S T S LAB

# RADIO TEST REPORT

Report No.:STS2003237W15

Issued for

Shanghai Unihertz E-Commerce Co., Ltd

Room 302, No. 5, Lane 59, Shennan Rd, Minhang district, Shanghai, China 201108

| | |
|---|---|
| **Product Name:** | Smart phone |
| **Brand Name:** | Unihertz |
| **Model Name:** | Atom L |
| **Series Model:** | N/A |
| **FCC ID:** | 2AK6CATOML |
| **Test Standard:** | FCC Part 15.247 |

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# TEST RESULT CERTIFICATION

**Applicant's Name** ..... : Shanghai Unihertz E-Commerce Co., Ltd

Address ..... : Room 302, No. 5, Lane 59, Shennan Rd, Minhang district, Shanghai, China 201108

**Manufacture's Name** ..... : OBLUE Communication Technology Co.,Ltd.

Address ..... : 7th floor, building B, dayou industrial and trade industrial park, heping yonghe road, fuyong street, baoan district, Shenzhen, China

**Product Description**

Product Name ..... : Smart phone

Brand Name ..... : Unihertz

Model Name..... : Atom L

SeriesModel ..... : N/A

**Test Standards** ..... : FCC Part15.247

Test Procedure.....: ANSI C63.10-2013

This device described above has been tested by STS, 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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**Date of Test**..... :

Date of receipt of test item..... : 19 Mar. 2020

Date (s) of performance of tests..... : 19 Mar. 2020 ~ 16 Apr. 2020

Date of Issue ..... : 16 Apr. 2020

Test Result ..... : **Pass**

Testing Engineer : Chris Chen

(Chris Chen)

Technical Manager : Sean She

(Sean she)

Authorized Signatory : Vita Li

(Vita Li)

TESTING CONSULTING SOLUTION CERTIFICATION STS APPROVAL

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## Revision History

| Rev. | Issue Date | Report No. | Effect Page | Contents |
|---|---|---|---|---|
| 00 | 16 Apr. 2020 | STS2003237W15 | ALL | Initial Issue |
| | | | | |

# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02.

| FCC Part 15.247,Subpart C | | | |
|---|---|---|---|
| Standard Section | Test Item | Judgment | Remark |
| 15.207 | Conducted Emission | PASS | -- |
| 15.247 (a)(2) | 6dB Bandwidth | PASS | -- |
| 15.247 (b)(3) | Output Power | PASS | -- |
| 15.247 (c) | Radiated Spurious Emission | PASS | -- |
| 15.247 (d) | Conducted Spurious & Band Edge Emission | PASS | -- |
| 15.247 (e) | Power Spectral Density | PASS | -- |
| 15.205 | Restricted Band Edge Emission | PASS | -- |
| Part 15.247(d)/part 15.209(a) | Band Edge Emission | PASS | -- |
| 15.203 | Antenna Requirement | PASS | -- |

NOTE:

(1) 'N/A' denotes test is not applicable in this Test Report.

(2) All tests are according to ANSI C63.10-2013.

## 1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD
Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

| No. | Item | Uncertainty |
|---|---|---|
| 1 | RF output power, conducted | ±0.68dB |
| 2 | Unwanted Emissions, conducted | ±2.988dB |
| 3 | All emissions, radiated 30-1GHz | ±6.7dB |
| 4 | All emissions, radiated 1G-6GHz | ±5.5dB |
| 5 | All emissions, radiated>6G | ±5.8dB |
| 6 | Conducted Emission (9KHz-150KHz) | ±4.43dB |
| 7 | Conducted Emission (150KHz-30MHz) | ±5dB |

# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF THE EUT

| | |
|---|---|
| Product Name | Smart phone |
| Trade Name | Unihertz |
| Model Name | Atom L |
| Series Model | N/A |
| Model Difference | N/A |
| Product Description | The EUT is a Smart phone<br>Operation Frequency: 802.11b/g/n 20: 2412~2462 MHz<br>802.11n(40MHz):2422~2452MHz<br>Modulation Type: 802.11b(DSSS):CCK,DQPSK,DBPSK<br>802.11g(OFDM):BPSK,QPSK,16-QAM,64-QAM<br>802.11n(OFDM):BPSK,QPSK,16-QAM,64-QAM<br>Bit Rate of Transmitter: 802.11b:11/5.5/2/1 Mbps<br>802.11g:54/48/36/24/18/12/9/6Mbps<br>802.11n(20MHz):<br>65/58.5/52/39/26/19.5/13/6.5Mbps<br>802.11n(40MHz):<br>135/121.5/108/81/54/40.5/37/13.5Mbps<br>Number of Channel: 802.11b/g/n20: 11CH<br>802.11n 40: 7CH<br>Antenna Designation: Please refer to the Note 3.<br>AntennaGain (dBi): 1.62 dBi<br>Duty Cycle: >98% |
| Channel List | Please refer to the Note 2. |
| Adapter | Input: 100-240V~50/60Hz 0.6A<br>Output: 3.6-6V ⎓ 3A<br>6-9V ⎓ 2.0A<br>9-12V ⎓ 1.5A |
| Battery | Rated Voltage: 3.85V<br>Charge Limit: 4.4V<br>Capacity: 4260mAh |
| Hardware version number | G63_V2.0 |
| Software version number | Unihertz_Atom_L_20200312 |
| Connecting I/O Port(s) | Please refer to the Note 1. |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.

2.

| Operation Frequency of channel | | | |
|---|---|---|---|
| 802.11b/g/n(20MHz) | | Channel List for 802.11n(40MHz) | |
| Channel | Frequency | Channel | Frequency |
| 01 | 2412 | 03 | 2422 |
| 02 | 2417 | 04 | 2427 |
| 03 | 2422 | 05 | 2432 |
| 04 | 2427 | 06 | 2437 |
| 05 | 2432 | 07 | 2442 |
| 06 | 2437 | 08 | 2447 |
| 07 | 2442 | 09 | 2452 |
| 08 | 2447 | | |
| 09 | 2452 | | |
| 10 | 2457 | | |
| 11 | 2462 | | |

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, themiddle frequency, and the highest frequency of channel were selected to perform the test, and the selectedchannel see below:
Carrier Frequency Channel

2.4GHz Test Frequency:

| For 802.11b/g/n (HT20) | | For 802.11n (HT40) | |
|---|---|---|---|
| Channel | Freq.(MHz) | Channel | Freq.(MHz) |
| 01 | 2412 | 03 | 2422 |
| 06 | 2437 | 06 | 2437 |
| 11 | 2462 | 09 | 2452 |

3.

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | NOTE |
|---|---|---|---|---|---|---|
| 1 | Unihertz | Atom L | PIFA | N/A | 1.62 dBi | WLAN Antenna |

## 2.2 DESCRIPTION OF THE TEST MODES

Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Worst Mode | Description | Data Rate |
|---|---|---|
| Mode 1 | TX IEEE 802.11b CH1 | 1 Mbps |
| Mode 2 | TX IEEE 802.11b CH6 | 1 Mbps |
| Mode 3 | TX IEEE 802.11 b CH11 | 1 Mbps |
| Mode 4 | TX IEEE 802.11g CH1 | 6 Mbps |
| Mode 5 | TX IEEE 802.11g CH6 | 6 Mbps |
| Mode 6 | TX IEEE 802.11g CH11 | 6 Mbps |
| Mode 7 | TX IEEE 802.11n HT20 CH1 | MCS 0 |
| Mode 8 | TX IEEE 802.11n HT20 CH6 | MCS 0 |
| Mode 9 | TX IEEE 802.11n HT20 CH11 | MCS 0 |
| Mode 10 | TX IEEE 802.11n HT40 CH3 | MCS 0 |
| Mode 11 | TX IEEE 802.11n HT40 CH6 | MCS 0 |
| Mode 12 | TX IEEE 802.11n HT40 CH9 | MCS 0 |

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V /60Hz is shown in the report.

AC Conducted Emission

| Test Case | |
|---|---|
| AC Conducted Emission | Mode13: Keeping WIFI TX |

## 2.3 TEST SOFTWARE AND POWER LEVEL

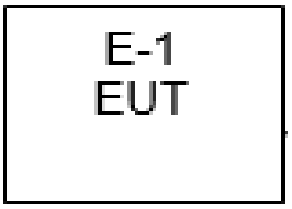
Describe the test modes available which can facilitate testing:

The EUT can entering Engineering Command by *#*#34635280#*#*

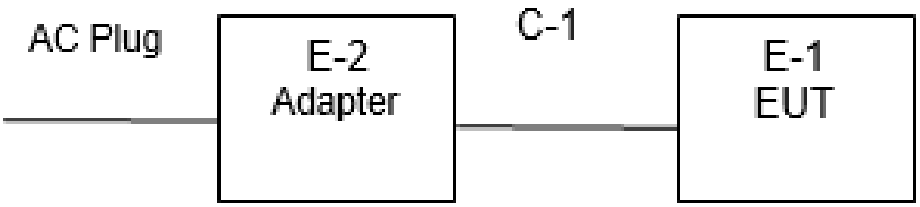
| Power Level | |
|---|---|
| Test mode | Power class |
| 802.11b | 16 |
| 802.11g | 7 |
| 802.11n(HT20) | 4 |
| 802.11n(HT40) | 4 |

## 2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiation Test Set




Conduction Test Set



## 2.5 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|---|---|---|---|---|---|
| E-2 | Adapter | Unihertz | TPA-10120150UU | N/A | N/A |
| C-1 | DC Cable | N/A | 110cm | N/A | N/A |
| | | | | | |
| | | | | | |

Support units

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|---|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | | |
| | | | | | |
| | | | | | |

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

## 2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|---|---|---|---|---|---|
| Test Receiver | R&S | ESCI | 101427 | 2019.07.29 | 2020.07.28 |
| Signal Analyzer | Agilent | N9020A | MY51110105 | 2020.03.05 | 2021.03.04 |
| Active loop Antenna | ZHINAN | ZN30900C | 16035 | 2018.03.11 | 2021.03.10 |
| Bilog Antenna | TESEQ | CBL6111D | 34678 | 2017.11.02 | 2020.11.01 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D(1201) | 9120D-1343 | 2018.10.19 | 2021.10.18 |
| SHF-EHF Horn Antenna (18G-40GHz) | A-INFO | LB-180400-KF | J211020657 | 2018.03.11 | 2021.03.10 |
| Pre-Amplifier(0.1M-3G Hz) | EM | EM330 | 060665 | 2019.10.09 | 2020.10.08 |
| Pre-Amplifier (1G-18GHz) | SKET | LNPA-01018G-45 | SK2018080901 | 2019.10.12 | 2020.10.11 |
| Pre-Amplifier (18G-40G) | SKET | LNPA_1840-50 | SK2018101801 | 2019.10.22 | 2020.10.21 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.12 | 2020.10.11 |
| Turn table | EM | SC100_1 | 60531 | N/A | N/A |
| Antenna mast | EM | SC100 | N/A | N/A | N/A |
| Test SW | FARAD | EZ-EMC(Ver.STSLAB-03A1 RE) | | | |

Conduction Test equipment

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|---|---|---|---|---|---|
| Test Receiver | R&S | ESCI | 101427 | 2019.07.29 | 2020.07.28 |
| LISN | R&S | ENV216 | 101242 | 2019.10.09 | 2020.10.08 |
| LISN | EMCO | 3810/2NM | 23625 | 2019.10.09 | 2020.10.08 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.12 | 2020.10.11 |
| Test SW | FARAD | EZ-EMC(Ver.STSLAB-03A1 CE) | | | |

RF Connected Test

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|---|---|---|---|---|---|
| USB RF power sensor | DARE | RPR3006W | 15I00041SNO03 | 2019.10.09 | 2020.10.08 |
| Signal Analyzer | Agilent | N9020A | MY49100060 | 2019.10.09 | 2020.10.08 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.12 | 2020.10.11 |
| Test SW | FARAD | LZ-RF /LzRf-3A3 | | | |

# 3. EMC EMISSION TEST

## 3.1 CONDUCTED EMISSION MEASUREMENT

### 3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 15. 207(a) limit in the table below has to be followed.

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

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

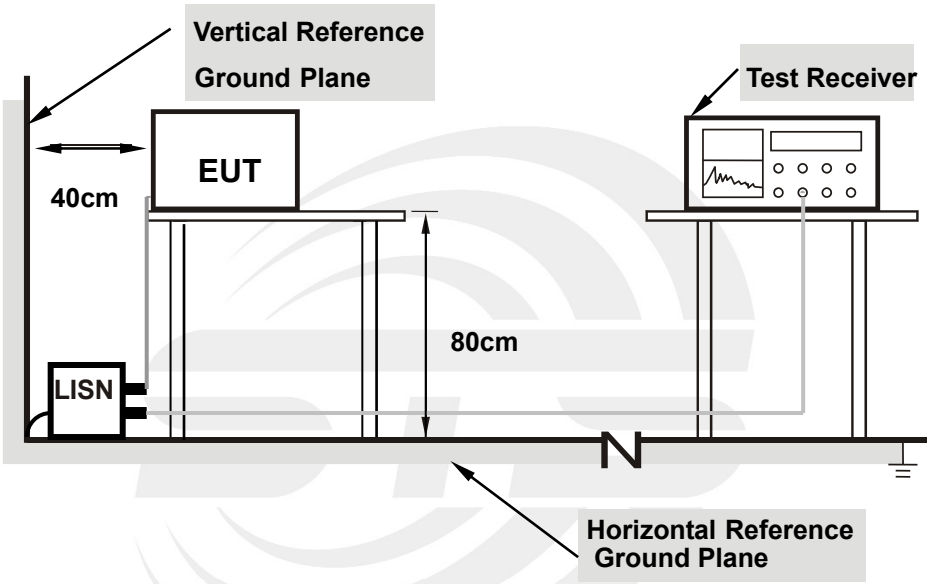
The following table is the setting of the receiver

| **Receiver Parameters** | **Setting** |
|---|---|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

3.1.2 TEST PROCEDURE

a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP




**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

3.1.4EUT OPERATING CONDITIONS

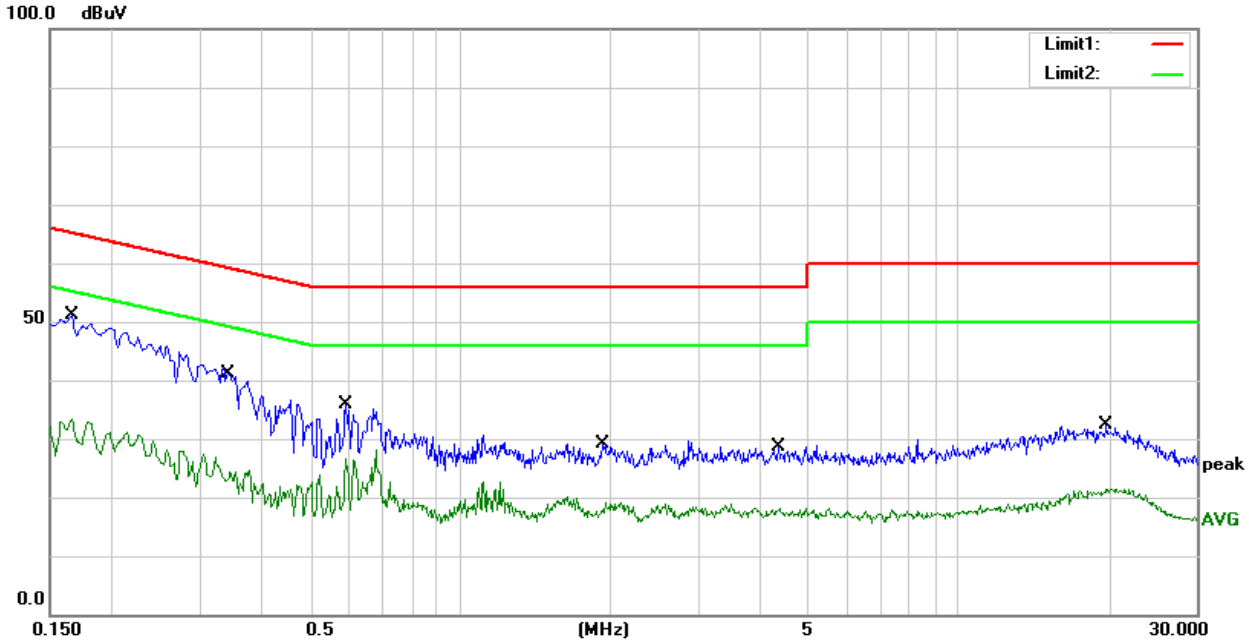
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.5 TEST RESULT

| | | | |
|---|---|---|---|
| Temperature: | 26.4(C) | Relative Humidity: | 56%RH |
| Test Voltage: | AC 120V/60Hz | Phase: | L |
| Test Mode: | Mode 13 | | |

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB) | (dBuV) | (dBuV) | (dB) | |
| 1 | 0.1660 | 30.54 | 20.57 | 51.11 | 65.16 | -14.05 | QP |
| 2 | 0.1660 | 12.78 | 20.57 | 33.35 | 55.16 | -21.81 | AVG |
| 3 | 0.3420 | 21.16 | 20.07 | 41.23 | 59.15 | -17.92 | QP |
| 4 | 0.3420 | 4.61 | 20.07 | 24.68 | 49.15 | -24.47 | AVG |
| 5 | 0.5900 | 15.78 | 20.07 | 35.85 | 56.00 | -20.15 | QP |
| 6 | 0.5900 | 7.94 | 20.07 | 28.01 | 46.00 | -17.99 | AVG |
| 7 | 1.9380 | 9.36 | 19.89 | 29.25 | 56.00 | -26.75 | QP |
| 8 | 1.9380 | 0.23 | 19.89 | 20.12 | 46.00 | -25.88 | AVG |
| 9 | 4.3580 | 8.20 | 20.33 | 28.53 | 56.00 | -27.47 | QP |
| 10 | 4.3580 | -2.20 | 20.33 | 18.13 | 46.00 | -27.87 | AVG |
| 11 | 19.8300 | 10.93 | 21.38 | 32.31 | 60.00 | -27.69 | QP |
| 12 | 19.8300 | 0.12 | 21.38 | 21.50 | 50.00 | -28.50 | AVG |

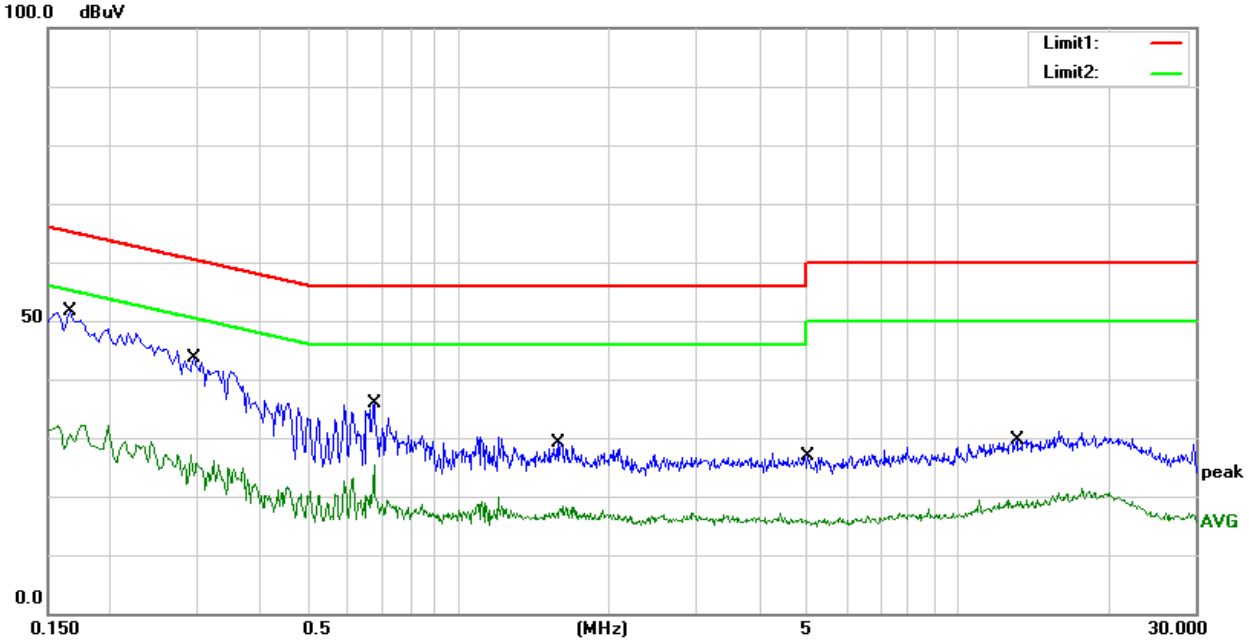
Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor )–Limit



| | | | |
|---|---|---|---|
| Temperature: | 26.4(C) | Relative Humidity: | 56%RH |
| Test Voltage: | AC 120V/60Hz | Phase: | N |
| Test Mode: | Mode 13 | | |

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB) | (dBuV) | (dBuV) | (dB) | |
| 1 | 0.1660 | 31.01 | 20.57 | 51.58 | 65.16 | -13.58 | QP |
| 2 | 0.1660 | 11.67 | 20.57 | 32.24 | 55.16 | -22.92 | AVG |
| 3 | 0.2940 | 23.65 | 20.07 | 43.72 | 60.41 | -16.69 | QP |
| 4 | 0.2940 | 7.06 | 20.07 | 27.13 | 50.41 | -23.28 | AVG |
| 5 | 0.6780 | 15.88 | 20.10 | 35.98 | 56.00 | -20.02 | QP |
| 6 | 0.6780 | 5.33 | 20.10 | 25.43 | 46.00 | -20.57 | AVG |
| 7 | 1.5780 | 9.42 | 19.71 | 29.13 | 56.00 | -26.87 | QP |
| 8 | 1.5780 | -1.31 | 19.71 | 18.40 | 46.00 | -27.60 | AVG |
| 9 | 5.0220 | 6.46 | 20.41 | 26.87 | 60.00 | -33.13 | QP |
| 10 | 5.0220 | -4.02 | 20.41 | 16.39 | 50.00 | -33.61 | AVG |
| 11 | 13.1020 | 8.76 | 20.68 | 29.44 | 60.00 | -30.56 | QP |
| 12 | 13.1020 | 0.71 | 20.68 | 21.39 | 50.00 | -28.61 | AVG |

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor )–Limit



## 3.2 RADIATED EMISSION MEASUREMENT

### 3.2.1RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

| Frequencies (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

LIMITS OF RADIATED EMISSION MEASUREMENT (1000MHz-25GHz)

| FREQUENCY (MHz) | (dBuV/m) (at 3M) | |
|---|---|---|
| | PEAK | AVERAGE |
| Above 1000 | 74 | 54 |

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

| FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (GHz) |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

For Radiated Emission

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Detector | Peak/QP/AV |
| Start Frequency | 9 KHz/150KHz(Peak/QP/AV) |
| Stop Frequency | 150KHz/30MHz(Peak/QP/AV) |
| RB / VB (emission in restricted band) | 200Hz (From 9kHz to 0.15MHz)/<br>9KHz (From 0.15MHz to 30MHz);<br>200Hz (From 9kHz to 0.15MHz)/<br>9KHz (From 0.15MHz to 30MHz) |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Detector | Peak/QP |
| Start Frequency | 30 MHz(Peak/QP) |
| Stop Frequency | 1000 MHz (Peak/QP) |
| RB / VB (emission in restricted band) | 120 KHz / 300 KHz |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Detector | Peak/AV |
| Start Frequency | 1000 MHz(Peak/AV) |
| Stop Frequency | 10th carrier hamonic(Peak/AV) |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz(Peak)<br>1 MHz/1/T MHz(AVG) |

For Restricted band

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak/AV |
| Start/Stop Frequency | Lower Band Edge: 2310 to 2430 MHz<br>Upper Band Edge: 2445 to 2500 MHz |
| RB / VB | 1 MHz / 3 MHz(Peak)<br>1 MHz/1/T MHz(AVG) |

| Receiver Parameter | Setting |
|---|---|
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

3.2.2 TEST PROCEDURE

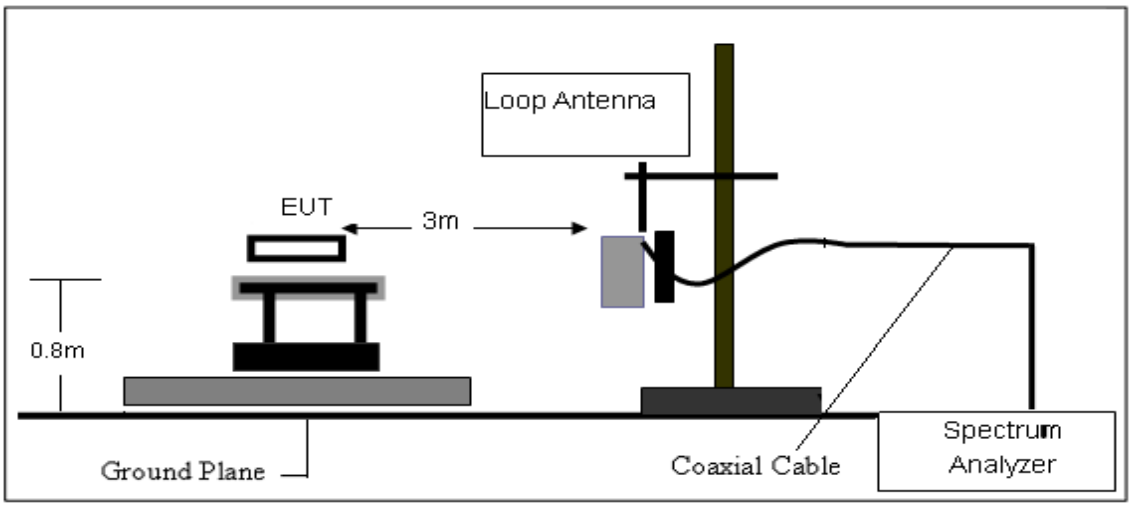
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

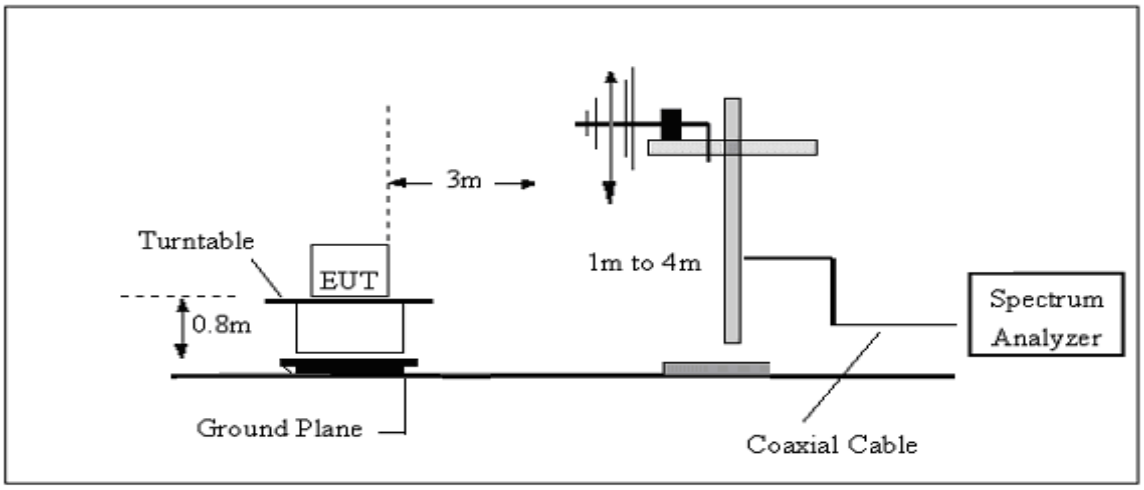
Both horizontal and vertical antenna polarities were testedand performed test to three orthogonal axis. The worst case emissions were reported.

3.2.3 TEST SETUP

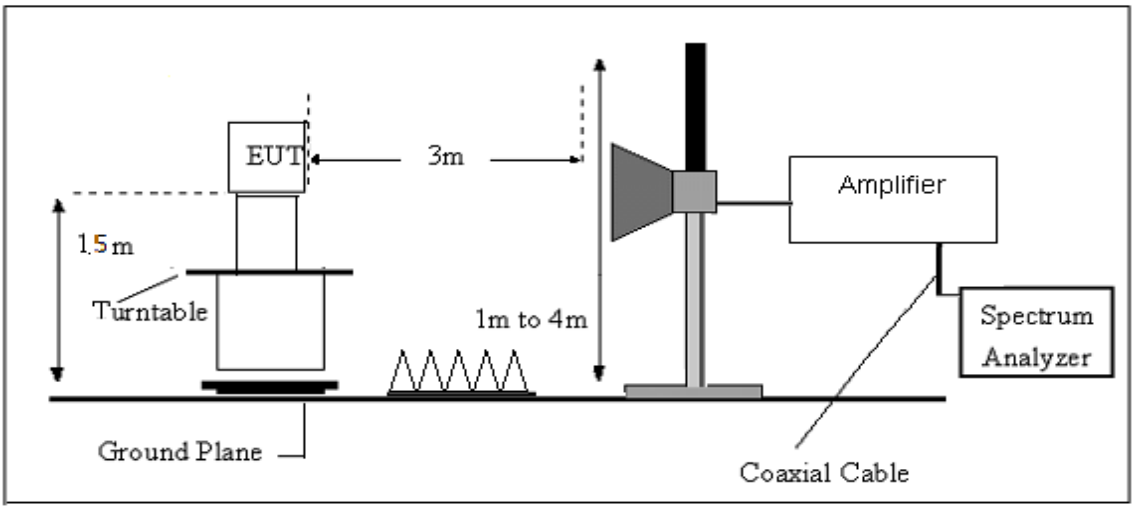
(A) Radiated Emission Test-Up Frequency Below 30MHz




(B) Radiated Emission Test-Up Frequency 30MHz~1GHz




(C) Radiated Emission Test-Up Frequency Above 1GHz




3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting theAmplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

| Frequency | FS | RA | AF | CL | AG | Factor |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV/m) | (dBμV/m) | (dB) | (dB) | (dB) | (dB) |
| 300 | 40 | 58.1 | 12.2 | 1.6 | 31.9 | -18.1 |

Factor=AF+CL-AG

3.2.6 TEST RESULT

9KHz-30MHz

| | | | |
|---|---|---|---|
| Temperature: | 23.2(C) | Relative Humidtity: | 48%RH |
| Test Voltage: | DC 3.85V | Polarization: | -- |
| Test Mode: | TX Mode | | |

| Freq. (MHz) | Reading (dBuV/m) | Limit (dBuV/m) | Margin (dB) | State P/F | Test Result |
|---|---|---|---|---|---|
| -- | -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | -- | PASS |

Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

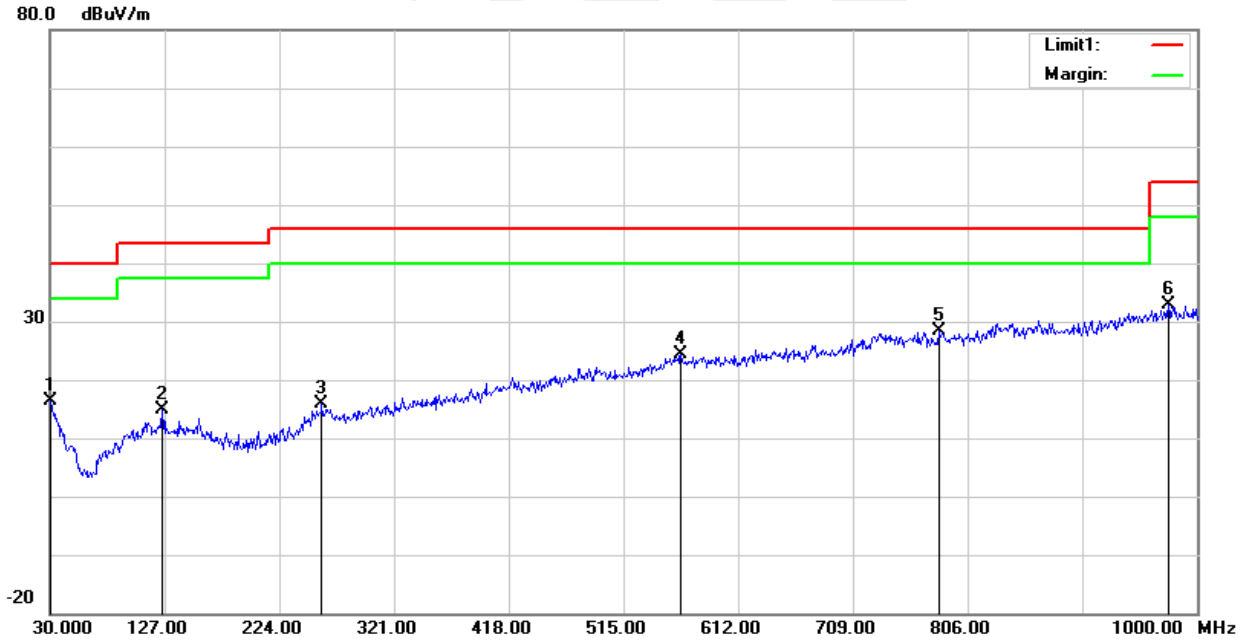
(30MHz - 1000MHz)

| | | | |
|---|---|---|---|
| Temperature: | 23.2(C) | Relative Humidtity: | 48%RH |
| Test Voltage: | DC 3.85V | Phase: | Horizontal |
| Test Mode: | Mode 1/2/3/4/5/6/7/8/9/10/11/12 (Mode 1 worst mode) | | |

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 30.9700 | 29.74 | -13.35 | 16.39 | 40.00 | -23.61 | QP |
| 2 | 125.0600 | 32.98 | -18.22 | 14.76 | 43.50 | -28.74 | QP |
| 3 | 259.8900 | 30.69 | -14.79 | 15.90 | 46.00 | -30.10 | QP |
| 4 | 563.5000 | 29.92 | -5.53 | 24.39 | 46.00 | -21.61 | QP |
| 5 | 781.7500 | 30.65 | -2.18 | 28.47 | 46.00 | -17.53 | QP |
| 6 | 975.7500 | 30.45 | 2.38 | 32.83 | 54.00 | -21.17 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor )–Limit

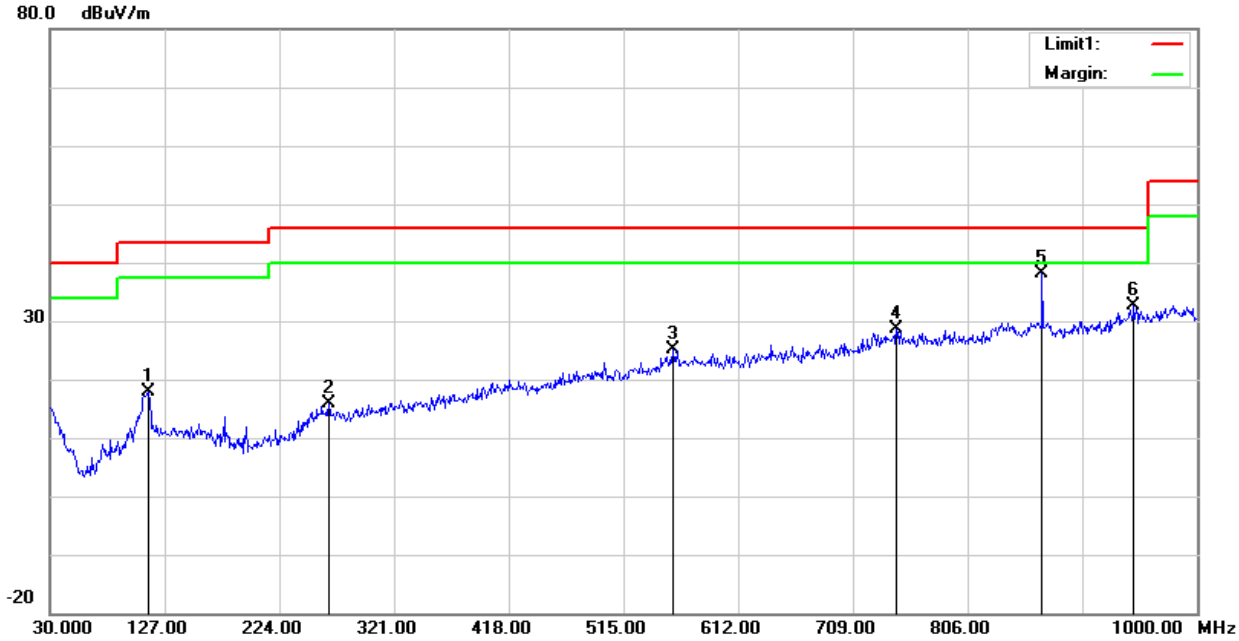


| | | | |
|---|---|---|---|
| Temperature: | 23.2(C) | Relative Humidtity: | 48%RH |
| Test Voltage: | DC 3.85V | Phase: | Vertical |
| Test Mode: | Mode 1/2/3/4/5/6/7/8/9/10/11/12 (Mode 1 worst mode) | | |

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 113.4200 | 36.73 | -18.73 | 18.00 | 43.50 | -25.50 | QP |
| 2 | 265.7100 | 30.72 | -14.83 | 15.89 | 46.00 | -30.11 | QP |
| 3 | 556.7100 | 30.83 | -5.58 | 25.25 | 46.00 | -20.75 | QP |
| 4 | 745.8600 | 30.77 | -2.14 | 28.63 | 46.00 | -17.37 | QP |
| 5 | 869.0500 | 38.61 | -0.52 | 38.09 | 46.00 | -7.91 | QP |
| 6 | 946.6500 | 31.13 | 1.52 | 32.65 | 46.00 | -13.35 | QP |

Remark:.

1. Margin = Result (Result =Reading + Factor )–Limit



(1000MHz-25GHz) Spurious emission Requirements

# 802.11 b

| Frequency | Meter Reading | Amplifier | Loss | Antenna Factor | Orrected Factor | Emission Level | Limits | Margin | Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | （dB） | （dB） | （dB/m） | （dB） | (dBμV/m) | (dBμV/m) | (dB) | Type | |
| Low Channel (802.11b/2412 MHz) | | | | | | | | | | |
| 3264.80 | 60.98 | 44.70 | 6.70 | 28.20 | -9.80 | 51.18 | 74.00 | -22.82 | PK | Vertical |
| 3264.80 | 50.83 | 44.70 | 6.70 | 28.20 | -9.80 | 41.03 | 54.00 | -12.97 | AV | Vertical |
| 3264.63 | 60.87 | 44.70 | 6.70 | 28.20 | -9.80 | 51.07 | 74.00 | -22.93 | PK | Horizontal |
| 3264.63 | 51.00 | 44.70 | 6.70 | 28.20 | -9.80 | 41.20 | 54.00 | -12.80 | AV | Horizontal |
| 4824.40 | 58.36 | 44.20 | 9.04 | 31.60 | -3.56 | 54.80 | 74.00 | -19.20 | PK | Vertical |
| 4824.40 | 50.59 | 44.20 | 9.04 | 31.60 | -3.56 | 47.03 | 54.00 | -6.97 | AV | Vertical |
| 4824.38 | 59.49 | 44.20 | 9.04 | 31.60 | -3.56 | 55.93 | 74.00 | -18.07 | PK | Horizontal |
| 4824.38 | 49.76 | 44.20 | 9.04 | 31.60 | -3.56 | 46.20 | 54.00 | -7.80 | AV | Horizontal |
| 5359.87 | 49.41 | 44.20 | 9.86 | 32.00 | -2.34 | 47.07 | 74.00 | -26.93 | PK | Vertical |
| 5359.87 | 39.32 | 44.20 | 9.86 | 32.00 | -2.34 | 36.98 | 54.00 | -17.02 | AV | Vertical |
| 5359.71 | 47.70 | 44.20 | 9.86 | 32.00 | -2.34 | 45.36 | 74.00 | -28.64 | PK | Horizontal |
| 5359.71 | 39.30 | 44.20 | 9.86 | 32.00 | -2.34 | 36.96 | 54.00 | -17.04 | AV | Horizontal |
| 7235.82 | 54.34 | 43.50 | 11.40 | 35.50 | 3.40 | 57.74 | 74.00 | -16.26 | PK | Vertical |
| 7235.82 | 44.69 | 43.50 | 11.40 | 35.50 | 3.40 | 48.09 | 54.00 | -5.91 | AV | Vertical |
| 7235.91 | 54.05 | 43.50 | 11.40 | 35.50 | 3.40 | 57.45 | 74.00 | -16.55 | PK | Horizontal |
| 7235.78 | 44.38 | 43.50 | 11.40 | 35.50 | 3.40 | 47.78 | 54.00 | -6.22 | AV | Horizontal |
| Middle Channel (802.11b/2437 MHz) | | | | | | | | | | |
| 3264.62 | 61.63 | 44.70 | 6.70 | 28.20 | -9.80 | 51.83 | 74.00 | -22.17 | PK | Vertical |
| 3264.62 | 51.45 | 44.70 | 6.70 | 28.20 | -9.80 | 41.65 | 54.00 | -12.35 | AV | Vertical |
| 3264.70 | 61.31 | 44.70 | 6.70 | 28.20 | -9.80 | 51.51 | 74.00 | -22.49 | PK | Horizontal |
| 3264.70 | 49.99 | 44.70 | 6.70 | 28.20 | -9.80 | 40.19 | 54.00 | -13.81 | AV | Horizontal |
| 4874.52 | 59.25 | 44.20 | 9.04 | 31.60 | -3.56 | 55.69 | 74.00 | -18.31 | PK | Vertical |
| 4874.52 | 49.27 | 44.20 | 9.04 | 31.60 | -3.56 | 45.71 | 54.00 | -8.29 | AV | Vertical |
| 4874.56 | 59.62 | 44.20 | 9.04 | 31.60 | -3.56 | 56.06 | 74.00 | -17.94 | PK | Horizontal |
| 4874.56 | 50.47 | 44.20 | 9.04 | 31.60 | -3.56 | 46.91 | 54.00 | -7.09 | AV | Horizontal |
| 5359.73 | 48.35 | 44.20 | 9.86 | 32.00 | -2.34 | 46.01 | 74.00 | -27.99 | PK | Vertical |
| 5359.73 | 39.93 | 44.20 | 9.86 | 32.00 | -2.34 | 37.58 | 54.00 | -16.42 | AV | Vertical |
| 5359.74 | 47.29 | 44.20 | 9.86 | 32.00 | -2.34 | 44.94 | 74.00 | -29.06 | PK | Horizontal |
| 5359.74 | 39.03 | 44.20 | 9.86 | 32.00 | -2.34 | 36.68 | 54.00 | -17.32 | AV | Horizontal |
| 7310.79 | 53.66 | 43.50 | 11.40 | 35.50 | 3.40 | 57.06 | 74.00 | -16.94 | PK | Vertical |
| 7310.79 | 43.63 | 43.50 | 11.40 | 35.50 | 3.40 | 47.03 | 54.00 | -6.97 | AV | Vertical |
| 7310.85 | 53.64 | 43.50 | 11.40 | 35.50 | 3.40 | 57.04 | 74.00 | -16.96 | PK | Horizontal |
| 7310.85 | 44.06 | 43.50 | 11.40 | 35.50 | 3.40 | 47.46 | 54.00 | -6.54 | AV | Horizontal |

| High Channel (802.11b/2462 MHz) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3264.79 | 61.19 | 44.70 | 6.70 | 28.20 | -9.80 | 51.39 | 74.00 | -22.61 | PK | Vertical |
| 3264.79 | 51.67 | 44.70 | 6.70 | 28.20 | -9.80 | 41.87 | 54.00 | -12.13 | AV | Vertical |
| 3264.64 | 61.93 | 44.70 | 6.70 | 28.20 | -9.80 | 52.13 | 74.00 | -21.87 | PK | Horizontal |
| 3264.64 | 50.10 | 44.70 | 6.70 | 28.20 | -9.80 | 40.30 | 54.00 | -13.70 | AV | Horizontal |
| 4924.48 | 58.20 | 44.20 | 9.04 | 31.60 | -3.56 | 54.64 | 74.00 | -19.36 | PK | Vertical |
| 4924.48 | 49.80 | 44.20 | 9.04 | 31.60 | -3.56 | 46.24 | 54.00 | -7.76 | AV | Vertical |
| 4924.43 | 58.94 | 44.20 | 9.04 | 31.60 | -3.56 | 55.38 | 74.00 | -18.62 | PK | Horizontal |
| 4924.43 | 49.19 | 44.20 | 9.04 | 31.60 | -3.56 | 45.63 | 54.00 | -8.37 | AV | Horizontal |
| 5359.73 | 49.31 | 44.20 | 9.86 | 32.00 | -2.34 | 46.97 | 74.00 | -27.03 | PK | Vertical |
| 5359.73 | 40.29 | 44.20 | 9.86 | 32.00 | -2.34 | 37.95 | 54.00 | -16.05 | AV | Vertical |
| 5359.67 | 48.02 | 44.20 | 9.86 | 32.00 | -2.34 | 45.68 | 74.00 | -28.32 | PK | Horizontal |
| 5359.67 | 39.14 | 44.20 | 9.86 | 32.00 | -2.34 | 36.80 | 54.00 | -17.20 | AV | Horizontal |
| 7385.96 | 53.55 | 43.50 | 11.40 | 35.50 | 3.40 | 56.95 | 74.00 | -17.05 | PK | Vertical |
| 7385.96 | 43.98 | 43.50 | 11.40 | 35.50 | 3.40 | 47.38 | 54.00 | -6.62 | AV | Vertical |
| 7385.86 | 53.97 | 43.50 | 11.40 | 35.50 | 3.40 | 57.37 | 74.00 | -16.63 | PK | Horizontal |
| 7385.86 | 44.93 | 43.50 | 11.40 | 35.50 | 3.40 | 48.33 | 54.00 | -5.67 | AV | Horizontal |

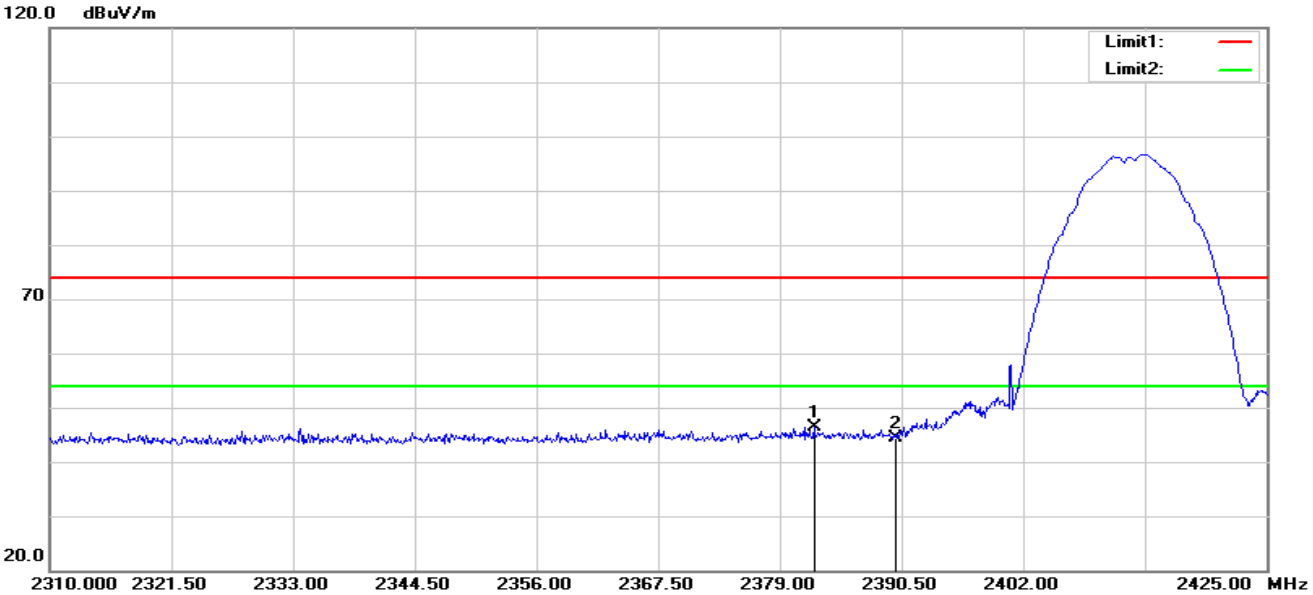
Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Scan with 802.11b, 802.11g, 802.11n (HT-20), 802.11n (HT-40) the worst case is 802.11 b.
   Emission Level = Reading + Factor
   Margin = Limit - Emission Level
3. The frequency emission of peak pointsthat did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

3.2.6 TEST RESULTS(Band edge Requirements)

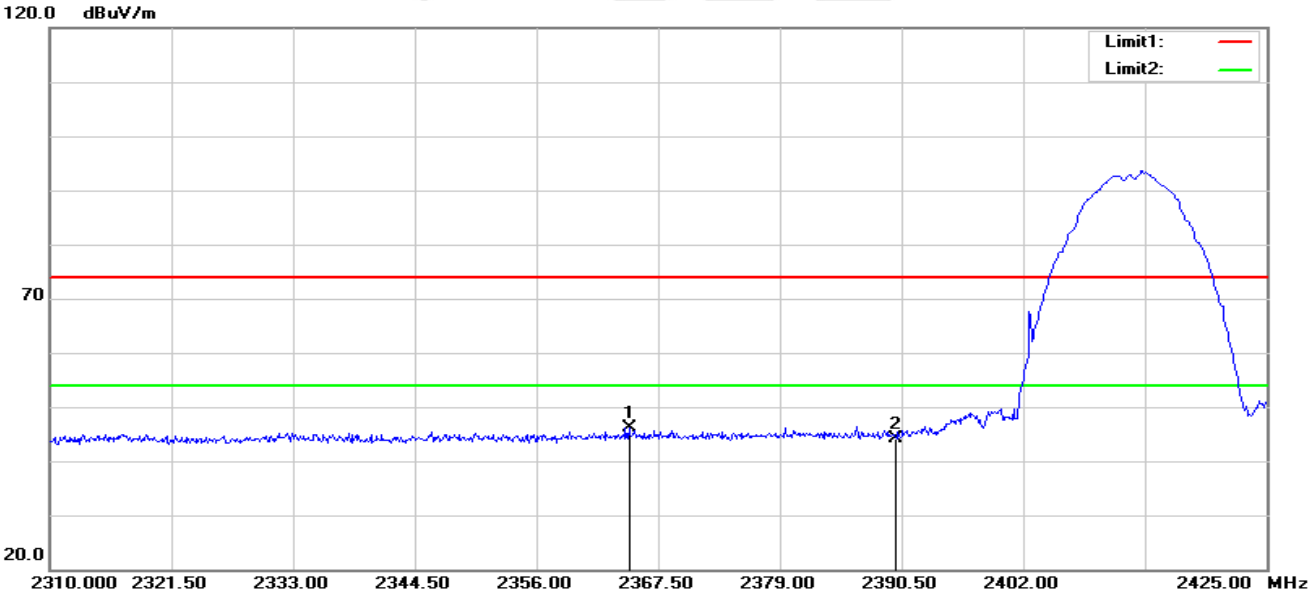
**802.11 b-Low**

Horizontal




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2382.220 | 42.25 | 4.22 | 46.47 | 74.00 | -27.53 | peak |
| 2 | 2390.000 | 40.11 | 4.34 | 44.45 | 74.00 | -29.55 | peak |

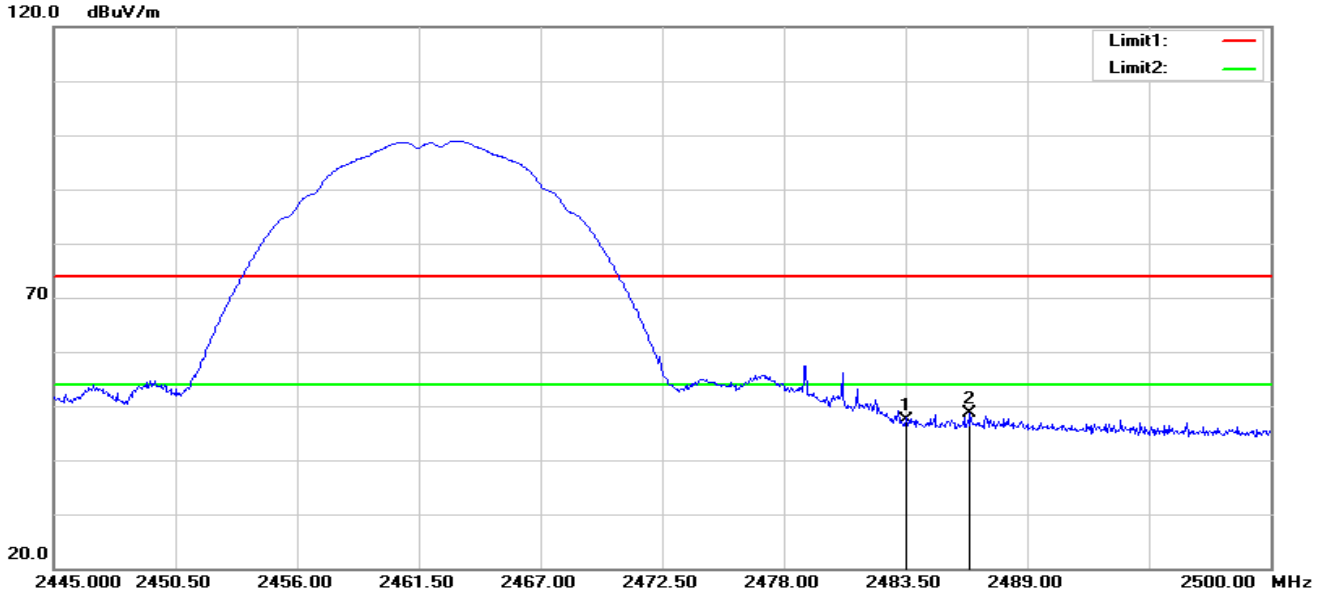
Vertical




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2364.740 | 42.08 | 3.96 | 46.04 | 74.00 | -27.96 | peak |
| 2 | 2390.000 | 39.79 | 4.34 | 44.13 | 74.00 | -29.87 | peak |

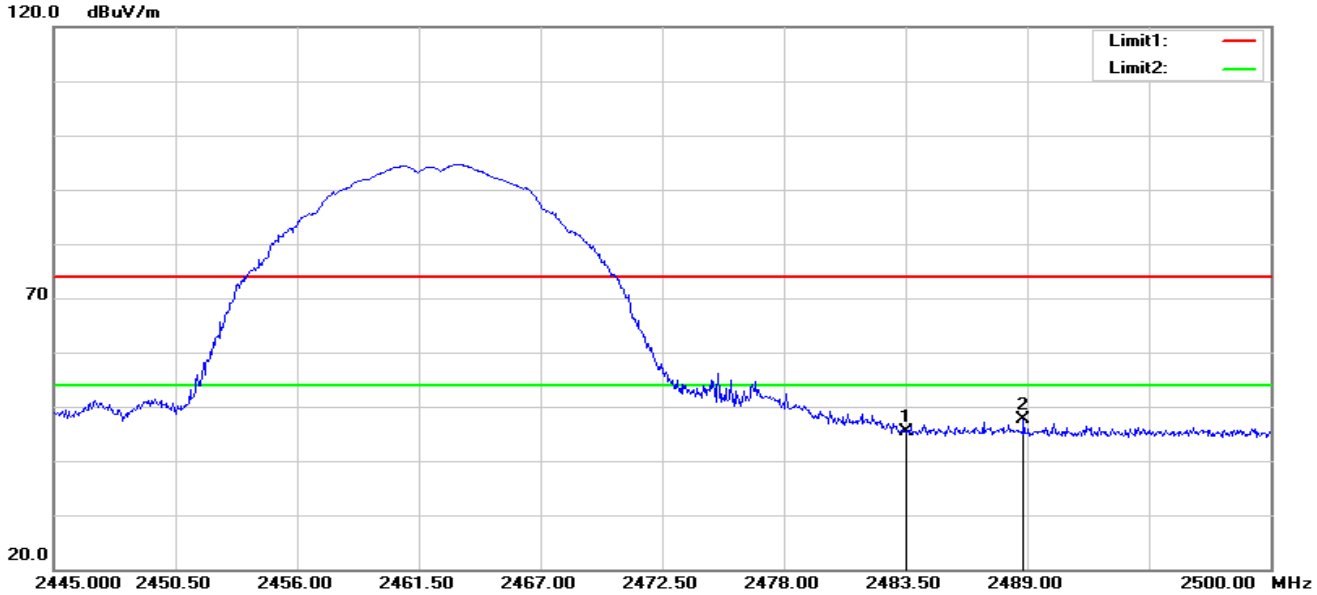
**802.11 b-High**

Horizontal




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 42.69 | 4.60 | 47.29 | 74.00 | -26.71 | peak |
| 2 | 2486.415 | 43.98 | 4.61 | 48.59 | 74.00 | -25.41 | peak |

Vertical




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 40.67 | 4.60 | 45.27 | 74.00 | -28.73 | peak |
| 2 | 2488.835 | 42.97 | 4.62 | 47.59 | 74.00 | -26.41 | peak |

Note: 802.11b, 802.11g, 802.11n (HT-20), 802.11n (HT-40) mode all have been tested, the worst case is 802.11 b, only show the worst case.

# 4.CONDUCTED SPURIOUS & BAND EDGE EMISSION

## 4.1 LIMIT

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

## 4.2 TEST PROCEDURE

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Start/Stop Frequency | 30 MHz to 10th carrier harmonic |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

.

For Band edge

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Start/Stop Frequency | Lower Band Edge: 2300 to 2432 MHz<br>Upper Band Edge: 2442 to 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

## 4.3DEVIATION FROM STANDARD

No deviation.

## 4.4 TEST SETUP

The EUT which is powered by the Battery, is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

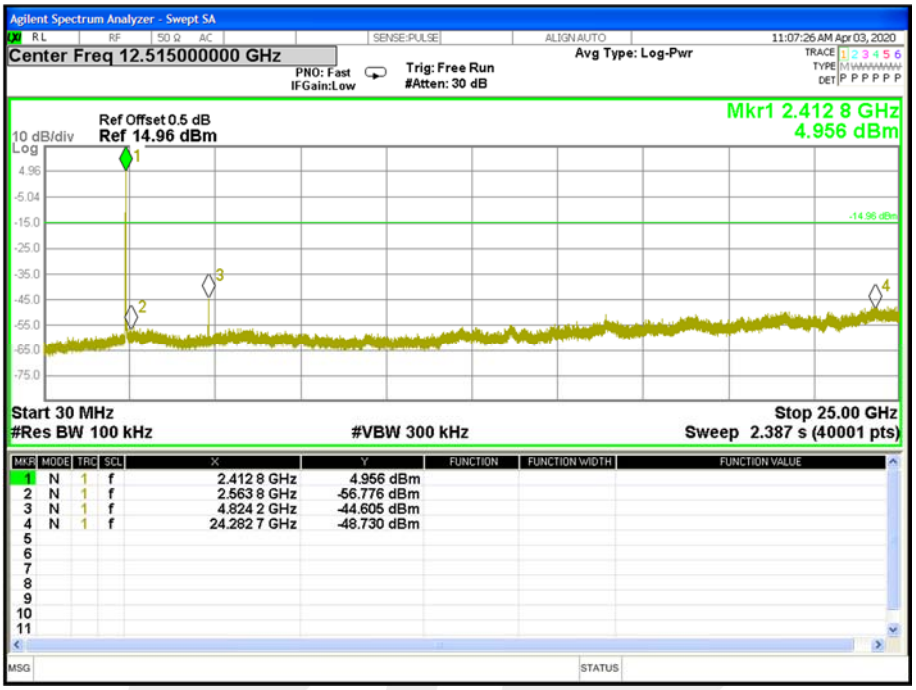
## 4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

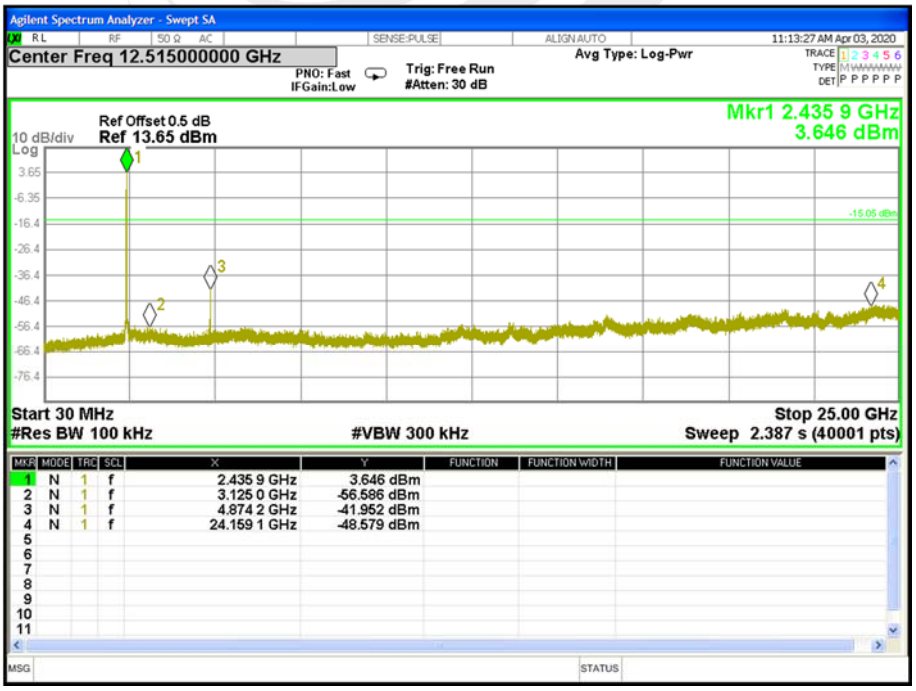
## 4.6 TEST RESULTS

| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX b Mode /CH01, CH06, CH11 |

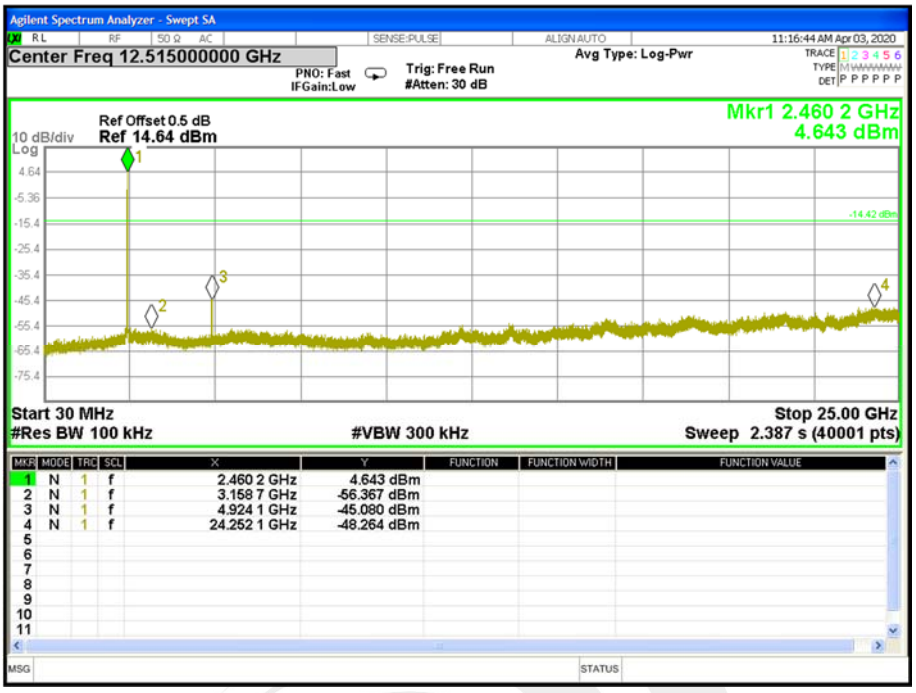
CH 01




CH 06

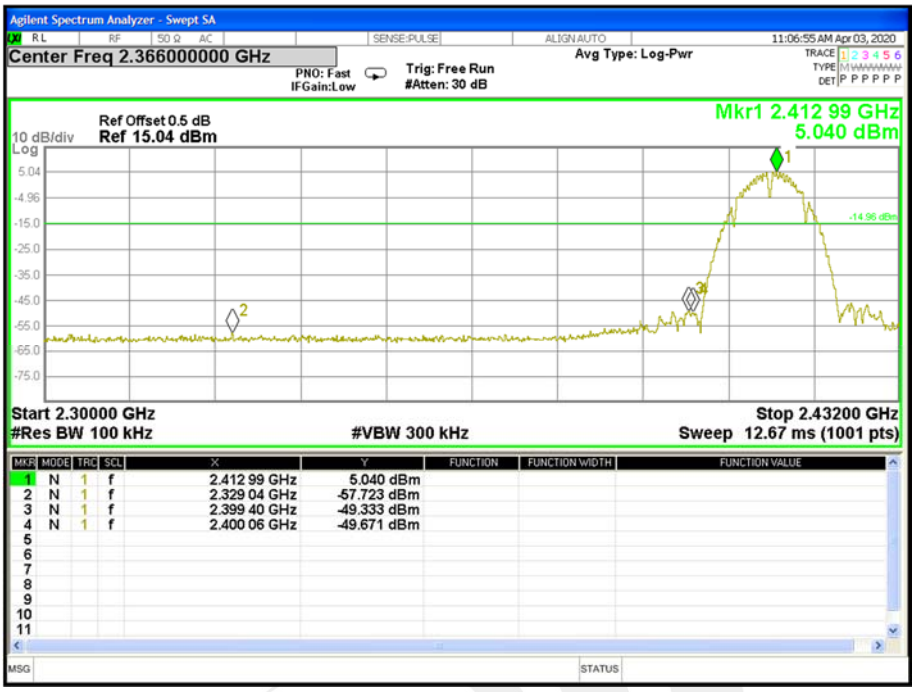


CH 11


Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:16:44 AM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 14.64 dBm
Mkr1 2.460 2 GHz
4.643 dBm
-14.42 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.460 2 GHz 4.643 dBm
2 N 1 f 3.158 7 GHz -56.367 dBm
3 N 1 f 4.924 1 GHz -45.080 dBm
4 N 1 f 24.252 1 GHz -48.264 dBm

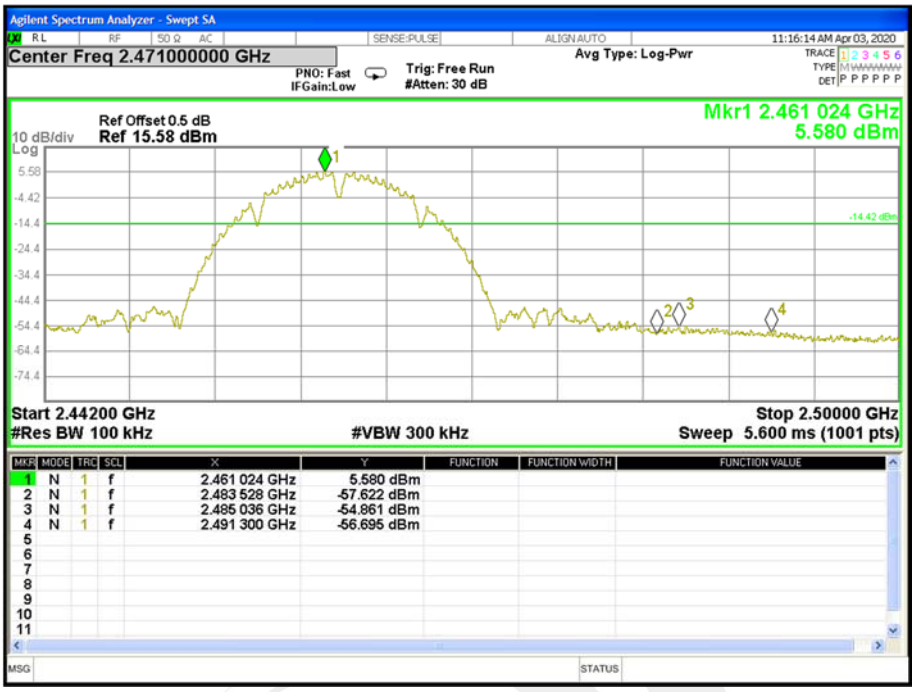
Band edge(it's also the reference level for conducted spurious emission)

CH 01



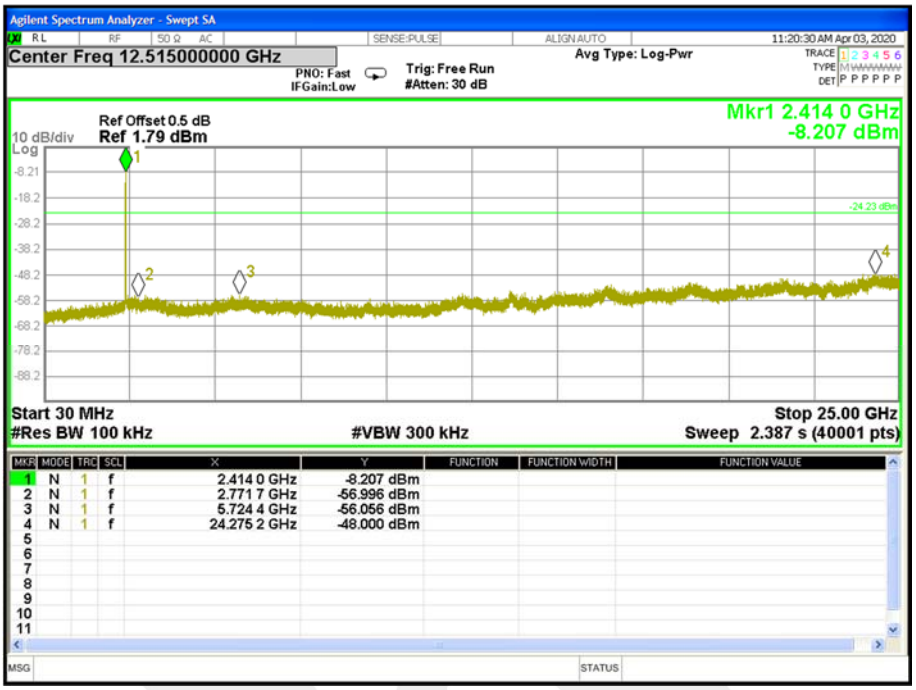

CH 06

CH 11

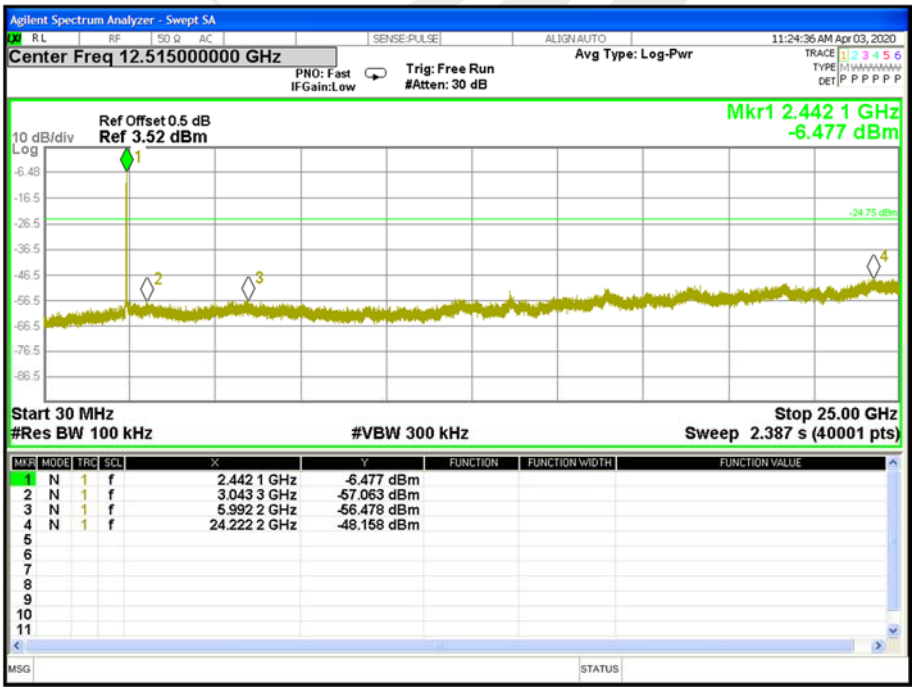

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:16:14 AM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 15.58 dBm
Mkr1 2.461 024 GHz
5.580 dBm
-14.42 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.600 ms (1001 pts)
1 N 1 f 2.461 024 GHz 5.580 dBm
2 N 1 f 2.483 528 GHz -57.622 dBm
3 N 1 f 2.485 036 GHz -54.861 dBm
4 N 1 f 2.491 300 GHz -56.695 dBm

| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX g Mode /CH01, CH06, CH11 |

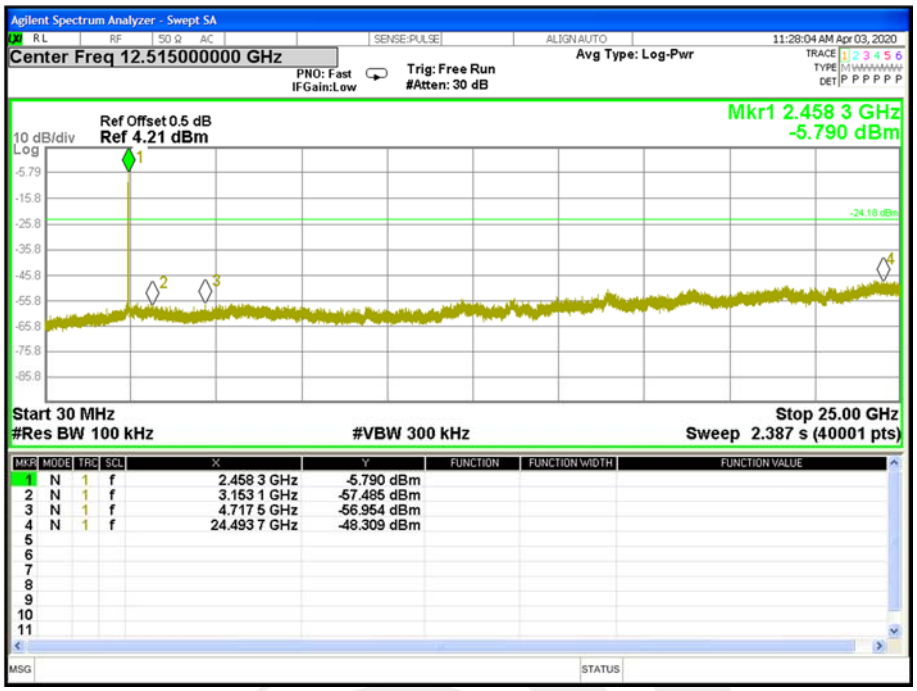
CH 01




CH06

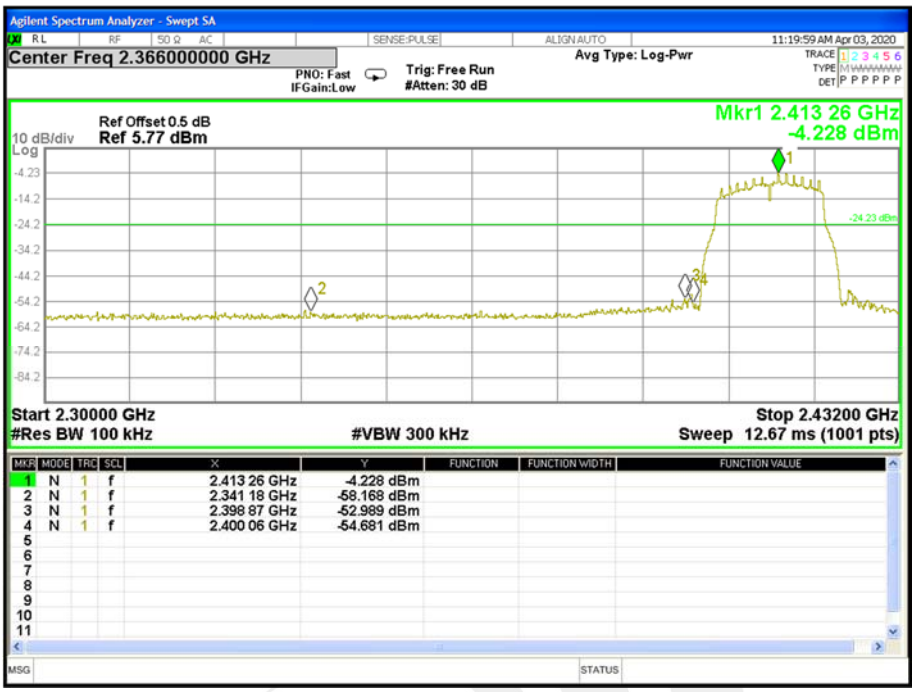


CH 11

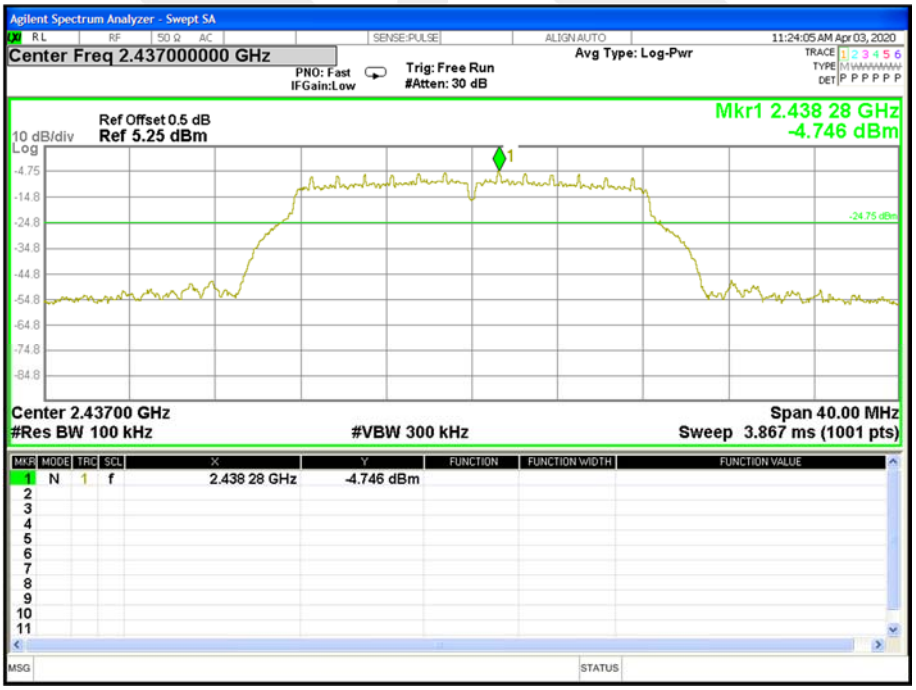

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:28:04 AM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 4.21 dBm
Mkr1 2.458 3 GHz
-5.790 dBm
-24.18 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.458 3 GHz -5.790 dBm
2 N 1 f 3.153 1 GHz -57.485 dBm
3 N 1 f 4.717 5 GHz -56.954 dBm
4 N 1 f 24.493 7 GHz -48.309 dBm

Band edge(it's also the reference level for conducted spurious emission)

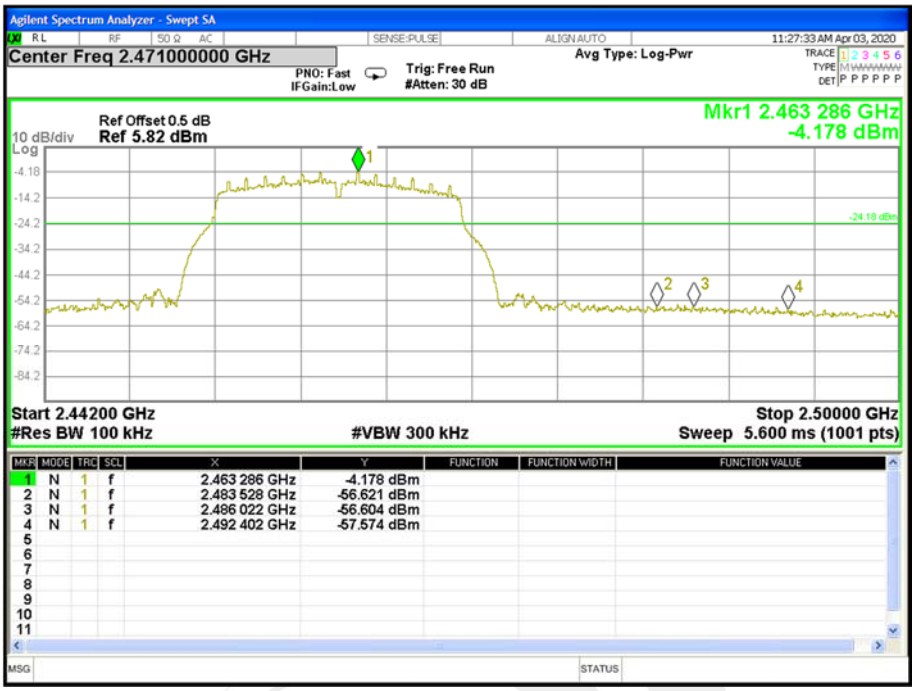
CH 01




CH06

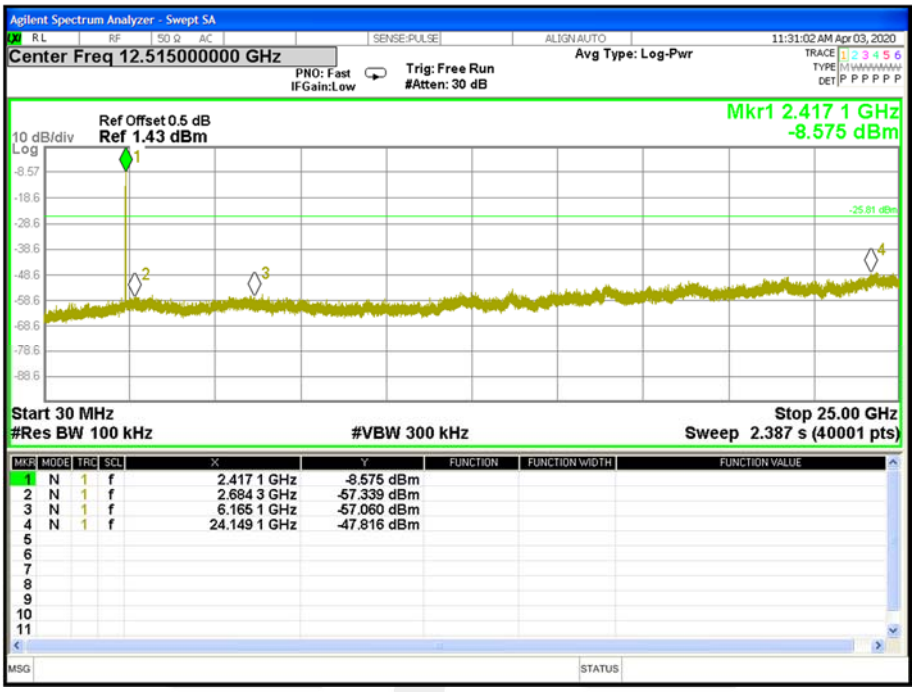


CH11

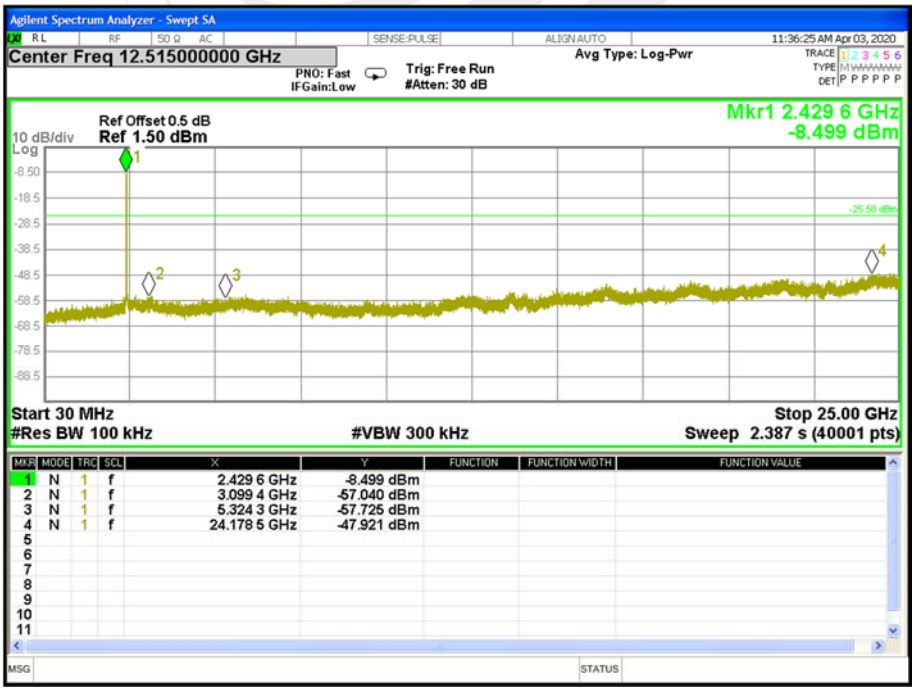

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:27:33 AM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 5.82 dBm
Mkr1 2.463 286 GHz
-4.178 dBm
-24.18 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.600 ms (1001 pts)
1 N 1 f 2.463 286 GHz -4.178 dBm
2 N 1 f 2.483 528 GHz -56.621 dBm
3 N 1 f 2.486 022 GHz -56.604 dBm
4 N 1 f 2.492 402 GHz -57.574 dBm

| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX n Mode(20M) /CH01, CH06, CH11 |

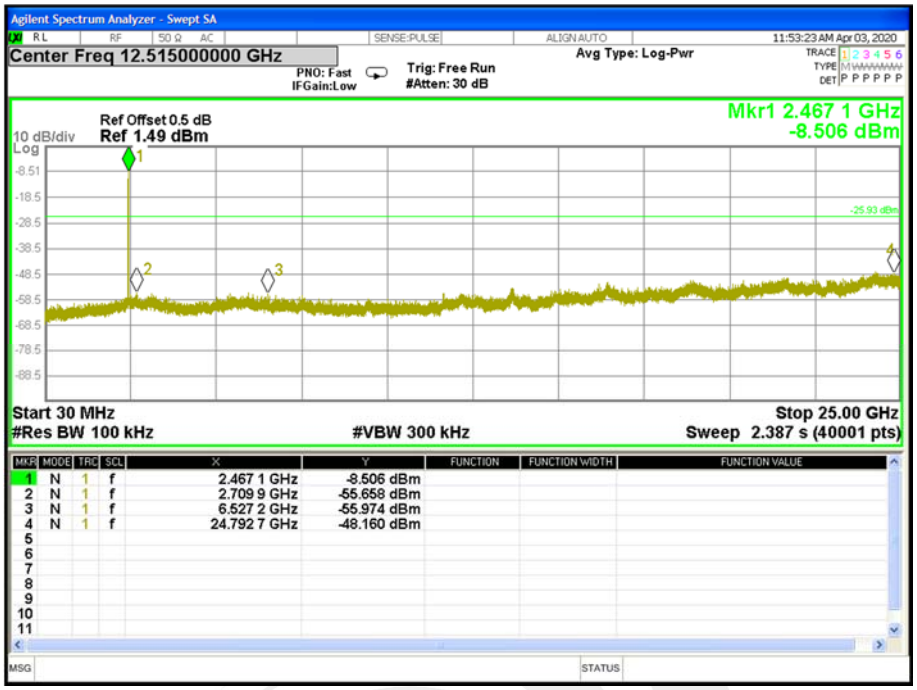
CH 01




CH 06

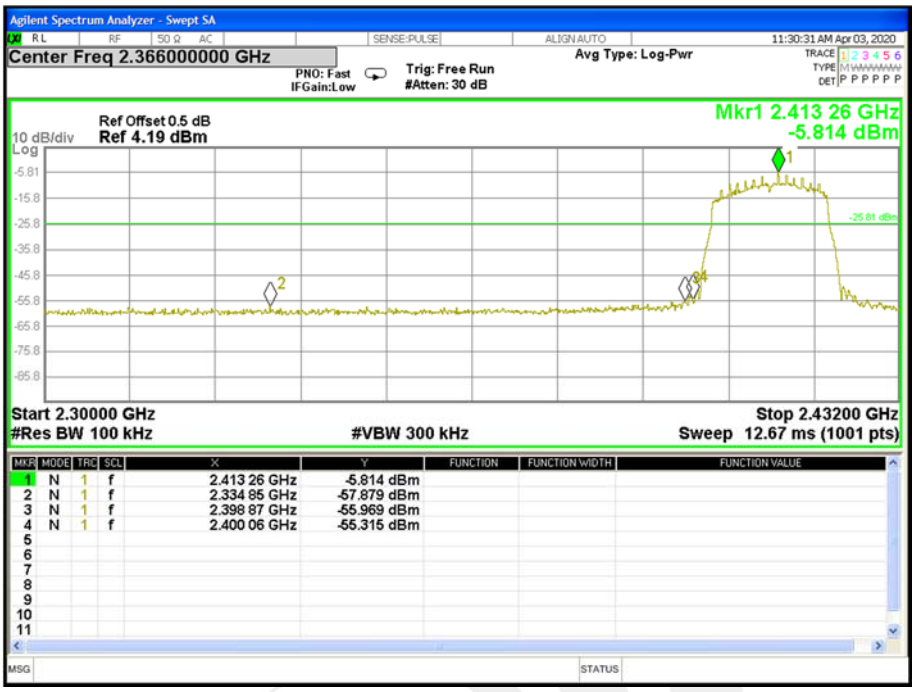


CH 11


Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:53:23 AM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 1.49 dBm
Log
Mkr1 2.467 1 GHz
-8.506 dBm
-25.93 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.467 1 GHz -8.506 dBm
2 N 1 f 2.709 9 GHz -55.658 dBm
3 N 1 f 6.527 2 GHz -55.974 dBm
4 N 1 f 24.792 7 GHz -48.160 dBm

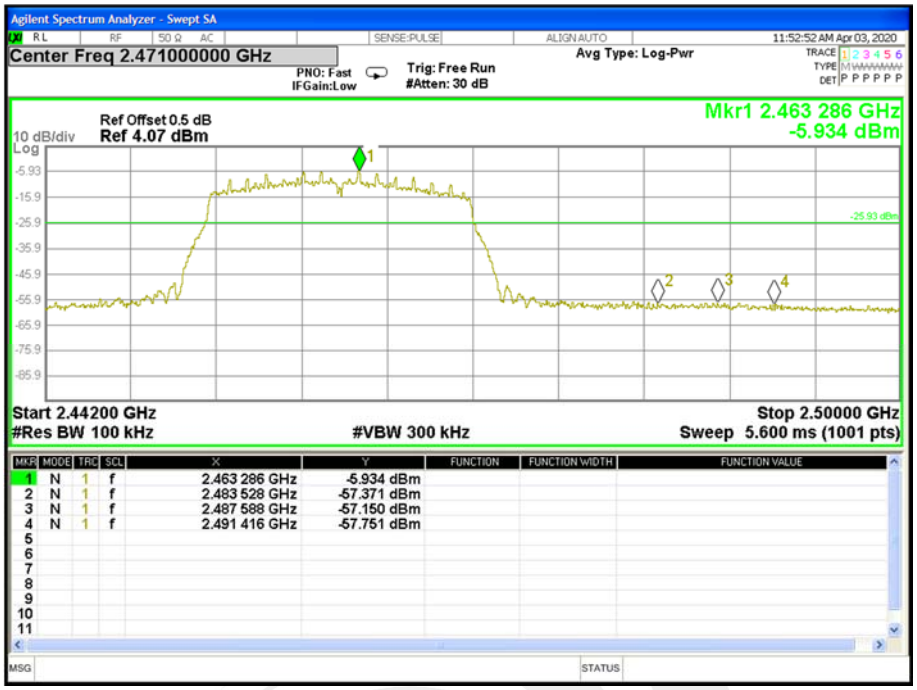
Band edge(it's also the reference level for conducted spurious emission)

CH 01



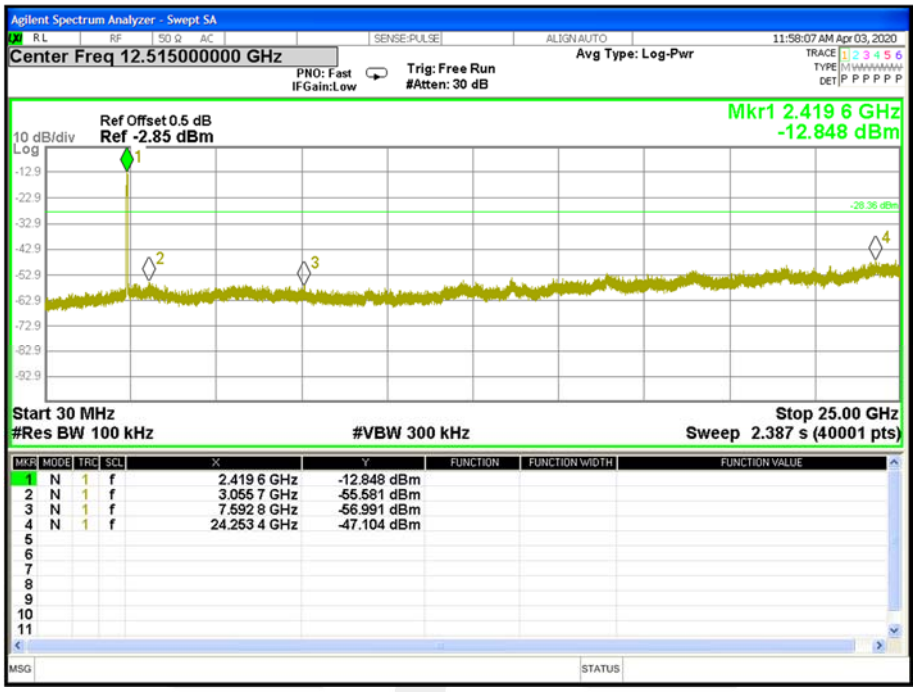

CH 06

CH 11

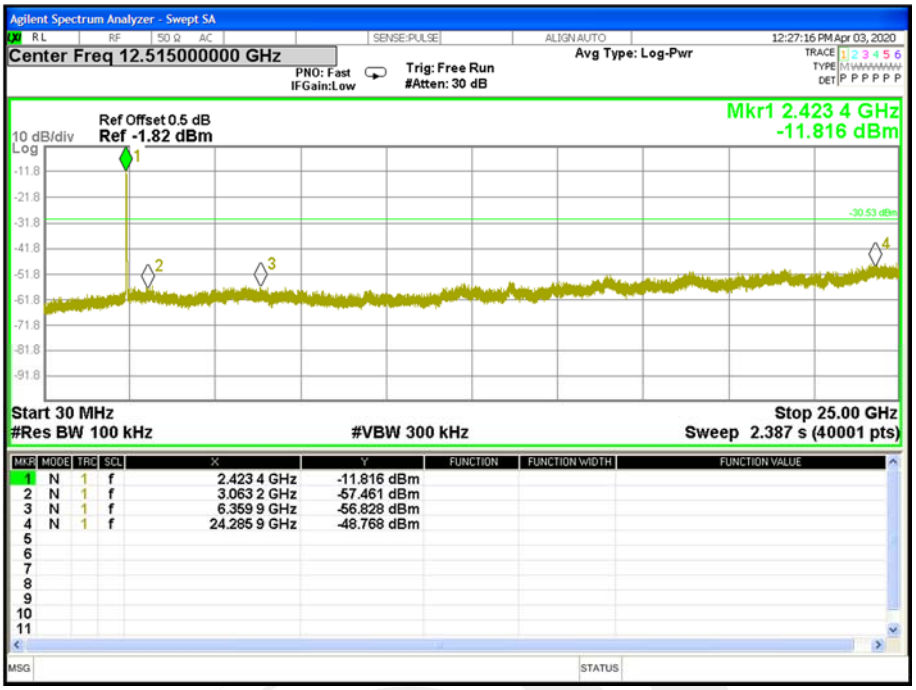

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.471000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
11:52:52 AM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 4.07 dBm
Mkr1 2.463 286 GHz
-5.934 dBm
-25.93 dBm
Start 2.44200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 5.600 ms (1001 pts)
1 N 1 f 2.463 286 GHz -5.934 dBm
2 N 1 f 2.483 528 GHz -57.371 dBm
3 N 1 f 2.487 588 GHz -57.150 dBm
4 N 1 f 2.491 416 GHz -57.751 dBm

| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX n Mode(40M) /CH03, CH06, CH09 |

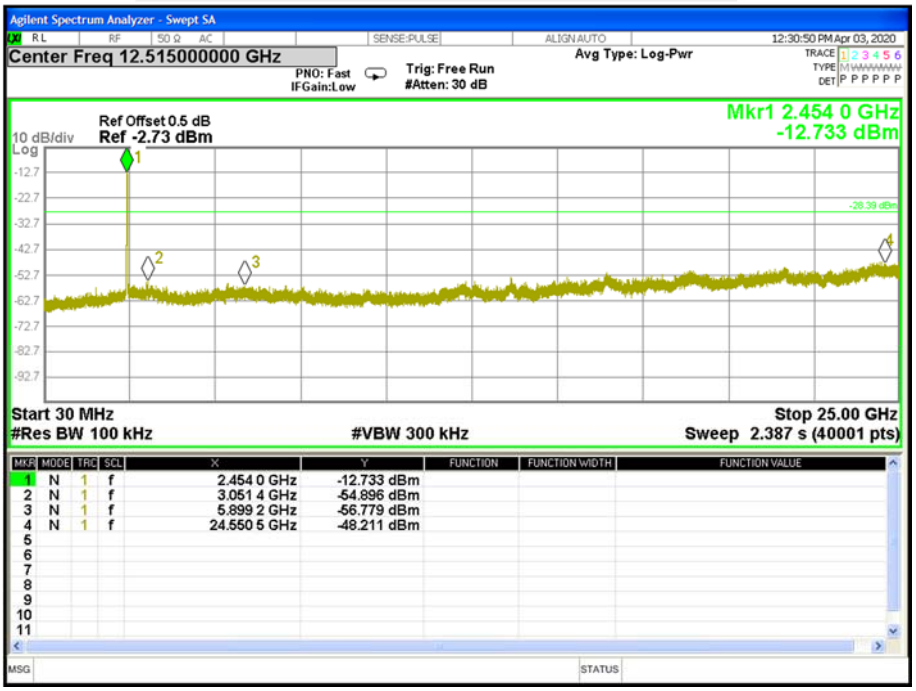
CH 03



CH06

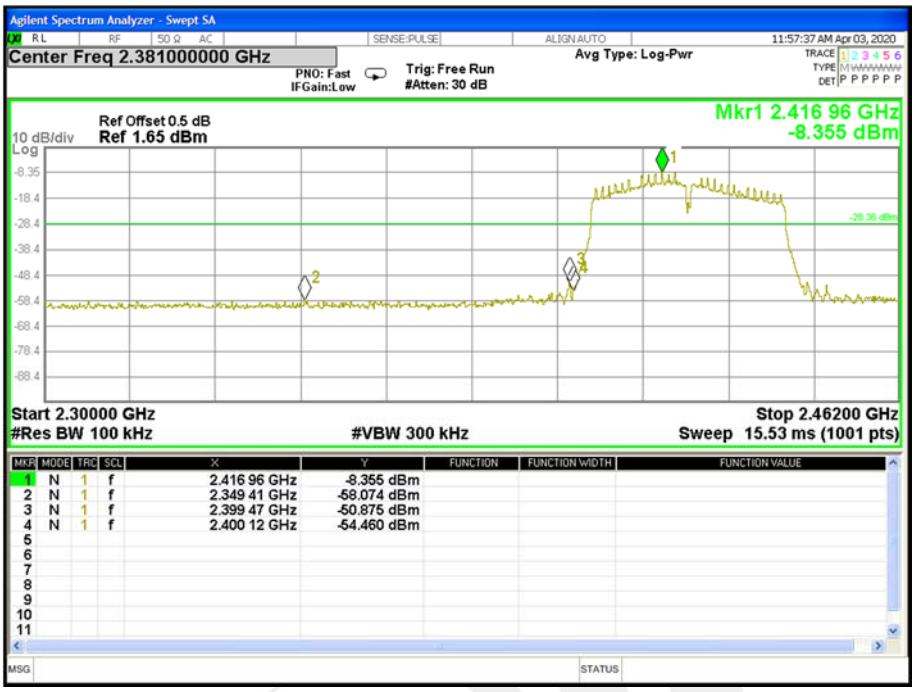

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
12:27:16 PM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref -1.82 dBm
Mkr1 2.423 4 GHz
-11.816 dBm
-30.53 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.423 4 GHz -11.816 dBm
2 N 1 f 3.063 2 GHz -57.461 dBm
3 N 1 f 6.359 9 GHz -56.828 dBm
4 N 1 f 24.285 9 GHz -48.768 dBm

CH09

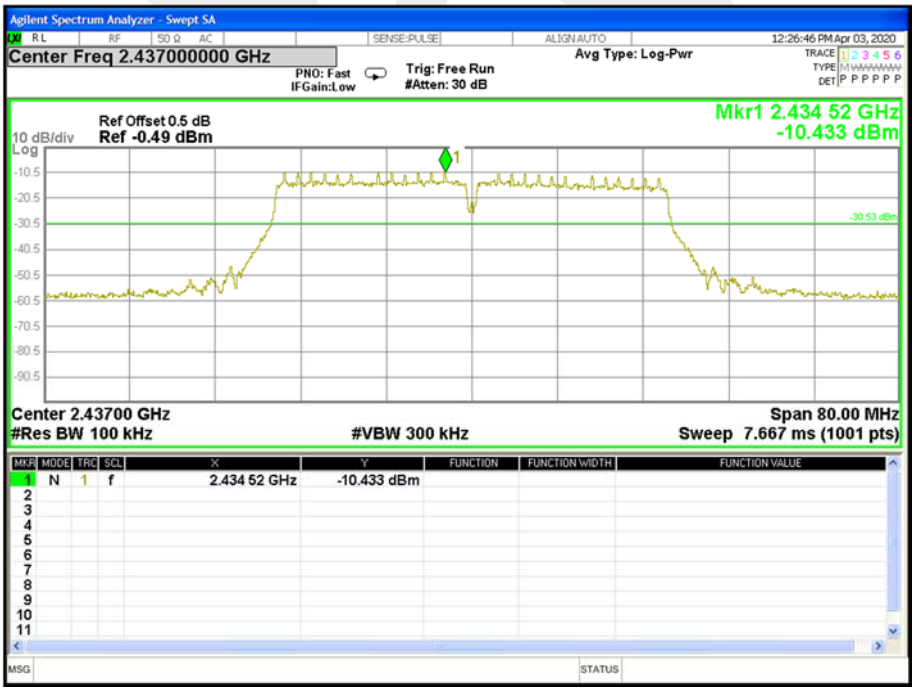

Agilent Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
12:30:50 PM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref -2.73 dBm
Mkr1 2.454 0 GHz
-12.733 dBm
-28.39 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (40001 pts)
1 N 1 f 2.454 0 GHz -12.733 dBm
2 N 1 f 3.051 4 GHz -54.896 dBm
3 N 1 f 5.899 2 GHz -56.779 dBm
4 N 1 f 24.550 5 GHz -48.211 dBm

Band edge(it's also the reference level for conducted spurious emission)

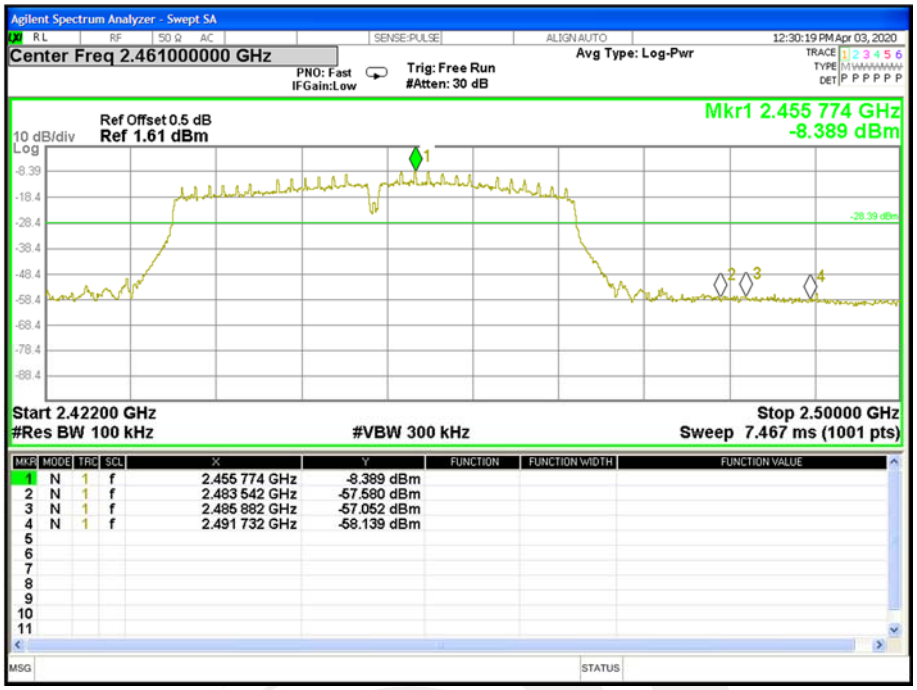
CH03




CH 06



CH 09


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.461000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
12:30:19 PM Apr 03, 2020
Ref Offset 0.5 dB
10 dB/div
Ref 1.61 dBm
Mkr1 2.455 774 GHz
-8.389 dBm
-28.39 dBm
Start 2.42200 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 7.467 ms (1001 pts)
1 N 1 f 2.455 774 GHz -8.389 dBm
2 N 1 f 2.483 542 GHz -57.580 dBm
3 N 1 f 2.485 882 GHz -57.052 dBm
4 N 1 f 2.491 732 GHz -58.139 dBm

# 5. POWER SPECTRAL DENSITY TEST

## 5.1 LIMIT

| FCC Part15.247 , Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(e) | Power Spectral Density | ≤8 dBm (RBW ≥3KHz) | 2400-2483.5 | PASS |

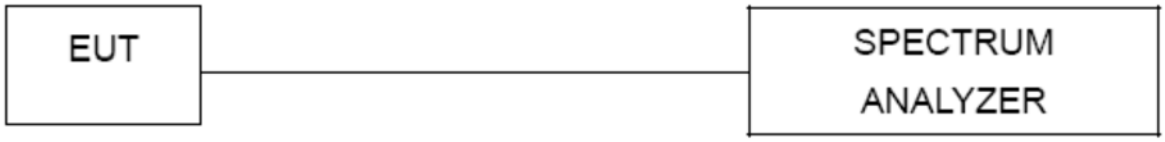
## 5.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the 100 kHz ≥ RBW ≥3 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.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

## 5.3 DEVIATION FROM STANDARD

No deviation.

## 5.4 TEST SETUP




## 5.5 EUT OPERATION CONDITIONS

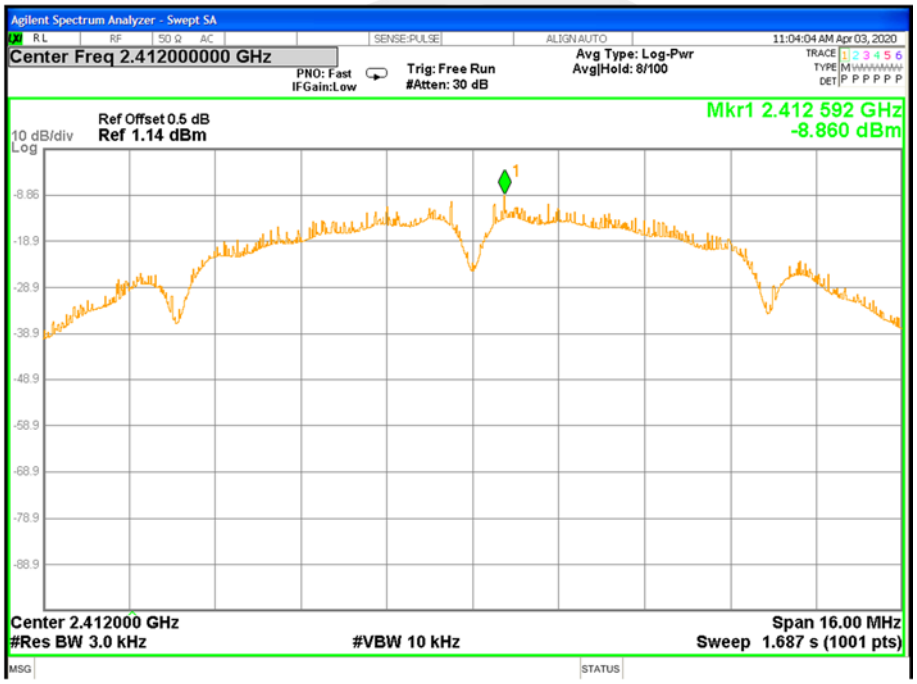
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

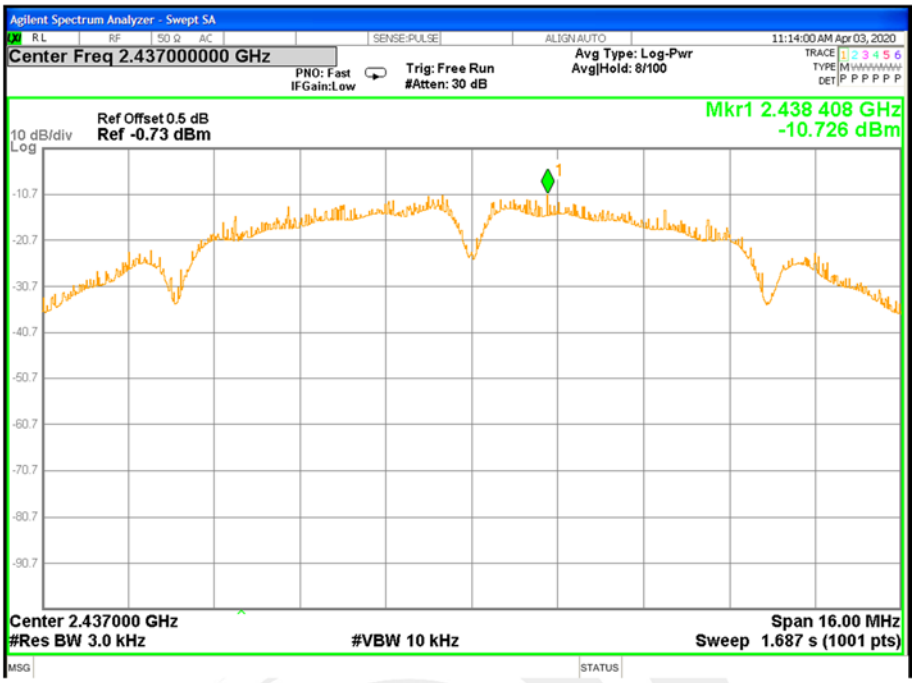
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX b Mode /CH01, CH06, CH11 |

| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3KHz) | Result |
|---|---|---|---|
| 2412 MHz | -8.86 | ≤8 | PASS |
| 2437 MHz | -10.726 | ≤8 | PASS |
| 2462 MHz | -9.721 | ≤8 | PASS |

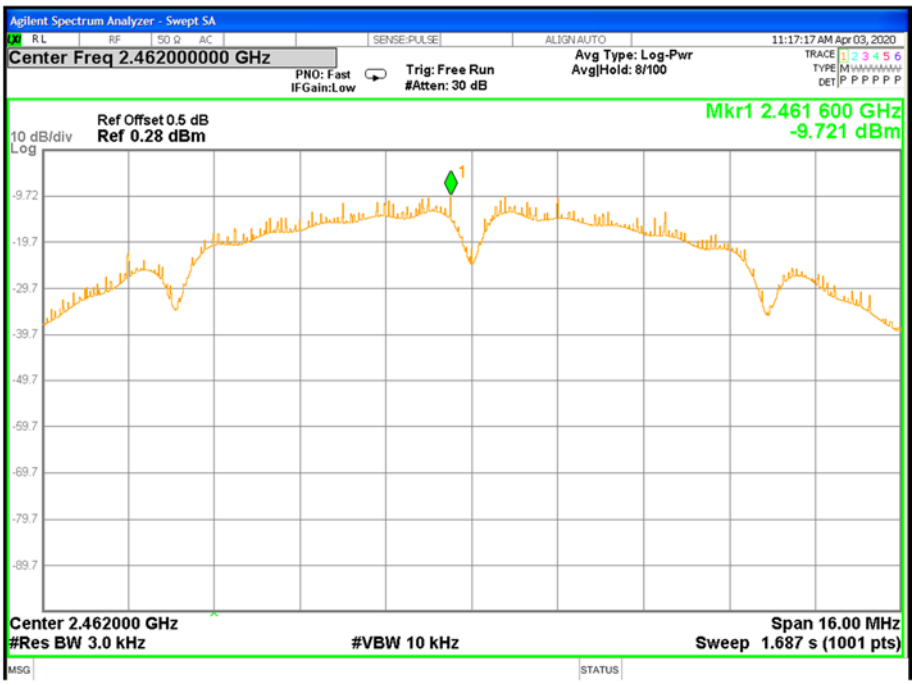
**TX CH01**



## TX CH06



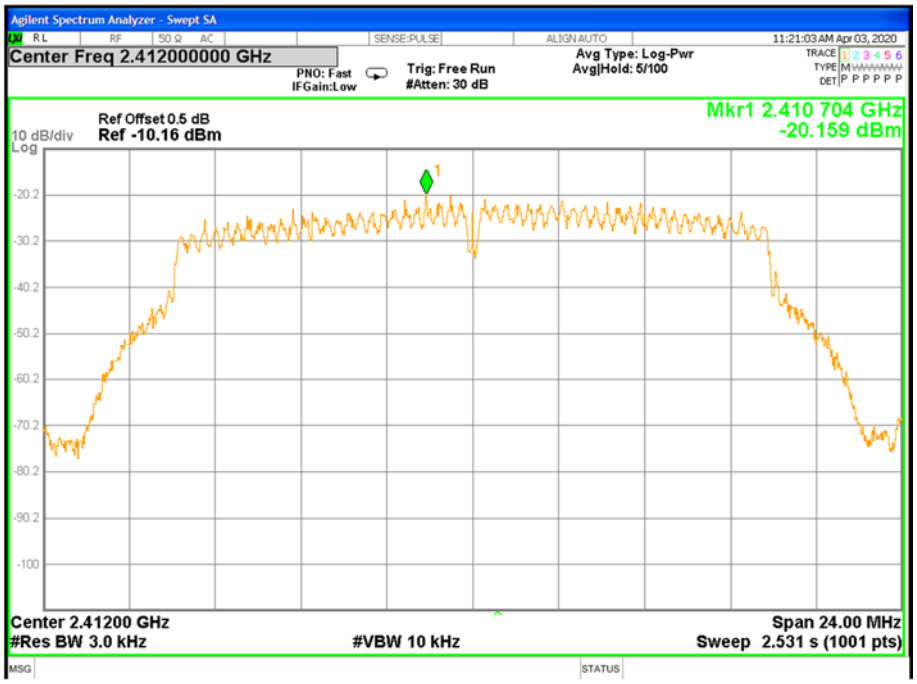

## TX CH11



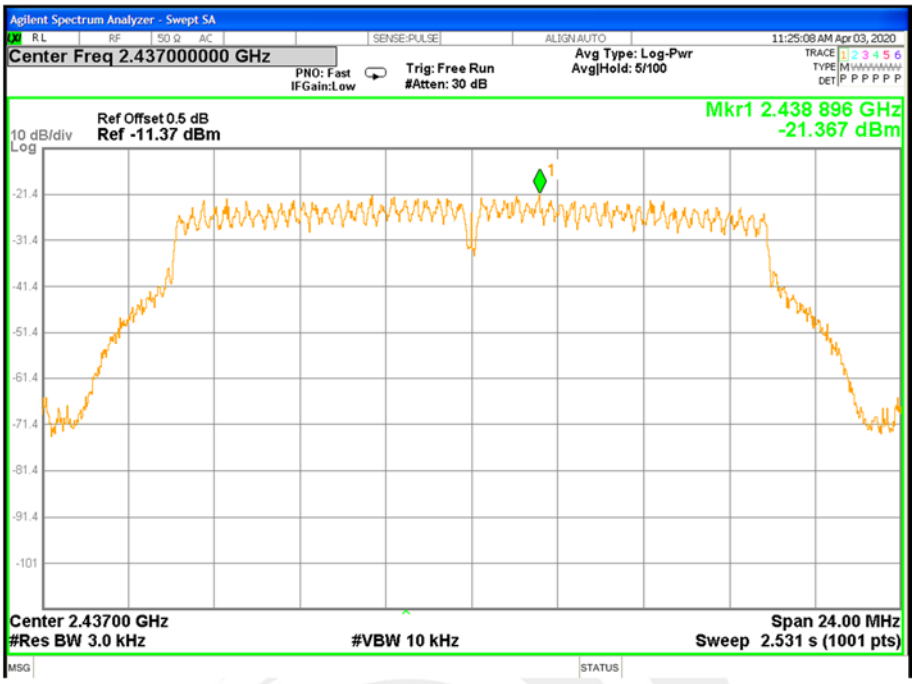
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX g Mode /CH01, CH06, CH11 |

| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3KHz) | Result |
|---|---|---|---|
| 2412 MHz | -20.159 | ≤8 | PASS |
| 2437 MHz | -21.367 | ≤8 | PASS |
| 2462 MHz | -20.483 | ≤8 | PASS |

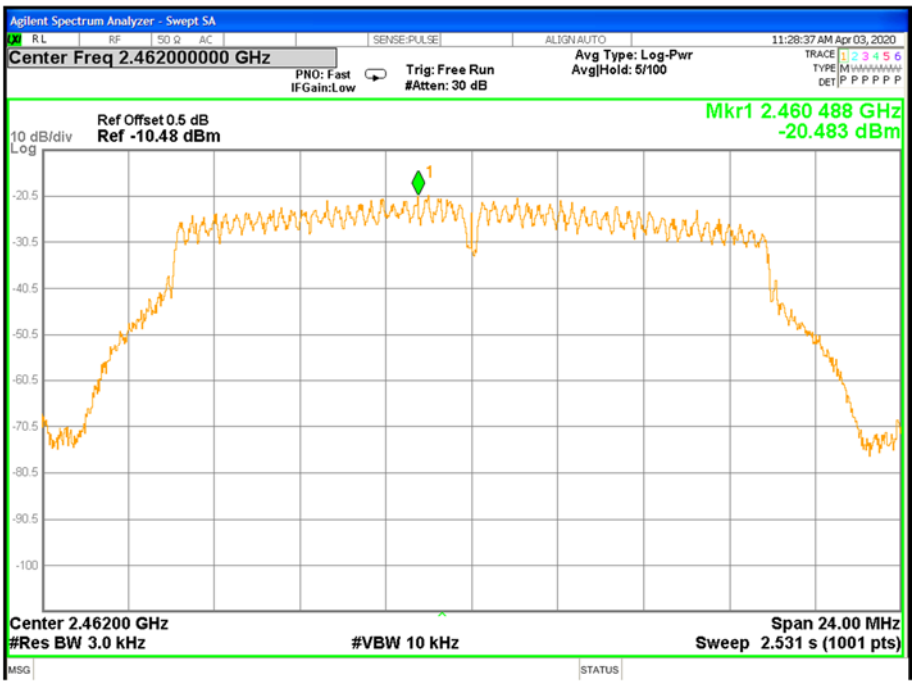
**TX CH01**



## TX CH06



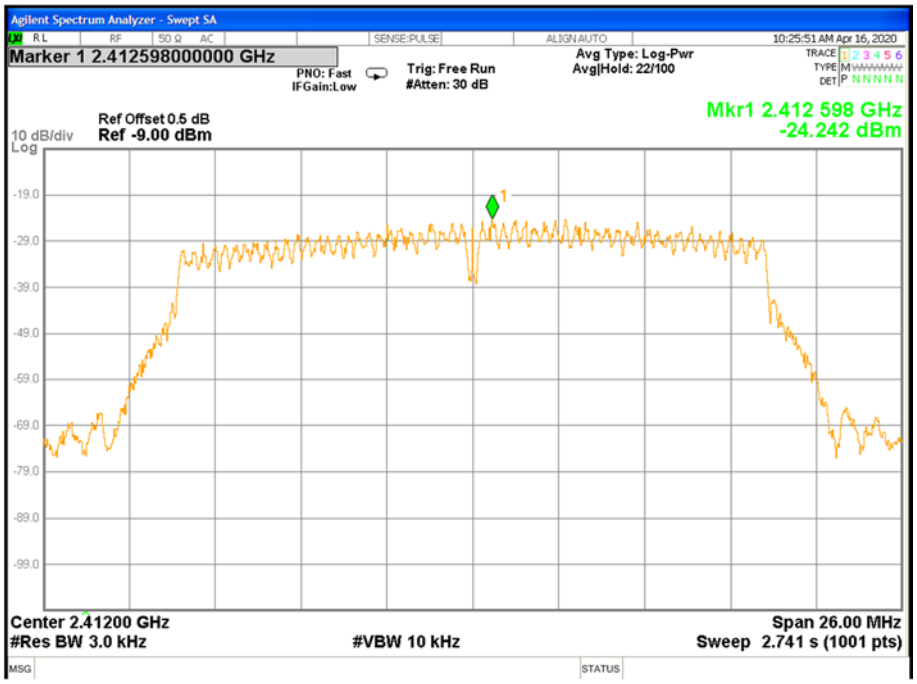

## TX CH11



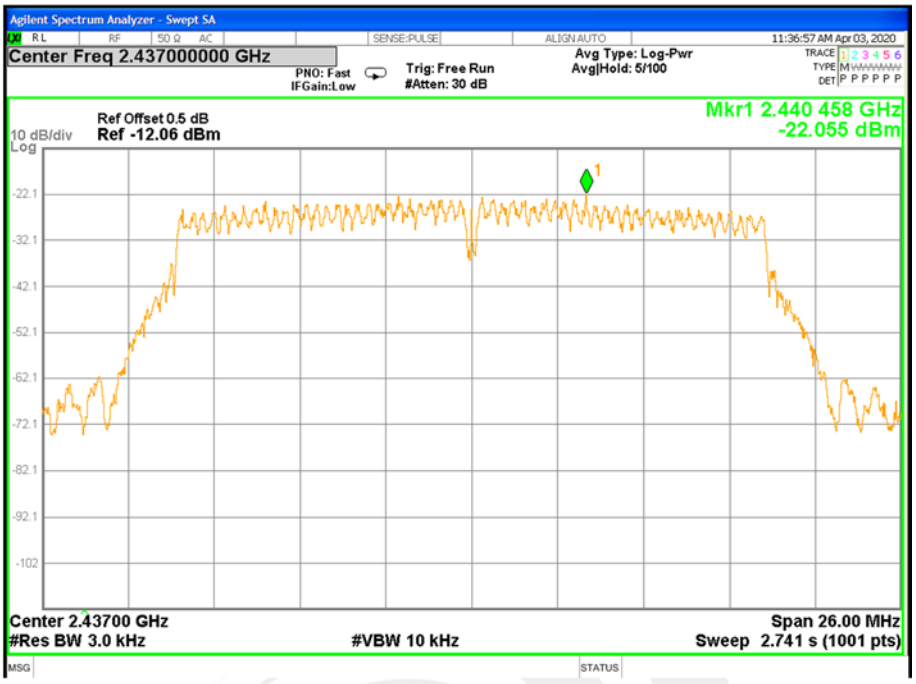
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX n Mode(20M) /CH01, CH06, CH11 |

| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3KHz) | Result |
|---|---|---|---|
| 2412 MHz | -24.242 | ≤8 | PASS |
| 2437 MHz | -22.055 | ≤8 | PASS |
| 2462 MHz | -23.489 | ≤8 | PASS |

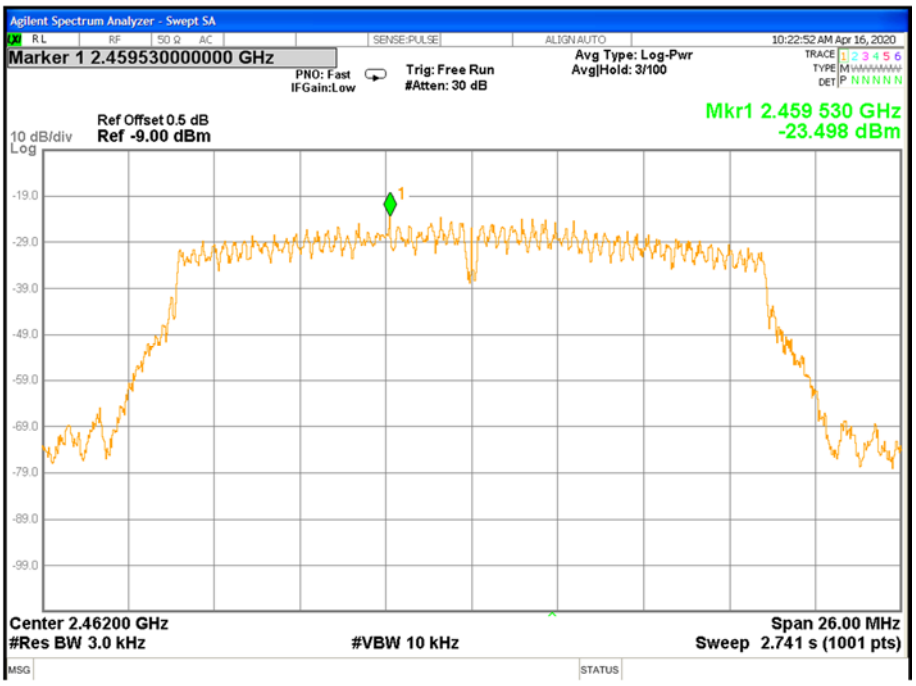
**TX CH01**



## TX CH06



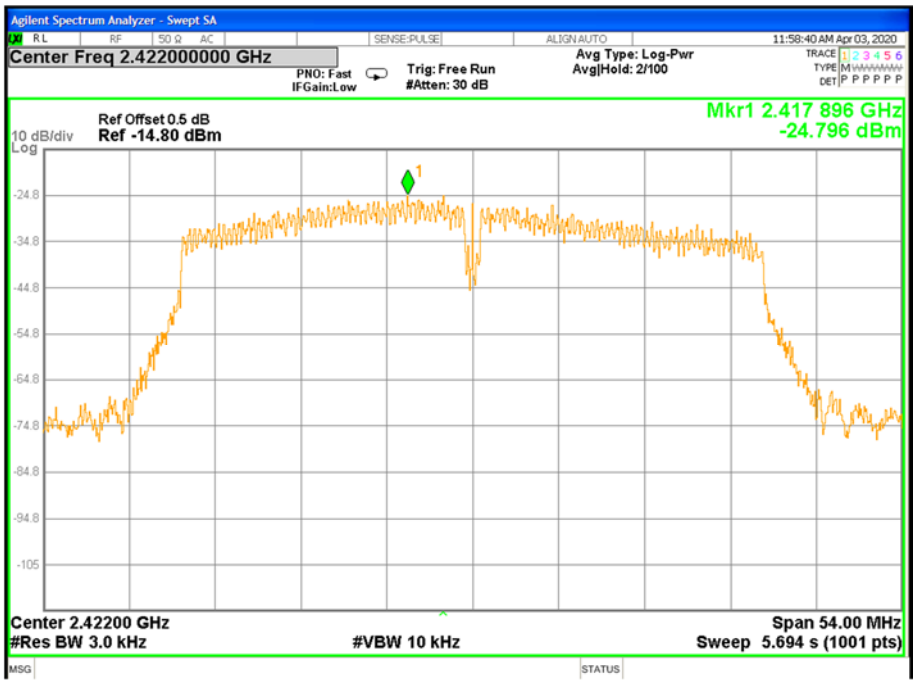

## TX CH11



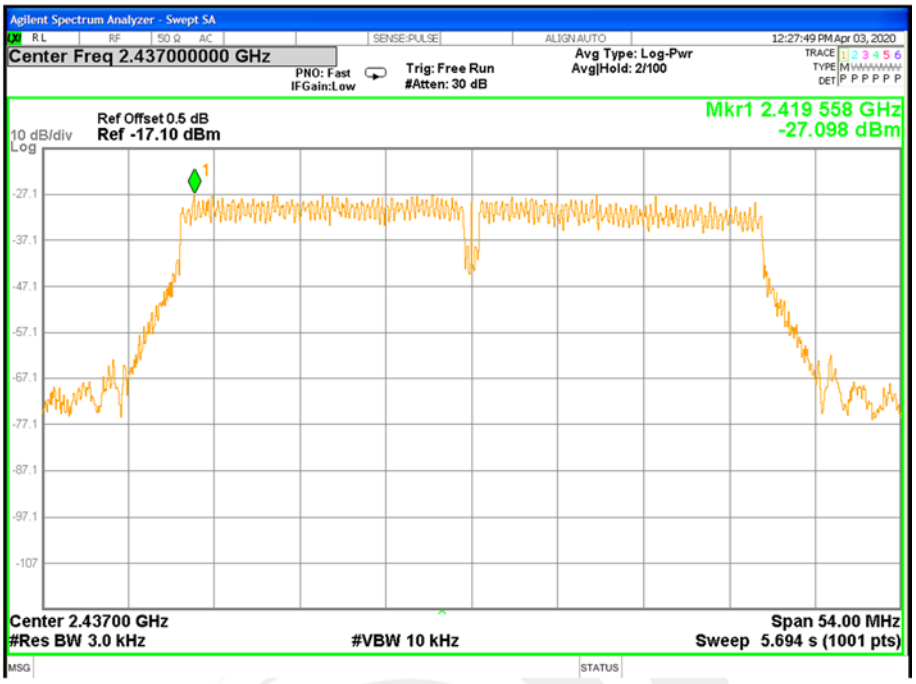
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX n Mode(40M) /CH03, CH06, CH09 |

| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3KHz) | Result |
|---|---|---|---|
| 2422 MHz | -24.796 | ≤8 | PASS |
| 2437 MHz | -27.098 | ≤8 | PASS |
| 2452 MHz | -24.955 | ≤8 | PASS |

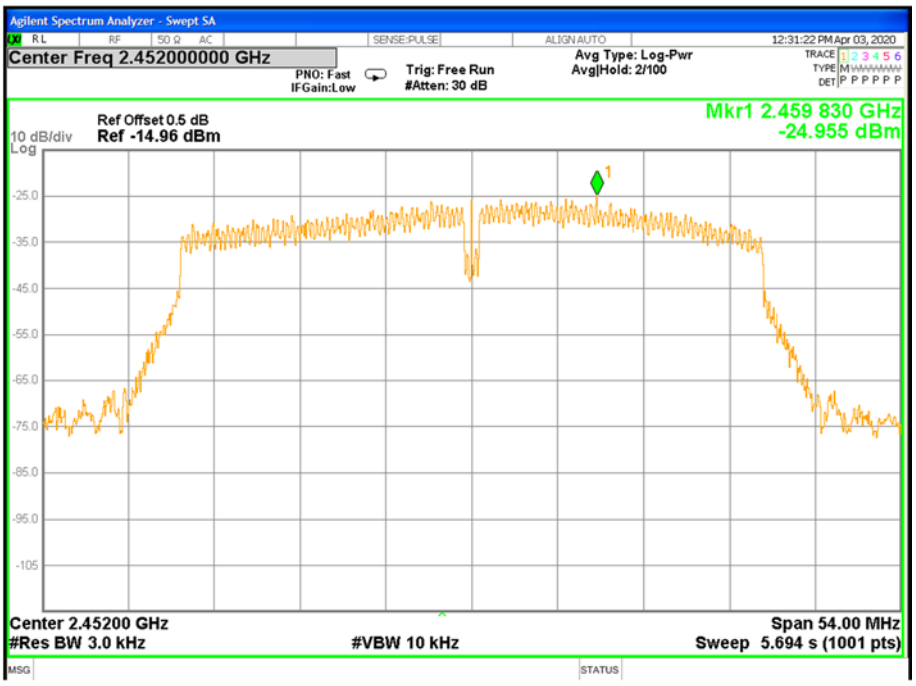
**TX CH03**



## TX CH06




## TX CH09



# 6. BANDWIDTH TEST

## 6.1 LIMIT

| FCC Part15.247,Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(a)(2) | Bandwidth | ≥500KHz (6dB bandwidth) | 2400-2483.5 | PASS |

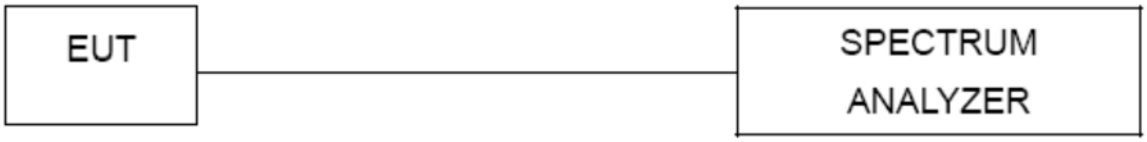
## 6.2 TEST PROCEDURE

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≥3RBW, 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.

## 6.3 DEVIATION FROM STANDARD

No deviation.

## 6.4 TEST SETUP




## 6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

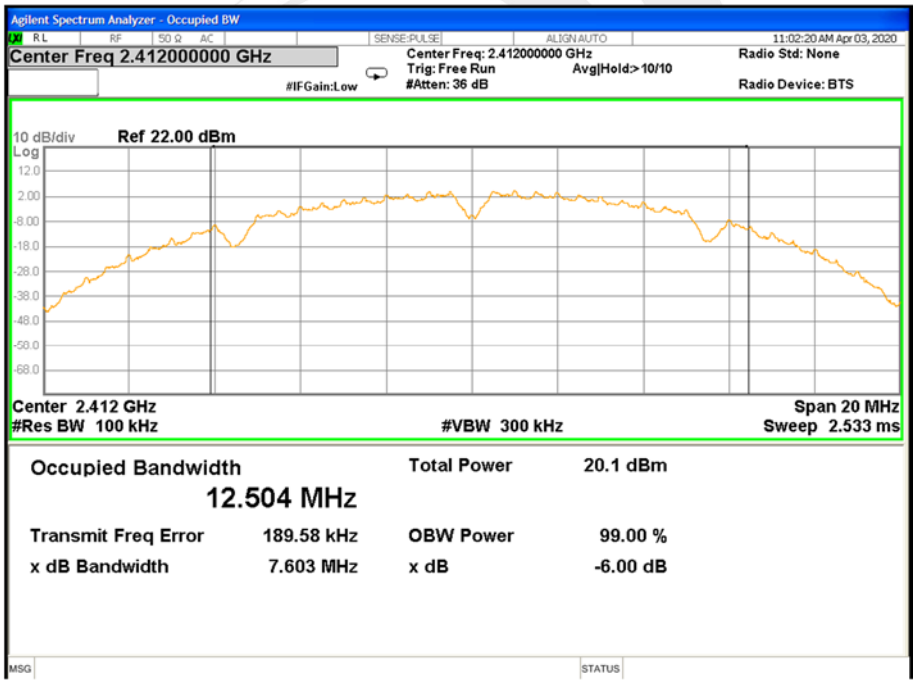
6.6 TEST RESULTS

| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX b Mode /CH01, CH06, CH11 |

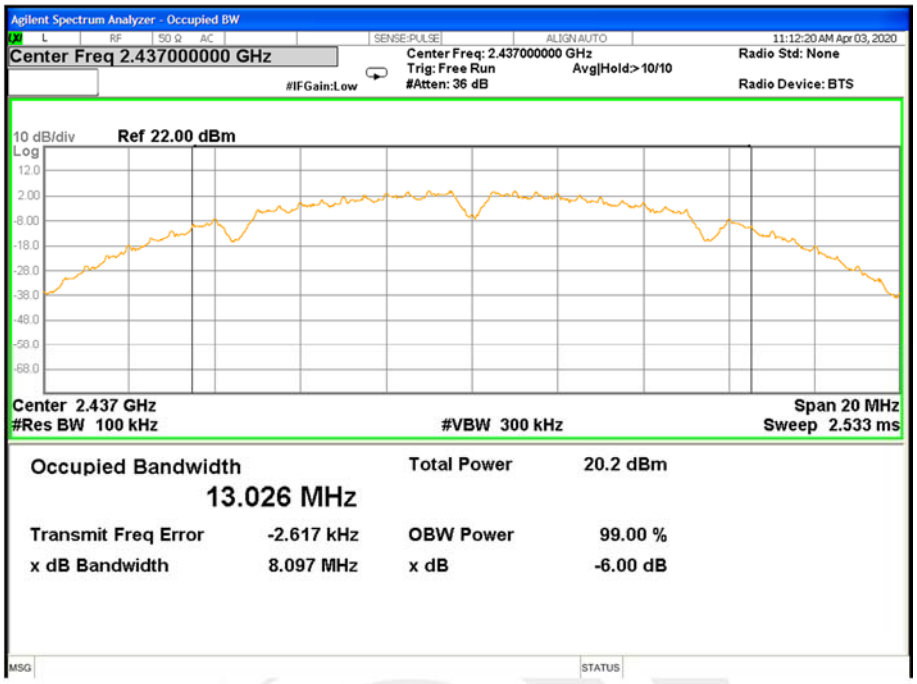
Remark: PEAK DETECTOR IS USED

| Frequency | 6dB Bandwidth | Channel Separation | Result |
|---|---|---|---|
| | (MHz) | (KHz) | |
| 2412 MHz | 7.603 | ≥500KHz | PASS |
| 2437 MHz | 8.097 | ≥500KHz | PASS |
| 2462 MHz | 8.066 | ≥500KHz | PASS |

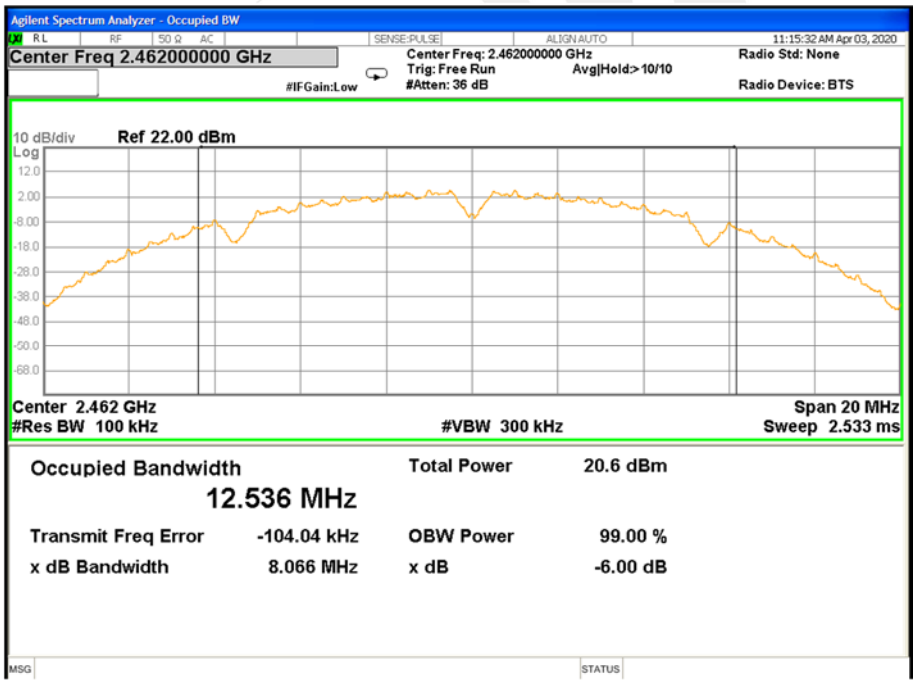
**TX CH 01**



## TX CH 06



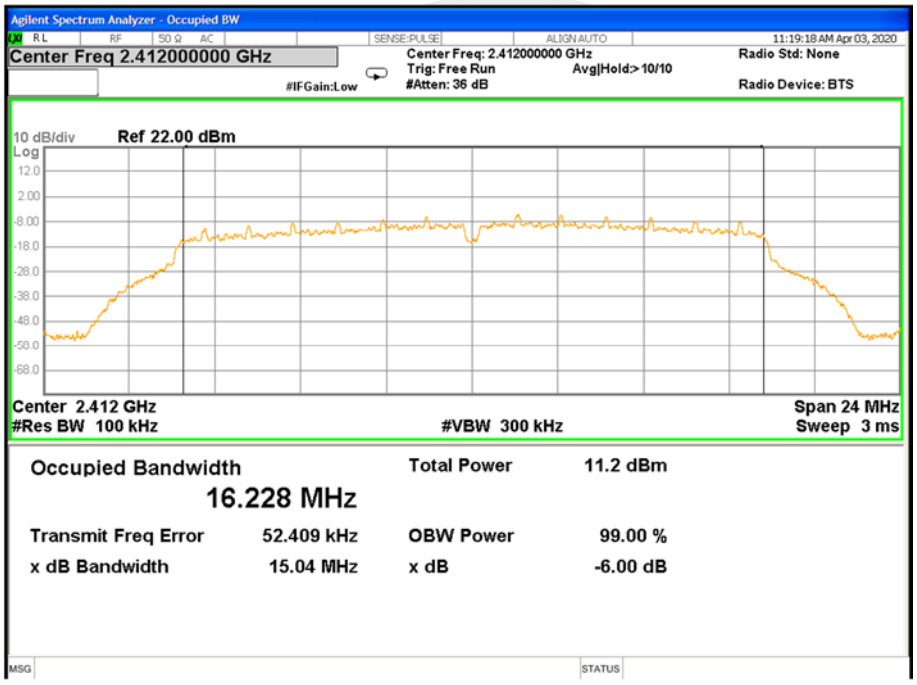

## TX CH 11



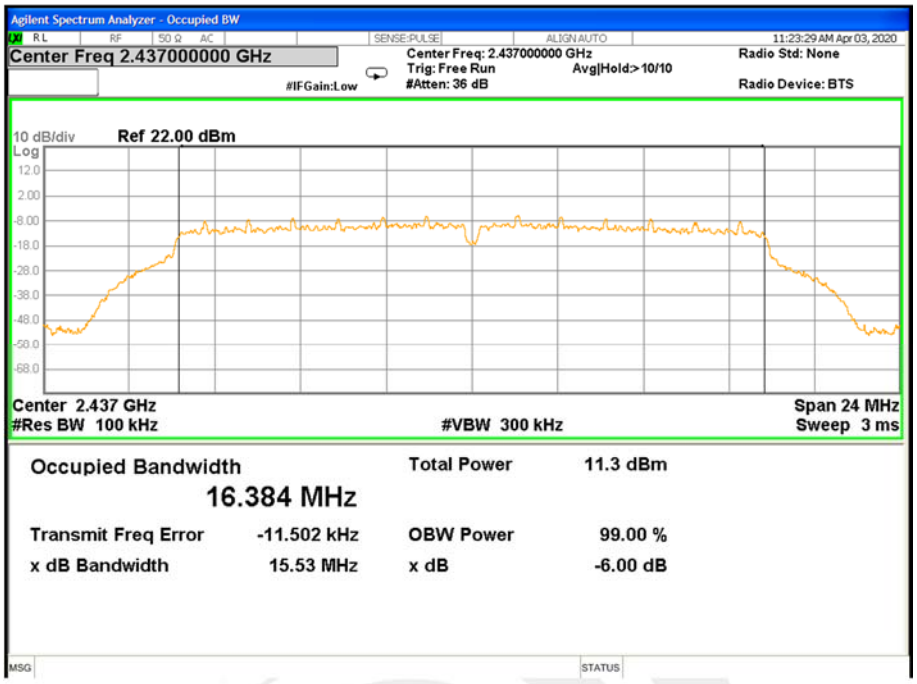
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX g Mode /CH01, CH06, CH11 |

| Frequency | 6dB Bandwidth | Channel Separation | Result |
|---|---|---|---|
| | (MHz) | (KHz) | |
| 2412 MHz | 15.04 | ≥500KHz | PASS |
| 2437 MHz | 15.53 | ≥500KHz | PASS |
| 2462 MHz | 15.10 | ≥500KHz | PASS |

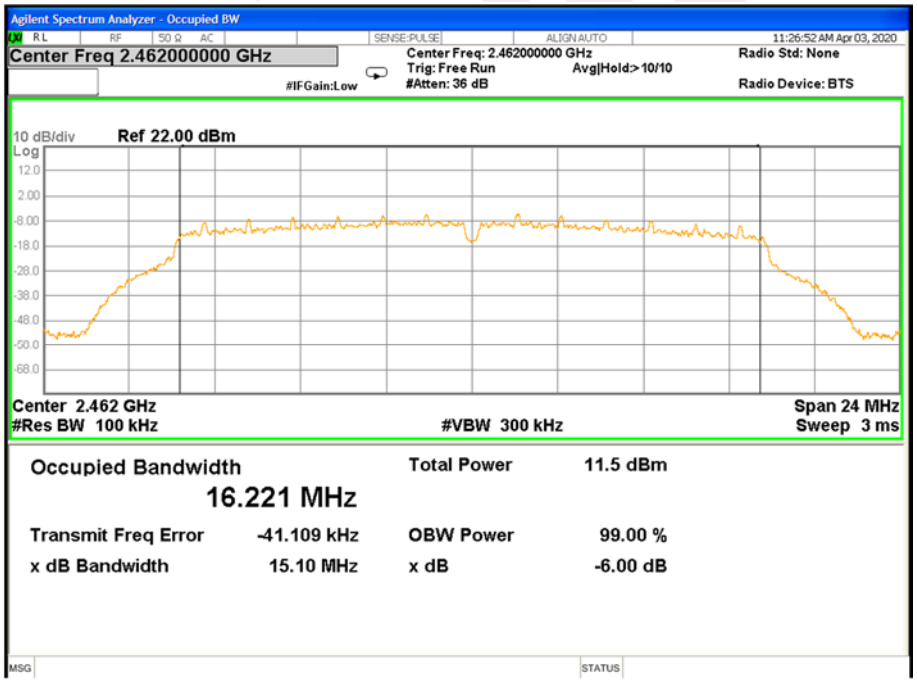
**TX CH 01**



## TX CH 06



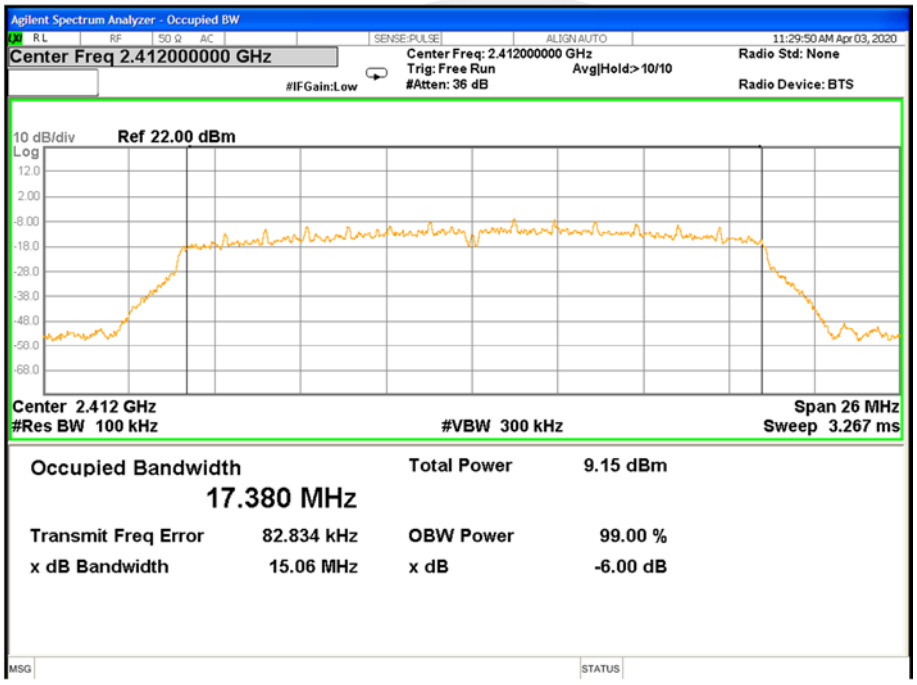

## TX CH 11



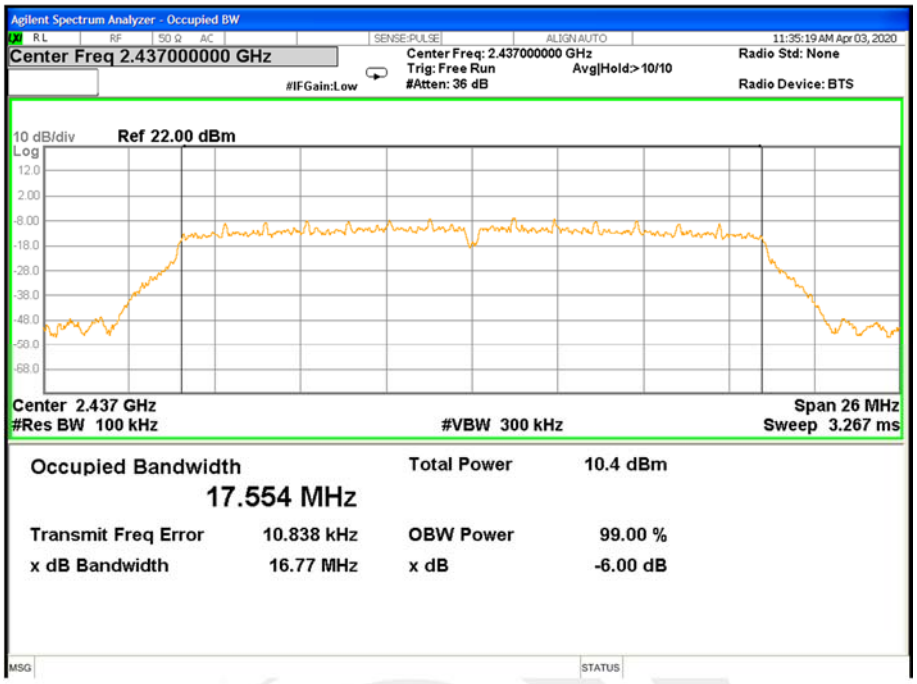
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX n Mode(20M) /CH01, CH06, CH11 |

| Frequency | 6dB Bandwidth | Channel Separation | Result |
|---|---|---|---|
| | (MHz) | (KHz) | |
| 2412 MHz | 15.06 | ≥500KHz | PASS |
| 2437 MHz | 16.77 | ≥500KHz | PASS |
| 2462 MHz | 15.08 | ≥500KHz | PASS |

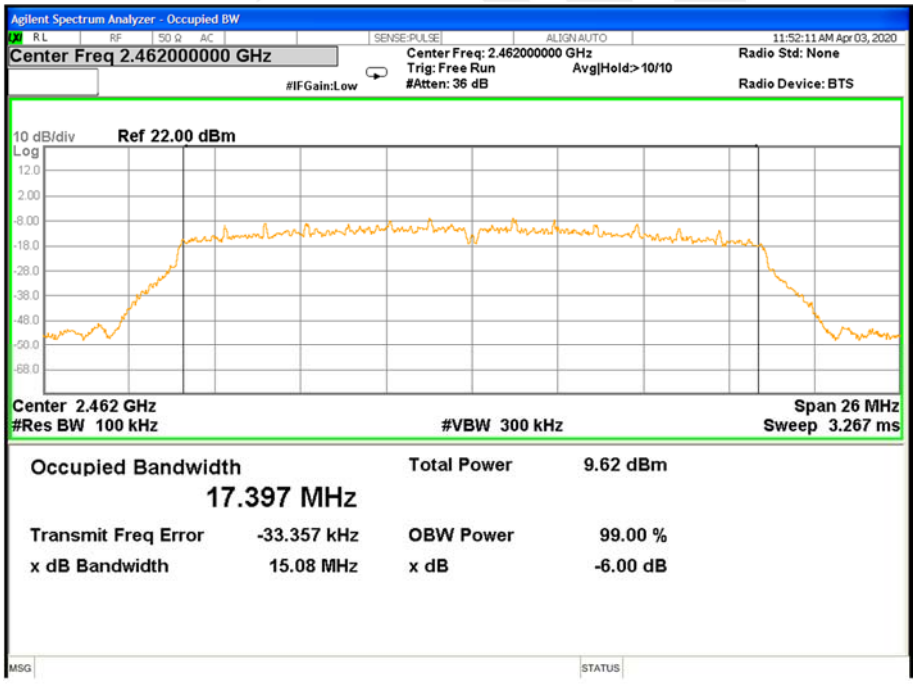
**TX CH 01**



## TX CH 06



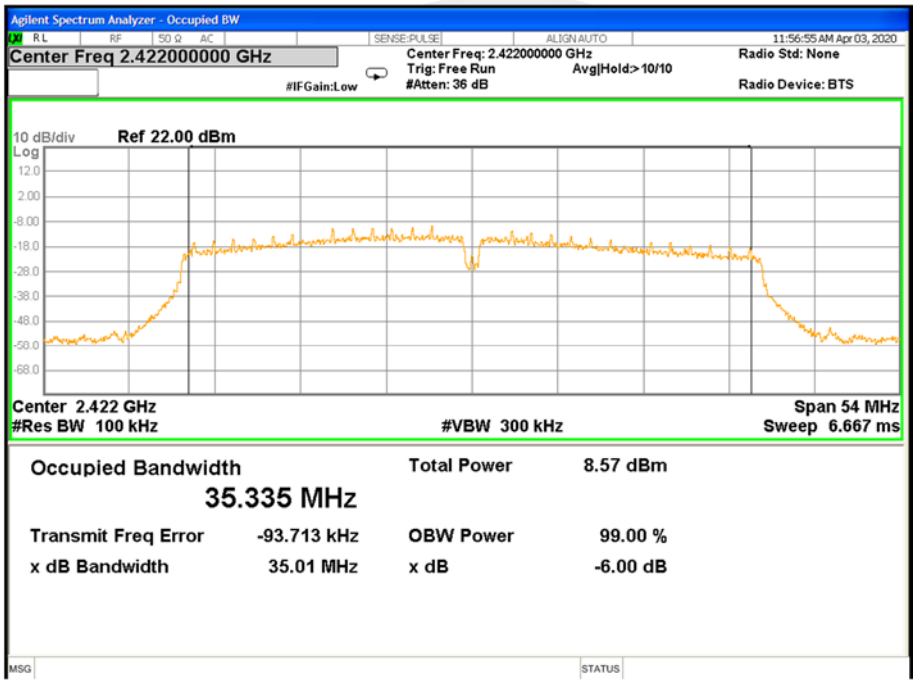

## TX CH 11



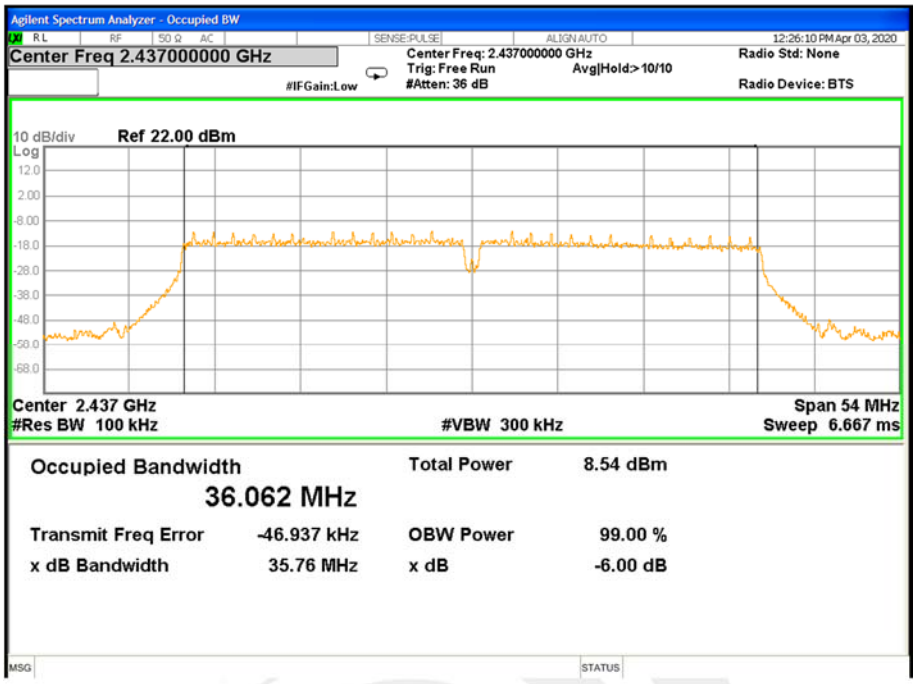
| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | Test Mode: | TX n Mode(40M) /CH03, CH06, CH09 |

| Frequency | 6dB Bandwidth | Channel Separation | Result |
|---|---|---|---|
| | (MHz) | (KHz) | |
| 2422 MHz | 35.01 | ≥500KHz | PASS |
| 2437 MHz | 35.76 | ≥500KHz | PASS |
| 2452 MHz | 35.00 | ≥500KHz | PASS |

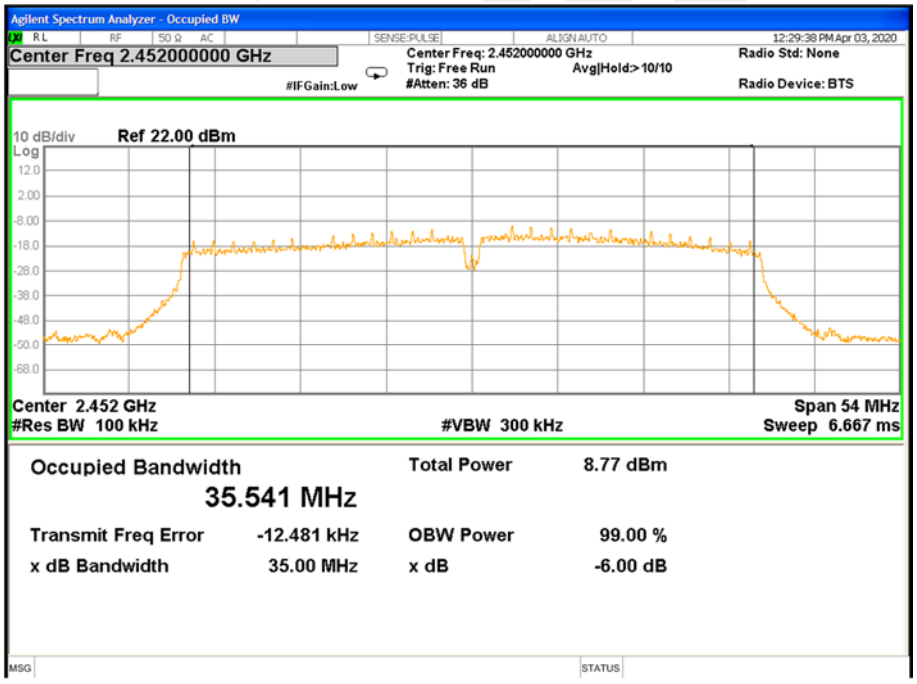
**TX CH 03**



## TX CH 06




## TX CH 09



# 7. PEAK OUTPUT POWER TEST

## 7.1 LIMIT

| FCC Part15.247,Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(b)(3) | Output Power | 1 watt or 30dBm | 2400-2483.5 | PASS |

## 7.2 TEST PROCEDURE

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

Integrated band power method:

The following procedure can be used when the maximum available RBW of the instrument is less than the

DTS bandwidth:

a) Set the RBW = 1 MHz.
b) Set the VBW ≥ [3 × RBW].
c) Set the span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

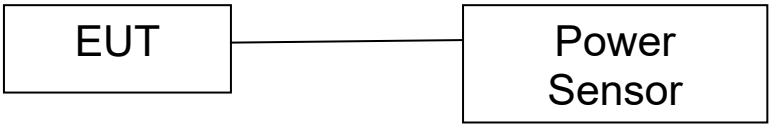
PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

## 7.3 DEVIATION FROM STANDARD

No deviation.

## 7.4 TEST SETUP




## 7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

| | | | |
|---|---|---|---|
| Temperature: | 25℃ | Relative Humidity: | 60% |
| Test Voltage: | DC 3.85V | | |

| Mode | Test Channe | Frequency | Peak Conducted Output Power | Average Conducted Output Power | LIMIT |
|---|---|---|---|---|---|
| | | (MHz) | (dBm) | (dBm) | dBm |
| TX 802.11b | CH01 | 2412 | 16.96 | 14.42 | 30 |
| | CH06 | 2437 | 16.58 | 14.41 | 30 |
| | CH11 | 2462 | 16.75 | 14.16 | 30 |
| TX 802.11g | CH01 | 2412 | 14.81 | 4.56 | 30 |
| | CH06 | 2437 | 14.66 | 4.74 | 30 |
| | CH11 | 2462 | 14.87 | 4.78 | 30 |
| TX 802.11n20 | CH01 | 2412 | 13.64 | 1.77 | 30 |
| | CH06 | 2437 | 13.42 | 1.74 | 30 |
| | CH11 | 2462 | 13.77 | 1.97 | 30 |
| TX 802.11n40 | CH03 | 2422 | 12.93 | 2.14 | 30 |
| | CH06 | 2437 | 12.78 | 2.12 | 30 |
| | CH09 | 2452 | 12.88 | 2.23 | 30 |

# 8. ANTENNA REQUIREMENT

## 8.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible partyshall be used with the device.

## 8.2 EUT ANTENNA

The EUT antenna is PIFA Antenna. It comply with the standard requirement.

APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※