

# FCC PART 15.247

## TEST REPORT

For

### Shenzhen Aodasen Technology Co.,Ltd

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District,Shenzhen

**FCC ID: 2ARY7-A1**

|                                            |                                                                                                                                                                                                                                                             |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report     | <b>Product Name:</b><br>Earbuds                                                                                                                                                                                                                             |
| <b>Report Number:</b> DG1210823-35924E-00A |                                                                                                                                                                                                                                                             |
| <b>Report Date:</b> 2021-09-03             |                                                                                                                                                                                                                                                             |
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## GENERAL INFORMATION

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

|                                               |                                                                       |
|-----------------------------------------------|-----------------------------------------------------------------------|
| <b>EUT Name:</b>                              | Earpods                                                               |
| <b>EUT Model:</b>                             | A1-TWS                                                                |
| <b>Multiple Models:</b>                       | A2-TWS, A3-TWS, A12-TWS, A25-TWS, A29-TWS, A30-TWS, A16C-TWS, A31-TWS |
| <b>Model Difference:</b>                      | Refer to Dos                                                          |
| <b>Operation Frequency:</b>                   | 2402-2480MHz                                                          |
| <b>Maximum Peak Output Power (Conducted):</b> | -3.53dBm                                                              |
| <b>Modulation Type:</b>                       | GFSK                                                                  |
| <b>Antenna Gain▲:</b>                         | 2 dBi                                                                 |
| <b>Rated Input Voltage:</b>                   | DC3.7V from battery or DC 5V from USB                                 |
| <b>Serial Number:</b>                         | DG1210823-35924E-RF-S1                                                |
| <b>EUT Received Date:</b>                     | 2021.8.25                                                             |
| <b>EUT Received Status:</b>                   | Good                                                                  |

### Objective

This report is prepared on behalf of ***Shenzhen Aodasen Technology Co.,Ltd*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the compliance of the EUT with FCC Rules Part 15-Subpart C, section 15.203, 15.205, 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 DTS Meas Guidance v05r02.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

## Measurement Uncertainty

| Parameter                         | Measurement Uncertainty                                                                                              |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Occupied Channel Bandwidth        | ±5 %                                                                                                                 |
| RF output power, conducted        | ±0.61dB                                                                                                              |
| Power Spectral Density, conducted | ±0.61 dB                                                                                                             |
| Unwanted Emissions, radiated      | 30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB |
| Unwanted Emissions, conducted     | ±1.5 dB                                                                                                              |
| Temperature                       | ±1 °C                                                                                                                |
| Humidity                          | ±5%                                                                                                                  |
| DC and low frequency voltages     | ±0.4%                                                                                                                |
| Duty Cycle                        | 1%                                                                                                                   |
| AC Power Lines Conducted Emission | 3.12 dB (150 kHz to 30 MHz)                                                                                          |

*Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1<sup>st</sup> Road, Tangxia Town, Dongguan, Guangdong, 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. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

## Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For Bluetooth LE mode, 40 channels are provided for testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 20      | 2442            |
| 1       | 2404            | ...     | ...             |
| ...     | ...             | ...     | ...             |
| ...     | ...             | ...     | ...             |
| ..      | ...             | 38      | 2478            |
| 19      | 2440            | 39      | 2480            |

EUT was tested with channel 0, 19 and 39.

### Equipment Modifications

No modification was made to the EUT.

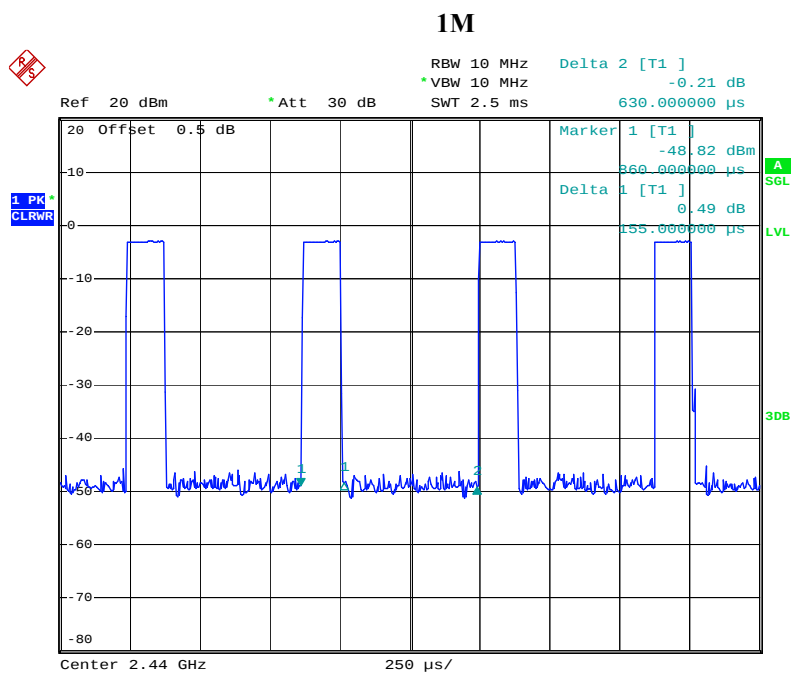
### EUT Exercise Software

The software “FCC Assist” was used for testing, which was provided by manufacturer. The maximum power was configured as below table, that provided by the manufacturer ▲:

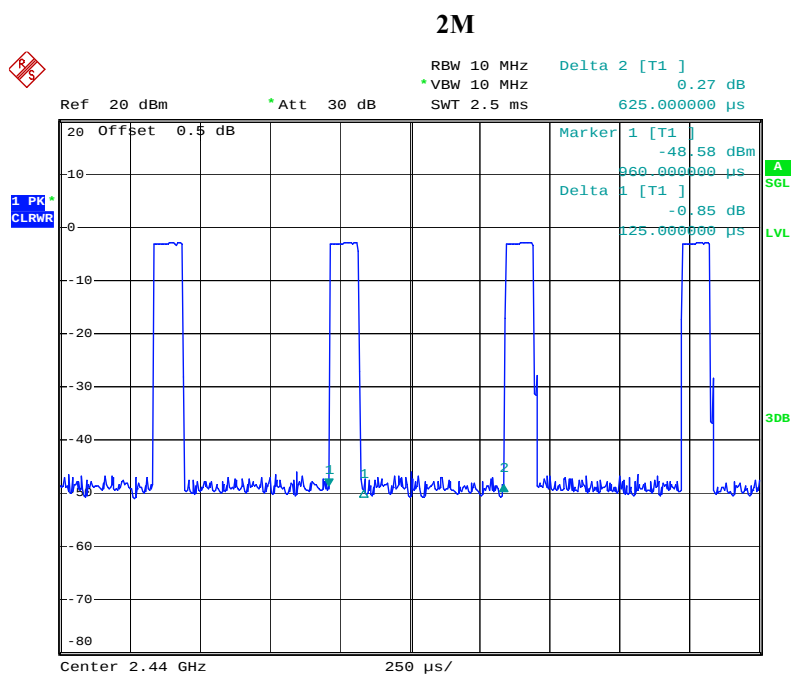
| Mode  | Channel | Frequency (MHz) | Data rate (Mbps) | Power level |
|-------|---------|-----------------|------------------|-------------|
| LE 1M | Low     | 2402            | 1                | default     |
|       | Middle  | 2440            | 1                | default     |
|       | High    | 2480            | 1                | default     |
| LE 2M | Low     | 2402            | 2                | default     |
|       | Middle  | 2440            | 2                | default     |
|       | High    | 2480            | 2                | default     |

The maximum duty cycle as following table:

| Test mode | T <sub>on</sub> (ms) | T <sub>on+off</sub> (ms) | Duty Cycle (%) |
|-----------|----------------------|--------------------------|----------------|
| BLE 1M    | 0.155                | 0.630                    | 24.6           |
| BLE 2M    | 0.125                | 0.625                    | 20             |



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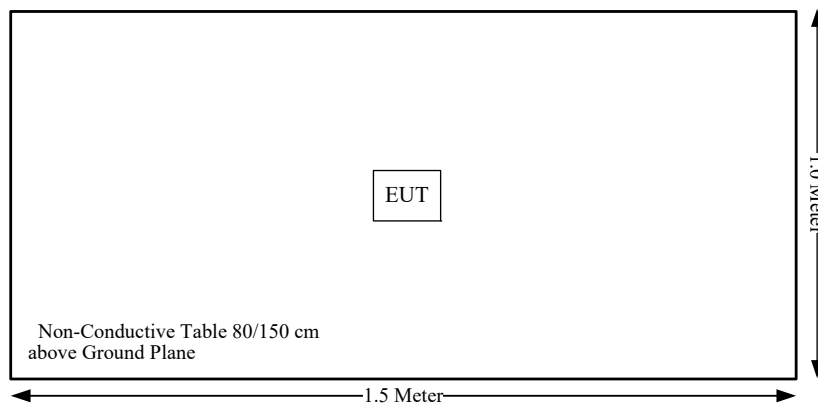
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**Support Equipment List and Details**

| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|-------|---------------|
| /            | /           | /     | /             |

**Support Cable List and Details**

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port | To |
|-------------------|----------------|--------------|------------|-----------|----|
| /                 | /              | /            | /          | /         | /  |

**Block Diagram of Test Setup**

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**SUMMARY OF TEST RESULTS**

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| FCC Rules                          | Description of Test                      | Result         |
|------------------------------------|------------------------------------------|----------------|
| FCC§15.247 (i) & §1.1310 & §2.1093 | RF Exposure                              | Compliance     |
| §15.203                            | Antenna Requirement                      | Compliance     |
| §15.207 (a)                        | AC Line Conducted Emissions              | Not applicable |
| §15.205, §15.209, §15.247(d)       | Spurious Emissions                       | Compliance     |
| §15.247 (a)(2)                     | 6 dB Bandwidth                           | Compliance     |
| §15.247(b)(3)                      | Maximum Conducted Output Power           | Compliance     |
| §15.247(d)                         | 100 kHz Bandwidth of Frequency Band Edge | Compliance     |
| §15.247(e)                         | Power Spectral Density                   | Compliance     |

Not applicable: the device was powered by battery when operating.

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**FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE**

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**Applicable Standard**

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

**Measurement Result**

**Result: Compliance.**

**For BLE**

The max conducted power including tune-up tolerance is -3dBm (0.501 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$   
 $= 0.501/5 \cdot (\sqrt{2.480}) = 0.2 < 3.0$

**So the stand-alone SAR evaluation is not necessary.**

## 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.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

### Antenna Connector Construction

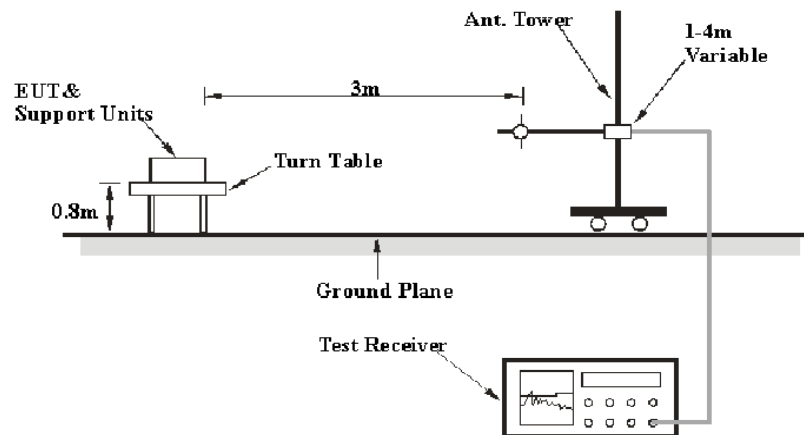
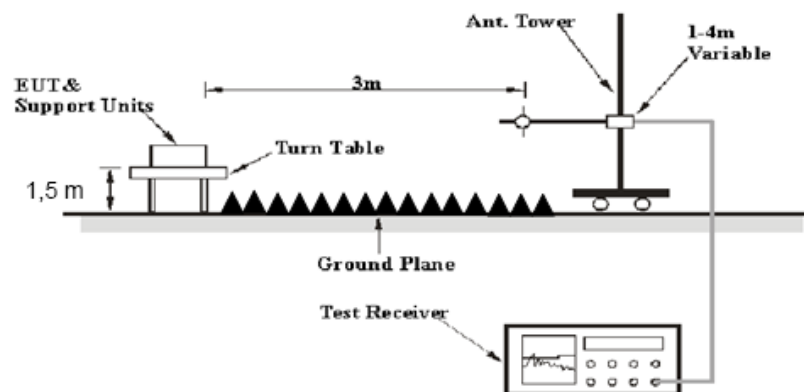
The EUT has one internal antenna arrangement, fulfill the requirement of this section. Please refer to the EUT photos.

| Antenna Type | input impedance (Ohm) | Antenna Gain /Frequency Range |
|--------------|-----------------------|-------------------------------|
| chip         | 50                    | 2dBi/2.4~2.5GHz               |

**Result:** Compliance.

**FCC §15.209, §15.205 & §15.247(d) - Spurious Emissions****Applicable Standard**

FCC §15.247 (d); §15.209; §15.205;

**EUT Setup****Below 1GHz:****Above 1GHz:**

The radiated emission below 1GHz tests were performed in the 10 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site A, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

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

30MHz-1000MHz:

| Measurement | RBW     | Video B/W | IF B/W |
|-------------|---------|-----------|--------|
| QP          | 120 kHz | 300 kHz   | 120kHz |

1GHz- 25GHz:

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## Corrected Amplitude & 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 “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

**Test Equipment List and Details**

| Manufacturer          | Description       | Model              | Serial Number      | Calibration Date | Calibration Due Date |
|-----------------------|-------------------|--------------------|--------------------|------------------|----------------------|
| Radiation Below 1GHz  |                   |                    |                    |                  |                      |
| Sunol Sciences        | Antenna           | JB3                | A060611-2          | 2020-08-25       | 2023-08-25           |
| R&S                   | EMI Test Receiver | ESCI               | 100224             | 2020-09-12       | 2021-09-12           |
| Unknown               | Coaxial Cable     | C-NJNJ-50          | C-1000-01          | 2020-09-05       | 2021-09-05           |
| Unknown               | Coaxial Cable     | C-NJNJ-50          | C-0400-02          | 2020-09-05       | 2021-09-05           |
| Unknown               | Coaxial Cable     | C-NJNJ-50          | C-0530-01          | 2020-09-24       | 2021-09-24           |
| Sonoma                | Amplifier         | 310N               | 185914             | 2020-10-13       | 2021-10-13           |
| Farad                 | Test Software     | EZ-EMC             | V1.1.4.2           | N/A              | N/A                  |
| Radiation Above 1GHz  |                   |                    |                    |                  |                      |
| ETS-Lindgren          | Horn Antenna      | 3115               | 000 527 35         | 2018-10-12       | 2021-10-12           |
| Ducommun Technologies | Horn Antenna      | ARH-4223-02        | 1007726-01<br>1304 | 2020-12-05       | 2023-12-04           |
| Agilent               | Spectrum Analyzer | E4440A             | SG43360054         | 2021-07-22       | 2022-07-21           |
| Unknown               | Coaxial Cable     | C-SJSJ-50          | C-0800-01          | 2020-09-05       | 2021-09-05           |
| Unknown               | Coaxial Cable     | C-2.4J2.4J-50      | C-0700-02          | 2021-06-27       | 2022-06-26           |
| Mini-Circuit          | Amplifier         | ZVA-213-S+         | 54201245           | 2020-09-05       | 2021-09-05           |
| Quinstar              | Amplifier         | QLW-18405536-JO    | 15964001001        | 2021-06-27       | 2022-06-26           |
| Farad                 | Test Software     | EZ-EMC             | V1.1.4.2           | N/A              | N/A                  |
| E-Microwave           | Band-stop Filters | OBSF-2400-2483.5-S | OE01601525         | 2021-06-16       | 2022-06-16           |
| Mini Circuits         | High Pass Filter  | VHF-6010+          | 31118              | 2021-06-16       | 2022-06-16           |

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

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

| Test Items         | Radiation Below 1GHz | Radiation Above 1GHz |
|--------------------|----------------------|----------------------|
| Temperature:       | 26.8°C               | 27.1°C               |
| Relative Humidity: | 55%                  | 54%                  |
| ATM Pressure:      | 100.6kPa             | 100.6kPa             |
| Tester:            | Johnson Huang        | Joker Chen           |
| Test Date:         | 2021-08-31           | 2021-08-30           |

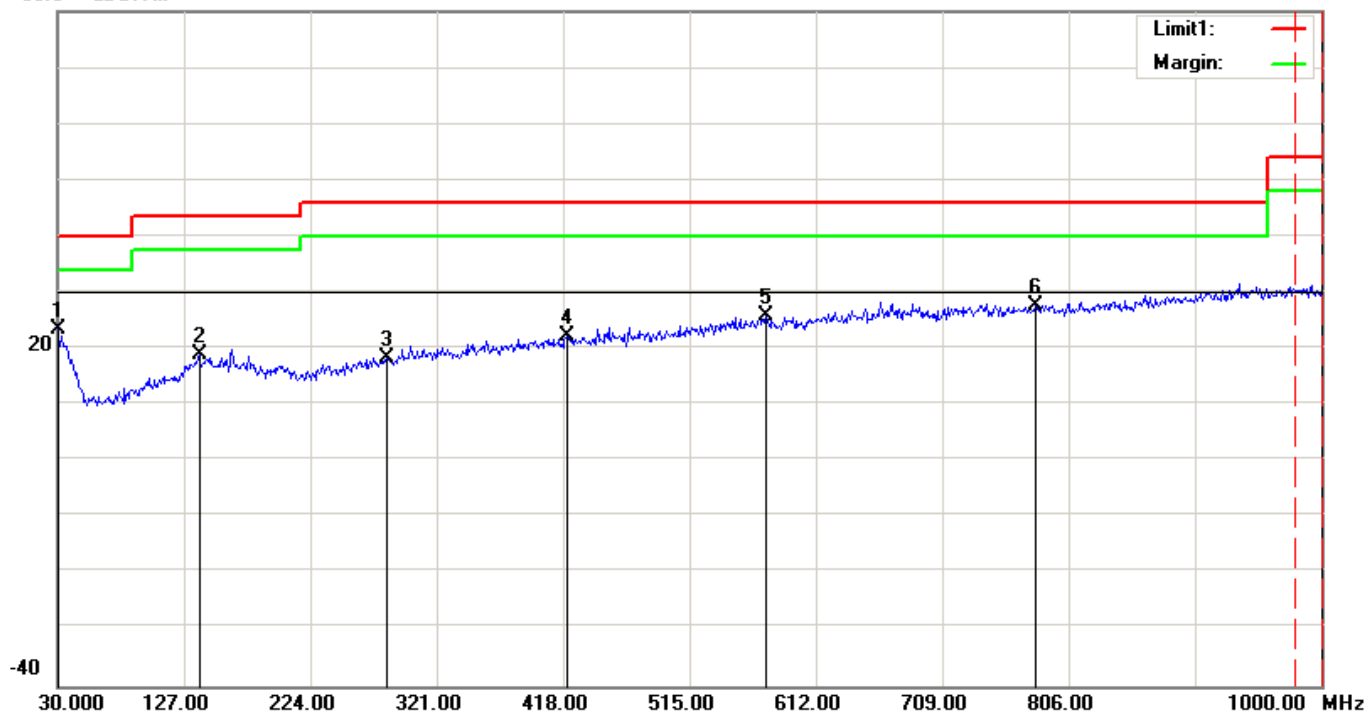
Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

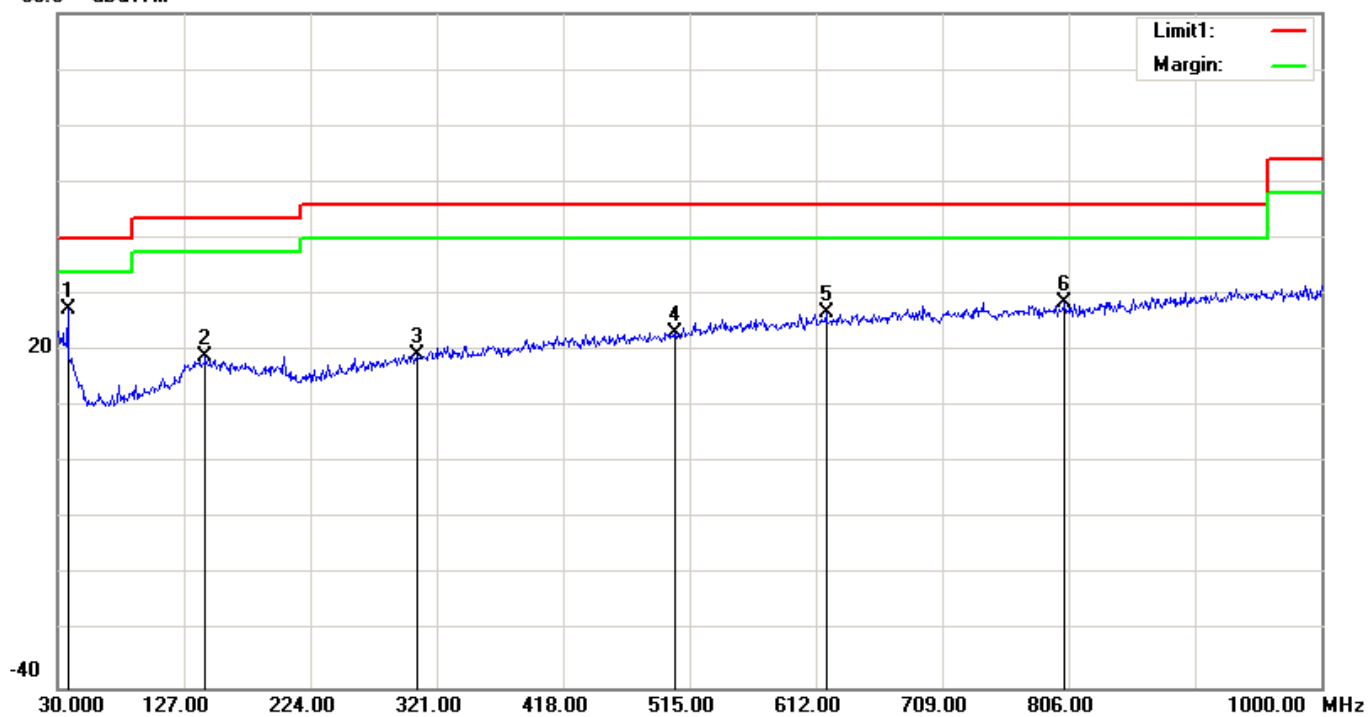
## 1) 30MHz-1GHz(2Mbps high channel was the worst)

Horizontal:

80.0 dBuV/m



| Frequency (MHz) | Receiver Reading (dBuV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|-------------------------|----------|--------------------------|---------------------|----------------|-------------|
| 30.0000         | 27.48                   | peak     | -4.06                    | 23.42               | 40.00          | 16.58       |
| 138.6400        | 28.15                   | peak     | -9.10                    | 19.05               | 43.50          | 24.45       |
| 283.1700        | 27.00                   | peak     | -8.50                    | 18.50               | 46.00          | 27.50       |
| 420.9100        | 26.83                   | peak     | -4.72                    | 22.11               | 46.00          | 23.89       |
| 574.1700        | 27.19                   | peak     | -1.49                    | 25.70               | 46.00          | 20.30       |
| 780.7800        | 26.49                   | peak     | 1.22                     | 27.71               | 46.00          | 18.29       |

**Vertical:****80.0 dBuV/m**

| Frequency (MHz) | Receiver Reading (dBuV) | Detector | Correction Factor (dB/m) | Cord. Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|-------------------------|----------|--------------------------|---------------------|----------------|-------------|
| 37.7600         | 35.30                   | peak     | -8.04                    | 27.26               | 40.00          | 12.74       |
| 143.4900        | 27.81                   | peak     | -8.92                    | 18.89               | 43.50          | 24.61       |
| 305.4800        | 26.67                   | peak     | -7.34                    | 19.33               | 46.00          | 26.67       |
| 503.3600        | 26.43                   | peak     | -3.24                    | 23.19               | 46.00          | 22.81       |
| 619.7600        | 27.32                   | peak     | -0.44                    | 26.88               | 46.00          | 19.12       |
| 803.0900        | 27.23                   | peak     | 1.23                     | 28.46               | 46.00          | 17.54       |

**2) 1-25GHz:****1Mbps:**

| Frequency<br>(MHz)       | Receiver          |          | Rx Antenna     |                  | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------------|-------------------|----------|----------------|------------------|-----------------------|---------------------------|------------------------------------|-------------------|----------------|
|                          | Reading<br>(dBμV) | Detector | Polar<br>(H/V) | Factor<br>(dB/m) |                       |                           |                                    |                   |                |
| Low Channel: 2402 MHz    |                   |          |                |                  |                       |                           |                                    |                   |                |
| 2402.00                  | 53.02             | PK       | H              | 28.10            | 1.80                  | 0.00                      | 82.92                              | N/A               | N/A            |
| 2402.00                  | 50.09             | AV       | H              | 28.10            | 1.80                  | 0.00                      | 79.99                              | N/A               | N/A            |
| 2402.00                  | 54.17             | PK       | V              | 28.10            | 1.80                  | 0.00                      | 84.07                              | N/A               | N/A            |
| 2402.00                  | 51.26             | AV       | V              | 28.10            | 1.80                  | 0.00                      | 81.16                              | N/A               | N/A            |
| 2390.00                  | 24.14             | PK       | V              | 28.08            | 1.80                  | 0.00                      | 54.02                              | 74.00             | 19.98          |
| 2390.00                  | 14.10             | AV       | V              | 28.08            | 1.80                  | 0.00                      | 43.98                              | 54.00             | 10.02          |
| 4804.00                  | 36.14             | PK       | V              | 32.91            | 3.17                  | 25.60                     | 46.62                              | 74.00             | 27.38          |
| 4804.00                  | 25.13             | AV       | V              | 32.91            | 3.17                  | 25.60                     | 35.61                              | 54.00             | 18.39          |
| 7206.00                  | 35.25             | PK       | V              | 35.74            | 4.82                  | 25.60                     | 50.21                              | 74.00             | 23.79          |
| 7206.00                  | 24.33             | AV       | V              | 35.74            | 4.82                  | 25.60                     | 39.29                              | 54.00             | 14.71          |
| Middle Channel: 2440 MHz |                   |          |                |                  |                       |                           |                                    |                   |                |
| 2440.00                  | 52.51             | PK       | H              | 28.18            | 1.82                  | 0.00                      | 82.51                              | N/A               | N/A            |
| 2440.00                  | 49.56             | AV       | H              | 28.18            | 1.82                  | 0.00                      | 79.56                              | N/A               | N/A            |
| 2440.00                  | 53.67             | PK       | V              | 28.18            | 1.82                  | 0.00                      | 83.67                              | N/A               | N/A            |
| 2440.00                  | 49.92             | AV       | V              | 28.18            | 1.82                  | 0.00                      | 79.92                              | N/A               | N/A            |
| 4880.00                  | 36.24             | PK       | V              | 33.06            | 3.27                  | 25.66                     | 46.91                              | 74.00             | 27.09          |
| 4880.00                  | 25.12             | AV       | V              | 33.06            | 3.27                  | 25.66                     | 35.79                              | 54.00             | 18.21          |
| 7320.00                  | 35.18             | PK       | V              | 36.03            | 4.62                  | 25.72                     | 50.11                              | 74.00             | 23.89          |
| 7320.00                  | 23.95             | AV       | V              | 36.03            | 4.62                  | 25.72                     | 38.88                              | 54.00             | 15.12          |
| High Channel: 2480 MHz   |                   |          |                |                  |                       |                           |                                    |                   |                |
| 2480.00                  | 52.59             | PK       | H              | 28.26            | 1.84                  | 0.00                      | 82.69                              | N/A               | N/A            |
| 2480.00                  | 49.68             | AV       | H              | 28.26            | 1.84                  | 0.00                      | 79.78                              | N/A               | N/A            |
| 2480.00                  | 53.70             | PK       | V              | 28.26            | 1.84                  | 0.00                      | 83.80                              | N/A               | N/A            |
| 2480.00                  | 50.77             | AV       | V              | 28.26            | 1.84                  | 0.00                      | 80.87                              | N/A               | N/A            |
| 2483.50                  | 26.31             | PK       | V              | 28.27            | 1.84                  | 0.00                      | 56.42                              | 74.00             | 17.58          |
| 2483.50                  | 14.55             | AV       | V              | 28.27            | 1.84                  | 0.00                      | 44.66                              | 54.00             | 9.34           |
| 4960.00                  | 35.37             | PK       | V              | 33.22            | 3.23                  | 25.63                     | 46.19                              | 74.00             | 27.81          |
| 4960.00                  | 24.48             | AV       | V              | 33.22            | 3.23                  | 25.63                     | 35.30                              | 54.00             | 18.70          |
| 7440.00                  | 35.32             | PK       | V              | 36.34            | 4.41                  | 25.85                     | 50.22                              | 74.00             | 23.78          |
| 7440.00                  | 24.30             | AV       | V              | 36.34            | 4.41                  | 25.85                     | 39.20                              | 54.00             | 14.80          |

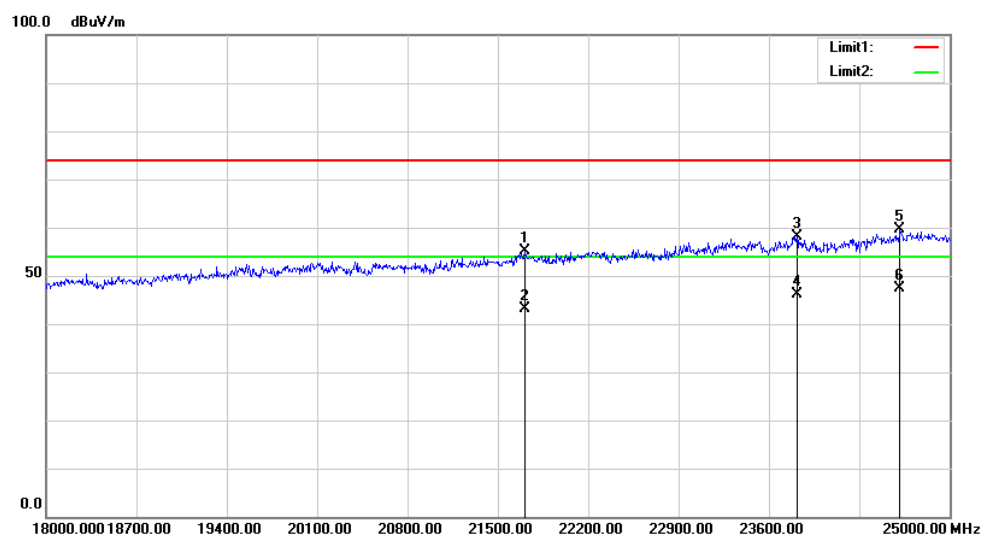
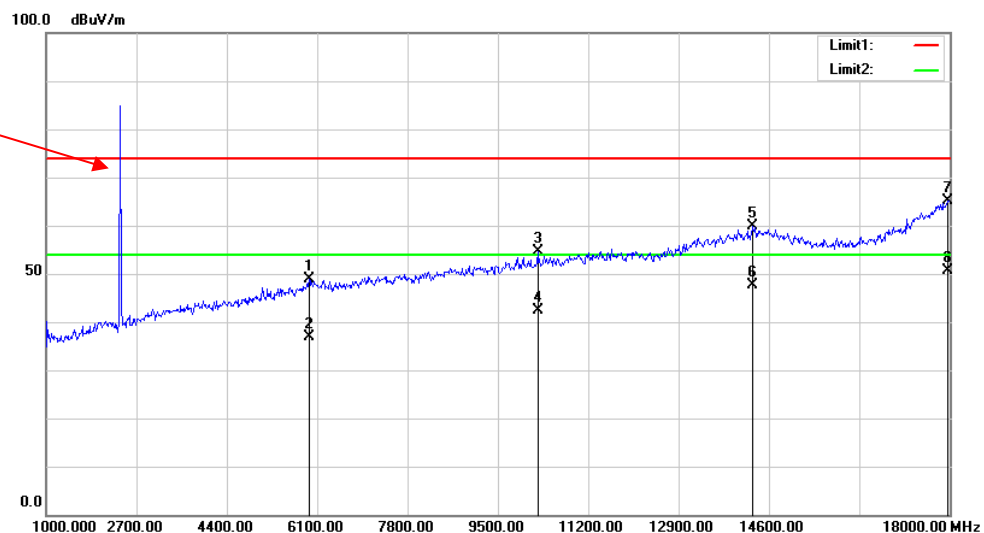
**2Mbps:**

| Frequency<br>(MHz)       | Receiver          |          | Rx Antenna     |                  | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------------|-------------------|----------|----------------|------------------|-----------------------|---------------------------|------------------------------------|-------------------|----------------|
|                          | Reading<br>(dBμV) | Detector | Polar<br>(H/V) | Factor<br>(dB/m) |                       |                           |                                    |                   |                |
| Low Channel: 2402 MHz    |                   |          |                |                  |                       |                           |                                    |                   |                |
| 2402.00                  | 53.23             | PK       | H              | 28.10            | 1.80                  | 0.00                      | 83.13                              | N/A               | N/A            |
| 2402.00                  | 50.33             | AV       | H              | 28.10            | 1.80                  | 0.00                      | 80.23                              | N/A               | N/A            |
| 2402.00                  | 54.37             | PK       | V              | 28.10            | 1.80                  | 0.00                      | 84.27                              | N/A               | N/A            |
| 2402.00                  | 51.46             | AV       | V              | 28.10            | 1.80                  | 0.00                      | 81.36                              | N/A               | N/A            |
| 2390.00                  | 25.32             | PK       | V              | 28.08            | 1.80                  | 0.00                      | 55.20                              | 74.00             | 18.80          |
| 2390.00                  | 14.17             | AV       | V              | 28.08            | 1.80                  | 0.00                      | 44.05                              | 54.00             | 9.95           |
| 4804.00                  | 35.26             | PK       | V              | 32.91            | 3.17                  | 25.60                     | 45.74                              | 74.00             | 28.26          |
| 4804.00                  | 24.32             | AV       | V              | 32.91            | 3.17                  | 25.60                     | 34.80                              | 54.00             | 19.20          |
| 7206.00                  | 35.16             | PK       | V              | 35.74            | 4.82                  | 25.60                     | 50.12                              | 74.00             | 23.88          |
| 7206.00                  | 24.28             | AV       | V              | 35.74            | 4.82                  | 25.60                     | 39.24                              | 54.00             | 14.76          |
| Middle Channel: 2440 MHz |                   |          |                |                  |                       |                           |                                    |                   |                |
| 2440.00                  | 52.25             | PK       | H              | 28.18            | 1.82                  | 0.00                      | 82.25                              | N/A               | N/A            |
| 2440.00                  | 49.37             | AV       | H              | 28.18            | 1.82                  | 0.00                      | 79.37                              | N/A               | N/A            |
| 2440.00                  | 53.41             | PK       | V              | 28.18            | 1.82                  | 0.00                      | 83.41                              | N/A               | N/A            |
| 2440.00                  | 50.58             | AV       | V              | 28.18            | 1.82                  | 0.00                      | 80.58                              | N/A               | N/A            |
| 4880.00                  | 35.15             | PK       | V              | 33.06            | 3.27                  | 25.66                     | 45.82                              | 74.00             | 28.18          |
| 4880.00                  | 24.42             | AV       | V              | 33.06            | 3.27                  | 25.66                     | 35.09                              | 54.00             | 18.91          |
| 7320.00                  | 35.07             | PK       | V              | 36.03            | 4.62                  | 25.72                     | 50.00                              | 74.00             | 24.00          |
| 7320.00                  | 24.26             | AV       | V              | 36.03            | 4.62                  | 25.72                     | 39.19                              | 54.00             | 14.81          |
| High Channel: 2480 MHz   |                   |          |                |                  |                       |                           |                                    |                   |                |
| 2480.00                  | 52.40             | PK       | H              | 28.26            | 1.84                  | 0.00                      | 82.50                              | N/A               | N/A            |
| 2480.00                  | 49.55             | AV       | H              | 28.26            | 1.84                  | 0.00                      | 79.65                              | N/A               | N/A            |
| 2480.00                  | 53.53             | PK       | V              | 28.26            | 1.84                  | 0.00                      | 83.63                              | N/A               | N/A            |
| 2480.00                  | 50.70             | AV       | V              | 28.26            | 1.84                  | 0.00                      | 80.80                              | N/A               | N/A            |
| 2483.50                  | 25.77             | PK       | V              | 28.27            | 1.84                  | 0.00                      | 55.88                              | 74.00             | 18.12          |
| 2483.50                  | 14.76             | AV       | V              | 28.27            | 1.84                  | 0.00                      | 44.87                              | 54.00             | 9.13           |
| 4960.00                  | 35.26             | PK       | V              | 33.22            | 3.23                  | 25.63                     | 46.08                              | 74.00             | 27.92          |
| 4960.00                  | 24.50             | AV       | V              | 33.22            | 3.23                  | 25.63                     | 35.32                              | 54.00             | 18.68          |
| 7440.00                  | 35.11             | PK       | V              | 36.34            | 4.41                  | 25.85                     | 50.01                              | 74.00             | 23.99          |
| 7440.00                  | 24.16             | AV       | V              | 36.34            | 4.41                  | 25.85                     | 39.06                              | 54.00             | 14.94          |

# Worst Test plots(2Mbps high channel)

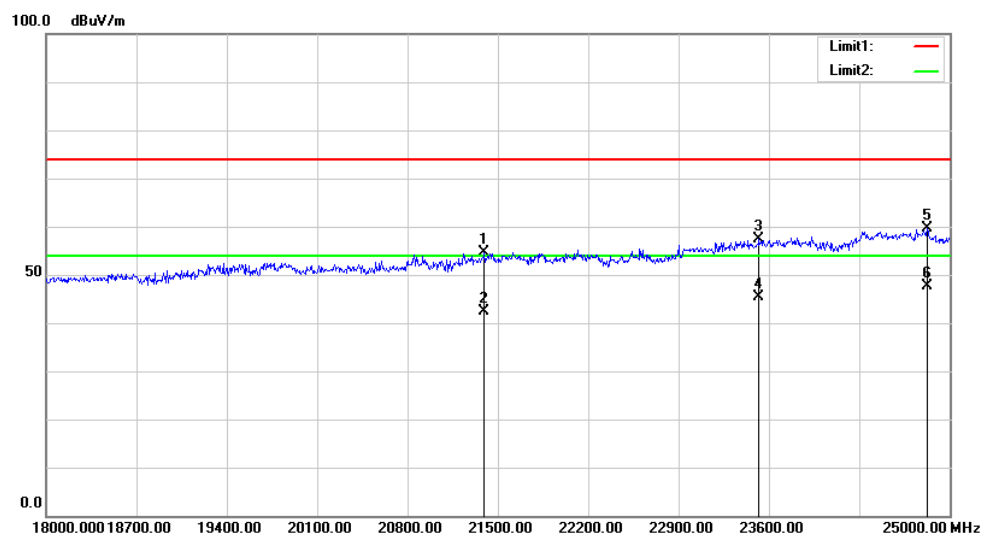
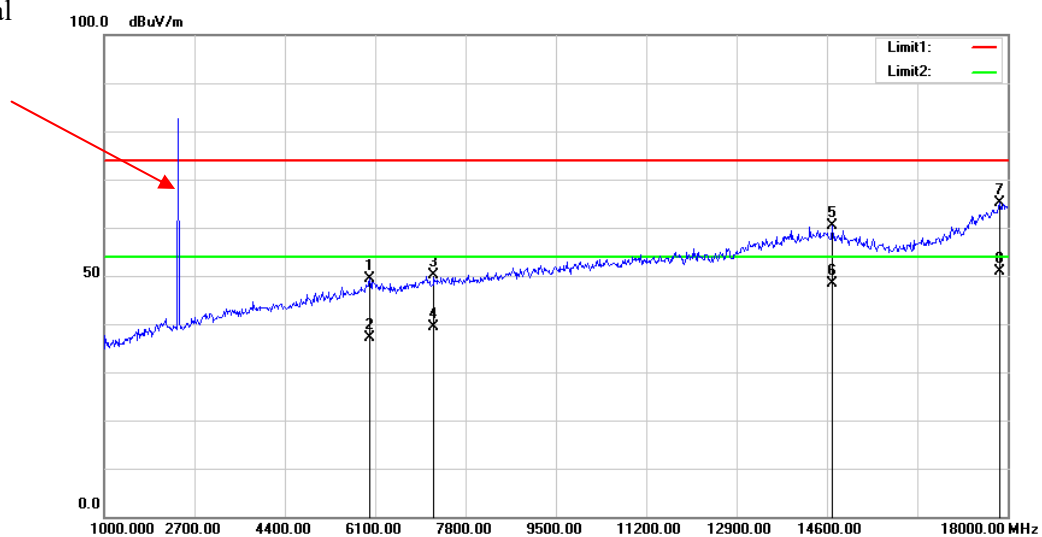
## Horizontal:

Fundamental



**Vertical:**

**Fundamental**



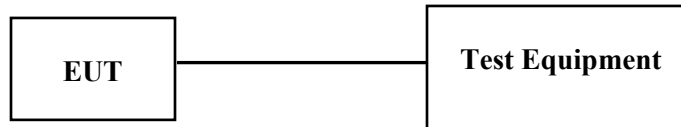
**FCC §15.247(a) (2)–6 dB EMISSION BANDWIDTH****Applicable Standard**

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**

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times \text{RBW}$ .
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**Test Equipment List and Details**

| Manufacturer | Description       | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSP 38      | 100478        | 2021-07-22       | 2022-07-21           |
| Unknown      | Coaxial Cable     | C-SJ00-0010 | C0010/02      | Each time        | N/A                  |

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

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

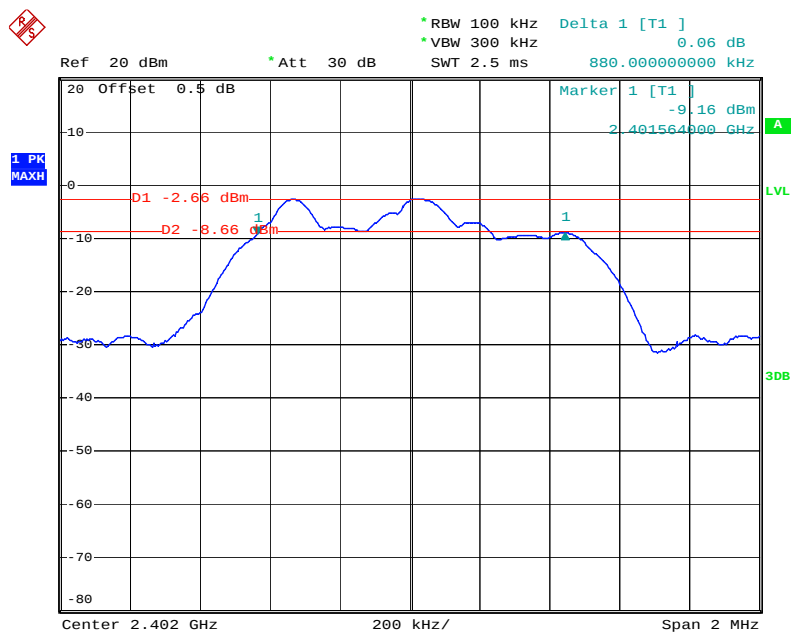
|                           |                       |
|---------------------------|-----------------------|
| <b>Temperature:</b>       | 23.8~28.4 °C          |
| <b>Relative Humidity:</b> | 54~57 %               |
| <b>ATM Pressure:</b>      | 100.5~100.6kPa        |
| <b>Tester:</b>            | CoCo Ye               |
| <b>Test Date:</b>         | 2021-08-31~2021-09-01 |

*Test Mode: Transmitting*

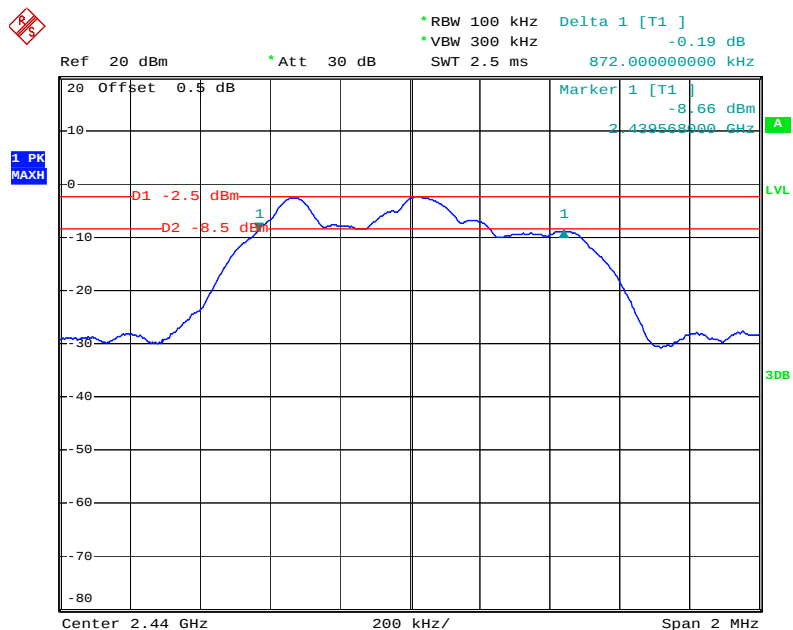
*Test Result: Compliance. Please refer to the following table and plots.*

| <b>Mode</b> | <b>Channel</b> | <b>Frequency<br/>(MHz)</b> | <b>6 dB<br/>Bandwidth<br/>(MHz)</b> | <b>Limit<br/>(MHz)</b> |
|-------------|----------------|----------------------------|-------------------------------------|------------------------|
| 1Mbps       | Low            | 2402                       | 0.880                               | ≥0.5                   |
|             | Middle         | 2440                       | 0.872                               | ≥0.5                   |
|             | High           | 2480                       | 0.888                               | ≥0.5                   |
| 2Mbps       | Low            | 2402                       | 0.936                               | ≥0.5                   |
|             | Middle         | 2440                       | 0.936                               | ≥0.5                   |
|             | High           | 2480                       | 0.936                               | ≥0.5                   |

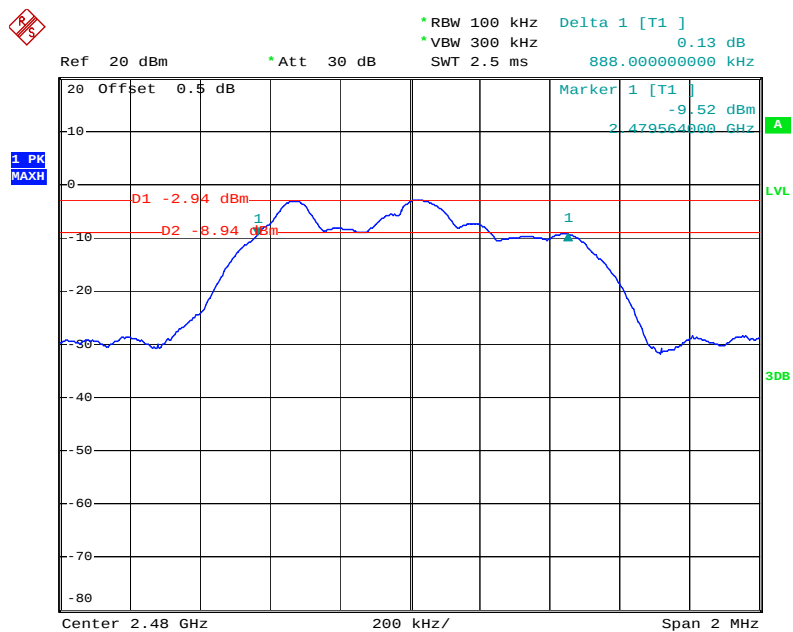
| <b>Mode</b> | <b>Channel</b> | <b>Frequency<br/>(MHz)</b> | <b>99%<br/>Bandwidth<br/>(MHz)</b> |
|-------------|----------------|----------------------------|------------------------------------|
| 2Mbps       | Low            | 2402                       | 2.04                               |
|             | Middle         | 2440                       | 2.04                               |
|             | High           | 2480                       | 2.04                               |

**6dB Emission Bandwidth:****1Mbps, Low Channel**

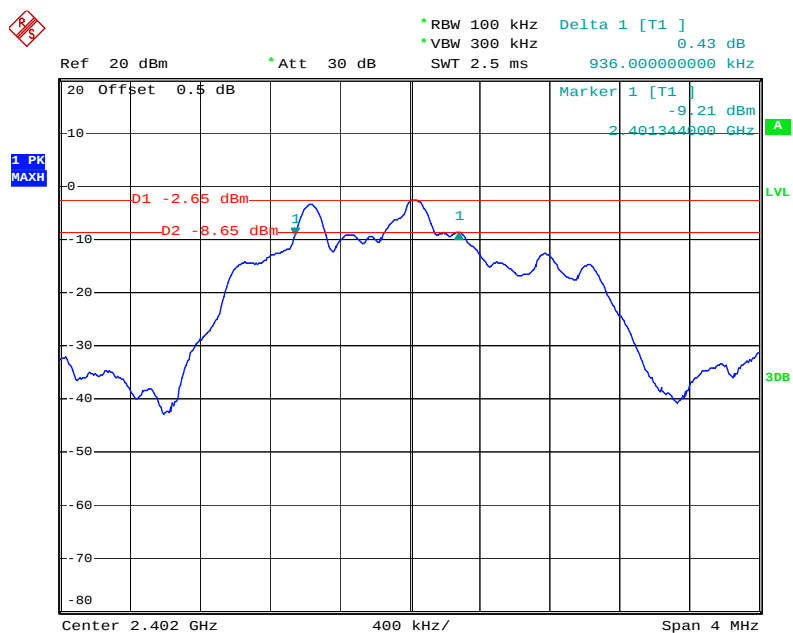
Date: 1.SEP.2021 18:03:33

**1Mbps, Middle Channel**

Date: 1.SEP.2021 18:15:01

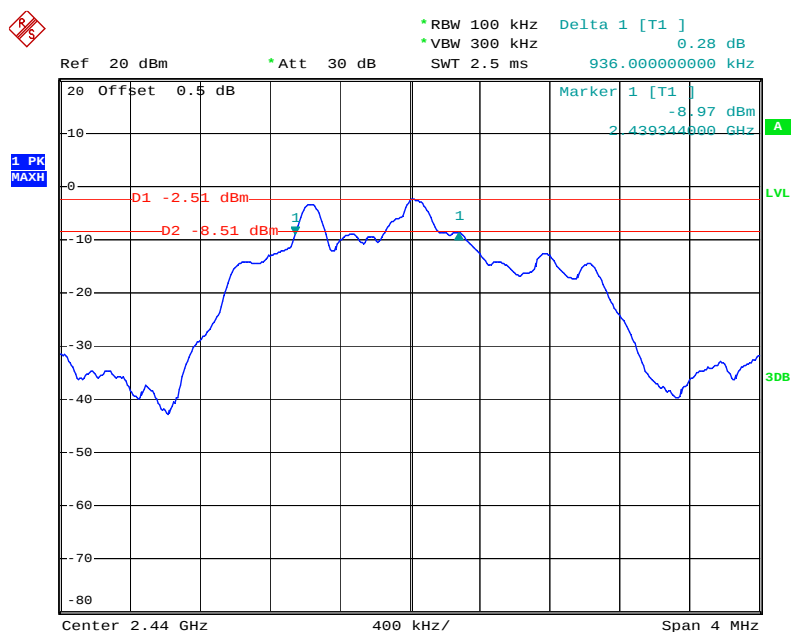
**1Mbps, High Channel**

Date: 1.SEP.2021 18:07:28

**2Mbps, Low Channel**

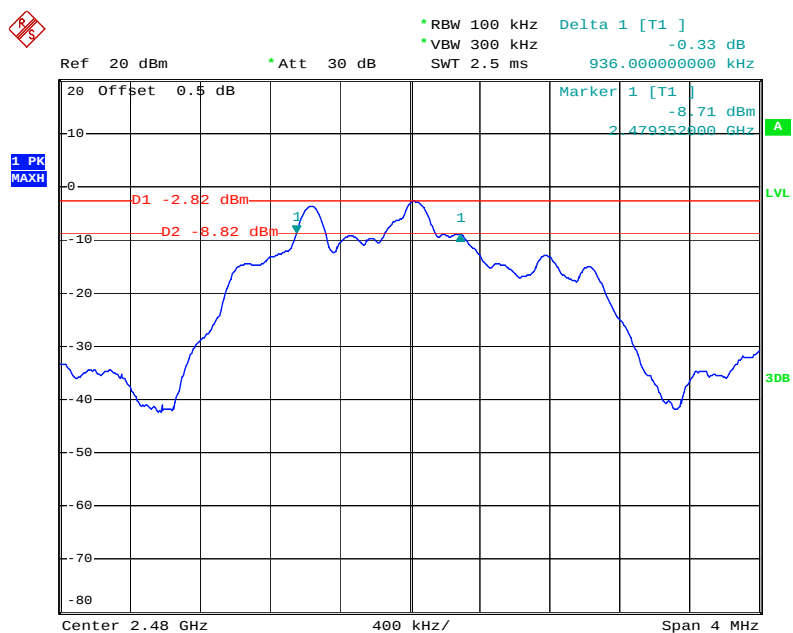
Date: 1.SEP.2021 18:17:05

## 2Mbps, Middle Channel



Date: 1.SEP.2021 18:18:39

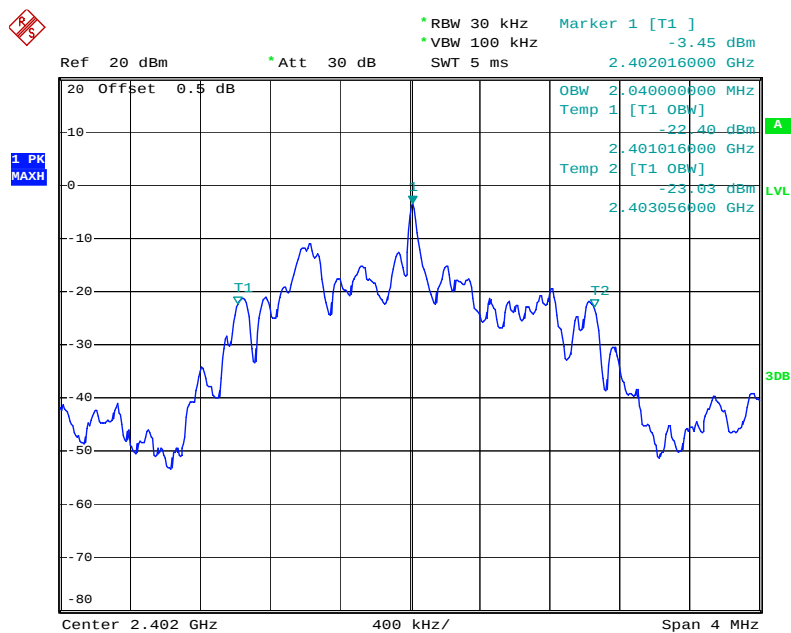
## 2Mbps, High Channel



Date: 1.SEP.2021 19:12:51

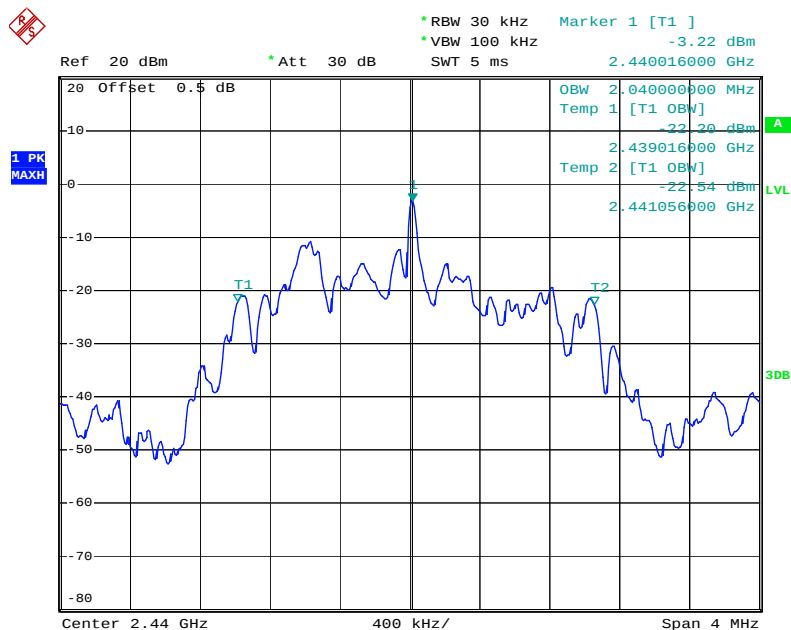
99% OBW:

## 2Mbps, Low Channel



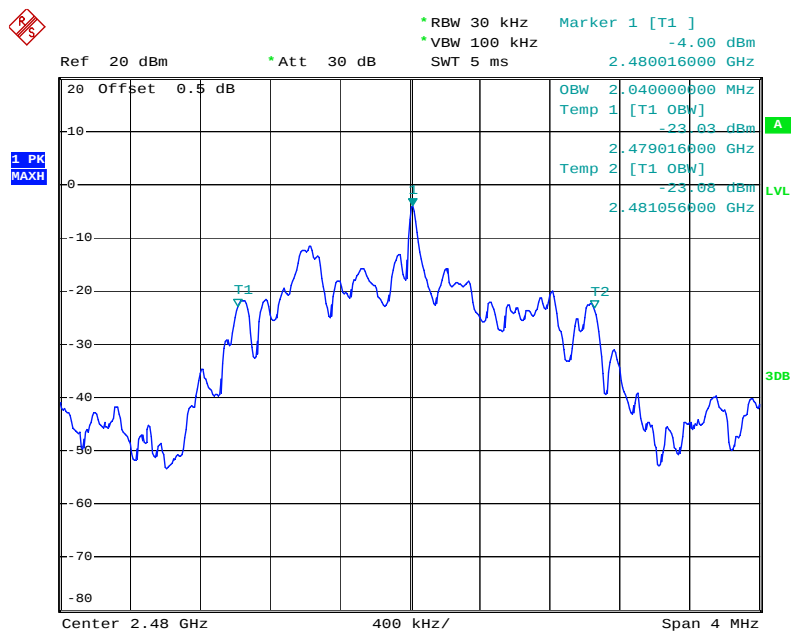
Date: 31.AUG.2021 16:49:13

## 2Mbps, Middle Channel



Date: 31.AUG.2021 16:51:29

## 2Mbps, High Channel



Date: 31.AUG.2021 16:52:46

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

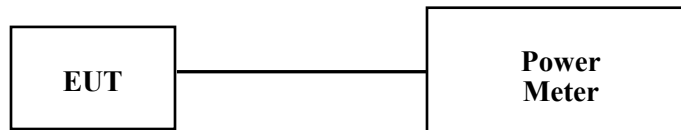
### Applicable Standard

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

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 test equipment.
3. Add a correction factor to the display.
4. Set the power meter to test average output power, record the result as average power.



### Test Equipment List and Details

| Manufacturer | Description               | Model        | Serial Number | Calibration Date | Calibration Due Date |
|--------------|---------------------------|--------------|---------------|------------------|----------------------|
| Unknown      | Coaxial Cable             | C-SJ00-0010  | C0010/02      | Each time        | N/A                  |
| E-Microwave  | Blocking Control          | EMDCB-00036  | 0E01201048    | 2021-05-06       | 2022-05-05           |
| E-Microwave  | Coaxial Attenuators       | EMCA10-5RN-6 | 0E01203239    | 2020-09-06       | 2021-09-06           |
| Agilent      | USB Wideband Power Sensor | U2022XA      | MY5417006     | 2021-07-22       | 2022-07-21           |

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

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

|                           |            |
|---------------------------|------------|
| <b>Temperature:</b>       | 23.8 °C    |
| <b>Relative Humidity:</b> | 54 %       |
| <b>ATM Pressure:</b>      | 100.5kPa   |
| <b>Tester:</b>            | CoCo Ye    |
| <b>Test Date:</b>         | 2021-09-01 |

*Test Mode: Transmitting*

*Test Result: Compliance. Please refer to the following table.*

| <b>Mode</b> | <b>Frequency<br/>(MHz)</b> | <b>Conducted Peak Output<br/>Power<br/>(dBm)</b> | <b>Limit<br/>(dBm)</b> |
|-------------|----------------------------|--------------------------------------------------|------------------------|
| 1Mbps       | 2402                       | -3.90                                            | 30                     |
|             | 2440                       | -3.62                                            | 30                     |
|             | 2480                       | -4.36                                            | 30                     |
| 2Mbps       | 2402                       | -3.71                                            | 30                     |
|             | 2440                       | -3.53                                            | 30                     |
|             | 2480                       | -4.26                                            | 30                     |

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

According to FCC§15.247(d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**Test Procedure**

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

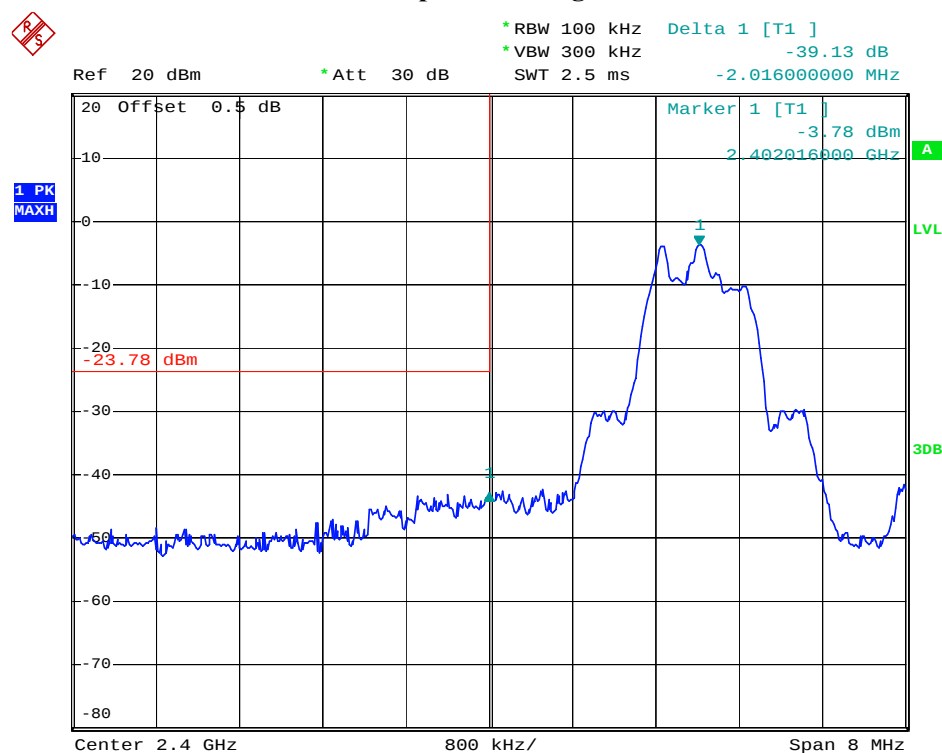
**Test Equipment List and Details**

| Manufacturer | Description       | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSP 38      | 100478        | 2021-07-22       | 2022-07-21           |
| Unknown      | Coaxial Cable     | C-SJ00-0010 | C0010/02      | Each time        | N/A                  |

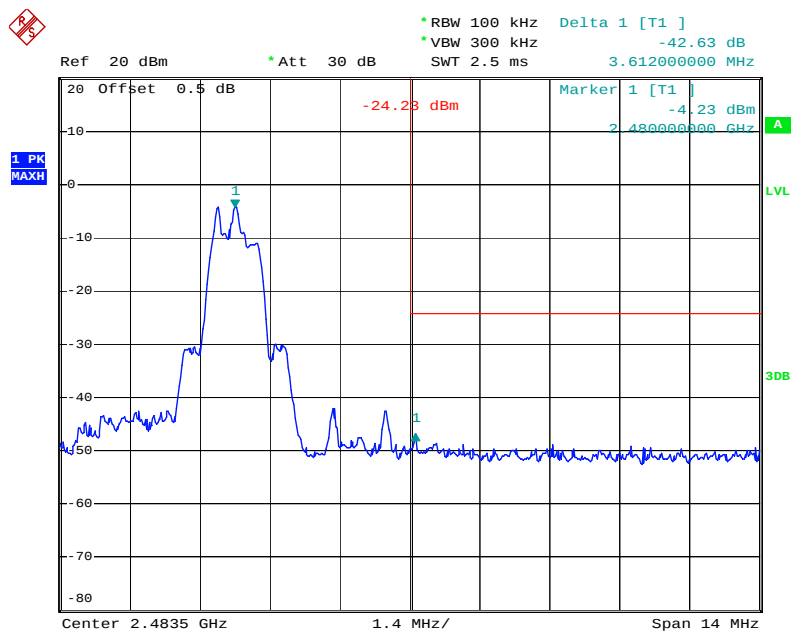
\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

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

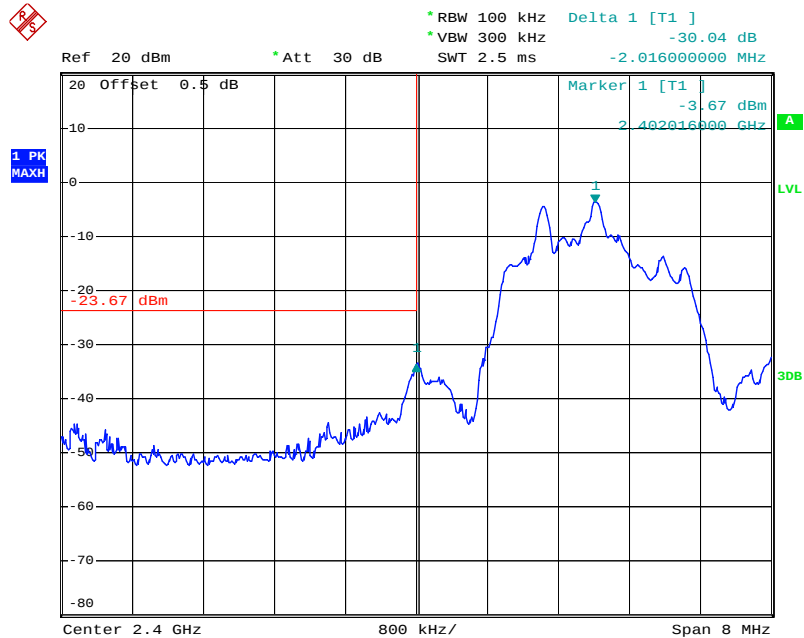
|                    |            |
|--------------------|------------|
| Temperature:       | 28.4 °C    |
| Relative Humidity: | 57 %       |
| ATM Pressure:      | 100.6kPa   |
| Tester:            | CoCo Ye    |
| Test Date:         | 2021-08-31 |

*Test mode: Transmitting**Test Result: Compliance. Please refer to following plots.***1Mbps, Band Edge, Left Side**

Date: 31.AUG.2021 16:41:14

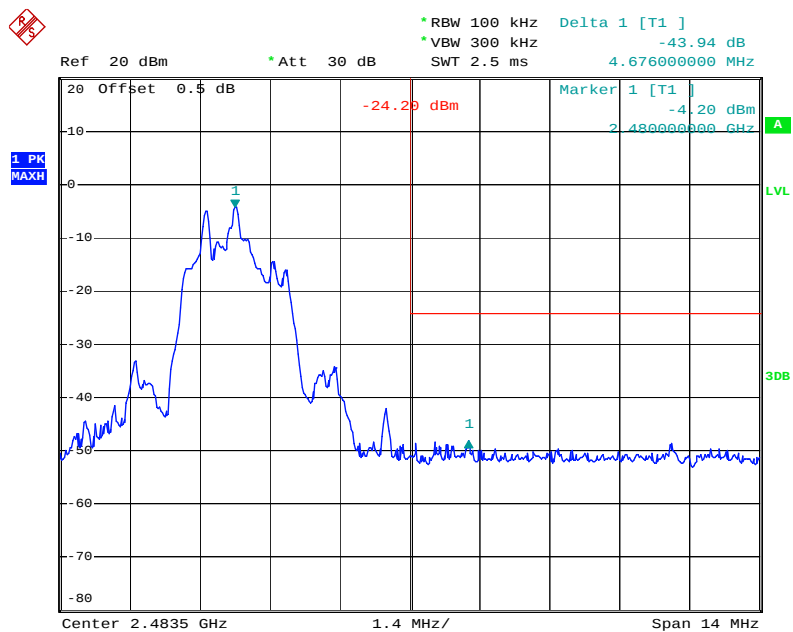
**1Mbps, Band Edge, Right Side**

Date: 31.AUG.2021 16:47:27

**2Mbps, Band Edge, Left Side**

Date: 31.AUG.2021 16:49:51

## 2Mbps, Band Edge, Right Side



Date: 31.AUG.2021 16:53:29

## 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

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 was set 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 the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

### Test Equipment List and Details

| Manufacturer | Description       | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSP 38      | 100478        | 2021-07-22       | 2022-07-21           |
| Unknown      | Coaxial Cable     | C-SJ00-0010 | C0010/02      | Each time        | N/A                  |

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

### Test Data

#### Environmental Conditions

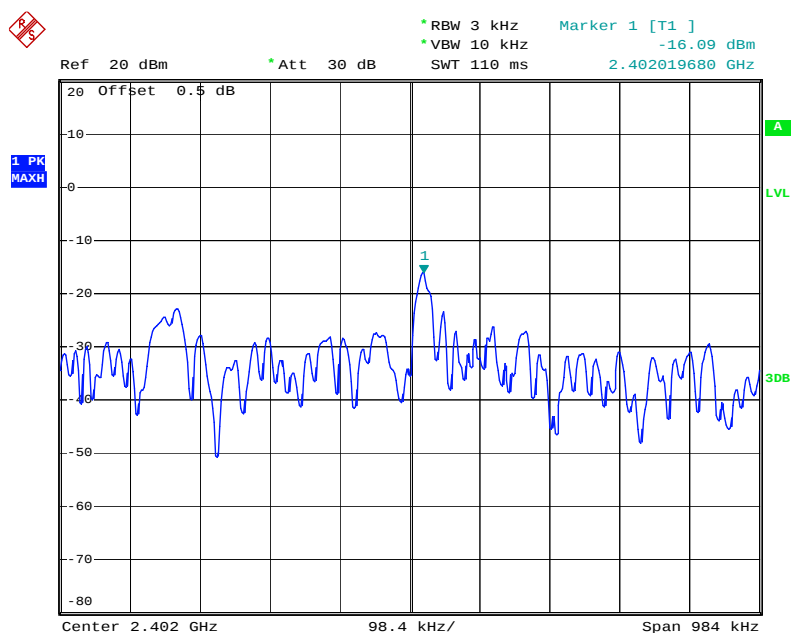
|                    |            |
|--------------------|------------|
| Temperature:       | 28.4 °C    |
| Relative Humidity: | 57 %       |
| ATM Pressure:      | 100.6kPa   |
| Tester:            | CoCo Ye    |
| Test Date:         | 2021-08-31 |

**Test Result:** Compliance. Please refer to the following table and plots

Test Mode: Transmitting

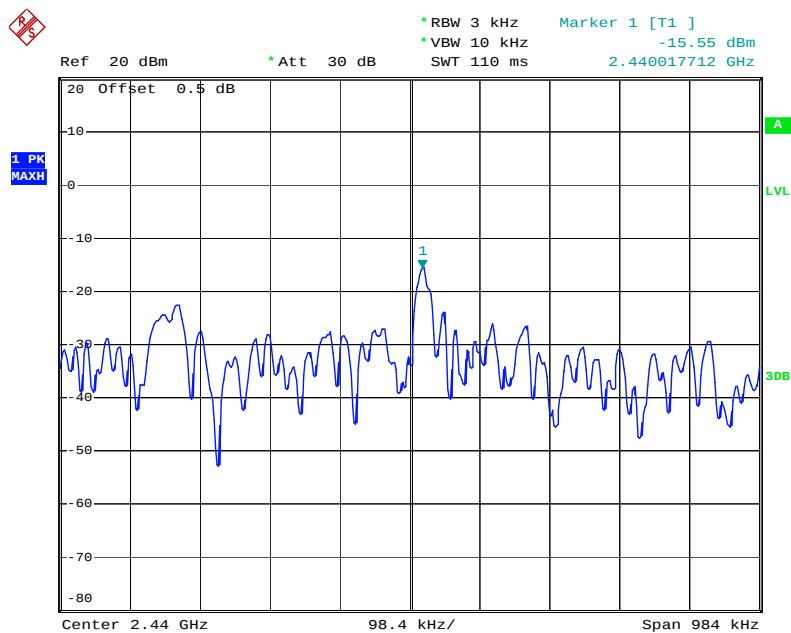
| Mode  | Frequency (MHz) | Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) |
|-------|-----------------|-----------------------------------|------------------|
| 1Mbps | 2402            | -16.09                            | ≤8               |
|       | 2440            | -15.55                            | ≤8               |
|       | 2480            | -16.58                            | ≤8               |
| 2Mbps | 2402            | -16.20                            | ≤8               |
|       | 2440            | -15.96                            | ≤8               |
|       | 2480            | -16.75                            | ≤8               |

### Power Spectral Density, 1Mbps, Low Channel



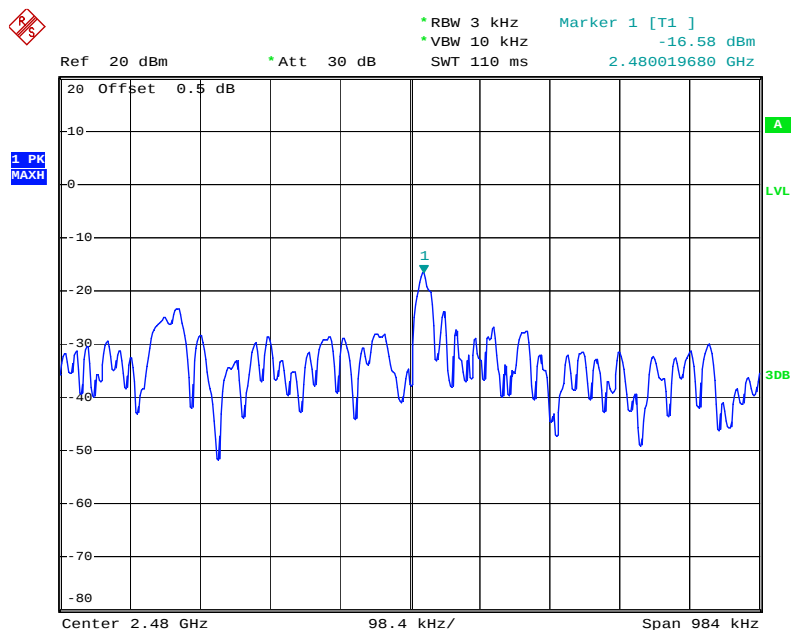
Date: 31.AUG.2021 16:40:57

### Power Spectral Density, 1Mbps, Middle Channel



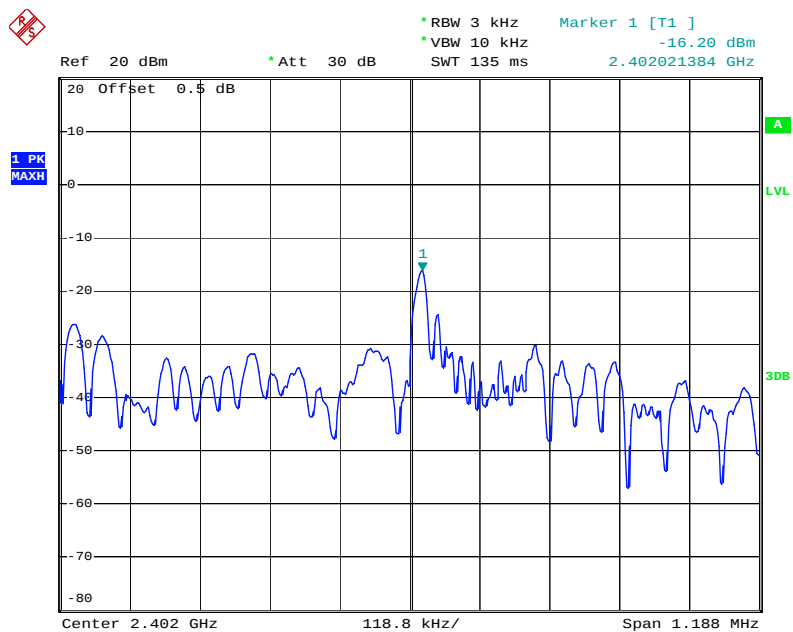
Date: 31.AUG.2021 16:45:38

### Power Spectral Density, 1Mbps, High Channel



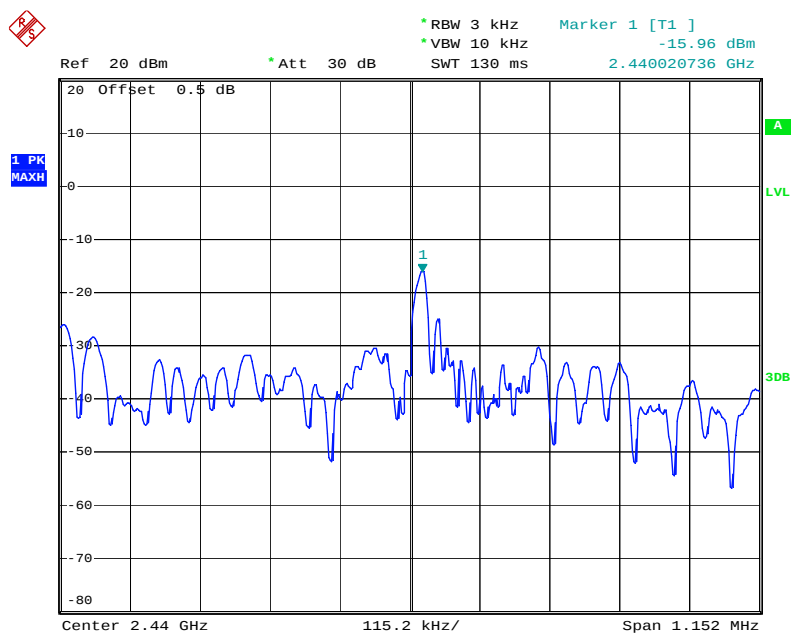
Date: 31.AUG.2021 16:47:09

## Power Spectral Density, 2Mbps, Low Channel



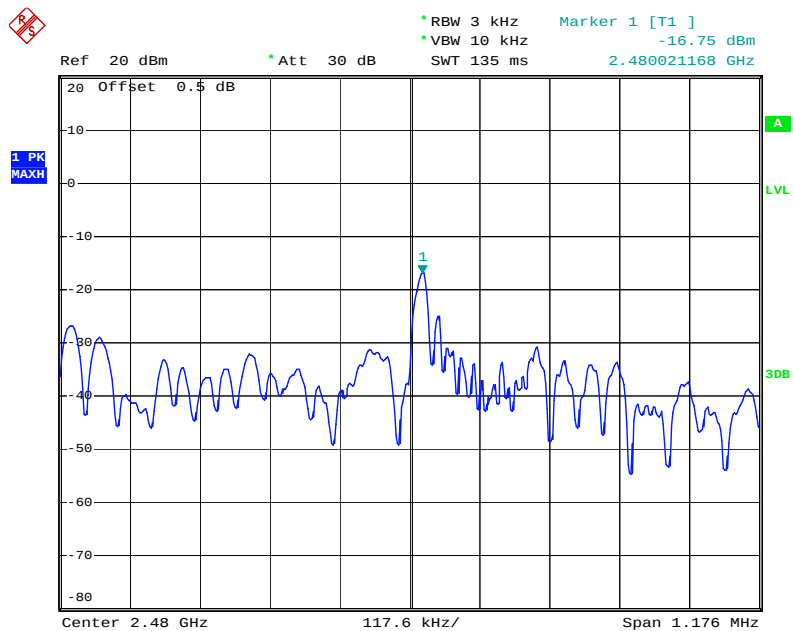
Date: 31.AUG.2021 16:49:37

## Power Spectral Density, 2Mbps, Middle Channel



Date: 31.AUG.2021 16:51:54

### Power Spectral Density, 2Mbps, High Channel



Date: 31.AUG.2021 16:53:15

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