FCC Part 15.247

TEST REPORT

For

SUNHENG TECHNOLOGY CO., LTD.

No. 88, Ln. 211, Taiming Rd., Wuri Dist., Taichung City 414, Taiwan, R.O.C.

FCC ID: 2BCGY-SH04BT

Report Type: Original Report	**Product Type:** Mini Bluetooth Rechargeable Digital Torque Wrench

Report Producer : Coco Lin

Report Number : RXZ241206041RF01

Report Date : 2025-02-20

Reviewed By: Andy Shih

Prepared By: Bay Area Compliance Laboratories Corp.
(New Taipei Laboratory)
70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,
New Taipei City 221, Taiwan, R.O.C.
Tel: +886 (2) 2647 6898
Fax: +886 (2) 2647 6895
www.baclcorp.com.tw

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ241206041	RXZ241206041RF01	2025-02-20	Original Report	Coco Lin

TABLE OF CONTENTS

1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	SUNHENG TECHNOLOGY CO., LTD.
	No. 88, Ln. 211, Taiming Rd., Wuri Dist., Taichung City 414, Taiwan, R.O.C.
Brand(Trade) Name	SUNHENG
Product (Equipment)	Mini Bluetooth Rechargeable Digital Torque Wrench
Main Model Name	SH04BT All series
Series Model Name	SH-CBMQ06，SH-CBMQ15，SH-CBMQ25，SH-CBMQ60，SH-CBMB06，SH-CBMB15，SH-CBMB25，SH-CBMI06，SH-CBMI15，SH-CBMI25，SH-CBMI60，SH-CBSD50，SH-CBSD200，SH-CBSD400
Model Discrepancy	Please refer to the difference declaration letter provided by the Applicant.
Frequency Range	BLE Mode: 2402 ~ 2480 MHz
Maximum Conducted Peak Output Power	BLE Mode: -6.57 dBm
Modulation Technique	BLE Mode: GFSK
Transmit Data Rate	BLE Mode: 1 Mbps
Power Operation (Voltage Range)	DC 3.7Vdc from Battery, 5Vdc from Adapter
Received Date	2024/12/24

*All measurement and test data in this report was gathered from production sample serial number: RXZ241206041-1 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of *SUNHENG TECHNOLOGY CO., LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

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.
KDB 558074 D01 15.247 Meas Guidance v05r02

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		+/- 3.02 dB
RF output power, conducted		+/- 0.57 dB
Power Spectral Density, conducted		+/- 0.60 dB
Occupied Bandwidth		+/- 0.09 %
Unwanted Emissions, conducted		+/- 1.09 dB
Emissions, radiated	9 kHz~30 MHz	+/- 3.20 dB
	30 MHz~1 GHz	+/- 3.30 dB
	1 GHz~18 GHz	+/- 5.14 dB
	18 GHz~40 GHz	+/- 4.75 dB
Temperature		+/- 0.76 °C
Humidity		+/- 0.41 %

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	2025/1/11	20.1	61	1027.8	Aaron
Radiation Spurious Emissions	2025/1/7~2025/1/16	18.6~20.4	53~62	1020.3~1026	Nick
Duty Cycle	2025/1/6	22.2	57	1020.6	Wayne
Conducted Spurious Emissions	2025/1/6	22.2	57	1020.6	Wayne
6 dB Emission Bandwidth	2025/1/6	22.2	57	1020.6	Wayne
Maximum Output Power	2025/1/6	22.2	57	1020.6	Wayne
100 kHz Bandwidth of Frequency Band Edge	2025/1/6	22.2	57	1020.6	Wayne
Power Spectral Density	2025/1/6	22.2	57	1020.6	Wayne

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.

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 "RFTest_0720_boxed v1.0"

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

Test Frequency		Low	Middle	High
Power Level Setting	BLE 1M	FF	FF	FF

2.4 Support Equipment List and Details

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

2.5 External Cable List and Details

Description	Manufacturer	Cable length
Micro USB	BACL	1m

2.6 Test Mode

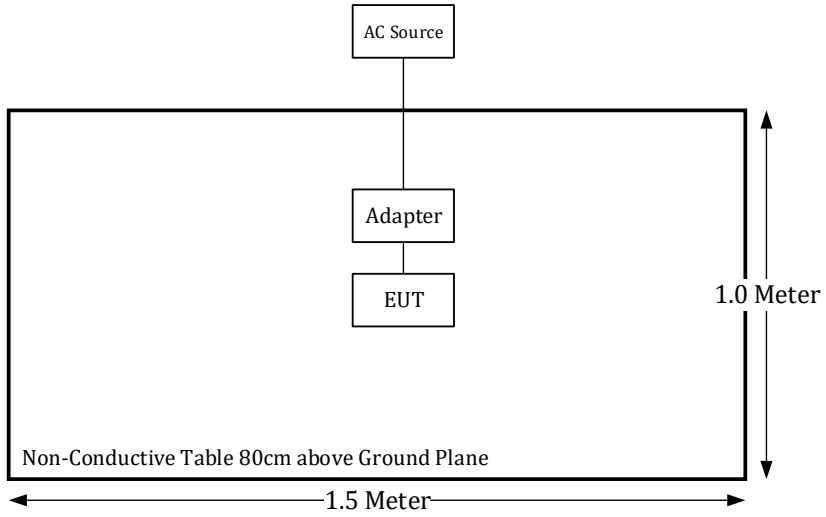
Full System (model: SH-CBMQ06) for all test item.

2.7 Block Diagram of Test Setup

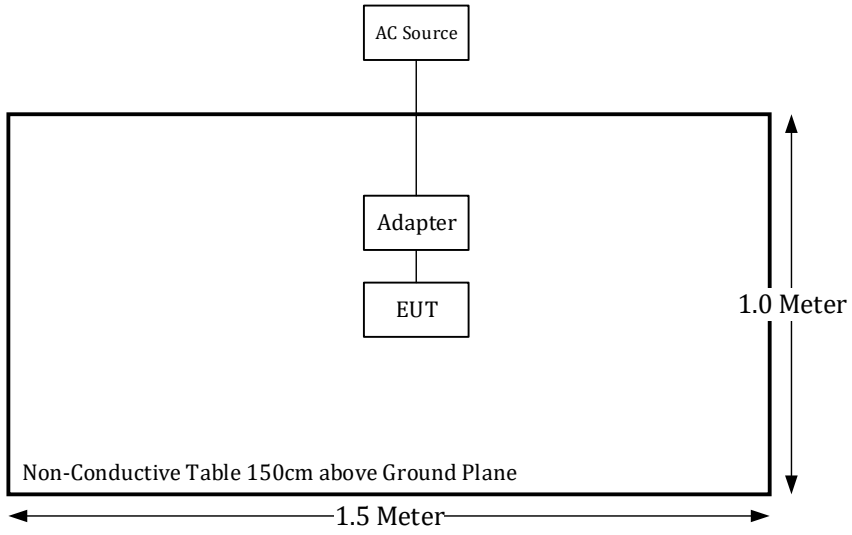
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

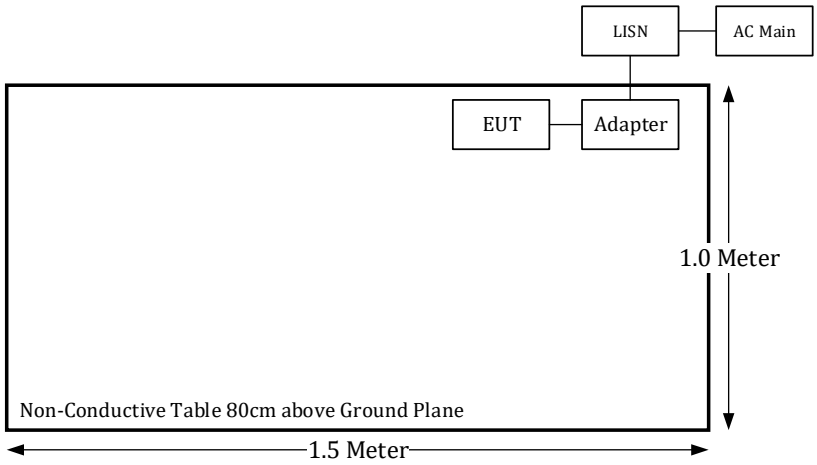
Below 1GHz:



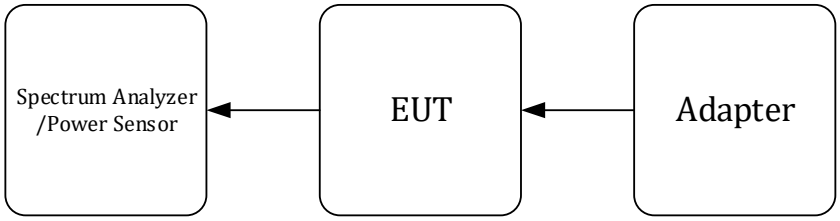
Above 1GHz:



Conduction:



Conducted:



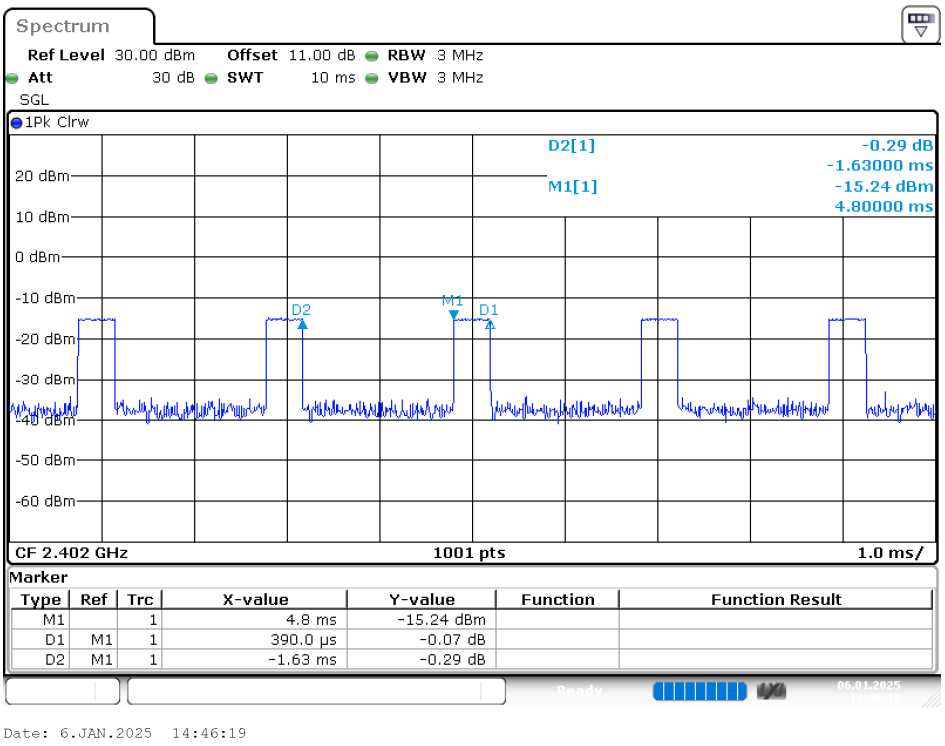
2.8 Duty Cycle

The duty cycle as below:

Radio Mode	Ton (ms)	Toff (ms)	Duty Cycle (%)	1/T (kHz)	1/T VBW setting (kHz)
BLE	0.39	1.63	19	2.56	3

Please refer to the following plots.

BLE Mode



3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1307(b)(3)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	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	ESW	100947	2024/5/24	2025/5/24
RF Cable	EMEC	EM-CB5D	1	2024/6/5	2025/6/5
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation 3M Room (966-A)					
Active Loop Antenna	ETS-Lindgren	6502	35796	2024/3/27	2025/3/27
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2024/1/19	2025/1/19
Double Ridged Guide Horn Antenna	A.H. system	SAS-571	1020	2024/5/21	2025/5/21
Horn Antenna	ETS-Lindgren	3116	62638	2024/8/30	2025/8/30
Preamplifier	Sonoma	310N	130601	2024/1/29	2025/1/29
Preamplifier	Channel	ERA-100M-18G-01D1748	EC2300051	2024/3/29	2025/3/29
Preamplifier	BACL	BACL-1313-A1840	4011511	2024/2/1	2025/2/1
EMI Test Receiver	Rohde & Schwarz(R&S)	ESR3	102099	2024/6/24	2025/6/24
Spectrum Analyzer	Rohde & Schwarz	FSV40	101939	2024/3/27	2025/3/27
Microflex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2024/1/23	2025/1/23
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2024/1/23	2025/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2024/12/20	2025/12/20
Cable	EMC	EMC105-SM-SM-10000	201003	2024/1/23	2025/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2024/12/20	2025/12/20
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2024/1/23	2025/1/23
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2024/1/23	2025/1/23
Band-stop filter	Woken	STI15-9831	STI15-9831-1	2024/10/19	2025/10/19
High-pass filter	XINGBOKEJI	XBLBQ-GTA54	200108-3-2	2024/10/19	2025/10/19
Software	AUDIX	E3	18621a	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz(R&S)	FSV40	101204	2024/5/30	2025/5/30
Cable	UTIFLEX	UFA210A	9435	2024/10/1	2025/10/1
Power Sensor	Boonton	RTP5006	11037	2024/5/21	2025/5/21
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

ccording 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 λ/2π, 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 λ/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)
BLE	2402	-6	-5.3	5	0.25

§ 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

Note: The Tune-up output power was declared by the Applicant.

Result: The device meets the exemption requirement.

6 FCC §15.203 – Antenna Requirements

6.1 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.

6.2 Antenna Information

Manufacturer	Model	Type	Antenna Gain
SUNHENG TECHNOLOGY CO., LTD.	SH-05BT-ANT	PCB Antenna	-5.3 dBi

The antenna is permanently attached to the device.

Result: Compliance

7 FCC §15.207(a) – AC Line Conducted Emissions

7.1 Applicable Standard

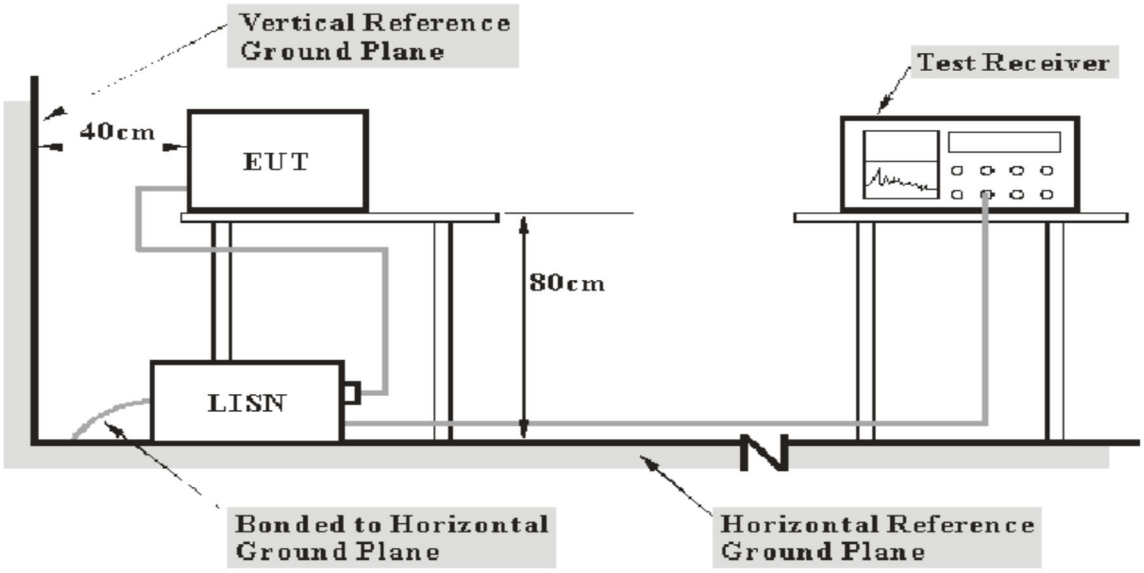
According to §15.207

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.

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.

7.2 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 limits.

7.3 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

7.4 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.

7.5 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

7.6 Test Results

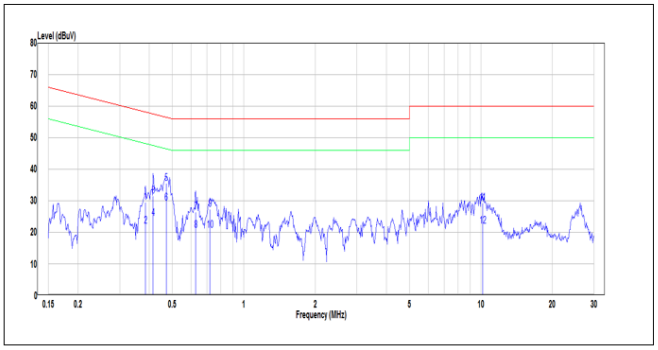
Test Mode: Transmitting

Main: AC120 V, 60 Hz

(Worst case is High Channel)

Description: **RBW 9kHz VBW 30kHz**

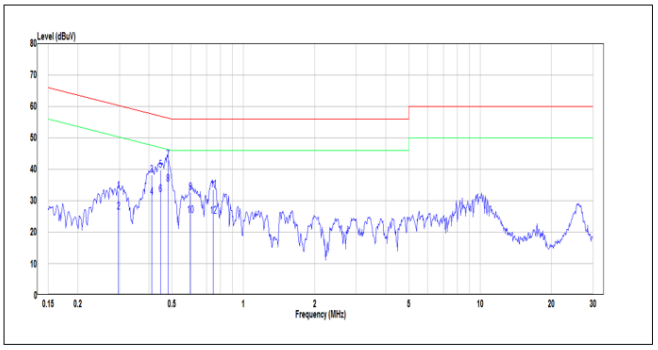
2025-01-11 02:49:05



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)		
1	0.385	19.46	10.17	29.64	58.17	-28.53	QP	Line
2	0.385	11.79	10.17	21.96	48.17	-26.21	Average	Line
3	0.415	21.42	10.19	31.62	57.55	-25.93	QP	Line
4	0.415	14.25	10.19	24.45	47.55	-23.10	Average	Line
5	0.471	25.36	10.24	35.60	56.49	-20.90	QP	Line
6	0.471	19.13	10.24	29.37	46.49	-17.12	Average	Line
7	0.627	16.21	10.28	26.49	56.00	-29.51	QP	Line
8	0.627	10.31	10.28	20.60	46.00	-25.40	Average	Line
9	0.720	16.96	10.30	27.26	56.00	-28.74	QP	Line
10	0.720	10.46	10.30	20.75	46.00	-25.25	Average	Line
11	10.179	18.97	10.45	29.42	60.00	-30.58	QP	Line
12	10.179	11.49	10.45	21.95	50.00	-28.05	Average	Line

Description: **RBW 9kHz VBW 30kHz**

2025-01-11 02:50:46



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark	Phase
	(MHz)	dBuV	Factor(dB)	dBuV	dBuV	(dB)		
1	0.297	22.97	10.11	33.08	60.32	-27.24	QP	Neutral
2	0.297	16.25	10.11	26.36	50.32	-23.96	Average	Neutral
3	0.410	28.09	10.20	38.29	57.64	-19.35	QP	Neutral
4	0.410	20.90	10.20	31.10	47.64	-16.54	Average	Neutral
5	0.447	29.50	10.23	39.73	56.93	-17.20	QP	Neutral
6	0.447	21.75	10.23	31.98	46.93	-14.95	Average	Neutral
7	0.481	32.71	10.26	42.97	56.32	-13.35	QP	Neutral
8	0.481	25.07	10.26	35.32	46.32	-10.99	Average	Neutral
9	0.598	22.36	10.29	32.65	56.00	-23.35	QP	Neutral
10	0.598	15.01	10.29	25.30	46.00	-20.70	Average	Neutral
11	0.747	23.17	10.31	33.48	56.00	-22.52	QP	Neutral
12	0.747	14.82	10.31	25.13	46.00	-20.87	Average	Neutral

Note:

Result = Reading + Factor

Over Limit = Result – Limit Line

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

8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

8.1 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 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): 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.

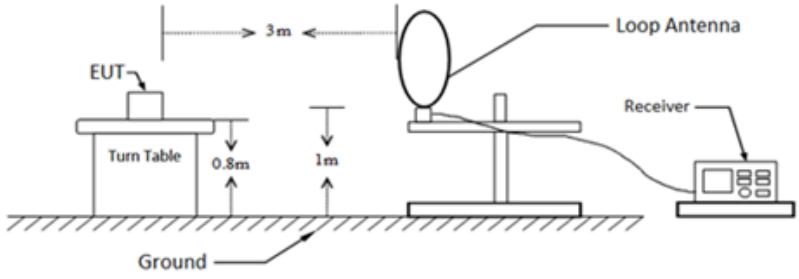
According to ANSI C63.10-2013, section 5.3.3

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).

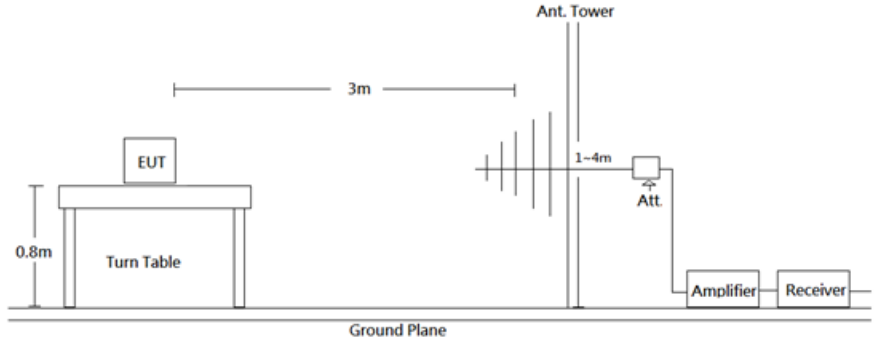
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the 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).

8.2 EUT Setup

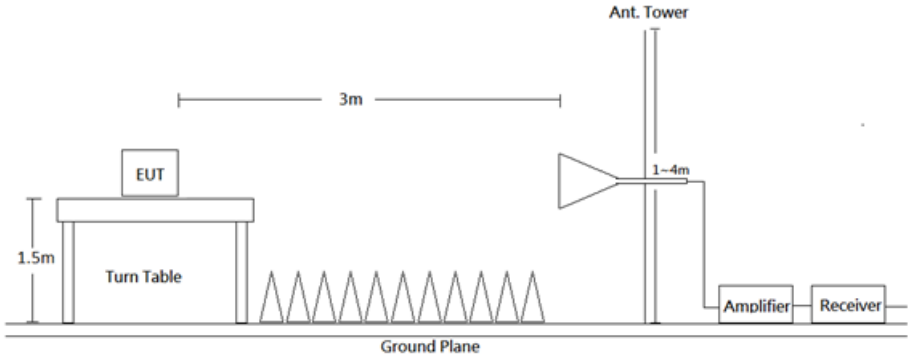
9kHz-30MHz:



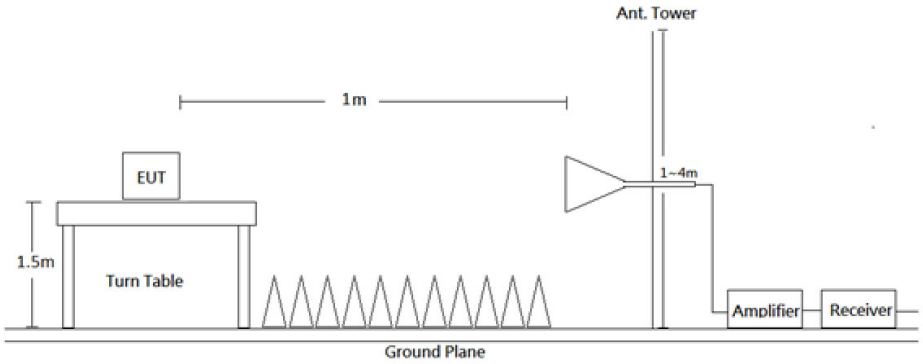
30MHz-1GHz:



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 and FCC 15.247 Limits.

8.3 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	Detector
9 kHz - 150 kHz	300 Hz	1 kHz	/	QP/AV	QP/AV
150 kHz - 30 MHz	10 kHz	30 kHz	/	QP/AV	QP/AV
30-1000 MHz	120 kHz	300 kHz	/	QP	QP
Above 1 GHz	Pre-scan :				
	1 MHz	3 MHz	/	PK	PK
	1 MHz	10 kHz	>98%	Ave	PK
	1 MHz	≥ 1/Ton, not less than 3 kHz	<98%	Ave	PK
	Final measurement for emission identified during pre-scan :				
	1 MHz	3 MHz	/	PK	PK
	1 MHz	10 Hz	>98%	Ave	PK
	1 MHz	≥ 1/Ton	<98%	Ave	PK

Note: Ton 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.

8.4 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.

8.5 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

8.6 Test Results

Test Mode: Transmitting

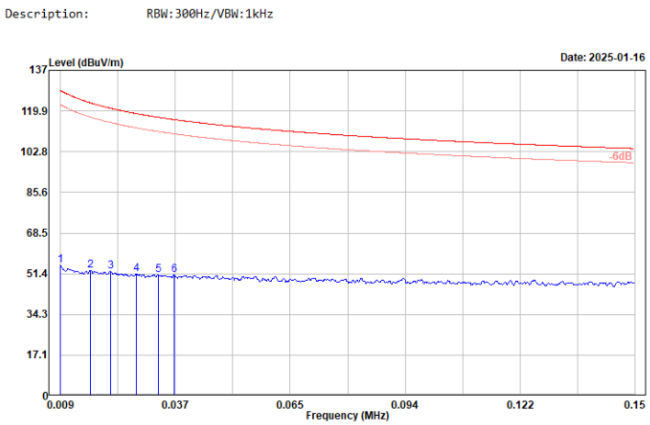
(Pre-scan with three orthogonal axis, and worse case as Z axis.)

9kHz-30MHz:

(worst case is high channel)

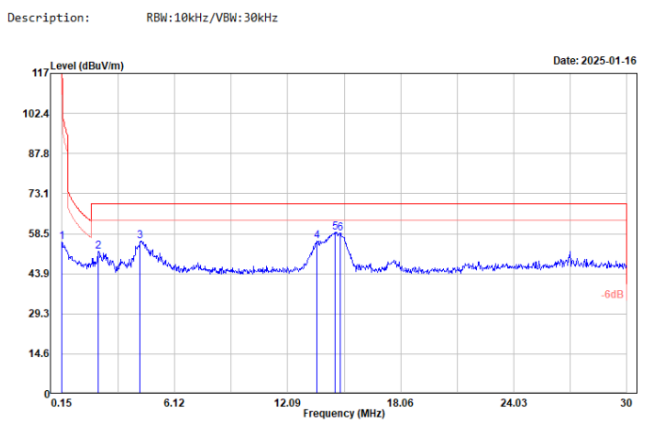
(Pre-scan using three directional polarities, worst case as parallel.)

9kHz-150kHz



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.009	36.97	17.81	54.78	128.52	-73.74	100	360	Average
0.016	37.38	15.51	52.89	123.34	-70.45	100	360	Average
0.021	37.29	14.93	52.22	121.05	-68.83	100	360	Average
0.028	37.23	14.04	51.27	118.78	-67.51	100	360	Average
0.033	37.56	13.47	51.03	117.24	-66.21	100	360	Average
0.037	37.58	13.17	50.75	116.26	-65.51	100	360	Average

150kHz-30MHz

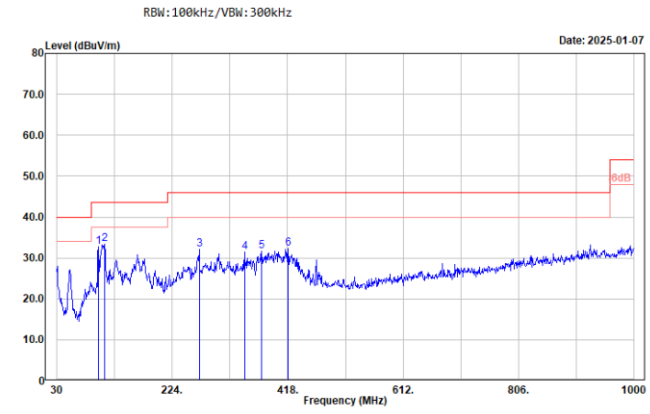


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.150	44.05	11.37	55.42	104.08	-48.66	100	0	Average
2.060	41.42	10.72	52.14	69.54	-17.40	100	0	QP
4.299	45.08	10.62	55.70	69.54	-13.84	100	0	QP
13.612	44.30	11.55	55.85	69.54	-13.69	100	0	QP
14.597	47.55	11.58	59.13	69.54	-10.41	100	0	QP
14.866	47.20	11.59	58.79	69.54	-10.75	100	0	QP

30MHz-1GHz:

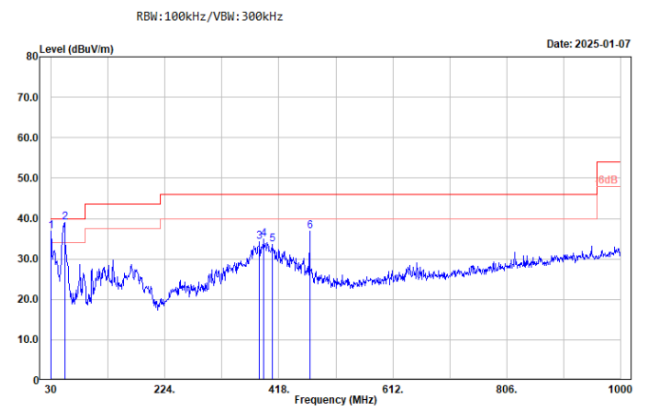
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
99.840	45.98	-13.16	32.82	43.50	-10.68	100	81	QP
110.510	44.13	-10.72	33.41	43.50	-10.09	100	57	QP
269.590	41.41	-9.40	32.01	46.00	-13.99	100	266	QP
345.250	39.64	-8.18	31.46	46.00	-14.54	100	240	QP
374.350	39.18	-7.51	31.67	46.00	-14.33	100	247	QP
418.970	38.56	-6.29	32.27	46.00	-13.73	100	266	QP

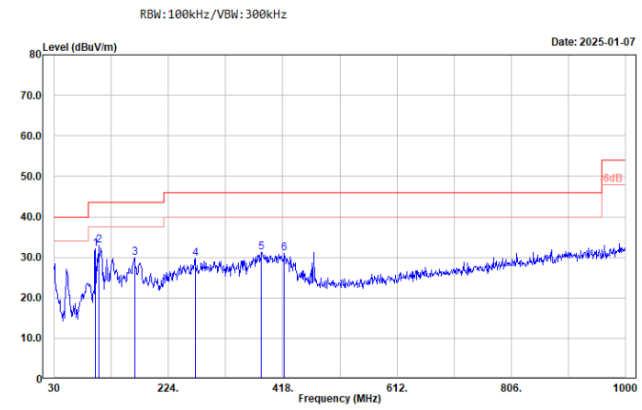
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.000	39.47	-2.53	36.94	40.00	-3.06	100	277	QP
53.280	54.66	-15.70	38.96	40.00	-1.04	100	169	QP
385.020	41.47	-7.17	34.30	46.00	-11.70	100	173	QP
391.810	41.82	-6.90	34.92	46.00	-11.08	100	169	QP
406.360	40.25	-6.64	33.61	46.00	-12.39	100	204	QP
470.380	41.88	-5.06	36.82	46.00	-9.18	100	32	QP

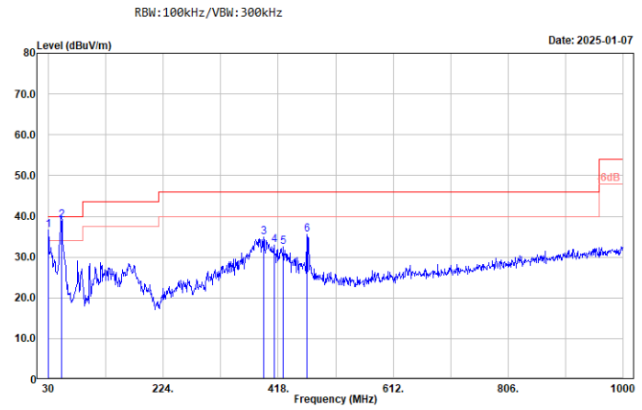
Middle channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
99.840	45.15	-13.16	31.99	43.50	-11.51	100	87	QP
105.660	44.61	-11.60	33.01	43.50	-10.49	100	83	QP
166.770	40.76	-10.78	29.98	43.50	-13.52	100	290	QP
269.590	39.09	-9.40	29.69	46.00	-16.31	100	302	QP
382.110	38.43	-7.24	31.19	46.00	-14.81	100	256	QP
420.910	37.32	-6.22	31.10	46.00	-14.90	100	264	QP

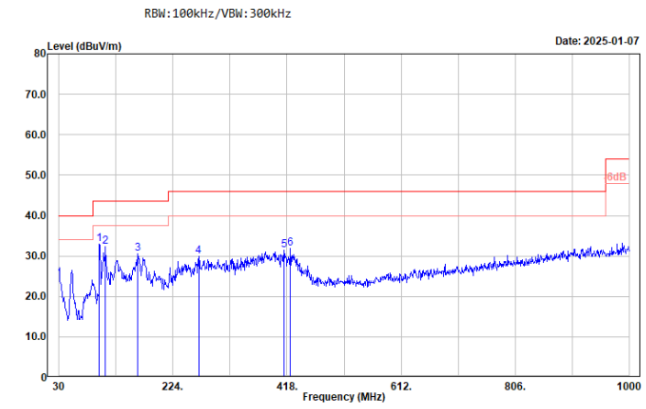
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.000	39.13	-2.53	36.60	40.00	-3.40	100	180	QP
52.310	54.64	-15.60	39.04	40.00	-0.96	100	176	QP
393.750	41.82	-6.82	35.00	46.00	-11.00	100	180	QP
411.210	39.54	-6.54	33.00	46.00	-13.00	100	173	QP
426.730	38.46	-6.02	32.44	46.00	-13.56	100	188	QP
466.500	40.71	-5.15	35.56	46.00	-10.44	100	196	QP

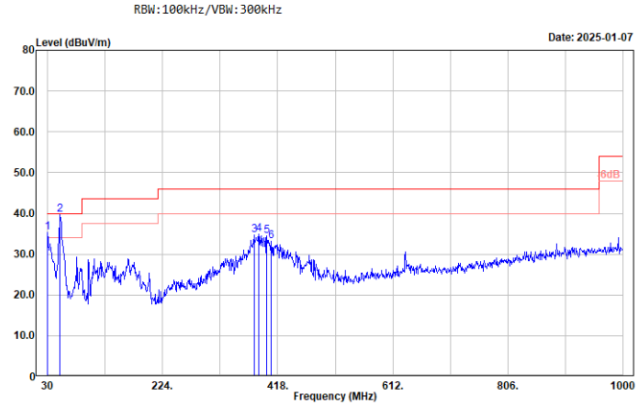
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
98.870	46.41	-13.36	33.05	43.50	-10.45	100	79	QP
109.540	43.00	-10.77	32.23	43.50	-11.27	100	244	QP
163.860	41.03	-10.49	30.54	43.50	-12.96	100	304	QP
267.650	39.43	-9.52	29.91	46.00	-16.09	100	236	QP
413.150	37.98	-6.50	31.48	46.00	-14.52	100	262	QP
423.820	38.03	-6.10	31.93	46.00	-14.07	100	259	QP

Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.000	37.96	-2.53	35.43	40.00	-4.57	100	320	QP
51.340	54.95	-15.37	39.58	40.00	-0.42	100	195	QP
378.230	42.08	-7.34	34.74	46.00	-11.26	100	184	QP
385.990	42.04	-7.13	34.91	46.00	-11.09	100	180	QP
399.570	41.21	-6.77	34.44	46.00	-11.56	100	184	QP
407.330	39.83	-6.62	33.21	46.00	-12.79	100	191	QP

Level = Reading + Factor.

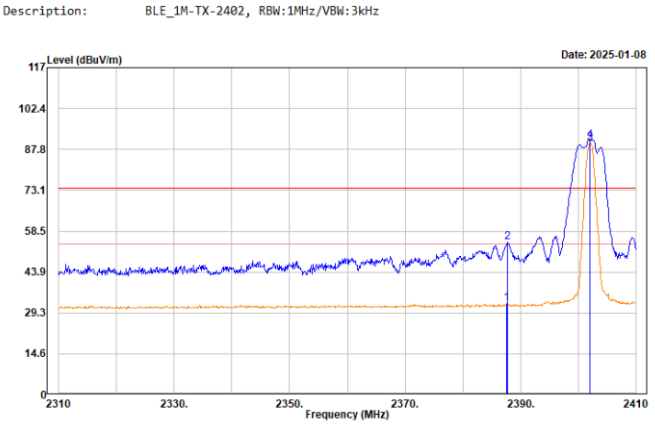
Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Band-Edge:

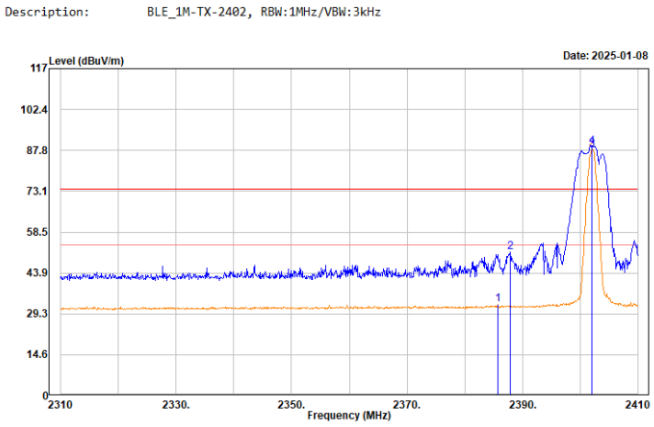
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2387.600	43.76	-11.10	32.66	54.00	-21.34	154	137	Average
2387.800	65.52	-11.10	54.42	74.00	-19.58	154	137	Peak
2402.000	101.09	-11.02	90.07			154	137	Average
2402.000	101.96	-11.02	90.94			154	137	Peak

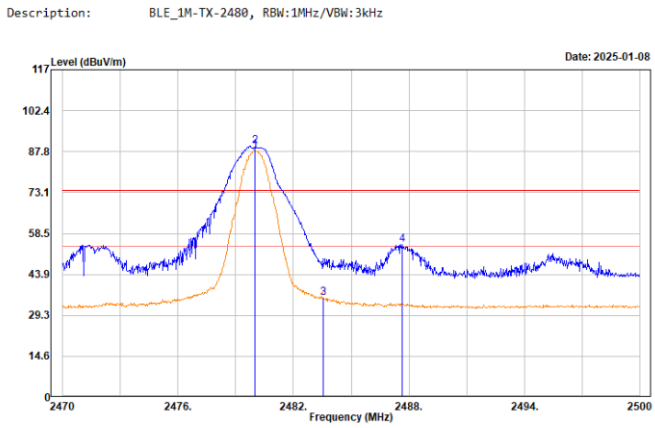
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2385.700	43.78	-11.13	32.65	54.00	-21.35	341	185	Average
2387.900	62.33	-11.10	51.23	74.00	-22.77	341	185	Peak
2402.000	99.25	-11.02	88.23			341	185	Average
2402.000	100.22	-11.02	89.20			341	185	Peak

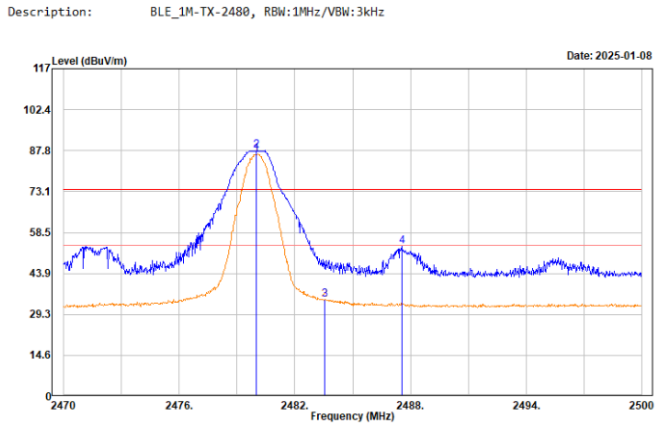
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	98.69	-10.66	88.03			168	132	Average
2480.000	100.31	-10.66	89.65			168	132	Peak
2483.560	46.01	-10.61	35.40	54.00	-18.60	168	132	Average
2487.670	65.13	-10.57	54.56	74.00	-19.44	168	132	Peak

Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	97.09	-10.66	86.43			374	180	Average
2480.000	98.44	-10.66	87.78			374	180	Peak
2483.530	45.27	-10.61	34.66	54.00	-19.34	374	180	Average
2487.550	64.06	-10.57	53.49	74.00	-20.51	374	180	Peak

Level = Reading + Factor.

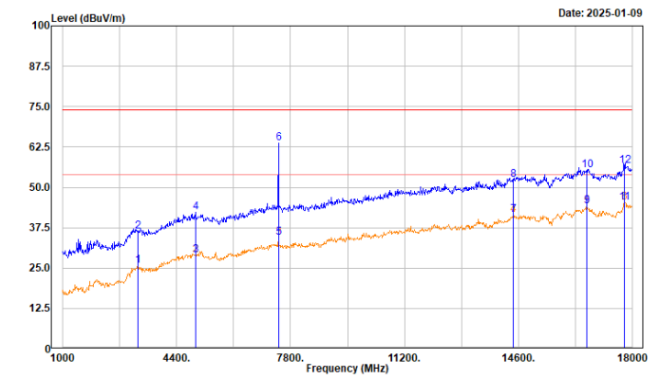
Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

1GHz-18GHz:

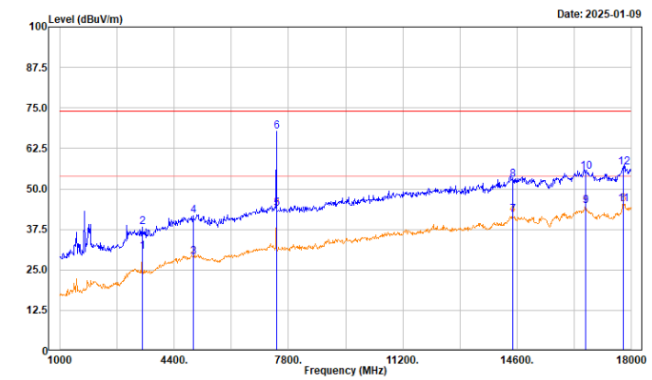
(worst case is high channel)

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3244.000	32.88	-7.23	25.65	54.00	-28.35	150	147	Average
3244.000	43.52	-7.23	36.29	74.00	-37.71	150	147	Peak
4960.000	32.69	-3.67	29.02	54.00	-24.98	135	159	Average
4960.000	46.02	-3.67	42.35	74.00	-31.65	135	159	Peak
7440.000	34.20	0.28	34.48	54.00	-19.52	124	178	Average
7440.000	63.28	0.28	63.56	74.00	-10.44	124	178	Peak
14447.000	30.10	11.31	41.41	54.00	-12.59	150	65	Average
14447.000	41.02	11.31	52.33	74.00	-21.67	150	65	Peak
16640.000	32.03	12.04	44.07	54.00	-9.93	150	46	Average
16640.000	43.14	12.04	55.18	74.00	-18.82	150	46	Peak
17762.000	32.35	12.83	45.18	54.00	-8.82	150	162	Average
17762.000	43.91	12.83	56.74	74.00	-17.26	150	162	Peak

Vertical

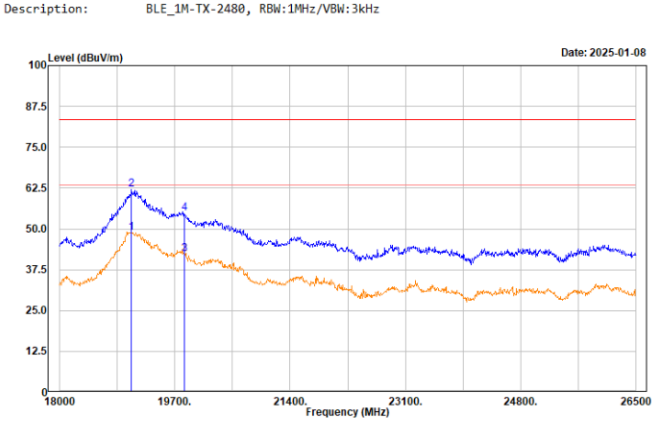


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3448.000	38.64	-8.14	30.50	54.00	-23.50	150	352	Average
3448.000	46.23	-8.14	38.09	74.00	-35.91	150	352	Peak
4960.000	32.80	-3.67	29.13	54.00	-24.87	132	85	Average
4960.000	45.45	-3.67	41.78	74.00	-32.22	132	85	Peak
7440.000	43.62	0.28	43.90	54.00	-10.10	111	51	Average
7440.000	67.55	0.28	67.83	74.00	-6.17	111	51	Peak
14464.000	30.75	11.36	42.11	54.00	-11.89	150	155	Average
14464.000	41.47	11.36	52.83	74.00	-21.17	150	155	Peak
16640.000	32.74	12.04	44.78	54.00	-9.22	150	9	Average
16640.000	43.19	12.04	55.23	74.00	-18.77	150	9	Peak
17762.000	32.48	12.83	45.31	54.00	-8.69	150	13	Average
17762.000	43.71	12.83	56.54	74.00	-17.46	150	13	Peak

18GHz-26.5GHz:

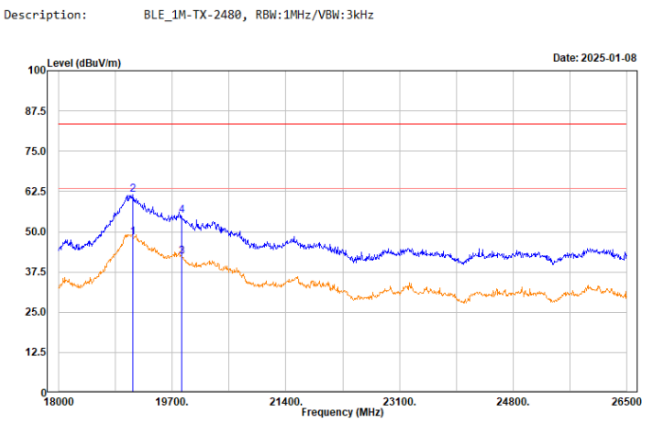
(worst case is high channel)

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19062.500	30.93	17.98	48.91	63.50	-14.59	150	155	Average
19062.500	44.18	17.98	62.16	83.50	-21.34	150	155	Peak
19840.000	31.00	11.37	42.37	63.50	-21.13	150	81	Average
19840.000	43.42	11.37	54.79	83.50	-28.71	150	81	Peak

Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19113.500	30.77	17.56	48.33	63.50	-15.17	150	27	Average
19113.500	44.06	17.56	61.62	83.50	-21.88	150	27	Peak
19840.000	30.84	11.37	42.21	63.50	-21.29	150	234	Average
19840.000	43.60	11.37	54.97	83.50	-28.53	150	234	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

For 18-26.5GHz Convert the test distance limit of 3 meters to a limit of 1 meter:

Conversion factor = 20 log (1m/3m) = 9.5 dB,

Average Limit = 54+9.5 = 63.50 dBuV/m@1m , Peak Limit = 63.50+20 = 83.50 dBuV/m@1m

Above 1GHz

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3941.000	33.06	-6.44	26.62	54.00	-27.38	150	142	Average
3941.000	45.23	-6.44	38.79	74.00	-35.21	150	142	Peak
4804.000	32.54	-4.09	28.45	54.00	-25.55	100	190	Average
4804.000	47.71	-4.09	43.62	74.00	-30.38	100	190	Peak
7206.000	31.59	0.43	32.02	54.00	-21.98	133	221	Average
7206.000	61.48	0.43	61.91	74.00	-12.09	133	221	Peak
14447.000	30.17	11.31	41.48	54.00	-12.52	150	303	Average
14447.000	41.87	11.31	53.18	74.00	-20.82	150	303	Peak
16623.000	31.94	12.07	44.01	54.00	-9.99	150	204	Average
16623.000	43.60	12.07	55.67	74.00	-18.33	150	204	Peak
17796.000	32.54	12.88	45.42	54.00	-8.58	150	118	Average
17796.000	44.86	12.88	57.74	74.00	-16.26	150	118	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3448.000	38.39	-8.14	30.25	54.00	-23.75	150	354	Average
3448.000	45.19	-8.14	37.05	74.00	-36.95	150	354	Peak
4804.000	36.06	-4.09	31.97	54.00	-22.03	155	199	Average
4804.000	46.55	-4.09	42.46	74.00	-31.54	155	199	Peak
7206.000	31.34	0.43	31.77	54.00	-22.23	108	50	Average
7206.000	66.63	0.43	67.06	74.00	-6.94	108	50	Peak
14430.000	30.35	11.26	41.61	54.00	-12.39	150	100	Average
14430.000	41.66	11.26	52.92	74.00	-21.08	150	100	Peak
16623.000	32.61	12.07	44.68	54.00	-9.32	150	236	Average
16623.000	42.81	12.07	54.88	74.00	-19.12	150	236	Peak
17762.000	32.62	12.83	45.45	54.00	-8.55	150	29	Average
17762.000	44.62	12.83	57.45	74.00	-16.55	150	29	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4128.000	33.59	-5.96	27.63	54.00	-26.37	150	119	Average
4128.000	44.59	-5.96	38.63	74.00	-35.37	150	119	Peak
4880.000	33.52	-3.54	29.98	54.00	-24.02	132	167	Average
4880.000	49.41	-3.54	45.87	74.00	-28.13	132	167	Peak
7320.000	31.71	0.53	32.24	54.00	-21.76	118	164	Average
7320.000	63.29	0.53	63.82	74.00	-10.18	118	164	Peak
14447.000	30.63	11.31	41.94	54.00	-12.06	150	170	Average
14447.000	41.98	11.31	53.29	74.00	-20.71	150	170	Peak
16640.000	31.96	12.04	44.00	54.00	-10.00	150	269	Average
16640.000	43.89	12.04	55.93	74.00	-18.07	150	269	Peak
17779.000	32.84	12.85	45.69	54.00	-8.31	150	107	Average
17779.000	44.60	12.85	57.45	74.00	-16.55	150	107	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3448.000	37.19	-8.14	29.05	54.00	-24.95	150	352	Average
3448.000	45.77	-8.14	37.63	74.00	-36.37	150	352	Peak
4880.000	32.97	-3.54	29.43	54.00	-24.57	287	201	Average
4880.000	45.36	-3.54	41.82	74.00	-32.18	287	201	Peak
7320.000	31.53	0.53	32.06	54.00	-21.94	123	46	Average
7320.000	63.29	0.53	63.82	74.00	-10.18	123	46	Peak
14379.000	30.52	11.11	41.63	54.00	-12.37	150	18	Average
14379.000	43.22	11.11	54.33	74.00	-19.67	150	18	Peak
16657.000	32.15	11.99	44.14	54.00	-9.86	150	360	Average
16657.000	42.72	11.99	54.71	74.00	-19.29	150	360	Peak
17813.000	32.71	12.95	45.66	54.00	-8.34	150	18	Average
17813.000	43.47	12.95	56.42	74.00	-17.58	150	18	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3244.000	32.88	-7.23	25.65	54.00	-28.35	150	147	Average
3244.000	43.52	-7.23	36.29	74.00	-37.71	150	147	Peak
4960.000	32.69	-3.67	29.02	54.00	-24.98	135	159	Average
4960.000	46.02	-3.67	42.35	74.00	-31.65	135	159	Peak
7440.000	34.20	0.28	34.48	54.00	-19.52	124	178	Average
7440.000	63.28	0.28	63.56	74.00	-10.44	124	178	Peak
14447.000	30.10	11.31	41.41	54.00	-12.59	150	65	Average
14447.000	41.02	11.31	52.33	74.00	-21.67	150	65	Peak
16640.000	32.03	12.04	44.07	54.00	-9.93	150	46	Average
16640.000	43.14	12.04	55.18	74.00	-18.82	150	46	Peak
17762.000	32.35	12.83	45.18	54.00	-8.82	150	162	Average
17762.000	43.91	12.83	56.74	74.00	-17.26	150	162	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
3448.000	38.64	-8.14	30.50	54.00	-23.50	150	352	Average
3448.000	46.23	-8.14	38.09	74.00	-35.91	150	352	Peak
4960.000	32.80	-3.67	29.13	54.00	-24.87	132	85	Average
4960.000	45.45	-3.67	41.78	74.00	-32.22	132	85	Peak
7440.000	43.62	0.28	43.90	54.00	-10.10	111	51	Average
7440.000	67.55	0.28	67.83	74.00	-6.17	111	51	Peak
14464.000	30.75	11.36	42.11	54.00	-11.89	150	155	Average
14464.000	41.47	11.36	52.83	74.00	-21.17	150	155	Peak
16640.000	32.74	12.04	44.78	54.00	-9.22	150	9	Average
16640.000	43.19	12.04	55.23	74.00	-18.77	150	9	Peak
17762.000	32.48	12.83	45.31	54.00	-8.69	150	13	Average
17762.000	43.71	12.83	56.54	74.00	-17.46	150	13	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

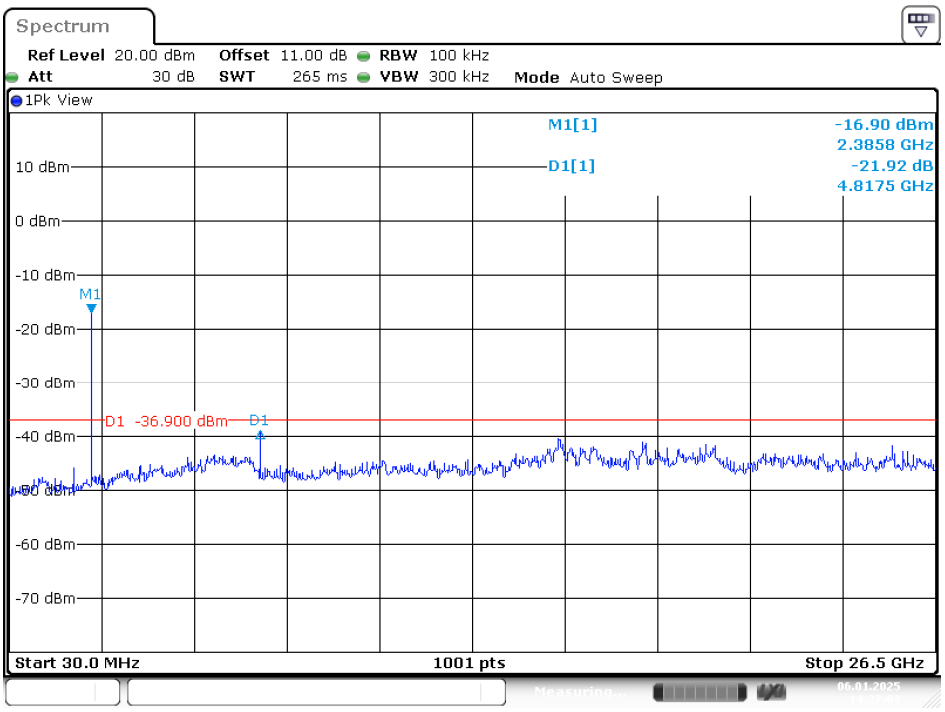
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	21.92	≥ 20	PASS
Mid	2440	20.43	≥ 20	PASS
High	2480	21.97	≥ 20	PASS

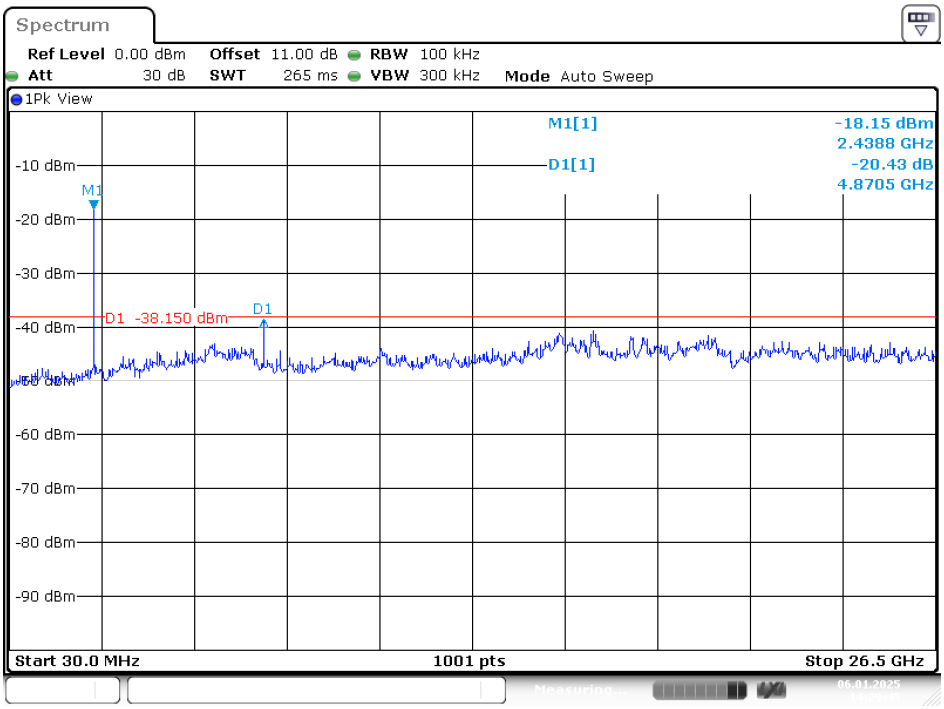
BLE Mode

Low Channel



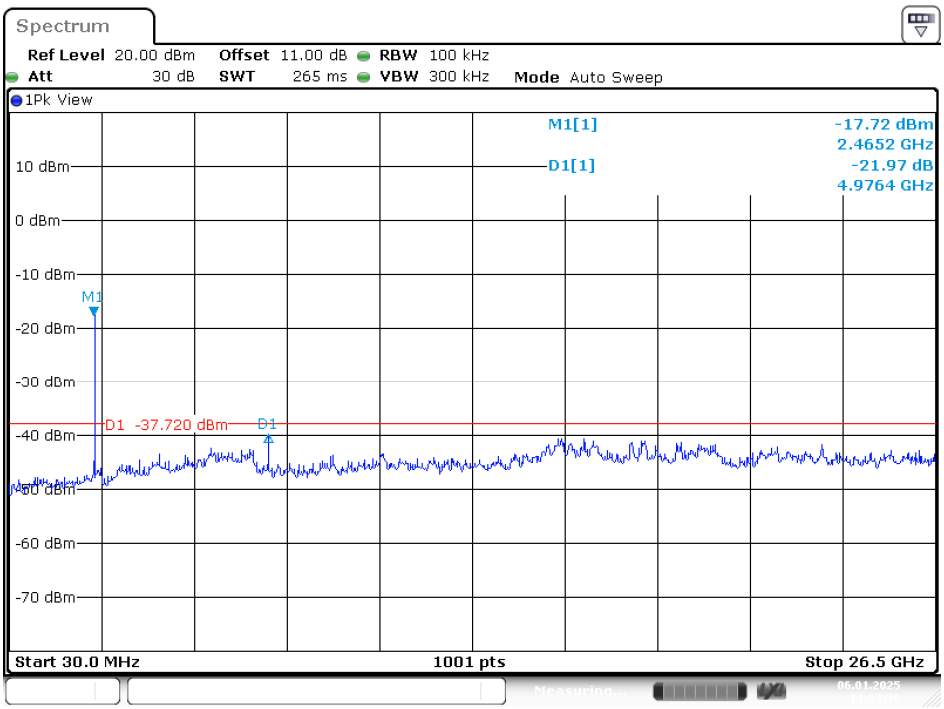
Date: 6.JAN.2025 14:27:04

Middle Channel



Date: 6.JAN.2025 14:29:46

High Channel



Date: 6.JAN.2025 14:33:36

9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

9.1 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.

9.2 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.

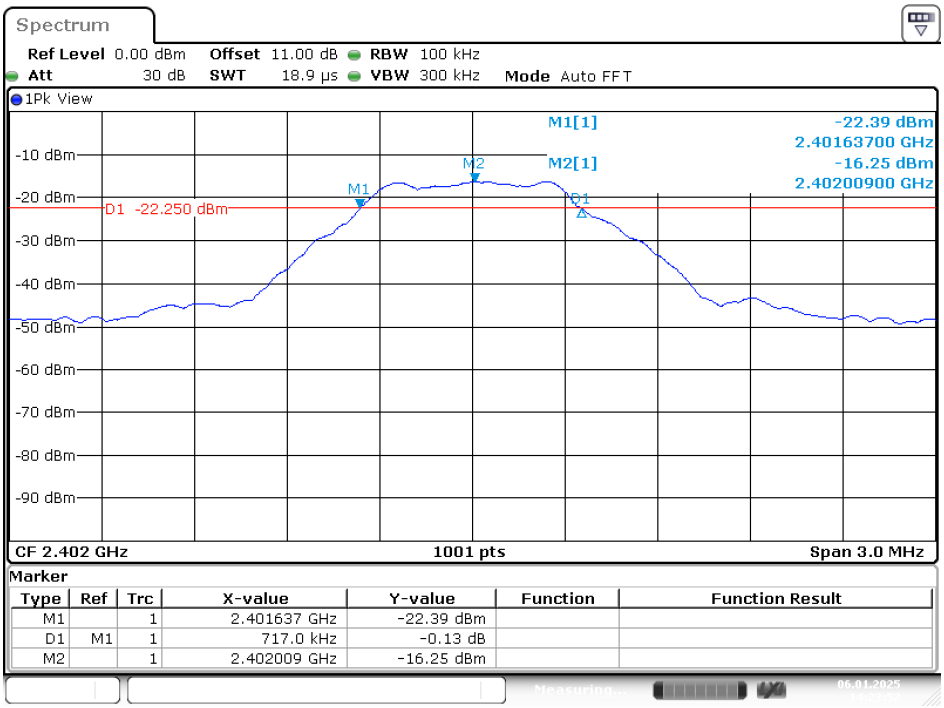
9.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
Low	2402	717	> 500	Compliance
Middle	2440	738	> 500	Compliance
High	2480	747	> 500	Compliance

Please refer to the following plots

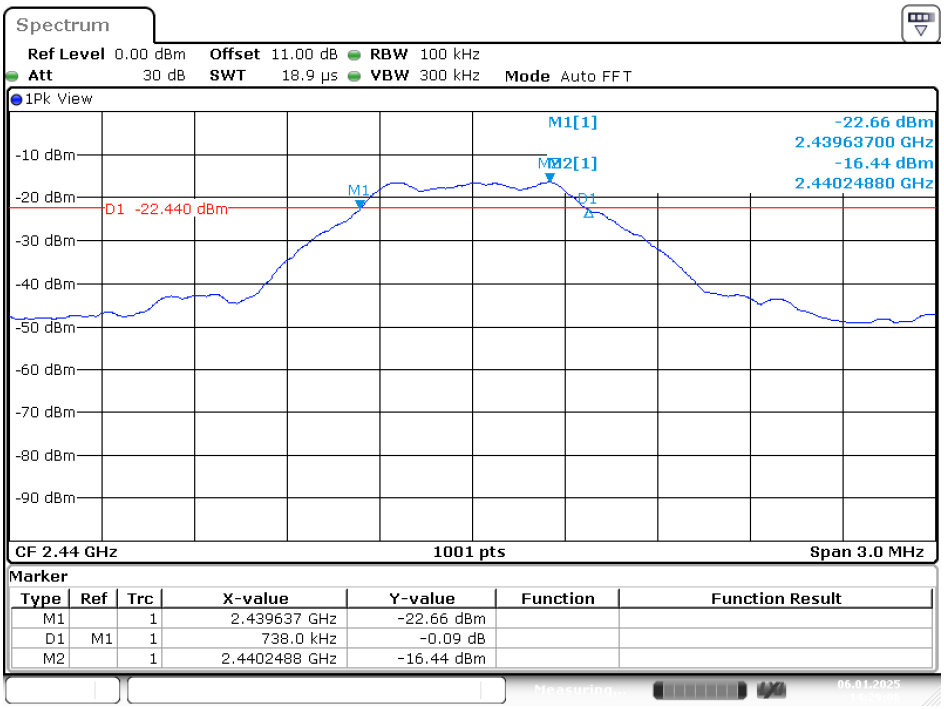
BLE Mode

Low Channel



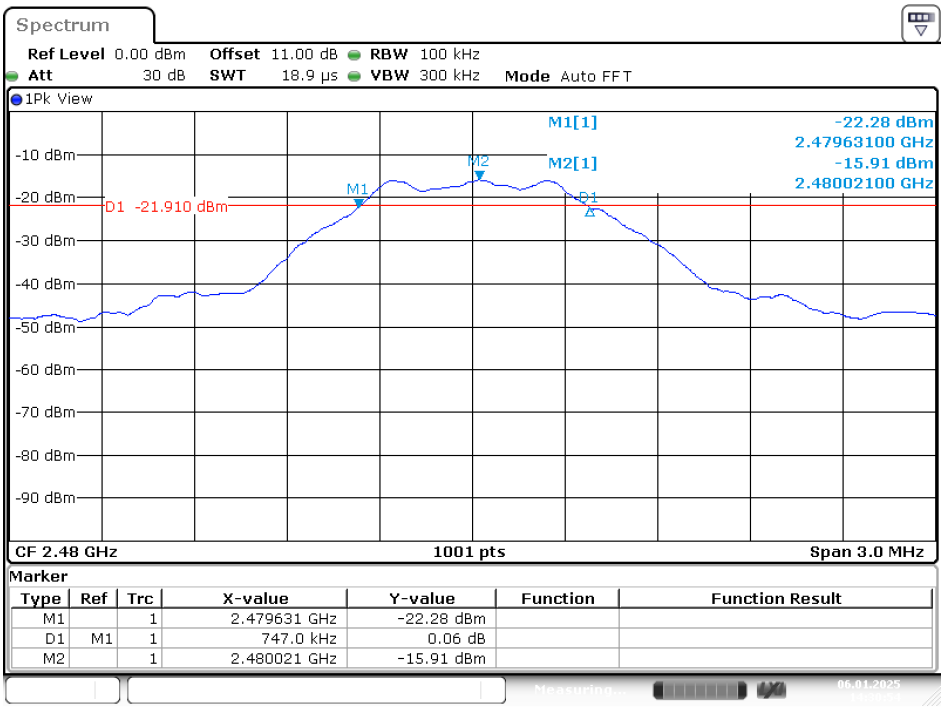
Date: 6.JAN.2025 14:23:53

Middle Channel



Date: 6.JAN.2025 14:29:06

High Channel



Date: 6.JAN.2025 14:30:54

10 FCC §15.247(b)(3) – Maximum Output Power

10.1 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.

10.2 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.

10.3 Test Results

Conducted Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Power (W)	Limit (W)	Result
BLE 1M Mode					
Low	2402	-6.79	0.0002	1	PASS
Middle	2440	-7.43	0.0002	1	PASS
High	2480	-6.57	0.0002	1	PASS

11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

11.1 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)).

11.2 Test Procedure

According to ANSI C63.10-2013 Section 11.11

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

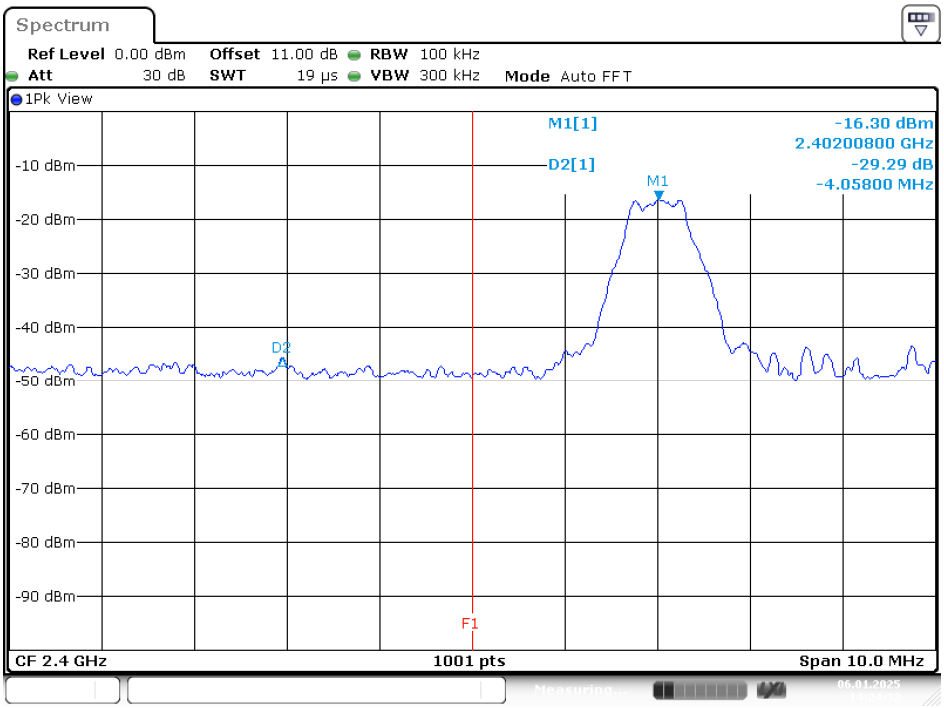
11.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	29.29	≥ 20	PASS
High	2480	30.92	≥ 20	PASS

Please refer to the following plots

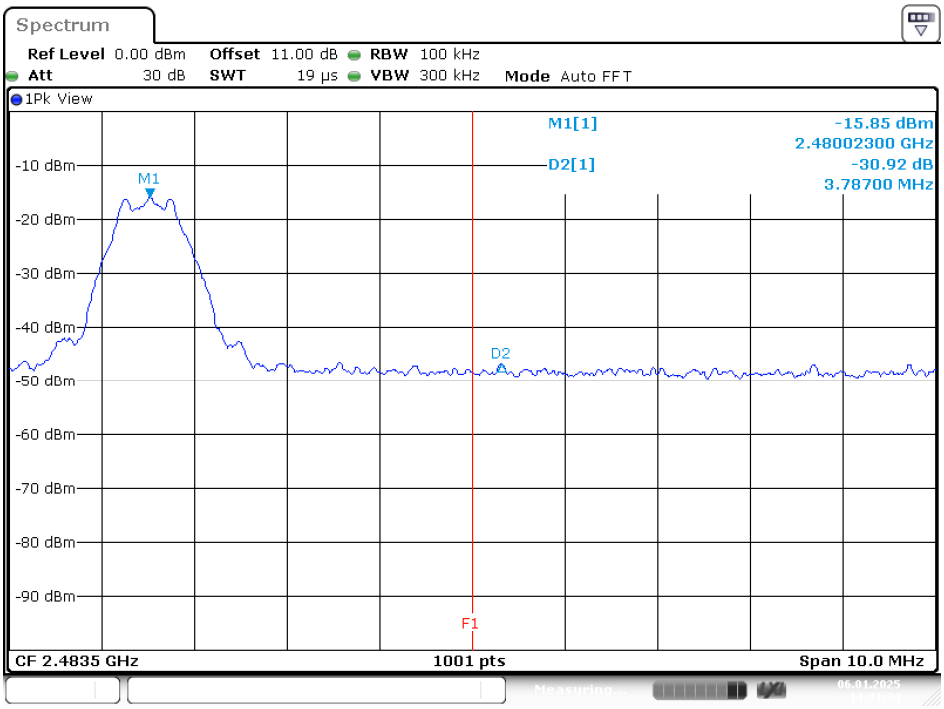
BLE Mode

Band Edge, Left Side



Date: 6.JAN.2025 14:24:33

Band Edge, Right Side



Date: 6.JAN.2025 14:31:34

12 FCC §15.247(e) – Power Spectral Density

12.1 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.

12.2 Test Procedure

According to ANSI C63.10-2013, section 11.10.2

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

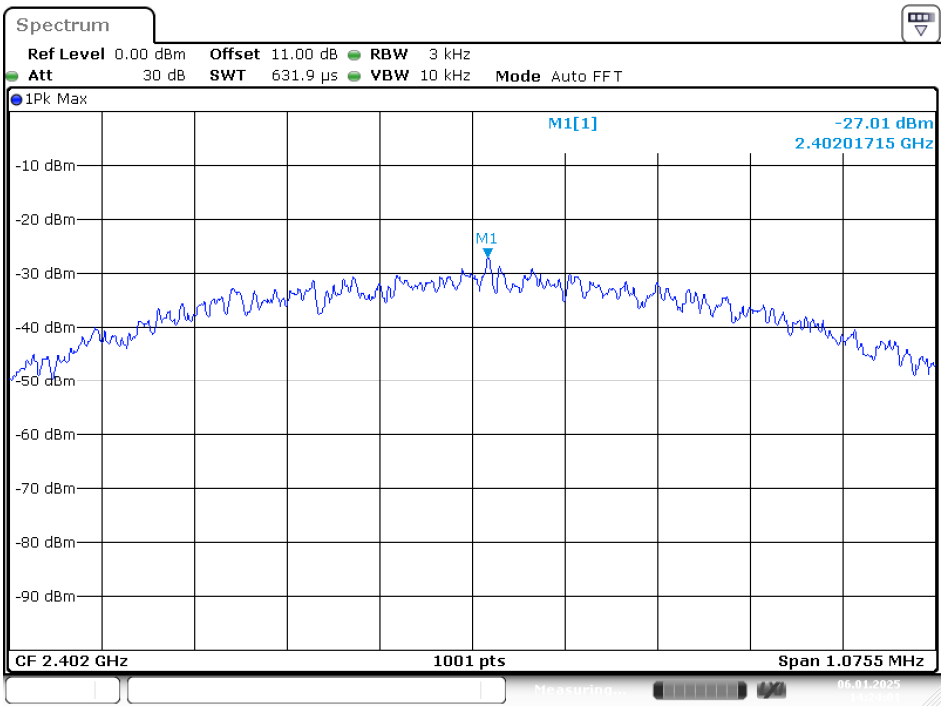
12.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
Low	2402	-27.01	8	Compliance
Middle	2440	-27.92	8	Compliance
High	2480	-27.24	8	Compliance

Please refer to the following plots

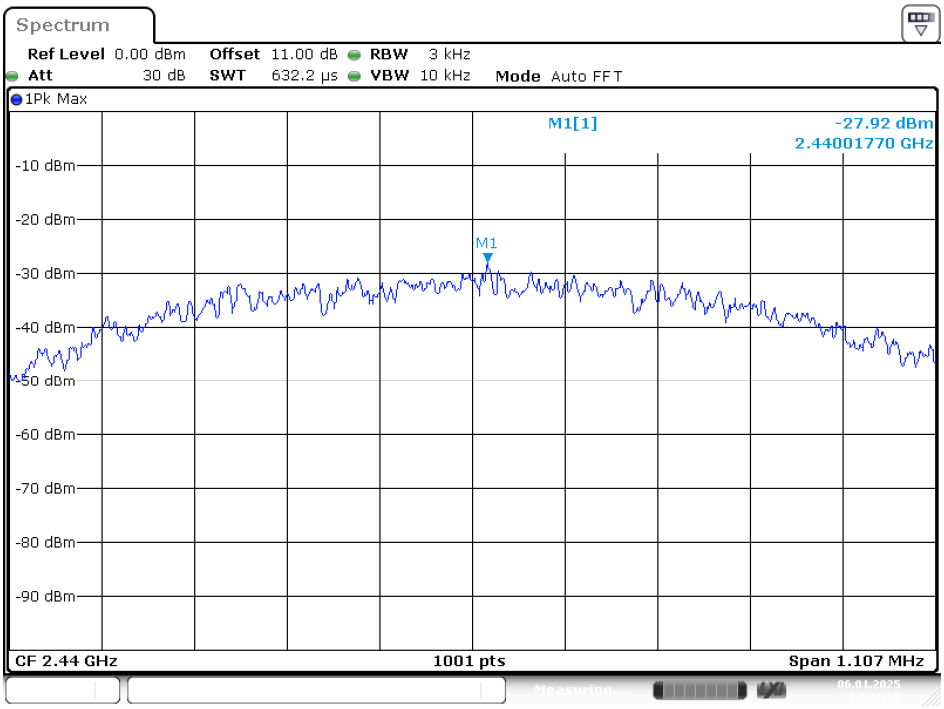
BLE Mode

Low Channel



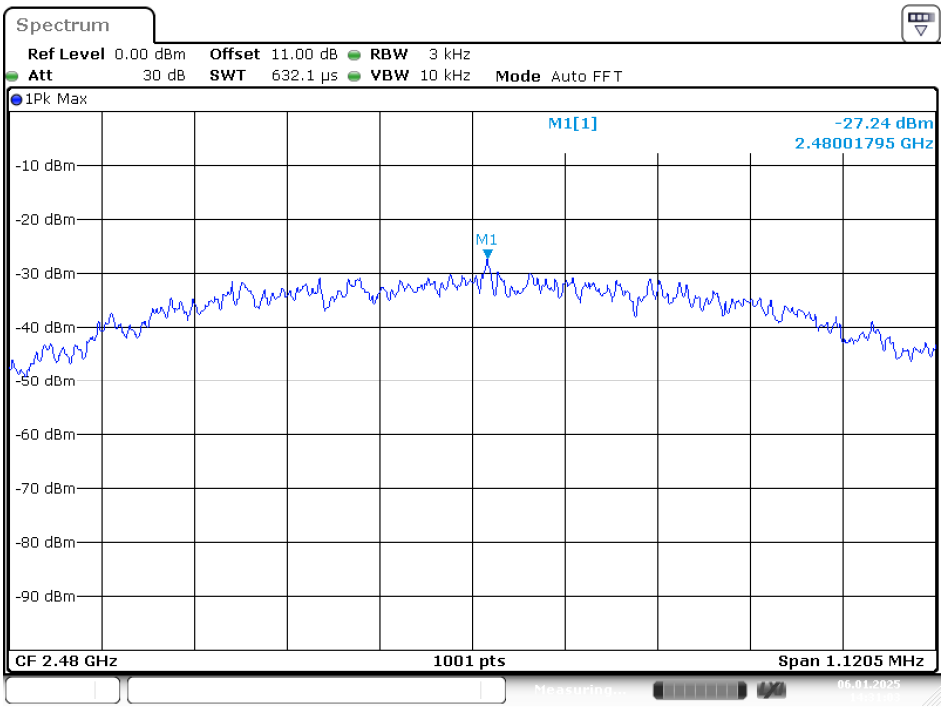
Date: 6.JAN.2025 14:24:02

Middle Channel



Date: 6.JAN.2025 14:29:15

High Channel



Date: 6.JAN.2025 14:31:03

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