

TEST REPORT

Applicant Name: Meizhou Guo Wei Electronics Co., Ltd.
Address: AD1 Section, Economic Development Area, Dongsheng Industrial District, Meizhou, Guangdong, China.
Report Number: 2401V85171E-RFA
FCC ID: 2ARRB-MB500L
IC: 20353-MB500L

Test Standard (s)

FCC PART 15.247; RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2;
RSS-247 ISSUE 3, AUGUST 2023

Sample Description

Product Type: TRUE WIRELESS EARBUDS
Model No.: MOTO BUDS 500 ANC
Multiple Model(s) No.: N/A
Trade Mark: Motorola
Date Received: 2024-07-09
Issue Date: 2024-11-08

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

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

Prepared and Checked By:



Wills Yu
RF Engineer

Approved By:



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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TABLE OF CONTENTS

| | |
|--|-----------|
| DOCUMENT REVISION HISTORY | 3 |
| GENERAL INFORMATION..... | 4 |
| PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) | 4 |
| OBJECTIVE | 4 |
| TEST METHODOLOGY | 4 |
| MEASUREMENT UNCERTAINTY..... | 5 |
| TEST FACILITY | 5 |
| SYSTEM TEST CONFIGURATION | 6 |
| SUMMARY OF TEST RESULTS | 8 |
| TEST EQUIPMENT LIST | 9 |
| REQUIREMENTS AND TEST PROCEDURES | 10 |
| AC LINE CONDUCTED EMISSIONS..... | 10 |
| RADIATED EMISSIONS..... | 12 |
| 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH..... | 15 |
| CHANNEL SEPARATION TEST | 17 |
| QUANTITY OF HOPPING CHANNEL TEST | 18 |
| TIME OF OCCUPANCY (DWELL TIME) | 19 |
| PEAK OUTPUT POWER MEASUREMENT..... | 20 |
| BAND EDGES..... | 21 |
| ANTENNA REQUIREMENT | 22 |
| TEST DATA AND RESULTS | 23 |
| RADIATED EMISSIONS..... | 23 |
| 20 dB EMISSION BANDWIDTH..... | 45 |
| OBW | 48 |
| CHANNEL SEPARATION | 51 |
| NUMBER OF HOPPING FREQUENCY | 53 |
| TIME OF OCCUPANCY (DWELL TIME) | 55 |
| MAXIMUM CONDUCTED OUTPUT POWER | 58 |
| 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE..... | 61 |
| RF EXPOSURE EVALUATION | 64 |
| EUT PHOTOGRAPHS | 67 |
| TEST SETUP PHOTOGRAPHS | 68 |

DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|-----------------|-----------------|-------------------------|------------------|
| 0 | 2401V85171E-RFA | Original Report | 2024-11-08 |

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

| | |
|--|---|
| HVIN | MB500L |
| FVIN | N/A |
| Frequency Range | 2402~2480MHz |
| Maximum Transmit Peak Power | 3.51dBm |
| Modulation Technique | Bluetooth: GFSK, $\pi/4$ -DQPSK, 8DPSK |
| Antenna Specification[#] | 1.95dBi (provided by the applicant) |
| Voltage Range | DC 3.7V from battery or DC 5V from charger case |
| Sample serial number | 2O8B-2 for Radiated Emissions Test 2O8B-3 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 Commissions rules and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and RSS-247 Issue 3, August 2023, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

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

Each test item follows test standards and with no deviation.

Measurement Uncertainty

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

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

Test Facility

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

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

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0023.

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 [#] | FCC_assist 1.0.2.2 |
| Power Level [#] | 10 |

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

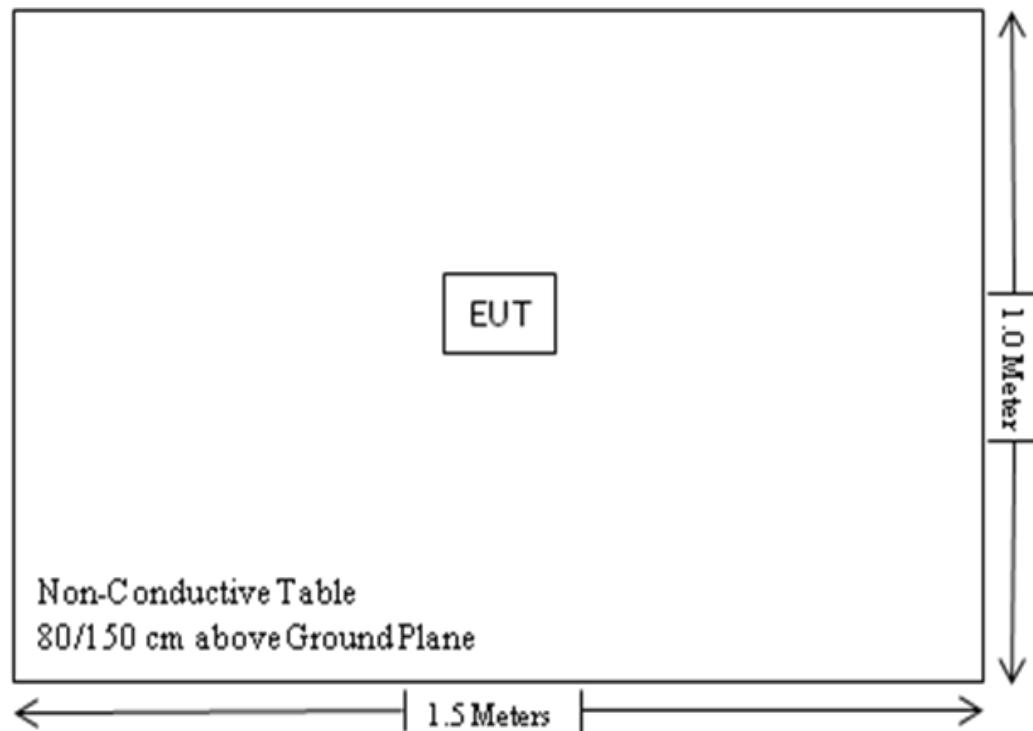
Support Equipment List and Details

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

External I/O Cable

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

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

| FCC Rules | RSS Rules | Description of Test | Result |
|-----------------------------------|---------------------------------|--|----------------|
| FCC §15.203 | RSS-Gen §6.8 | Antenna Requirement | PASS |
| FCC §15.207(a) | RSS-Gen §8.8 | AC Line Conducted Emissions | Not Applicable |
| FCC §15.205, §15.209, §15.247(d) | RSS-247 § 5.5, RSS-GEN § 8.10 | Radiated Spurious Emission | PASS |
| FCC §15.247(a)(1) | RSS-247 § 5.1(a), RSS-GEN § 6.7 | 20 dB Emission Bandwidth | PASS |
| FCC §15.247(a)(1) | RSS-247 § 5.1 (b) | Channel Separation | PASS |
| FCC §15.247(a)(1)(iii) | RSS-247 § 5.1 (d) | Number of Hopping Frequency | PASS |
| FCC §15.247(a)(1)(iii) | RSS-247 § 5.1 (d) | Time of Occupancy (dwell time) | PASS |
| FCC §15.247(b)(1) | RSS-247 § 5.1(b) & § 5.4(b) | Maximum Conducted Output Power | PASS |
| FCC §15.247(d) | RSS-247 § 5.5 | 100 kHz Bandwidth of Frequency Band Edge | PASS |
| FCC §1.1307& §2.1093& §15.247 (i) | RSS-102 § 2.5.1 | RF Exposure & Exemption Limits For Routine Evaluation-SAR Evaluation | PASS |

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 |
| Unknown | Cable | Chamber Cable 1 | F-03-EM236 | 2024/06/18 | 2025/06/17 |
| BACL | Active Loop Antenna | 1313-1A | 4031911 | 2024/05/14 | 2027/05/13 |
| Unknown | Cable | PNG214 | 1354 | 2024/05/21 | 2025/05/20 |
| Unknown | Cable | 2Y194 | 0735 | 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 |
| 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 |
| RF Conducted Test | | | | | |
| Rohde & Schwarz | Spectrum Analyze | FSU26 | 200982 | 2023/12/18 | 2024/12/17 |
| Rohde & Schwarz | Spectrum Analyzer | FSV40 | 101942 | 2023/12/18 | 2024/12/17 |
| Unknown | RF Cable | 65475 | 01670515 | 2024/06/27 | 2025/06/26 |
| 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).

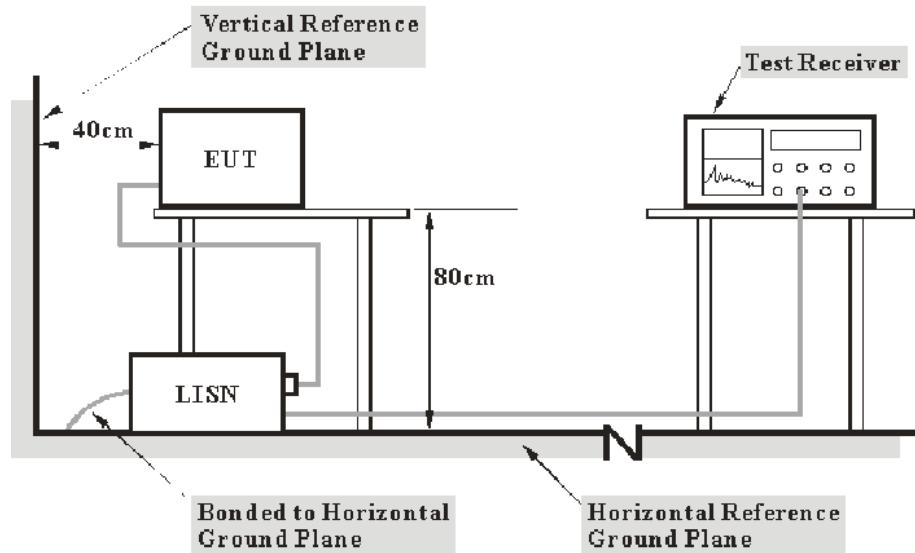
REQUIREMENTS AND TEST PROCEDURES

AC Line Conducted Emissions

Applicable Standard

FCC §15.207(a), RSS-GEN § 8.8

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 & RSS-Gen.

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:

$$\text{Over Limit} = \text{Level} - \text{Limit}$$

$$\text{Level} = \text{Read Level} + \text{Factor}$$

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

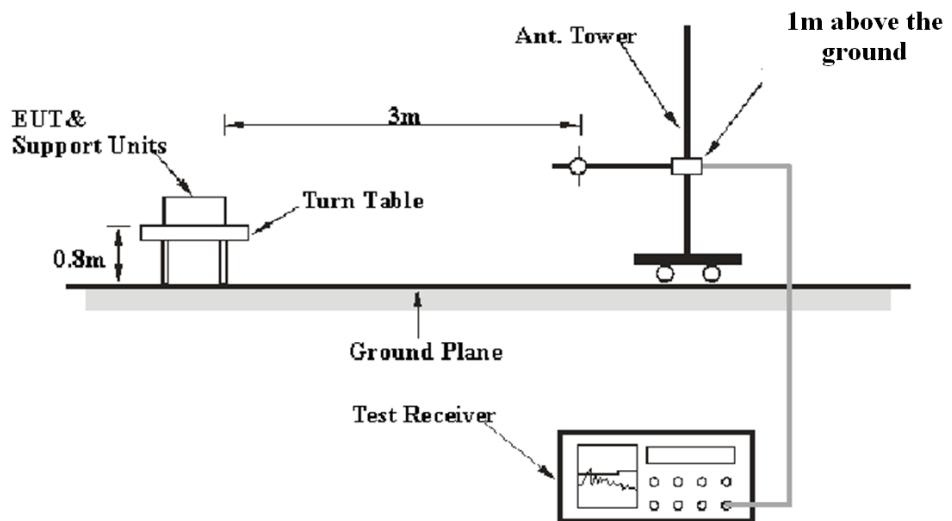
Radiated Emissions

Applicable Standard

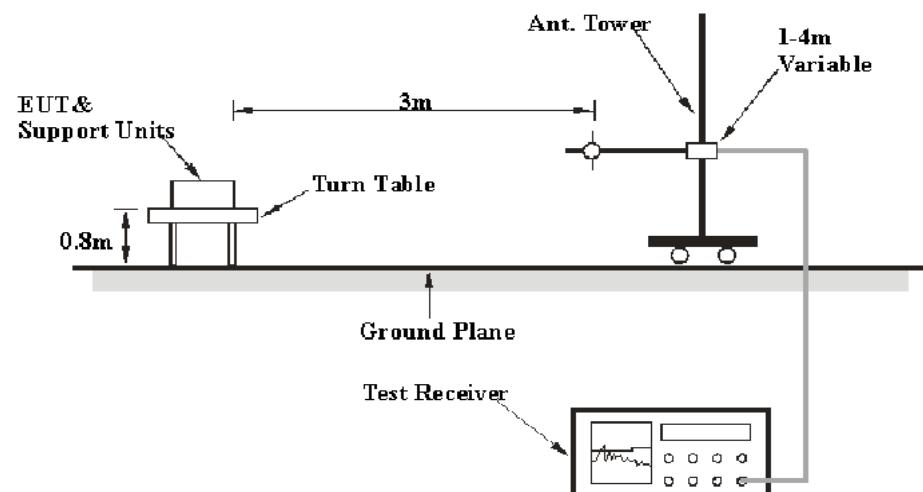
FCC §15.205; §15.209; §15.247(d); RSS-247 §5.5; RSS-GEN § 8.10

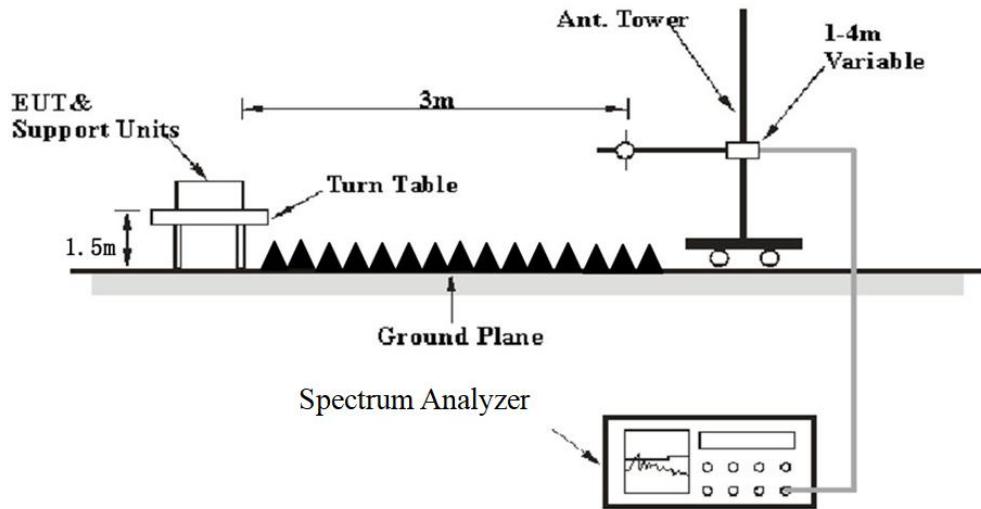
EUT Setup

9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:

The radiated emission performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.247, RSS-247, RSS-Gen 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 & Band Edge | | | |
| | 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:

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

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 & 99% Occupied Bandwidth

According to FCC §15.247(a) (1):

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.

According to RSS-247 § 5.1 (a), RSS-GEN § 6.7:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “20 dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated 20 dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

Test Procedure

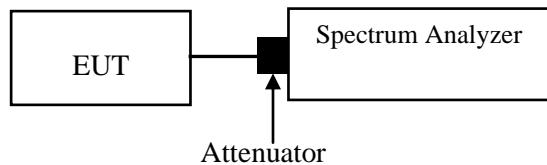
Test Method: ANSI C63.10-2013 Clause 7.8.7 & Clause 6.9.2

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Channel Separation Test

According to FCC §15.247(a) (1):

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.

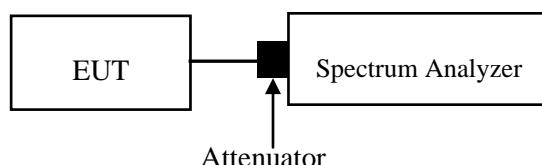
According to RSS-247 § 5.1 (b):

Frequency hopping systems (FHSs) 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, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W. 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

1. Set the EUT in transmitting mode, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.



Quantity of Hopping Channel Test

Applicable Standard

According to FCC §15.247(a) (1) (iii):

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.

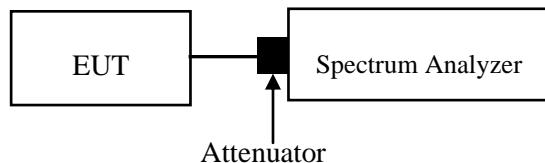
According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSS) operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the max-hold function record the quantity of the channel.



Time of Occupancy (Dwell Time)

Applicable Standard

According to FCC §15.247(a) (1) (iii):

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.

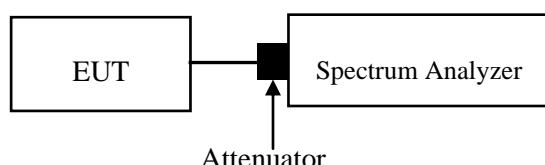
According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz shall use at least 15 hopping 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses



Peak Output Power Measurement

Applicable Standard

According to FCC §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.

According to RSS-247 § 5.1(b) & § 5.4(b):

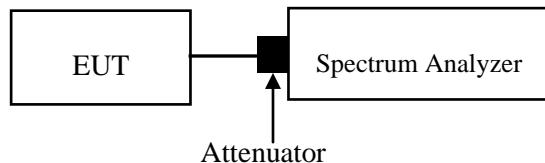
For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (see Section 5.4(e) for exceptions).

Frequency hopping systems (FHSs) 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, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5

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



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

According to FCC §15.247(d).

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

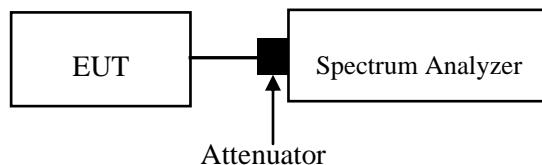
According to RSS-247 § 5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(e), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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.

According to FCC § 15.203, the applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device. Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has an internal antenna arrangement, which was permanently attached, the antenna gain[#] is 1.95dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant

TEST DATA AND RESULTS

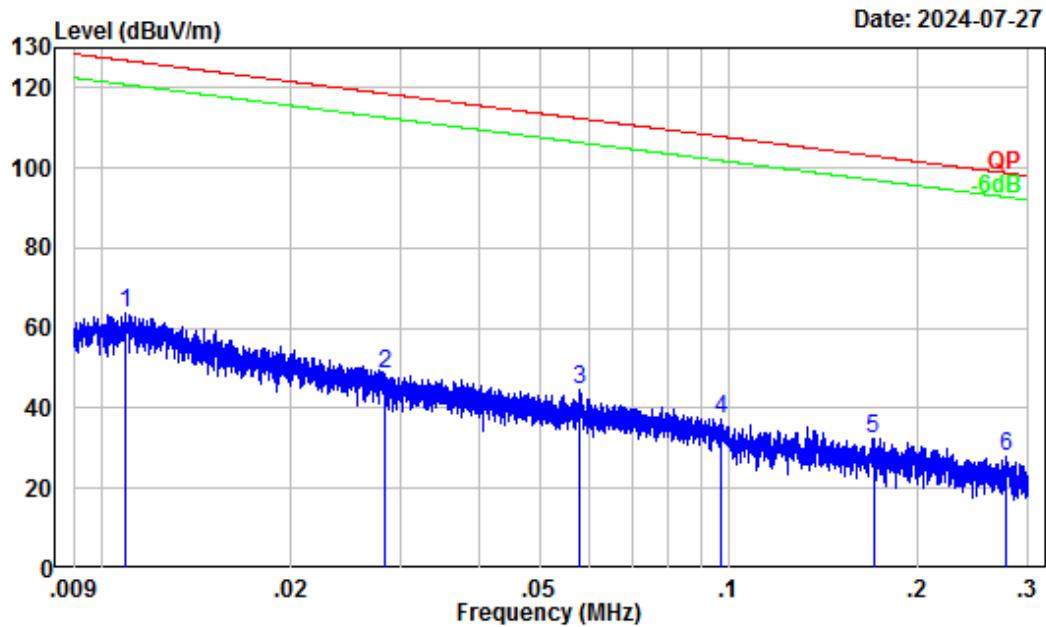
Radiated Emissions

Environmental Conditions

| | | | |
|----------------------------|---|------------------------------|------------------------------------|
| Temperature (°C) | 22 & 25.5 | Relative Humidity (%) | 54&50 |
| ATM Pressure (kPa): | 101 | Test engineer: | Anson Su & Zenos Qiao & Dylan Yang |
| Test date: | 2024.07.27 ~ 2024.11.08 | | |
| EUT operation mode: | Below 1GHz: Transmitting (Maximum output power mode, 8DPSK, Middle Channel) Above 1GHz: Transmitting (Maximum output power mode, 8DPSK) | | |
| Note: | 1. After pre-scan in the X, Y and Z axes of orientation, the worst case z-axis of orientation were recorded. 2. The spurious emission from 9 kHz-30MHz of IC RSS-247 standard, the unit of final result on the test plots are dB μ V/m, so the limit should be added by 51,5 dB from dB μ A/m to dB μ V/m. | | |

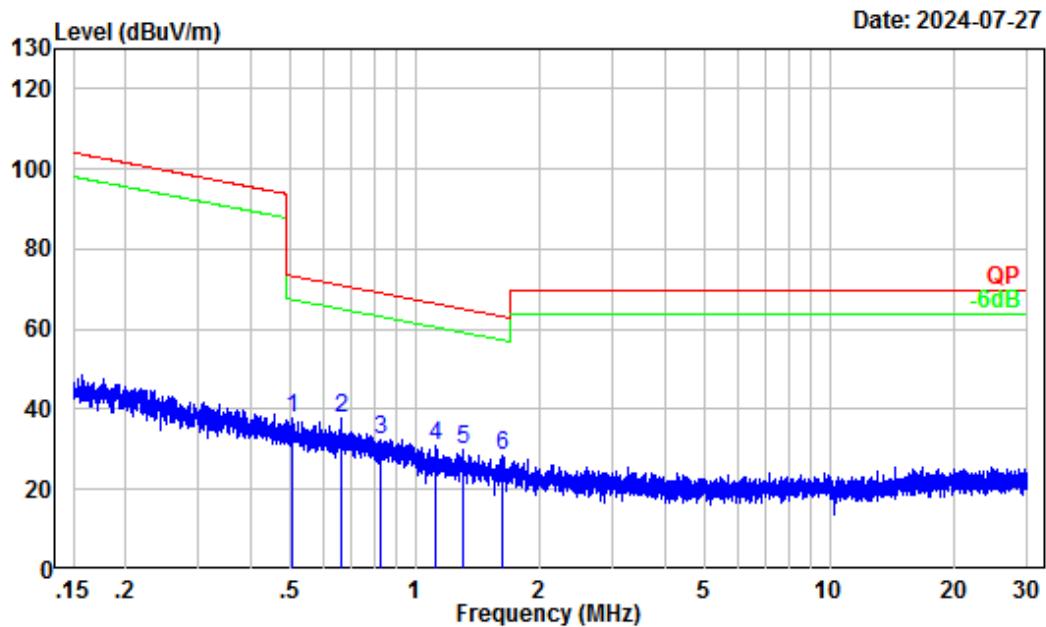
Below 1GHz:

Parallel (worst case)



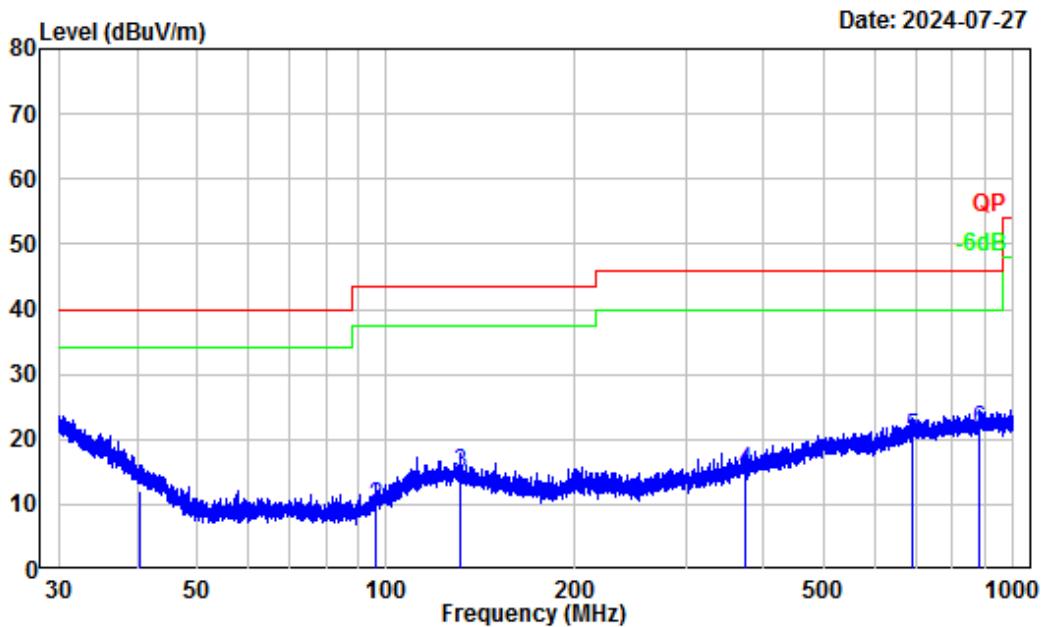
Site : Chamber A
Condition : 3m
Project Number: 2401V85171E-RF
Test Mode : BT
Tester : Anson Su

| Freq | Factor | Read | | Limit | | Over | Remark |
|------|--------|-------|-------|-------|--------|--------|--------|
| | | MHz | dB/m | dBuV | dBuV/m | Line | |
| 1 | 0.01 | 37.23 | 26.70 | 63.93 | 126.85 | -62.92 | Peak |
| 2 | 0.03 | 28.37 | 19.96 | 48.33 | 118.58 | -70.25 | Peak |
| 3 | 0.06 | 22.01 | 22.46 | 44.47 | 112.35 | -67.88 | Peak |
| 4 | 0.10 | 17.33 | 20.16 | 37.49 | 107.85 | -70.36 | Peak |
| 5 | 0.17 | 13.79 | 18.79 | 32.58 | 103.00 | -70.42 | Peak |
| 6 | 0.28 | 8.82 | 19.26 | 28.08 | 98.77 | -70.69 | Peak |



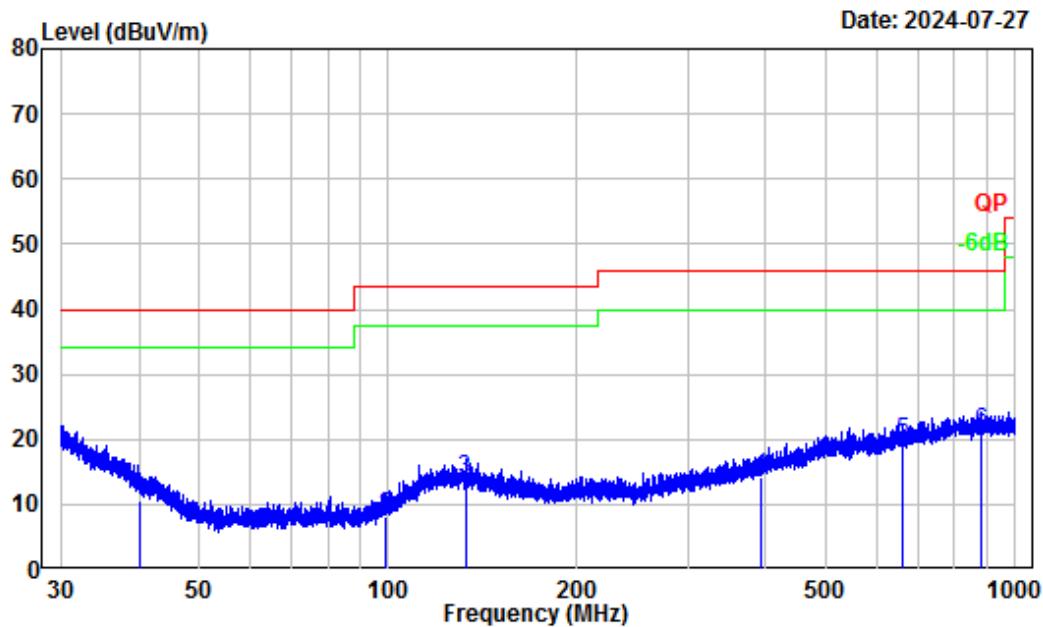
Site : Chamber A
Condition : 3m
Project Number: 2401V85171E-RF
Test Mode : BT
Tester : Anson Su

| Freq | Factor | Read | Limit | Over | Remark |
|------|--------|-------|-------|-------|-------------------|
| | | Level | Level | Line | |
| 1 | 0.50 | 3.43 | 34.19 | 37.62 | 73.55 -35.93 Peak |
| 2 | 0.66 | 1.51 | 36.26 | 37.77 | 71.09 -33.32 Peak |
| 3 | 0.83 | -0.30 | 32.90 | 32.60 | 69.17 -36.57 Peak |
| 4 | 1.12 | -2.01 | 32.88 | 30.87 | 66.46 -35.59 Peak |
| 5 | 1.31 | -2.66 | 32.64 | 29.98 | 65.10 -35.12 Peak |
| 6 | 1.63 | -3.79 | 32.10 | 28.31 | 63.13 -34.82 Peak |



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401V85171E-RF
Test Mode : BT
Tester : Anson Su

| | Freq | Factor | Read Level | Limit Level | Limit Line | Over Limit | Remark |
|---|--------|--------|------------|-------------|------------|------------|--------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 40.35 | -11.74 | 23.83 | 12.09 | 40.00 | -27.91 | QP |
| 2 | 96.39 | -16.39 | 26.00 | 9.61 | 43.50 | -33.89 | QP |
| 3 | 131.41 | -12.14 | 26.92 | 14.78 | 43.50 | -28.72 | QP |
| 4 | 373.15 | -11.34 | 26.40 | 15.06 | 46.00 | -30.94 | QP |
| 5 | 692.90 | -6.24 | 26.51 | 20.27 | 46.00 | -25.73 | QP |
| 6 | 879.86 | -4.59 | 26.11 | 21.52 | 46.00 | -24.48 | QP |



Site : Chamber A
Condition : 3m Vertical
Project Number: 2401V85171E-RF
Test Mode : BT
Tester : Anson Su

| | Freq | Factor | Read Level | Limit Level | Limit Line | Over Limit | Remark |
|---|--------|--------|------------|-------------|------------|------------|--------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 40.13 | -13.10 | 23.80 | 10.70 | 40.00 | -29.30 | QP |
| 2 | 98.88 | -17.15 | 25.34 | 8.19 | 43.50 | -35.31 | QP |
| 3 | 132.63 | -12.74 | 26.64 | 13.90 | 43.50 | -29.60 | QP |
| 4 | 392.27 | -11.03 | 25.36 | 14.33 | 46.00 | -31.67 | QP |
| 5 | 661.44 | -7.00 | 26.51 | 19.51 | 46.00 | -26.49 | QP |
| 6 | 885.67 | -4.91 | 26.09 | 21.18 | 46.00 | -24.82 | QP |

| Above 1GHz: | | | | | | | | | | | | |
|----------------------------|--|---------------|------------------------|--------------------------|--|--|------------------------|--|--|--|--|--|
| Frequency (MHz) | Receiver | | Polar (H/V) | Factor (dB/m) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) | | | | | |
| | Reading (dBμV) | PK/Ave | | | | | | | | | | |
| 8DPSK | | | | | | | | | | | | |
| Low Channel | | | | | | | | | | | | |
| 2387.86 | 55.14 | PK | H | -3.20 | 51.94 | 74 | -22.06 | | | | | |
| 2385.43 | 55.37 | PK | V | -3.20 | 52.17 | 74 | -21.83 | | | | | |
| 4804 | 50.52 | PK | H | 2.42 | 52.94 | 74 | -21.06 | | | | | |
| 4804 | 50.93 | PK | V | 2.42 | 53.35 | 74 | -20.65 | | | | | |
| Middle Channel | | | | | | | | | | | | |
| 4882 | 51.57 | PK | H | 2.58 | 54.15 | 74 | -19.85 | | | | | |
| 4882 | 52.14 | PK | V | 2.58 | 54.72 | 74 | -19.28 | | | | | |
| High Channel | | | | | | | | | | | | |
| 2483.63 | 58.89 | PK | H | -3.17 | 55.72 | 74 | -18.28 | | | | | |
| 2483.52 | 60.26 | PK | V | -3.17 | 57.09 | 74 | -16.91 | | | | | |
| 4960 | 50.09 | PK | H | 2.69 | 52.78 | 74 | -21.22 | | | | | |
| 4960 | 50.61 | PK | V | 2.69 | 53.30 | 74 | -20.70 | | | | | |

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 (dB μ V/m) | Polar (H/V) | Duty Cycle Corrected Factor (dB) | Average Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Comment |
| Low Channel | | | | | | | |
| 2387.86 | 51.94 | H | -24.73 | 27.21 | 54 | -26.79 | Bandedge |
| 2385.43 | 52.17 | V | -24.73 | 27.44 | 54 | -26.56 | Bandedge |
| 4804 | 52.94 | H | -24.73 | 28.21 | 54 | -25.79 | Harmonic |
| 4804 | 53.35 | V | -24.73 | 28.62 | 54 | -25.38 | Harmonic |
| Middle Channel | | | | | | | |
| 4882 | 54.15 | H | -24.73 | 29.42 | 54 | -24.58 | Harmonic |
| 4882 | 54.72 | V | -24.73 | 29.99 | 54 | -24.01 | Harmonic |
| High Channel | | | | | | | |
| 2483.63 | 55.72 | H | -24.73 | 30.99 | 54 | -23.01 | Bandedge |
| 2483.52 | 57.09 | V | -24.73 | 32.36 | 54 | -21.64 | Bandedge |
| 4960 | 52.78 | H | -24.73 | 28.05 | 54 | -25.95 | Harmonic |
| 4960 | 53.30 | V | -24.73 | 28.57 | 54 | -25.43 | Harmonic |

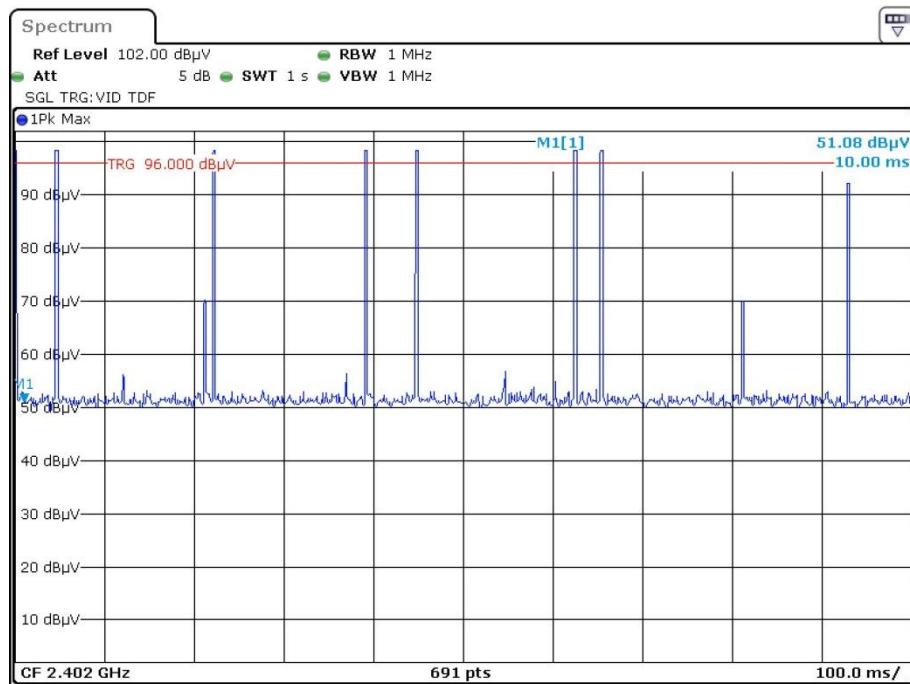
Note: Average level= Peak level + Duty Cycle Corrected Factor

Margin = Average level - Limit

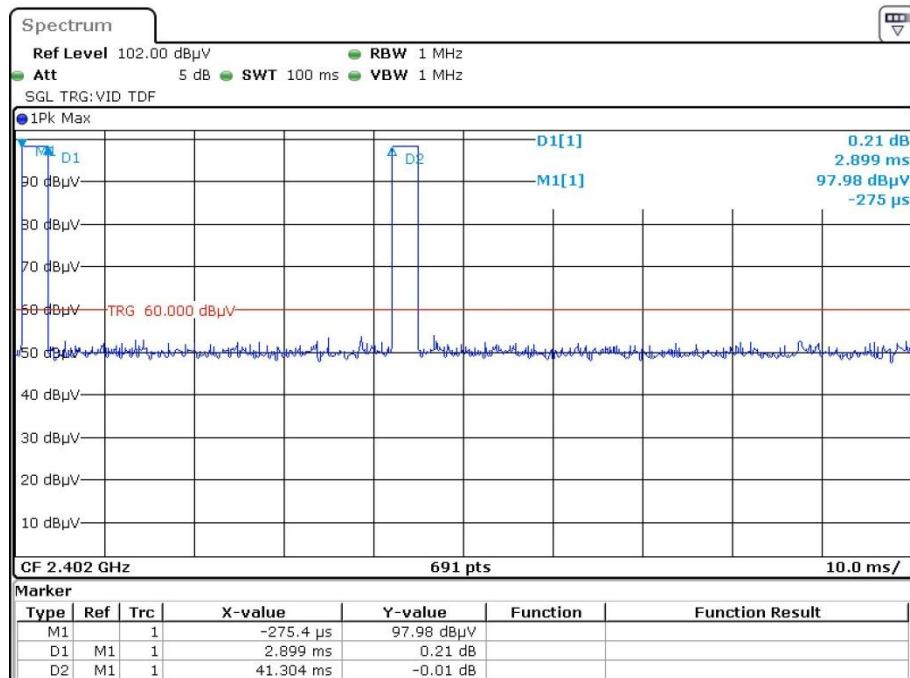
Worst case duty cycle:

Duty cycle = Ton/100ms = 2.899*2/100=0.05798

Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg0.05798 = -24.73



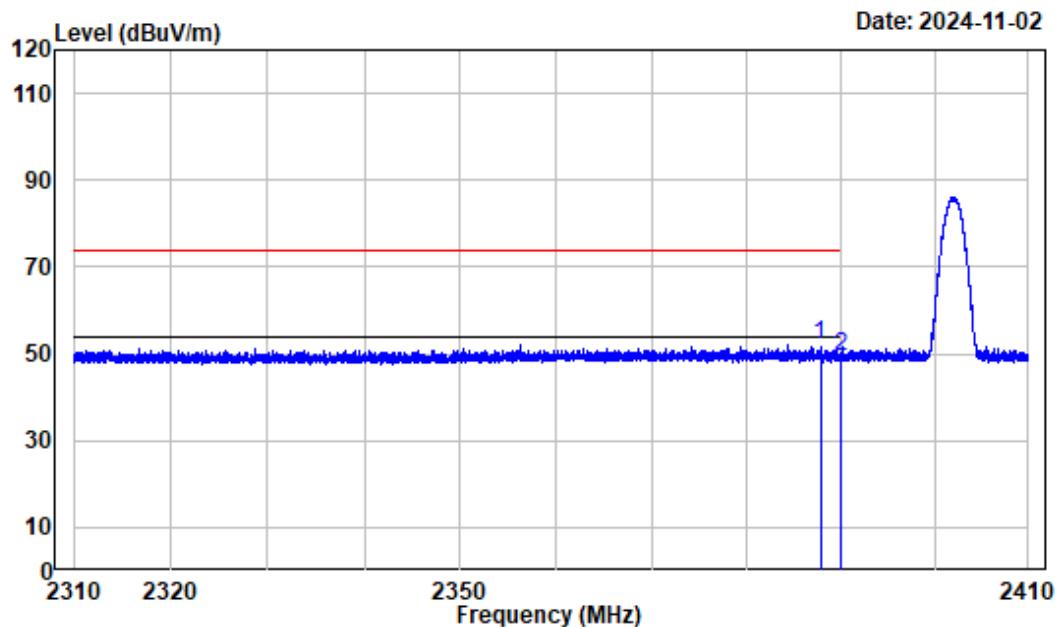
ProjectNo.:2401V85171E-RF Tester:Zenos Qiao
 Date: 30.JUL.2024 02:44:56



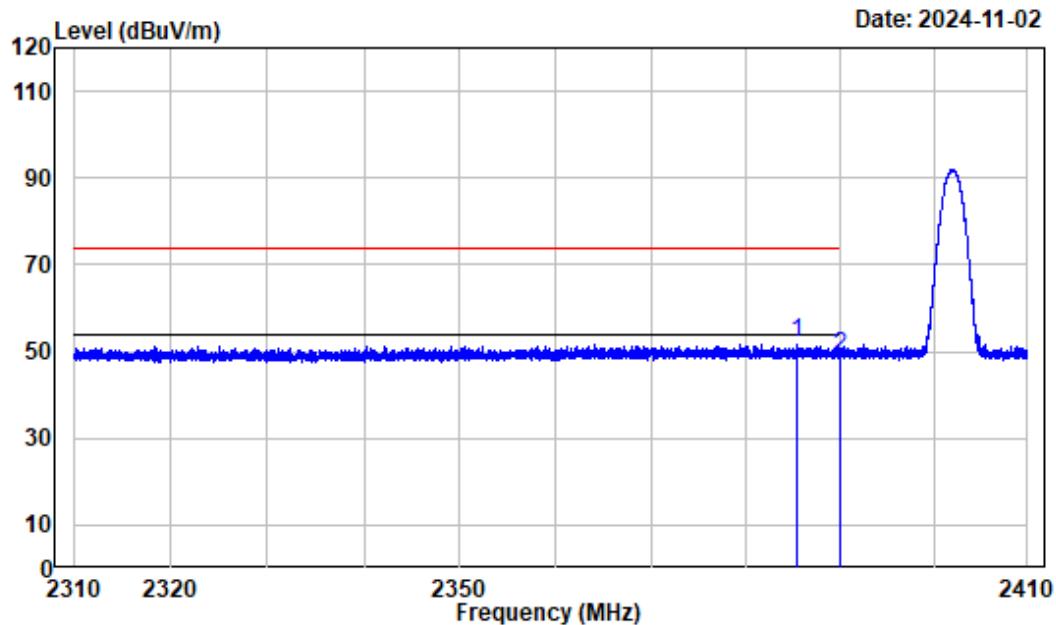
ProjectNo.:2401V85171E-RF Tester:Zenos Qiao
 Date: 30.JUL.2024 02:48:30

Band Edge Test plots

8DPSK mode, Low Channel-Horizontal



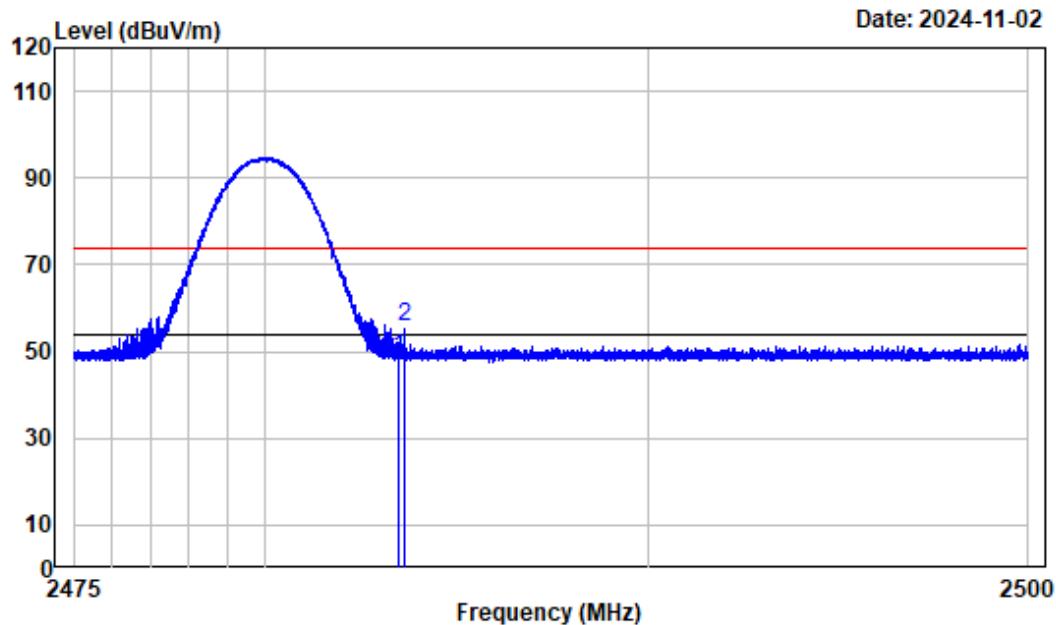
8DPSK mode, Low Channel-Vertical



Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2402

| | Freq | Factor | Read Level | Limit Level | Line | Over Limit | Remark |
|---|----------|--------|------------|-------------|--------|------------|--------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2385.430 | -3.20 | 55.37 | 52.17 | 74.00 | -21.83 | Peak |
| 2 | 2390.000 | -3.20 | 52.13 | 48.93 | 74.00 | -25.07 | Peak |

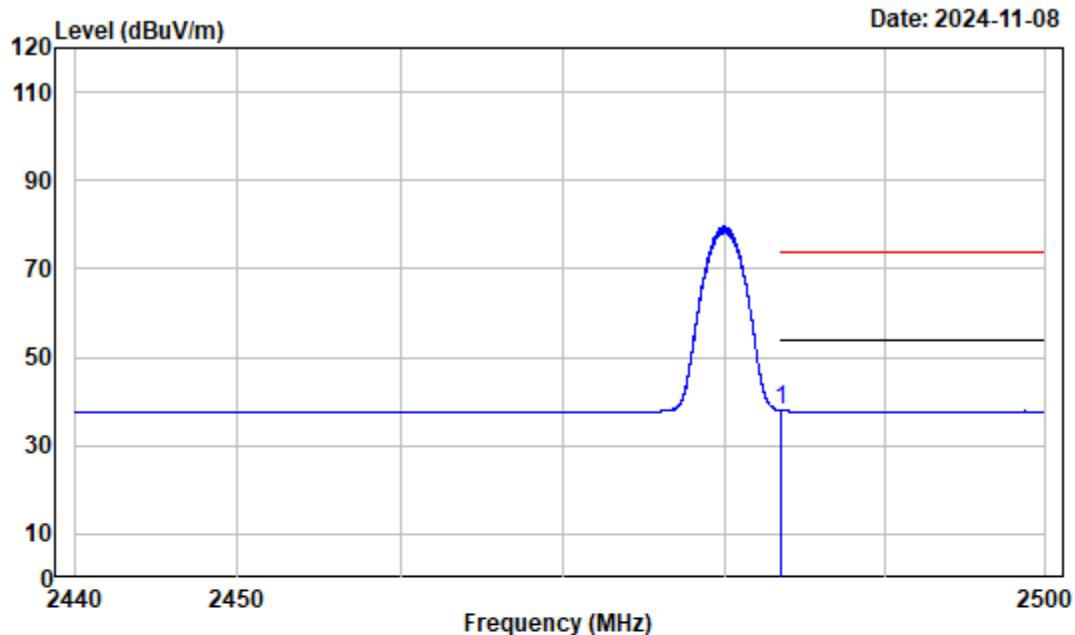
8DPSK mode, High Channel, Horizontal-Peak



Condition : Horizontal
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2480

| | Freq | Read Factor | Level | Limit Level | Line | Over Limit | Remark |
|---|----------|-------------|-------|-------------|--------|------------|--------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | -3.17 | 51.76 | 48.59 | 74.00 | -25.41 | Peak |
| 2 | 2483.632 | -3.17 | 58.89 | 55.72 | 74.00 | -18.28 | Peak |

8DPSK mode, High Channel, Horizontal-Average

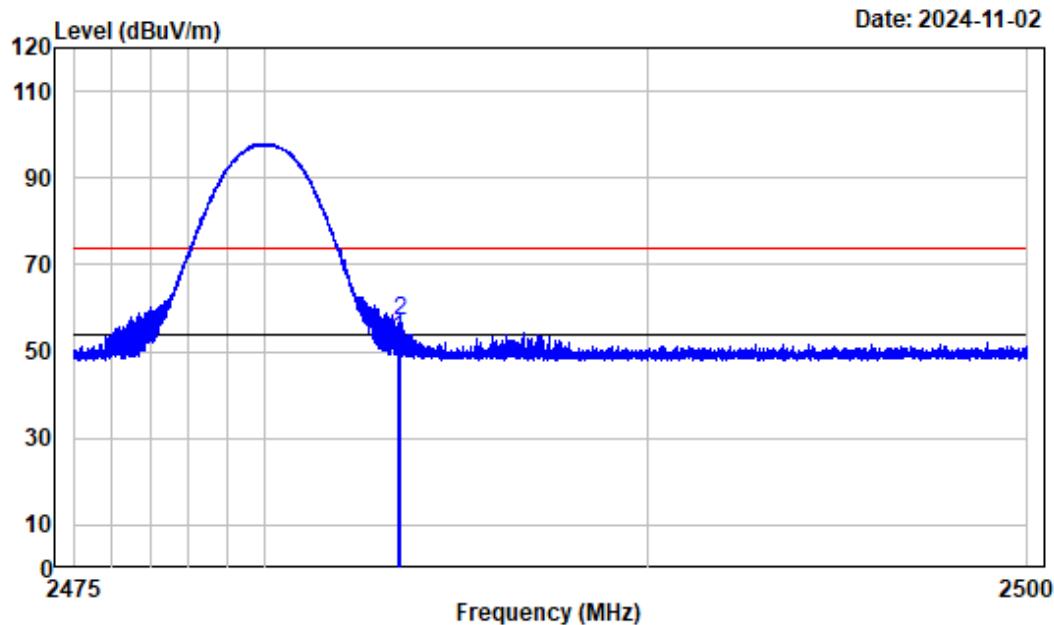


Condition : Horizontal
Project No.: 2401V85171E-RF
Tester : Dylan.Yang
Note : BT_3DH5_2480

| | Freq | Factor | Read Level | Limit Level | Over Line | Over Limit | Remark |
|---|----------|--------|------------|-------------|-----------|------------|---------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.505 | -3.17 | 41.15 | 37.98 | 54.00 | -16.02 | Average |

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

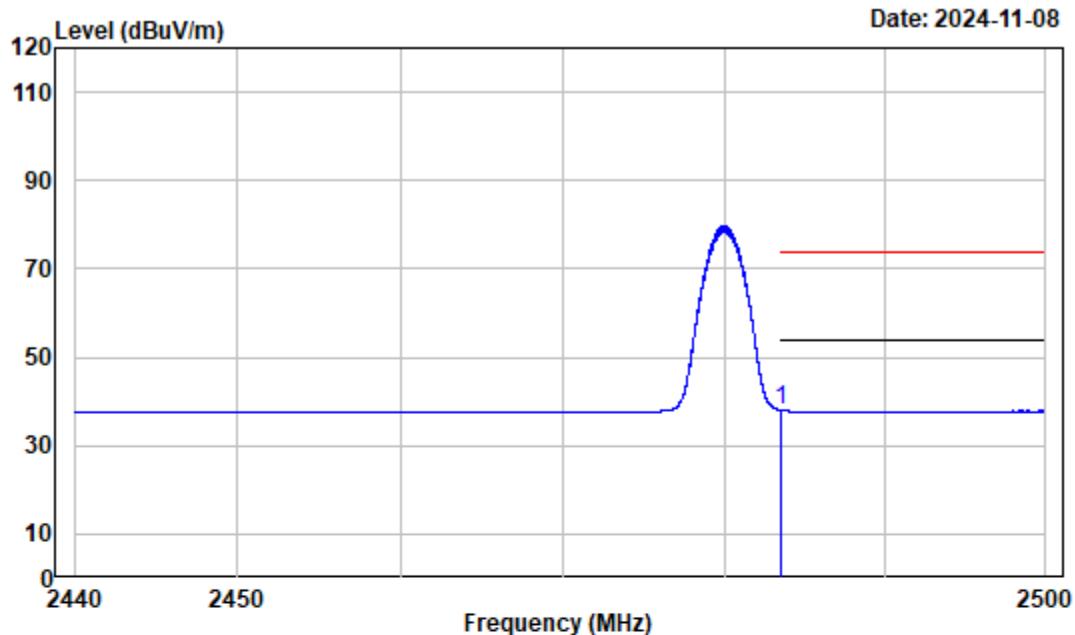
8DPSK mode, High Channel, Vertical-Peak



Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2480

| | Freq | Read Factor | Level | Limit Level | Line | Over Limit | Remark |
|---|----------|-------------|-------|-------------|--------|------------|--------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | -3.17 | 56.23 | 53.06 | 74.00 | -20.94 | Peak |
| 2 | 2483.522 | -3.17 | 60.26 | 57.09 | 74.00 | -16.91 | Peak |

8DPSK mode, High Channel, Vertical-Average

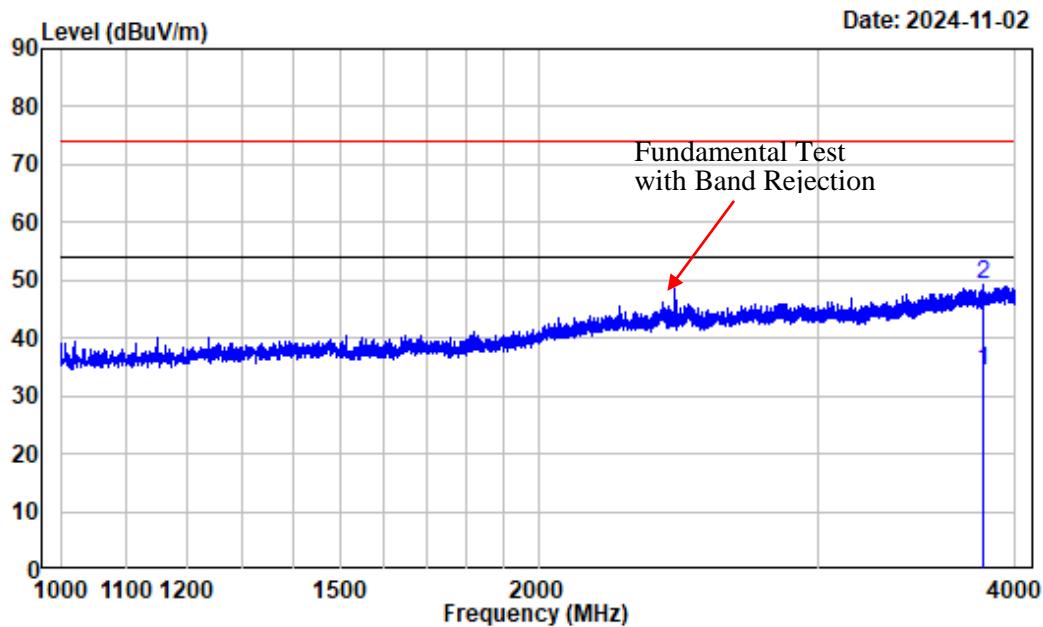


Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Dylan.Yang
Note : BT_3DH5_2480

| | Freq | Read Factor | Level | Limit Level | Line | Over Limit | Remark |
|---|----------|-------------|-------|-------------|--------|------------|---------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | -3.17 | 41.23 | 38.06 | 54.00 | -15.94 | Average |

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

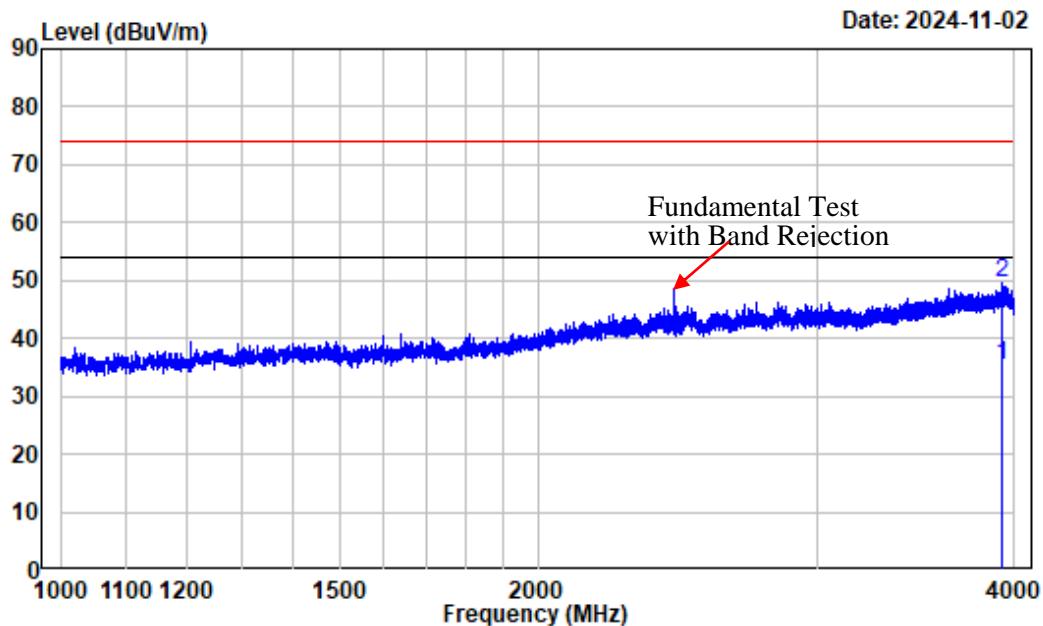
**Worst harmonic test plots: (EDR mode(8DPSK), middle channel)
1-4 GHz, Horizontal**



Condition : Horizontal
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| | Freq | Factor | Read Level | Limit Level | Limit Line | Over Limit | Remark |
|---|----------|--------|------------|-------------|------------|------------|---------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 3822.978 | -0.76 | 35.18 | 34.42 | 54.00 | -19.58 | Average |
| 2 | 3822.978 | -0.76 | 49.84 | 49.08 | 74.00 | -24.92 | Peak |

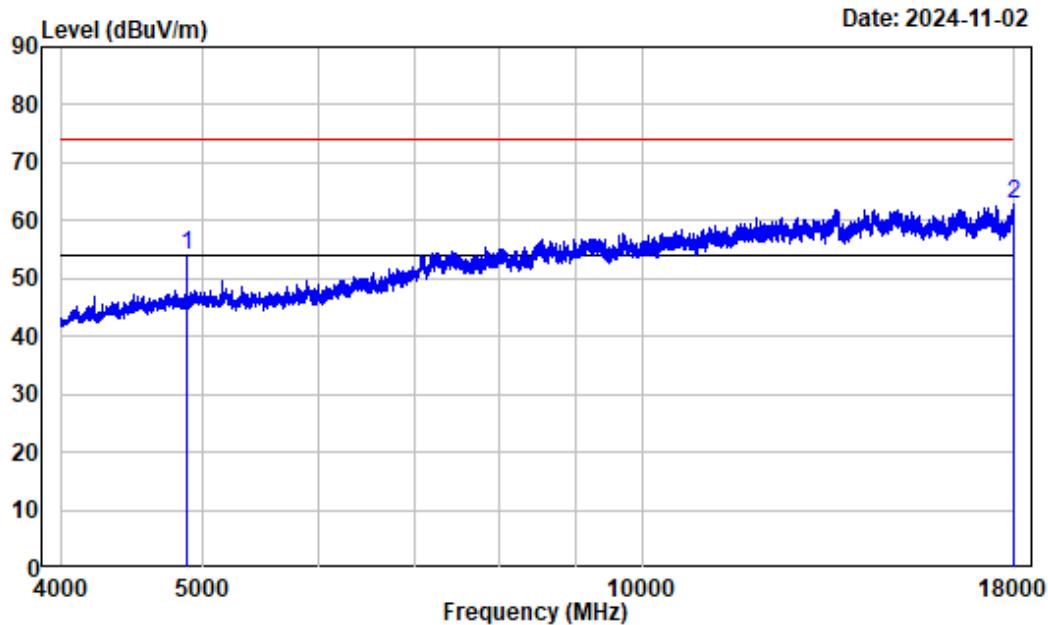
1-4 GHz, Vertical



Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| | Freq | Factor | Read Level | Limit Level | Limit Line | Over Limit | Remark |
|---|----------|--------|------------|-------------|------------|------------|---------|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 3925.741 | -0.34 | 35.69 | 35.35 | 54.00 | -18.65 | Average |
| 2 | 3925.741 | -0.34 | 49.78 | 49.44 | 74.00 | -24.56 | Peak |

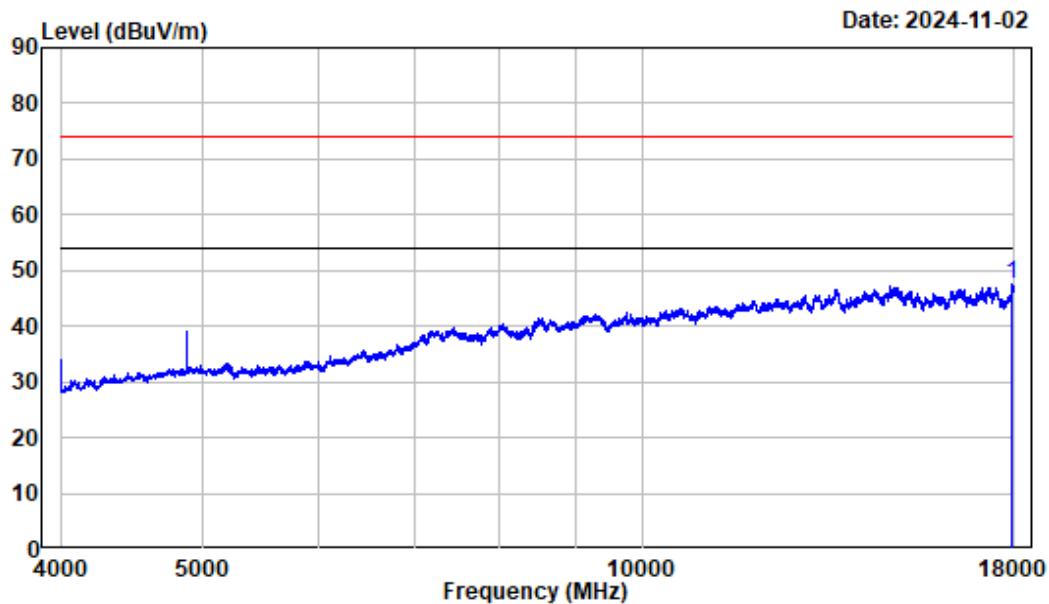
4-18 GHz, Horizontal-Peak



Condition : Horizontal
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| | Freq | Factor | Read Level | Limit Level | Line | Over Limit | Remark |
|---|-----------|--------|------------|-------------|-------|------------|--------|
| 1 | 4882.000 | 2.58 | 51.57 | 54.15 | 74.00 | -19.85 | Peak |
| 2 | 17961.500 | 24.35 | 38.33 | 62.68 | 74.00 | -11.32 | Peak |

4-18 GHz, Horizontal-Average

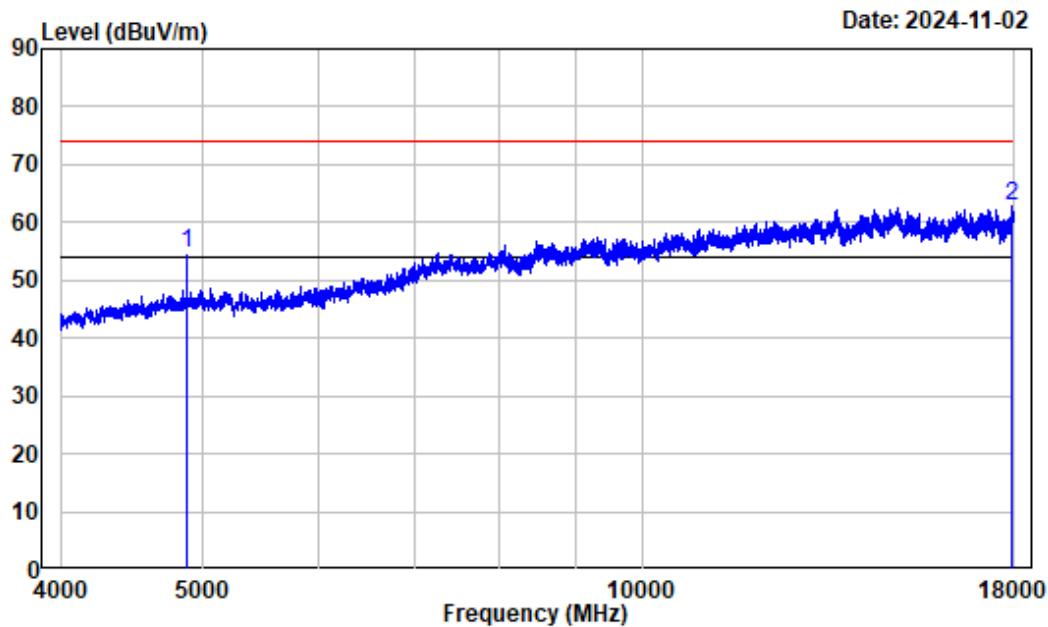


Condition : Horizontal
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| Freq | Factor | Read | | Limit | | Over | Remark |
|-------------|--------|-------|--------|--------|--------|---------|--------|
| | | Level | Level | Line | dBuV/m | | |
| MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 17935.240 | 24.16 | 23.53 | 47.69 | 54.00 | -6.31 | Average | |

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

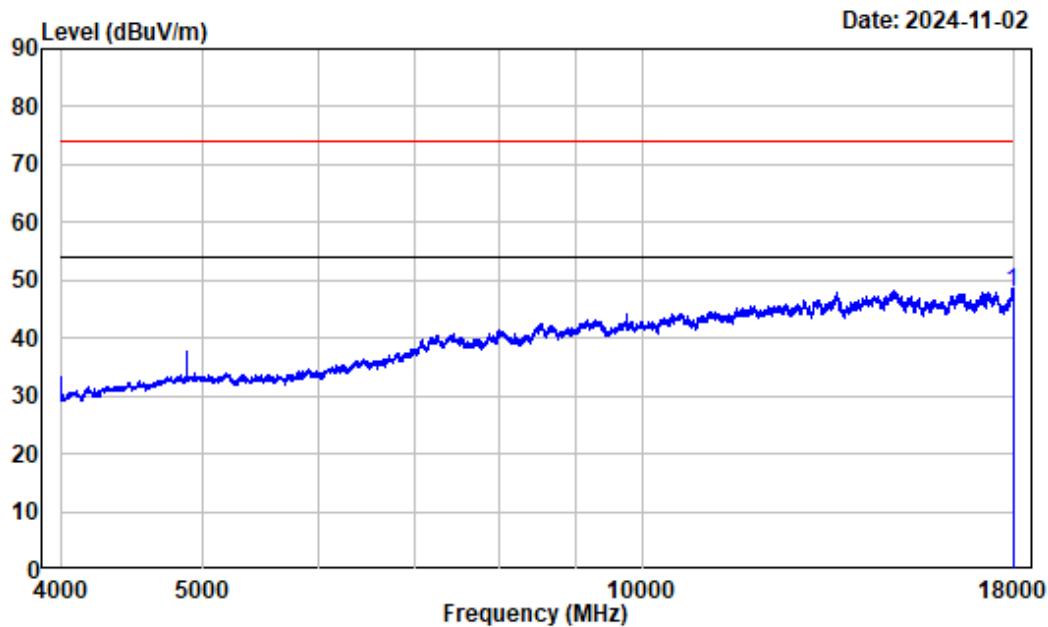
4-18 GHz, Vertical-Peak



Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| Freq | Factor | Read | | Limit Line | Over Limit | Remark |
|------|-----------|-------|-------|------------|------------|-------------|
| | | Level | Level | | | |
| 1 | 4882.000 | 2.58 | 52.14 | 54.72 | 74.00 | -19.28 Peak |
| 2 | 17936.990 | 24.17 | 38.83 | 63.00 | 74.00 | -11.00 Peak |

4-18 GHz, Vertical-Average

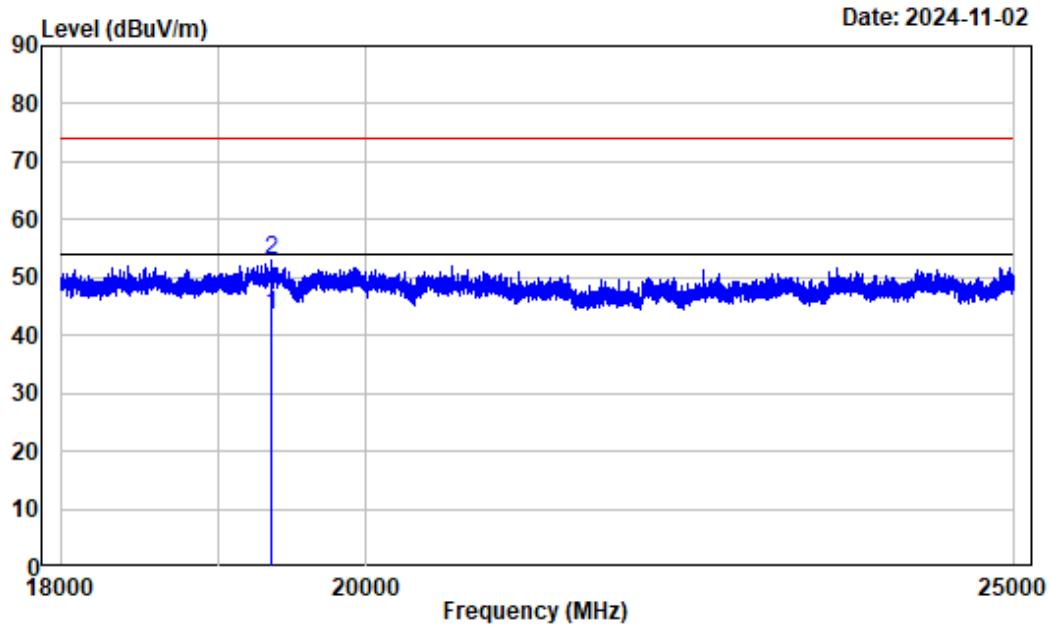


Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| Freq | Factor | Read | | Limit Line | Over Limit | Remark |
|------|-----------|-------|-------|------------|------------|---------------|
| | | Level | Level | | | |
| 1 | 17957.990 | 24.33 | 23.53 | 47.86 | 54.00 | -6.14 Average |

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

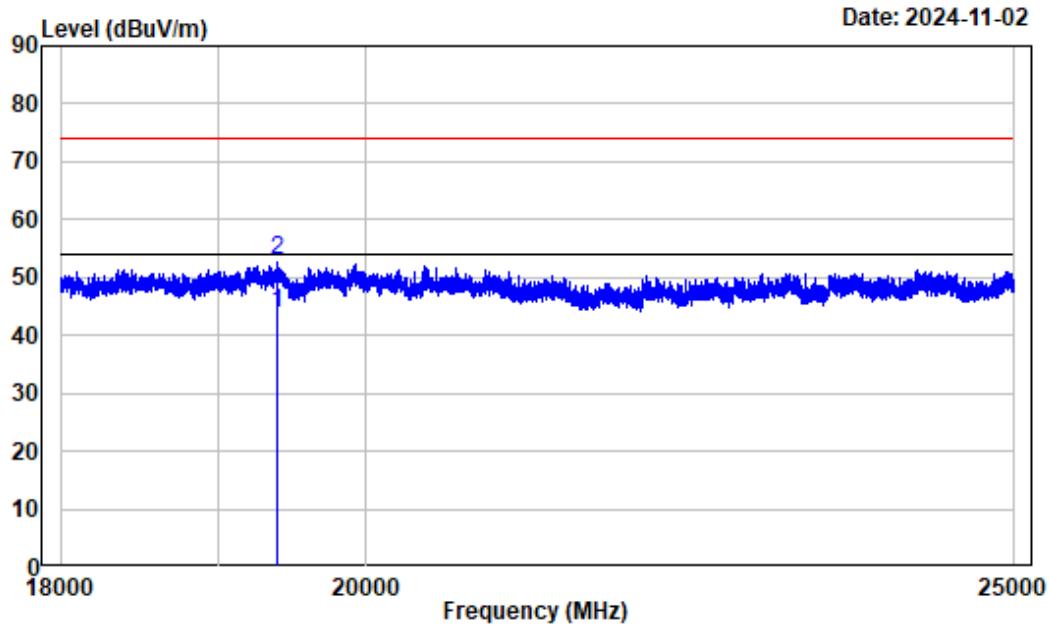
18-25 GHz, Horizontal



Condition : Horizontal
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| Freq | Factor | Read | | Limit | | Over | Remark |
|------|-----------|-------|-------|-------|-------|--------|---------|
| | | Level | Level | Line | Line | | |
| 1 | 19354.670 | 15.14 | 28.32 | 43.46 | 54.00 | -10.54 | Average |
| 2 | 19354.670 | 15.14 | 37.68 | 52.82 | 74.00 | -21.18 | Peak |

18-25 GHz, Vertical



Condition : Vertical
Project No.: 2401V85171E-RF
Tester : Zenos Qiao
Note : BT-3DH5-2441

| Freq | Factor | Read | | Limit | | Over | Remark |
|------|-----------|-------|-------|-------|-------|--------|---------|
| | | Level | Level | Line | Line | | |
| 1 | 19394.050 | 15.09 | 28.73 | 43.82 | 54.00 | -10.18 | Average |
| 2 | 19394.050 | 15.09 | 37.85 | 52.94 | 74.00 | -21.06 | Peak |

20 dB Emission Bandwidth

Test Information:

| | | | |
|--------------------|-----------|---------------------|--------------|
| Serial No.: | 208B-3 | Test Date: | 2024/07/24 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | N/A |

Environmental Conditions:

| | | | | | |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|
| Temperature: (°C): | 26 | Relative Humidity: (%) | 51 | ATM Pressure: (kPa) | 101 |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|

BDR

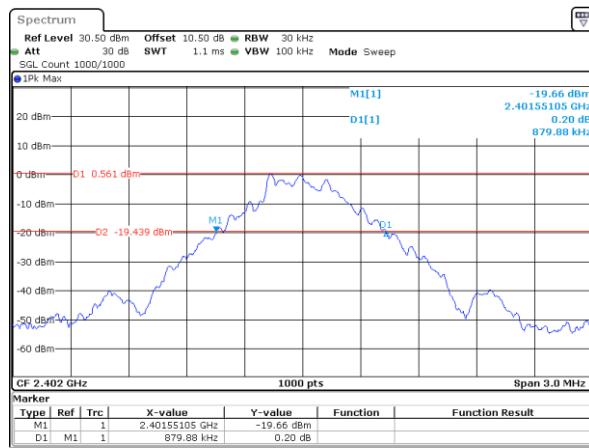
| Mode | Value (MHz) |
|-------------|-----------------------|
| GFSK_Low | 0.880 |
| GFSK_Middle | 0.886 |
| GFSK_High | 0.925 |

EDR

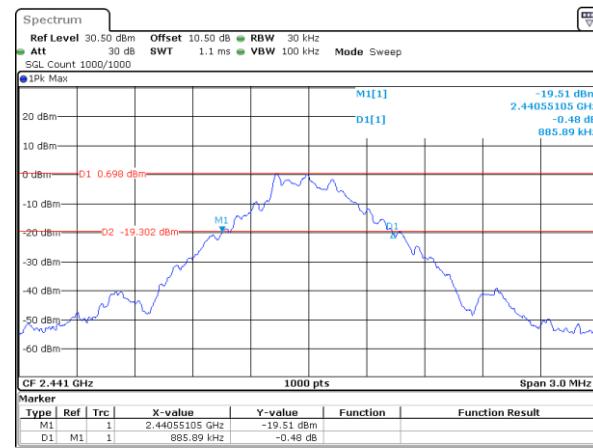
| Mode | Value (MHz) |
|-----------------------|-----------------------|
| $\pi/4$ -DQPSK_Low | 1.225 |
| $\pi/4$ -DQPSK_Middle | 1.249 |
| $\pi/4$ -DQPSK_High | 1.252 |
| 8DPSK_Low | 1.228 |
| 8DPSK_Middle | 1.228 |
| 8DPSK_High | 1.252 |

BDR

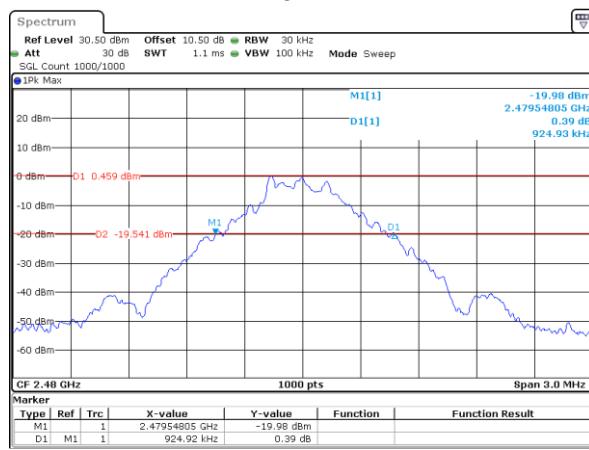
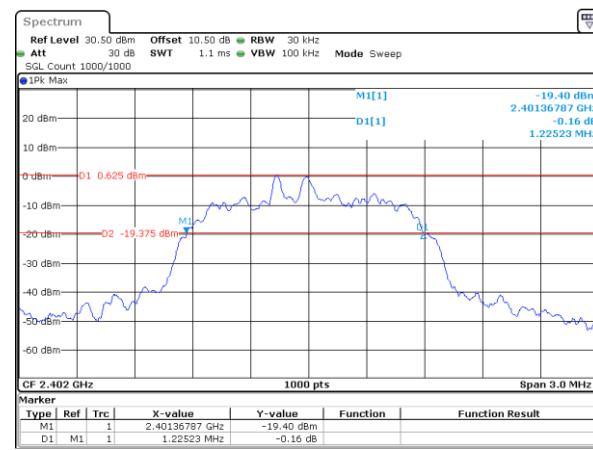
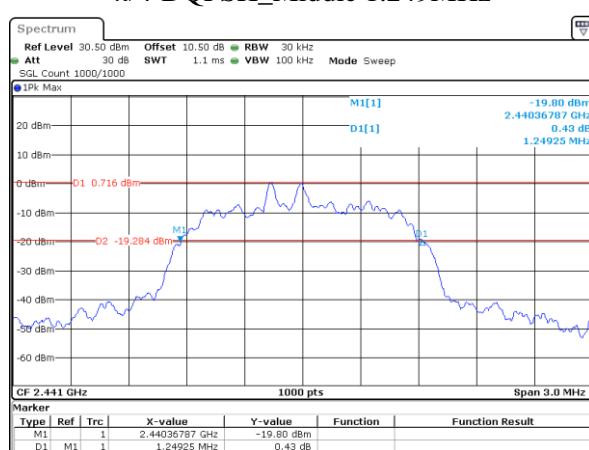
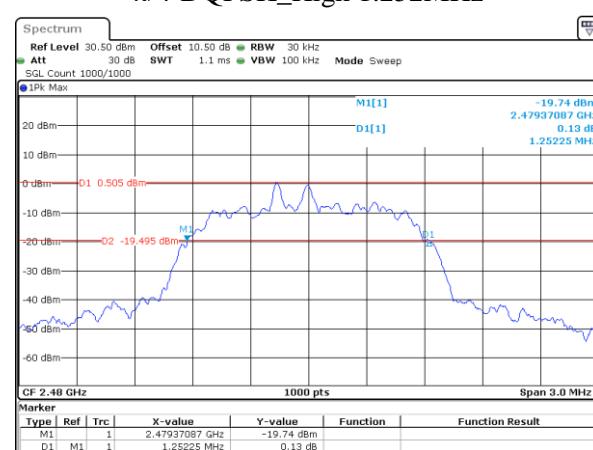
GFSK_Low 0.880MHz



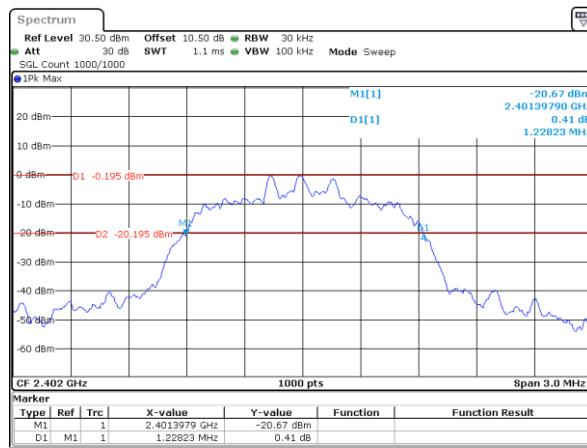
GFSK_Middle 0.886MHz



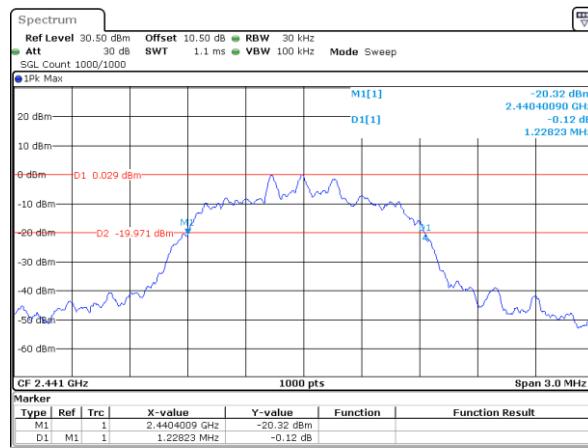
GFSK_High 0.925MHz

 $\pi/4$ -DQPSK_Low 1.225MHz $\pi/4$ -DQPSK_Middle 1.249MHz $\pi/4$ -DQPSK_High 1.252MHz

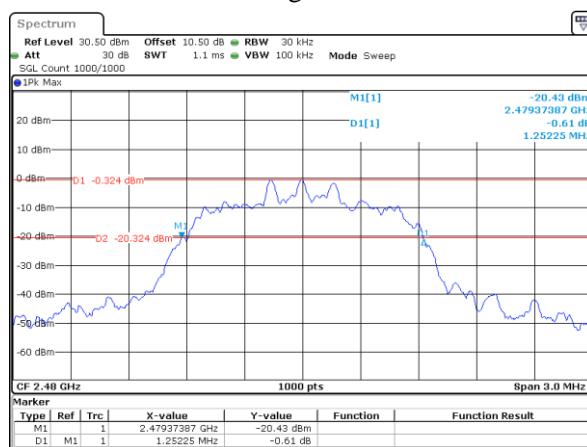
8DPSK_Low 1.228MHz



8DPSK_Middle 1.228MHz



8DPSK_High 1.252MHz



OBW**Test Information:**

| | | | |
|--------------------|-----------|---------------------|--------------|
| Serial No.: | 208B-3 | Test Date: | 2024/07/25 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | N/A |

Environmental Conditions:

| | | | | | |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|
| Temperature: (°C): | 26 | Relative Humidity: (%) | 53 | ATM Pressure: (kPa) | 101 |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|

BDR

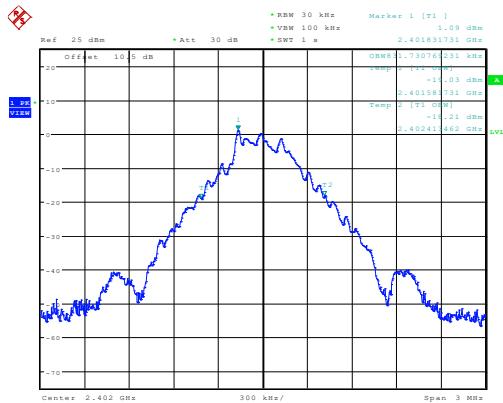
| Mode | Value (MHz) |
|-------------|-----------------------|
| GFSK_Low | 0.832 |
| GFSK_Middle | 0.837 |
| GFSK_High | 0.846 |

EDR

| Mode | Value (MHz) |
|-----------------------|-----------------------|
| $\pi/4$ -DQPSK_Low | 1.163 |
| $\pi/4$ -DQPSK_Middle | 1.163 |
| $\pi/4$ -DQPSK_High | 1.168 |
| 8DPSK_Low | 1.144 |
| 8DPSK_Middle | 1.149 |
| 8DPSK_High | 1.154 |

BDR

GFSK_Low 0.832MHz

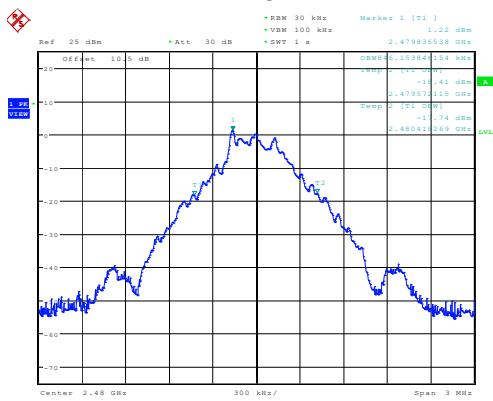
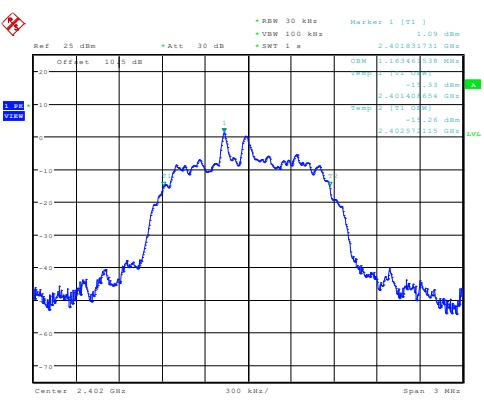
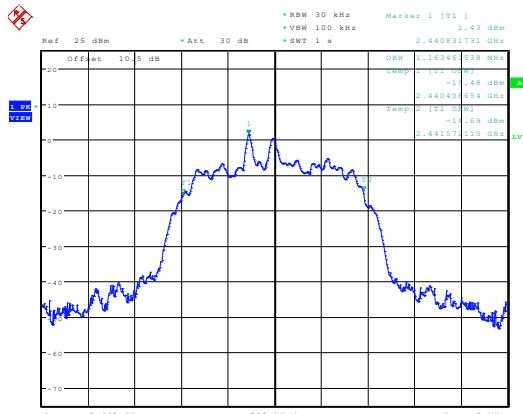
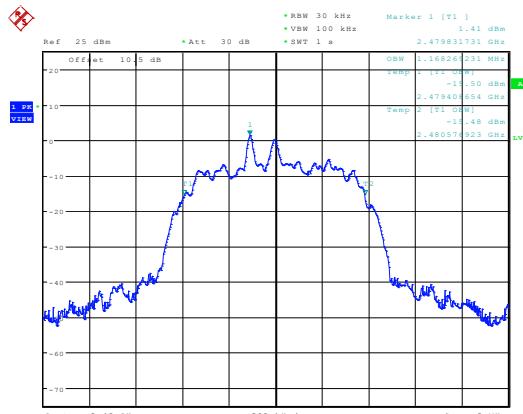


GFSK_Middle 0.837MHz

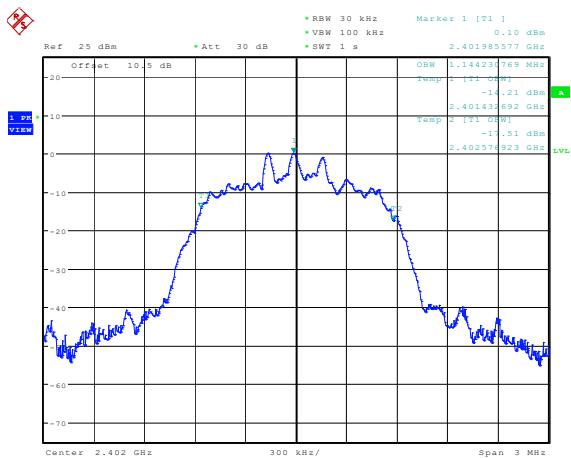


EDR

GFSK_High 0.846MHz

 $\pi/4$ -DQPSK_Low 1.163MHz $\pi/4$ -DQPSK_Middle 1.163MHz $\pi/4$ -DQPSK_High 1.168MHz

8DPSK_Low 1.144MHz



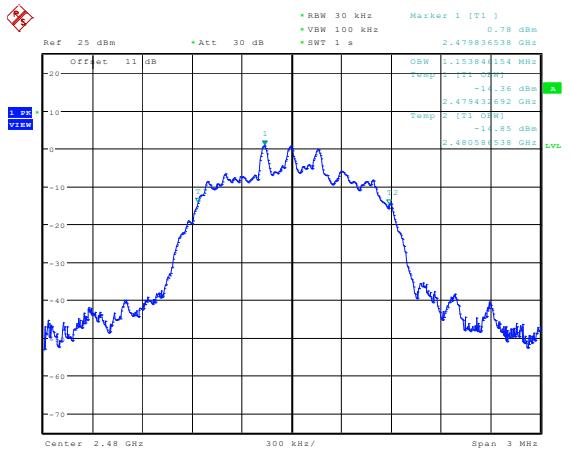
8DPSK_Middle 1.149MHz



ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 25.JUL.2024 21:04:50

ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 25.JUL.2024 21:07:50

8DPSK_High 1.154MHz



ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 25.JUL.2024 21:08:27

Channel Separation**Test Information:**

| | | | |
|--------------------|-----------|---------------------|--------------|
| Serial No.: | 208B-3 | Test Date: | 2024/07/24 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | Pass |

Environmental Conditions:

| | | | | | |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|
| Temperature: (°C): | 26 | Relative Humidity: (%) | 51 | ATM Pressure: (kPa) | 101 |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|

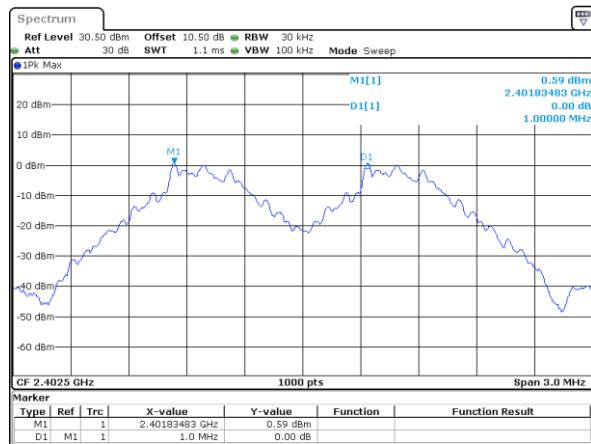
BDR

| Mode | Value (MHz) | Limit (MHz) | Result |
|-------------|-----------------------|-----------------------|---------------|
| GFSK_Low | 1.000 | 0.835 | Pass |
| GFSK_Middle | 1.000 | | Pass |
| GFSK_High | 1.003 | | Pass |

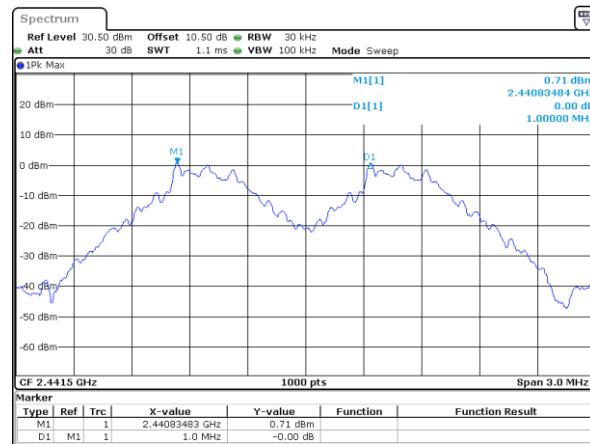
Note: Only the BDR (GFSK) mode result is reported since EDR ($\pi/4$ -DQPSK) and EDR (8DPSK) modes have the exact same channel plan, and the limit is the maximum 20dB bandwidth *2/3

BDR

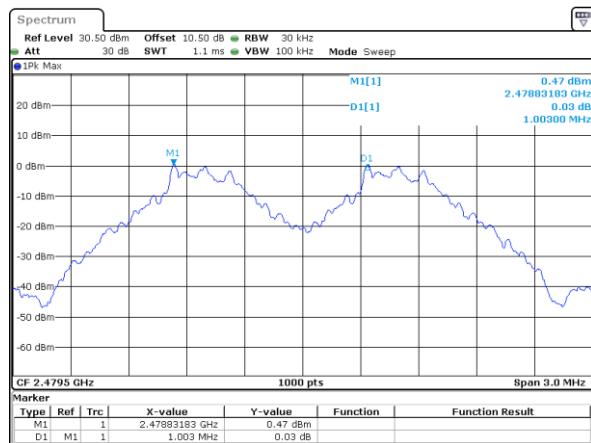
GFSK_Low 1MHz



GFSK_Middle 1MHz



GFSK_High 1.003MHz



Number of Hopping Frequency**Test Information:**

| | | | |
|--------------------|-----------|---------------------|--------------|
| Serial No.: | 208B-3 | Test Date: | 2024/07/24 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | Pass |

Environmental Conditions:

| | | | | | |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|
| Temperature: (°C): | 26 | Relative Humidity: (%) | 51 | ATM Pressure: (kPa) | 101 |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|

BDR

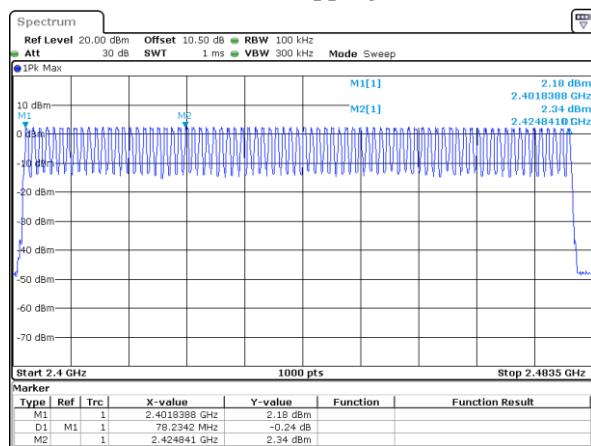
| Mode | Value | Limit | Result |
|--------------|--------------|--------------|---------------|
| GFSK_Hopping | 79 | 15 | Pass |

EDR

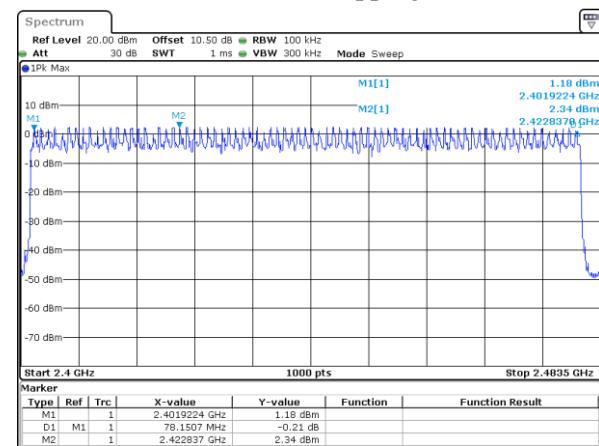
| Mode | Value | Limit | Result |
|-------------------|--------------|--------------|---------------|
| π/4-DQPSK_Hopping | 79 | 15 | Pass |
| 8DPSK_Hopping | 79 | 15 | Pass |

BDR

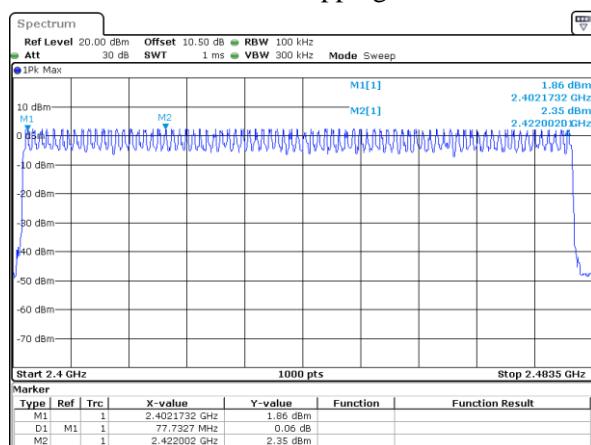
GFSK_Hopping 79



EDR

 $\pi/4$ -DQPSK_Hopping 79

8DPSK_Hopping 79



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

| | | | |
|--------------------|-----------|---------------------|--------------|
| Serial No.: | 208B-3 | Test Date: | 2024/07/24 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | Pass |

Environmental Conditions:

| | | | | | |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|
| Temperature: (°C): | 26 | Relative Humidity: (%) | 53 | ATM Pressure: (kPa) | 101 |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|

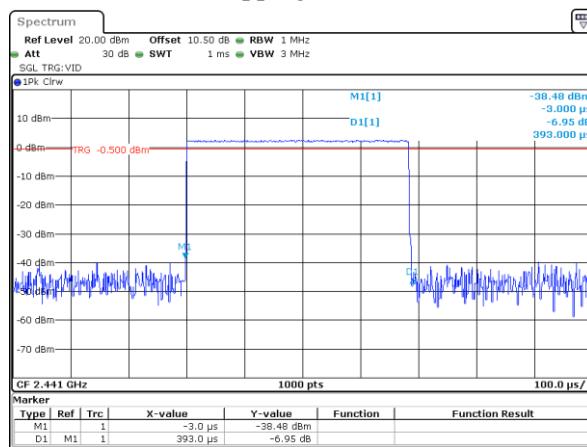
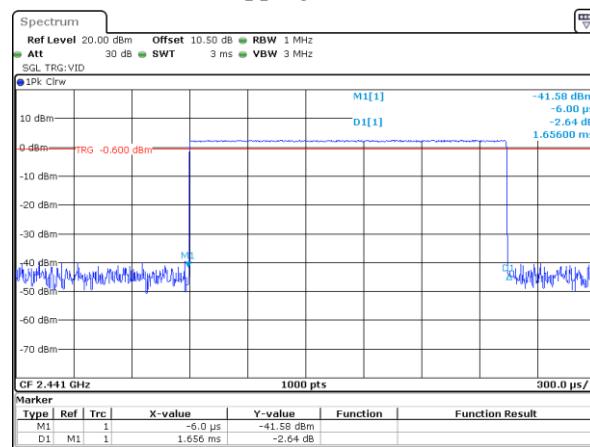
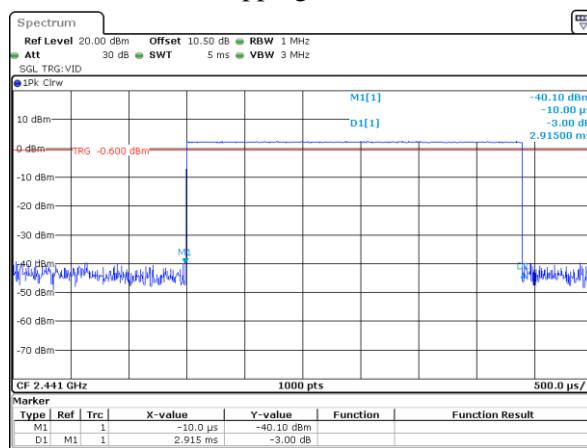
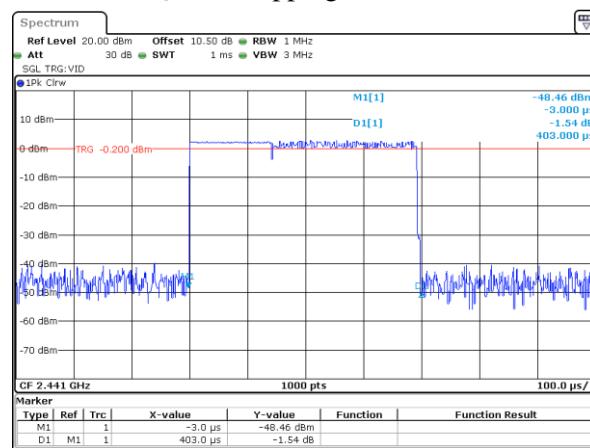
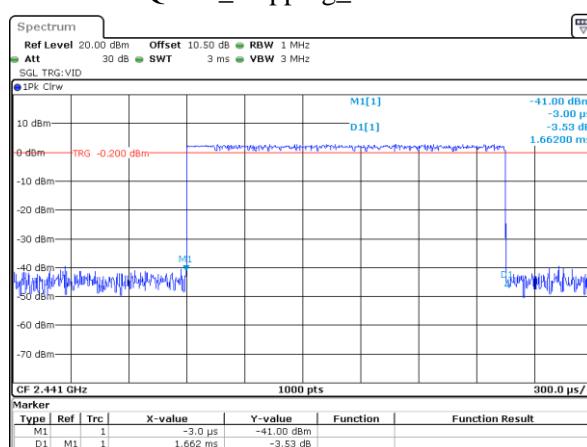
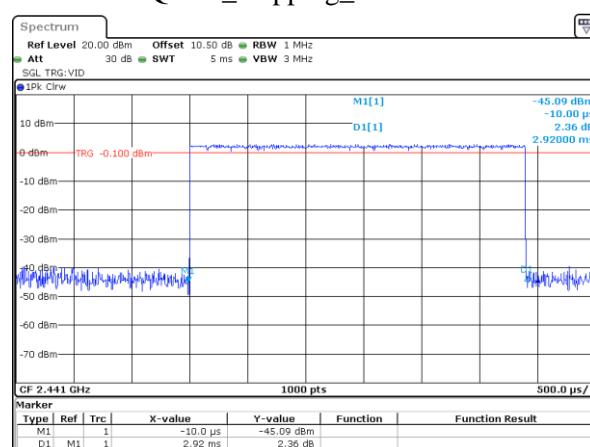
BDR

| Mode | Pulse width (ms) | Dwell time (s) | Limit (s) | Result |
|------------------|----------------------------|--------------------------|---------------------|---------------|
| GFSK_Hopping_DH1 | 0.393 | 0.126 | 0.400 | Pass |
| GFSK_Hopping_DH3 | 1.656 | 0.265 | 0.400 | Pass |
| GFSK_Hopping_DH5 | 2.915 | 0.311 | 0.400 | Pass |

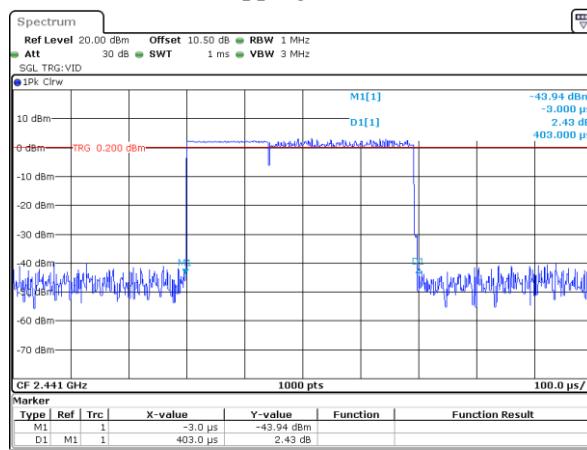
EDR

| Mode | Pulse width (ms) | Dwell time (s) | Limit (s) | Result |
|-----------------------------|----------------------------|--------------------------|---------------------|---------------|
| $\pi/4$ -DQPSK_Hopping_2DH1 | 0.403 | 0.129 | 0.400 | Pass |
| $\pi/4$ -DQPSK_Hopping_2DH3 | 1.662 | 0.266 | 0.400 | Pass |
| $\pi/4$ -DQPSK_Hopping_2DH5 | 2.920 | 0.311 | 0.400 | Pass |
| 8DPSK_Hopping_3DH1 | 0.403 | 0.129 | 0.400 | Pass |
| 8DPSK_Hopping_3DH3 | 1.662 | 0.266 | 0.400 | Pass |
| 8DPSK_Hopping_3DH5 | 2.920 | 0.311 | 0.400 | Pass |

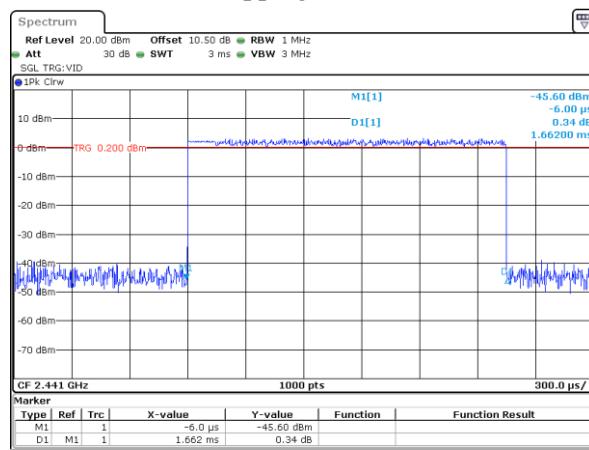
Note:DH1:Dwell time=Pulse width (ms) \times (1600/2/79) \times 31.6 sDH3:Dwell time=Pulse width (ms) \times (1600/4/79) \times 31.6 sDH5:Dwell time=Pulse width (ms) \times (1600/6/79) \times 31.6 s2DH1: Dwell time=Pulse width (ms) \times (1600/2/79) \times 31.6 s2DH3: Dwell time=Pulse width (ms) \times (1600/4/79) \times 31.6 s2DH5: Dwell time=Pulse width (ms) \times (1600/6/79) \times 31.6 s3DH1: Dwell time=Pulse width (ms) \times (1600/2/79) \times 31.6 s3DH3: Dwell time=Pulse width (ms) \times (1600/4/79) \times 31.6 s3DH5: Dwell time=Pulse width (ms) \times (1600/6/79) \times 31.6 s

BDR**GFSK_Hopping_DH1 0.393ms****GFSK_Hopping_DH3 1.656ms****GFSK_Hopping_DH5 2.915ms** **$\pi/4$ -DQPSK_Hopping_2DH1 0.403ms** **$\pi/4$ -DQPSK_Hopping_2DH3 1.662ms** **$\pi/4$ -DQPSK_Hopping_2DH5 2.920ms**

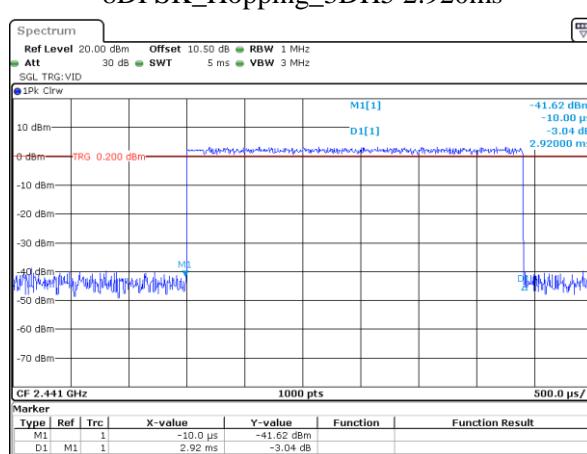
8DPSK_Hopping_3DH1 0.403ms



8DPSK_Hopping_3DH3 1.662ms



8DPSK_Hopping_3DH5 2.920ms



Maximum Conducted Output Power**Test Information:**

| | | | |
|--------------------|-----------|---------------------|--------------|
| Serial No.: | 208B-3 | Test Date: | 2024/08/06 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | Pass |

Environmental Conditions:

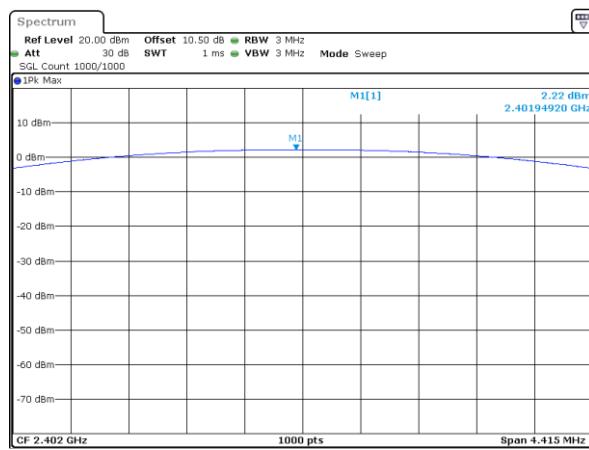
| | | | | | |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|
| Temperature: (°C): | 25 | Relative Humidity: (%) | 45 | ATM Pressure: (kPa) | 101 |
|------------------------------|----|----------------------------------|----|-------------------------------|-----|

BDR

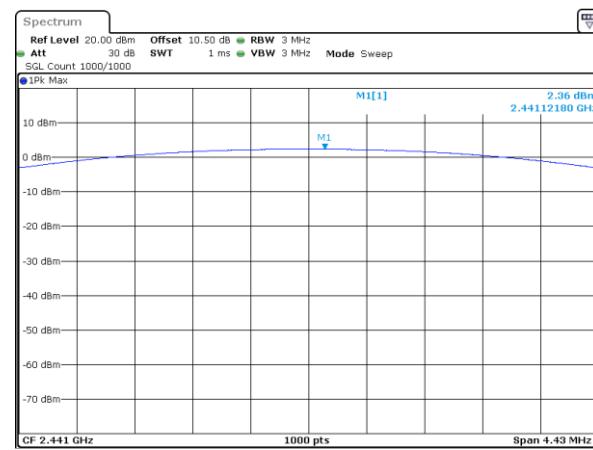
| Mode | Value (dBm) | Limit (dBm) | EIRP (dBm) | Limit (dBm) | Result |
|-------------|-----------------------|-----------------------|----------------------|-----------------------|---------------|
| GFSK_Low | 2.22 | 21.00 | 4.17 | 36.00 | Pass |
| GFSK_Middle | 2.36 | 21.00 | 4.31 | 36.00 | Pass |
| GFSK_High | 2.30 | 21.00 | 4.25 | 36.00 | Pass |

EDR

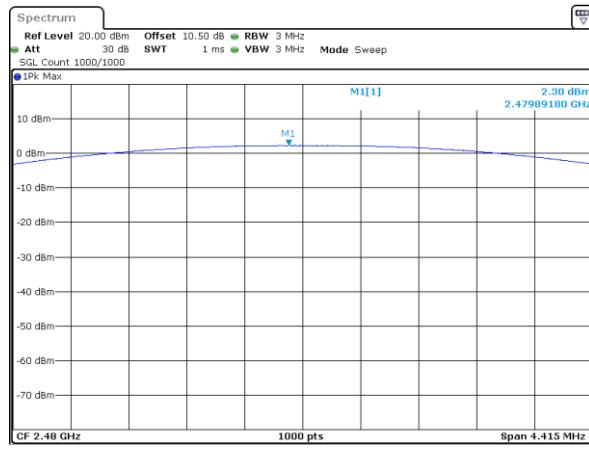
| Mode | Value (dBm) | Limit (dBm) | EIRP (dBm) | Limit (dBm) | Result |
|-----------------------|-----------------------|-----------------------|----------------------|-----------------------|---------------|
| $\pi/4$ -DQPSK_Low | 2.97 | 21.00 | 4.92 | 36.00 | Pass |
| $\pi/4$ -DQPSK_Middle | 3.11 | 21.00 | 5.06 | 36.00 | Pass |
| $\pi/4$ -DQPSK_High | 3.04 | 21.00 | 4.99 | 36.00 | Pass |
| 8DPSK_Low | 3.27 | 21.00 | 5.22 | 36.00 | Pass |
| 8DPSK_Middle | 3.51 | 21.00 | 5.46 | 36.00 | Pass |
| 8DPSK_High | 3.43 | 21.00 | 5.38 | 36.00 | Pass |

BDR**GFSK_Low 2.22dBm**

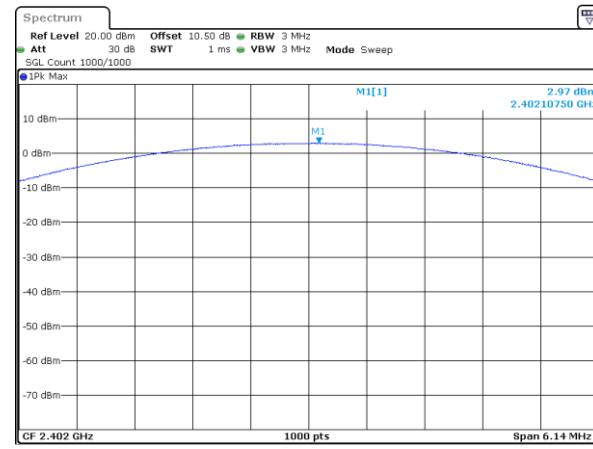
ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 6.AUG.2024 19:23:50

GFSK_Middle 2.36dBm

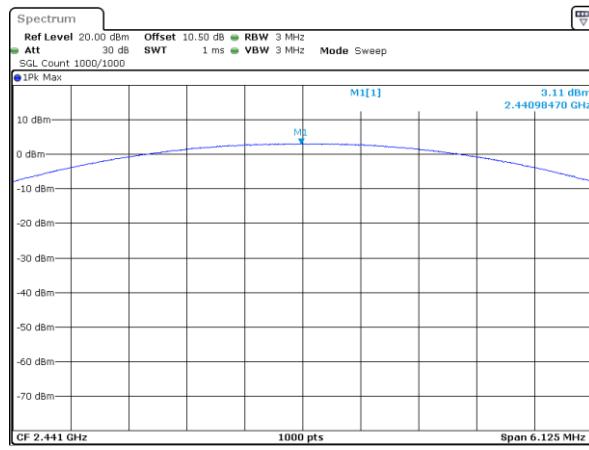
ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 6.AUG.2024 19:24:55

EDR**GFSK_High 2.30dBm**

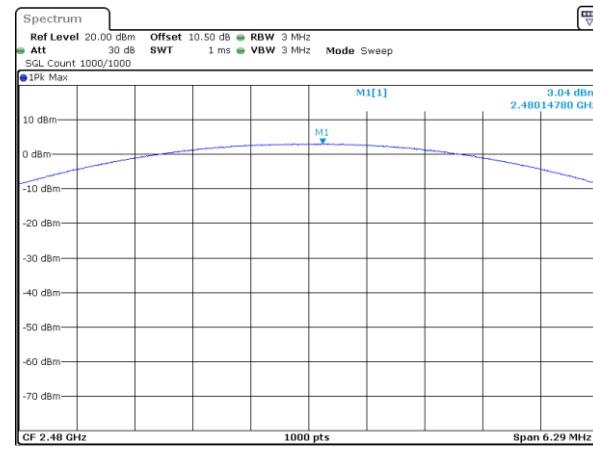
ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 6.AUG.2024 19:25:12

 $\pi/4$ -DQPSK_Low 2.97dBm

ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 6.AUG.2024 19:25:30

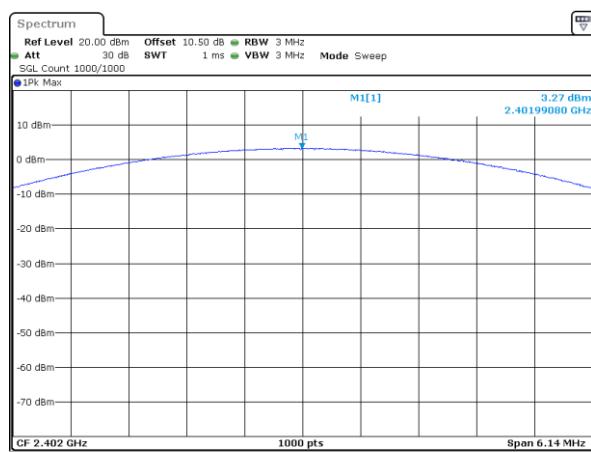
 $\pi/4$ -DQPSK_Middle 3.11dBm

ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 6.AUG.2024 19:26:19

 $\pi/4$ -DQPSK_High 3.04dBm

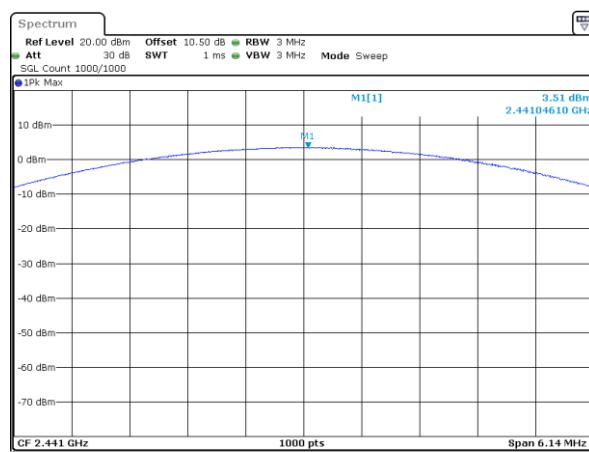
ProjectNo.:2401V85171E-RF Tester:Allen Bai
Date: 6.AUG.2024 19:26:37

8DPSK_Low 3.27dBm



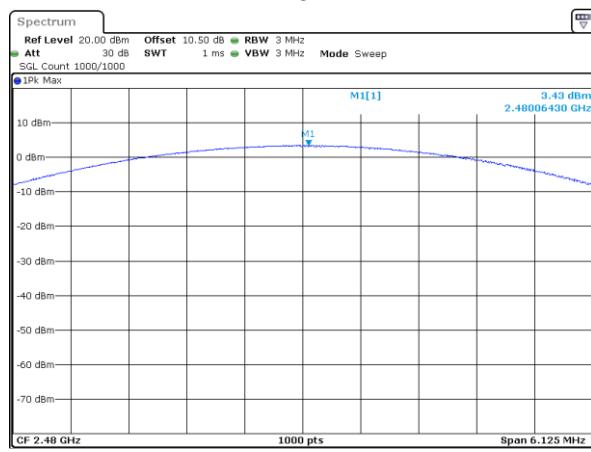
ProjectNo.:2401V85171E-RF Tester:Allen Bai
 Date: 6.AUG.2024 19:26:55

8DPSK_Middle 3.51dBm



ProjectNo.:2401V85171E-RF Tester:Allen Bai
 Date: 6.AUG.2024 19:27:18

8DPSK_High 3.43dBm



ProjectNo.:2401V85171E-RF Tester:Allen Bai
 Date: 6.AUG.2024 19:27:36

100 kHz Bandwidth of Frequency Band Edge**Test Information:**

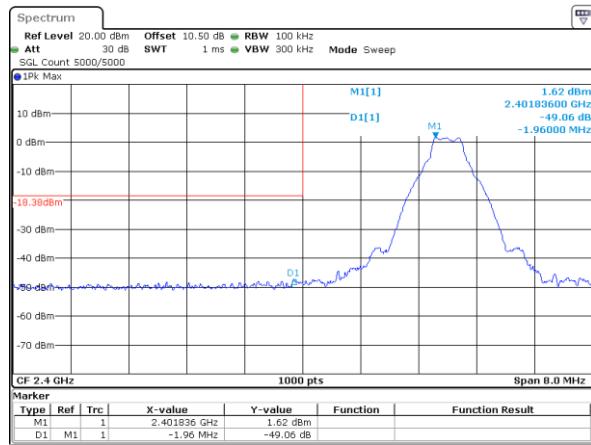
| | | | |
|--------------------|-----------|---------------------|-----------------------|
| Serial No.: | 2O8B-3 | Test Date: | 2024/07/24~2024-08-09 |
| Test Site: | RF | Test Mode: | Transmitting |
| Tester: | Allen Bai | Test Result: | Pass |

Environmental Conditions:

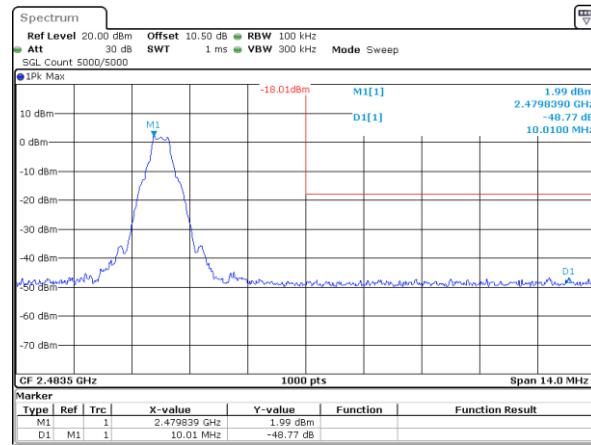
| | | | | | |
|------------------------------|-------|----------------------------------|-------|-------------------------------|-----|
| Temperature: (°C): | 25~26 | Relative Humidity: (%) | 53~55 | ATM Pressure: (kPa) | 101 |
|------------------------------|-------|----------------------------------|-------|-------------------------------|-----|

BDR

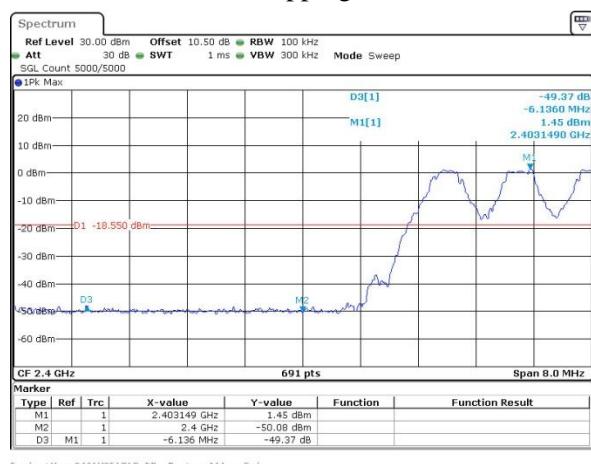
GFSK_Low



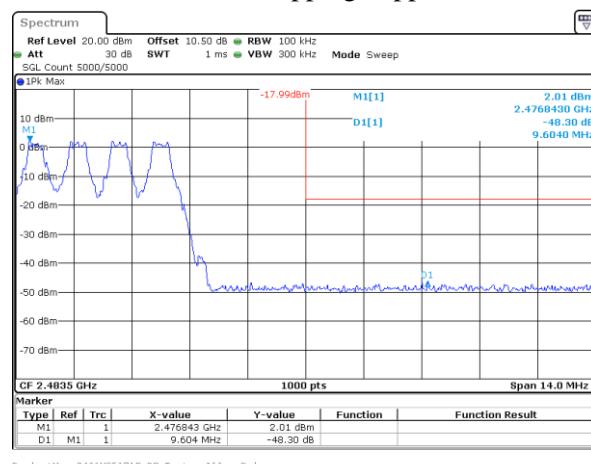
GFSK_High



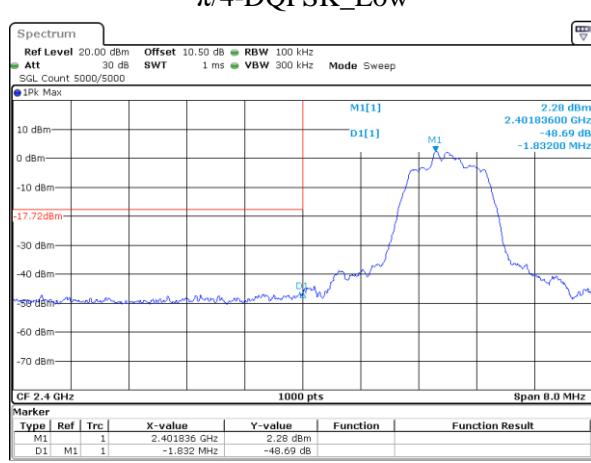
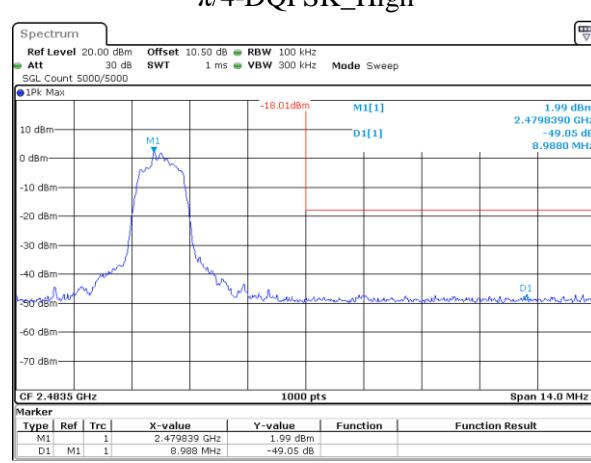
GFSK_Hopping_Lower

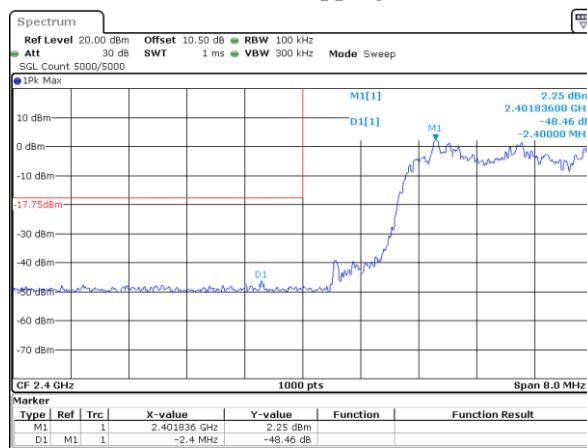
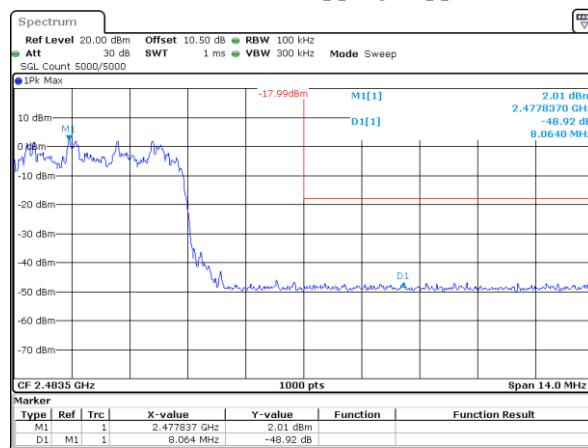


GFSK_Hopping_Upper

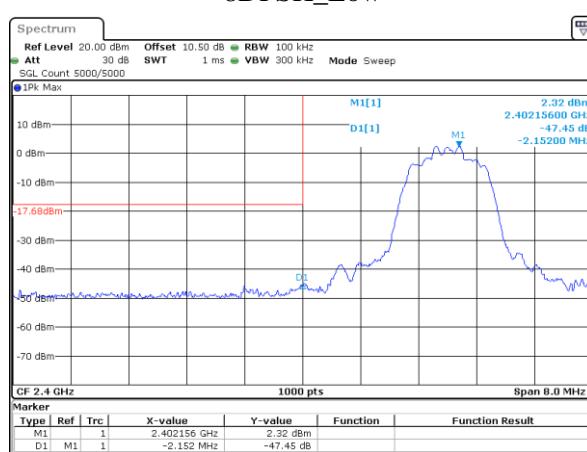


EDR

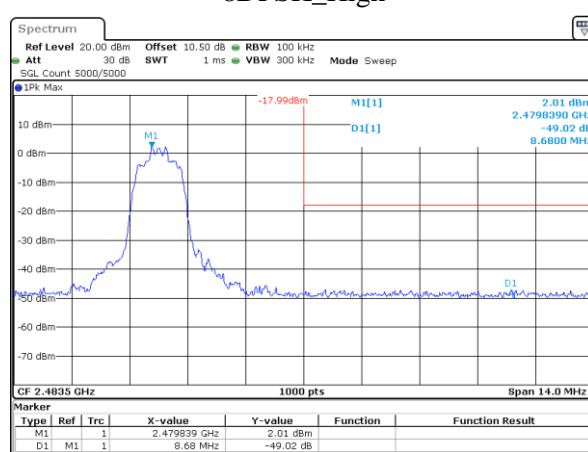
 $\pi/4$ -DQPSK_Low $\pi/4$ -DQPSK_High

$\pi/4$ -DQPSK_Hopping_Lower $\pi/4$ -DQPSK_Hopping_Upper

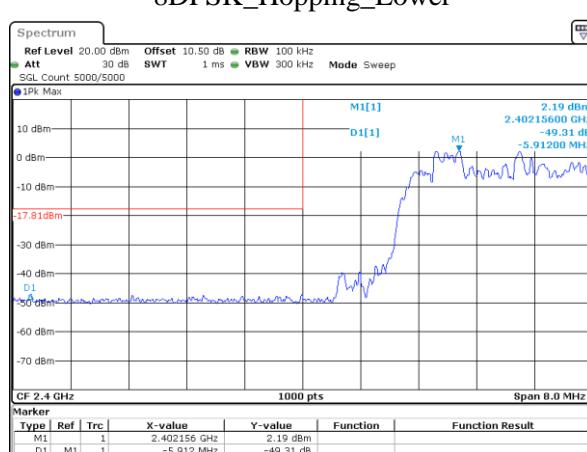
8DPSK_Low



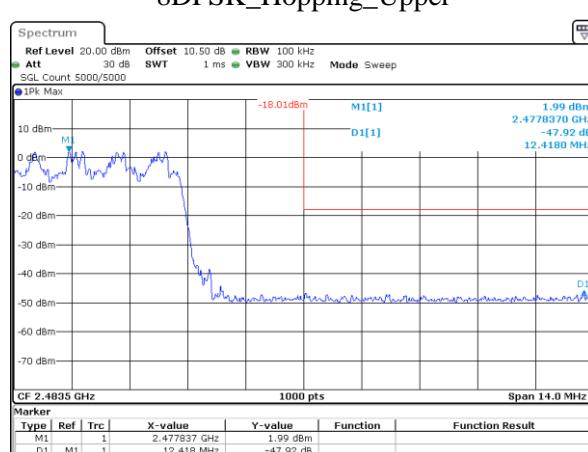
8DPSK_High



8DPSK_Hopping_Lower



8DPSK_Hopping_Upper



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

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

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot$

$[\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$

1. $f(\text{GHz})$ 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 | 3.90 | 2.46 | 5 | 0.8 | 3 | Yes |
| BLE | 2402-2480 | 3.00 | 2.00 | 5 | 0.6 | 3 | Yes |

Result: Compliant

EXEMPTION LIMITS FOR ROUTINE EVALUATION – SAR EVALUATION

Applicable Standard

According to RSS-102 Issue 5 § (2.5.1), SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | At separation distance of ≤5 mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| ≤300 | 71 mW | 101 mW | 132 mW | 162 mW | 193 mW |
| 450 | 52 mW | 70 mW | 88 mW | 106 mW | 123 mW |
| 835 | 17 mW | 30 mW | 42 mW | 55 mW | 67 mW |
| 1900 | 7 mW | 10 mW | 18 mW | 34 mW | 60 mW |
| 2450 | 4 mW | 7 mW | 15 mW | 30 mW | 52 mW |
| 3500 | 2 mW | 6 mW | 16 mW | 32 mW | 55 mW |
| 5800 | 1 mW | 6 mW | 15 mW | 27 mW | 41 mW |

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|
| | At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of ≥50 mm |
| ≤300 | 223 mW | 254 mW | 284 mW | 315 mW | 345 mW |
| 450 | 141 mW | 159 mW | 177 mW | 195 mW | 213 mW |
| 835 | 80 mW | 92 mW | 105 mW | 117 mW | 130 mW |
| 1900 | 99 mW | 153 mW | 225 mW | 316 mW | 431 mW |
| 2450 | 83 mW | 123 mW | 173 mW | 235 mW | 309 mW |
| 3500 | 86 mW | 124 mW | 170 mW | 225 mW | 290 mW |
| 5800 | 56 mW | 71 mW | 85 mW | 97 mW | 106 mW |

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required. For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

Test Result:

| Mode | Frequency (MHz) | Max tune-up conducted power# (dBm) | Max tune-up conducted power# (mW) | Gain (dBi) | Max tune-up EIRP# (dBm) | Max tune-up EIRP# (mW) | Distance (mm) | Exemption Limit (mW) | SAR Evaluation Exemption |
|-----------|-----------------|------------------------------------|-----------------------------------|------------|-------------------------|------------------------|---------------|----------------------|--------------------------|
| Bluetooth | 2402-2480 | 3.90 | 2.45 | 1.95 | 5.85 | 3.85 | 5 | 3.94 | Yes |
| BLE | 2402-2480 | 3.00 | 2.00 | 1.95 | 4.95 | 3.13 | 5 | 3.94 | Yes |

Compliant

EUT PHOTOGRAPHS

Please refer to the attachment 2401V85171E-RF External photo and 2401V85171E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401V85171E-RF Test Setup photo.

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