

9.6 Band edge testing

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize, use the peak and delta measurement to record the result.
5. The level displayed must comply with the limit specified in this Section.
6. Repeat above procedures until all frequencies measured were complete and submit all the plots.

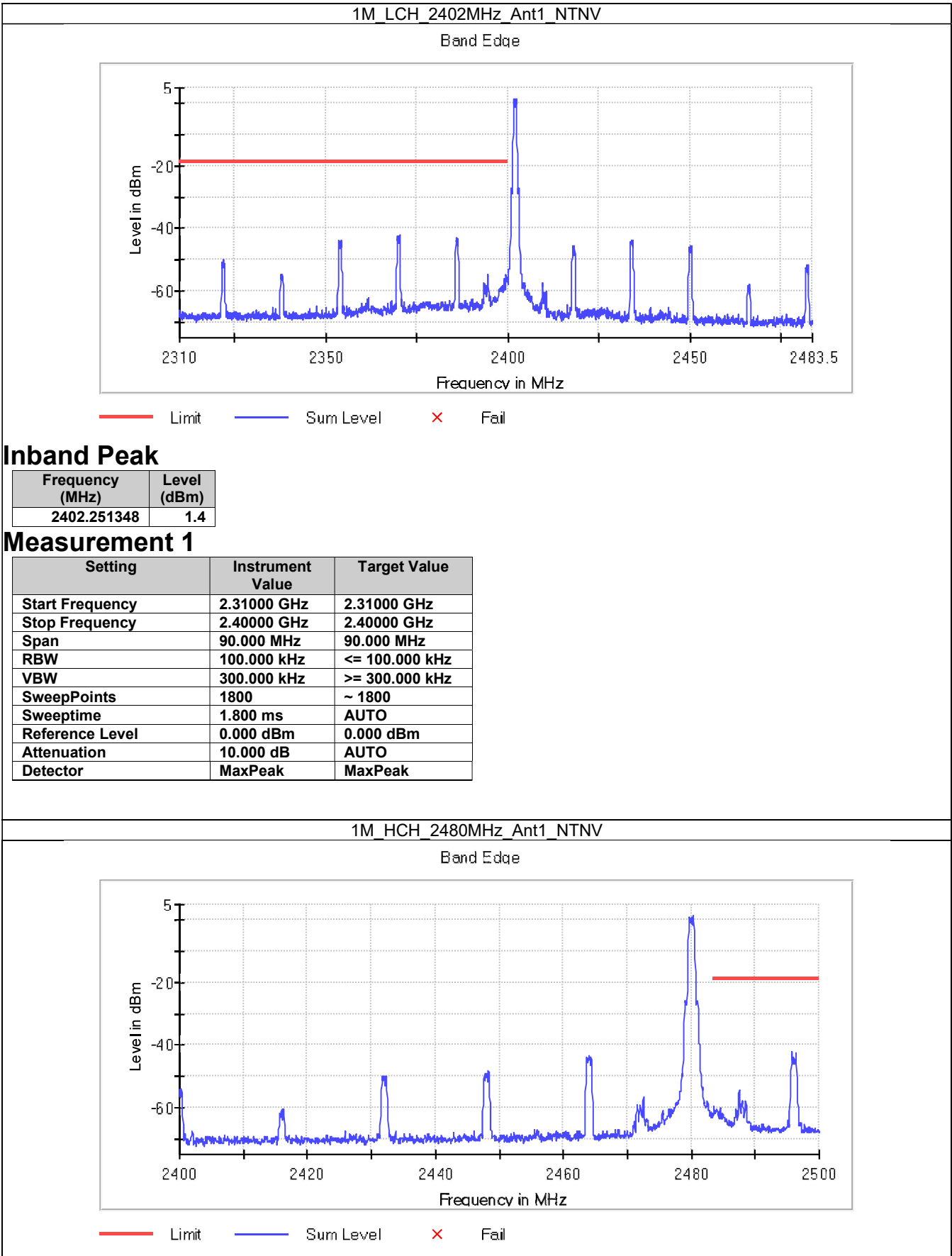
Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3), the attenuation required shall be 30 dB instead of 20 dB.

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	1.4	-18.6	Pass
		2480	1	1.3	-18.7	Pass



Inband Peak

Frequency (MHz)	Level (dBm)
2480.348113	1.3

Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	1.670 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak

9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Use the following spectrum analyzer settings According to C63.10:
 - 1) Procedure for Unwanted Emissions Measurements Below 1000 MHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz to 120KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
 - 2) For Peak unwanted emissions Above 1GHz:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
 - 3) Procedures for average unwanted emissions measurements above 1000 MHz
 - a) RBW = 1MHz.
 - b) VBW \ [3 × RBW].
 - c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
 - 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(AV) at frequency above 1GHz.

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in § 15.209(a) is not required. 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).

Frequency MHz	Field Strength μV/m	Field Strength dBμV/m	Detector	Measurement distance meters
0.009-0.490	2400/F(kHz)	48.5-13.8	AV	300
0.490-1.705	24000/F(kHz)	33.8-23.0	QP	30
1.705-30	30	29.5	QP	30
30-88	100	40	QP	3
88-216	150	43.5	QP	3
216-960	200	46	QP	3
960-1000	500	54	QP	3
Above 1000	500	54	AV	3
Above 1000	5000	74	PK	3

Note 1: Limit 3m(dBμV/m)=Limit 300m(dBμV/m)+40Log(300m/3m) (Below 30MHz)

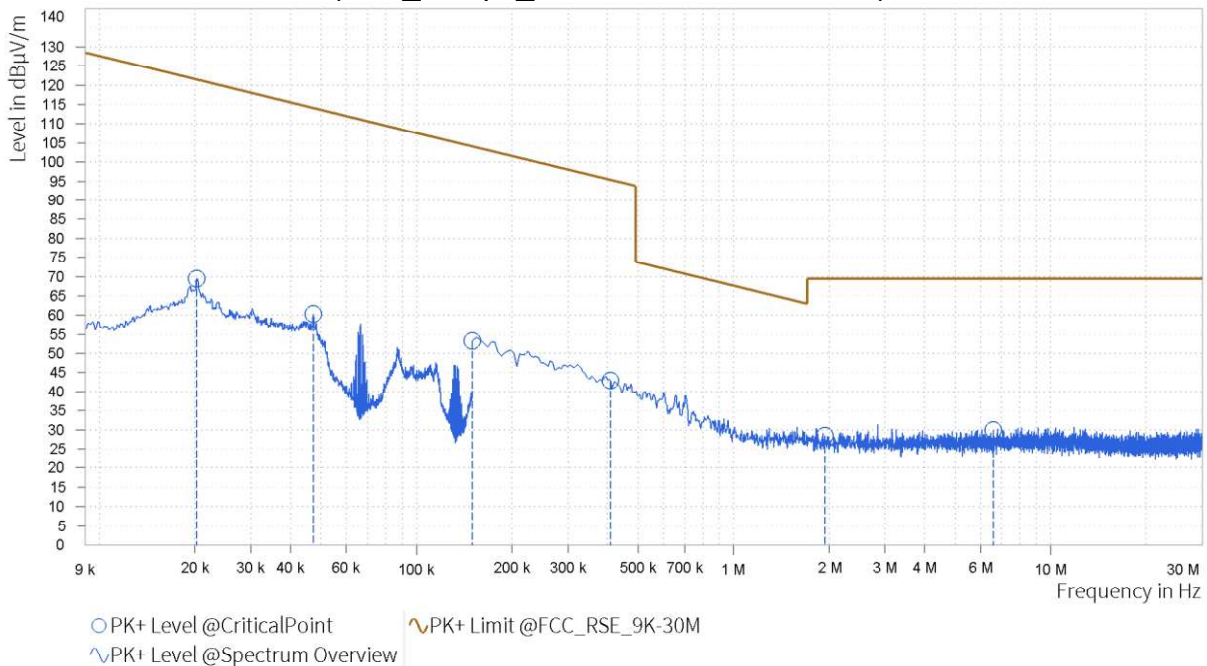
Note 2: Limit 3m(dBμV/m)=Limit 30m(dBμV/m)+40Log(30m/3m) (Below 30MHz)

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

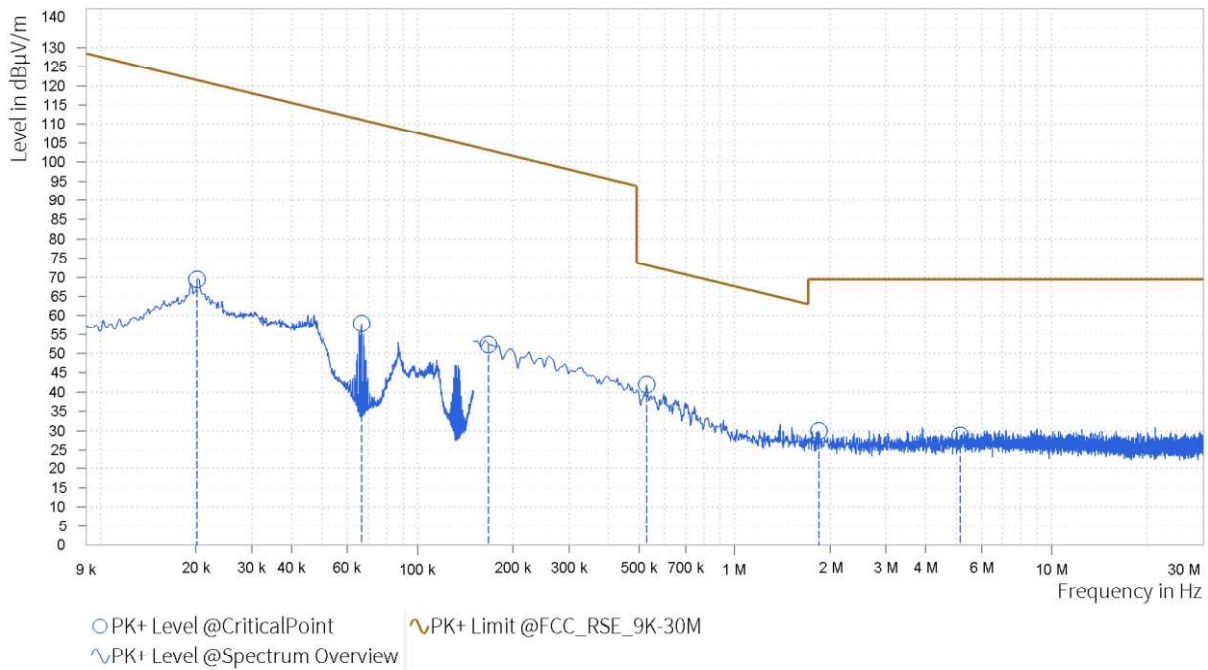
Transmitting spurious emission test result as below:

Emission 9kHz-30MHz (BLE_1Mbps_Low Channel: 2402MHz)



EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Antenna Height [m]
1	0.020	69.43	121.45	52.02	20.60	H	1.00
1	0.047	60.35	114.11	53.75	20.64	H	1.00
2	0.150	53.26	104.08	50.82	20.63	H	1.00
2	0.409	42.94	95.37	52.42	20.61	H	1.00
2	1.941	28.54	69.50	40.96	20.57	H	1.00
2	6.577	30.00	69.50	39.50	20.86	H	1.00



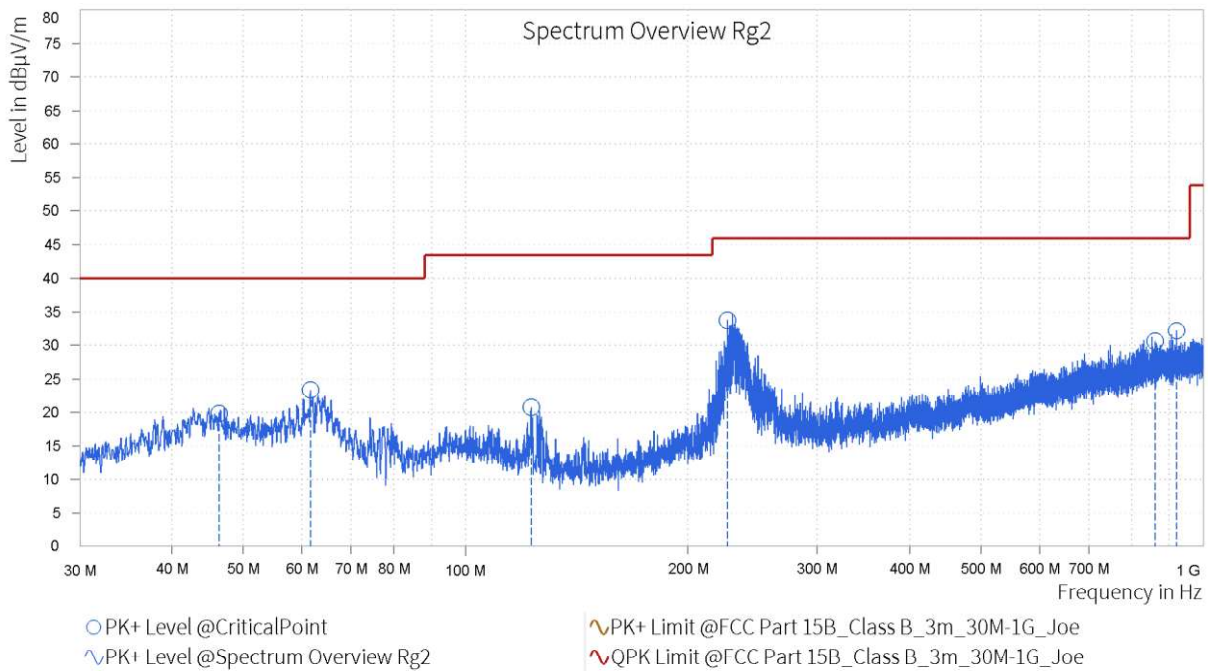
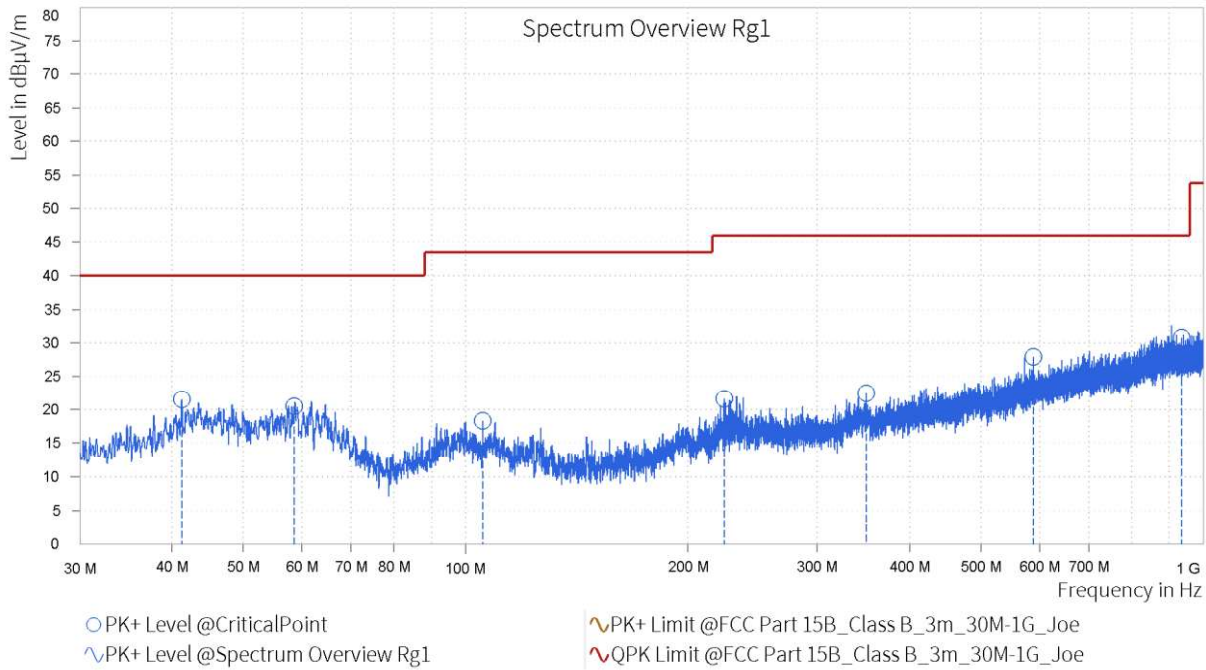
EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Antenna Height [m]
1	0.020	69.36	121.49	52.13	20.60	V	1.00
1	0.067	57.91	111.13	53.22	20.67	V	1.00
2	0.168	52.34	103.12	50.78	20.62	V	1.00
2	0.528	41.90	73.16	31.27	20.59	V	1.00
2	1.844	29.98	69.50	39.52	20.57	V	1.00
2	5.154	28.83	69.50	40.67	20.76	V	1.00

Remark: the test was performed for Low, Middle, High channel, and the worst channel data was recorded in the report.

Emission 30MHz-1GHz

BLE_1Mbps_Low Channel: 2402MHz



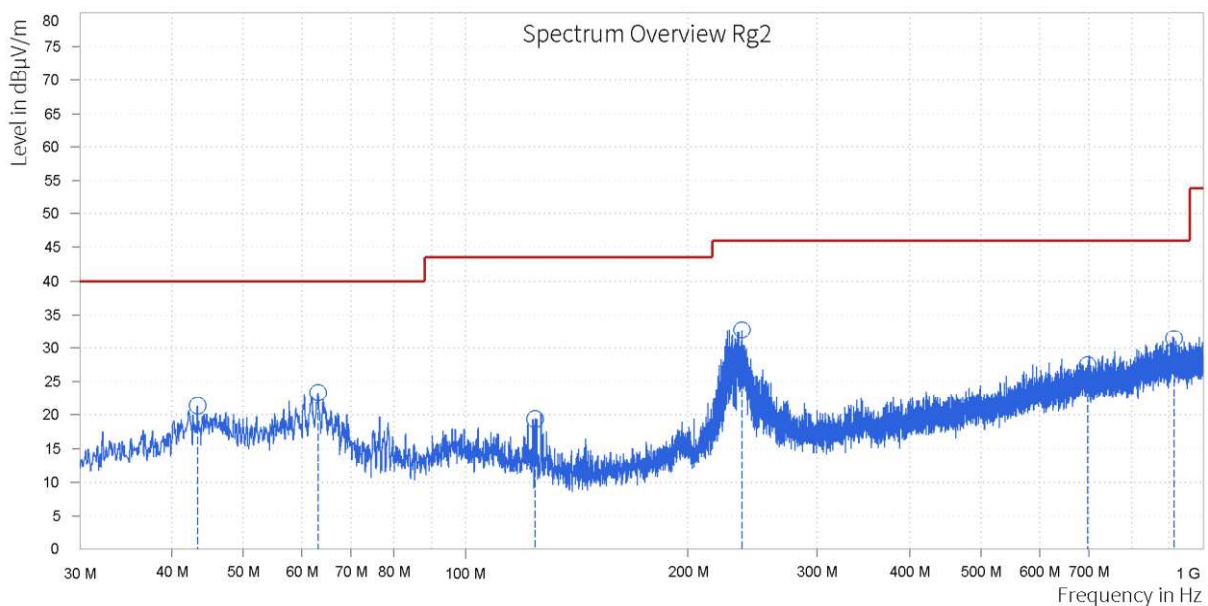
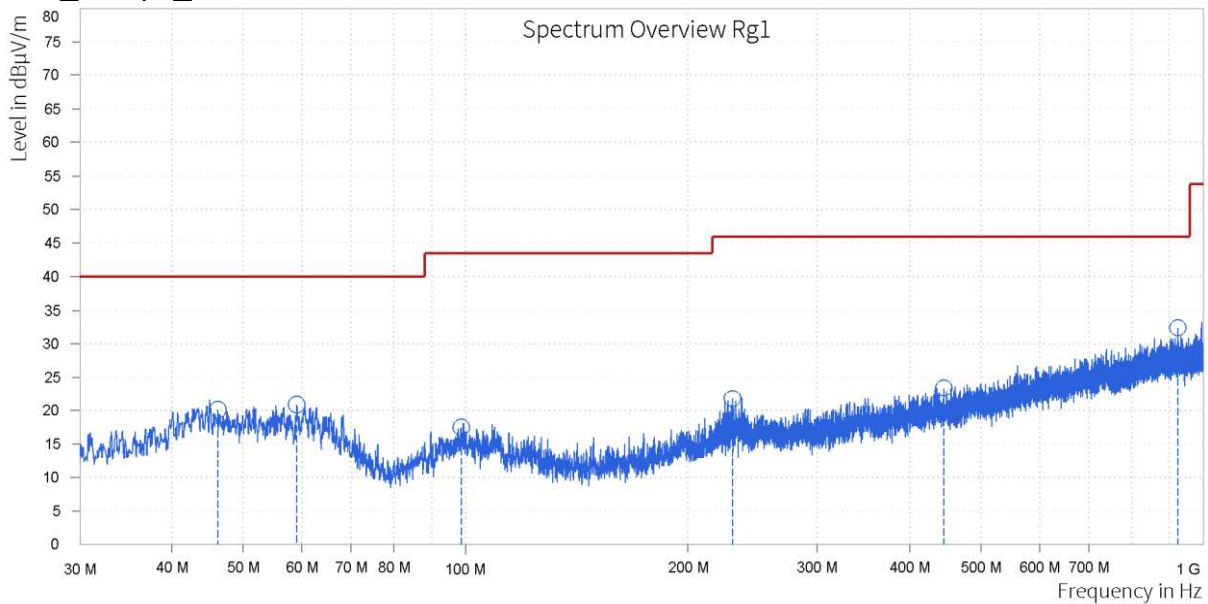
EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	41.263	21.50	40.00	18.50	-14.37	V	53.9	1.00
1	58.615	20.48	40.00	19.52	-15.61	V	53.9	1.00
1	105.552	18.33	43.50	25.17	-17.30	V	337.3	1.00
1	224.377	21.66	46.00	24.34	-17.24	V	154.8	1.00
1	349.399	22.42	46.00	23.58	-13.81	V	359.9	1.00
1	588.397	27.89	46.00	18.11	-9.48	V	133.9	1.00

1	934.902	30.77	46.00	15.23	-4.50	V	247	1.00
2	46.328	19.80	40.00	20.20	-13.80	H	209.3	1.00
2	61.633	23.40	40.00	16.60	-16.41	H	70.8	1.00
2	122.743	20.79	43.50	22.71	-19.43	H	243.7	1.00
2	226.533	33.73	46.00	12.27	-17.12	H	233.3	1.00
2	860.805	30.59	46.00	15.41	-5.07	H	10.9	1.00
2	920.244	32.15	46.00	13.85	-4.56	H	360	1.00

Emission 30MHz-1GHz

BLE_1Mbps_Middle Channel: 2440MHz

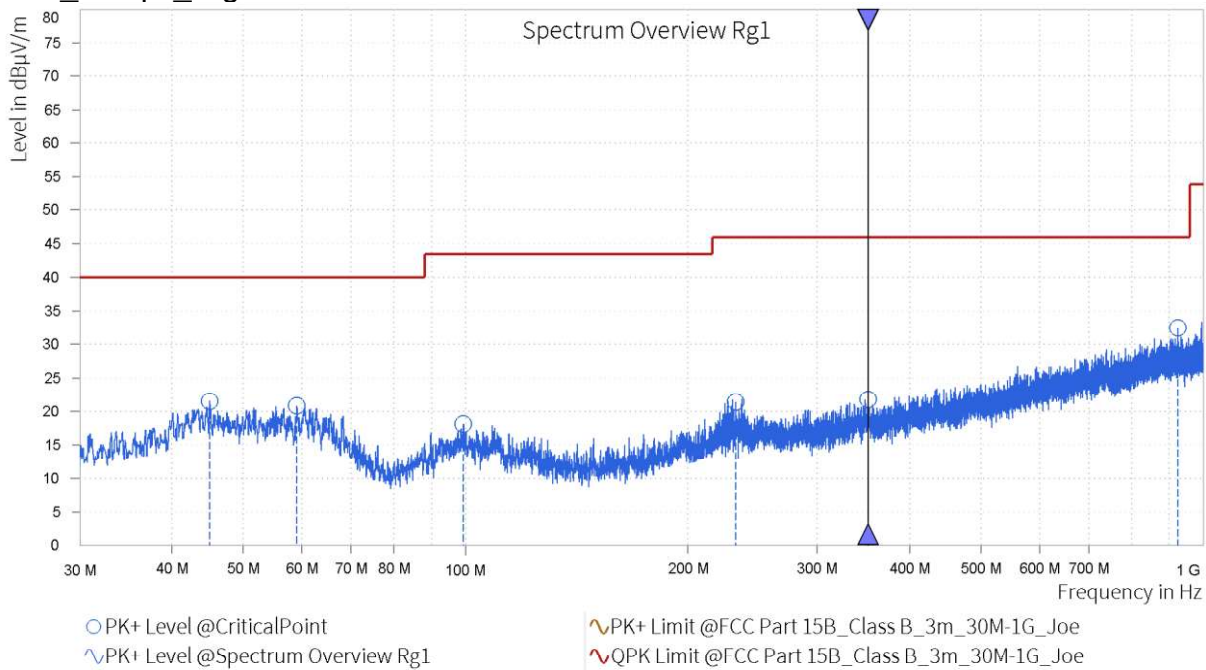


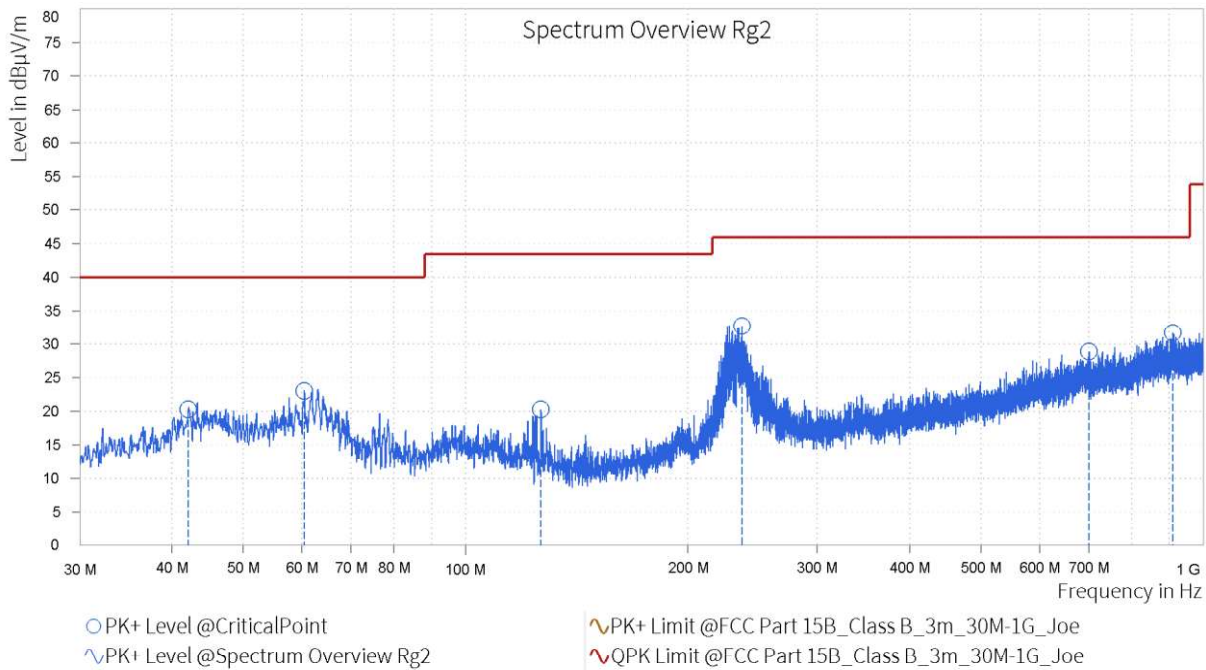
EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	46.167	20.08	40.00	19.92	-13.82	V	344.3	1.00
1	59.100	20.88	40.00	19.12	-15.76	V	2.9	1.00
1	98.762	17.48	43.50	26.02	-17.13	V	323.5	1.00
1	230.305	21.79	46.00	24.21	-16.99	V	155	1.00
1	444.837	23.40	46.00	22.60	-12.24	V	125.4	1.00
1	924.502	32.40	46.00	13.60	-4.53	V	61.1	1.00
2	43.311	21.30	40.00	18.70	-14.10	H	30.9	1.00
2	63.088	23.30	40.00	16.70	-16.71	H	197.2	1.00
2	124.252	19.40	43.50	24.10	-19.71	H	316.3	1.00
2	236.987	32.69	46.00	13.31	-16.82	H	72.5	1.00
2	696.929	27.43	46.00	18.57	-7.71	H	82.8	1.00
2	913.131	31.40	46.00	14.60	-4.58	H	297.3	1.00

Emission 30MHz-1GHz

BLE_1Mbps_High Channel: 2480MHz



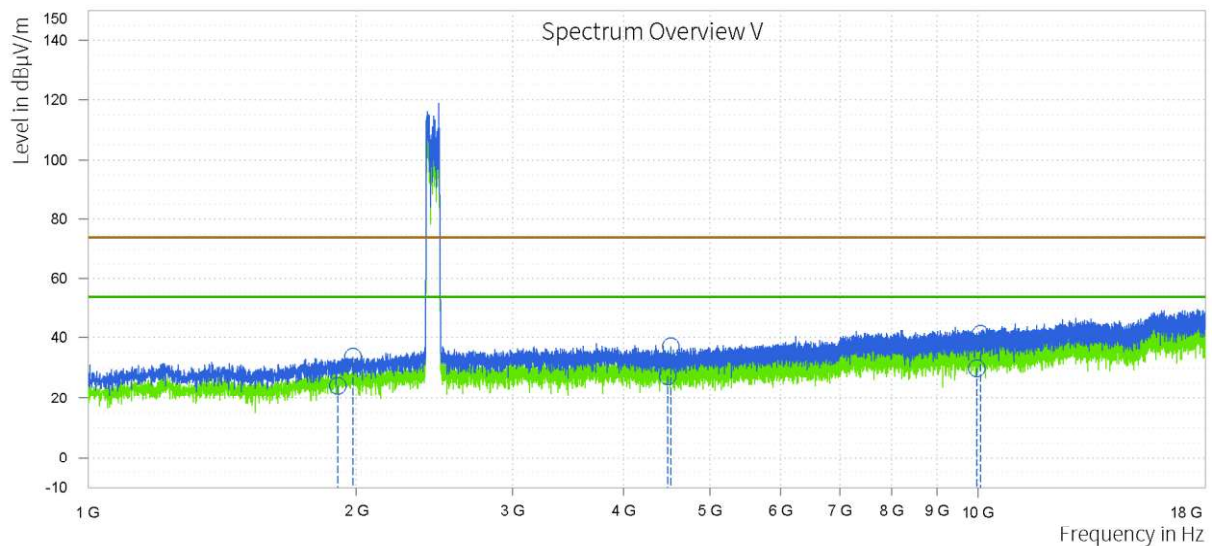
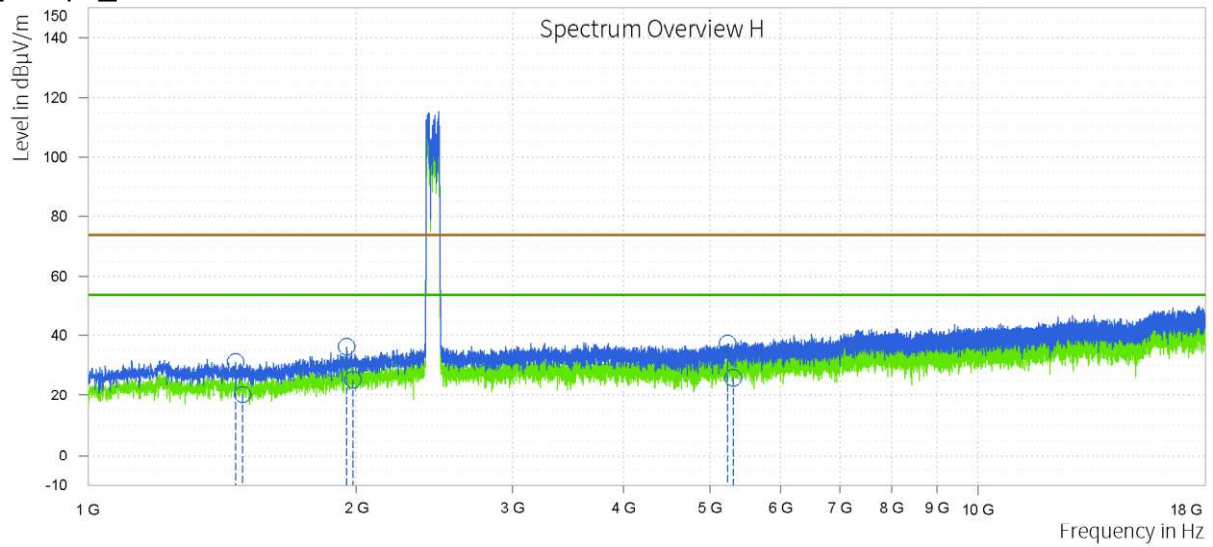


EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	44.981	21.56	40.00	18.44	-13.90	V	288.7	1.00
1	59.100	20.88	40.00	19.12	-15.76	V	2.9	1.00
1	99.409	18.14	43.50	25.36	-17.09	V	146.3	1.00
1	232.568	21.40	46.00	24.60	-16.93	V	333.9	1.00
1	351.555	21.80	46.00	24.20	-13.89	V	9.1	1.00
1	924.502	32.40	46.00	13.60	-4.53	V	61.1	1.00
2	42.125	20.34	40.00	19.66	-14.17	H	360	1.00
2	60.501	23.07	40.00	16.93	-16.13	H	162.6	1.00
2	126.623	20.35	43.50	23.15	-19.95	H	326.6	1.00
2	236.987	32.69	46.00	13.31	-16.82	H	72.5	1.00
2	700.863	28.89	46.00	17.11	-7.90	H	360	1.00
2	908.982	31.64	46.00	14.36	-4.54	H	337.1	1.00

Emission above 1-18GHz

BLE_1Mbps_Low Channel: 2402MHz



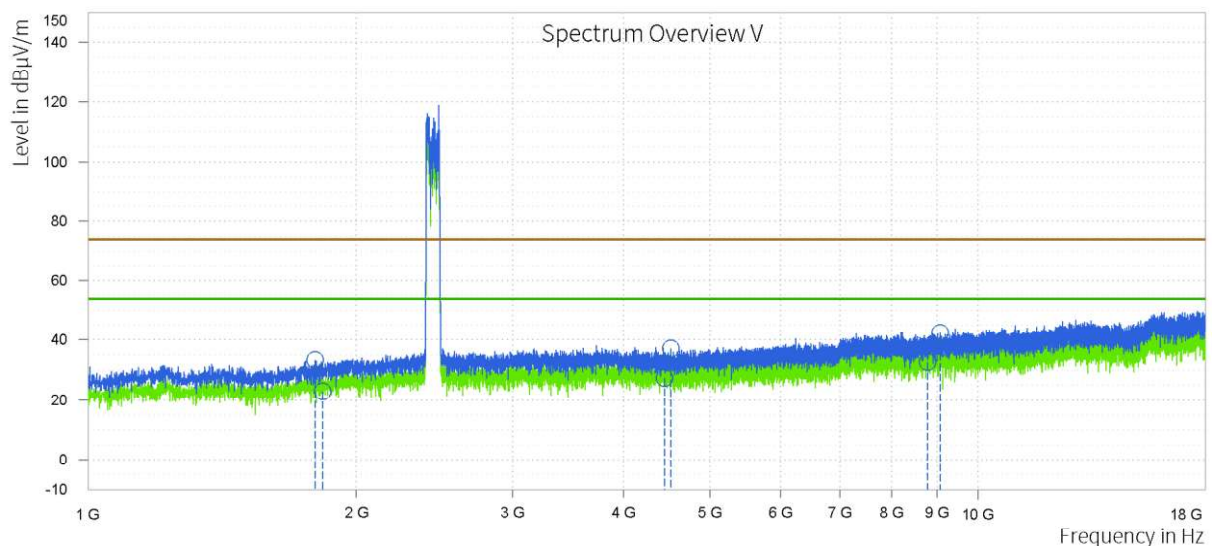
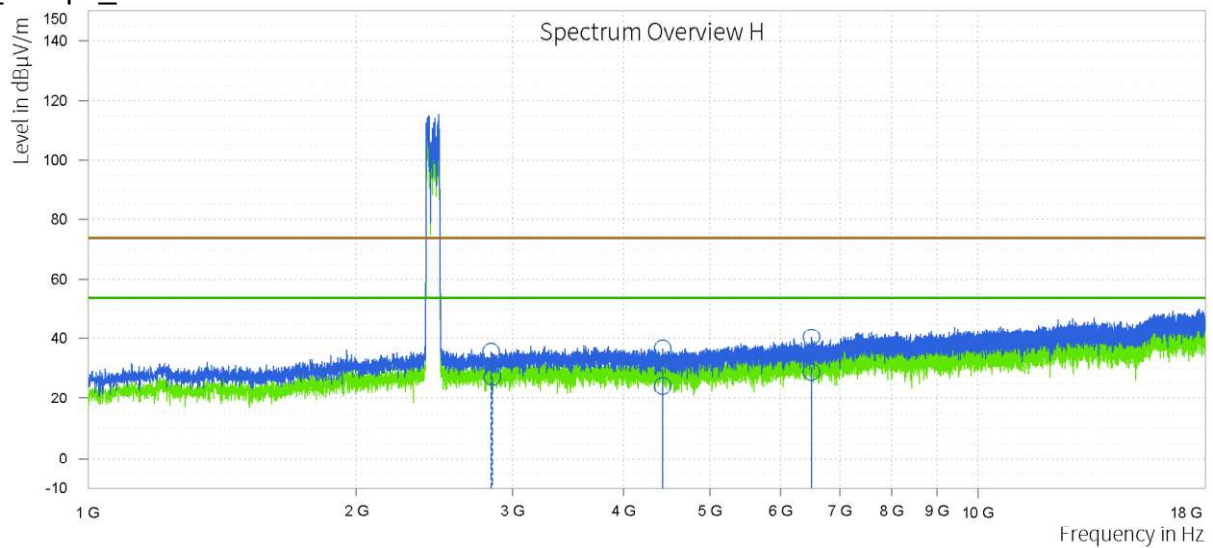
Remark: Data of measurement over the limit in frequency ranges 1-18GHz are fundamental frequency of BT.

EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization
1	1,464.500	31.30	73.90	42.60		53.90		-21.96	H
1	1,492.000		73.90		20.33	53.90	33.57	-22.05	H
1	1,909.500		73.90		24.15	53.90	29.75	-18.55	V
1	1,951.500	36.36	73.90	37.54		53.90		-18.14	H
1	1,985.000		73.90		25.32	53.90	28.58	-17.84	H
1	1,985.500	33.85	73.90	40.05		53.90		-17.83	V
1	4,480.000		73.90		27.49	53.90	26.41	-10.75	V
1	4,516.500	37.08	73.90	36.82		53.90		-10.77	V
1	5,231.500	37.45	73.90	36.45		53.90		-10.59	H
1	5,306.000		73.90		25.83	53.90	28.07	-10.68	H
1	9,966.500		73.90		29.99	53.90	23.91	-7.33	V
1	10,068.500	41.62	73.90	32.28		53.90		-7.08	V

Emission above 1-18GHz

BLE_1Mbps_Middle Channel: 2440MHz



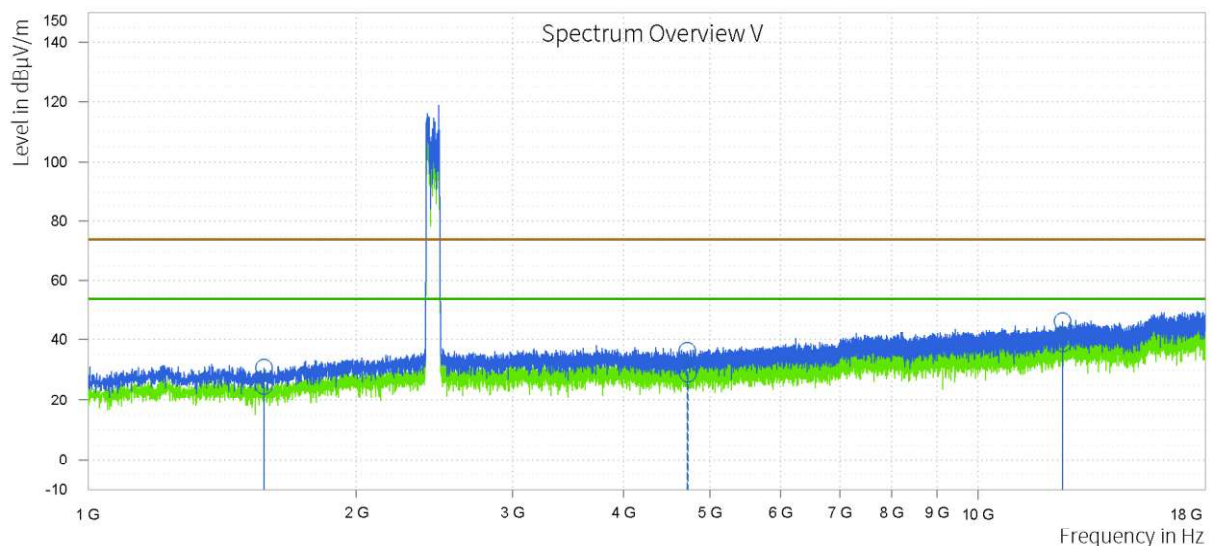
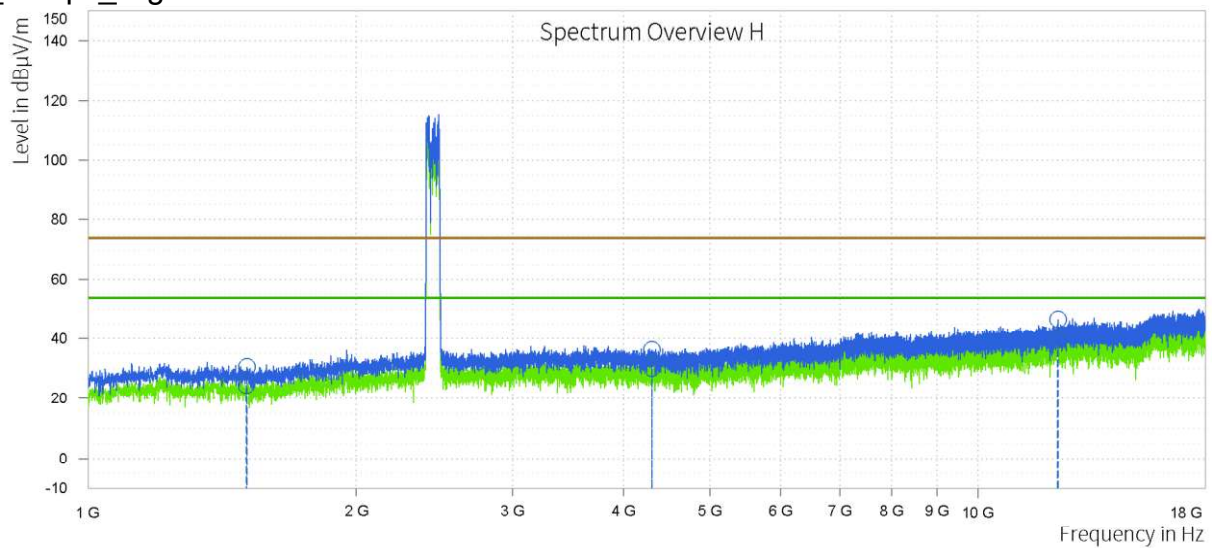
Remark: Data of measurement over the limit in frequency ranges 1-18GHz are fundamental frequency of BT.

EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization
1	1,798.500	33.31	73.90	40.59		53.90		-19.46	V
1	1,834.500		73.90		23.05	53.90	30.85	-19.08	V
1	2,837.500	35.55	73.90	38.35		53.90		-14.78	H
1	2,844.500		73.90		27.28	53.90	26.62	-14.71	H
1	4,421.500	36.62	73.90	37.28		53.90		-11.15	H
1	4,424.000		73.90		24.33	53.90	29.57	-11.13	H
1	4,445.000		73.90		27.35	53.90	26.55	-10.92	V
1	4,516.500	37.08	73.90	36.82		53.90		-10.77	V
1	6,498.000	40.41	73.90	33.49		53.90		-9.23	H
1	6,505.500		73.90		28.80	53.90	25.10	-9.24	H
1	8,775.000		73.90		32.60	53.90	21.30	-7.70	V
1	9,076.000	42.50	73.90	31.40		53.90		-7.55	V

Emission above 1-18GHz

BLE_1Mbps_High Channel: 2480MHz

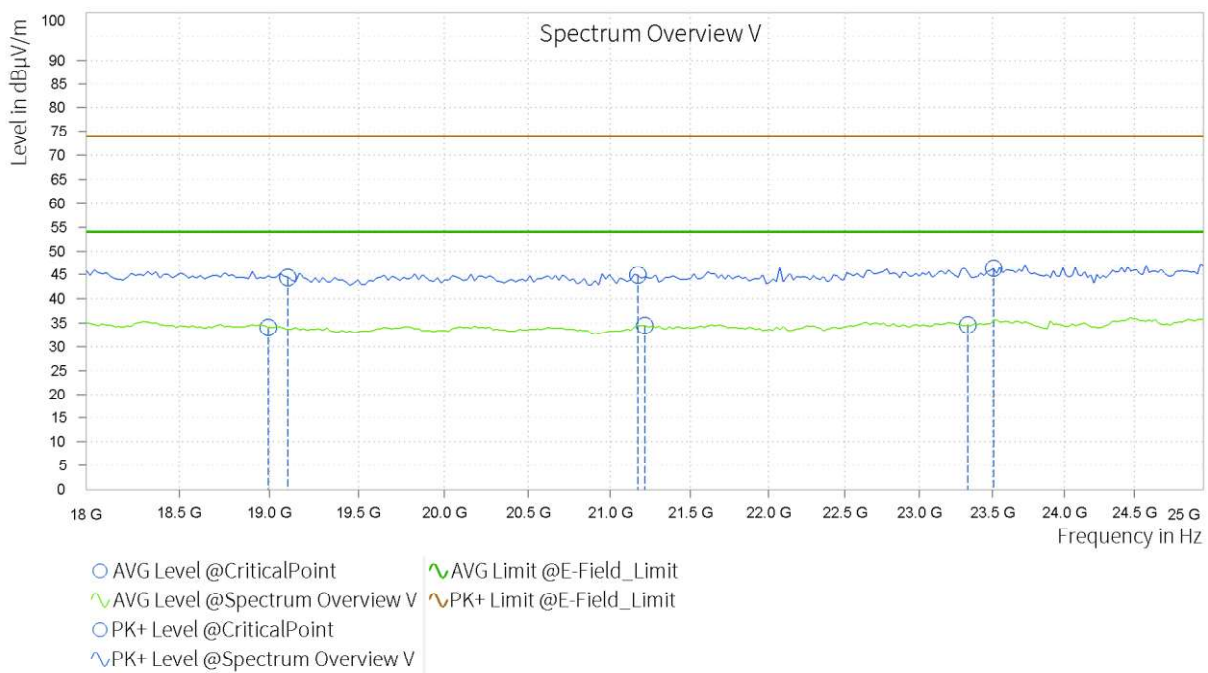
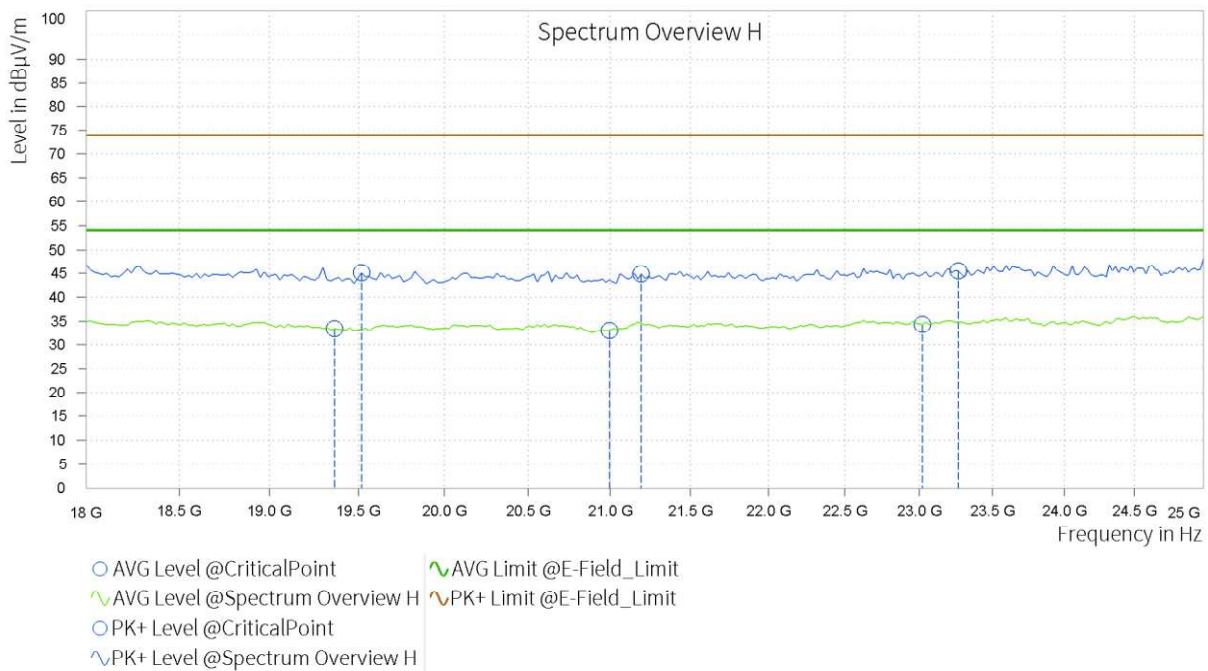


Remark: Data of measurement over the limit in frequency ranges 1-18GHz are fundamental frequency of BT.

EMI Critical Points

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]
1	1,506.000		73.90		24.39	53.90	29.51	-22.02
1	1,508.000	30.55	73.90	43.35		53.90		-22.04
1	1,575.500		73.90		24.83	53.90	29.07	-22.17
1	1,576.500	30.70	73.90	43.20		53.90		-22.17
1	4,299.500	36.32	73.90	37.58		53.90		-11.32
1	4,304.000		73.90		30.18	53.90	23.72	-11.32
1	4,714.000	36.23	73.90	37.67		53.90		-10.88
1	4,717.500		73.90		28.79	53.90	25.11	-10.89
1	12,281.500		73.90		39.59	53.90	14.31	-4.84
1	12,297.000	46.67	73.90	27.23		53.90		-4.77
1	12,439.500		73.90		38.83	53.90	15.07	-4.68
1	12,448.000	46.39	73.90	27.51		53.90		-4.68

Emission 18GHz-25GHz
BLE_1Mbps_Low Channel: 2402MHz

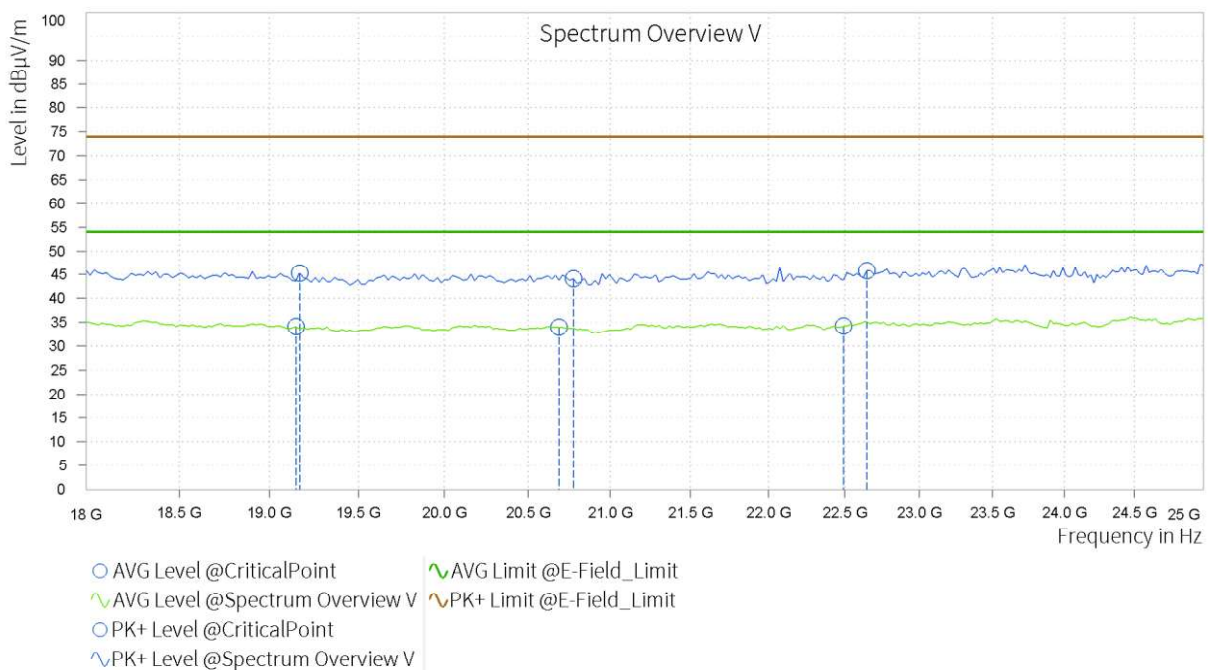
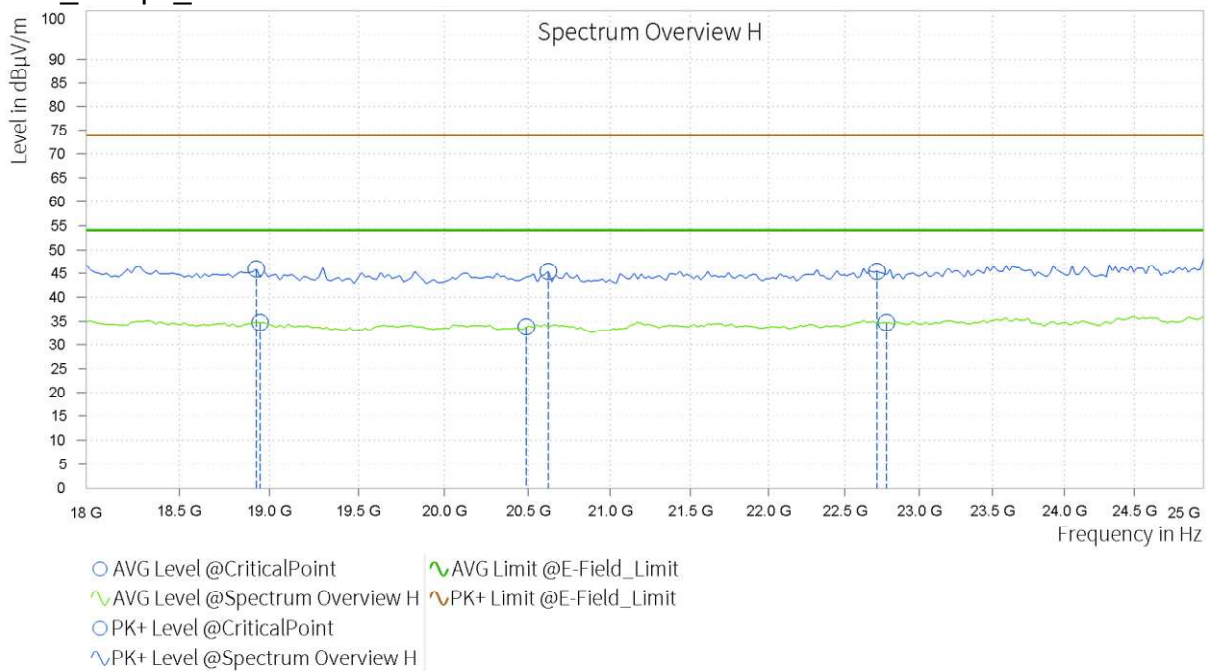


EMI Critical Points

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization
19,519.520	45.16	74.00	28.84		54.00		-12.21	H
19,365.365		74.00		33.38	54.00	20.62	-12.16	H
21,193.193	44.86	74.00	29.14		54.00		-12.28	H
20,994.995		74.00		33.03	54.00	20.97	-12.89	H
23,263.263	45.58	74.00	28.42		54.00		-11.27	H
23,021.021		74.00		34.35	54.00	19.65	-11.29	H
19,101.101	44.44	74.00	29.56		54.00		-11.59	V
18,990.991		74.00		34.11	54.00	19.89	-11.29	V
21,171.171	44.86	74.00	29.14		54.00		-12.35	V
21,215.215		74.00		34.54	54.00	19.46	-12.20	V
23,505.506	46.30	74.00	27.70		54.00		-10.74	V
23,329.329		74.00		34.58	54.00	19.42	-11.11	V

Emission 18GHz-25GHz

BLE_1Mbps_Middle Channel: 2440MHz

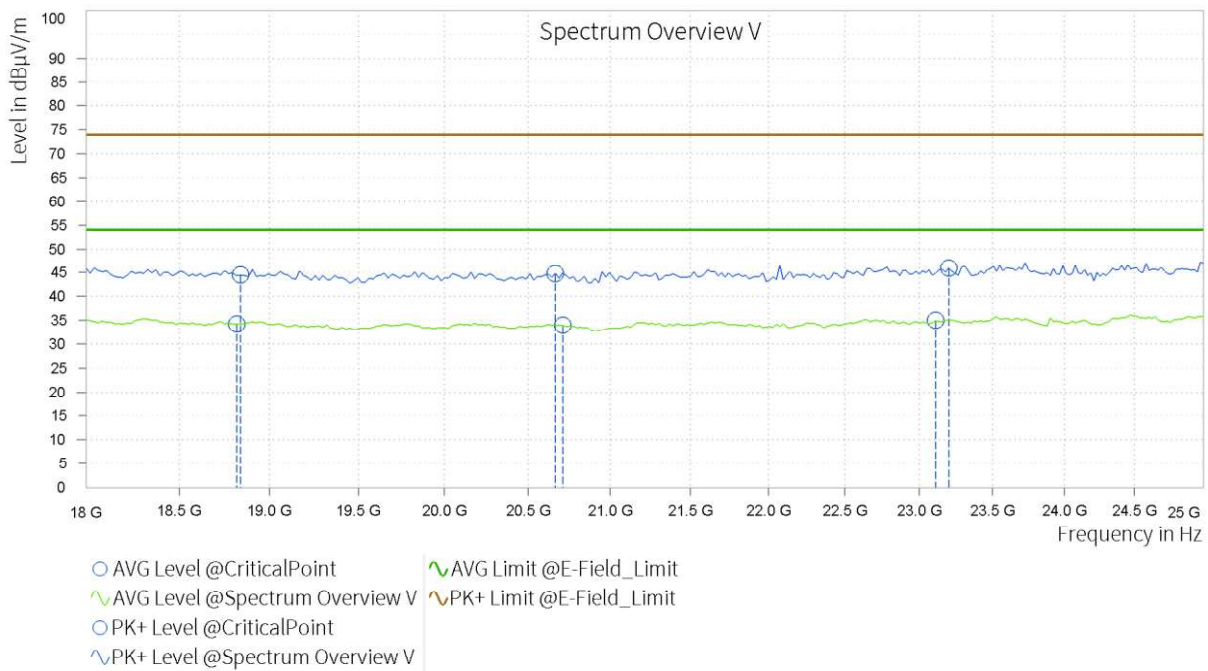
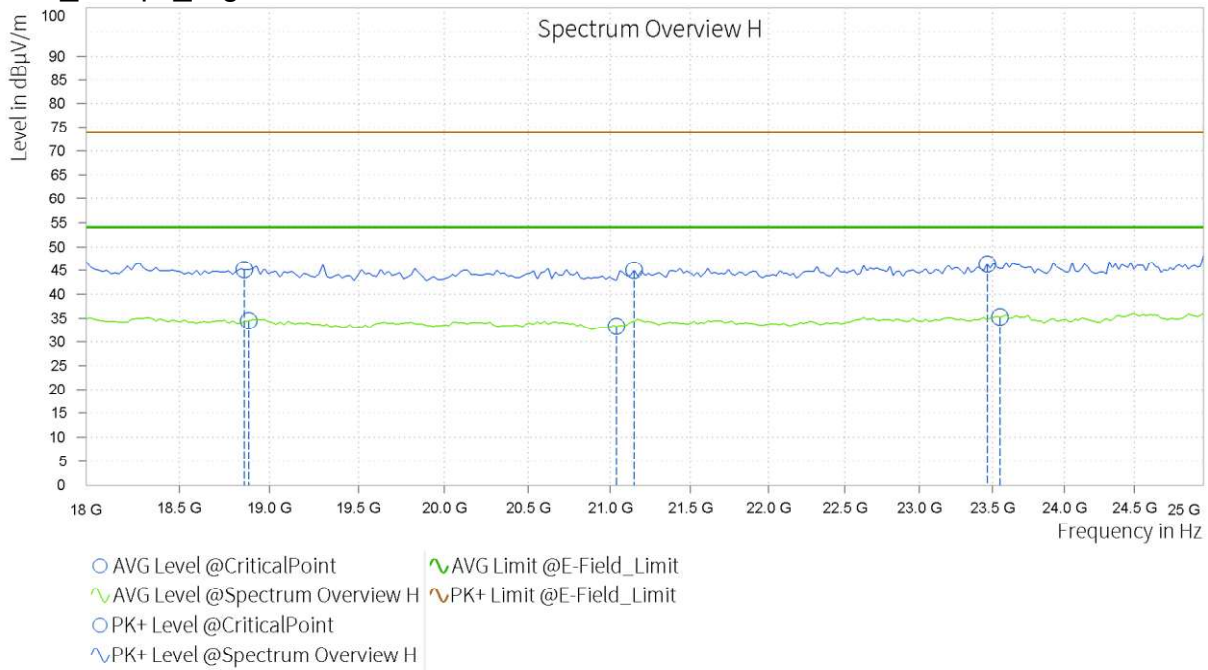


EMI Critical Points

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization
18,924.925	45.92	74.00	28.08		54.00		-11.52	H
18,946.947		74.00		34.68	54.00	19.32	-11.44	H
20,620.621	45.49	74.00	28.51		54.00		-12.46	H
20,488.488		74.00		33.83	54.00	20.17	-12.32	H
22,712.713	45.51	74.00	28.49		54.00		-11.61	H
22,778.779		74.00		34.71	54.00	19.29	-11.51	H
19,167.167	45.37	74.00	28.63		54.00		-11.82	V
19,145.145		74.00		34.08	54.00	19.92	-11.74	V
20,774.775	44.16	74.00	29.84		54.00		-12.47	V
20,686.687		74.00		33.93	54.00	20.07	-12.46	V
22,646.647	45.87	74.00	28.13		54.00		-11.71	V
22,492.492		74.00		34.18	54.00	19.82	-11.87	V

Emission 18GHz-25GHz

BLE_1Mbps_High Channel: 2480MHz



EMI Critical Points

Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization
18,858.859	45.15	74.00	28.85		54.00		-11.76	H
18,880.881		74.00		34.47	54.00	19.53	-11.68	H
21,149.149	45.03	74.00	28.97		54.00		-12.43	H
21,039.039		74.00		33.30	54.00	20.70	-12.81	H
23,461.461	46.43	74.00	27.57		54.00		-10.83	H
23,549.550		74.00		35.24	54.00	18.76	-10.71	H
18,836.837	44.46	74.00	29.54		54.00		-11.84	V
18,814.815		74.00		34.26	54.00	19.74	-11.92	V
20,664.665	44.84	74.00	29.16		54.00		-12.46	V
20,708.709		74.00		33.89	54.00	20.11	-12.45	V
23,197.197	45.91	74.00	28.09		54.00		-11.32	V
23,109.109		74.00		34.95	54.00	19.05	-11.33	V

Remark:

- (1) Data of measurement over the limit in frequency ranges 1-18GHz are fundamental frequency of BT.
- (2) Level= Reading Level + Correction Factor
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

10 Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 7	64-2-63-20-002	102240	1	2025-10-28
LISN	SCHWARZBECK	NNLK-8140	64-2-60-20-001	00136	1	2025-10-29
Testing Software	R&S	EMC32	64-2-26-20-003	V 10.60.20	N/A	N/A
10m SAC Control Room	TDK	SAC10-CR	64-2-90-20-007	----	3	2026-09-06

Radiated Emission Test, SAC-3

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESW44	64-2-63-24-003	103390	1	2026-07-28
Horn Antenna	Schwarzbeck	BBHA 9120D	64-2-62-20-004	02152	1	2025-11-15
Wave Guide Antenna	ETS	3117	64-2-62-24-005	269095	1	2026-08-06
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	64-2-62-20-001	00341	1	2025-10-31
Circular magnetic loop	Schwarzbeck	FESP 5133-7/41	64-2-62-21-002	Circular magnetic loop	1	2026-03-27
3m Semi-anechoic chamber	TDK	SAC-3	64-2-90-20-004	----	3	2026-09-04
Testing Software	R&S	ELEKTRA	64-2-26-24-002	V 5.04.0	N/A	N/A

RF Conducted Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESW44	64-2-63-24-003	103390	1	2026-07-28
Testing Software	R&S	RF Test Suite	64-2-26-24-001	V 12.00.00	N/A	N/A
10m SAC Control Room	TDK	SAC10-CR	64-2-90-20-007	N/A	3	2026-09-06

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission in new shielding room 150kHz-30MHz	2.84dB
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.32dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.14dB; Vertical: 5.52dB
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	5.13dB
Uncertainty for Radiated Emission in 3m chamber above 18000MHz	5.72
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.38dB Frequency test involved: 0.6×10 ⁻⁸ or 1%

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2023, clause 4.3.3.

--- END OF REPORT---