# TEST REPORT

Dt&C

**DT&C Co., Ltd.**
42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2208-0133

2. Customer

- Name (FCC) : Insight SiP / Name (IC) : Insight SiP
- Address (FCC) : 13 chemin de la halte, Grasse, France 06130
  Address (IC) : 13 chemin de la halte, Grasse, 06130 France

3. Use of Report : FCC & IC Certification

4. Product Name / Model Name : Dual-core Bluetooth 5.2 BLE Module / ISP2053
   FCC ID : 2AAQS-ISP2053
   IC : 11306A-ISP2053

5. FCC Regulation(s): Part 15.247
   IC Standard(s): RSS-247 Issue 2, RSS-Gen Issue 5
   Test Method used: KDB558074 D01v05r02, ANSI C63.10-2013

6. Date of Test : 2022.04.11 ~ 2022.07.29

7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

8. Testing Environment : See appended test report.

9. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : SeungMin Gil (Signature) | Technical Manager<br>Name : JaeJin Lee (Signature) |

**2022 . 08 . 08 .**

**DT&C Co., Ltd.**

**If this report is required to confirmation of authenticity, please contact to report@dtnc.net**

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# Test Report Version

| Test Report No. | Date | Description | Revised by | Reviewed by |
|---|---|---|---|---|
| DRTFCC2208-0133 | Aug, 08. 2022 | Initial issue | SeungMin Gil | JaeJin Lee |
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# 1. General Information

## 1.1. Description of EUT

| | |
|---|---|
| **Equipment Class** | Digital Transmission System (DTS) |
| **Product Name** | Dual-core Bluetooth 5.2 BLE Module |
| **Model Name** | ISP2053 |
| **Add Model Name** | - |
| **Firmware Version Identification Number** | SDK1.9.1 |
| **EUT Serial Number** | No Specified |
| **Power Supply(Rated voltage)** | VDDH: 3.7 V<br>VDD: 3 V |
| **Frequency Range** | 2 402 MHz ~ 2 480 MHz |
| **Max. RF Output Power** | 3.17 dBm (0.002 W) |
| **Modulation Technique (Data rate)** | GFSK (1Mbps, 2Mbps) |
| **Antenna Specification** | Antenna Type: Integrated Antenna (Printed Folded PIFA Type)<br>Gain: 1.00 dBi (PK) |

## 1.2. Declaration by the applicant / manufacturer

N/A

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## 1.3. Testing Laboratory

| **DT&C Co., Ltd.** | | |
|---|---|---|
| The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.<br>The test site complies with the requirements of Part 2.948 according to ANSI C63.4-2014.<br>**- FCC & IC MRA Designation No. : KR0034**<br>**- ISED#: 5740A** | | |
| www.dtnc.net | | |
| Telephone | : | + 82-31-321-2664 |
| FAX | : | + 82-31-321-1664 |

## 1.4. Testing Environment

| **Ambient Condition** | |
|---|---|
| ▪ Temperature | +20 ℃ ~ +25 ℃ |
| ▪ Relative Humidity | +40 % ~ +43 % |

## 1.5. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

| Parameter | Measurement uncertainty |
|---|---|
| Antenna-port conducted emission | 1.0 dB (The confidence level is about 95 %, k = 2) |
| AC power-line conducted emission | 3.4 dB (The confidence level is about 95 %, k = 2) |
| Radiated emission (1 GHz Below) | 4.9 dB (The confidence level is about 95 %, k = 2) |
| Radiated emission (1 GHz ~ 18 GHz) | 4.9 dB (The confidence level is about 95 %, k = 2) |
| Radiated emission (18 GHz Above) | 5.3 dB (The confidence level is about 95 %, k = 2) |

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## 1.6. Test Equipment List

| Type | Manufacturer | Model | Cal.Date (yy/mm/dd) | Next.Cal.Date (yy/mm/dd) | S/N |
|---|---|---|---|---|---|
| Spectrum Analyzer | Agilent Technologies | N9020A | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | MY46471622 |
| Spectrum Analyzer | Agilent Technologies | N9020A | 21/12/16 | 22/12/16 | MY48011700 |
| Spectrum Analyzer | Agilent Technologies | N9020A | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | US47360812 |
| Multimeter | FLUKE | 17B+ | 21/12/16 | 22/12/16 | 36390701WS |
| DC power supply | DIGITAL | DPR-303D | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 2090097 |
| DC Power Supply | Agilent Technologies | 66332A | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | US37473627 |
| Signal Generator | Rohde Schwarz | SMBV100A | 21/12/16 | 22/12/16 | 255571 |
| Signal Generator | ANRITSU | MG3695C | 21/12/16 | 22/12/16 | 173501 |
| Thermohygrometer | BODYCOM | BJ5478 | 21/12/16 | 22/12/16 | 120612-1 |
| Thermohygrometer | BODYCOM | BJ5478 | 21/12/16 | 22/12/16 | 120612-2 |
| Thermohygrometer | BODYCOM | BJ5478 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | N/A |
| Loop Antenna | ETS-Lindgren | 6502 | 21/01/28 | 23/01/28 | 00226186 |
| BILOG ANTENNA | Schwarzbeck | VULB 9160 | 21/12/16 | 22/12/16 | 3362 |
| Horn Antenna | ETS-Lindgren | 3117 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 00143278 |
| Horn Antenna | A.H.Systems Inc. | SAS-574 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 155 |
| PreAmplifier | tsj | MLA-0118-B01-40 | 21/12/16 | 22/12/16 | 1852267 |
| PreAmplifier | tsj | MLA-1840-J02-45 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 16966-10728 |
| PreAmplifier | H.P | 8447D | 21/12/16 | 22/12/16 | 2944A07774 |
| High Pass Filter | Wainwright Instruments | WHKX12-935-1000-15000-40SS | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 8 |
| High Pass Filter | Wainwright Instruments | WHKX10-2838-3300-18000-60SS | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 1 |
| High Pass Filter | Wainwright Instruments | WHNX8.0/26.5-6SS | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 3 |
| Attenuator | Hefei Shunze | SS5T2.92-10-40 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 16012202 |
| Attenuator | Aeroflex/Weinschel | 56-3 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | Y2370 |
| Attenuator | SMAJK | SMAJK-2-3 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 3 |
| Attenuator | SMAJK | SMAJK-2-3 | 21/06/24<br>22/06/24 | 22/06/24<br>23/06/24 | 2 |
| Power Meter & Wide Bandwidth Sensor | Anritsu | ML2496A<br>MA2490A | 21/12/16 | 22/12/16 | 1338004<br>1249303 |
| EMI Test Receiver | ROHDE&SCHWARZ | ESU | 21/11/12 | 22/11/12 | 100469 |
| PULSE LIMITER | Rohde Schwarz | ESH3-Z2 | 21/08/23 | 22/08/23 | 101333 |
| LISN | SCHWARZBECK | NSLK 8128 RC | 21/10/22 | 22/10/22 | 8128 RC-387 |
| HYGROMETER | TESTO | 608-H1 | 22/01/14 | 23/01/14 | 34862883 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | G-1 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | G-2 |
| Cable | HUBER+SUHNER | SUCOFLEX 100 | 22/01/04 | 23/01/04 | G-3 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | G-4 |
| Cable | Junkosha | MWX241 | 22/01/04 | 23/01/04 | mmW-1 |
| Cable | Junkosha | MWX241 | 22/01/04 | 23/01/04 | mmW-4 |
| Cable | HUBER+SUHNER | SUCOFLEX100 | 22/01/04 | 23/01/04 | M-01 |
| Cable | HUBER+SUHNER | SUCOFLEX100 | 22/01/04 | 23/01/04 | M-02 |
| Cable | JUNFLON | MWX241 | 22/01/04 | 23/01/04 | M-03 |
| Cable | JUNFLON | J12J101757-00 | 22/01/04 | 23/01/04 | M-07 |
| Cable | HUBER+SUHNER | SUCOFLEX106 | 22/01/04 | 23/01/04 | M-09 |
| Cable | DT&C | Cable | 22/01/04 | 23/01/04 | RFC-69 |
| Cable | RADIALL | TESTPRO 3 | 22/01/04 | 23/01/04 | RFC-44 |
| Test Software | tsj | Noise Terminal Measurement | NA | NA | Version 2.00.0170 |
| Test Software | tsj | Radiated Emission Measurement | NA | NA | Version 2.00.0177 |

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

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# 2. Test Methodology

The measurement procedures described in the ANSI C63.10-2013 and the guidance provided in KDB558074 D01v05r02 were used in measurement of the EUT.
The EUT was tested per the guidance of KDB558074 D01v05r02. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

## 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the test mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 2.3. General Test Procedures

### Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB558074 D01v05r02.
So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.
The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

### Radiated Emissions

Basically the radiated tests were performed with KDB558074 D01v05r02. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on section 12.1 of the KDB558074 D01v05r02.
The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

## 2.4. Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

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## 2.5. Description of Test Modes

This EUT has two power supply path. The EUT has been tested with the operating condition(worst case: maximum allowable voltage) for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting. The Bluetooth low energy mode with below low, middle and high channels were tested and reported.

| Test Mode | Description | Power supply path | Tested Frequency (MHz) | | |
|---|---|---|---|---|---|
| | | | Lowest Frequency | Middle Frequency | Highest Frequency |
| **TM 1** | BT LE(1 Mbps) | VDDH | 2 402 | 2 440 | 2 480 |
| **TM 2** | BT LE(2 Mbps) | VDDH | 2 402 | 2 440 | 2 480 |
| **TM 3** | BT LE(1 Mbps) | VDD | 2 402 | 2 440 | 2 480 |
| **TM 4** | BT LE(2 Mbps) | VDD | 2 402 | 2 440 | 2 480 |

### EUT Operation test setup

- Test Software: nRF Connect V3.6.1
- Power setting: 0 dBm

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# 3. Antenna Requirements

▣ **According to Part 15.203**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antenna is permanently attached on the device.**
**Therefore this E.U.T complies with the requirement of Part 15.203**

# 4. Summary of Test Results

| FCC part section(s) | RSS section(s) | Test Description | Limit | Test Condition | Status Note 1 |
|---|---|---|---|---|---|
| 15.247(a) | RSS-247[5.2] | 6 dB Bandwidth | > 500 kHz | Conducted | C |
| 15.247(b) | RSS-247[5.4] | Maximum Peak Output Power | < 1 Watt (conducted), FCC & IC<br>< 4 Watt (e.i.r.p), IC | | C |
| 15.247(d) | RSS-247[5.5] | Unwanted Emissions(Conducted) | 20 dBc in any 100 kHz BW | | C |
| 15.247(e) | RSS-247[5.2] | Power Spectral Density | < 8 dBm / 3 kHz | | C |
| - | RSS-Gen[6.7] | Occupied Bandwidth (99 %) | NA | | C |
| 15.247(d)<br>15.205<br>15.209 | RSS-247[5.5]<br>RSS-Gen[8.9]<br>RSS-Gen[8.10] | Unwanted Emissions(Radiated) | Part 15.209 limits (Refer to section 5.5) | Radiated | C Note 3 |
| 15.207 | RSS-Gen [8.8] | AC Power-Line Conducted Emissions | Part 15.207 limits (Refer to section 5.6) | AC Line Conducted | C |
| 15.203 | - | Antenna Requirements | Part 15.203 (Refer to section 3) | - | C |

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.
Note 3: This test item was performed in three orthogonal EUT positions and the worst case data was reported.

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# 5. Test Result

## 5.1. Maximum Peak Conducted Output Power

### ▣ Test Requirements and limit, Part 15.247(b) & RSS-247 [5.4]

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

**The maximum permissible conducted output power is 1 Watt.**

**The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of RSS-247.**

### 5.1.1. Test Setup

Refer to the APPENDIX I.

### 5.1.2. Test Procedures

- **KDB558074 D01v05r02 - Section 8.3.1.1**
- **ANSI C63.10-2013 – Section 11.9.1.1**

**RBW ≥ DTS bandwidth**

1. Set the RBW ≥ DTS bandwidth. **Actual RBW = 2.4 MHz**
2. Set VBW ≥ 3 x RBW. **Actual VBW = 8 MHz**
3. Set span **≥ 3 x RBW.**
4. Sweep time = **auto couple**
5. Detector = **peak**
6. Trace mode = **max hold**
7. Allow trace to fully stabilize
8. Use peak marker function to determine the peak amplitude level.

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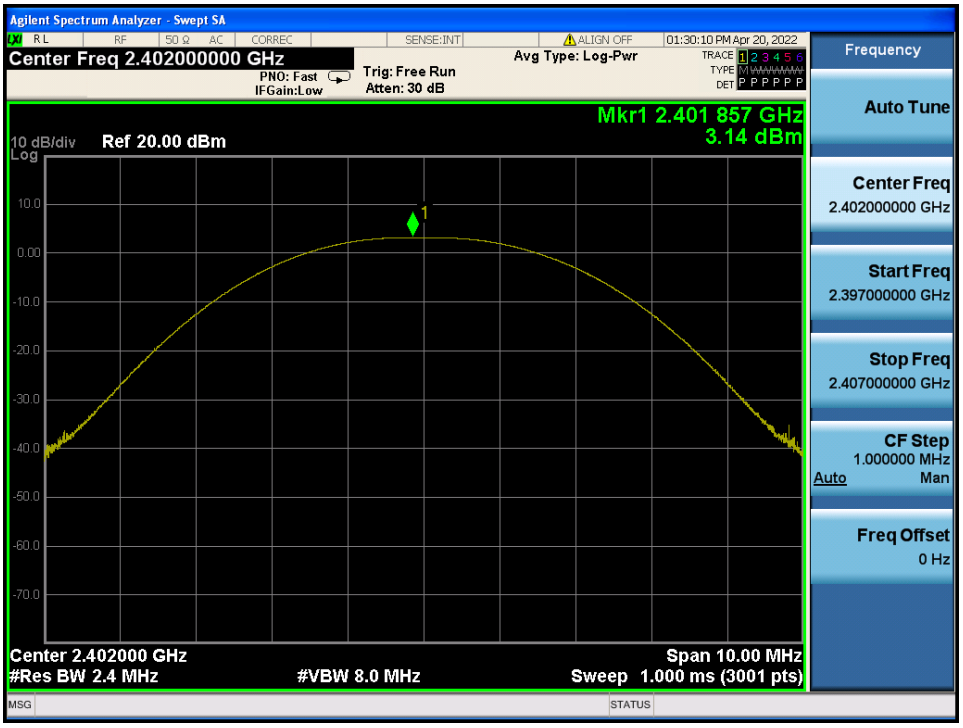
### 5.1.3. Test Results

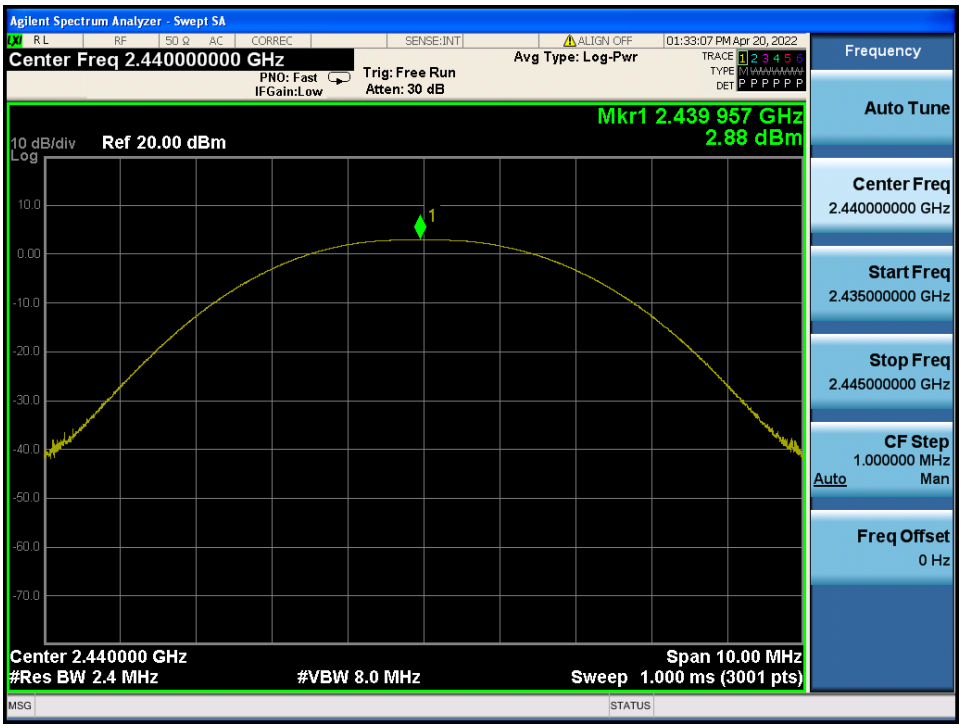
| Test Mode | Tested Channel | Burst Average Output Power | Peak Output Power | Antenna Gain | e.i.r.p[Note3] |
|---|---|---|---|---|---|
| | | dBm | dBm | dBi | dBm |
| TM 1 | Lowest | 2.78 | 3.14 | 1.00 | 4.14 |
| | Middle | 2.68 | 2.88 | 1.00 | 3.88 |
| | Highest | 2.59 | 2.86 | 1.00 | 3.86 |
| TM 2 | Lowest | 2.76 | 3.16 | 1.00 | 4.16 |
| | Middle | 2.67 | 2.90 | 1.00 | 3.90 |
| | Highest | 2.59 | 2.88 | 1.00 | 3.88 |
| TM 3 | Lowest | 2.73 | 3.09 | 1.00 | 4.09 |
| | Middle | 2.65 | 2.84 | 1.00 | 3.84 |
| | Highest | 2.57 | 2.89 | 1.00 | 3.89 |
| TM 4 | Lowest | 2.73 | **3.17** | 1.00 | 4.17 |
| | Middle | 2.64 | 2.91 | 1.00 | 3.91 |
| | Highest | 2.57 | 2.89 | 1.00 | 3.89 |

Note 1: The average output power was tested using an average power meter for reference only.
Note 2: See next pages for actual measured spectrum plots.
Note 3: e.i.r.p = $P_{cond}$ + $G_{EUT}$
$P_{cond}$ = measured power at feedpoint of the EUT antenna, in dBm (Peak Conducted Output Power)
$G_{EUT}$ = gain of the EUT radiating element (antenna), in dBi

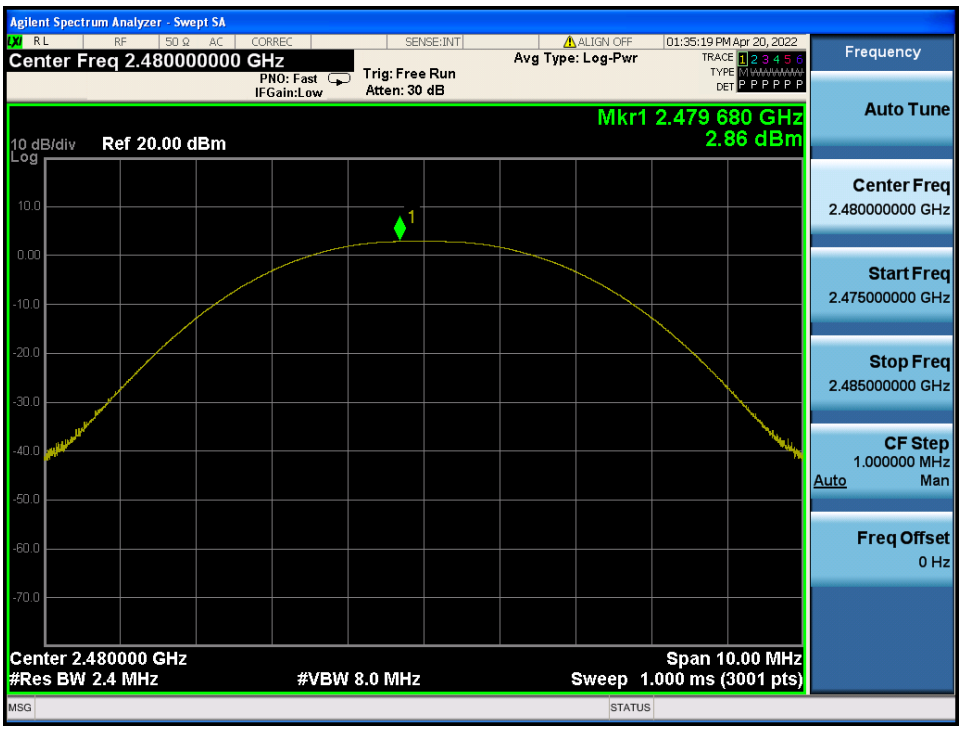
**Peak Output Power** TM 1 Test Channel : Lowest



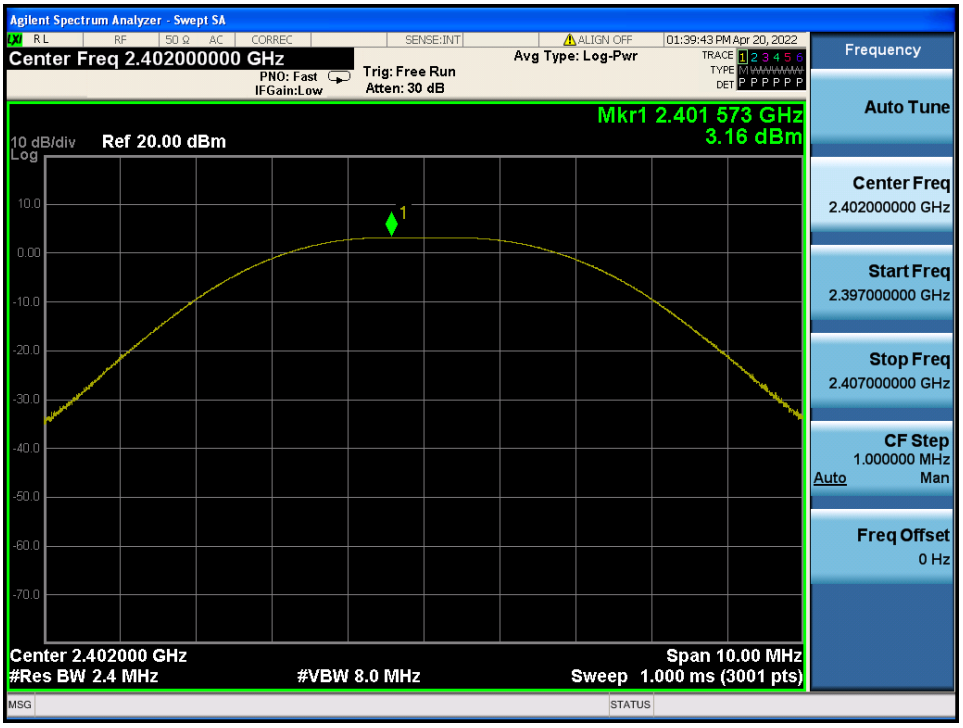

**Peak Output Power** TM 1 Test Channel : Middle



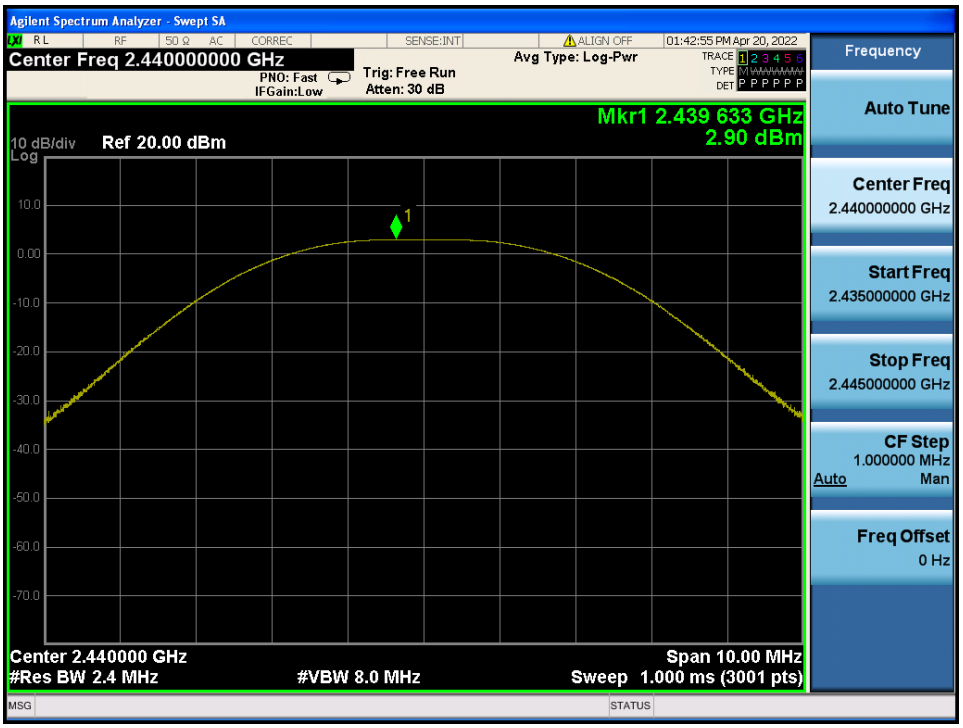
**Peak Output Power** TM 1 Test Channel : Highest



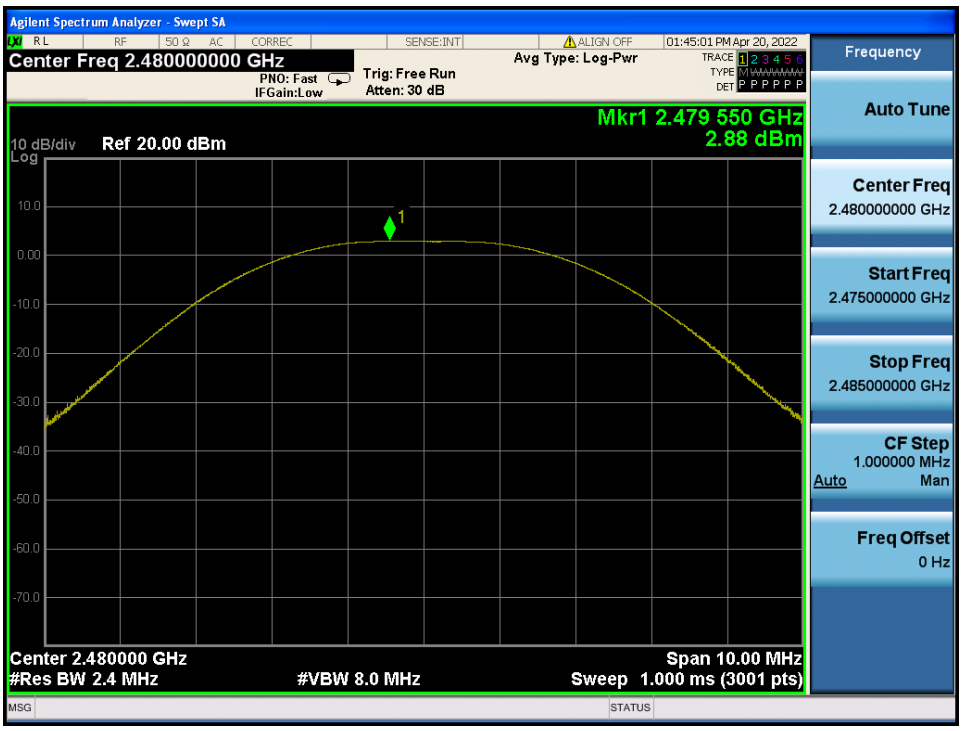
**Peak Output Power** TM 2 Test Channel : Lowest



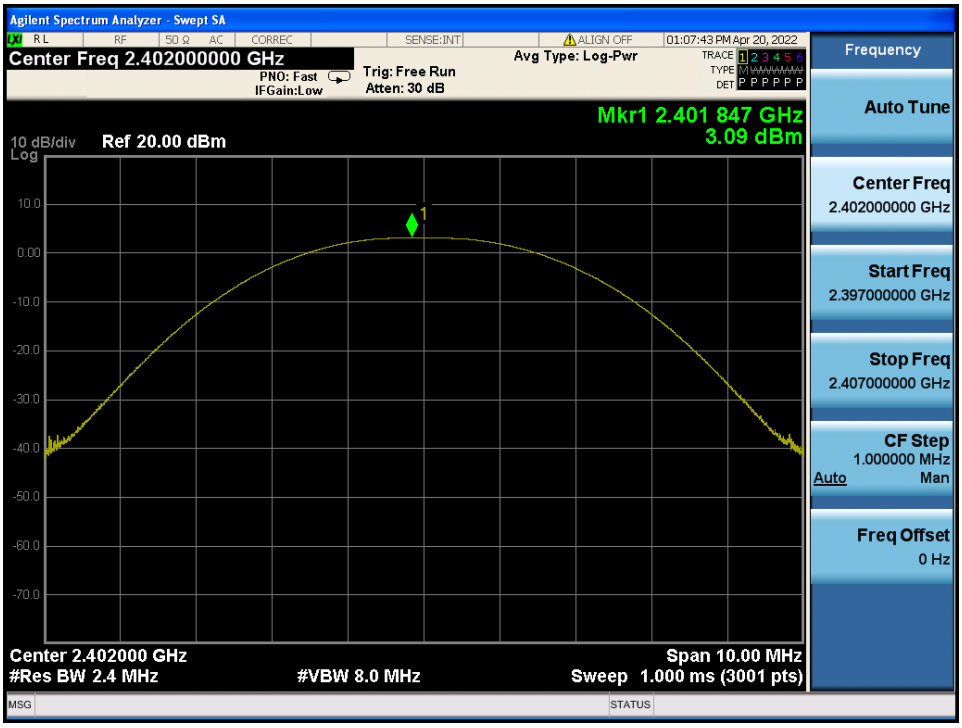

**Peak Output Power** TM 2 Test Channel : Middle



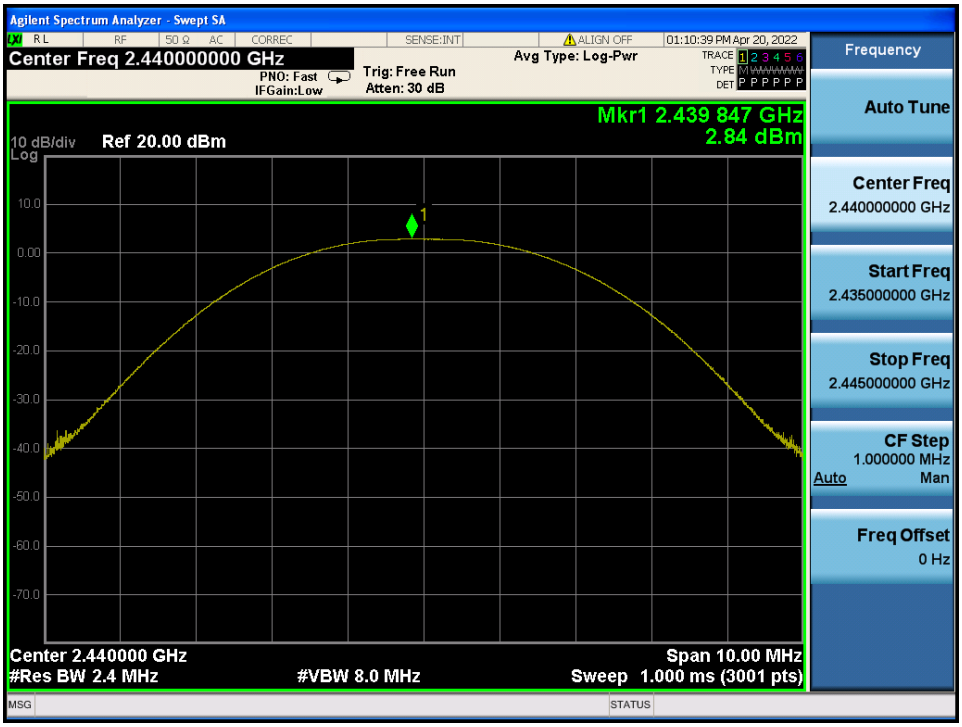
**Peak Output Power** TM 2 Test Channel : Highest



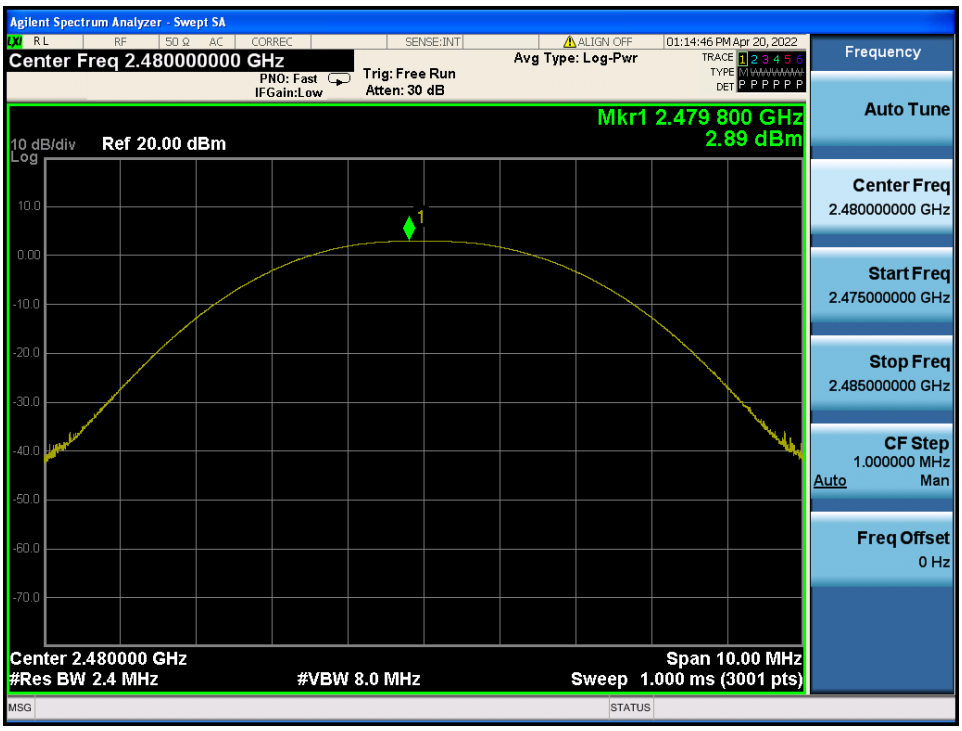
**Peak Output Power** TM 3 Test Channel : Lowest



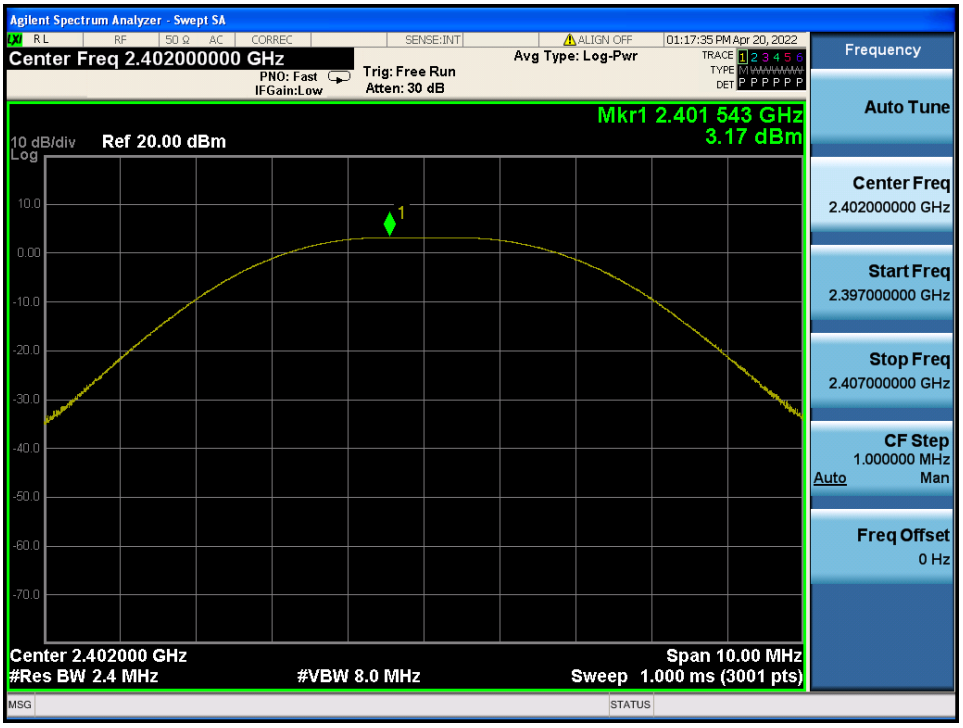

**Peak Output Power** TM 3 Test Channel : Middle



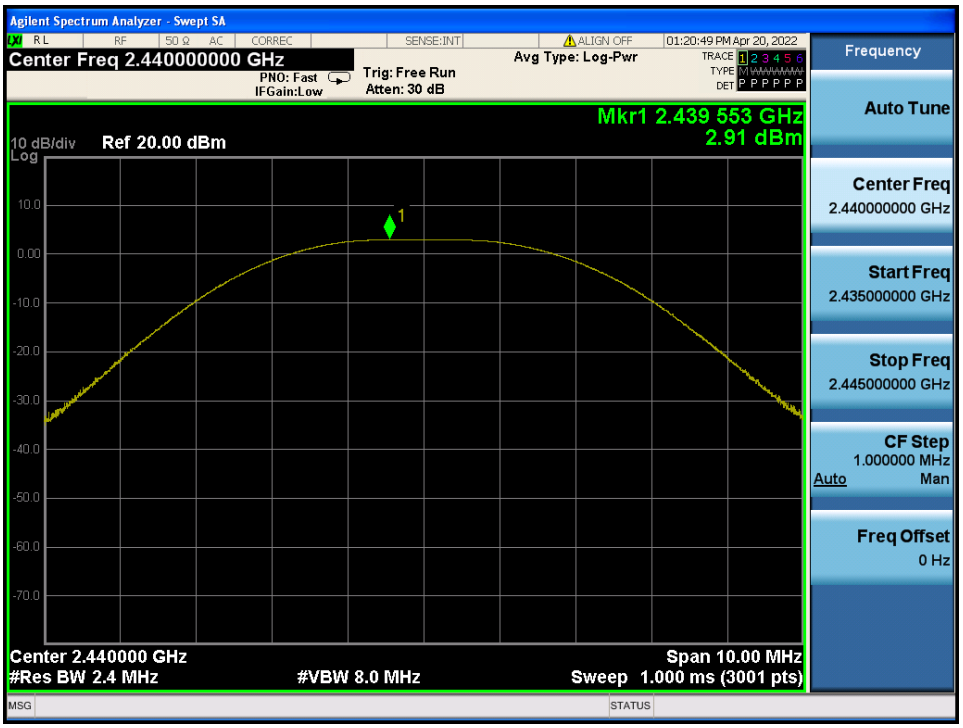
**Peak Output Power** TM 3 Test Channel : Highest



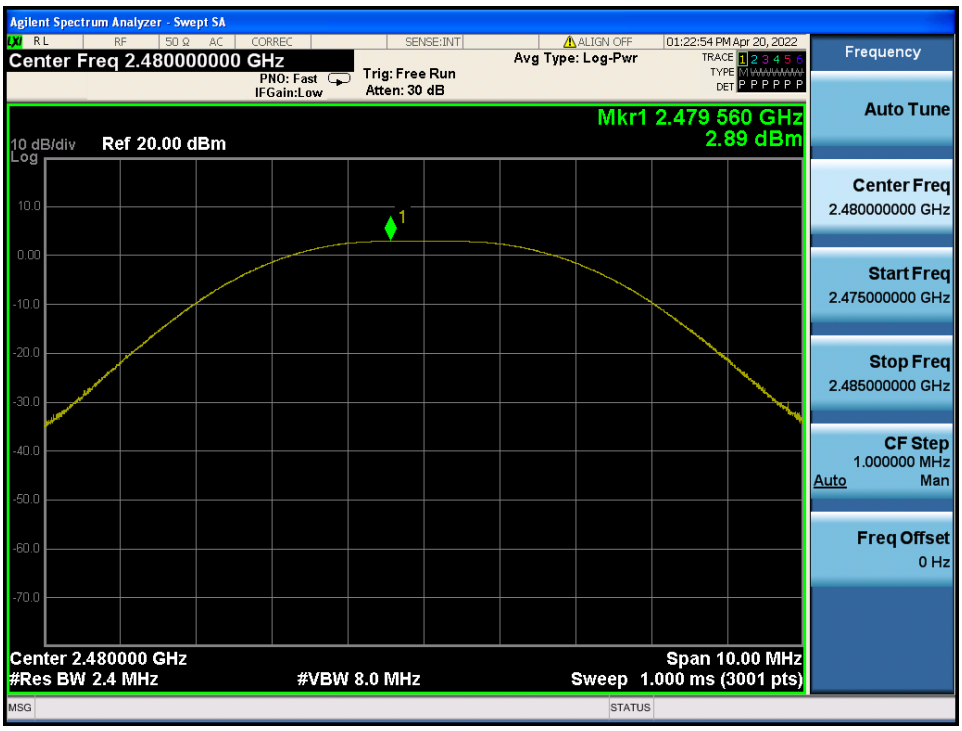
**Peak Output Power** TM 4 Test Channel : Lowest




**Peak Output Power** TM 4 Test Channel : Middle



**Peak Output Power** TM 4 Test Channel : Highest



## 5.2. 6 dB Bandwidth

### ▣ Test Requirements and limit, Part 15.247(a) & RSS-247 [5.2]

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the EUT's antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

**The minimum permissible 6 dB bandwidth is 500 kHz.**

### 5.2.1. Test Setup

Refer to the APPENDIX I.

### 5.2.2. Test Procedures

- **KDB558074 D01v05r02 - Section 8.2**
- **ANSI C63.10-2013 – Section 11.8.2**

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Option 1 - Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

   **Option 2 - The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.**

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### 5.2.3. Test Results

| Test Mode | Tested Channel | Test Results (MHz) |
|---|---|---|
| TM 1 | Lowest | 0.678 |
| | Middle | **0.682** |
| | Highest | 0.681 |
| TM 2 | Lowest | **1.125** |
| | Middle | 1.117 |
| | Highest | **1.125** |
| TM 3 | Lowest | 0.678 |
| | Middle | **0.682** |
| | Highest | 0.680 |
| TM 4 | Lowest | 1.123 |
| | Middle | 1.122 |
| | Highest | **1.124** |

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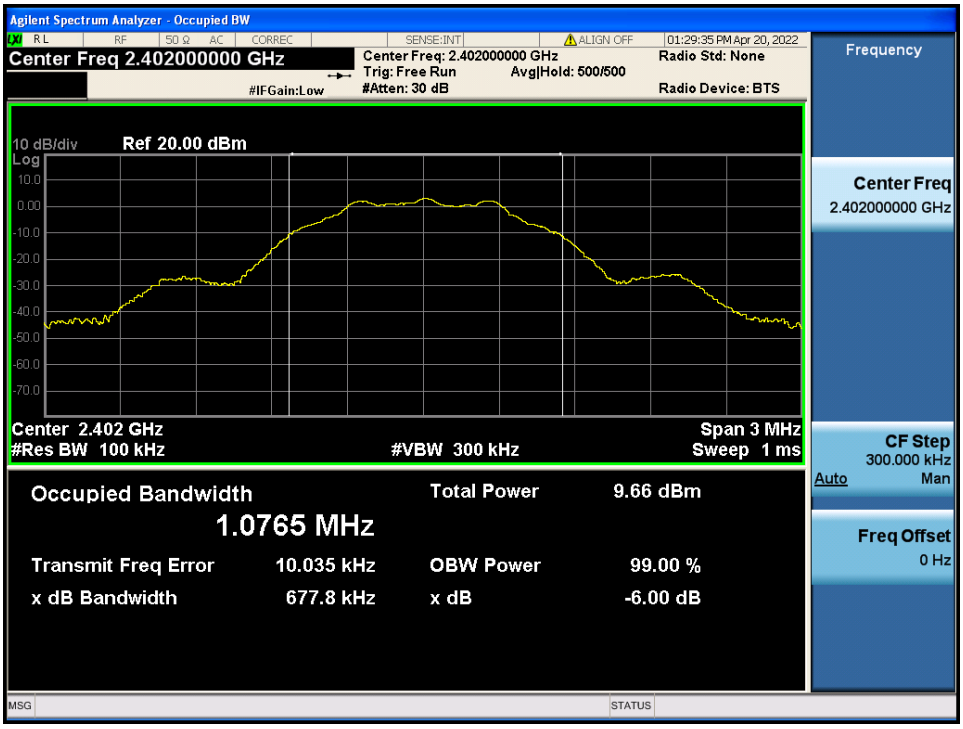
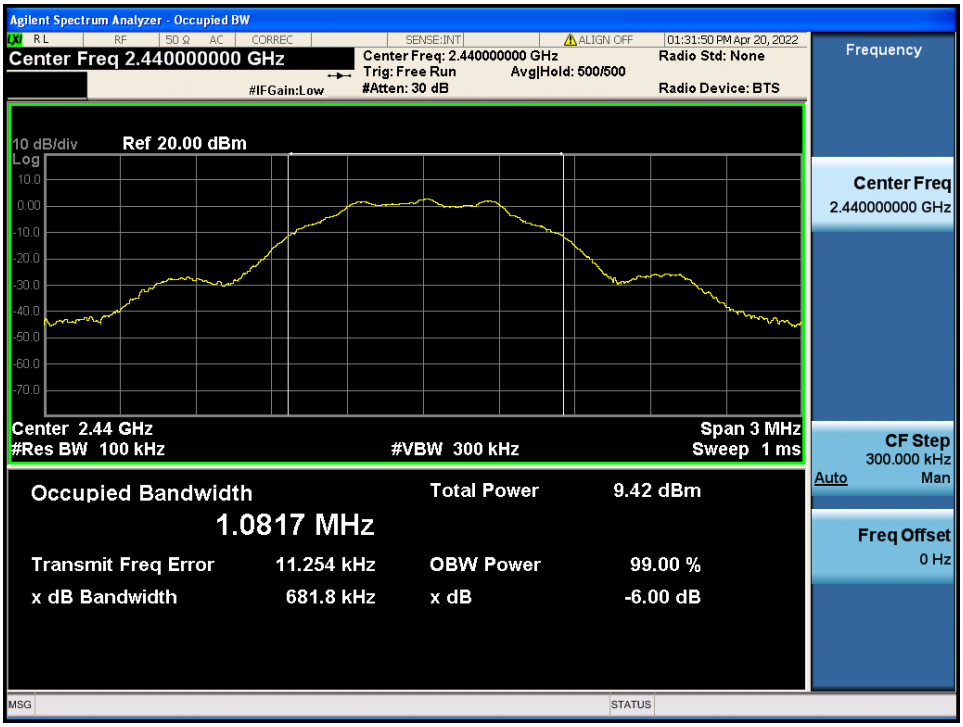
**6 dB Bandwidth** TM 1 Test Channel : Lowest



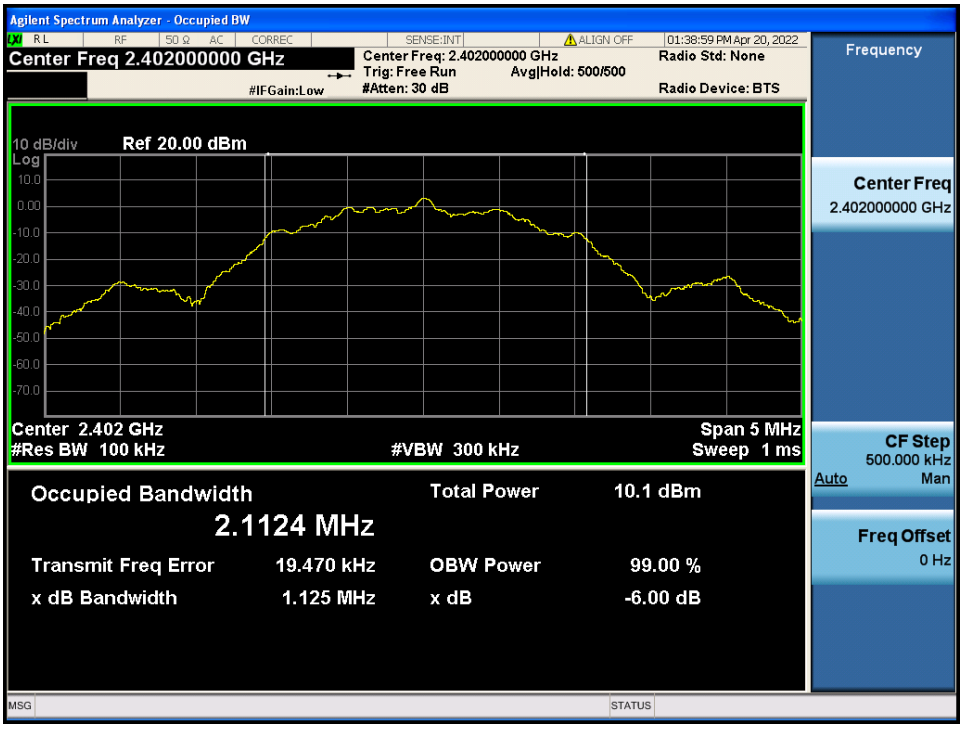

**6 dB Bandwidth** TM 1 Test Channel : Middle



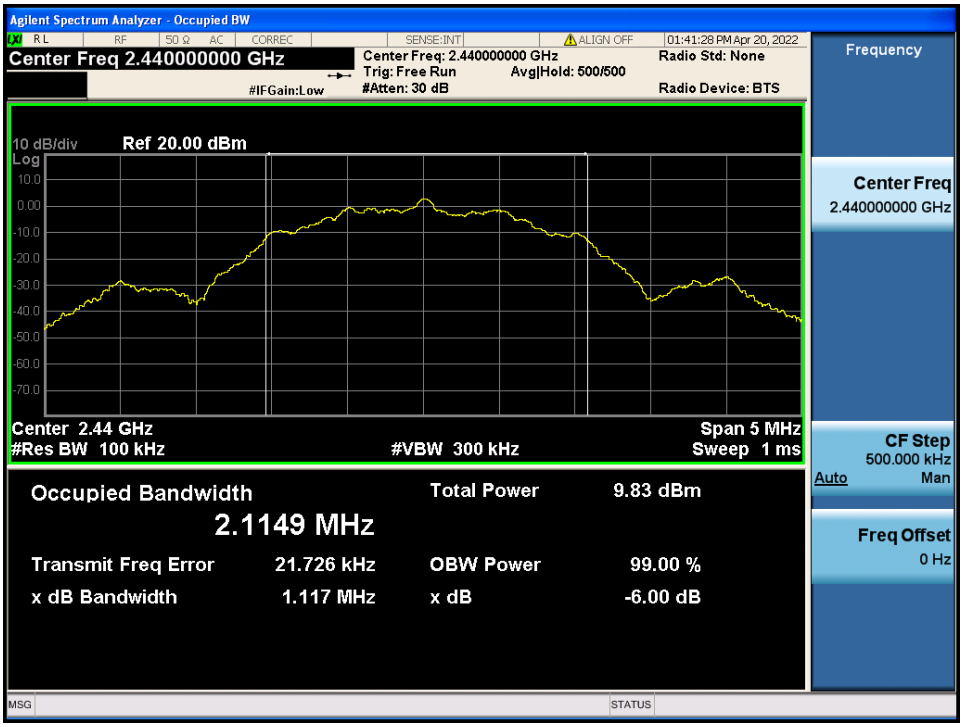
## 6 dB Bandwidth

TM 1 Test Channel : Highest

**6 dB Bandwidth** TM 2 Test Channel : Lowest

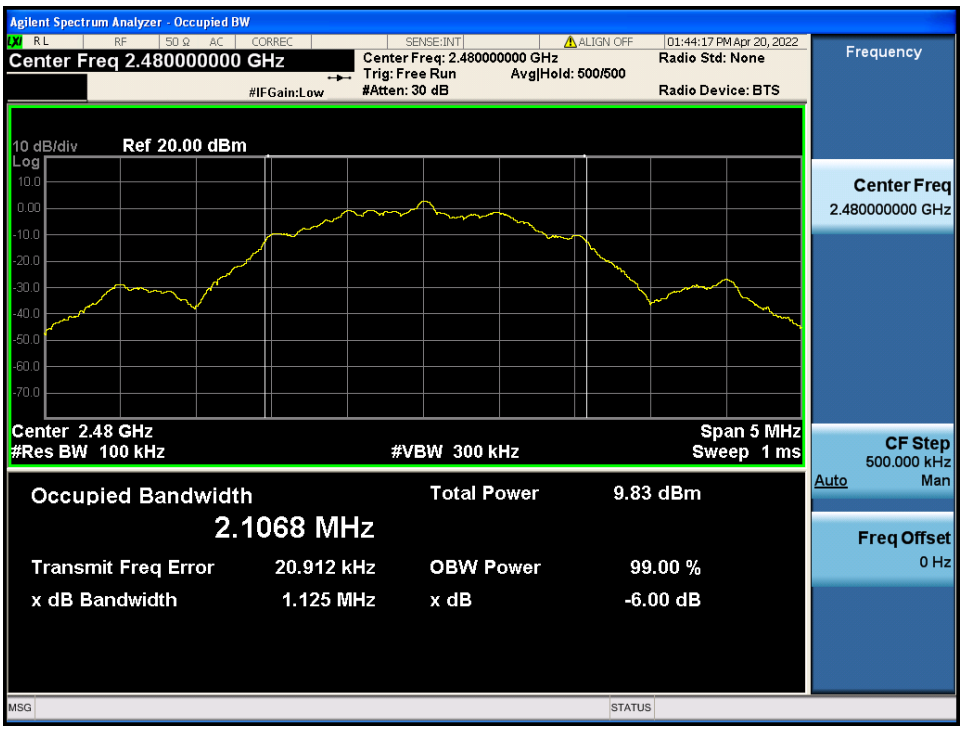



**6 dB Bandwidth** TM 2 Test Channel : Middle

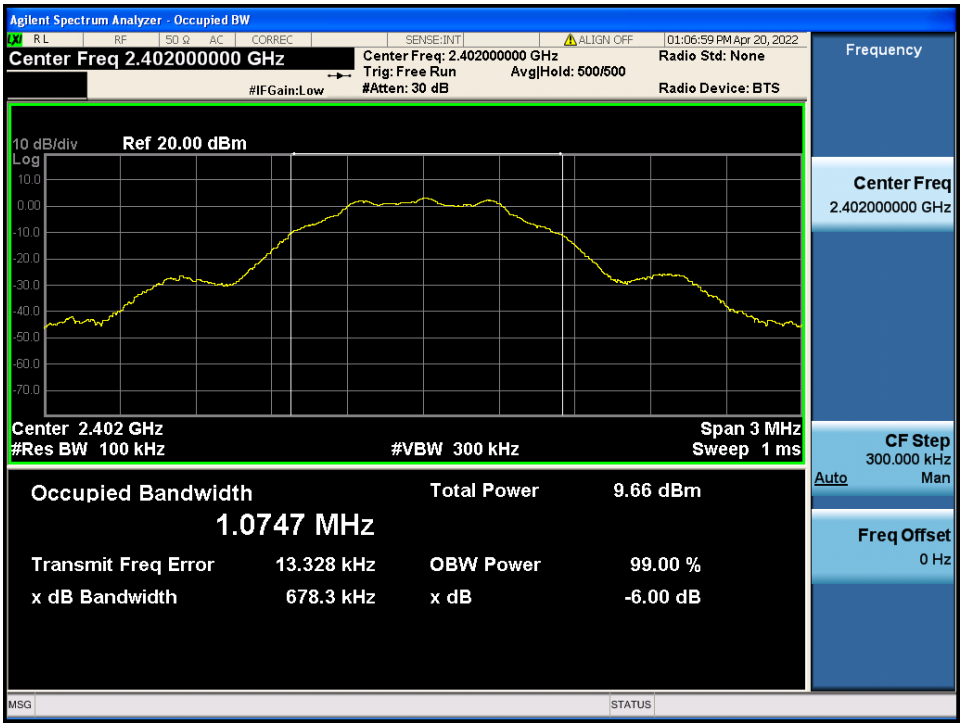


## 6 dB Bandwidth

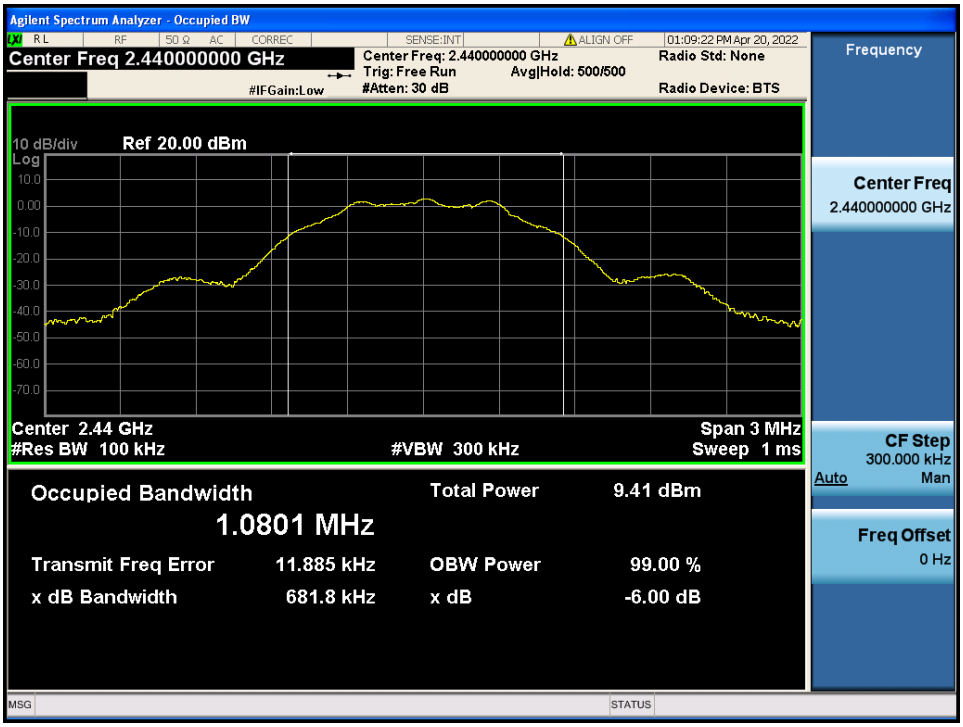
TM 2 Test Channel : Highest



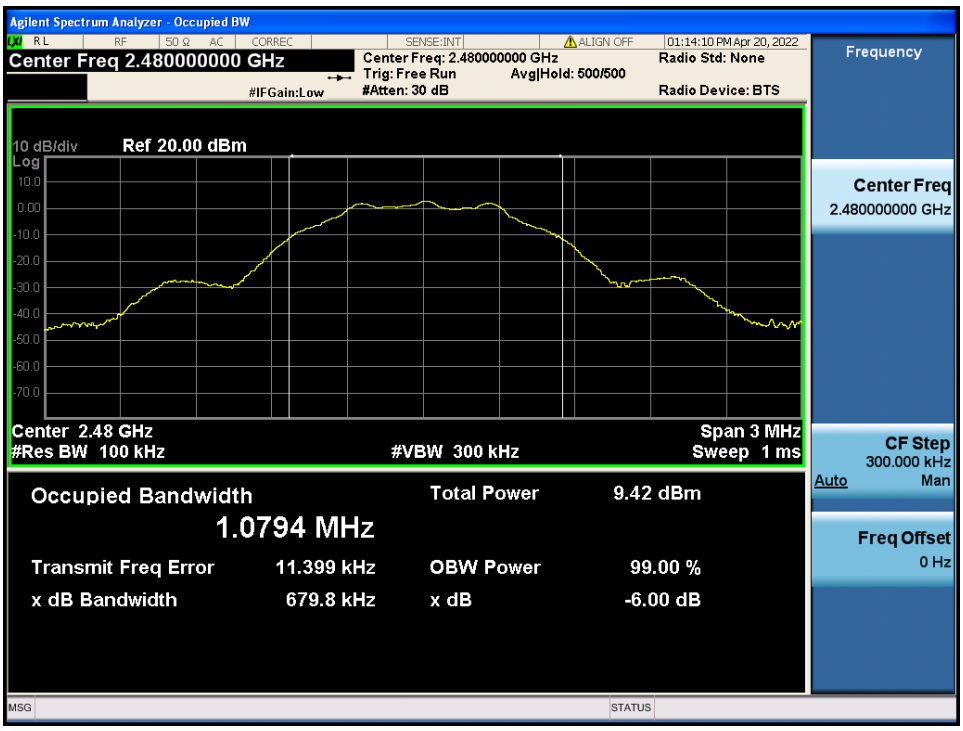
**6 dB Bandwidth** TM 3 Test Channel : Lowest



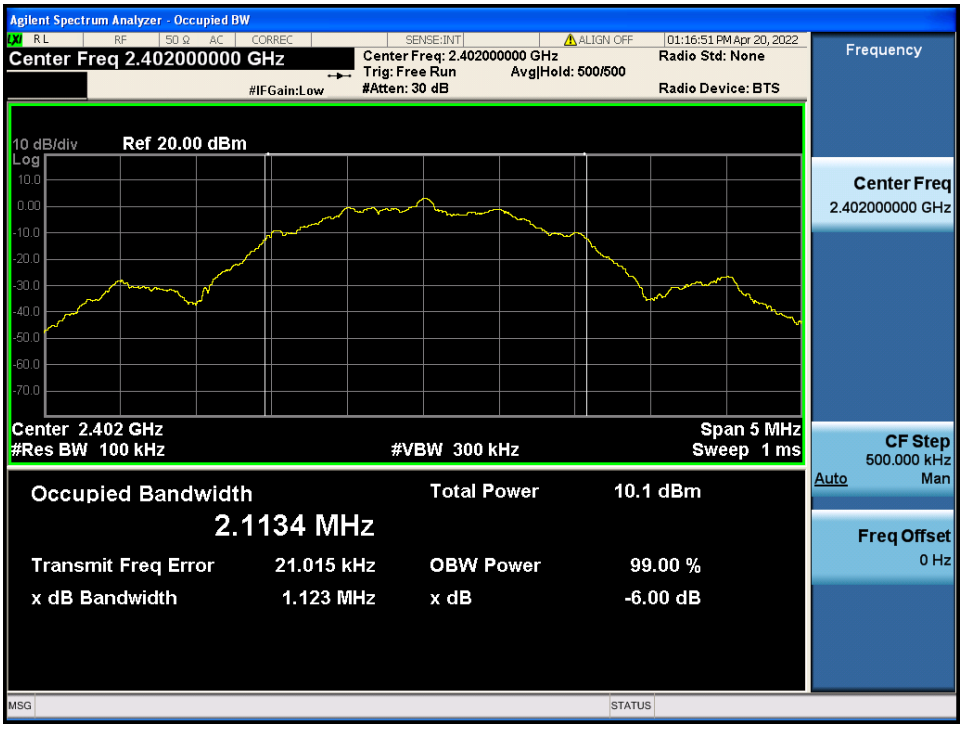

**6 dB Bandwidth** TM 3 Test Channel : Middle



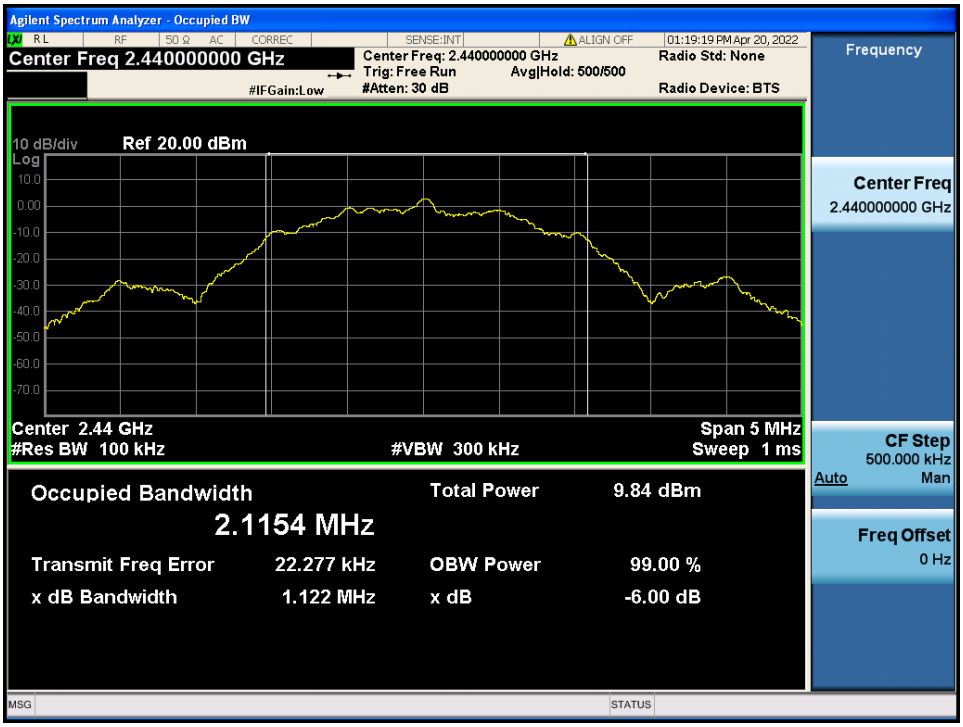
**6 dB Bandwidth** TM 3 Test Channel : Highest



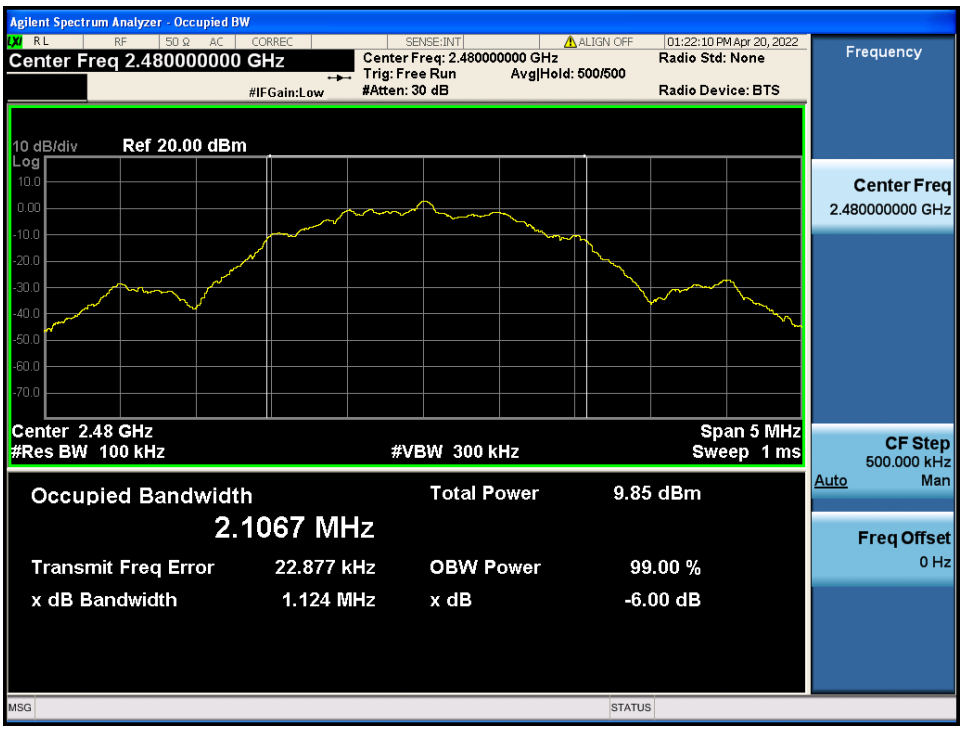
**6 dB Bandwidth** TM 4 Test Channel : Lowest




**6 dB Bandwidth** TM 4 Test Channel : Middle



**6 dB Bandwidth** TM 4 Test Channel : Highest



## 5.3. Power Spectral Density

### ▣ Test requirements and limit, Part 15.247(e) & RSS-247 [5.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

**Minimum Standard**

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

### 5.3.1. Test Setup

Refer to the APPENDIX I.

### 5.3.2. Test Procedures

- **KDB558074 D01v05r02 - Section 8.4**
- **ANSI C63.10-2013 – Section 11.10.2**

**Method PKPSD (peak PSD)**

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW : **3 kHz ≤ RBW ≤ 100 kHz**.
4. Set the VBW ≥ **3 x RBW.**
5. Detector = **peak.**
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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### 5.3.3. Test Results

| Test Mode | Tested Channel | RBW | PKPSD (dBm) | Limit (dBm / 3 kHz) |
|---|---|---|---|---|
| TM 1 | Lowest | 3 kHz | -12.30 | 8.00 |
| | Middle | 3 kHz | -12.51 | 8.00 |
| | Highest | 3 kHz | -12.69 | 8.00 |
| TM 2 | Lowest | 3 kHz | -14.41 | 8.00 |
| | Middle | 3 kHz | -14.60 | 8.00 |
| | Highest | 3 kHz | -14.84 | 8.00 |
| TM 3 | Lowest | 3 kHz | -12.10 | 8.00 |
| | Middle | 3 kHz | -12.39 | 8.00 |
| | Highest | 3 kHz | -12.58 | 8.00 |
| TM 4 | Lowest | 3 kHz | -14.16 | 8.00 |
| | Middle | 3 kHz | -14.42 | 8.00 |
| | Highest | 3 kHz | -14.77 | 8.00 |

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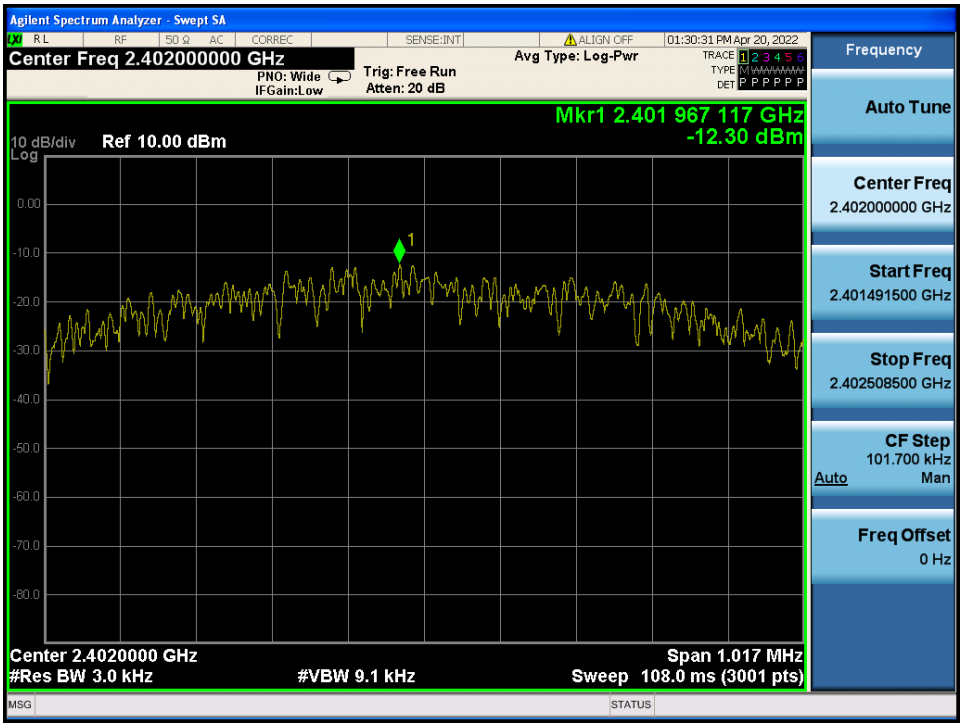
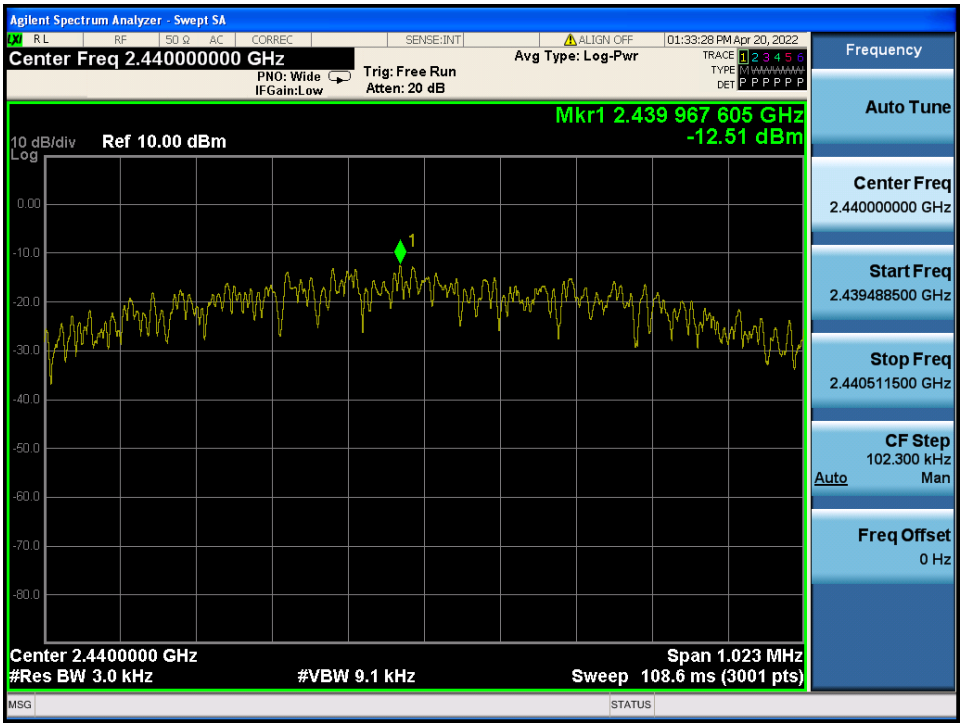
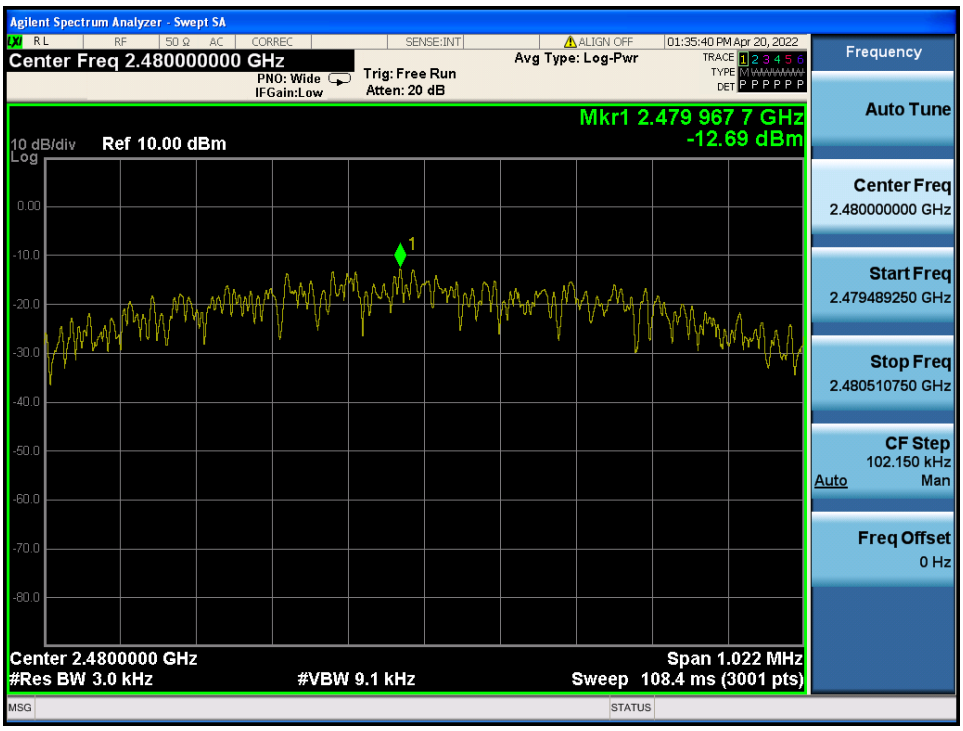
**Maximum PKPSD** TM 1 Test Channel : Lowest



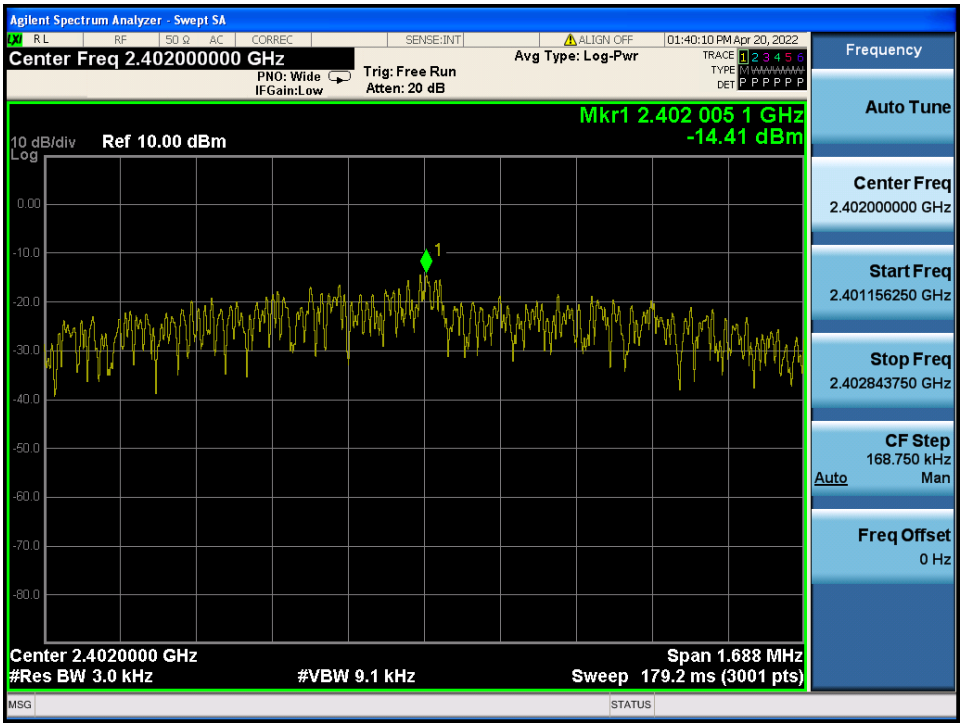

**Maximum PKPSD** TM 1 Test Channel : Middle



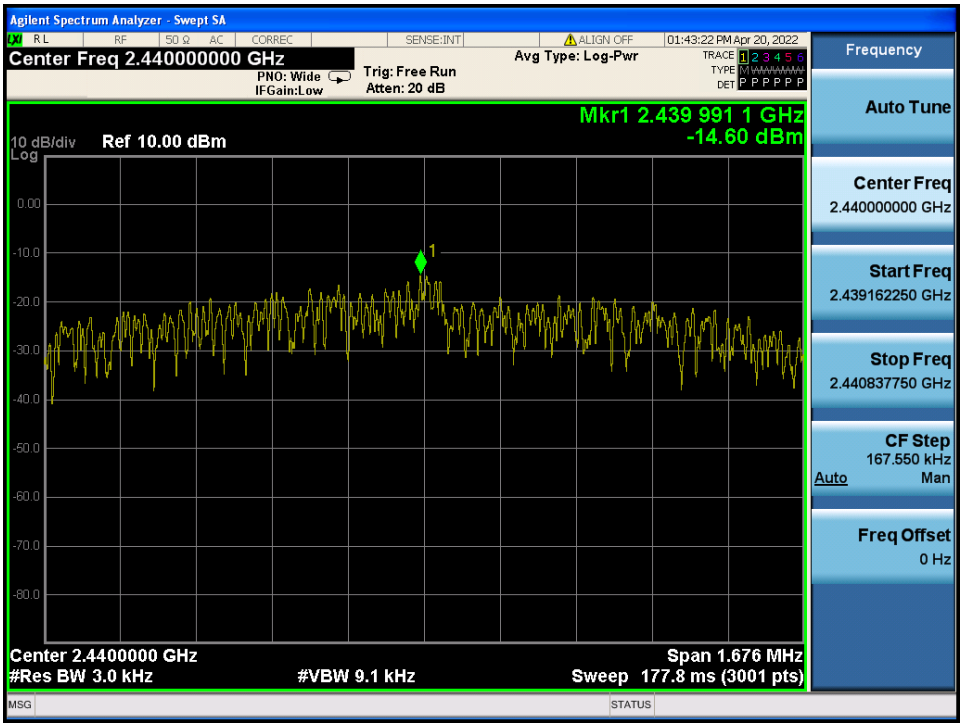
**Maximum PKPSD** TM 1 Test Channel : Highest



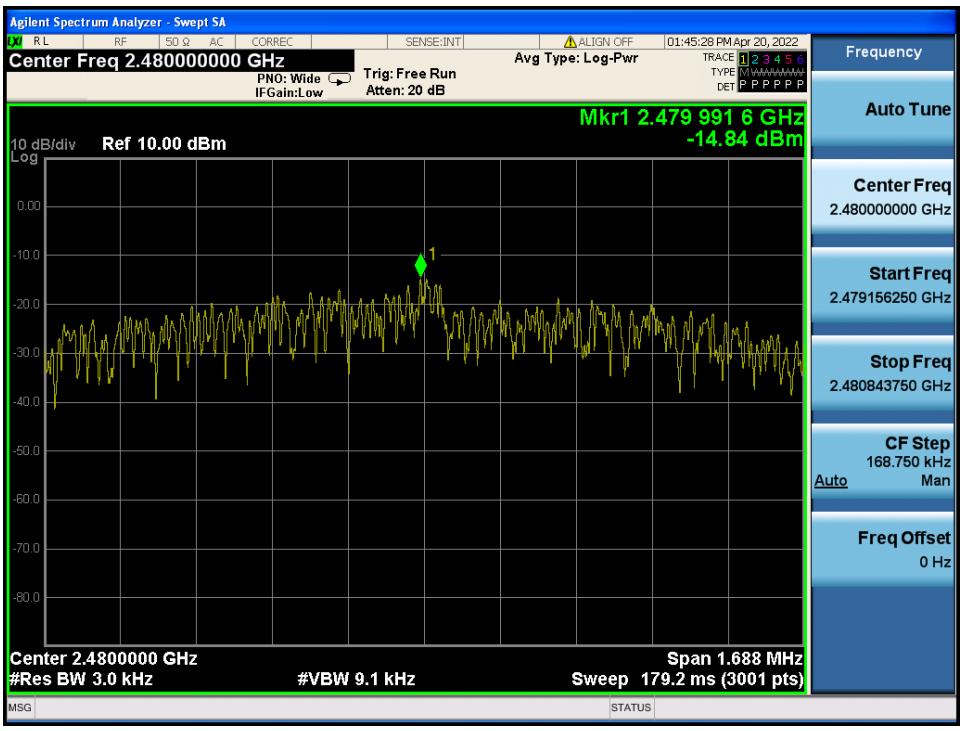
**Maximum PKPSD** TM 2 Test Channel : Lowest



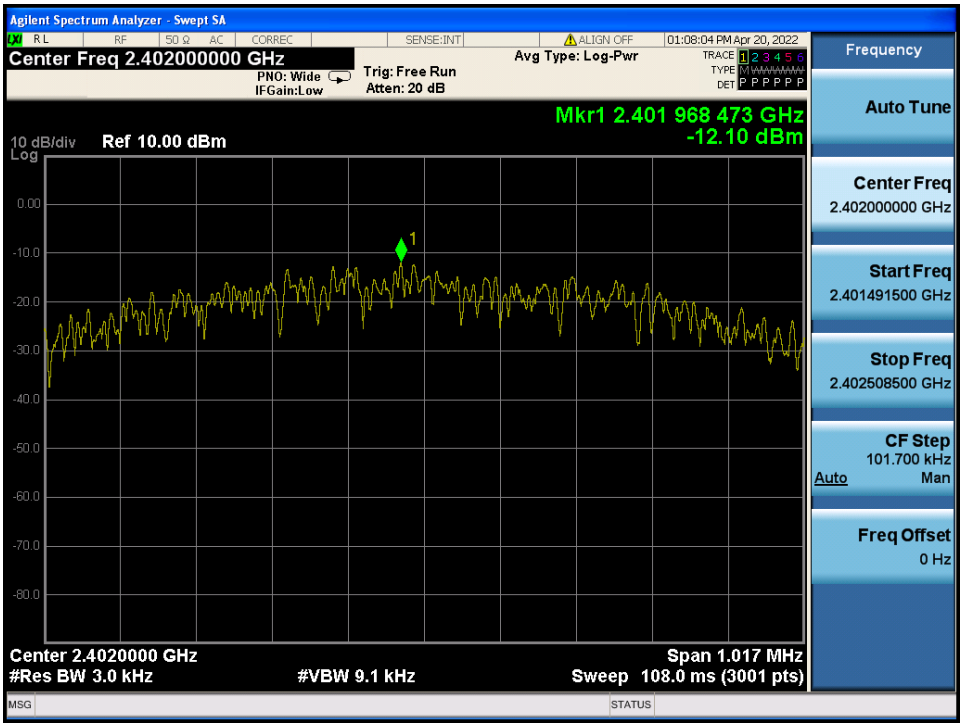

**Maximum PKPSD** TM 2 Test Channel : Middle



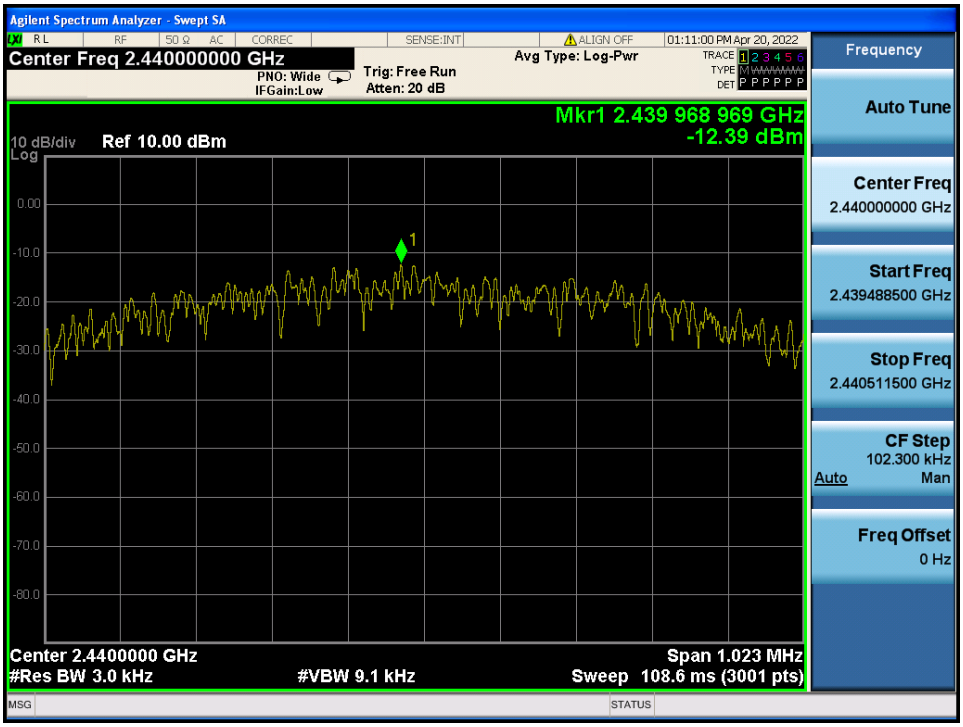
**Maximum PKPSD** TM 2 Test Channel : Highest



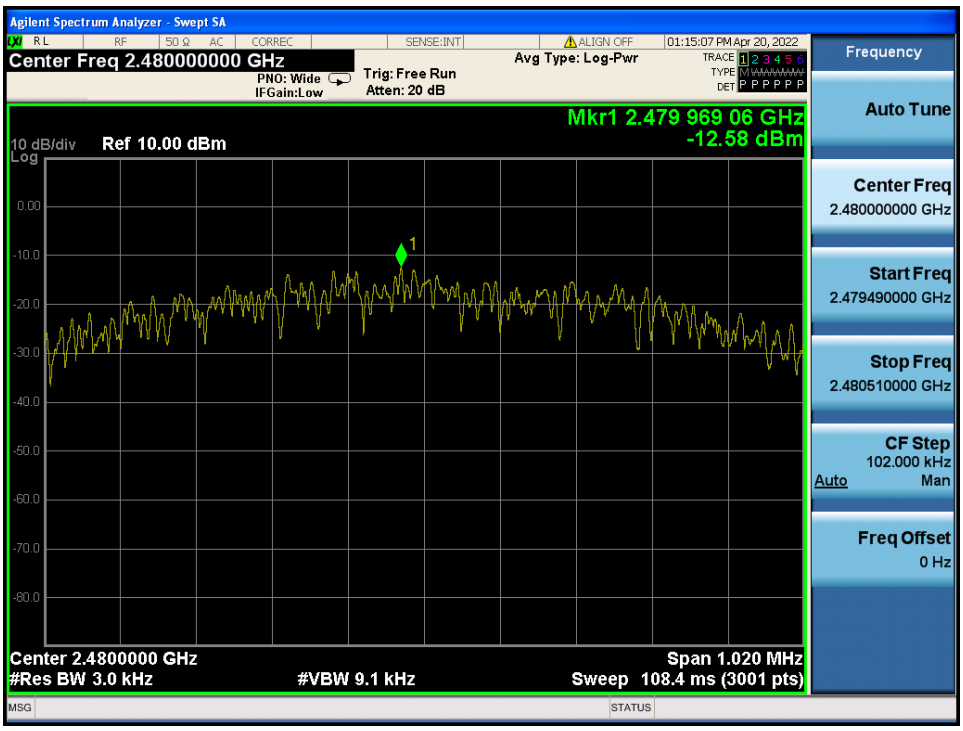
**Maximum PKPSD** TM 3 Test Channel : Lowest



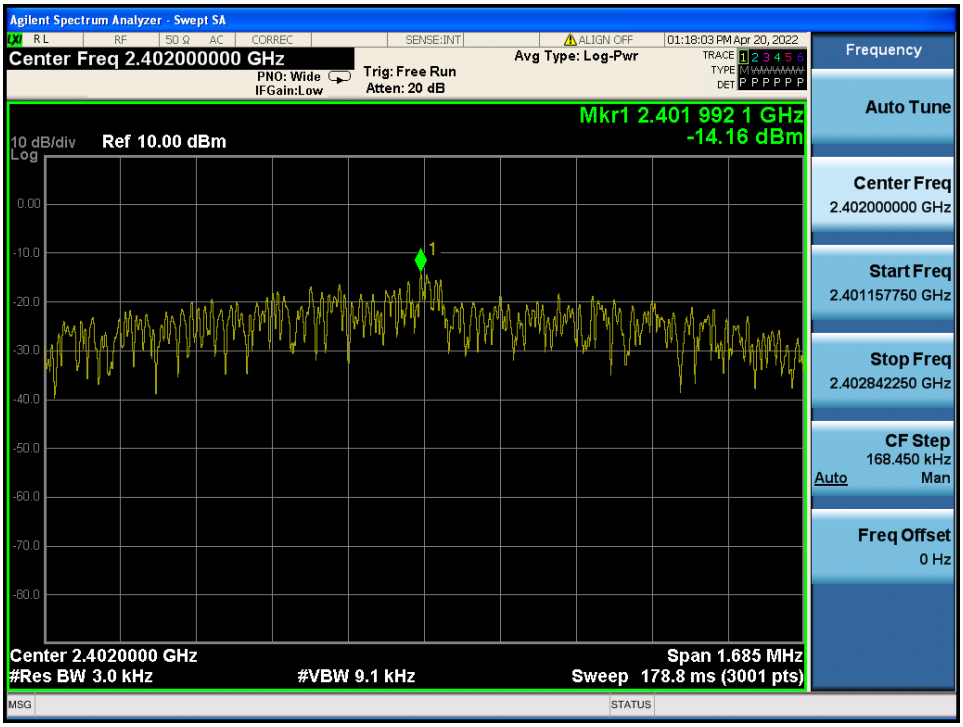

**Maximum PKPSD** TM 3 Test Channel : Middle



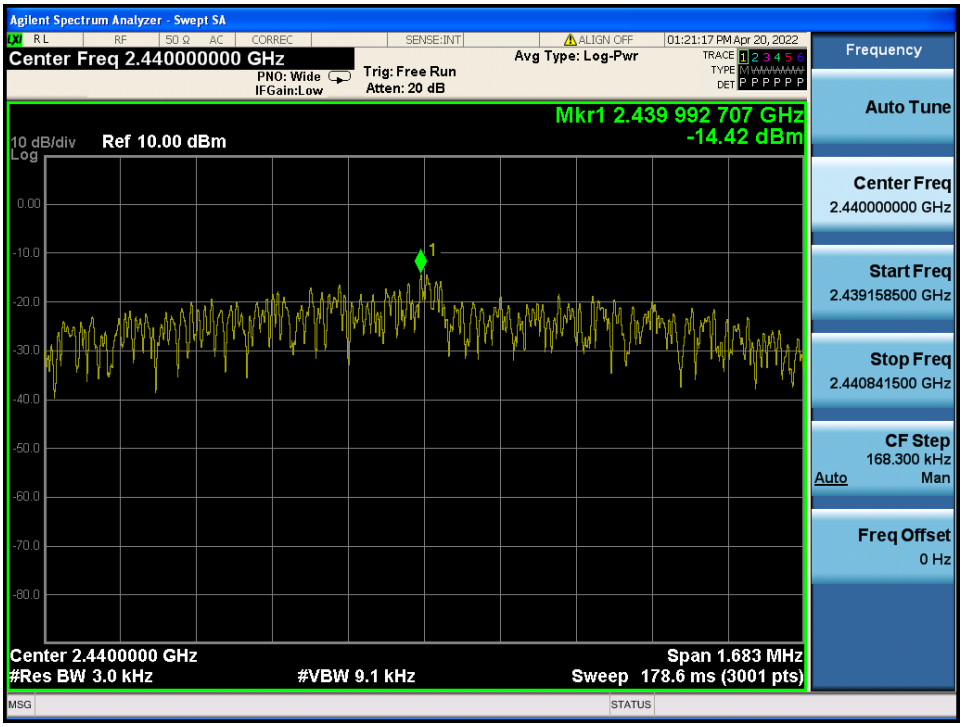
**Maximum PKPSD** TM 3 Test Channel : Highest



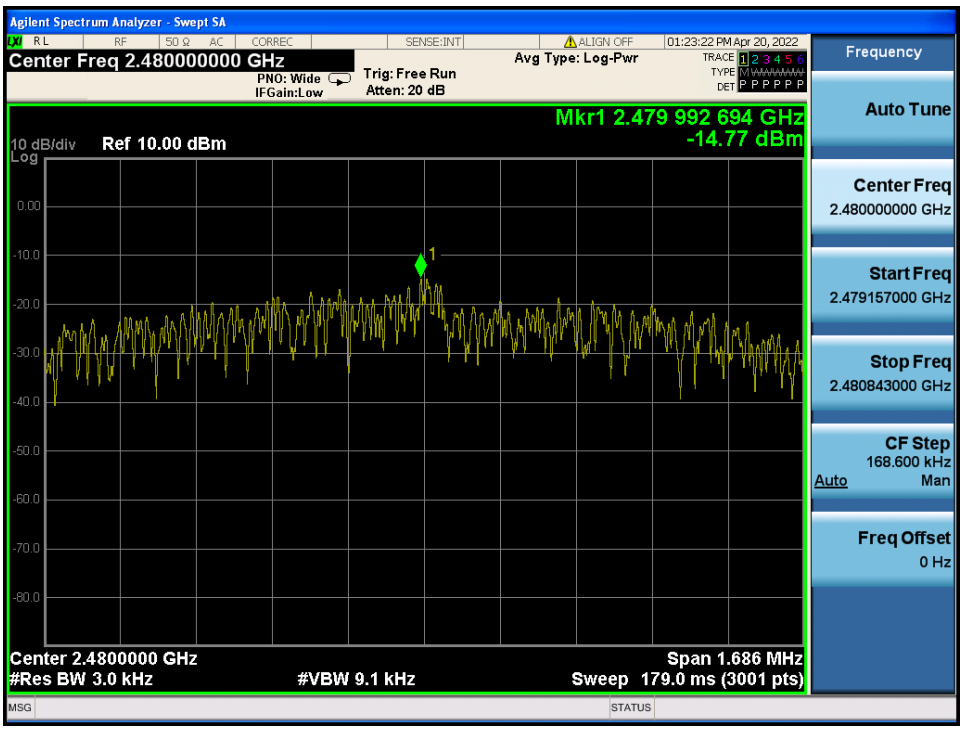
**Maximum PKPSD** TM 4 Test Channel : Lowest




**Maximum PKPSD** TM 4 Test Channel : Middle



**Maximum PKPSD** TM 4 Test Channel : Highest



## 5.4. Unwanted Emissions (Conducted)

▣ **Test requirements and limit, Part 15.247(d) & RSS-247 [5.5]**

In any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions :

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in §15.209(a) is not required.

### 5.4.1. Test Setup

Refer to the APPENDIX I including path loss

### 5.4.2. Test Procedures

- **KDB558074 D01v05r02 - Section 8.5**
- **ANSI C63.10-2013 – Section 11.11**

**Reference level measurement**

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to ≥ 1.5 times the DTS bandwidth.
3. Set the RBW = 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum PSD level

   **LIMIT LINE = 20 dB below of the reference level.**

**Emission level measurement**

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = **100 kHz.(Actual 1 MHz , See below note)**
3. Set the VBW ≥ **3 x RBW.(Actual 3 MHz, See below note)**
4. Detector = **peak**.
5. Ensure that the number of measurement points ≥ span / RBW
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use the peak marker function to determine the maximum amplitude level.

**Note:** The conducted spurious emission was tested with below settings.

| Frequency range | RBW | VBW | Detector | Trace | Sweep Point |
|---|---|---|---|---|---|
| 9 kHz ~ 30 MHz | 100 kHz | 300 kHz | Peak | Max Hold | 40 001 |
| 30 MHz ~ 10 GHz | 1 MHz | 3 MHz | | | |
| 10 GHz ~ 25 GHz | 1 MHz | 3 MHz | | | |

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2 001 to get accurate emission level within 100 kHz BW.

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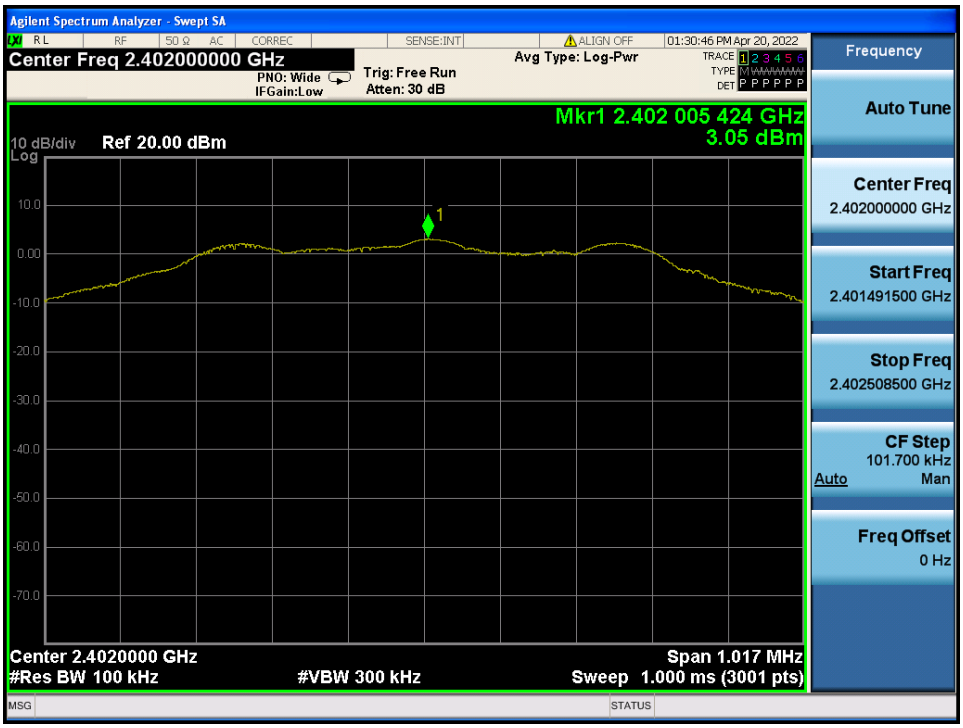
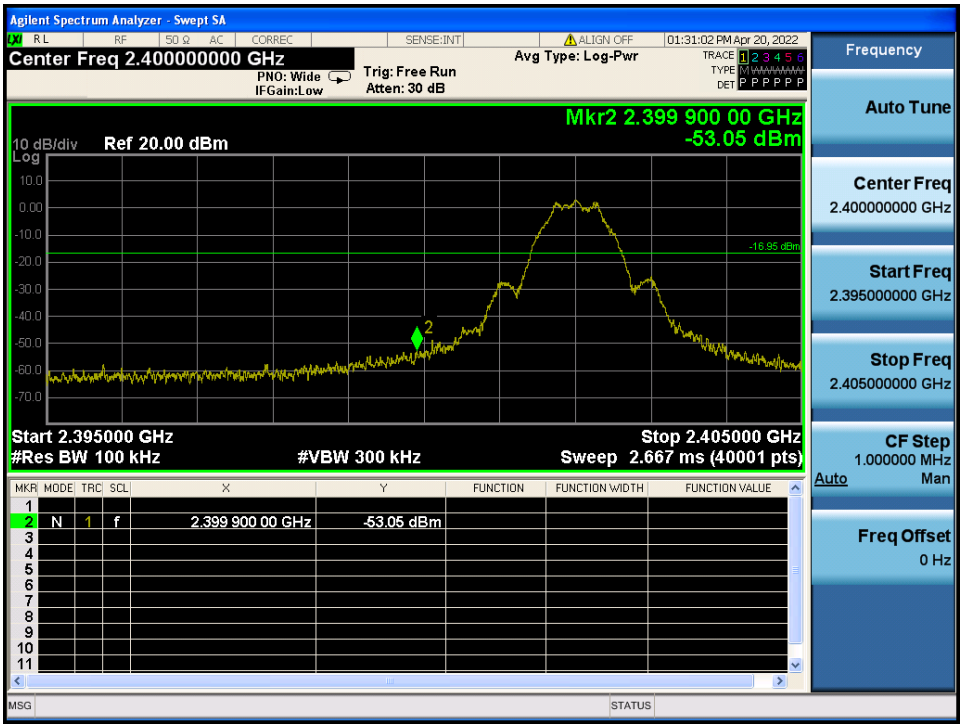
### 5.4.3. Test Results

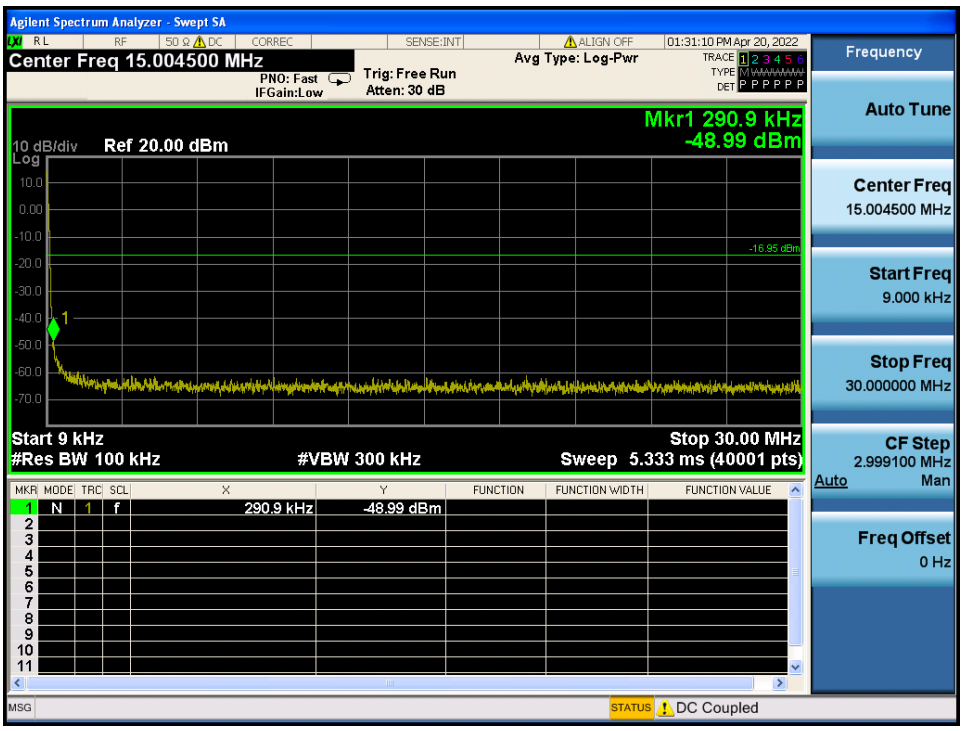
**TM 1 Reference** (Test Channel : Lowest)



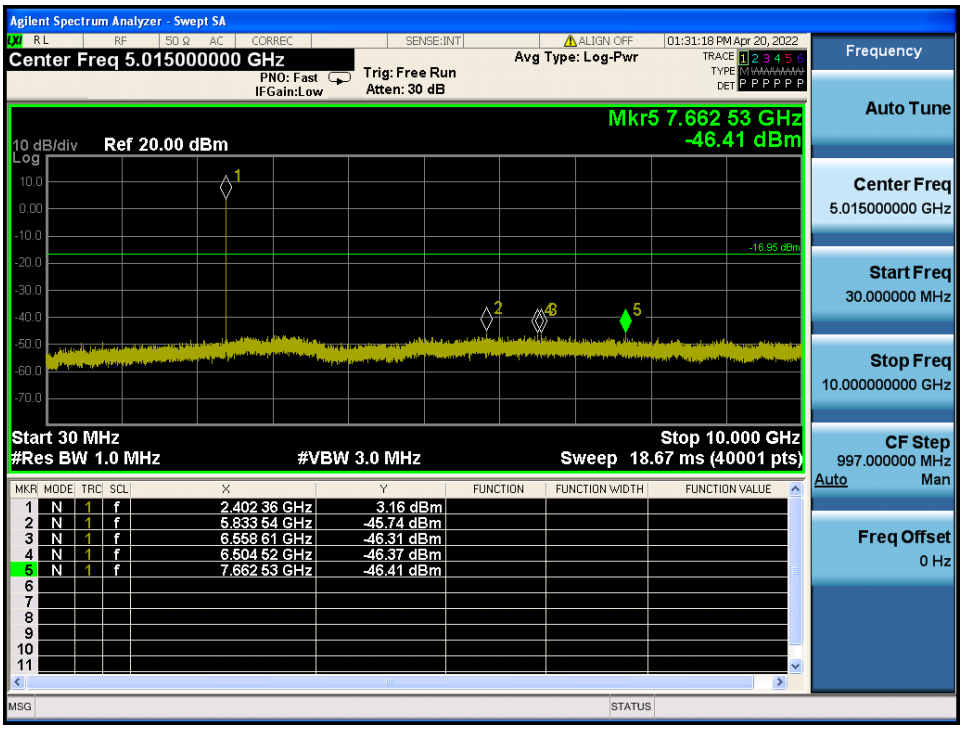

**TM 1 Low Band-edge** (Test Channel : Lowest)



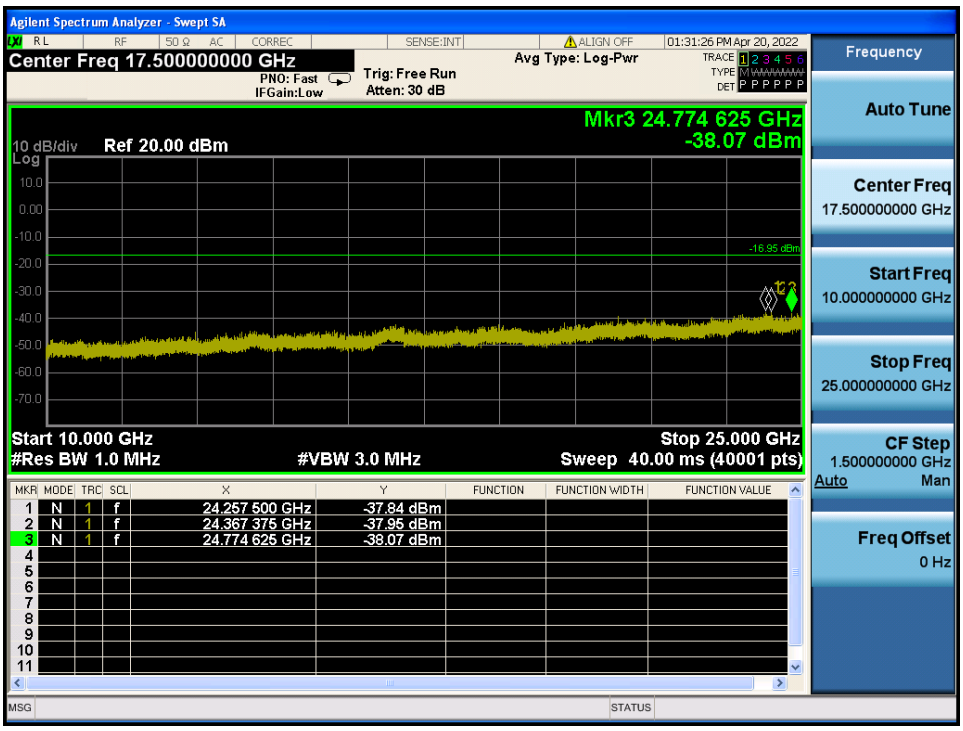
**TM 1 Conducted Spurious Emissions 1** (Test Channel : Lowest)



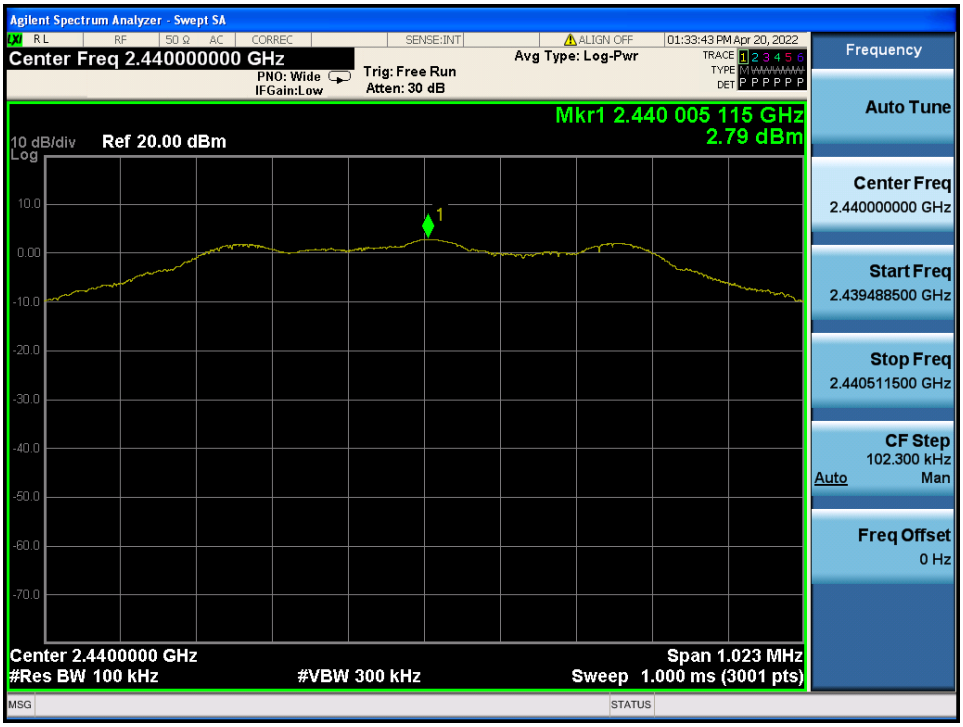

**TM 1 Conducted Spurious Emissions 2** (Test Channel : Lowest)



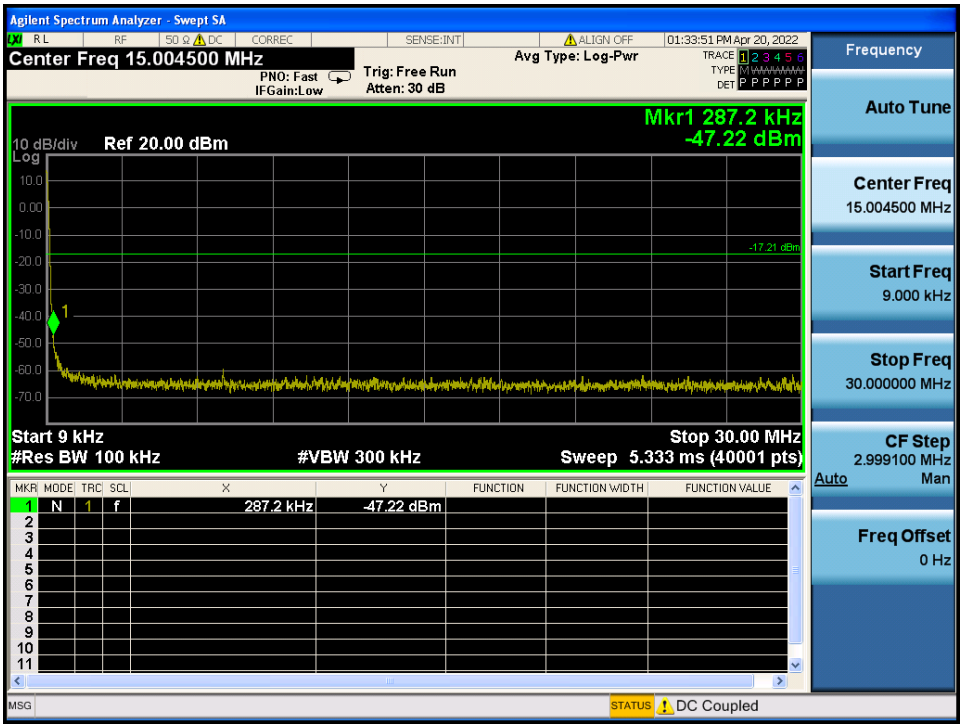
**TM 1 Conducted Spurious Emissions 3** (Test Channel : Lowest)



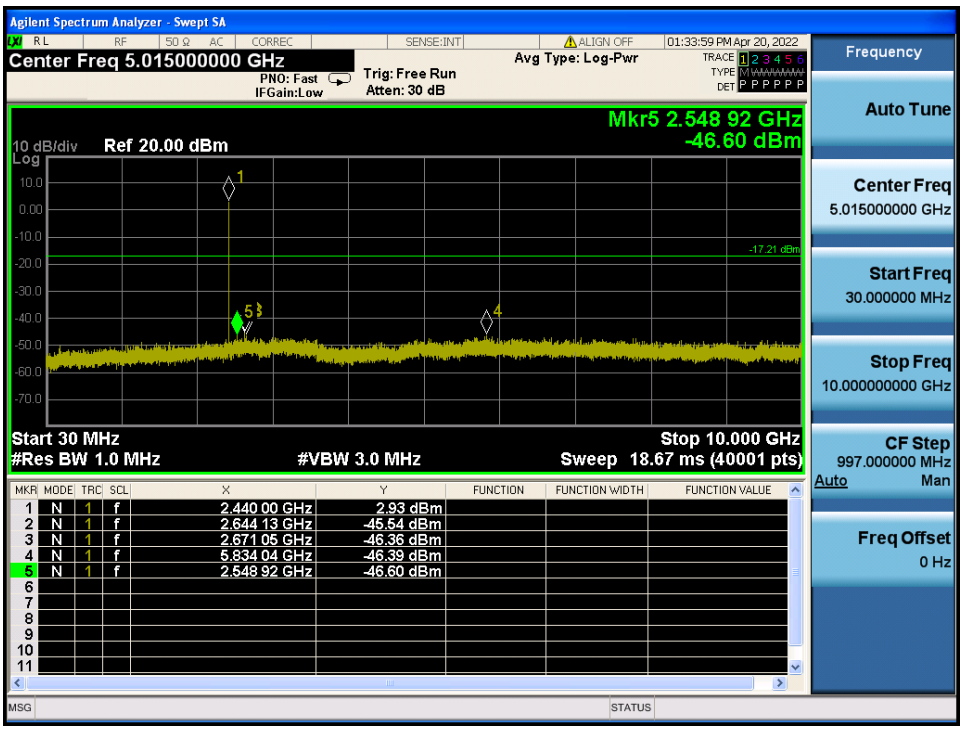
**TM 1 Reference** (Test Channel : Middle)



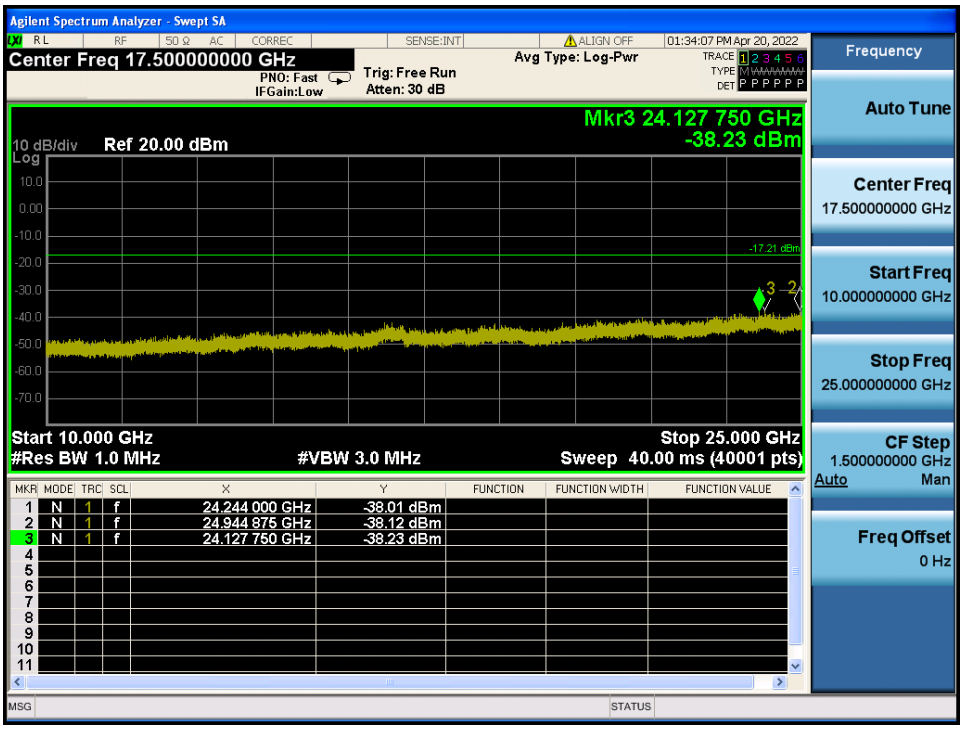

**TM 1 Conducted Spurious Emissions 1** (Test Channel : Middle)



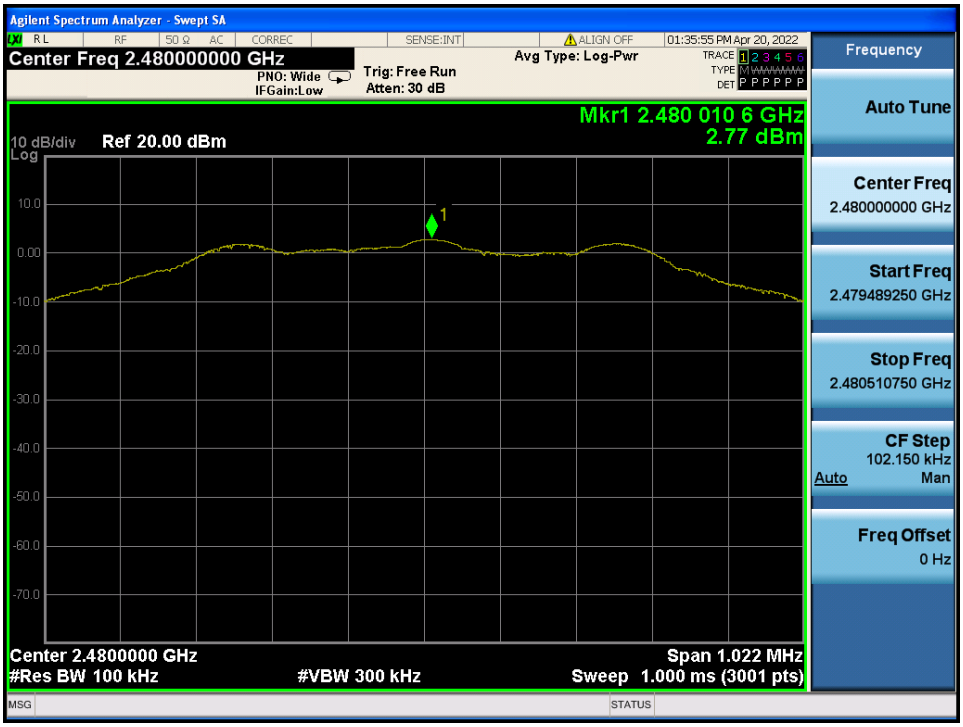
**TM 1 Conducted Spurious Emissions 2** (Test Channel : Middle)



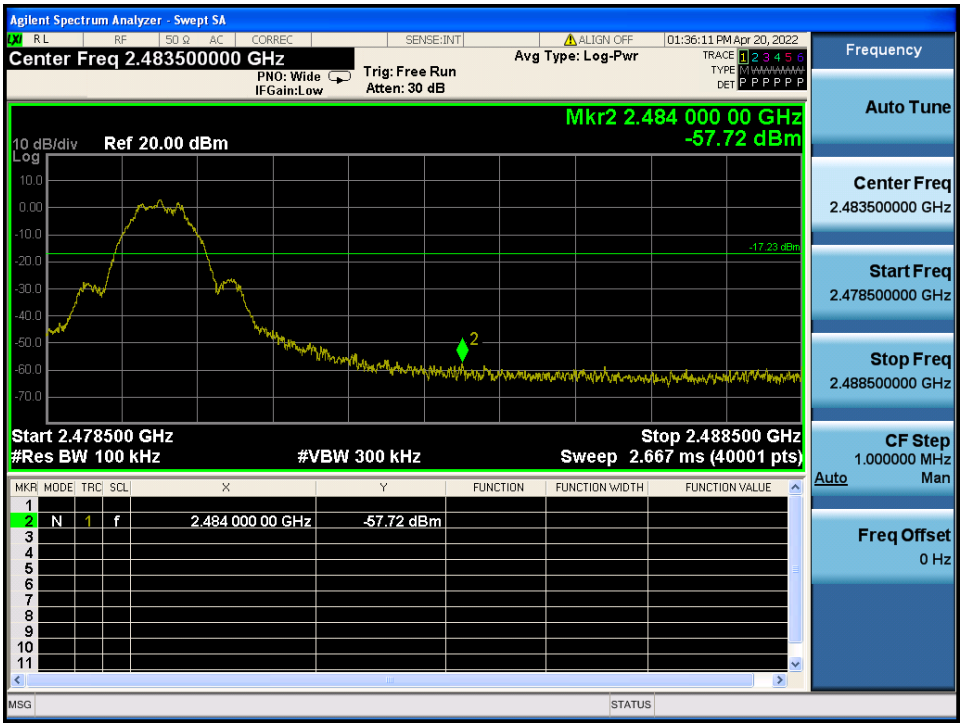

**TM 1 Conducted Spurious Emissions 3** (Test Channel : Middle)



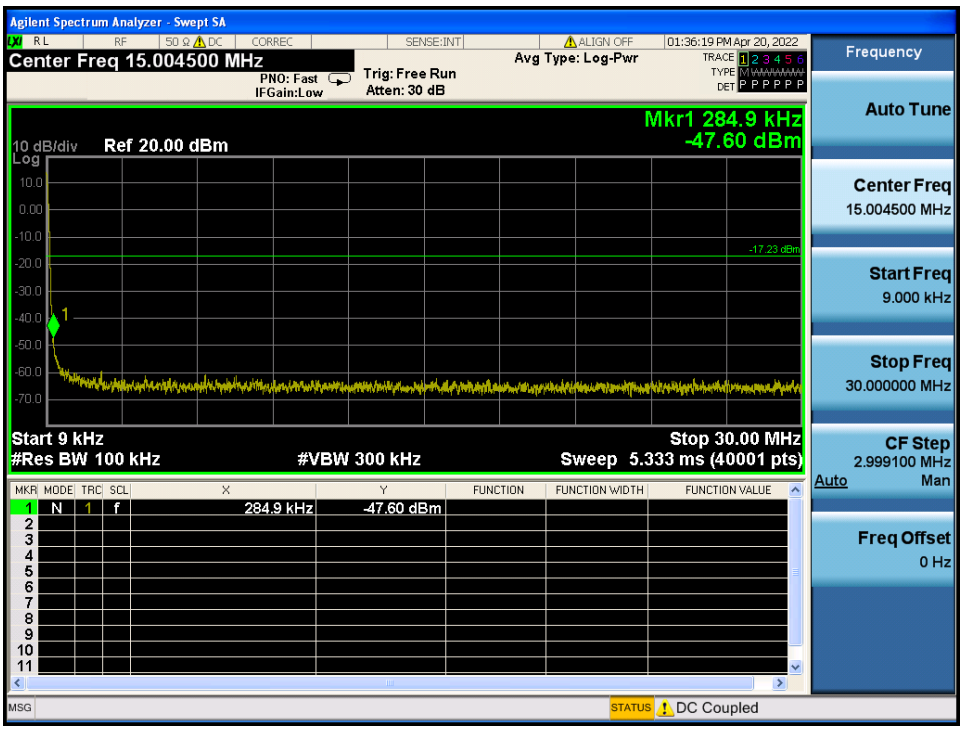
**TM 1 Reference** (Test Channel : Highest)



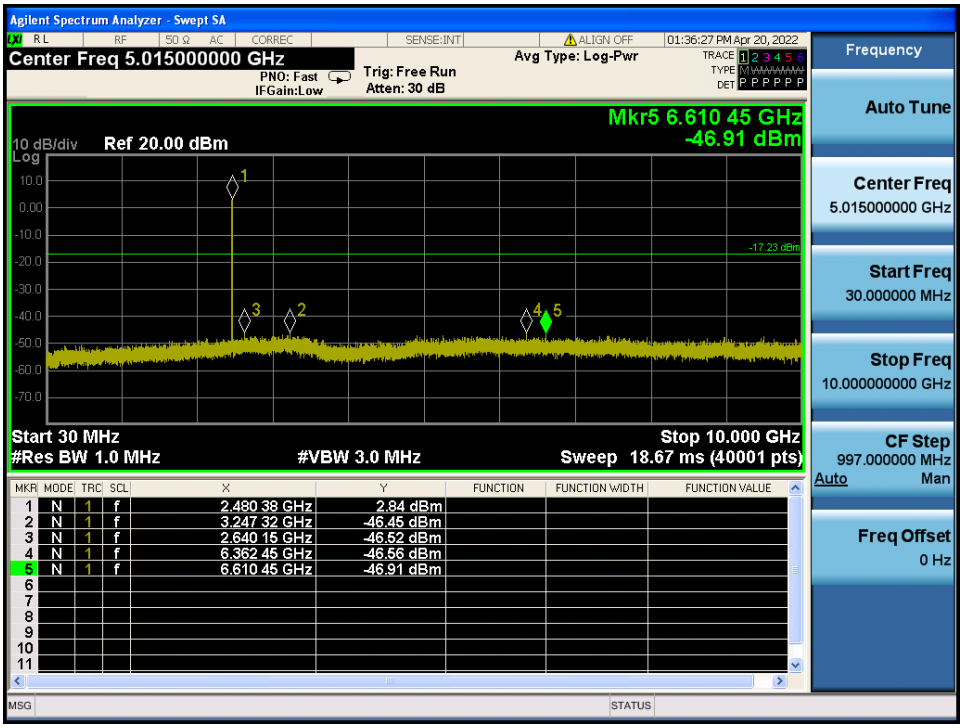

**TM 1 High Band-edge** (Test Channel : Highest)



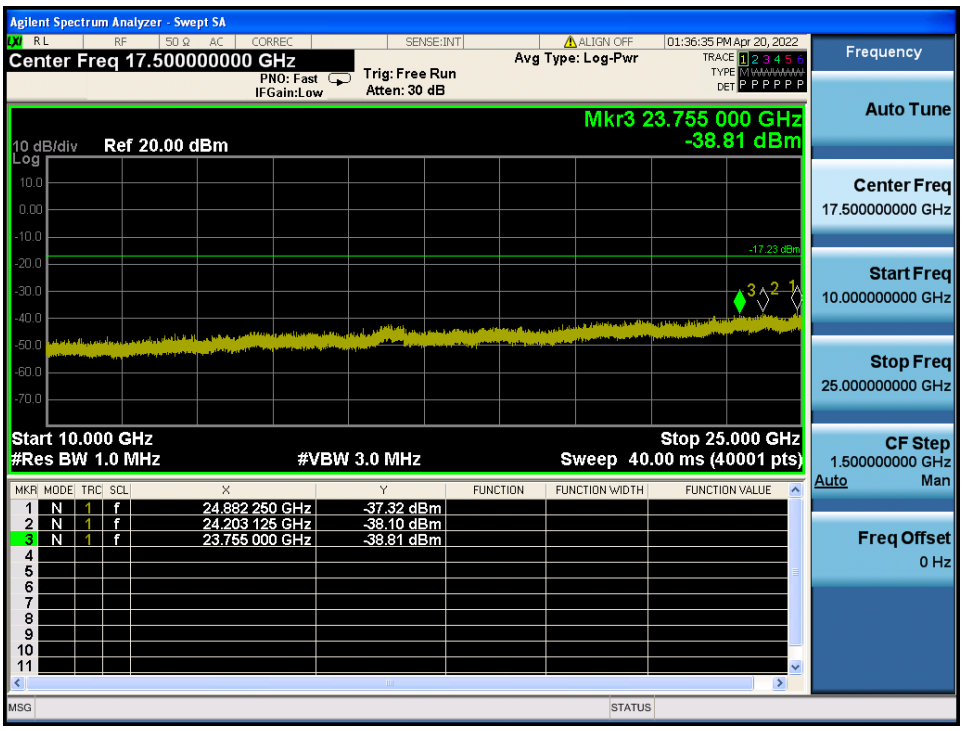
**TM 1 Conducted Spurious Emissions 1** (Test Channel : Highest)



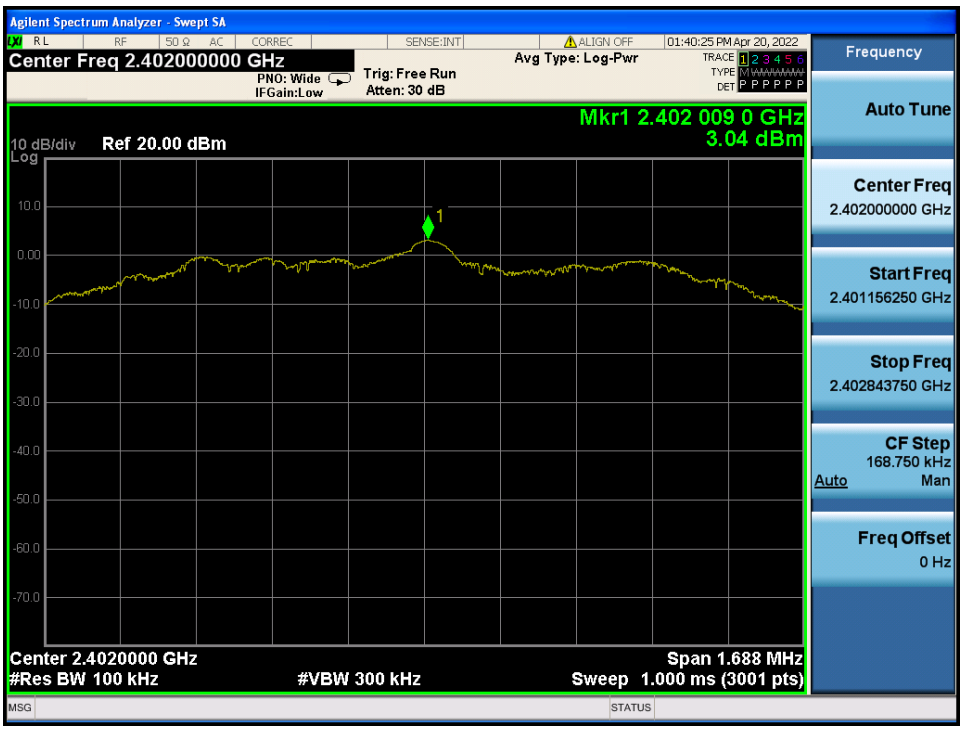

**TM 1 Conducted Spurious Emissions 2** (Test Channel : Highest)



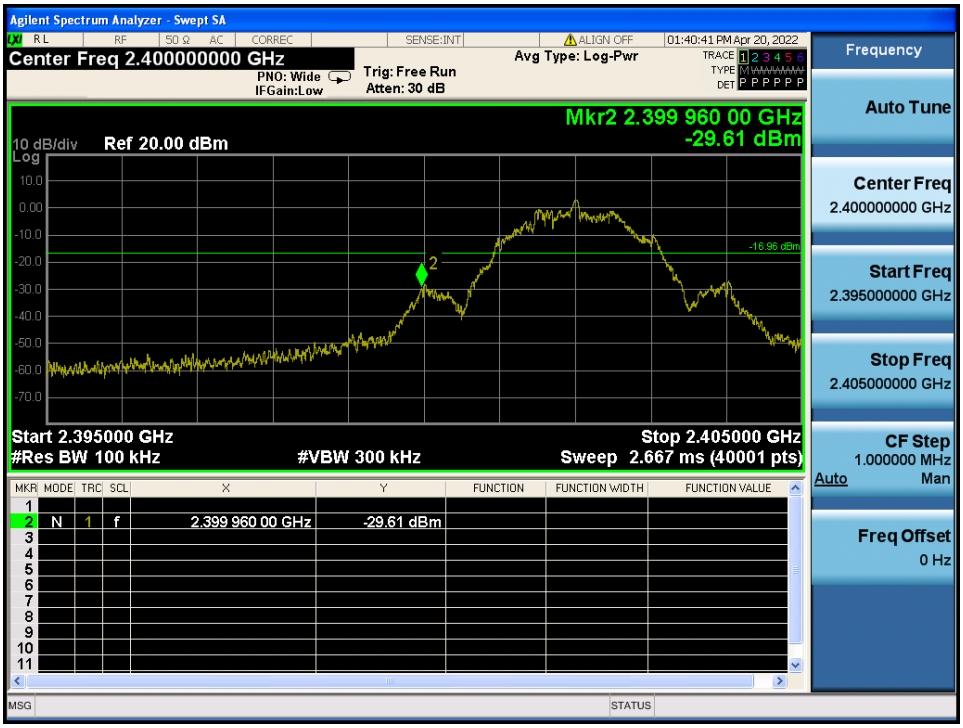
**TM 1 Conducted Spurious Emissions 3** (Test Channel : Highest)



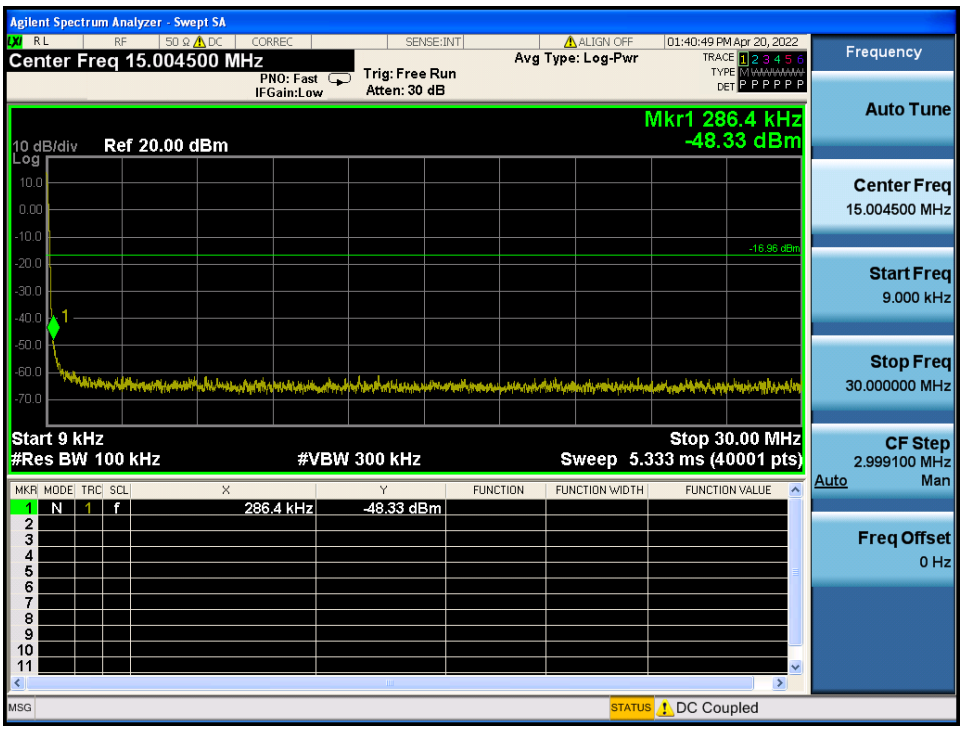
**TM 2 Reference** (Test Channel : Lowest)



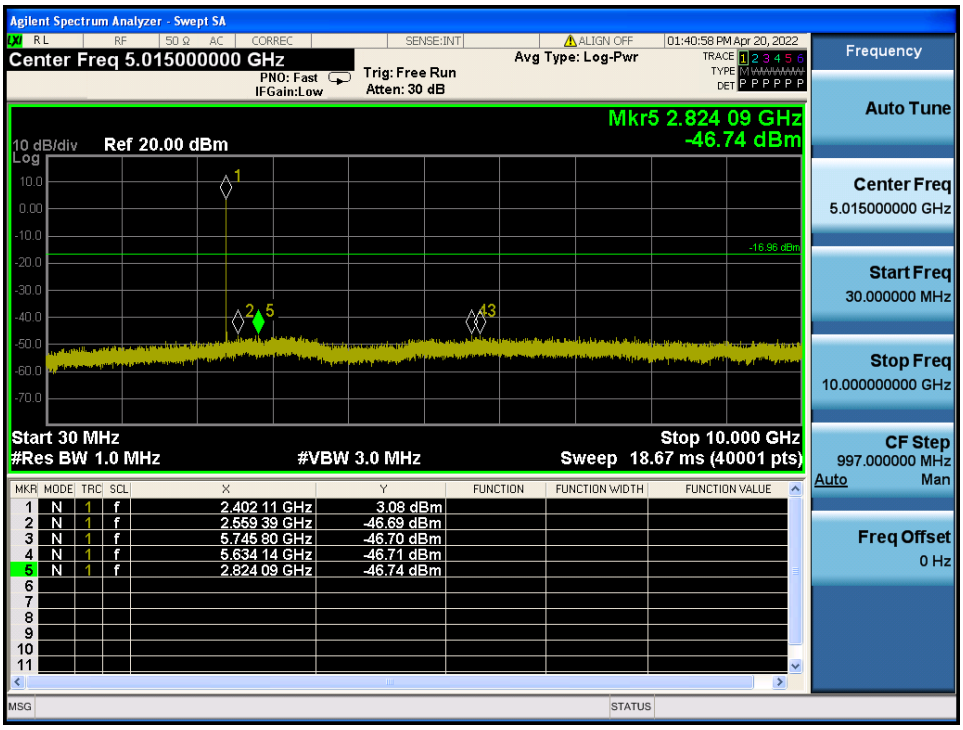

**TM 2 Low Band-edge** (Test Channel : Lowest)



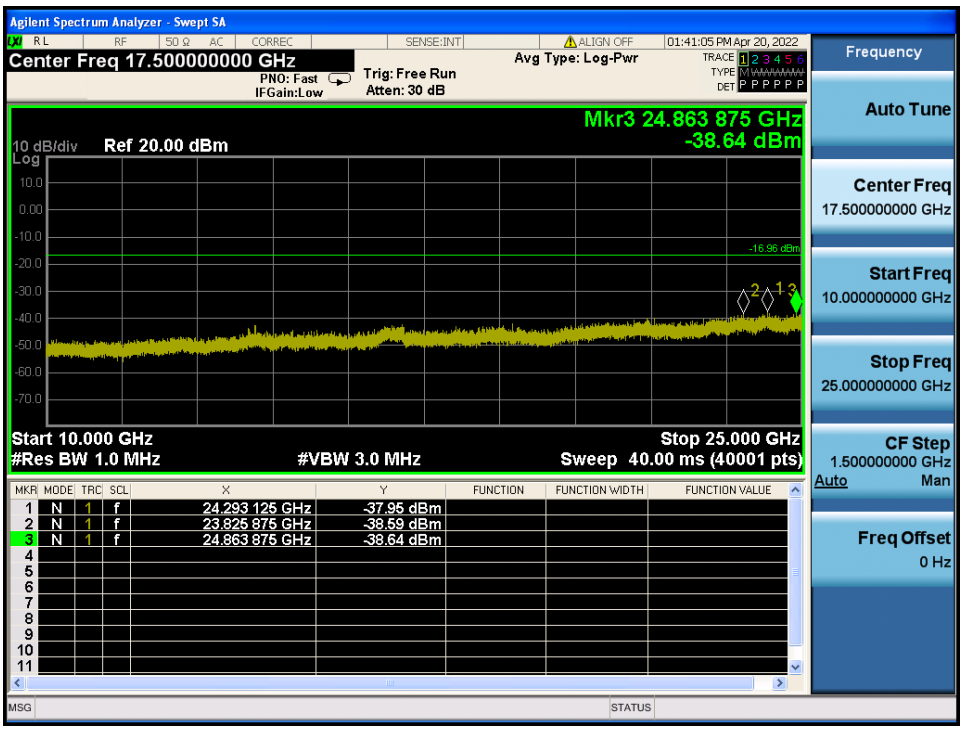
**TM 2 Conducted Spurious Emissions 1** (Test Channel : Lowest)



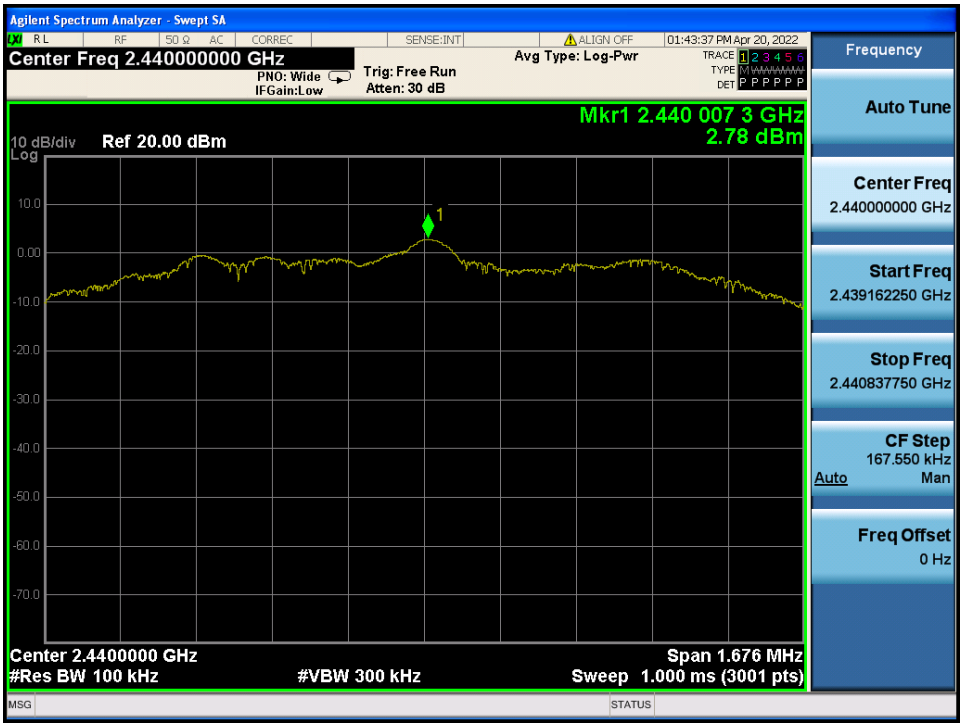

**TM 2 Conducted Spurious Emissions 2** (Test Channel : Lowest)



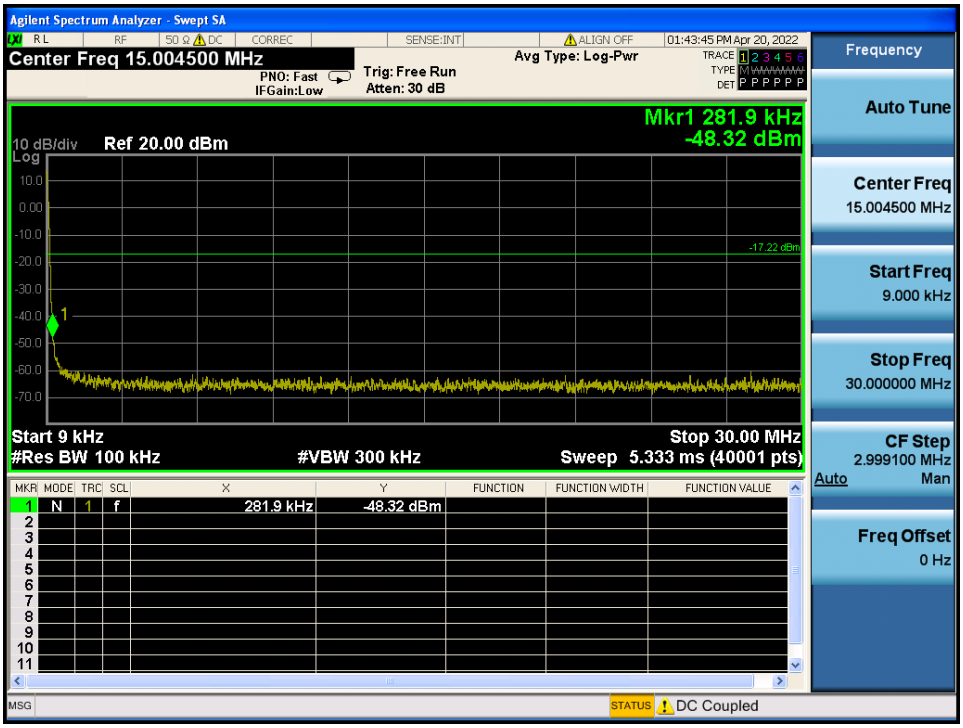
**TM 2 Conducted Spurious Emissions 3** (Test Channel : Lowest)



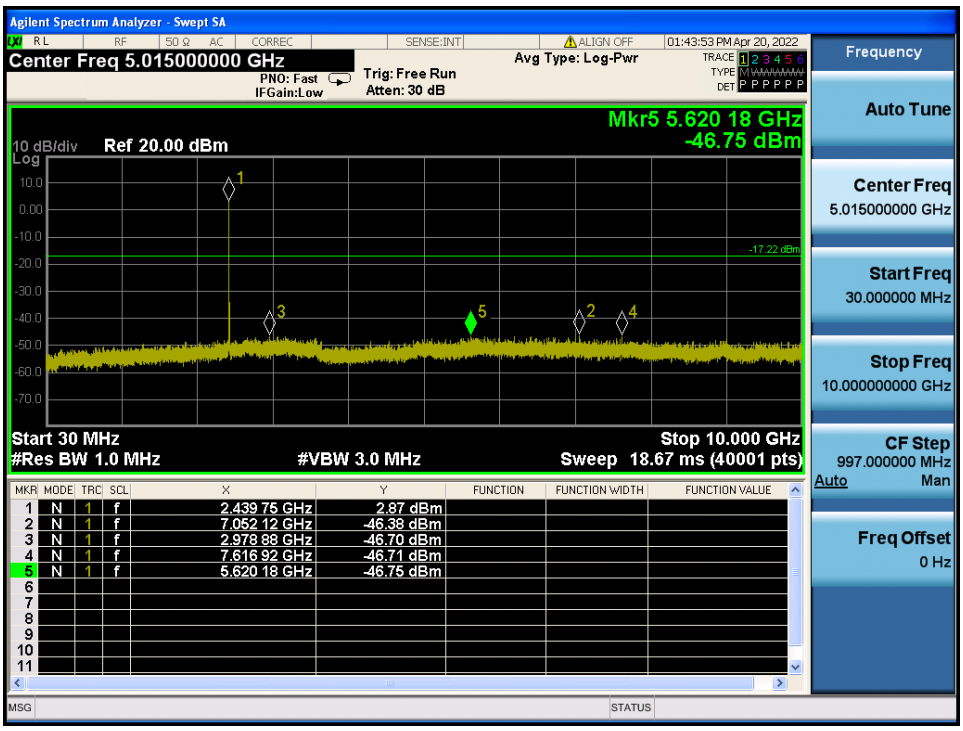
**TM 2 Reference** (Test Channel : Middle)



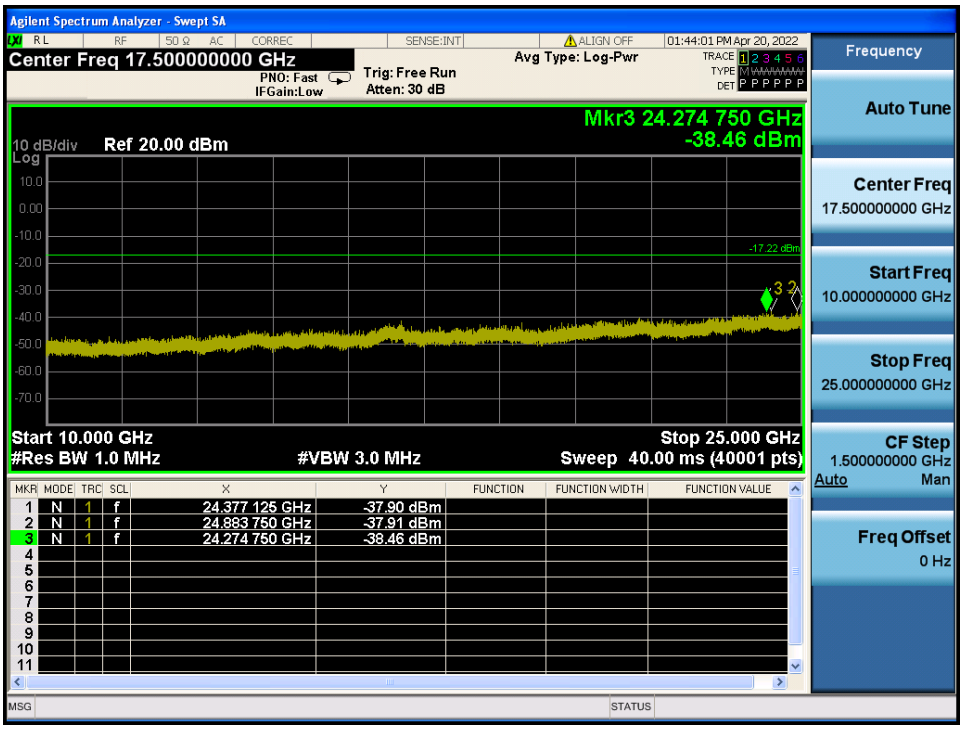

**TM 2 Conducted Spurious Emissions 1** (Test Channel : Middle)



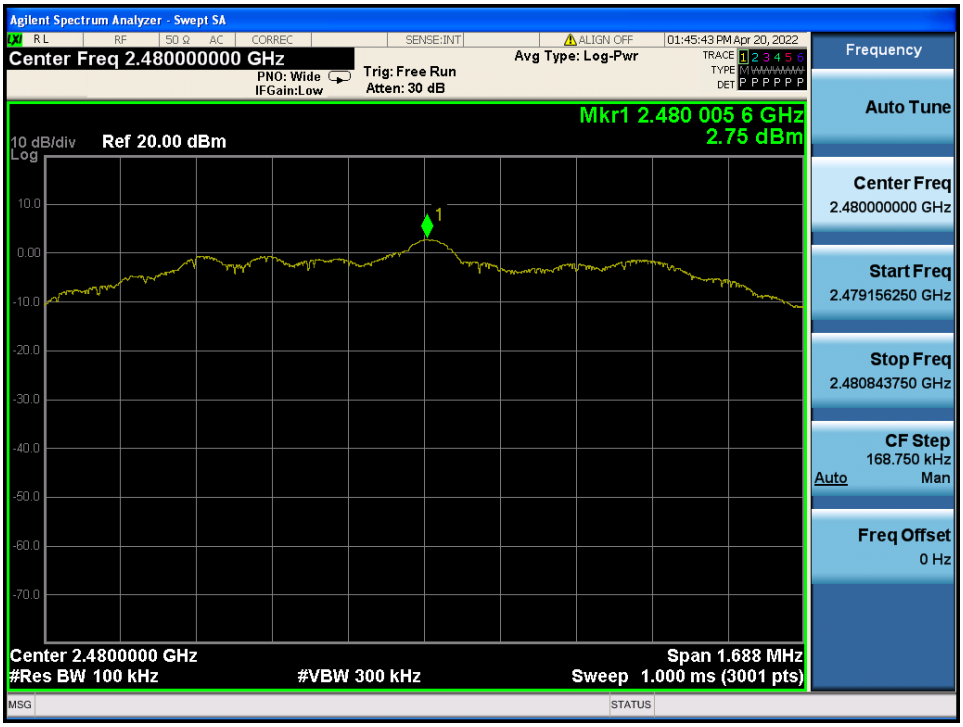
**TM 2 Conducted Spurious Emissions 2** (Test Channel : Middle)




**TM 2 Conducted Spurious Emissions 3** (Test Channel : Middle)

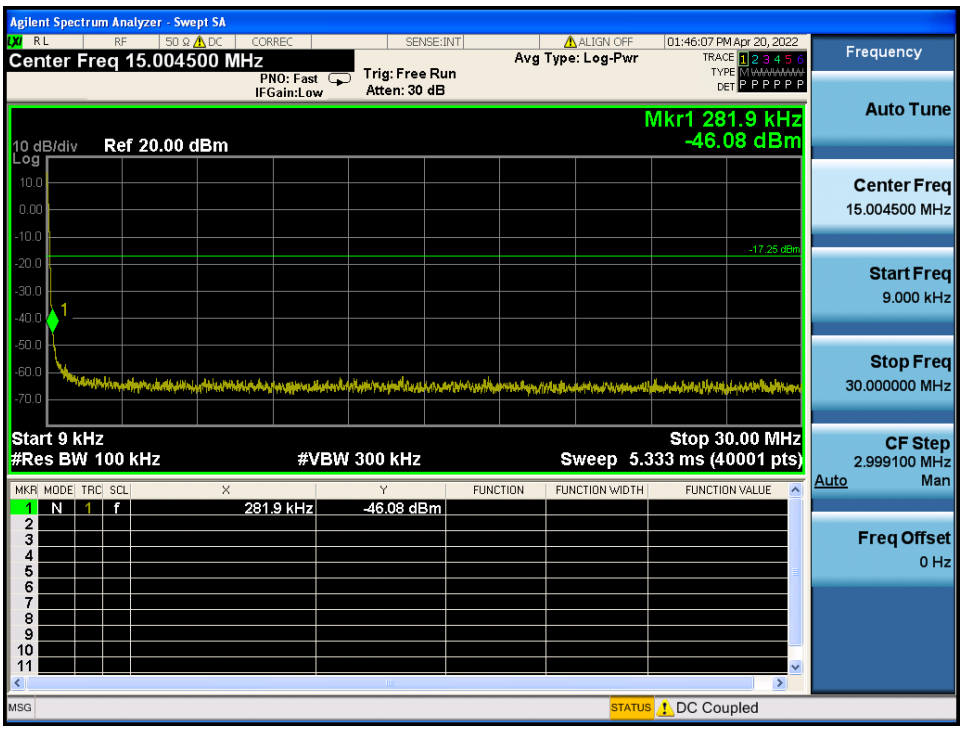


**TM 2 Reference** (Test Channel : Highest)

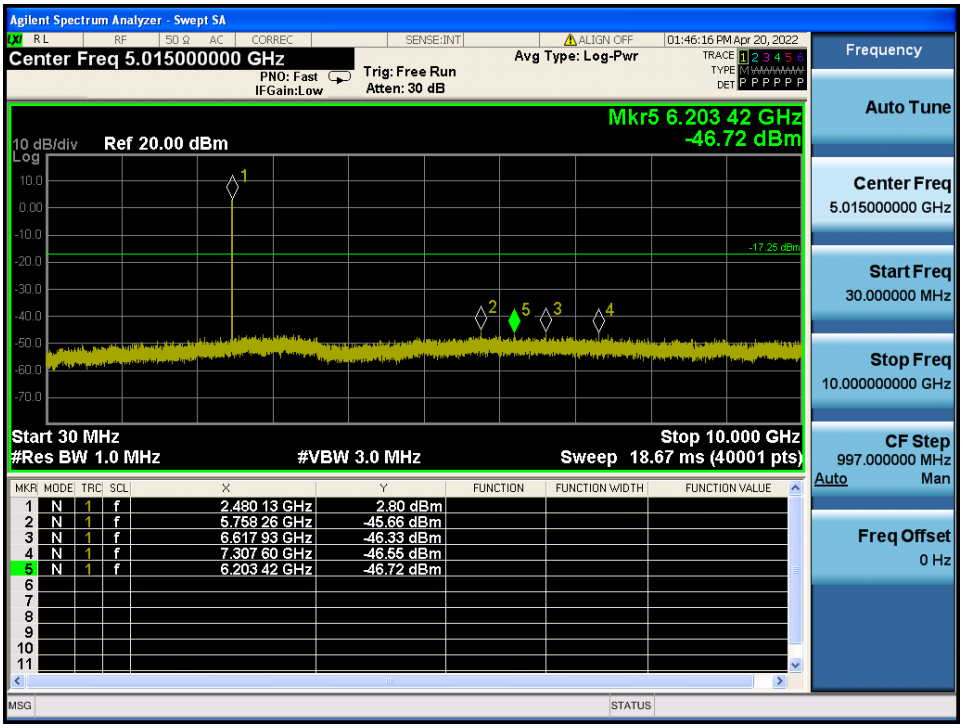



**TM 2 High Band-edge** (Test Channel : Highest)

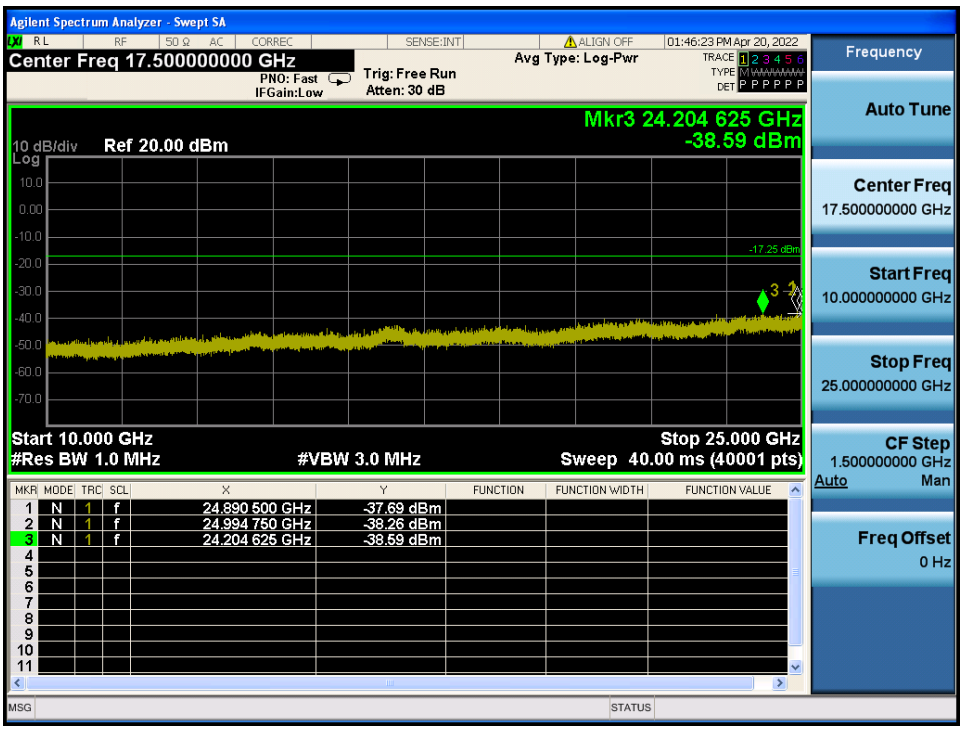
**TM 2 Conducted Spurious Emissions 1** (Test Channel : Highest)



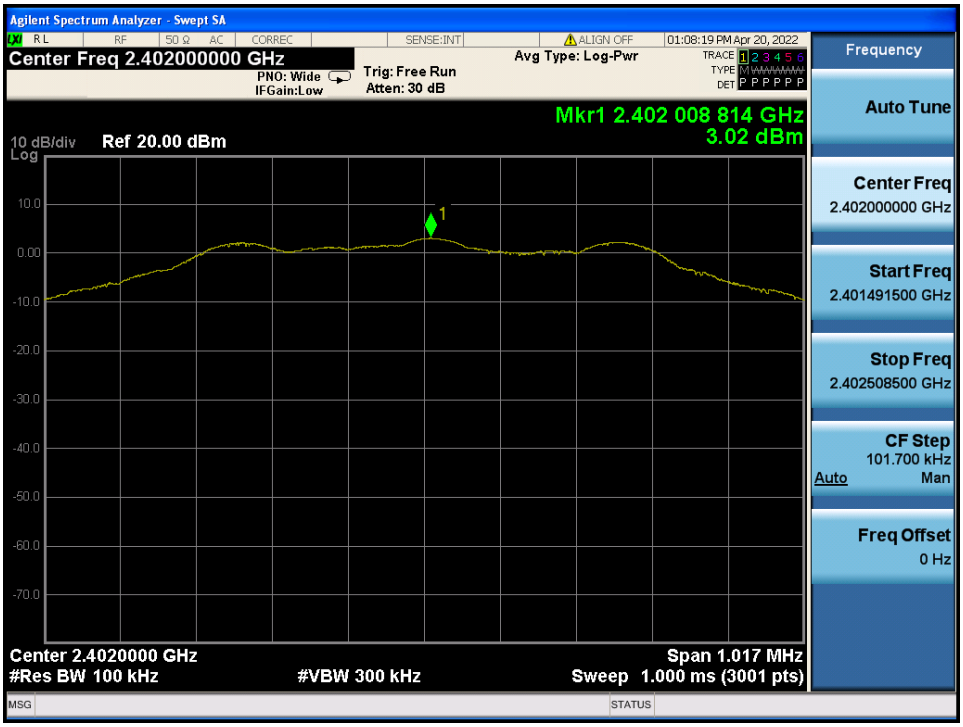

**TM 2 Conducted Spurious Emissions 2** (Test Channel : Highest)



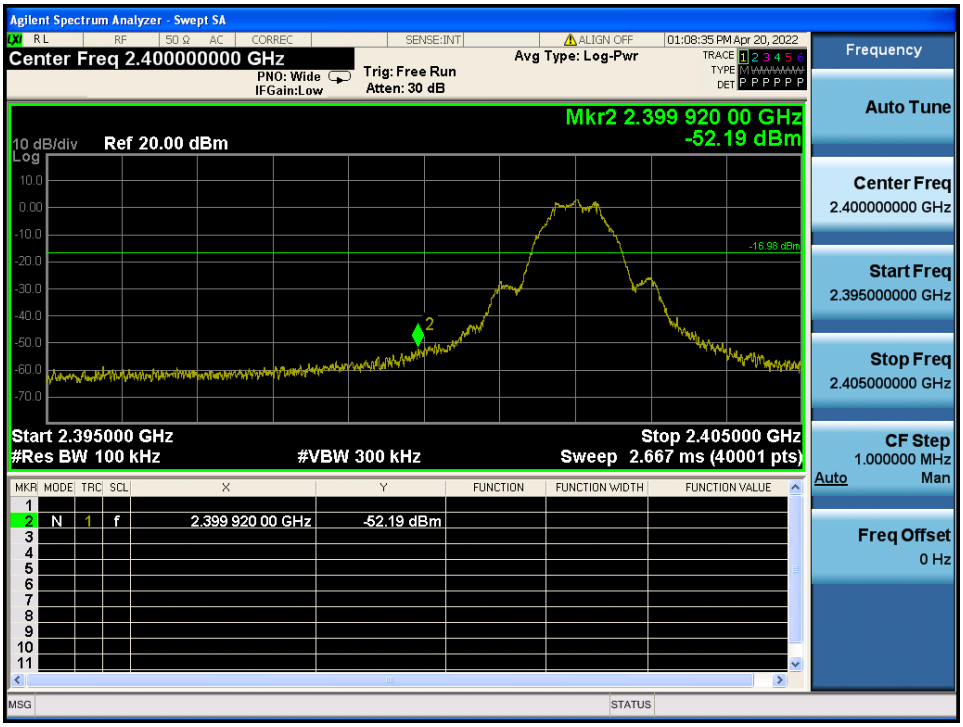
**TM 2 Conducted Spurious Emissions 3** (Test Channel : Highest)



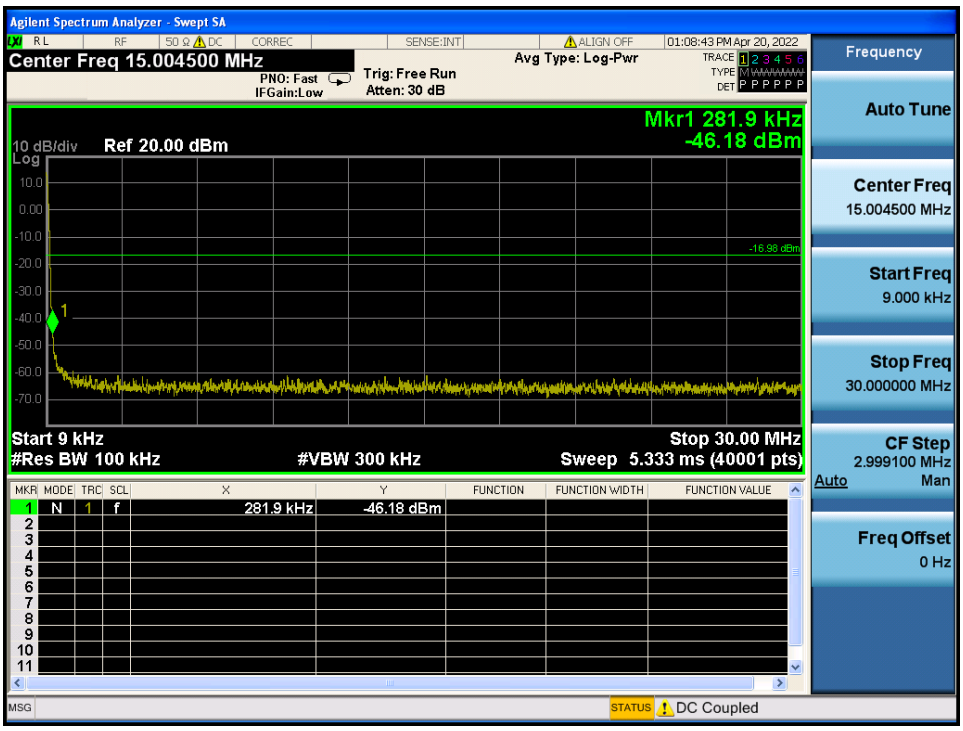
**TM 3 Reference** (Test Channel : Lowest)



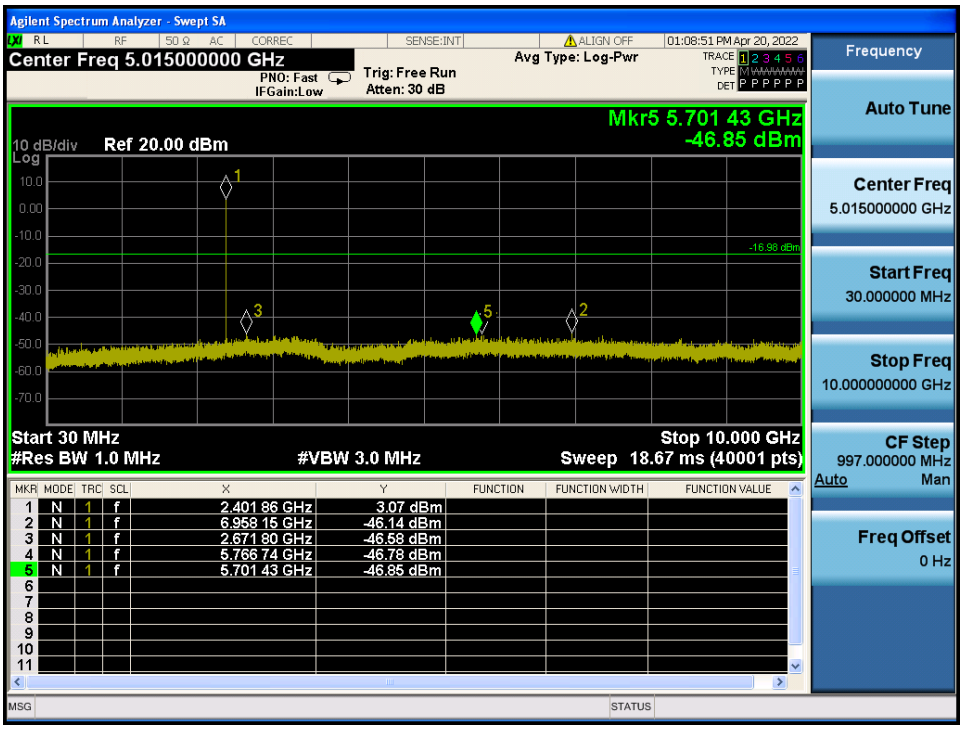

**TM 3 Low Band-edge** (Test Channel : Lowest)



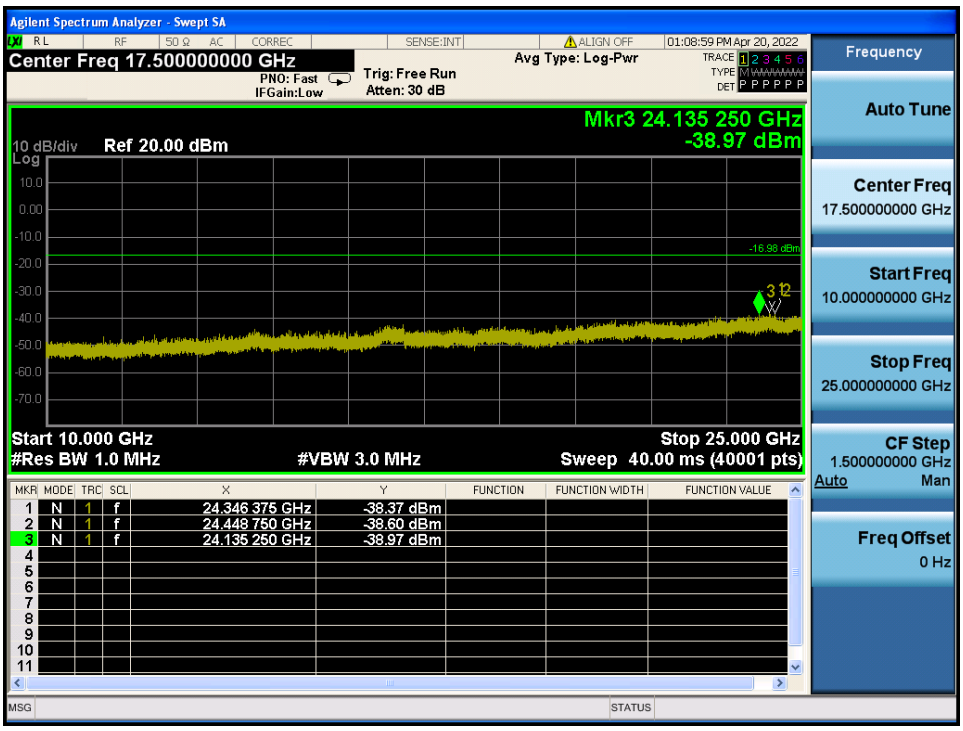
**TM 3 Conducted Spurious Emissions 1** (Test Channel : Lowest)



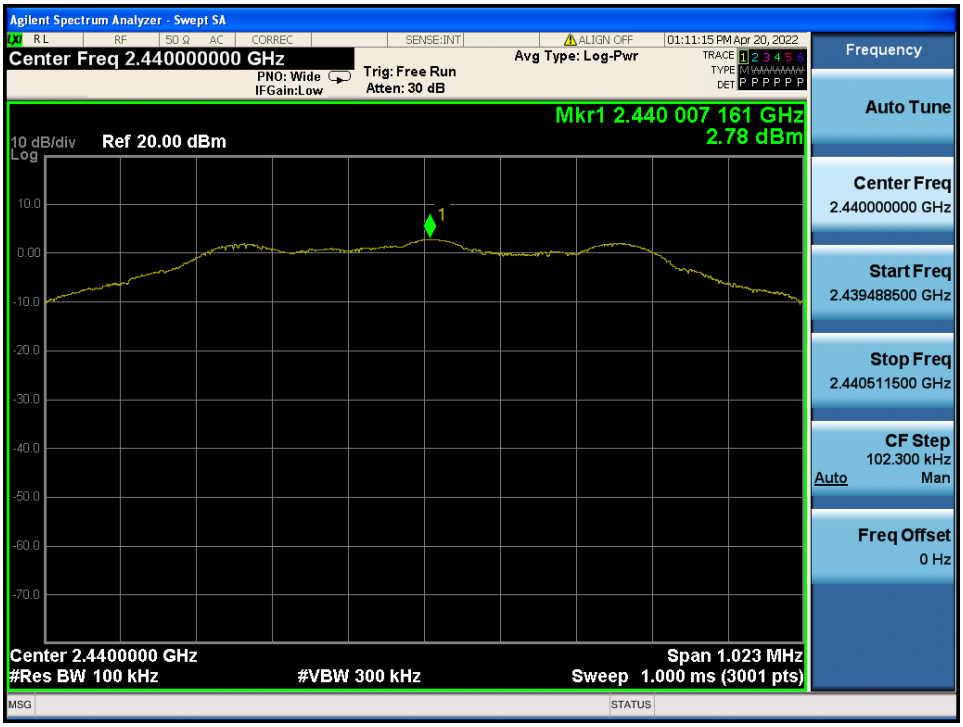

**TM 3 Conducted Spurious Emissions 2** (Test Channel : Lowest)



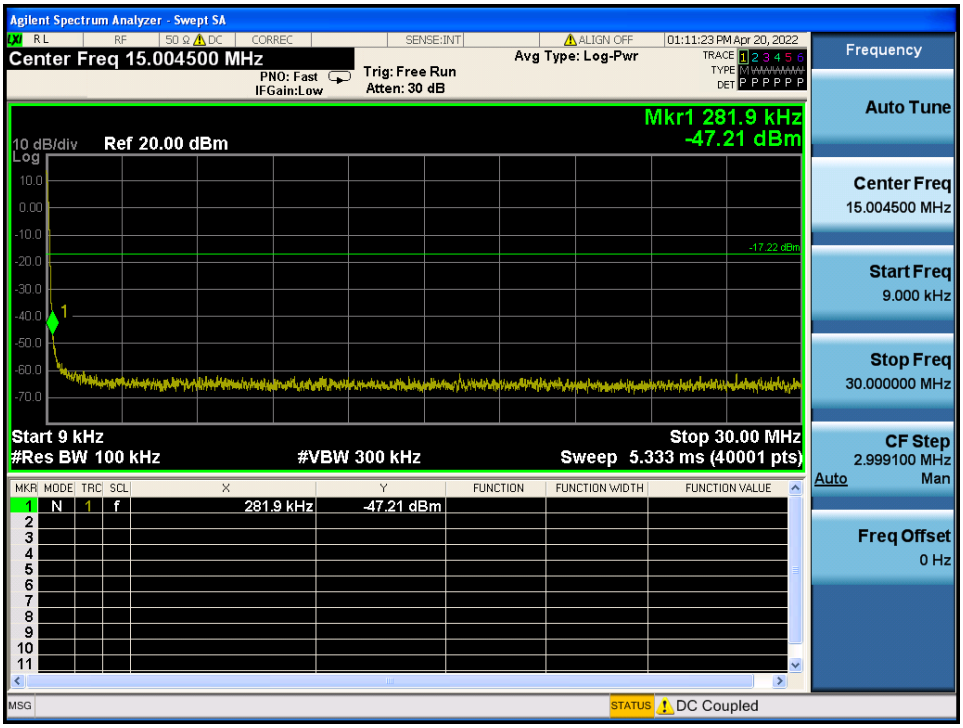
**TM 3 Conducted Spurious Emissions 3** (Test Channel : Lowest)



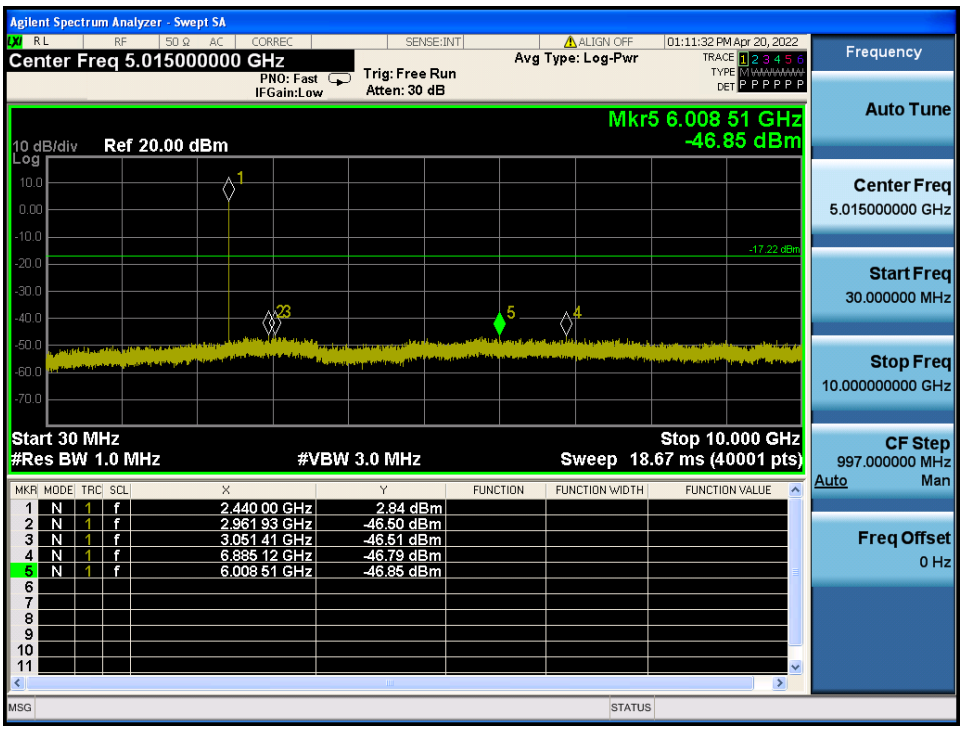
**TM 3 Reference** (Test Channel : Middle)



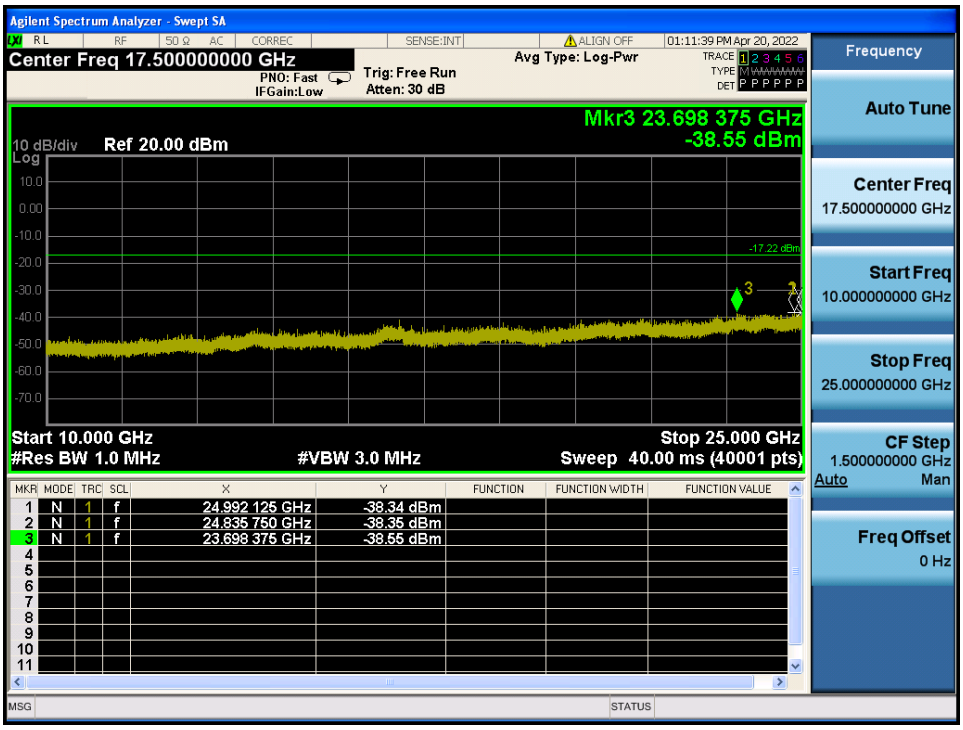

**TM 3 Conducted Spurious Emissions 1** (Test Channel : Middle)



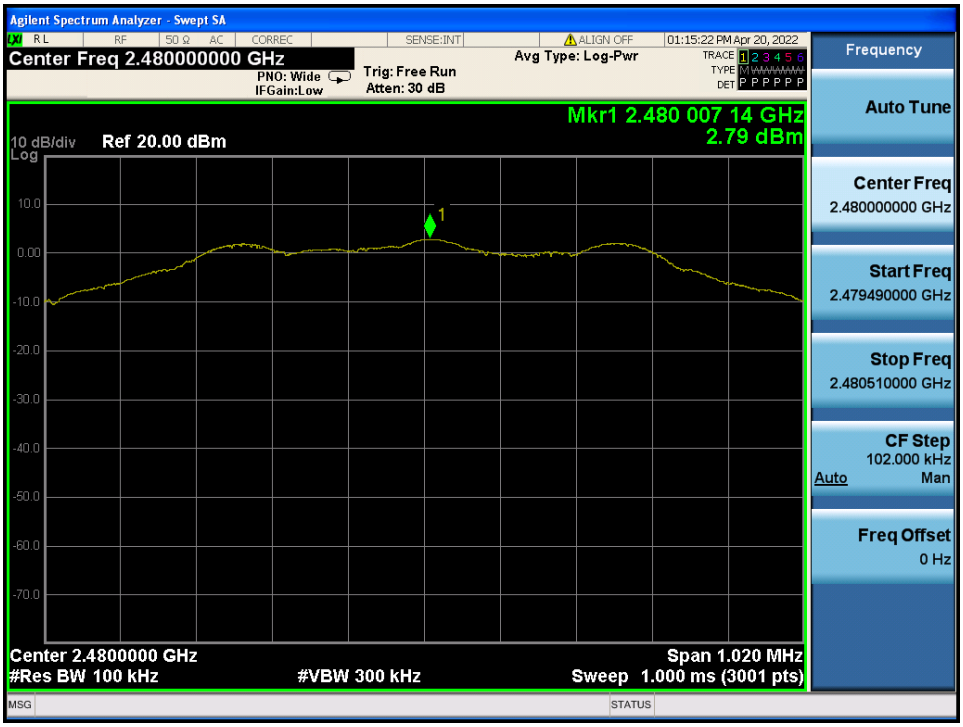
**TM 3 Conducted Spurious Emissions 2** (Test Channel : Middle)



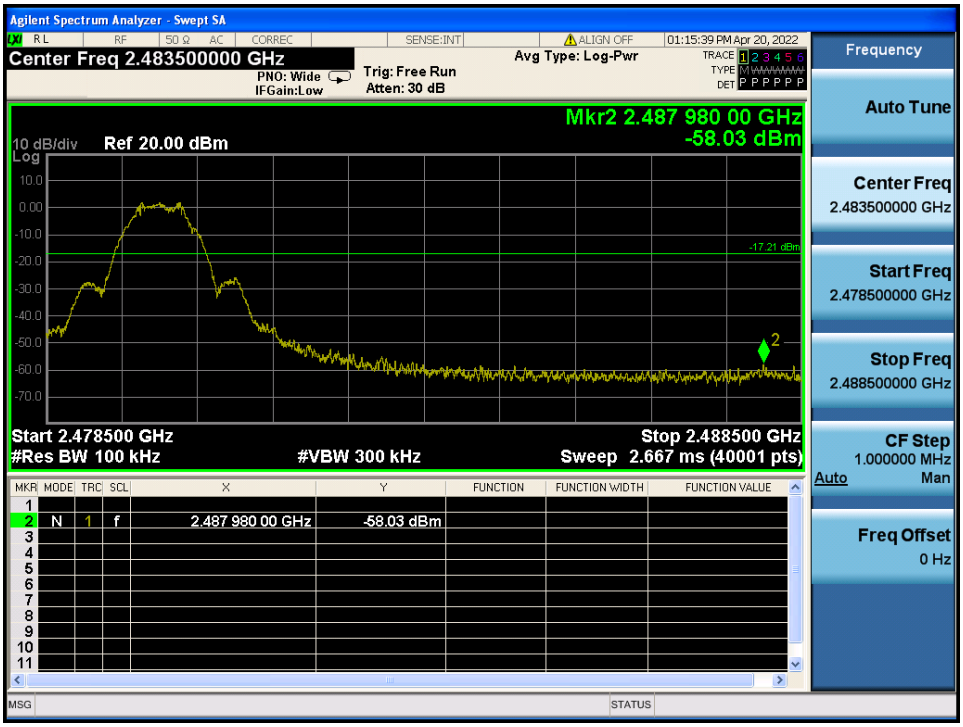

**TM 3 Conducted Spurious Emissions 3** (Test Channel : Middle)



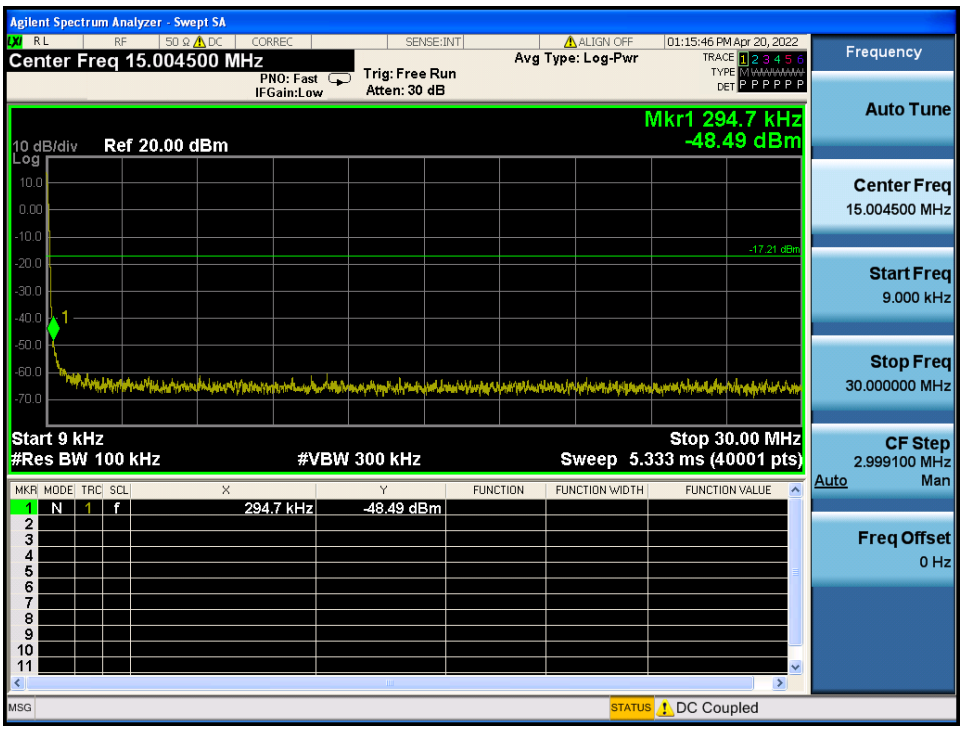
**TM 3 Reference** (Test Channel : Highest)

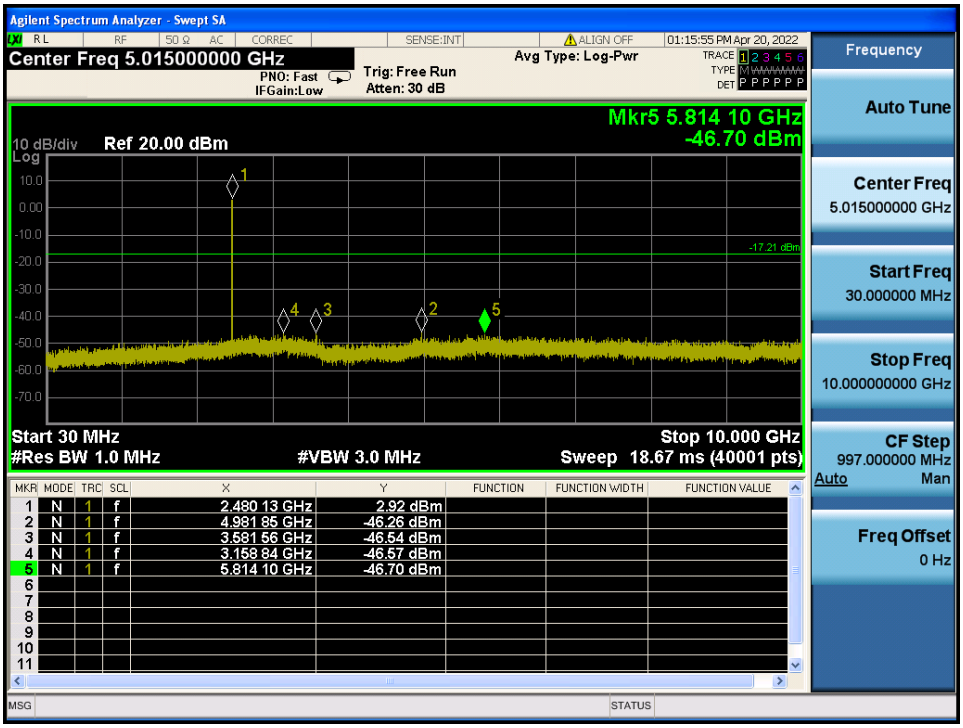



**TM 3 High Band-edge** (Test Channel : Highest)



**TM 3 Conducted Spurious Emissions 1** (Test Channel : Highest)




**TM 3 Conducted Spurious Emissions 2** (Test Channel : Highest)