

FCC/ISED - TEST REPORT

Report Number : **68.950.23.0888.01** Date of Issue: **2023-11-16**

Model/HVIN : **A1790**

Product Type : **Anker SOLIX F3800 Portable Power Station**

Applicant : **Anker Innovations Limited**

Address : **Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok,**
Kowloon, HONG KONG

Manufacturer : **Anker Innovations Limited**

Address : **Room 1318-19, Hollywood Plaza, 610 Nathan Road, Mongkok,**
Kowloon, HONG KONG

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including Appendices : **53**

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1 Table of Contents

1	Table of Contents.....	2
2	Details about the Test Laboratory.....	3
3	Description of the Equipment Under Test.....	4
4	Summary of Test Standards.....	5
5	Summary of Test Results.....	6
6	General Remarks	7
7	Test Setups	8
8	Systems Test Configuration.....	10
9	Technical Requirement	11
9.1	Conducted Emission	11
9.2	Conducted Peak Output Power & EIRP	14
9.3	Power Spectral Density	18
9.4	6 dB Bandwidth and 99% Occupied Bandwidth	21
9.5	Spurious RF Conducted Emissions	26
9.6	Band Edge Testing.....	34
9.7	Spurious Radiated Emissions for Transmitter.....	37
10	Test Equipment List.....	51
11	System Measurement Uncertainty	53

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

IC Registration No.: 10320A

ISED CAB identifier CN0077

3 Description of the Equipment Under Test

Product:	Anker SOLIX F3800 Portable Power Station
Model no.:	A1790
Hardware Version Identification No. (HVIN)	A1790
Product Marketing Name (PMN)	A1790
Brand name:	Anker
FCC ID:	2AOKB-A1790
IC:	23451-A1790
Options and accessories:	AC Charging Cable, MC4 Solar Charging Cable
Rating:	AC Input: 120V~ 15A (3hours Max), 12A 51.2Vdc 75Ah/3840Wh
Rating information:	AC Input: 120V~ 15A (3hours Max), 12A (continue), 60Hz AC Input Power (Charging): 1800W Max AC Input Power (Bypass Mode): 1440W Max; Solar Panel Input: 11-32V=10A; 32V-60V=25A (1200W Max Each) USB-C Output: 5V=3A / 9V=3A / 15V=3A / 20V=3A / 20V=5A (100W Max Per Port) USB-A Output: 5V=2.4A (12W Max Per Port); AC Output Power (Total): 6000W Max; AC Output 1: 120V~ 20A Max, 60Hz, 2400W Max AC Output 2: 120V~ 20A Max, 60Hz, 2400W Max Car Charger Output: 12V=10A AC Output (NEMA 14-50/ L14-30): 120V/240V~ 25A Max, 60Hz, 6000W Max Home Panel Power Port: 3800W Max (AC Input), 6000W Max (AC Output), 120V/240V
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	FPC
Antenna Gain	3.1dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Portable Power Station which support Low Energy Bluetooth(1M&2M) and Wi-Fi operated at 2.4GHz. Only Bluetooth Low Energy included in this report.

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

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2021 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5 April 2018 + Amendment 1 March 2019 + Amendment 2 February 2021	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 3 August 2023	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

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

5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C/ RSS-247 Issue 3/RSS-Gen Issue 5						
Test Condition		Test Site	Test Result			Test Environment
			Pass	Fail	N/A	
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	Site 1	☒	☐	☐	T: 23.1°C H: 51.2%
§15.247 (b) (3) & RSS-247 5.4(d)	Conducted peak output power	Site 1	☒	☐	☐	T: 23.4°C H: 52.7%
RSS-247 5.4(d)	Equivalent Isotropic Radiated Power	Site 1	☒	☐	☐	T: 23.4°C H: 52.7%
§15.247(a)(2) & RSS-247 5.2(a) & RSS-GEN 6.7	6dB bandwidth and 99% Occupied Bandwidth	Site 1	☒	☐	☐	T: 23.4°C H: 52.7%
§15.247(e) & RSS-247 5.2(b)	Power spectral density	Site 1	☒	☐	☐	T: 23.7°C H: 52.7%
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	Site 1	☒	☐	☐	T: 23.8°C H: 52.7%
§15.247(d) & RSS-247 5.5	Band edge	Site 1	☒	☐	☐	T: 23.1°C H: 58.0%
§15.247(d) & §15.209 & §15.205 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	Site 1	☒	☐	☐	T: 23.2°C H: 58.1%
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 2	☒	☐	☐	--

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a FPC antenna, which gain is 3.1dBi. In accordance to §15.203 & RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

Note 3: T :Temperature, H: Humidity.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AOKB-A1790, IC: 23451-A1790, complies with Section 15.207, 15.205, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

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.

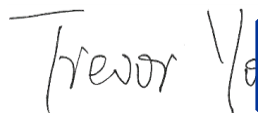
Sample Received Date: 2023-10-11

Testing Start Date: 2023-10-11

Testing End Date: 2023-11-15

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

Reviewed by:



Trevor You
EMC Project Manager

Prepared by:



Nick Huang
Project Engineer

Tested by:

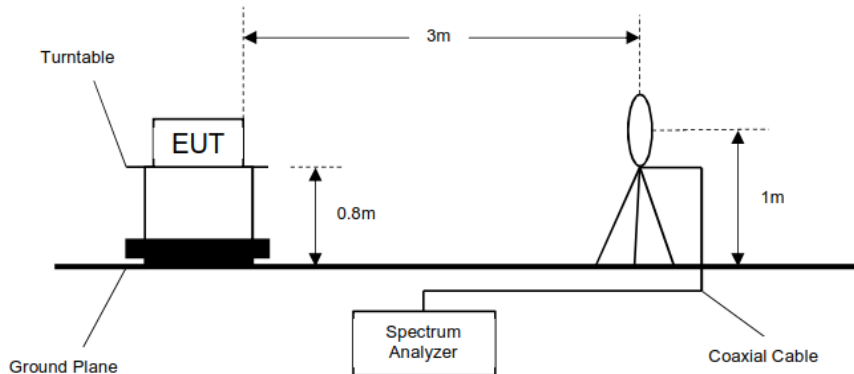


Carry Cai
Test Engineer

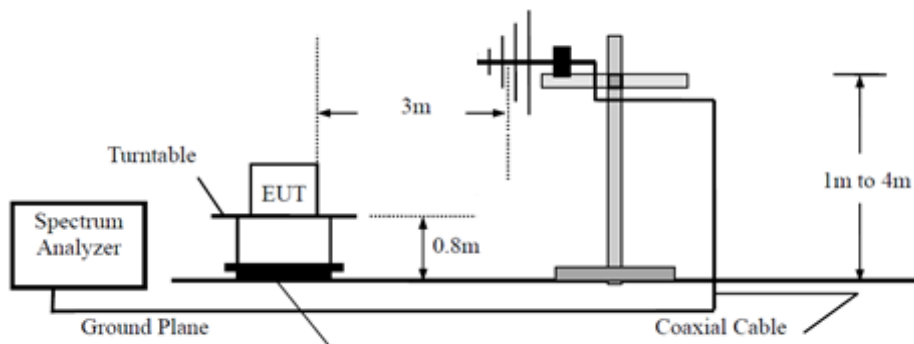
7 Test Setups

7.1 Radiated test setups

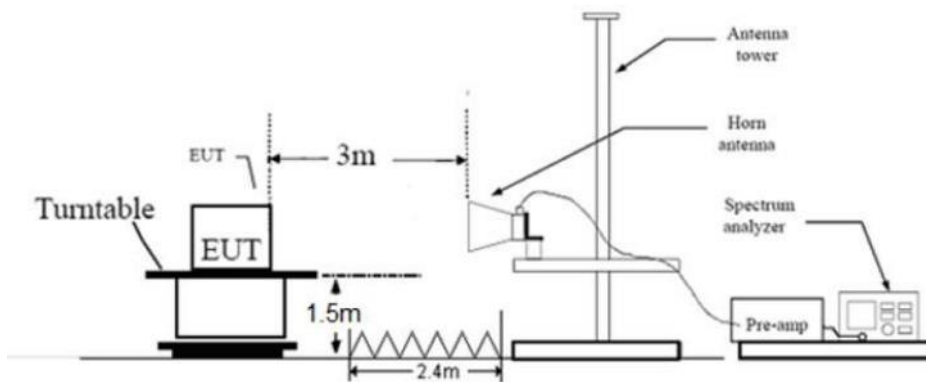
9KHz - 30MHz



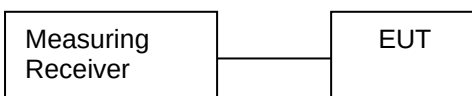
30MHz - 1GHz



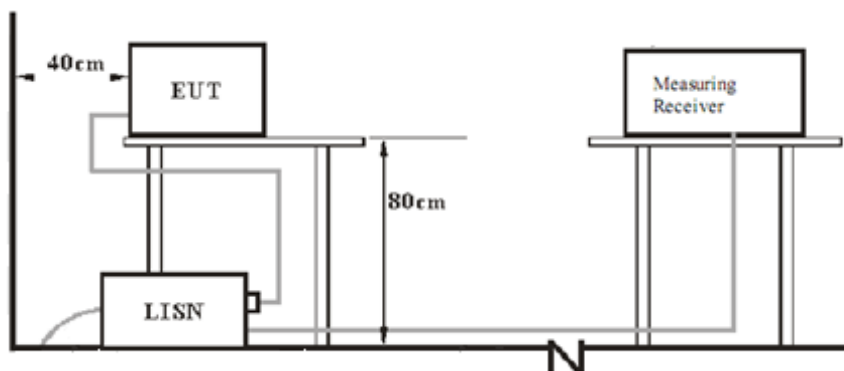
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



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	EspRFTTestTool_v2.8_Manual	
Modulation	Setting TX Power	Packet Type
GFSK	9	RBS9

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

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

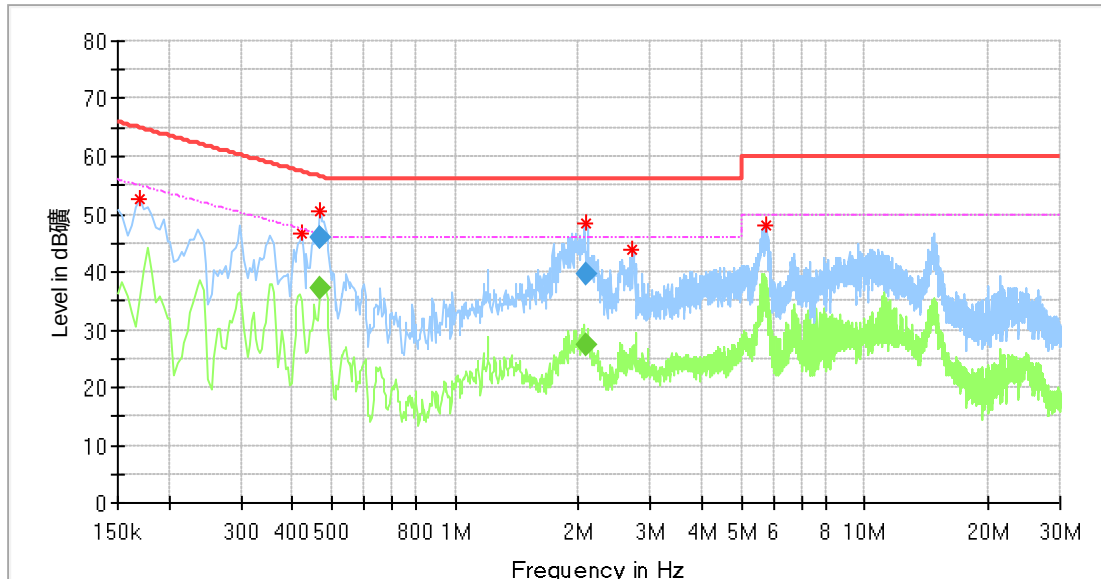
Limit

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Conducted Emission

Product Type : Anker SOLIX F3800 Portable Power Station
 M/N : A1790
 Operating Condition : Transmitting
 Test Specification : Line
 Comment : AC 120V/60Hz



Critical Freqs

Frequency (MHz)	MaxPeak * (dBμV)	Average * (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr.** (dB)
0.170000	52.48	---	64.96	12.48	L1	10.29
0.422000	46.51	---	57.41	10.90	L1	10.31
0.469000	50.40	---	56.58	6.18	L1	10.32
2.097000	48.48	---	56.00	7.52	L1	10.39
2.714000	43.78	---	56.00	12.22	L1	10.41
5.722000	48.04	---	60.00	11.96	L1	10.58

Final Result

Frequency (MHz)	QuasiPeak * (dBμV)	Average * (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr.** (dB)
0.469000	---	37.26	46.53	9.27	L1	10.32
0.469000	46.03	---	56.53	10.50	L1	10.32
2.097000	---	27.27	46.00	18.73	L1	10.39
2.097000	39.54	---	56.00	16.46	L1	10.39

Remark:

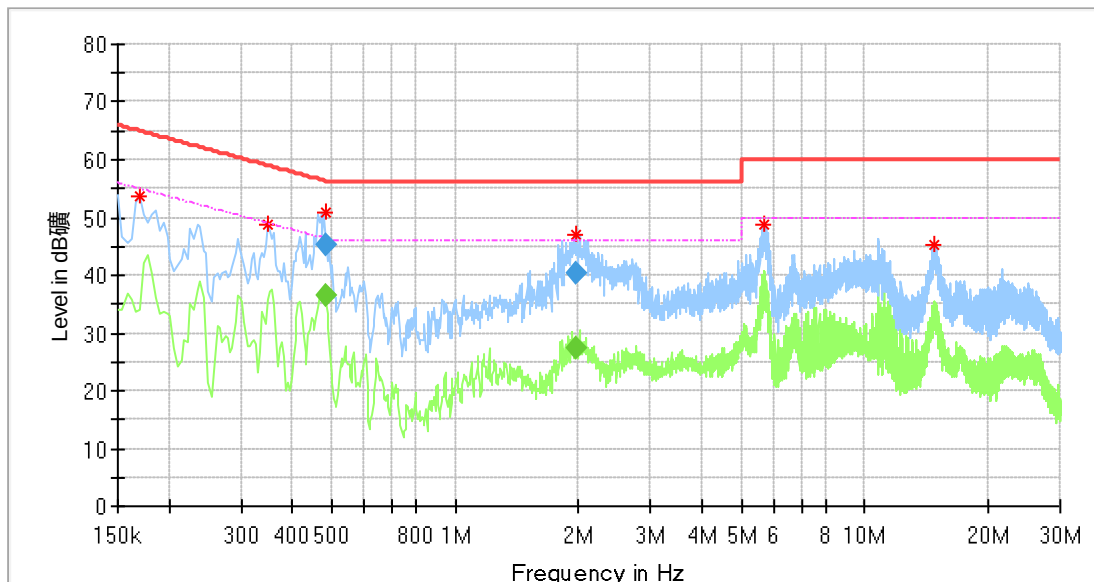
*Level=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Anker SOLIX F3800 Portable Power Station
M/N : A1790
Operating Condition : Transmitting
Test Specification : Neutral
Comment : AC 120V/60Hz



Critical_Freqs

Frequency (MHz)	MaxPeak * (dBμV)	Average * (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr.** (dB)
0.170000	53.74	---	64.96	11.23	N	10.30
0.350000	48.72	---	58.96	10.25	N	10.31
0.481000	50.84	---	56.51	5.68	N	10.32
1.961000	47.08	---	56.00	8.92	N	10.38
5.706000	48.62	---	60.00	11.38	N	10.60
14.698000	45.41	---	60.00	14.59	N	10.94

Final_Result

Frequency (MHz)	QuasiPeak * (dBμV)	Average * (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr.** (dB)
0.481000	---	36.47	46.32	9.85	N	10.32
0.481000	45.26	---	56.32	11.06	N	10.32
1.961000	---	27.26	46.00	18.74	N	10.38
1.961000	40.45	---	56.00	15.55	N	10.38

Remark:

*Level=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

9.2 Conducted Peak Output Power & EIRP

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 hopping channel
RBW > the 6dB bandwidth of the emission being measured, VBW $\geq$ 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) & RSS-247 5.4(d), conducted peak output power limit as below:

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

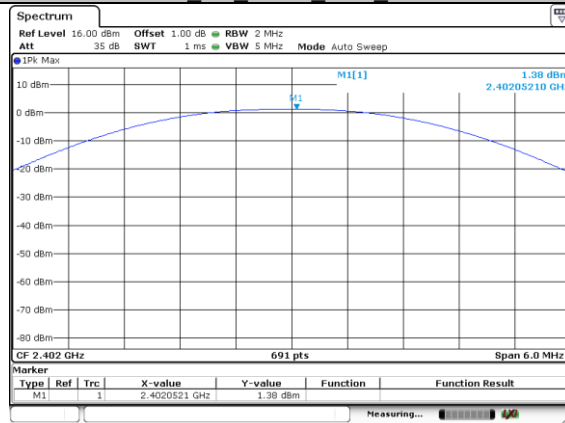
According to & RSS-247 5.4(d), EIRP limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 4	≤ 36

Conducted Peak Output Power & EIRP

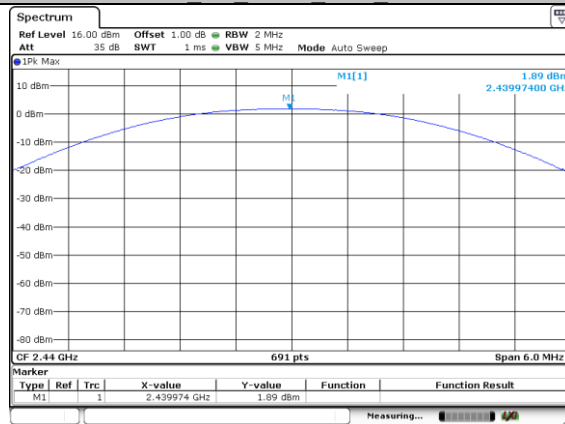
Frequency MHz	Mode	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Bottom channel 2402MHz	LE 1Mbps	1.38	3.1	4.48	Pass
Middle channel 2440MHz	LE 1Mbps	1.89	3.1	4.99	Pass
Top channel 2480MHz	LE 1Mbps	1.81	3.1	4.91	Pass
Bottom channel 2402MHz	LE 2Mbps	1.45	3.1	4.55	Pass
Middle channel 2440MHz	LE 2Mbps	1.76	3.1	4.86	Pass
Top channel 2480MHz	LE 2Mbps	1.79	3.1	4.89	Pass

BLE 1M BT4.0 Ant1 2402



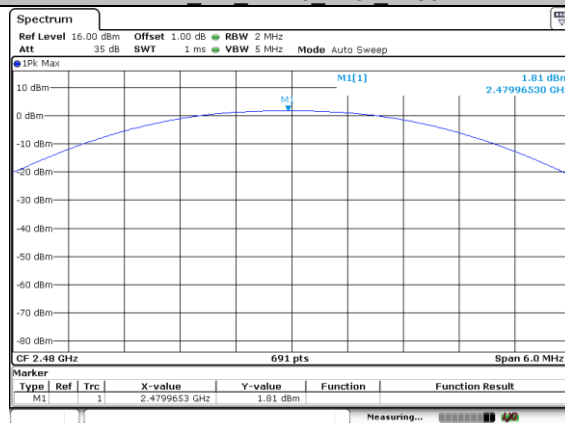
Date: 7 NOV 2023 20:35:19

BLE 1M BT4.0 Ant1 2440



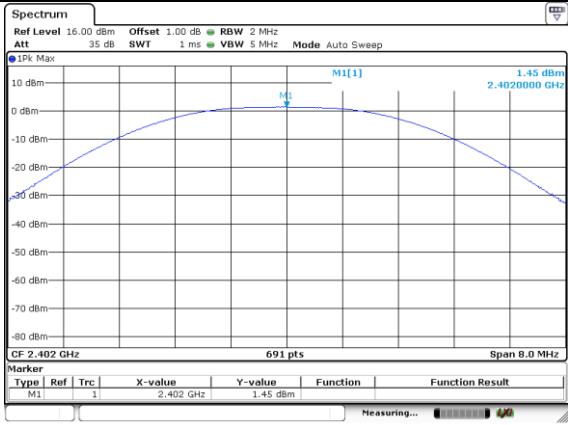
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BLE 1M BT4.0 Ant1 2480



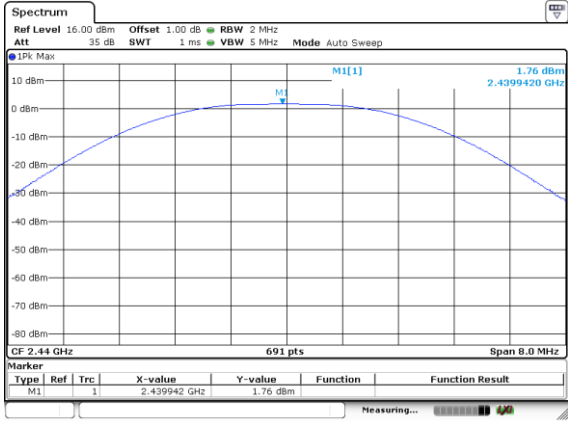
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BLE 2M BT5.0 Ant1 2402



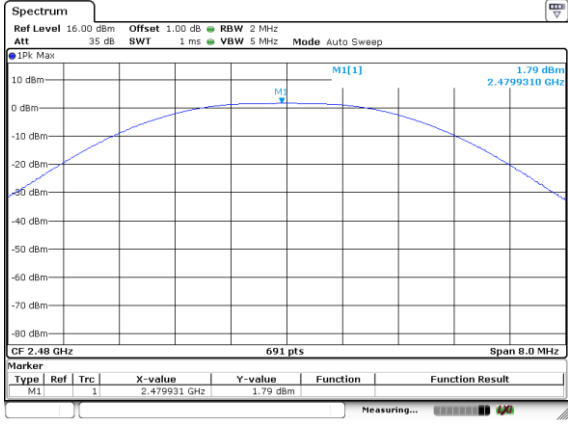
Date: 7.NOV.2023 20:39:14

BLE 2M BT5.0 Ant1 2440



Date: 7.NOV.2023 20:38:49

BLE 2M BT5.0 Ant1 2480



Date: 7.NOV.2023 20:38:22

9.3 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

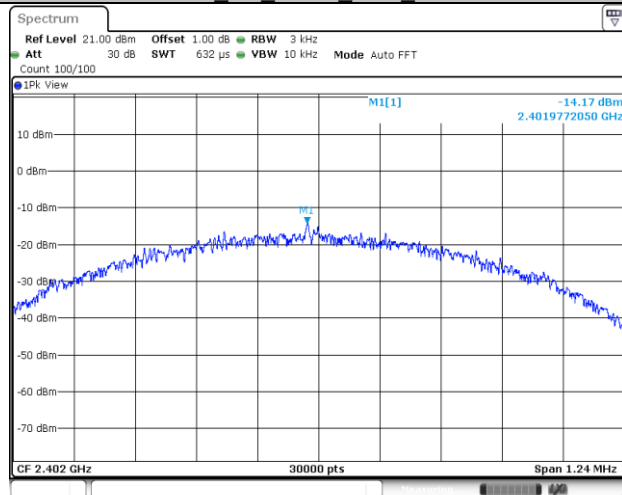
Limit [dBm/3KHz]

≤8

Test result

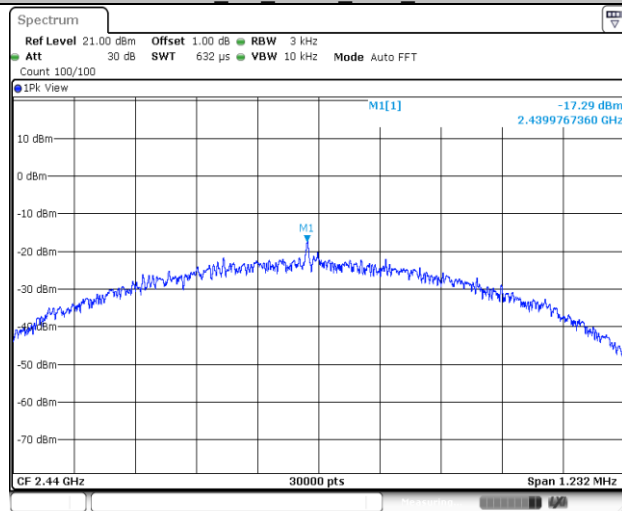
Frequency MHz	Mode	Power spectral density dBm/3KHz	Result
Bottom channel 2402MHz	LE 1Mbps	-14.17	Pass
Middle channel 2440MHz	LE 1Mbps	-17.29	Pass
Top channel 2480MHz	LE 1Mbps	-18.35	Pass
Bottom channel 2402MHz	LE 2Mbps	-16.23	Pass
Middle channel 2440MHz	LE 2Mbps	-19.40	Pass
Top channel 2480MHz	LE 2Mbps	-20.26	Pass

BLE 1M BT4.0 Ant1 2402



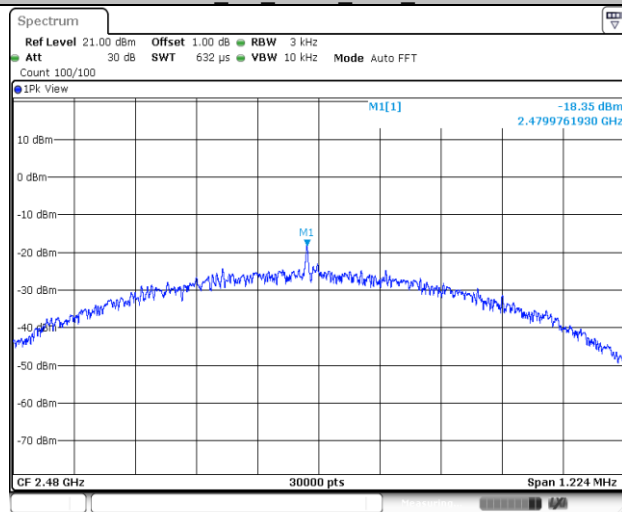
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BLE 1M BT4.0 Ant1 2440



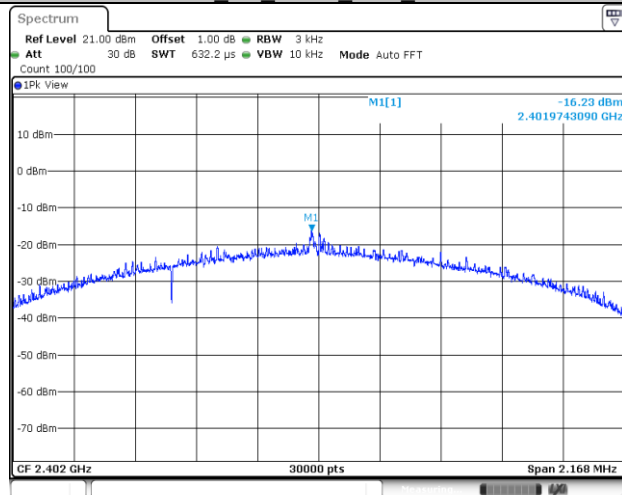
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BLE 1M BT4.0 Ant1 2480



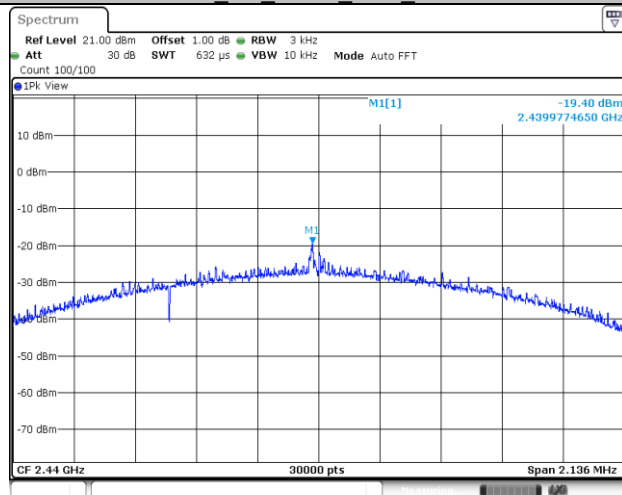
Date: 16 NOV 2023 17:16:18

BLE 2M BT5.0 Ant1 2402



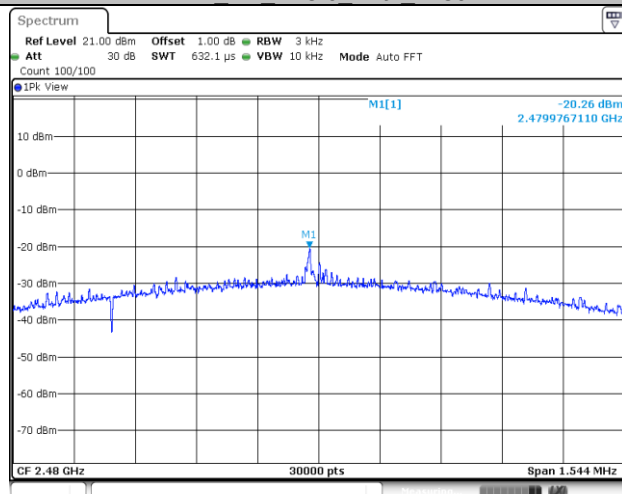
Date: 16 NOV 2023 17:16:58

BLE 2M BT5.0 Ant1 2440



Date: 16 NOV 2023 17:17:36

BLE 2M BT5.0 Ant1 2480



Date: 16 NOV 2023 17:23:43

9.4 6 dB Bandwidth and 99% Occupied Bandwidth

Test Method for 6 dB Bandwidth

1. Set center frequency to the nominal EUT channel center frequency
2. Set RBW = 100KHz
3. Set the video bandwidth (VBW) $\geq 3 \times$ RBW
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = Sweep = No faster than coupled (auto) time.
7. Allow the trace to stabilize.
8. 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.
9. Record the results in the test report.

Limit

Limit [kHz]

≥ 500

Test Method for 99 % Bandwidth

1. Set center frequency to the nominal EUT channel center frequency
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW ≥ 3 RBW
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Use the 99 % power bandwidth function of the instrument.
9. Record the results in the test report.

Limit

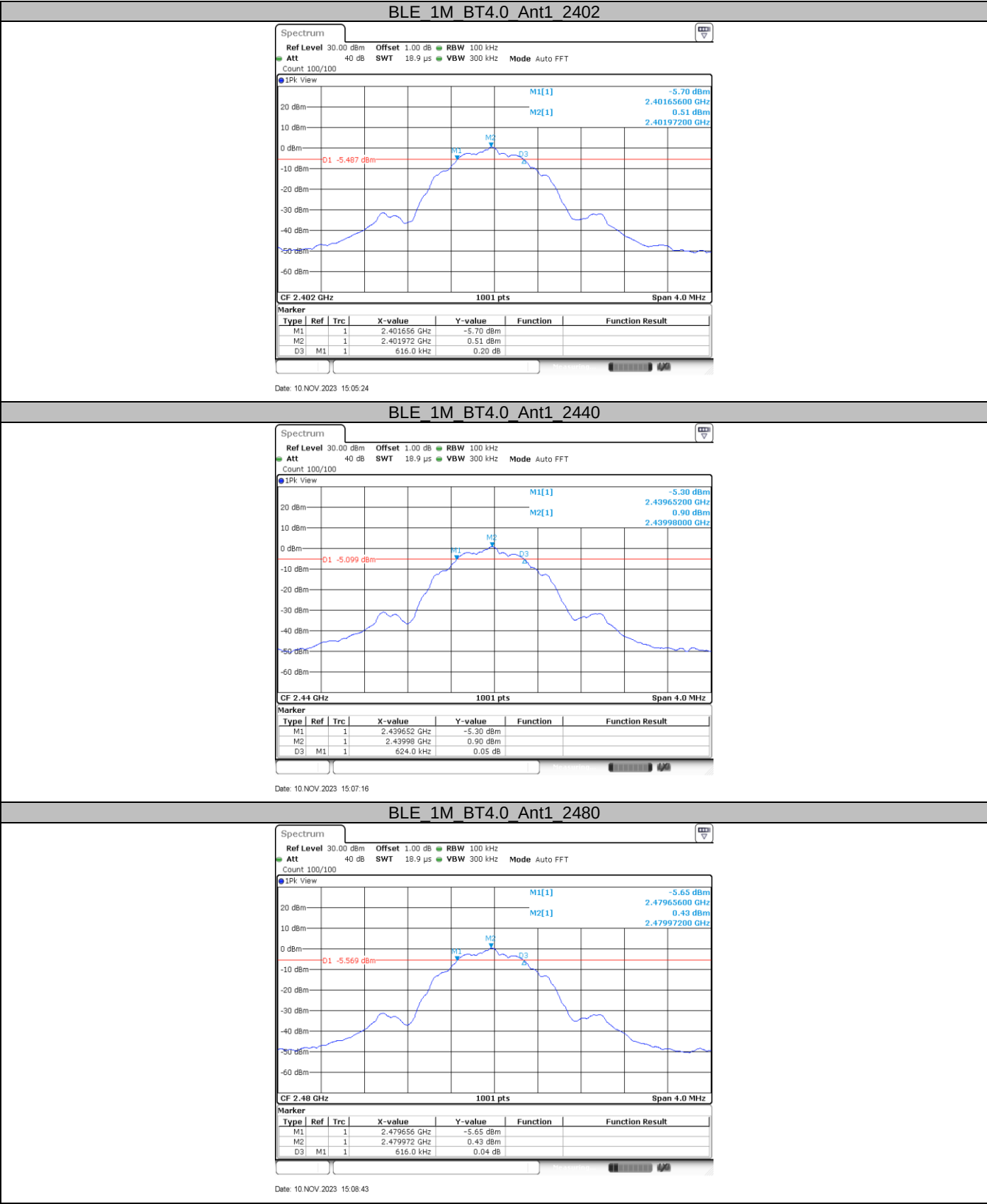
Limit [kHz]

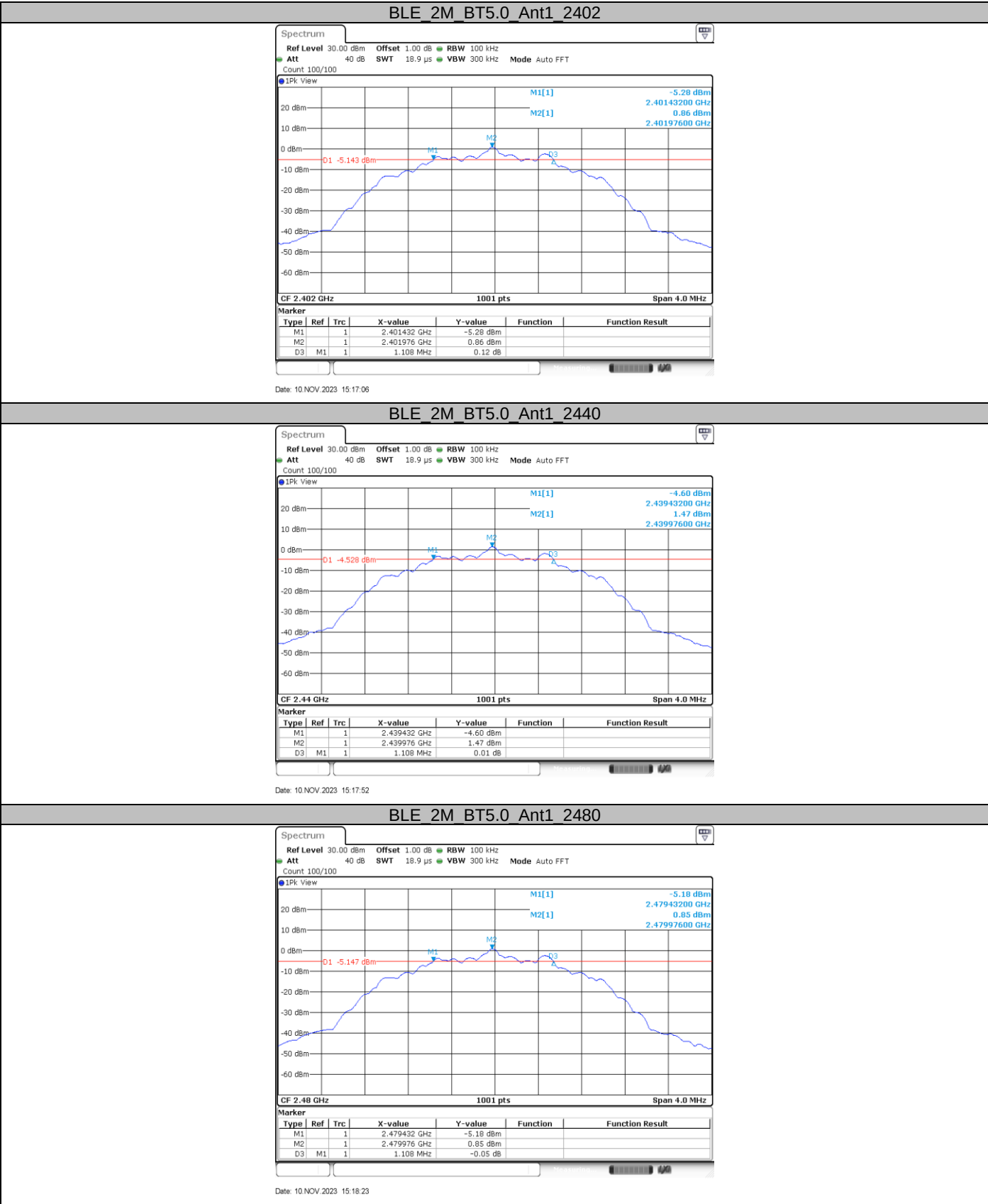
Test result

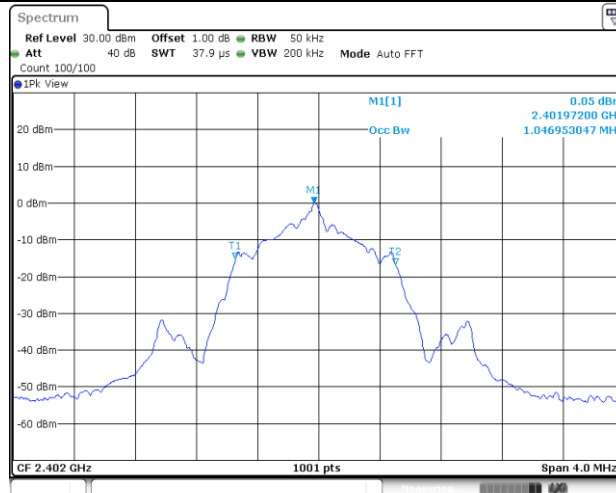
Frequency MHz	Mode	6dB bandwidth MHz	99% bandwidth MHz	Result
Bottom channel 2402MHz	LE 1Mbps	0.616	1.047	Pass
Middle channel 2440MHz	LE 1Mbps	0.624	1.051	Pass
Top channel 2480MHz	LE 1Mbps	0.616	1.047	Pass
Bottom channel 2402MHz	LE 1Mbps	1.108	2.062	Pass
Middle channel 2440MHz	LE 1Mbps	1.108	2.062	Pass
Top channel 2480MHz	LE 1Mbps	1.108	2.062	Pass



6 dB Bandwidth





99% Bandwidth**BLE 1M BT4.0 Ant1 2402**

Date: 10.NOV.2023 15:05:35

BLE 1M BT4.0 Ant1 2440

Date: 10.NOV.2023 15:07:27

BLE 1M BT4.0 Ant1 2480

Date: 10.NOV.2023 15:08:54

BLE 2M BT5.0 Ant1 2402



Date: 10.NOV.2023 15:10:35

BLE 2M BT5.0 Ant1 2440



Date: 10.NOV.2023 15:12:21

BLE 2M BT5.0 Ant1 2480



Date: 10.NOV.2023 15:14:05

9.5 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 $\geq$ 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.

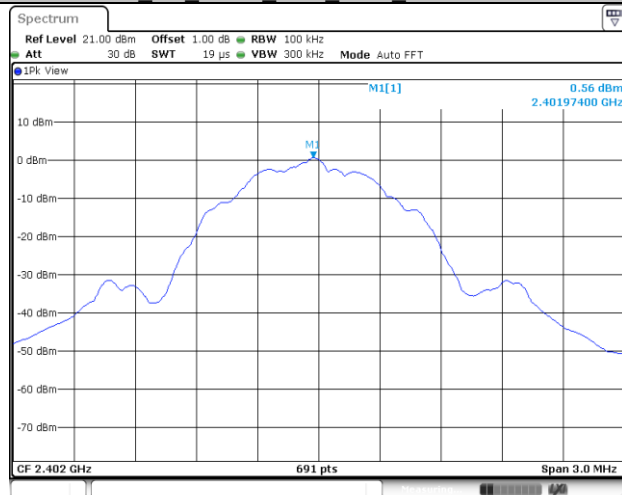
Limit

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

Spurious RF conducted emissions

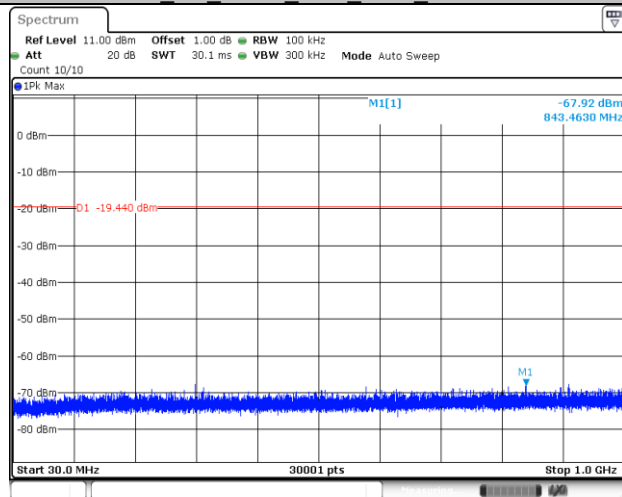
Test Mode	Antenna	Channel (MHz)	Frequency Range (MHz)	Result (dBm)	Limit (dBm)	Verdict
BLE_1Mbps	Ant0	2402	Reference	0.56	---	PASS
			30~1000	-67.92	<=-19.44	PASS
			1000~26500	-52.97	<=-19.44	PASS
		2440	Reference	0.93	---	PASS
			30~1000	-68.13	<=-19.07	PASS
			1000~26500	-51.59	<=-19.07	PASS
		2480	Reference	0.48	---	PASS
			30~1000	-68.43	<=-19.52	PASS
			1000~26500	-52.6	<=-19.52	PASS
BLE_2Mbps	Ant0	2402	Reference	0.89	---	PASS
			30~1000	-67.43	<=-19.11	PASS
			1000~26500	-46.19	<=-19.11	PASS
		2440	Reference	1.29	---	PASS
			30~1000	-68.2	<=-18.71	PASS
			1000~26500	-52.54	<=-18.71	PASS
		2480	Reference	0.82	---	PASS
			30~1000	-67.82	<=-19.18	PASS
			1000~26500	-51.78	<=-19.18	PASS

BLE 1M BT4.0 Ant1 2402 0~Reference



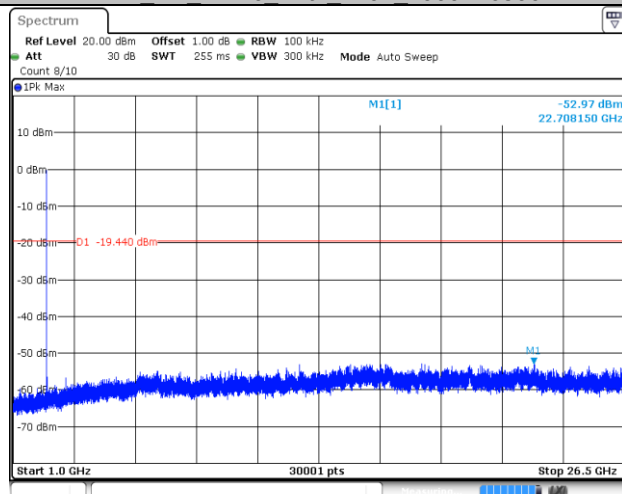
Date: 10 NOV 2023 15:05:56

BLE 1M BT4.0 Ant1 2402 30~1000



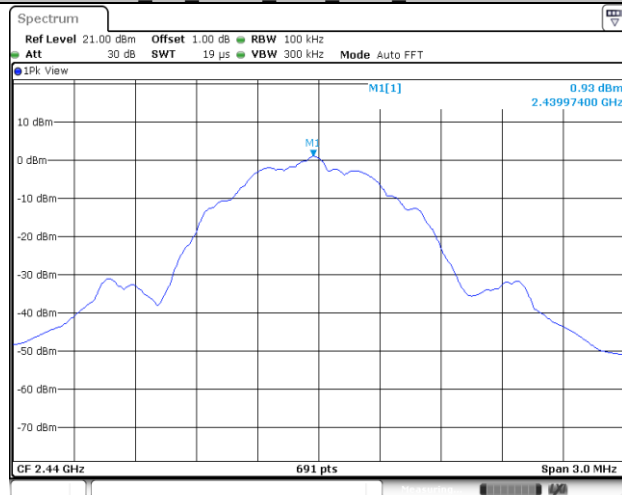
Date: 10 NOV 2023 15:06:02

BLE 1M BT4.0 Ant1 2402 1000~26500



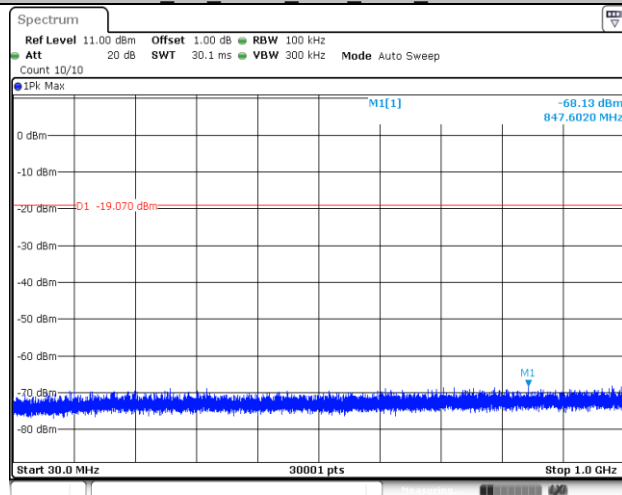
Date: 10 NOV 2023 15:06:10

BLE 1M BT4.0 Ant1 2440 0~Reference



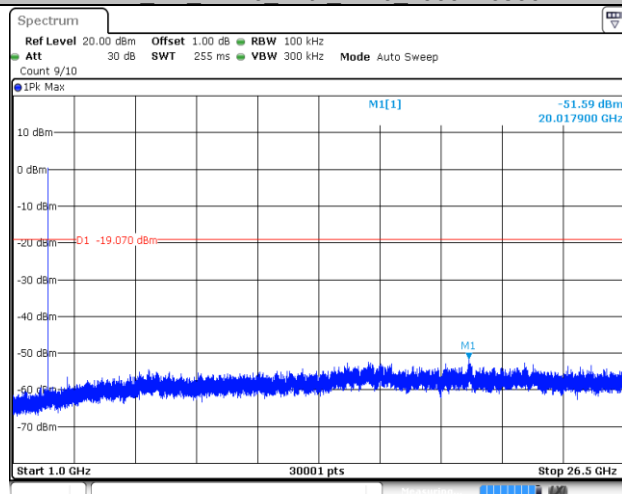
Date: 10 NOV 2023 15:07:38

BLE 1M BT4.0 Ant1 2440 30~1000



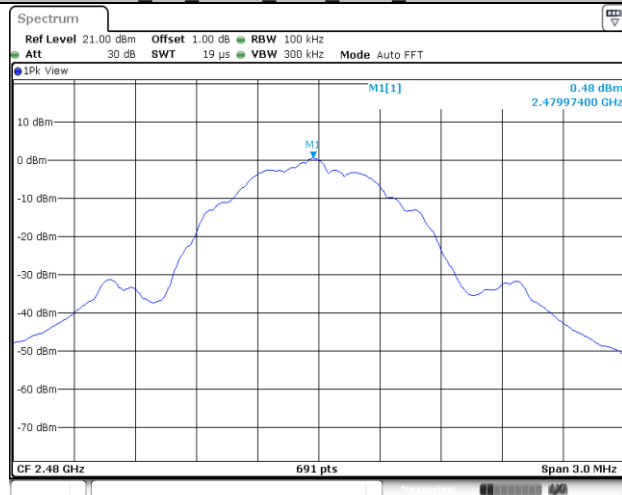
Date: 10 NOV 2023 15:07:45

BLE 1M BT4.0 Ant1 2440 1000~26500



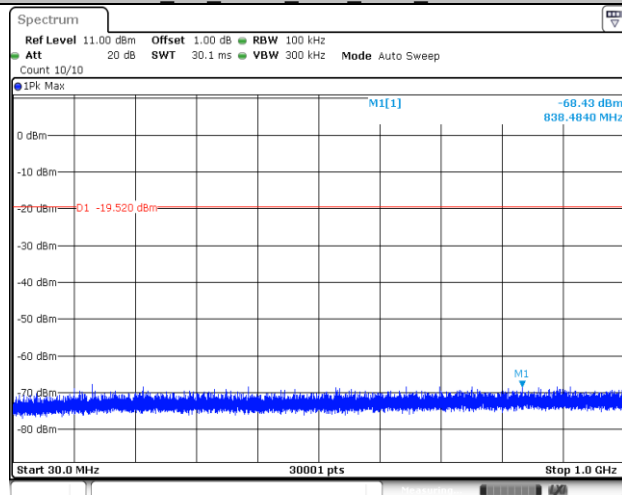
Date: 10 NOV 2023 15:07:52

BLE 1M BT4.0 Ant1 2480 0~Reference



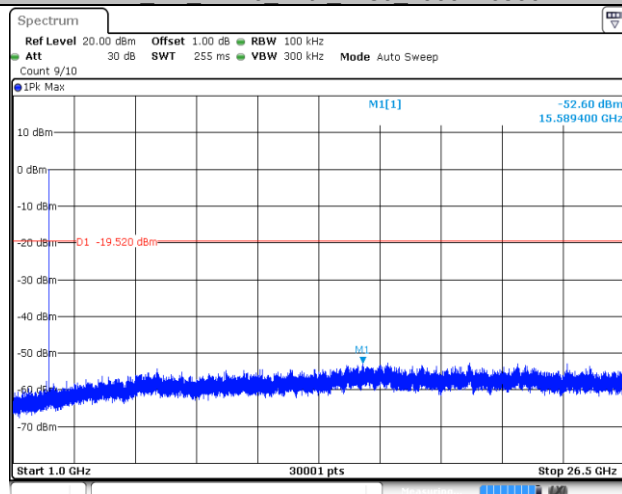
Date: 10.NOV.2023 15:09:15

BLE 1M BT4.0 Ant1 2480 30~1000



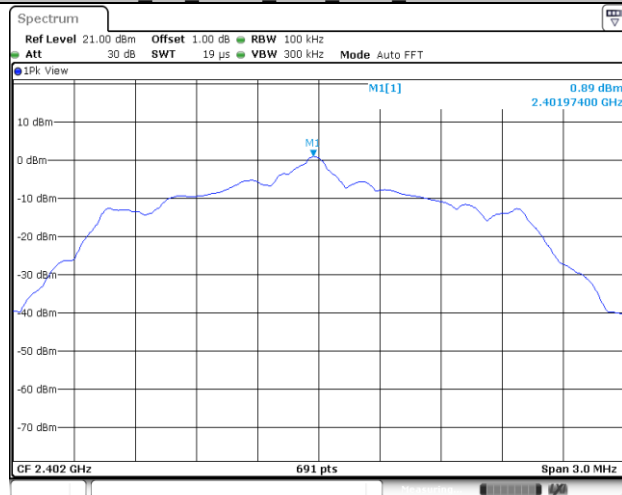
Date: 10.NOV.2023 15:09:21

BLE 1M BT4.0 Ant1 2480 1000~26500



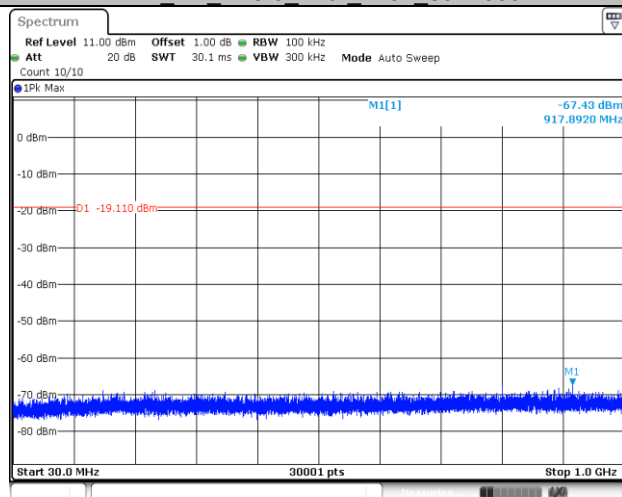
Date: 10.NOV.2023 15:09:29

BLE 2M BT5.0 Ant1 2402 0~Reference



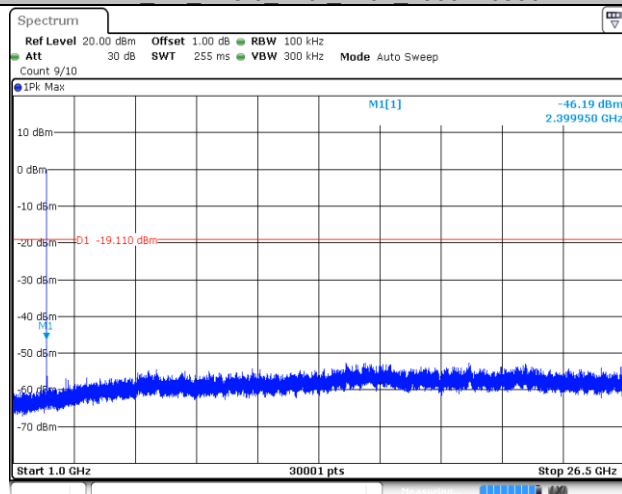
Date: 10.NOV.2023 15:10:56

BLE 2M BT5.0 Ant1 2402 30~1000



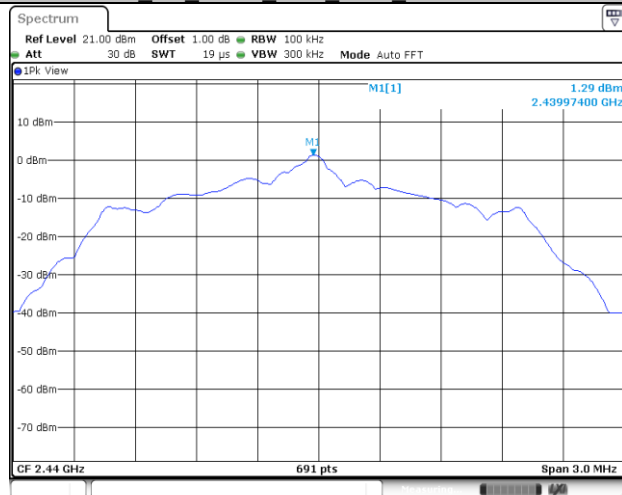
Date: 10.NOV.2023 15:11:02

BLE 2M BT5.0 Ant1 2402 1000~26500



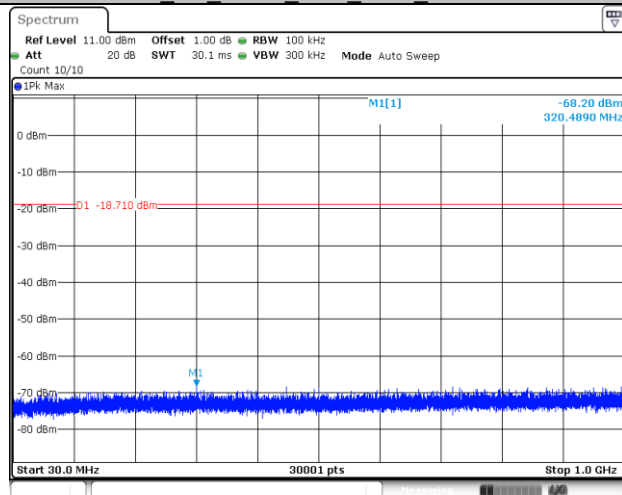
Date: 10.NOV.2023 15:11:10

BLE 2M BT5.0 Ant1 2440 0~Reference



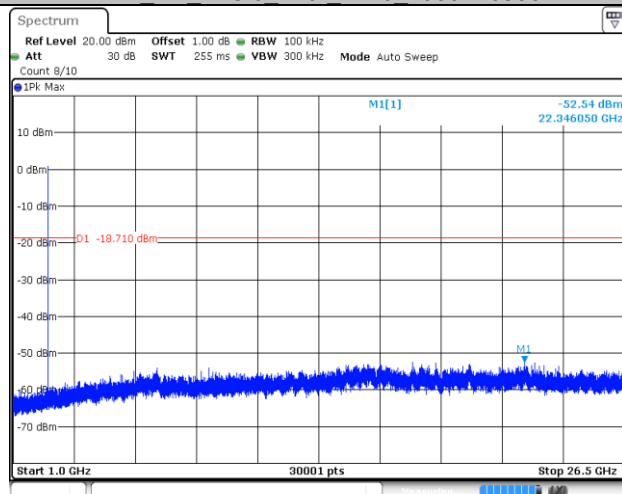
Date: 10 NOV 2023 15:12:32

BLE 2M BT5.0 Ant1 2440 30~1000



Date: 10 NOV 2023 15:12:39

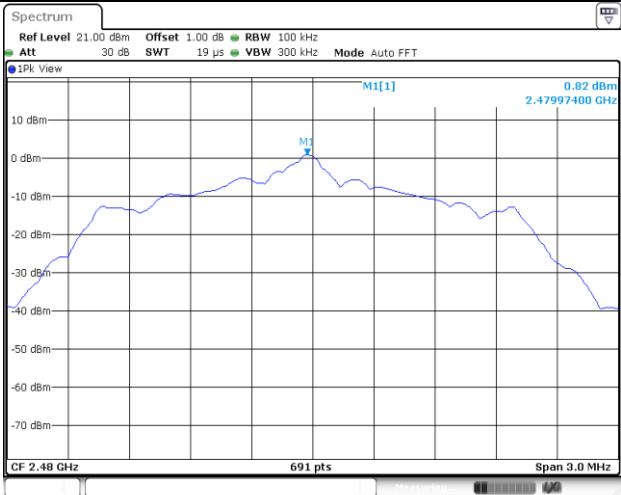
BLE 2M BT5.0 Ant1 2440 1000~26500



Date: 10 NOV 2023 15:12:46

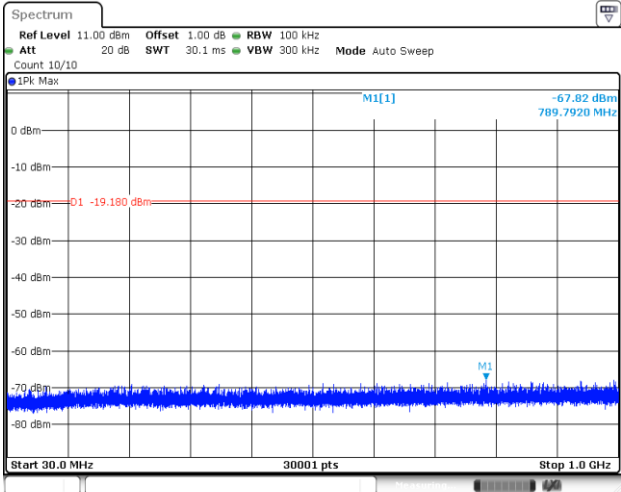


BLE 2M BT5.0 Ant1 2480 0~Reference



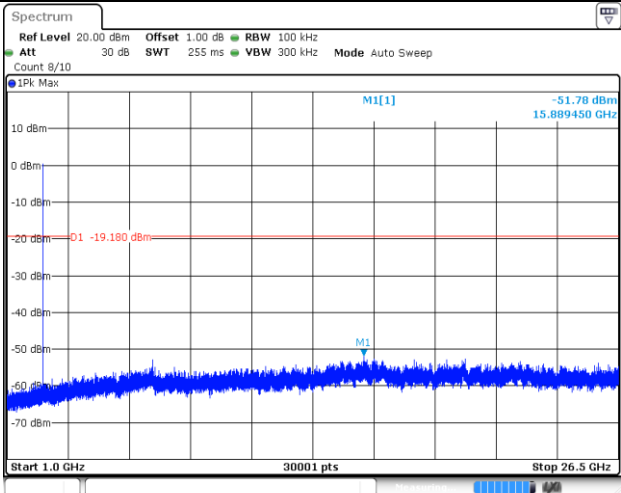
Date: 10.NOV.2023 15:14:25

BLE 2M BT5.0 Ant1 2480 30~1000



Date: 10.NOV.2023 15:14:32

BLE 2M BT5.0 Ant1 2480 1000~26500



Date: 10.NOV.2023 15:14:39

9.6 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 $\geq$ 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

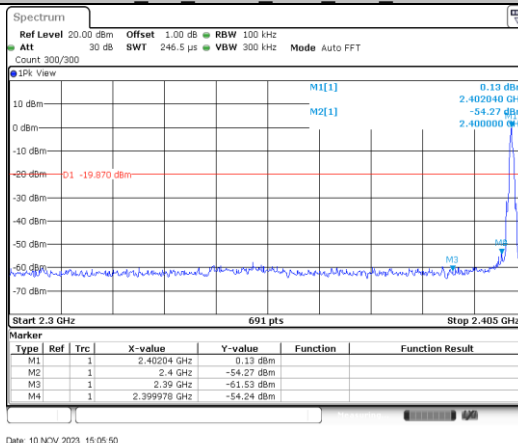
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either 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) and RSS-247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB.

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

Band edge testing

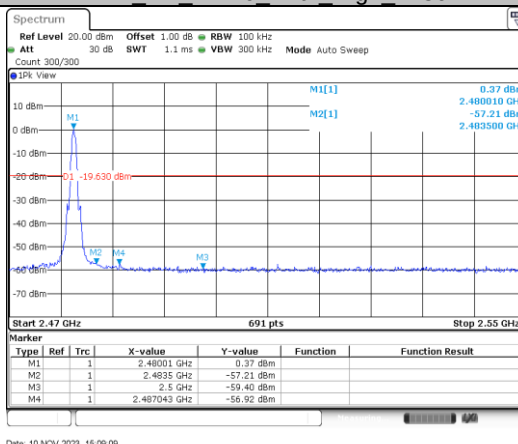
Test Mode	Antenna	Channel	Channel (MHz)	Reference Level (dBm)	Result (dBm)	Limit (dBm)	Verdict
BLE_1Mbps	Ant0	Low	2402	0.13	-54.24	<=-19.87	PASS
		High	2480	0.37	-56.92	<=-19.63	PASS
BLE_2Mbps	Ant0	Low	2402	0.56	-46.93	<=-19.44	PASS
		High	2480	0.81	-56.11	<=-19.19	PASS

BLE_1M_BT4.0_Ant1_Low_2402



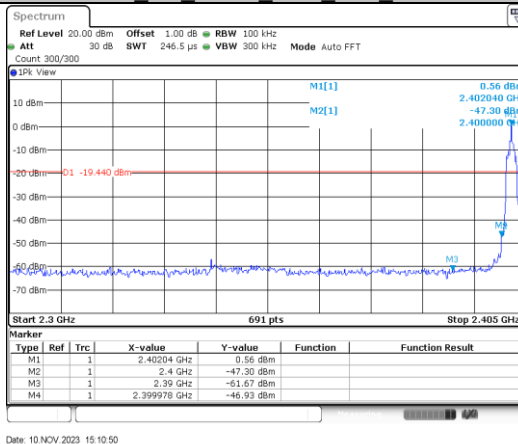
Date: 10 NOV 2023 15:05:50

BLE_1M_BT4.0_Ant1_High_2480

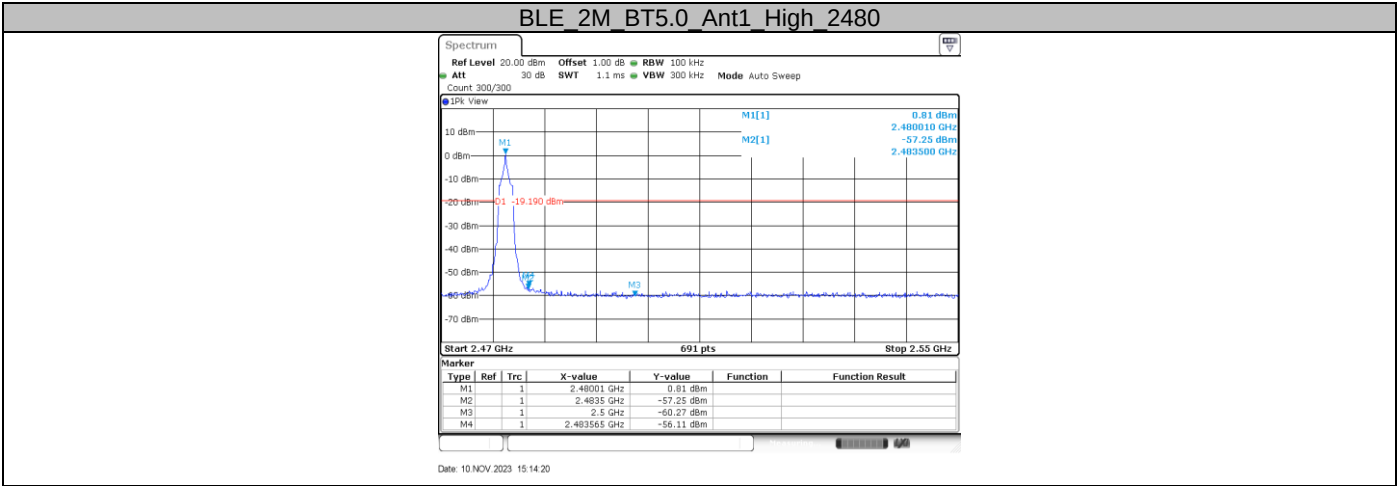


Date: 10 NOV 2023 15:09:09

BLE_2M_BT5.0_Ant1_Low_2402



Date: 10 NOV 2023 15:10:50



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:

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 = $[3 \times \text{RBW}]$.

c) Detector = RMS (power averaging), if $[\text{span} / (\# \text{ of points in sweep})] \leq \text{RBW} / 2$.

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) and RSS 247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in § 15.209(a) and RSS-Gen is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a) and RSS-Gen section 8.9, must also comply with the radiated emission limits specified in § 15.209(a) and RSS-Gen section 8.10.

Frequency MHz	Field Strength $\mu\text{V/m}$	Field Strength dB $\mu\text{V/m}$	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(dB $\mu\text{V/m}$)=Limit 300m(dB $\mu\text{V/m}$)+40Log(300m/3m) (Below 30MHz)

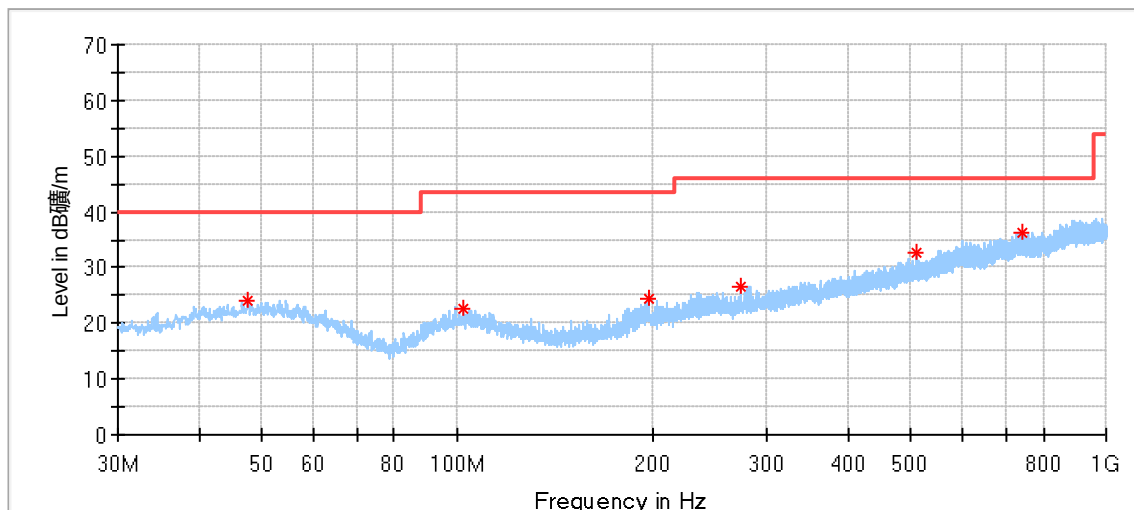
Note 2: Limit 3m(dB $\mu\text{V/m}$)=Limit 30m(dB $\mu\text{V/m}$)+40Log(30m/3m) (Below 30MHz)

Spurious radiated emissions for transmitter

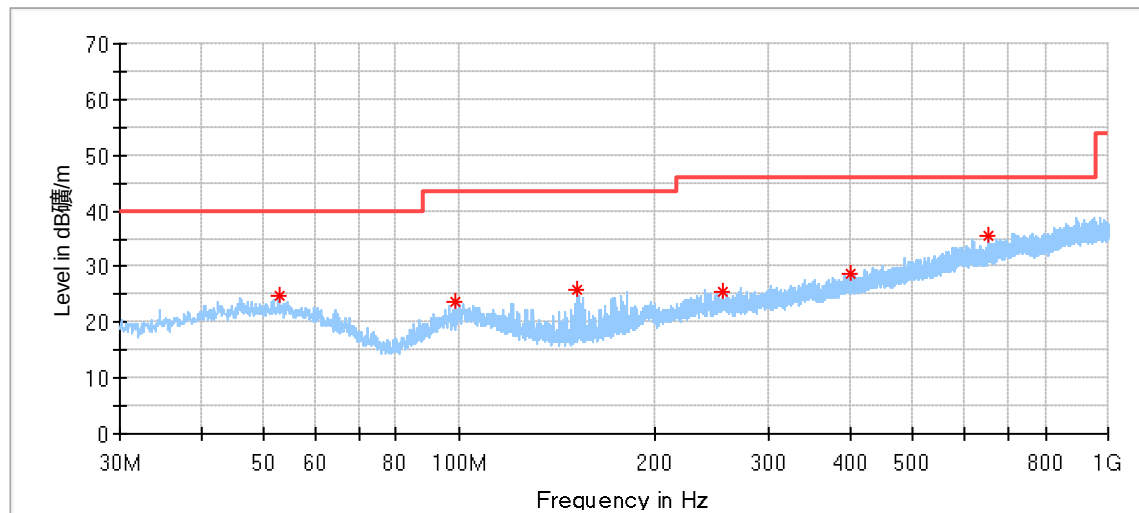
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Test data_30MHz to 1000MHz

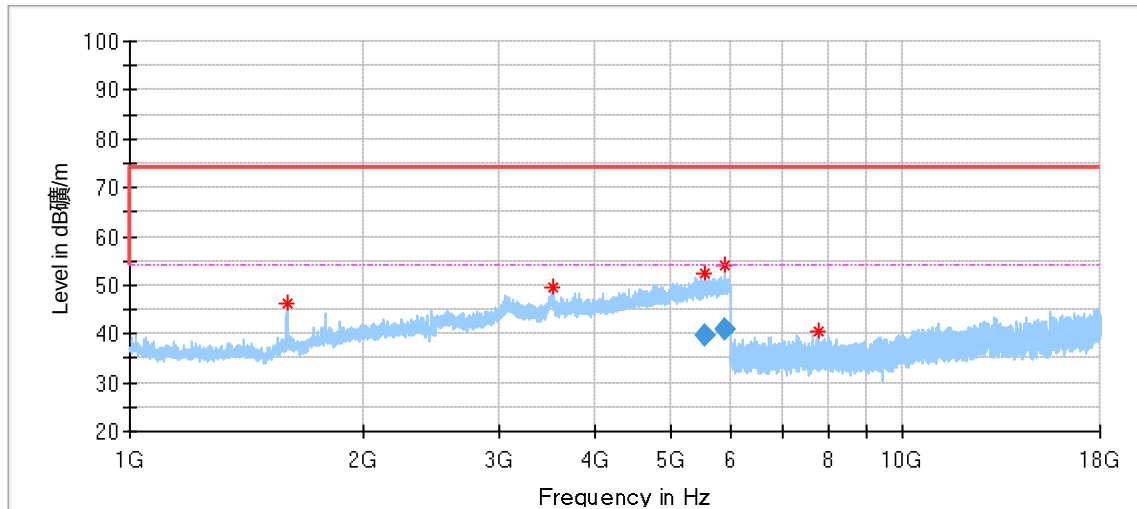


Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.567778	24.08	40.00	15.92	200.0	H	356.0	18.37
101.995556	22.48	43.50	21.02	100.0	H	136.0	16.08
197.594444	24.38	43.50	19.12	200.0	H	351.0	16.25
273.577778*	26.72	46.00	19.28	200.0	H	124.0	17.86
511.066111	32.65	46.00	13.35	100.0	H	9.0	23.14
741.926111	36.20	46.00	9.80	200.0	H	145.0	27.35

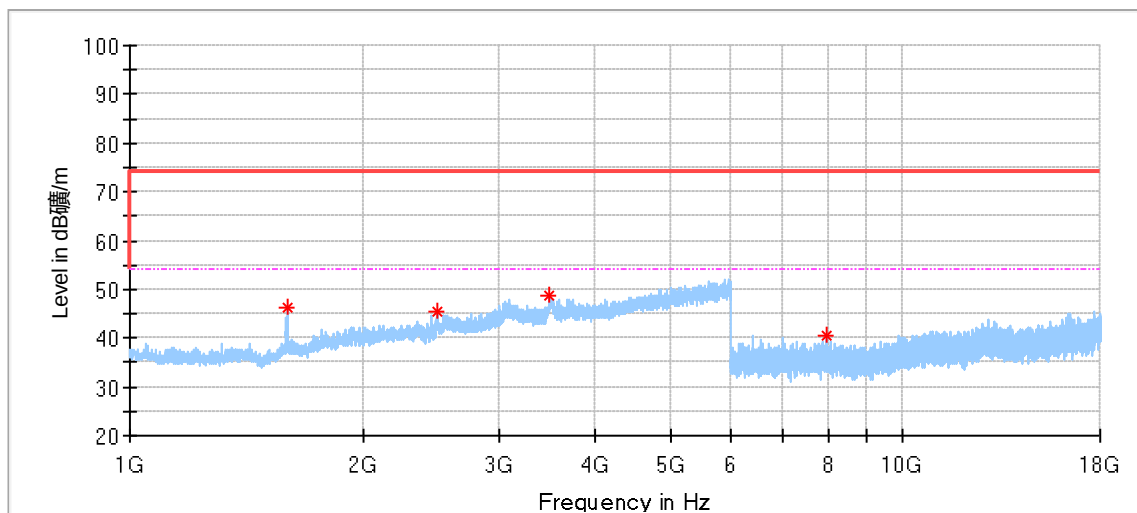


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
52.687222	24.72	40.00	15.28	100.0	V	229.0	18.17
98.708333	23.61	43.50	19.89	100.0	V	74.0	15.73
151.950556	25.84	43.50	17.66	100.0	V	106.0	12.78
254.393333*	25.53	46.00	20.47	100.0	V	323.0	17.98
401.456111*	28.76	46.00	17.24	200.0	V	140.0	21.23
655.380556	35.60	46.00	10.40	100.0	V	137.0	25.53

Test data 1GHz to 18GHz:
BLE_1Mbps_Low Channel:

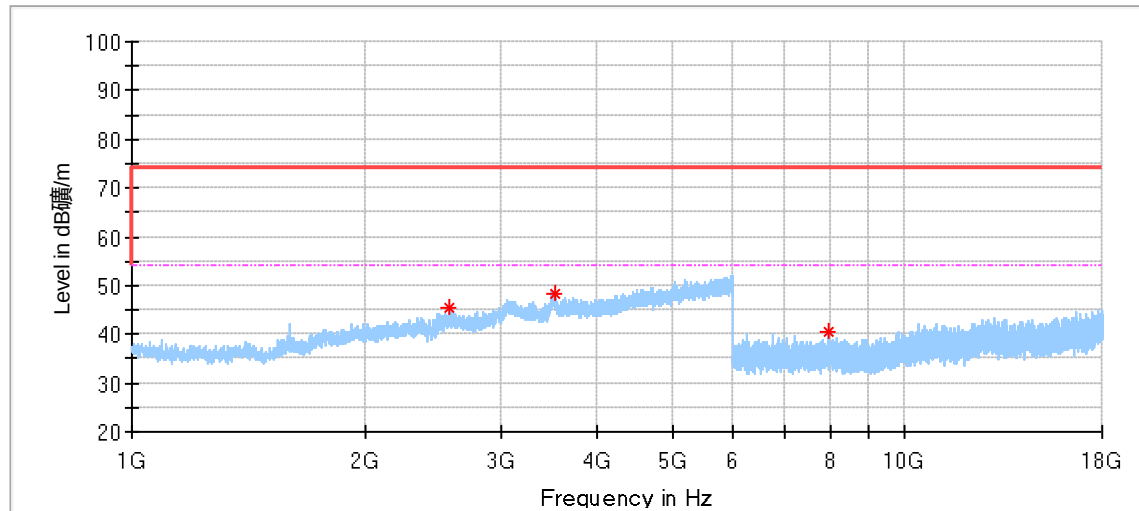


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1598.500000	46.41	74.00	27.59	150.0	H	251.0	-6.86
3521.000000	49.37	74.00	24.63	150.0	H	333.0	3.42
5542.000000*	52.59	74.00	21.41	150.0	H	303.0	6.96
5885.000000	54.07	74.00	19.93	150.0	H	313.0	8.04
7761.500000	40.42	74.00	33.58	150.0	H	224.0	7.10
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
5542.000000*	39.52	54.00	14.48	150.0	H	303.0	6.96
5885.000000	40.86	54.00	13.14	150.0	H	313.0	8.04

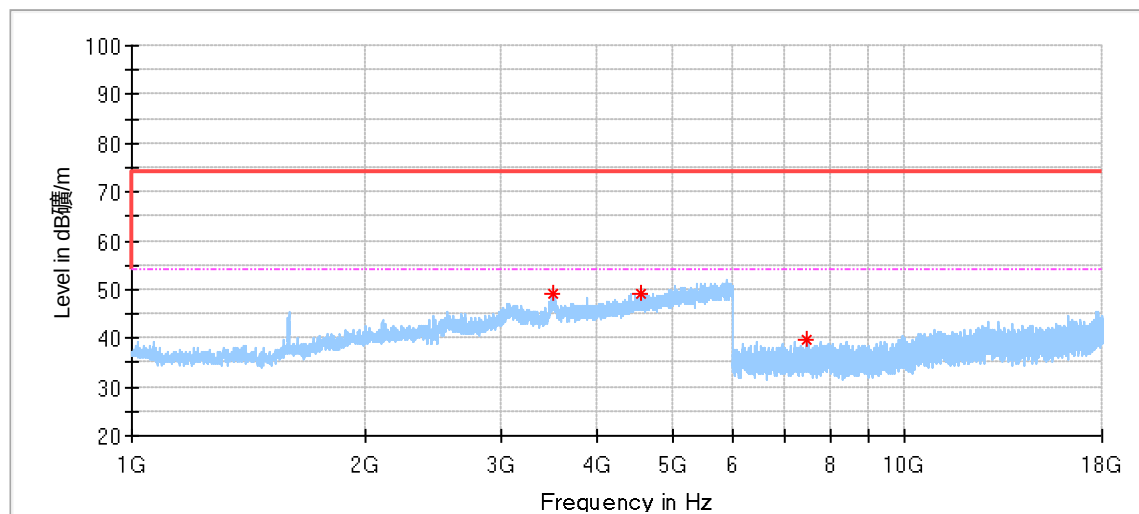


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1599.500000	46.27	74.00	27.73	150.0	V	333.0	-6.84
2492.500000*	45.26	74.00	28.74	150.0	V	128.0	-1.84
3488.500000	48.61	74.00	25.39	150.0	V	313.0	3.61
7981.500000	40.62	74.00	33.38	150.0	V	204.0	7.41

BLE_1Mbps _Middle Channel:

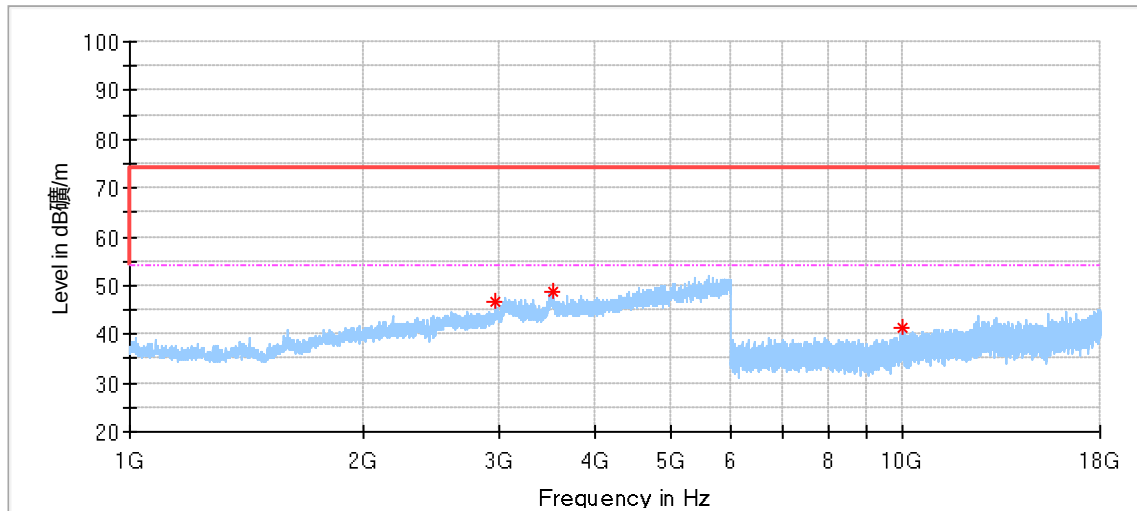


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2580.500000	45.24	74.00	28.76	150.0	H	73.0	-1.15
3527.500000	48.40	74.00	25.60	150.0	H	352.0	3.09
7950.500000	40.49	74.00	33.51	150.0	H	183.0	7.31

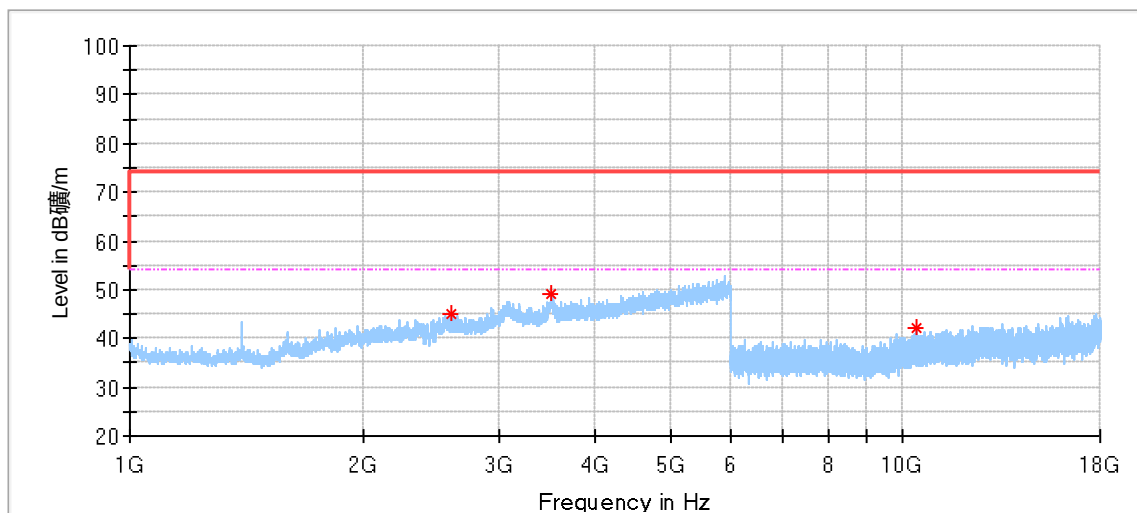


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
3497.000000	48.93	74.00	25.07	150.0	V	344.0	4.25
4554.000000*	48.95	74.00	25.05	150.0	V	251.0	4.30
7458.500000*	39.73	74.00	34.27	150.0	V	160.0	6.65

BLE_1Mbps_High Channel:

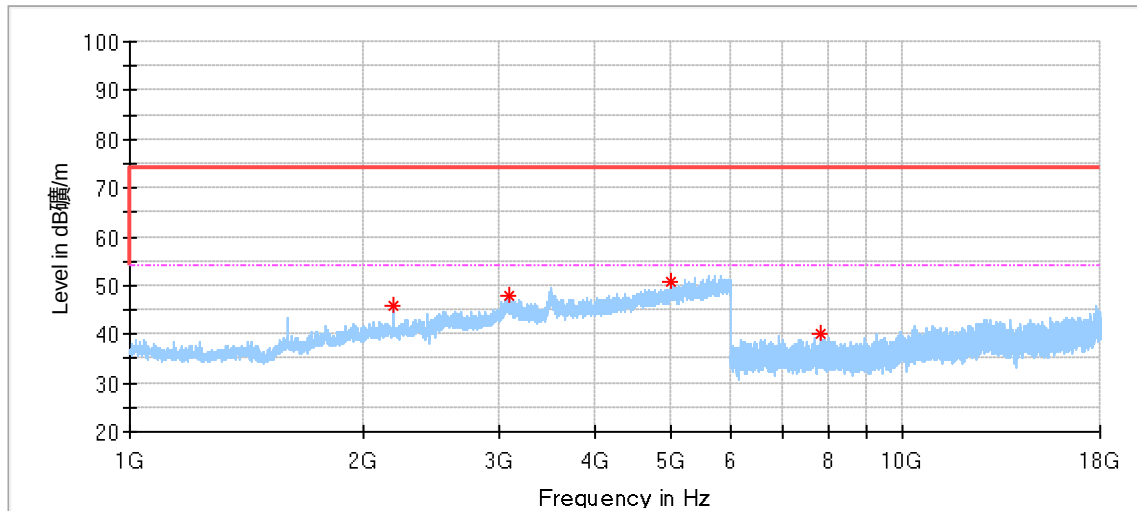


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2976.000000	46.75	74.00	27.25	150.0	H	34.0	-0.29
3524.000000	48.89	74.00	25.11	150.0	H	95.0	3.27
10016.000000	41.26	74.00	32.74	150.0	H	309.0	9.54

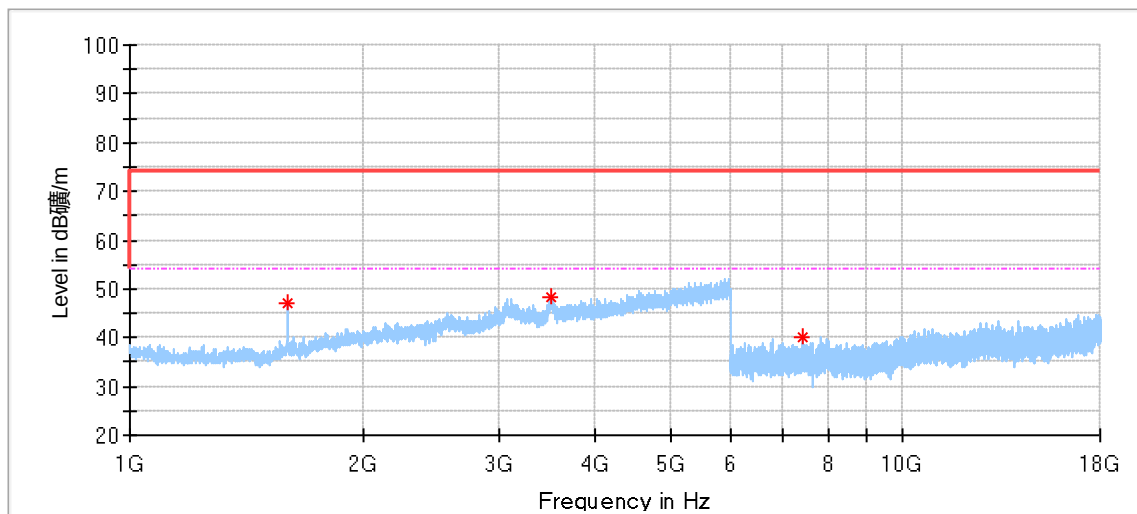


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2604.000000	44.99	74.00	29.01	150.0	V	146.0	-1.08
3499.000000	49.28	74.00	24.72	150.0	V	146.0	4.41
10421.500000	42.14	74.00	31.86	150.0	V	1.0	10.13

BLE_2Mbps_Low Channel:

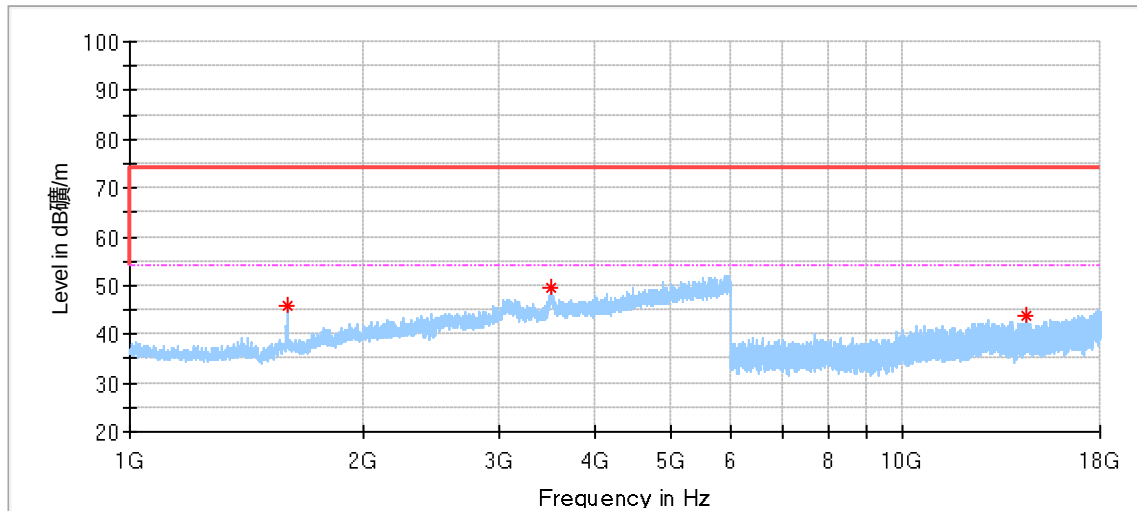


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2197.000000	45.73	74.00	28.27	150.0	H	310.0	-3.60
3096.500000	47.69	74.00	26.31	150.0	H	85.0	1.62
5000.000000	50.84	74.00	23.16	150.0	H	157.0	5.47
7813.500000	40.23	74.00	33.77	150.0	H	0.0	7.20

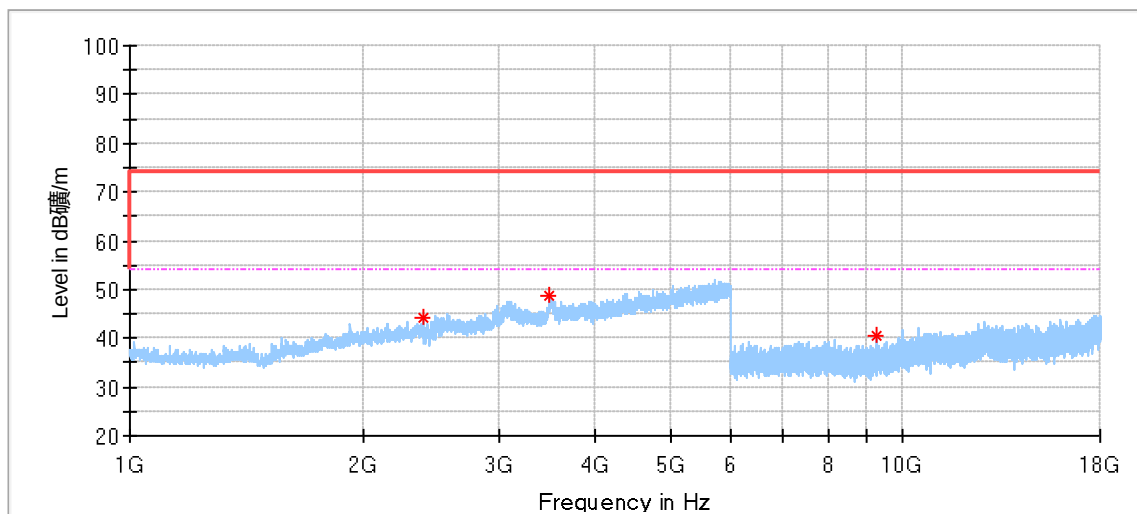


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1598.500000	46.92	74.00	27.08	150.0	V	359.0	-6.86
3500.000000	48.51	74.00	25.49	150.0	V	76.0	4.48
7411.000000*	40.09	74.00	33.91	150.0	V	266.0	6.54

BLE_2Mbps_Middle Channel:

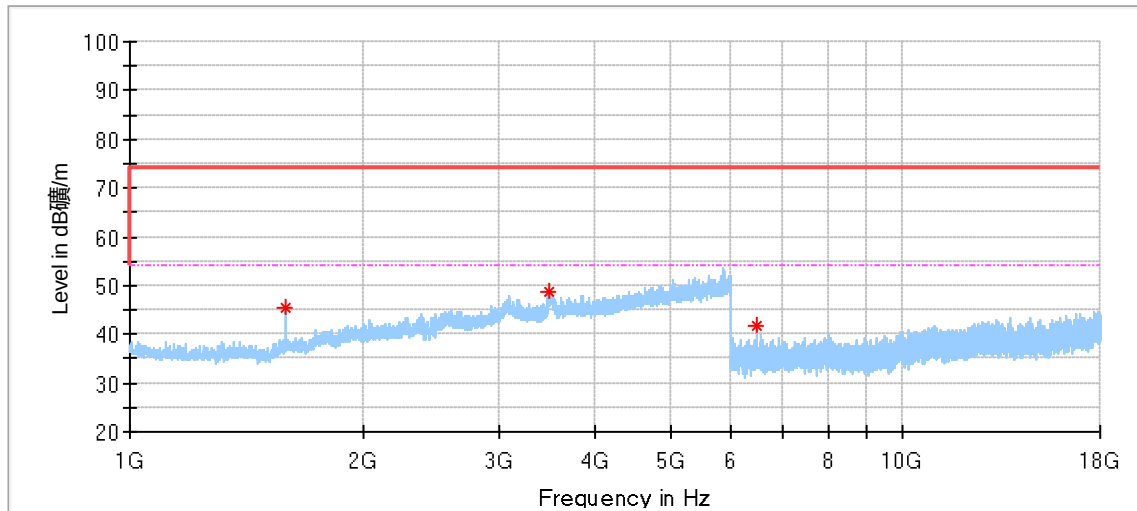


Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1596.500000*	45.93	74.00	28.07	150.0	H	228.0	-6.89
3499.500000*	49.42	74.00	24.58	150.0	H	310.0	4.44
14452.000000	43.94	74.00	30.06	150.0	H	34.0	13.35

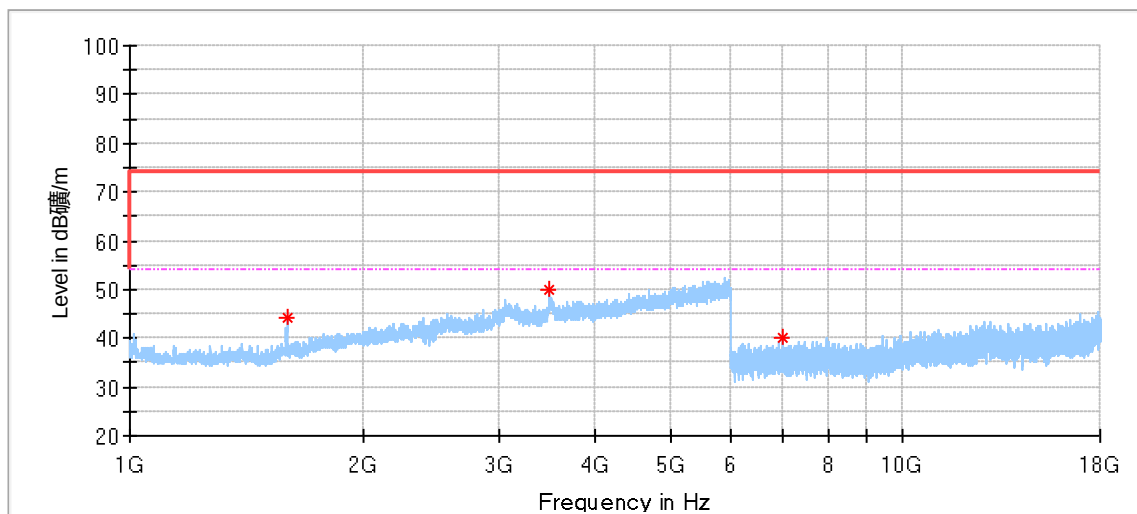


Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2391.000000	44.34	74.00	29.66	150.0	V	332.0	-2.44
3496.000000	48.58	74.00	25.42	150.0	V	22.0	4.18
9245.000000	40.33	74.00	33.67	150.0	V	309.0	8.19

BLE_2Mbps_High Channel:

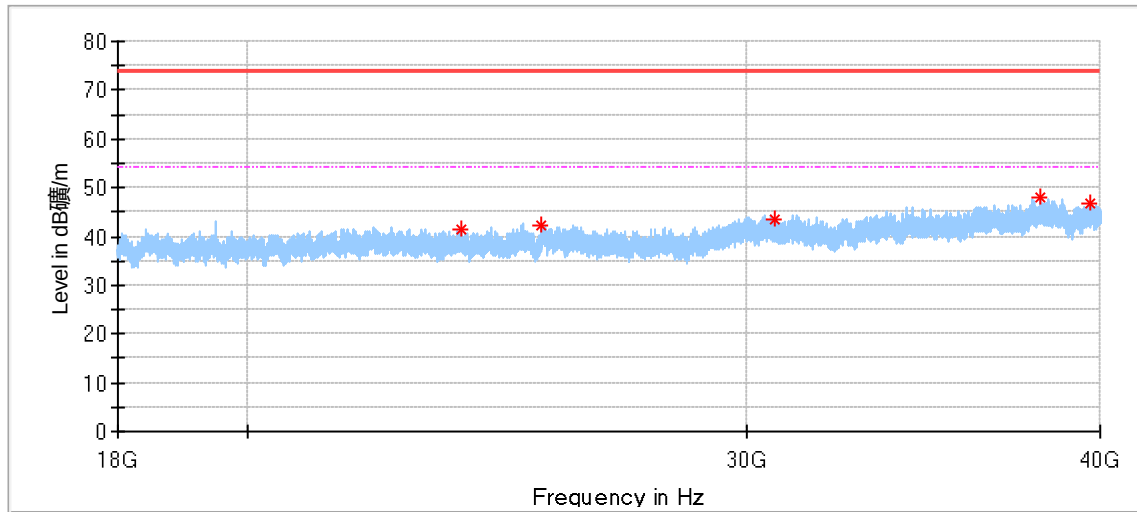


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1592.500000*	45.41	74.00	28.59	150.0	H	249.0	-6.96
3487.000000	48.77	74.00	25.23	150.0	H	228.0	3.49
6487.500000	41.62	74.00	32.38	150.0	H	0.0	6.03

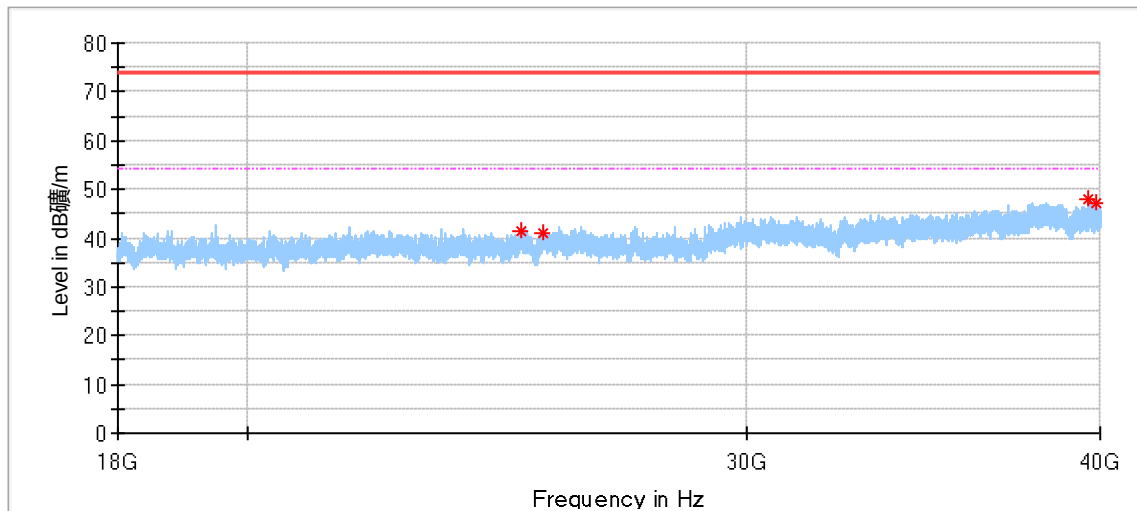


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1596.500000*	44.30	74.00	29.70	150.0	V	23.0	-6.89
3491.000000	50.14	74.00	23.86	150.0	V	241.0	3.80
6981.000000	40.24	74.00	33.76	150.0	V	57.0	6.28

Test data 18GHz to 40GHz:
BLE_1Mbps_Low Channel:

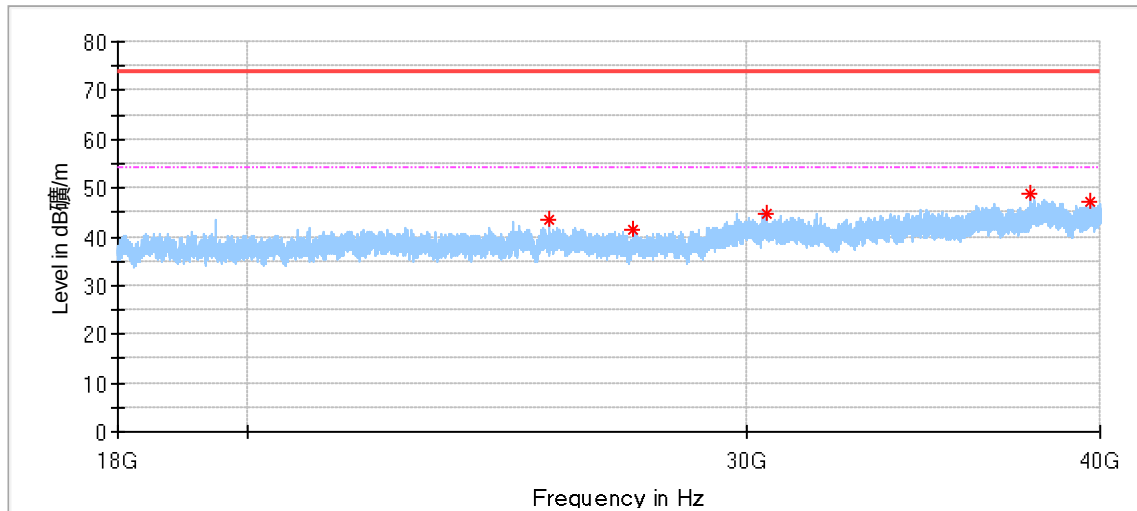


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
23786.000000*	41.64	74.00	32.36	150.0	H	297.0	0.57
25394.062500	42.29	74.00	31.71	150.0	H	312.0	1.34
30720.125000	43.33	74.00	30.67	150.0	H	4.0	1.89
38121.750000	47.88	74.00	26.12	150.0	H	353.0	5.61
39659.687500	46.80	74.00	27.20	150.0	H	233.0	7.50

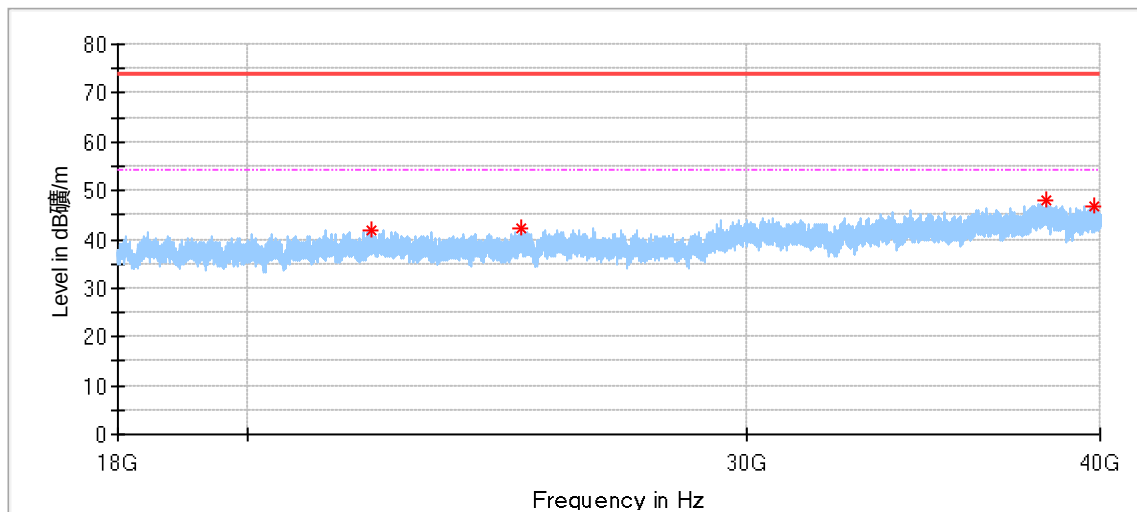


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
24994.625000	41.54	74.00	32.46	150.0	V	234.0	1.27
25447.000000	41.20	74.00	32.80	150.0	V	48.0	1.41
39640.437500	47.94	74.00	26.06	150.0	V	219.0	7.47
39894.812500	47.32	74.00	26.68	150.0	V	63.0	8.18

BLE_1Mbps_ Middle Channel:

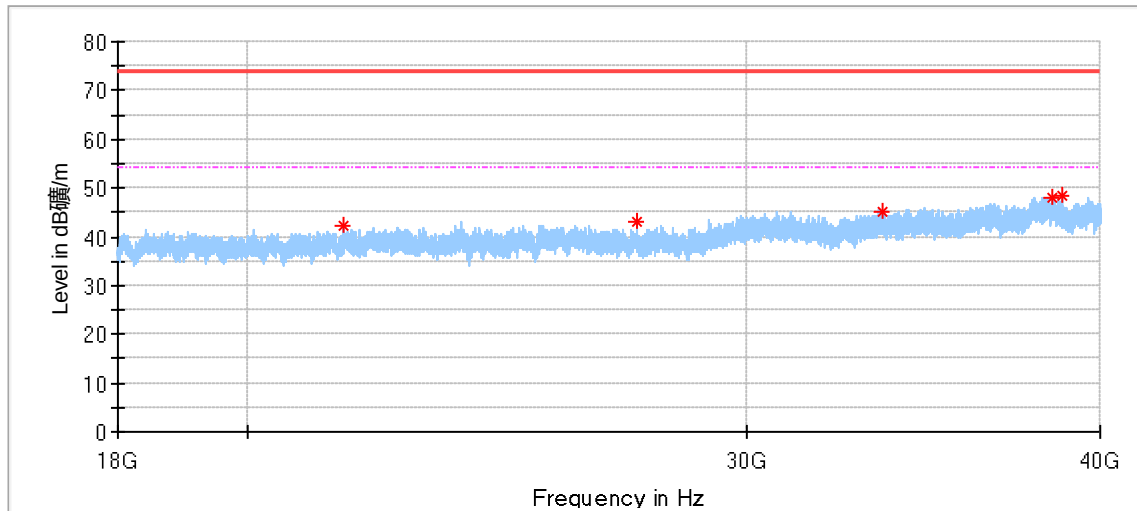


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
25541.875000	43.41	74.00	30.59	150.0	H	339.0	1.53
27363.062500	41.41	74.00	32.59	150.0	H	126.0	1.76
30481.562500	44.53	74.00	29.47	150.0	H	248.0	2.01
37789.000000	48.69	74.00	25.31	150.0	H	0.0	4.60
39668.625000	47.01	74.00	26.99	150.0	H	126.0	7.51

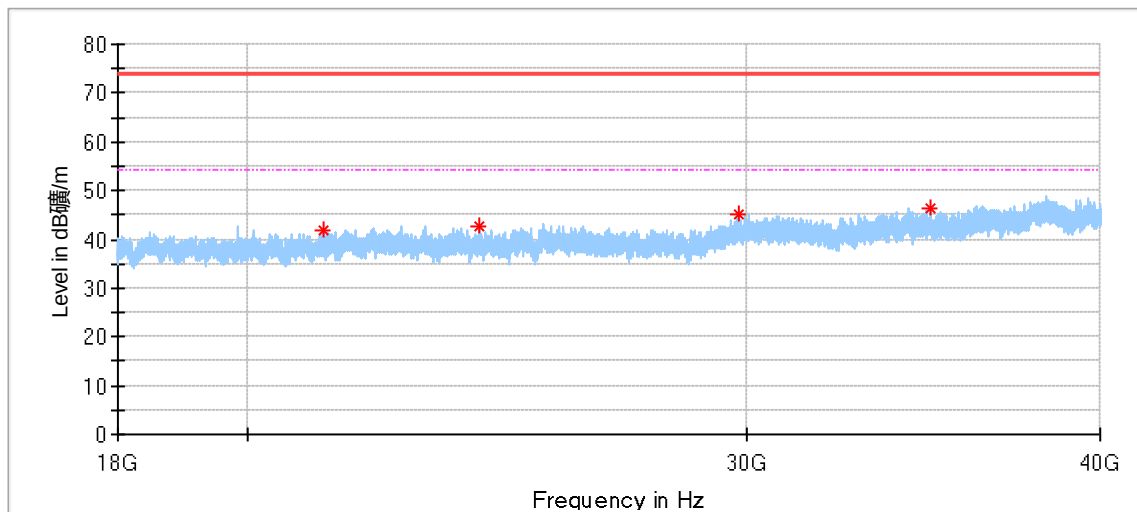


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
22118.812500*	41.97	74.00	32.03	150.0	V	16.0	0.14
24980.875000	42.46	74.00	31.54	150.0	V	1.0	1.23
38268.187500	47.96	74.00	26.04	150.0	V	77.0	6.30
39781.375000	46.97	74.00	27.03	150.0	V	214.0	7.86

BLE_1Mbps_High Channel:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
21631.375000	42.08	74.00	31.92	150.0	H	359.0	-0.26
27449.687500	43.27	74.00	30.73	150.0	H	97.0	1.66
33490.062500	45.10	74.00	28.90	150.0	H	282.0	2.76
38456.562500	48.19	74.00	25.81	150.0	H	160.0	6.57
38806.500000	48.44	74.00	25.56	150.0	H	0.0	5.70



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
21258.062500	41.85	74.00	32.15	150.0	V	65.0	-0.56
24157.250000	42.74	74.00	31.26	150.0	V	126.0	0.51
29818.125000	45.09	74.00	28.91	150.0	V	232.0	2.00
34843.062500	46.32	74.00	27.68	150.0	V	329.0	3.77

Remark:

- (1) “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205 & RSS-GEN 8.10.
- (2) Data of measurement within frequency range 9kHz-30MHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.
- (3) 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)

10 Test Equipment List

List of Test Instruments

Radiated Emission Test 1# (9kHz – 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	2024-5-20
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2024-8-7
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2024-5-19
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2024-8-1
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2024-5-19
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2024-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

Radiated Emission 2# Test (1GHz – 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	2024-5-20
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	1	2024-3-5
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2024-4-26
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2024-5-19
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2024-7-11
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2024-8-1
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2024-5-19
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2024-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

Conducted Emission 1# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2024-5-20
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	1	2024-5-20
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2024-5-19
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version10.35.02	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	3	2025-10-15

Conducted RF Test System

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	2024-5-19
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157W	68-4-93-14-003	101226/100929	1	2024-5-20
Power Splitter	Weinschel	1580	68-4-85-14-001	SC319	1	2024-5-20
10dB Attenuator	Weinschel	4M-10	68-4-81-14-003	43152	1	2024-5-19
10dB Attenuator	R&S	DNF	68-4-81-14-004	DNF-001	1	2024-5-19
10dB Attenuator	R&S	DNF	68-4-81-14-005	DNF-002	1	2024-5-19
10dB Attenuator	R&S	DNF	68-4-81-14-006	DNF-003	1	2024-5-19
10dB Attenuator	R&S	DNF	68-4-81-14-007	DNF-004	1	2024-5-19
Test software	Tonscend	System for BT/WIFI	68-4-74-14-006-A13	Version 2.6.77.0518	N/A	N/A
Shielding Room	TDK	TS8997	68-4-90-19-003	----	3	2025-10-15

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 shielding room (68-4-90-19-004) 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.15dB
Uncertainty for Radiated Emission in 3m chamber (68-4-90-14-001) 9kHz-30MHz	4.70dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 30MHz-1000MHz	Horizontal: 4.63dB; Vertical: 4.78dB;
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 5.38dB; Vertical: 5.38dB;
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 18GHz-40GHz	5.29dB
Uncertainty for Conducted RF test	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: 2021, clause 4.4.3 and 4.5.1.

---THE END OF REPORT---