

# TEST REPORT

Applicant Name: Telepower Communication Co., Ltd.  
Address: 5 Bld, Zone A, Hantian Technology Town No.17 ShenHai RD,  
Nanhai District Foshan China  
Report Number: SZ1240308-11508E-RF-00B  
FCC ID: 2AJ2B-T20C

## Test Standard (s)

FCC PART 15.247

## Sample Description

Product Type: Ticket Validator  
Model No.: T20  
Multiple Model(s) No.: T20B,T20C,T20D,T20P  
Trade Mark: Telpo  
Date Received: 2024/03/08  
Issue Date: 2024/05/28

Test Result:

Pass▲

▲ In the configuration tested, the EUT complied with the standards above.

## Prepared and Checked By:

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RF Engineer

## Approved By:

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Nancy Wang  
RF Supervisor

Note: The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

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DOCUMENT REVISION HISTORY

| Revision Number | Report Number           | Description of Revision | Date of Revision |
|-----------------|-------------------------|-------------------------|------------------|
| 0               | SZ1240308-11508E-RF-00B | Original Report         | 2024/05/28       |

## GENERAL INFORMATION

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

|                                                                                                                                                                                                          |                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Product                                                                                                                                                                                                  | Ticket Validator                                                                                              |
| Tested Model                                                                                                                                                                                             | T20                                                                                                           |
| Multiple Model(s)                                                                                                                                                                                        | T20B,T20C,T20D,T20P                                                                                           |
| Frequency Range                                                                                                                                                                                          | BLE:2402-2480MHz<br>Wi-Fi:2412-2462MHz/2422-2452 MHz                                                          |
| Maximum Conducted Output Peak Power                                                                                                                                                                      | BLE: -2.76dBm<br>Wi-Fi: 22.33dBm(802.11b), 23.16dBm(802.11g), 23.12dBm(802.11n20)<br>21.80dBm(802.11n40)      |
| Modulation Technique                                                                                                                                                                                     | BLE: GFSK<br>Wi-Fi: DSSS, OFDM                                                                                |
| Antenna Specification <sup>#</sup>                                                                                                                                                                       | 2.16dBi (provided by the applicant)                                                                           |
| Voltage Range                                                                                                                                                                                            | DC 9V-40V                                                                                                     |
| Sample serial number                                                                                                                                                                                     | 2LGK-4 for Conducted and Radiated Emissions Test<br>2LGK-3 for RF Conducted Test (Assigned by BACL, Shenzhen) |
| Sample/EUT Status                                                                                                                                                                                        | Good condition                                                                                                |
| Adapter Information                                                                                                                                                                                      | N/A                                                                                                           |
| Note: The Multiple models are electrically identical with the test model except for model name. Please refer to the declaration letter <sup>#</sup> for more detail, which was provided by manufacturer. |                                                                                                               |

### Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

## Measurement Uncertainty

| Parameter                          |                             | Uncertainty                           |
|------------------------------------|-----------------------------|---------------------------------------|
| Occupied Channel Bandwidth         |                             | ±5%                                   |
| RF output power, conducted         |                             | 0.72 dB(k=2, 95% level of confidence) |
| AC Power Lines Conducted Emissions | 9kHz~150 kHz                | 3.94dB(k=2, 95% level of confidence)  |
|                                    | 150 kHz ~30MHz              | 3.84dB(k=2, 95% level of confidence)  |
| Radiated Emissions                 | 9kHz - 30MHz                | 3.30dB(k=2, 95% level of confidence)  |
|                                    | 30MHz~200MHz (Horizontal)   | 4.48dB(k=2, 95% level of confidence)  |
|                                    | 30MHz~200MHz (Vertical)     | 4.55dB(k=2, 95% level of confidence)  |
|                                    | 200MHz~1000MHz (Horizontal) | 4.85dB(k=2, 95% level of confidence)  |
|                                    | 200MHz~1000MHz (Vertical)   | 5.05dB(k=2, 95% level of confidence)  |
|                                    | 1GHz - 6GHz                 | 5.35dB(k=2, 95% level of confidence)  |
|                                    | 6GHz - 18GHz                | 5.44dB(k=2, 95% level of confidence)  |
|                                    | 18GHz - 40GHz               | 5.16dB(k=2, 95% level of confidence)  |
| Temperature                        |                             | ±1°C                                  |
| Humidity                           |                             | ±1%                                   |
| Supply voltages                    |                             | ±0.4%                                 |

*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.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

For 2.4GHz Wi-Fi mode, total 11 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1       | 2412            | 8       | 2447            |
| 2       | 2417            | 9       | 2452            |
| 3       | 2422            | 10      | 2457            |
| 4       | 2427            | 11      | 2462            |
| 5       | 2432            | /       | /               |
| 6       | 2437            | /       | /               |
| 7       | 2442            | /       | /               |

802.11b, 802.11g and 802.11n-HT20 mode was tested with Channel 1, 6 and 11.

802.11n-HT40 mode was tested with Channel 3, 6 and 9.

For BLE mode, 40 channels are provided to testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 20      | 2442            |
| 1       | 2404            | 21      | 2444            |
| 2       | 2406            | 22      | 2446            |
| 3       | 2408            | 23      | 2448            |
| 4       | 2410            | 24      | 2450            |
| 5       | 2412            | 25      | 2452            |
| 6       | 2414            | 26      | 2454            |
| 7       | 2416            | 27      | 2456            |
| 8       | 2418            | 28      | 2458            |
| 9       | 2420            | 29      | 2460            |
| 10      | 2422            | 30      | 2462            |
| 11      | 2424            | 31      | 2464            |
| 12      | 2426            | 32      | 2466            |
| 13      | 2428            | 33      | 2468            |
| 14      | 2430            | 34      | 2470            |
| 15      | 2432            | 35      | 2472            |
| 16      | 2434            | 36      | 2474            |
| 17      | 2436            | 37      | 2476            |
| 18      | 2438            | 38      | 2478            |
| 19      | 2440            | 39      | 2480            |

EUT was tested with Channel 0, 19 and 39.

### Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

“QRCT4”<sup>#</sup> exercise software was used.

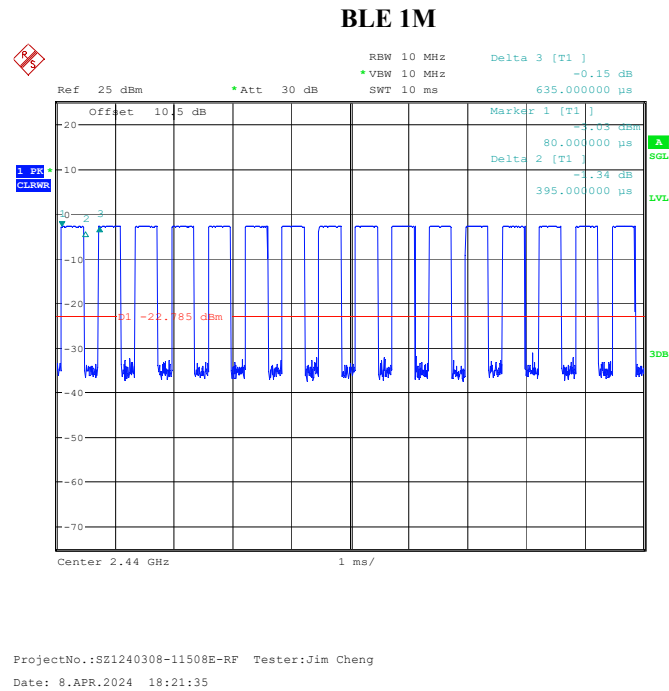
The device was tested with the worst case was performed as below:

| Mode      | Data rate | Power Level <sup>#</sup> |                |              |
|-----------|-----------|--------------------------|----------------|--------------|
|           |           | Low Channel              | Middle Channel | High Channel |
| 802.11b   | 1Mbps     | 20                       | 20             | 20           |
| 802.11g   | 6Mbps     | 16                       | 16             | 16           |
| 802.11n20 | MCS0      | 16                       | 16             | 16           |
| 802.11n40 | MCS0      | 14                       | 14             | 14           |
| BLE 1M    | 1Mbps     | Default                  | Default        | Default      |

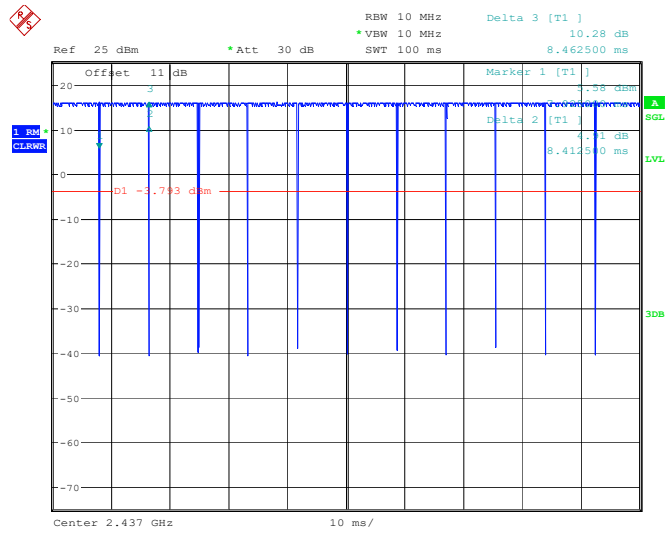
Note: the power level was provided by applicant.

Duty cycle

| Test Modes   | Ton (ms) | Ton+off (ms) | Duty Cycle (%) | 1/T (Hz) | VBW Setting (Hz) |
|--------------|----------|--------------|----------------|----------|------------------|
| BLE 1M       | 0.395    | 0.635        | 62.20          | 2532     | 3000             |
| 802.11b      | 8.413    | 8.463        | 99.41          | /        | 10               |
| 802.11g      | 1.391    | 1.428        | 97.41          | 719      | 1000             |
| 802.11n-HT20 | 1.300    | 1.335        | 97.38          | 769      | 1000             |
| 802.11n-HT40 | 0.839    | 0.891        | 94.16          | 1192     | 2000             |

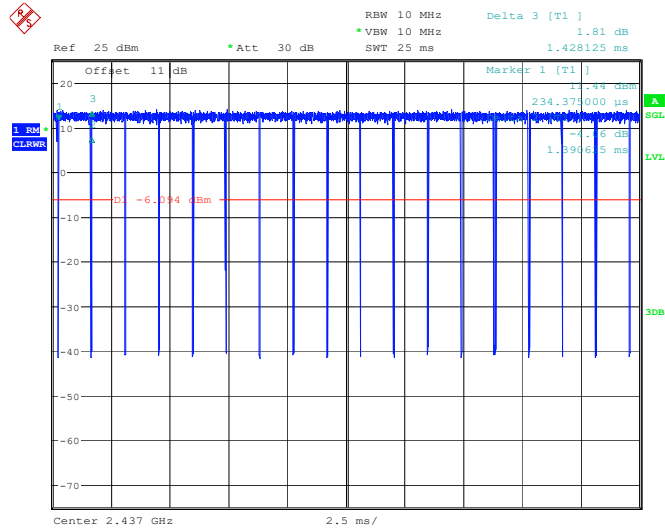


### 802.11b



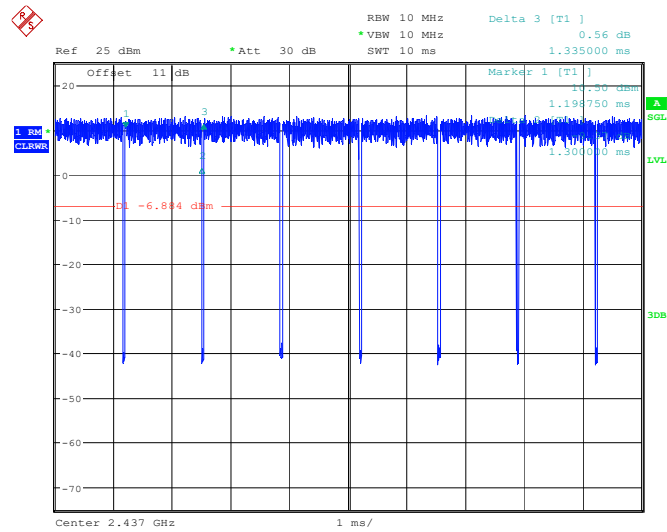
ProjectNo.:SZ1240308-11508E-RF Tester:Bamboo Zhan  
Date: 1.MAY.2024 09:14:44

### 802.11g



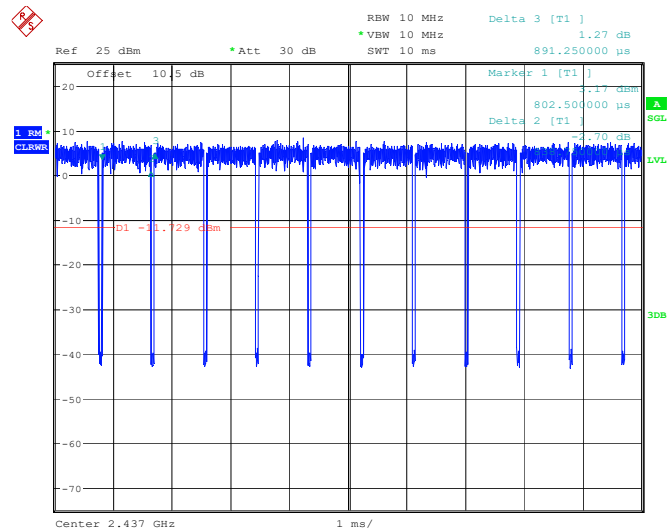
ProjectNo.:SZ1240308-11508E-RF Tester:Bamboo Zhan  
Date: 1.MAY.2024 09:27:20

802.11n20



ProjectNo.:SZ1240308-11508E-RF Tester:Bamboo Zhan  
Date: 1.MAY.2024 09:28:58

802.11n40



ProjectNo.:SZ1240308-11508E-RF Tester:Bamboo Zhan  
Date: 22.APR.2024 20:30:58

Support Equipment List and Details

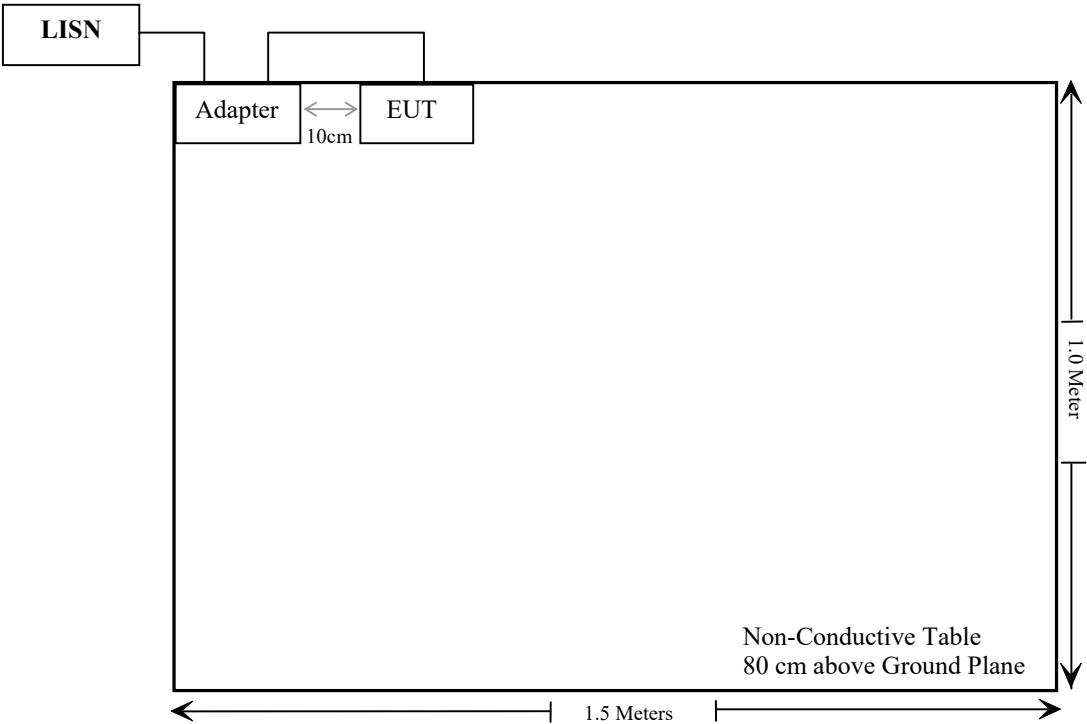
| Manufacturer | Description | Model   | Serial Number |
|--------------|-------------|---------|---------------|
| Unknown      | Socket      | Unknown | Unknown       |
| Unknown      | Adapter     | Unknown | Unknown       |

External I/O Cable

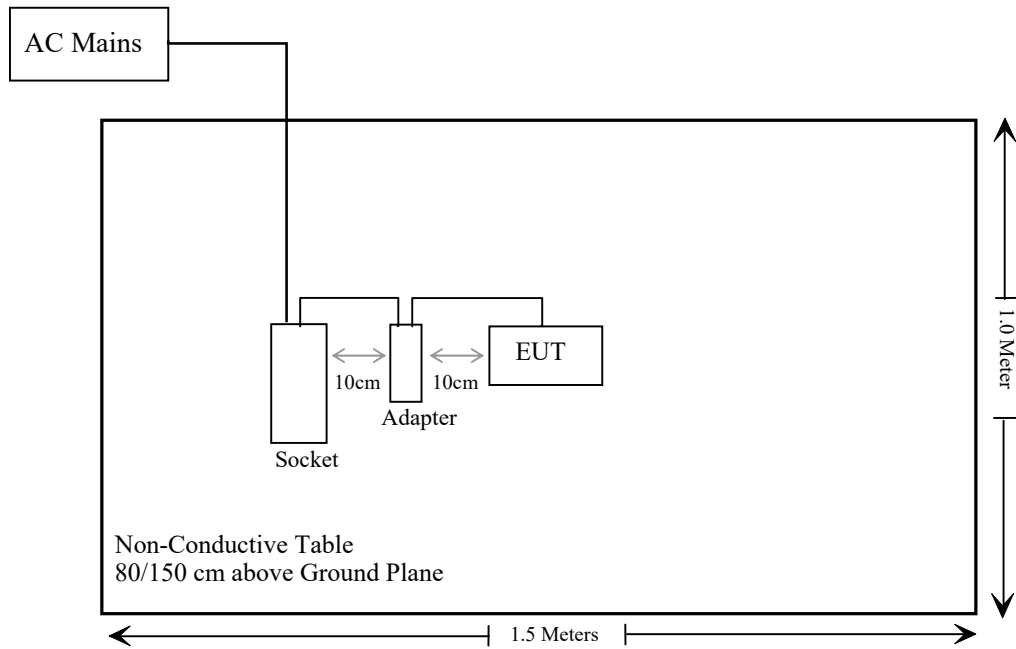
| Cable Description                   | Length (m) | From Port | To          |
|-------------------------------------|------------|-----------|-------------|
| Un-shielding Un-Detachable DC Cable | 1.0        | EUT       | Adapter     |
| Un-shielded Detachable AC Cable     | 1.5        | Adapter   | LISN/Socket |
| Un-shielding Un-Detachable AC Cable | 1.5        | Socket    | AC Mains    |

Block Diagram of Test Setup

For Conducted Emissions:



For Radiated Emissions:



**SUMMARY OF TEST RESULTS**

| FCC Rules                       | Description of Test                          | Result    |
|---------------------------------|----------------------------------------------|-----------|
| §1.1307 ,§2.1091                | MPE-Based Exemption                          | Compliant |
| §15.203                         | Antenna Requirement                          | Compliant |
| §15.207 (a)                     | AC Line Conducted Emissions                  | Compliant |
| §15.205, §15.209,<br>§15.247(d) | Spurious Emissions                           | Compliant |
| §15.247 (a)(2)                  | 6 dB Emission Bandwidth & Occupied Bandwidth | Compliant |
| §15.247(b)(3)                   | Maximum Conducted Output Power               | Compliant |
| §15.247(d)                      | 100 kHz Bandwidth of Frequency Band Edge     | Compliant |
| §15.247(e)                      | Power Spectral Density                       | Compliant |

**TEST EQUIPMENT LIST**

| Manufacturer                   | Description                 | Model                   | Serial Number          | Calibration Date | Calibration Due Date |
|--------------------------------|-----------------------------|-------------------------|------------------------|------------------|----------------------|
| <b>Conducted Emission Test</b> |                             |                         |                        |                  |                      |
| Rohde & Schwarz                | EMI Test Receiver           | ESCI                    | 101120                 | 2024/01/16       | 2025/01/15           |
| Rohde & Schwarz                | LISN                        | ENV216                  | 101613                 | 2024/01/16       | 2025/01/15           |
| Rohde & Schwarz                | Transient Limiter           | ESH3Z2                  | DE25985                | 2023/08/03       | 2024/08/02           |
| Unknown                        | CE Cable                    | CE Cable                | UF A210B-1-0720-504504 | 2023/08/03       | 2024/08/02           |
| Audix                          | EMI Test software           | E3                      | 191218(V9)             | NCR              | NCR                  |
| <b>Radiated Emission Test</b>  |                             |                         |                        |                  |                      |
| R&S                            | EMI Test Receiver           | ESR3                    | 102455                 | 2024/01/16       | 2025/01/15           |
| Sonoma instrument              | Pre-amplifier               | 310 N                   | 186238                 | 2023/06/08       | 2024/06/07           |
| Sunol Sciences                 | Broadband Antenna           | JB1                     | A040904-1              | 2023/07/20       | 2024/07/19           |
| ETS                            | Passive Loop Antenna        | 6512                    | 29604                  | 2023/07/07       | 2024/07/06           |
| Unknown                        | Cable                       | Chamber Cable 1         | F-03-EM236             | 2023/08/03       | 2024/08/02           |
| Unknown                        | Cable                       | Chamber Cable 4         | EC-007                 | 2023/08/03       | 2024/08/02           |
| Audix                          | EMI Test software           | E3                      | 19821b(V9)             | NCR              | NCR                  |
| Rohde & Schwarz                | Spectrum Analyzer           | FSV40                   | 101605                 | 2024/03/27       | 2025/03/26           |
| COM-POWER                      | Pre-amplifier               | PA-122                  | 181919                 | 2023/06/29       | 2024/06/28           |
| Schwarzbeck                    | Horn Antenna                | BBHA9120D(1201)         | 1143                   | 2023/07/26       | 2024/07/25           |
| Unknown                        | RF Cable                    | KMSE                    | 0735                   | 2023/10/08       | 2024/10/07           |
| Unknown                        | RF Cable                    | UFA147                  | 219661                 | 2023/10/08       | 2024/10/07           |
| SNSD                           | 2.4G Band Reject filter     | BSF2402-2480MN-0898-001 | 2.4G filter            | 2023/08/03       | 2024/08/02           |
| A.H.System                     | Pre-amplifier               | PAM-1840VH              | 190                    | 2023/08/03       | 2024/08/02           |
| Electro-Mechanics Co           | Horn Antenna                | 3116                    | 2026                   | 2023/09/18       | 2026/09/17           |
| UTIFLEX                        | RF Cable                    | NO. 13                  | 232308-001             | 2023/08/03       | 2024/08/02           |
| Audix                          | EMI Test software           | E3                      | 191218(V9)             | NCR              | NCR                  |
| <b>RF Conducted Test</b>       |                             |                         |                        |                  |                      |
| R&S                            | SPECTRUM ANALYZER           | FSU26                   | 200120                 | 2024/01/08       | 2025/01/07           |
| ANRITSU                        | Microwave peak power sensor | MA24418A                | 12622                  | 2023/08/08       | 2024/08/07           |
| Unknown                        | 10dB Attenuator             | Unknown                 | F-03-EM122             | 2023/07/04       | 2024/07/03           |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## FCC §1.1307 (B) & §2.1091- MPE-BASED EXEMPTION

### Applicable Standard

According to subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

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                 | $0.0128 R^2 f$ .      |
| 1,500-100,000             | $19.2 R^2$ .          |

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

**Result**

| Mode       | Frequency (MHz) | Tune up conducted power <sup>#</sup> | Antenna Gain <sup>#</sup> |       | ERP   |        | Evaluation Distance (m) | ERP Limit (mW) |
|------------|-----------------|--------------------------------------|---------------------------|-------|-------|--------|-------------------------|----------------|
|            |                 | (dBm)                                | (dBi)                     | (dBd) | (dBm) | (mW)   |                         |                |
| BT         | 2402-2480       | 10.0                                 | 2.16                      | 0.01  | 10.01 | 10.02  | 0.2                     | 768            |
| BLE        | 2402-2480       | -2.5                                 | 2.16                      | 0.01  | -2.49 | 0.56   | 0.2                     | 768            |
| 2.4G Wi-Fi | 2412-2462       | 23.5                                 | 2.16                      | 0.01  | 23.51 | 224.39 | 0.2                     | 768            |
| 5.2G Wi-Fi | 5180-5240       | 15.0                                 | 0                         | -2.15 | 12.85 | 19.28  | 0.2                     | 768            |
| GSM850*    | 824-849         | 25.98                                | -4.91                     | -7.06 | 18.92 | 77.98  | 0.2                     | 422            |
| PCS1900*   | 1850-1910       | 20.48                                | 2.30                      | 0.15  | 20.63 | 115.61 | 0.2                     | 768            |
| WCDMA B2   | 1850-1910       | 22.0                                 | 2.30                      | 0.15  | 22.15 | 164.06 | 0.2                     | 768            |
| WCDMA B5   | 824-849         | 23.0                                 | -4.91                     | -7.06 | 15.94 | 39.26  | 0.2                     | 422            |
| LTE B2     | 1850-1910       | 23.0                                 | 2.30                      | 0.15  | 23.15 | 206.54 | 0.2                     | 768            |
| LTE B4     | 1710-1755       | 23.0                                 | 1.88                      | -0.27 | 22.73 | 187.50 | 0.2                     | 768            |
| LTE B7     | 2500-2570       | 22.0                                 | 2.95                      | 0.8   | 22.8  | 190.55 | 0.2                     | 768            |
| LTE B38    | 2570-2620       | 22.5                                 | 3.34                      | 1.19  | 23.69 | 233.88 | 0.2                     | 768            |

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.

2. The BT, 2.4G Wi-Fi and 5G Wi-Fi cannot transmit at same time.

3. 0dBd=2.15dBi

Note\*: It was the time average power according to the duty cycle.

| Mode     |         | Tune-up Peak Output Power (dBm) |        |      | Tune-up Average Output Power (dBm) |              |              |
|----------|---------|---------------------------------|--------|------|------------------------------------|--------------|--------------|
|          |         | Low                             | Middle | High | Low                                | Middle       | High         |
| GPRS850  | 1 slot  | 33.5                            | 33.5   | 33.5 | 24.47                              | 24.47        | 24.47        |
|          | 2 slots | 32.0                            | 32.0   | 32.0 | <b>25.98</b>                       | <b>25.98</b> | <b>25.98</b> |
|          | 3 slots | 30.0                            | 30.0   | 30.0 | 25.74                              | 25.74        | 25.74        |
|          | 4 slots | 28.5                            | 28.5   | 28.5 | 25.49                              | 25.49        | 25.49        |
| GPRS1900 | 1 slot  | 27.5                            | 27.5   | 27.5 | 18.47                              | 18.47        | 18.47        |
|          | 2 slots | 26.5                            | 26.5   | 26.5 | <b>20.48</b>                       | <b>20.48</b> | <b>20.48</b> |
|          | 3 slots | 24.0                            | 24.0   | 24.0 | 19.74                              | 19.74        | 19.74        |
|          | 4 slots | 23.0                            | 23.0   | 23.0 | 19.99                              | 19.99        | 19.99        |

Note: the duty cycle for 1 slot is 1/8, 2 slots is 1/4, 3 slots is 3/8, 4 slots is 1/2

The average power=Peak power+ duty cycle factor

Duty cycle factor=10\*log (duty cycle)

**NFC:**

| Mode | Frequency<br>(MHz) | Maximum E-Field<br>(dBuV/m@3m) | Maximum EIRP<br>(dBm) | ERP    |       | Evaluation<br>Distance<br>(m) | ERP<br>Limit<br>(mW) |
|------|--------------------|--------------------------------|-----------------------|--------|-------|-------------------------------|----------------------|
|      |                    |                                |                       | (dBm)  | (mW)  |                               |                      |
| NFC  | 13.56              | 69.98                          | -25.22                | -27.37 | 0.002 | 0.2                           | 751                  |

Note: EIRP = E-Field – 95.2 @3m, ERP = EIRP-2.15

Simultaneous transmitting consideration (worst case):

The ratio=  $ERP_{2.4G\ Wi-Fi}/limit + ERP_{LTE\ B38}/limit + ERP_{NFC}/limit = 224.39/768 + 233.88/768 + 0.002/751 = 0.597 < 1.0$

So simultaneous exposure is compliant.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

**Result: Compliant**

## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

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 exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has one internal antenna arrangement, which was permanently attached, the antenna gain<sup>#</sup> is 2.16dBi, fulfill the requirement of this section. Please refer to the EUT photos.

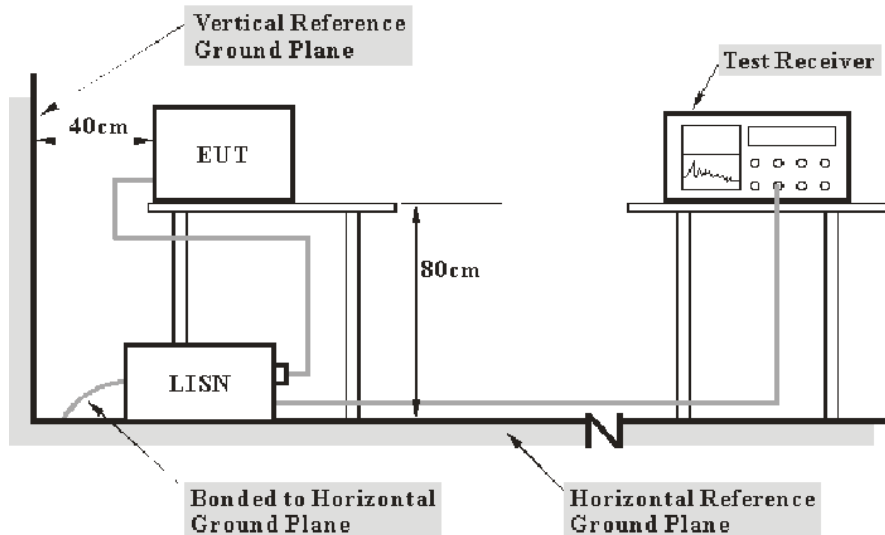
**Result: Compliant**

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC§15.207

### 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.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

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

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

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

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

## Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

$$\text{Factor} = \text{LISN VDF} + \text{Cable Loss}$$

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 calculation is as follows:

$$\begin{aligned}\text{Over Limit} &= \text{Level} - \text{Limit} \\ \text{Level} &= \text{Read Level} + \text{Factor}\end{aligned}$$

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

## Test Data

### Environmental Conditions

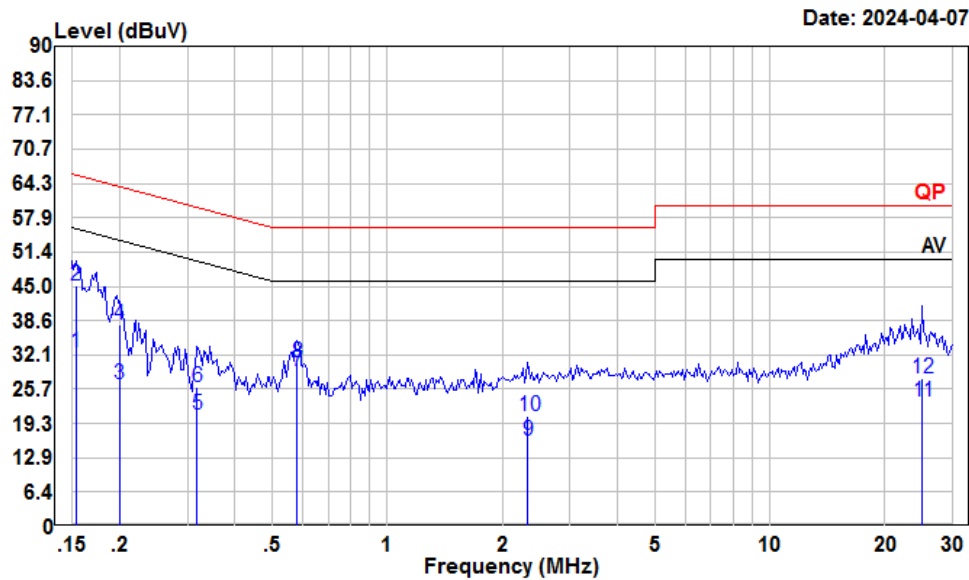
|                    |         |
|--------------------|---------|
| Temperature:       | 26 °C   |
| Relative Humidity: | 54 %    |
| ATM Pressure:      | 101 kPa |

*The testing was performed by Macy Shi on 2024-04-07.*

*EUT operation mode: Transmitting*

**BLE:** (maximum output power mode, Middle channel)

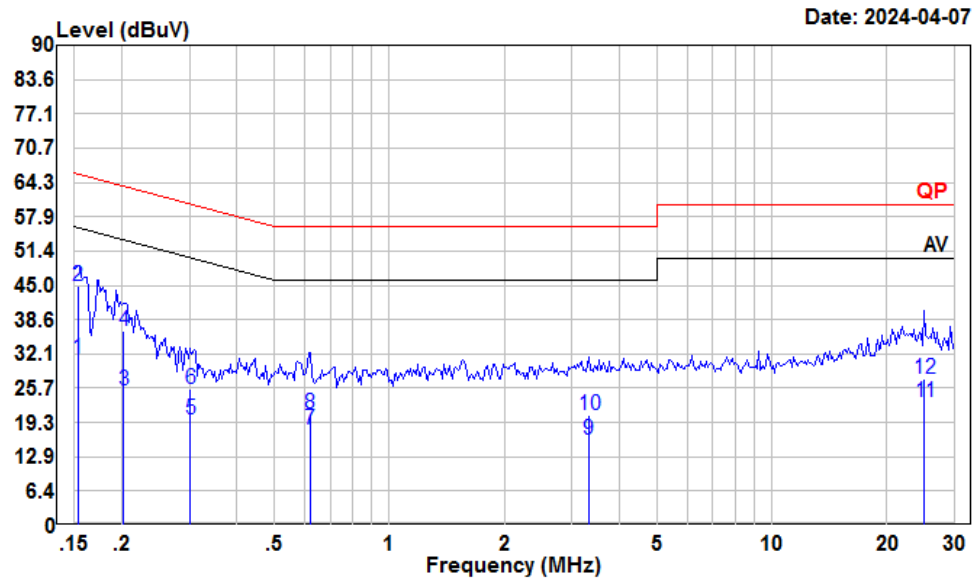
**AC 120V/60 Hz, Line**



Condition: Line  
Project : SZ1240308-11508E-RF  
Tester : Macy shi  
Note : BLE

|    | Freq  | Read Level | LISN Level | Factor | Cable Loss | Limit Line | Over Limit | Remark  |
|----|-------|------------|------------|--------|------------|------------|------------|---------|
|    | MHz   | dBuV       | dBuV       | dB     | dB         | dBuV       | dB         |         |
| 1  | 0.15  | 11.97      | 32.52      | 10.40  | 10.15      | 55.82      | -23.30     | Average |
| 2  | 0.15  | 24.70      | 45.25      | 10.40  | 10.15      | 65.82      | -20.57     | QP      |
| 3  | 0.20  | 6.11       | 26.60      | 10.40  | 10.09      | 53.62      | -27.02     | Average |
| 4  | 0.20  | 17.27      | 37.76      | 10.40  | 10.09      | 63.62      | -25.86     | QP      |
| 5  | 0.32  | 0.63       | 21.06      | 10.30  | 10.13      | 49.75      | -28.69     | Average |
| 6  | 0.32  | 5.77       | 26.20      | 10.30  | 10.13      | 59.75      | -33.55     | QP      |
| 7  | 0.58  | 8.60       | 29.10      | 10.29  | 10.21      | 46.00      | -16.90     | Average |
| 8  | 0.58  | 10.19      | 30.69      | 10.29  | 10.21      | 56.00      | -25.31     | QP      |
| 9  | 2.33  | -4.41      | 16.11      | 10.32  | 10.20      | 46.00      | -29.89     | Average |
| 10 | 2.33  | 0.09       | 20.61      | 10.32  | 10.20      | 56.00      | -35.39     | QP      |
| 11 | 25.05 | 2.54       | 23.42      | 10.64  | 10.24      | 50.00      | -26.58     | Average |
| 12 | 25.05 | 6.86       | 27.74      | 10.64  | 10.24      | 60.00      | -32.26     | QP      |

## AC 120V/60 Hz, Neutral



Condition: Neutral

Project : SZ1240308-11508E-RF

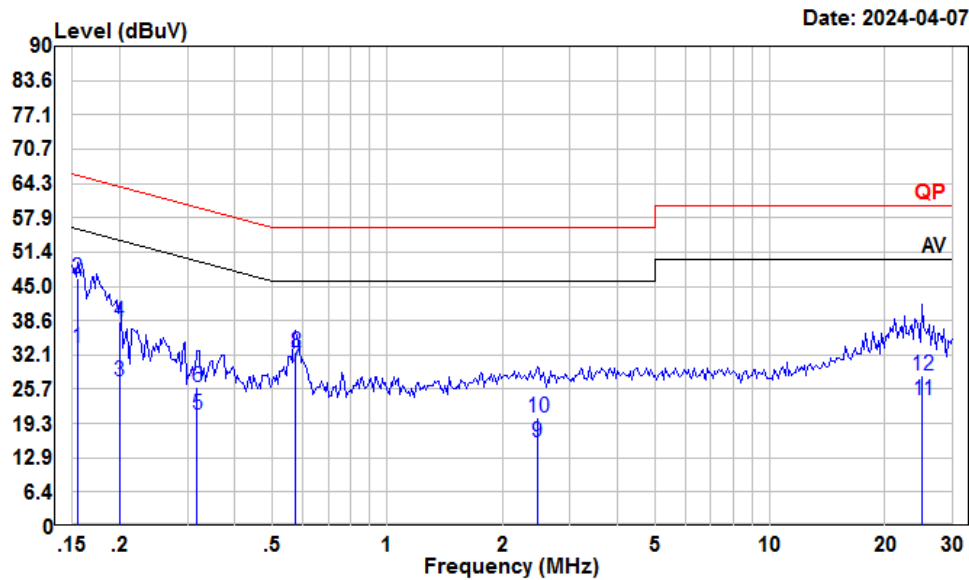
Tester : Macy shi

Note : BLE

|    | Freq  | Read Level | Level | LISN Factor | Cable Loss | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------|-------------|------------|------------|------------|---------|
|    | MHz   | dBuV       | dBuV  | dB          | dB         | dBuV       | dB         |         |
| 1  | 0.15  | 10.98      | 31.36 | 10.23       | 10.15      | 55.82      | -24.46     | Average |
| 2  | 0.15  | 24.43      | 44.81 | 10.23       | 10.15      | 65.82      | -21.01     | QP      |
| 3  | 0.20  | 4.71       | 25.40 | 10.60       | 10.09      | 53.54      | -28.14     | Average |
| 4  | 0.20  | 15.89      | 36.58 | 10.60       | 10.09      | 63.54      | -26.96     | QP      |
| 5  | 0.30  | -0.82      | 19.99 | 10.69       | 10.12      | 50.19      | -30.20     | Average |
| 6  | 0.30  | 4.81       | 25.62 | 10.69       | 10.12      | 60.19      | -34.57     | QP      |
| 7  | 0.62  | -2.74      | 18.09 | 10.61       | 10.22      | 46.00      | -27.91     | Average |
| 8  | 0.62  | 0.08       | 20.91 | 10.61       | 10.22      | 56.00      | -35.09     | QP      |
| 9  | 3.31  | -4.60      | 15.99 | 10.32       | 10.27      | 46.00      | -30.01     | Average |
| 10 | 3.31  | 0.03       | 20.62 | 10.32       | 10.27      | 56.00      | -35.38     | QP      |
| 11 | 25.05 | 2.54       | 23.04 | 10.26       | 10.24      | 50.00      | -26.96     | Average |
| 12 | 25.05 | 6.87       | 27.37 | 10.26       | 10.24      | 60.00      | -32.63     | QP      |

2.4G Wi-Fi: (maximum output power mode, 802.11g Low channel)

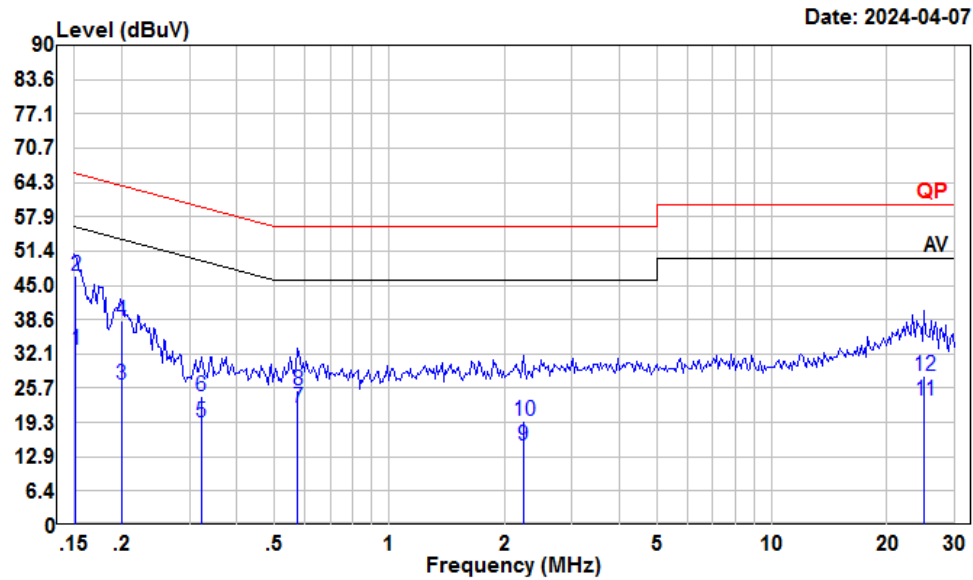
AC 120V/60 Hz, Line



Condition: Line  
Project : SZ1240308-11508E-RF  
Tester : Macy shi  
Note : 2.4G WIFI

|    | Freq  | Read Level | Level | LISN Factor | Cable Loss | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------|-------------|------------|------------|------------|---------|
|    | MHz   | dBuV       | dBuV  | dB          | dB         | dBuV       | dB         |         |
| 1  | 0.15  | 12.95      | 33.50 | 10.40       | 10.15      | 55.74      | -22.24     | Average |
| 2  | 0.15  | 25.86      | 46.41 | 10.40       | 10.15      | 65.74      | -19.33     | QP      |
| 3  | 0.20  | 6.77       | 27.26 | 10.40       | 10.09      | 53.62      | -26.36     | Average |
| 4  | 0.20  | 17.90      | 38.39 | 10.40       | 10.09      | 63.62      | -25.23     | QP      |
| 5  | 0.32  | 0.58       | 21.01 | 10.30       | 10.13      | 49.75      | -28.74     | Average |
| 6  | 0.32  | 5.58       | 26.01 | 10.30       | 10.13      | 59.75      | -33.74     | QP      |
| 7  | 0.58  | 9.33       | 29.81 | 10.28       | 10.20      | 46.00      | -16.19     | Average |
| 8  | 0.58  | 12.11      | 32.59 | 10.28       | 10.20      | 56.00      | -23.41     | QP      |
| 9  | 2.46  | -4.63      | 15.91 | 10.33       | 10.21      | 46.00      | -30.09     | Average |
| 10 | 2.46  | -0.23      | 20.31 | 10.33       | 10.21      | 56.00      | -35.69     | QP      |
| 11 | 25.05 | 2.77       | 23.65 | 10.64       | 10.24      | 50.00      | -26.35     | Average |
| 12 | 25.05 | 7.51       | 28.39 | 10.64       | 10.24      | 60.00      | -31.61     | QP      |

## AC 120V/60 Hz, Neutral



Condition: Neutral

Project : SZ1240308-11508E-RF

Tester : Macy shi

Note : 2.4G WIFI

|    | Freq  | Read Level | Level | LISN Factor | Cable Loss | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------|-------------|------------|------------|------------|---------|
|    | MHz   | dBuV       | dBuV  | dB          | dB         | dBuV       | dB         |         |
| 1  | 0.15  | 12.43      | 32.79 | 10.21       | 10.15      | 55.91      | -23.12     | Average |
| 2  | 0.15  | 26.38      | 46.74 | 10.21       | 10.15      | 65.91      | -19.17     | QP      |
| 3  | 0.20  | 5.62       | 26.31 | 10.60       | 10.09      | 53.62      | -27.31     | Average |
| 4  | 0.20  | 17.56      | 38.25 | 10.60       | 10.09      | 63.62      | -25.37     | QP      |
| 5  | 0.32  | -1.56      | 19.28 | 10.70       | 10.14      | 49.66      | -30.38     | Average |
| 6  | 0.32  | 3.28       | 24.12 | 10.70       | 10.14      | 59.66      | -35.54     | QP      |
| 7  | 0.58  | 1.22       | 22.09 | 10.67       | 10.20      | 46.00      | -23.91     | Average |
| 8  | 0.58  | 4.47       | 25.34 | 10.67       | 10.20      | 56.00      | -30.66     | QP      |
| 9  | 2.24  | -5.29      | 15.06 | 10.15       | 10.20      | 46.00      | -30.94     | Average |
| 10 | 2.24  | -0.90      | 19.45 | 10.15       | 10.20      | 56.00      | -36.55     | QP      |
| 11 | 25.05 | 2.89       | 23.39 | 10.26       | 10.24      | 50.00      | -26.61     | Average |
| 12 | 25.05 | 7.50       | 28.00 | 10.26       | 10.24      | 60.00      | -32.00     | QP      |

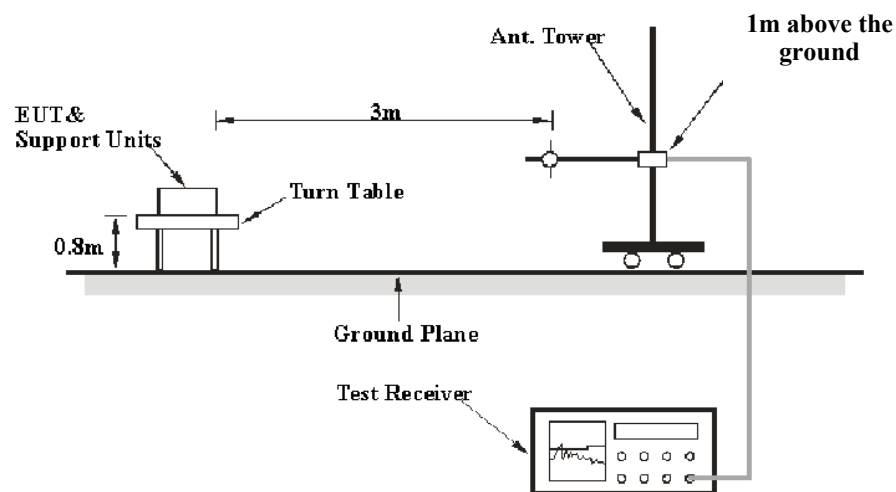
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

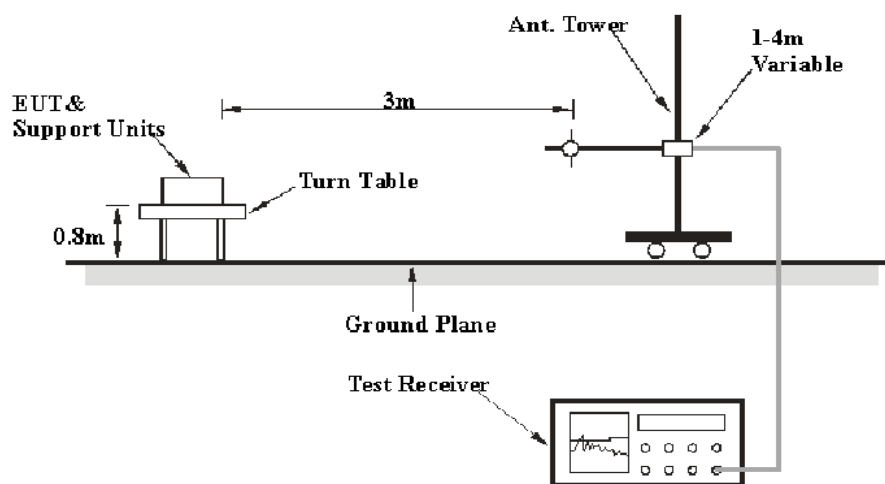
FCC §15.247 (d); §15.209; §15.205;

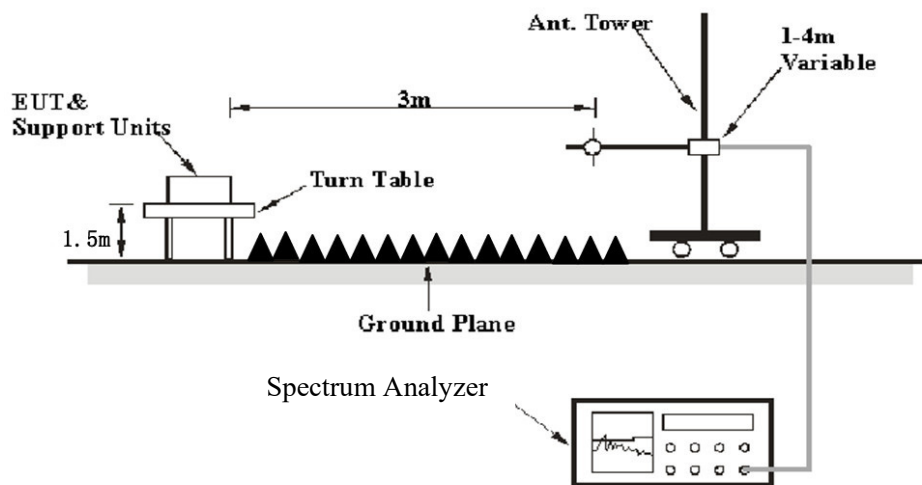
### EUT Setup

9 kHz-30MHz:



30MHz-1GHz:



**Above 1GHz:**

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 9 kHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

9 kHz-1GHz:

| Frequency Range   | RBW     | Video B/W | IF B/W  | Measurement |
|-------------------|---------|-----------|---------|-------------|
| 9 kHz – 150 kHz   | /       | /         | 200 Hz  | QP          |
|                   | 300 Hz  | 1 kHz     | /       | PK          |
| 150 kHz – 30 MHz  | /       | /         | 9 kHz   | QP          |
|                   | 10 kHz  | 30 kHz    | /       | PK          |
| 30 MHz – 1000 MHz | /       | /         | 120 kHz | QP          |
|                   | 100 kHz | 300 kHz   | /       | PK          |

1-25GHz:

| Measurement | Duty cycle | RBW  | Video B/W |
|-------------|------------|------|-----------|
| PK          | Any        | 1MHz | 3 MHz     |
| AV          | >98%       | 1MHz | 10 Hz     |
|             | <98%       | 1MHz | ≥1/Ton    |

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.

## Test Procedure

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

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

All emissions under the average limit and under the noise floor have not recorded in the report.

## Factor & Over Limit/Margin Calculation

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

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\begin{aligned}\text{Over Limit/Margin} &= \text{Level/Corrected Amplitude} - \text{Limit} \\ \text{Level / Corrected Amplitude} &= \text{Read Level} + \text{Factor}\end{aligned}$$

## Test Data

### Environmental Conditions

|                    |            |
|--------------------|------------|
| Temperature:       | 22~25.5 °C |
| Relative Humidity: | 50~54 %    |
| ATM Pressure:      | 101 kPa    |

*The testing was performed by Anson Su from 2024-04-01 to 2024-04-02 for below 1GHz and Zenos Qiao from 2024-04-16 to 2024-04-17 for above 1GHz.*

*EUT operation mode: Transmitting*

*Note: Pre-scan in the X, Y and Z axes of orientation, the worst case z-axis of orientation was recorded.*

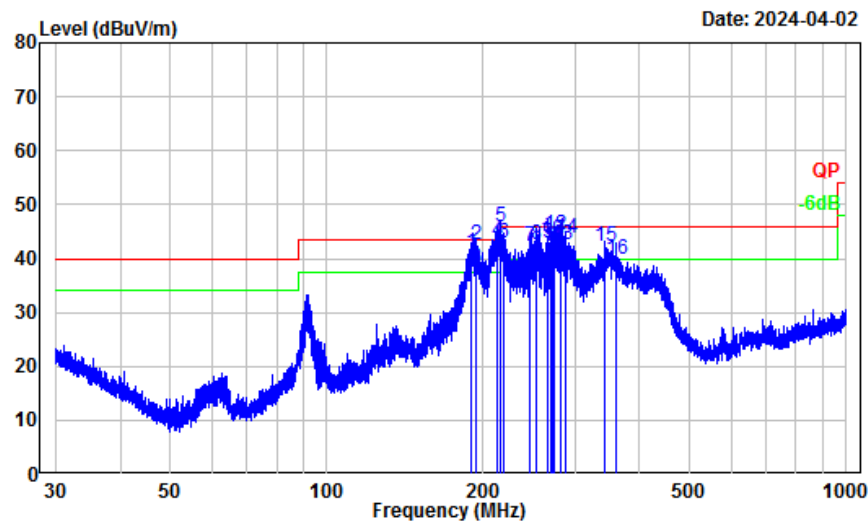
**BLE:** (maximum output power mode, Middle channel)

**9 kHz-30MHz:**

The amplitude of spurious emissions attenuated more than 20 dB below the limit was not recorded.

**30MHz-1GHz:** (maximum output power mode, Middle channel)

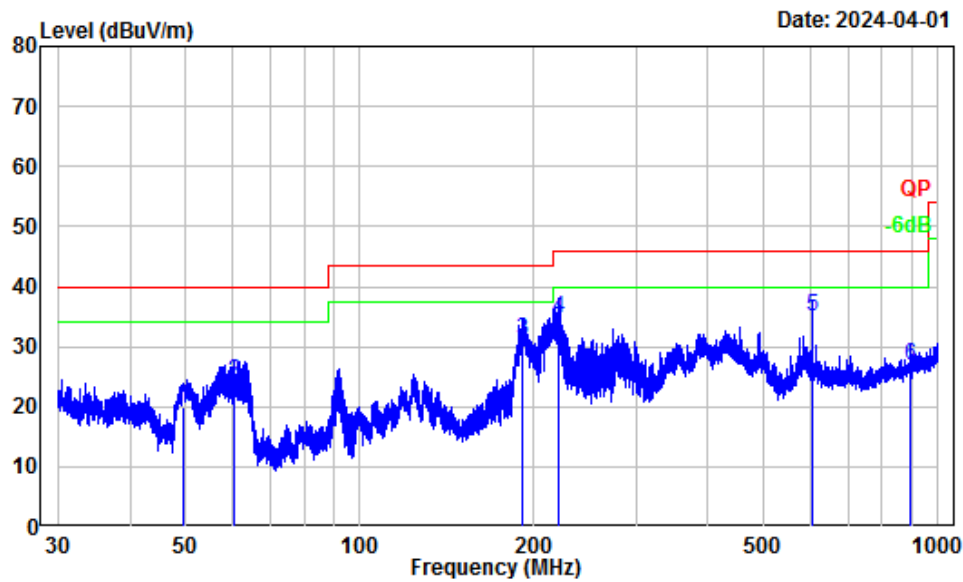
Horizontal



Site : Chamber A  
Condition : 3m Horizontal  
Project Number: SZ1240308-11508E-RF  
Note : BLE  
Tester : Anson Su

|    | Freq   | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|----|--------|--------|---------------|--------|---------------|---------------|--------|
|    | MHz    | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1  | 189.32 | -12.31 | 53.31         | 41.00  | 43.50         | -2.50         | QP     |
| 2  | 193.43 | -11.87 | 54.30         | 42.43  | 43.50         | -1.07         | QP     |
| 3  | 193.43 | -11.87 | 50.30         | 38.43  | 43.50         | -5.07         | QP     |
| 4  | 213.48 | -11.25 | 54.50         | 43.25  | 43.50         | -0.25         | QP     |
| 5  | 216.31 | -11.30 | 57.20         | 45.90  | 46.00         | -0.10         | QP     |
| 6  | 218.98 | -11.34 | 54.20         | 42.86  | 46.00         | -3.14         | QP     |
| 7  | 246.71 | -11.79 | 53.99         | 42.20  | 46.00         | -3.80         | QP     |
| 8  | 252.73 | -11.75 | 54.30         | 42.55  | 46.00         | -3.45         | QP     |
| 9  | 265.56 | -11.26 | 54.10         | 42.84  | 46.00         | -3.16         | QP     |
| 10 | 269.90 | -11.09 | 54.59         | 43.50  | 46.00         | -2.50         | QP     |
| 11 | 271.21 | -11.05 | 53.40         | 42.35  | 46.00         | -3.65         | QP     |
| 12 | 273.95 | -10.95 | 55.31         | 44.36  | 46.00         | -1.64         | QP     |
| 13 | 281.25 | -10.66 | 53.29         | 42.63  | 46.00         | -3.37         | QP     |
| 14 | 288.50 | -10.39 | 54.30         | 43.91  | 46.00         | -2.09         | QP     |
| 15 | 343.78 | -9.87  | 52.01         | 42.14  | 46.00         | -3.86         | QP     |
| 16 | 360.45 | -9.33  | 49.12         | 39.79  | 46.00         | -6.21         | QP     |

Vertical



Site : Chamber A  
Condition : 3m Vertical  
Project Number: SZ1240308-11508E-RF  
Note : BLE  
Tester : Anson Su

|   | Freq Factor |        | Read Level |        | Limit  | Over   | Remark |
|---|-------------|--------|------------|--------|--------|--------|--------|
|   | MHz         | dB/m   | dBuV       | dBuV/m | dBuV/m | dB     |        |
| 1 | 49.38       | -17.13 | 37.07      | 19.94  | 40.00  | -20.06 | QP     |
| 2 | 60.68       | -17.57 | 41.82      | 24.25  | 40.00  | -15.75 | QP     |
| 3 | 190.74      | -12.86 | 44.10      | 31.24  | 43.50  | -12.26 | QP     |
| 4 | 221.00      | -12.23 | 47.08      | 34.85  | 46.00  | -11.15 | QP     |
| 5 | 606.19      | -4.26  | 39.24      | 34.98  | 46.00  | -11.02 | QP     |
| 6 | 898.57      | 0.59   | 26.42      | 27.01  | 46.00  | -18.99 | QP     |

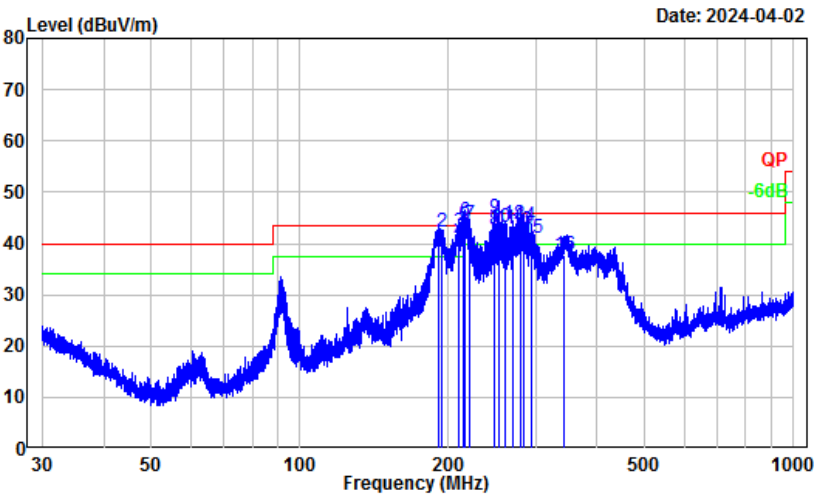
2.4G Wi-Fi: (maximum output power mode, 802.11g Low channel)

9 kHz-30MHz:

The amplitude of spurious emissions attenuated more than 20 dB below the limit was not recorded.

30MHz-1GHz: (maximum output power mode, 802.11g Low channel)

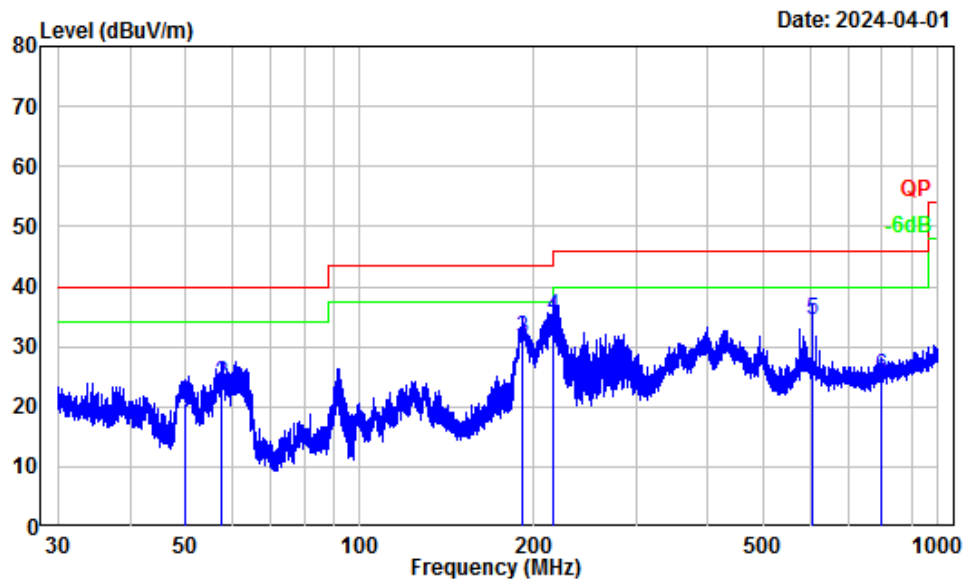
Horizontal



Site : Chamber A  
Condition : 3m Horizontal  
Project Number: SZ1240308-11508E-RF  
Note : 2.4G WIFI  
Tester : Anson Su

|    | Freq   | Factor | Read<br>Level | Limit<br>Level | Over<br>Limit | Remark   |
|----|--------|--------|---------------|----------------|---------------|----------|
|    | MHz    | dB/m   | dBuV          | dBuV/m         | dBuV/m        | dB       |
| 1  | 190.57 | -12.24 | 51.60         | 39.36          | 43.50         | -4.14 QP |
| 2  | 193.43 | -11.87 | 54.00         | 42.13          | 43.50         | -1.37 QP |
| 3  | 209.50 | -11.19 | 53.30         | 42.11          | 43.50         | -1.39 QP |
| 4  | 209.50 | -11.19 | 51.60         | 40.41          | 43.50         | -3.09 QP |
| 5  | 213.76 | -11.26 | 54.70         | 43.44          | 43.50         | -0.06 QP |
| 6  | 216.59 | -11.30 | 55.80         | 44.50          | 46.00         | -1.50 QP |
| 7  | 220.71 | -11.37 | 55.00         | 43.63          | 46.00         | -2.37 QP |
| 8  | 248.33 | -11.83 | 54.41         | 42.58          | 46.00         | -3.42 QP |
| 9  | 248.33 | -11.83 | 56.91         | 45.08          | 46.00         | -0.92 QP |
| 10 | 252.73 | -11.75 | 54.90         | 43.15          | 46.00         | -2.85 QP |
| 11 | 259.69 | -11.48 | 54.50         | 43.02          | 46.00         | -2.98 QP |
| 12 | 270.14 | -11.09 | 55.00         | 43.91          | 46.00         | -2.09 QP |
| 13 | 280.02 | -10.72 | 53.40         | 42.68          | 46.00         | -3.32 QP |
| 14 | 284.60 | -10.54 | 54.00         | 43.46          | 46.00         | -2.54 QP |
| 15 | 294.37 | -10.17 | 51.10         | 40.93          | 46.00         | -5.07 QP |
| 16 | 343.18 | -9.87  | 47.60         | 37.73          | 46.00         | -8.27 QP |

Vertical



Site : Chamber A  
Condition : 3m Vertical  
Project Number: SZ1240308-11508E-RF  
Note : 2.4G WIFI  
Tester : Anson Su

|   | Freq   | Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|---|--------|--------|------------|--------|------------|------------|--------|
|   | MHz    | dB/m   | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1 | 49.99  | -17.46 | 37.97      | 20.51  | 40.00      | -19.49     | QP     |
| 2 | 57.42  | -17.56 | 41.49      | 23.93  | 40.00      | -16.07     | QP     |
| 3 | 190.82 | -12.85 | 44.10      | 31.25  | 43.50      | -12.25     | QP     |
| 4 | 216.50 | -12.24 | 47.20      | 34.96  | 46.00      | -11.04     | QP     |
| 5 | 606.19 | -4.26  | 38.67      | 34.41  | 46.00      | -11.59     | QP     |
| 6 | 796.53 | -0.76  | 25.74      | 24.98  | 46.00      | -21.02     | QP     |

**1-25 GHz:**

| Frequency<br>(MHz)     | Receiver          |       | Polar<br>(H/V) | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|-------------------|-------|----------------|------------------|------------------------------------|-------------------|----------------|
|                        | Reading<br>(dBμV) | PK/AV |                |                  |                                    |                   |                |
| BLE 1M                 |                   |       |                |                  |                                    |                   |                |
| Low Channel 2402MHz    |                   |       |                |                  |                                    |                   |                |
| 2388.54                | 54.69             | PK    | H              | -2.93            | 51.76                              | 74                | -22.24         |
| 2388.54                | 41.42             | AV    | H              | -2.93            | 38.49                              | 54                | -15.51         |
| 2389.25                | 54.51             | PK    | V              | -2.93            | 51.58                              | 74                | -22.42         |
| 2389.25                | 41.26             | AV    | V              | -2.93            | 38.33                              | 54                | -15.67         |
| 4804.00                | 47.18             | PK    | H              | 2.42             | 49.60                              | 74                | -24.40         |
| 4804.00                | 32.89             | AV    | H              | 2.42             | 35.31                              | 54                | -18.69         |
| 4804.00                | 46.93             | PK    | V              | 2.42             | 49.35                              | 74                | -24.65         |
| 4804.00                | 32.71             | AV    | V              | 2.42             | 35.13                              | 54                | -18.87         |
| Middle Channel 2440MHz |                   |       |                |                  |                                    |                   |                |
| 4880.00                | 47.49             | PK    | H              | 2.58             | 50.07                              | 74                | -23.93         |
| 4880.00                | 33.18             | AV    | H              | 2.58             | 35.76                              | 54                | -18.24         |
| 4880.00                | 47.27             | PK    | V              | 2.58             | 49.85                              | 74                | -24.15         |
| 4880.00                | 32.95             | AV    | V              | 2.58             | 35.53                              | 54                | -18.47         |
| High Channel 2480MHz   |                   |       |                |                  |                                    |                   |                |
| 2483.86                | 59.10             | PK    | H              | -3.17            | 55.93                              | 74                | -18.07         |
| 2483.86                | 42.54             | AV    | H              | -3.17            | 39.37                              | 54                | -14.63         |
| 2483.62                | 57.33             | PK    | V              | -3.17            | 54.16                              | 74                | -19.84         |
| 2483.62                | 42.21             | AV    | V              | -3.17            | 39.04                              | 54                | -14.96         |
| 4960.00                | 47.84             | PK    | H              | 2.68             | 50.52                              | 74                | -23.48         |
| 4960.00                | 33.53             | AV    | H              | 2.68             | 36.21                              | 54                | -17.79         |
| 4960.00                | 47.61             | PK    | V              | 2.68             | 50.29                              | 74                | -23.71         |
| 4960.00                | 33.32             | AV    | V              | 2.68             | 36.00                              | 54                | -18.00         |

**Note:**

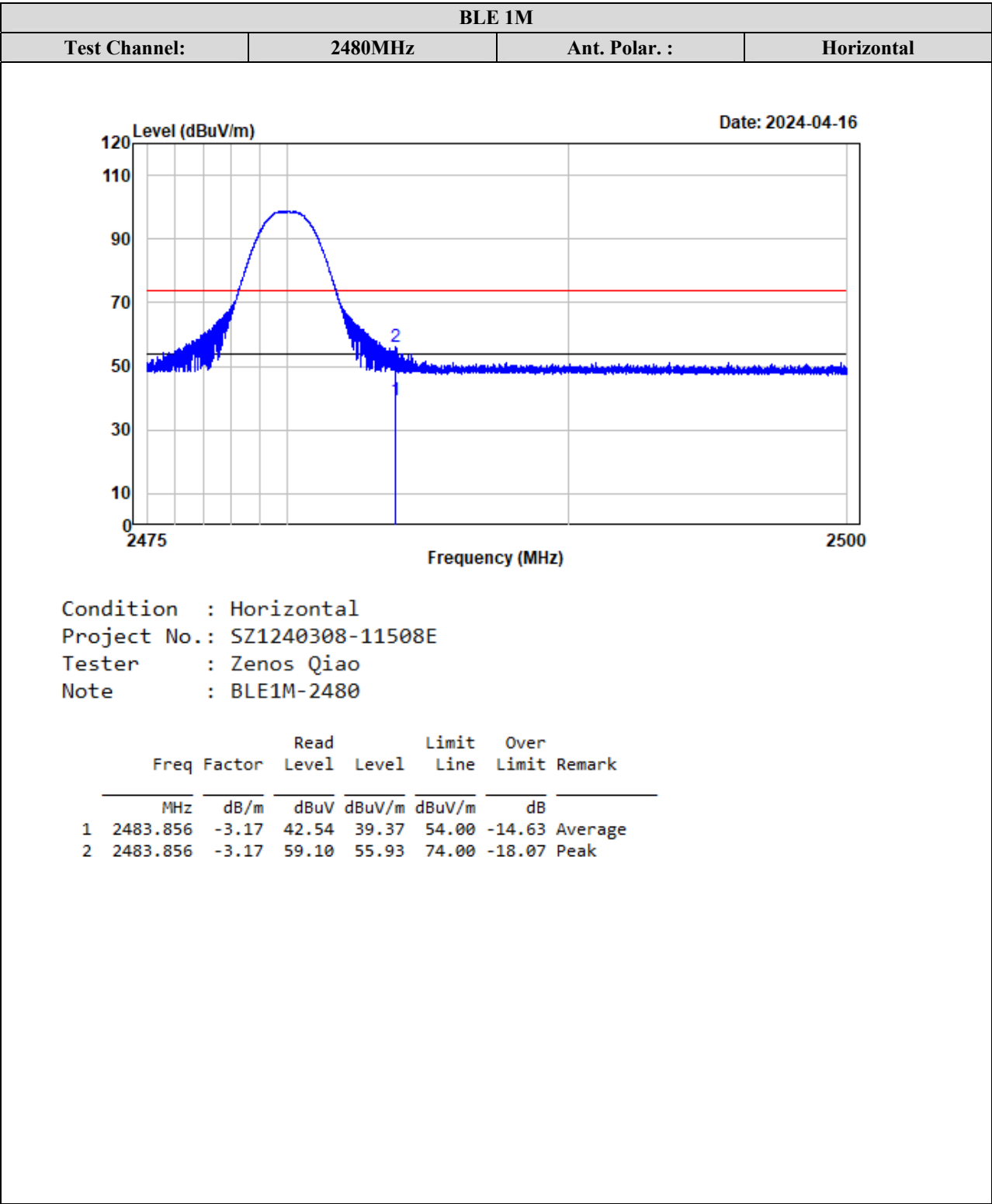
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

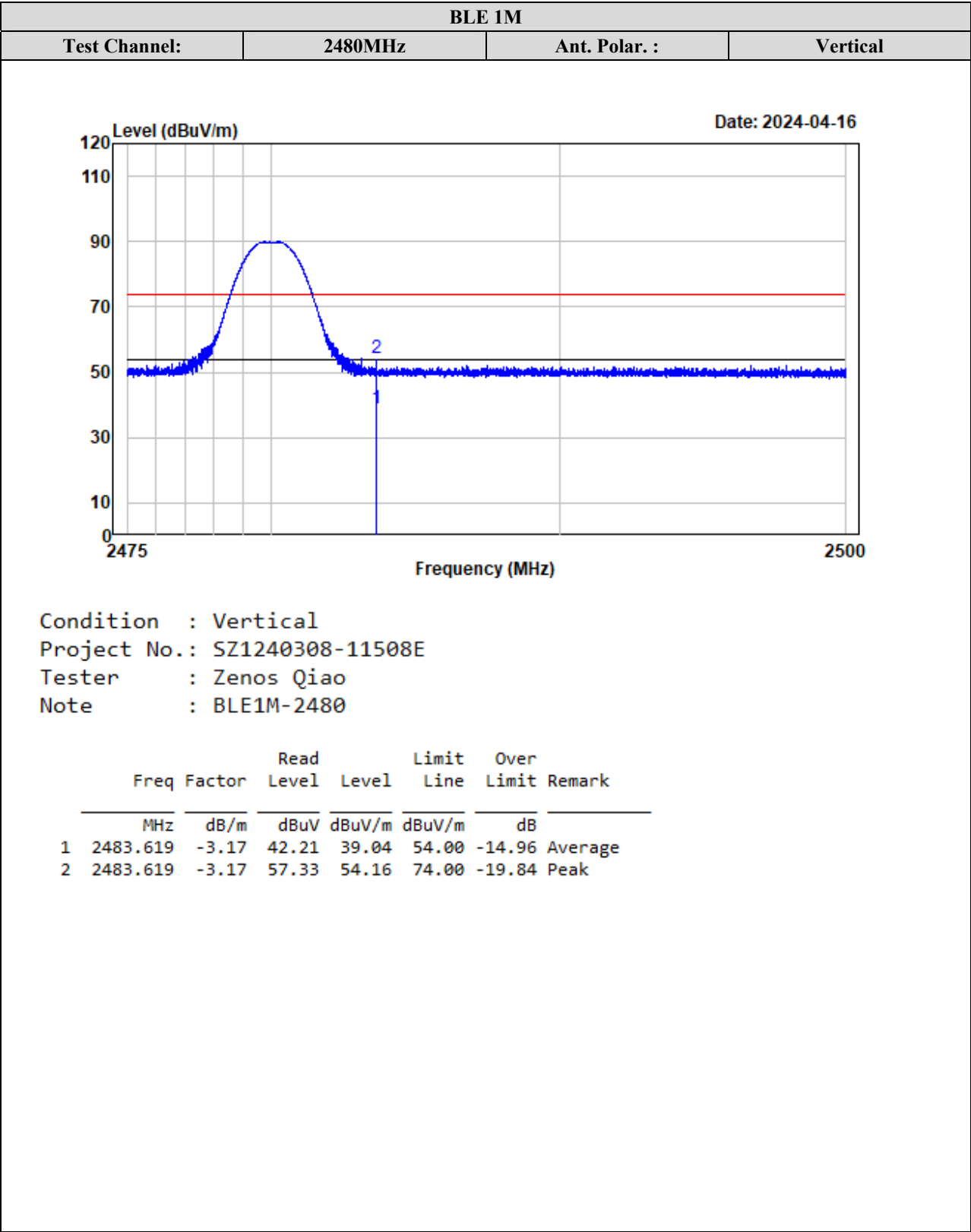
Corrected Amplitude = Corrected Factor + Reading

Margin = Corrected. Amplitude - Limit

The other spurious emission which is in the noise floor level was not recorded.

Test plots for Band Edge Measurements (Radiated):





**2.4G Wi-Fi**

| Frequency<br>(MHz)     | Receiver          |       | Polar<br>(H/V) | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|-------------------|-------|----------------|------------------|------------------------------------|-------------------|----------------|
|                        | Reading<br>(dBμV) | PK/AV |                |                  |                                    |                   |                |
| 802.11b                |                   |       |                |                  |                                    |                   |                |
| Low Channel 2412MHz    |                   |       |                |                  |                                    |                   |                |
| 2388.78                | 64.45             | PK    | H              | -2.93            | 61.52                              | 74                | -12.48         |
| 2388.78                | 49.69             | AV    | H              | -2.93            | 46.76                              | 54                | -7.24          |
| 2387.53                | 63.57             | PK    | V              | -2.93            | 60.64                              | 74                | -13.36         |
| 2387.53                | 48.98             | AV    | V              | -2.93            | 46.05                              | 54                | -7.95          |
| 4824.00                | 52.64             | PK    | H              | 2.45             | 55.09                              | 74                | -18.91         |
| 4824.00                | 46.31             | AV    | H              | 2.45             | 48.76                              | 54                | -5.24          |
| 4824.00                | 51.98             | PK    | V              | 2.45             | 54.43                              | 74                | -19.57         |
| 4824.00                | 45.79             | AV    | V              | 2.45             | 48.24                              | 54                | -5.76          |
| Middle Channel 2437MHz |                   |       |                |                  |                                    |                   |                |
| 4874.00                | 51.18             | PK    | H              | 2.56             | 53.74                              | 74                | -20.26         |
| 4874.00                | 44.84             | AV    | H              | 2.56             | 47.40                              | 54                | -6.60          |
| 4874.00                | 50.53             | PK    | V              | 2.56             | 53.09                              | 74                | -20.91         |
| 4874.00                | 44.27             | AV    | V              | 2.56             | 46.83                              | 54                | -7.17          |
| High Channel 2462MHz   |                   |       |                |                  |                                    |                   |                |
| 2483.69                | 65.66             | PK    | H              | -3.17            | 62.49                              | 74                | -11.51         |
| 2483.69                | 53.49             | AV    | H              | -3.17            | 50.32                              | 54                | -3.68          |
| 2483.64                | 63.06             | PK    | V              | -3.17            | 59.89                              | 74                | -14.11         |
| 2483.64                | 52.55             | AV    | V              | -3.17            | 49.38                              | 54                | -4.62          |
| 4924.00                | 49.72             | PK    | H              | 2.63             | 52.35                              | 74                | -21.65         |
| 4924.00                | 43.26             | AV    | H              | 2.63             | 45.89                              | 54                | -8.11          |
| 4924.00                | 49.37             | PK    | V              | 2.63             | 52.00                              | 74                | -22.00         |
| 4924.00                | 42.85             | AV    | V              | 2.63             | 45.48                              | 54                | -8.52          |

| Frequency<br>(MHz)     | Receiver          |       | Polar<br>(H/V) | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|-------------------|-------|----------------|------------------|------------------------------------|-------------------|----------------|
|                        | Reading<br>(dBμV) | PK/AV |                |                  |                                    |                   |                |
| 802.11g                |                   |       |                |                  |                                    |                   |                |
| Low Channel 2412MHz    |                   |       |                |                  |                                    |                   |                |
| 2389.36                | 62.21             | PK    | H              | -2.93            | 59.28                              | 74                | -14.72         |
| 2389.36                | 45.18             | AV    | H              | -2.93            | 42.25                              | 54                | -11.75         |
| 2389.57                | 61.36             | PK    | V              | -2.93            | 58.43                              | 74                | -15.57         |
| 2389.57                | 44.47             | AV    | V              | -2.93            | 41.54                              | 54                | -12.46         |
| 4824.00                | 48.19             | PK    | H              | 2.45             | 50.64                              | 74                | -23.36         |
| 4824.00                | 33.24             | AV    | H              | 2.45             | 35.69                              | 54                | -18.31         |
| 4824.00                | 47.86             | PK    | V              | 2.45             | 50.31                              | 74                | -23.69         |
| 4824.00                | 32.91             | AV    | V              | 2.45             | 35.36                              | 54                | -18.64         |
| Middle Channel 2437MHz |                   |       |                |                  |                                    |                   |                |
| 4874.00                | 47.58             | PK    | H              | 2.56             | 50.14                              | 74                | -23.86         |
| 4874.00                | 32.85             | AV    | H              | 2.56             | 35.41                              | 54                | -18.59         |
| 4874.00                | 47.27             | PK    | V              | 2.56             | 49.83                              | 74                | -24.17         |
| 4874.00                | 32.53             | AV    | V              | 2.56             | 35.09                              | 54                | -18.91         |
| High Channel 2462MHz   |                   |       |                |                  |                                    |                   |                |
| 2483.56                | 68.75             | PK    | H              | -3.17            | 65.58                              | 74                | -8.42          |
| 2483.56                | 52.86             | AV    | H              | -3.17            | 49.69                              | 54                | -4.31          |
| 2483.63                | 67.39             | PK    | V              | -3.17            | 64.22                              | 74                | -9.78          |
| 2483.63                | 51.64             | AV    | V              | -3.17            | 48.47                              | 54                | -5.53          |
| 4924.00                | 47.03             | PK    | H              | 2.63             | 49.66                              | 74                | -24.34         |
| 4924.00                | 32.45             | AV    | H              | 2.63             | 35.08                              | 54                | -18.92         |
| 4924.00                | 46.79             | PK    | V              | 2.63             | 49.42                              | 74                | -24.58         |
| 4924.00                | 32.12             | AV    | V              | 2.63             | 34.75                              | 54                | -19.25         |

| Frequency<br>(MHz)     | Receiver          |       | Polar<br>(H/V) | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|-------------------|-------|----------------|------------------|------------------------------------|-------------------|----------------|
|                        | Reading<br>(dBμV) | PK/AV |                |                  |                                    |                   |                |
| 802.11n20              |                   |       |                |                  |                                    |                   |                |
| Low Channel 2412MHz    |                   |       |                |                  |                                    |                   |                |
| 2389.94                | 63.07             | PK    | H              | -2.93            | 60.14                              | 74                | -13.86         |
| 2389.94                | 46.12             | AV    | H              | -2.93            | 43.19                              | 54                | -10.81         |
| 2389.83                | 61.94             | PK    | V              | -2.93            | 59.01                              | 74                | -14.99         |
| 2389.83                | 45.25             | AV    | V              | -2.93            | 42.32                              | 54                | -11.68         |
| 4824.00                | 47.64             | PK    | H              | 2.45             | 50.09                              | 74                | -23.91         |
| 4824.00                | 33.09             | AV    | H              | 2.45             | 35.54                              | 54                | -18.46         |
| 4824.00                | 47.38             | PK    | V              | 2.45             | 49.83                              | 74                | -24.17         |
| 4824.00                | 32.85             | AV    | V              | 2.45             | 35.30                              | 54                | -18.70         |
| Middle Channel 2437MHz |                   |       |                |                  |                                    |                   |                |
| 4874.00                | 47.25             | PK    | H              | 2.56             | 49.81                              | 74                | -24.19         |
| 4874.00                | 32.62             | AV    | H              | 2.56             | 35.18                              | 54                | -18.82         |
| 4874.00                | 47.01             | PK    | V              | 2.56             | 49.57                              | 74                | -24.43         |
| 4874.00                | 32.36             | AV    | V              | 2.56             | 34.92                              | 54                | -19.08         |
| High Channel 2462MHz   |                   |       |                |                  |                                    |                   |                |
| 2483.64                | 71.38             | PK    | H              | -3.17            | 68.21                              | 74                | -5.79          |
| 2483.64                | 53.95             | AV    | H              | -3.17            | 50.78                              | 54                | -3.22          |
| 2483.57                | 70.19             | PK    | V              | -3.17            | 67.02                              | 74                | -6.98          |
| 2483.57                | 52.87             | AV    | V              | -3.17            | 49.70                              | 54                | -4.30          |
| 4924.00                | 46.89             | PK    | H              | 2.63             | 49.52                              | 74                | -24.48         |
| 4924.00                | 32.13             | AV    | H              | 2.63             | 34.76                              | 54                | -19.24         |
| 4924.00                | 46.57             | PK    | V              | 2.63             | 49.20                              | 74                | -24.80         |
| 4924.00                | 31.88             | AV    | V              | 2.63             | 34.51                              | 54                | -19.49         |

| Frequency<br>(MHz)     | Receiver          |       | Polar<br>(H/V) | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|-------------------|-------|----------------|------------------|------------------------------------|-------------------|----------------|
|                        | Reading<br>(dBμV) | PK/AV |                |                  |                                    |                   |                |
| 802.11n40              |                   |       |                |                  |                                    |                   |                |
| Low Channel 2422MHz    |                   |       |                |                  |                                    |                   |                |
| 2389.59                | 59.93             | PK    | H              | -2.93            | 57.00                              | 74                | -17.00         |
| 2389.59                | 47.86             | AV    | H              | -2.93            | 44.93                              | 54                | -9.07          |
| 2389.68                | 59.07             | PK    | V              | -2.93            | 56.14                              | 74                | -17.86         |
| 2389.68                | 46.72             | AV    | V              | -2.93            | 43.79                              | 54                | -10.21         |
| 4844.00                | 47.04             | PK    | H              | 2.45             | 49.49                              | 74                | -24.51         |
| 4844.00                | 32.78             | AV    | H              | 2.45             | 35.23                              | 54                | -18.77         |
| 4844.00                | 46.81             | PK    | V              | 2.45             | 49.26                              | 74                | -24.74         |
| 4844.00                | 32.57             | AV    | V              | 2.45             | 35.02                              | 54                | -18.98         |
| Middle Channel 2437MHz |                   |       |                |                  |                                    |                   |                |
| 4874.00                | 46.77             | PK    | H              | 2.56             | 49.33                              | 74                | -24.67         |
| 4874.00                | 32.64             | AV    | H              | 2.56             | 35.20                              | 54                | -18.80         |
| 4874.00                | 46.53             | PK    | V              | 2.56             | 49.09                              | 74                | -24.91         |
| 4874.00                | 32.42             | AV    | V              | 2.56             | 34.98                              | 54                | -19.02         |
| High Channel 2452MHz   |                   |       |                |                  |                                    |                   |                |
| 2483.70                | 69.38             | PK    | H              | -3.17            | 66.21                              | 74                | -7.79          |
| 2483.70                | 54.10             | AV    | H              | -3.17            | 50.93                              | 54                | -3.07          |
| 2483.58                | 68.23             | PK    | V              | -3.17            | 65.06                              | 74                | -8.94          |
| 2483.58                | 53.04             | AV    | V              | -3.17            | 49.87                              | 54                | -4.13          |
| 4904.00                | 46.45             | PK    | H              | 2.64             | 49.09                              | 74                | -24.91         |
| 4904.00                | 32.52             | AV    | H              | 2.64             | 35.16                              | 54                | -18.84         |
| 4904.00                | 46.19             | PK    | V              | 2.64             | 48.83                              | 74                | -25.17         |
| 4904.00                | 32.28             | AV    | V              | 2.64             | 34.92                              | 54                | -19.08         |

**Note:**

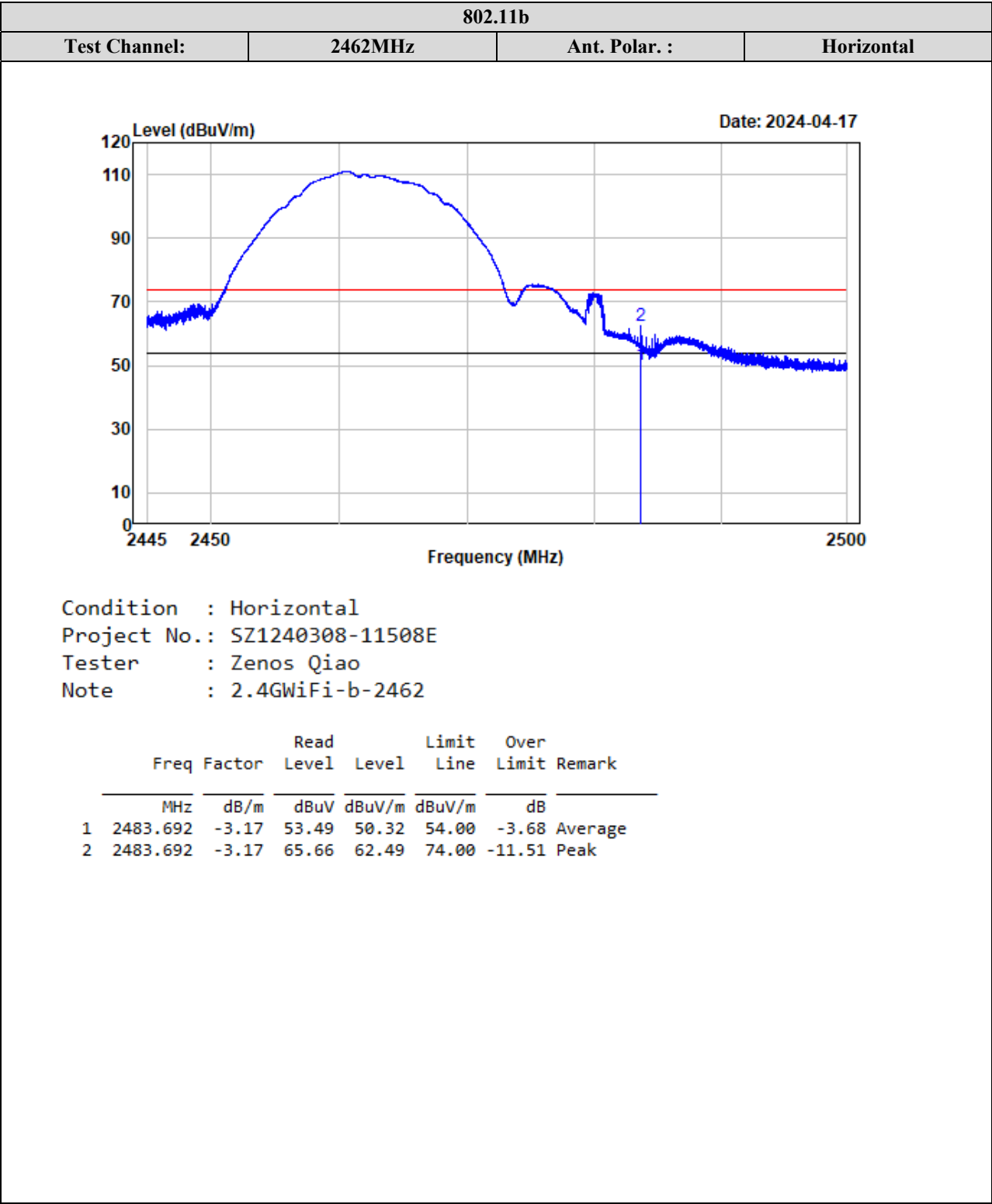
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

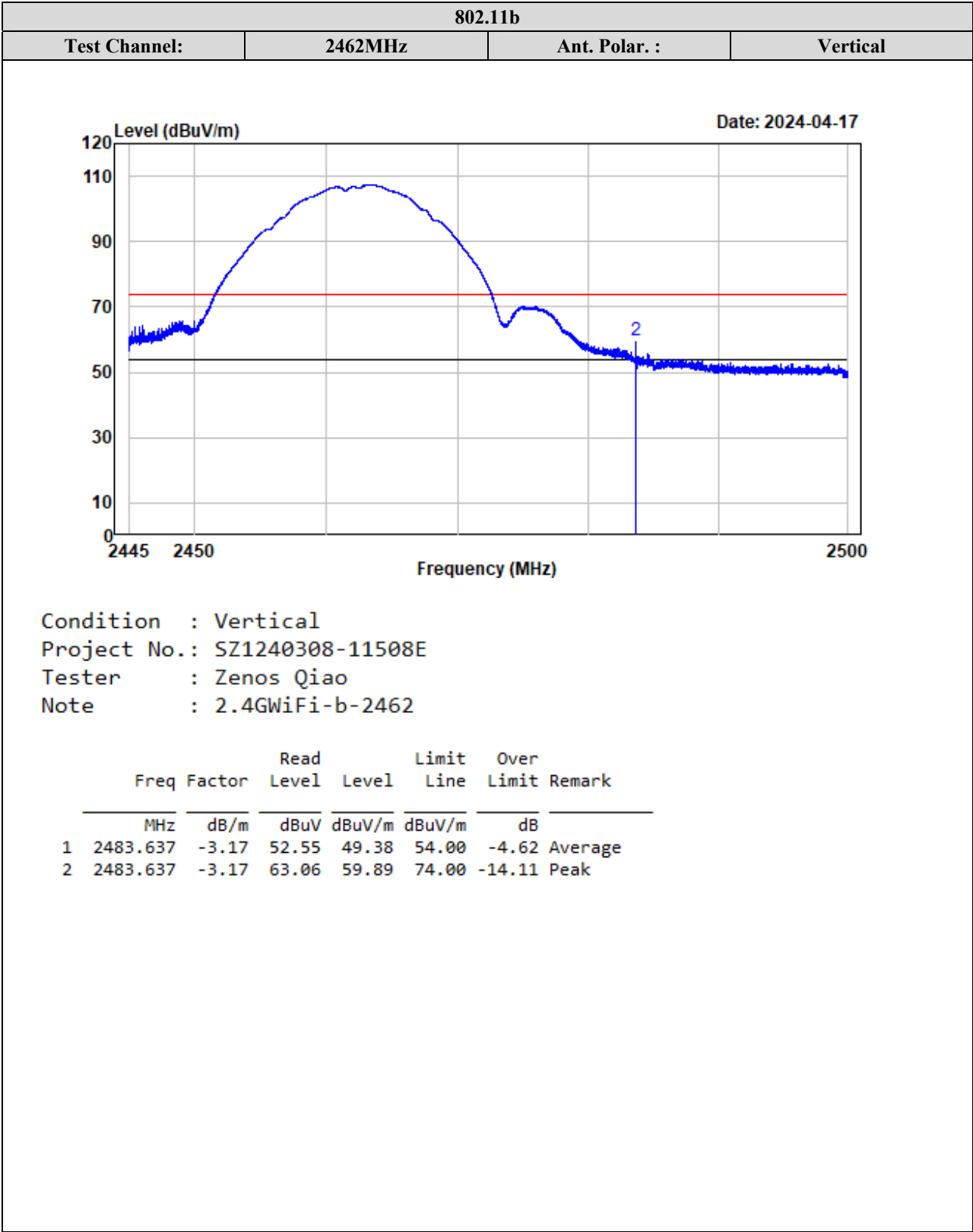
Corrected Amplitude = Factor + Reading

Margin = Corrected. Amplitude - Limit

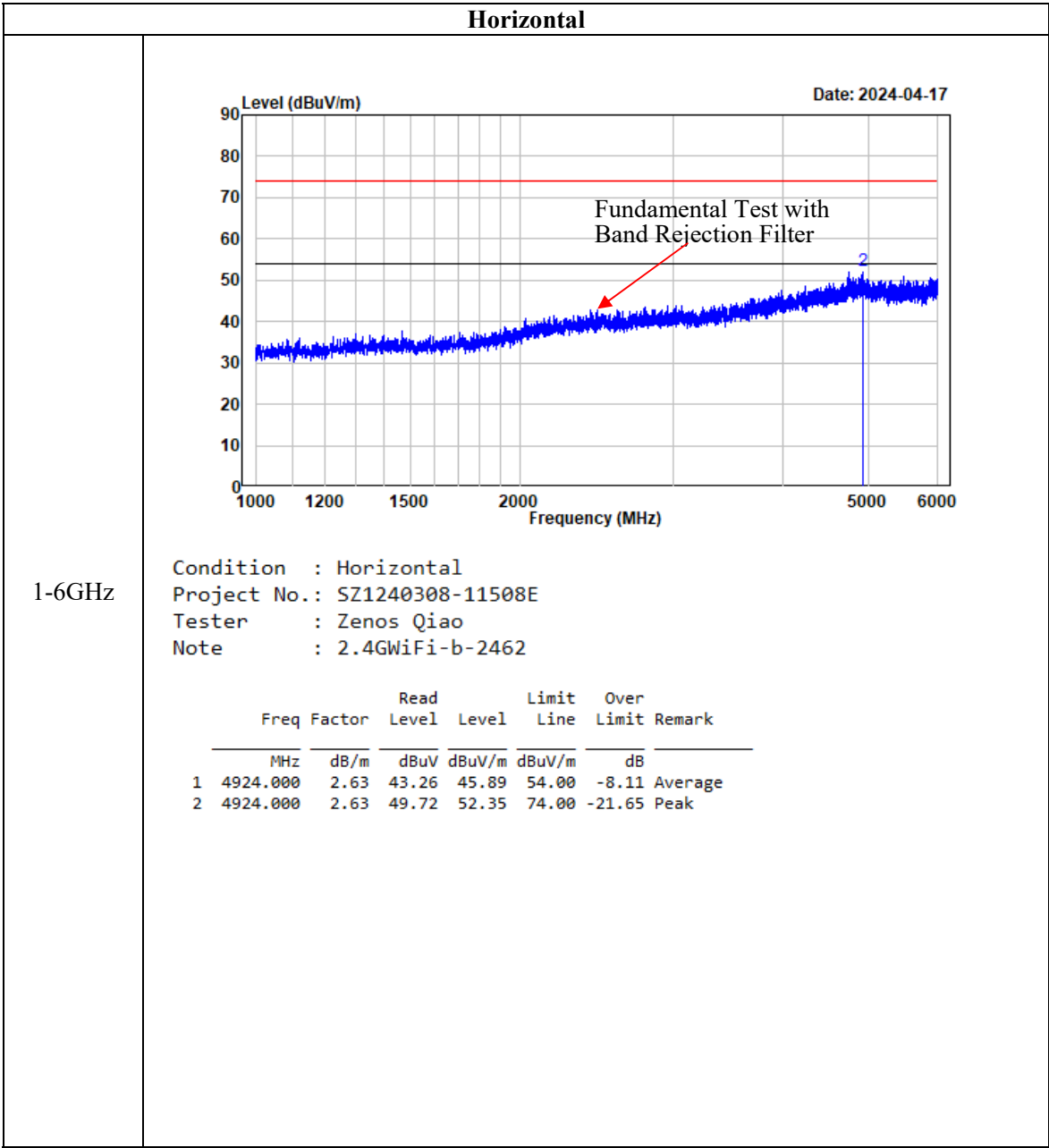
The other spurious emission which is in the noise floor level was not recorded.

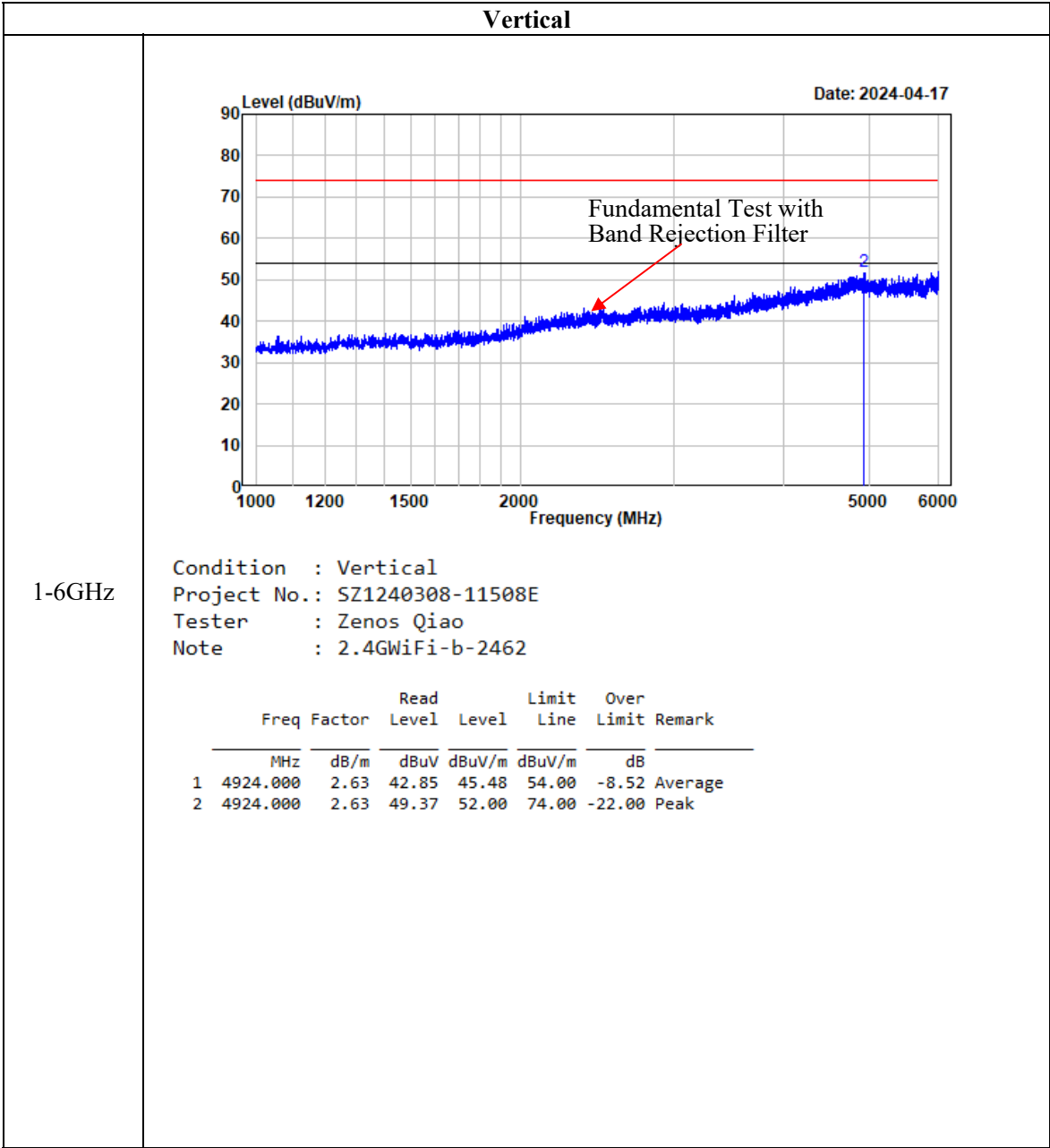
Test plots for Band Edge Measurements (Radiated):

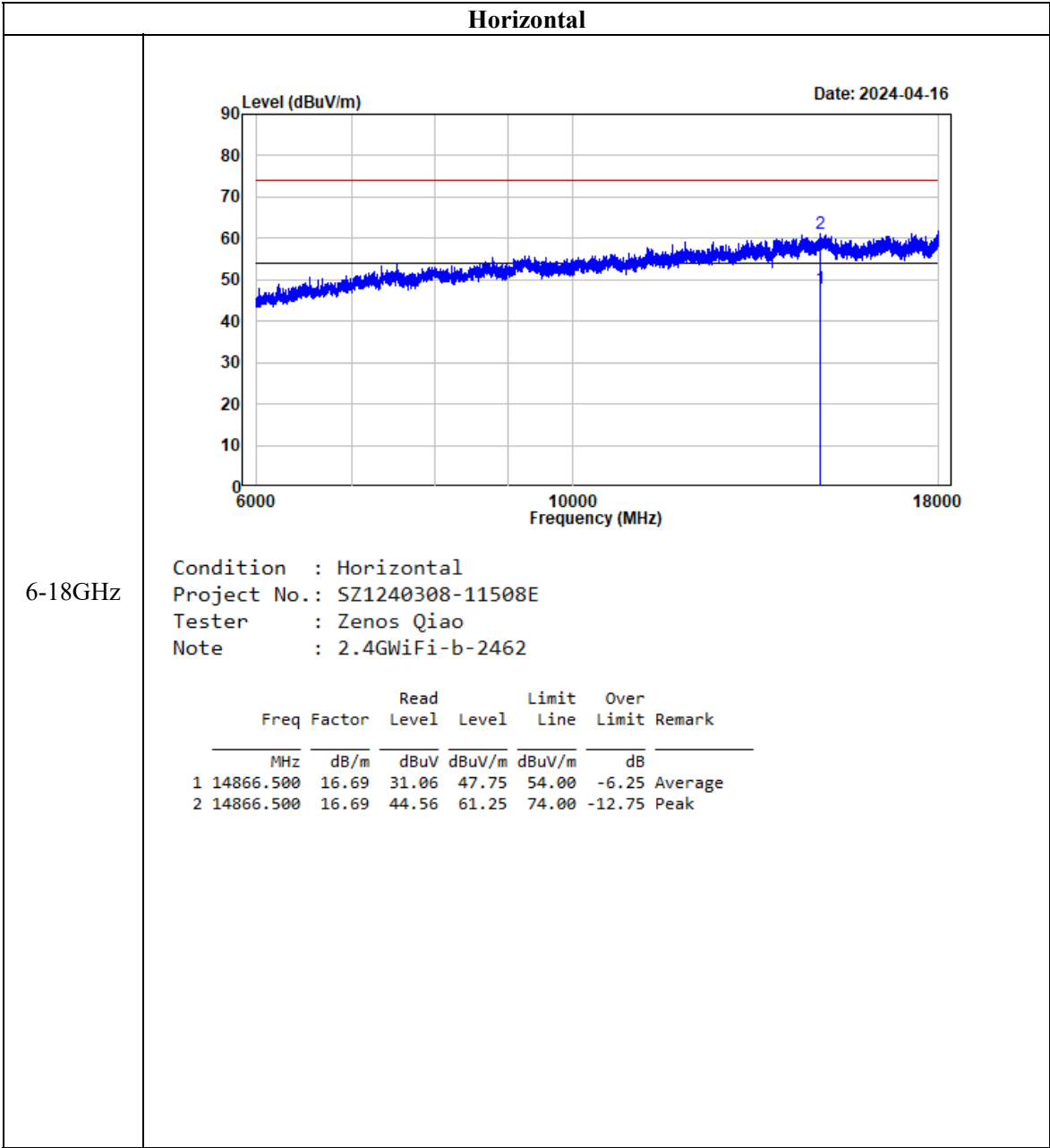


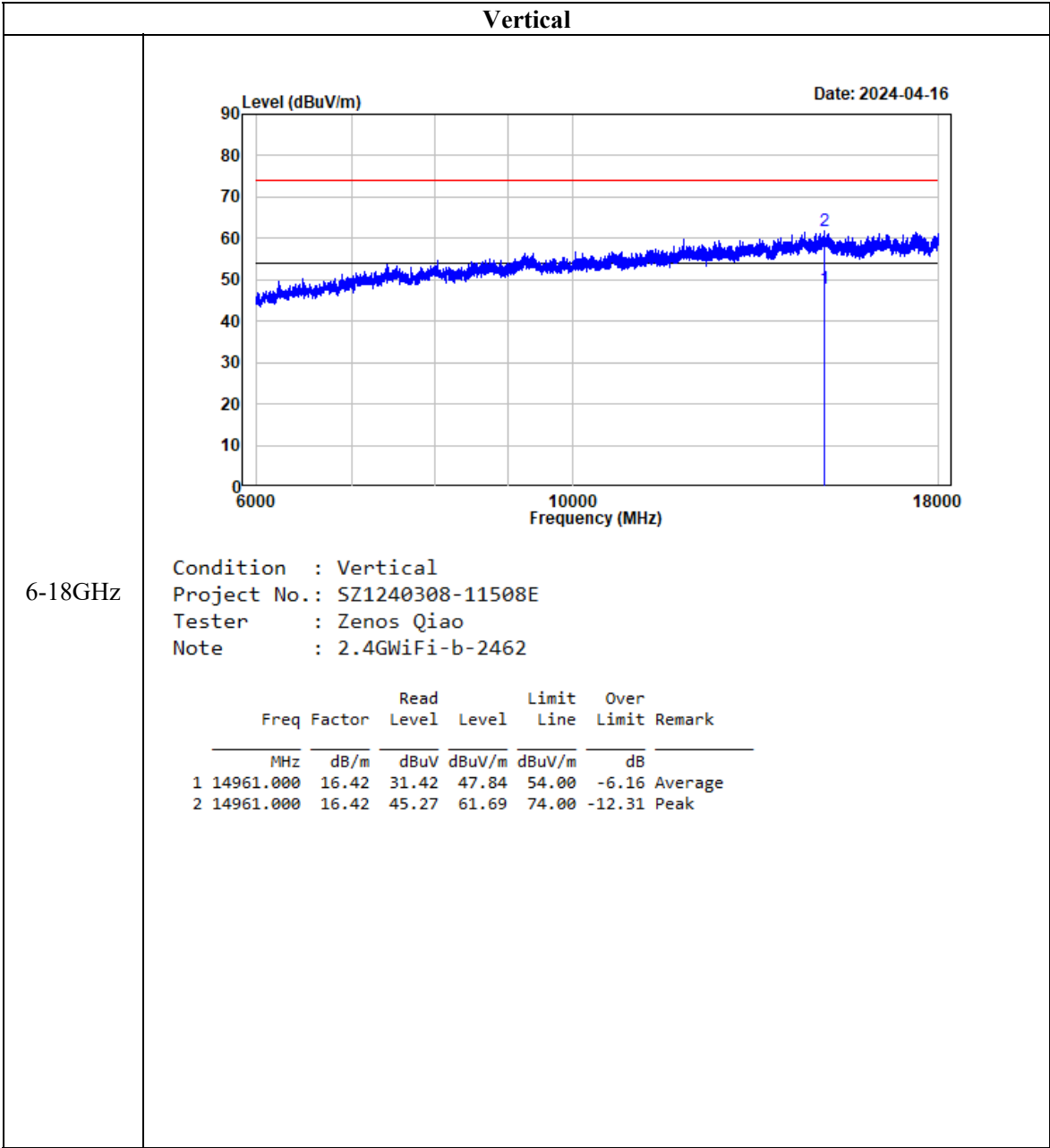


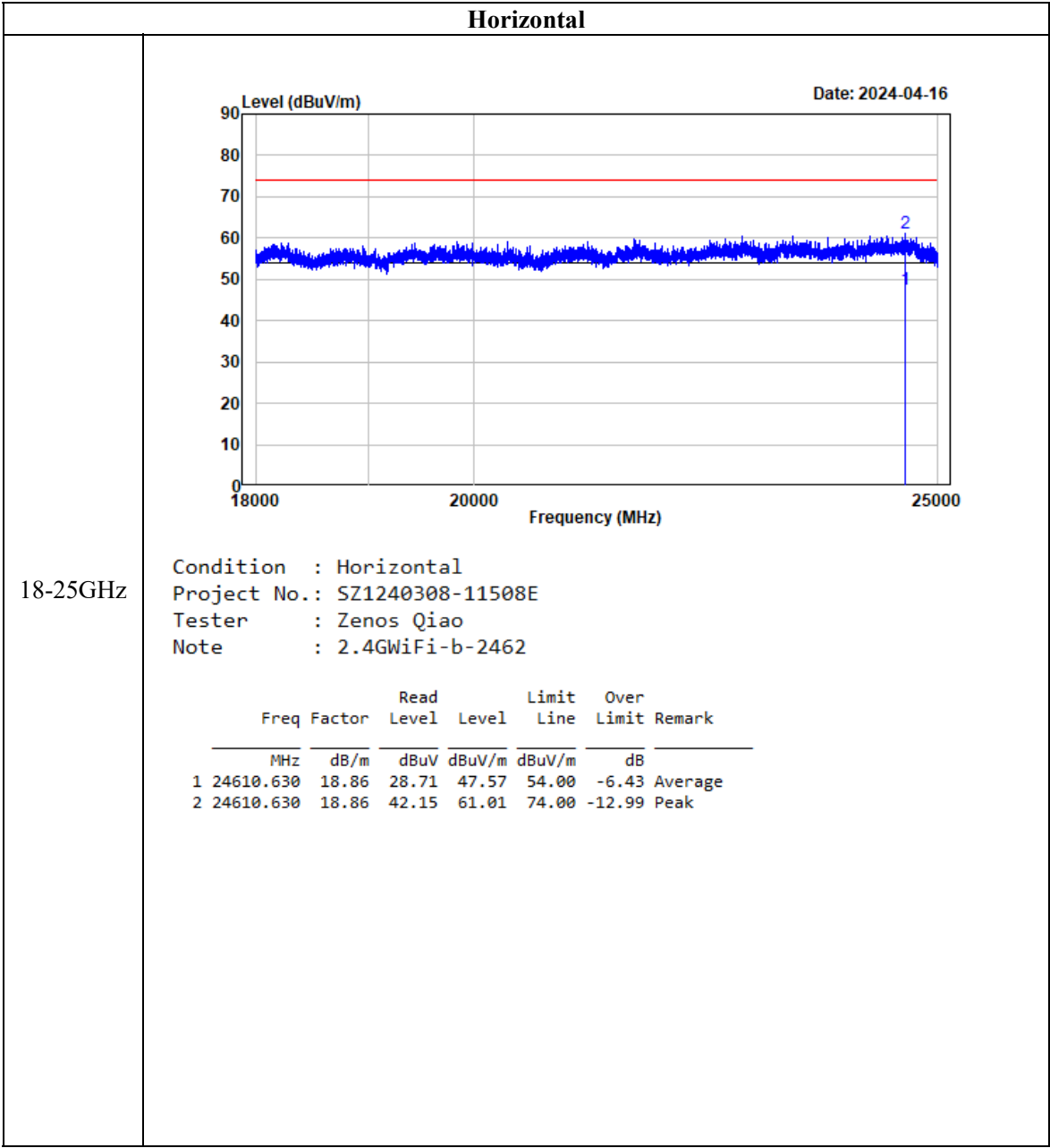
Test plots for Harmonic Measurements:

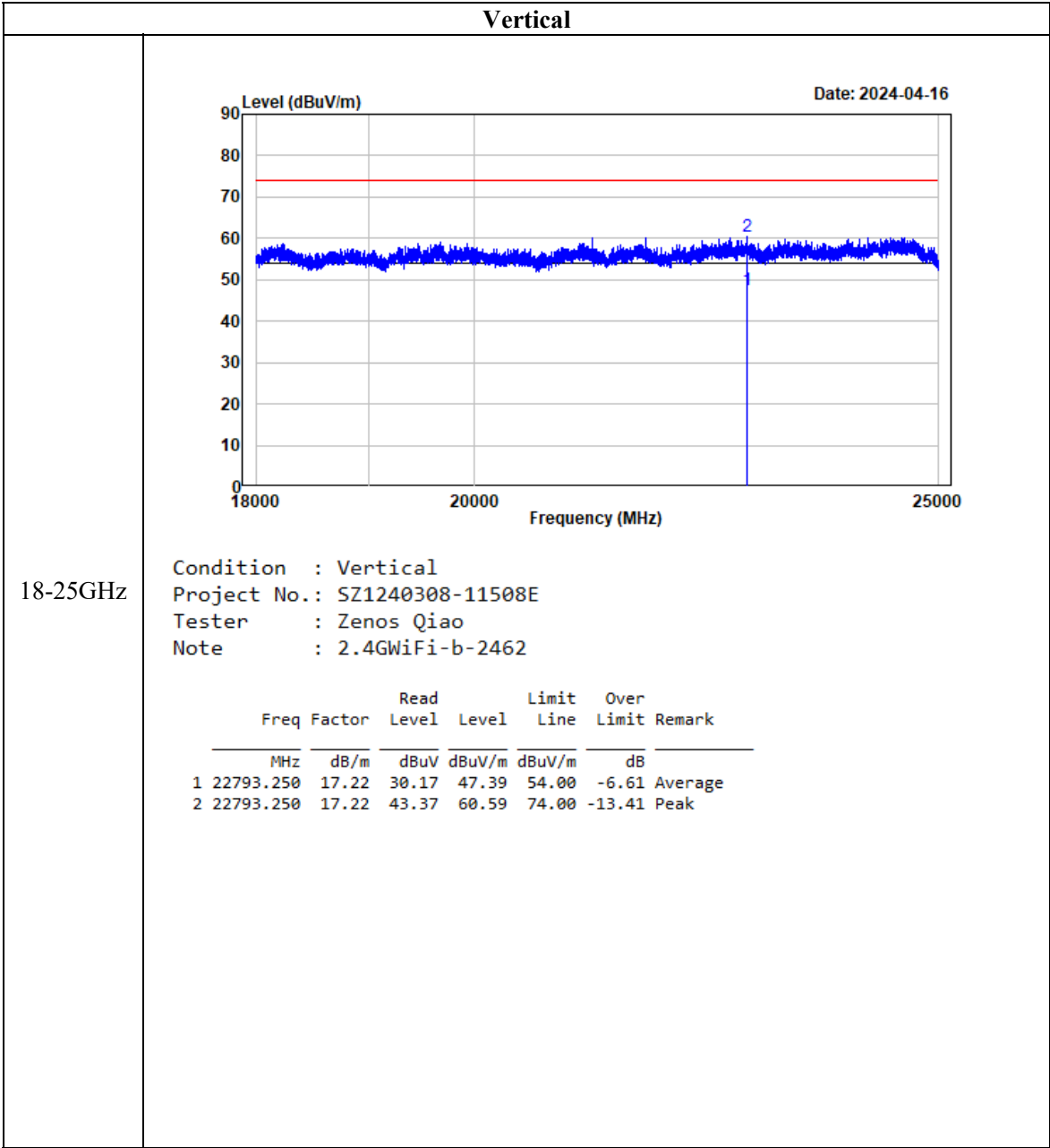












## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

### Applicable Standard

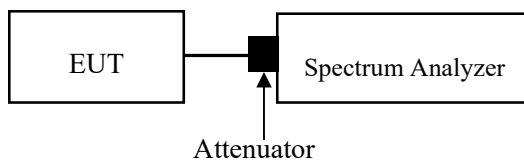
According to FCC §15.247(a) (2)

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.

### Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.8.1 & Clause 6.9.3

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



### Test Data

#### Environmental Conditions

|                    |         |
|--------------------|---------|
| Temperature:       | 25 °C   |
| Relative Humidity: | 50 %    |
| ATM Pressure:      | 101 kPa |

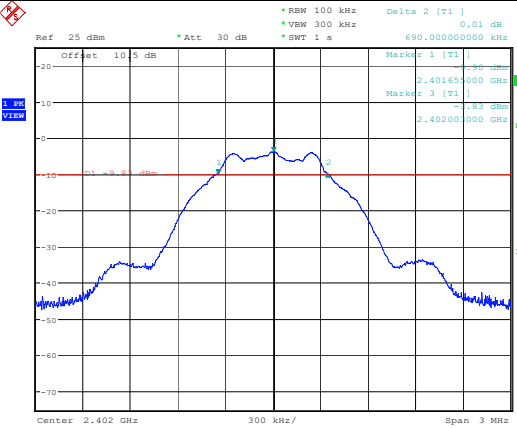
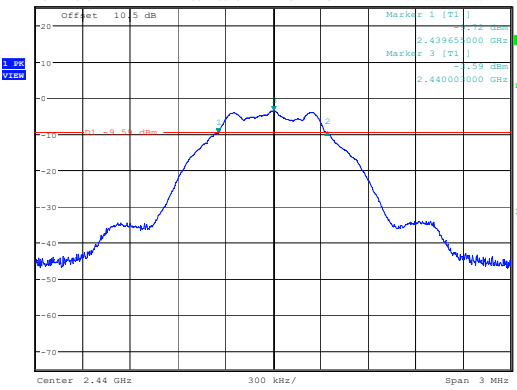
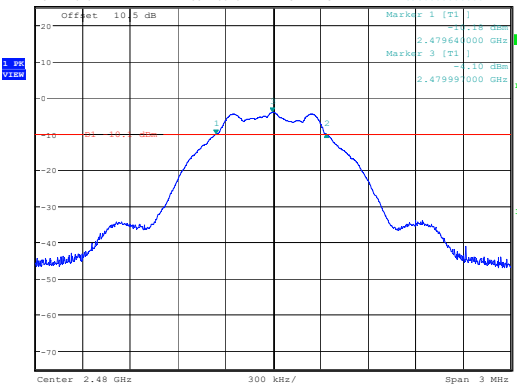
The testing was performed by Jim Cheng on 2024-04-08 and Bamboo Zhan from 2024-04-22 to 2024-05-20.

*EUT operation mode: Transmitting*

**Test Result: Compliant.**

| Test Modes | Test Frequency (MHz) | 6 dB Bandwidth (MHz) | 99% Emission Bandwidth (MHz) | Limit (MHz) |
|------------|----------------------|----------------------|------------------------------|-------------|
| BLE 1M     | 2402                 | 0.690                | 1.035                        | $\geq 0.5$  |
|            | 2440                 | 0.684                | 1.035                        | $\geq 0.5$  |
|            | 2480                 | 0.696                | 1.038                        | $\geq 0.5$  |
| 802.11b    | 2412                 | 9.12                 | 14.640                       | $\geq 0.5$  |
|            | 2437                 | 9.08                 | 14.487                       | $\geq 0.5$  |
|            | 2462                 | 9.09                 | 14.360                       | $\geq 0.5$  |
| 802.11g    | 2412                 | 15.51                | 16.840                       | $\geq 0.5$  |
|            | 2437                 | 16.35                | 17.600                       | $\geq 0.5$  |
|            | 2462                 | 15.21                | 16.760                       | $\geq 0.5$  |
| 802.11n20  | 2412                 | 17.54                | 18.012                       | $\geq 0.5$  |
|            | 2437                 | 17.37                | 18.141                       | $\geq 0.5$  |
|            | 2462                 | 17.31                | 18.141                       | $\geq 0.5$  |
| 802.11n40  | 2422                 | 35.16                | 36.000                       | $\geq 0.5$  |
|            | 2437                 | 36.60                | 36.720                       | $\geq 0.5$  |
|            | 2452                 | 35.22                | 36.080                       | $\geq 0.5$  |

6 dB Bandwidth

|                       |                                                                                                                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Low Channel</p>    | <p><b>BLE 1M</b></p>  <p>ProjectNo.:SZ1240308-11508E-RF Tester:Jim Cheng<br/>Date: 8.APR.2024 18:15:33</p> |
| <p>Middle Channel</p> |  <p>ProjectNo.:SZ1240308-11508E-RF Tester:Jim Cheng<br/>Date: 8.APR.2024 18:22:52</p>                     |
| <p>High Channel</p>   |  <p>ProjectNo.:SZ1240308-11508E-RF Tester:Jim Cheng<br/>Date: 8.APR.2024 18:31:12</p>                    |







Version 1.0 (2023/10/07)

## BLE 1M

Ref 25 dBm Att 30 dB

Marker 1 (T1) -6.23 dBm 2.401997000 GHz

Marker 2 (T2) -21.53 dBm 2.402521000 GHz

Center 2.402 GHz 300 kHz/ Span 3 MHz

Ref 25 dBm Att 30 dB Offset 10.5 dB

\*RBW 30 kHz \*VBN 100 kHz \*SMT 1 s

Marker 1 [T1] -6.01 dBm 2.439994000 GHz

ORW 1.035000000 MHz

Temp 1 [T1] 0.000 dBm -21.78 dBm

Temp 2 [T1] 0.000 dBm -21.47 dBm

Temp 3 [T1] 0.000 dBm -24.40 dBm

Center 2.44 GHz Span 3 MHz

Ref 25 dBm Att 30 dB Marker 1 [71] -6.53 dBm  
 \*BWM 30 kHz \*VVM 100 kHz \*SWT 1 s 2.479997000 GHz

Offset 10.5 dB

1.99 VdB

300 kHz

Center 2.48 GHz Span 3 MHz

Power (dBm): -20, -10, -20, -30, -40, -50, -60, -70

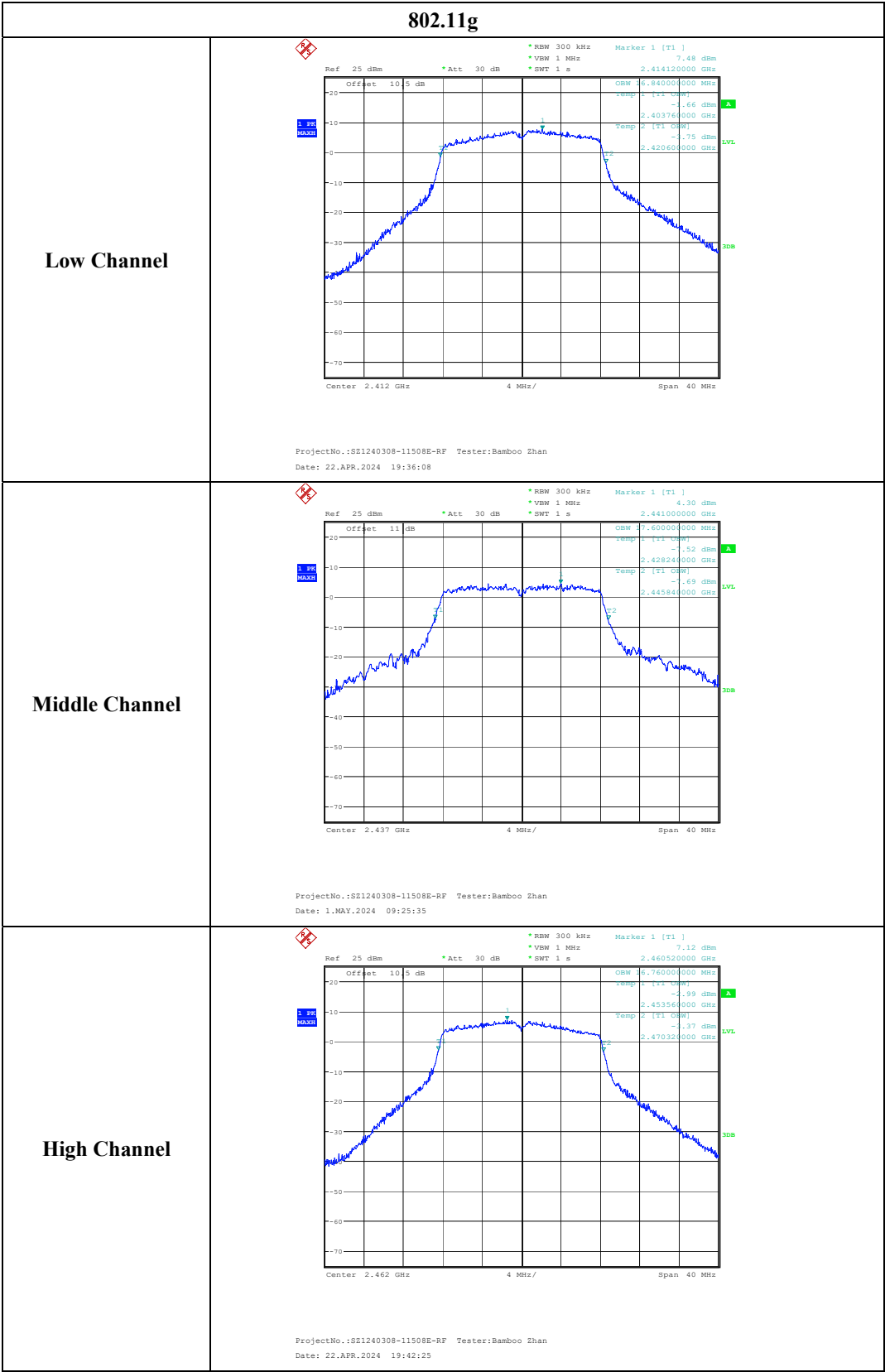
Frequency (GHz): 2.479997000, 2.480520000

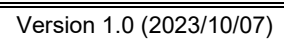
Power (dBm) at 2.480520000 GHz: -22.05 dBm

Power (dBm) at 2.479997000 GHz: -22.42 dBm

Version 1.0 (2023/10/07)









## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### Applicable Standard

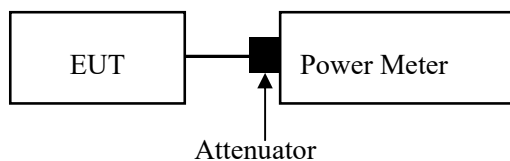
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted 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.

### Test Procedure

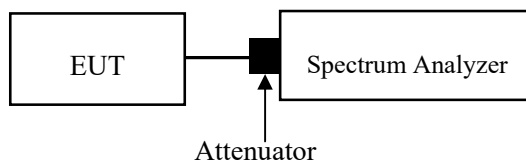
Test Method: ANSI C63.10-2013 Clause 11.9.1.1 for BLE & Clause 11.9.2.3.2 for Wi-Fi

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 one test equipment.
3. Add a correction factor to the display.

For Wi-Fi mode:



For BLE mode:



Test Data

Environmental Conditions

|                    |         |
|--------------------|---------|
| Temperature:       | 25 °C   |
| Relative Humidity: | 50 %    |
| ATM Pressure:      | 101 kPa |

The testing was performed by Jim Cheng on 2024-04-08 and Bamboo Zhan from 2024-04-08 to 2024-05-01 for Wi-Fi.

EUT operation mode: Transmitting

Test Result: Compliant.

| Test Modes | Test Frequency (MHz) | Maximum Conducted AV Output Power (dBm) | Maximum Conducted Peak Output Power (dBm) | Limit (dBm) |
|------------|----------------------|-----------------------------------------|-------------------------------------------|-------------|
| BLE 1M     | 2402                 | /                                       | -2.92                                     | ≤30         |
|            | 2440                 | /                                       | -2.76                                     | ≤30         |
|            | 2480                 | /                                       | -3.15                                     | ≤30         |
| 802.11b    | 2412                 | 18.62                                   | 22.33                                     | ≤30         |
|            | 2437                 | 16.94                                   | 20.73                                     | ≤30         |
|            | 2462                 | 18.09                                   | 21.91                                     | ≤30         |
| 802.11g    | 2412                 | 13.86                                   | 23.16                                     | ≤30         |
|            | 2437                 | 12.40                                   | 21.15                                     | ≤30         |
|            | 2462                 | 13.37                                   | 22.67                                     | ≤30         |
| 802.11n20  | 2412                 | 13.83                                   | 23.12                                     | ≤30         |
|            | 2437                 | 13.36                                   | 22.05                                     | ≤30         |
|            | 2462                 | 13.34                                   | 22.65                                     | ≤30         |
| 802.11n40  | 2422                 | 12.02                                   | 21.79                                     | ≤30         |
|            | 2437                 | 11.65                                   | 21.42                                     | ≤30         |
|            | 2452                 | 12.03                                   | 21.80                                     | ≤30         |



## FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

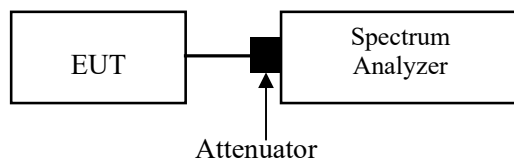
### Applicable Standard

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)).

### Test Procedure

Test Method: ANSI C63.10-2013 Clause 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.



### Test Data

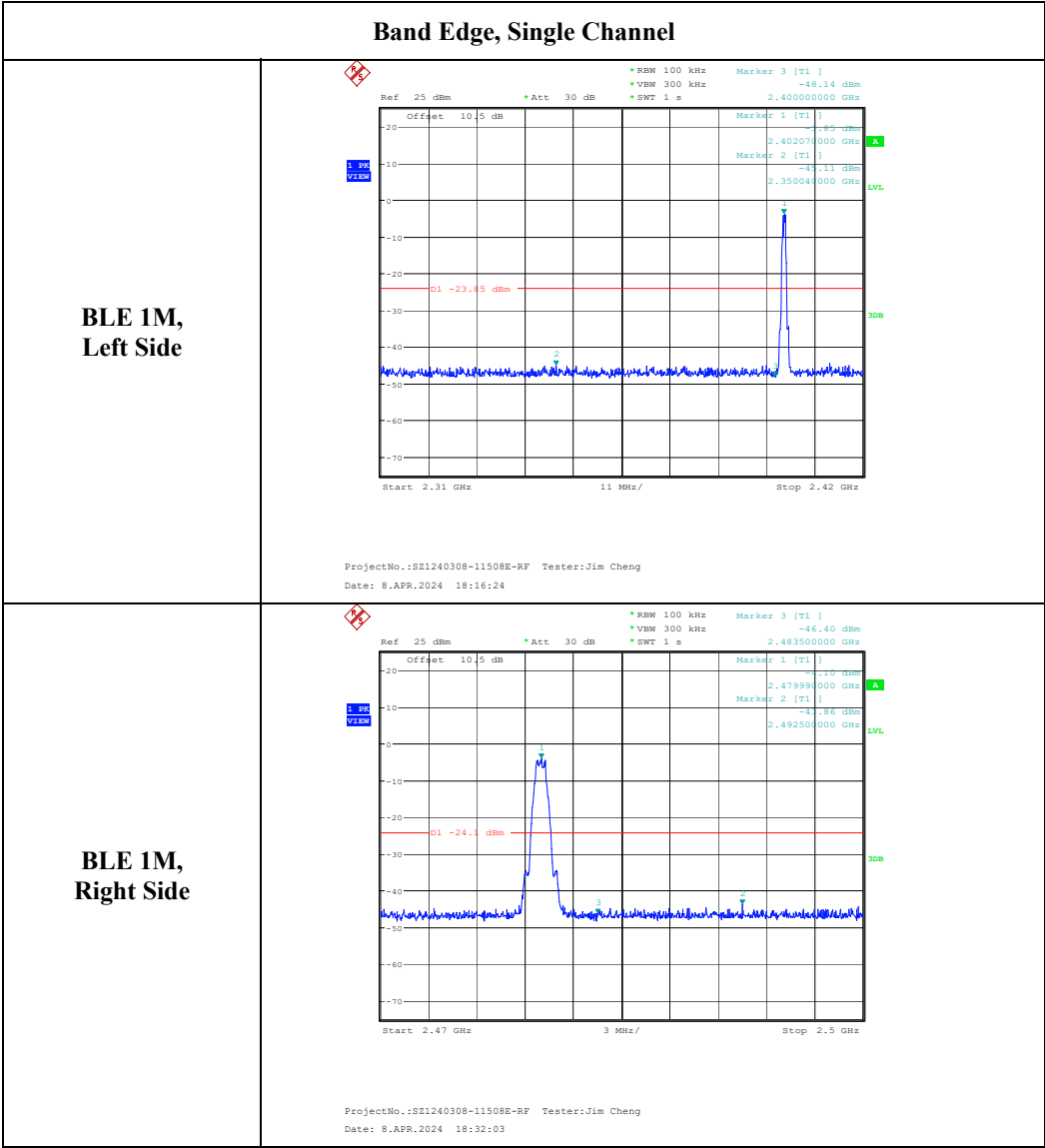
#### Environmental Conditions

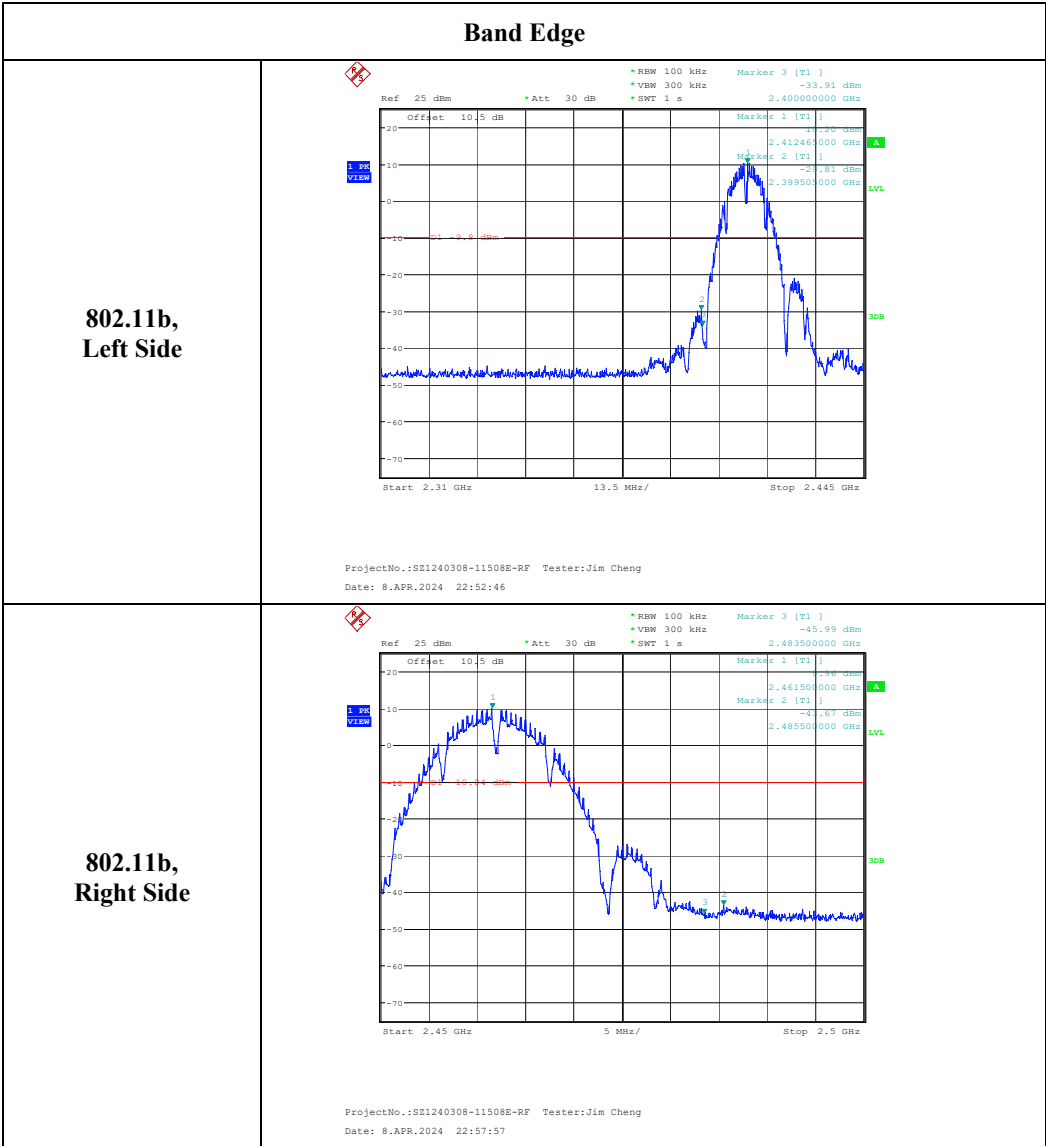
|                    |         |
|--------------------|---------|
| Temperature:       | 25 °C   |
| Relative Humidity: | 50 %    |
| ATM Pressure:      | 101 kPa |

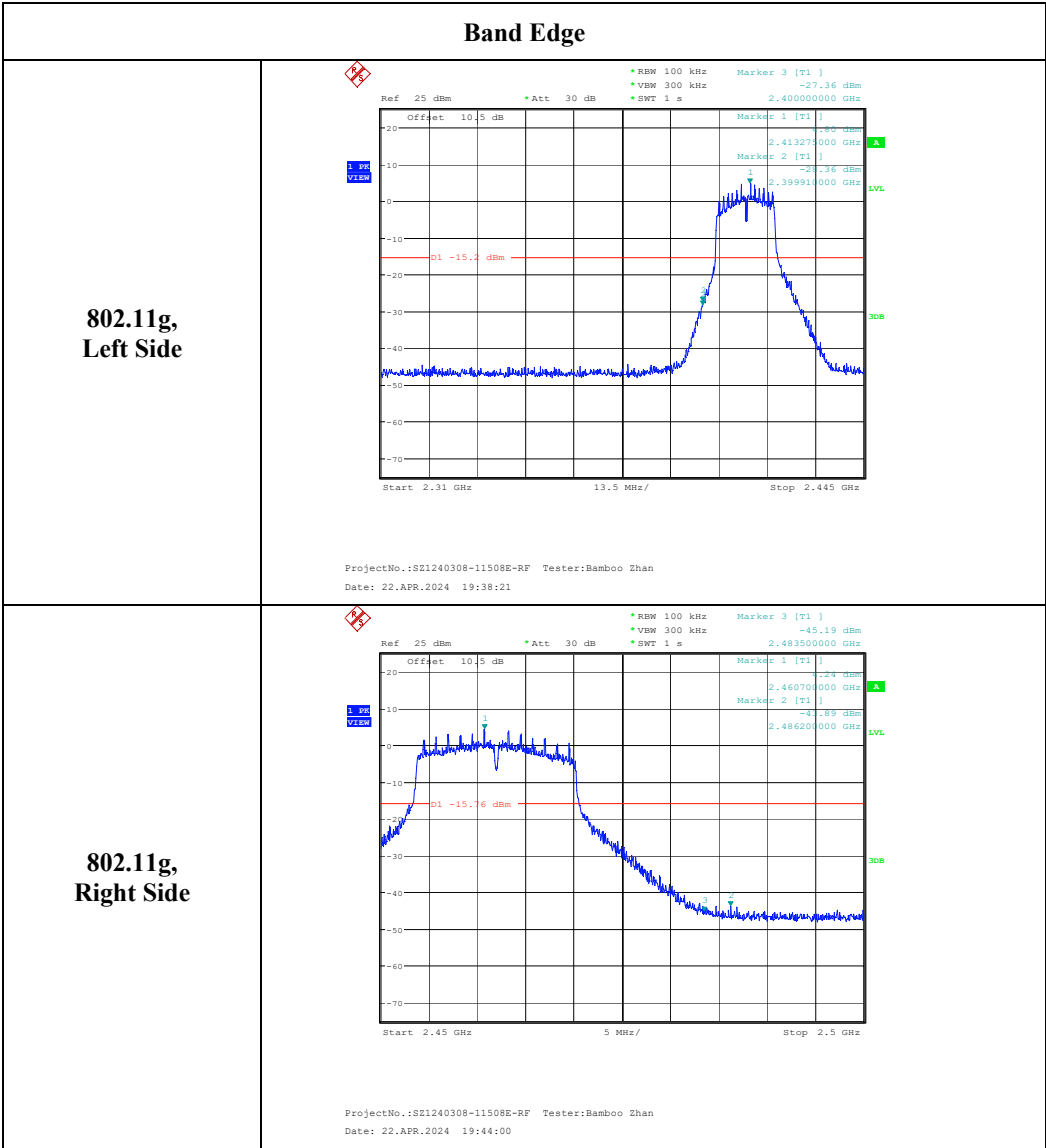
The testing was performed by Jim Cheng on 2024-04-08 and Bamboo Zhan on 2024-04-22.

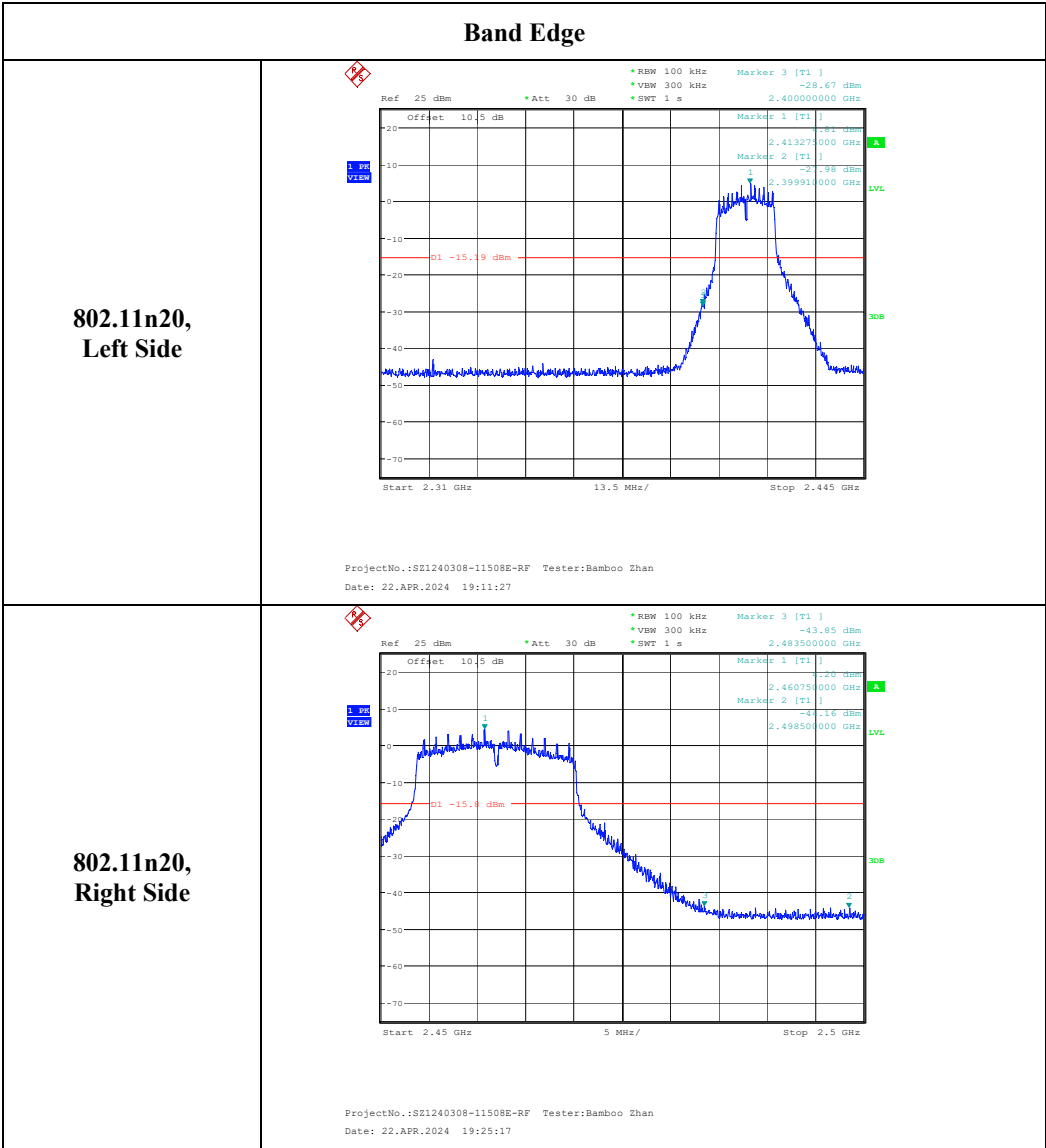
EUT operation mode: Transmitting

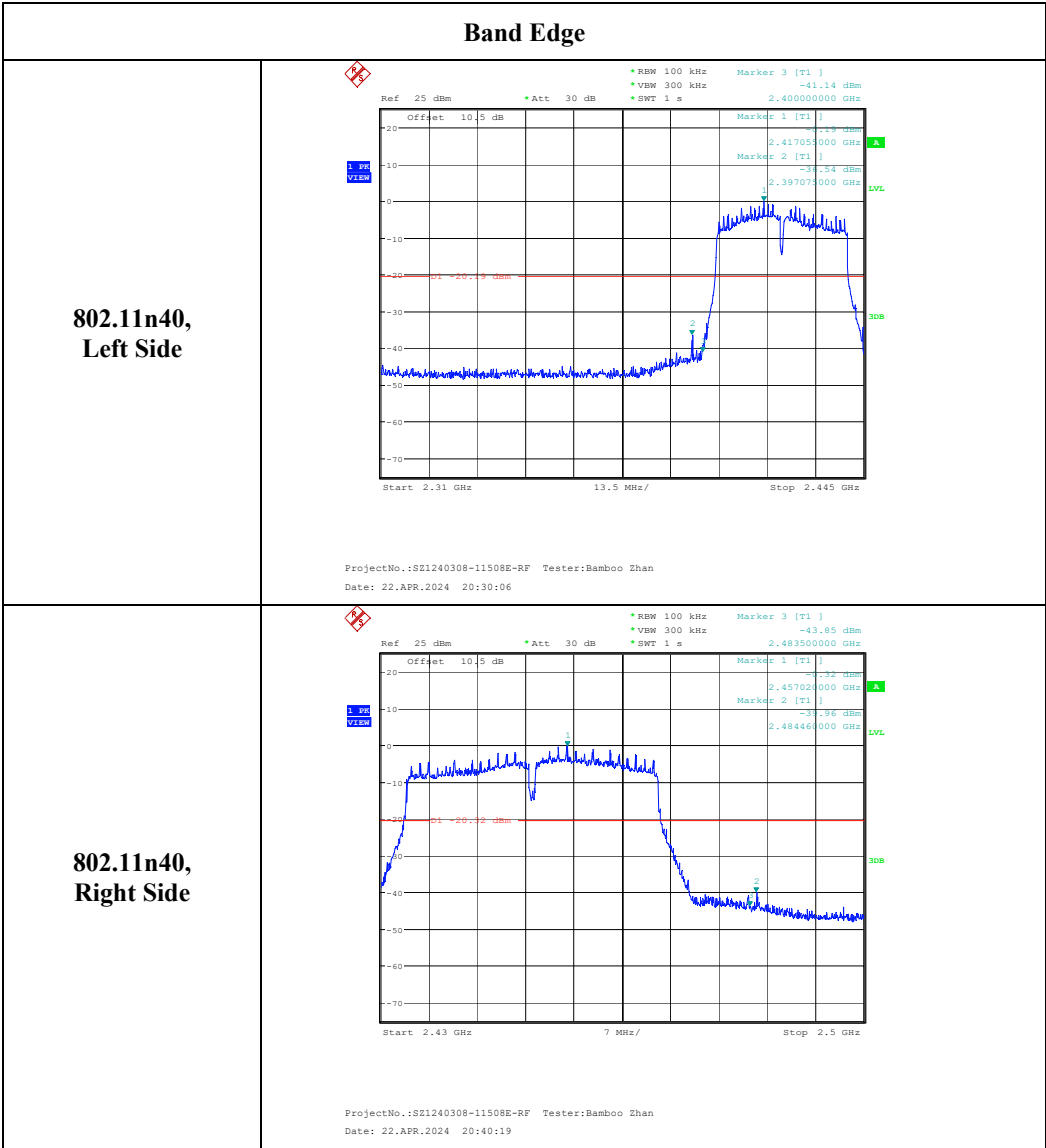
**Test Result: Compliant.**











## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

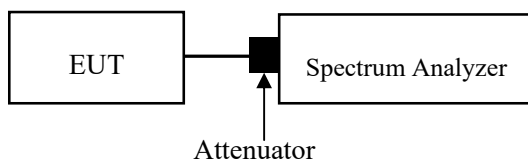
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of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

### Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.10.2

Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

1. Set the RBW to:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
2. Set the VBW  $\geq 3 \times \text{RBW}$ .
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



### Test Data

#### Environmental Conditions

|                    |         |
|--------------------|---------|
| Temperature:       | 25 °C   |
| Relative Humidity: | 50 %    |
| ATM Pressure:      | 101 kPa |

*The testing was performed by Jim Cheng from 2024-04-08 to 2024-05-15 and Bamboo Zhan from 2024-04-22 to 2024-05-18.*

*EUT operation mode: Transmitting*

**Test Result: Compliant.**

| Test Modes | Test Frequency (MHz) | Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) |
|------------|----------------------|-----------------------------------|------------------|
| BLE 1M     | 2402                 | -18.24                            | $\leq 8.00$      |
|            | 2440                 | -18.05                            | $\leq 8.00$      |
|            | 2480                 | -18.51                            | $\leq 8.00$      |
| 802.11b    | 2412                 | -3.62                             | $\leq 8.00$      |
|            | 2437                 | -4.09                             | $\leq 8.00$      |
|            | 2462                 | -4.26                             | $\leq 8.00$      |
| 802.11g    | 2412                 | -9.73                             | $\leq 8.00$      |
|            | 2437                 | -11.27                            | $\leq 8.00$      |
|            | 2462                 | -10.41                            | $\leq 8.00$      |
| 802.11n20  | 2412                 | -11.37                            | $\leq 8.00$      |
|            | 2437                 | -9.40                             | $\leq 8.00$      |
|            | 2462                 | -10.69                            | $\leq 8.00$      |
| 802.11n40  | 2422                 | -15.54                            | $\leq 8.00$      |
|            | 2437                 | -17.26                            | $\leq 8.00$      |
|            | 2452                 | -15.80                            | $\leq 8.00$      |











## **EUT PHOTOGRAPHS**

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Please refer to the attachment SZ1240308-11508E-RF External photo and SZ1240308-11508E-RF Internal photo.

## **TEST SETUP PHOTOGRAPHS**

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Please refer to the attachment SZ1240308-11508E-RFA Test Setup photo.

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