# TEST REPORT

| | |
|---|---|
| Applicant Name: | JINGSHAN JINGYANG ELECTRONICS CO., LTD |
| Address: | Group 1, Sanyang Village, Sanyang Town, Jingshan City, Jingmen City, Hubei Province, China |
| Report Number: | 2401Z20384E-RF-00A |
| FCC ID: | 2BFYM-TWS176 |

**Test Standard (s)**

FCC PART 15.247

**Sample Description**

| | |
|---|---|
| Product Type: | Silwrap TWS S24 Ast |
| Model No.: | PATW-1039-BK |
| Multiple Model(s) No.: | PATW-1039-WH, PATW-1039-PK, TWS176 |
| Trade Mark: | Prime Audio |
| Date Received: | 2024-11-14 |
| Issue Date: | 2024-12-25 |

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

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

**Prepared and Checked By:**

Allen. Bai

Allen Bai
RF Engineer

**Approved By:**

Michelle Zeng

Michelle Zeng
RF Supervisor

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# DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | 2401Z20384E-RF-00A | Original Report | 2024-12-25 |

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

| | |
|---|---|
| **Product** | Silwrap TWS S24 Ast |
| **Tested Model** | PATW-1039-BK |
| **Multiple Model(s) No.** | PATW-1039-WH, PATW-1039-PK, TWS176 |
| **UPC number** | 195207116439, 195207116446, 195207116453, 195207116460 |
| **SKU number** | 9183749 |
| **Frequency Range** | 2402~2480MHz |
| **Transmit Peak Power** | 8.48dBm |
| **Modulation Technique** | Bluetooth: GFSK, π/4-DQPSK, 8DPSK |
| **Antenna Specification#** | 2.78dBi (provided by the applicant) |
| **Voltage Range** | DC 3.7V from battery |
| **Sample serial number** | 2UJM-2 for Radiated Emissions Test<br>2UJM-3 for RF Conducted Test (Assigned by BACL, Shenzhen) |
| **Sample/EUT Status** | Good condition |
| **Adapter Information** | N/A |
| Note1: The multiple models are electrically identical with the test model except for model name and color. Please refer to the declaration letter# for more detail, which was provided by manufacturer.<br>Note2#: The left earbuds and the right earbuds are electrically identical, so the right earbuds was selected for test. | |

## 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, 15.205, 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.

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) |
| 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℃ |
| 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#** | BT_Tool v1.1.2 |
| **Power Level#** | 7 |

### Special Accessories

No special accessory.

### Equipment Modifications

No modification was made to the EUT tested.

### Support Equipment List and Details

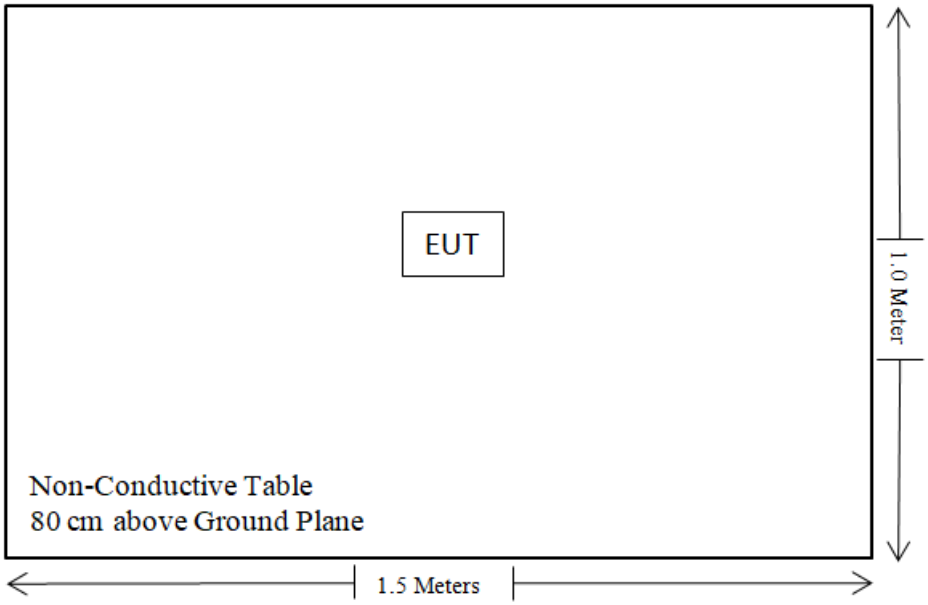
| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| / | / | / | / |

### External I/O Cable

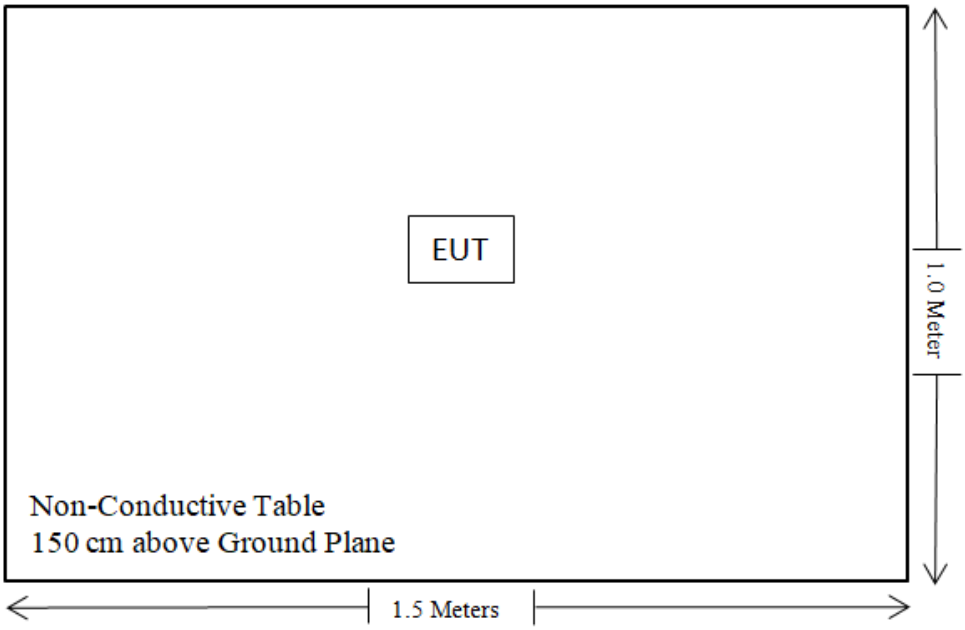
| Cable Description | Length (m) | From Port | To |
|---|---|---|---|
| / | / | / | / |

**Block Diagram of Test Setup**

For Radiated Emissions below 1GHz:




For Radiated Emissions above 1GHz:



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| FCC §15.203 | Antenna Requirement | Compliant |
| FCC §15.207(a) | AC Line Conducted Emissions | Not Applicable |
| FCC §15.205, §15.209, §15.247(d) | Radiated Spurious Emission | Compliant |
| FCC §15.247(a)(1) | 20 dB Emission Bandwidth | Compliant |
| FCC §15.247(a)(1) | Channel Separation | Compliant |
| FCC §15.247(a)(1)(iii) | Number of Hopping Frequency | Compliant |
| FCC §15.247(a)(1)(iii) | Time of Occupancy (dwell time) | Compliant |
| FCC §15.247(b)(1) | Maximum Conducted Output Power | Compliant |
| FCC §15.247(d) | 100 kHz Bandwidth of Frequency Band Edge | Compliant |
| FCC §1.1307&§2.1093&§15.247 (i) | RF Exposure | Compliant |

Not Applicable: The EUT is powered by battery.

# TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| **Radiated Emission Test** | | | | | |
| Rohde & Schwarz | EMI Test Receiver | ESR3 | 102455 | 2024/01/16 | 2025/01/15 |
| 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 | 2024/05/21 | 2025/05/20 |
| Unknown | Cable | PNG214 | 1354 | 2024/05/21 | 2025/05/20 |
| Audix | EMI Test software | E3 | 19821b(V9) | NCR | NCR |
| Rohde&Schwarz | Spectrum Analyzer | FSV40 | 101605 | 2024/03/27 | 2025/03/26 |
| COM-POWER | Pre-amplifier | PA-122 | 181919 | 2024/06/18 | 2025/06/17 |
| Schwarzbeck | Horn Antenna | BBHA9120D(1201) | 1143 | 2023/07/26 | 2026/07/25 |
| Unknown | RF Cable | KMSE | 0735 | 2024/06/18 | 2025/06/17 |
| Unknown | RF Cable | UFA147 | 219661 | 2024/06/18 | 2025/06/17 |
| Unknown | RF Cable | XH750A-N | J-10M | 2024/06/18 | 2025/06/17 |
| JD | Multiplex Switch Test Control Set | DT7220FSU | DQ77926 | 2024/06/18 | 2025/06/17 |
| A.H.System | Pre-amplifier | PAM-1840VH | 190 | 2024/06/18 | 2025/06/17 |
| Electro-Mechanics Co | Horn Antenna | 3116 | 2026 | 2023/09/18 | 2026/09/17 |
| UTIFLEX | RF Cable | NO. 13 | 232308-001 | 2024/06/18 | 2025/06/17 |
| Audix | EMI Test software | E3 | 191218(V9) | NCR | NCR |
| **RF Conducted Test** | | | | | |
| R&S | Spectrum Analyzer | FSU26 | 200120 | 2024/01/08 | 2025/01/07 |
| WEINSCHEL | 3dB Attenuator | Unknown | F-03-EM220 | 2024/06/27 | 2025/06/26 |
| MARCONI | 10dB Attenuator | 6534/3 | 2942 | 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).

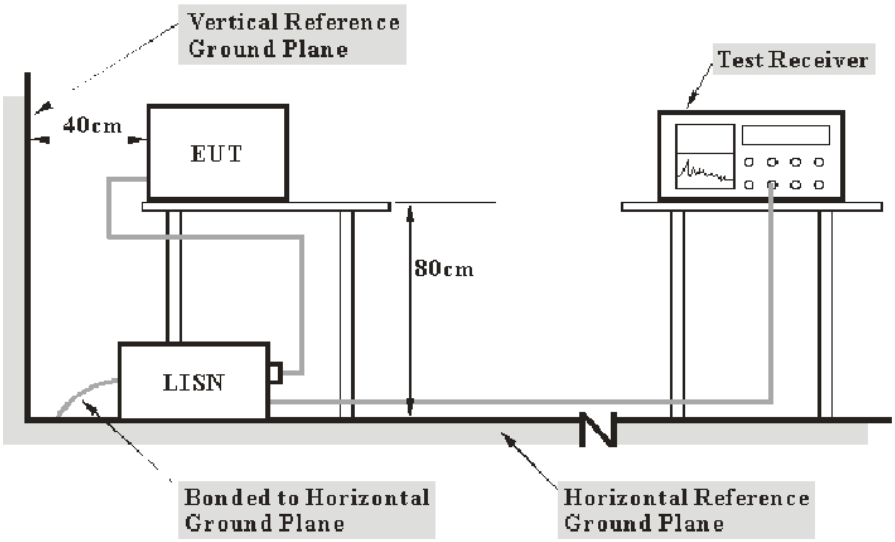
# REQUIREMENTS AND TEST PROCEDURES

## 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 C63.10-2013. 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:

Factor = LISN VDF + 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:

Over Limit = Level – Limit
Level = Read Level + Factor

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

**Test Result**

The EUT is powered by battery, so this test item is not required.

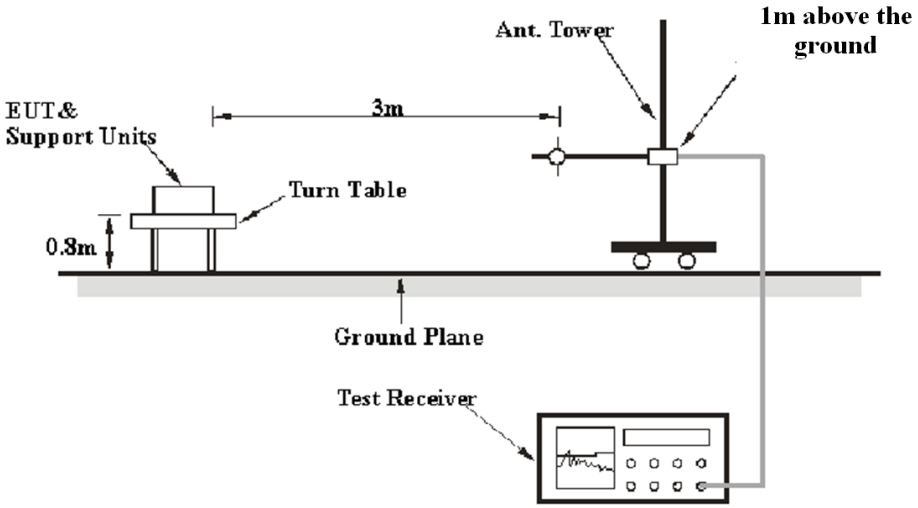
## Radiated Emissions

### Applicable Standard

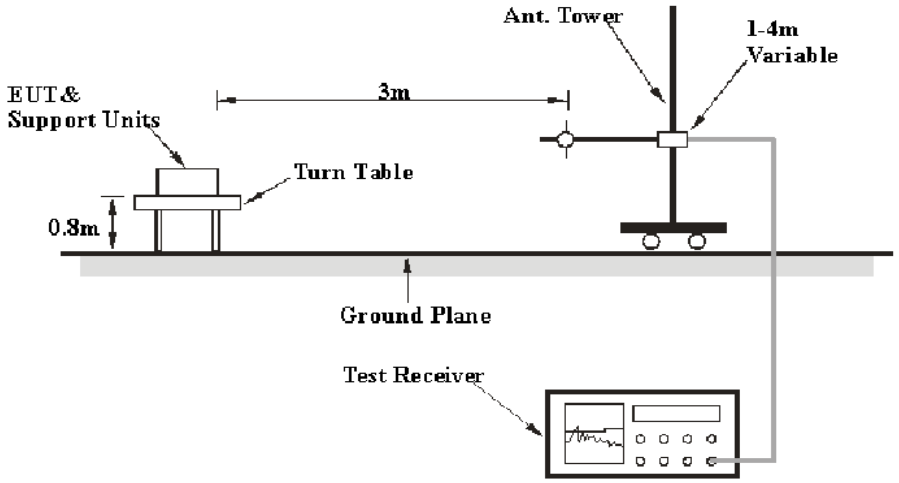
FCC §15.205; §15.209; §15.247(d)

### EUT Setup

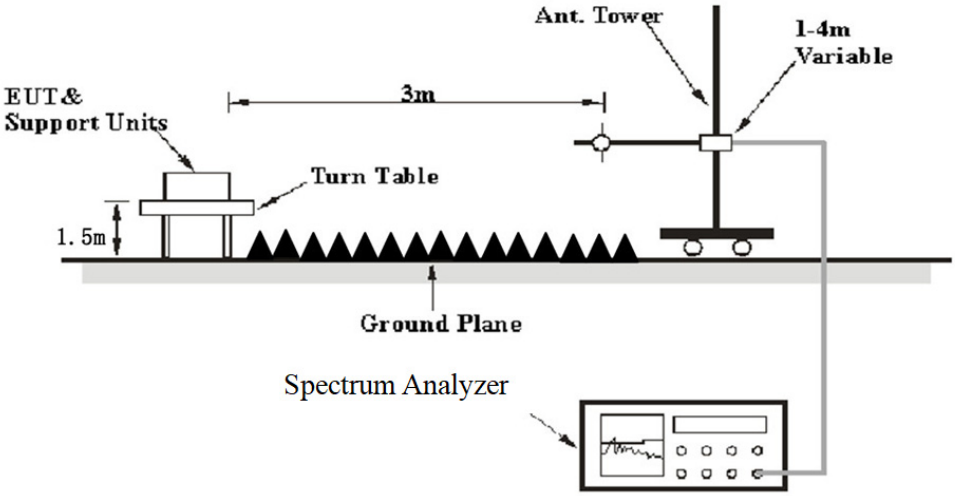
**9 kHz-30MHz:**




**30MHz-1GHz:**



**Above 1GHz:**




The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. 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 |
|---|---|---|---|---|
| 9 kHz – 150 kHz | / | / | 200 Hz | QP |
| | 300 Hz | 1 kHz | / | PK |
| 150 kHz – 30 MHz | / | / | 9 kHz | QP |
| | 10 kHz | 30 kHz | / | PK |
| 30 MHz – 1000 MHz | / | / | 120 kHz | QP |
| | 100 kHz | 300 kHz | / | PK |
| Above 1 GHz | Harmonics | | | |
| | 1MHz | 3 MHz | / | PK |
| | Average Emission Level=Peak Emission Level+20*log(Duty cycle) | | | |
| | Other Emissions | | | |
| | 1MHz | 3 MHz | / | PK |
| | 1MHz | ≥10 Hz | / | Average |

For Duty cycle measurement:

Use the duty cycle factor correction factor method per 15.35(c).
Duty cycle=On time/100milliseconds, On time=N1*L1+N2*L2+…Nn-1*Ln-1+Nn*Ln,
Where N1 is number of type 1 pulses, L1 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:

Factor = Antenna Factor + Cable Loss - 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:

Over Limit/Margin = Level/Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

## 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 C63.10-2013 Clause 7.8.7 & 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 approximately 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 (OBW/RBW)] below the reference level.

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.

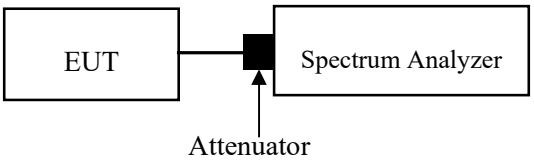
g) Determine the reference value: Set the EUT to transmit an un-modulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

h) Determine the "−xx dB down amplitude" using [(reference value) − 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 un-modulated 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 occupied 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 occupied bandwidth shall be reported by providing 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 hoping 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.

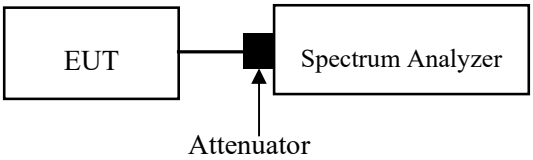
### Test Procedure

Test Method: ANSI C63.10-2013 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) ≥ RBW.
d) Sweep: Auto.
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.




Note: The limit is 2/3*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 C63.10-2013 Clause 7.8.3

a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may 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.

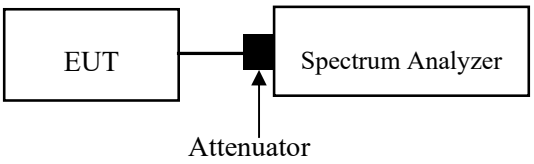
c) VBW ≥ RBW.

d) Sweep: Auto.

e) Detector function: Peak.

f) Trace: Max hold.

It might prove necessary to break the span up into sub ranges 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.



## 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 C63.10-2013 Clause 7.8.4

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

a) Span: Zero span, centered on a hopping channel.
b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
d) Detector function: Peak.
e) Trace: Max hold.

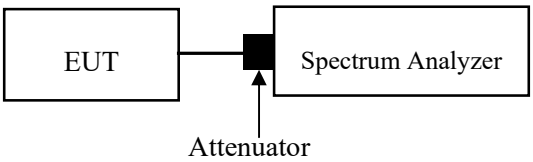
Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) =(number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.



## 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 C63.10-2013 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. The hopping shall be disabled for this test:

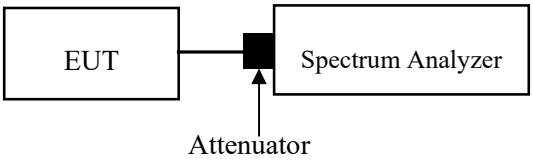
a) Use the following spectrum analyzer settings:

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ⩾ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.




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

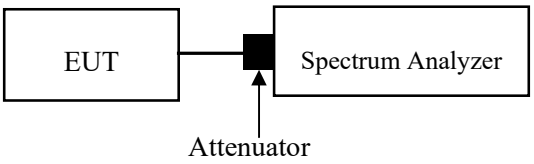
### Applicable Standard

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 C63.10-2013 Clause 7.8.6 & Clause 6.10

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 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.



# ANTENNA REQUIREMENT

**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 one internal antenna arrangement, which was permanently attached, the antenna gain# is 2.78dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result: Compliant**

# TEST DATA AND RESULTS

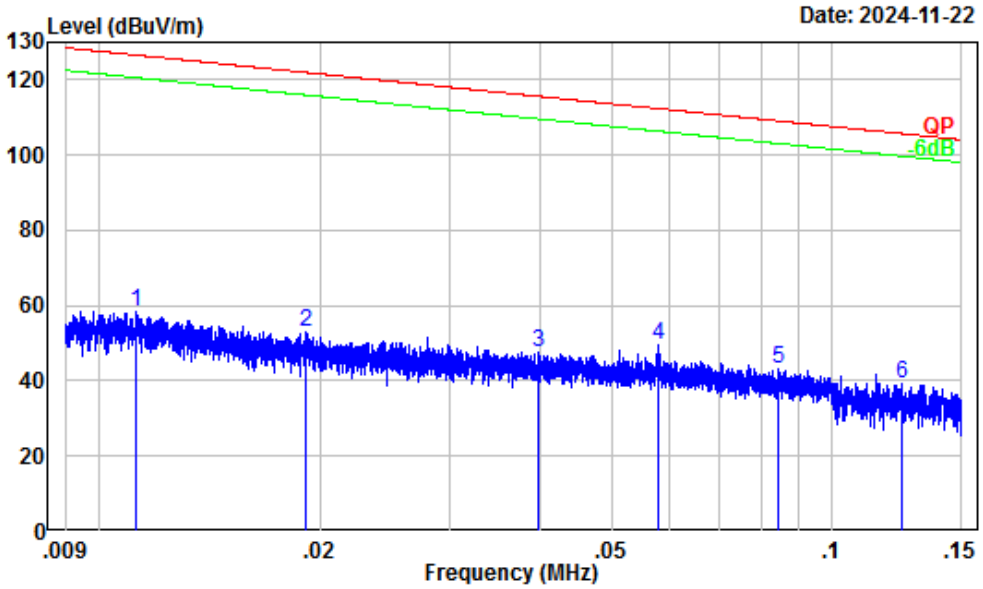
## Radiated Emissions

### Environmental Conditions

| | | | |
|---|---|---|---|
| **Temperature (℃)** | 22~24.9 | **Relative Humidity (%)** | 50~58 |
| **ATM Pressure (kPa):** | 101 | **Test engineer:** | Carl Zhu ,Karl Xu |
| **Test date:** | 2024/11/22-2024/11/23 | | |
| **EUT operation mode:** | Below 1GHz: Transmitting (Maximum output power mode, EDR (8DPSK) High Channel)<br>Above 1GHz: Transmitting(Maximum output power mode, EDR (8DPSK)) | | |
| **Note:** | 1. Pre-scan in the X, Y and Z axes of orientation, the worst case Z-axis of orientation was recorded.<br>2. For 9 kHz~30 MHz test, Pre-scan in the parallel, perpendicular and ground parallel, just the worst case parallel was recorded in the report | | |

**Below 1GHz:**

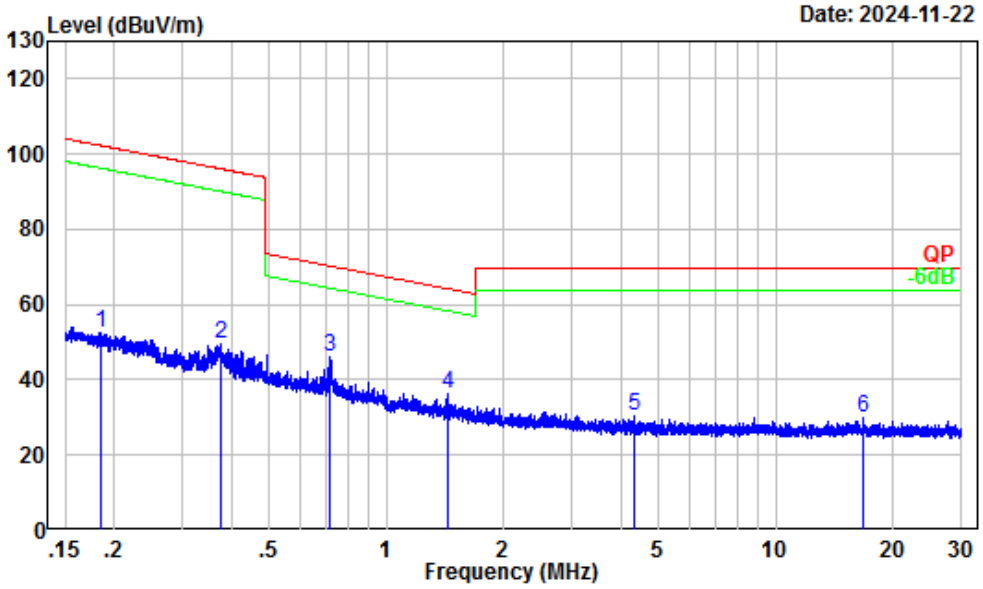
9 kHz-150 kHz




Site : Chamber A
Condition : 3m
Project Number: 2401Z20384E-RF
Test Mode : Transmitting
Tester : Carl Zhu

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 0.01 | 32.06 | 26.42 | 58.48 | 126.57 | -68.09 | Peak |
| 2 | 0.02 | 30.56 | 22.56 | 53.12 | 121.96 | -68.84 | Peak |
| 3 | 0.04 | 27.48 | 20.00 | 47.48 | 115.63 | -68.15 | Peak |
| 4 | 0.06 | 25.61 | 24.12 | 49.73 | 112.35 | -62.62 | Peak |
| 5 | 0.08 | 23.10 | 20.19 | 43.29 | 109.09 | -65.80 | Peak |
| 6 | 0.12 | 20.54 | 18.68 | 39.22 | 105.69 | -66.47 | Peak |

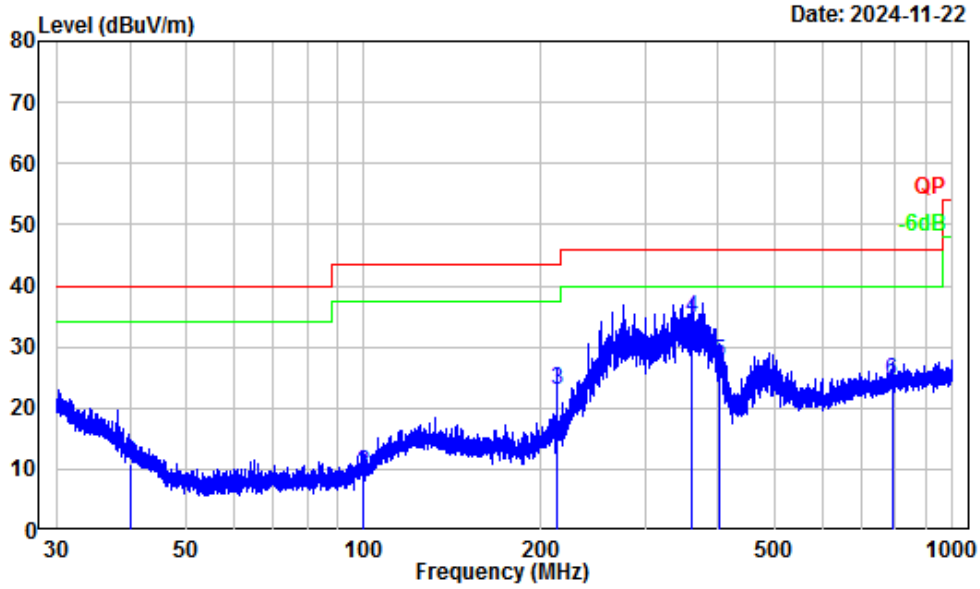
150 kHz-30MHz




Site : Chamber A
Condition : 3m
Project Number: 2401Z20384E-RF
Test Mode : Transmitting
Tester : Carl Zhu

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 0.19 | 16.97 | 35.49 | 52.46 | 102.25 | -49.79 | Peak |
| 2 | 0.38 | 8.73 | 40.81 | 49.54 | 96.07 | -46.53 | Peak |
| 3 | 0.72 | 3.74 | 42.59 | 46.33 | 70.44 | -24.11 | Peak |
| 4 | 1.44 | -0.03 | 36.29 | 36.26 | 64.25 | -27.99 | Peak |
| 5 | 4.35 | -2.74 | 33.24 | 30.50 | 69.54 | -39.04 | Peak |
| 6 | 16.86 | -2.56 | 32.49 | 29.93 | 69.54 | -39.61 | Peak |

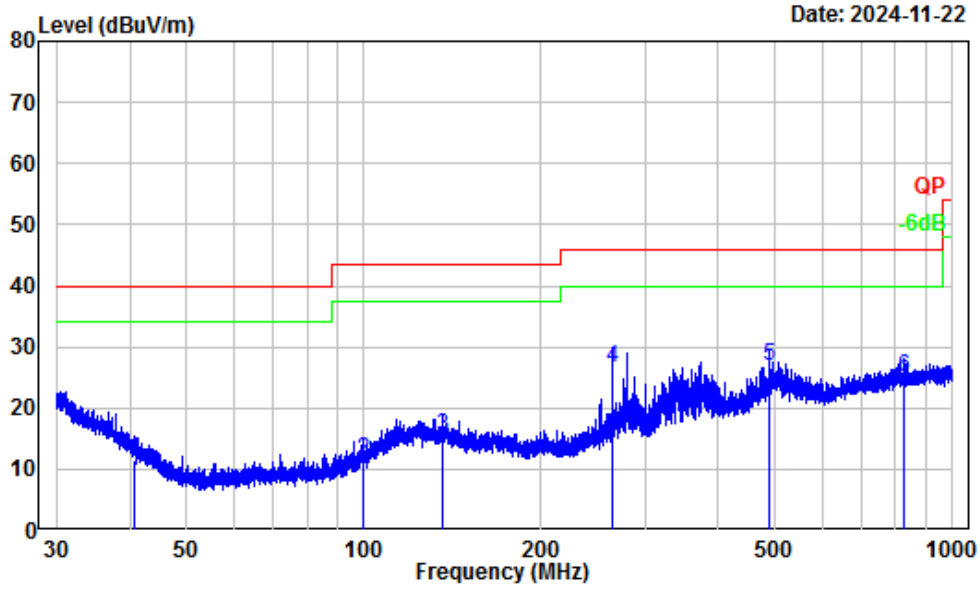
30 MHz-1 GHz Horizontal




Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401Z20384E-RF
Test Mode : Transmitting
Tester : Carl Zhu

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 40.08 | -12.43 | 23.26 | 10.83 | 40.00 | -29.17 | QP |
| 2 | 99.92 | -15.91 | 25.35 | 9.44 | 43.50 | -34.06 | QP |
| 3 | 213.02 | -14.14 | 37.17 | 23.03 | 43.50 | -20.47 | QP |
| 4 | 360.13 | -9.88 | 44.50 | 34.62 | 46.00 | -11.38 | QP |
| 5 | 401.49 | -8.36 | 35.80 | 27.44 | 46.00 | -18.56 | QP |
| 6 | 789.23 | -2.26 | 26.59 | 24.33 | 46.00 | -21.67 | QP |

30 MHz-1 GHz Vertical




Site : Chamber A
Condition : 3m Vertical
Project Number: 2401Z20384E-RF
Test Mode : Transmitting
Tester : Carl Zhu

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 40.83 | -12.95 | 24.38 | 11.43 | 40.00 | -28.57 | QP |
| 2 | 99.88 | -15.93 | 27.42 | 11.49 | 43.50 | -32.01 | QP |
| 3 | 136.16 | -11.60 | 27.08 | 15.48 | 43.50 | -28.02 | QP |
| 4 | 264.40 | -12.32 | 39.03 | 26.71 | 46.00 | -19.29 | QP |
| 5 | 487.74 | -6.08 | 32.95 | 26.87 | 46.00 | -19.13 | QP |
| 6 | 824.96 | -1.93 | 26.88 | 24.95 | 46.00 | -21.05 | QP |

**Above 1GHz:**

| Frequency (MHz) | Reading (dBµV) | Detector (PK/Ave) | Polar (H/V) | Factor (dB/m) | Corrected Amplitude (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| **8DPSK** | | | | | | | |
| Low Channel | | | | | | | |
| 4804 | 61.61 | PK | H | 2.42 | 64.03 | 74 | -9.97 |
| 4804 | 58.56 | PK | V | 2.42 | 60.98 | 74 | -13.02 |
| Middle Channel | | | | | | | |
| 4882 | 58.69 | PK | H | 1.69 | 60.38 | 74 | -13.62 |
| 4882 | 56.71 | PK | V | 1.69 | 58.4 | 74 | -15.6 |
| High Channel | | | | | | | |
| 4960 | 57.5 | PK | H | 2.77 | 60.27 | 74 | -13.73 |
| 4960 | 56.38 | PK | V | 2.77 | 59.15 | 74 | -14.85 |

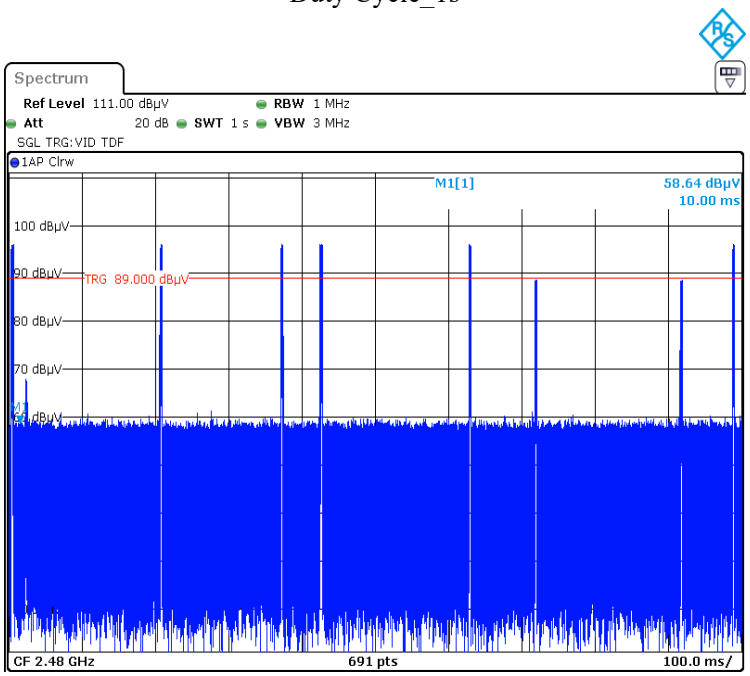
Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude/Level = Factor + Reading
Margin = Corrected Amplitude/Level - Limit
The other spurious emission which is in the noise floor level was not recorded.

| **Field Strength of Average** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Peak Measurement @3m (dBµV/m)** | **Polar (H/V)** | **Duty Cycle Correction Factor (dB)** | **Average Level (dBµV/m)** | **Limit (dBµV/m)** | **Margin (dB)** | **Comment** |
| Low Channel | | | | | | | |
| 4804 | 64.03 | H | -24.82 | 39.21 | 54 | -14.79 | Harmonic |
| 4804 | 60.98 | V | -24.82 | 36.16 | 54 | -17.84 | Harmonic |
| Middle Channel | | | | | | | |
| 4882 | 60.38 | H | -24.82 | 35.56 | 54 | -18.44 | Harmonic |
| 4882 | 58.4 | V | -24.82 | 33.58 | 54 | -20.42 | Harmonic |
| High Channel | | | | | | | |
| 4960 | 60.27 | H | -24.82 | 35.45 | 54 | -18.55 | Harmonic |
| 4960 | 59.15 | V | -24.82 | 34.33 | 54 | -19.67 | Harmonic |

Note: Average level= Peak level + Duty Cycle Corrected Factor
Margin = Average level – Limit

Worst case duty cycle:
Duty cycle = Ton/100ms = 2.87*2/100=0.0574
Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg0.0574 = -24.82

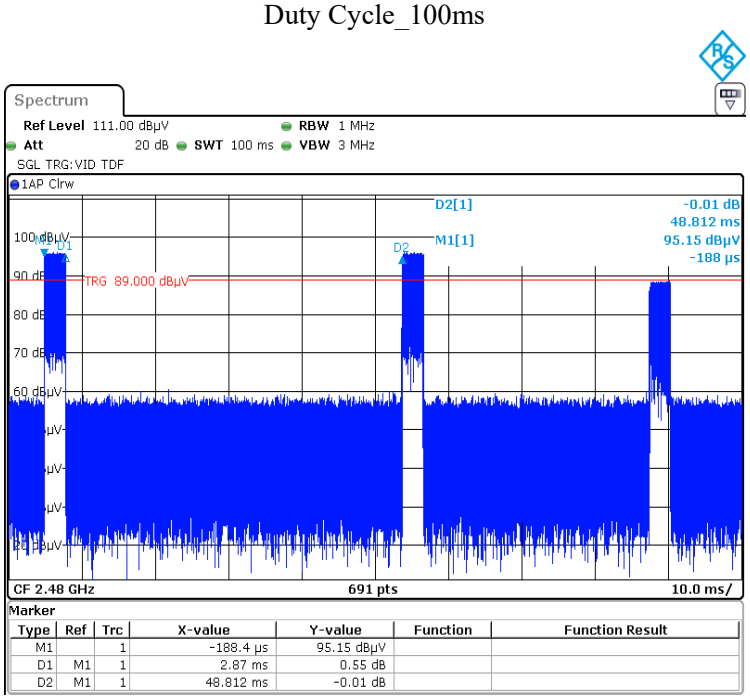
Duty Cycle_1s




ProjectNo.:2401Z20384E-RF-R Tester:Karl Xu

Date: 23.NOV.2024 10:52:08

Duty Cycle_100ms

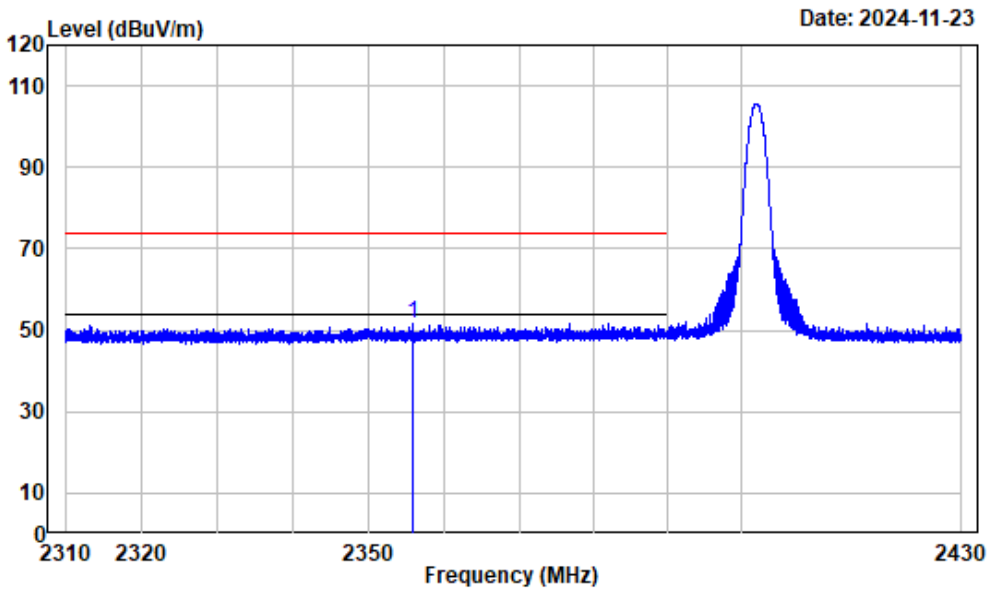



ProjectNo.:2401Z20384E-RF-R Tester:Karl Xu

Date: 23.NOV.2024 10:53:49

**Test plots**

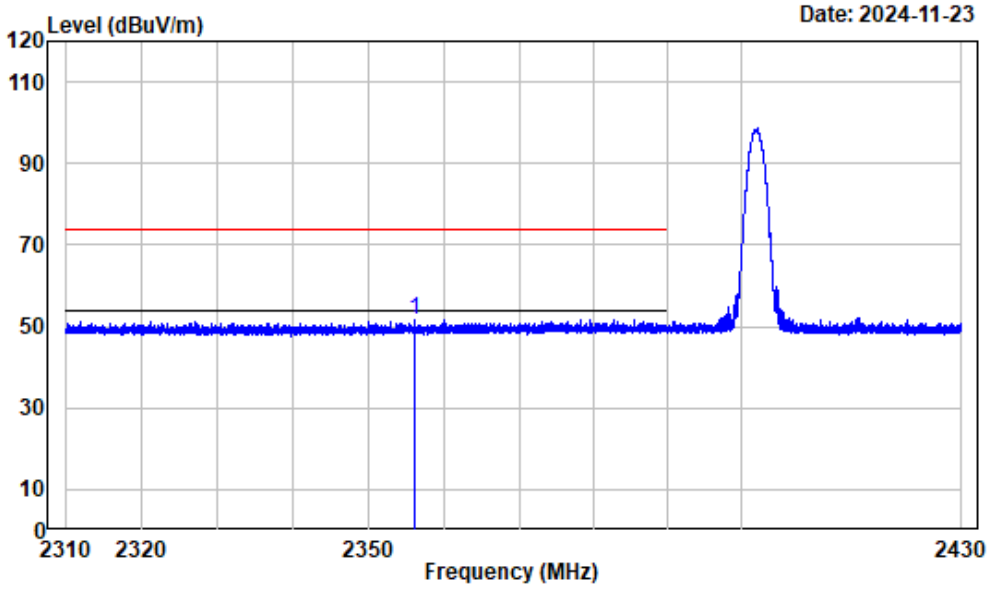
Left bandedge-Horizontal




Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2355.771 | -3.15 | 54.71 | 51.56 | 74.00 | -22.44 | peak |

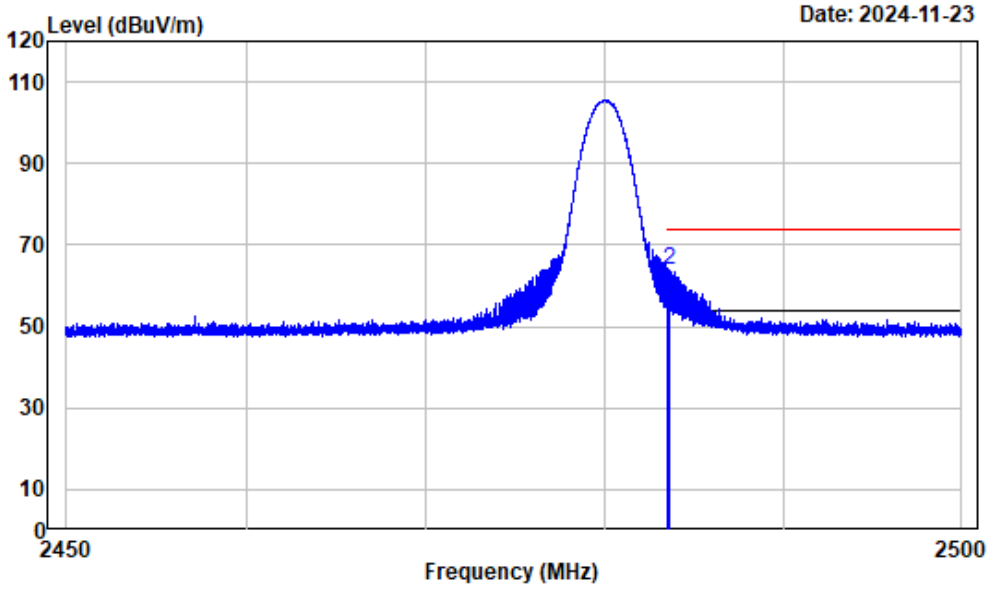
Left bandedge-Vertical




Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2356.101 | -3.15 | 54.97 | 51.82 | 74.00 | -22.18 | Peak |

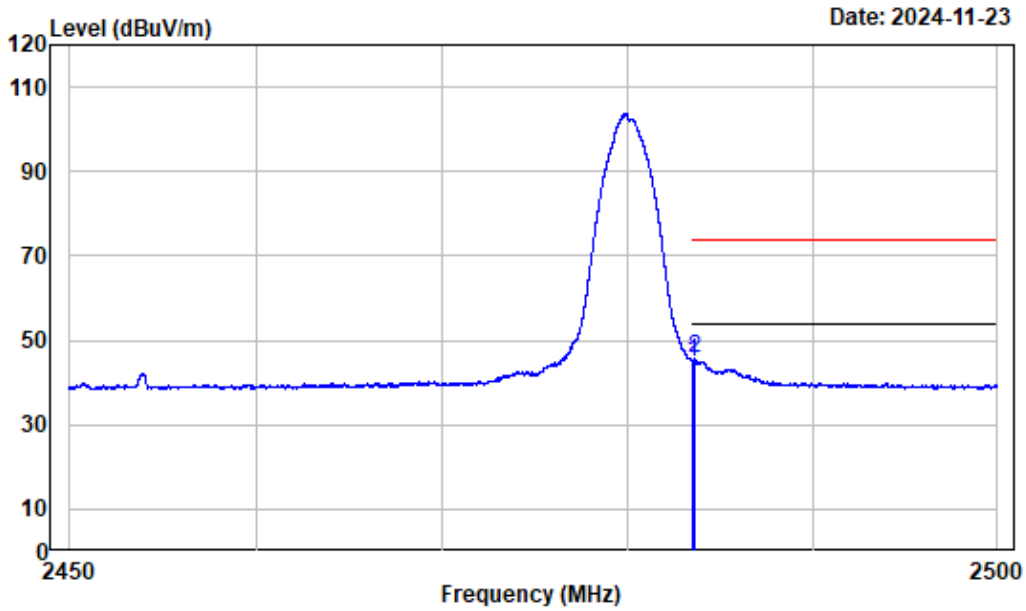
Right bandedge-Horizontal-Peak




Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2480

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | -3.17 | 57.43 | 54.26 | 74.00 | -19.74 | Peak |
| 2 | 2483.610 | -3.17 | 66.98 | 63.81 | 74.00 | -10.19 | peak |

Right bandedge-Horizontal-Average

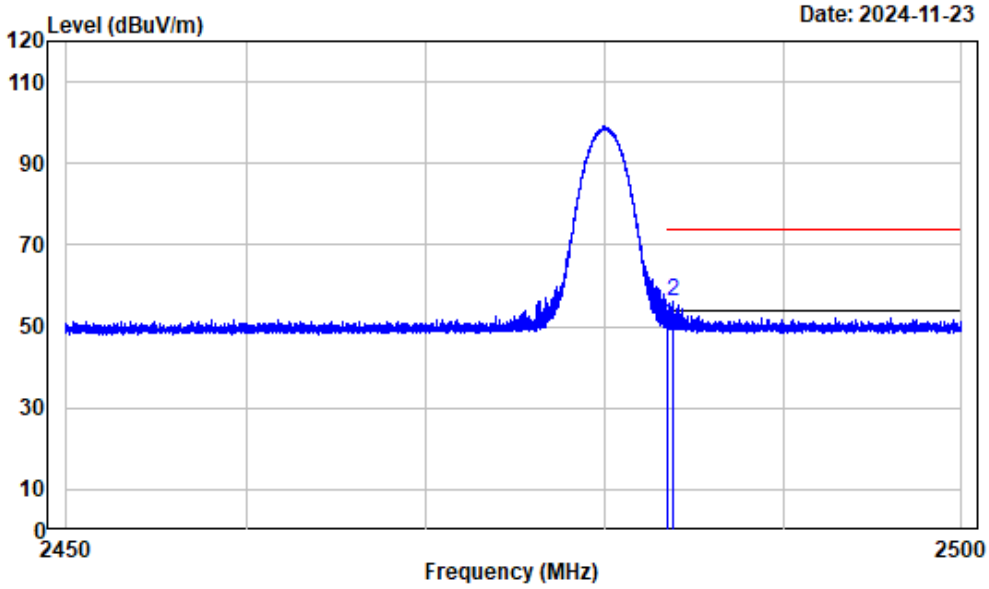



Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2480_AV

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | -3.17 | 48.07 | 44.90 | 54.00 | -9.10 | Average |
| 2 | 2483.604 | -3.17 | 48.69 | 45.52 | 54.00 | -8.48 | Average |

Note: Spectrum analyzer setting: RBW=1 MHz, VBW=5 kHz

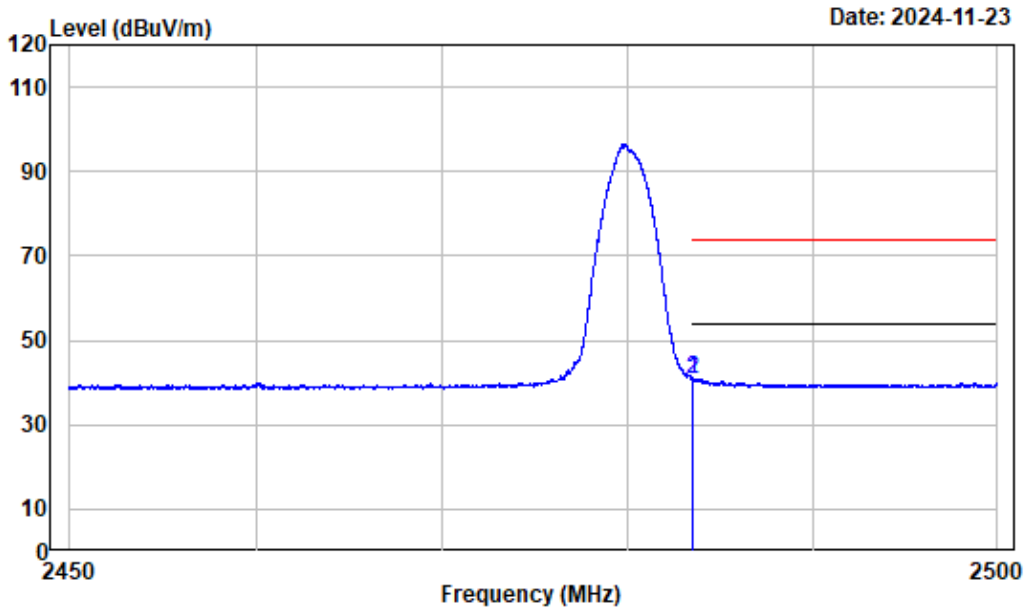
Right bandedge-Vertical-Peak




Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2480

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | -3.17 | 53.65 | 50.48 | 74.00 | -23.52 | Peak |
| 2 | 2483.760 | -3.17 | 59.26 | 56.09 | 74.00 | -17.91 | Peak |

Right bandedge-Vertical-Average



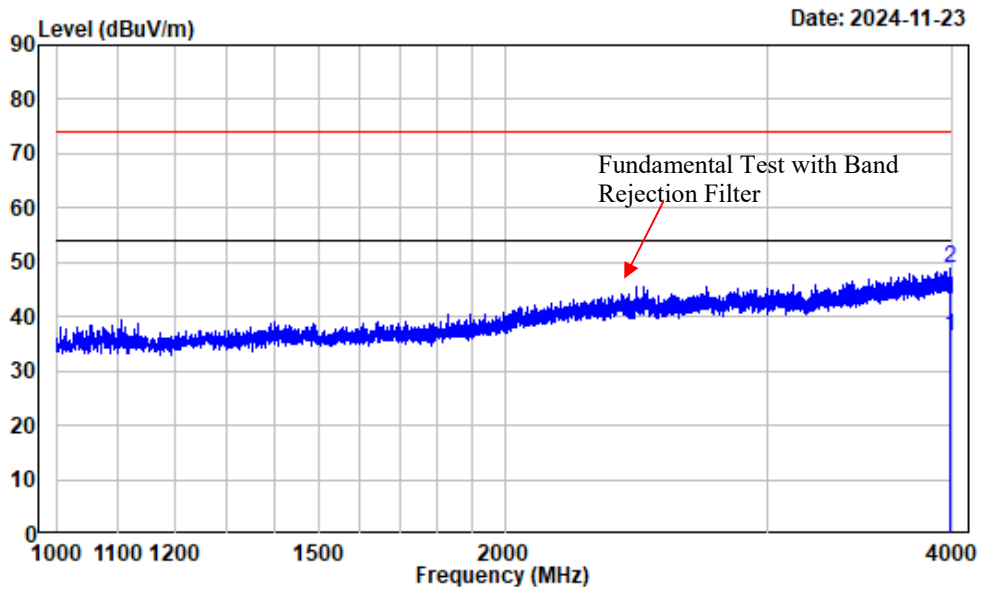

Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2480_AV

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.498 | -3.17 | 44.06 | 40.89 | 54.00 | -13.11 | Average |
| 2 | 2483.500 | -3.17 | 44.06 | 40.89 | 54.00 | -13.11 | Average |

Note: Spectrum analyzer setting: RBW=1 MHz, VBW=5 kHz

**Worst harmonic test plots (8DPSK, low channel)**

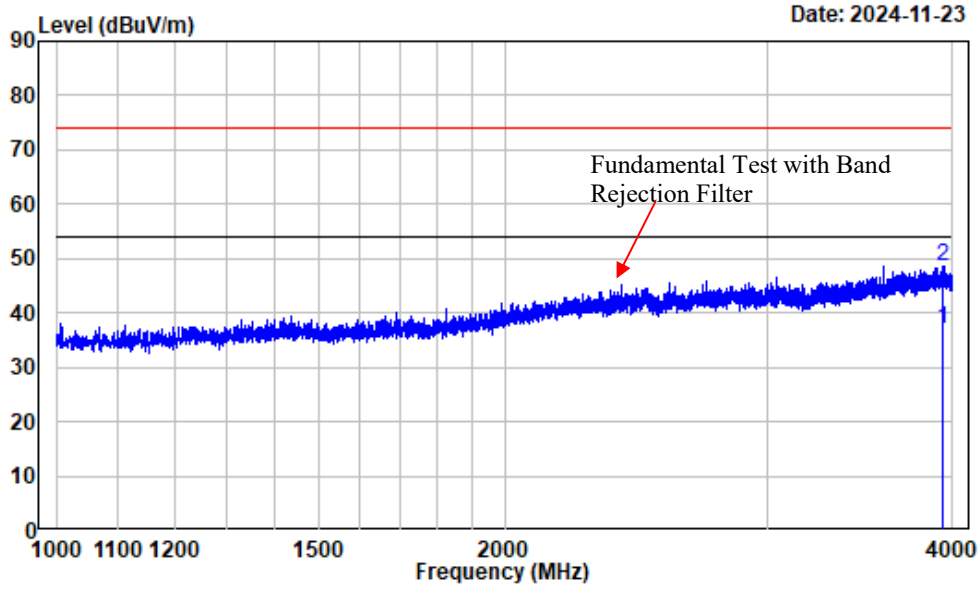
1-4GHz-Horizontal




Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 3980.498 | -0.20 | 36.59 | 36.39 | 54.00 | -17.61 | Average |
| 2 | 3980.498 | -0.20 | 48.97 | 48.77 | 74.00 | -25.23 | Peak |

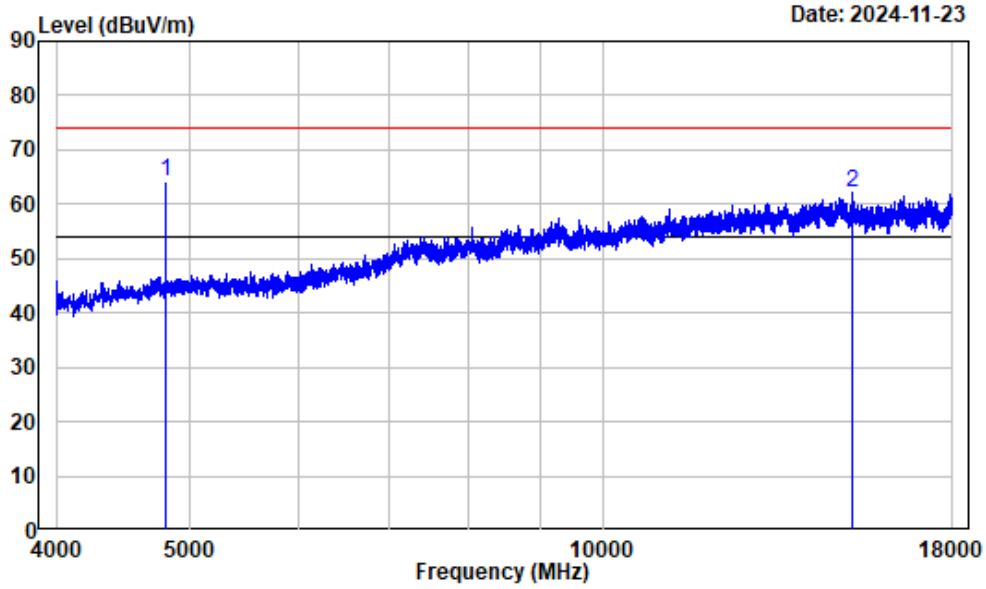
1-4GHz-Vertical




Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 3945.618 | -0.21 | 37.29 | 37.08 | 54.00 | -16.92 | Average |
| 2 | 3945.618 | -0.21 | 48.85 | 48.64 | 74.00 | -25.36 | Peak |

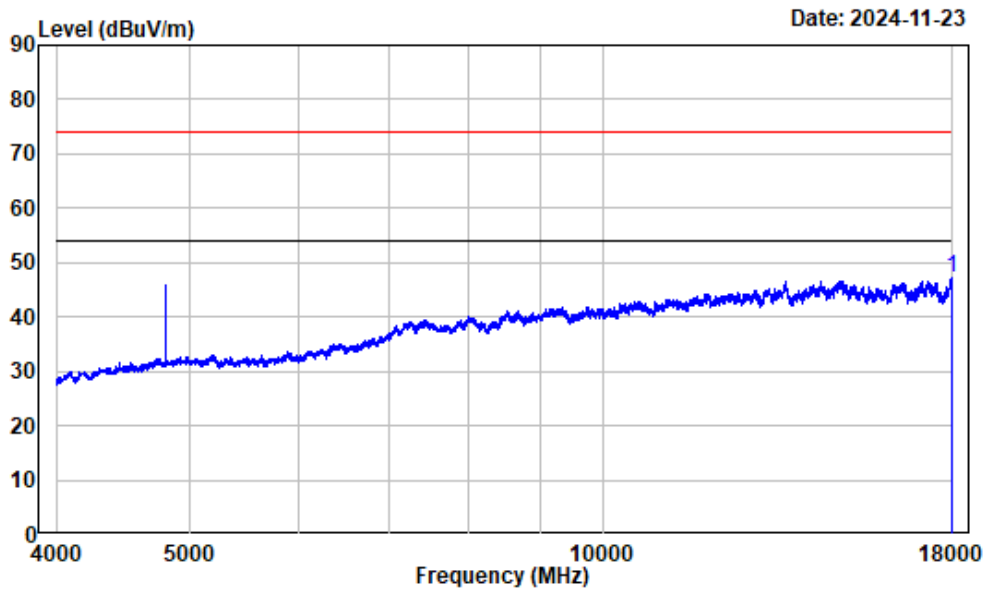
4-18GHz-Horizontal-Peak




Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 4804.000 | 2.42 | 61.61 | 64.03 | 74.00 | -9.97 | Peak |
| 2 | 15232.900 | 15.00 | 46.99 | 61.99 | 74.00 | -12.01 | Peak |

4-18GHz-Horizontal-Average

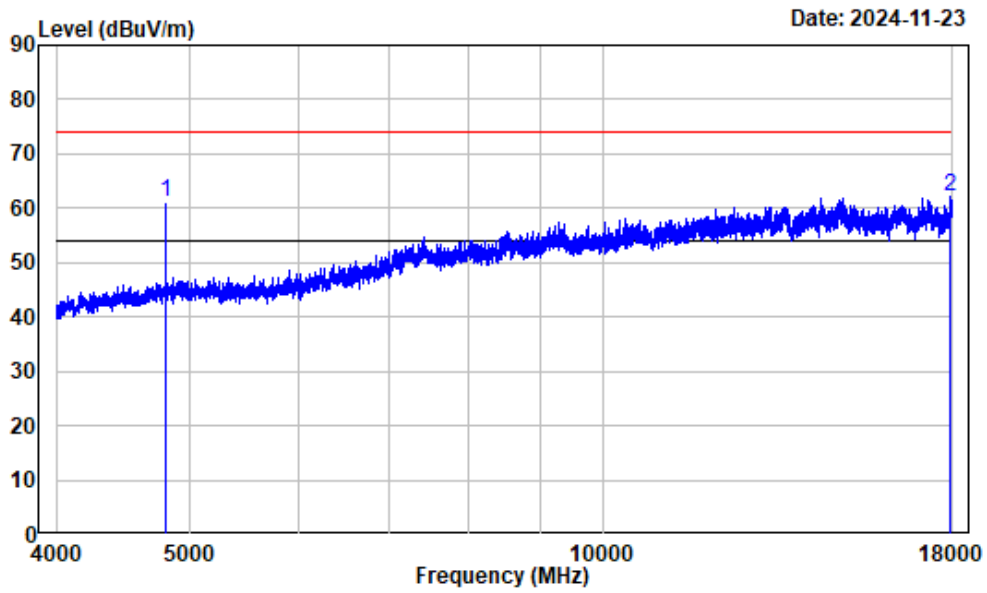



Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 17966.750 | 24.39 | 22.85 | 47.24 | 54.00 | -6.76 | Average |

Note: Spectrum analyzer setting: RBW=1 MHz, VBW=5 kHz

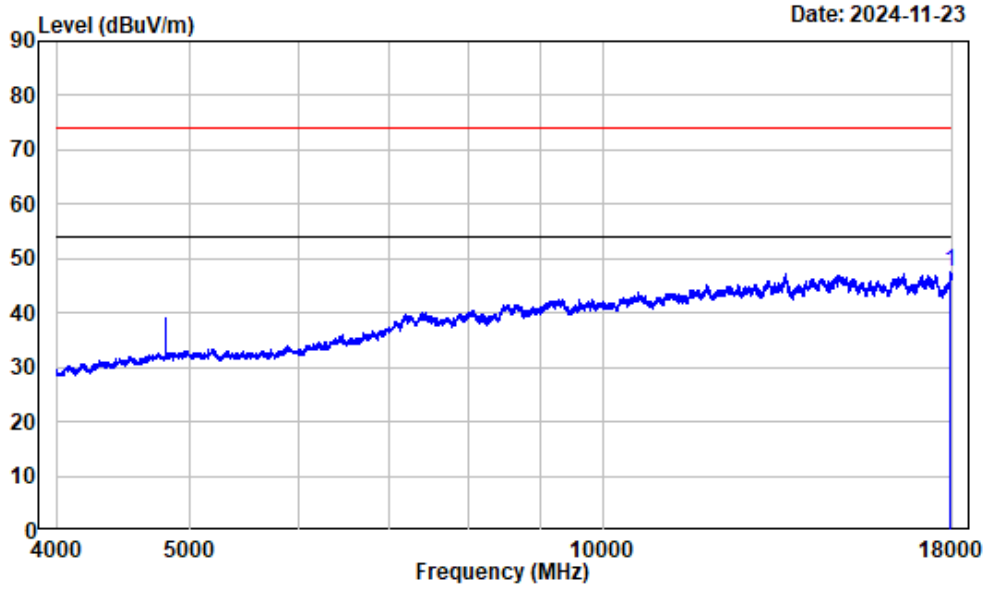
4-18GHz-Vertical-Peak




Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 4804.000 | 2.42 | 58.56 | 60.98 | 74.00 | -13.02 | Peak |
| 2 | 17943.990 | 24.22 | 38.06 | 62.28 | 74.00 | -11.72 | Peak |

4-18GHz-Vertical-Average

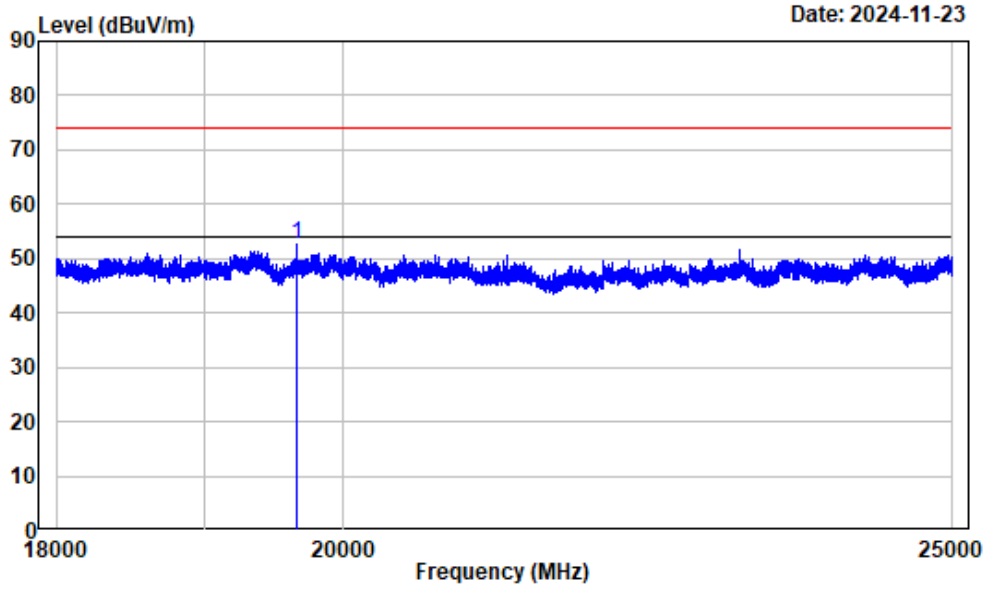



Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 17945.740 | 24.23 | 23.36 | 47.59 | 54.00 | -6.41 | Average |

Note: Spectrum analyzer setting: RBW=1 MHz, VBW=5 kHz

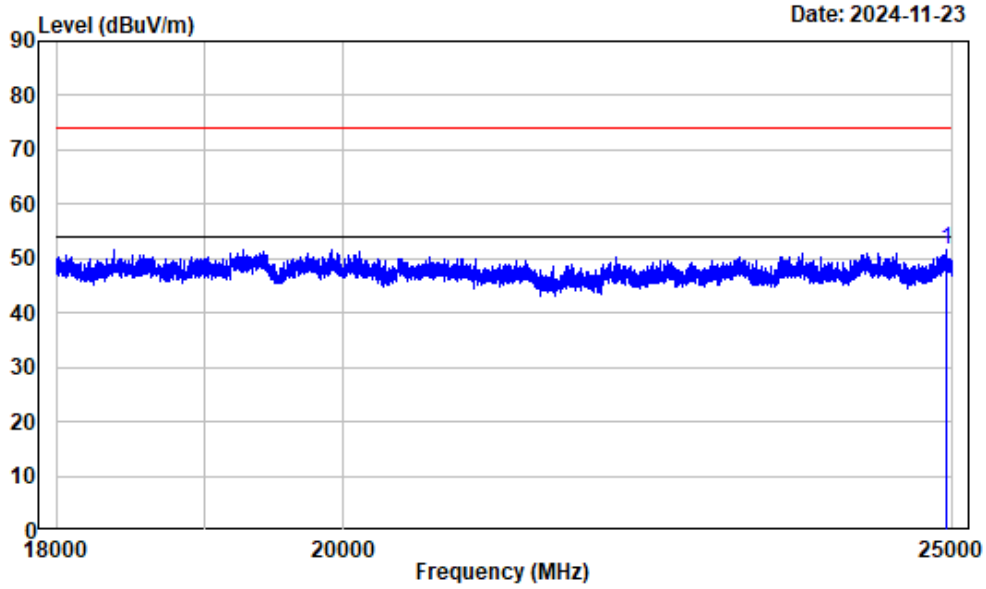
18-25GHz-Horizontal




Condition : Horizontal
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 19660.080 | 15.39 | 37.30 | 52.69 | 74.00 | -21.31 | Peak |

18-25GHz-Vertical




Condition : Vertical
Project Number: 2401Z20384E-RF-R
Tester : Karl Xu
Note : BT-2402

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 24936.990 | 17.00 | 34.77 | 51.77 | 74.00 | -22.23 | Peak |

## 20 dB Emission Bandwidth

### Test Information:

| | | | |
|---|---|---|---|
| **Sample No.:** | 2UJM-3 | **Test Date:** | 2024/11/22 |
| **Test Site:** | RF | **Test Mode:** | Transmitting |
| **Tester:** | Cheeb Huang | **Test Result:** | N/A |

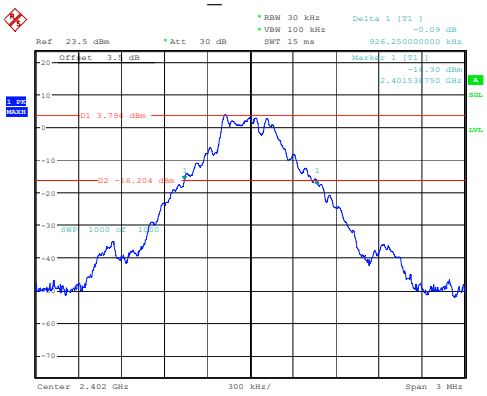
### Environmental Conditions:

| | | | | | |
|---|---|---|---|---|---|
| **Temperature: (°C):** | 25 | **Relative Humidity: (%)** | 42 | **ATM Pressure: (kPa)** | 101 |

### Test Data:

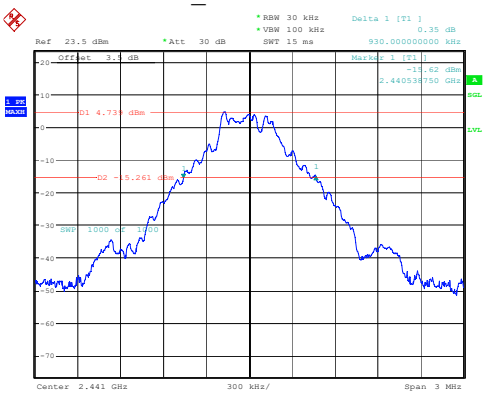
| Mode | Channel | Result (MHz) | Verdict |
|---|---|---|---|
| DH1 | Low Channel | 0.926 | Pass |
| | Middle Channel | 0.930 | Pass |
| | High Channel | 0.934 | Pass |
| 2DH1 | Low Channel | 1.260 | Pass |
| | Middle Channel | 1.256 | Pass |
| | High Channel | 1.260 | Pass |
| 3DH1 | Low Channel | 1.215 | Pass |
| | Middle Channel | 1.219 | Pass |
| | High Channel | 1.234 | Pass |

DH1_Low 0.926MHz



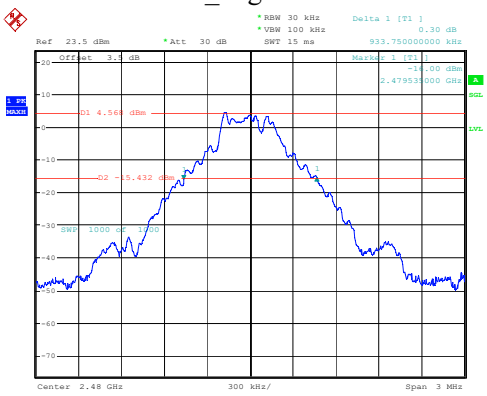

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:16:01

DH1_Middle 0.930MHz



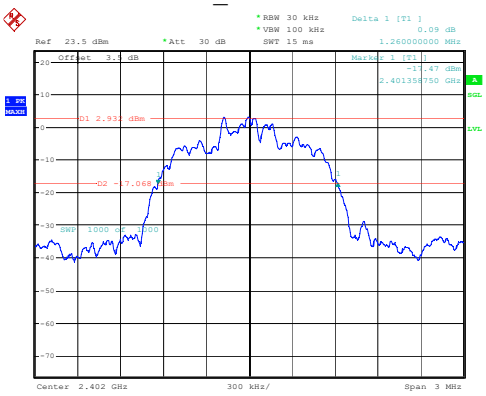

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:25:28

DH1_High 0.934MHz



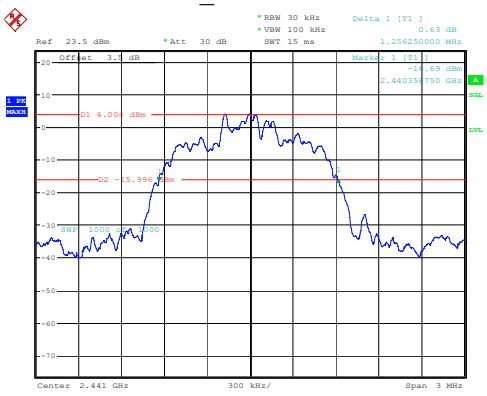

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:17:59

2DH1_Low 1.260MHz



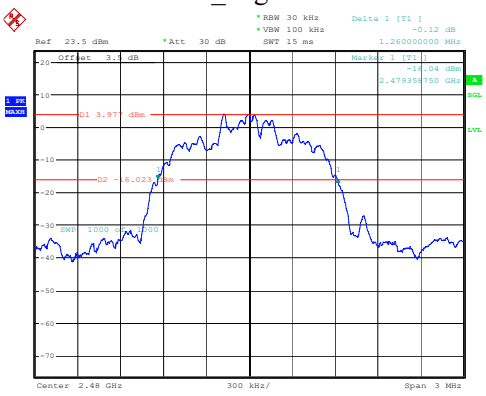

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:18:59

2DH1_Middle 1.256MHz



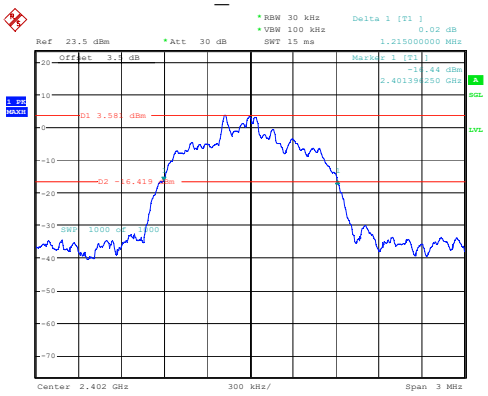

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:20:00

2DH1_High 1.260MHz



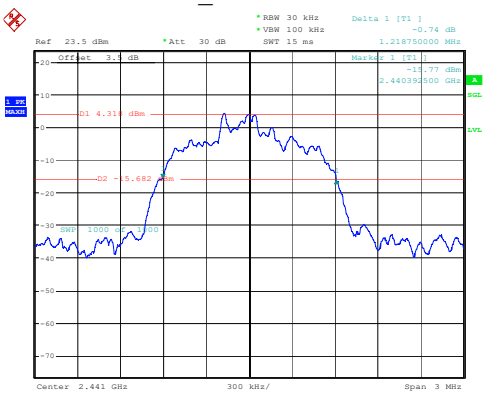

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:20:54

3DH1_Low 1.215MHz



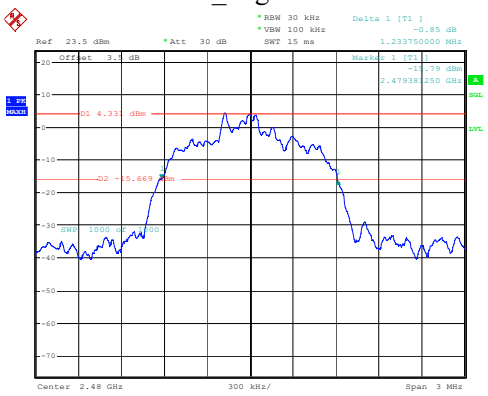

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:21:53

3DH1_Middle 1.219MHz




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:22:50

3DH1_High 1.234MHz




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:23:47

## Channel Separation

### Test Information:

| | | | |
|---|---|---|---|
| **Sample No.:** | 2UJM-3 | **Test Date:** | 2024/12/25 |
| **Test Site:** | RF | **Test Mode:** | Transmitting |
| **Tester:** | Cheeb Huang | **Test Result:** | Pass |

### Environmental Conditions:

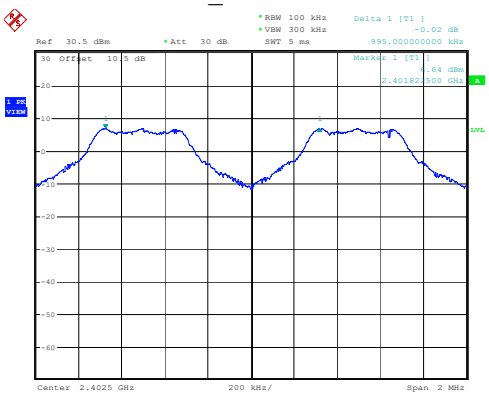
| | | | | | |
|---|---|---|---|---|---|
| **Temperature: (°C):** | 25 | **Relative Humidity: (%)** | 42 | **ATM Pressure: (kPa)** | 101 |

### Test Data:

| Mode | Channel | Result (MHz) | Limit (MHz) | Verdict |
|---|---|---|---|---|
| Hop_DH1 | Low Channel | 0.995 | 0.840 | Pass |
| | Middle Channel | 1.003 | | Pass |
| | High Channel | **1.005** | | Pass |

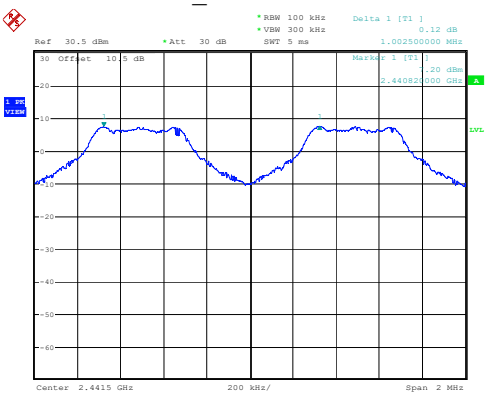
Note: Only the BDR (DH1 GFSK) mode result is reported since EDR 2DH1 (π/4-DQPSK) and EDR 3DH1 (8DPSK) modes have the exact same channel plan, and the limit is the maximum 20dB bandwidth *2/3

DH1_Low 0.995MHz



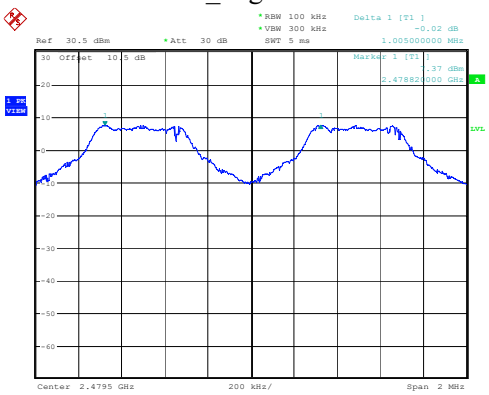

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 25.DEC.2024 00:58:18

DH1_Middle 1.003MHz




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 25.DEC.2024 01:02:53

DH1_High 1.005MHz




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 25.DEC.2024 01:07:39

## Number of Hopping Frequency

### Test Information:

| | | | |
|---|---|---|---|
| **Sample No.:** | 2UJM-3 | **Test Date:** | 2024/11/22 |
| **Test Site:** | RF | **Test Mode:** | Transmitting |
| **Tester:** | Cheeb Huang | **Test Result:** | Pass |

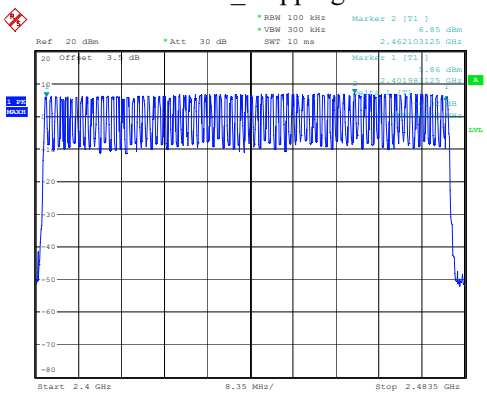
### Environmental Conditions:

| | | | | | |
|---|---|---|---|---|---|
| **Temperature: (°C):** | 25 | **Relative Humidity: (%)** | 42 | **ATM Pressure: (kPa)** | 101 |

### Test Data:

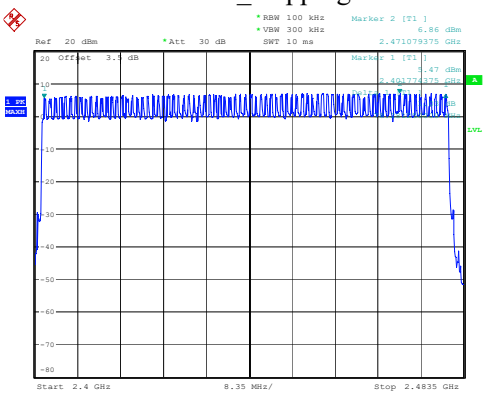
| Mode | Channel | Result | Limit | Verdict |
|---|---|---|---|---|
| DH1 | Hopping Channel | 79 | 15 | Pass |
| 2DH1 | Hopping Channel | 79 | 15 | Pass |
| 3DH1 | Hopping Channel | 79 | 15 | Pass |

DH1_Hopping 79



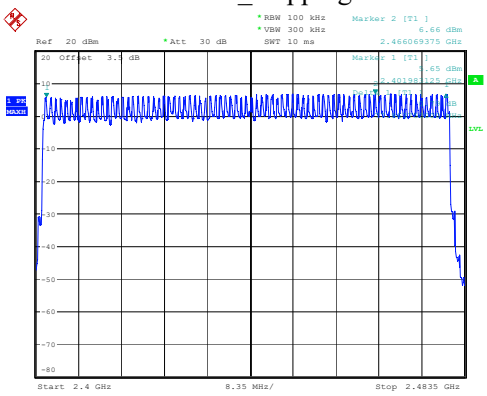

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:34:22

2DH1_Hopping 79




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:40:46

3DH1_Hopping 79




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:48:46

## Maximum Conducted Output Power

### Test Information:

| | | | |
|---|---|---|---|
| **Sample No.:** | 2UJM-3 | **Test Date:** | 2024/11/22 |
| **Test Site:** | RF | **Test Mode:** | Transmitting |
| **Tester:** | Cheeb Huang | **Test Result:** | Pass |

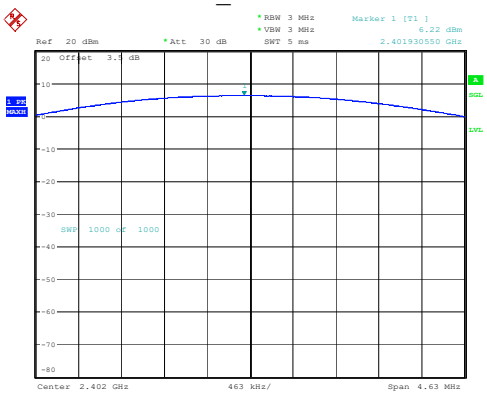
### Environmental Conditions:

| | | | | | |
|---|---|---|---|---|---|
| **Temperature: (°C):** | 25 | **Relative Humidity: (%)** | 42 | **ATM Pressure: (kPa)** | 101 |

### Test Data:

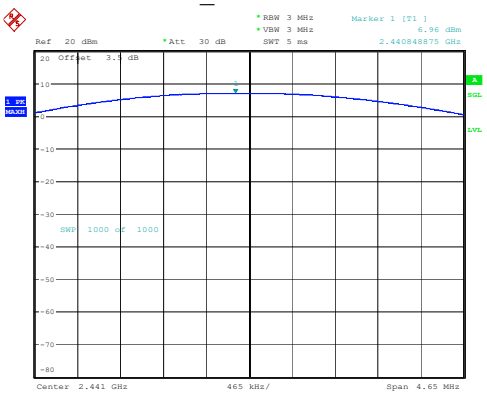
| Mode | Channel | Result (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|
| DH1 | Low Channel | 6.22 | 21.00 | Pass |
| | Middle Channel | 6.96 | 21.00 | Pass |
| | High Channel | 7.14 | 21.00 | Pass |
| 2DH1 | Low Channel | 7.18 | 21.00 | Pass |
| | Middle Channel | 7.83 | 21.00 | Pass |
| | High Channel | 7.97 | 21.00 | Pass |
| 3DH1 | Low Channel | 7.75 | 21.00 | Pass |
| | Middle Channel | 8.39 | 21.00 | Pass |
| | High Channel | 8.48 | 21.00 | Pass |

DH1_Low 6.22dBm



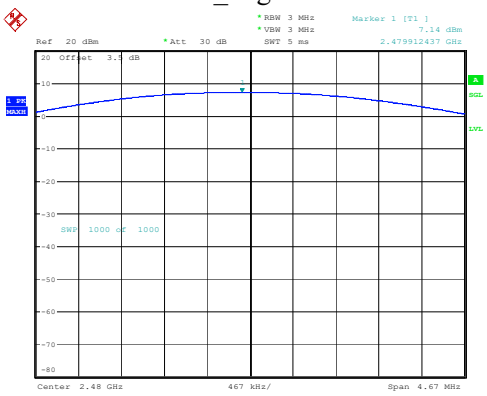

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:26:22

DH1_Middle 6.96dBm



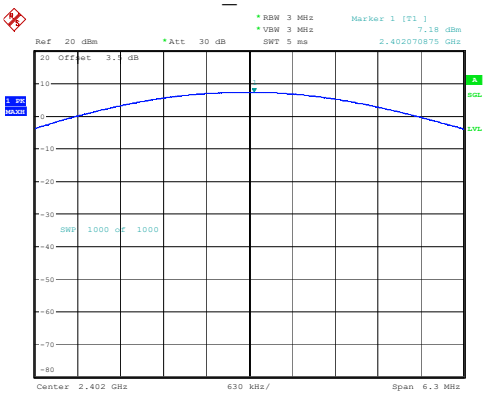

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:27:18

DH1_High 7.14dBm



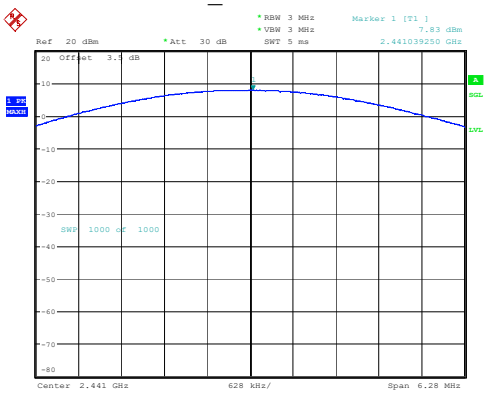

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:27:56

2DH1_Low 7.18dBm



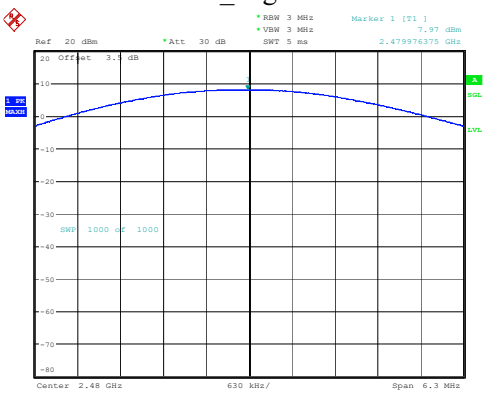

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:28:37

2DH1_Middle 7.83dBm



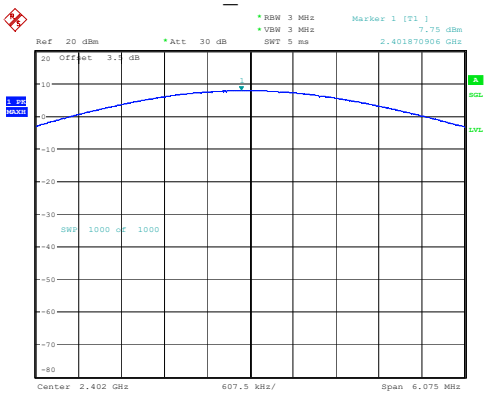

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:29:18

2DH1_High 7.97dBm



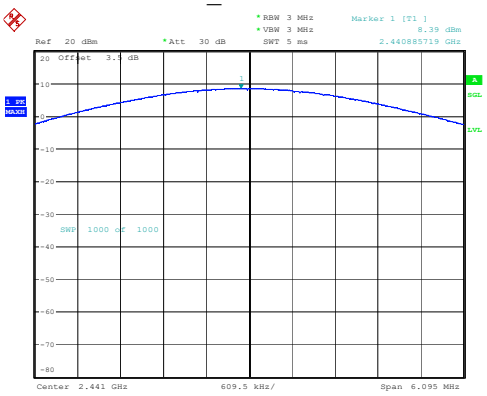

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:30:01

3DH1_Low 7.75dBm



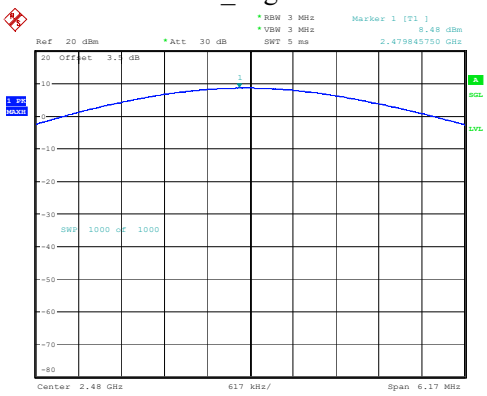

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:30:49

3DH1_Middle 8.39dBm




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:31:30

3DH1_High 8.48dBm




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:32:13

## 100 kHz Bandwidth of Frequency Band Edge

### Test Information:

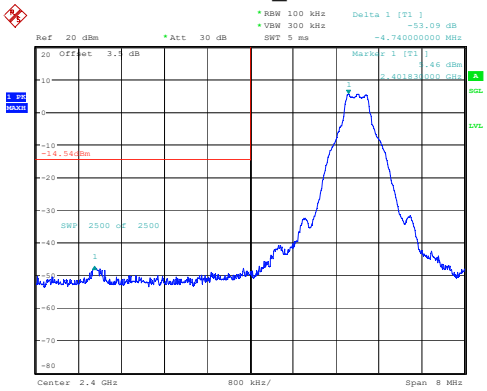
| | | | |
|---|---|---|---|
| **Sample No.:** | 2UJM-3 | **Test Date:** | 2024/11/22 |
| **Test Site:** | RF | **Test Mode:** | Transmitting |
| **Tester:** | Cheeb Huang | **Test Result:** | Pass |

### Environmental Conditions:

| | | | | | |
|---|---|---|---|---|---|
| **Temperature: (°C):** | 25 | **Relative Humidity: (%)** | 42 | **ATM Pressure: (kPa)** | 101 |

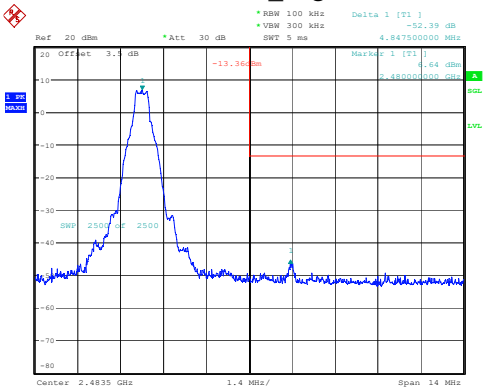
**Test Data:**

DH1_Low



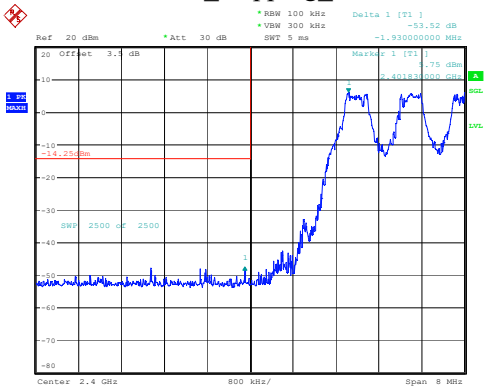

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:46:09

DH1_High



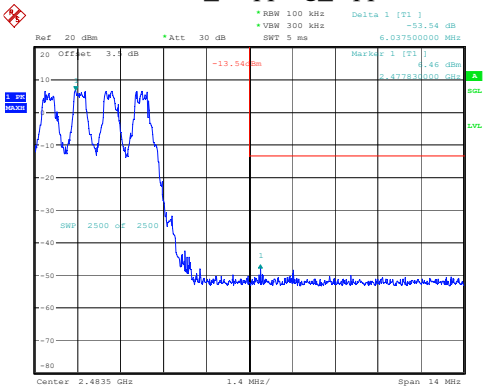

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:48:37

DH1_Hopping_Lower



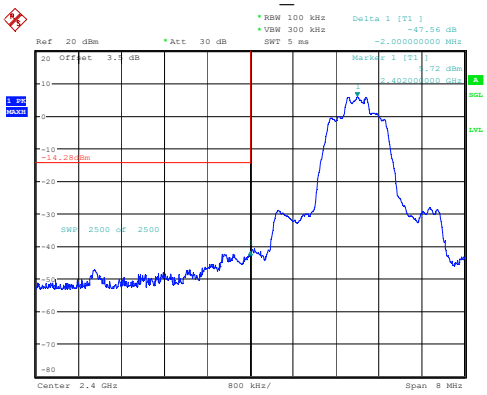

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:14:54

DH1_Hopping_Upper



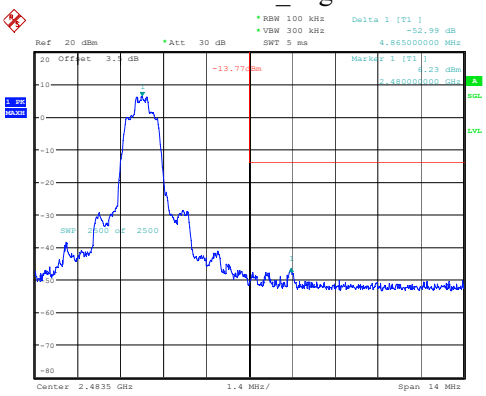

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:17:03

2DH1_Low



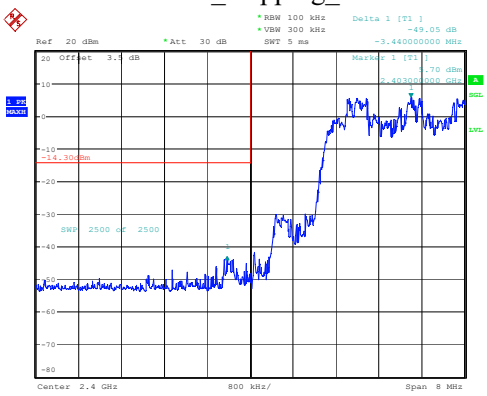

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:50:07

2DH1_High



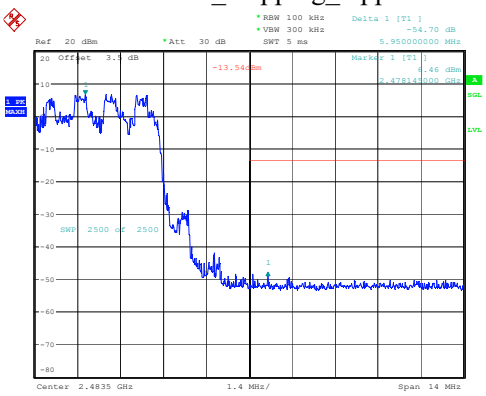

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:52:16

## 2DH1_Hopping_Lower



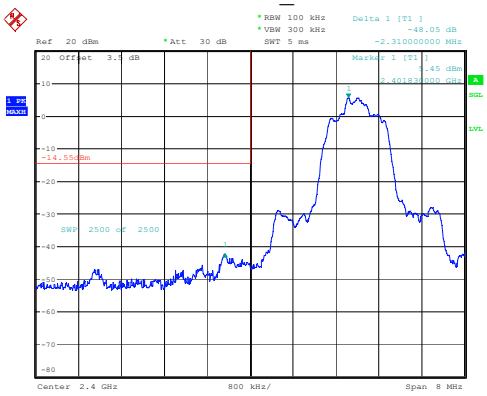

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:18:28

## 2DH1_Hopping_Upper



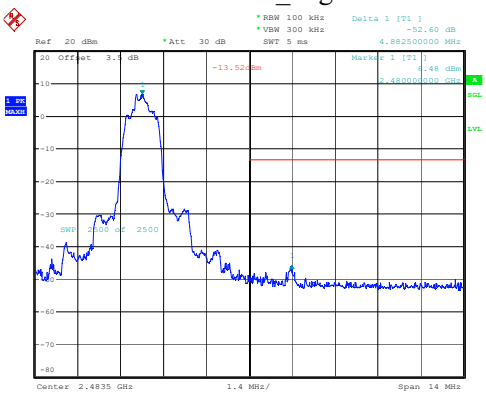

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:20:33

## 3DH1_Low



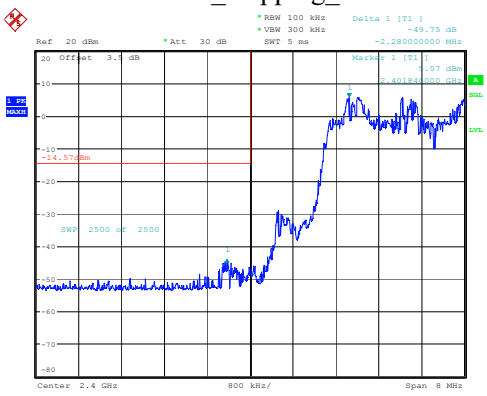

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:53:43

## 3DH1_High



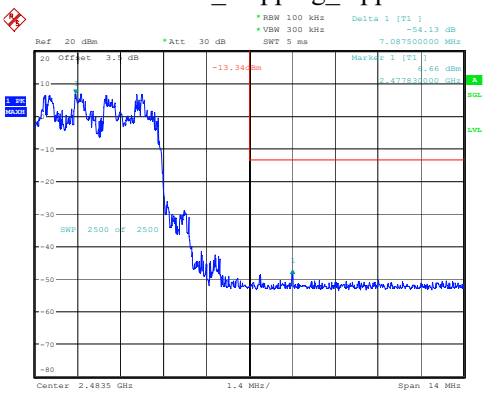

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 19:55:54

## 3DH1_Hopping_Lower




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:27:53

## 3DH1_Hopping_Upper




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:30:02

## Time of Occupancy (dwell time)

### Test Information:

| | | | |
|---|---|---|---|
| **Sample No.:** | 2UJM-3 | **Test Date:** | 2024/11/22 |
| **Test Site:** | RF | **Test Mode:** | Transmitting |
| **Tester:** | Cheeb Huang | **Test Result:** | Pass |

### Environmental Conditions:

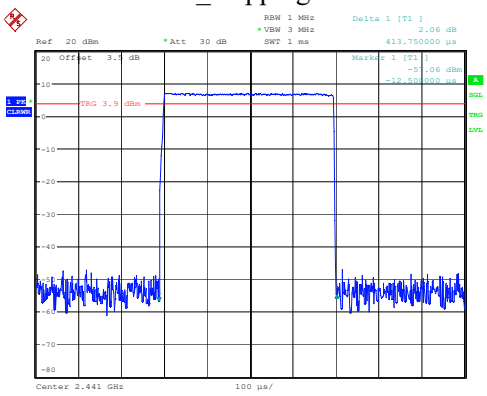
| | | | | | |
|---|---|---|---|---|---|
| **Temperature: (°C):** | 25 | **Relative Humidity: (%)** | 42 | **ATM Pressure: (kPa)** | 101 |

### Test Data:

| Mode | Channel | Pulse width (ms) | Dwell time (s) | Limit (s) | Verdict |
|---|---|---|---|---|---|
| DH1 | Hop_2441MHz | 0.414 | 0.132 | 0.400 | Pass |
| DH3 | Hop_2441MHz | 1.680 | 0.269 | 0.400 | Pass |
| DH5 | Hop_2441MHz | 2.950 | 0.315 | 0.400 | Pass |
| 2DH1 | Hop_2441MHz | 0.425 | 0.136 | 0.400 | Pass |
| 2DH3 | Hop_2441MHz | 1.684 | 0.269 | 0.400 | Pass |
| 2DH5 | Hop_2441MHz | 2.956 | 0.315 | 0.400 | Pass |
| 3DH1 | Hop_2441MHz | 0.428 | 0.137 | 0.400 | Pass |
| 3DH3 | Hop_2441MHz | 1.684 | 0.269 | 0.400 | Pass |
| 3DH5 | Hop_2441MHz | 2.956 | 0.315 | 0.400 | Pass |

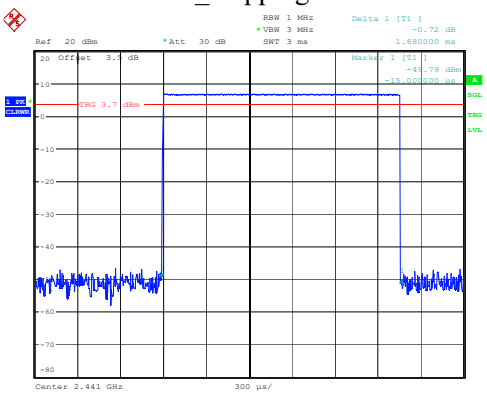
**Note:**
**DH1:Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s**
**DH3:Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s**
**DH5:Dwell time=Pulse width (ms) × (1600/6/79) ×31.6 s**
**2DH1: Dwell time=Pulse width (ms) × (1600/2/79) ×31.6 s**
**2DH3: Dwell time=Pulse width (ms) × (1600/4/79) ×31.6 s**
**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 0.414ms



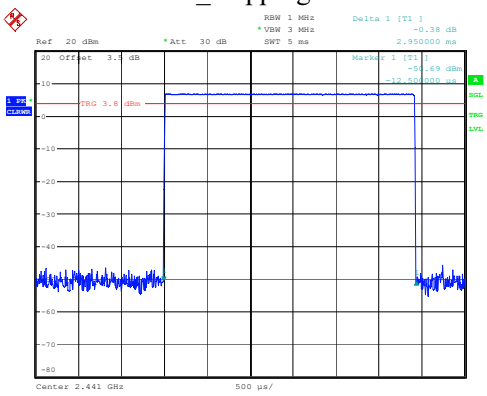

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:50:09

DH3_Hopping 1.680ms



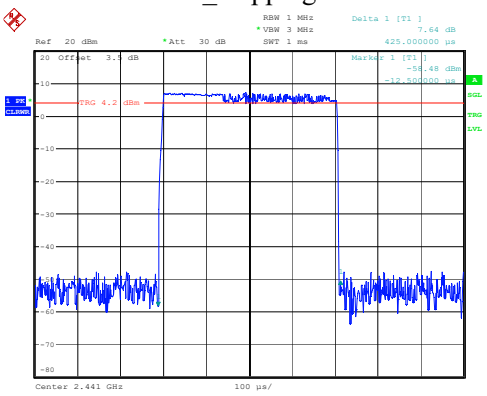

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:51:06

DH5_Hopping 2.950ms



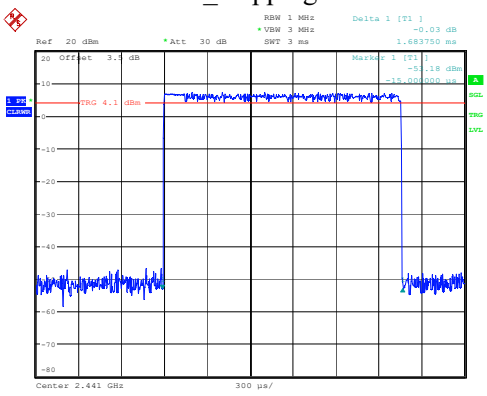

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:52:15

2DH1_Hopping 0.425ms



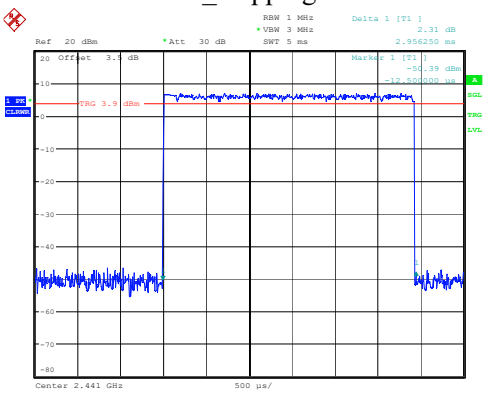

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:54:12

2DH3_Hopping 1.684ms



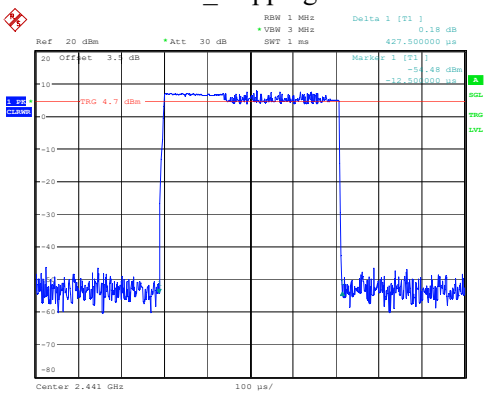

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:55:14

2DH5_Hopping 2.956ms



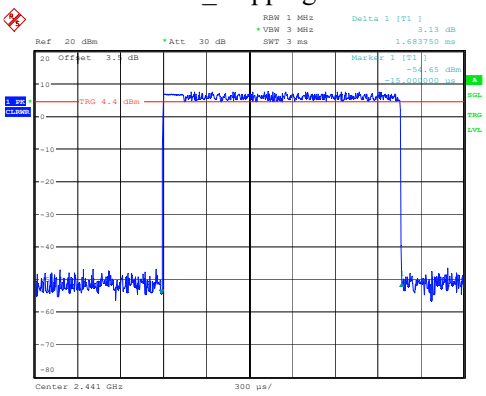

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 21:09:48

3DH1_Hopping 0.428ms



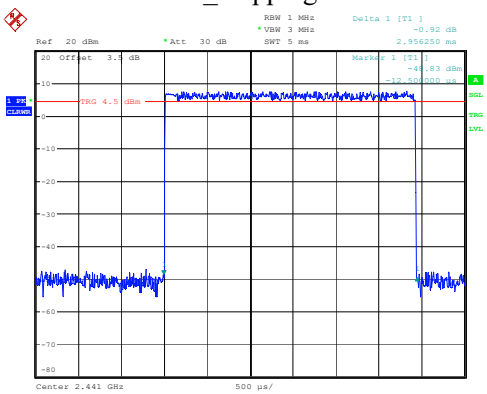

ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:57:41

3DH3_Hopping 1.684ms




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:58:43

3DH5_Hopping 2.956ms




ProjectNo.:2401Z20384E-RF Tester:Cheeb Huang
Date: 22.NOV.2024 20:59:39

# RF EXPOSURE EVALUATION

**RF EXPOSURE**

## Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), 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 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≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

**Measurement Result**

**For worst case:**

| Mode | Frequency (MHz) | Max tune-up conducted power#(dBm) | Max tune-up conducted power#(mW) | Distance (mm) | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion |
|---|---|---|---|---|---|---|---|
| Bluetooth | 2402-2480 | 9 | 7.94 | 5 | 2.5 | 3 | Yes |

**Result: Compliant**

# EUT PHOTOGRAPHS

Please refer to the attachment 2401Z20384E-RF External photo and 2401Z20384E-RF Internal photo.

# TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401Z20384E-RF-00A Test Setup photo.

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