

FCC RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

| | |
|----------------------|---|
| Test Standard | FCC Part 15.249 |
| FCC ID | X8DLEADR |
| Brand name | ROCCAT |
| Product name | ROCCAT® Leadr – Wireless Multi-Button RGB Gaming Mouse |
| Model No. | Leadr |
| Test Result | Pass |

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of CCS. Inc.

The sample selected for test was production product and was provided by manufacturer.



Approved by:

A handwritten signature in black ink, appearing to read "Sam Chuang", written over a horizontal line.

Sam Chuang
Manager

Reviewed by:

A handwritten signature in black ink, appearing to read "Zeus Chen", written over a horizontal line.

Zeus Chen
Supervisor

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|------|------------------|--|-------------|
| 00 | December 7, 2016 | Initial Issue | Doris Chu |
| 01 | March 4, 2017 | 1. Fieldstrength values as Output Power 2. Delete Sec. 4.3.2 | Angel Cheng |
| 02 | March 21, 2017 | 1. Add NO.4 in section 4.3.2 in page 19. 2. Add The Lowest Frequency in section 1.1 in page 4. 3. Revise Modulation Type in section 1.2 in page 5. | Doris Chu |
| 03 | March 27, 2017 | 1. add notes in section 4.3.2 (5. | Doris Chu |

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

| | |
|----------------------|--|
| Applicant | ROCCAT GmbH Otto von Bahrenpark Paul-Dessau-Str. 3G 22761 Hamburg Germany |
| Equipment | ROCCAT® Leadr - Wireless Multi-Button RGB Gaming Mouse |
| Model Name | Leadr |
| Model Discrepancy | N/A |
| EUT Functions | 2.4G SRD |
| The Lowest Frequency | 16MHz |
| Received Date | Oct 28, 2016 |
| Date of Test | Nov 11, 2016 ~ Dec 6, 2016 |
| Field strength | Peak : 83.28 dBuV/m at 3m Average : 78.29 dBuV/m at 3m |
| Power Operation | <input type="checkbox"/> AC 120V/60Hz <input type="checkbox"/> Adapter(Not for sale) <input type="checkbox"/> PoE(Not for sale) <input checked="" type="checkbox"/> DC Type : <input checked="" type="checkbox"/> Battery 3.7V <input type="checkbox"/> DC Power Supply <input type="checkbox"/> External DC adapter <input checked="" type="checkbox"/> From host system |

1.2 EUT CHANNEL INFORMATION

| | |
|-------------------|---------------------------------|
| Frequency Range | 2403MHz-2480MHz |
| Modulation Type | FSK & Frequency hopping for SRD |
| Number of channel | 78 Channels |

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 for test channels

| Number of frequencies to be tested | | |
|--|-----------------------|--|
| Frequency range in which device operates | Number of frequencies | Location in frequency range of operation |
| <input type="checkbox"/> 1 MHz or less | 1 | Middle |
| <input type="checkbox"/> 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| <input checked="" type="checkbox"/> More than 10 MHz | 3 | 1 near top, 1 near middle, and 1 near bottom |

1.3 ANTENNA INFORMATION

| | |
|------------------|--|
| Antenna Category | <input checked="" type="checkbox"/> Integral: antenna permanently attached <input type="checkbox"/> External dedicated antennas <input type="checkbox"/> External Unique antenna connector |
| Antenna Type | <input type="checkbox"/> PIFA <input checked="" type="checkbox"/> PCB <input type="checkbox"/> Dipole <input type="checkbox"/> Printed <input type="checkbox"/> Coils |
| Antenna Gain | 3.27 dBi |

1.4 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---------------------------------------|-------------|
| AC Powerline Conducted Emission | +/- 1.2575 |
| Emission bandwidth, 20dB bandwidth | +/- 1.4003 |
| RF output power, conducted | +/- 1.1372 |
| Power density, conducted | +/- 1.4003 |
| 3M Semi Anechoic Chamber / 30M~200M | +/- 4.0138 |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 3.9483 |
| 3M Semi Anechoic Chamber / 1G~8G | +/- 2.5975 |
| 3M Semi Anechoic Chamber / 8G~18G | +/- 2.6112 |
| 3M Semi Anechoic Chamber / 18G~26G | +/- 2.7389 |
| 3M Semi Anechoic Chamber / 26G~40G | +/- 2.9683 |
| 3M Semi Anechoic Chamber / 40G~60G | +/- 1.8509 |
| 3M Semi Anechoic Chamber / 60G~75G | +/- 1.9869 |
| 3M Semi Anechoic Chamber / 75G~110G | +/- 2.9651 |
| 3M Semi Anechoic Chamber / 110G~170G | +/- 2.7807 |
| 3M Semi Anechoic Chamber / 170G~220G | +/- 3.6437 |
| 3M Semi Anechoic Chamber / 220G~325G | +/- 4.2982 |

Remark:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at
No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

| Test site | Test Engineer | Remark |
|--------------------|---------------|--------|
| AC Conduction Room | Anderson Kuo | |
| Radiation | Dennis Li | |
| RF Conducted | ED Chiang | |

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

| RF Conducted Test Site | | | | |
|------------------------|--------------|--------|--------|------------|
| Equipment | Manufacturer | Model | S/N | Cal Due |
| Spectrum Analyzer | R&S | FSV 40 | 101073 | 07/31/2017 |

| 3M 966 Chamber Test Site | | | | |
|--------------------------|----------------|---------------------|-------------|------------|
| Equipment | Manufacturer | Model | S/N | Cal Due |
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 12/07/2016 |
| Loop Ant | COM-POWER | AL-130 | 121051 | 02/24/2017 |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 07/02/2017 |
| Pre-Amplifier | EMEC | EM330 | 60609 | 06/07/2017 |
| Horn Antenna | ETC | MCTD 1209 | DRH13M02003 | 09/01/2017 |
| Pre-Amplifier | MITEQ | AMF-6F-260400-40-8P | 985646 | 01/13/2017 |
| Horn Antenna | EMCO | 3116 | 26370 | 01/14/2017 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R |

| AC Conducted Emissions Test Site | | | | |
|----------------------------------|--------------|--------|--------|------------|
| Equipment | Manufacturer | Model | S/N | Cal Due |
| LISN | R&S | ENV216 | 101054 | 05/10/2017 |
| Receiver | R&S | ESCI | 101073 | 08/19/2017 |

Remark: Each piece of equipment is scheduled for calibration once a year.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT



| EUT Accessories Equipment | | | | | |
|---------------------------|-----------|-------|-------|------------|--------|
| No. | Equipment | Brand | Model | Series No. | FCC ID |
| | N/A | | | | |

| Support Equipment | | | | | |
|-------------------|-----------|-------|-------|------------|--------------|
| No. | Equipment | Brand | Model | Series No. | FCC ID |
| 1 | Notebook | ASUS | A&J | N/A | PD9WM3945ABG |

1.8 Test methodology and applied standards

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.249,

1.9 Table of accreditations and listings

| Country | Agency | Scope of Accreditation | Logo |
|---------|-----------------|--|---|
| USA | FCC | 3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements |  FCC MRA: TW1039 |
| Canada | Industry Canada | 3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform |  IC 2324G-1 IC 2324G-2 |

2. TEST SUMMERY

| FCC Standard Sec. | Chapter | Test Item | Result |
|-------------------------|---------|-----------------------------|--------|
| 15.203 | 1.2 | Antenna Requirement | Pass |
| 15.207(a) | 4.1 | AC Conducted Emission | Pass |
| 15.215 | 4.2 | 20 dB Bandwidth | Pass |
| - | 4.2 | Occupied Bandwidth (99%) | - |
| 15.249(a) | 4.3 | Radiation Band Edge | Pass |
| 15.249(a), 15.209(a) | 4.3 | Radiation Spurious Emission | Pass |

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

| | |
|--------------------------|---|
| Operation mode | SRD |
| Test Channel Frequencies | 1.Lowest Channel : 2403MHz 2.Middle Channel : 2441MHz 3.Highest Channel : 2480MHz |

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

.

3.2 THE WORST MODE OF MEASUREMENT

| AC Power Line Conducted Emission | |
|----------------------------------|--|
| Test Condition | AC Power line conducted emission for line and neutral |
| Voltage/Hz | 120V/60Hz |
| Test Mode | Mode 1: EUT power by host system via USB cable EUT |
| Worst Mode | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

| Radiated Emission Measurement Above 1G | |
|--|---|
| Test Condition | Band edge, Emission for Unwanted and Fundamental |
| Voltage/Hz | 120V/60Hz |
| Test Mode | Mode 1: EUT power by host system via USB cable EUT Mode 2: EUT power by battery |
| Worst Mode | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |
| Worst Position | <input type="checkbox"/> Placed in fixed position. <input checked="" type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> Placed in fixed position at Z-Plane (H-Plane) |
| Worst Polarity | <input checked="" type="checkbox"/> Horizontal <input type="checkbox"/> Vertical |

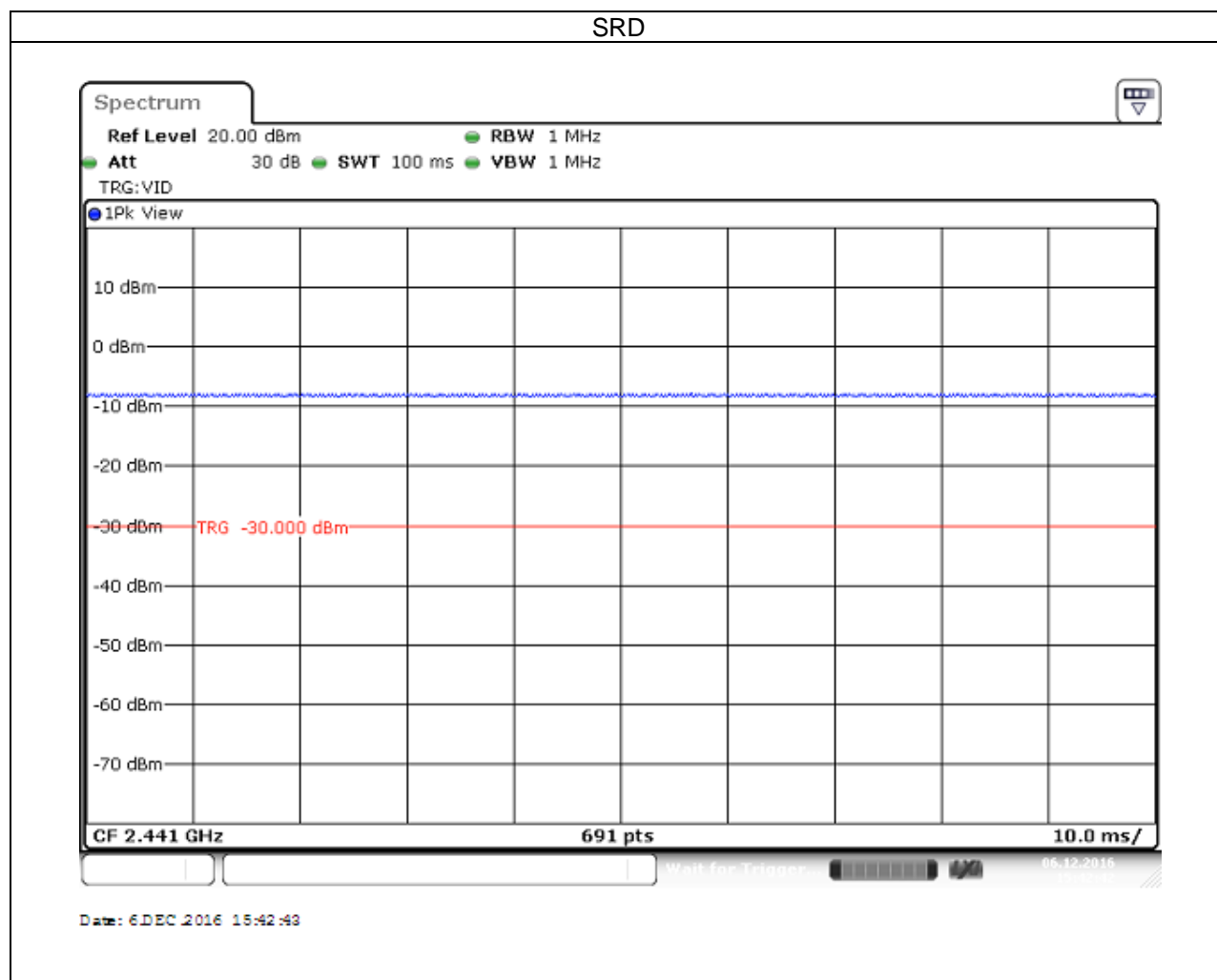
| Radiated Emission Measurement Below 1G | |
|--|---|
| Test Condition | Radiated Emission Below 1G |
| Voltage/Hz | 120V/60Hz |
| Test Mode | Mode 1: EUT power by host system via USB cable EUT Mode 2: EUT power by battery |
| Worst Mode | <input checked="" type="checkbox"/> Mode 1 <input checked="" type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(X-Plane and Horizontal) were recorded in this report.
3. For below 1G AC power line conducted emission and radiation emission were performed the EUT transmit at the highest output power channel as worse case.
4. EUT power supply had two ways (host system and battery),that EUT pre-scanned two power supply at Radiated below 1G, and the worst case was host system mode. Therefore EUT used adapter mode for Radiated measurement above 1G and Conduction below 1G in test report.

3.3 EUT DUTY CYCLE

| Duty Cycle | | | | |
|---------------|------------|-------------|----------------|-----------------|
| Configuration | TX ON (ms) | TX ALL (ms) | Duty Cycle (%) | Duty Factor(dB) |
| SRD | 100 | 100 | 100 % | 0.00 dB |



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a)

| Frequency Range (MHz) | Limits(dB μ V) | |
|--------------------------|--------------------|-----------|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

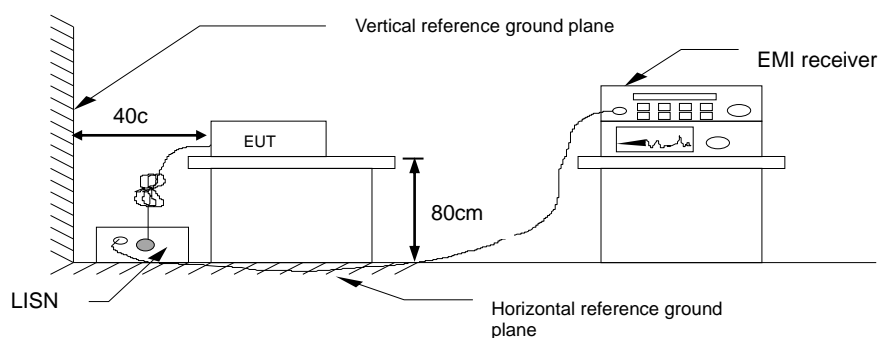
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup

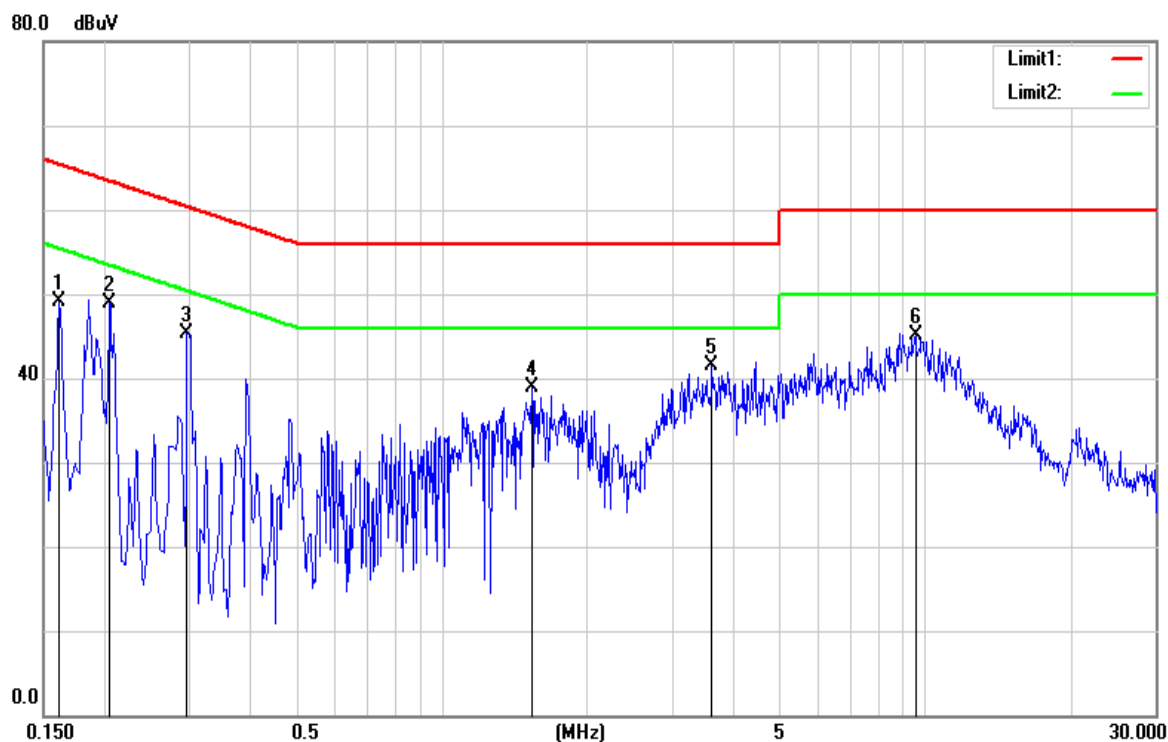


4.1.4 Test Result

Pass

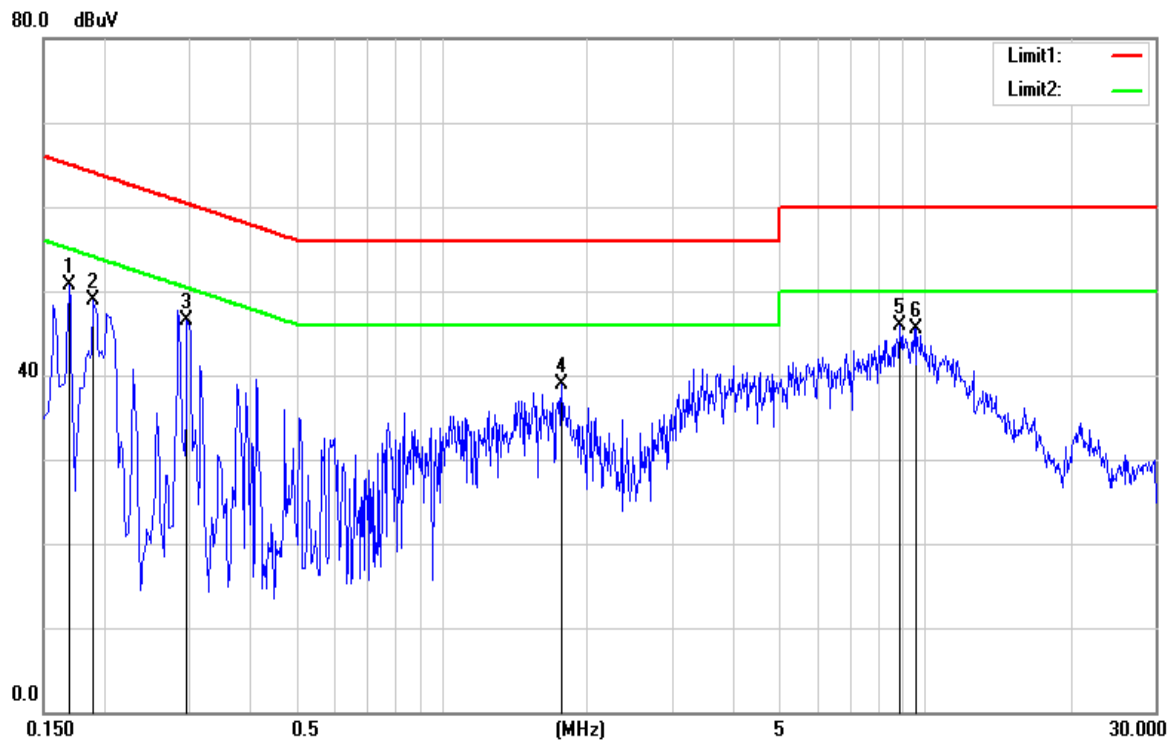
Test Data

| | | | |
|---------------|---------------|---------------|---------------|
| Test Mode: | Mode 1 | Temp/Hum | 24(°C)/ 56%RH |
| Test Voltage: | 120Vac / 60Hz | Test Date | Nov 11, 2016 |
| Phase: | Line | Test Engineer | Anderson Kuo |



| Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|-----------------|---------------------------|------------------------|------------------------|--------------------------|-----------------------|-------------------------|----------------------|------------------------|---------------------|--------|
| 0.1620 | 39.39 | 35.18 | 9.69 | 49.08 | 44.87 | 65.36 | 55.36 | -16.28 | -10.49 | Pass |
| 0.2060 | 39.29 | 37.75 | 9.68 | 48.97 | 47.43 | 63.36 | 53.37 | -14.39 | -5.94 | Pass |
| 0.2980 | 35.60 | 33.28 | 9.68 | 45.28 | 42.96 | 60.30 | 50.30 | -15.02 | -7.34 | Pass |
| 1.5420 | 28.77 | 24.85 | 10.11 | 38.88 | 34.96 | 56.00 | 46.00 | -17.12 | -11.04 | Pass |
| 3.6340 | 31.67 | 29.87 | 9.81 | 41.48 | 39.68 | 56.00 | 46.00 | -14.52 | -6.32 | Pass |
| 9.6020 | 35.08 | 32.74 | 9.94 | 45.02 | 42.68 | 60.00 | 50.00 | -14.98 | -7.32 | Pass |

| | | | |
|---------------|---------------|---------------|---------------|
| Test Mode: | Mode 1 | Temp/Hum | 27(°C)/ 53%RH |
| Test Voltage: | 120Vac / 60Hz | Test Date | Nov 11, 2016 |
| Phase: | Neutral | Test Engineer | Anderson Kuo |



| Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|-----------------|---------------------------|------------------------|------------------------|--------------------------|-----------------------|-------------------------|----------------------|------------------------|---------------------|--------|
| 0.1700 | 40.98 | 38.48 | 9.64 | 50.62 | 48.12 | 64.96 | 54.96 | -14.34 | -6.84 | Pass |
| 0.1900 | 39.24 | 37.88 | 9.64 | 48.88 | 47.52 | 64.03 | 54.04 | -15.15 | -6.48 | Pass |
| 0.2980 | 36.91 | 34.87 | 9.64 | 46.55 | 44.51 | 60.30 | 50.30 | -13.75 | -5.79 | Pass |
| 1.7780 | 29.02 | 27.44 | 9.89 | 38.91 | 37.33 | 56.00 | 46.00 | -17.09 | -8.67 | Pass |
| 8.9020 | 35.95 | 33.74 | 9.89 | 45.84 | 43.63 | 60.00 | 50.00 | -14.16 | -6.37 | Pass |
| 9.6500 | 35.69 | 33.94 | 9.91 | 45.60 | 43.85 | 60.00 | 50.00 | -14.40 | -6.15 | Pass |

4.2 20DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

4.2.1 Test Limit

20 dB Bandwidth : For reporting purposes only.

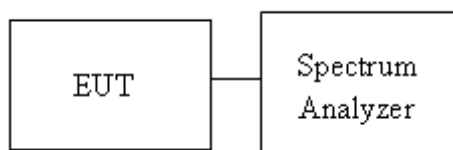
Occupied Bandwidth(99%) : For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.9.2,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth and 99% Bandwidth.
4. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup



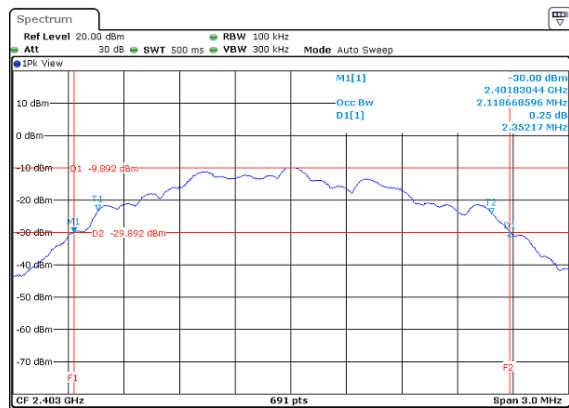
4.2.4 Test Result

| Test mode: SRD mode / 2403-2480 MHz | | | |
|-------------------------------------|-----------------|----------------|---------------|
| Channel | Frequency (MHz) | OBW(99%) (MHz) | 20dB BW (MHz) |
| Low | 2403 | 2.1186 | 2.3521 |
| Mid | 2442 | 2.1230 | 2.3826 |
| High | 2480 | 2.1273 | 2.3782 |

Test Data

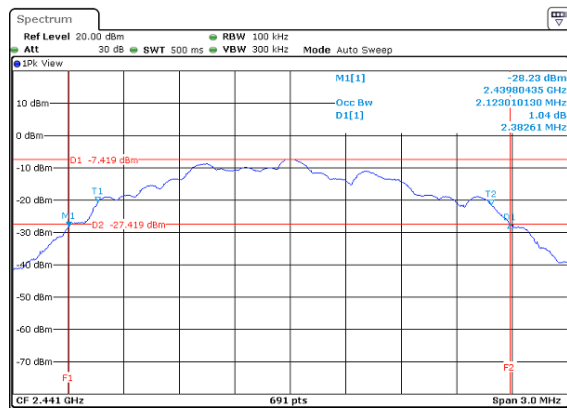
SRD mode

Low CH



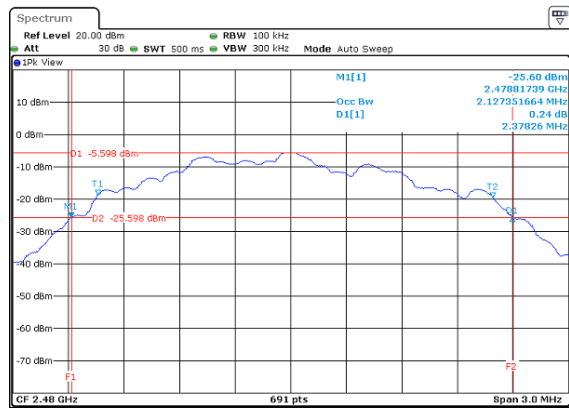
Date: 6 DEC 2016 16:02:59

Mid CH



Date: 6 DEC 2016 16:04:21

High CH



Date: 6 DEC 2016 16:05:46

4.3 RADIATION BANDEGE AND SPURIOUS EMISSION

4.3.1 Test Limit

According to §15.249(a)

(1) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency (MHz) | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) |
|-----------------------------|--|--|
| 2400-2483.5 | 50 | 500 |
| 5725-5875 | 50 | 500 |
| 24000-24250 | 250 | 2500 |

* Field strength limits are specified at a distance of 3 meters

| Fundamental Limit Conversion | | |
|------------------------------|------------------------|---------------------|
| Average (mV/m) at 3M | Average (dBuV/m) at 3M | Peak (dBuV/m) at 3M |
| 50 | 93.97 | 113.97 |

| Harmonic Limit Conversion | | |
|---------------------------|------------------------|---------------------|
| Average (uV/m) at 3M | Average (dBuV/m) at 3M | Peak (dBuV/m) at 1M |
| 500 | 53.97 | 73.97 |

*(Limit=20LOG(500)=53.79 dBuV/m)

(2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209(follow the table), whichever is the lesser attenuation

Below 30 MHz

| Frequency | Field Strength (microvolts/m) | Measurement Distance (metres) |
|---------------|----------------------------------|-------------------------------------|
| 9-490 kHz | 2,400/F (F in kHz) | 300 |
| 490-1,705 kHz | 24,000/F (F in kHz) | 30 |
| 1.705-30 MHz | 30 | 30 |

Above 30 MHz

| Frequency | Field Strength (microvolts/m) | Measurement Distance (metres) |
|-----------|----------------------------------|-------------------------------------|
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

4.3.2 Test Procedure

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.
3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.
4. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.
5. Below 30MHz radiated emission was investigated starting from 9KHz and no emissions were found within 20dB from the limit.

6. The SA setting following :

(1) Below 1G : RBW = 100kHz, VBW \geq 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G :

(2.1) For Peak measurement : RBW = 1MHz, VBW \geq 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement : RBW = 1MHz, VBW

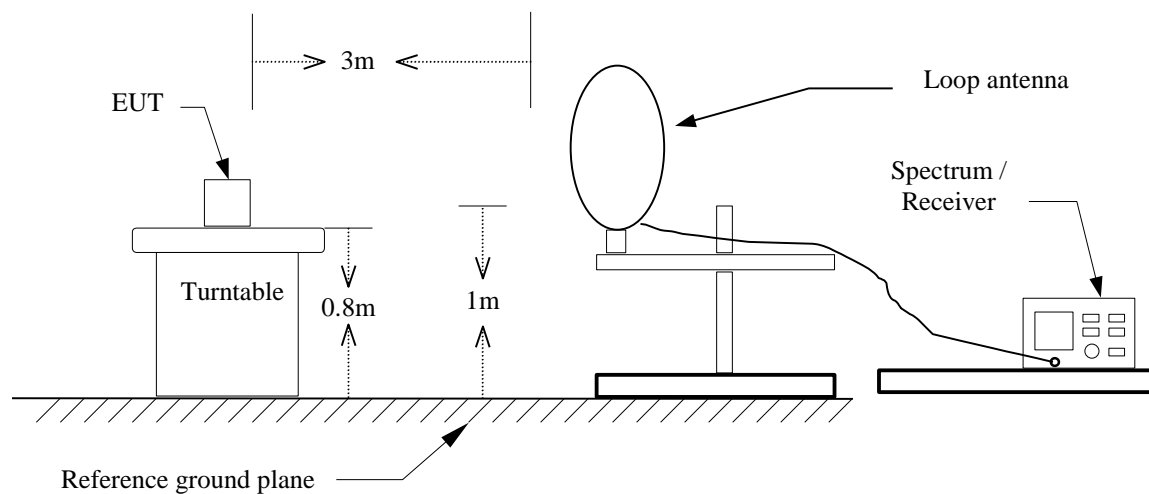
· If Duty Cycle \geq 98%, VBW=10Hz.

· If Duty Cycle < 98%, VBW=1/T.

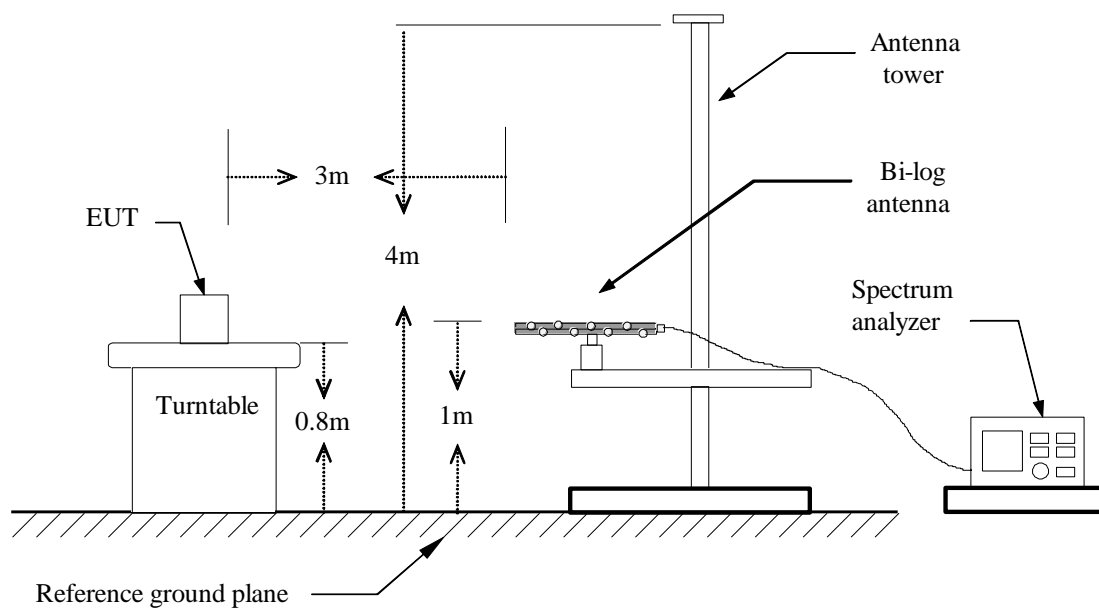
| Configuration | Duty Cycle (%) | VBW |
|---------------|----------------|------|
| SRD | 100% | 10Hz |

4.3.3 Test Setup

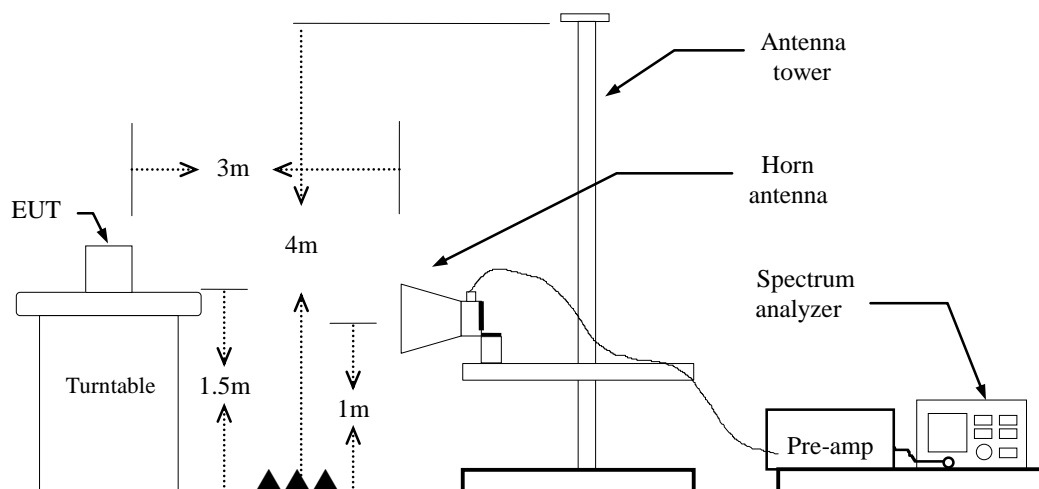
9kHz ~ 30MHz



30MHz ~ 1GHz



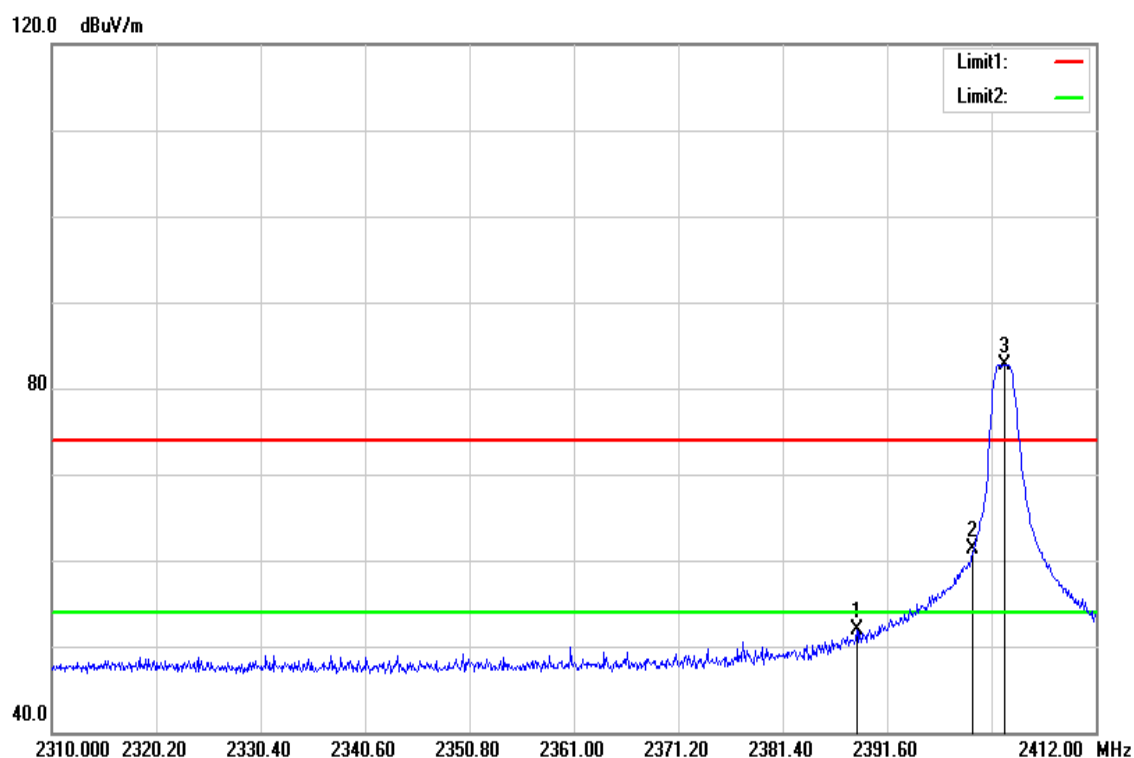
Above 1 GHz



4.3.4 Test Result

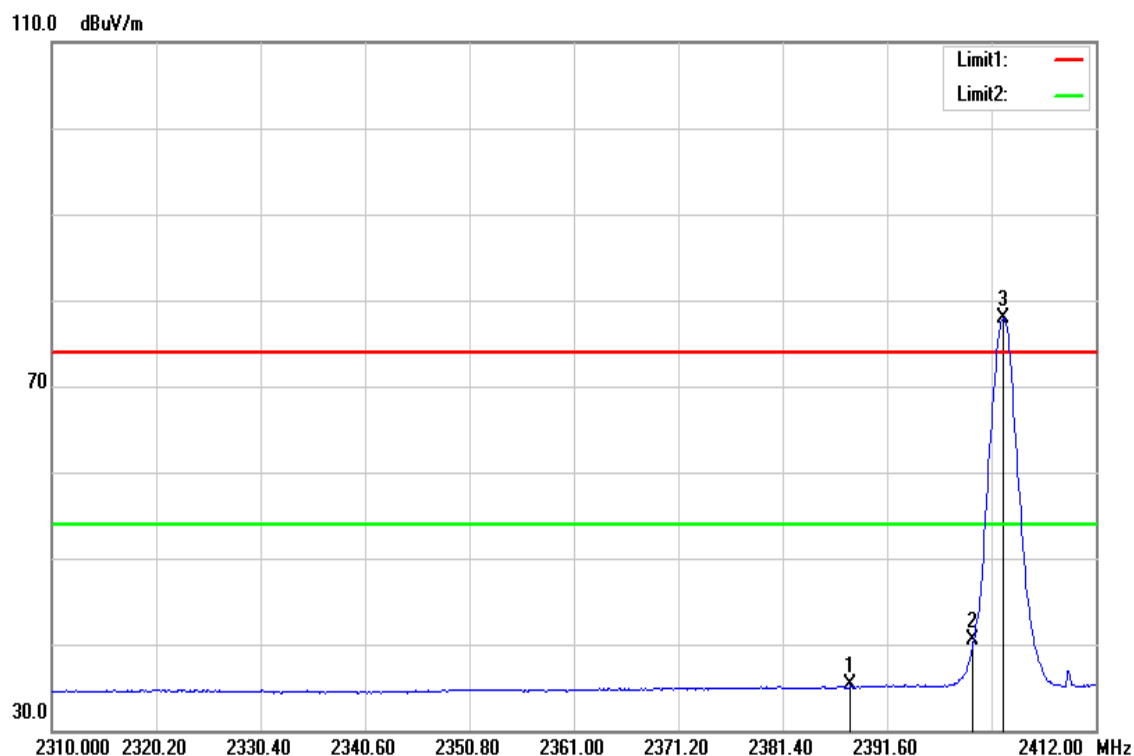
Band Edge Test Data

| | | | |
|------------|------------|---------------|---------------|
| Test Mode: | SRD Low CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Band Edge | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak | Test Voltage: | 120Vac / 60Hz |



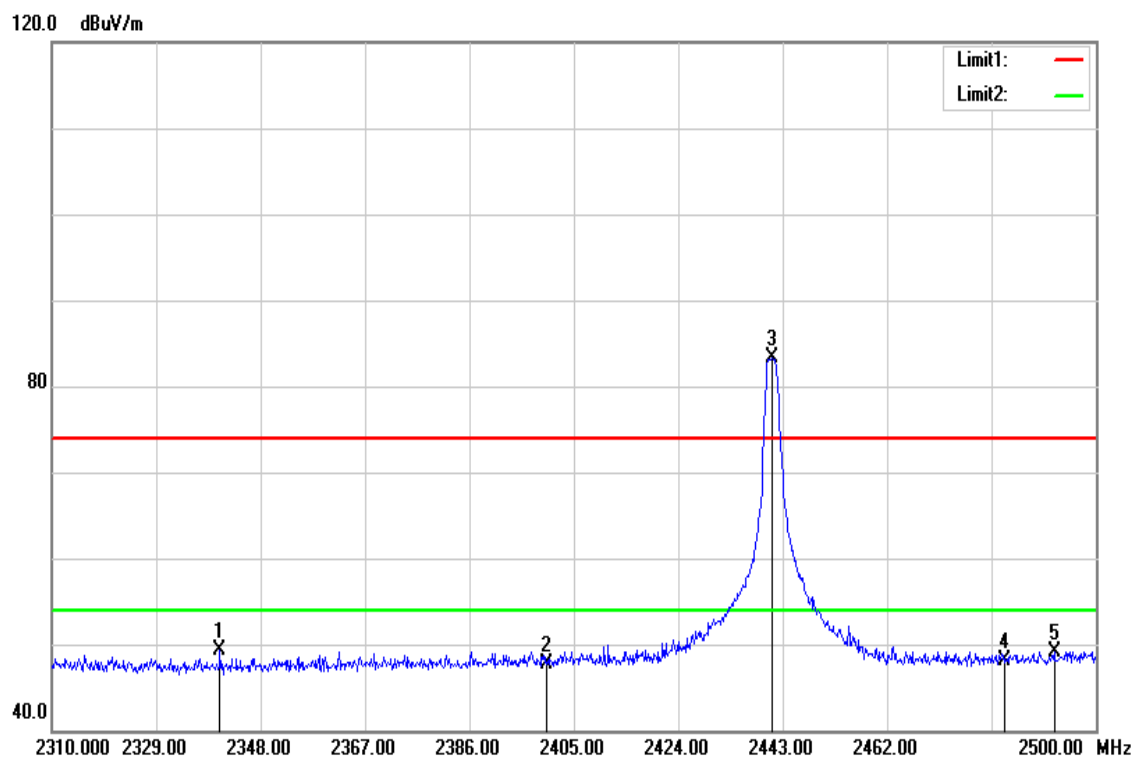
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 2388.642 | 54.47 | -2.50 | 51.97 | 74.00 | -22.03 | peak |
| 2400.000 | 63.68 | -2.41 | 61.27 | 74.00 | -12.73 | peak |
| 2403.126 | 85.17 | -2.42 | 82.75 | - | - | peak |

| | | | |
|------------|------------|---------------|---------------|
| Test Mode: | SRD Low CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Band Edge | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Average | Test Voltage: | 120Vac / 60Hz |



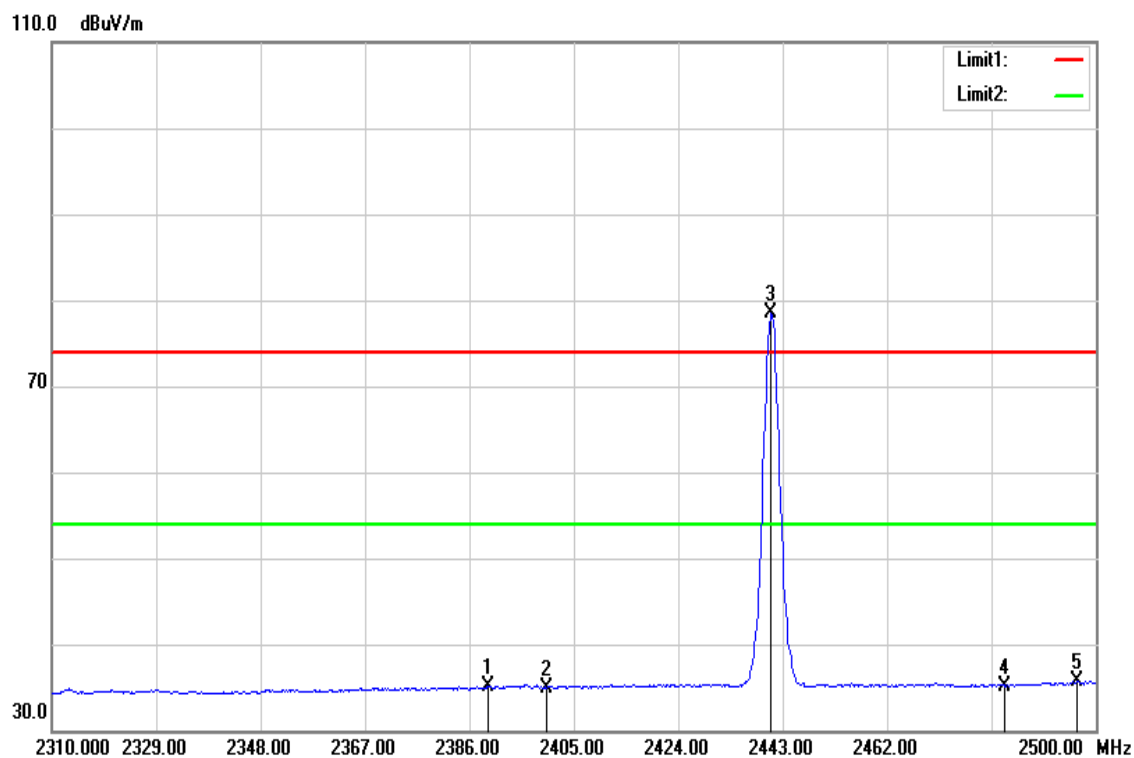
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 2388.030 | 37.72 | -2.51 | 35.21 | 54.00 | -18.79 | AVG |
| 2400.000 | 42.82 | -2.41 | 40.41 | 54.00 | -13.59 | AVG |
| 2402.922 | 80.37 | -2.42 | 77.95 | - | - | AVG |

| | | | |
|------------|------------|---------------|---------------|
| Test Mode: | SRD Mid CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Band Edge | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak | Test Voltage: | 120Vac / 60Hz |



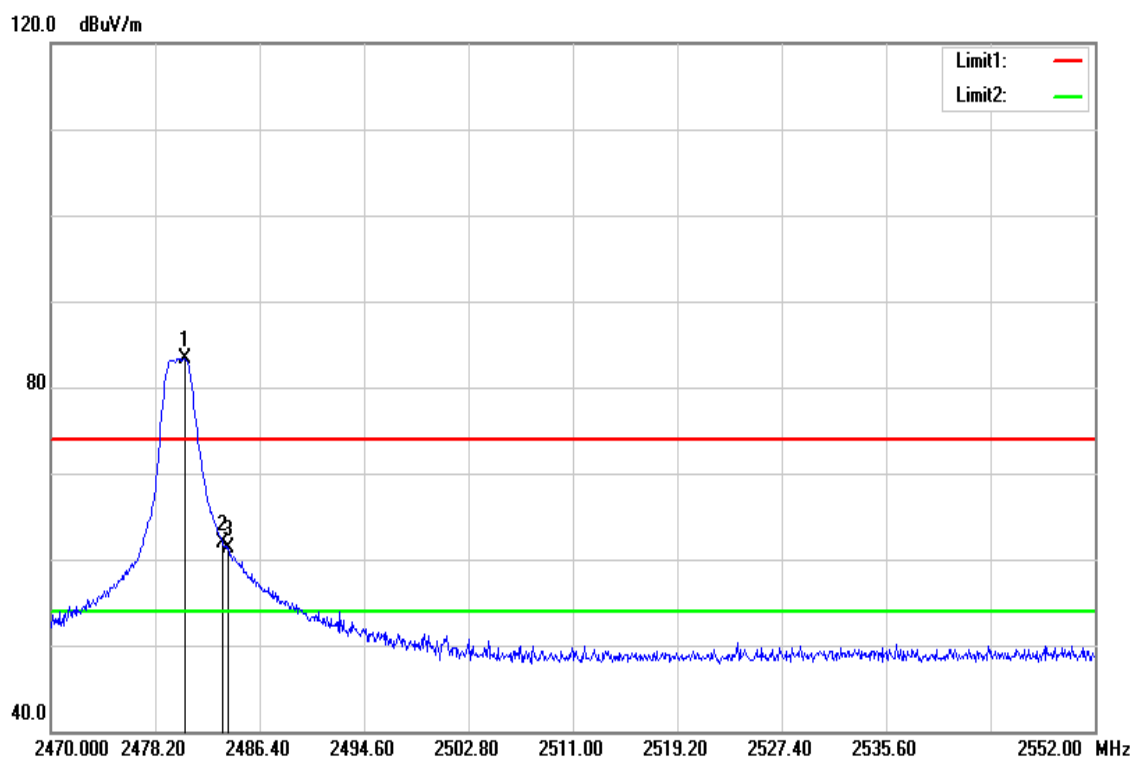
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 2340.590 | 52.20 | -2.95 | 49.25 | 74.00 | -24.75 | peak |
| 2400.000 | 50.13 | -2.41 | 47.72 | 74.00 | -26.28 | peak |
| 2441.100 | 85.43 | -2.20 | 83.23 | - | - | peak |
| 2483.500 | 50.04 | -1.99 | 48.05 | 74.00 | -25.95 | peak |
| 2492.400 | 51.03 | -1.91 | 49.12 | 74.00 | -24.88 | peak |

| | | | |
|------------|------------|---------------|---------------|
| Test Mode: | SRD Mid CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Band Edge | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Average | Test Voltage: | 120Vac / 60Hz |



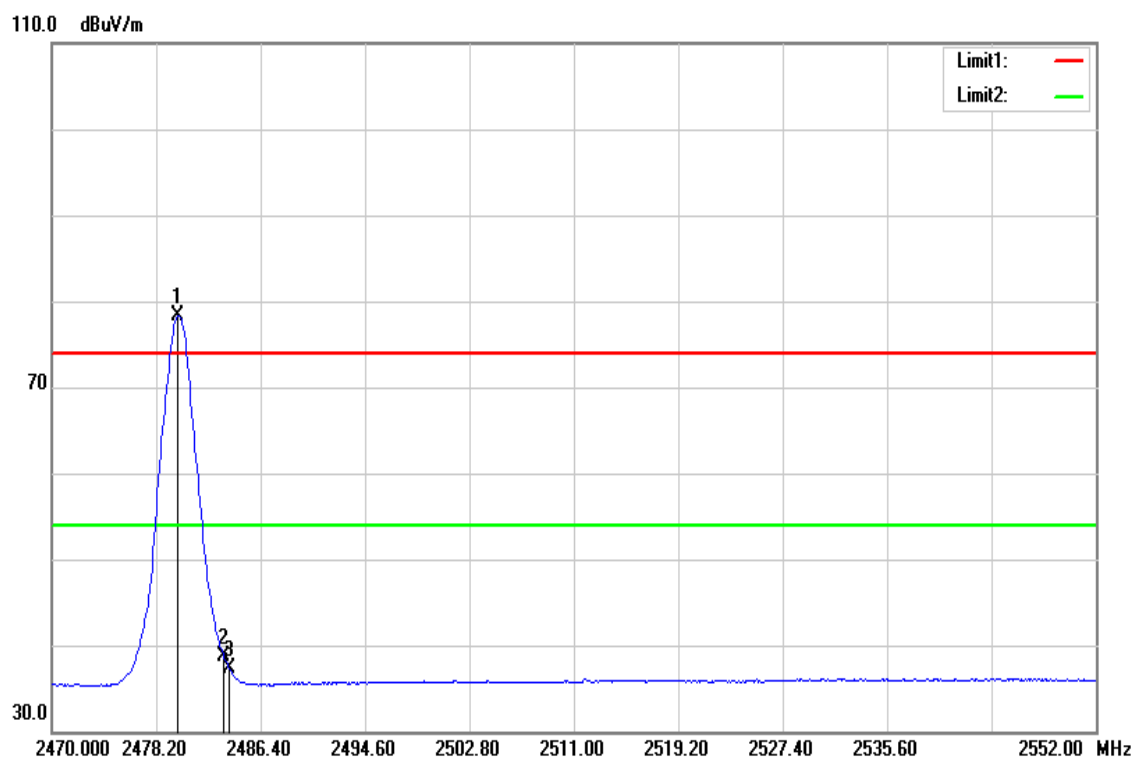
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 2389.420 | 37.59 | -2.50 | 35.09 | 54.00 | -18.91 | AVG |
| 2400.000 | 37.36 | -2.41 | 34.95 | 54.00 | -19.05 | AVG |
| 2440.910 | 80.64 | -2.21 | 78.43 | - | - | AVG |
| 2483.500 | 37.16 | -1.99 | 35.17 | 54.00 | -18.83 | AVG |
| 2496.580 | 37.60 | -1.88 | 35.72 | 54.00 | -18.28 | AVG |

| | | | |
|------------|-------------|---------------|---------------|
| Test Mode: | SRD High CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Band Edge | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak | Test Voltage: | 120Vac / 60Hz |



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 2480.496 | 85.31 | -2.03 | 83.28 | - | - | peak |
| 2483.500 | 63.86 | -1.99 | 61.87 | 74.00 | -12.13 | peak |
| 2483.900 | 63.39 | -1.99 | 61.40 | 74.00 | -12.60 | peak |

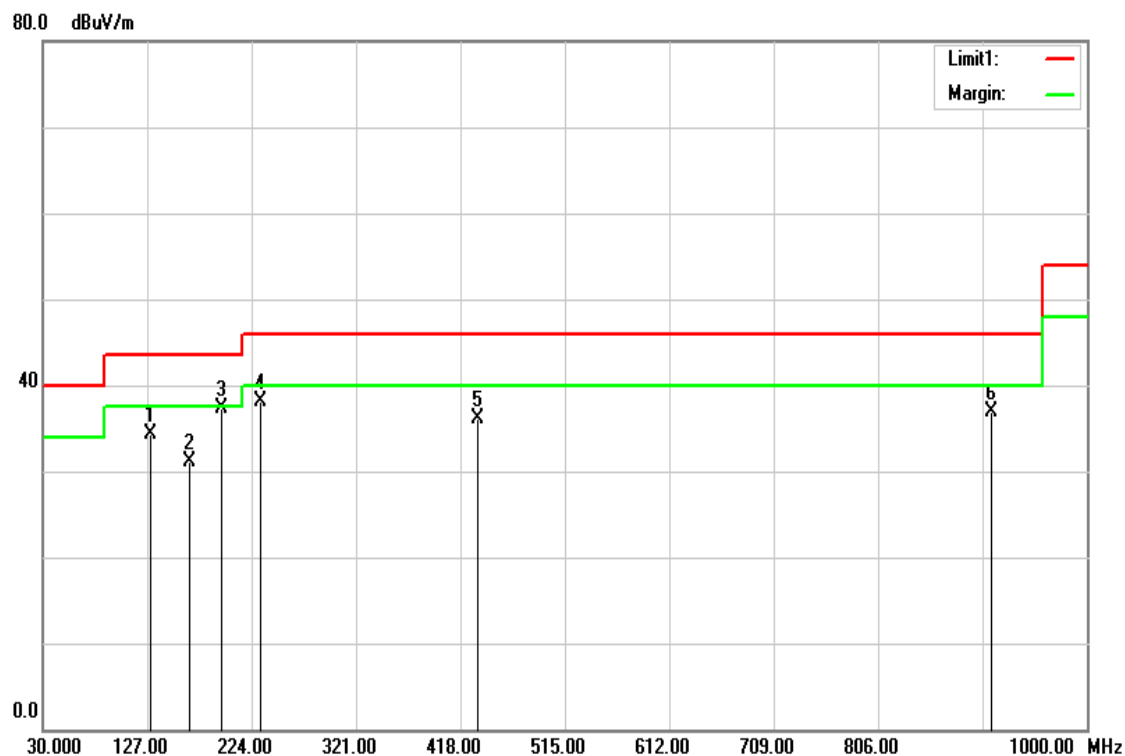
| | | | |
|------------|-------------|---------------|---------------|
| Test Mode: | SRD High CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Band Edge | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Average | Test Voltage: | 120Vac / 60Hz |



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 2479.922 | 80.32 | -2.03 | 78.29 | - | - | AVG |
| 2483.500 | 40.72 | -1.99 | 38.73 | 54.00 | -15.27 | AVG |
| 2483.900 | 39.30 | -1.99 | 37.31 | 54.00 | -16.69 | AVG |

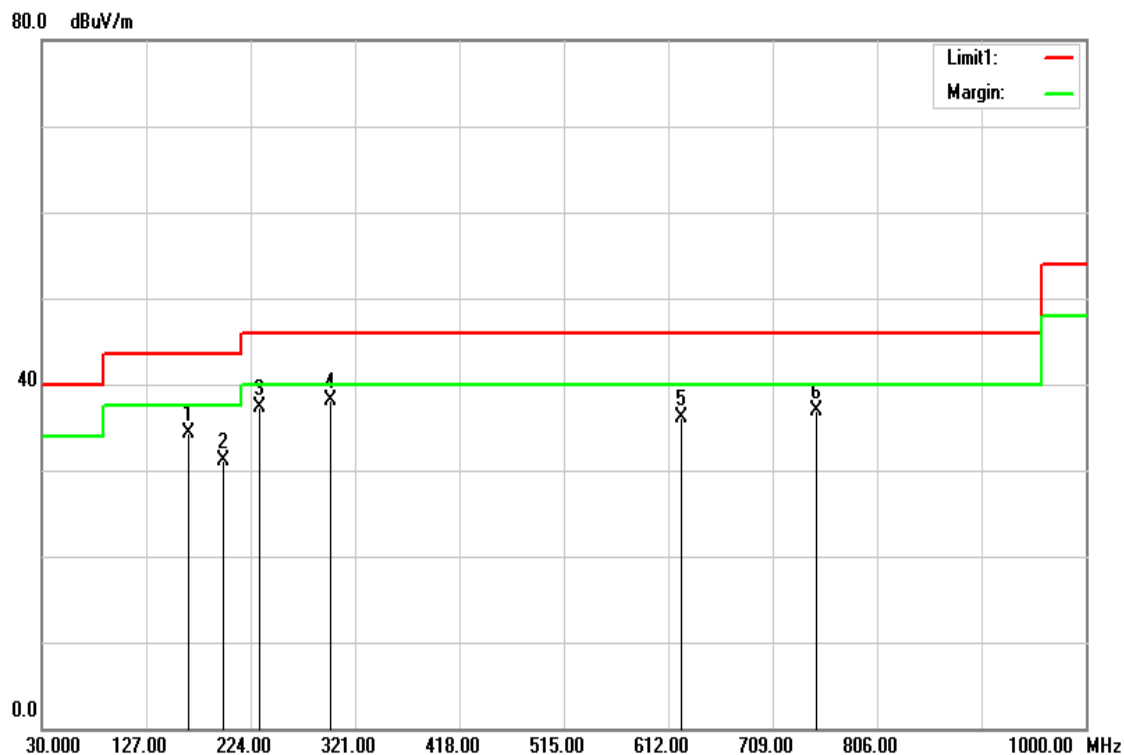
Below 1G Test Data

| | | | |
|------------|--------------------|---------------|---------------|
| Test Mode: | Mode 1 | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | 30MHz-1GHz | Test Date | Dec 05, 2016 |
| Polarize | Vertical | Test Engineer | Dennis Li |
| Detector | Peak and Qusi-peak | Test Voltage: | 120Vac / 60Hz |



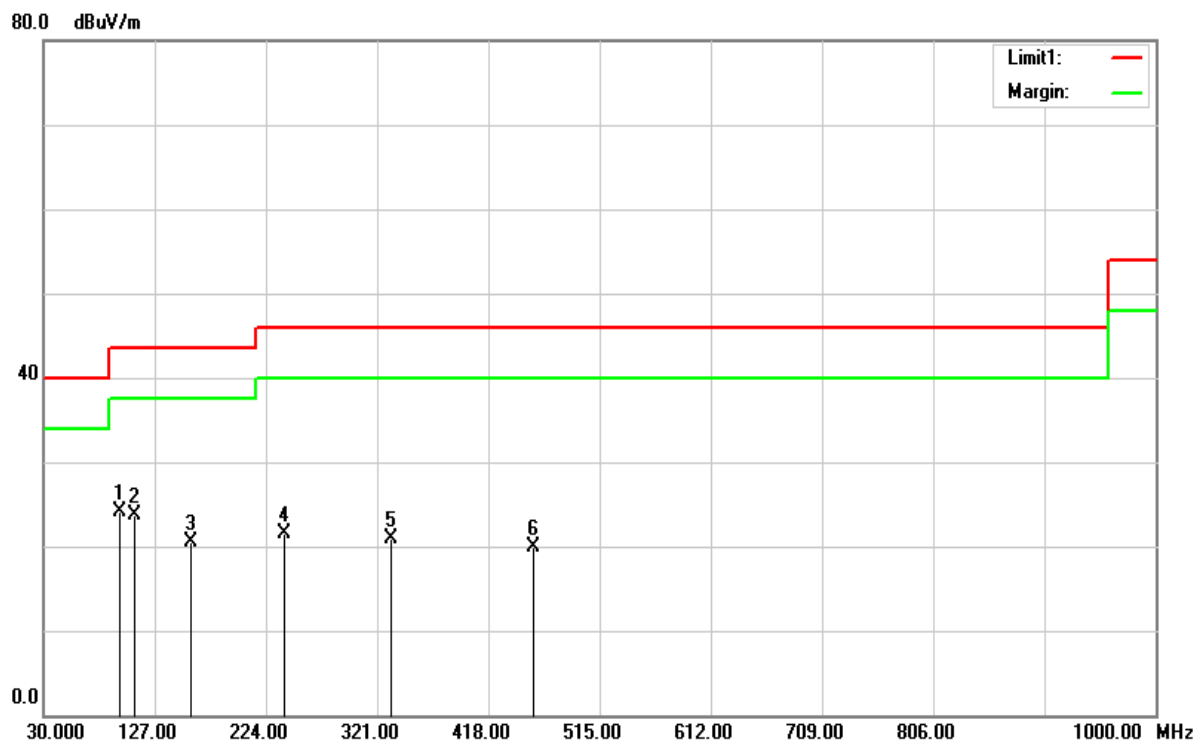
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 129.9100 | 50.01 | -15.64 | 34.37 | 43.50 | -9.13 | peak |
| 166.7700 | 47.70 | -16.69 | 31.01 | 43.50 | -12.49 | QP |
| 195.8700 | 53.20 | -15.92 | 37.28 | 43.50 | -6.22 | peak |
| 232.7300 | 54.80 | -16.67 | 38.13 | 46.00 | -7.87 | peak |
| 433.5200 | 46.85 | -10.69 | 36.16 | 46.00 | -9.84 | peak |
| 911.7300 | 39.86 | -3.00 | 36.86 | 46.00 | -9.14 | peak |

| | | | |
|------------|--------------------|---------------|---------------|
| Test Mode: | Mode 1 | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | 30MHz-1GHz | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak and Qusi-peak | Test Voltage: | 120Vac / 60Hz |



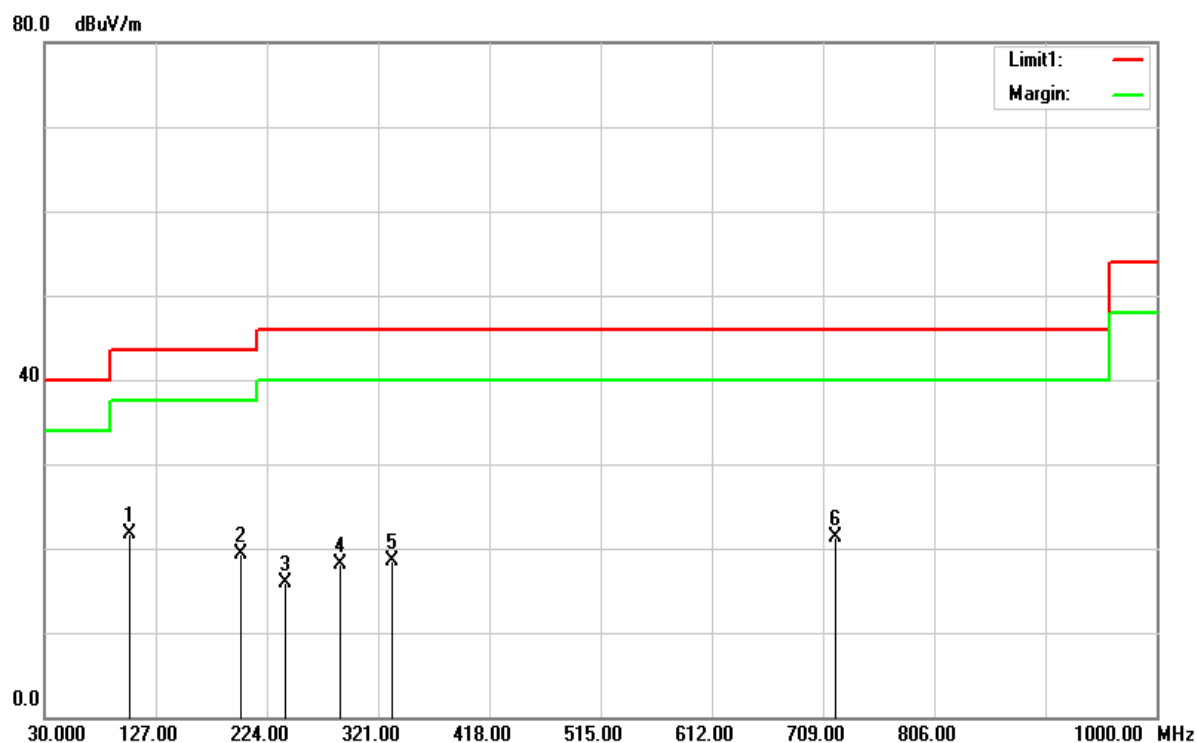
| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 166.7700 | 51.06 | -16.69 | 34.37 | 43.50 | -9.13 | peak |
| 198.7800 | 46.67 | -15.66 | 31.01 | 43.50 | -12.49 | peak |
| 232.7300 | 53.95 | -16.67 | 37.28 | 46.00 | -8.72 | peak |
| 298.6900 | 52.39 | -14.26 | 38.13 | 46.00 | -7.87 | peak |
| 624.6100 | 43.33 | -7.17 | 36.16 | 46.00 | -9.84 | peak |
| 749.7400 | 41.79 | -4.93 | 36.86 | 46.00 | -9.14 | peak |

| | | | |
|------------|--------------------|---------------|---------------|
| Test Mode: | Mode 2 | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | 30MHz-1GHz | Test Date | Dec 05, 2016 |
| Polarize | Vertical | Test Engineer | Dennis Li |
| Detector | Peak and Qusi-peak | Test Voltage: | 120Vac / 60Hz |



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 95.9600 | 44.16 | -20.03 | 24.13 | 43.50 | -19.37 | peak |
| 109.5400 | 41.14 | -17.35 | 23.79 | 43.50 | -19.71 | peak |
| 159.0100 | 36.85 | -16.33 | 20.52 | 43.50 | -22.98 | peak |
| 240.4900 | 38.05 | -16.50 | 21.55 | 46.00 | -24.45 | peak |
| 333.6100 | 34.15 | -13.33 | 20.82 | 46.00 | -25.18 | peak |
| 457.7700 | 29.92 | -10.04 | 19.88 | 46.00 | -26.12 | peak |

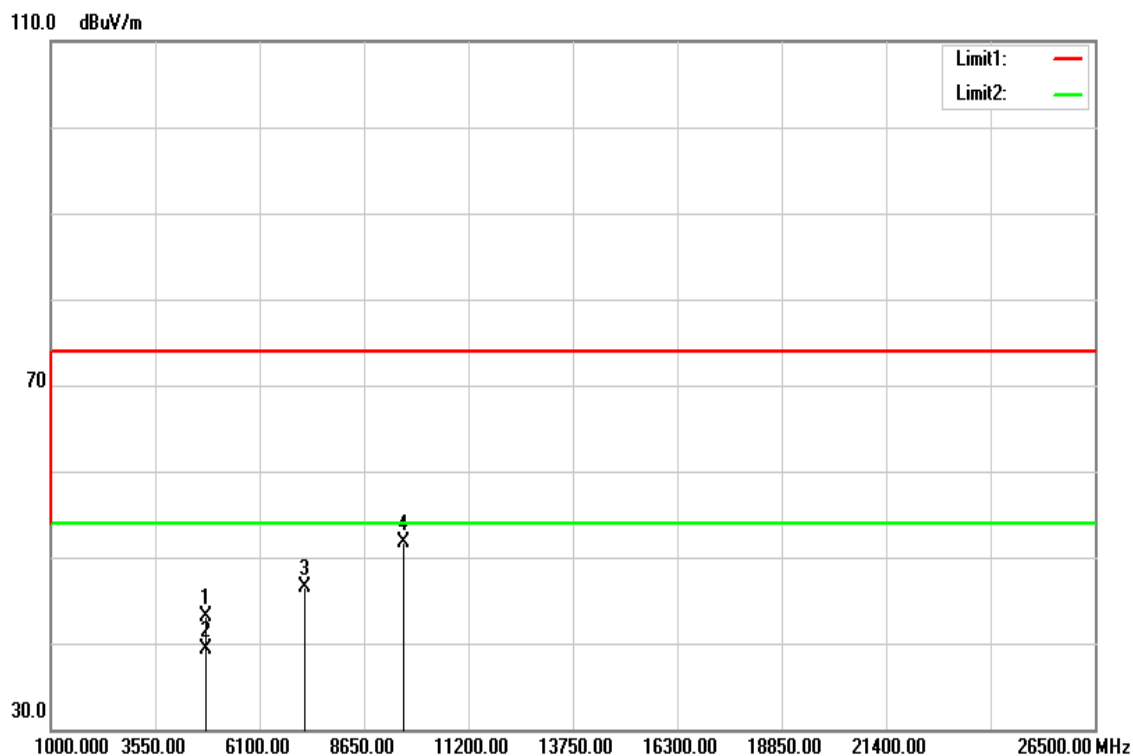
| | | | |
|------------|--------------------|---------------|---------------|
| Test Mode: | Mode 2 | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | 30MHz-1GHz | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak and Qusi-peak | Test Voltage: | 120Vac / 60Hz |



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 103.7200 | 40.00 | -18.37 | 21.63 | 43.50 | -21.87 | peak |
| 200.7200 | 34.93 | -15.60 | 19.33 | 43.50 | -24.17 | peak |
| 239.5200 | 32.40 | -16.52 | 15.88 | 46.00 | -30.12 | peak |
| 288.0200 | 32.58 | -14.46 | 18.12 | 46.00 | -27.88 | peak |
| 333.6100 | 31.77 | -13.33 | 18.44 | 46.00 | -27.56 | peak |
| 719.6700 | 26.94 | -5.62 | 21.32 | 46.00 | -24.68 | peak |

Above 1G Test Data

| | | | |
|------------|------------------|---------------|---------------|
| Test Mode: | SRD Low CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Harmonic | Test Date | Dec 05, 2016 |
| Polarize | Vertical | Test Engineer | Dennis Li |
| Detector | Peak and Average | Test Voltage: | 120Vac / 60Hz |

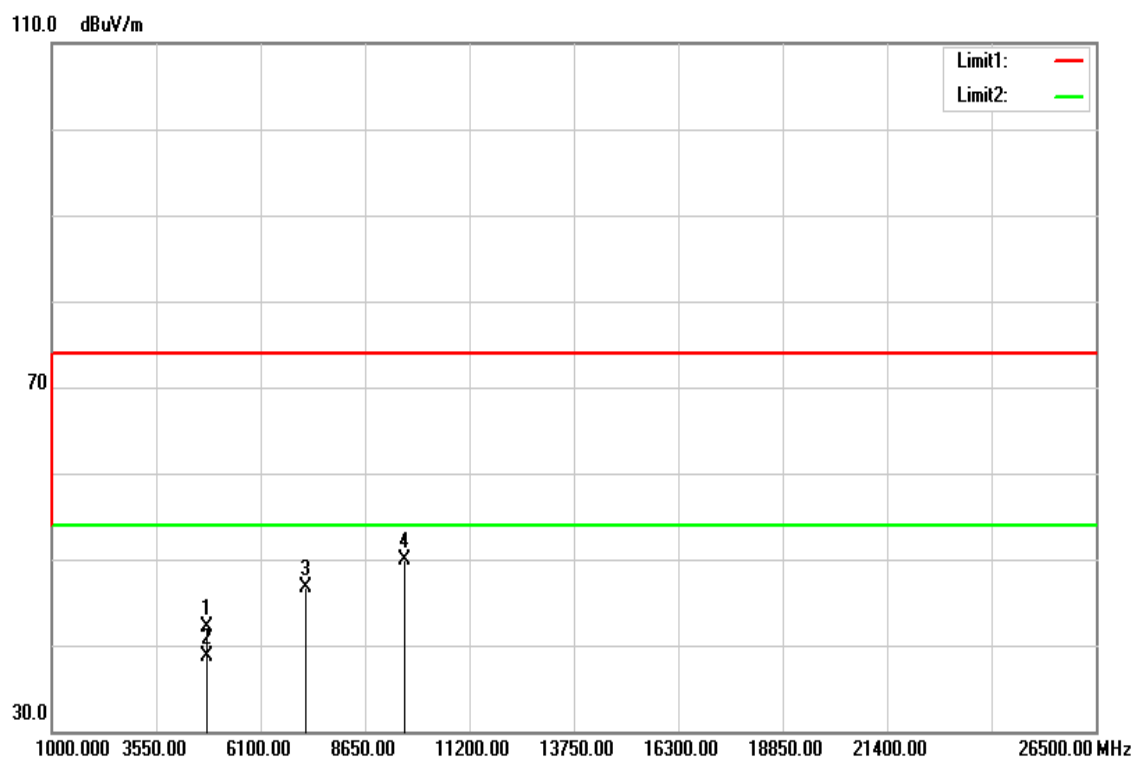


| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 4804.000 | 38.14 | 5.04 | 43.18 | 74.00 | -30.82 | peak |
| 4804.000 | 34.32 | 5.04 | 39.36 | 54.00 | -14.64 | AVG |
| 7206.000 | 33.97 | 12.62 | 46.59 | 74.00 | -27.41 | peak |
| 9608.000 | 34.11 | 17.60 | 51.71 | 74.00 | -22.29 | peak |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

| | | | |
|------------|------------------|---------------|---------------|
| Test Mode: | SRD Low CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Harmonic | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak and Average | Test Voltage: | 120Vac / 60Hz |

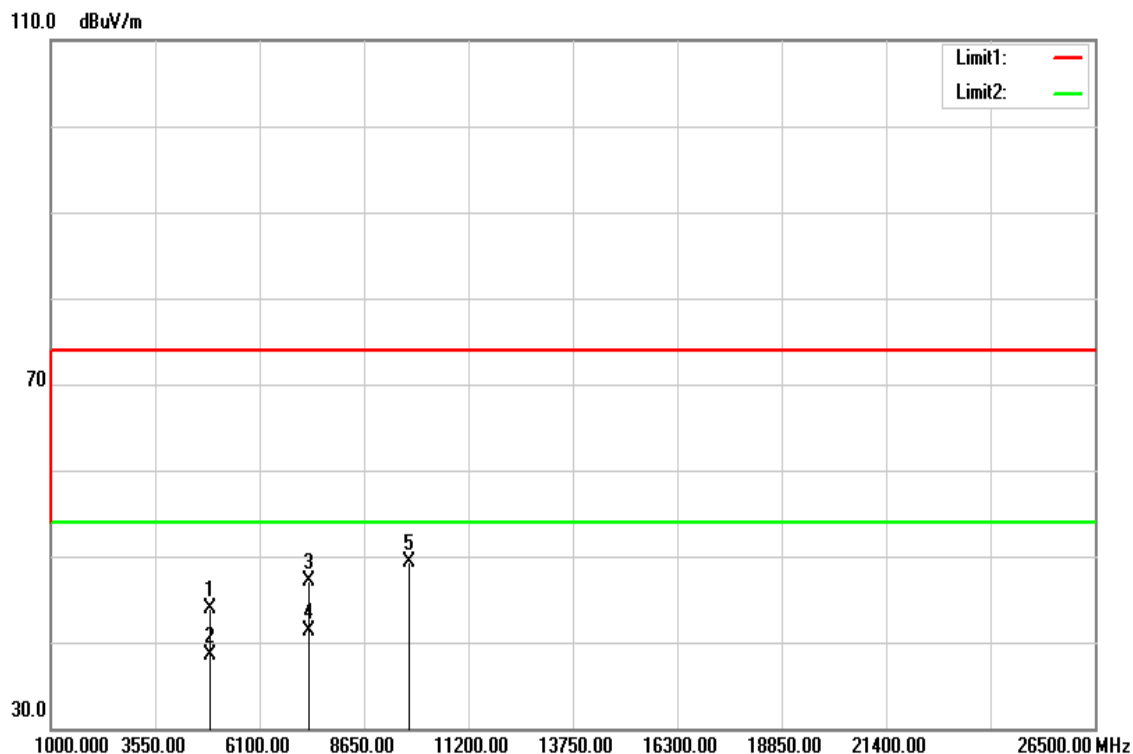


| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 4804.000 | 37.03 | 5.04 | 42.07 | 74.00 | -31.93 | peak |
| 4804.000 | 33.65 | 5.04 | 38.69 | 54.00 | -15.31 | AVG |
| 7206.000 | 34.06 | 12.62 | 46.68 | 74.00 | -27.32 | peak |
| 9608.000 | 32.40 | 17.60 | 50.00 | 74.00 | -24.00 | peak |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

| | | | |
|------------|------------------|---------------|---------------|
| Test Mode: | SRD Mid CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Harmonic | Test Date | Dec 05, 2016 |
| Polarize | Vertical | Test Engineer | Dennis Li |
| Detector | Peak and Average | Test Voltage: | 120Vac / 60Hz |

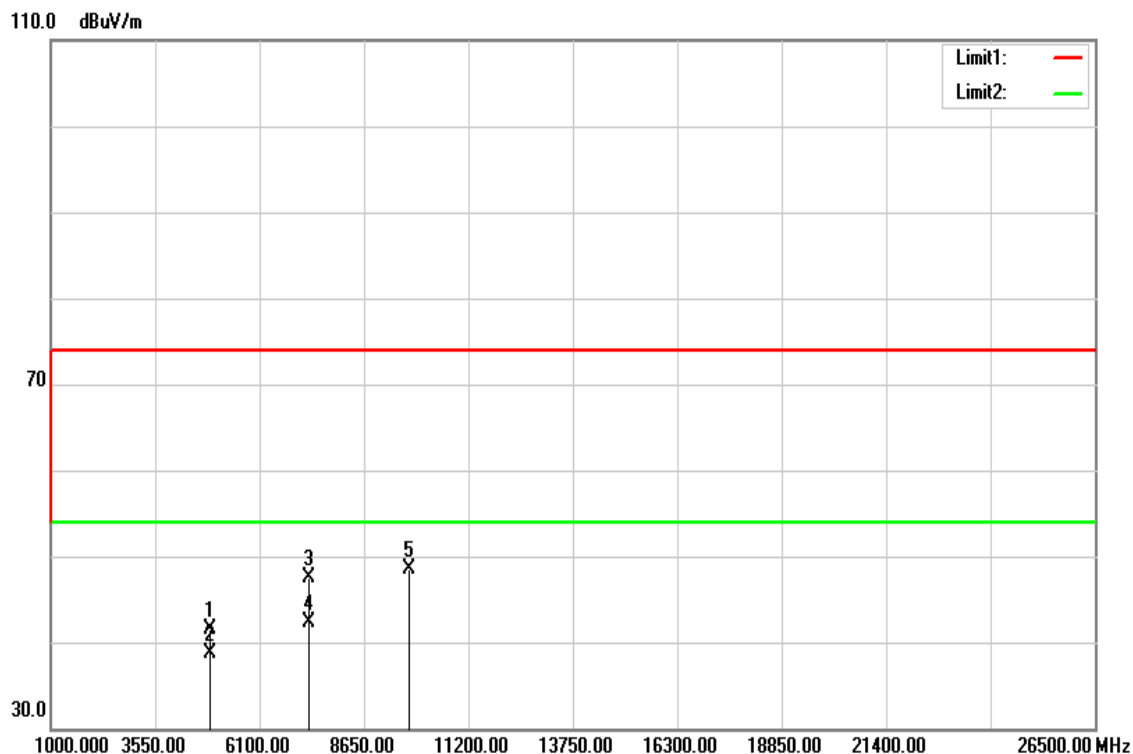


| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 4880.000 | 38.63 | 5.25 | 43.88 | 74.00 | -30.12 | peak |
| 4880.000 | 33.19 | 5.25 | 38.44 | 54.00 | -15.56 | AVG |
| 7320.000 | 34.18 | 12.97 | 47.15 | 74.00 | -26.85 | peak |
| 7320.000 | 28.39 | 12.97 | 41.36 | 54.00 | -12.64 | AVG |
| 9760.000 | 31.78 | 17.60 | 49.38 | 74.00 | -24.62 | peak |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

| | | | |
|------------|------------------|---------------|---------------|
| Test Mode: | SRD Mid CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Harmonic | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak and Average | Test Voltage: | 120Vac / 60Hz |

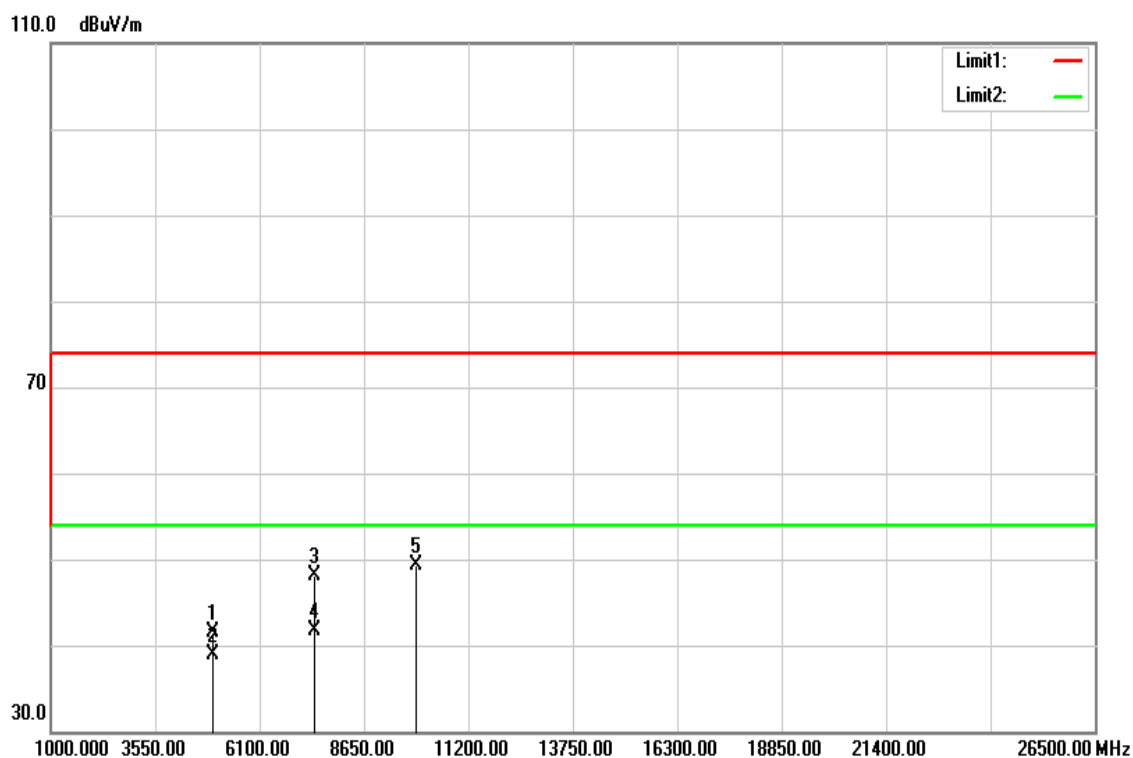


| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 4880.000 | 36.24 | 5.25 | 41.49 | 74.00 | -32.51 | peak |
| 4880.000 | 33.44 | 5.25 | 38.69 | 54.00 | -15.31 | AVG |
| 7320.000 | 34.53 | 12.97 | 47.50 | 74.00 | -26.50 | peak |
| 7320.000 | 29.39 | 12.97 | 42.36 | 54.00 | -11.64 | AVG |
| 9760.000 | 30.85 | 17.60 | 48.45 | 74.00 | -25.55 | peak |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

| | | | |
|------------|------------------|---------------|---------------|
| Test Mode: | SRD High CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Harmonic | Test Date | Dec 05, 2016 |
| Polarize | Vertical | Test Engineer | Dennis Li |
| Detector | Peak and Average | Test Voltage: | 120Vac / 60Hz |

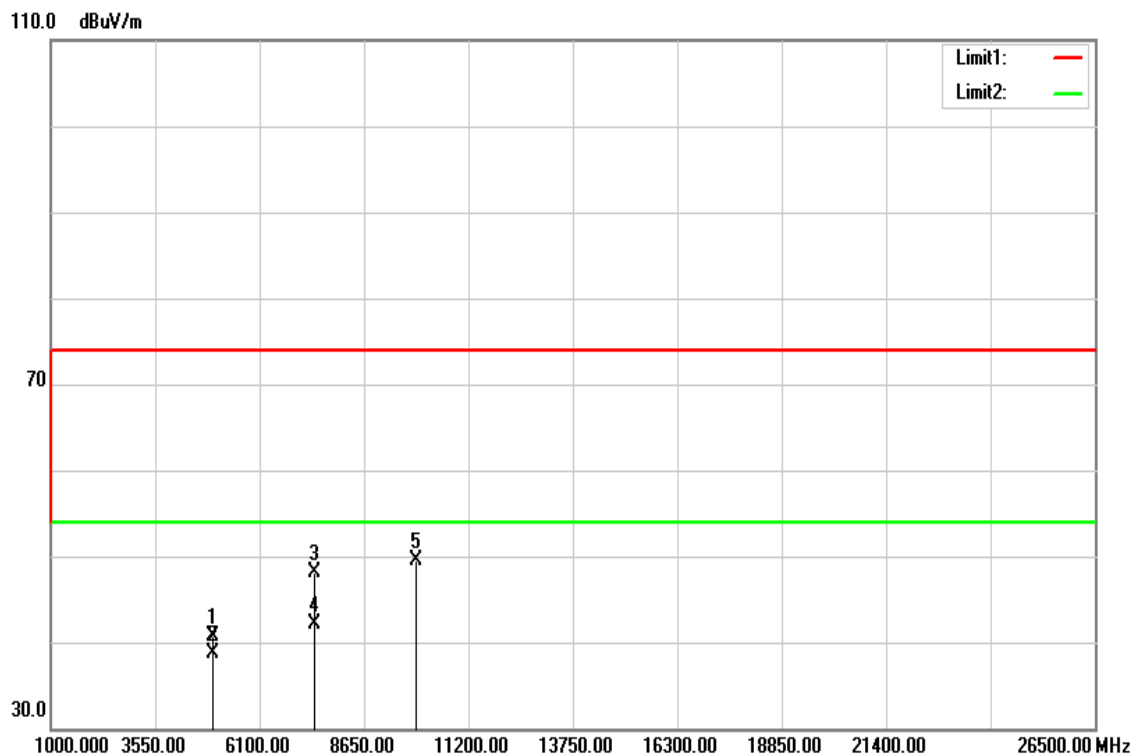


| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 4960.000 | 36.07 | 5.46 | 41.53 | 74.00 | -32.47 | peak |
| 4960.000 | 33.50 | 5.46 | 38.96 | 54.00 | -15.04 | AVG |
| 7440.000 | 34.68 | 13.33 | 48.01 | 74.00 | -25.99 | peak |
| 7440.000 | 28.33 | 13.33 | 41.66 | 54.00 | -12.34 | AVG |
| 9920.000 | 31.60 | 17.60 | 49.20 | 74.00 | -24.80 | peak |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

| | | | |
|------------|------------------|---------------|---------------|
| Test Mode: | SRD High CH | Temp/Hum | 27(°C)/ 53%RH |
| Test Item | Harmonic | Test Date | Dec 05, 2016 |
| Polarize | Horizontal | Test Engineer | Dennis Li |
| Detector | Peak and Average | Test Voltage: | 120Vac / 60Hz |



| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 4960.000 | 35.23 | 5.46 | 40.69 | 74.00 | -33.31 | peak |
| 4960.000 | 33.23 | 5.46 | 38.69 | 54.00 | -15.31 | AVG |
| 7440.000 | 34.83 | 13.33 | 48.16 | 74.00 | -25.84 | peak |
| 7440.000 | 28.79 | 13.33 | 42.12 | 54.00 | -11.88 | AVG |
| 9920.000 | 31.93 | 17.60 | 49.53 | 74.00 | -24.47 | peak |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit