# FCC TEST REPORT

# FCC ID: DGZABIWS1

| | | |
|---|---|---|
| Product | : | In-Wall Wi-Fi Smart Switch |
| Model Name | : | SH-ABIWS1-WH, WF305F-1HP |
| Brand | : | Intermatic |
| Report No. | : | PTC24110201301E-FC02 |

**Prepared for**

Intermatic Inc

7777 Winn Road, Spring Grove, Illinois, United States, 60081

**Prepared by**

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

# 1 TEST RESULT CERTIFICATION

| | | |
|---|---|---|
| Applicant's name | : | Intermatic Inc |
| Address | : | 7777 Winn Road, Spring Grove, Illinois, United States, 60081 |
| Manufacture's name | : | Ultra Tech Industries Co., Ltd. |
| Address | : | Industrial cluster Non Sao, Tan Dinh commune, Lang Giang district,Bac Giang，VIETNAM |
| Product name | : | In-Wall Wi-Fi Smart Switch |
| Model name | : | SH-ABIWS1-WH, WF305F-1HP |
| Standards | : | FCC CFR47 Part 15 Section 15.247 |
| Test procedure | : | ANSI C63.10:2013 |
| Test Date | : | Nov. 06, 2024 to Nov. 20, 2024 |
| Date of Issue | : | Nov. 20, 2024 |
| Test Result | : | Pass |

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Test Engineer:

Jack zhou / Engineer

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Simon Pu / Manager

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## 2 Test Summary

| Test Items | Test Requirement | Result |
|---|---|---|
| Conduct Emission | 15.207 | PASS |
| Radiated Spurious Emissions | 15.205(a)<br>15.209<br>15.247(d) | PASS |
| Conducted Spurious Emission | 15.247(d) | PASS |
| Band edge | 15.247(d)<br>15.205(a) | PASS |
| 6dB Bandwidth | 15.247(a)(2) | PASS |
| Maximum Peak Output Power | 15.247(b)(3) | PASS |
| Power Spectral Density | 15.247(e) | PASS |
| Antenna Requirement | 15.203 | PASS |
| Remark:<br>N/A: Not Applicable | | |

# 3 General Information

## 3.1General Description of E.U.T.

| | | |
|---|---|---|
| Product Name | : | In-Wall Wi-Fi Smart Switch |
| Model Name | : | SH-ABIWS1-WH, WF305F-1HP |
| Specification | : | 802.11b/g/n HT20/HT40 |
| Operating frequency | : | 2412-2462MHz for 802.11b/g/ n(HT20)<br>2422-2452MHz for 802.11 n(HT40) |
| Numbers of Channel | : | 11 channels for 802.11b/g/ n(HT20)<br>7 channels for 802.11n(HT40) |
| Antenna Type | : | PCB Antenna |
| Antenna Gain | : | 5.26 dBi |
| Type of Modulation | : | DSSS with DBPSK/DQPSK/CCK for 802.11b;<br>OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n; |
| Power supply | : | 120-277 VAC，50/60 Hz |
| Hardware Version | : | V2.2 |
| Software Version | : | V1.1.5 |
| Test sample No. | : | PTC24110201301E-1/2, PTC24110201301E-2/2 |

## 3.2 Channel List

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 (802.11b: 1 Mbps; 802.11g: 6 Mbps; 802.11n (HT20): MCS0;) 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 for 802.11 b/g/n (HT20/HT40)

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|
| 1 | 2412 | 5 | 2432 | 9 | 2452 |
| 2 | 2417 | 6 | 2437 | 10 | 2457 |
| 3 | 2422 | 7 | 2442 | 11 | 2462 |
| 4 | 2427 | 8 | 2447 | | |

The maximum duty cycle as following table:

| Test Mode | Duty Cycle(%) |
|---|---|
| 802.11b | 100% |
| 802.11g | 100% |
| 802.11n(HT20) | 100% |
| 802.11n(HT40) | 100% |

## 3.3Test Site

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

FCC Designation Number: CN1219

# 4 Equipment During Test

## 4.1Equipments List

RF Conducted Test

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Last Calibration | Calibration Interval |
|---|---|---|---|---|---|---|
| MXG Signal Analyzer | Agilent | N9020A | SER MY5111038 | 10Hz-26.5GHz | Aug.15, 2024 | 1 Year |
| Coaxial Cable | CDS | 79254 | 46107086 | 10Hz-30GHz | Aug.15, 2024 | 1 Year |
| Power Meter | Anritsu | ML2495A | 0949003 | 300MHz-40GHz | Aug.15, 2024 | 1 Year |
| Power Sensor | Anritsu | MA2411B | 0917017 | 300MHz-40GHz | Aug.15, 2024 | 1 Year |
| Test S/W | Tonscend | JS1120-3 | / | / | / | / |

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Last Calibration | Calibration Interval |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESPI7 | 101671 | 9KHz-7GHz | Aug.15, 2024 | 1 Year |
| Loop Antenna | Schwarzbeck | FMZB 1519 | 192 | 9 KHz -30MHz | Aug.15, 2024 | 1 Year |
| Bilog Antenna | SCHWARZBECK | VULB9160 | 9160-3355 | 25MHz-2GHz | Aug.15, 2024 | 1 Year |
| Preamplifier (low frequency) | SCHWARZBECK | BBV 9475 | 9745-0013 | 1MHz-1GHz | Aug.15, 2024 | 1 Year |
| Cable | IMRO | AK-9515E(9m) | Cable-L | 9KHz-3GHz | Aug.15, 2024 | 1 Year |
| Spectrum Analyzer | Rohde&Schwarz | FSV40 | 6625-01-588-5515 | 9KHz-40GHz | Aug.15, 2024 | 1 Year |
| Horn Antenna | SCHWARZBECK | 9120D | 9120D-1246 | 1GHz-18GHz | Aug.15, 2024 | 1 Year |
| Power Amplifier | ZHINAN | ZN3380C | 15002 | 1GHz-26.5GHz | Aug.15, 2024 | 1 Year |

| | | | | | | |
|---|---|---|---|---|---|---|
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 9170-1066 | 15GHz-40GHz | Jul. 19, 2024 | 1 Year |
| Amplifier | SCHWARZBECK | BBV 9721 | 9721-205 | 18GHz-40GHz | Jul. 19, 2024 | 1 Year |
| Cable | H+S | CBL-26 | N/A | 1GHz-26.5GHz | Aug.15, 2024 | 1 Year |
| RF Cable | R&S | R204 | R21X | 1GHz-40GHz | Aug.15, 2024 | 1 Year |
| Test S/W | Tonscend | TS+ | / | / | / | / |

Conducted Emissions

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101417 | 9KHz-3GHz | Aug.15, 2024 | 1 Year |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 102453 | 9KHz-300MHz | Aug.15, 2024 | 1 Year |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101342 | 9KHz-300MHz | Aug.15, 2024 | 1 Year |
| Limiter | R&S | ESH3-Z2 | 0357.8810.54-102808-NB | 0Hz-30MHz | Aug.15, 2024 | 1 Year |
| RF Switch | DIAMOND ANTENNA | CX-210 | / | 9kHz-6GHz | Mar. 22,2024 | 1 Year |
| Test S/W | Tonscend | JS32-CE | / | / | / | / |

## 4.2Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| RF output power, conducted | ±1.0dB |
| Power Spectral Density, conducted | ±2.2dB |
| Radio Frequency | ± 1 x $10^{-6}$ |
| Bandwidth | ± 1.5 x $10^{-6}$ |
| Time | ±2% |
| Duty Cycle | ±2% |
| Temperature | ±1°C |
| Humidity | ±5% |
| DC and low frequency voltages | ±3% |
| Conducted Emissions (150kHz~30MHz) | ±3.64dB |
| Radiated Emission(9kHz~30MHz) | ±3.15dB |
| Radiated Emission(30MHz~1GHz) | ±5.03dB |
| Radiated Emission(1GHz~25GHz) | ±4.74dB |

## 4.3Description of Support Units

| Equipment | Model No. | Series No. |
|---|---|---|
| Incandescent lamp | N/A | N/A |

# 5 Conducted Emission

| | | |
|---|---|---|
| Test Requirement: | : | FCC CFR 47 Part 15 Section 15.207 |
| Test Method | : | ANSI C63.10: 2013 |
| Test Result | : | PASS |
| Frequency Range | : | 150kHz to 30MHz |
| Class/Severity | : | Class B |

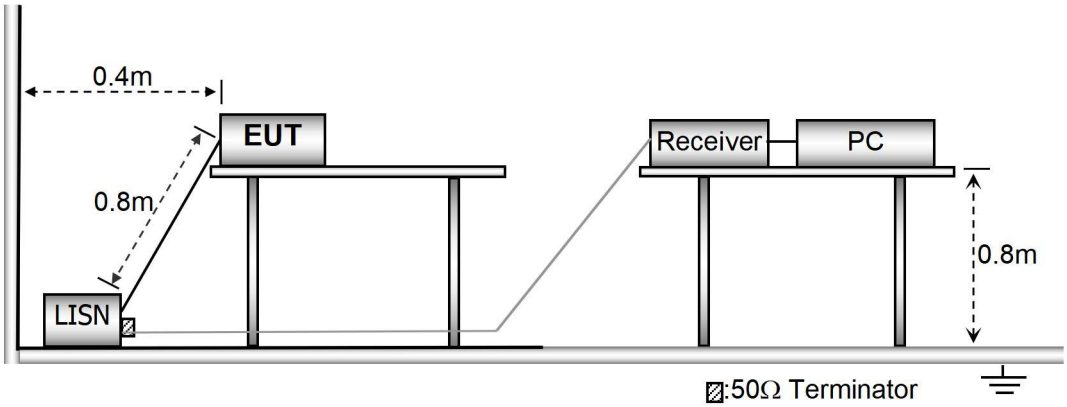
## 5.1E.U.T. Operation

Operating Environment :

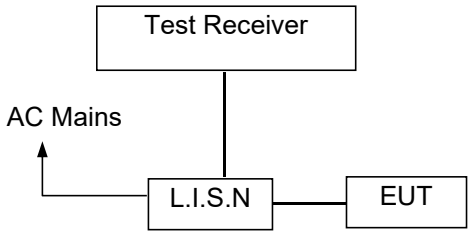
| | | |
|---|---|---|
| Temperature | : | 23.9 °C |
| Humidity | : | 51.4 % RH |
| Atmospheric Pressure | : | 101.21kPa |

## 5.2EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



## 5.3Test SET-UP (Block Diagram of Configuration)




## 5.4Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

## 5.5Conducted Emission Limit

**Conducted Emission**

| Frequency(MHz) | Quasi-peak | Average |
|---|---|---|
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

**Note:**
1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

## 5.6Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

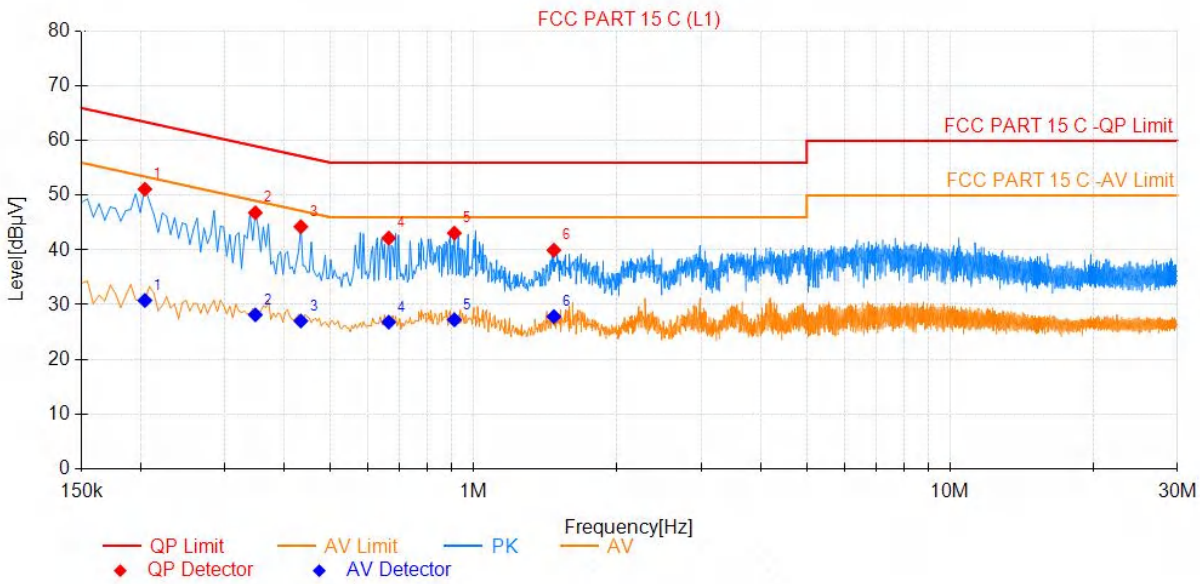
## 5.7Conducted Emission Test Result

Pass.

During the test, the 120Vac/60Hz power supplies were scanned in advance, and it was found that (120Vac/60Hz, TX 802.11b Low Channel) was a poor mode, and the report only reflected the poor mode.

Please refer to the following pages.

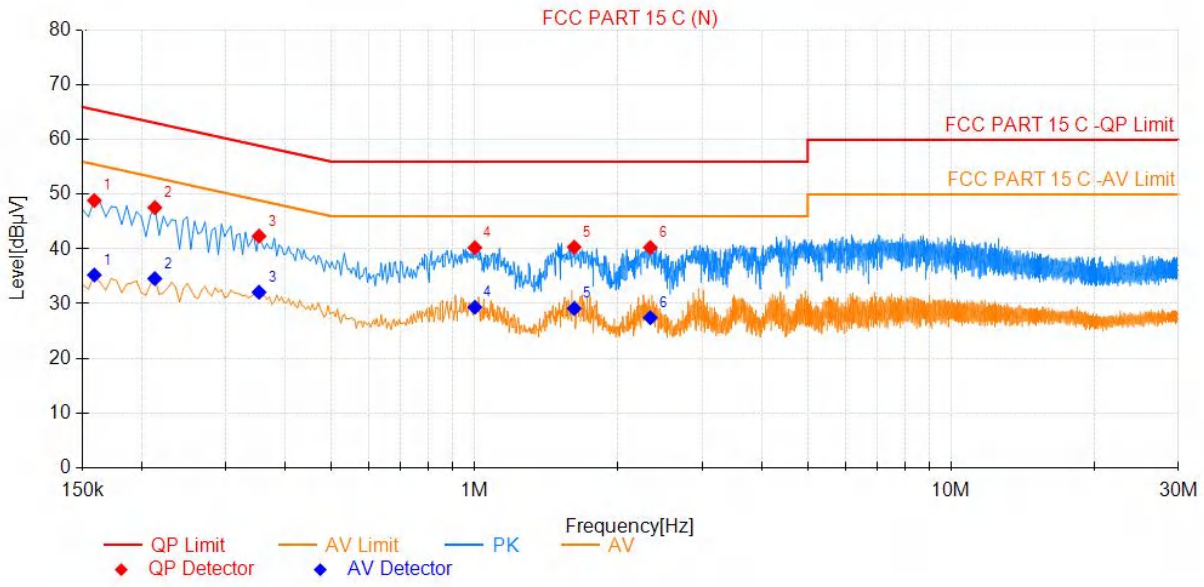
Line- AC 120V/60Hz




## Final Data List

| NO. | Freq. [MHz] | QP Reading [dBµV] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Reading [dBµV] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.204 | 32.00 | 19.13 | 51.13 | 63.45 | 12.32 | 11.64 | 30.77 | 53.45 | 22.68 | PASS |
| 2 | 0.348 | 27.67 | 19.15 | 46.82 | 59.01 | 12.19 | 8.99 | 28.14 | 49.01 | 20.87 | PASS |
| 3 | 0.434 | 25.01 | 19.26 | 44.27 | 57.19 | 12.92 | 7.75 | 27.01 | 47.19 | 20.18 | PASS |
| 4 | 0.663 | 22.96 | 19.22 | 42.18 | 56.00 | 13.82 | 7.58 | 26.80 | 46.00 | 19.20 | PASS |
| 5 | 0.911 | 23.86 | 19.23 | 43.09 | 56.00 | 12.91 | 7.99 | 27.22 | 46.00 | 18.78 | PASS |
| 6 | 1.473 | 20.76 | 19.21 | 39.97 | 56.00 | 16.03 | 8.61 | 27.82 | 46.00 | 18.18 | PASS |

Neutral-AC 120V/60Hz




| Final Data List | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | QP Reading [dBµV] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Reading [dBµV] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Verdict |
| 1 | 0.159 | 29.87 | 19.00 | 48.87 | 65.52 | 16.65 | 16.25 | 35.25 | 55.52 | 20.27 | PASS |
| 2 | 0.213 | 28.53 | 19.05 | 47.58 | 63.09 | 15.51 | 15.53 | 34.58 | 53.09 | 18.51 | PASS |
| 3 | 0.353 | 23.21 | 19.15 | 42.36 | 58.90 | 16.54 | 12.94 | 32.09 | 48.90 | 16.81 | PASS |
| 4 | 1.001 | 21.03 | 19.20 | 40.23 | 56.00 | 15.77 | 10.13 | 29.33 | 46.00 | 16.67 | PASS |
| 5 | 1.617 | 21.16 | 19.18 | 40.34 | 56.00 | 15.66 | 9.93 | 29.11 | 46.00 | 16.89 | PASS |
| 6 | 2.337 | 21.11 | 19.16 | 40.27 | 56.00 | 15.73 | 8.27 | 27.43 | 46.00 | 18.57 | PASS |

Note: QP Margin[dB]= QP Limit[dBµV]- QP Value[dBµV], AV Margin[dB]= AV Limit[dBµV]- AV Value[dBµV].

# 6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

| Frequency (MHz) | Field Strength | | Field Strength Limit at 3m Measurement Dist | |
|---|---|---|---|---|
| | uV/m | Distance (m) | uV/m | dBuV/m |
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 | 10000 * 2400/F(kHz) | $20\log^{(2400/F(kHz))} + 80$ |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 | 100 * 24000/F(kHz) | $20\log^{(24000/F(kHz))} + 40$ |
| 1.705 ~ 30 | 30 | 30 | 100 * 30 | $20\log^{(30)} + 40$ |
| 30 ~ 88 | 100 | 3 | 100 | $20\log^{(100)}$ |
| 88 ~ 216 | 150 | 3 | 150 | $20\log^{(150)}$ |
| 216 ~ 960 | 200 | 3 | 200 | $20\log^{(200)}$ |
| Above 960 | 500 | 3 | 500 | $20\log^{(500)}$ |

## 6.1EUT Operation

Operating Environment :

Temperature: : 24.5 °C

Humidity: : 52 % RH

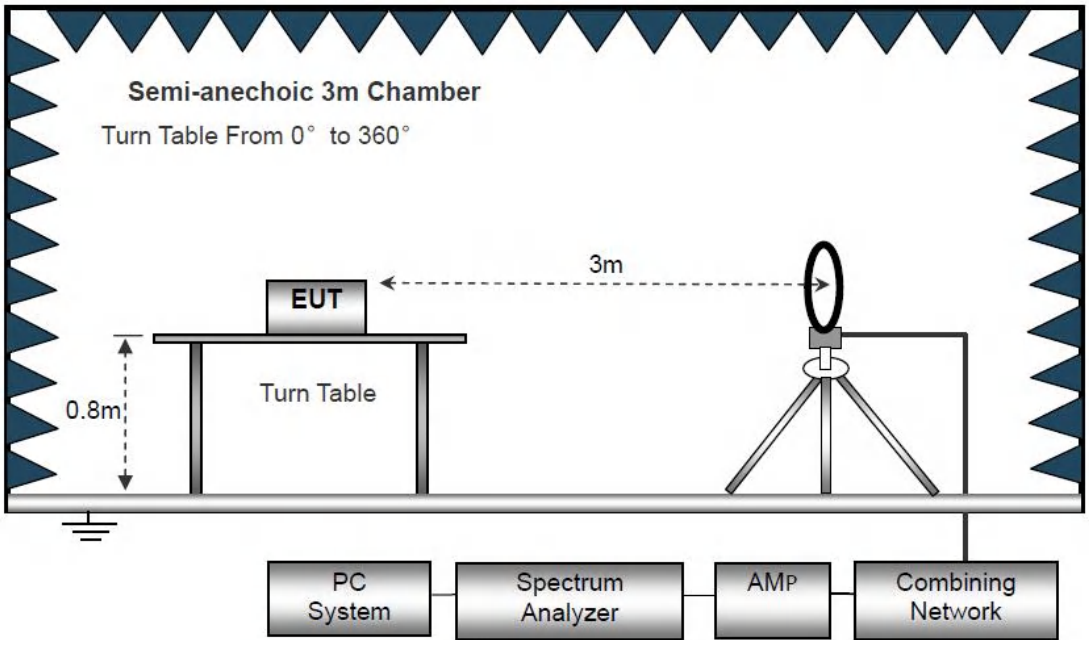
Atmospheric Pressure: : 101.3kPa

Test Voltage : AC 120V 60Hz

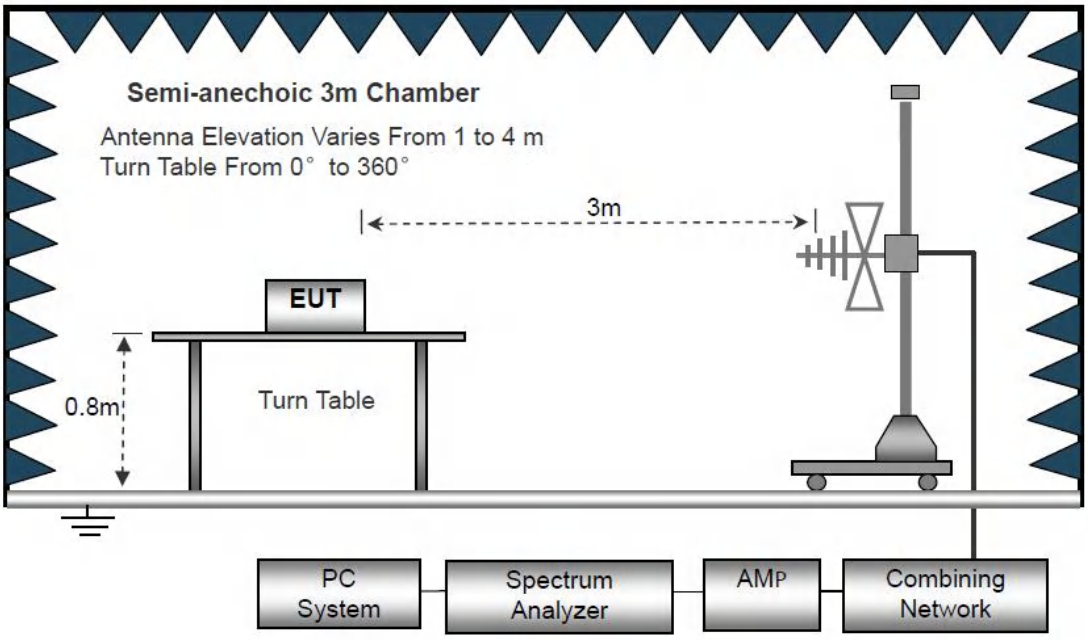
## 6.2Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

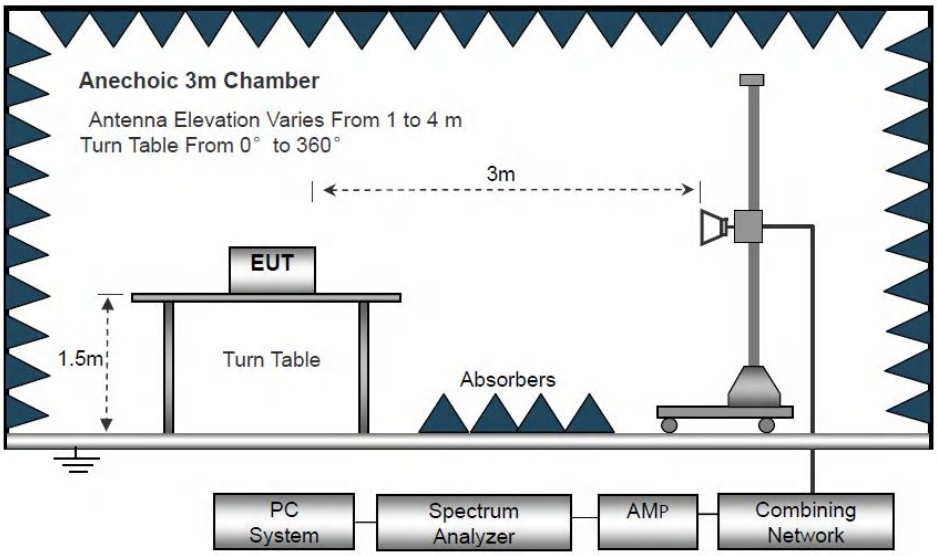
The test setup for emission measurement below 30MHz




The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz




## 6.3Spectrum Analyzer Setup

| | Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|---|
| Receiver Setup | Below 30MHz | -- | 10kHz | 10kHz | -- |
| | 30MHz ~ 1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak Value |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak Value |
| | | RMS | 1MHz | 3MHz | Average Value |

## 6.4Test Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room

## 6.5Summary of Test Results

**Test Frequency: 9KHz-30MHz**

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

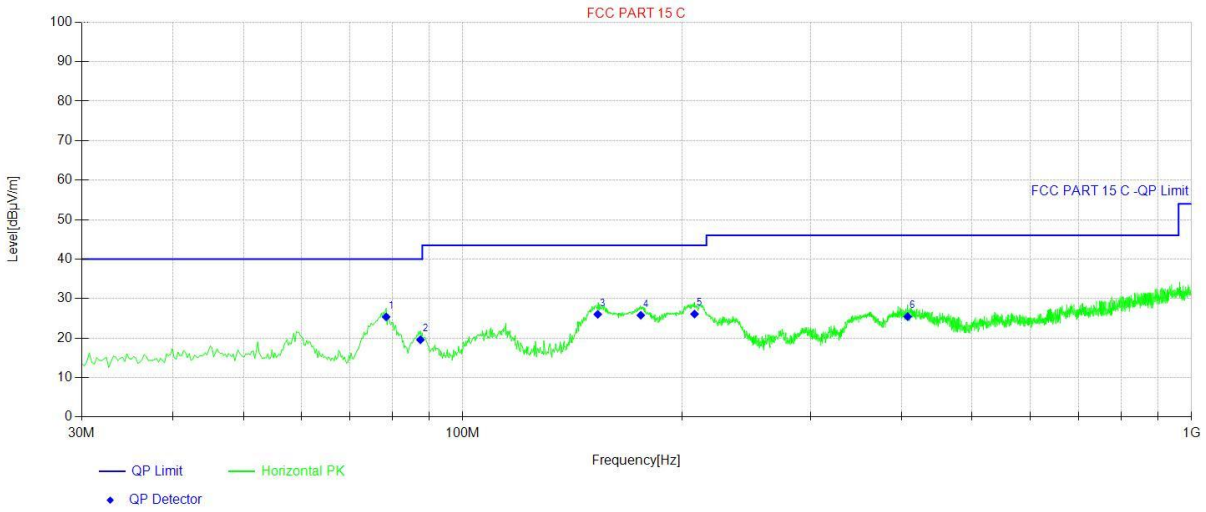
Distance extrapolation factor =40log(Specific distance/ test distance)( dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

**Test Frequency: 30MHz ~ 1GHz**

All the modulation modes were tested the data of the worst mode (TX 802.11b Low Channel) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following test plots:

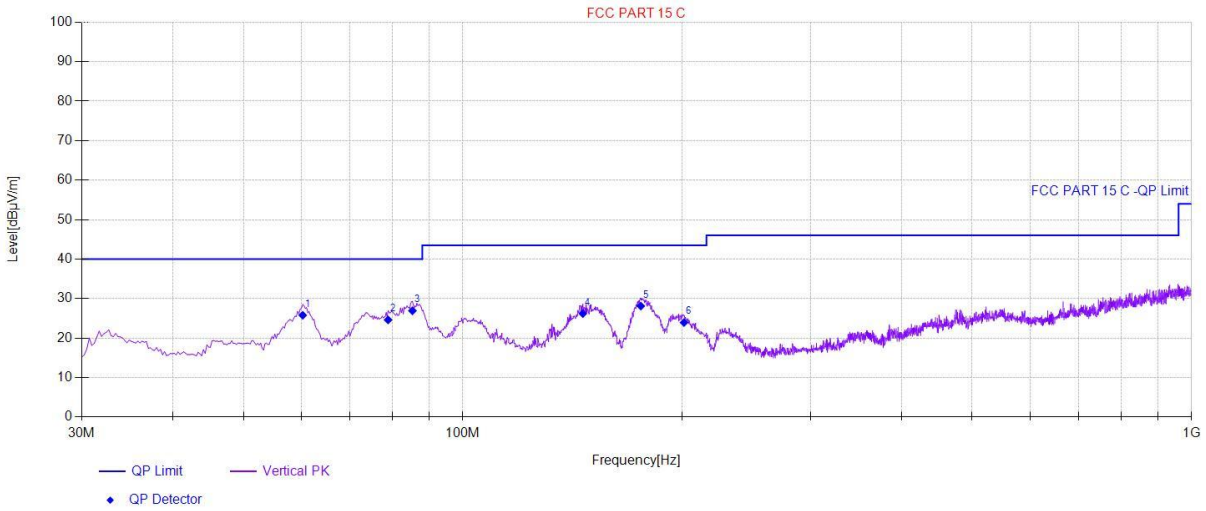
Antenna Polarization: Horizontal




| Final Data List[QP] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Polarity | Verdict |
| 1 | 78.50 | 40.11 | -14.75 | 25.36 | 40.00 | 14.64 | Horizontal | PASS |
| 2 | 87.47 | 35.45 | -15.88 | 19.57 | 40.00 | 20.43 | Horizontal | PASS |
| 3 | 153.19 | 35.25 | -9.23 | 26.02 | 43.50 | 17.48 | Horizontal | PASS |
| 4 | 175.50 | 36.15 | -10.37 | 25.78 | 43.50 | 17.72 | Horizontal | PASS |
| 5 | 208.00 | 39.02 | -12.93 | 26.09 | 43.50 | 17.41 | Horizontal | PASS |
| 6 | 407.82 | 31.71 | -6.28 | 25.43 | 46.00 | 20.57 | Horizontal | PASS |

Remark:1. QP Value= QP Reading+ Factor;
2.QP Margin= QP Limit- QP Value；
3.Factor= ANT Factor+ Cable Loss -AMP Factor.

Antenna Polarization: Vertical




| Final Data List[QP] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Polarity | Verdict |
| 1 | 60.31 | 37.32 | -11.54 | 25.78 | 40.00 | 14.22 | Vertical | PASS |
| 2 | 78.99 | 39.46 | -14.85 | 24.61 | 40.00 | 15.39 | Vertical | PASS |
| 3 | 85.29 | 42.68 | -15.76 | 26.92 | 40.00 | 13.08 | Vertical | PASS |
| 4 | 146.16 | 35.98 | -9.77 | 26.21 | 43.50 | 17.29 | Vertical | PASS |
| 5 | 175.50 | 38.49 | -10.37 | 28.12 | 43.50 | 15.38 | Vertical | PASS |
| 6 | 201.21 | 36.34 | -12.39 | 23.95 | 43.50 | 19.55 | Vertical | PASS |

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

## Test Frequency: From 1GHz to 18GHz

Worst case 802.11b

| Test Mode: 2412 | | | | | Test channel: Lowest | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4824 | 46.92 | 32.35 | 4.12 | 28.44 | 54.95 | 74 | -19.05 | V |
| 7236 | 38.90 | 36.08 | 6.3 | 27.74 | 53.54 | 74 | -20.46 | V |
| 9648 | 35.92 | 38.25 | 7.91 | 24.65 | 57.43 | 74 | -16.57 | V |
| 4824 | 43.31 | 32.35 | 4.12 | 28.44 | 51.34 | 74 | -22.66 | H |
| 7236 | 38.40 | 36.08 | 6.3 | 27.74 | 53.04 | 74 | -20.96 | H |
| 9648 | 33.96 | 38.25 | 7.91 | 24.65 | 55.47 | 74 | -18.53 | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4824 | 30.49 | 32.35 | 4.12 | 28.44 | 38.52 | 54 | -15.48 | V |
| 7236 | 24.28 | 36.08 | 6.3 | 27.74 | 38.92 | 54 | -15.08 | V |
| 9648 | 20.23 | 38.25 | 7.91 | 24.65 | 41.74 | 54 | -12.26 | V |
| 4824 | 30.01 | 32.35 | 4.12 | 28.44 | 38.04 | 54 | -15.96 | H |
| 7236 | 25.32 | 36.08 | 6.3 | 27.74 | 39.96 | 54 | -14.04 | H |
| 9648 | 21.68 | 38.25 | 7.91 | 24.65 | 43.19 | 54 | -10.81 | H |

Worst case 802.11b

| Test Mode: 2437 | | | | | Test channel: Middle | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4874 | 46.99 | 32.35 | 4.12 | 28.44 | 55.02 | 74 | -18.98 | V |
| 7311 | 38.68 | 36.08 | 6.3 | 27.74 | 53.32 | 74 | -20.68 | V |
| 9748 | 35.77 | 38.25 | 7.91 | 24.65 | 57.28 | 74 | -16.72 | V |
| 4874 | 42.68 | 32.35 | 4.12 | 28.44 | 50.71 | 74 | -23.29 | H |
| 7311 | 38.78 | 36.08 | 6.3 | 27.74 | 53.42 | 74 | -20.58 | H |
| 9748 | 35.22 | 38.25 | 7.91 | 24.65 | 56.73 | 74 | -17.27 | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4874 | 31.21 | 32.35 | 4.12 | 28.44 | 39.24 | 54 | -14.76 | V |
| 7311 | 24.19 | 36.08 | 6.3 | 27.74 | 38.83 | 54 | -15.17 | V |
| 9748 | 20.97 | 38.25 | 7.91 | 24.65 | 42.48 | 54 | -11.52 | V |
| 4874 | 31.17 | 32.35 | 4.12 | 28.44 | 39.20 | 54 | -14.80 | H |
| 7311 | 25.39 | 36.08 | 6.3 | 27.74 | 40.03 | 54 | -13.97 | H |
| 9748 | 20.52 | 38.25 | 7.91 | 24.65 | 42.03 | 54 | -11.97 | H |

Worst case 802.11b

| Test Mode: 2462 | | | | | Test channel: High | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4924 | 45.93 | 32.41 | 4.14 | 28.42 | 54.06 | 74 | -19.94 | V |
| 7386 | 38.38 | 36.15 | 6.36 | 27.68 | 53.21 | 74 | -20.79 | V |
| 9848 | 35.71 | 38.35 | 7.97 | 24.33 | 57.70 | 74 | -16.30 | V |
| 4924 | 43.19 | 32.41 | 4.14 | 28.42 | 51.32 | 74 | -22.68 | H |
| 7386 | 39.26 | 36.15 | 6.36 | 27.68 | 54.09 | 74 | -19.91 | H |
| 9848 | 35.14 | 38.35 | 7.97 | 24.33 | 57.13 | 74 | -16.87 | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4924 | 31.47 | 32.41 | 4.14 | 28.42 | 39.60 | 54 | -14.40 | V |
| 7386 | 23.79 | 36.15 | 6.36 | 27.68 | 38.62 | 54 | -15.38 | V |
| 9848 | 20.81 | 38.35 | 7.97 | 24.33 | 42.80 | 54 | -11.20 | V |
| 4924 | 30.15 | 32.41 | 4.14 | 28.42 | 38.28 | 54 | -15.72 | H |
| 7386 | 25.21 | 36.15 | 6.36 | 27.68 | 40.04 | 54 | -13.96 | H |
| 9848 | 21.89 | 38.35 | 7.97 | 24.33 | 43.88 | 54 | -10.12 | H |

Note:

1. The testing has been conformed to 10*2462MHz=24620MHz.
2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
   Emission Level = Reading + Factor
   Margin=Emission Level-Limit
4. X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

2.4G WiFi (802.11b/g/n)mode have been tested, and the worst result(802.11g) was report as below
Test Mode: Worst case 802.11g Low Channel 2412MHz

| Test Mode: 802.11g Low Channel 2412MHz | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over (dB) | Polarity H/V | Test Value |
| 2390 | 48.80 | 27.39 | 2.77 | 34.01 | 44.95 | 74 | -29.05 | H | Peak |
| 2400 | 59.37 | 27.42 | 2.78 | 34.01 | 55.56 | 74 | -18.44 | H | |
| 2390 | 48.20 | 27.39 | 2.77 | 34.01 | 44.35 | 74 | -29.65 | V | |
| 2400 | 55.02 | 27.42 | 2.78 | 34.01 | 51.21 | 74 | -22.79 | V | |
| 2390 | 40.61 | 27.39 | 2.77 | 34.01 | 36.76 | 54 | -17.24 | H | Average |
| 2400 | 43.45 | 27.42 | 2.78 | 34.01 | 39.64 | 54 | -14.36 | H | |
| 2390 | 39.75 | 27.39 | 2.77 | 34.01 | 35.90 | 54 | -18.10 | V | |
| 2400 | 44.59 | 27.42 | 2.78 | 34.01 | 40.78 | 54 | -13.22 | V | |

Test Mode: Worst case 802.11g High Channel 2462MHz

| Test Mode: 802.11g High Channel 2462MHz | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over (dB) | Polarity H/V | Test Value |
| 2483.5 | 60.63 | 27.39 | 2.77 | 34.01 | 56.78 | 74 | -17.22 | H | Peak |
| 2500 | 49.14 | 27.42 | 2.78 | 34.01 | 45.33 | 74 | -28.67 | H | |
| 2483.5 | 60.66 | 27.39 | 2.77 | 34.01 | 56.81 | 74 | -17.19 | V | |
| 2500 | 49.41 | 27.42 | 2.78 | 34.01 | 45.60 | 74 | -28.40 | V | |
| 2483.5 | 42.40 | 27.39 | 2.77 | 34.01 | 38.55 | 54 | -15.45 | H | Average |
| 2500 | 40.13 | 27.42 | 2.78 | 34.01 | 36.32 | 54 | -17.68 | H | |
| 2483.5 | 43.71 | 27.39 | 2.77 | 34.01 | 39.86 | 54 | -14.14 | V | |
| 2500 | 39.09 | 27.42 | 2.78 | 34.01 | 35.28 | 54 | -18.72 | V | |

## Test Frequency: From 18GHz to 25GHz

The measurements were more than 20dB below the limit and not reported.

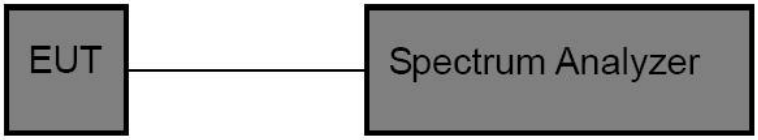
# 7 Conducted Spurious Emission

Test Requirement : FCC CFR47 Part 15 Section 15.247
Test Method : ANSI C63.10:2013
Test Limit : Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## 7.1Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

## 7.2Test Setup



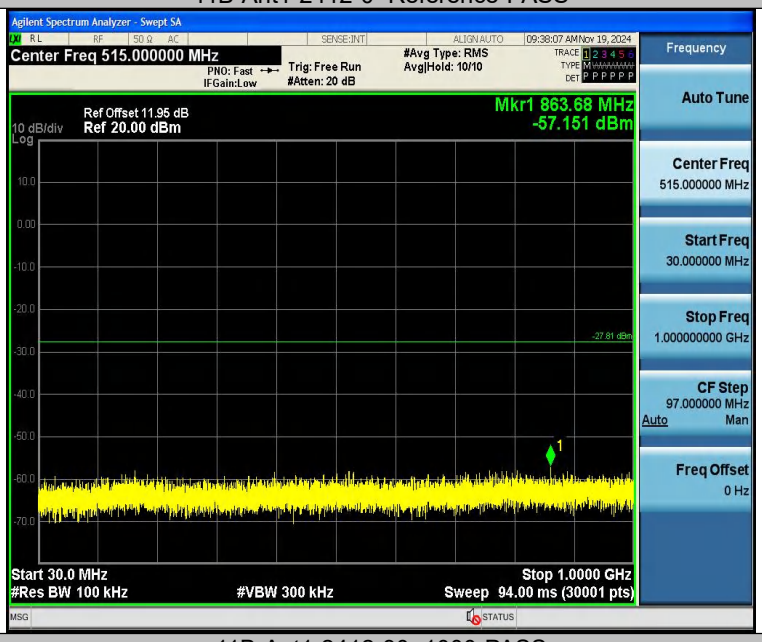

## 7.3Test Result

| TestMode | Antenna | Frequency[MHz] | FreqRange [Mhz] | RefLevel [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| 11B | Ant1 | 2412 | 0~Reference | 2.19 | 2.19 | --- | PASS |
| 11B | Ant1 | 2412 | 30~1000 | 2.19 | -57.15 | ≤-27.81 | PASS |
| 11B | Ant1 | 2412 | 1000~26500 | 2.19 | -41.62 | ≤-27.81 | PASS |
| 11B | Ant1 | 2437 | 0~Reference | 2.00 | 2.00 | --- | PASS |
| 11B | Ant1 | 2437 | 30~1000 | 2.00 | -58.47 | ≤-28 | PASS |
| 11B | Ant1 | 2437 | 1000~26500 | 2.00 | -42.27 | ≤-28 | PASS |
| 11B | Ant1 | 2462 | 0~Reference | 4.04 | 4.04 | --- | PASS |
| 11B | Ant1 | 2462 | 30~1000 | 4.04 | -57.42 | ≤-25.96 | PASS |
| 11B | Ant1 | 2462 | 1000~26500 | 4.04 | -42.47 | ≤-25.96 | PASS |
| 11G | Ant1 | 2412 | 0~Reference | -3.01 | -3.01 | --- | PASS |
| 11G | Ant1 | 2412 | 30~1000 | -3.01 | -56.83 | ≤-33.01 | PASS |
| 11G | Ant1 | 2412 | 1000~26500 | -3.01 | -41.97 | ≤-33.01 | PASS |
| 11G | Ant1 | 2437 | 0~Reference | -4.30 | -4.30 | --- | PASS |
| 11G | Ant1 | 2437 | 30~1000 | -4.30 | -57.25 | ≤-34.3 | PASS |
| 11G | Ant1 | 2437 | 1000~26500 | -4.30 | -42.41 | ≤-34.3 | PASS |
| 11G | Ant1 | 2462 | 0~Reference | -2.54 | -2.54 | --- | PASS |
| 11G | Ant1 | 2462 | 30~1000 | -2.54 | -57.18 | ≤-32.54 | PASS |

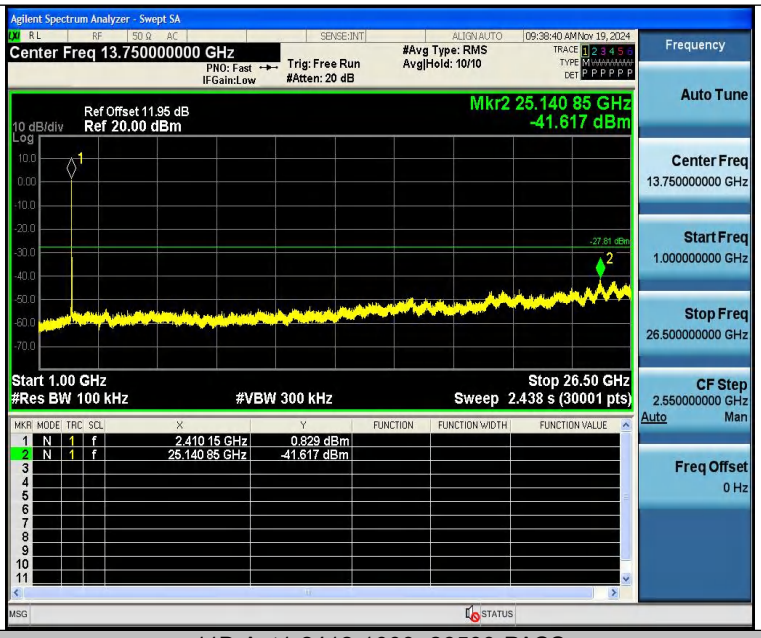
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11G | Ant1 | 2462 | 1000~26500 | -2.54 | -41.11 | ≤-32.54 | PASS |
| 11N20SISO | Ant1 | 2412 | 0~Reference | -3.23 | -3.23 | --- | PASS |
| 11N20SISO | Ant1 | 2412 | 30~1000 | -3.23 | -57.39 | ≤-33.23 | PASS |
| 11N20SISO | Ant1 | 2412 | 1000~26500 | -3.23 | -41.66 | ≤-33.23 | PASS |
| 11N20SISO | Ant1 | 2437 | 0~Reference | -4.23 | -4.23 | --- | PASS |
| 11N20SISO | Ant1 | 2437 | 30~1000 | -4.23 | -57.43 | ≤-34.23 | PASS |
| 11N20SISO | Ant1 | 2437 | 1000~26500 | -4.23 | -41.57 | ≤-34.23 | PASS |
| 11N20SISO | Ant1 | 2462 | 0~Reference | -2.90 | -2.90 | --- | PASS |
| 11N20SISO | Ant1 | 2462 | 30~1000 | -2.90 | -58.4 | ≤-32.9 | PASS |
| 11N20SISO | Ant1 | 2462 | 1000~26500 | -2.90 | -41.88 | ≤-32.9 | PASS |
| 11N40SISO | Ant1 | 2422 | 0~Reference | -4.30 | -4.30 | --- | PASS |
| 11N40SISO | Ant1 | 2422 | 30~1000 | -4.30 | -58.41 | ≤-34.3 | PASS |
| 11N40SISO | Ant1 | 2422 | 1000~26500 | -4.30 | -41.46 | ≤-34.3 | PASS |
| 11N40SISO | Ant1 | 2437 | 0~Reference | -3.75 | -3.75 | --- | PASS |
| 11N40SISO | Ant1 | 2437 | 30~1000 | -3.75 | -58.49 | ≤-33.75 | PASS |
| 11N40SISO | Ant1 | 2437 | 1000~26500 | -3.75 | -42.27 | ≤-33.75 | PASS |
| 11N40SISO | Ant1 | 2452 | 0~Reference | -3.72 | -3.72 | --- | PASS |
| 11N40SISO | Ant1 | 2452 | 30~1000 | -3.72 | -57.25 | ≤-33.72 | PASS |
| 11N40SISO | Ant1 | 2452 | 1000~26500 | -3.72 | -42.49 | ≤-33.72 | PASS |

Test Graphs:

11B-Ant1-2412-0~Reference-PASS

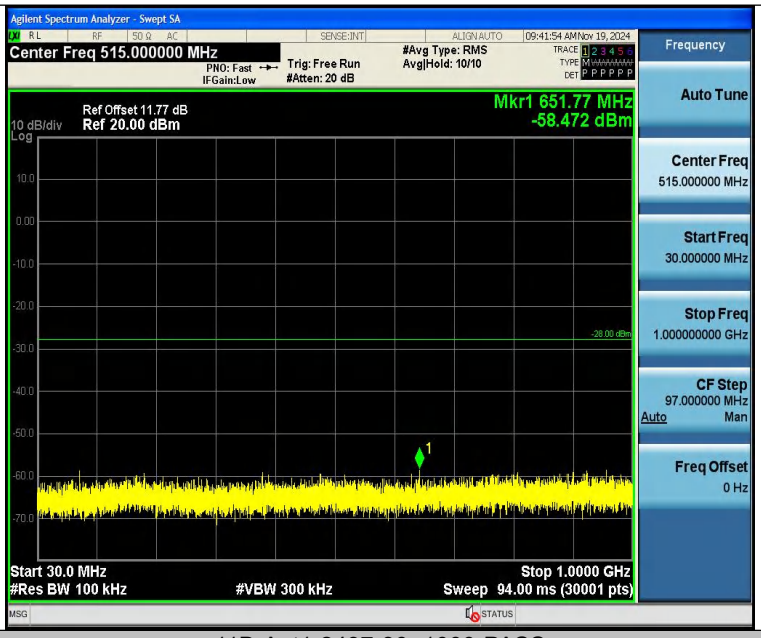



11B-Ant1-2412-30~1000-PASS

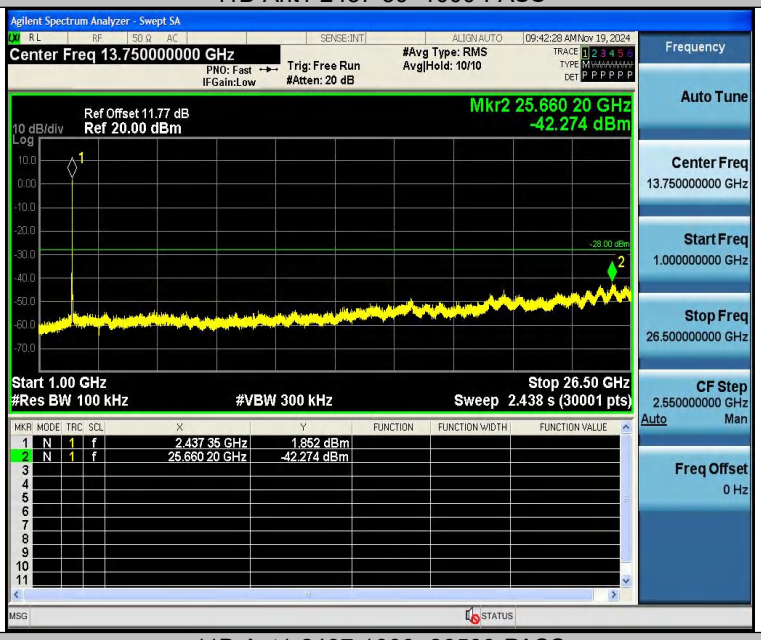



11B-Ant1-2412-1000~26500-PASS

11B-Ant1-2437-0~Reference-PASS

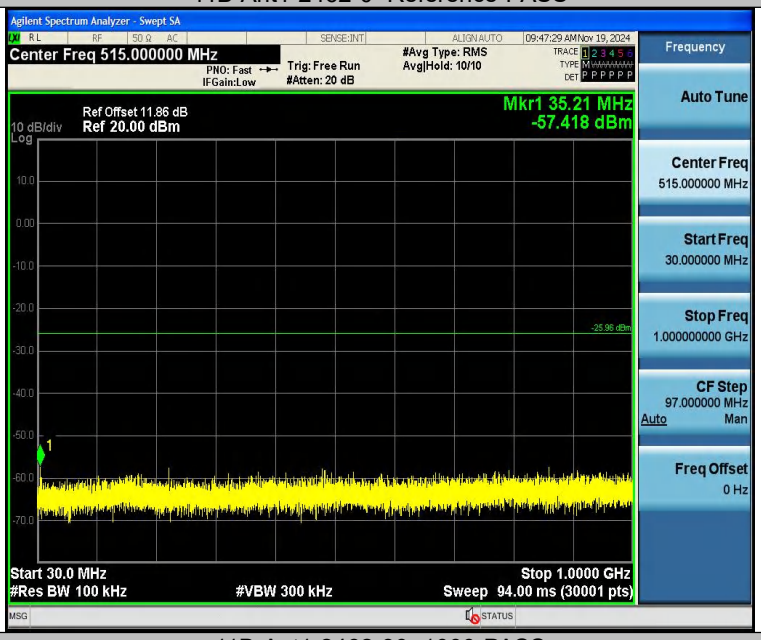



11B-Ant1-2437-30~1000-PASS

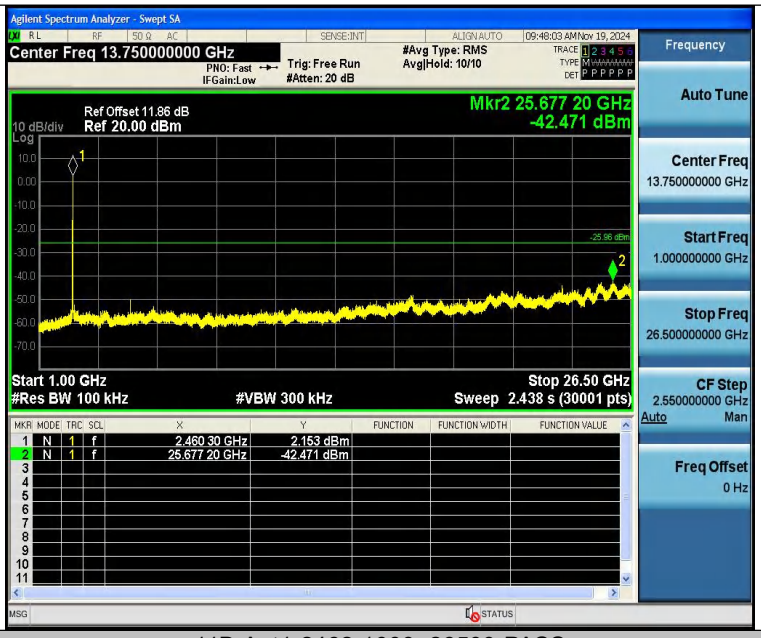



11B-Ant1-2437-1000~26500-PASS

11B-Ant1-2462-0~Reference-PASS

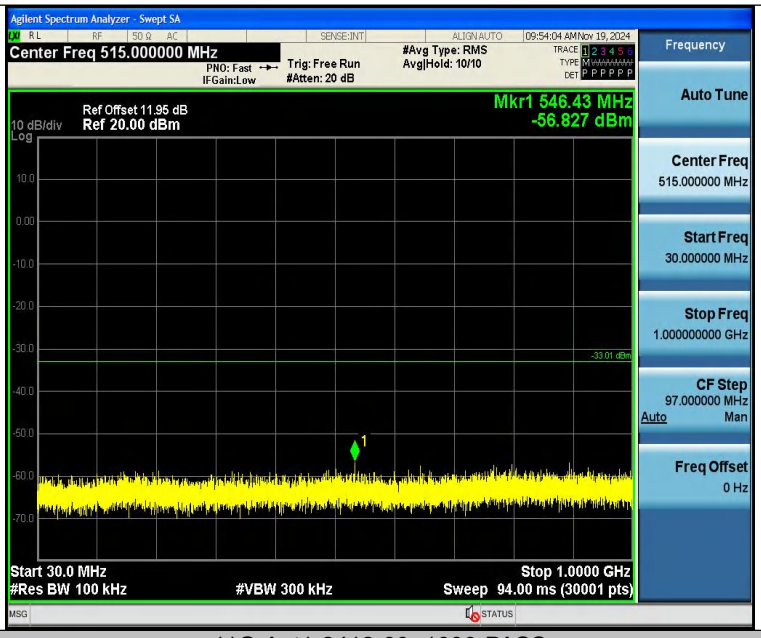



11B-Ant1-2462-30~1000-PASS

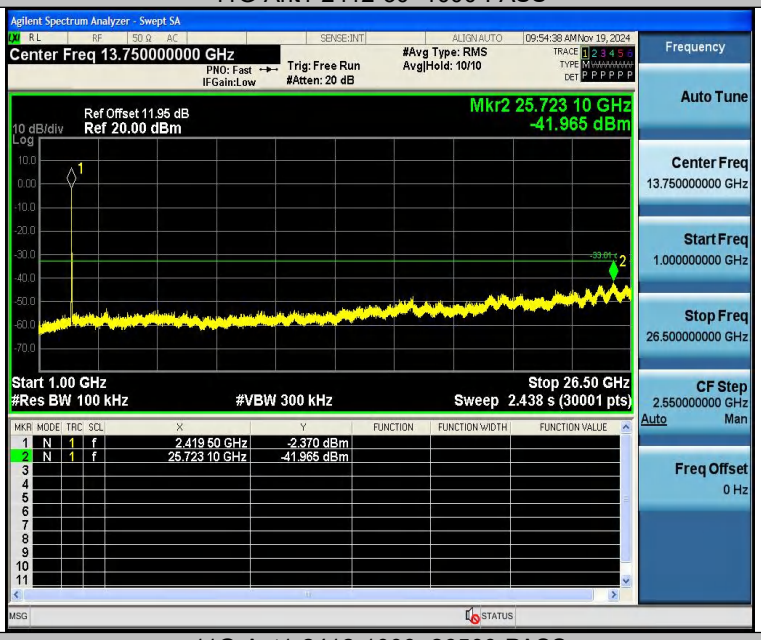



11B-Ant1-2462-1000~26500-PASS

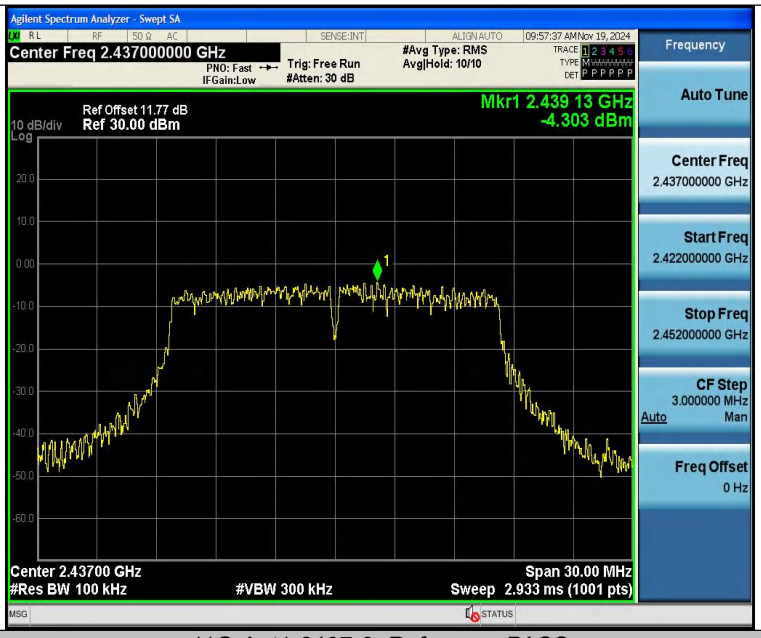
11G-Ant1-2412-0~Reference-PASS



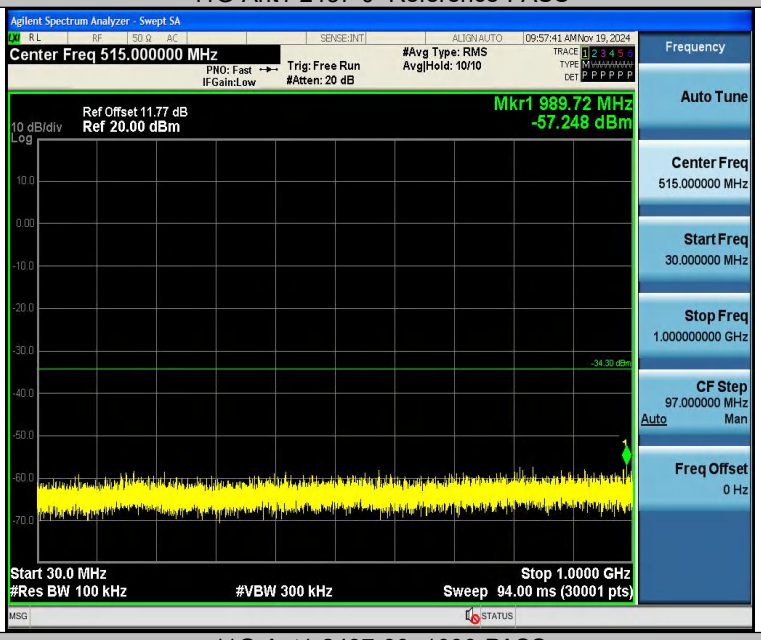

11G-Ant1-2412-30~1000-PASS



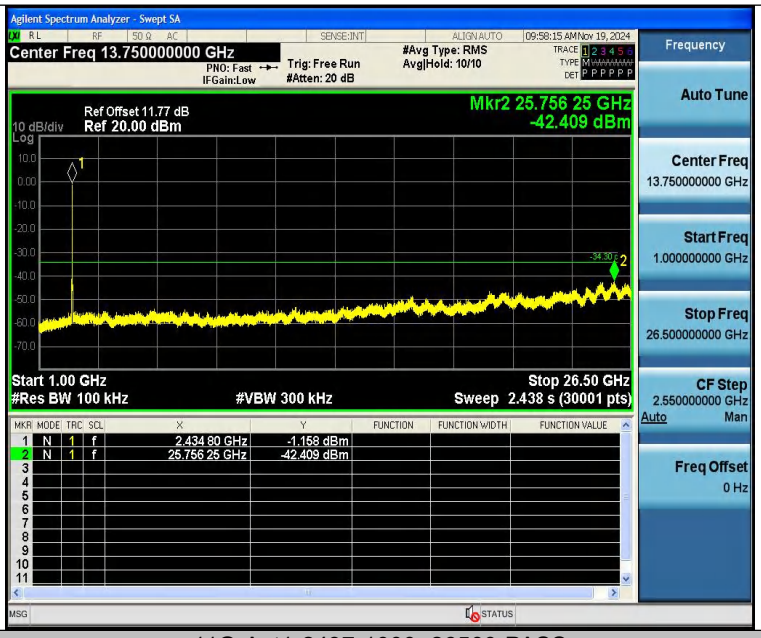

11G-Ant1-2412-1000~26500-PASS



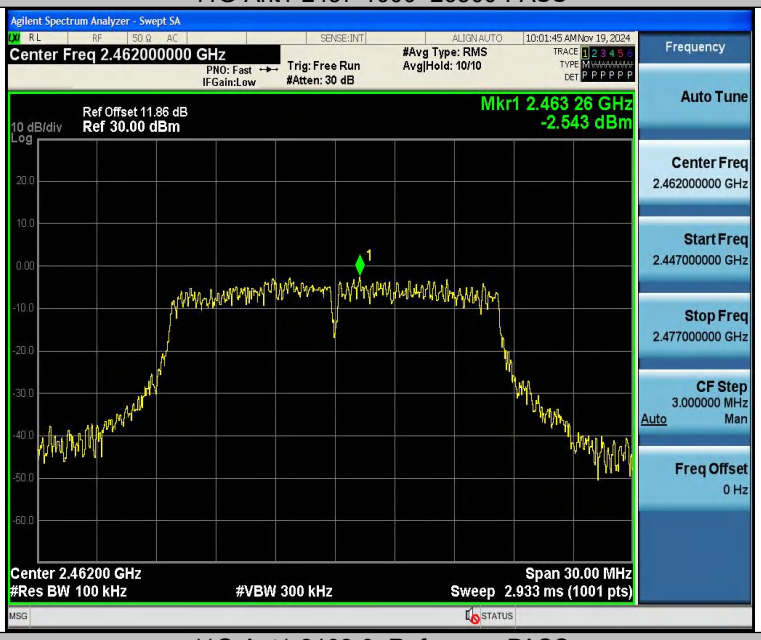

11G-Ant1-2437-0~Reference-PASS



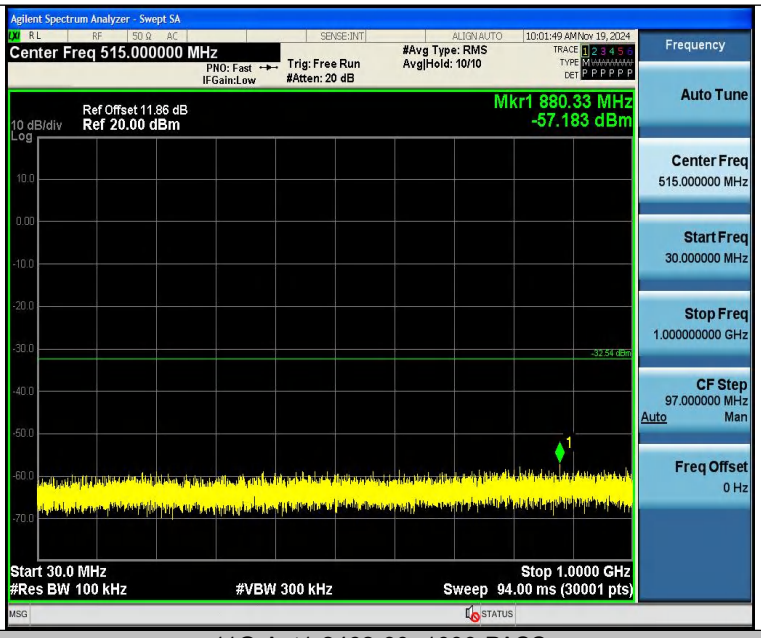

11G-Ant1-2437-30~1000-PASS



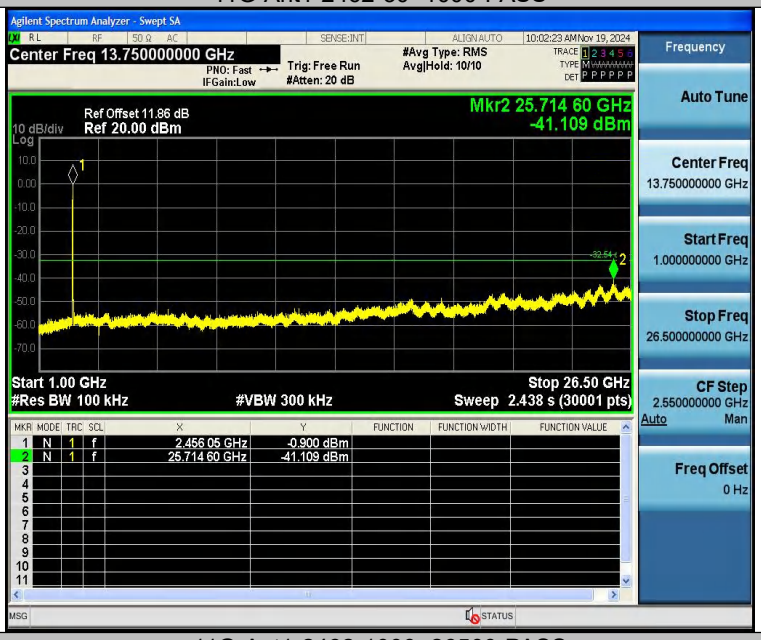

11G-Ant1-2437-1000~26500-PASS



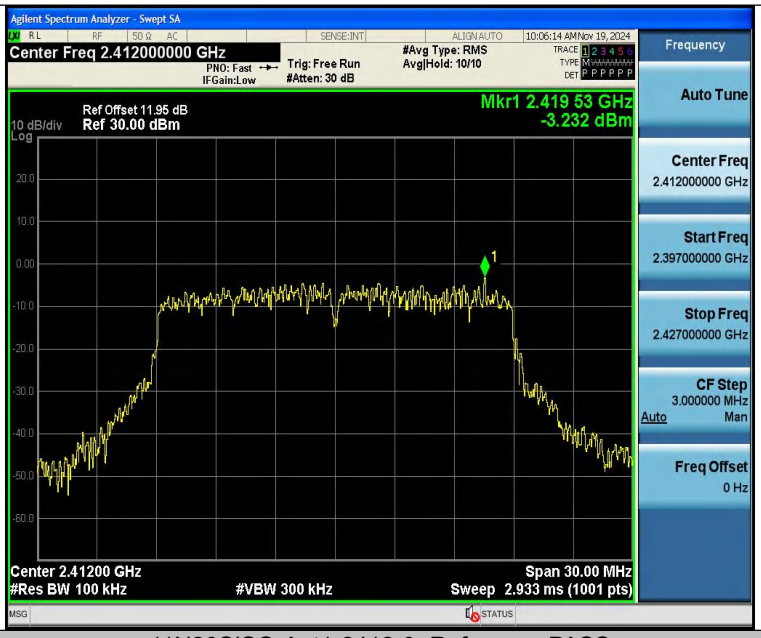

11G-Ant1-2462-0~Reference-PASS



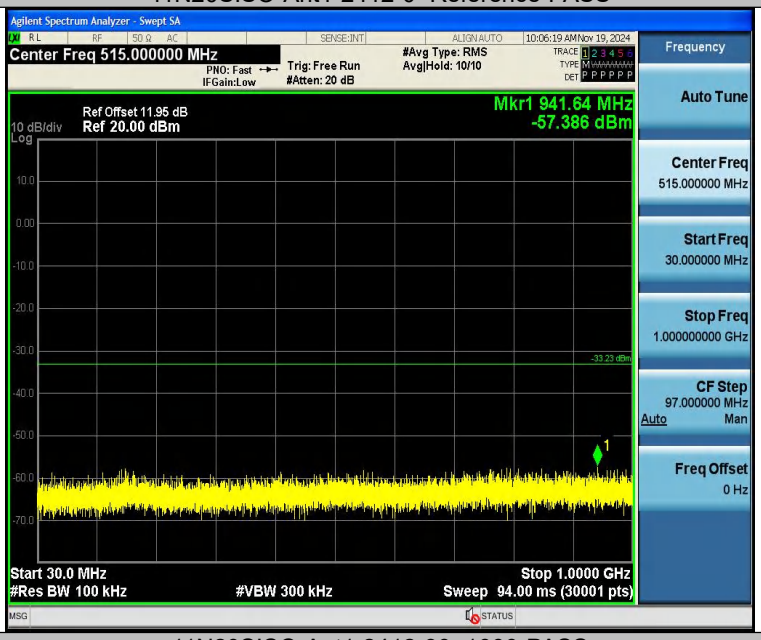

11G-Ant1-2462-30~1000-PASS



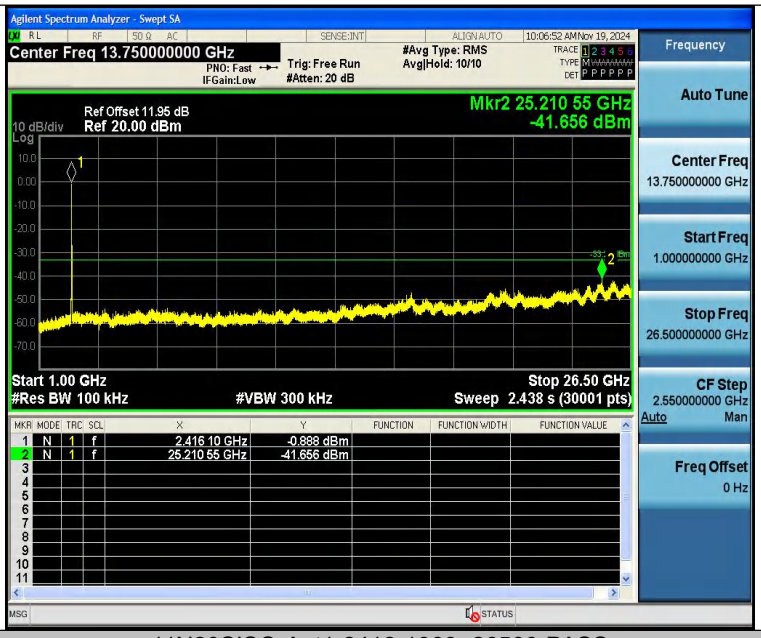

11G-Ant1-2462-1000~26500-PASS



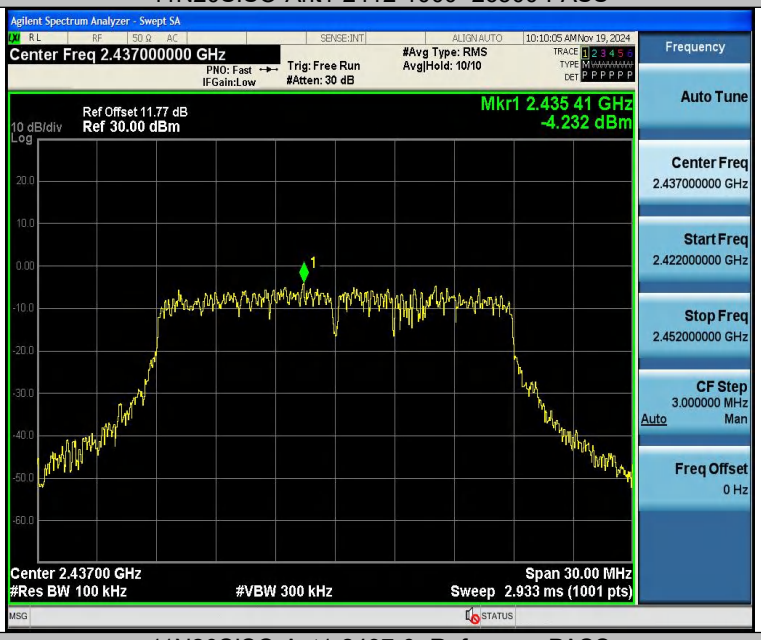

11N20SISO-Ant1-2412-0~Reference-PASS



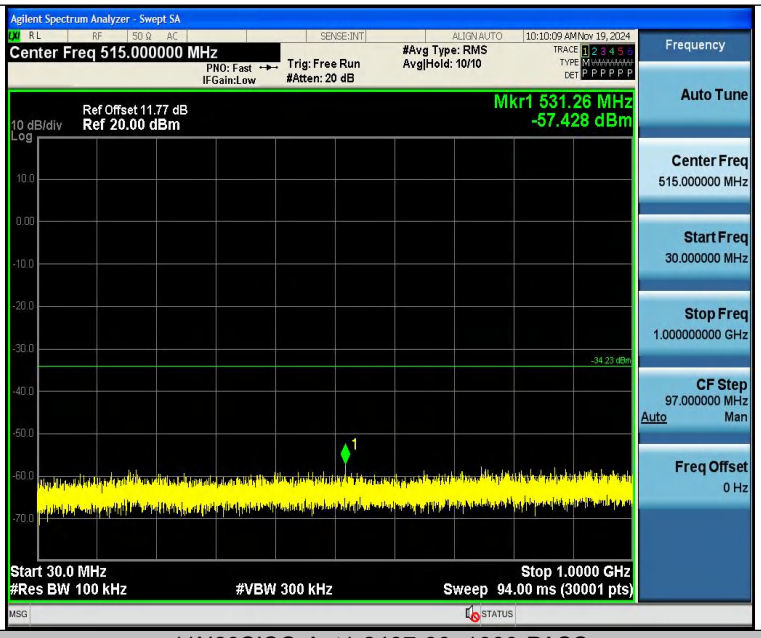

11N20SISO-Ant1-2412-30~1000-PASS



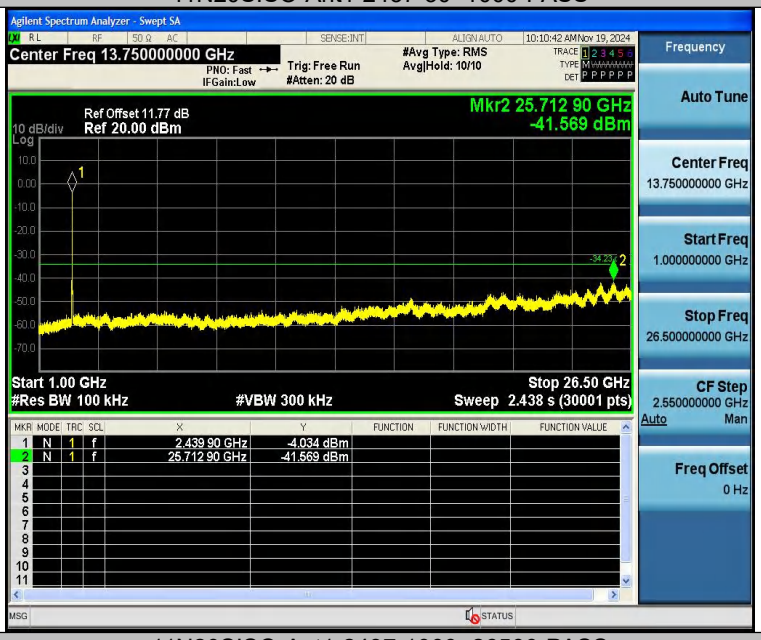

11N20SISO-Ant1-2412-1000~26500-PASS



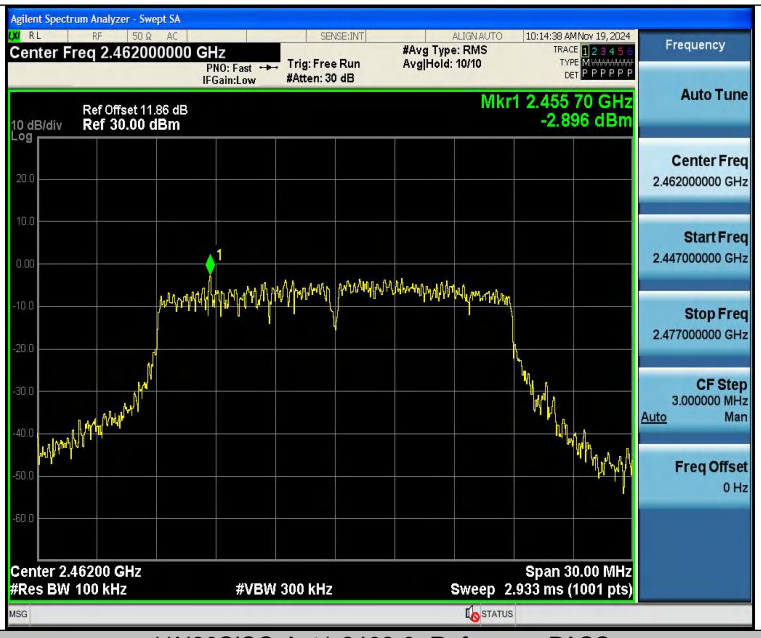

11N20SISO-Ant1-2437-0~Reference-PASS



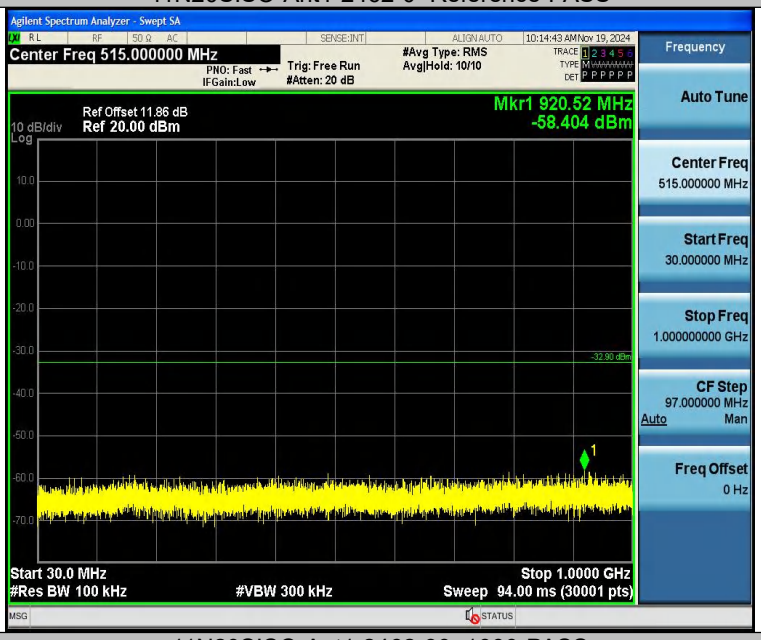

11N20SISO-Ant1-2437-30~1000-PASS



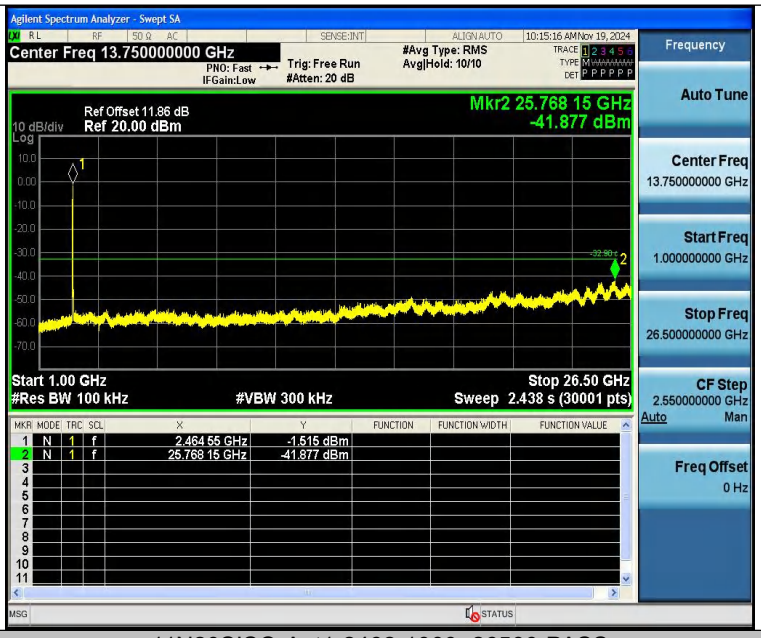

11N20SISO-Ant1-2437-1000~26500-PASS



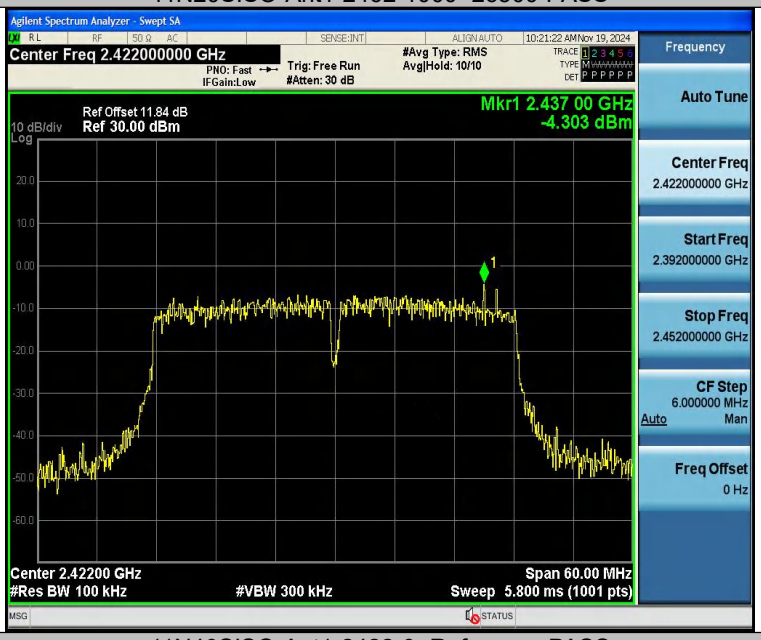

11N20SISO-Ant1-2462-0~Reference-PASS




11N20SISO-Ant1-2462-30~1000-PASS




11N20SISO-Ant1-2462-1000~26500-PASS

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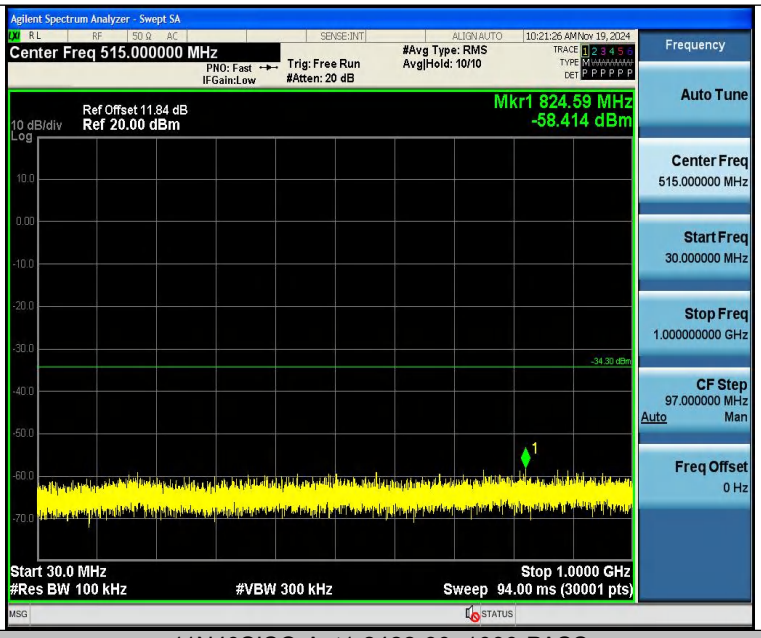
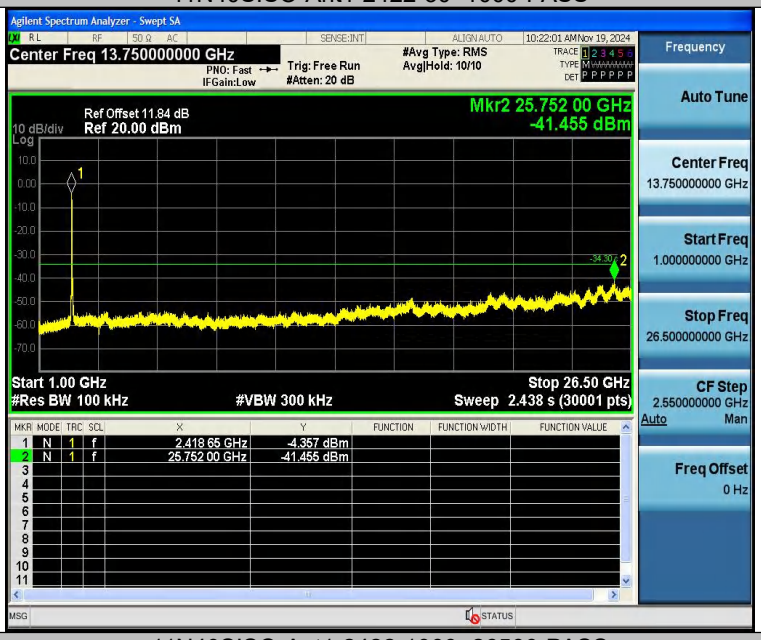



11N40SISO-Ant1-2422-30~1000-PASS

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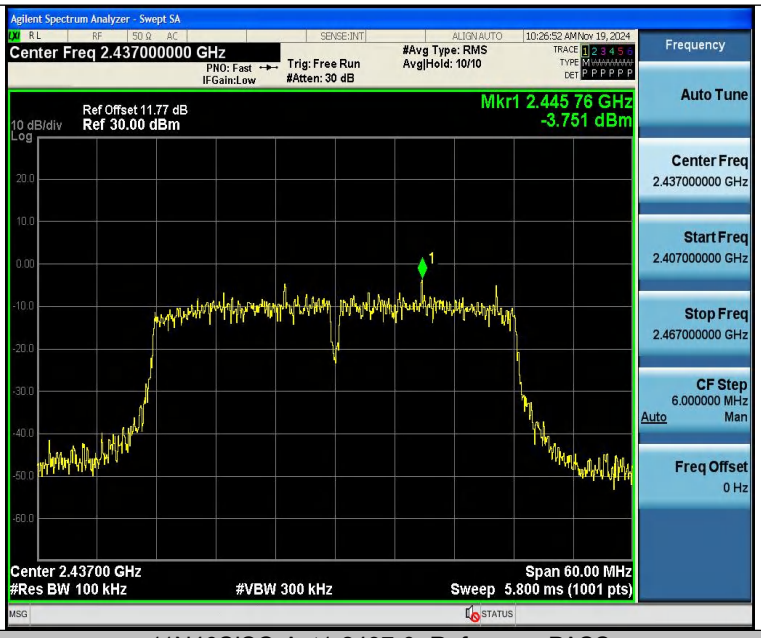
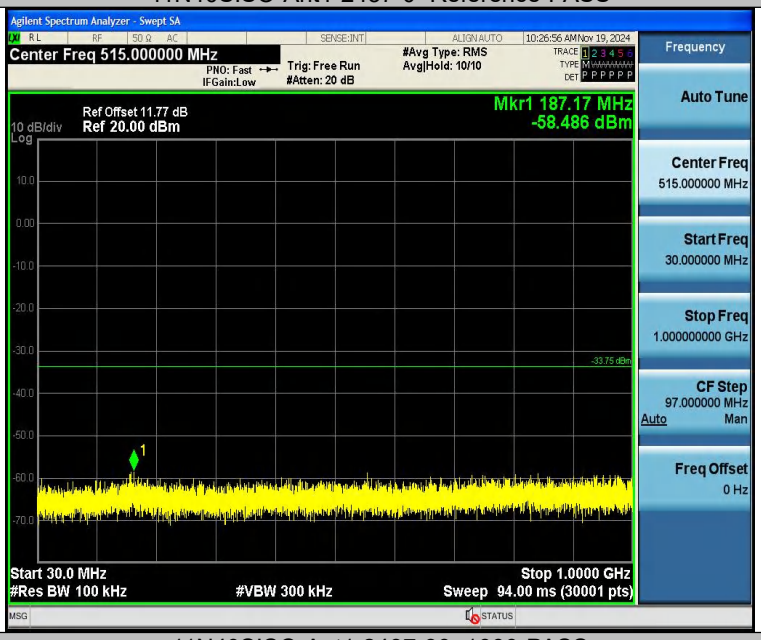
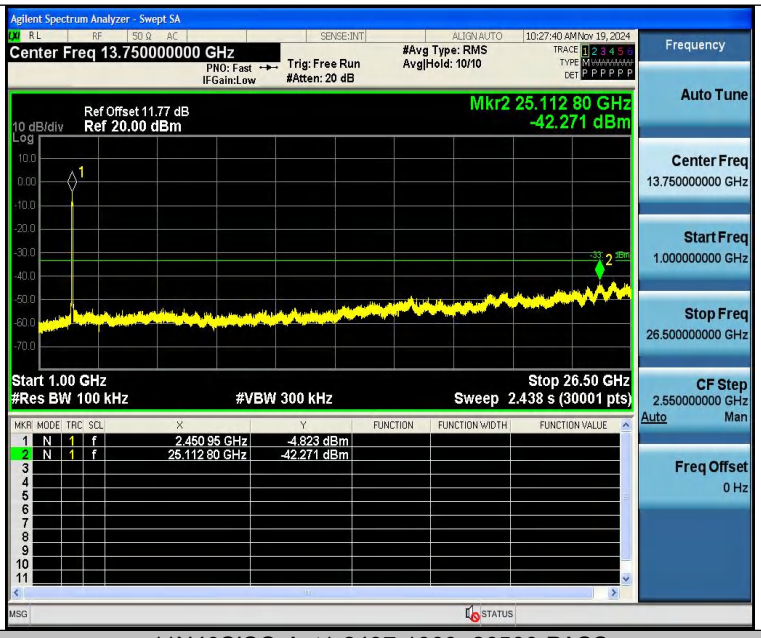


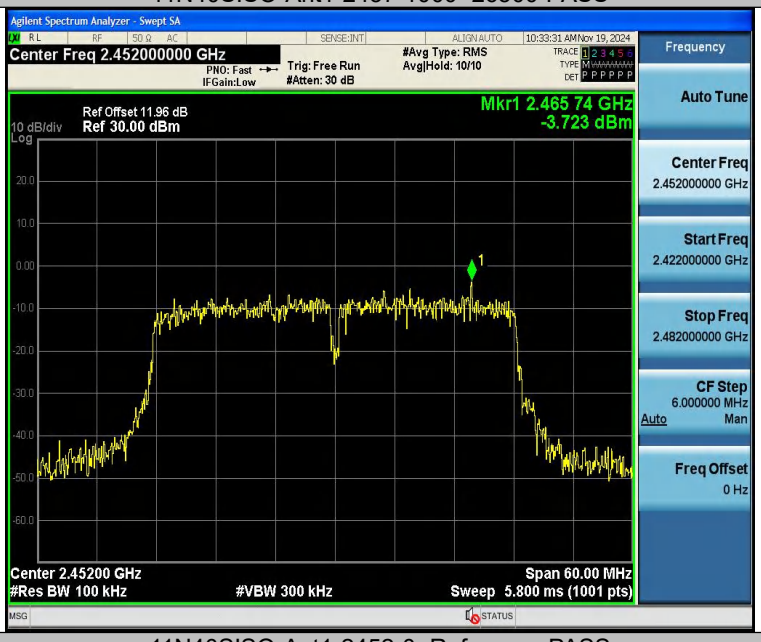

11N40SISO-Ant1-2437-0~Reference-PASS




11N40SISO-Ant1-2437-30~1000-PASS




11N40SISO-Ant1-2437-1000~26500-PASS

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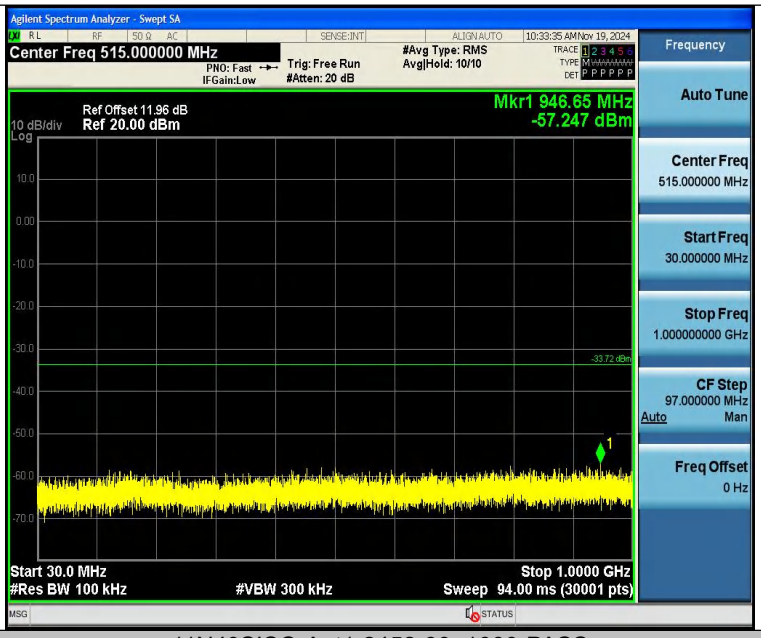
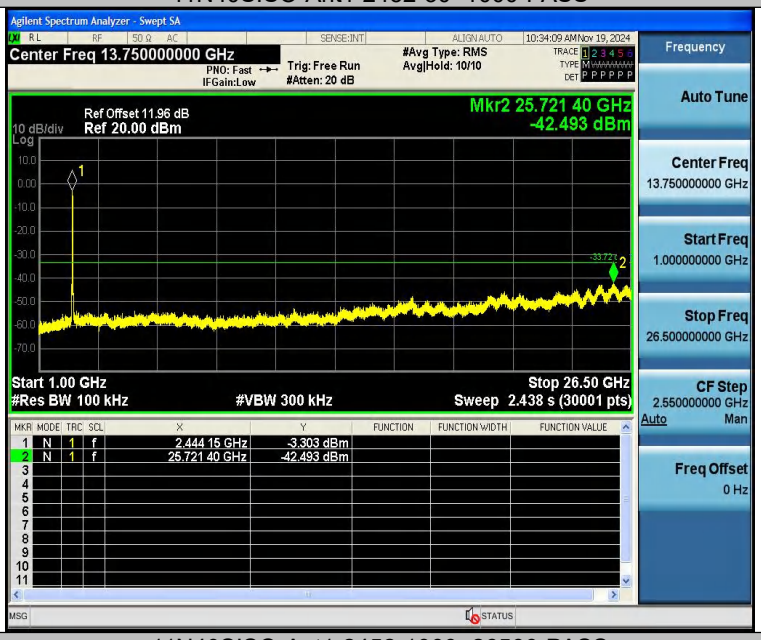



11N40SISO-Ant1-2452-30~1000-PASS




11N40SISO-Ant1-2452-1000~26500-PASS