FCC - TEST REPORT

Report Number	:	**68.950.24.1760.01**	Date of Issue:	**2024-12-31**
Model	:	**HG12823-US**		
Product Type	:	Smart Tag Finder		
Applicant	:	Lidl US, LLC		
Address	:	3500 S. Clark Street Arlington Virginia 22202, United States		
Manufacturer	:	Dongguan Tunno Electronics Technology Co., Ltd		
Address	:	Building 2, No.1 Zhiquan High-tech Park Road, Dongkeng Town 523034 Dongguan City, Guangdong Province, PEOPLE`S REPUBLIC OF CHINA		
Factory	:	Dongguan Tunno Electronics Technology Co., Ltd		
Address	:	Building 2, No.1 Zhiquan High-tech Park Road, Dongkeng Town 523034 Dongguan City, Guangdong Province, PEOPLE`S REPUBLIC OF CHINA		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**39**		

Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details, please see testing and certification regulation, chapter A-3.4.

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, Guangdong, China
Telephone:	+86 755 8828 6998
Fax:	+86 755 8828 5299
FCC Registration No.:	514049
FCC Designation Number:	CN5009

3 Description of the Equipment Under Test

Product:	Smart Tag Finder
Model no.:	HG12823-US
Brand name:	SILVERCREST
FCC ID:	2AJ9O-HG12823
Options and accessories:	N/A
Rating:	3.0VDC supplied by 1pc “CR2032” non-rechargeable lithium battery
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	PCB
Antenna Gain	-0.54dBi Max
Description of the EUT:	The Equipment Under Test (EUT) is a Smart Tag Finder which support Low Energy Bluetooth(1Mbps).

NOTE 1: The above EUT’s information is declared by manufacturer. Please refer to the specifications or user’s manual for more detailed description.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2023 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2020.

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Test Site	Test Result			Test Environment
			Pass	Fail	N/A	
§15.207	Conducted emission AC power port	Site 1	☐	☐	☒	T: --- H: ---
§15.247 (b) (3)	Conducted peak output power	Site 1	☒	☐	☐	T: 25.3℃ H: 22.9%
§15.247(a)(2)	6dB bandwidth and 99% Occupied Bandwidth	Site 1	☒	☐	☐	T: 25.3℃ H: 22.9%
§15.247(e)	Power spectral density	Site 1	☒	☐	☐	T: 25.3℃ H: 22.9%
§15.247(d)	Spurious RF conducted emissions	Site 1	☒	☐	☐	T: 25.3℃ H: 22.9%
§15.247(d)	Band edge	Site 1	☒	☐	☐	T: 25.3℃ H: 22.9%
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	Site 1	☒	☐	☐	T: 22.8℃ H: 37.5%
§15.203	Antenna requirement	See note 2	☒	☐	☐	--

Note 1: N/A=Not Applicable.
Note 2: The EUT uses a PCB antenna, which gain is -0.54dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.
Note 3: T: Temperature, H: Humidity.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AJ9O-HG12823, complies with Section 15.205, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

SUMMARY:

All tests according to the regulations cited on page 5 were.

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	2024-12-16
Testing Start Date:	2024-12-16
Testing End Date:	2024-12-25

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:	Tested by:
John Zhi	Hayden Hu	Carry Cai
EMC Project Manager	Project Engineer	Test Engineer

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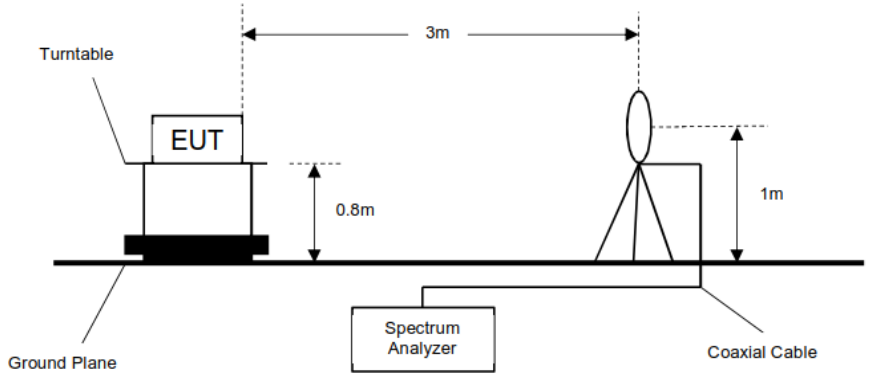
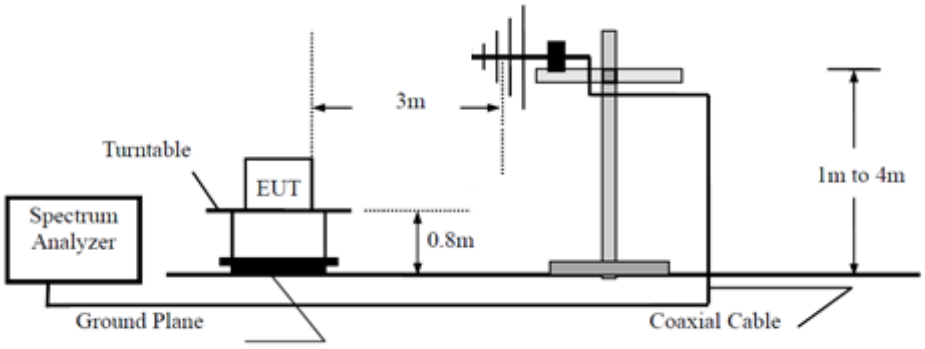
7 Test Setups

7.1 Radiated test setups

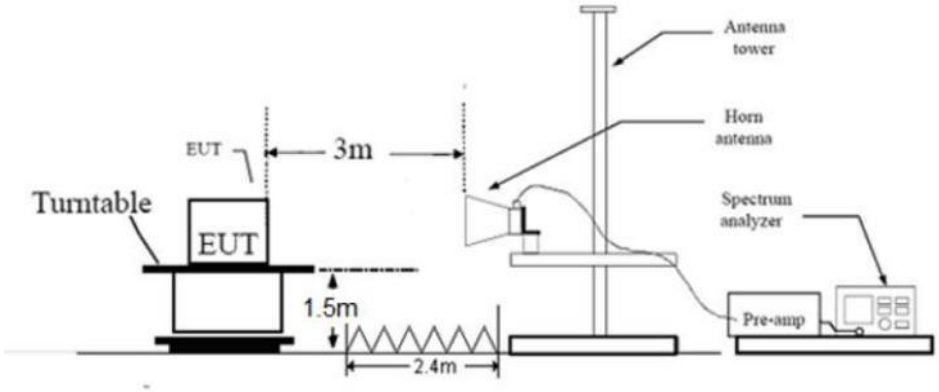
9KHz - 30MHz



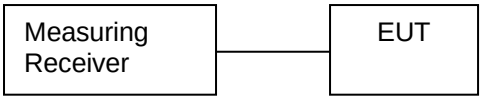
30MHz - 1GHz



Above 1GHz



7.2 Conducted RF test setups



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8 Systems Test Configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
Notebook	LENOVO	X220	---
Serial port board	---	---	---

Cables Used During Test:

Cable	Length	Shielded/unshielded	With / without ferrite
---	---	---	---

Test software information:

Test Software Version	LeKit_v2.5.2.exe	
Modulation	Setting TX Power	Packet Type
GFSK	Default	RBS9

The system was configured to non-hopping mode, testing channel 0, 19, 39.

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9 Technical Requirement

9.1 Conducted Peak Output Power

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 and enable the EUT transmit continuously.
3. Use the following test receiver settings:
   Span = approximately 5 times the 6dB bandwidth, centered on a channel need to test,
   RBW > the 6dB bandwidth of the emission being measured, VBW≥3RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

Limits

According to §15.247 (b)(3), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

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Conducted Peak Output Power & EIRP

Frequency MHz	Mode	Conducted Peak Output Power dBm	Result
Bottom channel 2402MHz	LE 1Mbps	0.97	Pass
Middle channel 2440MHz	LE 1Mbps	0.89	Pass
Top channel 2480MHz	LE 1Mbps	0.64	Pass

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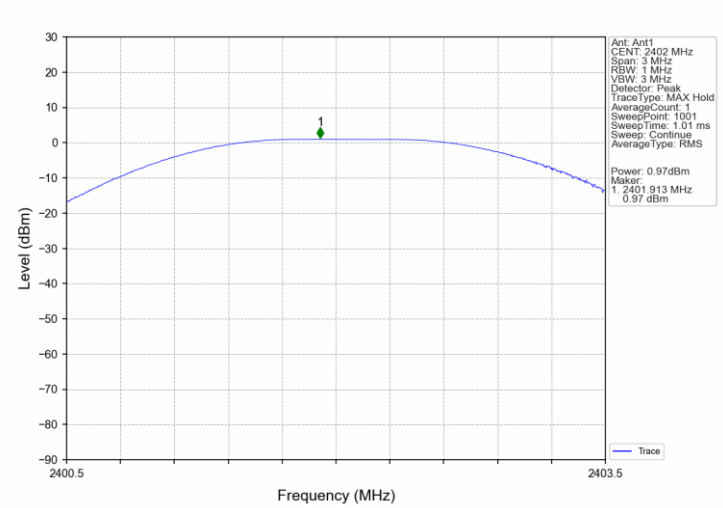

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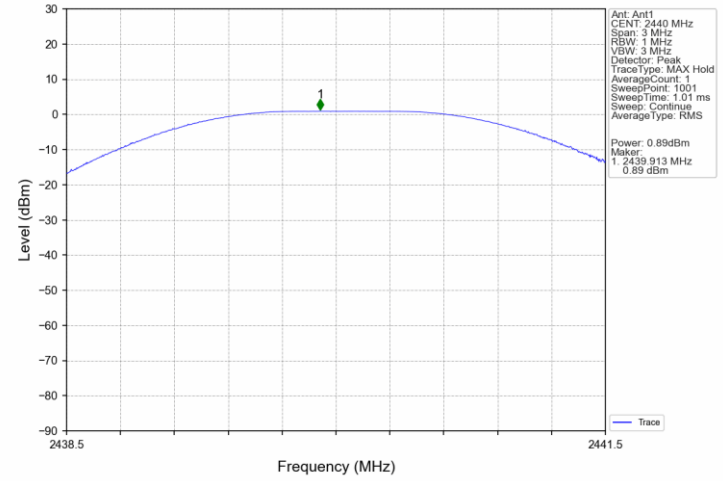
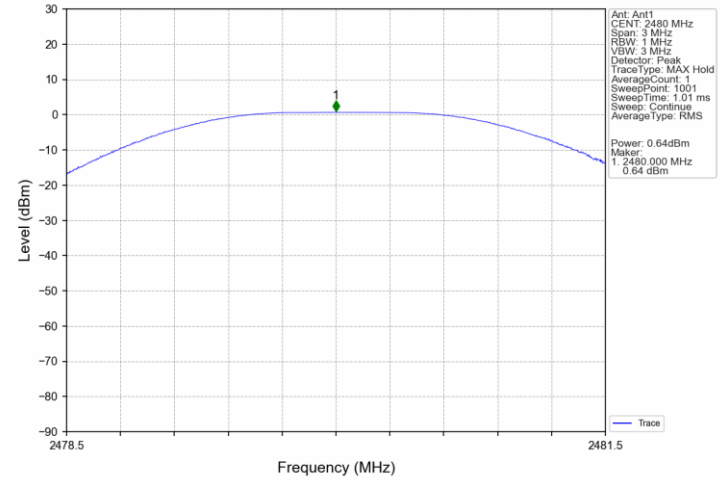


BLE_1M_BT4.0_Ant1_2480


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9.2 Power Spectral Density

Test Method

1. The RF output of EUT was connected to the spectrum analyzer. 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:
4. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
5. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
6. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3KHz]
≤8

Test result

Frequency MHz	Mode	Power spectral density dBm/3KHz	Result
Bottom channel 2402MHz	LE 1Mbps	-14.87	Pass
Middle channel 2440MHz	LE 1Mbps	-14.88	Pass
Top channel 2480MHz	LE 1Mbps	-15.14	Pass

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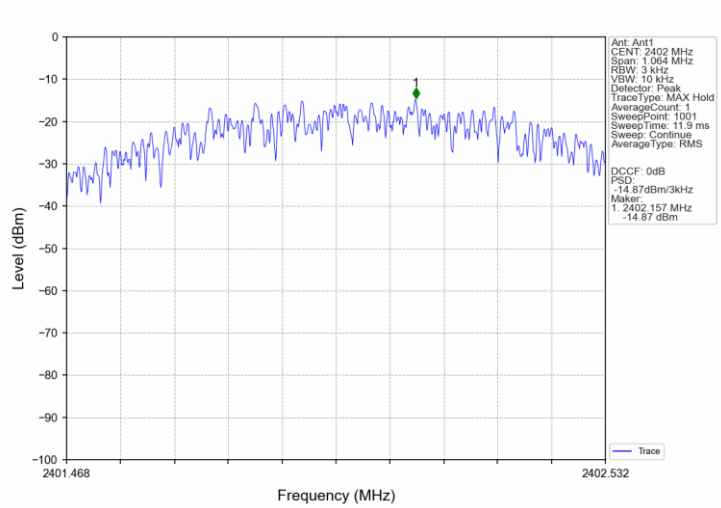
BLE_1M_BT4.0_Ant1_2402



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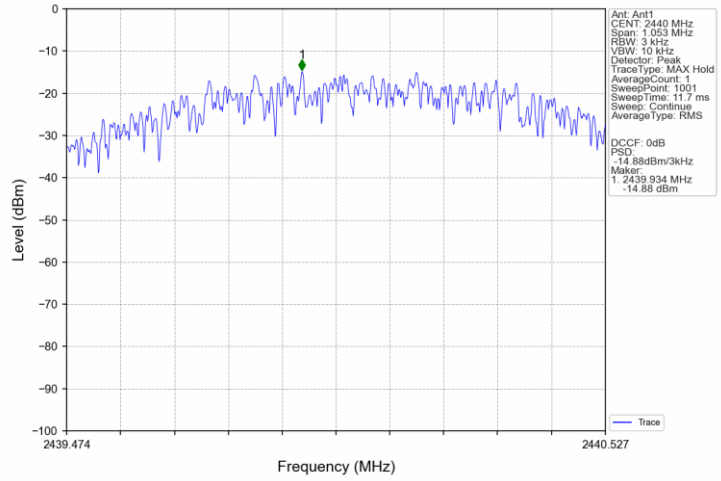
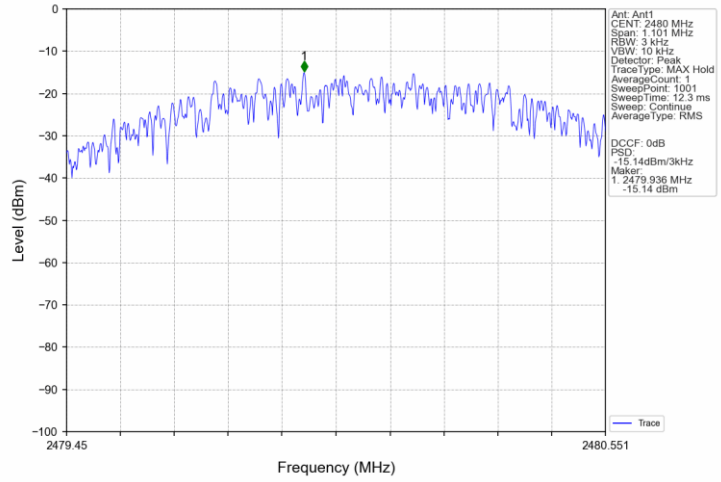


BLE_1M_BT4.0_Ant1_2480



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9.3 6 dB Bandwidth

Test Method for 6 dB Bandwidth

1. The RF output of EUT was connected to the spectrum analyzer. 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:
   RBW=100KHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
5. Allow the trace to stabilize, record the 6 dB Bandwidth value.

Limit

Limit [kHz]
≥500

Test result

Frequency MHz	Mode	6dB bandwidth MHz	Result
Bottom channel 2402MHz	LE 1Mbps	0.709	Pass
Middle channel 2440MHz	LE 1Mbps	0.702	Pass
Top channel 2480MHz	LE 1Mbps	0.734	Pass

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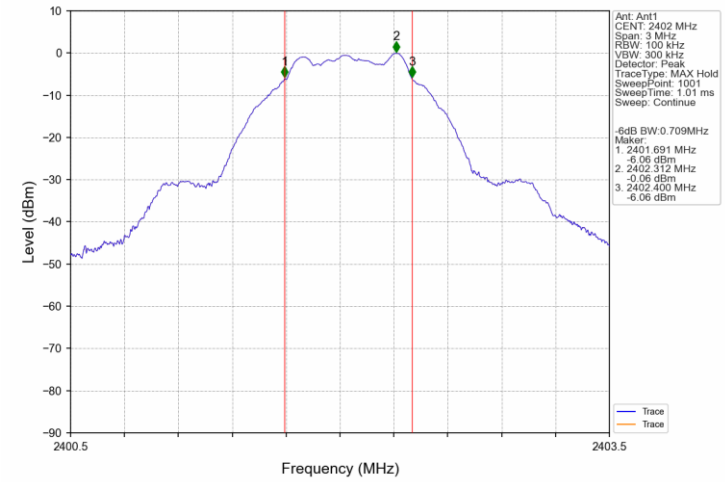
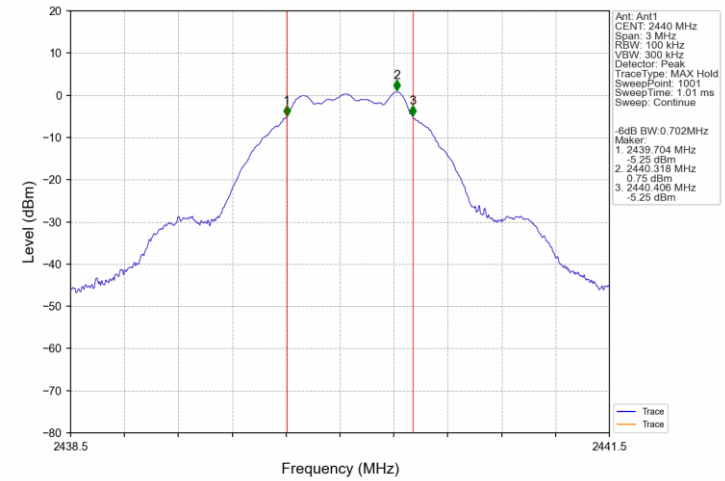
6 dB Bandwidth

BLE_1M_BT4.0_Ant1_2402



BLE_1M_BT4.0_Ant1_2440



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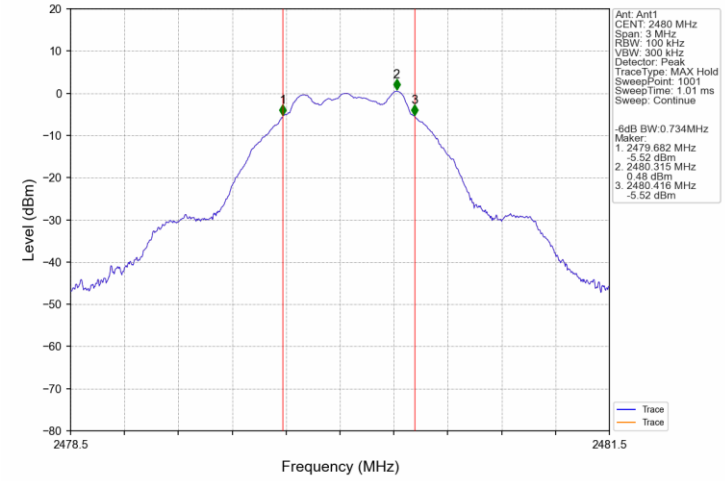

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9.4 Spurious RF Conducted Emissions

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 emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
5. The level displayed must comply with the limit specified in this Section. Submit these plots.
6. Repeat above procedures until all frequencies measured were complete.

Limit

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

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Spurious RF conducted emissions

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1Mbps	SISO	2402	1	0.84	-19.16	Pass
		2440	1	0.77	-19.23	Pass
		2480	1	0.50	-19.50	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.						

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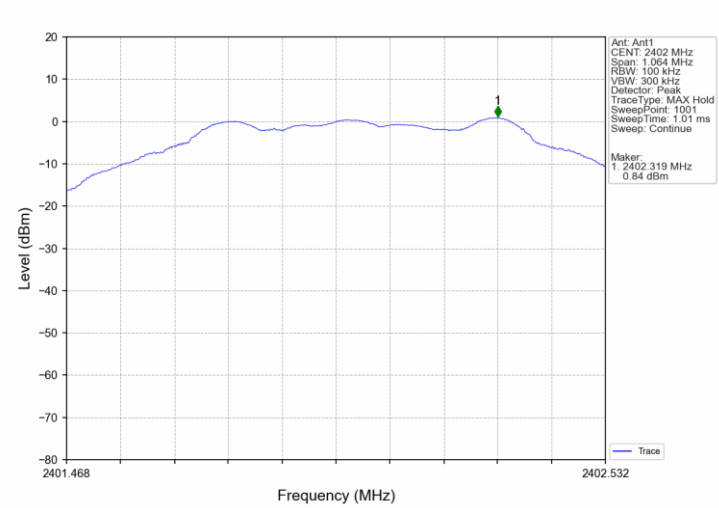
1M_LCH_2402MHz_Ant1_NTNV


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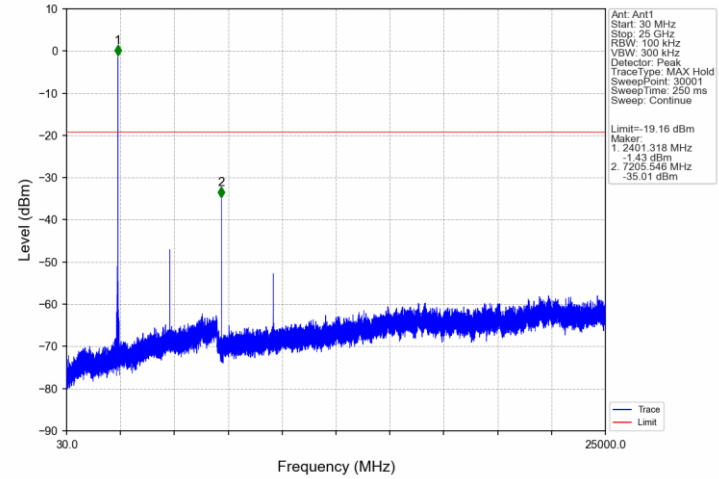

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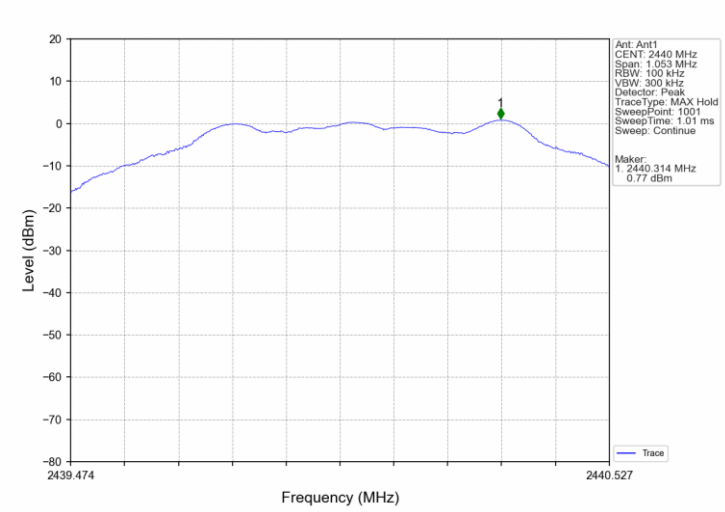
1M_MCH_2440MHz_Ant1_NTNV


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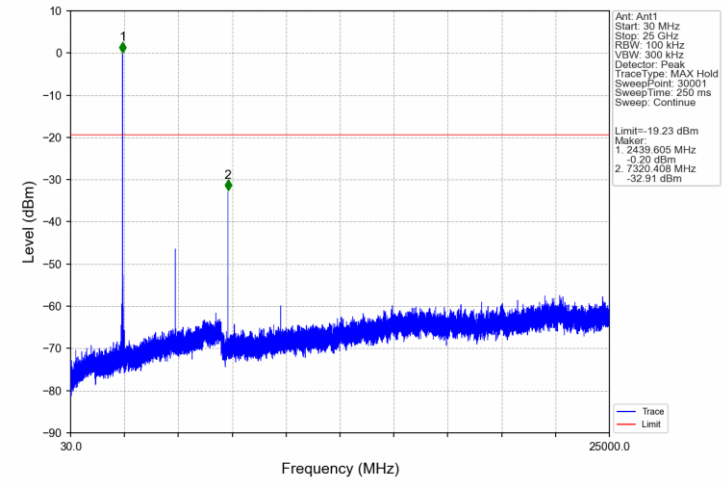

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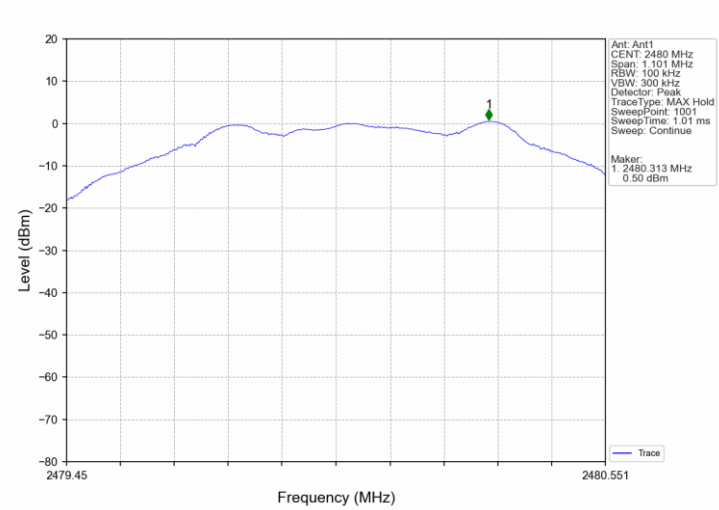
1M_HCH_2480MHz_Ant1_NTNV

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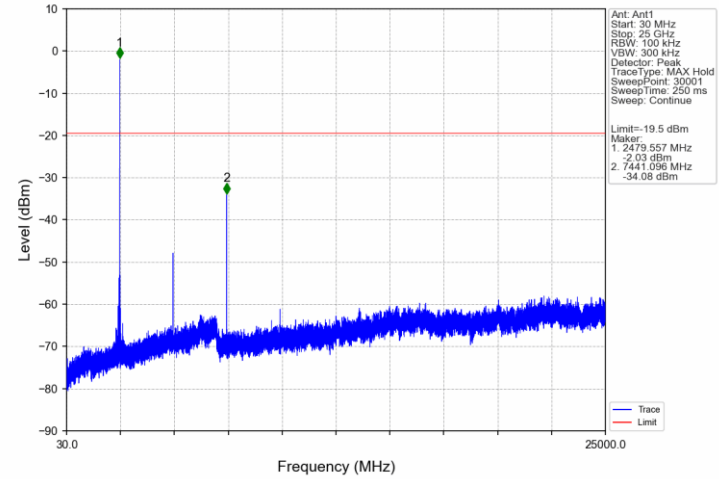

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9.5 Band Edge

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 emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
5. The level displayed must comply with the limit specified in this Section. Submit these plots.
6. Repeat above procedures until all frequencies measured were complete.

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

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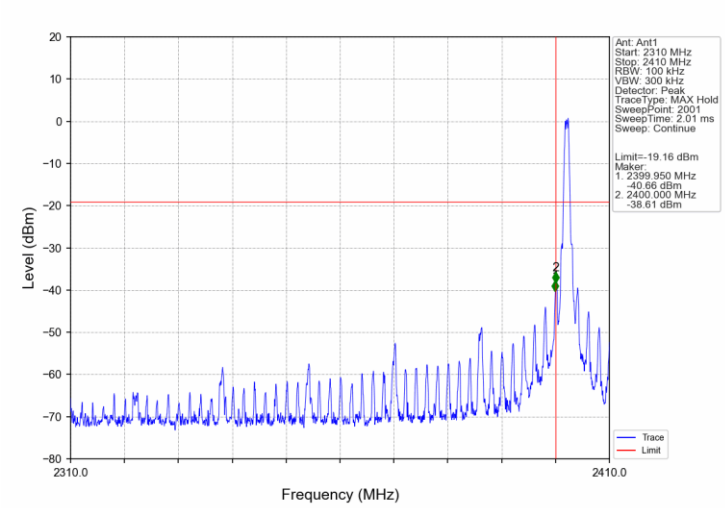
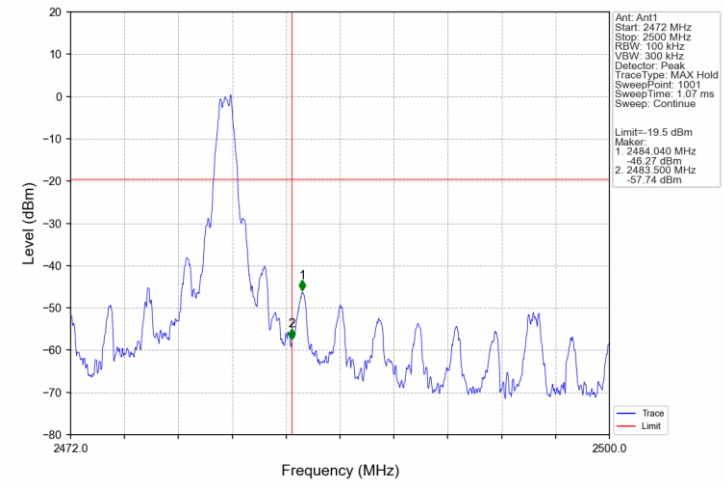
Band edge testing

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1Mbps	SISO	2402	1	0.84	-19.16	Pass
		2480	1	0.50	-19.50	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.						

1M_LCH_2402MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



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9.6 Spurious Radiated Emissions for Transmitter

Test Method

1. The EUT was place 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:

For Below 1GHz

Use the following test receiver settings:

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.

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.

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)

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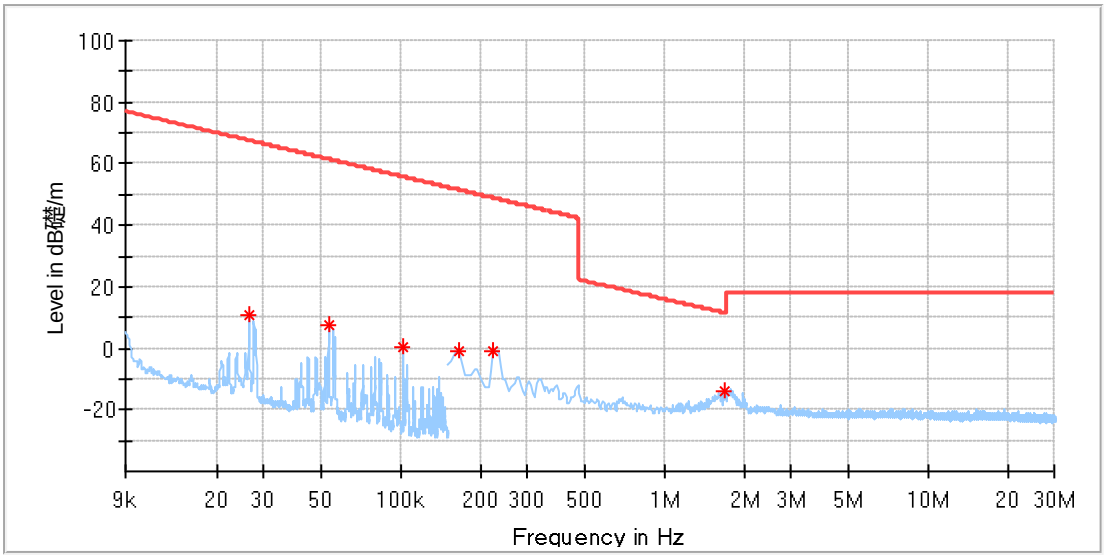
Spurious radiated emissions for transmitter

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.

Only the worst case (BLE 2402MHz) test result from 9KHz to 1000MHz is listed in the report.

Transmitting spurious emission test result as below:

Spurious radiated emissions for BLE 2402MHz (9KHz to 30MHz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµA/m)	Limit (dBµA/m)	Margin (dB)	Pol	Azimuth (deg)	Corr. (dB/m)
0.026531	10.85	67.51	56.66	H	235.0	-31.66
0.053039	7.57	61.43	53.85	H	307.0	-31.62
0.101731	0.08	55.71	55.63	H	323.0	-31.60
0.164925	-1.08	51.46	52.54	H	300.0	-31.64
0.224625	-1.06	48.75	49.81	H	246.0	-31.65
1.697225	-13.98	11.40	25.38	H	2.0	-31.51

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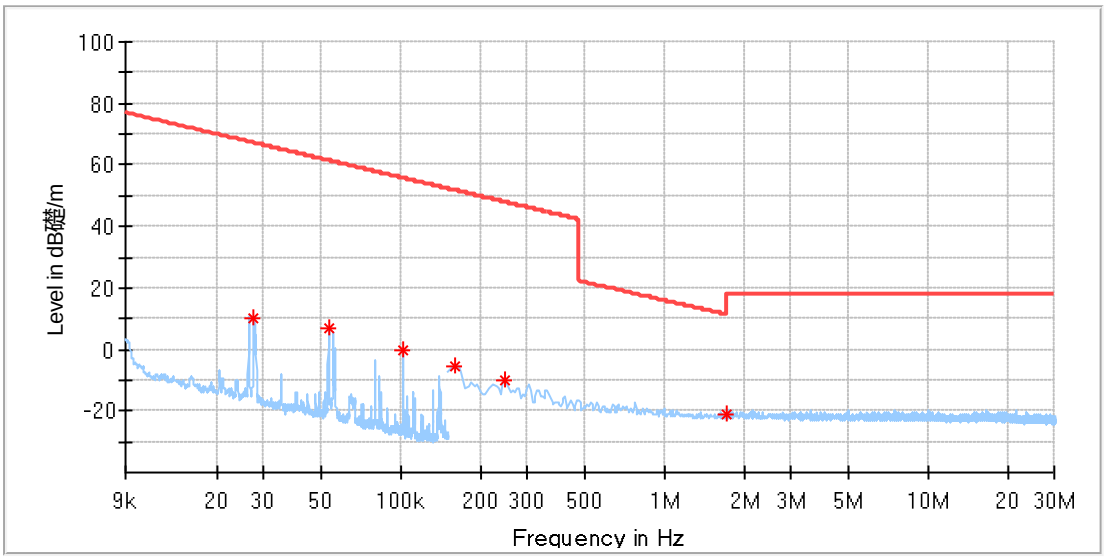
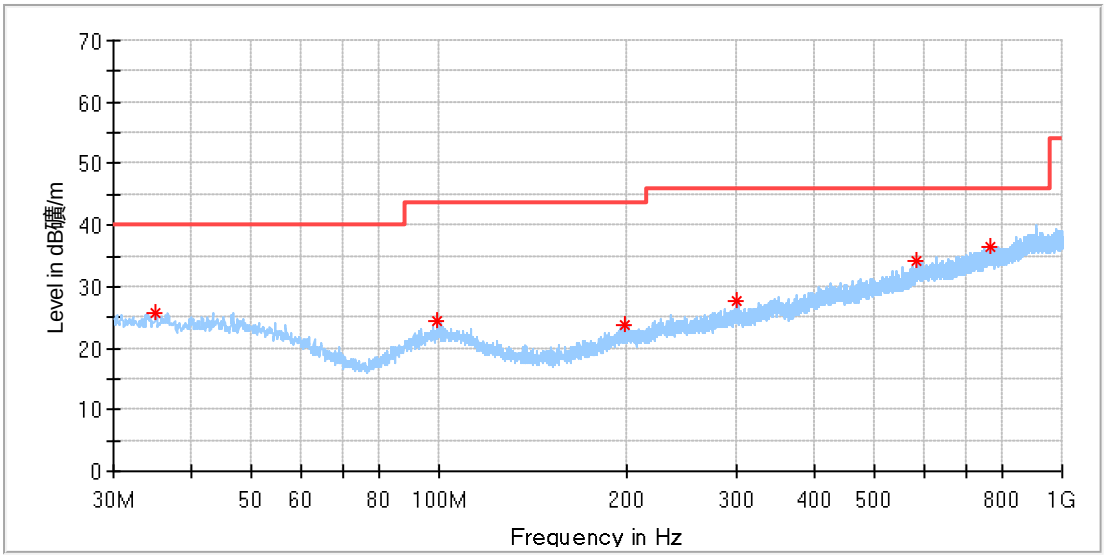


Critical_Freqs

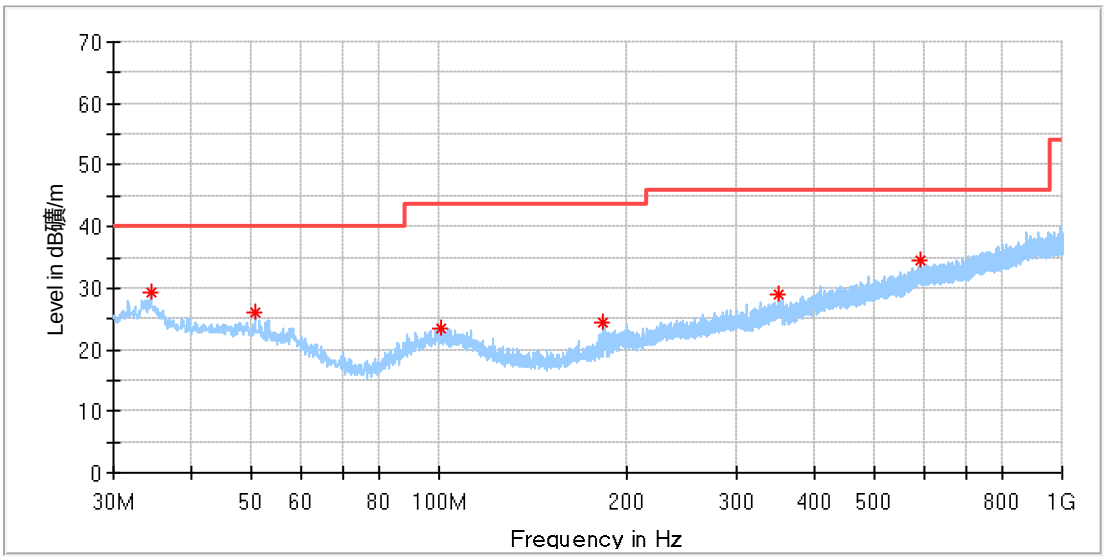
Frequency (MHz)	MaxPeak (dBµA/m)	Limit (dBµA/m)	Margin (dB)	Pol	Azimuth (deg)	Corr. (dB/m)
0.027612	10.24	67.16	56.91	V	14.0	-31.65
0.053039	6.86	61.43	54.56	V	206.0	-31.62
0.101684	0.02	55.71	55.69	V	230.0	-31.60
0.159950	-5.28	51.73	57.01	V	266.0	-31.63
0.249500	-9.86	47.83	57.69	V	94.0	-31.64
1.702200	-20.84	11.37	32.21	V	163.0	-31.51

Spurious radiated emissions for BLE 2402MHz (30MHz to 1GHz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.153125	25.69	40.00	14.31	100.0	H	0.0	21.01
99.173125	24.27	43.50	19.23	200.0	H	251.0	19.98
199.083125	23.72	43.50	19.78	100.0	H	346.0	18.92
299.296250	27.57	46.00	18.43	100.0	H	0.0	21.64
581.384375	34.34	46.00	11.66	200.0	H	358.0	27.74
767.381875	36.42	46.00	9.58	200.0	H	346.0	30.63



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
34.425625	29.26	40.00	10.74	100.0	V	14.0	20.95
50.551875	25.90	40.00	14.10	100.0	V	197.0	20.88
100.628125	23.41	43.50	20.09	100.0	V	21.0	20.01
183.078125	24.47	43.50	19.03	100.0	V	28.0	17.26
350.585000	28.98	46.00	17.02	100.0	V	248.0	23.57
591.933125	34.43	46.00	11.57	100.0	V	0.0	28.30

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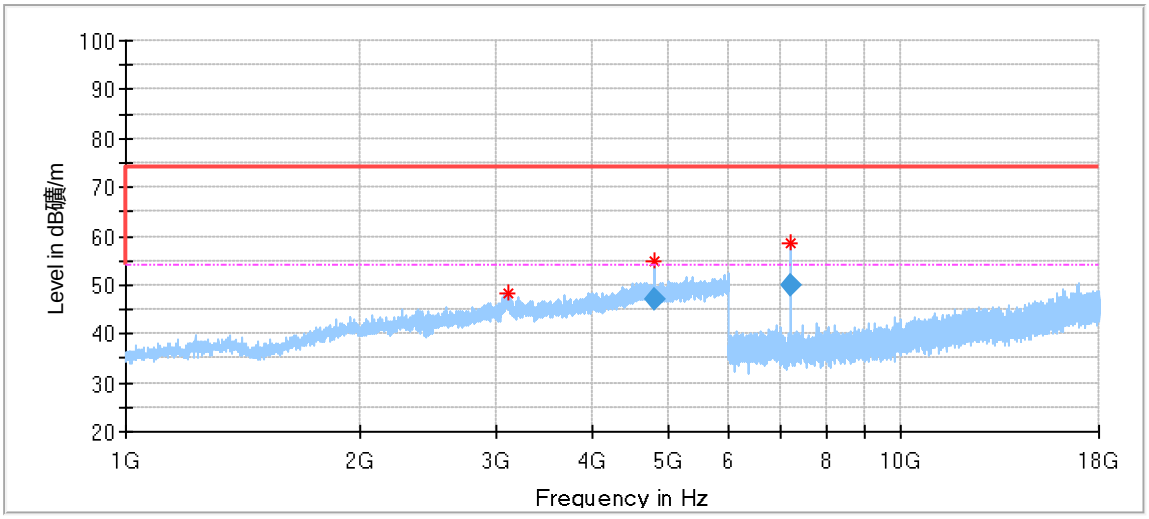
Spurious radiated emissions for BLE 2402MHz (1GHz to 18GHz)

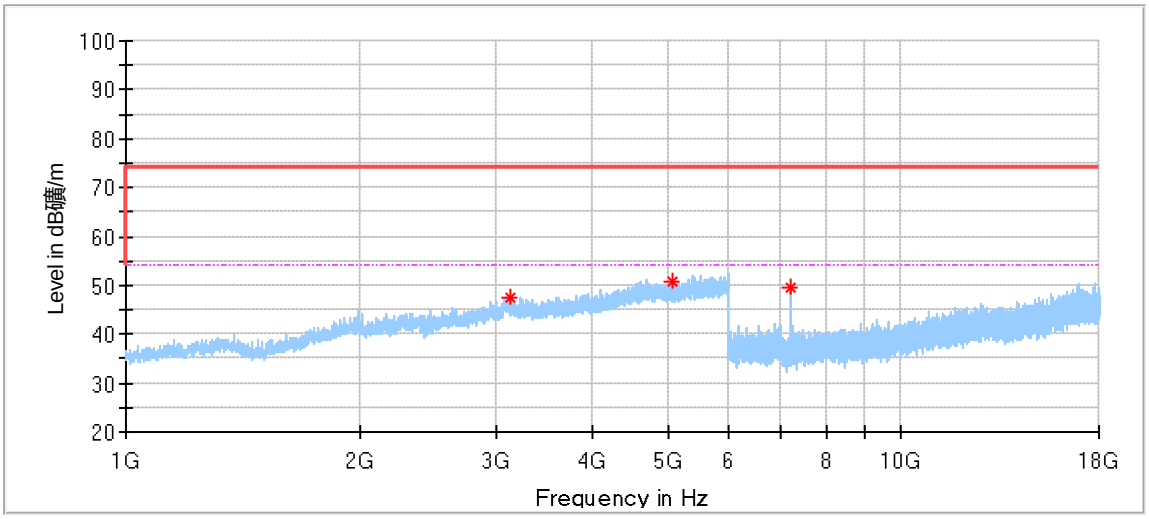


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3119.500000	48.48	74.00	25.52	150.0	H	167.0	1.92
4804.500000	54.89	74.00	19.11	150.0	H	191.0	5.68
7205.500000	58.68	74.00	15.32	150.0	H	232.0	8.73

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.500000	46.95	54.00	7.05	150.0	H	191.0	5.68
7205.500000	49.81	54.00	4.19	150.0	H	232.0	8.73



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3132.500000	47.61	74.00	26.39	150.0	V	20.0	1.49
5057.500000	50.73	74.00	23.27	150.0	V	104.0	5.74
7206.000000	49.57	74.00	24.43	150.0	V	187.0	8.73

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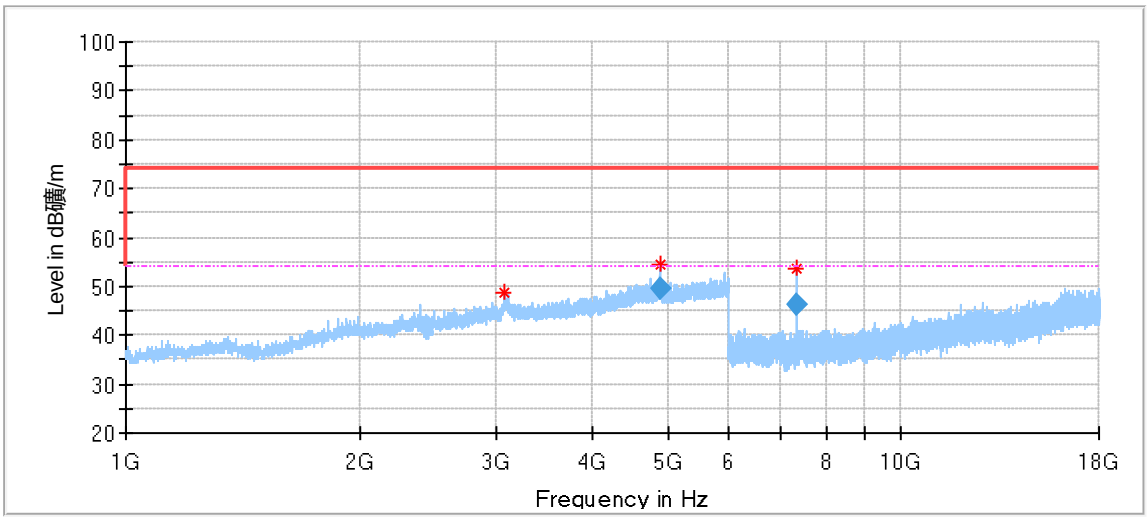
Spurious radiated emissions for BLE 2440MHz (1GHz to 18GHz)

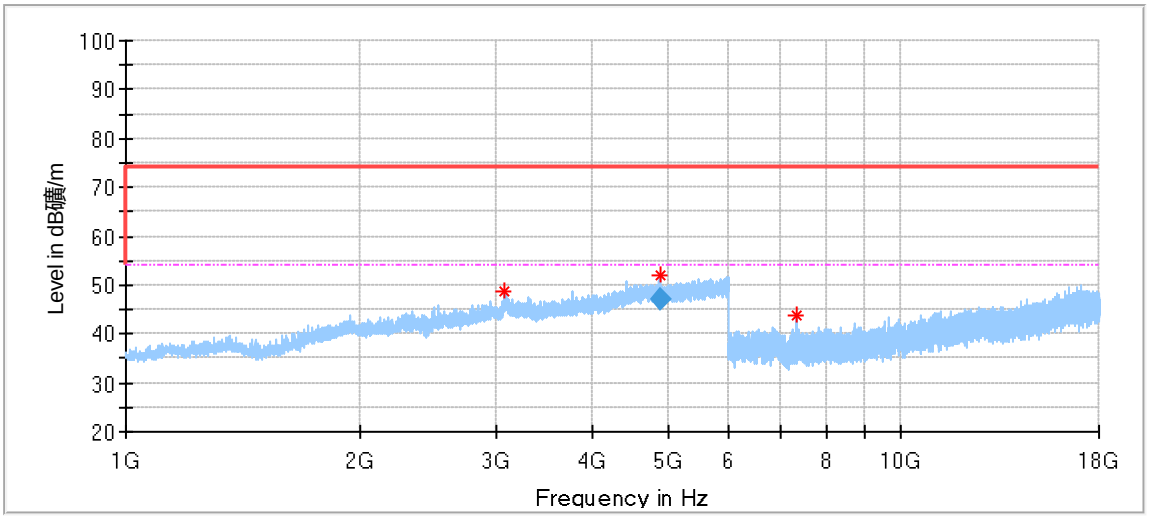


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3077.500000	48.66	74.00	25.34	150.0	H	125.0	1.98
4880.500000	54.40	74.00	19.60	150.0	H	237.0	5.91
7320.000000	53.78	74.00	20.22	150.0	H	232.0	9.38

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4880.500000	49.36	54.00	4.64	150.0	H	237.0	5.91
7320.000000	46.40	54.00	7.60	150.0	H	232.0	9.38



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3078.500000	48.88	74.00	25.12	150.0	V	334.0	2.02
4880.000000	52.13	74.00	21.87	150.0	V	297.0	5.92
7320.500000	43.87	74.00	30.13	150.0	V	158.0	9.38

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4880.000000	47.14	54.00	6.86	150.0	V	297.0	5.92

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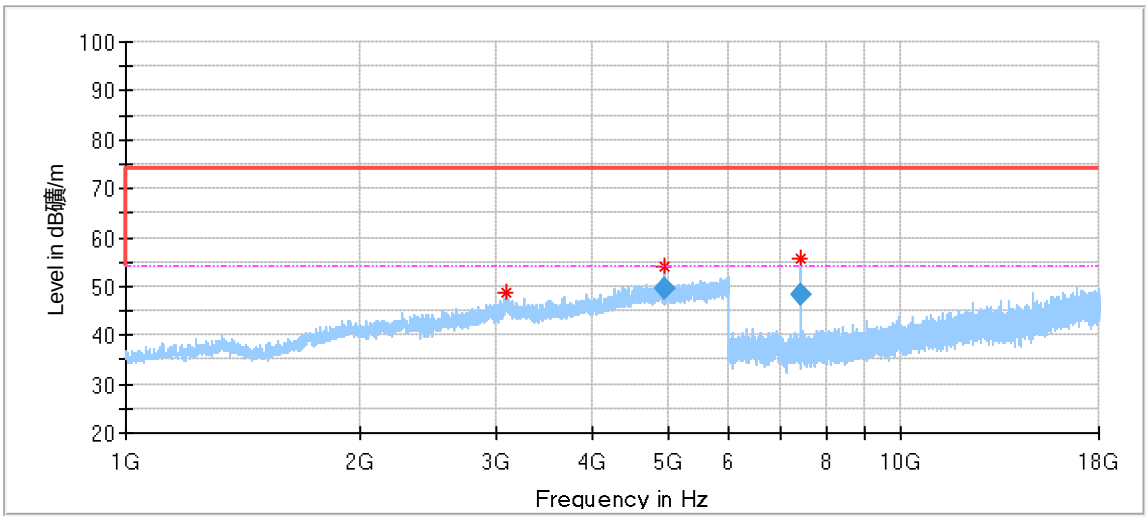
Spurious radiated emissions for BLE 2480MHz (1GHz to 18GHz)

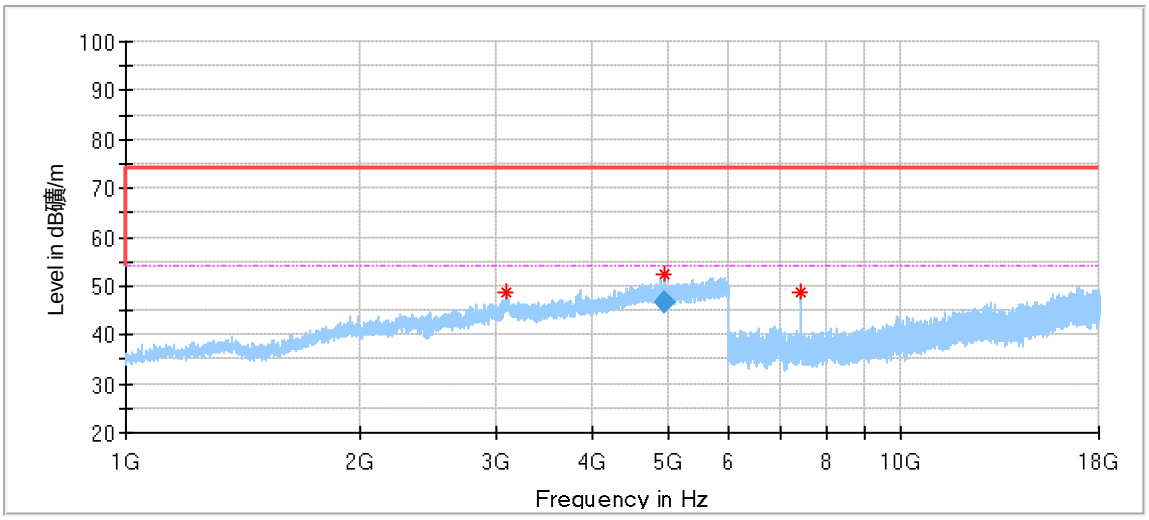


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3089.500000	48.64	74.00	25.36	150.0	H	331.0	2.35
4960.000000	53.87	74.00	20.13	150.0	H	183.0	5.82
7441.000000	55.88	74.00	18.12	150.0	H	0.0	9.48

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4960.000000	49.65	54.00	4.35	150.0	H	183.0	5.82
7441.000000	48.38	54.00	5.62	150.0	H	0.0	9.48



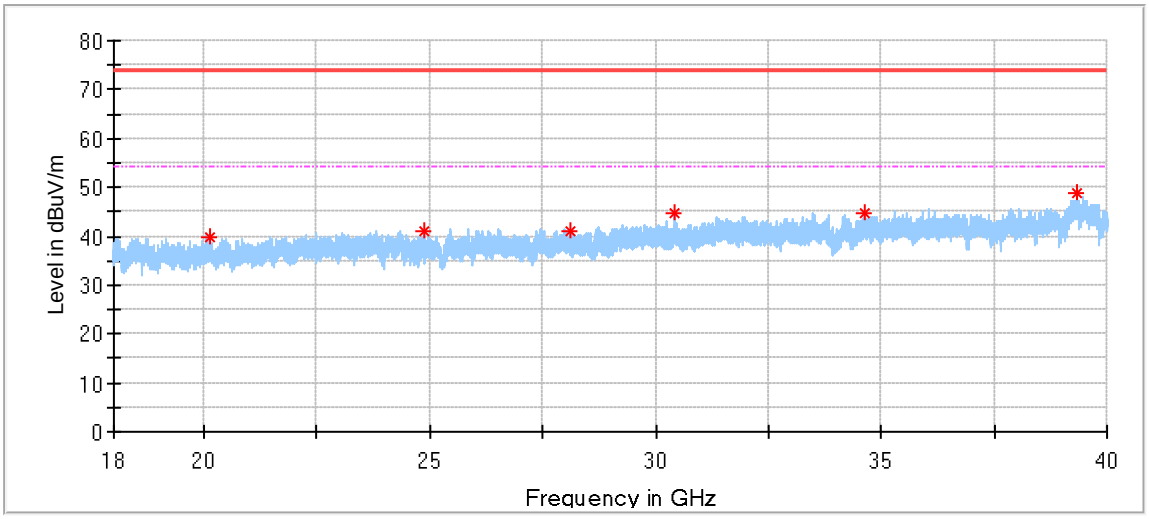
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3094.000000	48.67	74.00	25.33	150.0	V	7.0	2.49
4960.000000	52.28	74.00	21.72	150.0	V	295.0	5.82
7439.500000	48.65	74.00	25.35	150.0	V	59.0	9.48

Final_Result

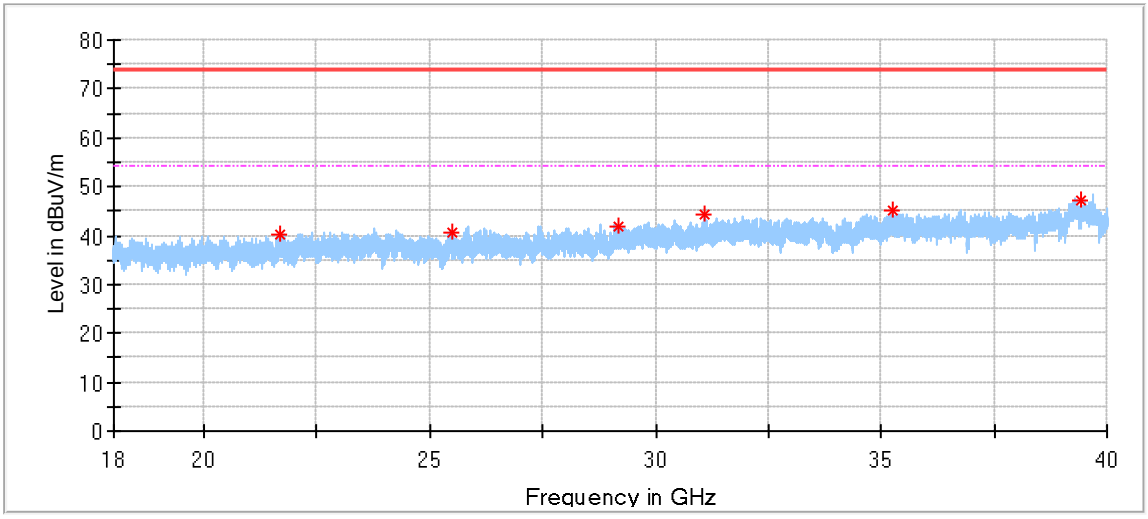
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4960.000000	46.75	54.00	7.25	150.0	V	295.0	5.82

Spurious radiated emissions for BLE 2402MHz (18GHz to 40GHz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
20109.250000	39.76	74.00	34.24	150.0	H	207.0	-3.62	---
24864.000000	40.93	74.00	33.07	150.0	H	167.0	-0.29	---
28105.562500	40.82	74.00	33.18	150.0	H	287.0	0.48	---
30438.250000	44.90	74.00	29.10	150.0	H	234.0	0.97	---
34633.375000	44.89	74.00	29.11	150.0	H	330.0	1.71	---
39324.875000	48.98	74.00	25.02	150.0	H	124.0	5.17	---



Critical_Freqs

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
21686.375000	40.35	74.00	33.65	150.0	V	45.0	-1.76	---
25476.562500	40.61	74.00	33.39	150.0	V	98.0	0.48	---
29165.687500	41.79	74.00	32.21	150.0	V	205.0	0.52	---
31080.375000	44.17	74.00	29.83	150.0	V	358.0	0.75	---
35272.750000	44.93	74.00	29.07	150.0	V	358.0	2.24	---
39436.250000	47.38	74.00	26.62	150.0	V	165.0	5.80	---

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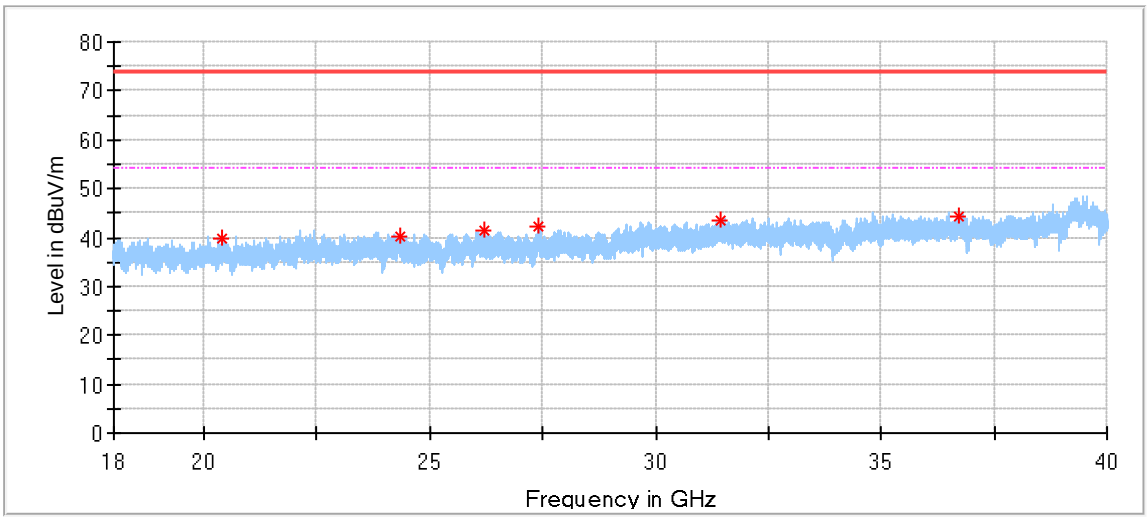
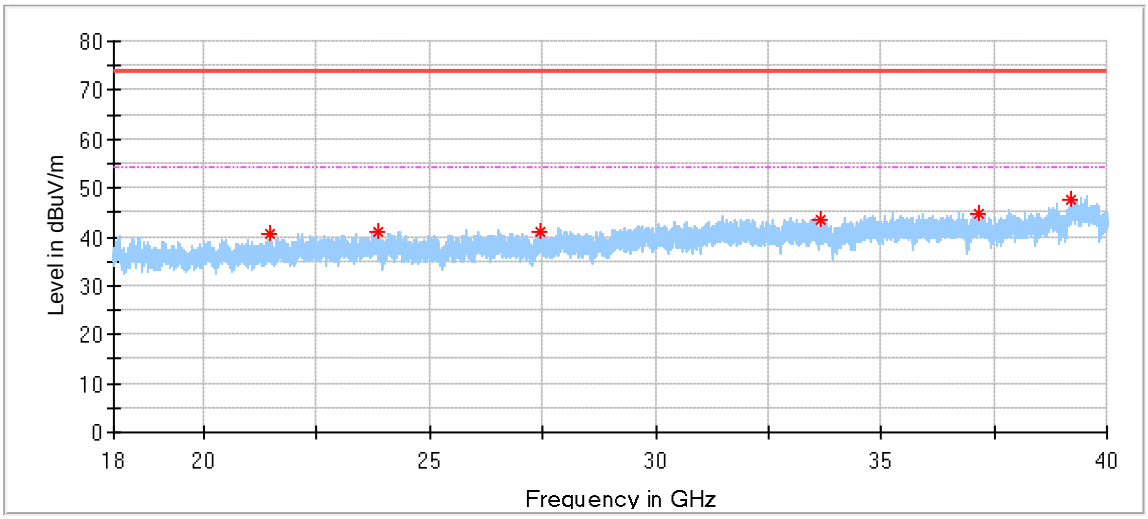
Spurious radiated emissions for BLE 2440MHz (18GHz to 40GHz)



Critical_Freqs

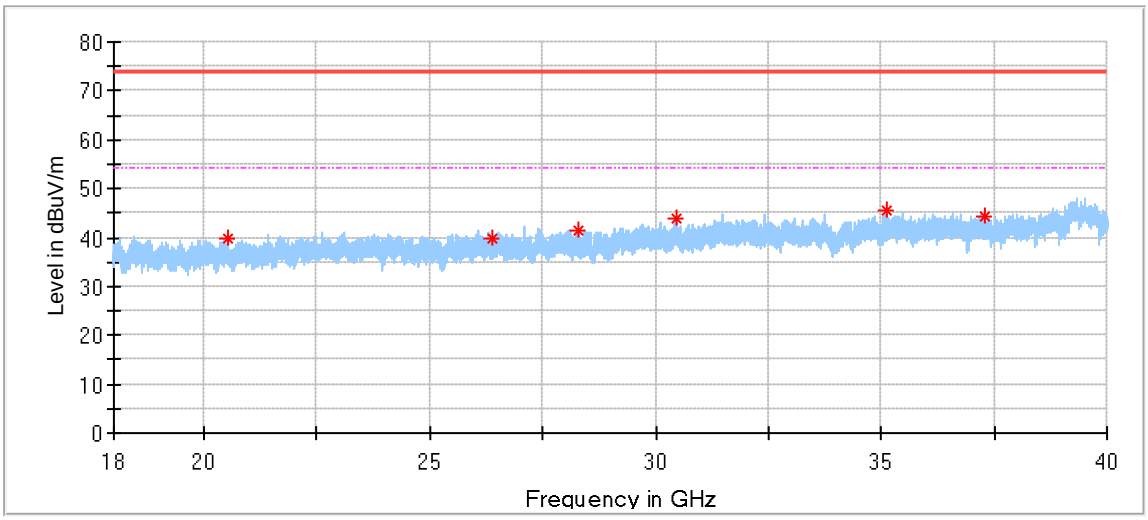
Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
20398.687500	39.76	74.00	34.24	150.0	H	138.0	-3.18	---
24348.375000	40.12	74.00	33.88	150.0	H	1.0	-0.18	---
26198.437500	41.49	74.00	32.51	150.0	H	0.0	0.79	---
27421.500000	42.44	74.00	31.56	150.0	H	1.0	0.93	---
31452.312500	43.33	74.00	30.67	150.0	H	85.0	1.40	---
36722.687500	44.46	74.00	29.54	150.0	H	356.0	2.37	---



Critical_Freqs

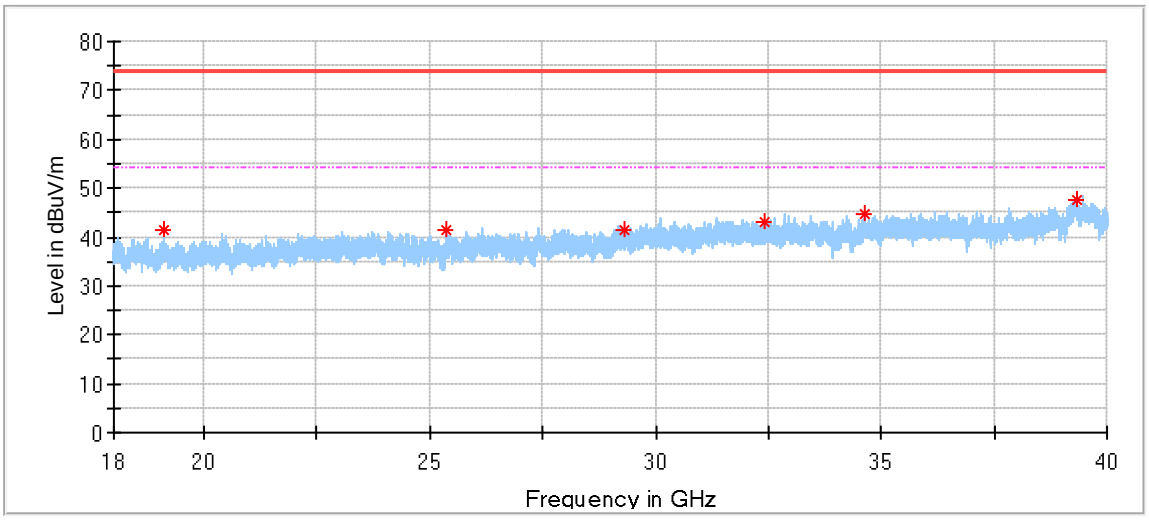
Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
21457.437500	40.52	74.00	33.48	150.0	V	152.0	-1.99	---
23832.750000	41.00	74.00	33.00	150.0	V	71.0	-0.19	---
27431.812500	41.21	74.00	32.79	150.0	V	30.0	0.96	---
33658.500000	43.48	74.00	30.52	150.0	V	272.0	0.97	---
37157.187500	44.61	74.00	29.39	150.0	V	85.0	2.41	---
39211.437500	47.45	74.00	26.55	150.0	V	0.0	4.47	---

Spurious radiated emissions for BLE 2480MHz (18GHz to 40GHz)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
20510.750000	39.82	74.00	34.18	150.0	H	259.0	-3.04	---
26375.812500	39.67	74.00	34.33	150.0	H	86.0	1.04	---
28306.312500	41.36	74.00	32.64	150.0	H	8.0	0.16	---
30445.812500	43.85	74.00	30.15	150.0	H	72.0	0.98	---
35105.687500	45.43	74.00	28.57	150.0	H	59.0	2.23	---
37284.375000	44.12	74.00	29.88	150.0	H	356.0	2.19	---

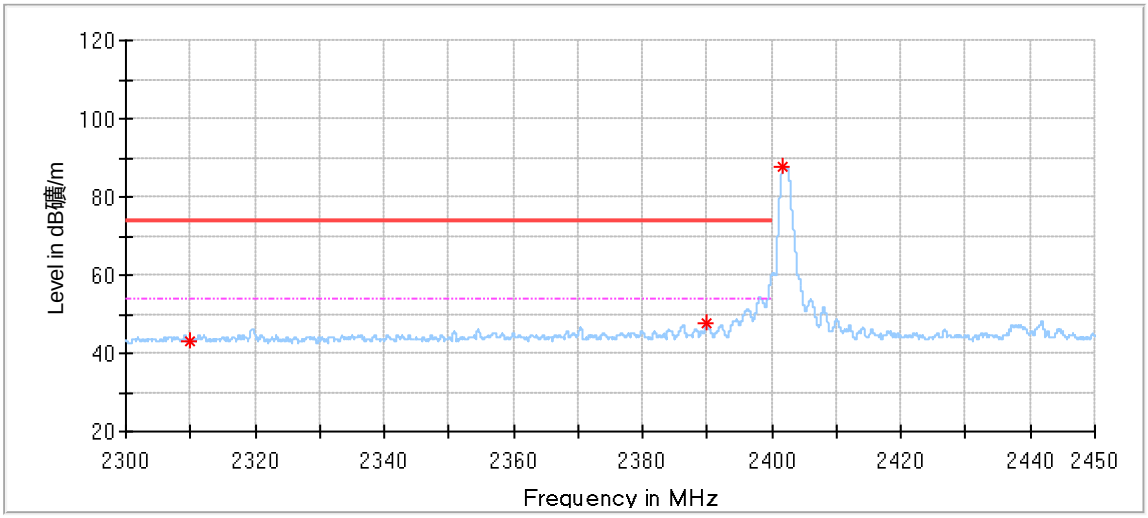


Critical_Freqs

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
19122.687500	41.50	74.00	32.51	150.0	V	154.0	-4.34	---
25361.062500	41.49	74.00	32.51	150.0	V	261.0	0.31	---
29332.062500	41.60	74.00	32.40	150.0	V	98.0	0.50	---
32434.750000	43.08	74.00	30.92	150.0	V	301.0	1.00	---
34649.187500	44.66	74.00	29.34	150.0	V	261.0	1.70	---
39320.062500	47.56	74.00	26.44	150.0	V	168.0	5.14	---

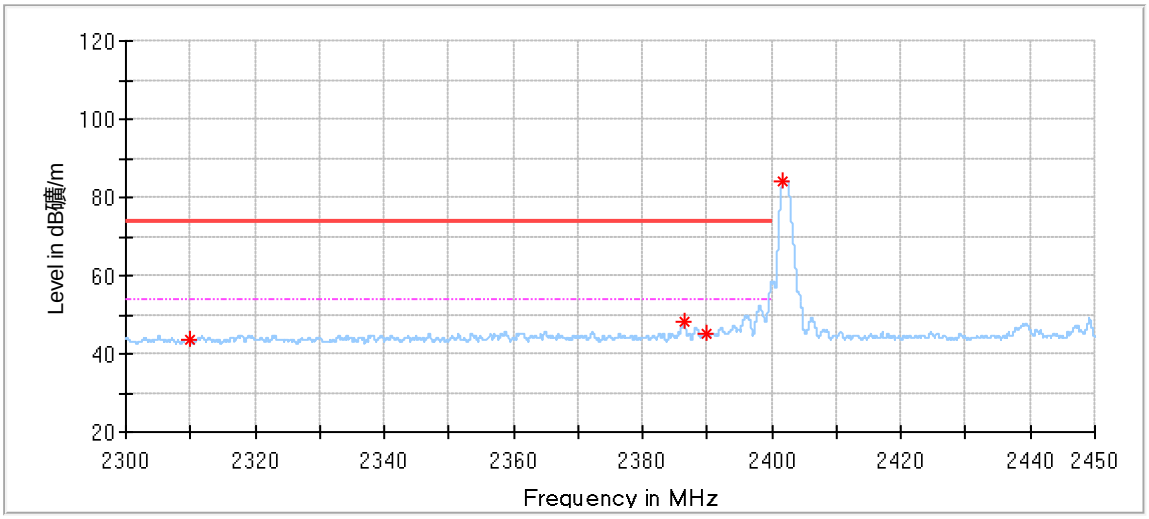
Restricted-band band-edge

BLE_1Mbps_Low Channel:



Critical_Freqs

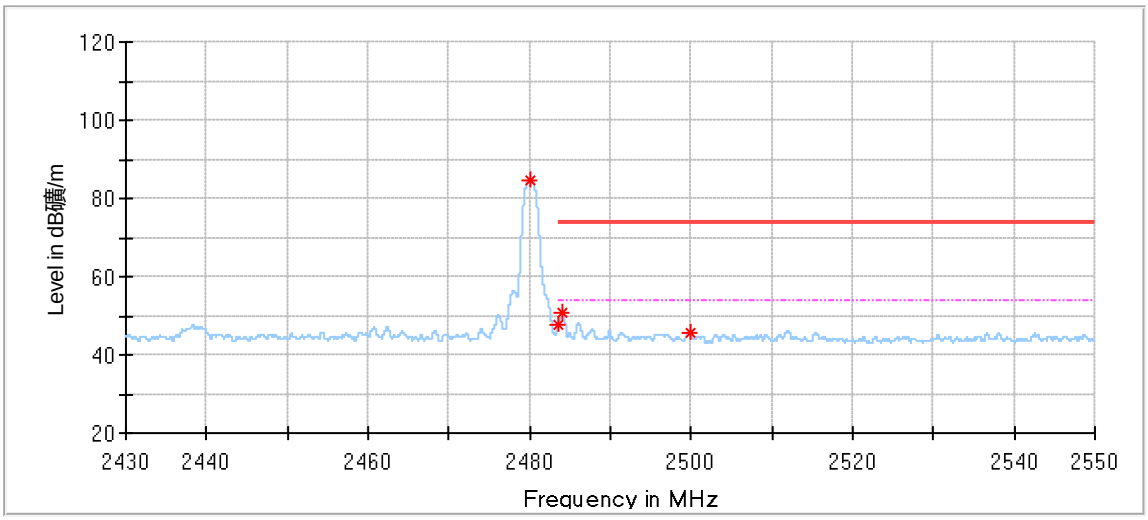
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2310.005000	43.10	74.00	30.90	150.0	H	202.0	-2.25
2390.000000	47.50	74.00	26.50	150.0	H	202.0	-1.74
2401.790000	87.61	---	---	150.0	H	202.0	-1.54



Critical_Freqs

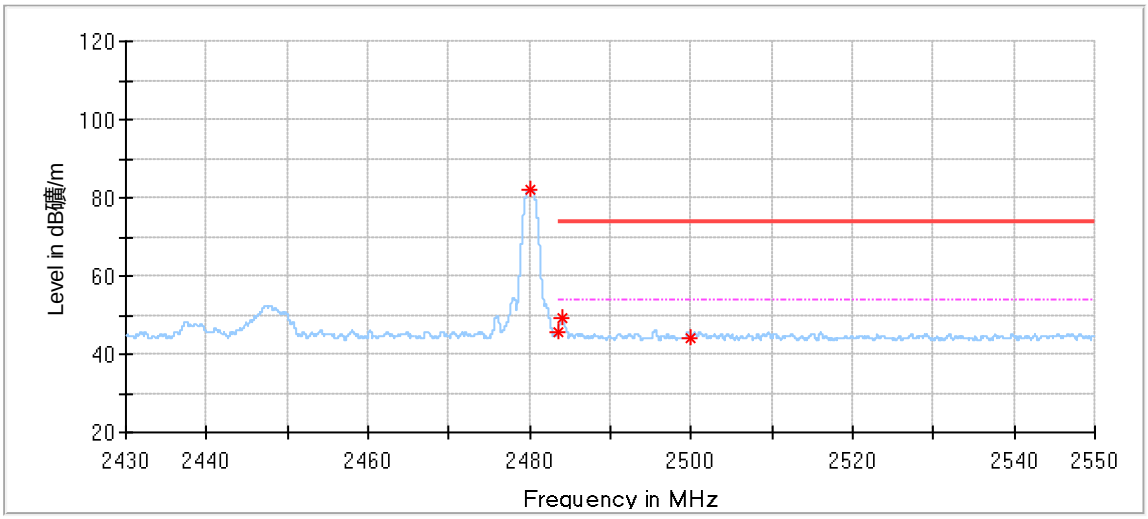
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2310.005000	43.73	74.00	30.27	150.0	V	169.0	-2.25
2386.340000	48.12	74.00	25.88	150.0	V	180.0	-1.80
2390.000000	45.25	74.00	28.75	150.0	V	82.0	-1.74
2401.760000	84.30	---	---	150.0	V	190.0	-1.54

BLE_1Mbps _High Channel:



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.052000	84.44	---	---	150.0	H	123.0	-1.80
2483.508000	47.46	74.00	26.54	150.0	H	123.0	-1.85
2484.024000	50.90	74.00	23.10	150.0	H	218.0	-1.86
2500.008000	45.63	74.00	28.37	150.0	H	197.0	-2.08



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.004000	82.05	---	---	150.0	V	242.0	-1.80
2483.508000	45.80	74.00	28.20	150.0	V	251.0	-1.85
2484.024000	49.32	74.00	24.68	150.0	V	247.0	-1.86
2500.008000	44.12	74.00	29.88	150.0	V	42.0	-2.08

Remark:

(1) Corrected Amplitude = Read level + Corrector factor
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)

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10 Test Equipment List

List of Test Instruments

Radiated Emission Test (9kHz-30MHz)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2025-5-13
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2025-7-24
Cable	HUBER-SUHNER	RG214	68-4-90-14-001-A21	----	----	----
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	3	2026-10-25
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version10.35.02	N/A	N/A

Radiated Emission Test (30MHz-1GHz)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2025-5-13
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	1	2025-2-22
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2025-5-11
Cable	OUQIAO	18DLB5-NMNM-7000	68-4-90-19-006-A22	----	----	----
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	3	2026-10-25
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

Radiated Emission Test (1GHz-18GHz)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2025-5-13
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2025-4-10
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2025-5-11
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2025-5-11
Cable	OUQIAO	18DLB5-NMNM-7000	68-4-90-19-006-A22	----	----	----
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	3	2026-10-25
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

Radiated Emission Test (18GHz-40GHz)

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2025-5-13
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2025-7-2
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2025-7-17
Cable	JUNFLON	MWX241	68-4-90-19-006-A21	----	----	----
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	3	2026-10-25
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

RF Conducted Test

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DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2025-5-11
RF Meas. and Switch Matrix Unit	TST PASS	TSCB3023R2	68-4-93-23-001	2811685c	1	2025-5-11
Cable	JUNFLON	J12J103539	68-4-90-19-003-A20	----	----	----
Test software	TST PASS	TST PASS	68-4-93-23-001-A03	Version 2.0	N/A	N/A
Shielding Room	TDK	TS8997	68-4-90-19-003	----	3	2025-10-15

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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 Radiated Emission in 3m chamber (68-4-90-14-001) 9kHz-30MHz	4.69dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 30MHz-1000MHz	Horizontal: 4.80dB Vertical: 5.91dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 5.40dB Vertical: 5.40dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) above 18000MHz	Horizontal: 5.10dB Vertical: 5.10dB
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.31dB 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 4.4.3 and 4.5.1.

---THE END OF REPORT---

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