

FCC RADIO TEST REPORT

FCC ID: 2AUO6-288ZDP

Product: Smart WiFi Camera

Trade Name: N/A

Model Name: TV-288ZD-2MP

Serial Model: N/A

Report No.: UNIA19092318FR-01

Prepared for

Shenzhen gang fan electronics co. LTD

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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name: Shenzhen gang fan electronics co. LTD

Address.....: 3K, 3rd Floor, Building A, Building C, Yuwei Factory Complex, Qingxiang Road, Qinghua Road, Longhua District, Shenzhen, China

Manufacture's Name.....: Shenzhen gang fan electronics co. LTD

Address.....: 3K, 3rd Floor, Building A, Building C, Yuwei Factory Complex, Qingxiang Road, Qinghua Road, Longhua District, Shenzhen, China

Product description

Product name: Smart WiFi Camera

Trade Mark.....: N/A

Model and/or type reference : TV-288ZD-2MP

Standards: FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test.....: Sep. 23, 2019

Date (s) of performance of tests.....: Sep. 23, 2019 -- Oct. 08, 2019

Date of Issue.....: Oct. 08, 2019

Test Result.....: Pass

Prepared by:



Kahn yang/Editor

Reviewer:



Sherwin Qian/Supervisor

Approved & Authorized Signer:



Liuzo/Manager

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1 TEST SUMMARY

1. Environment conditions

During the measurement the environment condition were within the listed ranges:

| | |
|--------------------|--------|
| Normal temperature | 25°C |
| Relative humidity | 55% |
| Air pressure | 101KPa |

2. TEST PROCEDURES AND RESULTS

| FCC PART 15.247 | | |
|---------------------------------|--------------------------------|------|
| FCC Part 15.207 | AC Power Conducted Emission | PASS |
| FCC Part 15.247(a)(2) | 6dB Bandwidth | PASS |
| FCC Part 15.247(d) | Spurious RF Conducted Emission | PASS |
| FCC Part 15.247(b) | Maximum Conducted Output Power | PASS |
| FCC Part 15.247(e) | Power Spectral Density | PASS |
| FCC Part 15.109/ 15.205/ 15.209 | Radiated Emissions | PASS |
| FCC Part 15.247(d) | Band Edge | PASS |
| FCC Part 15.203/15.247 (b) | Antenna Requirement | PASS |

3. TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.
Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files.

4. MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty(9kHz-30MHz) = 3.08dB, k=2

Radiated emission expanded uncertainty(30MHz-1000MHz) = 4.42dB, k=2

Radiated emission expanded uncertainty(Above 1GHz) = 4.06dB, k=2

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| | |
|--------------------|---|
| Equipment | Smart WiFi Camera |
| Trade Mark | N/A |
| Model Name | TV-288ZD-2MP |
| Serial No. | N/A |
| Model Difference | N/A |
| FCC ID | 2AUO6-288ZDP |
| Antenna Type | Glue stick antenna |
| Antenna Gain | 2dBi |
| Frequency Range | 802.11b/g/n20: 2412~2462 MHz 802.11n40: 2422~2452MHz |
| Number of Channels | 802.11b/g/n20: 11CH 802.11n40: 7CH |
| Modulation Type | CCK, OFDM/DSSS |
| Battery | N/A |
| Power Source | AC 120 50/60Hz |
| Adapter Model | MODEL:RXZ--0515 INPUT:100-240~50/60Hz 0.3A max OUTPUT: DC12V== 1500mA |

2.2 Description of Support Units

| Description | Manufacturer | Model No. | Remark | FCC certification |
|---------------|---|-----------|--------|-------------------|
| AC-DC adapter | SHENZHEN KEYU POWER SUPPLY TECHNOLOGY CO.,LTD | RXZ--0515 | / | SDOC |
| | | | | |

2.3 CARRIER FREQUENCY OF CHANNELS

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 01 | 2412 | 05 | 2432 | 09 | 2452 |
| 02 | 2417 | 06 | 2437 | 10 | 2457 |
| 03 | 2422 | 07 | 2442 | 11 | 2462 |
| 04 | 2427 | 08 | 2447 | | |

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 03 | 2422 | 06 | 2437 | 09 | 2452 |
| 04 | 2427 | 07 | 2442 | | |
| 05 | 2432 | 08 | 2447 | | |

OPERATION OF EUT DURING TESTING

Operating Mode: 802.11b/g/n(20MHz) Duty cycle>98%

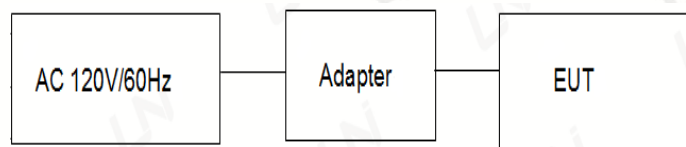
| | |
|----------------|---------|
| Low Channel: | 2412MHz |
| Middle Channel | 2437MHz |
| High Channel | 2462MHz |

Operating Mode: 802.11n(40MHz) Duty cycle>98%

| | |
|----------------|---------|
| Low Channel: | 2422MHz |
| Middle Channel | 2437MHz |
| High Channel | 2452MHz |

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation and Above1GHz Radiation testing:



2.5 MEASUREMENT INSTRUMENTS LIST

| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until |
|--------------------------|-------------------------------------|---------------|-------------|---------------|------------------|
| CONDUCTED EMISSIONS TEST | | | | | |
| 1 | AMN | Schwarzbeck | NNLK8121 | 8121370 | 2020.9.9 |
| 2 | AMN | ETS | 3810/2 | 00020199 | 2020.9.9 |
| 3 | EMI TEST RECEIVER | Rohde&Schwarz | ESCI | 101210 | 2020.9.9 |
| 4 | AAN | TESEQ | T8-Cat6 | 38888 | 2020.9.9 |
| RADIATED EMISSION TEST | | | | | |
| 1 | Horn Antenna | Sunol | DRH-118 | A101415 | 2020.9.29 |
| 2 | BicoNLog Antenna | Sunol | JB1 Antenna | A090215 | 2020.9.29 |
| 3 | PREAMP | HP | 8449B | 3008A00160 | 2020.9.9 |
| 4 | PREAMP | HP | 8447D | 2944A07999 | 2020.9.9 |
| 5 | EMI TEST RECEIVER | Rohde&Schwarz | ESR3 | 101891 | 2020.9.9 |
| 6 | VECTOR Signal Generator | Rohde&Schwarz | SMU200A | 101521 | 2020.9.28 |
| 7 | Signal Generator | Agilent | E4421B | MY4335105 | 2020.9.28 |
| 8 | MXA Signal Analyzer | Agilent | N9020A | MY50510140 | 2020.9.28 |
| 9 | MXA Signal Analyzer | Agilent | N9020A | MY51110104 | 2020.9.9 |
| 10 | ANT Tower&Turn table Controller | Champro | EM 1000 | 60764 | 2020.9.28 |
| 11 | Anechoic Chamber | Taihe Maorui | 9m*6m*6m | 966A0001 | 2020.9.9 |
| 12 | Shielding Room | Taihe Maorui | 6.4m*4m*3m | 643A0001 | 2020.9.9 |
| 13 | RF Power sensor | DARE | RPR3006W | 15I00041SNO88 | 2020.3.14 |
| 14 | RF Power sensor | DARE | RPR3006W | 15I00041SNO89 | 2020.3.14 |
| 15 | RF power divider | Anritsu | K241B | 992289 | 2020.9.28 |
| 16 | Wideband radio communication tester | Rohde&Schwarz | CMW500 | 154987 | 2020.9.28 |
| 17 | Biconical antenna | Schwarzbeck | VHA 9103 | 91032360 | 2020.9.8 |
| 18 | Biconical antenna | Schwarzbeck | VHA 9103 | 91032361 | 2020.9.8 |
| 19 | Broadband Hybrid Antennas | Schwarzbeck | VULB9163 | VULB9163#958 | 2020.9.8 |
| 20 | Horn Antenna | Schwarzbeck | BBHA9120D | 9120D-1680 | 2020.1.12 |
| 21 | Active Receive Loop Antenna | Schwarzbeck | FMZB 1919B | 00023 | 2020.11.02 |
| 22 | Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170651 | 2020.3.14 |
| 23 | Microwave Broadband Preamplifier | Schwarzbeck | BBV 9721 | 100472 | 2020.10.24 |
| 24 | Active Loop Antenna | Com-Power | AL-130R | 10160009 | 2020.5.10 |
| 25 | Power Meter | KEYSIGHT | N1911A | MY50520168 | 2020.5.10 |

3 TEST CONDITIONS AND RESULTS

3.1 CONDUCTED EMISSIONS TEST

Limit

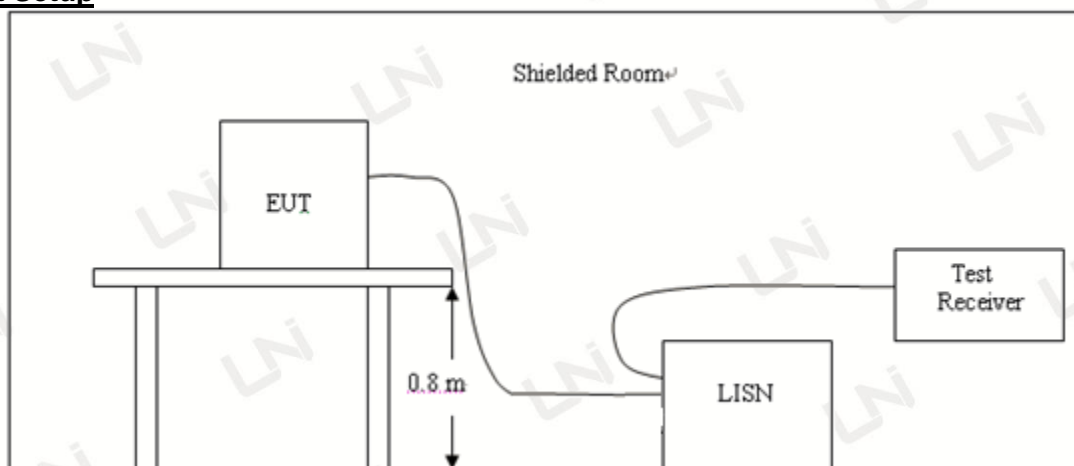
For unintentional device, according to § 15.207(a) Line Conducted Emission Limits is as following

| Frequency range (MHz) | Limit (dBuV) | |
|-----------------------|--------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

Test Setup



Test Procedure

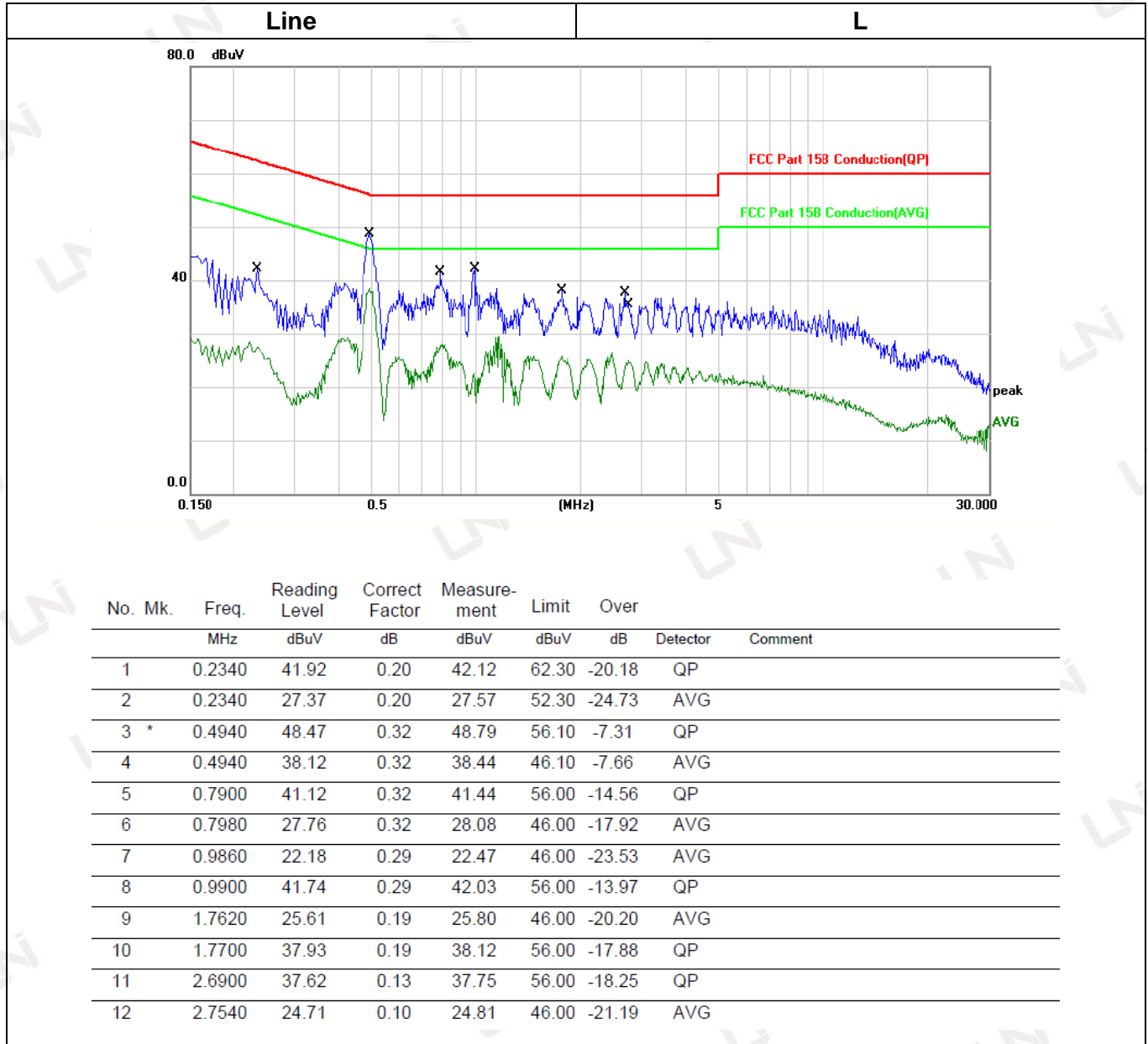
- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. A wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

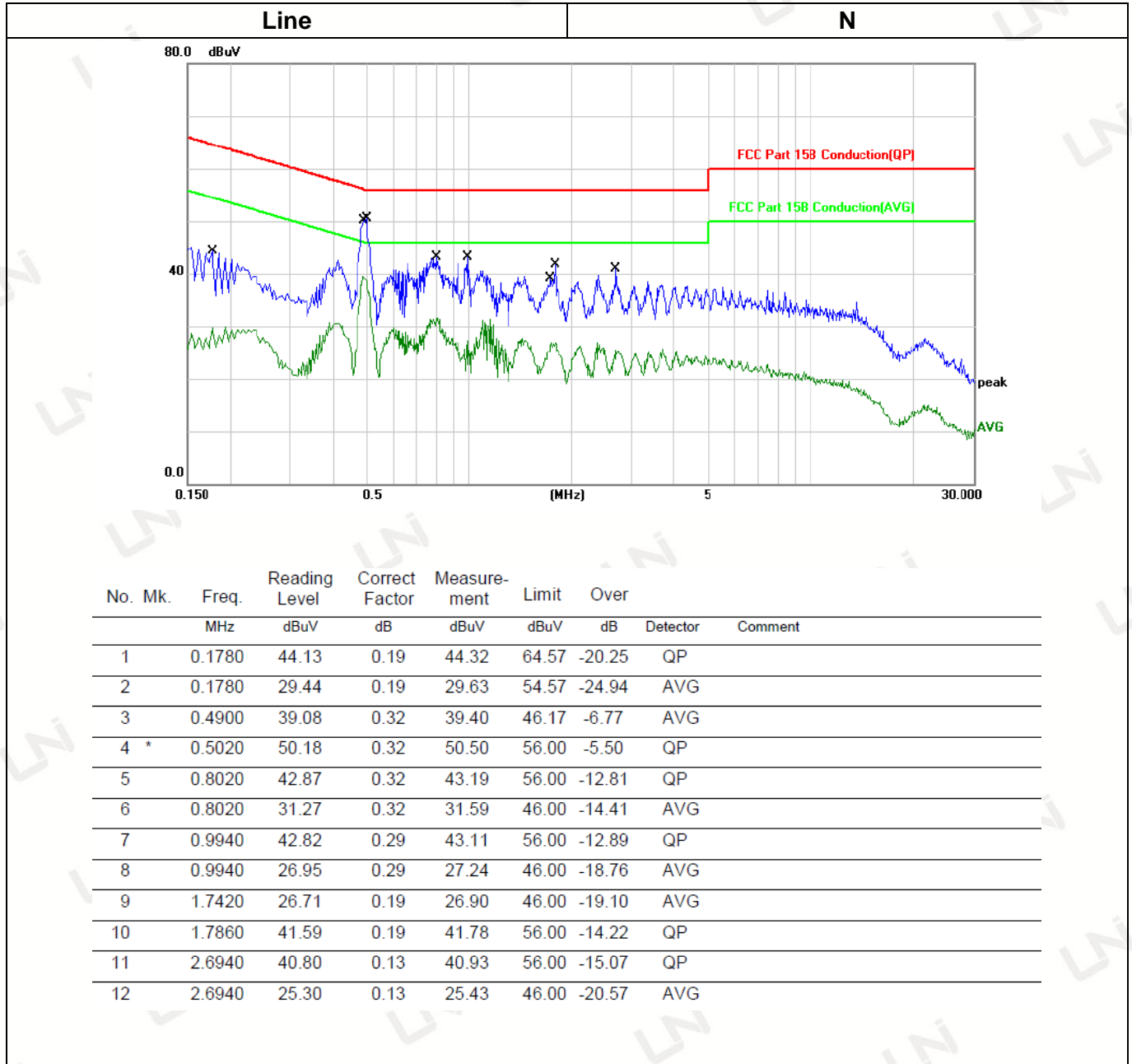
Test Result

---PASS---

| | | | |
|---------------|---------------|--------------------|------------|
| Temperature: | 25°C | Relative Humidity: | 48% |
| Test Date: | Sep. 27, 2019 | Pressure: | 1030hPa |
| Test Voltage: | AC 120V 60Hz | Polarization: | Horizontal |

Please refer to test data as follows:





3.2 RADIATED EMISSION TEST

Radiation Limit

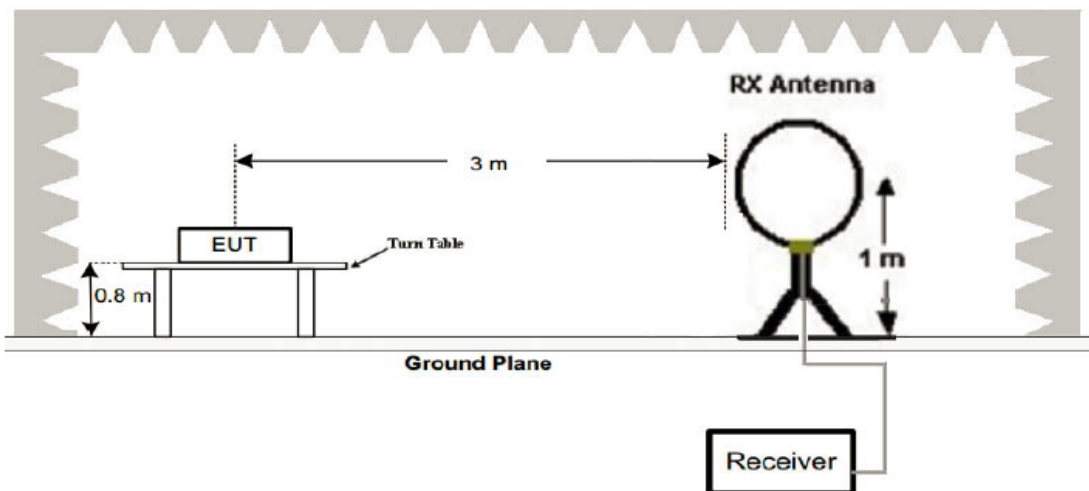
For unintentional device, according to § 15.209(a), except for Class B digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency (MHz) | Distance (Meters) | Radiated (dB μ V/m) | Radiated (μ V/m) |
|-----------------|-------------------|-------------------------|-----------------------|
| 30-88 | 3 | 40 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46 | 200 |
| Above 960 | 3 | 54 | 500 |

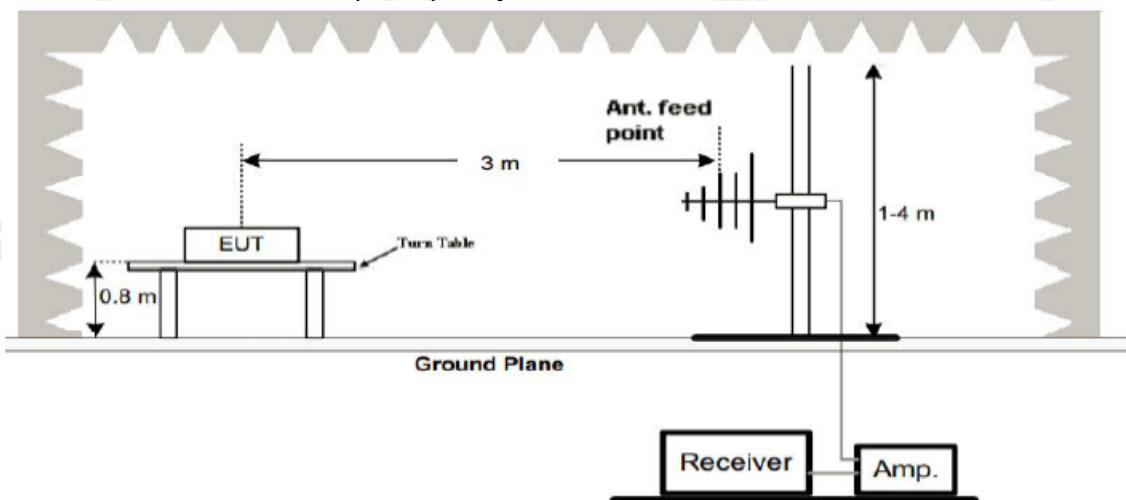
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

Test Setup

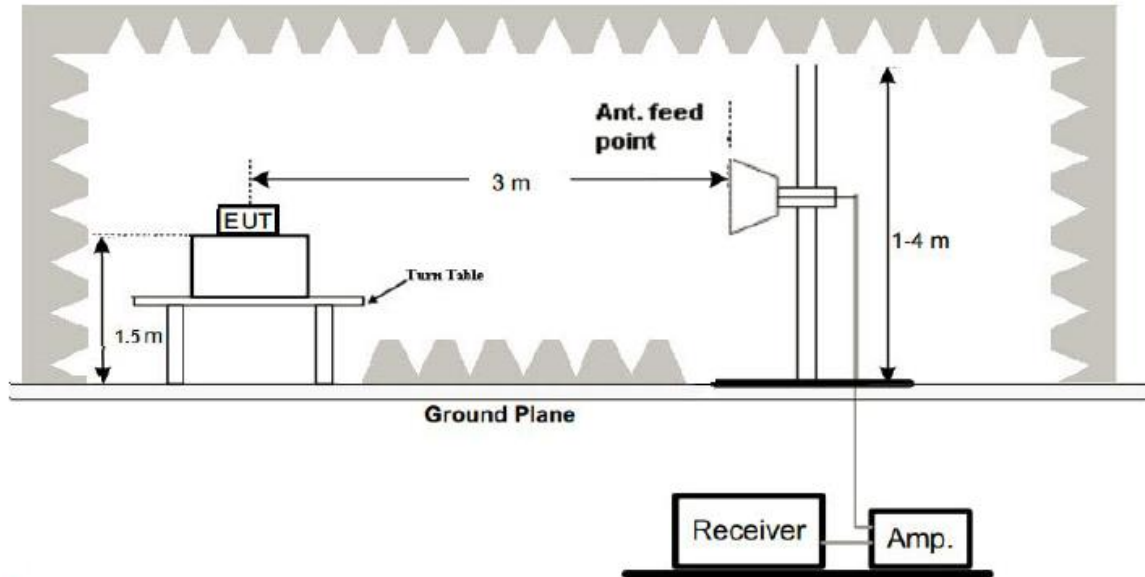
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9kHz to 25GHz per FCC PART 15.33(a).

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Result

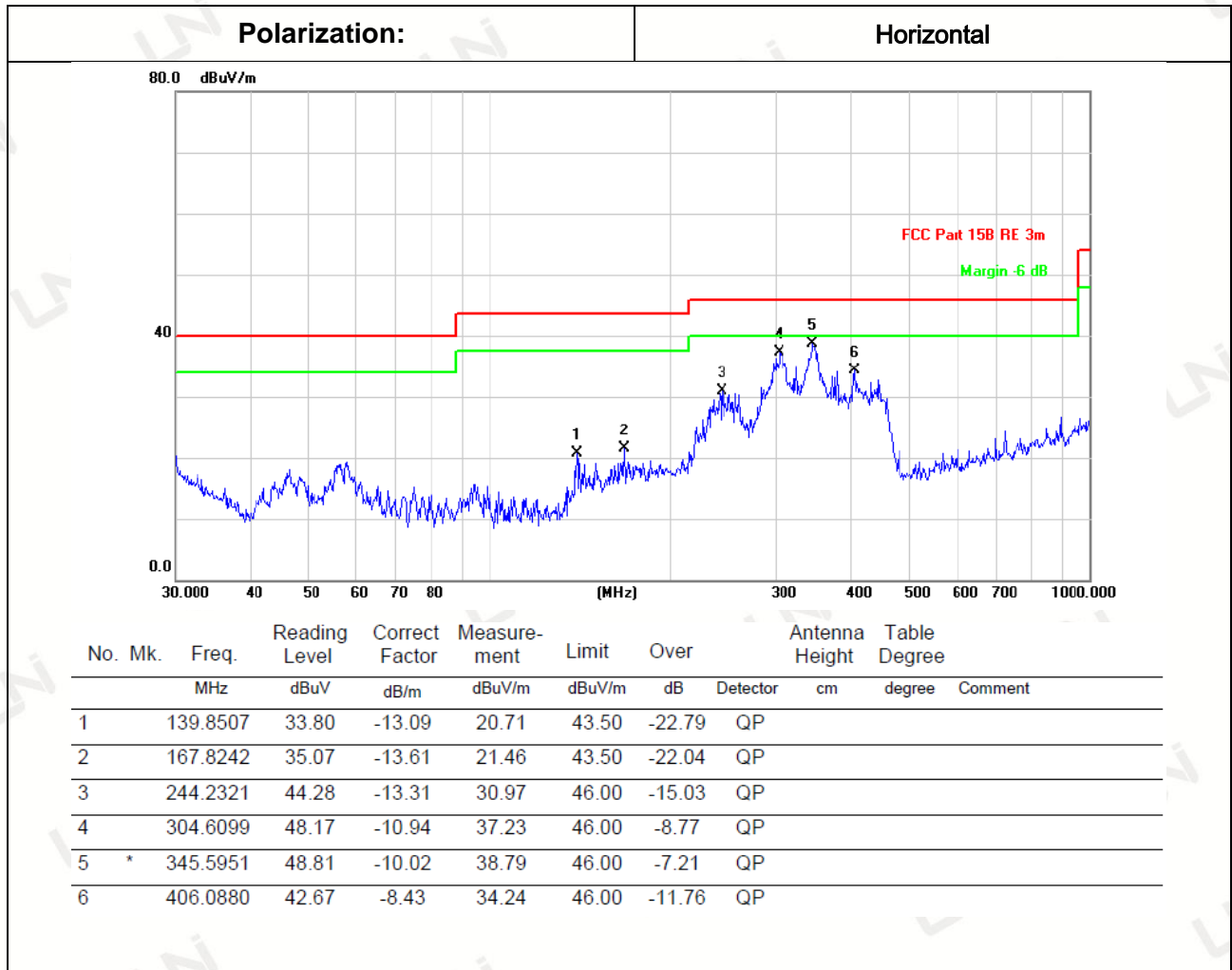
---PASS---

Remark:

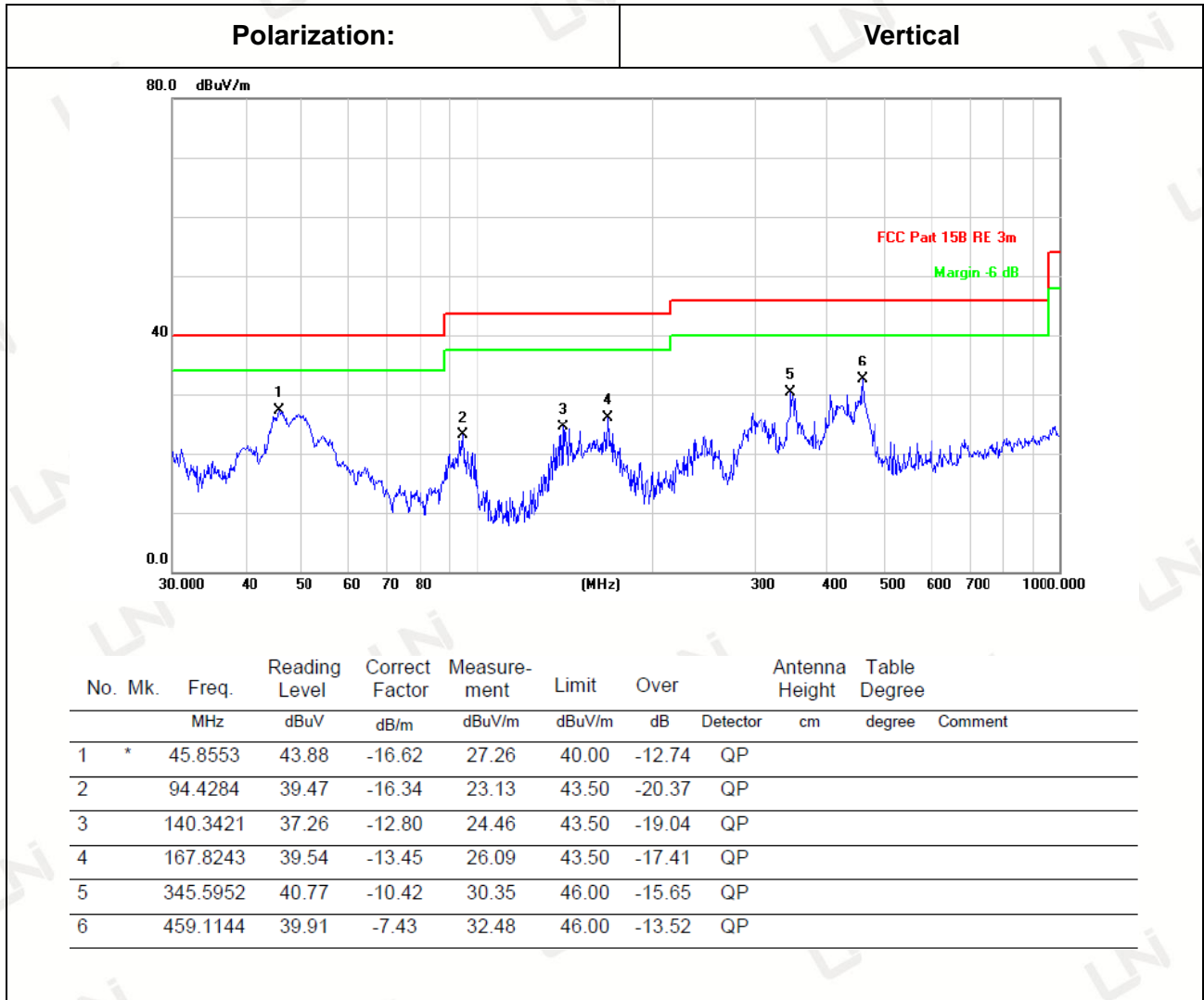
1. All the test modes completed for test. The worst case of Radiated Emission is Middle channel, the test data of this mode was reported.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.
3. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.

Below 1GHz Test Results:

| | | | |
|---------------|---------------|--------------------|------------|
| Temperature: | 25°C | Relative Humidity: | 48% |
| Test Date: | Sep. 27, 2019 | Pressure: | 1030hPa |
| Test Voltage: | AC 120V 60Hz | Polarization: | Horizontal |



Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier



Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Remark:

- (1) Measuring frequencies from 9 kHz to the 1 GHz, Radiated emission test from 9kHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:

Note: 802.11b/802.11g/802.11n(H20)/802.11n(H40) all have been tested, only worse case 802.11b is reported

802.11b Mode (2412MHz)

Horizontal:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|--|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 4804 | 49.06 | -3.64 | 45.42 | 74 | -28.58 | PK |
| 4804 | 40.74 | -3.64 | 37.10 | 54 | -16.90 | AV |
| 7206 | 49.38 | -0.95 | 48.43 | 74 | -25.57 | PK |
| 7206 | 39.24 | -0.95 | 38.29 | 54 | -15.71 | AV |
| -- | -- | -- | -- | -- | -- | -- |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit | | | | | | |

Vertical:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|--|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 4804 | 50.37 | -3.64 | 46.73 | 74 | -27.27 | PK |
| 4804 | 39.98 | -3.64 | 36.34 | 54 | -17.66 | AV |
| 7206 | 48.26 | -0.95 | 47.31 | 74 | -26.69 | PK |
| 7206 | 39.85 | -0.95 | 38.90 | 54 | -15.10 | AV |
| -- | -- | -- | -- | -- | -- | -- |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit | | | | | | |

802.11b Mode (2437MHz)

Horizontal:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|--|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 4880 | 49.51 | -3.51 | 46.00 | 74 | -28.00 | PK |
| 4880 | 39.04 | -3.51 | 35.53 | 54 | -18.47 | AV |
| 7320 | 48.40 | -0.82 | 47.58 | 74 | -26.42 | PK |
| 7320 | 39.67 | -0.82 | 38.85 | 54 | -15.15 | AV |
| -- | -- | -- | -- | -- | -- | -- |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit | | | | | | |

Vertical:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|--|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 4880 | 49.66 | -3.51 | 46.15 | 74 | -27.85 | PK |
| 4880 | 40.71 | -3.51 | 37.20 | 54 | -16.80 | AV |
| 7320 | 49.59 | -0.82 | 48.77 | 74 | -25.23 | PK |
| 7320 | 39.15 | -0.82 | 38.33 | 54 | -15.67 | AV |
| -- | -- | -- | -- | -- | -- | -- |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit | | | | | | |

802.11b Mode (2462MHz)

Horizontal:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|--|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 4960.00 | 49.10 | -3.43 | 45.67 | 74 | -28.33 | PK |
| 4960.00 | 40.39 | -3.43 | 36.96 | 54 | -17.04 | AV |
| 7440.00 | 49.89 | -0.75 | 49.14 | 74 | -24.86 | PK |
| 7440.00 | 39.02 | -0.75 | 38.27 | 54 | -15.73 | AV |
| -- | -- | -- | -- | -- | -- | -- |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit | | | | | | |

Vertical:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|--|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 4960.00 | 52.94 | -3.43 | 49.51 | 74 | -24.49 | PK |
| 4960.00 | 40.80 | -3.43 | 37.37 | 54 | -16.63 | AV |
| 7440.00 | 49.25 | -0.75 | 48.50 | 74 | -25.50 | PK |
| 7440.00 | 39.46 | -0.75 | 38.71 | 54 | -15.29 | AV |
| -- | -- | -- | -- | -- | -- | -- |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit | | | | | | |

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
- (7) All modes of operation were investigated and the worst-case emissions are reported.

3.3 BAND EDGE

Limits

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

Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 1MHz and VBM to 3MHz to measure the peak field strength and set RBW to 1MHz and VBW to 3MHz RMS to measure the average radiated field strength.

Test Result

---PASS---

Radiated Band Edge Test:

Note: 802.11b/802.11g/802.11n (H20)/802.11n (H40) all have been tested, only worse case 802.11b is reported

802.11b Mode (2412 MHz)

Horizontal:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|---|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 2310.00 | 56.99 | -5.81 | 51.18 | 74 | -22.82 | PK |
| 2310.00 | 43.80 | -5.81 | 37.99 | 54 | -16.01 | AV |
| 2390.00 | 56.01 | -5.84 | 50.17 | 74 | -23.83 | PK |
| 2390.00 | 49.62 | -5.84 | 43.78 | 54 | -10.22 | AV |
| 2400.00 | 59.40 | -5.84 | 53.56 | 74 | -20.44 | PK |
| 2400.00 | 48.65 | -5.84 | 42.81 | 54 | -11.19 | AV |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

Vertical:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector |
|---|----------------|--------|----------------|----------|--------|----------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type |
| 2310.00 | 55.24 | -5.81 | 49.43 | 74 | -24.57 | PK |
| 2310.00 | 44.13 | -5.81 | 38.32 | 54 | -15.68 | AV |
| 2390.00 | 56.50 | -5.84 | 50.66 | 74 | -23.34 | PK |
| 2390.00 | 47.55 | -5.84 | 41.71 | 54 | -12.29 | AV |
| 2400.00 | 57.57 | -5.84 | 51.73 | 74 | -22.27 | PK |
| 2400.00 | 45.53 | -5.84 | 39.69 | 54 | -14.31 | AV |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

802.11b Mode (2462 MHz)

Horizontal (Worst case):

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector Type |
|---|----------------|--------|----------------|----------|--------|---------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2483.50 | 54.76 | -5.65 | 49.11 | 74 | -24.89 | PK |
| 2483.50 | 48.06 | -5.65 | 42.41 | 54 | -11.59 | AV |
| 2487.25 | 56.09 | -5.65 | 50.44 | 74 | -23.56 | PK |
| 2487.25 | 47.59 | -5.65 | 41.94 | 54 | -12.06 | AV |
| 2500.00 | 56.42 | -5.72 | 50.70 | 74 | -23.30 | PK |
| 2500.00 | 45.66 | -5.72 | 39.94 | 54 | -14.06 | AV |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

Vertical:

| Frequency | Reading Result | Factor | Emission Level | Limits | Margin | Detector Type |
|---|----------------|--------|----------------|----------|--------|---------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2483.50 | 57.59 | -5.65 | 51.94 | 74 | -22.06 | PK |
| 2483.50 | 48.32 | -5.65 | 42.67 | 54 | -11.33 | AV |
| 2487.25 | 57.02 | -5.65 | 51.37 | 74 | -22.63 | PK |
| 2487.25 | 47.59 | -5.65 | 41.94 | 54 | -12.06 | AV |
| 2500.00 | 59.35 | -5.72 | 53.63 | 74 | -20.37 | PK |
| 2500.00 | 46.61 | -5.72 | 40.89 | 54 | -13.11 | AV |
| Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

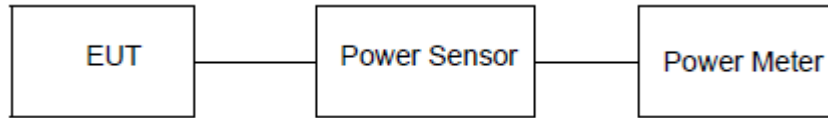
3.4 CONDUCTED OUTPUT POWER

Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.



Test Result

---PASS---

| Type | Channel | PK Output power (dBm) | Limit (dBm) | Result |
|---------------|---------|-----------------------|-------------|--------|
| 802.11b | 01 | 12.67 | 30.00 | Pass |
| | 06 | 10.26 | | |
| | 11 | 11.55 | | |
| 802.11g | 01 | 11.03 | 30.00 | Pass |
| | 06 | 9.43 | | |
| | 11 | 11.82 | | |
| 802.11n(HT20) | 01 | 11.07 | 30.00 | Pass |
| | 06 | 9.01 | | |
| | 11 | 11.33 | | |
| 802.11n(HT40) | 03 | 8.86 | 30.00 | Pass |
| | 06 | 7.99 | | |
| | 09 | 8.36 | | |

Note: 1.The test results including the cable lose.

3.5 POWER SPECTRAL DENSITY

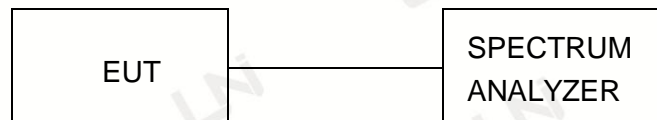
Limit

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

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
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 power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

Test Configuration



Test Results

| Type | Channel | Power Spectral Density (dBm/3KHz) | Limit (dBm/3KHz) | Result |
|---------------|---------|-----------------------------------|------------------|--------|
| 802.11b | 01 | -24.639 | 8.00 | Pass |
| | 06 | -22.357 | | |
| | 11 | -20.858 | | |
| 802.11g | 01 | -25.669 | 8.00 | Pass |
| | 06 | -25.167 | | |
| | 11 | -23.151 | | |
| 802.11n(HT20) | 01 | -27.429 | 8.00 | Pass |
| | 06 | -25.923 | | |
| | 11 | -23.242 | | |
| 802.11n(HT40) | 03 | -27.345 | 8.00 | Pass |
| | 06 | -26.886 | | |
| | 09 | -25.306 | | |

Test plot as follows:

802.11b



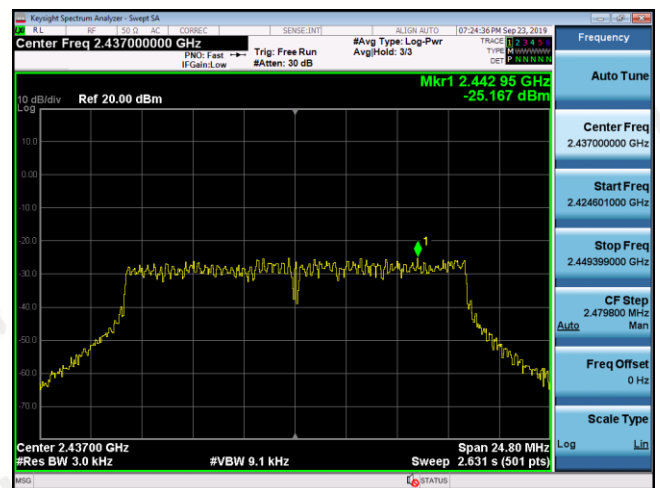
802.11g



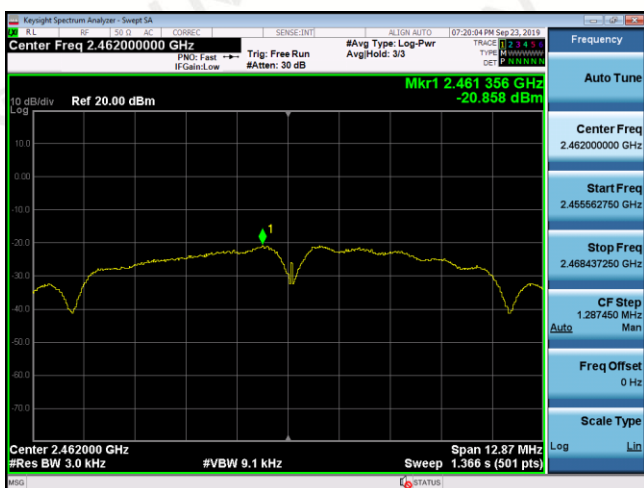
CH01



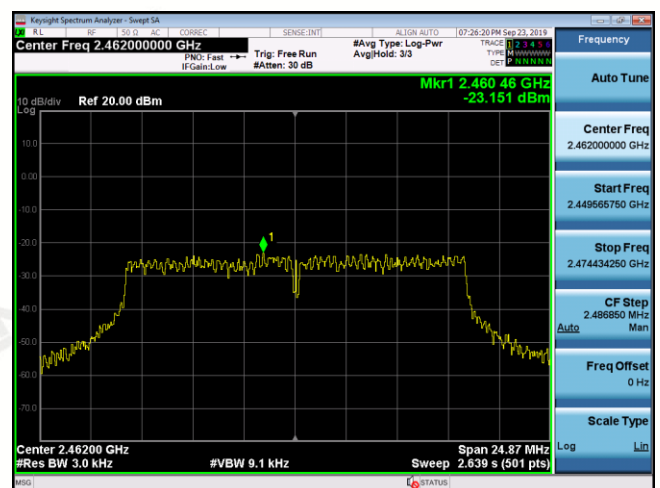
CH01



CH06



CH06



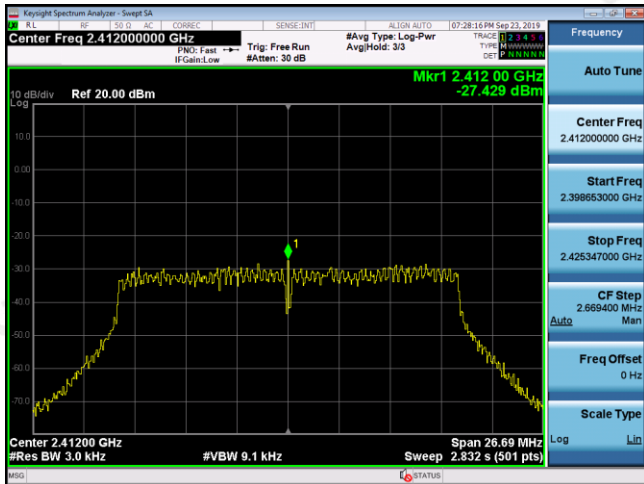
CH11



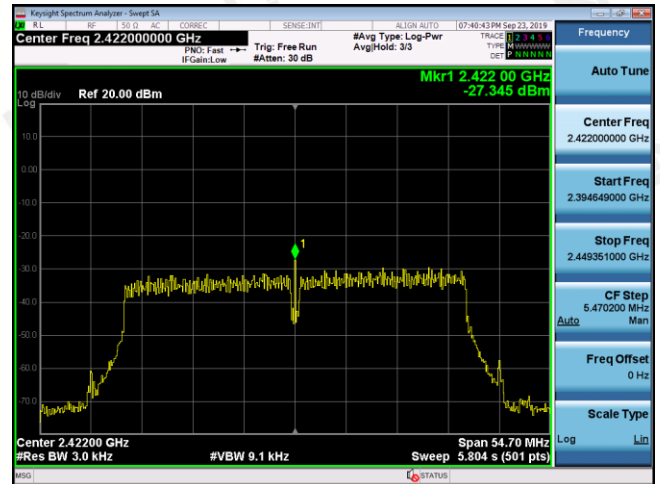
CH11



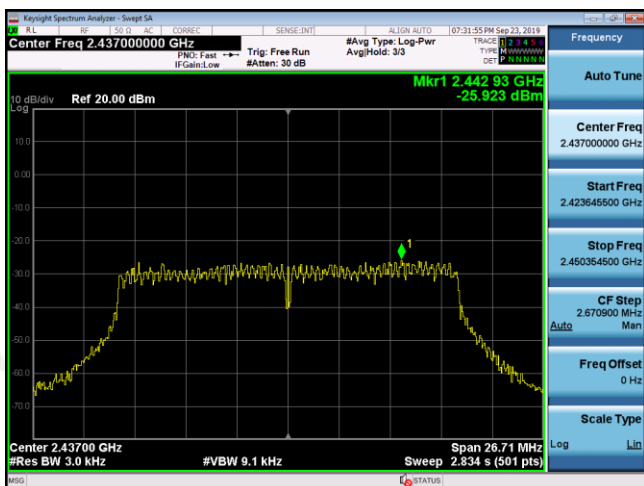
802.11n(HT20)



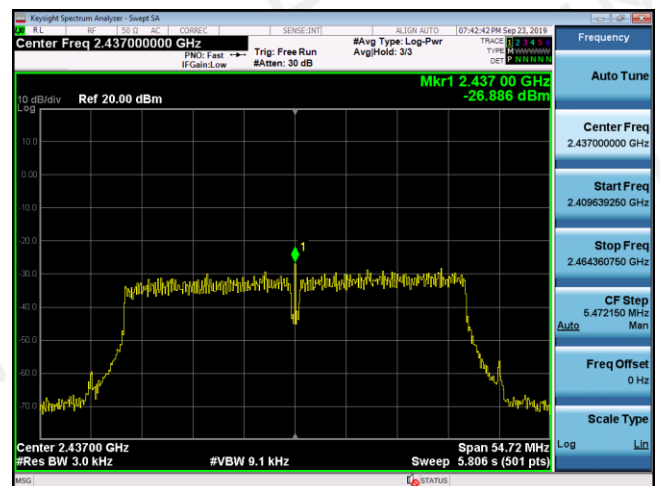
802.11n(HT40)



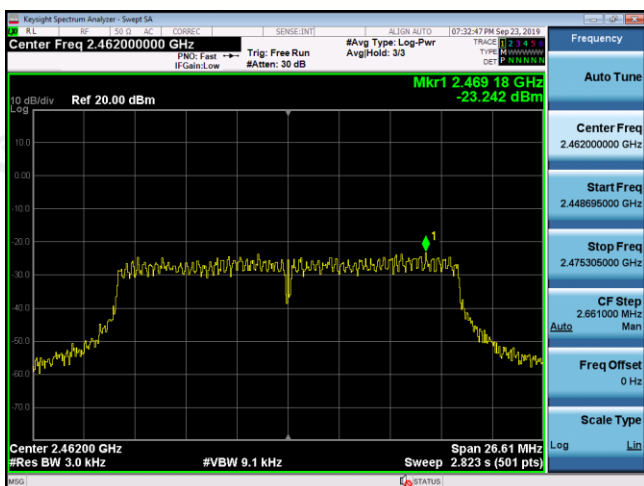
CH01



CH03



CH06



CH06



CH11



CH09



3.6 OCCUPIED BANDWIDTH MEASUREMENT

Test Limit

| FCC Part15(15.247), Subpart C | | | | |
|-------------------------------|-----------|---|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(a)(2) | Bandwidth | $\geq 500\text{KHz}$ (6dB bandwidth) | 2400-2483.5 | PASS |

Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on ANSI C63.10 section 6.9.2: RBW=30KHz, VBW=100KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

Measurement Equipment Used

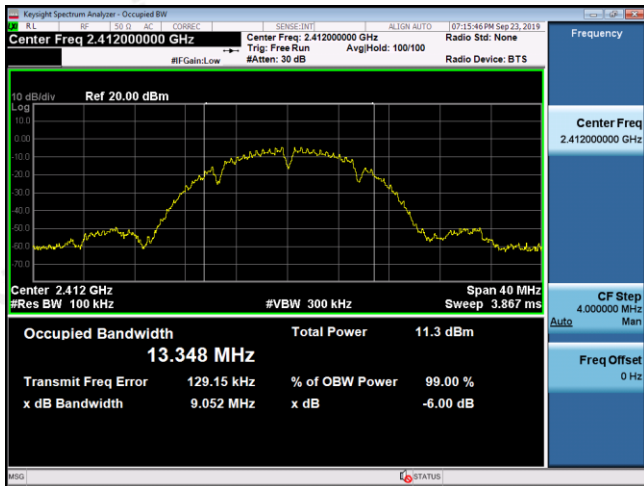
Same as Radiated Emission Measurement

Test Result

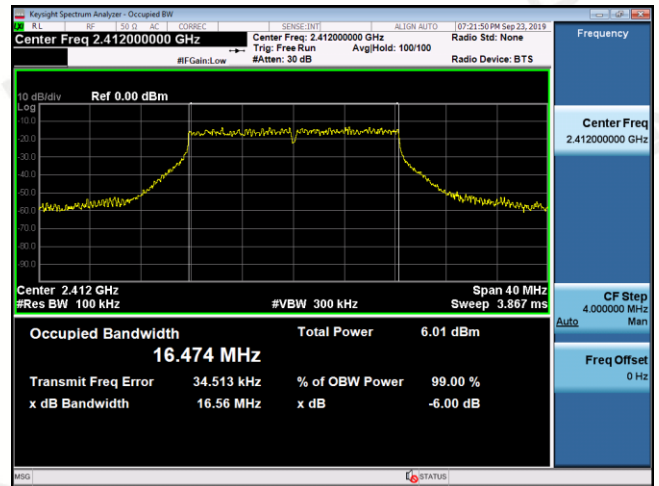
---PASS---

| Type | Channel | 6dB Bandwidth (MHz) | 99% OBW (MHz) | Limit (KHz) | Result |
|---------------|---------|---------------------|---------------|-------------|--------|
| 802.11b | 01 | 9.052 | 13.348 | ≥ 500 | Pass |
| | 06 | 8.619 | 13.331 | | |
| | 11 | 8.583 | 13.405 | | |
| 802.11g | 01 | 16.56 | 16.474 | ≥ 500 | Pass |
| | 06 | 16.53 | 16.464 | | |
| | 11 | 16.58 | 16.572 | | |
| 802.11n(HT20) | 01 | 17.80 | 17.676 | ≥ 500 | Pass |
| | 06 | 17.81 | 17.702 | | |
| | 11 | 17.74 | 17.696 | | |
| 802.11n(HT40) | 03 | 36.47 | 36.152 | ≥ 500 | Pass |
| | 06 | 36.48 | 36.139 | | |
| | 09 | 36.48 | 36.158 | | |

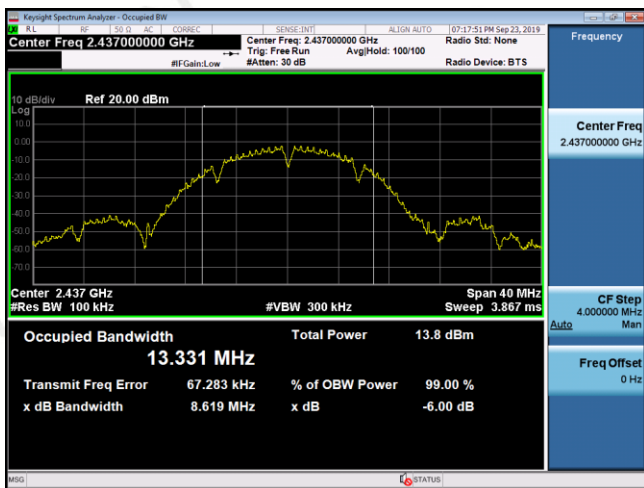
802.11b



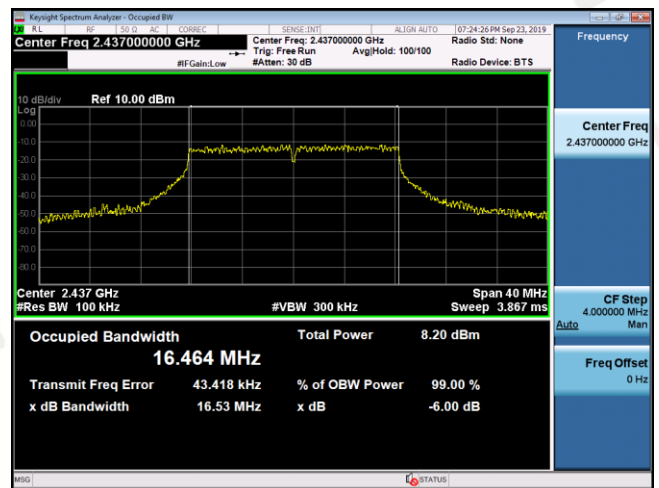
802.11g



CH01



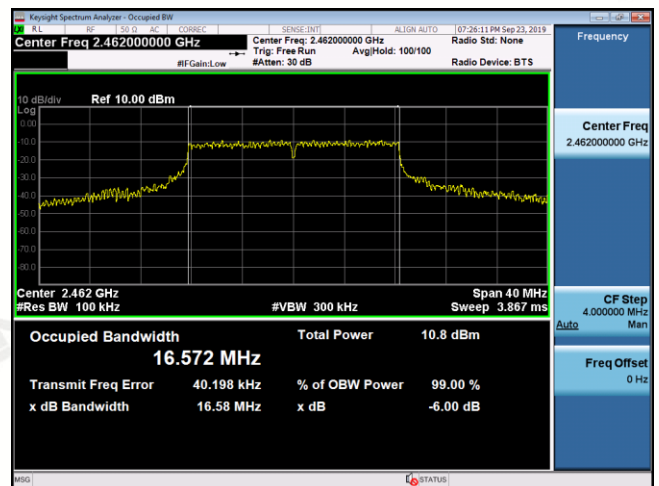
CH01



CH06



CH06



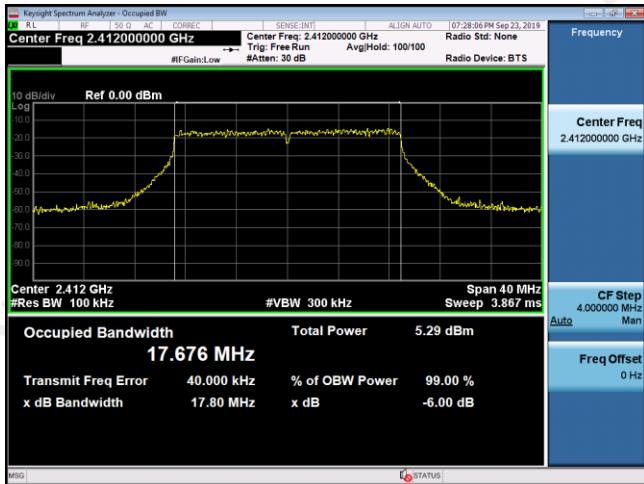
CH11



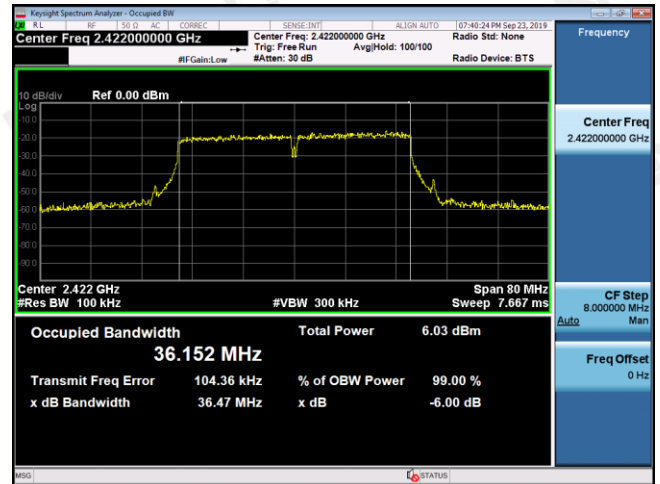
CH11



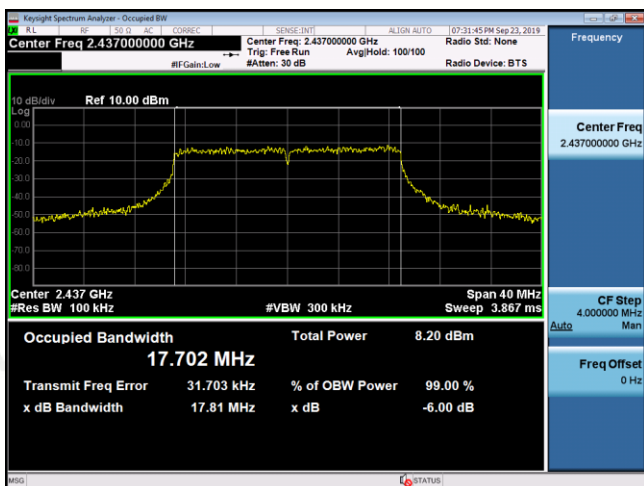
802.11n(HT20)



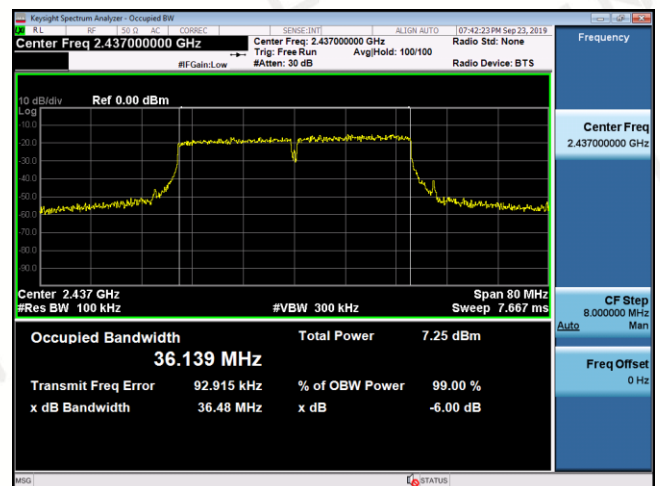
802.11n(HT40)



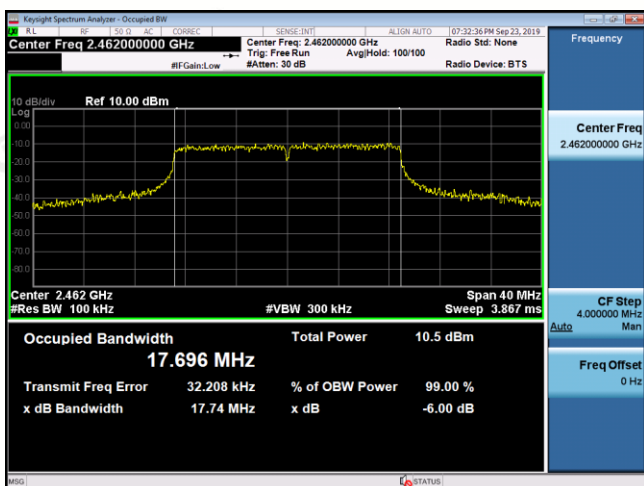
CH01



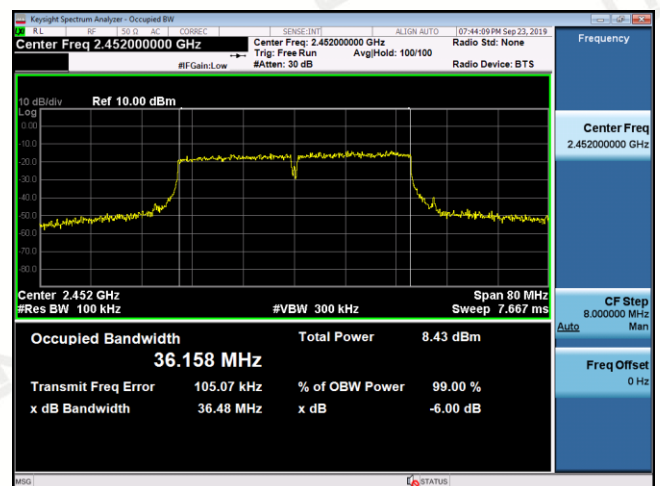
CH03



CH06



CH06



CH11

CH09

3.7 OUT-OF BAND EMISSIONS

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration

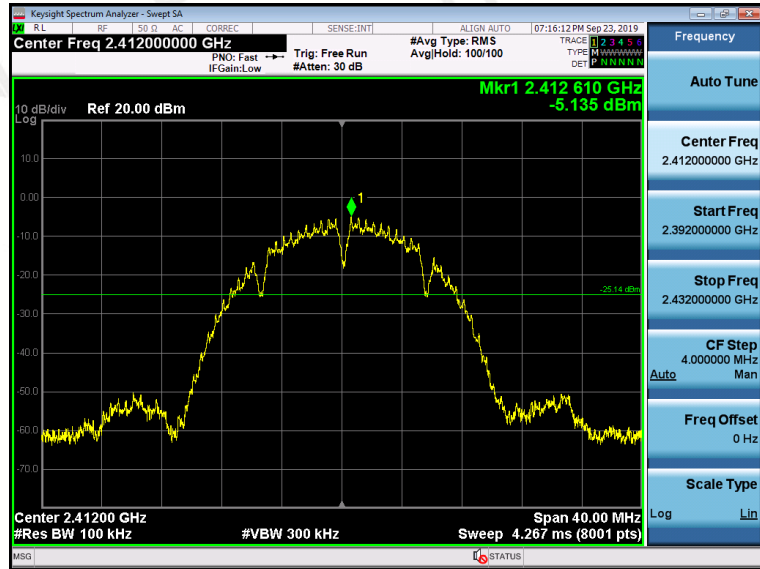


Test Results

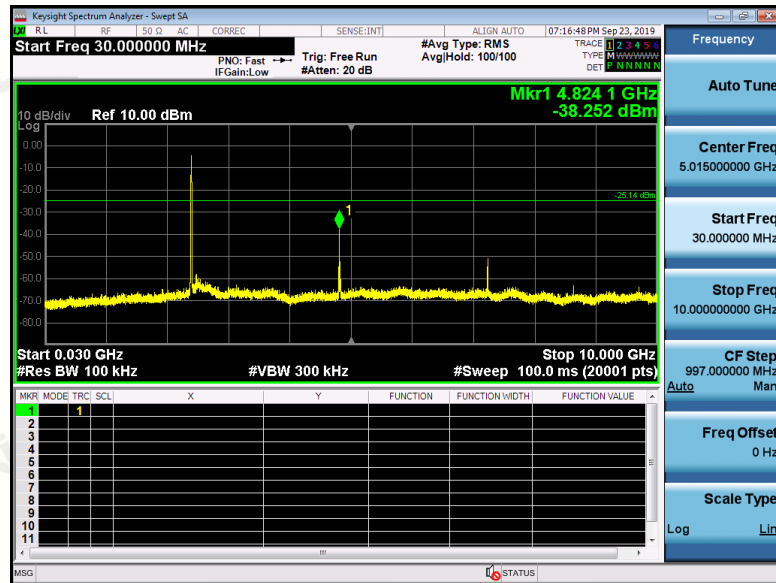
Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

802.11b- CH01

Reference



30MHz-10GHz



10GHz-26.5GHz

