	100.0	V	138.0	-2.0
8596.875000	47.18	---	74.00	26.82	500.0	100.0	H	99.0	0.8
9474.375000	---	36.05	54.00	17.95	500.0	100.0	V	152.0	1.2
10878.750000	---	35.42	54.00	18.58	500.0	200.0	H	0.0	1.5
11070.000000	48.08	---	74.00	25.92	500.0	100.0	V	67.0	1.4
13305.000000	---	37.29	54.00	16.71	500.0	100.0	V	165.0	2.2
13320.000000	48.76	---	74.00	25.24	500.0	100.0	H	194.0	2.2

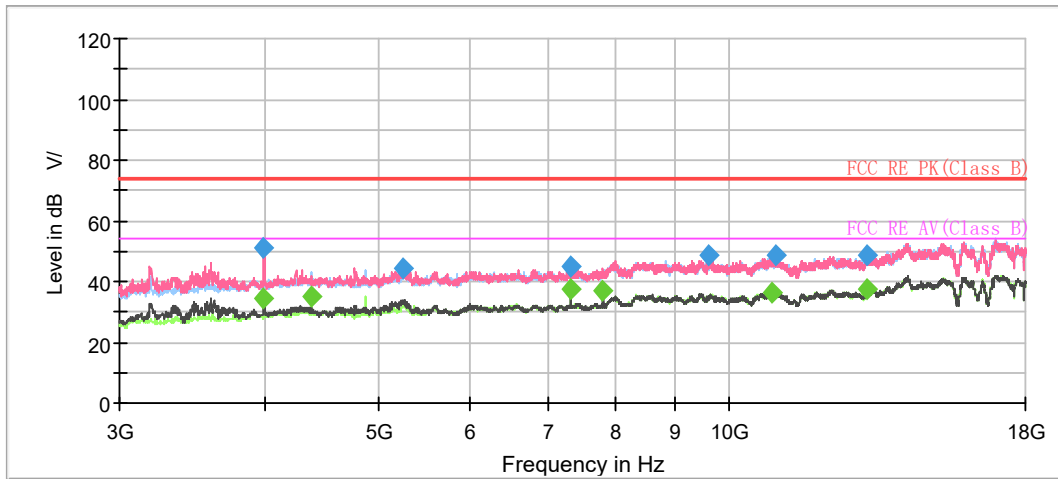
Zigbee-Channel 18



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

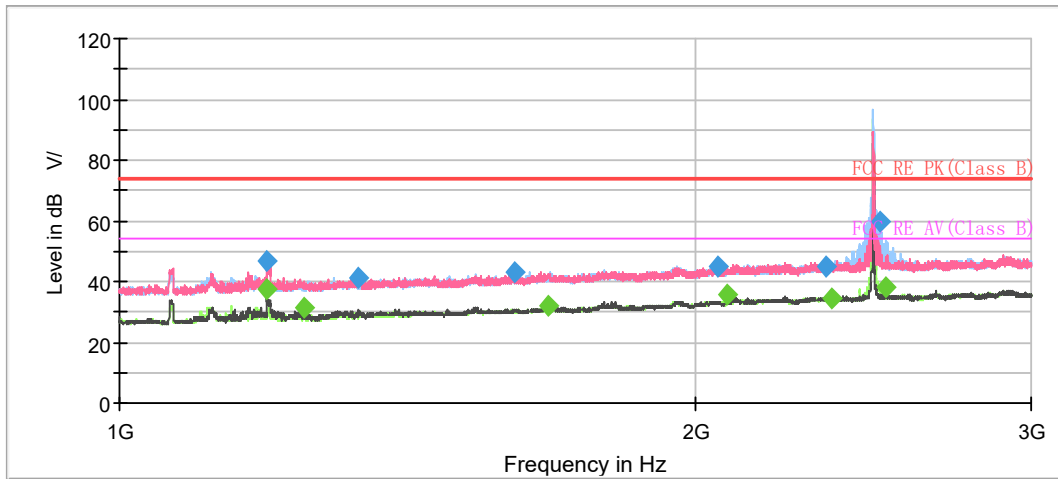
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1064.000000	44.56	---	74.00	29.44	500.0	200.0	V	216.0	-16.0
1064.500000	---	34.33	54.00	19.67	500.0	200.0	V	216.0	-16.0
1312.750000	---	31.51	54.00	22.49	500.0	100.0	V	229.0	-13.6
1436.500000	42.41	---	74.00	31.59	500.0	100.0	H	352.0	-12.6
1675.750000	---	32.97	54.00	21.03	500.0	200.0	H	122.0	-10.7
1709.500000	43.50	---	74.00	30.50	500.0	200.0	H	80.0	-10.7
1952.000000	50.03	---	74.00	23.97	500.0	100.0	H	287.0	-8.9
1952.000000	---	45.77	54.00	8.23	500.0	100.0	H	287.0	-8.9
2359.750000	60.83	---	74.00	13.17	500.0	200.0	H	304.0	-6.1
2360.500000	---	41.52	54.00	12.48	500.0	200.0	H	67.0	-6.1
2499.000000	63.18	---	74.00	10.82	500.0	100.0	H	300.0	-5.4
2520.500000	---	40.61	54.00	13.39	500.0	200.0	H	0.0	-5.5



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)
3984.375000	51.32	---	74.00	22.68	500.0	200.0	V	205.0	-10.3
3988.125000	---	34.34	54.00	19.66	500.0	200.0	V	219.0	-10.2
4391.250000	---	34.90	54.00	19.10	500.0	200.0	H	326.0	-8.7
5257.500000	44.59	---	74.00	29.41	500.0	200.0	V	205.0	-5.5
7318.125000	45.07	---	74.00	28.93	500.0	100.0	V	251.0	-1.4
7320.000000	---	37.68	54.00	16.32	500.0	100.0	V	251.0	-1.4
7807.500000	---	36.93	54.00	17.07	500.0	100.0	V	304.0	-1.3
9630.000000	48.54	---	74.00	25.46	500.0	100.0	V	224.0	0.2
10920.000000	---	36.16	54.00	17.84	500.0	100.0	H	84.0	1.6
10963.125000	48.43	---	74.00	25.57	500.0	200.0	H	68.0	1.5
13162.500000	48.52	---	74.00	25.48	500.0	200.0	V	164.0	2.6
13170.000000	---	37.41	54.00	16.59	500.0	100.0	V	125.0	2.6

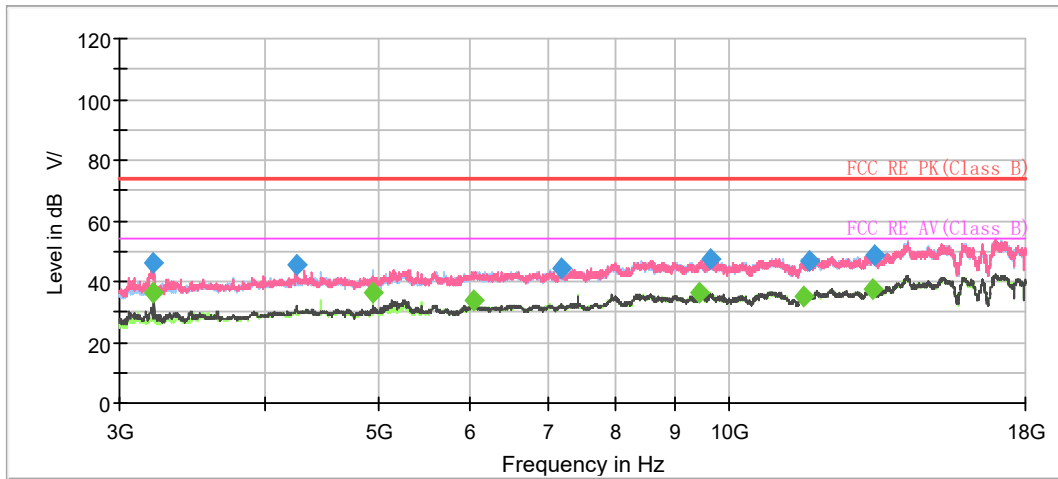
Zigbee-Channel 26



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

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)
1194.750000	---	37.27	54.00	16.73	500.0	100.0	V	223.0	-14.6
1194.750000	46.95	---	74.00	27.05	500.0	100.0	V	223.0	-14.6
1249.750000	---	31.11	54.00	22.89	500.0	100.0	V	223.0	-14.4
1332.000000	41.28	---	74.00	32.72	500.0	200.0	H	259.0	-13.6
1611.750000	43.25	---	74.00	30.75	500.0	200.0	V	191.0	-11.4
1675.000000	---	32.21	54.00	21.79	500.0	200.0	V	119.0	-10.7
2056.250000	44.84	---	74.00	29.16	500.0	200.0	H	222.0	-8.0
2079.000000	---	35.82	54.00	18.18	500.0	100.0	V	148.0	-8.0
2342.750000	44.96	---	74.00	29.04	500.0	200.0	H	185.0	-6.3
2360.250000	---	34.22	54.00	19.78	500.0	200.0	H	150.0	-6.1
2499.250000	59.98	---	74.00	14.02	500.0	200.0	H	285.0	-5.4
2519.500000	---	37.87	54.00	16.13	500.0	100.0	H	294.0	-5.5



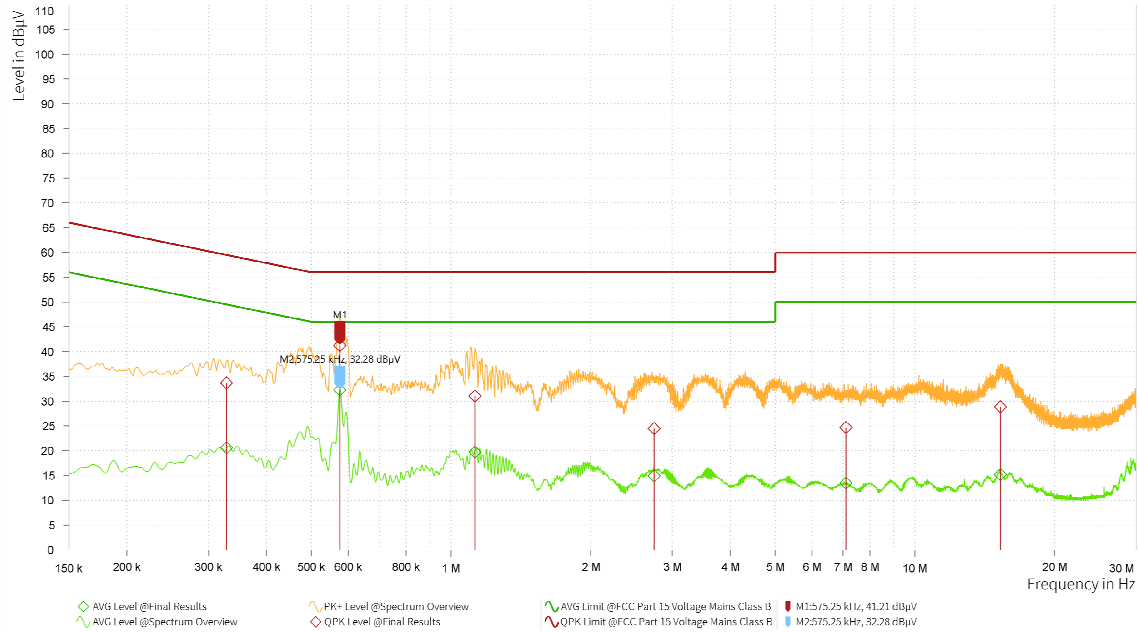
Radiates Emission from 3GHz to 18GHz

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)
3208.125000	---	36.30	54.00	17.70	500.0	200.0	V	209.0	-12.9
3208.125000	45.93	---	74.00	28.07	500.0	200.0	V	209.0	-12.9
4254.375000	45.25	---	74.00	28.76	500.0	100.0	V	192.0	-9.1
4959.375000	---	36.42	54.00	17.58	500.0	200.0	H	313.0	-7.3
6054.375000	---	33.62	54.00	20.38	500.0	100.0	V	307.0	-5.2
7192.500000	44.25	---	74.00	29.75	500.0	100.0	V	179.0	-1.7
9451.875000	---	36.12	54.00	17.88	500.0	100.0	H	0.0	0.7
9654.375000	47.34	---	74.00	26.66	500.0	100.0	V	346.0	0.6
11613.750000	---	35.19	54.00	18.81	500.0	200.0	H	192.0	0.8
11741.250000	46.98	---	74.00	27.02	500.0	200.0	V	250.0	1.1
13323.750000	---	37.56	54.00	16.44	500.0	100.0	V	334.0	2.2
13335.000000	48.81	---	74.00	25.19	500.0	100.0	V	219.0	2.1

2. Conducted Emission

2.1. Zigbee

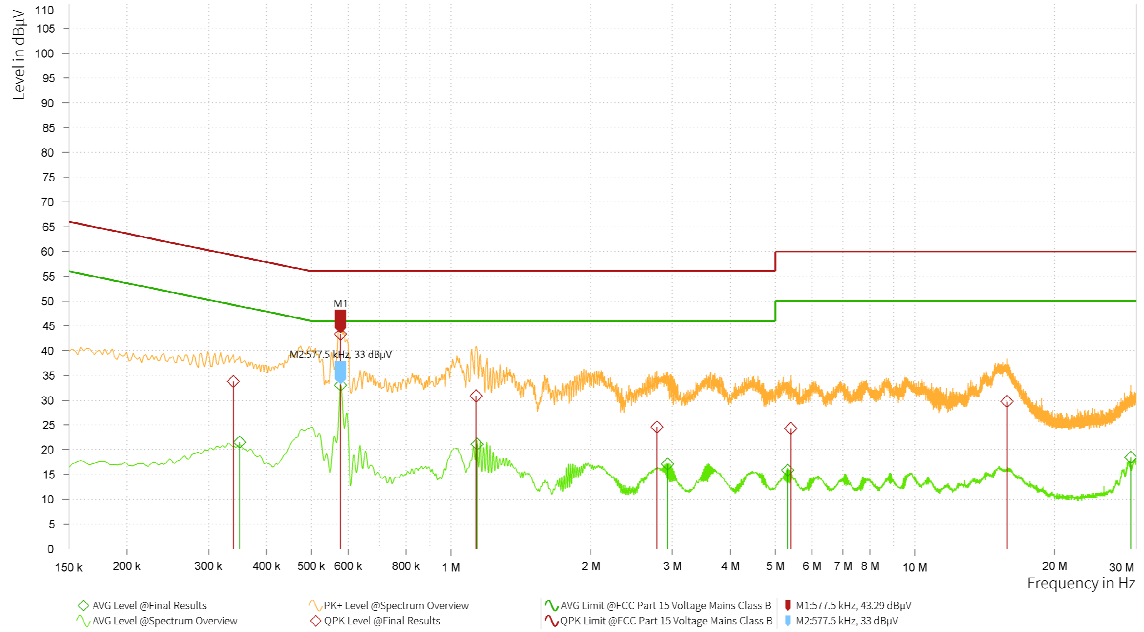
During the test, the Conducted Emission was performed in all modes with all channel. The test data of the worst-case condition (**Zigbee-Channel 11**) was recorded in this report.



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]
0.328	33.66	59.51	25.84	20.56	49.51	28.95	21.27	L1	9.000	1.000
0.575	41.21	56.00	14.79	32.28	46.00	13.72	21.05	L1	9.000	1.000
1.127	31.00	56.00	25.00	19.72	46.00	26.28	20.37	L1	9.000	1.000
2.742	24.45	56.00	31.55	14.95	46.00	31.05	19.86	L1	9.000	1.000
7.105	24.68	60.00	35.32	13.46	50.00	36.54	19.71	L1	9.000	1.000
15.297	28.83	60.00	31.17	15.19	50.00	34.81	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 Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [s]
0.339	33.75	59.23	25.47	--	--	--	21.22	N	9.000	1.000
0.350	--	--	--	21.52	48.96	27.44	21.20	N	9.000	1.000
0.578	43.29	56.00	12.71	33.00	46.00	13.00	21.00	N	9.000	1.000
1.133	30.84	56.00	25.16	--	--	--	20.40	N	9.000	1.000
1.138	--	--	--	21.13	46.00	24.87	20.39	N	9.000	1.000
2.778	24.58	56.00	31.42	--	--	--	19.84	N	9.000	1.000
2.929	--	--	--	17.13	46.00	28.87	19.83	N	9.000	1.000
5.318	--	--	--	15.87	50.00	34.13	19.79	N	9.000	1.000
5.399	24.26	60.00	35.74	--	--	--	19.78	N	9.000	1.000
15.806	29.73	60.00	30.27	--	--	--	19.84	N	9.000	1.000
29.236	--	--	--	18.43	50.00	31.57	20.21	N	9.000	1.000

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 kHz to 30 MHz