



FCC Test Report

Report No: FCS202206116W01

Issued for

| | |
|---|--|
| Applicant: | Shenzhen Zilongguo Technology Co., Ltd. |
| Address: | Room 306, No.33, 3rd Lane, Caowei Vil, Caowei Comm, Hangcheng St, Bao'an Dist Shenzhen, Guangdong |
| Product Name: | LCD SMART SCREEN |
| Brand Name: | N/A |
| Model Name: | ZLGB01 |
| Series Model: | ZLGB02, ZLGB03, ZLGB04, ZLGB05, ZLGB06, ZLGB07, ZLGB08, ZLGB09, ZLGB10, ZLGB11, ZLGB12, ZLGB13, ZLGB14, ZLGB15, ZLGB16, ZLGB17, ZLGB18, ZLGB19, ZLGB20, ZLGB21, ZLGB22, ZLGB23, ZLGB24, ZLGB25, ZLGB26, ZLGB27, ZLGB28, ZLGB29, ZLGB30, ZLGB31, ZLGB32, ZLGB33, ZLGB34, ZLGB35, ZLGB36, ZLGB37, ZLGB38, ZLGB39, ZLGB40, ZLGB41, ZLGB42, ZLGB43, ZLGB44, ZLGB45, ZLGB46, ZLGB47, ZLGB48, ZLGB49, ZLGB50 |
| FCC ID: | 2A7Y7-ZLGB01 |
| Issued By: Flux Compliance Service Laboratory Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 http://www.fcs-lab.com | |

TEST RESULT CERTIFICATION

Applicant's Name: Shenzhen Zilongguo Technology Co., Ltd.
Address.....: Room 306, No.33, 3rd Lane, Caowei Vil, Caowei Comm, Hangcheng St, Bao'an Dist Shenzhen, Guangdong
Manufacture's Name: Shenzhen Zilongguo Technology Co., Ltd.
Address.....: Room 306, No.33, 3rd Lane, Caowei Vil, Caowei Comm, Hangcheng St, Bao'an Dist Shenzhen, Guangdong

Product Description

Product Name: LCD SMART SCREEN
Model Name.....: ZLGB01
Series Model: ZLGB02,ZLGB03,ZLGB04,ZLGB05,ZLGB06,ZLGB07,ZLGB08, ZLGB09,ZLGB10,ZLGB11,ZLGB12,ZLGB13,ZLGB14,ZLGB15, ZLGB16,ZLGB17,ZLGB18,ZLGB19,ZLGB20,ZLGB21,ZLGB22, ZLGB23,ZLGB24,ZLGB25ZLGB26,ZLGB27,ZLGB28,ZLGB29, ZLGB30,ZLGB31,ZLGB32,ZLGB33,ZLGB34,ZLGB35,ZLGB36, ZLGB37,ZLGB38,ZLGB39,ZLGB40,ZLGB41,ZLGB42,ZLGB43, ZLGB44,ZLGB45,ZLGB46,ZLGB47,ZLGB48,ZLGB49,ZLGB50

Test Standards: CFR 47 FCC Part15E section 15.407
ANSI C63.10-2013
Test Procedure.....: KDB 789033 D02 General UNII Test procedures New Rules 02
KDB558074 D01 Meas Guidance v05

This device described above has been tested by Flux Compliance Service Laboratory, 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 (s) of performance of tests : 21 Jun, 2022 ~ 11 Jul, 2022

Date of Issue..... : 11 Jul, 2022

Test Result : Pass

Tested by


Scott Shen

(Scott Shen)

Reviewed by


Duke Qian

(Duke Qian)

Approved by


Jack Wang



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**Revision History**

| Rev. | Issue Date | Report NO. | Effect Page | Contents |
|------|--------------|-----------------|-------------|---------------|
| 00 | 11 Jul, 2022 | FCS202206116W01 | ALL | Initial Issue |
| | | | | |

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| Standard Section | Test Item | Judgment | Remark |
|--|---|----------|--------|
| 15.407 (a)(1) 15.407 (a)(3) | 26db Bandwidth and 99% Bandwidth | PASS | -- |
| 15.209a,15.407(b) | Spurious Radiated Emission | PASS | |
| FCC 15.407 (a) | Maximum Conducted Output Power | PASS | -- |
| FCC 15.407 (a) | Power Spectral Density | PASS | -- |
| FCC 15.407 (g) | Frequency Stability Measurement | PASS | |
| FCC 15.407 (a) FCC 15.209 FCC 15.205 | Emissions in restricted frequency bands | PASS | |
| FCC 15.407 (a) FCC 15.209 FCC 15.205 | Band Edge Compliance | PASS | |
| FCC 15.207 | Power Line Conducted Emission | PASS | |
| FCC 15.203 | Antenna requirement | PASS | -- |

1.1 TEST FACTORY

| | |
|---|--|
| Company Name: | Flux Compliance Service Laboratory |
| Address: | Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan |
| Telephone: | +86-769-27280901 |
| Fax: | +86-769-27280901 |
| FCC Test Firm Registration Number: 514908 Designation number: CN0127 A2LA accreditation number: 5545.01 | |

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, 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 | $\pm 0.71 \text{ dB}$ |
| 2 | Unwanted Emissions, conducted | $\pm 2.988 \text{ dB}$ |
| 3 | Conducted Emission (9KHz-150KHz) | $\pm 4.13 \text{ dB}$ |
| 4 | Conducted Emission (150KHz-30MHz) | $\pm 4.74 \text{ dB}$ |
| 5 | All emissions, radiated(<1G) 9KHz-30MHz | $\pm 5.2 \text{ dB}$ |
| 6 | All emissions, radiated(<1G) 30MHz-1000MHz | $\pm 5.2 \text{ dB}$ |
| 7 | All emissions, radiated 1GHz -18GHz | $\pm 4.66 \text{ dB}$ |
| 8 | All emissions, radiated 18GHz -40GHz | $\pm 4.31 \text{ dB}$ |

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

| | |
|-------------------------|---|
| Product Name | LCD SMART SCREEN |
| Trade Name | N/A |
| Model Name | ZLGB01 |
| Series Model | ZLGB02,ZLGB03,ZLGB04,ZLGB05,ZLGB06,ZLGB07, ZLGB08,ZLGB09,ZLGB10,ZLGB11,ZLGB12,ZLGB13, ZLGB14,ZLGB15,ZLGB16,ZLGB17,ZLGB18,ZLGB19, ZLGB20,ZLGB21,ZLGB22,ZLGB23,ZLGB24,ZLGB25 ZLGB26,ZLGB27,ZLGB28,ZLGB29,ZLGB30,ZLGB31, ZLGB32,ZLGB33,ZLGB34,ZLGB35,ZLGB36,ZLGB37, ZLGB38,ZLGB39,ZLGB40,ZLGB41,ZLGB42,ZLGB43, ZLGB44,ZLGB45,ZLGB46,ZLGB47,ZLGB48,ZLGB49, ZLGB50 |
| Model Difference | The above product with same circuit, PCB layout, electrical parts, materials and wiring structures, Appearance shape, the materials of decorative accessories is same, only different color. |
| Channel List | Please refer to the Note 2.2. |
| Operation frequency | IEEE 802.11a/n/ac(HT20): U-NII-1 5150MHz ~5250MHz |
| Number of channel | 5150MHz ~5250MHz (7CH) |
| Modulation: | OFDM |
| Power supply | Input: 100-240V |
| Battery | N/A |
| Hardware version number | V1.0 |
| Software version number | V1.0 |
| Sample type | Portable equipment |
| Connecting I/O Port(s) | Please refer to the User's Manual |

Note:

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

2.

| U-NII-1 (5.15-5.25GHz) | | | |
|------------------------|----------------|---------|----------------|
| channel | Frequency(MHz) | channel | Frequency(MHz) |
| 36 | 5180 | 38 | 5190 |
| 40 | 5200 | 42 | 5210 |
| 44 | 5220 | 46 | 5230 |
| 48 | 5240 | | |

3. Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | NOTE |
|------|-------|------------|------------------|-----------|------------|-------------------|
| 1 | N/A | GTBF | external antenna | N/A | 1.0 dBi | 5G WIFI Antenna 1 |
| 2 | N/A | GTBF | external antenna | N/A | 1.0 dBi | 5G WIFI Antenna 2 |

2.2 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Block diagram of EUT configuration for test



Test software: the QA tool

The test software was used to control EUT work in continuous TX mode, and select test channel, Wireless mode as below table

For 802.11a/n/ac(HT20)

U-NII-1

| channel | Frequency(MHz) | channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 36 | 5180 | 40 | 5200 |
| 48 | 5240 | | |

2.3 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 |
|------|-----------|-----------|----------------|------------|------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Support units

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

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.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".

2.4 EQUIPMENTS LIST

Radiation Test equipment

| Kind of Equipment | Manufacturer | Type No. | Company No. | Last calibration | Calibrated until |
|----------------------------------|--------------|--------------|-------------|------------------|------------------|
| EMI Test Receiver | R&S | ESRP 3 | FCS-E001 | 2022.02.10 | 2023.02.09 |
| Signal Analyzer | R&S | FSV40-N | FCS-E012 | 2022.02.10 | 2023.02.09 |
| Active loop Antenna | ZHINAN | ZN30900C | FCS-E013 | 2022.02.10 | 2023.02.09 |
| Bilog Antenna | SCHWARZBECK | VULB 9168 | FCS-E002 | 2022.02.10 | 2023.02.09 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D | FCS-E003 | 2022.02.10 | 2023.02.09 |
| SHF-EHF Horn Antenna (18G-40GHz) | A-INFO | LB-180400-KF | FCS-E018 | 2022.02.10 | 2023.02.09 |
| Pre-Amplifier(0.1M-3G Hz) | EMCI | EM330N | FCS-E004 | 2022.02.10 | 2023.02.09 |
| Pre-Amplifier (1G-18GHz) | N/A | TSAMP-0518SE | FCS-E014 | 2022.02.10 | 2023.02.09 |
| Pre-Amplifier (18G-40GHz) | TERA-MW | TRLA-0400 | FCS-E019 | 2022.02.10 | 2023.02.09 |
| Temperature & Humidity | HTC-1 | victor | FCS-E005 | 2022.02.10 | 2023.02.09 |

Conduction Test equipment

| Kind of Equipment | Manufacturer | Type No. | Company No. | Last calibration | Calibrated until |
|------------------------|--------------|----------|-------------|------------------|------------------|
| EMI Test Receiver | R&S | ESCI | FCS-E020 | 2022.02.10 | 2023.02.09 |
| LISN | R&S | ENV216 | FCS-E007 | 2022.02.10 | 2023.02.09 |
| LISN | ETS | 3810/2NM | FCS-E009 | 2022.02.10 | 2023.02.09 |
| Temperature & Humidity | HTC-1 | victor | FCS-E008 | 2022.02.10 | 2023.02.09 |

RF Connected Test

| Kind of Equipment | Manufacturer | Type No. | Company No. | Last calibration | Calibrated until |
|---------------------|--------------|----------|-------------|------------------|------------------|
| MXA SIGNAL Analyzer | Keysight | N9020A | FCS-E015 | 2022.02.10 | 2023.02.09 |
| Spectrum Analyzer | Agilent | E4447A | MY50180039 | 2022.02.10 | 2023.02.09 |
| Spectrum Analyzer | R&S | FSV-40 | 101499 | 2022.02.10 | 2023.02.09 |

3. 26dB Bandwidth Bandwidth and 99% Bandwidth

3.1 Limit

| FCC Part15, Subpart E | | |
|-----------------------|------------------------------|--|
| Test Item | Limit | Frequency Range (MHz) |
| Bandwidth | 26 dB Bandwidth | 5150-5250 |
| | 26 dB Bandwidth | 5250-5350 |
| | 26 dB Bandwidth | For FCC:5470-5725 For IC:5470-5600 5650-5725 |
| | Minimum 500kHz 6dB Bandwidth | 5725-5850 |

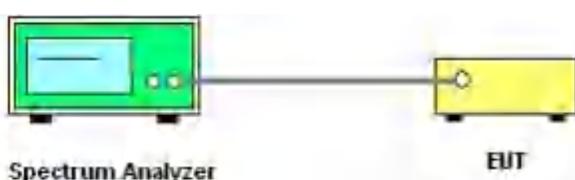
3.2 Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

| | |
|------------------|--|
| Center Frequency | The centre frequency of the channel under test |
| Detector | Peak |
| RBW | For 6dB Bandwidth: RBW=100kHz For 26dB Bandwidth: approximately 1% of the emission bandwidth. |
| VBW | For 6dB Bandwidth: VBW=300kHz For 26dB Bandwidth: >3RBW |
| Trace | Max hold |
| Sweep | Auto couple |

(2) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26dB and 6dB relative to the maximum level measured in the fundamental emission.

3.3 Test setup

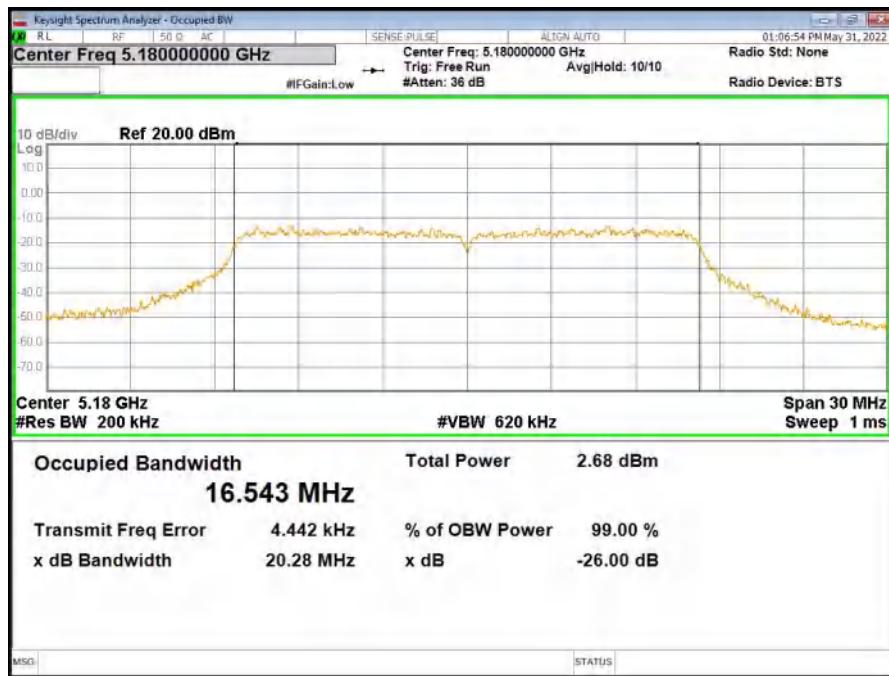


3.4 Test results

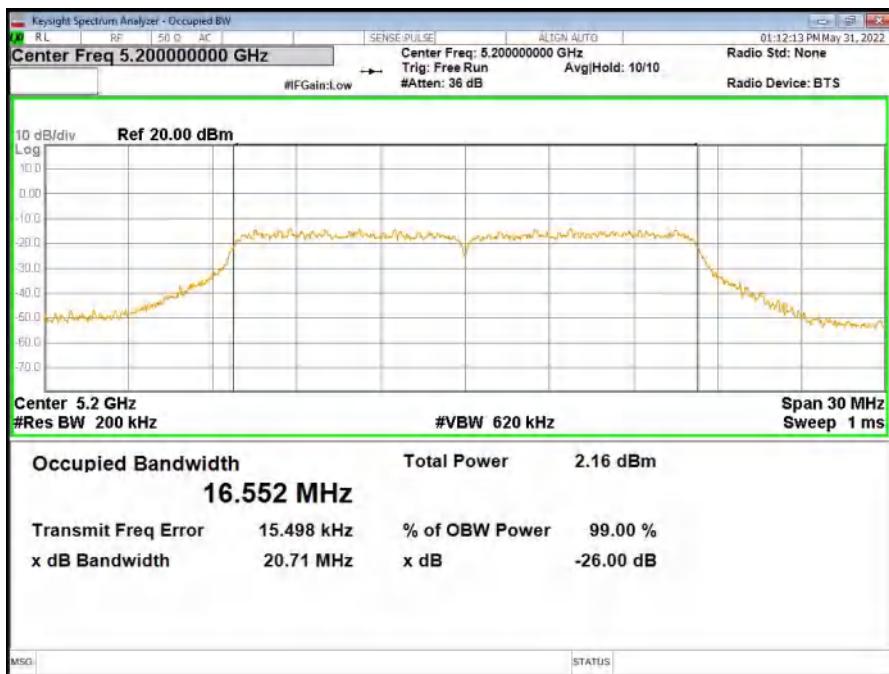
| Band | Operation mode | 26 dB Bandwidth (MHz) | | | 99% Bandwidth (MHz) | | |
|---------|----------------|-----------------------|--------|-------|---------------------|--------|--------|
| | | Low | Middle | High | Low | Middle | High |
| U-NII-1 | 802.11a | 20.28 | 20.71 | 20.63 | 16.543 | 16.552 | 16.546 |
| | 802.11n(HT20) | 20.35 | 20.50 | 20.37 | 17.613 | 17.605 | 17.624 |
| | 802.11ac(HT20) | 20.51 | 20.49 | 20.29 | 17.607 | 17.611 | 17.646 |

3.5 Original Test Data

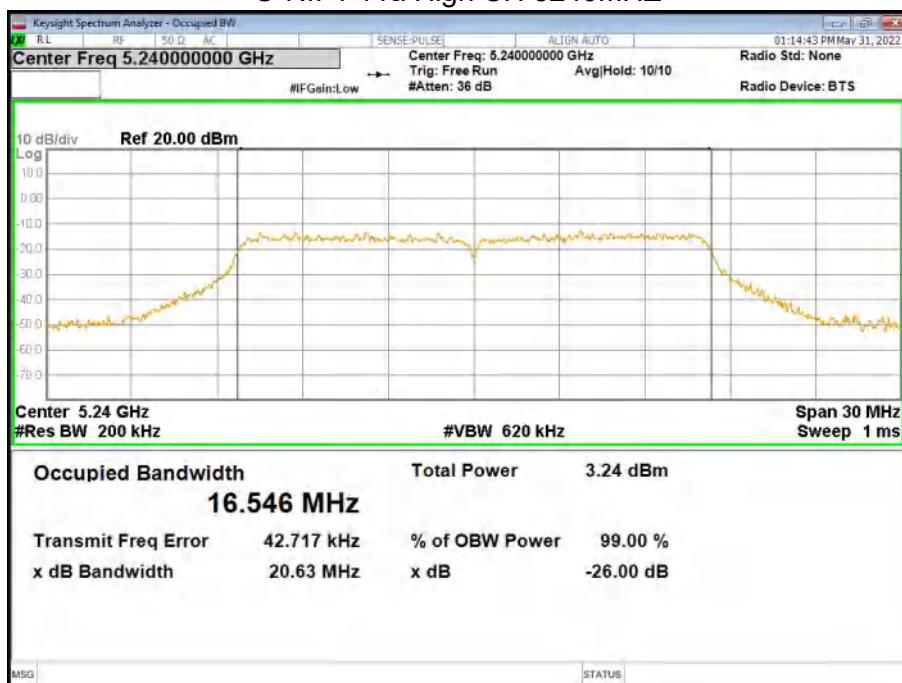
U-NII-1 11a Low CH 5180MHz



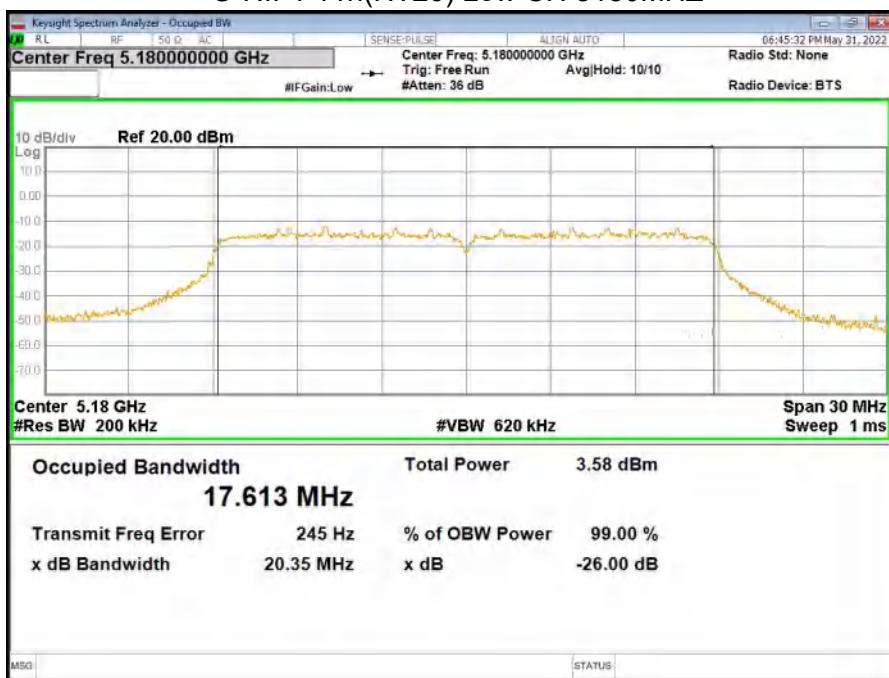
U-NII-1 11a Middle CH 5200MHz



U-NII-1 11a High CH 5240MHz



U-NII-1 11n(HT20) Low CH 5180MHz



U-NII-1 11n(HT20) Middle CH 5200MHZ

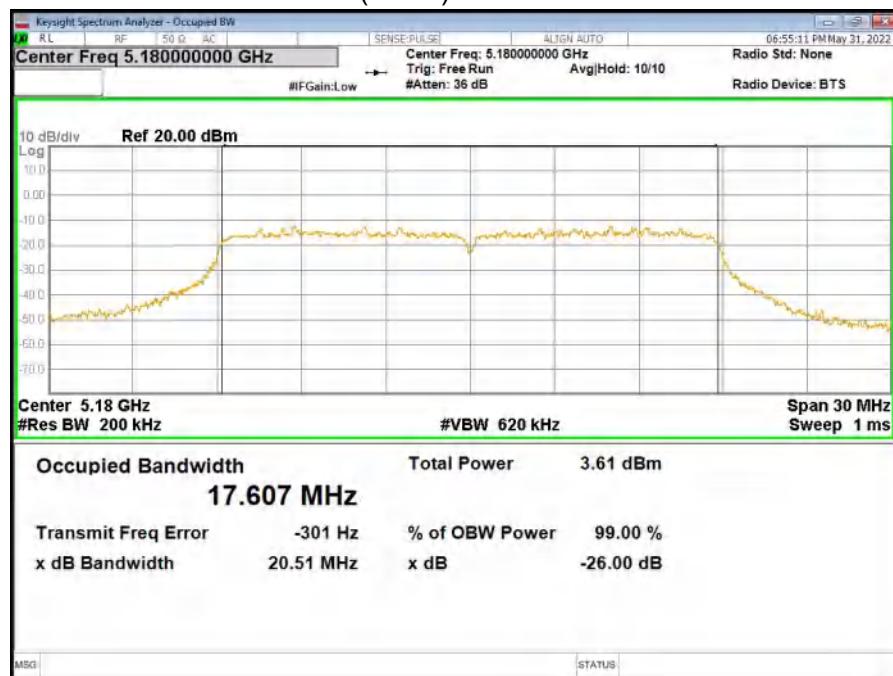


U-NII-1 11n(HT20)High CH 5240MHZ





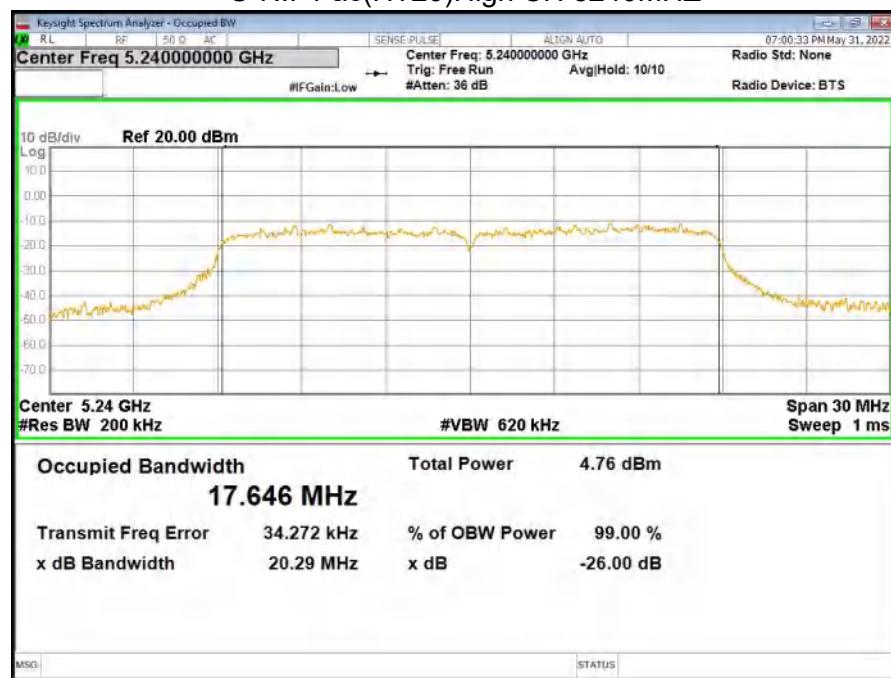
U-NII-1 ac(HT20) Low CH 5180MHz



U-NII-1 ac(HT20) Middle CH 5200MHZ



U-NII-1 ac(HT20)High CH 5240MHZ



4 CONDUCTED OUTPUT POWER

4.1 limit

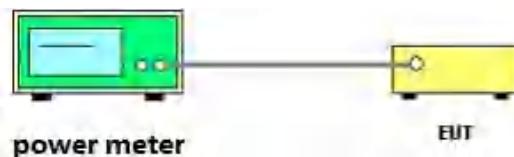
| FCC Part15, Subpart E/ RSS-247 | | |
|--------------------------------|--|--|
| Test Item | Limit | Frequency Range (MHz) |
| Conducted Output Power | For FCC client devices: 250mW (24dBm) | 5150-5250 |
| | For RSS: e.i.r.p. power: not exceed 200 mW(23dBm) or $10 + 10 \log_{10} B$ | |
| | 250mW (24dBm) or $11 + 10 \log_{10} B$ | 5250-5350 |
| | 250mW (24dBm) or $11 + 10 \log_{10} B$ | For FCC:5470-5725 For IC:5470-5600 5650-5725 |
| | 1 Watt (30dBm) | 5725-5850 |

Note: For ISED: B=99% bandwidth.

4.2 test procedure

- Connect each EUT's antenna output to power meter by RF cable and attenuator
- Get each antenna port's output power of EUT.

4.3 TEST SETUP



4.4 test results

ANT 1

| Band | Operation mode | Connected Output Power(dBm) | | |
|-------|----------------|-----------------------------|--------|------|
| | | Low | Middle | High |
| U-NIM | 802.11a | 5.43 | 6.03 | 6.35 |
| | 802.11 n(HT20) | 5.19 | 5.98 | 6.30 |
| | 802.11ac(HT20) | 5.07 | 5.93 | 6.31 |

ANT 2

| Band | Operation mode | Connected Output Power(dBm) | | |
|-------|----------------|-----------------------------|--------|------|
| | | Low | Middle | High |
| U-NIM | 802.11a | 4.71 | 4.12 | 5.39 |
| | 802.11 n(HT20) | 4.76 | 4.10 | 5.38 |
| | 802.11ac(HT20) | 4.70 | 4.06 | 5.34 |

MIMO

| Band | Operation mode | Connected Output Power(dBm) | | |
|-------|----------------|-----------------------------|--------|------|
| | | Low | Middle | High |
| U-NIM | 802.11a | 5.68 | 6.29 | 6.48 |
| | 802.11 n(HT20) | 5.44 | 6.23 | 6.53 |
| | 802.11ac(HT20) | 5.41 | 6.33 | 6.66 |

5. POWER SPECTRAL DENSITY

5.1 LIMIT

| FCC Part15, Subpart E/ RSS-247 | | |
|--------------------------------|--|--|
| Test Item | Limit | Frequency Range (MHz) |
| Power Spectral Density | For FCC: Other than Mobile and portable:17dBm/MHz Mobile and portable:11dBm/MHz | 5150-5250 |
| | For RSS eirp:10dBm/MHz | |
| | 11dBm/MHz | 5250-5350 |
| | 11dBm/MHz | For FCC:5470-5725 For IC:5470-5600 5650-5725 |
| | 30dBm/500kHz | 5725-5850 |

5.2 TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW.

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

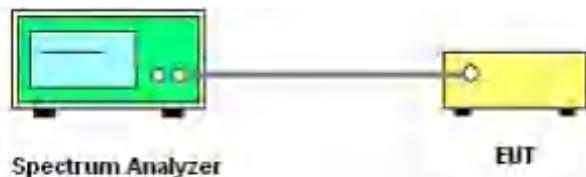
5725MHz-5850MHz

Note:

1. For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v01, section II.F.5., it is acceptable to set RBW at 1MHz and VBW at 3MHz if the spectrum analyzer does not have 500kHz RBW.
2. The value measured with RBW=1MHz is to be added with $10\log(500\text{kHz}/1\text{MHz})$ which is - 3dB. For example, if the measured value is +10dBm using RBW=1MHz (that is +10dBm/MHz), then the converted value will be +7dBm/500kHz.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

5.3 TEST SETUP



5.4 TEST RESULTS

ANT 1

| Band | Operation mode | Power Spectral Density(dBm/MHz) | | |
|-------|----------------|---------------------------------|--------|--------|
| | | Low | Middle | High |
| U-NIM | 802.11a | -5.940 | -6.795 | -4.476 |
| | 802.11 n(HT20) | -5.457 | -6.030 | -4.495 |
| | 802.11ac(HT20) | -5.460 | -6.073 | -4.489 |

ANT 2

| Band | Operation mode | Power Spectral Density(dBm/MHz) | | |
|-------|----------------|---------------------------------|--------|--------|
| | | Low | Middle | High |
| U-NIM | 802.11a | -5.260 | -4.692 | -4.229 |
| | 802.11 n(HT20) | -5.405 | -4.256 | -4.326 |
| | 802.11ac(HT20) | -5.216 | -4.310 | -3.458 |

MIMO

| Band | Operation mode | Power Spectral Density(dBm/MHz) | | |
|-------|----------------|---------------------------------|--------|--------|
| | | Low | Middle | High |
| U-NIM | 802.11a | -5.517 | -6.369 | -5.046 |
| | 802.11 n(HT20) | -5.311 | -6.121 | -4.462 |
| | 802.11ac(HT20) | -5.600 | -5.943 | -3.633 |

5.5 original test data

ANT 1

U-NII-1 802.11a Low CH



U-NII-1 802.11a Middle CH



U-NII-1 802.11a High CH



U-NII-1 802.11n(HT20) Low CH



U-NII-1 802.11n(HT20) Middle CH



U-NII-1 802.11n(HT20) High CH



U-NII-1 802.11ac(HT20) Low CH



U-NII-1 802.11ac(HT20) Middle CH



U-NII-1 802.11ac(HT20) High CH



ANT 2

U-NII-1 802.11a Low CH



U-NII-1 802.11a Middle CH



U-NII-1 802.11a High CH



U-NII-1 802.11n(HT20) Low CH



U-NII-1 802.11n(HT20) Middle CH



U-NII-1 802.11n(HT20) High CH



U-NII-1 802.11ac(HT20) Low CH



U-NII-1 802.11ac(HT20) Middle CH



U-NII-1 802.11ac(HT20) High CH



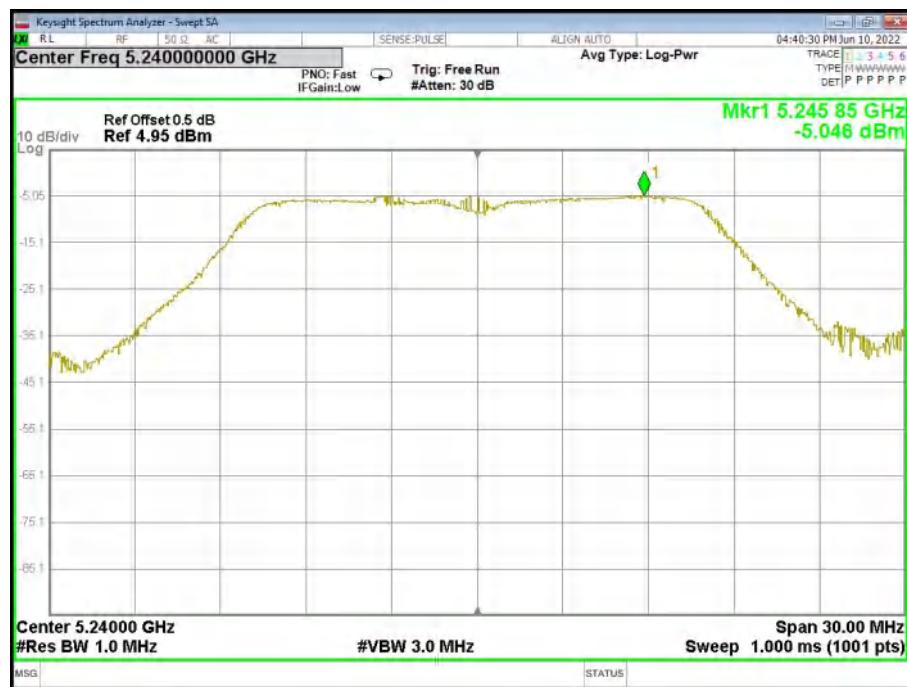
U-NII-1 802.11a Low CH



U-NII-1 802.11a Middle CH



U-NII-1 802.11a High CH



U-NII-1 802.11n(HT20) Low CH



U-NII-1 802.11n(HT20) Middle CH



U-NII-1 802.11n(HT20) High CH



U-NII-1 802.11ac(HT20) Low CH



U-NII-1 802.11ac(HT20) Middle CH



U-NII-1 802.11ac(HT20) High CH



6. FREQUENCY STABILITY MEASUREMENT

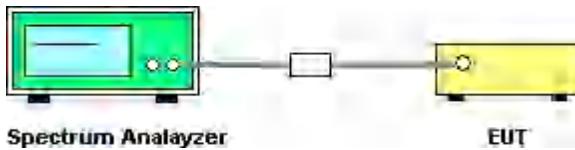
6.1 LIMIT

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual

6.2 TEST PROCEDURE

- (1) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
- (2) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
- (3) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

6.3 TEST SETUP



6.4 TEST RESULTS

| U-NII-1 Test Frequency:5180MHz | | | | |
|--------------------------------|-------------------|----------------------|-----------------------|-------------|
| Temperature (°C) | Power Supply (DC) | Frequency Error (Hz) | Frequency Error (ppm) | Limit (ppm) |
| 50 | 120 V | / | / | / |
| 45 | | 1807 | 2.1599 | 20 |
| 30 | | 1800 | 2.1516 | 20 |
| 20 | | 1806 | 2.1587 | 20 |
| 10 | | 1800 | 2.1516 | 20 |
| 0 | | 1803 | 2.1552 | 20 |
| -10 | | 1800 | 2.1516 | 20 |
| -15 | | 1809 | 2.1623 | 20 |
| -30 | | / | / | / |
| 20 | 108 V | 1810 | 2.1635 | 20 |
| 20 | 132 V | 1798 | 2.1492 | 20 |

7. Conducted spurious emission and Band edge

7.1 LIMIT

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

| Frequency Band (MHz) | Limit |
|----------------------|---|
| 5150 - 5250 | Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm |
| 5250 - 5350 | Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm |
| 5470 - 5725 | Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm |
| 5725 - 5850 | All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. |

7.2 TEST PROCEDURE

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 1 MHz for $f > 1$ GHz, 100 kHz
 $f < 1$ GHz VBW > RBW

Sweep = auto

Detector

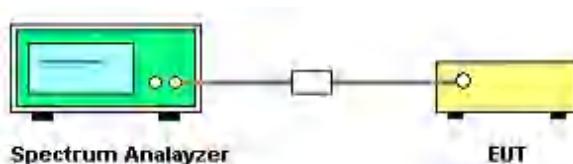
function =

peak Trace =

max hold

Allow the trace to stabilize

7.3 TEST SETUP



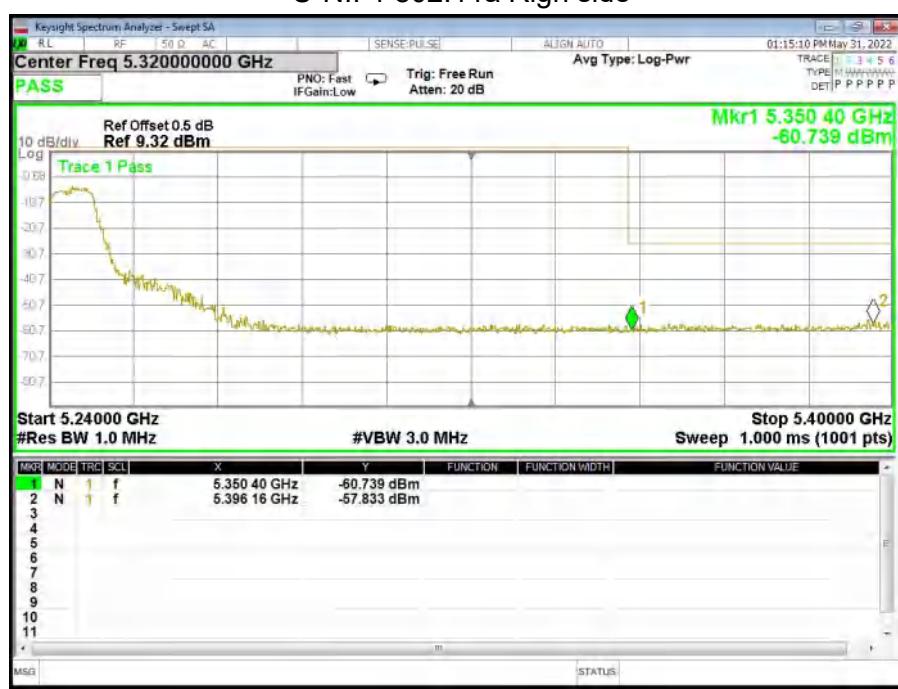
7.4 TEST RESULTS

7.5 Original test data

U-NII-1 802.11a left side



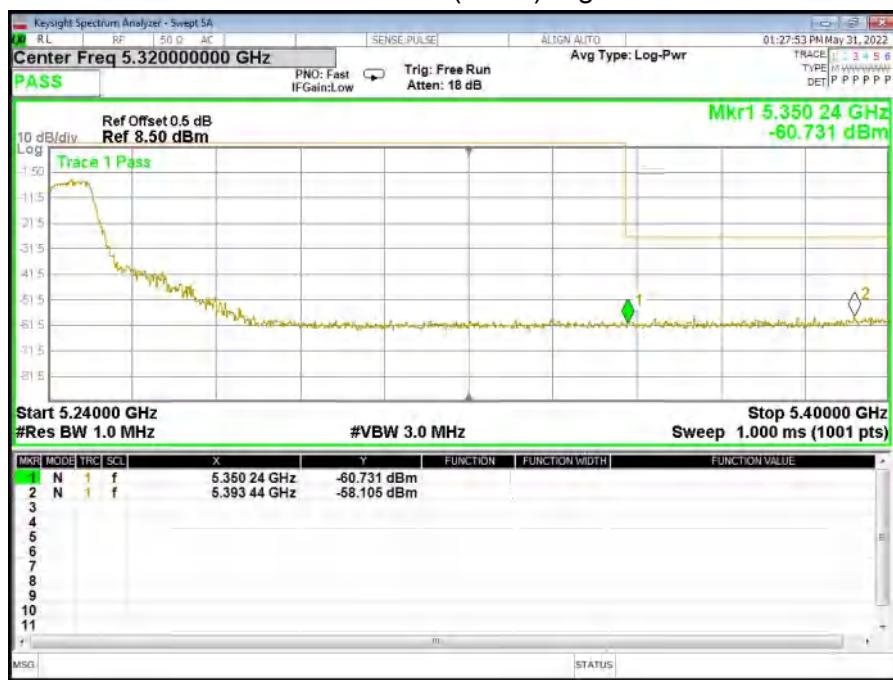
U-NII-1 802.11a Right side



U-NII-1 802.11n(HT20) left side



U-NII-1 802.11n(HT20) Right side



U-NII-1 802.11ac(HT20) left side



U-NII-1 802.11ac(HT20) Right side



conducted spurious

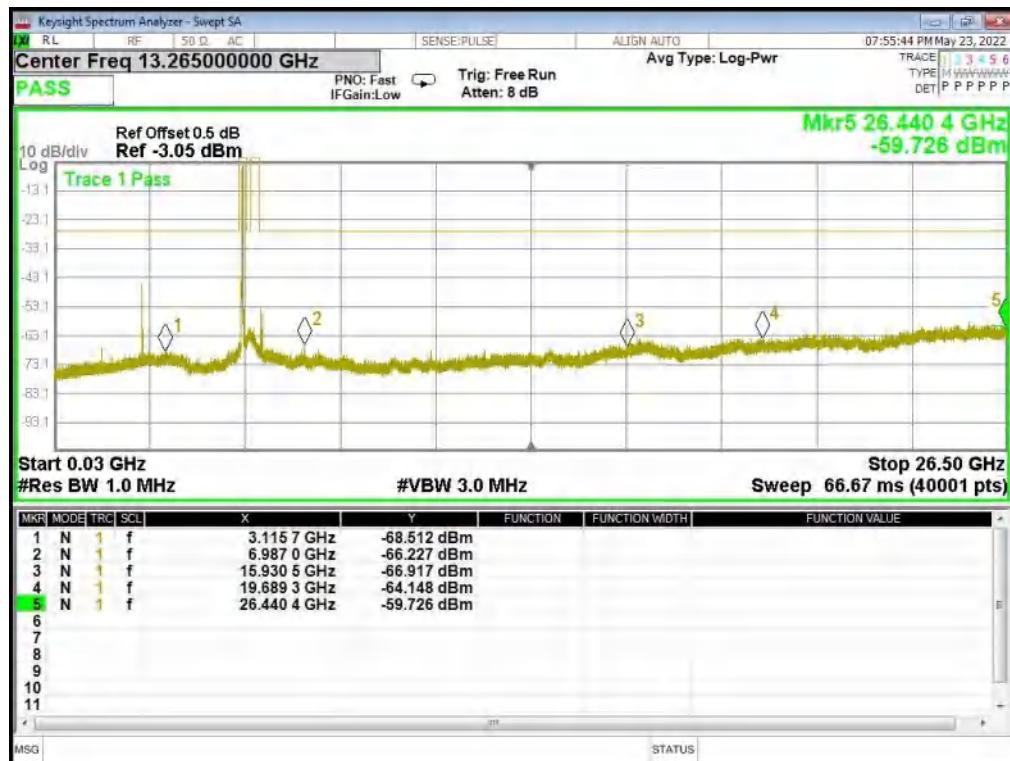
U-NII-1 802.11a Low CH



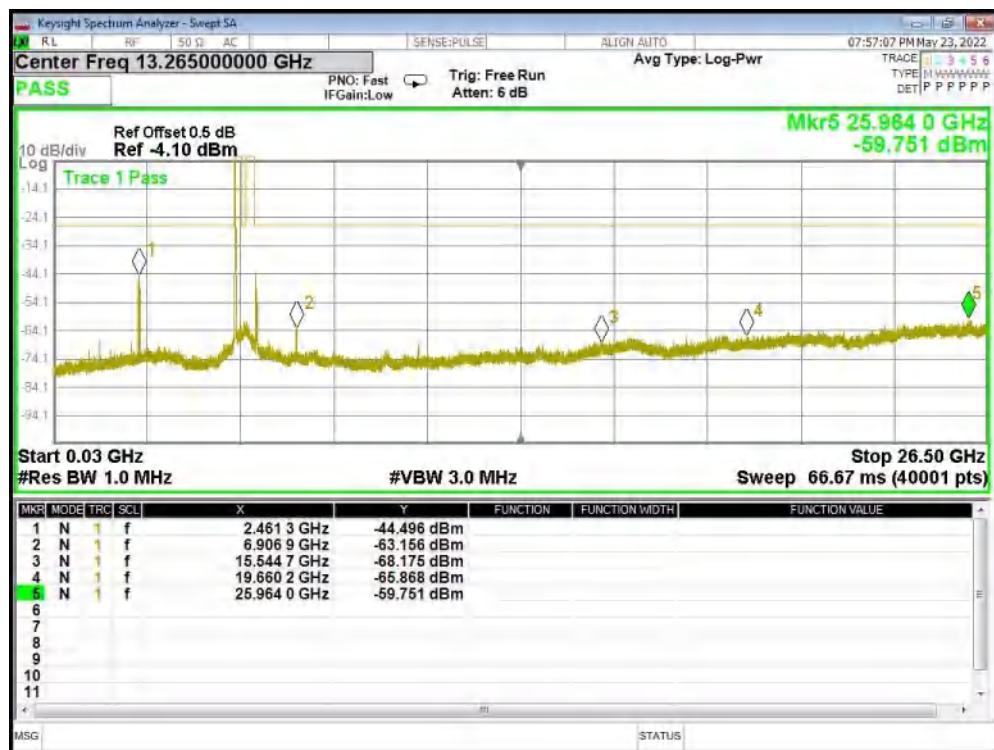
U-NII-1 802.11a Middle CH



U-NII-1 802.11a High CH



U-NII-1 802.11n(HT20) Low CH



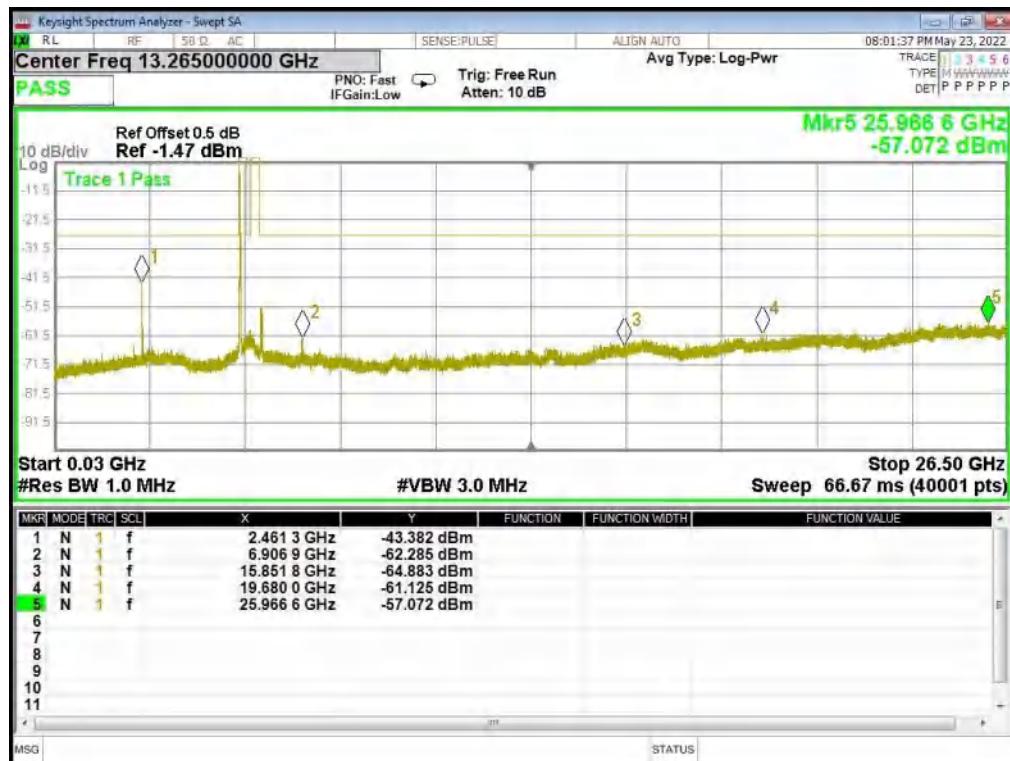
U-NII-1 802.11n(HT20) Middle CH



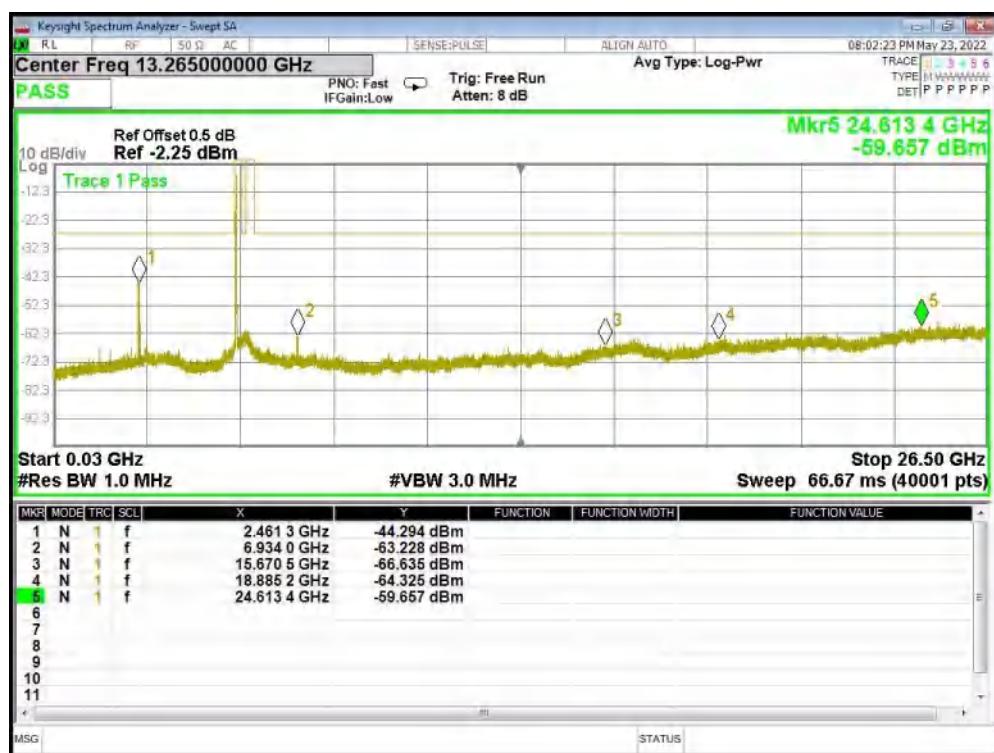
U-NII-1 802.11n(HT20) High CH



U-NII-1 802.11ac(HT20) Low CH



U-NII-1 802.11ac(HT20) Middle CH



U-NII-1 802.11ac(HT20) High CH



Note:1.The emission levels of other frequencies were less than 20dB margin against the limit.

8. Duty Cycle

8.1 TEST REQUIREMENT

47 CFR Part 15C 15.407 and 789033 D02 General UNII Test

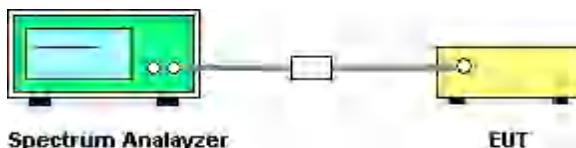
Procedures New Rules v02r01(December 14, 2017), Section (B)

ANSI C63.10: 2013

8.2 TEST PROCEDURE

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.

7.3 TEST SETUP



8.4 TEST RESULTS

| 802.11a mode | | | |
|--------------|-------------|------------|---------------|
| channel | On time(ms) | Period(ms) | Duty Cycle(%) |
| 36 | 100 | 100 | 100 |
| 52 | 100 | 100 | 100 |
| 149 | 100 | 100 | 100 |

| 802.11n(HT20) mode | | | |
|--------------------|-------------|------------|---------------|
| channel | On time(ms) | Period(ms) | Duty Cycle(%) |
| 36 | 100 | 100 | 100 |
| 52 | 100 | 100 | 100 |
| 149 | 100 | 100 | 100 |

| 802.11ac(HT20) mode | | | |
|---------------------|-------------|------------|---------------|
| channel | On time(ms) | Period(ms) | Duty Cycle(%) |
| 36 | 100 | 100 | 100 |
| 52 | 100 | 100 | 100 |
| 149 | 100 | 100 | 100 |

9 RADIATED EMISSION MEASUREMENT

9.1 RADIATED 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 |

For Radiated Emission

| 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) | PK=1MHz / 1MHz, AV=1 MHz / 10 Hz |

9.2 TEST PROCEDURE

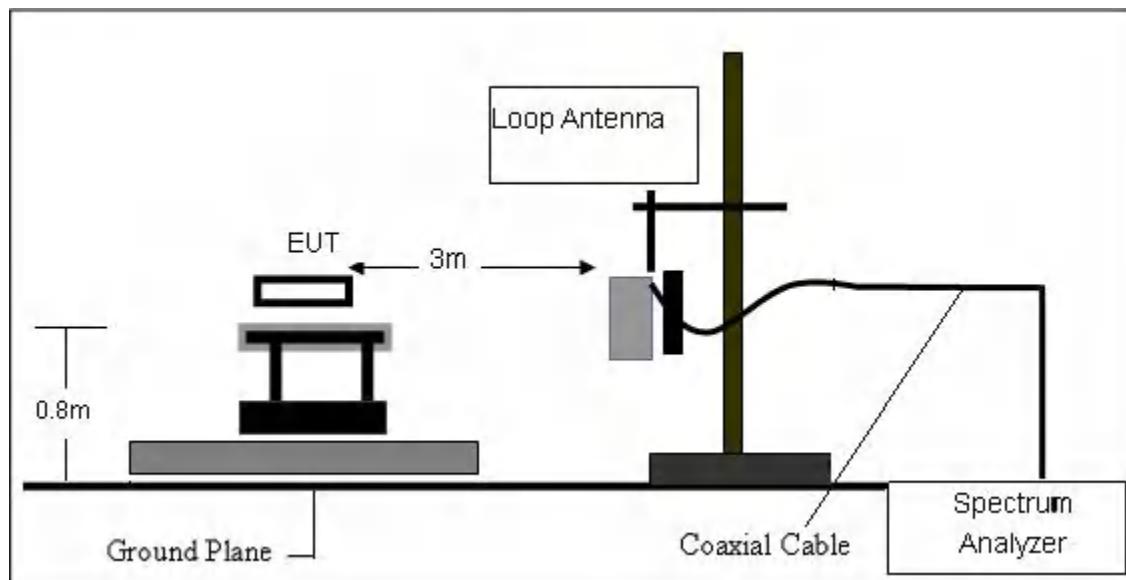
- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to 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 QuasiPeak 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:

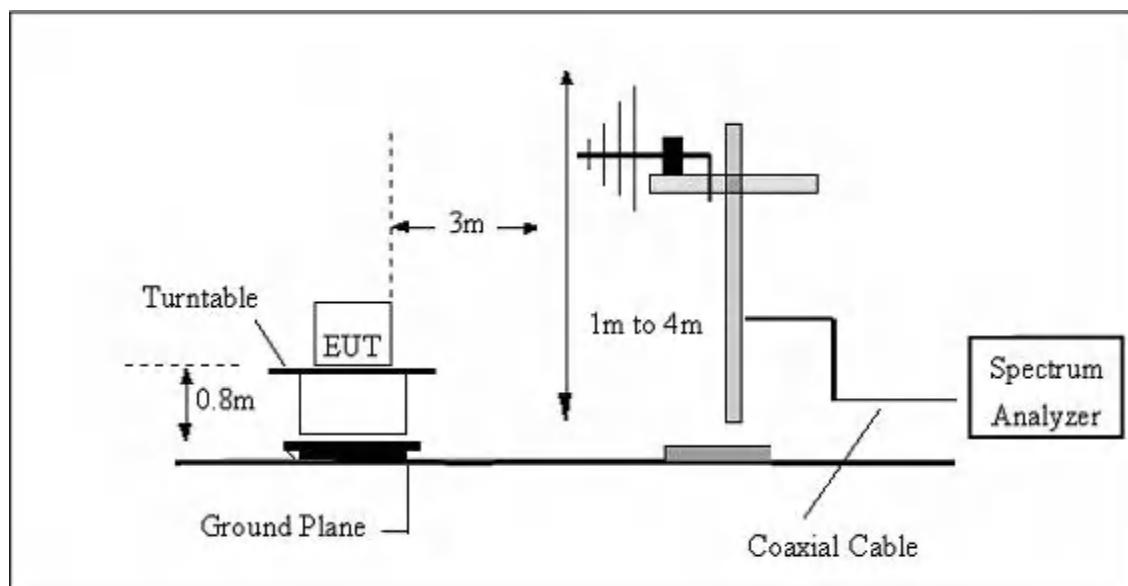
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

9.3 TESTSETUP

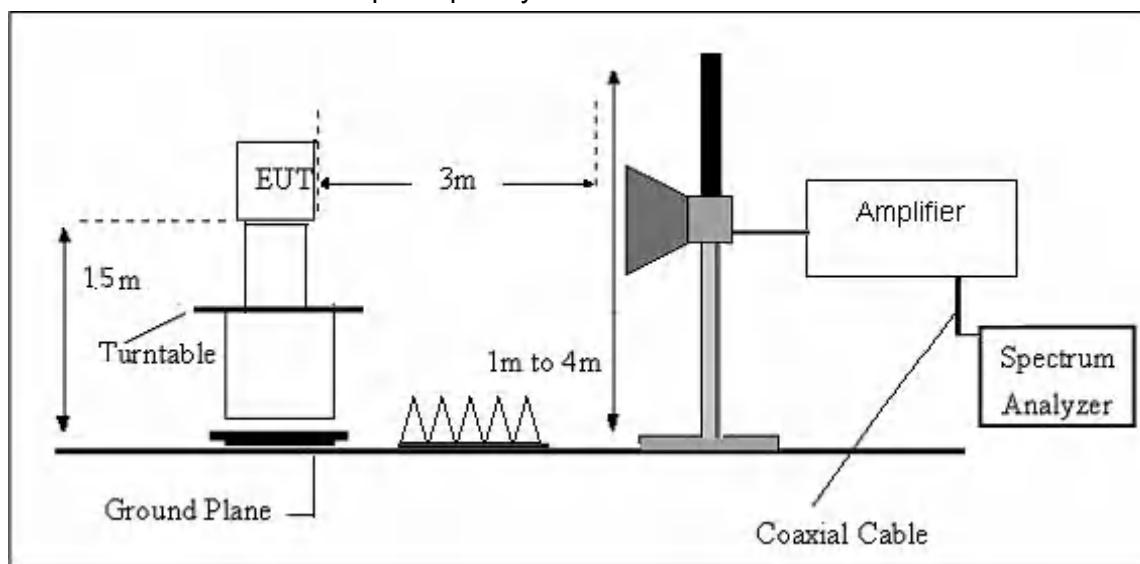
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



9.4. TEST RESULTS

(9KHz-30MHz)

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

(30MHz~40GHz) Restricted band and Spurious emission Requirements

| Frequency | Receiver Reading | Detector | Turn table Angle | RX Antenna | | Corrected Factor | Corrected Amplitude | FCC Part 15.407/209/205 | |
|--|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
| | | | | Height | Polar | | | Limit | Margin |
| (MHz) | (dB μ V) | (PK/QP/Ave) | Degree | (m) | (H/V) | (dB) | (dB μ V/m) | (dB μ V/m) | (dB) |
| 802.11a U-NII-1 Low Channel 5180MHz | | | | | | | | | |
| 223.45 | 39.99 | QP | 242 | 1.2 | H | -11.62 | 28.37 | 46.00 | -17.63 |
| 223.45 | 35.21 | QP | 57 | 1.3 | V | -11.62 | 23.59 | 46.00 | -22.41 |
| 4500.37 | 49.00 | PK | 109 | 1.8 | H | -2.03 | 46.97 | 74.00 | -27.03 |
| 4500.37 | 45.66 | Ave | 109 | 1.8 | H | -2.03 | 43.63 | 54.00 | -10.37 |
| 10360.00 | 41.87 | PK | 359 | 1.3 | H | 5.33 | 47.20 | 68.20 | -26.80 |
| 10360.00 | 36.00 | Ave | 359 | 1.3 | H | 5.33 | 41.33 | 54.00 | -12.67 |
| 802.11a U-NII-1 Middle channel 5200MHz | | | | | | | | | |
| 223.45 | 40.79 | QP | 286 | 1.2 | H | -11.62 | 29.17 | 46.00 | -16.83 |
| 223.45 | 34.59 | QP | 164 | 1.2 | V | -11.62 | 22.97 | 46.00 | -23.03 |
| 4531.52 | 50.05 | PK | 246 | 1.8 | H | -1.94 | 48.11 | 74.00 | -25.89 |
| 4531.52 | 44.98 | Ave | 246 | 1.8 | H | -1.94 | 43.04 | 54.00 | -10.96 |
| 10400.00 | 42.05 | PK | 110 | 1.6 | H | 5.21 | 47.26 | 68.20 | -26.74 |
| 10400.00 | 36.17 | Ave | 110 | 1.6 | H | 5.21 | 41.38 | 54.00 | -12.62 |
| 802.11a U-NII-1 High channel 5240MHz | | | | | | | | | |
| 223.45 | 39.33 | QP | 308 | 1.5 | H | -11.62 | 27.71 | 46.00 | -18.29 |
| 223.45 | 35.16 | QP | 48 | 1.8 | V | -11.62 | 23.54 | 46.00 | -22.46 |
| 4502.74 | 49.98 | PK | 298 | 1.7 | H | -2.24 | 47.74 | 74.00 | -26.26 |
| 4502.74 | 43.84 | Ave | 298 | 1.7 | H | -2.24 | 41.60 | 54.00 | -12.40 |
| 10480.00 | 42.03 | PK | 118 | 1.4 | H | 5.14 | 47.17 | 68.20 | -26.83 |
| 10480.00 | 35.42 | Ave | 118 | 1.4 | H | 5.14 | 40.56 | 54.00 | -13.44 |

Note:

All model are tested. Only show worst data on report.

10 CONDUCTED EMISSION TEST

10.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 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.

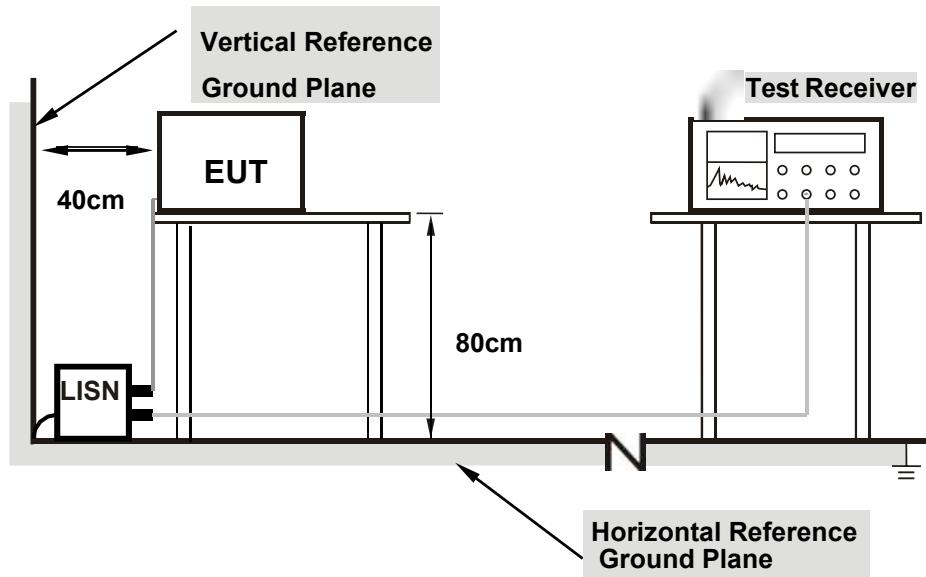
The following table is the setting of the receiver

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

10.2 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.

10.3 TEST SETUP



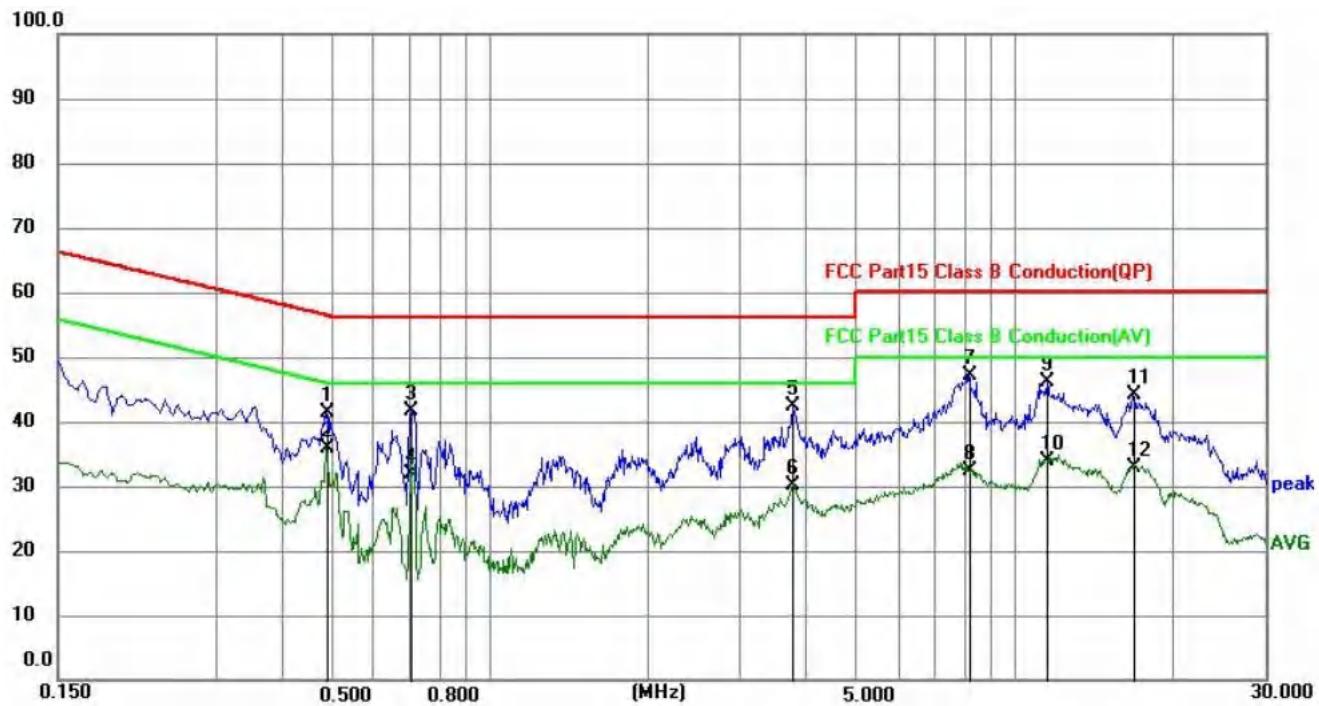
Note:

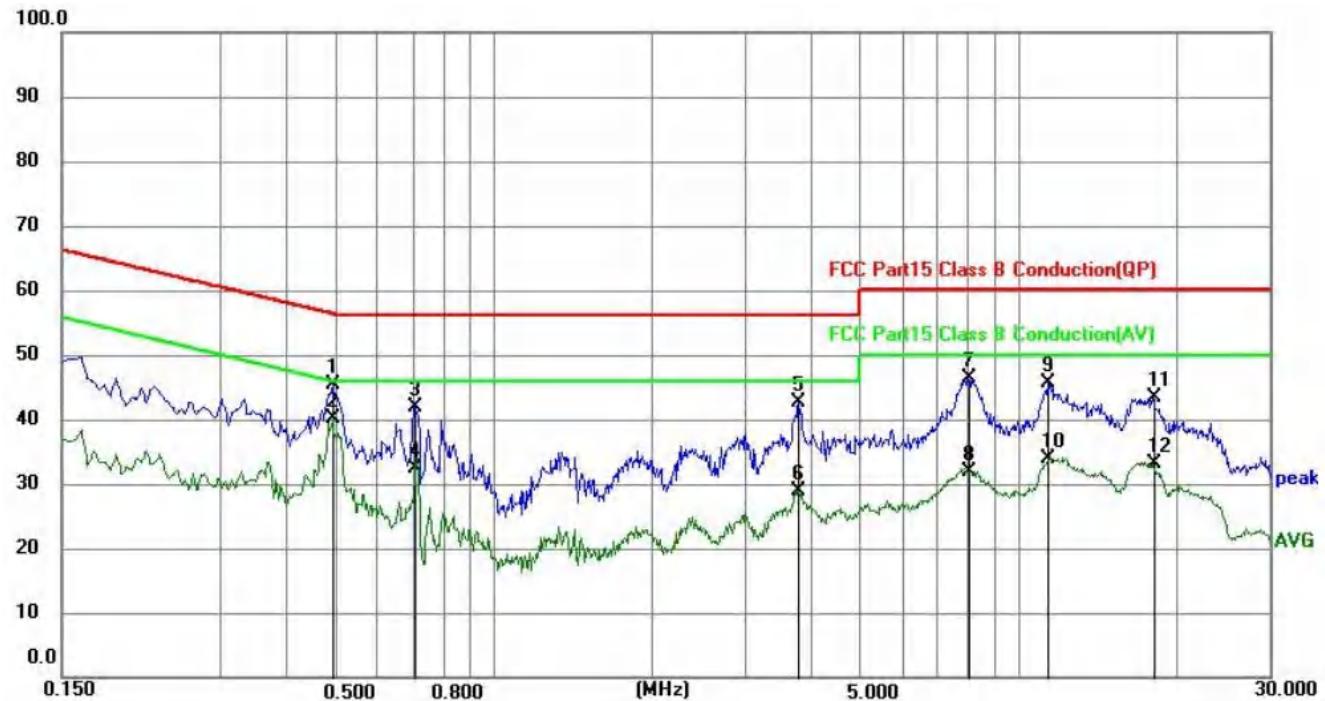
1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

10.4 TEST RESULT

| | | | |
|---------------|--------------|--------------------|-----|
| Temperature: | 22.1 °C | Relative Humidity: | 56% |
| Test Voltage: | AC 120V/60Hz | Phase: | L/N |
| Test Mode: | ON | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct | Result | Limit | Margin | Remark |
|-----|--------------------|-------------------|--------------|----------|----------|--------|--------|
| | | | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 0.4875 | 31.49 | 9.87 | 41.36 | 56.21 | 14.85 | QP |
| 2 | 0.4875 | 25.90 | 9.87 | 35.77 | 46.21 | 10.44 | AVG |
| 3 | 0.7080 | 31.66 | 9.89 | 41.55 | 56.00 | 14.45 | QP |
| 4 | 0.7080 | 22.04 | 9.89 | 31.93 | 46.00 | 14.07 | AVG |
| 5 | 3.7725 | 24.43 | 17.90 | 42.33 | 56.00 | 13.67 | QP |
| 6 | 3.7725 | 12.17 | 17.90 | 30.07 | 46.00 | 15.93 | AVG |
| 7 | 8.1555 | 27.25 | 20.00 | 47.25 | 60.00 | 12.75 | QP |
| 8 | 8.1555 | 12.33 | 20.00 | 32.33 | 50.00 | 17.67 | AVG |
| 9 | 11.5034 | 26.08 | 20.04 | 46.12 | 60.00 | 13.88 | QP |
| 10 | 11.5034 | 13.93 | 20.04 | 33.97 | 50.00 | 16.03 | AVG |
| 11 | 16.7685 | 23.90 | 20.13 | 44.03 | 60.00 | 15.97 | QP |
| 12 | 16.7685 | 12.82 | 20.13 | 32.95 | 50.00 | 17.05 | AVG |





| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 0.4920 | 35.46 | 9.87 | 45.33 | 56.13 | 10.80 | QP |
| 2 | 0.4920 | 30.33 | 9.87 | 40.20 | 46.13 | 5.93 | AVG |
| 3 | 0.7080 | 32.01 | 9.89 | 41.90 | 56.00 | 14.10 | QP |
| 4 | 0.7080 | 22.38 | 9.89 | 32.27 | 46.00 | 13.73 | AVG |
| 5 | 3.8130 | 24.69 | 18.00 | 42.69 | 56.00 | 13.31 | QP |
| 6 | 3.8130 | 10.88 | 18.00 | 28.88 | 46.00 | 17.12 | AVG |
| 7 | 8.0070 | 26.35 | 20.14 | 46.49 | 60.00 | 13.51 | QP |
| 8 | 8.0070 | 11.80 | 20.14 | 31.94 | 50.00 | 18.06 | AVG |
| 9 | 11.3549 | 25.56 | 20.19 | 45.75 | 60.00 | 14.25 | QP |
| 10 | 11.3549 | 13.72 | 20.19 | 33.91 | 50.00 | 16.09 | AVG |
| 11 | 17.9790 | 23.14 | 20.24 | 43.38 | 60.00 | 16.62 | QP |
| 12 | 17.9790 | 12.79 | 20.24 | 33.03 | 50.00 | 16.97 | AVG |

11. ANTENNA REQUIREMENT

11.1 STANDARD REQUIREMENT

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2 RESULT

The antennas used for this product are external antenna and other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 1.0 dBi.

*****END OF THE REPORT*****