

# TEST REPORT

Applicant Name: SMART SIM TECHNOLOGY COMPANY LIMITED  
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Report Number: SZ1240111-02642E-RF-00A  
FCC ID: 2BE7FB30CPE

## Test Standard (s)

FCC PART 15.247

## Sample Description

Product Type: 4G LTE WiFi Router  
Model No.: B30  
Multiple Model(s) No.: N/A  
Trade Mark: N/A  
Date Received: 2024/01/11  
Report Date: 2024/02/29

|              |       |
|--------------|-------|
| Test Result: | Pass▲ |
|--------------|-------|

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

## Prepared and Checked By:

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Black Chen  
RF Engineer

## Approved By:

*Nancy Wang*

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               | SZ1240111-02642E-RF-00A | Original Report         | 2024/02/29       |

## GENERAL INFORMATION

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

|                                        |                                                                                                               |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Product                                | 4G LTE WiFi Router                                                                                            |
| Tested Model                           | B30                                                                                                           |
| Multiple Model(s)                      | N/A                                                                                                           |
| Frequency Range                        | 2412-2462MHz                                                                                                  |
| Maximum Conducted Average Output Power | 802.11b: 25.06dBm<br>802.11g: 24.83dBm<br>802.11n-HT20M: 25.76dBm<br>802.11n-HT40M: 21.65dBm                  |
| Modulation Technique                   | DSSS,OFDM                                                                                                     |
| Antenna Specification <sup>#</sup>     | 2.84dBi (provided by the applicant)                                                                           |
| Voltage Range                          | DC12V form adapter                                                                                            |
| Sample serial number                   | 2GHX-2 for Conducted and Radiated Emissions Test<br>2GHX-1 for RF Conducted Test (Assigned by BACL, Shenzhen) |
| Sample/EUT Status                      | Good condition                                                                                                |
| Adapter Information                    | Model: ZL-A012W1201000<br>Input: 100-240~50/60Hz 0.5A Max<br>Output: 12V,1.0A                                 |

### 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.

## 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-150kHz                 | 3.94dB(k=2, 95% level of confidence)  |
|                                    | 150kHz-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 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            | /       | /               |

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

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

The device supports SISO/MIMO in all modes, per pretest, MIMO mode was the worst mode and reported for all modes.

### Equipment Modifications

No modification was made to the EUT tested.

## EUT Exercise Software

“cmd.exe---adb shell”<sup>#</sup> Exercise Software was used.

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

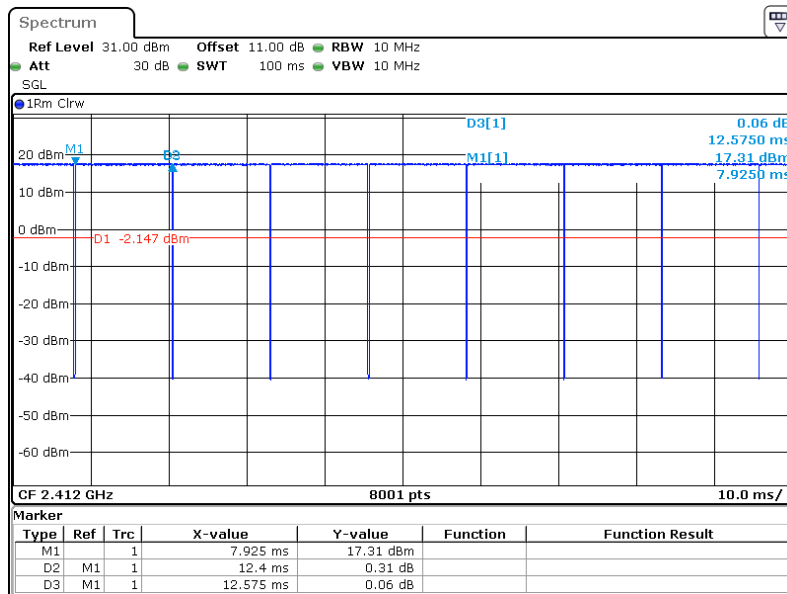
| Test Modes   | Test Channels | Test Frequency | Data rate | Power Level Setting <sup>#</sup> |         |
|--------------|---------------|----------------|-----------|----------------------------------|---------|
|              |               |                |           | Chain 0                          | Chain 1 |
| 802.11b      | Lowest        | 2412           | 1Mbps     | 35                               | 35      |
|              | Middle        | 2437           | 1Mbps     | 35                               | 35      |
|              | Highest       | 2462           | 1Mbps     | 35                               | 35      |
| 802.11g      | Lowest        | 2412           | 6Mbps     | 34                               | 34      |
|              | Middle        | 2437           | 6Mbps     | 34                               | 34      |
|              | Highest       | 2462           | 6Mbps     | 34                               | 34      |
| 802.11n ht20 | Lowest        | 2412           | MCS8      | 35                               | 35      |
|              | Middle        | 2437           | MCS8      | 35                               | 35      |
|              | Highest       | 2462           | MCS8      | 35                               | 35      |
| 802.11n ht40 | Lowest        | 2422           | MCS8      | 28                               | 28      |
|              | Middle        | 2437           | MCS8      | 28                               | 28      |
|              | Highest       | 2452           | MCS8      | 28                               | 28      |

The software and power level was provided by applicant.

## Duty cycle

| Test Modes   | Ton (ms) | Ton+off (ms) | Duty Cycle (%) | 1/T (Hz) | VBW Setting (Hz) |
|--------------|----------|--------------|----------------|----------|------------------|
| 802.11b      | 12.4     | 12.575       | 98.61          | 81       | /                |
| 802.11g      | 2.06     | 2.24125      | 91.91          | 485      | 500              |
| 802.11n-HT20 | 1.91375  | 2.105        | 90.91          | 523      | 1000             |
| 802.11n-HT40 | 0.943125 | 1.095        | 86.13          | 1060     | 2000             |

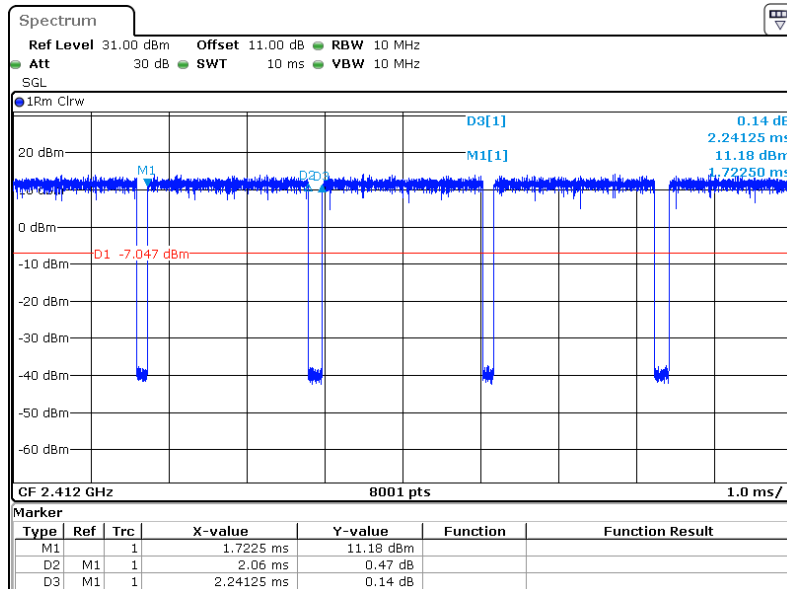
## 802.11b



ProjectNo.:SZ1240111-02642E Tester:Bamboo Zhan

Date: 21.FEB.2024 09:40:07

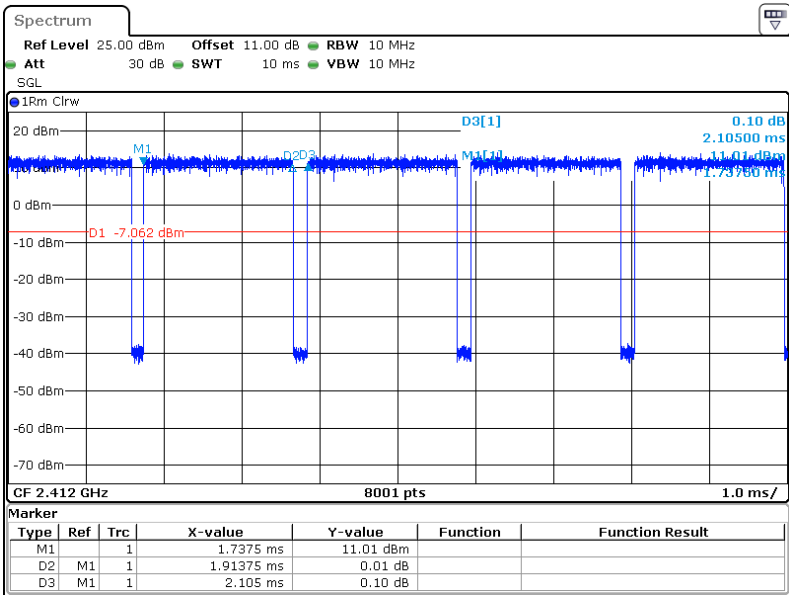
## 802.11g



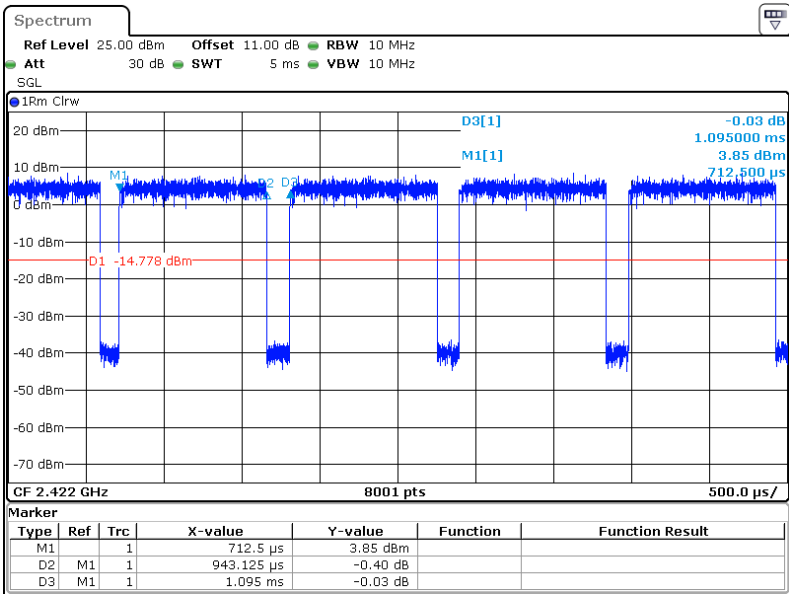
ProjectNo.:SZ1240111-02642E Tester:Bamboo Zhan

Date: 21.FEB.2024 10:52:07

802.11n20



802.11n40



Support Equipment List and Details

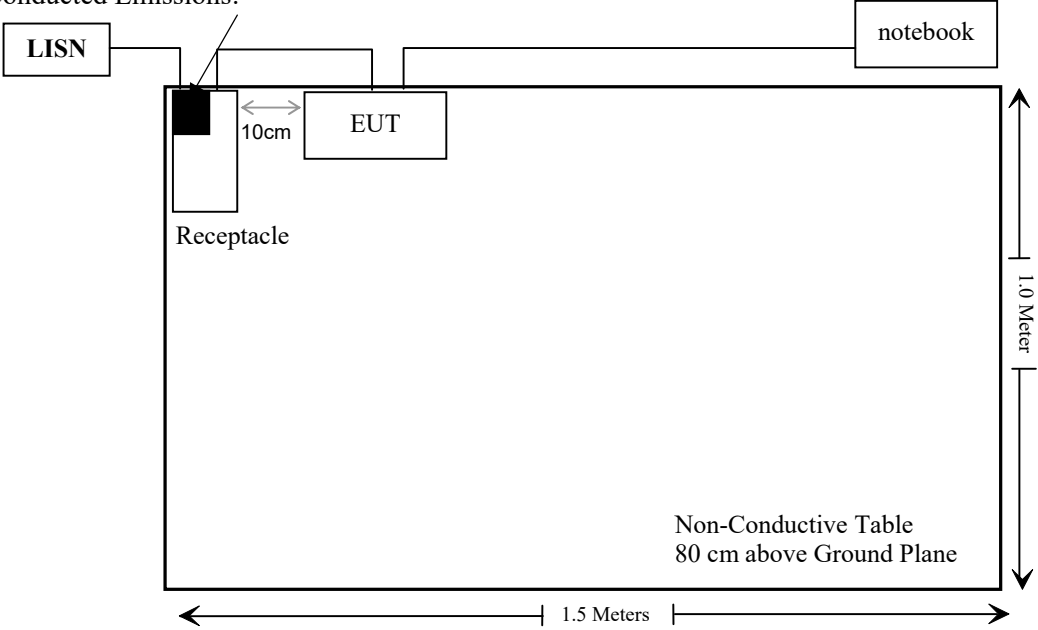
| Manufacturer | Description | Model    | Serial Number |
|--------------|-------------|----------|---------------|
| Dell         | Notebook    | Inspiron | Unknown       |

External I/O Cable

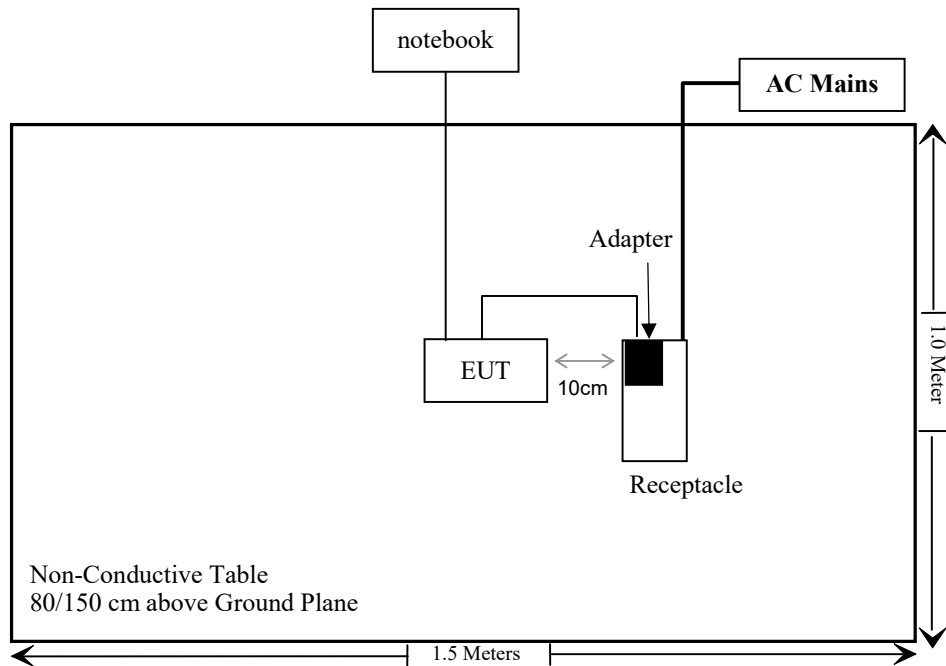
| Cable Description | Length (m) | From Port | To  |
|-------------------|------------|-----------|-----|
| RJ45 cable        | 10         | Notebook  | EUT |

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             | MAXIMUM PERMISSIBLE EXPOSURE (MPE)           | Compliant |
| §15.203                      | Antenna Requirement                          | Compliant |
| §15.207 (a)                  | AC Line Conducted Emissions                  | Compliant |
| §15.205, §15.209, §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                 | 2023/02/08       | 2024/02/07           |
| Rohde & Schwarz                | LISN                    | ENV216                  | 101613                 | 2023/02/08       | 2024/02/07           |
| 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                 | NCR              | NCR                  |
| <b>Radiated Emissions Test</b> |                         |                         |                        |                  |                      |
| R&S                            | EMI Test Receiver       | ESR3                    | 102455                 | 2023/02/08       | 2024/02/07           |
| 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                 | 2023/04/18       | 2024/04/17           |
| 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           |
| MICRO-TRONICS                  | 2.8G Passband filter    | HPM50111                | F-03-EM217             | 2023/08/03       | 2024/08/02           |
| SNSD                           | 2.4G Band Reject filter | BSF2402-2480MN-0898-001 | 2.4G filter            | 2023/08/03       | 2024/08/02           |
| Audix                          | EMI Test software       | E3                      | 191218(V9)             | NCR              | NCR                  |
| 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                  |

| Manufacturer      | Description                  | Model   | Serial Number | Calibration Date | Calibration Due Date |
|-------------------|------------------------------|---------|---------------|------------------|----------------------|
| RF Conducted Test |                              |         |               |                  |                      |
| Agilent           | USB wideband power sensor    | U2021XA | MY52350001    | 2023/06/08       | 2024/06/07           |
| Rohde & Schwarz   | Signal and Spectrum Analyzer | FSV40   | 101473        | 2024/02/07       | 2025/02/06           |
| 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 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

### **Applicable Standard**

According to subpart 15.247 (i) and 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.

#### **Limits for General Population/Uncontrolled Exposure**

| <b>Limits for General Population/Uncontrolled Exposure</b> |                                      |                                      |                                          |                                 |
|------------------------------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------|---------------------------------|
| <b>Frequency Range (MHz)</b>                               | <b>Electric Field Strength (V/m)</b> | <b>Magnetic Field Strength (A/m)</b> | <b>Power Density (mW/cm<sup>2</sup>)</b> | <b>Averaging Time (Minutes)</b> |
| 0.3-1.34                                                   | 614                                  | 1.63                                 | *(100)                                   | 30                              |
| 1.34-30                                                    | 824/f                                | 2.19/f                               | *(180/f <sup>2</sup> )                   | 30                              |
| 30-300                                                     | 27.5                                 | 0.073                                | 0.2                                      | 30                              |
| 300-1500                                                   | /                                    | /                                    | f/1500                                   | 30                              |
| 1500-100,000                                               | /                                    | /                                    | 1.0                                      | 30                              |

f = frequency in MHz

\* = Plane-wave equivalent power density

### **Result**

#### **Calculated Formulary:**

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**Result****For worst case:**

| Mode     | Frequency<br>(MHz) | Antenna Gain <sup>#</sup> |           | Tune up conducted power <sup>#</sup> |        | Evaluation Distance<br>(cm) | Power Density<br>(mW/cm <sup>2</sup> ) | MPE Limit<br>(mW/cm <sup>2</sup> ) |
|----------|--------------------|---------------------------|-----------|--------------------------------------|--------|-----------------------------|----------------------------------------|------------------------------------|
|          |                    | (dBi)                     | (numeric) | (dBm)                                | (mW)   |                             |                                        |                                    |
| Wi-Fi    | 2412-2462          | 2.84                      | 1.92      | 26                                   | 398.11 | 20                          | 0.1521                                 | 1                                  |
| WCDMA B2 | 1850-1910          | 2.56                      | 1.8       | 23                                   | 199.53 | 20                          | 0.0715                                 | 1                                  |
| WCDMA B5 | 824-849            | -2.31                     | 0.59      | 25                                   | 316.23 | 20                          | 0.0371                                 | 0.549                              |
| LTE B2   | 1850-1910          | 2.56                      | 1.8       | 23                                   | 199.53 | 20                          | 0.0715                                 | 1                                  |
| LTE B4   | 1710-1755          | 1.62                      | 1.45      | 22                                   | 158.49 | 20                          | 0.0457                                 | 1                                  |
| LTE B12  | 699-716            | -1.56                     | 0.7       | 23                                   | 199.53 | 20                          | 0.0278                                 | 0.466                              |
| LTE B17  | 704-716            | -1.56                     | 0.7       | 24                                   | 251.19 | 20                          | 0.0350                                 | 0.469                              |

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

Simultaneous transmitting consideration (worst case):

The ratio= $MPE_{Wi-Fi}/limit_{Wi-Fi} + MPE_{LTE\ Band\ 17}/limit_{LTE\ Band\ 17} = 0.1521/1 + 0.0350/0.469 = 0.227 < 1.0$

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**

---

### **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.
- 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 an internal antenna arrangement, which was permanently attached and the antenna gain<sup>#</sup> is 2.84dBi, fulfill the requirement of this section. Please refer to the EUT photos.

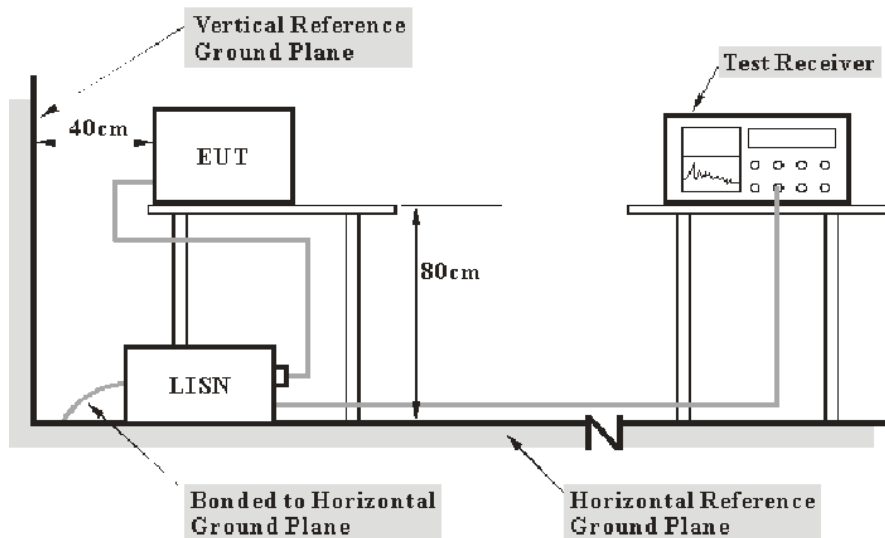
### **Result: Compliant**

## 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 device 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 margin calculation is as follows:

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

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

## Test Data

### Environmental Conditions

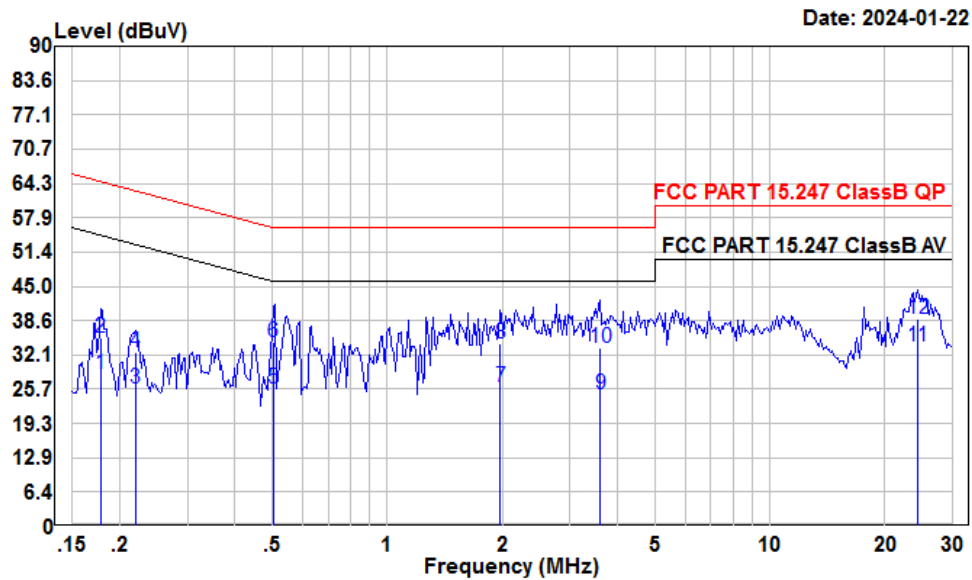
|                    |         |
|--------------------|---------|
| Temperature:       | 25 °C   |
| Relative Humidity: | 52%     |
| ATM Pressure:      | 101 kPa |

*The testing was performed by Macy Shi on 2024-01-22.*

*EUT operation mode: Transmitting*

**Wi-Fi: (Worst case is 802.11b mode, Low Channel)**

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



Condition: Line

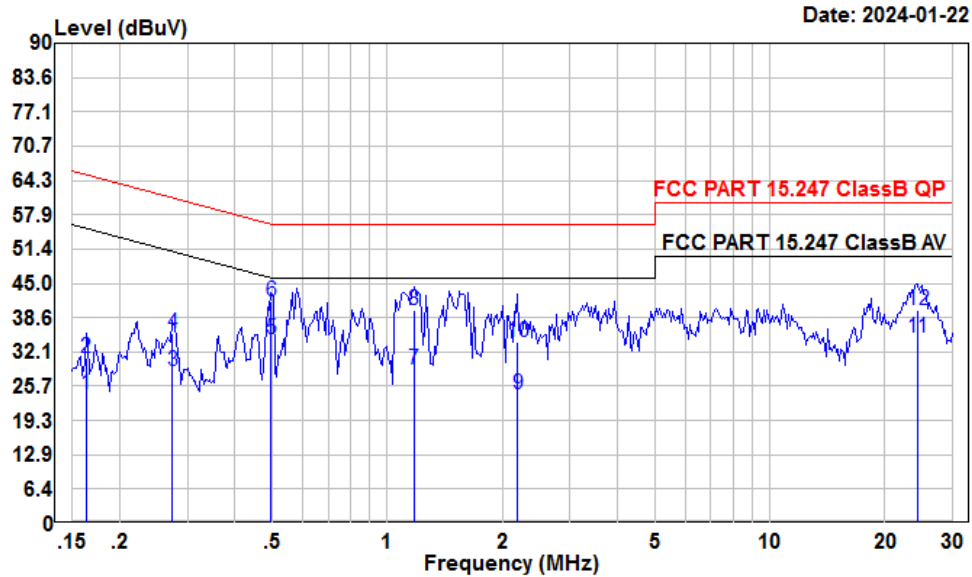
Project : SZ1240111-02642E-RF

Tester : Macy shi

Note : 2.4G WIFI

|    | Freq  | Read Level | Cable Level | Cable Loss | LISN Factor | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------------|------------|-------------|------------|------------|---------|
|    | MHz   | dBuV       | dBuV        | dB         | dB          | dBuV       | dB         |         |
| 1  | 0.18  | 7.95       | 28.68       | 10.13      | 10.60       | 54.59      | -25.91     | Average |
| 2  | 0.18  | 14.54      | 35.27       | 10.13      | 10.60       | 64.59      | -29.32     | QP      |
| 3  | 0.22  | 5.11       | 25.86       | 10.14      | 10.61       | 52.83      | -26.97     | Average |
| 4  | 0.22  | 11.78      | 32.53       | 10.14      | 10.61       | 62.83      | -30.30     | QP      |
| 5  | 0.50  | 5.12       | 25.97       | 10.15      | 10.70       | 46.00      | -20.03     | Average |
| 6  | 0.50  | 13.79      | 34.64       | 10.15      | 10.70       | 56.00      | -21.36     | QP      |
| 7  | 1.97  | 5.02       | 26.00       | 10.18      | 10.80       | 46.00      | -20.00     | Average |
| 8  | 1.97  | 13.40      | 34.38       | 10.18      | 10.80       | 56.00      | -21.62     | QP      |
| 9  | 3.60  | 3.91       | 24.80       | 10.26      | 10.63       | 46.00      | -21.20     | Average |
| 10 | 3.60  | 12.60      | 33.49       | 10.26      | 10.63       | 56.00      | -22.51     | QP      |
| 11 | 24.27 | 12.84      | 33.81       | 10.22      | 10.75       | 50.00      | -16.19     | Average |
| 12 | 24.27 | 17.88      | 38.85       | 10.22      | 10.75       | 60.00      | -21.15     | QP      |

## AC 120V/60 Hz, Neutral



Condition: Neutral

Project : SZ1240111-02642E-RF

Tester : Macy shi

Note : 2.4G WIFI

|    | Freq  | Read Level | Level | Cable Loss | LISN Factor | Limit Line | Over Limit | Remark  |
|----|-------|------------|-------|------------|-------------|------------|------------|---------|
|    | MHz   | dBuV       | dBuV  | dB         | dB          | dBuV       | dB         |         |
| 1  | 0.16  | 3.38       | 24.09 | 10.15      | 10.56       | 55.30      | -31.21     | Average |
| 2  | 0.16  | 10.39      | 31.10 | 10.15      | 10.56       | 65.30      | -34.20     | QP      |
| 3  | 0.27  | 7.59       | 28.49 | 10.17      | 10.73       | 50.98      | -22.49     | Average |
| 4  | 0.27  | 14.76      | 35.66 | 10.17      | 10.73       | 60.98      | -25.32     | QP      |
| 5  | 0.50  | 13.51      | 34.46 | 10.15      | 10.80       | 46.05      | -11.59     | Average |
| 6  | 0.50  | 20.64      | 41.59 | 10.15      | 10.80       | 56.05      | -14.46     | QP      |
| 7  | 1.17  | 8.25       | 28.94 | 10.07      | 10.62       | 46.00      | -17.06     | Average |
| 8  | 1.17  | 19.34      | 40.03 | 10.07      | 10.62       | 56.00      | -15.97     | QP      |
| 9  | 2.19  | 3.42       | 24.32 | 10.20      | 10.70       | 46.00      | -21.68     | Average |
| 10 | 2.19  | 12.97      | 33.87 | 10.20      | 10.70       | 56.00      | -22.13     | QP      |
| 11 | 24.27 | 13.78      | 34.75 | 10.22      | 10.75       | 50.00      | -15.25     | Average |
| 12 | 24.27 | 18.91      | 39.88 | 10.22      | 10.75       | 60.00      | -20.12     | QP      |

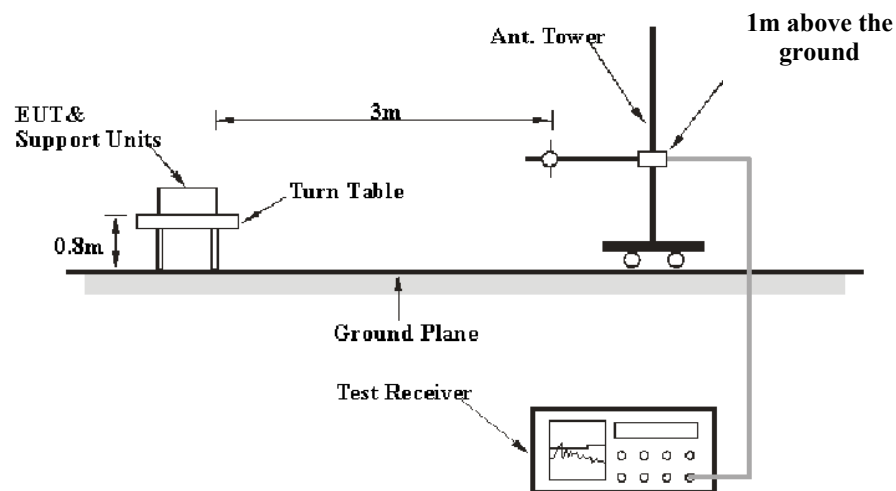
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

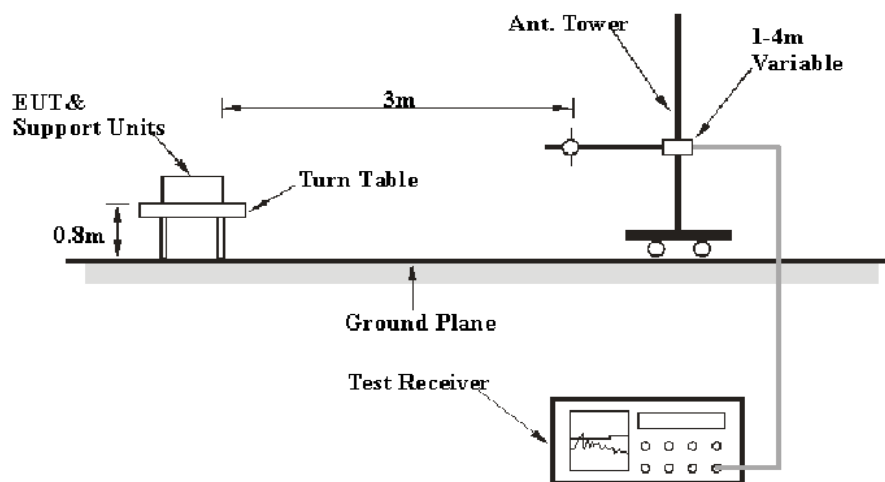
FCC §15.247 (d); §15.209; §15.205;

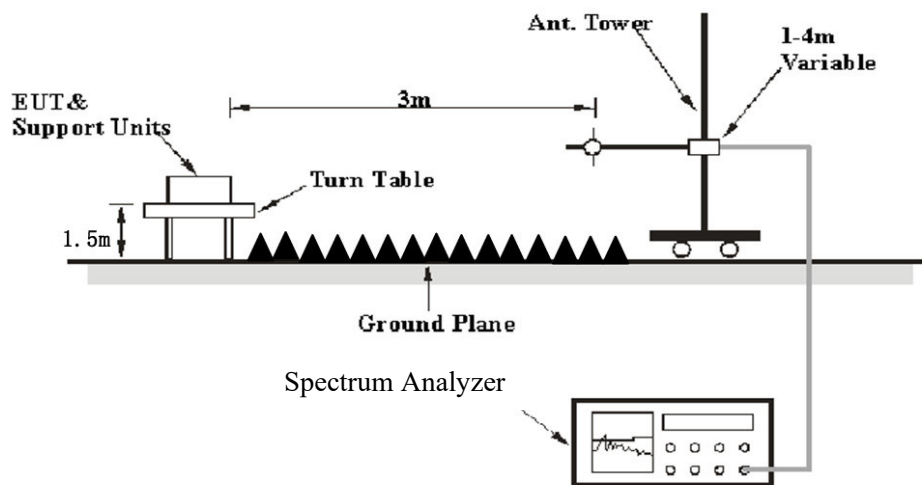
### EUT Setup

9 kHz-30MHz:



30MHz-1GHz:



**Above 1GHz:**

The radiated emission performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, 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:

| Frequency Range | Duty cycle | RBW  | Video B/W  |
|-----------------|------------|------|------------|
| PK              | Any        | 1MHz | 3 MHz      |
| AV              | >98%       | 1MHz | 10 Hz      |
|                 | <98%       | 1MHz | $\geq 1/T$ |

Note: T is minimum transmission duration

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

## 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.

## Factor & Over Limit/Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Over Limit or 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 margin calculation is as follows:

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

## Test Data

### Environmental Conditions

|                    |               |
|--------------------|---------------|
| Temperature:       | 22~24 °C      |
| Relative Humidity: | 54~61 %       |
| ATM Pressure:      | 101~101.2 kPa |

*The testing was performed by Anson Su on 2024-01-19 for below 1GHz and Dylan Yang on 2024-02-19 for above 1GHz.*

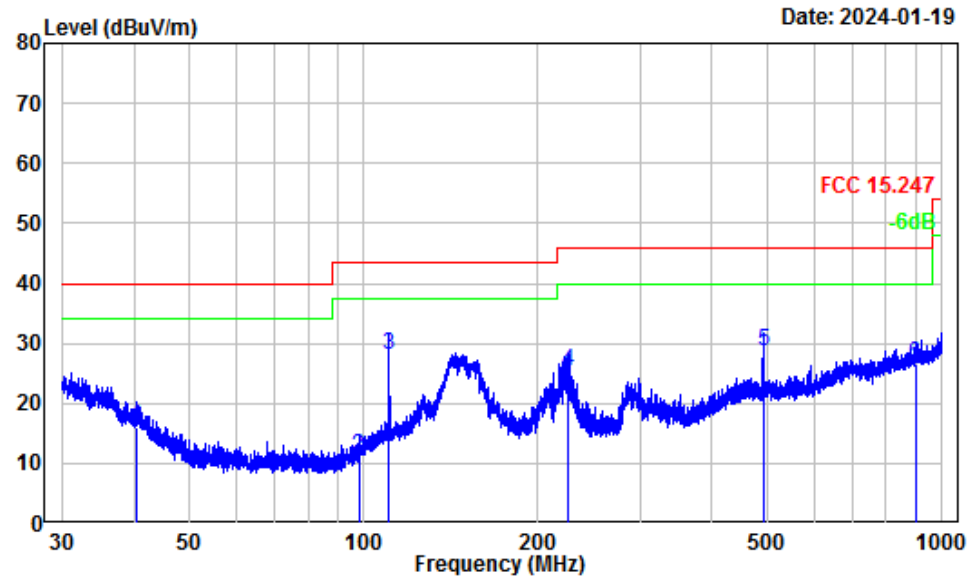
*EUT operation mode: Transmitting*

*Note: For 9 kHz-30MHz, The amplitude of spurious emissions attenuated more than 20 dB below the limit was not be recorded.*

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

30MHz-1GHz: (Worst case is 802.11b mode, low Channel)

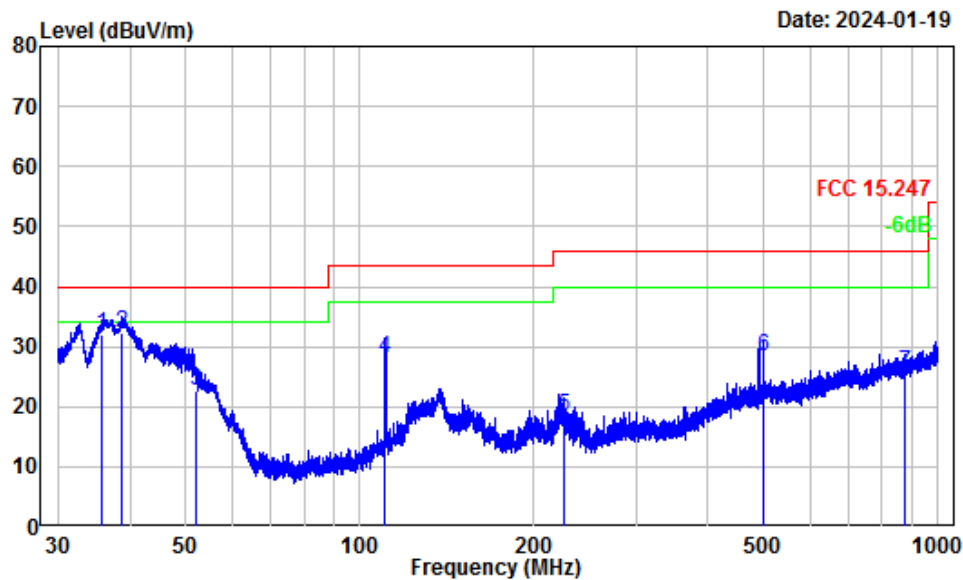
Horizontal



Site : chamber  
Condition : 3m Horizontal  
Project Number: SZ1240111-02642E-RF  
Note : 2.4G WIFI  
Tester : Anson Su

|   | Freq Factor |        | Read  |        | Limit  | Over   | Remark |
|---|-------------|--------|-------|--------|--------|--------|--------|
|   | MHz         | dB/m   | Level | Level  | Line   | Limit  |        |
|   | MHz         | dB/m   | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1 | 40.49       | -10.70 | 26.82 | 16.12  | 40.00  | -23.88 | QP     |
| 2 | 97.93       | -14.32 | 25.37 | 11.05  | 43.50  | -32.45 | QP     |
| 3 | 110.52      | -11.10 | 39.29 | 28.19  | 43.50  | -15.31 | QP     |
| 4 | 225.11      | -11.44 | 36.86 | 25.42  | 46.00  | -20.58 | QP     |
| 5 | 490.96      | -5.15  | 33.90 | 28.75  | 46.00  | -17.25 | QP     |
| 6 | 898.96      | 0.99   | 25.70 | 26.69  | 46.00  | -19.31 | QP     |

Vertical



Site : chamber  
Condition : 3m Vertical  
Project Number: SZ1240111-02642E-RF  
Note : 2.4G WIFI  
Tester : Anson Su

|   | Freq Factor |        | Read Level | Limit Level | Over Limit | Remark    |
|---|-------------|--------|------------|-------------|------------|-----------|
|   | MHz         | dB/m   | dBuV       | dBuV/m      | dBuV/m     | dB        |
| 1 | 35.83       | -9.30  | 41.21      | 31.91       | 40.00      | -8.09 QP  |
| 2 | 38.82       | -11.15 | 43.49      | 32.34       | 40.00      | -7.66 QP  |
| 3 | 52.16       | -17.49 | 40.07      | 22.58       | 40.00      | -17.42 QP |
| 4 | 110.62      | -12.24 | 40.45      | 28.21       | 43.50      | -15.29 QP |
| 5 | 225.60      | -12.24 | 30.67      | 18.43       | 46.00      | -27.57 QP |
| 6 | 500.08      | -5.25  | 33.59      | 28.34       | 46.00      | -17.66 QP |
| 7 | 877.94      | 0.29   | 25.27      | 25.56       | 46.00      | -20.44 QP |

**1-18 GHz:**

| Frequency<br>(MHz)                                                                  | Receiver          |         | Turntable<br>Angle<br>Degree | Rx Antenna    |                | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|-------------------------------------------------------------------------------------|-------------------|---------|------------------------------|---------------|----------------|------------------|------------------------------------|-------------------|----------------|
|                                                                                     | Reading<br>(dBμV) | PK/Ave. |                              | Height<br>(m) | Polar<br>(H/V) |                  |                                    |                   |                |
| 802.11b                                                                             |                   |         |                              |               |                |                  |                                    |                   |                |
| Low Channel(2412MHz)                                                                |                   |         |                              |               |                |                  |                                    |                   |                |
| 4824.00                                                                             | 51.52             | PK      | 79                           | 1.6           | H              | 2.45             | 53.97                              | 74                | -20.03         |
| 4824.00                                                                             | 48.25             | AV      | 79                           | 1.6           | H              | 2.45             | 50.70                              | 54                | -3.30          |
| 4824.00                                                                             | 46.54             | PK      | 230                          | 1.4           | V              | 2.45             | 48.99                              | 74                | -25.01         |
| 4824.00                                                                             | 41.33             | AV      | 230                          | 1.4           | V              | 2.45             | 43.78                              | 54                | -10.22         |
| Middle Channel(2437MHz)                                                             |                   |         |                              |               |                |                  |                                    |                   |                |
| 4874.00                                                                             | 50.91             | PK      | 348                          | 1.3           | H              | 2.56             | 53.47                              | 74                | -20.53         |
| 4874.00                                                                             | 47.70             | AV      | 348                          | 1.3           | H              | 2.56             | 50.26                              | 54                | -3.74          |
| 4874.00                                                                             | 46.01             | PK      | 274                          | 1.1           | V              | 2.56             | 48.57                              | 74                | -25.43         |
| 4874.00                                                                             | 41.30             | AV      | 274                          | 1.1           | V              | 2.56             | 43.86                              | 54                | -10.14         |
| The maximum value of the main wave on the X-axis: 109.78dBuV                        |                   |         |                              |               |                |                  |                                    |                   |                |
| The maximum value of the main wave on the Y-axis: 110.66dBuV                        |                   |         |                              |               |                |                  |                                    |                   |                |
| The maximum value of the main wave on the Z-axis: 112.33dBuV *（worst case position） |                   |         |                              |               |                |                  |                                    |                   |                |
| High Channel(2462MHz)                                                               |                   |         |                              |               |                |                  |                                    |                   |                |
| 4924.00                                                                             | 52.13             | PK      | 305                          | 1.0           | H              | 2.63             | 54.76                              | 74                | -19.24         |
| 4924.00                                                                             | 47.65             | AV      | 305                          | 1.0           | H              | 2.63             | 50.28                              | 54                | -3.72          |
| 4924.00                                                                             | 46.74             | PK      | 117                          | 2.1           | V              | 2.63             | 49.37                              | 74                | -24.63         |
| 4924.00                                                                             | 38.12             | AV      | 117                          | 2.1           | V              | 2.63             | 40.75                              | 54                | -13.25         |

| Frequency<br>(MHz)      | Receiver          |         | Turntable<br>Angle<br>Degree | Rx Antenna    |                | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|-------------------------|-------------------|---------|------------------------------|---------------|----------------|------------------|------------------------------------|-------------------|----------------|
|                         | Reading<br>(dBμV) | PK/Ave. |                              | Height<br>(m) | Polar<br>(H/V) |                  |                                    |                   |                |
| 802.11g                 |                   |         |                              |               |                |                  |                                    |                   |                |
| Low Channel(2412MHz)    |                   |         |                              |               |                |                  |                                    |                   |                |
| 4824.00                 | 50.77             | PK      | 189                          | 1.5           | H              | 2.45             | 53.22                              | 74                | -20.78         |
| 4824.00                 | 35.27             | AV      | 189                          | 1.5           | H              | 2.45             | 37.72                              | 54                | -16.28         |
| 4824.00                 | 46.81             | PK      | 47                           | 1.3           | V              | 2.45             | 49.26                              | 74                | -24.74         |
| 4824.00                 | 34.66             | AV      | 47                           | 1.3           | V              | 2.45             | 37.11                              | 54                | -16.89         |
| Middle Channel(2437MHz) |                   |         |                              |               |                |                  |                                    |                   |                |
| 4874.00                 | 48.39             | PK      | 209                          | 1.4           | H              | 2.56             | 50.95                              | 74                | -23.05         |
| 4874.00                 | 34.13             | AV      | 209                          | 1.4           | H              | 2.56             | 36.69                              | 54                | -17.31         |
| 4874.00                 | 48.55             | PK      | 296                          | 1.2           | V              | 2.56             | 51.11                              | 74                | -22.89         |
| 4874.00                 | 33.67             | AV      | 296                          | 1.2           | V              | 2.56             | 36.23                              | 54                | -17.77         |
| High Channel(2462 MHz)  |                   |         |                              |               |                |                  |                                    |                   |                |
| 4924.00                 | 47.02             | PK      | 73                           | 1.1           | H              | 2.63             | 49.65                              | 74                | -24.35         |
| 4924.00                 | 33.39             | AV      | 73                           | 1.1           | H              | 2.63             | 36.02                              | 54                | -17.98         |
| 4924.00                 | 47.84             | PK      | 355                          | 1.6           | V              | 2.63             | 50.47                              | 74                | -23.53         |
| 4924.00                 | 32.77             | AV      | 355                          | 1.6           | V              | 2.63             | 35.40                              | 54                | -18.60         |

| Frequency<br>(MHz)      | Receiver          |         | Turntable<br>Angle<br>Degree | Rx Antenna    |                | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dΒμV/m) | Limit<br>(dΒμV/m) | Margin<br>(dB) |
|-------------------------|-------------------|---------|------------------------------|---------------|----------------|------------------|------------------------------------|-------------------|----------------|
|                         | Reading<br>(dΒμV) | PK/Ave. |                              | Height<br>(m) | Polar<br>(H/V) |                  |                                    |                   |                |
| 802.11n20               |                   |         |                              |               |                |                  |                                    |                   |                |
| Low Channel(2412MHz)    |                   |         |                              |               |                |                  |                                    |                   |                |
| 4824.00                 | 50.45             | PK      | 139                          | 1.1           | H              | 2.45             | 52.90                              | 74                | -21.10         |
| 4824.00                 | 35.51             | AV      | 139                          | 1.1           | H              | 2.45             | 37.96                              | 54                | -16.04         |
| 4824.00                 | 47.31             | PK      | 83                           | 1.5           | V              | 2.45             | 49.76                              | 74                | -24.24         |
| 4824.00                 | 34.62             | AV      | 83                           | 1.5           | V              | 2.45             | 37.07                              | 54                | -16.93         |
| Middle Channel(2437MHz) |                   |         |                              |               |                |                  |                                    |                   |                |
| 4874.00                 | 49.71             | PK      | 253                          | 2.5           | H              | 2.56             | 52.27                              | 74                | -21.73         |
| 4874.00                 | 35.44             | AV      | 253                          | 2.5           | H              | 2.56             | 38.00                              | 54                | -16.00         |
| 4874.00                 | 47.33             | PK      | 349                          | 1.4           | V              | 2.56             | 49.89                              | 74                | -24.11         |
| 4874.00                 | 34.52             | AV      | 349                          | 1.4           | V              | 2.56             | 37.08                              | 54                | -16.92         |
| High Channel(2462 MHz)  |                   |         |                              |               |                |                  |                                    |                   |                |
| 4924.00                 | 49.31             | PK      | 297                          | 1.9           | H              | 2.63             | 51.94                              | 74                | -22.06         |
| 4924.00                 | 34.17             | AV      | 297                          | 1.9           | H              | 2.63             | 36.80                              | 54                | -17.20         |
| 4924.00                 | 46.62             | PK      | 72                           | 2.5           | V              | 2.63             | 49.25                              | 74                | -24.75         |
| 4924.00                 | 33.65             | AV      | 72                           | 2.5           | V              | 2.63             | 36.28                              | 54                | -17.72         |

| Frequency<br>(MHz)     | Receiver          |         | Turntable<br>Angle<br>Degree | Rx Antenna    |                | Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|-------------------|---------|------------------------------|---------------|----------------|------------------|------------------------------------|-------------------|----------------|
|                        | Reading<br>(dBμV) | PK/Ave. |                              | Height<br>(m) | Polar<br>(H/V) |                  |                                    |                   |                |
| 802.11n40              |                   |         |                              |               |                |                  |                                    |                   |                |
| Low Channel 2422MHz    |                   |         |                              |               |                |                  |                                    |                   |                |
| 4844.00                | 46.51             | PK      | 5                            | 1.4           | H              | 2.45             | 48.96                              | 74                | -25.04         |
| 4844.00                | 33.29             | AV      | 5                            | 1.4           | H              | 2.45             | 35.74                              | 54                | -18.26         |
| 4844.00                | 46.65             | PK      | 277                          | 1.4           | V              | 2.45             | 49.10                              | 74                | -24.90         |
| 4844.00                | 33.09             | AV      | 277                          | 1.4           | V              | 2.45             | 35.54                              | 54                | -18.46         |
| Middle Channel 2437MHz |                   |         |                              |               |                |                  |                                    |                   |                |
| 4874.00                | 46.06             | PK      | 286                          | 1.1           | H              | 2.56             | 48.62                              | 74                | -25.38         |
| 4874.00                | 32.71             | AV      | 286                          | 1.1           | H              | 2.56             | 35.27                              | 54                | -18.73         |
| 4874.00                | 46.44             | PK      | 130                          | 1.7           | V              | 2.56             | 49.00                              | 74                | -25.00         |
| 4874.00                | 32.77             | AV      | 130                          | 1.7           | V              | 2.56             | 35.33                              | 54                | -18.67         |
| High Channel 2452MHz   |                   |         |                              |               |                |                  |                                    |                   |                |
| 4904.00                | 46.19             | PK      | 323                          | 1.7           | H              | 2.64             | 48.83                              | 74                | -25.17         |
| 4904.00                | 33.05             | AV      | 323                          | 1.7           | H              | 2.64             | 35.69                              | 54                | -18.31         |
| 4904.00                | 46.29             | PK      | 47                           | 1.8           | V              | 2.64             | 48.93                              | 74                | -25.07         |
| 4904.00                | 33.12             | AV      | 47                           | 1.8           | V              | 2.64             | 35.76                              | 54                | -18.24         |

**Note:**

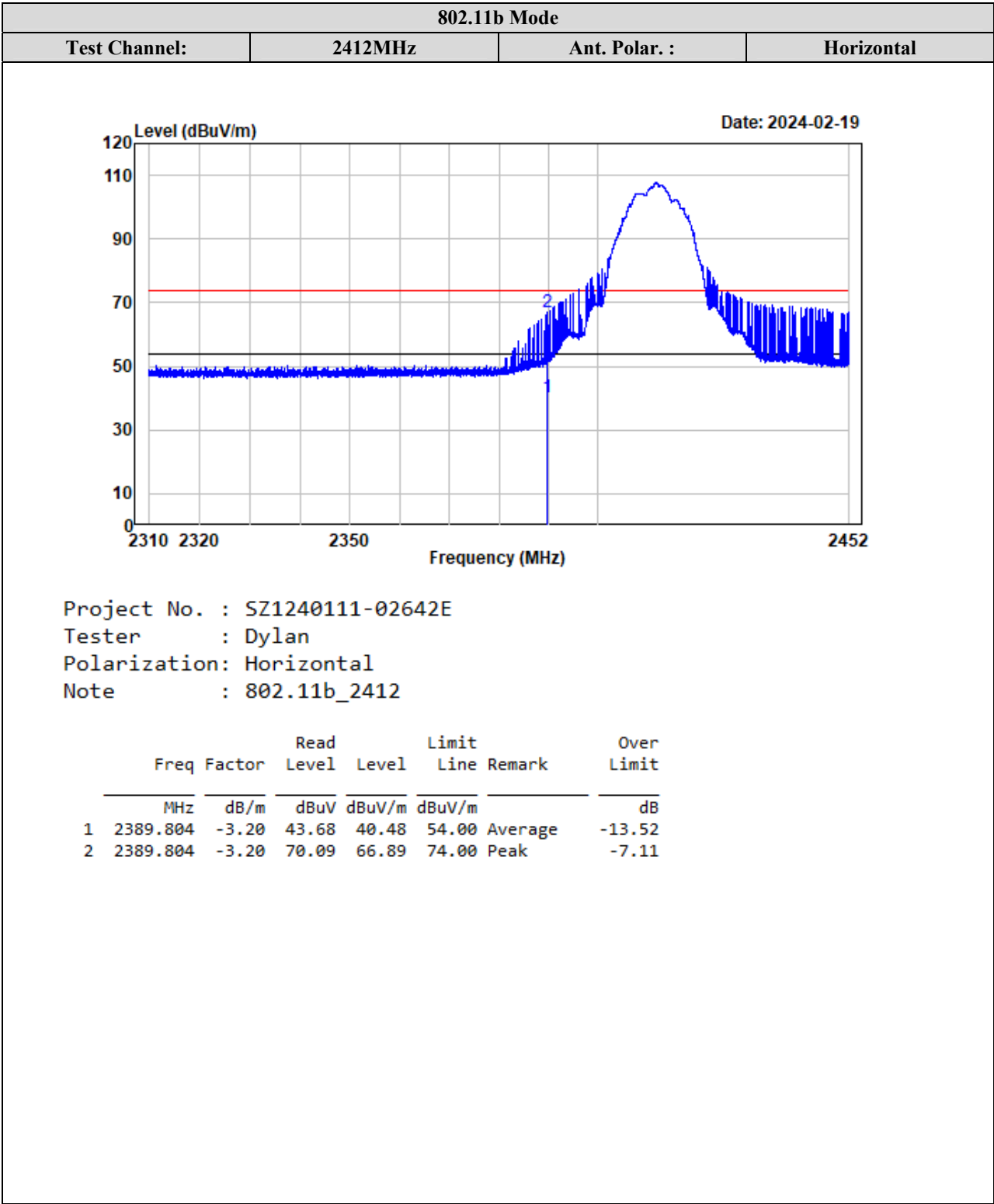
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

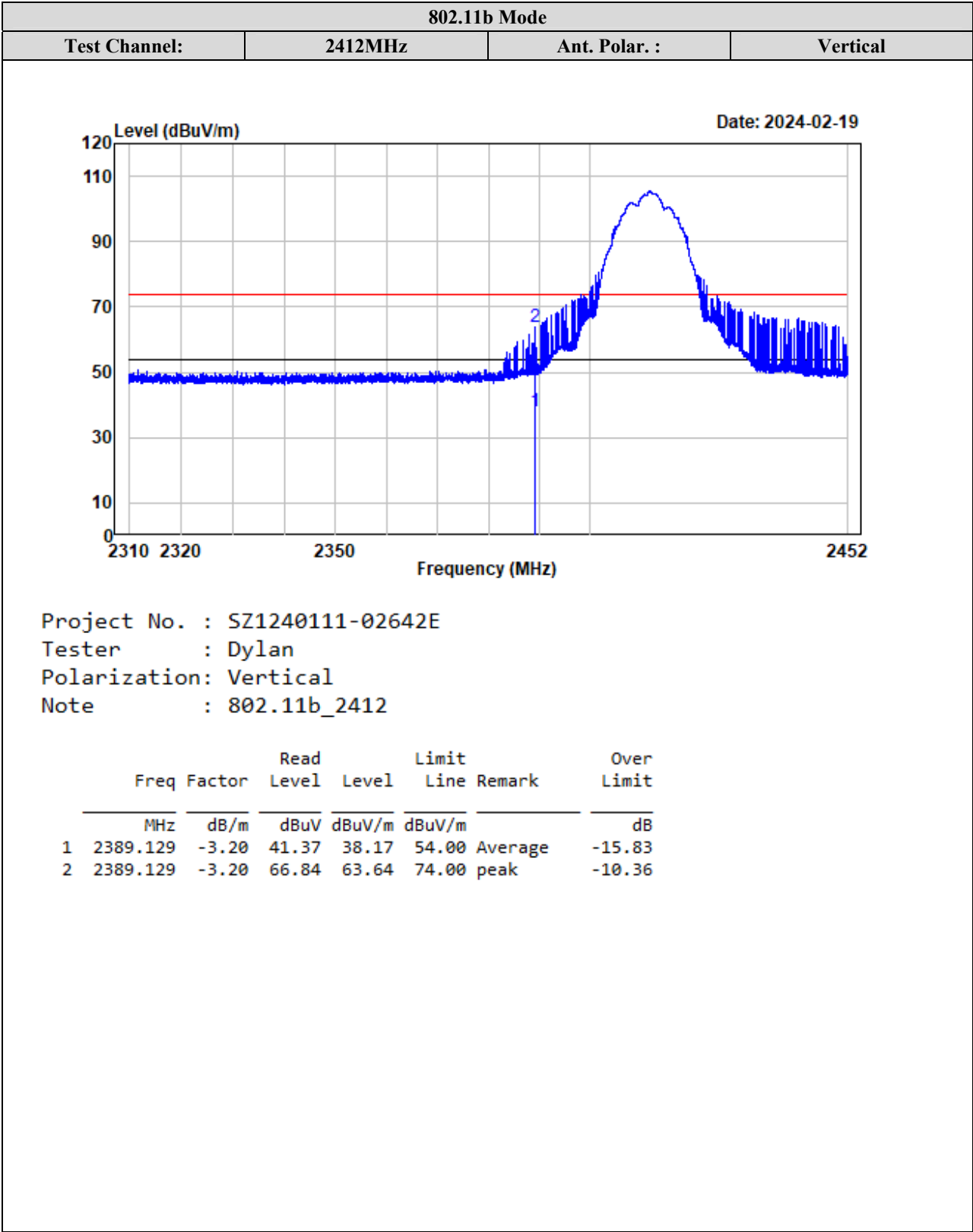
Corrected Amplitude= Factor + Reading

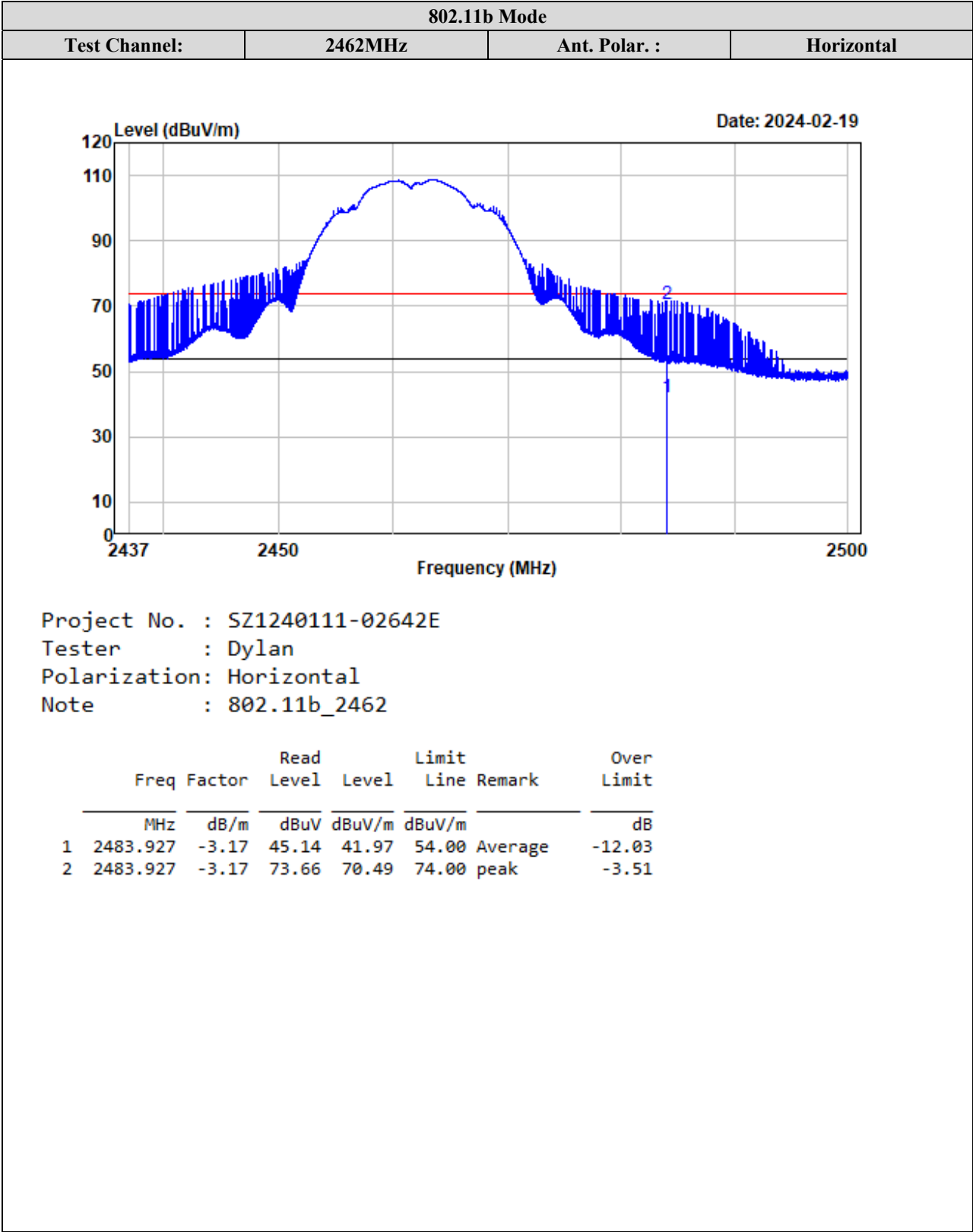
Margin = Corrected Amplitude - Limit

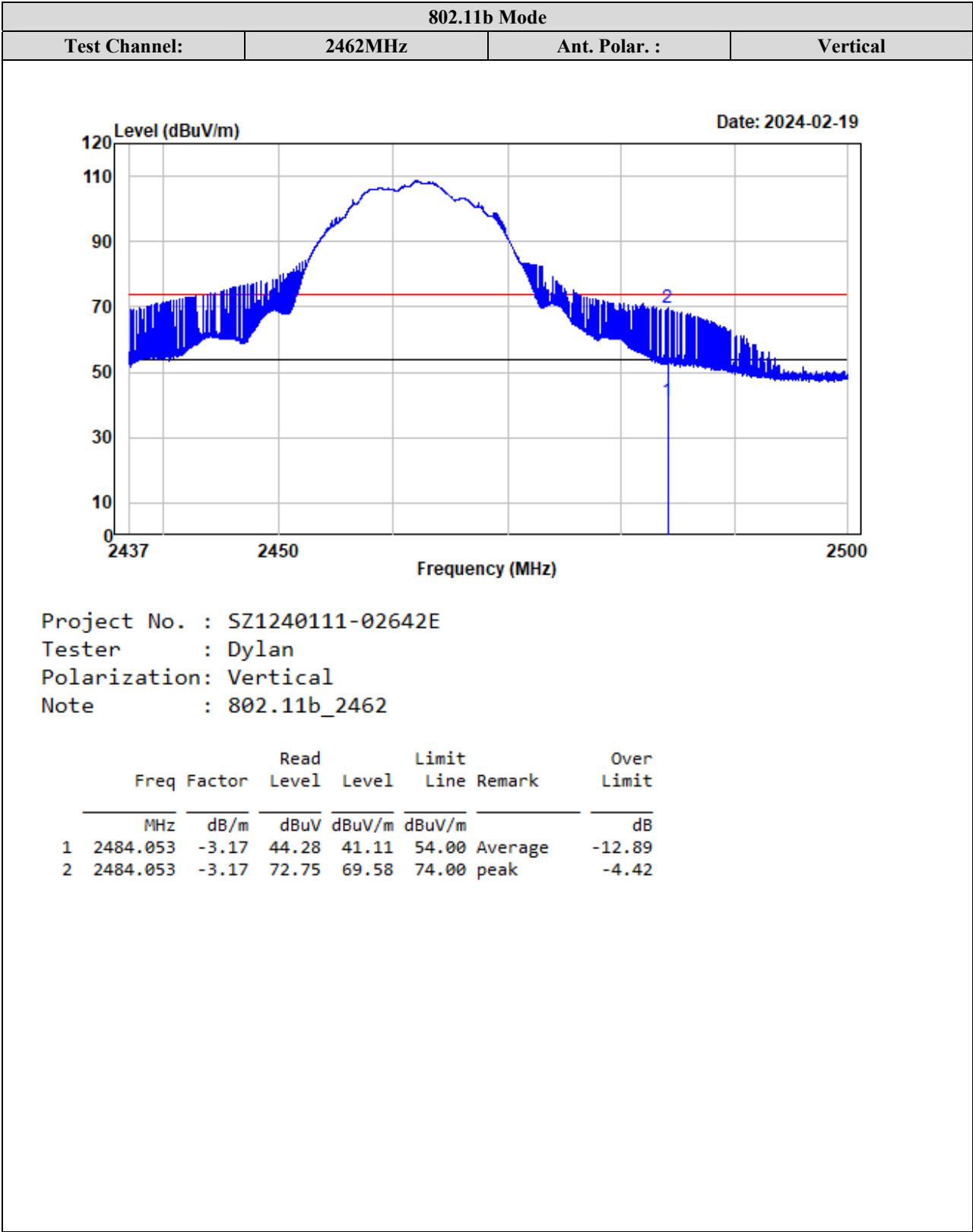
The other spurious emission which is 20dB below to the limit or in noise floor level was not recorded.

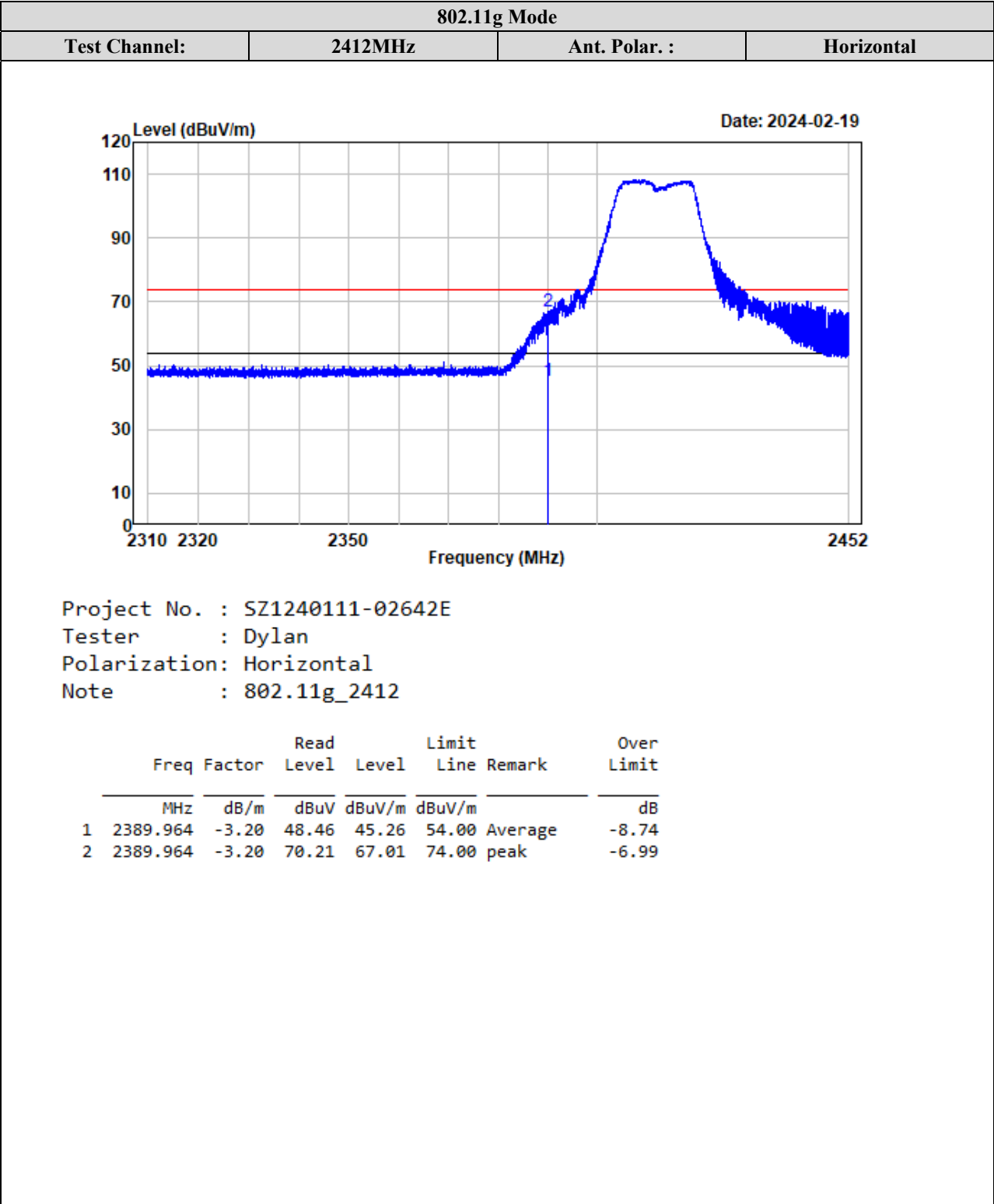
Test plots for Band Edge Measurements (Radiated):

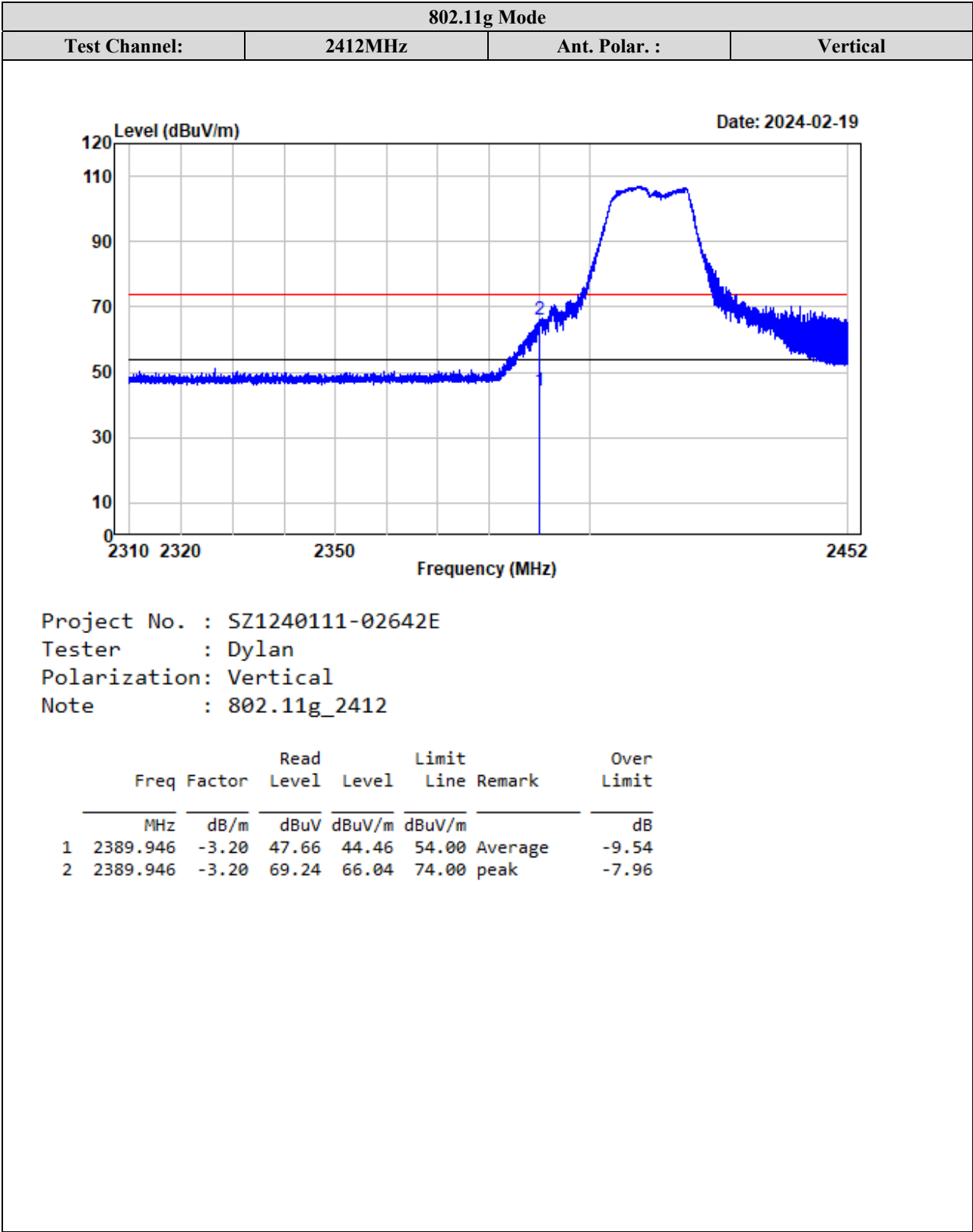


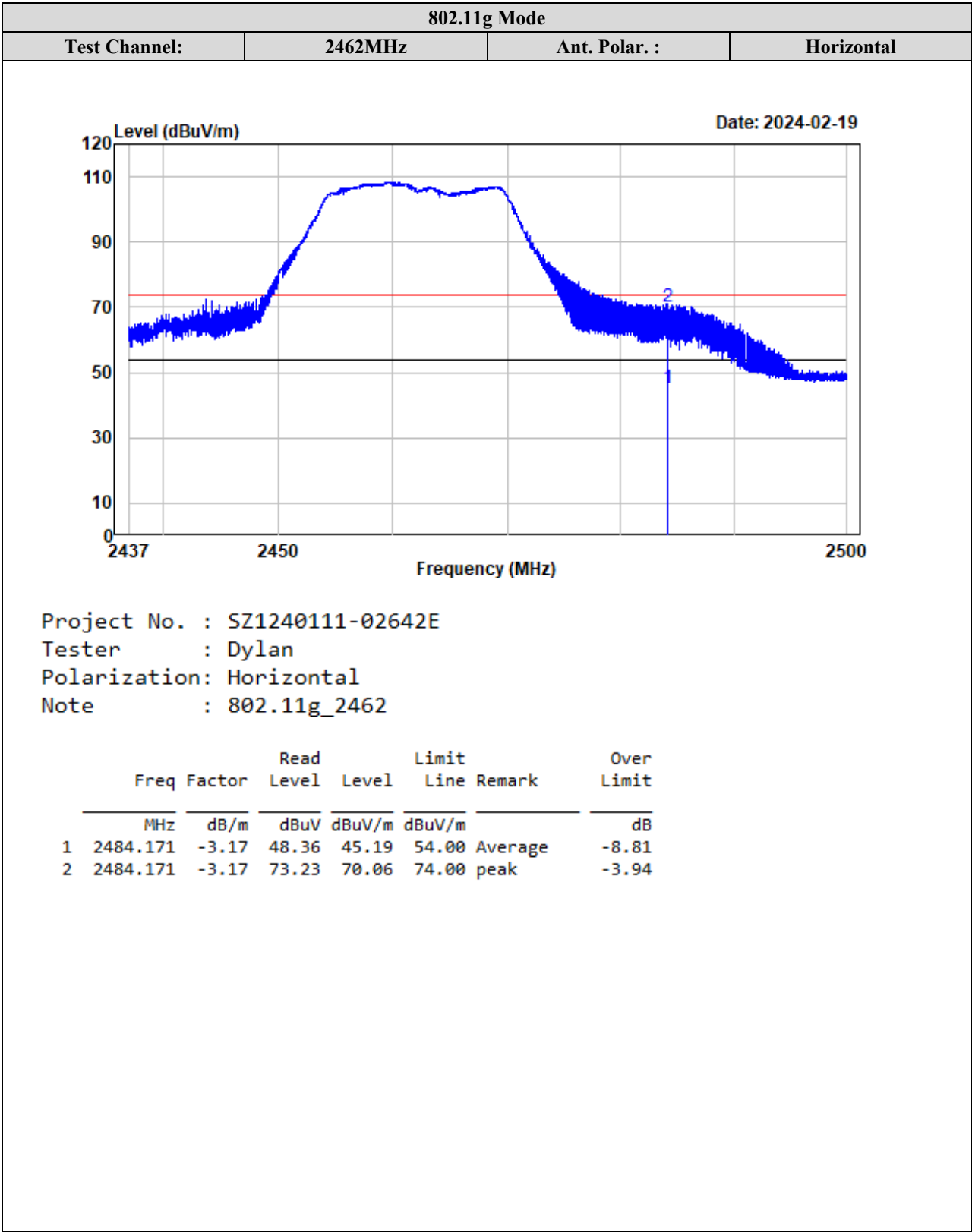


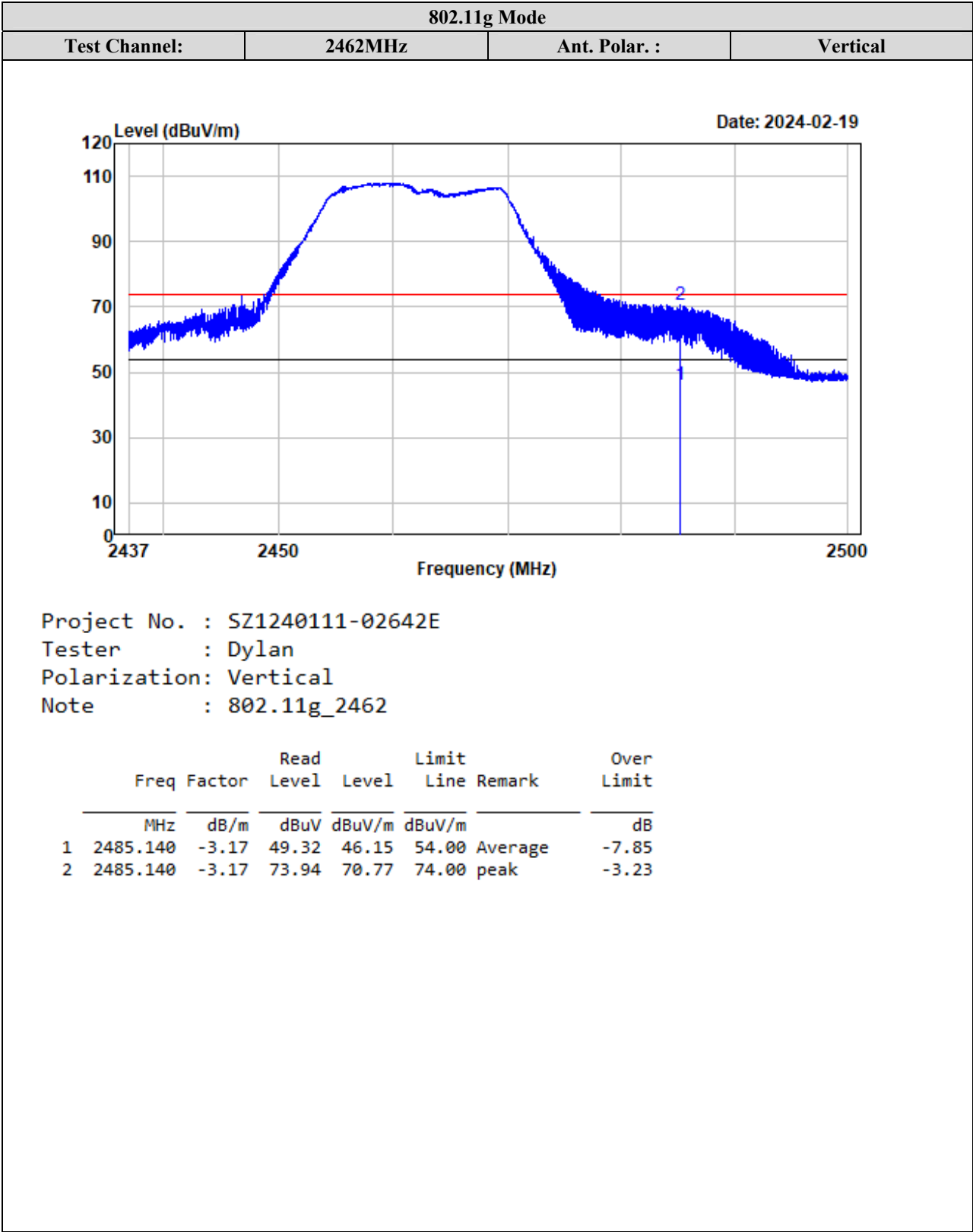


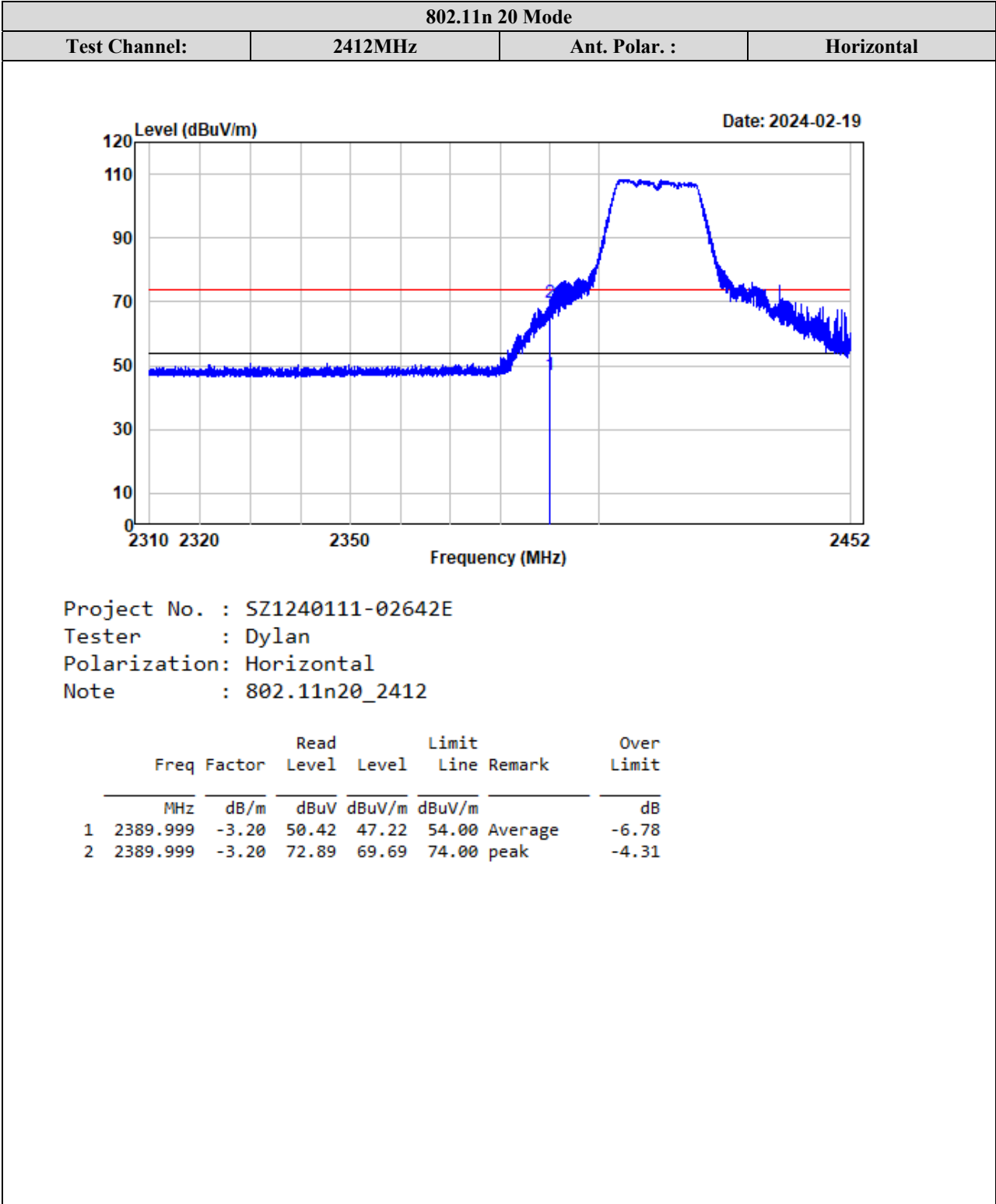


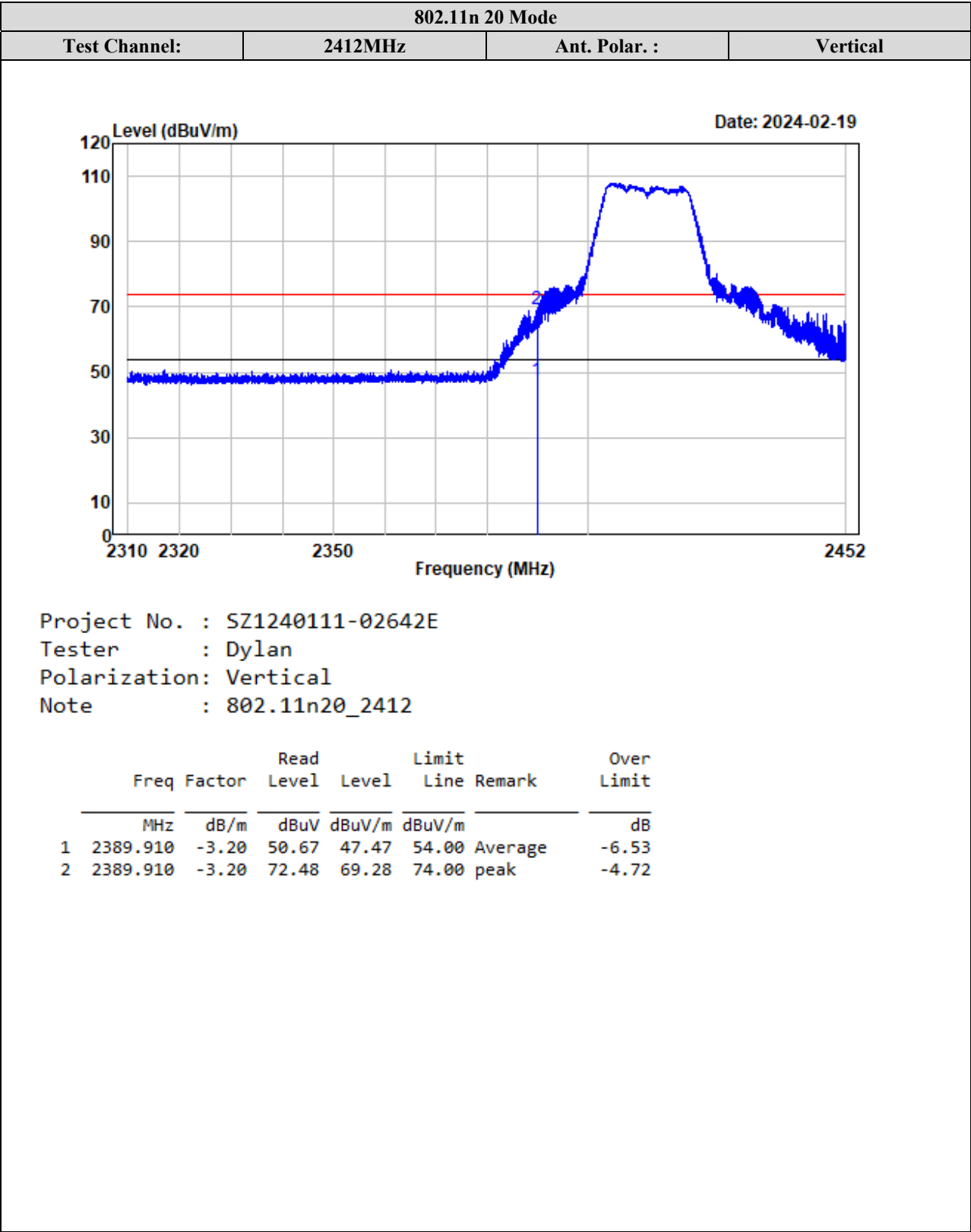


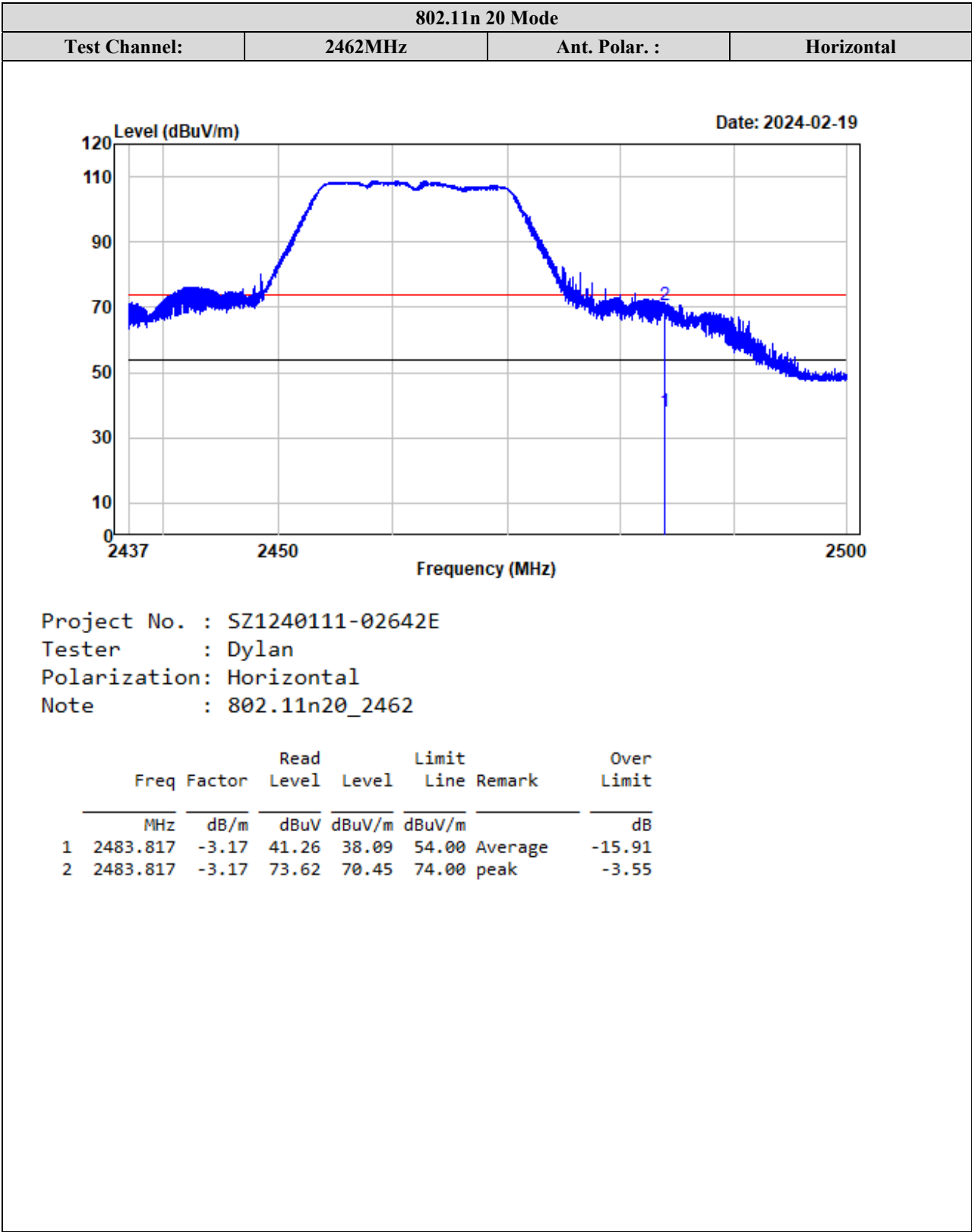


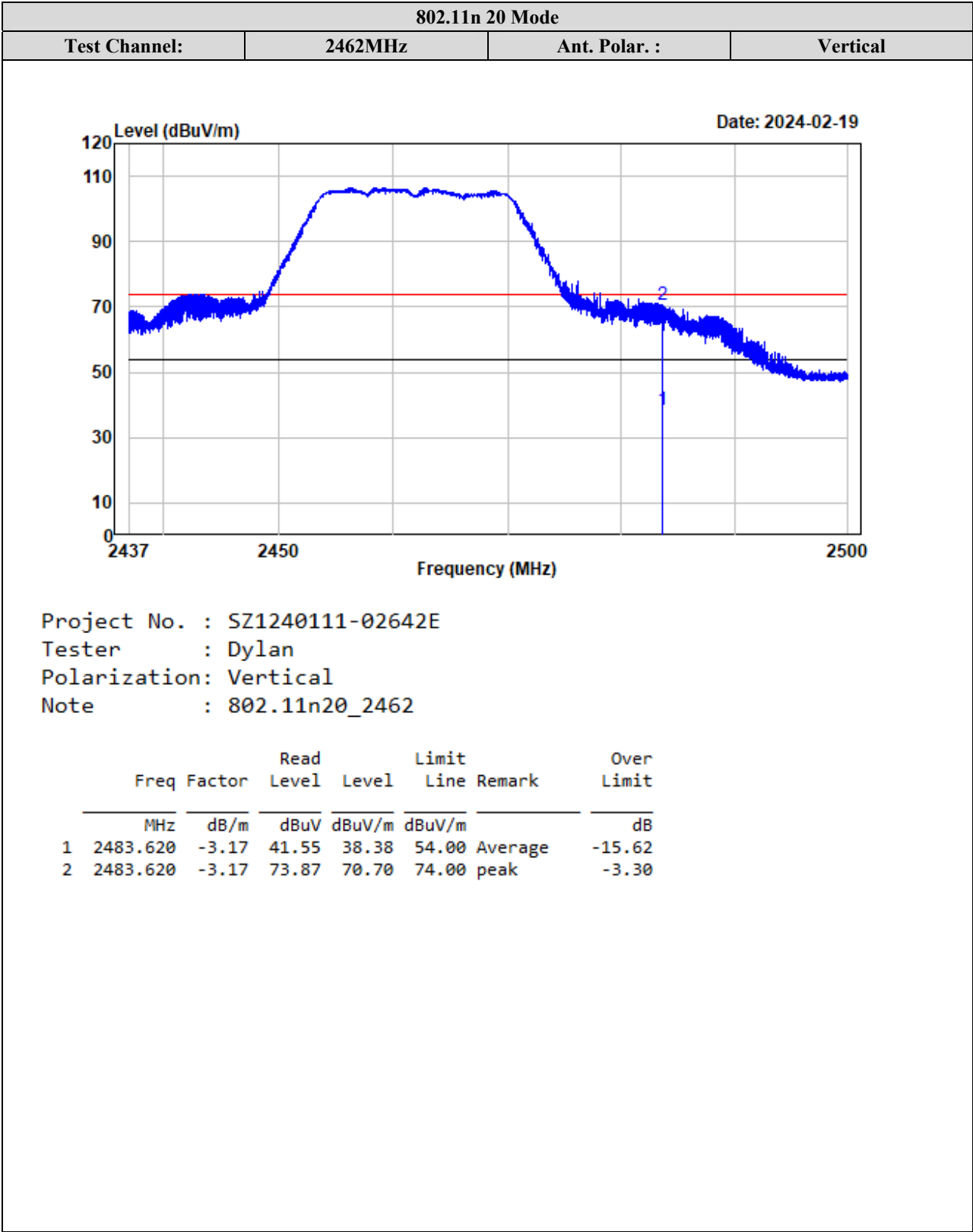


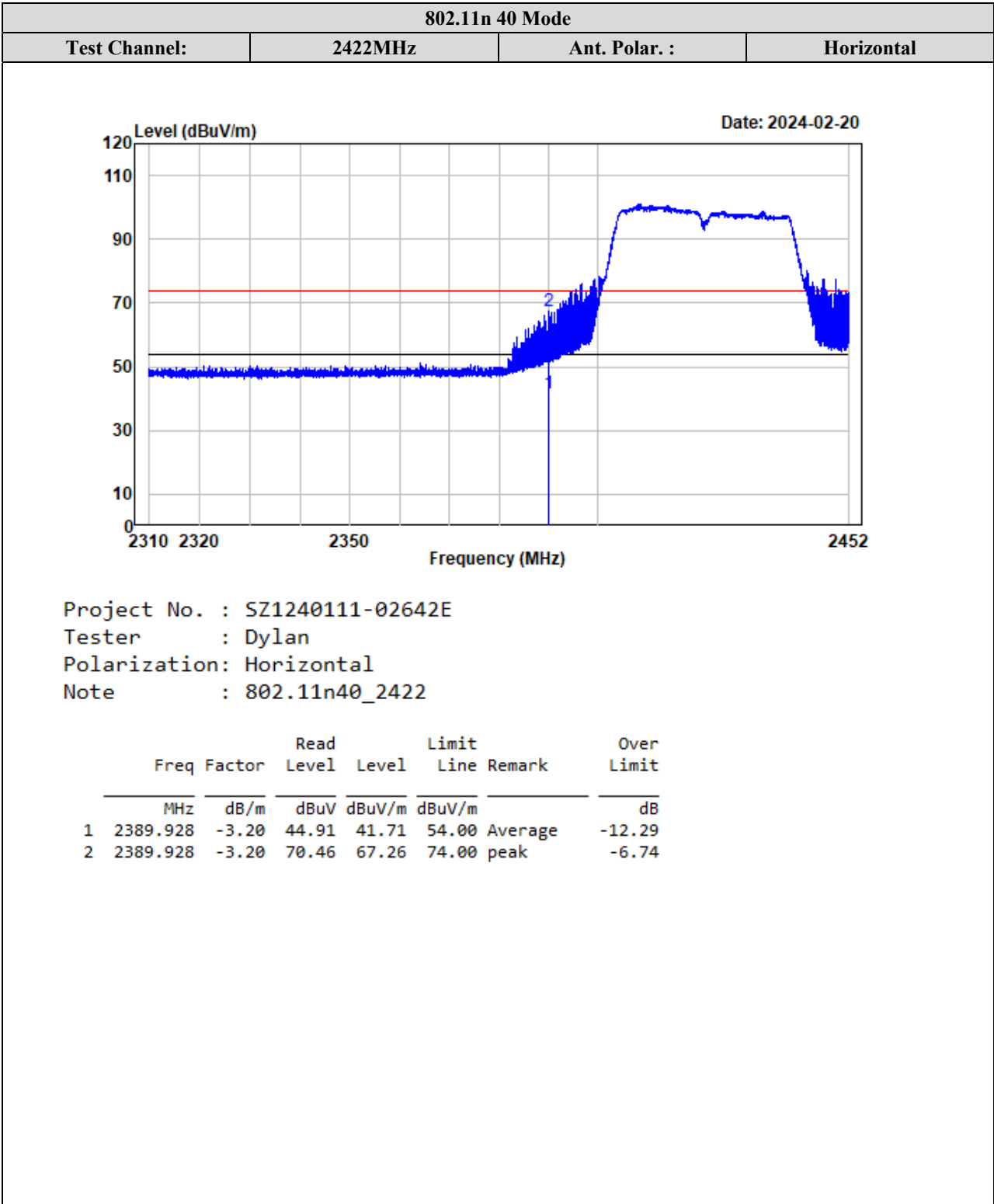


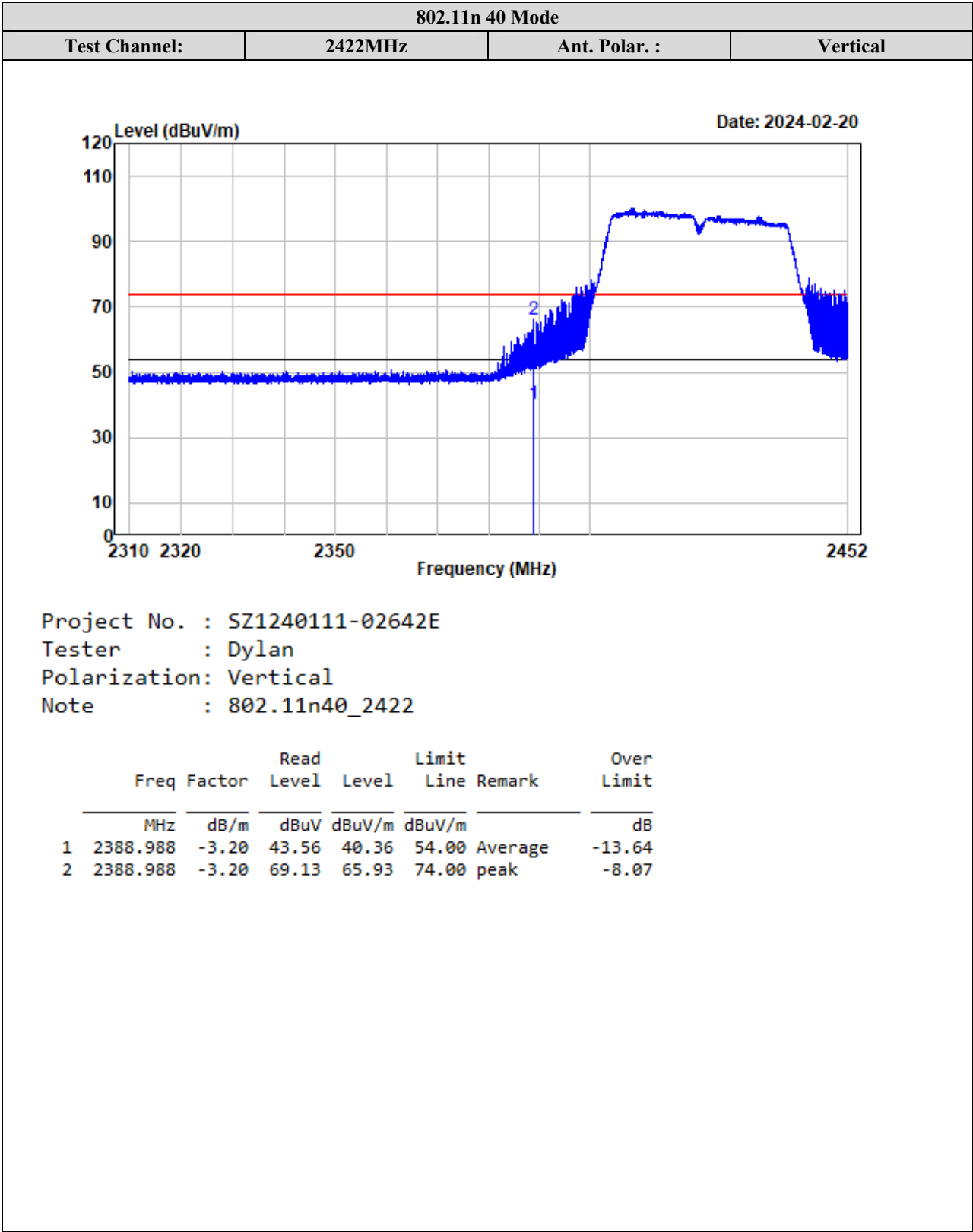


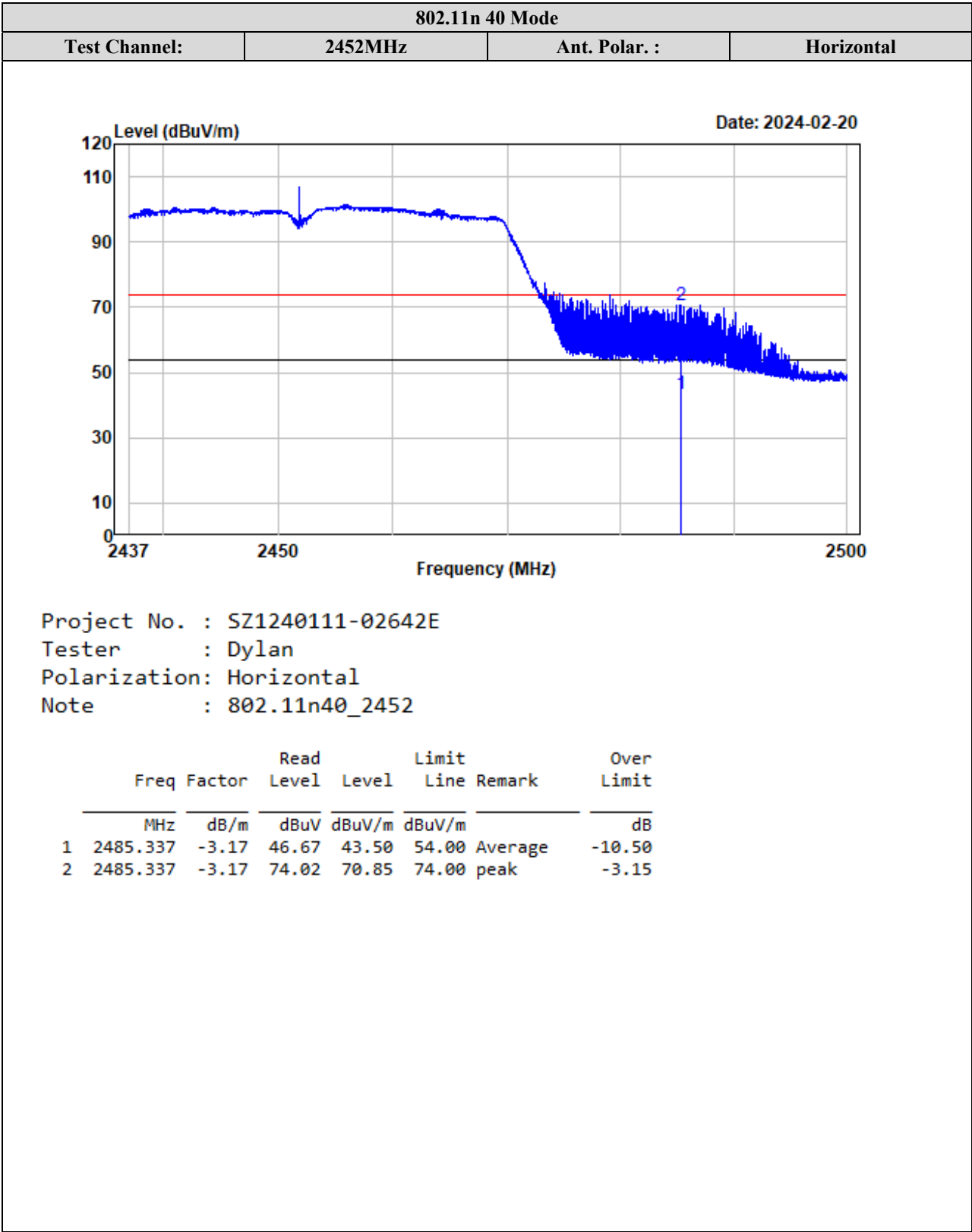


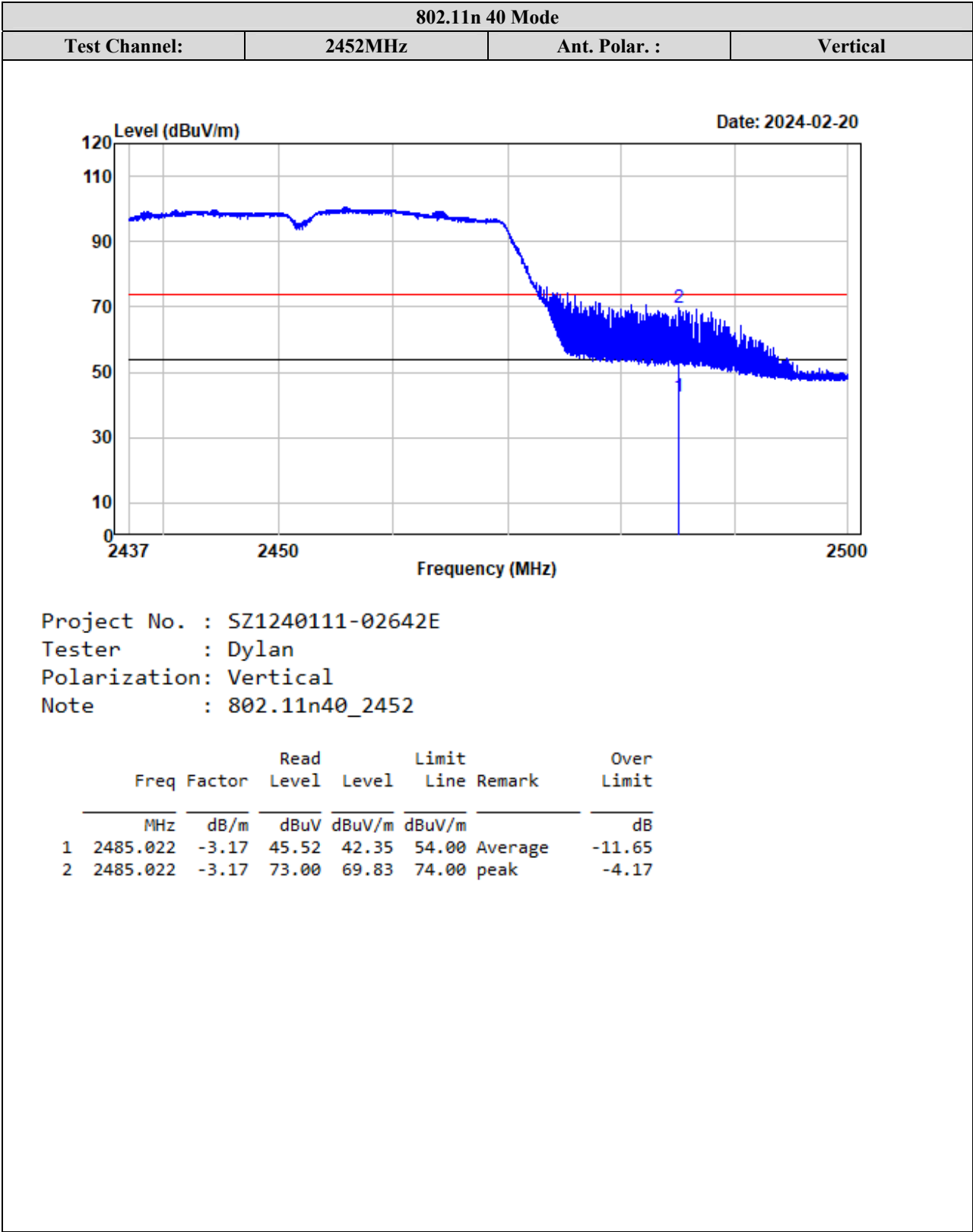




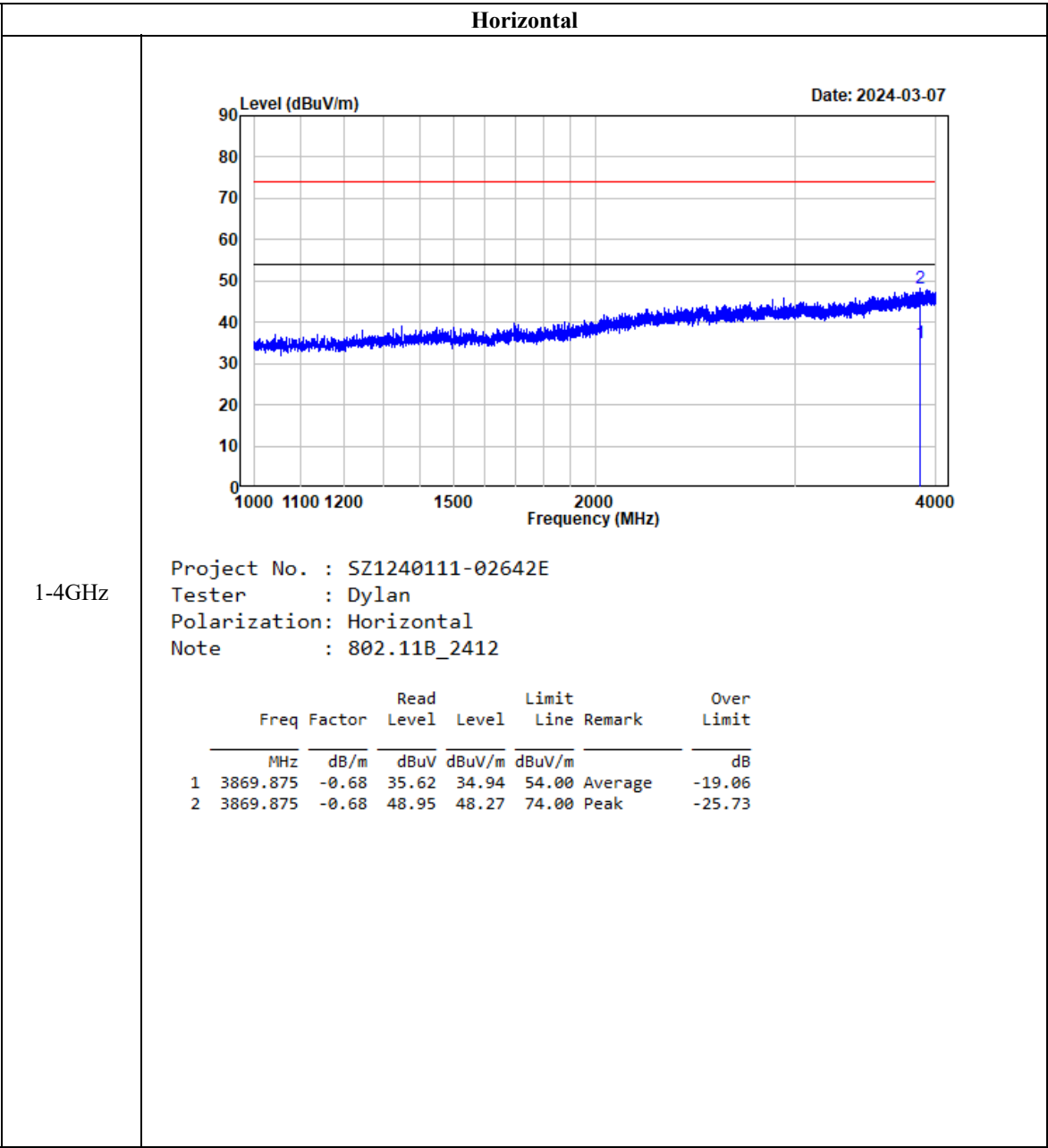


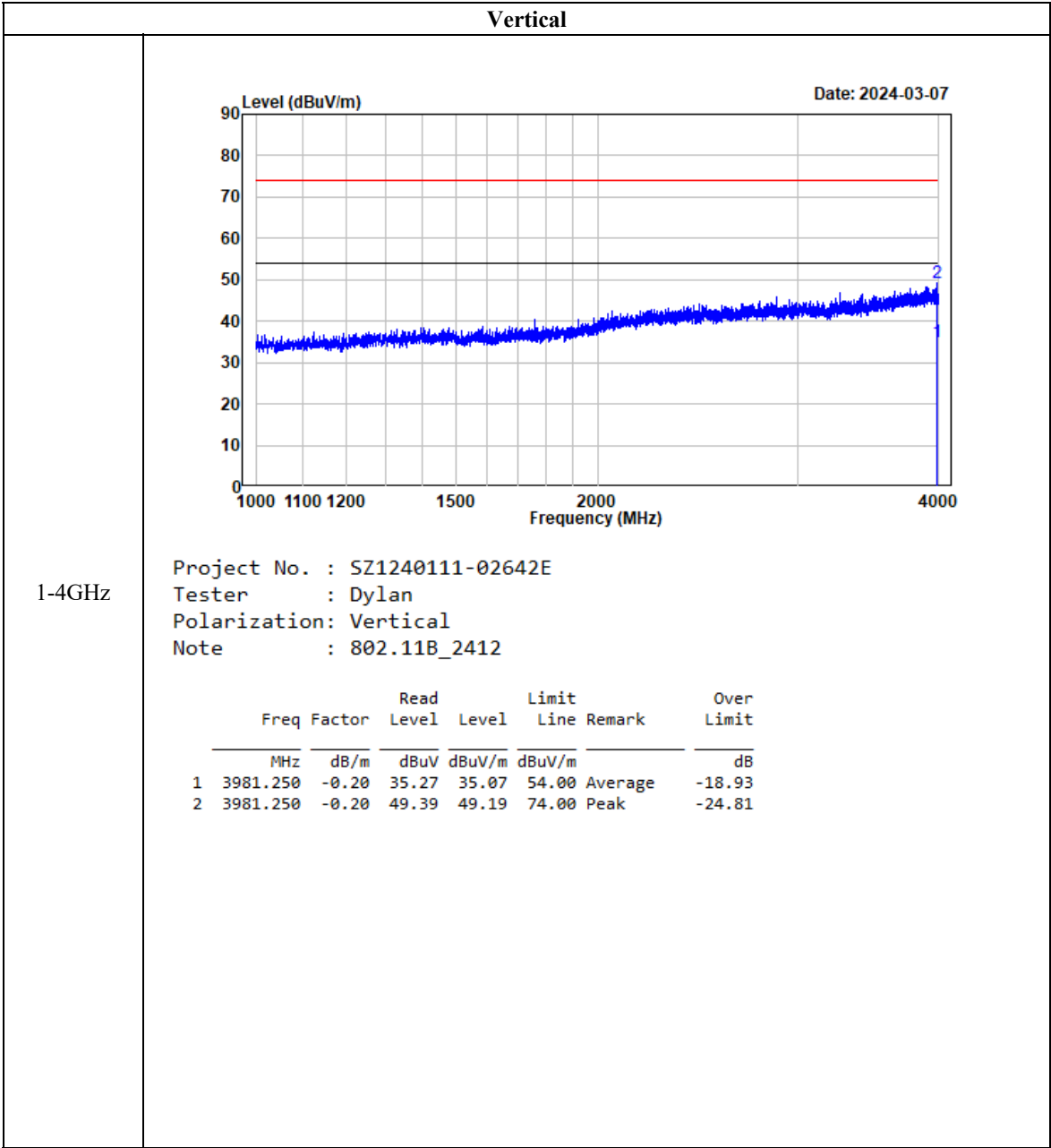


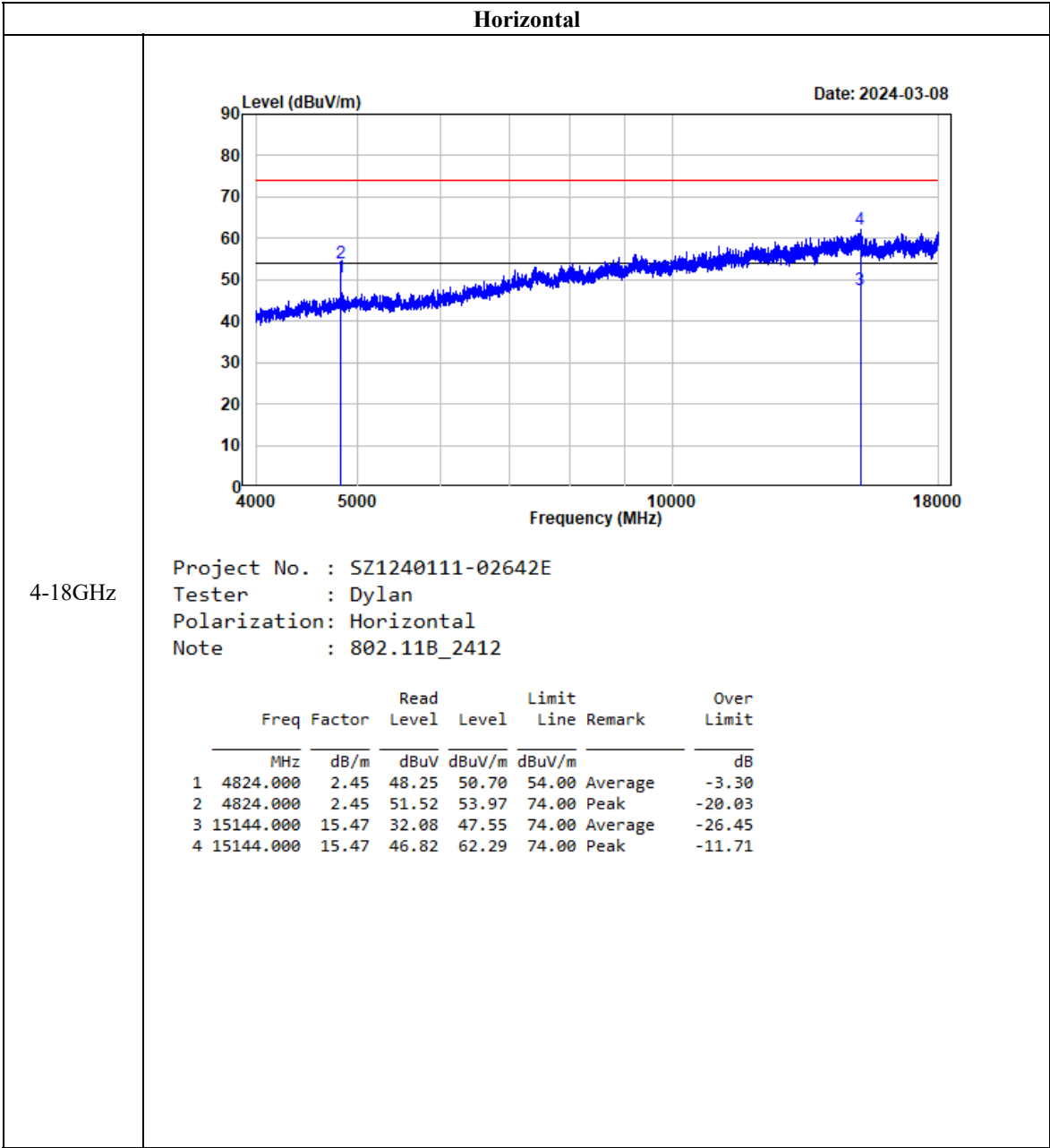


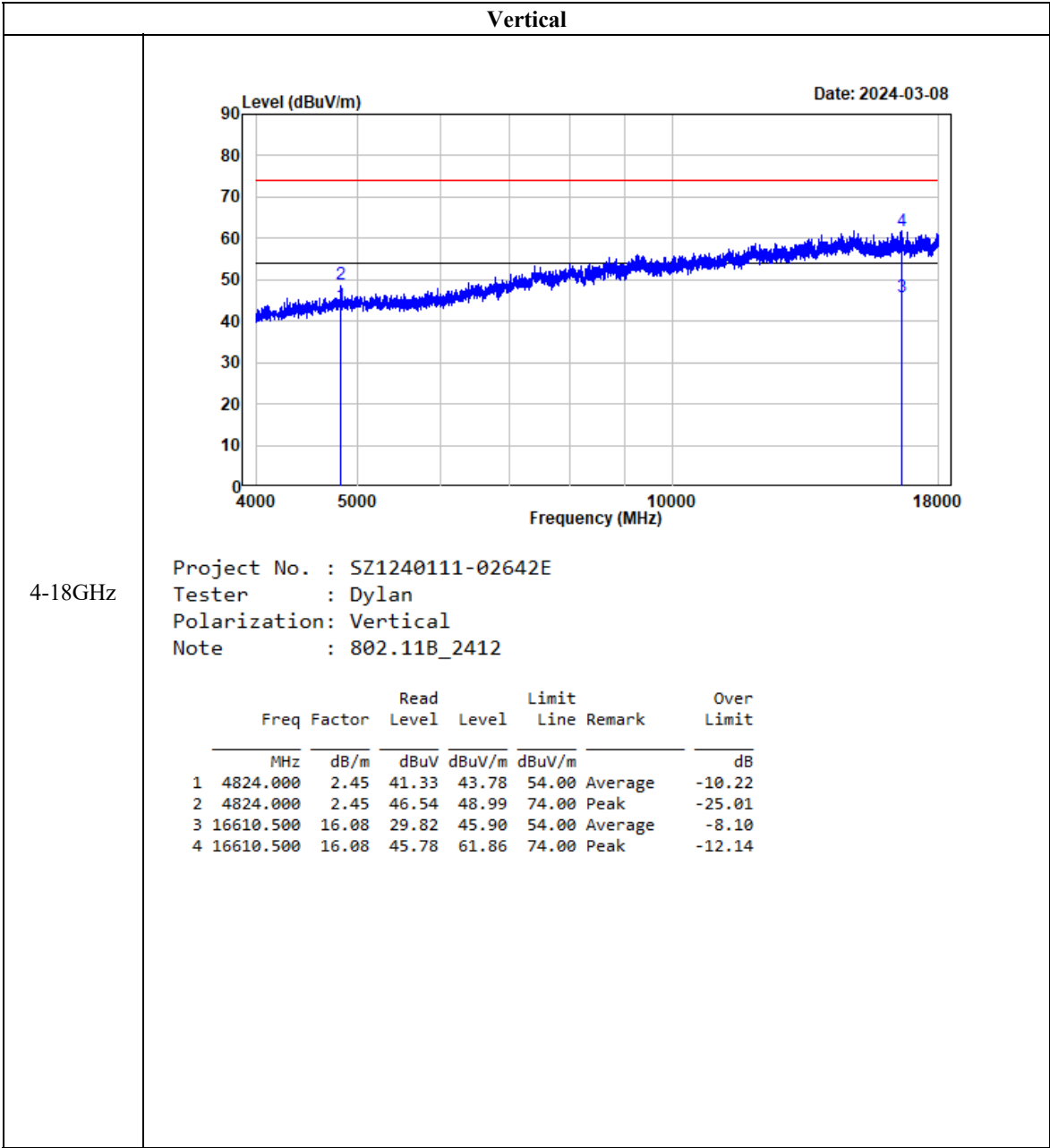


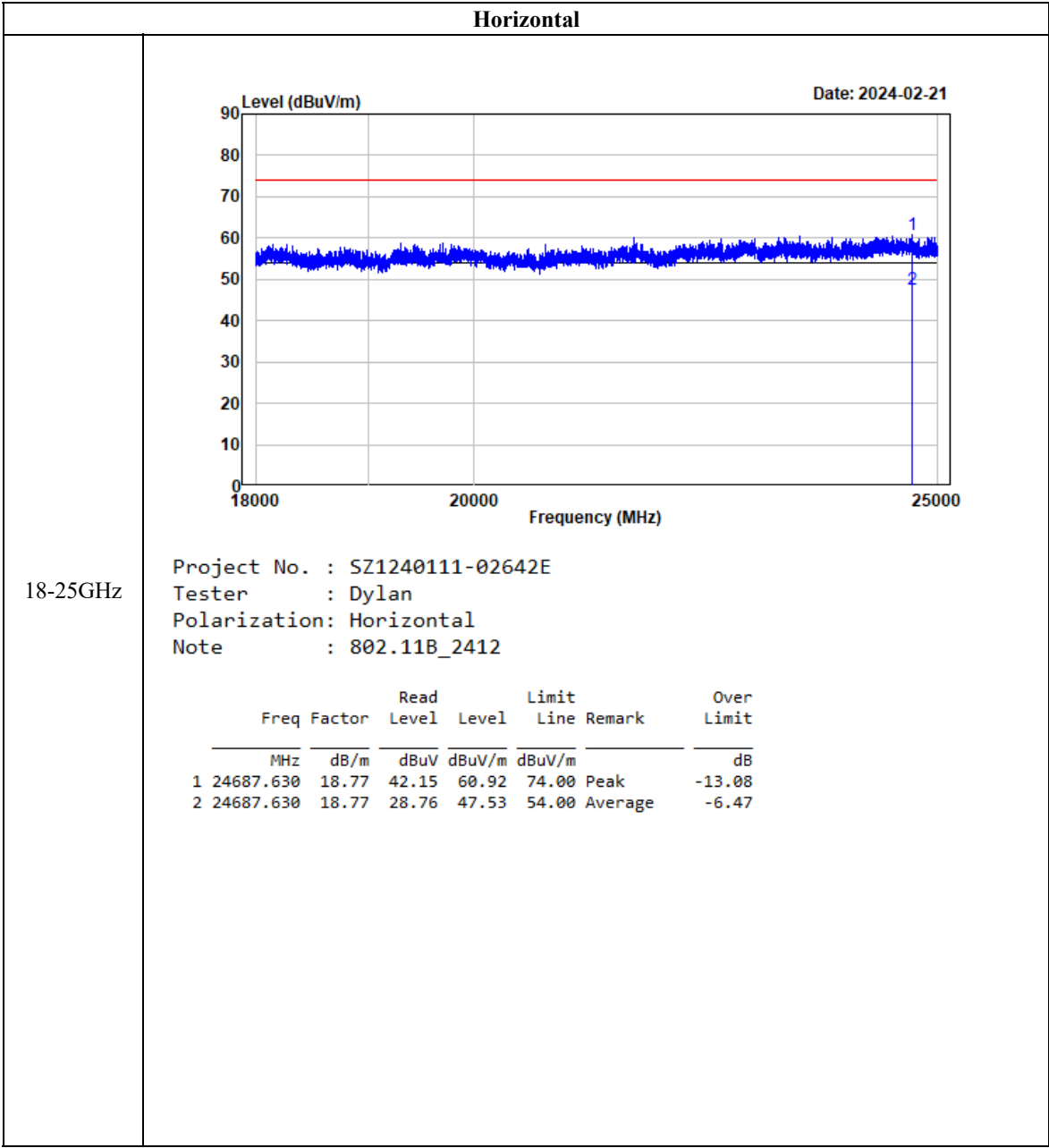
Listed with the worst harmonic margin test plot:

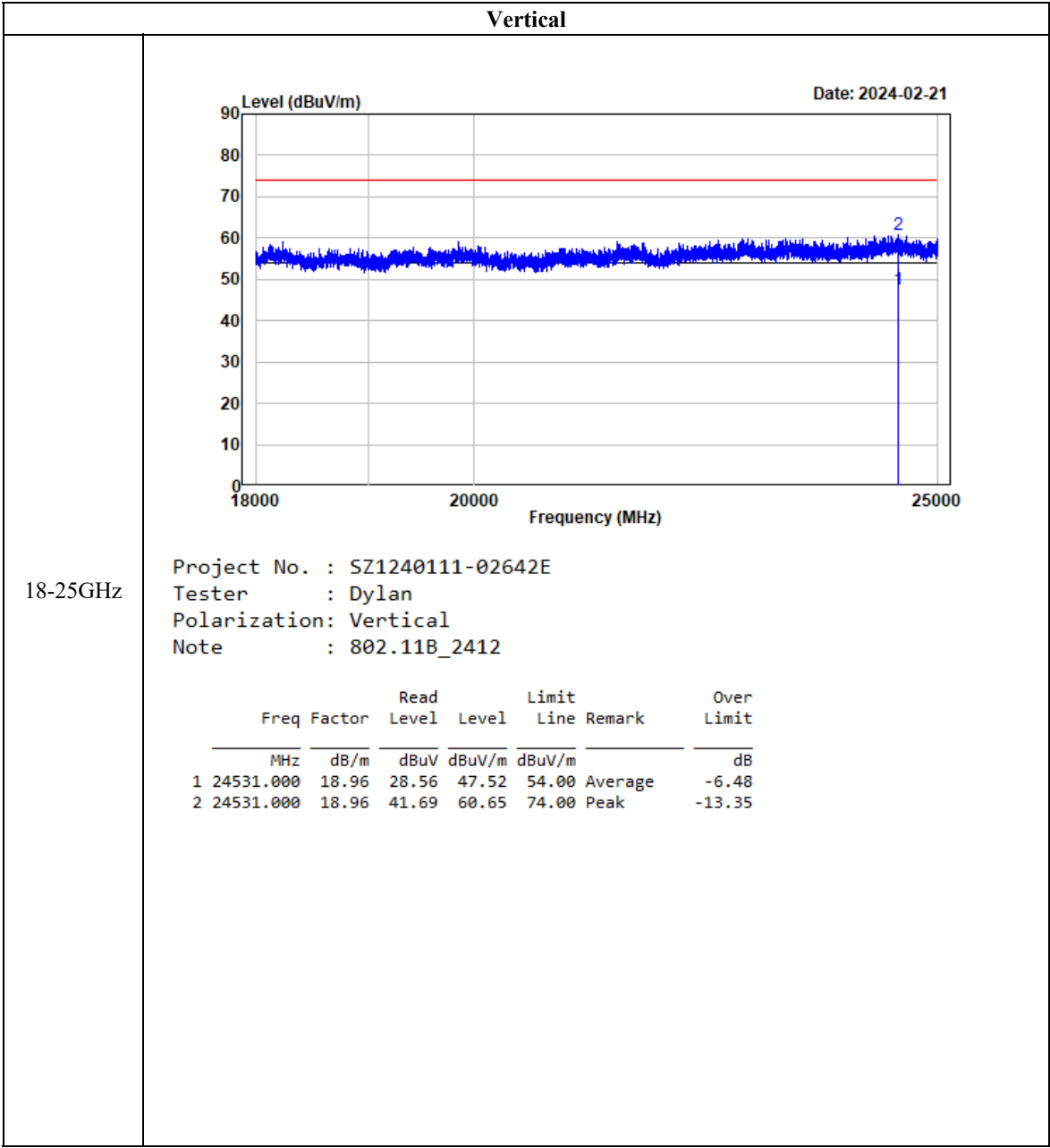












## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

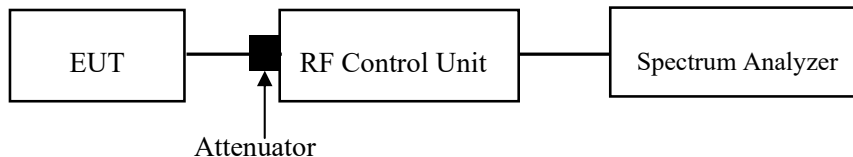
### Applicable Standard

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:       | 25.1°C  |
| Relative Humidity: | 48 %    |
| ATM Pressure:      | 101 kPa |

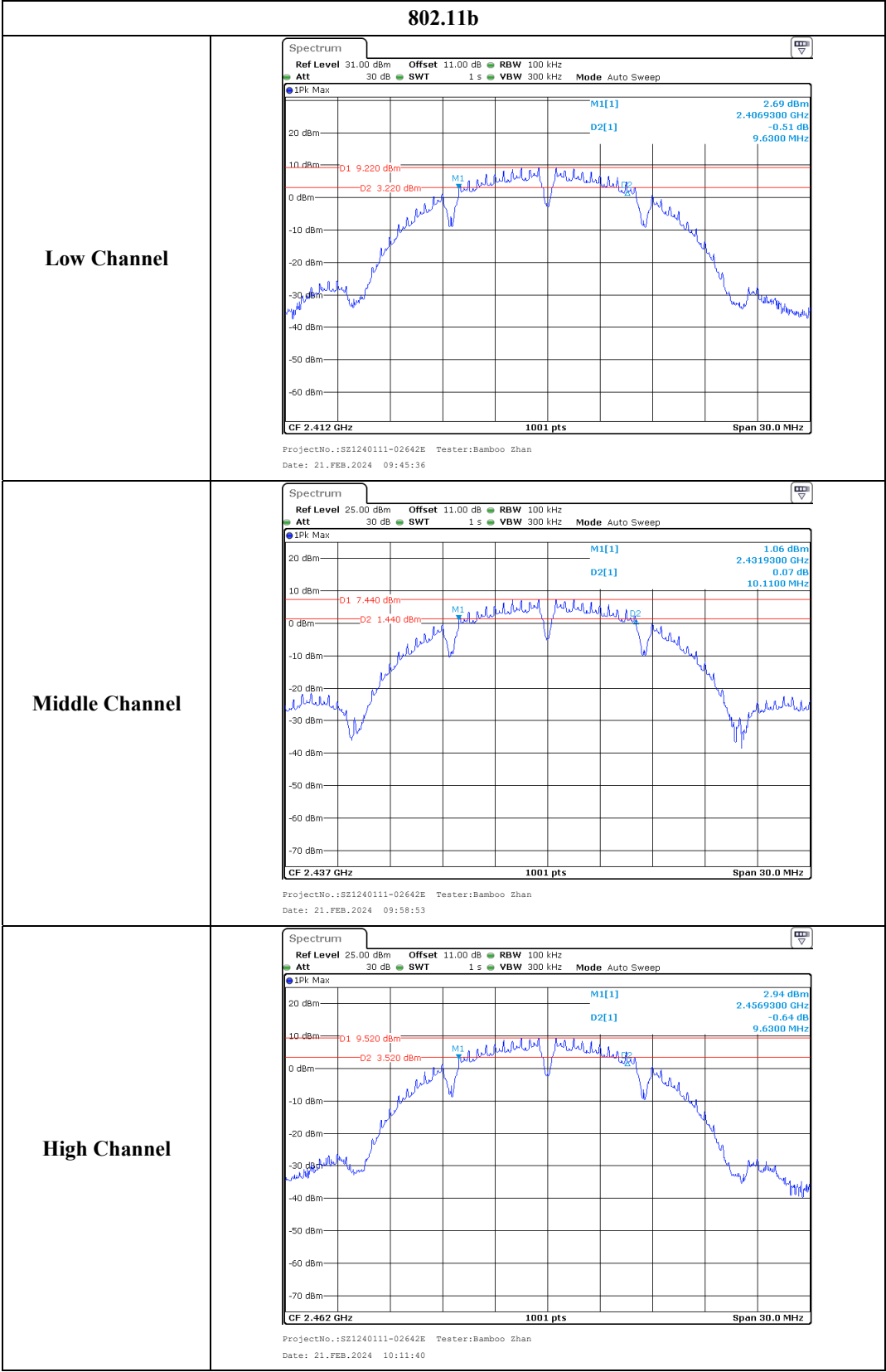
*The testing was performed by Bamboo Zhan on 2024-02-21.*

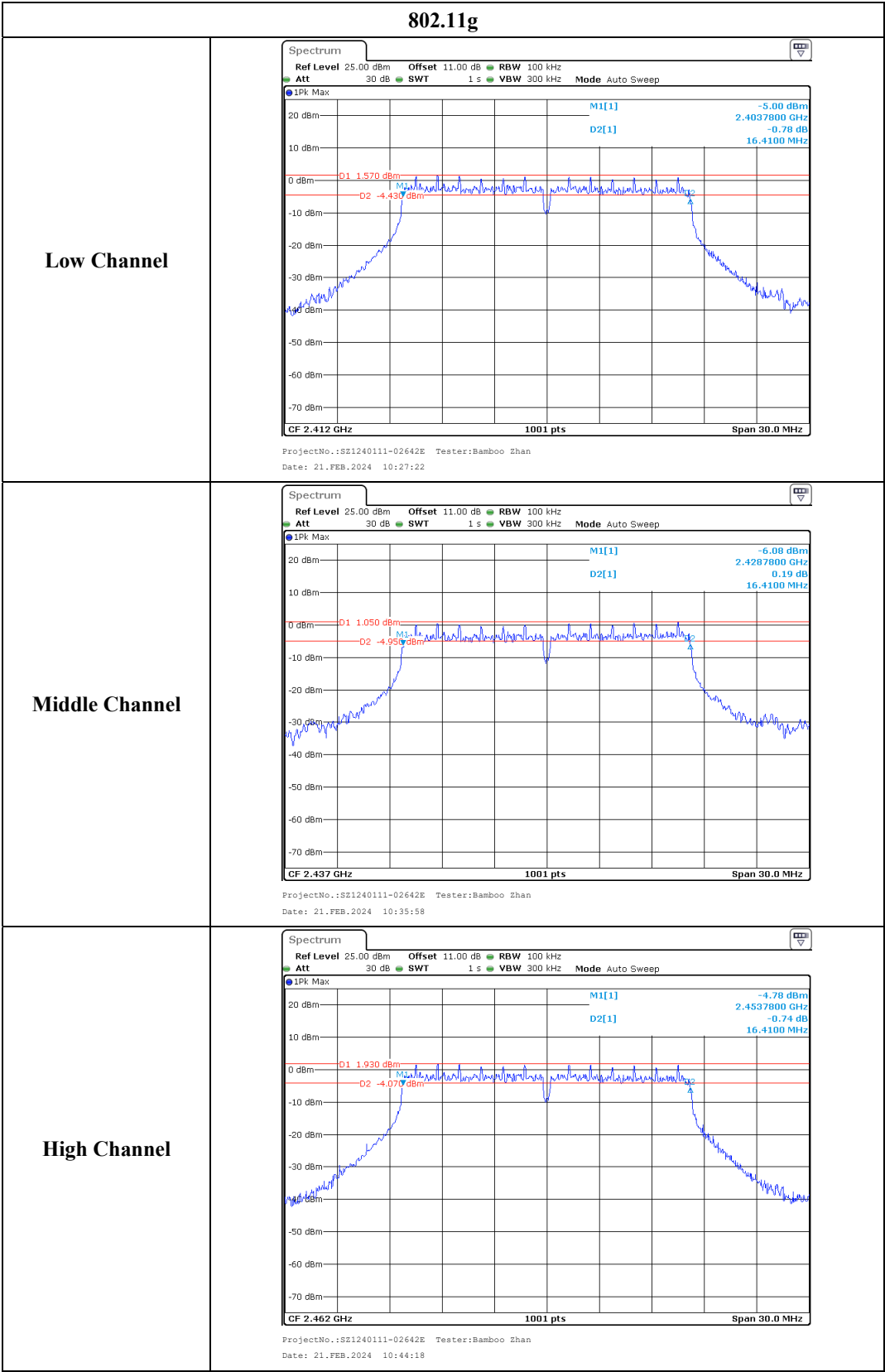
*EUT operation mode: Transmitting*

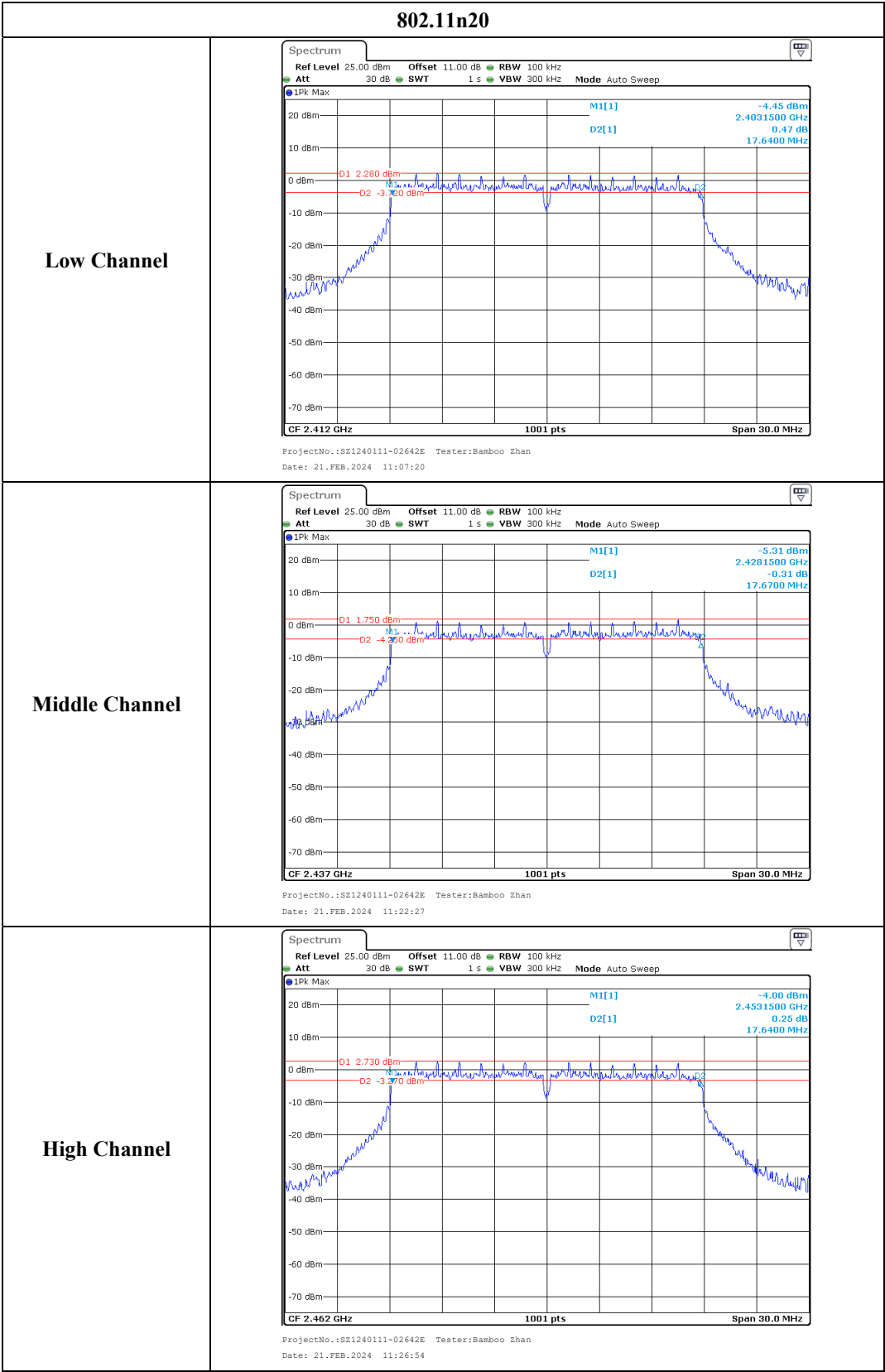
***Test Result: Compliant.***

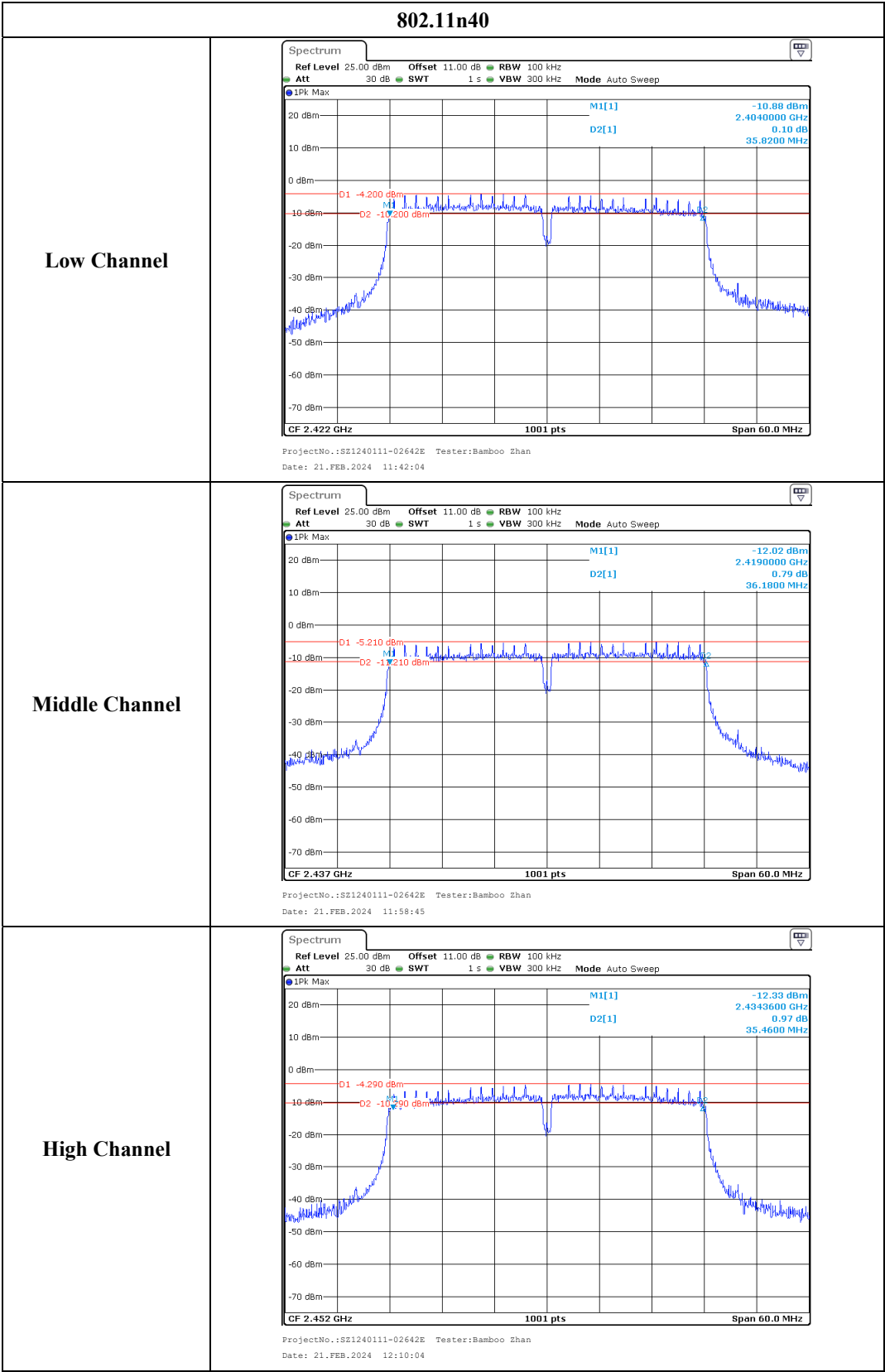
| Test Modes   | Test Frequency (MHz) | 6 dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) | Limit (MHz) |
|--------------|----------------------|----------------------|------------------------------|-------------|
| 802.11b      | 2412                 | 9.63                 | 15.18                        | 0.5         |
|              | 2437                 | 10.11                | 16.06                        | 0.5         |
|              | 2462                 | 9.63                 | 15.1                         | 0.5         |
| 802.11g      | 2412                 | 16.41                | 17.1                         | 0.5         |
|              | 2437                 | 16.41                | 17.38                        | 0.5         |
|              | 2462                 | 16.41                | 17.06                        | 0.5         |
| 802.11n ht20 | 2412                 | 17.64                | 18.3                         | 0.5         |
|              | 2437                 | 17.67                | 18.7                         | 0.5         |
|              | 2462                 | 17.64                | 18.22                        | 0.5         |
| 802.11n ht40 | 2422                 | 35.82                | 36.6                         | 0.5         |
|              | 2437                 | 36.18                | 36.52                        | 0.5         |
|              | 2452                 | 35.46                | 36.28                        | 0.5         |

6 dB Bandwidth

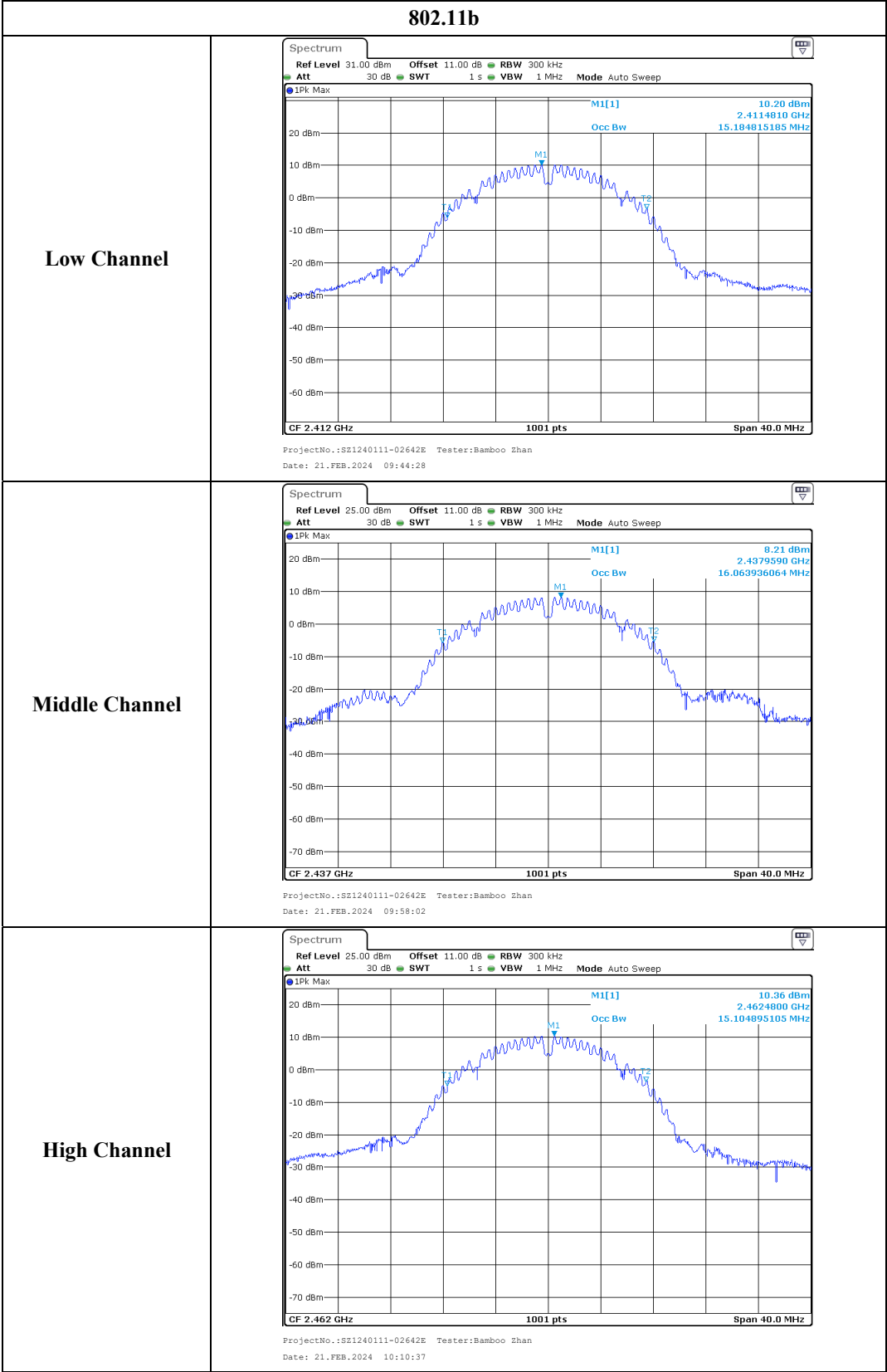


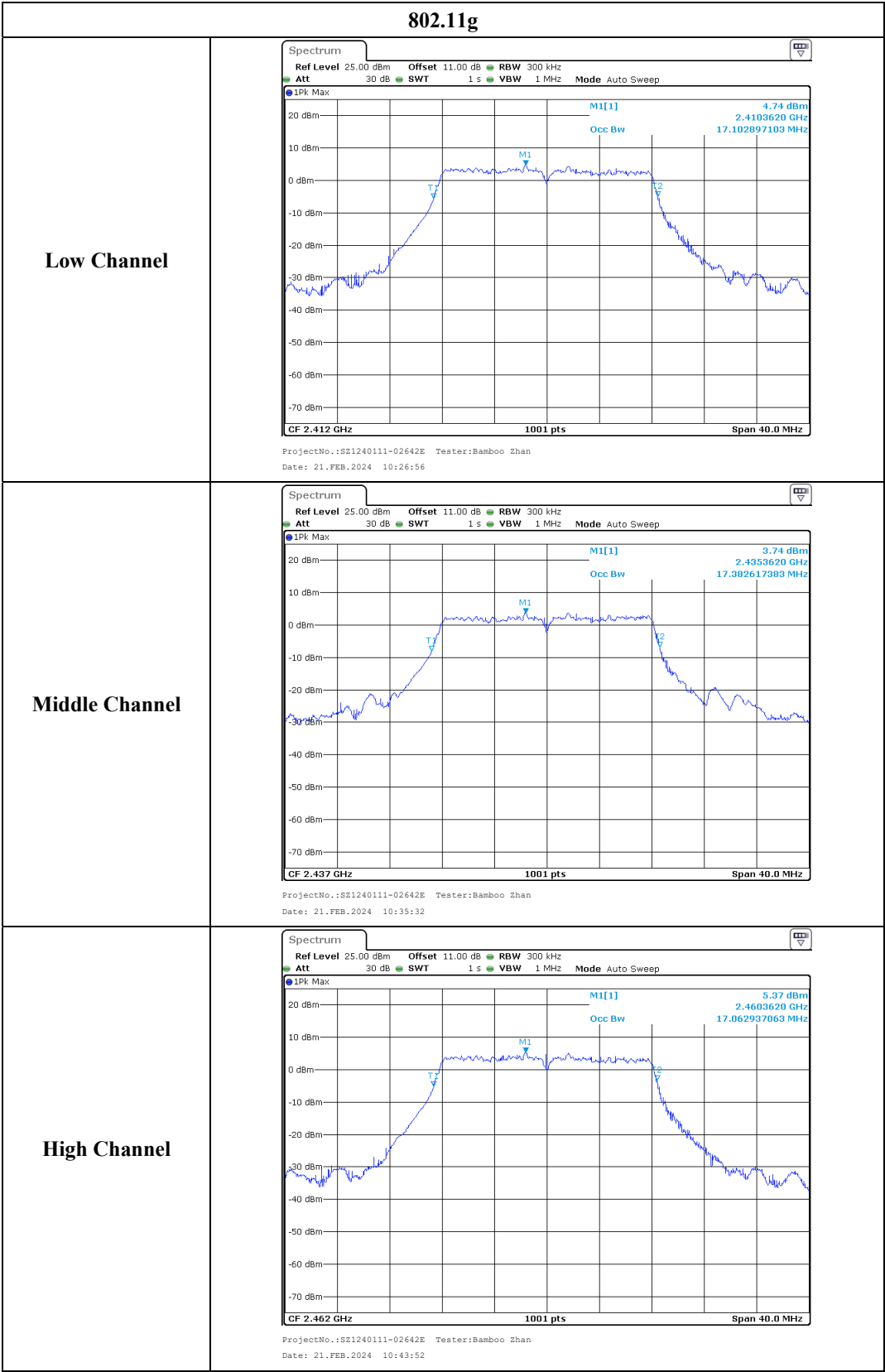


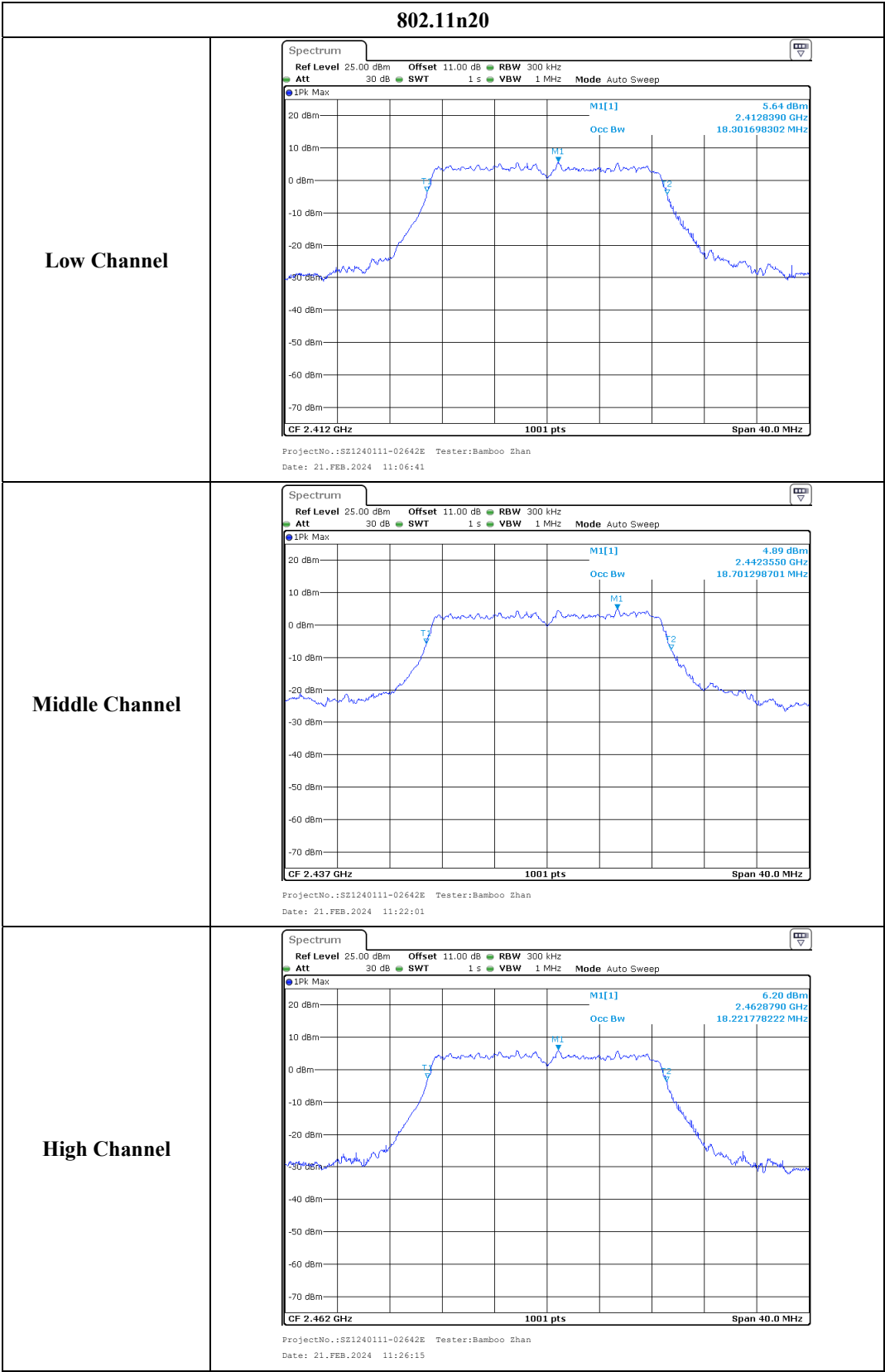


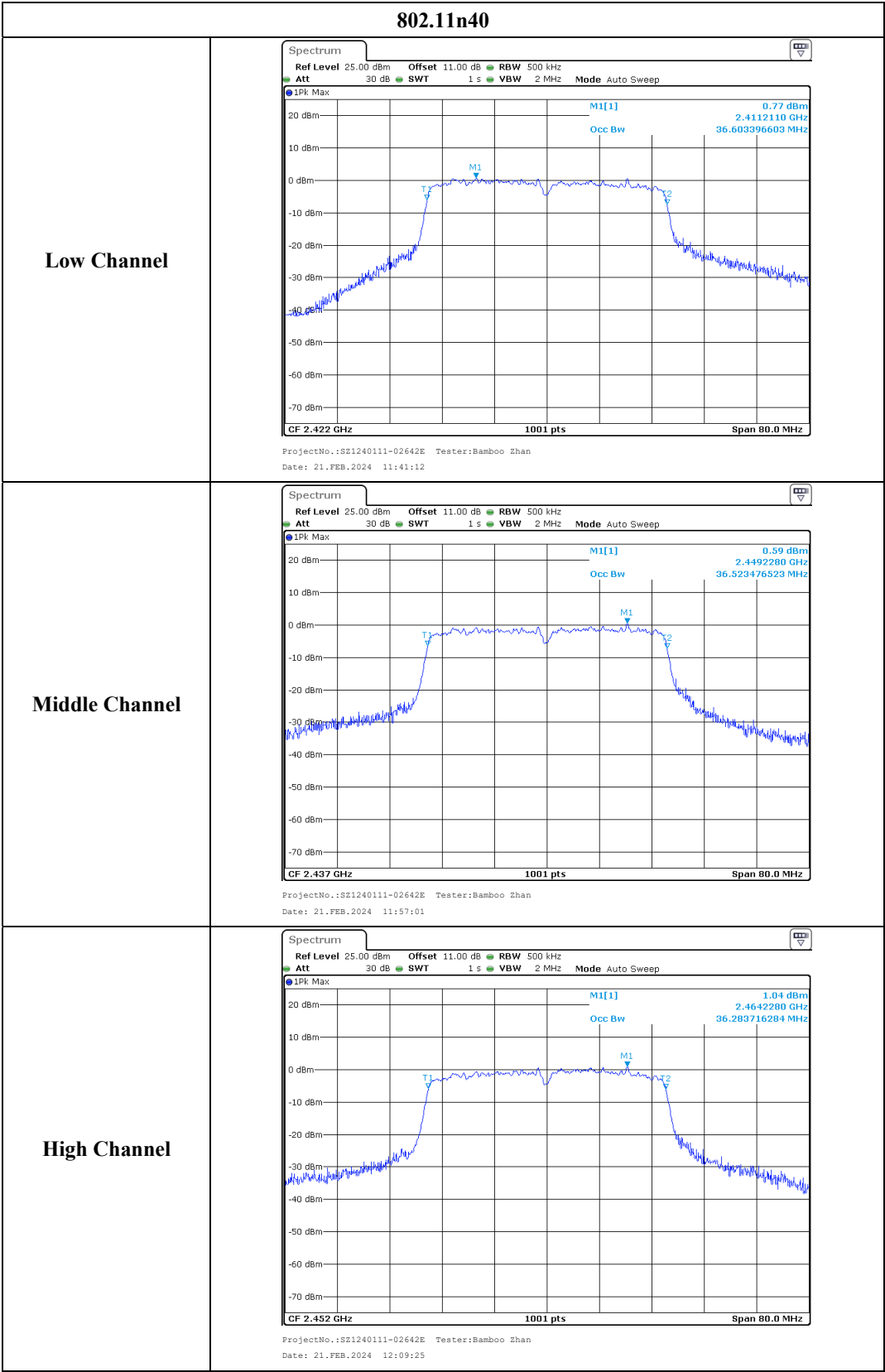


99% Occupied Bandwidth









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

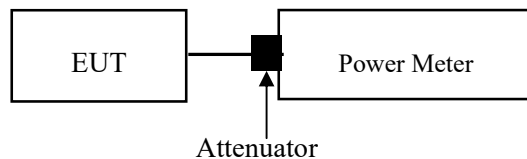
### Applicable Standard

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 11.9.2.3

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



### Test Data

#### Environmental Conditions

|                    |         |
|--------------------|---------|
| Temperature:       | 25.1°C  |
| Relative Humidity: | 48 %    |
| ATM Pressure:      | 101 kPa |

*The testing was performed by Bamboo Zhan on 2024-02-21.*

*EUT operation mode: Transmitting*

***Test Result: Compliant.***

| Test Modes                                                                                                                                                                                                                                                        | Test Frequency (MHz) | Maximum Conducted Peak Output Power (dBm) |         |       | Limit (dBm) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------|---------|-------|-------------|
|                                                                                                                                                                                                                                                                   |                      | Chain 0                                   | Chain 1 | Total |             |
| 802.11b                                                                                                                                                                                                                                                           | 2412                 | 22.13                                     | 21.69   | 24.93 | 30          |
|                                                                                                                                                                                                                                                                   | 2437                 | 20.72                                     | 20.32   | 23.53 | 30          |
|                                                                                                                                                                                                                                                                   | 2462                 | 22.37                                     | 21.7    | 25.06 | 30          |
| 802.11g                                                                                                                                                                                                                                                           | 2412                 | 21.44                                     | 21.95   | 24.71 | 30          |
|                                                                                                                                                                                                                                                                   | 2437                 | 20.68                                     | 21.31   | 24.02 | 30          |
|                                                                                                                                                                                                                                                                   | 2462                 | 21.73                                     | 21.9    | 24.83 | 30          |
| 802.11n ht20                                                                                                                                                                                                                                                      | 2412                 | 22.01                                     | 22.55   | 25.30 | 30          |
|                                                                                                                                                                                                                                                                   | 2437                 | 21.33                                     | 21.82   | 24.59 | 30          |
|                                                                                                                                                                                                                                                                   | 2462                 | 22.28                                     | 23.18   | 25.76 | 30          |
| 802.11n ht40                                                                                                                                                                                                                                                      | 2422                 | 18.29                                     | 18.97   | 21.65 | 30          |
|                                                                                                                                                                                                                                                                   | 2437                 | 17.58                                     | 18.31   | 20.97 | 30          |
|                                                                                                                                                                                                                                                                   | 2452                 | 18.14                                     | 18.29   | 21.23 | 30          |
| Note: The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:<br>Array Gain = 0 dB (i.e., no array gain) for $N_{\text{ANT}} \leq 4$ |                      |                                           |         |       |             |

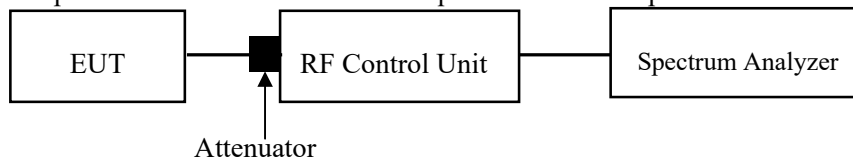
**FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE****Applicable Standard**

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.

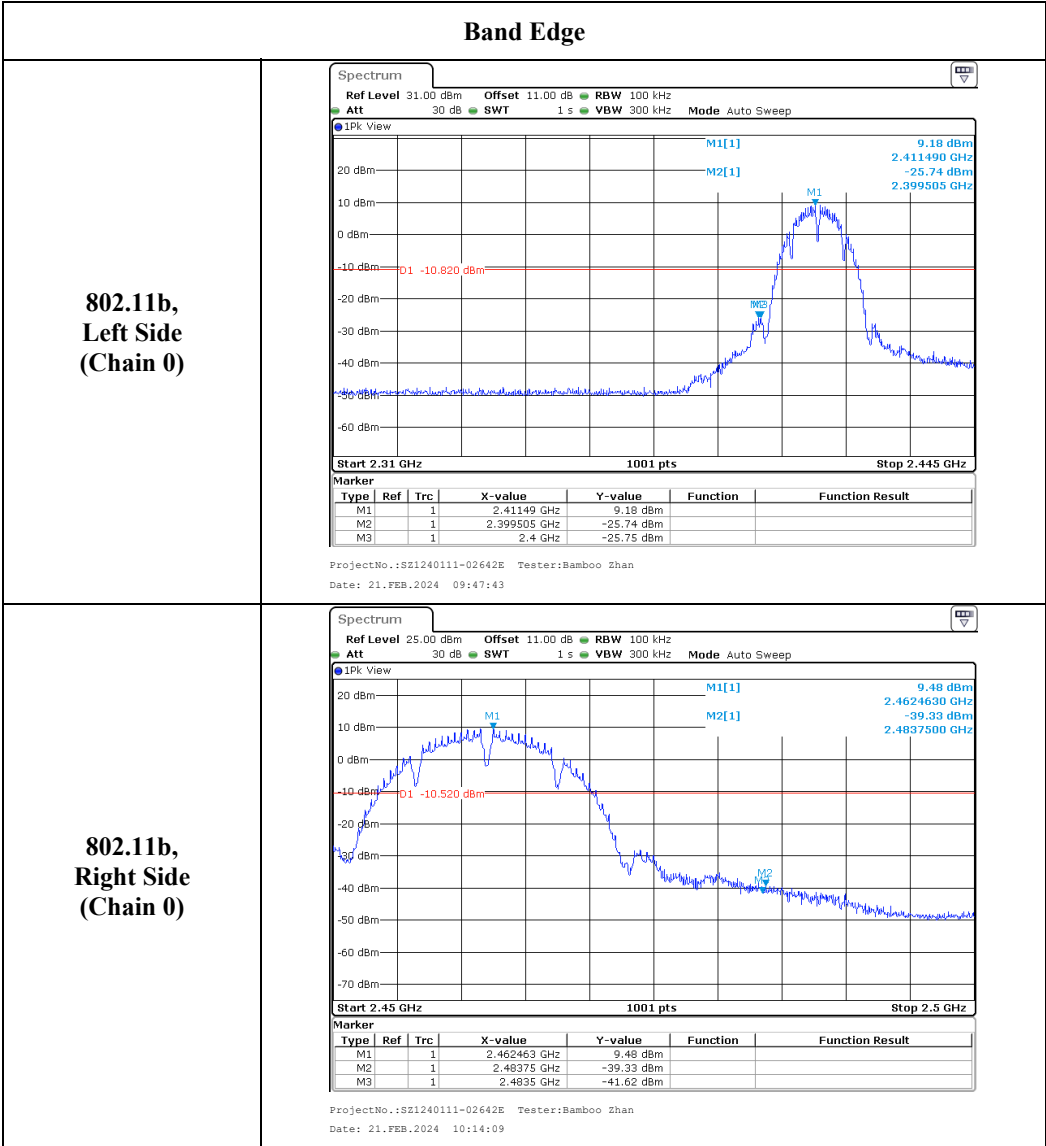
**Test Data****Environmental Conditions**

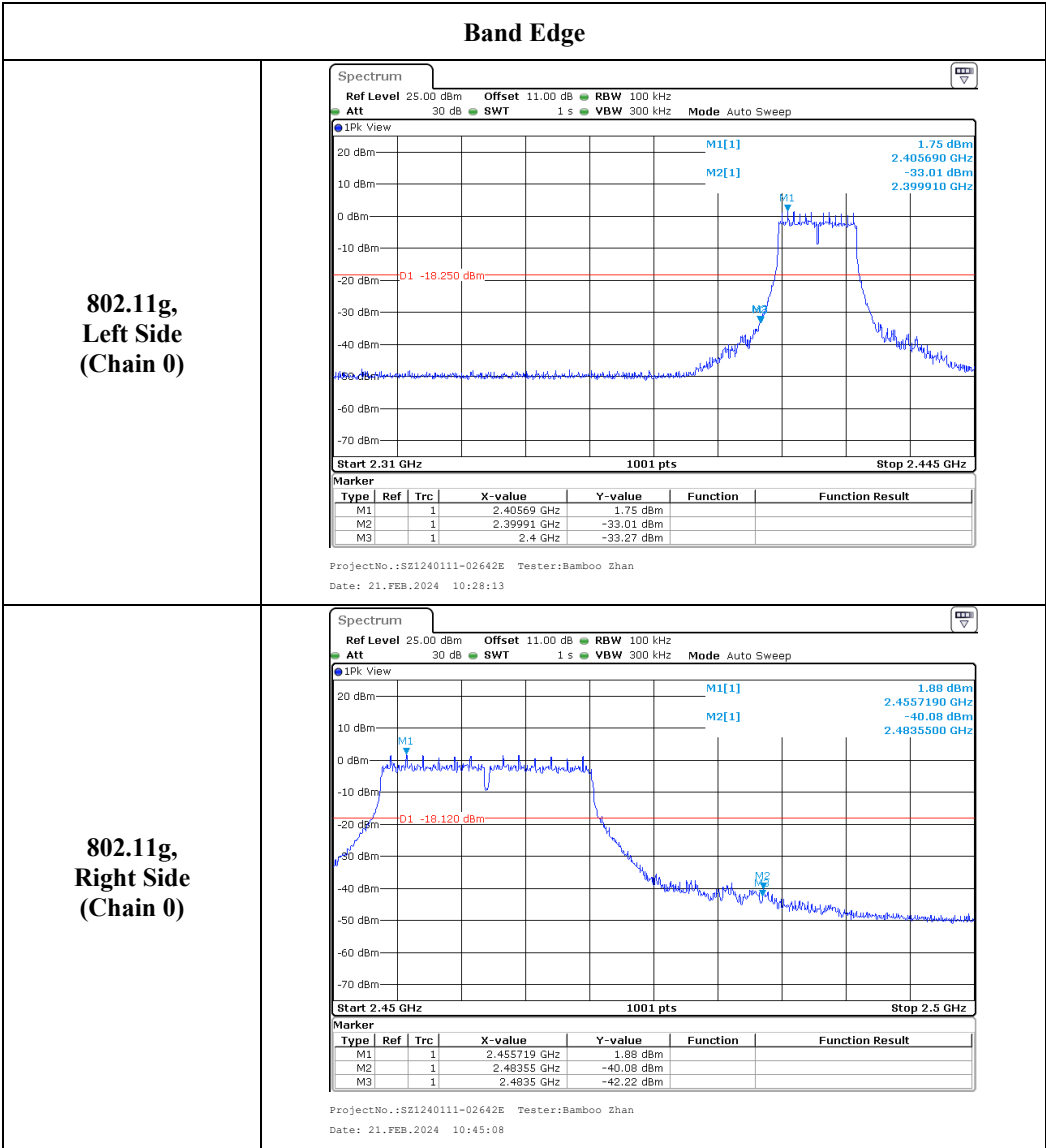
|                    |         |
|--------------------|---------|
| Temperature:       | 25.1°C  |
| Relative Humidity: | 48 %    |
| ATM Pressure:      | 101 kPa |

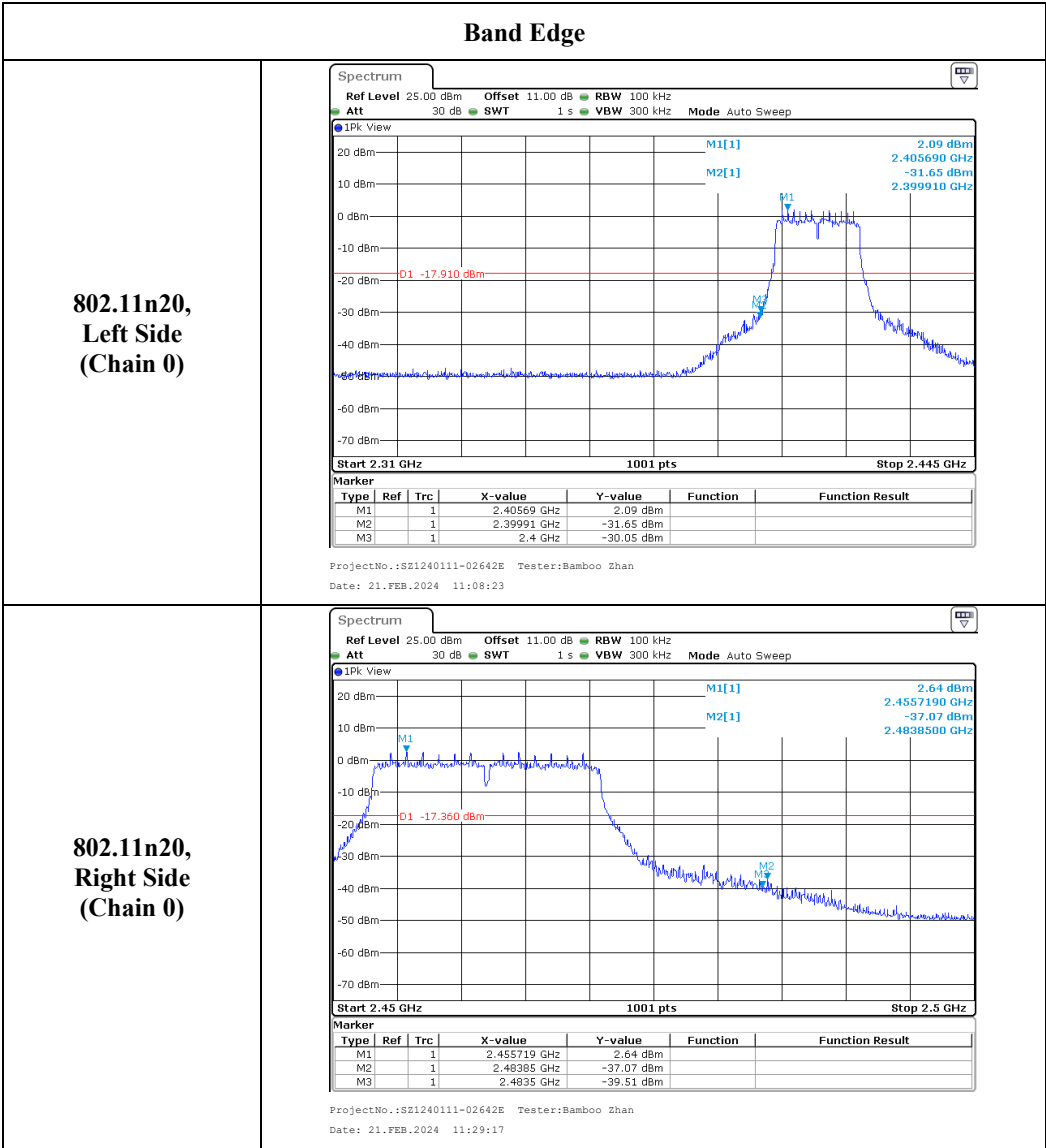
*The testing was performed by Bamboo Zhan on 2024-02-21.*

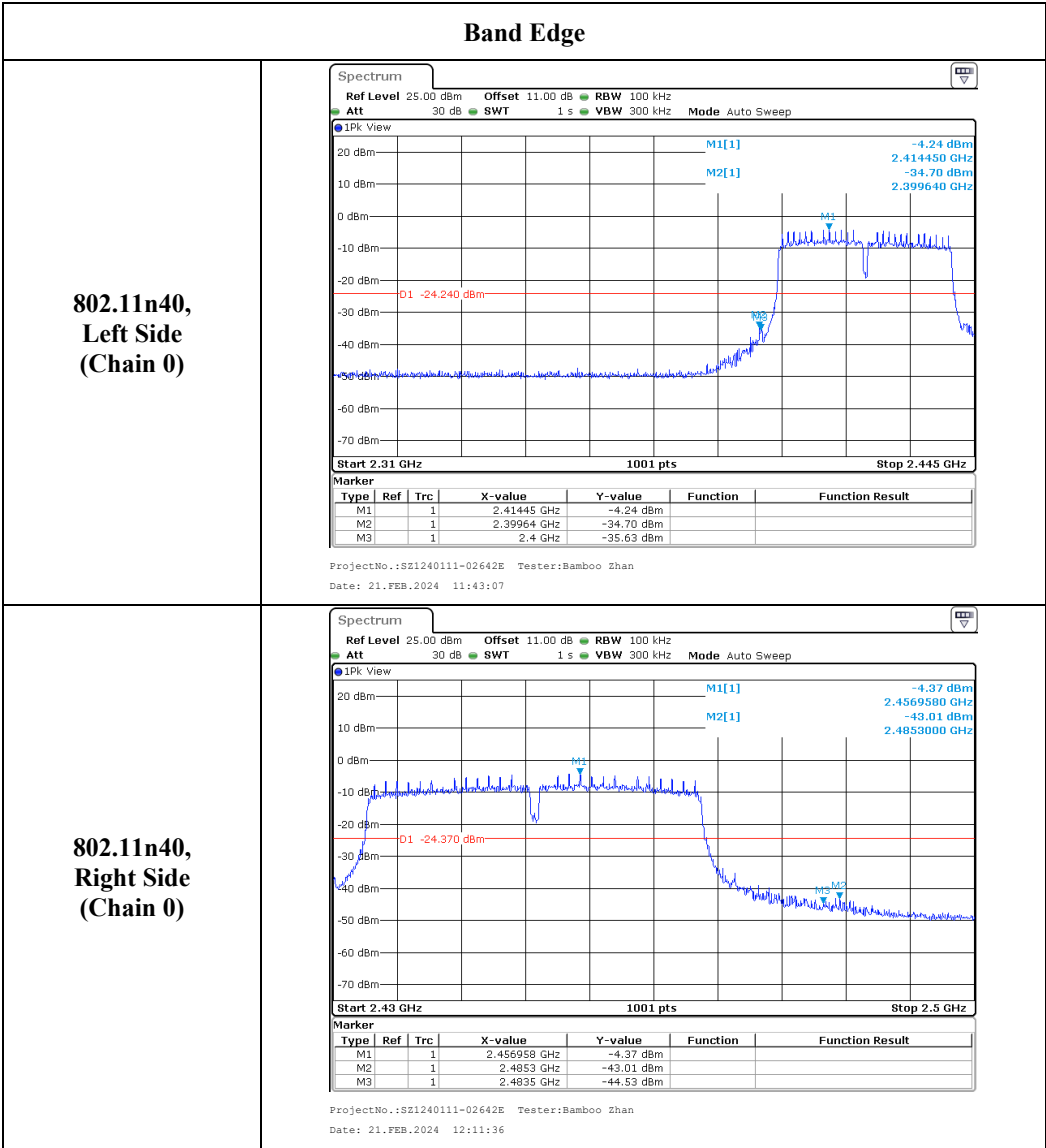
*EUT operation mode: Transmitting*

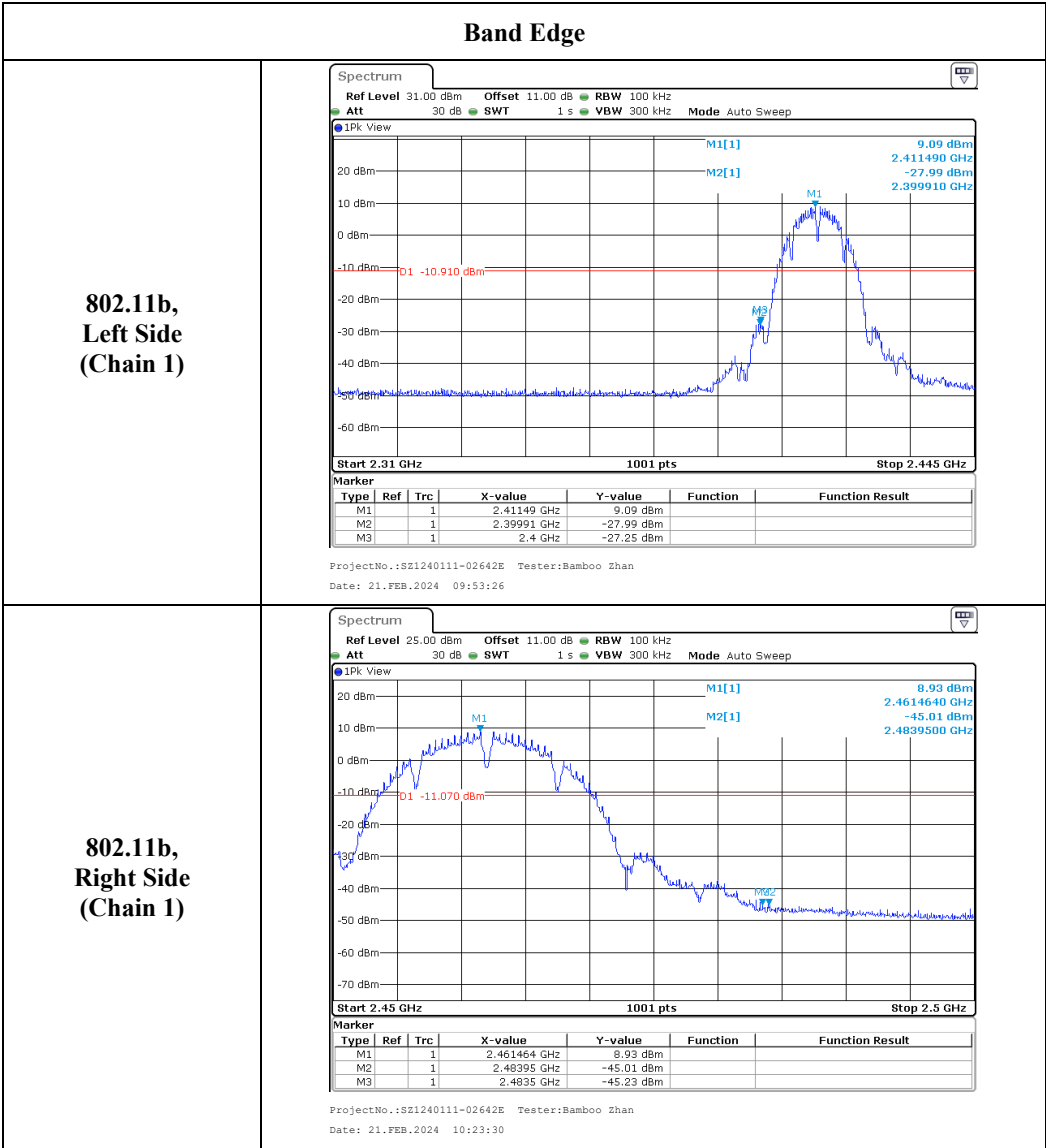
***Test Result: Compliant***

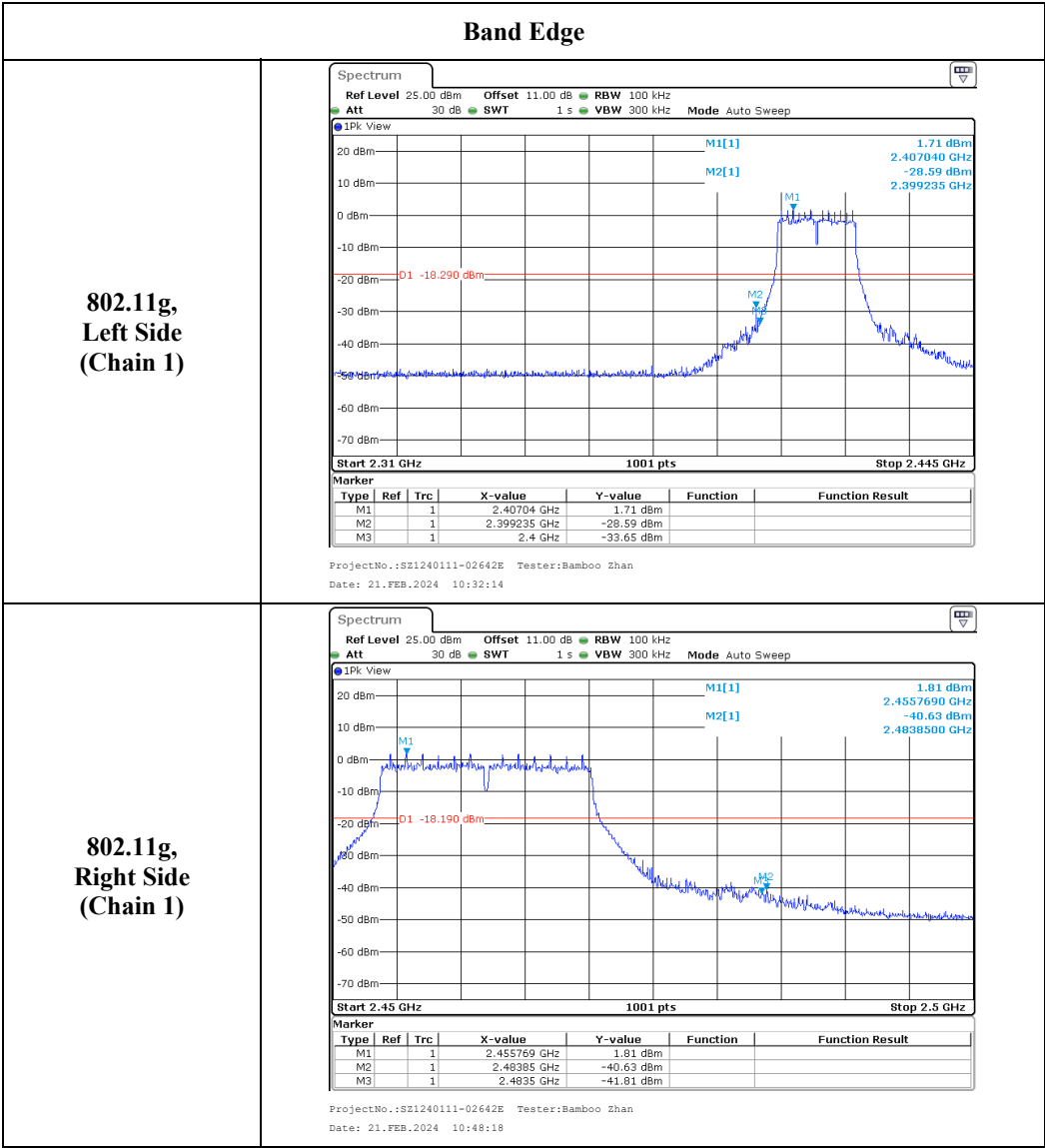


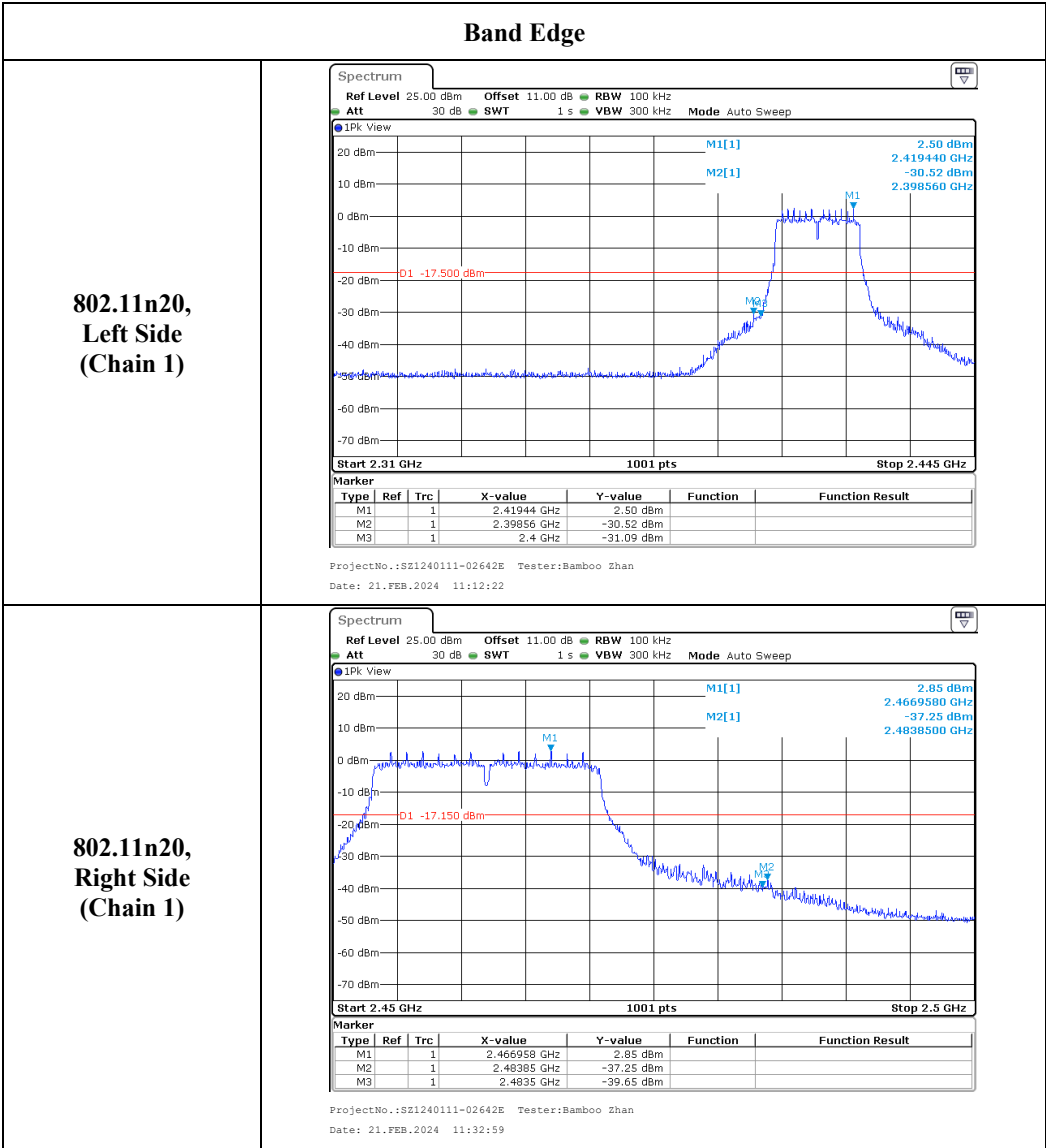


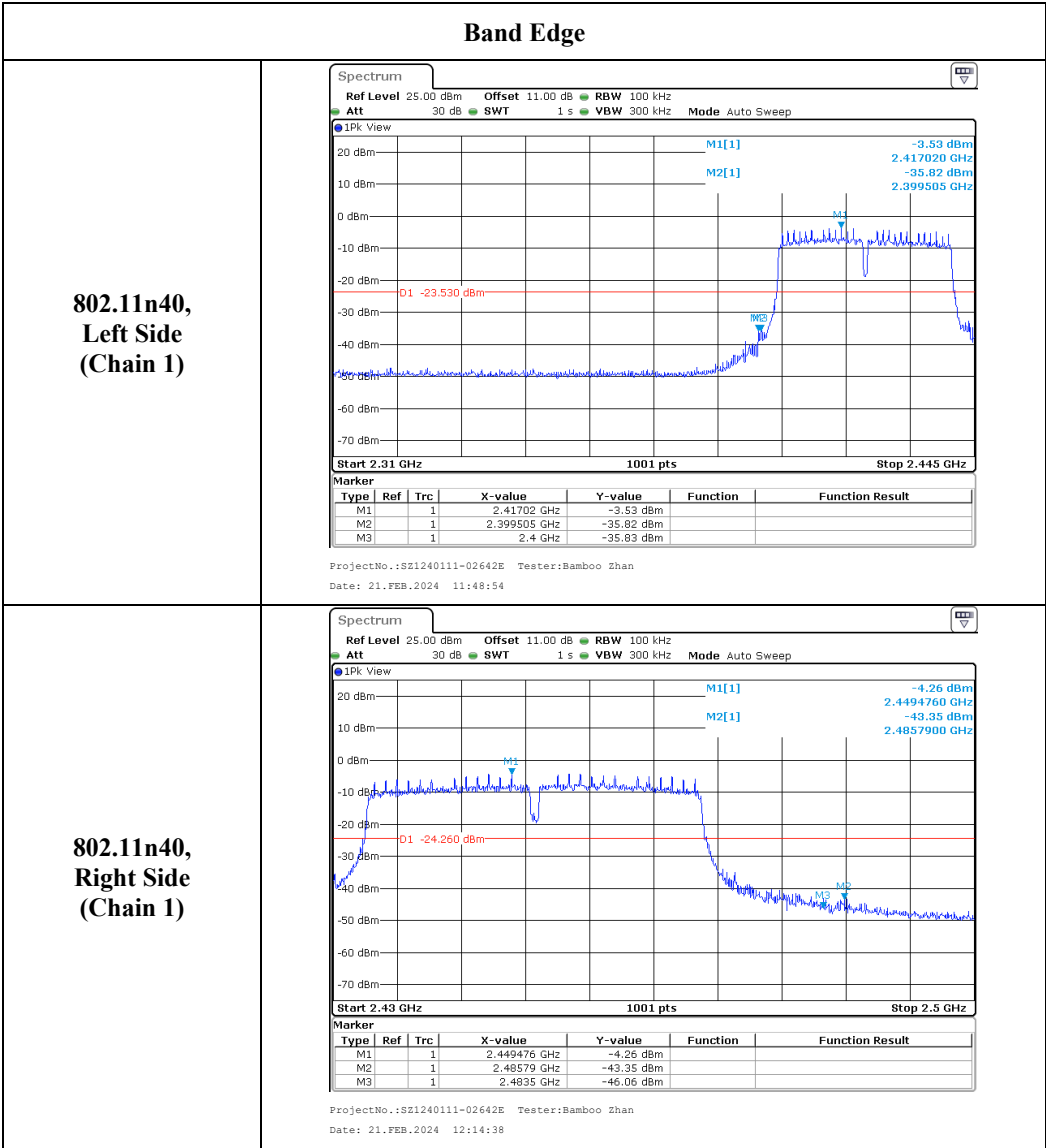












## **FCC §15.247(e) - POWER SPECTRAL DENSITY**

### **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 Method: ANSI C63.10-2013 Clause 11.10.3 Method AVGPSD-1

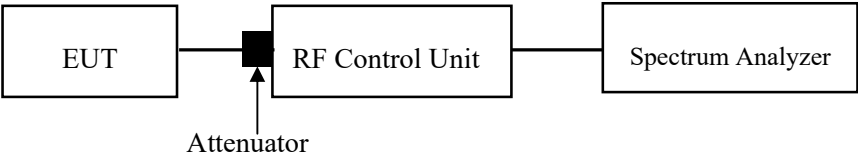
The following procedure may be used when the maximum (average) conducted output power was used to determine compliance to the fundamental output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has a power averaging (rms) detector, then it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously ( $D \geq 98\%$ ), or else sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter OFF time to be considered):

1. Set instrument center frequency to DTS channel center frequency.
2. Set span to at least 1.5 times the OBW.
3. Set the RBW to:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
4. Set the VBW  $\geq 3 \times \text{BW}$ .
5. Detector = power averaging (rms) or sample detector (when rms not available)
6. Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / \text{RBW}]$ .
7. Sweep time = auto couple.
8. Employ trace averaging (rms) mode over a minimum of 100 traces.
9. Use the peak marker function to determine the maximum amplitude level.
10. If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

Test Method: ANSI C63.10-2013 Clause 11.10.5 Method AVGPST-2

The following procedure is applicable when the EUT cannot be configured to transmit continuously (i.e.,  $D < 98\%$ ), when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than  $\pm 2\%$ ):

1. Measure the duty cycle (D) of the transmitter output signal as described in 11.6.
2. Set instrument center frequency to DTS channel center frequency.
3. Set span to at least 1.5 times the OBW.
4. Set the RBW to:  $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
5. Set the VBW  $\geq 3 \times \text{BW}$ .
6. Detector = power averaging (rms) or sample detector (when rms not available)
7. Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / \text{RBW}]$ .
8. Sweep time = auto couple.
9. Do not use sweep triggering; allow sweep to “free run.”
10. Employ trace averaging (rms) mode over a minimum of 100 traces.
11. Use the peak marker function to determine the maximum amplitude level.
12. If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).



Test Data

Environmental Conditions

|                    |         |
|--------------------|---------|
| Temperature:       | 25.1°C  |
| Relative Humidity: | 48 %    |
| ATM Pressure:      | 101 kPa |

The testing was performed by Bamboo Zhan on 2024-02-21.

EUT operation mode: Transmitting

Test Result: Compliant.

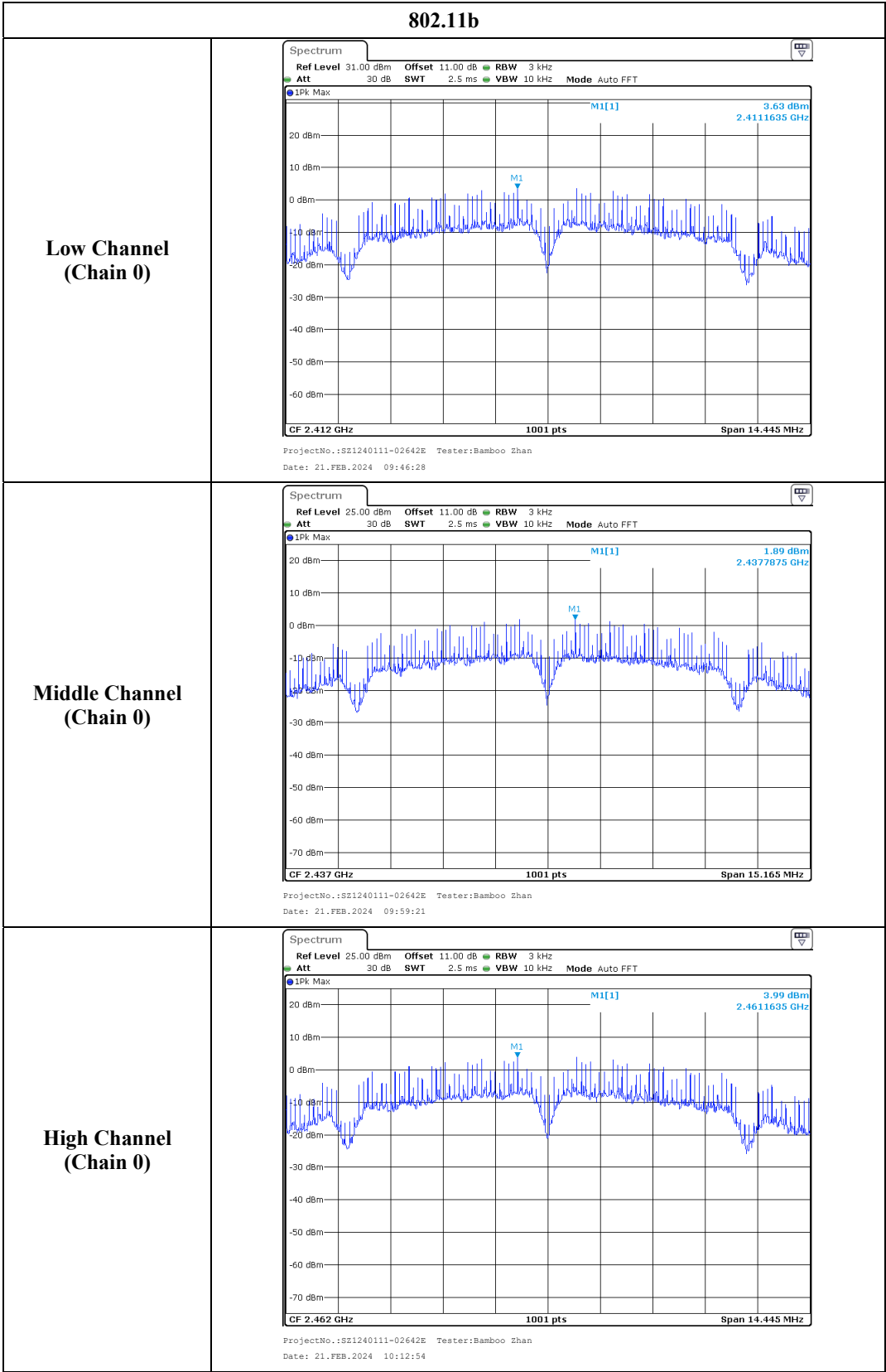
| Test Modes   | Test Frequency (MHz) | Reading(dBm/3kHz) |         | Maximum Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) |
|--------------|----------------------|-------------------|---------|-------------------------------------------|------------------|
|              |                      | Chain 0           | Chain 1 |                                           |                  |
| 802.11b      | 2412                 | 3.63              | 3.45    | 6.55                                      | 8.00             |
|              | 2437                 | 1.89              | 1.88    | 4.90                                      | 8.00             |
|              | 2462                 | 3.99              | 3.42    | 6.72                                      | 8.00             |
| 802.11g      | 2412                 | -14.25            | -13.95  | -10.72                                    | 8.00             |
|              | 2437                 | -15.13            | -14.6   | -11.48                                    | 8.00             |
|              | 2462                 | -13.83            | -13.47  | -10.27                                    | 8.00             |
| 802.11n ht20 | 2412                 | -13.08            | -12.52  | -9.37                                     | 8.00             |
|              | 2437                 | -13.61            | -13.44  | -10.10                                    | 8.00             |
|              | 2462                 | -12.62            | -12.47  | -9.12                                     | 8.00             |
| 802.11n ht40 | 2422                 | -19.13            | -18.94  | -15.38                                    | 8.00             |
|              | 2437                 | -20.05            | -19.62  | -16.17                                    | 8.00             |
|              | 2452                 | -19.34            | -19.12  | -15.57                                    | 8.00             |

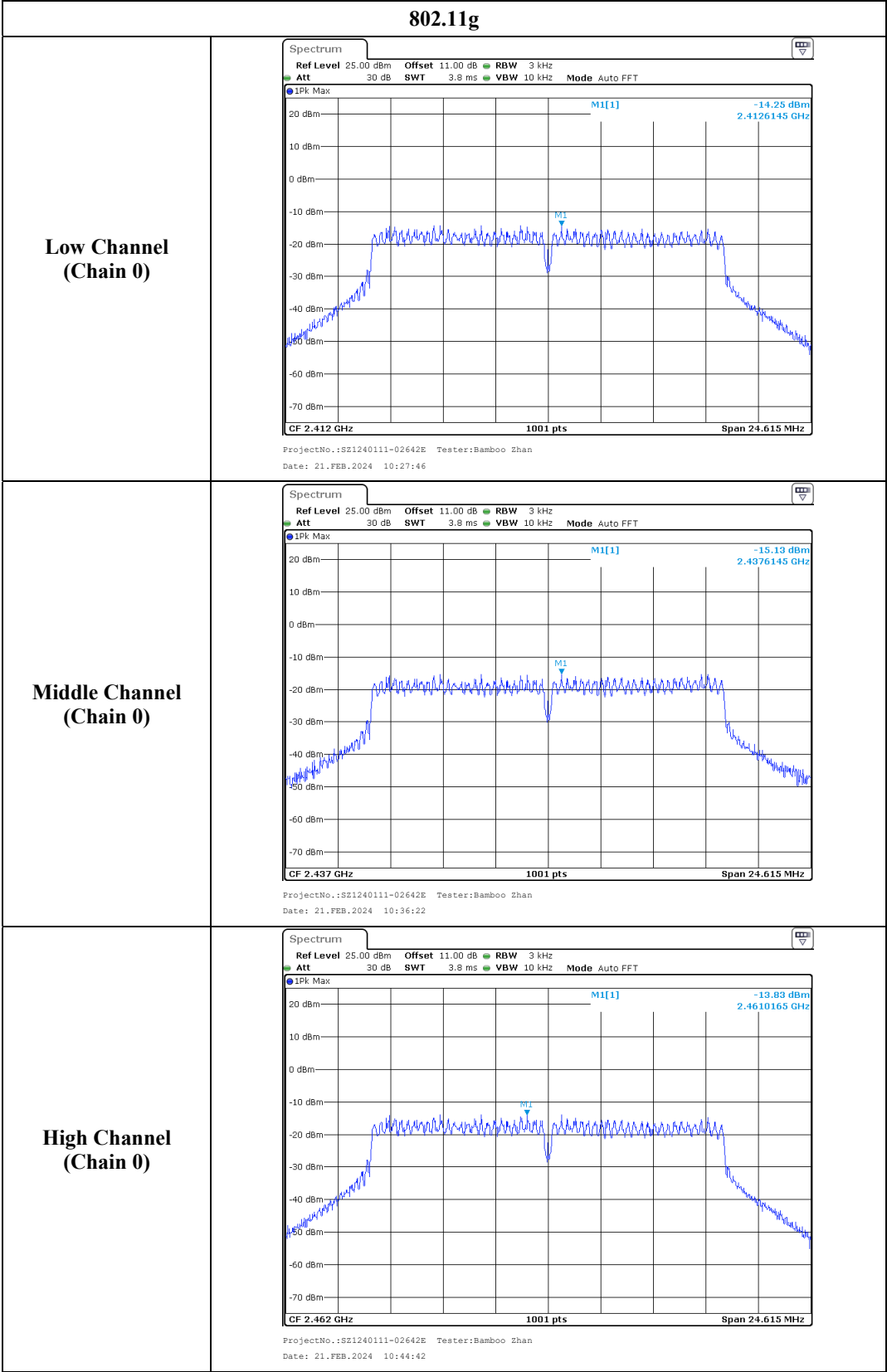
## Note:

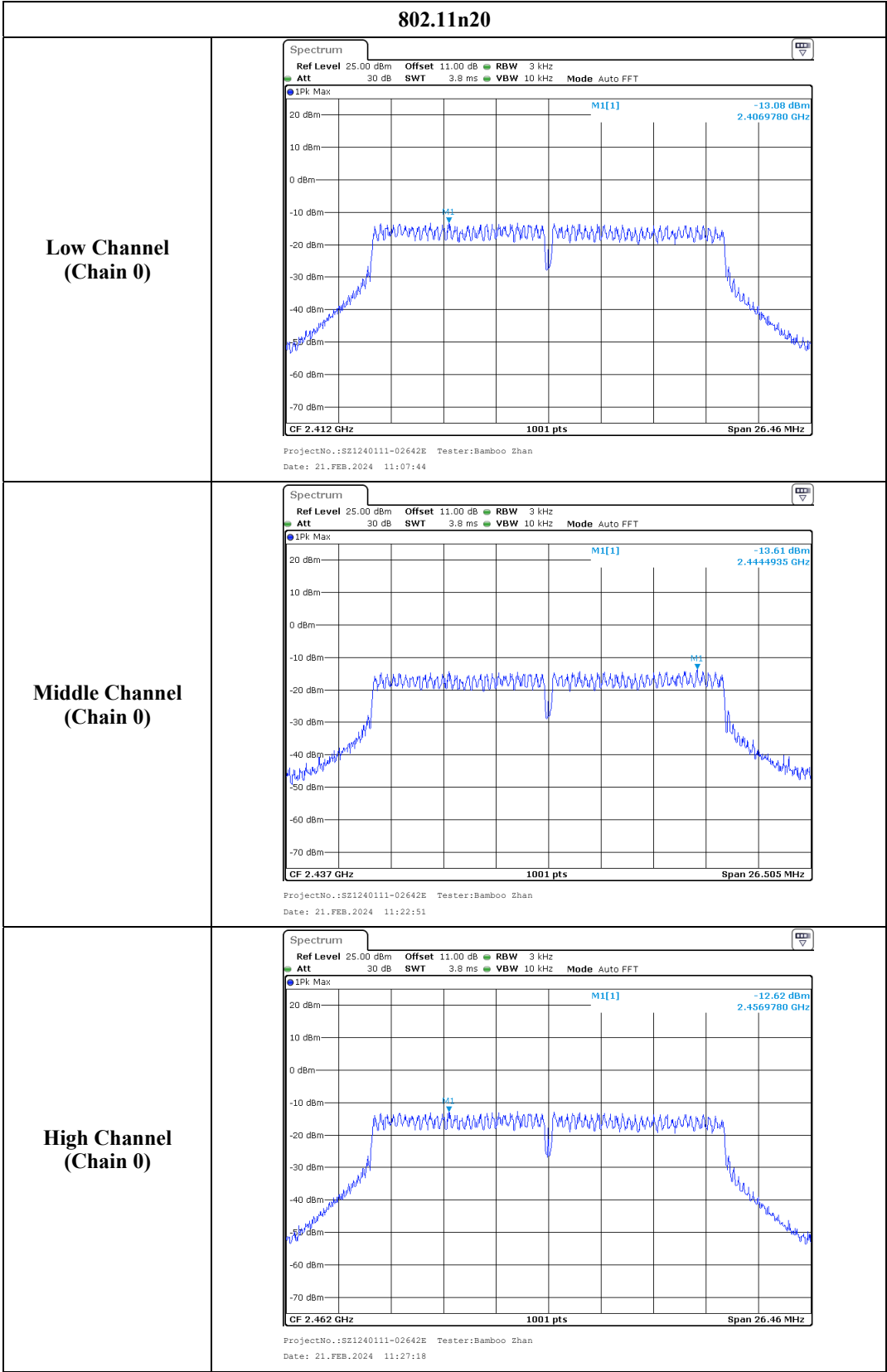
The maximum Power Spectral Density was calculated the result of the maximum chain for SISO mode, and Total chains for MIMO mode.

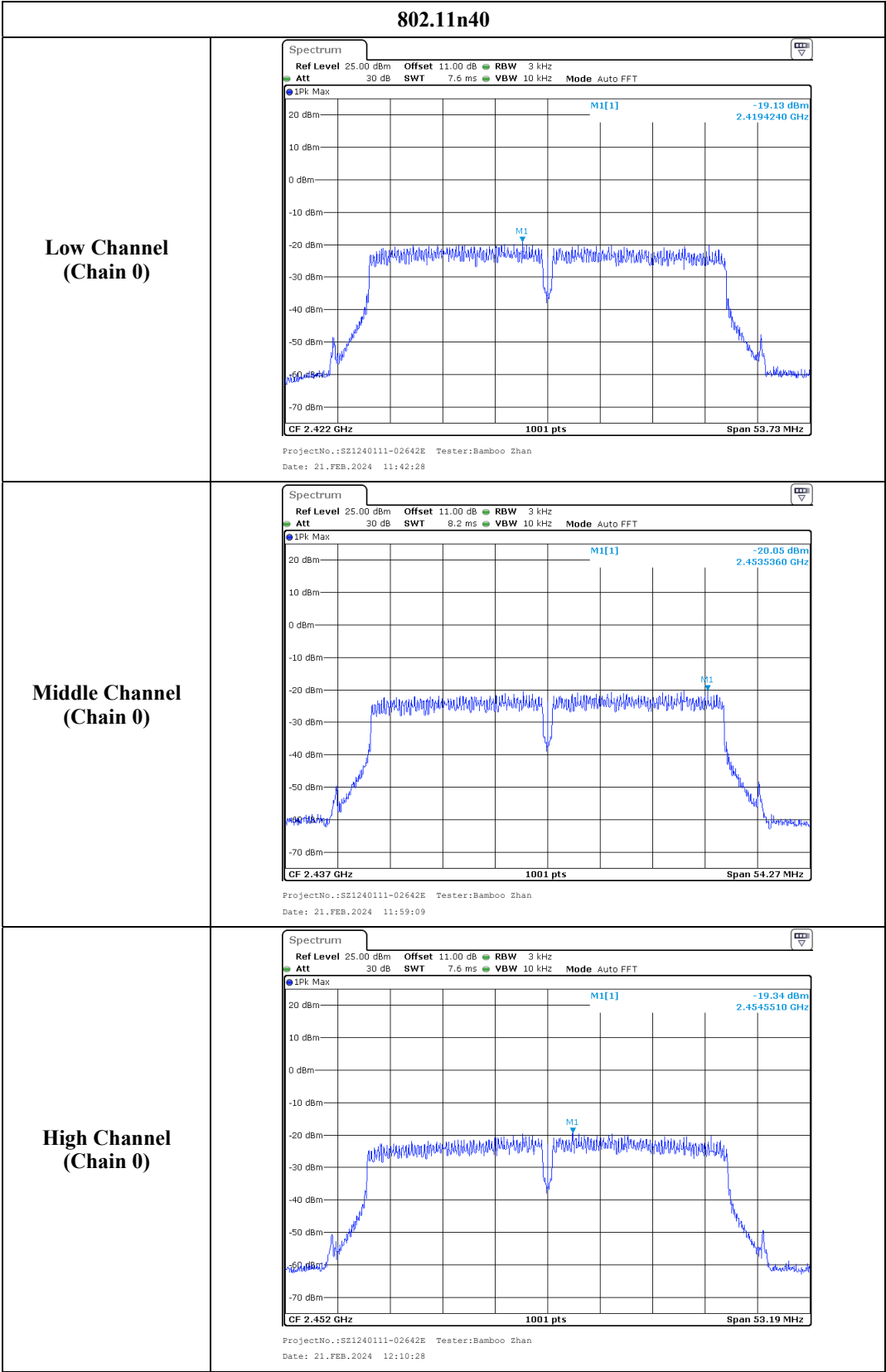
The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

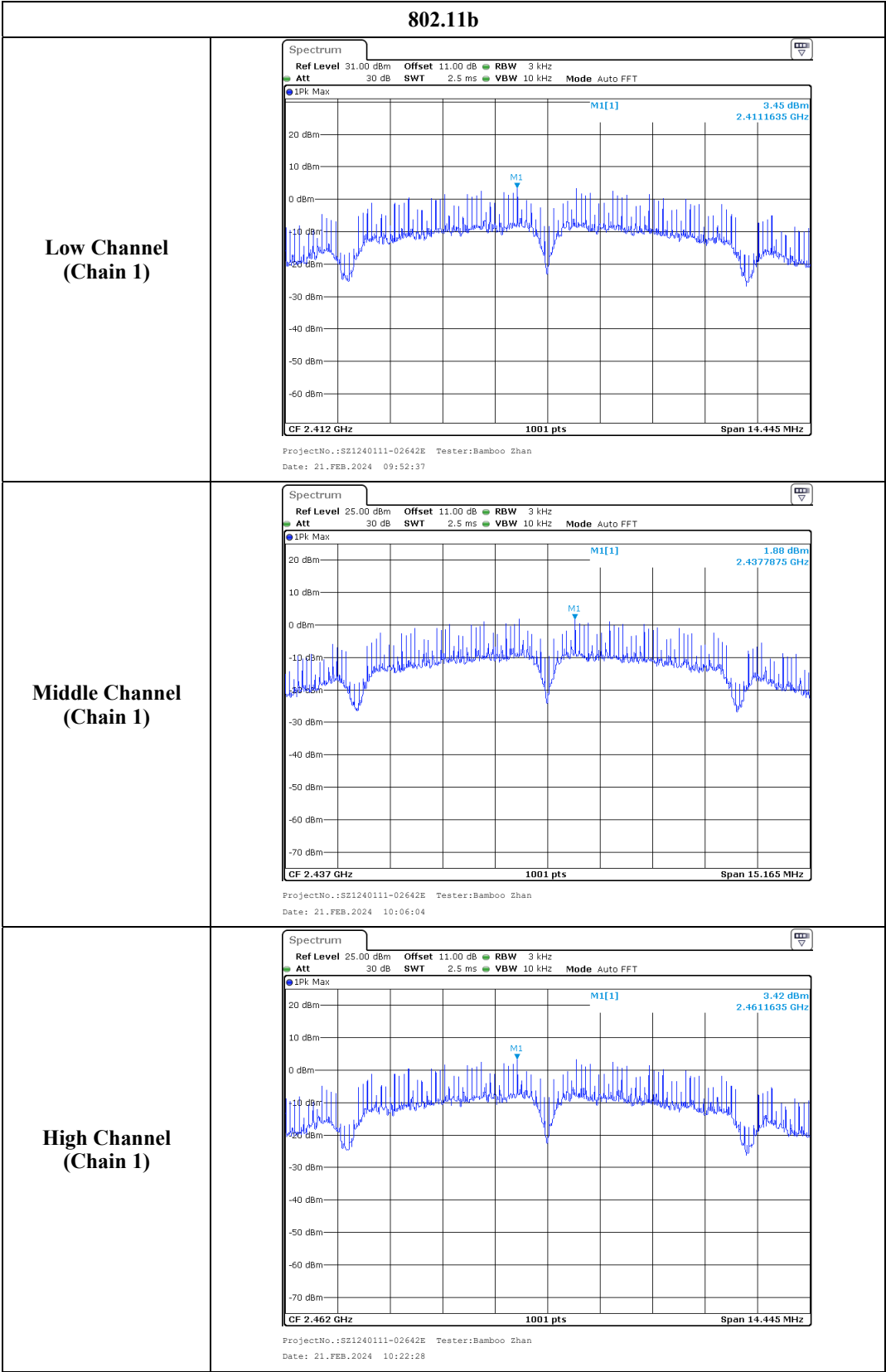
Array Gain =  $10 \log(N_{\text{ANT}}/N_{\text{SS}})$  dB

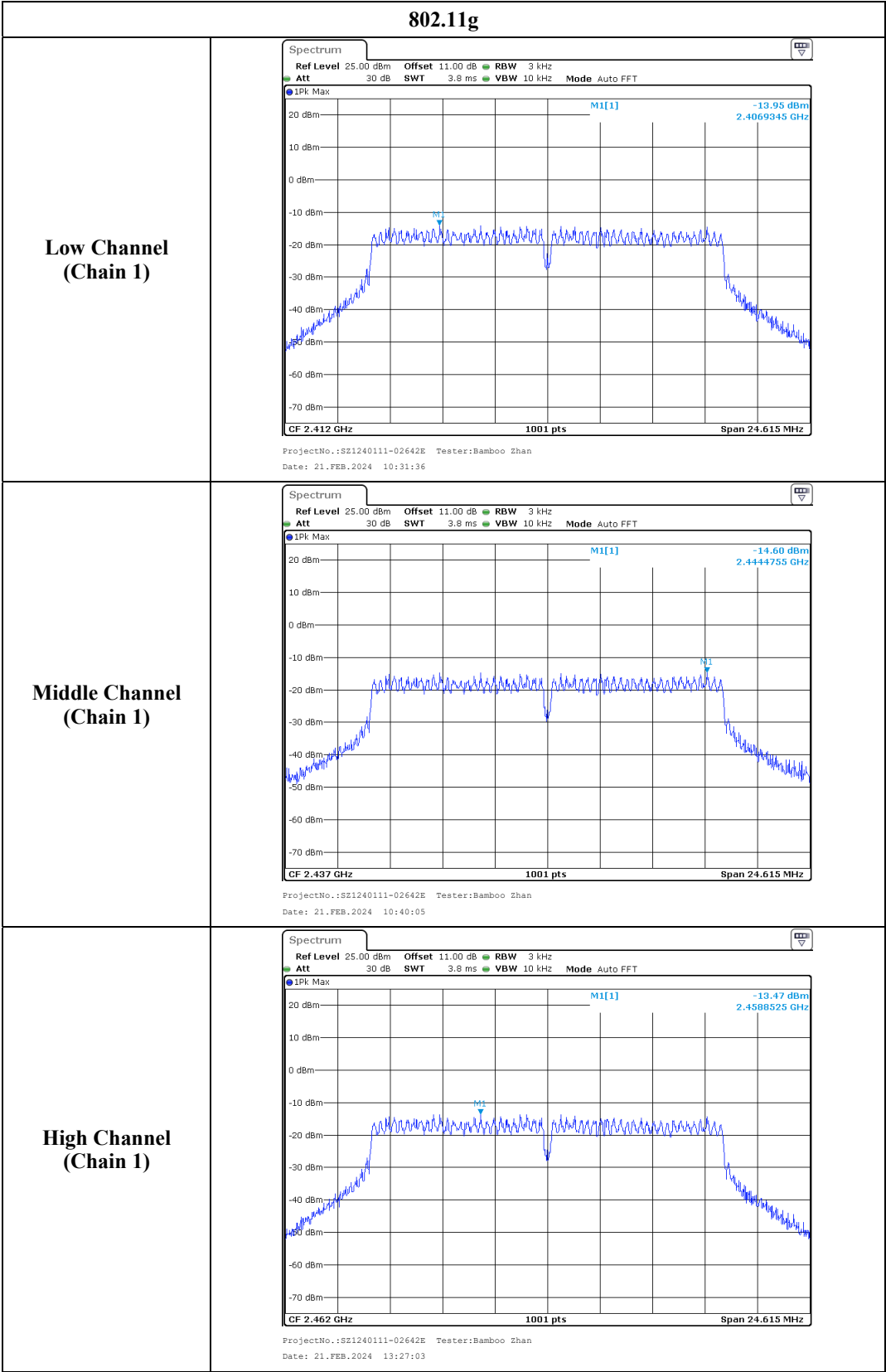


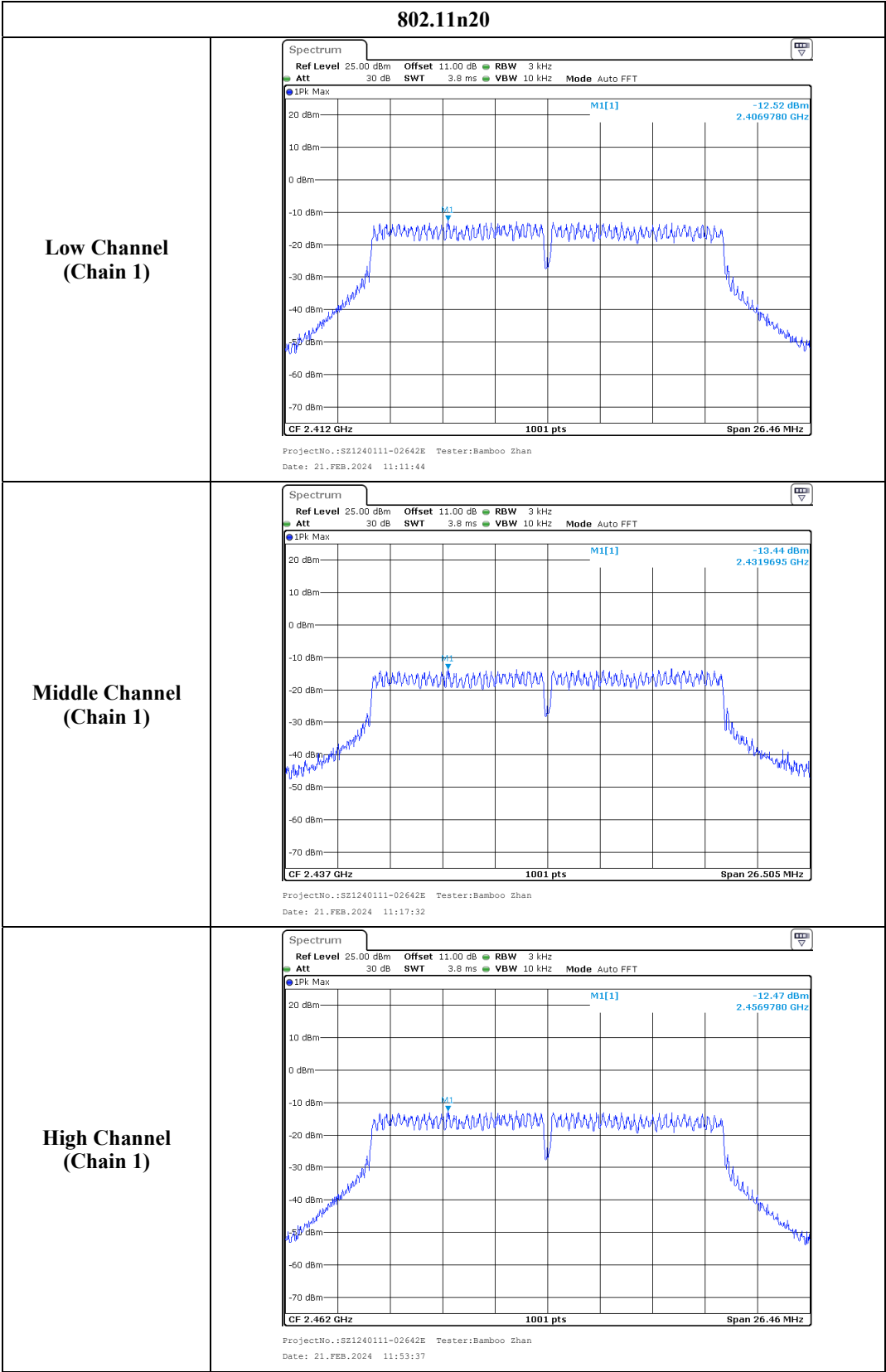


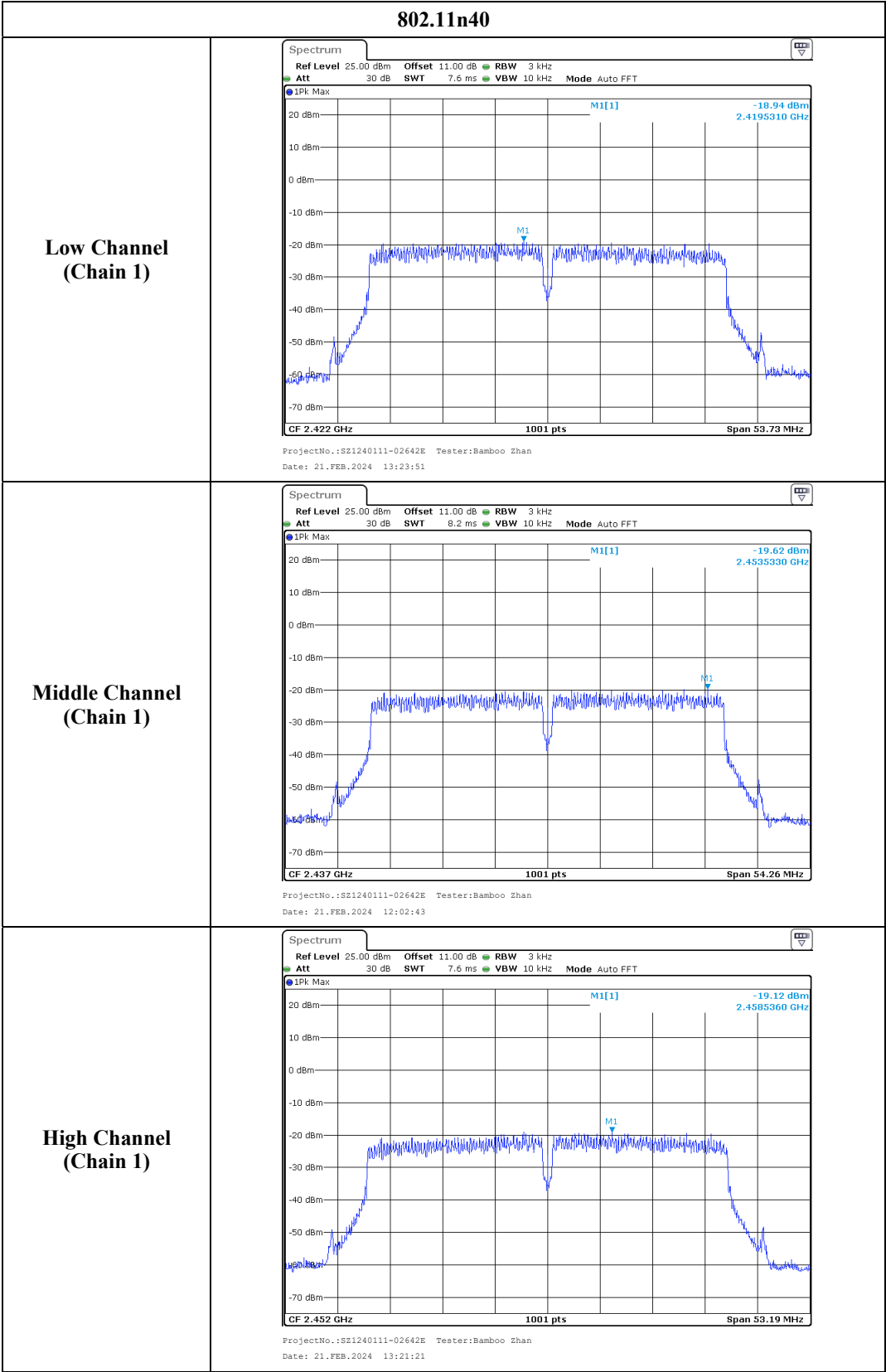












## **EUT PHOTOGRAPHS**

Please refer to the attachment SZ1240111-02642E-RF External photo and SZ1240111-02642E-RF Internal photo.

## **TEST SETUP PHOTOGRAPHS**

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Please refer to the attachment SZ1240111-02642E-RF Test Setup photo.

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