



**FCC 47 CFR PART 15 SUBPART C
ISED RSS-210 ISSUE 9**

CERTIFICATION TEST REPORT

For

z-wave extender

MODEL NUMBER: 4AR1S70EN0

**FCC ID: 2AB2QBHARP002
IC: 10256A-BHARP002**

REPORT NUMBER: 4788997489.1-1

ISSUE DATE: July 12, 2019

Prepared for

**LEEDARSON LIGHTING CO., LTD.
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Zhangzhou City, Fujian Province, P.R.China**

Prepared by

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Revision History

| Rev. | Issue Date | Revisions | Revised By |
|------|------------|---------------|------------|
| V0 | 07/12/2019 | Initial Issue | |

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: LEEDARSON LIGHTING CO., LTD.
Address: Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R.China

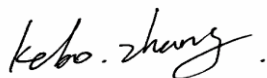
Manufacturer Information

Company Name: LEEDARSON LIGHTING CO., LTD.
Address: Xingtai Industrial Zone, Economic Development Zone, Changtai County, Zhangzhou City, Fujian Province, P.R.China

EUT Name: z-wave extender
Brand: /
Model: 4AR1S70EN0
Sample Status: Normal
Sample Received Date: May 8, 2019
Date of Tested: May 9~July 12, 2019

| APPLICABLE STANDARDS | |
|--------------------------|--------------|
| STANDARD | TEST RESULTS |
| CFR 47 Part 15 Subpart C | PASS |
| ISED RSS-210 Issue 9 | PASS |
| ISED RSS-GEN Issue 5 | PASS |

Tested By:



Kebo Zhang
Engineer

Checked By:



Shawn Wen
Laboratory Leader

Approved By:



Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, ISED RSS-210 Issue 9 and RSS-GEN Issue 5

3. FACILITIES AND ACCREDITATION

| | |
|---------------------------|---|
| Accreditation Certificate | <p>A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.</p> <p>IAS (Lab Code: TL-702) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has demonstrated compliance with ISO/IEC Standard 17025:2005, General requirements for the competence of testing and calibration laboratories</p> <p>FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules</p> <p>IC(Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320.</p> <p>VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B, the VCCI registration No. is C-20012 and T-20011</p> |
|---------------------------|---|

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OATS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Test Item | Uncertainty |
|---|---------------------|
| Uncertainty for Conduction emission test | 2.90dB |
| Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz) | 2.2dB |
| Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz) | 4.52dB |
| Uncertainty for Radiation Emission test (1GHz to 26GHz)(include Fundamental emission) | 5.04dB(1-6GHz) |
| | 5.30dB (6GHz-18Gz) |
| | 5.23dB (18GHz-26Gz) |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. | |

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

| | | |
|--------------------------|--------------------|------------------------|
| Equipment | z-wave extender | |
| Model Name | 4AR1S70EN0 | |
| Data Rates | 908.4 MHz:40kbps | |
| | 908.42 MHz:9.6kbps | |
| | 916.0 MHz:100kbps | |
| Transmit Channel Tested: | Channel ID | Channel Frequency(MHz) |
| | 1 | 908.40 |
| | 2 | 908.42 |
| | 3 | 916.00 |
| Power Supply | AC120V, 60Hz | |

5.2. MAXIMUM EMISSIONS FIELD STRENGTH

| Frequency Range (MHz) | Number of Transmit Chains (NTX) | Frequency (MHz) | Channel Number | Max. Emissions Field Strength (dB μ V/m) |
|-----------------------|---------------------------------|-----------------|----------------|--|
| 902-928 | 1 | 908.4-916 | 3[3] | 92.54 |

5.3. THE WORSE CASE POWER SETTING PARAMETER

| The Worse Case Power Setting Parameter | | | | |
|--|-------------------------|--------------|------|------|
| Test Software | | UartAssis | | |
| Test Mode | Transmit Antenna Number | Test Channel | | |
| | | CH 1 | CH 2 | CH 3 |
| Z-WAVE | 1 | 17 | 17 | 17 |

5.4. TEST ENVIRONMENT

| Environment Parameter | Selected Values During Tests | |
|-----------------------|------------------------------|-------------|
| Relative Humidity | 55 ~ 65% | |
| Atmospheric Pressure: | 1025Pa | |
| Temperature | TN | 23 ~ 28°C |
| Voltage : | VL | N/A |
| | VN | AC120V,60Hz |
| | VH | N/A |

Note: VL= Lower Extreme Test Voltage
 VN= Nominal Voltage
 VH= Upper Extreme Test Voltage
 TN= Normal Temperature

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

| Ant. | Frequency (MHz) | Antenna Type | Antenna Gain (dBi) |
|------|-----------------|--------------|--------------------|
| 1 | 908.4~916 | Built-in | -2.59 |

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| Item | Equipment | Brand Name | Model Name |
|------|--------------------------------|------------|------------|
| 1 | Laptop | ThinkPad | T460S |
| 2 | USB to Serial Conversion board | N/A | N/A |

I/O CABLES

| No. | Port | Connector Type | Cable Type | Cable Length(m) | Remarks |
|-----|------|----------------|------------|-----------------|---------|
| 1 | N/A | N/A | N/A | N/A | N/A |

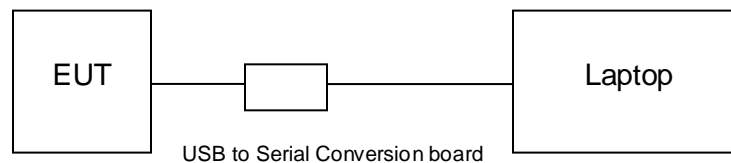
ACCESSORY

| Item | Accessory | Brand Name | Model Name | Description |
|------|-----------|------------|------------|-------------|
| 1 | N/A | N/A | N/A | N/A |

TEST SETUP

The EUT can work in an engineer mode with a software through a table PC.

SETUP DIAGRAM FOR TESTS



5.7. MEASURING INSTRUMENT AND SOFTWARE USED

| Conducted Emissions | | | | | | |
|-------------------------------------|---|--------------|--------------|-------------------|--------------|--------------|
| Instrument | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| <input checked="" type="checkbox"/> | EMI Test Receiver | R&S | ESR3 | 101961 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | Two-Line V- Network | R&S | ENV216 | 101983 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | Artificial Mains Networks | Schwarzbeck | NSLK 8126 | 8126465 | Dec.10,2018 | Dec.10,2019 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | Version | |
| <input checked="" type="checkbox"/> | Test Software for Conducted disturbance | | Farad | EZ-EMC | Ver. UL-3A1 | |
| Radiated Emissions | | | | | | |
| Instrument | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| <input checked="" type="checkbox"/> | MXE EMI Receiver | KESIGHT | N9038A | MY56400036 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | Hybrid Log Periodic Antenna | TDK | HLP-3003C | 130960 | Sep.17, 2018 | Sep.17, 2021 |
| <input checked="" type="checkbox"/> | Preamplifier | HP | 8447D | 2944A09099 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | EMI Measurement Receiver | R&S | ESR26 | 101377 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | Horn Antenna | TDK | HRN-0118 | 130939 | Sep.17, 2018 | Sep.17, 2021 |
| <input checked="" type="checkbox"/> | High Gain Horn Antenna | Schwarzbeck | BBHA-9170 | 691 | Aug.11, 2018 | Aug.11, 2021 |
| <input checked="" type="checkbox"/> | Preamplifier | TDK | PA-02-0118 | TRS-305- 00066 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | Preamplifier | TDK | PA-02-2 | TRS-307- 00003 | Dec.10,2018 | Dec.10,2019 |
| <input checked="" type="checkbox"/> | Loop antenna | Schwarzbeck | 1519B | 00008 | Jan.01,2019 | Dec.07, 2022 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | Version | |
| <input checked="" type="checkbox"/> | Test Software for Radiated disturbance | | Farad | EZ-EMC | Ver. UL-3A1 | |

6. SUMMARY OF TEST RESULTS

| Summary of Test Results | | | |
|-------------------------|---|---|--------------|
| Clause | Test Items | FCC/IC Rules | Test Results |
| 1 | 20dB Bandwidth | FCC Part 2.1049 | Pass |
| 2 | 99%dB Bandwidth | RSS-Gen Clause 6.7 | Pass |
| 3 | TX Spurious Emission | FCC 15.249 (a)(d)(e) FCC 15.209 FCC 15.205 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10 | Pass |
| 4 | Conducted Emission Test For AC Power Port | FCC 15.207 RSS-GEN Clause 8.8 | Pass |

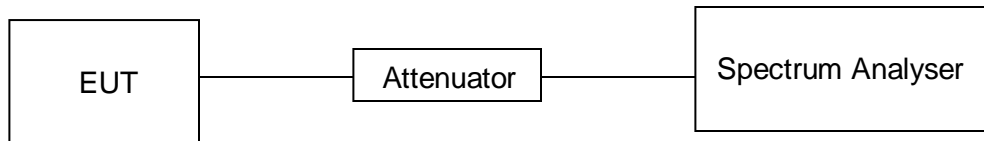
7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only

TEST SETUP



RESULTS

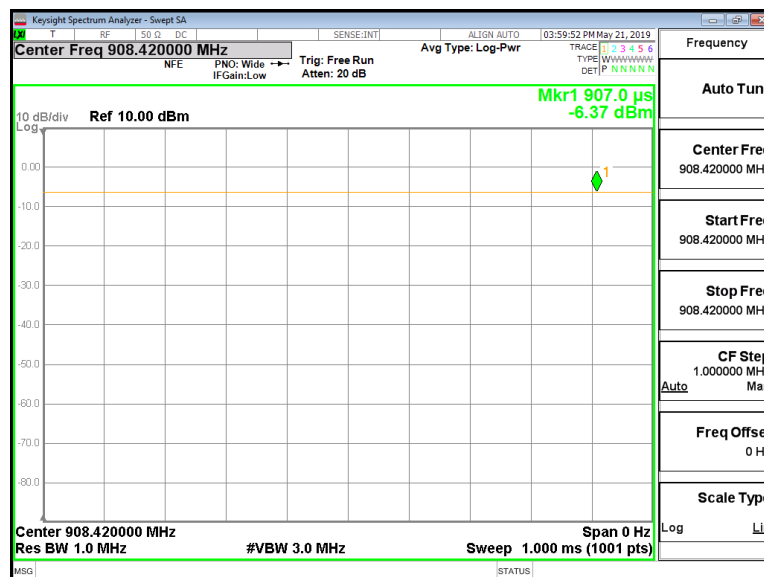
| Test Channel | On Time (msec) | Period (msec) | Duty Cycle x (Linear) | Duty Cycle (%) | Duty Cycle Correction Factor (db) | minimum VBW 1/T (KHz) |
|--------------|----------------|---------------|-----------------------|----------------|-----------------------------------|-----------------------|
| MID | 1 | 1 | 1 | 100% | 0 | 0.01 |

Note: Duty Cycle Correction Factor=10log(1/x).

Where: x is Duty Cycle (Linear)

Where: T is On Time (transmit duration)

ON TIME AND DUTY CYCLE MID



7.2. 20 dB AND 99% BANDWIDTH

LIMITS

| FCC Part15 (15.249) , Subpart C | | | |
|---------------------------------|---------------|-----------------------------|-----------------------|
| Section | Test Item | Limit | Frequency Range (MHz) |
| FCC 15.249(d) | Bandwidth | for reporting purposes only | 902-928 MHz |
| RSS-Gen Clause 6.6 | 99% Bandwidth | N/A | 902-928MHz |

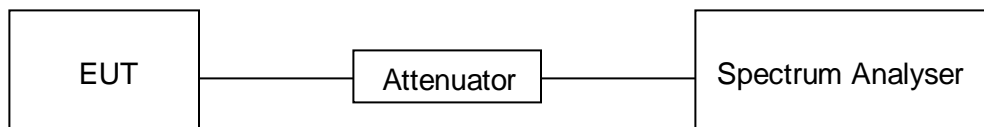
TEST PROCEDURE

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

| | |
|------------------|--|
| Center Frequency | The center frequency of the channel under test |
| Detector | Peak |
| RBW | 1% to 5% of the occupied bandwidth |
| VBW | $\geq 3 \times \text{RBW}$ |
| Trace | Max hold |
| Sweep | Auto couple |

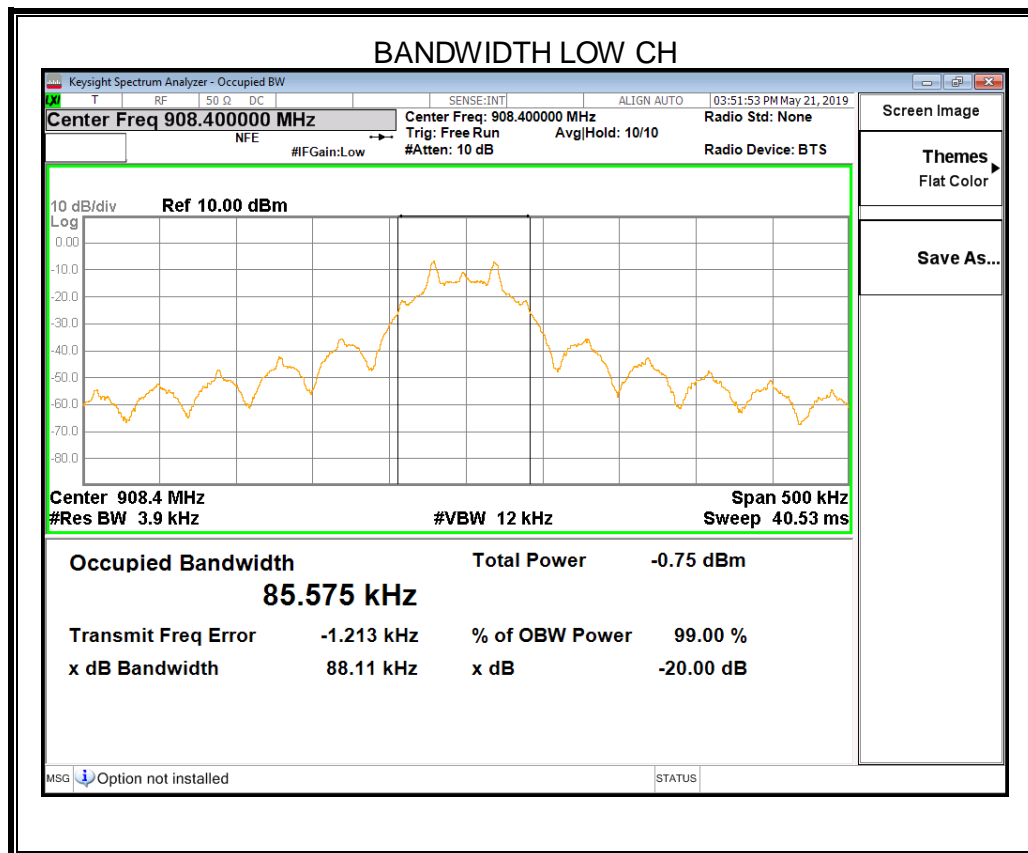
Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

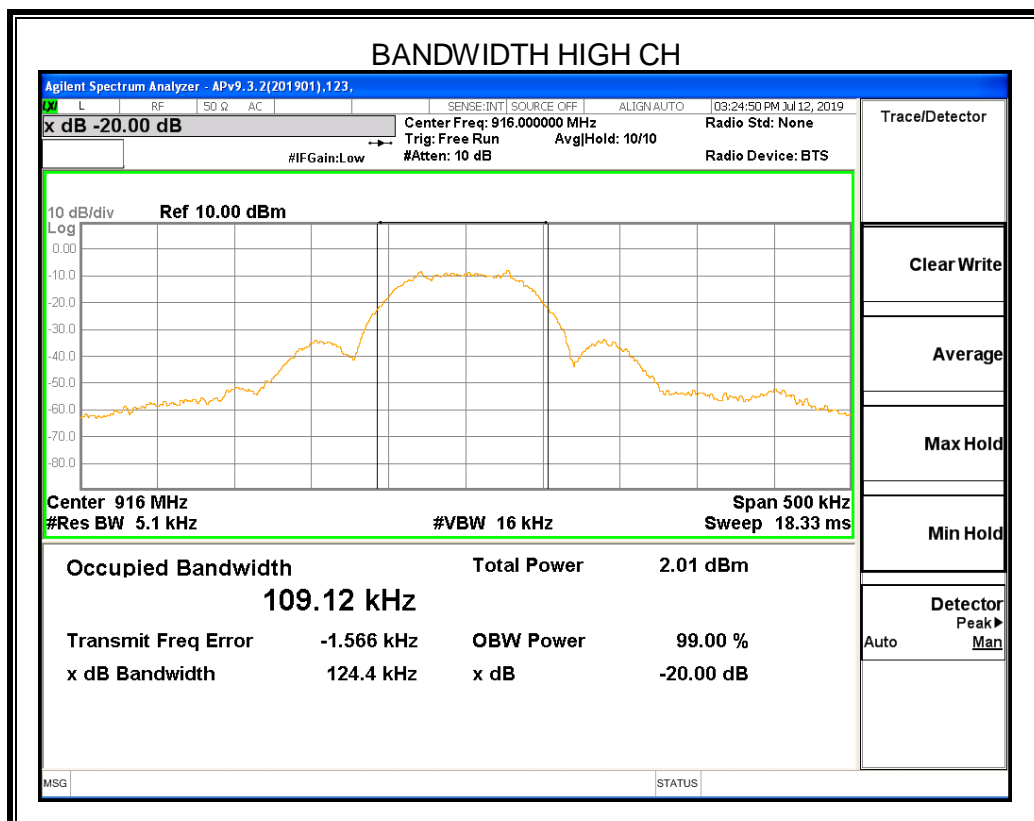
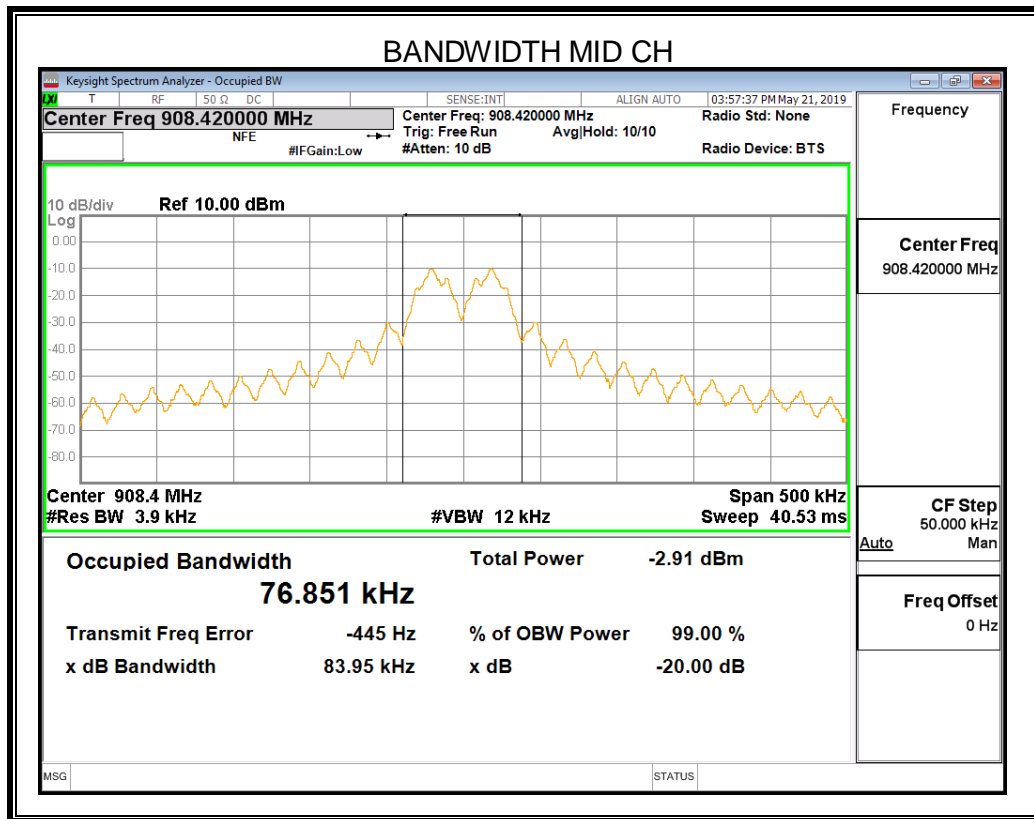
TEST SETUP



RESULTS

| Channel | 20dB bandwidth (KHz) | 99% bandwidth (KHz) | Result |
|---------|----------------------|---------------------|--------|
| Low | 88.11 | 85.575 | Pass |
| Middle | 83.95 | 76.851 | Pass |
| High | 124.40 | 109.12 | Pass |





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

Please refer to FCC §15.205 and §15.209

Please refer to FCC §15.249 (a)(d)(e)

RSS-210 Issue 9 Clause Annex B B.10

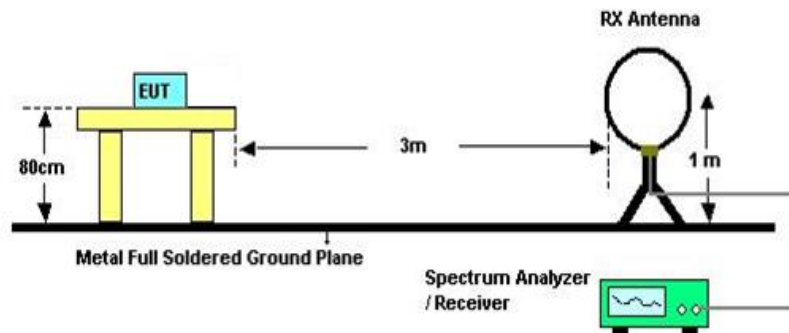
| The field strength of emissions from intentional radiators operated within these frequency bands | | | |
|--|-------------------------------|-----------------------------|--------------|
| Frequency (MHz) | Field strength of Fundamental | Field strength of Harmonics | Distance (m) |
| 902 - 928 | 50 mV/m (94dBuV/m) | 500 uV/m (54dBuV/m) | 3 |
| 2400 – 2483.5 | 50 mV/m (94dBuV/m) | 500 uV/m (54dBuV/m) | 3 |
| 5725 – 5875 | 50 mV/m (94dBuV/m) | 500 uV/m (54dBuV/m) | 3 |

| Emissions radiated outside of the specified frequency bands | | |
|---|------------------------------------|--------------------------------------|
| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
| 30 - 88 | 100 | Quasi-Peak |
| 30 - 88 | 100 | 40 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46 |
| Above 960 | 500 | 54 |
| Above 1000 | 500 | Peak |
| | | Average |
| | | 74 |
| | | 54 |

About Restricted bands of operation please refer to RSS-Gen section 8.10 and FCC §15.205 (a)

TEST SETUP AND PROCEDURE

Below 30MHz



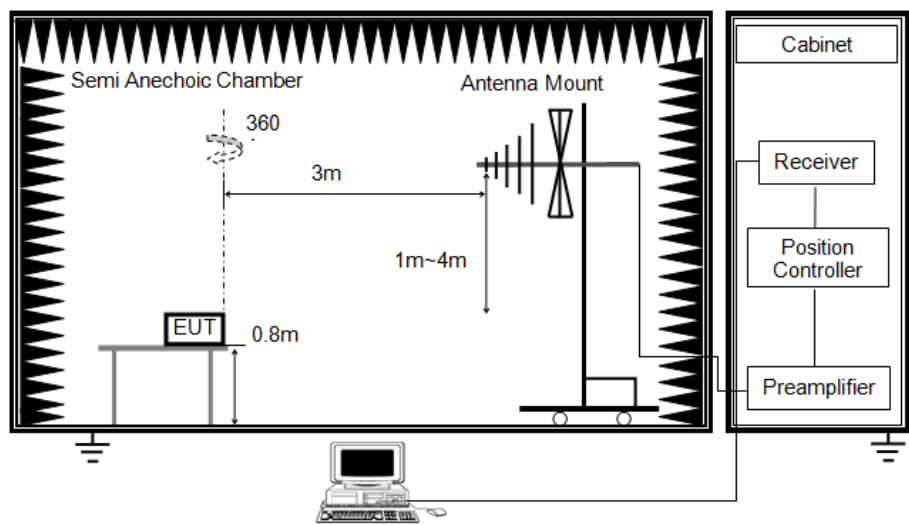
The setting of the spectrum analyser

| | |
|----------|--|
| RBW | 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz) |
| VBW | 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz) |
| Sweep | Auto |
| Detector | Peak/QP/ Average |
| Trace | Max hold |

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Three polarizations(Horizontal, Face-on and Face-off)of the antenna are set to make the measurement. At least a pre-check to show that parallel to the ground if is not worst case and that face-on and face-off are worst case.
check in 3 polarizations, at least a pre-check to show that parallel to the ground if is not worst case and that face-on and face-off are worst case
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Measurement = Reading Level + Correct Factor
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)
8. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m 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 414788.

Below 1G

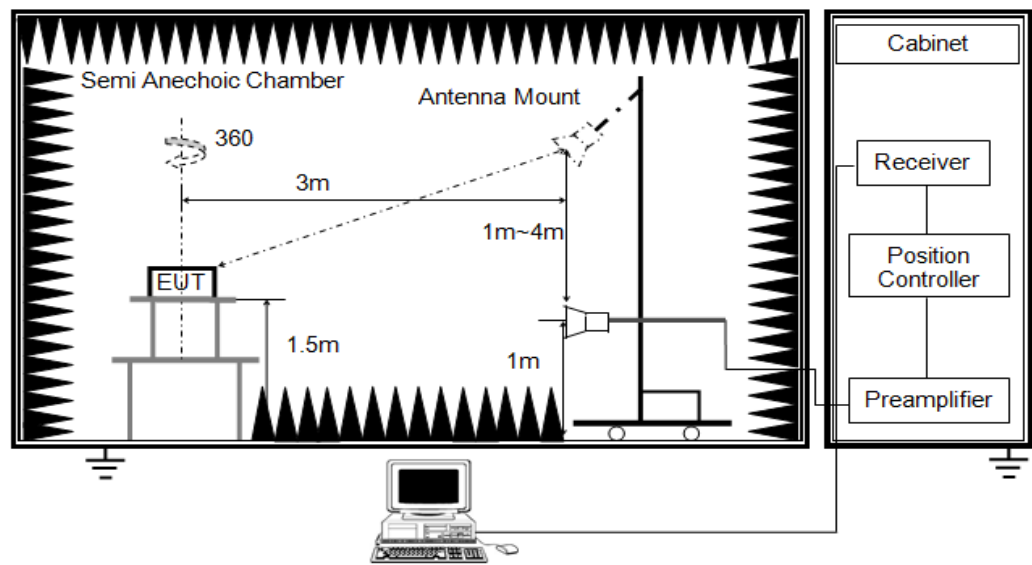


The setting of the spectrum analyser

| | |
|----------|----------|
| RBW | 120K |
| VBW | 300K |
| Sweep | Auto |
| Detector | Peak/QP |
| Trace | Max hold |

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Measurement = Reading Level + Correct Factor
6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G

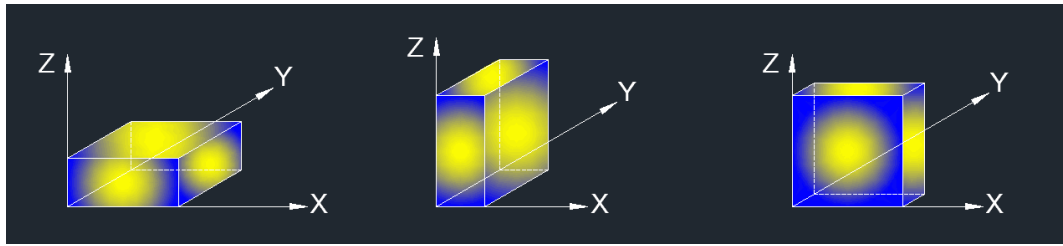


The setting of the spectrum analyser

| | |
|----------|-----------------------------|
| RBW | 1M MHz |
| VBW | PEAK: 3M AVG: See Note 6 |
| Sweep | Auto |
| Detector | Peak |
| Trace | Max hold |

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For average power measurement, set the detector to AVG, while maintaining all of the other instrument settings, if the duty cycle of the EUT is less than 98%, the Duty Cycle Correction Factor shall be added to the measured emission levels. For the Duty Cycle and Correction Factor please refer to clause 7.1.ON TIME AND DUTY CYCLE.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

X axis, Y axis, Z axis positions:

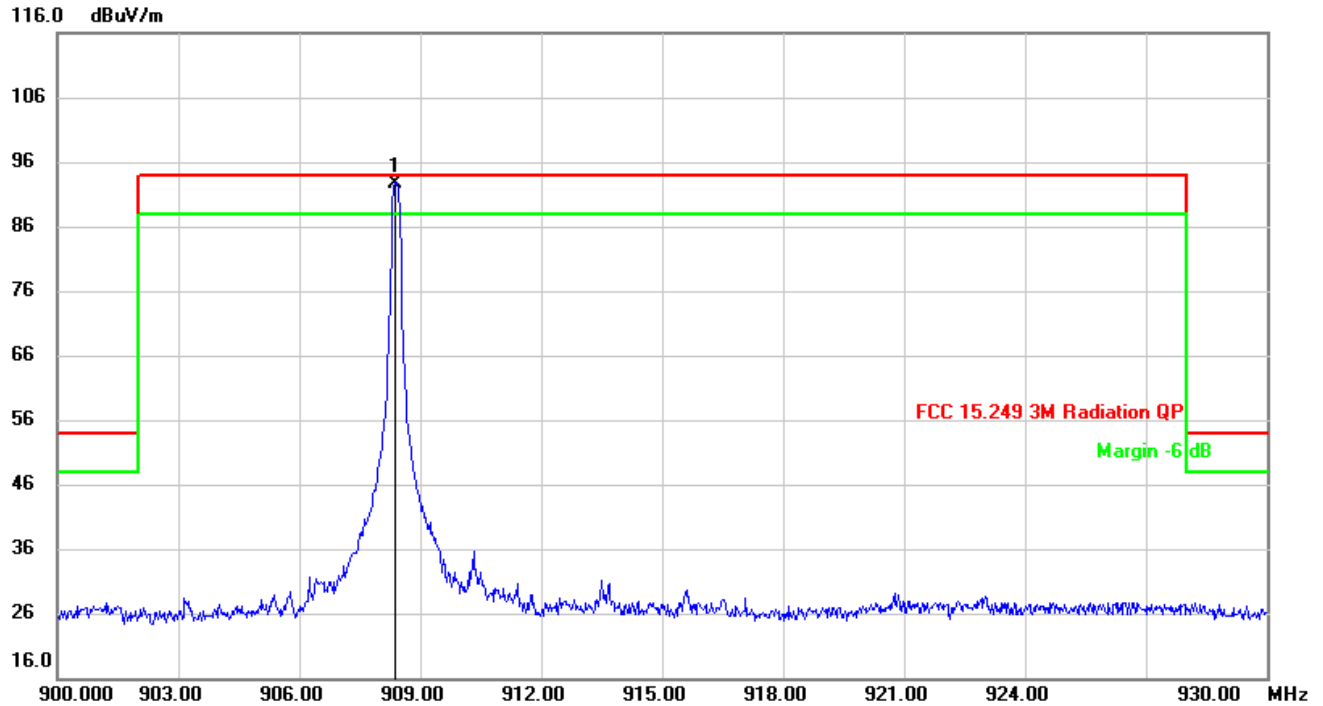


Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: All the EUT's emissions had been evaluated for simultaneous transmission with the other transmitter and there were no any additional or worse emissions found.

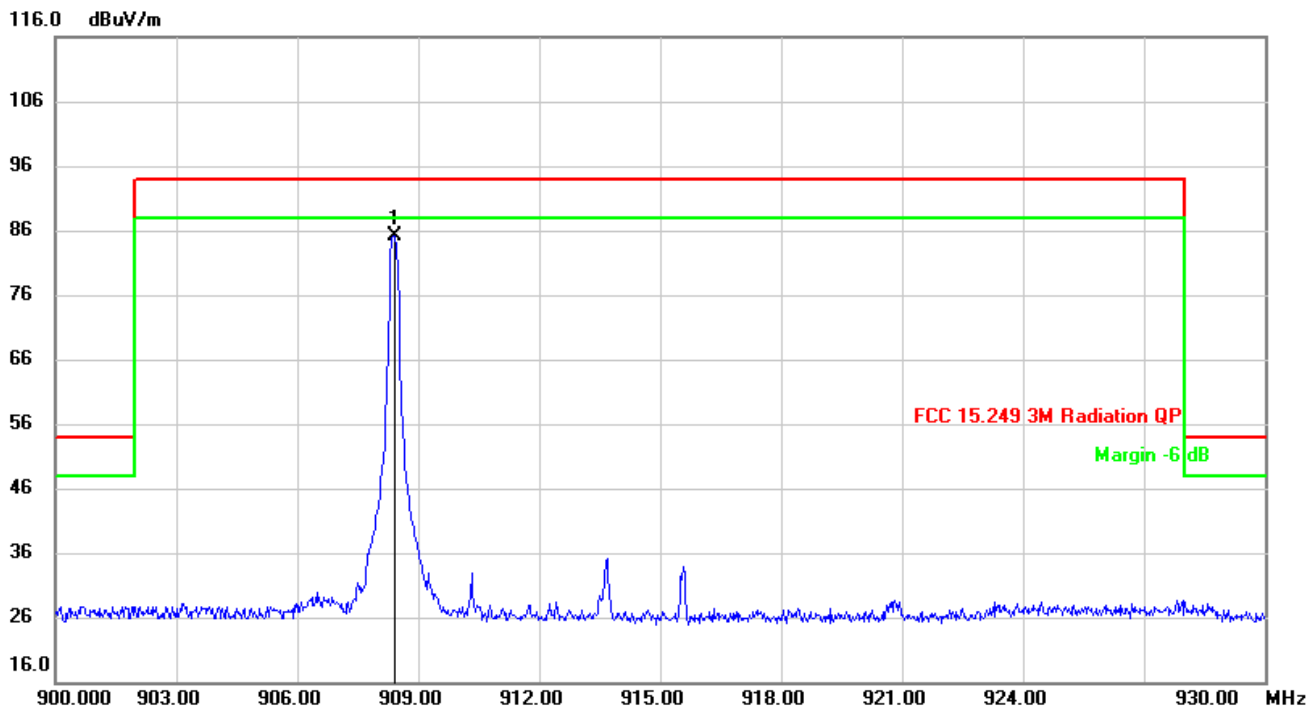
8.2. FIELD STRENGTH OF INTENTIONAL EMISSIONS

FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, HORIZONTAL)



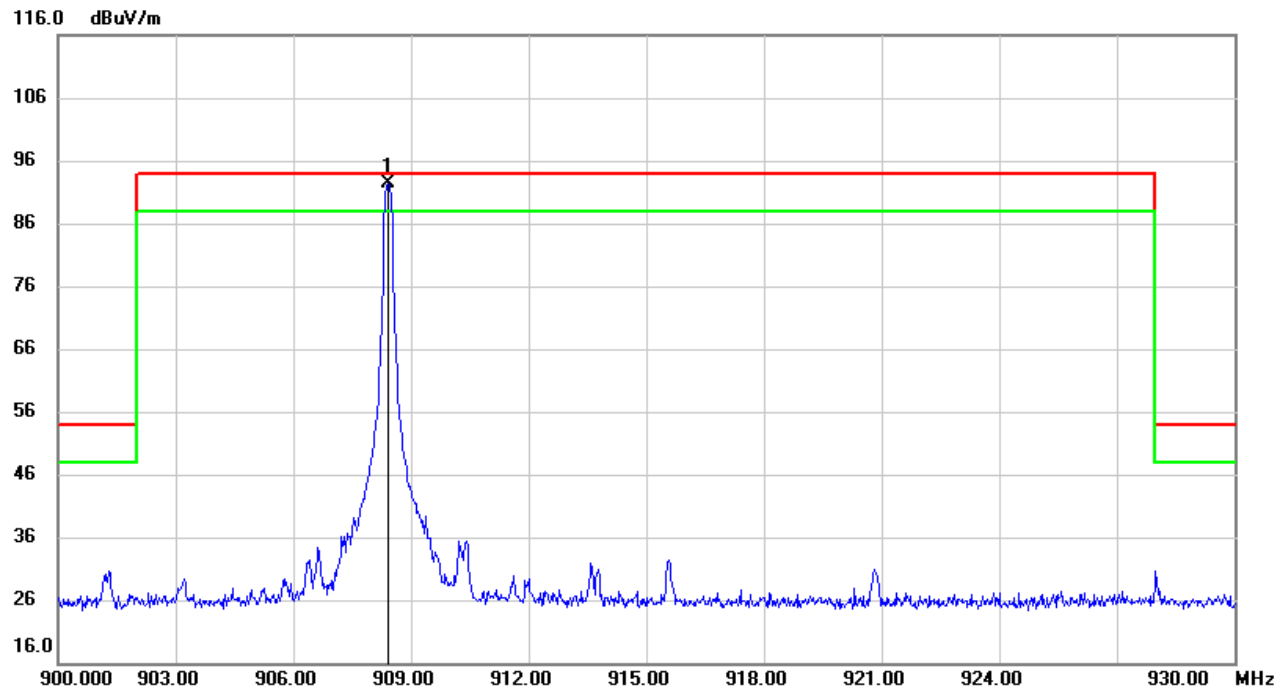
| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 908.3700 | 96.54 | -4.00 | 92.54 | 94.00 | -1.46 | QP |

Note: 1. Measurement = Reading Level + Correct Factor.
 2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 908.4000 | 89.20 | -4.00 | 85.20 | 94.00 | -8.80 | QP |

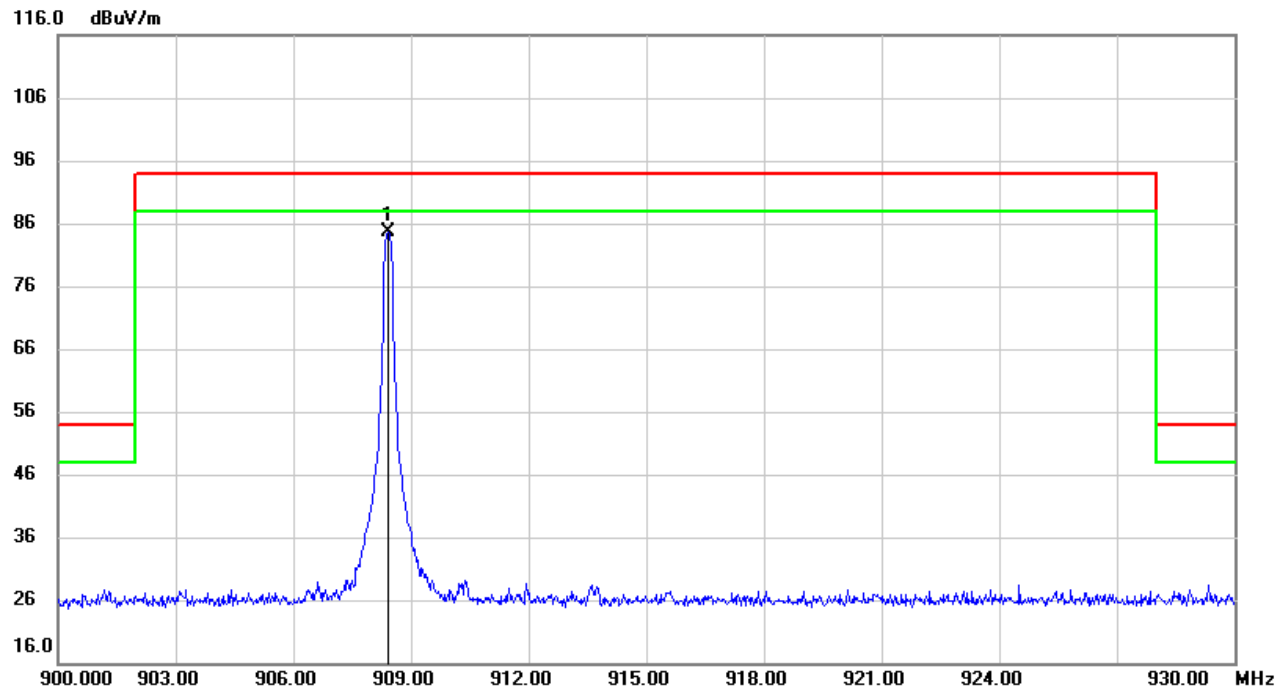
Note: 1. Measurement = Reading Level + Correct Factor.
 2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|--------------------|-------------------|----------------|--------|
| 1 | 908.4300 | 96.33 | -3.99 | 92.34 | 94.00 | -1.66 | QP |

Note: 1. Measurement = Reading Level + Correct Factor.

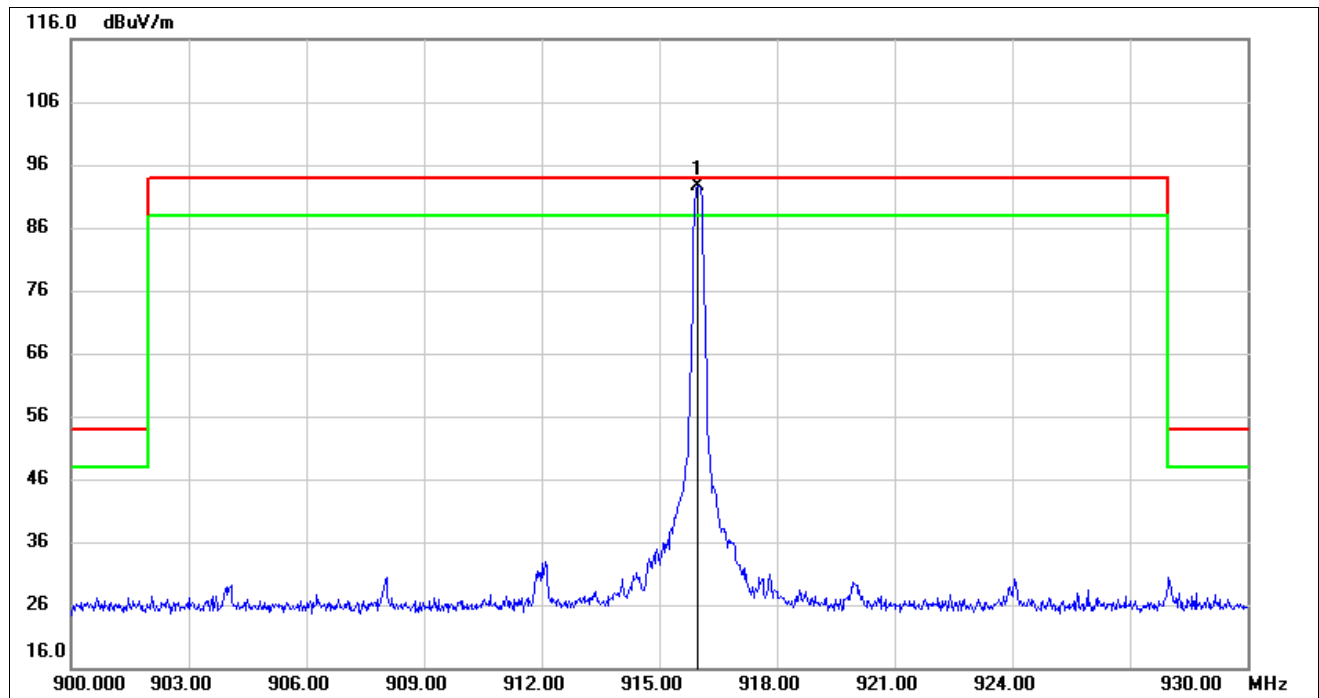
2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 908.4300 | 88.52 | -3.99 | 84.53 | 94.00 | -9.47 | QP |

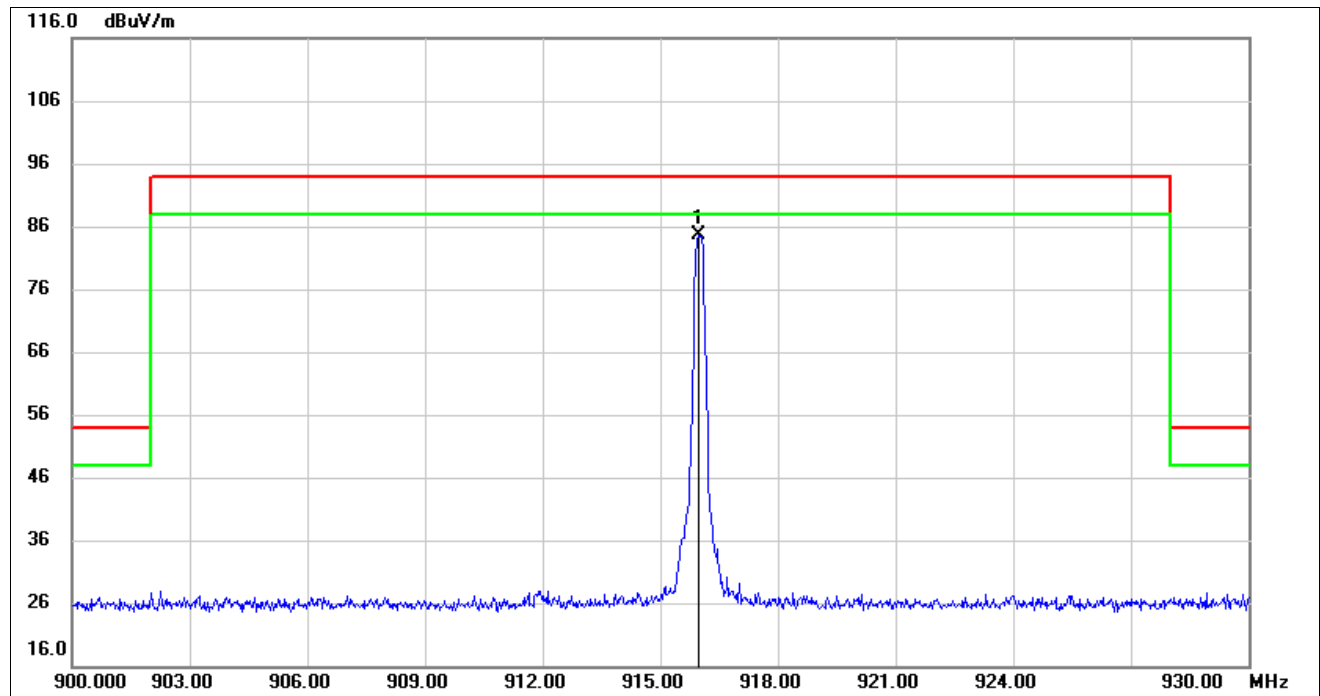
Note: 1. Measurement = Reading Level + Correct Factor.

2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, HORIZONTAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|--------------------|-------------------|----------------|--------|
| 1 | 915.9600 | 96.41 | -3.89 | 92.52 | 94.00 | -1.48 | QP |

Note: 1. Measurement = Reading Level + Correct Factor.
 2. QP detector.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|--------------------|-------------------|----------------|--------|
| 1 | 915.9600 | 88.41 | -3.89 | 84.52 | 94.00 | -9.48 | QP |

Note: 1. Measurement = Reading Level + Correct Factor.

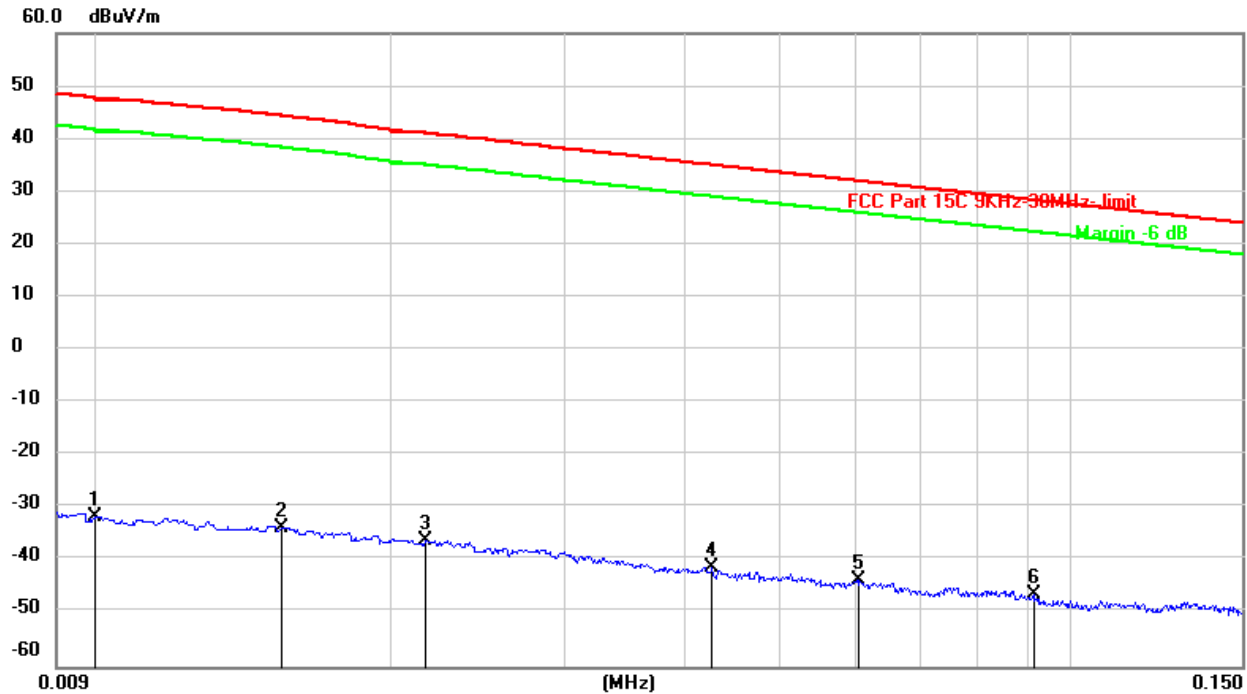
2. QP detector.

8.3. SPURIOUS EMISSIONS BELOW 30M

SPURIOUS EMISSIONS

(LOW CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9kHz~150kHz

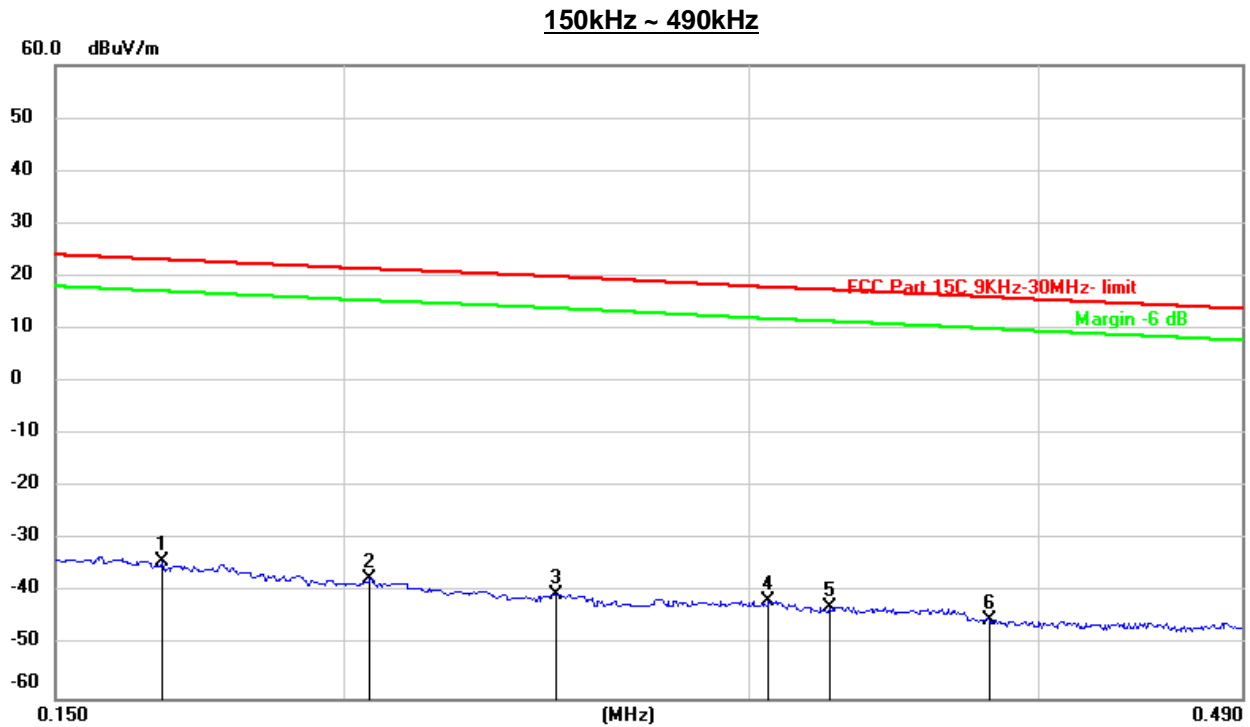


| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 0.0100 | 69.72 | -101.40 | -31.68 | 47.60 | -79.28 | peak |
| 2 | 0.0154 | 67.49 | -101.37 | -33.88 | 44.35 | -78.23 | peak |
| 3 | 0.0216 | 65.19 | -101.35 | -36.16 | 41.02 | -77.18 | peak |
| 4 | 0.0427 | 60.14 | -101.45 | -41.31 | 35.04 | -76.35 | peak |
| 5 | 0.0604 | 57.92 | -101.52 | -43.60 | 31.99 | -75.59 | peak |
| 6 | 0.0913 | 55.34 | -101.73 | -46.39 | 28.40 | -74.79 | peak |

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

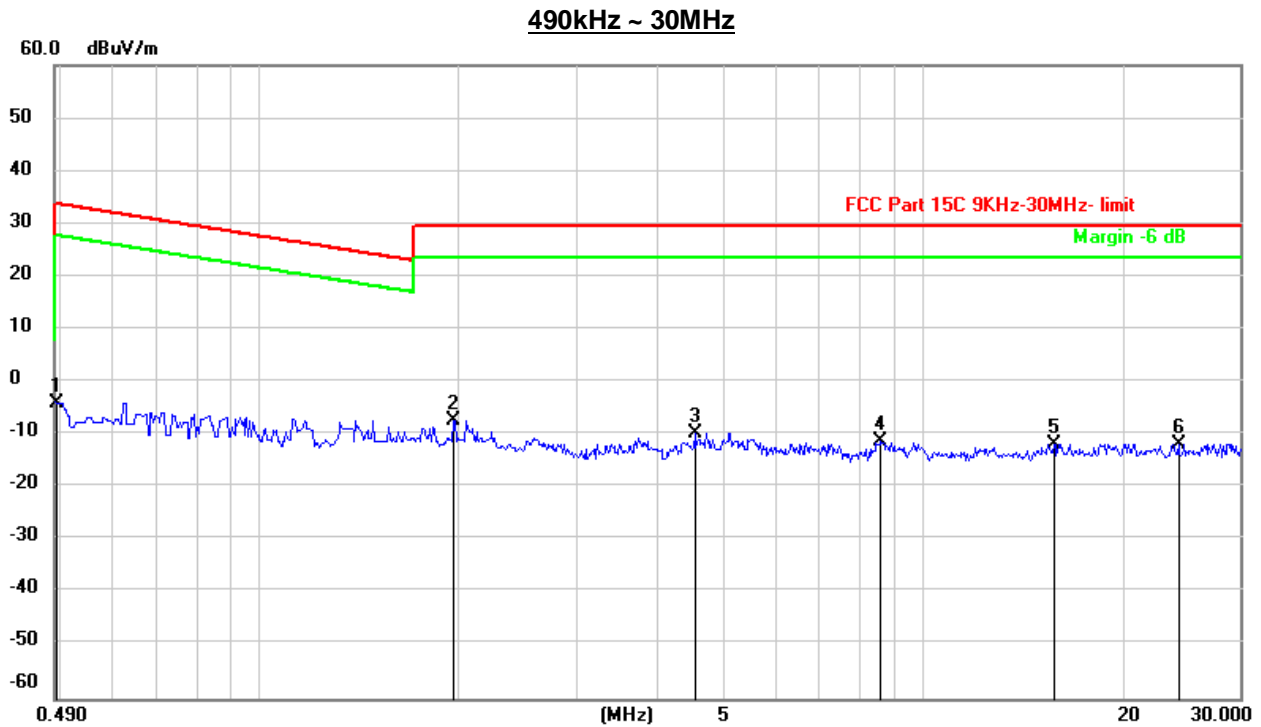


| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 0.1669 | 67.65 | -101.66 | -34.01 | 23.16 | -57.17 | peak |
| 2 | 0.2053 | 64.30 | -101.73 | -37.43 | 21.39 | -58.82 | peak |
| 3 | 0.2472 | 61.45 | -101.80 | -40.35 | 19.92 | -60.27 | peak |
| 4 | 0.3057 | 60.26 | -101.86 | -41.60 | 17.92 | -59.52 | peak |
| 5 | 0.3245 | 59.25 | -101.88 | -42.63 | 17.45 | -60.08 | peak |
| 6 | 0.3809 | 56.91 | -101.94 | -45.03 | 16.04 | -61.07 | peak |

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.



| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 0.4939 | 58.14 | -62.06 | -3.92 | 33.74 | -37.66 | peak |
| 2 | 1.9522 | 54.61 | -61.84 | -7.23 | 29.54 | -36.77 | peak |
| 3 | 4.5327 | 51.82 | -61.42 | -9.60 | 29.54 | -39.14 | peak |
| 4 | 8.6348 | 49.60 | -60.99 | -11.39 | 29.54 | -40.93 | peak |
| 5 | 15.7759 | 49.25 | -60.99 | -11.74 | 29.54 | -41.28 | peak |
| 6 | 24.3045 | 48.80 | -60.51 | -11.71 | 29.54 | -41.25 | peak |

Note: 1. Measurement = Reading Level + Correct Factor.

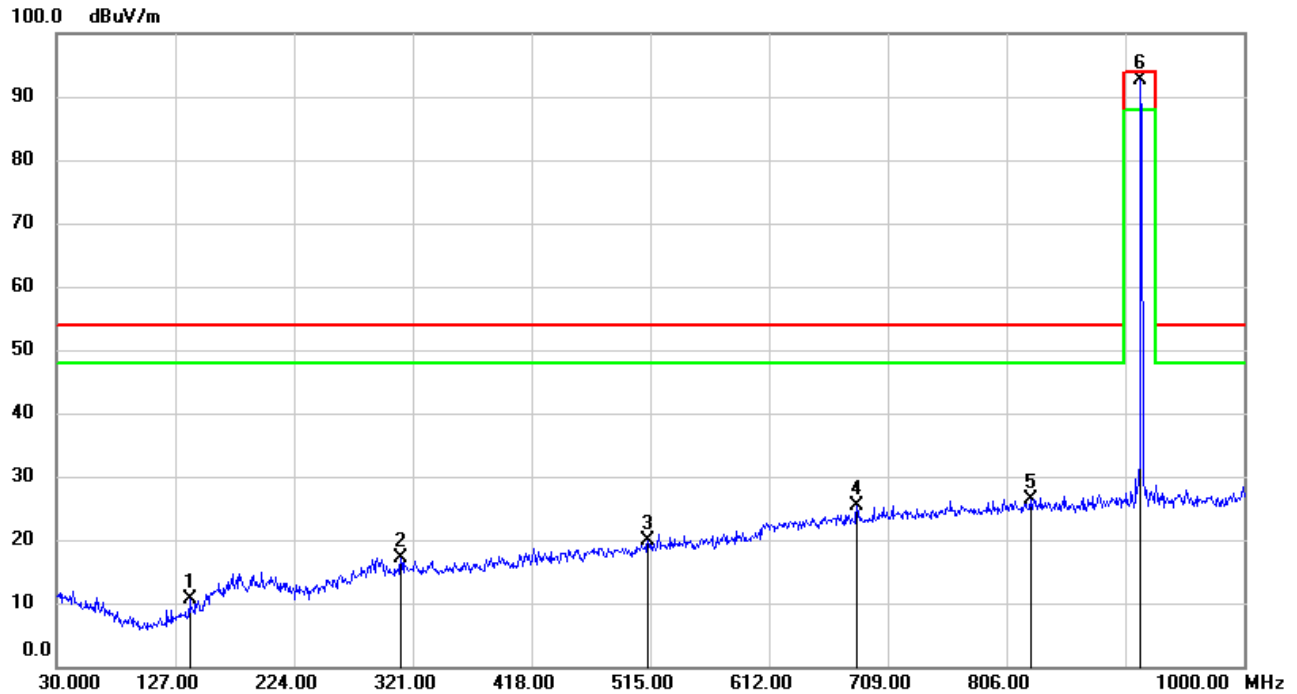
2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes had been tested, but only the worst data recorded in the report.

8.4. SPURIOUS EMISSIONS BELOW 1 GHz

SPURIOUS EMISSIONS BELOW 1GHz (WORST-CASE HIGH CHANNEL, HORIZONTAL)

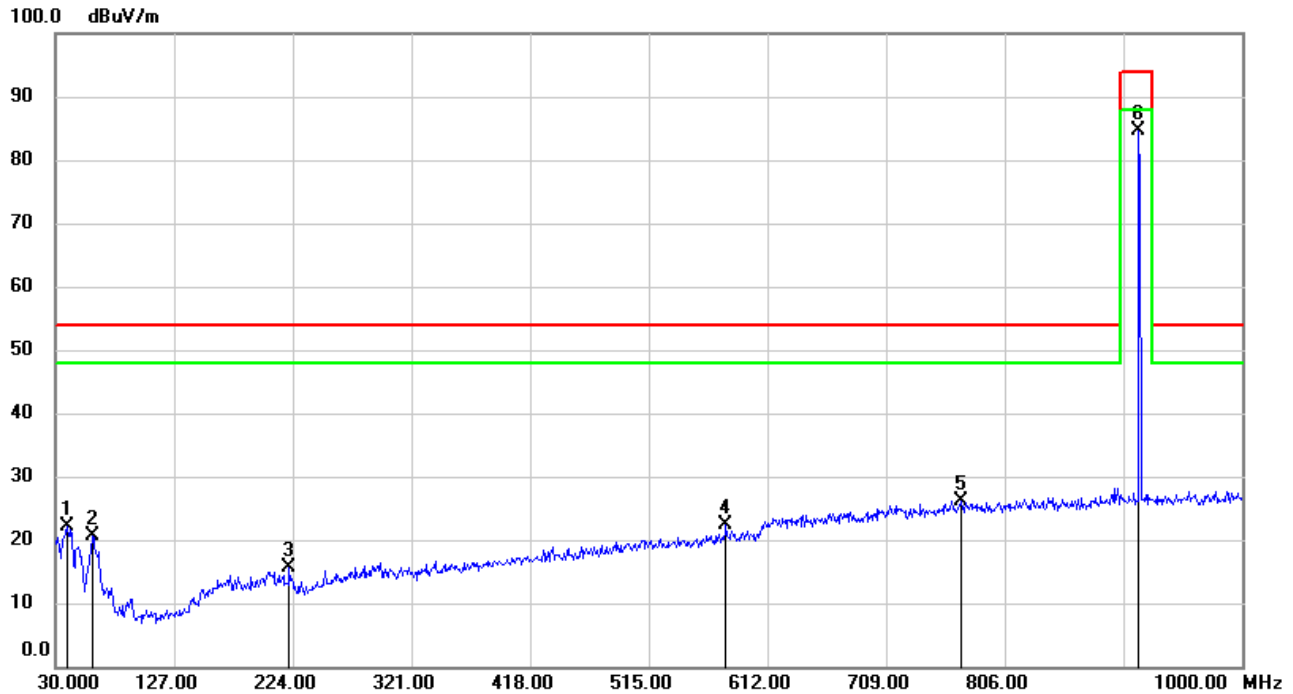


| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 138.6400 | 29.88 | -19.26 | 10.62 | 54.00 | -43.38 | QP |
| 2 | 311.3000 | 30.81 | -13.77 | 17.04 | 54.00 | -36.96 | QP |
| 3 | 513.0600 | 30.07 | -10.13 | 19.94 | 54.00 | -34.06 | QP |
| 4 | 683.7800 | 32.22 | -6.92 | 25.30 | 54.00 | -28.70 | QP |
| 5 | 825.4000 | 31.31 | -4.86 | 26.45 | 54.00 | -27.55 | QP |
| 6 | 915.6100 | 96.65 | -3.90 | 92.75 | 94.00 | -1.25 | QP |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

SPURIOUS EMISSIONS BELOW 1GHz (WORST-CASE HIGH CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 39.7000 | 40.03 | -17.93 | 22.10 | 54.00 | -31.90 | QP |
| 2 | 60.0700 | 40.05 | -19.46 | 20.59 | 54.00 | -33.41 | QP |
| 3 | 221.0900 | 32.54 | -17.02 | 15.52 | 54.00 | -38.48 | QP |
| 4 | 578.0500 | 31.07 | -8.77 | 22.30 | 54.00 | -31.70 | QP |
| 5 | 770.1100 | 32.06 | -5.82 | 26.24 | 54.00 | -27.76 | QP |
| 6 | 915.6100 | 88.50 | -3.90 | 84.60 | 94.00 | -9.40 | QP |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

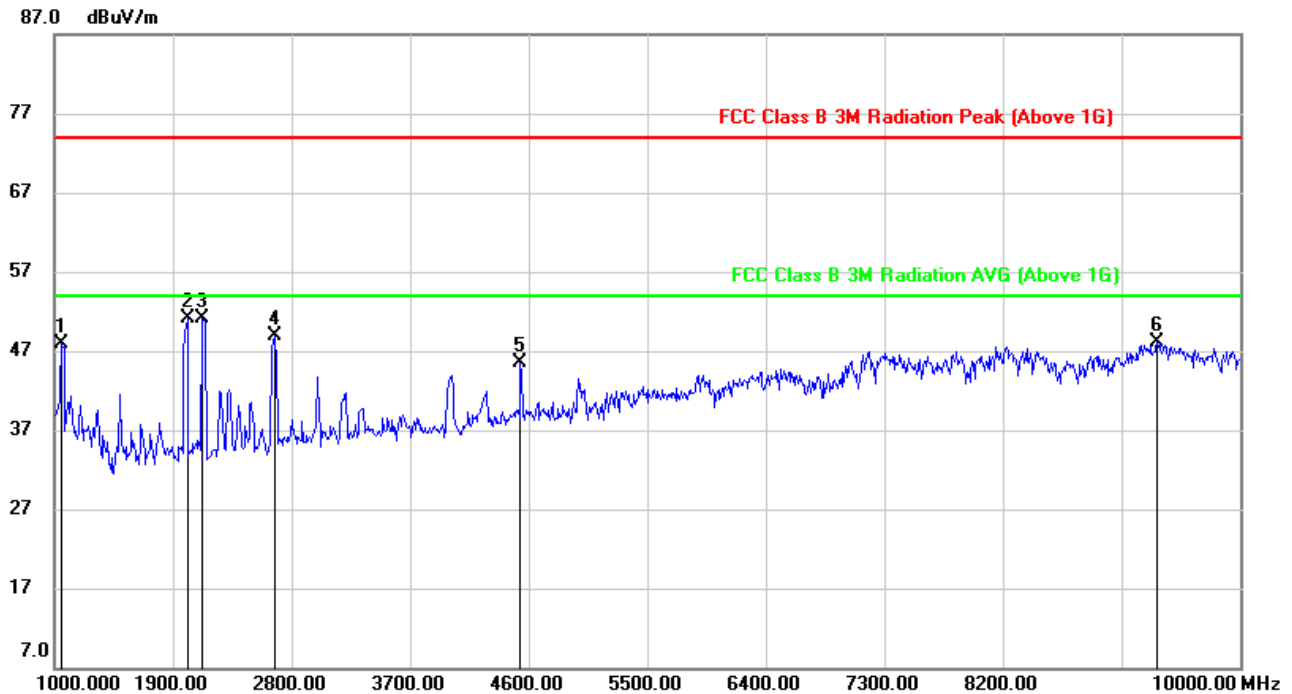
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

Note: All the modes had been tested, but only the worst data recorded in the report.

8.5. SPURIOUS EMISSIONS 1 ~ 10GHz

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)

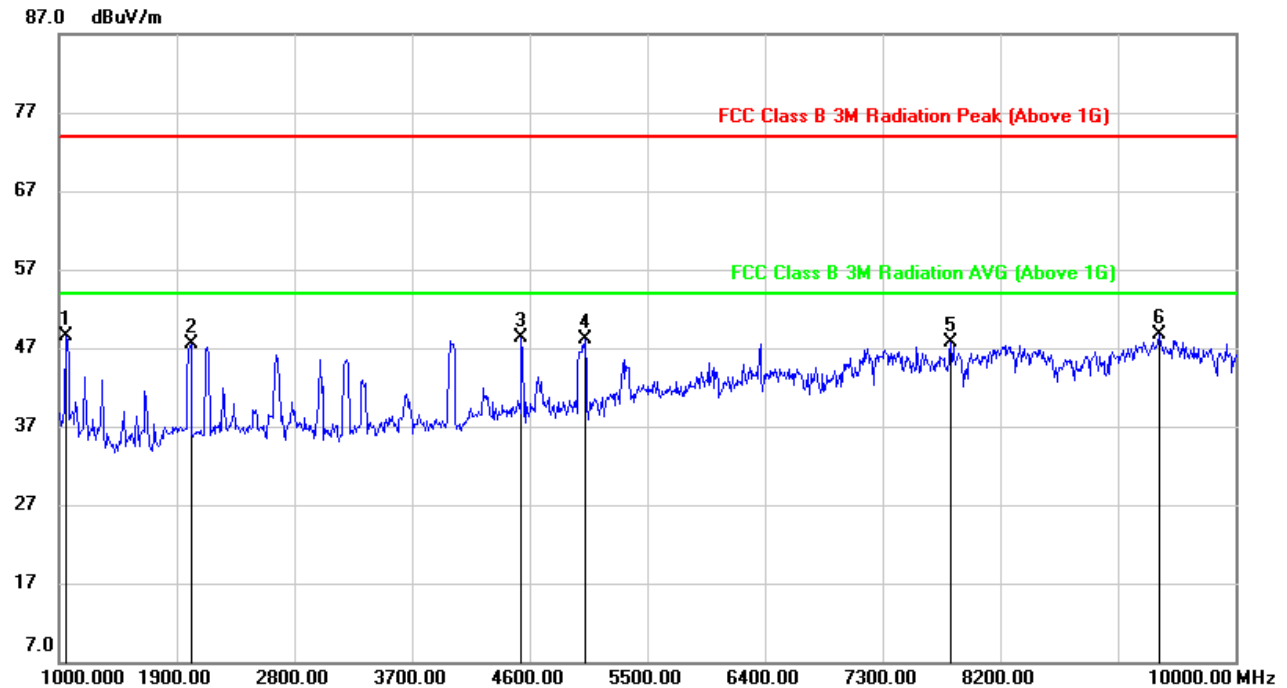


| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 1054.000 | 62.51 | -14.52 | 47.99 | 74.00 | -26.01 | peak |
| 2 | 2008.000 | 61.85 | -10.81 | 51.04 | 74.00 | -22.96 | peak |
| 3 | 2116.000 | 61.26 | -10.14 | 51.12 | 74.00 | -22.88 | peak |
| 4 | 2674.000 | 57.06 | -8.08 | 48.98 | 74.00 | -25.02 | peak |
| 5 | 4537.000 | 47.52 | -2.07 | 45.45 | 74.00 | -28.55 | peak |
| 6 | 9370.000 | 38.09 | 10.10 | 48.19 | 74.00 | -25.81 | peak |

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

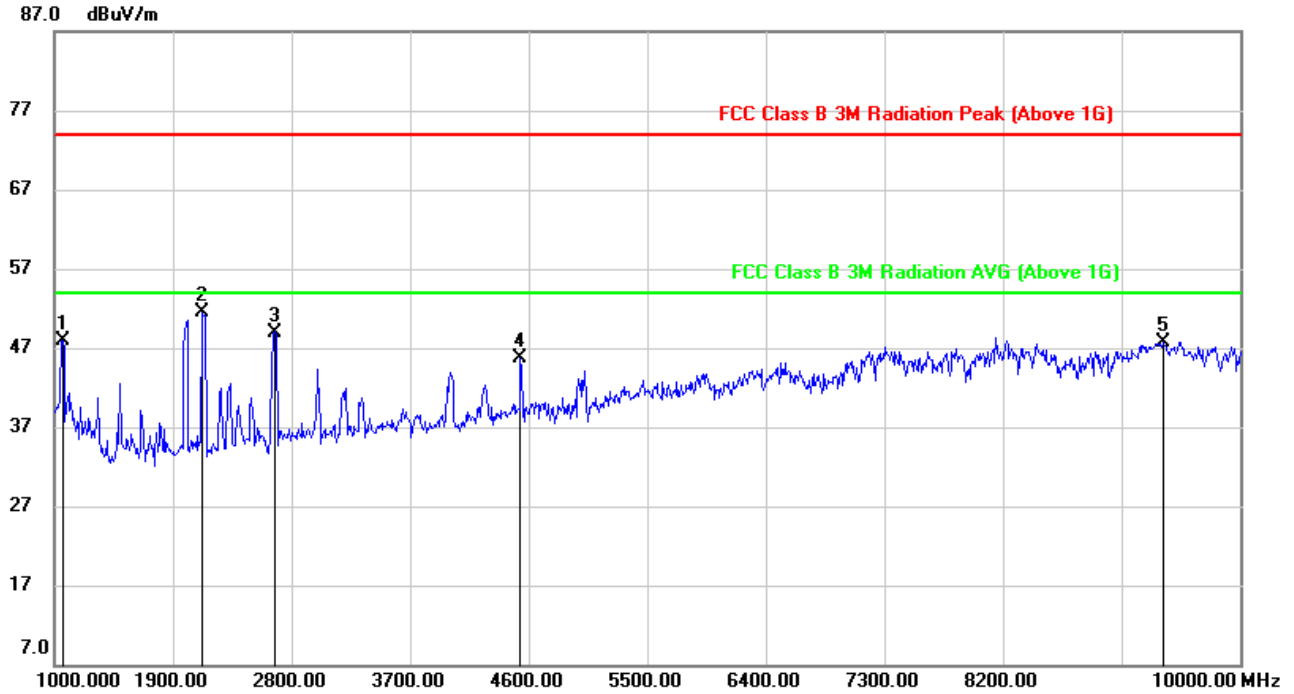
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 1054.000 | 63.05 | -14.52 | 48.53 | 74.00 | -25.47 | peak |
| 2 | 2008.000 | 58.33 | -10.81 | 47.52 | 74.00 | -26.48 | peak |
| 3 | 4537.000 | 50.41 | -2.07 | 48.34 | 74.00 | -25.66 | peak |
| 4 | 5023.000 | 48.03 | -0.01 | 48.02 | 74.00 | -25.98 | peak |
| 5 | 7822.000 | 39.22 | 8.44 | 47.66 | 74.00 | -26.34 | peak |
| 6 | 9415.000 | 38.36 | 10.27 | 48.63 | 74.00 | -25.37 | peak |

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

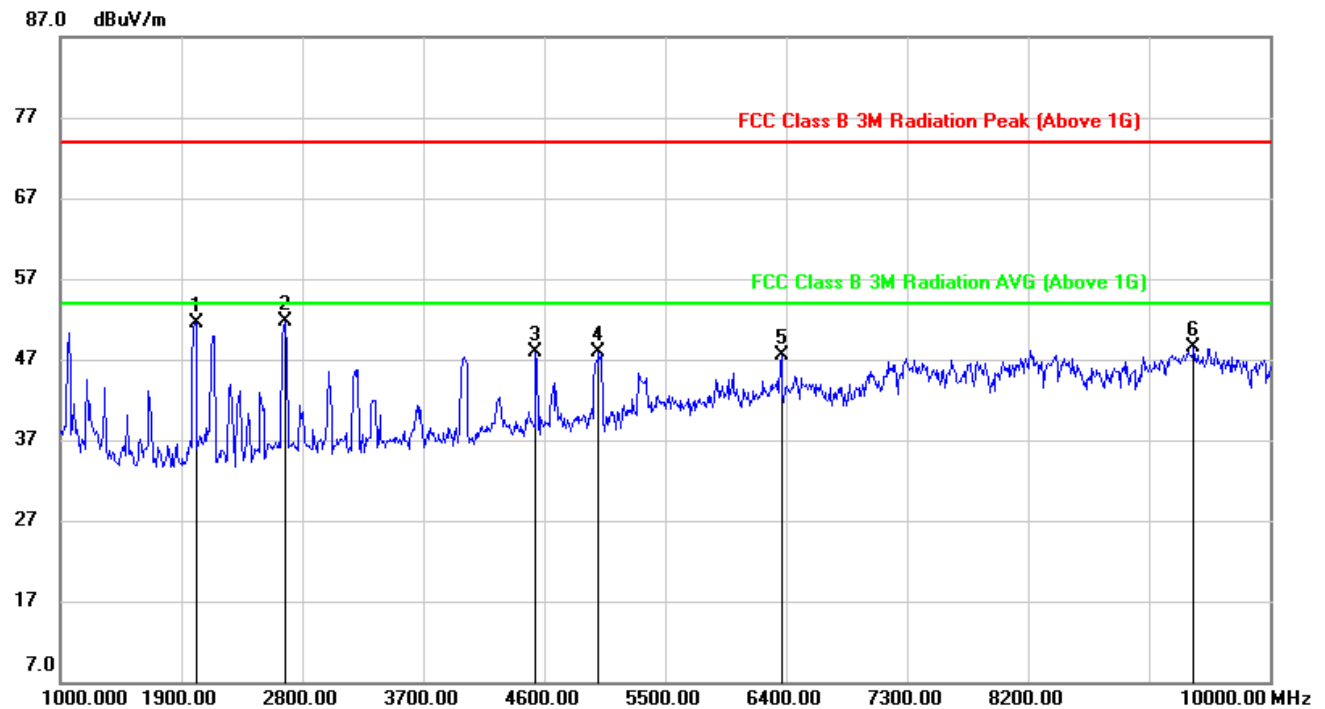
HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|--------------------|-------------------|----------------|--------|
| 1 | 1063.000 | 62.44 | -14.51 | 47.93 | 74.00 | -26.07 | peak |
| 2 | 2116.000 | 61.66 | -10.14 | 51.52 | 74.00 | -22.48 | peak |
| 3 | 2674.000 | 57.08 | -8.08 | 49.00 | 74.00 | -25.00 | peak |
| 4 | 4537.000 | 47.79 | -2.07 | 45.72 | 74.00 | -28.28 | peak |
| 5 | 9415.000 | 37.53 | 10.27 | 47.80 | 74.00 | -26.20 | peak |

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

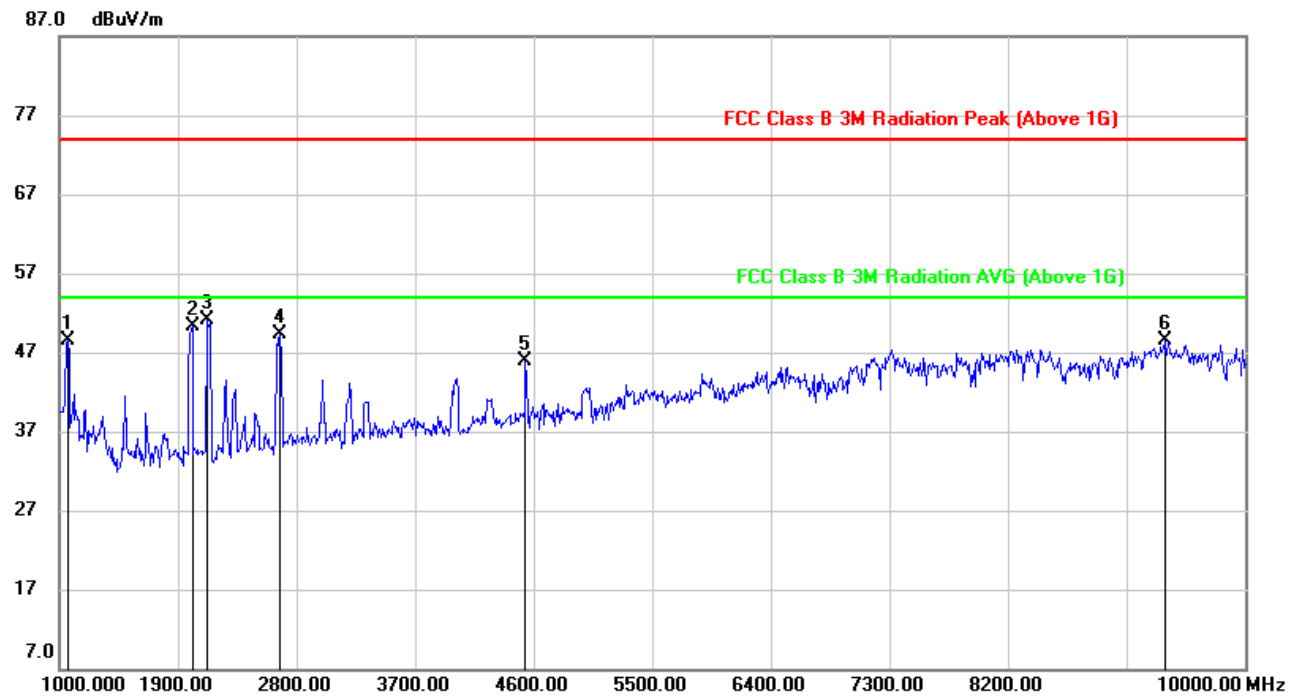
HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 2008.000 | 62.40 | -10.81 | 51.59 | 74.00 | -22.41 | peak |
| 2 | 2674.000 | 59.74 | -8.08 | 51.66 | 74.00 | -22.34 | peak |
| 3 | 4537.000 | 49.95 | -2.07 | 47.88 | 74.00 | -26.12 | peak |
| 4 | 5005.000 | 47.87 | -0.04 | 47.83 | 74.00 | -26.17 | peak |
| 5 | 6364.000 | 43.18 | 4.40 | 47.58 | 74.00 | -26.42 | peak |
| 6 | 9433.000 | 38.19 | 10.30 | 48.49 | 74.00 | -25.51 | peak |

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

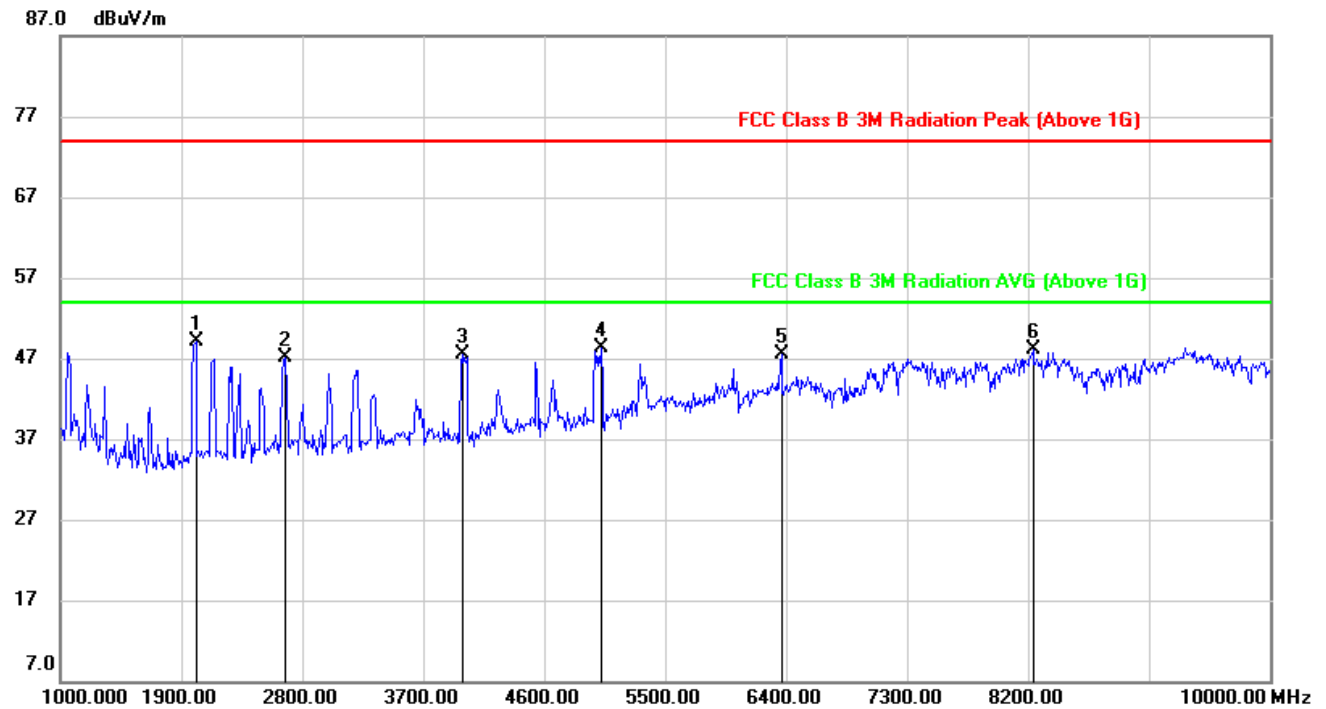
HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|--------------------|-------------------|----------------|--------|
| 1 | 1063.000 | 63.07 | -14.51 | 48.56 | 74.00 | -25.44 | peak |
| 2 | 2008.000 | 61.02 | -10.81 | 50.21 | 74.00 | -23.79 | peak |
| 3 | 2116.000 | 61.26 | -10.14 | 51.12 | 74.00 | -22.88 | peak |
| 4 | 2674.000 | 57.35 | -8.08 | 49.27 | 74.00 | -24.73 | peak |
| 5 | 4537.000 | 47.88 | -2.07 | 45.81 | 74.00 | -28.19 | peak |
| 6 | 9388.000 | 38.37 | 10.18 | 48.55 | 74.00 | -25.45 | peak |

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 2008.000 | 59.98 | -10.81 | 49.17 | 74.00 | -24.83 | peak |
| 2 | 2674.000 | 55.27 | -8.08 | 47.19 | 74.00 | -26.81 | peak |
| 3 | 3997.000 | 51.66 | -4.09 | 47.57 | 74.00 | -26.43 | peak |
| 4 | 5023.000 | 48.27 | -0.01 | 48.26 | 74.00 | -25.74 | peak |
| 5 | 6364.000 | 43.13 | 4.40 | 47.53 | 74.00 | -26.47 | peak |
| 6 | 8236.000 | 38.99 | 9.03 | 48.02 | 74.00 | -25.98 | peak |

Note: 1. Result = Reading + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

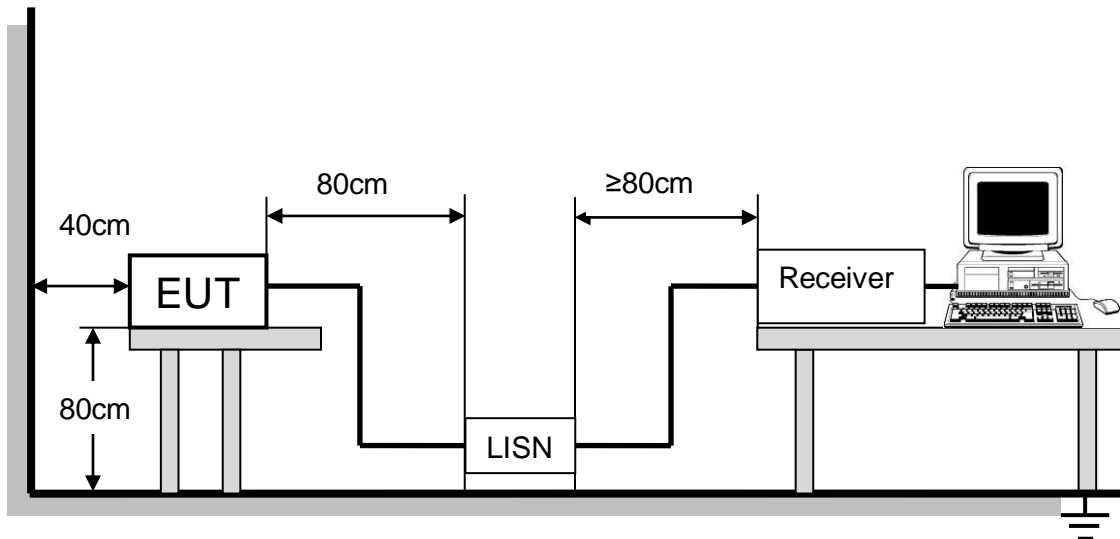
9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8.

| FREQUENCY (MHz) | 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 |

TEST SETUP AND PROCEDURE

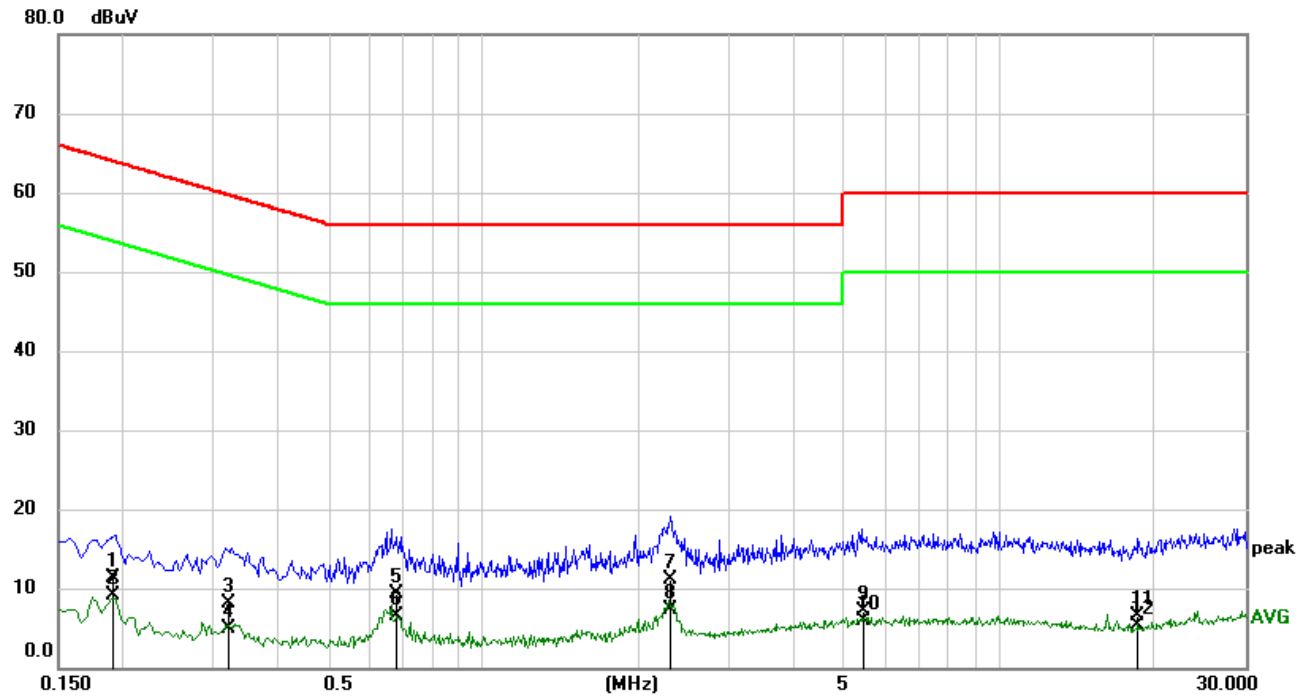


The EUT is put on a table of non-conducting material that is 80mm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

| | | | |
|---------------------|--------|-------------------|---------|
| Temperature | 23°C | Relative Humidity | 60% |
| Atmosphere Pressure | 101kPa | Test Voltage | AC 120V |

TEST RESULTS (MID CHANNEL, WORST-CASE CONFIGURATION)**LINE N RESULTS**

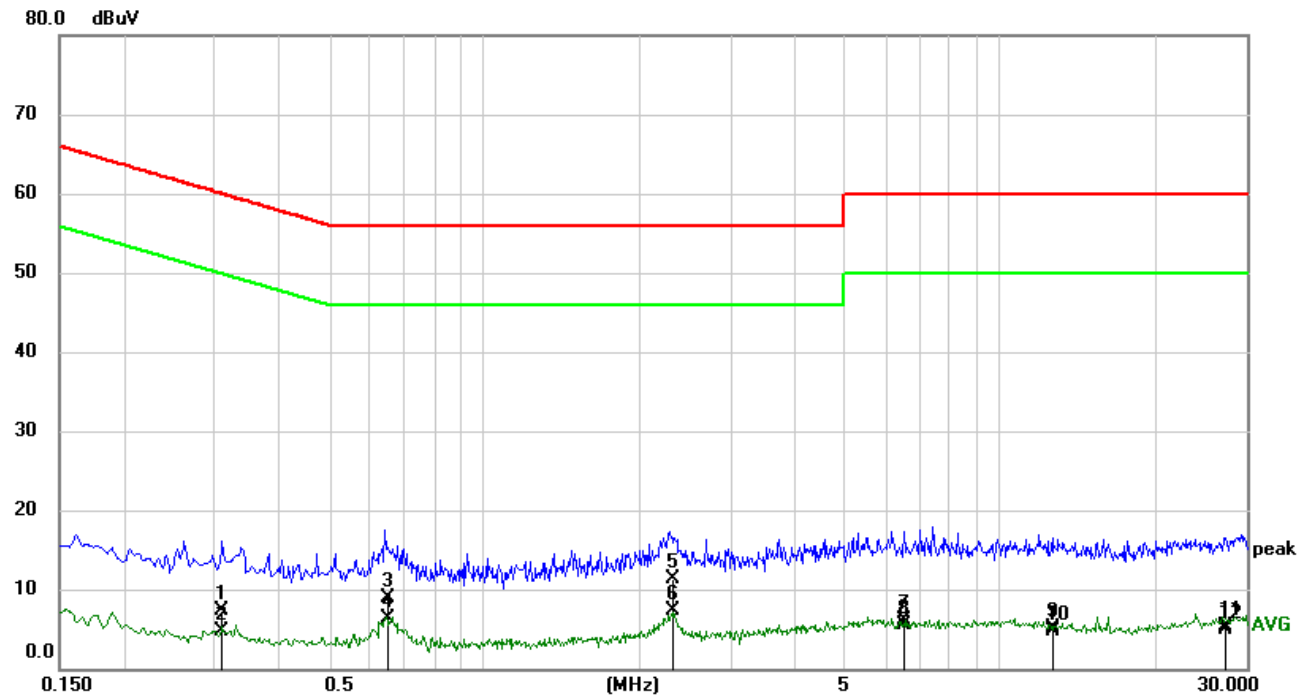
| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------|---------------|--------------|-------------|--------|
| 1 | 0.1907 | 1.72 | 9.60 | 11.32 | 64.01 | -52.69 | QP |
| 2 | 0.1907 | -0.56 | 9.60 | 9.04 | 54.01 | -44.97 | AVG |
| 3 | 0.3209 | -1.59 | 9.60 | 8.01 | 59.68 | -51.67 | QP |
| 4 | 0.3209 | -4.66 | 9.60 | 4.94 | 49.68 | -44.74 | AVG |
| 5 | 0.6774 | -0.37 | 9.60 | 9.23 | 56.00 | -46.77 | QP |
| 6 | 0.6774 | -3.13 | 9.60 | 6.47 | 46.00 | -39.53 | AVG |
| 7 | 2.3024 | 1.57 | 9.63 | 11.20 | 56.00 | -44.80 | QP |
| 8 | 2.3024 | -2.33 | 9.63 | 7.30 | 46.00 | -38.70 | AVG |
| 9 | 5.4634 | -2.58 | 9.69 | 7.11 | 60.00 | -52.89 | QP |
| 10 | 5.4634 | -3.77 | 9.69 | 5.92 | 50.00 | -44.08 | AVG |
| 11 | 18.5740 | -3.74 | 10.15 | 6.41 | 60.00 | -53.59 | QP |
| 12 | 18.5740 | -4.83 | 10.15 | 5.32 | 50.00 | -44.68 | AVG |

Note: 1. Result = Reading +Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

LINE L RESULTS

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------|---------------|--------------|-------------|--------|
| 1 | 0.3110 | -2.34 | 9.60 | 7.26 | 59.94 | -52.68 | QP |
| 2 | 0.3110 | -4.97 | 9.60 | 4.63 | 49.94 | -45.31 | AVG |
| 3 | 0.6511 | -0.70 | 9.60 | 8.90 | 56.00 | -47.10 | QP |
| 4 | 0.6511 | -3.22 | 9.60 | 6.38 | 46.00 | -39.62 | AVG |
| 5 | 2.3031 | 1.69 | 9.63 | 11.32 | 56.00 | -44.68 | QP |
| 6 | 2.3031 | -2.38 | 9.63 | 7.25 | 46.00 | -38.75 | AVG |
| 7 | 6.5177 | -3.50 | 9.70 | 6.20 | 60.00 | -53.80 | QP |
| 8 | 6.5177 | -4.20 | 9.70 | 5.50 | 50.00 | -44.50 | AVG |
| 9 | 12.5543 | -4.67 | 9.79 | 5.12 | 60.00 | -54.88 | QP |
| 10 | 12.5543 | -5.16 | 9.79 | 4.63 | 50.00 | -45.37 | AVG |
| 11 | 27.3958 | -4.61 | 9.88 | 5.27 | 60.00 | -54.73 | QP |
| 12 | 27.3958 | -4.92 | 9.88 | 4.96 | 50.00 | -45.04 | AVG |

Note: 1. Result = Reading +Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

Note: All the modes had been tested, but only the worst data recorded in the report.

10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

RESULTS

Complies

END OF REPORT