# TEST REPORT

| | | |
|---|---|---|
| **APPLICANT** | : | Shenzhen Chainway Information Technology Co., Ltd |
| **PRODUCT NAME** | : | Mobile Data Terminal |
| **MODEL NAME** | : | MC62 |
| **BRAND NAME** | : | CHAINWAY |
| **FCC ID** | : | 2AC6AMC62 |
| **STANDARD(S)** | : | 47 CFR Part 15 Subpart C |
| **RECEIPT DATE** | : | 2023-05-10 |
| **TEST DATE** | : | 2023-05-15 to 2023-08-09 |
| **ISSUE DATE** | : | 2023-08-28 |

Edited by: Peng Mi (Rapporteur)

Approved by: Shen Junsheng (Supervisor)

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MORLAB
Shenzhen Morlab Communications Technology Co., Ltd.
FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.cn E-mail: service@morlab.cn

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| Change History | | |
|---|---|---|
| **Version** | **Date** | **Reason for change** |
| 1.0 | 2023-08-28 | First edition |
| | | |

# 1. Summary of Test Result

| No. | Section | Description | Test Date | Test Engineer | Result | Method Determination /Remark |
|---|---|---|---|---|---|---|
| 1 | 15.203 | Antenna Requirement | N/A | N/A | PASS | No deviation |
| 2 | 15.247(a) 15.247(h) | Hopping Mechanism | N/A | N/A | PASS | No deviation |
| 3 | 15.247(a) | Number of Hopping Frequency | May 18, 2023 | He Yuyang | PASS | No deviation |
| 4 | ANSI C63.10 | Duty Cycle | May 18, 2023 | He Yuyang | PASS | No deviation |
| 5 | 15.247(b) | Maximum Peak Conducted Output Power | May 18, 2023 | He Yuyang | PASS | No deviation |
| 6 | 15.247(b) | Maximum Average Conducted Output Power | May 18, 2023 | He Yuyang | PASS | No deviation |
| 7 | 15.247(a) | 20dB Bandwidth | May 18, 2023 | He Yuyang | PASS | No deviation |
| 8 | 15.247(a) | Carrier Frequency Separation | May 18, 2023 | He Yuyang | PASS | No deviation |
| 9 | 15.247(a) | Time of Occupancy (Dwell time) | May 18, 2023 | He Yuyang | PASS | No deviation |
| 10 | 15.247(d) | Conducted Spurious Emission | May 18, 2023 | He Yuyang | PASS | No deviation |
| 11 | 15.207 | Conducted Emission | Aug. 09, 2023 | Fan Zehang | PASS | No deviation |
| 12 | 15.247(d) | Restricted Frequency Bands | Jun. 15, 2023 | Gao Jianrou | PASS | No deviation |
| 13 | 15.209, | Radiated | Jun. 15, 2023 | Gao Jianrou | PASS | No deviation |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 15.247(d) | Emission | | | | |

**Note 1:** The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013, KDB558074 D01 v05r02 and DA 00-075.

**Note 2:** Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

**Note 3:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

## 1.1. Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

• 47 CFR Part 15 Subpart C Radio Frequency Devices

# 1.2. Test Equipment List

### 1.2.1 Conducted Test Equipments

| Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| EXA Signal Analzyer | MY53470836 | N9010A | Agilent | 2023.02.27 | 2024.02.26 |
| RF Cable (30MHz-26GHz) | CB01 | RF01 | Morlab | N/A | N/A |
| Coaxial Cable | CB02 | RF02 | Morlab | N/A | N/A |
| SMA Connector | CN01 | RF03 | HUBER-SUHNER | N/A | N/A |

### 1.2.2 Conducted Emission Test Equipments

| Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| Receiver | MY56400093 | N9038A | KEYSIGHT | 2023.02.09 | 2024.02.08 |
| LISN | 8127449 | NSLK 8127 | Schwarzbeck | 2023.02.21 | 2024.02.20 |
| Pulse Limiter (10dB) | VTSD 9561 F-B #206 | VTSD 9561-F | Schwarzbeck | 2022.07.06 | 2023.07.05 |
| | | | | 2023.06.27 | 2024.06.26 |
| RF Coaxial Cable (DC-100MHz) | BNC | MRE04 | Qualwave | N/A | N/A |

### 1.2.3 List of Software Used

| Description | Manufacturer | Software Version |
|---|---|---|
| Test System | MaiWei | 2.0.0.0 |
| Morlab EMCR V1.2 | Morlab | V1.0 |
| TS+ -[JS32-CE] | Tonscend | V2.5.0.0 |

### 1.2.4 Radiated Test Equipments

| Equipment Name | Serial No. | Type | Manufacturer | Cal. Date | Due Date |
|---|---|---|---|---|---|
| Receiver | MY54130016 | N9038A | Agilent | 2022.07.06 | 2023.07.05 |
| | | | | 2023.06.21 | 2024.06.20 |
| Test Antenna - Bi-Log | 9163-519 | VULB 9163 | Schwarzbeck | 2022.05.25 | 2025.05.24 |
| Test Antenna - Loop | 1519-022 | FMZB1519 | Schwarzbeck | 2022.02.11 | 2025.02.10 |
| Test Antenna – Horn | 01774 | BBHA 9120D | Schwarzbeck | 2022.07.13 | 2025.07.12 |
| Test Antenna – Horn | BBHA9170 #773 | BBHA9170 | Schwarzbeck | 2022.07.14 | 2025.07.13 |
| Preamplifier (10MHz-6GHz) | 46732 | S10M100L3802 | LUCIX CORP. | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| Preamplifier (2GHz-18GHz) | 61171/61172 | S020180L3203 | LUCIX CORP. | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| Preamplifier (18GHz-40GHz) | DS77209 | DCLNA0118-40C-S | Decentest | 2022.07.23 | 2023.07.22 |
| | | | | 2023.07.04 | 2024.07.03 |
| RF Coaxial Cable (DC-18GHz) | MRE001 | PE330 | Pasternack | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| RF Coaxial Cable (DC-18GHz) | MRE002 | CLU18 | Pasternack | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| RF Coaxial Cable (DC-18GHz) | MRE003 | CLU18 | Pasternack | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| RF Coaxial Cable (DC-40GHz) | 22290045 | QA360-40-KK-0.5 | Qualwave | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| RF Coaxial Cable (DC-40GHz) | 22290046 | QA360-40-KKF-2 | Qualwave | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| RF Coaxial Cable (DC-18GHz) | 22120181 | QA500-18-NN-5 | Qualwave | 2022.07.08 | 2023.07.07 |
| | | | | 2023.06.27 | 2024.06.26 |
| Notch Filter | N/A | WRCG-2400-2483.5-60SS | Wainwright | N/A | N/A |
| Anechoic Chamber | N/A | 9m*6m*6m | CRT | 2022.05.10 | 2025.05.09 |

## 1.3. Measurement Uncertainty

| Test Items | Uncertainty | Remark |
|---|---|---|
| Number of Hopping Frequency | ±5% | Confidence levels of 95% |
| Peak Output Power | ±2.22dB | Confidence levels of 95% |
| Bandwidth | ±5% | Confidence levels of 95% |
| Carrier Frequency Separation | ±5% | Confidence levels of 95% |
| Time of Occupancy (Dwell time) | ±5% | Confidence levels of 95% |
| Conducted Spurious Emission | ±2.77dB | Confidence levels of 95% |
| Restricted Frequency Bands | ±5% | Confidence levels of 95% |
| Radiated Emission | ±2.95dB | Confidence levels of 95% |
| Conducted Emission | ±2.44dB | Confidence levels of 95% |

## 1.4. Testing Laboratory

| | |
|---|---|
| **Laboratory Name** | Shenzhen Morlab Communications Technology Co., Ltd. |
| **Laboratory Address** | FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China |
| **Telephone** | +86 755 36698555 |
| **Facsimile** | +86 755 36698525 |
| **FCC Designation Number** | CN1192 |
| **FCC Test Firm Registration Number** | 226174 |

# 2. General Description

## 2.1. Information of Applicant and Manufacturer

| | |
|---|---|
| **Applicant** | Shenzhen Chainway Information Technology Co., Ltd |
| **Applicant Address** | 9F Building 2, Daqian Industrial Park, District 67, XingDong Community, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China |
| **Manufacturer** | Shenzhen Chainway Information Technology Co., Ltd |
| **Manufacturer Address** | 9F Building 2, Daqian Industrial Park, District 67, XingDong Community, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China |

## 2.2. Information of EUT

| | | |
|---|---|---|
| **Product Name:** | Mobile Data Terminal | |
| **Sample No.:** | 10# | |
| **Hardware Version:** | MC62_hardware_version P | |
| **Software Version:** | MC62_software_version P | |
| **Equipment Type:** | Bluetooth classic | |
| **Bluetooth Version:** | 5.0 | |
| **Modulation Type:** | FHSS (GFSK(1Mbps), π/4-DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps)) | |
| **Operating Frequency Range:** | 2402MHz-2480MHz | |
| **Antenna Type:** | PIFA Antenna | |
| **Antenna Gain:** | 2.00dBi | |
| **Accessory Information:** | Battery | |
| | Brand Name: | UTL |
| | Model No.: | MC62 |
| | Serial No.: | N/A |
| | Capacity: | 5000mAh |
| | Rated Voltage: | 3.87V |
| | Charge Limit: | 4.45V |
| | Manufacturer: | SHENZHEN UTILITY ENERGY CO., LTD. |

| | | |
|---|---|---|
| **Accessory Information:** | AC Adapter | |
| | Brand Name: | Chainway |
| | Model No.: | HJ-0502000W2-US |
| | Serial No.: | N/A |
| | Rated Output: | 5.0V⎓2.0A |
| | Rated Input: | 100-240V~50/60Hz, 0.3A |
| | Manufacturer: | Shenzhen Huajin Electronics Co.,Ltd |
| | USB cable | |
| | Model No.: | 1.8.17.095 |
| | Manufacturer: | King Power Electronics Co., Ltd. |

**Note 1:** We use the dedicated software to control the EUT continuous transmission.

**Note 2:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

## 2.3. Channel List of EUT

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| **0** | **2402** | 20 | 2422 | 40 | 2442 | 60 | 2462 |
| 1 | 2403 | 21 | 2423 | 41 | 2443 | 61 | 2463 |
| 2 | 2404 | 22 | 2424 | 42 | 2444 | 62 | 2464 |
| 3 | 2405 | 23 | 2425 | 43 | 2445 | 63 | 2465 |
| 4 | 2406 | 24 | 2426 | 44 | 2446 | 64 | 2466 |
| 5 | 2407 | 25 | 2427 | 45 | 2447 | 65 | 2467 |
| 6 | 2408 | 26 | 2428 | 46 | 2448 | 66 | 2468 |
| 7 | 2409 | 27 | 2429 | 47 | 2449 | 67 | 2469 |
| 8 | 2410 | 28 | 2430 | 48 | 2450 | 68 | 2470 |
| 9 | 2411 | 29 | 2431 | 49 | 2451 | 69 | 2471 |
| 10 | 2412 | 30 | 2432 | 50 | 2452 | 70 | 2472 |
| 11 | 2413 | 31 | 2433 | 51 | 2453 | 71 | 2473 |
| 12 | 2414 | 32 | 2434 | 52 | 2454 | 72 | 2474 |
| 13 | 2415 | 33 | 2435 | 53 | 2455 | 73 | 2475 |
| 14 | 2416 | 34 | 2436 | 54 | 2456 | 74 | 2476 |
| 15 | 2417 | 35 | 2437 | 55 | 2457 | 75 | 2477 |
| 16 | 2418 | 36 | 2438 | 56 | 2458 | 76 | 2478 |
| 17 | 2419 | 37 | 2439 | 57 | 2459 | 77 | 2479 |
| 18 | 2420 | 38 | 2440 | 58 | 2460 | **78** | **2480** |
| 19 | 2421 | **39** | **2441** | 59 | 2461 | | |

**Note 1:** The black bold channels were selected for test.

## 2.4. Test Configuration of EUT

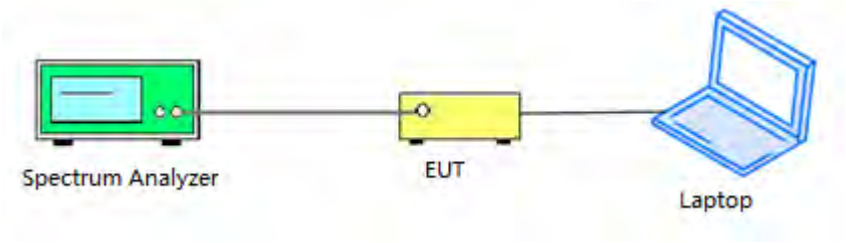
Test mode is used to control the EUT under the maximum power level during test.

## 2.5. Test Conditions

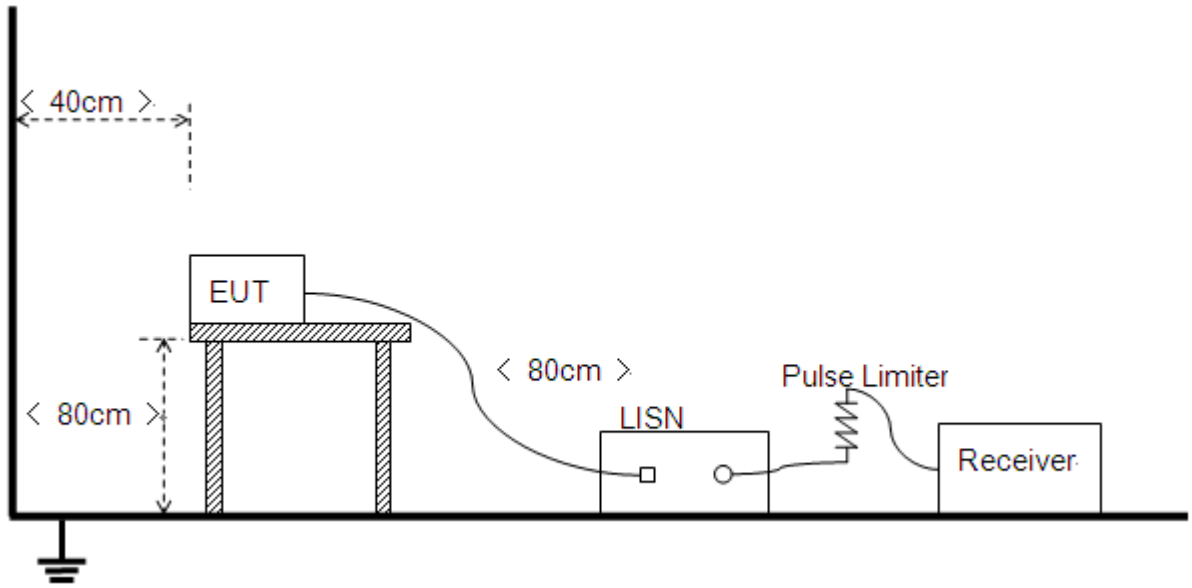
| | |
|---|---|
| **Temperature (°C)** | 15-35 |
| **Relative Humidity (%)** | 30-60 |
| **Atmospheric Pressure (kPa)** | 86-106 |

## 2.6. Test Setup Layout Diagram

### 2.6.1.Conducted Measurement

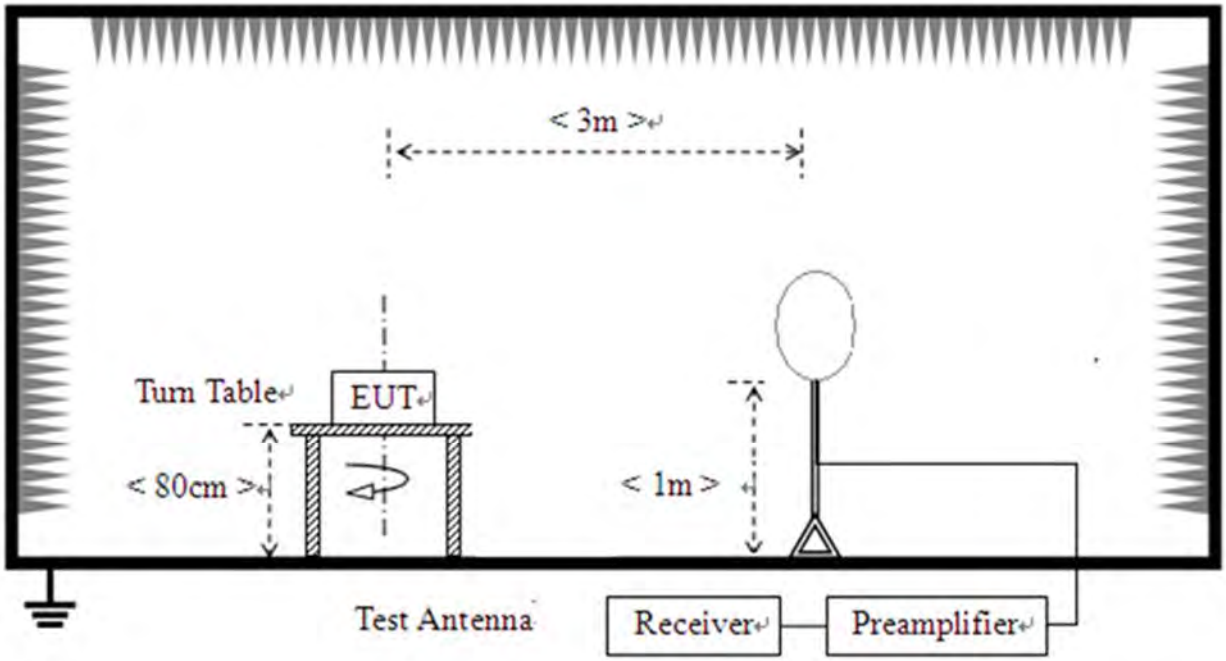



### 2.6.2.Conducted Emission Measurement

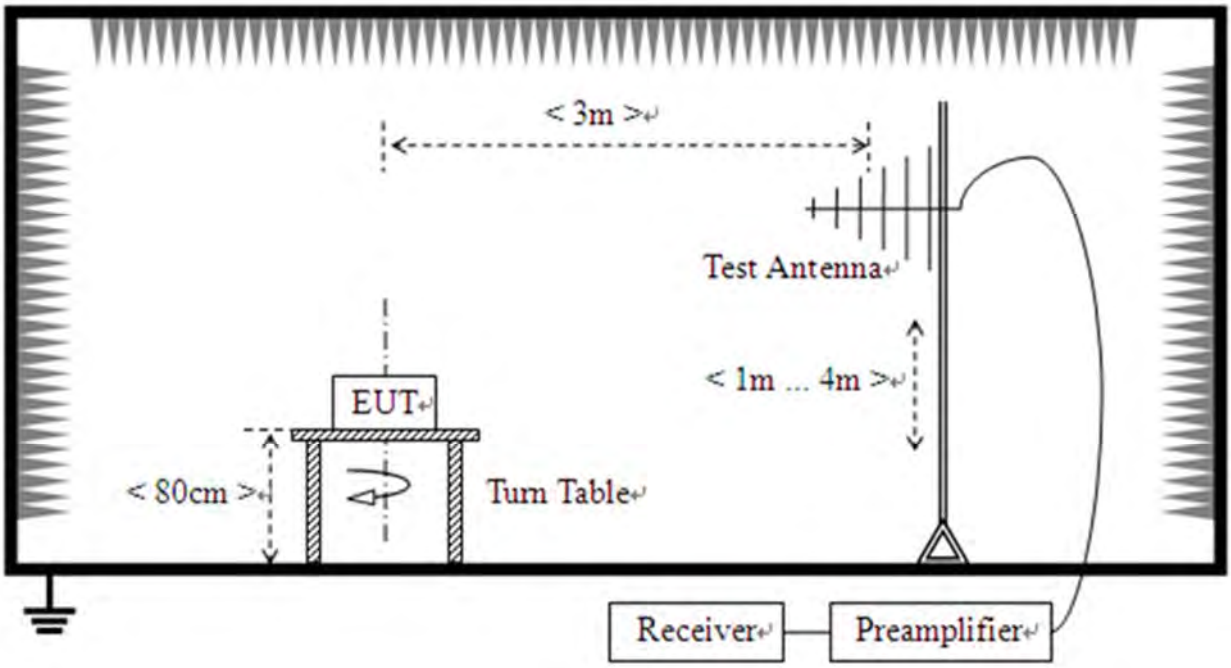


### 2.6.3.Radiation Measurement

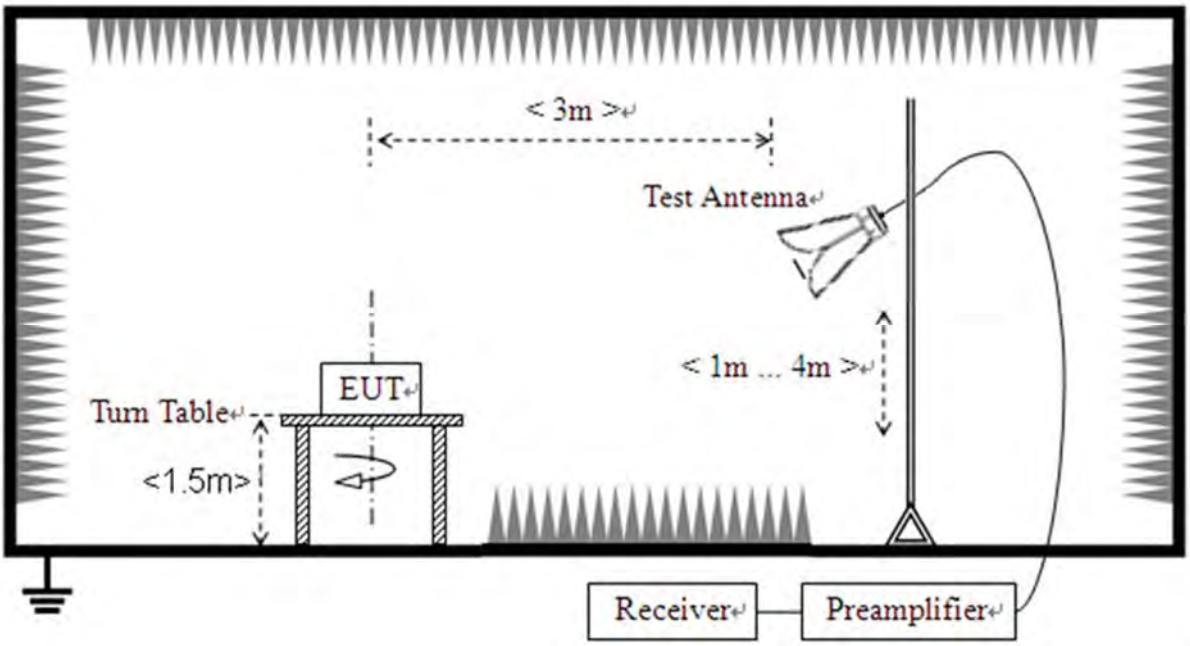
1) For radiated emissions from 9kHz to 30MHz




2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



# 3. Test Results

## 3.1. Antenna Requirement

### 3.1.1.Requirement

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.

### 3.1.2.Test Result

Inside of the EUT has a PIFA antenna coupled with the metal shrapnel. Please refer to the EUT photos.

## 3.2. Hopping Mechanism

### 3.2.1.Requirement

According to FCC section 15.247(a)(1), a frequency hopping spread spectrum 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 FCC section 15.247(h), the incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

### 3.2.2.Test Result

The hopping mechanism of the EUT is in compliance with the document "***Bluetooth core specification v5.1***".

## 3.3. Number of Hopping Frequency

### 3.3.1.Requirement

According to FCC section 15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

### 3.3.2.Test Procedures

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

### 3.3.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.3.4.Test Result

Refer to Annex A.1 in this report.

## 3.4. Duty Cycle of Test Signal

### 3.4.1.Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%).When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration(T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e.,no transmitter OFF-time is to be considered).
When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be non constant.

### 3.4.2.Test Result

Refer to Annex A.2 in this report.

## 3.5. Maximum Peak Conducted Output Power

### 3.5.1.Requirement

According to FCC section 15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

### 3.5.2.Test Procedures

KDB 558074 Section 8.3.1 was used in order to prove compliance.

### 3.5.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.5.4.Test Result

Refer to Annex A.3 in this report.

# 3.6. Maximum Average Conducted Output Power

### 3.6.1.Requirement

According to FCC section 15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

### 3.6.2.Test Procedures

KDB 558074 Section 8.3.2 was used in order to prove compliance.

### 3.6.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.6.4.Test Result

Refer to Annex A.4 in this report.

# 3.7. 20 dB Bandwidth

### 3.7.1.Requirement

According to FCC section 15.247(a)(1), the 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth (10*log1% = 20 dB) taking the total RF output power.

### 3.7.1.Test Procedures

Use the following spectrum analyzer settings:
Span = between 2 to 5 times the OBW, centered on the test channel
RBW= 1% to 5% of the OBW
VBW ≥ 3 x RBW
Sweep = auto
Detector function = peak
Trace = max hold

### 3.7.2.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.7.3.Test Result

Refer to Annex A.5 in this report.

## 3.8. Carried Frequency Separation

### 3.8.1.Requirement

According to FCC section 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

### 3.8.2.Test Procedures

The EUT must have its hopping function enabled. According to DA 00-705, use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

### 3.8.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.8.4.Test Result

Refer to Annex A.6 in this report.

# 3.9. Time of Occupancy (Dwell time)

### 3.9.1.Requirement

According to FCC section 15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping 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.

### 3.9.2.Test Procedures

Normal Mode:
DH1: Dwell time equal to Pulse time (ms) *(1600 / 2 /79)*31.6 Millisecond DH3: Dwell time equal to Pulse time (ms) * (1600 /4 /79) *31.6 Millisecond DH5: Dwell time equal to Pulse Time (ms)* (1600 / 6 /79) *31.6 Millisecond
AFH Mode:
DH1: Dwell time equal to Pulse time (ms) *(800 / 2 /20)*(0.4*20) Millisecond DH3: Dwell time equal to Pulse time (ms) * (800 / 4 /20)*(0.4*20) Millisecond DH5: Dwell time equal to Pulse Time (ms)* (800 / 6 /20)*(0.4*20) Millisecond.

### 3.9.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.9.4.Test Result

Refer to Annex A.7 in this report.

# 3.10. Conducted Spurious Emissions and Band Edge

### 3.10.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 3.10.2.Test Procedures

Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize.

### 3.10.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.10.4.Test Result

Refer to Annex A.8 and A.9 in this report.

# 3.11. Conducted Emission

### 3.11.1.Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

| Frequency Range (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | Quai-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

Note:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

### 3.11.2.Test Procedures

The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

### 3.11.3.Test Setup Layout

Refer to chapter 2.6.2 in this report.

### 3.11.4.Test Result

Refer to Annex A.10 in this report.

# 3.12. Restricted Frequency Bands

### 3.12.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

### 3.12.2.Test Procedures

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.
For the Test Antenna:
Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1GHz
VBW = 3 MHz
Sweep = auto
Detector function = peak/average
Trace = max hold
Allow the trace to stabilize

### 3.12.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

### 3.12.4.Test Result

Refer to Annex A.11 in this report.

# 3.13. Radiated Emission

### 3.13.1.Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (μV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

**Note1:** For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
**Note2:**For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

### 3.13.2.Test Procedures

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

### 3.13.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

### 3.13.4.Test Result

Refer to Annex A.12 in this report.

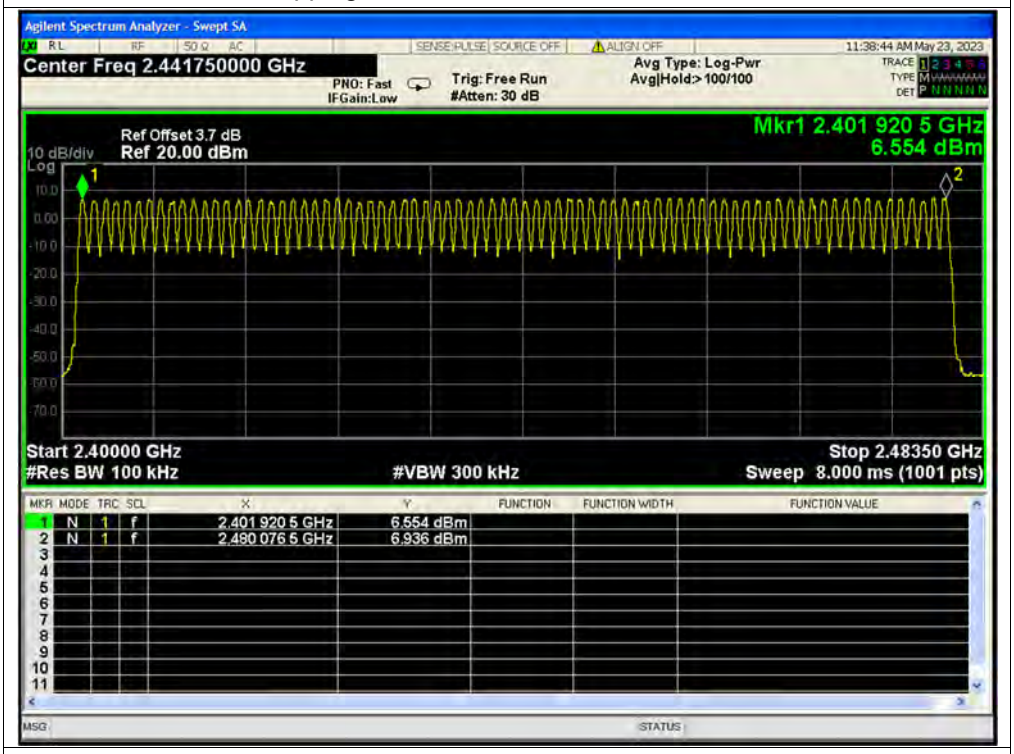
# Annex A Test Data and Result

## A.1. Number of Hopping Frequency

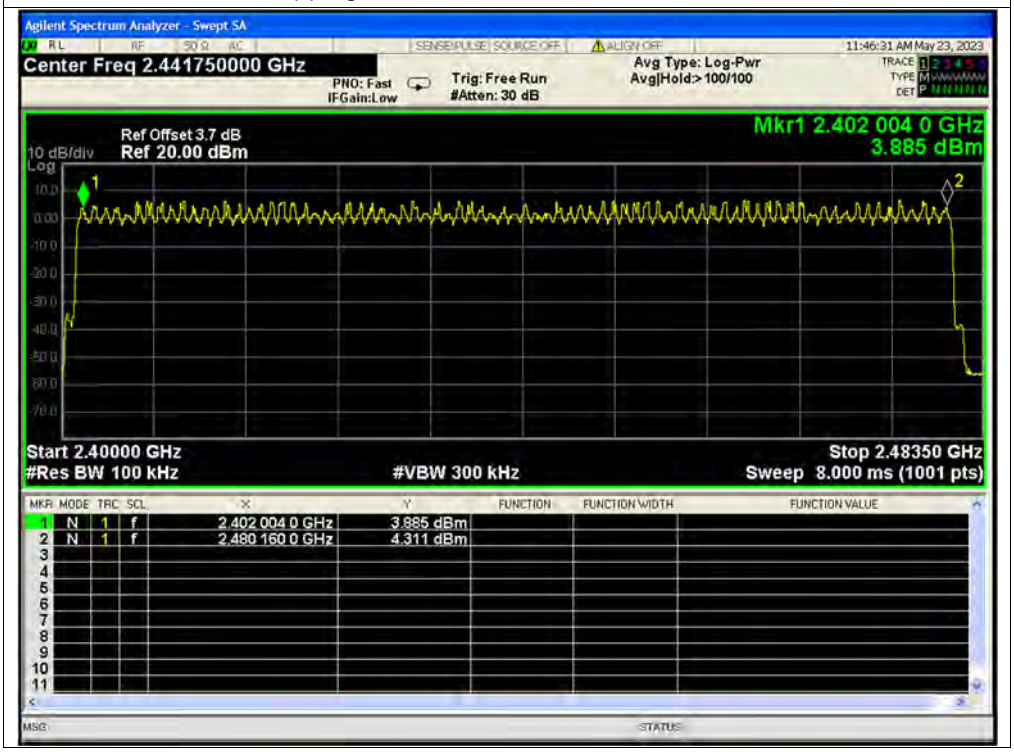
| Condition | Mode | Antenna | Hopping Number | Limit | Verdict |
|---|---|---|---|---|---|
| NVNT | 1-DH5 | Ant1 | 79 | 15 | Pass |
| NVNT | 2-DH5 | Ant1 | 79 | 15 | Pass |
| NVNT | 3-DH5 | Ant1 | 79 | 15 | Pass |

Test Graphs

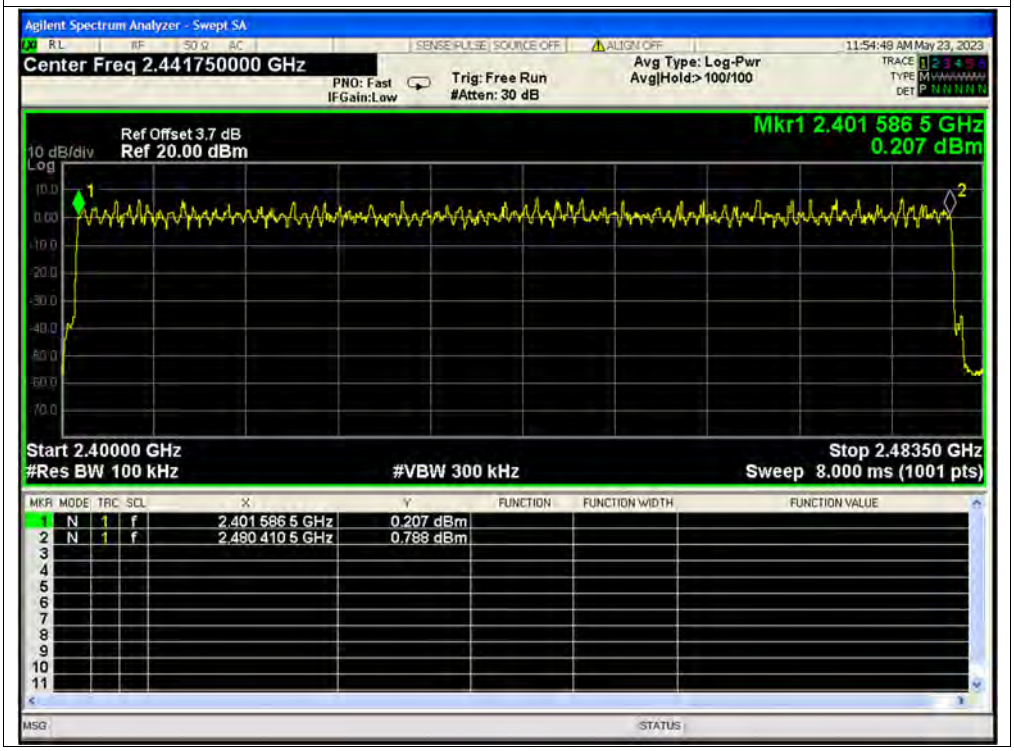
Hopping No. NVNT 1-DH5 2402MHz Ant1




Hopping No. NVNT 2-DH5 2402MHz Ant1



Hopping No. NVNT 3-DH5 2402MHz Ant1

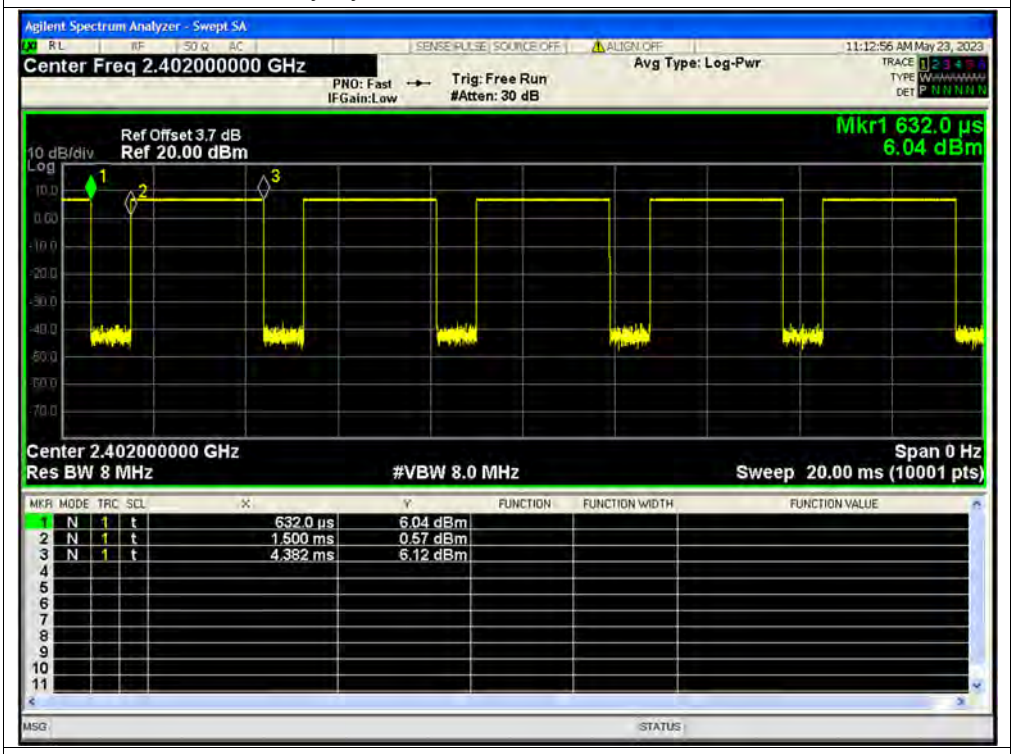


## A.2. Duty Cycle of Test Signal

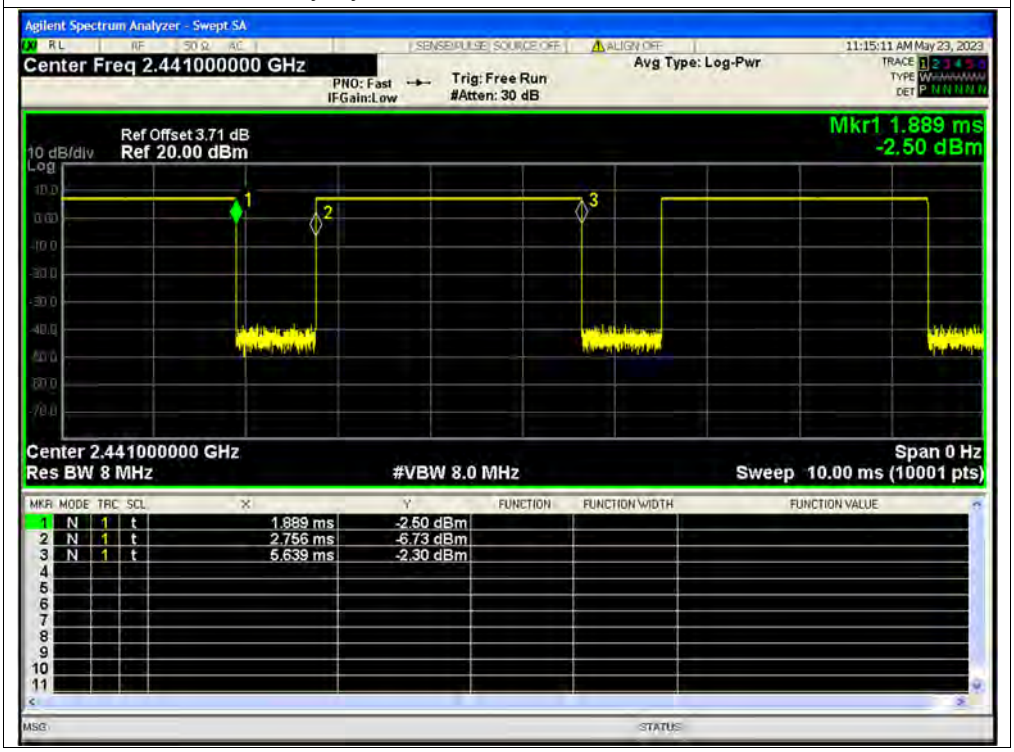
| Condition | Mode | Frequency (MHz) | Antenna | Duty Cycle (%) | Correction Factor (dB) | 1/T (kHz) |
|---|---|---|---|---|---|---|
| NVNT | 1-DH5 | 2402 | Ant1 | 76.85 | 1.14 | 0.35 |
| NVNT | 1-DH5 | 2441 | Ant1 | 76.88 | 1.14 | 0.35 |
| NVNT | 1-DH5 | 2480 | Ant1 | 76.88 | 1.14 | 0.35 |
| NVNT | 2-DH5 | 2402 | Ant1 | 76.96 | 1.14 | 0.35 |
| NVNT | 2-DH5 | 2441 | Ant1 | 76.96 | 1.14 | 0.35 |
| NVNT | 2-DH5 | 2480 | Ant1 | 76.96 | 1.14 | 0.35 |
| NVNT | 3-DH5 | 2402 | Ant1 | 77.04 | 1.13 | 0.35 |
| NVNT | 3-DH5 | 2441 | Ant1 | 77.01 | 1.13 | 0.35 |
| NVNT | 3-DH5 | 2480 | Ant1 | 77.04 | 1.13 | 0.35 |

Test Graphs

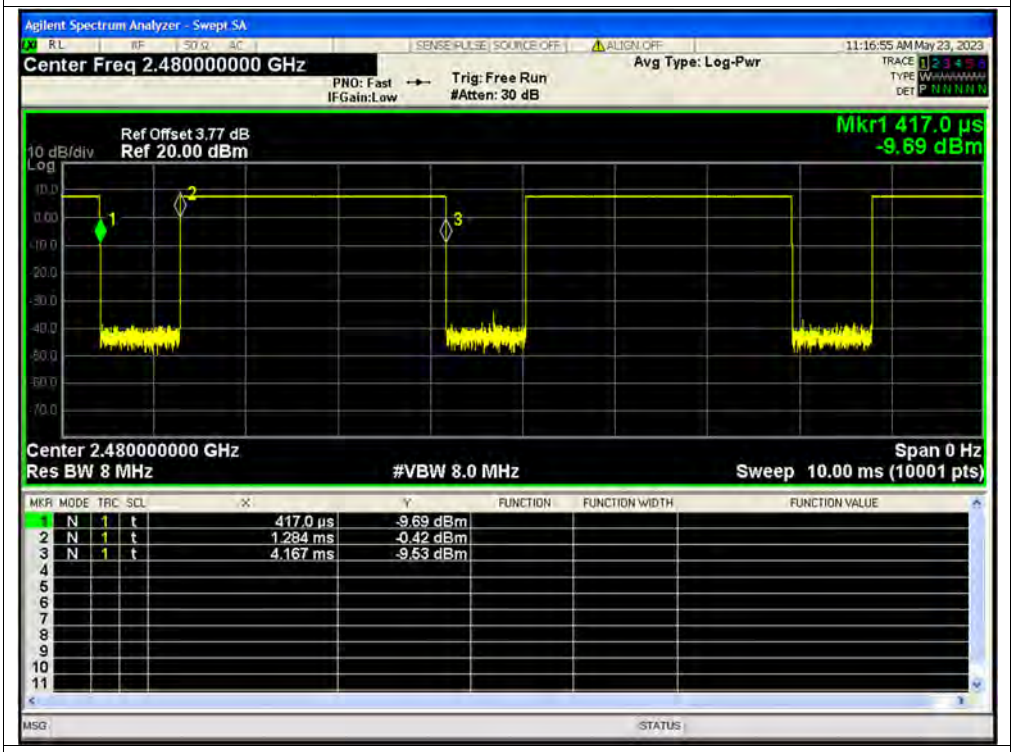
Duty Cycle NVNT 1-DH5 2402MHz Ant1



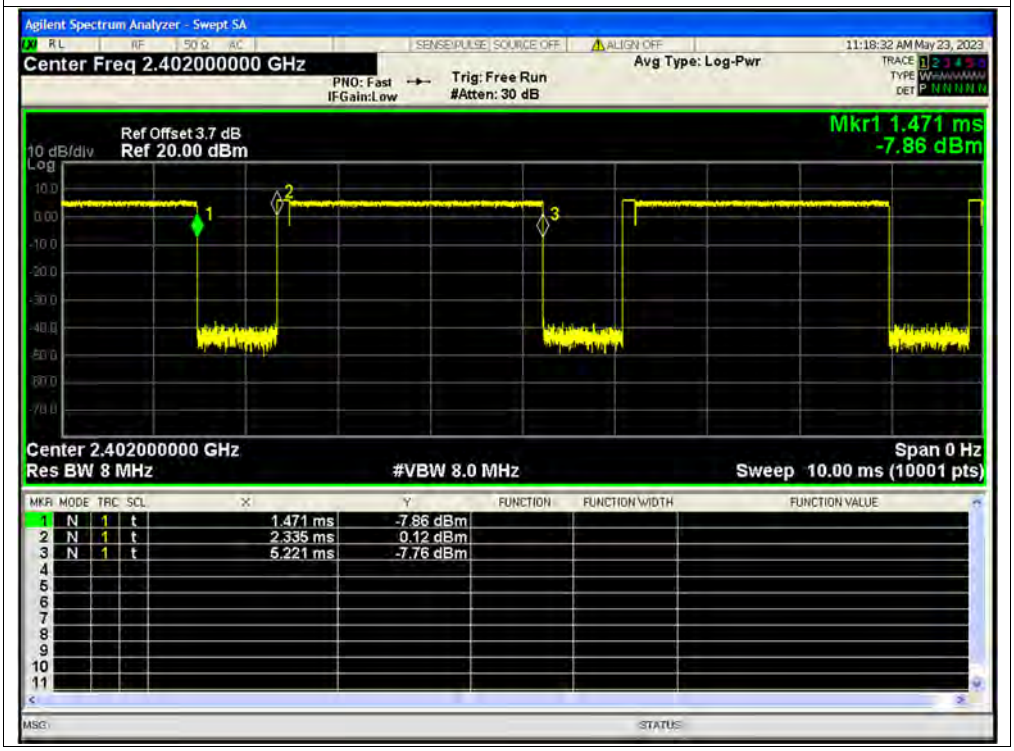

Duty Cycle NVNT 1-DH5 2441MHz Ant1



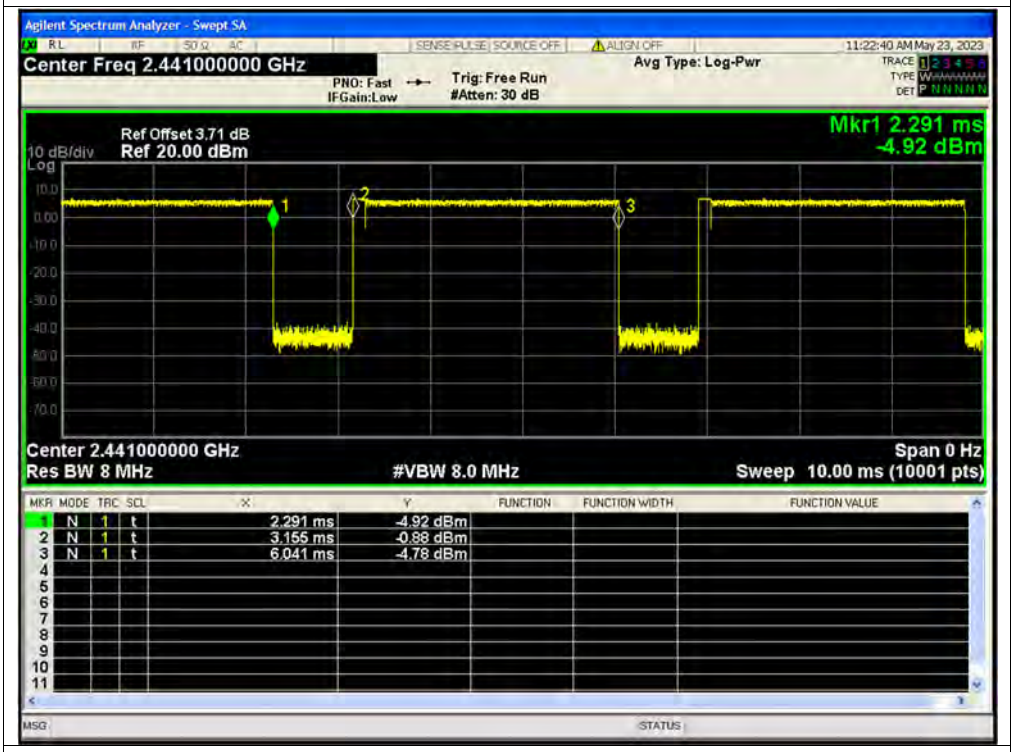
Duty Cycle NVNT 1-DH5 2480MHz Ant1



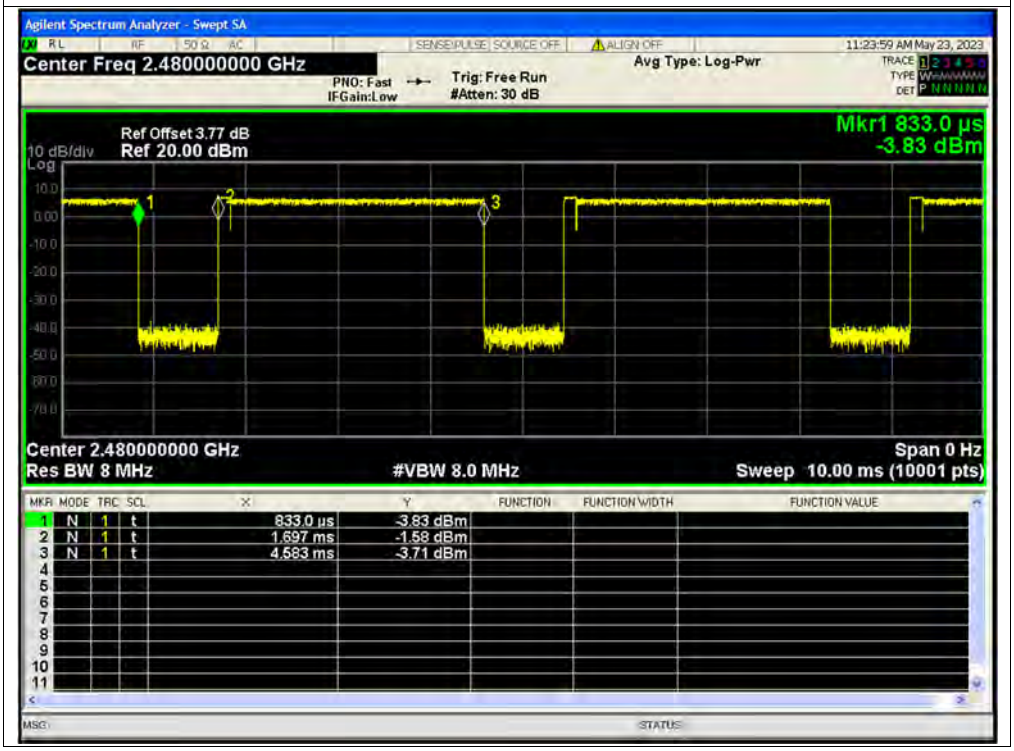

Duty Cycle NVNT 2-DH5 2402MHz Ant1



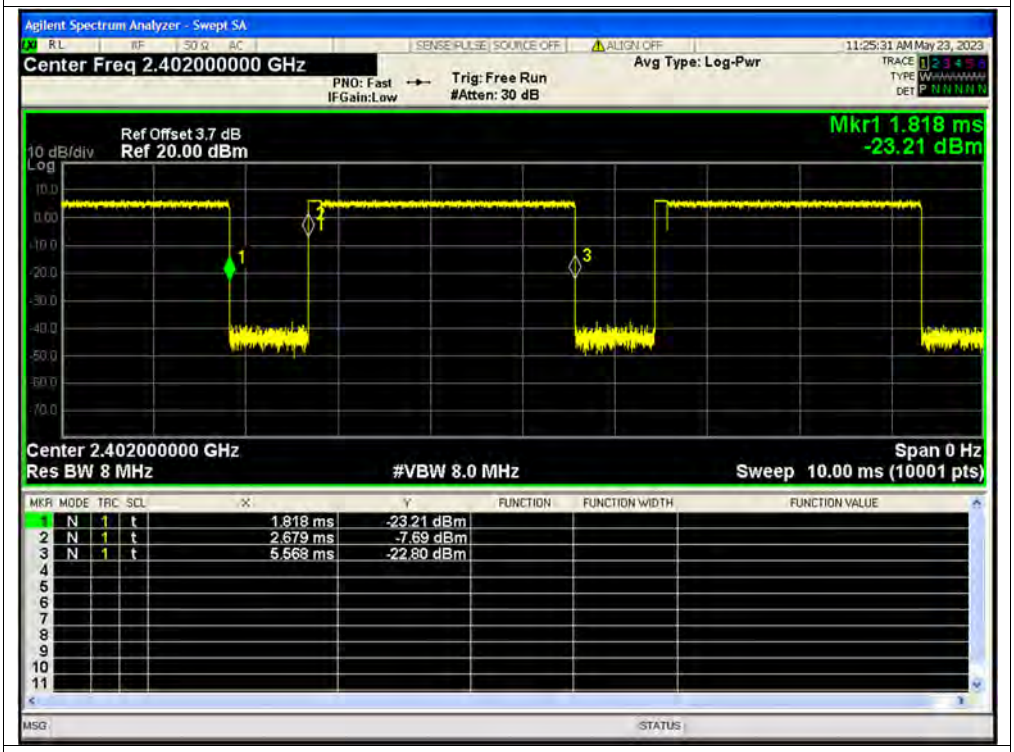
Duty Cycle NVNT 2-DH5 2441MHz Ant1



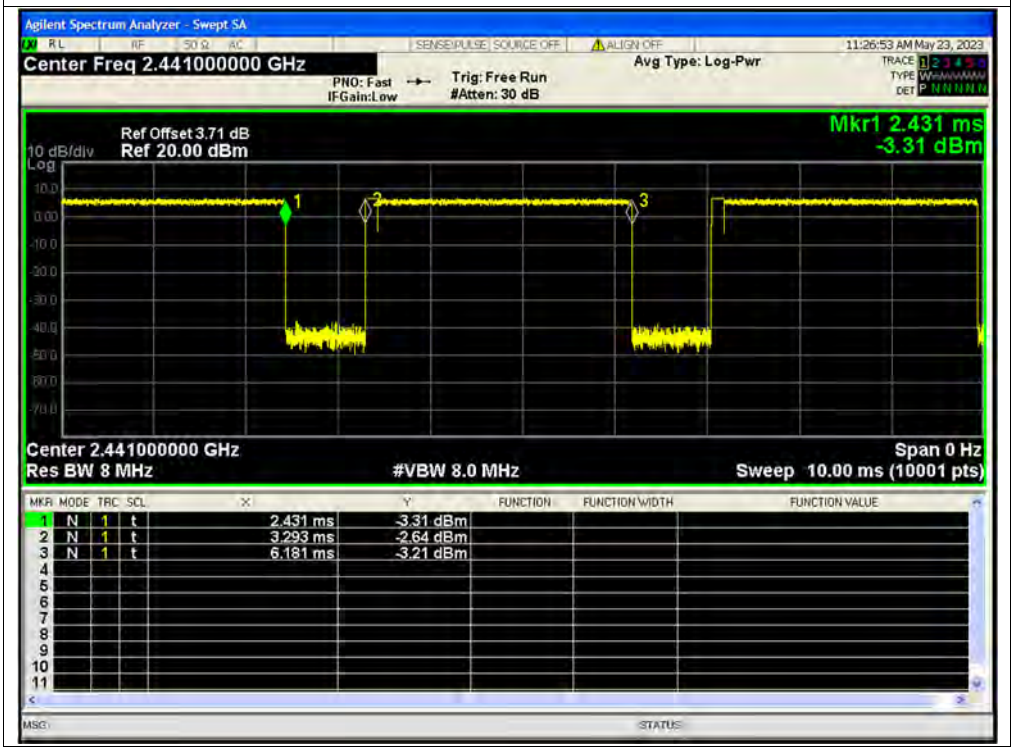

Duty Cycle NVNT 2-DH5 2480MHz Ant1



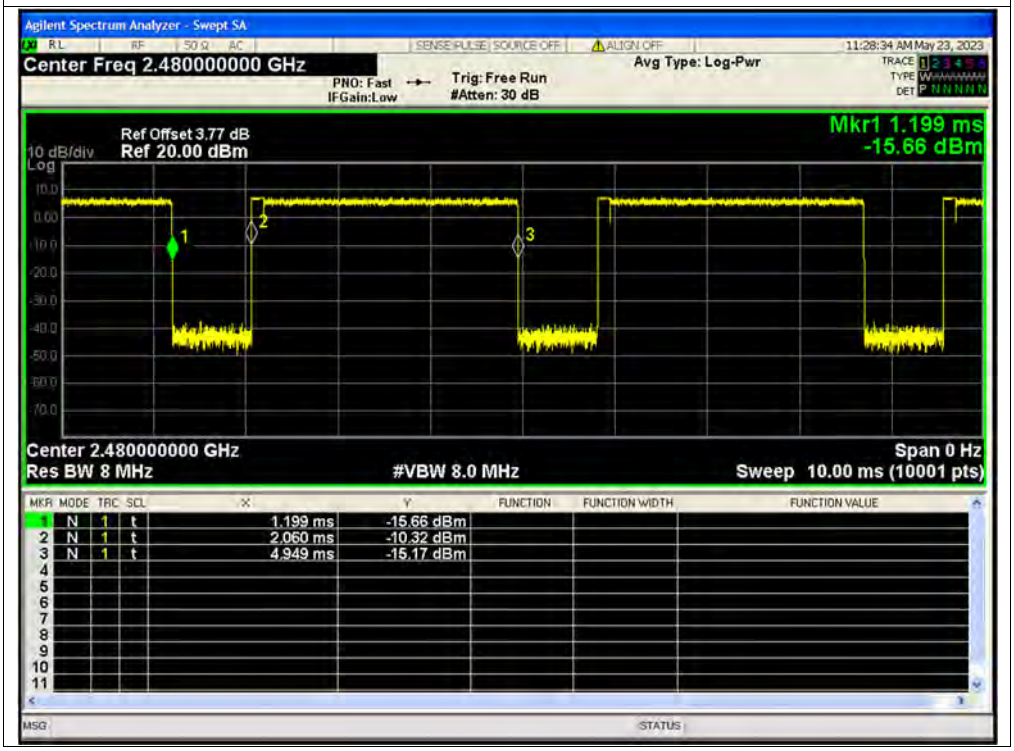
Duty Cycle NVNT 3-DH5 2402MHz Ant1




Duty Cycle NVNT 3-DH5 2441MHz Ant1



Duty Cycle NVNT 3-DH5 2480MHz Ant1



## A.3. Maximum Peak Conducted Output Power

| Condition | Mode | Frequency (MHz) | Antenna | Conducted Power (dBm) | Duty Factor (dB) | Total Conducted Power (dBm) | Total Conducted Power (mW) | Limit Conducted (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| NVNT | 1-DH5 | 2402 | Ant1 | 6.9 | 0 | 6.9 | 4.9 | 30 | Pass |
| NVNT | 1-DH5 | 2441 | Ant1 | 7.35 | 0 | 7.35 | 5.43 | 30 | Pass |
| NVNT | 1-DH5 | 2480 | Ant1 | 7.65 | 0 | 7.65 | 5.82 | 30 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | 6.23 | 0 | 6.23 | 4.2 | 30 | Pass |
| NVNT | 2-DH5 | 2441 | Ant1 | 6.73 | 0 | 6.73 | 4.71 | 30 | Pass |
| NVNT | 2-DH5 | 2480 | Ant1 | 6.99 | 0 | 6.99 | 5 | 30 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | 6.24 | 0 | 6.24 | 4.21 | 30 | Pass |
| NVNT | 3-DH5 | 2441 | Ant1 | 6.71 | 0 | 6.71 | 4.68 | 30 | Pass |
| NVNT | 3-DH5 | 2480 | Ant1 | 6.98 | 0 | 6.98 | 4.98 | 30 | Pass |

Test Graphs

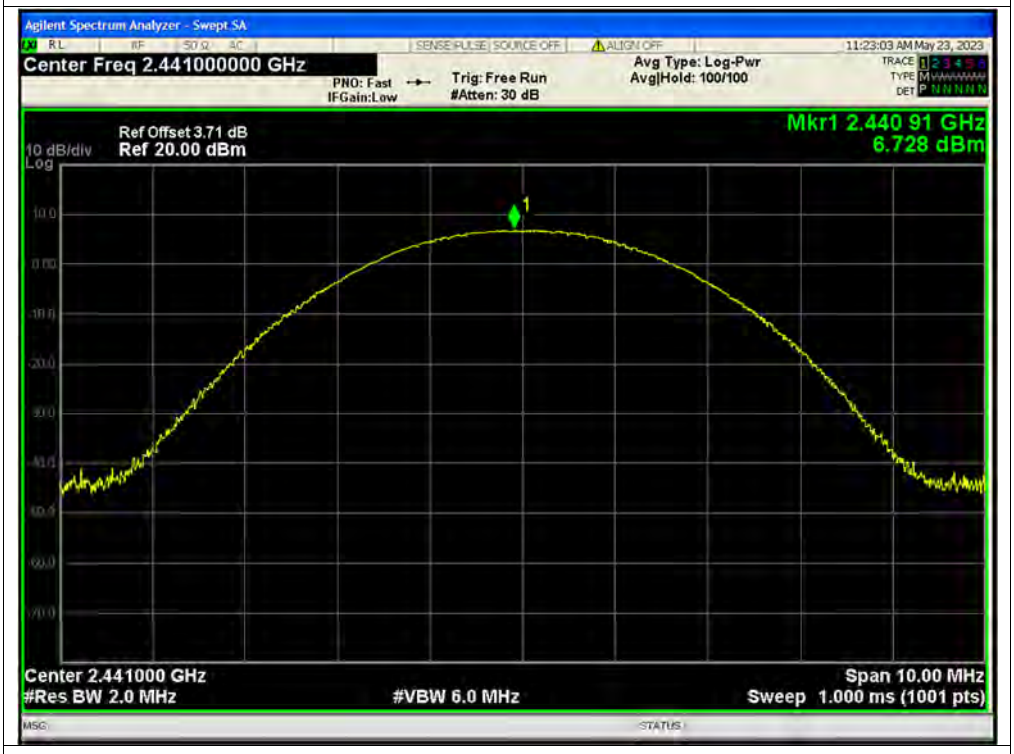
Peak Power NVNT 1-DH5 2402MHz Ant1

Peak Power NVNT 1-DH5 2441MHz Ant1

Peak Power NVNT 1-DH5 2480MHz Ant1

Peak Power NVNT 2-DH5 2402MHz Ant1

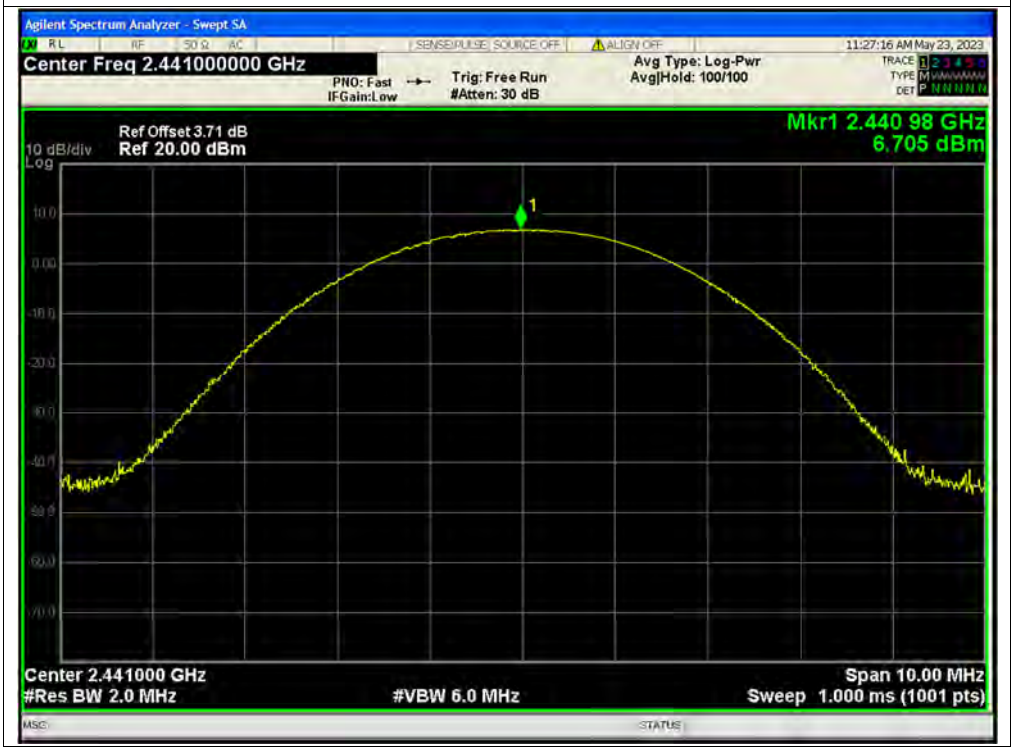
Peak Power NVNT 2-DH5 2441MHz Ant1




Peak Power NVNT 2-DH5 2480MHz Ant1

Peak Power NVNT 3-DH5 2402MHz Ant1

Peak Power NVNT 3-DH5 2441MHz Ant1



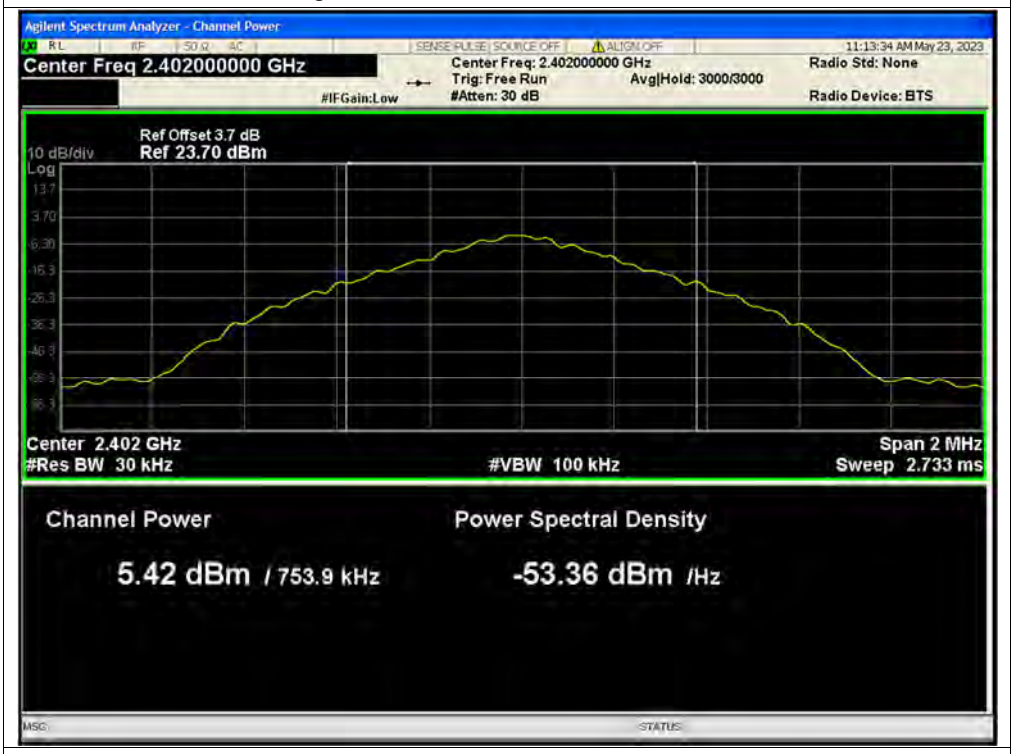
Peak Power NVNT 3-DH5 2480MHz Ant1

## A.4. Maximum Average Conducted Output Power

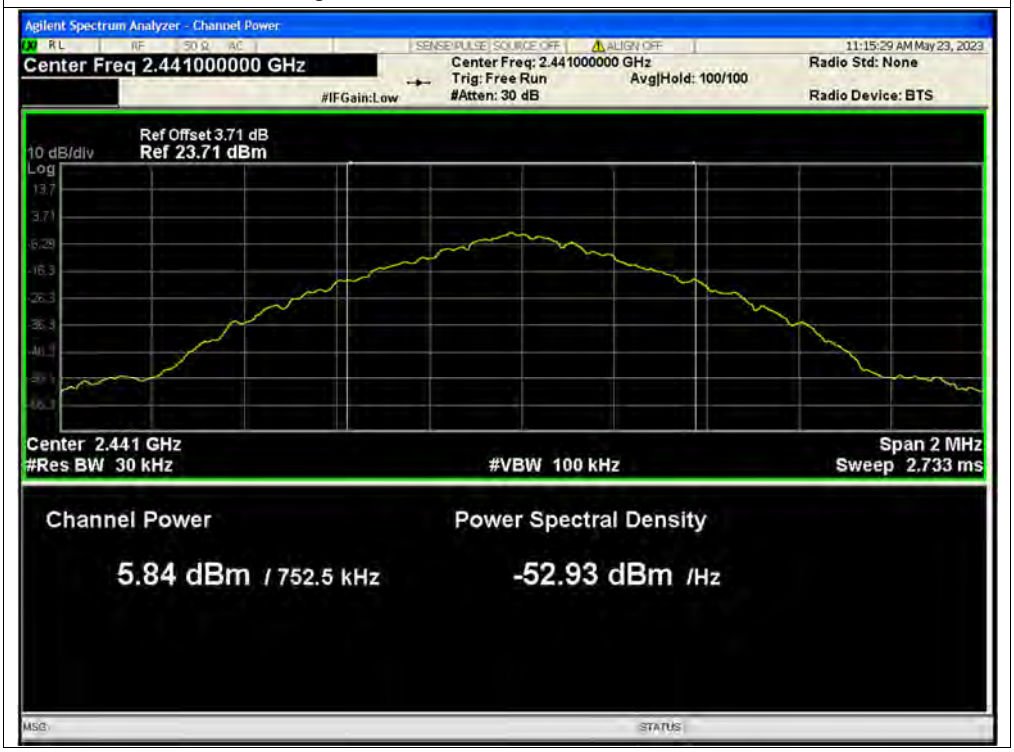
| Condition | Mode | Frequency (MHz) | Antenna | Conducted Power (dBm) | Duty Factor (dB) | Total Conducted Power (dBm) | Total Conducted Power (mW) | Limit Conducted (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| NVNT | 1-DH5 | 2402 | Ant1 | 5.42 | 1.14 | 6.56 | 4.53 | 30 | Pass |
| NVNT | 1-DH5 | 2441 | Ant1 | 5.84 | 1.14 | 6.98 | 4.99 | 30 | Pass |
| NVNT | 1-DH5 | 2480 | Ant1 | 5.89 | 1.14 | 7.03 | 5.05 | 30 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | 2.42 | 1.14 | 3.56 | 2.27 | 30 | Pass |
| NVNT | 2-DH5 | 2441 | Ant1 | 2.99 | 1.14 | 4.13 | 2.59 | 30 | Pass |
| NVNT | 2-DH5 | 2480 | Ant1 | 2.97 | 1.14 | 4.11 | 2.58 | 30 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | 2.54 | 1.13 | 3.67 | 2.33 | 30 | Pass |
| NVNT | 3-DH5 | 2441 | Ant1 | 2.87 | 1.13 | 4 | 2.51 | 30 | Pass |
| NVNT | 3-DH5 | 2480 | Ant1 | 3.07 | 1.13 | 4.2 | 2.63 | 30 | Pass |

Test Graphs

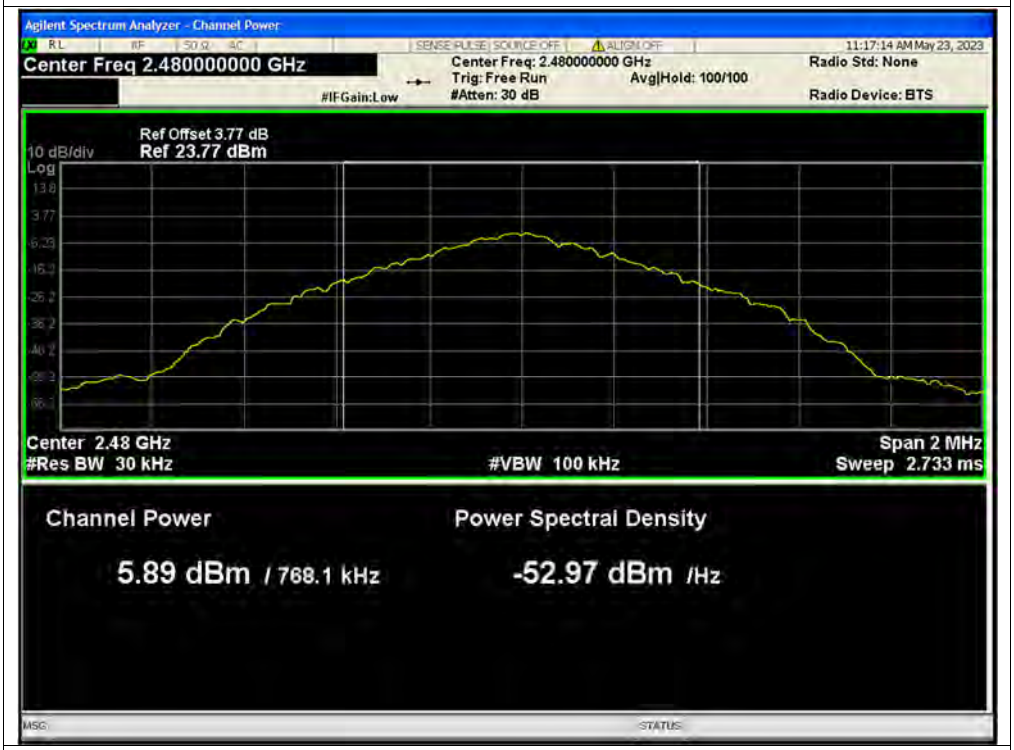
Average Power NVNT 1-DH5 2402MHz Ant1



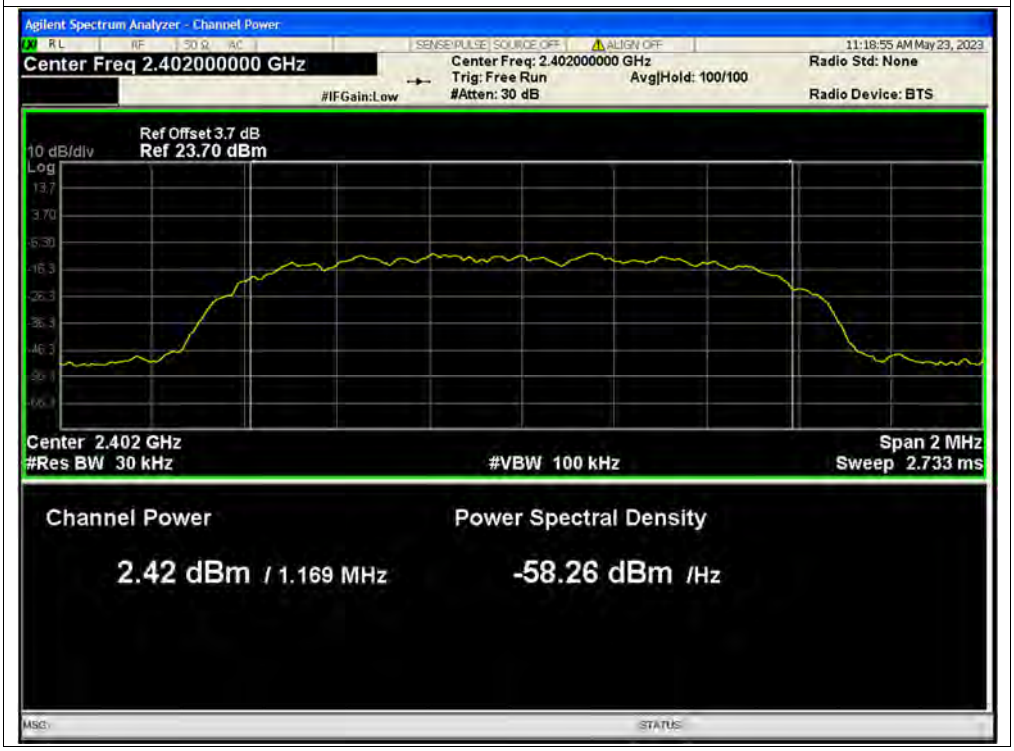

Average Power NVNT 1-DH5 2441MHz Ant1



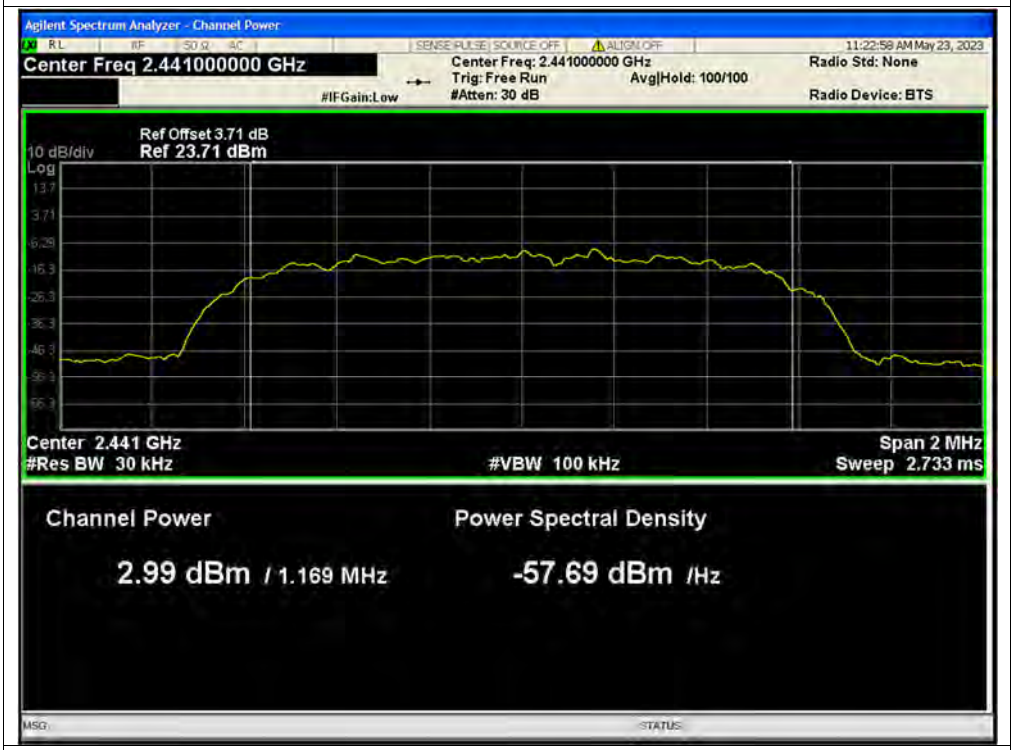
Average Power NVNT 1-DH5 2480MHz Ant1



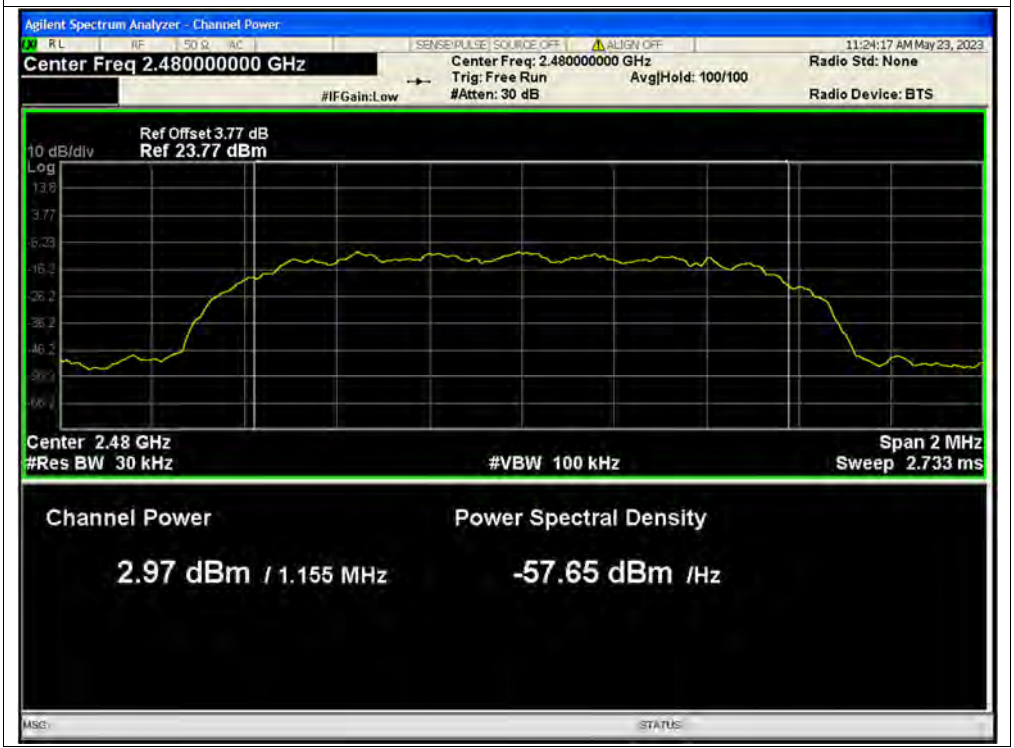

Average Power NVNT 2-DH5 2402MHz Ant1



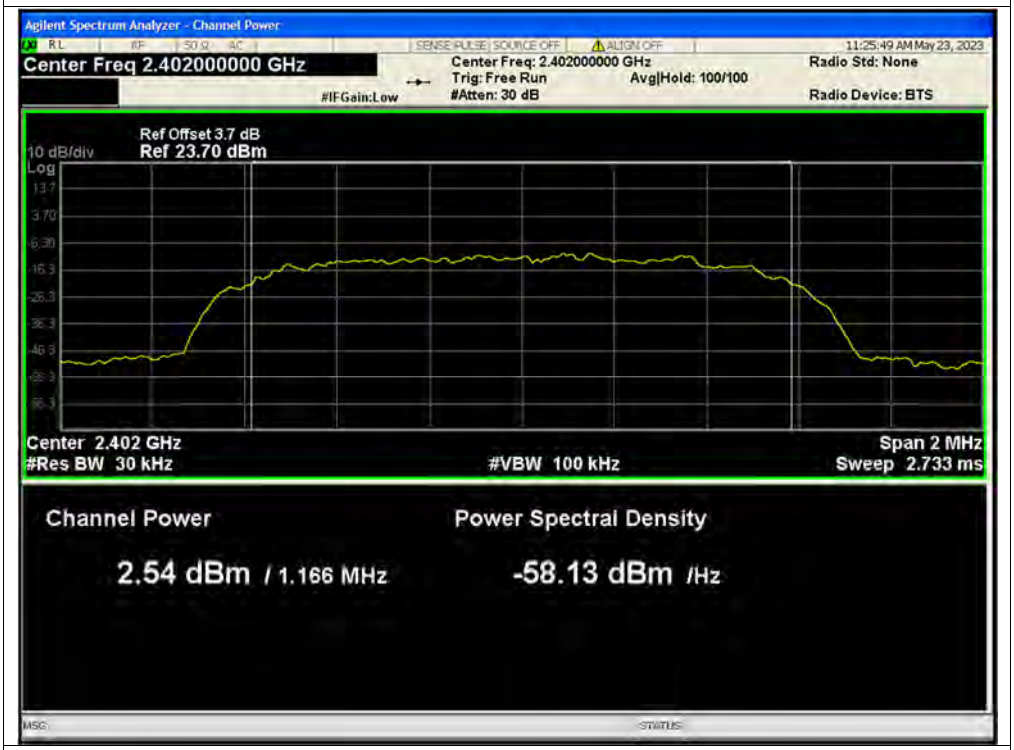
Average Power NVNT 2-DH5 2441MHz Ant1



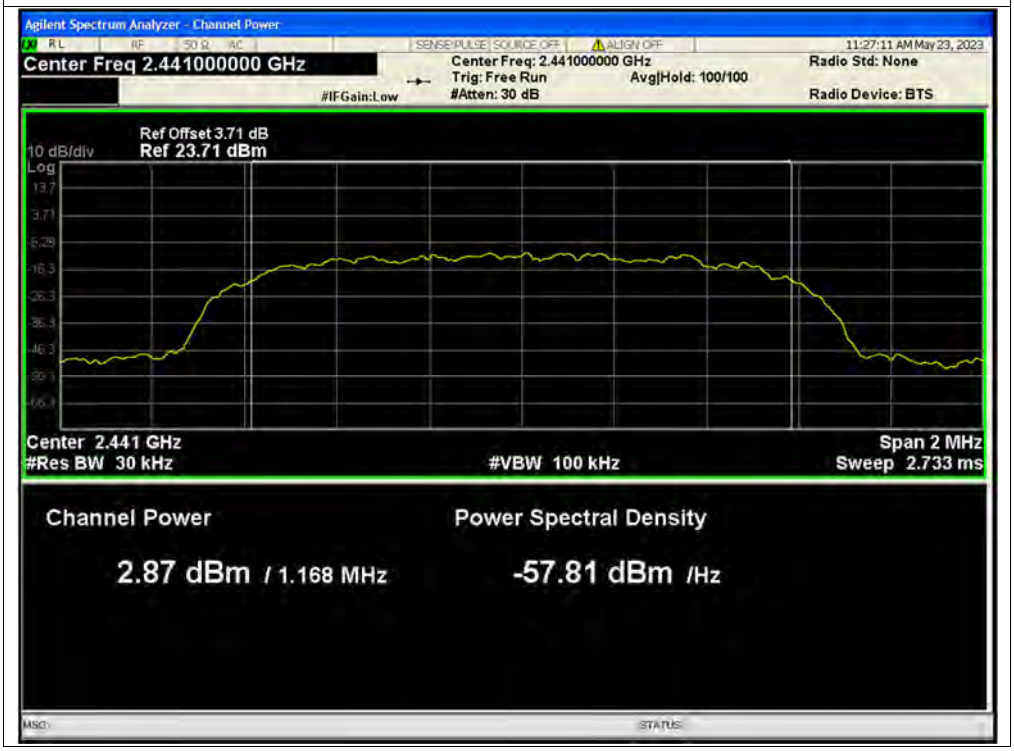

Average Power NVNT 2-DH5 2480MHz Ant1



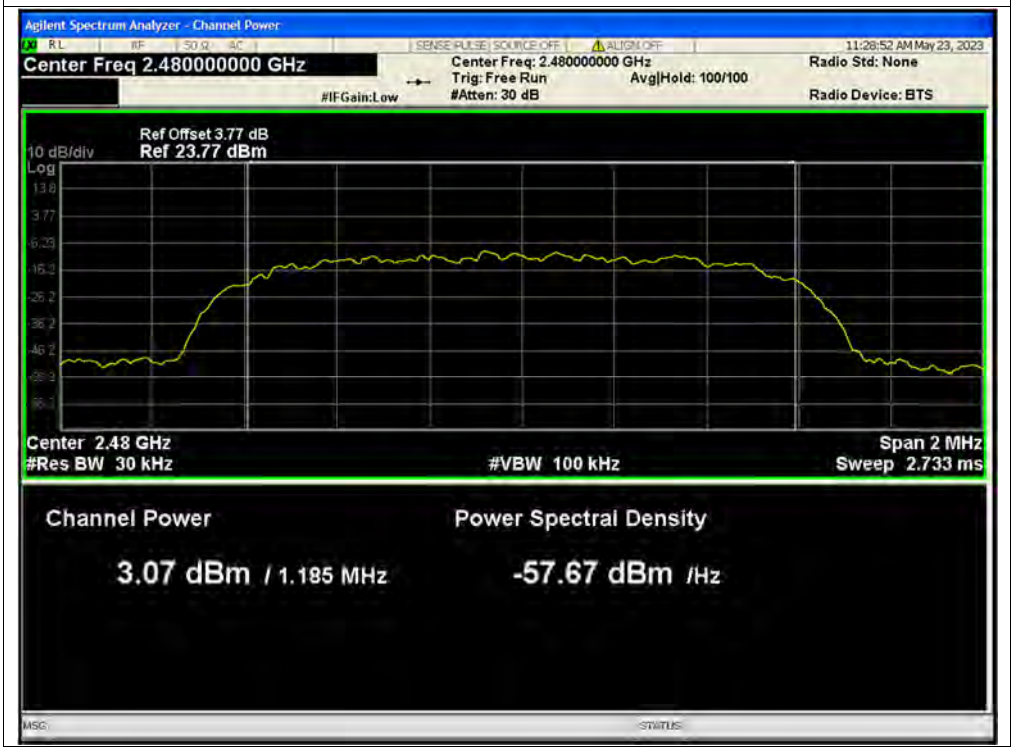
Average Power NVNT 3-DH5 2402MHz Ant1




Average Power NVNT 3-DH5 2441MHz Ant1



Average Power NVNT 3-DH5 2480MHz Ant1



## A.5. 20 dB Bandwidth

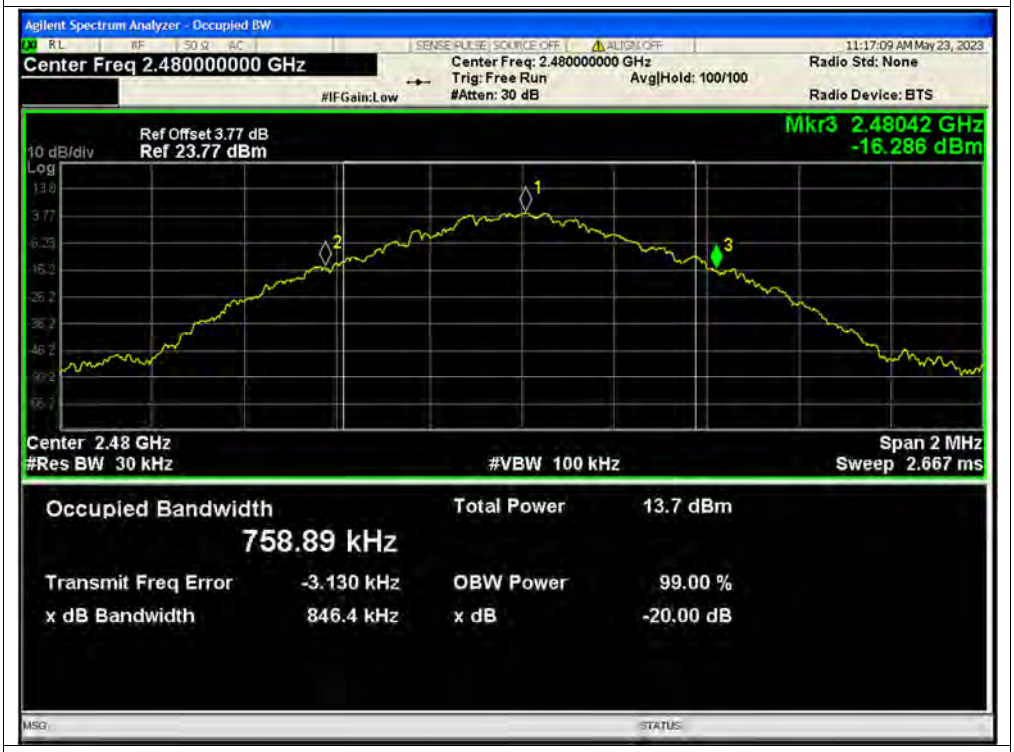
| Condition | Mode | Frequency (MHz) | Antenna | -20 dB Bandwidth (MHz) | Verdict |
|---|---|---|---|---|---|
| NVNT | 1-DH5 | 2402 | Ant1 | 0.843 | Pass |
| NVNT | 1-DH5 | 2441 | Ant1 | 0.844 | Pass |
| NVNT | 1-DH5 | 2480 | Ant1 | 0.846 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | 1.281 | Pass |
| NVNT | 2-DH5 | 2441 | Ant1 | 1.264 | Pass |
| NVNT | 2-DH5 | 2480 | Ant1 | 1.276 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | 1.258 | Pass |
| NVNT | 3-DH5 | 2441 | Ant1 | 1.269 | Pass |
| NVNT | 3-DH5 | 2480 | Ant1 | 1.276 | Pass |

Test Graphs

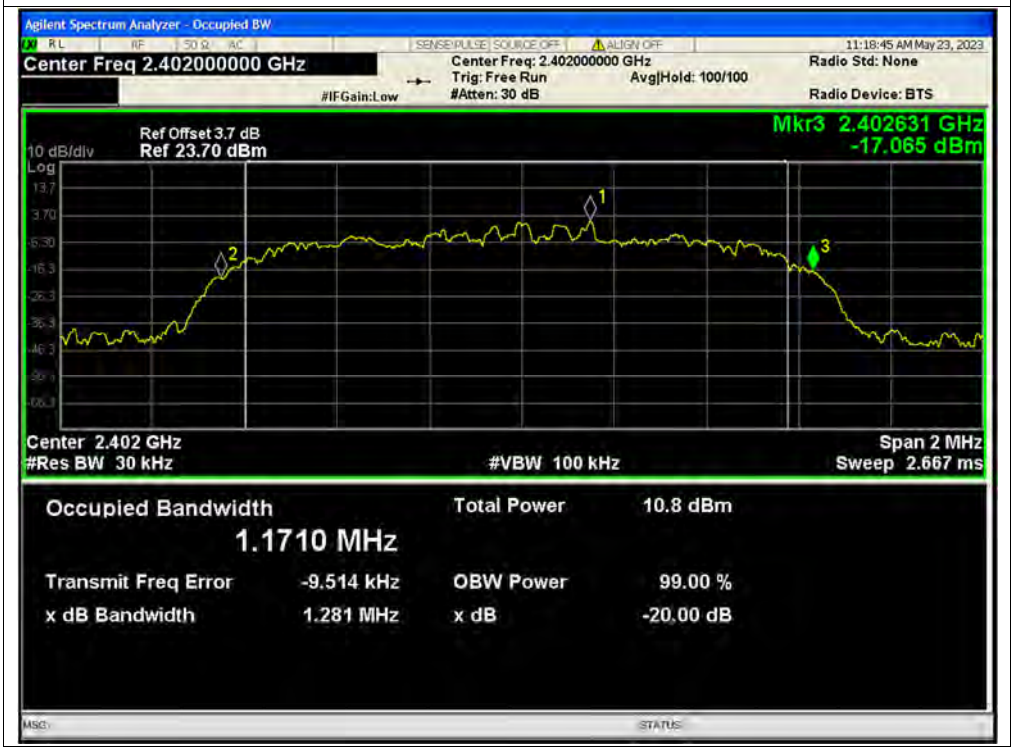
-20dB Bandwidth NVNT 1-DH5 2402MHz Ant1

-20dB Bandwidth NVNT 1-DH5 2441MHz Ant1

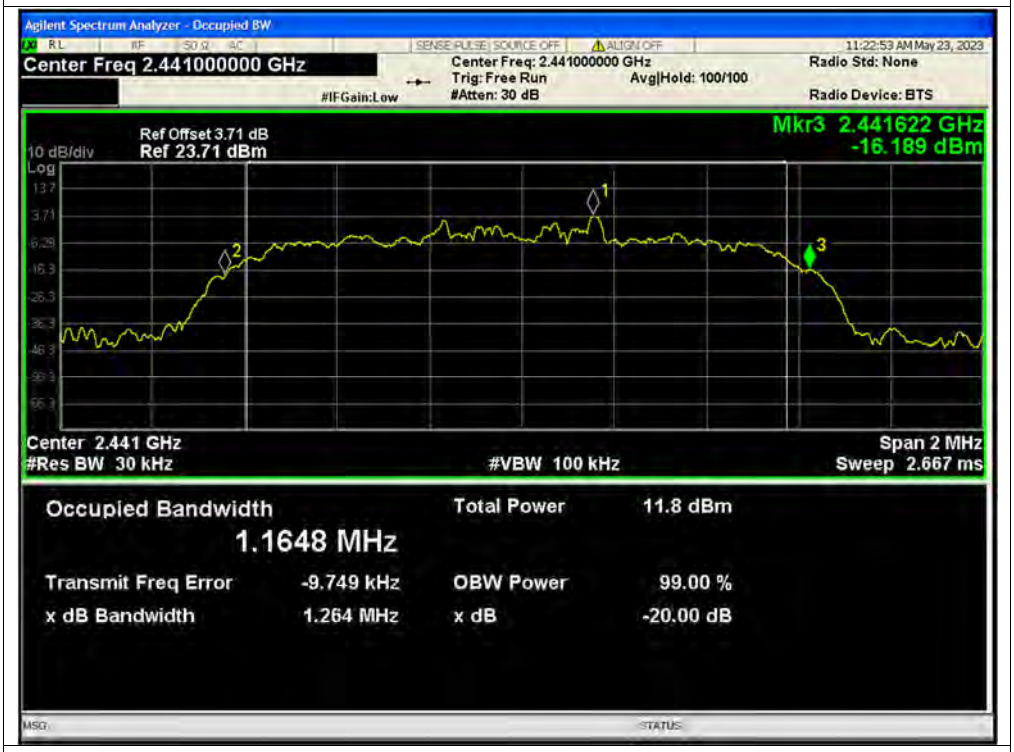
-20dB Bandwidth NVNT 1-DH5 2480MHz Ant1



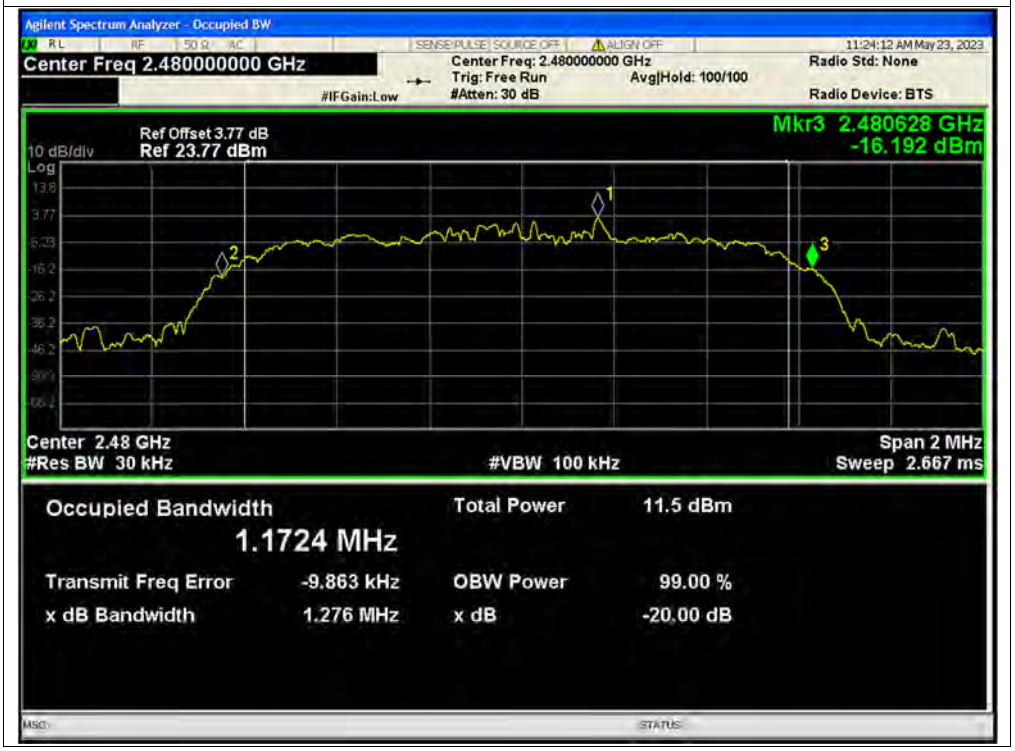

-20dB Bandwidth NVNT 2-DH5 2402MHz Ant1



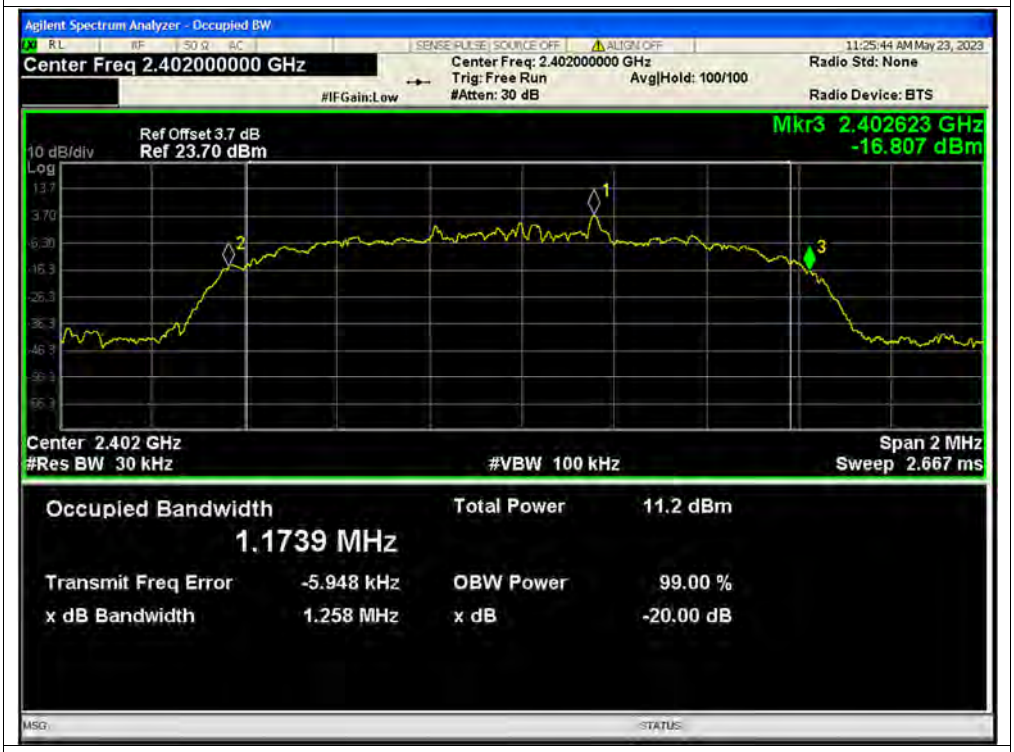
-20dB Bandwidth NVNT 2-DH5 2441MHz Ant1



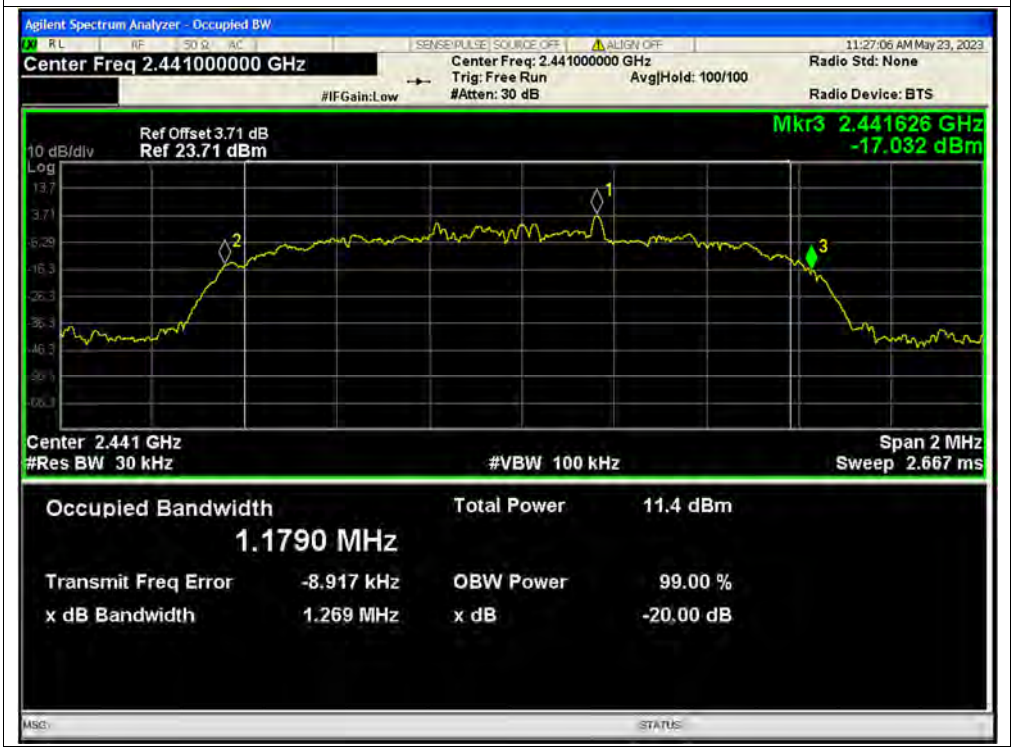

-20dB Bandwidth NVNT 2-DH5 2480MHz Ant1



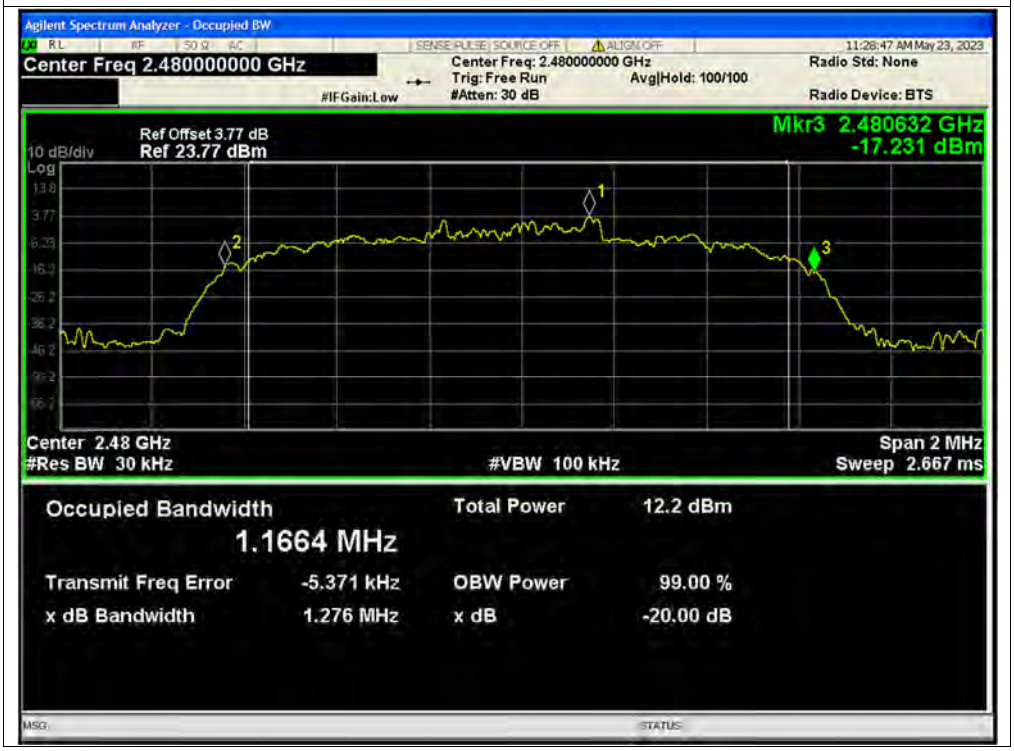
-20dB Bandwidth NVNT 3-DH5 2402MHz Ant1




-20dB Bandwidth NVNT 3-DH5 2441MHz Ant1



-20dB Bandwidth NVNT 3-DH5 2480MHz Ant1

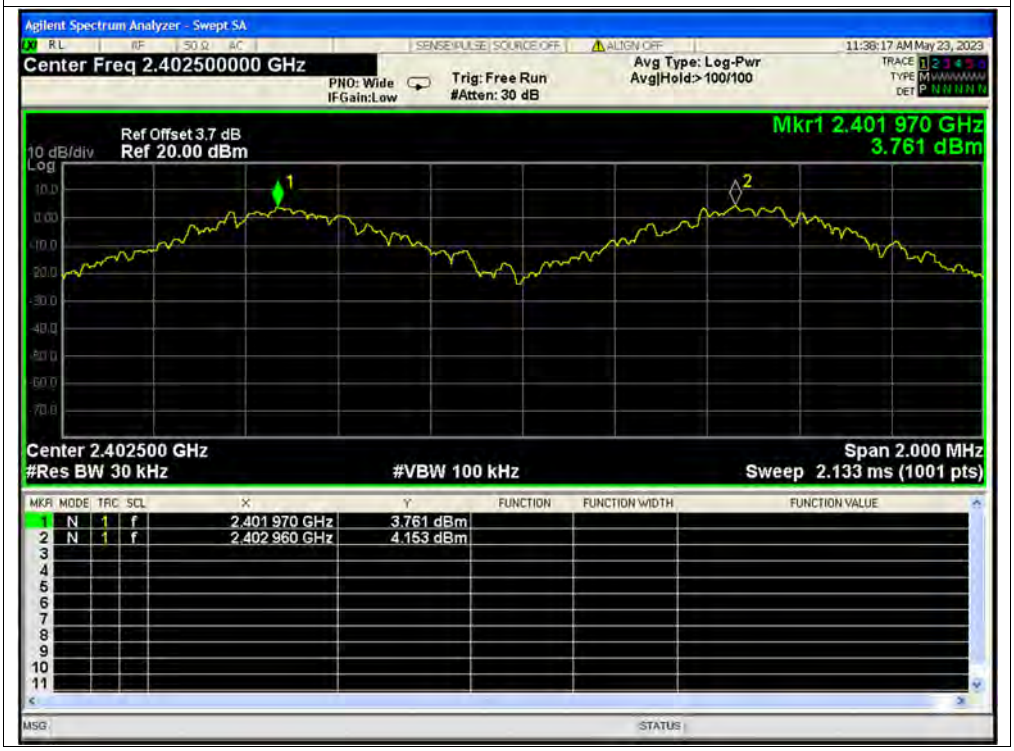


## A.6. Carried Frequency Separation

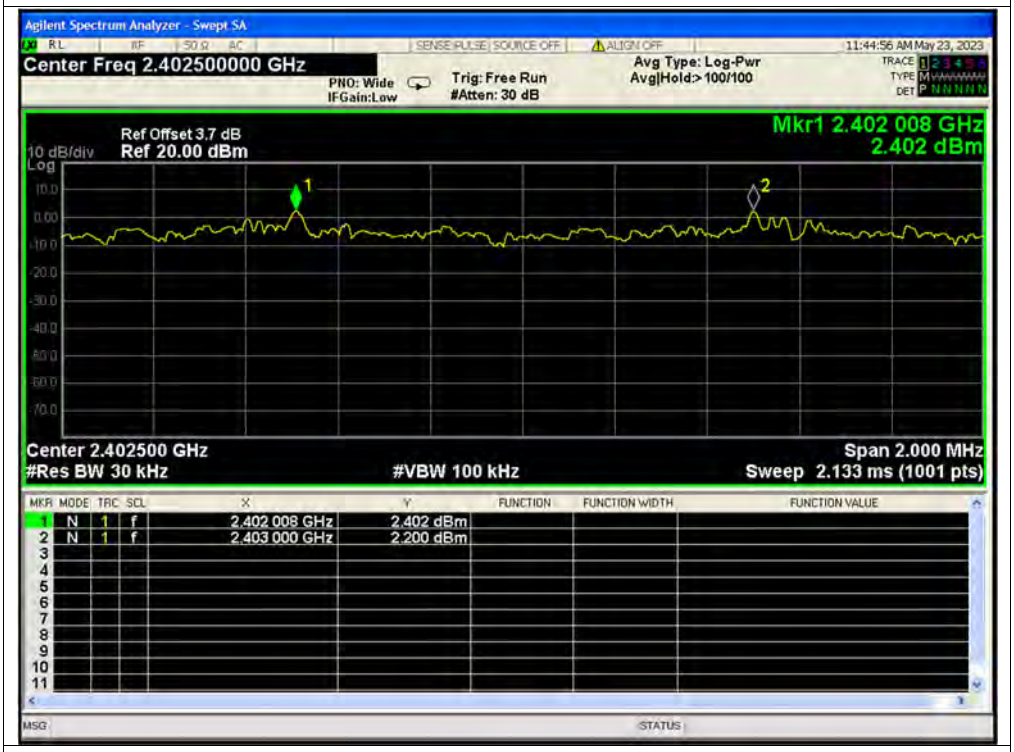
| Condition | Mode | Antenna | Hopping Freq1 (MHz) | Hopping Freq2 (MHz) | HFS (MHz) | Limit (MHz) | Verdict |
|---|---|---|---|---|---|---|---|
| NVNT | 1-DH5 | Ant1 | 2401.97 | 2402.96 | 0.99 | 0.562 | Pass |
| NVNT | 2-DH5 | Ant1 | 2402.008 | 2403 | 0.992 | 0.854 | Pass |
| NVNT | 3-DH5 | Ant1 | 2402.164 | 2403.008 | 0.844 | 0.839 | Pass |

Test Graphs

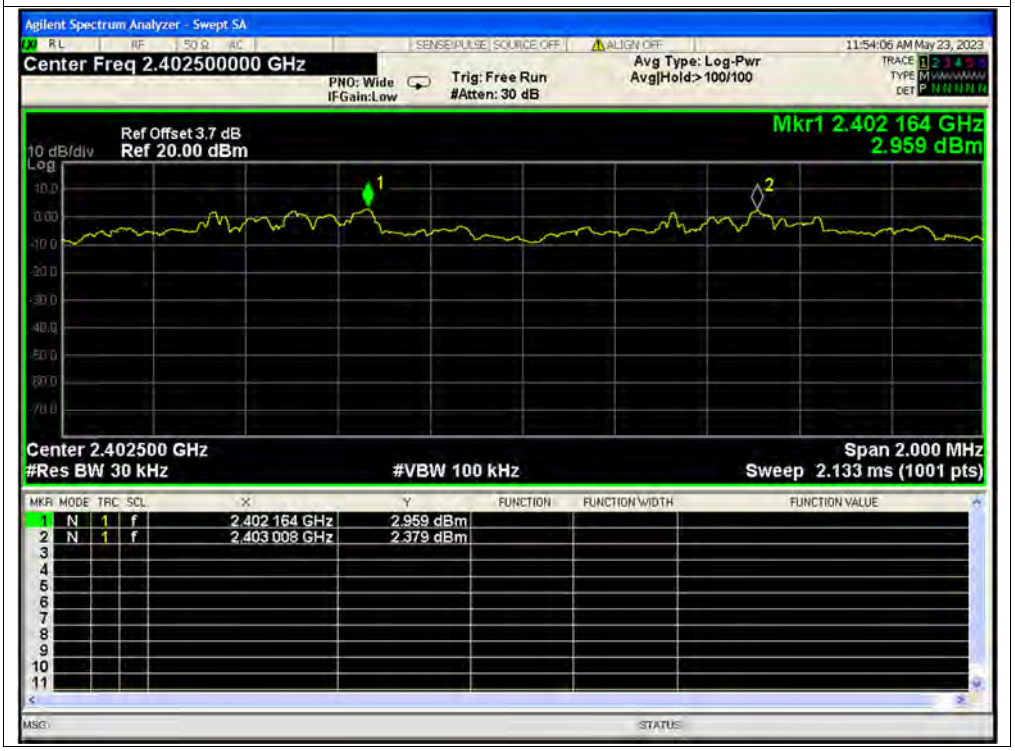
CFS NVNT 1-DH5 2402MHz Ant1



CFS NVNT 2-DH5 2402MHz Ant1




CFS NVNT 3-DH5 2402MHz Ant1

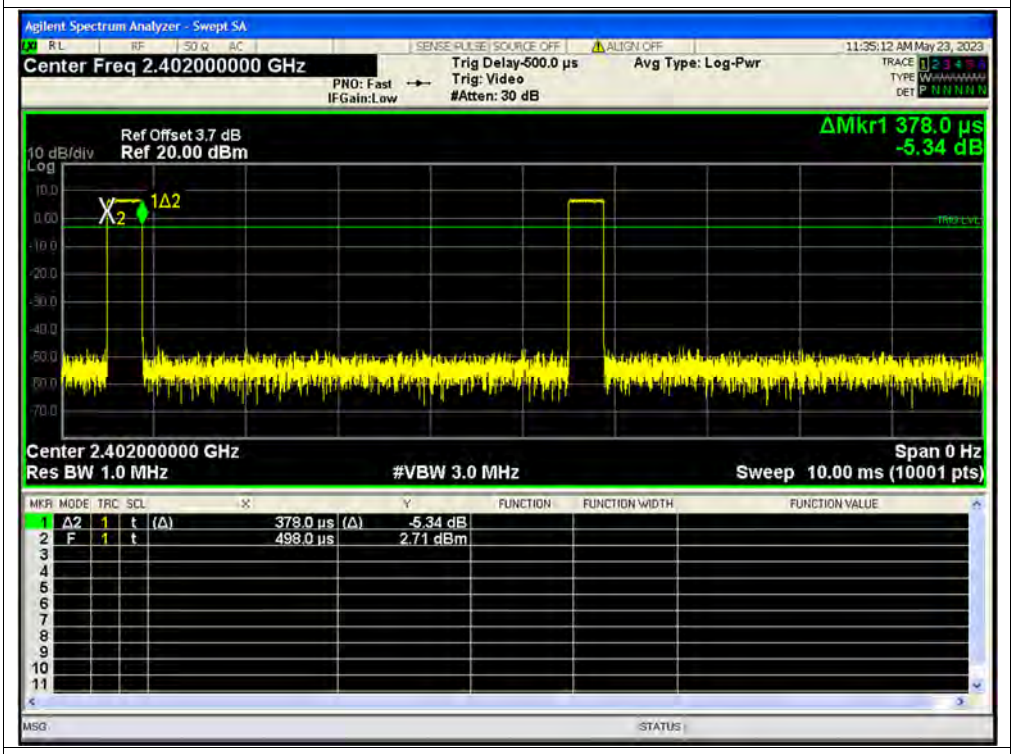


## A.7. Time of Occupancy (Dwell time)

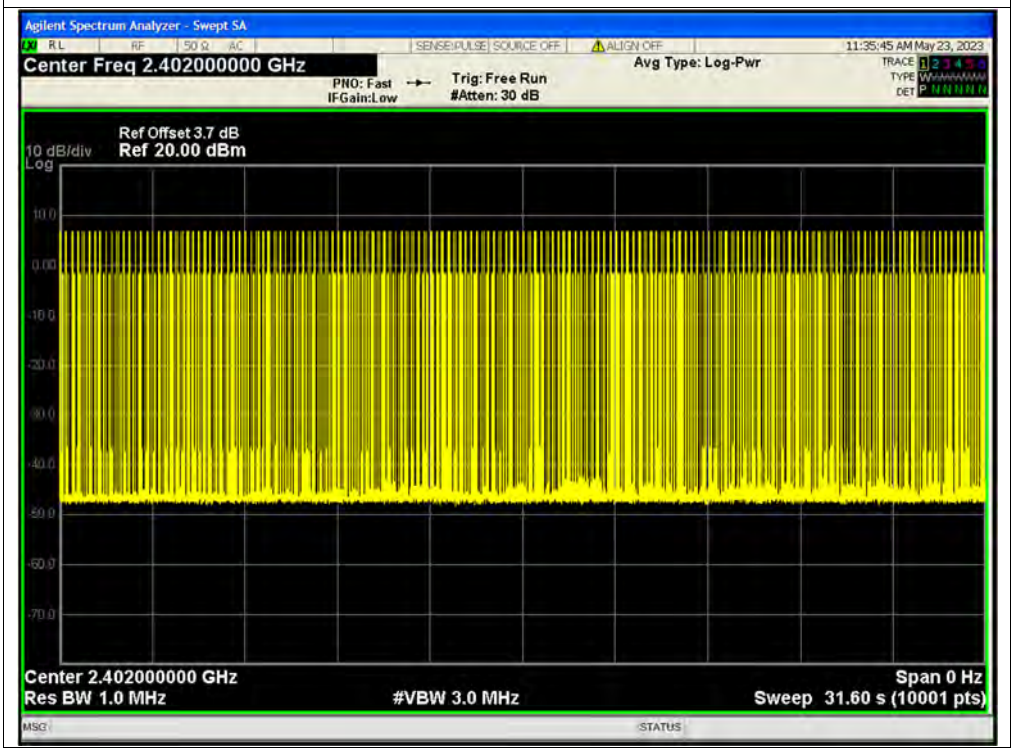
| Condition | Mode | Frequency (MHz) | Antenna | Pulse Time (ms) | Total Dwell Time (ms) | Burst Count | Period Time (ms) | Limit (ms) | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| NVNT | 1-DH1 | 2402 | Ant1 | 0.378 | 119.07 | 315 | 31600 | 400 | Pass |
| NVNT | 1-DH3 | 2402 | Ant1 | 1.634 | 223.858 | 137 | 31600 | 400 | Pass |
| NVNT | 1-DH5 | 2402 | Ant1 | 2.882 | 305.492 | 106 | 31600 | 400 | Pass |
| NVNT | 2-DH1 | 2402 | Ant1 | 0.385 | 120.89 | 314 | 31600 | 400 | Pass |
| NVNT | 2-DH3 | 2402 | Ant1 | 1.637 | 286.475 | 175 | 31600 | 400 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | 2.885 | 271.19 | 94 | 31600 | 400 | Pass |
| NVNT | 3-DH1 | 2402 | Ant1 | 0.386 | 121.204 | 314 | 31600 | 400 | Pass |
| NVNT | 3-DH3 | 2402 | Ant1 | 1.636 | 233.948 | 143 | 31600 | 400 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | 2.887 | 277.152 | 96 | 31600 | 400 | Pass |

Test Graphs

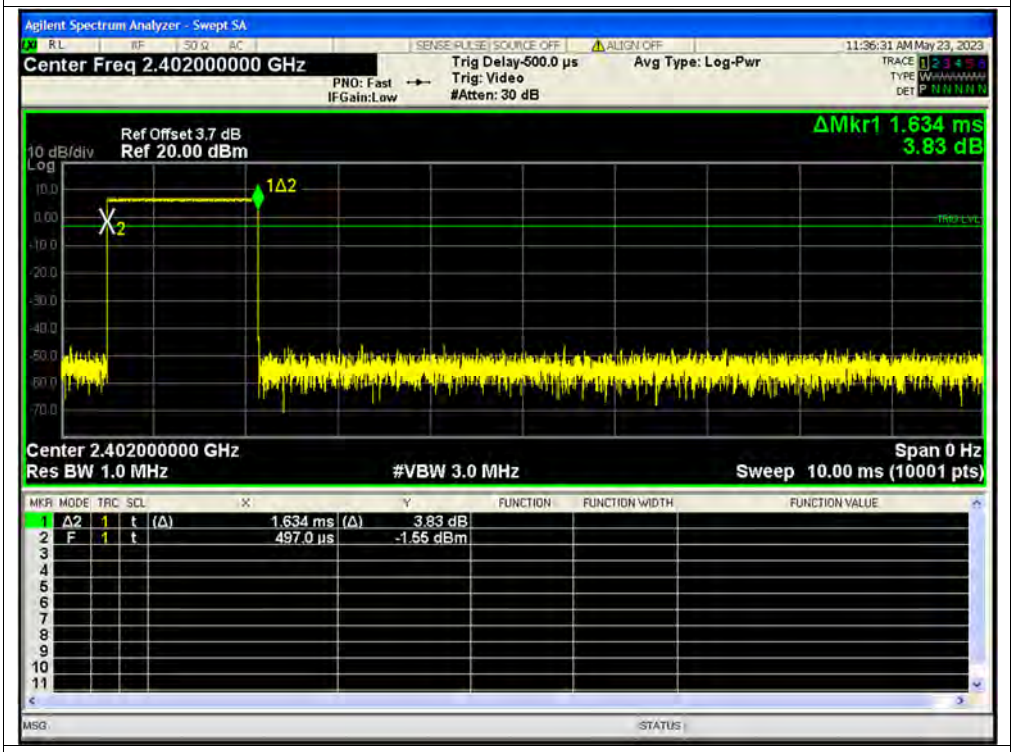
Dwell NVLT 1-DH1 2402MHz Ant1 One Burst



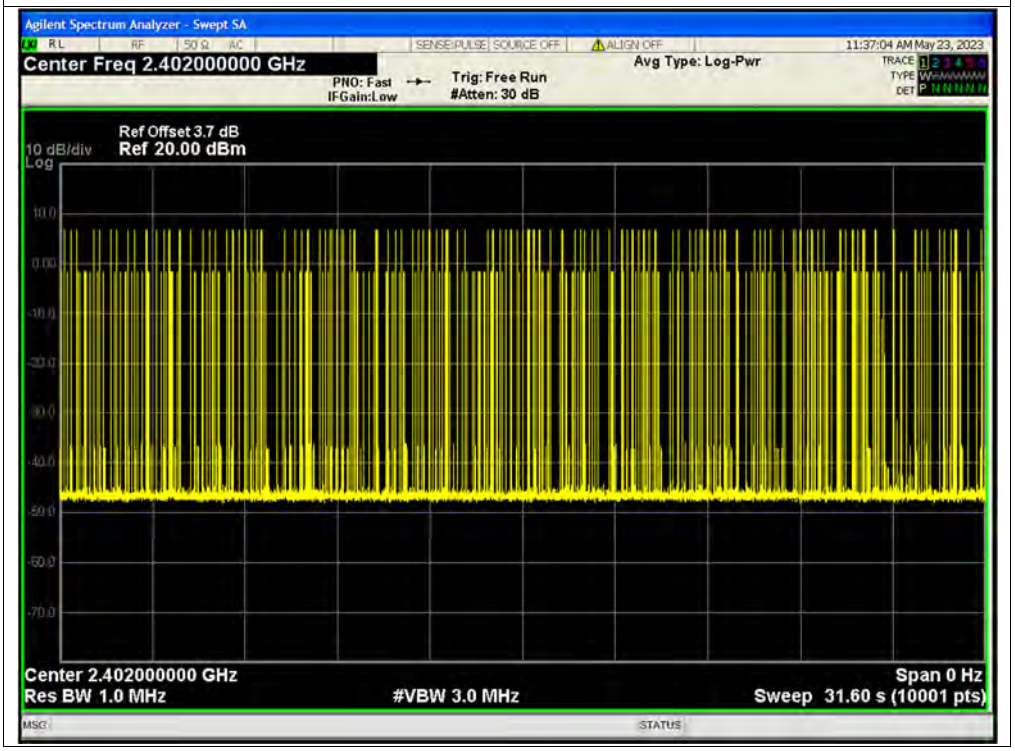

Dwell NVLT 1-DH1 2402MHz Ant1 Accumulated



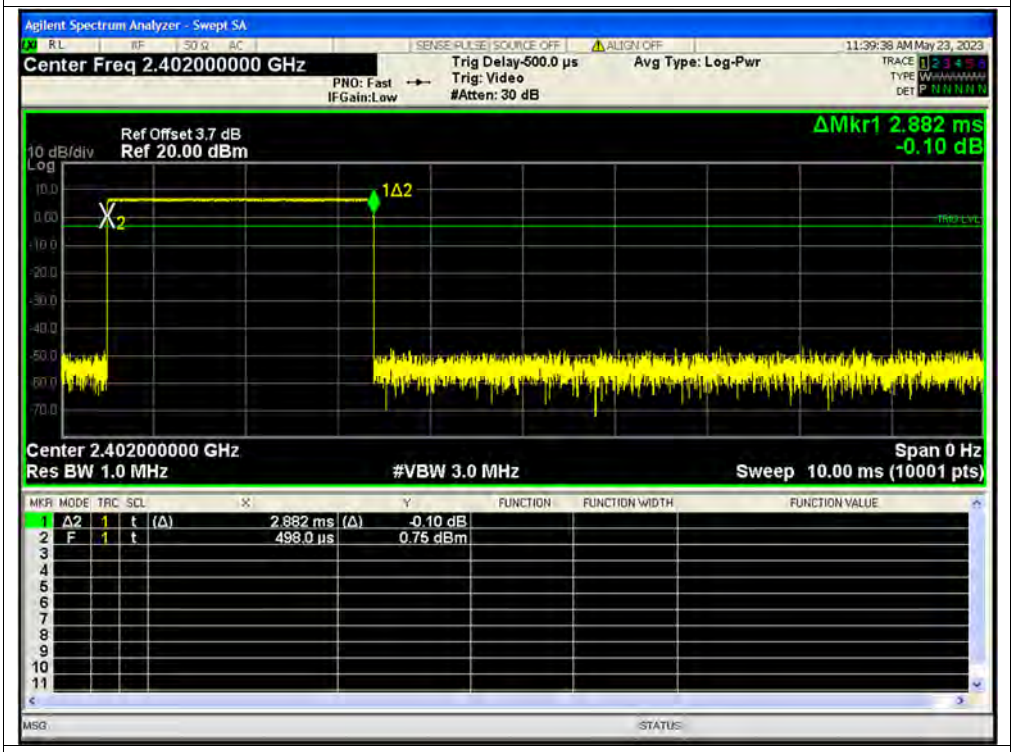
Dwell NVLT 1-DH3 2402MHz Ant1 One Burst



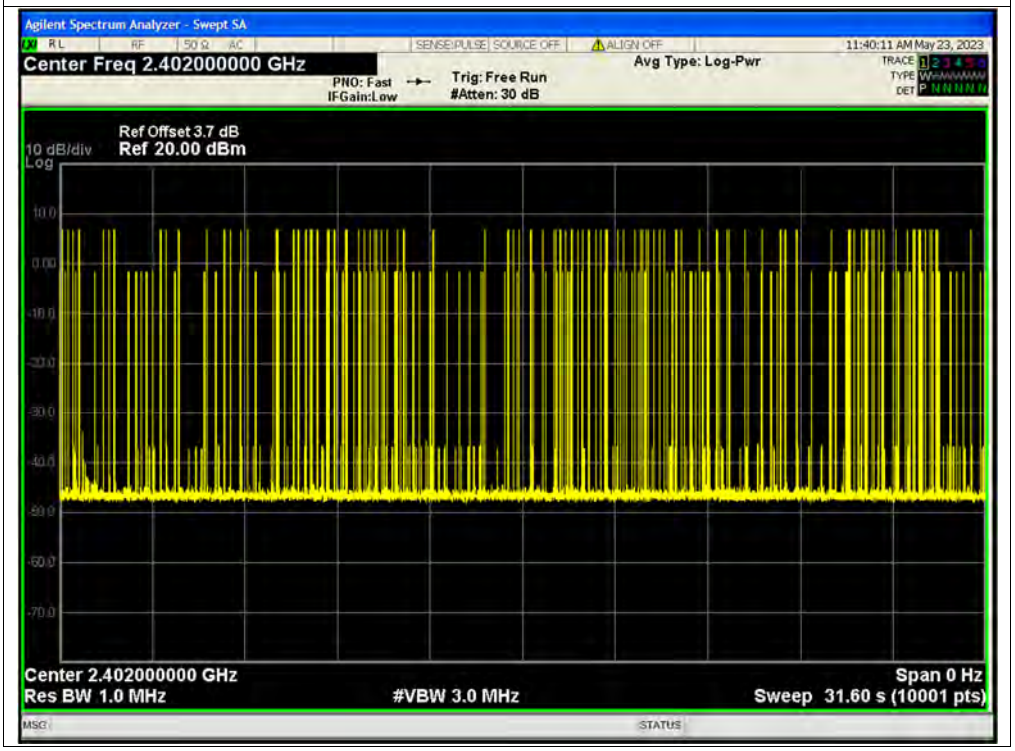

Dwell NVLT 1-DH3 2402MHz Ant1 Accumulated



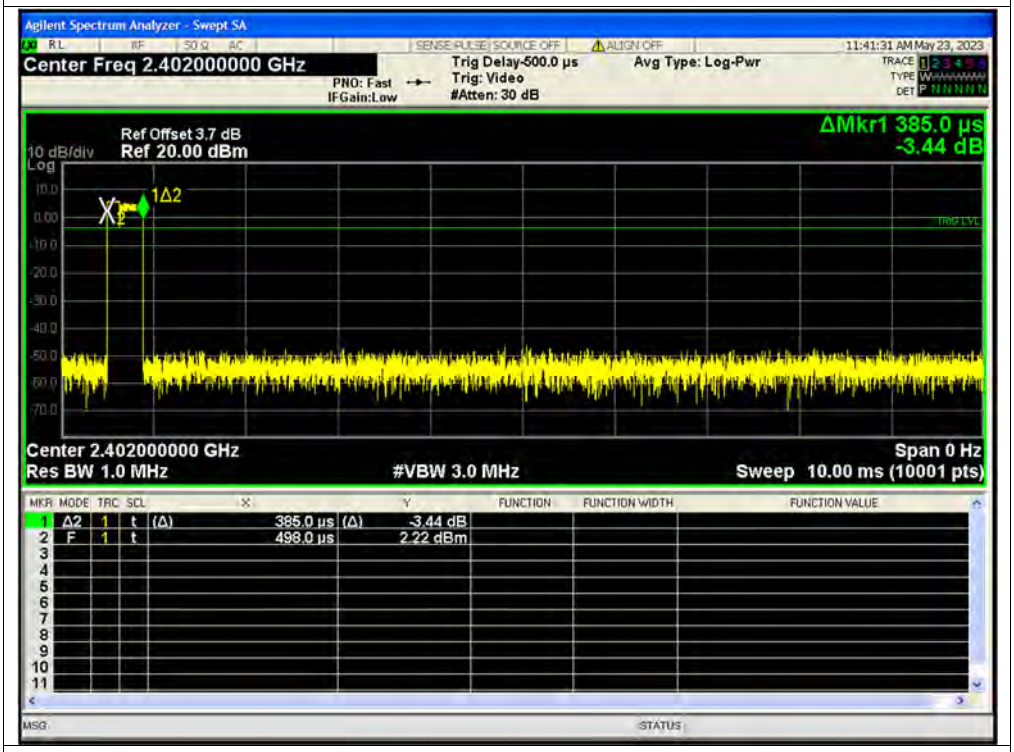
Dwell NVLT 1-DH5 2402MHz Ant1 One Burst



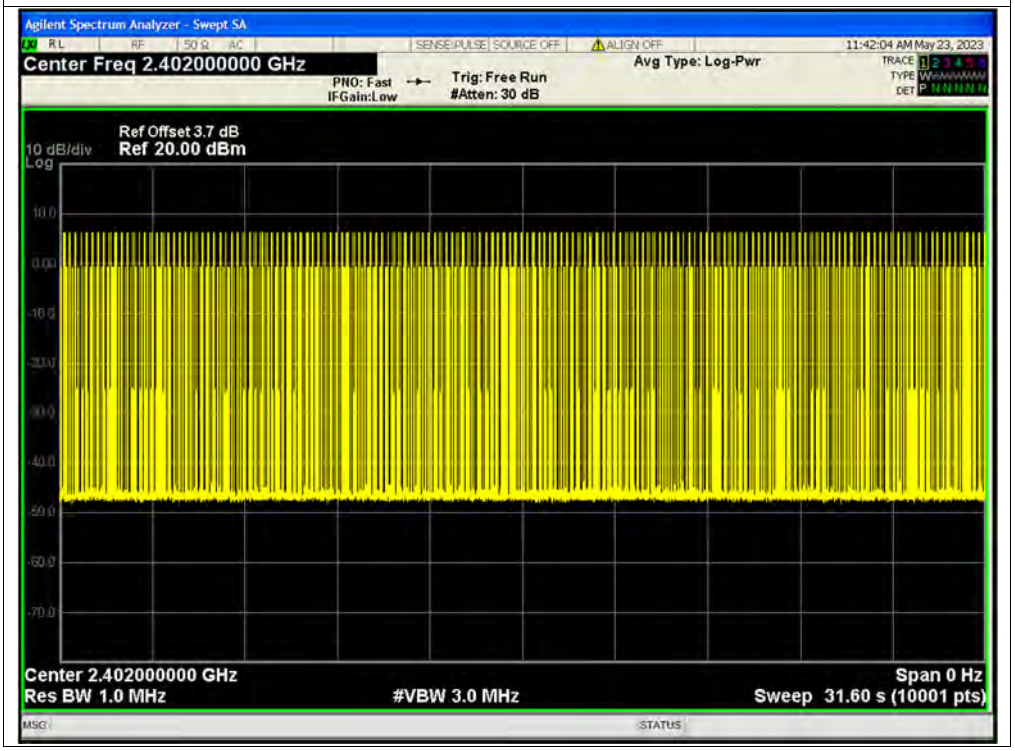

Dwell NVLT 1-DH5 2402MHz Ant1 Accumulated



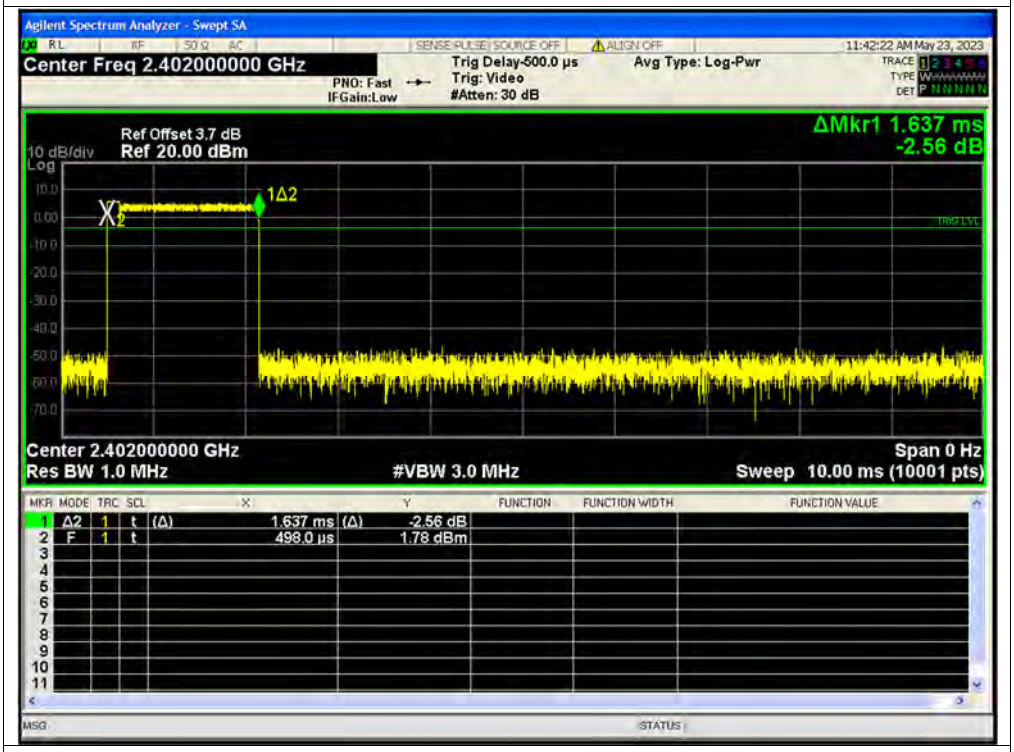
Dwell NVLT 2-DH1 2402MHz Ant1 One Burst



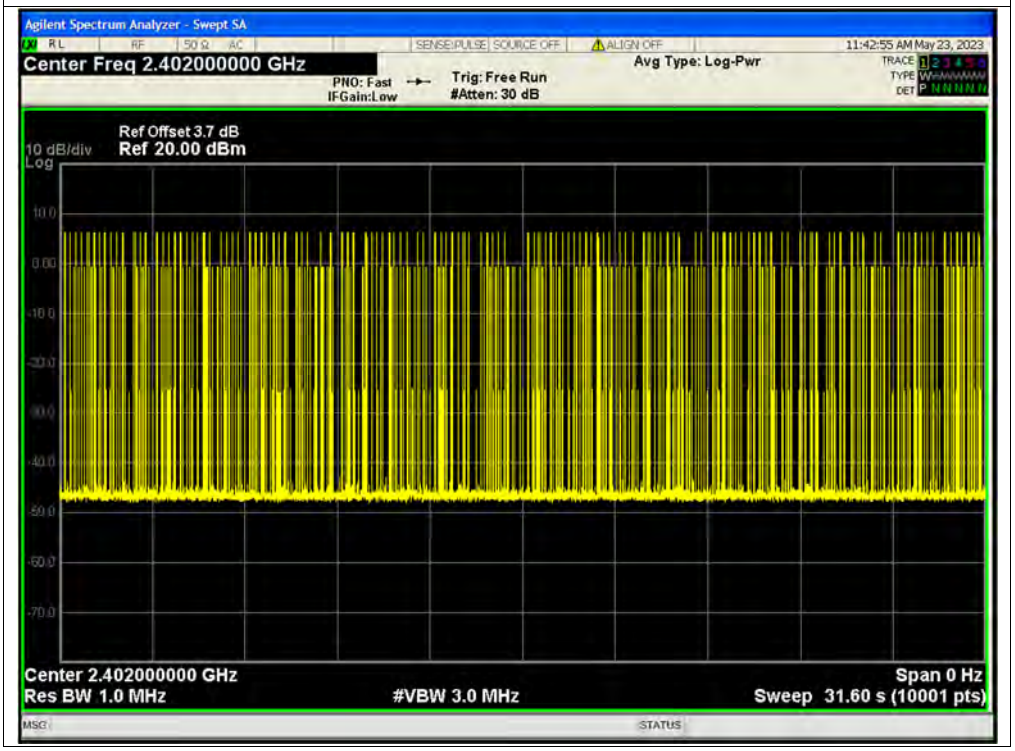

Dwell NVLT 2-DH1 2402MHz Ant1 Accumulated



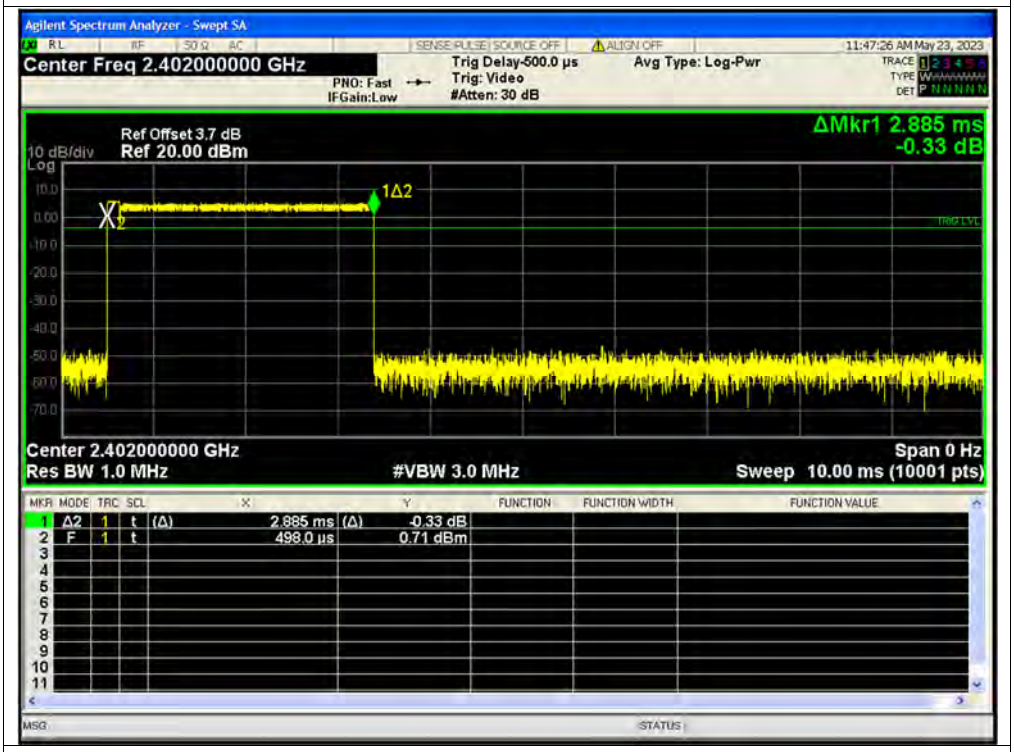
Dwell NVLT 2-DH3 2402MHz Ant1 One Burst



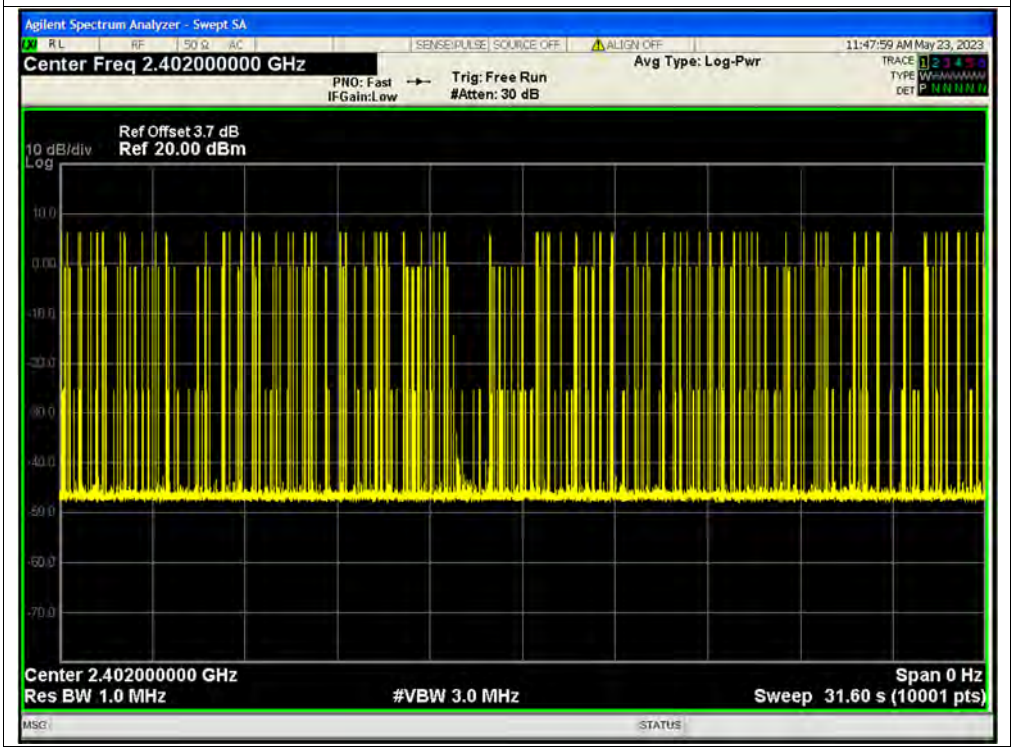

Dwell NVLT 2-DH3 2402MHz Ant1 Accumulated



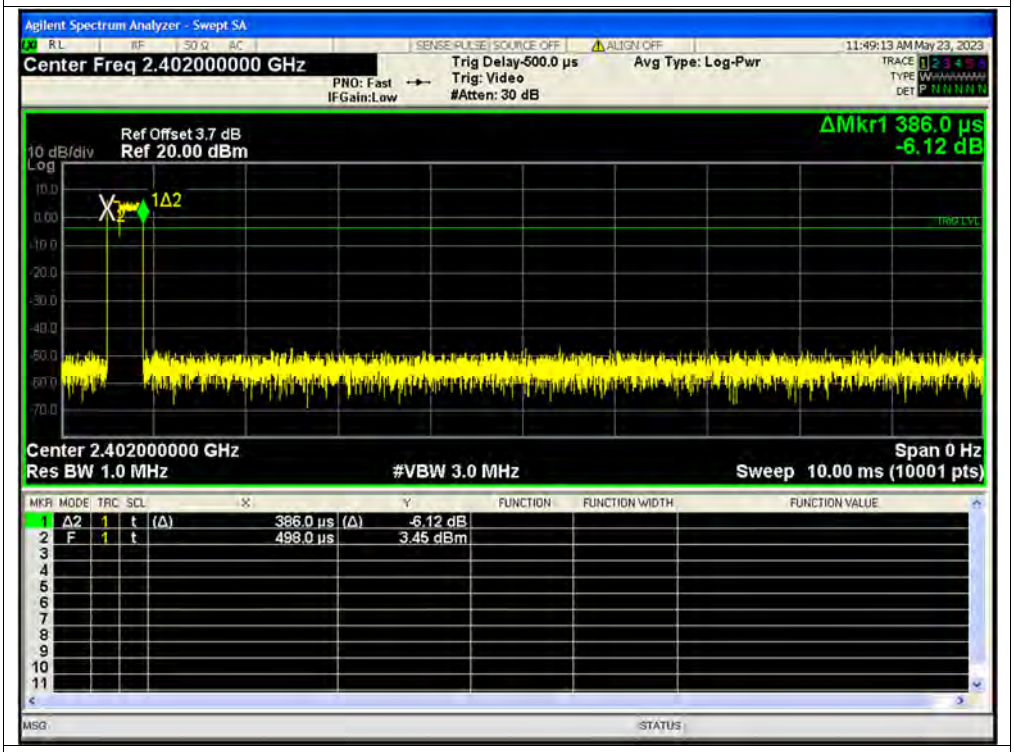
Dwell NVLT 2-DH5 2402MHz Ant1 One Burst



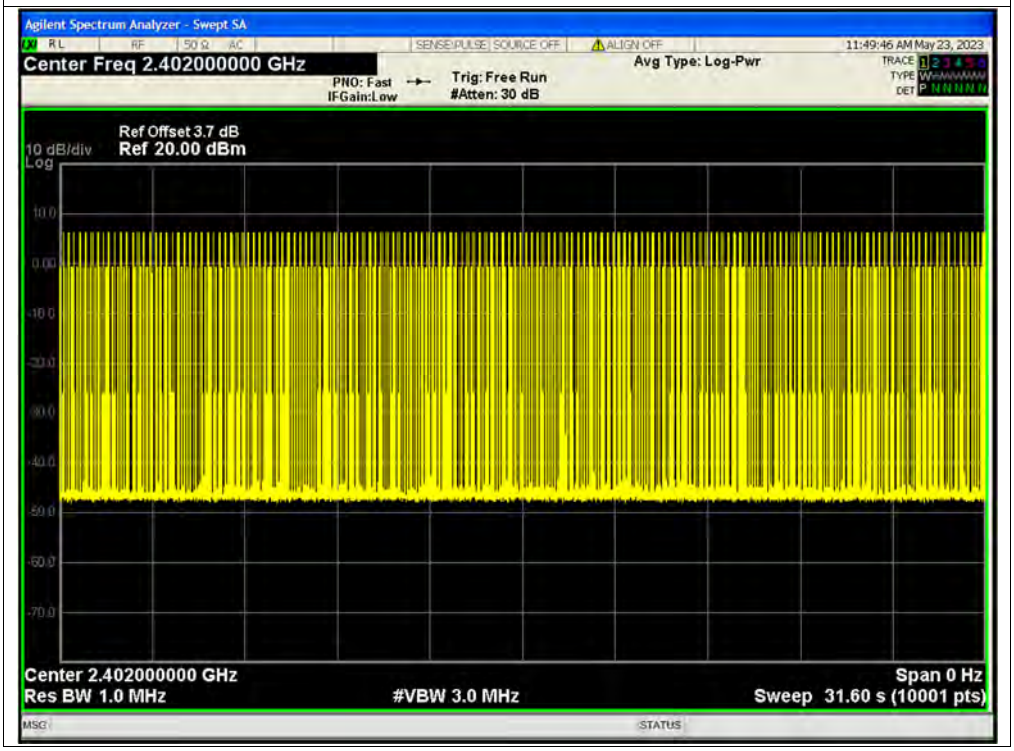

Dwell NVLT 2-DH5 2402MHz Ant1 Accumulated



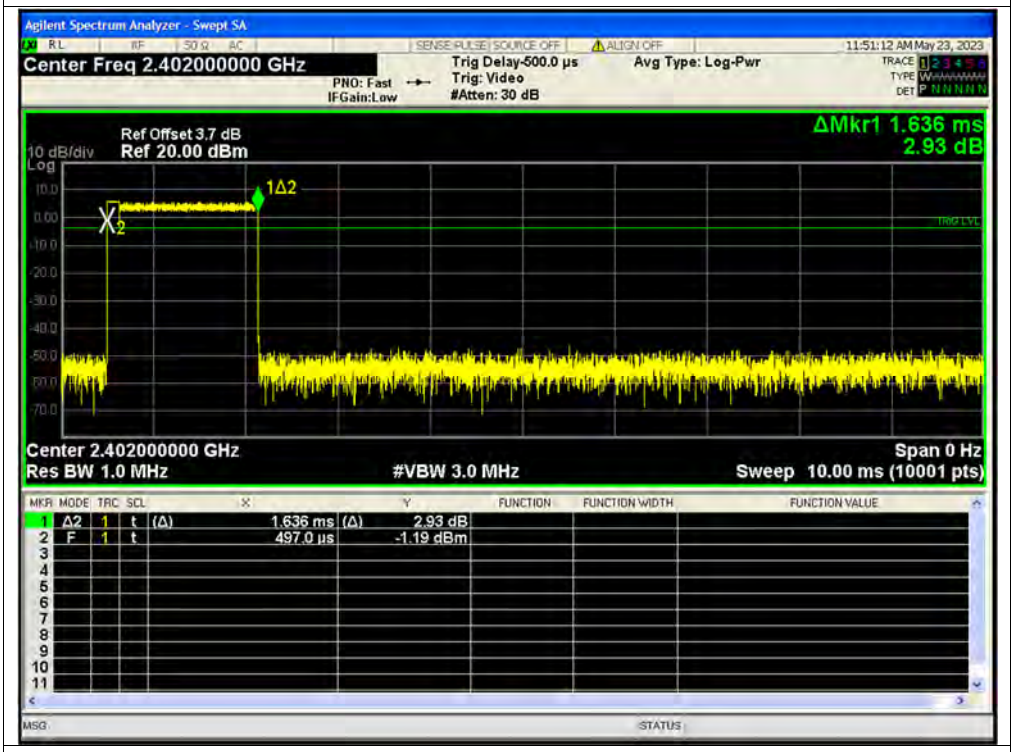
Dwell NVLT 3-DH1 2402MHz Ant1 One Burst



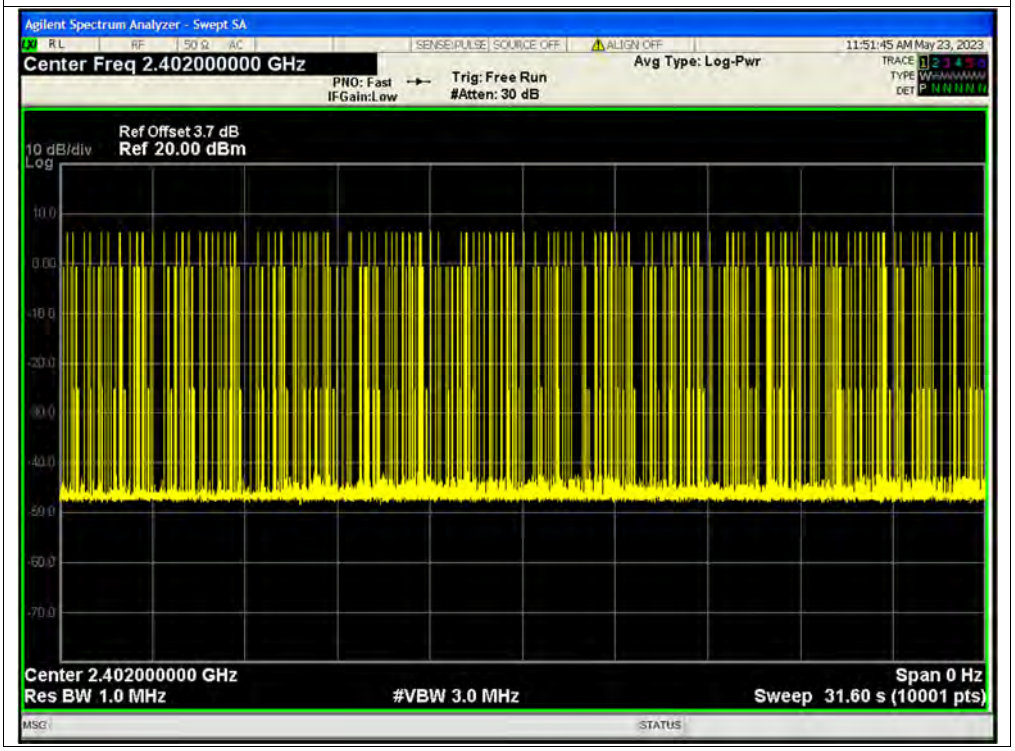

Dwell NVLT 3-DH1 2402MHz Ant1 Accumulated



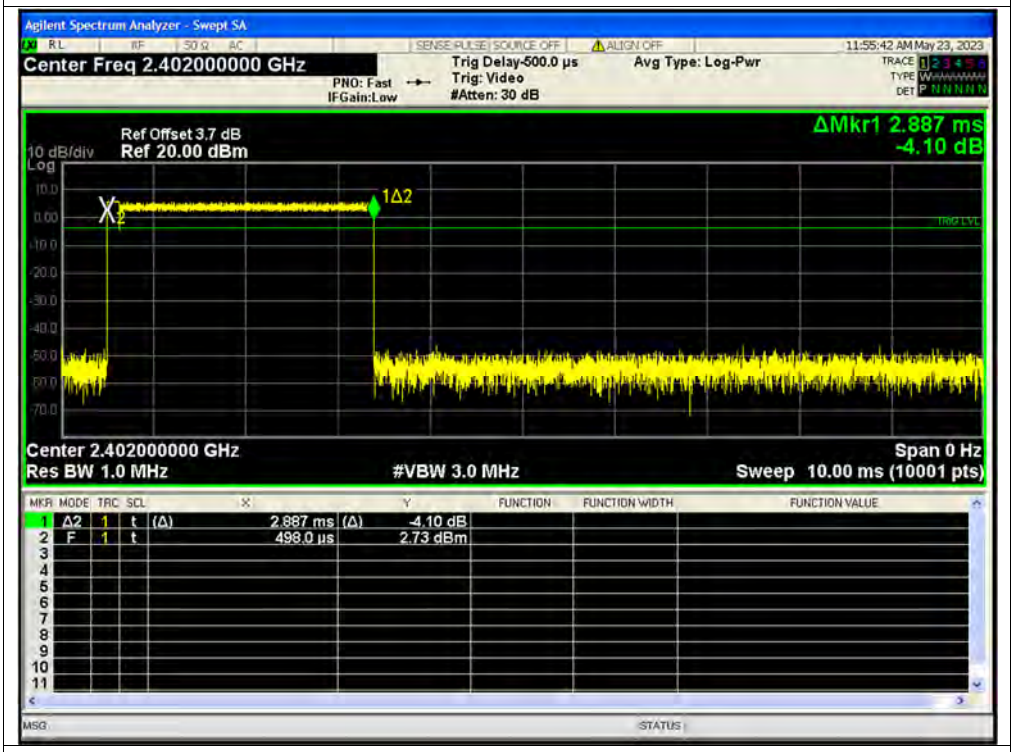
Dwell NVLT 3-DH3 2402MHz Ant1 One Burst



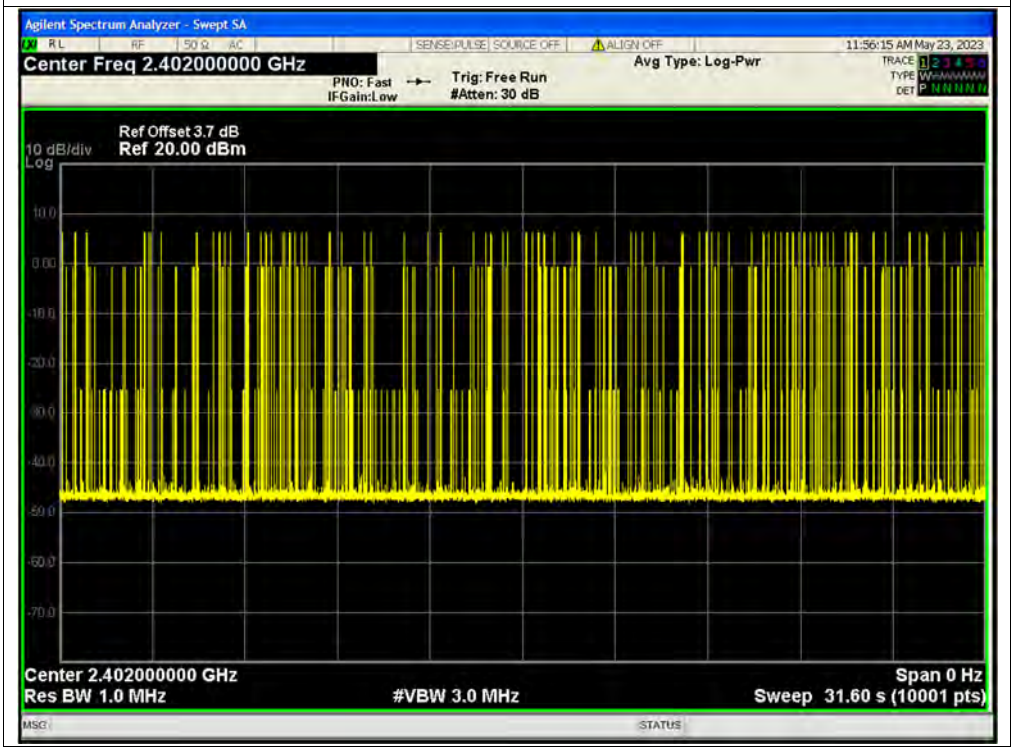

Dwell NVLT 3-DH3 2402MHz Ant1 Accumulated



Dwell NVLT 3-DH5 2402MHz Ant1 One Burst




Dwell NVLT 3-DH5 2402MHz Ant1 Accumulated



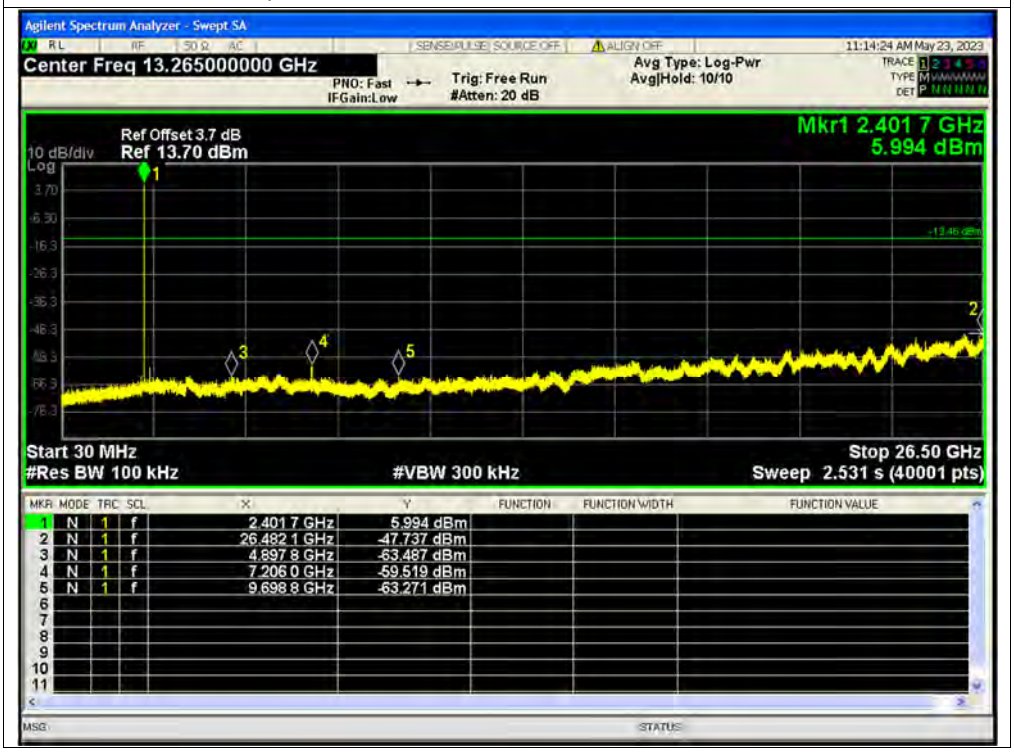
## A.8. Conducted Spurious Emissions

| Condition | Mode | Frequency (MHz) | Antenna | Max Value (dBc) | Limit (dBc) | Verdict |
|---|---|---|---|---|---|---|
| NVNT | 1-DH5 | 2402 | Ant1 | -54.27 | -20 | Pass |
| NVNT | 1-DH5 | 2441 | Ant1 | -54.91 | -20 | Pass |
| NVNT | 1-DH5 | 2480 | Ant1 | -52.8 | -20 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | -53.7 | -20 | Pass |
| NVNT | 2-DH5 | 2441 | Ant1 | -54.68 | -20 | Pass |
| NVNT | 2-DH5 | 2480 | Ant1 | -54.6 | -20 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | -54.11 | -20 | Pass |
| NVNT | 3-DH5 | 2441 | Ant1 | -54.91 | -20 | Pass |
| NVNT | 3-DH5 | 2480 | Ant1 | -52.95 | -20 | Pass |

Test Graphs

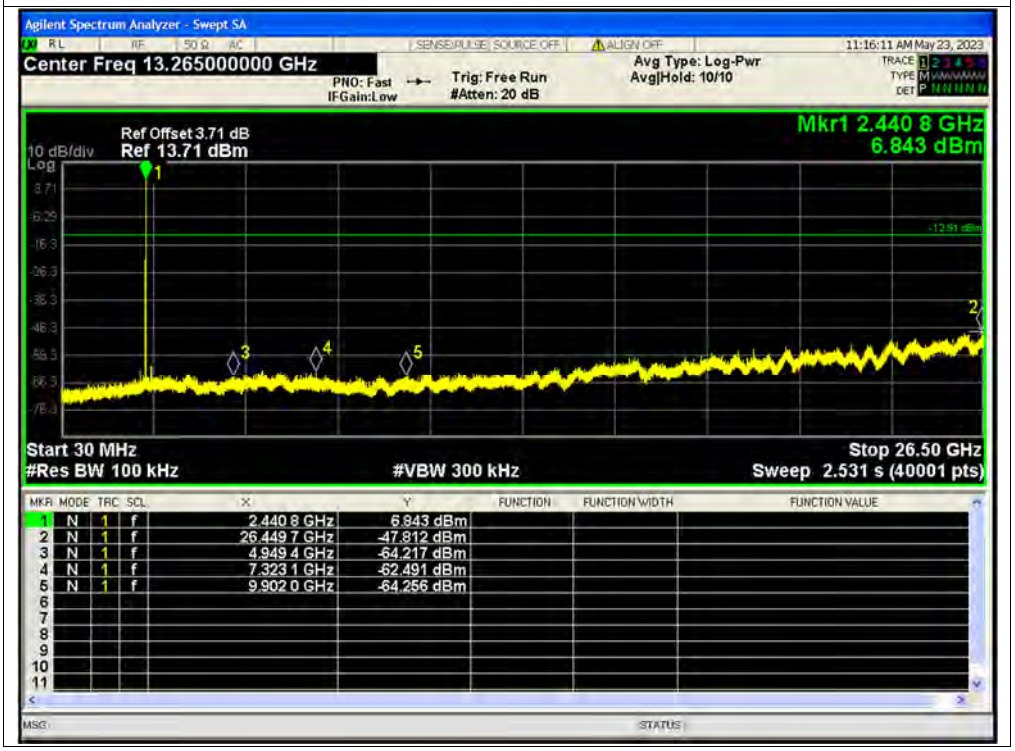
Tx. Spurious NVLT 1-DH5 2402MHz Ant1 Ref

Tx. Spurious NVLT 1-DH5 2402MHz Ant1 Emission



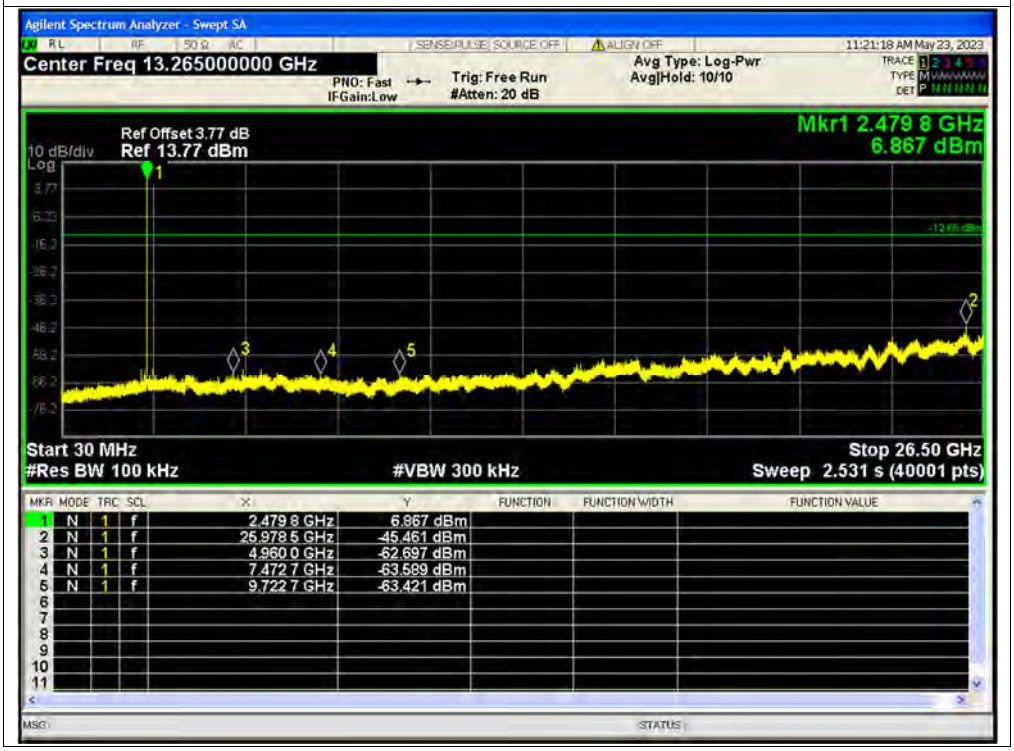
Tx. Spurious NVLT 1-DH5 2441MHz Ant1 Ref

Tx. Spurious NVLT 1-DH5 2441MHz Ant1 Emission



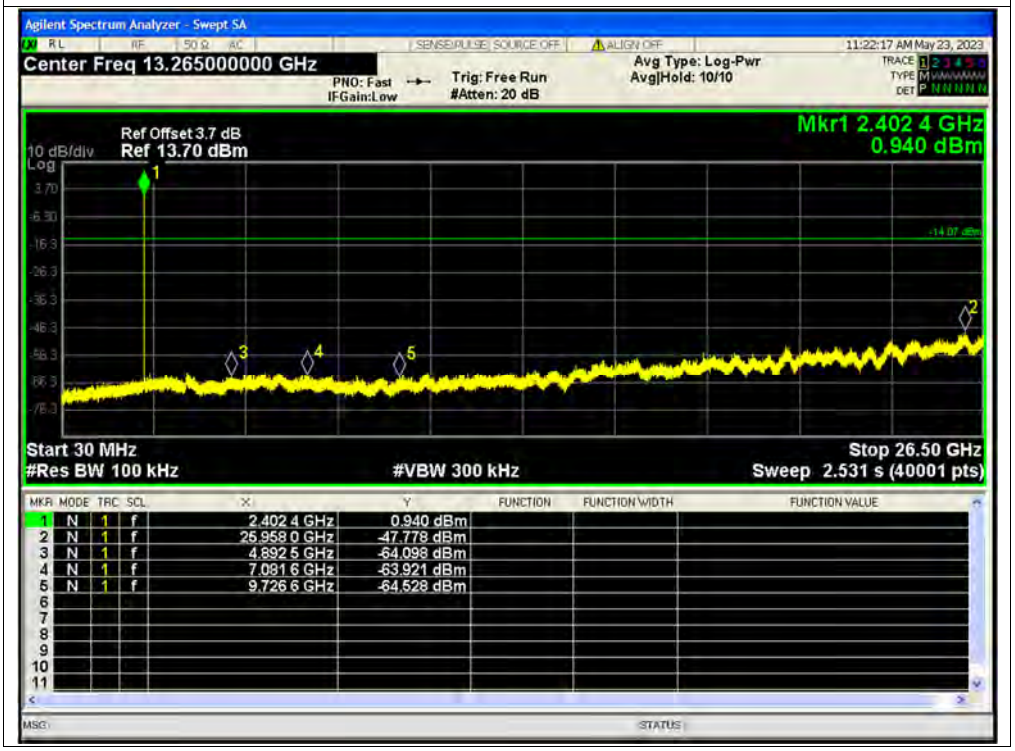
Tx. Spurious NVLT 1-DH5 2480MHz Ant1 Ref

Tx. Spurious NVLT 1-DH5 2480MHz Ant1 Emission



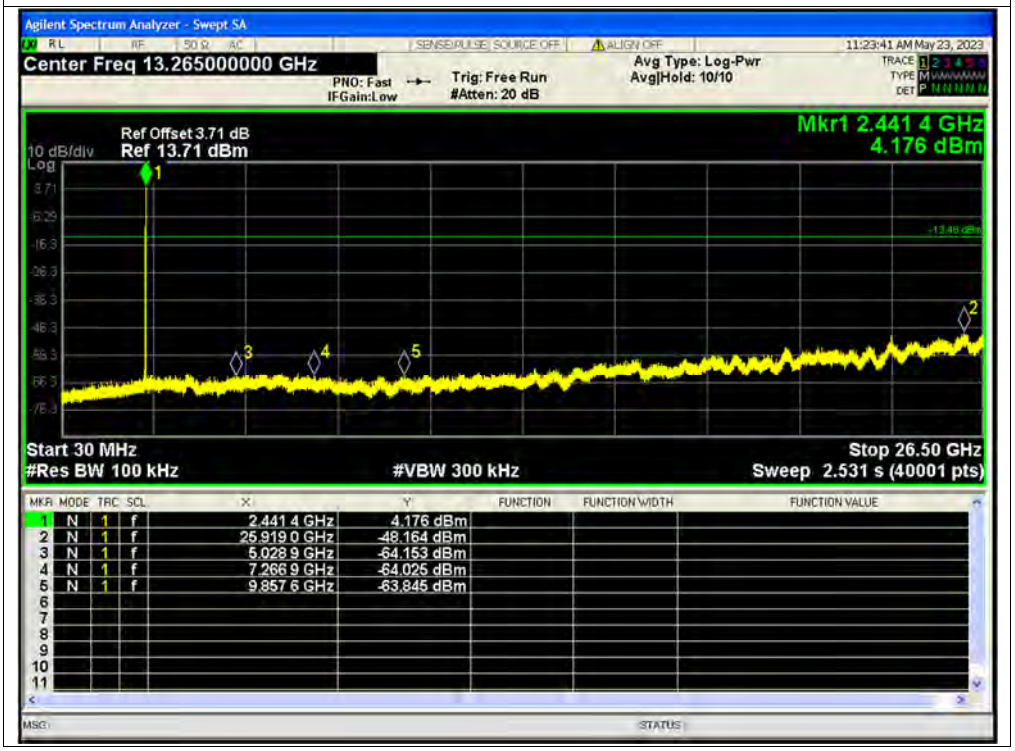
Tx. Spurious NVLT 2-DH5 2402MHz Ant1 Ref

Tx. Spurious NVLT 2-DH5 2402MHz Ant1 Emission



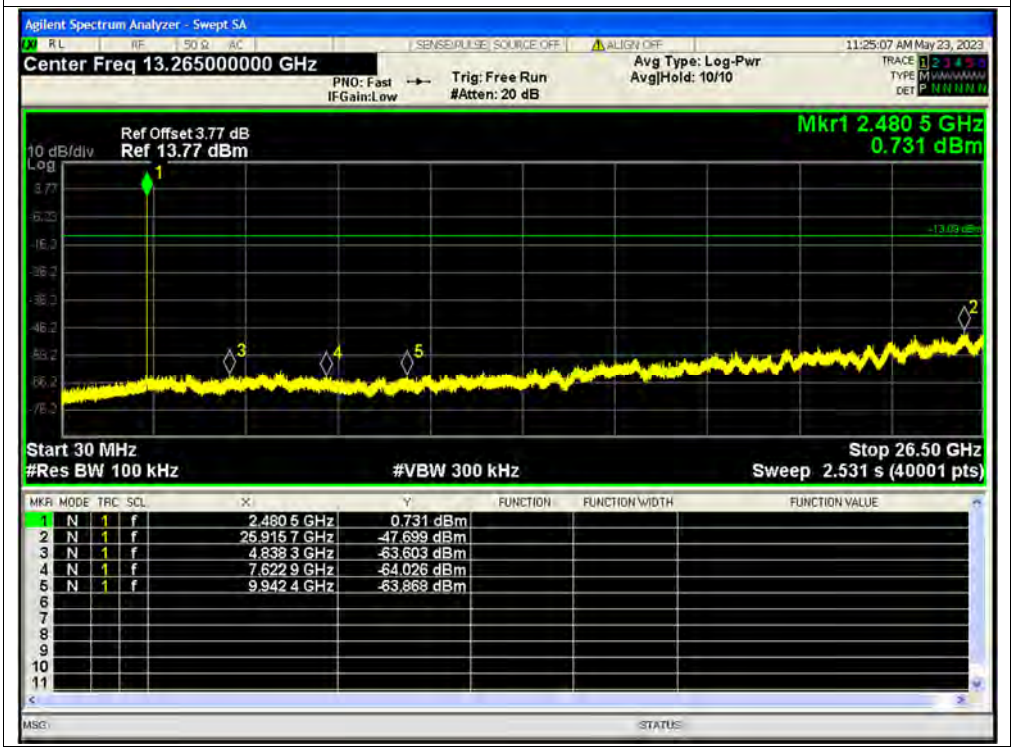
Tx. Spurious NVLT 2-DH5 2441MHz Ant1 Ref

Tx. Spurious NVLT 2-DH5 2441MHz Ant1 Emission



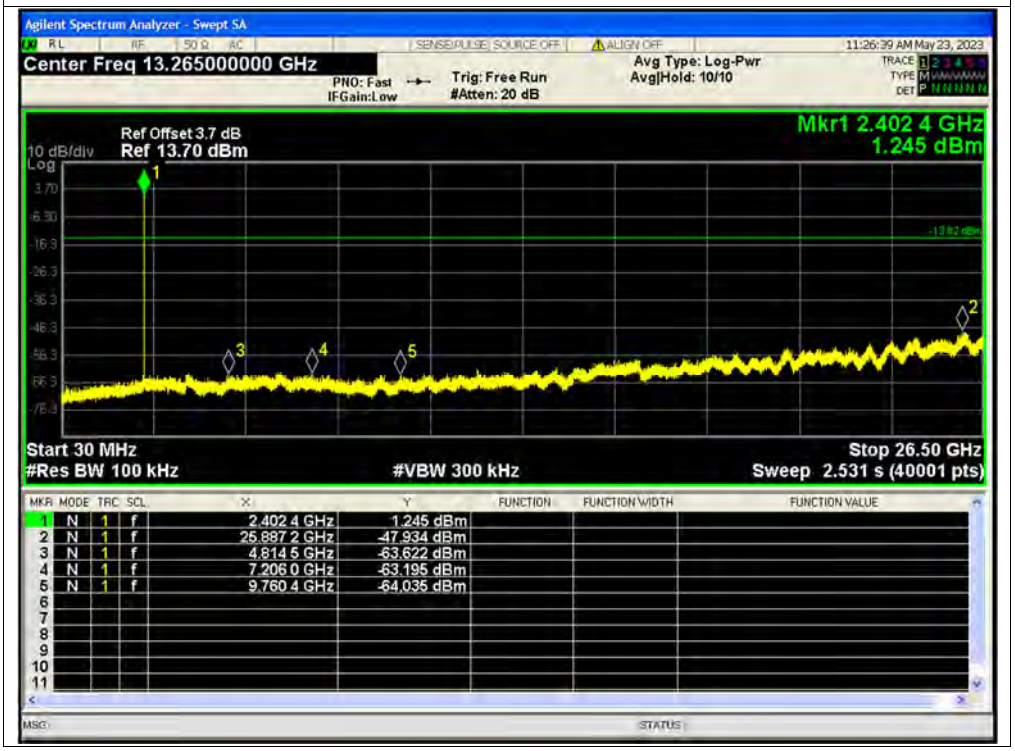
Tx. Spurious NVLT 2-DH5 2480MHz Ant1 Ref

Tx. Spurious NVLT 2-DH5 2480MHz Ant1 Emission



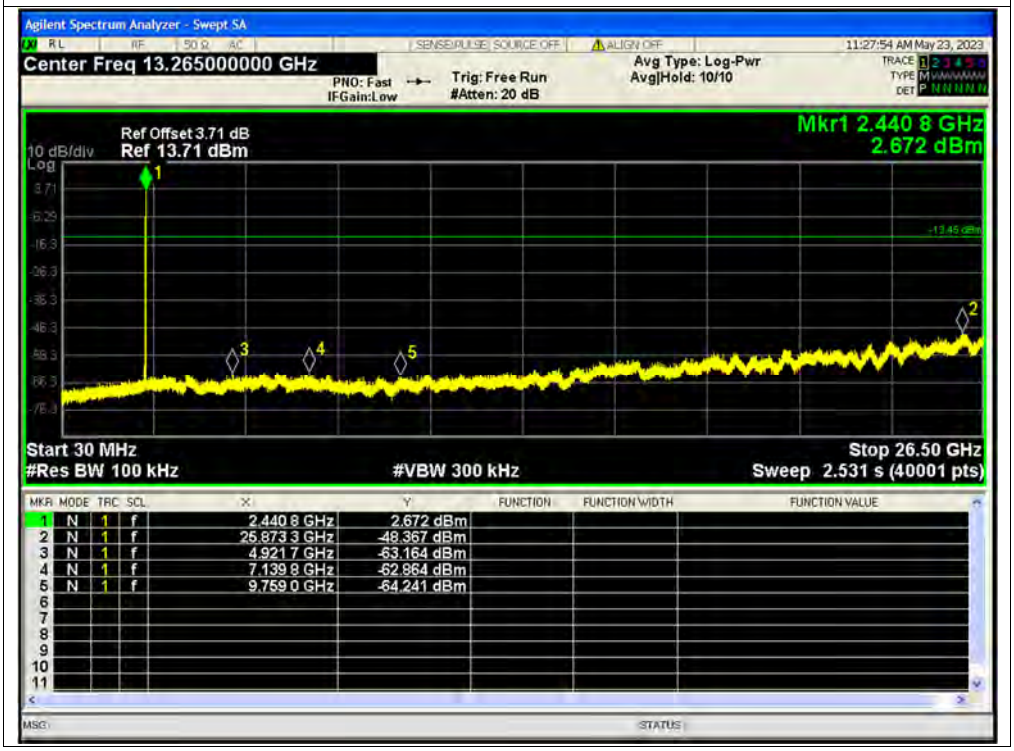
Tx. Spurious NVLT 3-DH5 2402MHz Ant1 Ref

Tx. Spurious NVLT 3-DH5 2402MHz Ant1 Emission



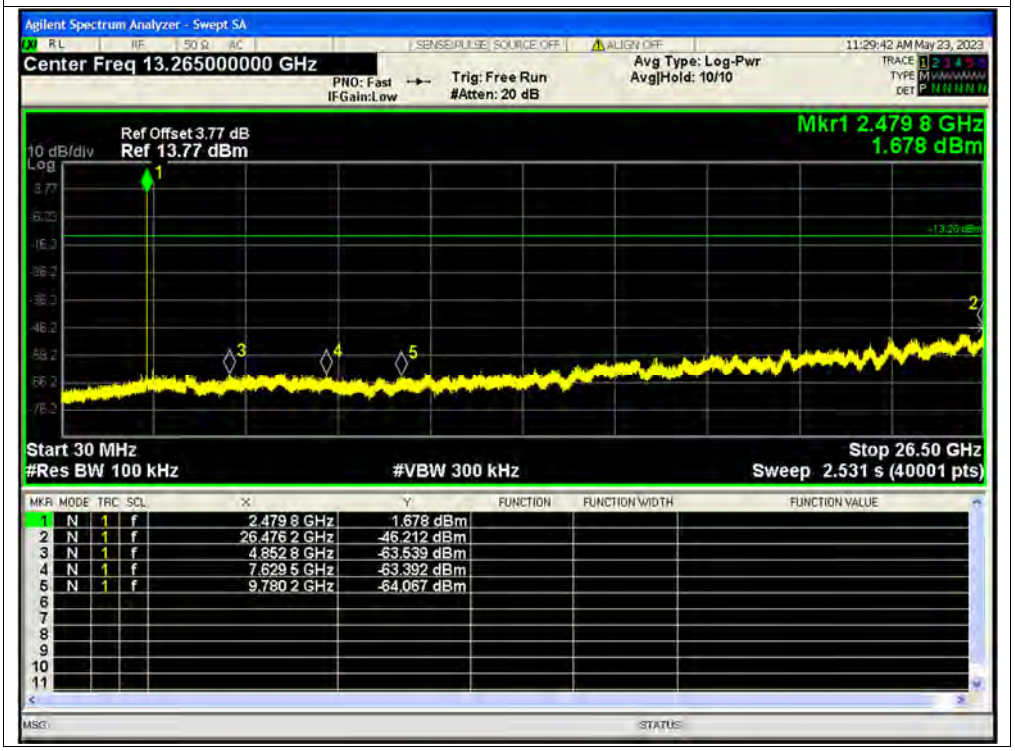
Tx. Spurious NVLT 3-DH5 2441MHz Ant1 Ref

Tx. Spurious NVLT 3-DH5 2441MHz Ant1 Emission



Tx. Spurious NVLT 3-DH5 2480MHz Ant1 Ref

Tx. Spurious NVLT 3-DH5 2480MHz Ant1 Emission

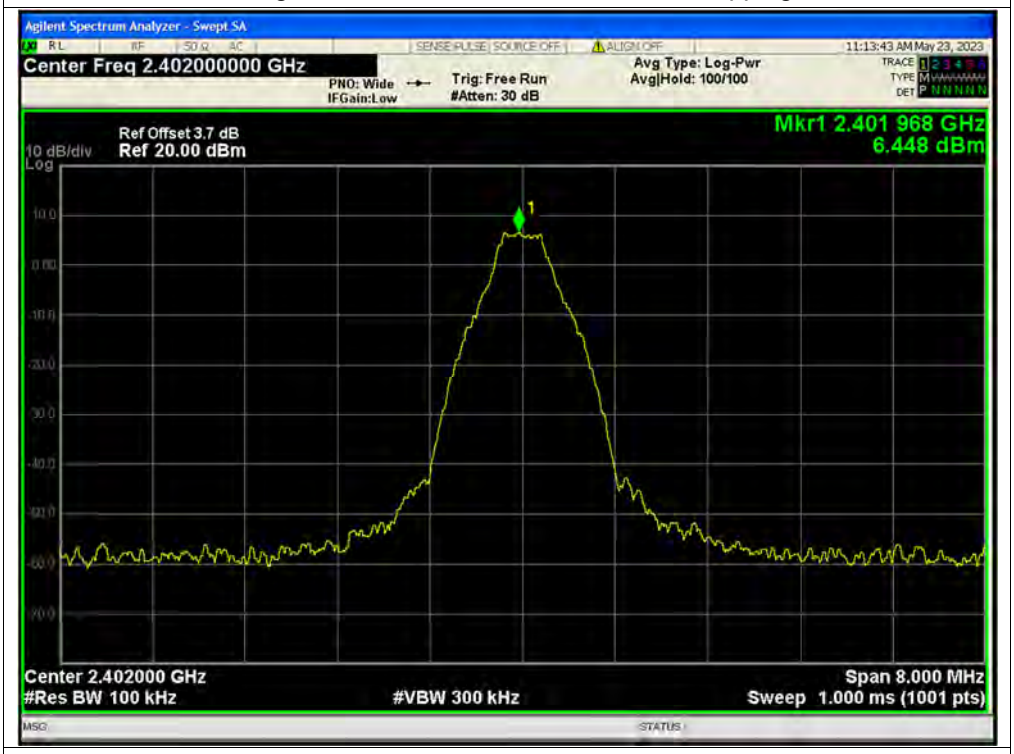


## A.9. Band Edge

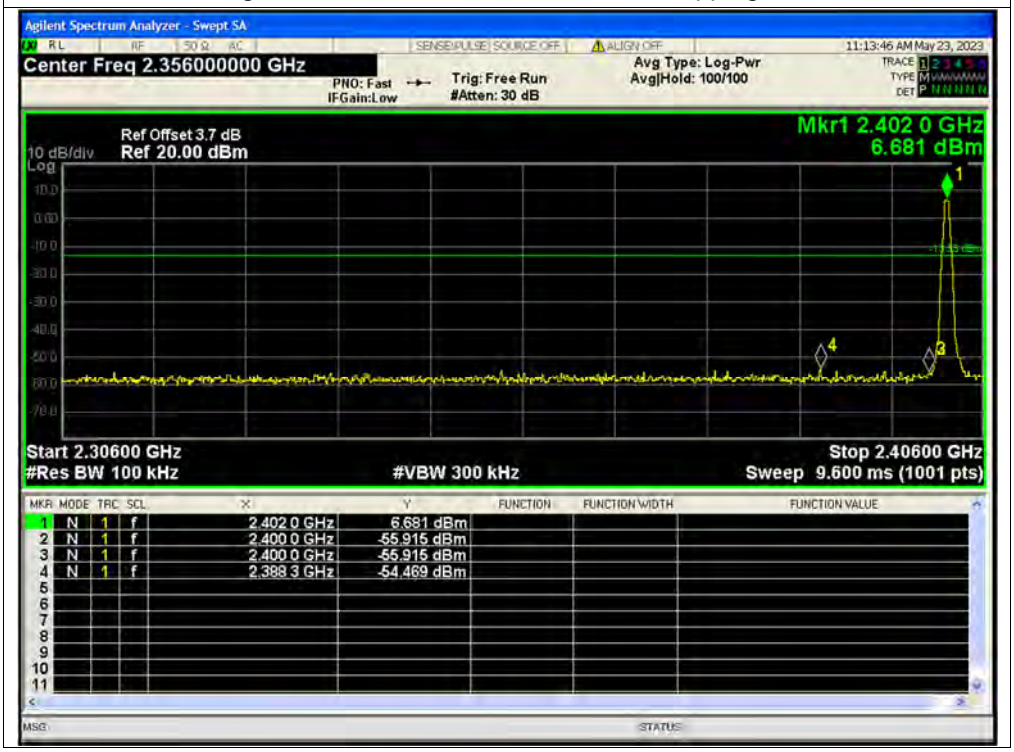
| Condition | Mode | Frequency (MHz) | Antenna | Hopping Mode | Max Value (dBc) | Limit (dBc) | Verdict |
|---|---|---|---|---|---|---|---|
| NVNT | 1-DH5 | 2402 | Ant1 | No-Hopping | -60.91 | -20 | Pass |
| NVNT | 1-DH5 | 2480 | Ant1 | No-Hopping | -61.49 | -20 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | No-Hopping | -58.48 | -20 | Pass |
| NVNT | 2-DH5 | 2480 | Ant1 | No-Hopping | -60.1 | -20 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | No-Hopping | -56.1 | -20 | Pass |
| NVNT | 3-DH5 | 2480 | Ant1 | No-Hopping | -57.33 | -20 | Pass |
| NVNT | 1-DH5 | 2402 | Ant1 | Hopping | -60.81 | -20 | Pass |
| NVNT | 1-DH5 | 2480 | Ant1 | Hopping | -61.4 | -20 | Pass |
| NVNT | 2-DH5 | 2402 | Ant1 | Hopping | -59.77 | -20 | Pass |
| NVNT | 2-DH5 | 2480 | Ant1 | Hopping | -59.35 | -20 | Pass |
| NVNT | 3-DH5 | 2402 | Ant1 | Hopping | -59.68 | -20 | Pass |
| NVNT | 3-DH5 | 2480 | Ant1 | Hopping | -60.83 | -20 | Pass |

Test Graphs

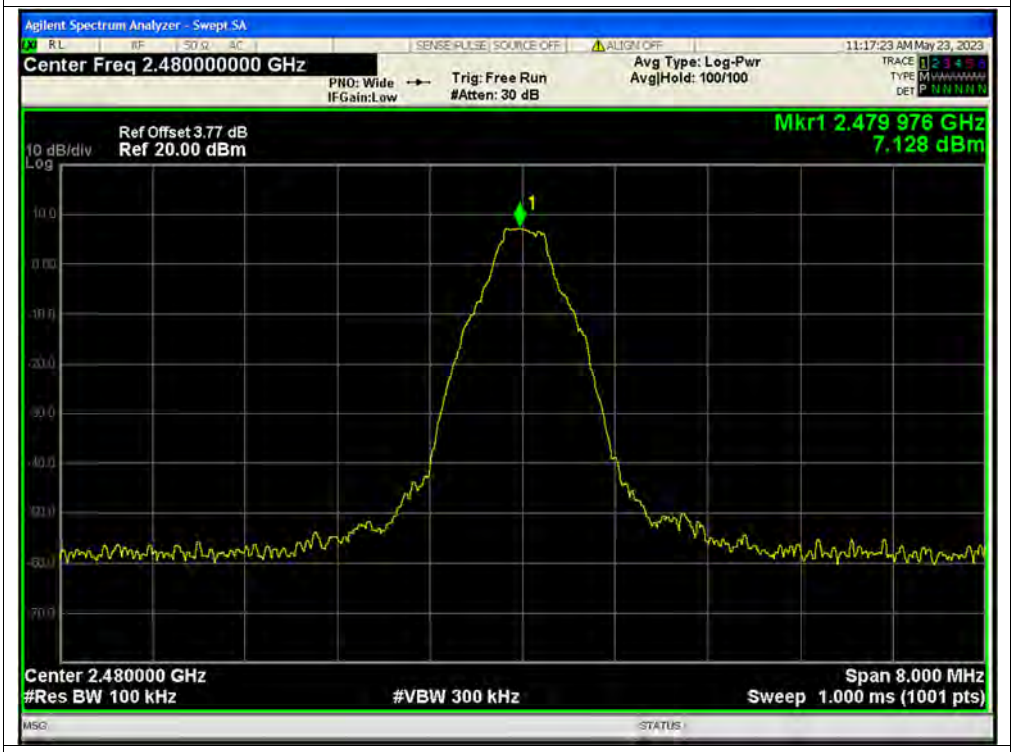
Band Edge NVLT 1-DH5 2402MHz Ant1 No-Hopping Ref



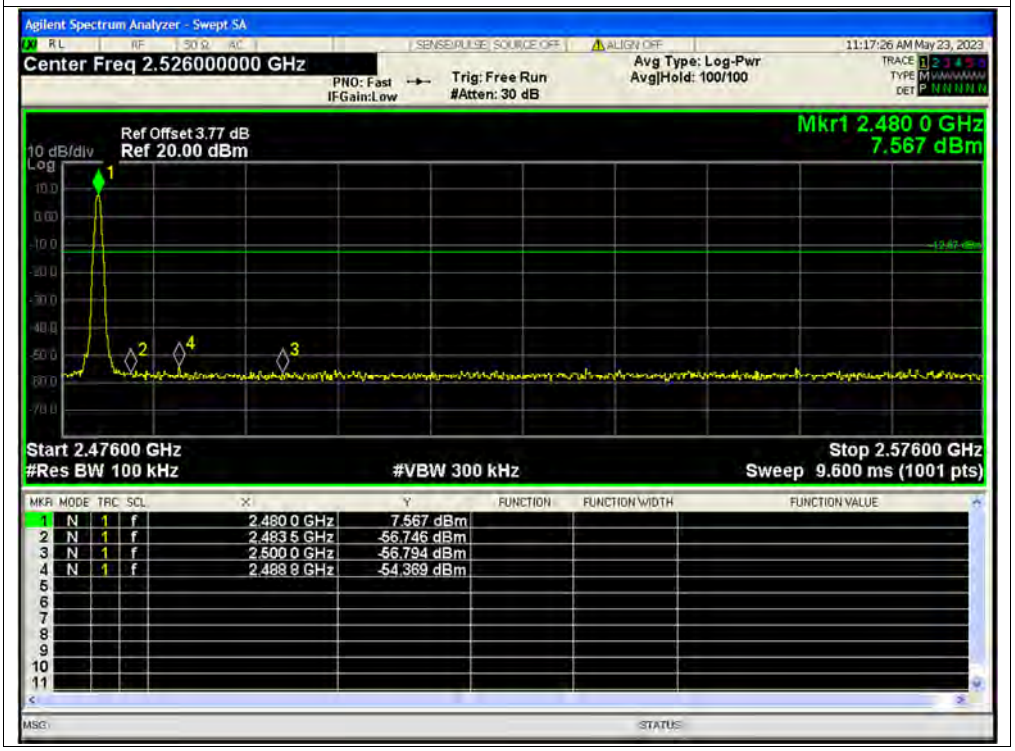

Band Edge NVLT 1-DH5 2402MHz Ant1 No-Hopping Emission



Band Edge NVLT 1-DH5 2480MHz Ant1 No-Hopping Ref

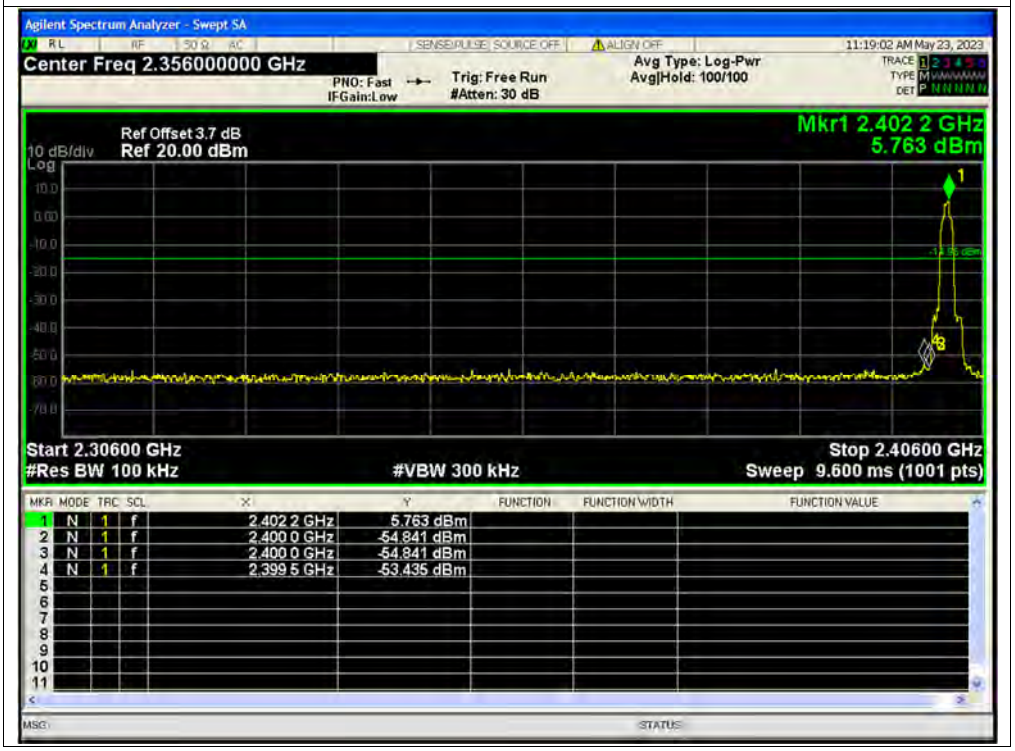



Band Edge NVLT 1-DH5 2480MHz Ant1 No-Hopping Emission



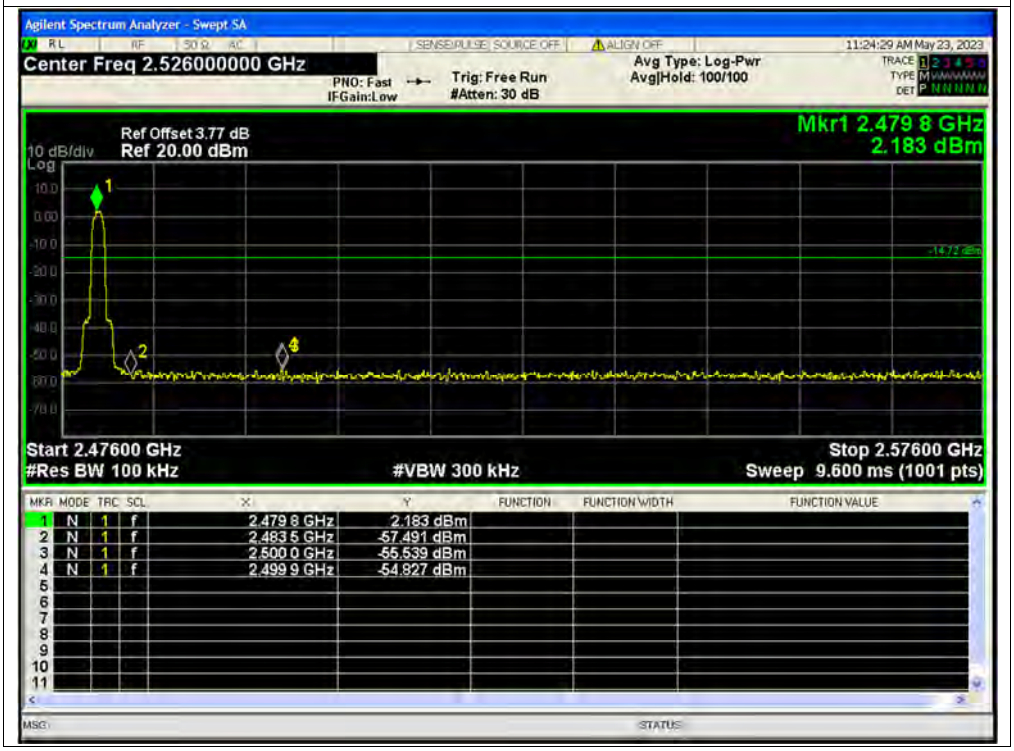
Band Edge NVLT 2-DH5 2402MHz Ant1 No-Hopping Ref

Band Edge NVLT 2-DH5 2402MHz Ant1 No-Hopping Emission



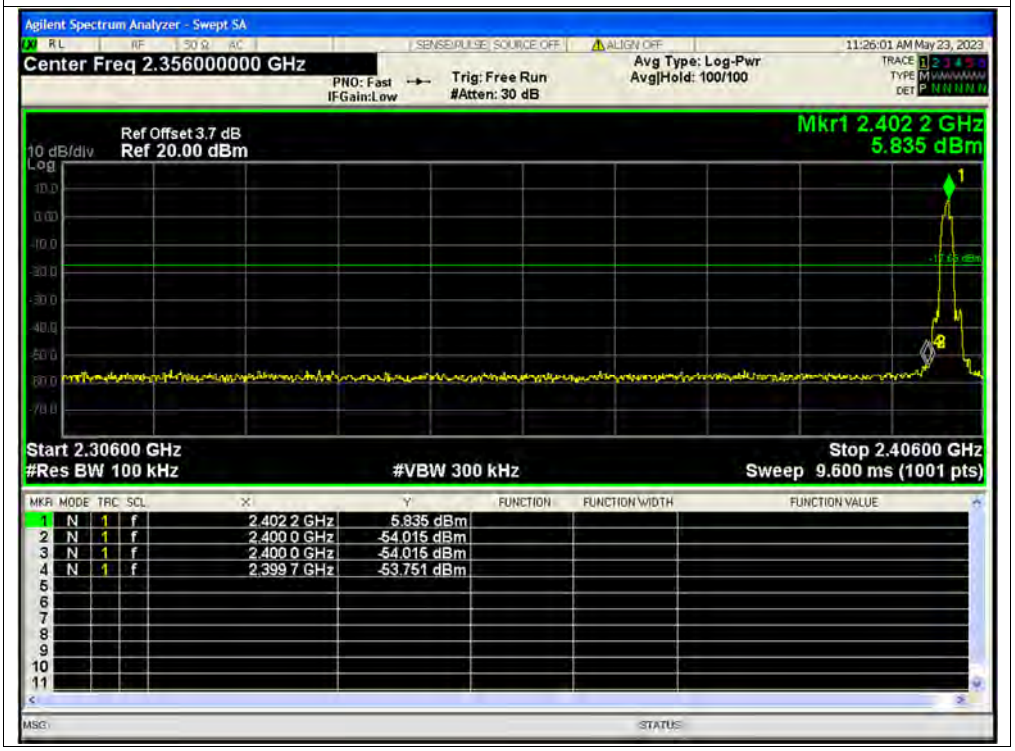
Band Edge NVLT 2-DH5 2480MHz Ant1 No-Hopping Ref

Band Edge NVLT 2-DH5 2480MHz Ant1 No-Hopping Emission



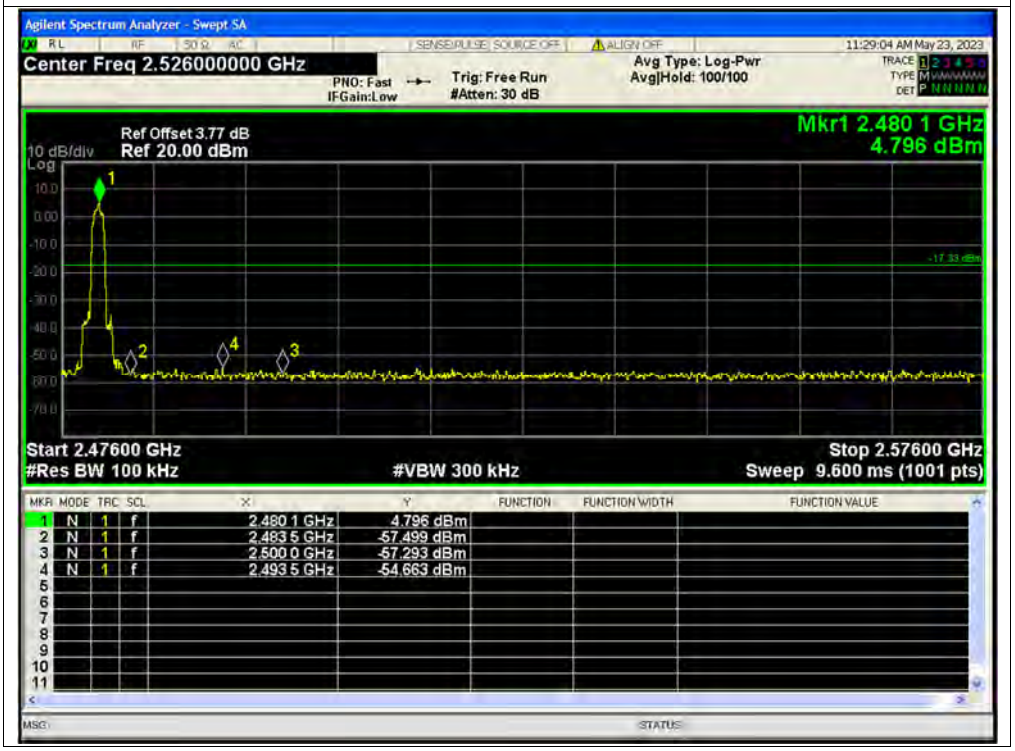
Band Edge NVLT 3-DH5 2402MHz Ant1 No-Hopping Ref

Band Edge NVLT 3-DH5 2402MHz Ant1 No-Hopping Emission



Band Edge NVLT 3-DH5 2480MHz Ant1 No-Hopping Ref

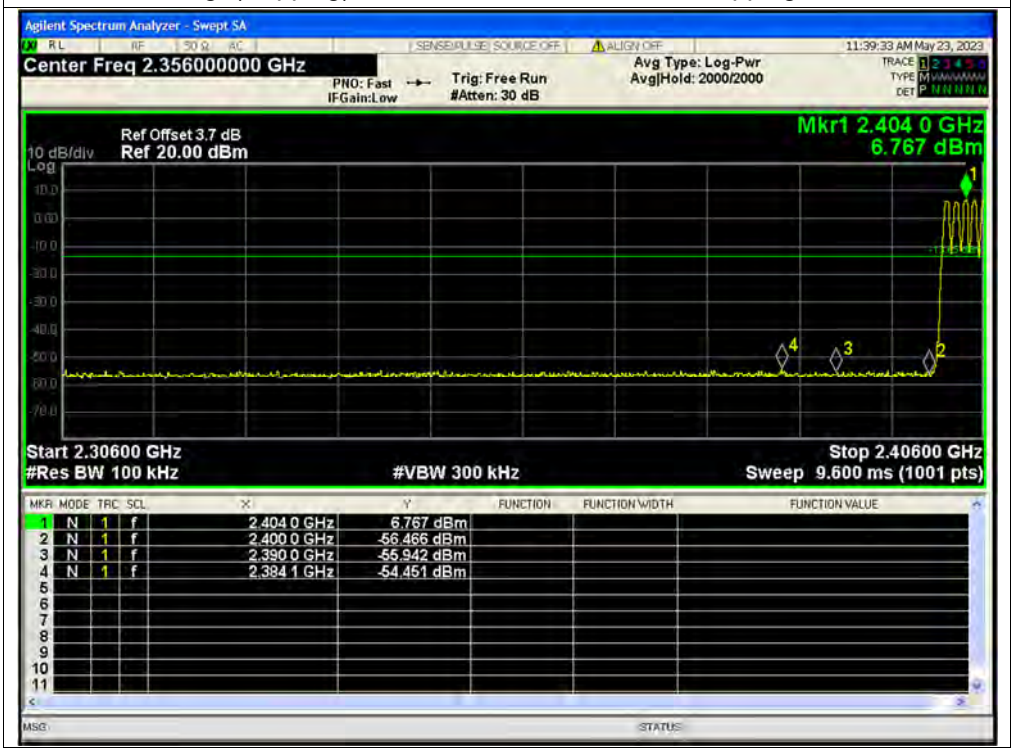
Band Edge NVLT 3-DH5 2480MHz Ant1 No-Hopping Emission



Test Graphs

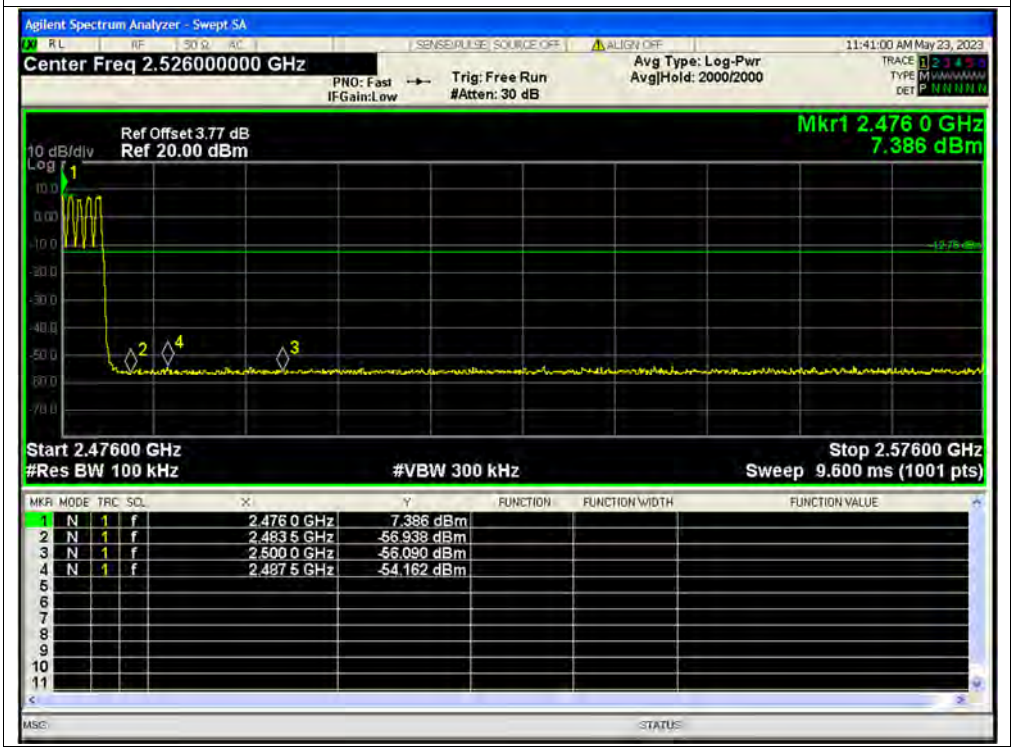
Band Edge(Hopping) NVLT 1-DH5 2402MHz Ant1 Hopping Ref

Band Edge(Hopping) NVLT 1-DH5 2402MHz Ant1 Hopping Emission



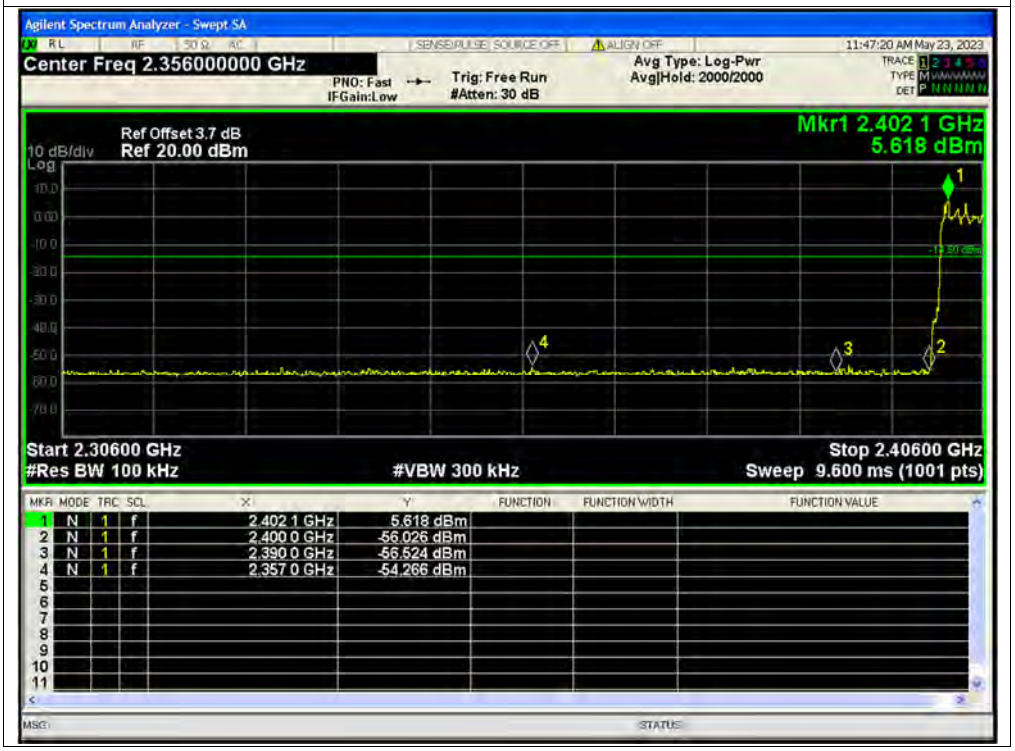
Band Edge(Hopping) NVLT 1-DH5 2480MHz Ant1 Hopping Ref

Band Edge(Hopping) NVLT 1-DH5 2480MHz Ant1 Hopping Emission



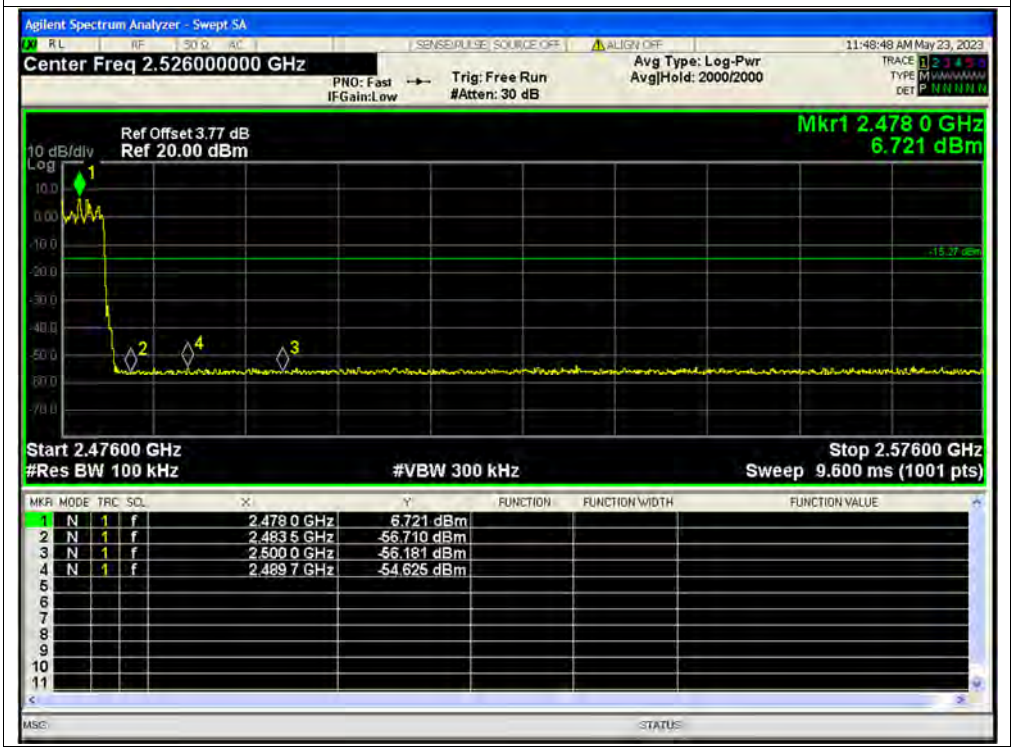
Band Edge(Hopping) NVLT 2-DH5 2402MHz Ant1 Hopping Ref

Band Edge(Hopping) NVLT 2-DH5 2402MHz Ant1 Hopping Emission



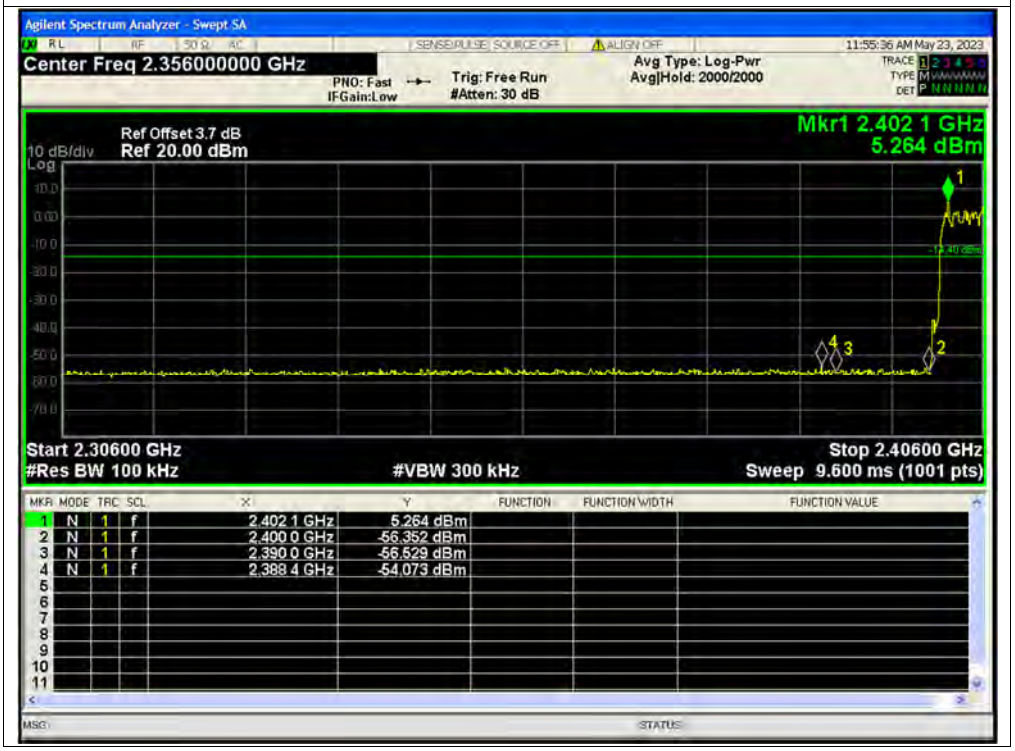
Band Edge(Hopping) NVLT 2-DH5 2480MHz Ant1 Hopping Ref

Band Edge(Hopping) NVLT 2-DH5 2480MHz Ant1 Hopping Emission



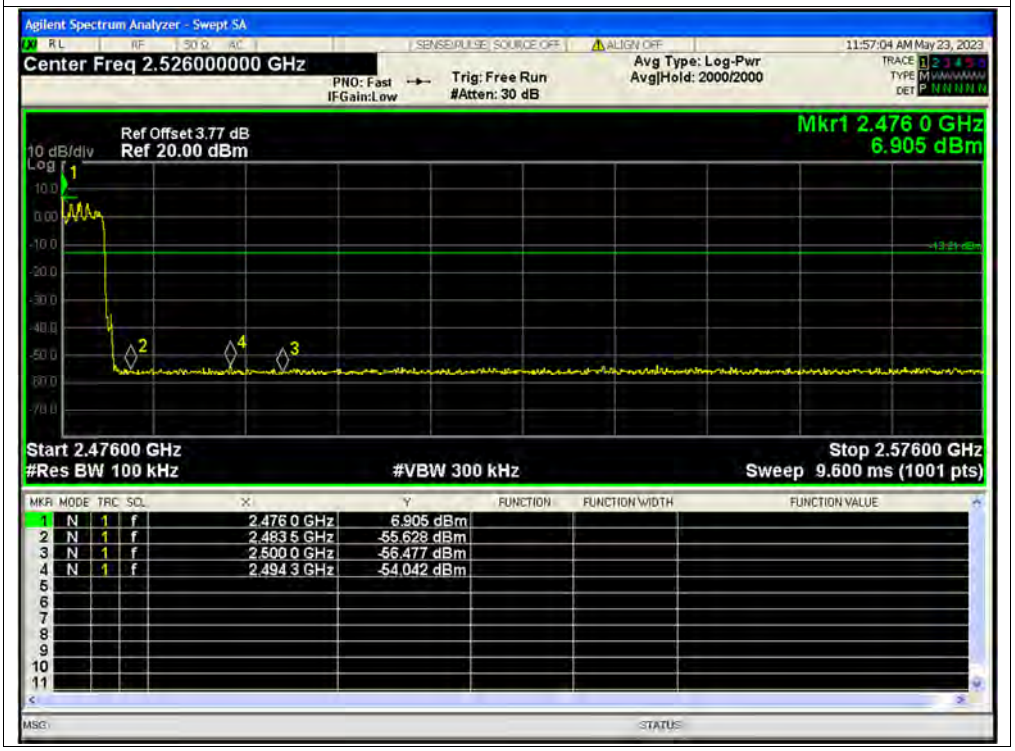
Band Edge(Hopping) NVLT 3-DH5 2402MHz Ant1 Hopping Ref

Band Edge(Hopping) NVLT 3-DH5 2402MHz Ant1 Hopping Emission



Band Edge(Hopping) NVLT 3-DH5 2480MHz Ant1 Hopping Ref

Band Edge(Hopping) NVLT 3-DH5 2480MHz Ant1 Hopping Emission



## A.10. Conducted Emission

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

**Note:** Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

**A. Test Setup:**

Test Mode: EUT + PC + PC adapter + BT TX

Test voltage: AC 120V/60Hz

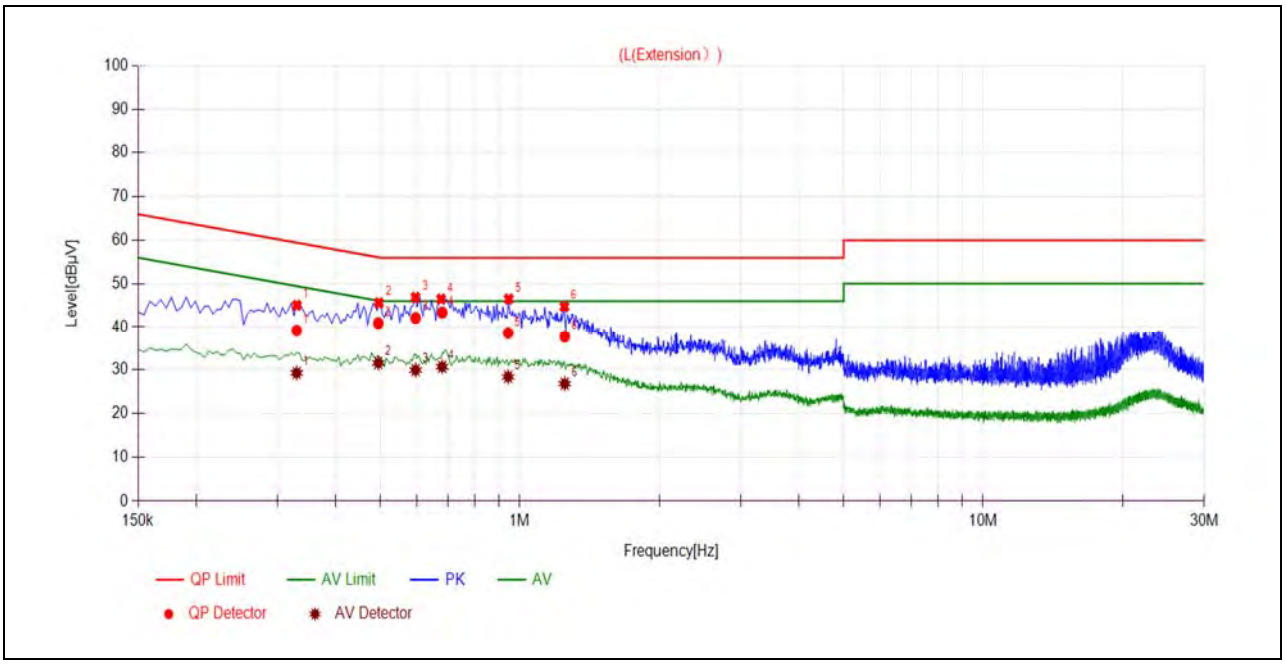
The measurement results are obtained as below:

E [dBμV] $=U_R + L_{Cable\ loss}$ [dB] + $A_{Factor}$

$U_R$: Receiver Reading

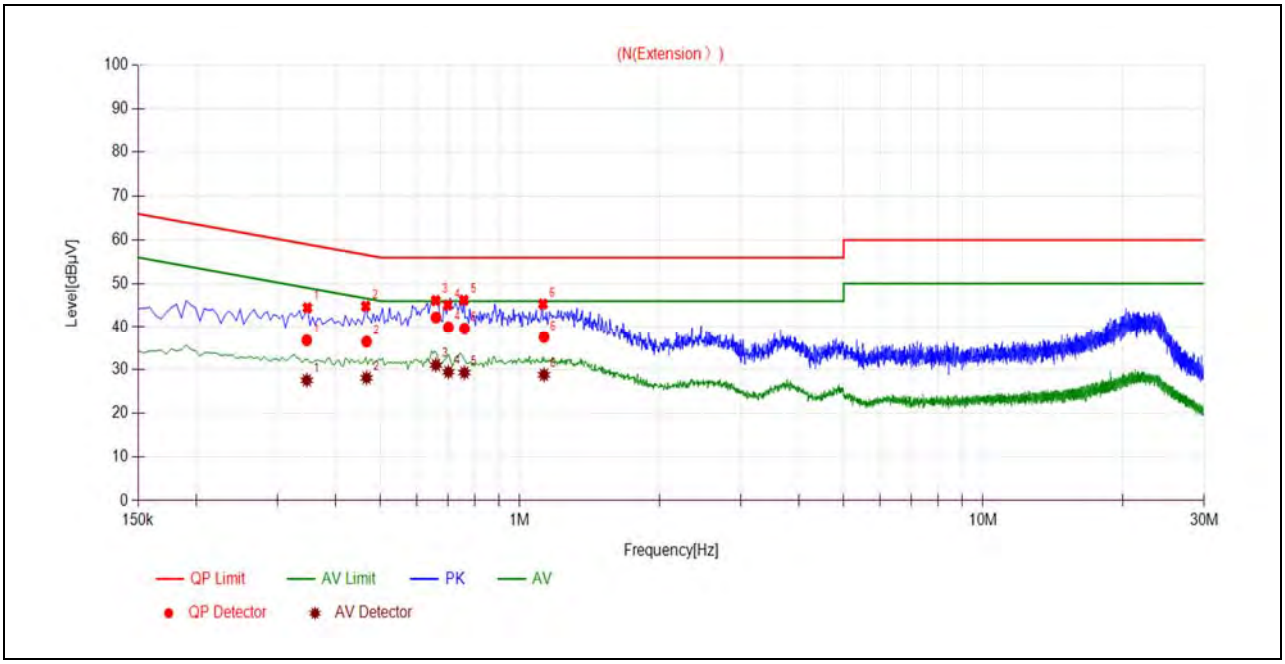
$A_{Factor}$: Voltage division factor of LISN

**B. Test Plot:**




(L Phase)

| No. | Fre. (MHz) | Emission Level (dBμV) | | Limit (dBμV) | | Power-line | Verdict |
|---|---|---|---|---|---|---|---|
| | | Quai-peak | Average | Quai-peak | Average | | |
| 1 | 0.3299 | 39.12 | 29.28 | 59.45 | 49.45 | Line | PASS |
| 2 | 0.4949 | 40.89 | 31.57 | 56.08 | 46.08 | | PASS |
| 3 | 0.5959 | 42.08 | 29.95 | 56.00 | 46.00 | | PASS |
| 4 | 0.6798 | 43.37 | 30.70 | 56.00 | 46.00 | | PASS |
| 5 | 0.9439 | 38.55 | 28.37 | 56.00 | 46.00 | | PASS |
| 6 | 1.2501 | 37.69 | 26.80 | 56.00 | 46.00 | | PASS |




(N Phase)

| No. | Fre. (MHz) | Emission Level (dBµV) | | Limit (dBµV) | | Power-line | Verdict |
|---|---|---|---|---|---|---|---|
| | | Quai-peak | Average | Quai-peak | Average | | |
| 1 | 0.3469 | 36.81 | 27.58 | 59.04 | 49.04 | Neutral | PASS |
| 2 | 0.4670 | 36.51 | 28.12 | 56.57 | 46.57 | | PASS |
| 3 | 0.6589 | 42.22 | 31.08 | 56.00 | 46.00 | | PASS |
| 4 | 0.7014 | 39.91 | 29.49 | 56.00 | 46.00 | | PASS |
| 5 | 0.7594 | 39.59 | 29.34 | 56.00 | 46.00 | | PASS |
| 6 | 1.1276 | 37.58 | 28.82 | 56.00 | 46.00 | | PASS |

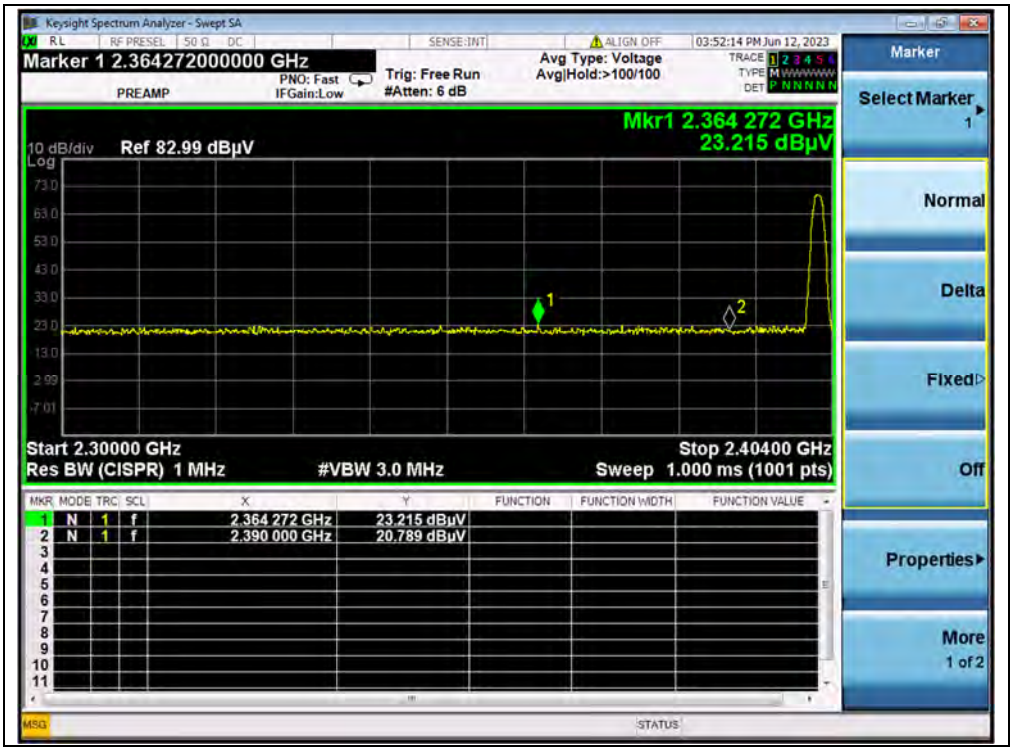
## A.11. Restricted Frequency Bands

The lowest and highest channels are tested to verify the Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]-$G_{preamp}$ [dB]
$A_T$: Total correction Factor except Antenna
$U_R$: Receiver Reading
$G_{preamp}$: Preamplifier Gain
$A_{Factor}$: Antenna Factor at 3m

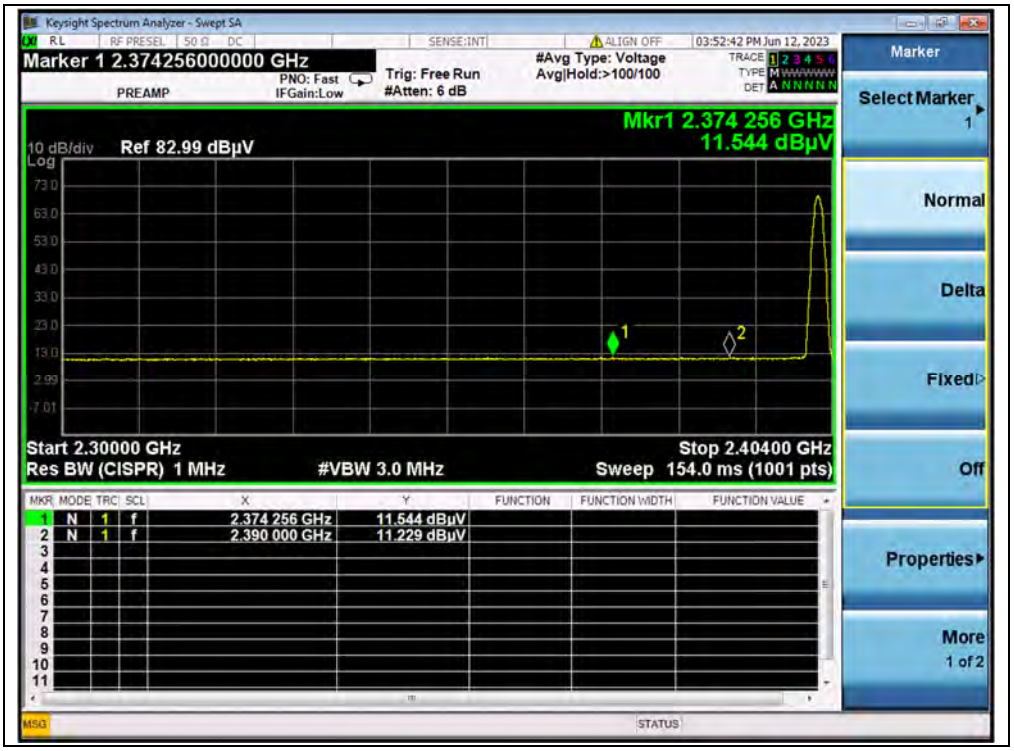
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

**GFSK Mode**

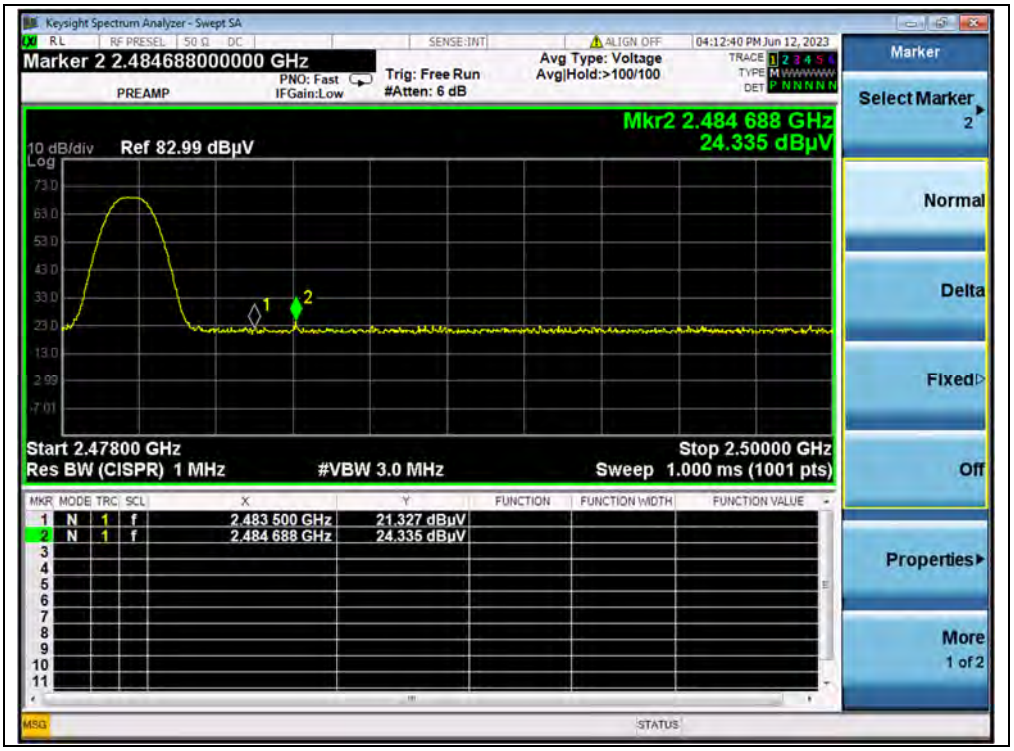
| Channel | Frequency (MHz) | Detector PK/ AV | Receiver Reading $U_R$ (dBμV) | $A_T$ (dB) | $A_{Factor}$ (dB@3m) | Max. Emission E (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| 0 | 2364.27 | PK | 23.22 | 6.74 | 27.20 | 57.16 | 74 | PASS |
| 0 | 2374.26 | AV | 11.54 | 6.74 | 27.20 | 45.48 | 54 | PASS |
| 78 | 2484.69 | PK | 24.34 | 6.74 | 27.20 | 58.28 | 74 | PASS |
| 78 | 2483.70 | AV | 23.67 | 6.74 | 27.20 | 57.61 | 54 | PASS |



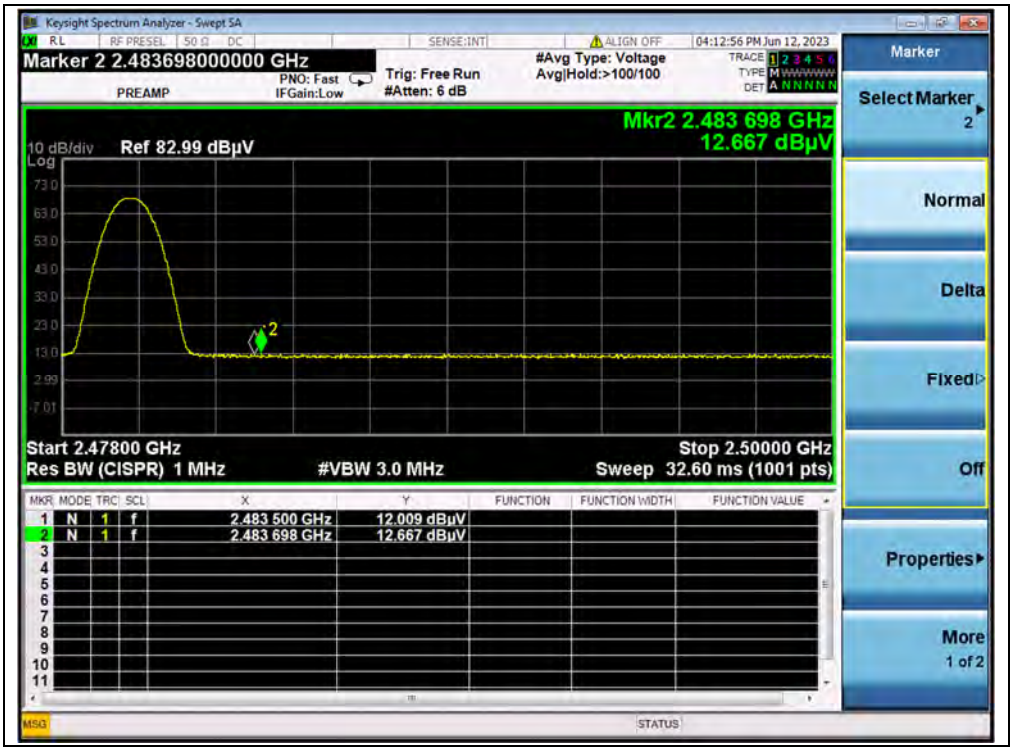

(PEAK, Channel 0, GFSK)




(AVERAGE, Channel 0, GFSK)



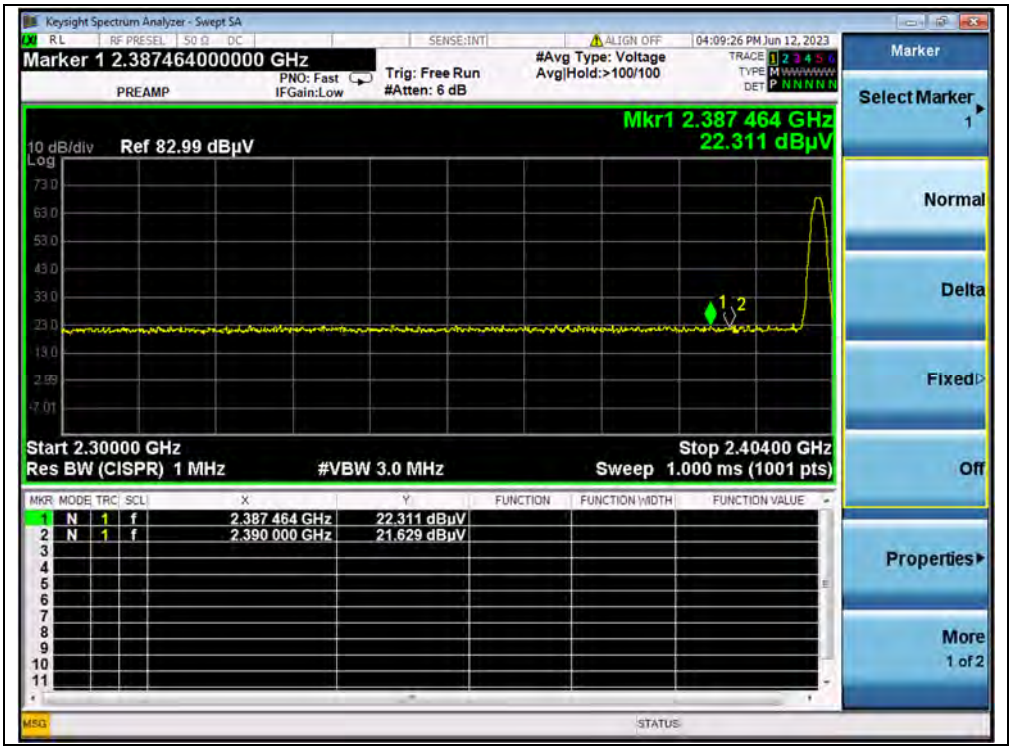

(PEAK, Channel 78, GFSK)



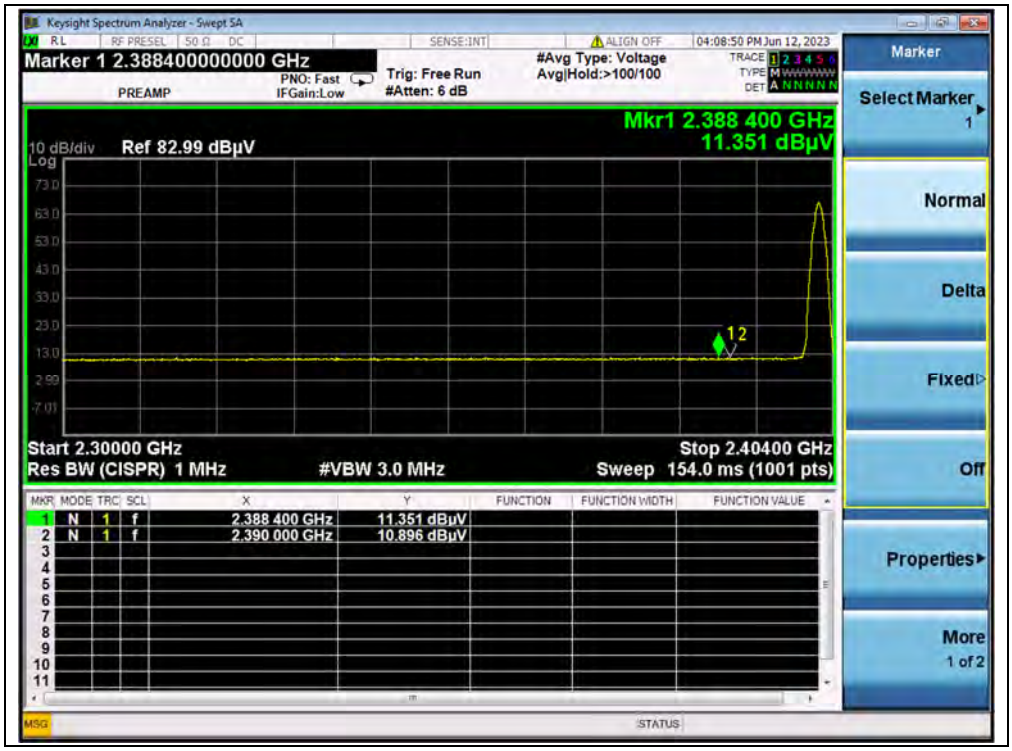

(AVERAGE, Channel 78, GFSK)

**π/4-DQPSK Mode**

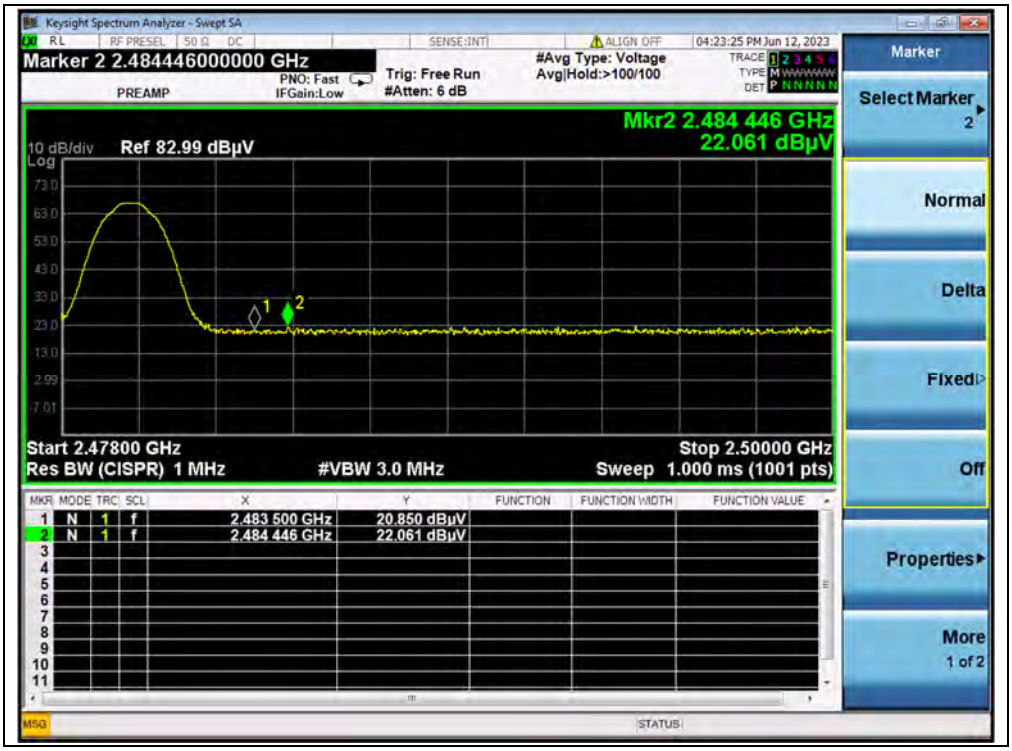
| Channel | Frequency (MHz) | Detector PK/ AV | Receiver Reading $U_R$ (dBμV) | $A_T$ (dB) | $A_{Factor}$ (dB@3m) | Max. Emission E (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| 0 | 2387.46 | PK | 22.31 | 6.74 | 27.20 | 56.25 | 74 | PASS |
| 0 | 2388.40 | AV | 11.35 | 6.74 | 27.20 | 45.29 | 54 | PASS |
| 78 | 2484.45 | PK | 22.06 | 6.74 | 27.20 | 56.00 | 74 | PASS |
| 78 | 2483.61 | AV | 12.40 | 6.74 | 27.20 | 46.34 | 54 | PASS |



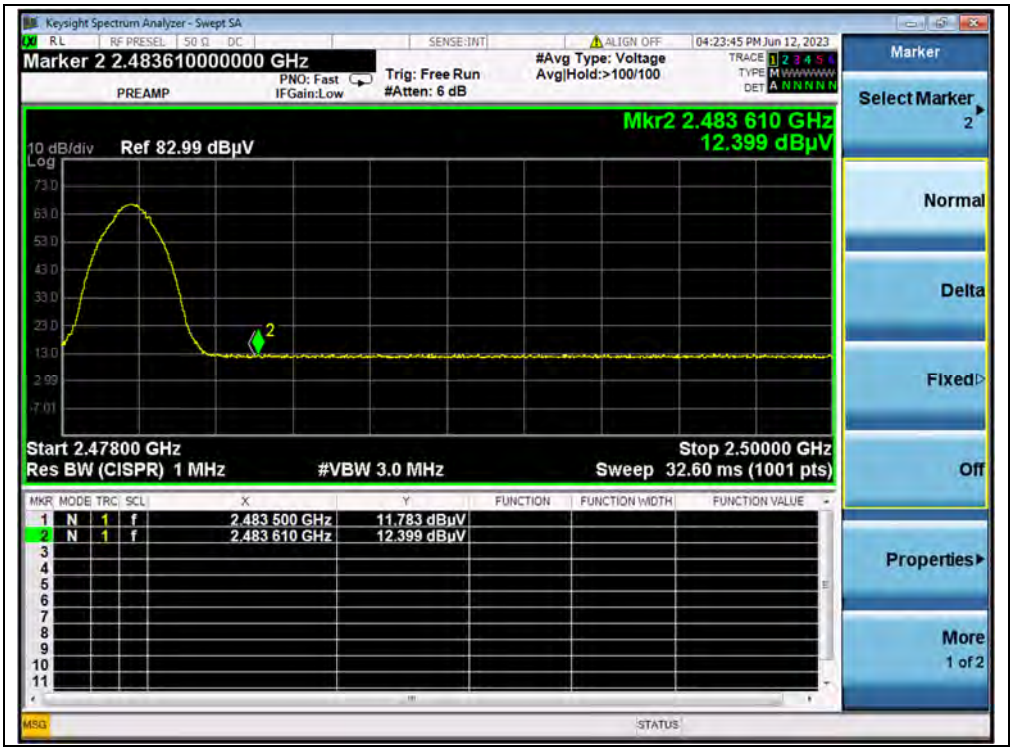

(PEAK, Channel 0,π/4-DQPSK)




(AVERAGE, Channel 0, π/4-DQPSK)



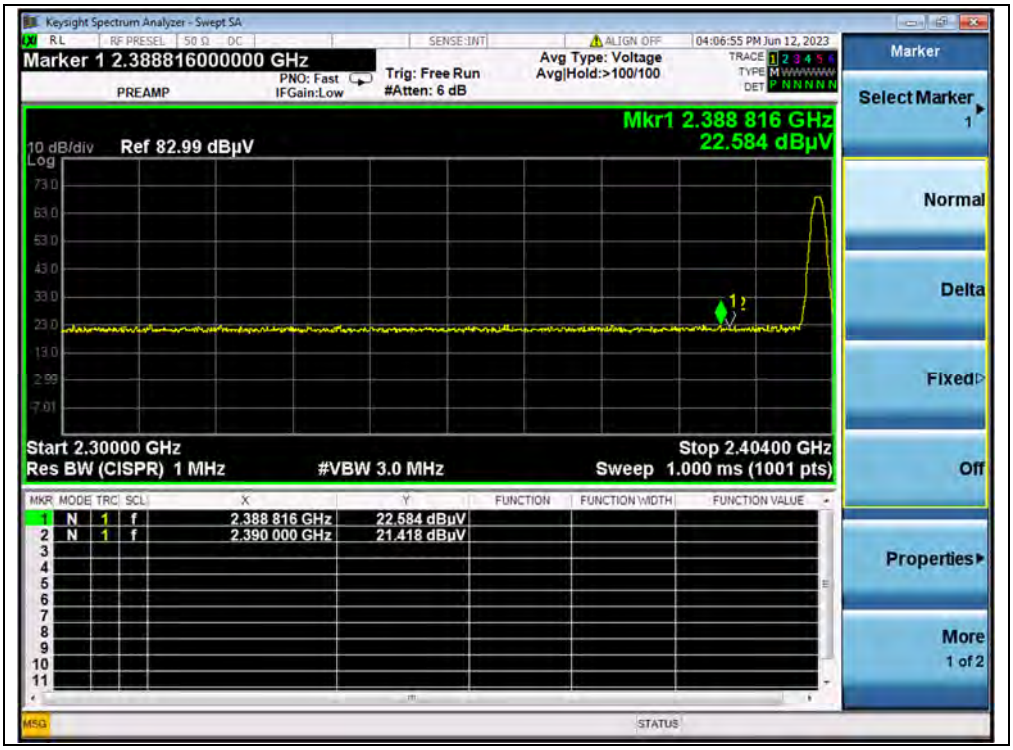

(PEAK, Channel 78, π/4-DQPSK)



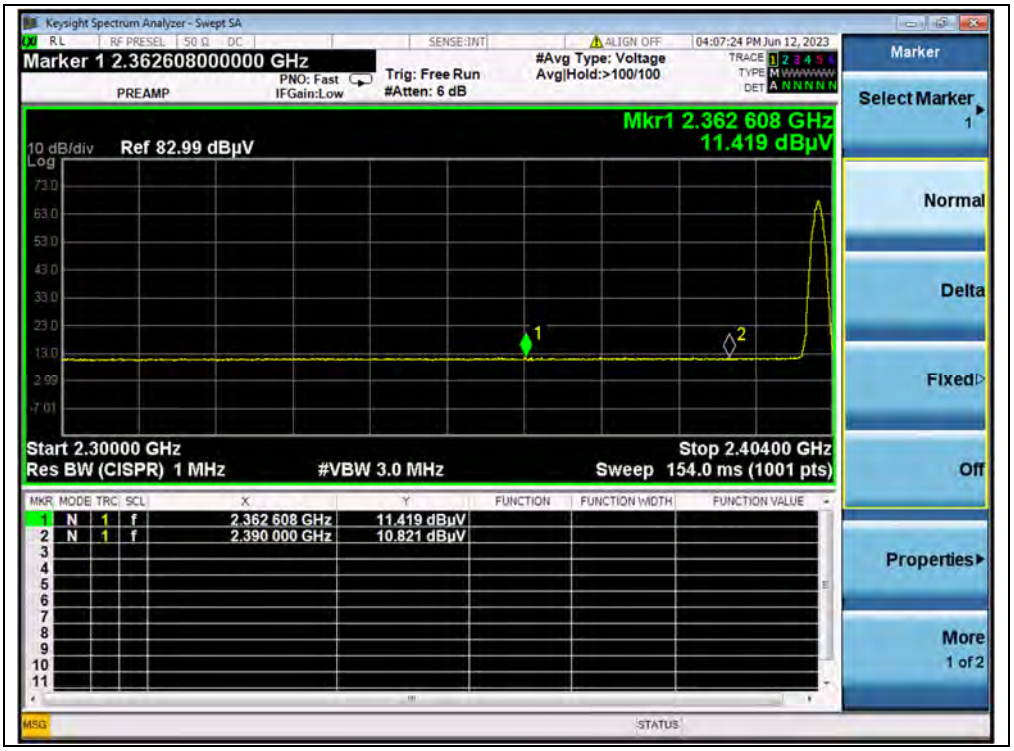

(AVERAGE, Channel 78, π/4-DQPSK)

**8-DPSK Mode**

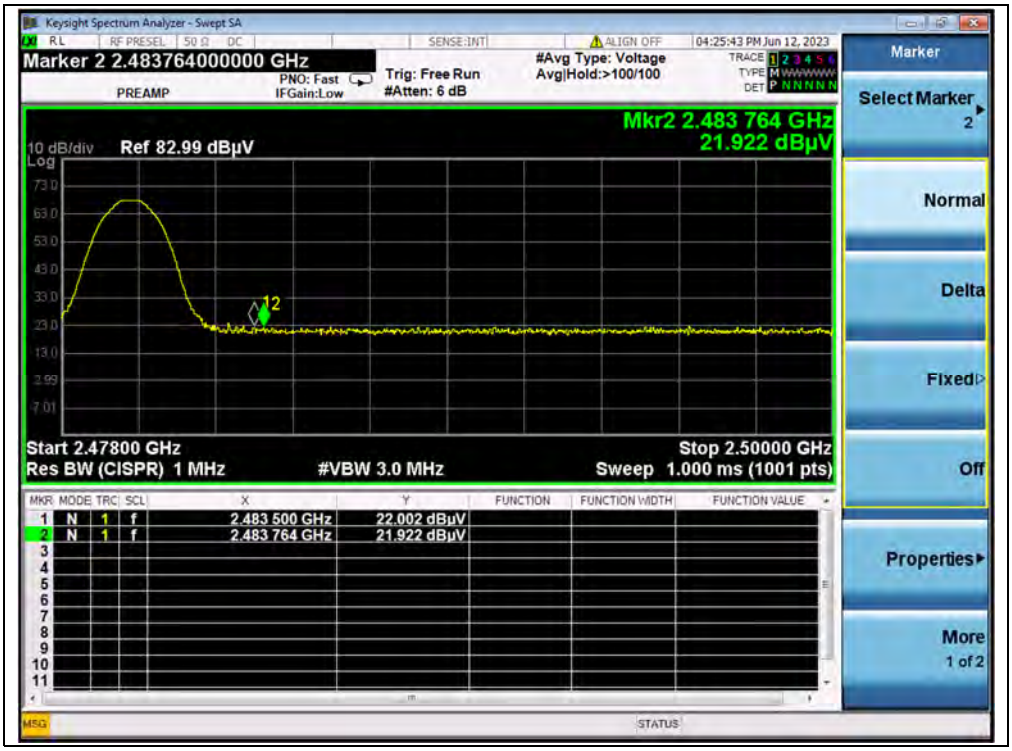
| Channel | Frequency (MHz) | Detector PK/ AV | Receiver Reading $U_R$ (dBμV) | $A_T$ (dB) | $A_{Factor}$ (dB@3m) | Max. Emission E (dBμV/m) | Limit (dBμV/m) | Verdict |
|---|---|---|---|---|---|---|---|---|
| 0 | 2388.82 | PK | 22.58 | 6.74 | 27.20 | 56.52 | 74 | PASS |
| 0 | 2362.61 | AV | 11.42 | 6.74 | 27.20 | 45.36 | 54 | PASS |
| 78 | 2483.50 | PK | 22.00 | 6.74 | 27.20 | 55.94 | 74 | PASS |
| 78 | 2484.16 | AV | 12.19 | 6.74 | 27.20 | 46.13 | 54 | PASS |



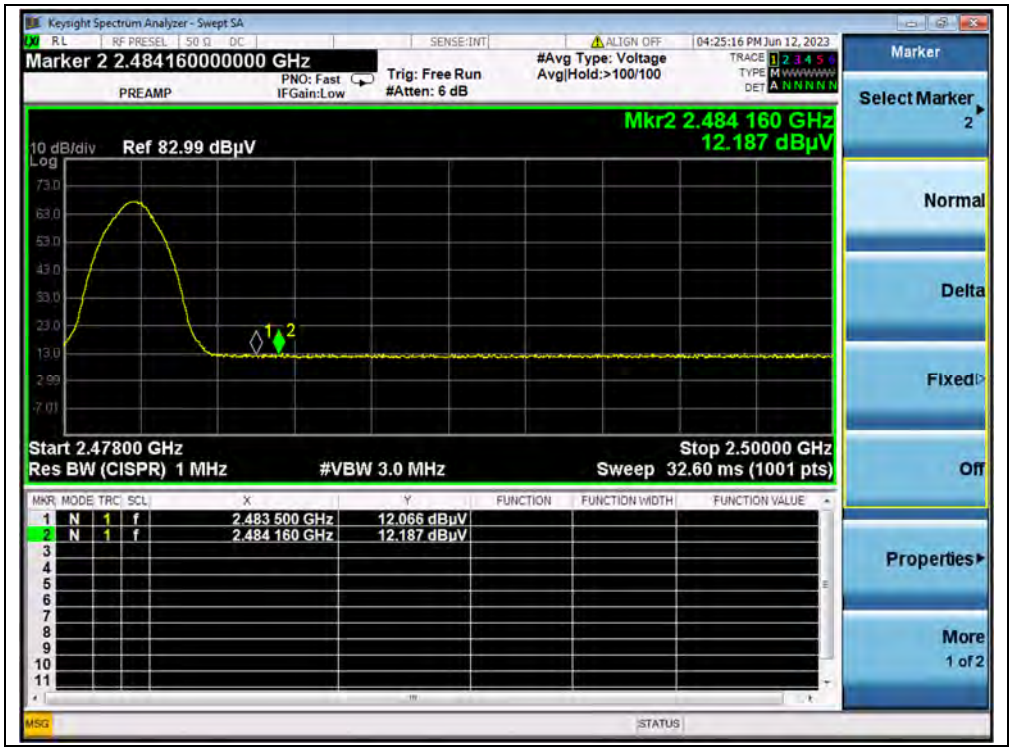

(PEAK, Channel 0, 8-DPSK)




(AVERAGE, Channel 0, 8-DPSK)




(PEAK, Channel 78, 8-DPSK)




(AVERAGE, Channel 78, 8-DPSK)

## A.12. Radiated Emission

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]$-G_{preamp}$ [dB]

$A_T$: Total correction Factor except Antenna

$U_R$: Receiver Reading

$G_{preamp}$: Preamplifier Gain

$A_{Factor}$: Antenna Factor at 3m

During the test, the total correction Factor $A_T$ and $A_{Factor}$ were built in test software.

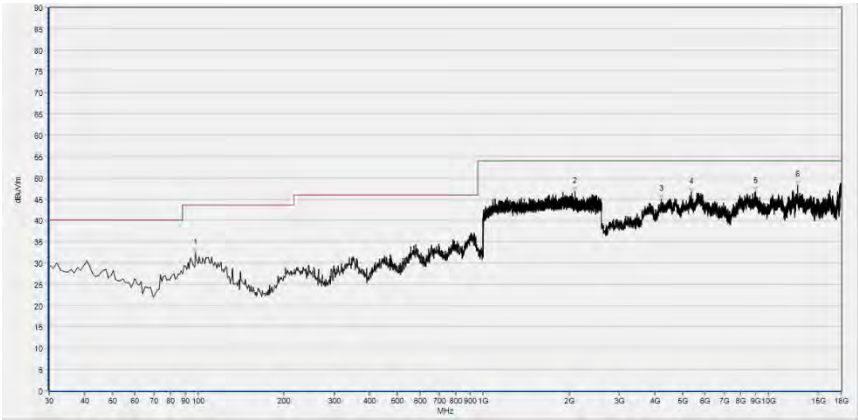
**Note1:** All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

**Note2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

**Note3:** For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

**GFSK Mode**

Plots for Channel 0



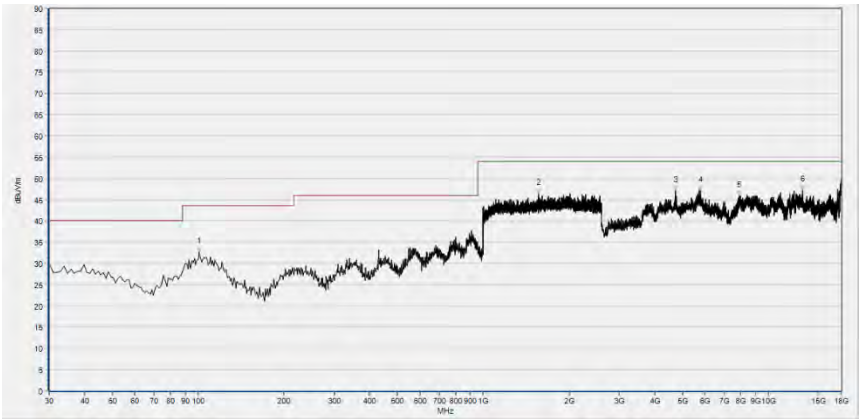
| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 97.900 | 32.30 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 2095.467 | 46.81 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 4223.160 | 44.93 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5375.080 | 46.60 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8997.160 | 46.72 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 12683.920 | 48.25 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)

| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 104.690 | 31.80 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 1614.400 | 46.04 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3696.480 | 44.94 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5760.080 | 46.65 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8433.520 | 47.25 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12529.920 | 46.78 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

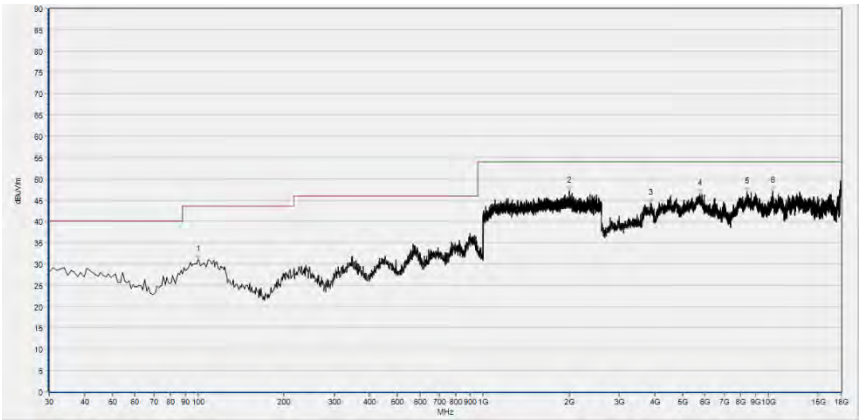
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 39



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 100.810 | 32.71 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1566.400 | 46.49 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 4715.960 | 47.11 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5775.480 | 47.05 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 7882.200 | 45.89 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 13210.600 | 47.29 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)



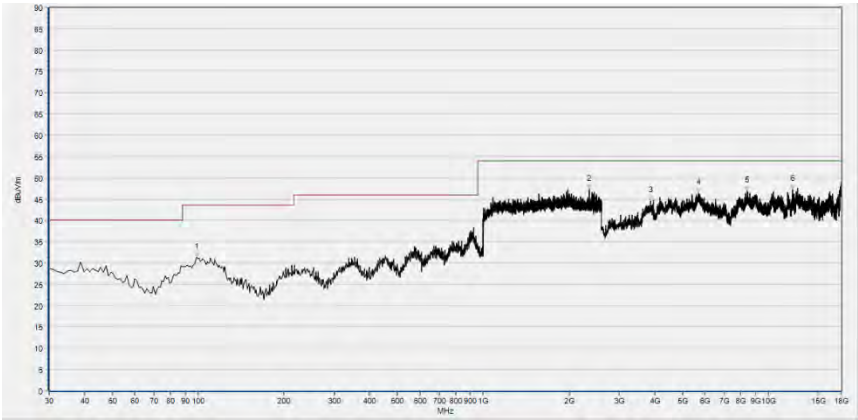
| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 99.840 | 30.97 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 2007.467 | 47.06 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 3853.560 | 44.31 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5760.080 | 46.39 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8424.280 | 46.96 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 10346.200 | 47.14 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 78

| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 99.840 | 31.87 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1897.600 | 46.70 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 3705.720 | 43.61 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5652.280 | 46.80 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8424.280 | 46.98 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 12151.080 | 46.78 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)

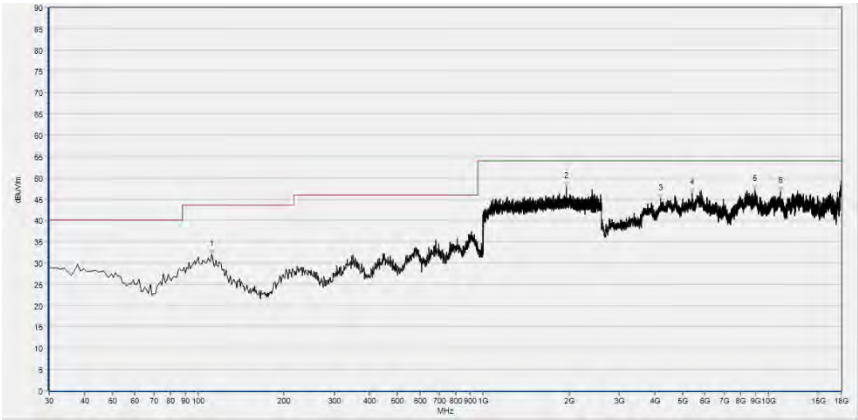


| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 98.870 | 31.35 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 2353.067 | 47.28 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3865.880 | 44.56 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5698.480 | 46.41 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8433.520 | 46.93 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12188.040 | 47.27 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

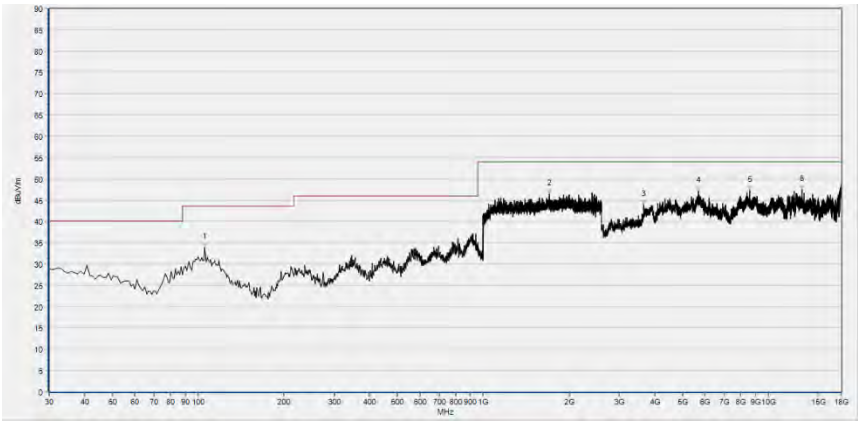
**π/4-DQPSK Mode**

Plots for Channel 0



| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 111.480 | 31.94 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1952.533 | 47.88 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 4186.200 | 45.11 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5399.720 | 46.40 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8978.680 | 47.21 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 10999.160 | 46.76 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)



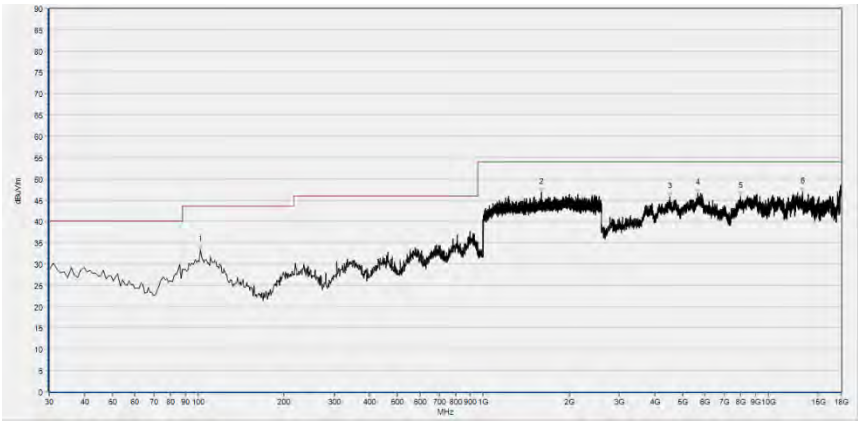
| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 105.660 | 33.80 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 1701.867 | 46.37 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3656.440 | 43.96 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5673.840 | 47.18 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8584.440 | 47.20 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 13078.160 | 47.47 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 39

| Fre. (MHz) | PK (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 97.900 | 32.43 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1934.933 | 46.34 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 3890.520 | 45.22 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5609.160 | 46.37 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8411.960 | 46.77 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 12899.520 | 47.67 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)



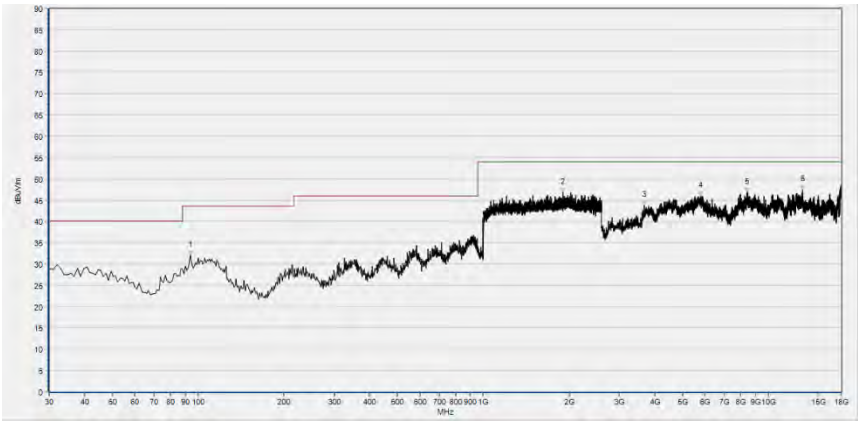
| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 101.780 | 33.31 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 1603.733 | 46.74 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 4525.000 | 45.75 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5664.600 | 46.66 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 7990.000 | 45.93 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 13201.360 | 46.96 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 78

| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 101.780 | 32.00 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1947.200 | 45.70 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 3197.520 | 42.67 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5855.560 | 46.20 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 9052.600 | 46.25 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 10346.200 | 47.39 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)

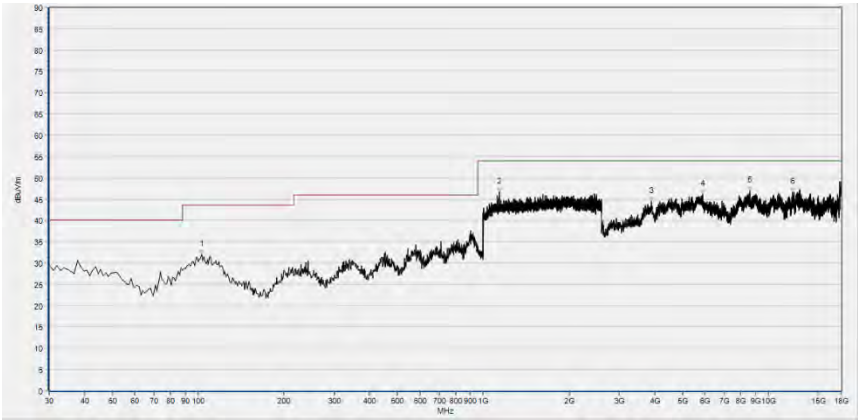


| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 94.020 | 31.93 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 1905.600 | 46.78 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3665.680 | 43.75 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5769.320 | 45.91 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8424.280 | 46.82 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 13204.440 | 47.39 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

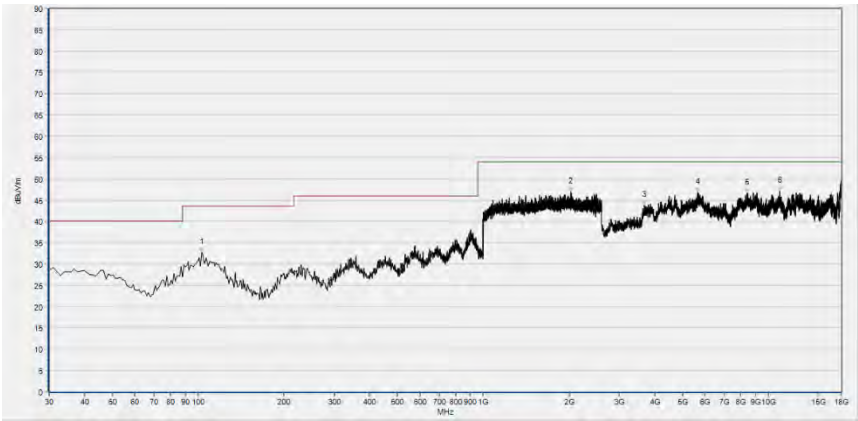
**8-DPSK Mode**

Plots for Channel 0



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 102.750 | 32.04 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1136.533 | 46.56 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 3878.200 | 44.34 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5870.960 | 46.05 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8602.920 | 46.95 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 12141.840 | 46.61 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

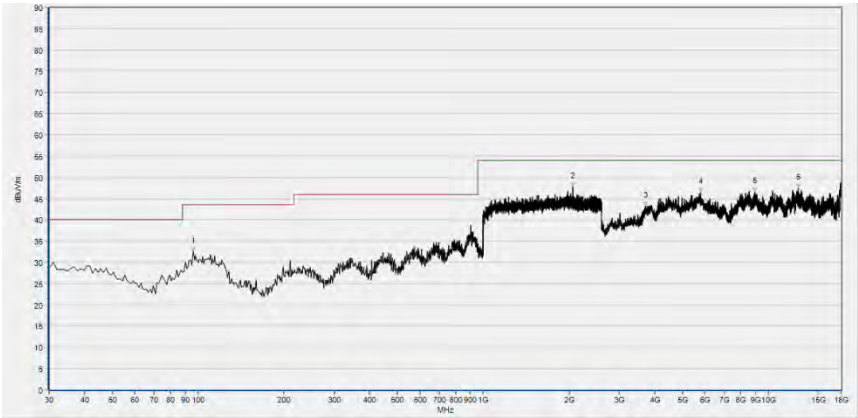
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 102.750 | 32.77 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 2030.400 | 46.88 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3678.000 | 43.69 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5655.360 | 46.73 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8421.200 | 46.63 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 10959.120 | 47.02 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

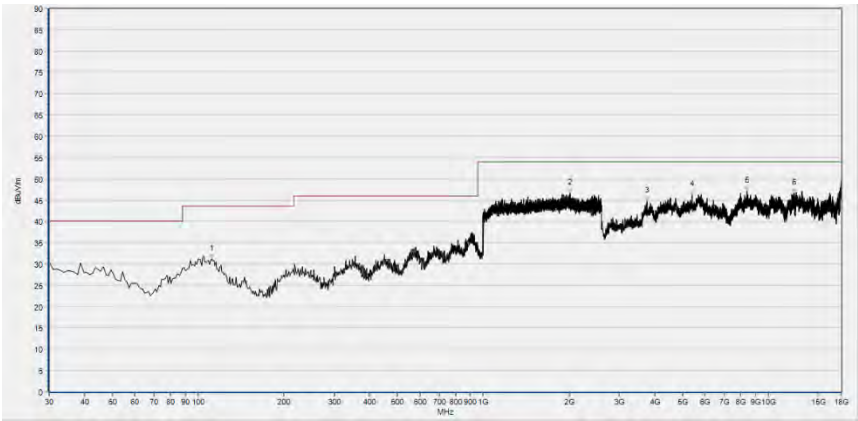
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 39



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 95.960 | 32.53 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 2060.800 | 47.76 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 3711.880 | 43.31 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5775.480 | 46.45 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 8981.760 | 46.59 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 12736.280 | 47.51 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

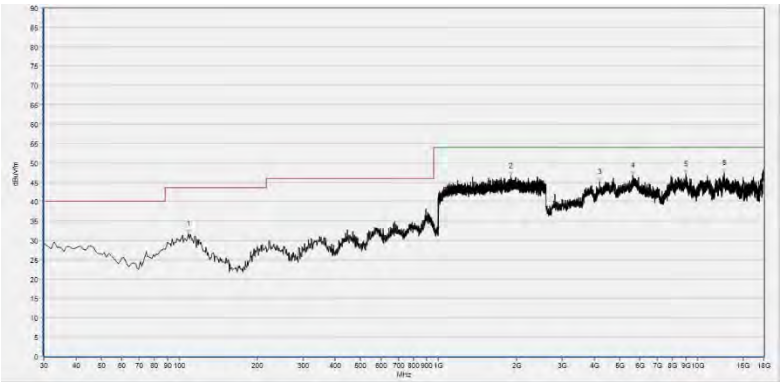
(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 111.480 | 31.16 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 2012.267 | 46.63 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3755.000 | 44.80 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5402.800 | 46.30 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8411.960 | 47.02 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12283.520 | 46.57 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

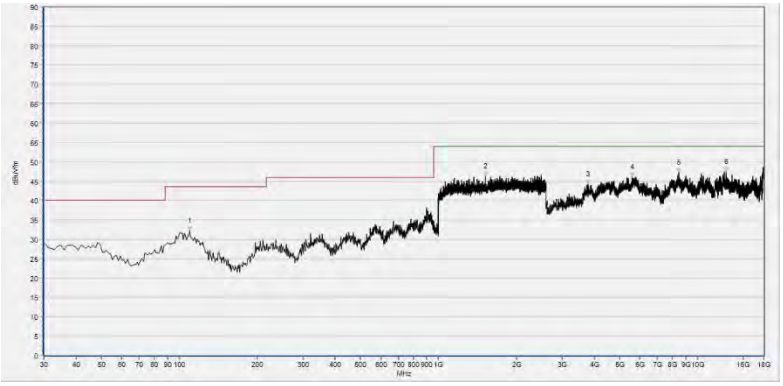
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 78



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 108.570 | 31.60 | N/A | N/A | N/A | 43.50 | N/A | Horizontal | PASS |
| 1900.267 | 46.62 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 4183.120 | 45.09 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 5633.800 | 46.81 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 9006.400 | 47.09 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |
| 12696.240 | 47.42 | N/A | N/A | 74.00 | N/A | 54.00 | Horizontal | PASS |

(Antenna Horizontal, 30MHz to 18GHz)



| Fre. (MHz) | Pk (dBμV/m) | QP (dBμV/m) | AV (dBμV/m) | Limit-PK (dBμV/m) | Limit-QP (dBμV/m) | Limit-AV (dBμV/m) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|
| 109.540 | 32.25 | N/A | N/A | N/A | 43.50 | N/A | Vertical | PASS |
| 1514.667 | 46.18 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 3773.480 | 44.20 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 5575.280 | 46.09 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 8464.320 | 47.23 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |
| 12874.880 | 47.49 | N/A | N/A | 74.00 | N/A | 54.00 | Vertical | PASS |

(Antenna Vertical, 30MHz to 18GHz)

END OF REPORT