# TEST REPORT

| | |
|---|---|
| **Application No.:** | BTEK231016006AE |
| **Applicant:** | Always Promotion, Inc. |
| **Address of Applicant:** | 210 Parrott Road, West Nyack,New York,USA |
| **Manufacturer:** | Always Promotion, Inc. |
| **Address of Manufacturer:** | 210 Parrott Road, West Nyack,New York,USA |
| **Factory:** | NA |
| **Address of Factory:** | NA |
| **Equipment Under Test (EUT):** | |
| **EUT Name:** | Wireless Mini Speaker |
| **Model No.:** | BT2301 |
| **Trade Mark:** | NA |
| **Standard(s) :** | 47 CFR Part 15, Subpart C 15.247 |
| **Date of Receipt:** | 2023-10-16 |
| **Date of Test:** | 2023-10-16 to 2023-11-14 |
| **Date of Issue:** | 2023-11-14 |
| **Test Result:** | **Pass*** |

* In the configuration tested, the EUT complied with the standards specified above.

Damon Su
EMC Laboratory Manager

| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| *01* | | 2023-11-14 | | *Original* |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by** | | | | |
| | |  **Carl Yang/ Project Engineer** | | |
| | |  **Keven Tan/ Reviewer** | | |

# 2 Test Summary

| Radio Spectrum Technical Requirement | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Antenna Requirement | 47 CFR Part 15, Subpart C 15.247 | N/A | 47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4) | Pass |
| Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence | | N/A | 47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h) | Pass |

| Radio Spectrum Matter Part | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Conducted Emissions at AC Power Line (150kHz-30MHz) | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.2 | 47 CFR Part 15, Subpart C 15.207 | Pass |
| Conducted Peak Output Power | | ANSI C63.10 (2013) Section 7.8.5 | 47 CFR Part 15, Subpart C 15.247(b)(1) | Pass |
| 20dB Bandwidth | | ANSI C63.10 (2013) Section 7.8.7 | 47 CFR Part 15, Subpart C 15.247(a)(1) | Pass |
| Carrier Frequencies Separation | | ANSI C63.10 (2013) Section 7.8.2 | 47 CFR Part 15, Subpart C 15.247a(1) | Pass |
| Hopping Channel Number | | ANSI C63.10 (2013) Section 7.8.3 | 47 CFR Part 15, Subpart C 15.247a(1)(iii) | Pass |
| Dwell Time | | ANSI C63.10 (2013) Section 7.8.4 | 47 CFR Part 15, Subpart C 15.247a(1)(iii) | Pass |
| Conducted Band Edges Measurement | | ANSI C63.10 (2013) Section 7.8.6 | 47 CFR Part 15, Subpart C 15.247(d) | Pass |
| Conducted Spurious Emissions | | ANSI C63.10 (2013) Section 7.8.8 | 47 CFR Part 15, Subpart C 15.247(d) | Pass |
| Radiated Emissions which fall in the restricted bands | | ANSI C63.10 (2013) Section 6.10.5 | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass |
| Radiated Spurious Emissions (Below 1GHz) | | ANSI C63.10 (2013) Section 6.4,6.5,6.6 | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass |
| Radiated Spurious Emissions (Above 1GHz) | | ANSI C63.10 (2013) Section 6.4,6.5,6.6 | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass |

**Note:**

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

# 3 Contents

# 4 General Information

## 4.1 Details of E.U.T.

| | |
|---|---|
| Power supply: | DC 3.7V by rechargeable lithium-ion battery(300mAh) and recharged by DC 5V. |
| Cable(s): | / |
| Frequency Range: | 2402MHz to 2480MHz |
| Bluetooth Version: | Bluetooth 5.0 |
| Spectrum Spread Technology: | Frequency Hopping Spread Spectrum(FHSS) |
| Hopping Channel Type: | Adaptive Frequency Hopping systems |
| Modulation Type: | GFSK, π/4DQPSK, 8DPSK |
| Number of Channels: | 79 |
| Sample Type: | Portable device |
| Antenna Type: | PCB Antenna |
| Antenna Gain: | 1.7dBi |
| Hardware Version | BT2301-V1.0 |
| Software and Firmware Version | V1.0 |
| Remark: The information in this section is provided by the applicant or manufacturer, BANTEK is not liable to the accuracy, suitability, reliability or/and integrity of the information. | |
| Sample No.: | BTEK231016006AE-01 |

## 4.2 Description of Support Units

| Description | Manufacturer | Model No. | Serial No. |
|---|---|---|---|
| adapter | JW | 4441 | / |

## 4.3 Measurement Uncertainty

| Test Item | Measurement Uncertainty |
|---|---|
| Conducted Peak Output Power | ± 0.76dB |
| 20dB Bandwidth | ± 3% |
| Carrier Frequencies Separation | ± 7.3 x 10-8 |
| Hopping Channel Number | ± 7.3 x 10-8 |
| Dwell Time | ± 0.4% |
| Conducted Band Edges Measurement | ± 0.8dB |
| Conducted Spurious Emissions | ± 0.8dB |
| Radiated Emissions which fall in the restricted bands | ±5.1dB (1GHz-6GHz); ±5.2dB(above 6GHz) |
| Radiated Spurious Emissions (Below 1GHz) | ±5.1dB |
| Radiated Spurious Emissions (Above 1GHz) | ±5.1dB (1GHz-6GHz); ±5.2dB(above 6GHz) |

## 4.4 Test Location

All tests were performed at:
Shenzhen BANTEK Testing Co., Ltd.,
A5&A6, Building B1&B2, No.45 Gangtou Road, Bogang Community, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518104
Tel:0755-2334 4200 Fax: 0755-2334 4200
FCC Registration Number: 264293
Designation Number: CN1356
No tests were sub-contracted.

## 4.5 Deviation from Standards

None

## 4.6 Abnormalities from Standard Conditions

None

# 5 Equipment List

| Conducted Test | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Serial No. | Cal. Date | Cal. Due |
| Shielding Room | YIHENG ENECTRONIC | 9*5*3.3 | YH-BT-220304-04 | 2022-03-03 | 2025-03-02 |
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101021 | 2023-06-12 | 2024-06-11 |
| Measurement Software | Fara | EZ_EMC Ver. FA-03A2 | N/A | N/A | N/A |
| LISN | Rohde&Schwarz | ENV216 | 101472 | 2023-06-12 | 2024-06-11 |
| LISN | Schwarzbeck | NSLK 8128 | 05127 | 2023-06-12 | 2024-06-11 |

| RF Conducted | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Serial No** | **Cal Date** | **Cal Due Date** |
| Shielding Room | YIHENG ENECTRONIC | 5.5*3.1*3 | YH-BT-220304-03 | 2022-03-03 | 2025-03-02 |
| EXA Signal Analyzer | KEYSIGHT | N9020A | MY54230486 | 2023-06-12 | 2024-06-11 |
| DC Power Supply | E3632A | E3642A | KR75304416 | 2023-06-12 | 2024-06-11 |
| Attenuator | RswTech | SMA-JK-6dB | N/A | 2023-06-12 | 2024-06-11 |
| Attenuator | RswTech | SMA-JK-3dB | N/A | 2023-06-12 | 2024-06-11 |
| RF Control Unit | Techy | TR1029-1 | N/A | 2023-06-12 | 2024-06-11 |
| RF Sensor Unit | Techy | TR1029-2 | N/A | 2023-06-12 | 2024-06-11 |
| WIDEBAND RADIO COMMUNICATION TESTER | R&S | CMW 500 | 141258 | 2023-06-12 | 2024-06-11 |
| MXG Vector Signal Generator | Agilent | N5182A | US46240522 | 2023-06-12 | 2024-06-11 |
| Programmable Temperature&Humidity Chamber | GRT | GR-HWX1000 | GR22051001 | 2023-06-12 | 2024-06-11 |
| Measurement Software | TACHOY | RF TestSoft | N/A | N/A | N/A |

| RSE | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Serial No** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | YIHENG ENECTRONIC | 966 | YH-BT-220304-01 | 2022-03-03 | 2025-03-02 |
| EMI Test Receiver | Rohde&Schwarz | ESCI | 100694 | 2023-06-12 | 2024-06-11 |
| TRILOG Broadband Antenna | Schwarzbeck | VULB 9168 | 01324 | 2022-06-15 | 2025-06-14 |
| Pre-Amplifier | Schwarzbeck | BBV 9745 | #180 | 2023-06-12 | 2024-06-11 |
| Measurement Software | Fara | EZ_EMC Ver. FA-03A2 | N/A | 2023-06-12 | 2024-06-11 |
| EXA Signal Analyzer | Keysight | N9020A | MY54440290 | 2023-06-12 | 2024-06-11 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 02695 | 2022-06-15 | 2025-06-14 |
| Pre-Amplifier | Tonscend | TAP0118045 | AP20K806109 | 2023-06-12 | 2024-06-11 |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 1157 | 2022-06-15 | 2025-06-14 |

| | | | | | |
|---|---|---|---|---|---|
| Low Noise Pre-amplifier | SKET | LNPA-1840G-50 | SK2022032902 | 2023-06-12 | 2024-06-11 |
| Signal analyzer | ROHDE&SCHWARZ | FSQ40 | 100010 | 2023-06-12 | 2024-06-11 |
| Loop Antenna | ETS | 6502 | 00201177 | 2022-06-15 | 2025-06-14 |

| **General used equipment** | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Serial No** | **Cal Date** | **Cal Due Date** |
| Humidity/Temperature/Barometric Pressure Indicator | KUMAR | F132 | N/A | 2023-06-12 | 2024-06-11 |
| Humidity/Temperature/Barometric Pressure Indicator | KUMAR | F132 | N/A | 2023-06-12 | 2024-06-11 |

# 6 Radio Spectrum Technical Requirement

## 6.1 Antenna Requirement

### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

### 6.1.2 Conclusion

Standard Requirement:

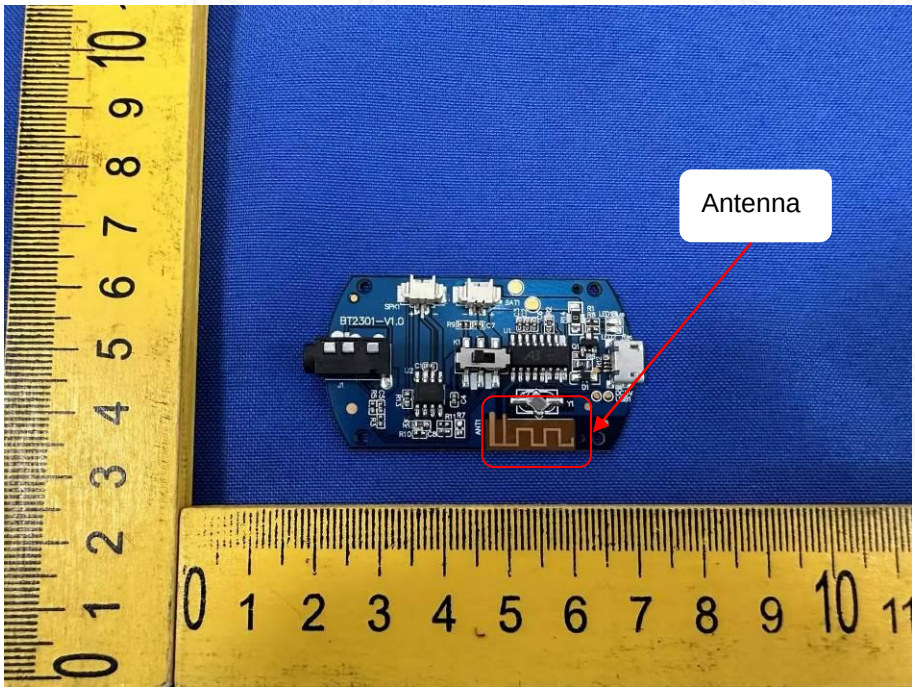
Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the Chip in PCB and no consideration of replacement. The best case gain of the antenna is 1.7dBi.



## 6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

### 6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

Limit:

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

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 hopsets 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.

Compliance for section 15.247(a)(1):

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

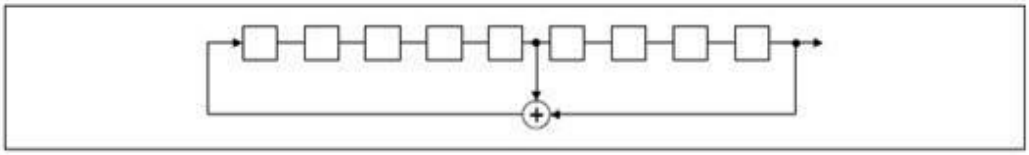
> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

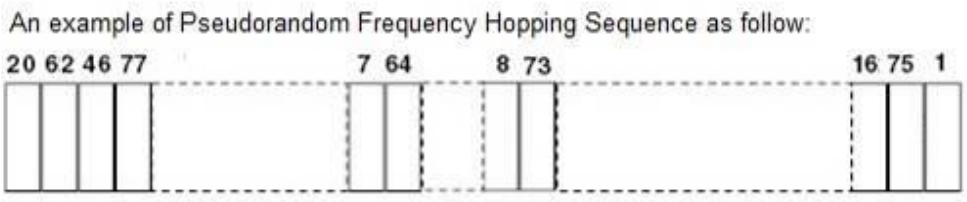
> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



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



Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

### 6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

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 hopsets 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.

Compliance for section 15.247(a)(1):

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

> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

# 7 Radio Spectrum Matter Test Results

## 7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2
Limit:

| Frequency of emission(MHz) | Conducted limit(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| *Decreases with the logarithm of the frequency. | | |
| Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz | | |

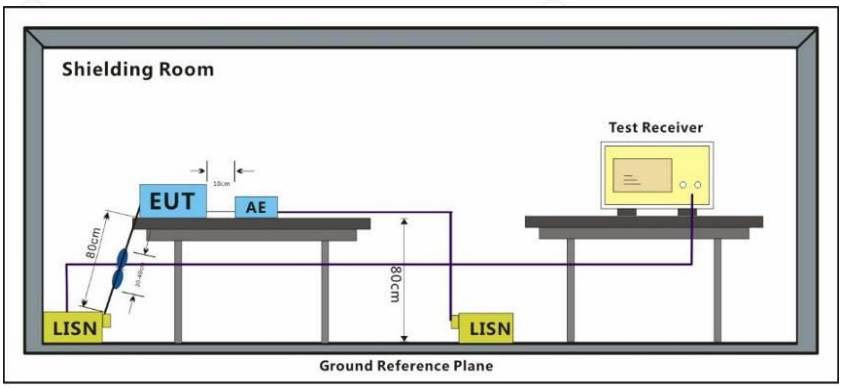
### 7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 22.2 °C Humidity: 60.5 % RH Atmospheric Pressure: 1010 mbar

### 7.1.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.1.3 Test Setup Diagram




### 7.1.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

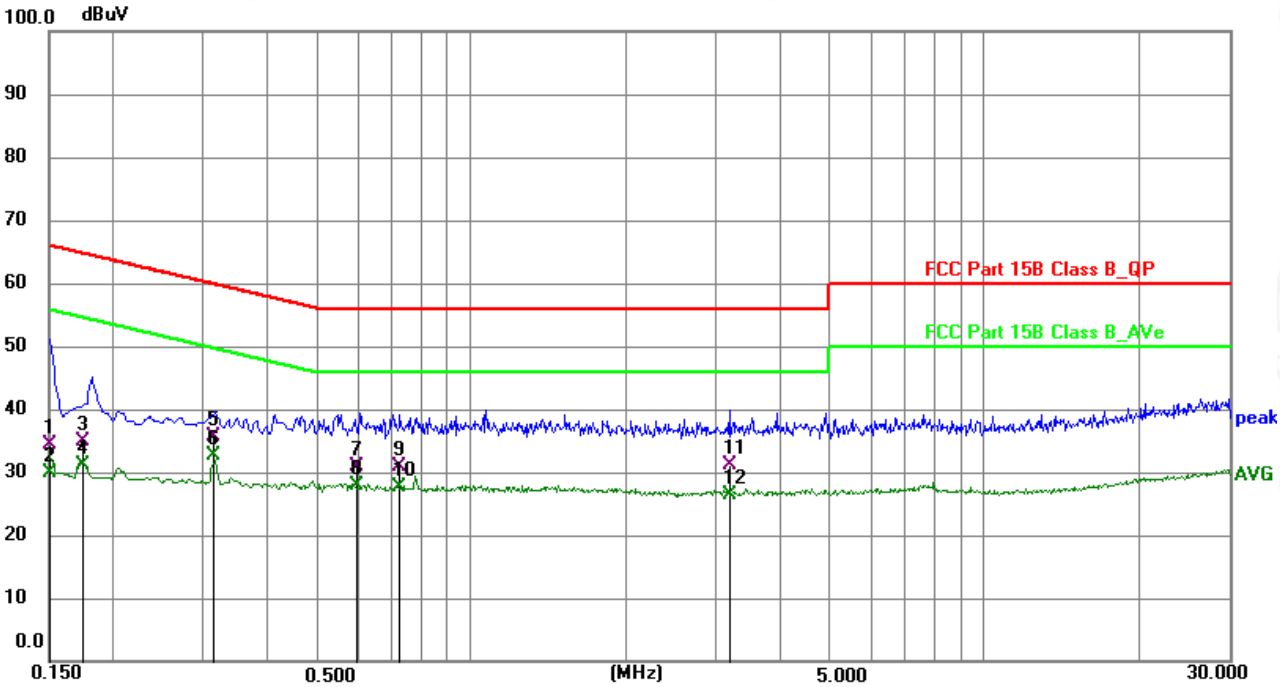
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

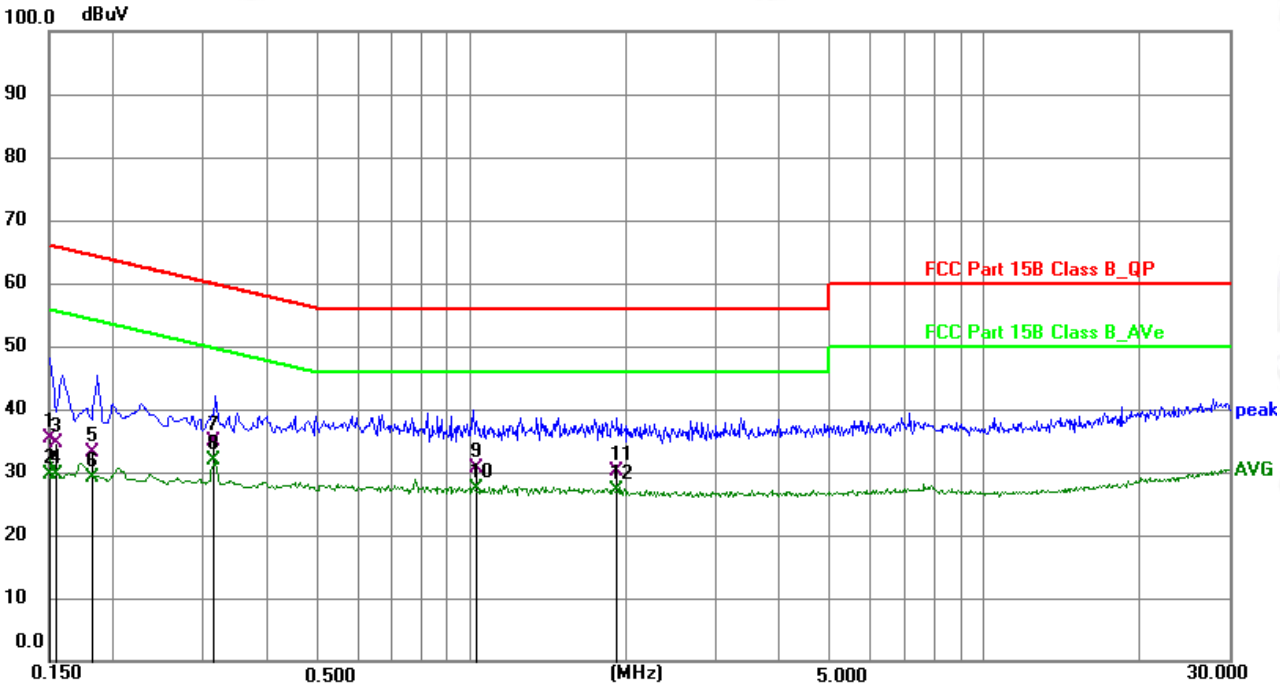
Remark: Final Test Level = Reading Level + Factor

Test Mode: 01; Line: Live line; Modulation:GFSK; ; Channel:Low




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1511 | 14.67 | 19.75 | 34.42 | 65.94 | -31.52 | QP | P | |
| 2 | 0.1511 | 10.01 | 19.75 | 29.76 | 55.94 | -26.18 | AVG | P | |
| 3 | 0.1757 | 15.06 | 19.78 | 34.84 | 64.69 | -29.85 | QP | P | |
| 4 | 0.1757 | 11.25 | 19.78 | 31.03 | 54.69 | -23.66 | AVG | P | |
| 5 | 0.3135 | 15.85 | 19.82 | 35.67 | 59.88 | -24.21 | QP | P | |
| 6 * | 0.3135 | 12.72 | 19.82 | 32.54 | 49.88 | -17.34 | AVG | P | |
| 7 | 0.5970 | 11.11 | 19.87 | 30.98 | 56.00 | -25.02 | QP | P | |
| 8 | 0.5970 | 7.95 | 19.87 | 27.82 | 46.00 | -18.18 | AVG | P | |
| 9 | 0.7251 | 11.05 | 19.92 | 30.97 | 56.00 | -25.03 | QP | P | |
| 10 | 0.7251 | 7.82 | 19.92 | 27.74 | 46.00 | -18.26 | AVG | P | |
| 11 | 3.1858 | 10.95 | 20.19 | 31.14 | 56.00 | -24.86 | QP | P | |
| 12 | 3.1858 | 6.27 | 20.19 | 26.46 | 46.00 | -19.54 | AVG | P | |

Test Mode: 01; Line: Neutral Line; Modulation:GFSK; ; Channel:Low




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1508 | 15.53 | 19.77 | 35.30 | 65.96 | -30.66 | QP | P | |
| 2 | 0.1508 | 9.96 | 19.77 | 29.73 | 55.96 | -26.23 | AVG | P | |
| 3 | 0.1550 | 14.89 | 19.77 | 34.66 | 65.73 | -31.07 | QP | P | |
| 4 | 0.1550 | 9.87 | 19.77 | 29.64 | 55.73 | -26.09 | AVG | P | |
| 5 | 0.1828 | 13.38 | 19.80 | 33.18 | 64.36 | -31.18 | QP | P | |
| 6 | 0.1828 | 9.33 | 19.80 | 29.13 | 54.36 | -25.23 | AVG | P | |
| 7 | 0.3122 | 15.14 | 19.83 | 34.97 | 59.91 | -24.94 | QP | P | |
| 8 * | 0.3122 | 12.01 | 19.83 | 31.84 | 49.91 | -18.07 | AVG | P | |
| 9 | 1.0241 | 10.72 | 20.02 | 30.74 | 56.00 | -25.26 | QP | P | |
| 10 | 1.0241 | 7.45 | 20.02 | 27.47 | 46.00 | -18.53 | AVG | P | |
| 11 | 1.9228 | 10.08 | 20.07 | 30.15 | 56.00 | -25.85 | QP | P | |
| 12 | 1.9228 | 7.00 | 20.07 | 27.07 | 46.00 | -18.93 | AVG | P | |

**Note:**

1) Pre-scan all modes and recorded the worst case results in this report(Low Channel).
2) Level= Reading+ Factor; Margin=Level-limit.

## 7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.5
Limit:

| Frequency range(MHz) | Output power of the intentional radiator(watt) |
|---|---|
| 902-928 | 1 for ≥50 hopping channels |
| | 0.25 for 25≤ hopping channels <50 |
| | 1 for digital modulation |
| 2400-2483.5 | 1 for ≥75 non-overlapping hopping channels |
| | 0.125 for all other frequency hopping systems |
| | 1 for digital modulation |
| 5725-5850 | 1 for frequency hopping systems and digital modulation |

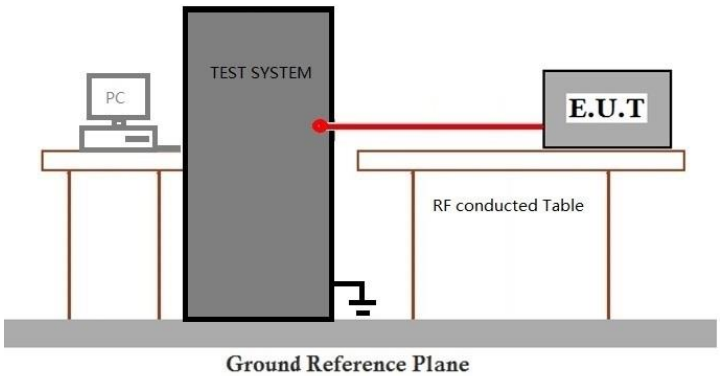
### 7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.2.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.2.3 Test Setup Diagram



**7.2.4 Measurement Procedure and Data**

cable loss=0.83dB

Please Refer to Appendix for Details

## 7.3 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.7

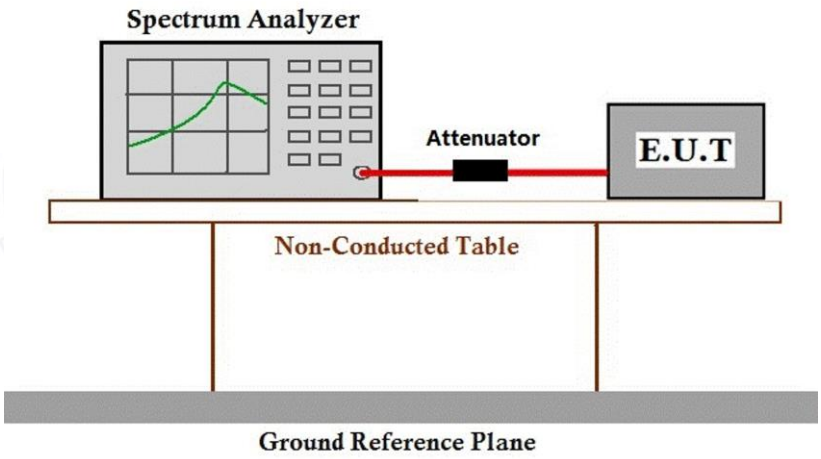
### 7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.3.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.3.3 Test Setup Diagram




### 7.3.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details

## 7.4 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)
Test Method: ANSI C63.10 (2013) Section 7.8.2
Limit:

2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W.

### 7.4.1 E.U.T. Operation

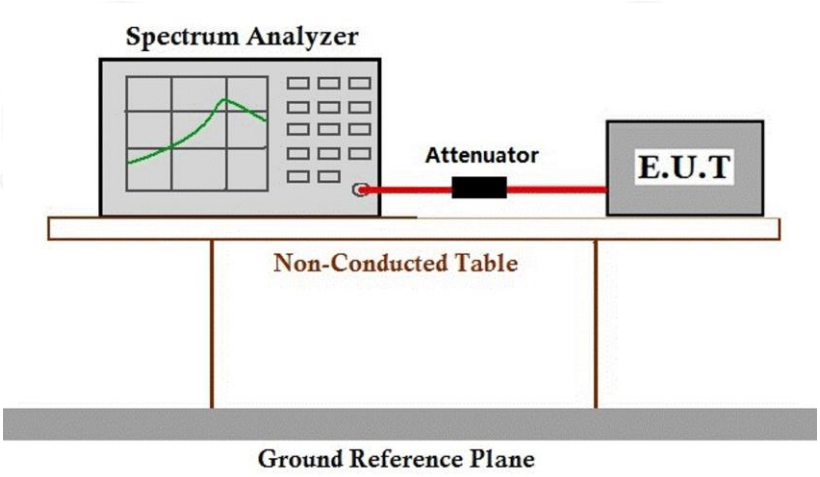
Operating Environment:

Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.4.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.4.3 Test Setup Diagram




### 7.4.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details

## 7.5 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.3
Limit:

| Frequency range(MHz) | Number of hopping channels (minimum) |
|---|---|
| 902-928 | 50 for 20dB bandwidth <250kHz |
| | 25 for 20dB bandwidth ≥250kHz |
| 2400-2483.5 | 15 |
| 5725-5850 | 75 |

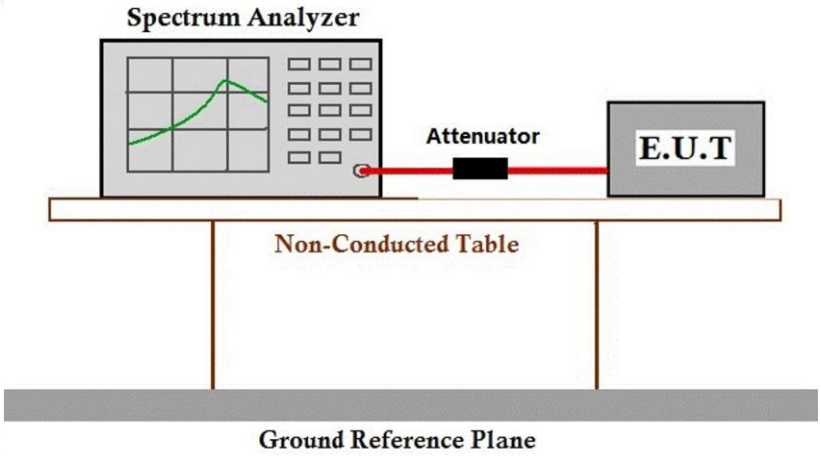
### 7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.5.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 02 | TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.5.3 Test Setup Diagram




### 7.5.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details

## 7.6 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.4
Limit:

| Frequency(MHz) | Limit |
|---|---|
| 902-928 | 0.4s within a 20s period(20dB bandwidth<250kHz) |
| | 0.4s within a 10s period(20dB bandwidth≥250kHz) |
| 2400-2483.5 | 0.4s within a period of 0.4s multiplied by the number of hopping channels |
| 5725-5850 | 0.4s within a 30s period |

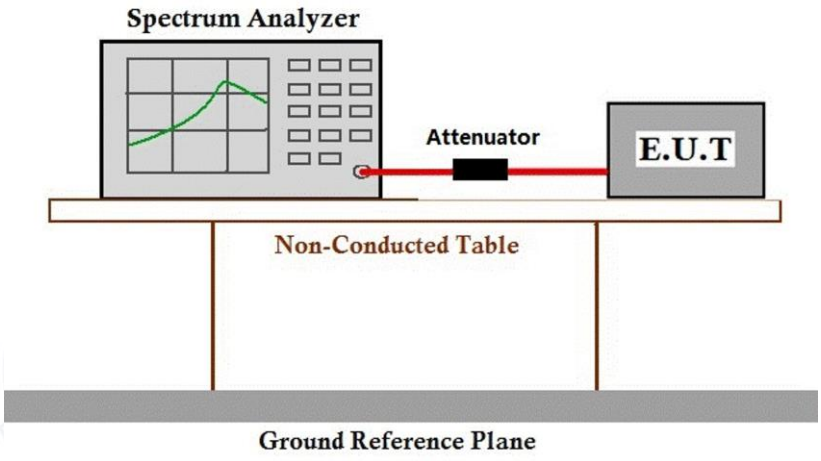
### 7.6.1 E.U.T. Operation

Operating Environment:
Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.6.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 02 | TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.6.3 Test Setup Diagram




### 7.6.4 Measurement Procedure and Data

cable loss=0.83dB
Please Refer to Appendix for Details

## 7.7 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.6

Limit:

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

### 7.7.1 E.U.T. Operation

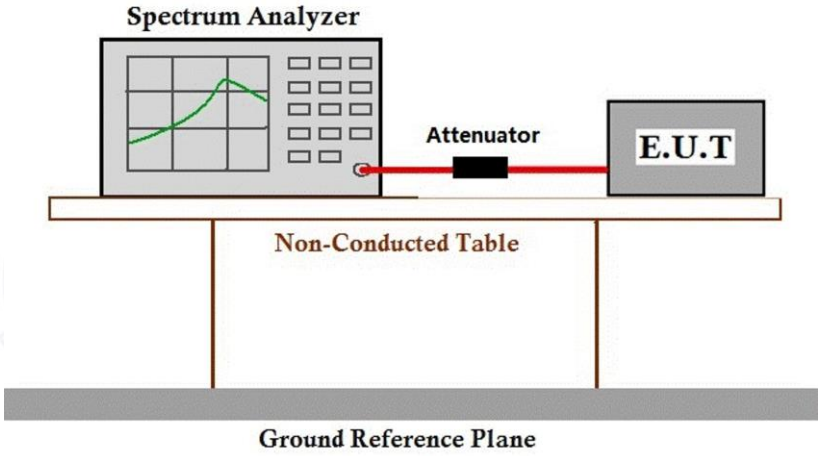
Operating Environment:

Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.7.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |
| Final test | 02 | TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.7.3 Test Setup Diagram




### 7.7.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details

## 7.8 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit:

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

### 7.8.1 E.U.T. Operation

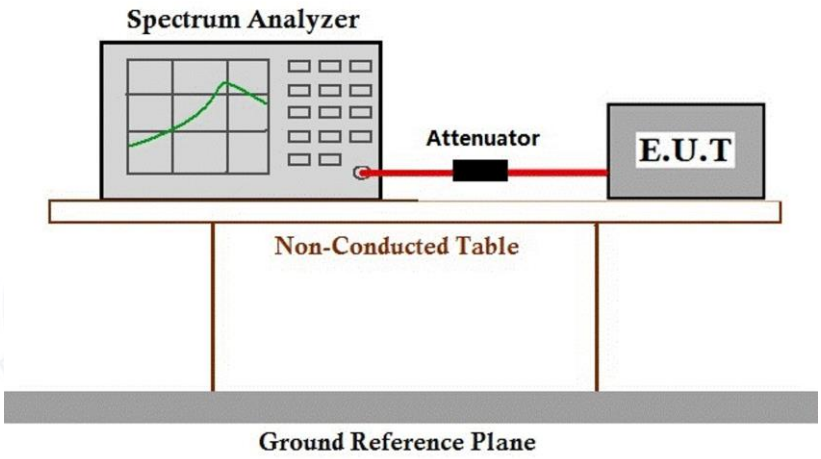
Operating Environment:

Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

### 7.8.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.8.3 Test Setup Diagram



**7.8.4 Measurement Procedure and Data**

cable loss=0.83dB

Please Refer to Appendix for Details

## 7.9 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|---|---|---|
| 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 |
| Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. | | |

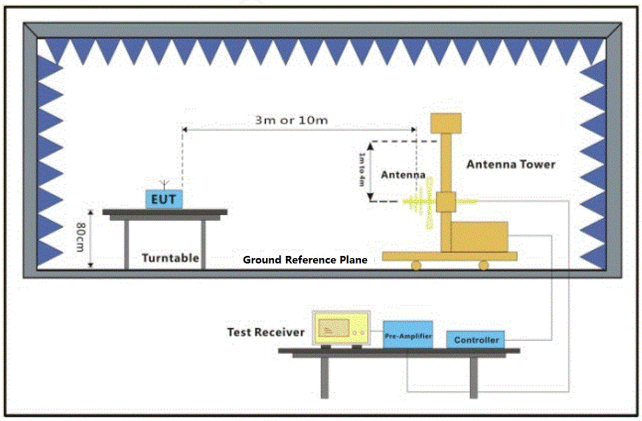
### 7.9.1 E.U.T. Operation

Operating Environment:
Temperature: 21.4 °C Humidity: 54.3 % RH Atmospheric Pressure: 1010 mbar

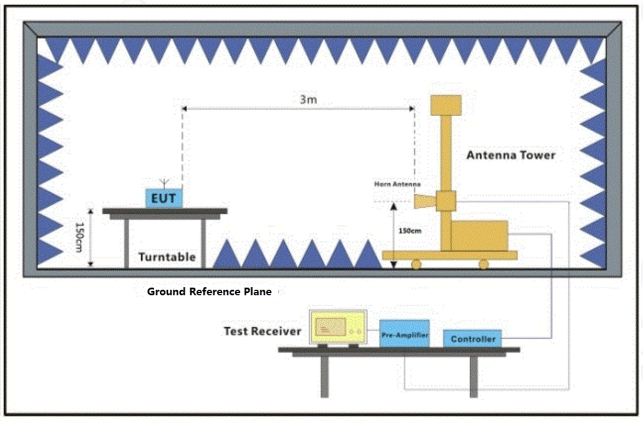
### 7.9.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.9.3 Test Setup Diagram




30MHz-1GHz




Above 1GHz

### 7.9.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Reading Level + Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Note: Level = Reading level + Factor

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin( dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2310.000 | 67.69 | -30.59 | 37.10 | 74.00 | -36.90 | peak | P |
| 2 | 2390.000 | 70.61 | -30.49 | 40.12 | 74.00 | -33.88 | peak | P |
| 3 | 2400.000 | 77.48 | -30.48 | 47.00 | 74.00 | -27.00 | peak | P |

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin( dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2310.000 | 68.50 | -30.59 | 37.91 | 74.00 | -36.09 | peak | P |
| 2 | 2390.000 | 70.19 | -30.49 | 39.70 | 74.00 | -34.30 | peak | P |
| 3 | 2400.000 | 78.30 | -30.48 | 47.82 | 74.00 | -26.18 | peak | P |

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin( dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 80.46 | -30.39 | 50.07 | 74.00 | -23.93 | peak | P |
| 2 | 2500.000 | 71.78 | -30.37 | 41.41 | 74.00 | -32.59 | peak | P |

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin( dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 79.61 | -30.39 | 49.22 | 74.00 | -24.78 | peak | P |
| 2 | 2500.000 | 70.15 | -30.37 | 39.78 | 74.00 | -34.22 | peak | P |

Note: Level = Reading level + Factor
Factor= Antenna Factor+ Cable Loss-Preamp Factor

## 7.10 Radiated Spurious Emissions (Below 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|---|---|---|
| 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 |
| Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. | | |

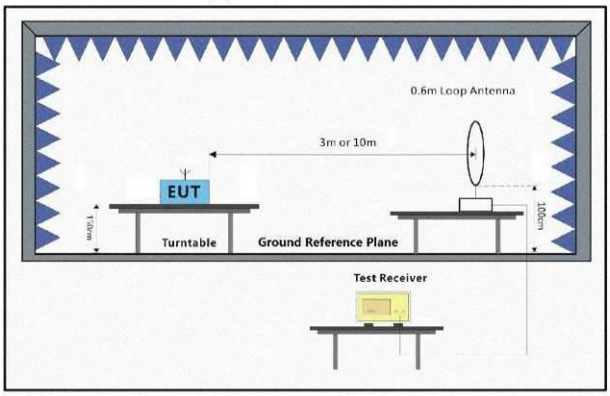
### 7.10.1 E.U.T. Operation

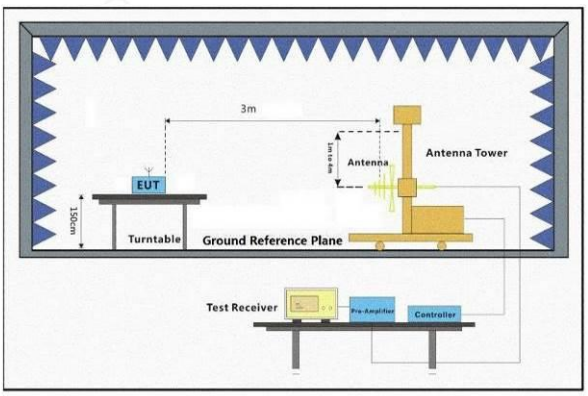
Operating Environment:
Temperature: 25.5 °C Humidity: 68.6 % RH Atmospheric Pressure: 1010 mbar

### 7.10.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.10.3 Test Setup Diagram




### 7.10.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

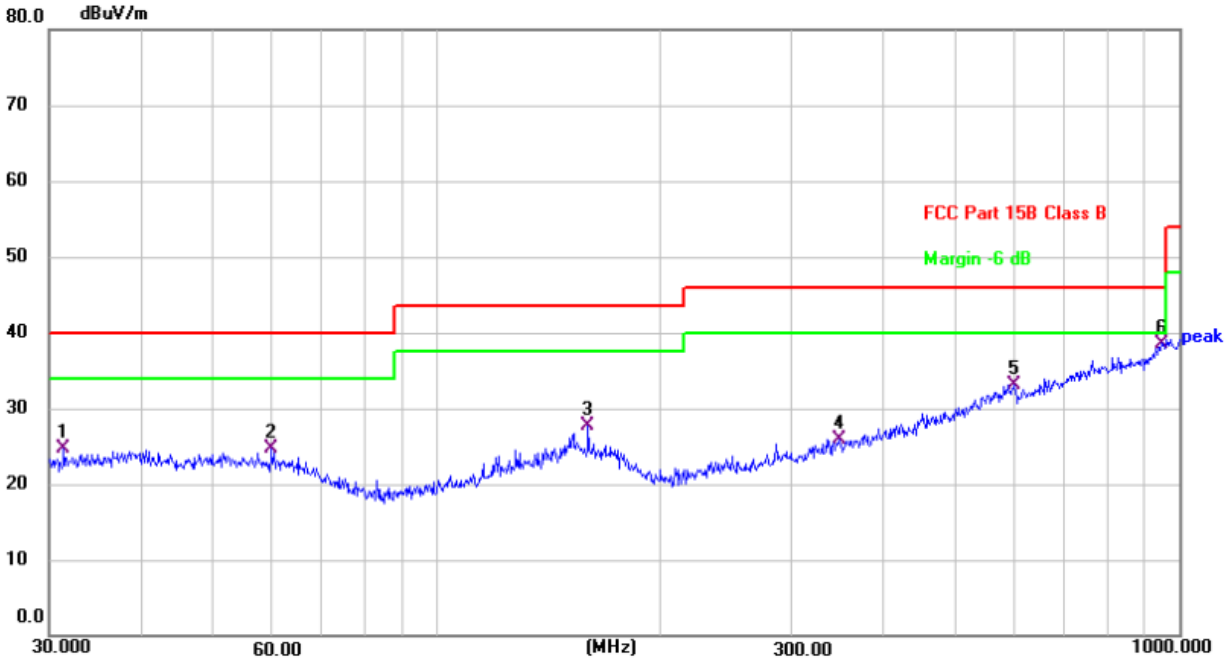
1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Reading Level + Factor

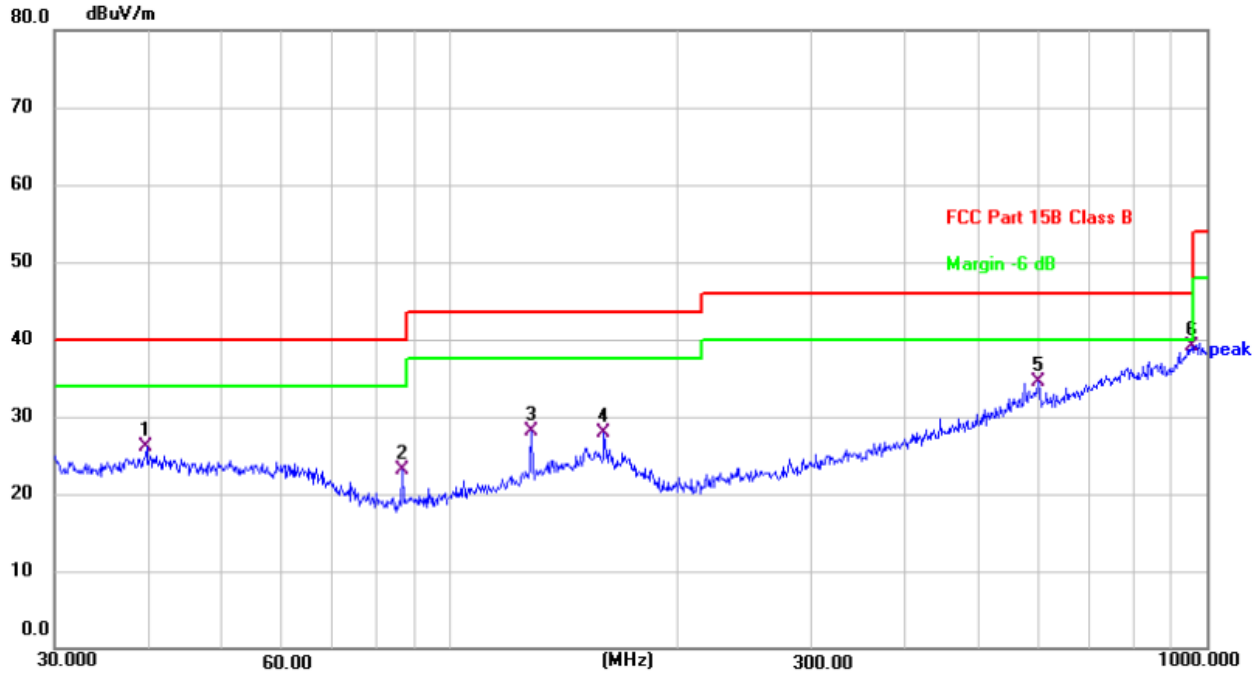
3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31.3992 | 42.69 | -17.90 | 24.79 | 40.00 | -15.21 | QP | 300 | 348 | P | |
| 2 | 59.8588 | 42.74 | -18.06 | 24.68 | 40.00 | -15.32 | QP | 300 | 348 | P | |
| 3 | 159.7844 | 44.91 | -17.23 | 27.68 | 43.50 | -15.82 | QP | 300 | 14 | P | |
| 4 | 348.0274 | 42.47 | -16.49 | 25.98 | 46.00 | -20.02 | QP | 300 | 1 | P | |
| 5 | 599.3212 | 44.62 | -11.59 | 33.03 | 46.00 | -12.97 | QP | 300 | 348 | P | |
| 6 * | 948.7610 | 45.56 | -6.96 | 38.60 | 46.00 | -7.40 | QP | 300 | 348 | P | |

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 39.7146 | 43.04 | -16.92 | 26.12 | 40.00 | -13.88 | QP | 100 | 136 | P | |
| 2 | 86.5029 | 45.28 | -22.12 | 23.16 | 40.00 | -16.84 | QP | 200 | 236 | P | |
| 3 | 128.1130 | 46.37 | -18.26 | 28.11 | 43.50 | -15.39 | QP | 300 | 270 | P | |
| 4 | 159.7844 | 45.12 | -17.23 | 27.89 | 43.50 | -15.61 | QP | 300 | 11 | P | |
| 5 | 599.3212 | 46.07 | -11.59 | 34.48 | 46.00 | -11.52 | QP | 200 | 213 | P | |
| 6 * | 955.4381 | 45.94 | -6.91 | 39.03 | 46.00 | -6.97 | QP | 100 | 86 | P | |

***Note:***

1) Pre-scan all modes and recorded the worst case results in this report (High Channel).
2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
3) Level= Reading+ Factor, Margin= Level- Limit, Factor= Antenna Factor Cable Loss-Preamp Factor

## 7.11 Radiated Spurious Emissions (Above 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|---|---|---|
| 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 |
| Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. | | |

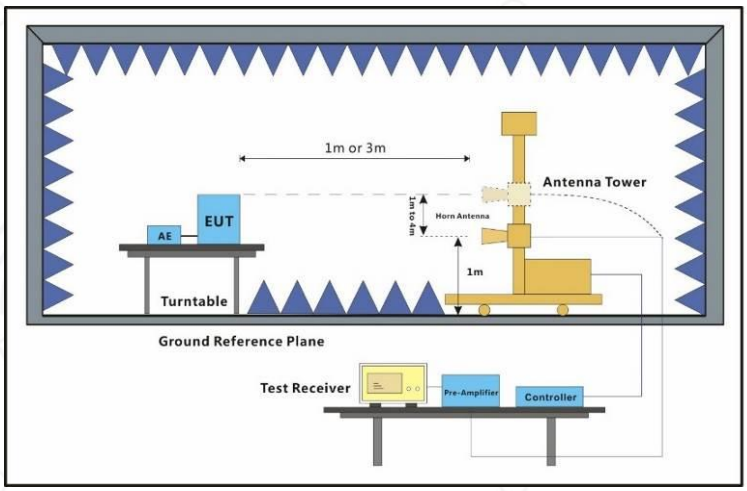
### 7.11.1 E.U.T. Operation

Operating Environment:
Temperature: 21.4 °C Humidity: 54.3 % RH Atmospheric Pressure: 1010 mbar

### 7.11.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 01 | TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. |

### 7.11.3 Test Setup Diagram



### 7.11.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) The field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin(dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2914.659 | 69.12 | -28.95 | 40.17 | 74.00 | -33.83 | peak | P |
| 2 | 4276.409 | 68.44 | -28.06 | 40.38 | 74.00 | -33.62 | peak | P |
| 3 | 6084.991 | 64.08 | -26.11 | 37.97 | 74.00 | -36.03 | peak | P |
| 4 | 8645.640 | 69.92 | -24.20 | 45.73 | 74.00 | -28.27 | peak | P |
| 5 | 11048.295 | 67.59 | -22.85 | 44.73 | 74.00 | -29.27 | peak | P |
| 6 | 14217.540 | 70.23 | -21.99 | 48.24 | 74.00 | -25.76 | peak | P |

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin(dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2974.199 | 67.15 | -28.70 | 38.46 | 74.00 | -35.54 | peak | P |
| 2 | 4312.274 | 69.52 | -28.06 | 41.46 | 74.00 | -32.54 | peak | P |
| 3 | 6352.881 | 66.97 | -24.75 | 42.22 | 74.00 | -31.78 | peak | P |
| 4 | 8576.450 | 69.16 | -24.36 | 44.80 | 74.00 | -29.20 | peak | P |
| 5 | 11286.412 | 68.14 | -24.18 | 43.96 | 74.00 | -30.04 | peak | P |
| 6 | 14956.760 | 70.39 | -20.88 | 49.51 | 74.00 | -24.49 | peak | P |

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Middle

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin(dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2913.811 | 69.12 | -30.36 | 38.76 | 74.00 | -35.24 | peak | P |
| 2 | 4277.346 | 68.31 | -28.86 | 39.45 | 74.00 | -34.55 | peak | P |
| 3 | 6085.794 | 64.43 | -25.20 | 39.24 | 74.00 | -34.76 | peak | P |
| 4 | 8646.500 | 69.93 | -24.90 | 45.03 | 74.00 | -28.97 | peak | P |
| 5 | 11047.893 | 68.64 | -24.13 | 44.51 | 74.00 | -29.49 | peak | P |
| 6 | 14217.228 | 71.09 | -21.89 | 49.21 | 74.00 | -24.79 | peak | P |

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Middle

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin(dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973.331 | 66.57 | -29.96 | 36.62 | 74.00 | -37.38 | peak | P |
| 2 | 4313.202 | 68.90 | -27.96 | 40.94 | 74.00 | -33.06 | peak | P |
| 3 | 6353.867 | 67.81 | -26.35 | 41.46 | 74.00 | -32.54 | peak | P |
| 4 | 8575.325 | 68.98 | -24.23 | 44.75 | 74.00 | -29.25 | peak | P |
| 5 | 11285.584 | 67.88 | -24.00 | 43.88 | 74.00 | -30.12 | peak | P |
| 6 | 14956.427 | 70.37 | -20.44 | 49.92 | 74.00 | -24.08 | peak | P |

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin(dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2914.426 | 69.10 | -29.70 | 39.40 | 74.00 | -34.60 | peak | P |
| 2 | 4277.364 | 68.19 | -29.73 | 38.47 | 74.00 | -35.53 | peak | P |
| 3 | 6085.828 | 65.71 | -24.49 | 41.22 | 74.00 | -32.78 | peak | P |
| 4 | 8646.326 | 70.40 | -24.63 | 45.76 | 74.00 | -28.24 | peak | P |
| 5 | 11046.694 | 67.97 | -22.67 | 45.30 | 74.00 | -28.70 | peak | P |
| 6 | 14218.167 | 70.98 | -20.87 | 50.11 | 74.00 | -23.89 | peak | P |

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High

| No. | Frequency (MHz) | Reading (dBuv) | Factor (dB/m) | Level (dBuv/m) | Limit (dBuv/m) | Margin(dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 2972.949 | 67.07 | -30.10 | 36.97 | 74.00 | -37.03 | peak | P |
| 2 | 4313.188 | 69.54 | -29.55 | 39.99 | 74.00 | -34.01 | peak | P |
| 3 | 6353.763 | 66.77 | -25.89 | 40.88 | 74.00 | -33.12 | peak | P |
| 4 | 8576.547 | 68.98 | -25.49 | 43.49 | 74.00 | -30.51 | peak | P |
| 5 | 11285.319 | 67.06 | -23.08 | 43.98 | 74.00 | -30.02 | peak | P |
| 6 | 14956.433 | 71.97 | -19.94 | 52.03 | 74.00 | -21.97 | peak | P |

***Notes:***

1).Measuring frequencies from 9 KHz~10th harmonic(ex.26GHz),at least have 20dB margin found between lowest internal used/generated frequency to 30 MHz.

2).Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex.26GHz)were made with an instrument using Peak detector mode.

3).18-25GHz at least have 20dB margin.No recording in the test report.

4) Level=Reading +Factor

Factor= Antenna Factor+ Cable Loss-Preamp Factor

# 8 Test Setup Photo

Please Refer to Appendix – Test Setup Photos.

# 9 EUT Constructional Details (EUT Photos)

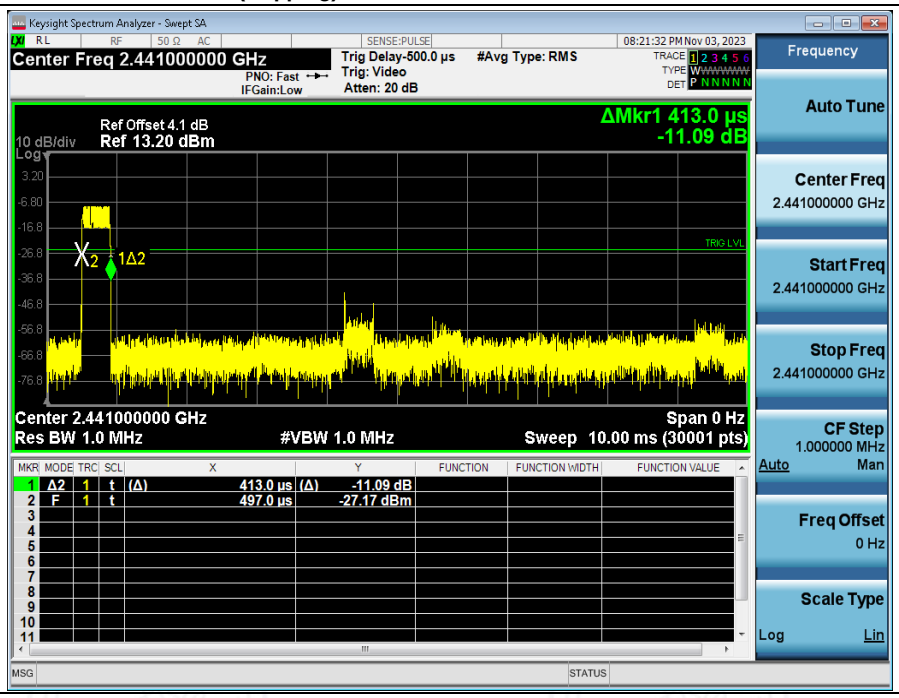
Please Refer to Appendix - External and Internal Appendix EUT Photos

# 10 Appendix

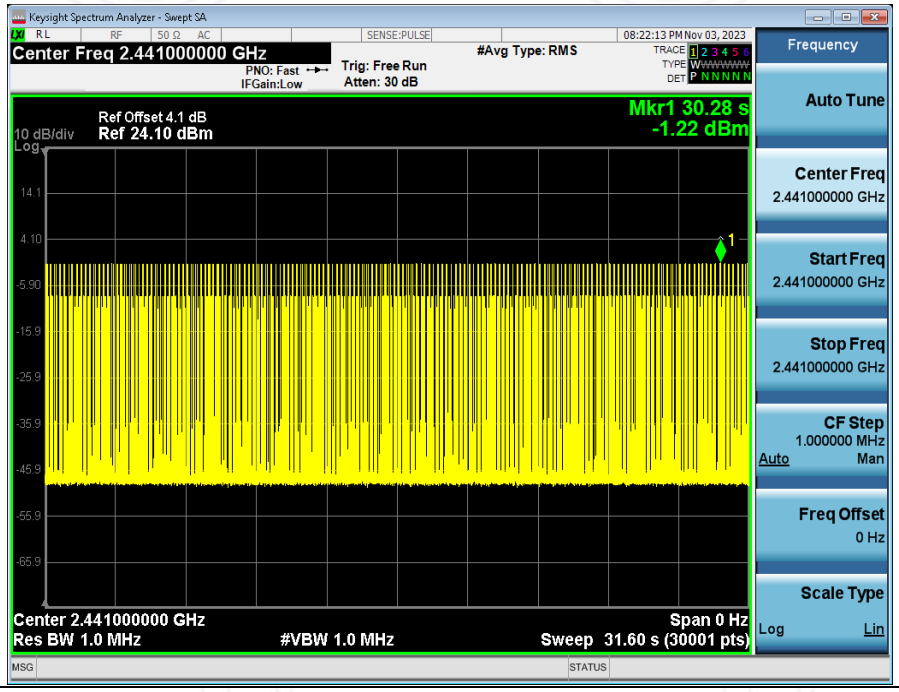
## 1. Dwell Time (Hopping)

| Condition | Antenna | Packet Type | Pulse Time(ms) | Hops | Dwell Time(ms) | Limit(s) | Result |
|---|---|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH1 | 0.413 | 320.00 | 132.160 | 0.40 | Pass |
| NVNT | ANT1 | 1-DH3 | 1.669 | 163.00 | 272.047 | 0.40 | Pass |
| NVNT | ANT1 | 1-DH5 | 2.917 | 101.00 | 294.617 | 0.40 | Pass |
| NVNT | ANT1 | 2-DH1 | 0.422 | 320.00 | 135.040 | 0.40 | Pass |
| NVNT | ANT1 | 2-DH3 | 1.674 | 154.00 | 257.796 | 0.40 | Pass |
| NVNT | ANT1 | 2-DH5 | 2.918 | 102.00 | 297.636 | 0.40 | Pass |
| NVNT | ANT1 | 3-DH1 | 0.422 | 316.00 | 133.352 | 0.40 | Pass |
| NVNT | ANT1 | 3-DH3 | 1.674 | 157.00 | 262.818 | 0.40 | Pass |
| NVNT | ANT1 | 3-DH5 | 2.922 | 110.00 | 321.420 | 0.40 | Pass |

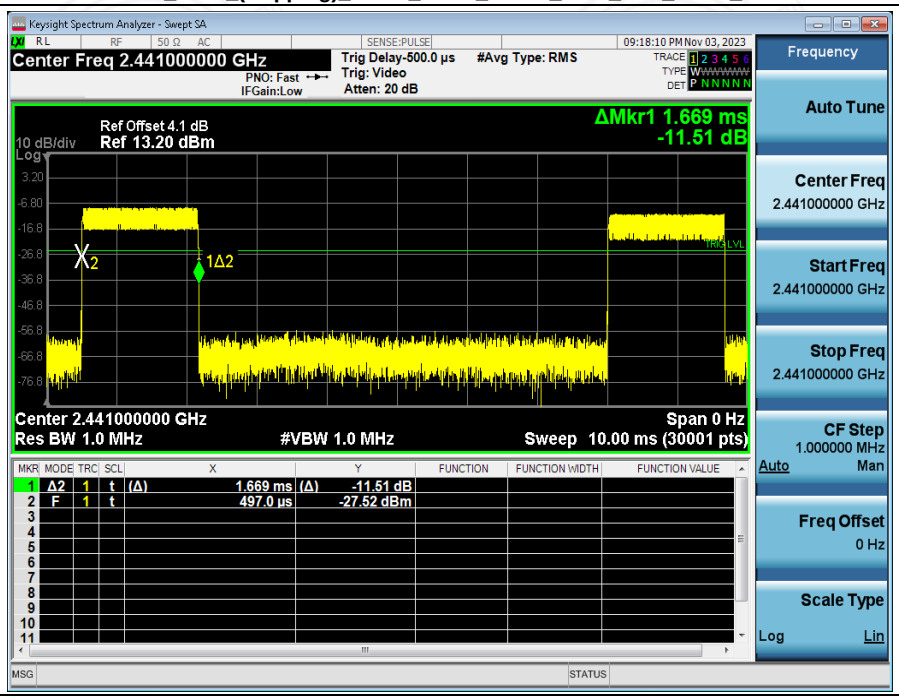
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_One_Burst_Time



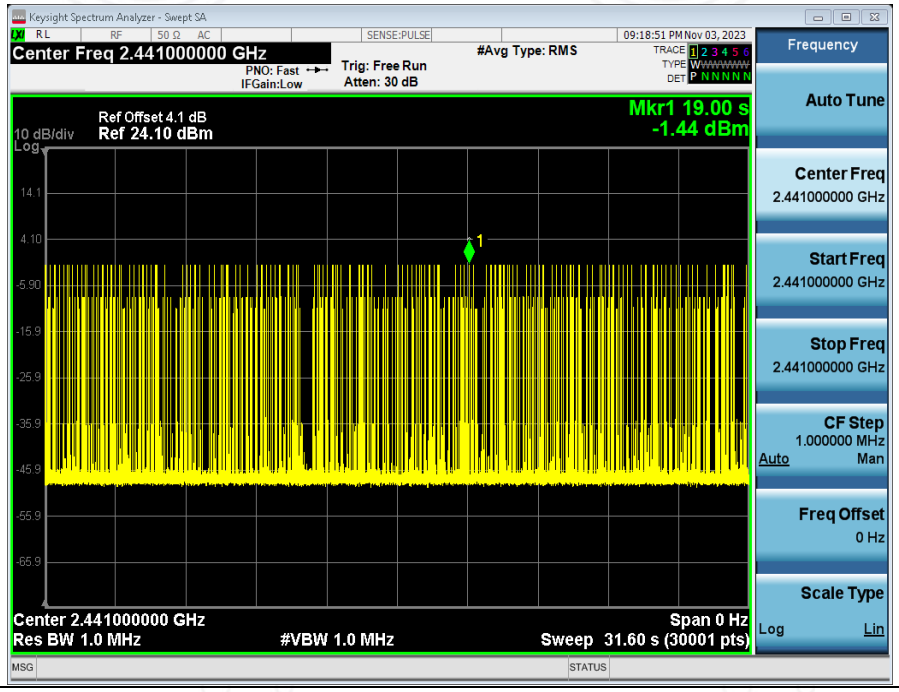

Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_Accumulated



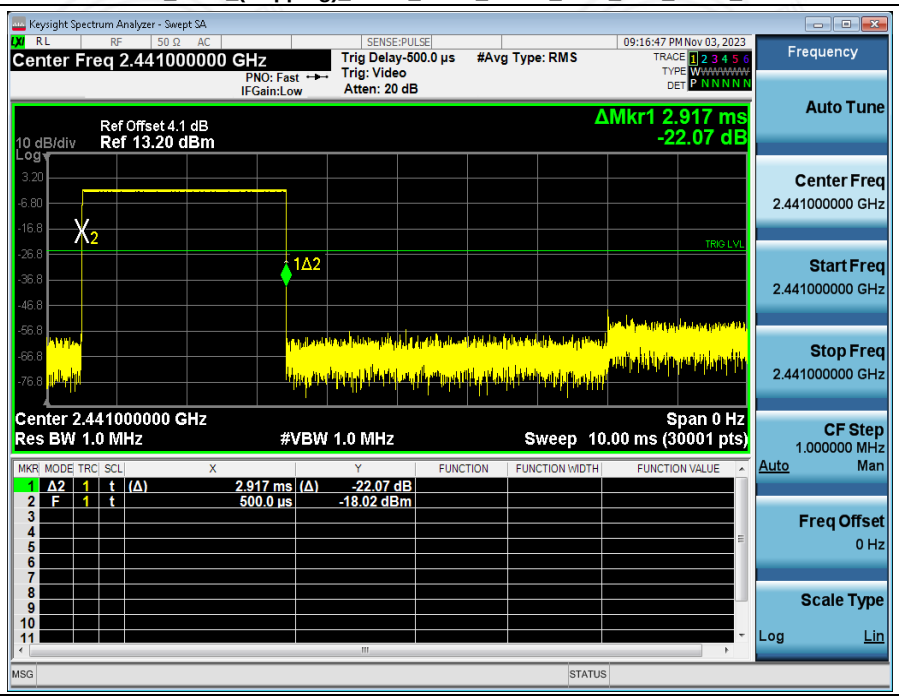

Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_One_Burst_Time



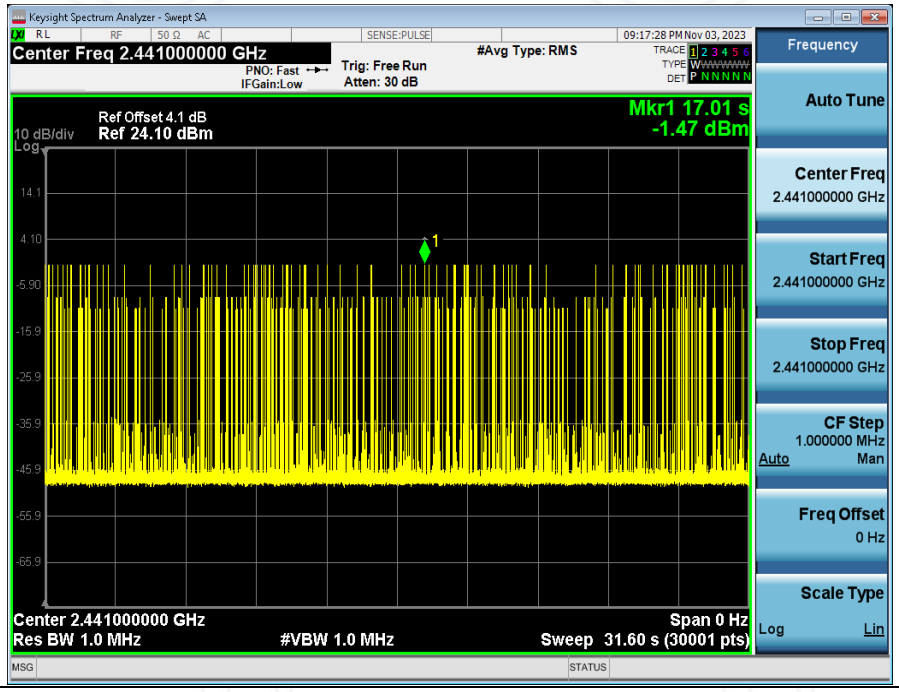

Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_Accumulated



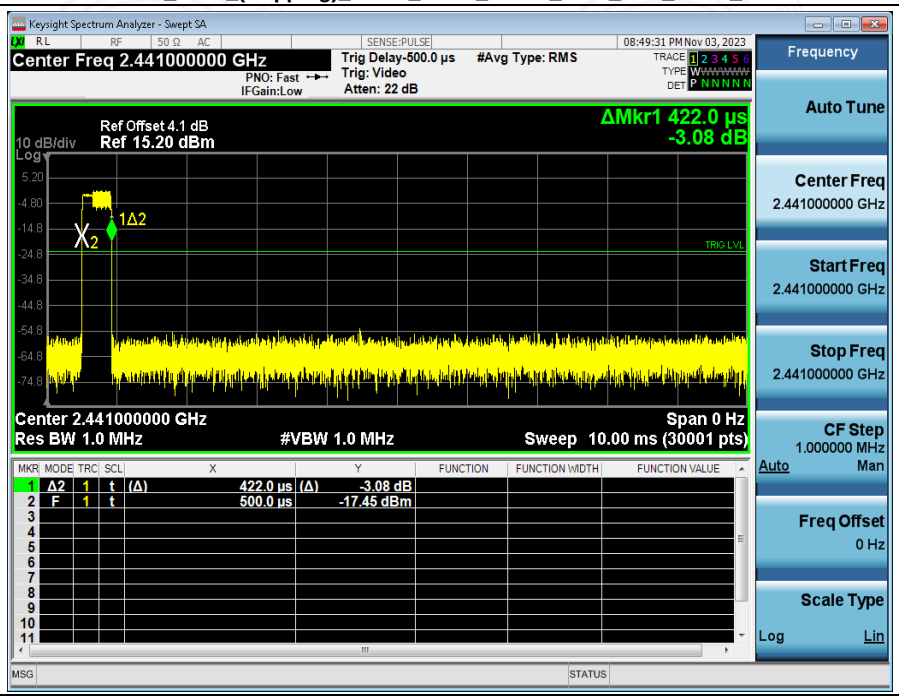

Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_One_Burst_Time



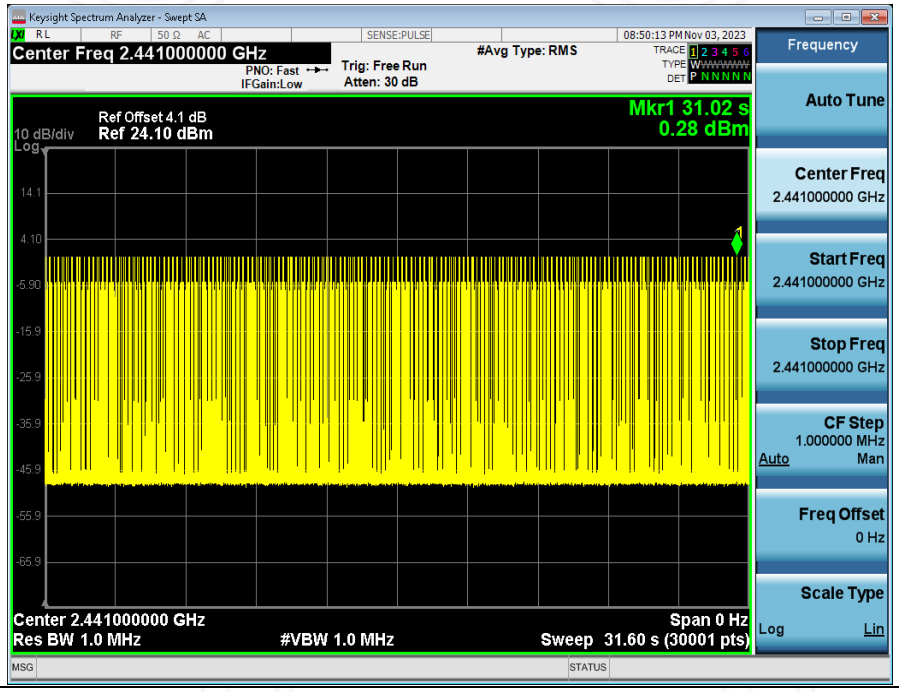

Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_Accumulated



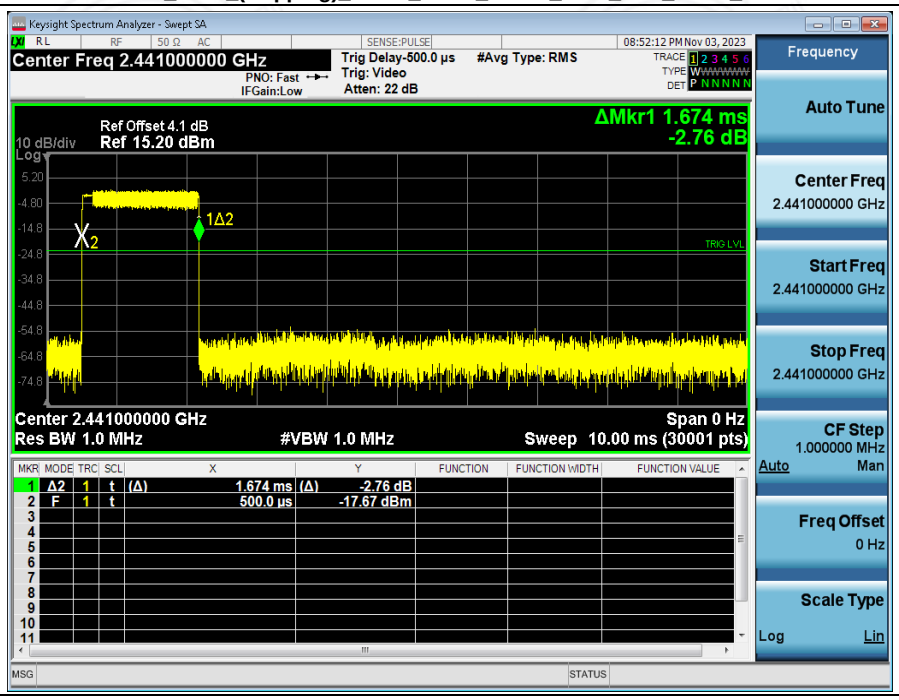

Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_One_Burst_Time



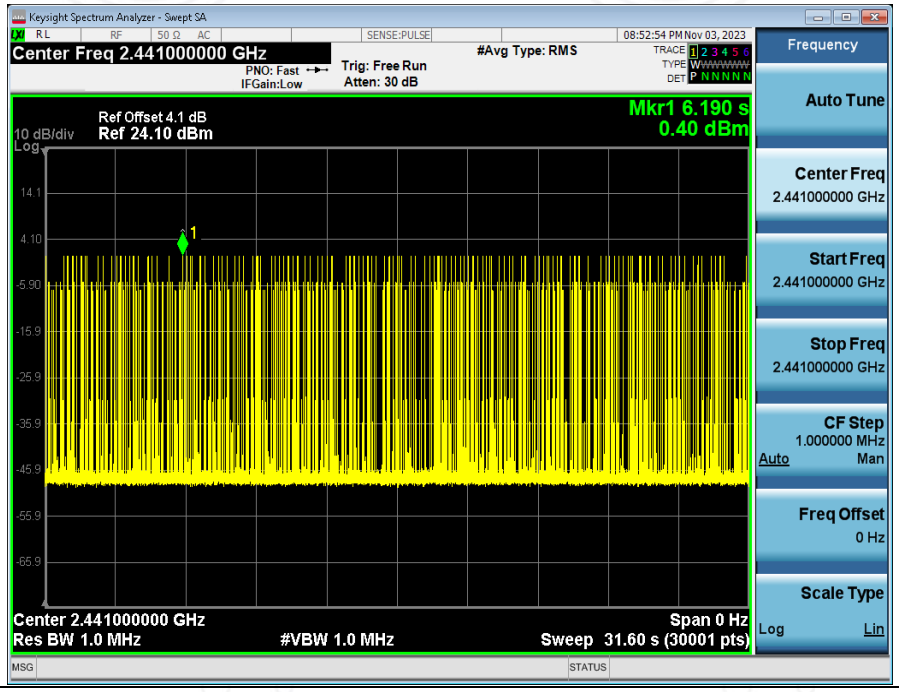

Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_Accumulated



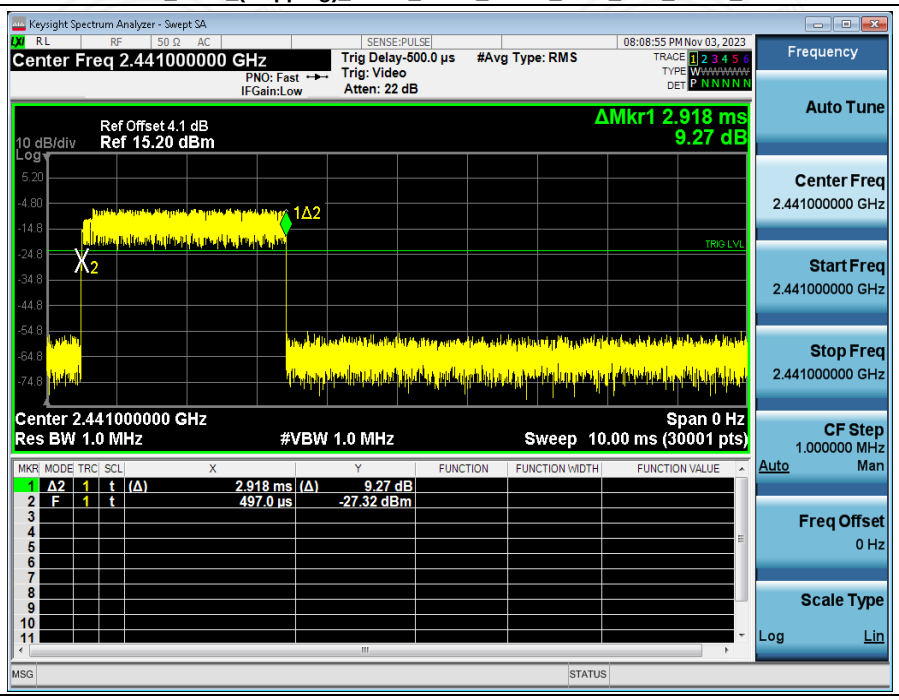

Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_One_Burst_Time



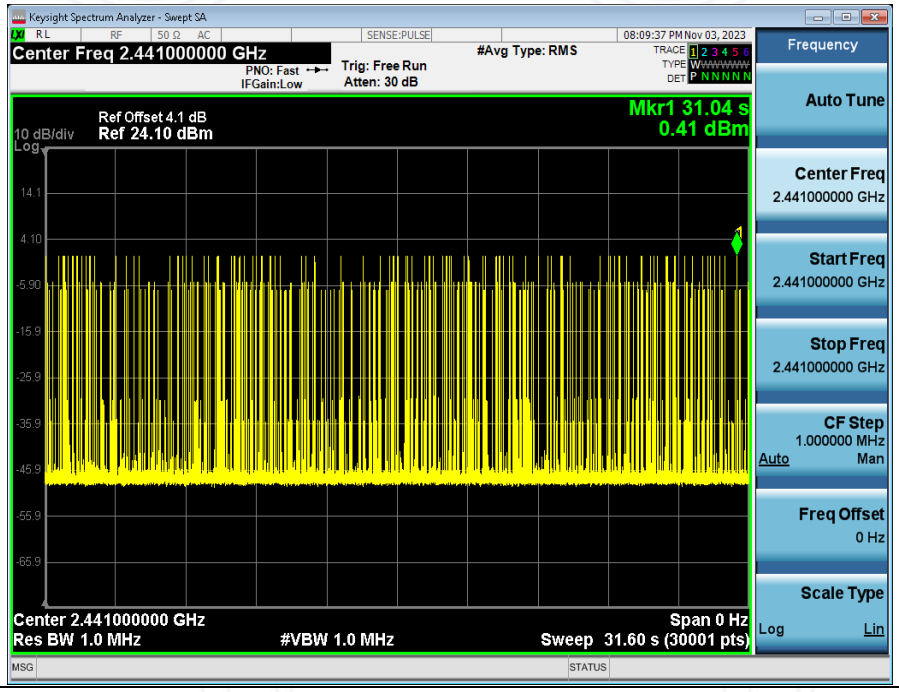

Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_Accumulated



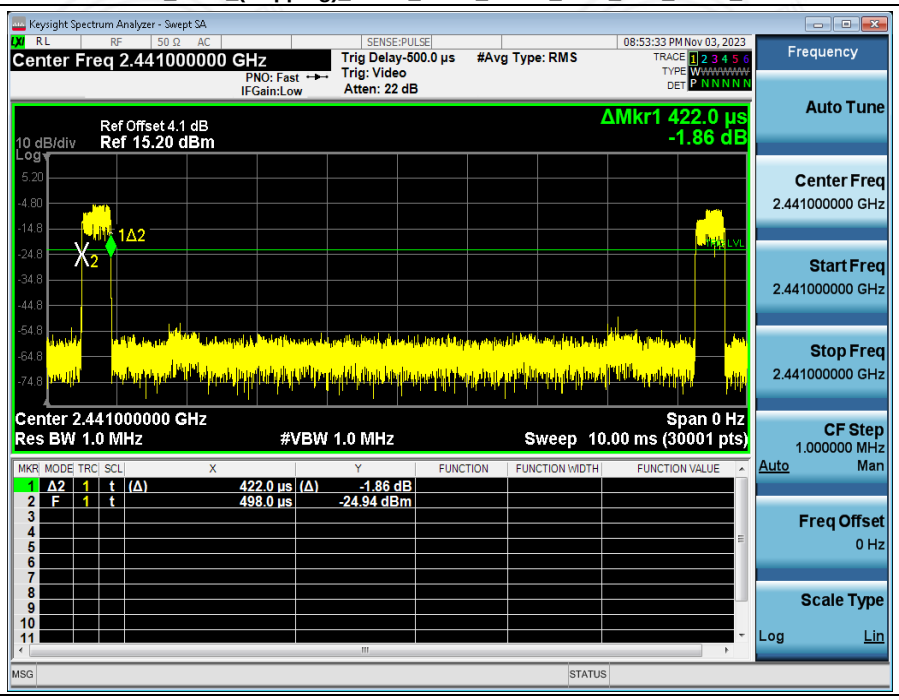

Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_One_Burst_Time



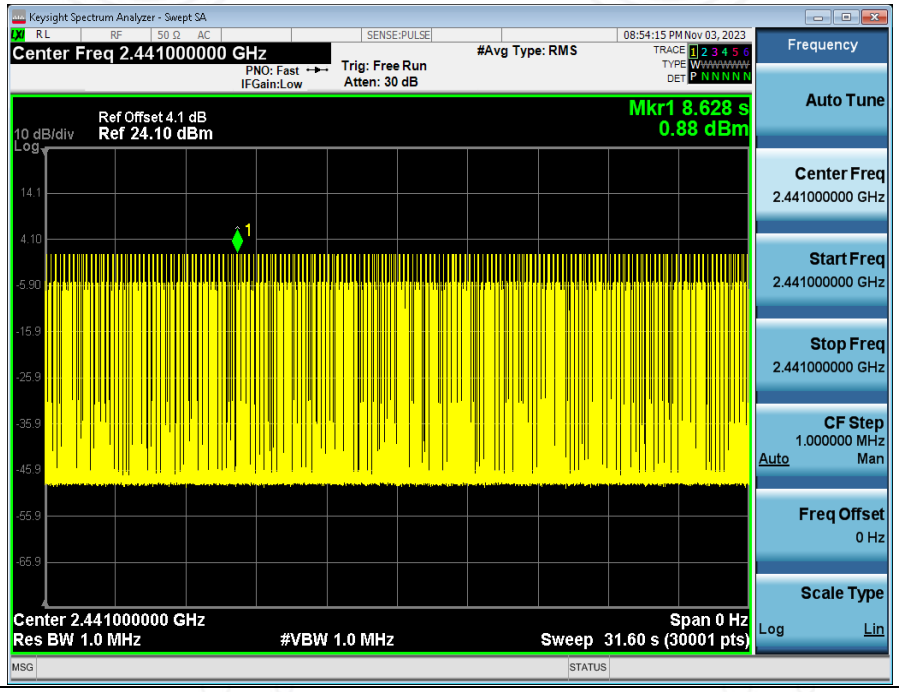

Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_Accumulated



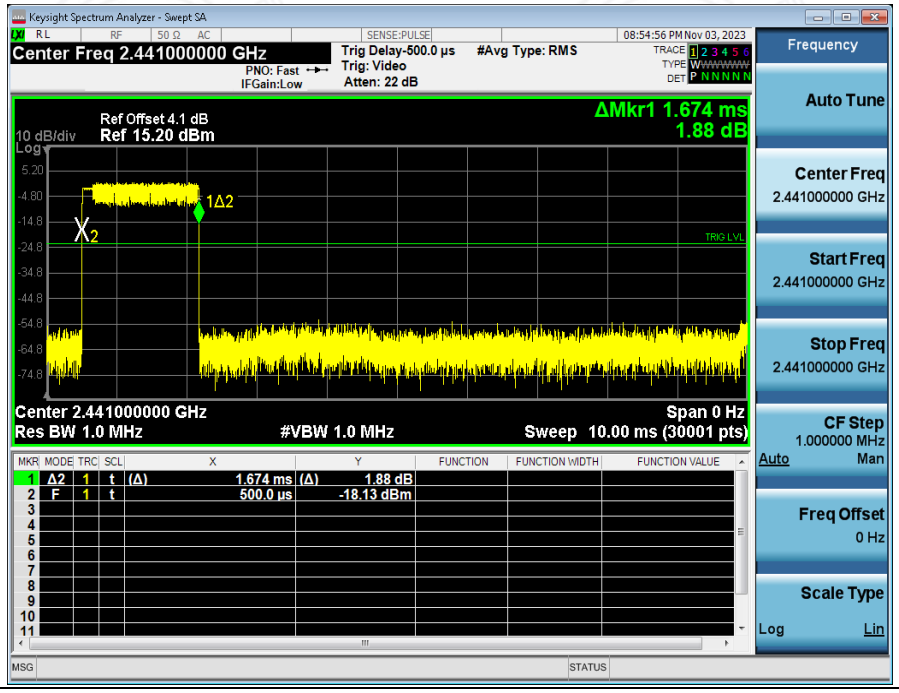

Dwell_Time_(Hopping)_NVNT_ANT1_3-DH1_2441_One_Burst_Time



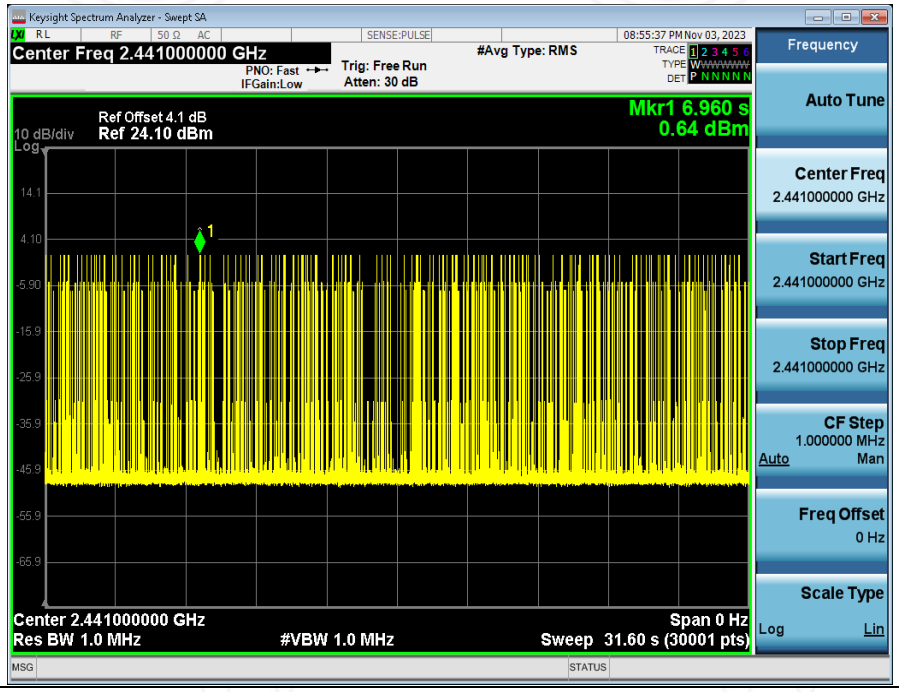

Dwell_Time_(Hopping)_NVNT_ANT1_3-DH1_2441_Accumulated



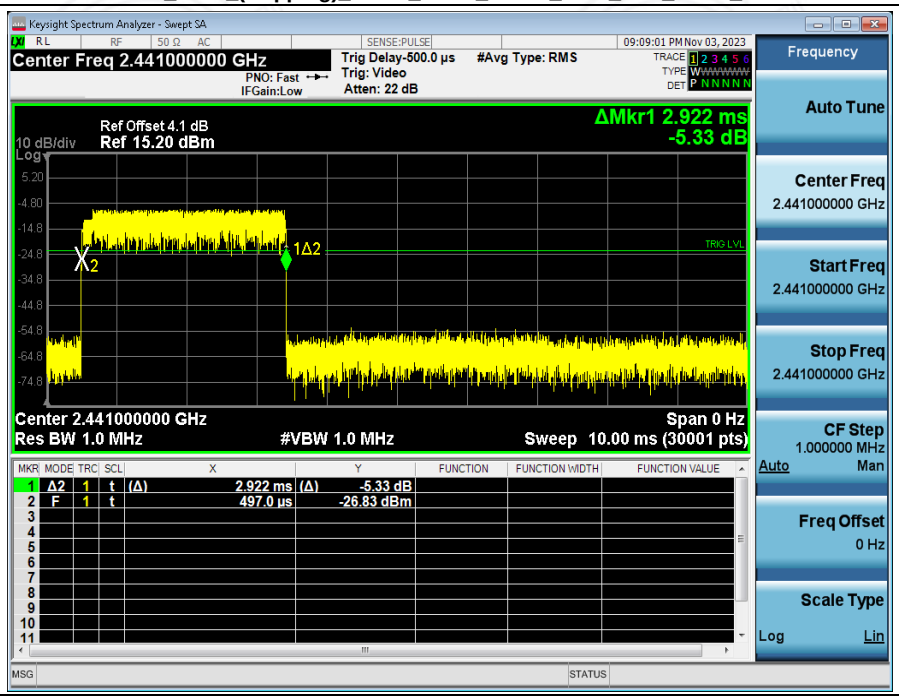

Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_One_Burst_Time



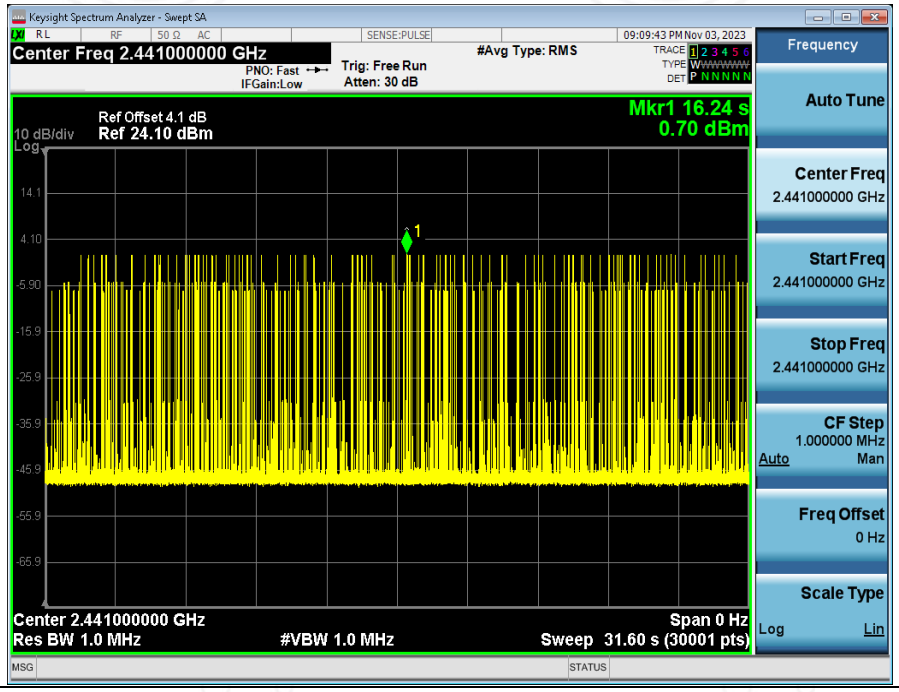

Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_Accumulated




Dwell_Time_(Hopping)_NVNT_ANT1_3-DH5_2441_One_Burst_Time



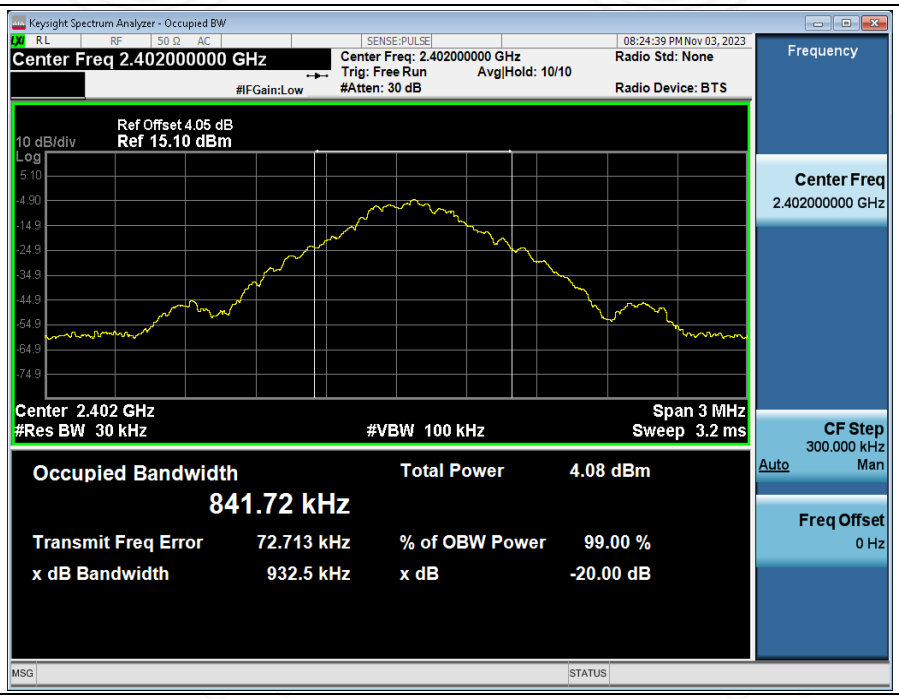

Dwell_Time_(Hopping)_NVNT_ANT1_3-DH5_2441_Accumulated


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
#Avg Type: RMS
09:09:43 PM Nov 03, 2023
Ref Offset 4.1 dB
10 dB/div
Ref 24.10 dBm
Log
Mkr1 16.24 s
0.70 dBm
14.1
4.10
-5.90
-15.9
-25.9
-35.9
-45.9
-55.9
-65.9
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 31.60 s (30001 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin
MSG
STATUS

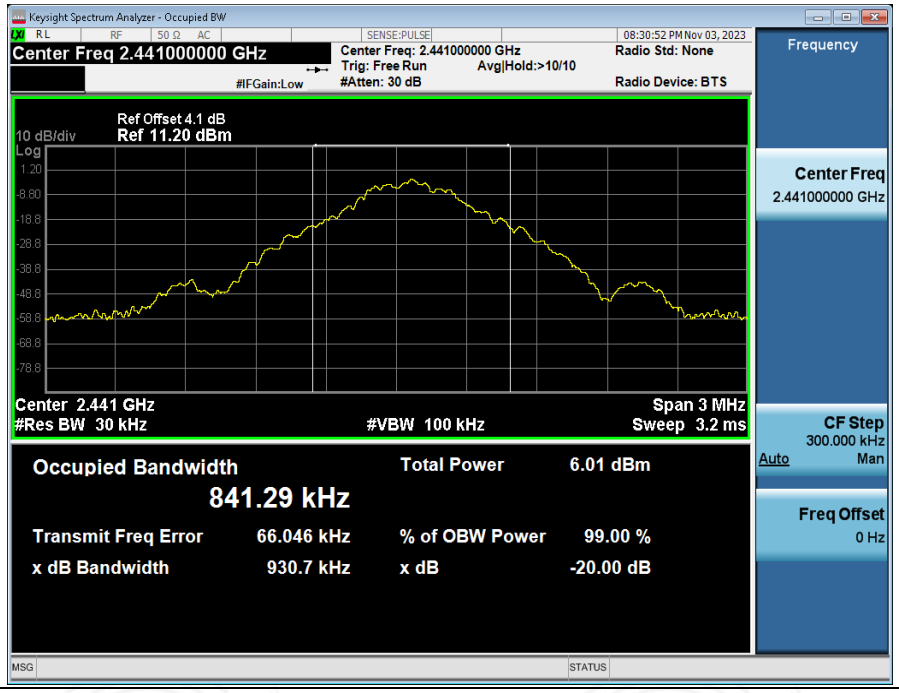
## 2. -20dB Bandwidth

| Condition | Antenna | Modulation | Frequency (MHz) | -20dB BW(MHz) | if larger than CFS |
|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 2402.00 | 0.932 | No |
| NVNT | ANT1 | 1-DH5 | 2441.00 | 0.931 | No |
| NVNT | ANT1 | 1-DH5 | 2480.00 | 0.928 | No |
| NVNT | ANT1 | 2-DH5 | 2402.00 | 1.283 | Yes |
| NVNT | ANT1 | 2-DH5 | 2441.00 | 1.284 | Yes |
| NVNT | ANT1 | 2-DH5 | 2480.00 | 1.288 | Yes |
| NVNT | ANT1 | 3-DH5 | 2402.00 | 1.300 | Yes |
| NVNT | ANT1 | 3-DH5 | 2441.00 | 1.307 | Yes |
| NVNT | ANT1 | 3-DH5 | 2480.00 | 1.295 | Yes |

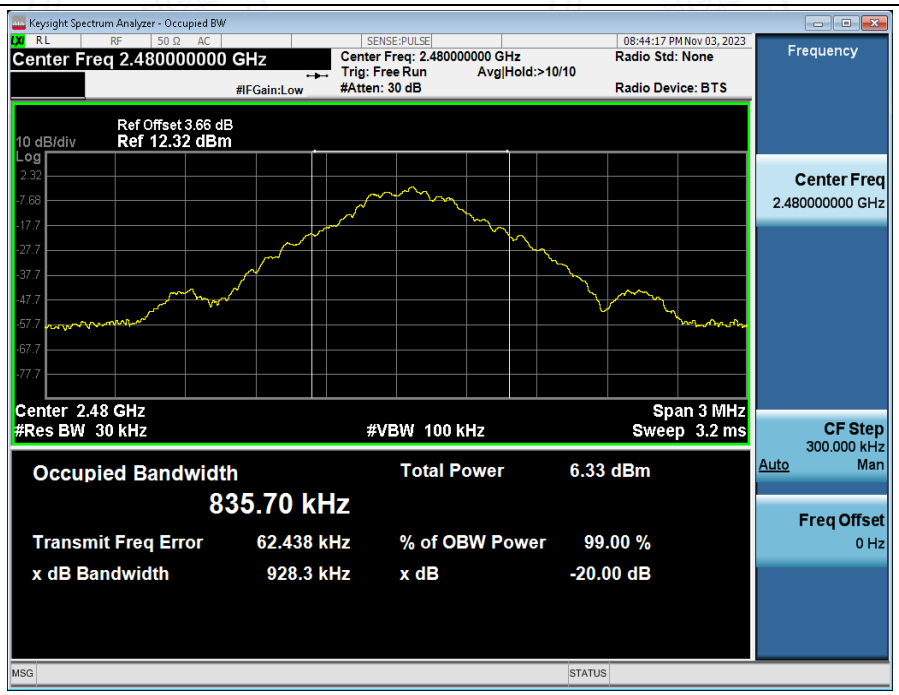
**-20dB_Bandwidth_NVNT_ANT1_1-DH5_2402**

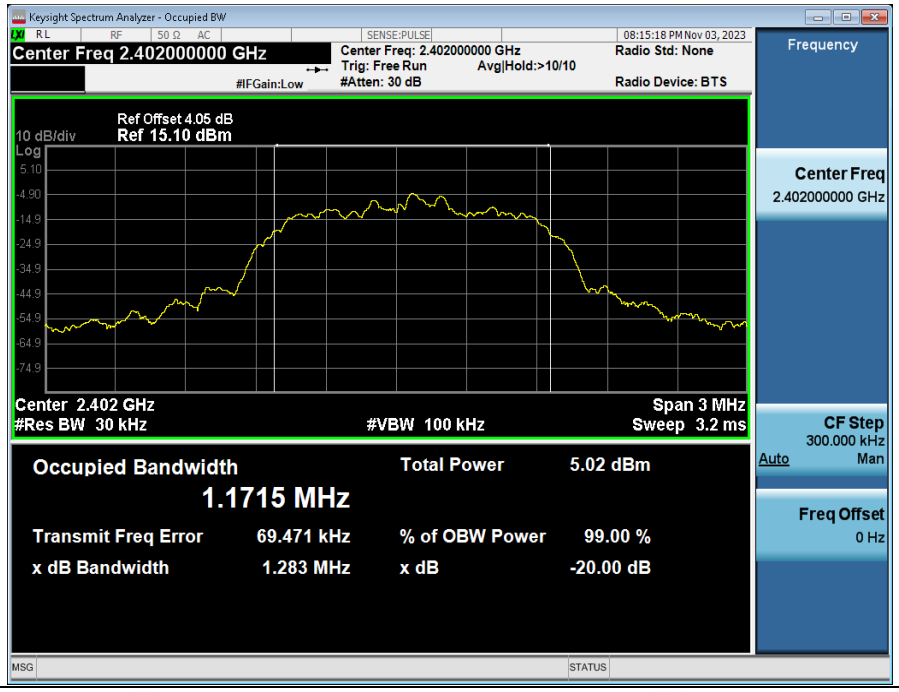


-20dB_Bandwidth_NVNT_ANT1_1-DH5_2441

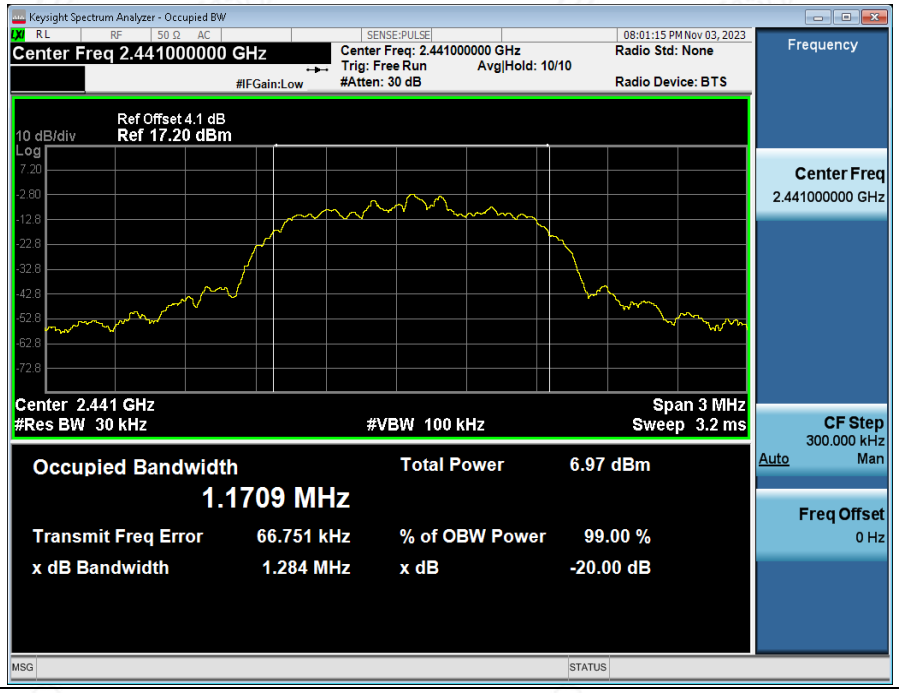


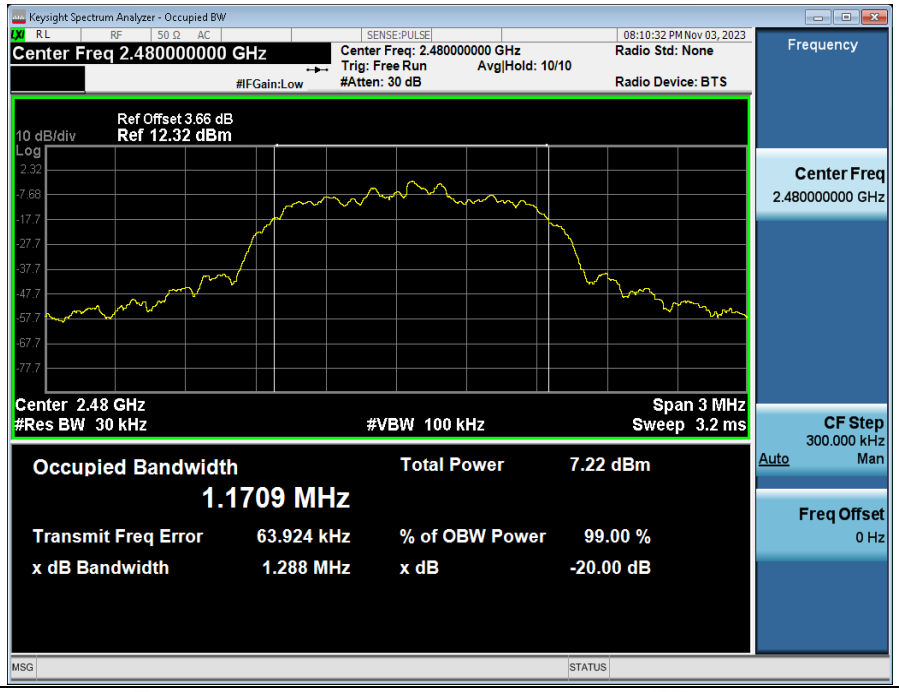

-20dB_Bandwidth_NVNT_ANT1_1-DH5_2480



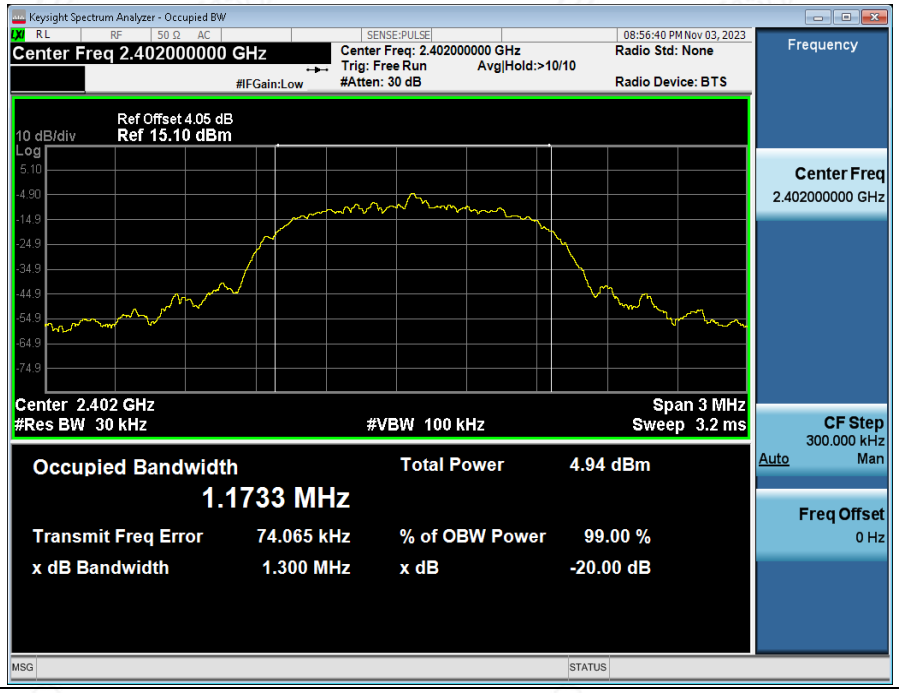
| -20dB_Bandwidth_NVNT_ANT1_2-DH5_2402 |
| --- |
|  |

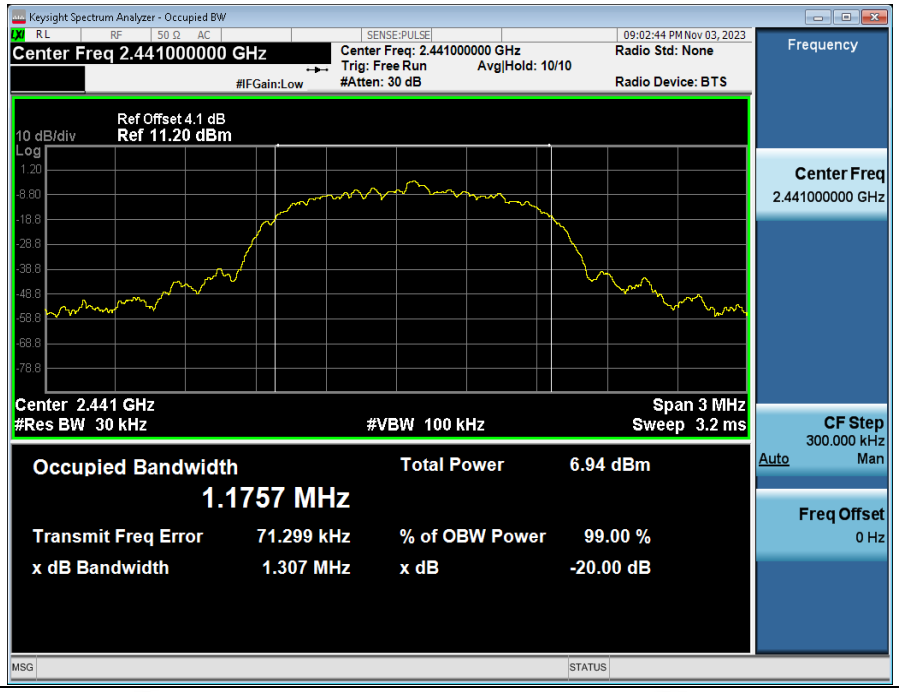


| -20dB_Bandwidth_NVNT_ANT1_2-DH5_2441 |
| --- |
|  |

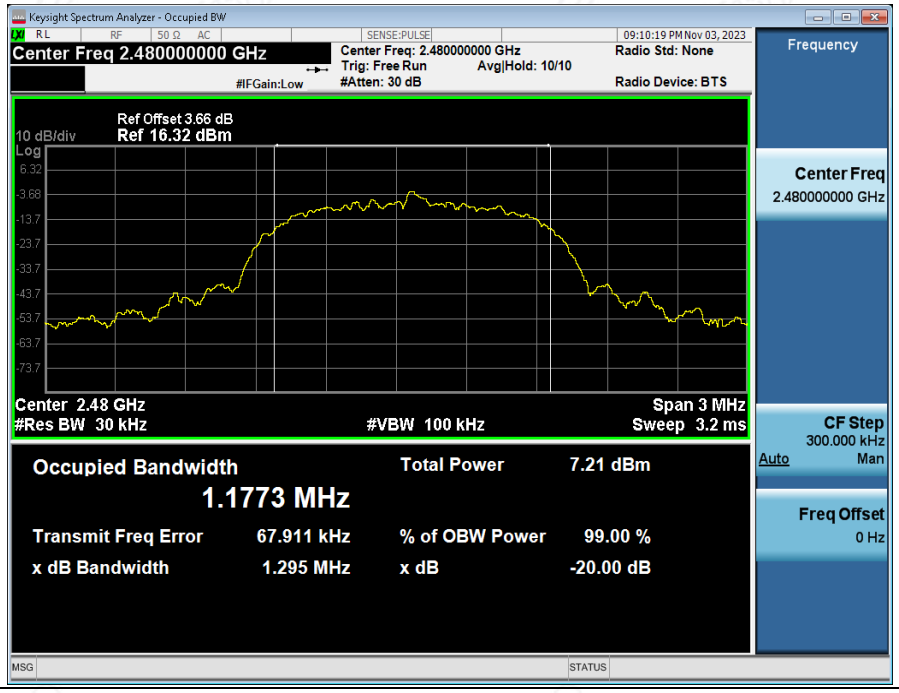
| -20dB_Bandwidth_NVNT_ANT1_2-DH5_2480 |
| --- |
|  |



| -20dB_Bandwidth_NVNT_ANT1_3-DH5_2402 |
| --- |
|  |

| -20dB_Bandwidth_NVNT_ANT1_3-DH5_2441 |
| --- |
|  |

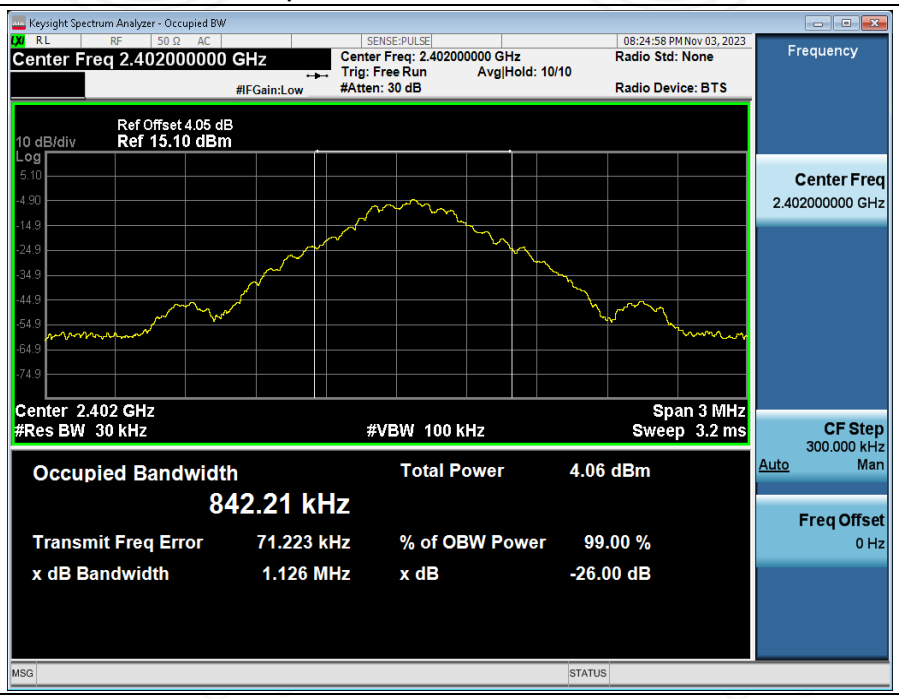


| -20dB_Bandwidth_NVNT_ANT1_3-DH5_2480 |
| --- |
|  |

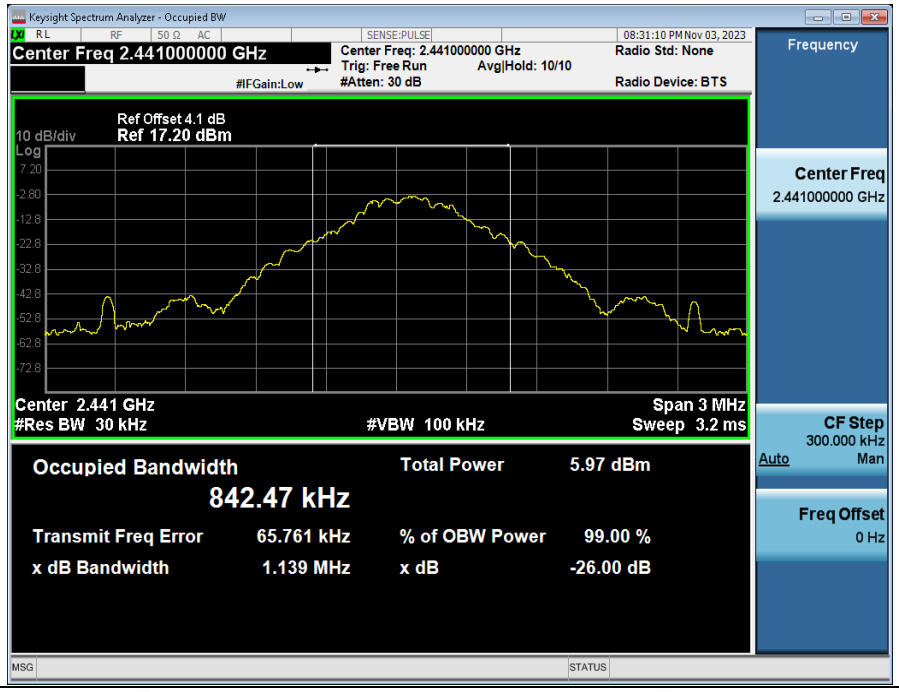
## 3. 99% Occupied Bandwidth

| Condition | Antenna | Modulation | Frequency (MHz) | 99%%BW(MHz) |
|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 2402.00 | 0.842 |
| NVNT | ANT1 | 1-DH5 | 2441.00 | 0.842 |
| NVNT | ANT1 | 1-DH5 | 2480.00 | 0.835 |
| NVNT | ANT1 | 2-DH5 | 2402.00 | 1.171 |
| NVNT | ANT1 | 2-DH5 | 2441.00 | 1.171 |
| NVNT | ANT1 | 2-DH5 | 2480.00 | 1.173 |
| NVNT | ANT1 | 3-DH5 | 2402.00 | 1.176 |
| NVNT | ANT1 | 3-DH5 | 2441.00 | 1.174 |
| NVNT | ANT1 | 3-DH5 | 2480.00 | 1.175 |

**99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2402**

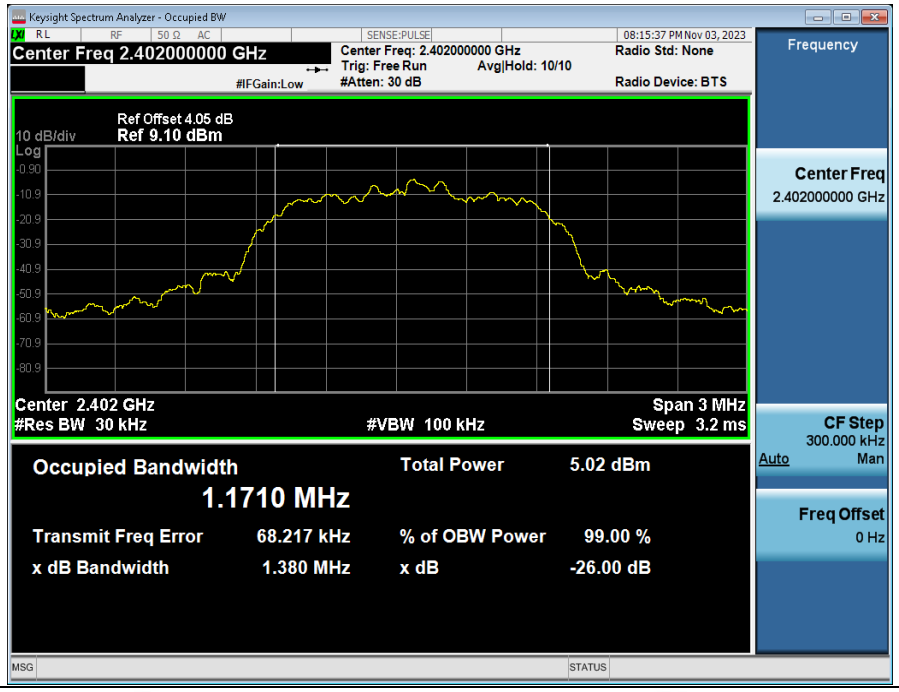


| 99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2441 |
| --- |

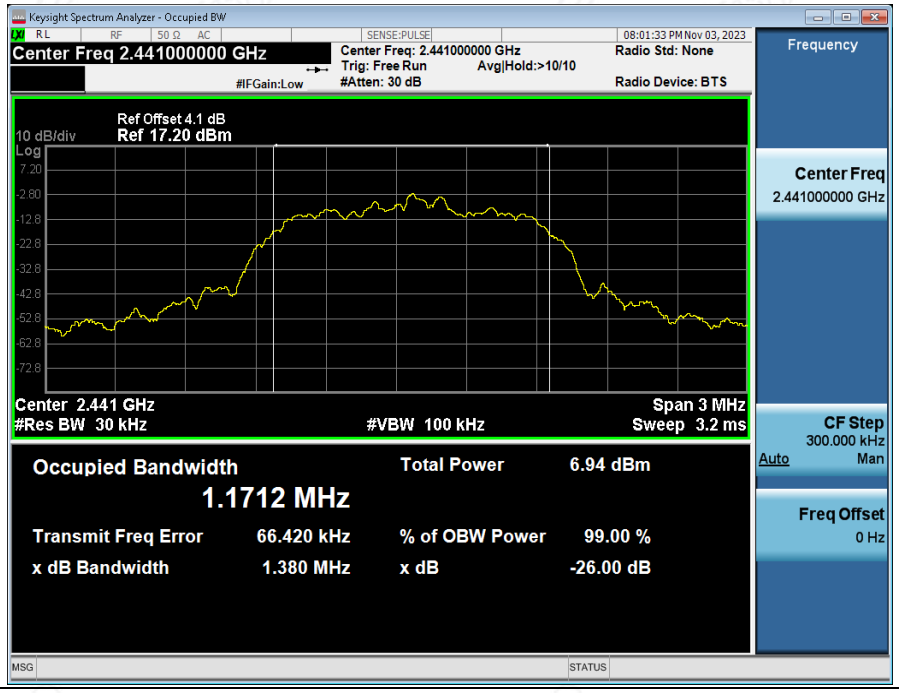



| 99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2480 |
| --- |

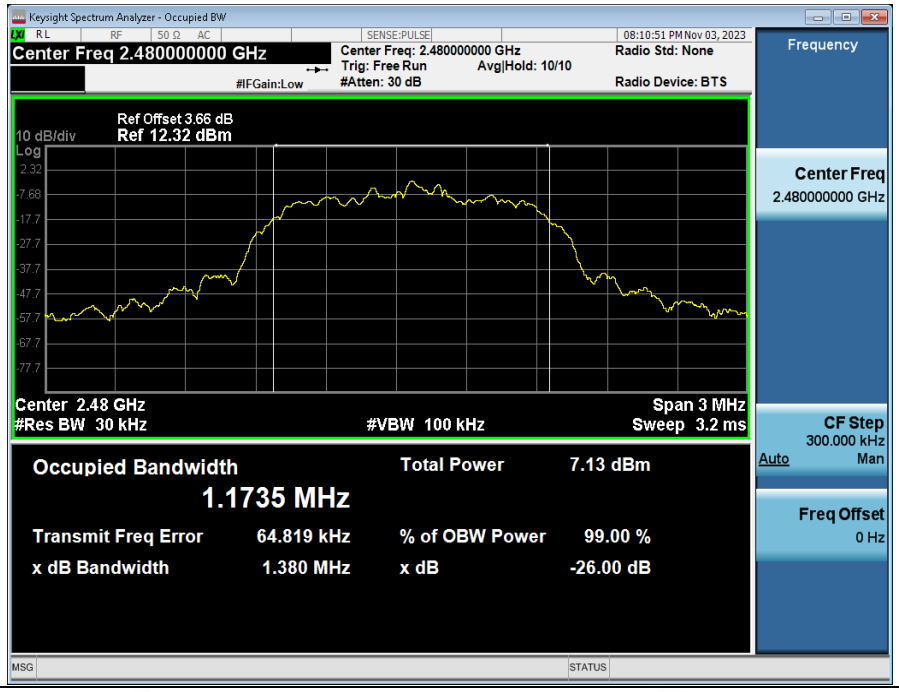
| 99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2402 |
|---|



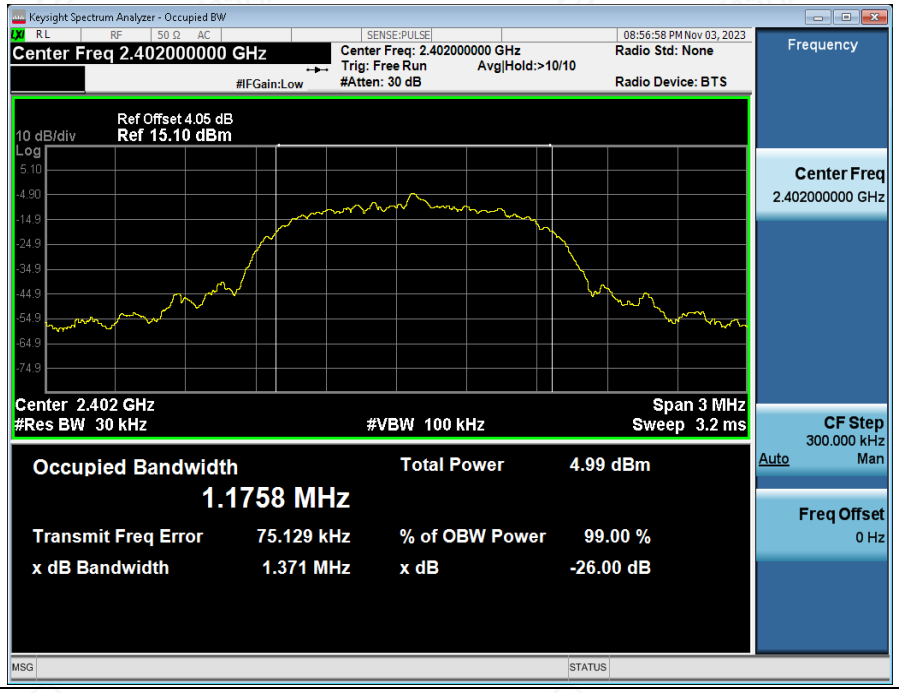

| 99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2441 |
|---|



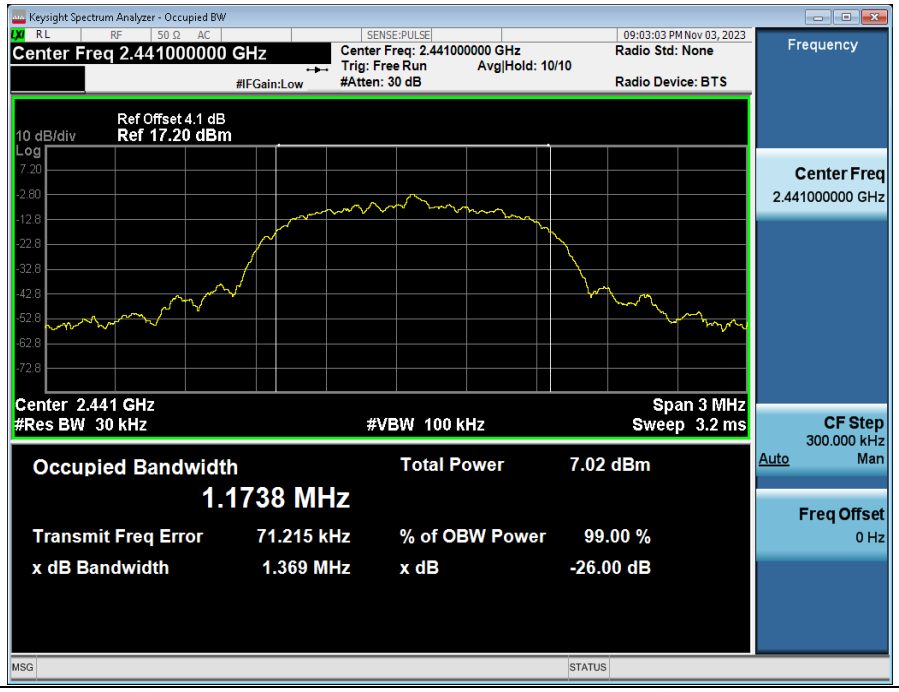
| 99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2480 |
| --- |



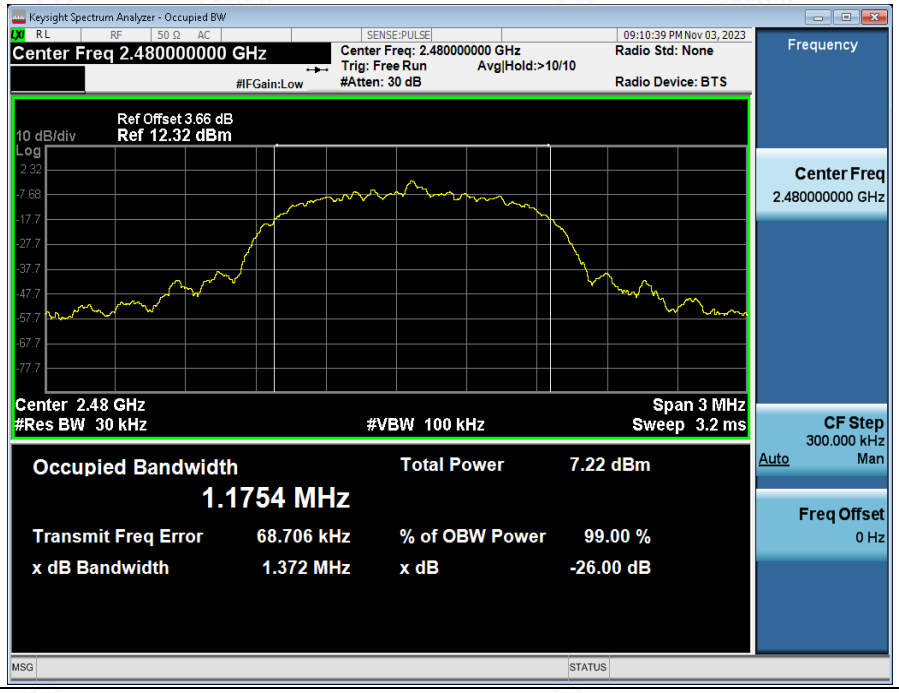

| 99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2402 |
| --- |



| 99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2441 |
| --- |



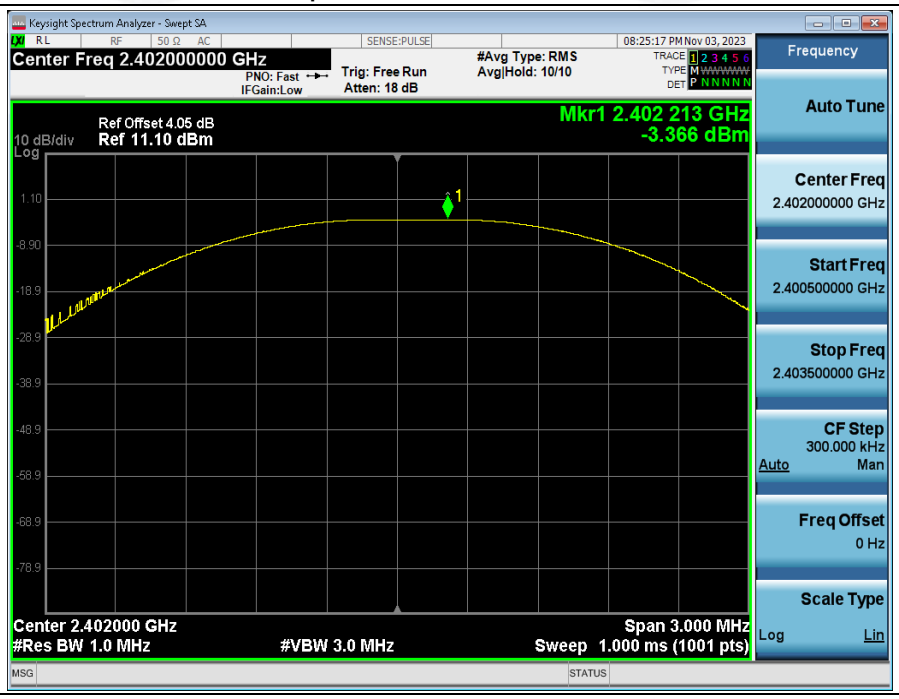

| 99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2480 |
| --- |



## 4. Peak Output Power

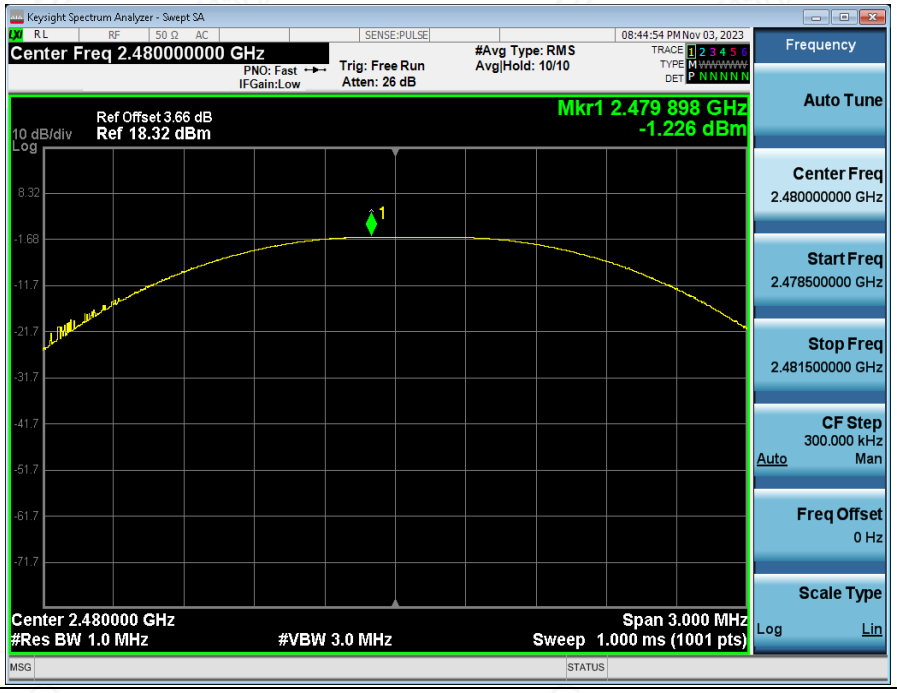
| Condition | Antenna | Modulation | Frequency (MHz) | Max. Conducted Power(dBm) | Max. Conducted Power(mW) | Limit(mW) | Result |
|---|---|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 2402.00 | -3.37 | 0.46 | 1000 | Pass |
| NVNT | ANT1 | 1-DH5 | 2441.00 | -1.41 | 0.72 | 1000 | Pass |
| NVNT | ANT1 | 1-DH5 | 2480.00 | -1.23 | 0.75 | 1000 | Pass |
| NVNT | ANT1 | 2-DH5 | 2402.00 | -0.90 | 0.81 | 125 | Pass |
| NVNT | ANT1 | 2-DH5 | 2441.00 | 0.94 | 1.24 | 125 | Pass |
| NVNT | ANT1 | 2-DH5 | 2480.00 | 1.13 | 1.30 | 125 | Pass |
| NVNT | ANT1 | 3-DH5 | 2402.00 | -0.38 | 0.92 | 125 | Pass |
| NVNT | ANT1 | 3-DH5 | 2441.00 | 1.48 | 1.41 | 125 | Pass |
| NVNT | ANT1 | 3-DH5 | 2480.00 | 1.68 | 1.47 | 125 | Pass |

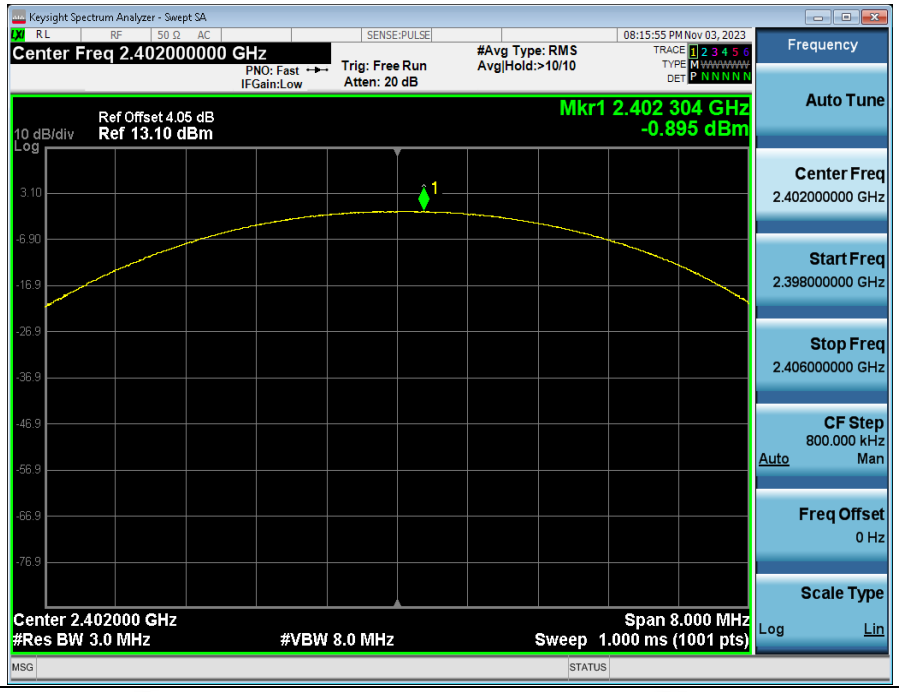
**Peak_Output_Power_NVNT_ANT1_1-DH5_2402**



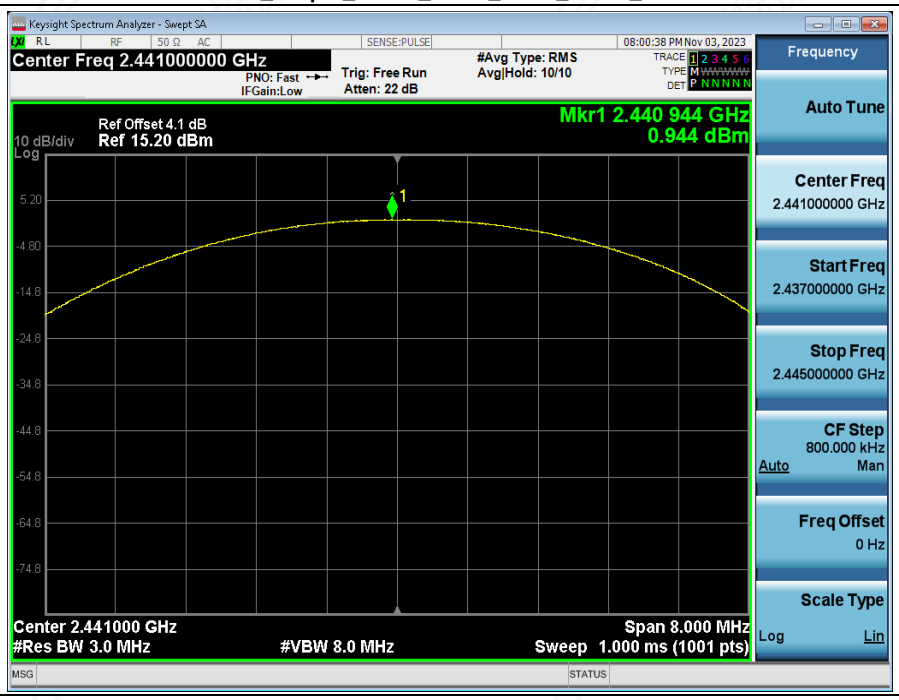
| Peak_Output_Power_NVNT_ANT1_1-DH5_2441 |
| --- |
|  |

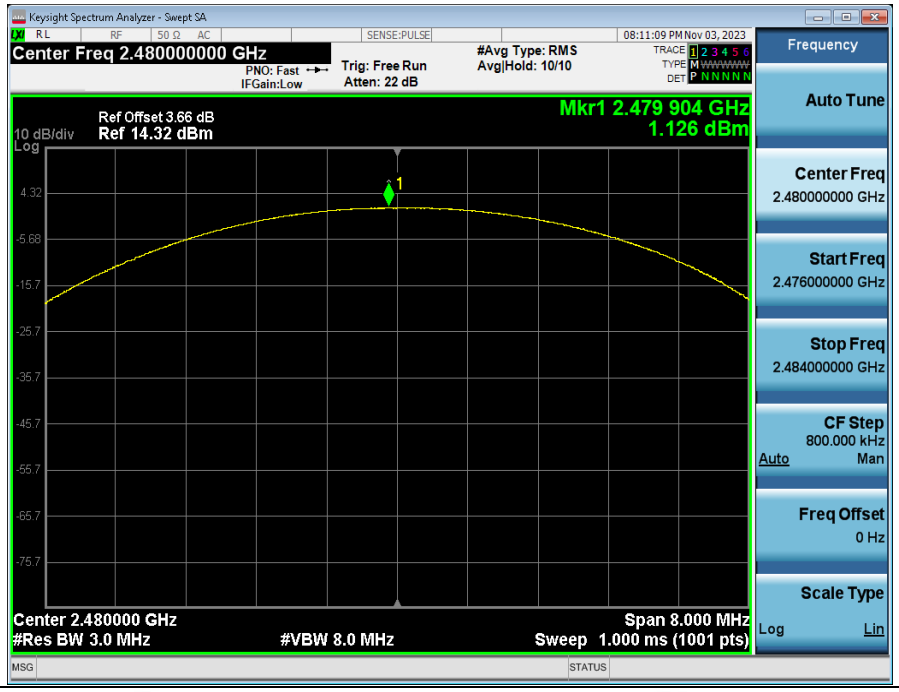


| Peak_Output_Power_NVNT_ANT1_1-DH5_2480 |
| --- |
|  |

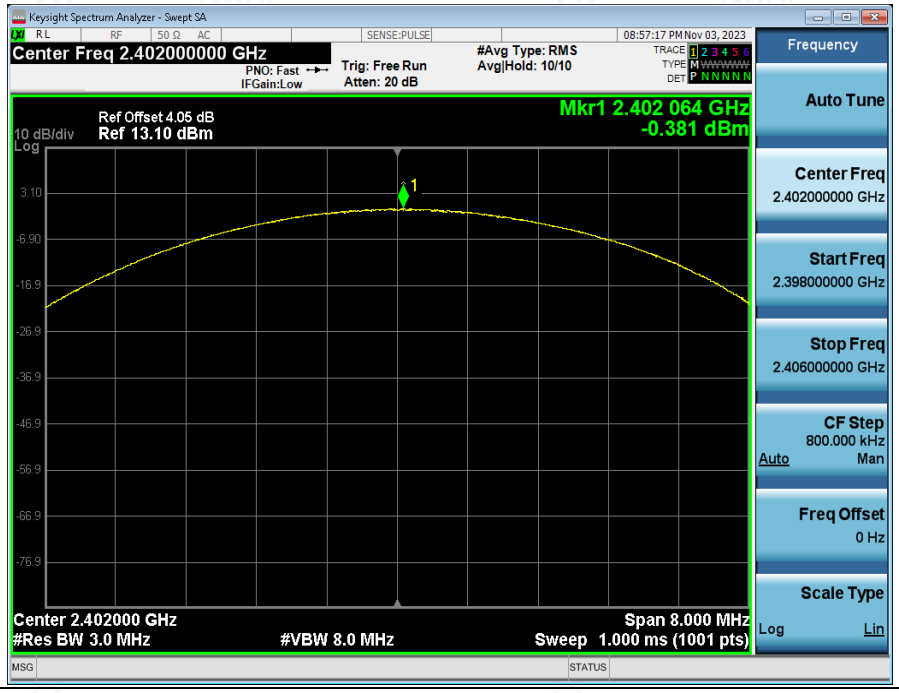
| Peak_Output_Power_NVNT_ANT1_2-DH5_2402 |
| --- |
|  |

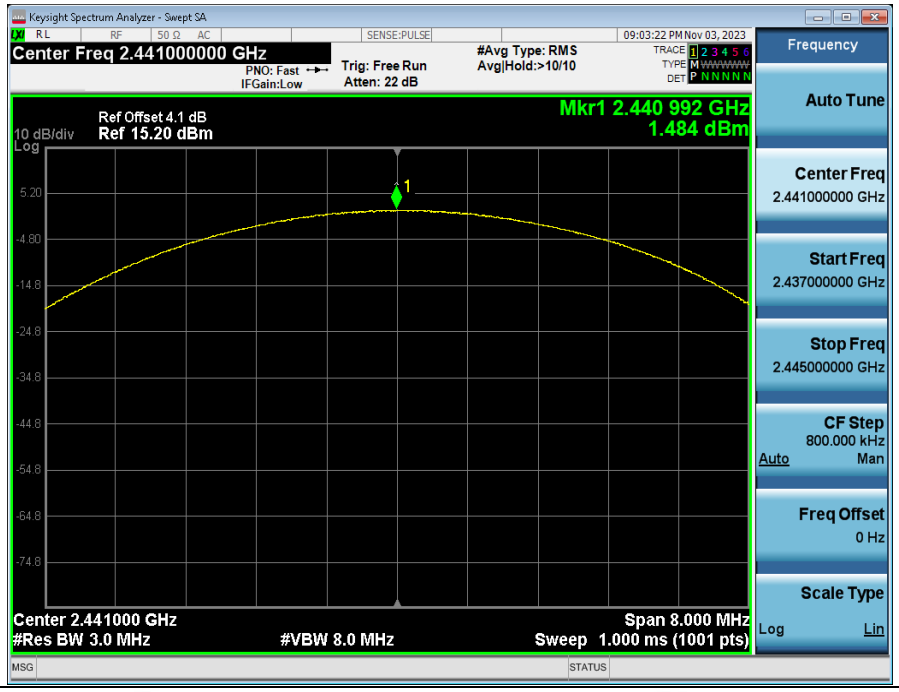


| Peak_Output_Power_NVNT_ANT1_2-DH5_2441 |
| --- |
|  |

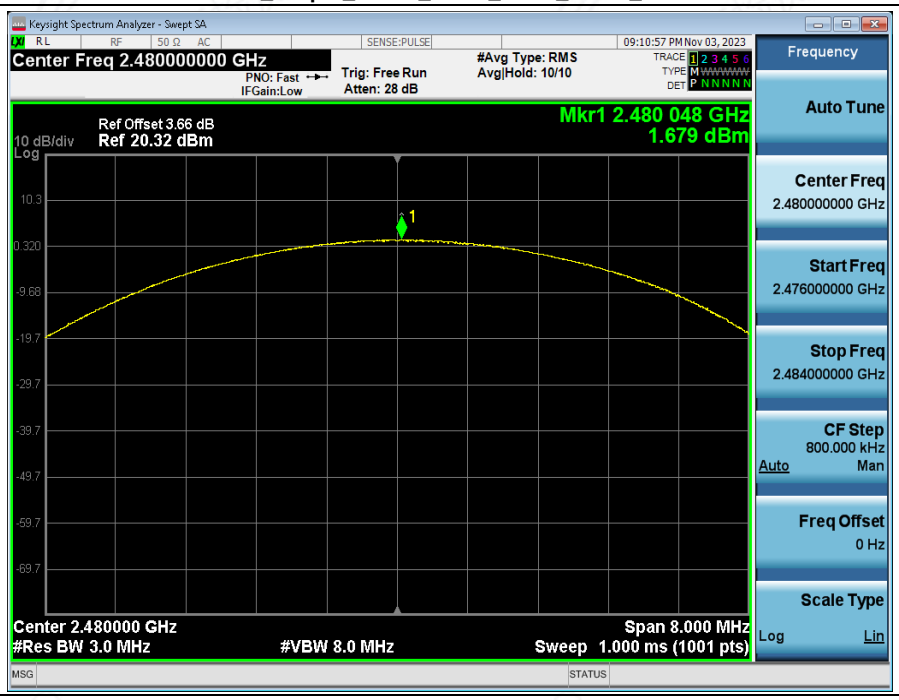
| Peak_Output_Power_NVNT_ANT1_2-DH5_2480 |
| --- |
|  |



| Peak_Output_Power_NVNT_ANT1_3-DH5_2402 |
| --- |
|  |

| Peak_Output_Power_NVNT_ANT1_3-DH5_2441 |
| --- |
|  |



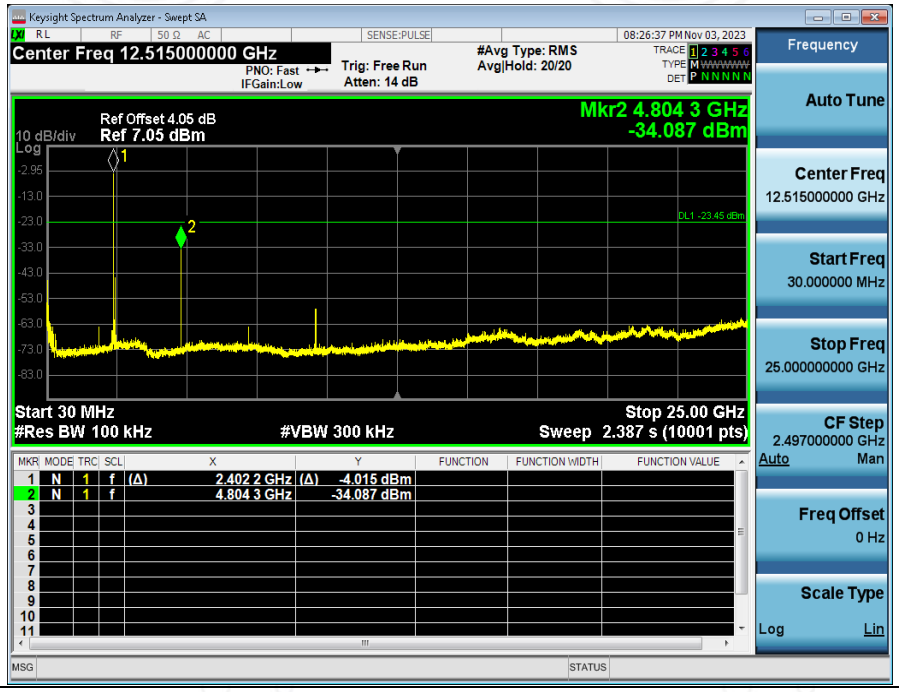
| Peak_Output_Power_NVNT_ANT1_3-DH5_2480 |
| --- |
|  |

## 5. Spurious Emissions

| Condition | Antenna | Modulation | TX Mode | Spurious MAX.Value(dBm) | Limit | Result |
|---|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 2402.00 | -34.087 | -23.454 | Pass |
| NVNT | ANT1 | 1-DH5 | 2441.00 | -34.536 | -21.565 | Pass |
| NVNT | ANT1 | 1-DH5 | 2480.00 | -34.170 | -21.286 | Pass |
| NVNT | ANT1 | 2-DH5 | 2402.00 | -38.065 | -23.464 | Pass |
| NVNT | ANT1 | 2-DH5 | 2441.00 | -34.259 | -21.503 | Pass |
| NVNT | ANT1 | 2-DH5 | 2480.00 | -35.051 | -21.242 | Pass |
| NVNT | ANT1 | 3-DH5 | 2402.00 | -34.918 | -23.430 | Pass |
| NVNT | ANT1 | 3-DH5 | 2441.00 | -34.661 | -21.565 | Pass |
| NVNT | ANT1 | 3-DH5 | 2480.00 | -34.864 | -21.293 | Pass |

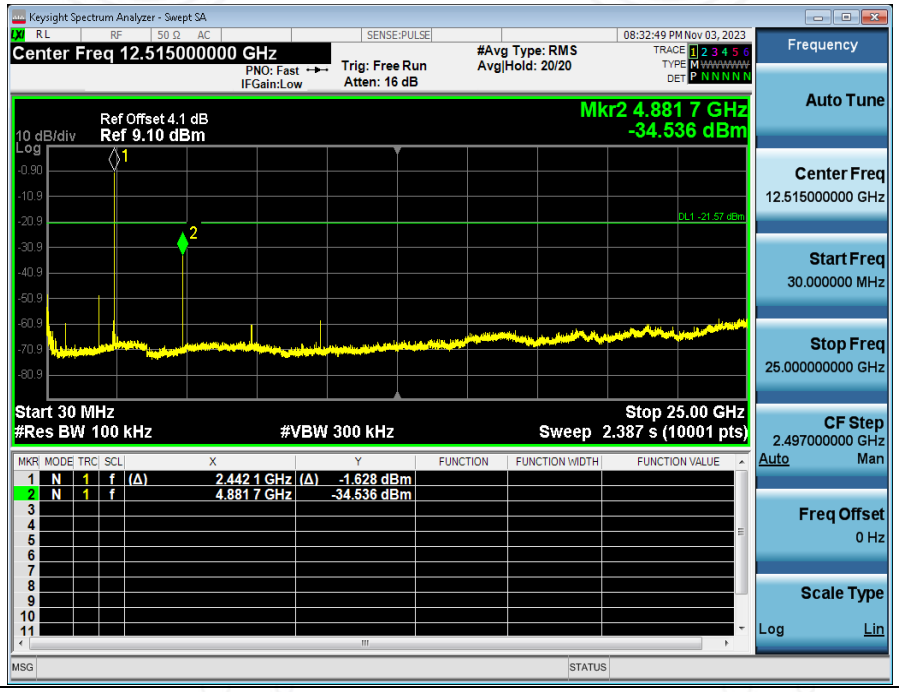
1_Reference_Level_NVNT_ANT1_1-DH5_2402


2_Spurious_Emissions_NVNT_ANT1_1-DH5_2402



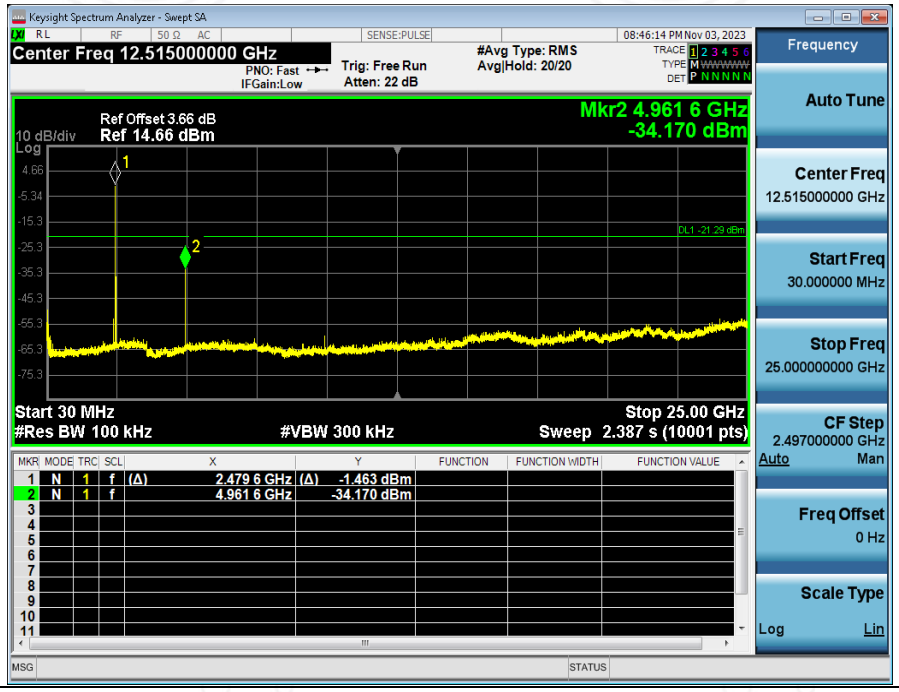

1_Reference_Level_NVNT_ANT1_1-DH5_2441


2_Spurious_Emissions_NVNT_ANT1_1-DH5_2441

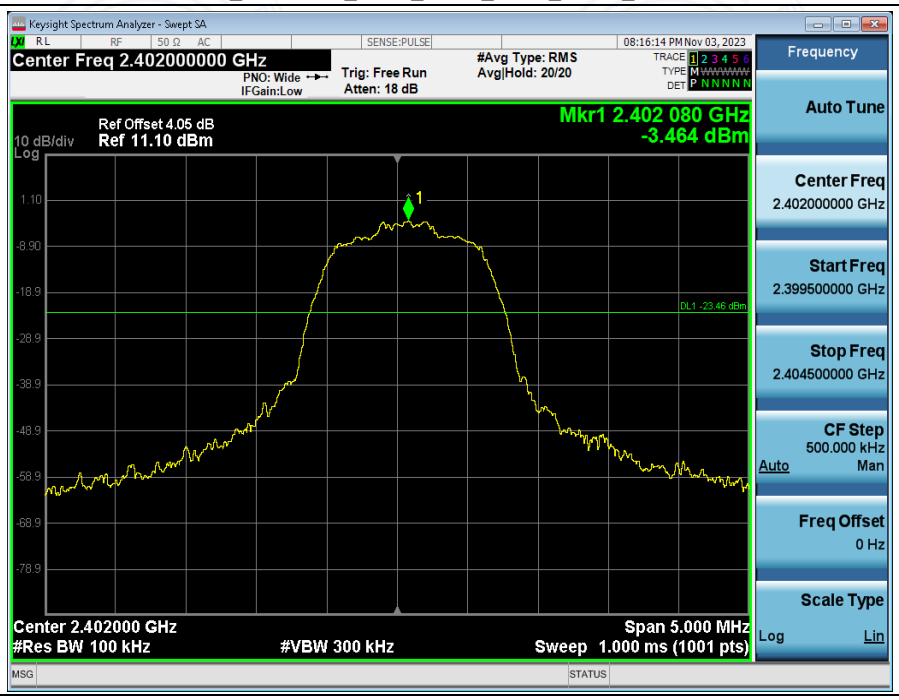



1_Reference_Level_NVNT_ANT1_1-DH5_2480

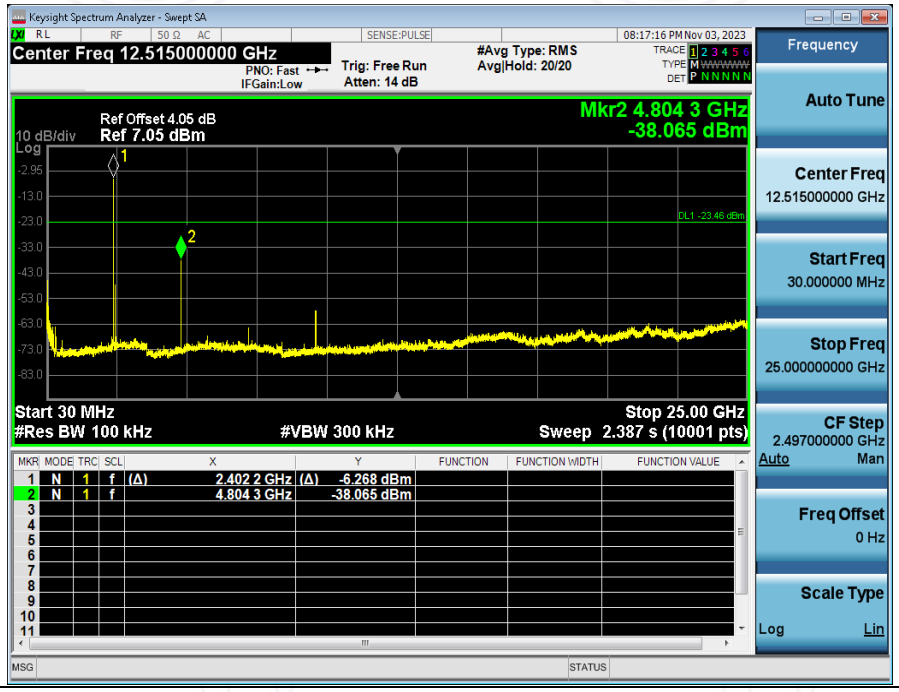

2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480




1_Reference_Level_NVNT_ANT1_2-DH5_2402

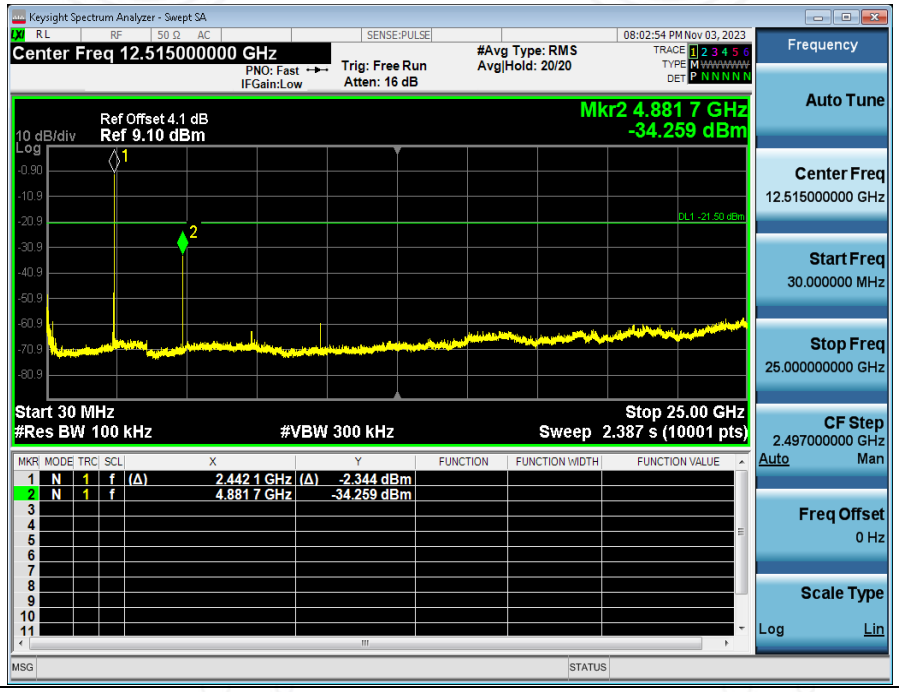



2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402

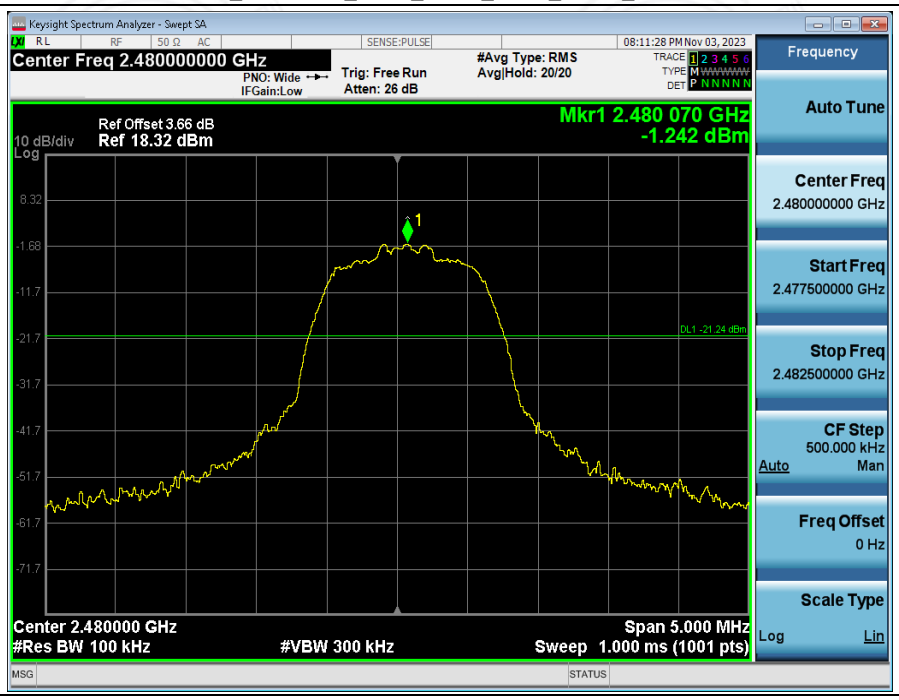



1_Reference_Level_NVNT_ANT1_2-DH5_2441

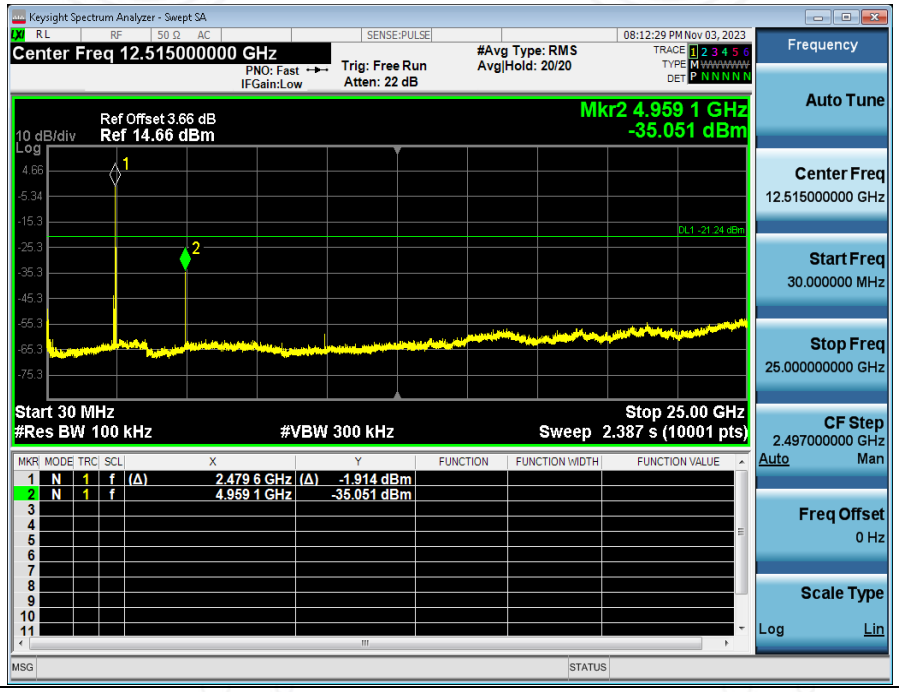

2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441




1_Reference_Level_NVNT_ANT1_2-DH5_2480

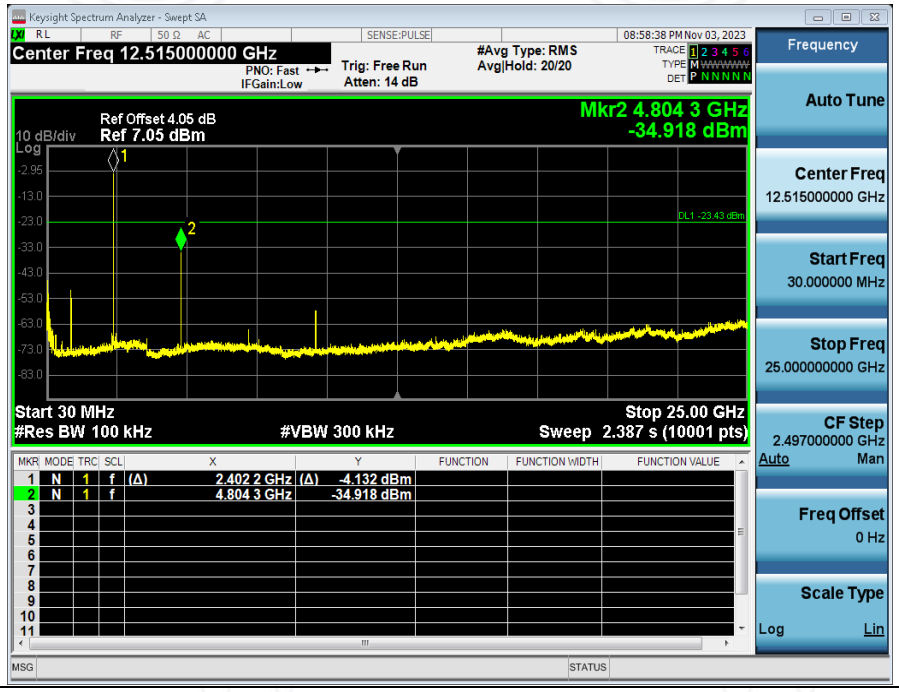



2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480



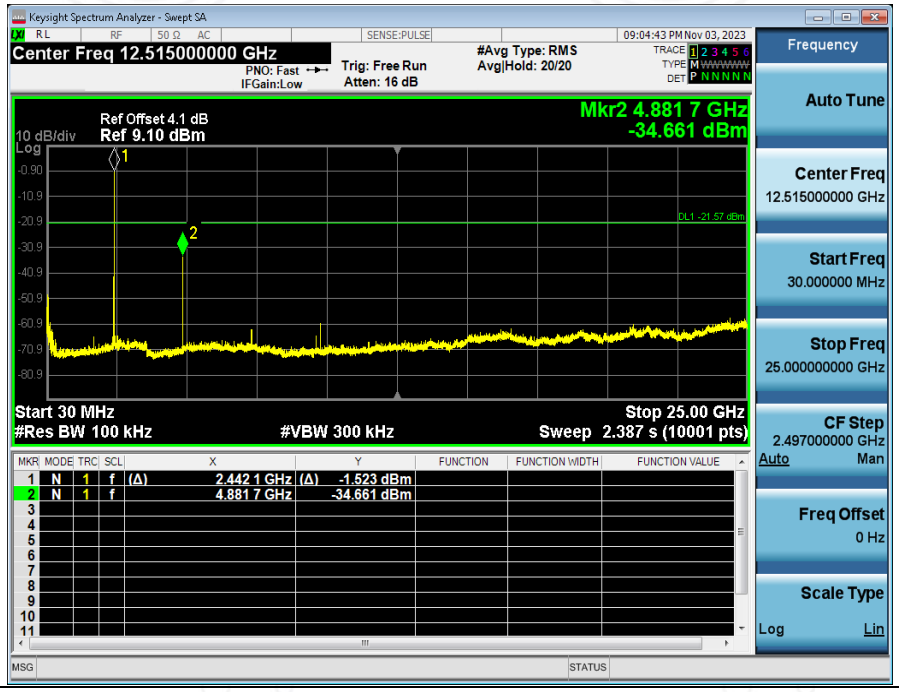

1_Reference_Level_NVNT_ANT1_3-DH5_2402


2_Spurious_Emissions_NVNT_ANT1_3-DH5_2402



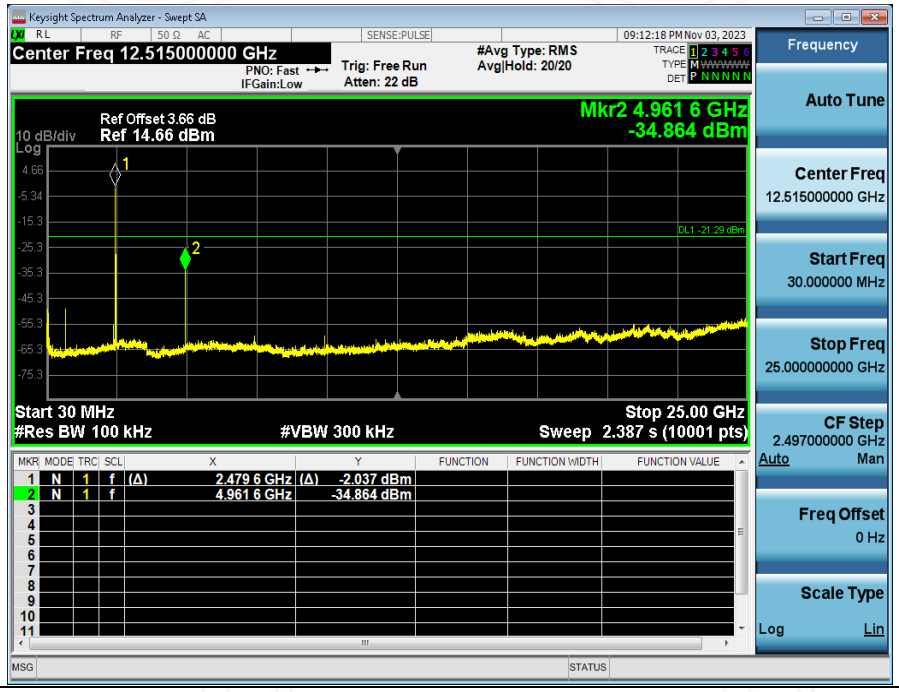

1_Reference_Level_NVNT_ANT1_3-DH5_2441


2_Spurious_Emissions_NVNT_ANT1_3-DH5_2441




1_Reference_Level_NVNT_ANT1_3-DH5_2480


2_Spurious_Emissions_NVNT_ANT1_3-DH5_2480

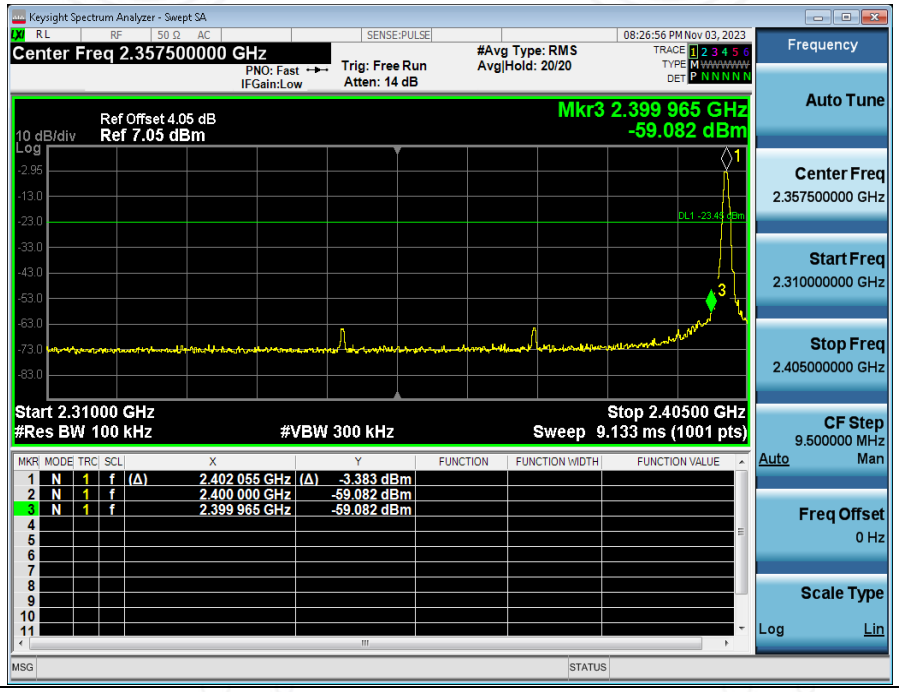

Keysight Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 22 dB
#Avg Type: RMS
Avg|Hold: 20/20
09:12:18 PM Nov 03, 2023
Ref Offset 3.66 dB
10 dB/div
Ref 14.66 dBm
Mkr2 4.961 6 GHz
-34.864 dBm
DL1 -21.29 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (10001 pts)
1 N 1 f (Δ) 2.479 6 GHz (Δ) -2.037 dBm
2 N 1 f 4.961 6 GHz -34.864 dBm
Frequency
Auto Tune
Center Freq
12.515000000 GHz
Start Freq
30.000000 MHz
Stop Freq
25.000000000 GHz
CF Step
2.497000000 GHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin
MSG
STATUS

## 6. Bandedge

| Condition | Antenna | Modulation | TX Mode | Bandedge MAX.Value | Limit | Result |
|---|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 2402.00 | -59.082 | -23.454 | Pass |
| NVNT | ANT1 | 1-DH5 | Hopping_LCH | -61.030 | -20.919 | Pass |
| NVNT | ANT1 | 1-DH5 | 2480.00 | -58.116 | -21.286 | Pass |
| NVNT | ANT1 | 1-DH5 | Hopping_HCH | -61.685 | -21.278 | Pass |
| NVNT | ANT1 | 2-DH5 | 2402.00 | -54.438 | -23.464 | Pass |
| NVNT | ANT1 | 2-DH5 | Hopping_LCH | -54.377 | -20.841 | Pass |
| NVNT | ANT1 | 2-DH5 | 2480.00 | -58.824 | -21.242 | Pass |
| NVNT | ANT1 | 2-DH5 | Hopping_HCH | -62.738 | -21.189 | Pass |
| NVNT | ANT1 | 3-DH5 | 2402.00 | -54.028 | -23.430 | Pass |
| NVNT | ANT1 | 3-DH5 | Hopping_LCH | -60.492 | -20.888 | Pass |
| NVNT | ANT1 | 3-DH5 | 2480.00 | -59.001 | -21.293 | Pass |
| NVNT | ANT1 | 3-DH5 | Hopping_HCH | -62.935 | -21.331 | Pass |

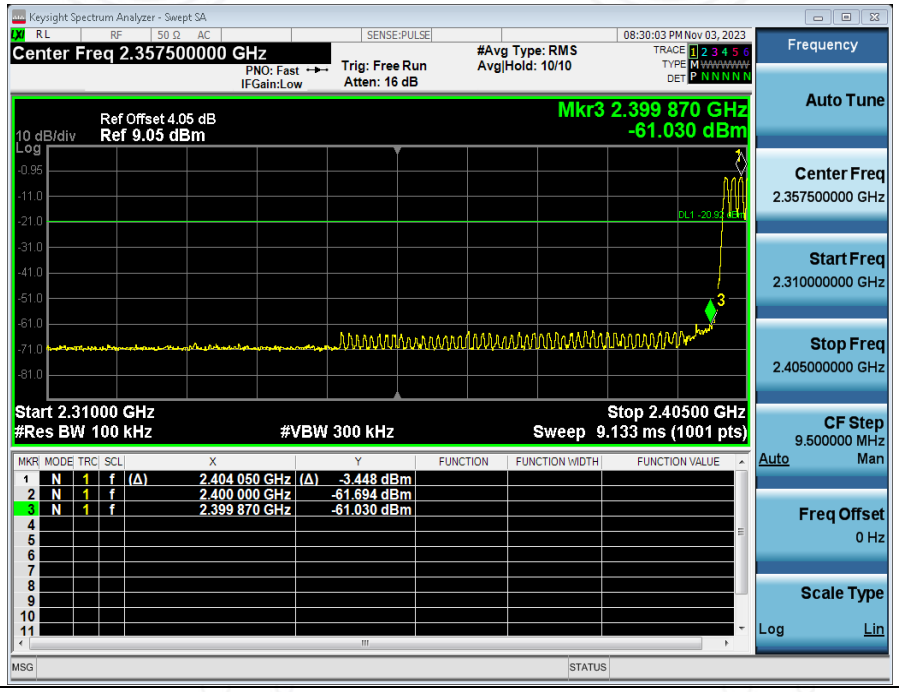
1_Reference_Level_NVNT_ANT1_1-DH5_2402


2_Bandedge_NVNT_ANT1_1-DH5_2402



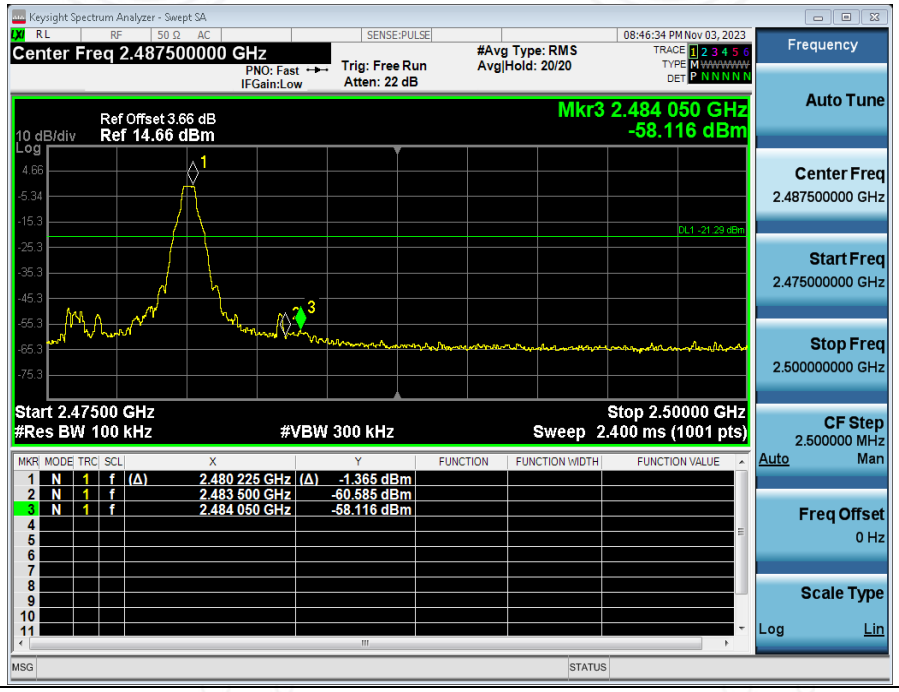

1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping


2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



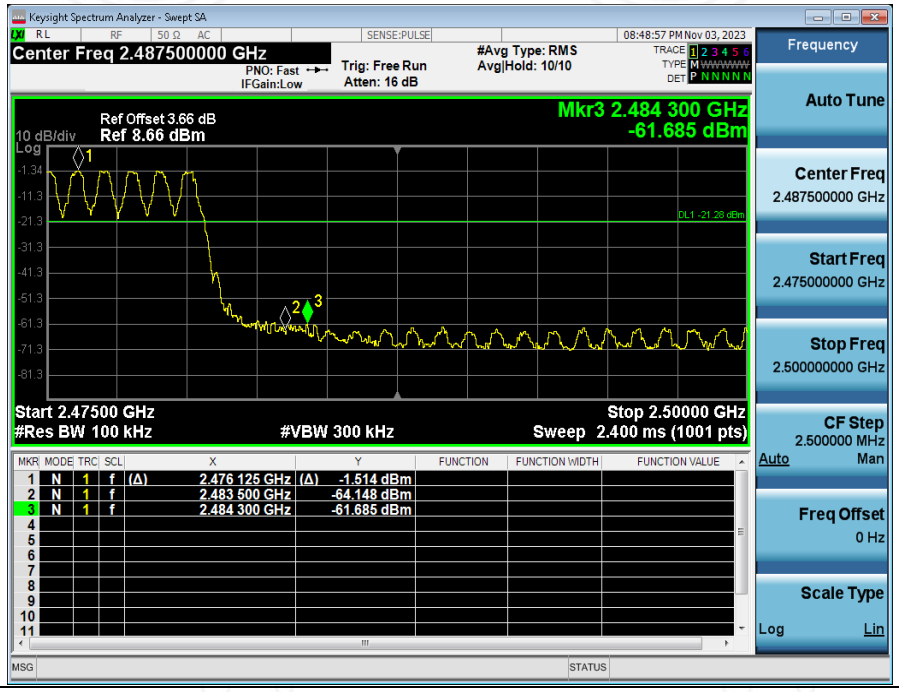

1_Reference_Level_NVNT_ANT1_1-DH5_2480


2_Bandedge_NVNT_ANT1_1-DH5_2480

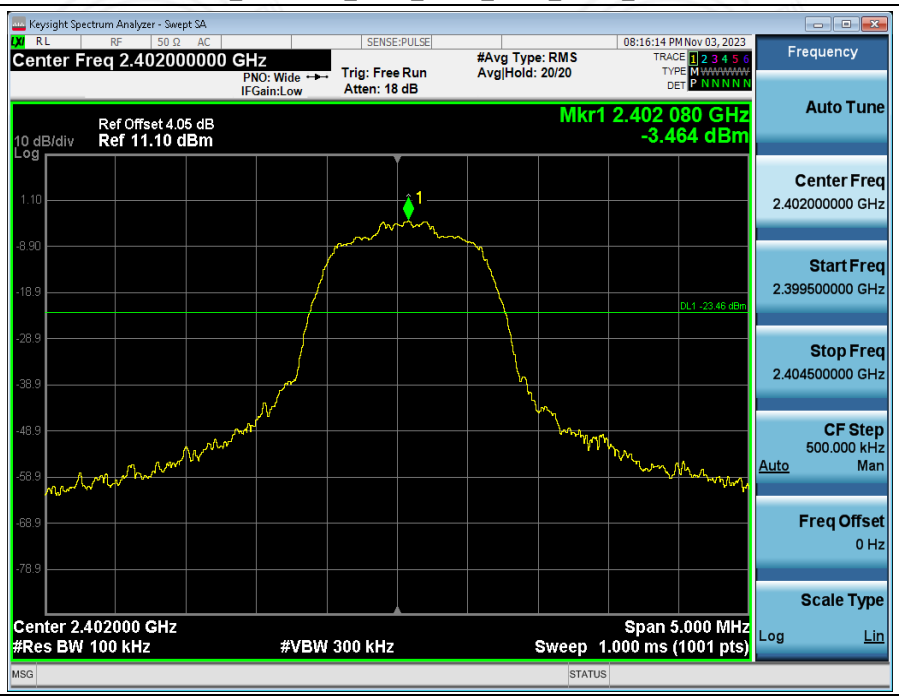



1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

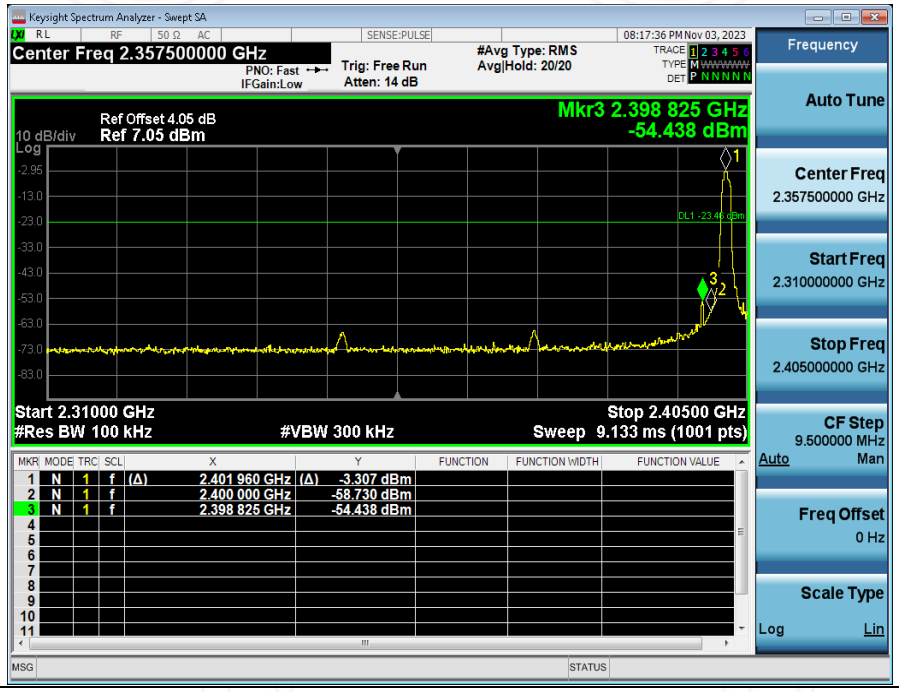

2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



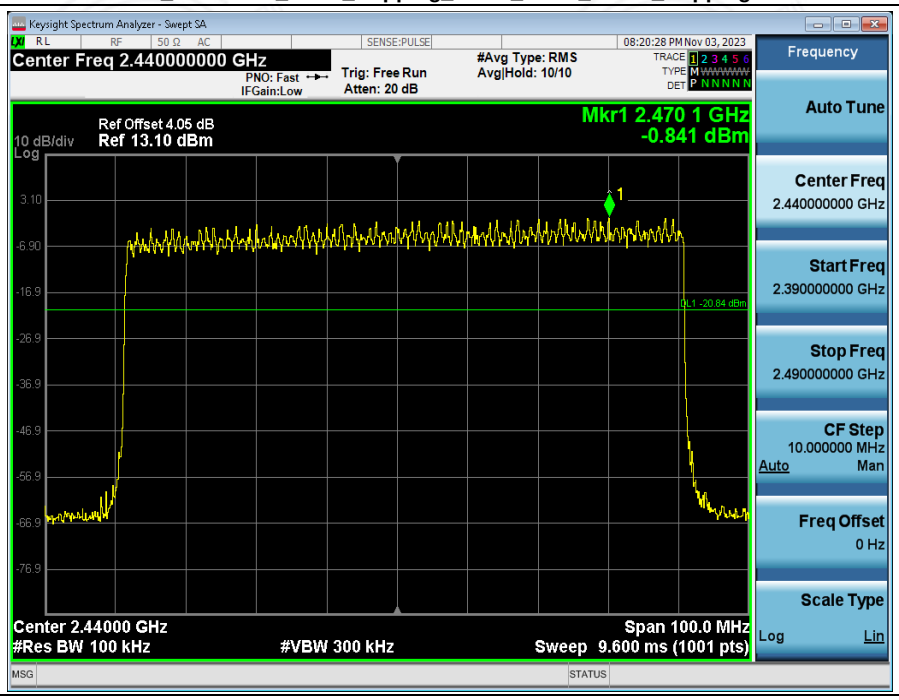

1_Reference_Level_NVNT_ANT1_2-DH5_2402



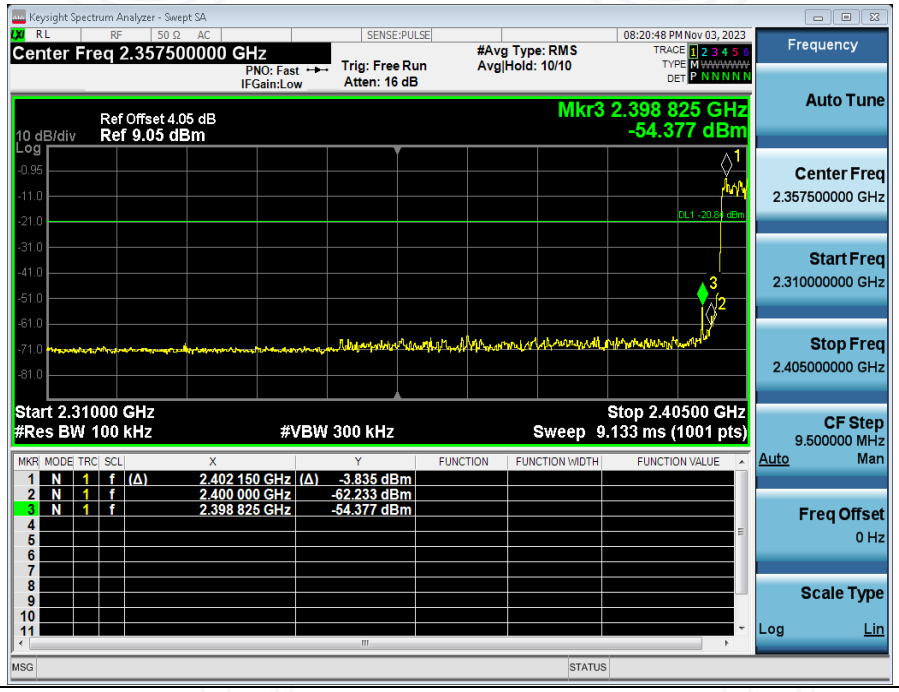

2_Bandedge_NVNT_ANT1_2-DH5_2402



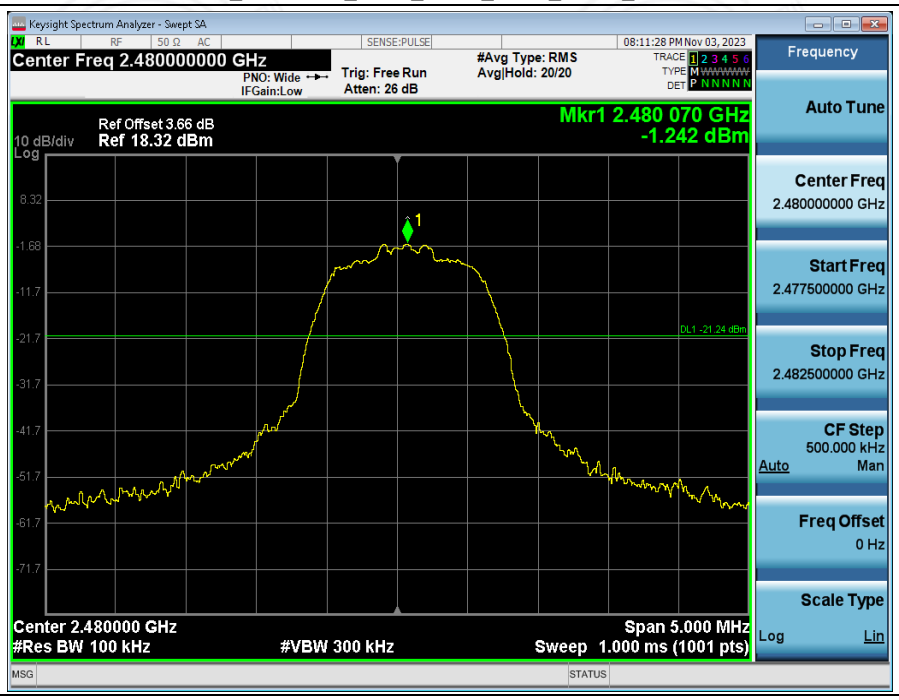

1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping



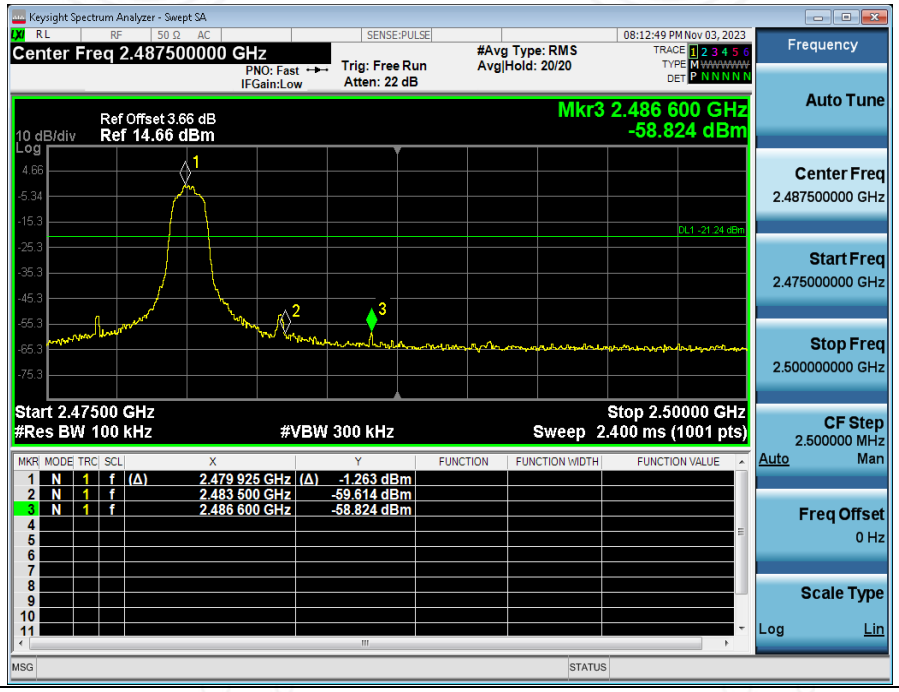

2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



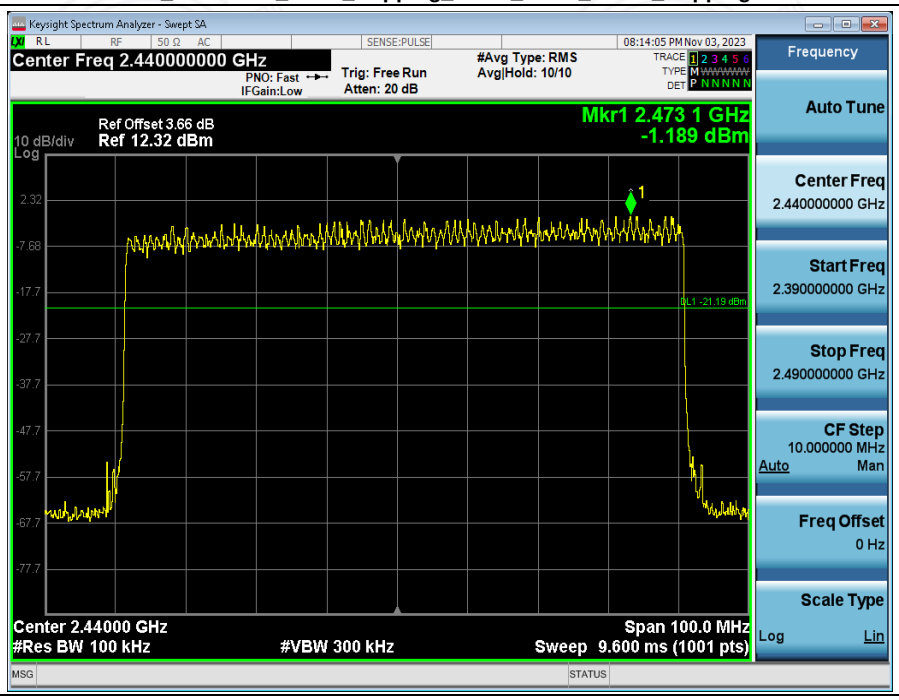

1_Reference_Level_NVNT_ANT1_2-DH5_2480



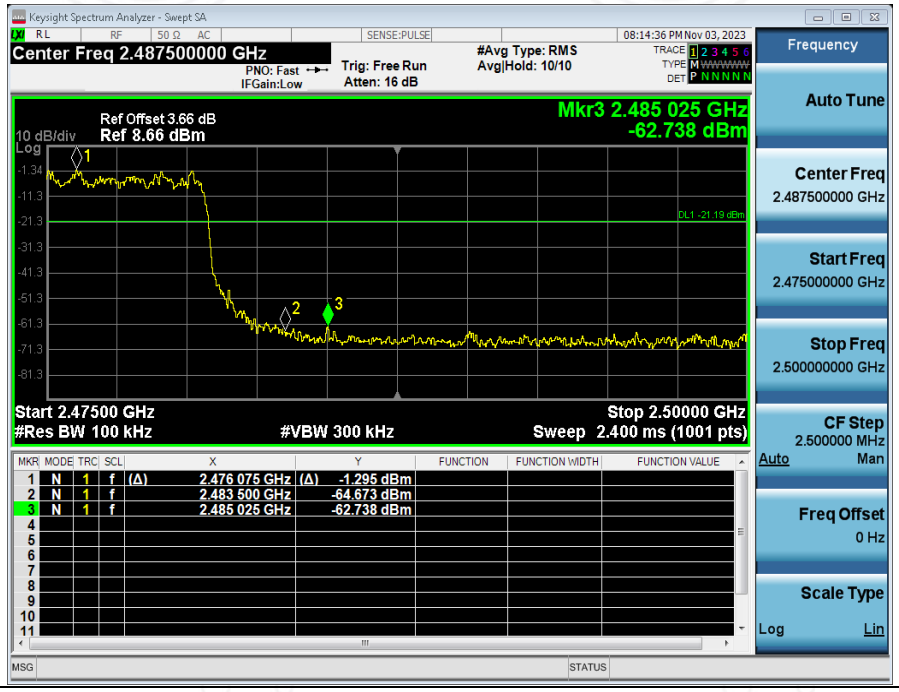

2_Bandedge_NVNT_ANT1_2-DH5_2480




1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping

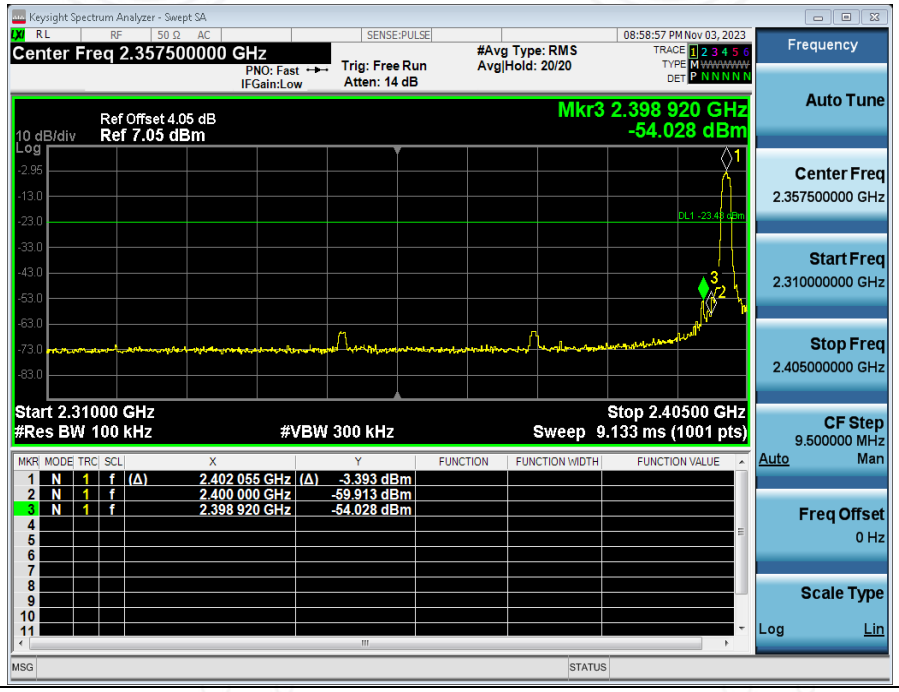



2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping

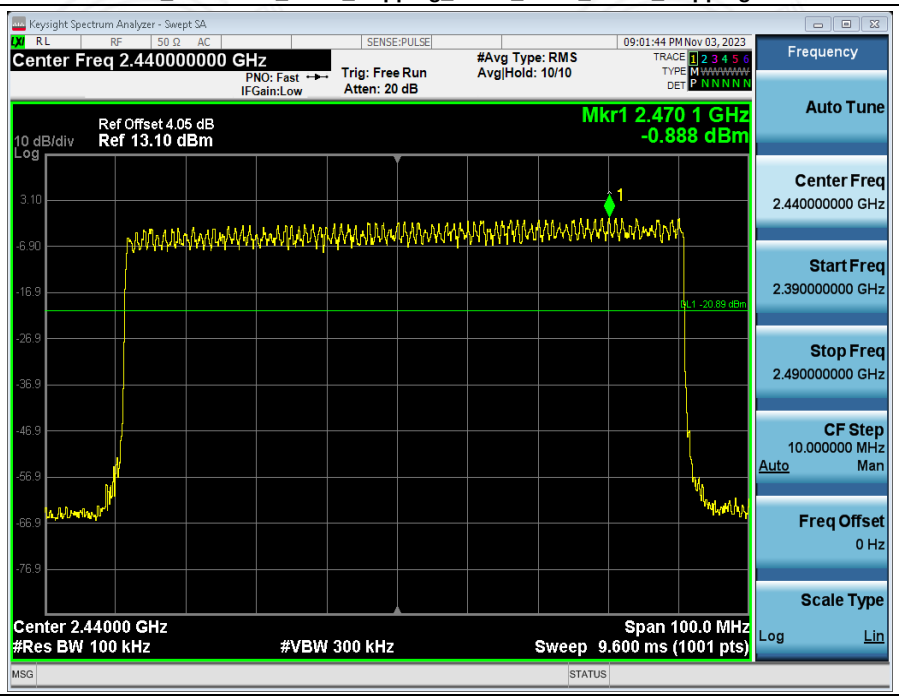



1_Reference_Level_NVNT_ANT1_3-DH5_2402

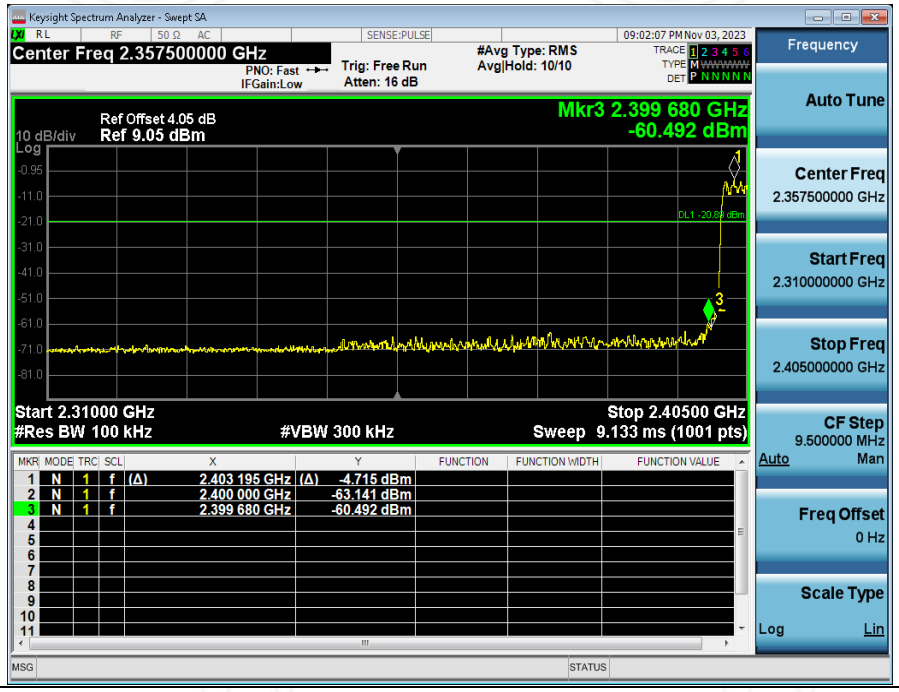

2_Bandedge_NVNT_ANT1_3-DH5_2402




1_Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping

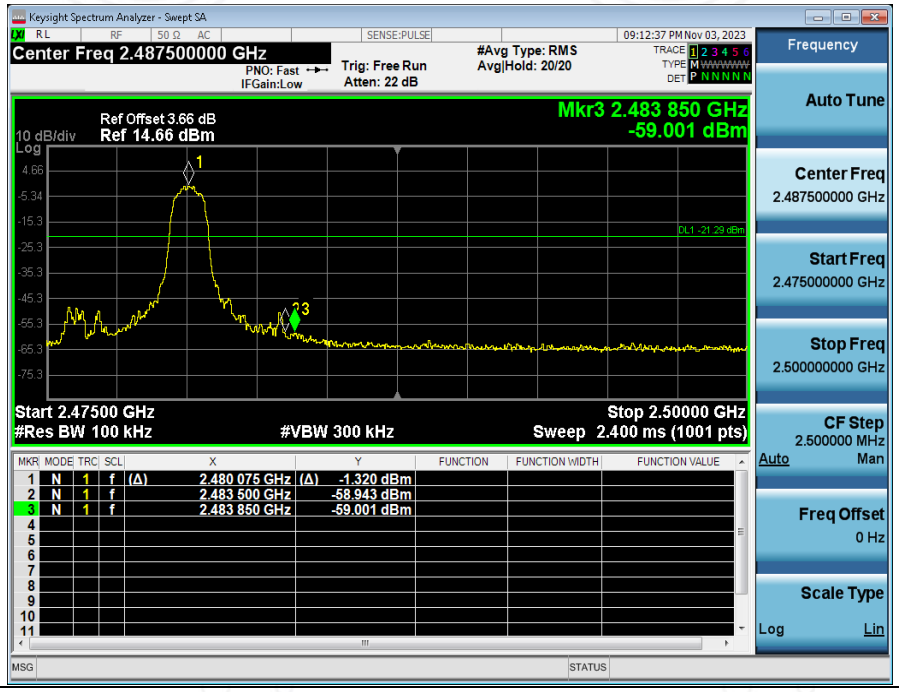



2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping

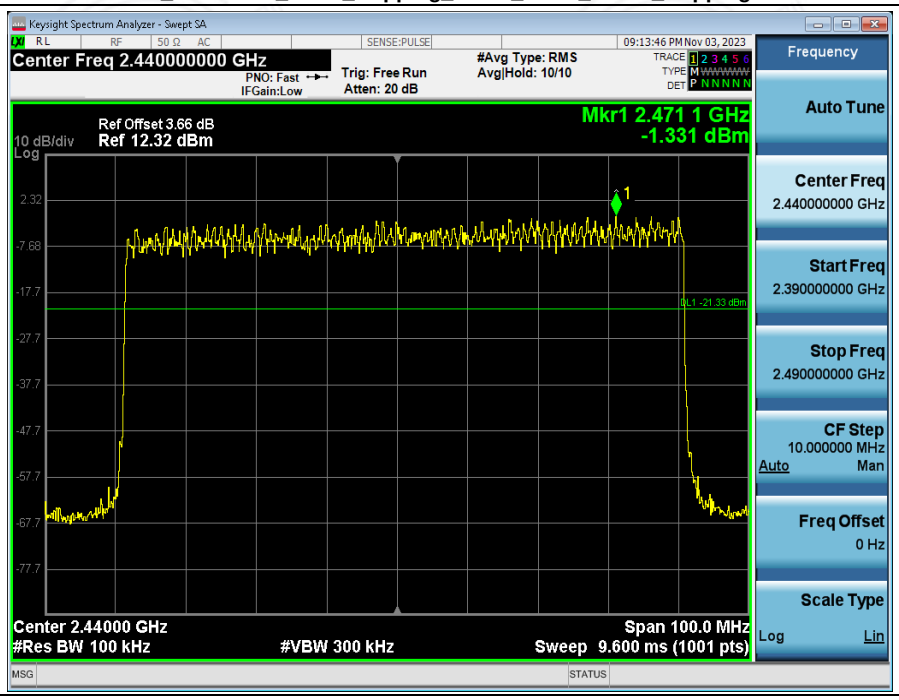



1_Reference_Level_NVNT_ANT1_3-DH5_2480

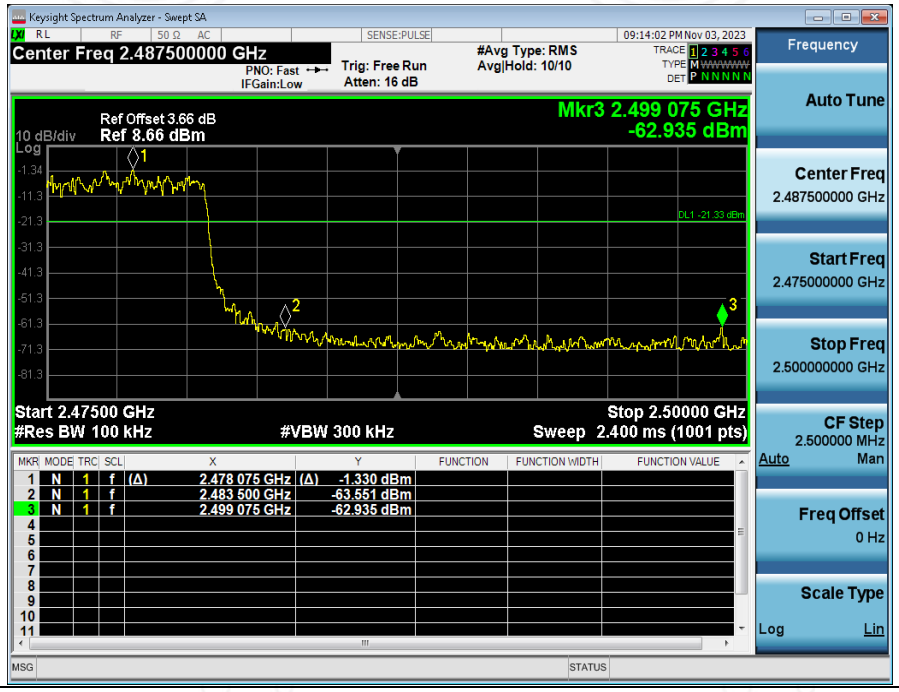

2_Bandedge_NVNT_ANT1_3-DH5_2480




1_Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping



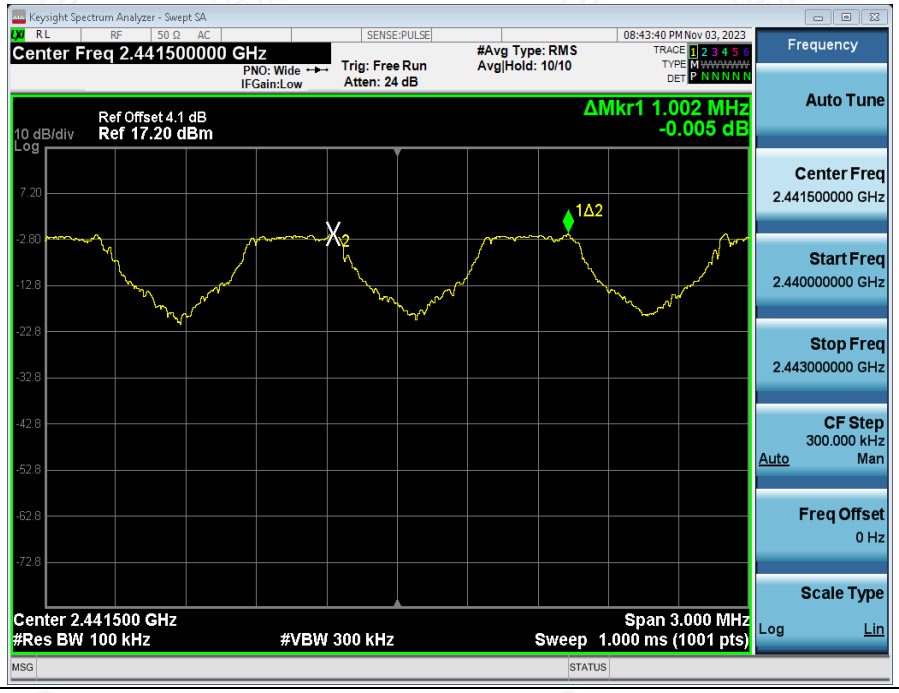

2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.487500000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 16 dB
#Avg Type: RMS
Avg|Hold: 10/10
09:14:02 PM Nov 03, 2023
Ref Offset 3.66 dB
10 dB/div
Ref 8.66 dBm
Log
Mkr3 2.499 075 GHz
-62.935 dBm
DL1 -21.33 dBm
Start 2.47500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.400 ms (1001 pts)
1 N 1 f (Δ) 2.478 075 GHz (Δ) -1.330 dBm
2 N 1 f 2.483 500 GHz -63.551 dBm
3 N 1 f 2.499 075 GHz -62.935 dBm
Frequency
Auto Tune
Center Freq
2.487500000 GHz
Start Freq
2.475000000 GHz
Stop Freq
2.500000000 GHz
CF Step
2.500000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin
MSG
STATUS

## 7. Carrier Frequencies Separation (Hopping)

| Condition | Antenna | Modulation | Frequency(MHz) | Hopping NO.0 (MHz) | Hopping NO.1 (MHz) | Carrier Frequencies Separation(MHz) | Limit(MHz) | Result |
|---|---|---|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 2441.00 | 2441.227 | 2442.229 | 1.00 | 0.931 | Pass |
| NVNT | ANT1 | 2-DH5 | 2441.00 | 2441.068 | 2442.070 | 1.00 | 0.856 | Pass |
| NVNT | ANT1 | 3-DH5 | 2441.00 | 2441.068 | 2442.070 | 1.00 | 0.871 | Pass |

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_1-DH5_Hopping




Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_2-DH5_Hopping

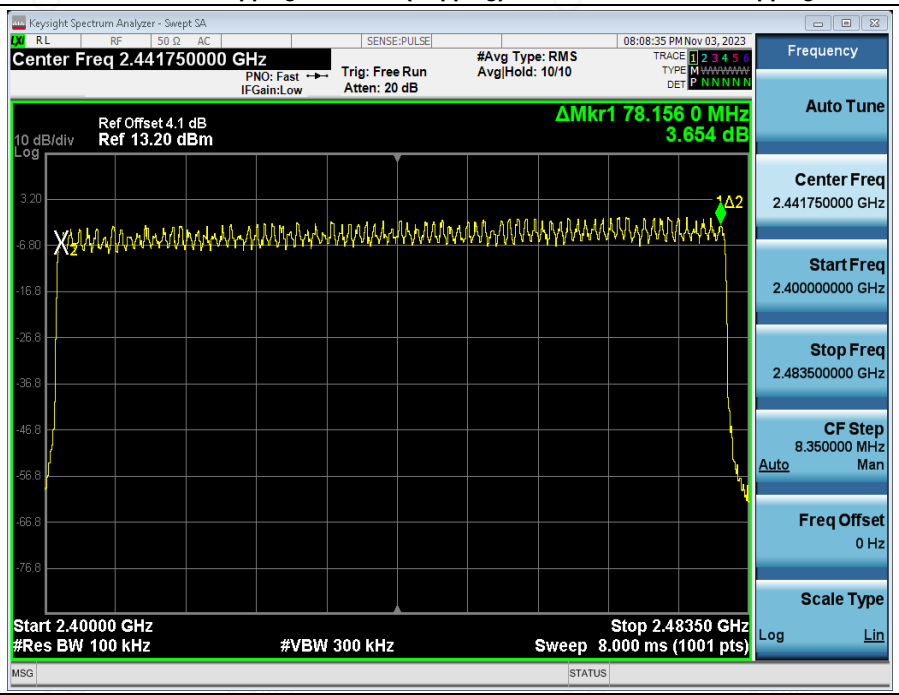
| Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_3-DH5_Hopping |
| --- |
|  |

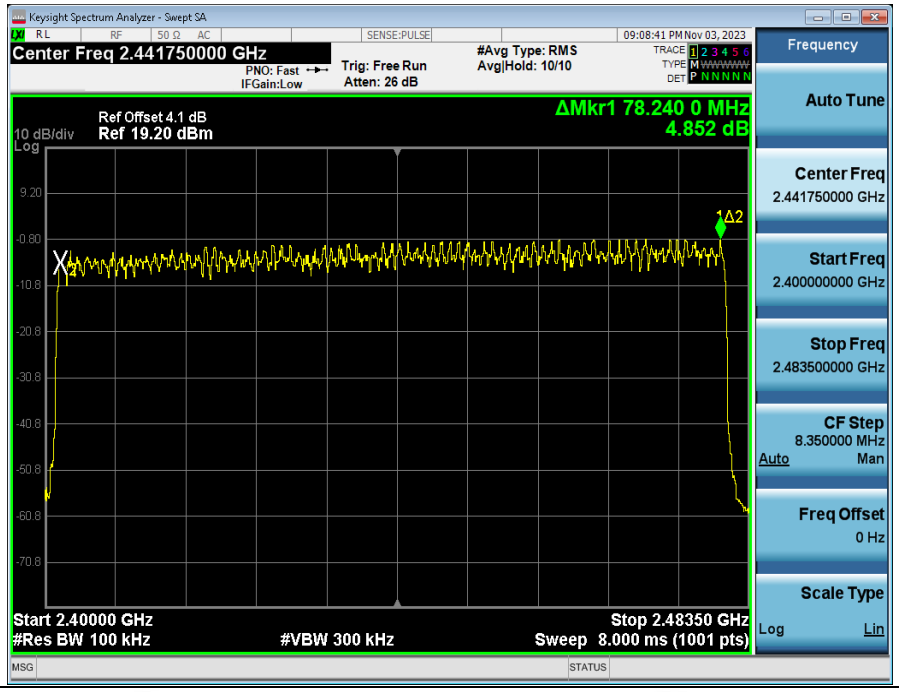
## 8. Number of Hopping Channel (Hopping)

| Condition | Antenna | Modulation | Hopping Num | Limit | Result |
|---|---|---|---|---|---|
| NVNT | ANT1 | 1-DH5 | 79 | 15 | Pass |
| NVNT | ANT1 | 2-DH5 | 79 | 15 | Pass |
| NVNT | ANT1 | 3-DH5 | 79 | 15 | Pass |

Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_1-DH5_Hopping


Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_2-DH5_Hopping



| Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_3-DH5_Hopping |
| --- |
|  |



- End of the Report -