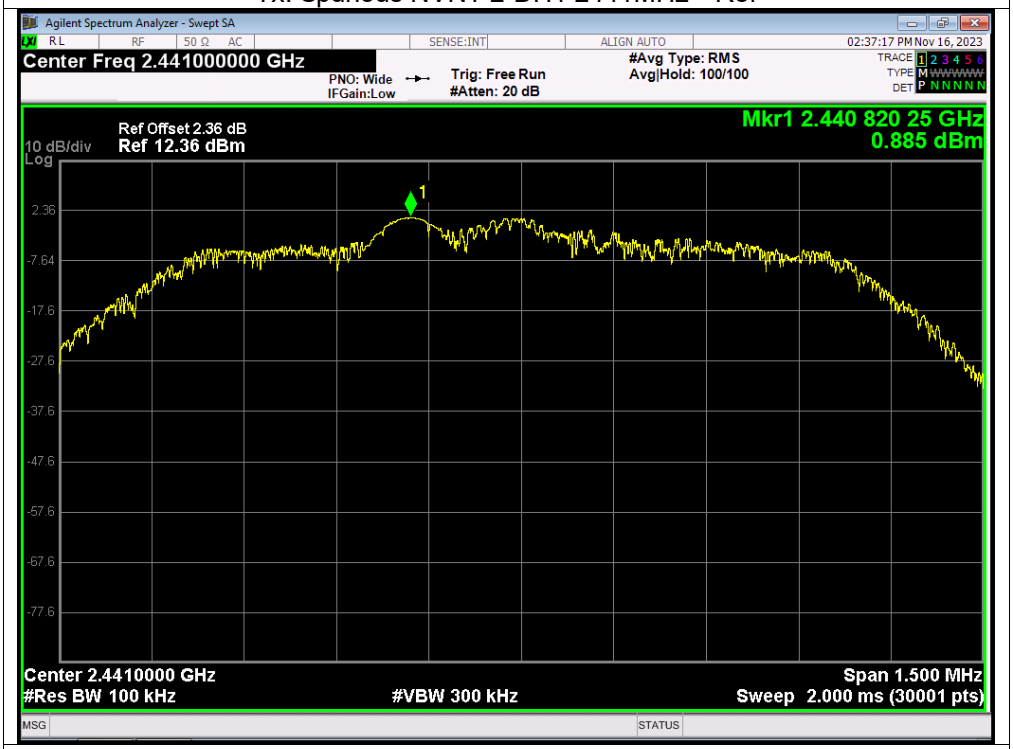
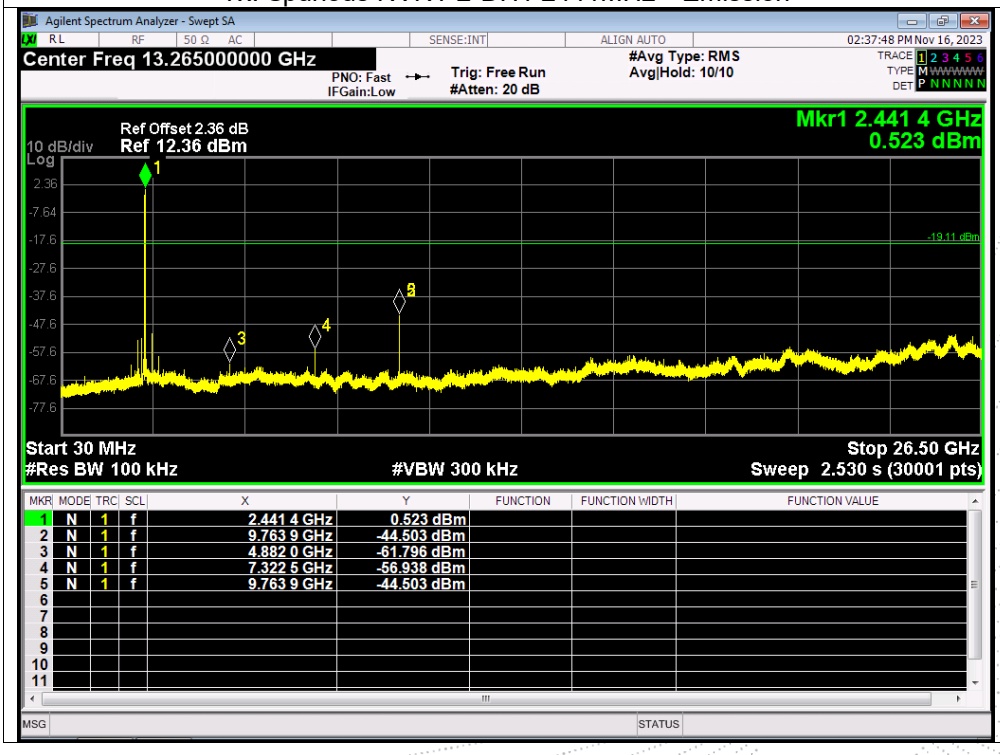
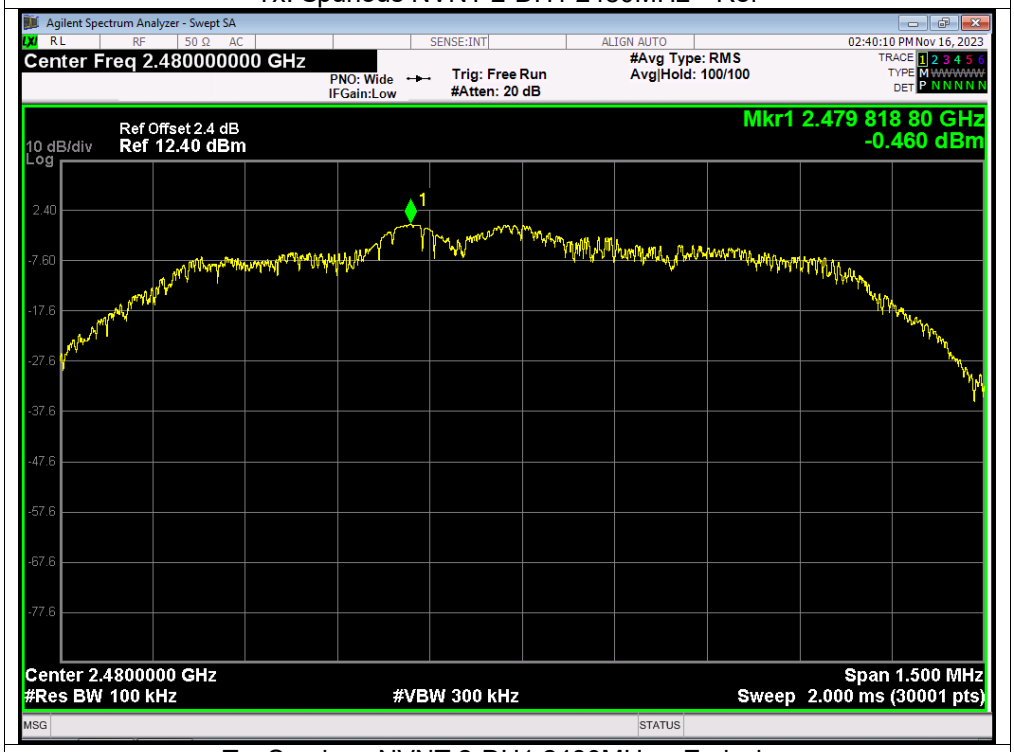
Tx. Spurious NVNT 2-DH1 2441MHz Ref



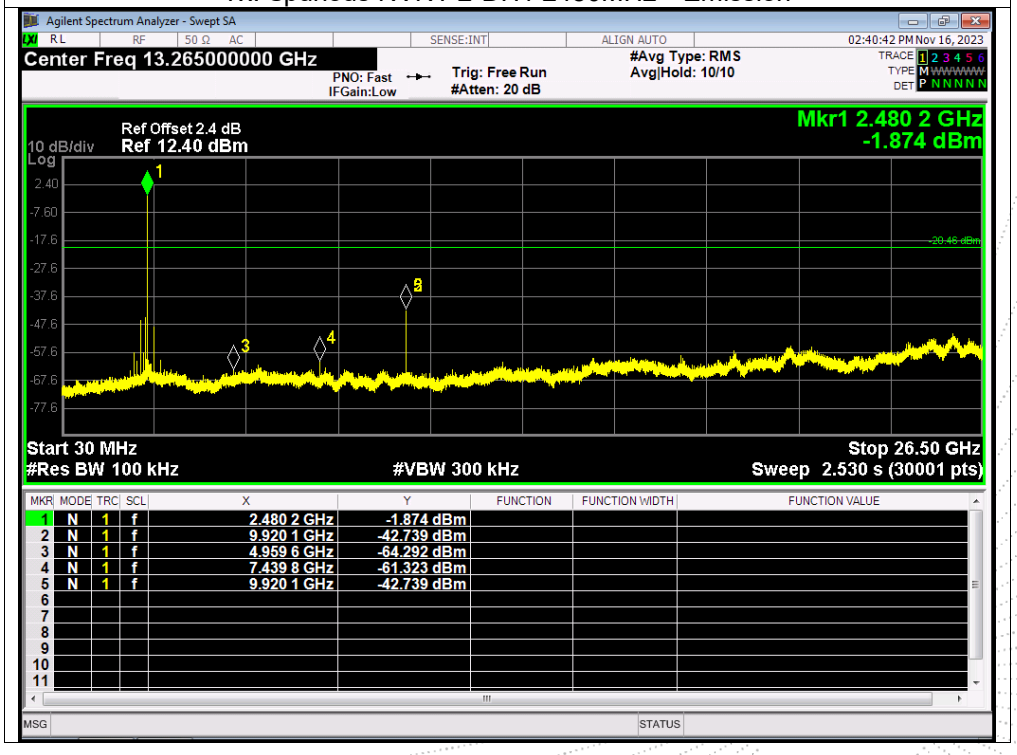

Tx. Spurious NVNT 2-DH1 2441MHz Emission



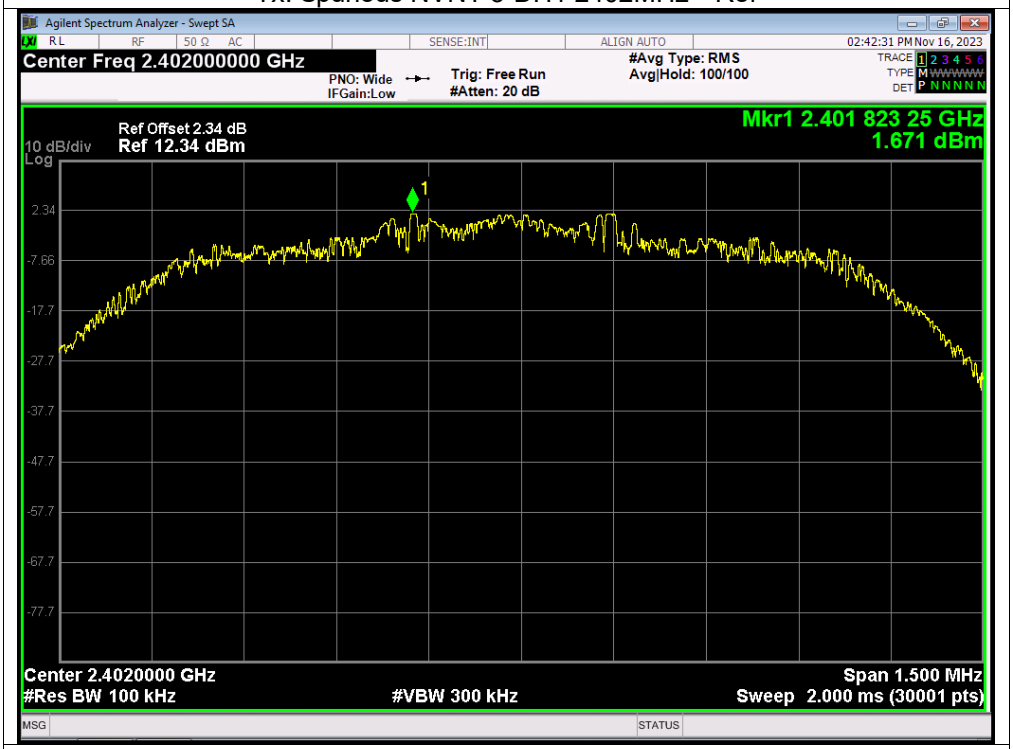
Tx. Spurious NVNT 2-DH1 2480MHz Ref



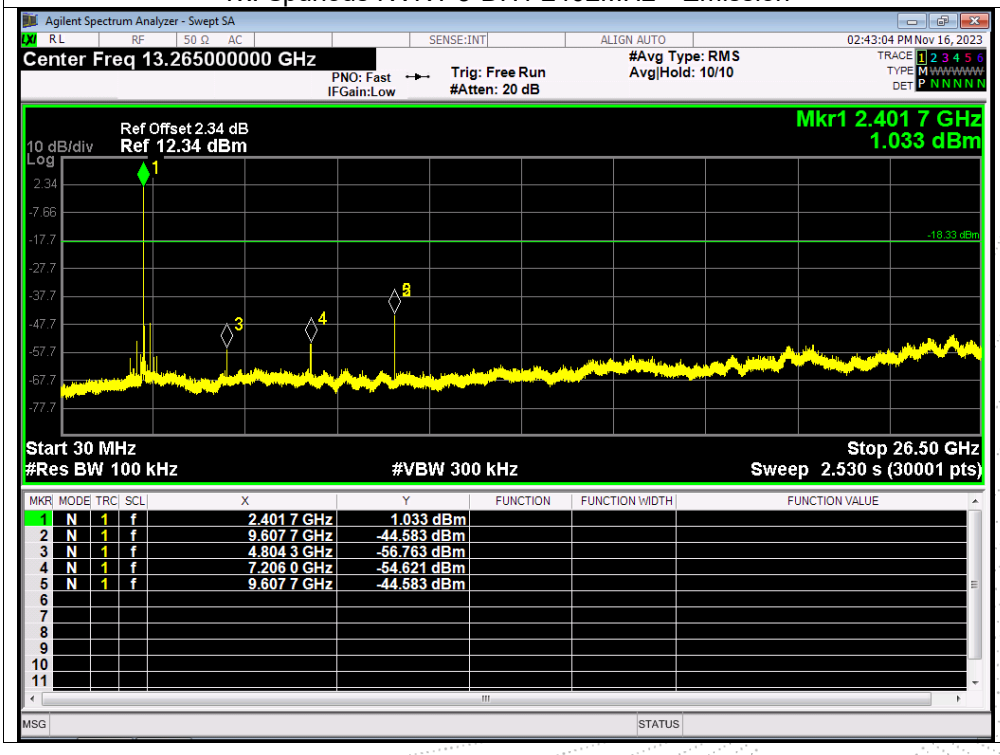

Tx. Spurious NVNT 2-DH1 2480MHz Emission



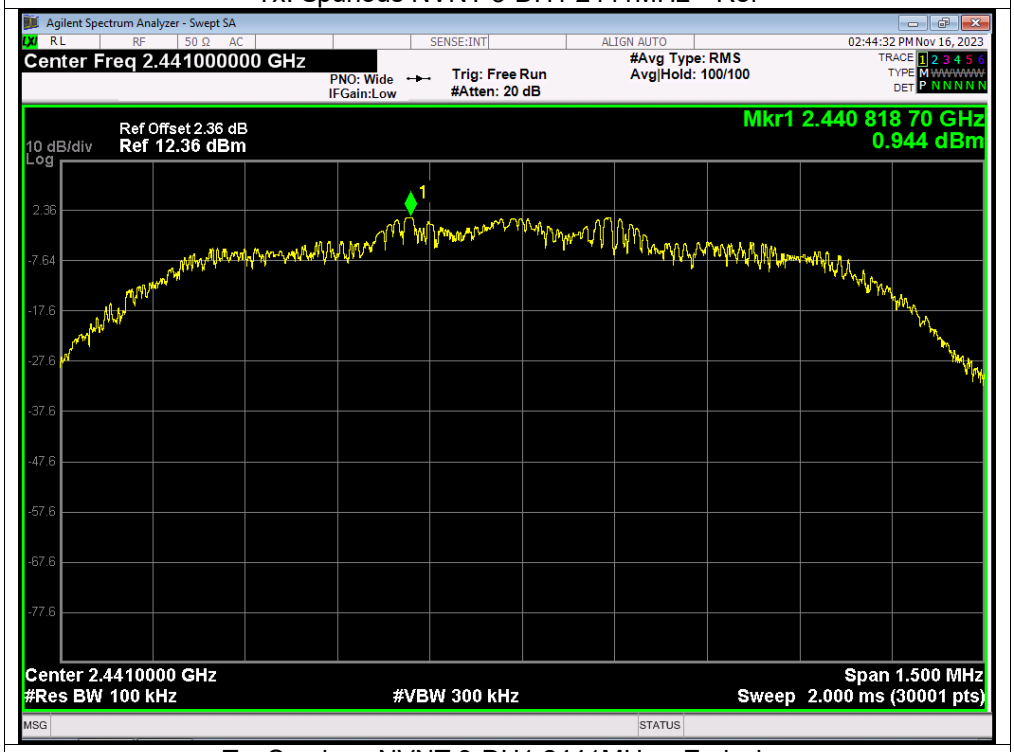
Tx. Spurious NVNT 3-DH1 2402MHz Ref



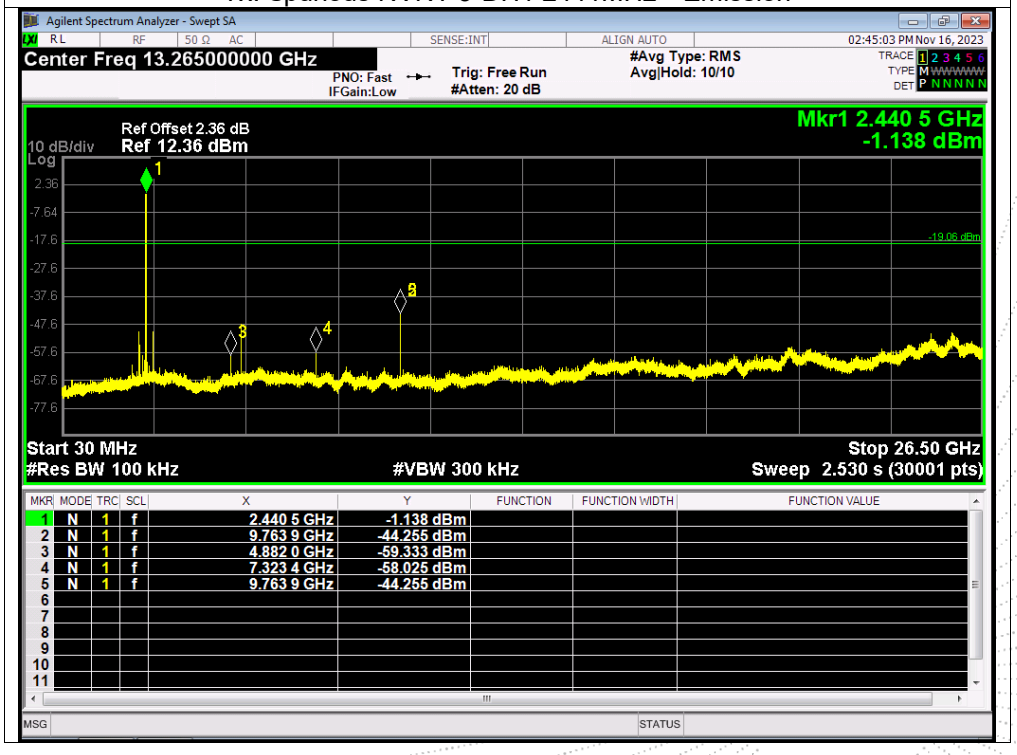

Tx. Spurious NVNT 3-DH1 2402MHz Emission



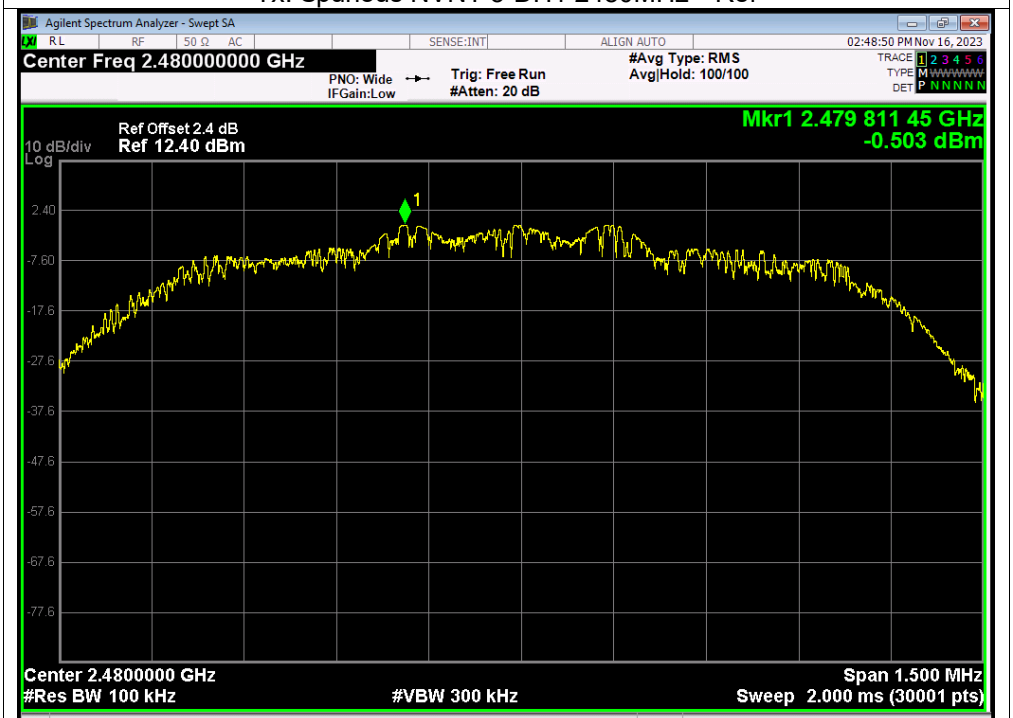
Tx. Spurious NVNT 3-DH1 2441MHz Ref



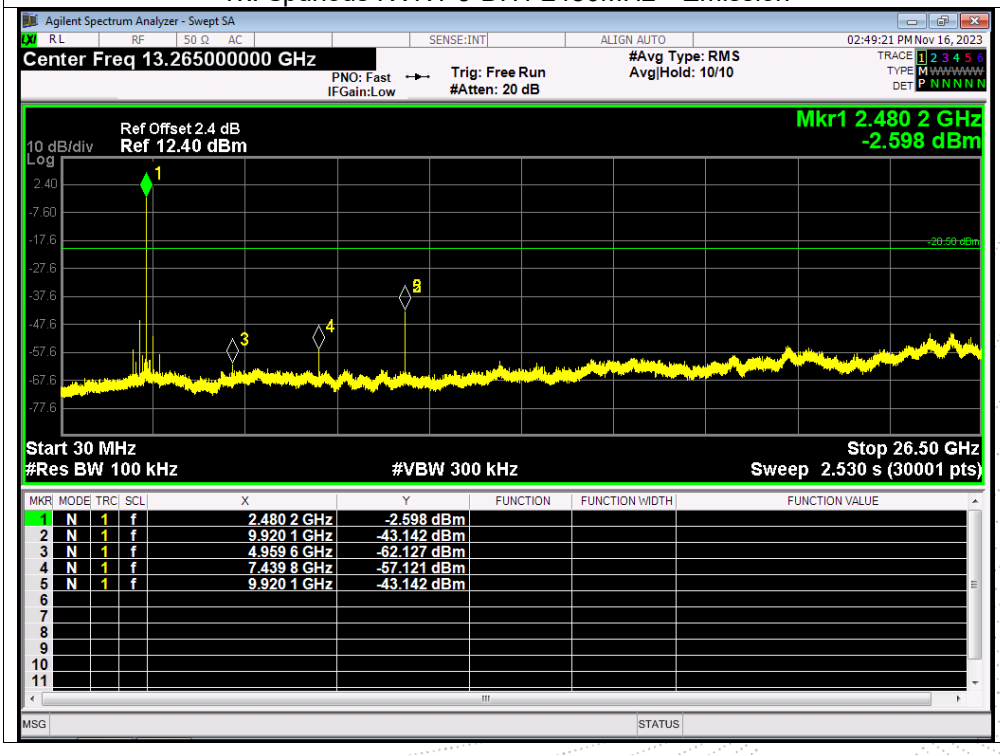

Tx. Spurious NVNT 3-DH1 2441MHz Emission



Tx. Spurious NVNT 3-DH1 2480MHz Ref

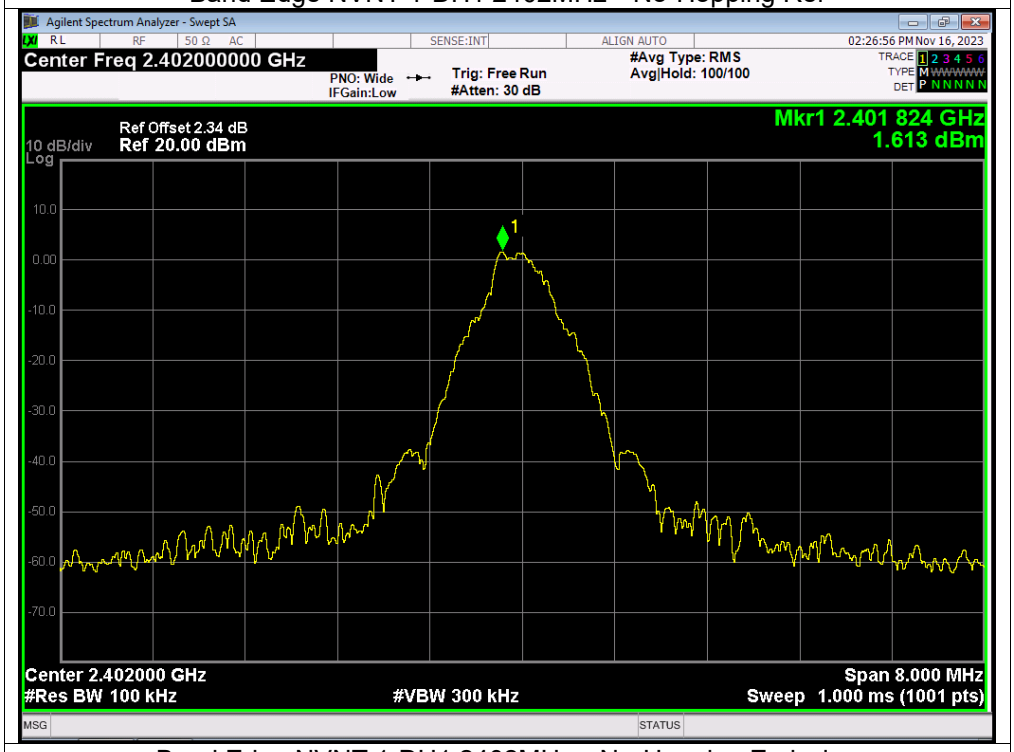



Tx. Spurious NVNT 3-DH1 2480MHz Emission

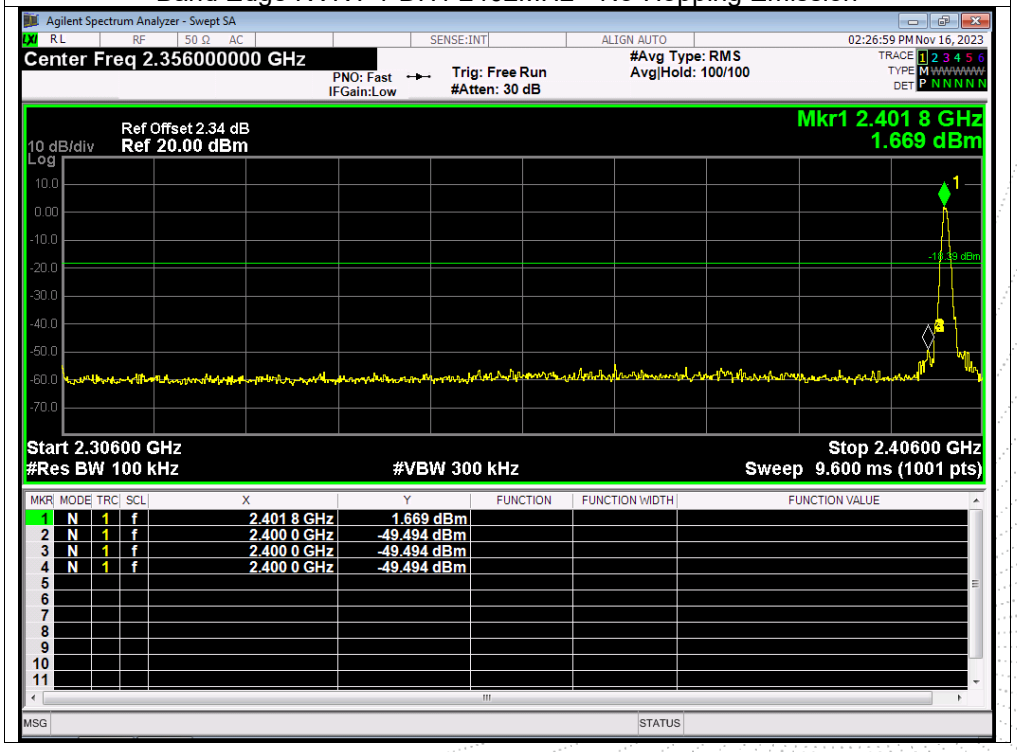


Test Graphs

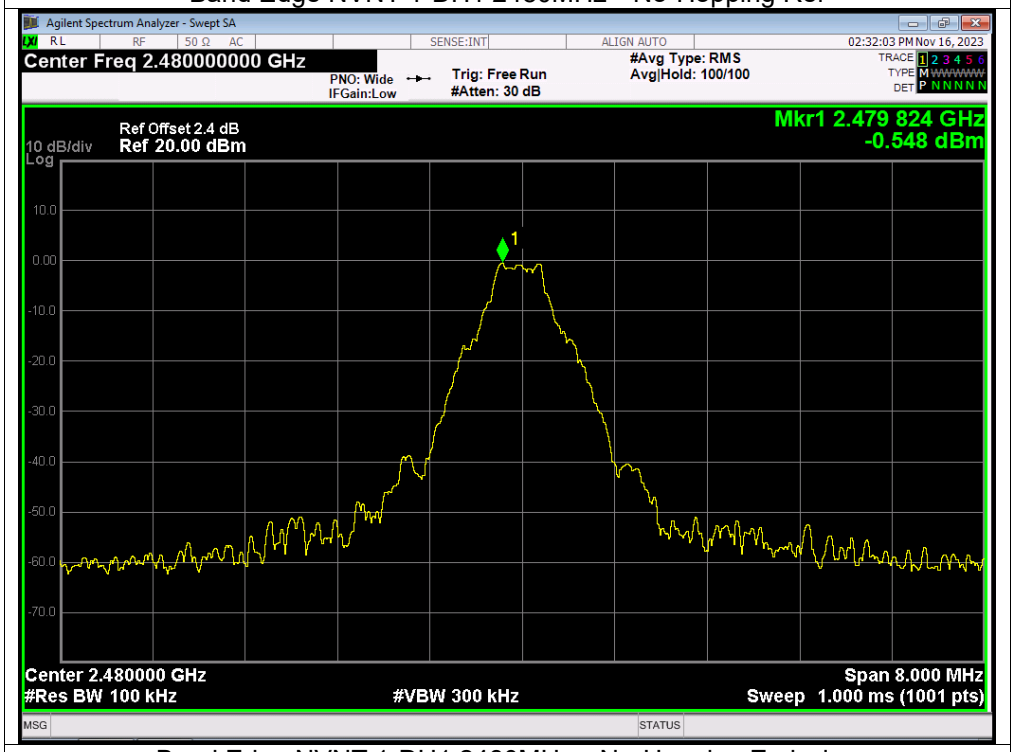
Band Edge NVNT 1-DH1 2402MHz No-Hopping Ref



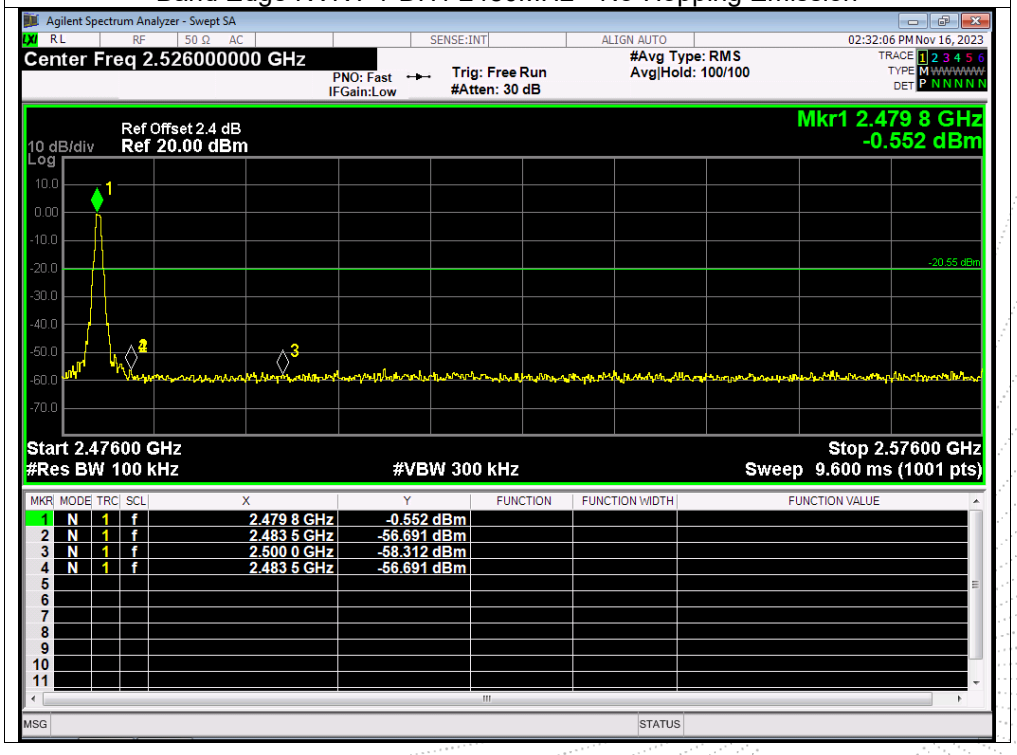

Band Edge NVNT 1-DH1 2402MHz No-Hopping Emission



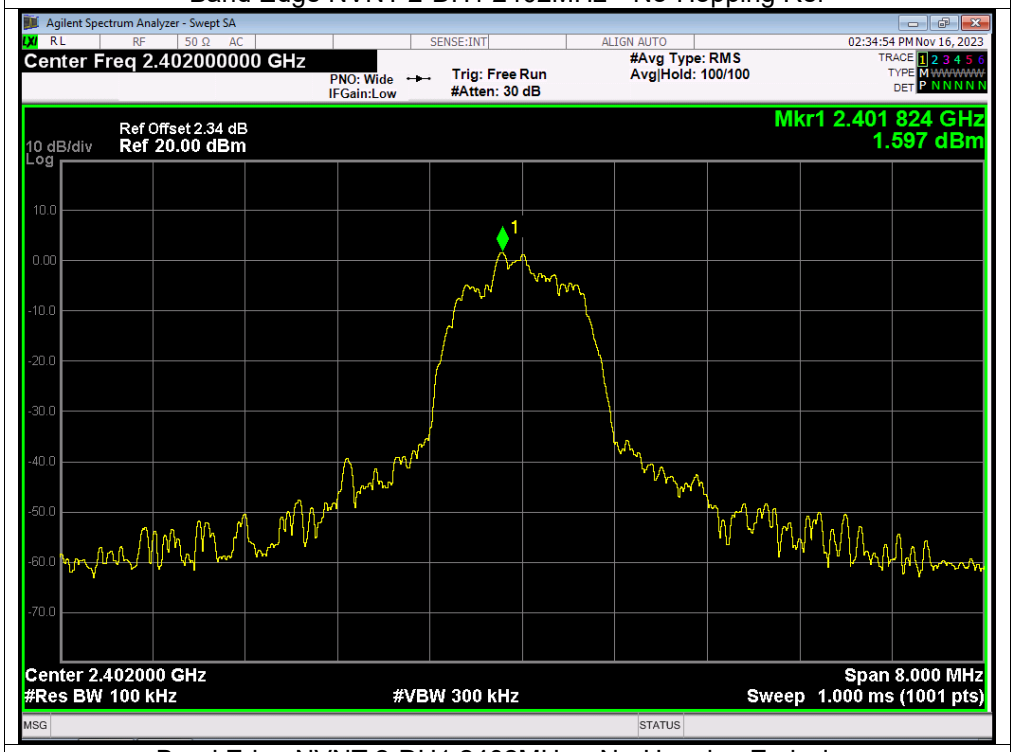
Band Edge NVNT 1-DH1 2480MHz No-Hopping Ref



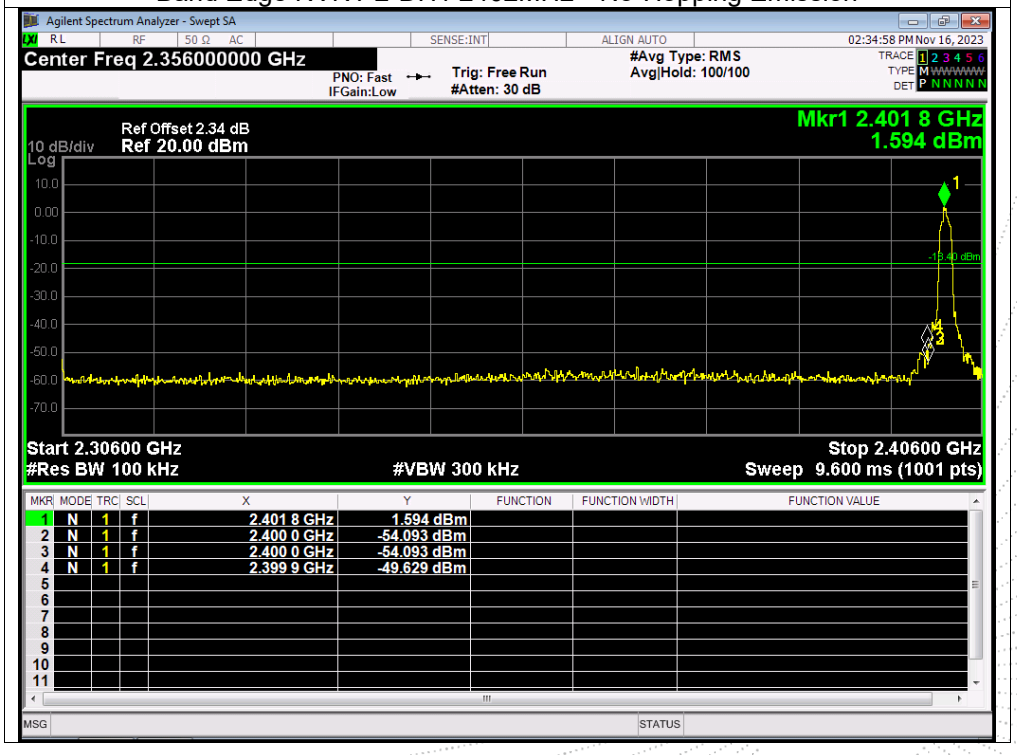

Band Edge NVNT 1-DH1 2480MHz No-Hopping Emission



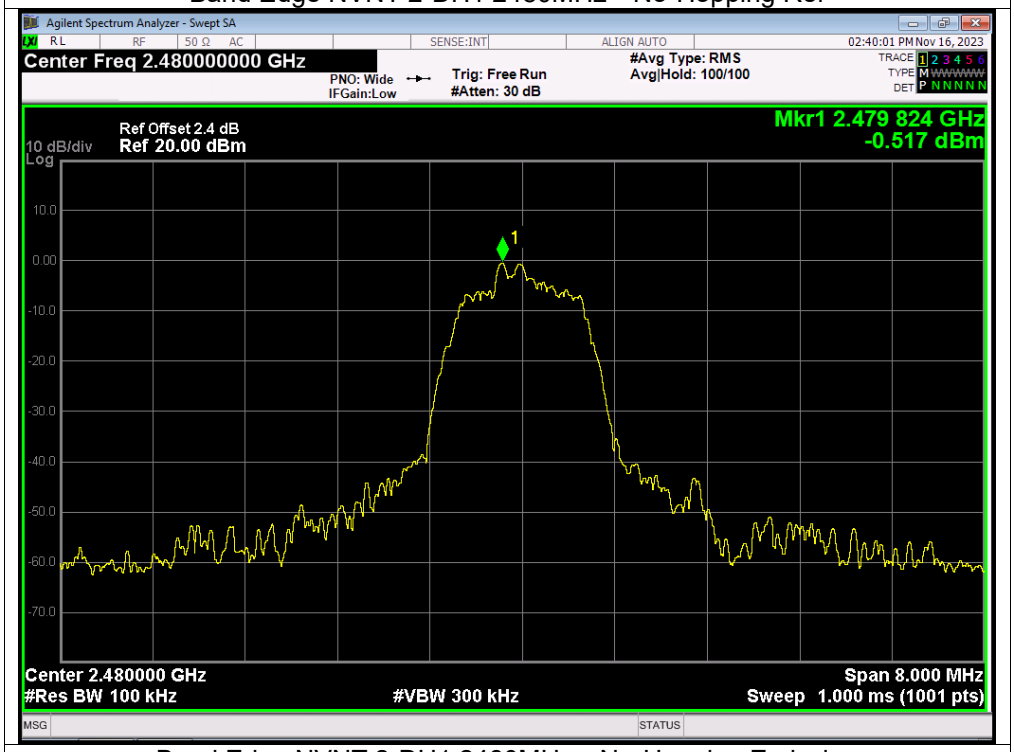
Band Edge NVNT 2-DH1 2402MHz No-Hopping Ref



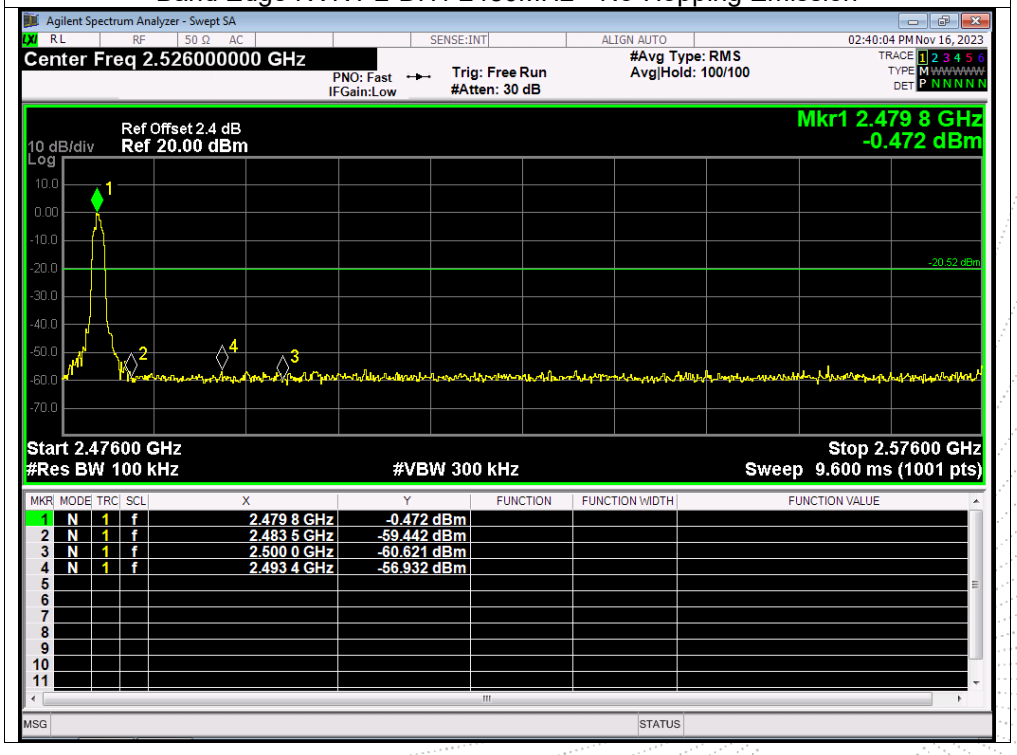

Band Edge NVNT 2-DH1 2402MHz No-Hopping Emission



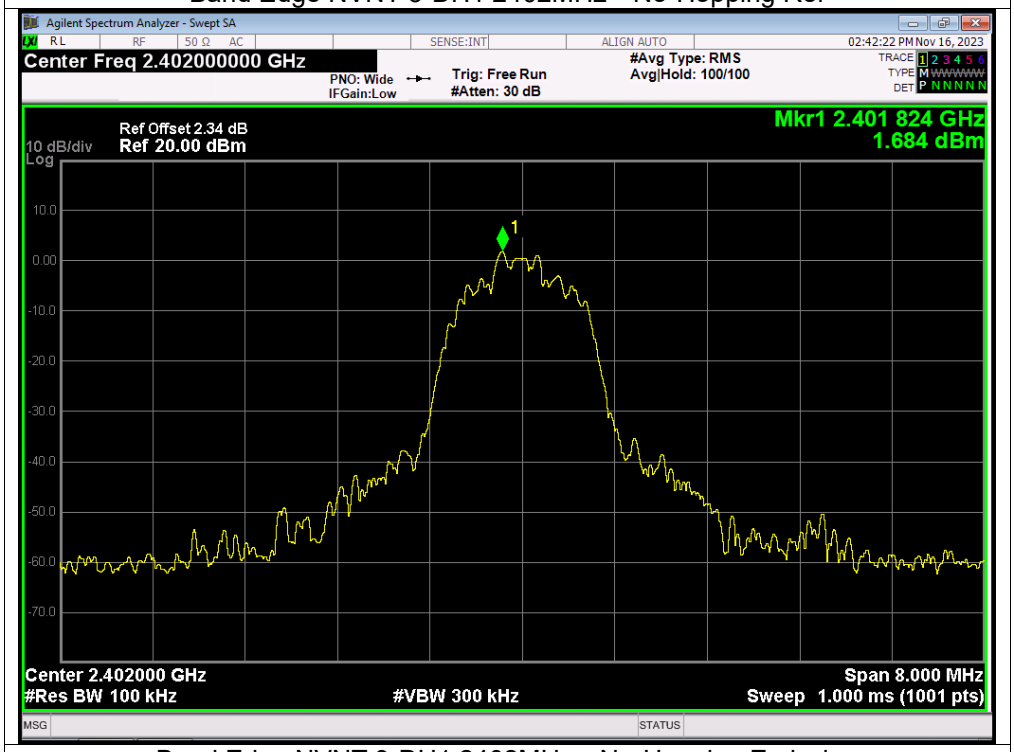
Band Edge NVNT 2-DH1 2480MHz No-Hopping Ref



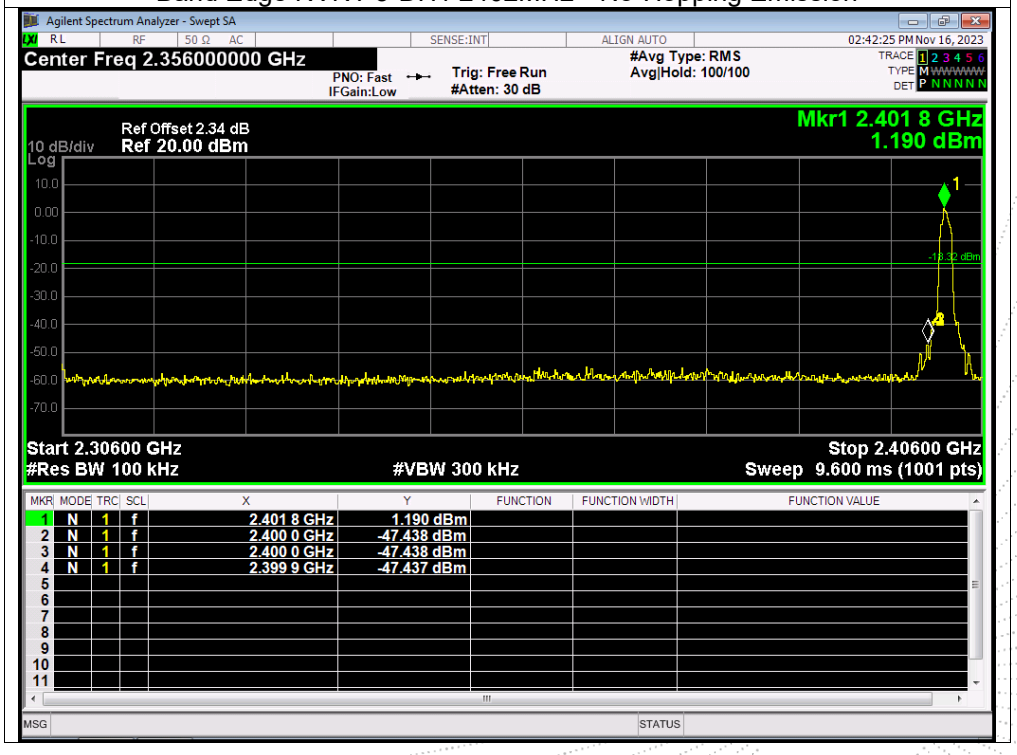

Band Edge NVNT 2-DH1 2480MHz No-Hopping Emission



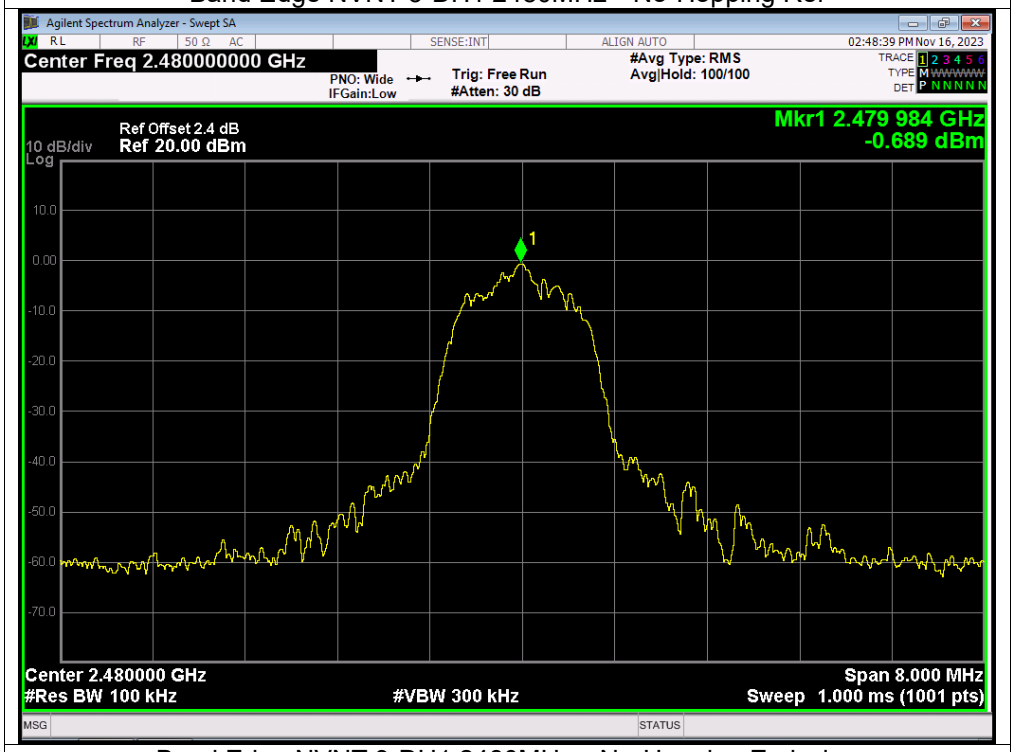
Band Edge NVNT 3-DH1 2402MHz No-Hopping Ref



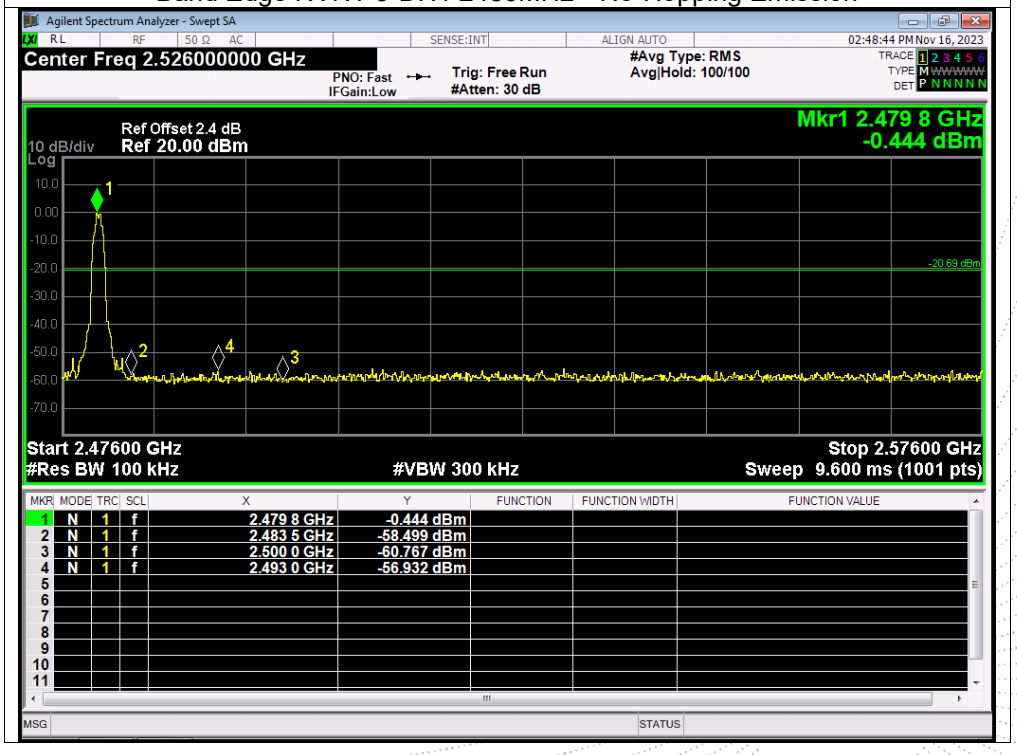

Band Edge NVNT 3-DH1 2402MHz No-Hopping Emission



Band Edge NVNT 3-DH1 2480MHz No-Hopping Ref



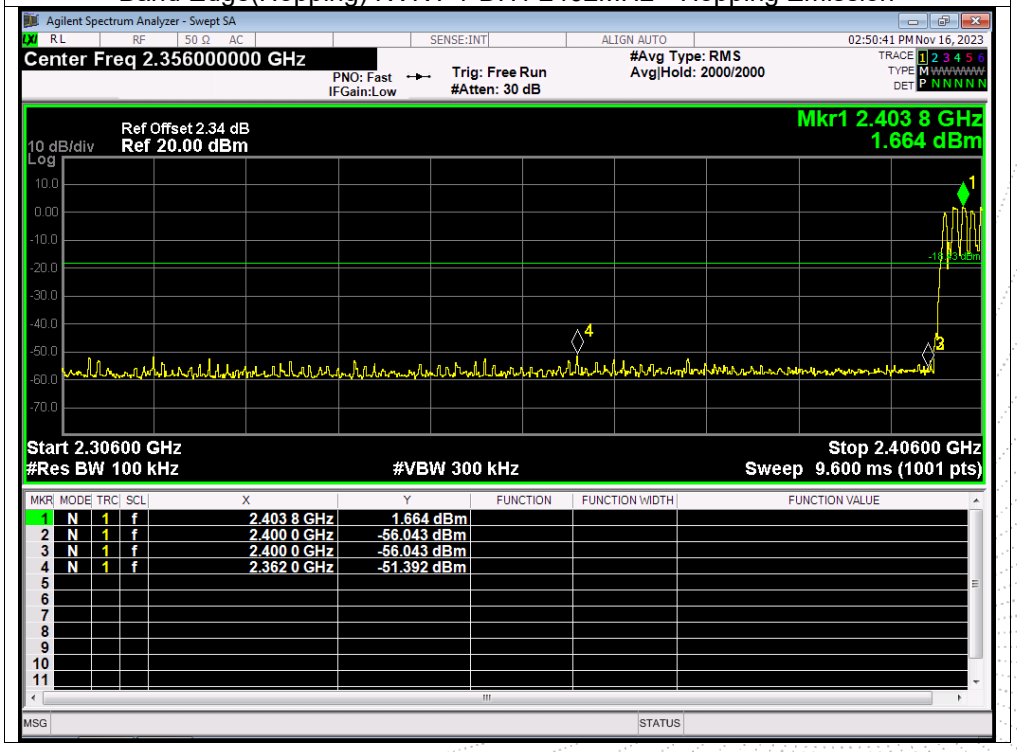

Band Edge NVNT 3-DH1 2480MHz No-Hopping Emission



Test Graphs

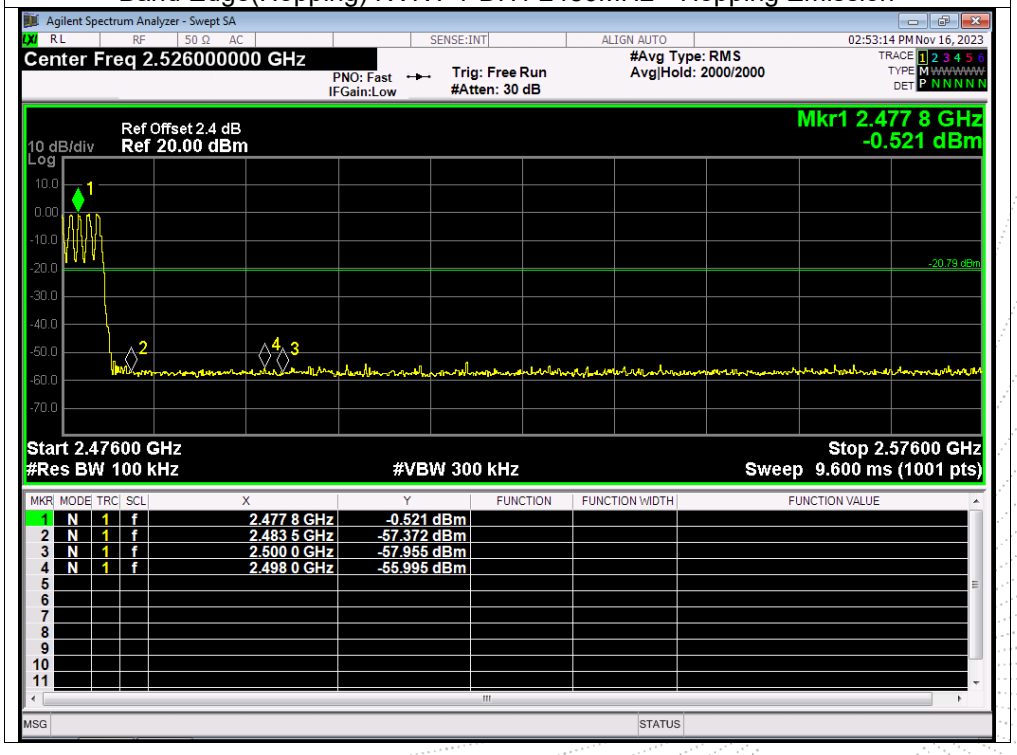
Band Edge(Hopping) NVNT 1-DH1 2402MHz Hopping Ref

Band Edge(Hopping) NVNT 1-DH1 2402MHz Hopping Emission

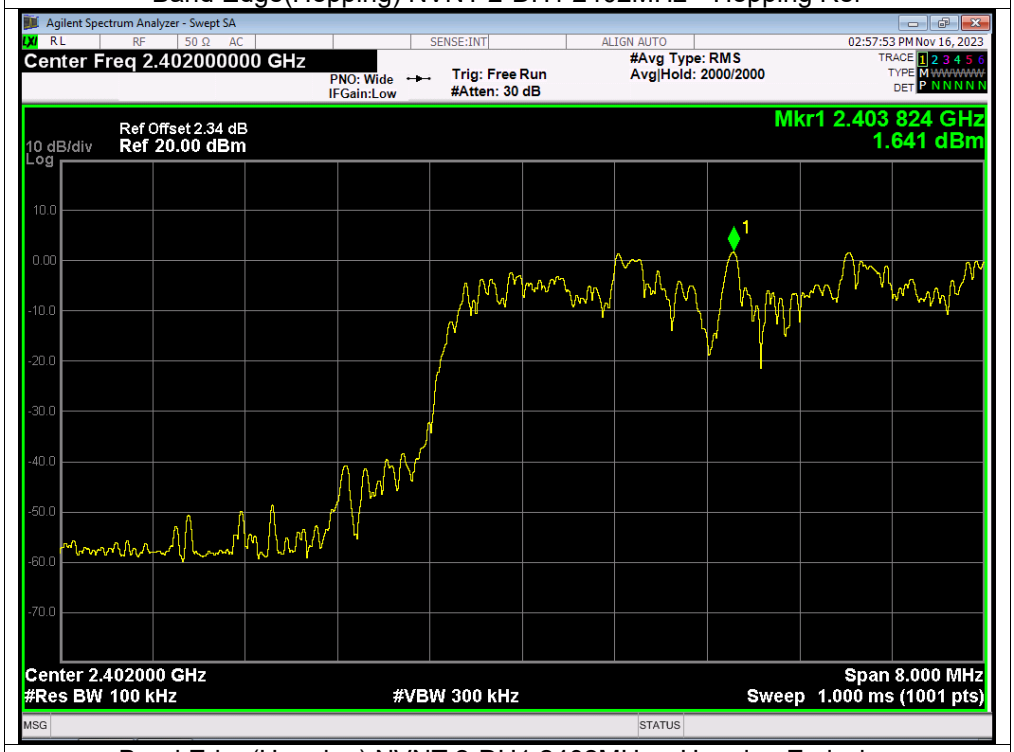


Band Edge(Hopping) NVNT 1-DH1 2480MHz Hopping Ref

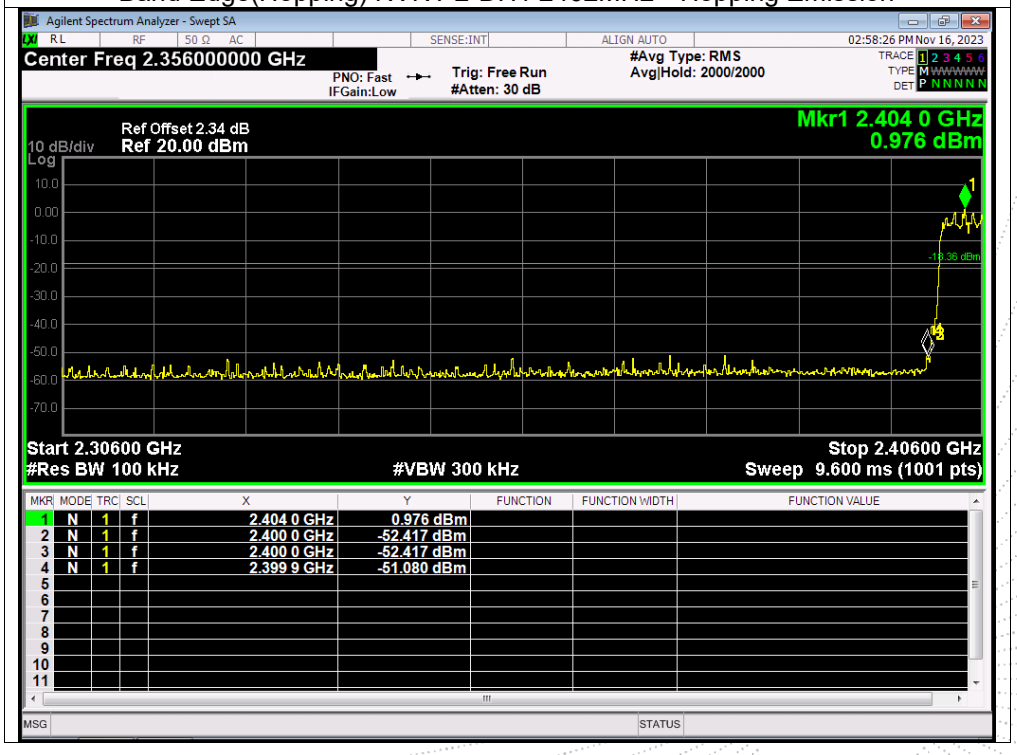
Band Edge(Hopping) NVNT 1-DH1 2480MHz Hopping Emission



Band Edge(Hopping) NVNT 2-DH1 2402MHz Hopping Ref

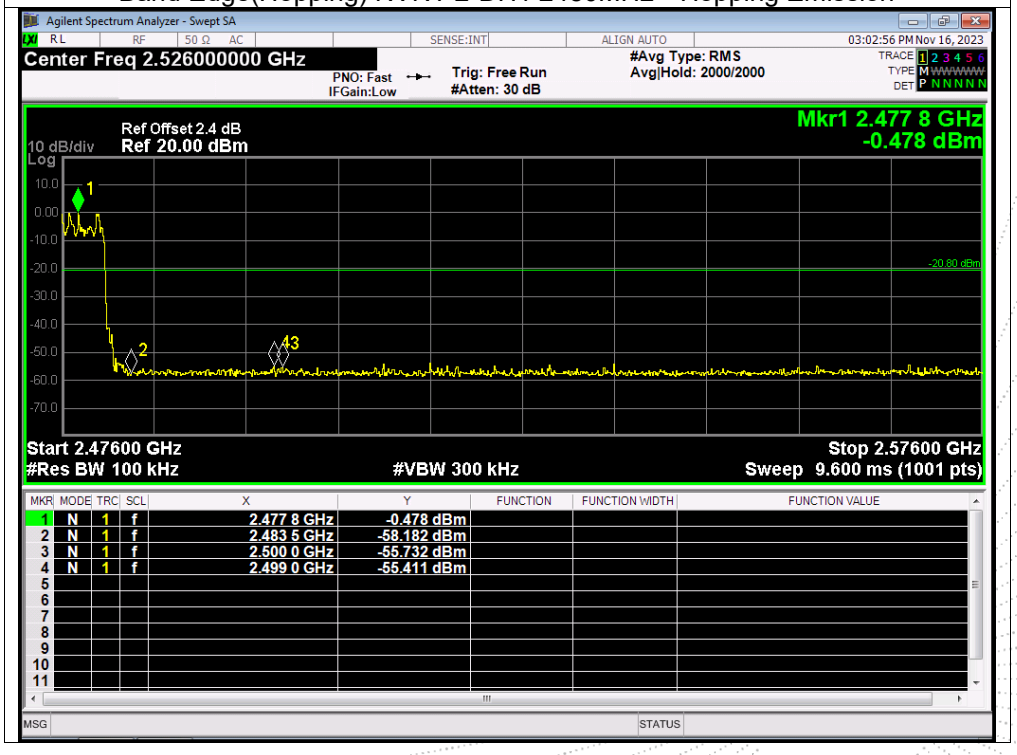



Band Edge(Hopping) NVNT 2-DH1 2402MHz Hopping Emission



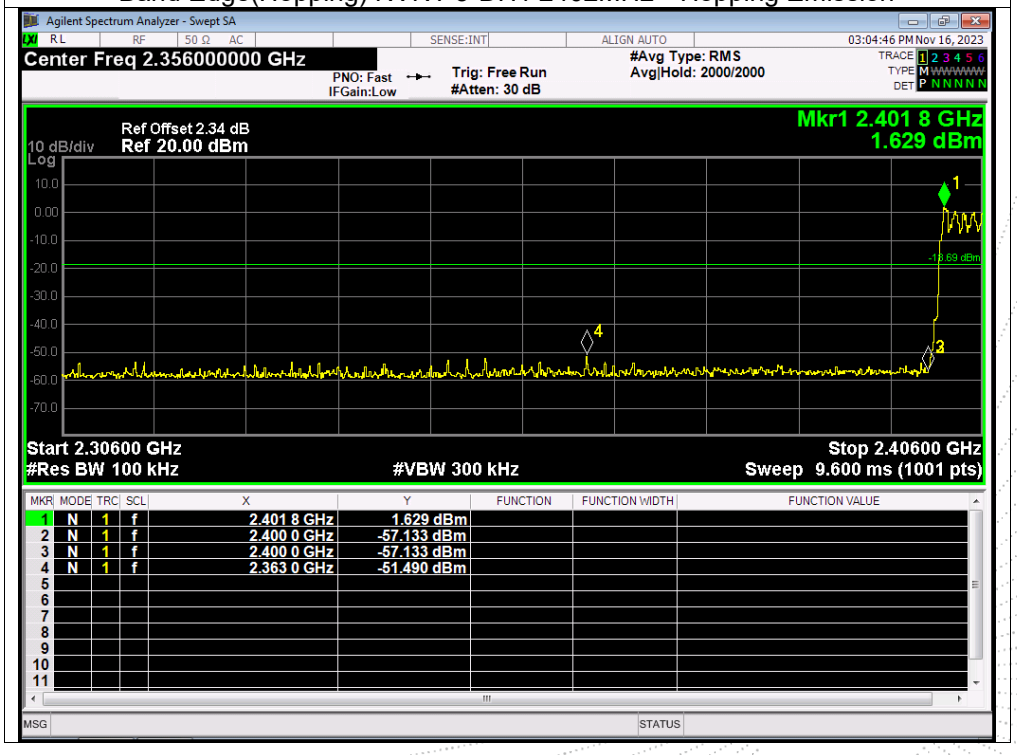
Band Edge(Hopping) NVNT 2-DH1 2480MHz Hopping Ref

Band Edge(Hopping) NVNT 2-DH1 2480MHz Hopping Emission



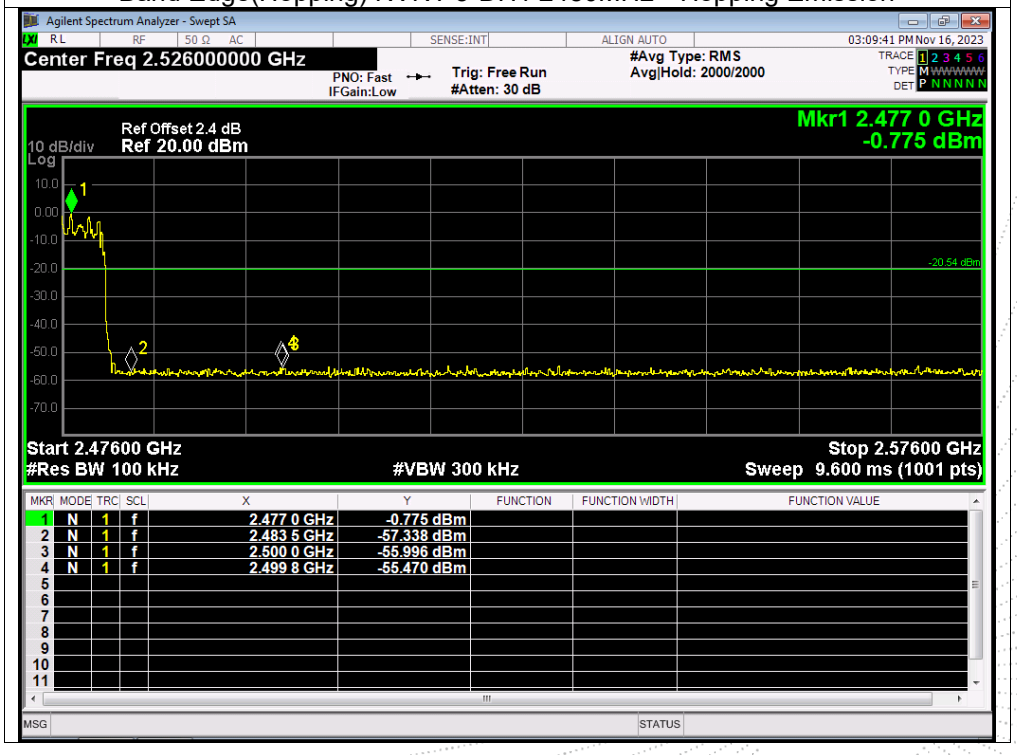
Band Edge(Hopping) NVNT 3-DH1 2402MHz Hopping Ref

Band Edge(Hopping) NVNT 3-DH1 2402MHz Hopping Emission



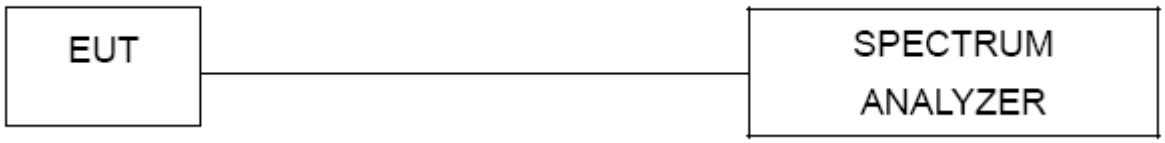
Band Edge(Hopping) NVNT 3-DH1 2480MHz Hopping Ref

Band Edge(Hopping) NVNT 3-DH1 2480MHz Hopping Emission



# 10. 20 dB Bandwidth

## 10.1 Block Diagram Of Test Setup




## 10.2 Limit

N/A

## 10.3 Test procedure

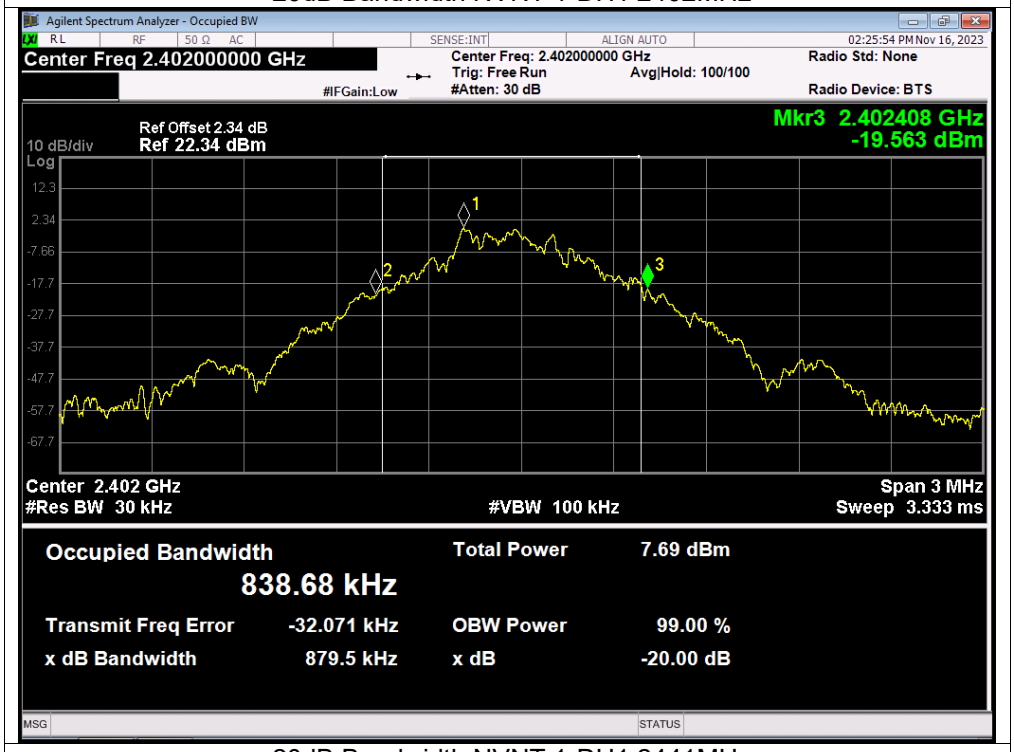
1. Set RBW = 30kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

## 10.4 Test Result

| Condition | Mode | Frequency (MHz) | -20 dB Bandwidth (MHz) | Verdict |
|---|---|---|---|---|
| NVNT | 1-DH1 | 2402 | 0.880 | Pass |
| NVNT | 1-DH1 | 2441 | 0.913 | Pass |
| NVNT | 1-DH1 | 2480 | 0.921 | Pass |
| NVNT | 2-DH1 | 2402 | 1.196 | Pass |
| NVNT | 2-DH1 | 2441 | 1.244 | Pass |
| NVNT | 2-DH1 | 2480 | 1.246 | Pass |
| NVNT | 3-DH1 | 2402 | 1.213 | Pass |
| NVNT | 3-DH1 | 2441 | 1.213 | Pass |
| NVNT | 3-DH1 | 2480 | 1.212 | Pass |

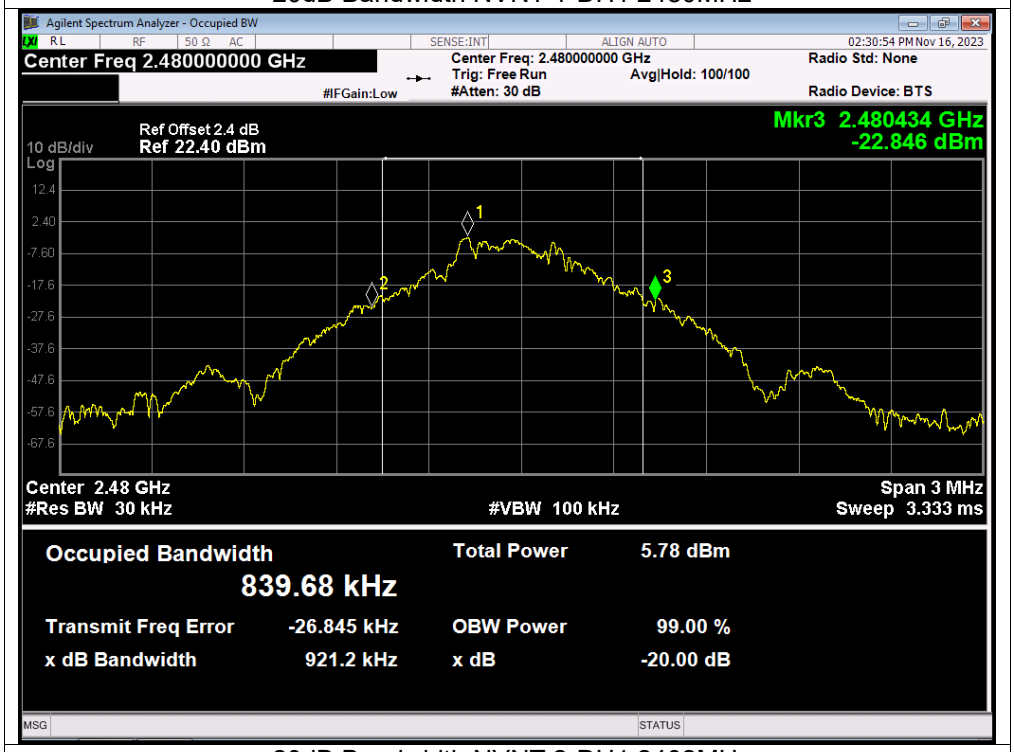
Test Graphs

-20dB Bandwidth NVNT 1-DH1 2402MHz



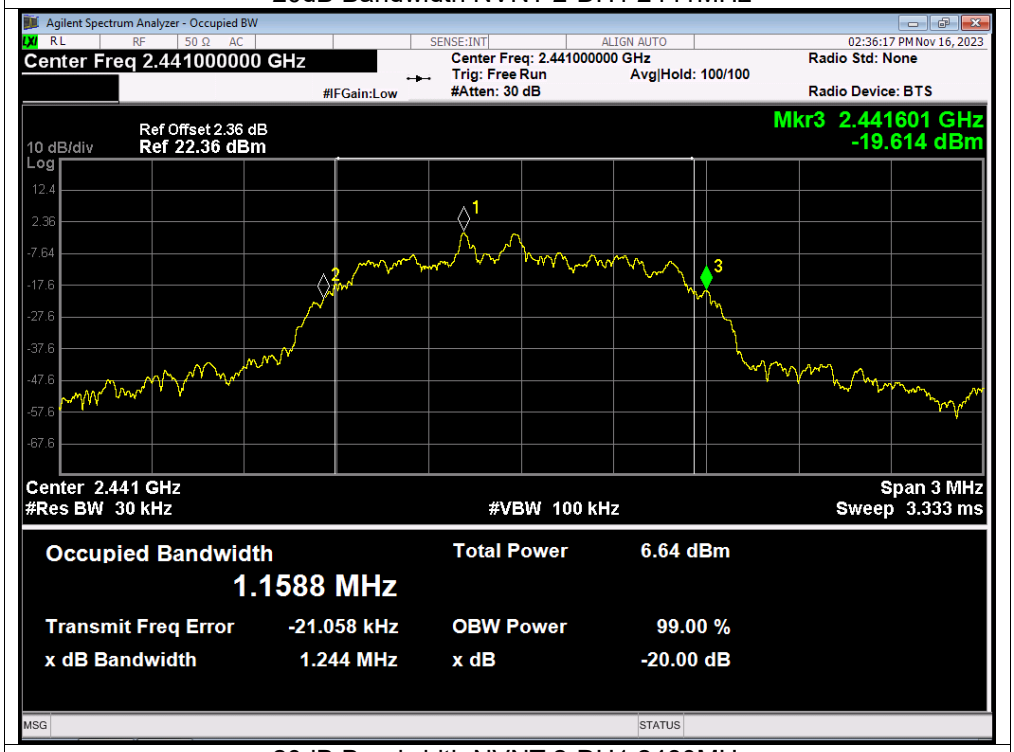

-20dB Bandwidth NVNT 1-DH1 2441MHz

-20dB Bandwidth NVNT 1-DH1 2480MHz

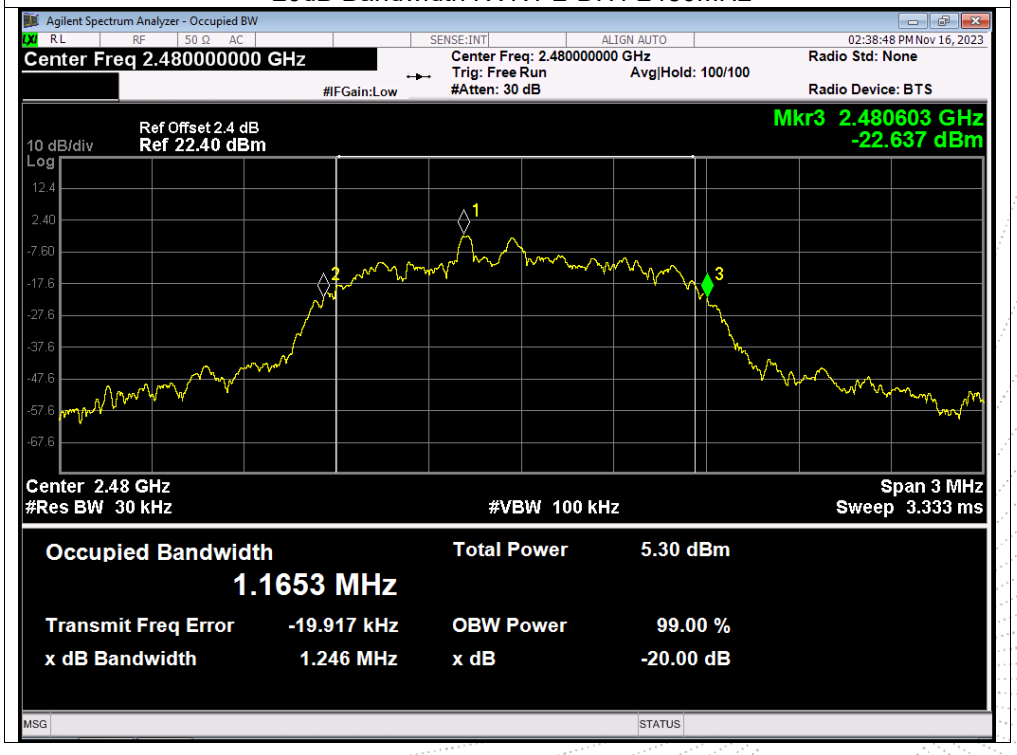



-20dB Bandwidth NVNT 2-DH1 2402MHz

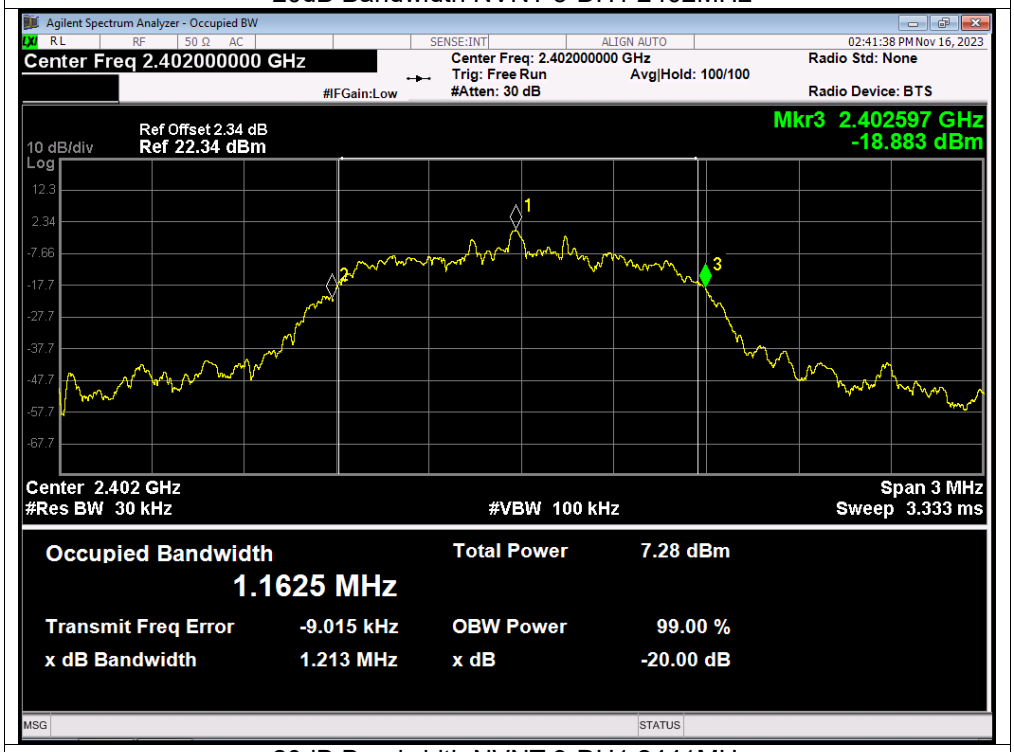
-20dB Bandwidth NVNT 2-DH1 2441MHz




-20dB Bandwidth NVNT 2-DH1 2480MHz



-20dB Bandwidth NVNT 3-DH1 2402MHz

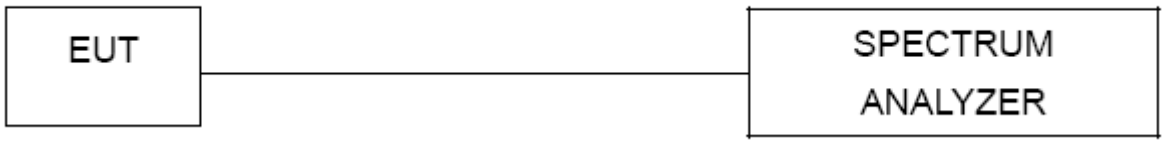



-20dB Bandwidth NVNT 3-DH1 2441MHz

-20dB Bandwidth NVNT 3-DH1 2480MHz

# 11. Maximum Peak Output Power

## 11.1 Block Diagram Of Test Setup




## 11.2 Limit

| FCC Part15 (15.247) , Subpart C | | | | |
|---|---|---|---|---|
| **Section** | **Test Item** | **Limit** | **Frequency Range (MHz)** | **Result** |
| 15.247(b)(1) | Peak Output Power | 0.125 watt or 21dBm | 2400-2483.5 | PASS |

## 11.3 Test procedure

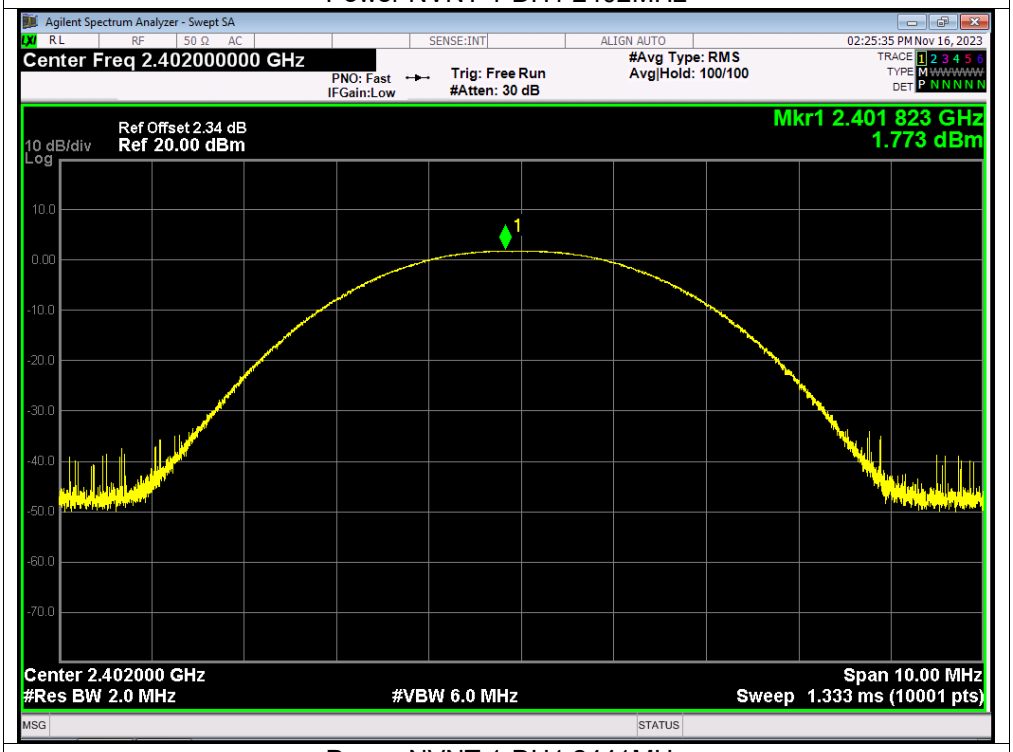
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2MHz. VBW = 6MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

## 11.4 Test Result

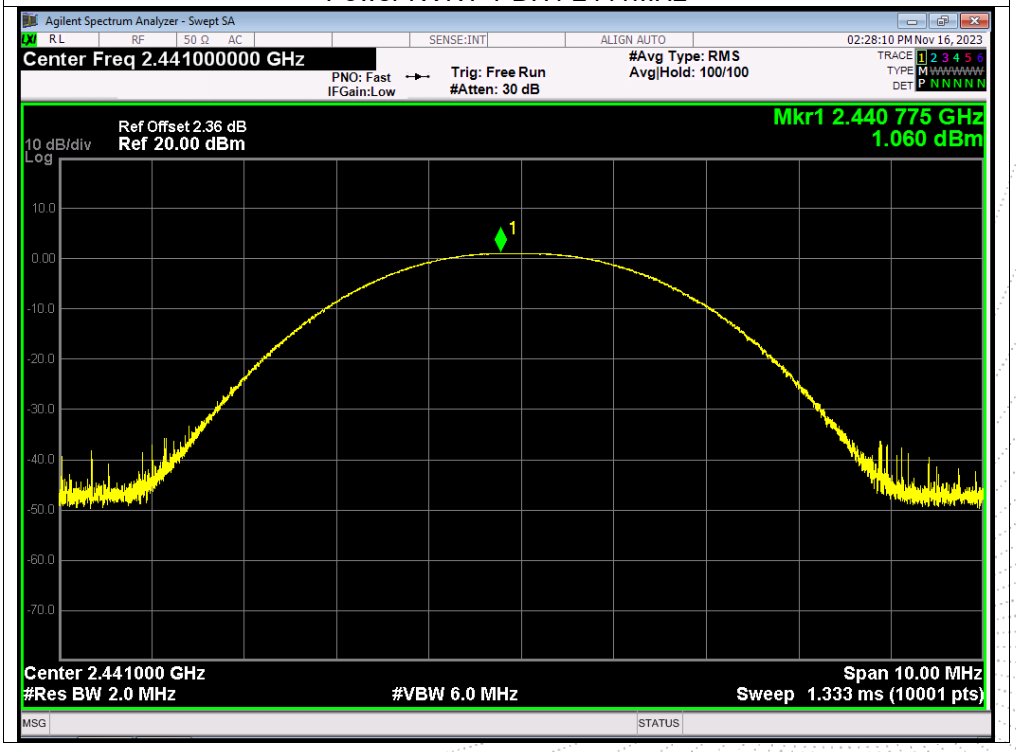
| Condition | Mode | Frequency (MHz) | Conducted Power (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|
| NVNT | 1-DH1 | 2402 | 1.77 | 21 | Pass |
| NVNT | 1-DH1 | 2441 | 1.06 | 21 | Pass |
| NVNT | 1-DH1 | 2480 | -0.34 | 21 | Pass |
| NVNT | 2-DH1 | 2402 | 2.52 | 21 | Pass |
| NVNT | 2-DH1 | 2441 | 1.79 | 21 | Pass |
| NVNT | 2-DH1 | 2480 | 0.46 | 21 | Pass |
| NVNT | 3-DH1 | 2402 | 3.08 | 21 | Pass |
| NVNT | 3-DH1 | 2441 | 2.30 | 21 | Pass |
| NVNT | 3-DH1 | 2480 | 0.90 | 21 | Pass |

Test Graphs

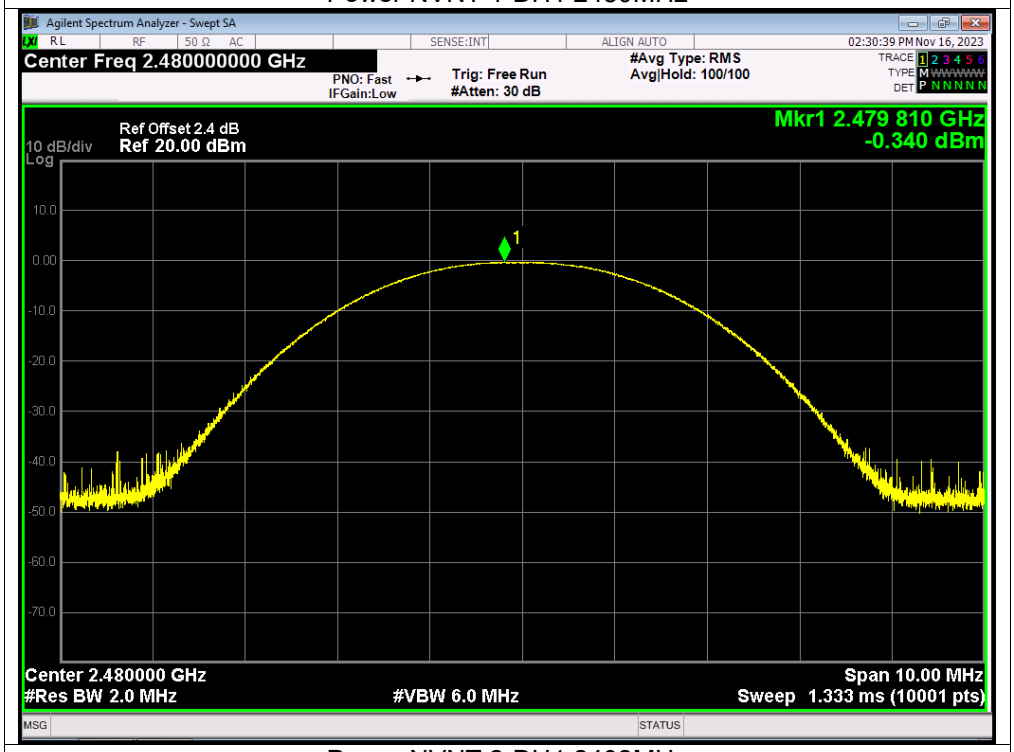
Power NVNT 1-DH1 2402MHz



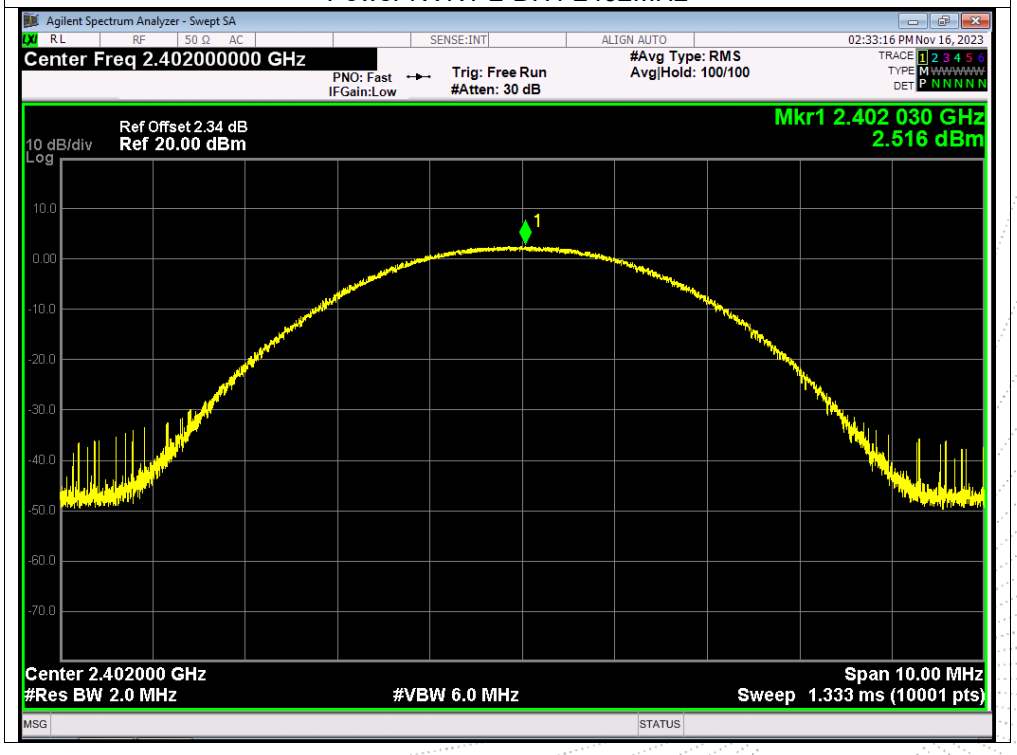

Power NVNT 1-DH1 2441MHz



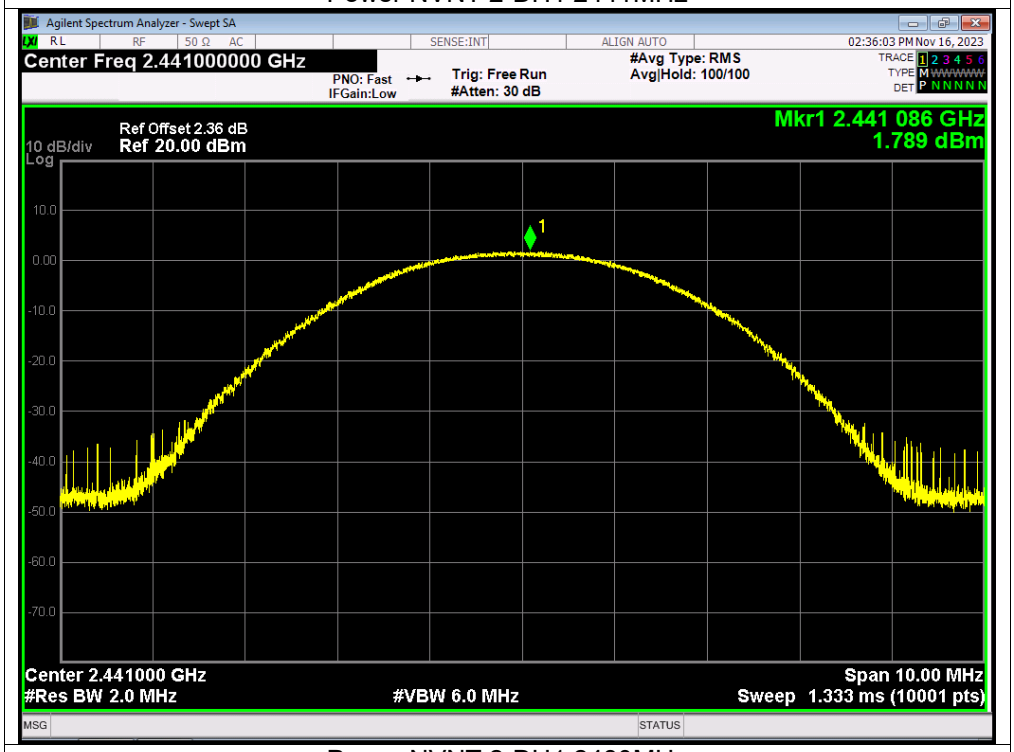
Power NVNT 1-DH1 2480MHz



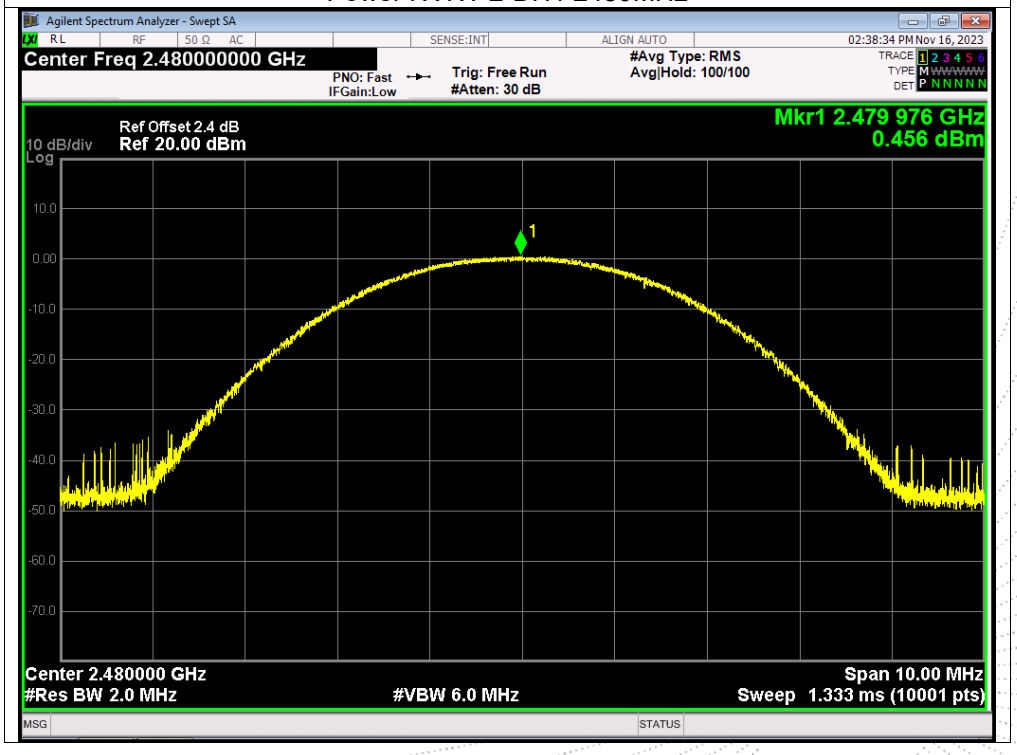

Power NVNT 2-DH1 2402MHz



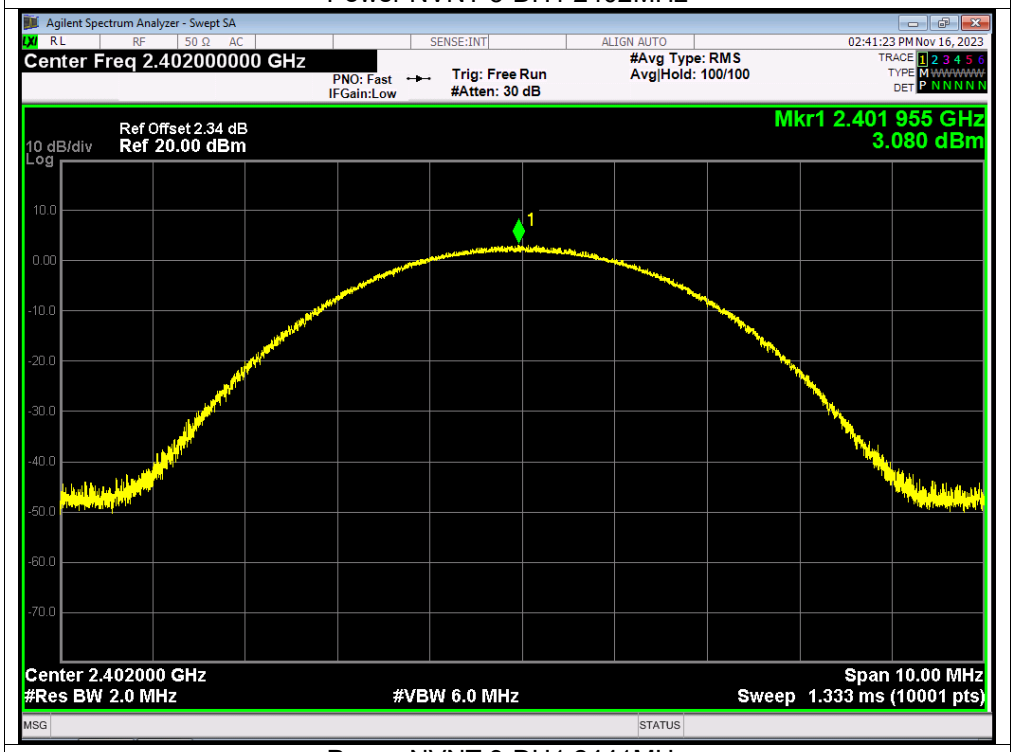
Power NVNT 2-DH1 2441MHz



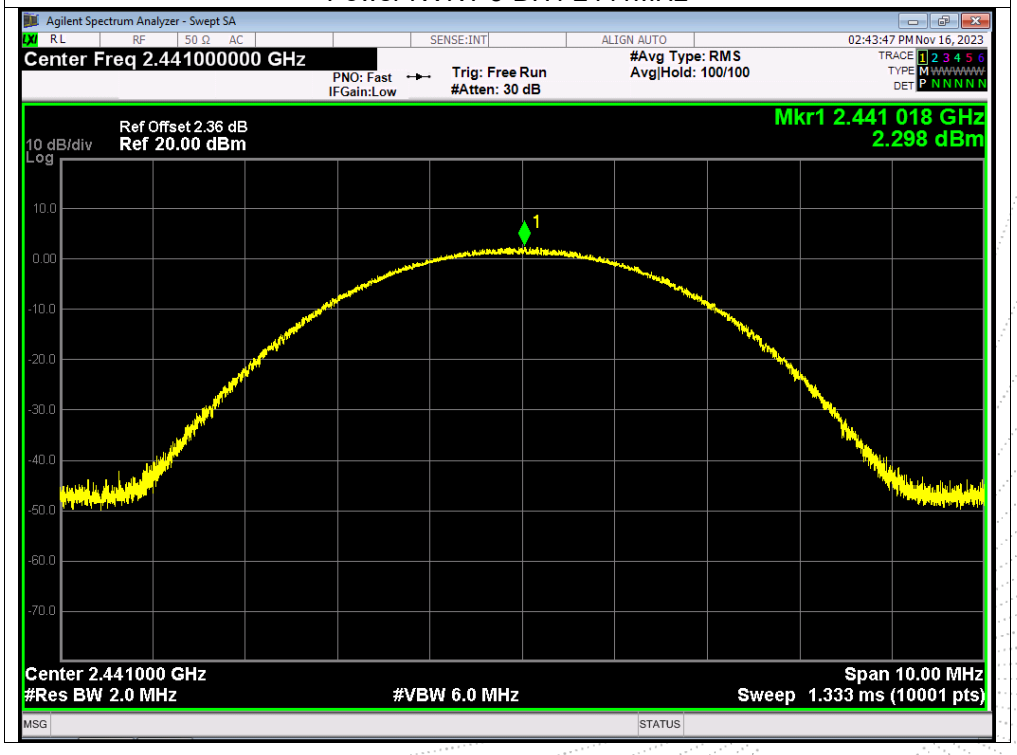

Power NVNT 2-DH1 2480MHz



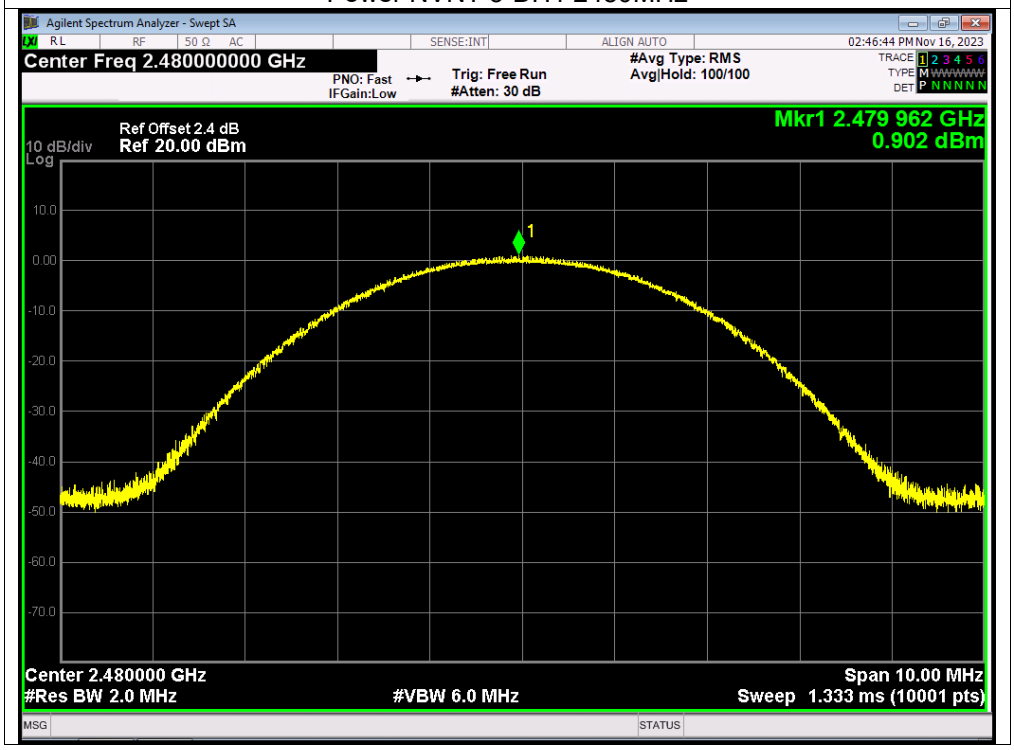
Power NVNT 3-DH1 2402MHz




Power NVNT 3-DH1 2441MHz

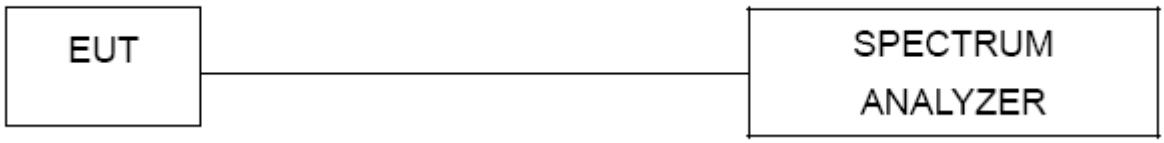


Power NVNT 3-DH1 2480MHz



# 12. Hopping Channel Separation

## 12.1 Block Diagram Of Test Setup




## 12.2 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125W.

## 12.3 Test procedure

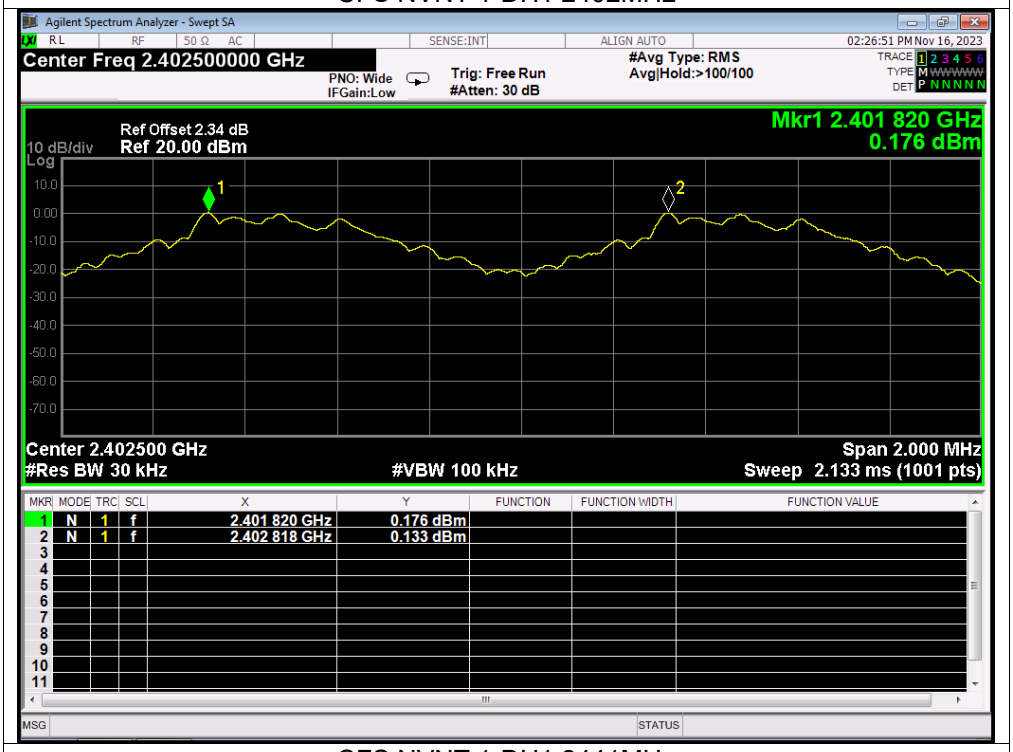
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

## 12.4 Test Result

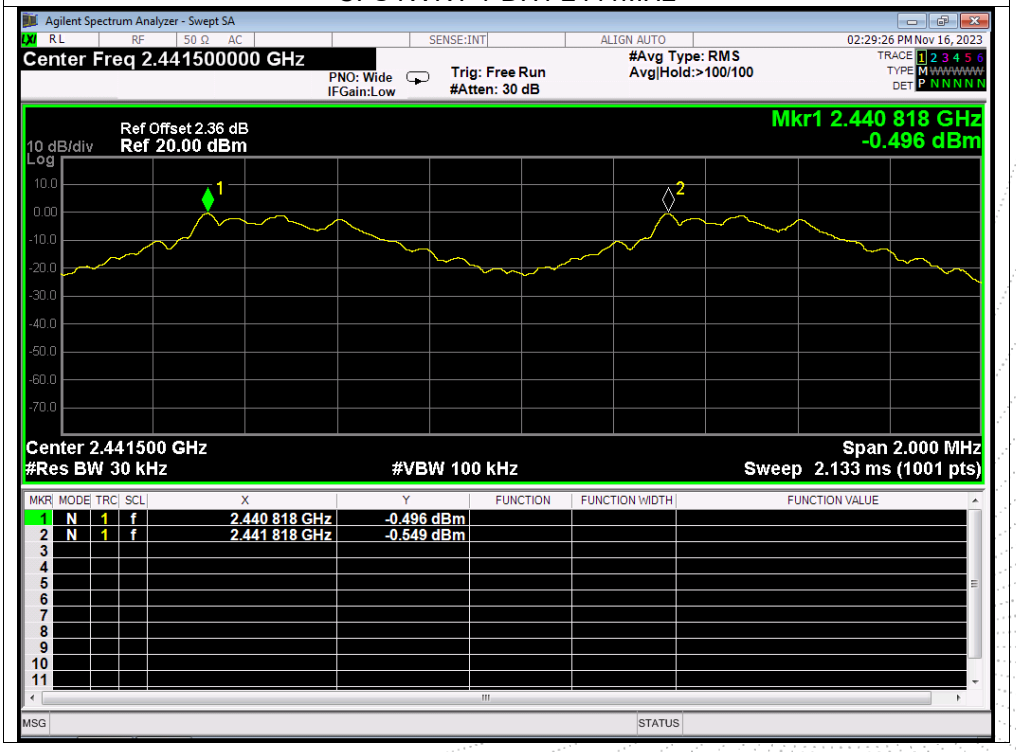
| Modulation | Test Channel | Separation (MHz) | Limit(MHz) | Result |
|---|---|---|---|---|
| GFSK | Low | 0.998 | 0.587 | PASS |
| GFSK | Middle | 1.000 | 0.609 | PASS |
| GFSK | High | 1.000 | 0.614 | PASS |
| π/4 DQPSK | Low | 0.998 | 0.797 | PASS |
| π/4 DQPSK | Middle | 1.000 | 0.829 | PASS |
| π/4 DQPSK | High | 0.998 | 0.831 | PASS |
| 8DPSK | Low | 1.000 | 0.809 | PASS |
| 8DPSK | Middle | 1.000 | 0.809 | PASS |
| 8DPSK | High | 1.002 | 0.808 | PASS |

Test Graphs

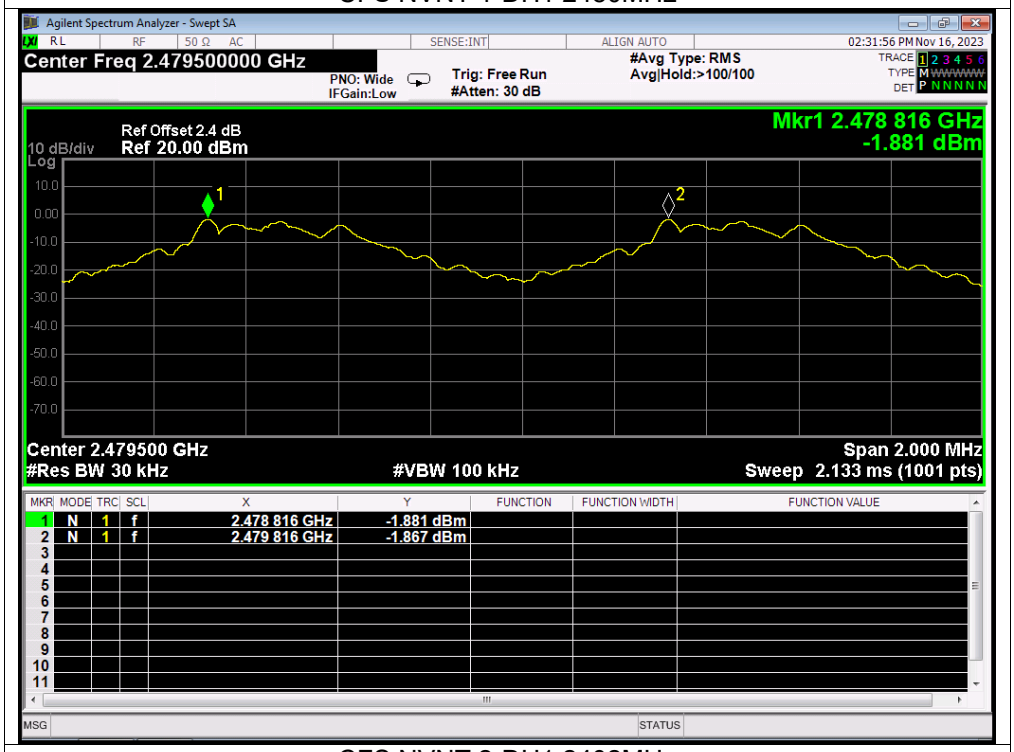
CFS NVNT 1-DH1 2402MHz



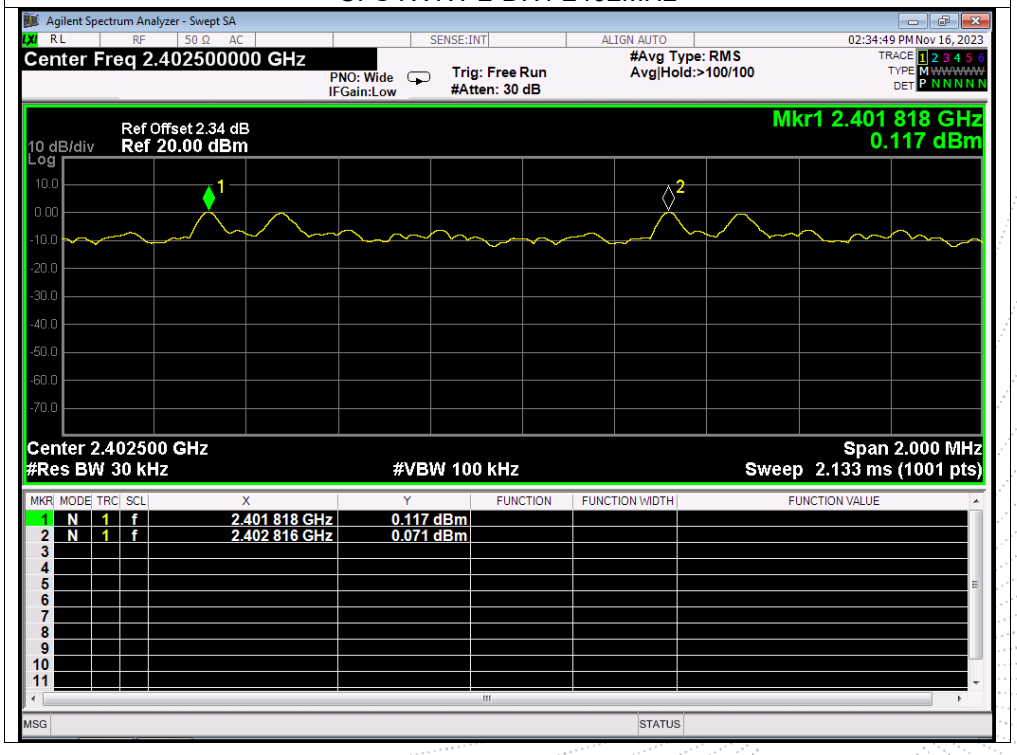

CFS NVNT 1-DH1 2441MHz



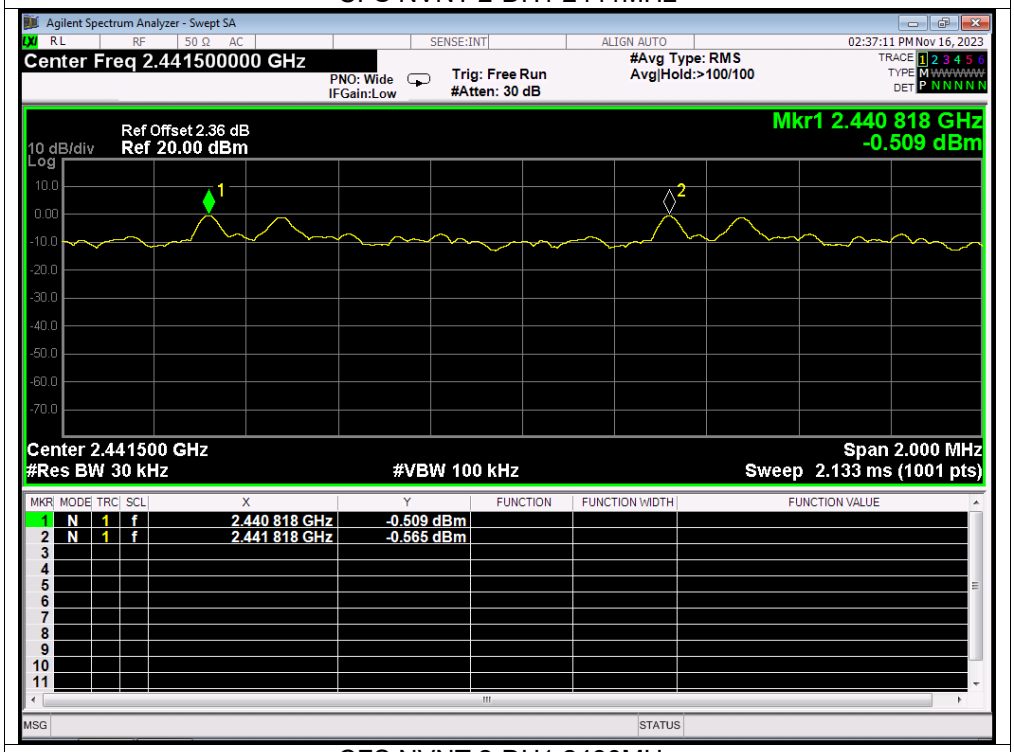
CFS NVNT 1-DH1 2480MHz



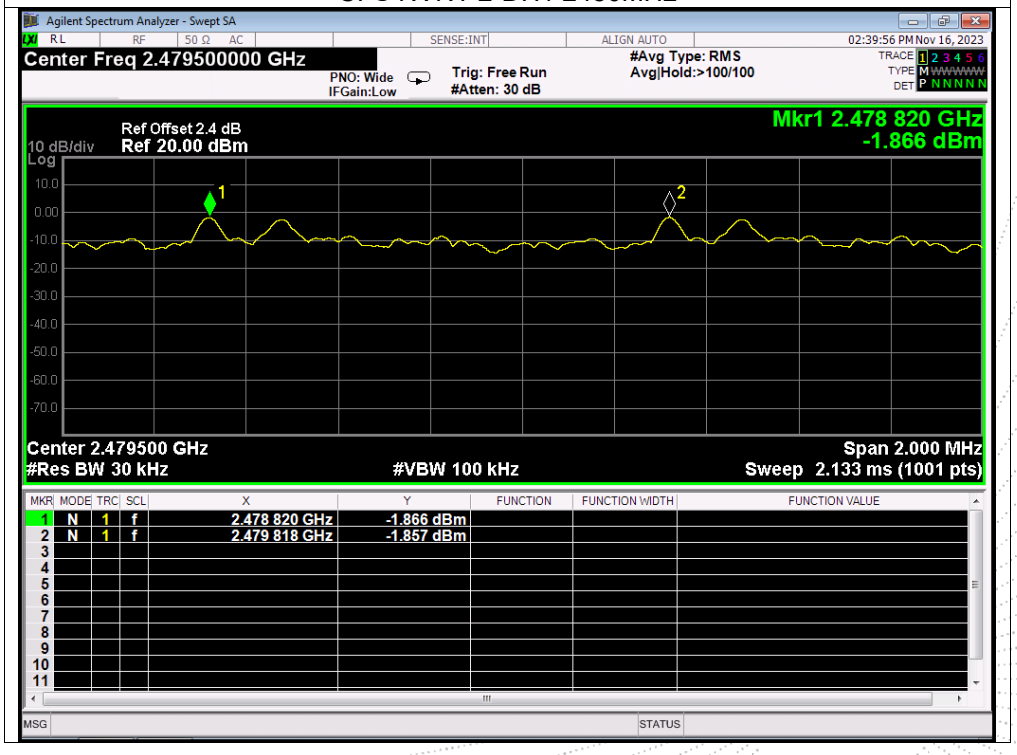

CFS NVNT 2-DH1 2402MHz



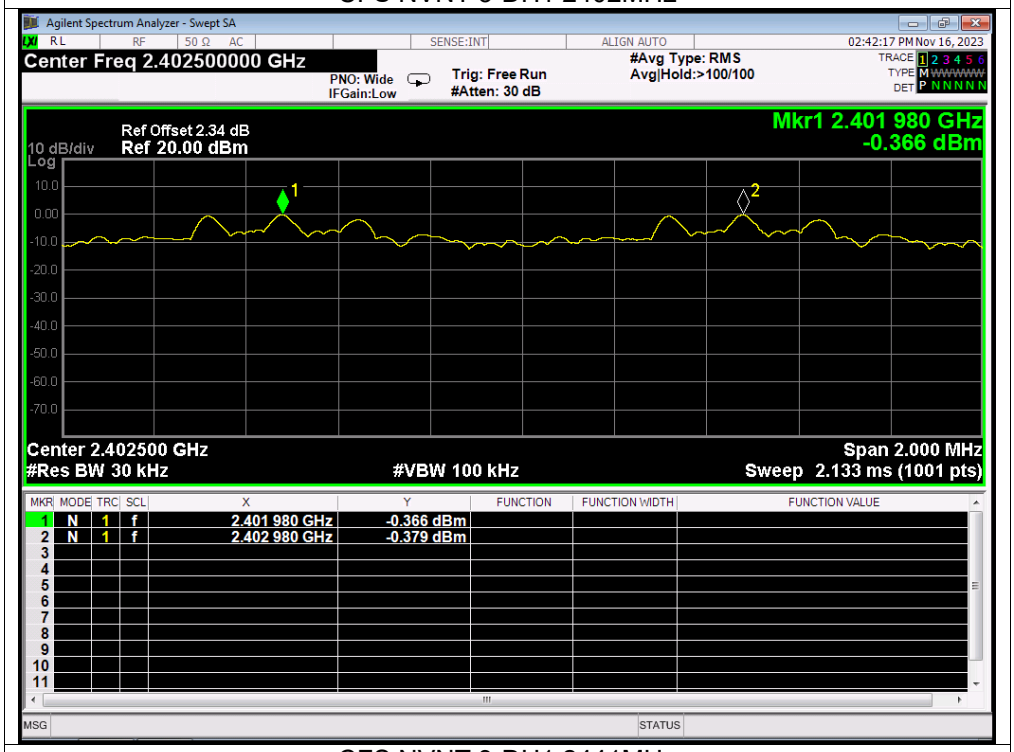
CFS NVNT 2-DH1 2441MHz



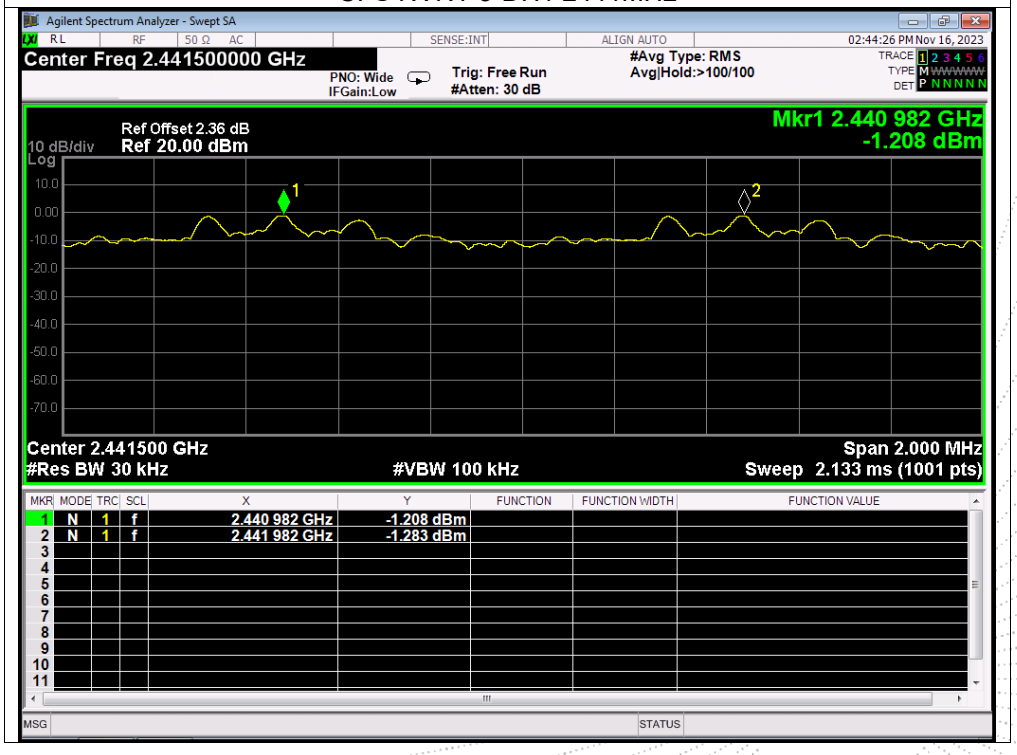

CFS NVNT 2-DH1 2480MHz



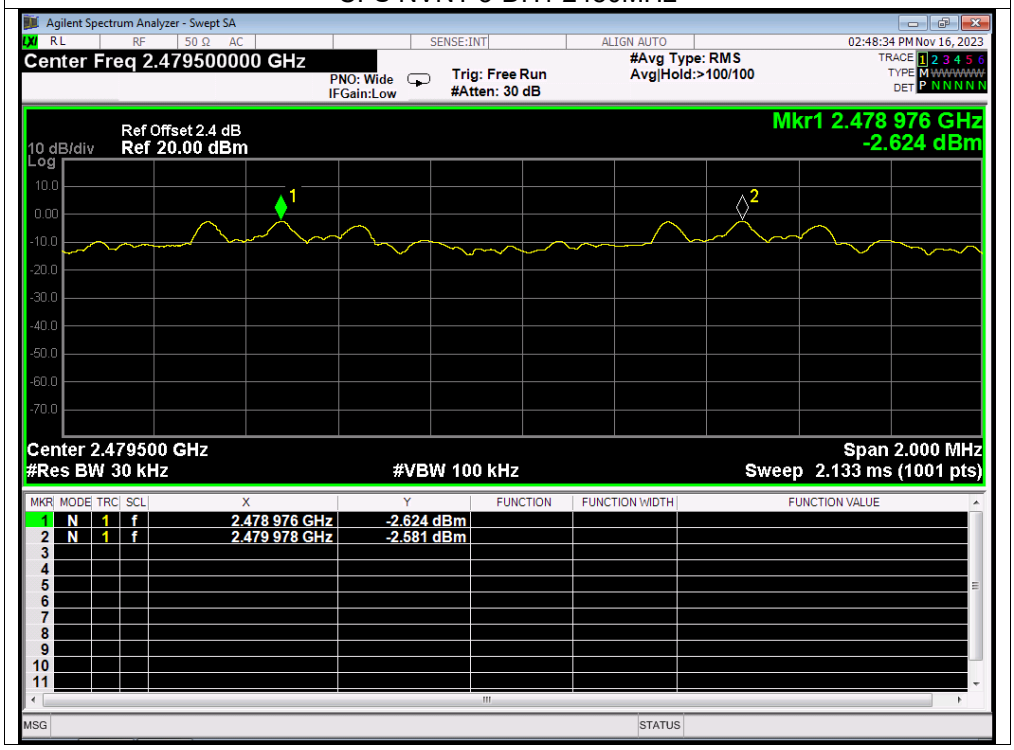
CFS NVNT 3-DH1 2402MHz




CFS NVNT 3-DH1 2441MHz

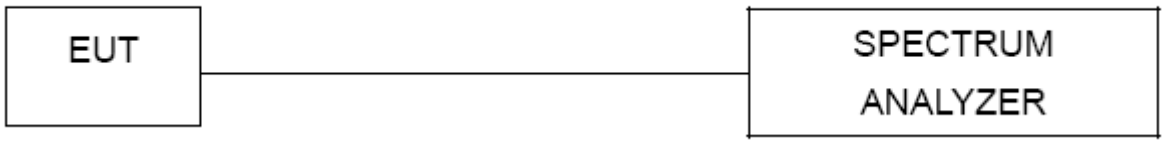


CFS NVNT 3-DH1 2480MHz



# 13. Number Of Hopping Frequency

## 13.1 Block Diagram Of Test Setup




## 13.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

## 13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

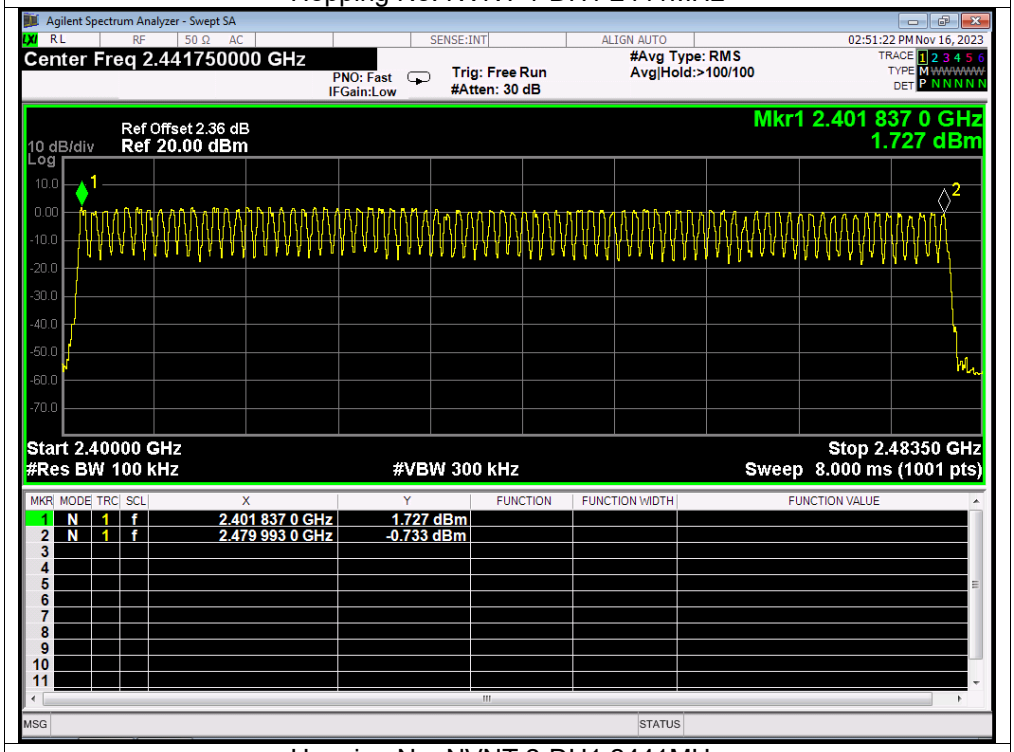
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

## 13.4 Test Result

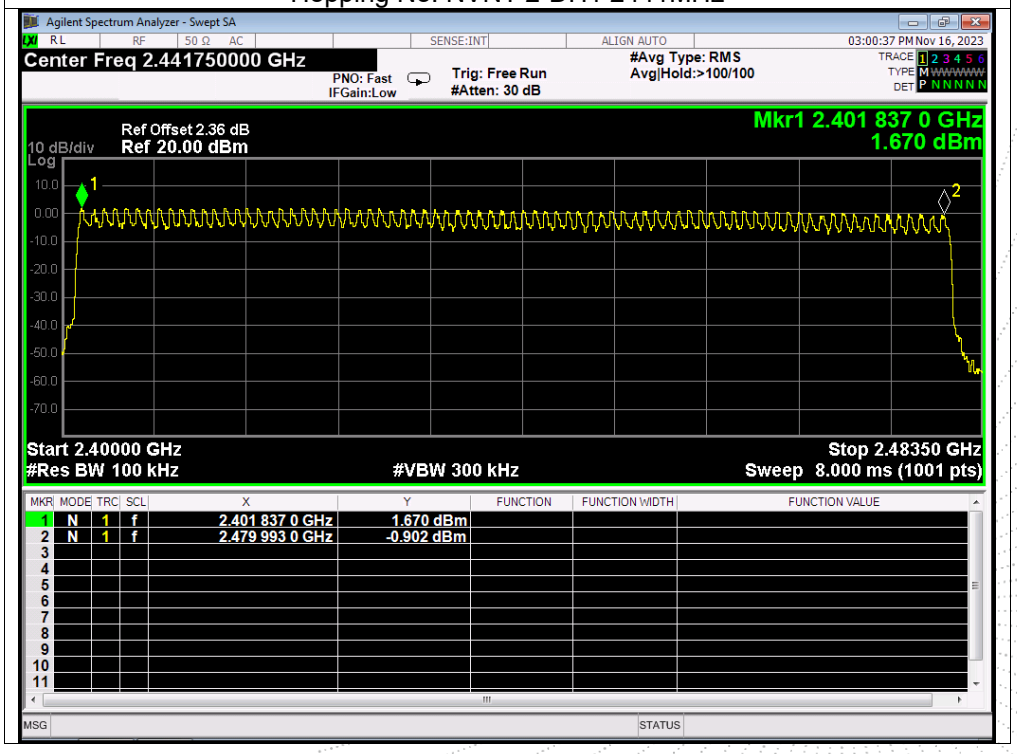
| Condition | Mode | Hopping Number | Limit | Verdict |
|---|---|---|---|---|
| NVNT | 1-DH1 | 79 | 15 | Pass |
| NVNT | 2-DH1 | 79 | 15 | Pass |
| NVNT | 3-DH1 | 79 | 15 | Pass |

Test Graphs

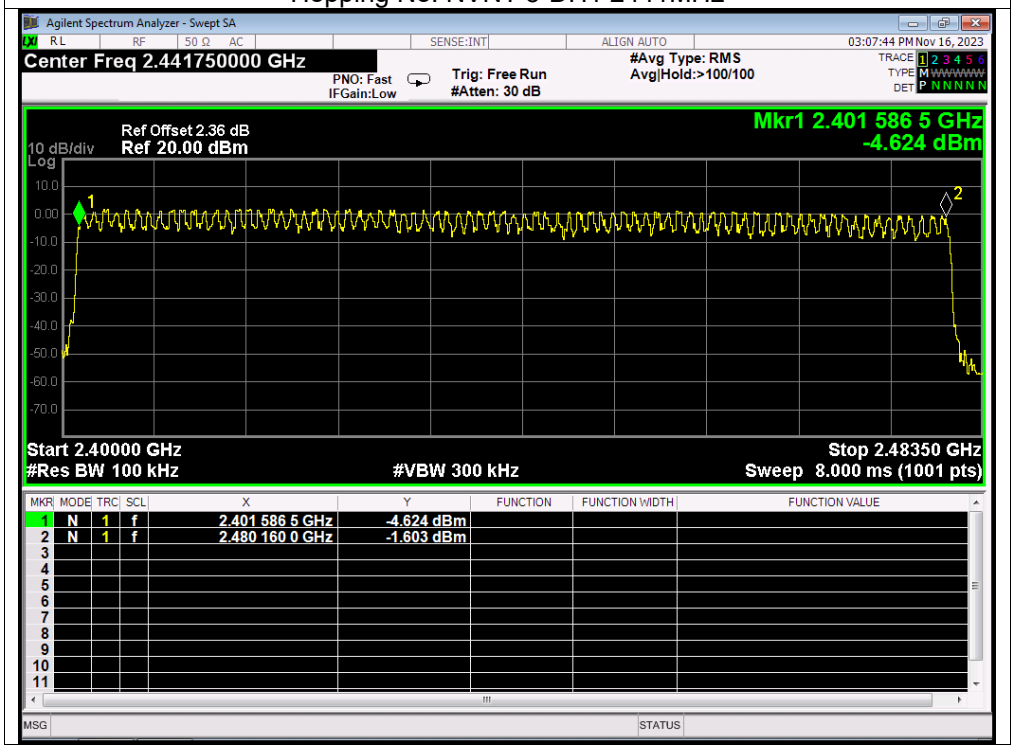
Hopping No. NVNT 1-DH1 2441MHz




Hopping No. NVNT 2-DH1 2441MHz

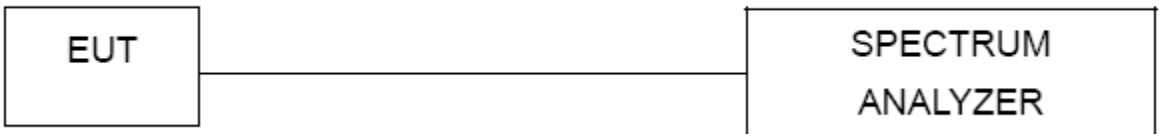


Hopping No. NVNT 3-DH1 2441MHz



# 14. Dwell Time

## 14.1 Block Diagram Of Test Setup




## 14.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## 14.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

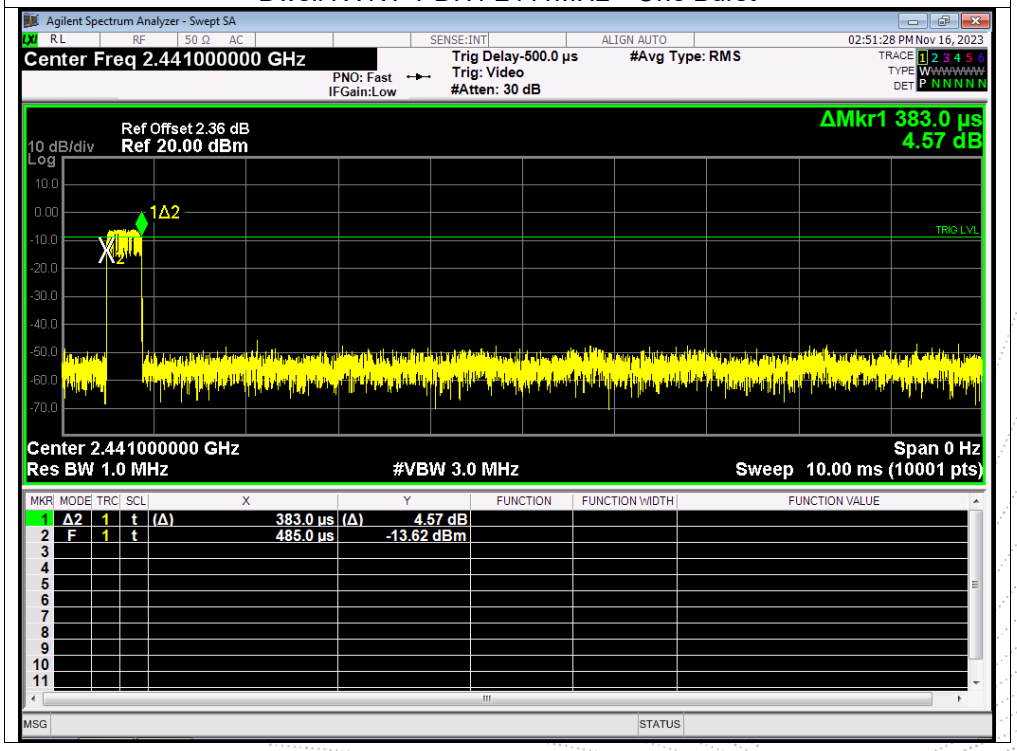
## 14.4 Test Result

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel
(5 time slots RX, 1 time slot TX).
DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel
(3 time slots RX, 1 time slot TX).
DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel
(1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:
DH5:1600/79/6*0.4*79*(MkrDelta)/1000
DH3:1600/79/4*0.4*79*(MkrDelta)/1000
DH1:1600/79/2*0.4*79*(MkrDelta)/1000
Remark: Mkr Delta is once pulse time.

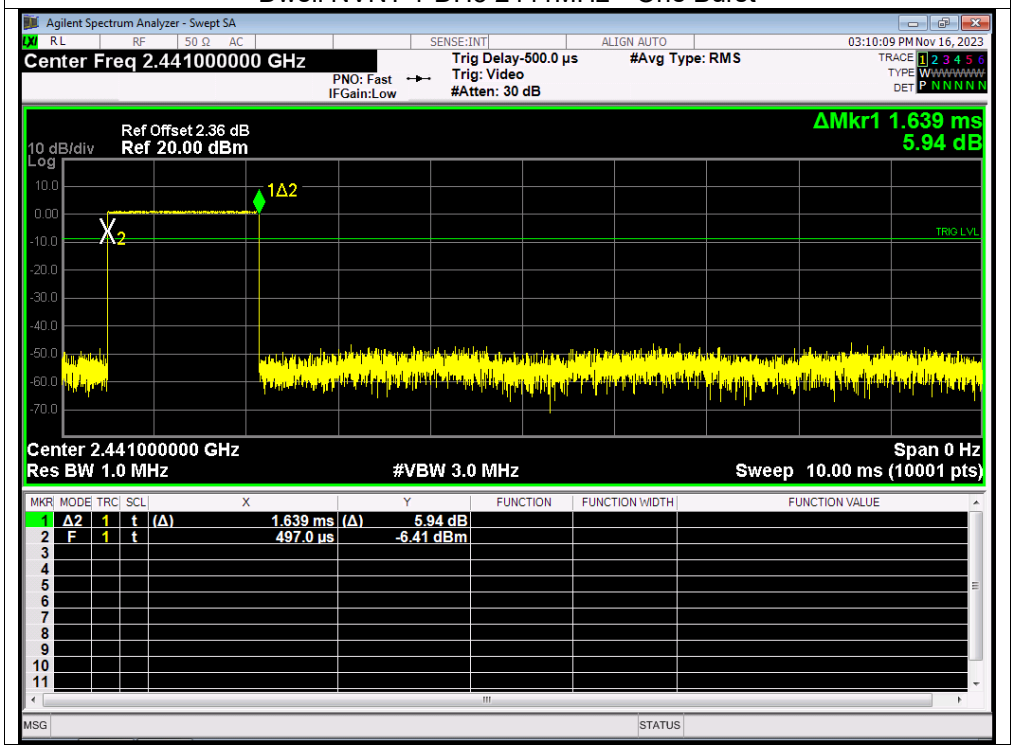
| Modulation | Channel Data | Packet | pulse time(ms) | Dwell Time(s) | Limits(s) |
|---|---|---|---|---|---|
| GFSK | Middle | 1DH1 | 0.383 | 0.123 | 0.4 |
| | | 1DH3 | 1.639 | 0.262 | 0.4 |
| | | 1DH5 | 2.887 | 0.308 | 0.4 |
| π/ 4 DQPSK | Middle | 2DH1 | 0.391 | 0.125 | 0.4 |
| | | 2DH3 | 1.644 | 0.263 | 0.4 |
| | | 2DH5 | 2.891 | 0.308 | 0.4 |
| 8DPSK | Middle | 3DH1 | 0.391 | 0.125 | 0.4 |
| | | 3DH3 | 1.643 | 0.263 | 0.4 |
| | | 3DH5 | 2.893 | 0.309 | 0.4 |

Test Graphs

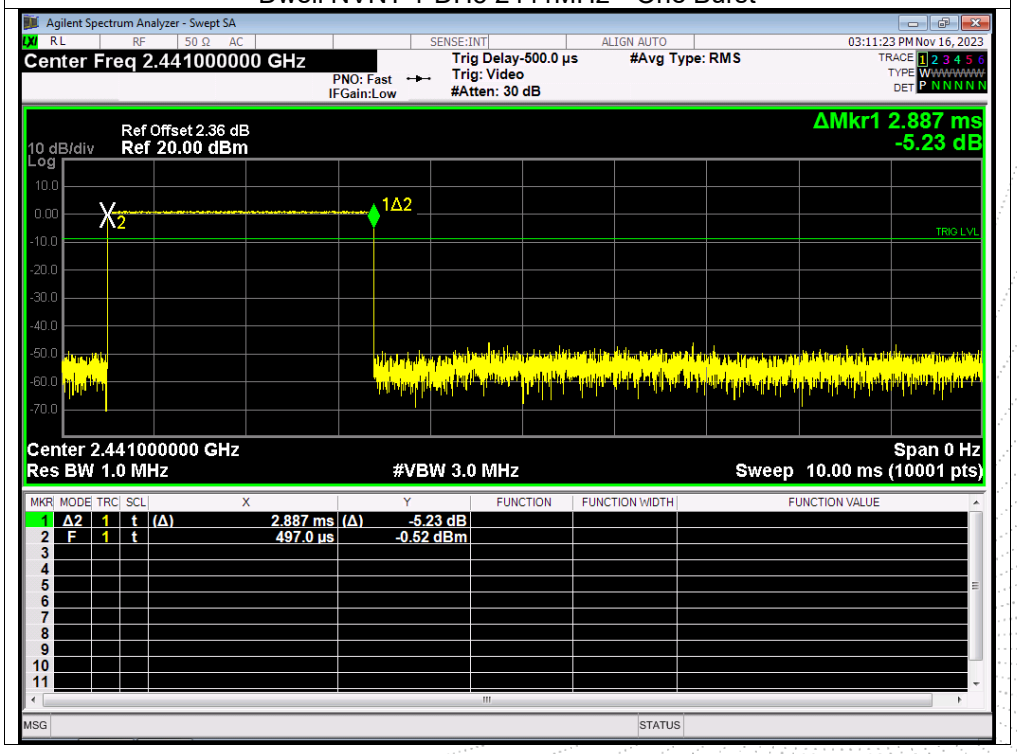
Dwell NVNT 1-DH1 2441MHz One Burst



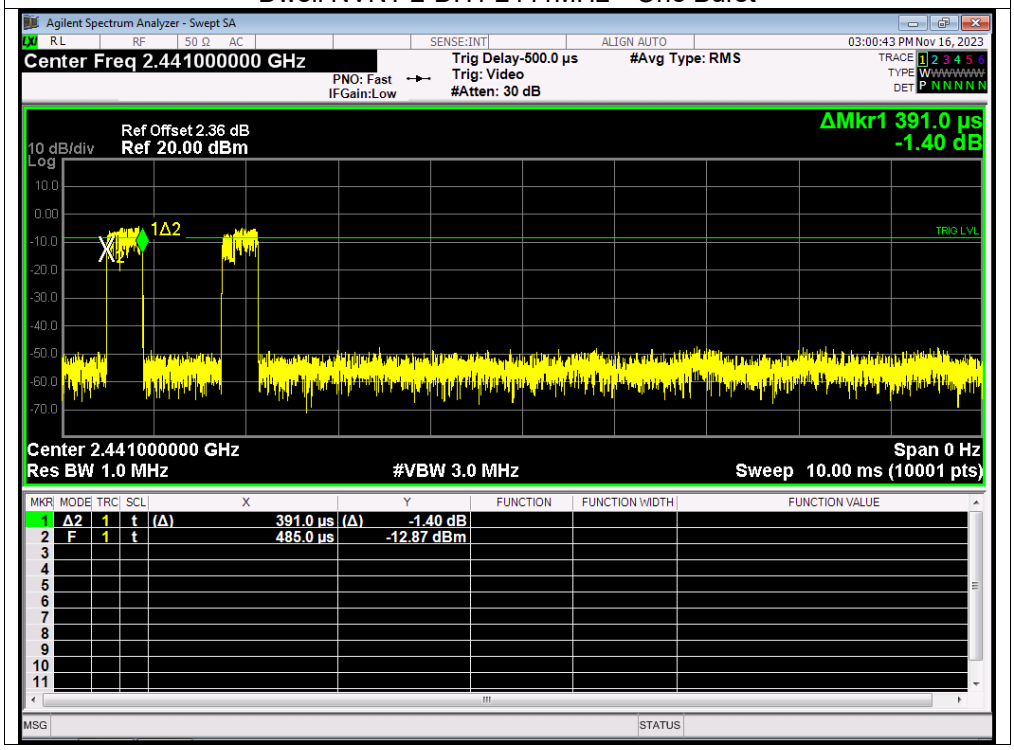
Dwell NVNT 1-DH3 2441MHz One Burst



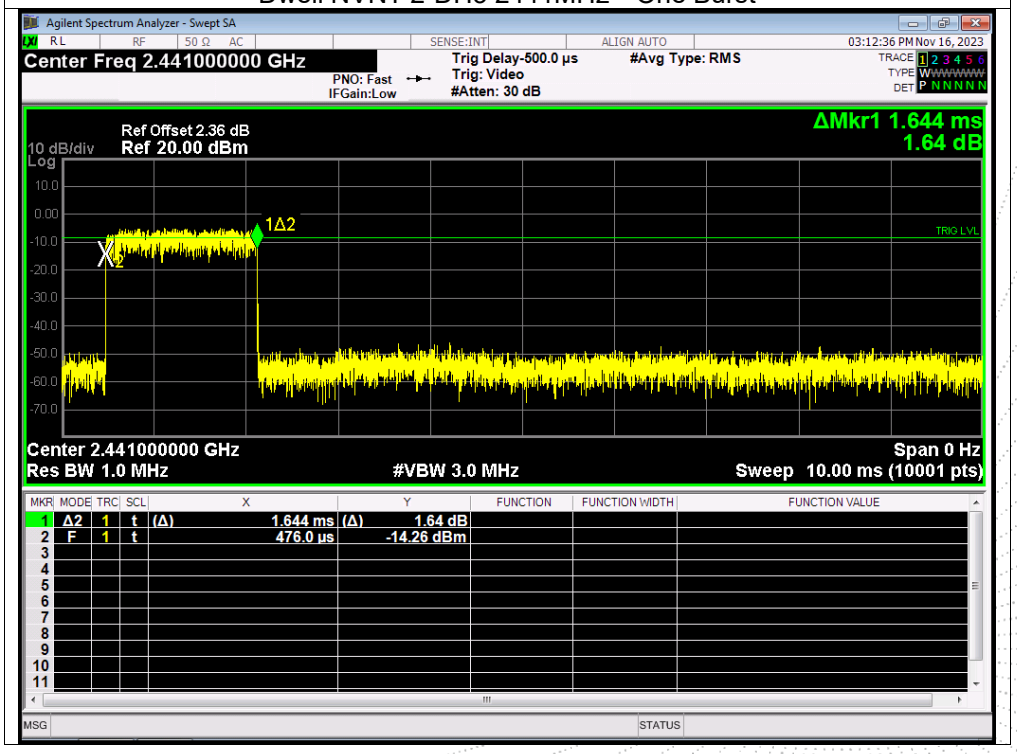

Dwell NVNT 1-DH5 2441MHz One Burst



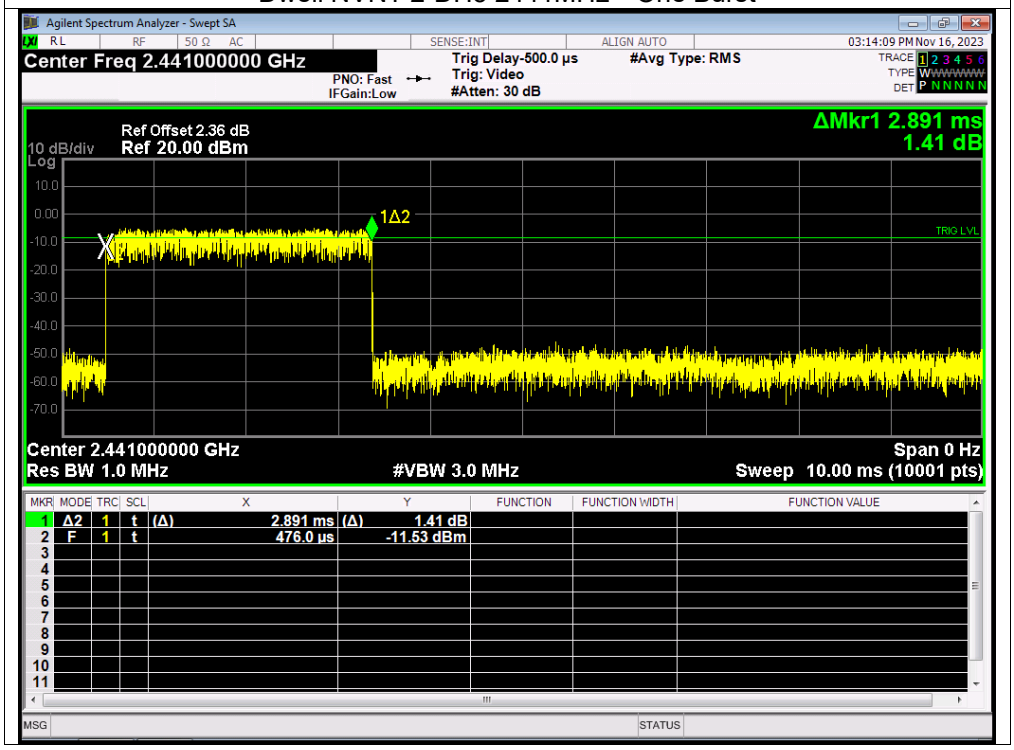
Dwell NVNT 2-DH1 2441MHz One Burst



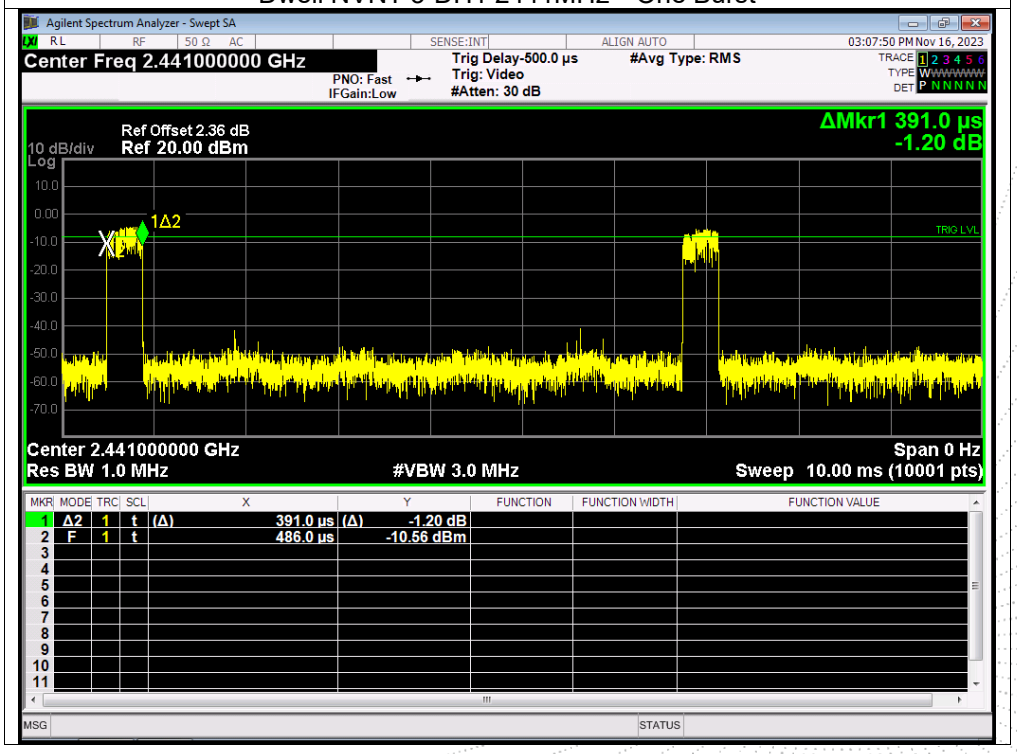

Dwell NVNT 2-DH3 2441MHz One Burst



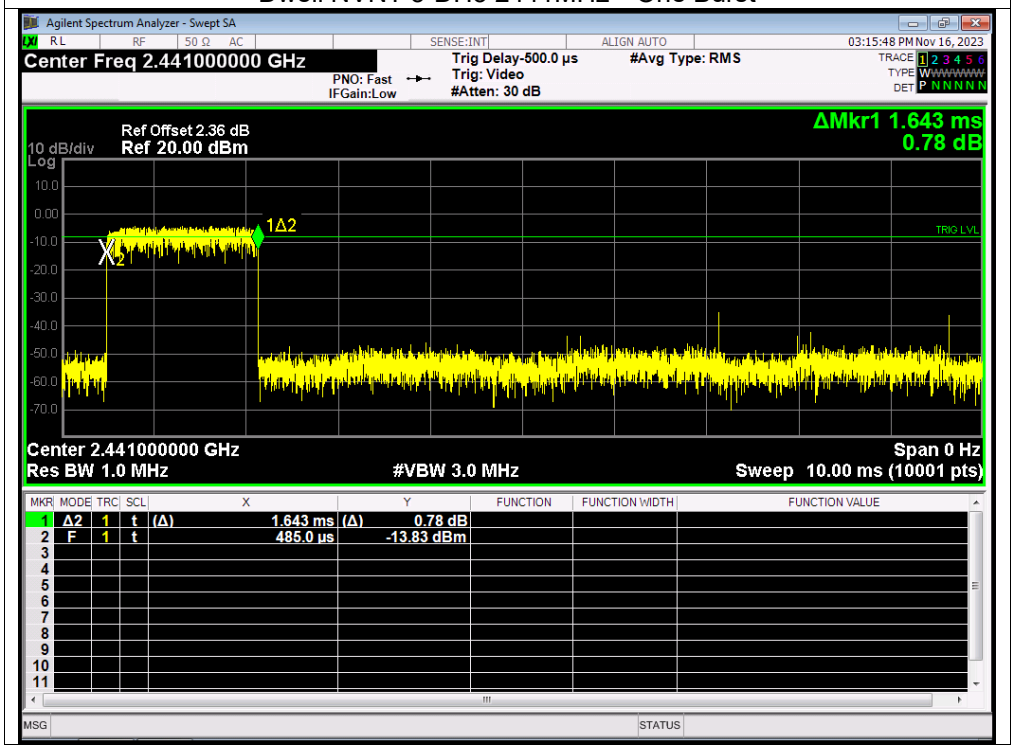
Dwell NVNT 2-DH5 2441MHz One Burst



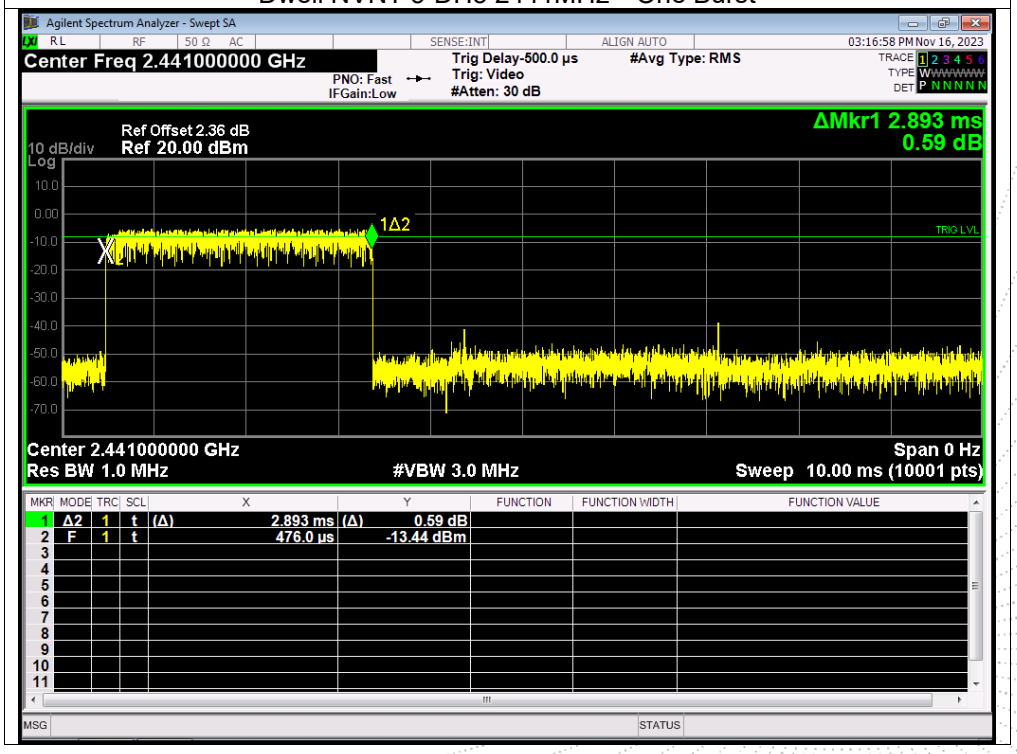

Dwell NVNT 3-DH1 2441MHz One Burst



Dwell NVNT 3-DH3 2441MHz One Burst




Dwell NVNT 3-DH5 2441MHz One Burst



# 15. Antenna Requirement

## 15.1 Limit

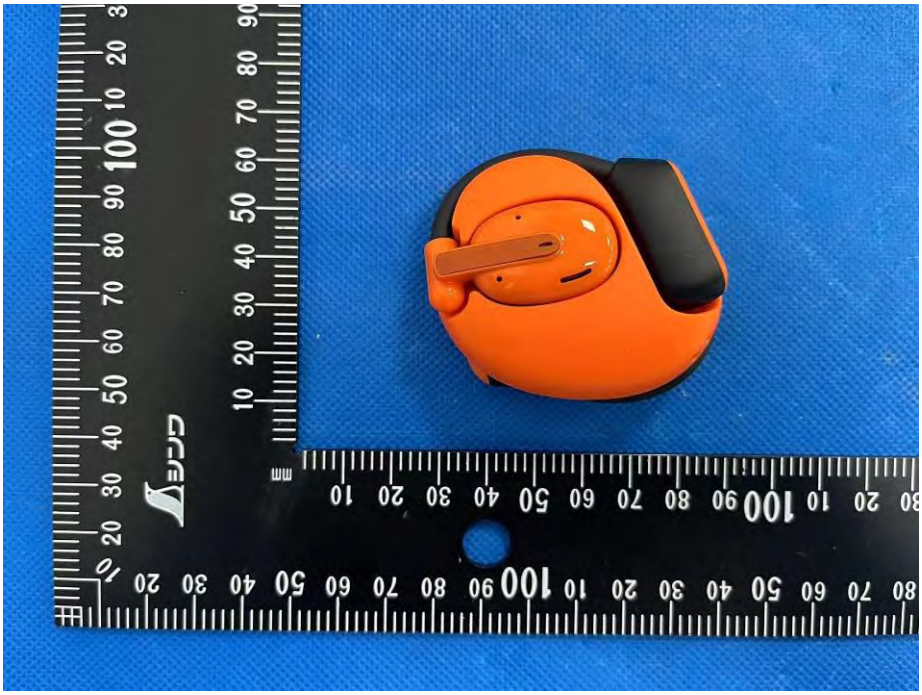
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

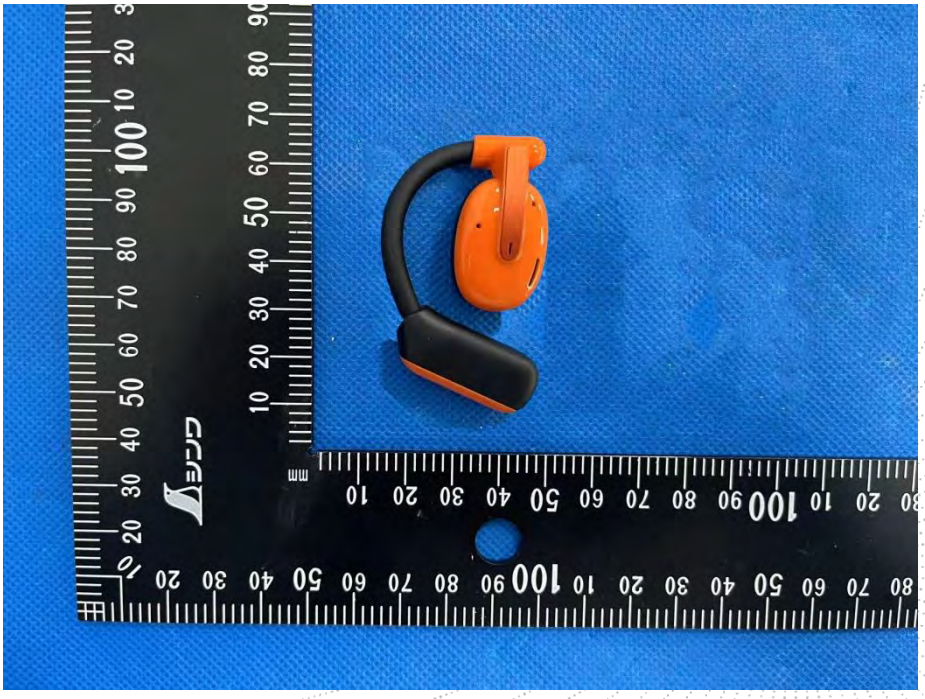
## 15.2 Test Result

The EUT antenna is Internal antenna, fulfill the requirement of this section.

## 16. EUT Photographs

EUT Photo



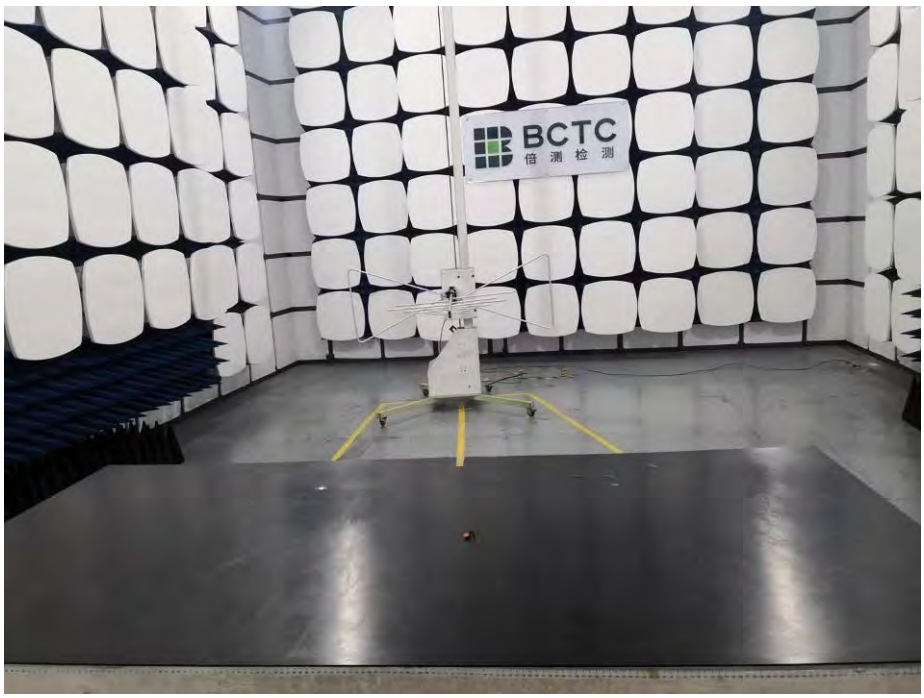


NOTE: Appendix-Photographs Of EUT Constructional Details

## 17. EUT Test Setup Photographs

Conducted emissions

Radiated Measurement Photos



# STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The quality system of our laboratory is in accordance with ISO/IEC17025.

8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

E-Mail: bctc@bctc-lab.com.cn

※※※※※ END ※※※※※