# FCC Part 15C
# Measurement and Test Report

**For**

**Shenzhen Daiku technology Co., LTD**

**FCC ID:2BCKX-DK69**

| | | |
|---|---|---|
| **FCC Rule(s):** | FCC Part 15.247 | |
| **Product Description:** | Smart Watch | |
| **Tested Model:** | DK69 | |
| **Report No.:** | BSL240504175002RF | |
| **Tested Date:** | May 20~31，2024 | |
| **Issued Date:** | May 31, 2024 | |
| **Tested By:** | Cindy Zheng / Engineer | Cindy zheng |
| **Reviewed By:** | Haley Wen / EMC Manager | Haley wen |
| **Approved & Authorized By:** | Mike Mo / PSQ Manager | |

**Prepared By:**

**BSL Testing Co.,LTD.**
1/F, Building B, Xinshidai GR Park, Shiyan Street,
Bao'an District, Shenzhen, ShiyanStreet, Bao'an District,
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## TABLE OF CONTENTS

# 1. GENERAL INFORMATION

## 1.1 Product Description for Equipment Under Test (EUT)

| | |
|---|---|
| Applicant: | Shenzhen Daiku technology Co., LTD |
| Address of applicant: | 605-606, Building E, Longjing Science Park, 339 Bulong Road, Longgang District, Shenzhen |
| Manufacturer: | Shenzhen Daiku technology Co., LTD |
| Address of manufacturer: | 605-606, Building E, Longjing Science Park, 339 Bulong Road, Longgang District, Shenzhen |
| Product Name: | Smart Watch |
| Model No.: | DK69 |
| Test Model No: | DK69 |
| Quantity of tested samples | 1 |
| Serial No.: | N/A |
| Operation Frequency: | 2402MHz~2480MHz |
| Channel numbers: | 79 |
| Channel separation: | 1MHz |
| Modulation type: | GFSK,Pi/4 QPSK,8DPSK |
| Antenna Type: | Cable Antenna |
| Antenna gain: | 1.49dBi |
| Power supply: | DC 3.7V by battery |

| Operation Frequency each of channel | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1 | 2402MHz | 21 | 2422MHz | 41 | 2442MHz | 61 | 2462MHz |
| 2 | 2403MHz | 22 | 2423MHz | 42 | 2443MHz | 62 | 2463MHz |
| 3 | 2404MHz | 23 | 2424MHz | 43 | 2444MHz | 63 | 2464MHz |
| 4 | 2405MHz | 24 | 2425MHz | 44 | 2445MHz | 64 | 2465MHz |
| 5 | 2406MHz | 25 | 2426MHz | 45 | 2446MHz | 65 | 2466MHz |
| 6 | 2407MHz | 26 | 2427MHz | 46 | 2447MHz | 66 | 2467MHz |
| 7 | 2408MHz | 27 | 2428MHz | 47 | 2448MHz | 67 | 2468MHz |
| 8 | 2409MHz | 28 | 2429MHz | 48 | 2449MHz | 68 | 2469MHz |
| 9 | 2410MHz | 29 | 2430MHz | 49 | 2450MHz | 69 | 2470MHz |
| 10 | 2411MHz | 30 | 2431MHz | 50 | 2451MHz | 70 | 2471MHz |
| 11 | 2412MHz | 31 | 2432MHz | 51 | 2452MHz | 71 | 2472MHz |
| 12 | 2413MHz | 32 | 2433MHz | 52 | 2453MHz | 72 | 2473MHz |
| 13 | 2414MHz | 33 | 2434MHz | 53 | 2454MHz | 73 | 2474MHz |
| 14 | 2415MHz | 34 | 2435MHz | 54 | 2455MHz | 74 | 2475MHz |
| 15 | 2416MHz | 35 | 2436MHz | 55 | 2456MHz | 75 | 2476MHz |
| 16 | 2417MHz | 36 | 2437MHz | 56 | 2457MHz | 76 | 2477MHz |
| 17 | 2418MHz | 37 | 2438MHz | 57 | 2458MHz | 77 | 2478MHz |
| 18 | 2419MHz | 38 | 2439MHz | 58 | 2459MHz | 78 | 2479MHz |
| 19 | 2420MHz | 39 | 2440MHz | 59 | 2460MHz | 79 | 2480MHz |
| 20 | 2421MHz | 40 | 2441MHz | 60 | 2461MHz | | |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test.

**EUT Cable List and Details**

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|---|---|---|---|
| / | / | / | / |

**Auxiliary Equipment List and Details**

| Description | Manufacturer | Model | Serial Number |
|---|---|---|---|
| Notebook | Lenovo | Lenovo B490 | BSTSZEMC-77 |
| | | | |

**Special Cable List and Details**

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|---|---|---|---|
| / | / | / | / |

## 1.2 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows: During the test, pre-scan F18m, F18, DK69, and found the F18m model which it is worse case model.

| **Test Mode List** | | | |
|---|---|---|---|
| Test Mode | Description | Channel | Frequency (MHz) |
| 1 | GFSK, | CH1 | 2402 |
| | | CH40 | 2441 |
| | | CH79 | 2480 |
| 2 | Pi/4 QPSK | CH1 | 2402 |
| | | CH40 | 2441 |
| | | CH79 | 2480 |
| 3 | 8DPSK | CH1 | 2402 |
| | | CH40 | 2441 |
| | | CH79 | 2480 |

## 1.3 Test Standards

The following report accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

## 1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

## 1.5 Test Facility

BSL Testing Co.,LTD.
1/F, Building B, Xinshidai GR Park, Shiyan Street, Bao'an District, Shenzhen, ShiyanStreet, Bao'an District, Shenzhen,Guangdong,518052,People’s Republic of China

FCC Test Firm Registration Number: 562200
Designation Number: CN1338

Tel: 400-882-9628
Fax: 86-755-26508703

## 1.6 Measurement Uncertainty

| **Measurement uncertainty** | | |
|---|---|---|
| Parameter | Conditions | Uncertainty |
| RF Output Power | Conducted | ±0.42dB |
| Occupied Bandwidth | Conducted | ±1.5% |
| Power Spectral Density | Conducted | ±1.8dB |
| Conducted Spurious Emission | Conducted | ±2.17dB |
| Conducted Emissions | Conducted | ±2.88dB |
| Transmitter Spurious Emissions | Radiated | ±5.1dB |

## 1.7 Test Equipment List and Details

| Description | Manufacturer | Model | Serial No. | Cal Date | Due. Date |
|---|---|---|---|---|---|
| Communication Tester | Rohde & Schwarz | CMW500 | 100358 | 2023-10-27 | 2024-10-26 |
| Spectrum Analyzer | R&S | FSP40 | 100550 | 2023-10-27 | 2024-10-26 |
| Test Receiver | R&S | ESCI7 | US47140102 | 2023-10-27 | 2024-10-26 |
| Signal Generator | HP | 83630B | 3844A01028 | 2023-10-27 | 2024-10-26 |
| Test Receiver | R&S | ESPI-3 | 100180 | 2023-10-27 | 2024-10-26 |
| Amplifier | Agilent | 8449B | 4035A00116 | 2023-10-27 | 2024-10-26 |
| Amplifier | HP | 8447E | 2945A02770 | 2023-10-27 | 2024-10-26 |
| Signal Generator | IFR | 2023A | 202307/242 | 2023-10-27 | 2024-10-26 |
| Broadband Antenna | SCHAFFNER | 2774 | 2774 | 2023-10-27 | 2024-10-26 |
| Biconical and log periodic antennas | ELECTRO-METRICS | EM-6917B-1 | 171 | 2023-10-27 | 2024-10-26 |
| Horn Antenna | R&S | HF906 | 100253 | 2023-10-27 | 2024-10-26 |
| Horn Antenna | EM | EM-6961 | 6462 | 2023-10-27 | 2024-10-26 |
| LISN | R&S | ESH3-Z5 | 100196 | 2023-10-27 | 2024-10-26 |
| LISN | COM-POWER | LI-115 | 02027 | 2023-10-27 | 2024-10-26 |
| 3m Semi-Anechoic Chamber | Chengyu Electron | 9 (L)*6 (W)* 6 (H) | BSL086 | 2023-10-27 | 2024-10-26 |
| Horn Antenna | A-INFOMW | LB-180400KF | BSL088 | 2023-10-27 | 2024-10-26 |
| 20dB Attenuator | ICPROBING | IATS1 | BSL1003 | 2023-10-27 | 2024-10-26 |
| POWER DIVIDER | Mini-circuits | PD-2SF-0010 | N/A | 2023-10-27 | 2024-10-26 |
| POWER DIVIDER | Mini-circuits | PD-2SF-0010 | N/A | 2023-10-27 | 2024-10-26 |
| Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2023-10-27 | 2024-10-26 |
| Antenna Tower | SKET | BK-4AT-BS | N/A | N/A | N/A |

# 3. RF Exposure

## 3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

## 3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

# 4. Antenna Requirement

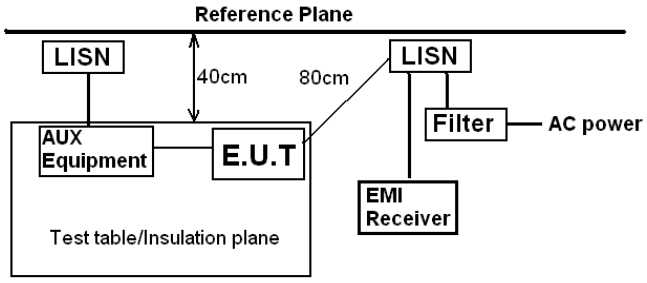
## 4.1 Standard Applicable

According to FCC Part 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.

## 4.2 Evaluation Information

This product has a PCB antenna(1.49dBi), fulfill the requirement of this section.

## 5. Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>150KHz to 30MHz</td></tr>
<tr><td>Class / Severity:</td><td>Class B</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9KHz, VBW=30KHz, Sweep time=auto</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test setup:</td><td>


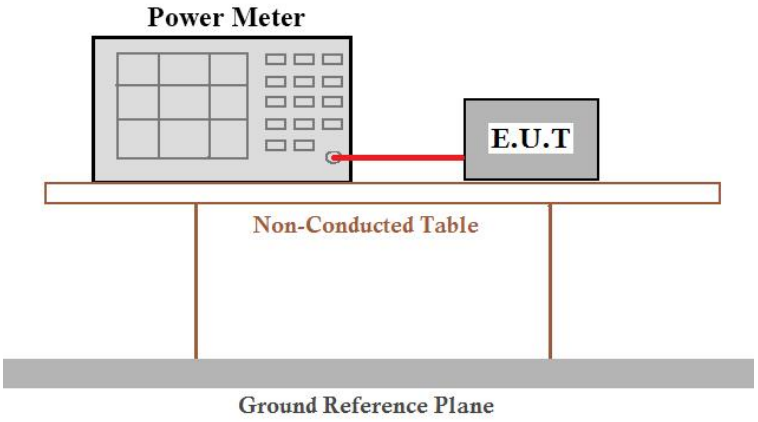
Remark:<br>E.U.T: Equipment Under Test<br>LISN: Line Impedence Stabilization Network<br>Test table height=0.8m
</td></tr>
<tr><td>Test procedure:</td><td>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.<br>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).<br>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 1.7 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 1.2 for details</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

The equipment is battery powered, so do not test this item

*Notes:*

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

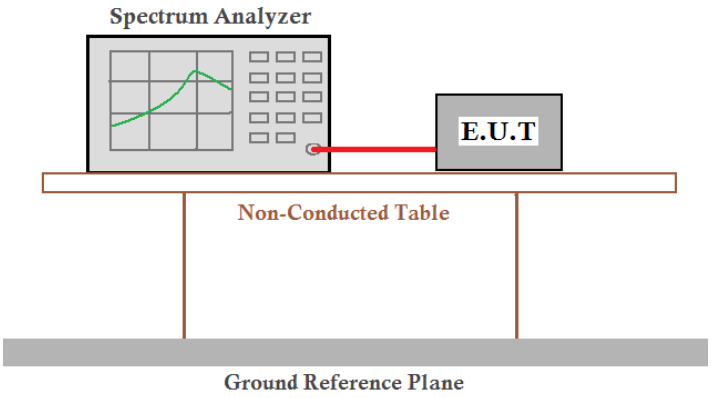
## 6. Conducted Peak Output Power

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (b)(3) |
| Test Method: | ANSI C63.10:2013 |
| Limit: | 30dBm(for GFSK),20.97dBm(for EDR) |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

**Measurement Data:**

| Mode | Test channel | Peak Output Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| GFSK | Lowest | -1.01 | 30.00 | Pass |
| | Middle | 1.33 | | |
| | Highest | 0.3 | | |
| Pi/4QPSK | Lowest | 1.21 | 20.97 | Pass |
| | Middle | 0.57 | | |
| | Highest | -0.32 | | |
| 8DPSK | Lowest | 1.25 | 20.97 | Pass |
| | Middle | 0.66 | | |
| | Highest | -0.31 | | |

# 6. 20dB Emission Bandwidth

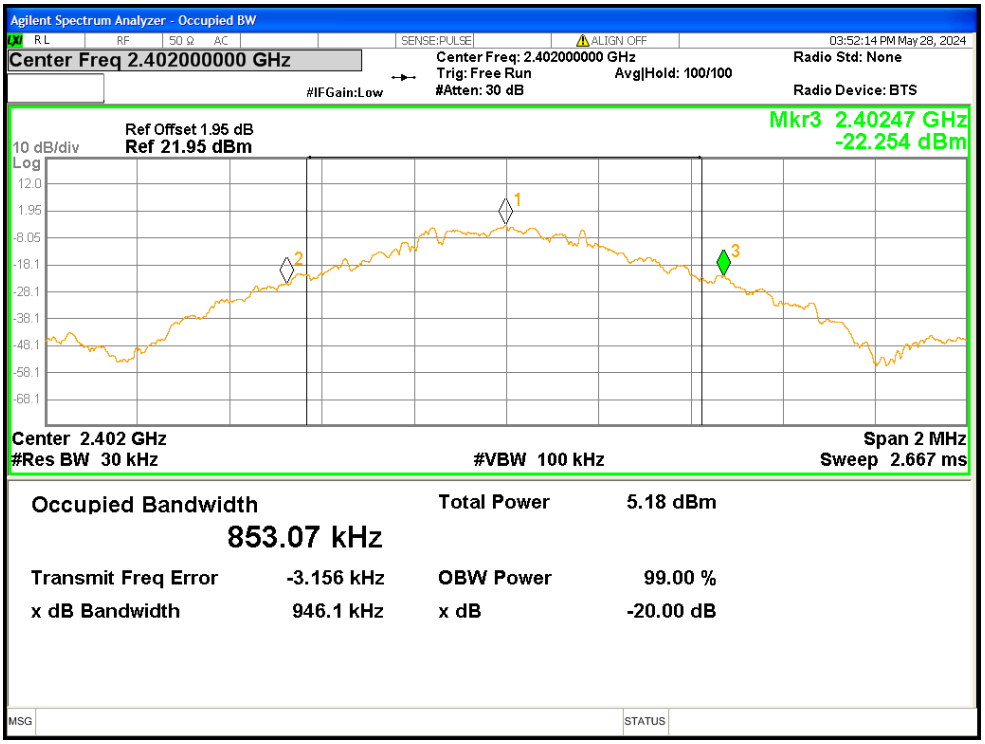
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(2) |
| Test Method: | ANSI C63.10:2013 |
| Limit: | N/A |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

**Measurement Data:**

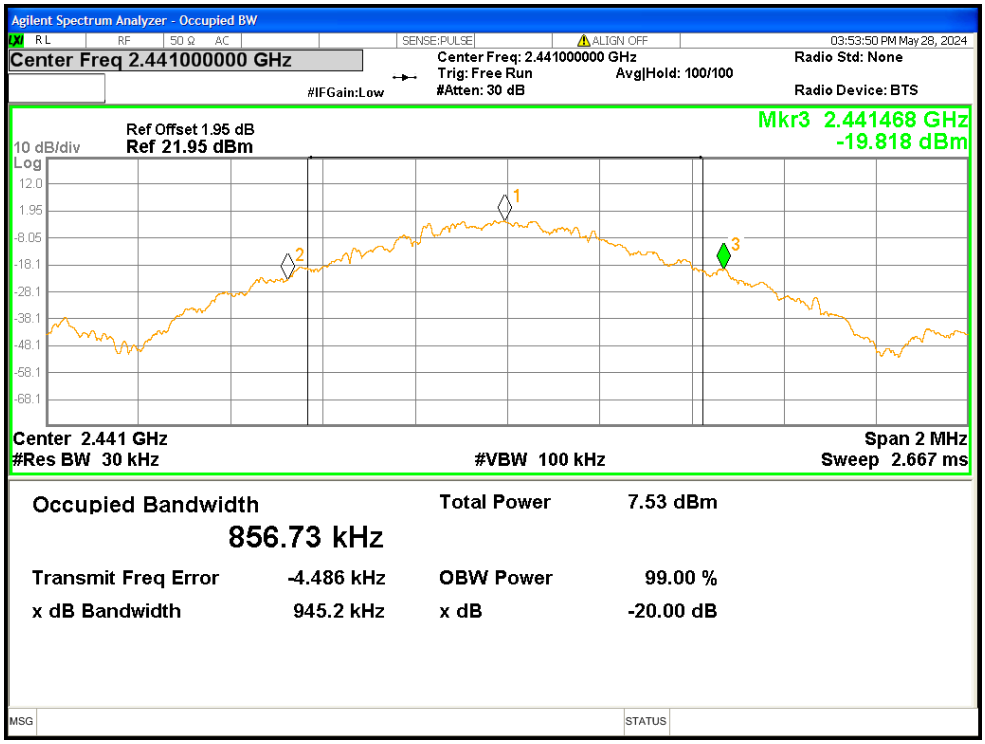
| Mode | Test channel | 20dB Emission Bandwidth (MHz) | Result |
|---|---|---|---|
| GFSK | Lowest | 0.946 | Pass |
| | Middle | 0.945 | |
| | Highest | 0.946 | |
| Pi/4QPSK | Lowest | 1.32 | Pass |
| | Middle | 1.32 | |
| | Highest | 1.314 | |
| 8DPSK | Lowest | 1.304 | Pass |
| | Middle | 1.28 | |
| | Highest | 1.314 | |

**Test plot as follows:**

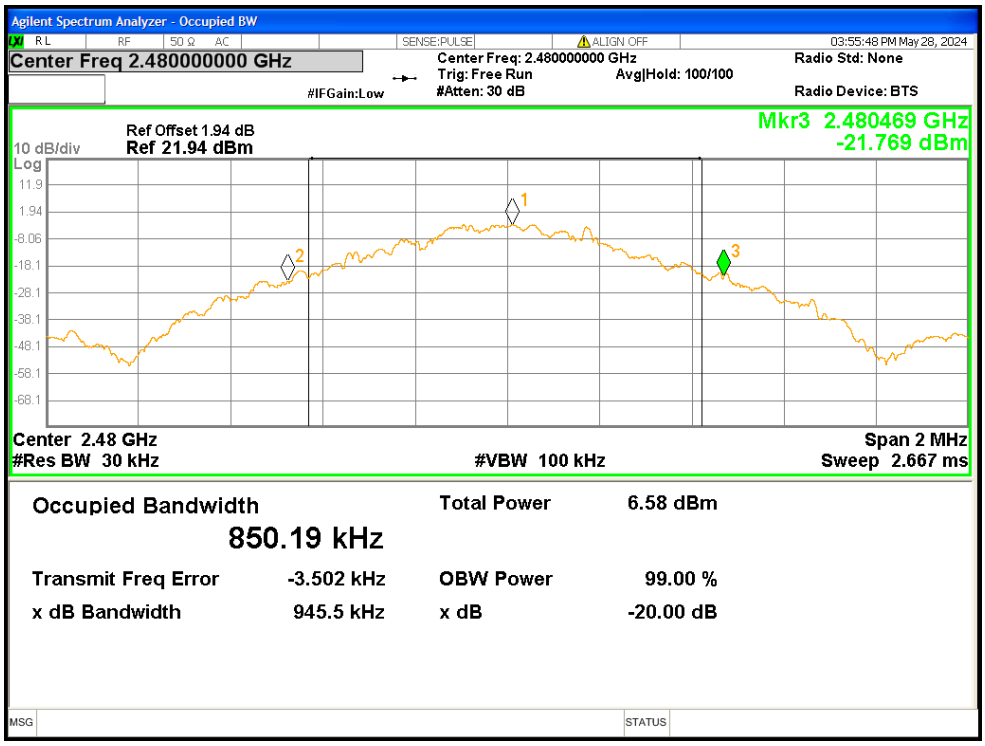
| Test mode: | GFSK mode |
|---|---|




Lowest channel

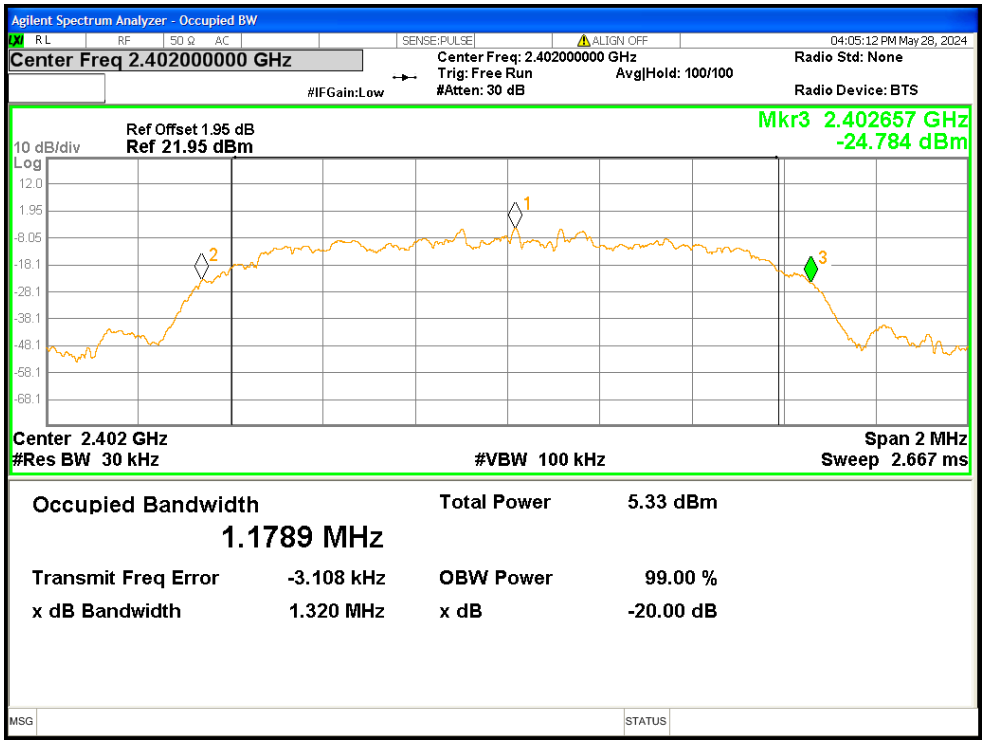



Middle channel

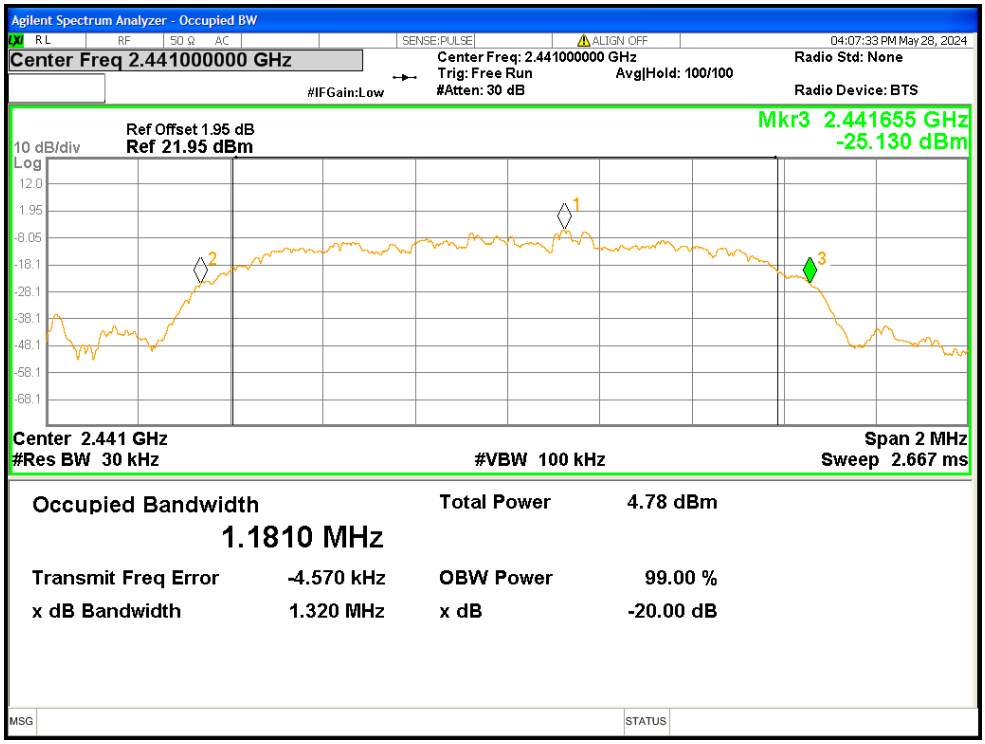



Highest channel

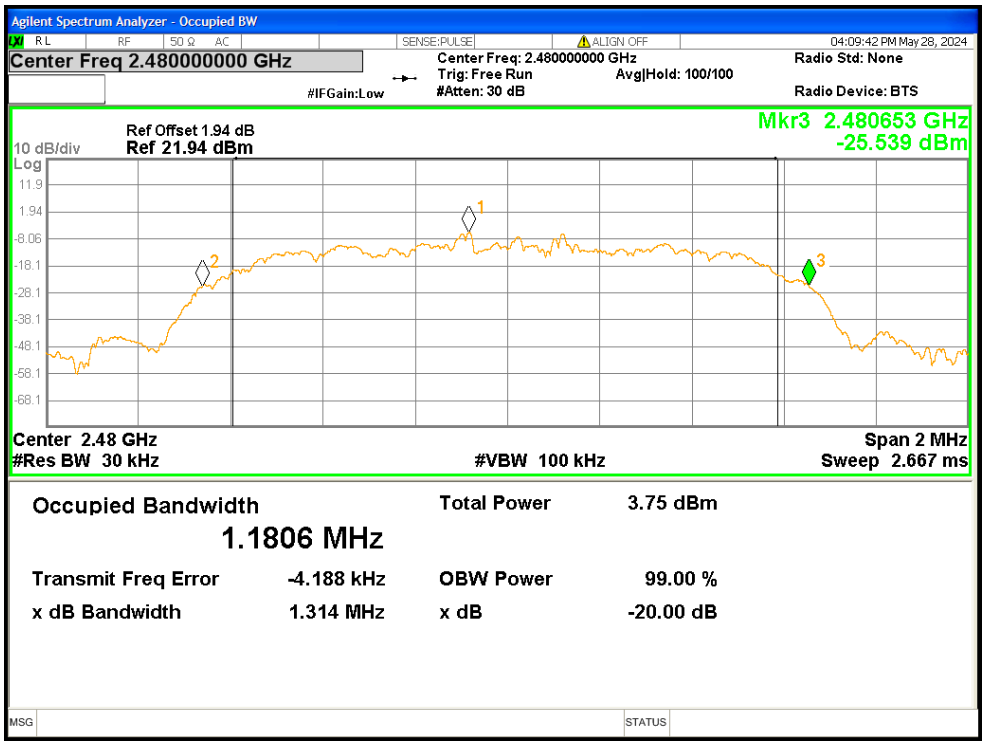
| Test mode: | Pi/4QPSK mode |
|---|---|




Lowest channel

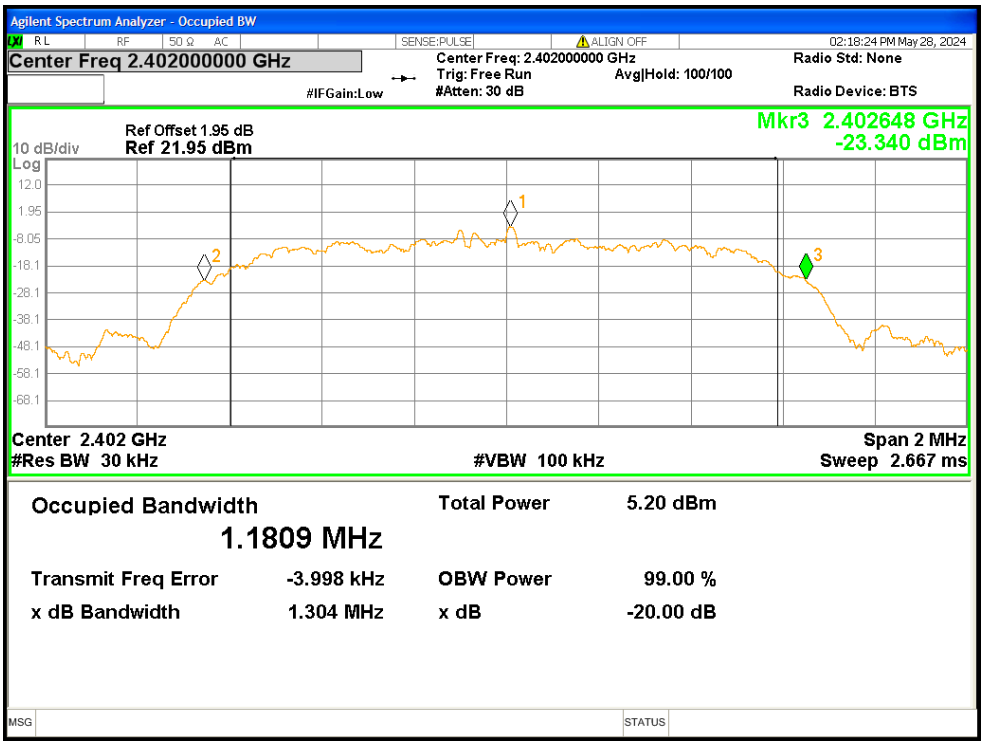



Middle channel

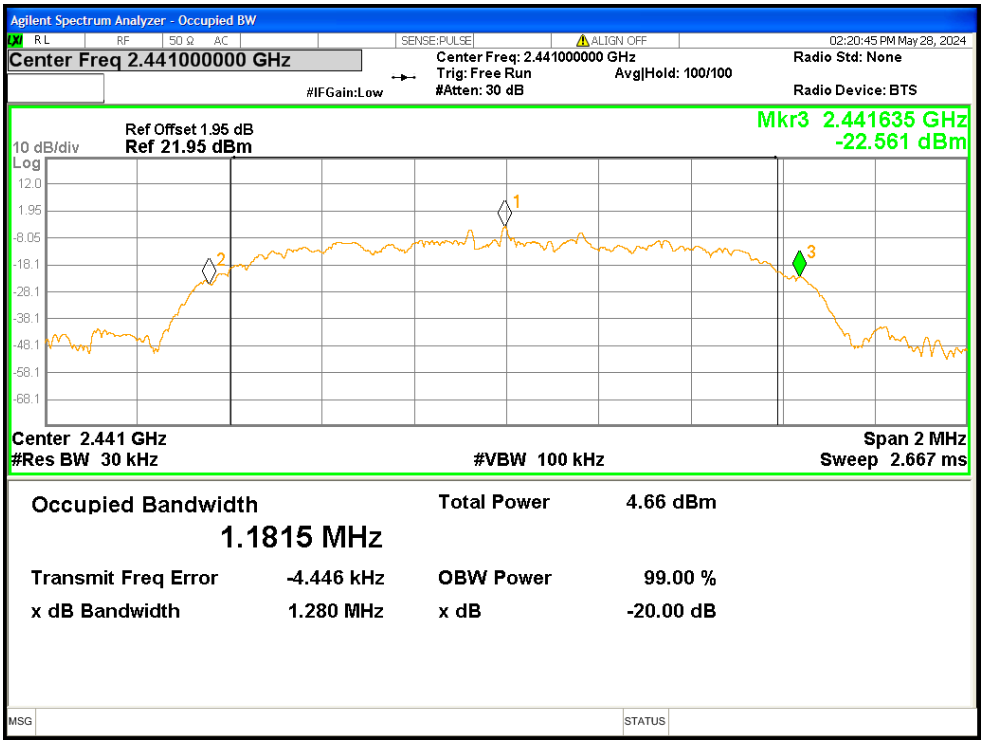



Highest channel

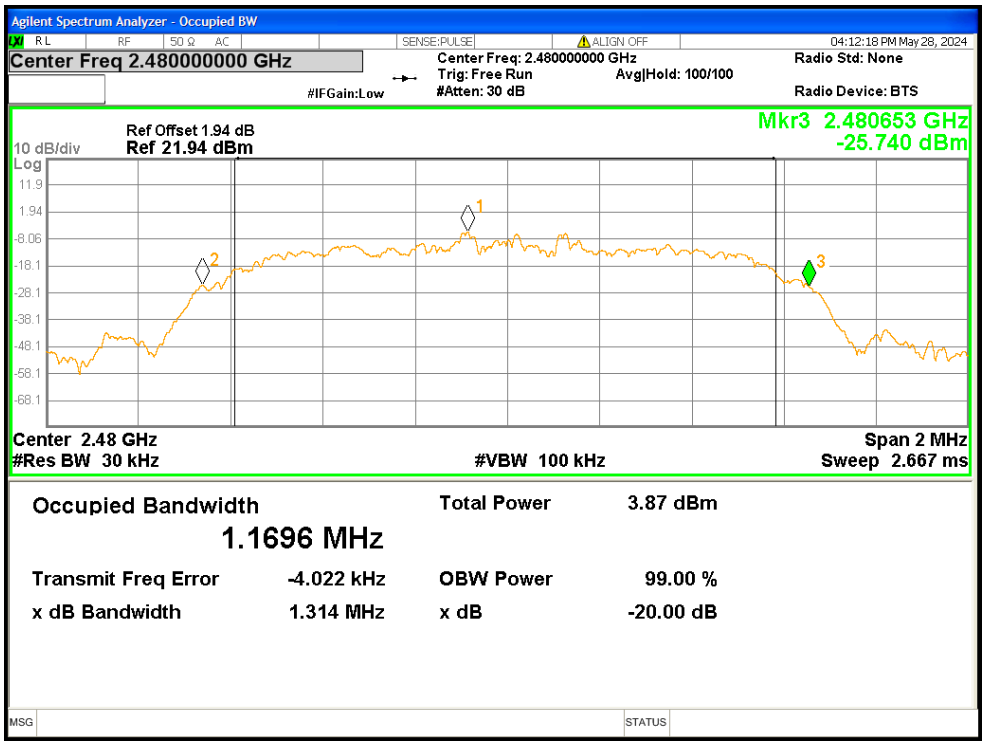
| Test mode: | 8DPSK mode |
|---|---|




Lowest channel

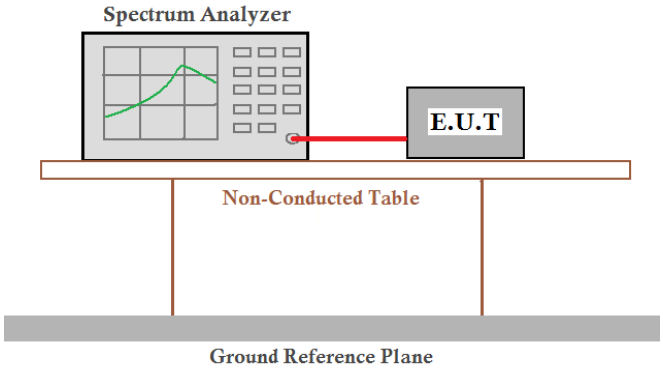



Middle channel




Highest channel

# 7. Carrier Frequencies Separation

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10:2013 |
| Receiver setup: | RBW=20KHz, VBW=62KHz, detector=Peak |
| Limit: | 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater) |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

**Measurement Data:**

| Mode | Test channel | Carrier Frequencies Separation (MHz) | Limit (MHz) | Result |
|---|---|---|---|---|
| GFSK | Lowest | 0.93 | 0.631 | Pass |
| | Middle | 0.984 | 0.63 | Pass |
| | Highest | 0.998 | 0.631 | Pass |
| Pi/4QPSK | Lowest | 1.01 | 0.88 | Pass |
| | Middle | 0.994 | 0.88 | Pass |
| | Highest | 1.016 | 0.876 | Pass |
| 8DPSK | Lowest | 1.004 | 0.869 | Pass |
| | Middle | 1.012 | 0.853 | Pass |
| | Highest | 1.154 | 0.876 | Pass |

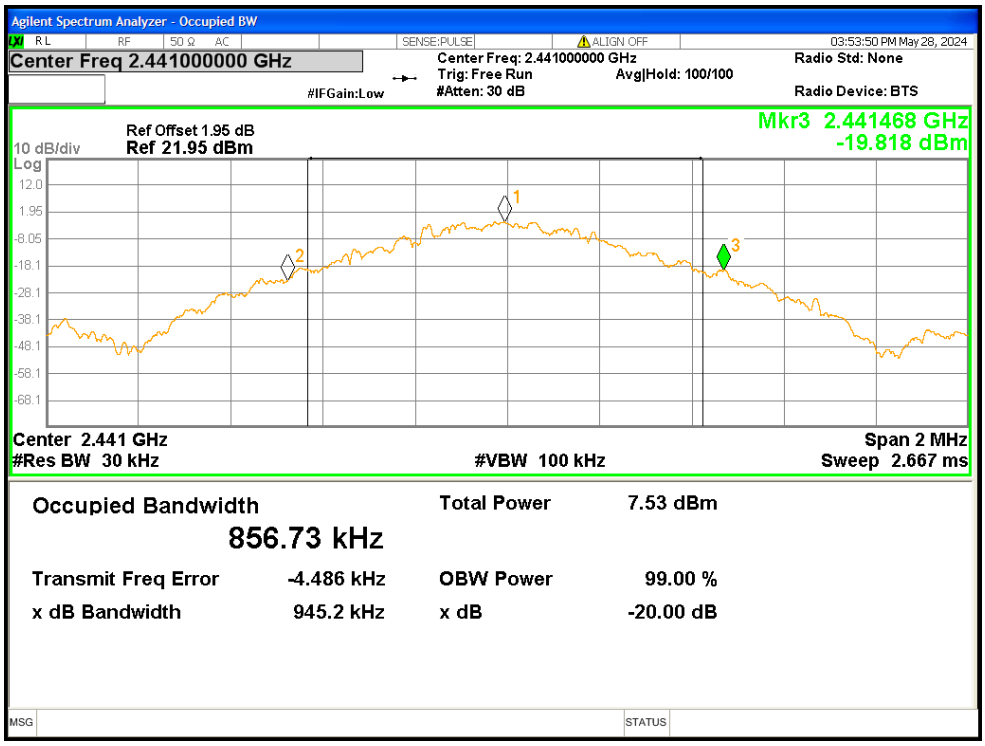
*Note: According to section 7.4*

| Mode | 20dB bandwidth (kHz) (worse case) | Limit (kHz) (Carrier Frequencies Separation) |
|---|---|---|
| GFSK | 945.00 | 630 |
| Pi/4QPSK | 1314.00 | 876 |
| 8DSK | 1280.00 | 853 |

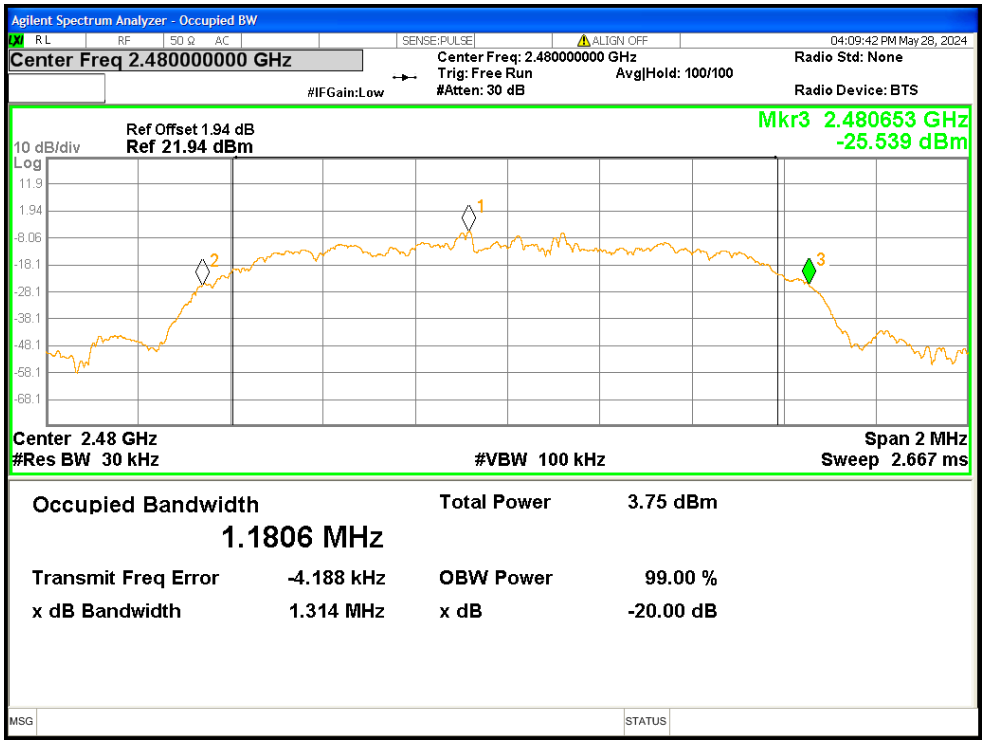
**Test plot as follows:**

**Only show the worst case**

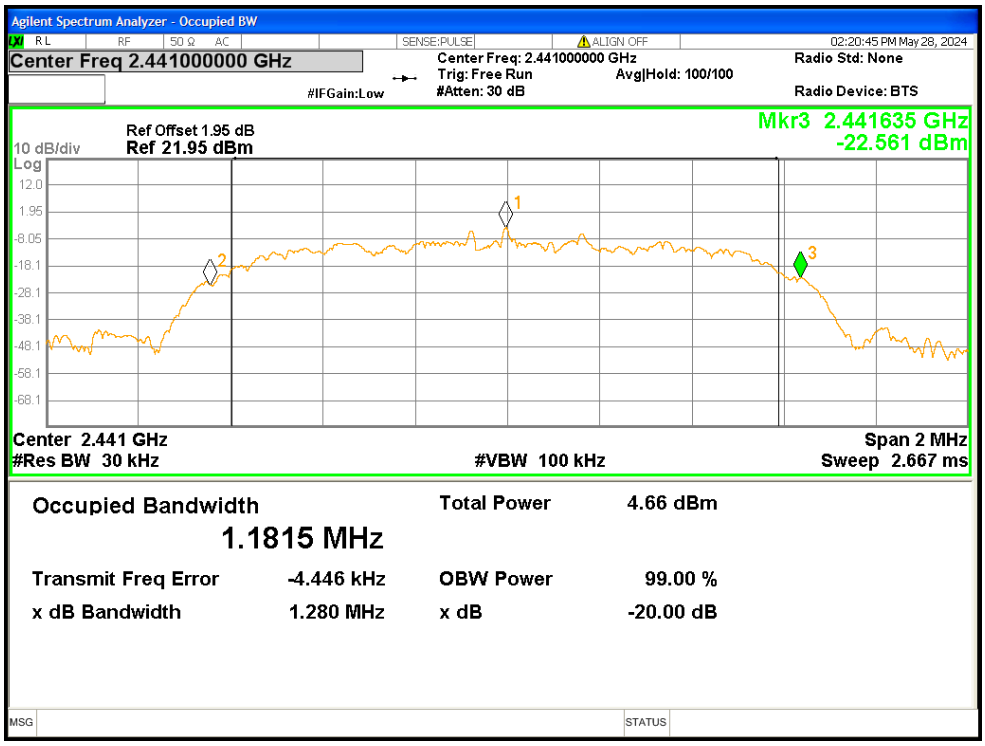
| GFSK |
|---|



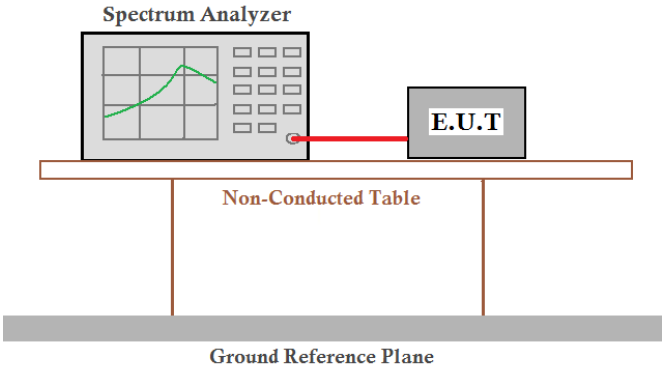

| Pi/4QPSK |
|---|



8DPSK


Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN OFF
02:20:45 PM May 28, 2024
Center Freq 2.441000000 GHz
Center Freq: 2.441000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Ref Offset 1.95 dB
10 dB/div
Ref 21.95 dBm
Log
12.0
1.95
-8.05
-18.1
-28.1
-38.1
-48.1
-58.1
-68.1
Mkr3 2.441635 GHz
-22.561 dBm
Center 2.441 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.667 ms
Occupied Bandwidth
1.1815 MHz
Total Power 4.66 dBm
Transmit Freq Error -4.446 kHz
OBW Power 99.00 %
x dB Bandwidth 1.280 MHz
x dB -20.00 dB
MSG
STATUS

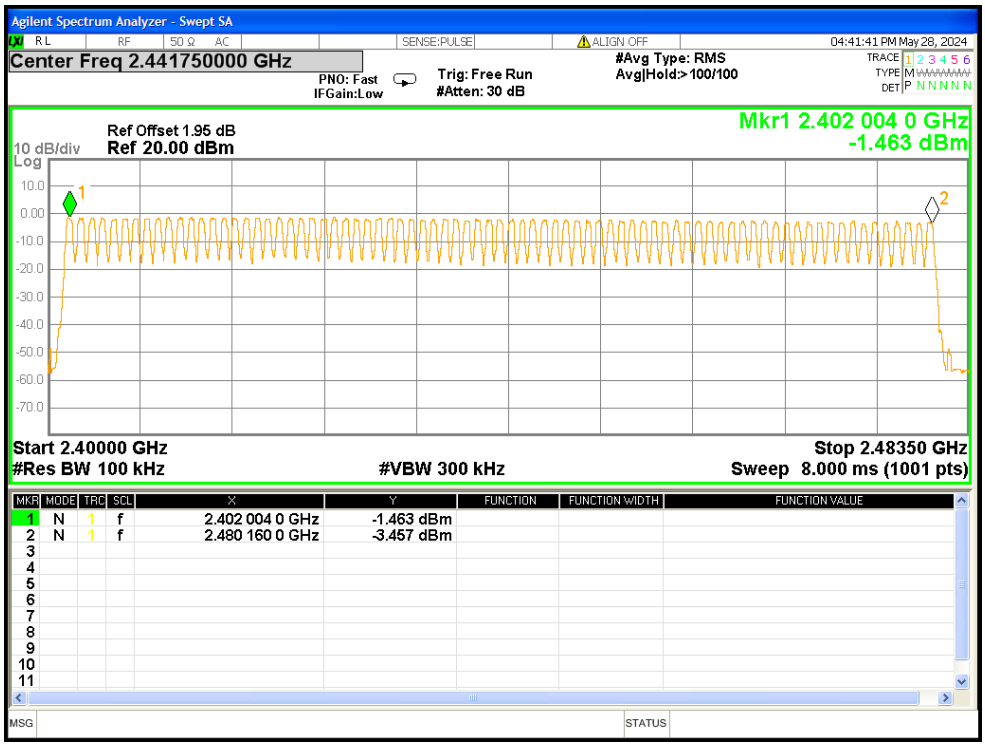
# 8. Hopping Channel Number

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10:2013 |
| Receiver setup: | RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak |
| Limit: | 15 channels |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

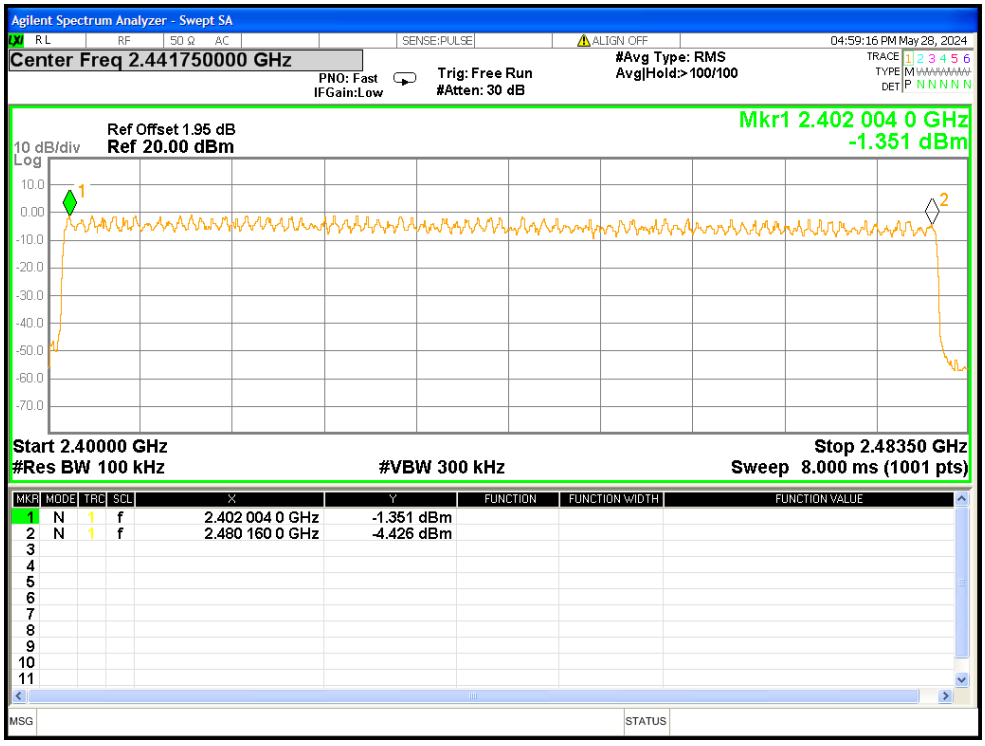
**Measurement Data:**

| Mode | Hopping channel numbers | Limit | Result |
|---|---|---|---|
| GFSK | 79 | 15 | Pass |
| Pi/4QPSK | 79 | 15 | Pass |
| 8DPSK | 79 | 15 | Pass |

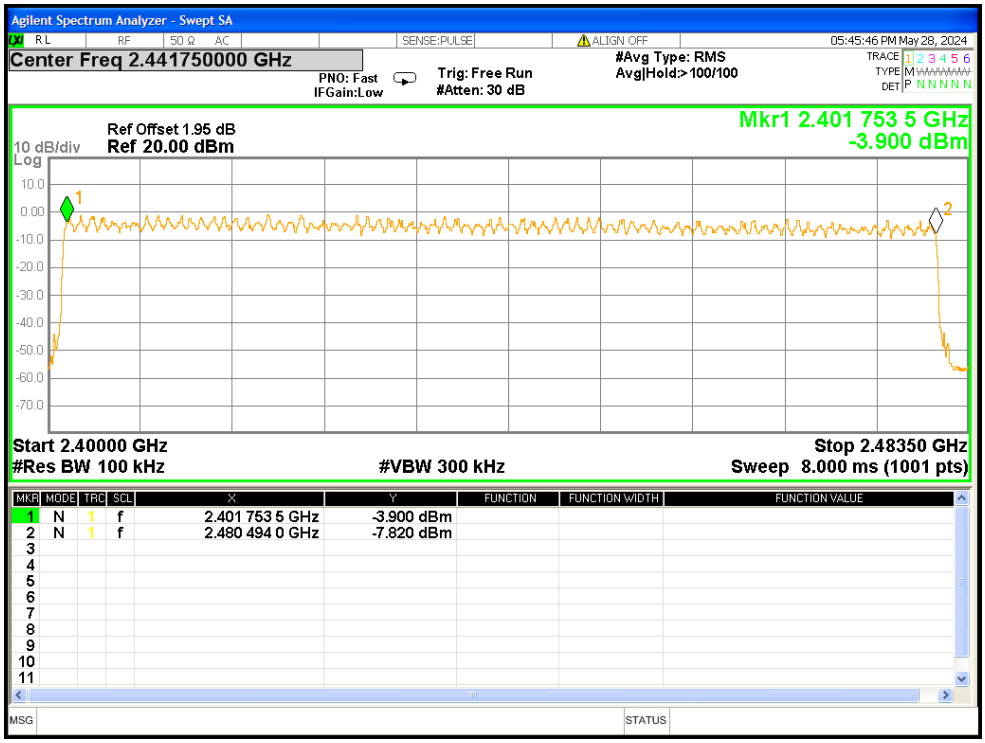
GFSK



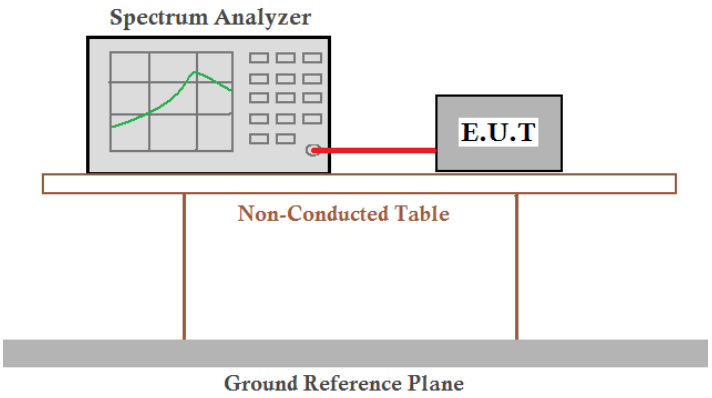

Pi/4QPSK



8DPSK


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold:>100/100
05:45:46 PM May 28, 2024
Ref Offset 1.95 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.401 753 5 GHz
-3.900 dBm
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (1001 pts)
1 N 1 f 2.401 753 5 GHz -3.900 dBm
2 N 1 f 2.480 494 0 GHz -7.820 dBm

## 9. Dwell Time

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10:2013 |
| Receiver setup: | RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak |
| Limit: | 0.4 Second |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

**Measurement Data:**

| Mode | Frequency (MHz) | Burst Type | Pulse Width (ms) | Dwell Time (ms) | Limit (ms) | Verdict |
|---|---|---|---|---|---|---|
| GFSK | 2441 | DH1 | 2.905 | 325.36 | 400 | PASS |
| | | DH3 | 2.906 | 305.13 | | |
| | | DH5 | 2.905 | 313.74 | | |
| π/4-DQPSK | 2441 | DH1 | 2.91 | 323.01 | 400 | PASS |
| | | DH3 | 2.892 | 323.904 | | |
| | | DH5 | 2.91 | 346.29 | | |
| 8DPSK | 2441 | DH1 | 2.91 | 296.82 | 400 | PASS |
| | | DH3 | 2.91 | 273.54 | | |
| | | DH5 | 2.911 | 314.388 | | |

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

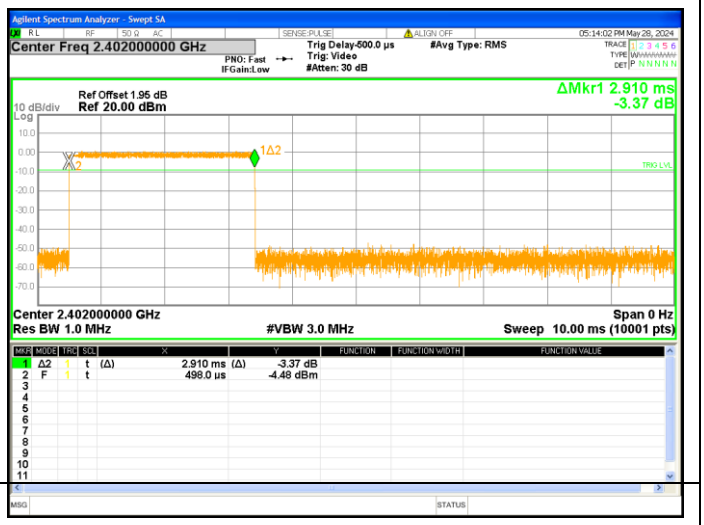
Test channel: 2402MHz/2441MHz/2480MHz as blow

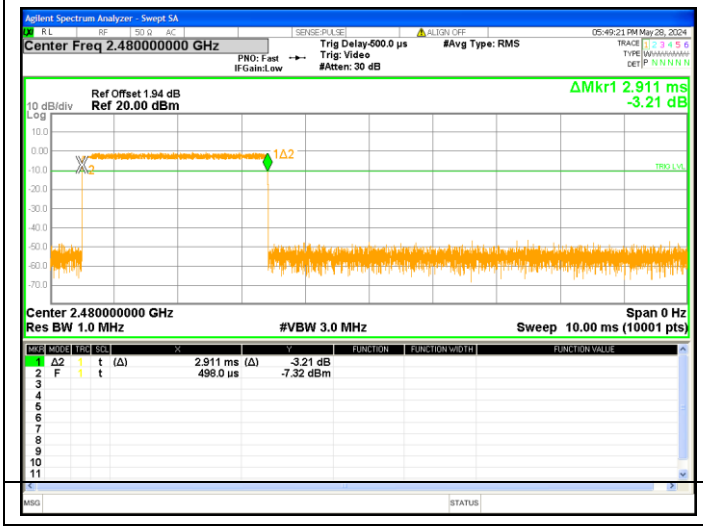
DH1 time slot= Pulse time (ms)*(1600/ (2*79))*31.6

DH3 time slot= Pulse time (ms)*(1600/ (4*79))*31.6

DH5 time slot= Pulse time (ms)*(1600/ (6*79))*31.6

**Test plot as follows:**

| *Dwell time* | |
|---|---|
| GFSK | *π/4-DQPSK* |
|  |  |
|  |  |
|  |  |

| *Dwell time* | |
|---|---|
| *8DPSK* | |
|  | |
| | |
|  | |
| | |
|  | |
| | |

# 10. Pseudorandom Frequency Hopping Sequence

| Test Requirement: | FCC Part15 C Section 15.247 (a)(1) requirement: |
|---|---|

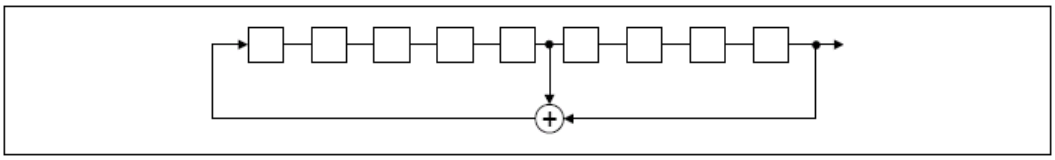
*Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.*

*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 Pseudorandom 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.*

**EUT Pseudorandom Frequency Hopping Sequence**

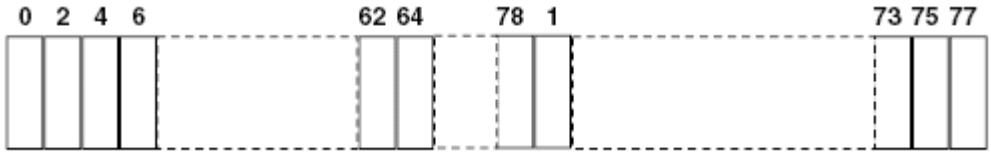
*The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.*

- *Number of shift register stages: 9*
- *Length of pseudo-random sequence: $2^9$ -1 = 511 bits*
- *Longest sequence of zeros: 8 (non-inverted signal)*



*Linear Feedback Shift Register for Generation of the PRBS sequence*

*An example of Pseudorandom Frequency Hopping Sequence as follow:*

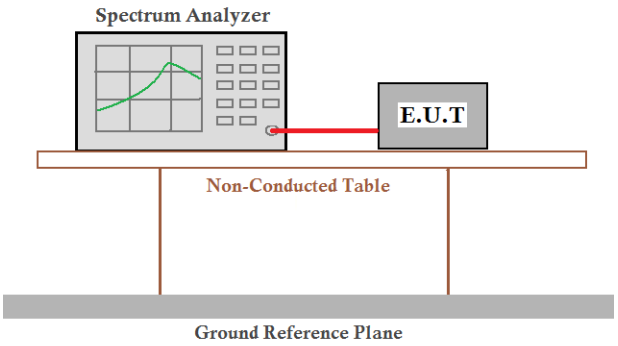



*Each frequency used equally on the average by each transmitter.*

*The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.*

# 11. Band Edge

### Conducted Emission Method

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d) |
| Test Method: | ANSI C63.10:2013 |
| Receiver setup: | RBW=100kHz, VBW=300kHz, Detector=Peak |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

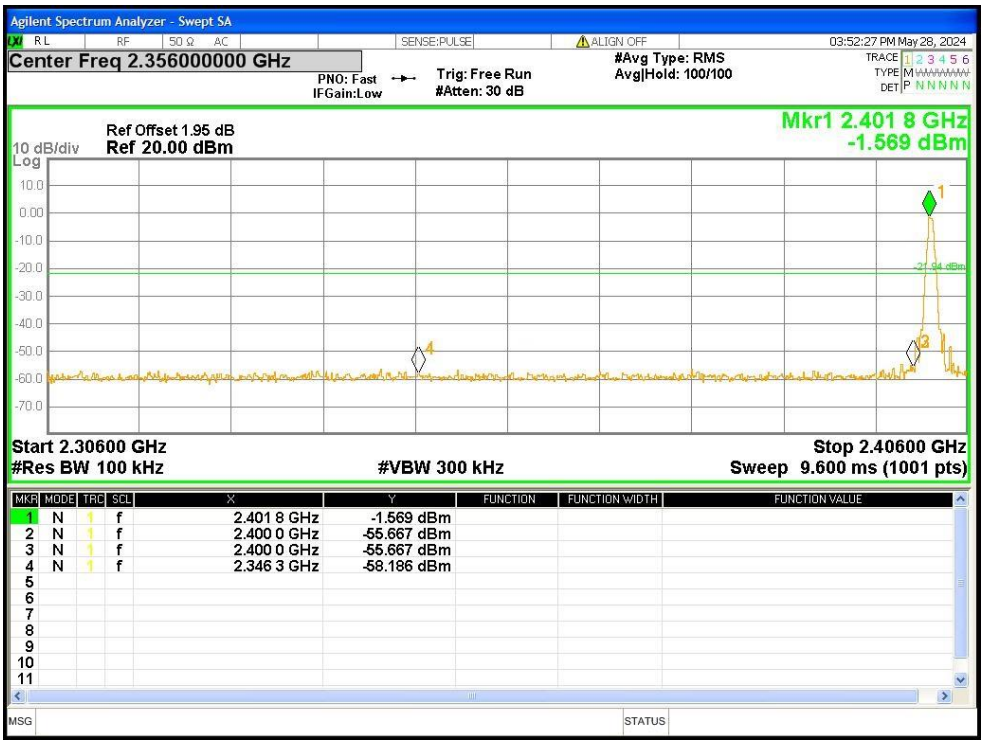
### Marker-Delta Method

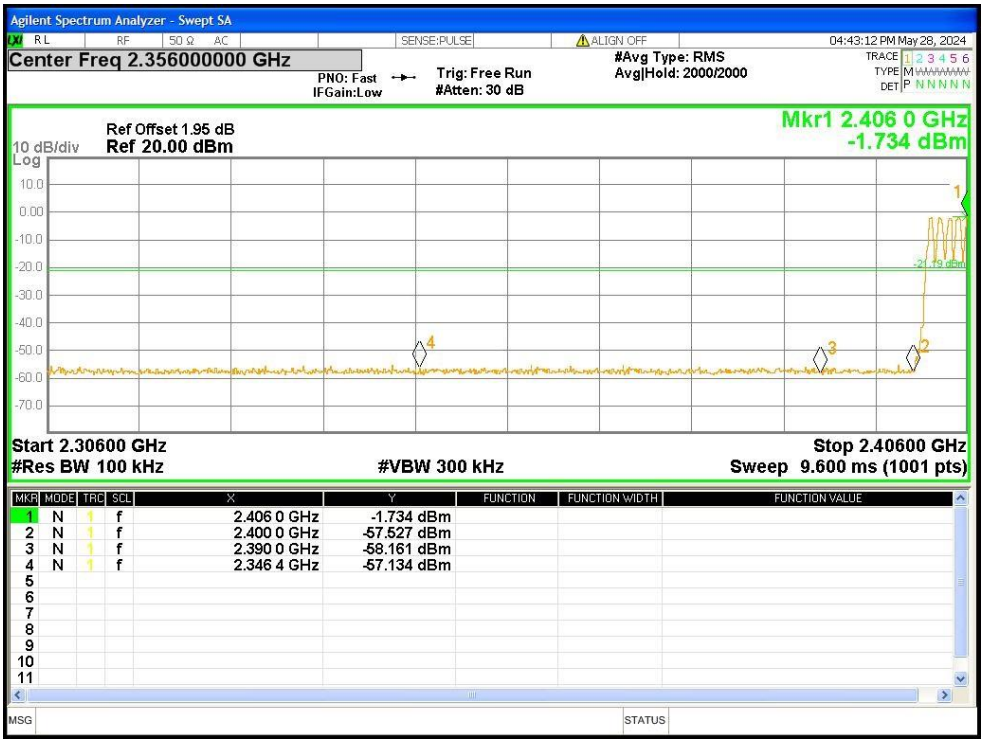
| | | | |
|---|---|---|---|
| Test Requirement: | FCC Part15 C Section 15.209 and 15.205 | | |
| Test Method: | ANSI C63.10:2013 section 6.10.6 | | |
| Test Frequency Range: | All restriction band have been tested. | | |
| Limit: | Frequency | Limit (dBuV/m @3m) | Remark |
| | Above 1GHz | 54.00 | Average Value |
| | | 74.00 | Peak Value |

**Test plot as follows:**

**GFSK Mode:**

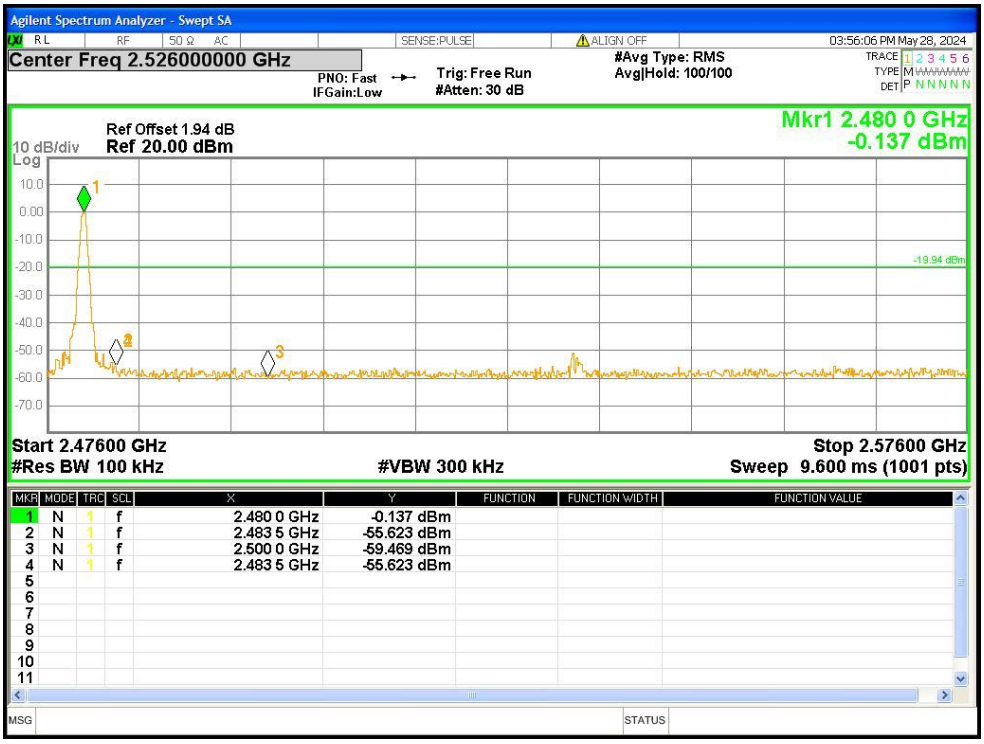
| Test channel:<br>Lowest channel |
|---|



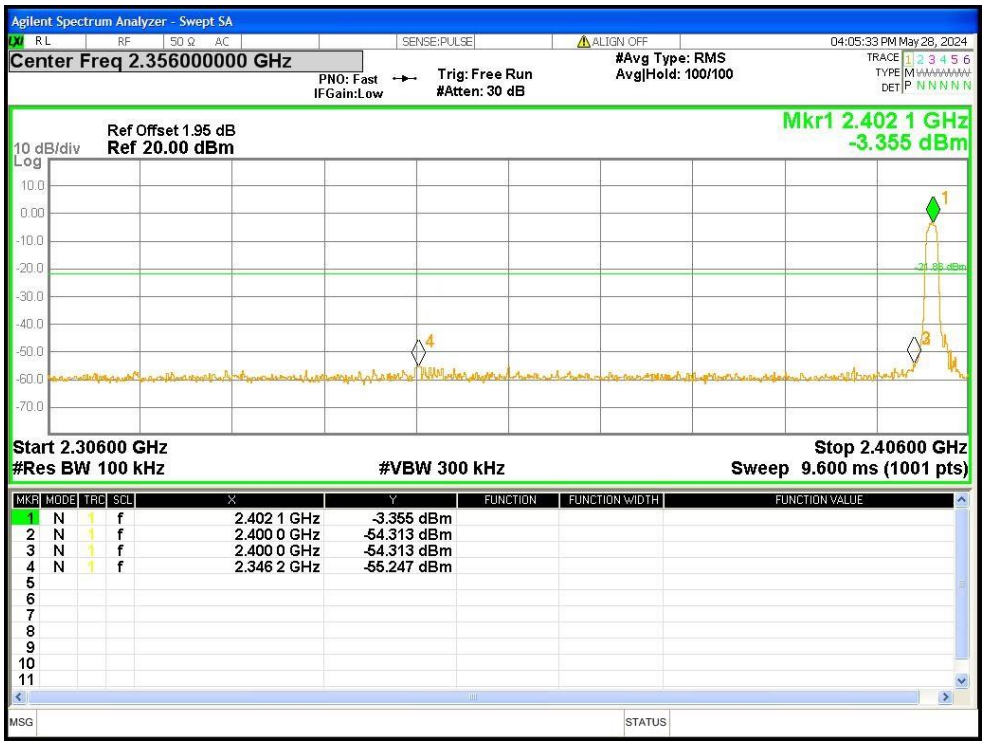
Test channel:

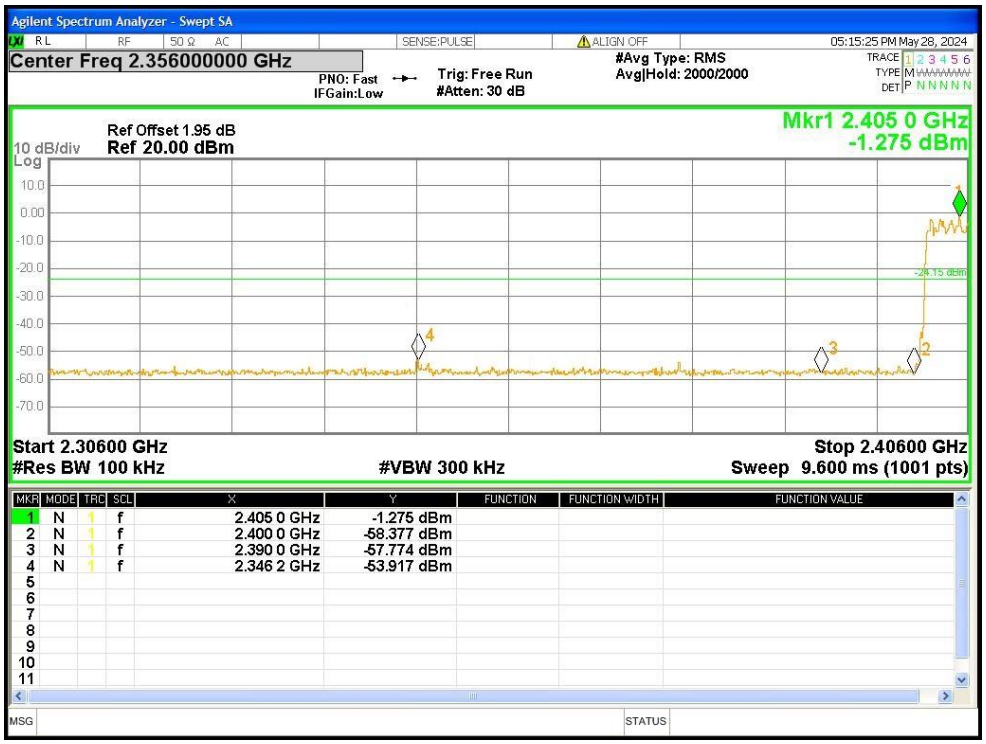
Highest channel



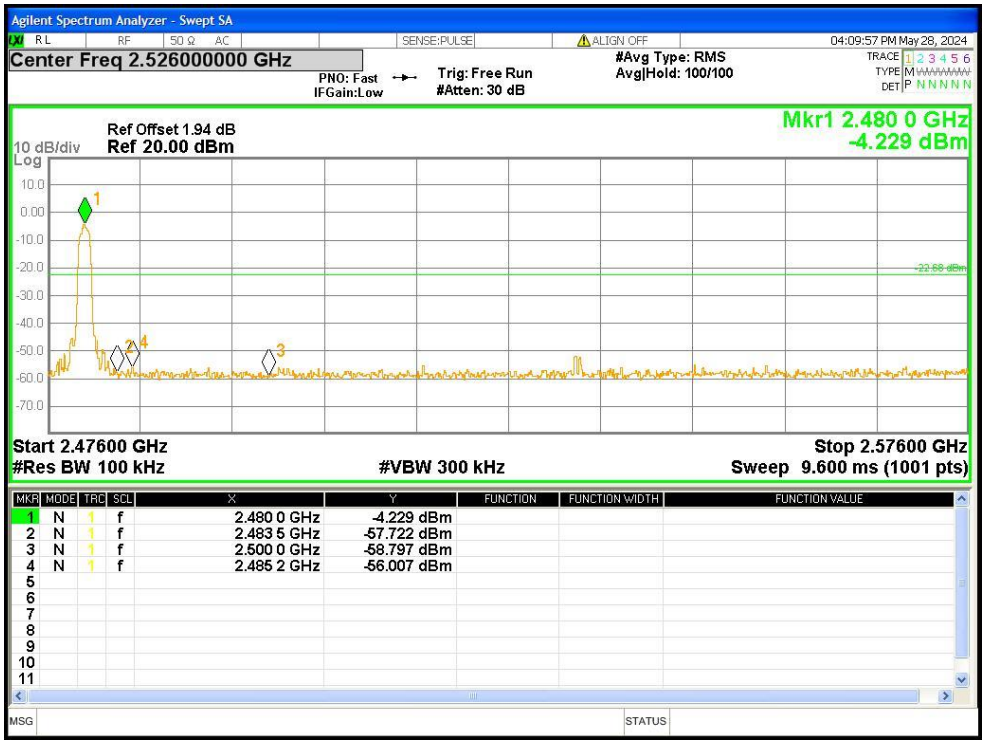

**Pi/4QPSK Mode:**

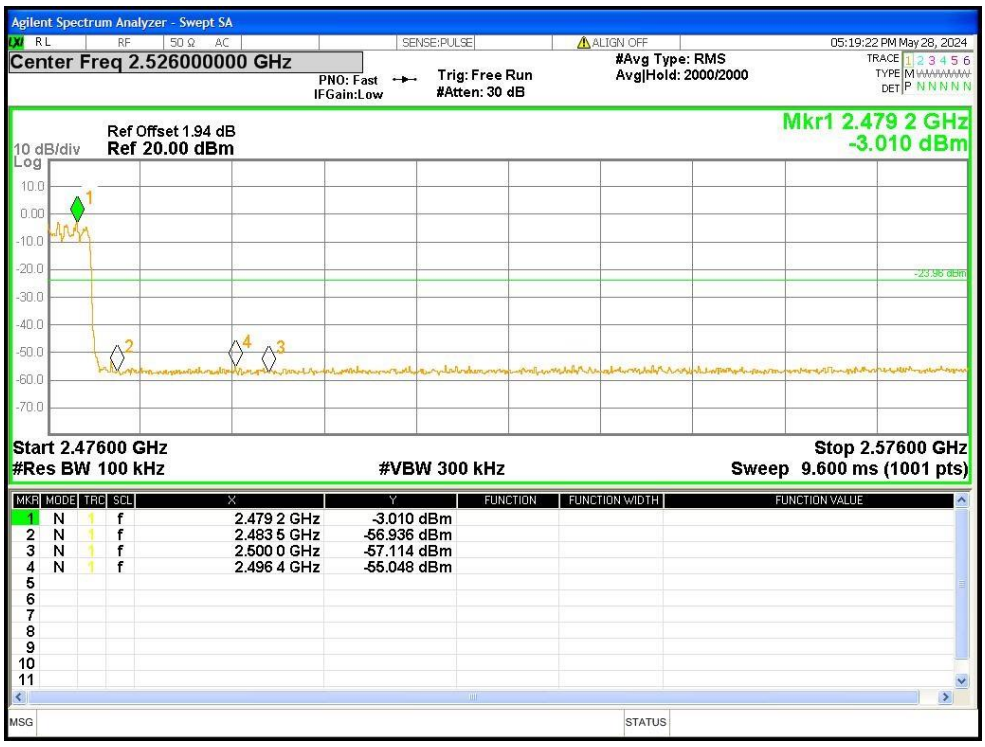
| Test channel:<br>Lowest channel |
|---|



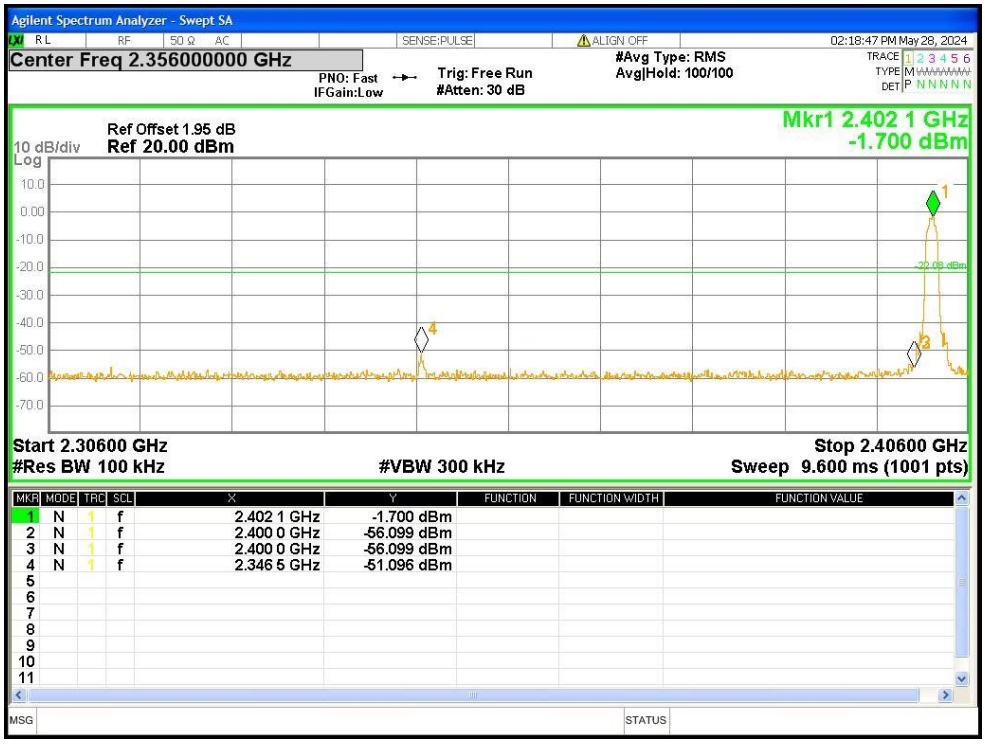
Test channel:
Highest channel



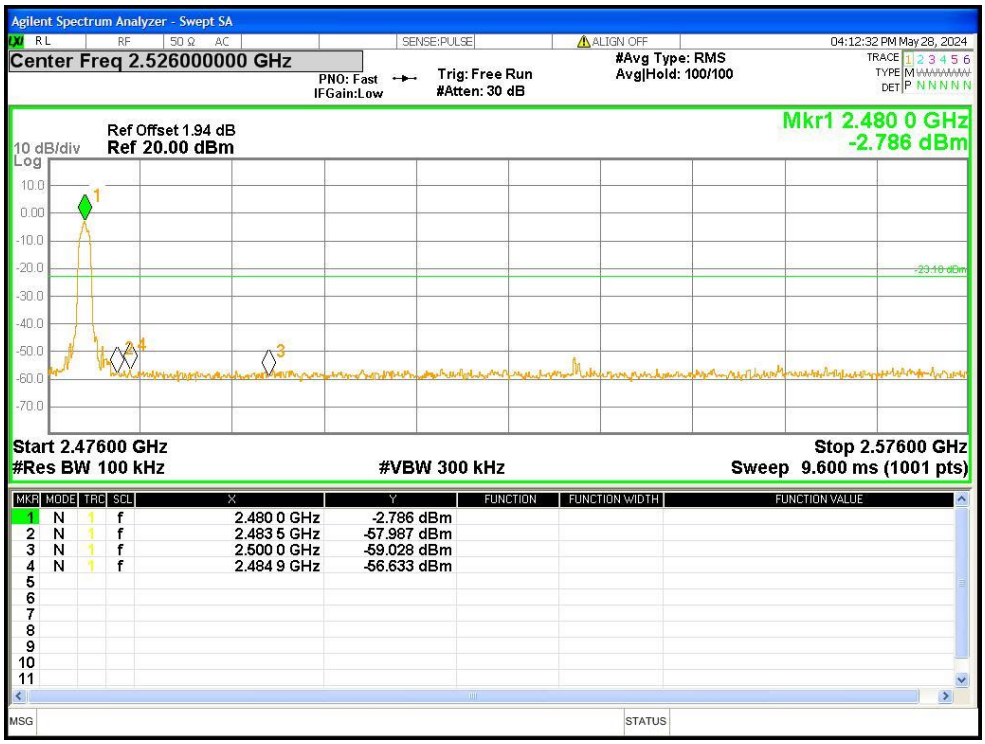



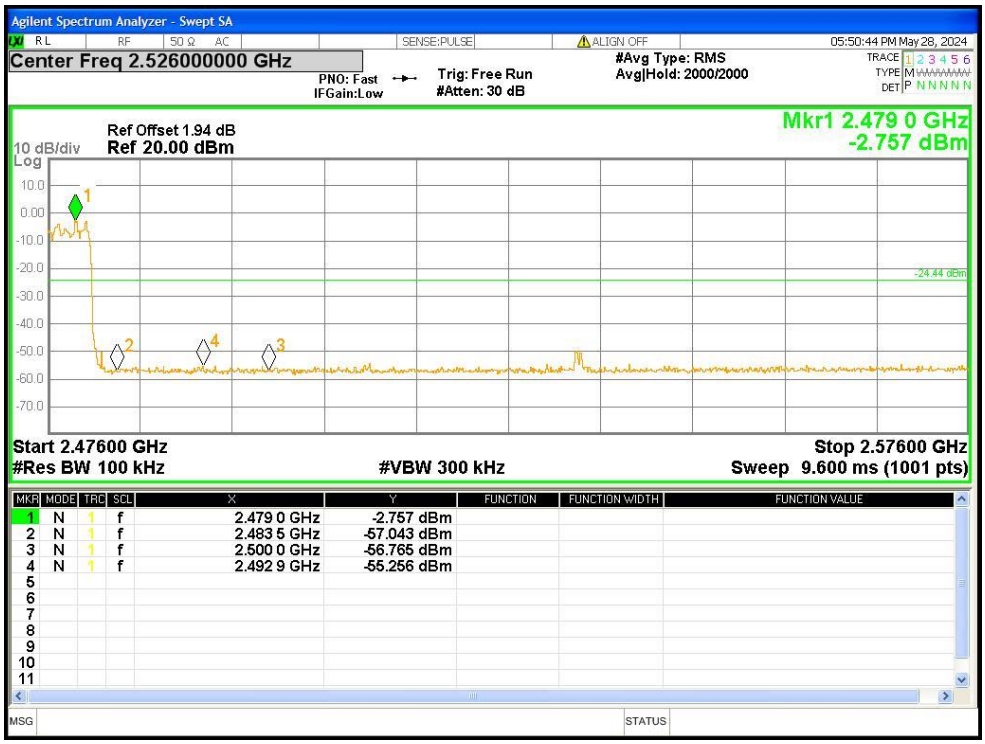
**8DPSK Mode:**

| Test channel:<br>Lowest channel |
|---|




Test channel:
Highest channel

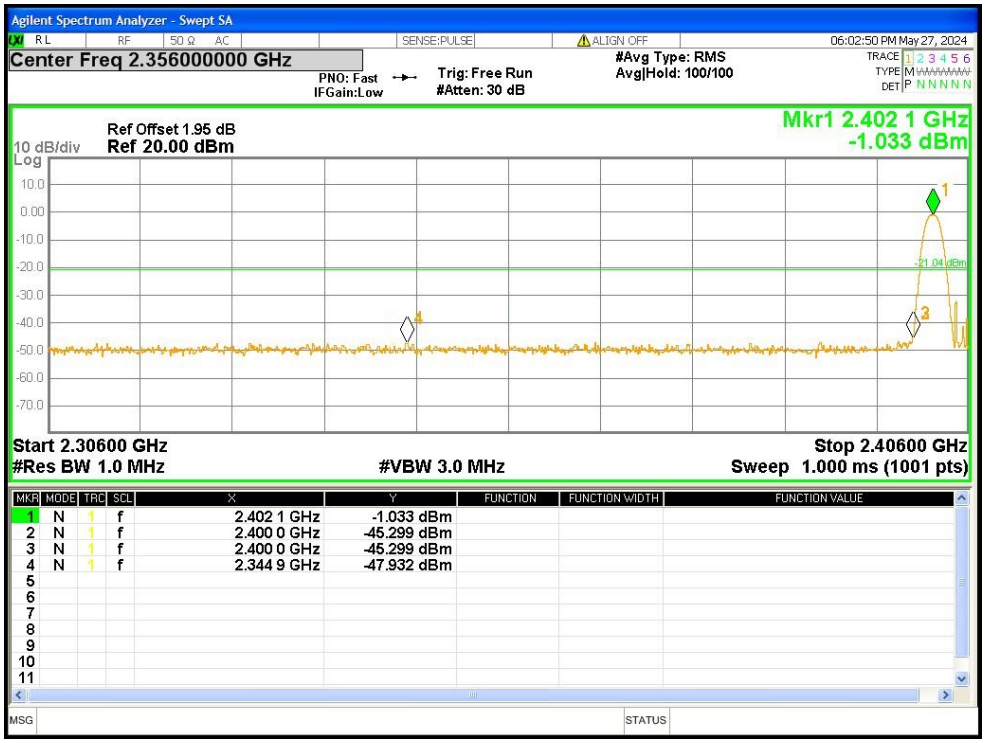


Bandedge (Conducted)

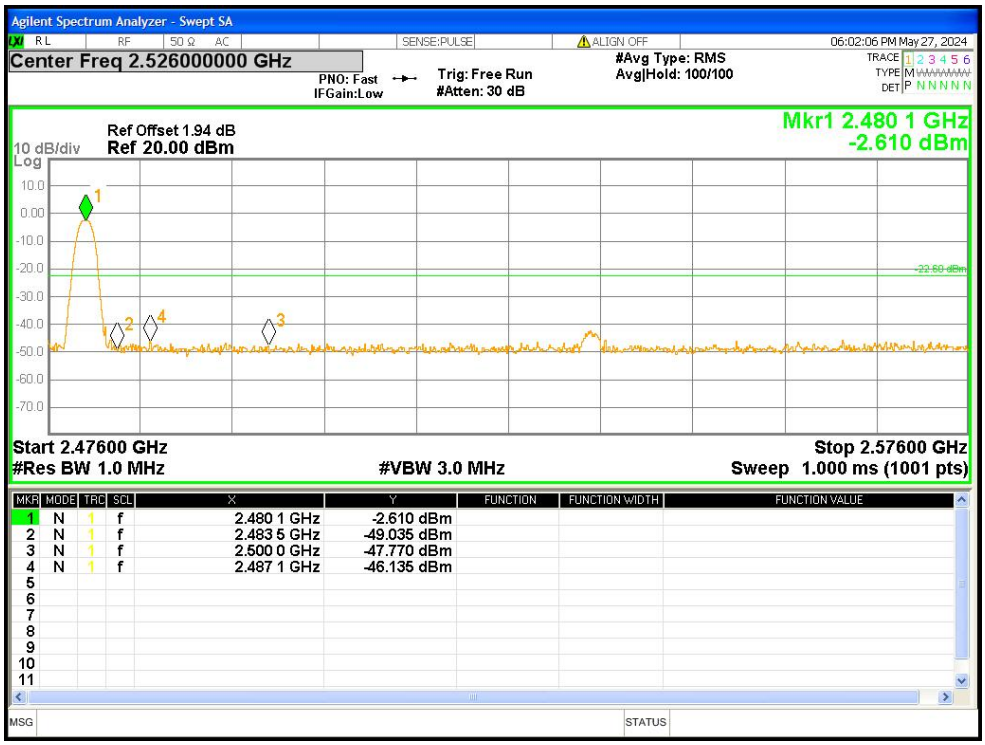
Lowest Channel:

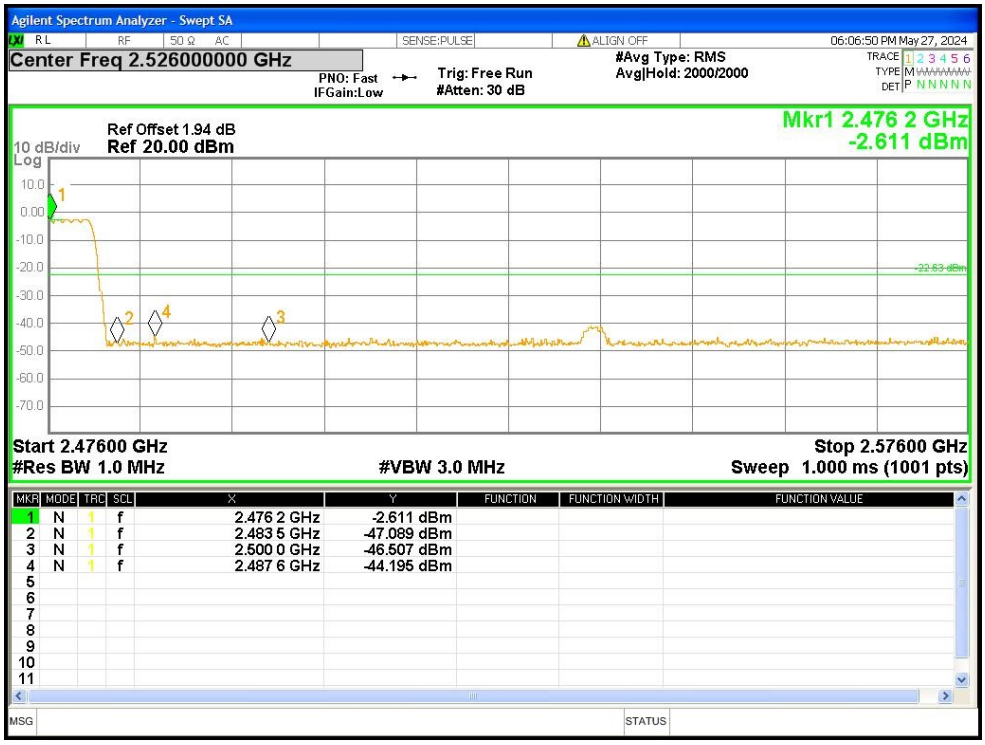
**GFSK Mode**




High Channel:

**GFSK Mode**



| Channel | Mode | Detector | Frequency(MHz) | Level(dBm) | Delta(dB) |
|---|---|---|---|---|---|
| Low | Hop off | Peak | 2402.30 | -1.03 | -- |
| | | | 2400.00 | -45.29 | **44.26** |
| | | | 2344.90 | -47.93 | 46.90 |
| | Hop on | | 2406.00 | -1.07 | -- |
| | | | 2400.00 | -45.94 | 44.87 |
| | | | 2390.00 | -47.57 | 46.50 |
| | | | 2356.80 | -45.63 | 44.56 |
| High | Hop off | | 2480.1 | -2.61 | -- |
| | | | 2483.50 | -49.03 | 46.42 |
| | | | 2487.10 | -46.13 | 43.52 |
| | | | 2500.00 | -47.77 | 45.16 |
| | Hop on | | 2476.20 | -2.61 | -- |
| | | | 2483.50 | -47.08 | 44.47 |
| | | | 2487.60 | -44.19 | **41.58** |
| | | | 2500.00 | -46.50 | 43.89 |

| Test channel: | Lowest |
|---|---|

**Peak value:**

| Frequency (MHz) | Fundamental (dBuV/m) | Delta (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|
| 2400.00 | 89.34 | 44.26 | 45.08 | 74.00 | -28.92 | Vertical |
| 2400.00 | 88.61 | 44.26 | 44.35 | 74.00 | -30.65 | Horizontal |

| Test channel: | Highest |
|---|---|

**Peak value:**

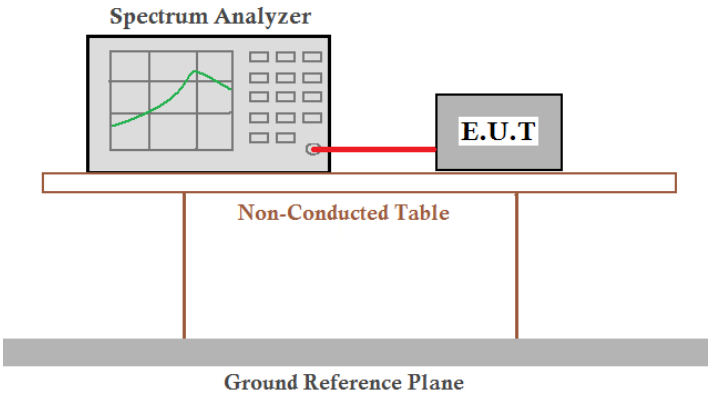
| Frequency (MHz) | Fundamental (dBuV/m) | Delta (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|
| 2483.50 | 87.59 | 41.58 | 46.01 | 74.00 | -27.99 | Vertical |
| 2483.50 | 86.64 | 41.58 | 45.06 | 74.00 | -28.94 | Horizontal |

*Remark:*

1. *Final Level = Filed Strength of Fundamental – Delta*
2. *During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.*
3. *The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.*

# 12. Spurious Emission

## Conducted Emission Method

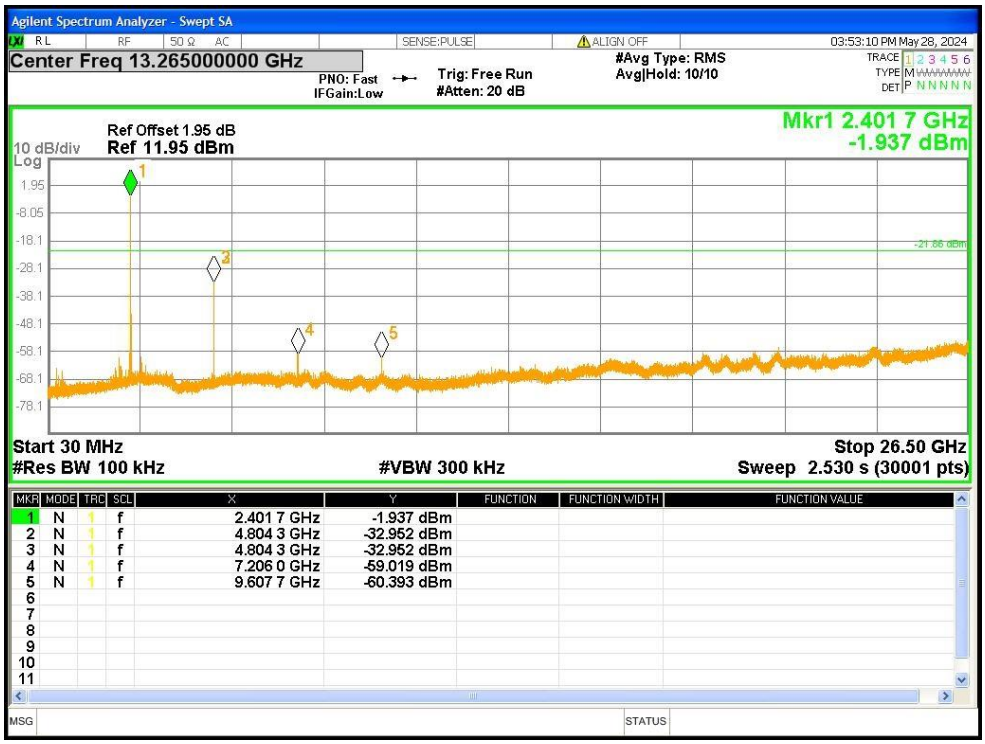
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d) |
| Test Method: | ANSI C63.10:2013 |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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. |
| Test setup: |  |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

Remark:

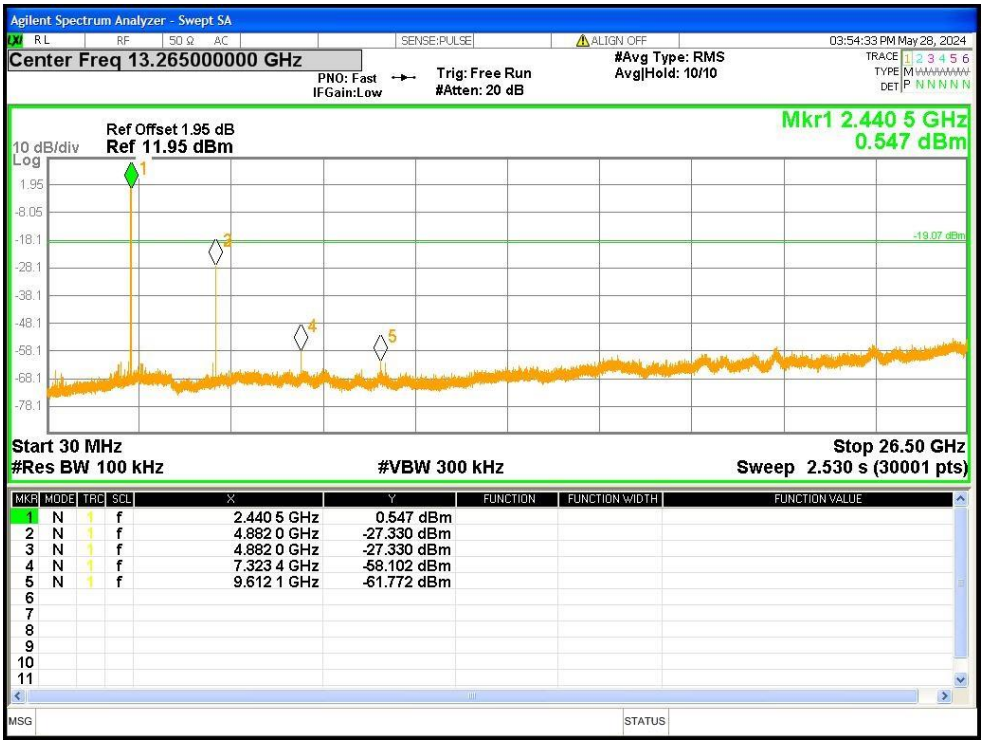
During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.

Not recorded emission from 9 KHz to 30 MHz as emission level at least 20dBc lower than emission limit.

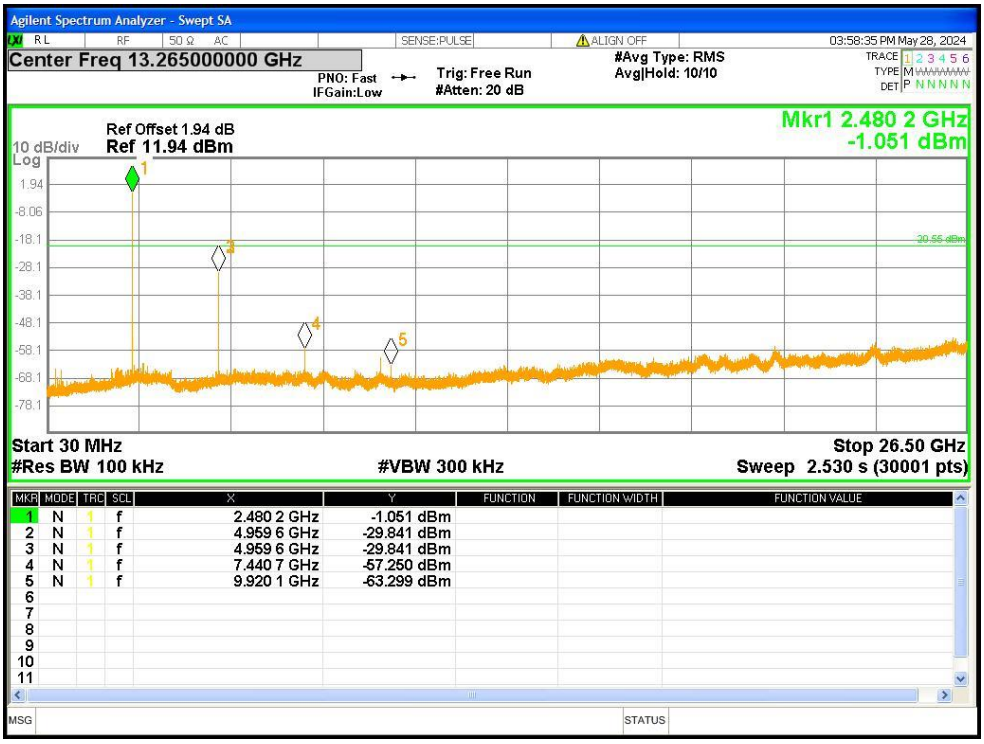
| Test channel: | Lowest |
|---|---|



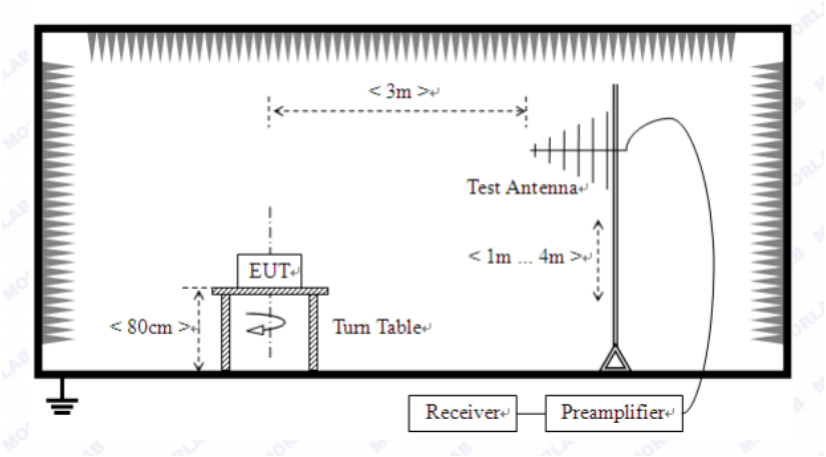
| Test channel: | Middle |
|---|---|



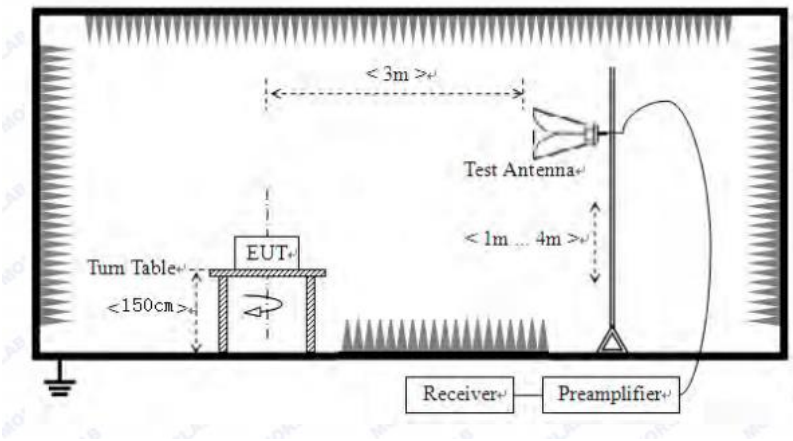
| Test channel: | Highest |
|---|---|



**Radiated Emission Method**

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Average</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz<br> 

<br>Above 1GHz</td></tr>
</table>

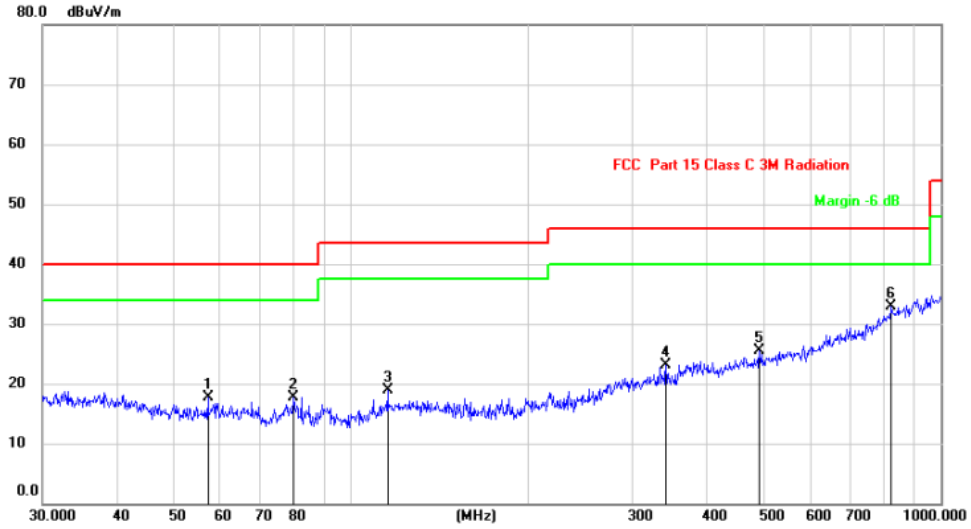
| | |
|---|---|
| |  |
| Test Procedure: | 1. The EUT was placed on the top of a rotating table (0.8 meters below 1G and 1.5 meters above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. |
| Test Instruments: | Refer to section 1.7 for details |
| Test mode: | Refer to section 1.2 for details |
| Test results: | Pass |

*Remark:*

1. *During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

**Measurement data:**

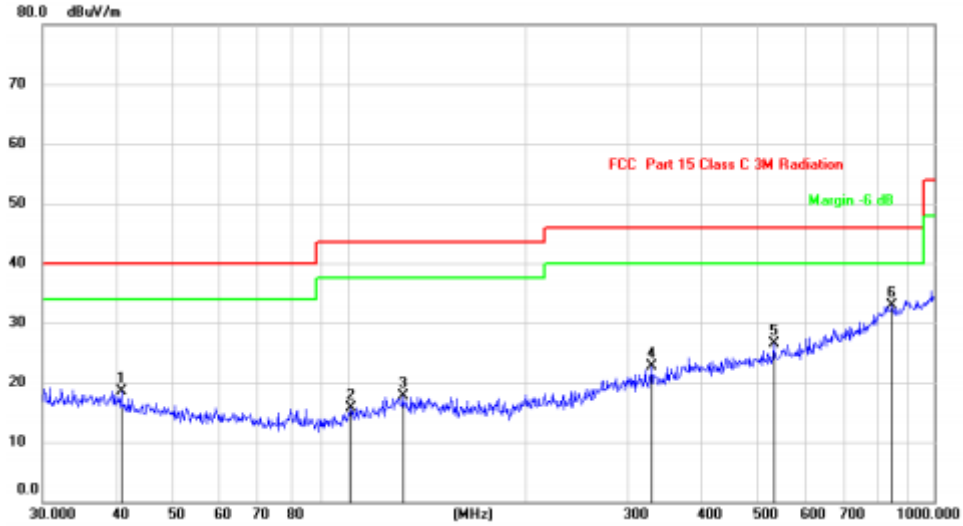
**Vertical:**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dBuV/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 57.1914 | 15.89 | 1.86 | 17.75 | 40.00 | -22.25 | QP |
| 2 | | 79.8002 | 16.39 | 1.27 | 17.66 | 40.00 | -22.34 | QP |
| 3 | | 115.3204 | 15.31 | 3.53 | 18.84 | 43.50 | -24.66 | QP |
| 4 | | 341.9786 | 15.00 | 8.16 | 23.16 | 46.00 | -22.84 | QP |
| 5 | | 492.4685 | 14.60 | 10.81 | 25.41 | 46.00 | -20.59 | QP |
| 6 | * | 824.5968 | 14.89 | 18.00 | 32.89 | 46.00 | -13.11 | QP |

*:Maximum data x:Over limit !:over margin

**Horizontal:**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dBuV/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 40.8445 | 14.15 | 4.31 | 18.46 | 40.00 | -21.54 | QP |
| 2 | | 100.9339 | 13.78 | 1.87 | 15.65 | 43.50 | -27.85 | QP |
| 3 | | 123.6984 | 13.81 | 3.93 | 17.74 | 43.50 | -25.76 | QP |
| 4 | | 329.0389 | 14.66 | 8.02 | 22.68 | 46.00 | -23.32 | QP |
| 5 | | 531.9634 | 15.31 | 11.13 | 26.44 | 46.00 | -19.56 | QP |
| 6 | * | 848.0562 | 14.87 | 18.00 | 32.87 | 46.00 | -13.13 | QP |

*:Maximum data x:Over limit !:over margin

**Above 1GHz**

| Test channel: | Lowest |
|---|---|

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|
| 2402 | 89.34 | - | - | Vertical |
| 4804 | 40.26 | 74.00 | -33.74 | Vertical |
| 7206 | 37.43 | 74.00 | -36.57 | Vertical |
| 9608 | 31.57 | 74.00 | -42.43 | Vertical |
| 2402 | 88.61 | - | - | Horizontal |
| 4804 | 40.18 | 74.00 | -33.82 | Horizontal |
| 7206 | 37.23 | 74.00 | -36.77 | Horizontal |
| 9608 | 31.35 | 74.00 | -42.65 | Horizontal |

**Average value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|
| 2402 | 87.43 | - | - | Vertical |
| 4804 | 37.51 | 54.00 | -16.49 | Vertical |
| 7206 | 35.81 | 54.00 | -18.19 | Vertical |
| 9608 | 30.51 | 54.00 | -23.49 | Vertical |
| 2402 | 86.73 | - | - | Horizontal |
| 4804 | 37.16 | 54.00 | -16.84 | Horizontal |
| 7206 | 35.42 | 54.00 | -18.58 | Horizontal |
| 9608 | 30.38 | 54.00 | -23.62 | Horizontal |

*Remark:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.*
4. *In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.*

| Test channel: | Middle |
|---|---|

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|
| 2442 | 88.43 | - | - | Vertical |
| 4882 | 39.41 | 74.00 | -34.59 | Vertical |
| 7323 | 37.94 | 74.00 | -36.06 | Vertical |
| 9764 | 31.64 | 74.00 | -42.36 | Vertical |
| 2442 | 86.76 | - | - | Horizontal |
| 4882 | 40.53 | 74.00 | -33.47 | Horizontal |
| 7323 | 37.59 | 74.00 | -36.41 | Horizontal |
| 9764 | 31.42 | 74.00 | -42.58 | Horizontal |

**Average value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|
| 2442 | 86.39 | - | - | Vertical |
| 4882 | 37.54 | 54.00 | -16.46 | Vertical |
| 7323 | 35.80 | 54.00 | -18.20 | Vertical |
| 9764 | 30.26 | 54.00 | -23.74 | Vertical |
| 2442 | 85.69 | - | - | Horizontal |
| 4882 | 37.14 | 54.00 | -16.86 | Horizontal |
| 7323 | 35.43 | 54.00 | -18.57 | Horizontal |
| 9764 | 30.57 | 54.00 | -23.43 | Horizontal |

*Remark:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.*
4. *In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.*

| Test channel: | Highest |
|---|---|

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|
| 2480 | 87.59 | - | - | Vertical |
| 4960 | 39.81 | 74.00 | -34.19 | Vertical |
| 7440 | 37.62 | 74.00 | -36.38 | Vertical |
| 9920 | 31.73 | 74.00 | -42.27 | Vertical |
| 2480 | 86.64 | - | - | Horizontal |
| 4960 | 40.51 | 74.00 | -33.49 | Horizontal |
| 7440 | 37.27 | 74.00 | -36.73 | Horizontal |
| 9920 | 31.43 | 74.00 | -42.57 | Horizontal |

**Average value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|
| 2480 | 85.43 | - | - | Vertical |
| 4960 | 37.73 | 54.00 | -16.27 | Vertical |
| 7440 | 35.41 | 54.00 | -18.59 | Vertical |
| 9920 | 30.27 | 54.00 | -23.73 | Vertical |
| 2480 | 85.75 | - | - | Horizontal |
| 4960 | 37.16 | 54.00 | -16.84 | Horizontal |
| 7440 | 35.41 | 54.00 | -18.59 | Horizontal |
| 9920 | 30.28 | 54.00 | -23.72 | Horizontal |

*Remark:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission from 9 kHz to 30MHz was pre tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.*
4. *In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.*

------End------