# MEASUREMENT REPORT
## FCC PART 15.247 Bluetooth-LE

Report No.: S20241010265301E02
Issue Date: 01-14-2025

| | |
|---|---|
| **Applicant:** | L&S Lighting Equipment (Shanghai) Co.,Ltd |
| **Address:** | Building NO.1,Lane 255 Longpan Road,Malu Town, Jiading District ;Shanghai China |
| **FCC ID:** | 2BD9AS05051-4052 |
| **Product:** | matter controller |
| **Model No.:** | LITE MT; LITE MT RP; LITE BT1 |
| **FCC Classification:** | Digital Transmission System (DTS) |
| **FCC Rule Part(s):** | Part 15 Subpart C (15.247) |
| **Test Procedure(s):** | ANSI C63.10-2013, KDB 558074 D01v05r02 |
| **Result:** | Pass |
| **Item Receipt Date:** | Oct. 23, 2024 |
| **Test Date:** | Nov. 05, ~ Nov. 11, 2024 |

Compiled By: Chuang Li
(Chuang Li)
Senior Test Engineer

Approved By: Line Chen
(Line Chen)
Engineer Manager

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of Fangguang Inspection & Testing Co., Ltd.
The test report must not be used by the client to claim product certifications, approval, or endorsement by NVLAP, NIST or any agency of U.S. Government.

# Revision History

| Report No. | Version | Description | Issue Date |
|---|---|---|---|
| S20241010265301E02 | Rev. 01 | / | 01-14-2025 |

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## §2.1033 General Information

| | |
|---|---|
| **Applicant:** | L&S Lighting Equipment (Shanghai) Co.,Ltd |
| **Applicant Address:** | Building NO.1,Lane 255 Longpan Road,Malu Town, Jiading District ;Shanghai China |
| **Manufacturer:** | L&S Lighting Equipment (Shanghai) Co.,Ltd |
| **Manufacturer Address:** | Building NO.1,Lane 255 Longpan Road,Malu Town, Jiading District ;Shanghai China |
| **Factory:** | Suzhou KainengJingxin Electronics Co.,LTD |
| **Factory Address:** | Building 7, Group 28, Anhu Village, Hengfan Street, East Taihu Lake Ecotourism Resort (Taihu New Town), Wujiang District, Suzhou City |
| **Test Site:** | Fangguang Inspection & Testing Co., Ltd |
| **LAB ID:** | CN5037 |
| **Test Site Address:** | No.8 Ningyun Rd., Xinwu District Wuxi,Jiangsu 214000 China |
| **FCC Rule Part(s):** | Part 15 Subpart C (15.247) |
| **FCC ID:** | 2BD9AS05051-4052 |
| **Test Device Serial No.:** | S/N:/<br>☐ Production ☒ Pre-Production ☐ Engineering |
| **FCC Classification:** | Digital Transmission System (DTS) |

# 1. INTRODUCTION

## 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

## 1.2. Fangguang Test Location

These measurement tests were performed at the Fangguang Inspection and testing Co.,LTD located at No.8 Ningyun Rd., Xinwu District Wuxi,Jiangsu 214000 China. The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014.

# 2. PRODUCT INFORMATION

## 2.1. Equipment Description

| | |
|---|---|
| Product Name: | matter controller |
| Main Test Model: | LITE MT |
| Additional Model: | LITE MT RP; LITE BT1 |
| Model Description: | LITE MT, LITE MT RP and LITE BT1 are identical to each other in all aspects, Schematic, Hardware version, structure and internal photos are same, only different as below:<br>LITE MT RP has a reverse polarity of output terminal compared to LITE MT.<br>LITE BT1 has a updated software compared to LITE MT. |
| Trade Mark: | L&S |
| Input Voltage Range: | DC 24V 6.25A |
| Bluetooth Version: | 5.1 |
| Software Version: | 1.10 |
| Hardware Version: | 1.0 |
| Note: | This information is provided by the Customer and its authenticty is the responsibility of the Customer. |

## 2.2. Product Specification Subjective to this Report

| | |
|---|---|
| Bluetooth Frequency | 2402~2480MHz |
| Type of modulation | GFSK |
| Data Rate | 1Mbps |
| Antenna Type: | PCB antenna |
| Antenna Gain: | -1.3dBi |

## 2.3. Operation Frequency / Channel List

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 00 | 2402 MHz | 01 | 2404 MHz | 02 | 2406 MHz |
| 03 | 2408 MHz | 04 | 2410 MHz | 05 | 2412 MHz |
| 06 | 2414 MHz | 07 | 2416 MHz | 08 | 2418 MHz |
| 09 | 2420 MHz | 10 | 2422 MHz | 11 | 2424 MHz |
| 12 | 2426 MHz | 13 | 2428 MHz | 14 | 2430 MHz |
| 15 | 2432 MHz | 16 | 2434 MHz | 17 | 2436 MHz |
| 18 | 2438 MHz | 19 | 2440 MHz | 20 | 2442 MHz |
| 21 | 2444 MHz | 22 | 2446 MHz | 23 | 2448 MHz |
| 24 | 2450 MHz | 25 | 2452 MHz | 26 | 2454 MHz |
| 27 | 2456 MHz | 28 | 2458 MHz | 29 | 2460 MHz |
| 30 | 2462 MHz | 31 | 2464 MHz | 32 | 2466 MHz |
| 33 | 2468 MHz | 34 | 2470 MHz | 35 | 2472 MHz |
| 36 | 2474 MHz | 37 | 2476 MHz | 38 | 2478 MHz |
| 39 | 2480 MHz | -- | -- | -- | -- |

## 2.4. Device Capabilities

This device contains the following capabilities:Bluetooth (5.0)

**Note:** The maximum achievable duty cycle was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW =8MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles of BLE_1M are 68.25%.

## 2.5. Description of Test Software

The test utility software used during testing was “Wifi Test Tool v1.6.5.exe” , Power Parameter Value:

| Test Mode | ANT1 |
|---|---|
| BLE_1M | Default |

## 2.6. Test Mode

| Test Mode | Mode 1: Transmit by BLE_1M |
|---|---|

## 2.7. Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

## 2.8. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 2.9. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

## 2.10. Calculation with all conversion and correction factors used

For AC Line Conducted Emissions Test:

Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

For Radiated Emissions Below 1GHz Test:

Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

For Radiated Emissions Above 1GHz Test:

Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB).

# 3. DESCRIPTION OF TEST

## 3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

**Deviation from measurement procedure…….....None**

## 3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

## 3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. The turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-25GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

# 4. ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.”

- Use a unique coupling to the intentional radiator.

# 5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR3 | FWXGJC-2016-181 | 1 year | 2025/03/07 |
| Two-Line V-Network | R&S | ENV 216 | FWXGJC-2016-182 | 1 year | 2025/04/28 |
| Thermohygrometer | Yuhuaze | HTC-1 | FWXDA-2016-385 | 1 year | 2025/02/25 |

Radiated Emission

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| Loop Antenna | Schwarzbeck | FMZB 1519B | FWXGJC-2018-015 | 3 year | 2025/07/23 |
| Bi-Log Antenna | R&S | HL562E | FWXGJC-2016-267-06 | 1 year | 2025/03/02 |
| Broadband Horn Antenna | R&S | HF907 | FWXGJC-2016-267-07 | 1 year | 2025/07/26 |
| Broadband Horn Antenna | Schwarzbeck | BBHA9170 | FWXGJC-2018-016 | 3 year | 2025/07/26 |
| EMI Receiver | R&S | ESR26 | FWXGJC-2016-267-01 | 1 year | 2025/07/26 |
| Pre-Amplifier | R&S | SCU-18D | FWXGJC-2016-267-05 | 1 year | 2025/07/23 |
| Pre-Amplifier | R&S | EMC184055 SE | FWXGJC-2018-018 | 3 year | 2025/07/23 |
| Hygrothermograph | Mittel | HTC-1 | FWXDA-2016-386 | 1 year | 2025/02/25 |
| Anechoic Chamber | Aimuke | EMCCT-3 | FWXGJC-2016-270 | 3 year | 2026/04/05 |

Conducted Test Equipment

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EXA Signal Analyzer | Keysight | N9010B | FWXGJC-2018-010 | 1 year | 2025/03/02 |
| RF Control Unit | Toncend | JS0806-2 | FWXGJC-2018-013 | 1 year | 2025/05/19 |
| Thermohygrometer | Yuhuaze | HTC-1 | FWXDA-2016-385 | 1 year | 2025/02/25 |

Auxiliary Equipment

| Instrument | Manufacturer | Type No. | Asset No. | Function |
|---|---|---|---|---|
| Filter | Toncend | ZBSF6 | 07247867 | / |
| Filter | Toncend | ZHPF6 | 07233297 | / |
| Attenuator | Toncend | 10dB | / | / |
| RF Cable | Toncend | T-1 | / | / |

Test Software

| Test Software | Manufacturer | Version | Asset No. | Function |
|---|---|---|---|---|
| EMI Test Software | Tonscend | V2.5.2.4 | FWXWA-2018-004 | Emission Test |
| RF Test Software | Tonscend | 3.3.10 | / | / |

# 6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| |
|---|
| AC Conducted Emission Measurement |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.05dB |
| Radiated Emission Measurement（below 1GHz） |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.06dB |
| Radiated Emission Measurement（above 1GHz） |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 4.13dB |
| Spurious Emissions, Conducted |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 30MHz-1GHz: 1.00 dB 1GHz-12.75GHz: 1.30 dB |
| Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.60dB |
| Power Spectrum Density |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.80dB |
| Occupied Bandwidth |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.20MHz |
| Frequency Stability |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): $0.1\times10^{-6}$ |

# 7. TEST RESULT

## 7.1. Summary

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| 15.247(a)(2) | 6dB Bandwidth | ≥ 500kHz | Conducted | Pass | Section 7.2 |
| 15.247(b)(3) | Output Power | ≤ 30dBm | | Pass | Section 7.3 |
| 15.247(e) | Power Spectral Density | ≤ 8dBm/3kHz | | Pass | Section 7.4 |
| 15.247(d) | Band Edge | ≥ 20dBc | | Pass | Section 7.5 |
| 15.247(d) | Out-of-Band Emissions | ≥ 20dBc | | Pass | Section 7.5 |
| 15.205 | Restricted Bands | Emissions in restricted bands must meet the radiated limits detailed in 15.205 | Radiated | Pass | Section 7.7 |
| 15.209 | General Field Strength Limits (Radiated Emission Limits) | Radiated Emission must meet the radiated limits detailed in 15.209 (RSS GEN [8.9]) | | Pass | Section 7.6 |
| 15.207 | AC Conducted Emissions 150kHz - 30MHz | < FCC 15.207 limits ( RSS GEN [8.8]) | Line Conducted | N/A | Section 7.8 |

**Notes:**

1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

## 7.2. 6dB Bandwidth Measurement

### 7.2.1. Test Limit

The minimum permissible 6dB bandwidth is 500 kHz.

### 7.2.2. Test Procedure used

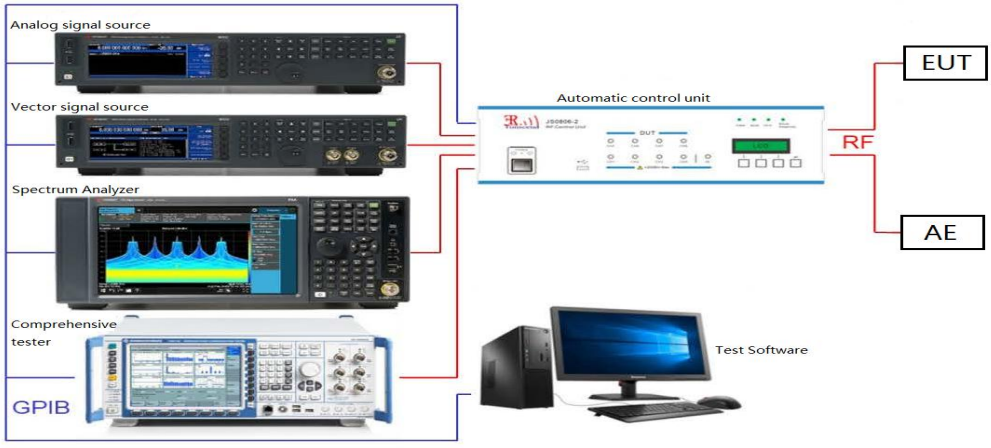
ANSI C63.10-2013 Section 11.8.2 Option 1

KDB 558074 D01 v05r02 – Section 8.2

### 7.2.3. Test Setting

1. Set RBW = 100 kHz
2. VBW ≥ 3 × RBW
3. Detector = peak
4. Trace mode = max hold
5. Sweep = auto couple
6. Allow the trace was allowed to stabilize
7. 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.

### 7.2.4. Test Setup



### 7.2.5. Test Result

| Test Mode | Antenna | Channel | DTS BW [MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | 99% BW[MHz] | Verdict |
|---|---|---|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | 0.676 | 2401.644 | 2402.320 | 0.5 | 1.0314 | PASS |
| | | 2440 | 0.672 | 2439.640 | 2440.312 | 0.5 | 1.0320 | PASS |
| | | 2480 | 0.676 | 2479.636 | 2480.312 | 0.5 | 1.0321 | PASS |

## Test Graphs of 6dB Bandwidth

BLE_1M_Ant1_2402




BLE_1M_Ant1_2440




BLE_1M_Ant1_2480


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 40 dB
PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
1 Spectrum
Ref Lvl Offset 8.65 dB
Ref Level 30.00 dBm
ΔMkr3 676 kHz
0.22 dB
Scale/Div 10 dB
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1Δ1 -1.08 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Span 4.000 MHz
Sweep 1.00 ms (1001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 2.479 636 GHz -1.004 dBm
2 N 1 f 2.479 980 GHz 4.920 dBm
3 Δ1 1 f (Δ) 676 kHz (Δ) 0.2165 dB
4
5
6
Nov 05, 2024
4:03:54 PM
Frequency
Settings
Center Frequency
2.480000000 GHz
Span
4.00000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.478000000 GHz
Stop Freq
2.482000000 GHz
AUTO TUNE
CF Step
400.000 kHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)

## Test Graphs of Occupied Channel Bandwidth

BLE_1M_Ant1_2402




BLE_1M_Ant1_2440




BLE_1M_Ant1_2480


Spectrum Analyzer 1
Occupied BW
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
Atten: 40 dB
Trig: Free Run
Gate: Off
#IF Gain: Low
Center Freq: 2.480000000 GHz
Avg|Hold:>100/100
Radio Std: None
Frequency
Center Frequency
2.480000000 GHz
Settings
Span
4.0000 MHz
CF Step
400.000 kHz
Auto
Man
Freq Offset
0 Hz
1 Graph
Ref Lvl Offset 8.65 dB
Ref Value 30.00 dBm
Mkr1 2.4800 GHz
4.95 dBm
Scale/Div 10.0 dB
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 2.48 GHz
#Res BW 43.000 kHz
#Video BW 130.00 kHz
Span 4 MHz
Sweep 2.07 ms (1001 pts)
2 Metrics
Occupied Bandwidth
1.0321 MHz
Total Power
12.1 dBm
Transmit Freq Error
-11.278 kHz
% of OBW Power
99.00 %
x dB Bandwidth
1.236 MHz
x dB
-26.00 dB
Nov 05, 2024
4:04:03 PM

## 7.3. Output Power Measurement

### 7.3.1. Test Limit

The maximum permissible conducted output power is 1 Watt (30dBm). And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 7.3.2. Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.1

KDB 558074 D01 v05r02 – Section 8.3.1.2

### 7.3.3. Test Setting

1.Set the RBW ≥ DTS bandwidth.

2.Set the VBW ≥ [3 × RBW].

3.Set the span ≥[3 × RBW].

4.Detector = peak.

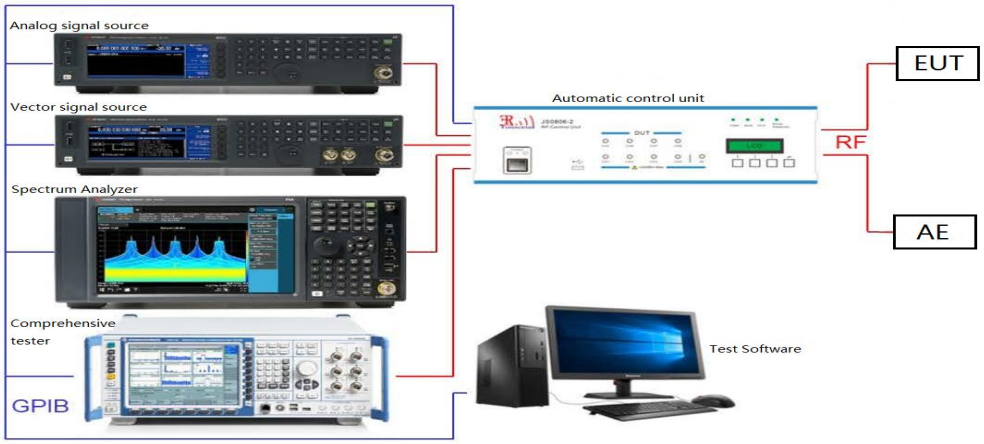
5.Sweep time = auto couple.

6.Trace mode = max hold.

7.Allow trace to fully stabilize.

8. Use peak marker function to determine the peak amplitude level.

### 7.3.4. Test Setup

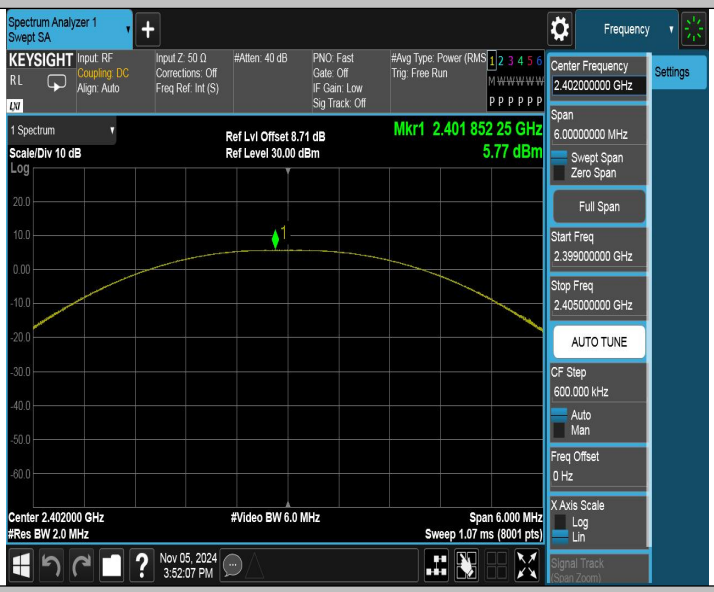



### 7.3.5. Test Result

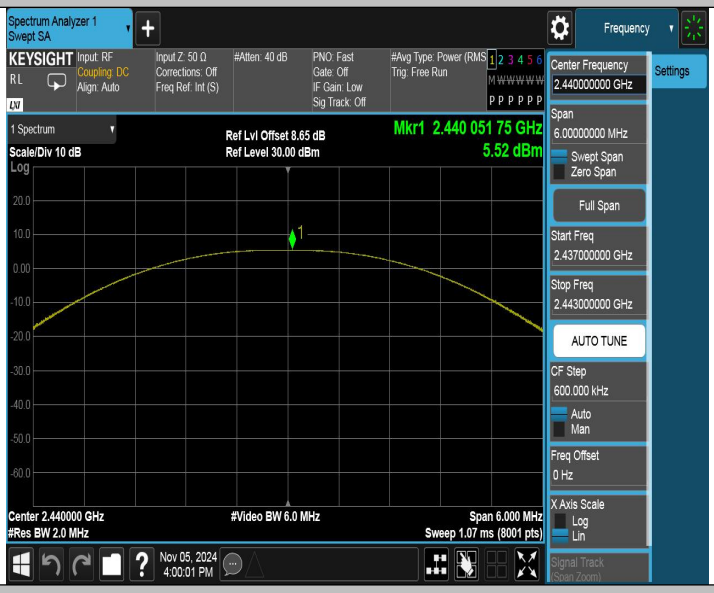
| Test Mode | Antenna | Channel | Result[dBm] | Limit[dBm] | Verdict |
|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | 5.77 | ≤30 | PASS |
| | | 2440 | 5.52 | ≤30 | PASS |
| | | 2480 | 5.22 | ≤30 | PASS |

## Test Graphs

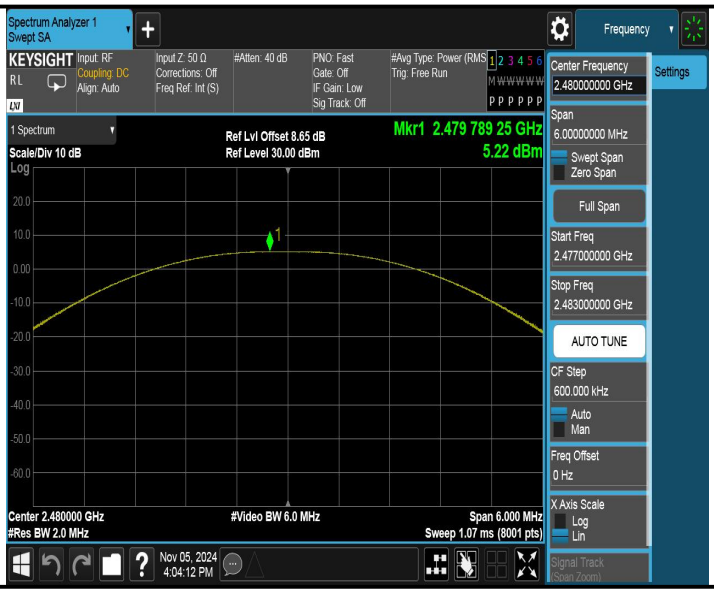
BLE_1M_Ant1_2402




BLE_1M_Ant1_2440




BLE_1M_Ant1_2480


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 40 dB
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
1 Spectrum
Ref Lvl Offset 8.65 dB
Ref Level 30.00 dBm
Mkr1 2.479 789 25 GHz
5.22 dBm
Scale/Div 10 dB
Log
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
Center 2.480000 GHz
#Res BW 2.0 MHz
#Video BW 6.0 MHz
Span 6.000 MHz
Sweep 1.07 ms (8001 pts)
Nov 05, 2024
4:04:12 PM
Frequency
Settings
Center Frequency
2.480000000 GHz
Span
6.00000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.477000000 GHz
Stop Freq
2.483000000 GHz
AUTO TUNE
CF Step
600.000 kHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)

## 7.4. Power Spectral Density Measurement

### 7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 7.4.2. Test Procedure Used

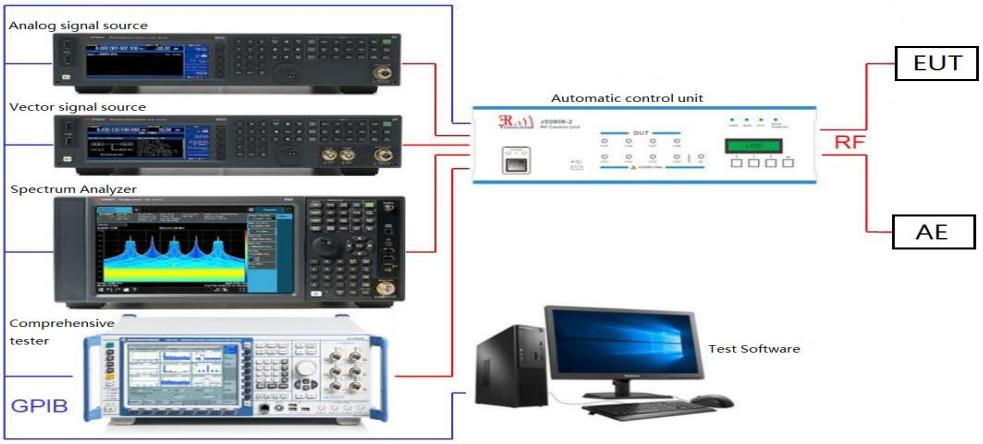
KDB 558074 D01 v05r02 - Section 8.4

ANSI C63.10 – Section 11.10.2

### 7.4.3. Test Setting

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ [3 × RBW].
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.

### 7.4.4. Test Setup

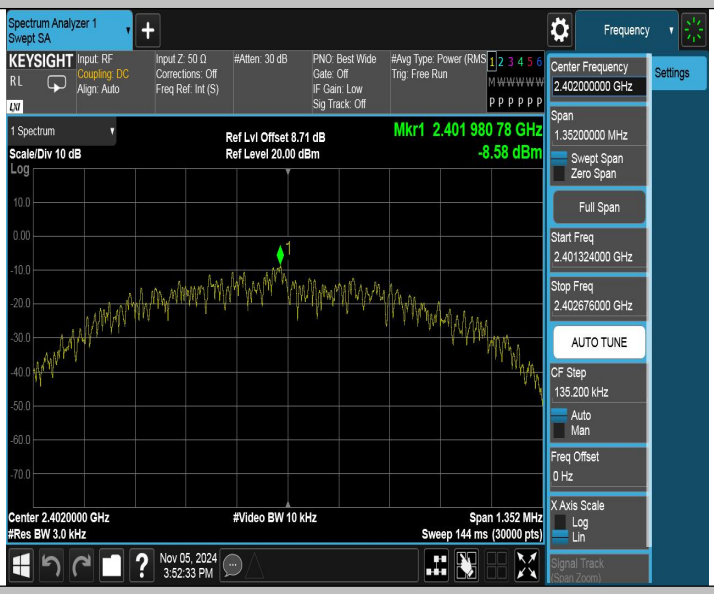


### 7.4.5. Test Result

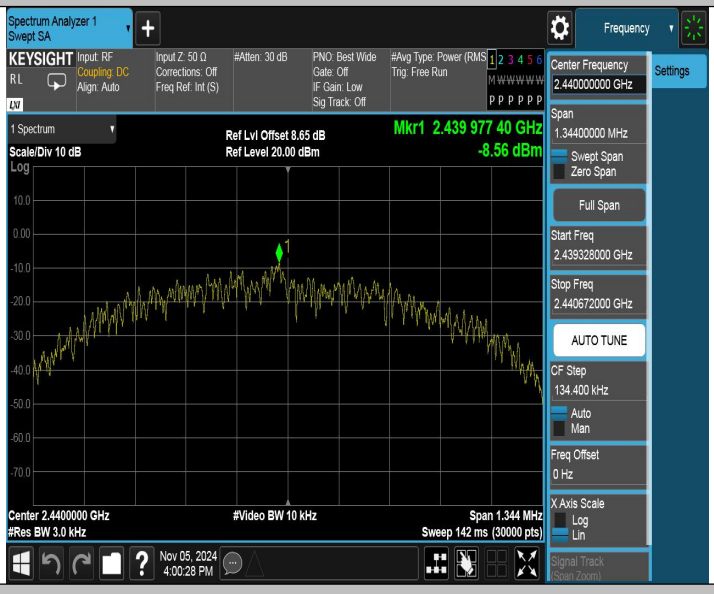
| Test Mode | Antenna | Channel | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | -8.58 | ≤8.00 | PASS |
| | | 2440 | -8.56 | ≤8.00 | PASS |
| | | 2480 | -8.85 | ≤8.00 | PASS |

## Test Graphs

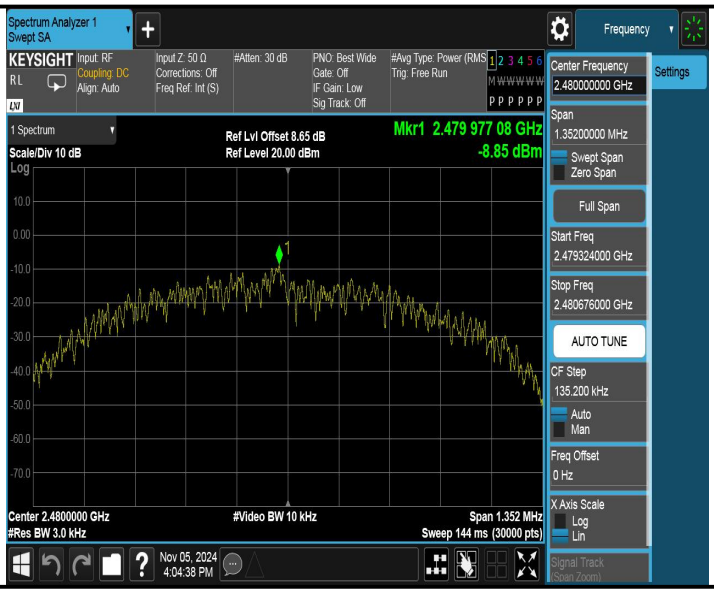
BLE_1M_Ant1_2402




BLE_1M_Ant1_2440




BLE_1M_Ant1_2480


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
#Atten: 30 dB
PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Trig: Free Run
1 Spectrum
Ref Lvl Offset 8.65 dB
Ref Level 20.00 dBm
Mkr1 2.479 977 08 GHz
-8.85 dBm
Scale/Div 10 dB
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.4800000 GHz
#Res BW 3.0 kHz
#Video BW 10 kHz
Span 1.352 MHz
Sweep 144 ms (30000 pts)
Nov 05, 2024
4:04:38 PM
Frequency
Settings
Center Frequency
2.480000000 GHz
Span
1.35200000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.479324000 GHz
Stop Freq
2.480676000 GHz
AUTO TUNE
CF Step
135.200 kHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)

## 7.5. Conducted Band Edge and Out-of-Band Emissions

### 7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

### 7.5.2. Test Procedure Used

KDB 558074 D01 v05r02 - Section 8.5 & Section 8.6

ANSI C63.10 – Section 11.11&11.12

### 7.5.3. Test Settitng

(a) Set the center frequency and span to encompass frequency range to be measured

(b) RBW = 100kHz

(c) VBW = 300kHz

(d) Detector = Peak

(e) Trace mode = max hold

(f) Sweep time = auto couple

(g) The trace was allowed to stabilize

### 7.5.4. Test Setup

