

# TEST REPORT

Applicant Name: NINGBO WISEASIA CO., LTD.  
Address: 3F, Unit 7, No.688 Jinda Road, Yinzhou, Ningbo, China.  
Report Number: 2501R16873E-RF-00  
FCC ID: 2BH43-BT102

## Test Standard (s)

FCC PART 15.247

## Sample Description

Product Type: Ripple Wave Bluetooth Speaker RGB Lamp  
Model No.: TS-BT102-199  
Multiple Model(s) No.: N/A  
Trade Mark: N/A  
Date Received: 2025-03-17  
Issue Date: 2025-04-17

Test Result:

Pass▲

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

## Prepared and Checked By:

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Allen Bai  
RF Engineer

## Approved By:

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Michelle Zeng  
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               | 2501R16873E-RF-00 | Original Report         | 2025-04-17       |

## GENERAL INFORMATION

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

|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| UPC number                         | 194383080381                                                                                                  |
| Frequency Range                    | 2402~2480MHz                                                                                                  |
| Transmit Peak Power                | -7.48dBm                                                                                                      |
| Modulation Technique               | Bluetooth: GFSK, $\pi/4$ -DQPSK, 8DPSK                                                                        |
| Antenna Specification <sup>#</sup> | -0.58dBi (provided by the applicant)                                                                          |
| Voltage Range                      | DC 5V from USB port                                                                                           |
| Sample serial number               | 2ZYL-3 for Conducted and Radiated Emissions Test<br>2ZYL-2 for RF Conducted Test (Assigned by BACL, Shenzhen) |
| Sample/EUT Status                  | Good condition                                                                                                |
| Adapter Information                | N/A                                                                                                           |

### Objective

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

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

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

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

Each test item follows test standards and with no deviation.

## Measurement Uncertainty

| Parameter                          |                             | Uncertainty                            |
|------------------------------------|-----------------------------|----------------------------------------|
| Occupied Channel Bandwidth         |                             | 109.2kHz(k=2, 95% level of confidence) |
| RF output power, conducted         |                             | 0.86dB(k=2, 95% level of confidence)   |
| Dwell Time                         |                             | ±1%(k=2, 95% level of confidence)      |
| AC Power Lines Conducted Emissions | 9kHz-150kHz                 | 3.63dB(k=2, 95% level of confidence)   |
|                                    | 150kHz-30MHz                | 3.66dB(k=2, 95% level of confidence)   |
| Radiated Emissions                 | 0.009MHz~30MHz              | 3.60dB(k=2, 95% level of confidence)   |
|                                    | 30MHz~200MHz (Horizontal)   | 5.32dB(k=2, 95% level of confidence)   |
|                                    | 30MHz~200MHz (Vertical)     | 5.43dB(k=2, 95% level of confidence)   |
|                                    | 200MHz~1000MHz (Horizontal) | 5.77dB(k=2, 95% level of confidence)   |
|                                    | 200MHz~1000MHz (Vertical)   | 5.73dB(k=2, 95% level of confidence)   |
|                                    | 1GHz - 6GHz                 | 5.34dB(k=2, 95% level of confidence)   |
|                                    | 6GHz - 18GHz                | 5.40dB(k=2, 95% level of confidence)   |
|                                    | 18GHz - 40GHz               | 5.64dB(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

The system was configured for testing in an engineering mode.

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 40      | 2442            |
| 1       | 2403            | 41      | 2443            |
| 2       | 2404            | 42      | 2444            |
| ...     | ...             | ...     | ...             |
| ...     | ...             | ...     | ...             |
| 36      | 2438            | 75      | 2477            |
| 37      | 2439            | 76      | 2478            |
| 38      | 2440            | 77      | 2479            |
| 39      | 2441            | 78      | 2480            |

EUT was tested with Channel 0, 39 and 78.

### EUT Exercise Software

|                                |                |
|--------------------------------|----------------|
| Exercise Software <sup>#</sup> | bt_tool_v1.1.2 |
| Power Level <sup>#</sup>       | 7              |

### Special Accessories

No special accessory.

### Equipment Modifications

No modification was made to the EUT tested.

### Support Equipment List and Details

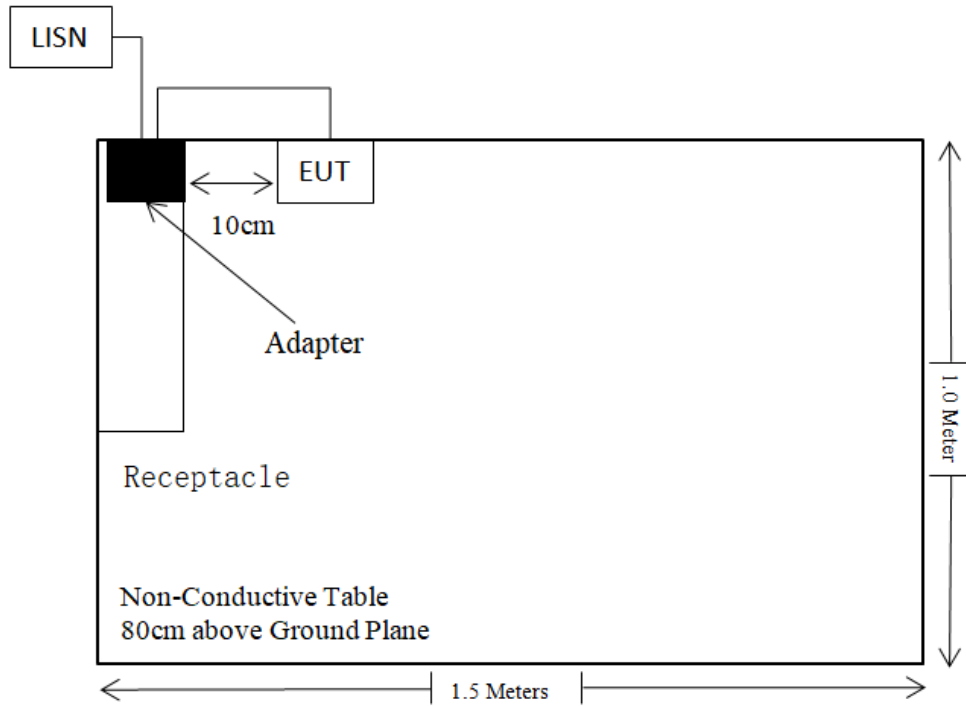
| Manufacturer | Description | Model        | Serial Number |
|--------------|-------------|--------------|---------------|
| OUPU         | Receptacle  | PDU-OP1606K  | 6971041358020 |
| UMICIGI      | Adapter     | QZ-02002AC00 | Unknown       |

### External I/O Cable

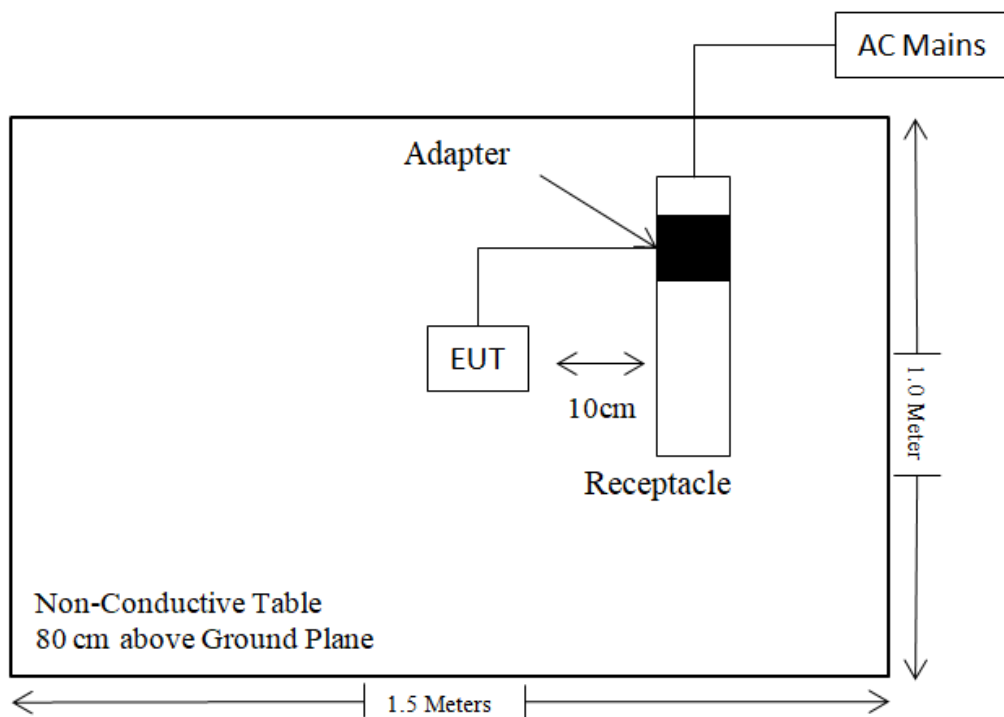
| Cable Description                | Length (m) | From Port  | To            |
|----------------------------------|------------|------------|---------------|
| Shielded Un-detachable AC Cable  | 1.0        | Receptacle | AC Mains/LISN |
| Un-shielding Detachable DC Cable | 1.0        | Adapter    | EUT           |

## Block Diagram of Test Setup

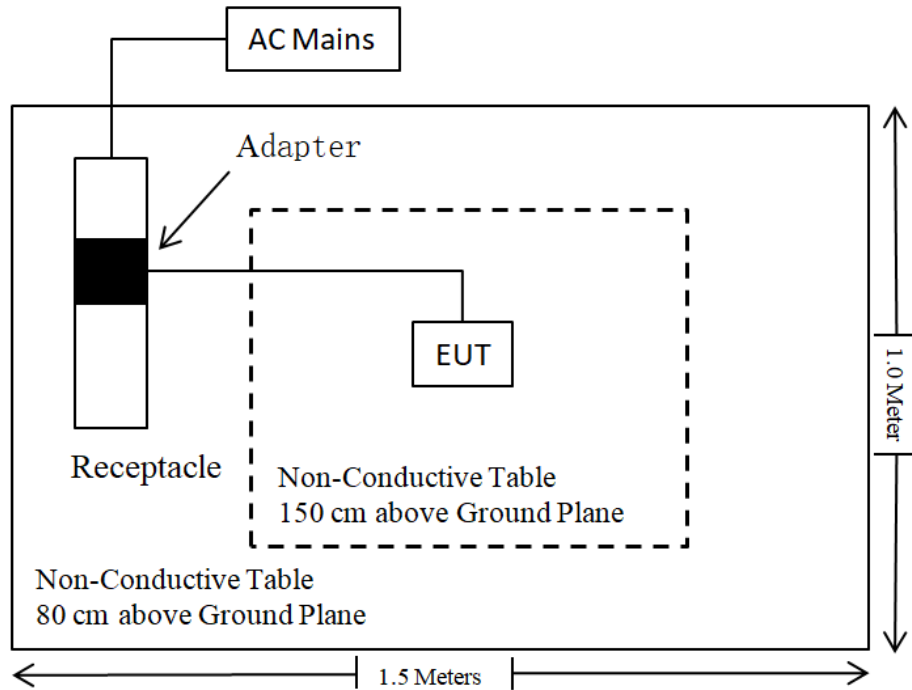
For Conducted Emissions:



For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



**SUMMARY OF TEST RESULTS**

| <b>FCC Rules</b>                          | <b>Description of Test</b>       | <b>Result</b> |
|-------------------------------------------|----------------------------------|---------------|
| FCC §15.203                               | Antenna Requirement              | Compliant     |
| FCC §15.207(a)                            | AC Line Conducted Emissions      | Compliant     |
| FCC §15.205, §15.209, §15.247(d)          | Radiated Emissions               | Compliant     |
| FCC §15.247(a)(1)                         | 20 dB Emission Bandwidth         | Compliant     |
| FCC §15.247(a)(1)                         | Channel Separation Test          | Compliant     |
| FCC §15.247(a)(1)(iii)                    | Quantity of hopping channel Test | Compliant     |
| FCC §15.247(b)(1)                         | Peak Output Power Measurement    | Compliant     |
| FCC §15.247(d)                            | Band edges                       | Compliant     |
| FCC §15.247(a)(1)(iii)                    | Time of Occupancy (Dwell Time)   | Compliant     |
| §15.247 (i), §1.1307(b)(3)(i)(A)& §2.1091 | RF Exposure                      | Compliant     |

**TEST EQUIPMENT LIST**

| Manufacturer                   | Description                       | Model           | Serial Number          | Calibration Date | Calibration Due Date |
|--------------------------------|-----------------------------------|-----------------|------------------------|------------------|----------------------|
| <b>Conducted Emission Test</b> |                                   |                 |                        |                  |                      |
| Rohde & Schwarz                | EMI Test Receiver                 | ESCI            | 101120                 | 2024/12/04       | 2025/12/03           |
| Rohde & Schwarz                | LISN                              | ENV216          | 101613                 | 2024/12/04       | 2025/12/03           |
| Rohde & Schwarz                | Transient Limiter                 | ESH3Z2          | DE25985                | 2024/05/21       | 2025/05/20           |
| Unknown                        | CE Cable                          | Unknown         | UF A210B-1-0720-504504 | 2024/05/21       | 2025/05/20           |
| Audix                          | EMI Test software                 | E3              | 191218(V9)             | NCR              | NCR                  |
| <b>Radiated Emission Test</b>  |                                   |                 |                        |                  |                      |
| Rohde & Schwarz                | EMI Test Receiver                 | ESR3            | 102455                 | 2024/12/04       | 2025/12/03           |
| Sonoma instrument              | Pre-amplifier                     | 310N            | 186238                 | 2024/05/21       | 2025/05/20           |
| Sunol Sciences                 | Broadband Antenna                 | JB1             | A040904-1              | 2023/07/20       | 2026/07/19           |
| Unknown                        | Cable                             | XH500C          | J-10M-A                | 2024/06/18       | 2025/06/17           |
| BACL                           | Active Loop Antenna               | 1313-1A         | 4031911                | 2024/05/14       | 2027/05/13           |
| Unknown                        | Cable                             | 2Y194           | 0735                   | 2024/12/04       | 2025/12/03           |
| Unknown                        | Cable                             | PNG214          | 1354                   | 2024/12/04       | 2025/12/03           |
| Rohde&Schwarz                  | Spectrum Analyzer                 | FSV40           | 101605                 | 2025/03/26       | 2026/03/25           |
| A.H.System                     | Preamplifier                      | PAM-0118P       | 489                    | 2024/11/15       | 2025/11/14           |
| Schwarzbeck                    | Horn Antenna                      | BBHA9120D(1201) | 1143                   | 2023/07/26       | 2026/07/25           |
| Unknown                        | RF Cable                          | KMSE            | 0735                   | 2024/12/06       | 2025/12/05           |
| Unknown                        | RF Cable                          | UFA147          | 219661                 | 2024/12/06       | 2025/12/05           |
| Unknown                        | RF Cable                          | XH750A-N        | J-10M                  | 2024/12/06       | 2025/12/05           |
| JD                             | Multiplex Switch Test Control Set | DT7220FSU       | DQ77926                | 2024/06/18       | 2025/06/17           |
| JD                             | Multiplex Switch Test Control Set | DT7220SCU       | DS79903                | 2024/09/09       | 2025/09/08           |
| A.H.System                     | Pre-amplifier                     | PAM-1840VH      | 190                    | 2024/06/18       | 2025/06/17           |
| Electro-Mechanics Co           | Horn Antenna                      | 3116            | 9510-2270              | 2023/09/18       | 2026/09/17           |
| UTIFLEX                        | RF Cable                          | NO. 13          | 232308-001             | 2024/12/18       | 2025/12/17           |
| Audix                          | EMI Test software                 | E3              | 191218(V9)             | NCR              | NCR                  |
| <b>RF Conducted Test</b>       |                                   |                 |                        |                  |                      |
| Rohde&Schwarz                  | Spectrum Analyzer                 | FSV40-N         | 102259                 | 2024/12/04       | 2025/12/03           |
| Unknown                        | 10dB Attenuator                   | Unknown         | F-03-EM190             | 2024/06/27       | 2025/06/26           |

**\* 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).

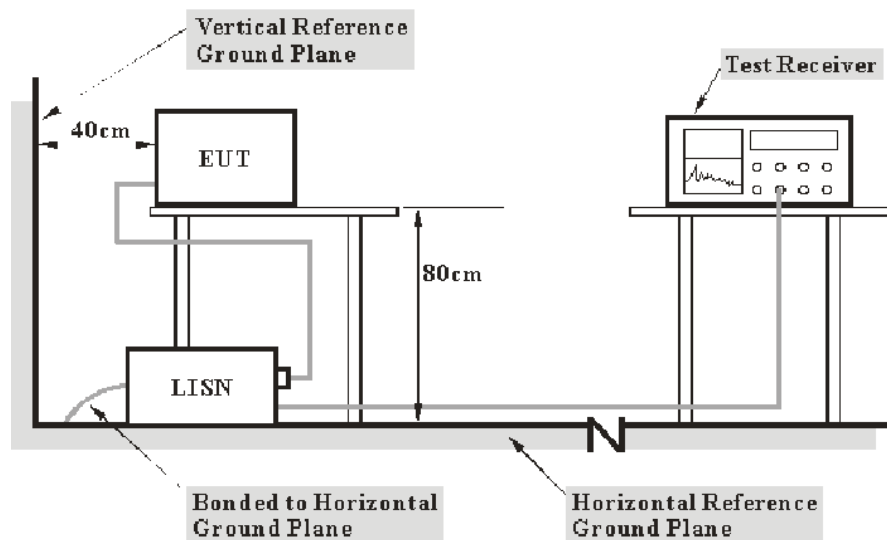
## REQUIREMENTS AND TEST PROCEDURES

### AC Line Conducted Emissions

#### Applicable Standard

FCC §15.207(a)

#### 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 measurement procedure of EUT setup is according with ANSI C63.10-2020. The related limit was specified in FCC Part 15.207.

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

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

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

**Factor & Over Limit Calculation**

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

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

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

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

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

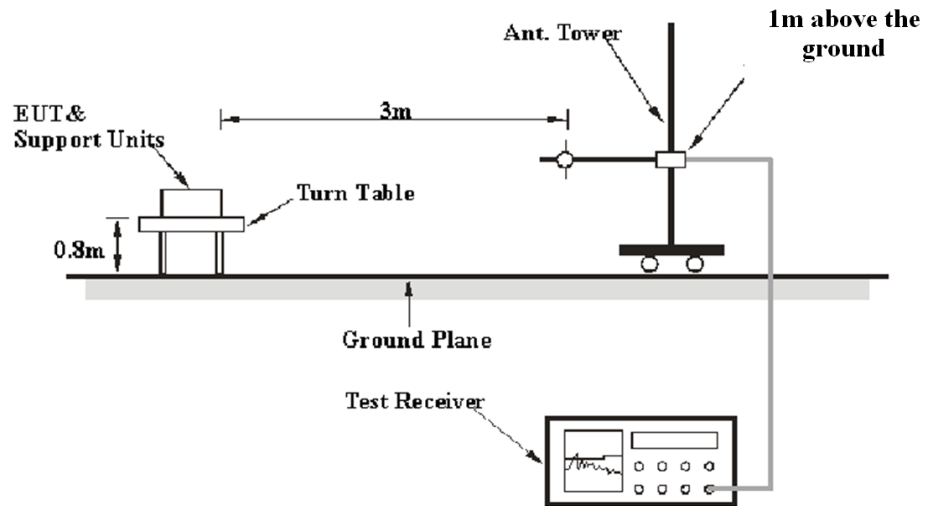
## Radiated Emissions

### Applicable Standard

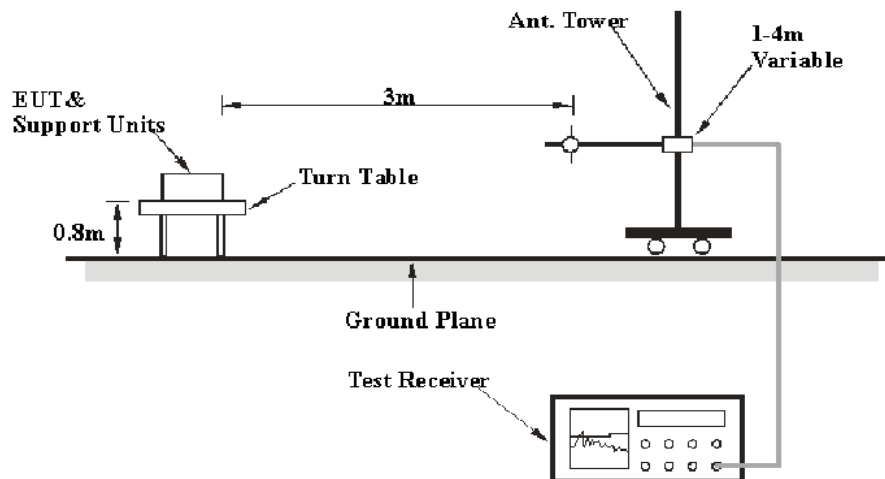
FCC §15.205; §15.209; §15.247(d)

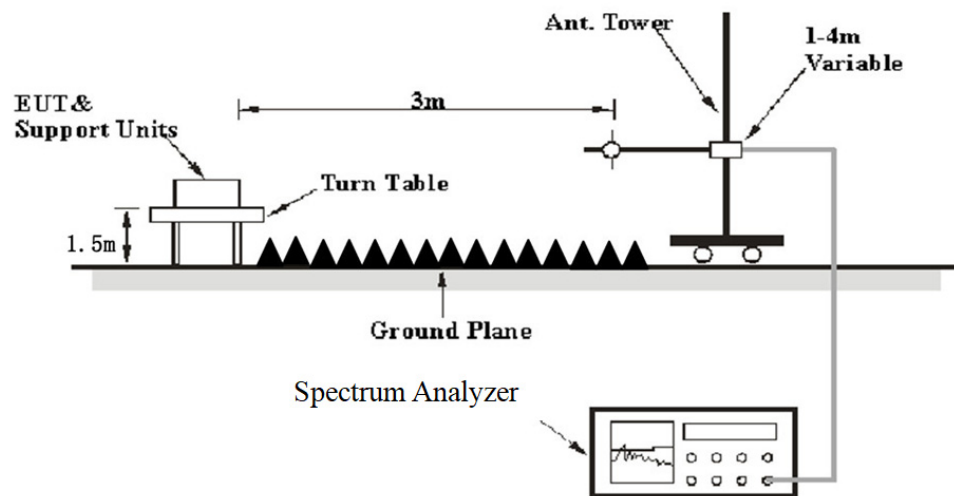
### EUT Setup

9 kHz-30MHz:



30MHz-1GHz:



**Above 1GHz:**

The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2020. The specification used was the FCC 15.209 and FCC 15.247 limits.

**EMI Test Receiver & Spectrum Analyzer Setup**

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range   | RBW                                                           | Video B/W | IF B/W  | Measurement | Detector |
|-------------------|---------------------------------------------------------------|-----------|---------|-------------|----------|
| 9 kHz – 150 kHz   | /                                                             | /         | 200 Hz  | QP          | QP       |
|                   | 300 Hz                                                        | 1 kHz     | /       | PK          | Peak     |
| 150 kHz – 30 MHz  | /                                                             | /         | 9 kHz   | QP          | QP       |
|                   | 10 kHz                                                        | 30 kHz    | /       | PK          | Peak     |
| 30 MHz – 1000 MHz | /                                                             | /         | 120 kHz | QP          | QP       |
|                   | 100 kHz                                                       | 300 kHz   | /       | PK          | Peak     |
| Above 1 GHz       | Harmonics                                                     |           |         |             |          |
|                   | 1MHz                                                          | 3 MHz     | /       | PK          | Peak     |
|                   | Average Emission Level=Peak Emission Level+20*log(Duty cycle) |           |         |             |          |
|                   | Band Edge & Other Emissions                                   |           |         |             |          |
|                   | 1MHz                                                          | 3 MHz     | /       | PK          | Peak     |
|                   | 1MHz                                                          | ≥10 Hz    | /       | Average     | Peak     |

For Duty cycle measurement:

Use the duty cycle factor correction factor method per 15.35(c).

Duty cycle=On time/100milliseconds, On time= $N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n$ ,

Where  $N_1$  is number of type 1 pulses,  $L_1$  is length of type 1 pulse, etc.

**Test Procedure**

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

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

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

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.

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

**Factor & Over Limit/Margin Calculation**

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

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

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

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

## 20 dB Emission Bandwidth

### Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

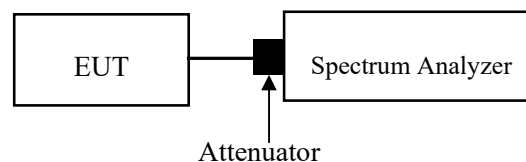
### Test Procedure

Test Method: ANSI C63.10-2020 Clause 6.9.2

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be at least three times RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  below the reference level. Specific guidance is given in 4.1.6.2.
- d) Steps a) through c) might require iteration to adjust within the specified tolerances.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Set detection mode to peak and trace mode to max-hold.
- g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- h) Determine the “-xx dB down amplitude” using  $[(\text{reference value}) - \text{xx}]$ . Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).

j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “-xx dB down amplitude” determined in step h). If a marker is below this “-xx dB down amplitude” value, then it shall be as close as possible to this value. The dBc bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “-xx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

k) The dBc bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



## Channel Separation Test

### Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

### Test Procedure

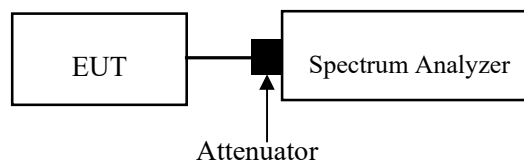
Test Method: ANSI C63.10-2020 Clause 7.8.2

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Wide enough to capture the peaks of two adjacent channels.
- b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- c) Video (or average) bandwidth (VBW)  $\geq$  RBW.
- d) Sweep: No faster than coupled (auto) time.
- e) Detector function: Peak.
- f) Trace: Max-hold.
- g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A spectral plot of the data shall be included in the test report.

Where the device shares the same channel plan (carrier frequencies and number of channels) across multiple data rates or modulation schemes then the carrier separation need only be measured for one of those modulation schemes or data rates.



Note: The limit is  $\frac{2}{3} \times 20$  dB bandwidth

## Quantity of Hopping Channel Test

### Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### Test Procedure

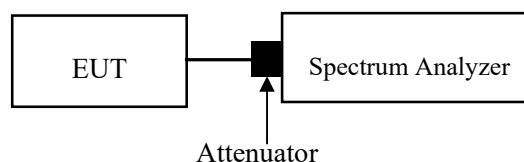
Test Method: ANSI C63.10-2020 Clause 7.8.3

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: The frequency band of operation. Depending on the number of channels the device supports, it could be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- c) VBW  $\geq$  RBW.
- d) Sweep: No faster than coupled (auto) time.
- e) Detector function: Peak.
- f) Trace: Max-hold.
- g) Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A spectral plot of the data shall be included in the test report.

Where the device shares the same channel plan (carrier frequencies and number of channels) across multiple data rates or modulation schemes then the number of channels need only be measured for one of those modulation schemes or data rates.



## Time of Occupancy (Dwell Time)

### Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### Test Procedure

Test Method: ANSI C63.10-2020 Clause 7.8.4

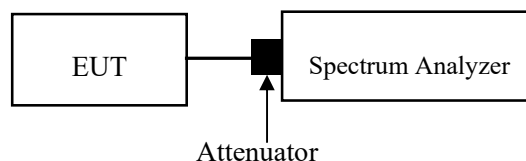
Use the following spectrum analyzer settings to determine the dwell time per hop:

- a) Span: Zero span, centered on a hopping channel.
- b) RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $\gg 1 / T$ , where T is the expected transmission time per hop.
- c) Sweep time: Set so that the start of the first transmission and end of the last transmission for the hop are clearly captured. Setting the sweep time to be slightly longer than the hopping period per channel (hopping period =  $1/\text{hopping rate}$ ) should achieve this.
- d) Use a video trigger, where possible with a trigger delay, so that the start of the transmission is clearly observed. The trigger level might need adjustment to reduce the chance of triggering when the system hops on an adjacent channel.
- e) Detector function: Peak.
- f) Trace: Clear-write, single sweep.
- g) Place markers at the start of the first transmission on the channel and at the end of the last transmission. The dwell time per hop is the time between these two markers.

To determine the number of hops on a channel in the regulatory observation period repeat the measurement using a longer sweep time. When the device uses a single hopping sequence the period of measurement should be sufficient to capture at least 2 hops. When the device uses a dynamic hopping sequence, or the sequence varies, the period of measurement may need to capture multiple hops to better determine the average time of occupancy. Count the number of hops on the channel across the sweep time.

The average number of hops on the same channel within the regulatory observation period is calculated from the number of hops on the channel divided by the spectrum analyzer sweep time multiplied by the regulatory observation period. For example, if three hops are counted with an analyzer sweep time of 500 ms and the regulatory observation period is 10 s, then the number of hops in that ten seconds is  $3 / 0.5 \times 10$ , or 60 hops.

The average time of occupancy is calculated by multiplying the dwell time per hop by the number of hops in the observation period.



## Peak Output Power Measurement

### Applicable Standard

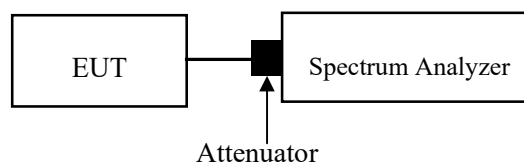
According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

### Test Procedure

Test Method: ANSI C63.10-2020 Clause 7.8.5

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. Frequency hopping shall be disabled for this test. Use the following spectrum analyzer settings:

- a) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- b) RBW > 20 dB bandwidth of the emission being measured.
- c) VBW  $\geq$  RBW.
- d) Sweep: No faster than coupled (auto) time.
- e) Detector function: Peak.
- f) Trace: Max-hold.
- g) Allow trace to stabilize.
- h) Use the marker-to-peak function to set the marker to the peak of the emission.
- i) The indicated level is the peak output power, after any corrections for external attenuators and cables.
- j) A spectral plot of the test results and setup description shall be included in the test report.



Note: A short RF cable with low cable loss connected to the EUT antenna port, which was provided by client or lab, the cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable loss

## Band Edges

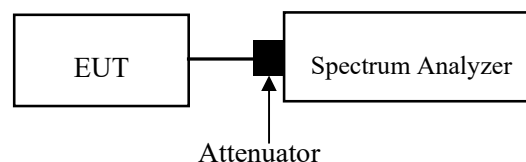
### Applicable Standard

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 C63.10-2020 Clause 7.8.7.2 & Clause 6.10

- 1) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products that fall outside of the authorized band of operation.
- 2) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW/RBW})]$  below the reference level. Specific guidance is given in 4.1.6.2.
- 3) Attenuation: Auto (at least 10 dB preferred).
- 4) Sweep time: No faster than coupled (auto) time.
- 5) Resolution bandwidth: 100 kHz.
- 6) Video bandwidth: 300 kHz.
- 7) Detector: Peak.
- 8) Trace: Max-hold.



## **ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to FCC § 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 use of a standard antenna jack or electrical connector is prohibited.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### **Antenna Connector Construction**

The EUT has an internal antenna arrangement, which was permanently attached, the antenna gain<sup>#</sup> is -0.58dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result: Compliant**

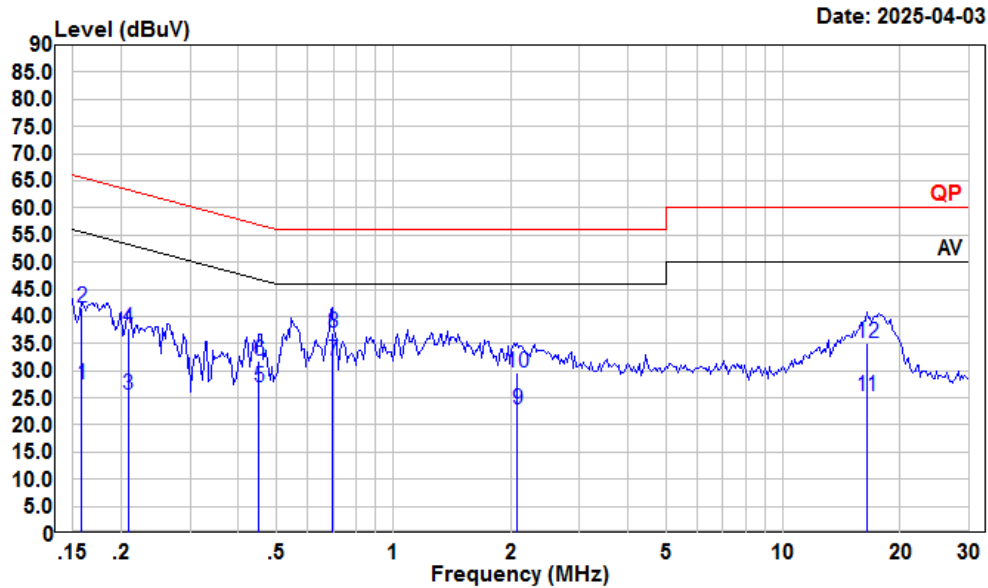
## TEST DATA AND RESULTS

### AC Line Conducted Emissions

#### Environmental Conditions

|                               |                                                                   |                                  |          |
|-------------------------------|-------------------------------------------------------------------|----------------------------------|----------|
| <b>Temperature<br/>(°C)</b>   | 22.1                                                              | <b>Relative Humidity<br/>(%)</b> | 54       |
| <b>ATM Pressure<br/>(kPa)</b> | 101.3                                                             | <b>Test engineer</b>             | Macy.shi |
| <b>Test date</b>              | 2025/4/3                                                          |                                  |          |
| <b>EUT operation mode</b>     | Transmitting(Maximum output power mode, EDR (8DPSK) High Channel) |                                  |          |

## AC 120V 60 Hz, Line



Condition: Line

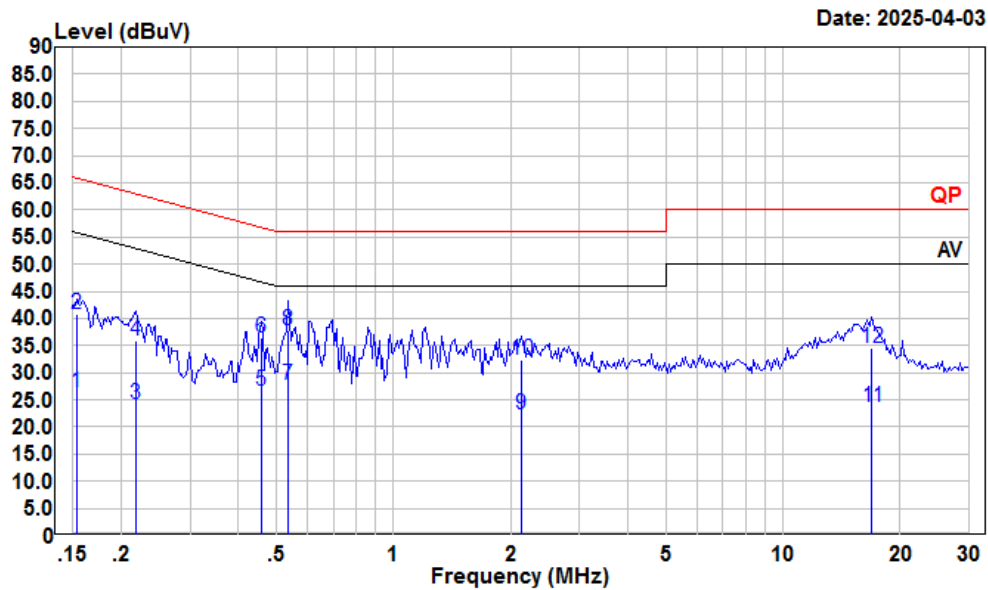
Project : 2501R16873E-RF

tester : Macy.shi Note:Transmitting

Setting : RBW:9kHz

|    |        | Read  |       | LISN   | Cable | Limit | Over   |         |
|----|--------|-------|-------|--------|-------|-------|--------|---------|
|    | Freq   | Level | Level | Factor | Loss  | Line  | Limit  | Remark  |
|    | MHz    | dBuV  | dBuV  | dB     | dB    | dBuV  | dB     |         |
| 1  | 0.158  | 6.76  | 27.34 | 10.46  | 10.12 | 55.56 | -28.22 | Average |
| 2  | 0.158  | 20.97 | 41.55 | 10.46  | 10.12 | 65.56 | -24.01 | QP      |
| 3  | 0.208  | 4.84  | 25.62 | 10.69  | 10.09 | 53.27 | -27.65 | Average |
| 4  | 0.208  | 16.96 | 37.74 | 10.69  | 10.09 | 63.27 | -25.53 | QP      |
| 5  | 0.452  | 6.18  | 26.82 | 10.52  | 10.12 | 46.85 | -20.03 | Average |
| 6  | 0.452  | 11.30 | 31.94 | 10.52  | 10.12 | 56.85 | -24.91 | QP      |
| 7  | 0.697  | 10.77 | 31.82 | 10.90  | 10.15 | 46.00 | -14.18 | Average |
| 8  | 0.697  | 15.91 | 36.96 | 10.90  | 10.15 | 56.00 | -19.04 | QP      |
| 9  | 2.077  | 1.54  | 22.82 | 11.09  | 10.19 | 46.00 | -23.18 | Average |
| 10 | 2.077  | 8.27  | 29.55 | 11.09  | 10.19 | 56.00 | -26.45 | QP      |
| 11 | 16.398 | 4.63  | 25.36 | 10.52  | 10.21 | 50.00 | -24.64 | Average |
| 12 | 16.398 | 14.36 | 35.09 | 10.52  | 10.21 | 60.00 | -24.91 | QP      |

## AC 120V 60 Hz, Neutral



Condition: Neutral

Project : 2501R16873E-RF

tester : Macy.shi Note:Transmitting

Setting : RBW:9kHz

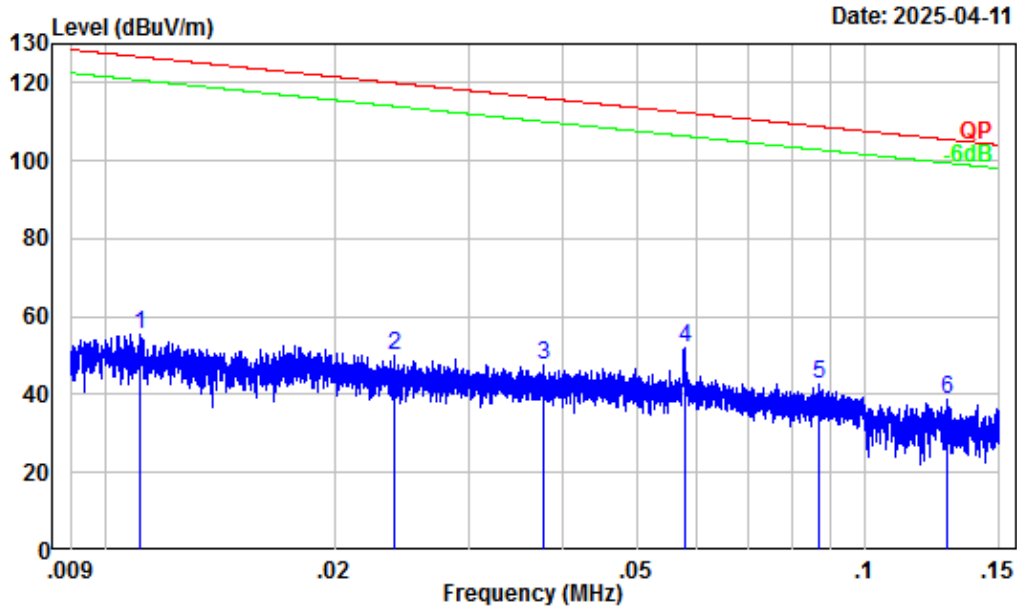
|    |        | Read  |       | LISN   | Cable | Limit | Over   |         |
|----|--------|-------|-------|--------|-------|-------|--------|---------|
|    | Freq   | Level | Level | Factor | Loss  | Line  | Limit  | Remark  |
|    | MHz    | dBuV  | dBuV  | dB     | dB    | dBuV  | dB     |         |
| 1  | 0.153  | 5.95  | 26.51 | 10.43  | 10.13 | 55.82 | -29.31 | Average |
| 2  | 0.153  | 20.25 | 40.81 | 10.43  | 10.13 | 65.82 | -25.01 | QP      |
| 3  | 0.217  | 3.28  | 24.14 | 10.77  | 10.09 | 52.92 | -28.78 | Average |
| 4  | 0.217  | 15.17 | 36.03 | 10.77  | 10.09 | 62.92 | -26.89 | QP      |
| 5  | 0.456  | 5.88  | 26.53 | 10.53  | 10.12 | 46.76 | -20.23 | Average |
| 6  | 0.456  | 15.84 | 36.49 | 10.53  | 10.12 | 56.76 | -20.27 | QP      |
| 7  | 0.535  | 7.07  | 27.72 | 10.52  | 10.13 | 46.00 | -18.28 | Average |
| 8  | 0.535  | 17.26 | 37.91 | 10.52  | 10.13 | 56.00 | -18.09 | QP      |
| 9  | 2.121  | 1.38  | 22.30 | 10.73  | 10.19 | 46.00 | -23.70 | Average |
| 10 | 2.121  | 11.56 | 32.48 | 10.73  | 10.19 | 56.00 | -23.52 | QP      |
| 11 | 16.928 | 2.80  | 23.64 | 10.64  | 10.20 | 50.00 | -26.36 | Average |
| 12 | 16.928 | 13.81 | 34.65 | 10.64  | 10.20 | 60.00 | -25.35 | QP      |

**Radiated Emissions****Environmental Conditions**

|                            |                                                                                                                                                                                                                                                                                                                                                                                        |                              |                    |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------|
| <b>Temperature (°C)</b>    | 22.5-23.1                                                                                                                                                                                                                                                                                                                                                                              | <b>Relative Humidity (%)</b> | 46-52              |
| <b>ATM Pressure (kPa):</b> | 101.3                                                                                                                                                                                                                                                                                                                                                                                  | <b>Test engineer:</b>        | Anson Su& Visen Wu |
| <b>Test date:</b>          | 2025/4/3~2025/4/11                                                                                                                                                                                                                                                                                                                                                                     |                              |                    |
| <b>EUT operation mode:</b> | Below 1GHz: Transmitting (Maximum output mode EDR(8DPSK),High channel)<br>Above 1GHz: Transmitting (Maximum output mode EDR(8DPSK))                                                                                                                                                                                                                                                    |                              |                    |
| <b>Note:</b>               | 1. For the radiated spurious emission below 30MHz, only the worst case (parallel) was recorded.<br>2. For the radiated spurious emission below 30MHz, When the test result of peak was less than the limit of QP/Average more than 6dB, just peak value were recorded.<br>3. After pre-scan in the X, Y and Z axes of orientation, the worst case z-axis of orientation were recorded. |                              |                    |

**Below 1GHz:**

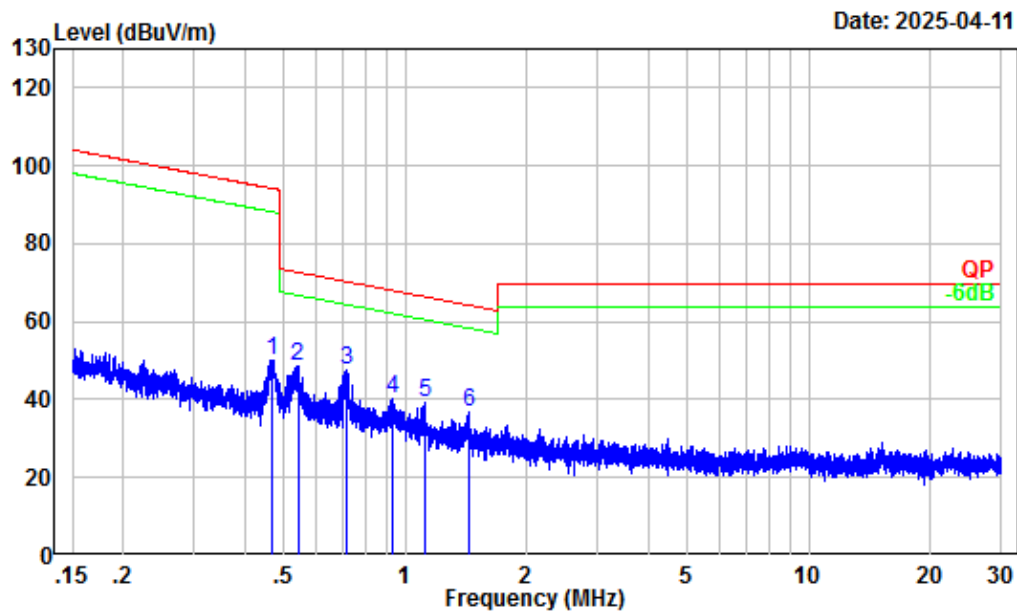
9kHz-150kHz



Site : Chamber A  
 Condition : 3m  
 Project Number : 2501R16873E-RF  
 Test Mode : BT Transmitting  
 Detector: Peak RBW/VBW: 0.3/1kHz  
 Tester : Anson Su

|   | Freq | Factor | Read Level | Level  | Limit  | Over Limit | Remark |
|---|------|--------|------------|--------|--------|------------|--------|
|   | MHz  | dB/m   | dBuV       | dBuV/m | dBuV/m | dB         |        |
| 1 | 0.01 | 32.08  | 23.31      | 55.39  | 126.67 | -71.28     | Peak   |
| 2 | 0.02 | 29.64  | 20.25      | 49.89  | 120.00 | -70.11     | Peak   |
| 3 | 0.04 | 27.69  | 19.93      | 47.62  | 116.07 | -68.45     | Peak   |
| 4 | 0.06 | 25.62  | 26.45      | 52.07  | 112.36 | -60.29     | Peak   |
| 5 | 0.09 | 22.93  | 19.53      | 42.46  | 108.84 | -66.38     | Peak   |
| 6 | 0.13 | 20.35  | 18.25      | 38.60  | 105.47 | -66.87     | Peak   |

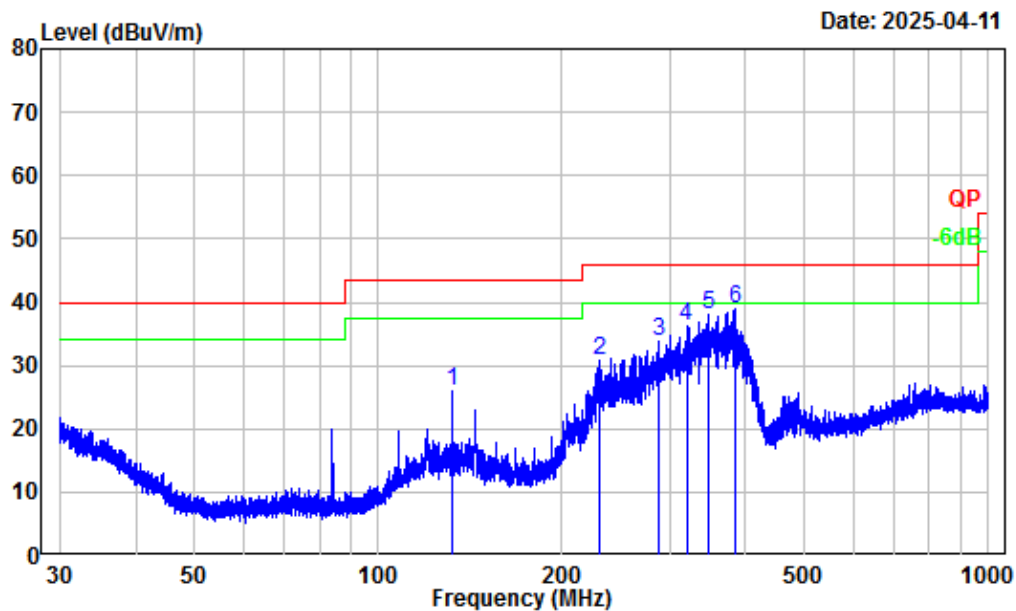
150kHz-30MHz



Site : Chamber A  
Condition : 3m  
Project Number : 2501R16873E-RF  
Test Mode : BT Transmitting  
Detector: Peak RBW/VBW: 10/30kHz  
Tester : Anson Su

|   | Freq | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz  | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 0.47 | 7.02   | 42.97         | 49.99  | 94.21         | -44.22        | Peak   |
| 2 | 0.54 | 5.88   | 42.66         | 48.54  | 72.90         | -24.36        | Peak   |
| 3 | 0.72 | 3.73   | 44.05         | 47.78  | 70.43         | -22.65        | Peak   |
| 4 | 0.93 | 1.71   | 38.58         | 40.29  | 68.10         | -27.81        | Peak   |
| 5 | 1.12 | 0.87   | 38.32         | 39.19  | 66.48         | -27.29        | Peak   |
| 6 | 1.44 | -0.02  | 36.81         | 36.79  | 64.26         | -27.47        | Peak   |

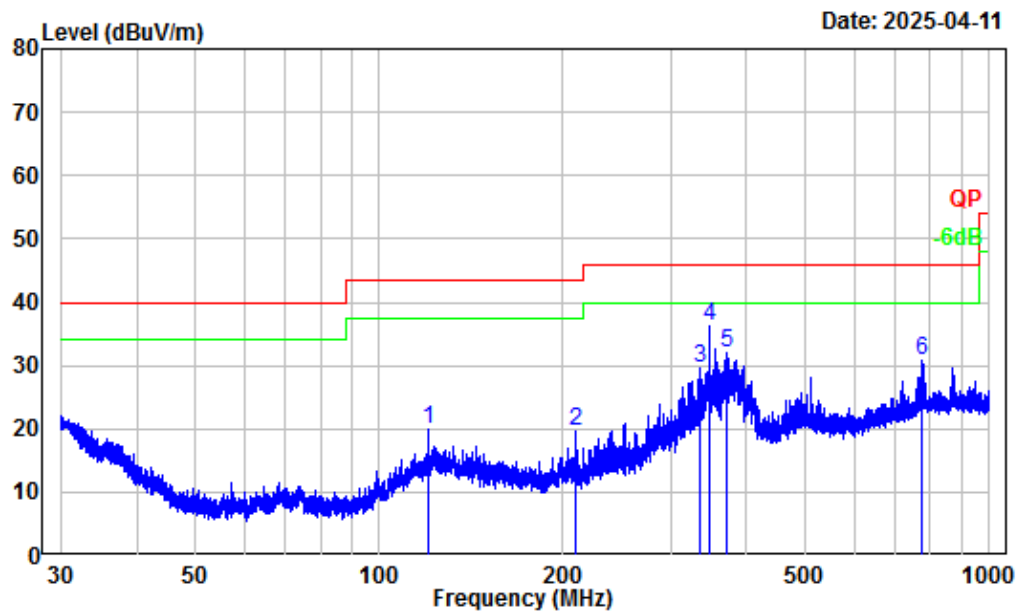
## 30MHz-1GHz\_Horizontal



Site : Chamber A  
Condition : 3m Horizontal  
Project Number : 2501R16873E-RF  
Test Mode : BT Transmitting  
Detector: Peak RBW/VBW: 100/300kHz  
Tester : Anson Su

|   | Freq   | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|--------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz    | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 132.10 | -11.31 | 37.33         | 26.02  | 43.50         | -17.48        | Peak   |
| 2 | 231.01 | -13.79 | 44.53         | 30.74  | 46.00         | -15.26        | Peak   |
| 3 | 288.12 | -11.22 | 45.12         | 33.90  | 46.00         | -12.10        | Peak   |
| 4 | 320.08 | -10.81 | 46.91         | 36.10  | 46.00         | -9.90         | Peak   |
| 5 | 348.33 | -10.20 | 48.28         | 38.08  | 46.00         | -7.92         | Peak   |
| 6 | 383.93 | -9.04  | 48.09         | 39.05  | 46.00         | -6.95         | Peak   |

## 30MHz-1GHz\_Vertical



Site : Chamber A  
Condition : 3m Vertical  
Project Number : 2501R16873E-RF  
Test Mode : BT Transmitting  
Detector: Peak RBW/VBW: 100/300kHz  
Tester : Anson Su

|   | Freq   | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|--------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz    | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 120.01 | -11.45 | 31.52         | 20.07  | 43.50         | -23.43        | Peak   |
| 2 | 210.32 | -14.04 | 33.80         | 19.76  | 43.50         | -23.74        | Peak   |
| 3 | 336.18 | -10.50 | 40.23         | 29.73  | 46.00         | -16.27        | Peak   |
| 4 | 348.18 | -10.21 | 46.35         | 36.14  | 46.00         | -9.86         | Peak   |
| 5 | 372.33 | -9.42  | 41.49         | 32.07  | 46.00         | -13.93        | Peak   |
| 6 | 777.56 | -2.41  | 33.31         | 30.90  | 46.00         | -15.10        | Peak   |

**Above 1GHz:**

| Frequency (MHz) | Reading (dBμV) | Detector (PK) | Polar (H/V) | Factor (dB/m) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|----------------|---------------|-------------|---------------|------------------------------|----------------|-------------|
| <b>8DPSK</b>    |                |               |             |               |                              |                |             |
| Low Channel     |                |               |             |               |                              |                |             |
| 4804            | 55.34          | PK            | H           | -7.79         | 47.55                        | 74             | -26.45      |
| 4804            | 56.49          | PK            | V           | -7.79         | 48.70                        | 74             | -25.30      |
| Middle Channel  |                |               |             |               |                              |                |             |
| 4882            | 57.18          | PK            | H           | -7.58         | 49.60                        | 74             | -24.40      |
| 4882            | 58.12          | PK            | V           | -7.58         | 50.54                        | 74             | -23.46      |
| High Channel    |                |               |             |               |                              |                |             |
| 4960            | 58.29          | PK            | H           | -7.56         | 50.73                        | 74             | -23.27      |
| 4960            | 58.07          | PK            | V           | -7.56         | 50.51                        | 74             | -23.49      |

Note:

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

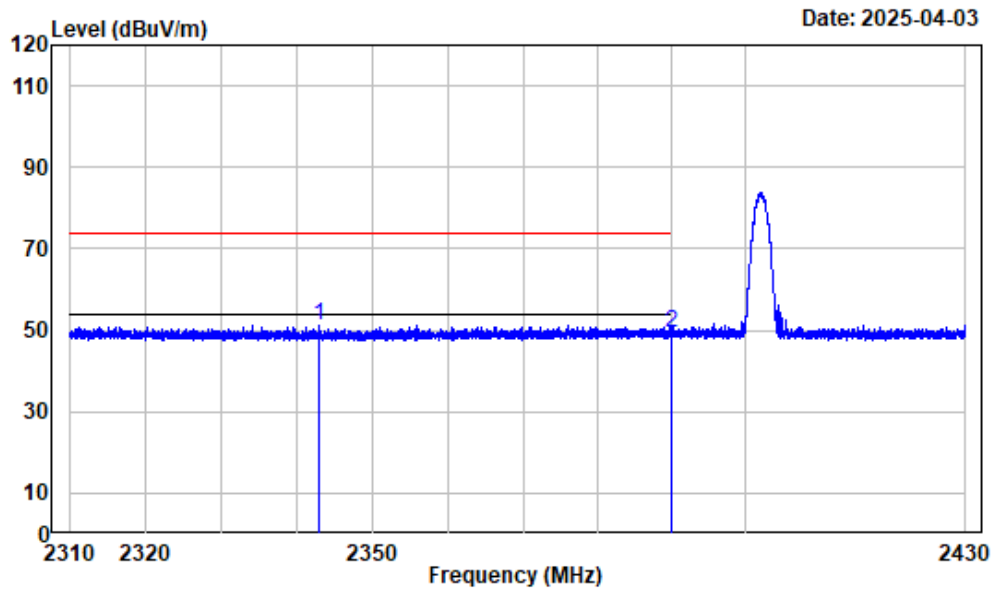
Corrected Amplitude/Level = Factor + Reading

Margin = Corrected Amplitude/Level - Limit

The other spurious emission which is in the noise floor level was not recorded. The test result of peak was less than the limit of average, it meets the average limit, so just peak values were recorded.

# Test plots

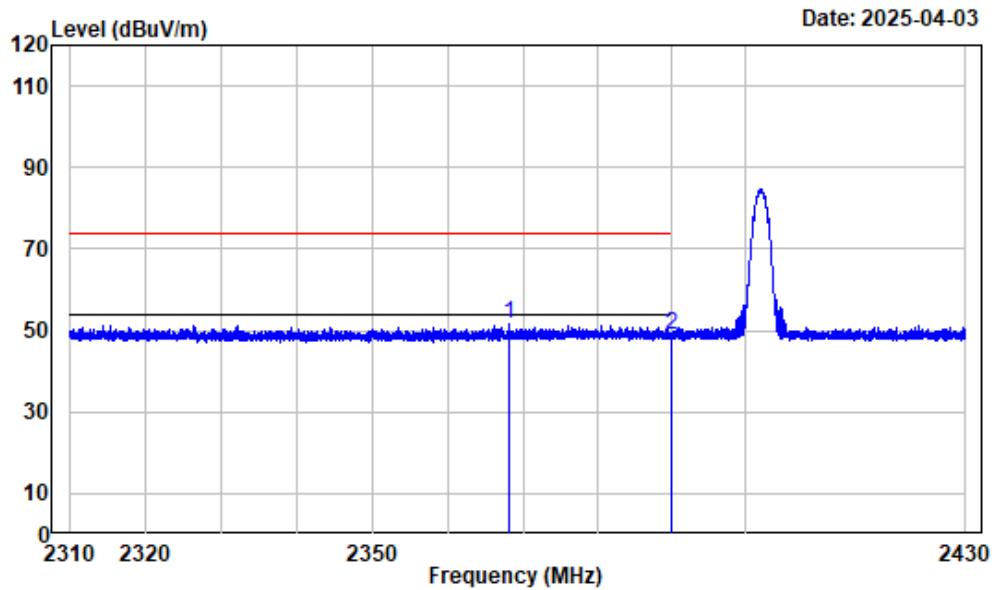
## Left Band edge\_Horizontal



Condition : Horizontal  
 Project No. : 2501R16873E-RF  
 Tester : Visen Wu  
 Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
 Note : BT\_3DH5\_2402

|   | Freq     | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|----------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz      | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 2342.779 | -10.88 | 62.16         | 51.28  | 74.00         | -22.72        | Peak   |
| 2 | 2390.000 | -10.98 | 60.40         | 49.42  | 74.00         | -24.58        | Peak   |

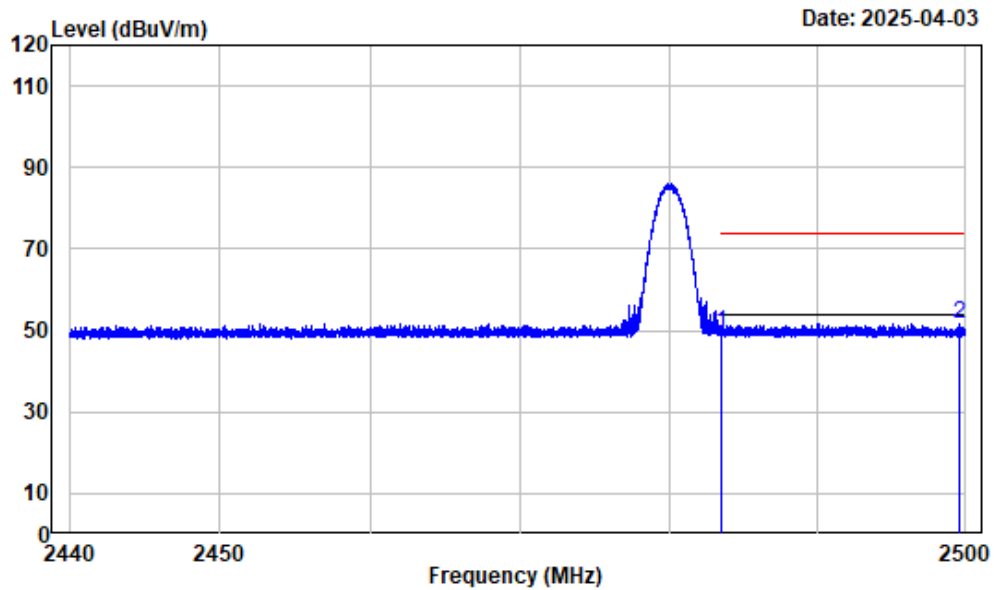
Left Band edge\_Vertical



Condition : Vertical  
 Project No. : 2501R16873E-RF  
 Tester : Visen Wu  
 Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
 Note : BT\_3DH5\_2402

|   | Freq     | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|----------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz      | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 2368.042 | -10.93 | 62.33         | 51.40  | 74.00         | -22.60        | Peak   |
| 2 | 2390.000 | -10.98 | 59.66         | 48.68  | 74.00         | -25.32        | Peak   |

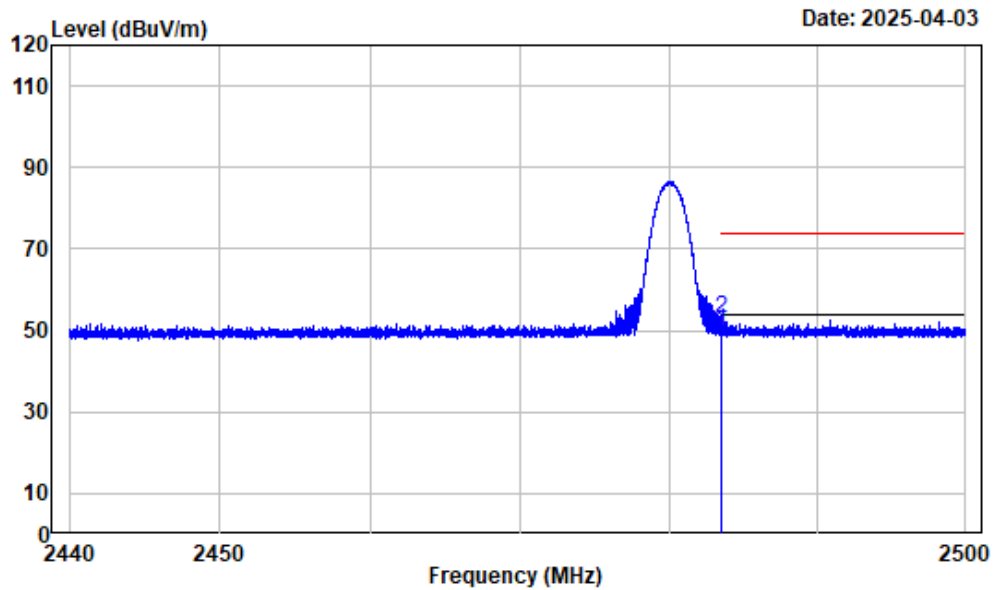
## Right Band edge\_Horizontal



Condition : Horizontal  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

|             |          | Read   |        | Limit  | Over  | Remark      |
|-------------|----------|--------|--------|--------|-------|-------------|
| Freq Factor |          | Level  | Level  | Line   | Limit |             |
| MHz         | dB/m     | dBuV   | dBuV/m | dBuV/m | dB    |             |
| 1           | 2483.500 | -10.97 | 60.22  | 49.25  | 74.00 | -24.75 Peak |
| 2           | 2499.565 | -11.00 | 62.80  | 51.80  | 74.00 | -22.20 Peak |

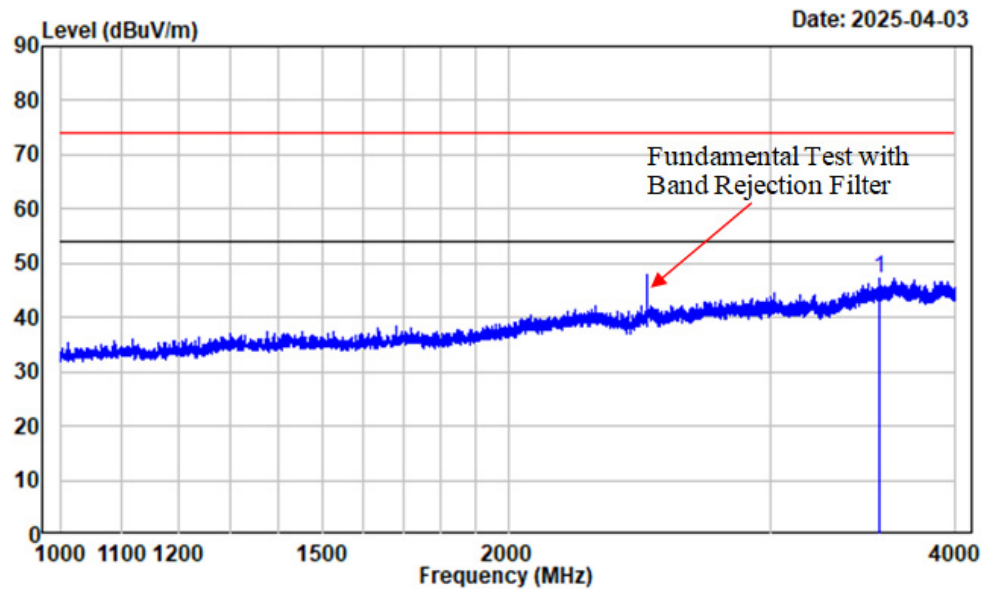
## Right Band edge\_Vertical



Condition : Vertical  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

|             |          | Read   |        | Limit  | Over  | Remark      |
|-------------|----------|--------|--------|--------|-------|-------------|
| Freq Factor |          | Level  | Level  | Line   | Limit |             |
| MHz         | dB/m     | dBuV   | dBuV/m | dBuV/m | dB    |             |
| 1           | 2483.500 | -10.97 | 60.68  | 49.71  | 74.00 | -24.29 Peak |
| 2           | 2483.505 | -10.97 | 64.04  | 53.07  | 74.00 | -20.93 Peak |

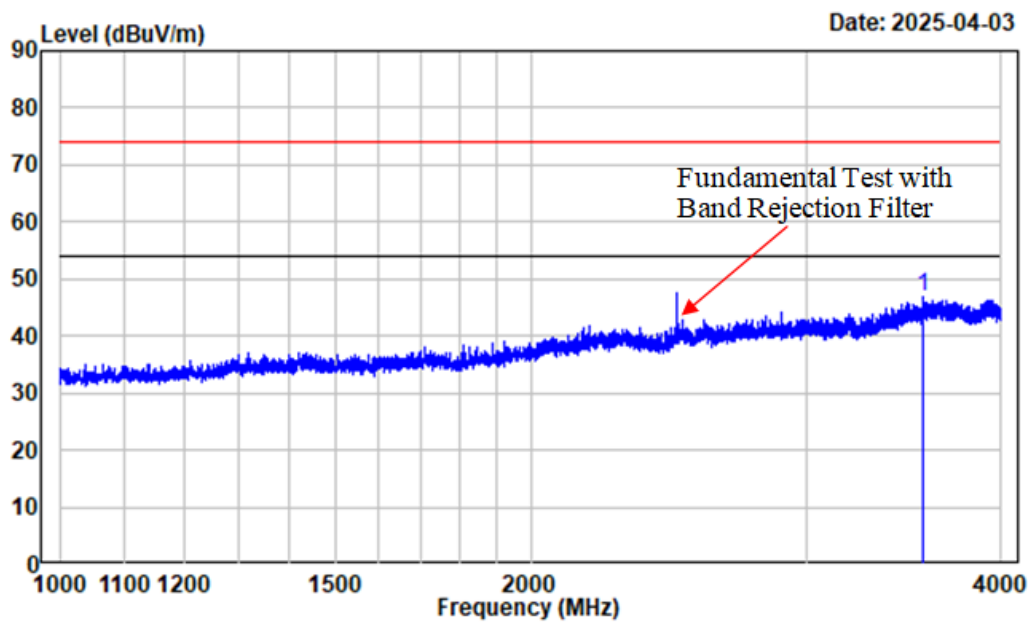
Listed with the worst harmonic margin test plot  
1-4GHz\_Horizontal



Condition : Horizontal  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

| Freq Factor |          | Read Level |        | Limit  | Over  | Remark      |
|-------------|----------|------------|--------|--------|-------|-------------|
| MHz         | dB/m     | dBuV       | dBuV/m | dBuV/m | dB    |             |
| 1           | 3558.945 | -9.82      | 57.05  | 47.23  | 74.00 | -26.77 Peak |

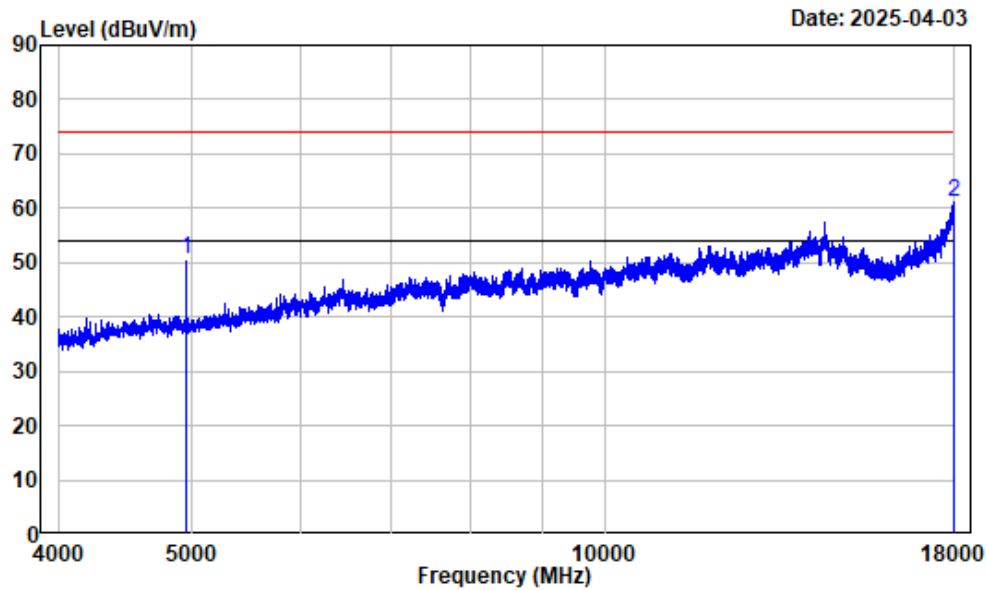
1-4GHz\_Vertical



Condition : Vertical  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

|   | Freq     | Factor | Read<br>Level | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|----------|--------|---------------|--------|---------------|---------------|--------|
|   | MHz      | dB/m   | dBuV          | dBuV/m | dBuV/m        | dB            |        |
| 1 | 3567.946 | -9.91  | 56.86         | 46.95  | 74.00         | -27.05        | Peak   |

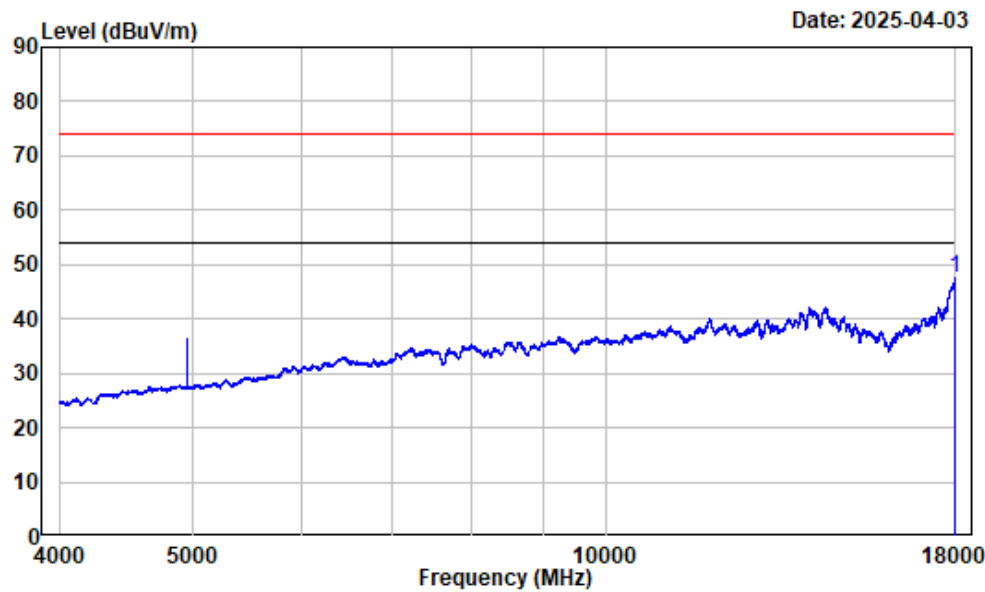
4-18GHz\_Horizontal\_Peak



Condition : Horizontal  
 Project No. : 2501R16873E-RF  
 Tester : Visen Wu  
 Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
 Note : BT\_3DH5\_2480

|             |       | Read  |        | Limit  | Over   | Remark |
|-------------|-------|-------|--------|--------|--------|--------|
| Freq Factor |       | Level | Level  | Line   | Limit  |        |
| MHz         | dB/m  | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1 4960.000  | -7.56 | 58.29 | 50.73  | 74.00  | -23.27 | Peak   |
| 2 17984.250 | 13.12 | 47.89 | 61.01  | 74.00  | -12.99 | Peak   |

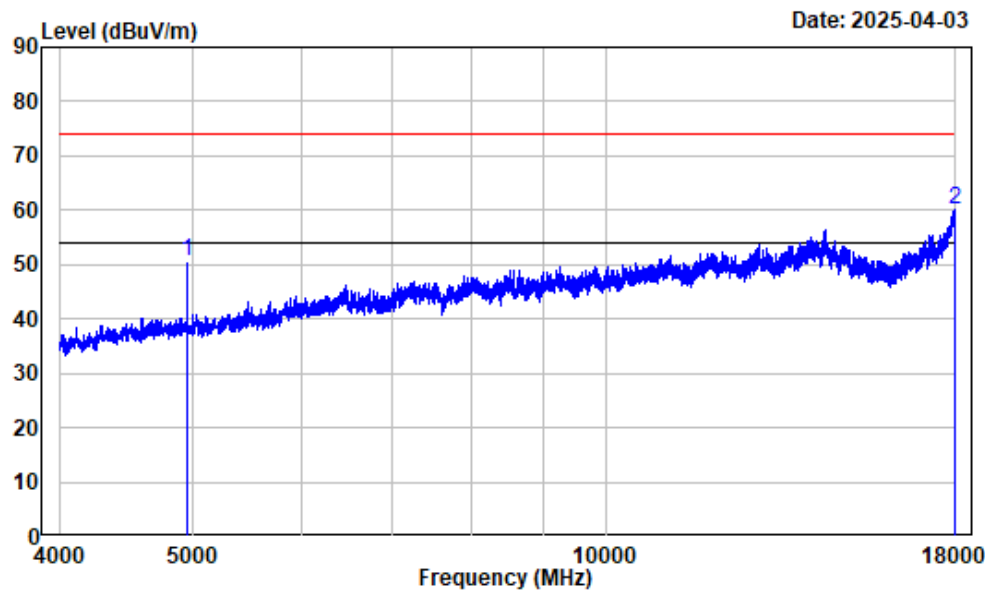
4-18GHz\_Horizontal\_Average



Condition : Horizontal  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak  
Note : BT\_3DH5\_2480

| Freq Factor |       | Read Level | Level  | Limit Line | Over Limit | Remark  |
|-------------|-------|------------|--------|------------|------------|---------|
| MHz         | dB/m  | dBuV       | dBuV/m | dBuV/m     | dB         |         |
| 1 18000.000 | 13.20 | 34.46      | 47.66  | 54.00      | -6.34      | Average |

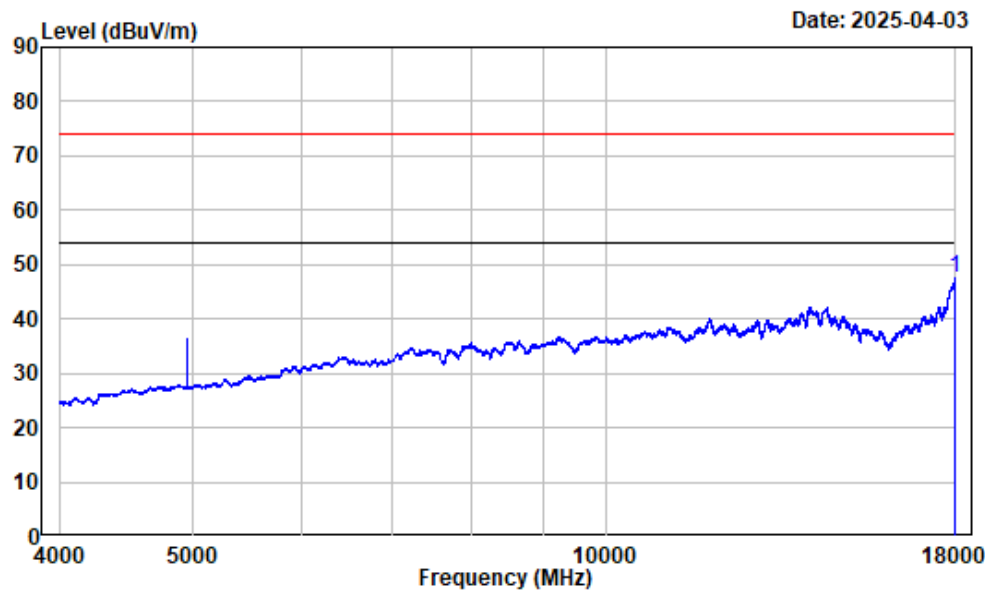
4-18GHz\_Vertical\_Peak



Condition : Vertical  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

|             |       | Read  |        | Limit  | Over   | Remark |
|-------------|-------|-------|--------|--------|--------|--------|
| Freq Factor |       | Level | Level  | Line   | Limit  |        |
| MHz         | dB/m  | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1 4960.000  | -7.56 | 58.07 | 50.51  | 74.00  | -23.49 | Peak   |
| 2 17968.500 | 13.05 | 47.21 | 60.26  | 74.00  | -13.74 | Peak   |

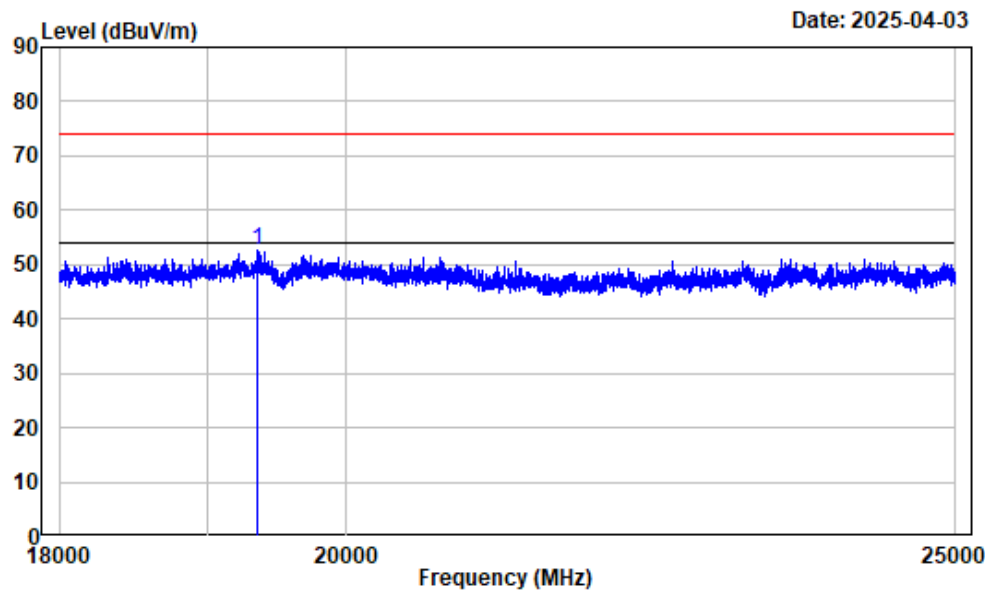
4-18GHz\_Vertical\_Average



Condition : Vertical  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak  
Note : BT\_3DH5\_2480

| Freq Factor |       | Read Level |        | Limit Line | Over Limit | Remark  |
|-------------|-------|------------|--------|------------|------------|---------|
| MHz         | dB/m  | dBuV       | dBuV/m | dBuV/m     | dB         |         |
| 1 17993.000 | 13.17 | 34.54      | 47.71  | 54.00      | -6.29      | Average |

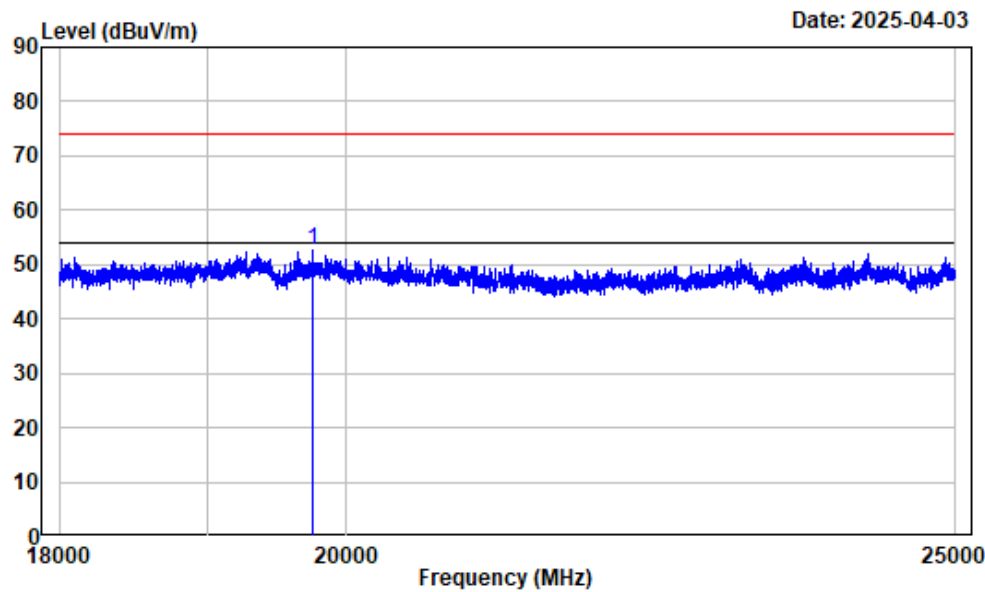
18-25GHz\_Horizontal



Condition : Horizontal  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

|             |        | Read  |        | Limit  | Over   | Remark |
|-------------|--------|-------|--------|--------|--------|--------|
| Freq        | Factor | Level | Level  | Line   | Limit  |        |
| MHz         | dB/m   | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1 19357.670 | 15.13  | 37.39 | 52.52  | 74.00  | -21.48 | Peak   |

18-25GHz\_Vertical



Condition : Vertical  
Project No. : 2501R16873E-RF  
Tester : Visen Wu  
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak  
Note : BT\_3DH5\_2480

| Freq |           | Factor | Read Level | Level  | Limit Line | Over Limit | Remark |
|------|-----------|--------|------------|--------|------------|------------|--------|
| MHz  |           | dB/m   | dBuV       | dBuV/m | dBuV/m     | dB         |        |
| 1    | 19752.220 | 15.39  | 37.13      | 52.52  | 74.00      | -21.48     | Peak   |

20 dB Emission Bandwidth

Test Information:

|             |             |              |              |
|-------------|-------------|--------------|--------------|
| Sample No.: | 2ZYL-2      | Test Date:   | 2025/04/03   |
| Test Site:  | RF          | Test Mode:   | Transmitting |
| Tester:     | Rainbow Zhu | Test Result: | Pass         |

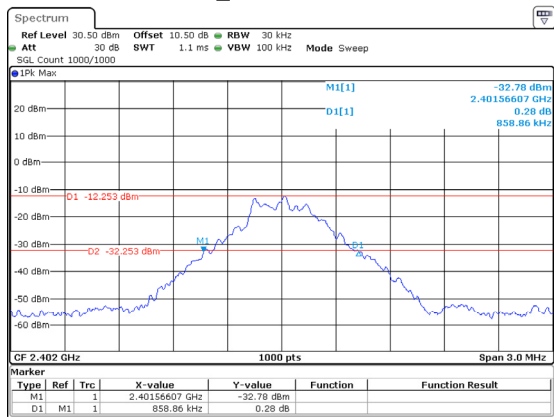
Environmental Conditions:

|                      |      |                              |    |                        |       |
|----------------------|------|------------------------------|----|------------------------|-------|
| Temperature:<br>(°C) | 23.5 | Relative<br>Humidity:<br>(%) | 47 | ATM Pressure:<br>(kPa) | 101.3 |
|----------------------|------|------------------------------|----|------------------------|-------|

Test Data:

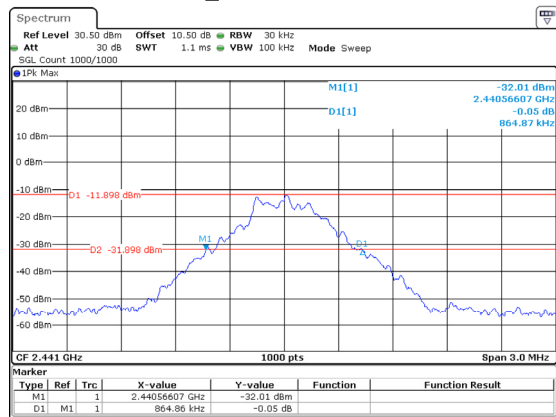
| Mode | Channel        | Result<br>(MHz) |
|------|----------------|-----------------|
| DH1  | Low Channel    | 0.859           |
|      | Middle Channel | 0.865           |
|      | High Channel   | 0.862           |
| 2DH1 | Low Channel    | 1.255           |
|      | Middle Channel | 1.255           |
|      | High Channel   | 1.255           |
| 3DH1 | Low Channel    | 1.219           |
|      | Middle Channel | 1.222           |
|      | High Channel   | 1.243           |

DH1\_Low 0.859MHz



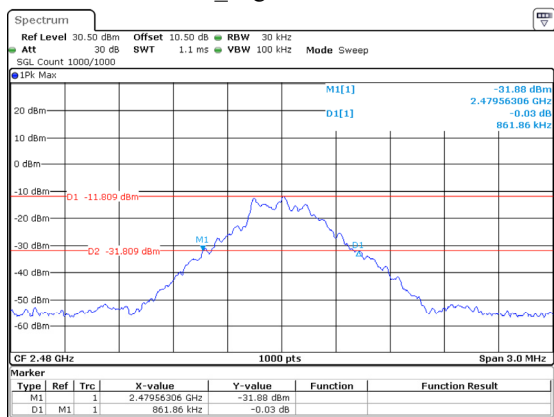
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
 Date: 3.APR.2025 15:09:05

DH1\_Middle 0.865MHz



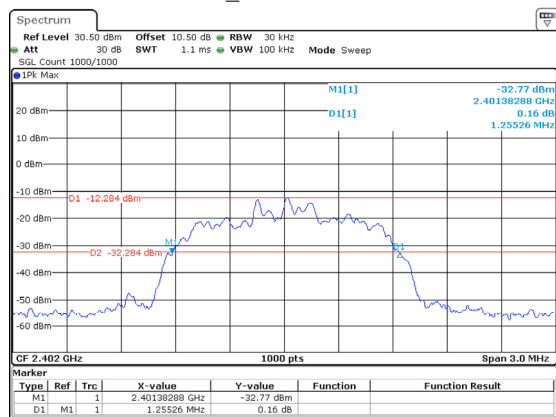
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
 Date: 3.APR.2025 15:12:38

DH1\_High 0.862MHz



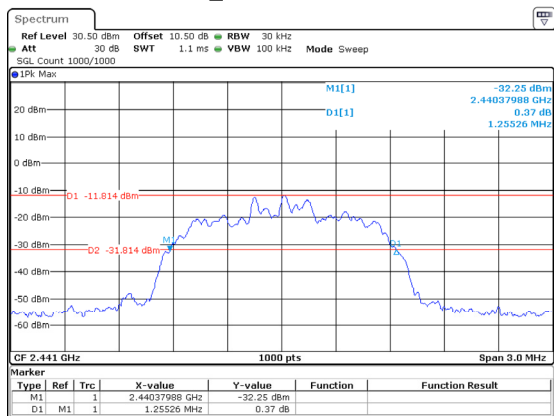
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
 Date: 3.APR.2025 15:13:35

2DH1\_Low 1.255MHz



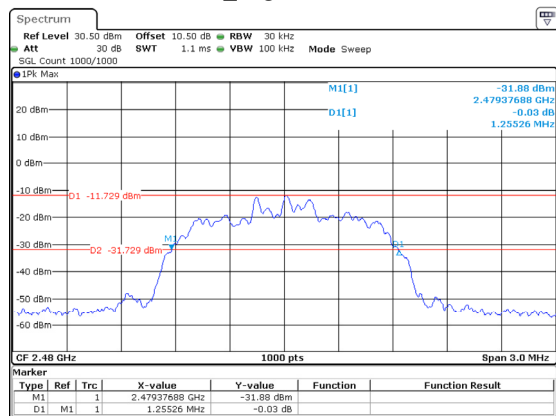
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
 Date: 3.APR.2025 15:15:51

2DH1\_Middle 1.255MHz



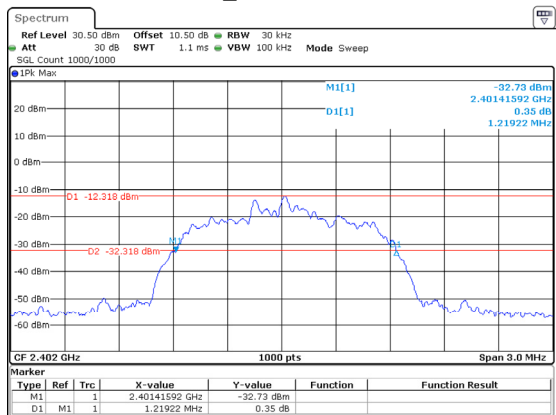
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
 Date: 3.APR.2025 15:18:18

2DH1\_High 1.255MHz



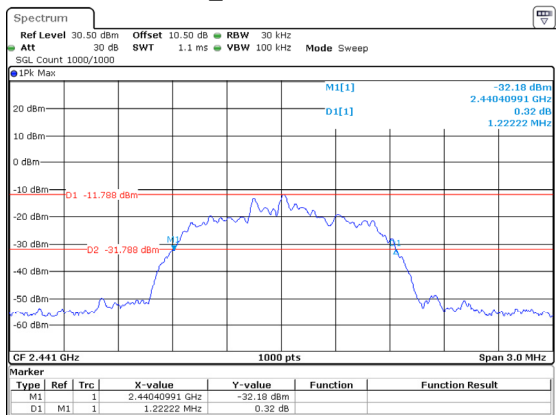
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
 Date: 3.APR.2025 15:19:32

3DH1\_Low 1.219MHz



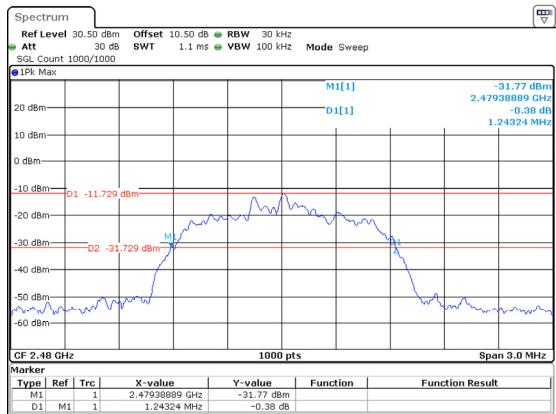
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:21:43

3DH1\_Middle 1.222MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:24:20

3DH1\_High 1.243MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:25:16

99% Occupied Bandwidth

Test Information:

|             |             |              |              |
|-------------|-------------|--------------|--------------|
| Sample No.: | 2ZYL-2      | Test Date:   | 2025/04/03   |
| Test Site:  | RF          | Test Mode:   | Transmitting |
| Tester:     | Rainbow Zhu | Test Result: | Pass         |

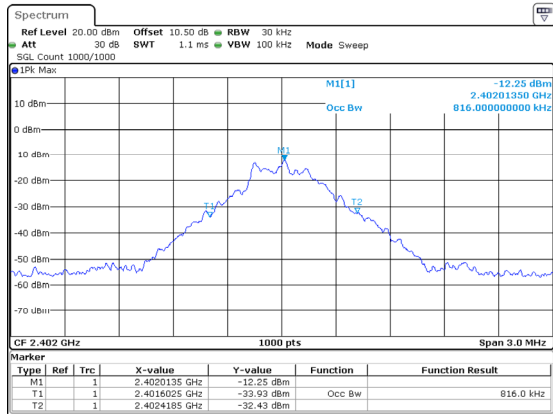
Environmental Conditions:

|                      |      |                              |    |                        |       |
|----------------------|------|------------------------------|----|------------------------|-------|
| Temperature:<br>(°C) | 23.5 | Relative<br>Humidity:<br>(%) | 47 | ATM Pressure:<br>(kPa) | 101.3 |
|----------------------|------|------------------------------|----|------------------------|-------|

Test Data:

| Mode | Channel        | 99% OBW<br>(MHz) |
|------|----------------|------------------|
| DH1  | Low Channel    | 0.816            |
|      | Middle Channel | 0.813            |
|      | High Channel   | 0.822            |
| 2DH1 | Low Channel    | 1.158            |
|      | Middle Channel | 1.158            |
|      | High Channel   | 1.158            |
| 3DH1 | Low Channel    | 1.155            |
|      | Middle Channel | 1.152            |
|      | High Channel   | 1.155            |

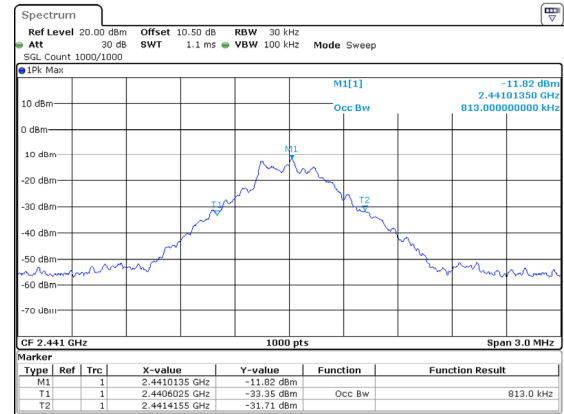
### DH1\_Low 0.816MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu

Date: 3.APR.2025 15:10:55

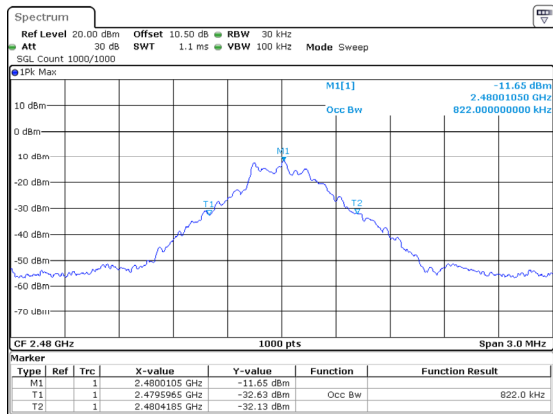
### DH1\_Middle 0.813MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu

Date: 3.APR.2025 15:12:53

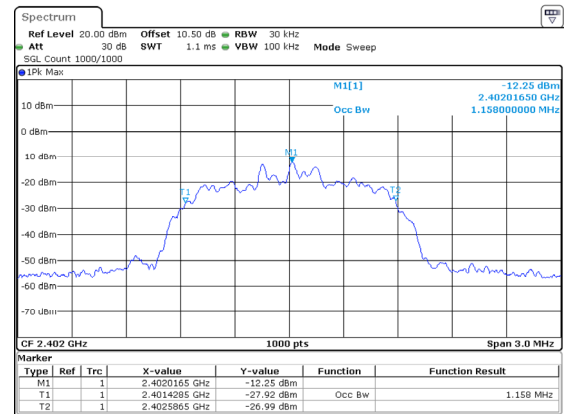
### DH1\_High 0.822MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu

Date: 3.APR.2025 15:15:03

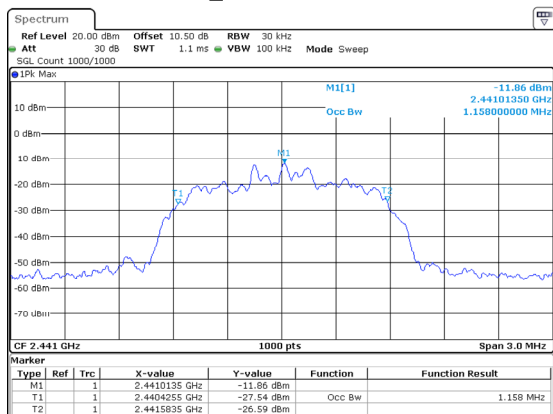
### 2DH1\_Low 1.158MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu

Date: 3.APR.2025 15:17:41

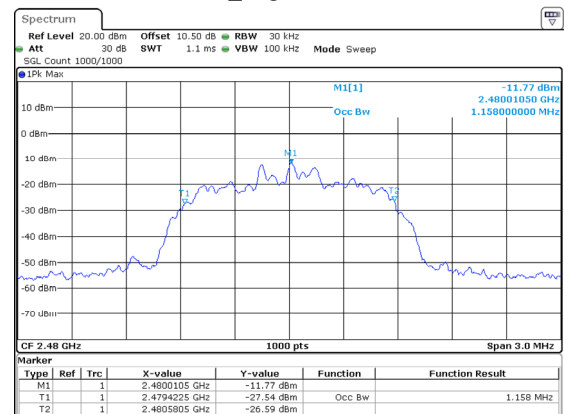
### 2DH1\_Middle 1.158MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu

Date: 3.APR.2025 15:18:33

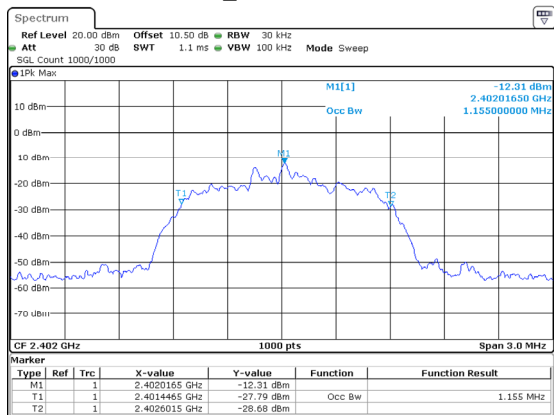
### 2DH1\_High 1.158MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu

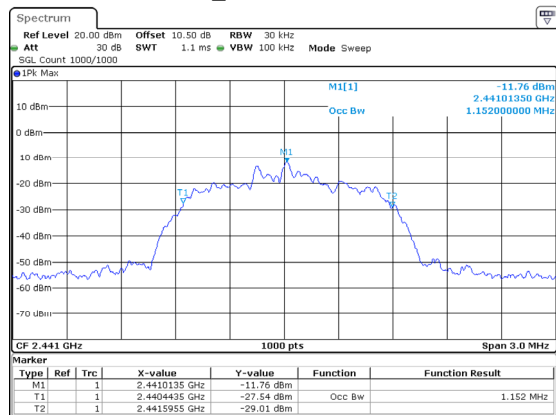
Date: 3.APR.2025 15:21:00

3DH1\_Low 1.155MHz



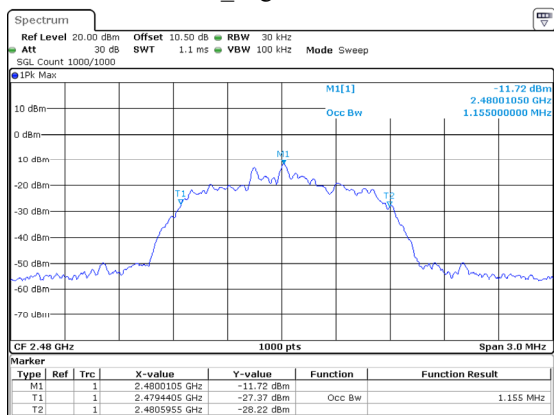
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:23:34

3DH1\_Middle 1.152MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:24:36

3DH1\_High 1.155MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:26:44

**Channel Separation****Test Information:**

|                    |             |                     |              |
|--------------------|-------------|---------------------|--------------|
| <b>Sample No.:</b> | 2ZYL-2      | <b>Test Date:</b>   | 2025/04/03   |
| <b>Test Site:</b>  | RF          | <b>Test Mode:</b>   | Transmitting |
| <b>Tester:</b>     | Rainbow Zhu | <b>Test Result:</b> | Pass         |

**Environmental Conditions:**

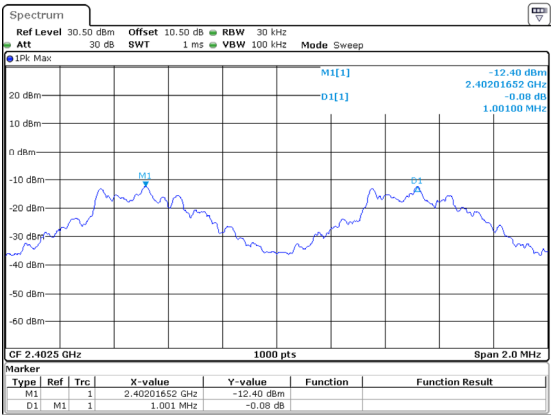
|                             |      |                                  |    |                               |       |
|-----------------------------|------|----------------------------------|----|-------------------------------|-------|
| <b>Temperature:</b><br>(°C) | 23.5 | <b>Relative Humidity:</b><br>(%) | 47 | <b>ATM Pressure:</b><br>(kPa) | 101.3 |
|-----------------------------|------|----------------------------------|----|-------------------------------|-------|

**Test Data:**

| Mode | Channel        | Result (MHz) | Limit (MHz) | Verdict |
|------|----------------|--------------|-------------|---------|
| DH1  | Low Channel    | 1.001        | 0.837       | Pass    |
|      | Middle Channel | 1.001        |             | Pass    |
|      | High Channel   | <b>1.003</b> |             | Pass    |

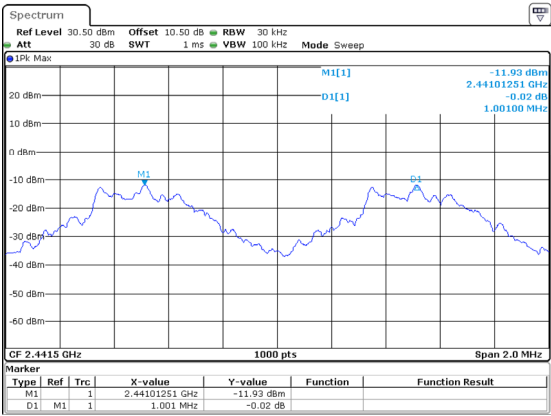
**Note: Only the BDR (GFSK) mode result is reported since EDR ( $\pi/4$ -DQPSK) and EDR (8DPSK) modes have the exact same channel plan, and the limit is the maximum 20dB bandwidth \*2/3.**

DH1\_Low 1.001MHz



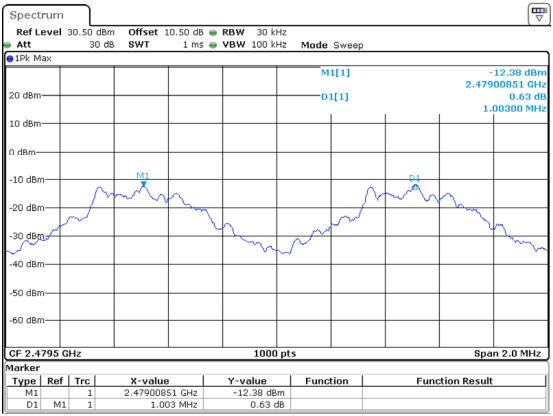
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:46:21

DH1\_Middle 1.001MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:47:47

DH1\_High 1.003MHz



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:42:27

Number of Hopping Frequency

Test Information:

|             |             |              |              |
|-------------|-------------|--------------|--------------|
| Sample No.: | 2ZYL-2      | Test Date:   | 2025/04/03   |
| Test Site:  | RF          | Test Mode:   | Transmitting |
| Tester:     | Rainbow Zhu | Test Result: | Pass         |

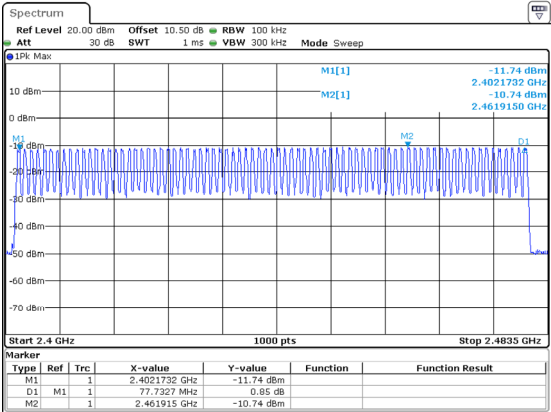
Environmental Conditions:

|                      |      |                              |    |                        |       |
|----------------------|------|------------------------------|----|------------------------|-------|
| Temperature:<br>(°C) | 23.5 | Relative<br>Humidity:<br>(%) | 47 | ATM Pressure:<br>(kPa) | 101.3 |
|----------------------|------|------------------------------|----|------------------------|-------|

Test Data:

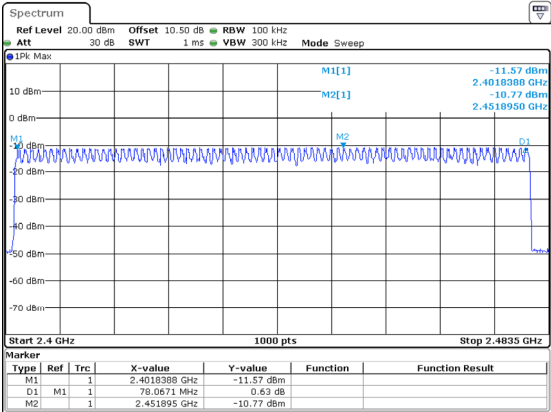
| Mode | Channel         | Result | Limit | Verdict |
|------|-----------------|--------|-------|---------|
| DH1  | Hopping Channel | 79     | 15    | Pass    |
| 2DH1 | Hopping Channel | 79     | 15    | Pass    |
| 3DH1 | Hopping Channel | 79     | 15    | Pass    |

DH1\_Hopping 79



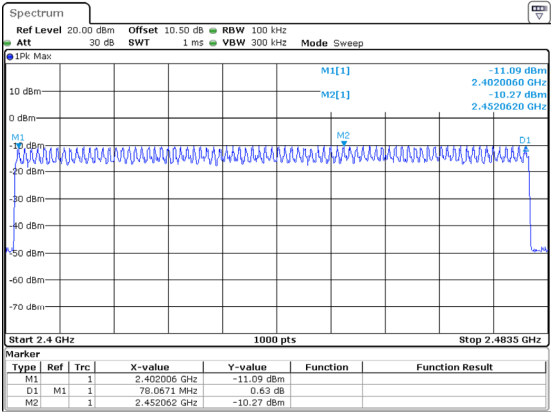
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:28:06

2DH1\_Hopping 79



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:30:04

3DH1\_Hopping 79



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:31:20

Maximum Conducted Output Power

Test Information:

|             |             |              |              |
|-------------|-------------|--------------|--------------|
| Sample No.: | 2ZYL-2      | Test Date:   | 2025/04/03   |
| Test Site:  | RF          | Test Mode:   | Transmitting |
| Tester:     | Rainbow Zhu | Test Result: | Pass         |

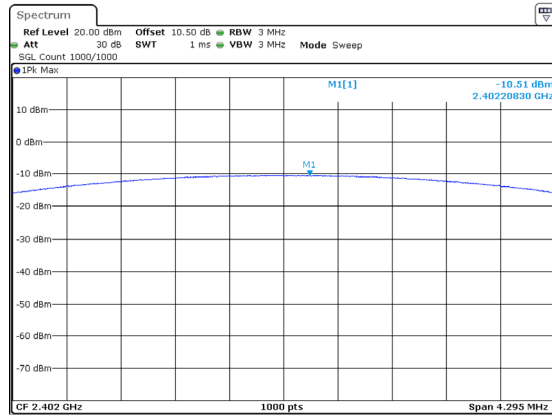
Environmental Conditions:

|                      |      |                              |    |                        |       |
|----------------------|------|------------------------------|----|------------------------|-------|
| Temperature:<br>(°C) | 23.5 | Relative<br>Humidity:<br>(%) | 47 | ATM Pressure:<br>(kPa) | 101.3 |
|----------------------|------|------------------------------|----|------------------------|-------|

Test Data:

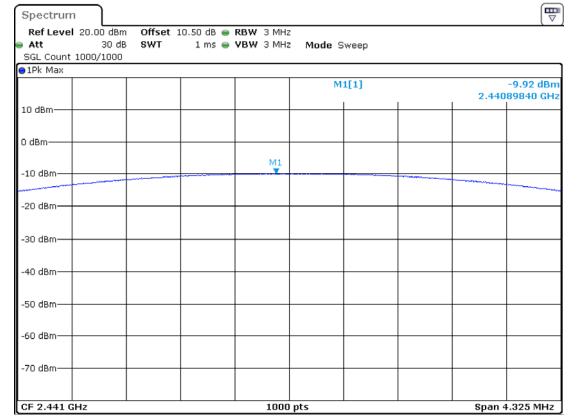
| Mode | Test Frequency<br>(MHz) | Peak Output<br>Power<br>(dBm) | Limit<br>(dBm) | Verdict |
|------|-------------------------|-------------------------------|----------------|---------|
| DH1  | 2402                    | -10.51                        | 21.00          | Pass    |
|      | 2441                    | -9.92                         | 21.00          | Pass    |
|      | 2480                    | -9.89                         | 21.00          | Pass    |
| 2DH1 | 2402                    | -8.64                         | 21.00          | Pass    |
|      | 2441                    | -8.20                         | 21.00          | Pass    |
|      | 2480                    | -8.08                         | 21.00          | Pass    |
| 3DH1 | 2402                    | -8.20                         | 21.00          | Pass    |
|      | 2441                    | -7.67                         | 21.00          | Pass    |
|      | 2480                    | -7.48                         | 21.00          | Pass    |

DH1\_Low -10.51dBm



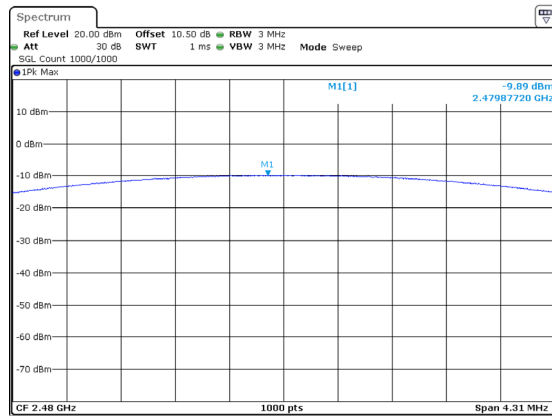
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:11:08

DH1\_Middle -9.92dBm



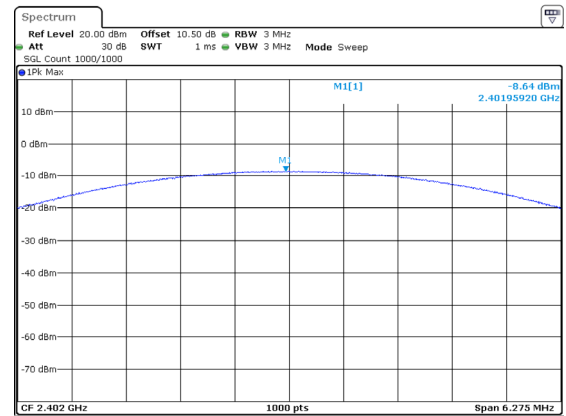
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:13:12

DH1\_High -9.89dBm



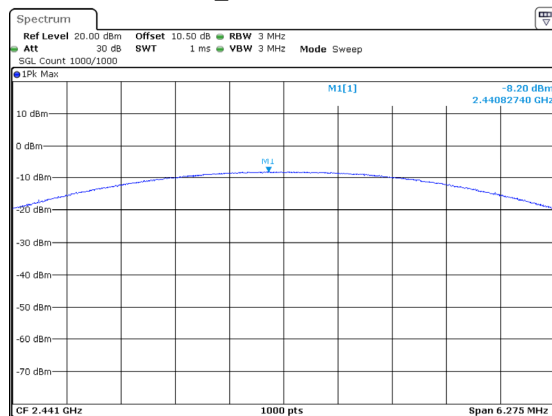
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:11:08

2DH1\_Low -8.64dBm



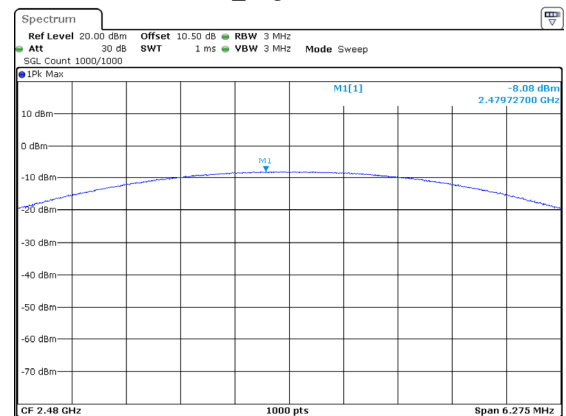
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:17:54

2DH1\_Middle -8.20dBm



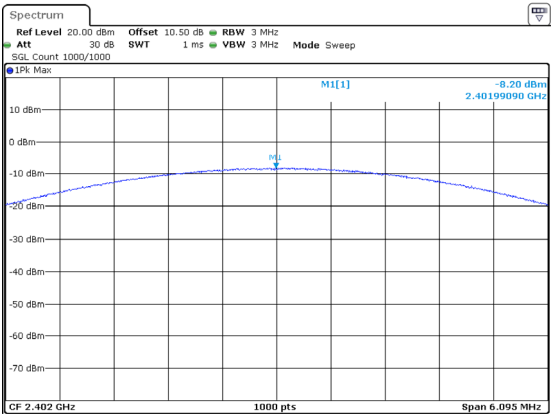
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:18:54

2DH1\_High -8.08dBm



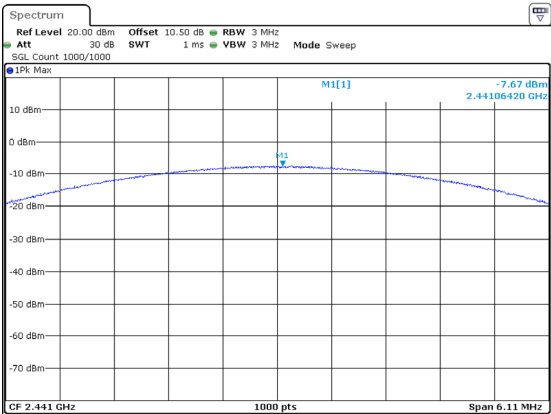
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:21:13

3DH1\_Low -8.20dBm



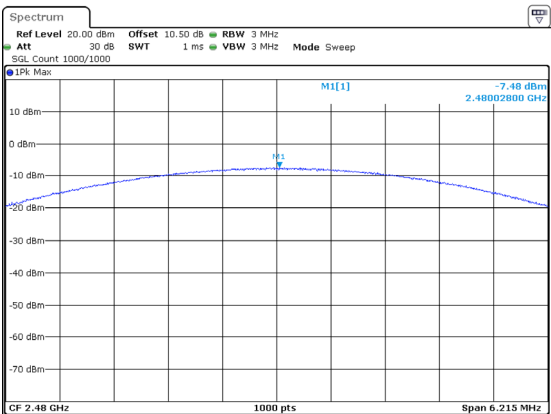
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:23:48

3DH1\_Middle -7.67dBm



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:24:49

3DH1\_High -7.48dBm



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:27:02

100 kHz Bandwidth of Frequency Band Edge

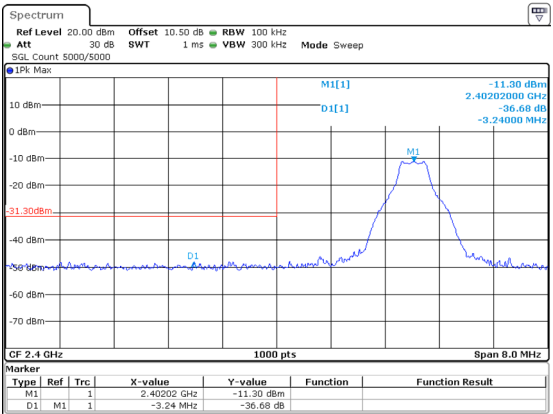
Test Information:

|             |             |              |              |
|-------------|-------------|--------------|--------------|
| Sample No.: | 2ZYL-2      | Test Date:   | 2025/04/03   |
| Test Site:  | RF          | Test Mode:   | Transmitting |
| Tester:     | Rainbow Zhu | Test Result: | Pass         |

Environmental Conditions:

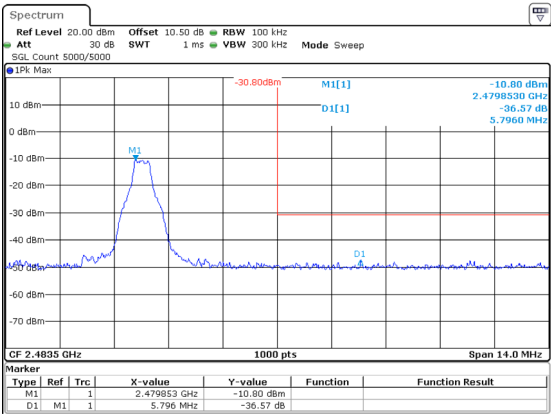
|                      |      |                              |    |                        |       |
|----------------------|------|------------------------------|----|------------------------|-------|
| Temperature:<br>(°C) | 23.5 | Relative<br>Humidity:<br>(%) | 47 | ATM Pressure:<br>(kPa) | 101.3 |
|----------------------|------|------------------------------|----|------------------------|-------|

DH1\_Low



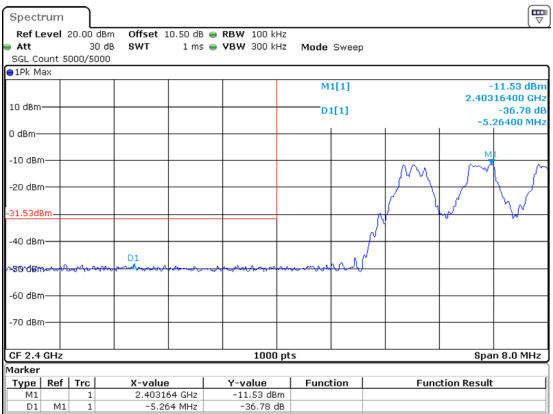
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:10:40

DH1\_High



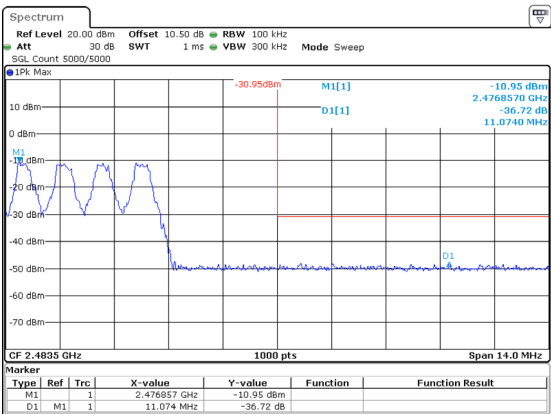
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:14:47

DH1\_Hopping\_Lower



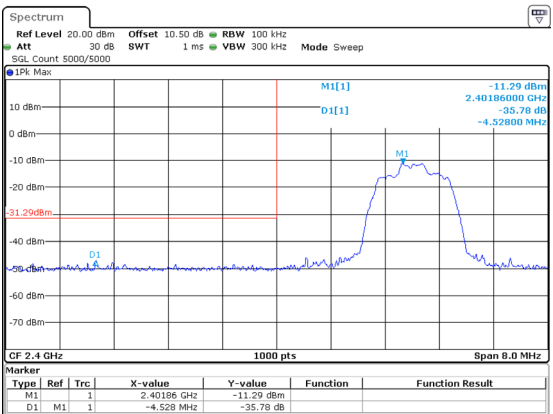
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:50:07

DH1\_Hopping\_Upper



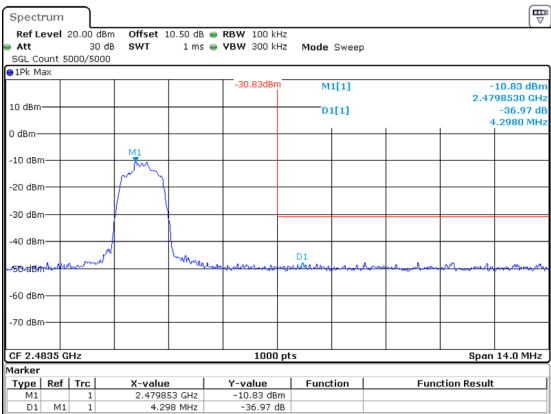
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:51:51

2DH1\_Low



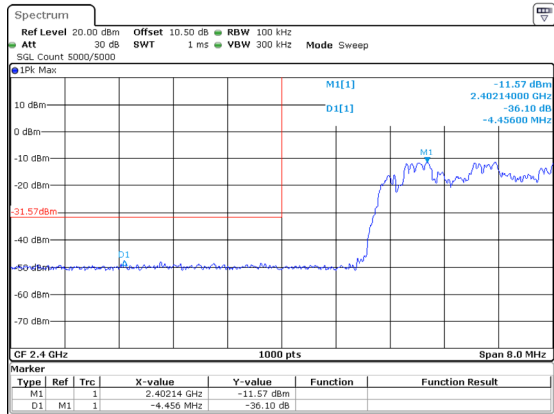
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:17:26

2DH1\_High



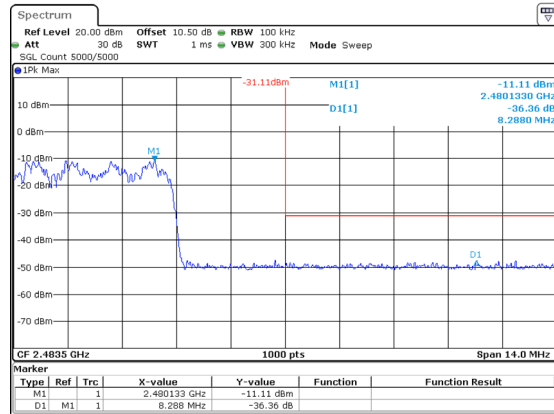
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:20:44

2DH1\_Hopping\_Lower



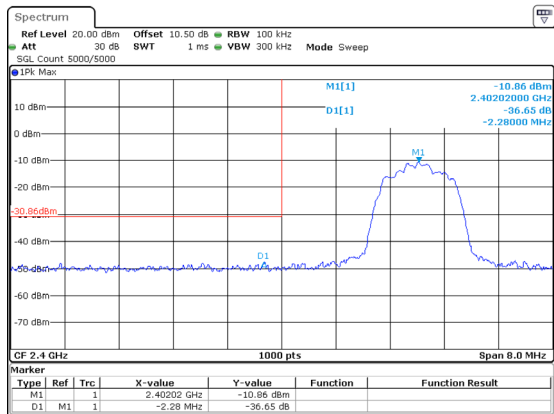
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:53:34

2DH1\_Hopping\_Upper



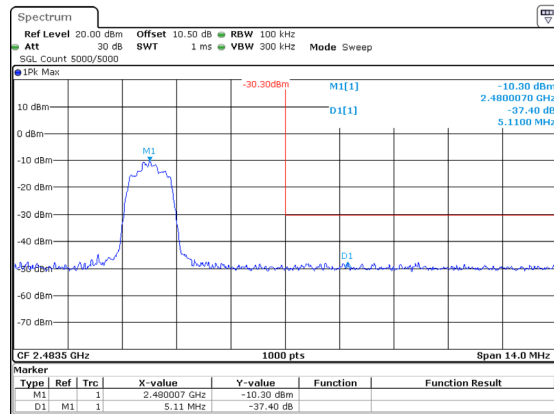
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:54:48

3DH1\_Low



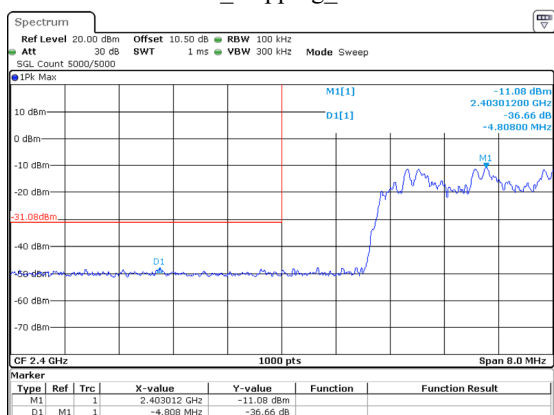
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:53:18

3DH1\_High



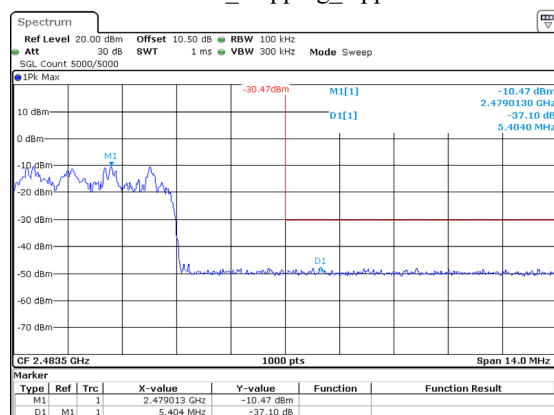
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:56:28

3DH1\_Hopping\_Lower



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:56:32

3DH1\_Hopping\_Upper



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 15:57:49

**Time of Occupancy (dwell time)****Test Information:**

|                    |             |                     |              |
|--------------------|-------------|---------------------|--------------|
| <b>Sample No.:</b> | 2ZYL-2      | <b>Test Date:</b>   | 2025/04/03   |
| <b>Test Site:</b>  | RF          | <b>Test Mode:</b>   | Transmitting |
| <b>Tester:</b>     | Rainbow Zhu | <b>Test Result:</b> | Pass         |

**Environmental Conditions:**

|                             |      |                                  |    |                               |       |
|-----------------------------|------|----------------------------------|----|-------------------------------|-------|
| <b>Temperature:</b><br>(°C) | 23.5 | <b>Relative Humidity:</b><br>(%) | 47 | <b>ATM Pressure:</b><br>(kPa) | 101.3 |
|-----------------------------|------|----------------------------------|----|-------------------------------|-------|

**Test Data:**

| Mode | Channel         | Pulse width<br>(ms) | Dwell time<br>(s) | Limit<br>(s) | Verdict |
|------|-----------------|---------------------|-------------------|--------------|---------|
| DH1  | Hopping Channel | 0.417               | 0.133             | 0.400        | Pass    |
| DH3  | Hopping Channel | 1.679               | 0.269             | 0.400        | Pass    |
| DH5  | Hopping Channel | 2.933               | 0.313             | 0.400        | Pass    |
| 2DH1 | Hopping Channel | 0.427               | 0.137             | 0.400        | Pass    |
| 2DH3 | Hopping Channel | 1.685               | 0.270             | 0.400        | Pass    |
| 2DH5 | Hopping Channel | <b>2.938</b>        | 0.313             | 0.400        | Pass    |
| 3DH1 | Hopping Channel | 0.432               | 0.138             | 0.400        | Pass    |
| 3DH3 | Hopping Channel | 1.682               | 0.269             | 0.400        | Pass    |
| 3DH5 | Hopping Channel | <b>2.938</b>        | 0.313             | 0.400        | Pass    |

**Note:**

**DH1:** Dwell time = Pulse width (ms) × (1600/2/79) × 31.6 s

**DH3:** Dwell time = Pulse width (ms) × (1600/4/79) × 31.6 s

**DH5:** Dwell time = Pulse width (ms) × (1600/6/79) × 31.6 s

**2DH1:** Dwell time = Pulse width (ms) × (1600/2/79) × 31.6 s

**2DH3:** Dwell time = Pulse width (ms) × (1600/4/79) × 31.6 s

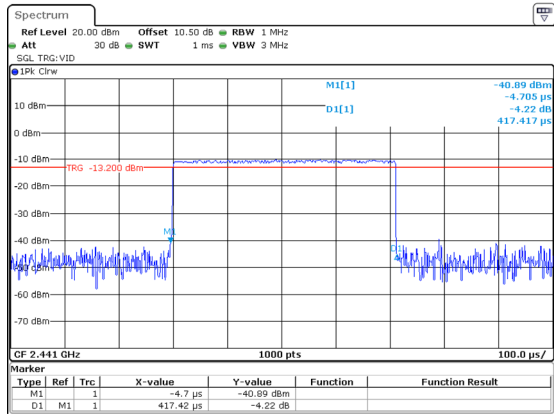
**2DH5:** Dwell time = Pulse width (ms) × (1600/6/79) × 31.6 s

**3DH1:** Dwell time = Pulse width (ms) × (1600/2/79) × 31.6 s

**3DH3:** Dwell time = Pulse width (ms) × (1600/4/79) × 31.6 s

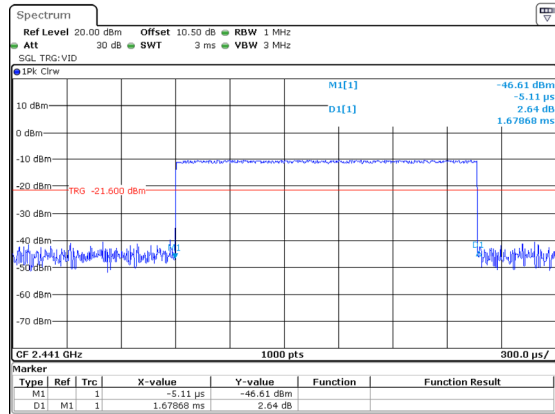
**3DH5:** Dwell time = Pulse width (ms) × (1600/6/79) × 31.6 s

DH1\_Hopping 0.417ms



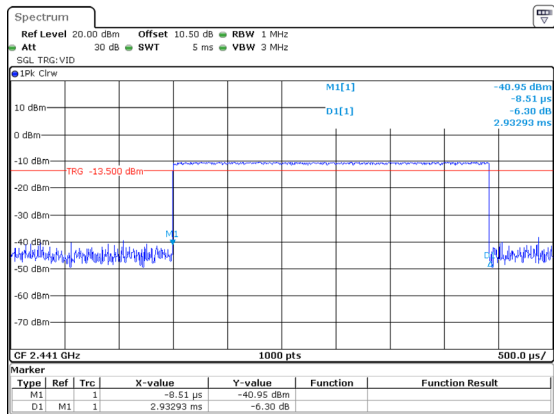
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:00:18

DH3\_Hopping 1.679ms



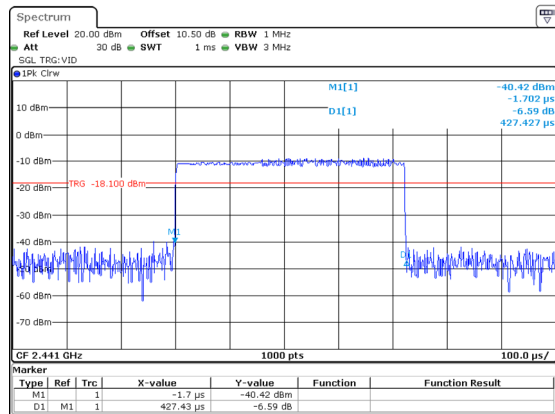
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:01:05

DH5\_Hopping 2.933ms



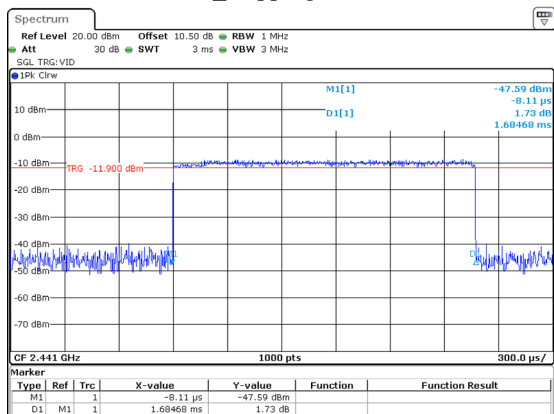
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:01:58

2DH1\_Hopping 0.427ms



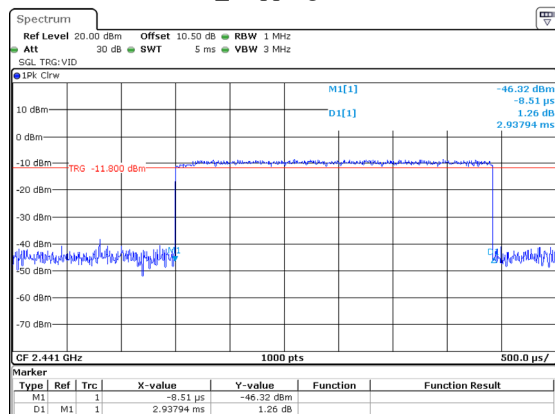
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:02:49

2DH3\_Hopping 1.685ms



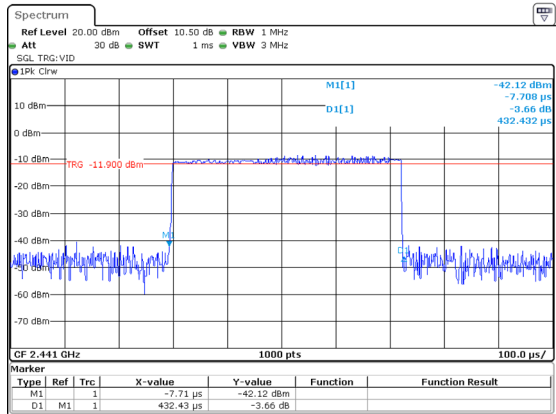
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:04:56

2DH5\_Hopping 2.938ms



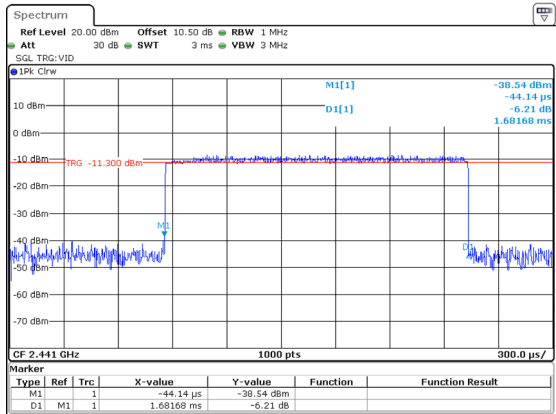
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:06:10

3DH1\_Hopping 0.432ms



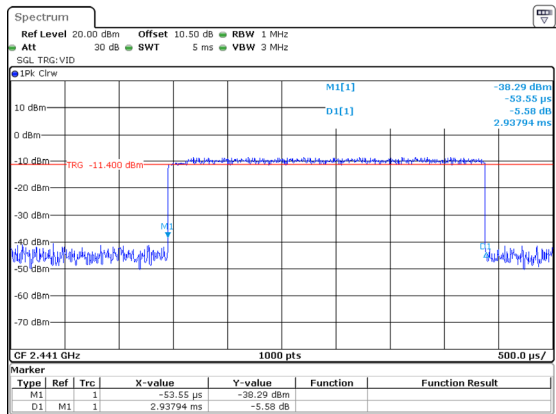
ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:08:06

3DH3\_Hopping 1.682ms



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:08:57

3DH5\_Hopping 2.938ms



ProjectNo.:2501R16873E-RF Tester:Rainbow Zhu  
Date: 3.APR.2025 16:09:47

## RF EXPOSURE EVALUATION

### RF EXPOSURE

#### Applicable Standard

According to FCC §2.1091 and §1.1307(b) (3), 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 KDB 447498 D04 Interim General RF Exposure Guidance V01

#### 1-mW Test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

### Result

#### For worst case:

| Radio     | Frequency<br>(MHz) | Conducted output<br>power including<br>Tune-up Tolerance<br>(dBm) | Antenna<br>Gain<br>(dBi) | The Greater of<br>Conducted Power |     | Exemption<br>Limit<br>(mW) |
|-----------|--------------------|-------------------------------------------------------------------|--------------------------|-----------------------------------|-----|----------------------------|
|           |                    |                                                                   |                          | dBm                               | mW  |                            |
| Bluetooth | 2402-2480          | -7                                                                | -0.58                    | -7                                | 0.2 | 1                          |

Note: The antenna gain<sup>#</sup> and tune up conducted power<sup>#</sup> was provided by the applicant

#### Result: Compliant

## **EUT PHOTOGRAPHS**

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Please refer to the attachment 2501R16873E-RF External photo and 2501R16873E-RF Internal photo.

## **TEST SETUP PHOTOGRAPHS**

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Please refer to the attachment 2501R16873E-RF Test Setup photo.

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