# FCC Part 15.247

# TEST REPORT

For

# LT Security Inc

**17333 Freedom Way, City of Industry, CA 91748 United States**

## FCC ID: 2A2TG-LXK101BD

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Access Reader |

**Report Producer :** Coco Lin

**Report Number :** RLK250312040RF01

**Report Date :** 2025-03-26

**Reviewed By:** Rory Cheng

**Prepared By:**

**Bay Area Compliance Laboratories Corp.(Taiwan)**
**No. 6, Wende 2Rd., Guishan Dist., Taoyuan City 33382,**
**Taiwan (R.O.C.)**
**Tel: +886 (3)3961072; Fax: +886 (3) 3961027**
**www.baclcorp.com.tw**

# Revision History

| Revision | No. | Report Number | Issue Date | Description | Author/ Revised by |
|---|---|---|---|---|---|
| 0.0 | RLK250312040 | RLK250312040RF01 | 2025-03-26 | Original Report | Coco Lin |

# TABLE OF CONTENTS

**1 General Information ..... 5**

1.1 Product Description for Equipment under Test (EUT) ..... 5
1.2 Objective ..... 6
1.3 Related Submittal(s)/Grant(s) ..... 6
1.4 Test Methodology ..... 6
1.5 Statement of Compliance ..... 6
1.6 Measurement Uncertainty ..... 7
1.7 Environmental Conditions ..... 7
1.8 Test Facility ..... 7

**2 System Test Configuration ..... 8**

2.1 Description of Test Configuration ..... 8
2.2 Equipment Modifications ..... 8
2.3 EUT Exercise Software ..... 8
2.4 Support Equipment List and Details ..... 8
2.5 External Cable List and Details ..... 8
2.6 Test Mode ..... 8
2.7 Block Diagram of Test Setup ..... 8
2.8 Duty Cycle ..... 11

**3 Summary of Test Results ..... 12**

**4 Test Equipment List and Details ..... 13**

**5 FCC §15.247(i), §1.1307(b)(3) - RF Exposure ..... 15**

5.1 Applicable Standard ..... 15
5.2 RF Exposure Evaluation Result ..... 16

**6 FCC §15.203 – Antenna Requirements ..... 17**

6.1 Applicable Standard ..... 17
6.2 Antenna Information ..... 17

**7 FCC §15.207(a) – AC Line Conducted Emissions ..... 18**

**7.1 Applicable Standard** ..... 18
**7.2 EUT Setup** ..... 18
**7.3 EMI Test Receiver Setup** ..... 19
**7.4 Test Procedure** ..... 19
**7.5 Factor & Over Limit** ..... 19
**7.6 Test Results** ..... 20

**8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions ..... 21**

**8.1 Applicable Standard** ..... 21
**8.2 EUT Setup** ..... 22
**8.3 EMI Test Receiver & Spectrum Analyzer Setup** ..... 23
8.4 Test Procedure ..... 24
**8.6 Test Results** ..... 25

**9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth ..... 32**

**9.1 Applicable Standard** ..... 32
**9.2 Test Procedure** ..... 32
**9.3 Test Results** ..... 32

**10 FCC §15.247(b)(3) – Maximum Output Power ..... 35**

**10.1 Applicable Standard** ..... 35
**10.2 Test Procedure** ..... 35
**10.3 Test Results** ..... 35
**11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge ..... 36**
**11.1 Applicable Standard** ..... 36
**11.2 Test Procedure** ..... 36
**11.3 Test Results** ..... 36
**12 FCC §15.247(e) – Power Spectral Density ..... 38**
**12.1 Applicable Standard** ..... 38
**12.2 Test Procedure** ..... 38
**12.3 Test Results** ..... 38

# 1 General Information

## 1.1 Product Description for Equipment under Test (EUT)

| | |
|---|---|
| Applicant | LT Security Inc |
| | 17333 Freedom Way, City of Industry, CA 91748 United States |
| Brand(Trade) Name | LT Security Inc |
| Product (Equipment) | Access Reader |
| Main Model Name | LXK101-BD |
| Series Model Name | N/A |
| Frequency Range | BLE Mode: 2402 ~ 2480 MHz |
| Transmit Power | BLE Mode: -0.29 dBm |
| Modulation Technique | BLE Mode: GFSK |
| Power Operation | 12Vdc from DC Power Supply |
| Received Date | 2025/03/13 |

*All measurement and test data in this report was gathered from production sample serial number: RLK250312040-1&2 (Assigned by BACL, Linkou Laboratory).

## 1.2 Objective

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

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

## 1.3 Related Submittal(s)/Grant(s)

N/A.

## 1.4 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 Meas Guidance v05r02

## 1.5 Statement of Compliance

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

The measurement results in this report were performed at Bay Area Compliance Laboratories Corp. (Linkou Laboratory)

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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. (Linkou Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

## 1.6 Measurement Uncertainty

| Parameter | | Uncertainty |
|---|---|---|
| AC Mains | | ±4.67 (dB) |
| RF output power, conducted | | ±3.73 (dB) |
| Power Spectral Density, conducted | | ±0.45 (dBm) |
| Occupied Bandwidth | | ±0.09 (%) |
| Unwanted Emissions, conducted | | ±1.03 (dB) |
| Emissions, radiated | 9kHZ~30MHz | ±3.13 (dB) |
| | 30 MHz~1GHz | ±3.09 (dB) |
| | 1 GHz~18 GHz | ±5.22 (dB) |
| | 18 GHz~40 GHz | ±4.72 (dB) |
| Temperature | | ±0.04 (%) |
| Humidity | | ±0.78 (°C) |

## 1.7 Environmental Conditions

| Test Site | Test Data | Temperature (℃) | Relative Humidity (%) | Test Engineer |
|---|---|---|---|---|
| AC Line Conducted Emissions | 2025/03/17 | 19.5 | 54 | Hank |
| Radiation Spurious Emissions | 2025/03/14 | 21.4 | 51 | Bruce |
| Conducted Spurious Emissions | 2025/03/17 | 23.2 | 52 | Hank |
| 6 dB Emission Bandwidth | 2025/03/17 | 23.2 | 52 | Hank |
| Maximum Output Power | 2025/03/17 | 23.2 | 52 | Hank |
| 100 kHz Bandwidth of Frequency Band Edge | 2025/03/17 | 23.2 | 52 | Hank |
| Power Spectral Density | 2025/03/17 | 23.2 | 52 | Hank |
| Duty Cycle | 2025/03/17 | 23.2 | 52 | Hank |

## 1.8 Test Facility

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

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

Bay Area Compliance Laboratories Corp. (Linkou Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) and the FCC designation No.TW3546 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.

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

## 2.2 Equipment Modifications

No modification was made to the EUT.

## 2.3 EUT Exercise Software

The test software was used “EMI_Tool-v1.4.exe”

| Test Frequency | | Low | Mid | High |
|---|---|---|---|---|
| Power Level Setting | BLE 1M | 1.7 | 1.7 | 1.7 |

## 2.4 Support Equipment List and Details

| Description | Manufacturer | Model Number | S/N |
|---|---|---|---|
| Notebook | DELL | E6410 | 14478897241 |
| Fixture | LTS | AC02B3 | 2405007AKJ001547 |
| Fixture2 | Telink | TLSRGSOCBK56B | N/A |
| DC Power Supply | KIKUSUI | PMC35-3 | LG000648 |

## 2.5 External Cable List and Details

N/A

## 2.6 Test Mode

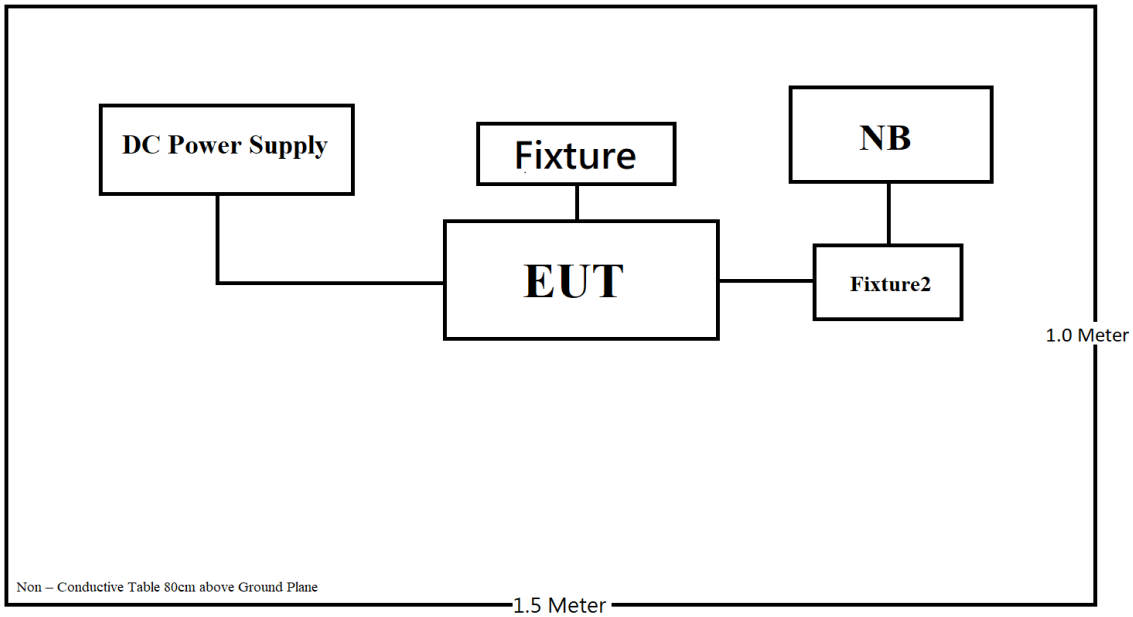
Full System (model: LXK101-BD) for all test item.

## 2.7 Block Diagram of Test Setup

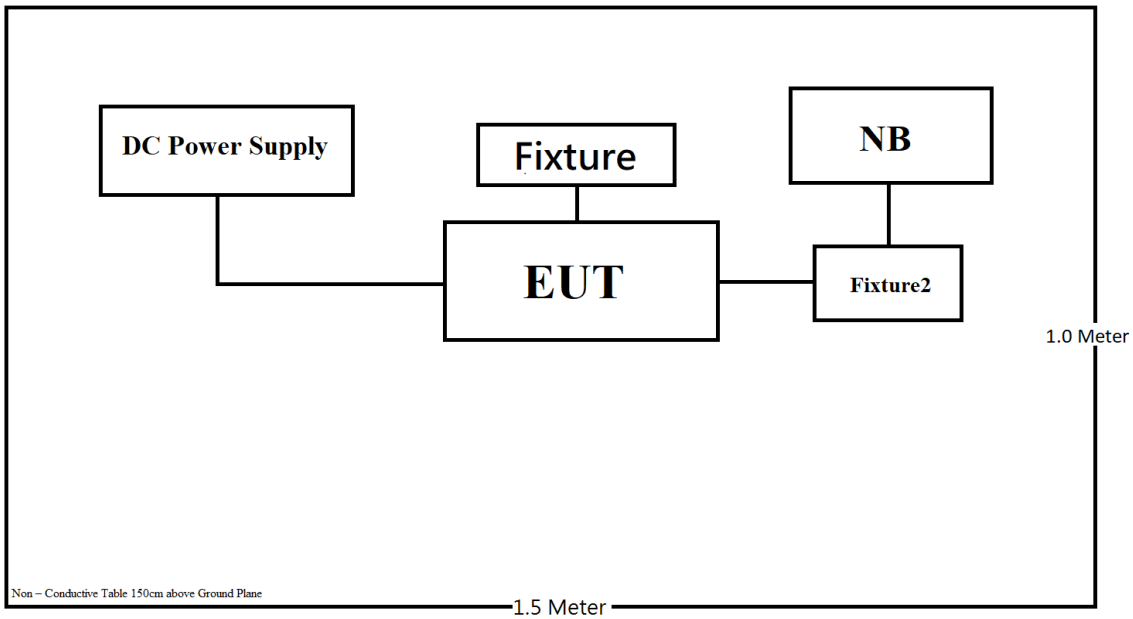
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

**Radiation:**

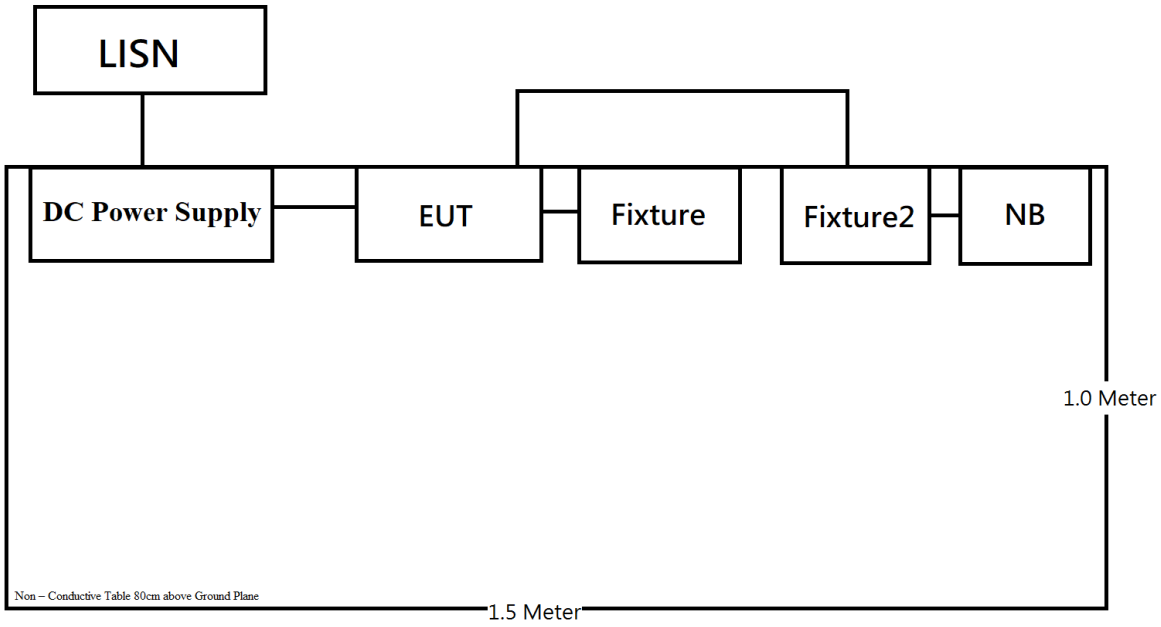
Below 1GHz:



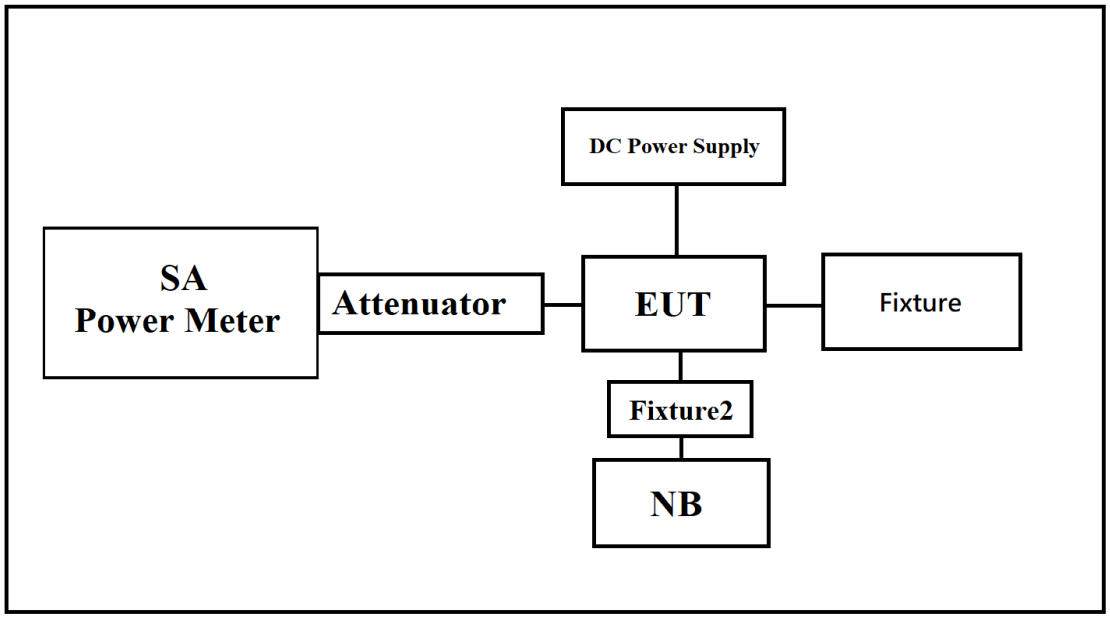

Above 1GHz:



**Conduction:**




**Conducted:**



## 2.8 Duty Cycle

According to KDB 558074 D01 15.247 Meas Guidance v05 section 6.0:

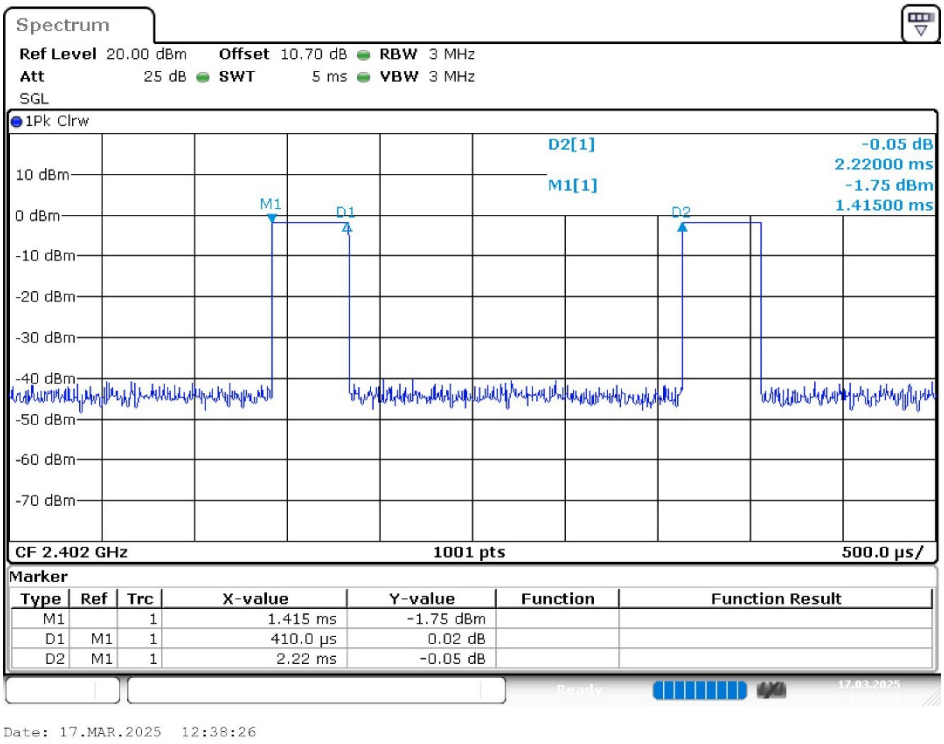
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximumpower transmission duration, T, are required for each tested mode of operation.

| Radio Mode | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/T VBW setting (kHz) |
|---|---|---|---|---|---|
| BLE | 0.41 | 2.22 | 18 | 7.45 | 3 |

Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

**BLE Mode**



# 3 Summary of Test Results

| FCC Rules | Description of Test | Results |
|---|---|---|
| §15.247(i), §1.1310, §2.1091 | Maximum Permissible Exposure (MPE) | 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) | | | | | |
| Two-Line V-Network | Rohde & Schwarz | ENV216 | 100037 | 2024/09/13 | 2025/09/13 |
| ESR EMI Test Receiver | Rohde & Schwarz | ESR3 | 102430 | 2024/04/23 | 2025/04/23 |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F | 00432 | 2024/08/14 | 2025/08/14 |
| RF Cable | EMCI | EMCCFD300-BM-BM-3000 | 221013 | 2024/10/17 | 2025/10/17 |
| Software | Audix | e3 v9 | E3LK-03 | N.C.R | N.C.R |
| Radiation 3M Room (966-A) | | | | | |
| Bilog Antenna & 6 dB Attenuator | SUNOL SCIENCES & EMCI | JB3 & N-6-06 | A111513 & AT-N0668 | 2024/04/19 | 2025/04/19 |
| Active Loop Antenna | ETS-Lindgren | 6502 | 0001-3322 | 2024/03/27 | 2025/03/27 |
| Horn Antenna | EMCO | 3115 | 2058 | 2024/03/26 | 2025/03/26 |
| Horn Antenna | ETS-Lindgren | 3160-09 | 00123852 | 2024/07/12 | 2025/07/12 |
| Horn Antenna | ETS-Lindgren | 3160-10 | 00123855 | 2024/07/12 | 2025/07/12 |
| Preamplifier | A.H. Systems | PAM-1840VH | 174 | 2024/03/26 | 2025/03/26 |
| Preamplifier with 1W input limiter | A.H. Systems | PAM-0118P | 470 | 2024/03/26 | 2025/03/26 |
| ESR EMI Test Receiver | Rohde & Schwarz | ESR3 | 102448 | 2024/09/26 | 2025/09/26 |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101940 | 2024/12/12 | 2025/12/12 |
| Microflex Cable (1m) | MTJ | 00000-MT26A-100 | H0919 | 2024/08/01 | 2025/08/01 |
| Microflex Cable (2m) | EMCI | EMCI06-SM-SM-2000 | 180515 | 2024/08/01 | 2025/08/01 |
| Microflex Cable (8m) | UTIFLEX | UFA210A-1-3149-300300 | MFR 64639 232490-001 | 2024/08/01 | 2025/08/01 |
| Software | AUDIX | E3 V9 | E3LK-01 | N.C.R | N.C.R |
| Conducted Room | | | | | |
| Cable | MTJ | MT40S | 620620-MT40S-100 | 2024/12/21 | 2025/12/21 |
| Signal and Spectrum Analyzer | Rohde & Schwarz | FSV40 | 101457 | 2024/09/04 | 2025/09/04 |

| | | | | | |
|---|---|---|---|---|---|
| USB Wideband Power Sensor | AGILENT | U2021XA | MY54080011 | 2024/08/28 | 2025/08/28 |
| 10dB Attenuator | MCL | BW-S10W5+ | 605 | 2024/03/22 | 2025/03/22 |

***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 $\lambda$ 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 | 19.2$R^2$. |

## 5.2 RF Exposure Evaluation Result

Project info

| Band | Freq (MHz) | Turn-up Power (dBm) | Ant Gain (dBi) | Distances (mm) | Tum-up Power (mW) | EIRP (dBm) | EIRP (mW) |
|---|---|---|---|---|---|---|---|
| BLE 1M | 2402 | 0 | 4.01 | 200 | 1.00 | 1.86 | 1.53 |

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

| Band | Freq (MHz) | Result Option A |
|---|---|---|
| BLE 1M | 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.
NFC and BLE can't transmit simultaneously.

**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.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

## 6.2 Antenna Information

| Manufacturer | Model | Type | Antenna Gain |
|---|---|---|---|
| LTS | LXK101-BD | PCB Antenna | 4.014 dBi |

**Result: Compliance**

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

## 7.1 Applicable Standard

According to §15.207

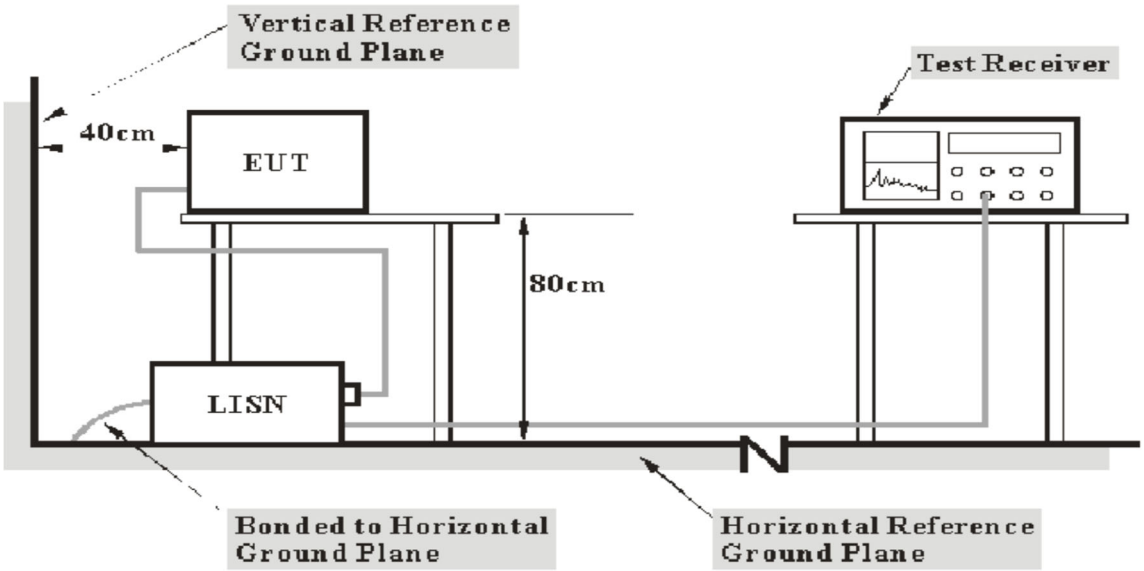
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured 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 2 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Note 1: Decreases with the logarithm of the frequency.*

*Note 2: A linear average detector is required*

## 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 Factor & Over Limit

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:

Level = Read Level + Factor

Over Limit = Level – Limit Line

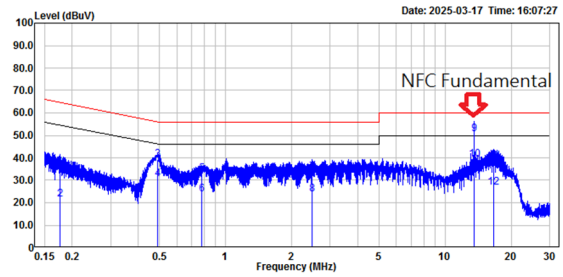
## 7.6 Test Results

Test Mode: Transmitting

**Main: AC120 V, 60 Hz**

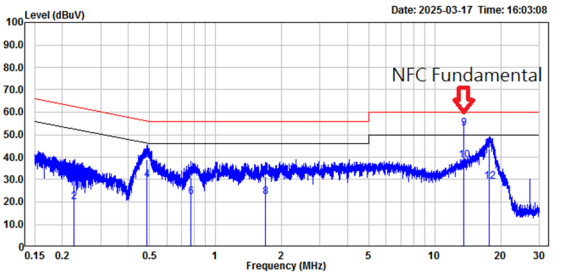
**(**Worst case is Low Channel)

| Line | Neutral |
|---|---|




Site : Conduction
Condition: Line
Job No : RLK250312040
Test By : Hank
Power : AC 120V/60Hz
Temp.(℃)/Hum.(%RH): 19.5℃/54%
Mode : TX BLE 2402MHz

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | |
| 1 | 0.1757 | 15.98 | 20.02 | 36.00 | 64.69 | -28.69 | QP |
| 2 | 0.1757 | 1.56 | 20.02 | 21.58 | 54.69 | -33.11 | Average |
| 3 | 0.4913 | 19.22 | 20.03 | 39.25 | 56.15 | -16.90 | QP |
| 4 | 0.4913 | 10.39 | 20.03 | 30.42 | 46.15 | -15.73 | Average |
| 5 | 0.7765 | 12.78 | 20.05 | 32.83 | 56.00 | -23.17 | QP |
| 6 | 0.7765 | 3.78 | 20.05 | 23.83 | 46.00 | -22.17 | Average |
| 7 | 2.4830 | 13.52 | 20.06 | 33.58 | 56.00 | -22.42 | QP |
| 8 | 2.4830 | 3.64 | 20.06 | 23.70 | 46.00 | -22.30 | Average |
| 9 | 13.5529 | 30.15 | 20.29 | 50.44 | 60.00 | -9.56 | QP |
| 10 | 13.5529 | 18.86 | 20.29 | 39.15 | 50.00 | -10.85 | Average |
| 11 | 16.5850 | 18.28 | 20.39 | 38.67 | 60.00 | -21.33 | QP |
| 12 | 16.5850 | 6.54 | 20.39 | 26.93 | 50.00 | -23.07 | Average |




Site : Conduction
Condition: Neutral
Job No : RLK250312040
Test By : Hank
Power : AC 120V/60Hz
Temp.(℃)/Hum.(%RH): 19.5℃/54%
Mode : TX BLE 2402MHz

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | |
| 1 | 0.2253 | 14.22 | 20.00 | 34.22 | 62.62 | -28.40 | QP |
| 2 | 0.2253 | -0.05 | 20.00 | 19.95 | 52.62 | -32.67 | Average |
| 3 | 0.4864 | 18.89 | 19.99 | 38.88 | 56.23 | -17.35 | QP |
| 4 | 0.4864 | 9.82 | 19.99 | 29.81 | 46.23 | -16.42 | Average |
| 5 | 0.7750 | 11.05 | 19.99 | 31.04 | 56.00 | -24.96 | QP |
| 6 | 0.7750 | 2.42 | 19.99 | 22.41 | 46.00 | -23.59 | Average |
| 7 | 1.6916 | 11.27 | 19.98 | 31.25 | 56.00 | -24.75 | QP |
| 8 | 1.6916 | 2.40 | 19.98 | 22.38 | 46.00 | -23.62 | Average |
| 9 | 13.5529 | 32.55 | 20.20 | 52.75 | 60.00 | -7.25 | QP |
| 10 | 13.5529 | 18.40 | 20.20 | 38.60 | 50.00 | -11.40 | Average |
| 11 | 17.7159 | 23.49 | 20.35 | 43.84 | 60.00 | -16.16 | QP |
| 12 | 17.7159 | 8.56 | 20.35 | 28.91 | 50.00 | -21.09 | Average |

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

# 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

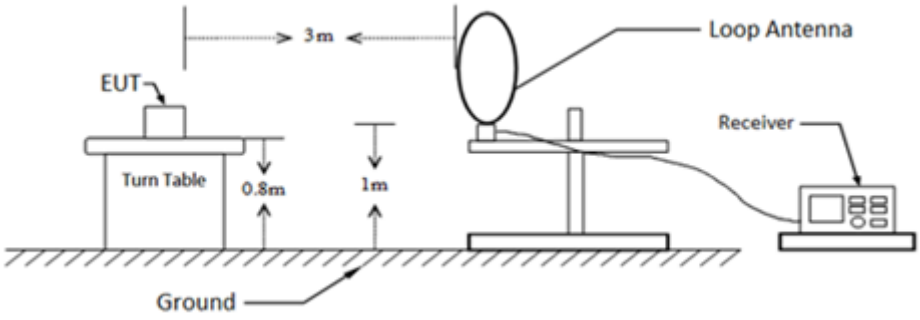
Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field, and the emissions to be measured can be detected by the measurement equipment (see 4.3.4).

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).

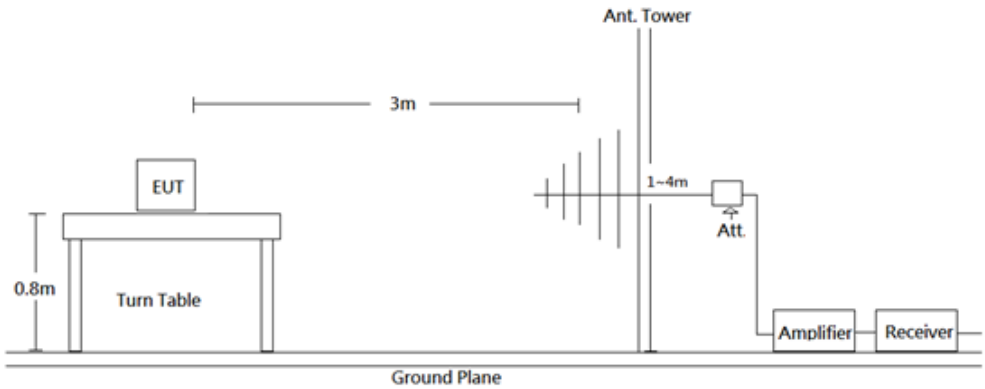
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the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

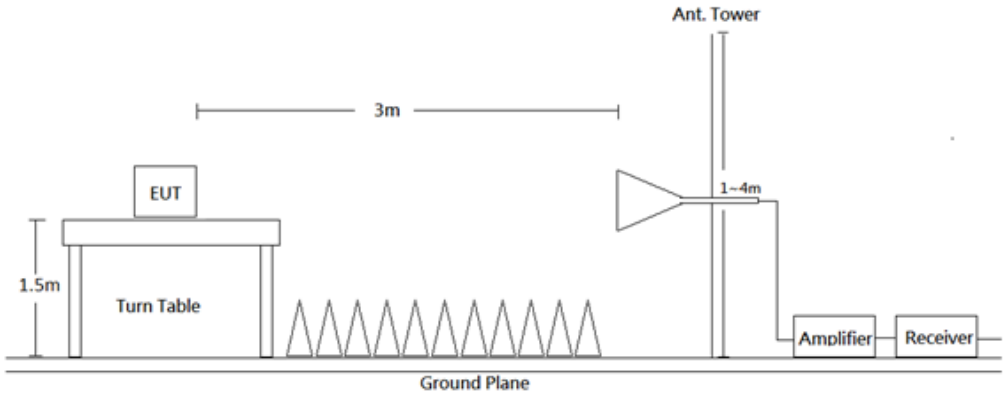
9kHz-30MHz:



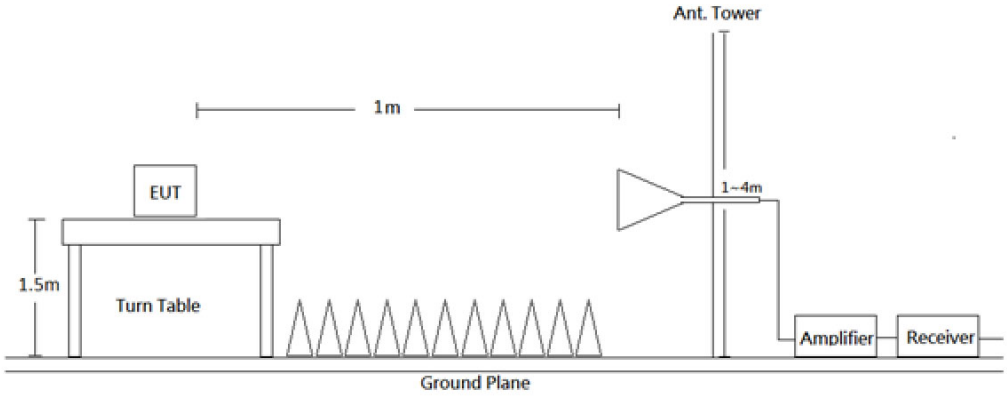

30MHz-1GHz:



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 | 3 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 Factor & Over Limit

The 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:

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:

Level = Read Level + Factor

Over Limit = Level – Limit Line

## 8.6 Test Results

Test Mode: Transmitting

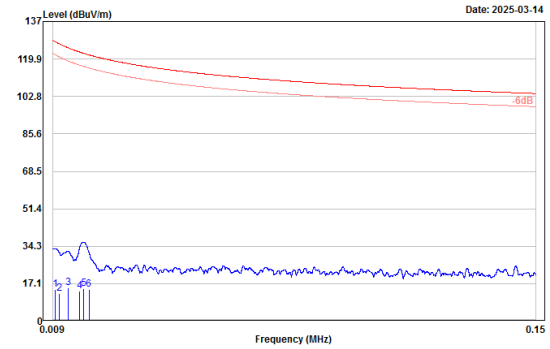
**BLE Mode** (Pre-scan with three orthogonal axis, and worse case as Z axis.)

9kHz-30MHz:

(worst case is low channel)

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

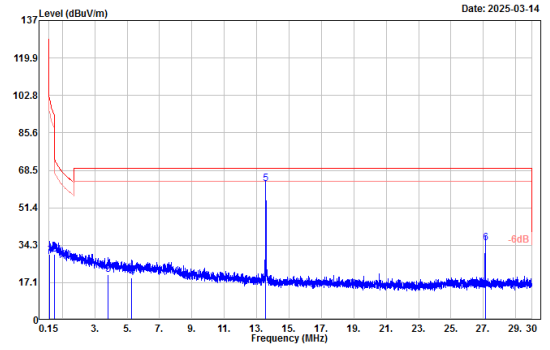
**9kHz-150kHz**




Site : LK-966A
Condition: 3m
Mode : BLE TX
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 0.010 | 0.60 | 13.87 | 14.47 | 127.90 | -113.43 | Average |
| 2 | 0.011 | -0.70 | 13.47 | 12.77 | 126.80 | -114.03 | Average |
| 3 | 0.013 | 1.80 | 13.57 | 15.37 | 125.00 | -109.63 | Average |
| 4 | 0.017 | -0.10 | 13.70 | 13.60 | 123.11 | -109.51 | Average |
| 5 | 0.018 | 1.10 | 13.75 | 14.85 | 122.52 | -107.67 | Average |
| 6 | 0.020 | 0.80 | 13.81 | 14.61 | 121.77 | -107.16 | Average |

**150kHz-30MHz**



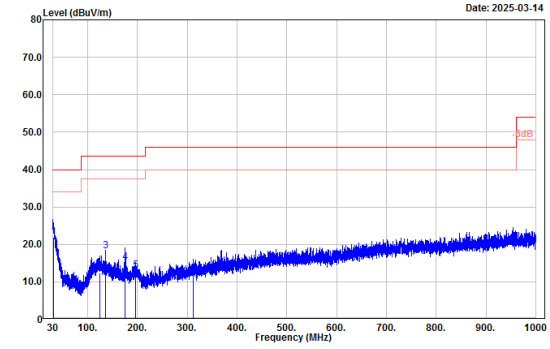

Site : LK-966A
Condition: 3m horizontal
Mode : BLE TX
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 0.201 | 18.32 | 11.93 | 30.25 | 101.55 | -71.30 | Average |
| 2 | 0.502 | 18.30 | 11.73 | 30.03 | 73.59 | -43.56 | QP |
| 3 | 3.816 | 9.78 | 10.85 | 20.63 | 69.54 | -48.91 | QP |
| 4 | 5.293 | 7.85 | 11.31 | 19.16 | 69.54 | -50.38 | QP |
| 5 | 13.559 | 50.60 | 11.72 | 62.32 | 69.54 | -7.22 | QP |
| 6 | 27.119 | 24.34 | 10.91 | 35.25 | 69.54 | -34.29 | QP |

30MHz-1GHz:

**Low channel**

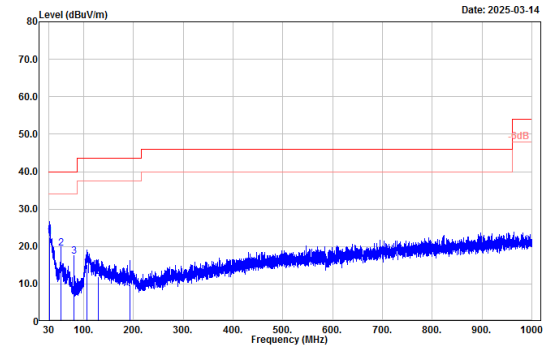
**Horizontal**




Site : LK-966A
Condition: 3m horizontal
Mode : BLE TX-2402MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 32.231 | 32.31 | -10.37 | 21.94 | 40.00 | -18.06 | QP |
| 2 | 124.575 | 30.86 | -18.44 | 12.42 | 43.50 | -31.08 | QP |
| 3 | 135.536 | 37.20 | -18.96 | 18.24 | 43.50 | -25.26 | QP |
| 4 | 175.500 | 36.42 | -21.20 | 15.22 | 43.50 | -28.28 | QP |
| 5 | 195.773 | 33.58 | -20.65 | 12.93 | 43.50 | -30.57 | QP |
| 6 | 312.755 | 31.84 | -19.71 | 12.13 | 46.00 | -33.87 | QP |

**Vertical**

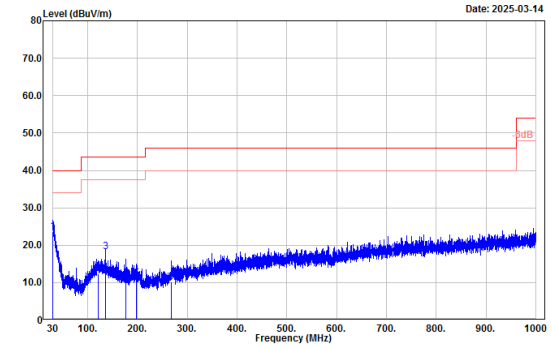



Site : LK-966A
Condition: 3m vertical
Mode : BLE TX-2402MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 31.649 | 32.52 | -9.91 | 22.61 | 40.00 | -17.39 | QP |
| 2 | 54.153 | 42.75 | -23.15 | 19.60 | 40.00 | -20.40 | QP |
| 3 | 81.313 | 41.69 | -24.34 | 17.35 | 40.00 | -22.65 | QP |
| 4 | 106.242 | 35.59 | -20.43 | 15.16 | 43.50 | -28.34 | QP |
| 5 | 128.940 | 30.38 | -18.47 | 11.91 | 43.50 | -31.59 | QP |
| 6 | 192.766 | 30.75 | -21.01 | 9.74 | 43.50 | -33.76 | QP |

## Middle channel

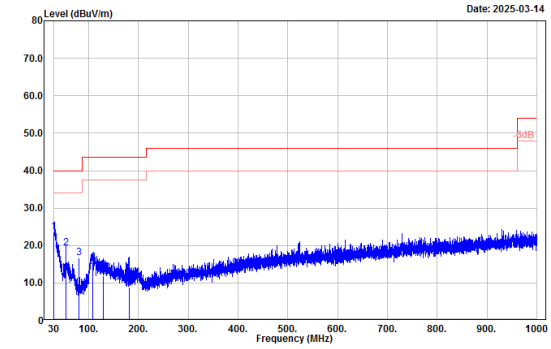
### Horizontal




Site : LK-966A
Condition: 3m horizontal
Mode : BLE TX-2440MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 30.000 | 32.26 | -8.62 | 23.64 | 40.00 | -16.36 | QP |
| 2 | 122.053 | 30.86 | -18.42 | 12.44 | 43.50 | -31.06 | QP |
| 3 | 135.536 | 37.21 | -18.96 | 18.25 | 43.50 | -25.25 | QP |
| 4 | 176.567 | 32.86 | -21.27 | 11.59 | 43.50 | -31.91 | QP |
| 5 | 198.004 | 31.51 | -20.38 | 11.13 | 43.50 | -32.37 | QP |
| 6 | 268.426 | 30.52 | -20.27 | 10.25 | 46.00 | -35.75 | QP |

### Vertical

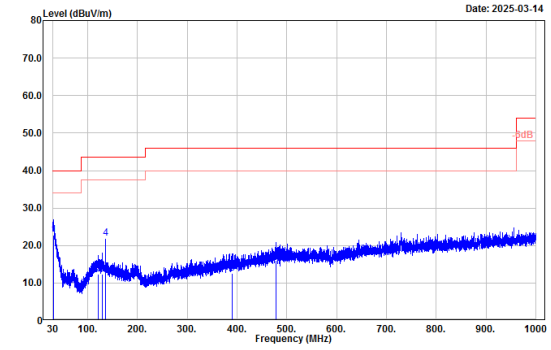



Site : LK-966A
Condition: 3m vertical
Mode : BLE TX-2440MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 30.388 | 32.52 | -8.93 | 23.59 | 40.00 | -16.41 | QP |
| 2 | 54.250 | 42.43 | -23.15 | 19.28 | 40.00 | -20.72 | QP |
| 3 | 81.313 | 40.94 | -24.34 | 16.60 | 40.00 | -23.40 | QP |
| 4 | 107.988 | 35.54 | -20.01 | 15.53 | 43.50 | -27.97 | QP |
| 5 | 129.231 | 30.42 | -18.47 | 11.95 | 43.50 | -31.55 | QP |
| 6 | 180.932 | 30.26 | -21.46 | 8.80 | 43.50 | -34.70 | QP |

## High channel

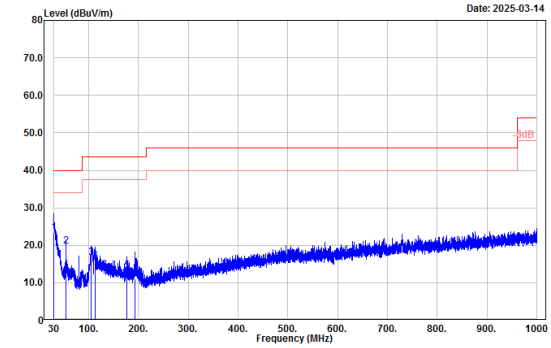
### Horizontal




Site : LK-966A
Condition: 3m horizontal
Mode : BLE TX-2480MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 31.164 | 32.32 | -9.54 | 22.78 | 40.00 | -17.22 | QP |
| 2 | 121.956 | 30.86 | -18.42 | 12.44 | 43.50 | -31.06 | QP |
| 3 | 129.910 | 30.87 | -18.48 | 12.39 | 43.50 | -31.11 | QP |
| 4 | 135.536 | 40.77 | -18.96 | 21.81 | 43.50 | -21.69 | QP |
| 5 | 391.131 | 30.43 | -17.96 | 12.47 | 46.00 | -33.53 | QP |
| 6 | 478.043 | 31.84 | -15.81 | 16.03 | 46.00 | -29.97 | QP |

### Vertical




Site : LK-966A
Condition: 3m vertical
Mode : BLE TX-2480MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 30.097 | 32.17 | -8.70 | 23.47 | 40.00 | -16.53 | QP |
| 2 | 54.153 | 42.94 | -23.15 | 19.79 | 40.00 | -20.21 | QP |
| 3 | 105.660 | 37.19 | -20.56 | 16.63 | 43.50 | -26.87 | QP |
| 4 | 112.547 | 35.10 | -19.25 | 15.85 | 43.50 | -27.65 | QP |
| 5 | 176.761 | 34.52 | -21.28 | 13.24 | 43.50 | -30.26 | QP |
| 6 | 193.930 | 32.00 | -20.88 | 11.12 | 43.50 | -32.38 | QP |

Level = Read Level + Factor

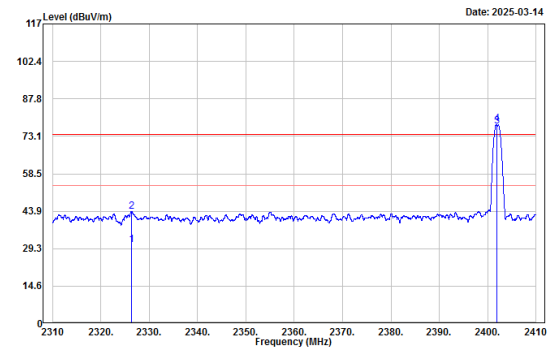
Over Limit = Level – Limit Line

Factor = Antenna Factor + Cable Loss – Amplifier Gain

## Band-Edge:

### Low channel

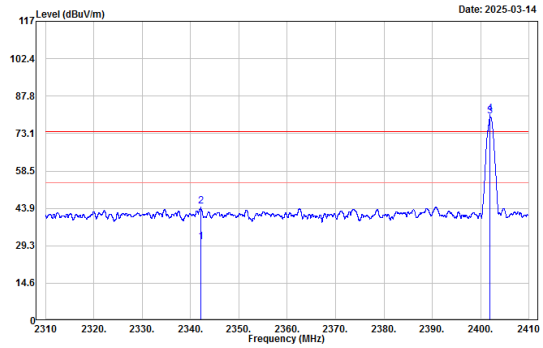
#### Horizontal




Site : LK-966A
Condition: 3m horizontal
Mode : BLE TX-2402MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 2326.350 | 39.41 | -8.65 | 30.76 | 54.00 | -23.24 | Average |
| 2 | 2326.350 | 52.42 | -8.65 | 43.77 | 74.00 | -30.23 | Peak |
| 3 | 2402.000 | 85.45 | -8.41 | 77.04 | ------ | ------ | Average |
| 4 | 2402.000 | 86.47 | -8.41 | 78.06 | ------ | ------ | Peak |

#### Vertical

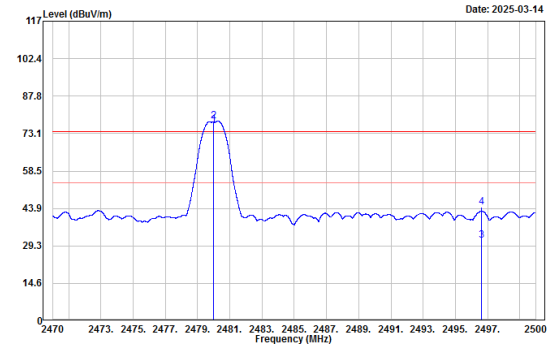



Site : LK-966A
Condition: 3m vertical
Mode : BLE TX-2402MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 2342.040 | 39.36 | -8.47 | 30.89 | 54.00 | -23.11 | Average |
| 2 | 2342.040 | 53.03 | -8.47 | 44.56 | 74.00 | -29.44 | Peak |
| 3 | 2402.000 | 88.37 | -8.41 | 79.96 | ------ | ------ | Average |
| 4 | 2402.000 | 89.33 | -8.41 | 80.92 | ------ | ------ | Peak |

### High channel

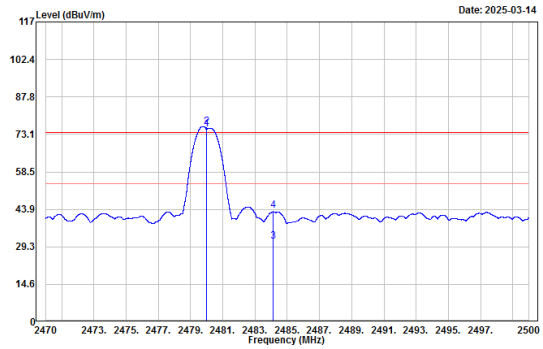
#### Horizontal




Site : LK-966A
Condition: 3m horizontal
Mode : BLE TX-2480MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 2480.000 | 84.78 | -8.00 | 76.78 | ------ | ------ | Average |
| 2 | 2480.000 | 86.02 | -8.00 | 78.02 | ------ | ------ | Peak |
| 3 | 2496.628 | 39.37 | -8.01 | 31.36 | 54.00 | -22.64 | Average |
| 4 | 2496.628 | 52.35 | -8.01 | 44.34 | 74.00 | -29.66 | Peak |

#### Vertical




Site : LK-966A
Condition: 3m vertical
Mode : BLE TX-2480MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 2480.000 | 83.07 | -8.00 | 75.07 | ------ | ------ | Average |
| 2 | 2480.000 | 84.20 | -8.00 | 76.20 | ------ | ------ | Peak |
| 3 | 2484.142 | 39.32 | -8.00 | 31.32 | 54.00 | -22.68 | Average |
| 4 | 2484.142 | 51.51 | -8.00 | 43.51 | 74.00 | -30.49 | Peak |

Level = Read Level + Factor

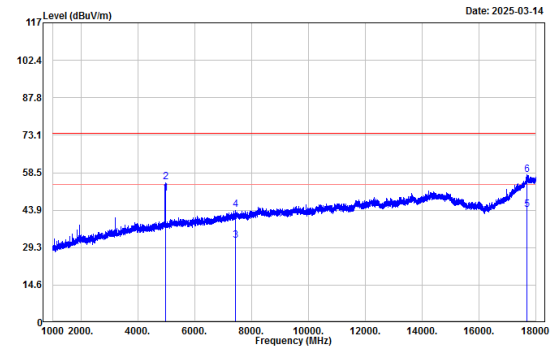
Over Limit = Level – Limit Line

Factor = Antenna Factor + Cable Loss – Amplifier Gain

## 1GHz-18GHz:

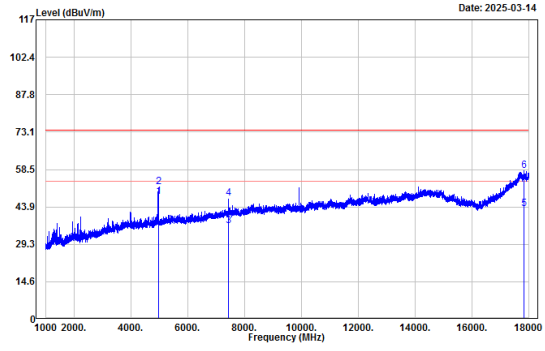
(worst case is High channel)

| Horizontal | Vertical |
|---|---|




Site : LK-966A
Condition: 3m Horizontal
Mode : BLE TX-2480MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Over Line | Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 ! | 4960.000 | 51.37 | -1.07 | 50.30 | 54.00 | -3.70 | Average |
| 2 | 4960.000 | 55.85 | -1.07 | 54.78 | 74.00 | -19.22 | Peak |
| 3 | 7440.000 | 27.10 | 4.79 | 31.89 | 54.00 | -22.11 | Average |
| 4 | 7440.000 | 39.40 | 4.79 | 44.19 | 74.00 | -29.81 | Peak |
| 5 | 17694.850 | 22.32 | 21.76 | 44.08 | 54.00 | -9.92 | Average |
| 6 | 17694.850 | 35.89 | 21.76 | 57.65 | 74.00 | -16.35 | Peak |



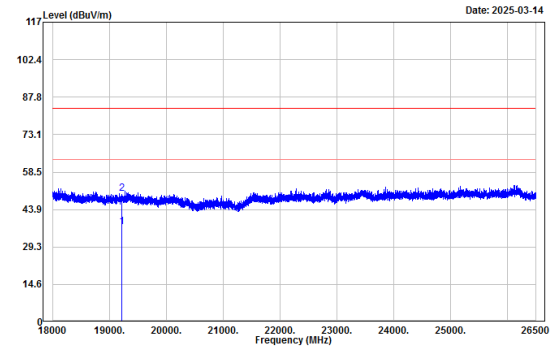

Site : LK-966A
Condition: 3m Vertical
Mode : BLE TX-2480MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Over Line | Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 4960.000 | 48.84 | -1.07 | 47.77 | 54.00 | -6.23 | Average |
| 2 | 4960.000 | 52.66 | -1.07 | 51.59 | 74.00 | -22.41 | Peak |
| 3 | 7440.000 | 31.71 | 4.79 | 36.50 | 54.00 | -17.50 | Average |
| 4 | 7440.000 | 42.36 | 4.79 | 47.15 | 74.00 | -26.85 | Peak |
| 5 | 17825.750 | 20.83 | 22.32 | 43.15 | 54.00 | -10.85 | Average |
| 6 | 17825.750 | 35.59 | 22.32 | 57.91 | 74.00 | -16.09 | Peak |

## 18GHz-26.5GHz:

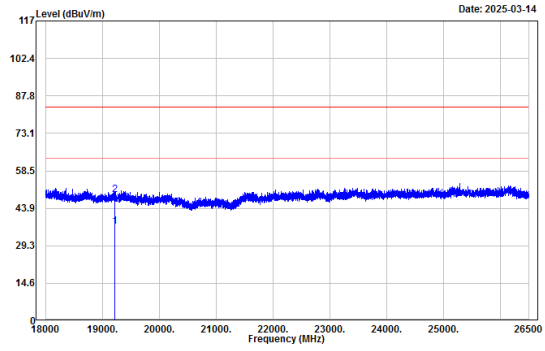
(worst case is low channel)

| Horizontal | Vertical |
|---|---|




Site : LK-966A
Condition: 1m horizontal
Mode : BLE TX-2402MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Over Line | Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 19216.000 | 22.09 | 15.05 | 37.14 | 63.50 | -26.36 | Average |
| 2 | 19216.000 | 35.20 | 15.05 | 50.25 | 83.50 | -33.25 | Peak |




Site : LK-966A
Condition: 1m vertical
Mode : BLE TX-2402MHz
Note : Temp/RH:21.4°C/51%
Tester: Bruce

| | Freq | Read Level | Factor | Limit Level | Over Line | Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 19216.000 | 21.79 | 15.05 | 36.84 | 63.50 | -26.66 | Average |
| 2 | 19216.000 | 34.15 | 15.05 | 49.20 | 83.50 | -34.30 | 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 , Limit = 54+9.5 = 63.50 dBuV/m @ 1m

## Above 1GHz

**Low channel**

**Horizontal**

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 4804.000 | 48.96 | -1.58 | 47.38 | 54.00 | -6.62 | Average |
| 2 | 4804.000 | 53.55 | -1.58 | 51.97 | 74.00 | -22.03 | Peak |
| 3 | 7206.000 | 32.09 | 4.16 | 36.25 | 54.00 | -17.75 | Average |
| 4 | 7206.000 | 43.02 | 4.16 | 47.18 | 74.00 | -26.82 | Peak |
| 5 | 17809.600 | 21.13 | 22.35 | 43.48 | 54.00 | -10.52 | Average |
| 6 | 17809.600 | 35.25 | 22.35 | 57.60 | 74.00 | -16.40 | Peak |

**Vertical**

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 4804.000 | 43.72 | -1.58 | 42.14 | 54.00 | -11.86 | Average |
| 2 | 4804.000 | 49.69 | -1.58 | 48.11 | 74.00 | -25.89 | Peak |
| 3 | 7206.000 | 29.81 | 4.16 | 33.97 | 54.00 | -20.03 | Average |
| 4 | 7206.000 | 41.11 | 4.16 | 45.27 | 74.00 | -28.73 | Peak |
| 5 | 17690.600 | 22.36 | 21.73 | 44.09 | 54.00 | -9.91 | Average |
| 6 | 17690.600 | 36.03 | 21.73 | 57.76 | 74.00 | -16.24 | Peak |

**Middle channel**

**Horizontal**

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 ! | 4880.000 | 50.72 | -1.17 | 49.55 | 54.00 | -4.45 | Average |
| 2 | 4880.000 | 55.17 | -1.17 | 54.00 | 74.00 | -20.00 | Peak |
| 3 | 7320.000 | 29.52 | 4.53 | 34.05 | 54.00 | -19.95 | Average |
| 4 | 7320.000 | 41.23 | 4.53 | 45.76 | 74.00 | -28.24 | Peak |
| 5 | 17788.350 | 21.09 | 22.29 | 43.38 | 54.00 | -10.62 | Average |
| 6 | 17788.350 | 35.36 | 22.29 | 57.65 | 74.00 | -16.35 | Peak |

**Vertical**

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 4880.000 | 46.82 | -1.17 | 45.65 | 54.00 | -8.35 | Average |
| 2 | 4880.000 | 52.38 | -1.17 | 51.21 | 74.00 | -22.79 | Peak |
| 3 | 7320.000 | 30.21 | 4.53 | 34.74 | 54.00 | -19.26 | Average |
| 4 | 7320.000 | 41.59 | 4.53 | 46.12 | 74.00 | -27.88 | Peak |
| 5 | 17994.050 | 21.98 | 22.00 | 43.98 | 54.00 | -10.02 | Average |
| 6 | 17994.050 | 35.80 | 22.00 | 57.80 | 74.00 | -16.20 | Peak |

**High channel**

**Horizontal**

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 ! | 4960.000 | 51.37 | -1.07 | 50.30 | 54.00 | -3.70 | Average |
| 2 | 4960.000 | 55.85 | -1.07 | 54.78 | 74.00 | -19.22 | Peak |
| 3 | 7440.000 | 27.10 | 4.79 | 31.89 | 54.00 | -22.11 | Average |
| 4 | 7440.000 | 39.40 | 4.79 | 44.19 | 74.00 | -29.81 | Peak |
| 5 | 17694.850 | 22.32 | 21.76 | 44.08 | 54.00 | -9.92 | Average |
| 6 | 17694.850 | 35.89 | 21.76 | 57.65 | 74.00 | -16.35 | Peak |

**Vertical**

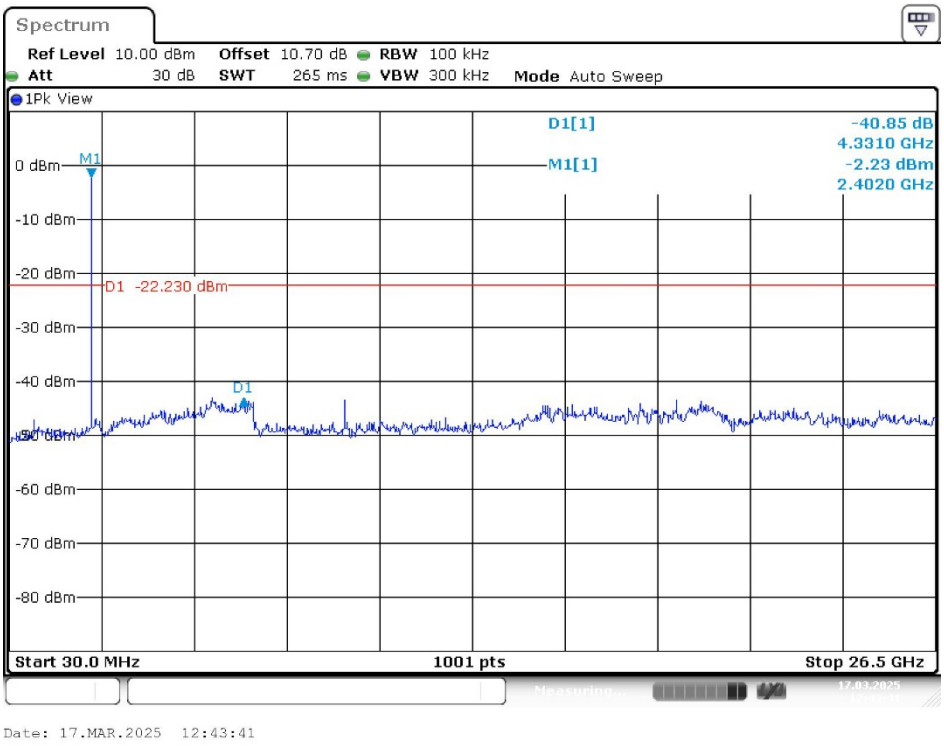
| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 4960.000 | 48.84 | -1.07 | 47.77 | 54.00 | -6.23 | Average |
| 2 | 4960.000 | 52.66 | -1.07 | 51.59 | 74.00 | -22.41 | Peak |
| 3 | 7440.000 | 31.71 | 4.79 | 36.50 | 54.00 | -17.50 | Average |
| 4 | 7440.000 | 42.36 | 4.79 | 47.15 | 74.00 | -26.85 | Peak |
| 5 | 17825.750 | 20.83 | 22.32 | 43.15 | 54.00 | -10.85 | Average |
| 6 | 17825.750 | 35.59 | 22.32 | 57.91 | 74.00 | -16.09 | Peak |

## Conducted Spurious Emissions:

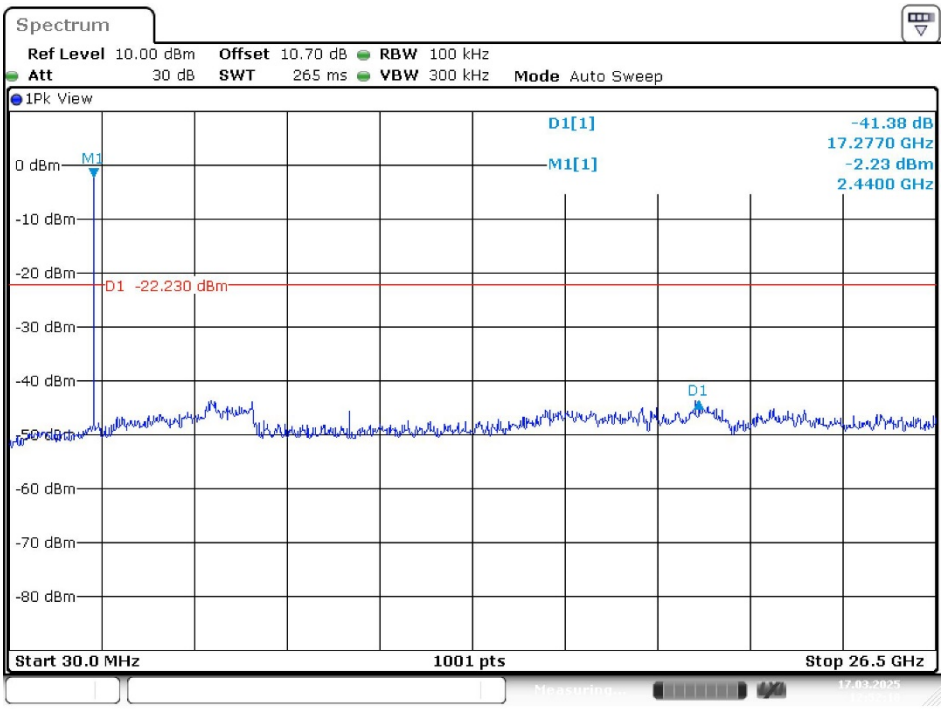
| Channel | Frequency (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Result |
|---|---|---|---|---|
| Low | 2402 | 40.85 | ≥ 20 | PASS |
| Mid | 2441 | 41.38 | ≥ 20 | PASS |
| High | 2480 | 40.40 | ≥ 20 | PASS |

**BLE Mode**

**Low Channel**

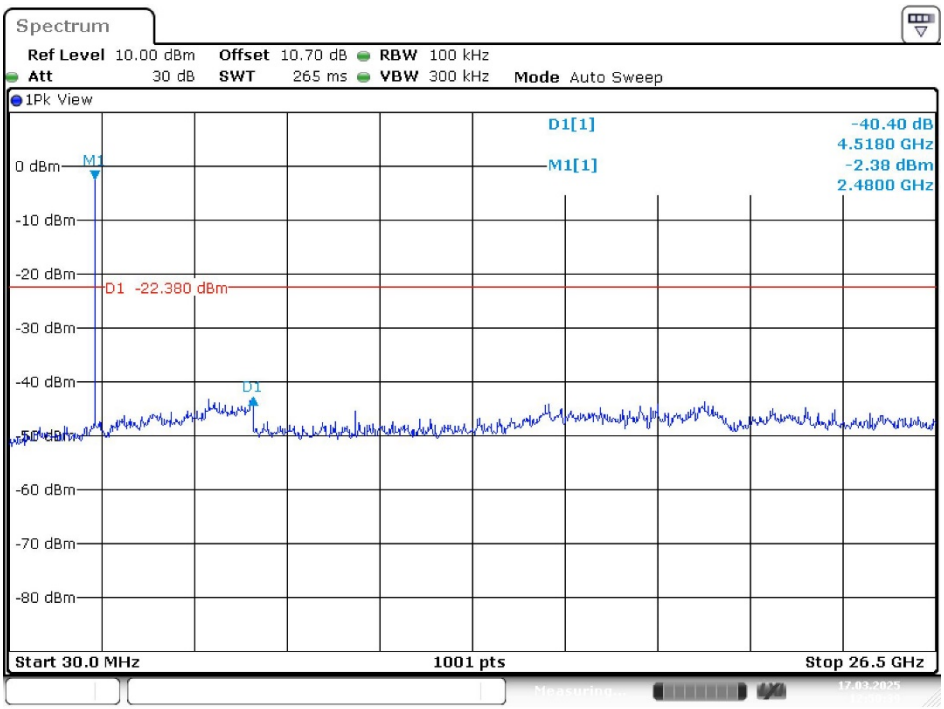


## Middle Channel




Date: 17.MAR.2025 12:52:09

## High Channel




Date: 17.MAR.2025 12:50:39

# 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

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.

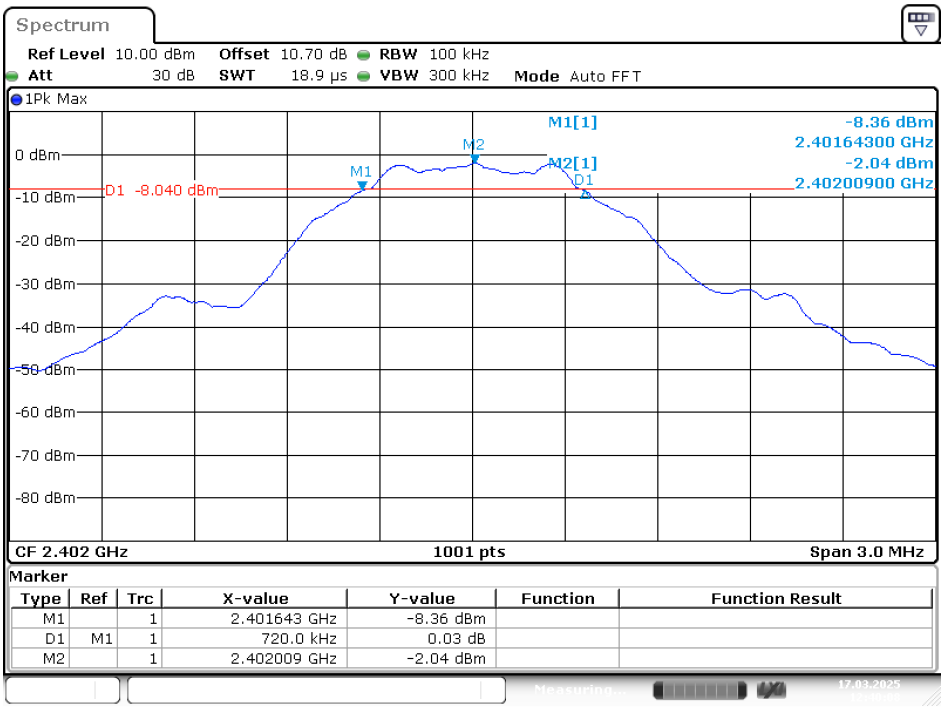
## 9.3 Test Results

| Channel | Frequency (MHz) | 6 dB Emission Bandwidth (kHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| Low | 2402 | 0.72 | > 500 | Compliance |
| Middle | 2440 | 0.71 | > 500 | Compliance |
| High | 2480 | 0.71 | > 500 | Compliance |

Please refer to the following plots

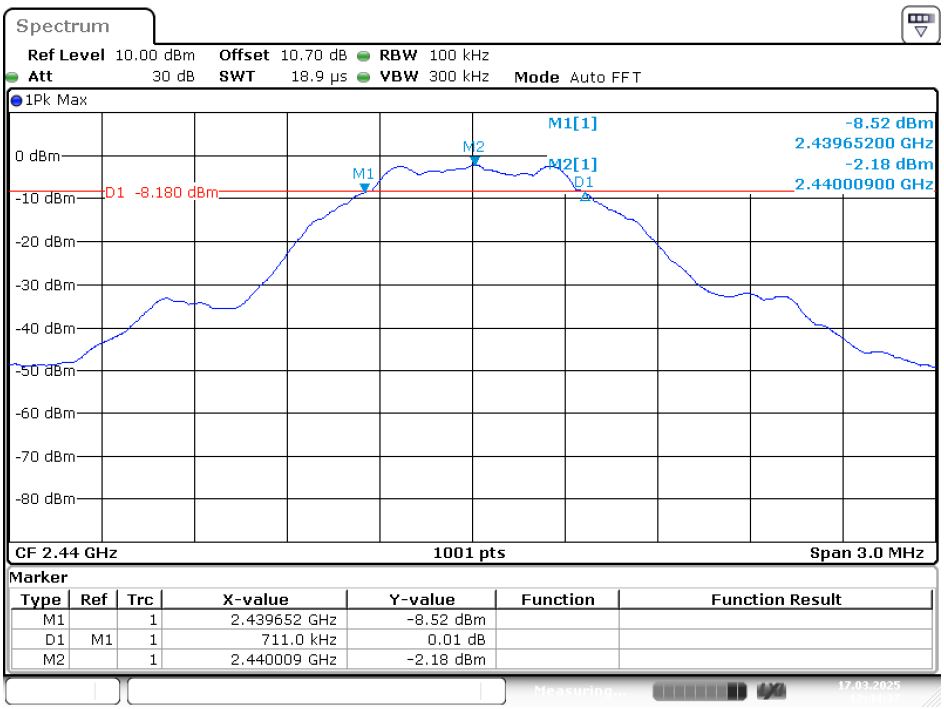
## BLE Mode

### Low Channel



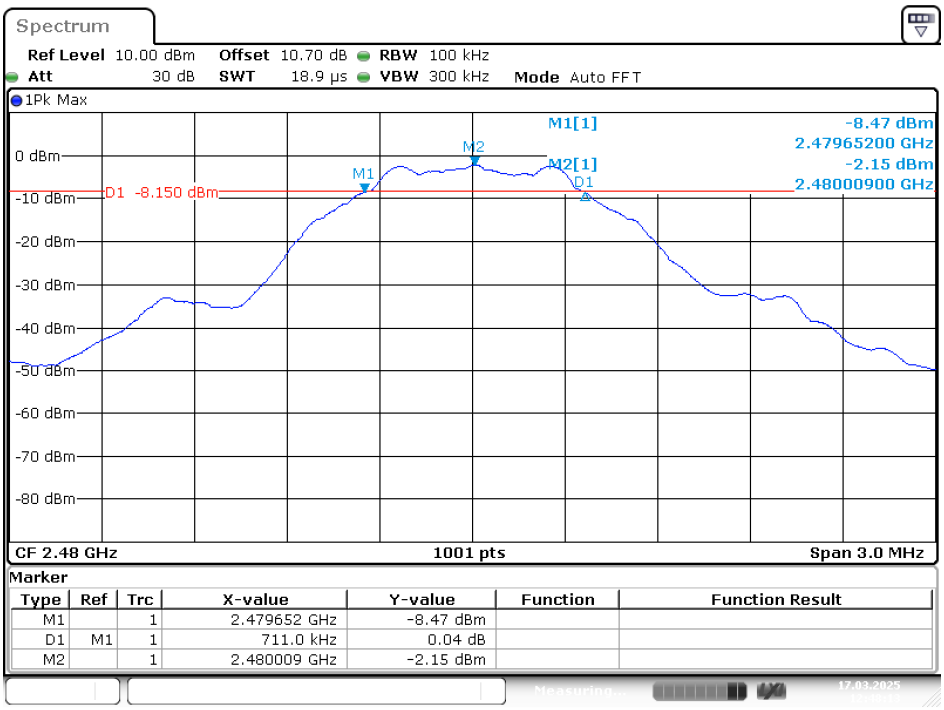

Date: 17.MAR.2025 12:40:08

### Middle Channel




Date: 17.MAR.2025 12:44:37

## High Channel




Date: 17.MAR.2025 12:48:13

# 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

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) | Power (dBm) | Power (W) | Limit (W) | Result |
|---|---|---|---|---|---|
| BLE Mode | | | | | |
| Low | 2402 | -0.29 | 0.00094 | 1 | PASS |
| Middle | 2440 | -0.52 | 0.00089 | 1 | PASS |
| High | 2480 | -0.75 | 0.00084 | 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

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.

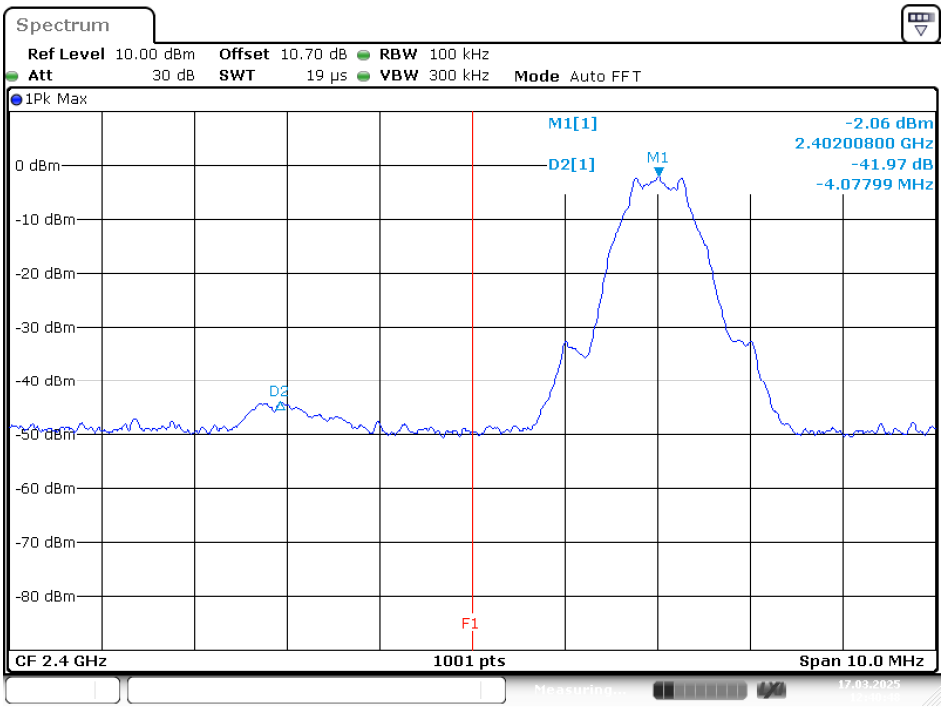
## 11.3 Test Results

| Channel | Frequency (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Result |
|---|---|---|---|---|
| Low | 2402 | 41.97 | ≥ 20 | PASS |
| High | 2480 | 41.32 | ≥ 20 | PASS |

Please refer to the following plots

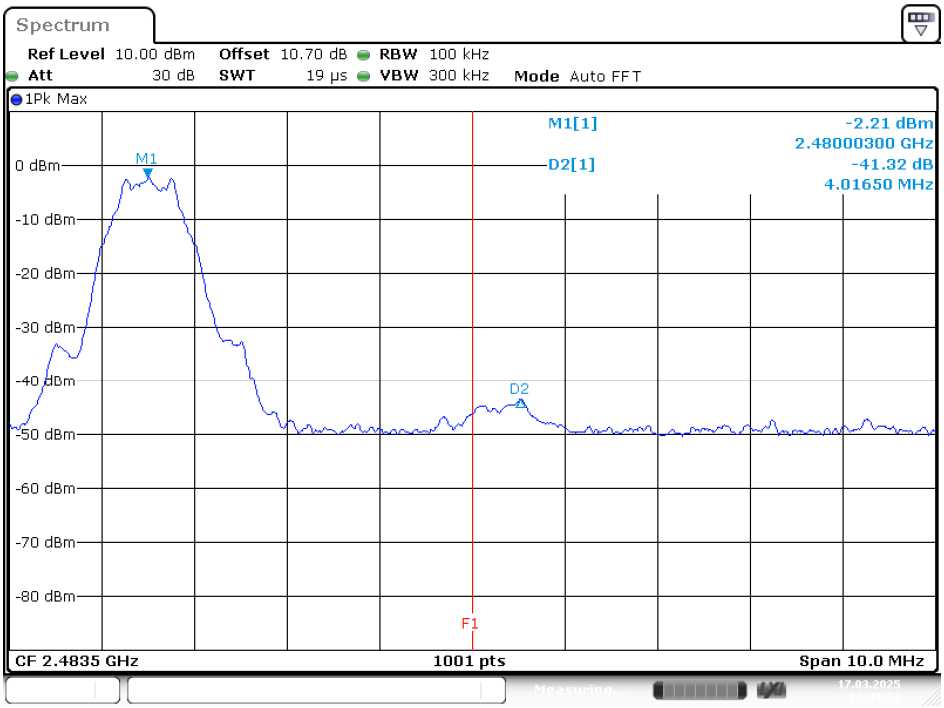
## BLE Mode

## Band Edge, Left Side




Date: 17.MAR.2025 12:40:48

## Band Edge, Right Side




Date: 17.MAR.2025 12:48:53

# 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

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

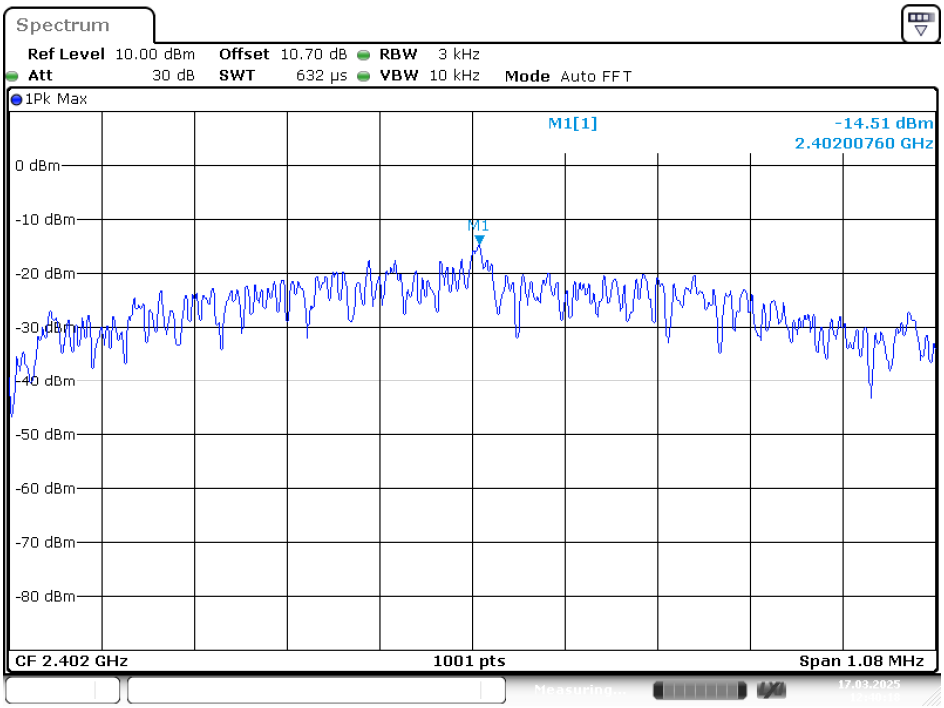
## 12.3 Test Results

| Channel | Frequency (MHz) | Power Spectral Density (dBm/3 kHz) | Limit (dBm/3 kHz) | Result |
|---|---|---|---|---|
| Low | 2402 | -14.51 | 8 | Compliance |
| Middle | 2440 | -14.57 | 8 | Compliance |
| High | 2480 | -14.61 | 8 | Compliance |

Please refer to the following plots

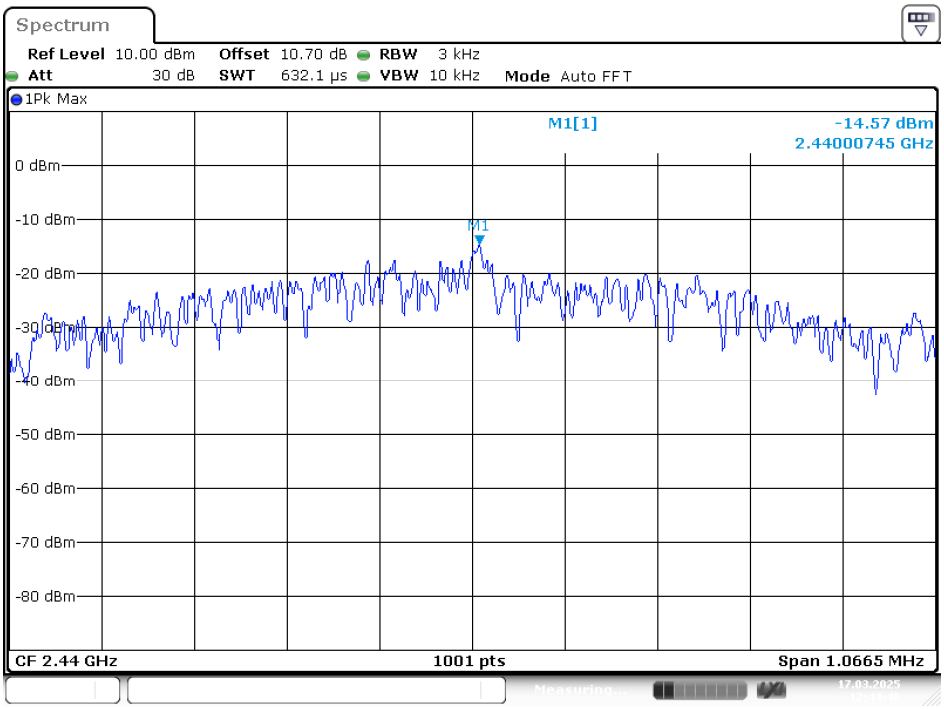
## BLE Mode

### Low Channel



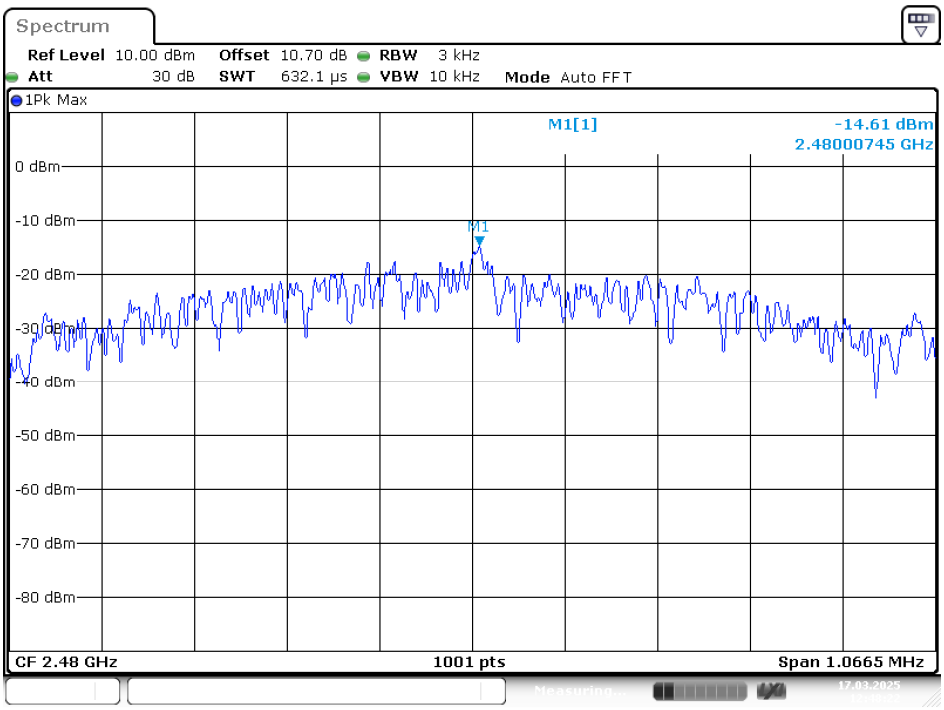

Date: 17.MAR.2025 12:40:17

### Middle Channel




Date: 17.MAR.2025 12:44:46

## High Channel




Date: 17.MAR.2025 12:48:22

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