FCC Part 15.247
RSS-247, ISSUE 3, August 2023
RSS-GEN, ISSUE 5, February 2021 Amendment 2
TEST REPORT

For

Acetk Corp LTD.

9F., No. 116, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan

FCC ID: 2AVZW0PAT6210
IC: 30804-0000PAT6210

Report Type:	**Product Type:**
Original Report	AC6000MKIII BT

Report Producer : Coco Lin

Report Number : RXZ240109019RF02

Report Date : 2024-05-22

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ240109019	RXZ240109019RF02	2024-05-22	Original Report	Coco Lin

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	Acetk Corp LTD.
	9F., No. 116, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan
Brand(Trade) Name	ACETECH
Product (Equipment) / PMN	AC6000MKIII BT
HVIN	AC6000MKIII BT
Main Model Name	AC6000MKIII BT
Frequency Range	BLE(1M) / BLE(2M) : 2402 ~ 2480 MHz
Maximum Conducted Peak Output Power	BLE(1M) Mode : -3.15 dBm BLE(2M) Mode : -3.48 dBm
Modulation Technique	BLE(1M) / BLE(2M) : GFSK
Transmit Data Rate	BLE(1M) Mode : 1 Mbps BLE(2M) Mode : 2 Mbps
Power Operation (Voltage Range)	☒ DC Type ☒ Battery 1.5V*4 ☐ DC Power Supply ☒ External from USB 5V ☐ External DC Adapter
Received Date	2024/01/08
Date of Test	2024/02/21 ~ 2024/03/07

*All measurement and test data in this report was gathered from production sample serial number: RXZ240109019-01 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of *Acetk Corp LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules and RSS-247, Issue 3, August 2023, RSS-Gen, Issue 5, February 2021 Amendment 2 of the Innovation, Science and Economic Development Canada.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and KDB 558074 D01 15.247 Meas Guidance v05r02. And RSS-247, Issue 3, August 2023, RSS-Gen, Issue 5, February 2021 Amendment 2 of the Innovation, Science and Economic Development Canada.

1.4 Statement

Decision Rule: No, (The test results do not include MU judgment)

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.
Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.5 Measurement Uncertainty

Parameter		Uncertainty
AC Mains		+/- 2.53 dB
RF output power, conducted		+/- 3.74 dB
Power Spectral Density, conducted		+/- 0.58 dBm
Occupied Bandwidth		+/- 0.09 %
Unwanted Emissions, conducted		+/- 1.13 dBm
Emissions, radiated	9 kHz~30 MHz	+/- 3.54 dB
	30 MHz~1 GHz	+/- 4.99 dB
	1 GHz~18 GHz	+/- 7.56 dB
	18 GHz~40 GHz	+/- 5.06 dB
Temperature		+/- 0.79 °C
Humidity		+/- 0.44 %

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

1.6 Environmental Conditions

Test Site	Test Date	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2024/02/29	23.6	58	1010	Aaron Pan
Radiation Spurious Emissions	2024/02/21~2024/03/07	19.6~24.4	66~68	1010	Jim Chen
Conducted Spurious Emissions	2023/02/23	21.5	59	1010	Jim Chen
Emission Bandwidth	2023/02/23	21.5	59	1010	Jim Chen
Maximum Output Power	2023/02/23	21.5	59	1010	Jim Chen
100 kHz Bandwidth of Frequency Band Edge	2023/02/23	21.5	59	1010	Jim Chen
Power Spectral Density	2023/02/23	21.5	59	1010	Jim Chen

1.7 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 221, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: TW3732.

2 System Test Configuration

2.1 Description of Test Configuration

For BLE mode, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	2440	39	2480

For BLE Modes were tested with channel 0, 19 and 39.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The test software was used “Serial Port Utility v2.6.9.0916”

The system was configured for testing in engineering mode, which was provided by Applicant.

Test Frequency		Low	Middle	High
Power Level Setting	BLE 1M	default	default	default
	BLE 2M	default	default	default

2.4 Test Mode

Pre-scan

Radiated Spurious Emissions

Mode 1: AC6000MKIII BT + Adapter

Mode 2: AC6000MKIII BT + Battery

Worst case is the Mode 1: AC6000MKIII BT + Adapter

Mode 1: AC6000MKIII BT + Adapter tested all measure item.

Mode 2: AC6000MKIII BT + Battery test Below 1GHz Radiated Spurious Emissions

2.5 Support Equipment List and Details

Description	Manufacturer	Model Number
Adapter	NEXGO	ADS-12CG-06 05010EPCU
Battery	DURACELL	MN1500

2.6 External Cable List and Details

Description	Manufacturer	Cable length
Type-C Cable	BACL	1m

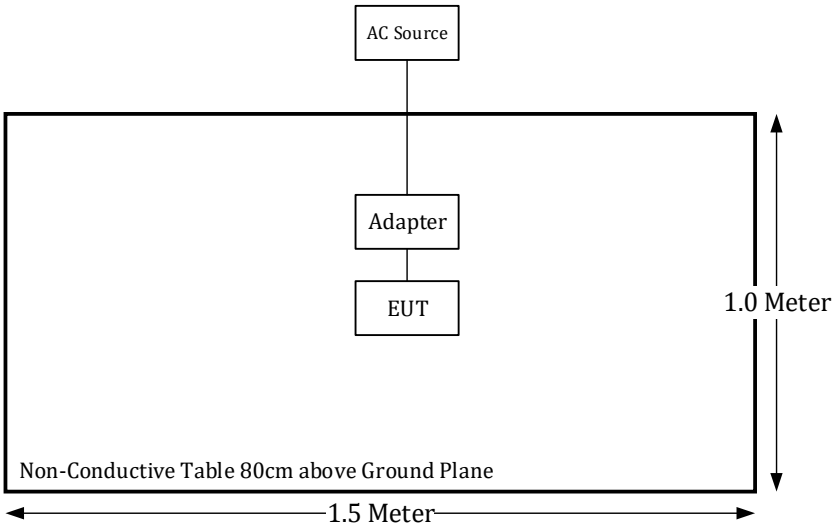
2.7 Block Diagram of Test Setup

See test photographs attached in setup photos for the actual connections between EUT and support equipment.

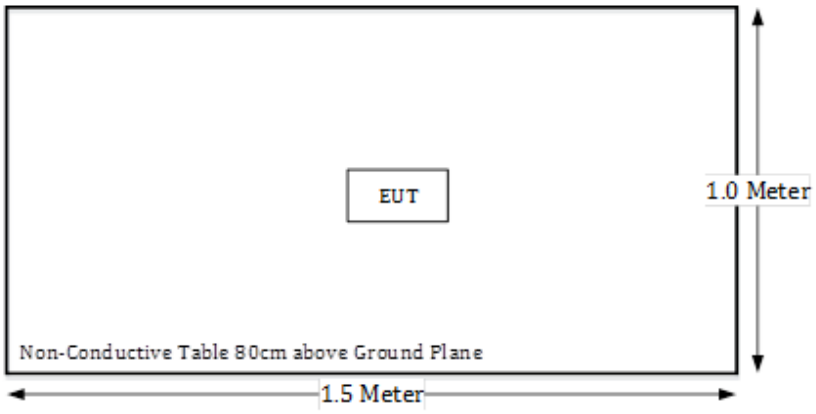
Radiation:

Below 1GHz

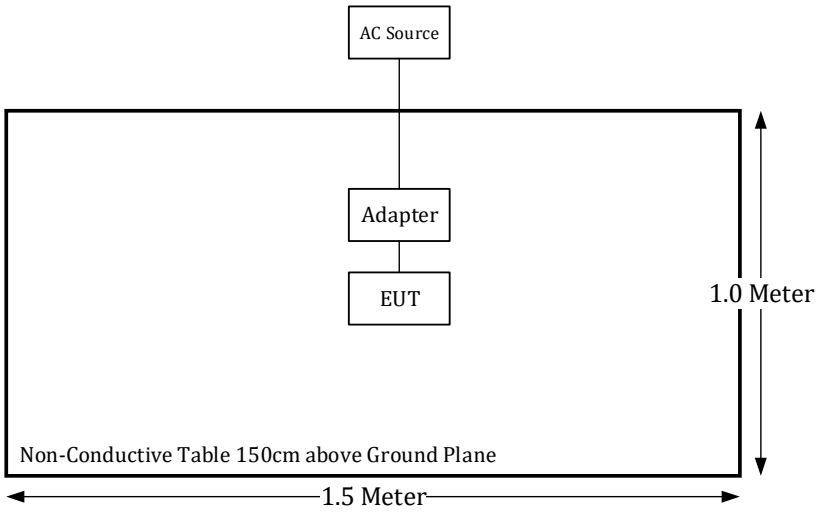
Adapter



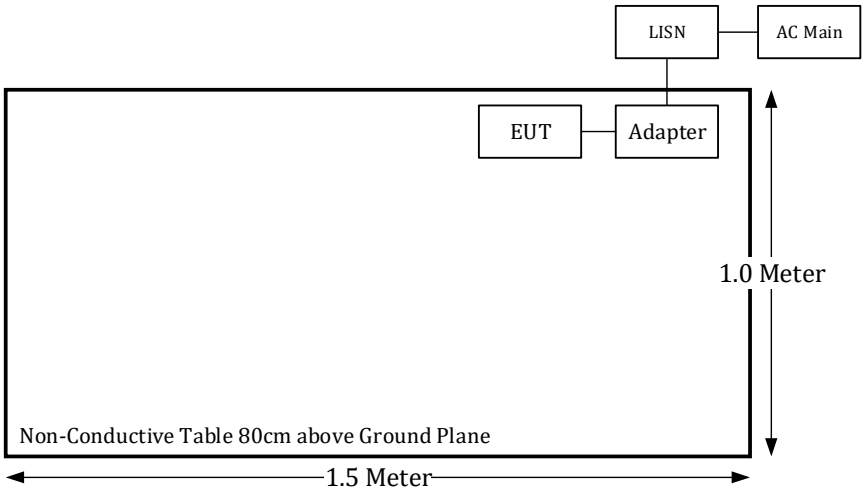
Battery



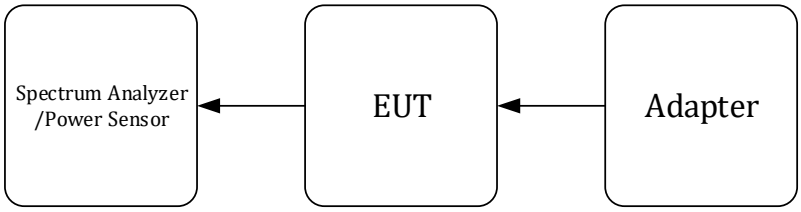
Above 1GHz:



Conduction:



Conducted:



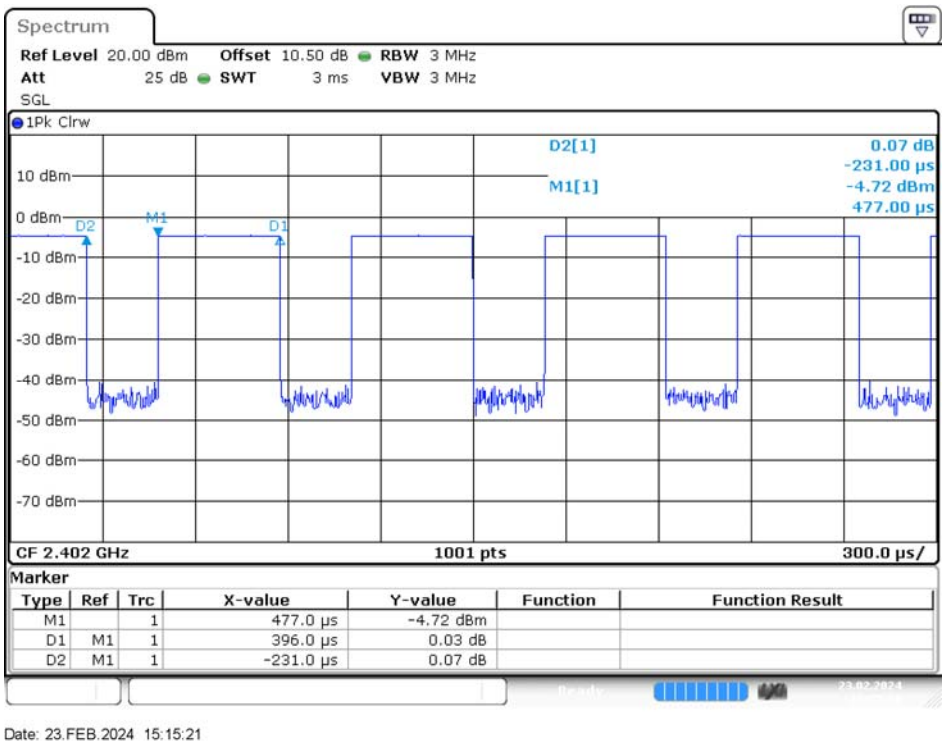
2.8 Duty Cycle

The duty cycle as below:

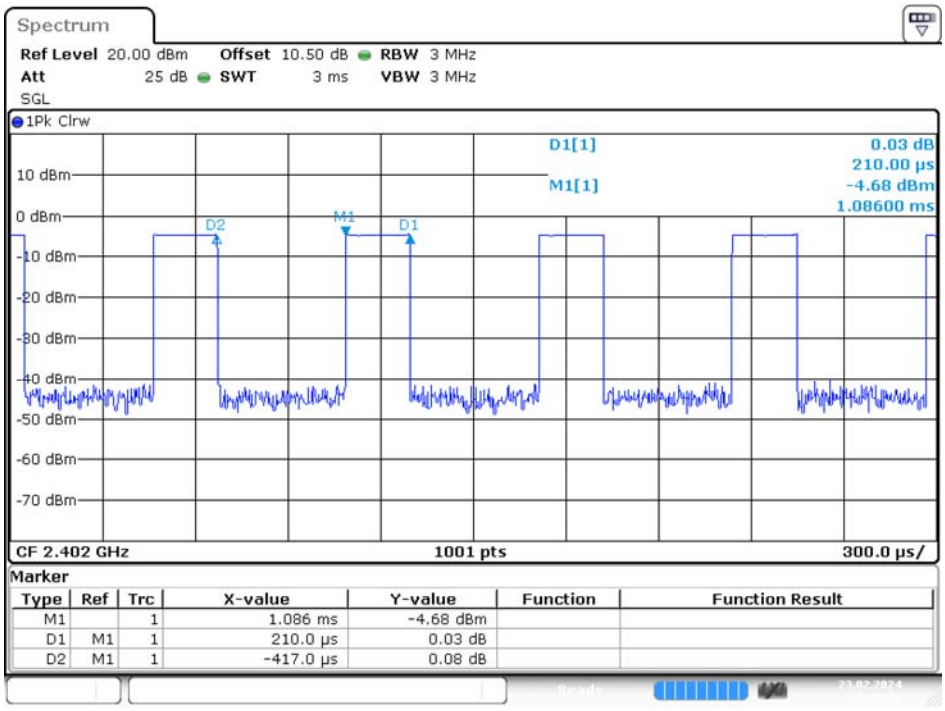
Radio Mode	On Time (ms)	Off Time (ms)	Duty Cycle (%)	1/T (kHz)	VBW Setting (kHz)
BLE(1M)	0.396	0.231	63	2.53	3
BLE(2M)	0.210	0.417	33	4.76	5

Please refer to the following plots.

BLE(1M) Mode



BLE(2M) Mode



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3 Summary of Test Results

Rules	Description of Test	Results
FCC §15.247(i), §1.1307(b)(3)	RF Exposure	Compliance
RSS-102 §2.5.2	Exemption From Routine Evaluation Limits – RF Exposure Evaluation	Compliance
FCC §15.203 RSS-Gen §6.8	Antenna Requirement	Compliance
FCC §15.207(a) RSS-Gen §8.8	AC Line Conducted Emissions	Compliance
FCC §15.205, §15.209, §15.247(d) RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10	Spurious Emissions	Compliance
FCC §15.247(a)(2) RSS-247 §5.2(a) RSS-Gen §6.7	Emission Bandwidth	Compliance
FCC §15.247(b)(3) RSS-247 §5.4(d)	Maximum Peak Output Power	Compliance
FCC §15.247(d) RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
FCC §15.247(e) RSS-247 §5.2(b)	Power Spectral Density	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2024/2/16	2025/2/16
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2023/5/22	2024/5/21
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2023/5/18	2024/5/17
RF Cable	EMEC	EM-CB5D	001	2023/6/6	2024/6/5
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation Room (966-A)					
Active Loop Antenna	ETS-Lindgren	6502	35796	2023/3/23	2024/3/24
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2024/1/19	2025/1/19
Horn Antenna	EMCO	SAS-571	1020	2023/5/18	2024/5/17
Horn Antenna	ETS-Lindgren	3116	62638	2023/8/25	2024/8/24
Preamplifier	Sonoma	310N	130602	2023/6/16	2024/6/15
Preamplifier	Channel	ERA-100M-18G-01D1748	EC2300051	2023/04/1	2024/03/31
Preamplifier	A.H. Systems	PAM-1840VH	174	2023/3/24	2024/3/23
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2024/2/7	2025/2/7
EMI Test Receiver	Rohde & Schwarz	ESR3	102099	2023/6/16	2024/6/15
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2024/1/23	2025/1/21
Coaxial Cable	COMMATE	PEWC	8Dr	2023/12/23	2024/12/22
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2024/1/23	2025/1/21
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2023/12/23	2024/12/22
Cable	EMC	EMC105-SM-SM-10000	201003	2024/1/23	2025/1/21
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2024/1/23	2025/1/21
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-50CM	15120-1	2024/1/23	2025/1/21
Band-stop filter	Woken	STI15-9831	STI15-9831-1	2023/10/20	2024/10/19
High-pass filter	XINGBOKEJI	XBLBQ-GTA54	200108-3-2	2023/10/20	2024/10/19
Software	AUDIX	E3	18621a	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2024/2/7	2025/2/7
Cable	UTIFLEX	UFA210A	9435	2023/10/2	2024/10/1
Power Sensor	Boonton	RTP5006	11037	2023/5/23	2024/5/21
Attenuator	MCL	BW-S10W5+	1419	2024/2/23	2025/2/23

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

5 FCC §15.247(i), §1.1307(b)(3) - RF Exposure

5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

5.2 RF Exposure Evaluation Result

Project info

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Tune-up Power (mW)	ERP (dBm)	ERP (mW)
BLE	2402	-3	1.5	200	0.50	-3.65	0.43

§ 1.1307(b)(3)(i)(A) method is applicable.

Band	Freq (MHz)	Result Option A
BLE	2402	exempt

The available maximum time-averaged power is no more than 1 mW

Result: The device meets the exemption requirement.

6 RSS-102 §2.5.2 - EXEMPTION FROM ROUTINE EVALUATION LIMITS – RF EXPOSURE EVALUATION

6.1 Applicable Standard

According to RSS-102 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[Footnote6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

6.2 RF Exposure Evaluation Result

Tune-up power = -3 dBm

EIRP Tune-up power = -1.5 dBm = 0.001 W

Exemption from Routine Evaluation Limit is:

$1.31 \times 10^{-2}\ f^{0.6834} = 1.31 \times 10^{-2}\ 2402^{0.6834} = 2.68\text{W} > 0.001$ W

Result: The device meets the exemption requirement.

7 FCC §15.203 & RSS-GEN §6.8– Antenna Requirements

7.1 Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

According to RSS-Gen 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type

7.2 Antenna Information

Manufacturer	Model	Type	Antenna Gain	Impedance
SILICON LABS	BSM220S12A	PCB Antenna	1.5 dBi	50Ω

The antenna is permanently attached to the device.

Result: Compliance

8 FCC §15.207(a) & RSS-GEN §8.8– AC Line Conducted Emissions

8.1 Applicable Standard

According to §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

According to RSS-GEN §8.8

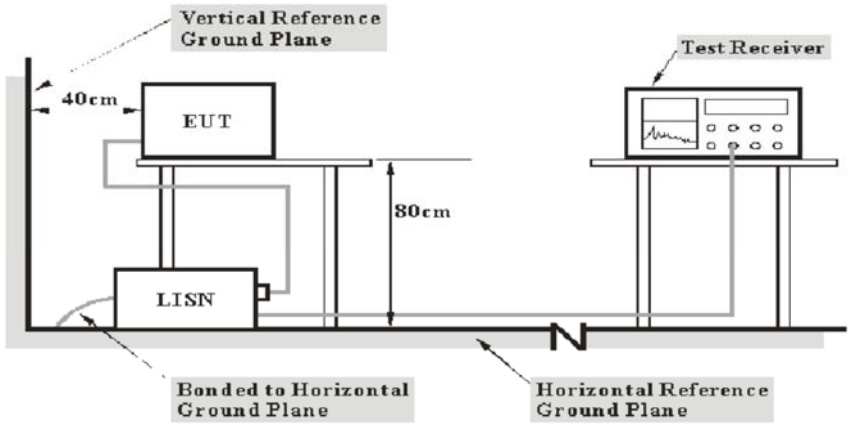
Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

8.2 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 and RSS-GEN limits.

8.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

8.4 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

8.5 Corrected Factor & Over Limit Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Result – Limit Line

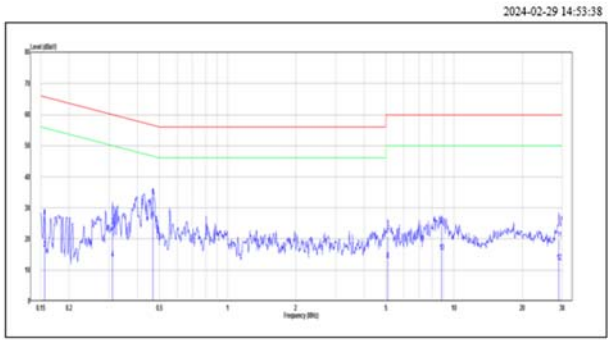
8.6 Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz

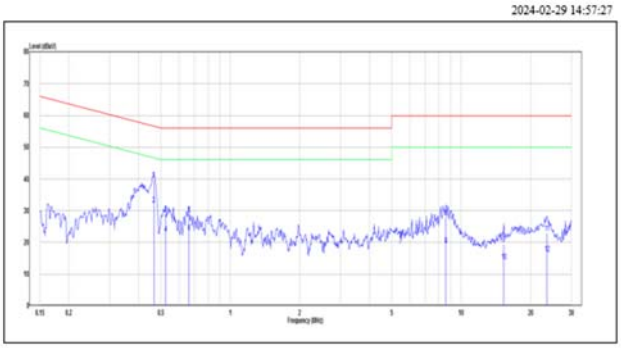
(Worst case is BLE 1M mode High channel)

Line



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.156	7.85	19.44	27.29	65.69	-38.40	QP	Line
2	0.156	-2.51	19.44	16.93	55.69	-38.76	Average	Line
3	0.310	4.73	19.49	24.22	59.97	-35.76	QP	Line
4	0.310	-5.80	19.49	13.69	49.97	-36.28	Average	Line
5	0.469	14.21	19.56	33.77	56.54	-22.77	QP	Line
6	0.469	6.85	19.56	26.40	46.54	-20.13	Average	Line
7	5.085	0.90	20.11	21.01	60.00	-38.99	QP	Line
8	5.085	-6.86	20.11	13.25	50.00	-36.75	Average	Line
9	8.822	4.26	20.08	24.34	60.00	-35.66	QP	Line
10	8.822	-4.29	20.08	15.80	50.00	-34.20	Average	Line
11	29.061	-0.75	20.63	19.88	60.00	-40.12	QP	Line
12	29.061	-7.98	20.63	12.66	50.00	-37.34	Average	Line

Neutral



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.466	20.30	19.57	39.87	56.58	-16.71	QP	Neutral
2	0.466	12.26	19.57	31.83	46.58	-14.75	Average	Neutral
3	0.524	9.42	19.59	29.02	56.00	-26.98	QP	Neutral
4	0.524	3.17	19.59	22.76	46.00	-23.24	Average	Neutral
5	0.661	9.20	19.66	28.86	56.00	-27.14	QP	Neutral
6	0.661	3.50	19.66	23.17	46.00	-22.83	Average	Neutral
7	8.592	7.70	20.10	27.80	60.00	-32.20	QP	Neutral
8	8.592	-1.05	20.10	19.05	50.00	-30.95	Average	Neutral
9	15.307	-0.72	20.29	19.57	60.00	-40.43	QP	Neutral
10	15.307	-6.31	20.29	13.98	50.00	-36.02	Average	Neutral
11	23.511	2.32	20.61	22.93	60.00	-37.07	QP	Neutral
12	23.511	-4.25	20.61	16.36	50.00	-33.64	Average	Neutral

Note:

Result = Reading + Factor

Over Limit = Result – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

9 FCC §15.209, §15.205, §15.247(d) & RSS-247 §5.5, RSS-GEN §8.9, §8.10 – Spurious Emissions

9.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As per RSS-Gen 8.10,

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a)The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).

(b)Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

(c)Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	608 – 614	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	5. 35 – 5. 46
2.1735 – 2.1905	16.80425 – 16.80475	1300 – 1427	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1435 – 1626.5	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1645.5 – 1646.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1660 – 1710	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1718.8 – 1722.2	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	2200 – 2300	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2310 – 2390	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2483.5 – 2500	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2690 – 2900	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	22.01 – 23.12
8.41425 – 8.41475	162.0125 –167.17	3.332 – 3.339	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3.600 – 4.400	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		

As per FCC §15.209(a) and RSS-GEN §8.9: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per RSS-GEN §8.9: Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency (MHz)	Field Strength (H-Field) (µA/m)	Measurement distance (m)
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Note 2: The limit was added 51.5dB to convert the limit from dBuA/m to dBuV/m.

According to ANSI C63.10-2013, section 5.3.3

Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field, and the emissions to be measured can be detected by the measurement equipment (see 4.3.4). Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. Measurements from 18 GHz to 40 GHz are typically made at distances significantly less than 3 m from the EUT. When performing

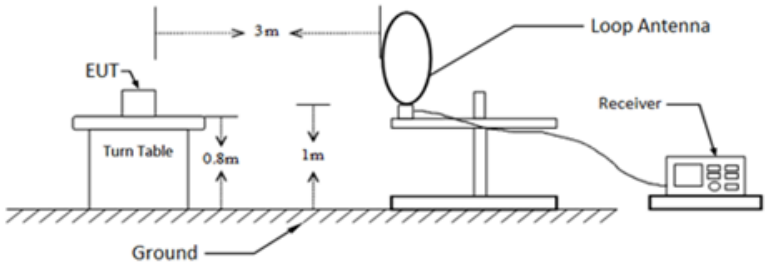
measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade of distance (inverse of linear distance for field-strength measurements or inverse of linear distance-squared for power-density measurements).

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 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 paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general 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) (see §15.205(c).

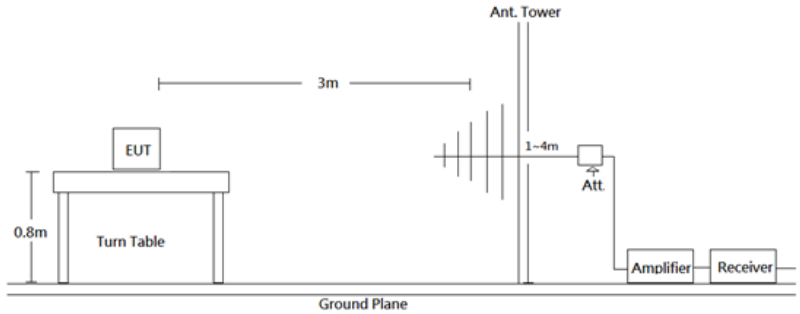
As per RSS-247 5.5,
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, 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 root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

9.2 EUT Setup

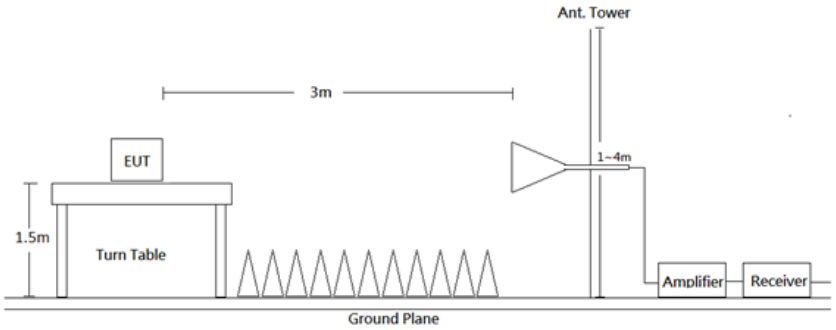
9kHz-30MHz:



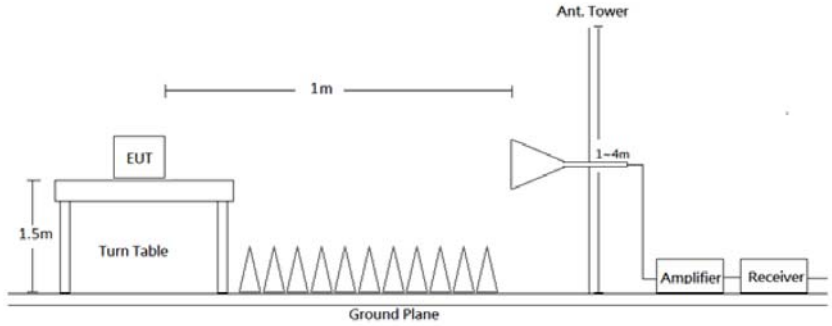
30MHz-1GHz:



1-18 GHz:



18-26.5 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209, FCC 15.247 and RSS-Gen, RSS-247 Limits.

9.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
9 kHz - 150 kHz	300 Hz	1 kHz	/	QP/AV
150 kHz - 30 MHz	10 kHz	30 kHz	/	QP/AV
30-1000 MHz	120 kHz	300 kHz	/	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

9.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in Quasi-peak and average detector mode from 9 kHz to 30 MHz, Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

9.5 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Level – Limit

9.6 Test Results

Test Mode: Transmitting

(Pre-scan with two orthogonal axis, and worse case as X axis.)

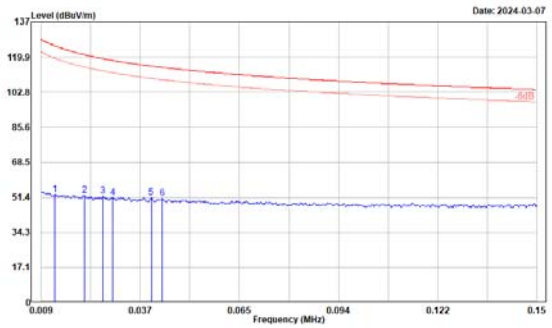
9kHz-30MHz:

(worst case is BLE(2M) Mode high channel)

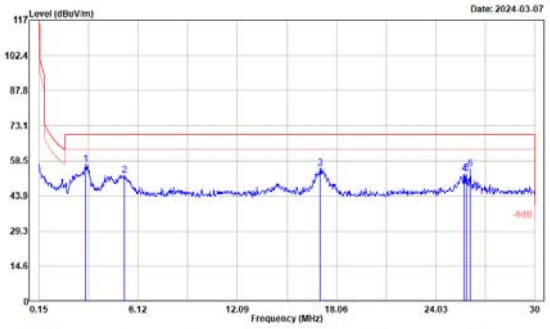
(Pre-scan using three directional polarities, worst case as parallel.)

Adapter

9kHz-150kHz	150kHz-30MHz



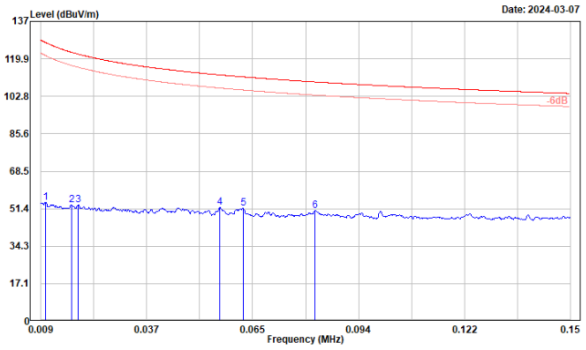
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.013	36.51	16.25	52.76	125.36	-72.60	100	310	Average
0.021	37.71	14.76	52.47	121.05	-68.58	100	228	Average
0.027	37.70	14.11	51.81	119.10	-67.29	100	357	Average
0.029	37.38	13.79	51.17	118.27	-67.10	100	101	Average
0.040	38.44	12.72	51.16	115.50	-64.34	100	68	Average
0.043	38.02	12.69	50.71	114.85	-64.14	100	252	Average



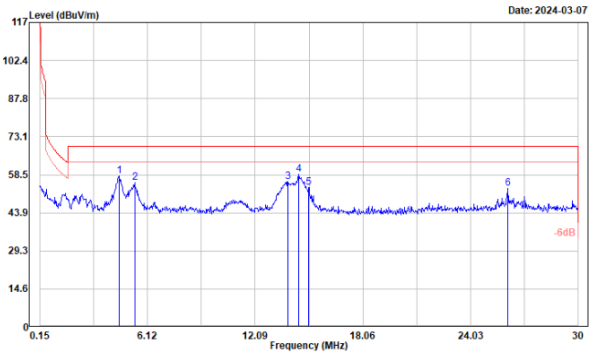
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2.926	46.58	10.48	57.06	69.54	-12.48	100	10	QP
5.284	41.55	11.01	52.56	69.54	-16.98	100	225	QP
17.075	43.85	11.57	55.42	69.54	-14.12	100	149	QP
25.731	41.52	11.71	53.23	69.54	-16.31	100	314	QP
25.881	41.57	11.71	53.28	69.54	-16.26	100	52	QP
26.120	43.54	11.71	55.25	69.54	-14.29	100	117	QP

Battery

9kHz-150kHz	150kHz-30MHz



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.010	37.58	16.76	54.34	127.37	-73.03	100	150	Average
0.017	37.69	15.45	53.14	122.90	-69.76	100	220	Average
0.019	37.94	15.10	53.04	122.03	-68.99	100	315	Average
0.057	40.01	11.93	51.94	112.54	-60.60	100	152	Average
0.063	39.88	11.57	51.45	111.64	-60.19	100	114	Average
0.082	39.13	11.28	50.41	109.32	-58.91	100	106	Average



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4.568	47.52	10.65	58.17	69.54	-11.37	100	106	QP
5.404	44.45	11.15	55.60	69.54	-13.94	100	225	QP
13.911	44.45	11.49	55.94	69.54	-13.60	100	3	QP
14.508	47.22	11.50	58.72	69.54	-10.82	100	147	QP
15.045	42.11	11.52	53.63	69.54	-15.91	100	138	QP
26.120	41.44	11.71	53.15	69.54	-16.39	100	225	QP

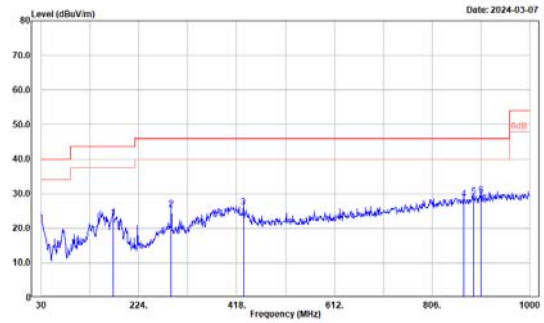
30MHz-1GHz:

(worst case is BLE(2M) Mode)

Adapter

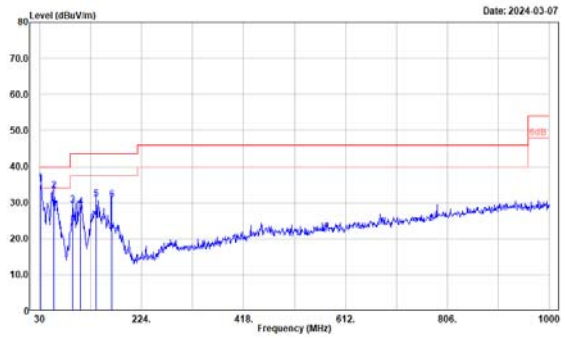
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
172.590	34.81	-11.75	23.06	43.50	-20.44	100	70	QP
288.020	34.68	-9.22	25.46	46.00	-20.54	100	285	QP
431.580	32.14	-6.14	26.00	46.00	-20.00	100	336	QP
869.050	27.17	1.29	28.46	46.00	-17.54	100	98	QP
888.450	27.21	1.83	29.04	46.00	-16.96	100	46	QP
903.000	27.34	2.09	29.43	46.00	-16.57	100	313	QP

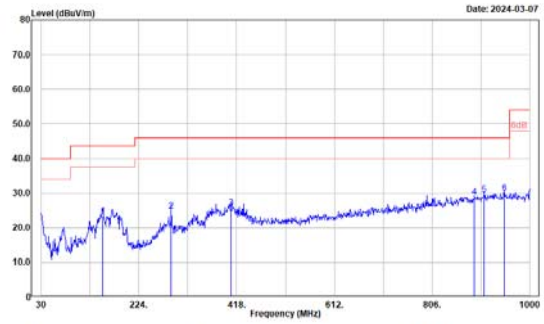
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	38.38	-3.36	35.02	40.00	-4.98	100	347	QP
57.160	49.55	-16.22	33.33	40.00	-6.67	100	167	QP
93.050	44.20	-15.03	29.17	43.50	-14.33	100	347	QP
107.600	40.57	-11.65	28.92	43.50	-14.58	100	48	QP
137.670	41.00	-9.97	31.03	43.50	-12.47	100	309	QP
166.770	41.82	-11.13	30.69	43.50	-12.81	100	258	QP

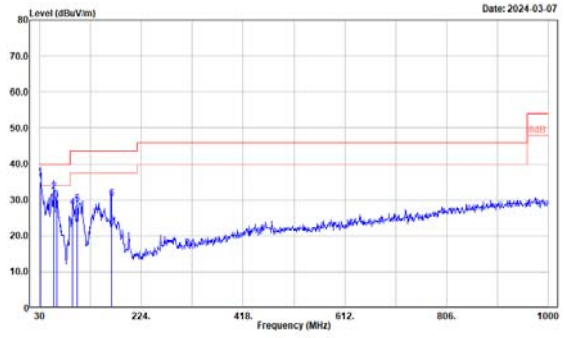
Middle channel

Horizontal



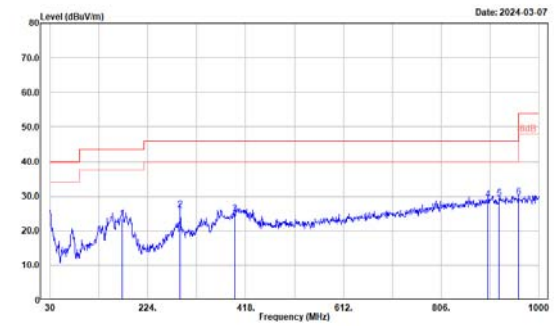
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
152.220	33.62	-10.32	23.30	43.50	-20.20	100	72	QP
288.020	33.95	-9.22	24.73	46.00	-21.27	100	260	QP
407.330	32.40	-6.90	25.50	46.00	-20.50	100	307	QP
890.390	26.84	1.90	28.74	46.00	-17.26	100	42	QP
909.790	27.26	2.16	29.42	46.00	-16.58	100	0	QP
949.560	27.27	2.59	29.86	46.00	-16.14	100	167	QP

Vertical

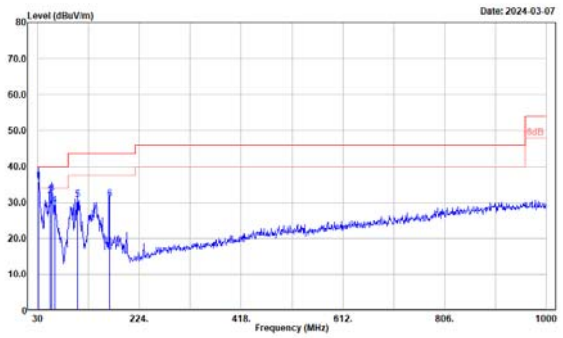


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
31.940	39.26	-4.31	34.95	40.00	-5.05	100	298	QP
57.160	48.63	-16.22	32.41	40.00	-7.59	100	252	QP
62.010	45.99	-16.15	29.84	40.00	-10.16	100	28	QP
93.050	43.06	-15.03	28.03	43.50	-15.47	100	213	QP
101.780	41.69	-12.92	28.77	43.50	-14.73	100	80	QP
166.770	41.55	-11.13	30.42	43.50	-13.08	100	237	QP

High channel	
Horizontal	**Vertical**



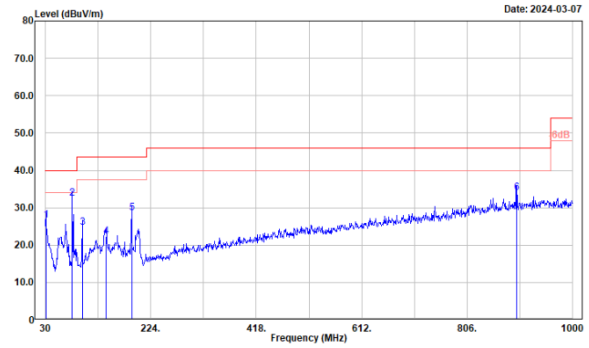
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
173.560	35.26	-11.83	23.43	43.50	-20.07	100	357	QP
288.020	35.15	-9.22	25.93	46.00	-20.07	100	283	QP
396.660	32.07	-7.06	25.01	46.00	-20.99	100	322	QP
899.120	27.04	1.99	29.03	46.00	-16.97	100	287	QP
921.430	27.21	2.13	29.34	46.00	-16.66	100	41	QP
959.260	27.21	2.43	29.64	46.00	-16.36	100	268	QP



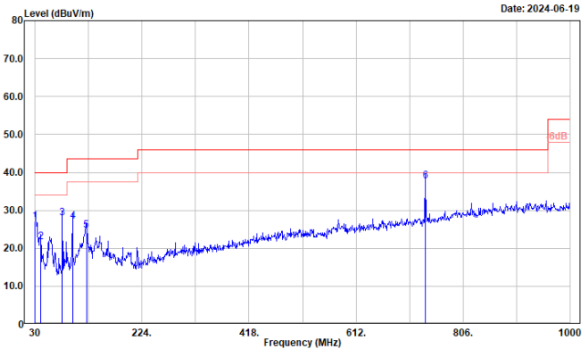
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	39.06	-3.36	35.70	40.00	-4.30	100	15	QP
53.280	47.96	-16.04	31.92	40.00	-8.08	100	0	QP
57.160	48.84	-16.22	32.62	40.00	-7.38	100	52	QP
62.010	45.48	-16.15	29.33	40.00	-10.67	100	0	QP
106.630	42.59	-11.77	30.82	43.50	-12.68	100	183	QP
166.770	42.05	-11.13	30.92	43.50	-12.58	100	257	QP

Battery

Low channel	
Horizontal	**Vertical**



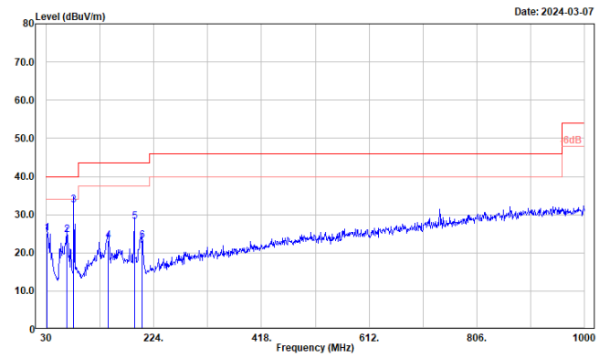
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	29.92	-3.36	26.56	40.00	-13.44	100	53	QP
79.470	48.45	-15.97	32.48	40.00	-7.52	100	174	QP
97.900	38.75	-14.00	24.75	43.50	-18.75	100	360	QP
141.550	32.52	-10.11	22.41	43.50	-21.09	100	213	QP
189.080	40.48	-11.96	28.52	43.50	-14.98	100	217	QP
897.180	32.15	1.92	34.07	46.00	-11.93	100	201	QP



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.000	30.08	-2.89	27.19	40.00	-12.81	100	359	QP
40.670	32.34	-10.73	21.61	40.00	-18.39	100	351	QP
79.470	43.93	-15.97	27.96	40.00	-12.04	100	164	QP
97.900	41.19	-14.00	27.19	43.50	-16.31	100	293	QP
123.120	34.23	-9.62	24.61	43.50	-18.89	100	66	QP
737.130	39.15	-1.50	37.65	46.00	-8.35	100	263	QP

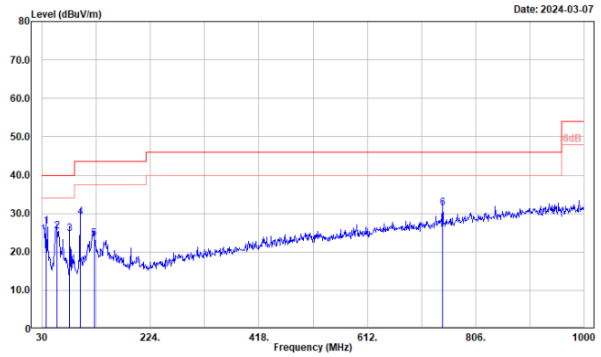
Middle channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	28.57	-3.36	25.21	40.00	-14.79	100	277	QP
67.830	40.15	-15.43	24.72	40.00	-15.28	100	342	QP
79.470	48.57	-15.97	32.60	40.00	-7.40	100	360	QP
141.550	33.27	-10.11	23.16	43.50	-20.34	100	205	QP
189.080	40.22	-11.96	28.26	43.50	-15.24	100	137	QP
202.660	34.25	-11.13	23.12	43.50	-20.38	100	30	QP

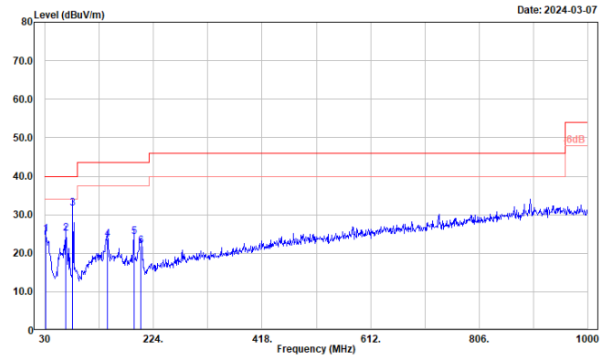
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
36.790	34.52	-7.92	26.60	40.00	-13.40	100	360	QP
56.190	41.53	-16.20	25.33	40.00	-14.67	100	194	QP
79.470	40.64	-15.97	24.67	40.00	-15.33	100	220	QP
97.900	43.11	-14.00	29.11	43.50	-14.39	100	300	QP
123.120	33.12	-9.62	23.50	43.50	-20.00	100	350	QP
746.830	32.65	-1.17	31.48	46.00	-14.52	100	0	QP

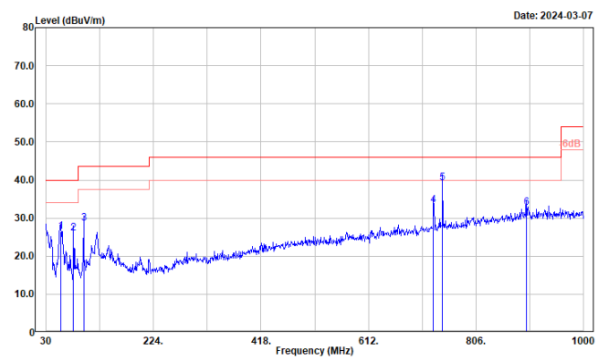
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.970	28.24	-3.36	24.88	40.00	-15.12	100	84	QP
66.860	40.83	-15.64	25.19	40.00	-14.81	100	358	QP
79.470	47.73	-15.97	31.76	40.00	-8.24	100	76	QP
141.550	33.77	-10.11	23.66	43.50	-19.84	100	256	QP
189.080	36.17	-11.96	24.21	43.50	-19.29	100	360	QP
201.690	32.72	-10.77	21.95	43.50	-21.55	100	56	QP

Vertical



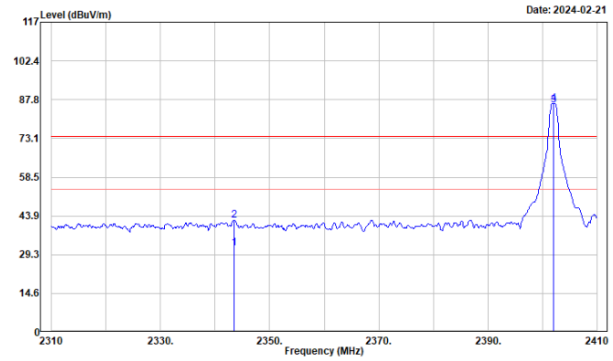
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
56.190	42.62	-16.20	26.42	40.00	-13.58	100	249	QP
79.470	42.03	-15.97	26.06	40.00	-13.94	100	291	QP
97.900	42.58	-14.00	28.58	43.50	-14.92	100	253	QP
729.370	34.85	-1.43	33.42	46.00	-12.58	100	66	QP
745.860	40.53	-1.20	39.33	46.00	-6.67	100	9	QP
897.180	30.85	1.92	32.77	46.00	-13.23	100	24	QP

Band-Edge:

BLE(1M) Mode

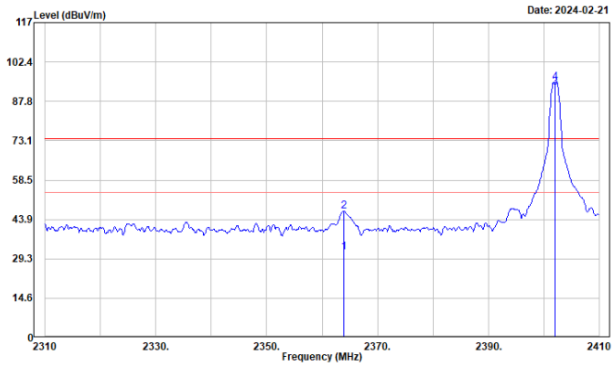
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2343.500	42.83	-11.23	31.60	54.00	-22.40	164	286	Average
2343.500	53.54	-11.23	42.31	74.00	-31.69	164	286	Peak
2402.000	96.40	-10.90	85.50			164	286	Average
2402.000	97.17	-10.90	86.27			164	286	Peak

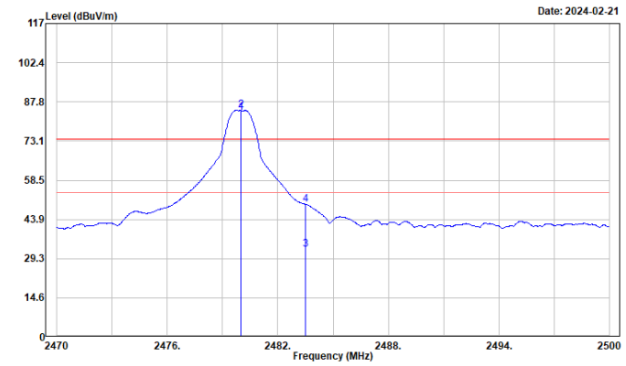
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2363.900	42.71	-11.10	31.61	54.00	-22.39	137	258	Average
2363.900	58.06	-11.10	46.96	74.00	-27.04	137	258	Peak
2402.000	103.93	-10.90	93.03			137	258	Average
2402.000	105.68	-10.90	94.78			137	258	Peak

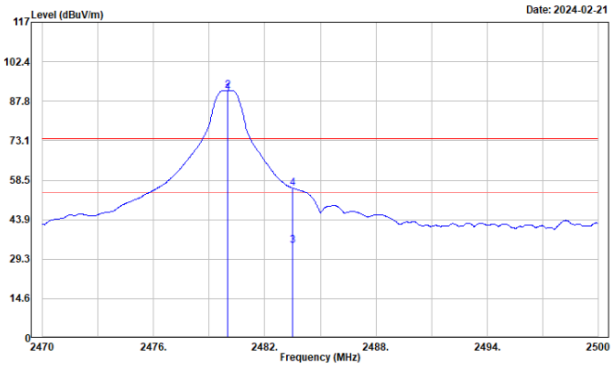
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	94.22	-10.55	83.67			149	280	Average
2480.000	95.13	-10.55	84.58			149	280	Peak
2483.500	43.00	-10.50	32.50	54.00	-21.50	149	280	Average
2483.500	60.05	-10.50	49.55	74.00	-24.45	149	280	Peak

Vertical

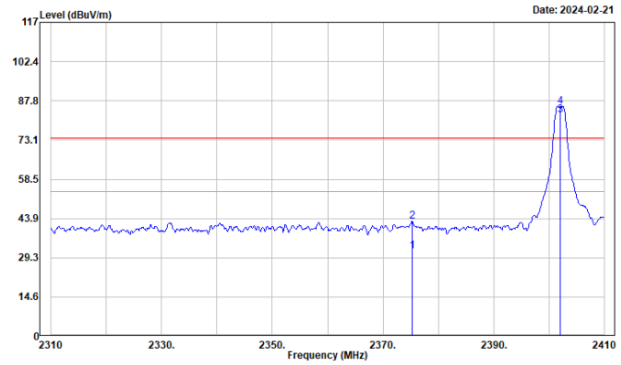


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	101.37	-10.55	90.82			138	234	Average
2480.000	102.26	-10.55	91.71			138	234	Peak
2483.500	44.82	-10.50	34.32	54.00	-19.68	138	234	Average
2483.500	66.09	-10.50	55.59	74.00	-18.41	138	234	Peak

BLE(2M) Mode

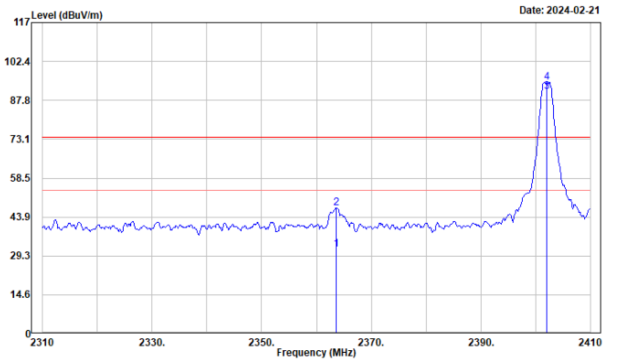
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2375.300	42.69	-11.04	31.65	54.00	-22.35	168	131	Average
2375.300	53.75	-11.04	42.71	74.00	-31.29	168	131	Peak
2402.000	93.30	-10.90	82.40			168	131	Average
2402.000	96.61	-10.90	85.71			168	131	Peak

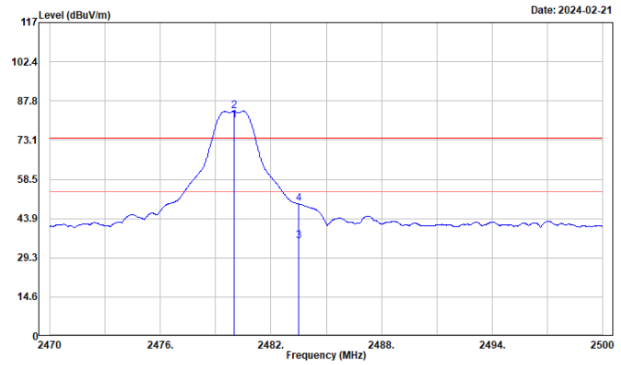
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2363.600	42.91	-11.11	31.80	54.00	-22.20	169	252	Average
2363.600	58.47	-11.11	47.36	74.00	-26.64	169	252	Peak
2402.000	101.81	-10.90	90.91			169	252	Average
2402.000	105.28	-10.90	94.38			169	252	Peak

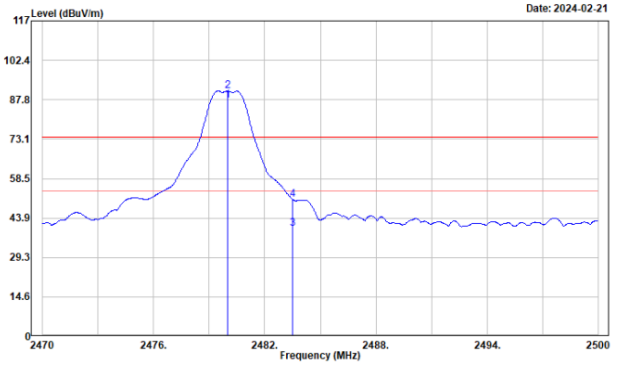
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	91.10	-10.55	80.55			137	283	Average
2480.000	94.48	-10.55	83.93			137	283	Peak
2483.500	45.98	-10.50	35.48	54.00	-18.52	137	283	Average
2483.500	59.84	-10.50	49.34	74.00	-24.66	137	283	Peak

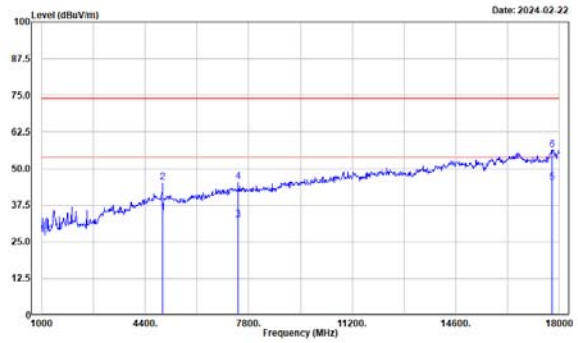
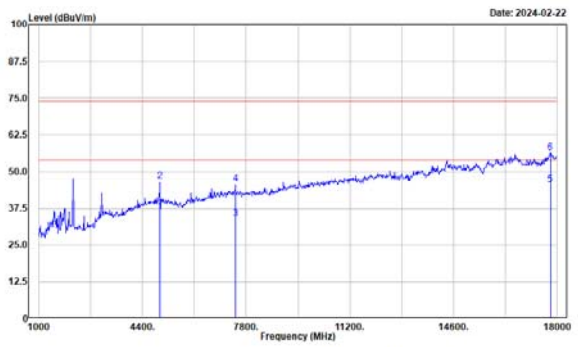
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	98.00	-10.55	87.45			158	247	Average
2480.000	101.52	-10.55	90.97			158	247	Peak
2483.500	50.55	-10.50	40.05	54.00	-13.95	158	247	Average
2483.500	61.34	-10.50	50.84	74.00	-23.16	158	247	Peak

1GHz-18GHz:

(worst case is BLE(2M) Mode high channel)

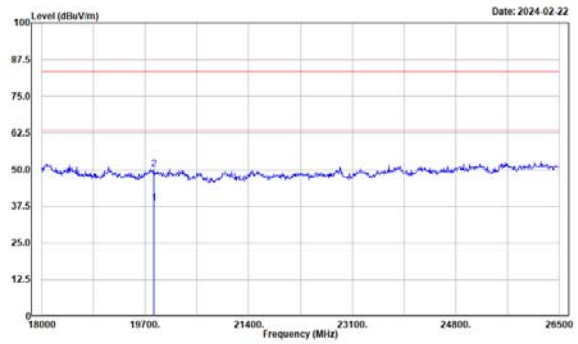
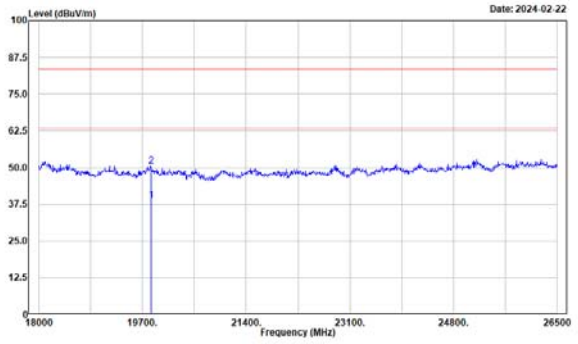
Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	38.31	-3.44	34.87	54.00	-19.13	305	232	Average
4960.000	48.57	-3.44	45.13	74.00	-28.87	305	232	Peak
7440.000	31.91	0.53	32.44	54.00	-21.56	150	139	Average
7440.000	44.91	0.53	45.44	74.00	-28.56	150	139	Peak
17762.000	32.29	13.02	45.31	54.00	-8.69	150	294	Average
17762.000	43.45	13.02	56.47	74.00	-17.53	150	294	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	39.74	-3.44	36.30	54.00	-17.70	221	200	Average
4960.000	50.02	-3.44	46.58	74.00	-27.42	221	200	Peak
7440.000	33.31	0.53	33.84	54.00	-20.16	282	163	Average
7440.000	45.18	0.53	45.71	74.00	-28.29	282	163	Peak
17779.000	32.49	13.03	45.52	54.00	-8.48	150	13	Average
17779.000	43.29	13.03	56.32	74.00	-17.68	150	13	Peak

18GHz-26.5GHz:

(worst case is BLE(2M) Mode high channel)

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19840.000	21.25	17.36	38.61	63.50	-24.89	150	237	Average
19840.000	32.91	17.36	50.27	83.50	-33.23	150	237	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19840.000	21.51	17.36	38.87	63.50	-24.63	150	125	Average
19840.000	33.08	17.36	50.44	83.50	-33.06	150	125	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Above 1GHz

BLE(1M) Mode

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	41.77	-3.97	37.80	54.00	-16.20	100	216	Average
4804.000	49.52	-3.97	45.55	74.00	-28.45	100	216	Peak
7206.000	33.52	0.30	33.82	54.00	-20.18	152	157	Average
7206.000	45.56	0.30	45.86	74.00	-28.14	152	157	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	39.37	-3.97	35.40	54.00	-18.60	150	158	Average
4804.000	48.83	-3.97	44.86	74.00	-29.14	150	158	Peak
7206.000	37.19	0.30	37.49	54.00	-16.51	105	179	Average
7206.000	47.75	0.30	48.05	74.00	-25.95	105	179	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	39.31	-3.79	35.52	54.00	-18.48	266	213	Average
4880.000	47.63	-3.79	43.84	74.00	-30.16	266	213	Peak
7320.000	34.37	0.44	34.81	54.00	-19.19	345	157	Average
7320.000	45.57	0.44	46.01	74.00	-27.99	345	157	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	38.53	-3.79	34.74	54.00	-19.26	273	210	Average
4880.000	49.49	-3.79	45.70	74.00	-28.30	273	210	Peak
7320.000	33.67	0.44	34.11	54.00	-19.89	112	176	Average
7320.000	45.81	0.44	46.25	74.00	-27.75	112	176	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	37.24	-3.44	33.80	54.00	-20.20	109	9	Average
4960.000	46.64	-3.44	43.20	74.00	-30.80	109	9	Peak
7440.000	32.22	0.53	32.75	54.00	-21.25	339	147	Average
7440.000	45.42	0.53	45.95	74.00	-28.05	339	147	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	35.39	-3.44	31.95	54.00	-22.05	245	203	Average
4960.000	46.00	-3.44	42.56	74.00	-31.44	245	203	Peak
7440.000	32.45	0.53	32.98	54.00	-21.02	129	214	Average
7440.000	44.44	0.53	44.97	74.00	-29.03	129	214	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

BLE(2M) Mode

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	38.49	-3.97	34.52	54.00	-19.48	134	178	Average
4804.000	48.50	-3.97	44.53	74.00	-29.47	134	178	Peak
7206.000	34.21	0.30	34.51	54.00	-19.49	144	96	Average
7206.000	45.71	0.30	46.01	74.00	-27.99	144	96	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	39.12	-3.97	35.15	54.00	-18.85	265	211	Average
4804.000	49.41	-3.97	45.44	74.00	-28.56	265	211	Peak
7206.000	36.28	0.30	36.58	54.00	-17.42	105	176	Average
7206.000	47.09	0.30	47.39	74.00	-26.61	105	176	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	37.19	-3.79	33.40	54.00	-20.60	146	169	Average
4880.000	48.47	-3.79	44.68	74.00	-29.32	146	169	Peak
7320.000	32.95	0.44	33.39	54.00	-20.61	125	87	Average
7320.000	45.53	0.44	45.97	74.00	-28.03	125	87	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	38.98	-3.79	35.19	54.00	-18.81	273	211	Average
4880.000	48.81	-3.79	45.02	74.00	-28.98	273	211	Peak
7320.000	35.04	0.44	35.48	54.00	-18.52	103	171	Average
7320.000	46.62	0.44	47.06	74.00	-26.94	103	171	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	38.31	-3.44	34.87	54.00	-19.13	305	232	Average
4960.000	48.57	-3.44	45.13	74.00	-28.87	305	232	Peak
7440.000	31.91	0.53	32.44	54.00	-21.56	150	139	Average
7440.000	44.91	0.53	45.44	74.00	-28.56	150	139	Peak
17762.000	32.29	13.02	45.31	54.00	-8.69	150	294	Average
17762.000	43.45	13.02	56.47	74.00	-17.53	150	294	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	39.74	-3.44	36.30	54.00	-17.70	221	200	Average
4960.000	50.02	-3.44	46.58	74.00	-27.42	221	200	Peak
7440.000	33.31	0.53	33.84	54.00	-20.16	282	163	Average
7440.000	45.18	0.53	45.71	74.00	-28.29	282	163	Peak
17779.000	32.49	13.03	45.52	54.00	-8.48	150	13	Average
17779.000	43.29	13.03	56.32	74.00	-17.68	150	13	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

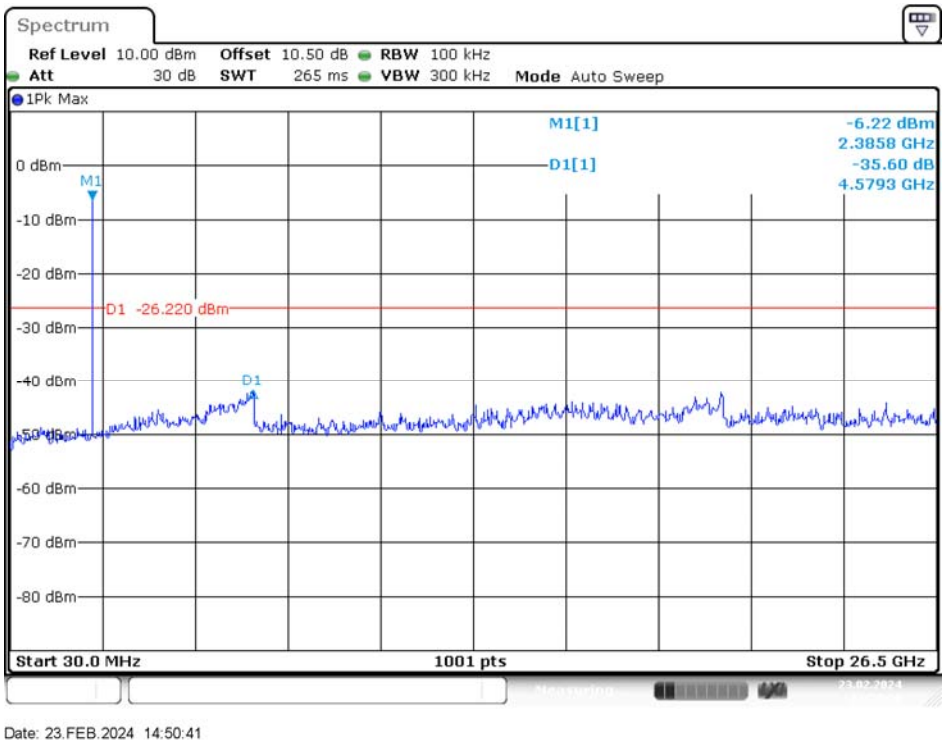
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Conducted Spurious Emissions:

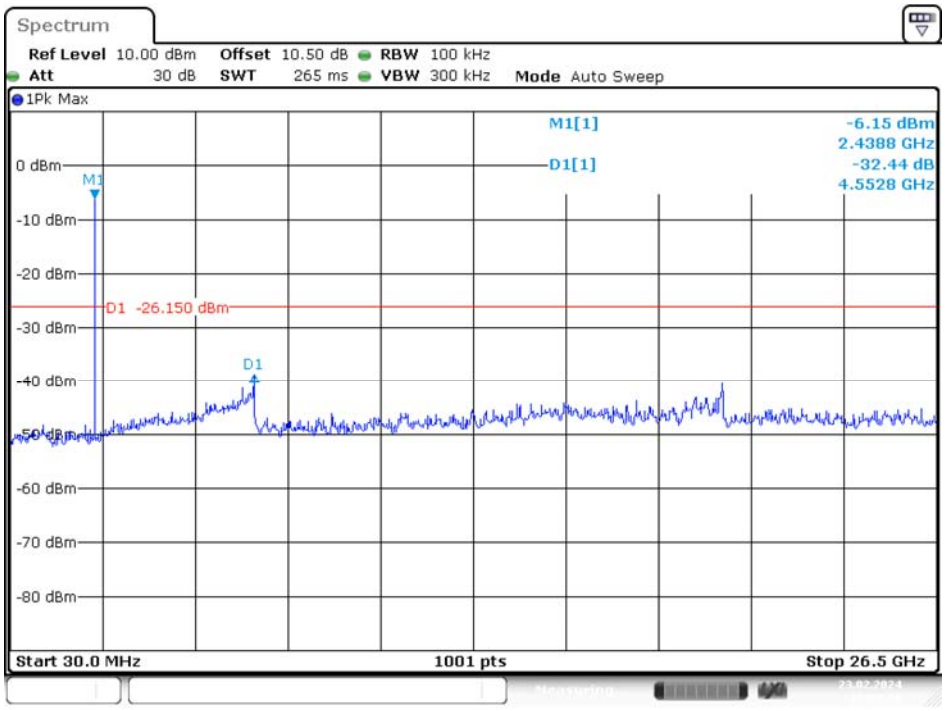
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) Mode				
Low	2402	35.60	≥ 20	PASS
Middle	2440	32.44	≥ 20	PASS
High	2480	34.36	≥ 20	PASS
BLE(2M) Mode				
Low	2402	31.89	≥ 20	PASS
Middle	2440	35.02	≥ 20	PASS
High	2480	32.29	≥ 20	PASS

BLE(1M) Mode

Low Channel



Middle Channel



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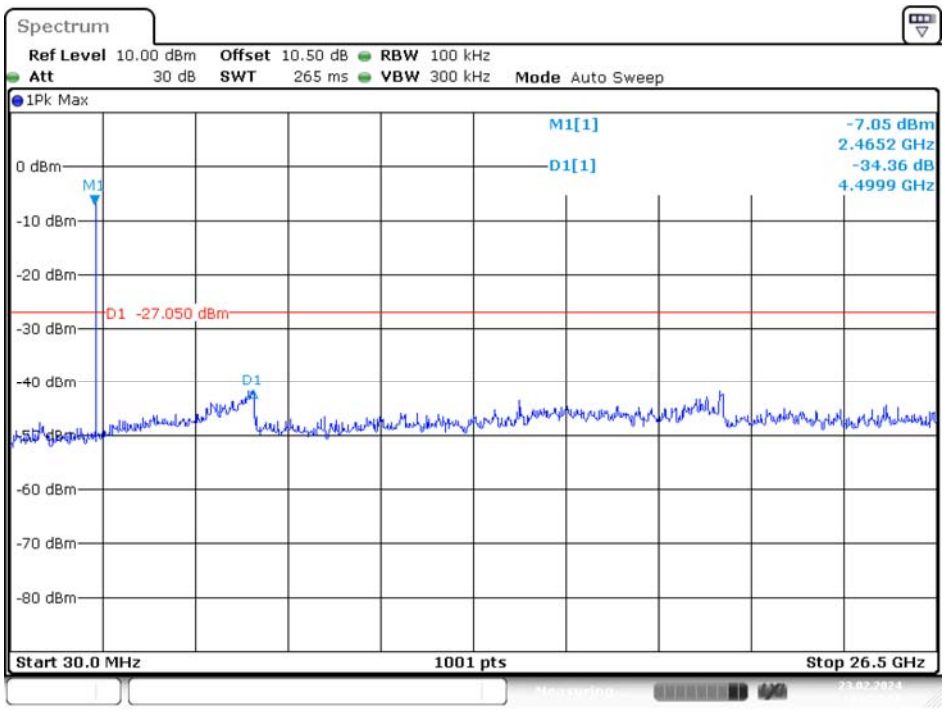
High Channel



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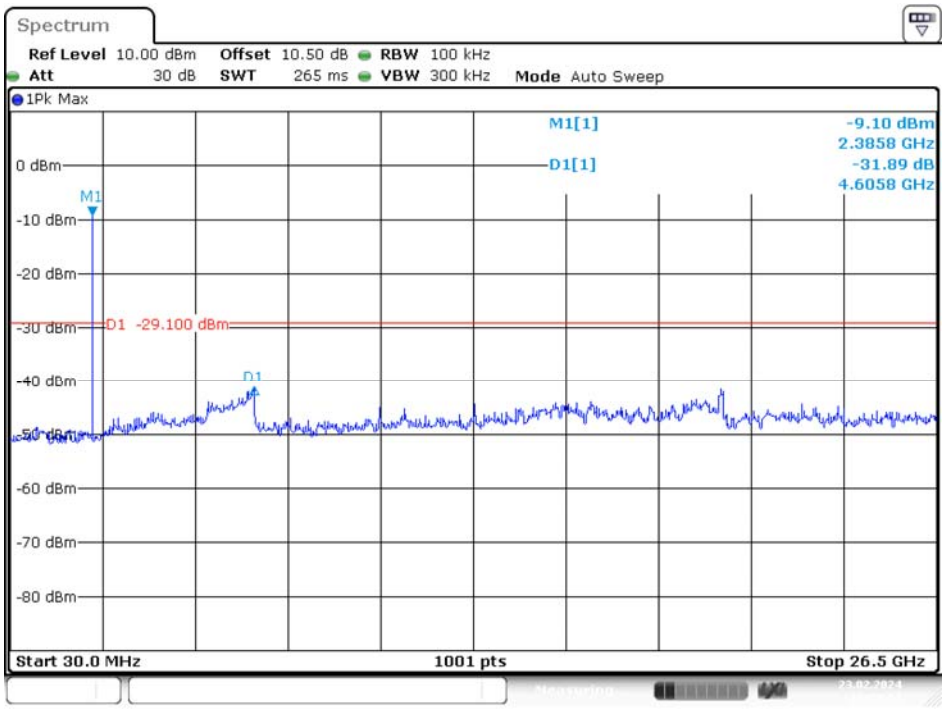
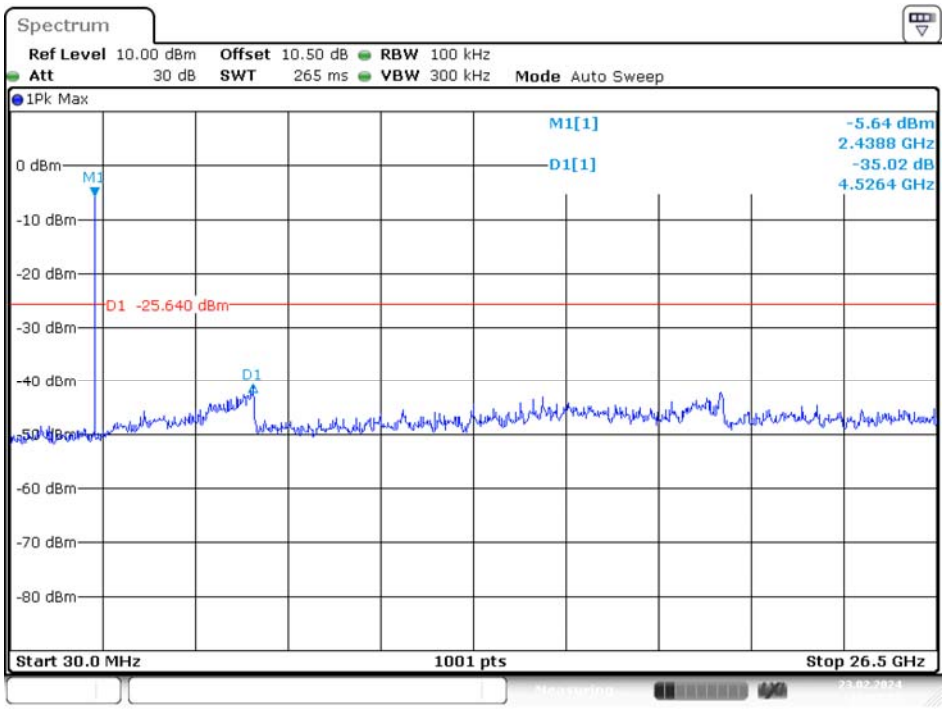
BLE(2M) Mode

Low Channel



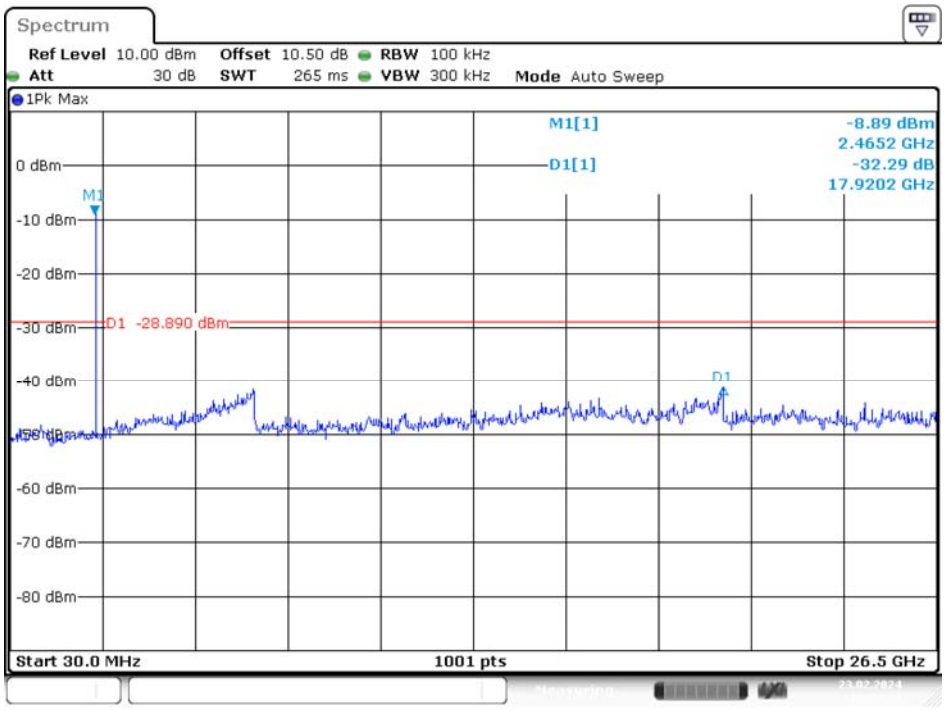
Date: 23.FEB.2024 15:39:47

Middle Channel



Date: 23.FEB.2024 15:32:35

High Channel



Date: 23.FEB.2024 15:34:38

10 FCC §15.247(a)(2) & RSS-247 §5.2(a), RSS-GEN §6.7 – 6 dB Emission Bandwidth & Occupied Bandwidth

10.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

According to RSS-247 §5.2 (a)

The minimum 6 dB bandwidth shall be 500 kHz.

According to RSS-GEN §6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

10.2 Test Procedure

According to ANSI C63.10-2013, section 11.8

The steps for the first option are as follows:

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) 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.

According to ANSI C63.10-2013 Section 6.9.3

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

10.3 Test Results

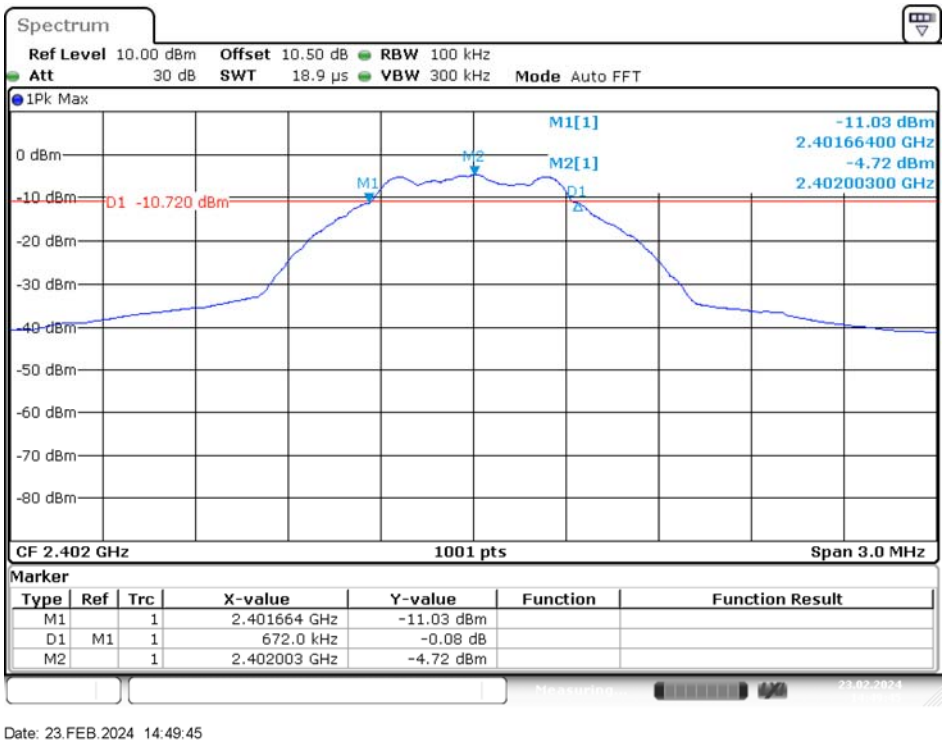
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Result
BLE(1M) Mode					
Low	2402	0.67	1.02	> 500	PASS
Middle	2440	0.67	1.02	> 500	PASS
High	2480	0.67	1.02	> 500	PASS
BLE(2M) Mode					
Low	2402	1.18	2.01	> 500	PASS
Middle	2440	1.18	2.02	> 500	PASS
High	2480	1.18	2.02	> 500	PASS

Please refer to the following plots

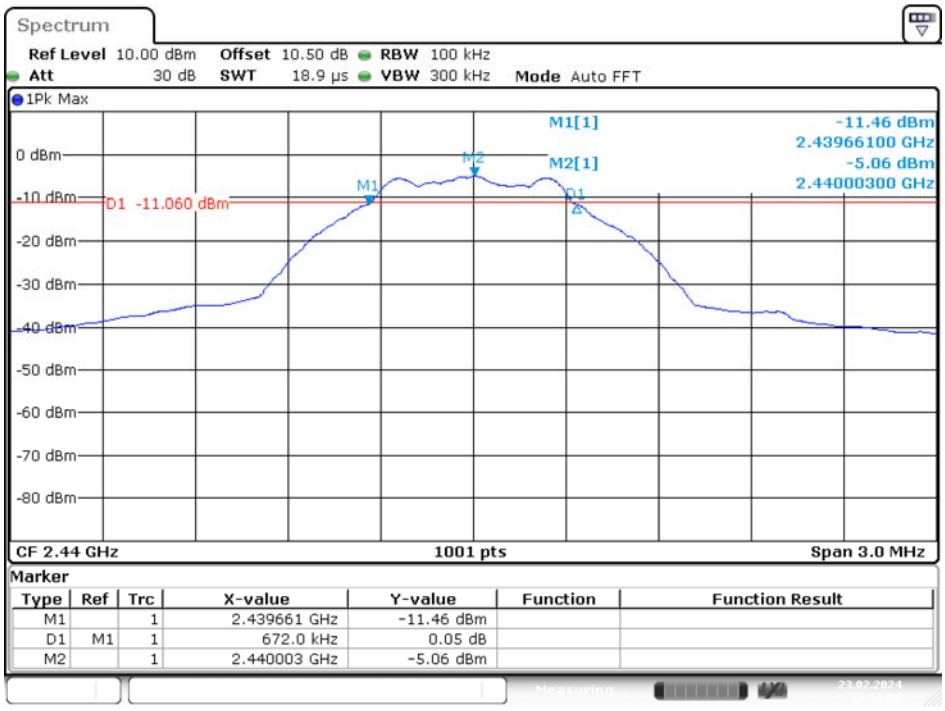
6 dB Emission Bandwidth

BLE(1M) Mode

Low Channel

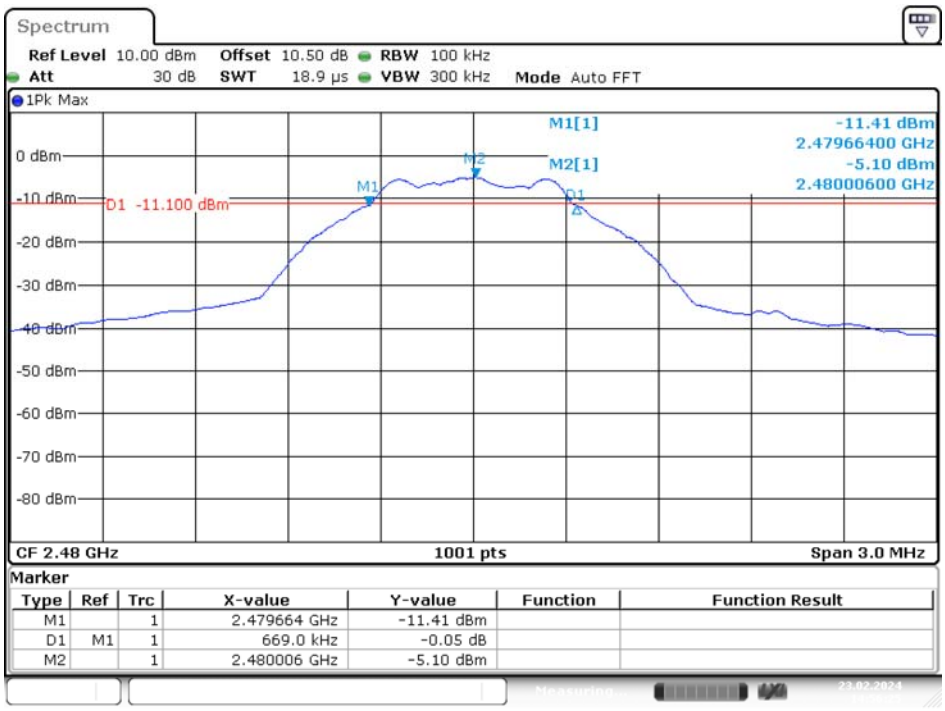


Middle Channel



Date: 23.FEB.2024 14:53:00

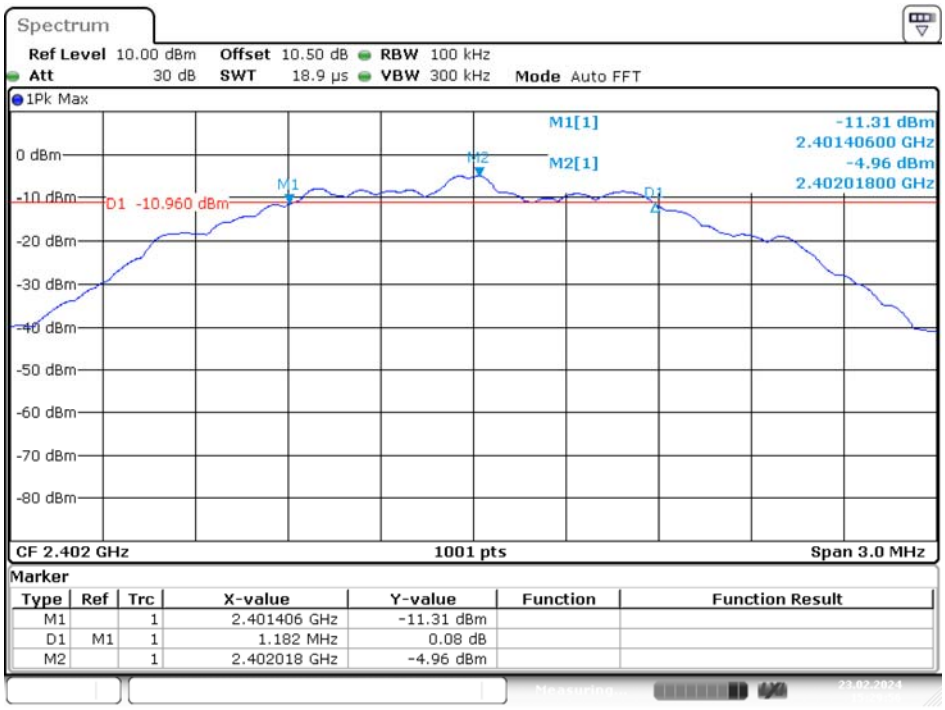
High Channel



Date: 23.FEB.2024 14:56:25

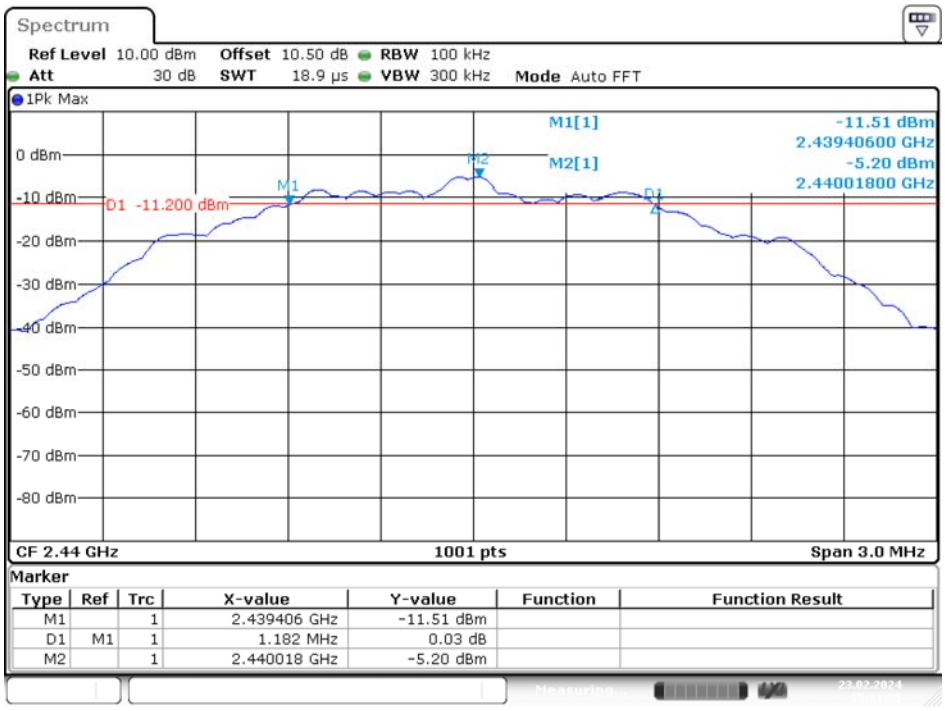
BLE(2M) Mode

Low Channel



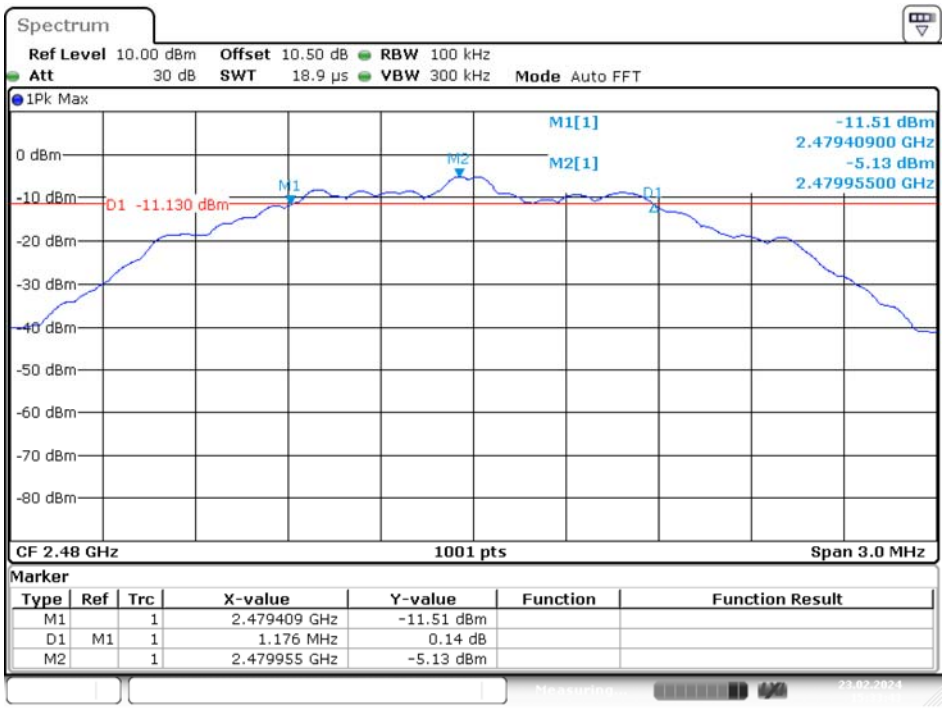
Date: 23.FEB.2024 15:29:56

Middle Channel



Date: 23.FEB.2024 15:31:56

High Channel



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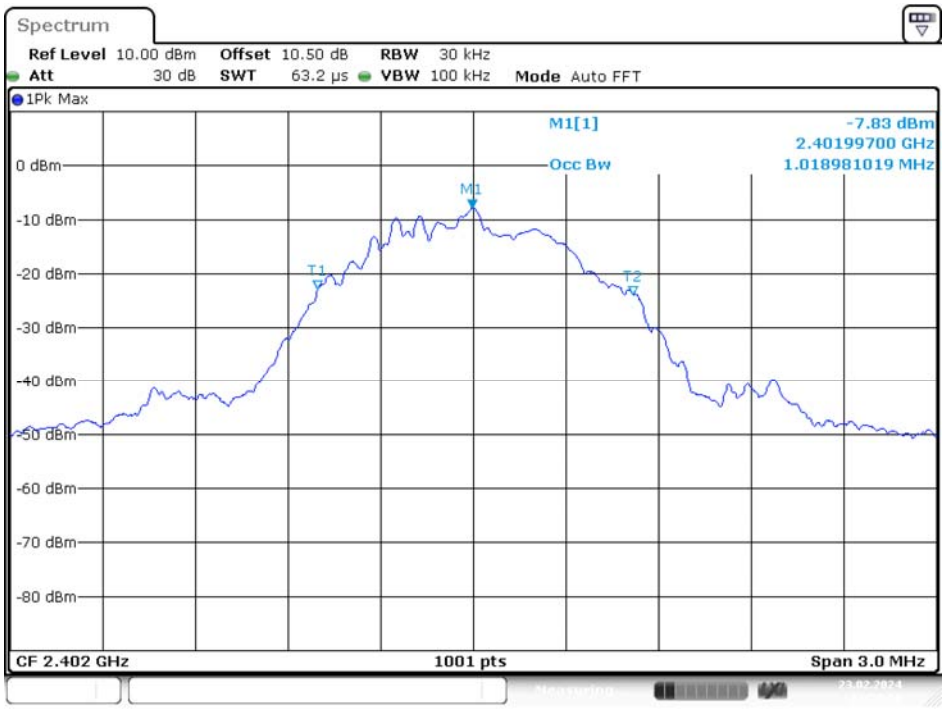
99% Bandwidth

BLE(1M) Mode

Low Channel



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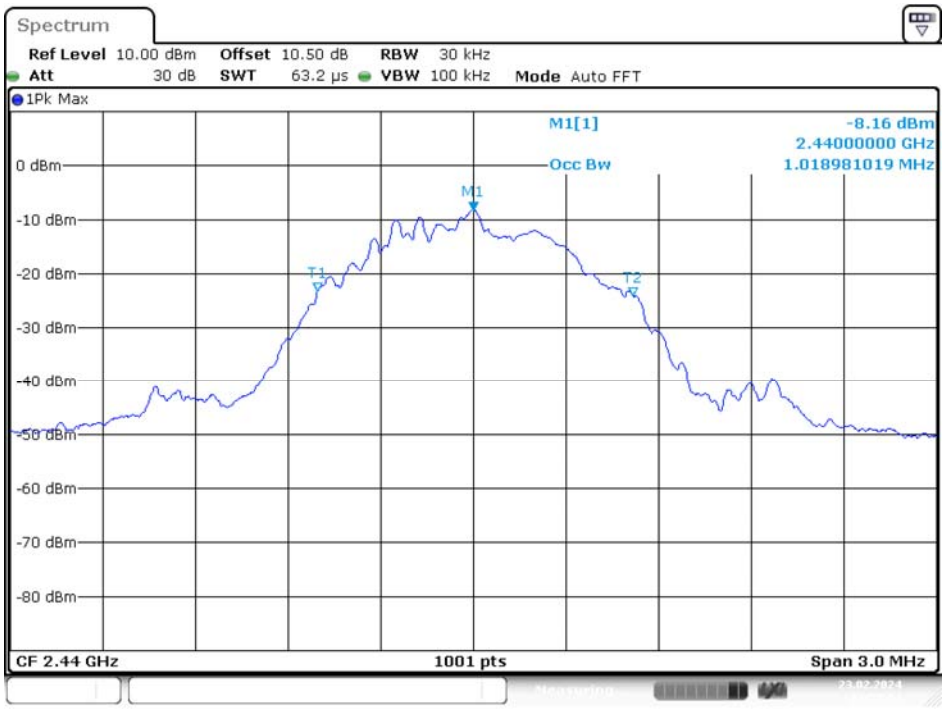
Middle Channel



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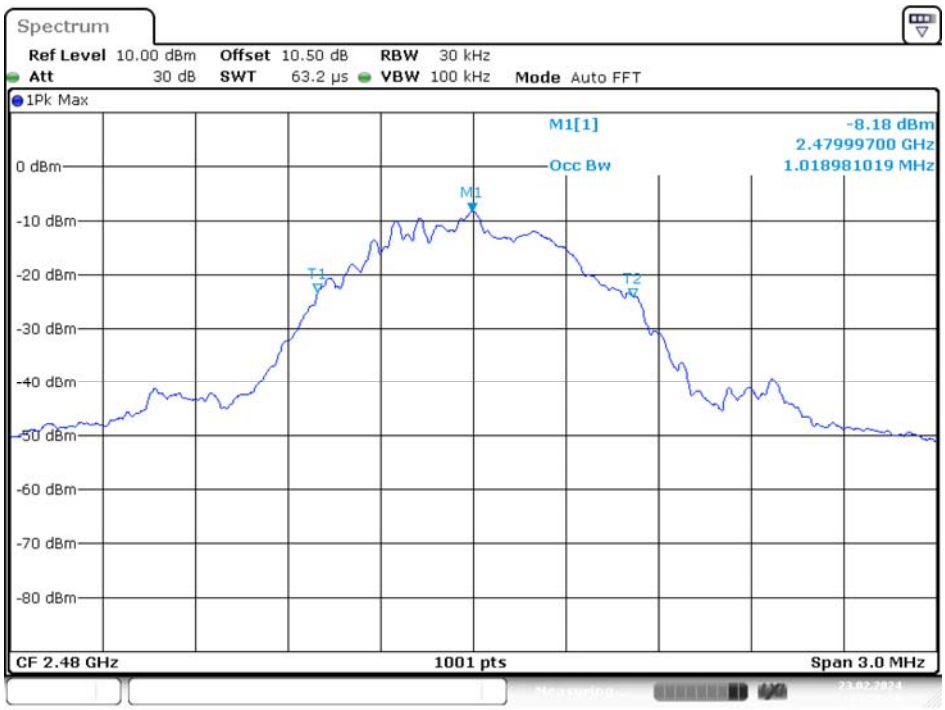
High Channel



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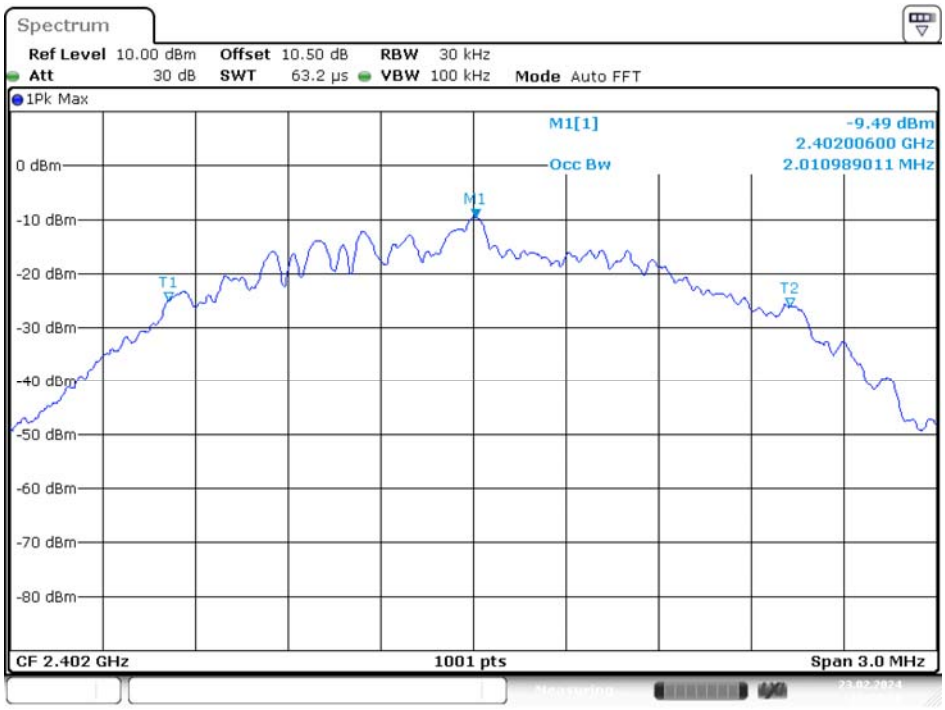
BLE(2M) Mode

Low Channel



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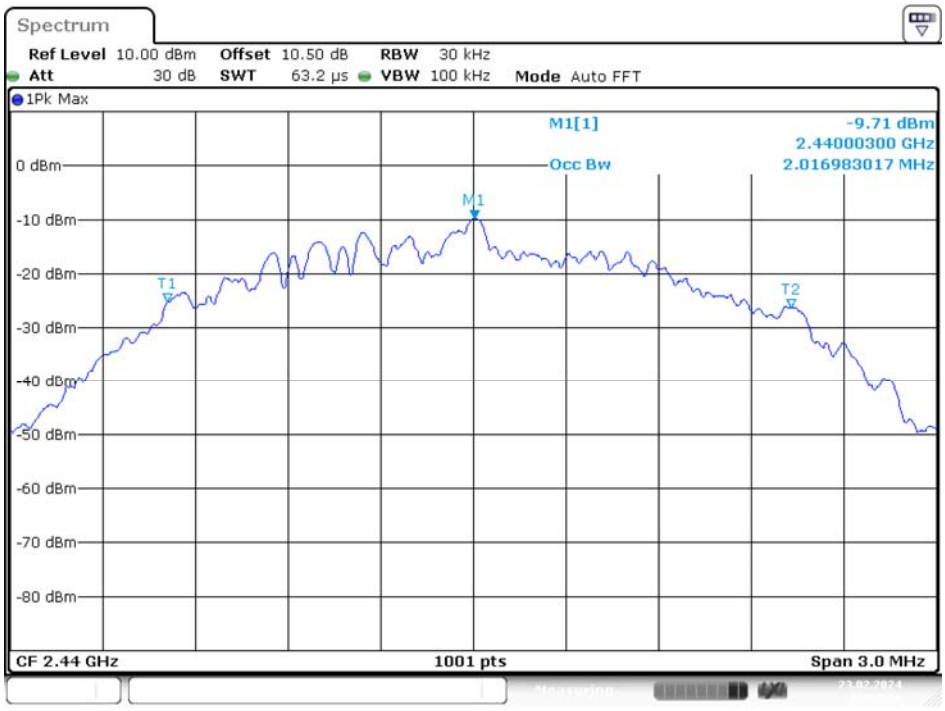
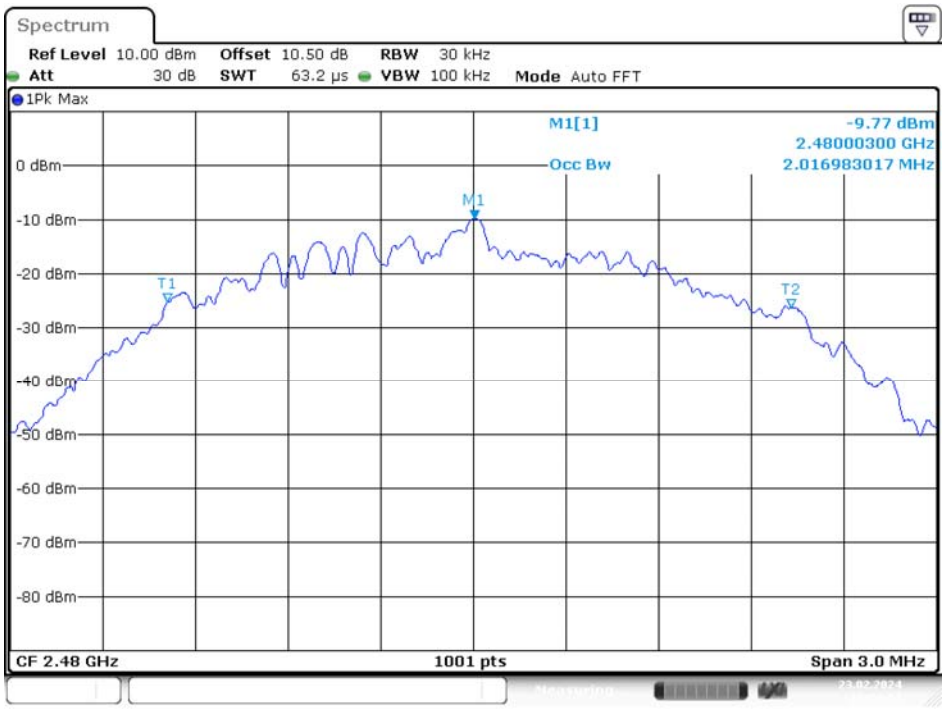
Middle Channel



Date: 23.FEB.2024 15:32:20

High Channel



Date: 23.FEB.2024 15:34:07

11 FCC §15.247(b)(3) & RSS-247 §5.4(d) – Maximum Output Power

11.1 Applicable Standard

According to FCC §15.247(b) (3).

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to RSS-247 §5.4(d).

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

11.2 Test Procedure

According to ANSI C63.10-2013, section 11.9.1.3

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

11.3 Test Results

Conducted Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Limit (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)
BLE(1M) Mode						
Low	2402	-3.15	30	1.5	-1.65	36
Middle	2440	-3.33	30	1.5	-1.83	36
High	2480	-3.26	30	1.5	-1.76	36
BLE(2M) Mode						
Low	2402	-3.48	30	1.5	-1.98	36
Middle	2440	-3.67	30	1.5	-2.17	36
High	2480	-3.69	30	1.5	-2.19	36

12 FCC §15.247(d) & RSS-247 §5.5 – 100 kHz Bandwidth of Frequency Band Edge

12.1 Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 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 paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general 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) (see §15.205(c)).

According to RSS-247 §5.5.

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 root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

12.2 Test Procedure

According to ANSI C63.10-2013 Section 11.11

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ [3 × RBW].
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

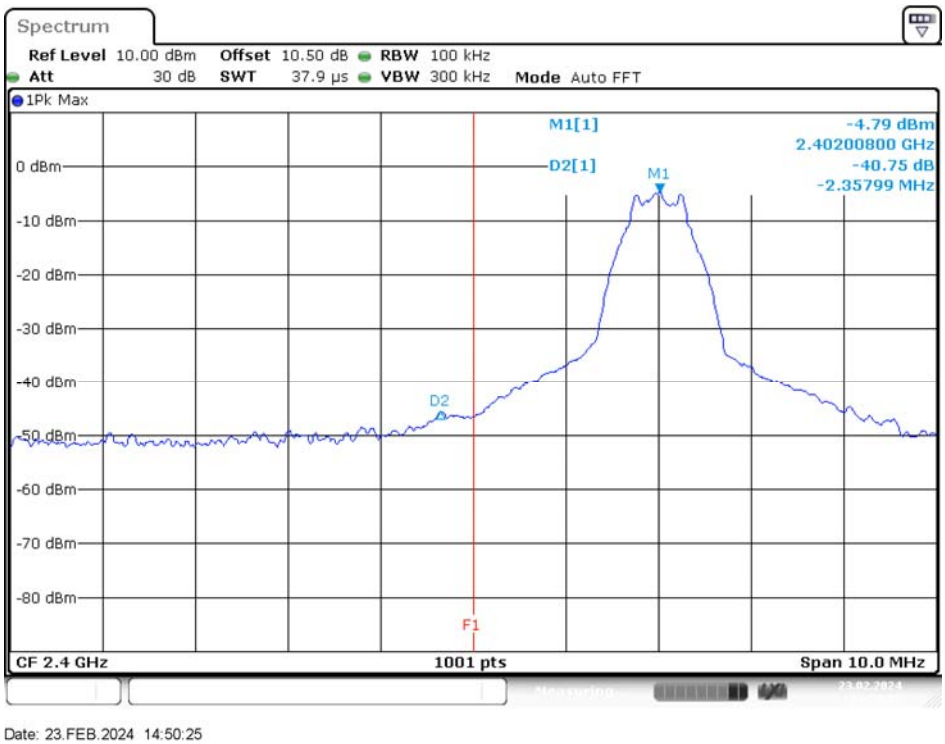
12.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) Mode				
Low	2402	40.75	≥ 20	PASS
High	2480	43.59	≥ 20	PASS
BLE(2M) Mode				
Low	2402	37.12	≥ 20	PASS
High	2480	44.04	≥ 20	PASS

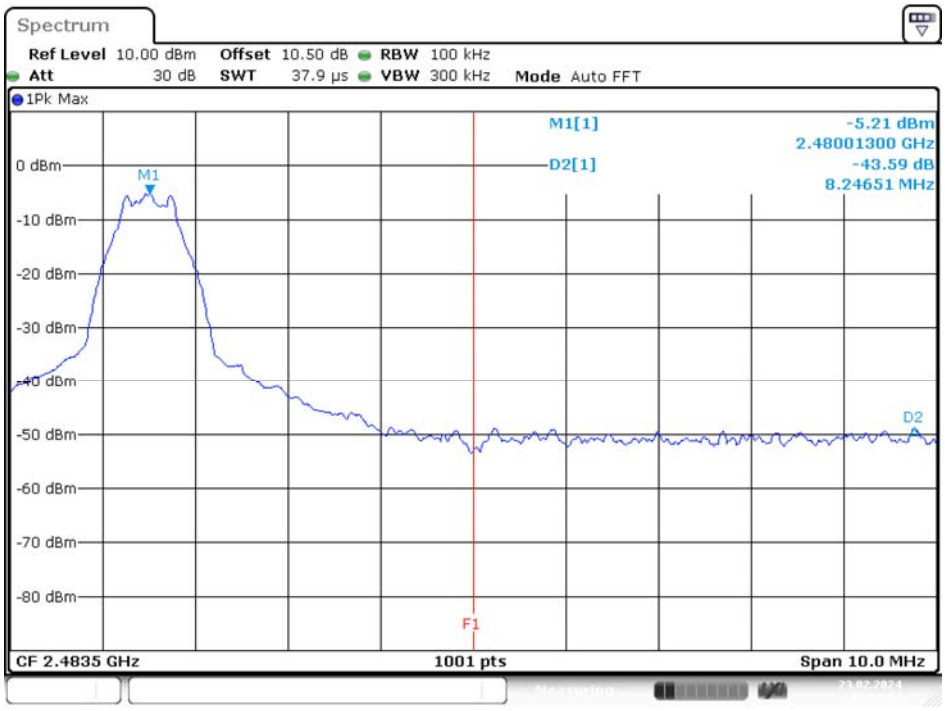
Please refer to the following plots

BLE(1M) Mode

Band Edge, Left Side



Band Edge, Right Side



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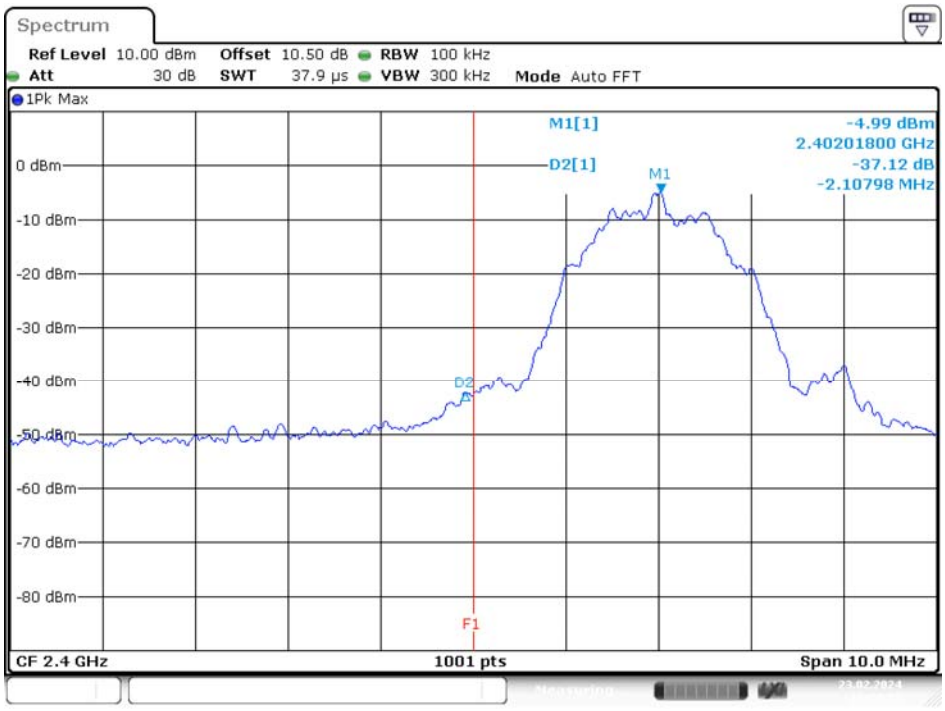
BLE(2M) Mode

Band Edge, Left Side



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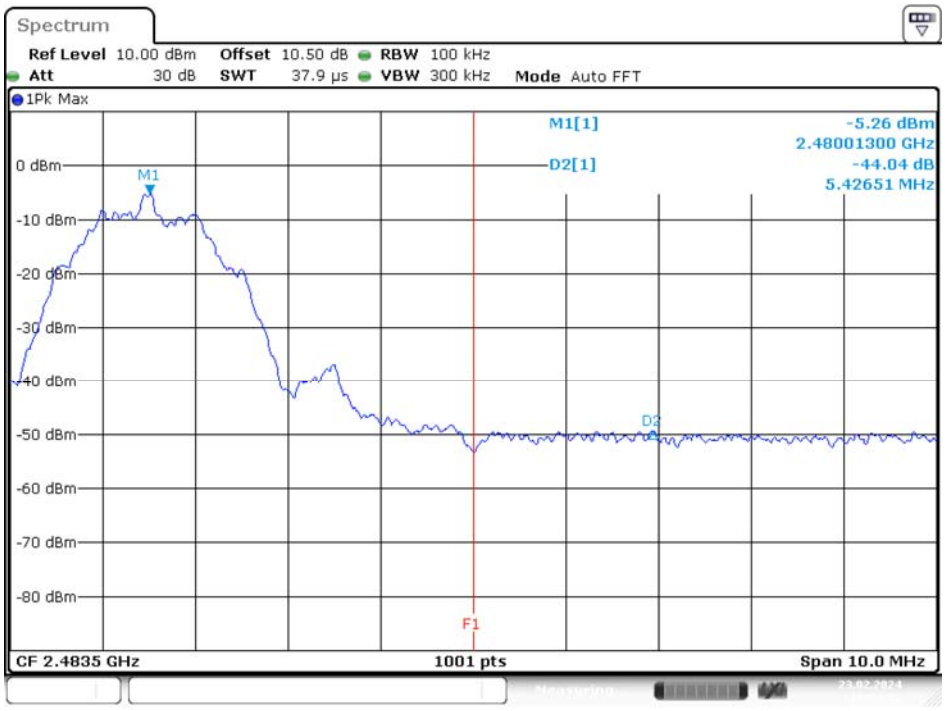
Band Edge, Right Side



Date: 23.FEB.2024 15:34:23

13 FCC §15.247(e) & RSS-247 §5.2(b) – Power Spectral Density

13.1 Applicable Standard

According to FCC §15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-247 §5.2(b).

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

13.2 Test Procedure

According to ANSI C63.10-2013, section 11.10.2

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ [3 × RBW].
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

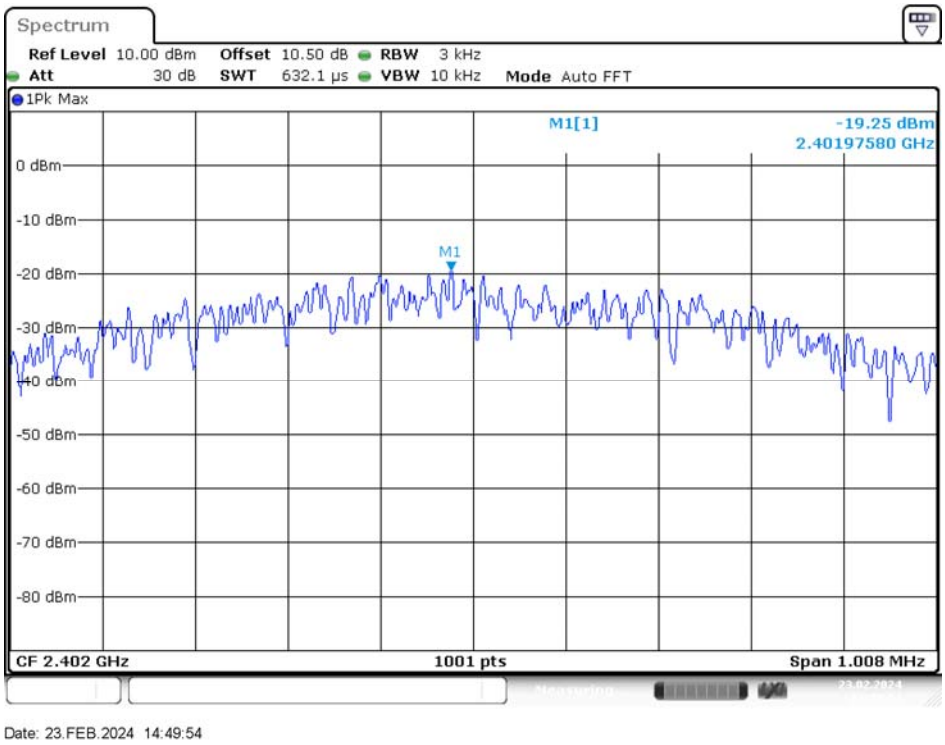
13.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
BLE(1M) Mode				
Low	2402	-19.25	8	PASS
Middle	2440	-19.58	8	PASS
High	2480	-19.62	8	PASS
BLE(1M) Mode				
Low	2402	-22.20	8	PASS
Middle	2440	-22.42	8	PASS
High	2480	-22.46	8	PASS

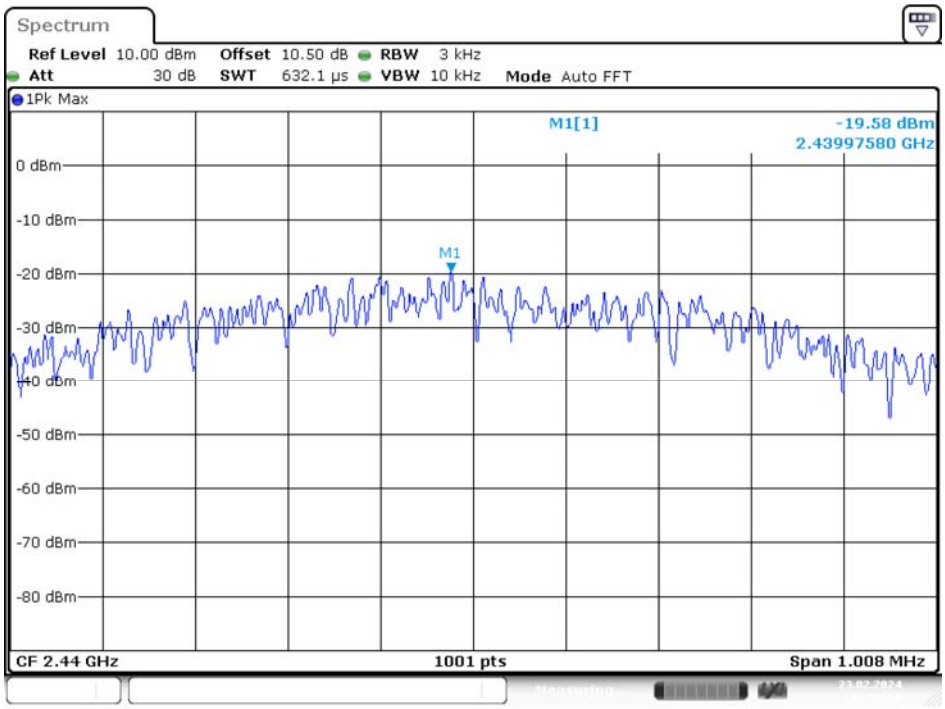
Please refer to the following plots

BLE(1M) Mode

Low Channel

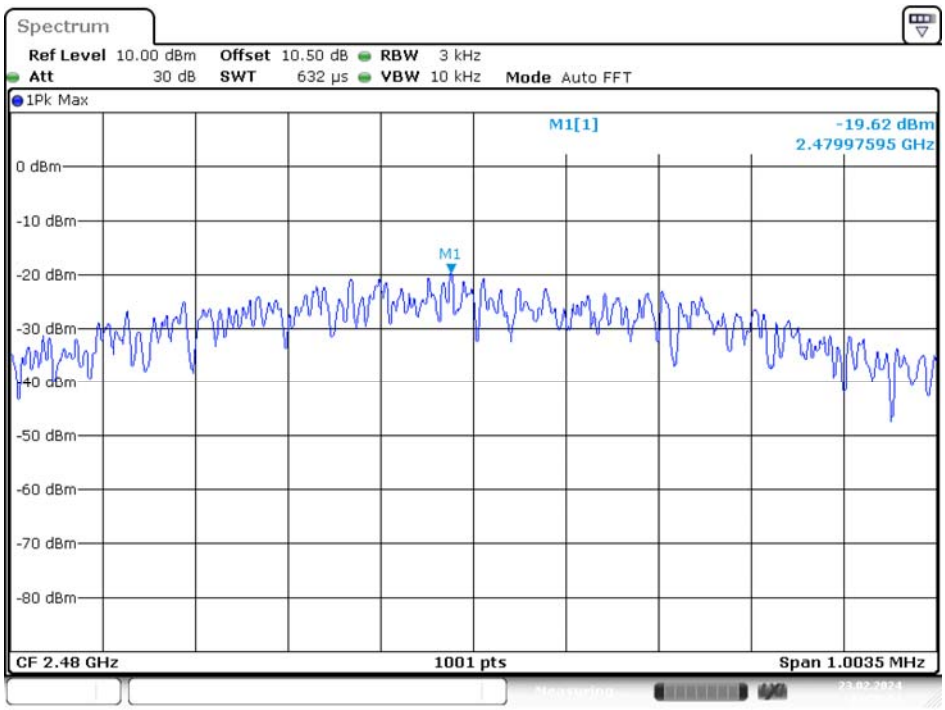


Middle Channel



Date: 23.FEB.2024 14:53:09

High Channel



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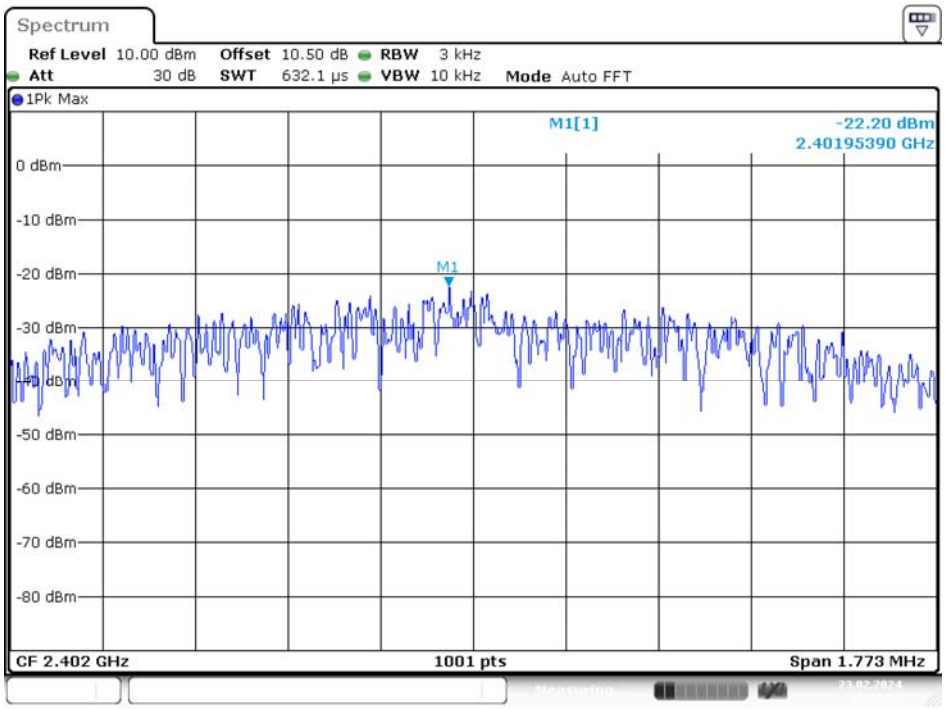
BLE(2M) Mode

Low Channel



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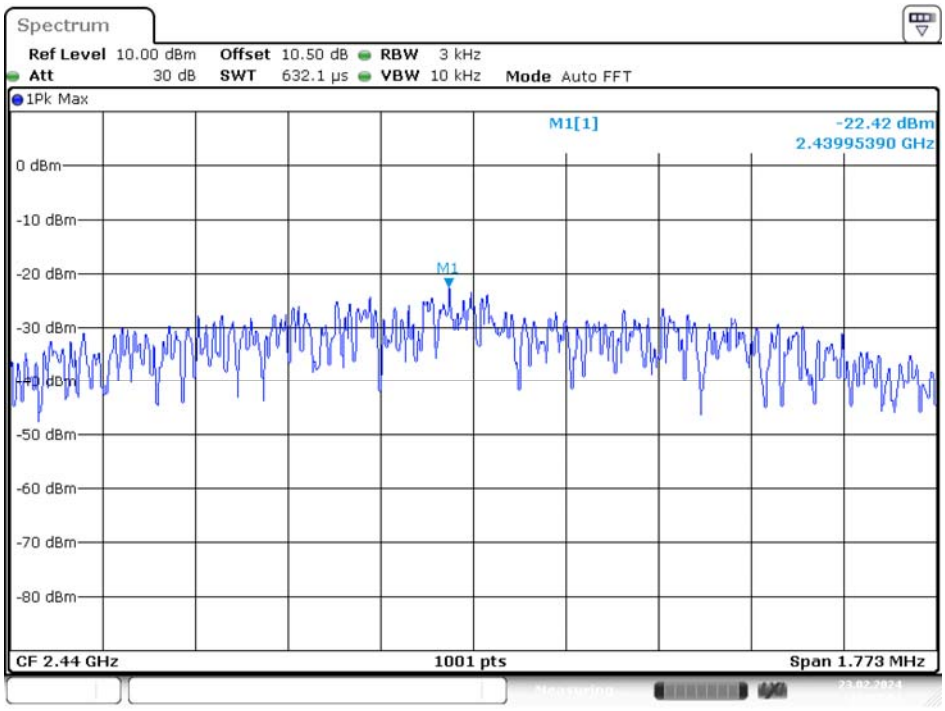
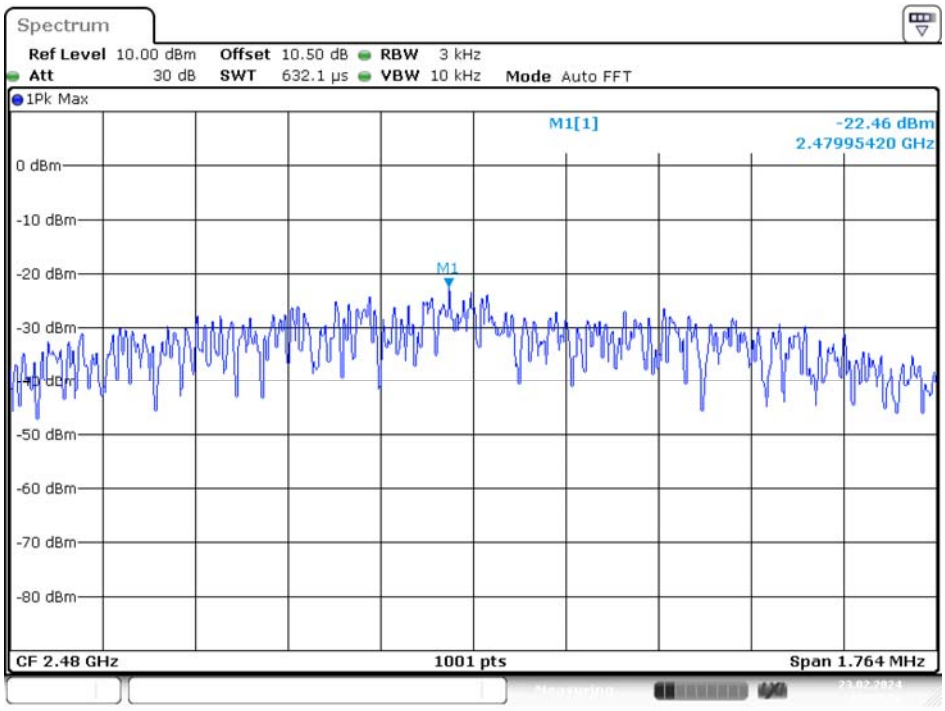
Middle Channel



Date: 23.FEB.2024 15:32:05

High Channel



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******* END OF REPORT *******