# TEST REPORT

| | | |
|---|---|---|
| **APPLICANT** | : | OnePlus Technology (Shenzhen) Co., Ltd. |
| **PRODUCT NAME** | : | Mobile Phone |
| **MODEL NAME** | : | CPH2513, CPH2515 |
| **BRAND NAME** | : | ONEPLUS |
| **FCC ID** | : | 2ABZ2-AA534 |
| **STANDARD(S)** | : | 47 CFR Part 15 Subpart C |
| **RECEIPT DATE** | : | 2023-01-06 |
| **TEST DATE** | : | 2023-01-18 to 2023-02-23 |
| **ISSUE DATE** | : | 2023-03-14 |

Edited by: Peng Mi (Rapporteur)

Approved by: Shen Junsheng (Supervisor)

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| Change History | | |
|---|---|---|
| **Version** | **Date** | **Reason for change** |
| 1.0 | 2023-03-14 | 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 | N/A | Duty Cycle of Test Signal | Feb. 13, 2023 | Zhong Yanshan | PASS | No deviation |
| 3 | 15.247(b) | Maximum Peak Conducted Output Power | Feb. 13, 2023 | Zhong Yanshan | PASS | No deviation |
| 4 | 15.247(b) | Maximum Average Conducted Output Power | Feb. 13, 2023 | Zhong Yanshan | PASS | No deviation |
| 5 | 15.247(a) | Bandwidth | Feb. 13, 2023 | Zhong Yanshan | PASS | No deviation |
| 6 | 15.247(d) | Conducted Spurious Emission and Band Edge | Feb. 13, 2023 | Zhong Yanshan | PASS | No deviation |
| 7 | 15.247(e) | Power Spectral Density | Feb. 13, 2023 | Zhong Yanshan | PASS | No deviation |
| 8 | 15.207 | Conducted Emission | Jan. 18, 2023 | Fan Zehang | PASS | No deviation |
| 9 | 15.247(d) | Restricted Frequency Bands | Feb. 23, 2023 | Su Zhan | PASS | No deviation |
| 10 | 15.209, 15.247(d) | Radiated Emission | Feb. 23, 2023 | Su Zhan | PASS | No deviation |

**Note 1:** The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013 and KDB558074 D01 v05r02.

**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 | 2022.03.01 | 2023.02.28 |
| Power Sensor | MY54180008 | U2021XA | Agilent | 2022.10.11 | 2023.10.10 |
| Attenuator | MTJ6004-20 | VAT-10+ | MTJ Cooperation | N/A | N/A |
| 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 | 2022.03.03 | 2023.03.02 |
| LISN | 8127449 | NSLK 8127 | Schwarzbeck | 2022.03.03 | 2023.03.02 |
| Pulse Limiter (10dB) | VTSD 9561 F-B #206 | VTSD 9561-F | Schwarzbeck | 2022.07.06 | 2023.07.05 |
| RF Coaxial Cable (DC-100MHz) | BNC | MRE04 | Qualwave | 2022.07.08 | 2023.07.07 |

### 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 |
| 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 |
| Preamplifier (2GHz-18GHz) | 61171/61172 | S020180L3203 | LUCIX CORP. | 2022.07.08 | 2023.07.07 |
| Preamplifier (18GHz-40GHz) | DS77209 | DCLNA0118-40C-S | Decentest | 2022.07.23 | 2023.07.22 |
| RF Coaxial Cable (DC-18GHz) | MRE001 | PE330 | Pasternack | 2022.07.08 | 2023.07.07 |
| RF Coaxial Cable (DC-18GHz) | MRE002 | CLU18 | Pasternack | 2022.07.08 | 2023.07.07 |
| RF Coaxial Cable (DC-18GHz) | MRE003 | CLU18 | Pasternack | 2022.07.08 | 2023.07.07 |
| RF Coaxial Cable (DC-40GHz) | 22290045 | QA360-40-KK-0.5 | Qualwave | 2022.07.08 | 2023.07.07 |
| RF Coaxial Cable (DC-40GHz) | 22290046 | QA360-40-KKF-2 | Qualwave | 2022.07.08 | 2023.07.07 |
| RF Coaxial Cable (DC-18GHz) | 22120181 | QA500-18-NN-5 | Qualwave | 2022.07.08 | 2023.07.07 |
| Notch Filter | N/A | WRCG-2400-2483.5-60SS | Wainwright | 2022.07.08 | 2023.07.07 |
| Anechoic Chamber | N/A | 9m*6m*6m | CRT | 2022.05.10 | 2025.05.09 |

## 1.3. Measurement Uncertainty

| Test Items | Uncertainty | Remark |
|---|---|---|
| Peak Output Power | ±2.22dB | Confidence levels of 95% |
| Power Spectral Density | ±2.22dB | Confidence levels of 95% |
| Bandwidth | ±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.1-3, 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 |

# 2. General Description

## 2.1. Information of Applicant and Manufacturer

| | |
|---|---|
| **Applicant** | OnePlus Technology (Shenzhen) Co., Ltd. |
| **Applicant Address** | 18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China |
| **Manufacturer** | OnePlus Technology (Shenzhen) Co., Ltd. |
| **Manufacturer Address** | 18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China |

## 2.2. Information of EUT

| | | |
|---|---|---|
| **Product Name:** | Mobile Phone | |
| **Sample No.:** | 65# | |
| **Hardware Version:** | 11 | |
| **Software Version:** | OxygenOS 13.1 | |
| **Modulation Technology:** | DSSS, OFDM | |
| **Modulation Type:** | Refer to section1.3 | |
| **Operating Frequency Range:** | 802.11b/g/ n (HT20) / (HT40) / ac (VHT20) / ac (VHT40): 2412MHz–2462MHz | |
| **Antenna Type:** | Inverted F Antenna | |
| **Antenna Gain:** | 0.5dBi | |
| **Accessory Information:** | Battery 1 | |
| | Brand Name: | SUPERVOOC |
| | Model No.: | BLP989 |
| | Serial No.: | N/A |
| | Capacity: | Typical: 5000mAh, Rated: 4880mAh |
| | Rated Voltage: | 3.89V |
| | Charge Limit: | 4.48V |
| | Manufacturer: | Dongguan NVT Technology Co., Ltd. |

| | | |
|---|---|---|
| **Accessory Information:** | Battery 2 | |
| | Brand Name: | SUPERVOOC |
| | Model No.: | BLP989 |
| | Serial No.: | N/A |
| | Capacity: | Typical: 5000mAh, Rated: 4880mAh |
| | Rated Voltage: | 3.89V |
| | Charge Limit: | 4.48V |
| | Manufacturer: | SUNWODA Electronic Co., Ltd. |
| | AC Adapter 1 | |
| | Brand Name: | SUPERVOOC |
| | Model No.: | VCB7CAUH |
| | Serial No.: | N/A |
| | Rated Output: | 5V⎓2A or 5V-11V⎓5A Max<br>5V⎓2A or 5V-11V⎓6.1A Max |
| | Rated Input: | 100-130V, 200-240V~50/60Hz, 1.8A |
| | Manufacturer: | Dongguan YOHOO Electronic Technology Co., Ltd. |
| | AC Adapter 2 | |
| | Brand Name: | SUPERVOOC |
| | Model No.: | VCB7CAUH |
| | Serial No.: | N/A |
| | Rated Output: | 5V⎓2A or 5V-11V⎓5A Max<br>5V⎓2A or 5V-11V⎓6.1A Max |
| | Rated Input: | 100-130V, 200-240V~50/60Hz, 1.8A |
| | Manufacturer: | Jiangsu Chenyang Electron Co., Ltd. |
| | USB Cable 1 | |
| | Model No.: | DL124 |
| | USB Cable 2 | |
| | Model No.: | DL129 |

**Note 1:** According to the certificate holder, they declared that the models CPH2513 for dual SIM and CPH2515 for single SIM are accordant in both hardware and software version. These two models only differ in model name and SIM card slot. Everything else are the same. The main measuring model is CPH2515, only the results for CPH2515 were recorded in this report.

**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

| Test Mode | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|
| 802.11b/g/n (HT20) /ac(VHT20) | **1** | **2412** | 8 | 2447 |
| | 2 | 2417 | 9 | 2452 |
| | 3 | 2422 | 10 | 2457 |
| | 4 | 2427 | **11** | **2462** |
| | 5 | 2432 | | |
| | **6** | **2437** | | |
| | 7 | 2442 | | |
| **Test Mode** | **Channel** | **Frequency (MHz)** | **Channel** | **Frequency (MHz)** |
| 802.11n (HT40)/ ac(VHT40) | 3 | 2422 | 8 | 2447 |
| | 4 | 2427 | **9** | **2452** |
| | 5 | 2432 | | |
| | **6** | **2437** | | |
| | 7 | 2442 | | |

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

## 2.4. Test Configuration of EUT

### 2.4.1.Modulation Type and Data Rate of EUT

| Modulation technology | Modulation Type | Data Rate (Mbps) Note1 |
|---|---|---|
| DSSS (802.11b) | DBPSK | **1** |
| | DQPSK | 2 |
| | CCK | 5.5/ 11 |
| OFDM (802.11g) | BPSK | **6** / 9 |
| | QPSK | 12 / 18 |
| | 16QAM | 24 / 36 |
| | 64QAM | 48 / 54 |
| OFDM (802.11n (HT20)/ ac (VHT20)) | BPSK | **6.5** |
| | QPSK | 13/19.5 |
| | 16QAM | 26/39 |
| | 64QAM | 52/58.5/65 |
| OFDM (802.11n (HT40)/ ac (VHT40)) | BPSK | **13.5** |
| | QPSK | 27/40.5 |
| | 16QAM | 54/81/108 |
| | 64QAM | 121.5/135 |

**Note1:** The worst-case mode (bold face) in all data rates has been determined during the pre-scan, only the test data of the worst-case were recorded in this report.

**Note2:** The RF signal transmission of EUT is controlled by the build-in engineering mode which is provided by the manufacturer. The recorded power setting value is the maximum that the engineering mode has configuration during testing.

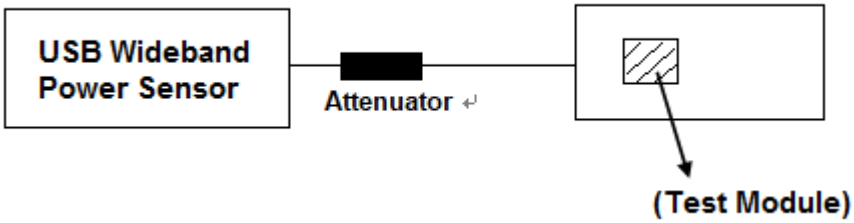
## 2.5. Test Conditions

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

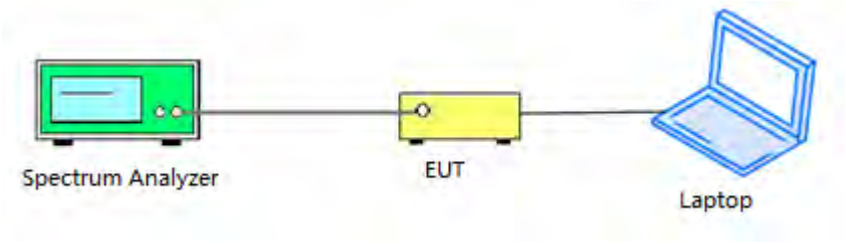
# 2.6. Test Setup Layout Diagram

## 2.6.1.Conducted Measurement

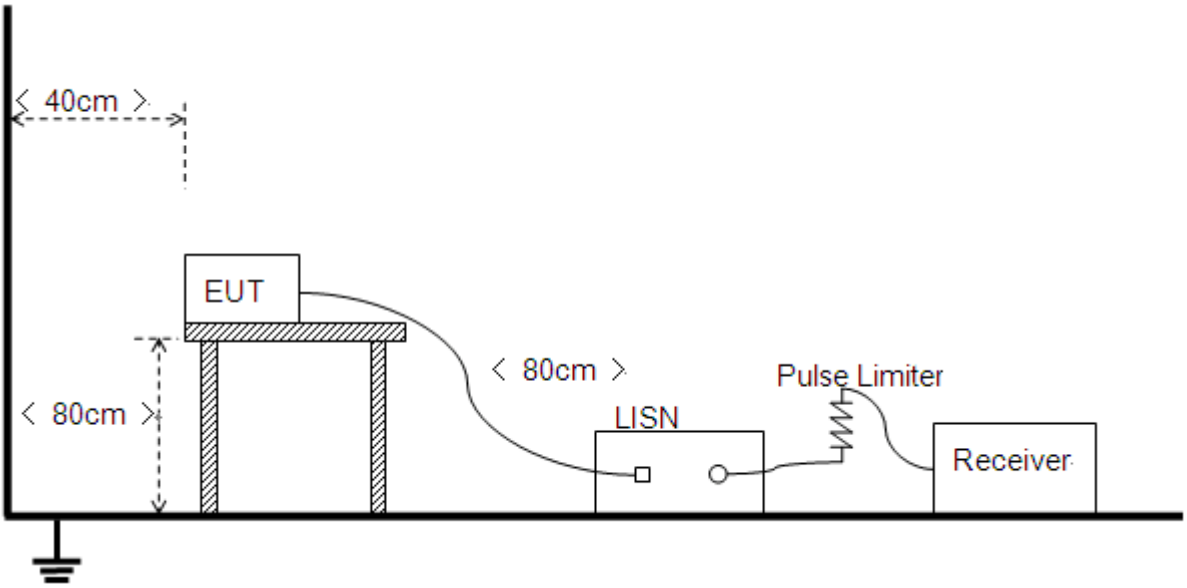
Power item




Other items

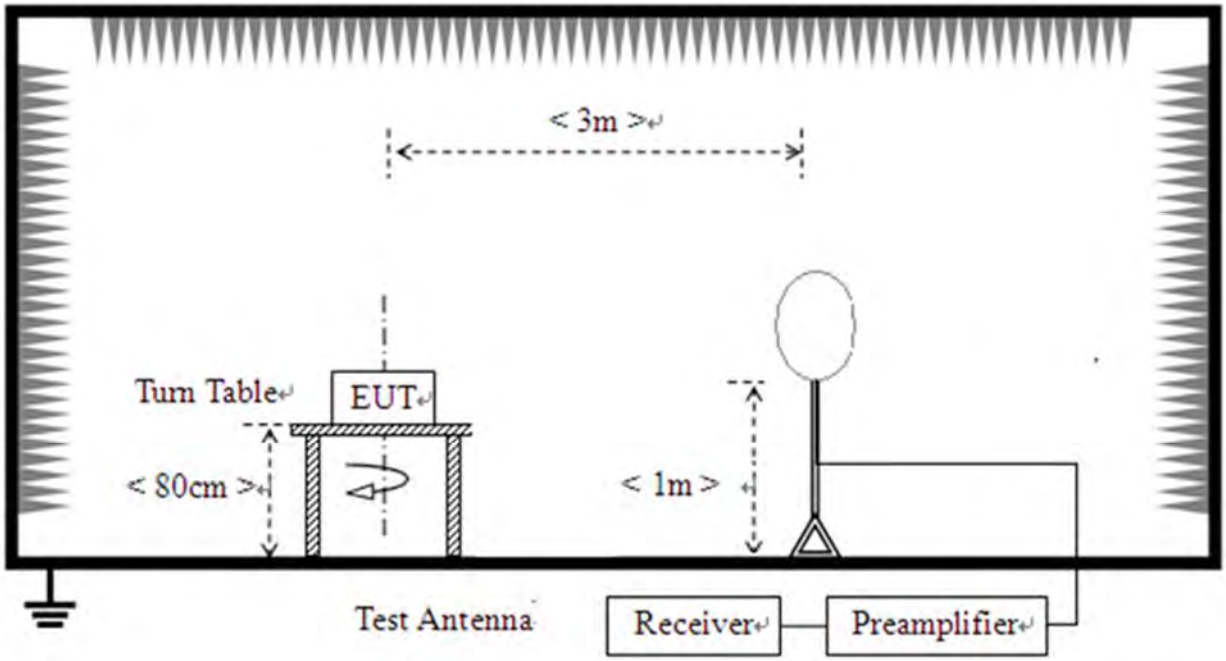



## 2.6.2.Conducted Emission Measurement

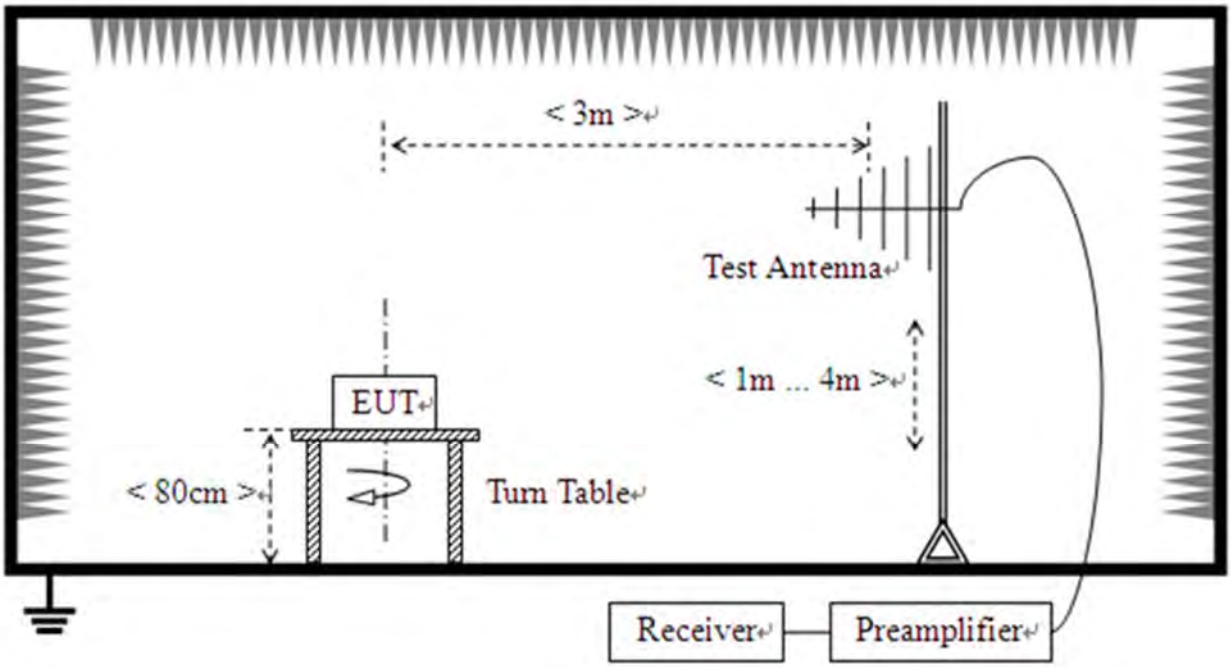


### 2.6.3.Radiation Measurement

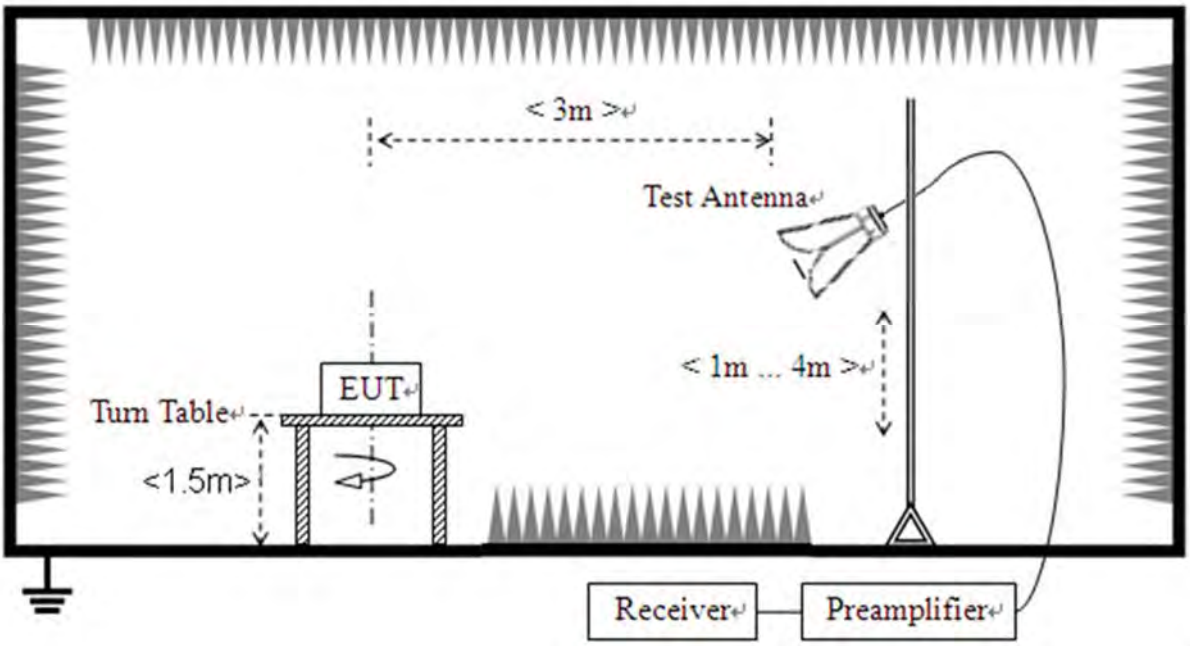
1) For radiated emissions from 9kHz to 30MHz




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

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

## 3.2. Duty Cycle of Test Signal

### 3.2.1.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.

### 3.2.2.Test Result

Refer to Annex A.1 in this report.

## 3.3. Maximum Peak and Average Conducted Output Power

### 3.3.1.Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum conducted output power of the intentional radiator shall not exceed 1 Watt.

### 3.3.2.Test Procedures

The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

### 3.3.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.3.4.Test Result

Refer to Annex A.2 and A.3 in this report.

# 3.4.6 dB Bandwidth

### 3.4.1.Requirement

According to FCC section 15.247(a) (2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

### 3.4.1.Test Procedures

KDB 558074 Section 8.2 was used in order to prove compliance.

### 3.4.2.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.4.3.Test Result

Refer to Annex A.4 in this report.

## 3.5. Conducted Spurious Emissions and Band Edge

### 3.5.1. 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.

### 3.5.2. Test Procedures

KDB 558074 Section 8.5 and 8.7 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.5 and A.6 in this report.

## 3.6. Power Spectral Density

### 3.6.1.Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 3.6.2.Test Procedures

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:
a) Set analyzer center frequency to channel center frequency
b) Set span to1.5 times DTS
c) Set RBW to 30kHz
d) Set VBW to 100kHz
e) Detector = peak
f) Sweep time = auto couple
g) Trace mode = max hold
h) Allow trace to fully stabilize
i) Use the peak marker function to determine the maximum amplitude level and recorded as PD
j) Use below formula to calculate the Conducted PSD value that at specified RBW:
Conducted PSD=PD-10lg(30k/3k)

### 3.6.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

### 3.6.4.Test Result

Refer to Annex A.7 in this report.

# 3.7. Conducted Emission

### 3.7.1.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.

### 3.7.2.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.

### 3.7.3.Test Setup Layout

Refer to chapter 2.6.2 in this report.

### 3.7.4.Test Result

Refer to Annex A.8 in this report.

## 3.8. Restricted Frequency Bands

### 3.8.1.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).

### 3.8.2.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

### 3.8.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

### 3.8.4.Test Result

Refer to Annex A.9 in this report.

# 3.9. Radiated Emission

### 3.9.1.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).

### 3.9.2.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.

### 3.9.3.Test Setup Layout

Refer to chapter 2.6.3 in this report.

### 3.9.4.Test Result

Refer to Annex A.10 in this report.

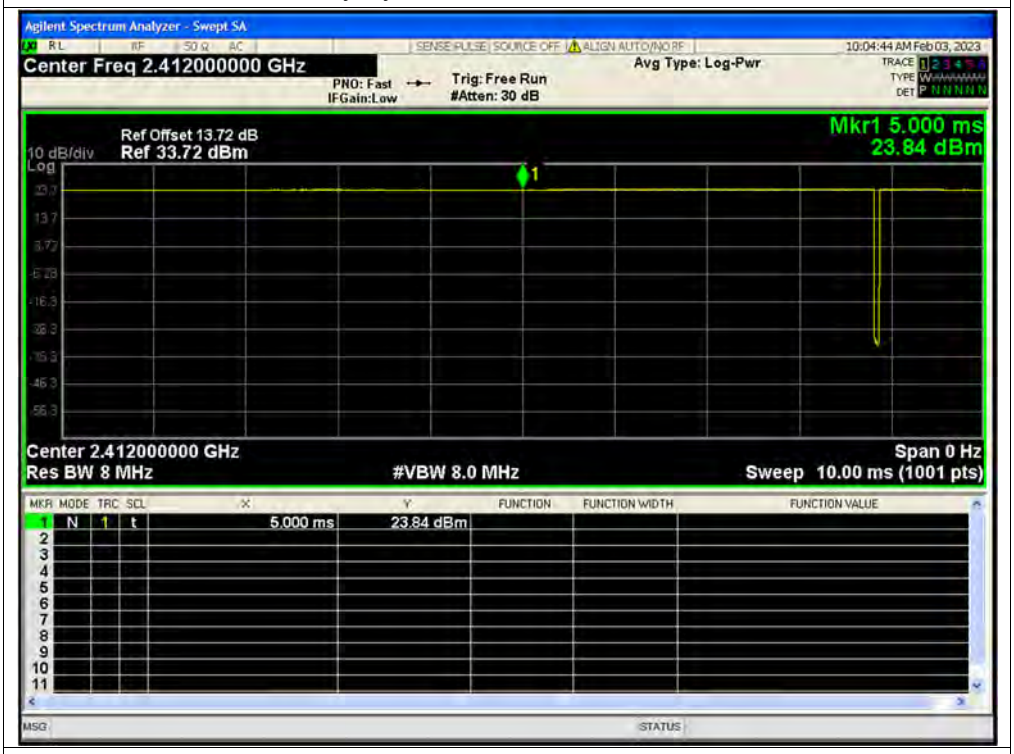
# Annex A Test Data and Result

## A.1. Duty Cycle of Test Signal

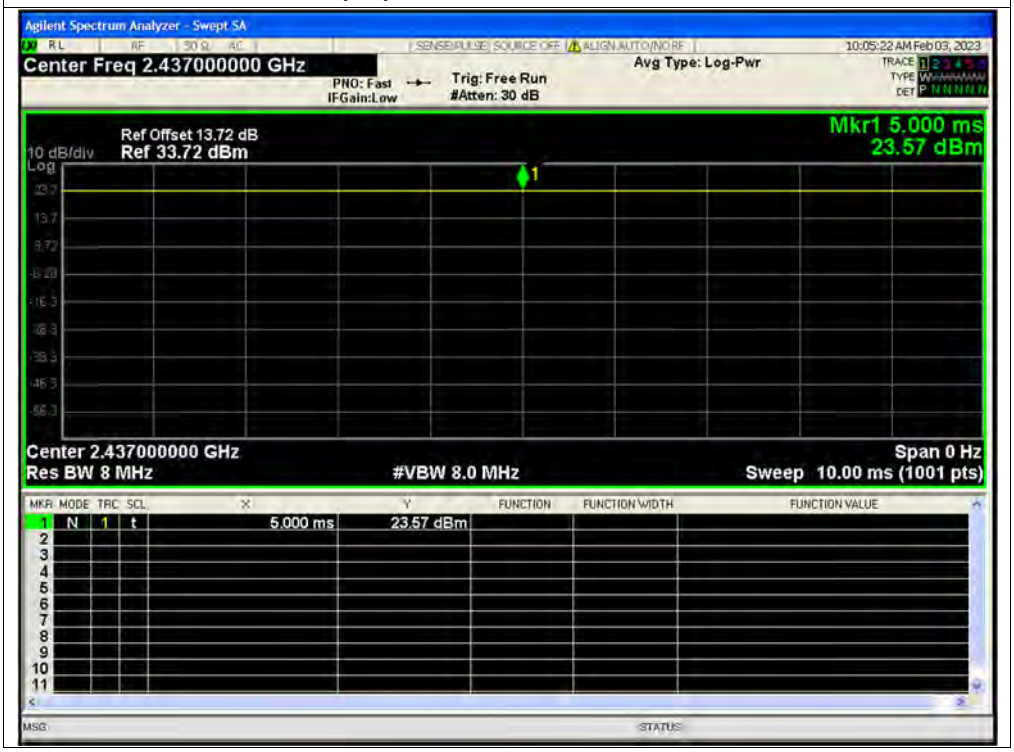
| Condition | Mode | Frequency (MHz) | Antenna | Duty Cycle (%) | Correction Factor (dB) | 1/T (kHz) |
|---|---|---|---|---|---|---|
| NVNT | b | 2412 | Ant1 | 99.5 | 0.02 | 0 |
| NVNT | b | 2437 | Ant1 | 100 | 0 | 0 |
| NVNT | b | 2462 | Ant1 | 99.4 | 0.03 | 0 |
| NVNT | g | 2412 | Ant1 | 98.57 | 0.06 | 0.48 |
| NVNT | g | 2437 | Ant1 | 98.1 | 0.08 | 0.49 |
| NVNT | g | 2462 | Ant1 | 98.57 | 0.06 | 0.48 |
| NVNT | n20 | 2412 | Ant1 | 98.57 | 0.06 | 0.48 |
| NVNT | n20 | 2437 | Ant1 | 98.1 | 0.08 | 0.49 |
| NVNT | n20 | 2462 | Ant1 | 98.1 | 0.08 | 0.49 |
| NVNT | n40 | 2422 | Ant1 | 95 | 0.22 | 1.05 |
| NVNT | n40 | 2437 | Ant1 | 95 | 0.22 | 1.05 |
| NVNT | n40 | 2452 | Ant1 | 95 | 0.22 | 1.05 |
| NVNT | ac20 | 2412 | Ant1 | 97.96 | 0.09 | 0.52 |
| NVNT | ac20 | 2437 | Ant1 | 98.47 | 0.07 | 0.52 |
| NVNT | ac20 | 2462 | Ant1 | 98.47 | 0.07 | 0.52 |
| NVNT | ac40 | 2422 | Ant1 | 95 | 0.22 | 1.05 |
| NVNT | ac40 | 2437 | Ant1 | 95.05 | 0.22 | 1.04 |
| NVNT | ac40 | 2452 | Ant1 | 95 | 0.22 | 1.05 |

Test Graphs

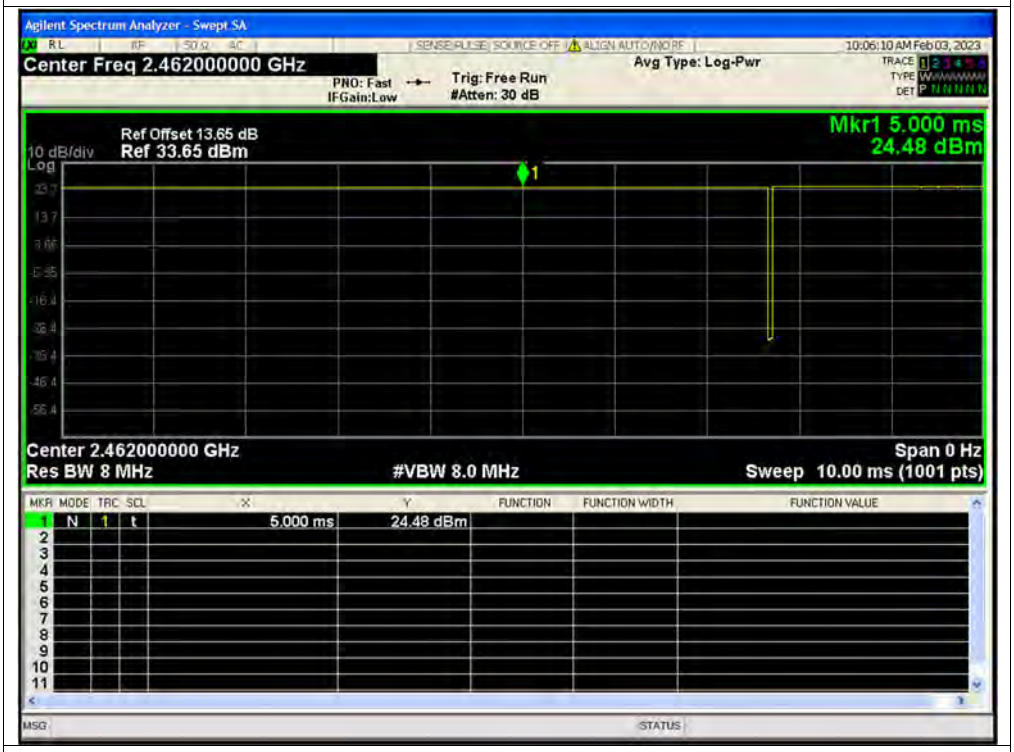
Duty Cycle NVNT b 2412MHz Ant1



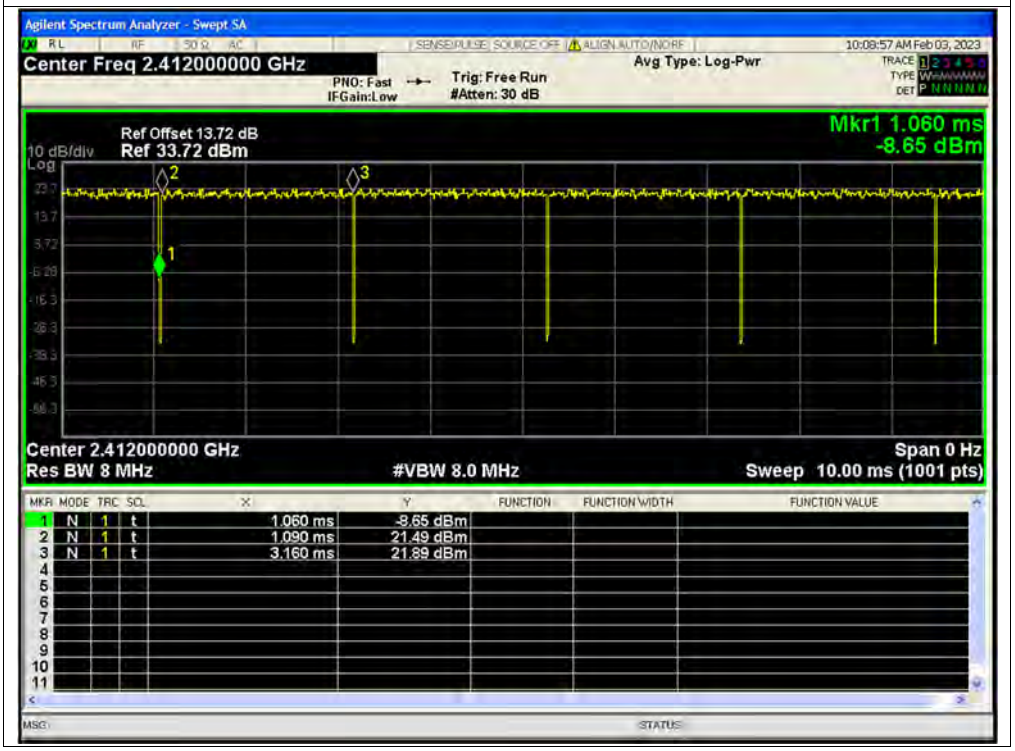

Duty Cycle NVNT b 2437MHz Ant1



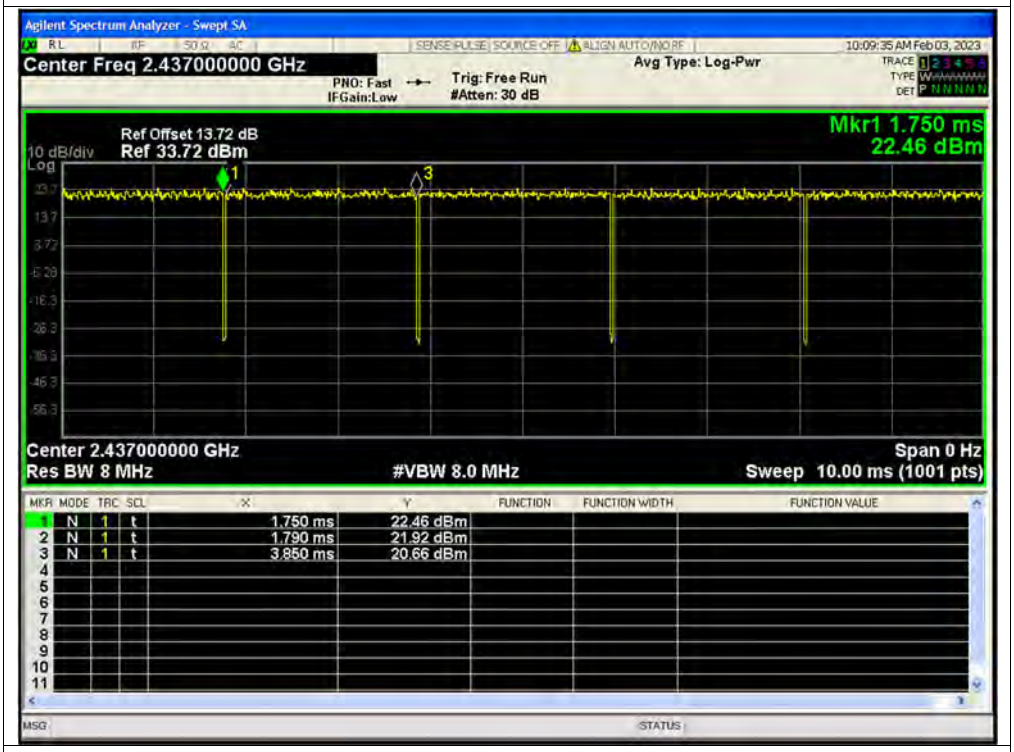
Duty Cycle NVNT b 2462MHz Ant1



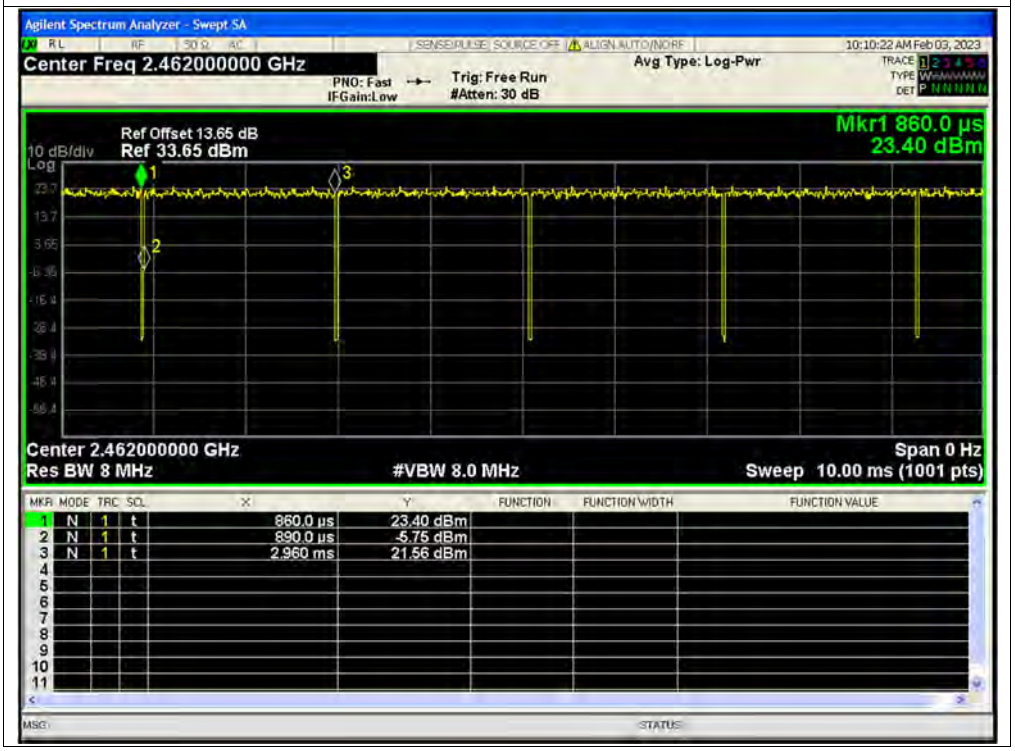

Duty Cycle NVNT g 2412MHz Ant1



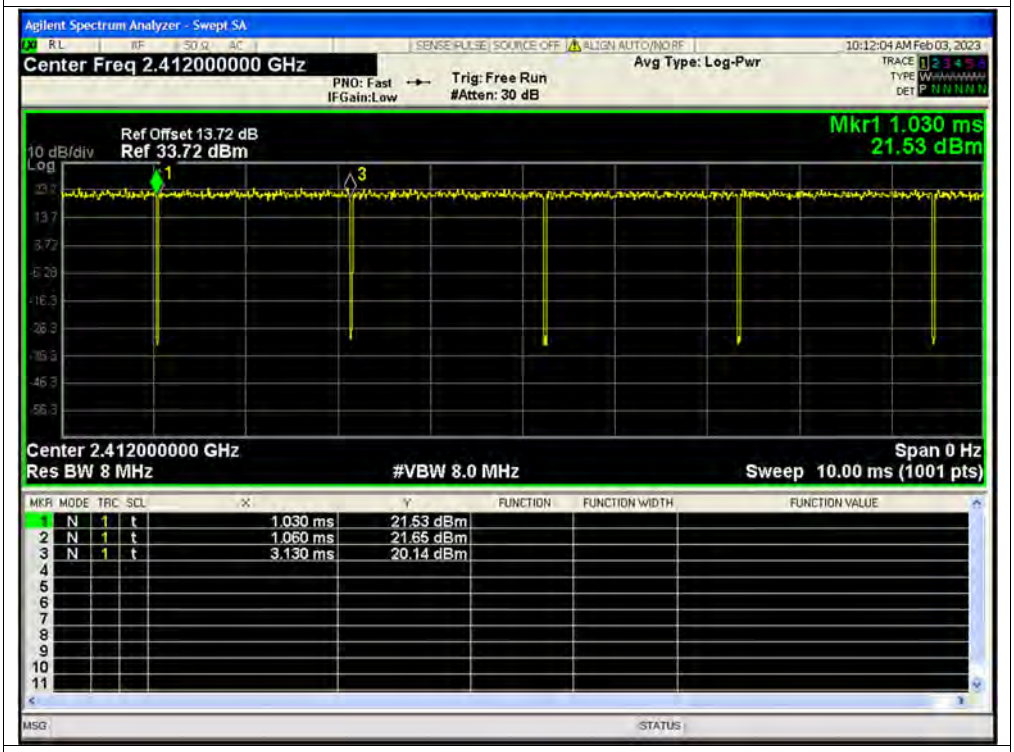
Duty Cycle NVNT g 2437MHz Ant1



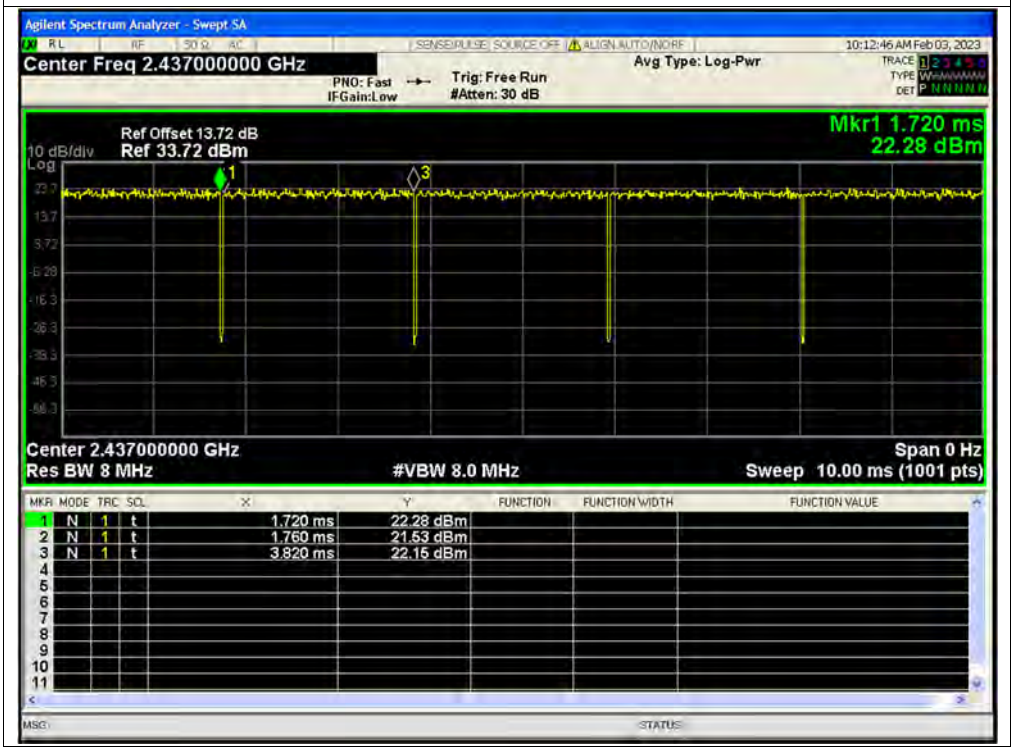

Duty Cycle NVNT g 2462MHz Ant1



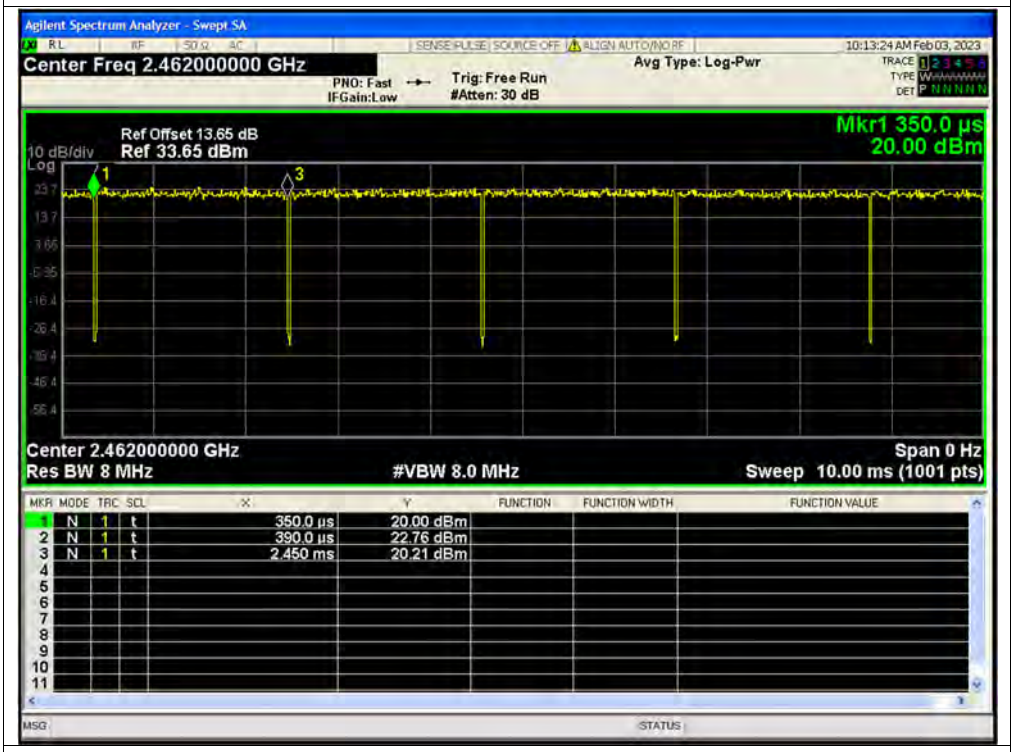
Duty Cycle NVNT n20 2412MHz Ant1



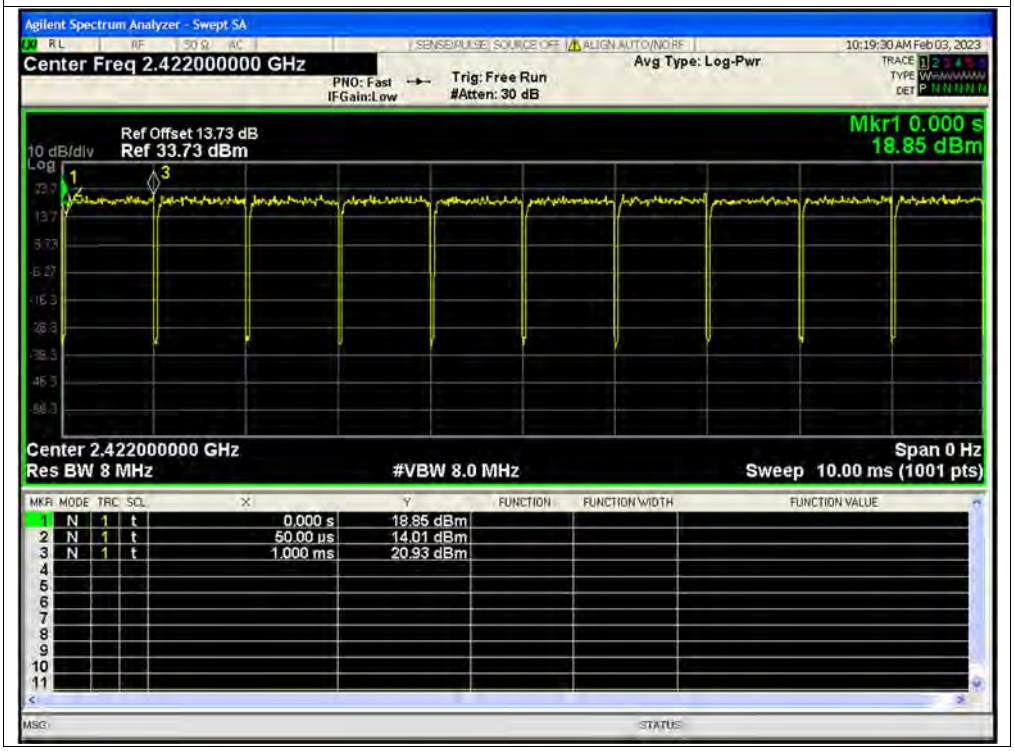

Duty Cycle NVNT n20 2437MHz Ant1



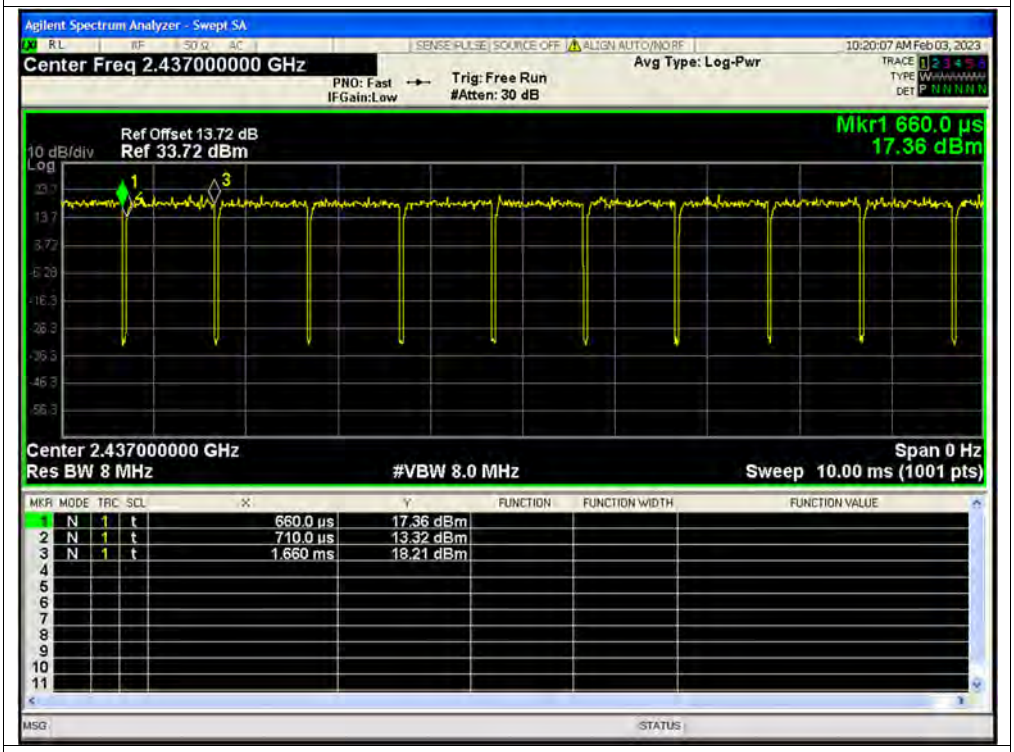
Duty Cycle NVNT n20 2462MHz Ant1



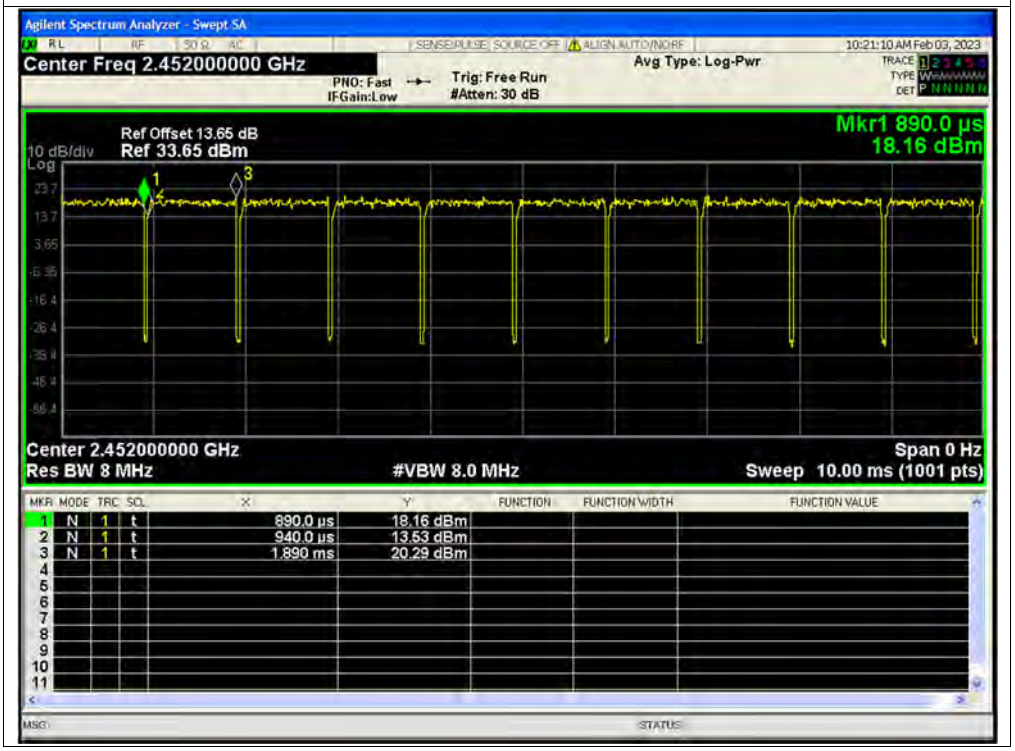

Duty Cycle NVNT n40 2422MHz Ant1



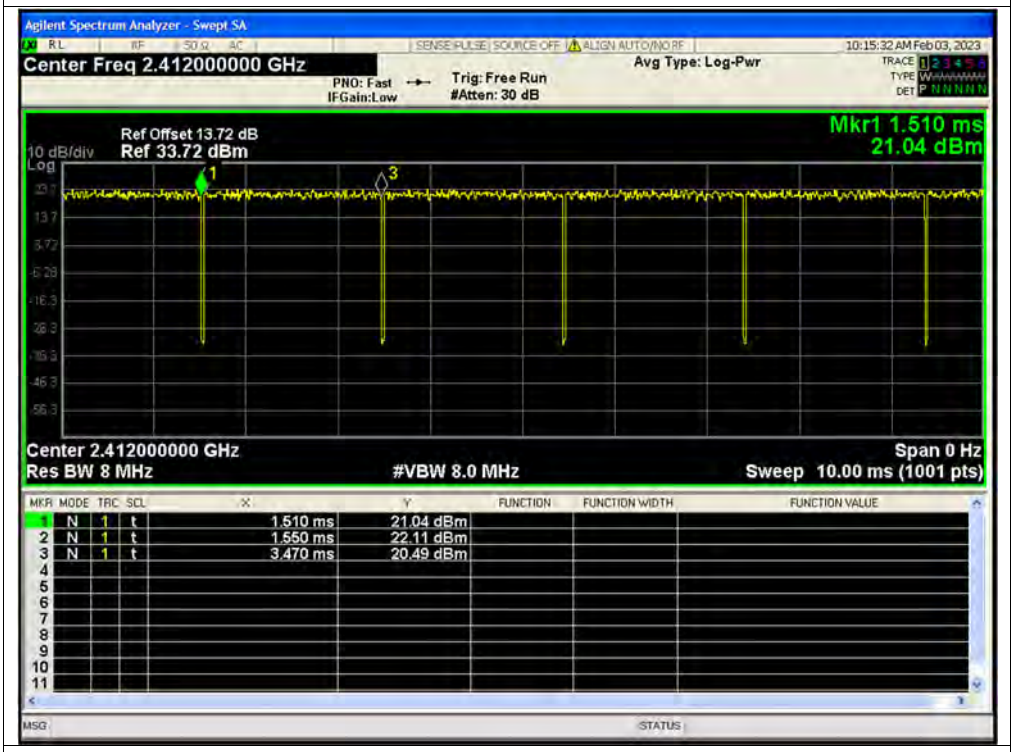
Duty Cycle NVNT n40 2437MHz Ant1



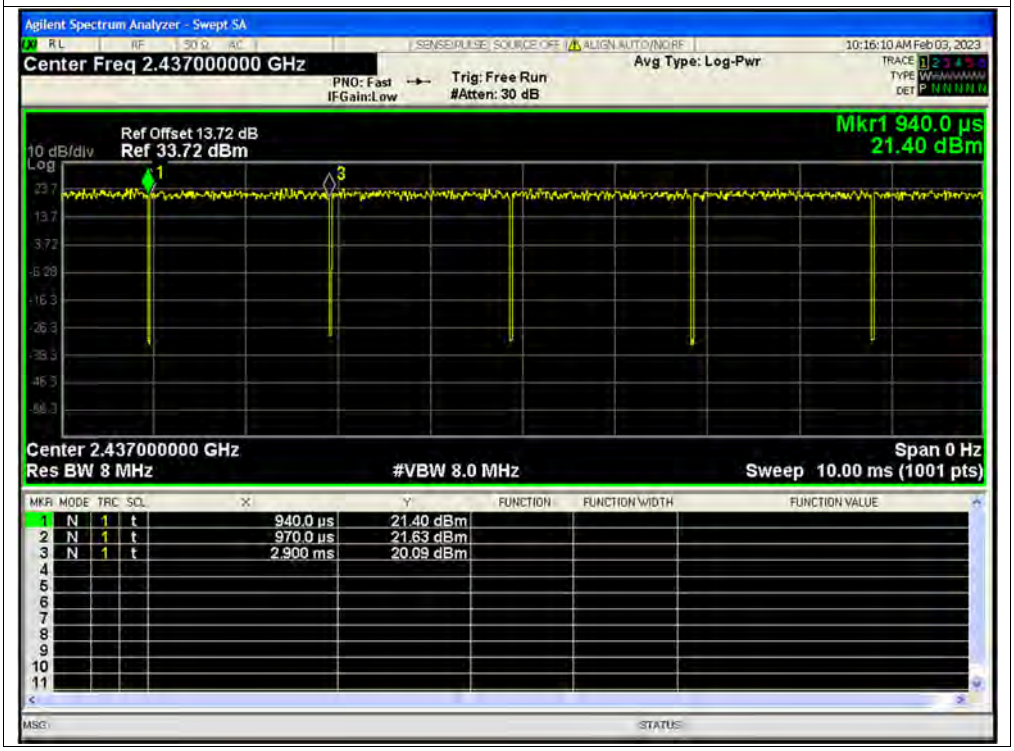

Duty Cycle NVNT n40 2452MHz Ant1



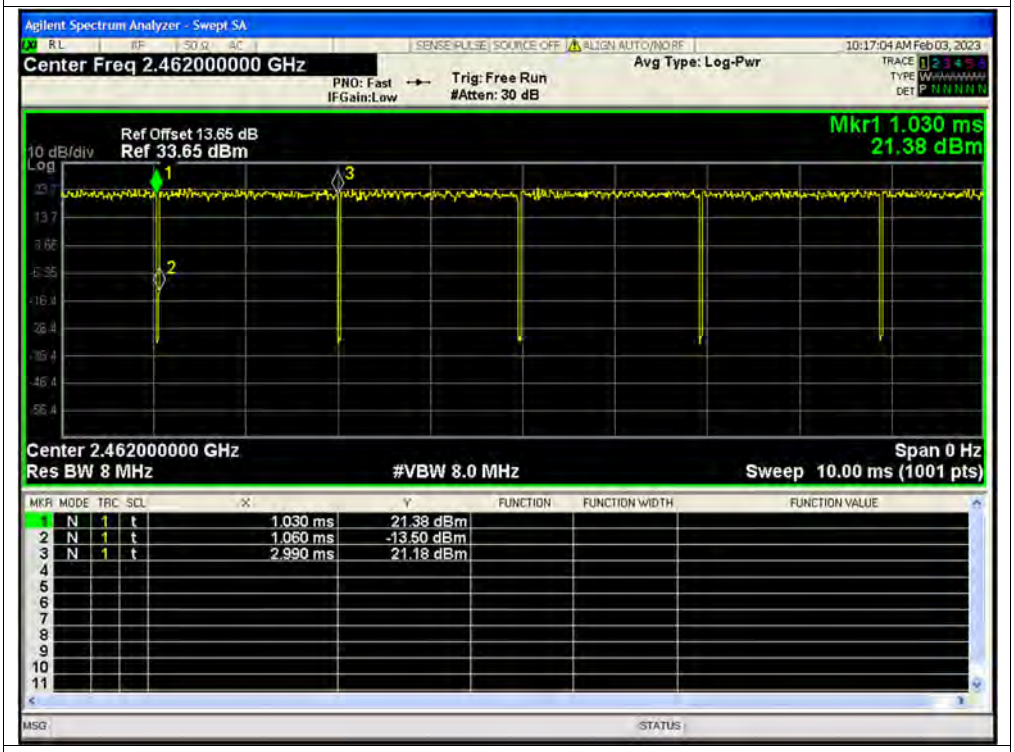
Duty Cycle NVNT ac20 2412MHz Ant1



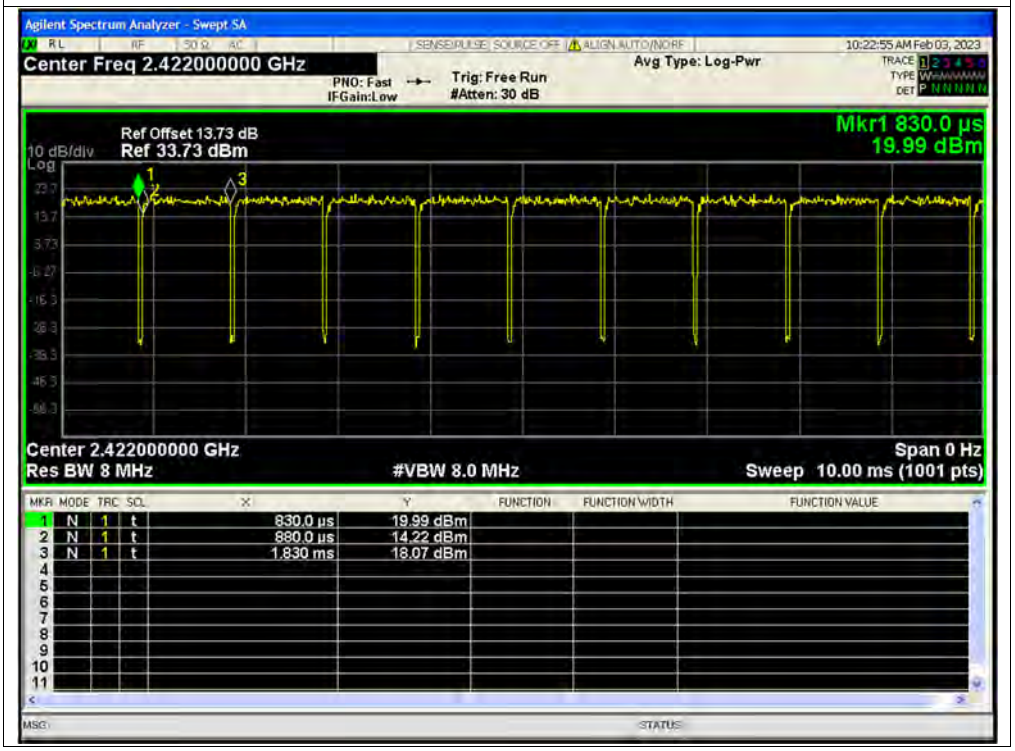

Duty Cycle NVNT ac20 2437MHz Ant1



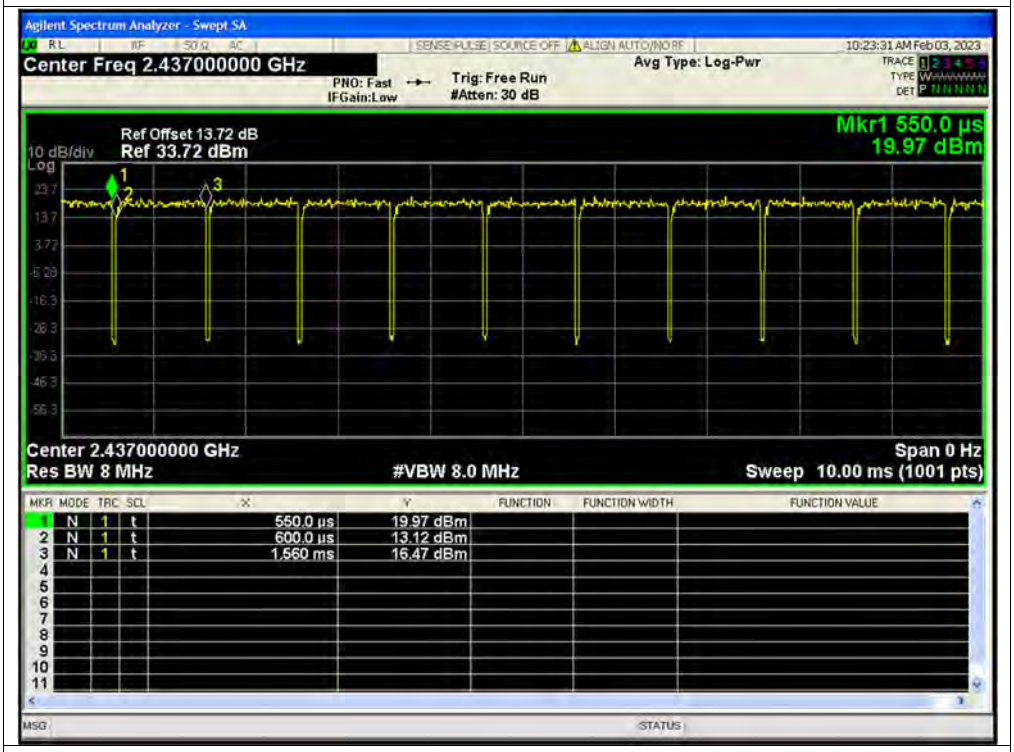
Duty Cycle NVNT ac20 2462MHz Ant1



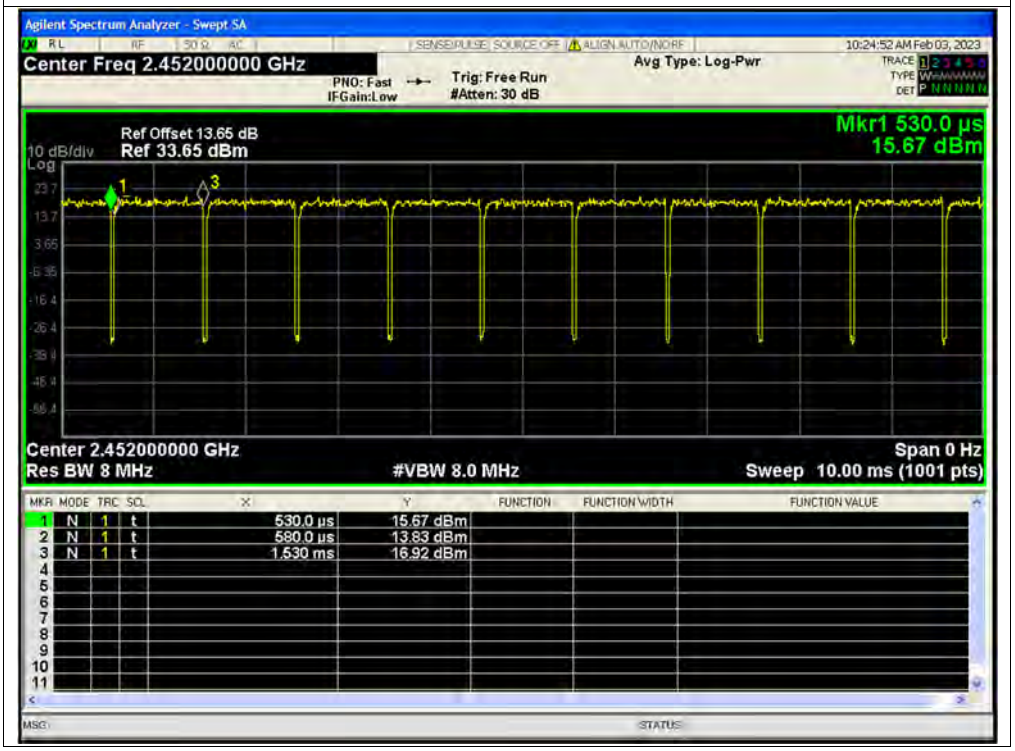

Duty Cycle NVNT ac40 2422MHz Ant1



Duty Cycle NVNT ac40 2437MHz Ant1




Duty Cycle NVNT ac40 2452MHz Ant1

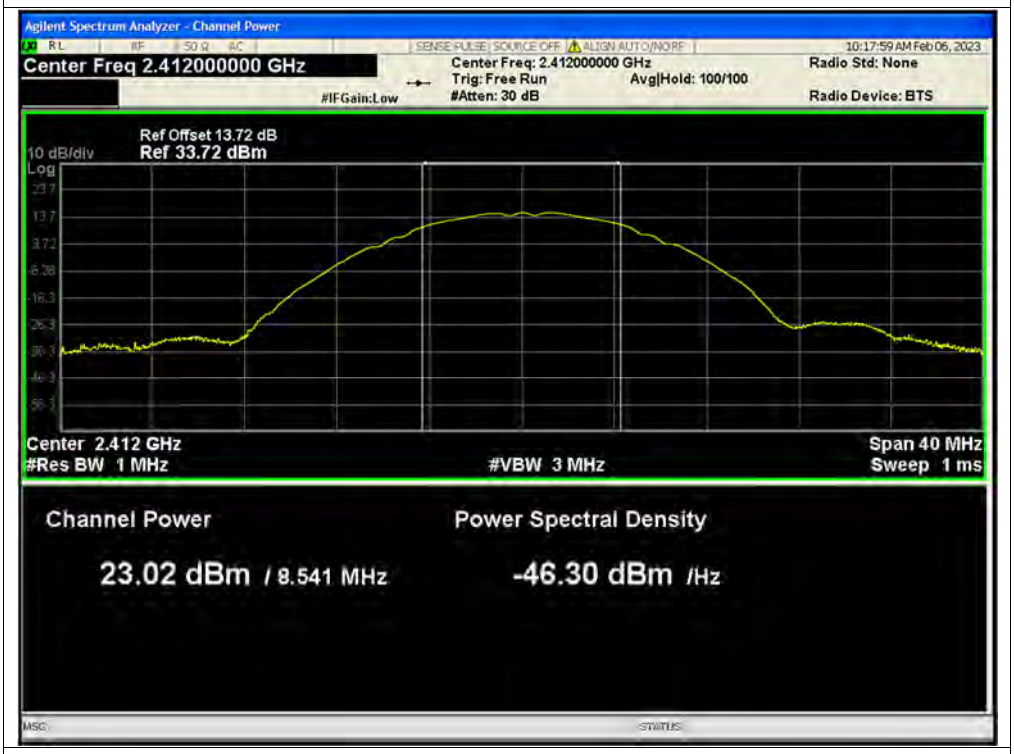


## A.2. Maximum Peak Conducted Output Power

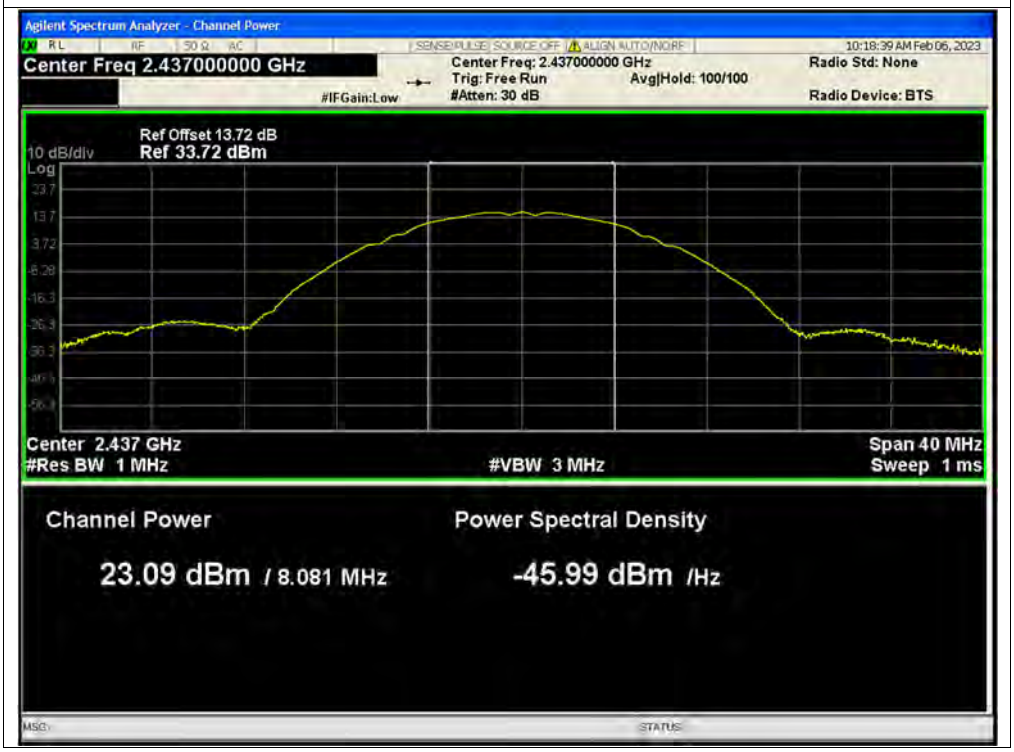
| Condition | Mode | Frequency (MHz) | Antenna | Conducted Power (dBm) | Duty Factor (dB) | Total Power (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| NVNT | b | 2412 | Ant1 | 23.02 | 0 | 23.02 | 30 | Pass |
| NVNT | b | 2437 | Ant1 | 23.09 | 0 | 23.09 | 30 | Pass |
| NVNT | b | 2462 | Ant1 | 23.34 | 0 | 23.34 | 30 | Pass |
| NVNT | g | 2412 | Ant1 | 25.34 | 0 | 25.34 | 30 | Pass |
| NVNT | g | 2437 | Ant1 | 25.52 | 0 | 25.52 | 30 | Pass |
| NVNT | g | 2462 | Ant1 | 22.89 | 0 | 22.89 | 30 | Pass |
| NVNT | n20 | 2412 | Ant1 | 25.09 | 0 | 25.09 | 30 | Pass |
| NVNT | n20 | 2437 | Ant1 | 25.2 | 0 | 25.2 | 30 | Pass |
| NVNT | n20 | 2462 | Ant1 | 22.54 | 0 | 22.54 | 30 | Pass |
| NVNT | n40 | 2422 | Ant1 | 25.51 | 0 | 25.51 | 30 | Pass |
| NVNT | n40 | 2437 | Ant1 | 22.92 | 0 | 22.92 | 30 | Pass |
| NVNT | n40 | 2452 | Ant1 | 21.04 | 0 | 21.04 | 30 | Pass |
| NVNT | ac20 | 2412 | Ant1 | 25.42 | 0 | 25.42 | 30 | Pass |
| NVNT | ac20 | 2437 | Ant1 | 25.21 | 0 | 25.21 | 30 | Pass |
| NVNT | ac20 | 2462 | Ant1 | 22.6 | 0 | 22.6 | 30 | Pass |
| NVNT | ac40 | 2422 | Ant1 | 25.58 | 0 | 25.58 | 30 | Pass |
| NVNT | ac40 | 2437 | Ant1 | 22.9 | 0 | 22.9 | 30 | Pass |
| NVNT | ac40 | 2452 | Ant1 | 21.09 | 0 | 21.09 | 30 | Pass |

Test Graphs

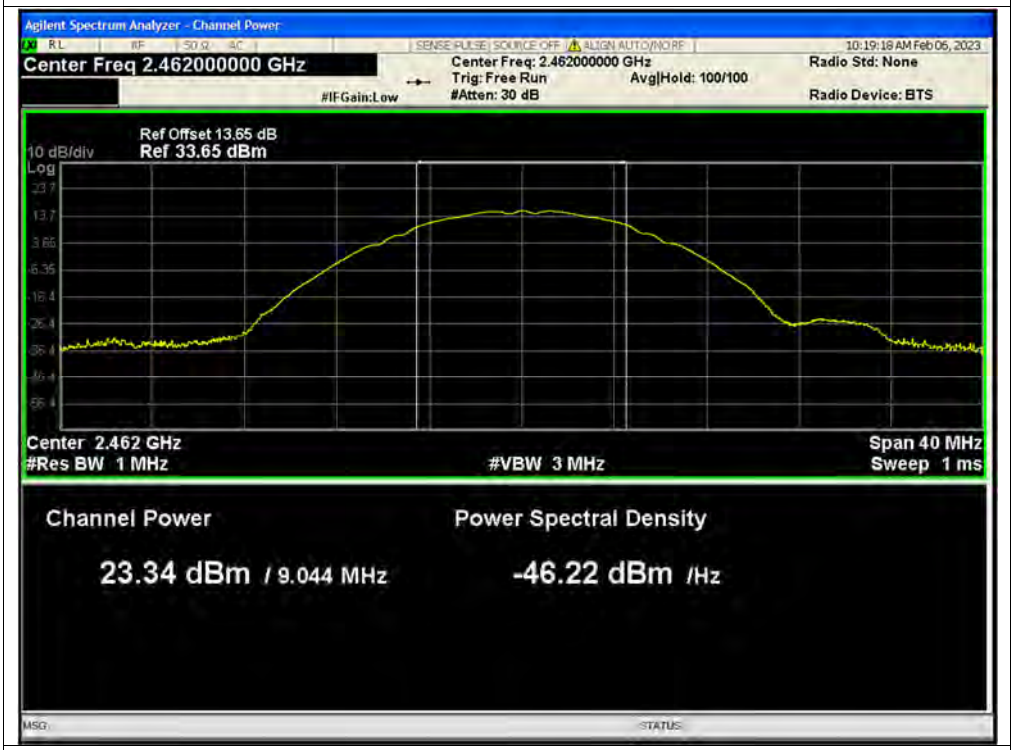
Peak Power NVNT b 2412MHz Ant1



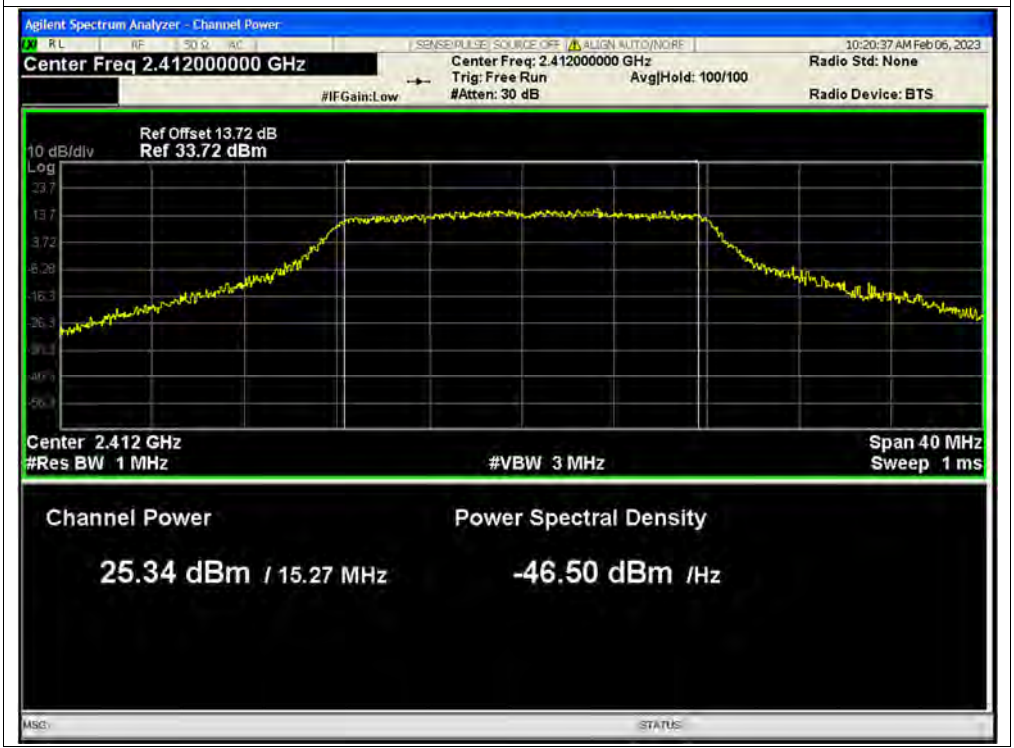

Peak Power NVNT b 2437MHz Ant1



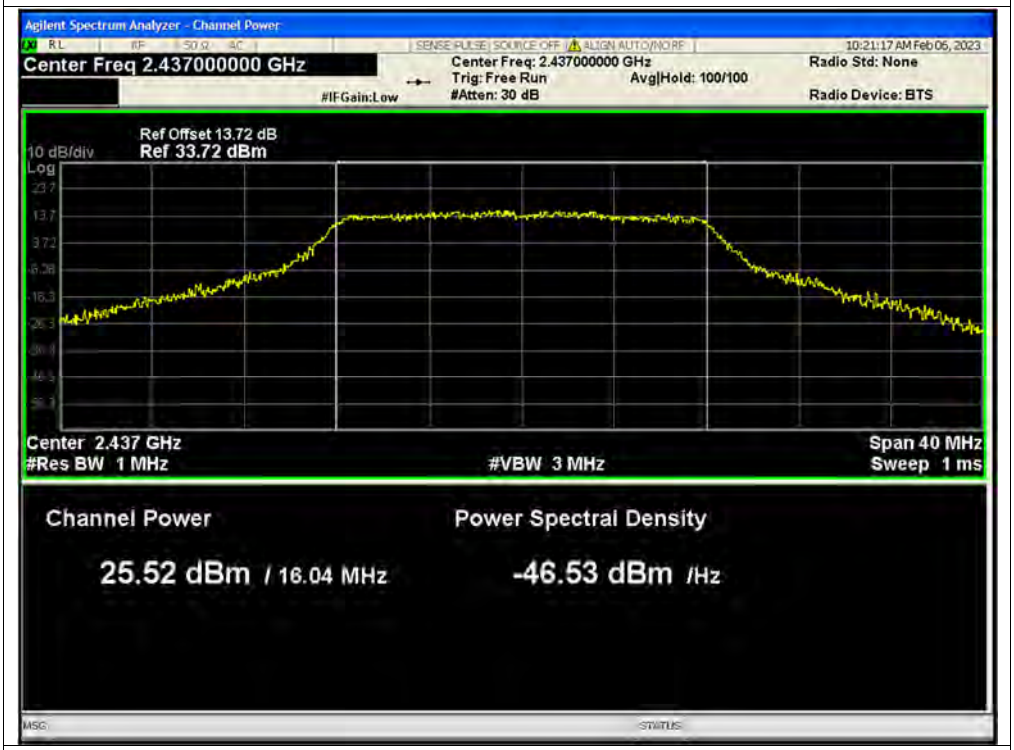
Peak Power NVNT b 2462MHz Ant1



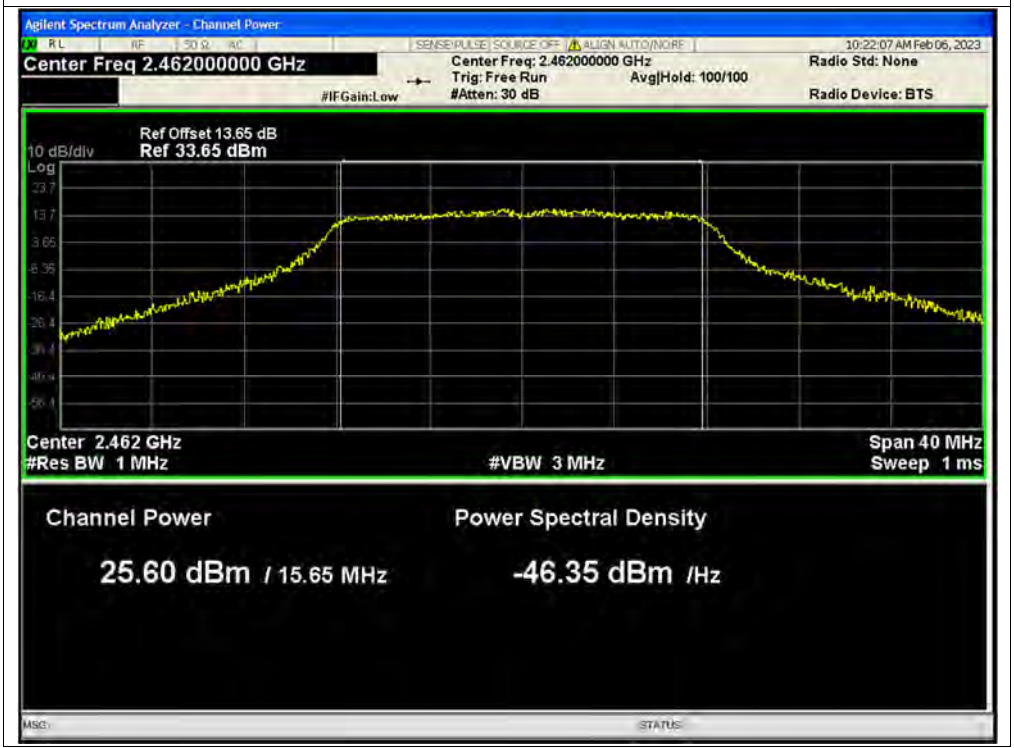

Peak Power NVNT g 2412MHz Ant1



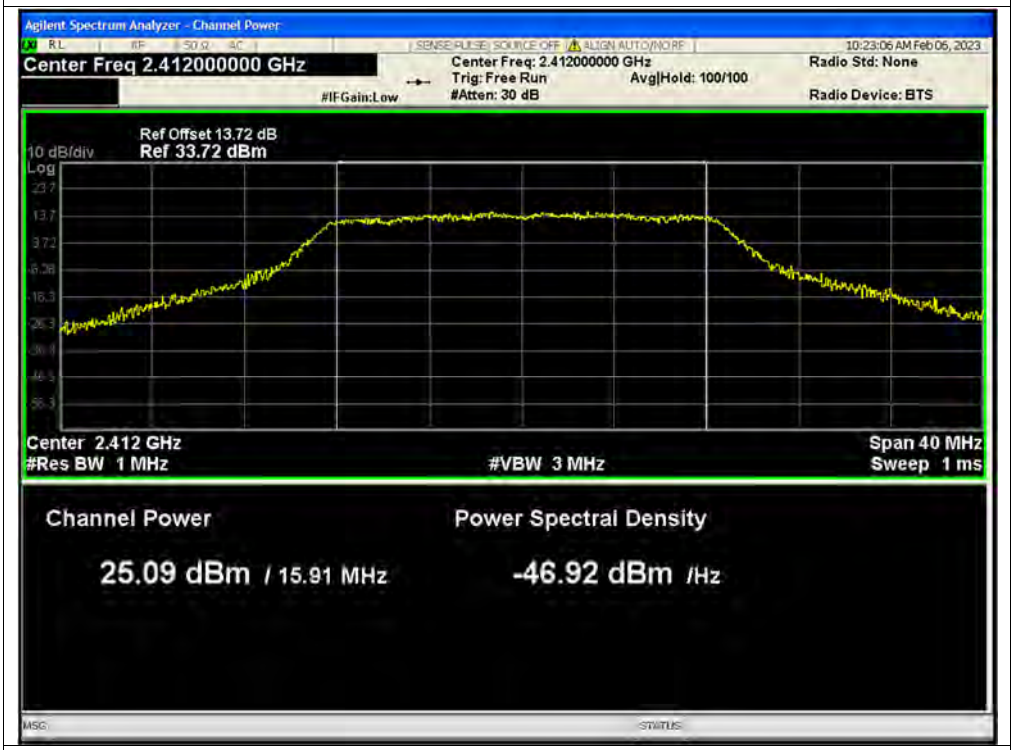
Peak Power NVNT g 2437MHz Ant1



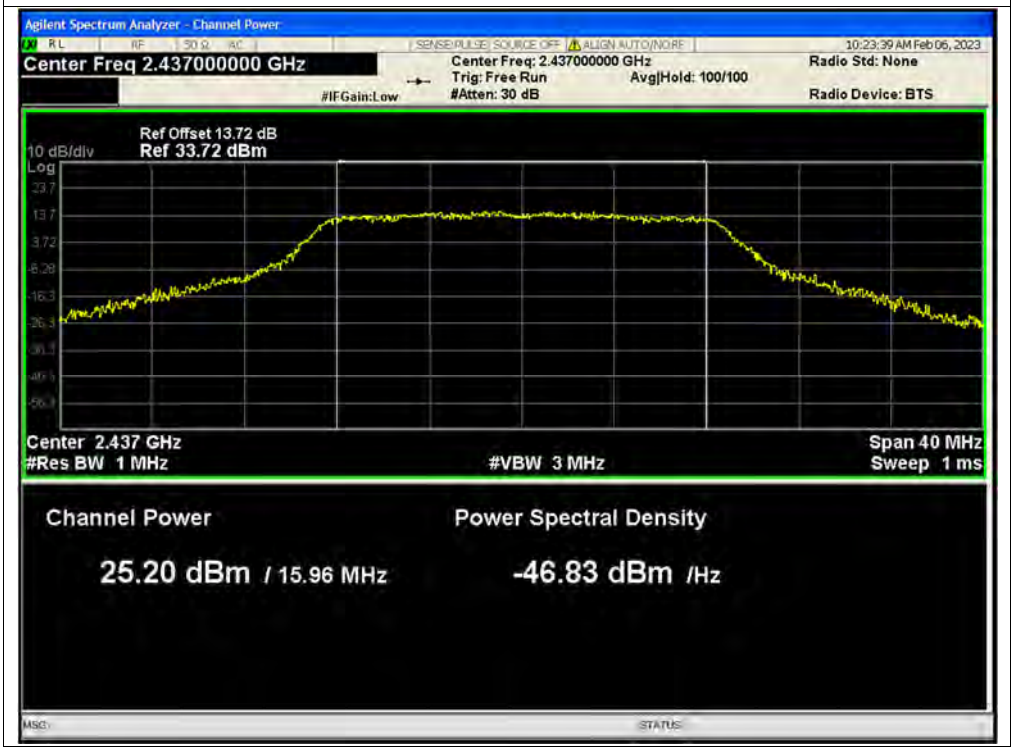

Peak Power NVNT g 2462MHz Ant1



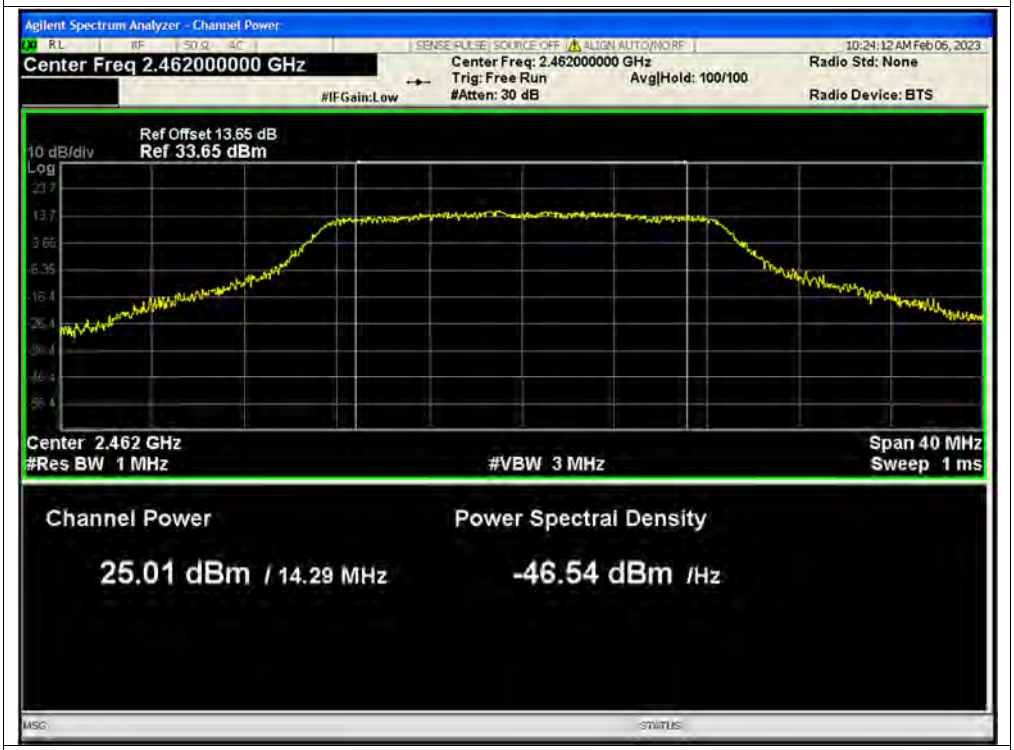
Peak Power NVNT n20 2412MHz Ant1



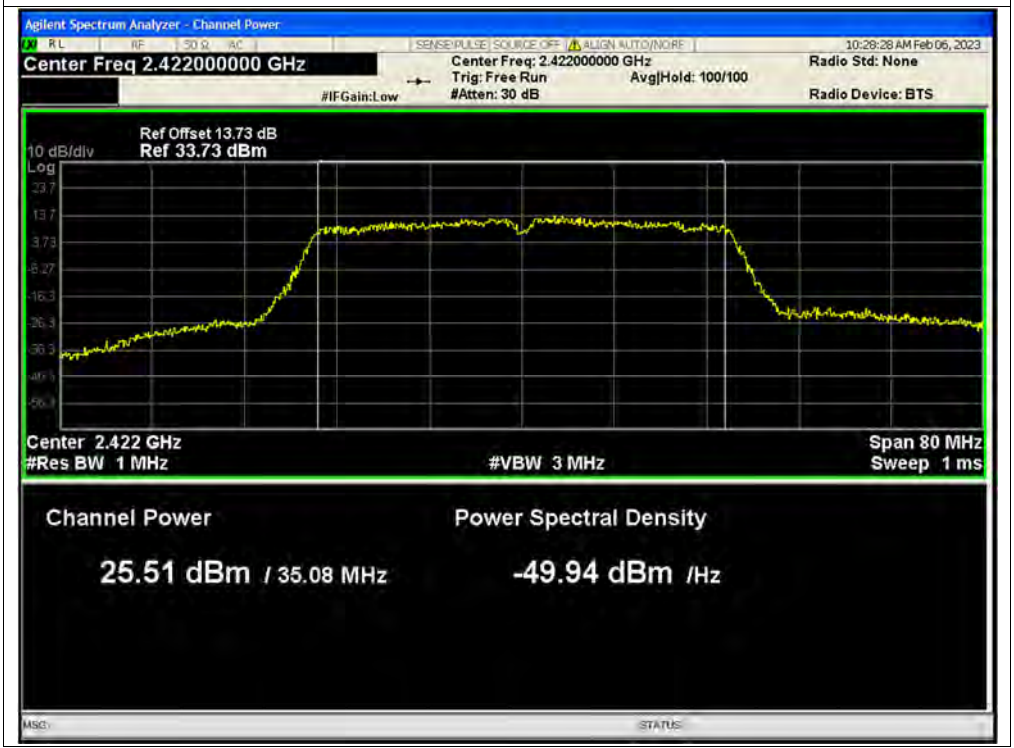

Peak Power NVNT n20 2437MHz Ant1



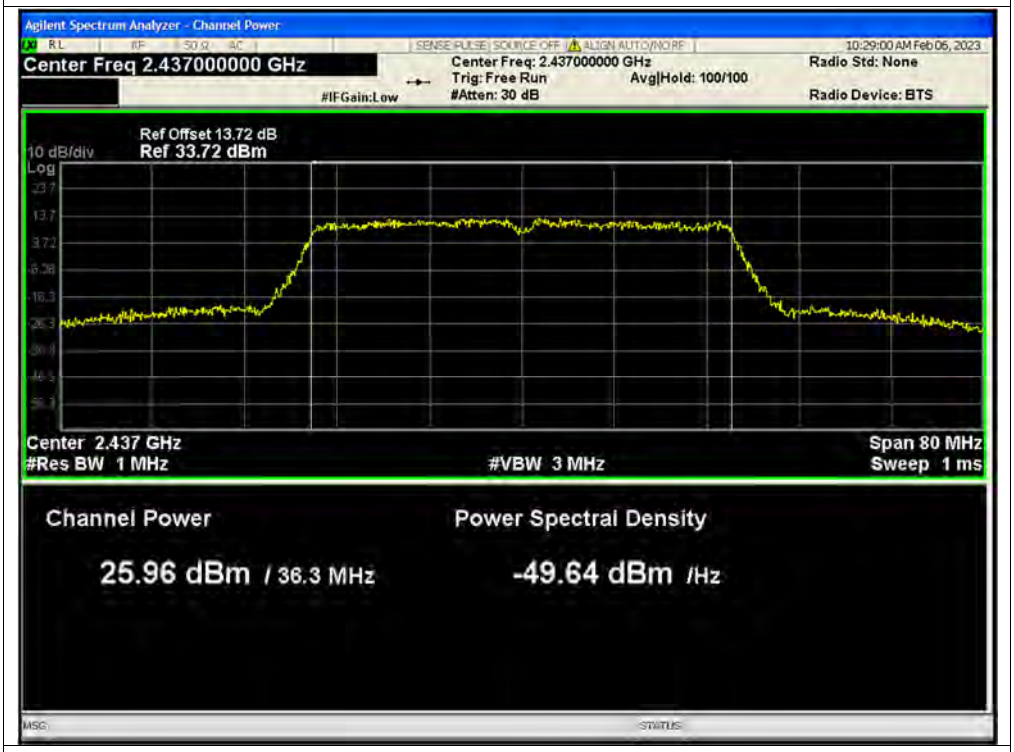
Peak Power NVNT n20 2462MHz Ant1



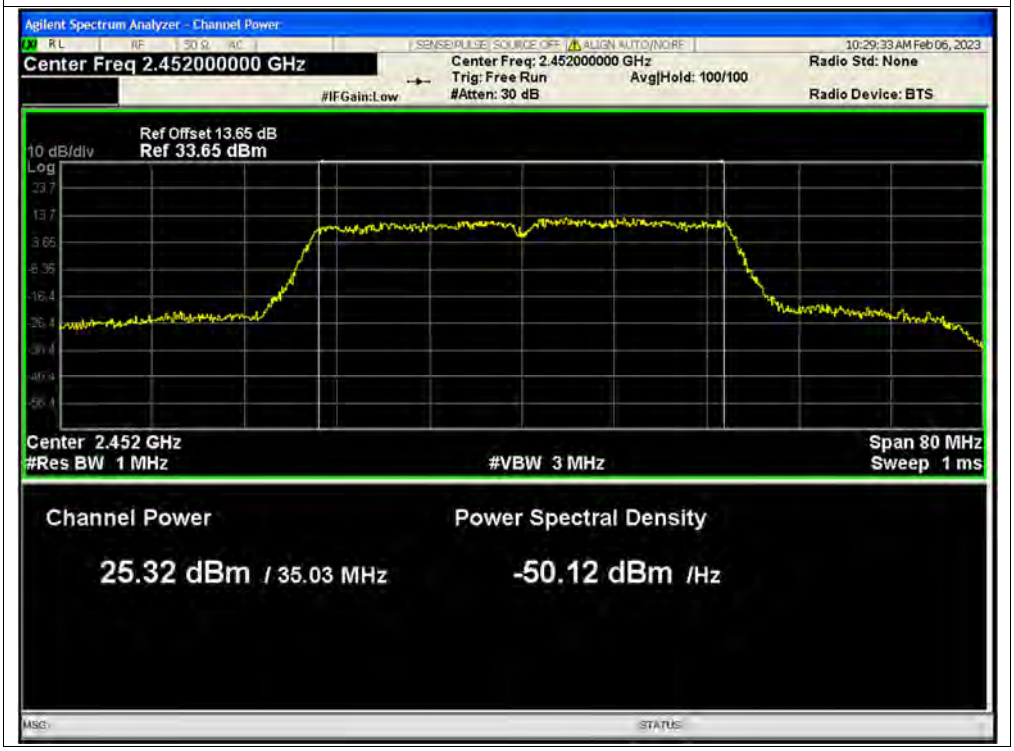

Peak Power NVNT n40 2422MHz Ant1



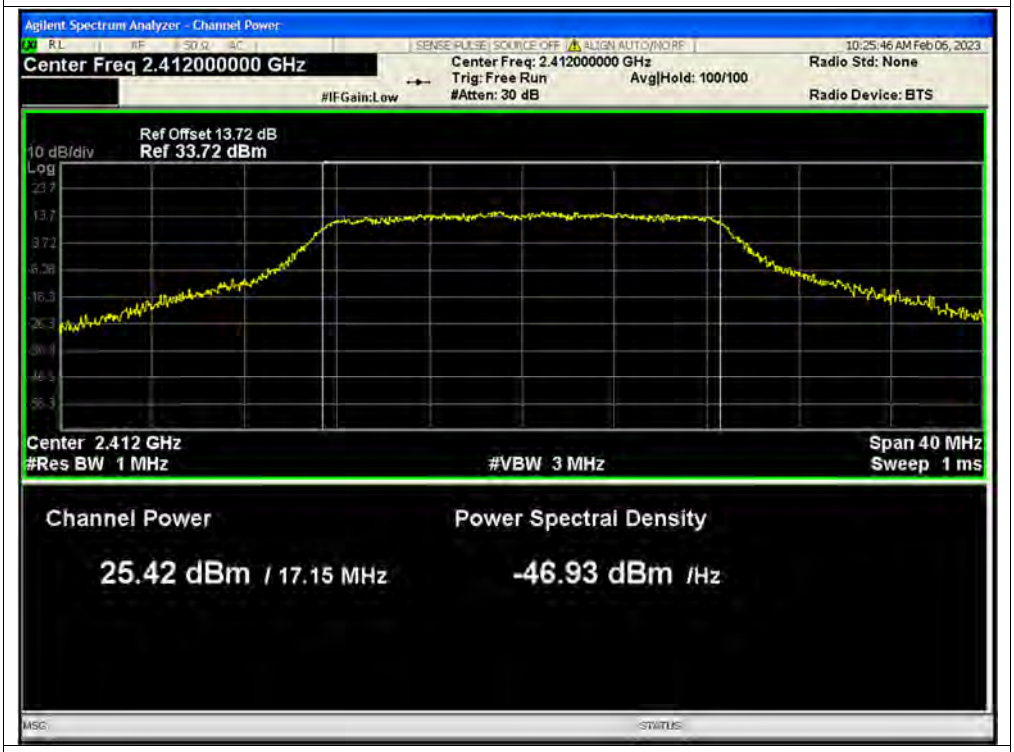
Peak Power NVNT n40 2437MHz Ant1



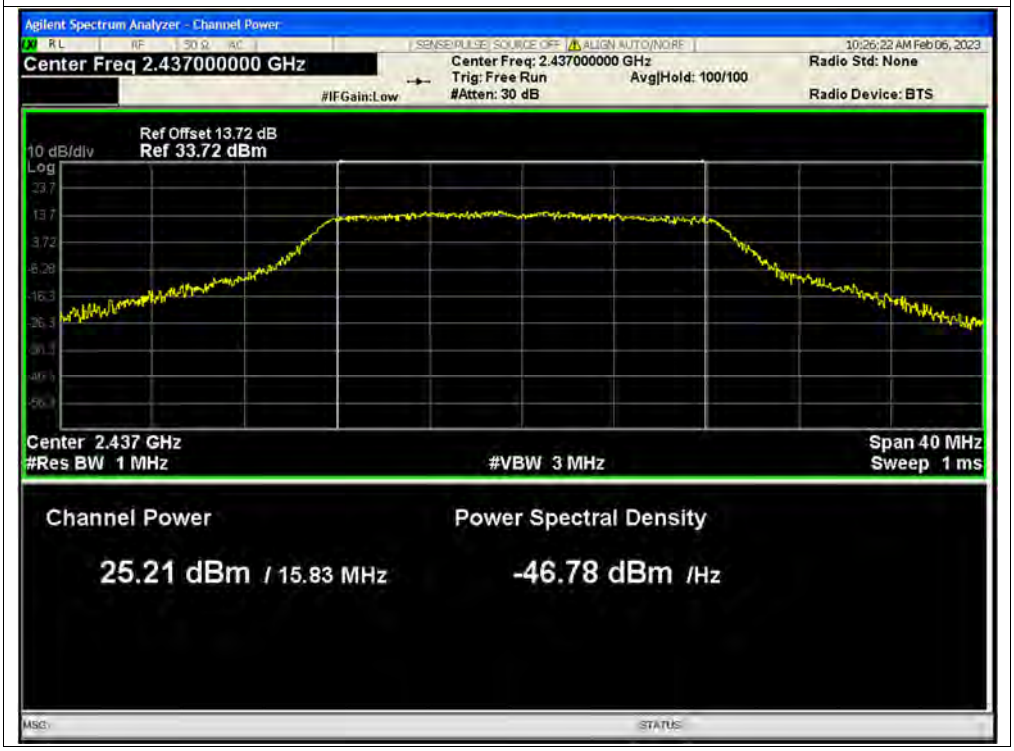

Peak Power NVNT n40 2452MHz Ant1



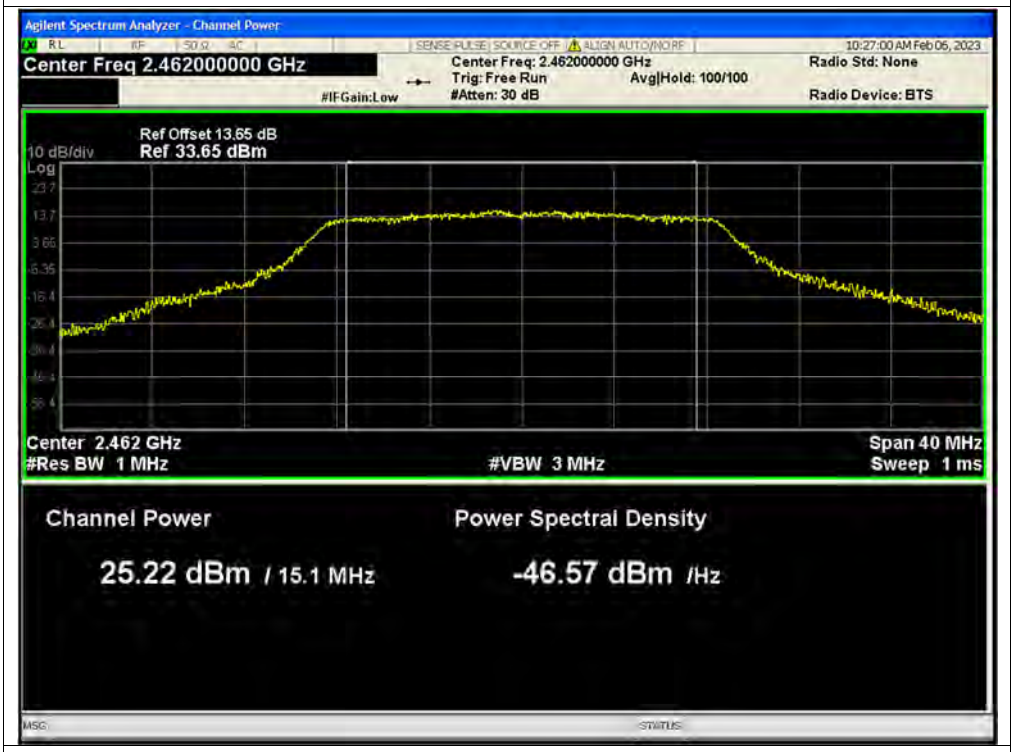
Peak Power NVNT ac20 2412MHz Ant1



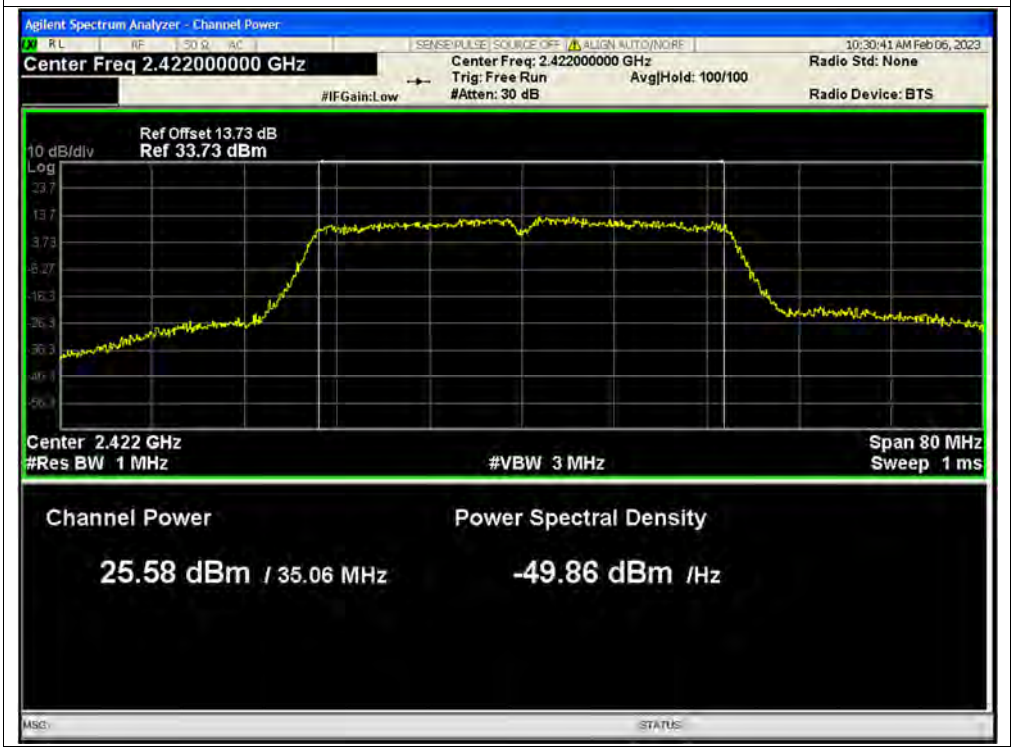

Peak Power NVNT ac20 2437MHz Ant1



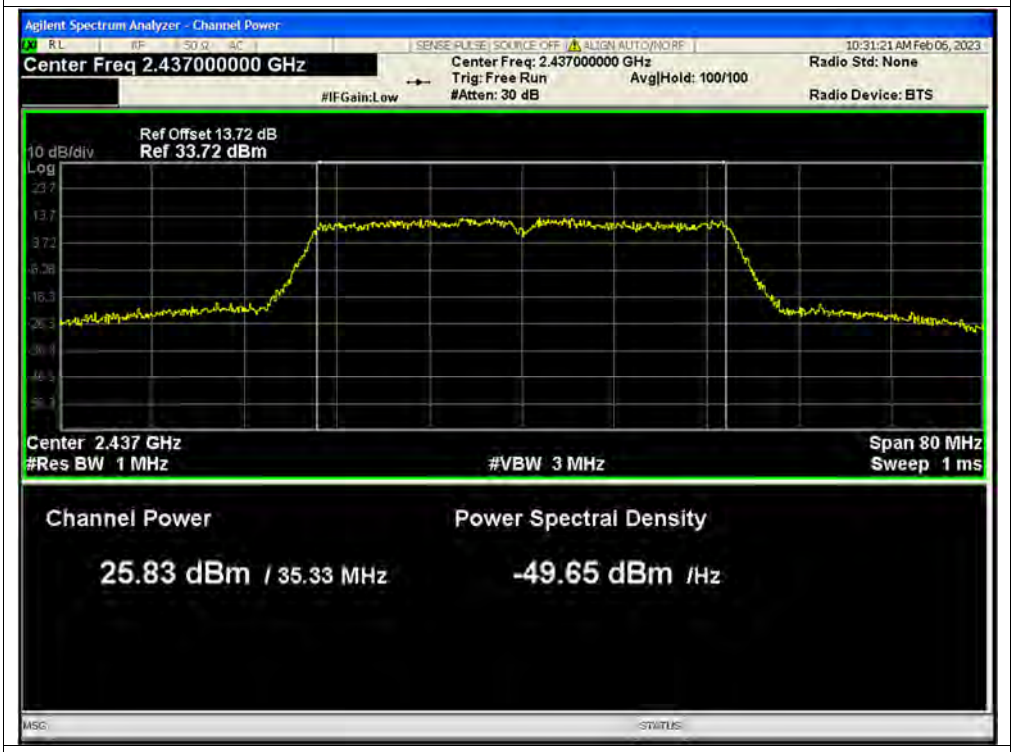
Peak Power NVNT ac20 2462MHz Ant1



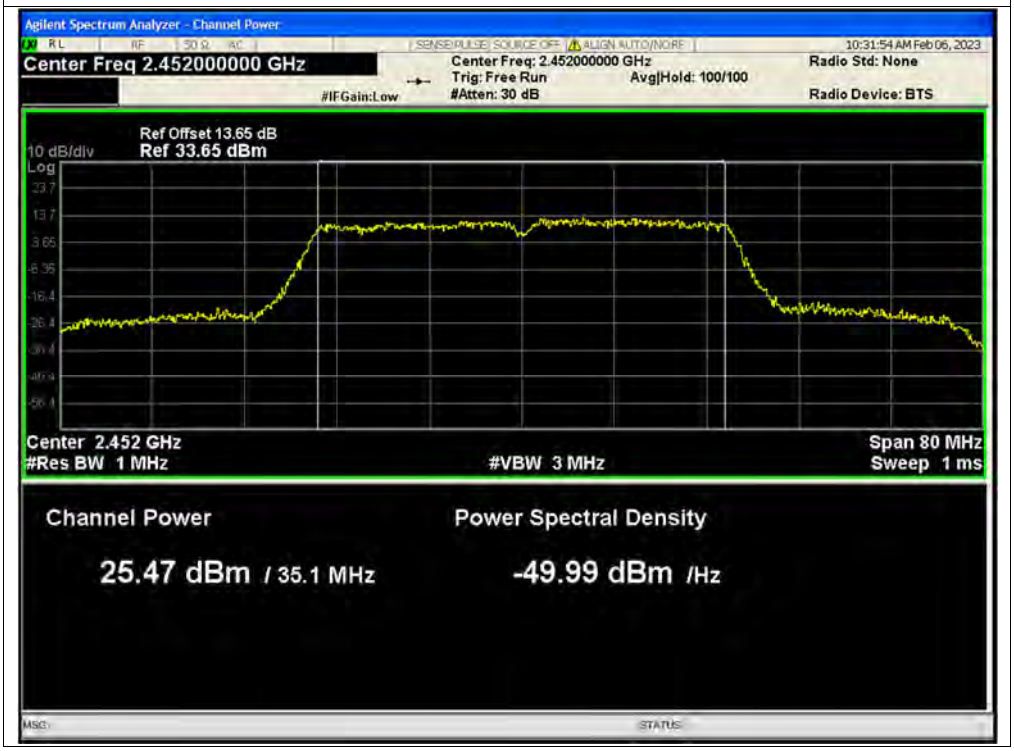

Peak Power NVNT ac40 2422MHz Ant1



Peak Power NVNT ac40 2437MHz Ant1




Peak Power NVNT ac40 2452MHz Ant1

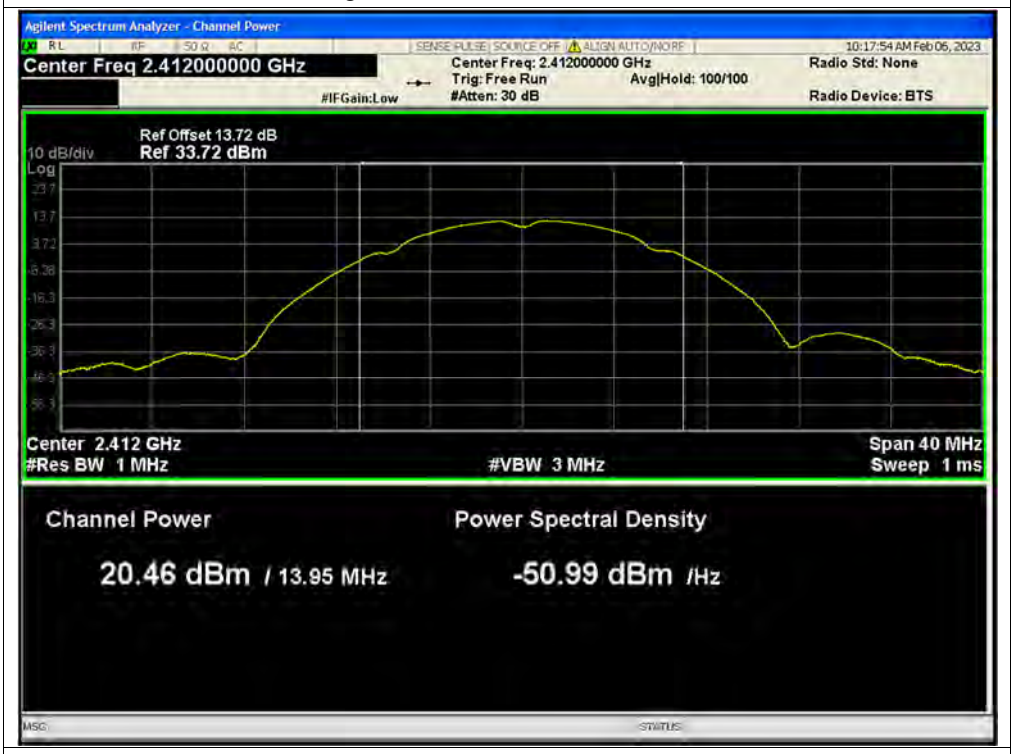


## A.3. Maximum Average Conducted Output Power

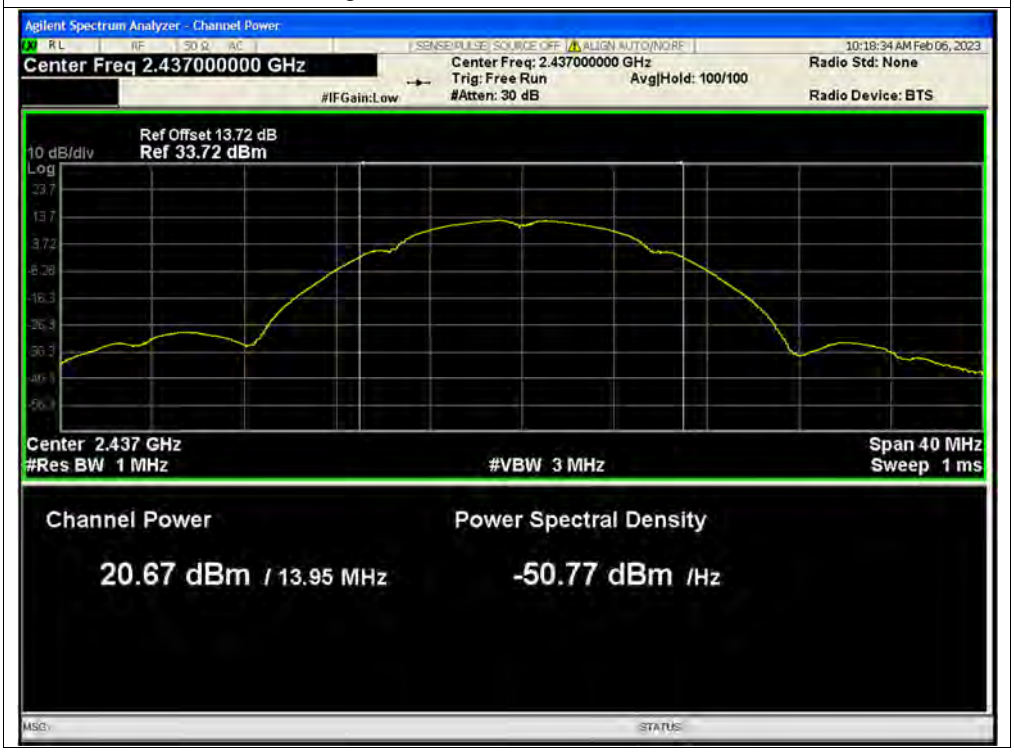
| Condition | Mode | Frequency (MHz) | Antenna | Conducted Power (dBm) | Duty Factor (dB) | Total Power (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|
| NVNT | b | 2412 | Ant1 | 20.46 | 0.02 | 20.48 | 30 | Pass |
| NVNT | b | 2437 | Ant1 | 20.67 | 0 | 20.67 | 30 | Pass |
| NVNT | b | 2462 | Ant1 | 20.63 | 0.03 | 20.66 | 30 | Pass |
| NVNT | g | 2412 | Ant1 | 18.41 | 0.06 | 18.47 | 30 | Pass |
| NVNT | g | 2437 | Ant1 | 18.42 | 0.08 | 18.5 | 30 | Pass |
| NVNT | g | 2462 | Ant1 | 16.07 | 0.06 | 16.13 | 30 | Pass |
| NVNT | n20 | 2412 | Ant1 | 18.22 | 0.06 | 18.28 | 30 | Pass |
| NVNT | n20 | 2437 | Ant1 | 18.19 | 0.08 | 18.27 | 30 | Pass |
| NVNT | n20 | 2462 | Ant1 | 15.43 | 0.08 | 15.51 | 30 | Pass |
| NVNT | n40 | 2422 | Ant1 | 18.28 | 0.22 | 18.5 | 30 | Pass |
| NVNT | n40 | 2437 | Ant1 | 15.53 | 0.22 | 15.75 | 30 | Pass |
| NVNT | n40 | 2452 | Ant1 | 13.7 | 0.22 | 13.92 | 30 | Pass |
| NVNT | ac20 | 2412 | Ant1 | 18.23 | 0.09 | 18.32 | 30 | Pass |
| NVNT | ac20 | 2437 | Ant1 | 18.17 | 0.07 | 18.24 | 30 | Pass |
| NVNT | ac20 | 2462 | Ant1 | 15.42 | 0.07 | 15.49 | 30 | Pass |
| NVNT | ac40 | 2422 | Ant1 | 18.23 | 0.22 | 18.45 | 30 | Pass |
| NVNT | ac40 | 2437 | Ant1 | 15.49 | 0.22 | 15.71 | 30 | Pass |
| NVNT | ac40 | 2452 | Ant1 | 13.74 | 0.22 | 13.96 | 30 | Pass |

Test Graphs

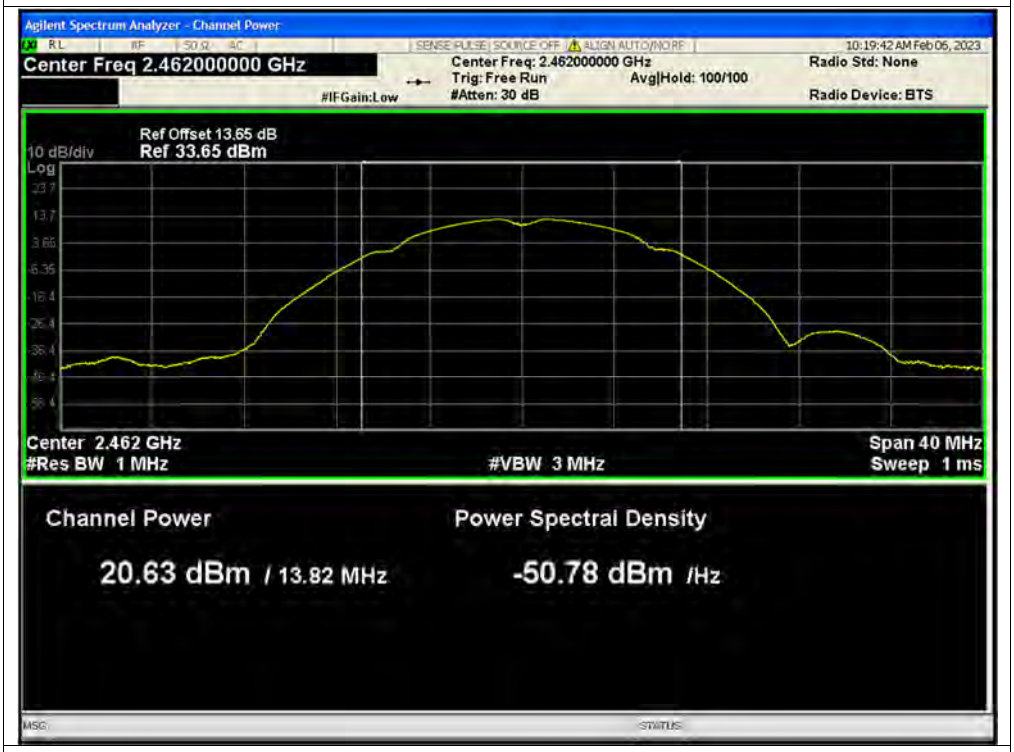
Average Power NVNT b 2412MHz Ant1



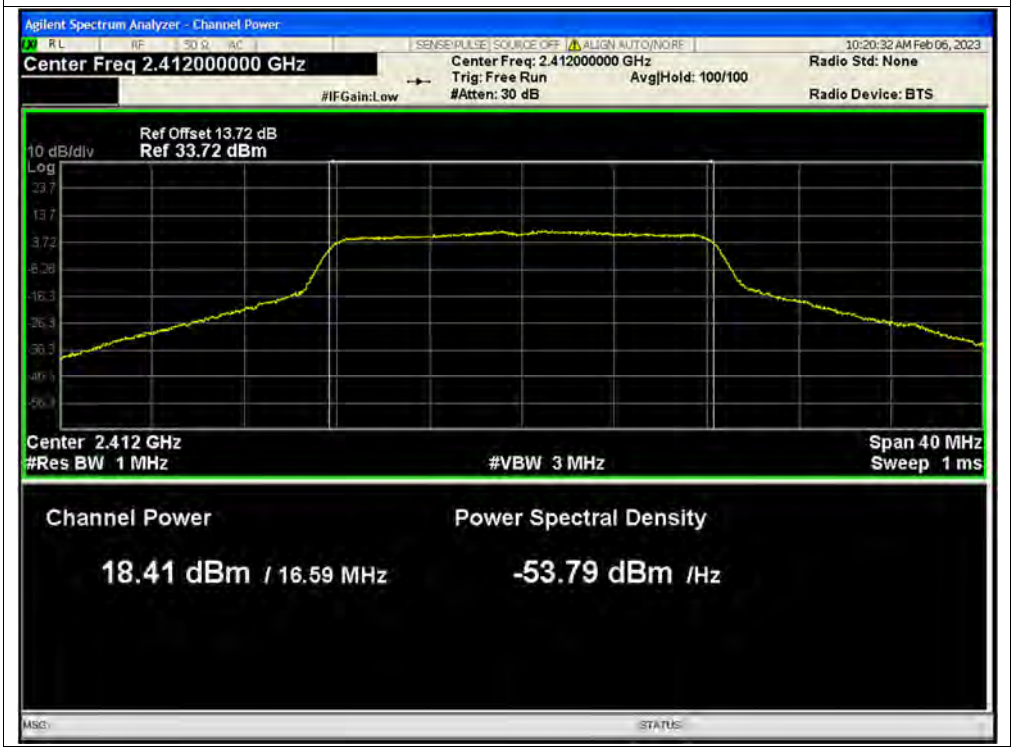

Average Power NVNT b 2437MHz Ant1



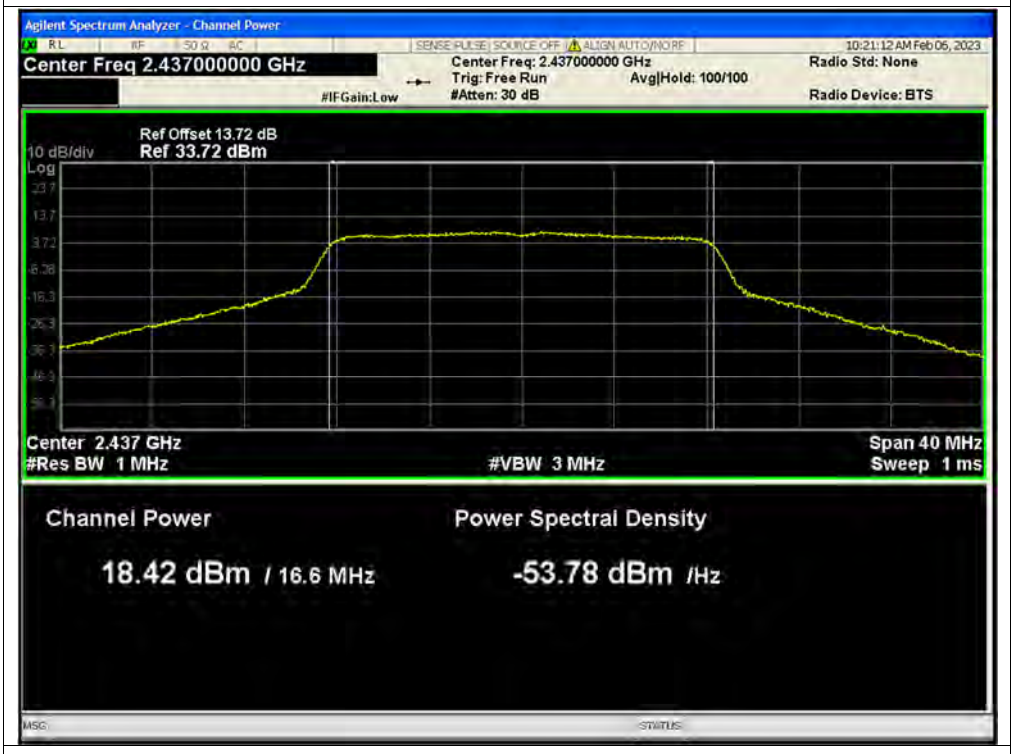
Average Power NVNT b 2462MHz Ant1



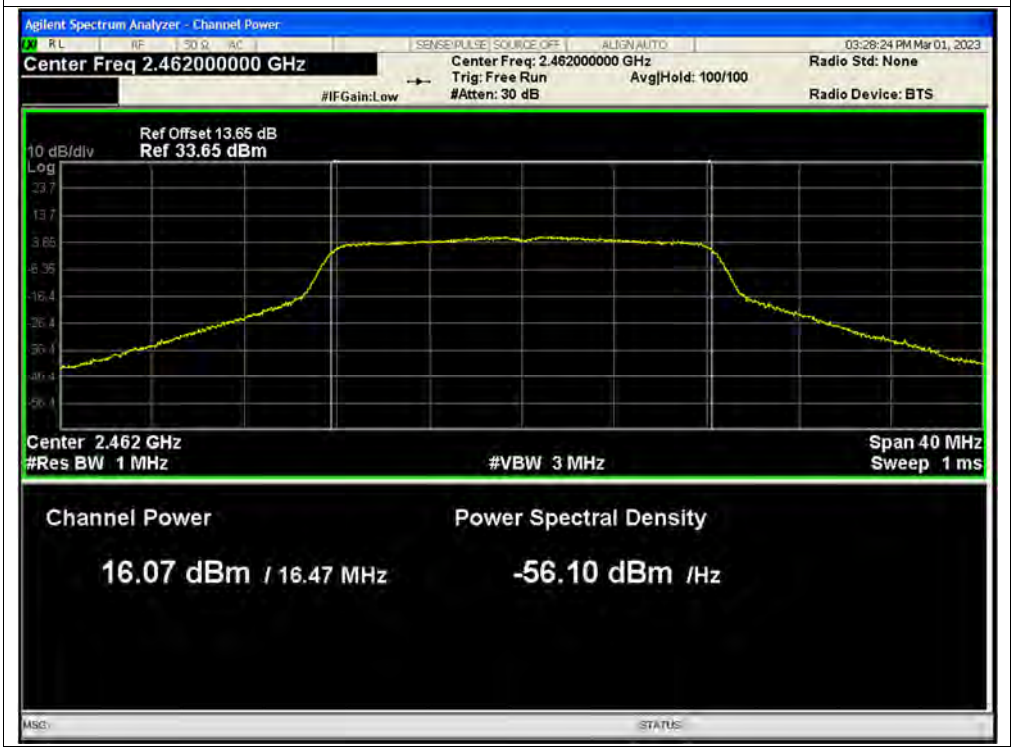

Average Power NVNT g 2412MHz Ant1



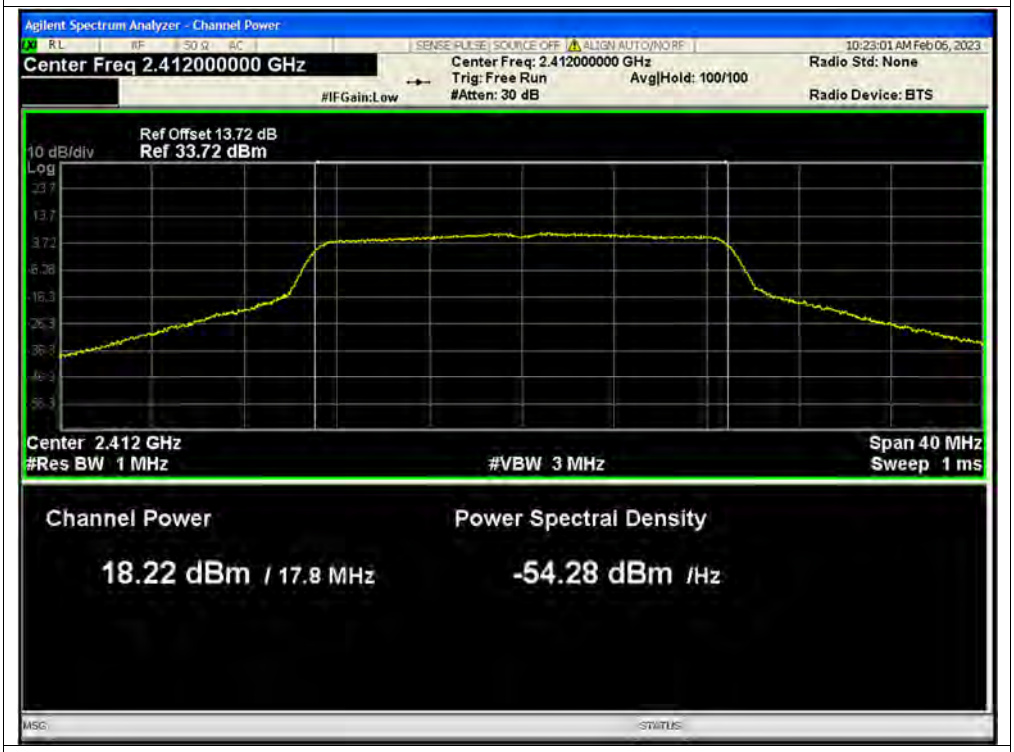
Average Power NVNT g 2437MHz Ant1



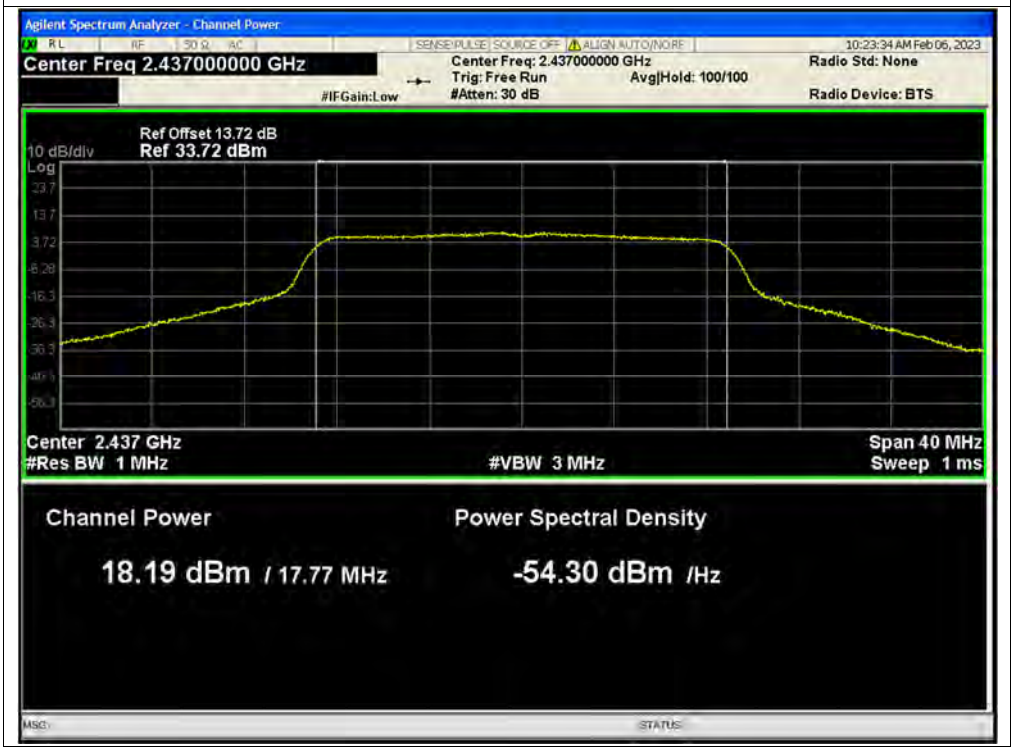

Average Power NVNT g 2462MHz Ant1



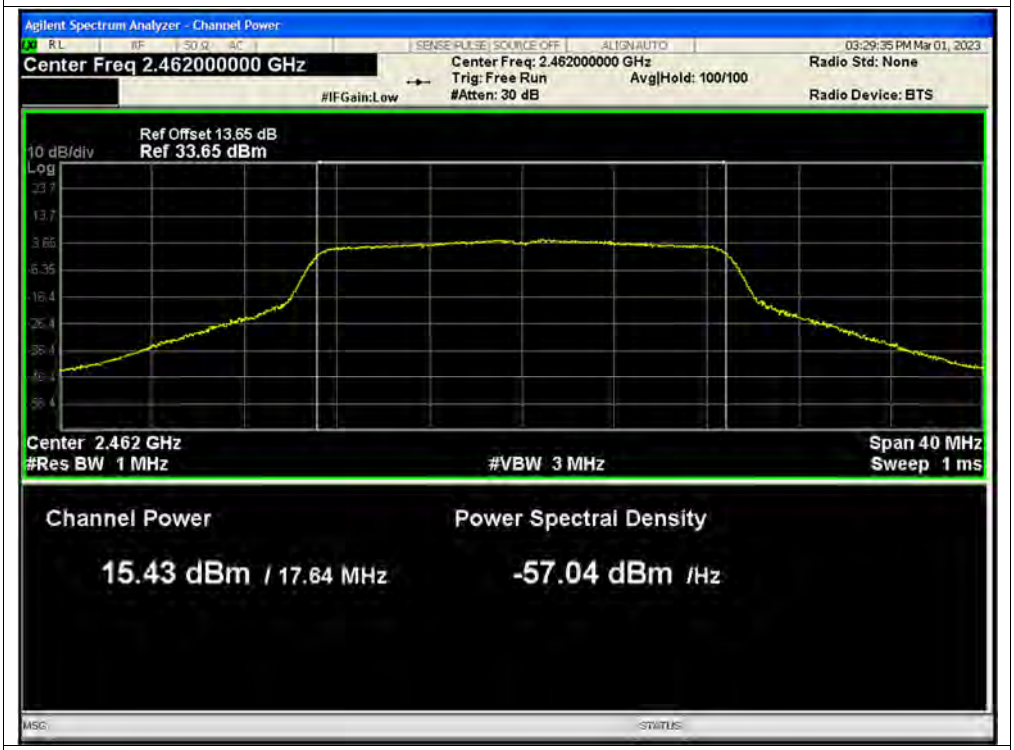
Average Power NVNT n20 2412MHz Ant1



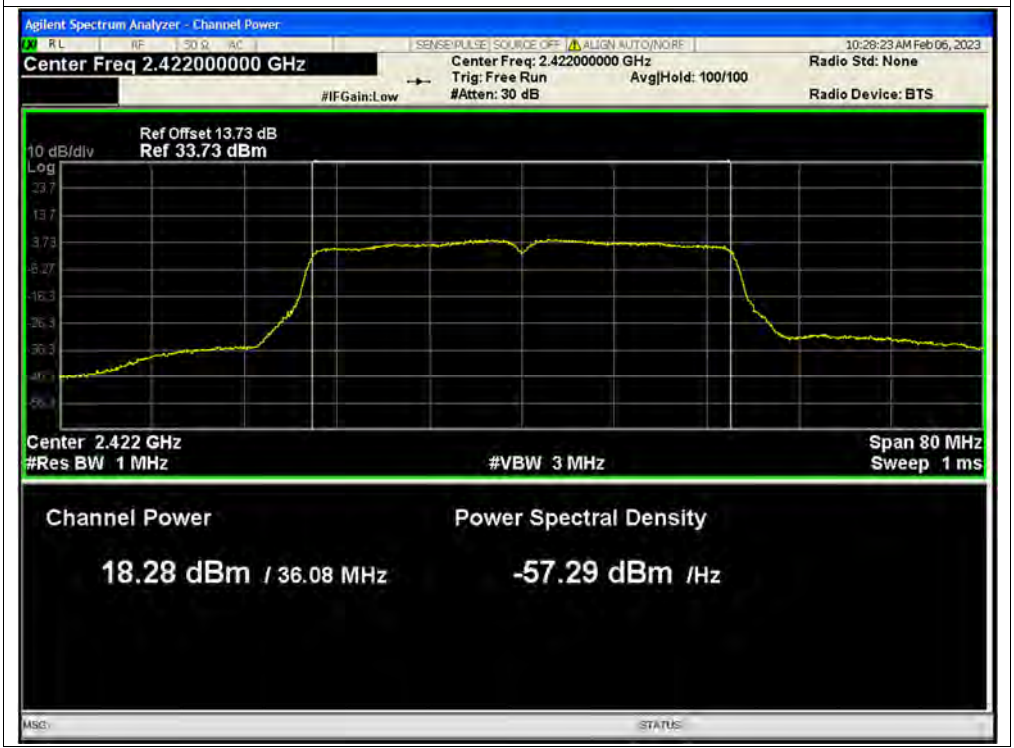

Average Power NVNT n20 2437MHz Ant1



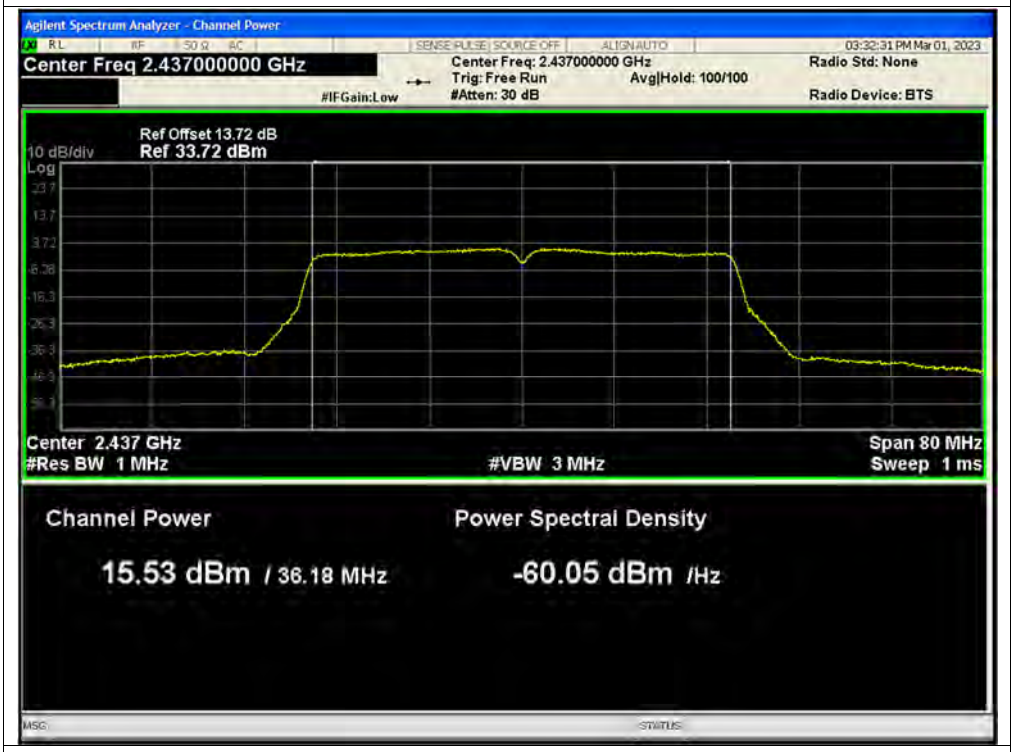
Average Power NVNT n20 2462MHz Ant1



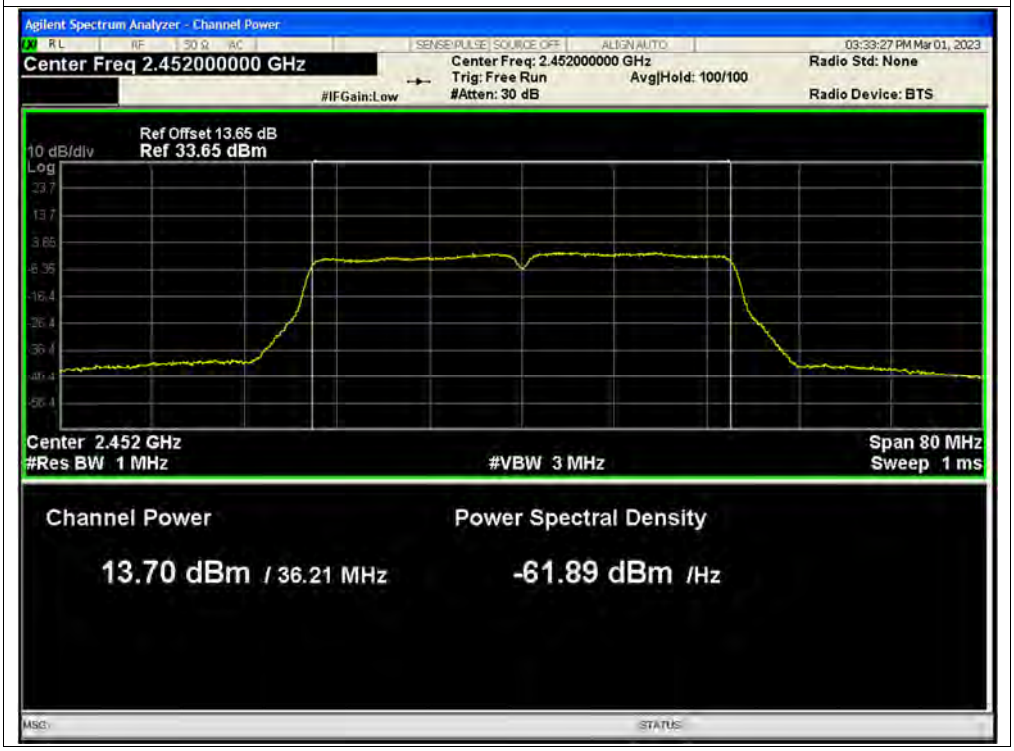

Average Power NVNT n40 2422MHz Ant1



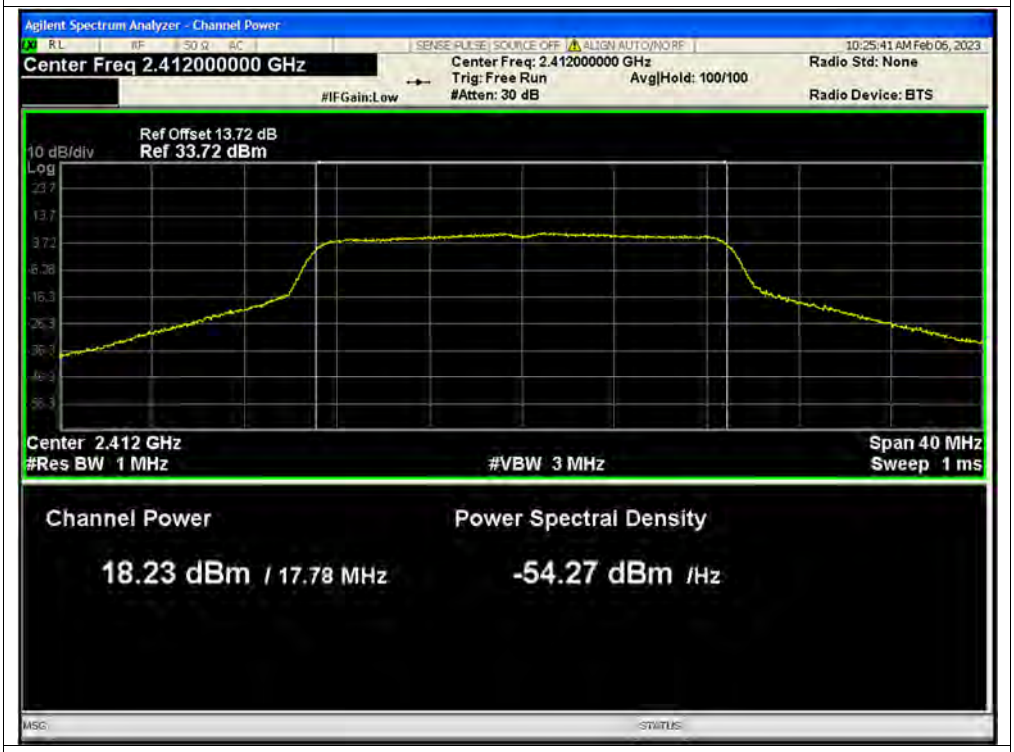
Average Power NVNT n40 2437MHz Ant1



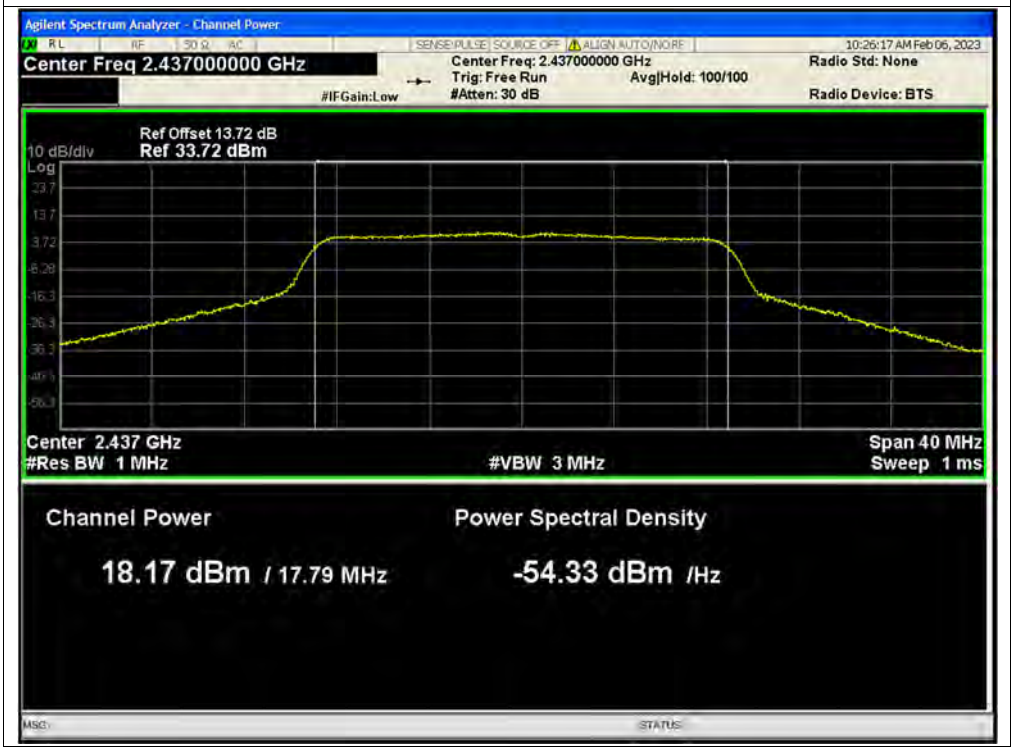

Average Power NVNT n40 2452MHz Ant1



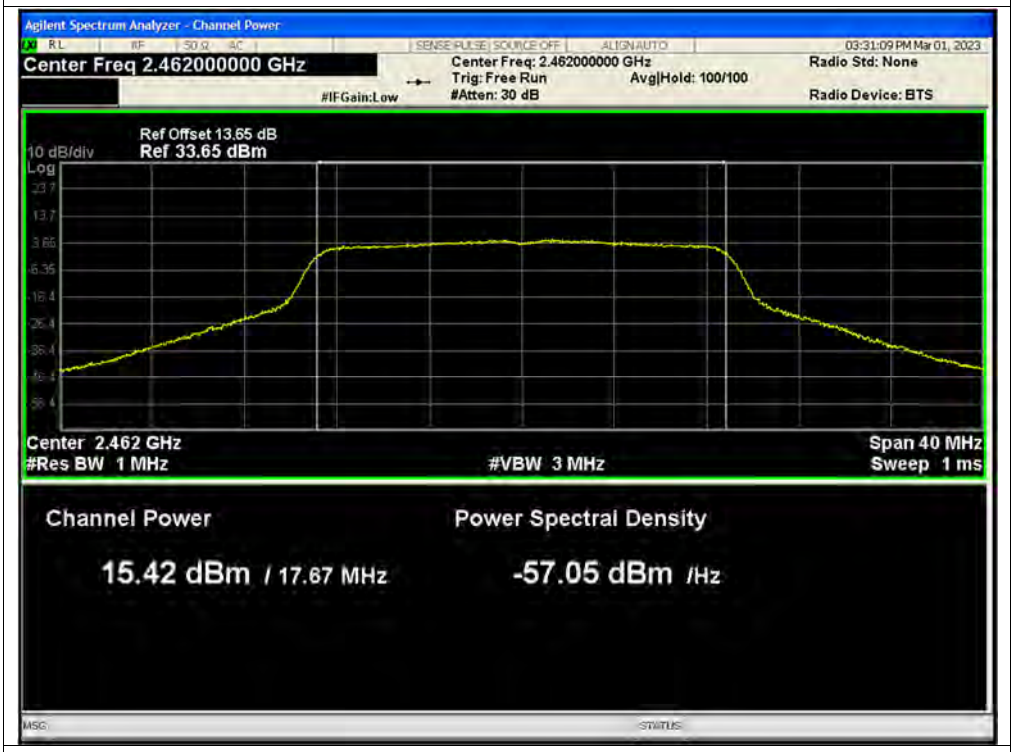
Average Power NVNT ac20 2412MHz Ant1



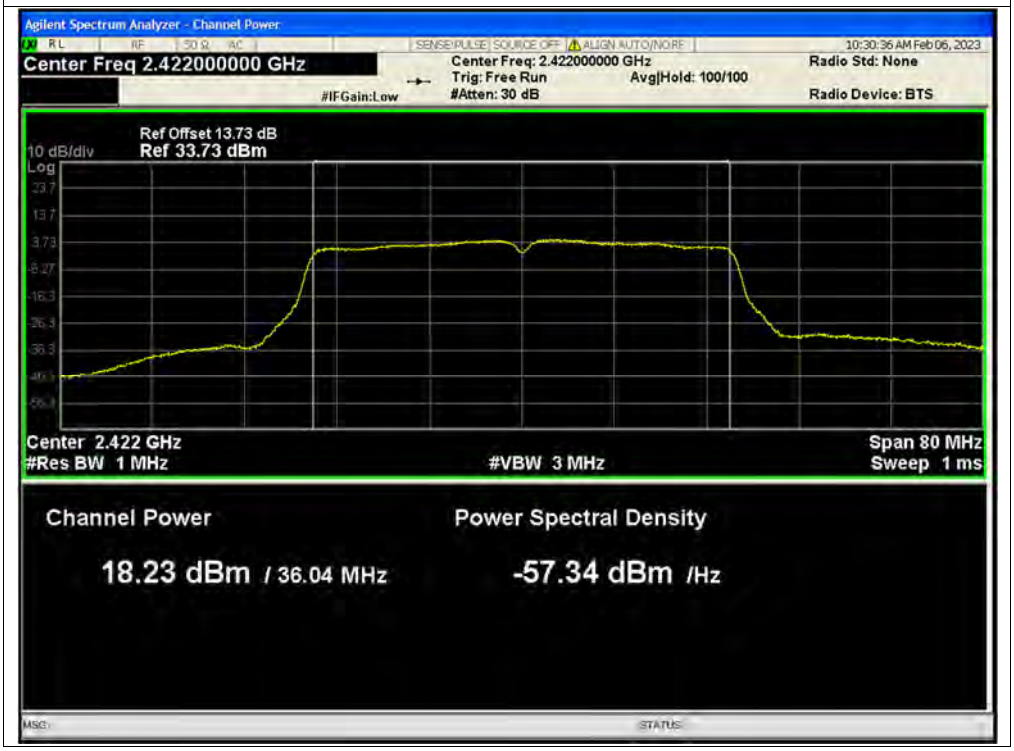

Average Power NVNT ac20 2437MHz Ant1



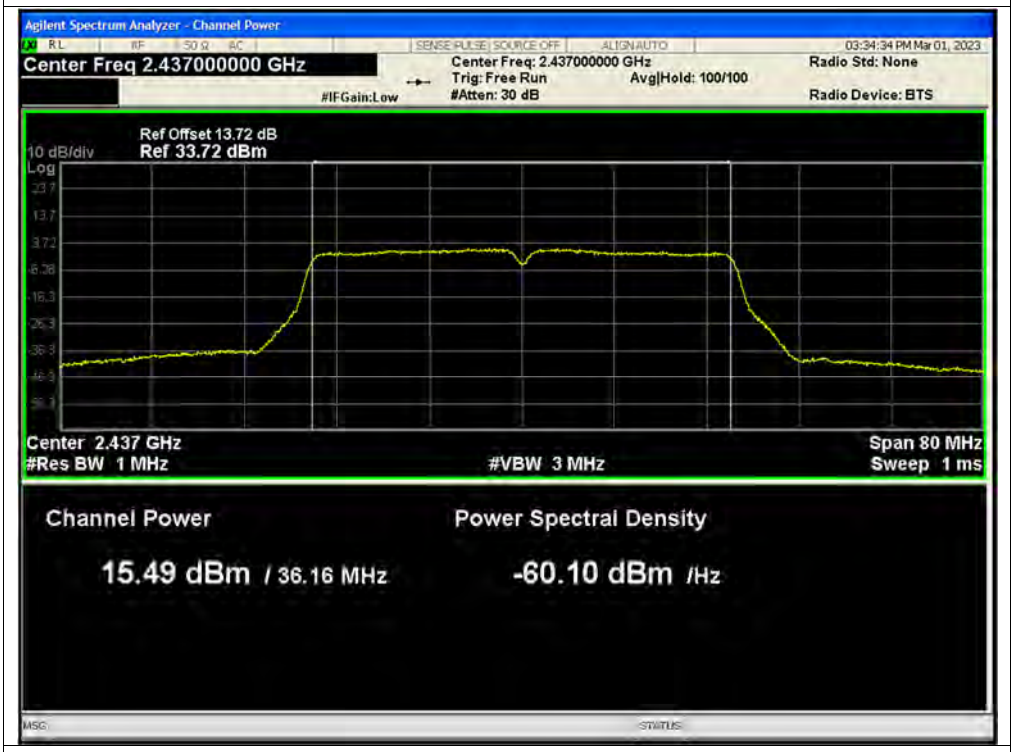
Average Power NVNT ac20 2462MHz Ant1



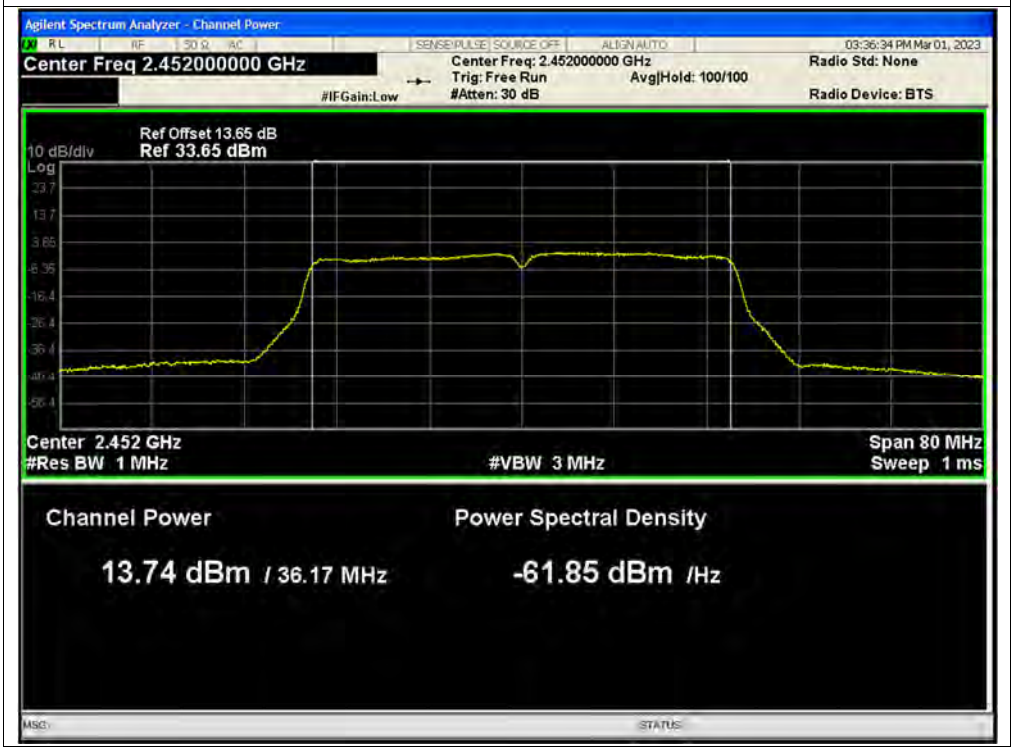

Average Power NVNT ac40 2422MHz Ant1



Average Power NVNT ac40 2437MHz Ant1




Average Power NVNT ac40 2452MHz Ant1



## A.4. 6 dB Bandwidth

| Condition | Mode | Frequency (MHz) | Antenna | -6 dB Bandwidth (MHz) | Limit -6 dB Bandwidth (MHz) | Verdict |
|---|---|---|---|---|---|---|
| NVNT | b | 2412 | Ant1 | 8.541 | 0.5 | Pass |
| NVNT | b | 2437 | Ant1 | 8.081 | 0.5 | Pass |
| NVNT | b | 2462 | Ant1 | 9.044 | 0.5 | Pass |
| NVNT | g | 2412 | Ant1 | 15.271 | 0.5 | Pass |
| NVNT | g | 2437 | Ant1 | 16.039 | 0.5 | Pass |
| NVNT | g | 2462 | Ant1 | 15.646 | 0.5 | Pass |
| NVNT | n20 | 2412 | Ant1 | 15.906 | 0.5 | Pass |
| NVNT | n20 | 2437 | Ant1 | 15.957 | 0.5 | Pass |
| NVNT | n20 | 2462 | Ant1 | 14.285 | 0.5 | Pass |
| NVNT | b | 2412 | Ant1 | 35.084 | 0.5 | Pass |
| NVNT | b | 2437 | Ant1 | 36.295 | 0.5 | Pass |
| NVNT | b | 2462 | Ant1 | 35.032 | 0.5 | Pass |
| NVNT | g | 2412 | Ant1 | 17.146 | 0.5 | Pass |
| NVNT | g | 2437 | Ant1 | 15.832 | 0.5 | Pass |
| NVNT | g | 2462 | Ant1 | 15.102 | 0.5 | Pass |
| NVNT | n20 | 2412 | Ant1 | 35.061 | 0.5 | Pass |
| NVNT | n20 | 2437 | Ant1 | 35.334 | 0.5 | Pass |
| NVNT | n20 | 2462 | Ant1 | 35.104 | 0.5 | Pass |

Test Graphs

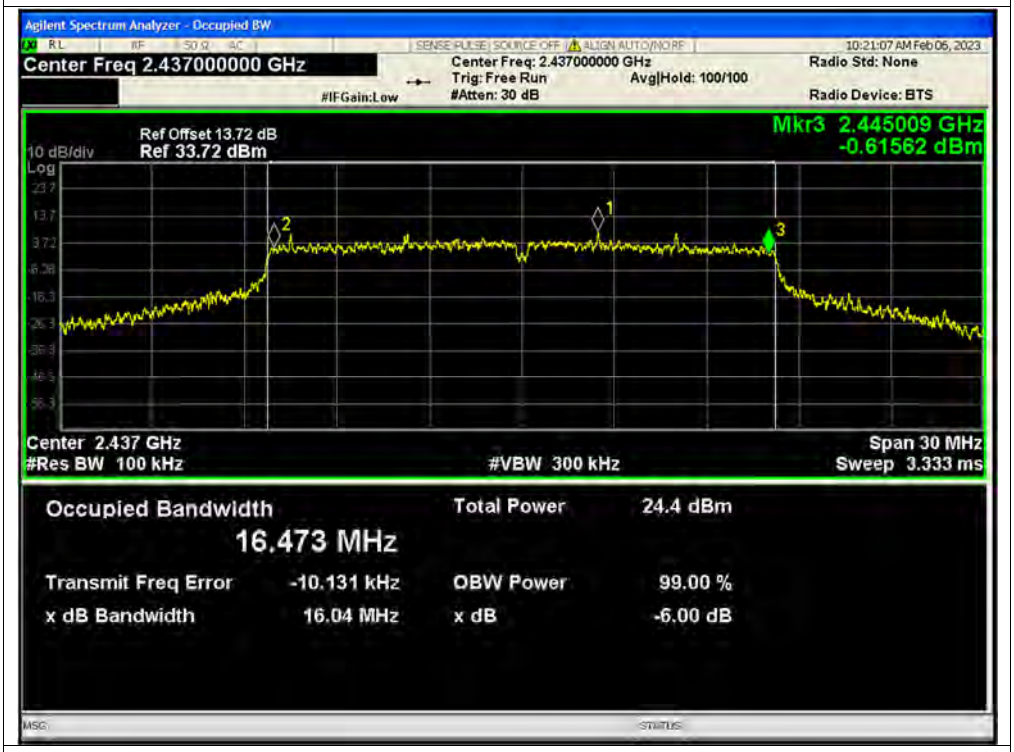
-6dB Bandwidth NVNT b 2412MHz Ant1

-6dB Bandwidth NVNT b 2437MHz Ant1

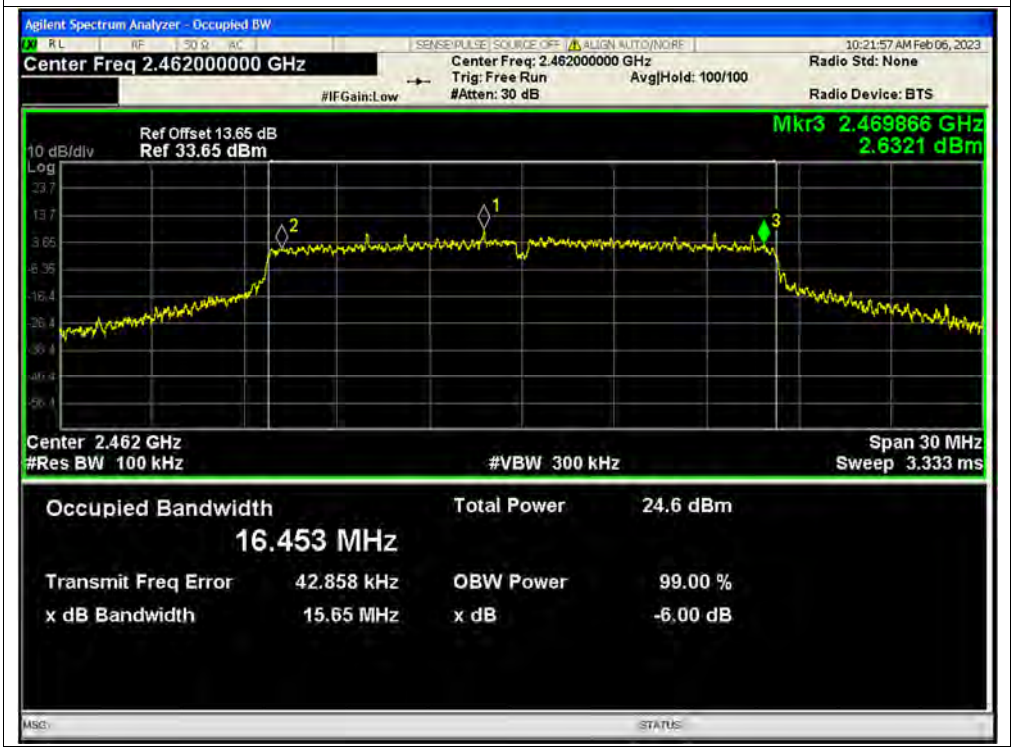
-6dB Bandwidth NVNT b 2462MHz Ant1

-6dB Bandwidth NVNT g 2412MHz Ant1

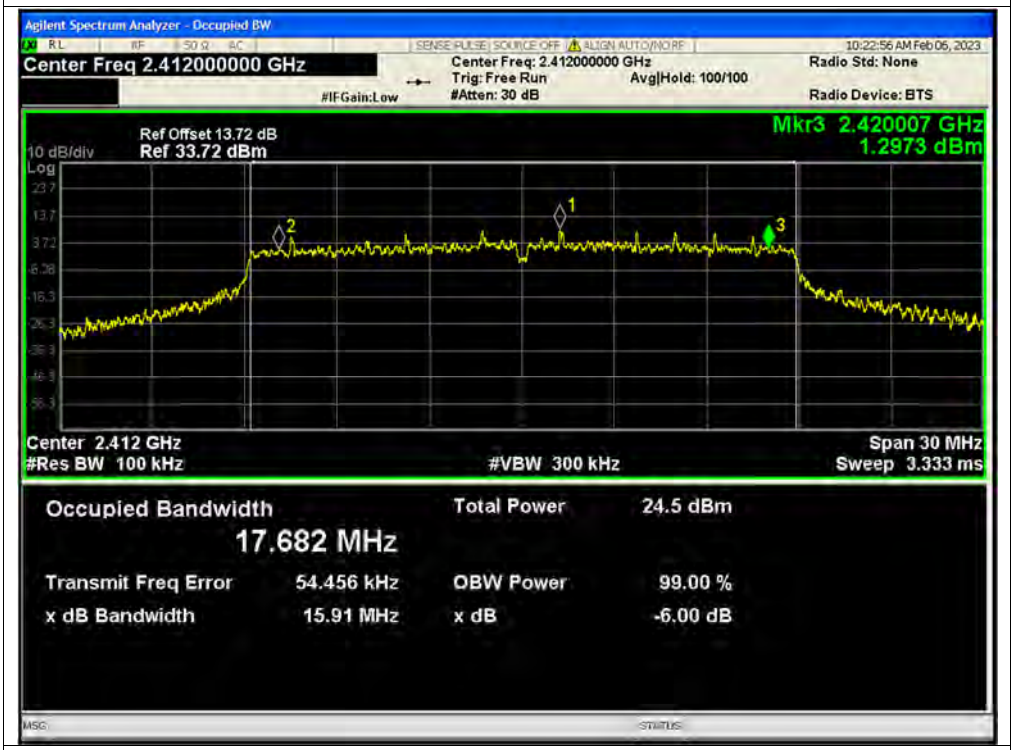
-6dB Bandwidth NVNT g 2437MHz Ant1



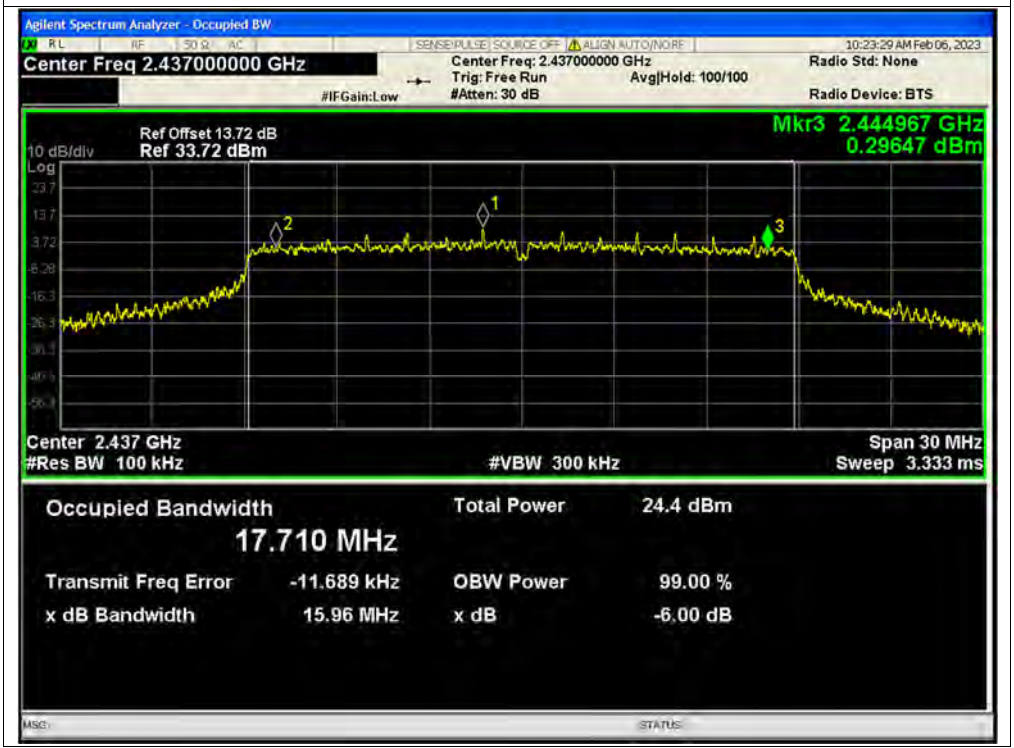

-6dB Bandwidth NVNT g 2462MHz Ant1



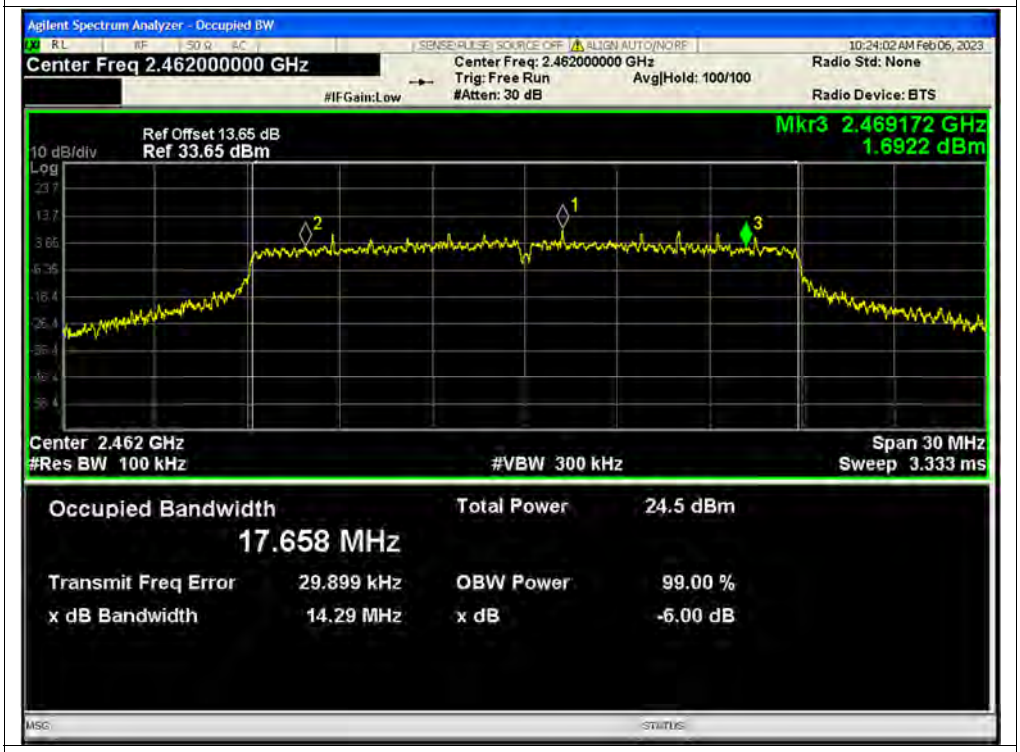
-6dB Bandwidth NVNT n20 2412MHz Ant1



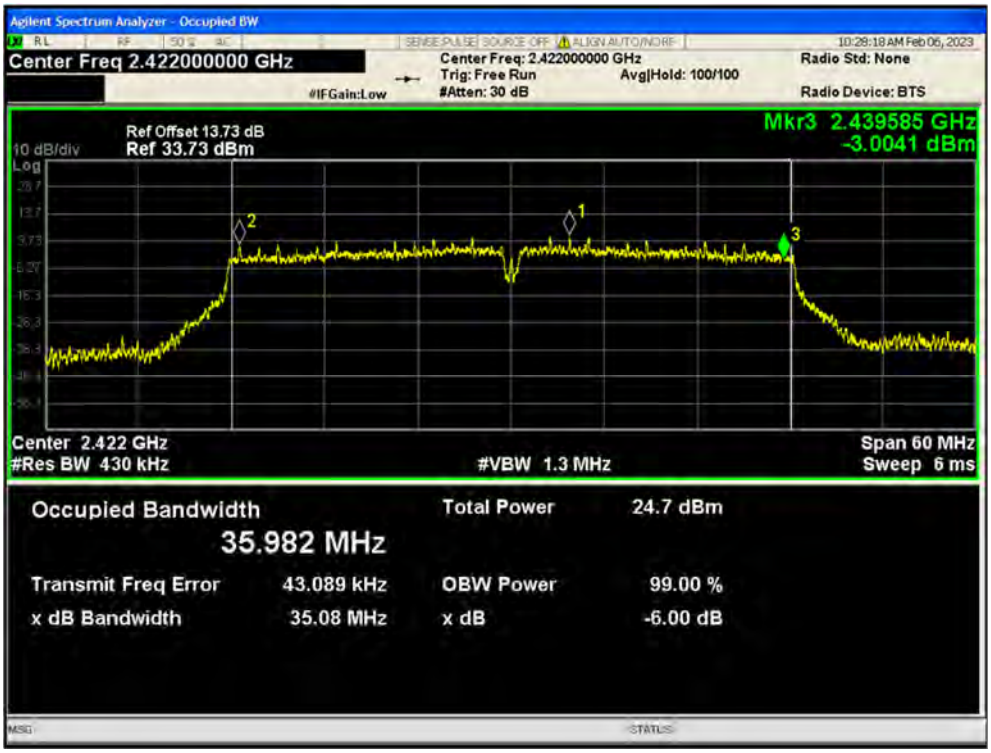

-6dB Bandwidth NVNT n20 2437MHz Ant1



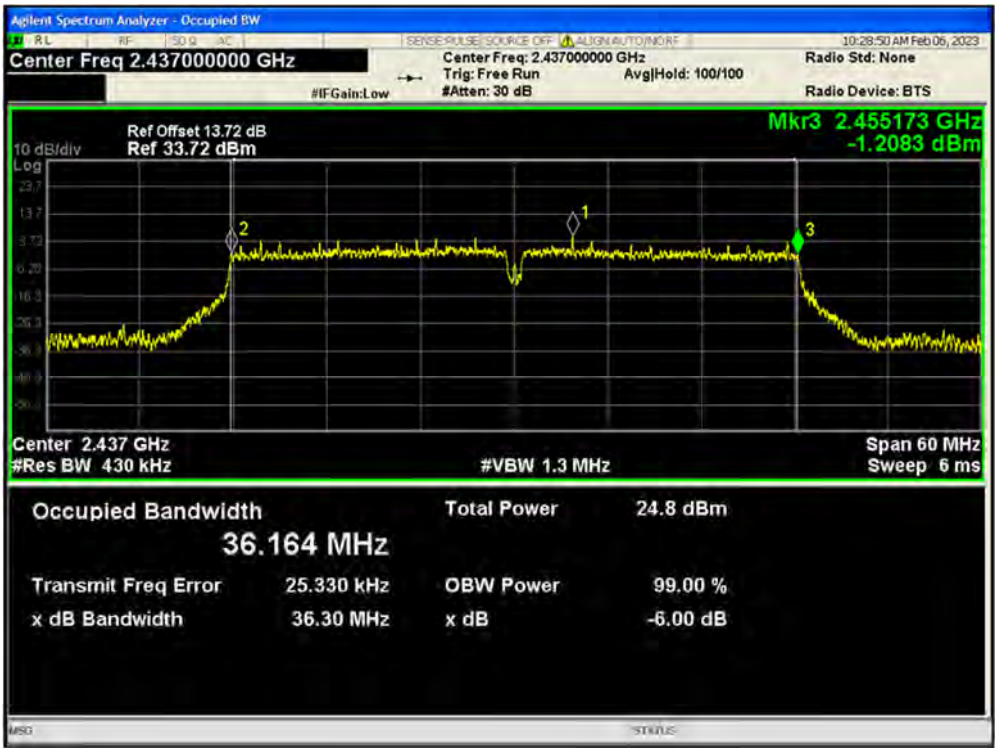
-6dB Bandwidth NVNT n20 2462MHz Ant1



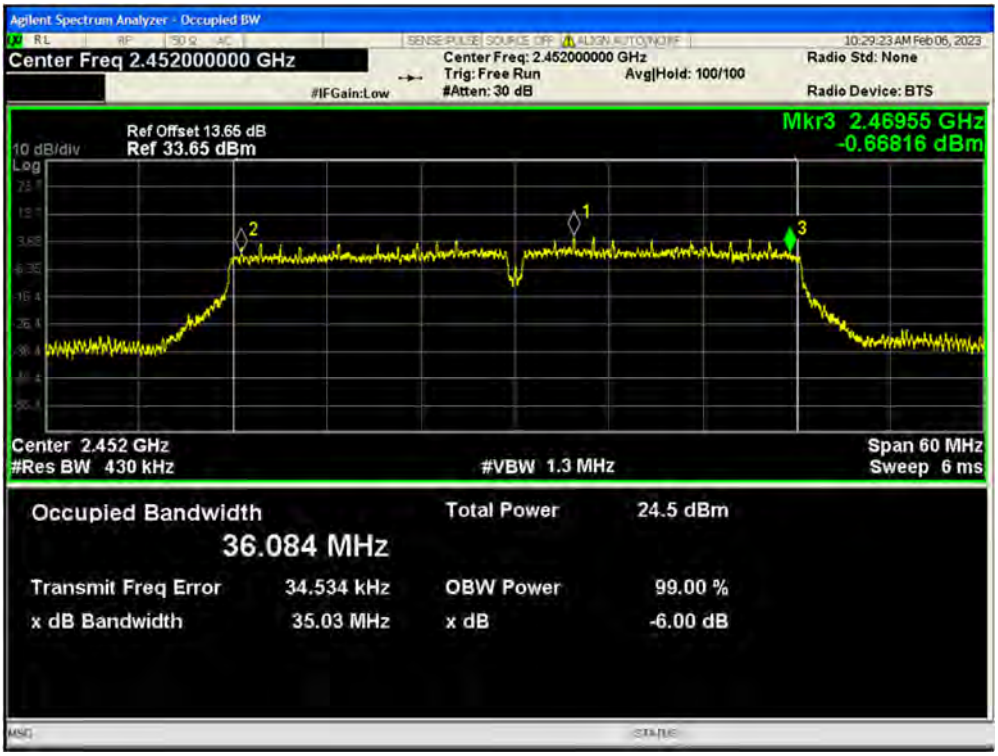

-6dB Bandwidth NVNT n40 2422MHz Ant1



-6dB Bandwidth NVNT n40 2437MHz Ant1

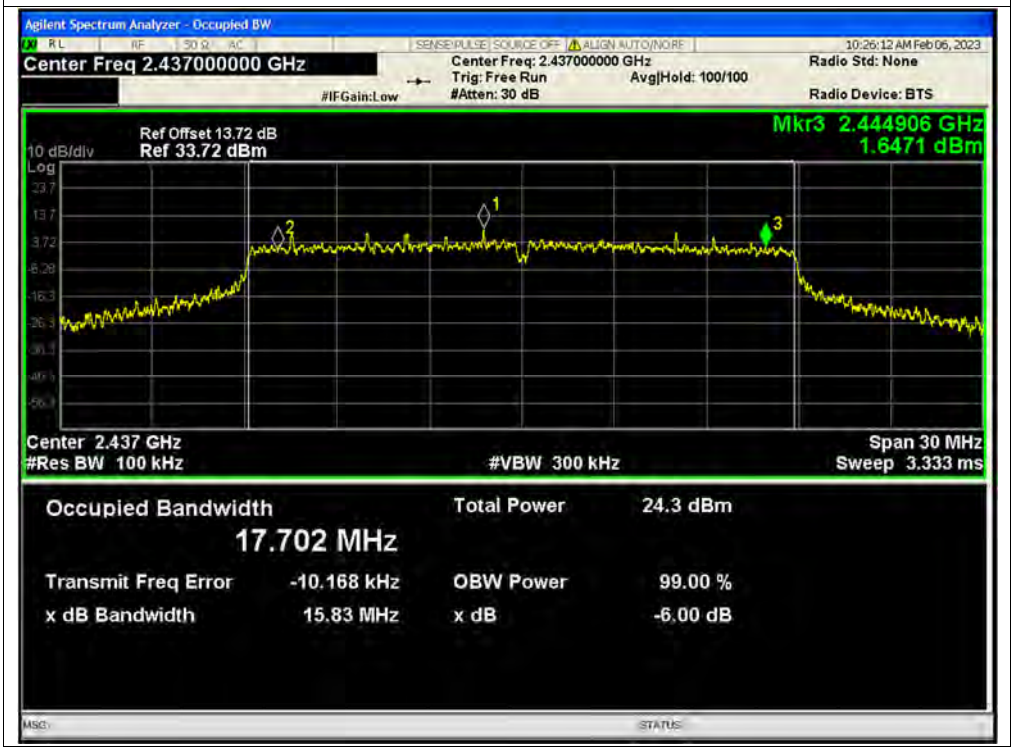



-6dB Bandwidth NVNT n40 2452MHz Ant1

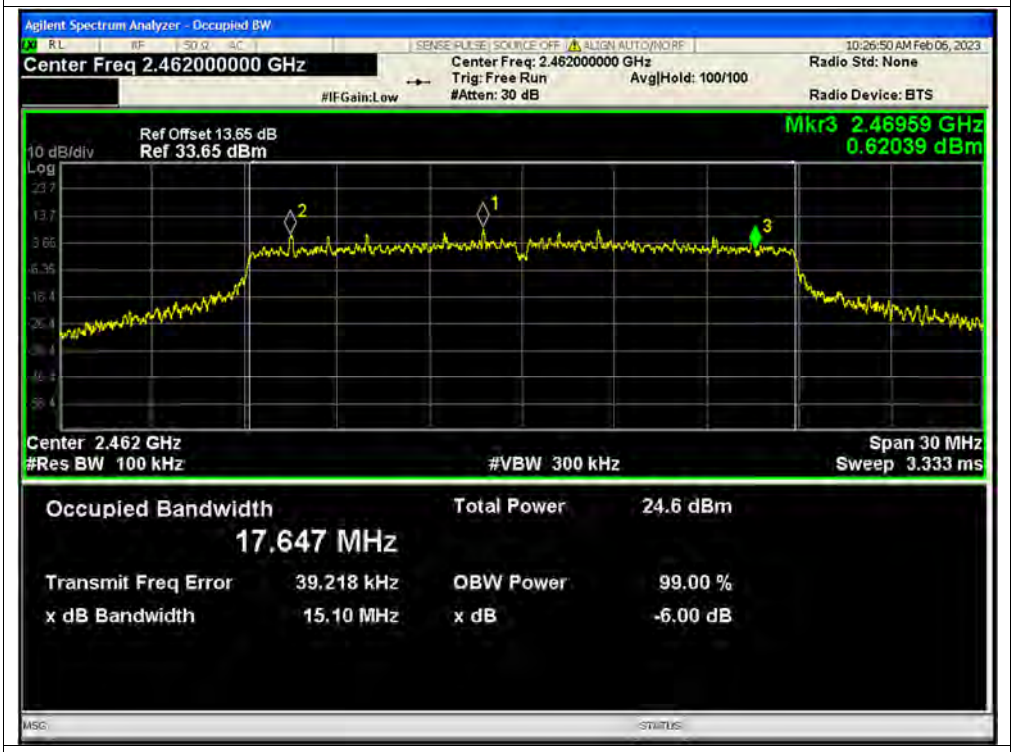


-6dB Bandwidth NVNT ac20 2412MHz Ant1

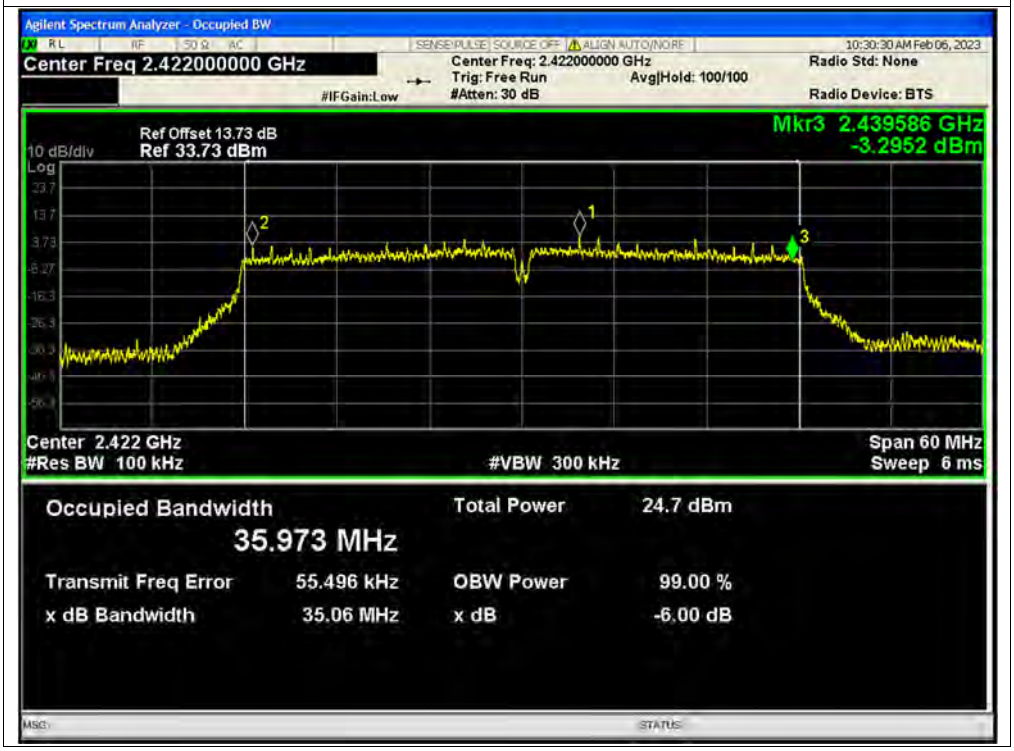
-6dB Bandwidth NVNT ac20 2437MHz Ant1



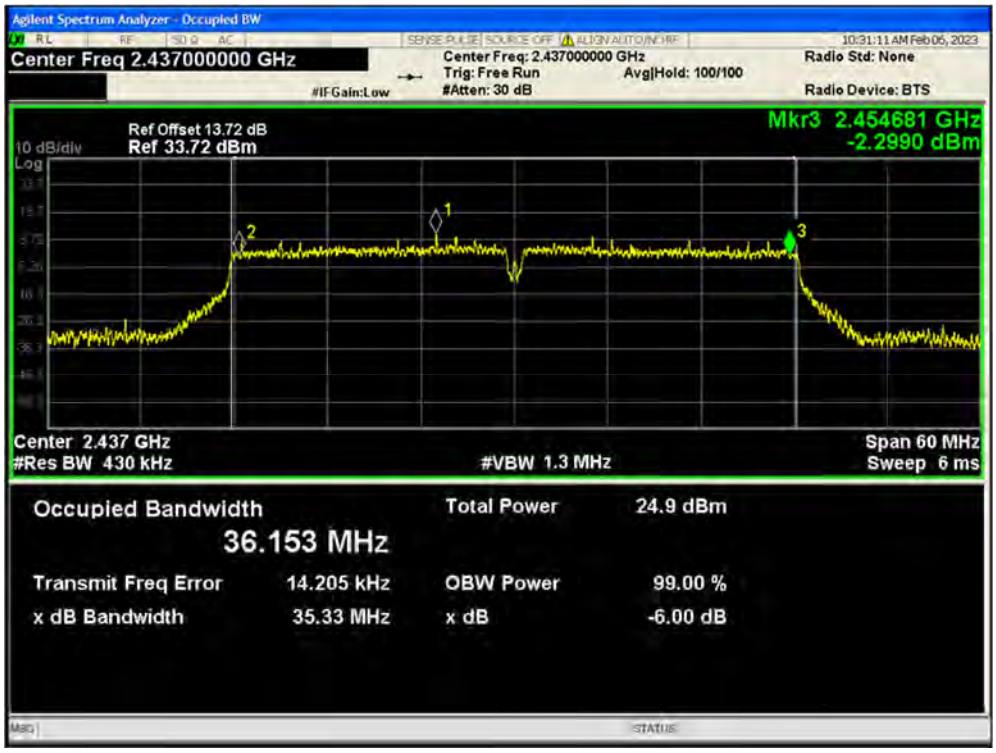
-6dB Bandwidth NVNT ac20 2462MHz Ant1



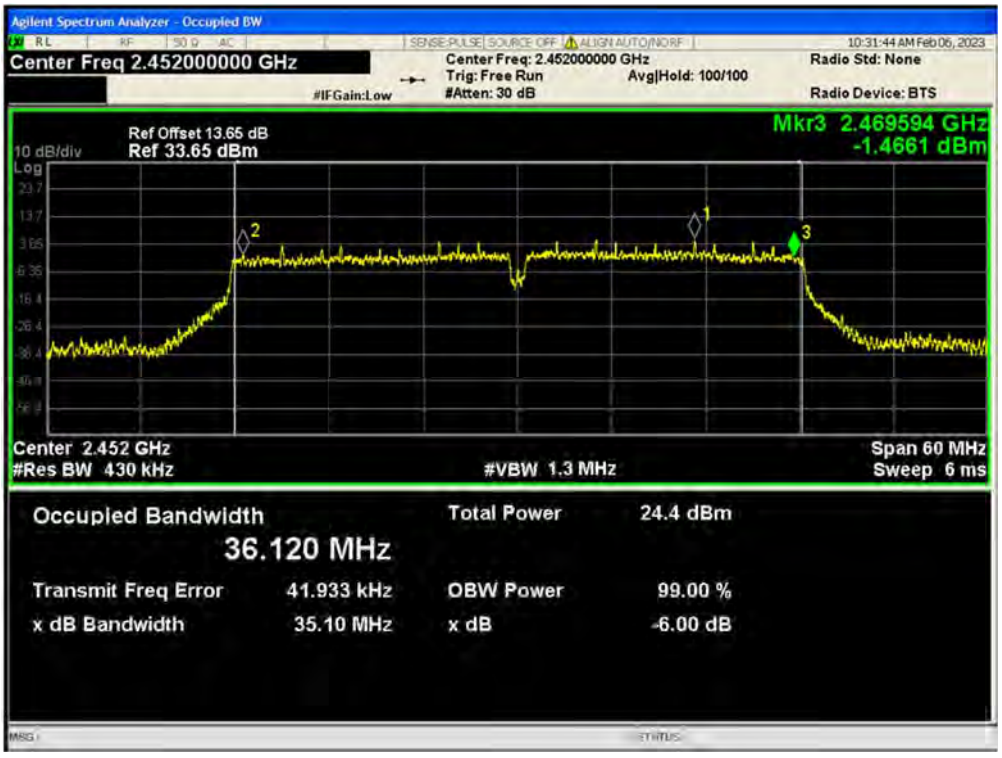

-6dB Bandwidth NVNT ac40 2422MHz Ant1



-6dB Bandwidth NVNT ac40 2437MHz Ant1




-6dB Bandwidth NVNT ac40 2452MHz Ant1



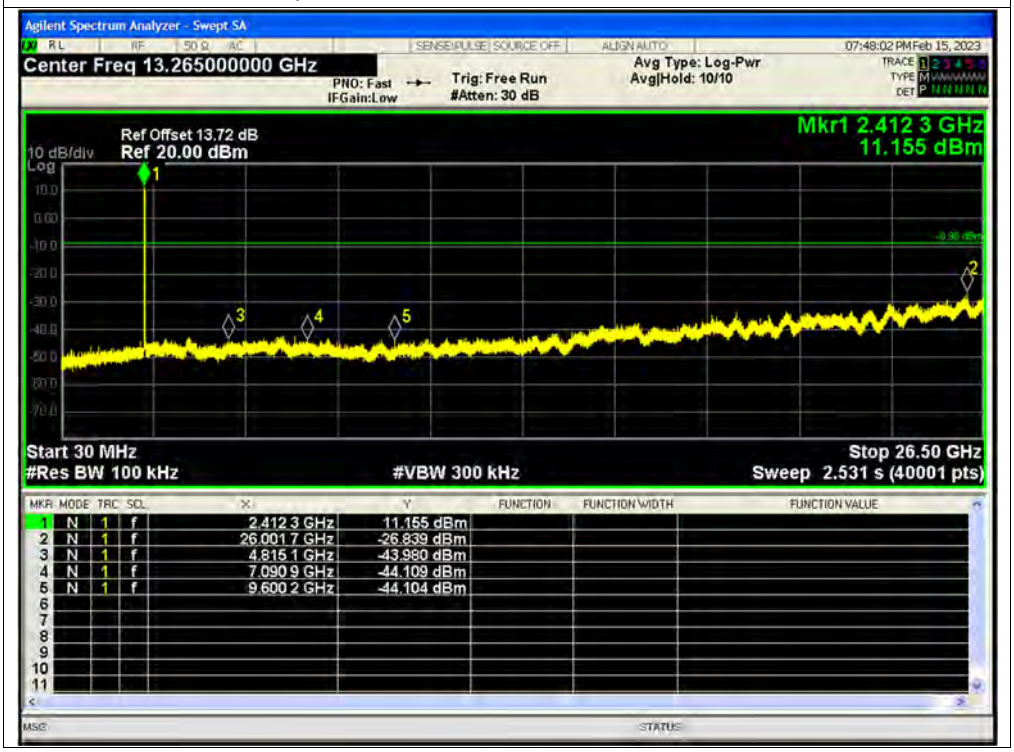
## A.5. Conducted Spurious Emissions

| Condition | Mode | Frequency (MHz) | Antenna | Max Value (dBc) | Limit (dBc) | Verdict |
|---|---|---|---|---|---|---|
| NVNT | b | 2412 | Ant1 | -37.85 | -20 | Pass |
| NVNT | b | 2437 | Ant1 | -38.97 | -20 | Pass |
| NVNT | b | 2462 | Ant1 | -38.37 | -20 | Pass |
| NVNT | g | 2412 | Ant1 | -37.01 | -20 | Pass |
| NVNT | g | 2437 | Ant1 | -35.76 | -20 | Pass |
| NVNT | g | 2462 | Ant1 | -36.68 | -20 | Pass |
| NVNT | n20 | 2412 | Ant1 | -36.17 | -20 | Pass |
| NVNT | n20 | 2437 | Ant1 | -35.78 | -20 | Pass |
| NVNT | n20 | 2462 | Ant1 | -37.35 | -20 | Pass |
| NVNT | n40 | 2422 | Ant1 | -33.82 | -20 | Pass |
| NVNT | n40 | 2437 | Ant1 | -32.98 | -20 | Pass |
| NVNT | n40 | 2452 | Ant1 | -32.6 | -20 | Pass |
| NVNT | ac20 | 2412 | Ant1 | -34.76 | -20 | Pass |
| NVNT | ac20 | 2437 | Ant1 | -36.61 | -20 | Pass |
| NVNT | ac20 | 2462 | Ant1 | -36.69 | -20 | Pass |
| NVNT | ac40 | 2422 | Ant1 | -33.64 | -20 | Pass |
| NVNT | ac40 | 2437 | Ant1 | -32.47 | -20 | Pass |
| NVNT | ac40 | 2452 | Ant1 | -34.3 | -20 | Pass |

Test Graphs

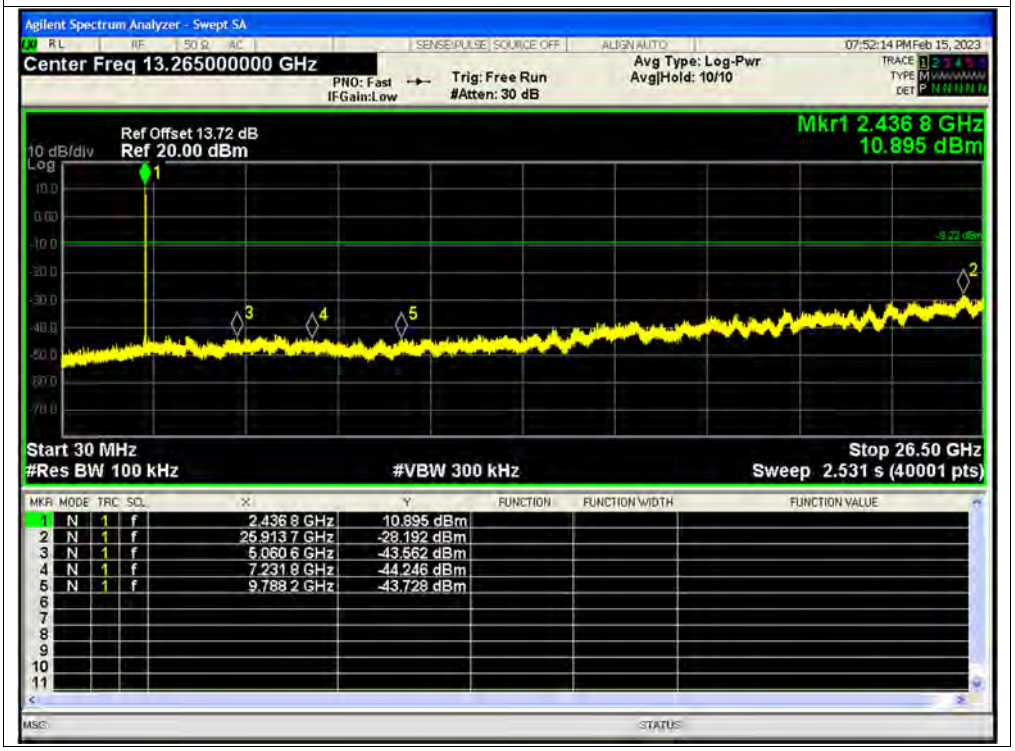
Tx. Spurious NVNT b 2412MHz Ant1 Ref

Tx. Spurious NVNT b 2412MHz Ant1 Emission



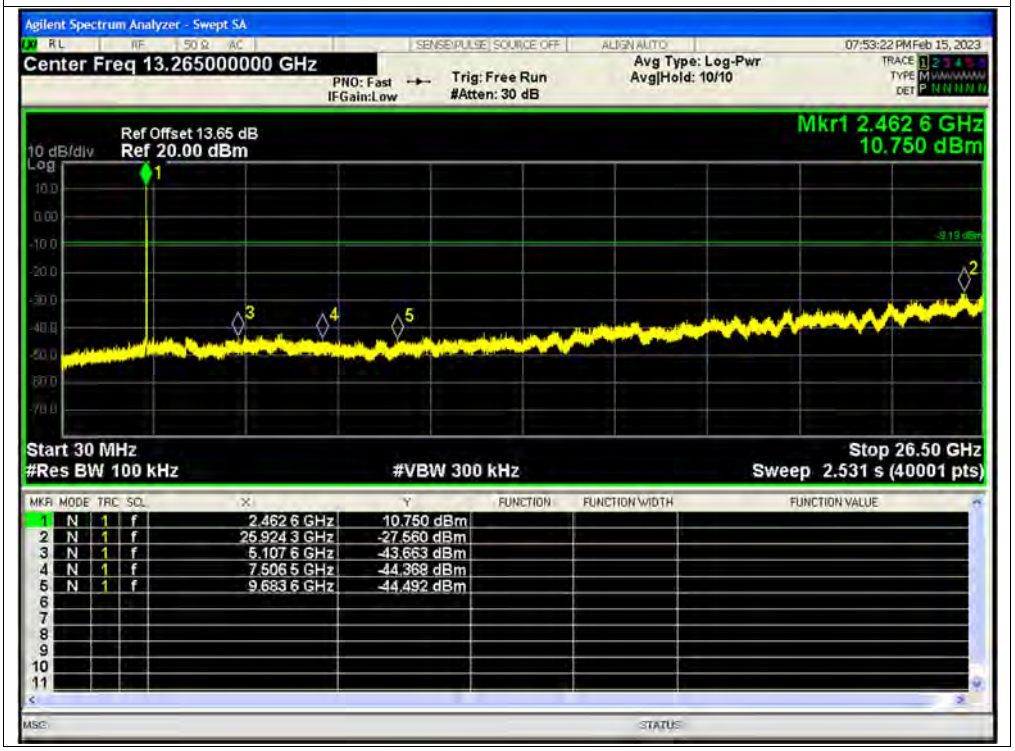
Tx. Spurious NVNT b 2437MHz Ant1 Ref

Tx. Spurious NVNT b 2437MHz Ant1 Emission



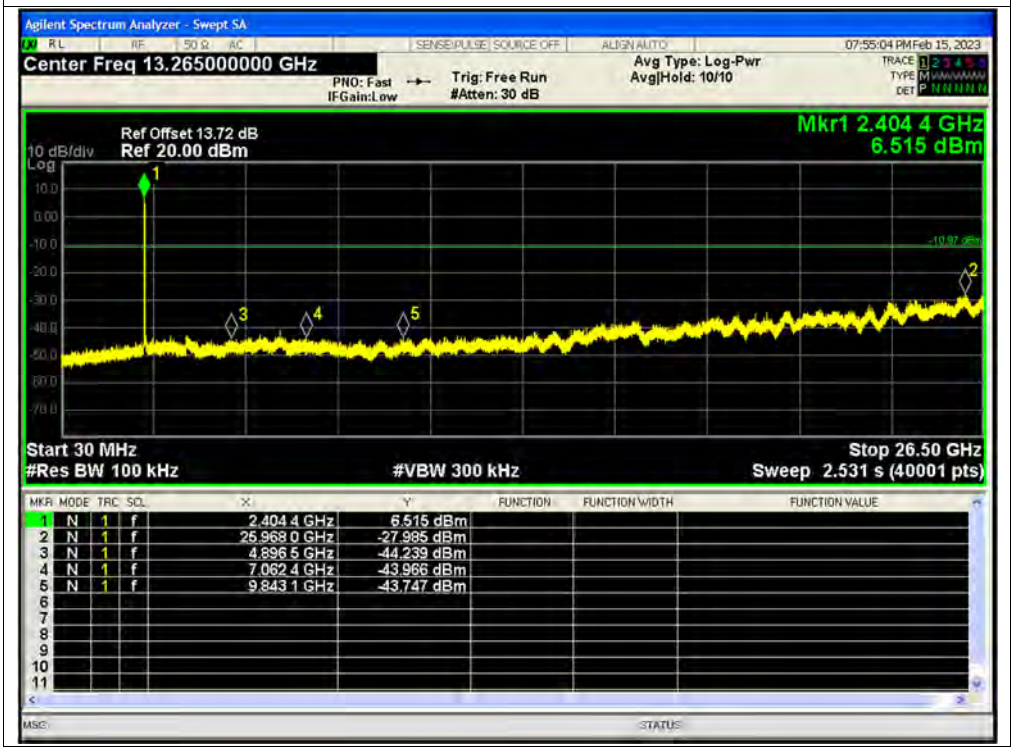
Tx. Spurious NVNT b 2462MHz Ant1 Ref

Tx. Spurious NVNT b 2462MHz Ant1 Emission



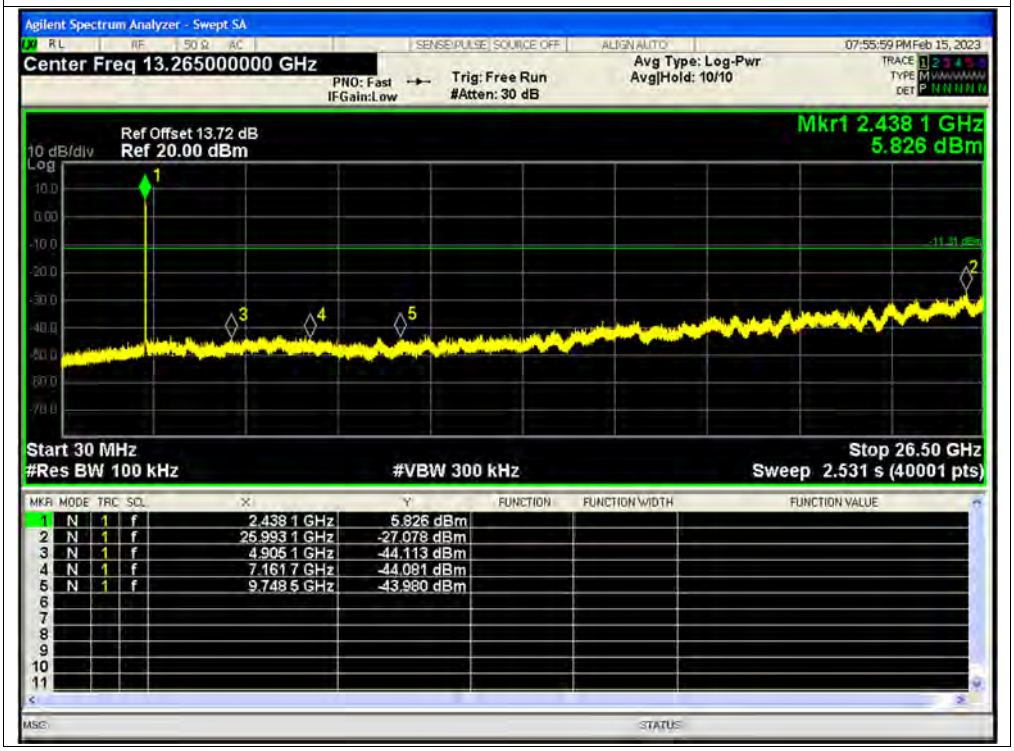
Tx. Spurious NVNT g 2412MHz Ant1 Ref

Tx. Spurious NVNT g 2412MHz Ant1 Emission

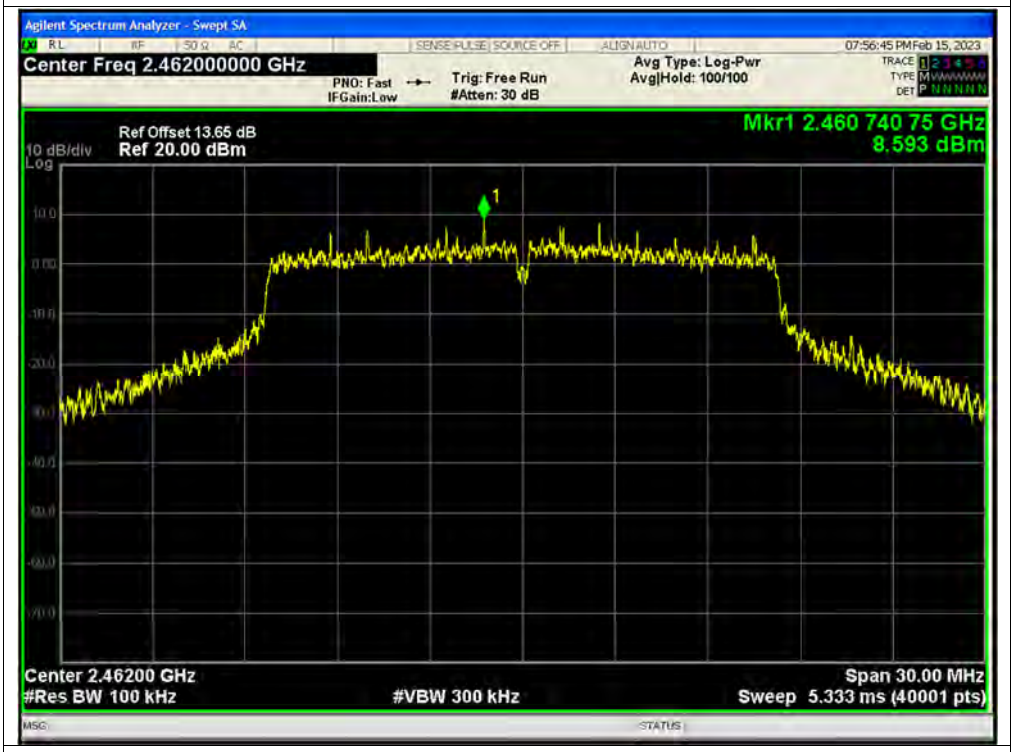


Tx. Spurious NVNT g 2437MHz Ant1 Ref

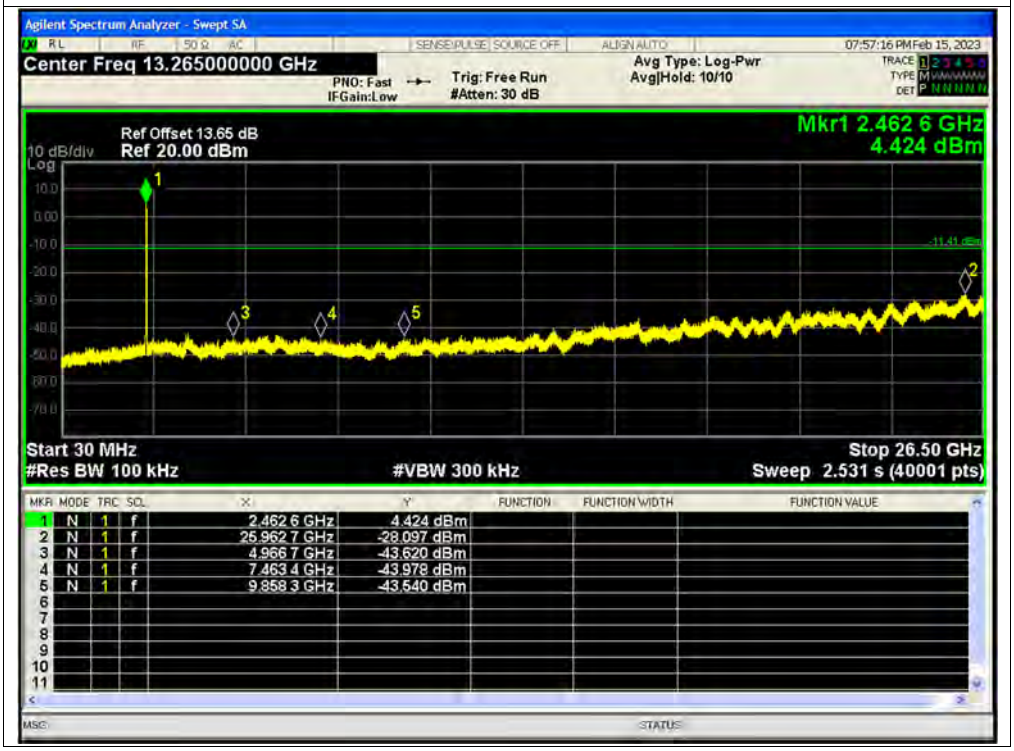
Tx. Spurious NVNT g 2437MHz Ant1 Emission



Tx. Spurious NVNT g 2462MHz Ant1 Ref

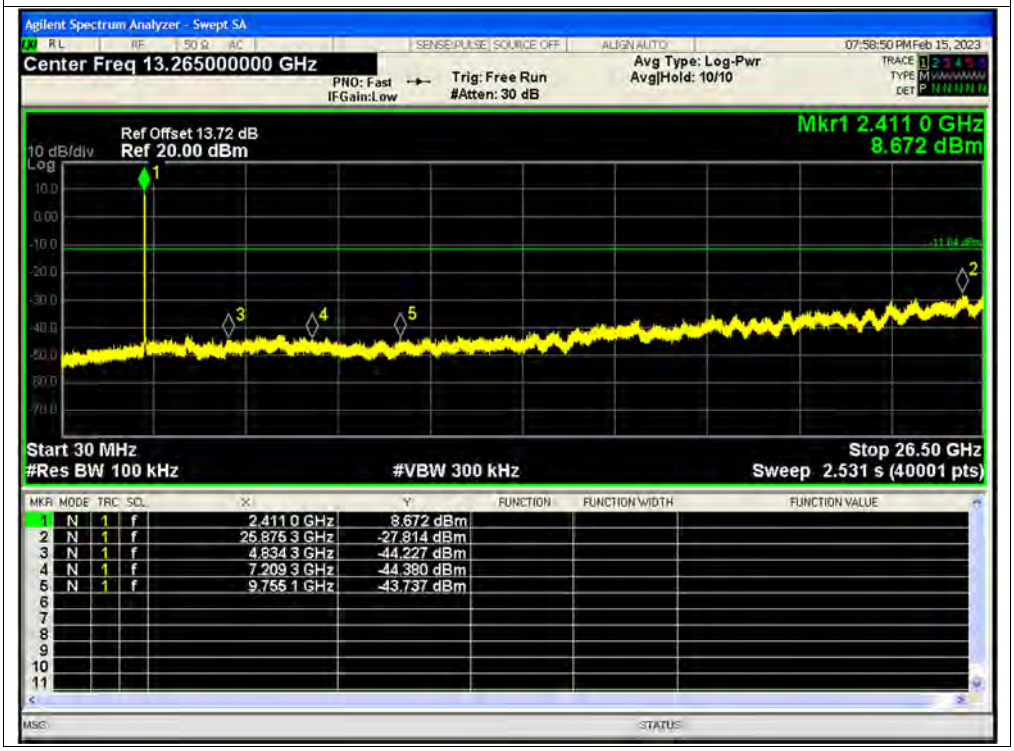



Tx. Spurious NVNT g 2462MHz Ant1 Emission



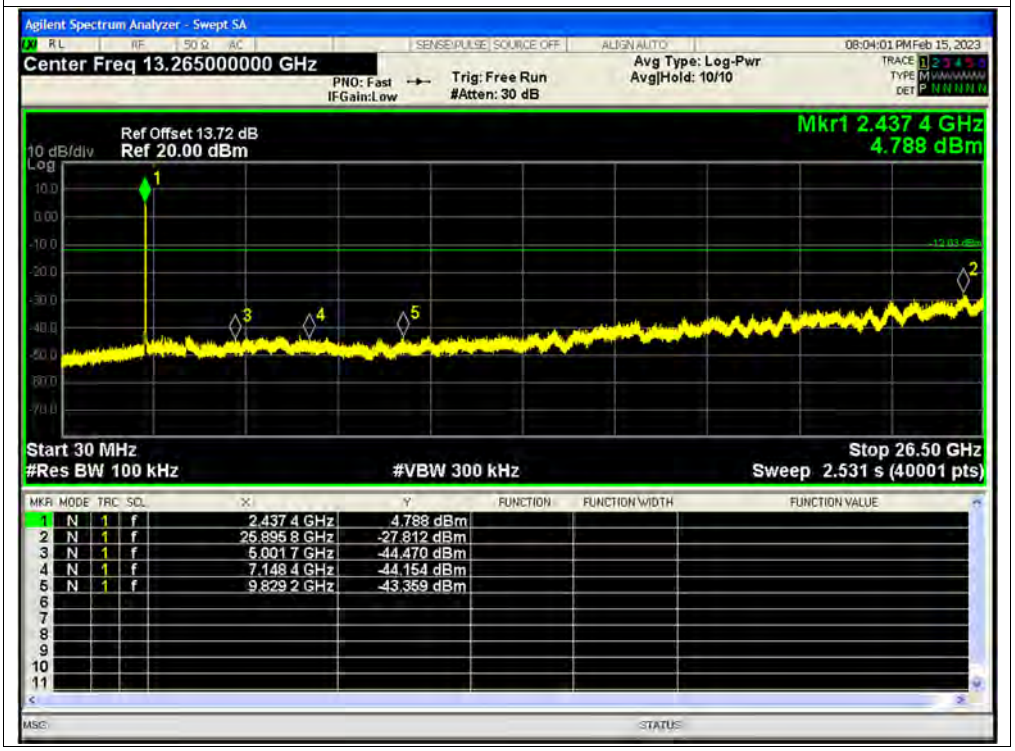
Tx. Spurious NVNT n20 2412MHz Ant1 Ref

Tx. Spurious NVNT n20 2412MHz Ant1 Emission

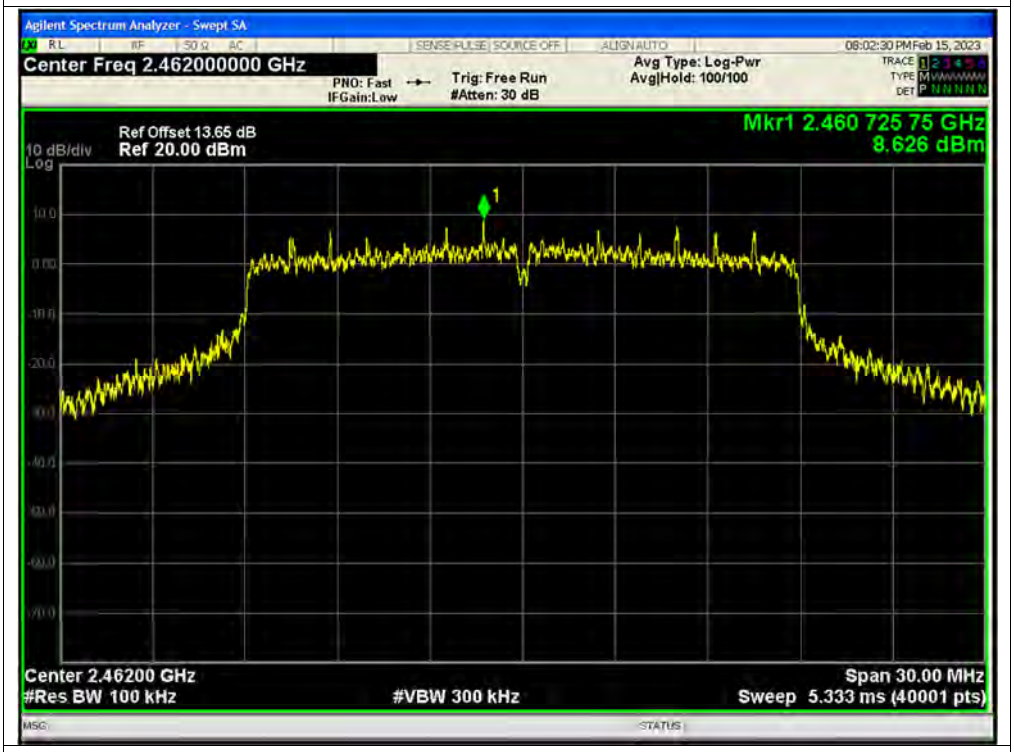


Tx. Spurious NVNT n20 2437MHz Ant1 Ref

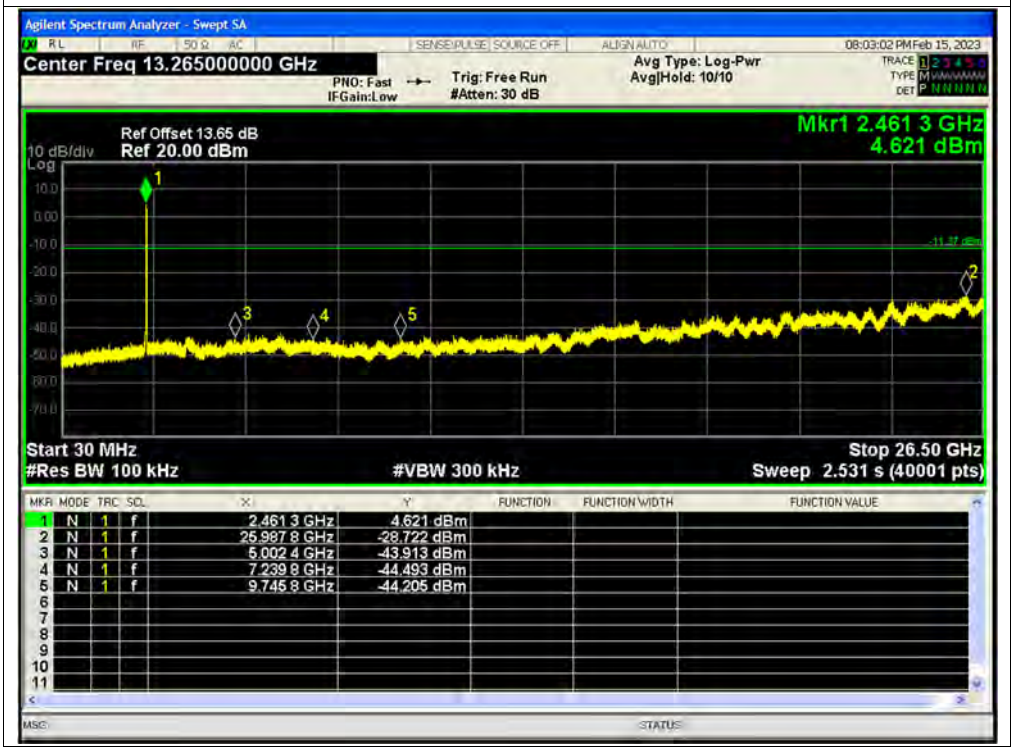
Tx. Spurious NVNT n20 2437MHz Ant1 Emission



Tx. Spurious NVNT n20 2462MHz Ant1 Ref

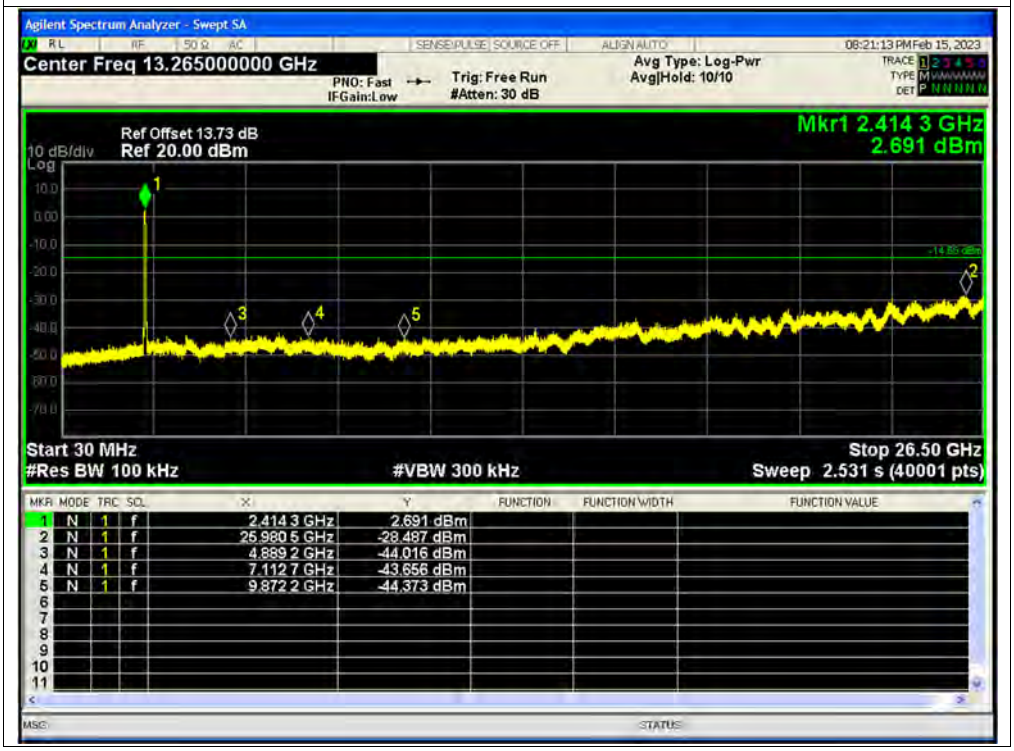



Tx. Spurious NVNT n20 2462MHz Ant1 Emission



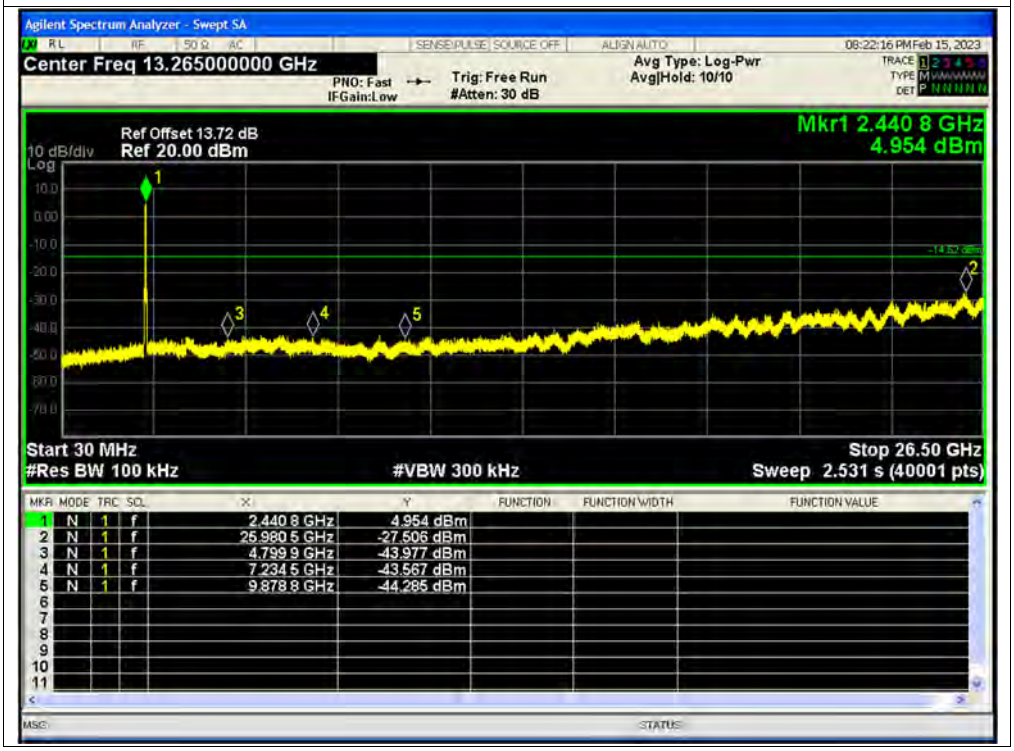
Tx. Spurious NVNT n40 2422MHz Ant1 Ref

Tx. Spurious NVNT n40 2422MHz Ant1 Emission

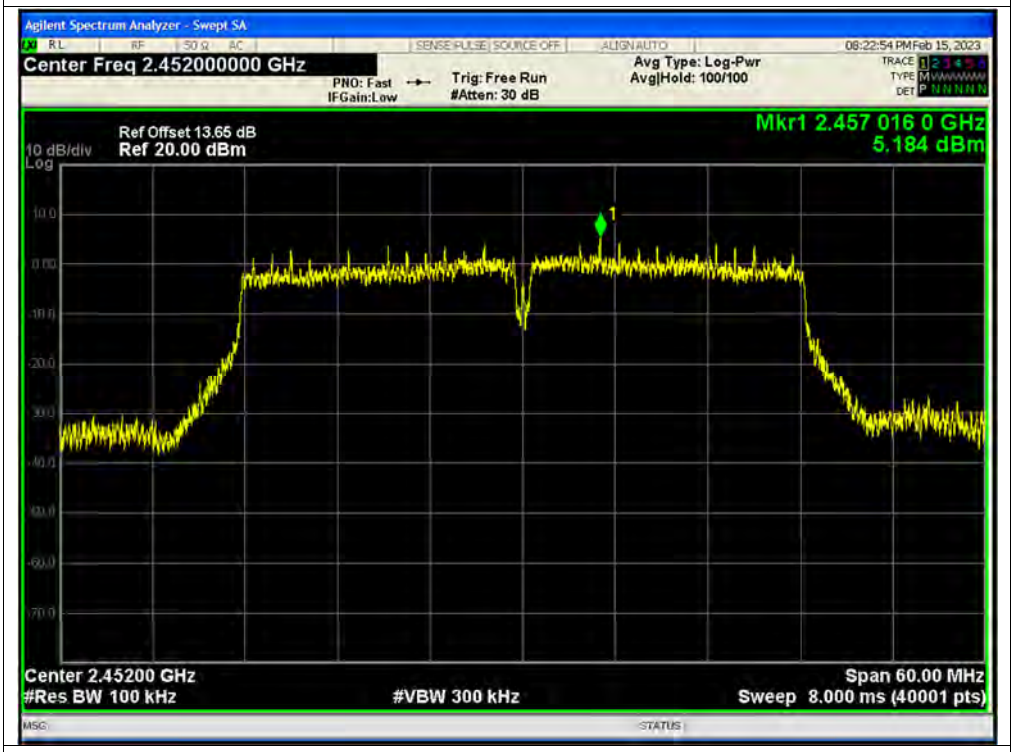


Tx. Spurious NVNT n40 2437MHz Ant1 Ref

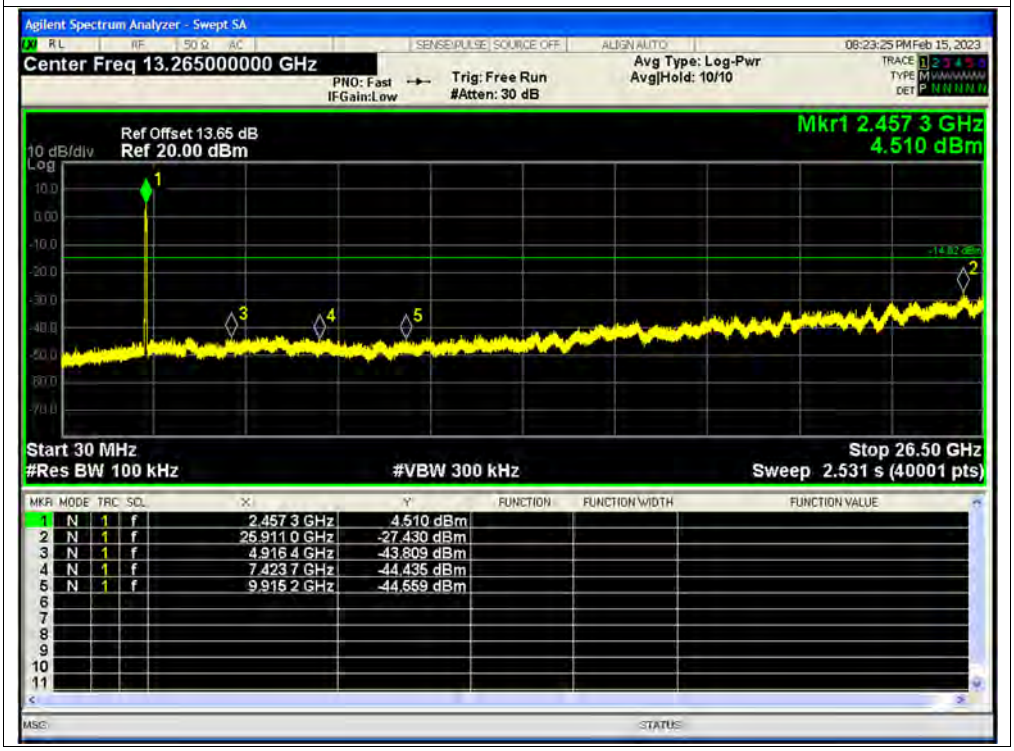
Tx. Spurious NVNT n40 2437MHz Ant1 Emission



Tx. Spurious NVNT n40 2452MHz Ant1 Ref

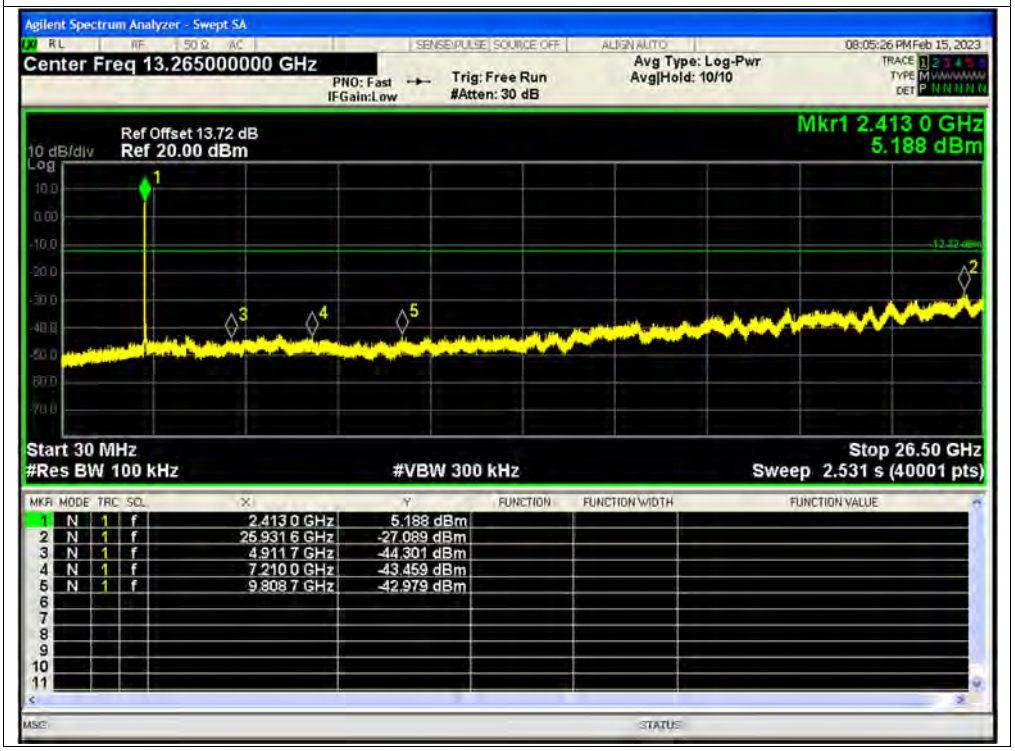



Tx. Spurious NVNT n40 2452MHz Ant1 Emission



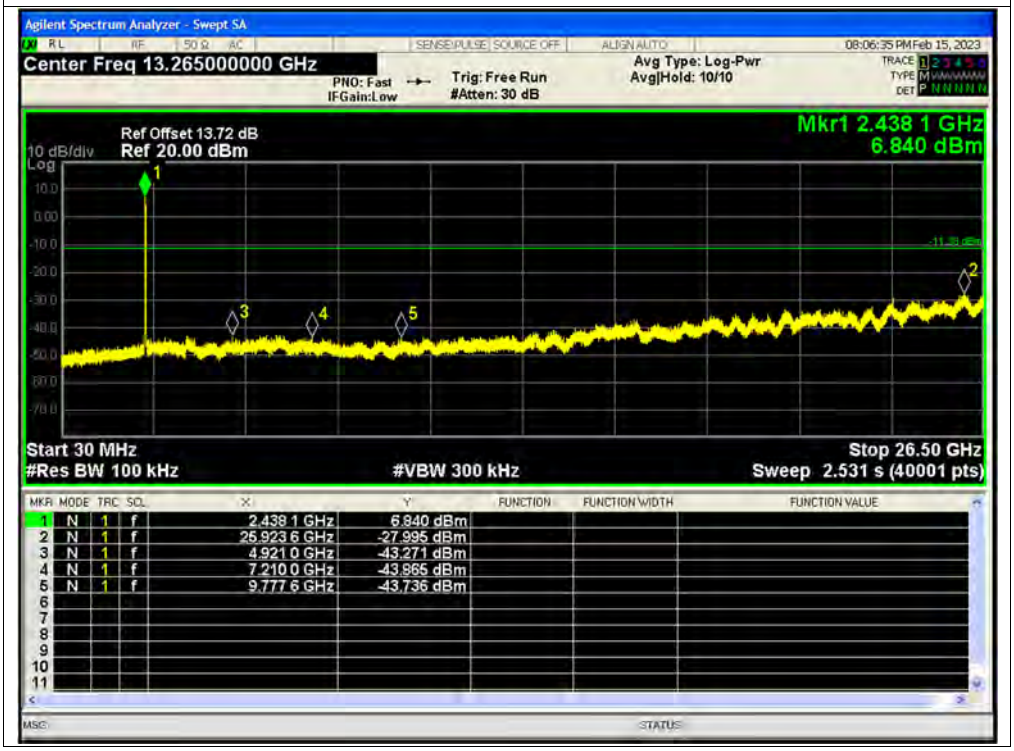
Tx. Spurious NVNT ac20 2412MHz Ant1 Ref

Tx. Spurious NVNT ac20 2412MHz Ant1 Emission

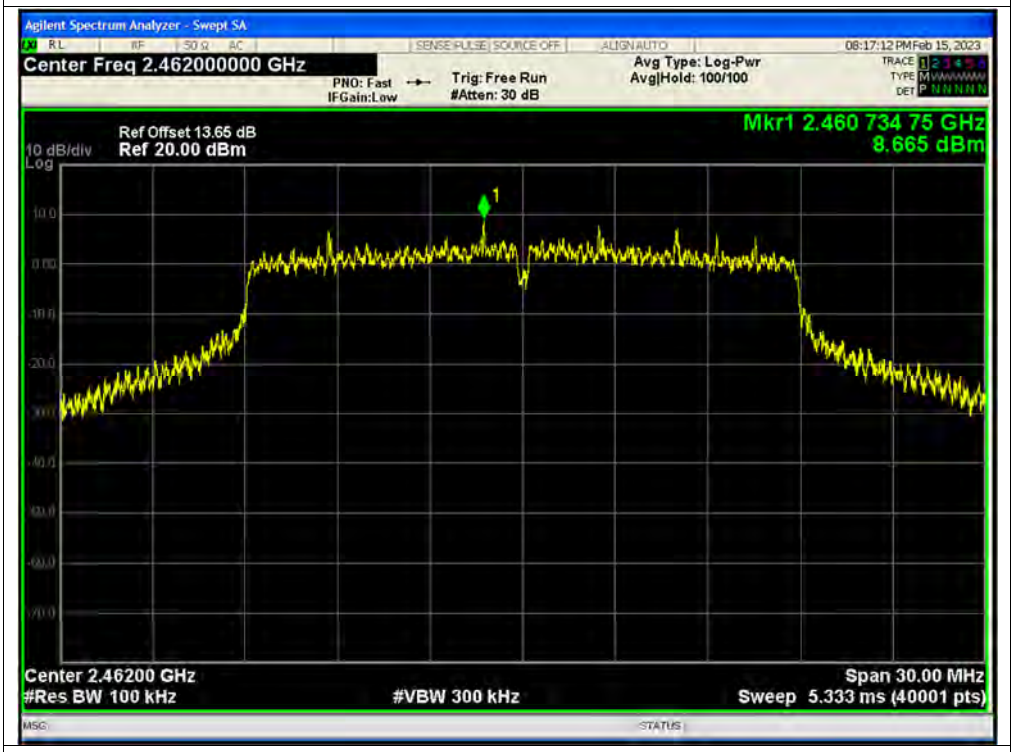


Tx. Spurious NVNT ac20 2437MHz Ant1 Ref

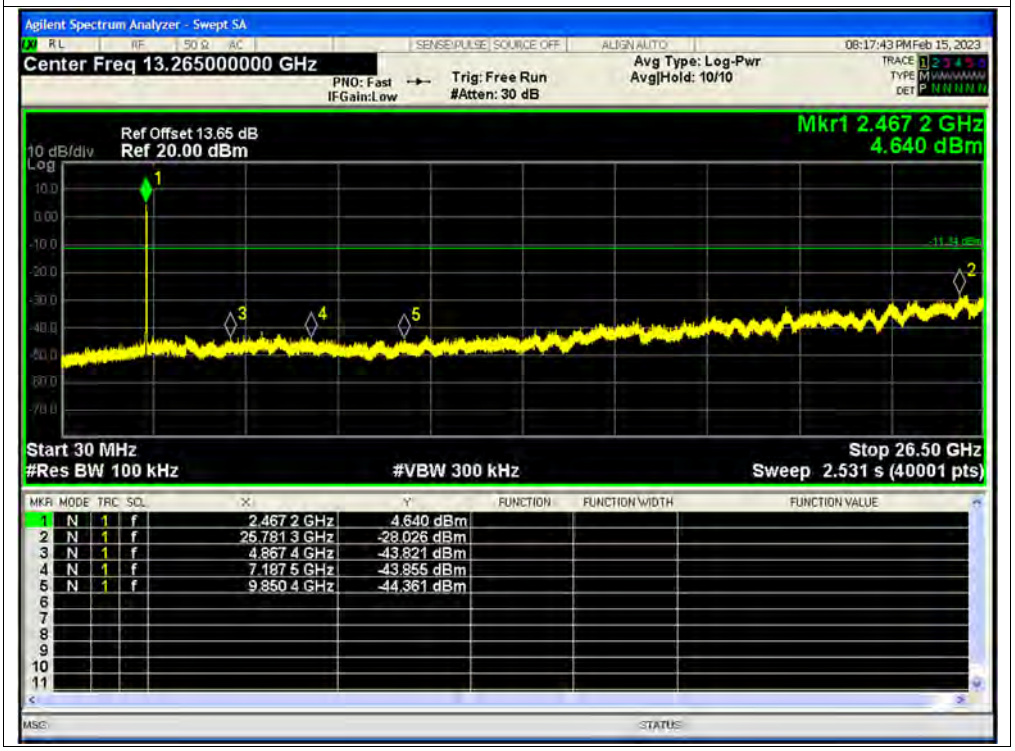
Tx. Spurious NVNT ac20 2437MHz Ant1 Emission



Tx. Spurious NVNT ac20 2462MHz Ant1 Ref

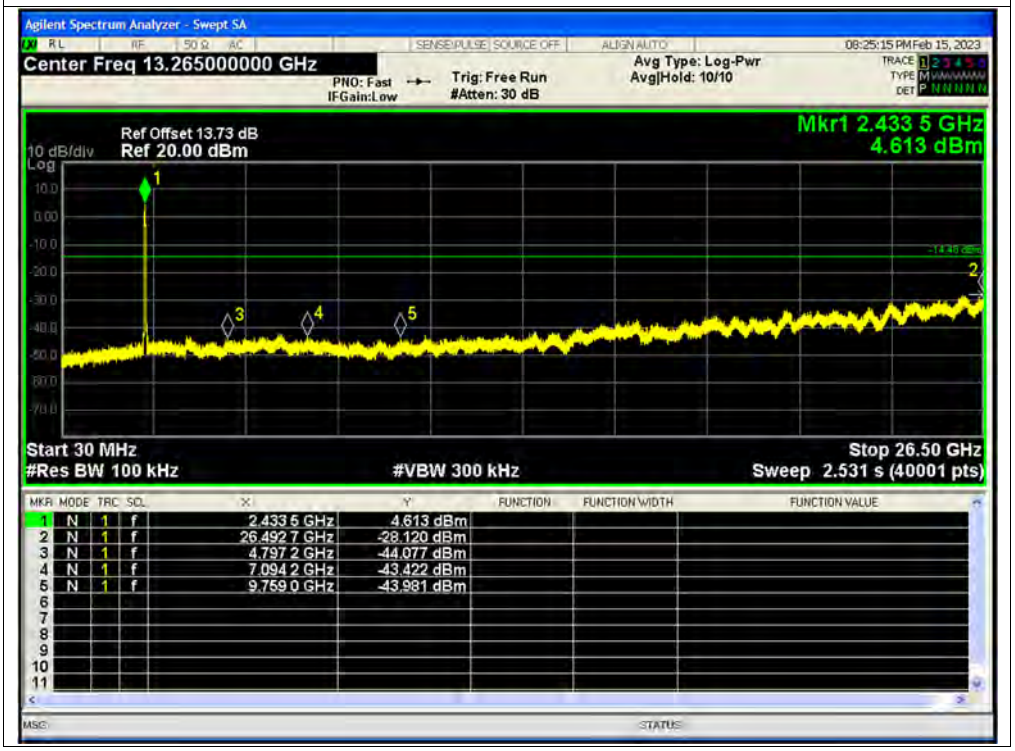



Tx. Spurious NVNT ac20 2462MHz Ant1 Emission



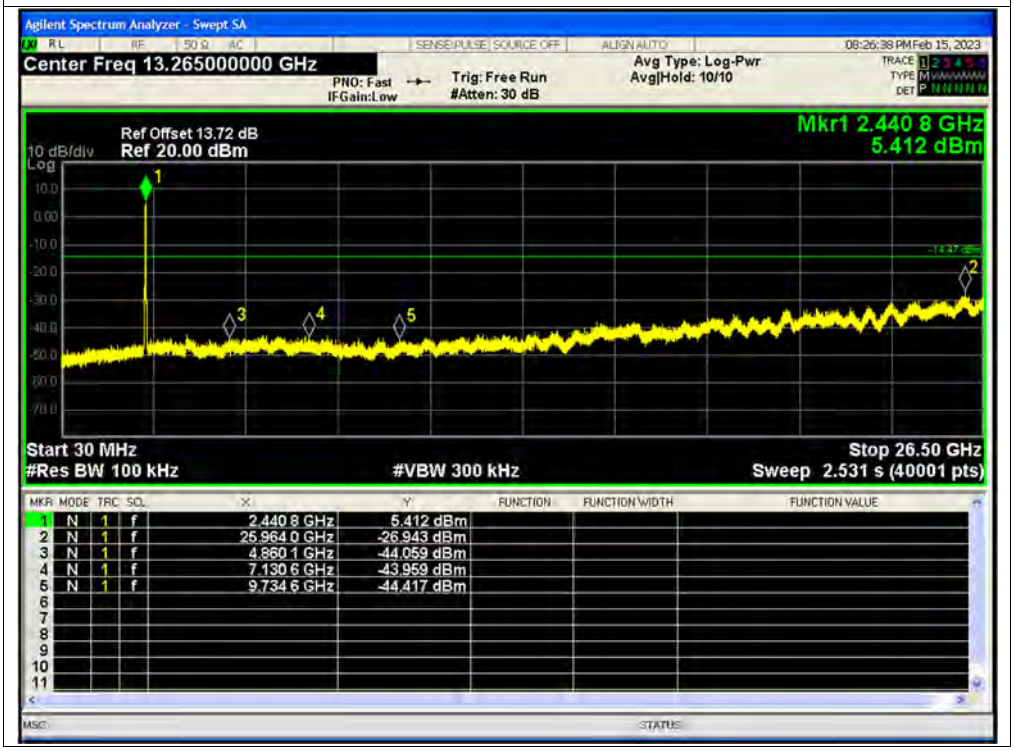
Tx. Spurious NVNT ac40 2422MHz Ant1 Ref

Tx. Spurious NVNT ac40 2422MHz Ant1 Emission

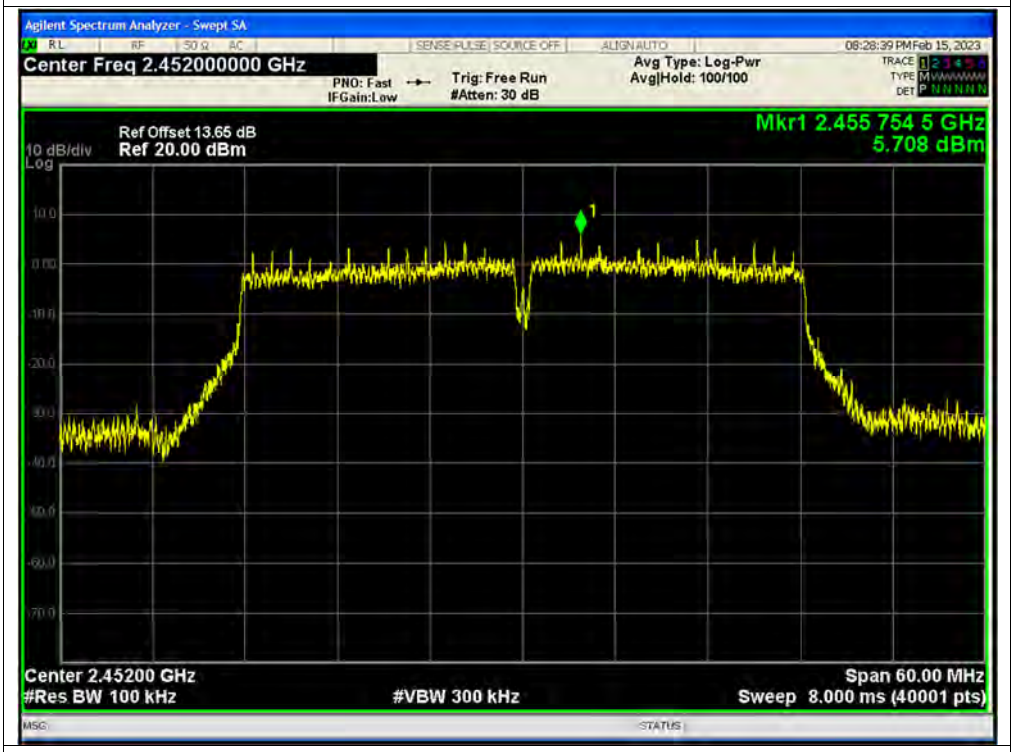


Tx. Spurious NVNT ac40 2437MHz Ant1 Ref

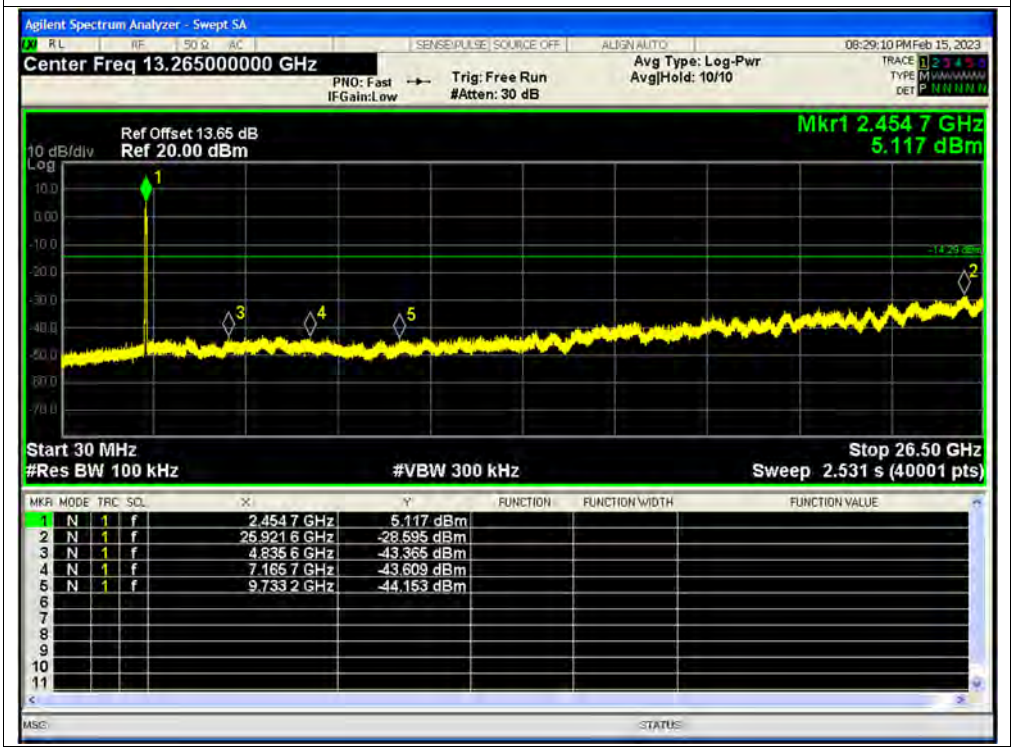
Tx. Spurious NVNT ac40 2437MHz Ant1 Emission



Tx. Spurious NVNT ac40 2452MHz Ant1 Ref




Tx. Spurious NVNT ac40 2452MHz Ant1 Emission



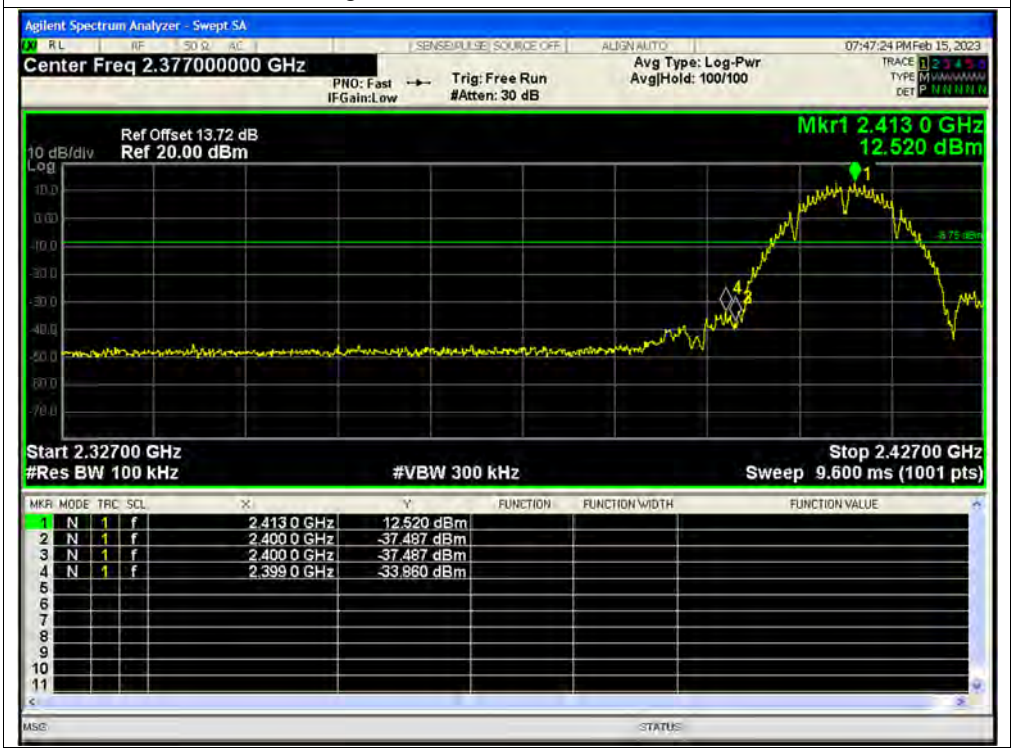
## A.6. Band Edge

| Condition | Mode | Frequency (MHz) | Antenna | Max Value (dBc) | Limit (dBc) | Verdict |
|---|---|---|---|---|---|---|
| NVNT | b | 2412 | Ant1 | -45.1 | -20 | Pass |
| NVNT | b | 2462 | Ant1 | -55.18 | -20 | Pass |
| NVNT | g | 2412 | Ant1 | -30.59 | -20 | Pass |
| NVNT | g | 2462 | Ant1 | -45.4 | -20 | Pass |
| NVNT | n20 | 2412 | Ant1 | -29.6 | -20 | Pass |
| NVNT | n20 | 2462 | Ant1 | -45.53 | -20 | Pass |
| NVNT | n40 | 2422 | Ant1 | -33.13 | -20 | Pass |
| NVNT | n40 | 2452 | Ant1 | -33.21 | -20 | Pass |
| NVNT | ac20 | 2412 | Ant1 | -28.32 | -20 | Pass |
| NVNT | ac20 | 2462 | Ant1 | -46.55 | -20 | Pass |
| NVNT | ac40 | 2422 | Ant1 | -35.07 | -20 | Pass |
| NVNT | ac40 | 2452 | Ant1 | -32.28 | -20 | Pass |

Test Graphs

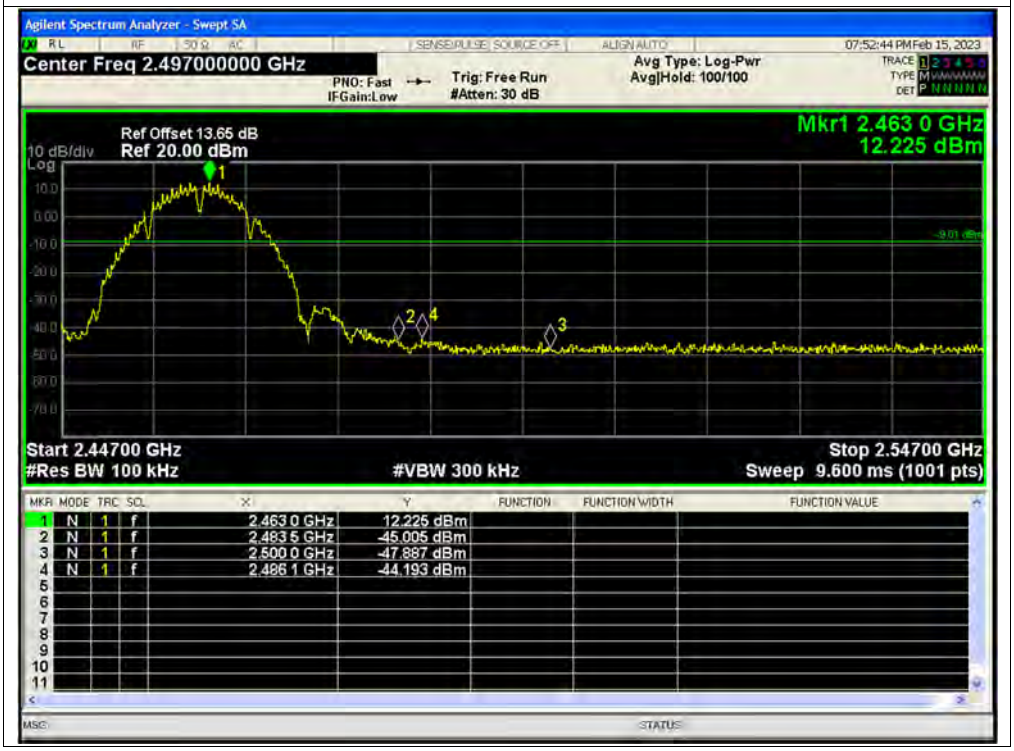
Band Edge NVNT b 2412MHz Ant1 Ref

Band Edge NVNT b 2412MHz Ant1 Emission



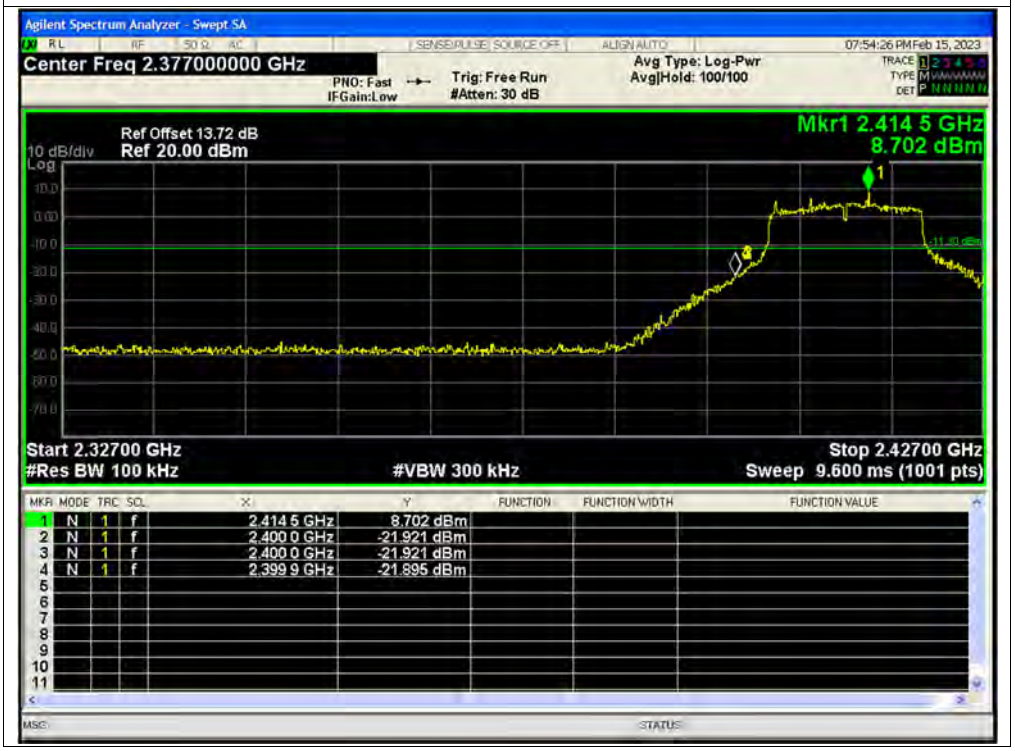
Band Edge NVNT b 2462MHz Ant1 Ref

Band Edge NVNT b 2462MHz Ant1 Emission



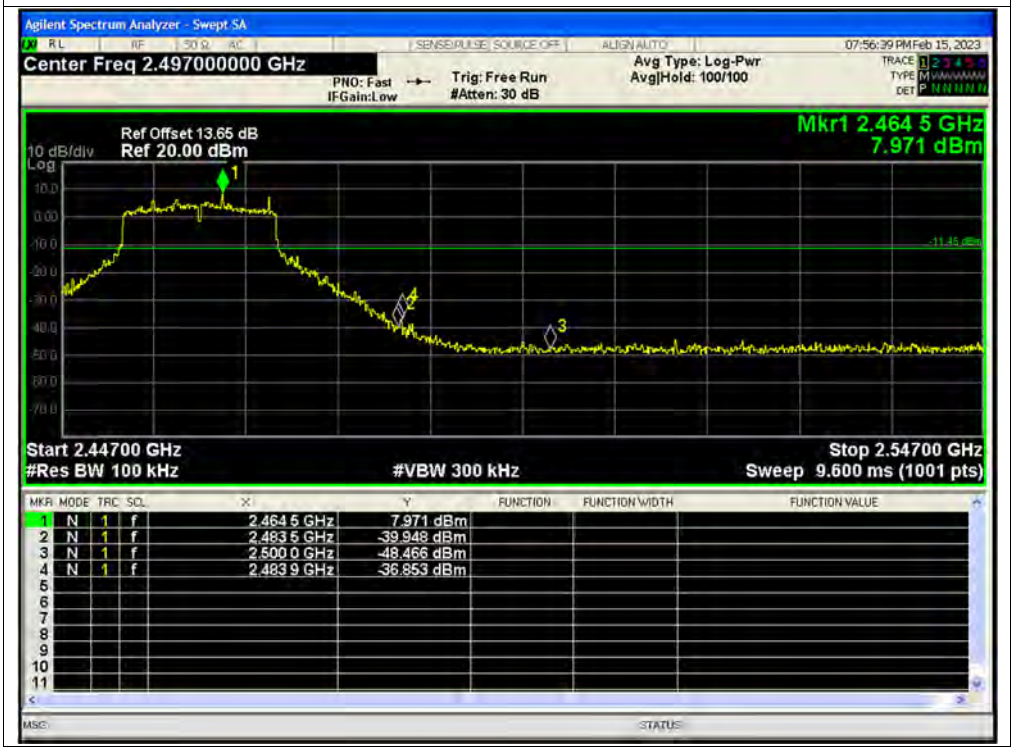
Band Edge NVNT g 2412MHz Ant1 Ref

Band Edge NVNT g 2412MHz Ant1 Emission

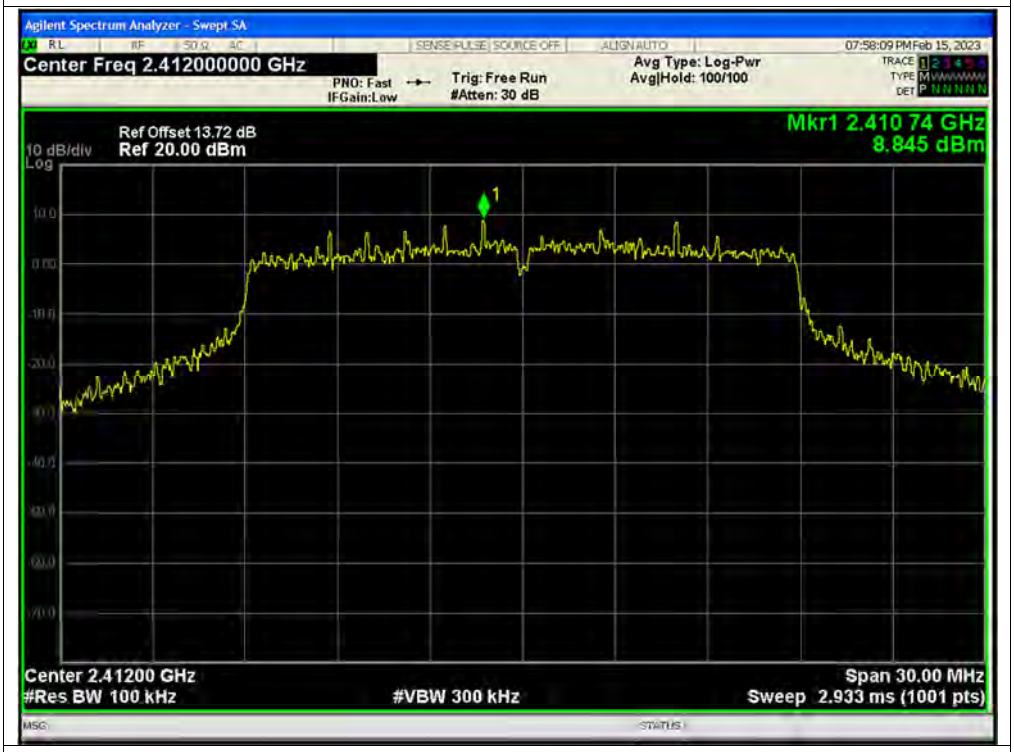


Band Edge NVNT g 2462MHz Ant1 Ref

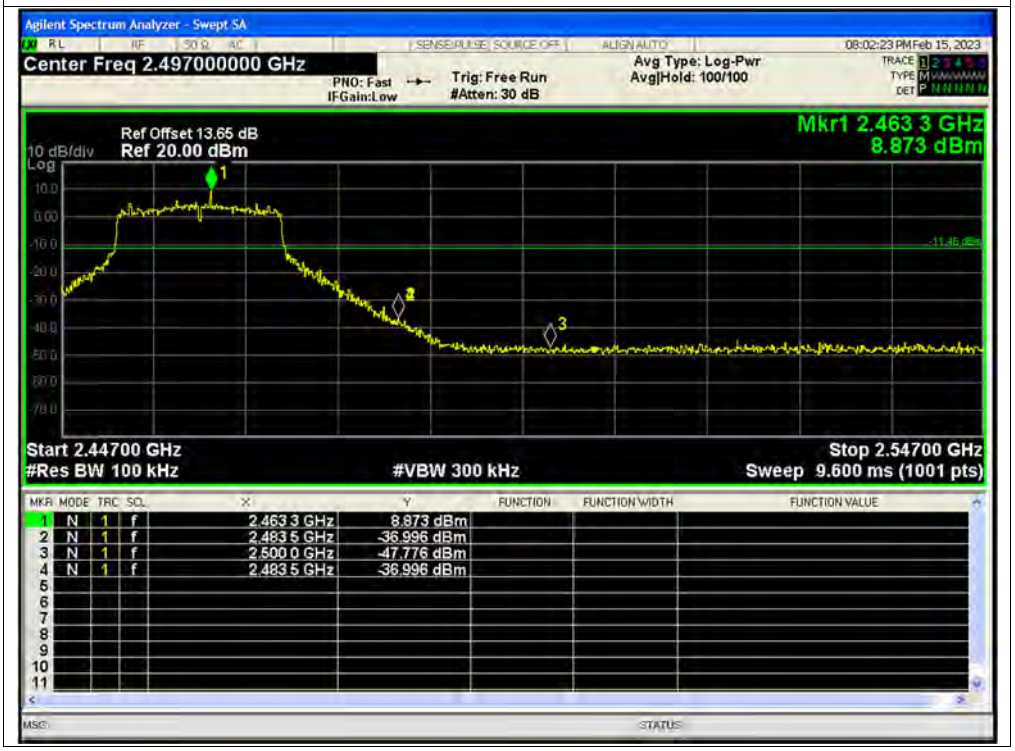
Band Edge NVNT g 2462MHz Ant1 Emission



Band Edge NVNT n20 2412MHz Ant1 Ref




Band Edge NVNT n20 2412MHz Ant1 Emission

Band Edge NVNT n20 2462MHz Ant1 Ref

Band Edge NVNT n20 2462MHz Ant1 Emission