

**CFR 47 FCC PART 15 SUBPART C(DSS)**

**TEST REPORT**

*For*

**BlueTooth Earphone**

**MODEL NUMBER: K3C0005**

**REPORT NUMBER: E04A24060048F00101**

**ISSUE DATE: July 5, 2024**

**FCC ID: 2BB27-K3C0005**

*Prepared for*

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**This report is based on a single evaluation of the submitted sample(s) of the above mentioned  
Product, it does not imply an assessment of the production of the products.**

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Global Testing Technology Co., Ltd.**

Revision History

| Rev. | Issue Date   | Revisions     | Revised By |
|------|--------------|---------------|------------|
| V0   | July 5, 2024 | Initial Issue |            |

### Summary of Test Results

| Test Item                                | Clause                                        | Limit/Requirement                  | Result |
|------------------------------------------|-----------------------------------------------|------------------------------------|--------|
| Antenna Requirement                      | N/A                                           | FCC Part 15.203/15.247 (c)         | Pass   |
| AC Power Line Conducted Emission         | ANSI C63.10-2013 Clause 6.2                   | FCC Part 15.207                    | Pass   |
| Conducted Output Power                   | ANSI C63.10-2013 Clause 7.8.5                 | FCC Part 15.247 (b)(1)             | Pass   |
| 20 dB Bandwidth                          | ANSI C63.10-2013 Clause 6.9.2                 | FCC Part 15.247 (a)(1)             | Pass   |
| Carrier Hopping Channel Separation       | ANSI C63.10-2013 Clause 7.8.2                 | FCC Part 15.247 (a)(1)             | Pass   |
| Number of Hopping Frequency              | ANSI C63.10-2013 Clause 7.8.3                 | FCC Part 15.247 (b)(1)             | Pass   |
| Time of Occupancy (Dwell Time)           | ANSI C63.10-2013 Clause 7.8.4                 | FCC Part 15.247 (a)(1)             | Pass   |
| Conducted Bandedge and Spurious Emission | ANSI C63.10-2013 Clause 6.10.4 & Clause 7.8.8 | FCC Part 15.247(d)                 | Pass   |
| Radiated Band edge and Spurious Emission | ANSI C63.10-2013 Clause 6.3 & 6.5 & 6.6       | FCC Part 15.205/15.209             | Pass   |
| Duty Cycle                               | ANSI C63.10-2013, Clause 11.6                 | None; for reporting purposes only. | Pass   |

\*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

\*The measurement result for the sample received is <Pass> according to <CFR 47 FCC PART 15 SUBPART C(DSS)> when <Accuracy Method> decision rule is applied.

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## 1. ATTESTATION OF TEST RESULTS

### Applicant Information

Company Name: Foshan Heizuan Trading Co., Ltd  
Address: One of the first floors of Building A, No. 8, Fengxiugang Industrial Zone, Bichong, Huangqi, Nanhai District, Foshan City

### Manufacturer Information

Company Name: Foshan Heizuan Trading Co., Ltd  
Address: One of the first floors of Building A, No. 8, Fengxiugang Industrial Zone, Bichong, Huangqi, Nanhai District, Foshan City

### EUT Information

Product Description: BlueTooth Earphone  
Model: K3C0005  
Series Model: N/A  
Brand: N/A  
Sample Received Date: June 06, 2024  
Sample Status: Normal  
Sample ID: A24060048 001  
Date of Tested: June 06, 2024 to June 11, 2024

| APPLICABLE STANDARDS              |              |
|-----------------------------------|--------------|
| STANDARD                          | TEST RESULTS |
| CFR 47 FCC PART 15 SUBPART C(DSS) | Pass         |

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## 2. TEST METHODOLOGY

All tests were performed in accordance with the standard CFR 47 FCC PART 15 SUBPART C(DSS)

## 3. FACILITIES AND ACCREDITATION

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accreditation Certificate | <p><b>A2LA (Certificate No.: 6947.01)</b><br/>Guangdong Global Testing Technology Co., Ltd.<br/>has been assessed and proved to be in compliance with A2LA.</p> <p><b>FCC (FCC Designation No.: CN1343)</b><br/>Guangdong Global Testing Technology Co., Ltd.<br/>has been recognized to perform compliance testing on equipment<br/>subject to Supplier's Declaration of Conformity (SDoC) and<br/>Certification rules</p> <p><b>ISED (Company No.: 30714)</b><br/>Guangdong Global Testing Technology Co., Ltd.<br/>has been registered and fully described in a report filed with ISED.<br/>The Company Number is 30714 and the test lab Conformity<br/>Assessment Body Identifier (CABID) is CN0148.</p> |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Test Items                                                                                                                                       | k    | Uncertainty                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------|
| DTS Bandwidth                                                                                                                                    | 1.96 | ±9.2 PPM                                                                                                    |
| 20dB Emission Bandwidth                                                                                                                          | 1.96 | ±9.2 PPM                                                                                                    |
| Carrier Frequency Separation                                                                                                                     | 1.96 | ±9.2 PPM                                                                                                    |
| Time of Occupancy                                                                                                                                | 1.96 | ±0.57%                                                                                                      |
| Conducted Output Power                                                                                                                           | 1.96 | ±1.5 dB                                                                                                     |
| Power Spectral Density Level                                                                                                                     | 1.96 | ±1.9 dB                                                                                                     |
| Conducted Spurious Emission                                                                                                                      | 1.96 | 9 kHz-30 MHz: ± 0.95 dB<br>30 MHz-1 GHz: ± 1.5 dB<br>1GHz-12.75GHz: ± 1.8 dB<br>12.75 GHz-26.5 GHz: ± 2.1dB |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96. |      |                                                                                                             |

| Test Item                                                                                                                                     | Measurement Frequency Range | K | U(dB) |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---|-------|
| Conducted emissions from the AC mains power ports (AMN)                                                                                       | 150 kHz ~ 30 MHz            | 2 | 3.37  |
| Radiated emissions                                                                                                                            | 9 kHz ~ 30 MHz              | 2 | 4.16  |
| Radiated emissions                                                                                                                            | 30 MHz ~ 1 GHz              | 2 | 3.79  |
| Radiated emissions                                                                                                                            | 1 GHz ~ 18 GHz              | 2 | 5.62  |
| Radiated emissions                                                                                                                            | 18 GHz ~ 40 GHz             | 2 | 5.54  |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. |                             |   |       |

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

|                  |         |                                                             |
|------------------|---------|-------------------------------------------------------------|
| EUT Name         |         | BlueTooth Earphone                                          |
| Model            |         | K3C0005                                                     |
| Series Model     |         | N/A                                                         |
| Model Difference |         | N/A                                                         |
| Hardware Version |         | V1.0                                                        |
| Software Version |         | V1.0                                                        |
| Ratings          |         | DC 5V, 1A                                                   |
| Power Supply     | DC      | 5V                                                          |
|                  | Battery | Charging Box: DC 3.7V, 200mAh<br>Headphones: DC 3.7V, 28mAh |

|                       |                                                                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Band:       | 2400 MHz to 2483.5 MHz                                                                                                                           |
| Frequency Range:      | 2402 MHz to 2480 MHz                                                                                                                             |
| Bluetooth Version:    | Bluetooth V5.3                                                                                                                                   |
| Bluetooth Mode:       | Bluetooth BR + EDR                                                                                                                               |
| Modulation Technique: | Frequency Hopping Spread Spectrum(FHSS)                                                                                                          |
| Type of Modulation:   | GFSK, $\pi/4$ -DQPSK                                                                                                                             |
| Number of Channels:   | 79                                                                                                                                               |
| Channel Separation:   | 1 MHz                                                                                                                                            |
| Maximum Peak Power:   | 0.05dBm                                                                                                                                          |
| Antenna Type:         | Chip Antenna                                                                                                                                     |
| Antenna Gain:         | 2.78 dBi                                                                                                                                         |
| Normal Test Voltage:  | 3.7 Vdc                                                                                                                                          |
| EUT Test software:    | FCC_assist_1.0.2.2                                                                                                                               |
| Note:                 | The Antenna Gain was provided by customer, and this information may affect the validity of the results, customer should be responsible for this. |

### 5.2. CHANNEL LIST

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 20      | 2422            | 40      | 2442            | 60      | 2462            |
| 01      | 2403            | 21      | 2423            | 41      | 2443            | 61      | 2463            |
| 02      | 2404            | 22      | 2424            | 42      | 2444            | 62      | 2464            |
| 03      | 2405            | 23      | 2425            | 43      | 2445            | 63      | 2465            |
| 04      | 2406            | 24      | 2426            | 44      | 2446            | 64      | 2466            |
| 05      | 2407            | 25      | 2427            | 45      | 2447            | 65      | 2467            |
| 06      | 2408            | 26      | 2428            | 46      | 2448            | 66      | 2468            |
| 07      | 2409            | 27      | 2429            | 47      | 2449            | 67      | 2469            |
| 08      | 2410            | 28      | 2430            | 48      | 2450            | 68      | 2470            |
| 09      | 2411            | 29      | 2431            | 49      | 2451            | 69      | 2471            |
| 10      | 2412            | 30      | 2432            | 50      | 2452            | 70      | 2472            |

|    |      |    |      |    |      |    |      |
|----|------|----|------|----|------|----|------|
| 11 | 2413 | 31 | 2433 | 51 | 2453 | 71 | 2473 |
| 12 | 2414 | 32 | 2434 | 52 | 2454 | 72 | 2474 |
| 13 | 2415 | 33 | 2435 | 53 | 2455 | 73 | 2475 |
| 14 | 2416 | 34 | 2436 | 54 | 2456 | 74 | 2476 |
| 15 | 2417 | 35 | 2437 | 55 | 2457 | 75 | 2477 |
| 16 | 2418 | 36 | 2438 | 56 | 2458 | 76 | 2478 |
| 17 | 2419 | 37 | 2439 | 57 | 2459 | 77 | 2479 |
| 18 | 2420 | 38 | 2440 | 58 | 2460 | 78 | 2480 |
| 19 | 2421 | 39 | 2441 | 59 | 2461 | /  | /    |

### 5.3. MAXIMUM PEAK OUTPUT POWER

| Test Mode      | Frequency (MHz) | Channel Number | Maximum Peak Output Power (dBm) | Maximum EIRP (dBm) |
|----------------|-----------------|----------------|---------------------------------|--------------------|
| GFSK           | 2402 ~ 2480     | 0-78[79]       | -0.77                           | /                  |
| $\pi/4$ -DQPSK | 2402 ~ 2480     | 0-78[79]       | 0.05                            | /                  |

### 5.4. TEST CHANNEL CONFIGURATION

| Test Mode      | Test Channel                                               | Frequency                    |
|----------------|------------------------------------------------------------|------------------------------|
| GFSK           | CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel) | 2402 MHz, 2441 MHz, 2480 MHz |
| $\pi/4$ -DQPSK | CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel) | 2402 MHz, 2441 MHz, 2480 MHz |

Note: The hop is hopping mode.

### PACKET TYPE CONFIGURATION

| Test Mode      | Packet Type | Setting (Packet Length) |
|----------------|-------------|-------------------------|
| GFSK           | DH1         | 27                      |
|                | DH3         | 183                     |
|                | DH5         | 339                     |
| $\pi/4$ -DQPSK | 2-DH1       | 54                      |
|                | 2-DH3       | 367                     |
|                | 2-DH5       | 679                     |

### 5.5. THE WORSE CASE POWER SETTING PARAMETER

#### WORST-CASE CONFIGURATIONS

| Bluetooth Mode | Modulation Technology | Modulation Type | Data Rate (Mbps) |
|----------------|-----------------------|-----------------|------------------|
| BR             | FHSS                  | GFSK            | 1Mbit/s          |
| EDR            | FHSS                  | $\pi/4$ -DQPSK  | 2Mbit/s          |

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

| The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band |                         |                             |       |       |
|--------------------------------------------------------------------|-------------------------|-----------------------------|-------|-------|
| Test Software                                                      |                         | FCC_assist_1.0.2.2          |       |       |
| Modulation Type                                                    | Transmit Antenna Number | Test Software setting value |       |       |
|                                                                    |                         | CH 00                       | CH 39 | CH 78 |
| GFSK                                                               | 1                       | 10                          | 10    | 10    |
| $\pi/4$ -DQPSK                                                     | 1                       | 10                          | 10    | 10    |

## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

| Antenna | Frequency (MHz) | Antenna Type | MAX Antenna Gain (dBi) |
|---------|-----------------|--------------|------------------------|
| 1       | 2402-2480       | Chip         | 2.78                   |

| Test Mode      | Transmit and Receive Mode                    | Description                                              |
|----------------|----------------------------------------------|----------------------------------------------------------|
| GFSK           | <input checked="" type="checkbox"/> 1TX, 1RX | Antenna 1 can be used as transmitting/receiving antenna. |
| $\pi/4$ -DQPSK | <input checked="" type="checkbox"/> 1TX, 1RX | Antenna 1 can be used as transmitting/receiving antenna. |
| Note:          |                                              |                                                          |

## 5.7. SUPPORT UNITS FOR SYSTEM TEST

The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Note        |
|------|-----------|-----------|----------------|------------|-------------|
| E-1  | Adapter   | Xiaomi    | MDY-11-EX      | N/A        | GTG Support |
| E-2  | PC        | Lenovo    | B4650-D002     | M90601U3   | GTG Support |

The following cables were used to form a representative test configuration during the tests.

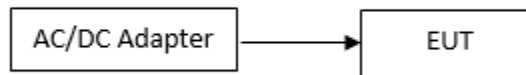
| Item | Type of cable | Shielded Type | Ferrite Core    | Length |
|------|---------------|---------------|-----------------|--------|
| C-1  | USB cable     | Shielded      | without ferrite | 1.0 m  |

## 5.8. SETUP DIAGRAM

Radiated emissions:



AC Power Line Conducted Emission:



## 6. MEASURING EQUIPMENT AND SOFTWARE USED

| Test Equipment of Conducted RF      |                 |                      |             |            |            |
|-------------------------------------|-----------------|----------------------|-------------|------------|------------|
| Equipment                           | Manufacturer    | Model No.            | Serial No.  | Last Cal.  | Due Date   |
| Spectrum Analyzer                   | Rohde & Schwarz | FSV40                | 102257      | 2023/09/18 | 2024/09/17 |
| Spectrum Analyzer                   | KEYSIGHT        | N9020A               | MY51285127  | 2023/09/18 | 2024/09/17 |
| EXG Analog Signal Generator         | KEYSIGHT        | N5173B               | MY61253075  | 2023/09/18 | 2024/09/17 |
| Vector Signal Generator             | Rohde & Schwarz | SMM100A              | 101899      | 2023/09/18 | 2024/09/17 |
| RF Control box                      | MWRF-test       | MW100-RFCB           | MW220926GTG | 2023/09/18 | 2024/09/17 |
| Wideband Radio Communication Tester | Rohde & Schwarz | CMW270               | 102792      | 2023/09/18 | 2024/09/17 |
| Wideband Radio Communication Tester | Rohde & Schwarz | CMW500               | 103235      | 2023/09/18 | 2024/09/17 |
| temperature humidity chamber        | Espec           | SH-241               | SH-241-2014 | 2023/09/18 | 2024/09/17 |
| RF Test Software                    | MWRF-test       | MTS8310E (Ver. V2/0) | N/A         | N/A        | N/A        |

| Test Equipment of Radiated emissions below 1GHz |                 |                         |            |            |            |
|-------------------------------------------------|-----------------|-------------------------|------------|------------|------------|
| Equipment                                       | Manufacturer    | Model No.               | Serial No. | Last Cal.  | Due Date   |
| 3m Semi-anechoic Chamber                        | ETS             | 9m*6m*6m                | Q2146      | 2022/08/30 | 2025/08/29 |
| EMI Test Receiver                               | Rohde & Schwarz | ESCI3                   | 101409     | 2023/09/18 | 2024/09/17 |
| Spectrum Analyzer                               | KEYSIGHT        | N9020A                  | MY51283932 | 2023/09/18 | 2024/09/17 |
| Pre-Amplifier                                   | HzEMC           | HPA-9K0130              | HYP A21001 | 2023/09/18 | 2024/09/17 |
| Biconilog Antenna                               | Schwarzbeck     | VULB 9168               | 01315      | 2022/10/10 | 2025/10/09 |
| Biconilog Antenna                               | ETS             | 3142E                   | 00243646   | 2022/03/23 | 2025/03/22 |
| Loop Antenna                                    | ETS             | 6502                    | 243668     | 2022/03/30 | 2025/03/29 |
| Test Software                                   | Farad           | EZ-EMC (Ver.FA-03A2 RE) | N/A        | N/A        | N/A        |

| Test Equipment of Radiated emissions above 1GHz |                 |            |            |            |            |
|-------------------------------------------------|-----------------|------------|------------|------------|------------|
| Equipment                                       | Manufacturer    | Model No.  | Serial No. | Last Cal.  | Due Date   |
| 3m Semi-anechoic Chamber                        | ETS             | 9m*6m*6m   | Q2149      | 2022/08/30 | 2025/08/29 |
| Spectrum Analyzer                               | Rohde & Schwarz | FSV40      | 101413     | 2023/09/18 | 2024/09/17 |
| Spectrum Analyzer                               | KEYSIGHT        | N9020A     | MY51283932 | 2023/09/18 | 2024/09/17 |
| Pre-Amplifier                                   | A-INFO          | HPA-1G1850 | HYP A21003 | 2023/09/18 | 2024/09/17 |
| Horn antenna                                    | A-INFO          | 3117       | 246069     | 2022/03/11 | 2025/03/10 |
| Pre-Amplifier                                   | ZKJC            | HPA-184057 | HYP A21004 | 2023/09/18 | 2024/09/17 |

|               |       |                                |        |            |            |
|---------------|-------|--------------------------------|--------|------------|------------|
| Horn antenna  | ZKJC  | 3116C                          | 246265 | 2022/03/29 | 2025/03/28 |
| Test Software | Farad | EZ-EMC<br>(Ver.FA-03A2<br>RE+) | N/A    | N/A        | N/A        |

| Test Equipment of Conducted emissions |                    |                                    |            |            |            |
|---------------------------------------|--------------------|------------------------------------|------------|------------|------------|
| Equipment                             | Manufacturer       | Model No.                          | Serial No. | Last Cal.  | Due Date   |
| Shielded Room                         | CHENG YU           | 8m*5m*4m                           | N/A        | 2022/10/29 | 2025/10/28 |
| EMI Test Receiver                     | Rohde &<br>Schwarz | ESR3                               | 102647     | 2023/09/18 | 2024/09/17 |
| LISN/AMN                              | Rohde &<br>Schwarz | ENV216                             | 102843     | 2023/09/18 | 2024/09/17 |
| NNLK 8129 RC                          | Schwarzbeck        | NNLK 8129 RC                       | 5046       | 2023/09/18 | 2024/09/17 |
| Test Software                         | Farad              | EZ-EMC (Ver.<br>EMC-con-3A1<br>1+) | N/A        | N/A        | N/A        |

## 7. ANTENNA PORT TEST RESULTS

### 7.1. CONDUCTED OUTPUT POWER

#### LIMITS

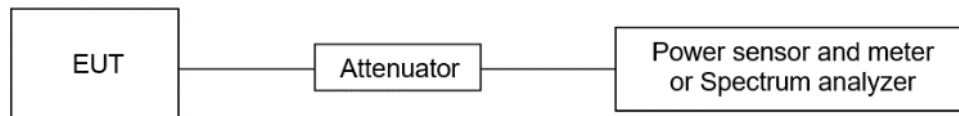
| CFR 47 FCC Part15 (15.247) Subpart C |                           |                  |                       |
|--------------------------------------|---------------------------|------------------|-----------------------|
| Section                              | Test Item                 | Limit            | Frequency Range (MHz) |
| CFR 47 FCC 15.247(b)(3)              | Peak Conduct Output Power | 1 watt or 30 dBm | 2400-2483.5           |

#### TEST PROCEDURE

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).

Measure peak emission level, the indicated level is the peak output power, after any corrections for external attenuators and cables.

#### TEST SETUP



#### TEST ENVIRONMENT

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

#### TEST RESULTS

Please refer to section "Test Data" - Appendix A

## 7.2. 20 DB BANDWIDTH

### LIMITS

| CFR 47FCC Part15 (15.247) Subpart C |                 |                                    |                       |
|-------------------------------------|-----------------|------------------------------------|-----------------------|
| Section                             | Test Item       | Limit                              | Frequency Range (MHz) |
| CFR 47 FCC 15.247 (a) (1)           | 20 dB Bandwidth | None; for reporting purposes only. | 2400-2483.5           |

### TEST PROCEDURE

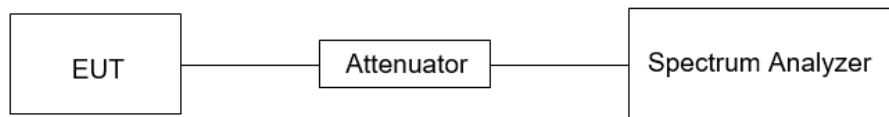
Refer to ANSI C63.10-2013 clause 6.9.2.

Connect the EUT to the spectrum analyser and use the following settings:

|                  |                                                        |
|------------------|--------------------------------------------------------|
| Center Frequency | The center frequency of the channel under test         |
| Detector         | Peak                                                   |
| RBW              | For 20 dB Bandwidth: 1 % to 5 % of the 20 dB bandwidth |
| VBW              | For 20 dB Bandwidth: approximately 3×RBW               |
| Span             | Approximately 2 to 3 times the 20dB bandwidth          |
| Trace            | Max hold                                               |
| Sweep            | Auto couple                                            |

a) Use the occupied bandwidth function of the instrument, allow the trace to stabilize and report the measured 20 dB Bandwidth.

### TEST SETUP



### TEST ENVIRONMENT

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

### TEST RESULTS

Please refer to section "Test Data" - Appendix A

### 7.3. CARRIER HOPPING CHANNEL SEPARATION

#### LIMITS

| CFR 47 FCC Part15 (15.247), |                              |                                                                                                                                                                                                                                                                                                                                                                                                         |                       |
|-----------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Section                     | Test Item                    | Limit                                                                                                                                                                                                                                                                                                                                                                                                   | Frequency Range (MHz) |
| CFR 47 FCC 15.247 (a) (1)   | Carrier Frequency Separation | 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.<br>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. | 2400-2483.5           |

#### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.2.

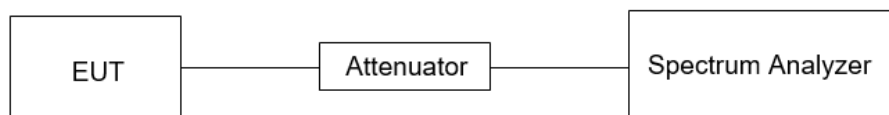
Connect the EUT to the spectrum analyzer and use the following settings:

|                  |                                                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Center Frequency | The center frequency of the channel under test                                                                                                   |
| Span             | wide enough to capture the peaks of two adjacent channels                                                                                        |
| Detector         | Peak                                                                                                                                             |
| RBW              | Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel. |
| VBW              | $\geq$ RBW                                                                                                                                       |
| Trace            | Max hold                                                                                                                                         |
| Sweep time       | Auto couple                                                                                                                                      |

Allow the trace to stabilize and use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Compliance of an EUT with the appropriate regulatory limit shall be determined.

#### TEST SETUP



**TEST ENVIRONMENT**

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

**TEST RESULTS**

Please refer to section "Test Data" - Appendix A

## 7.4. NUMBER OF HOPPING FREQUENCY

### LIMITS

| CFR 47 FCC Part15 (15.247), Subpart C |                             |                              |
|---------------------------------------|-----------------------------|------------------------------|
| Section                               | Test Item                   | Limit                        |
| CFR 47 15.247 (a) (1) III             | Number of Hopping Frequency | at least 15 hopping channels |

### TEST PROCEDURE

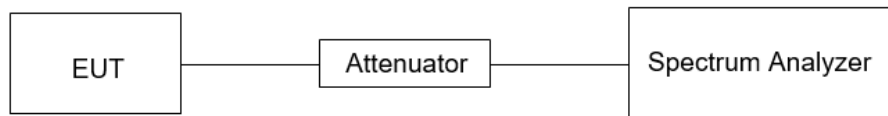
Refer to ANSI C63.10-2013 clause 7.8.3.

Connect the EUT to the spectrum Analyzer and use the following settings:

|            |                                                                                                                                                                                                                                      |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Detector   | Peak                                                                                                                                                                                                                                 |
| RBW        | To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.                                                                                       |
| VBW        | ≥RBW                                                                                                                                                                                                                                 |
| Span       | The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. |
| Trace      | Max hold                                                                                                                                                                                                                             |
| Sweep time | Auto couple                                                                                                                                                                                                                          |

Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer, count the quantity of peaks to get the number of hopping channels.

### TEST SETUP



### TEST ENVIRONMENT

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

**TEST RESULTS**

Please refer to section "Test Data" - Appendix A

## 7.5. TIME OF OCCUPANCY (DWELL TIME)

### LIMITS

| CFR 47 FCC Part15 (15.247), Subpart C |                                |                                                                                                                                                                           |
|---------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section                               | Test Item                      | Limit                                                                                                                                                                     |
| CFR 47 15.247 (a) (1) III             | Time of Occupancy (Dwell Time) | 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. |

### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.4.

Connect the EUT to the spectrum Analyzer and use the following settings:

|                  |                                                                                                                                                                                                                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Center Frequency | The center frequency of the channel under test                                                                                                                                                                                                                                                                                 |
| Detector         | Peak                                                                                                                                                                                                                                                                                                                           |
| RBW              | 1 MHz                                                                                                                                                                                                                                                                                                                          |
| VBW              | ≥RBW                                                                                                                                                                                                                                                                                                                           |
| Span             | Zero span, centered on a hopping channel                                                                                                                                                                                                                                                                                       |
| Trace            | Max hold                                                                                                                                                                                                                                                                                                                       |
| Sweep time       | As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel |

Use the marker-delta function to determine the transmit time per hop (Burst Width). If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

For FHSS Mode (79 Channel):

DH1/3DH1 Dwell Time:  $\text{Burst Width} * (1600/2) * 31.6 / (\text{channel number})$

DH3/3DH3 Dwell Time:  $\text{Burst Width} * (1600/4) * 31.6 / (\text{channel number})$

DH5/3DH5 Dwell Time:  $\text{Burst Width} * (1600/6) * 31.6 / (\text{channel number})$

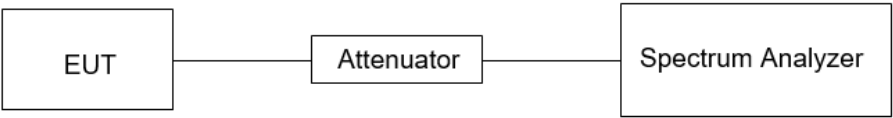
For AFHSS Mode (20 Channel):

DH1/3DH1 Dwell Time:  $\text{Burst Width} * (1600/2) * 8 / (\text{channel number})$

DH3/3DH3 Dwell Time:  $\text{Burst Width} * (1600/4) * 8 / (\text{channel number})$

DH5/3DH5 Dwell Time:  $\text{Burst Width} * (1600/6) * 8 / (\text{channel number})$

**TEST SETUP**



**TEST ENVIRONMENT**

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

**TEST RESULTS**

Please refer to section "Test Data" - Appendix A

## 7.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSION

### LIMITS

| CFR 47 FCC Part15 (15.247), Subpart C |                             |                                                                                                                         |
|---------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Section                               | Test Item                   | Limit                                                                                                                   |
| CFR 47 FCC §15.247 (d)                | Conducted Spurious Emission | at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power |

### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.6 and 7.8.8.

Connect the EUT to the spectrum analyser and use the following settings for reference level measurement:

|                  |                                                |
|------------------|------------------------------------------------|
| Center Frequency | The center frequency of the channel under test |
| Detector         | Peak                                           |
| RBW              | 100 kHz                                        |
| VBW              | $\geq 3 \times \text{RBW}$                     |
| Span             | $1.5 \times \text{DTS bandwidth}$              |
| Trace            | Max hold                                       |
| Sweep time       | Auto couple.                                   |

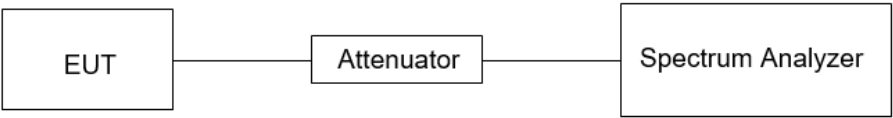
Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

Change the settings for emission level measurement:

|                    |                                                                               |
|--------------------|-------------------------------------------------------------------------------|
| Span               | Set the center frequency and span to encompass frequency range to be measured |
| Detector           | Peak                                                                          |
| RBW                | 100 kHz                                                                       |
| VBW                | $\geq 3 \times \text{RBW}$                                                    |
| measurement points | $\geq \text{span/RBW}$                                                        |
| Trace              | Max hold                                                                      |
| Sweep time         | Auto couple.                                                                  |

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum

**TEST SETUP**



**TEST ENVIRONMENT**

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

**TEST RESULTS**

Please refer to section "Test Data" - Appendix A

## 7.7. DUTY CYCLE

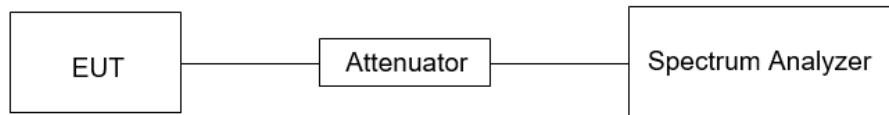
### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

Refer to ANSI C63.10-2013 Zero – Span Spectrum Analyzer method.

### TEST SETUP



### TEST ENVIRONMENT

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 22.7°C | Relative Humidity | 53% |
| Atmosphere Pressure | 100kPa |                   |     |

### TEST RESULTS

Please refer to section "Test Data" - Appendix A

## 8. RADIATED TEST RESULTS

### LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz-1 GHz)

| Emissions radiated outside of the specified frequency bands above 30 MHz |                                    |                                      |         |
|--------------------------------------------------------------------------|------------------------------------|--------------------------------------|---------|
| Frequency Range (MHz)                                                    | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |         |
|                                                                          |                                    | Quasi-Peak                           |         |
| 30 - 88                                                                  | 100                                | 40                                   |         |
| 88 - 216                                                                 | 150                                | 43.5                                 |         |
| 216 - 960                                                                | 200                                | 46                                   |         |
| Above 960                                                                | 500                                | 54                                   |         |
| Above 1000                                                               | 500                                | Peak                                 | Average |
|                                                                          |                                    | 74                                   | 54      |

| FCC Emissions radiated outside of the specified frequency bands below 30 MHz |                                   |                               |
|------------------------------------------------------------------------------|-----------------------------------|-------------------------------|
| 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                            |

FCC Restricted bands of operation refer to FCC §15.205 (a):

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.17725-4.17775          | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.20725-4.20775          | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0        |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41              |                     |               |                  |

Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6c

**TEST PROCEDURE**

Below 30 MHz

The setting of the spectrum analyser

|       |                                                                  |
|-------|------------------------------------------------------------------|
| RBW   | 200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz) |
| VBW   | 200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz) |
| Sweep | Auto                                                             |

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of  $377\Omega$ . For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to  $Y-51.5 = Z$  dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

The setting of the spectrum analyser

|          |          |
|----------|----------|
| RBW      | 120 kHz  |
| VBW      | 300 kHz  |
| Sweep    | Auto     |
| Detector | Peak/QP  |
| Trace    | Max hold |

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

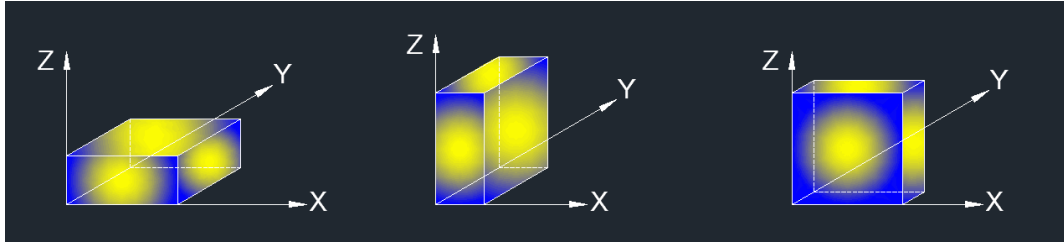
Above 1 GHz

The setting of the spectrum analyser

|          |                                |
|----------|--------------------------------|
| RBW      | 1 MHz                          |
| VBW      | PEAK: 3 MHz<br>AVG: see note 6 |
| Sweep    | Auto                           |
| Detector | Peak                           |
| Trace    | Max hold                       |

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

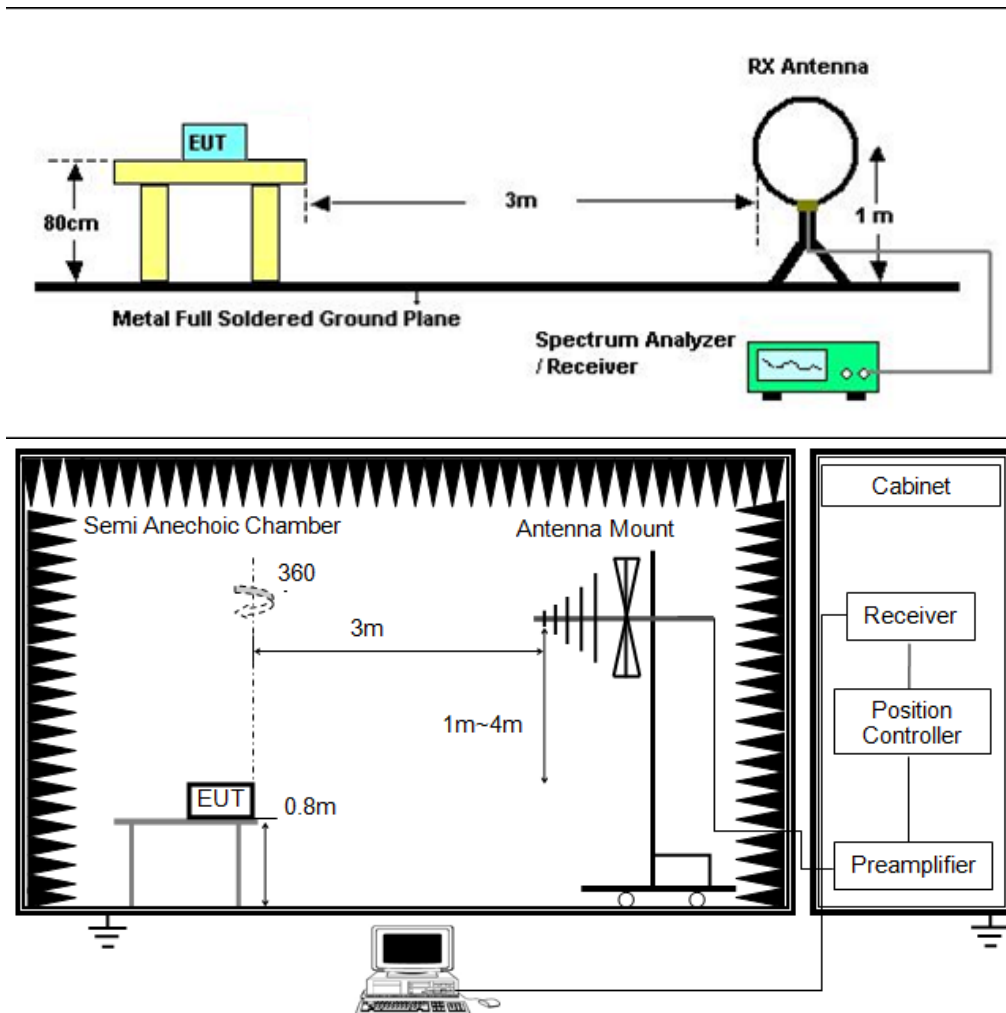
X axis, Y axis, Z axis positions:

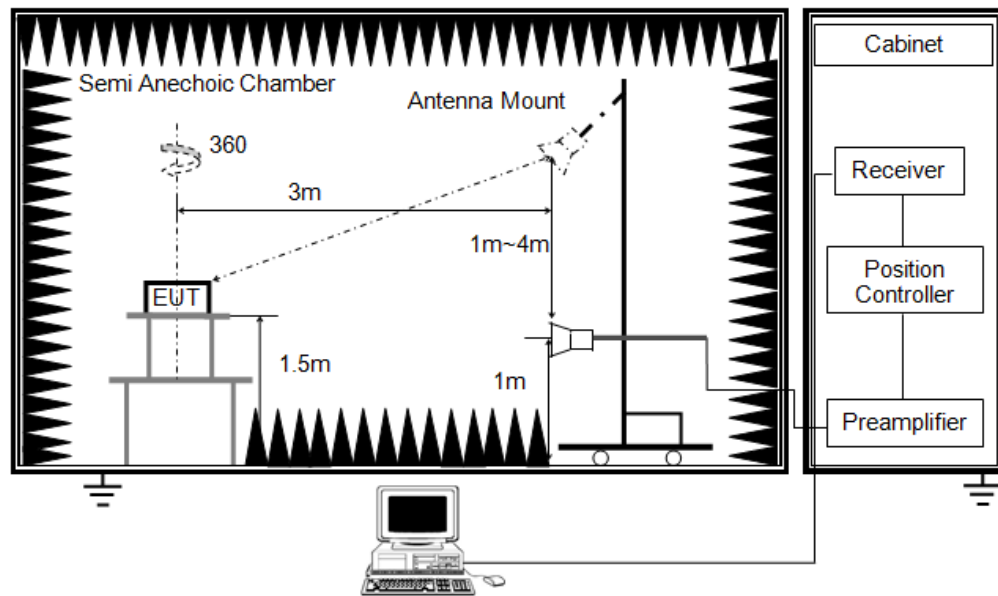


Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

### TEST SETUP





### TEST ENVIRONMENT

|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 24.3°C | Relative Humidity | 54% |
| Atmosphere Pressure | 101kPa |                   |     |

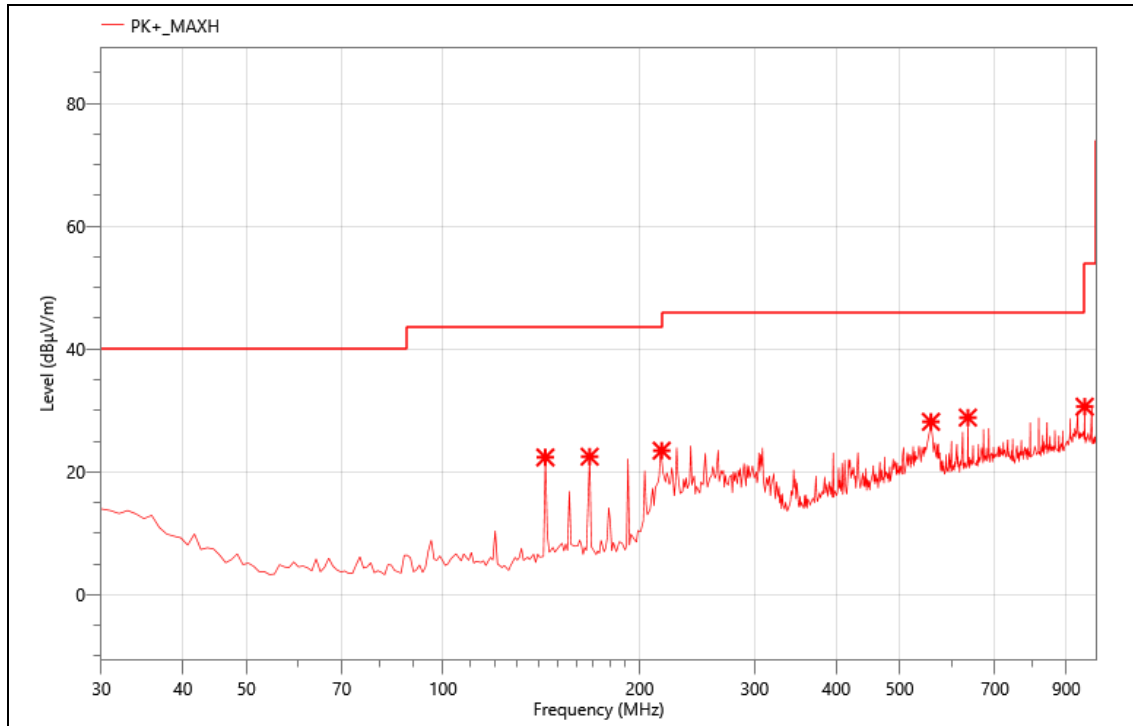
### TEST RESULTS

## 8.1. RADIATED BAND EDGE AND SPURIOUS EMISSION

30MHz to 1GHz

The worst result as bellow:

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2402        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

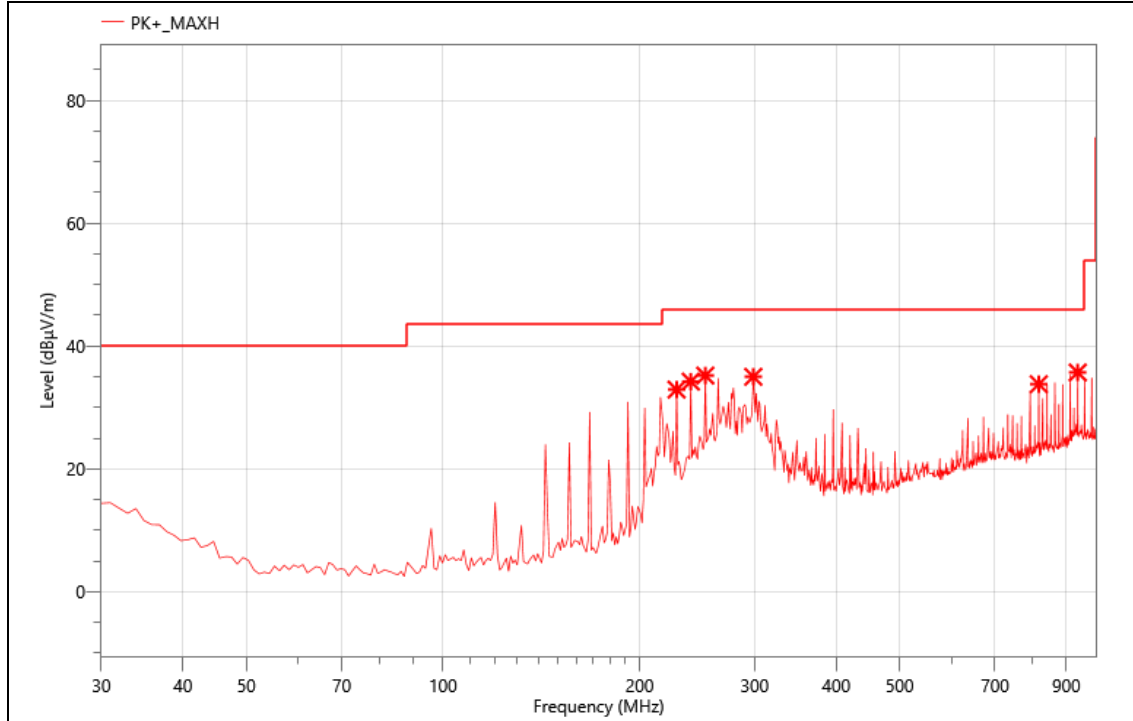


### Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBμV) | Corr. (dB) | Meas. (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 143.490     | 45.87          | -23.52     | 22.35          | 43.50          | 21.15       | PK+  | V    |
| 2   | 167.740     | 45.17          | -22.7      | 22.47          | 43.50          | 21.03       | PK+  | V    |
| 3   | 216.240     | 44.40          | -20.95     | 23.45          | 46.00          | 22.55       | PK+  | V    |
| 4   | 558.650     | 38.40          | -10.25     | 28.15          | 46.00          | 17.85       | PK+  | V    |
| 5   | 636.250     | 37.71          | -8.87      | 28.84          | 46.00          | 17.16       | PK+  | V    |
| 6   | 960.230     | 34.43          | -3.82      | 30.61          | 53.90          | 23.29       | PK+  | V    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2402        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |



### Critical\_Freqs

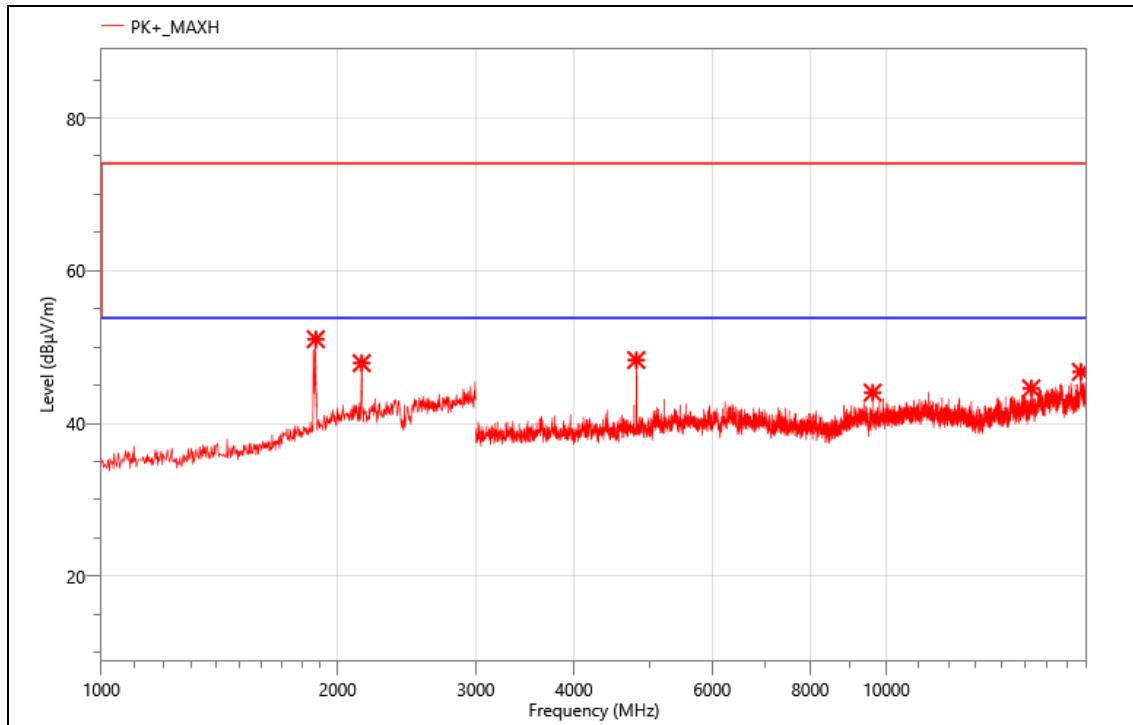
| No. | Freq. (MHz) | Reading (dBμV) | Corr. (dB) | Meas. (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 227.880     | 53.32          | -20.4      | 32.92          | 46.00          | 13.08       | PK+  | H    |
| 2   | 239.520     | 53.88          | -19.66     | 34.22          | 46.00          | 11.78       | PK+  | H    |
| 3   | 252.130     | 54.19          | -18.99     | 35.20          | 46.00          | 10.80       | PK+  | H    |
| 4   | 298.690     | 53.91          | -18.91     | 35.00          | 46.00          | 11.00       | PK+  | H    |
| 5   | 816.670     | 39.95          | -6.16      | 33.79          | 46.00          | 12.21       | PK+  | H    |
| 6   | 936.950     | 38.87          | -3.17      | 35.70          | 46.00          | 10.30       | PK+  | H    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

Above 1GHz

The worst result as bellow:

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2402        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

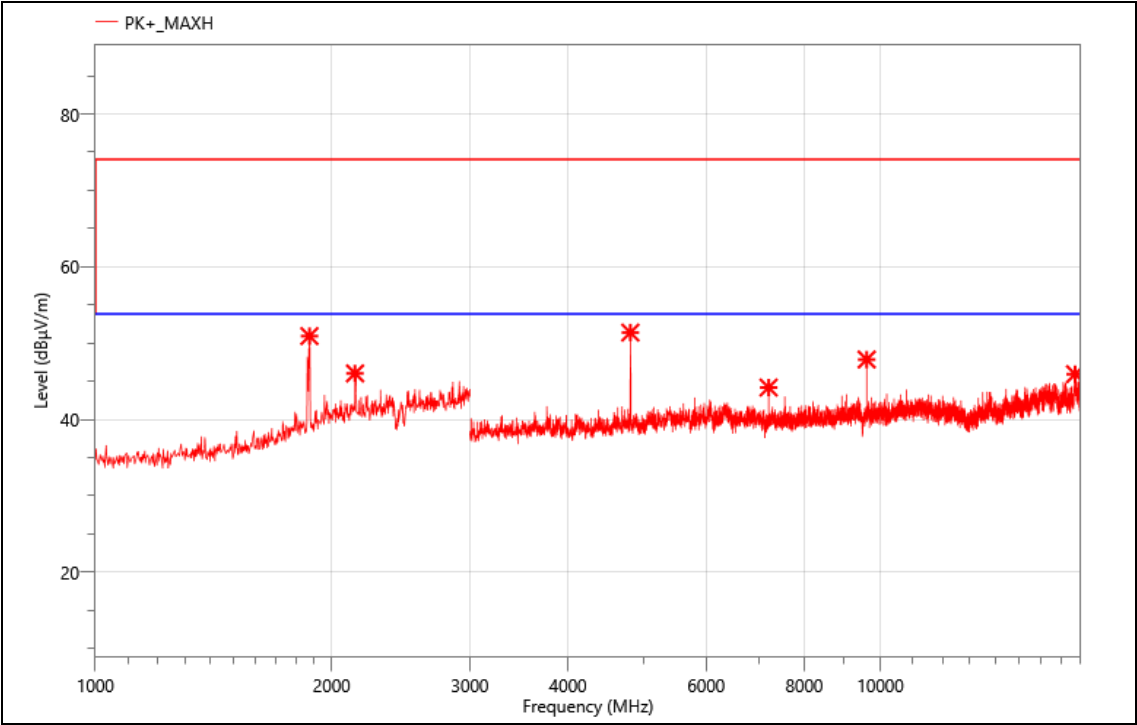


### Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBμV) | Corr. (dB) | Meas. (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 1876.000    | 61.37          | -10.34     | 51.03          | 74.00          | 22.97       | PK+  | V    |
| 2   | 2146.000    | 56.95          | -9.05      | 47.90          | 74.00          | 26.10       | PK+  | V    |
| 3   | 4803.000    | 59.64          | -11.34     | 48.30          | 74.00          | 25.70       | PK+  | V    |
| 4   | 9607.500    | 51.09          | -7.06      | 44.03          | 74.00          | 29.97       | PK+  | V    |
| 5   | 15295.500   | 47.34          | -2.75      | 44.59          | 74.00          | 29.41       | PK+  | V    |
| 6   | 17695.500   | 46.55          | 0.21       | 46.76          | 74.00          | 27.24       | PK+  | V    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2402        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

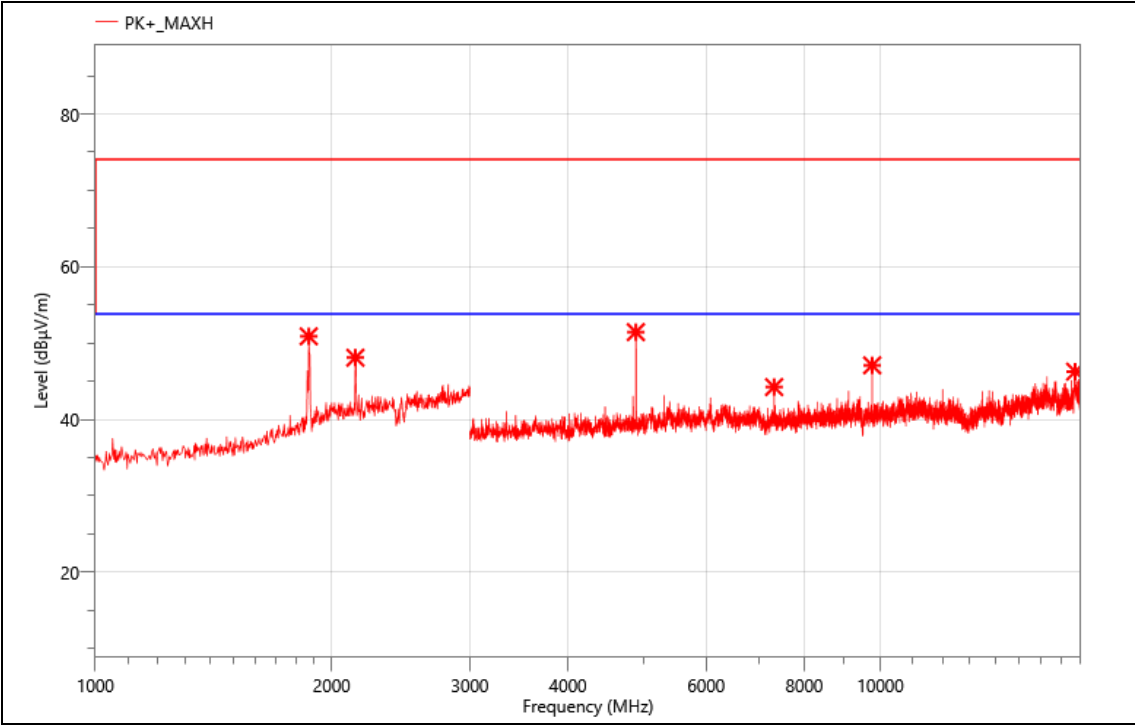


Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBµV) | Corr. (dB) | Meas. (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 1874.000    | 61.27          | -10.35     | 50.92          | 74.00          | 23.08       | PK+  | H    |
| 2   | 2142.000    | 55.08          | -9.05      | 46.03          | 74.00          | 27.97       | PK+  | H    |
| 3   | 4803.000    | 62.72          | -11.34     | 51.38          | 74.00          | 22.62       | PK+  | H    |
| 4   | 7206.000    | 52.18          | -8         | 44.18          | 74.00          | 29.82       | PK+  | H    |
| 5   | 9607.500    | 54.91          | -7.06      | 47.85          | 74.00          | 26.15       | PK+  | H    |
| 6   | 17706.000   | 45.88          | 0.05       | 45.93          | 74.00          | 28.07       | PK+  | H    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2441        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

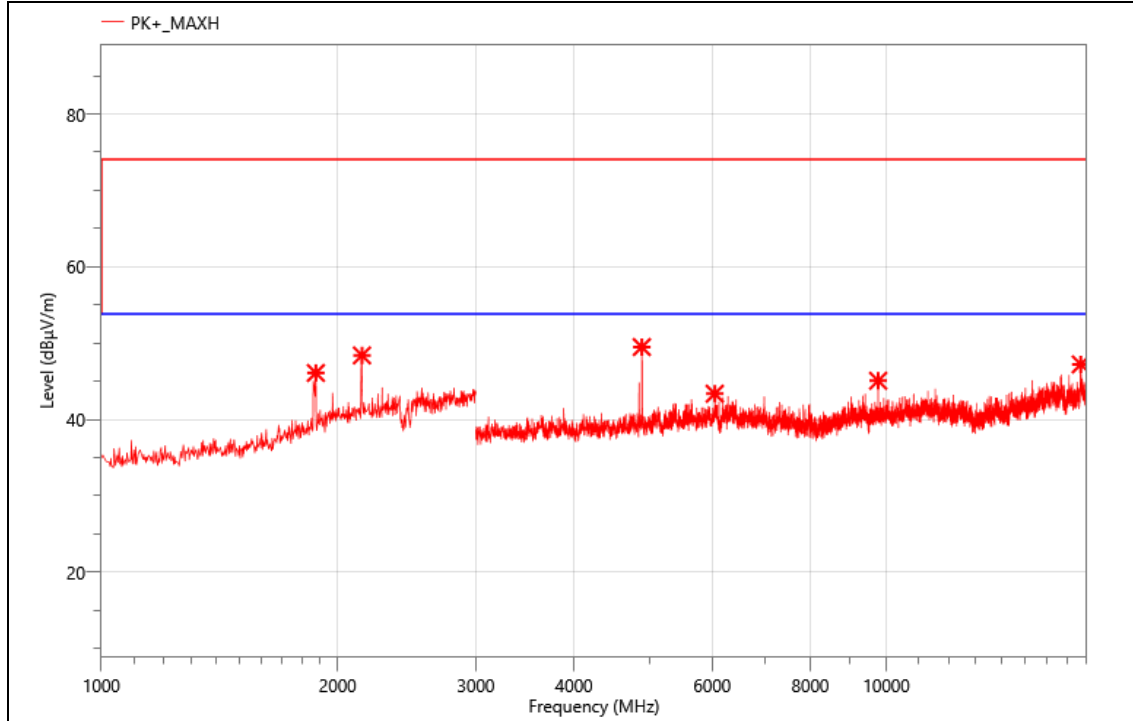


Critical\_Freqs

| No. | Freq.<br>(MHz) | Reading<br>(dBµV) | Corr.<br>(dB) | Meas.<br>(dBµV/m) | Limit<br>(dBµV/m) | Margin<br>(dB) | Det. | Pol. |
|-----|----------------|-------------------|---------------|-------------------|-------------------|----------------|------|------|
| 1   | 1870.000       | 61.26             | -10.37        | 50.89             | 74.00             | 23.11          | PK+  | H    |
| 2   | 2144.000       | 57.14             | -9.05         | 48.09             | 74.00             | 25.91          | PK+  | H    |
| 3   | 4881.000       | 62.58             | -11.14        | 51.44             | 74.00             | 22.56          | PK+  | H    |
| 4   | 7323.000       | 52.20             | -7.95         | 44.25             | 74.00             | 29.75          | PK+  | H    |
| 5   | 9763.500       | 54.06             | -6.97         | 47.09             | 74.00             | 26.91          | PK+  | H    |
| 6   | 17707.500      | 46.24             | 0.02          | 46.26             | 74.00             | 27.74          | PK+  | H    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2441        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

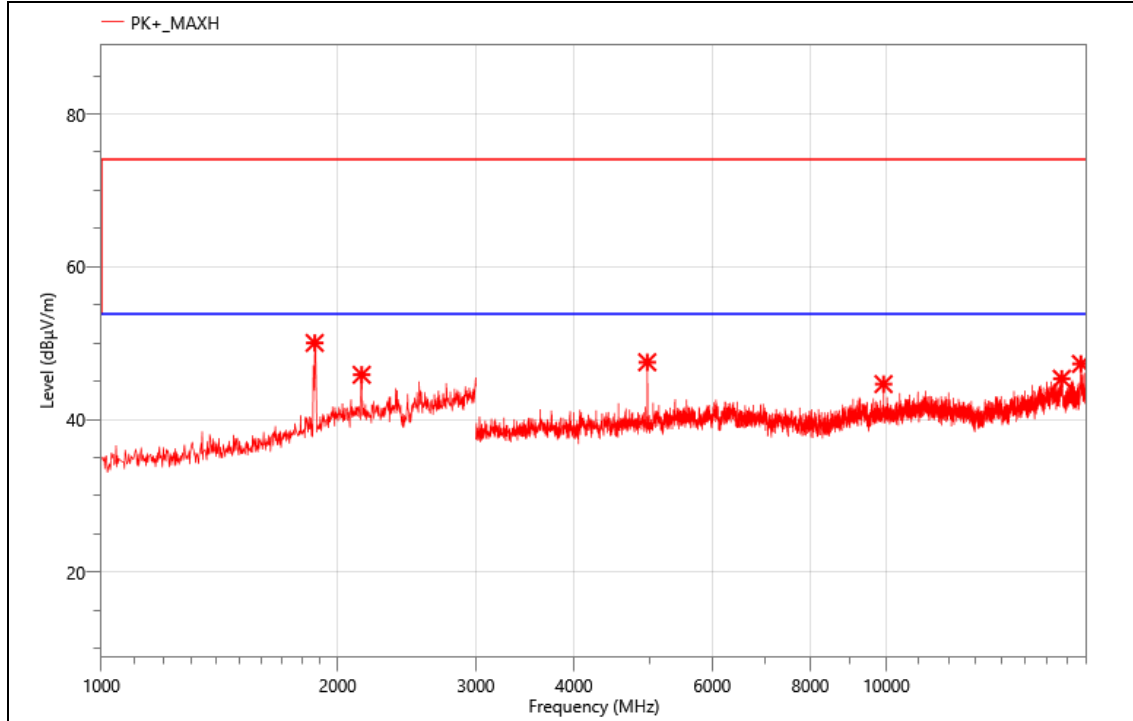


### Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBμV) | Corr. (dB) | Meas. (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 1876.000    | 56.43          | -10.34     | 46.09          | 74.00          | 27.91       | PK+  | V    |
| 2   | 2148.000    | 57.44          | -9.05      | 48.39          | 74.00          | 25.61       | PK+  | V    |
| 3   | 4881.000    | 60.62          | -11.14     | 49.48          | 74.00          | 24.52       | PK+  | V    |
| 4   | 6045.000    | 51.56          | -8.19      | 43.37          | 74.00          | 30.63       | PK+  | V    |
| 5   | 9763.500    | 52.04          | -6.97      | 45.07          | 74.00          | 28.93       | PK+  | V    |
| 6   | 17688.000   | 46.96          | 0.25       | 47.21          | 74.00          | 26.79       | PK+  | V    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2480        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

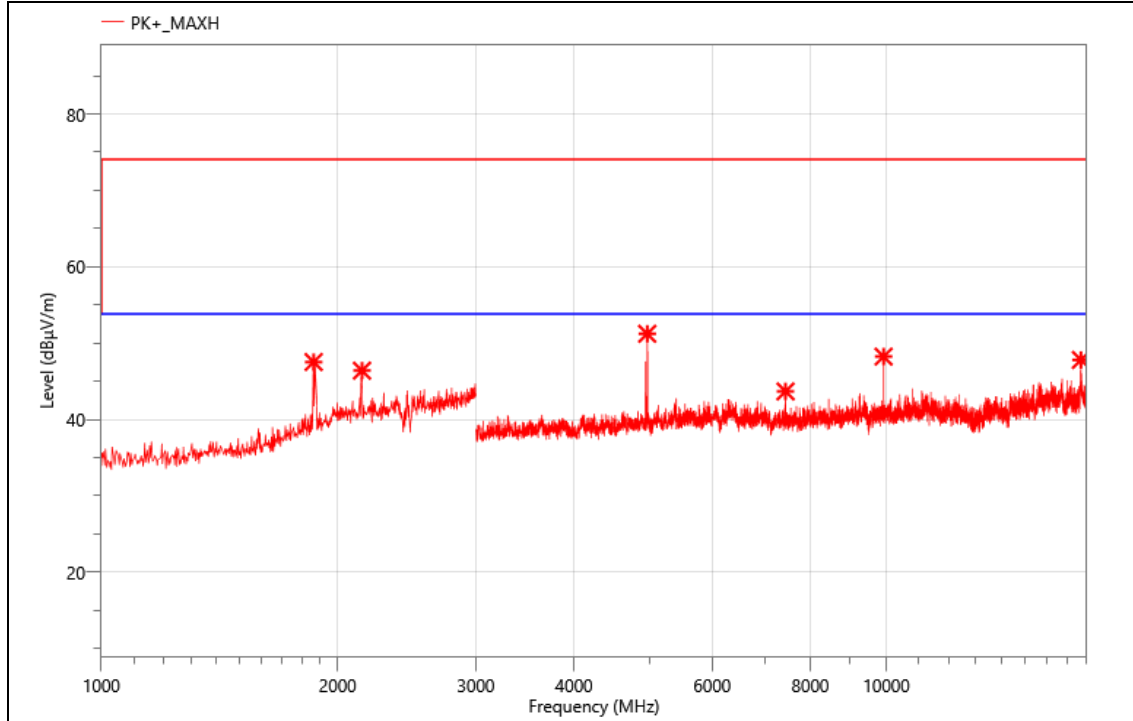


### Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBμV) | Corr. (dB) | Meas. (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 1870.000    | 60.39          | -10.37     | 50.02          | 74.00          | 23.98       | PK+  | V    |
| 2   | 2146.000    | 54.90          | -9.05      | 45.85          | 74.00          | 28.15       | PK+  | V    |
| 3   | 4959.000    | 58.84          | -11.35     | 47.49          | 74.00          | 26.51       | PK+  | V    |
| 4   | 9919.500    | 50.98          | -6.35      | 44.63          | 74.00          | 29.37       | PK+  | V    |
| 5   | 16729.500   | 46.40          | -1.06      | 45.34          | 74.00          | 28.66       | PK+  | V    |
| 6   | 17700.000   | 47.09          | 0.18       | 47.27          | 74.00          | 26.73       | PK+  | V    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2480        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |



### Critical\_Freqs

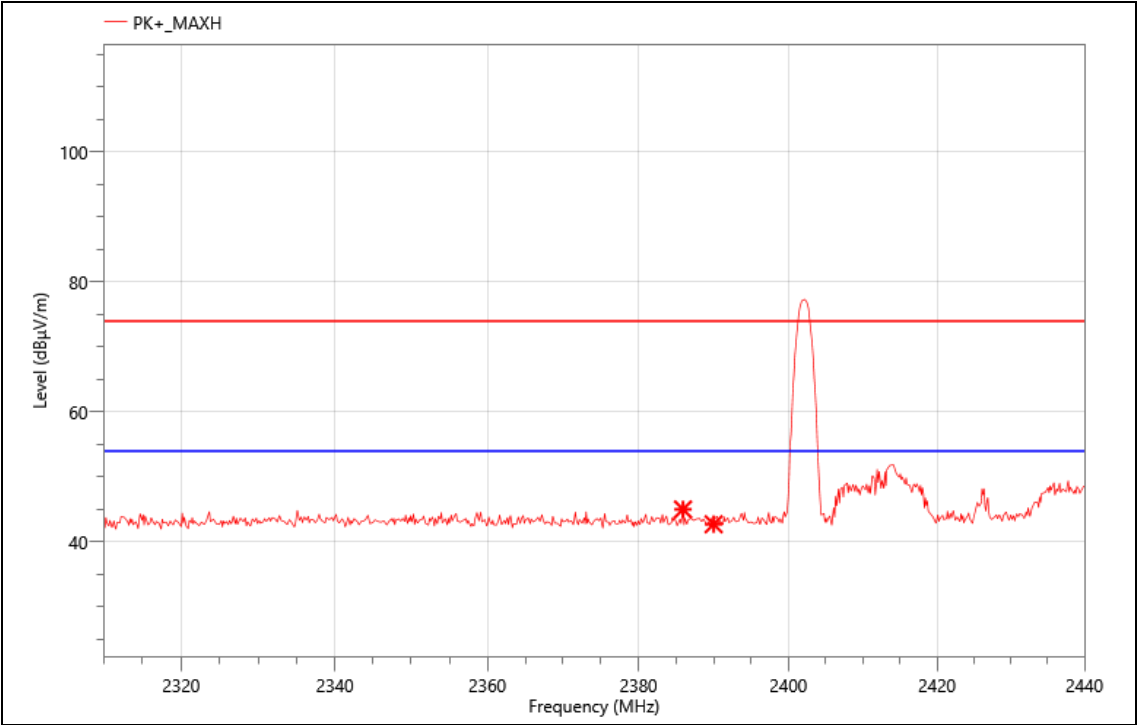
| No. | Freq.<br>(MHz) | Reading<br>(dBμV) | Corr.<br>(dB) | Meas.<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) | Det. | Pol. |
|-----|----------------|-------------------|---------------|-------------------|-------------------|----------------|------|------|
| 1   | 1864.000       | 57.92             | -10.4         | 47.52             | 74.00             | 26.48          | PK+  | H    |
| 2   | 2148.000       | 55.44             | -9.05         | 46.39             | 74.00             | 27.61          | PK+  | H    |
| 3   | 4959.000       | 62.57             | -11.35        | 51.22             | 74.00             | 22.78          | PK+  | H    |
| 4   | 7440.000       | 51.63             | -7.96         | 43.67             | 74.00             | 30.33          | PK+  | H    |
| 5   | 9919.500       | 54.58             | -6.35         | 48.23             | 74.00             | 25.77          | PK+  | H    |
| 6   | 17695.500      | 47.58             | 0.21          | 47.79             | 74.00             | 26.21          | PK+  | H    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

For the frequency above 18 GHz, a pre-scan was performed, and the result was 20 dB lower than the limit line, the test data was not shown in the report.

Band Edge  
The worst result as bellow:

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2402        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

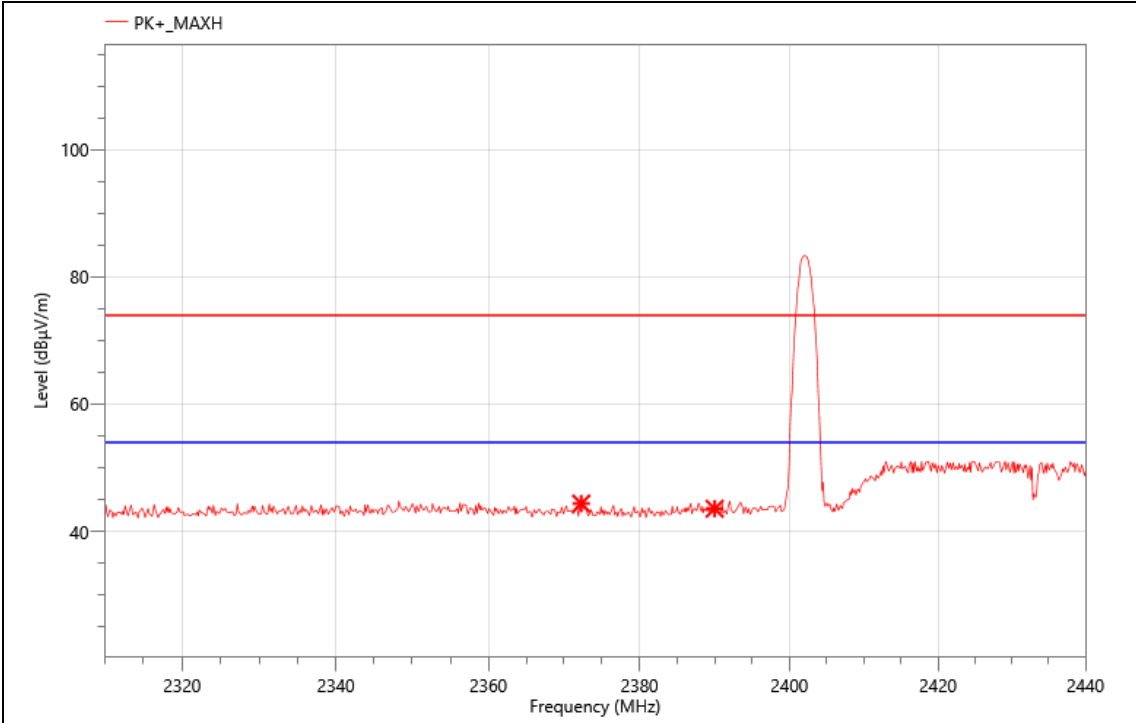


Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBµV) | Corr. (dB) | Meas. (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 2385.920    | 22.36          | 22.64      | 45.00          | 74.00          | 29.00       | PK+  | V    |
| 2   | 2390.000    | 19.99          | 22.72      | 42.71          | 74.00          | 31.29       | PK+  | V    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2402        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

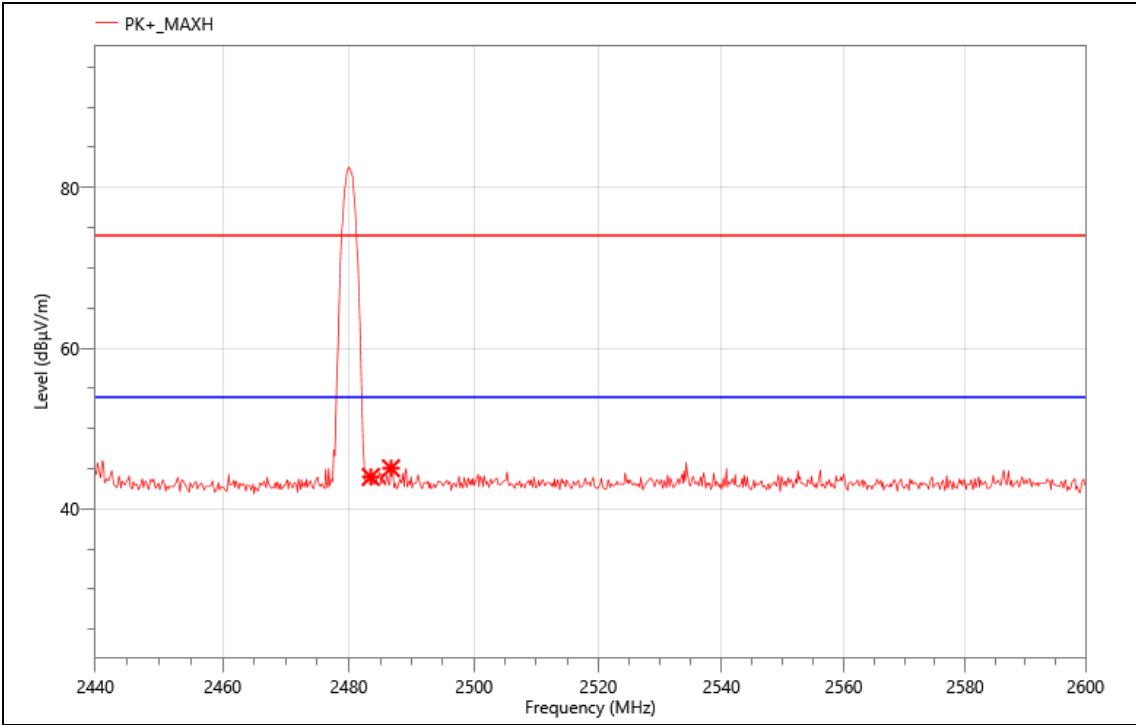


Critical\_Freqs

| No. | Freq.<br>(MHz) | Reading<br>(dBµV) | Corr.<br>(dB) | Meas.<br>(dBµV/m) | Limit<br>(dBµV/m) | Margin<br>(dB) | Det. | Pol. |
|-----|----------------|-------------------|---------------|-------------------|-------------------|----------------|------|------|
| 1   | 2372.270       | 21.77             | 22.6          | 44.37             | 74.00             | 29.63          | PK+  | H    |
| 2   | 2390.000       | 20.84             | 22.72         | 43.56             | 74.00             | 30.44          | PK+  | H    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2480        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |

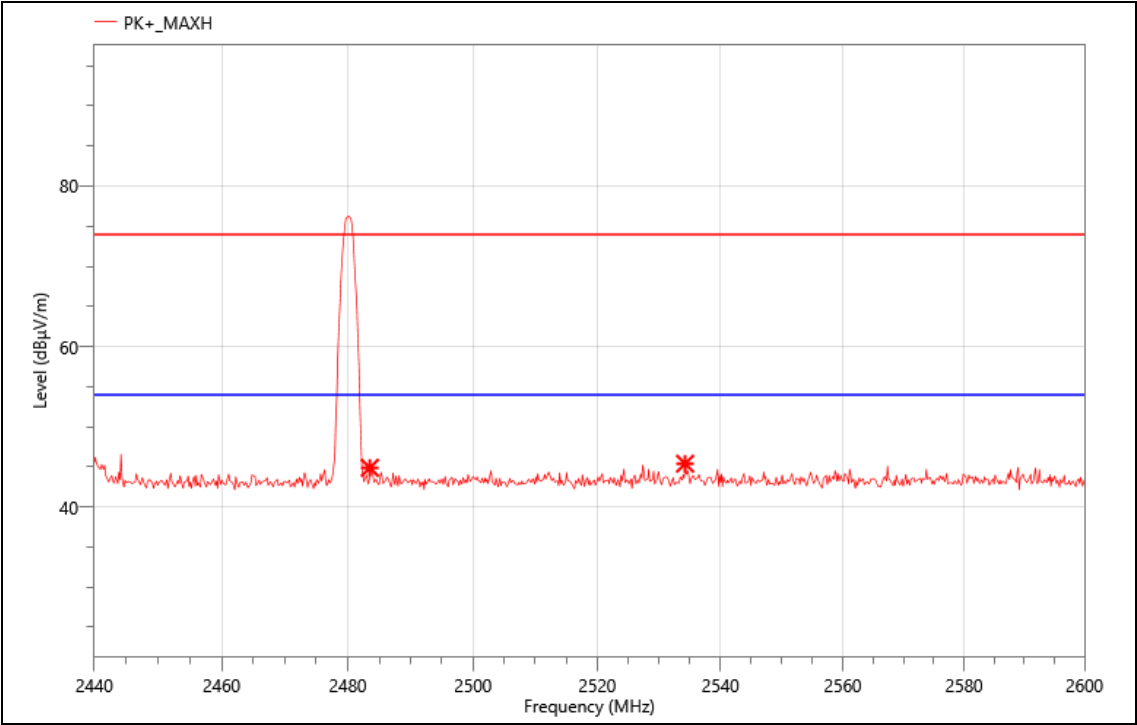


Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBµV) | Corr. (dB) | Meas. (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 2483.500    | 20.83          | 23.15      | 43.98          | 74.00          | 30.02       | PK+  | H    |
| 2   | 2486.720    | 21.92          | 23.14      | 45.06          | 74.00          | 28.94       | PK+  | H    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

|        |                   |
|--------|-------------------|
| Mode:  | 2-DH5-2480        |
| Power: | DC 5V             |
| TE:    | Berny             |
| Date   | 2024/4/16         |
| T/A/P  | 24.3°C/54%/101Kpa |



Critical\_Freqs

| No. | Freq. (MHz) | Reading (dBµV) | Corr. (dB) | Meas. (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Det. | Pol. |
|-----|-------------|----------------|------------|----------------|----------------|-------------|------|------|
| 1   | 2483.500    | 21.72          | 23.15      | 44.87          | 74.00          | 29.13       | PK+  | V    |
| 2   | 2534.240    | 22.20          | 23.19      | 45.39          | 74.00          | 28.61       | PK+  | V    |

Note: [Margin=Limit-Meas.]; [Meas.=Reading+Corr. ]

## 9. ANTENNA REQUIREMENT

### REQUIREMENT

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

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.

### DESCRIPTION

Pass

## 10. AC POWER LINE CONDUCTED EMISSION

### LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

| FREQUENCY (MHz) | Quasi-peak | Average   |
|-----------------|------------|-----------|
| 0.15 -0.5       | 66 - 56 *  | 56 - 46 * |
| 0.50 -5.0       | 56.00      | 46.00     |
| 5.0 -30.0       | 60.00      | 50.00     |

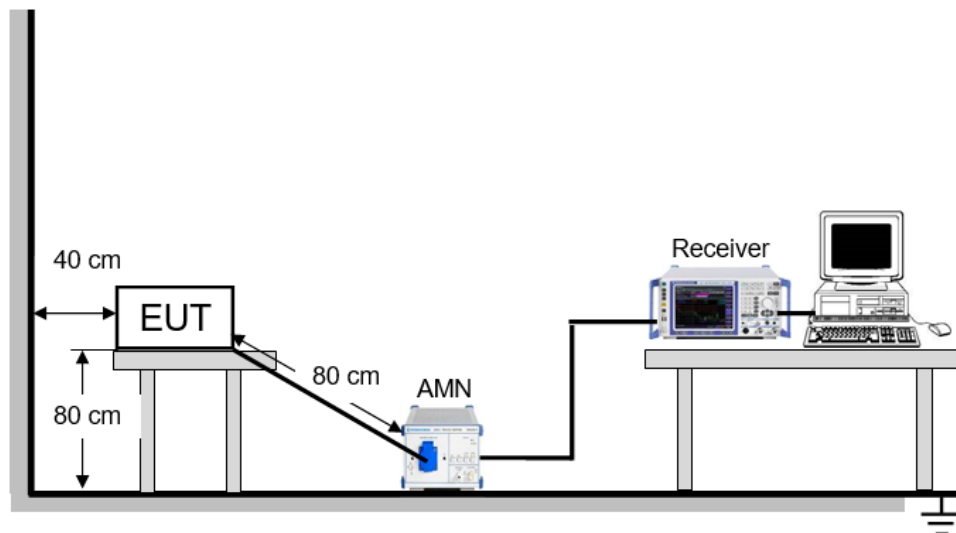
### TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 6.2.

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver is used to test the emissions from the AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

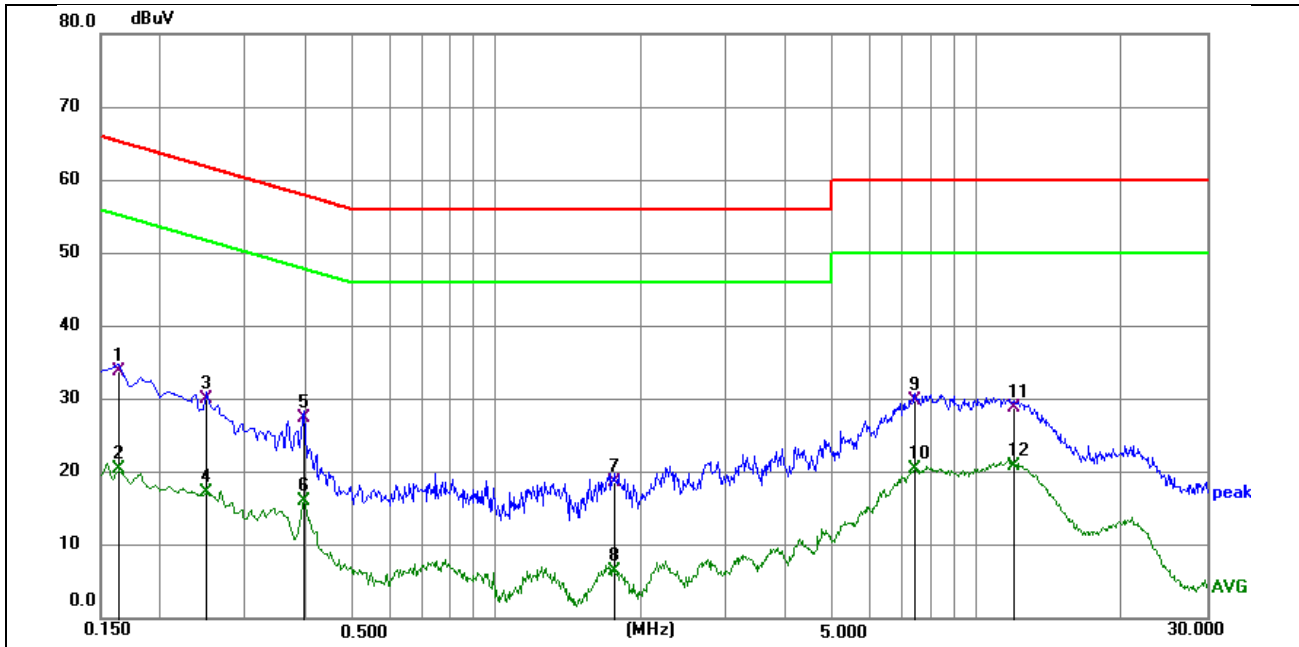
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

### TEST SETUP



### TEST ENVIRONMENT

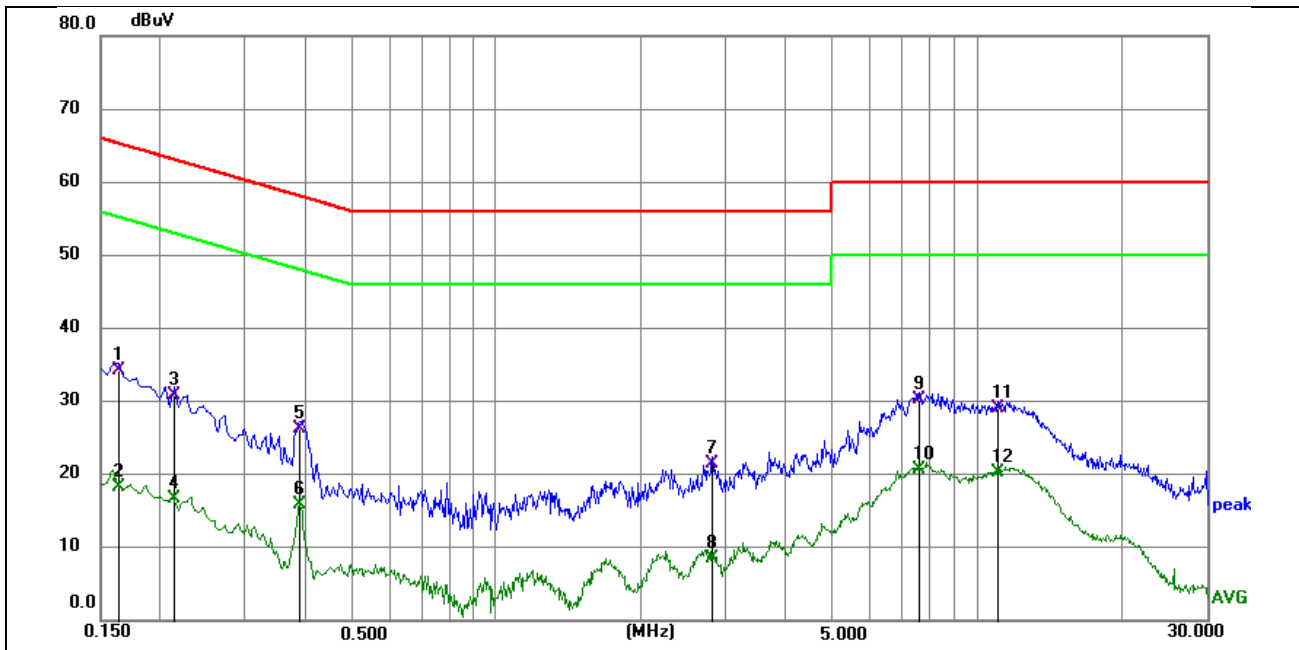
|                     |        |                   |     |
|---------------------|--------|-------------------|-----|
| Temperature         | 25.3°C | Relative Humidity | 52% |
| Atmosphere Pressure | 100kPa |                   |     |

**TEST RESULTS**

Phase: L1

Mode: 2DH5 2402MHz

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------|------------------|-----------------|----------------|--------|
| 1   | 0.1635             | 23.89             | 9.96            | 33.85            | 65.28           | -31.43         | QP     |
| 2   | 0.1635             | 10.42             | 9.96            | 20.38            | 55.28           | -34.90         | AVG    |
| 3   | 0.2490             | 20.02             | 9.91            | 29.93            | 61.79           | -31.86         | QP     |
| 4   | 0.2490             | 7.27              | 9.91            | 17.18            | 51.79           | -34.61         | AVG    |
| 5   | 0.3975             | 17.45             | 9.94            | 27.39            | 57.91           | -30.52         | QP     |
| 6   | 0.3975             | 6.21              | 9.94            | 16.15            | 47.91           | -31.76         | AVG    |
| 7   | 1.7564             | 8.52              | 10.16           | 18.68            | 56.00           | -37.32         | QP     |
| 8   | 1.7564             | -3.75             | 10.16           | 6.41             | 46.00           | -39.59         | AVG    |
| 9   | 7.4310             | 19.18             | 10.55           | 29.73            | 60.00           | -30.27         | QP     |
| 10  | 7.4310             | 9.92              | 10.55           | 20.47            | 50.00           | -29.53         | AVG    |
| 11  | 11.9715            | 17.88             | 10.98           | 28.86            | 60.00           | -31.14         | QP     |
| 12  | 11.9715            | 9.85              | 10.98           | 20.83            | 50.00           | -29.17         | AVG    |



Phase: N

Mode: 2DH5 2402MHz

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------|------------------|-----------------|----------------|--------|
| 1   | 0.1635             | 24.36             | 9.91            | 34.27            | 65.28           | -31.01         | QP     |
| 2   | 0.1635             | 8.40              | 9.91            | 18.31            | 55.28           | -36.97         | AVG    |
| 3   | 0.2130             | 21.01             | 9.91            | 30.92            | 63.09           | -32.17         | QP     |
| 4   | 0.2130             | 6.74              | 9.91            | 16.65            | 53.09           | -36.44         | AVG    |
| 5   | 0.3885             | 16.47             | 9.85            | 26.32            | 58.10           | -31.78         | QP     |
| 6   | 0.3885             | 5.95              | 9.85            | 15.80            | 48.10           | -32.30         | AVG    |
| 7   | 2.8140             | 11.37             | 10.08           | 21.45            | 56.00           | -34.55         | QP     |
| 8   | 2.8140             | -1.64             | 10.08           | 8.44             | 46.00           | -37.56         | AVG    |
| 9   | 7.5975             | 19.59             | 10.65           | 30.24            | 60.00           | -29.76         | QP     |
| 10  | 7.5975             | 9.99              | 10.65           | 20.64            | 50.00           | -29.36         | AVG    |
| 11  | 11.0670            | 18.08             | 11.00           | 29.08            | 60.00           | -30.92         | QP     |
| 12  | 11.0670            | 9.20              | 11.00           | 20.20            | 50.00           | -29.80         | AVG    |

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

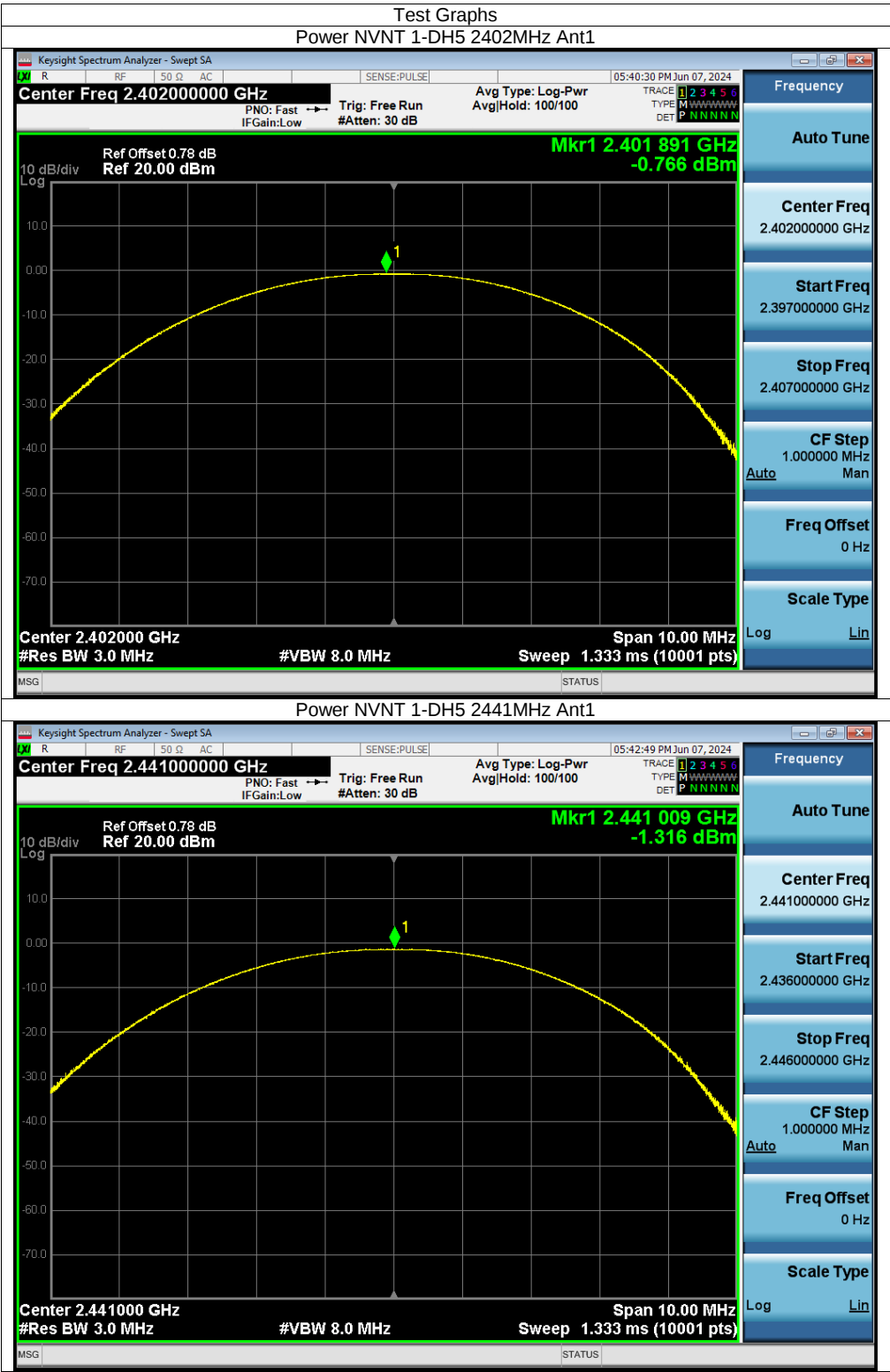
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

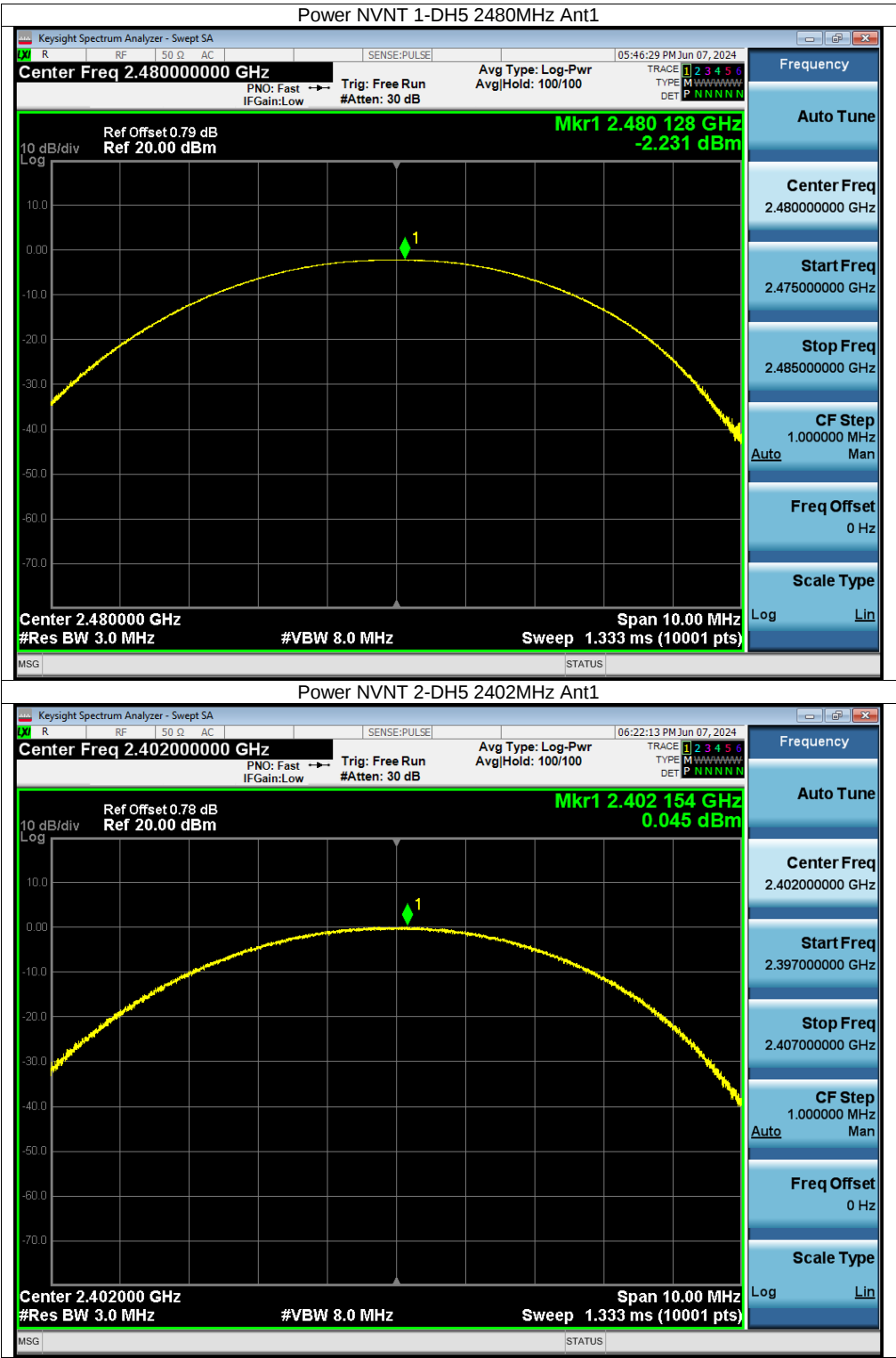
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

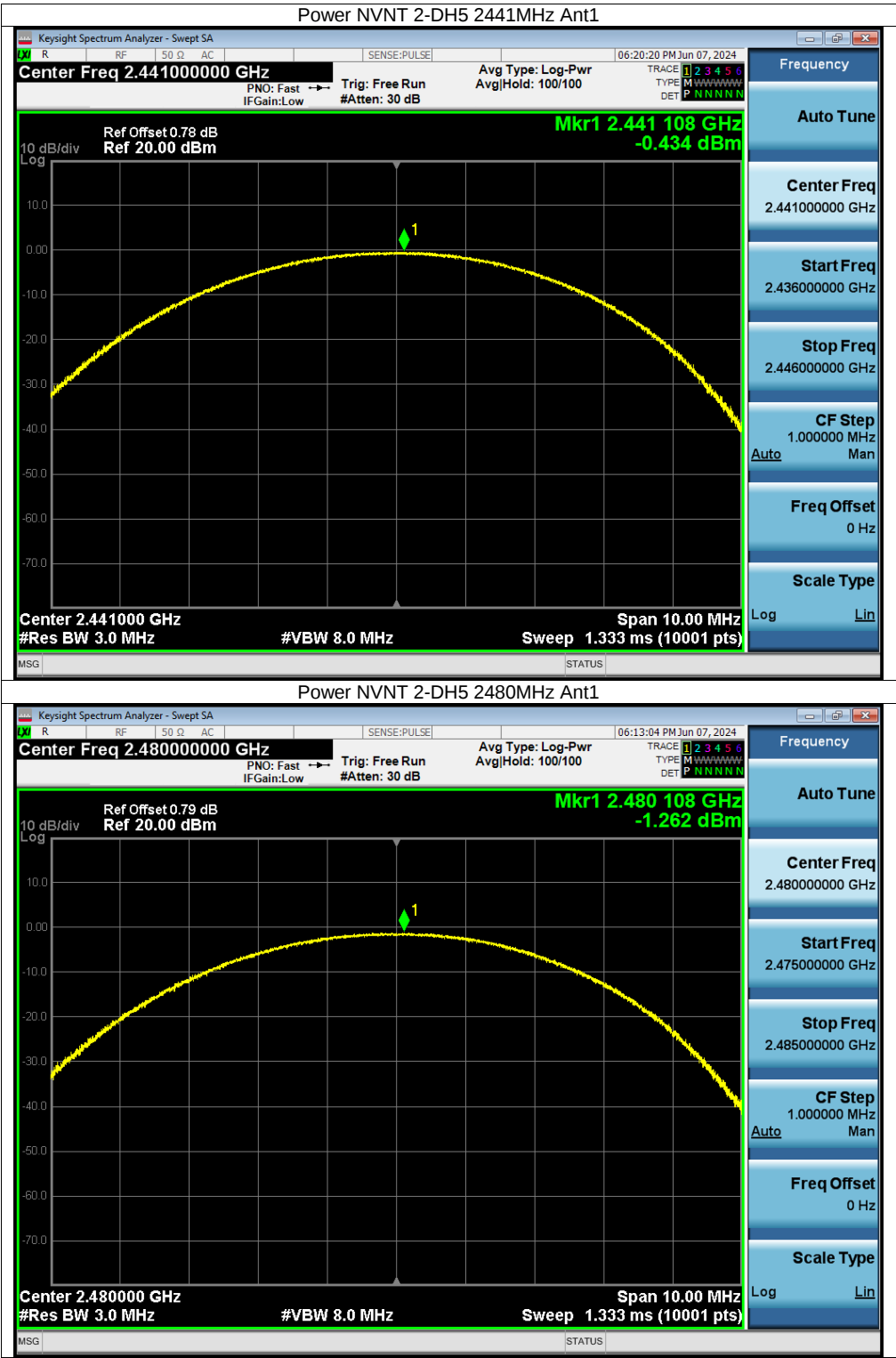
## 11. TEST DATA - Appendix A

### Maximum Conducted Output Power

| Condition | Mode  | Frequency (MHz) | Antenna | Conducted Power (dBm) | Duty Factor (dB) | Total Power (dBm) | Limit (dBm) | Verdict |
|-----------|-------|-----------------|---------|-----------------------|------------------|-------------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant1    | -0.77                 | 0                | -0.77             | 21          | Pass    |
| NVNT      | 1-DH5 | 2441            | Ant1    | -1.32                 | 0                | -1.32             | 21          | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant1    | -2.23                 | 0                | -2.23             | 21          | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant1    | 0.05                  | 0                | 0.05              | 21          | Pass    |
| NVNT      | 2-DH5 | 2441            | Ant1    | -0.43                 | 0                | -0.43             | 21          | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant1    | -1.26                 | 0                | -1.26             | 21          | Pass    |



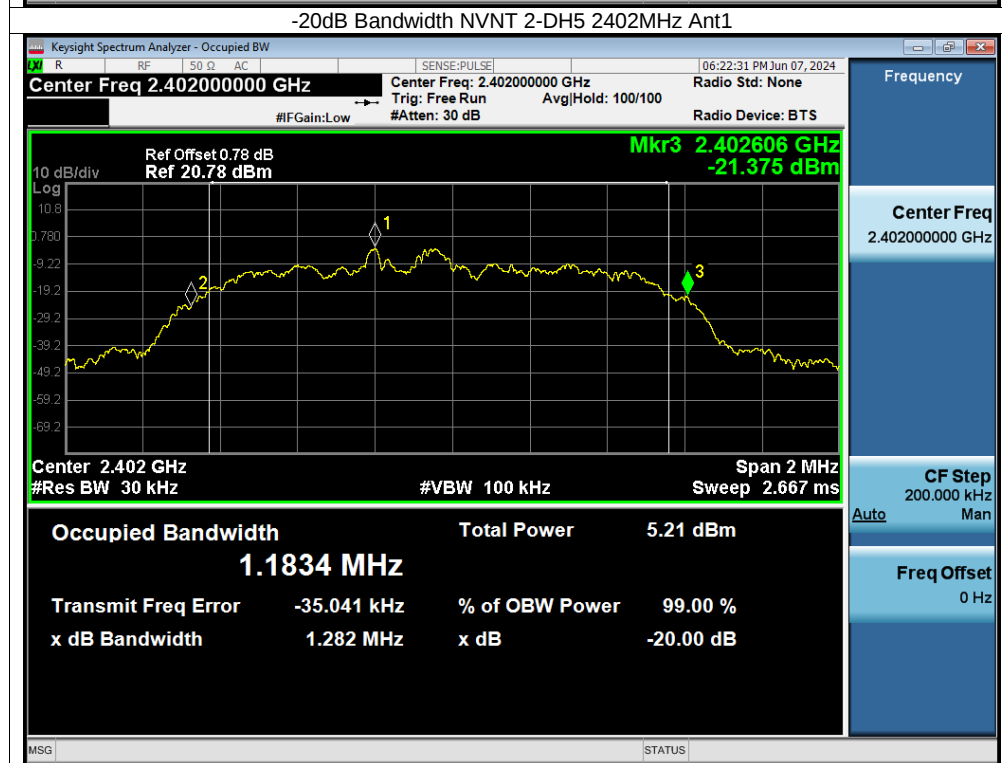




## -20dB Bandwidth

| Condition | Mode  | Frequency (MHz) | Antenna | -20 dB Bandwidth (MHz) | Limit -20 dB Bandwidth (MHz) | Verdict |
|-----------|-------|-----------------|---------|------------------------|------------------------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant1    | 1.01                   | N/A                          | N/A     |
| NVNT      | 1-DH5 | 2441            | Ant1    | 1                      | N/A                          | N/A     |
| NVNT      | 1-DH5 | 2480            | Ant1    | 1.01                   | N/A                          | N/A     |
| NVNT      | 2-DH5 | 2402            | Ant1    | 1.28                   | N/A                          | N/A     |
| NVNT      | 2-DH5 | 2441            | Ant1    | 1.34                   | N/A                          | N/A     |
| NVNT      | 2-DH5 | 2480            | Ant1    | 1.3                    | N/A                          | N/A     |





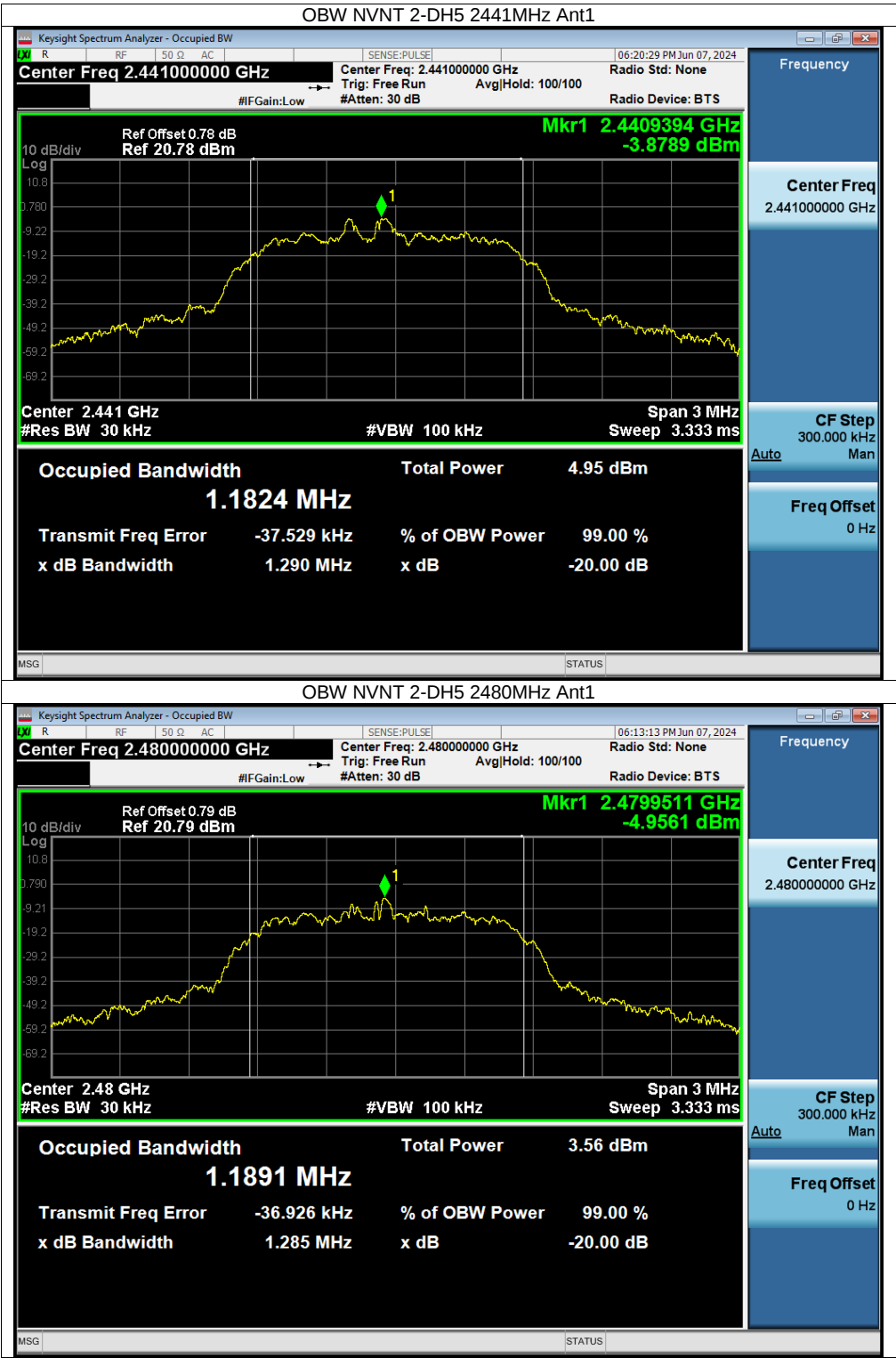


## Occupied Channel Bandwidth

| Condition | Mode  | Frequency (MHz) | Antenna | 99% OBW (MHz) |
|-----------|-------|-----------------|---------|---------------|
| NVNT      | 1-DH5 | 2402            | Ant1    | 0.895         |
| NVNT      | 1-DH5 | 2441            | Ant1    | 0.884         |
| NVNT      | 1-DH5 | 2480            | Ant1    | 0.892         |
| NVNT      | 2-DH5 | 2402            | Ant1    | 1.196         |
| NVNT      | 2-DH5 | 2441            | Ant1    | 1.182         |
| NVNT      | 2-DH5 | 2480            | Ant1    | 1.189         |

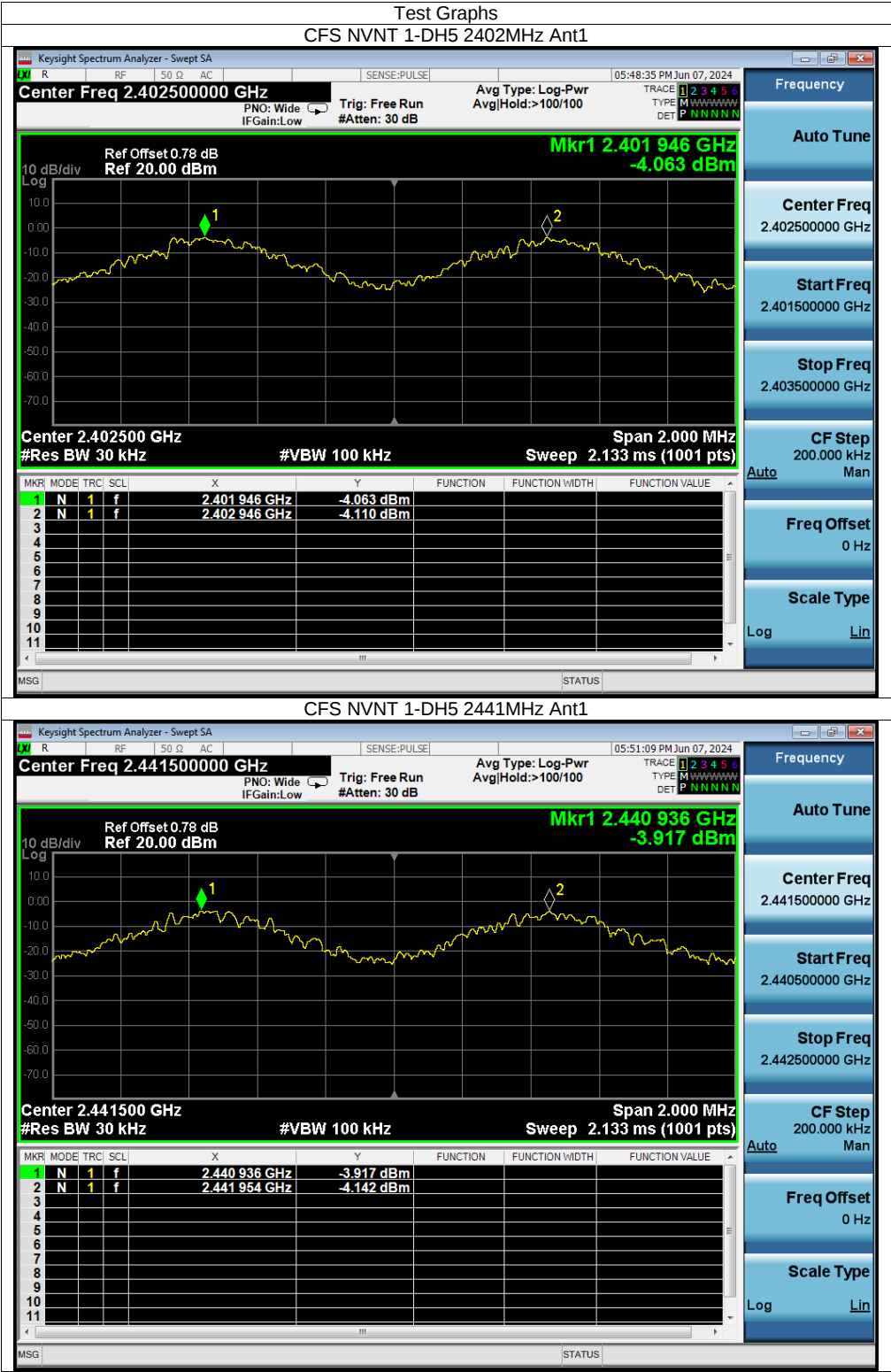


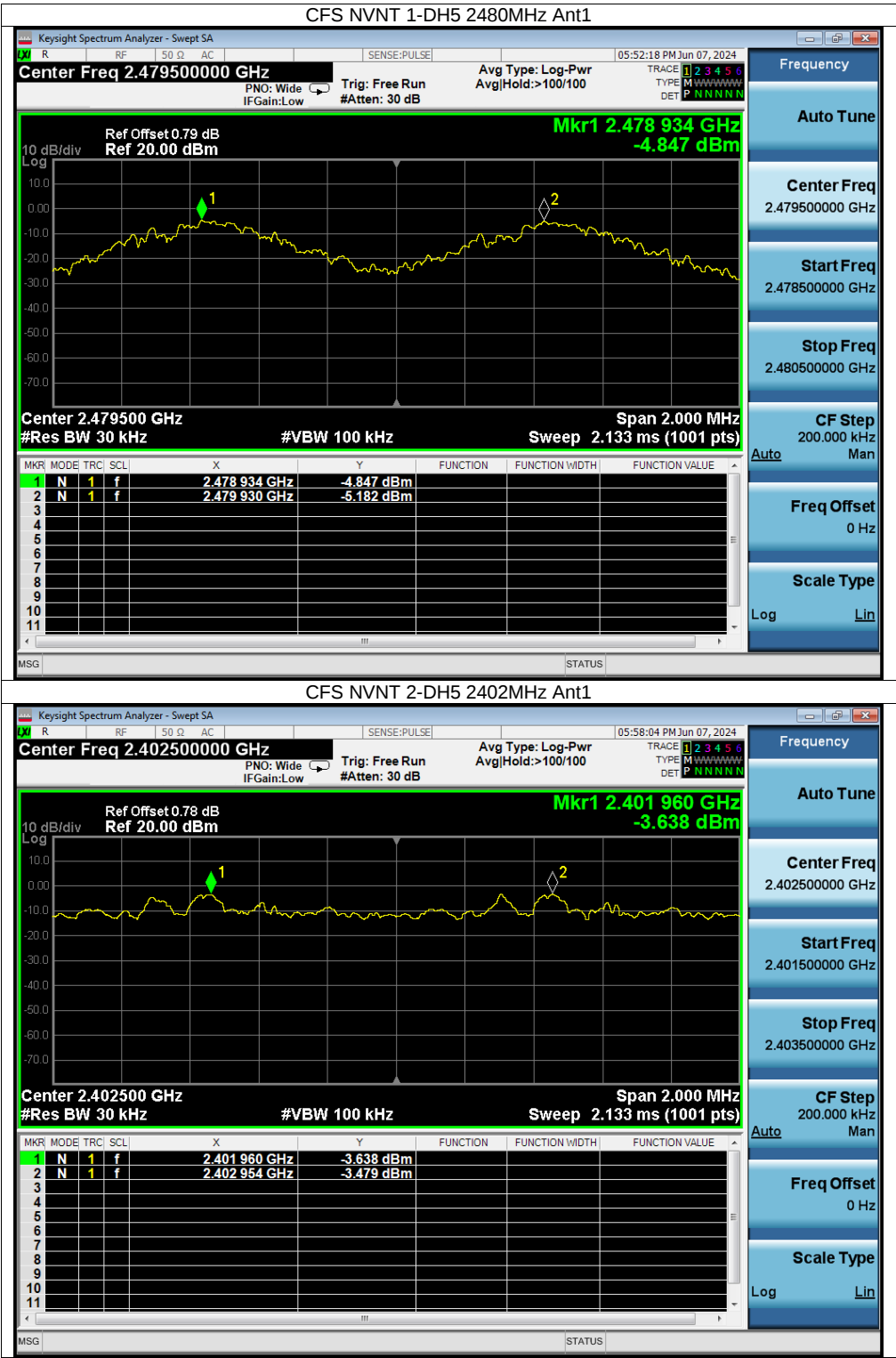


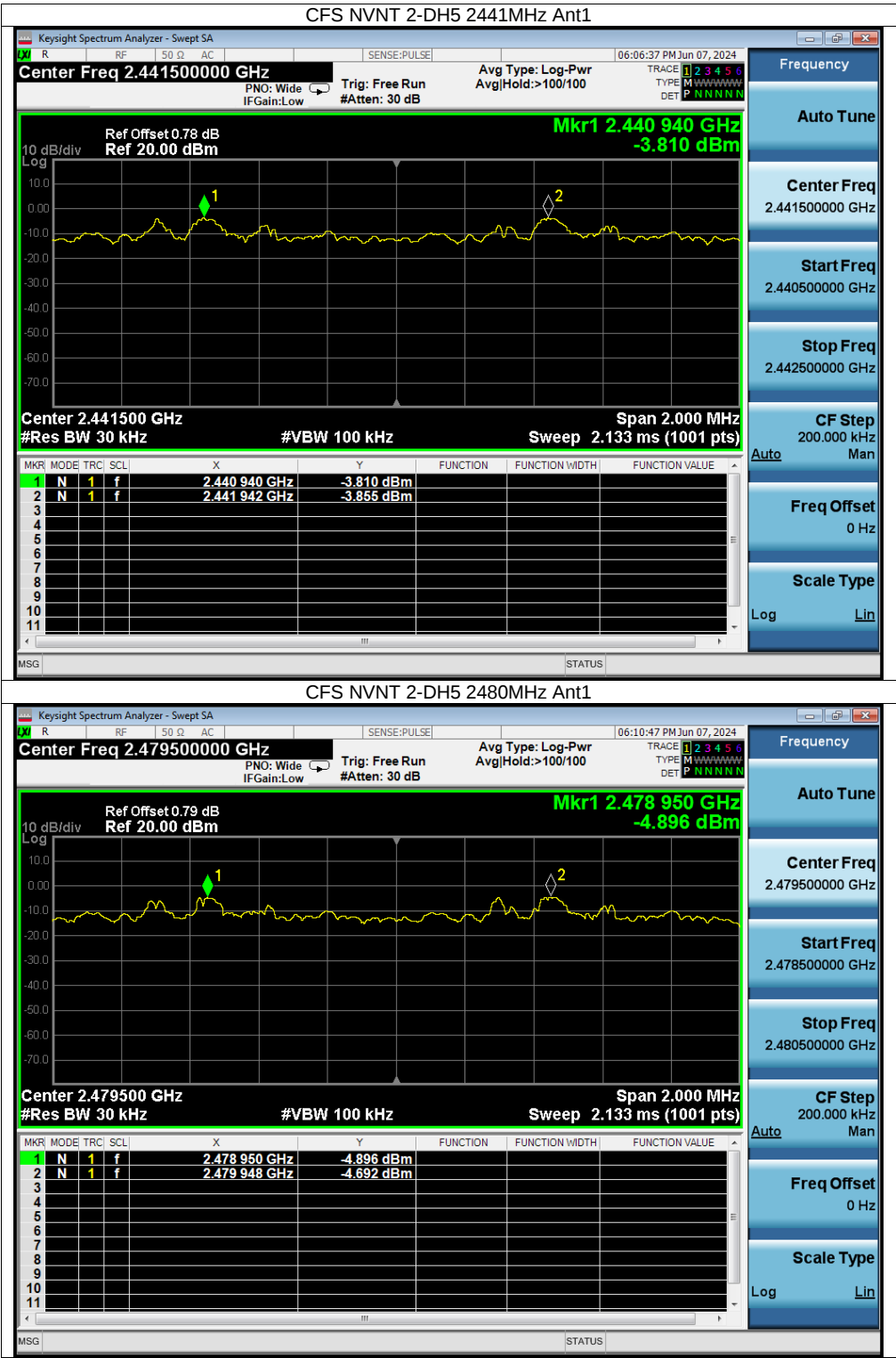


## Carrier Frequencies Separation

| Condition | Mode  | Antenna | Hopping Freq1 (MHz) | Hopping Freq2 (MHz) | HFS (MHz) | Limit (MHz) | Verdict |
|-----------|-------|---------|---------------------|---------------------|-----------|-------------|---------|
| NVNT      | 1-DH5 | Ant1    | 2401.946            | 2402.946            | 1         | 0.673       | Pass    |
| NVNT      | 1-DH5 | Ant1    | 2440.936            | 2441.954            | 1.018     | 0.667       | Pass    |
| NVNT      | 1-DH5 | Ant1    | 2478.934            | 2479.93             | 0.996     | 0.673       | Pass    |
| NVNT      | 2-DH5 | Ant1    | 2401.96             | 2402.954            | 0.994     | 0.025       | Pass    |
| NVNT      | 2-DH5 | Ant1    | 2440.94             | 2441.942            | 1.002     | 0.025       | Pass    |
| NVNT      | 2-DH5 | Ant1    | 2478.95             | 2479.948            | 0.998     | 0.025       | Pass    |

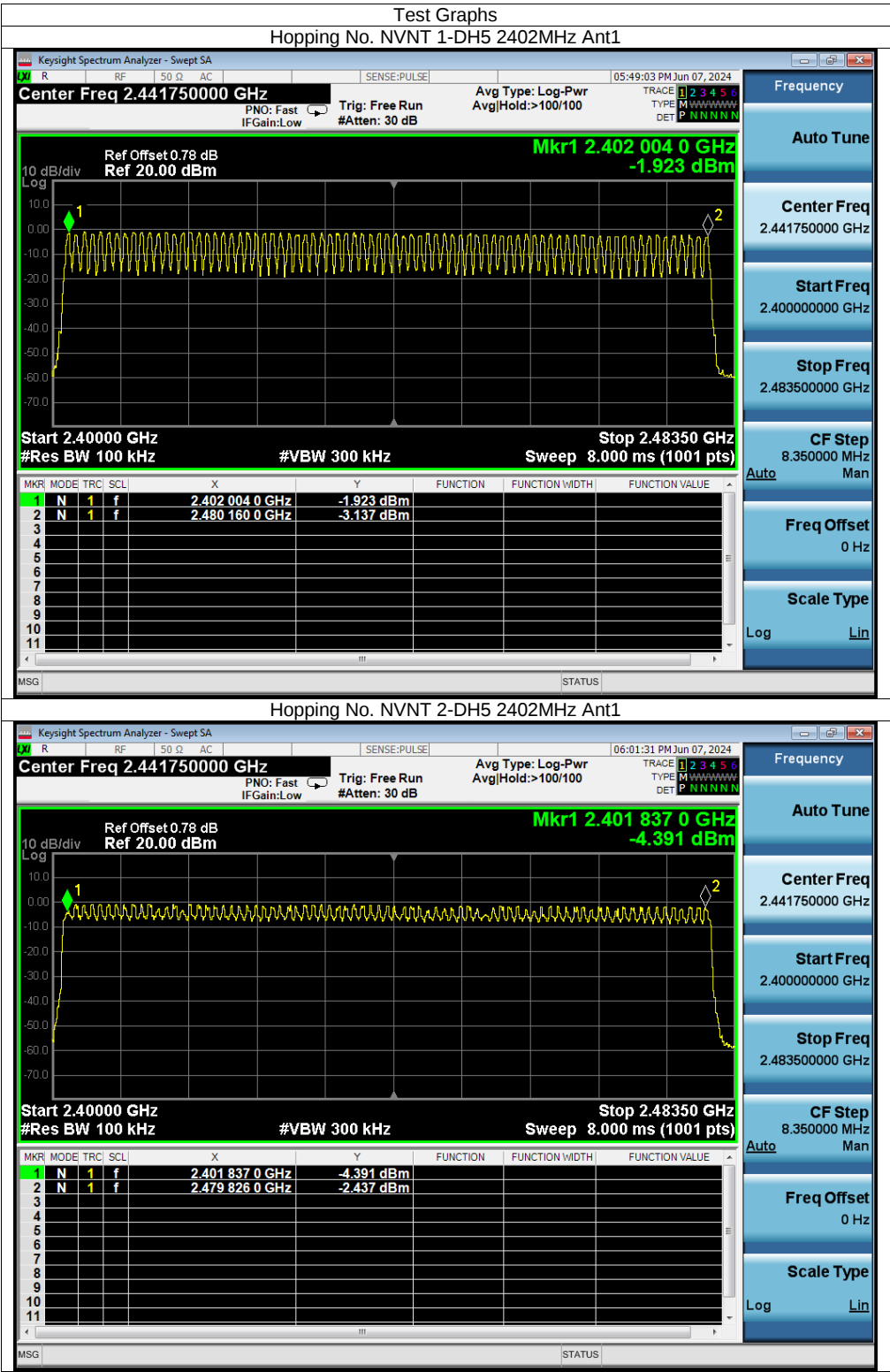






Number of Hopping Channel

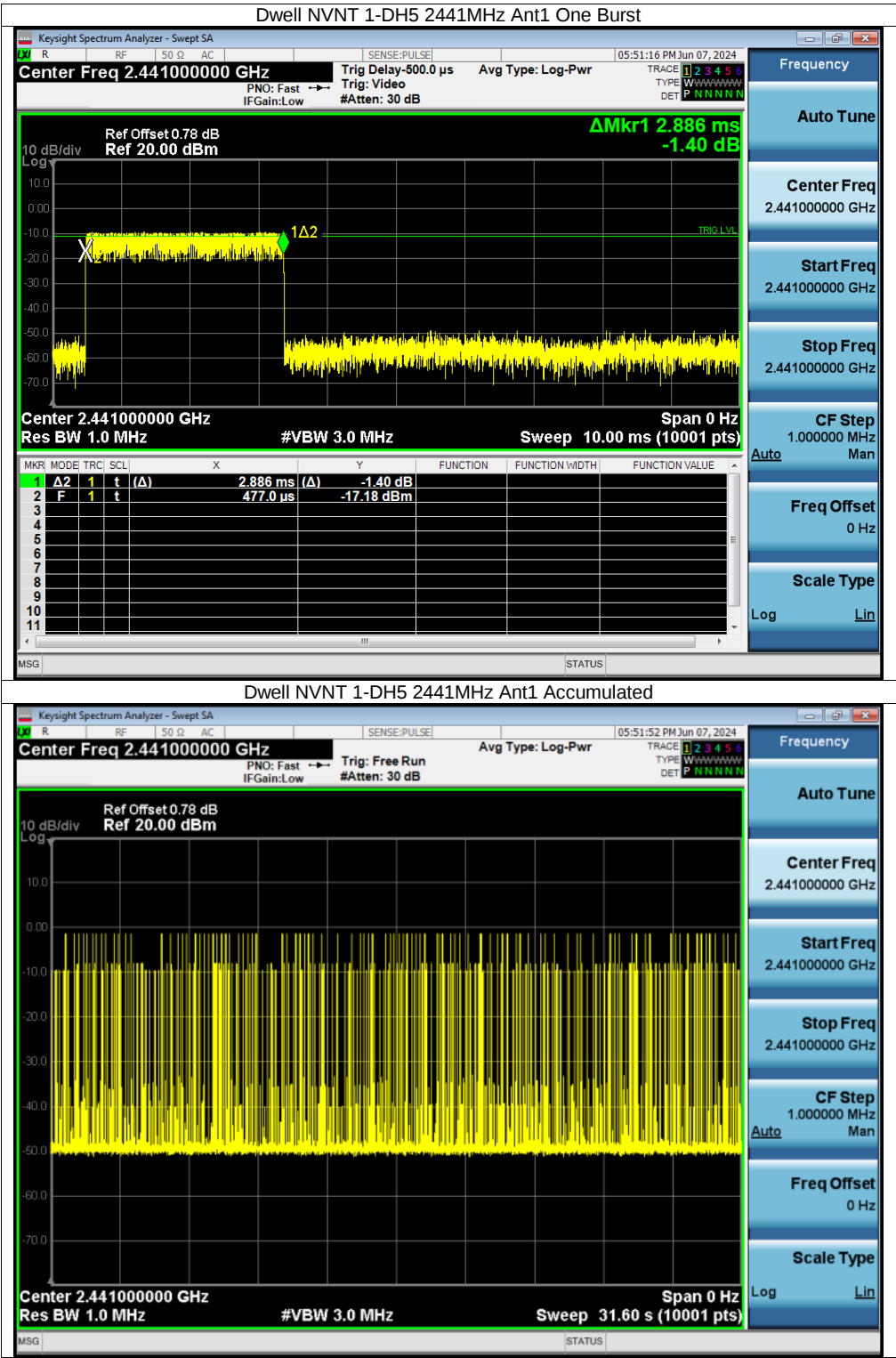
| Condition | Mode  | Antenna | Hopping Number | Limit | Verdict |
|-----------|-------|---------|----------------|-------|---------|
| NVNT      | 1-DH5 | Ant1    | 79             | 15    | Pass    |
| NVNT      | 2-DH5 | Ant1    | 79             | 15    | Pass    |



## Dwell Time

| Condition | Mode  | Frequency (MHz) | Antenna | Pulse Time (ms) | Total Dwell Time (ms) | Burst Count | Period Time (ms) | Limit (ms) | Verdict |
|-----------|-------|-----------------|---------|-----------------|-----------------------|-------------|------------------|------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant1    | 2.886           | 277.056               | 96          | 31600            | 400        | Pass    |
| NVNT      | 1-DH5 | 2441            | Ant1    | 2.886           | 326.118               | 113         | 31600            | 400        | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant1    | 2.885           | 305.81                | 106         | 31600            | 400        | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant1    | 2.891           | 344.029               | 119         | 31600            | 400        | Pass    |
| NVNT      | 2-DH5 | 2441            | Ant1    | 2.891           | 303.555               | 105         | 31600            | 400        | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant1    | 2.891           | 329.574               | 114         | 31600            | 400        | Pass    |





Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated

Keysight Spectrum Analyzer - Swept SA

Center Freq 2.441000000 GHz

Trig: Free Run

Avg Type: Log-Pwr

PNO: Fast

IFGain:Low

#Atten: 30 dB

05:51:52 PM Jun 07, 2024

TRACE 1 2 3 4 5 6

TYPE W W W W W W W W

DET P N N N N N

Ref Offset 0.78 dB

Ref 20.00 dBm

10 dB/div

Log

10.0

0.00

-10.0

-20.0

-30.0

-40.0

-50.0

-60.0

-70.0

Center 2.441000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 31.60 s (10001 pts)

Span 0 Hz

MSG

STATUS

Frequency

Auto Tune

Center Freq 2.441000000 GHz

Start Freq 2.441000000 GHz

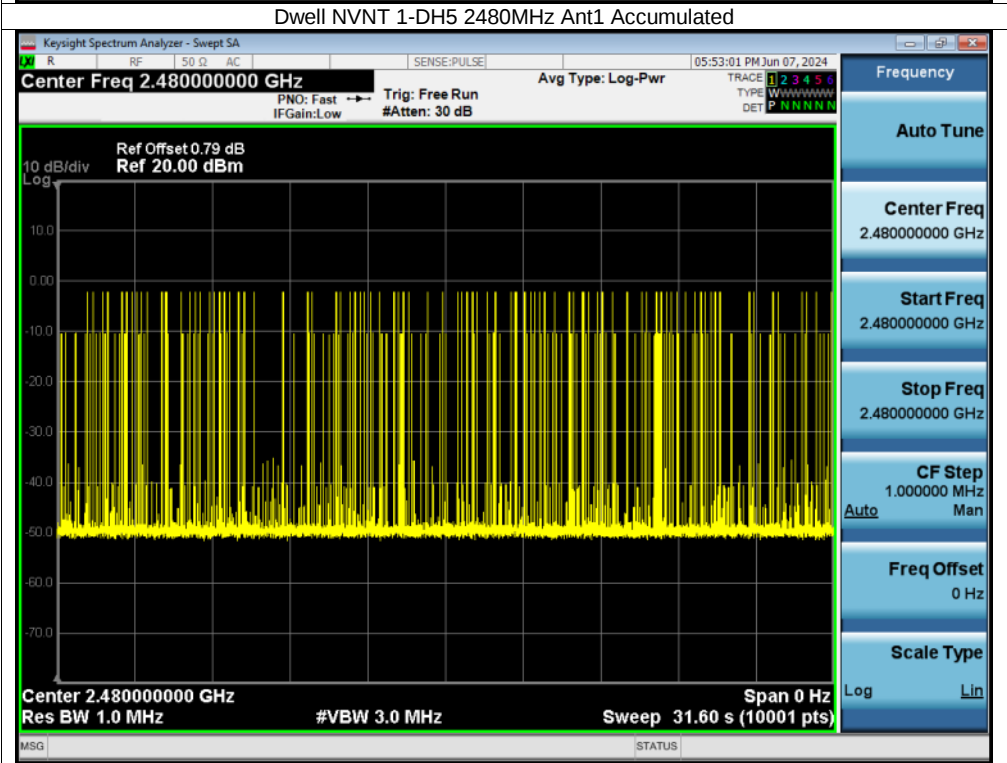
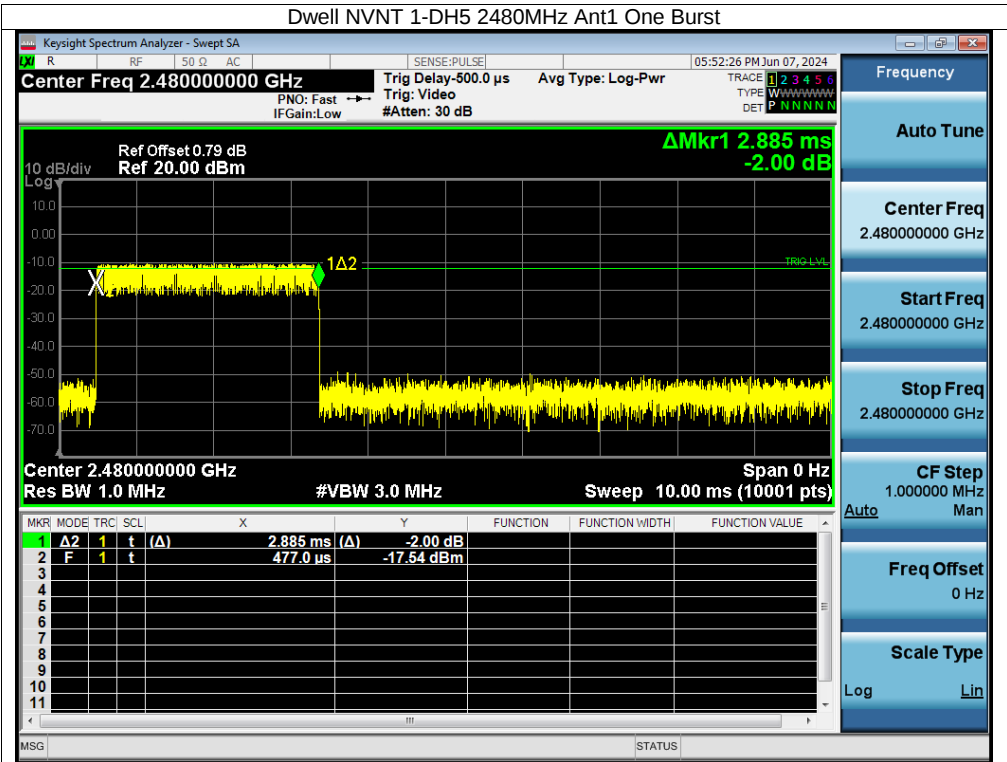
Stop Freq 2.441000000 GHz

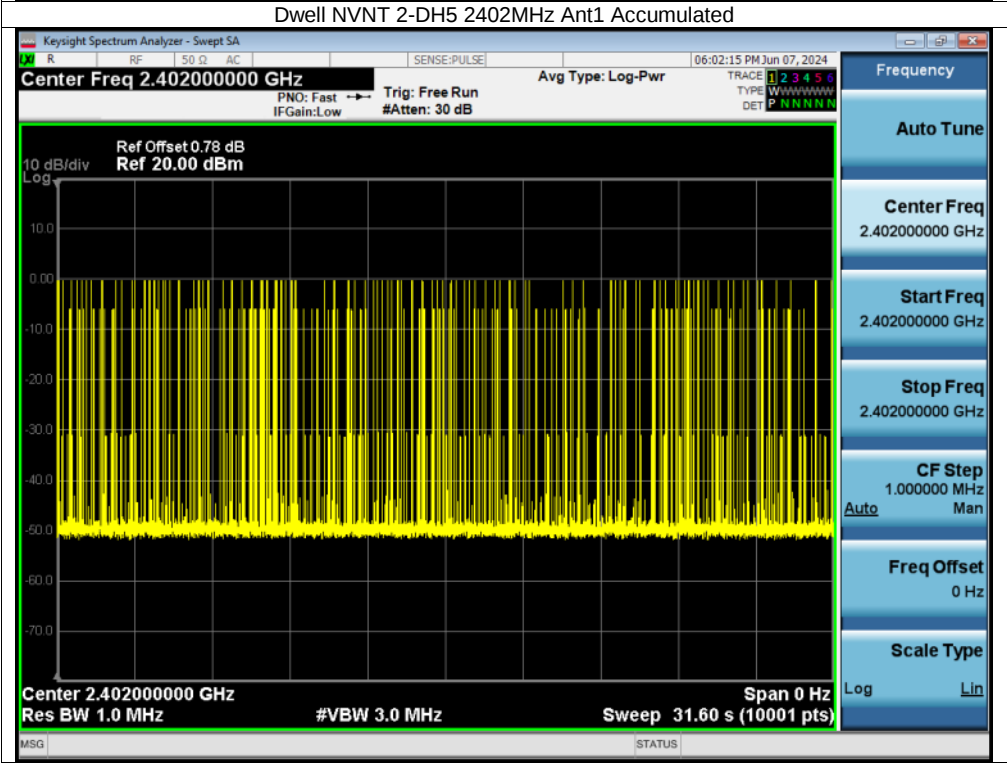
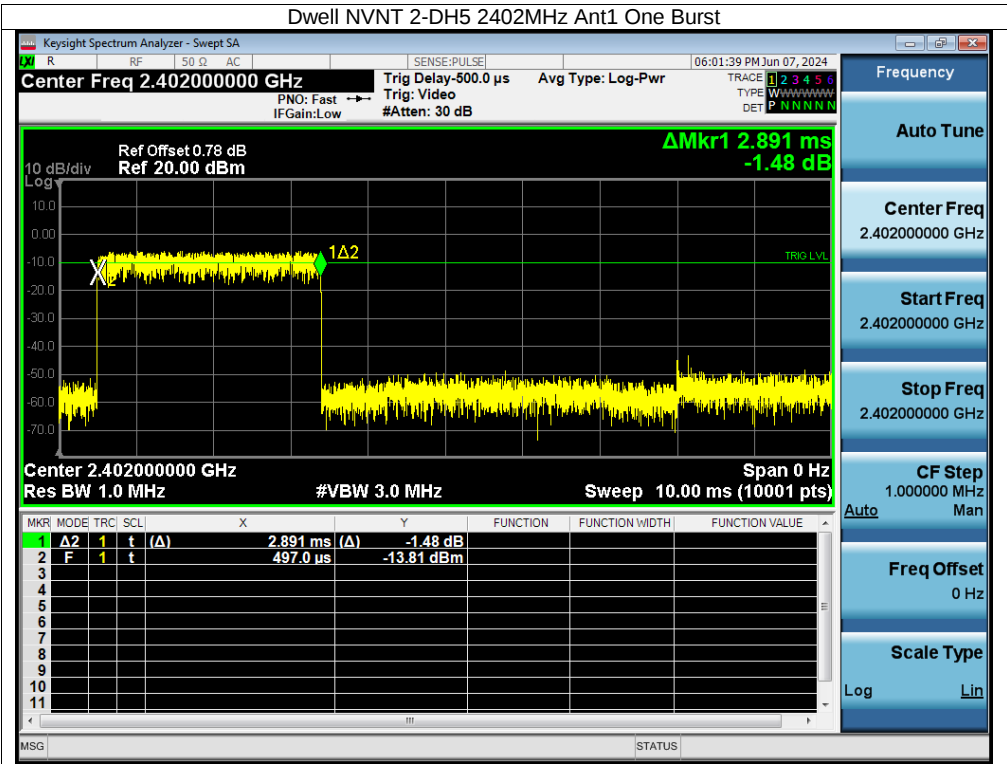
CF Step 1.000000 MHz

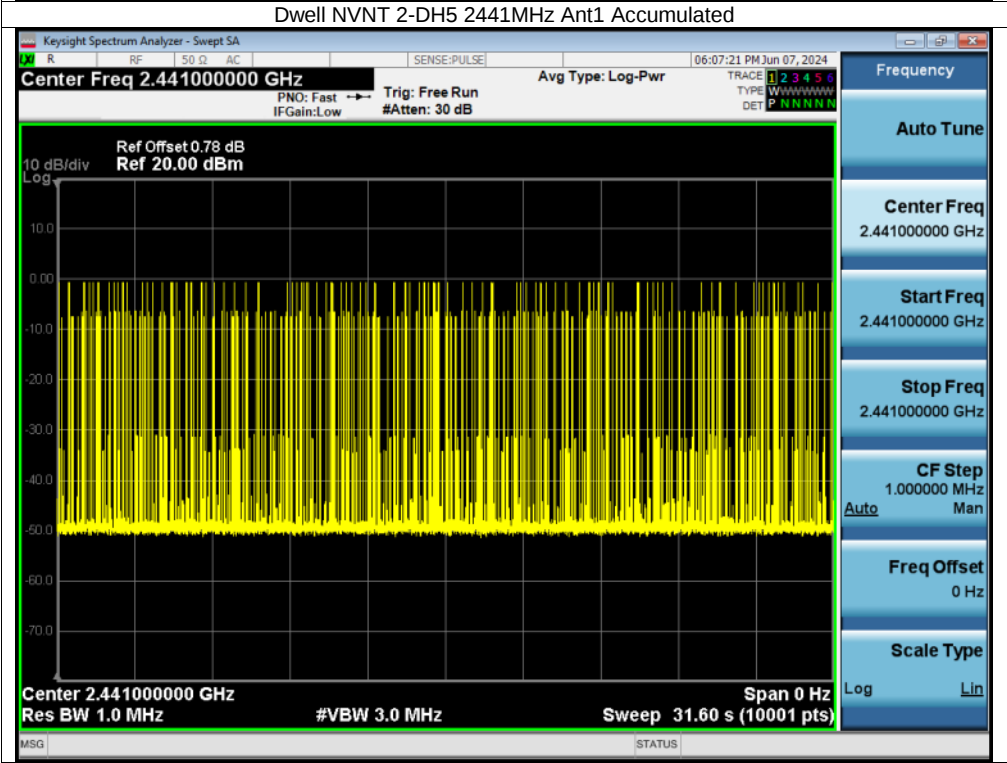
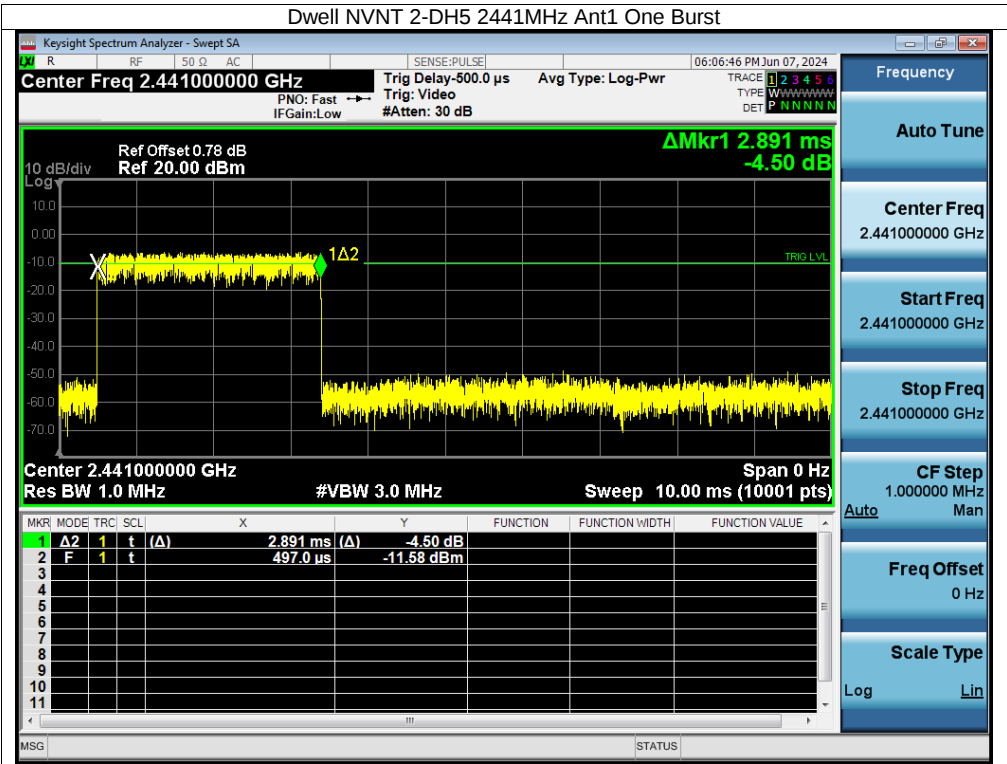
Auto Man

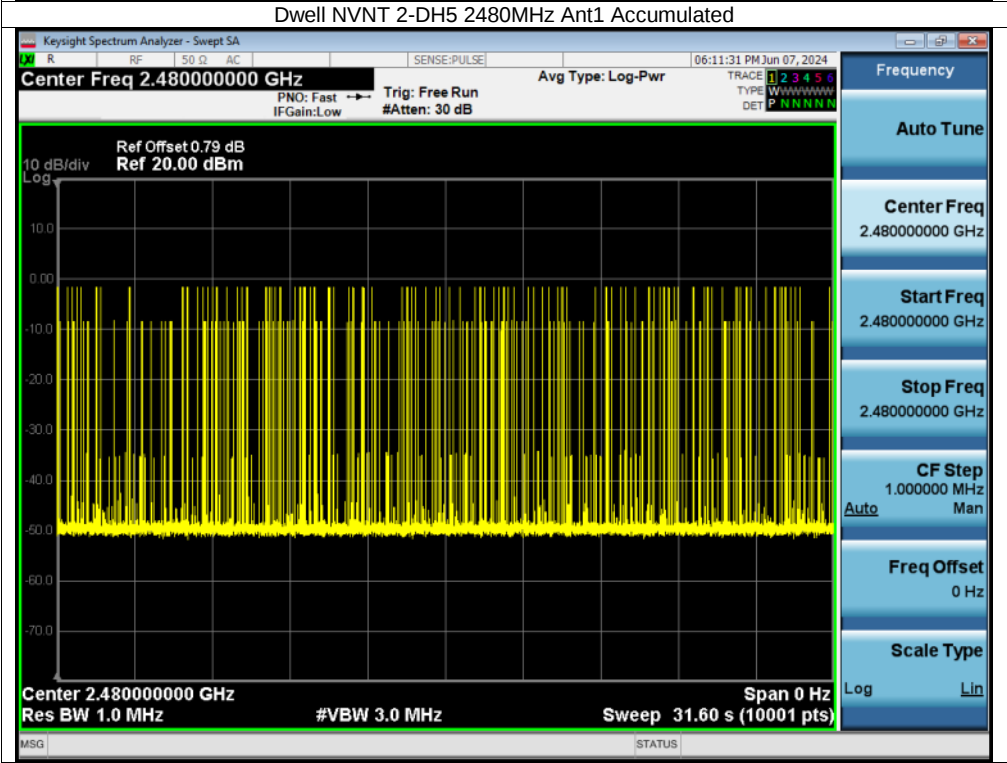
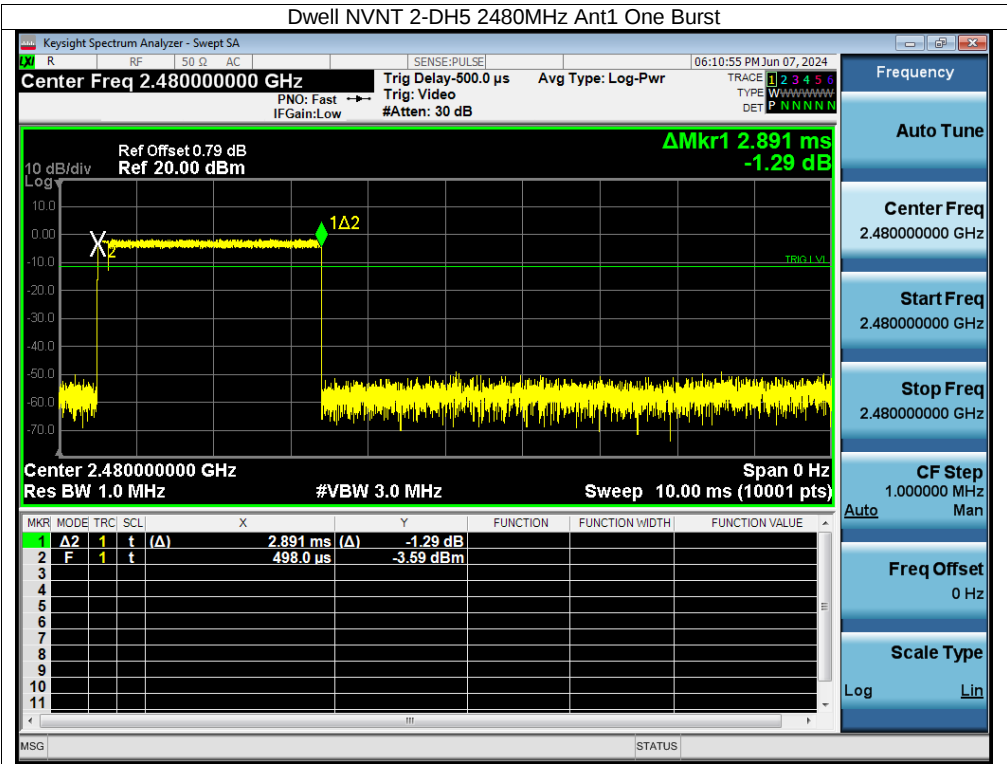
Freq Offset 0 Hz

Scale Type Log Lin



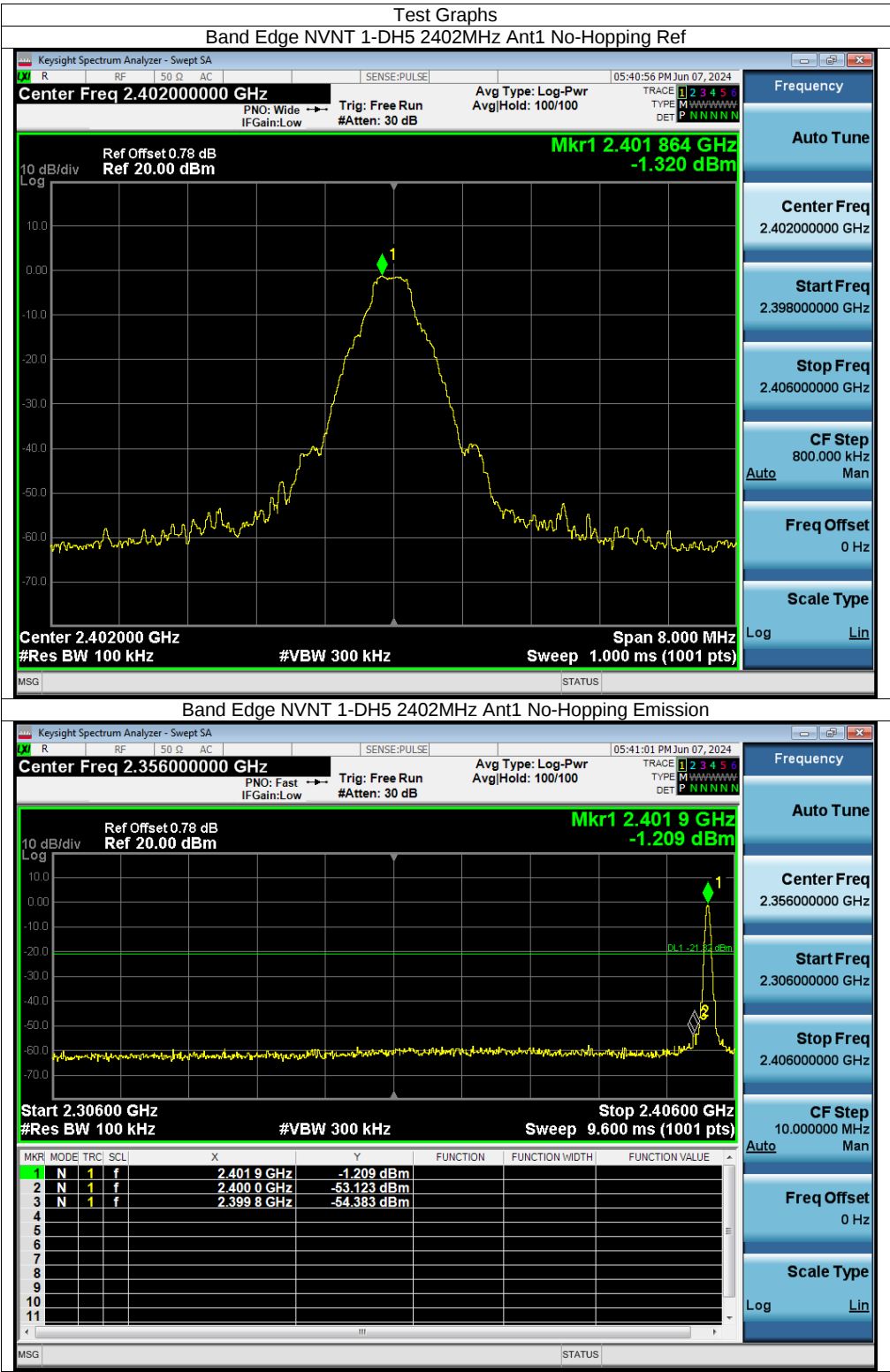


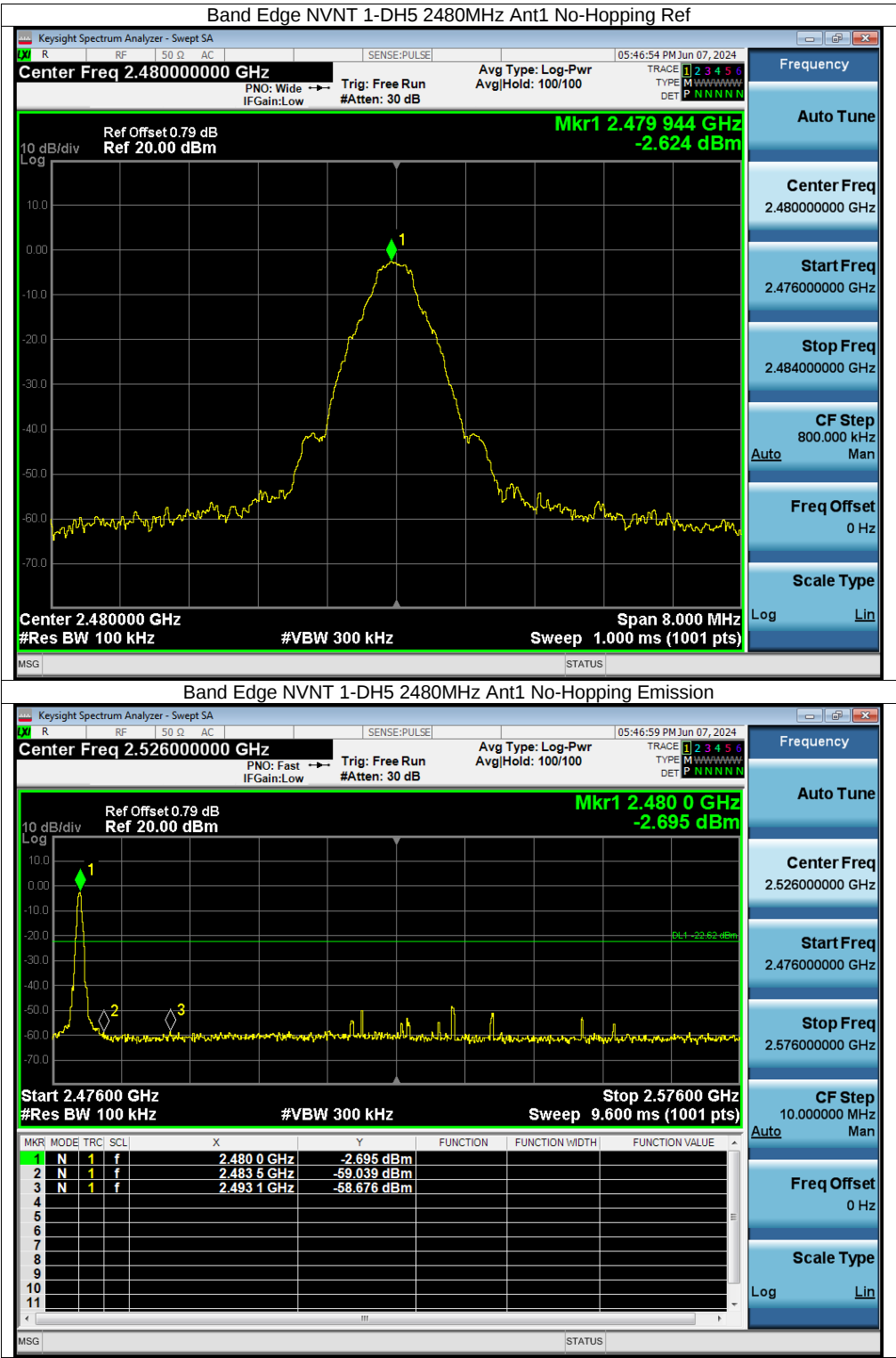


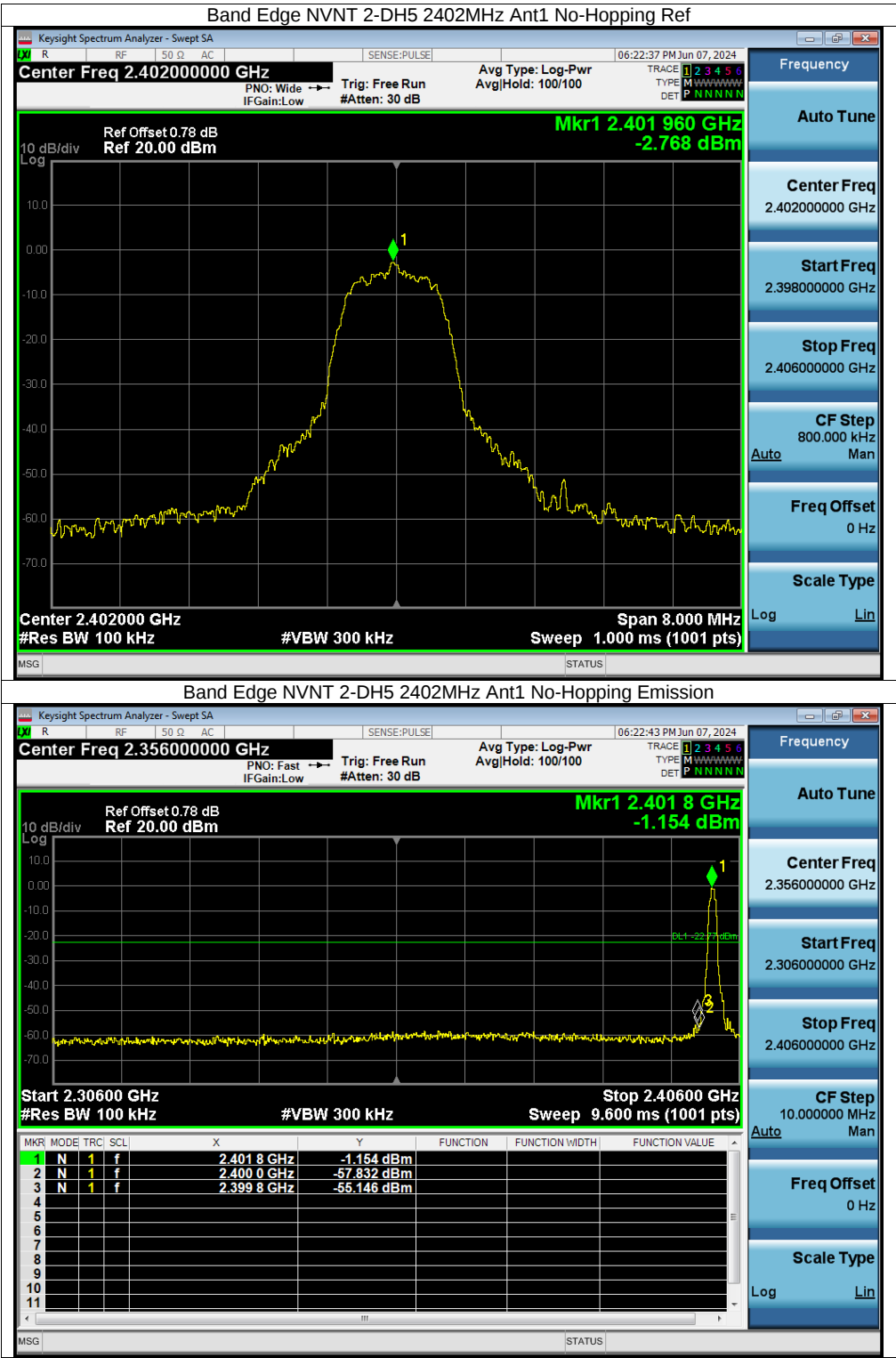


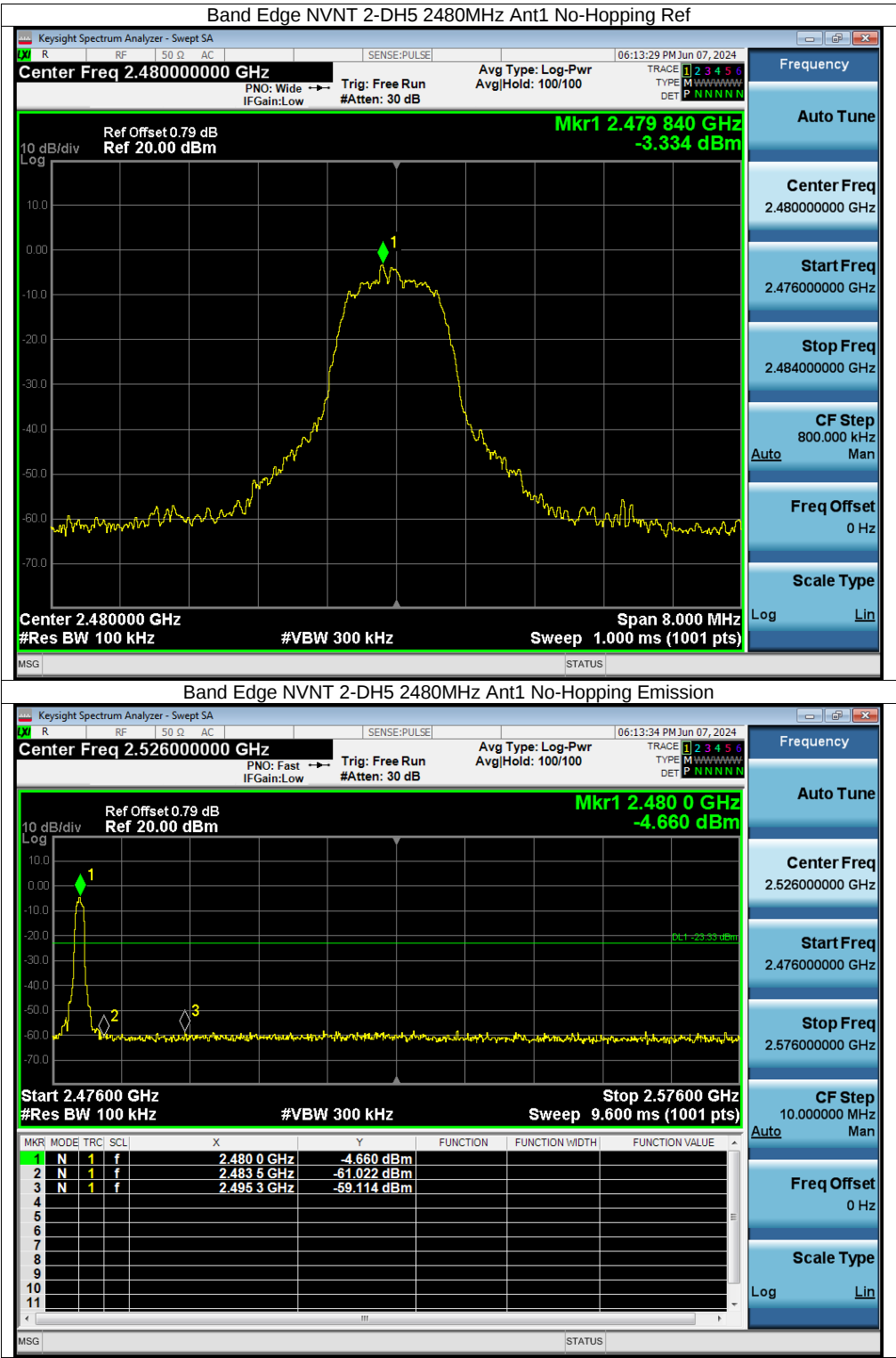
## Band Edge

| Condition | Mode  | Frequency (MHz) | Antenna | Hopping Mode | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|-------|-----------------|---------|--------------|-----------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant1    | No-Hopping   | -51.8           | -20         | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant1    | No-Hopping   | -56.06          | -20         | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant1    | No-Hopping   | -52.38          | -20         | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant1    | No-Hopping   | -55.78          | -20         | Pass    |









## Band Edge(Hopping)

| Condition | Mode  | Frequency (MHz) | Antenna | Hopping Mode | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|-------|-----------------|---------|--------------|-----------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant1    | Hopping      | -54.87          | -20         | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant1    | Hopping      | -55.08          | -20         | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant1    | Hopping      | -55.51          | -20         | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant1    | Hopping      | -54.43          | -20         | Pass    |

