# TEST REPORT

| | | | |
|---|---|---|---|
| **Applicant:**<br>**Address:** | **Wuchao (Shenzhen) Technology Development Co., Ltd.**<br>**Room 1916, Tower A, Rongchuang Zhihui Building, Minzhi Street, Longhua District, Shenzhen City, Guangdong, China** | | |
| **Manufacturer:**<br>**Address:** | **Wuchao (Shenzhen) Technology Development Co., Ltd.**<br>**Room 1916, Tower A, Rongchuang Zhihui Building, Minzhi Street, Longhua District, Shenzhen City, Guangdong, China** | | |
| **Factory:**<br>**Address:** | **Wuchao (Shenzhen) Technology Development Co., Ltd.**<br>**Room 1916, Tower A, Rongchuang Zhihui Building, Minzhi Street, Longhua District, Shenzhen City, Guangdong, China** | | |
| **E.U.T.:** | **True Wireless Earphones** | | |
| **Model Number:** | **HY-C09** | | |
| **Trade Mark:** | **HYUNDAI** | | |
| **FCC ID:** | **2BMKL-HY-C09** | | |
| **Date of Receipt:** | **2024-12-21** | **Date of Test:** | **2024-12-21 to 2024-12-24** |
| **Test Specification:** | **FCC 47 CFR Part 15, Subpart C** | | |
| **Test Result:** | **The equipment under test was found to be compliance with the requirements of the standards applied.** | | |

Prepared by:

Jerry Hu/ Engineer

Date: 2024-12-24

Approved & Authorized Signer:

Frank Shen/ Manager

Issue Date: 2024-12-31

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| Revision History of This Test Report | | |
|---|---|---|
| Report Number | Description | Issued Date |
| LP24120045C10-01 | Initial Issue | 2024-12-31 |
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# 1. GENERAL PRODUCT INFORMATION

## 1.1. PRODUCT FUNCTION

Refer to Technical Construction Form and User Manual.

## 1.2. EUT TECHNICAL DESCRIPTION

| | |
|---|---|
| Product Name: | True Wireless Earphones |
| Model No.: | HY-C09 |
| Test Model No: | HY-C09 |
| Difference: | N/A |
| Serial No.: | N/A |
| Test sample(s) ID: | LP24120045C10-S001 |
| Sample(s) Status | Engineer sample |
| Hardware: | V 1.0 |
| Software: | V 1.0 |
| Operation Frequency: | 2402MHz-2480MHz |
| Channel numbers: | 79 |
| Channel separation: | 1MHz |
| Modulation type: | GFSK, π/4-DQPSK, 8DPSK |
| Antenna Type: | Chip Antenna |
| Antenna gain: | 2.7dBi |
| Power supply: | ☒ DC 5V form USB<br>☒ DC 3.7V form battery |

## 1.3. INDEPENDENT OPERATION MODES

The EUT has been tested under its typical operating condition.
The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.
Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (1Mbps for GFSK modulation; 2Mbps for pi/4-DQPSK modulation; 3Mbps for 8DPSK modulation ) were used for all test.
Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 0 | 2402 | 39 | 2441 | … | … |
| 1 | 2403 | 40 | 2442 | 76 | 2478 |
| 2 | 2404 | 41 | 2443 | 77 | 2479 |
| … | … | … | … | 78 | 2480 |
| Note: fc=2402MHz+(k-1)×1MHz k=1 to 79 | | | | | |

Test Frequency and channel

| Lowest Frequency | | Middle Frequency | | Highest Frequency | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 0 | 2402 | 39 | 2441 | 78 | 2480 |

## 1.4. TEST SOFTWARE

| Software | | Description |
|---|---|---|
| FCC_assist_1.0.2.2.exe | | Set the COM Port Test Tool to set the corresponding Test conditions |

## 1.5. GENERAL CONDITION

| | Temperature | Humidity |
|---|---|---|
| Ambient Condition: | 23.5℃ | 49.1%RH |

## 1.6. SUPPORT EQUIPMENT

| EUT Cable List and Details | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| / | / | / | / |

| Auxiliary Cable List and Details | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| / | / | / | / |

| Auxiliary Equipment List and Details | | | |
|---|---|---|---|
| Description | Manufacturer | Model | Serial Number |
| Laptop computer | Lenovo | Xiaoxin Pro IA5HR | PF490VB0 |
| | | | |

**Notes:**

1.All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2.Grounding was established in accordance with the manufacturer’s requirements and conditions for the intended use.

# 2. TEST STANDARDS AND SITES

## 2.1. DESCRIPTION OF STANDARDS AND RESULTS

The EUT have been tested according to the applicable standards as referenced below.

| FCC Part Clause | Test Parameter | Verdict | Remark |
|---|---|---|---|
| 15.247(a)(1) | 20 dB Bandwidth | PASS | |
| 15.247(a)(1) | Carrier Frequency Separation | PASS | |
| 15.247(a)(1) | Number of Hopping Frequencies | PASS | |
| 15.247(a)(1) | Average Time of Occupancy (Dwell Time) | PASS | |
| 15.247(b)(1) | Maximum Peak Conducted Output Power | PASS | |
| 15.247(d) | Conducted Spurious Emissions | PASS | |
| 15.247(d)<br>15.209 | Radiated Spurious Emissions | PASS | |
| 15.207 | Conducted Emission | PASS | |
| 15.203 | Antenna Application | PASS | |
| 15.247 (a) (1)/g/h | Frequency Hopping System | PASS | |

NOTE1: N/A (Not Applicable)
NOTE2: According to FCC KDB 558074 D01 15.247 Meas Guidance v05r02, the report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.

## 2.2. LIST OF TEST AND MEASUREMENT INSTRUMENTS

| For conducted emission at the mains terminals test(Shielded Room 1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval | Lab No. | Remark |
| EMI Test Receiver | Rohde & Schwarz | ESHS30 | 8290501003 | Jan. 24, 2024 | 1 Year | LEP-E002 | ☑ |
| Artificial Mains Network | Baluelec | LSN016 | BL041122050121 | Nov. 01, 2021 | 1 Year | LEP-E067 | ☑ |
| Shielded Room 1 | MR | MR-L05 | LEP-E053 | Nov. 17, 2022 | 3 Year | LEP-E053 | ☑ |
| Test software | EZ-EMC | Fala | LEPONT-03A2 | N/A | N/A | N/A | ☑ |
| **For radiated(9K-30M) emission test(966 Chamber 1)** | | | | | | | |
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval | Lab No. | Remark |
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101849 | Jan. 31, 2024 | 1 Year | LEP-E006 | ☑ |
| Active Loop Antenna | Schwarzbeck | FMZB 1519C | 00008 | Jan. 24, 2024 | 3 Year | LEP-E068 | ☑ |
| 966 Chamber 1 | MR | MR-L02 | LEP-E051 | Nov. 17, 2022 | 3 Year | LEP-E051 | ☑ |
| Test software | EZ-EMC | Fala | EMEC-3A1 | N/A | N/A | N/A | ☑ |
| **For radiated(30M-1G) emission test(966 Chamber 1)** | | | | | | | |
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval | Lab No. | Remark |
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101849 | Jan. 31, 2024 | 1 Year | LEP-E006 | ☑ |
| TRILOG Broadband Antenna | Schwarzbeck | VULB 9163 | 743 | Nov. 20, 2022 | 3 Year | LEP-E005 | ☑ |
| Signal Amplifier | HP | 8447D | 1726A01222 | Jan. 24, 2024 | 1 Year | LEP-E007 | ☐ |
| 6dB Attenuator | RswTech | 5W 6dB | LEP-E084 | Jan. 24, 2024 | 1 Year | LEP-E084 | ☐ |
| 966 Chamber 1 | MR | MR-L02 | LEP-E051 | Nov. 17, 2022 | 3 Year | LEP-E051 | ☑ |
| Test software | EZ-EMC | Fala | EMEC-3A1 | N/A | N/A | N/A | ☑ |
| **For radiated(1-18G) emission test(966 Chamber 1)** | | | | | | | |
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval | Lab No. | Remark |
| Spectrum analyzer | Rohde & Schwarz | FSV40 | 101412 | Jan. 24, 2024 | 1 Year | LEP-E076 | ☑ |
| Spectrum analyzer | Agilent | N9020A | MY49100060 | Jan. 24, 2024 | 1 Year | LEP-E020 | ☑ |
| Horn antenna | Schwarzbeck | BBHA 9120D | 01875 | Nov. 20, 2022 | 3 Year | LEP-E024 | ☑ |
| Preamplifier | Schwarzbeck | BBN 9718B | 00010 | Jan. 24, 2024 | 1 Year | LEP-E025 | ☑ |
| 966 Chamber 1 | MR | MR-L02 | LEP-E051 | Nov. 17, 2022 | 3 Year | LEP-E051 | ☑ |
| Test software | EZ-EMC | Fala | EMEC-3A1 | N/A | N/A | N/A | ☑ |
| **For radiated(18-40G) emission test(966 Chamber 1)** | | | | | | | |
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval | Lab No. | Remark |
| Spectrum analyzer | Rohde & Schwarz | FSV40 | 101412 | Jan. 24, 2024 | 1 Year | LEP-E076 | ☑ |
| Horn antenna+Preamplifier | COM-POWER | AH840 | 10100020 | Sep. 05, 2022 | 3 Year | LEP-E075 | ☑ |
| 966 Chamber 1 | MR | MR-L02 | LEP-E051 | Nov. 17, 2022 | 3 Year | LEP-E051 | ☑ |
| Test software | EZ-EMC | Fala | EMEC-3A1 | N/A | N/A | N/A | ☑ |
| **For RF test** | | | | | | | |
| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval | Lab No. | Remark |
| Spectrum analyzer | Rohde & Schwarz | FSV40 | 101412 | Jan. 24, 2024 | 1 Year | LEP-E076 | ☑ |
| Spectrum analyzer | Agilent | N9020A | MY49100060 | Jan. 24, 2024 | 1 Year | LEP-E020 | ☑ |
| Vector source | Agilent | N5182A | MY47420382 | Jan. 24, 2024 | 1 Year | LEP-E021 | ☑ |
| Analog signal source | Agilent | N5171B | MY51350292 | Jan. 24, 2024 | 1 Year | LEP-E022 | ☑ |
| All instrument | Rohde & Schwarz | CMW 500 | 1201.002K50 | Jan. 24, 2024 | 1 Year | LEP-E019 | ☑ |
| High and low temperature chamber | Math-mart | MT-1202-40 | LEP-E041 | Jan. 24, 2024 | 1 Year | LEP-E041 | ☑ |
| control unit | Tonscend | JS0806-2 | 10165 | Jan. 24, 2024 | 1 Year | LEP-E034 | ☑ |
| Testing software | Tonscend | JSTS1120-3 | Ver 2.6.77.0518 | N/A | N/A | N/A | ☑ |

## 2.3. MEASUREMENT UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Parameter | Uncertainty |
|---|---|
| Radio Frequency | ±1x10^-5 |
| Maximum Peak Output Power Test | ±1.0% |
| Conducted Emissions Test | ±3.08dB |
| Radiated Emission Test | ±4.60dB |
| Power Density | ±0.9% |
| Occupied Bandwidth Test | ±2.3% |
| Band Edge Test | ±1.2% |
| Antenna Port Emission | ±3dB |
| Temperature | ±3.2% |
| Humidity | ±2.5% |
| Measurement Uncertainty for a level of Confidence of 95% | |

## 2.4. TEST FACILITY

EMC Lab. : The Laboratory has been assessed and proved to be in compliance with CNAS/CL01
The Certificate Registration Number is L10100.
The Laboratory has been assessed and proved to be in compliance with A2LA
The Certificate Registration Number is 6901.01

FCC Designation No.: CN1351
Test Firm Registration No.: 397428

ISED CAB identifier: CN0151
Test Firm Registration No.: 20133

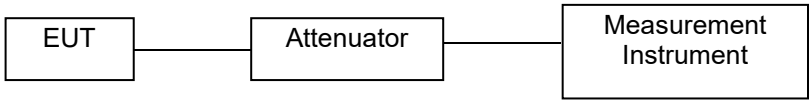
Test Location : Dongguan Lepont Testing Service Co., Ltd.

Address : Room 102, Building 11, No.7, Houjie Science And Technology Avenue, Houjie, Dongguan, Guangdong, China

# 3. SETUP OF EQUIPMENT UNDER TEST

## 3.1. RADIO FREQUENCY TEST SETUP 1

The component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.




## 3.2. RADIO FREQUENCY TEST SETUP 2

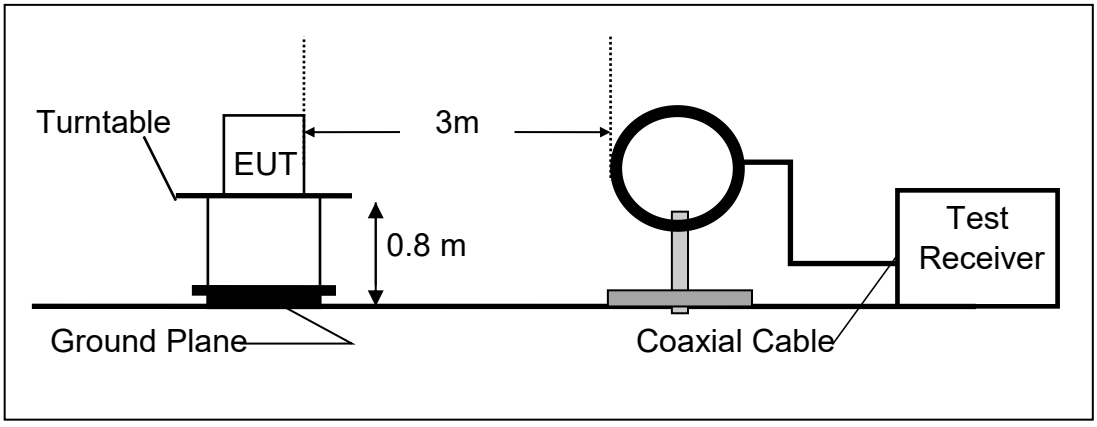
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 32.

Below 30MHz：
The EUT is placed on a turntable 0.8meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

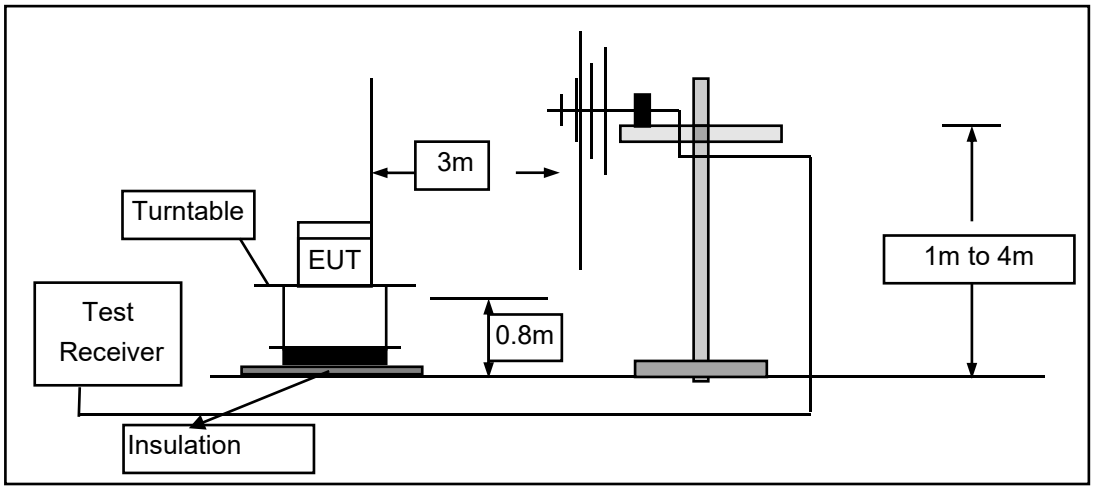
Above 30MHz：
The EUT is placed on a turntable 0.8meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz:
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)
The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

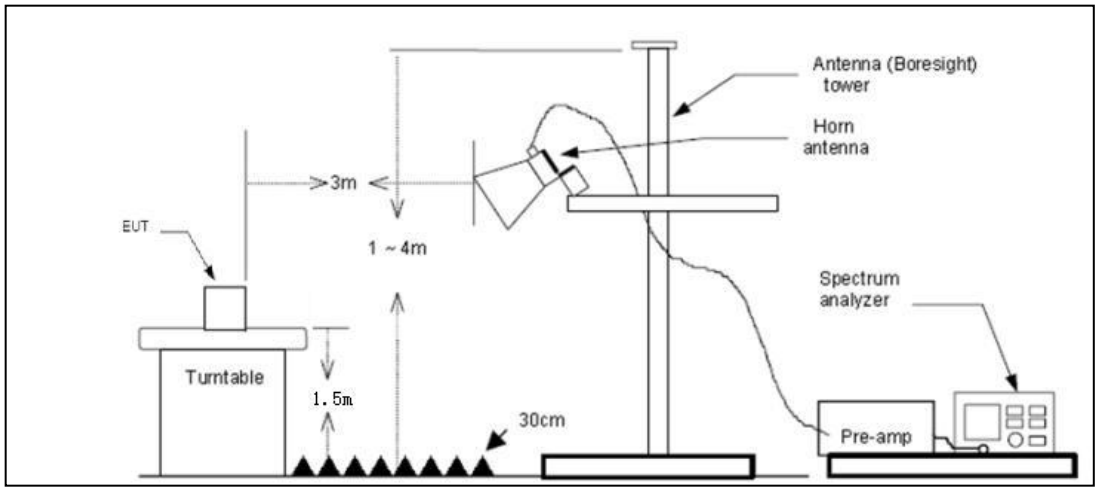
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz

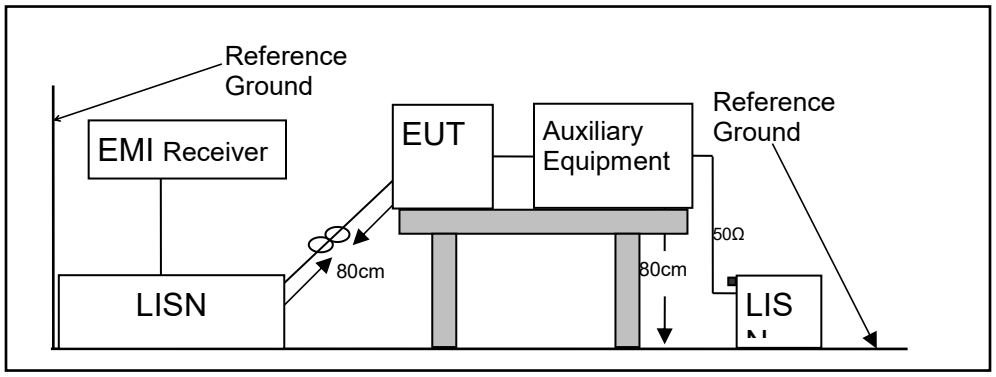



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

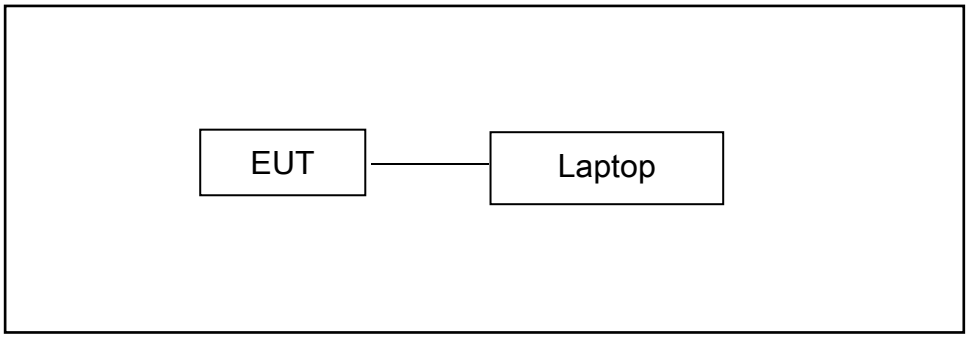


## 3.3. CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (Perfect Share Mini) must be connected to LISN. The LISN shall be placed 0.8m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.
Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.8m.
According to the requirements in Section 13.1.4.1 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.




## 3.4. BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



# 4. TEST RESULTS AND MEASUREMENT DATA

## 4.1. 20DB BANDWIDTH

### 4.1.1. Applicable Standard

According to FCC Part 15.247(a)(1) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.1.2. Conformance Limit

No limit requirement.

### 4.1.3. Test Configuration

Test according to clause 3.1 radio frequency test setup 1

### 4.1.4. Test Procedure

The EUT was operating in Bluetooth mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously
Set RBW = 30 kHz.
Set the video bandwidth (VBW) =100 kHz.
Set Span= approximately 2 to 3 times the 20 dB bandwidth
Set Detector = Peak.
Set Trace mode = max hold.
Set Sweep = auto couple.
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.
If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. Measure and record the results in the test report.

Test Results：

| TestMode | Antenna | Freq(MHz) | 20dB EBW[MHz] | FL[MHz] | FH[MHz] | Limit[MHz] |
|---|---|---|---|---|---|---|
| DH5 | Ant1 | 2402 | 1.005 | 2401.484 | 2402.489 | N/A |
| | | 2441 | 1.005 | 2440.487 | 2441.492 | N/A |
| | | 2480 | 1.020 | 2479.466 | 2480.486 | N/A |
| 2DH5 | Ant1 | 2402 | 1.311 | 2401.331 | 2402.642 | N/A |
| | | 2441 | 1.362 | 2440.304 | 2441.666 | N/A |
| | | 2480 | 1.296 | 2479.349 | 2480.645 | N/A |
| 3DH5 | Ant1 | 2402 | 1.026 | 2401.475 | 2402.501 | N/A |
| | | 2441 | 1.020 | 2440.481 | 2441.501 | N/A |
| | | 2480 | 1.026 | 2479.481 | 2480.507 | N/A |

## Test Graphs

DH5_Ant1_2402


DH5_Ant1_2441


DH5_Ant1_2480


2DH5_Ant1_2402


2DH5_Ant1_2441


2DH5_Ant1_2480


3DH5_Ant1_2402


3DH5_Ant1_2441


3DH5_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:06:11 AM Dec 24, 2024
Ref Offset 8.94 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 1.026 MHz
-0.010 dB
Center 2.480000 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
1 N 1 f 2.479 481 GHz -24.255 dBm
2 N 1 f 2.479 982 GHz -4.098 dBm
3 Δ1 1 f (Δ) 1.026 MHz (Δ) -0.010 dB
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

## 4.2. CARRIER FREQUENCY SEPARATION

### 4.2.1. Applicable Standard

According to FCC Part 15.247(a)(1) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.2.2. Conformance Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400 – 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 4.2.3. Test Configuration

Test according to clause 3.1 radio frequency test setup 1

### 4.2.4. Test Procedure

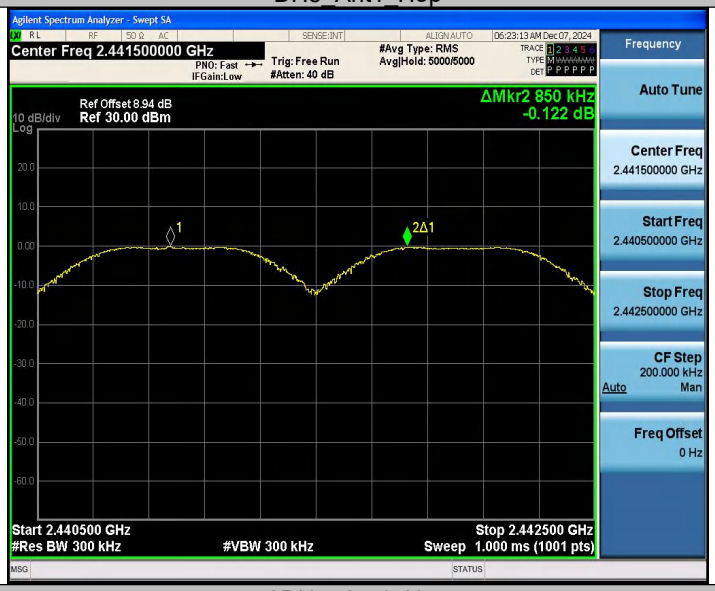
■ According to FCC Part15.247(a)(1)
The EUT must have its hopping function enabled.
Set the RBW =300kHz.
Set VBW =300kHz.
Set the span = wide enough to capture the peaks of two adjacent channels
Set Sweep time = auto couple.
Set Detector = peak. Set Trace mode = max hold.
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

## Test Results：

| TestMode | Antenna | Freq(MHz) | Result[MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| DH5 | Ant1 | Hop | 1.306 | ≥1.020 | PASS |
| 2DH5 | Ant1 | Hop | 0.996 | ≥0.908 | PASS |
| 3DH5 | Ant1 | Hop | 0.974 | ≥0.684 | PASS |

## Test Graphs

DH5_Ant1_Hop




2DH5_Ant1_Hop

| 3DH5_Ant1_Hop |
| --- |
|  |

## 4.3. NUMBER OF HOPPING FREQUENCIES

### 4.3.1. Applicable Standard

According to FCC Part 15.247(a)(1) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.3.2. Conformance Limit

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

### 4.3.3. Test Configuration

Test according to clause 3.1 radio frequency test setup 1

### 4.3.4. Test Procedure

■ According to FCC Part15.247(a)(1)(iii)

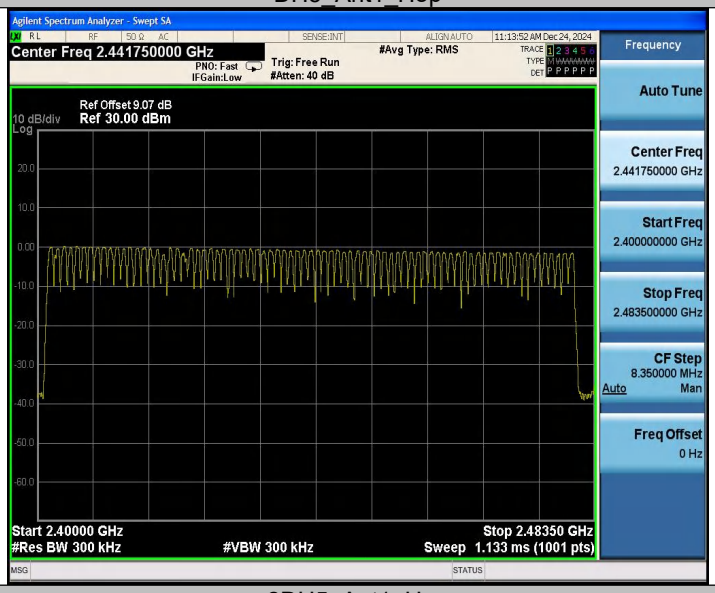
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation (2400-2483.5MHz)
RBW ≥ 100KHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies.

**Test Results:**

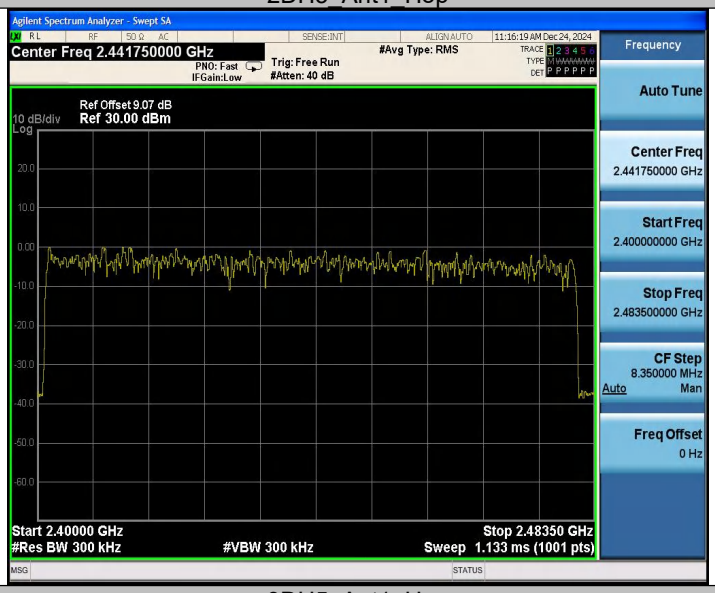
| TestMode | Antenna | Freq(MHz) | Result[Num] | Limit[Num] | Verdict |
|---|---|---|---|---|---|
| DH5 | Ant1 | Hop | 79 | ≥15 | PASS |
| 2DH5 | Ant1 | Hop | 79 | ≥15 | PASS |
| 3DH5 | Ant1 | Hop | 79 | ≥15 | PASS |

## Test Graphs

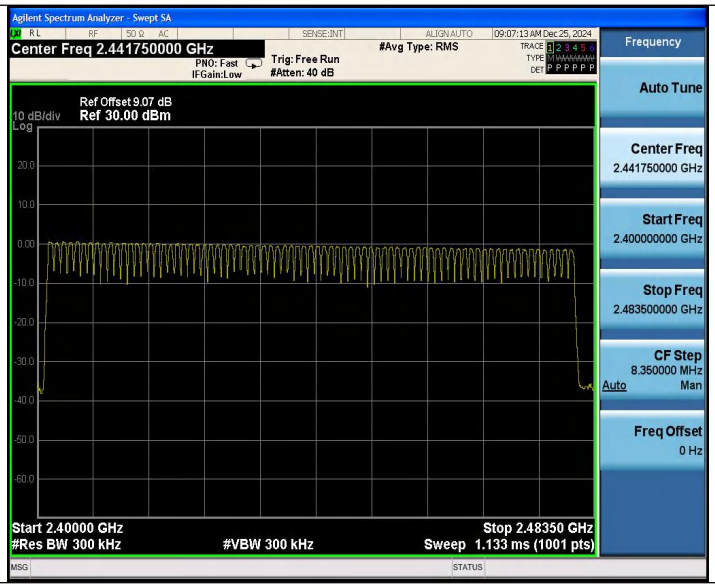
DH5_Ant1_Hop




2DH5_Ant1_Hop




3DH5_Ant1_Hop


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
09:07:13 AM Dec 25, 2024
Ref Offset 9.07 dB
10 dB/div
Log
Ref 30.00 dBm
Start 2.40000 GHz
#Res BW 300 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 1.133 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441750000 GHz
Start Freq
2.400000000 GHz
Stop Freq
2.483500000 GHz
CF Step
8.350000 MHz
Auto
Man
Freq Offset
0 Hz

## 4.4. AVERAGE TIME OF OCCUPANCY (DWELL TIME)

### 4.4.1. Applicable Standard

According to FCC Part 15.247(a)(1) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.4.2. Conformance Limit

For frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4s within a period of 0.4s multiplied by the number of hopping channels employed.

### 4.4.3. Test Configuration

Test according to clause 3.1 radio frequency test setup 1

### 4.4.4. Test Procedure

■ According to FCC Part15.247(a)(1)(iii)

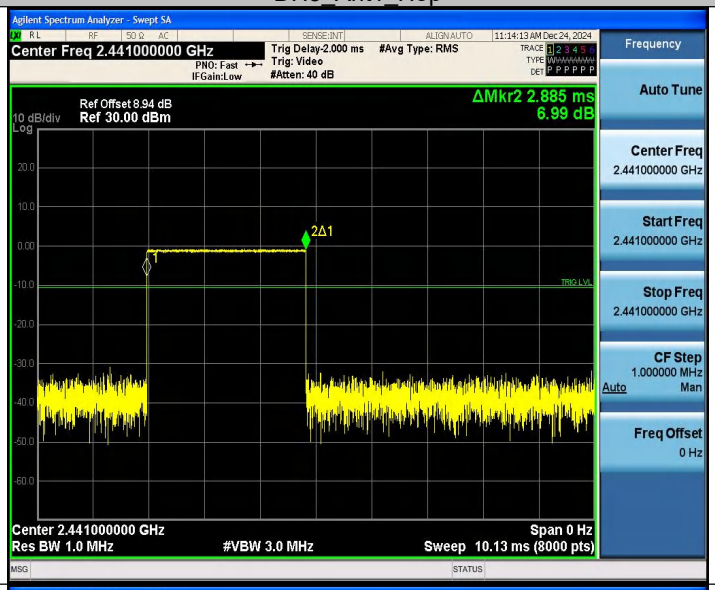
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel
RBW = 1 MHz
VBW ≥ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak
Trace = max hold
If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section.

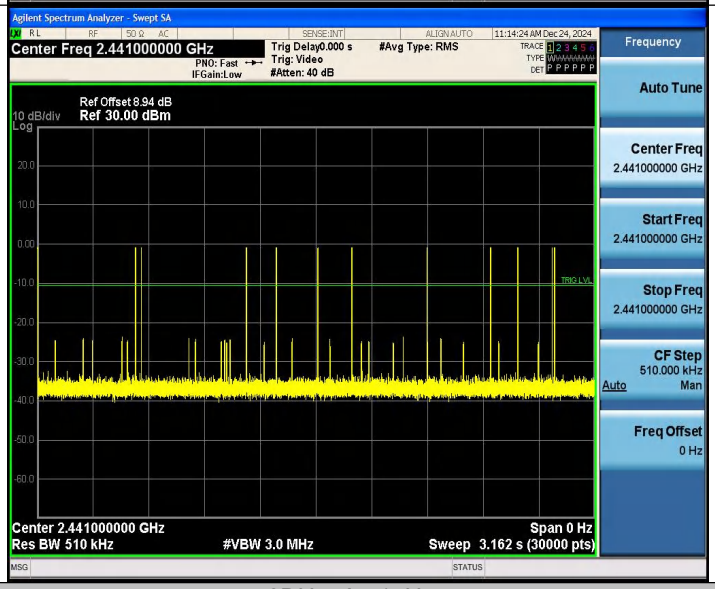
## Test Results：

| TestMode | Antenna | Freq(MHz) | BurstWidth [ms] | TotalHops [Num] | Result[s] | Limit[s] | Verdict |
|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | Hop | 2.885 | 120 | 0.346 | ≤0.4 | PASS |
| 2DH5 | Ant1 | Hop | 2.891 | 120 | 0.347 | ≤0.4 | PASS |
| 3DH5 | Ant1 | Hop | 2.360 | 110 | 0.26 | ≤0.4 | PASS |

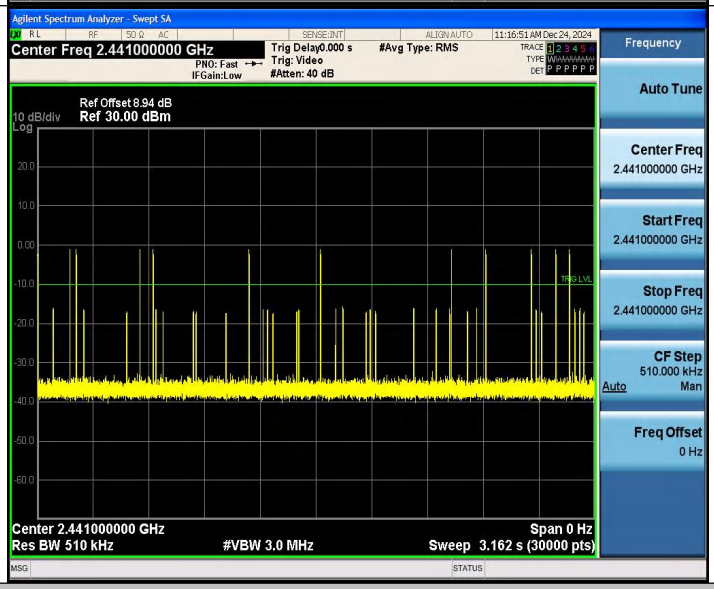
## Test Graphs

DH5_Ant1_Hop

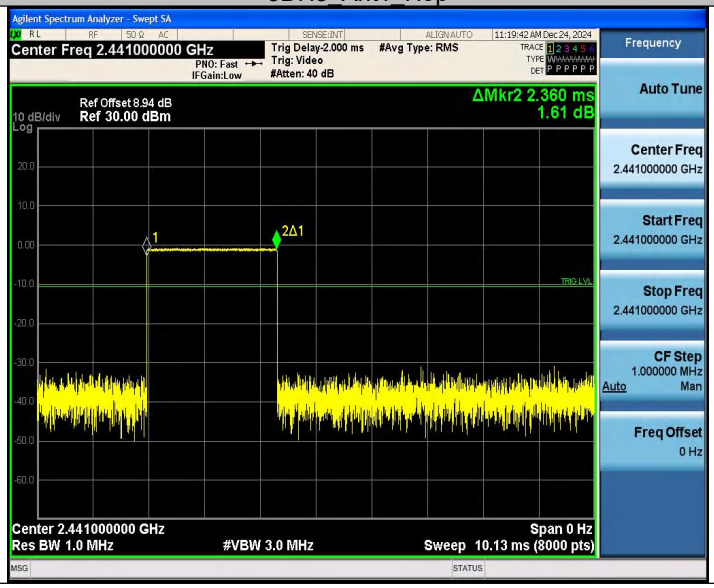


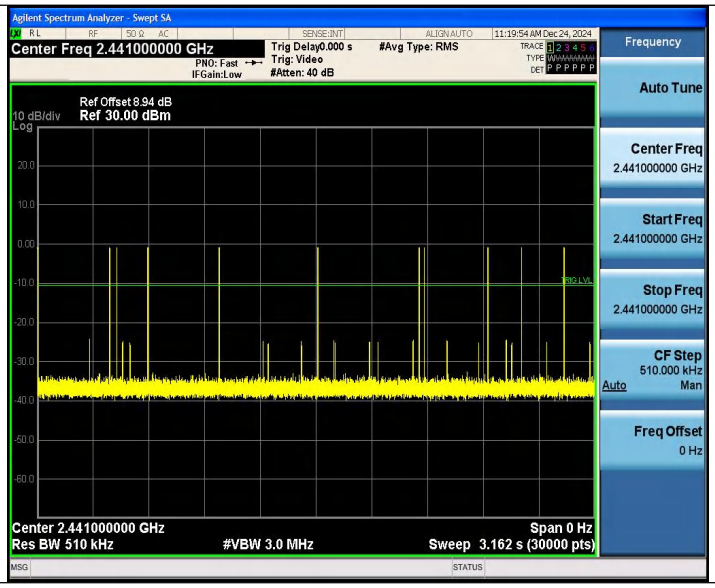




2DH5_Ant1_Hop


3DH5_Ant1_Hop




Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig Delay0.000 s
Trig: Video
#Avg Type: RMS
#Atten: 40 dB
11:19:54 AM Dec 24, 2024
Ref Offset 8.94 dB
10 dB/div
Log
Ref 30.00 dBm
Center 2.441000000 GHz
Res BW 510 kHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 3.162 s (30000 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
510.000 kHz
Auto
Man
Freq Offset
0 Hz

## 4.5. MAXIMUM PEAK CONDUCTED OUTPUT POWER

### 4.5.1. Applicable Standard

According to FCC Part 15.247(b)(1) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.5.2. Conformance Limit

The max For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 4.5.3. Test Configuration

Test according to clause 4.5.4 radio frequency test setup 1

### 4.5.4. Test Procedure

■ According to FCC Part15.247(b)(1)

As an alternative to a peak power measurement, compliance with the limit can be based on a measurement of the maximum conducted output power.
Use the following spectrum analyzer settings:
Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
Set RBW > the 20 dB bandwidth of the emission being measured
Set VBW ≥ RBW
Set Sweep = auto
Set Detector function = peak
Set Trace = max hold
Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission to determine the peak amplitude level.

## Test Results

| Test Mode | Antenna | Freq(MHz) | Conducted Peak Powert[dBm] | Conducted Limit[dBm] | Verdict |
|---|---|---|---|---|---|
| DH5 | Ant1 | 2402 | 0.57 | ≤30 | PASS |
| | | 2441 | -0.61 | ≤30 | PASS |
| | | 2480 | -1.39 | ≤30 | PASS |
| 2DH5 | Ant1 | 2402 | 1.29 | ≤20.97 | PASS |
| | | 2441 | 0.15 | ≤20.97 | PASS |
| | | 2480 | -0.65 | ≤20.97 | PASS |
| 3DH5 | Ant1 | 2402 | 0.56 | ≤20.97 | PASS |
| | | 2441 | -0.53 | ≤20.97 | PASS |
| | | 2480 | -1.37 | ≤20.97 | PASS |

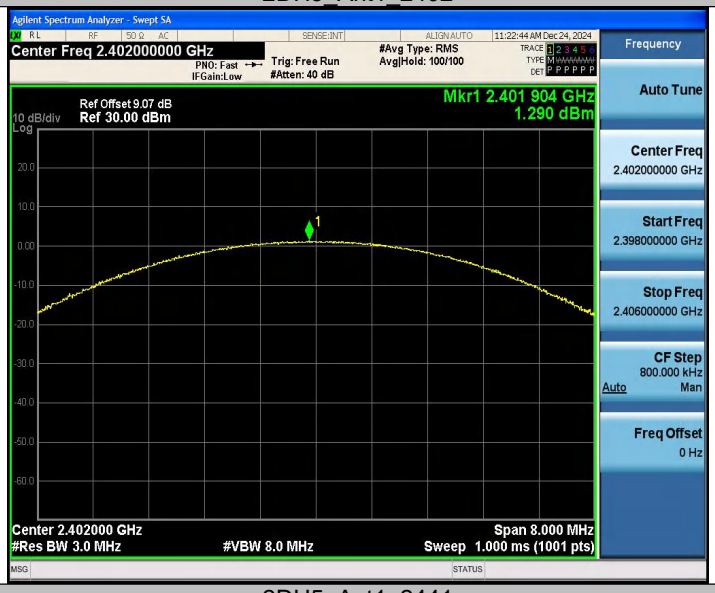
## Test Graphs

DH5_Ant1_2402

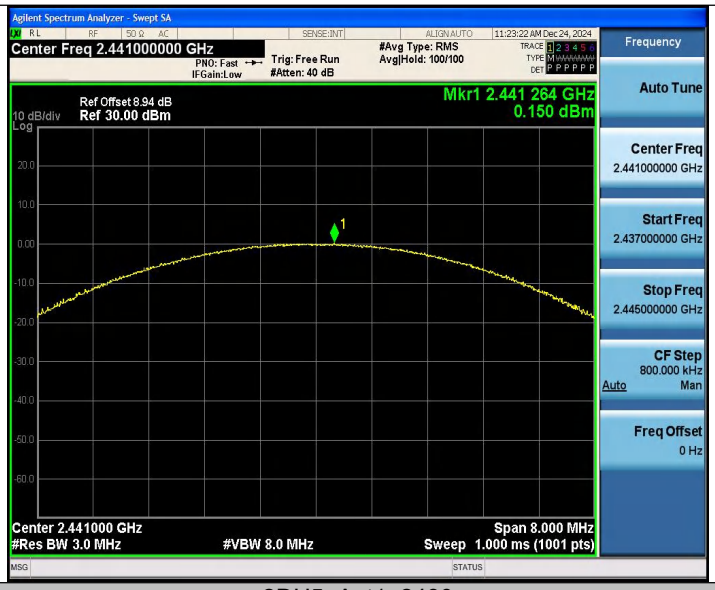

DH5_Ant1_2441


DH5_Ant1_2480

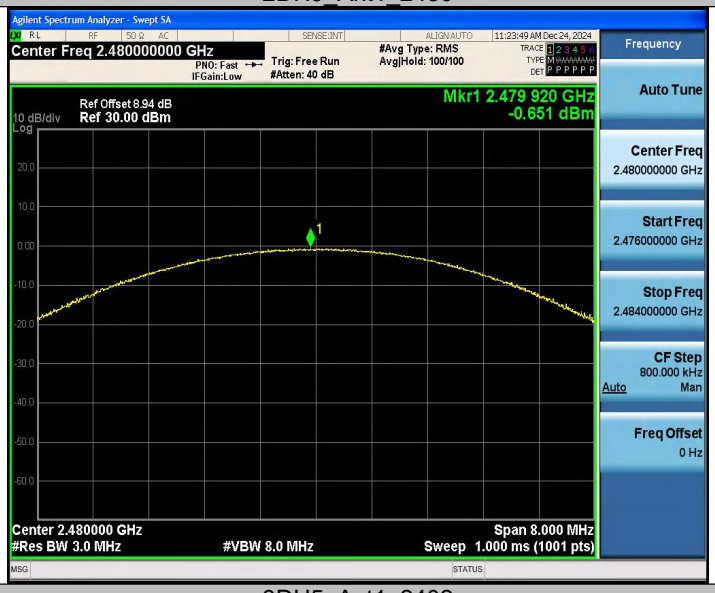

2DH5_Ant1_2402



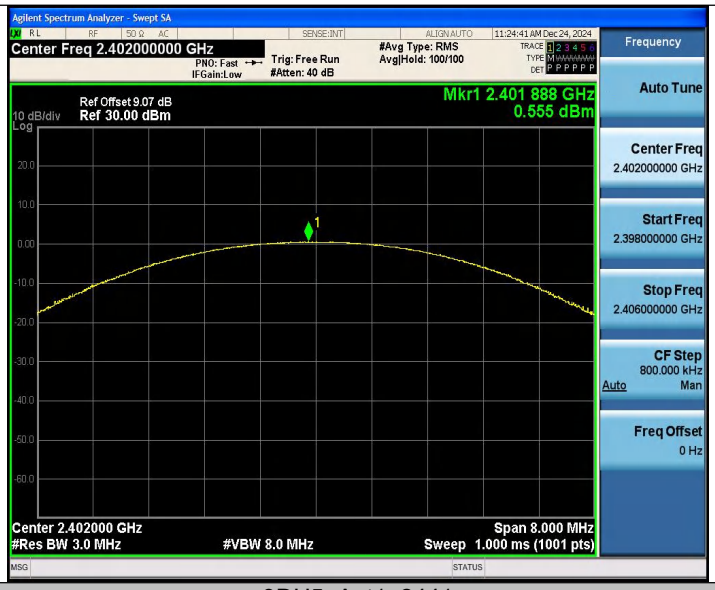

2DH5_Ant1_2441



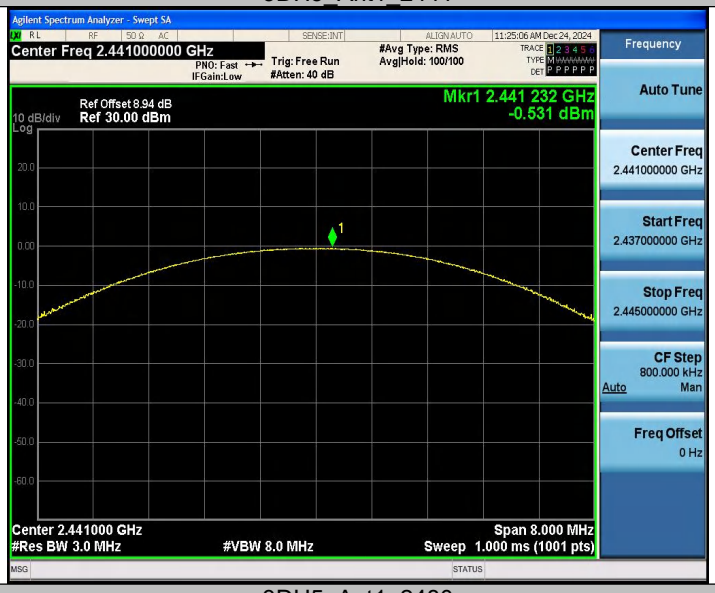

2DH5_Ant1_2480




3DH5_Ant1_2402




3DH5_Ant1_2441




3DH5_Ant1_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
11:24:15 AM Dec 24, 2024
Ref Offset 8.94 dB
10 dB/div
Log
Ref 30.00 dBm
Mkr1 2.479 856 GHz
-1.374 dBm
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.476000000 GHz
Stop Freq
2.484000000 GHz
CF Step
800.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

## 4.6. CONDUCTED SUPRIOUS EMISSION AND BAND EDGE

### 4.6.1. Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02

### 4.6.2. Conformance Limit

According to FCC Part 15.247(d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted, provided the transmitter demonstrates compliance with the peak conducted power limits.

### 4.6.3. Test Configuration

Test according to clause 3.1 radio frequency test setup 1

### 4.6.4. Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer

**■ Reference level measurement**

Establish a reference level by using the following procedure:
Set instrument center frequency to DSS channel center frequency.
Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel.
Set the RBW = 100 kHz. Set the VBW ≥ 3 x RBW.
Set Detector = peak. Set Sweep time = auto couple.
Set Trace mode = max hold. Allow trace to fully stabilize.
Use the peak marker function to determine the maximum Maximum conduceted level.
Note that the channel found to contain the maximum conduceted level can be used to establish the reference level.

**■ Band-edge Compliance of RF Conducted Emissions**

Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation
Set RBW ≥ 1% of the span=100kHz Set VBW ≥ RBW
Set Sweep = auto Set Detector function = peak Set Trace = max hold
Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.
Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

**■ Conduceted Spurious RF Conducted Emission**

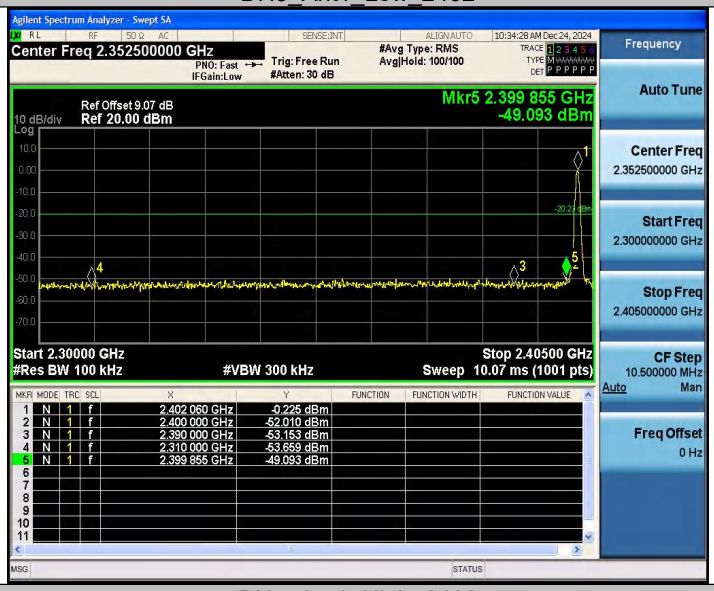
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.(30MHz to 26.5GHz). Set RBW = 100 kHz Set VBW ≥ RBW
Set Sweep = auto Set Detector function = peak Set Trace = max hold
Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.

**Test Results：**

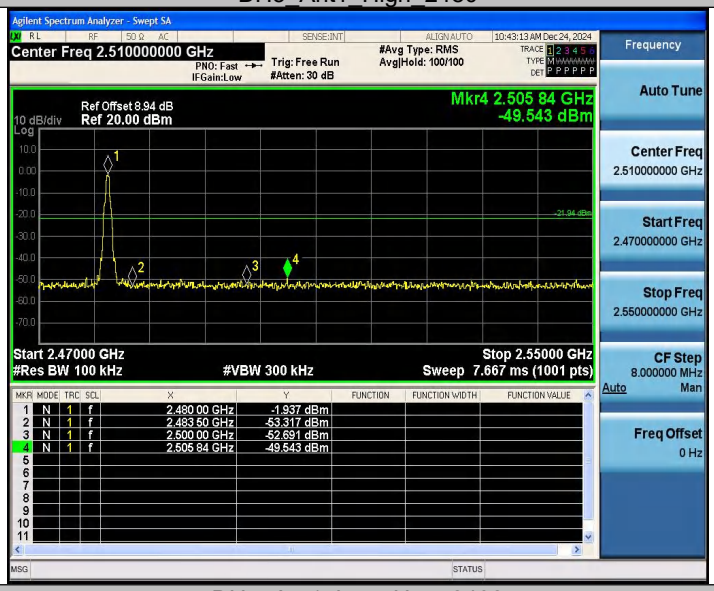
| TestMode | Antenna | ChName | Freq(MHz) | RefLevel [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| DH5 | Ant1 | Low | 2402 | -0.23 | -49.09 | ≤-20.23 | PASS |
| | | High | 2480 | -1.94 | -49.54 | ≤-21.94 | PASS |
| | | Low | Hop_2402 | -0.02 | -49.45 | ≤-20.02 | PASS |
| | | High | Hop_2480 | -1.77 | -49.14 | ≤-21.77 | PASS |
| 2DH5 | Ant1 | Low | 2402 | -3.19 | -49.2 | ≤-23.19 | PASS |
| | | High | 2480 | -2.84 | -49.16 | ≤-22.84 | PASS |
| | | Low | Hop_2402 | -0.60 | -49.35 | ≤-20.6 | PASS |
| | | High | Hop_2480 | -1.82 | -49.21 | ≤-21.82 | PASS |
| 3DH5 | Ant1 | Low | 2402 | -0.06 | -49.23 | ≤-20.06 | PASS |
| | | High | 2480 | -2.03 | -49.82 | ≤-22.03 | PASS |
| | | Low | Hop_2402 | -0.20 | -48.62 | ≤-20.2 | PASS |
| | | High | Hop_2480 | -1.64 | -48.96 | ≤-21.64 | PASS |

## Test Graphs

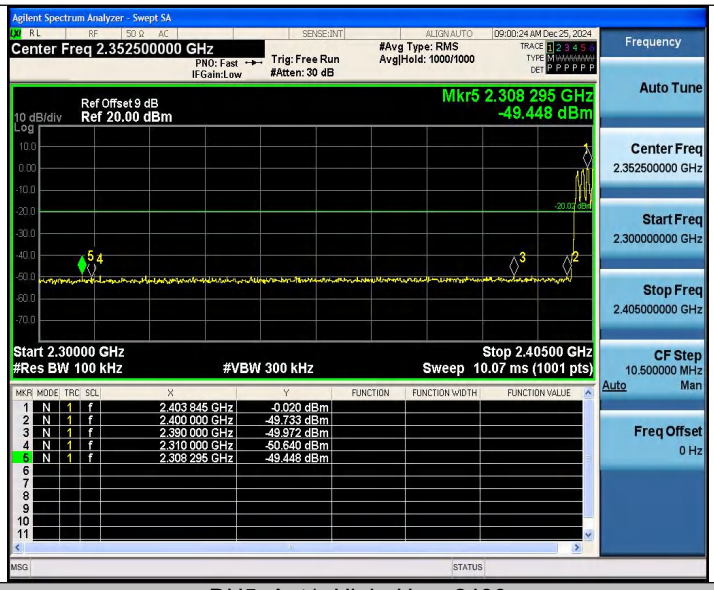
DH5_Ant1_Low_2402



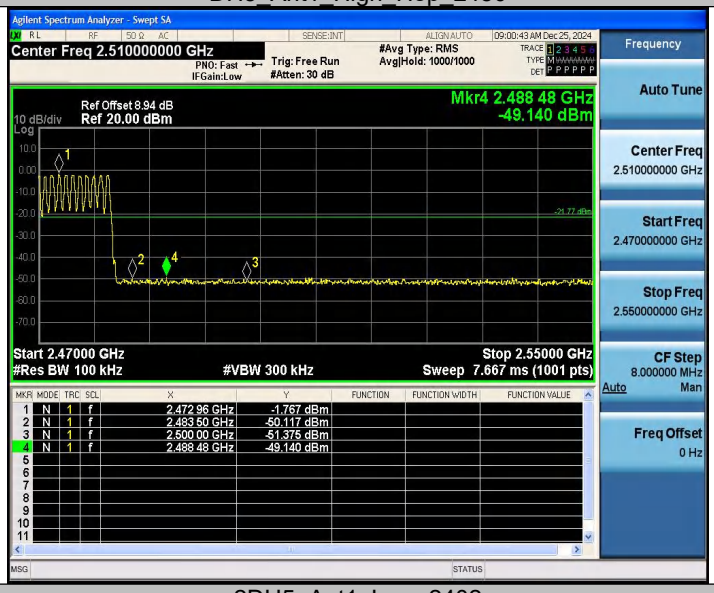

DH5_Ant1_High_2480



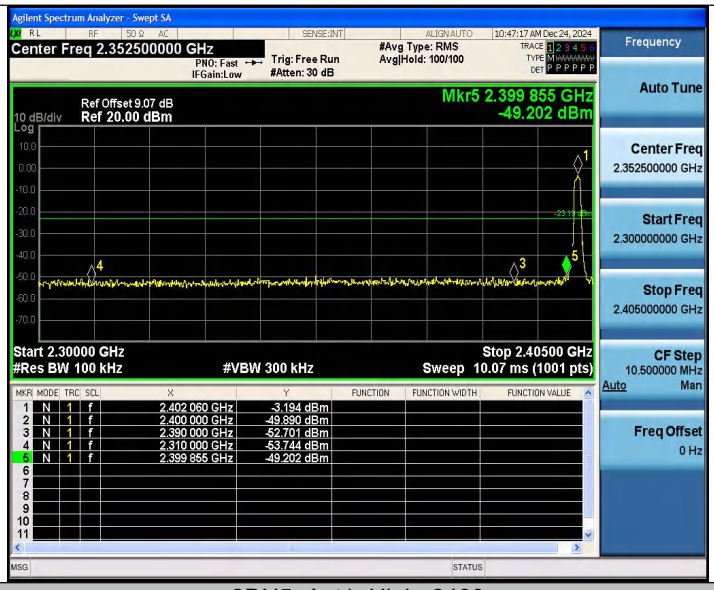

DH5_Ant1_Low_Hop_2402



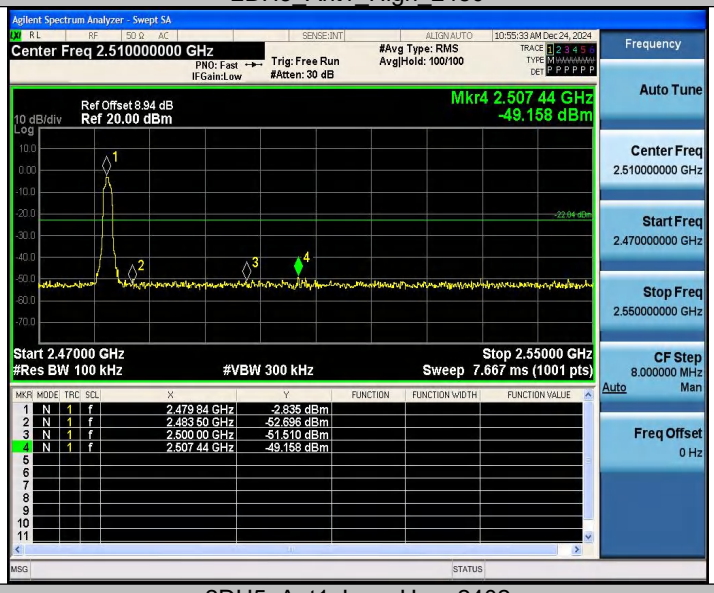

DH5_Ant1_High_Hop_2480



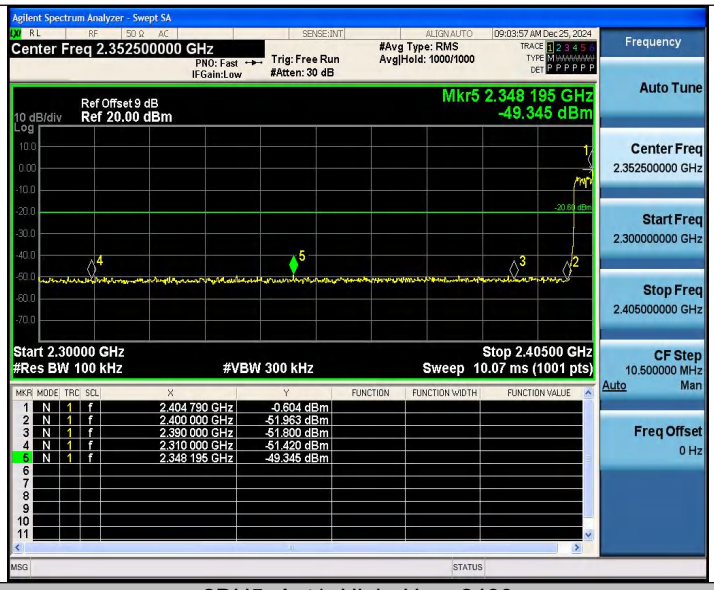

2DH5_Ant1_Low_2402



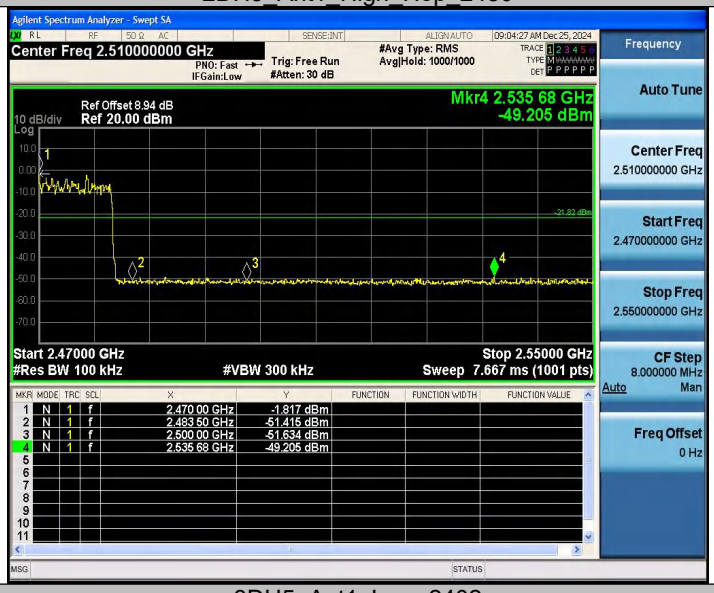

2DH5_Ant1_High_2480



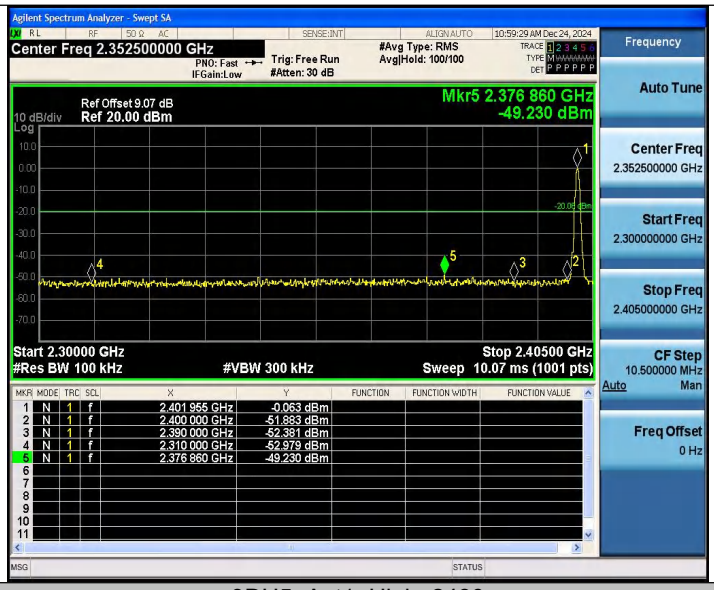

2DH5_Ant1_Low_Hop_2402



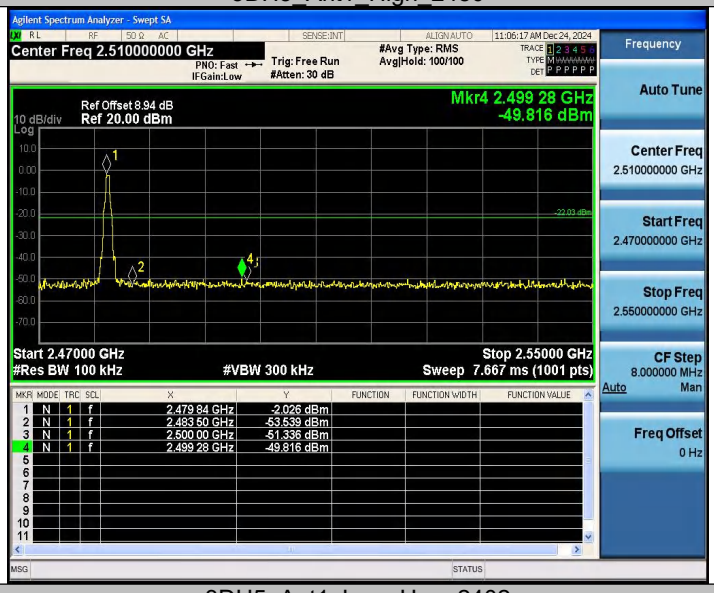

2DH5_Ant1_High_Hop_2480



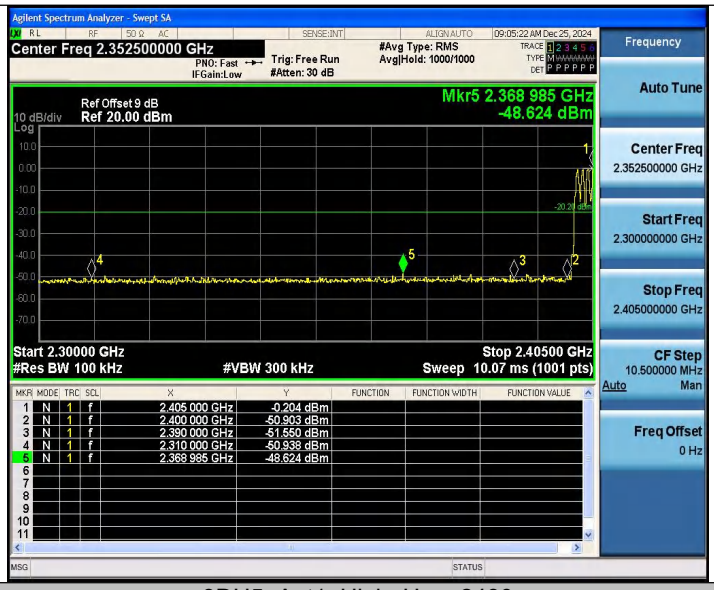

3DH5_Ant1_Low_2402




3DH5_Ant1_High_2480




3DH5_Ant1_Low_Hop_2402




3DH5_Ant1_High_Hop_2480