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

# CERTIFICATION TEST REPORT

*For*

**Contact Sensor**

**MODEL NUMBER: 5AT3S2**

**FCC ID: 2AB2Q5AT3S2**
**IC: 10256A-5AT3S2**

**REPORT NUMBER: 4789271186.1-2**

**ISSUE DATE: December 10, 2019**

*Prepared for*

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

*Prepared by*

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch**
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**Test Result: PASS**

*For the detail, please refer to page 11.

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V0 | 12/10/2019 | 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 Information**

| | |
|---|---|
| EUT Name: | Contact Sensor |
| Model: | 5AT3S2 |
| Sample Received Date: | November 27, 2019 |
| Sample Status: | Normal |
| Sample ID: | 2718943 |
| Date of Tested: | December 2~10, 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 |

Prepared By:

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Project Engineer

Checked By:

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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 | **A2LA (Certificate No.: 4102.01)**<br>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.<br>**IAS (Lab Code: TL-702)**<br>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<br>**FCC (FCC Designation No.: CN1187)**<br>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules<br>**IC(Company No.: 21320)**<br>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.<br>**VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)**<br>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.<br>Facility Name:<br>Chamber D, the VCCI registration No. is G-20019 and R-20004<br>Shielding Room B , the VCCI registration No. is C-20012 and T-20011 |

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 OFS.

# 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 | Contact Sensor | |
| Model Name | 5AT3S2 | |
| Data Rates/Modulation | 908.4 MHz:40kbps/FSK | |
| | 908.42 MHz:9.6kbps/FSK | |
| | 916.0 MHz:100kbps/GFSK | |
| Transmit Channel Tested: | Channel ID | Channel Frequency(MHz) |
| | 1 | 908.40 |
| | 2 | 908.42 |
| | 3 | 916.00 |
| Power Supply | DC 3V | |

## 5.2. MAXIMUM EMISSIONS FIELD STRENGTH

| Frequency Band (MHz) | Number of Transmit Chains (NTX) | Operation Frequency (MHz) | Channel Number | Max. Emissions Field Strength (dBµV/m) |
|---|---|---|---|---|
| 902-928 | 1 | 908.4-916 | 1[3] | 92.86 |

## 5.3. THE WORSE CASE POWER SETTING PARAMETER

| The Worse Case Power Setting Parameter under 908.4~916MHz | | | | |
|---|---|---|---|---|
| Test Software | | sscom | | |
| Modulation Type | Transmit Antenna Number | Test Software Setting Value | | |
| | | 916MHz | 908.42MHz | 908.4MHz |
| FSK&GFSK | 1 | 15(raw) | 15(raw) | 15(raw) |

Note:
1. raw is the test software setting description provide by customer.
2. All tests executed under maximum input levels.

## 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 | DC 3V |
| | VH | N/A |

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

## 5.5. TEST CHANNEL CONFIGURATION

| Test Mode | Test Channel Number | Test Channel |
|---|---|---|
| Z-wave | CH 1, CH 2, CH 3/ Low, Middle, High | 908.4MHz, 908.42MHz, 916MHz |

## 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

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

## 5.7. 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 |

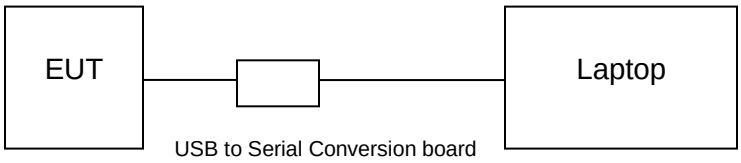
**ACCESSORY**

| 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**



## 5.8. MEASURING INSTRUMENT AND SOFTWARE USED

**For the previous calibration information**

| **Conducted Emissions** | | | | | | |
|---|---|---|---|---|---|---|
| Instrument | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| ☒ | EMI Test Receiver | R&S | ESR3 | 101961 | Dec.10,2018 | Dec.10,2019 |
| ☒ | Two-Line V-Network | R&S | ENV216 | 101983 | Dec.10,2018 | Dec.10,2019 |
| ☒ | Artificial Mains Networks | Schwarzbeck | NSLK 8126 | 8126465 | Dec.10,2018 | Dec.10,2019 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | Version | |
| ☒ | 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. |
| ☑ | MXE EMI Receiver | KESIGHT | N9038A | MY56400036 | Dec.10,2018 | Dec.10,2019 |
| ☑ | Hybrid Log Periodic Antenna | TDK | HLP-3003C | 130960 | Sep.17, 2018 | Sep.17, 2021 |
| ☑ | Preamplifier | HP | 8447D | 2944A09099 | Dec.10,2018 | Dec.10,2019 |
| ☑ | EMI Measurement Receiver | R&S | ESR26 | 101377 | Dec.10,2018 | Dec.10,2019 |
| ☑ | Horn Antenna | TDK | HRN-0118 | 130939 | Sep.17, 2018 | Sep.17, 2021 |
| ☑ | Preamplifier | TDK | PA-02-0118 | TRS-305-00066 | Dec.10,2018 | Dec.10,2019 |
| ☑ | Preamplifier | TDK | PA-02-2 | TRS-307-00003 | Dec.10,2018 | Dec.10,2019 |
| ☑ | Loop antenna | Schwarzbeck | 1519B | 00008 | Jan.07, 2019 | Jan.07, 2022 |
| ☑ | High Pass Filter | Wi | WHJ10-882-980-10000-40SS | 82345 | Dec.10,2018 | Dec.10,2019 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | Version | |
| ☑ | Test Software for Radiated disturbance | | Farad | EZ-EMC | Ver. UL-3A1 | |
| Other instruments | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| ☑ | Spectrum Analyzer | Keysight | N9030A | MY55410512 | Dec.10,2018 | Dec.10,2019 |

**For the last calibration information**

| **Conducted Emissions** | | | | | | |
|---|---|---|---|---|---|---|
| Instrument | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| ☒ | EMI Test Receiver | R&S | ESR3 | 101961 | Dec.05,2019 | Dec.05,2020 |
| ☒ | Two-Line V-Network | R&S | ENV216 | 101983 | Dec.05,2019 | Dec.05,2020 |
| ☒ | Artificial Mains Networks | Schwarzbeck | NSLK 8126 | 8126465 | Dec.05,2019 | Dec.05,2020 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | Version | |
| ☒ | 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. |
| ☑ | MXE EMI Receiver | KESIGHT | N9038A | MY56400036 | Dec.06,2019 | Dec.06,2020 |
| ☑ | Hybrid Log Periodic Antenna | TDK | HLP-3003C | 130960 | Sep.17, 2018 | Sep.17, 2021 |
| ☑ | Preamplifier | HP | 8447D | 2944A09099 | Dec.05,2019 | Dec.05,2020 |
| ☑ | EMI Measurement Receiver | R&S | ESR26 | 101377 | Dec.05,2019 | Dec.05,2020 |
| ☑ | Horn Antenna | TDK | HRN-0118 | 130939 | Sep.17, 2018 | Sep.17, 2021 |
| ☑ | Preamplifier | TDK | PA-02-0118 | TRS-305-00066 | Dec.05,2019 | Dec.05,2020 |
| ☑ | Preamplifier | TDK | PA-02-2 | TRS-307-00003 | Dec.05,2019 | Dec.05,2020 |
| ☑ | Loop antenna | Schwarzbeck | 1519B | 00008 | Jan.07, 2019 | Jan.07, 2022 |
| ☑ | High Pass Filter | Wi | WHJ10-882-980-10000-40SS | 82345 | Dec.05,2019 | Dec.05,2020 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | Version | |
| ☑ | Test Software for Radiated disturbance | | Farad | EZ-EMC | Ver. UL-3A1 | |
| Other instruments | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| ☑ | Spectrum Analyzer | Keysight | N9030A | MY55410512 | Dec.06,2019 | Dec.06,2020 |

# 6. SUMMARY OF TEST RESULTS

| Summary of Test Results | | | |
|---|---|---|---|
| Clause | Test Items | FCC/IC Rules | Test Results |
| 1 | 20dB Bandwidth | FCC Part 15.215(c) | Pass |
| 2 | 99%dB Bandwidth | RSS-Gen Clause 6.7 | Pass |
| 3 | TX Spurious Emission | FCC 15.249 (a)(d)(e)<br>FCC 15.209<br>FCC 15.205<br>RSS-GEN Clause 8.9<br>RSS-GEN Clause 8.10 | Pass |
| 4 | Conducted Emission Test for AC Power Port | FCC 15.207<br>RSS-GEN Clause 8.8 | N/A |
| 5 | Antenna Requirement | FCC Part 15.203<br>RSS-GEN Clause 6.8 | Pass |
| "N/A" denotes test is not applicable in this test report. | | | |

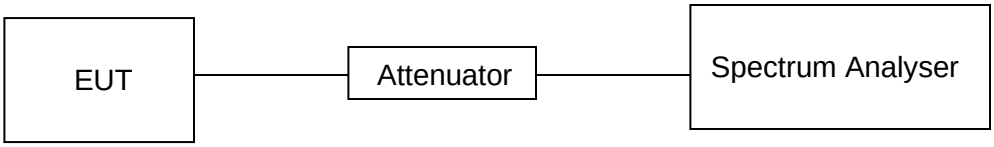
# 7. ANTENNA PORT TEST RESULTS

## 7.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only

**TEST SETUP**

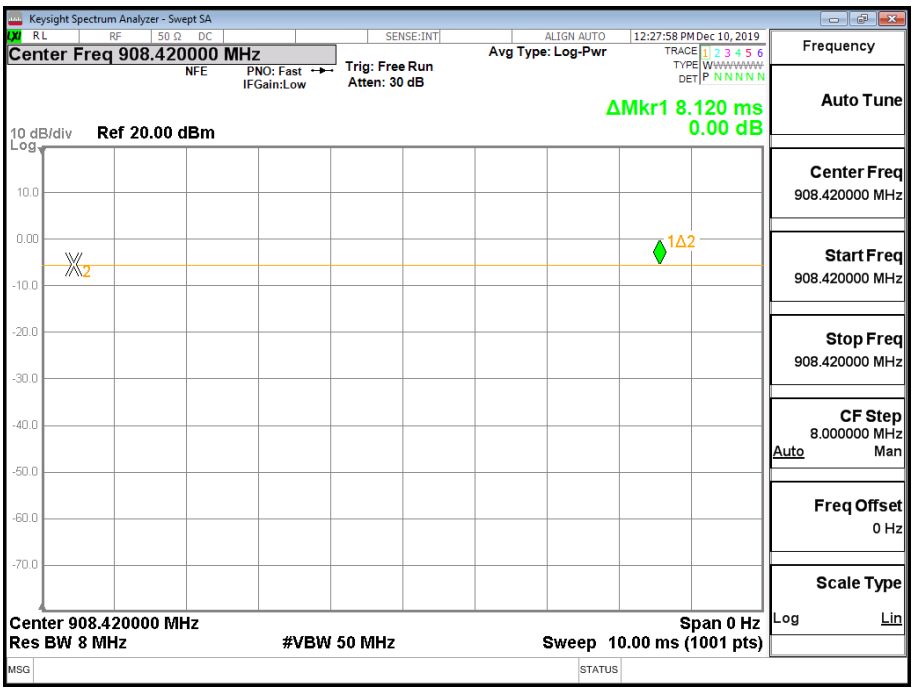



**RESULTS**

| 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 15.215(c) | 20dB Bandwidth | for reporting purposes only | 902-928 MHz |
| RSS-Gen Clause 6.7 | 99% Bandwidth | N/A | 902-928MHz |

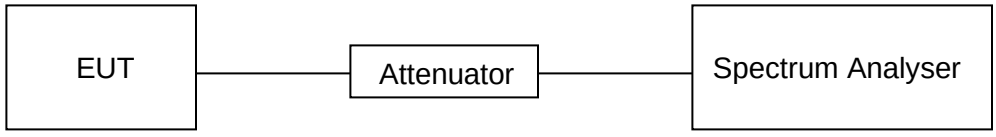
**TEST PROCEDURE**

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 | ≥ 3×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.

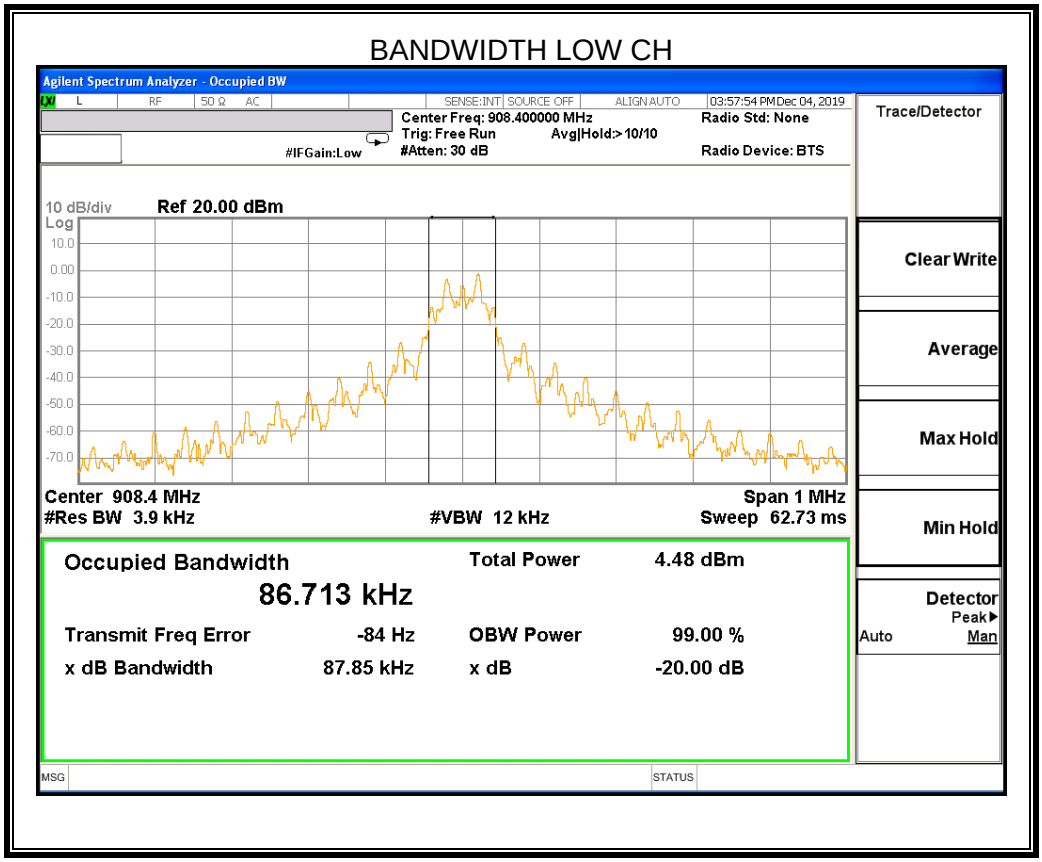
**TEST SETUP**



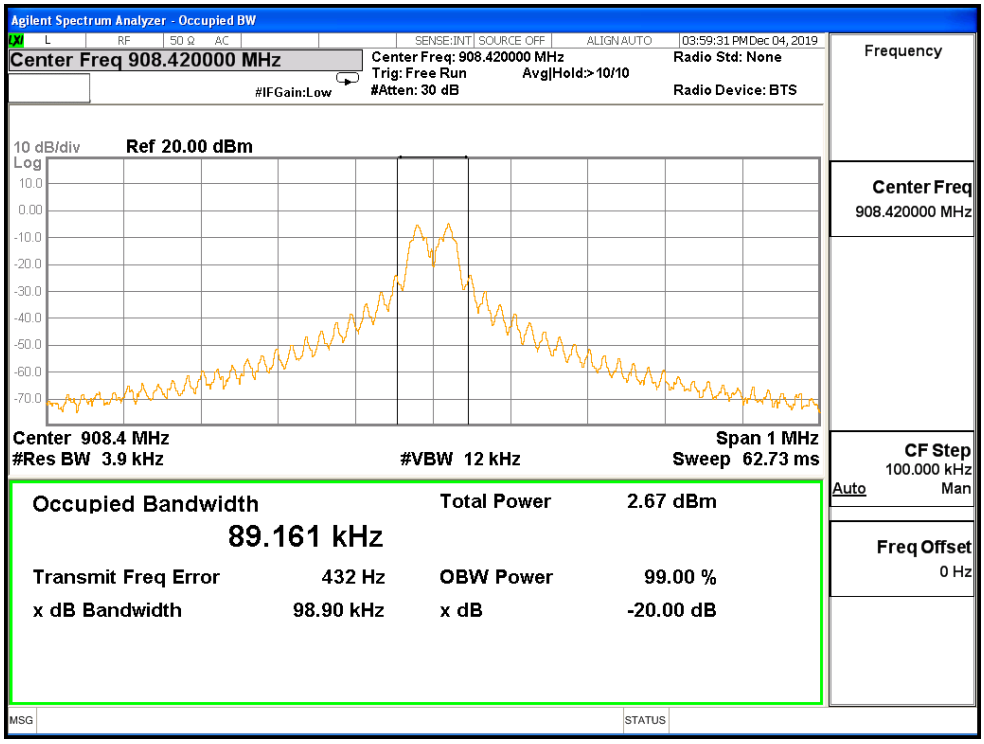
**RESULTS**

| Channel | 20dB bandwidth (KHz) | 99% bandwidth (KHz) | Result |
|---|---|---|---|
| Low | 87.85 | 86.713 | Pass |
| Middle | 98.90 | 89.161 | Pass |
| High | 120.7 | 113.08 | Pass |

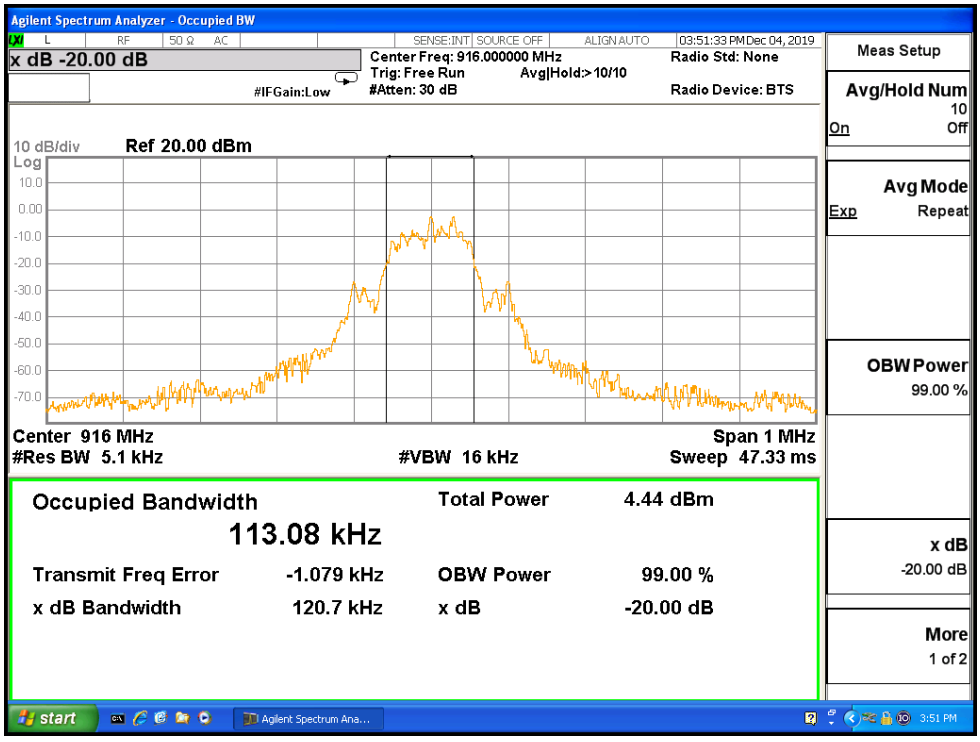
BANDWIDTH LOW CH



BANDWIDTH MID CH




BANDWIDTH HIGH CH



# 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
Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10

| 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 |

Radiation Disturbance Test Limit for FCC (Class B)(9kHz-1GHz)

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(kHz) | 300 |
| 0.490~1.705 | 24000/F(kHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| 960~1000 | 500 | 3 |

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation

factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

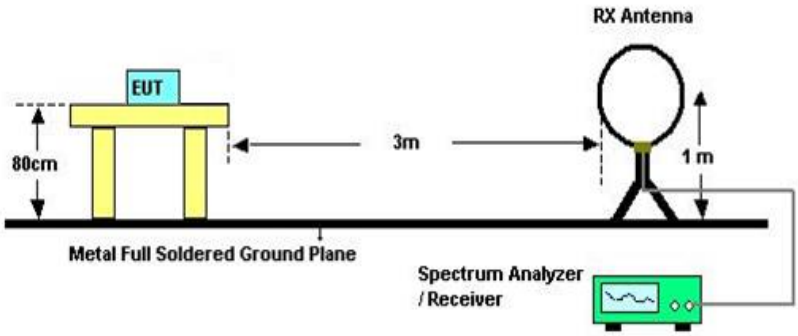
Radiation Disturbance Test Limit for FCC (Above 1GHz)

| Frequency (MHz) | dB(uV/m) (at 3 meters) | |
|---|---|---|
| | Peak | Average |
| Above 1000 | 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. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80cm 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.

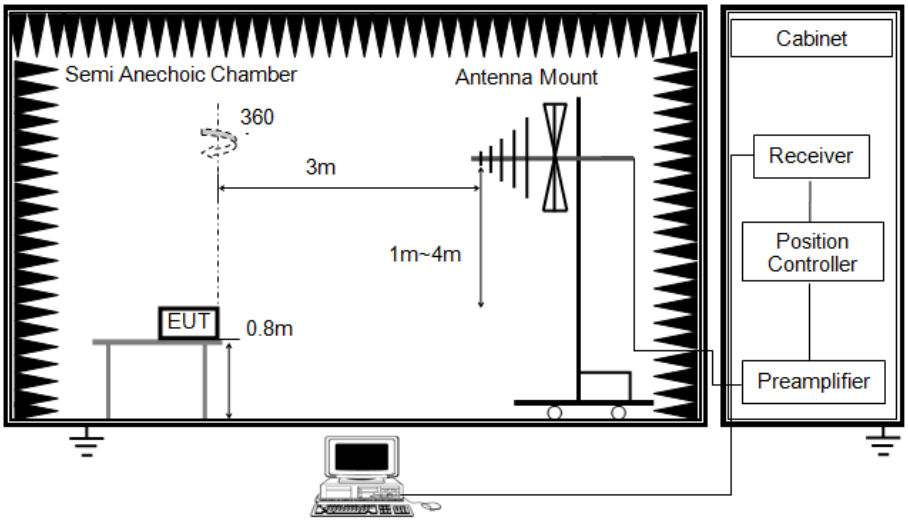
5. Measurement = Reading Level + Correct Factor

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.

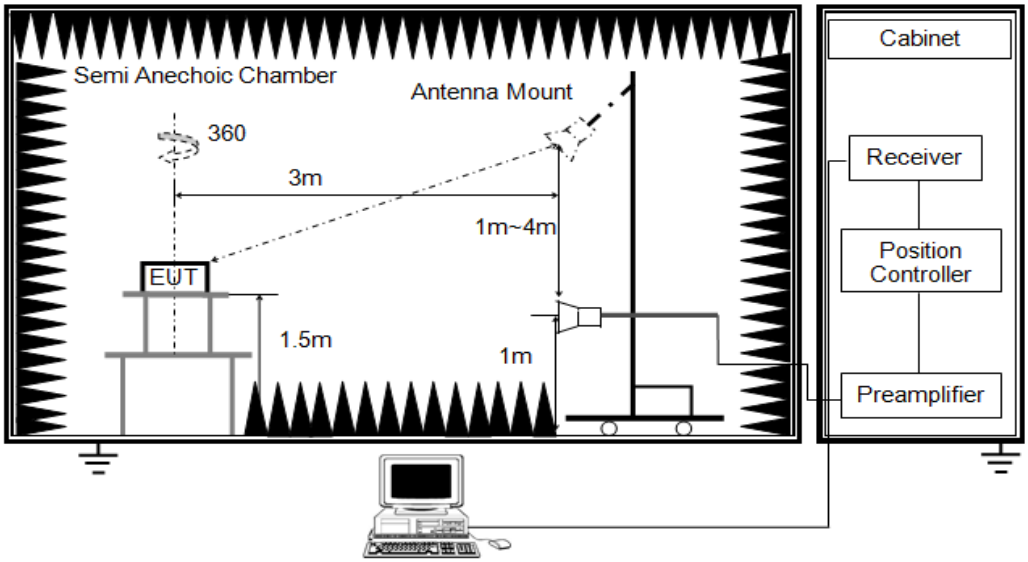
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

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<br>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.

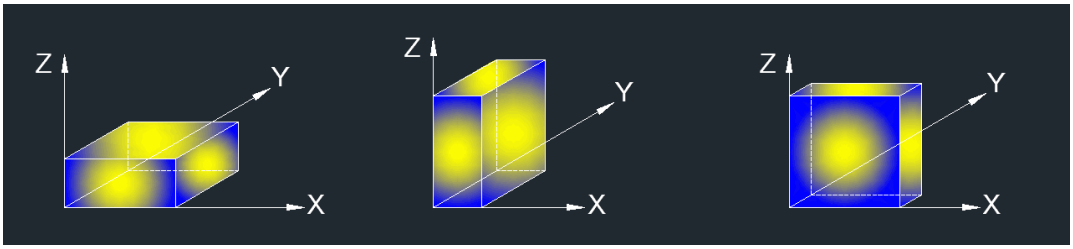
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

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)

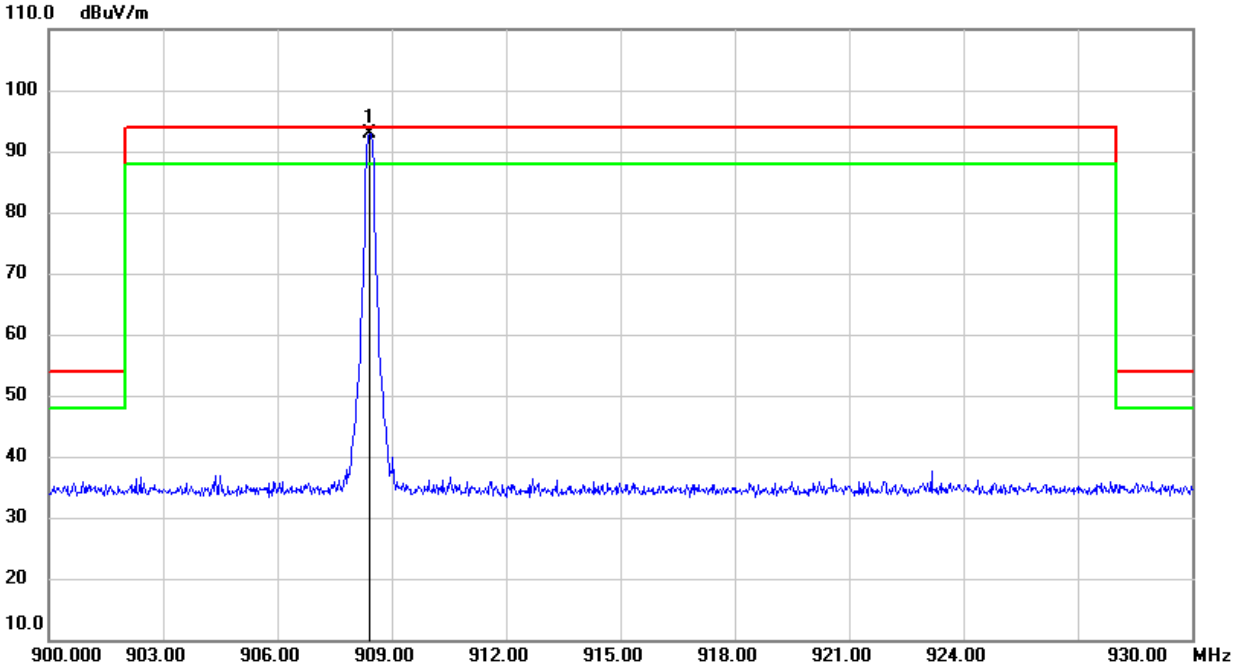
X axis, Y axis, Z axis positions:




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.

## 8.2. FIELD STRENGTH OF INTENTIONAL EMISSIONS

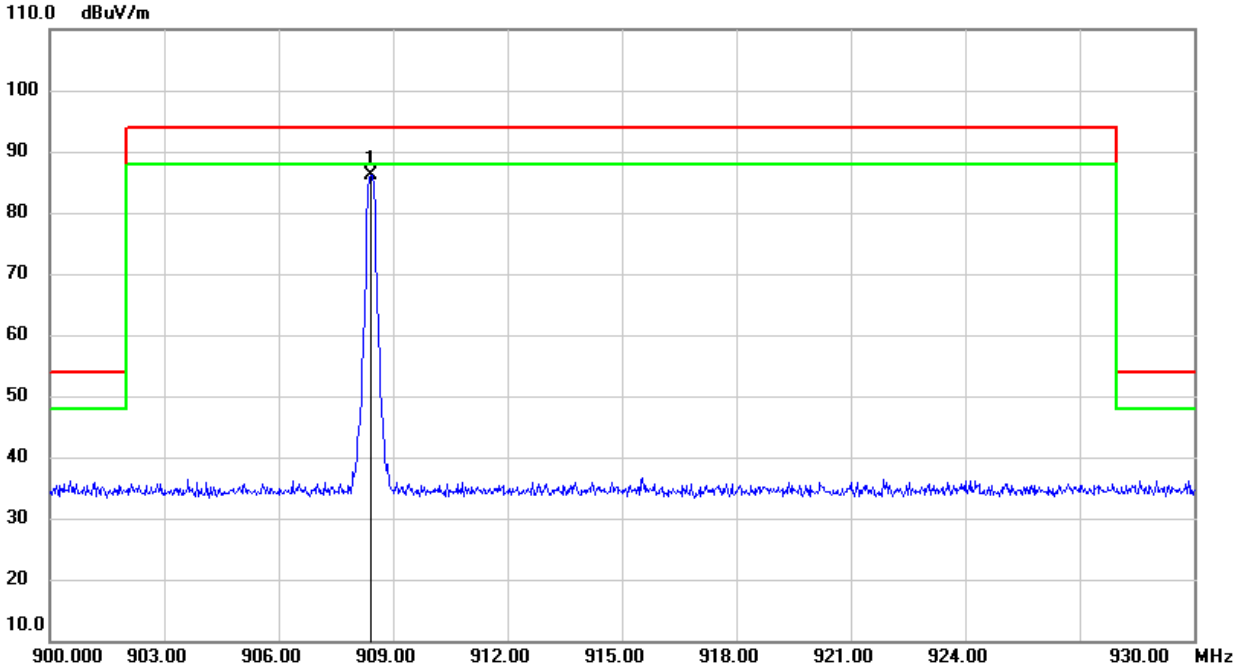
**FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, HORIZONTAL)**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 908.4000 | 96.85 | -3.99 | 92.86 | 94.00 | -1.14 | QP |

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

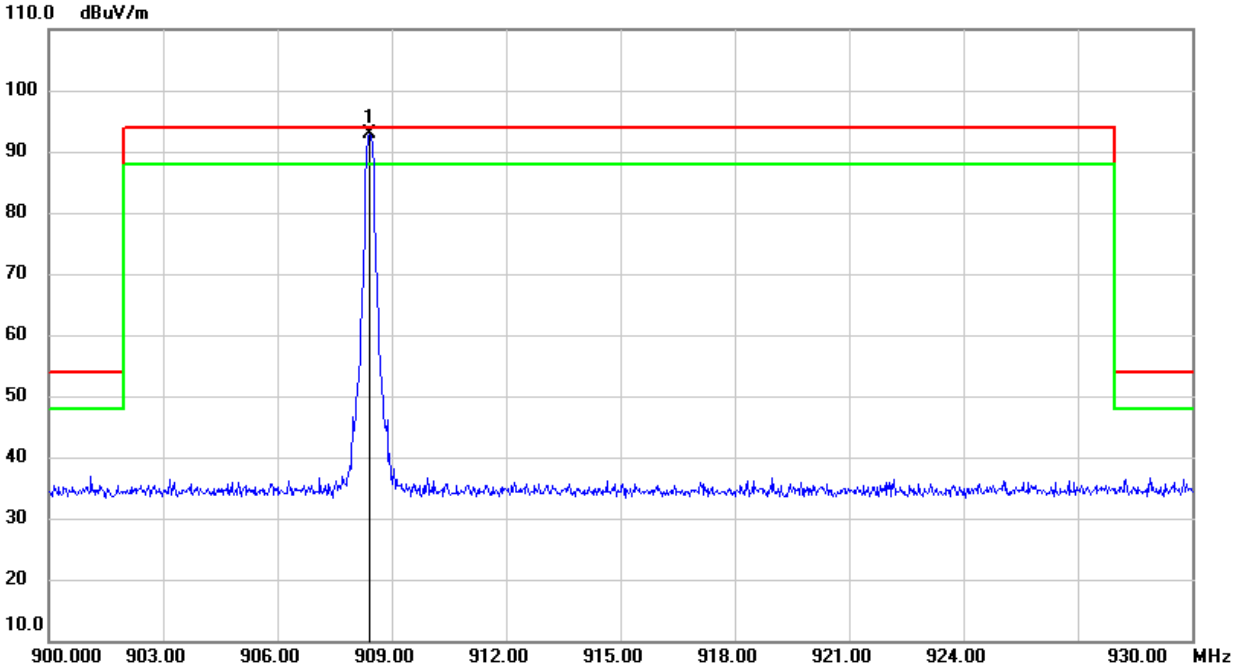
**FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, VERTICAL)**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 908.4000 | 90.21 | -4.00 | 86.21 | 94.00 | -7.79 | QP |

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

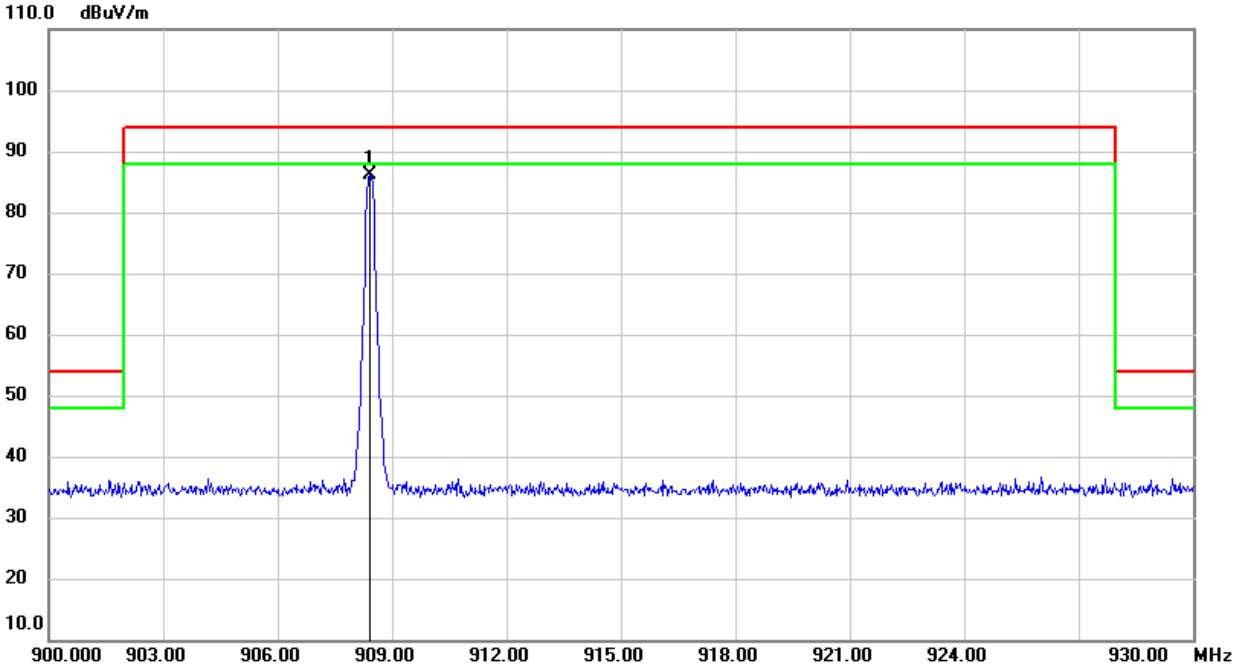
**FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)**




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 908.4200 | 96.77 | -3.99 | 92.78 | 94.00 | -1.22 | QP |

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

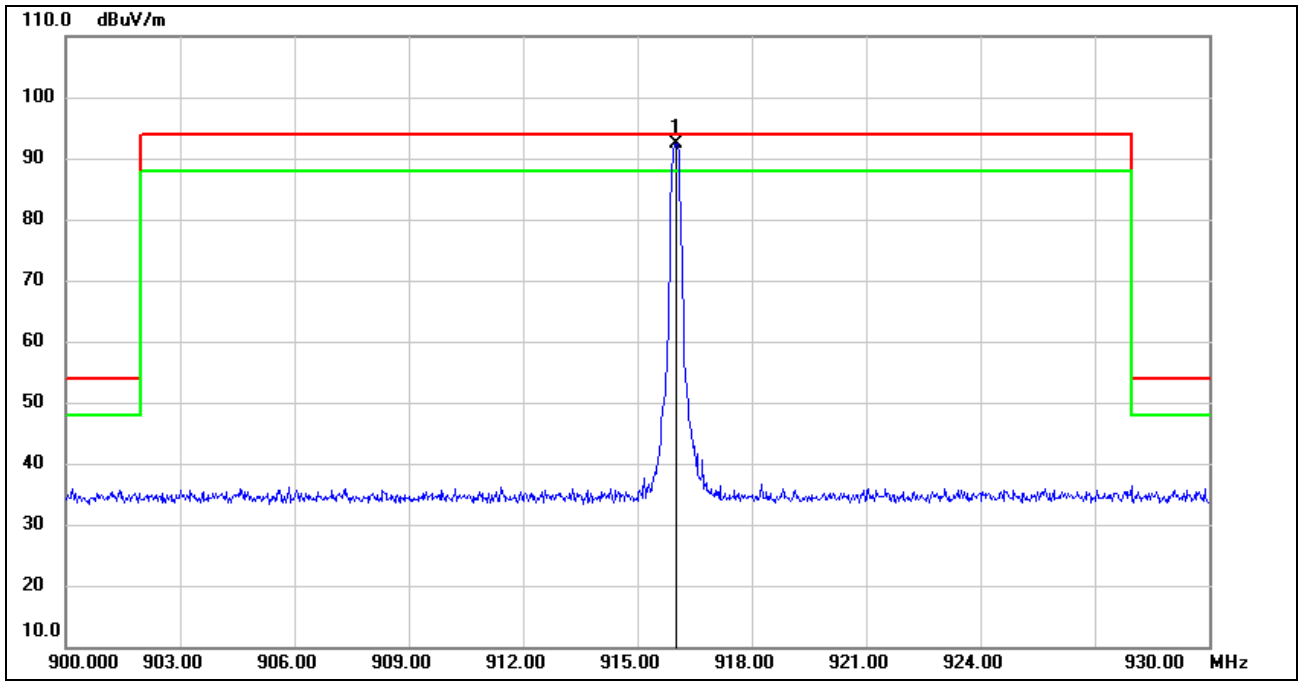
## FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, VERTICAL)




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 908.4200 | 90.07 | -3.99 | 86.08 | 94.00 | -7.92 | QP |

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

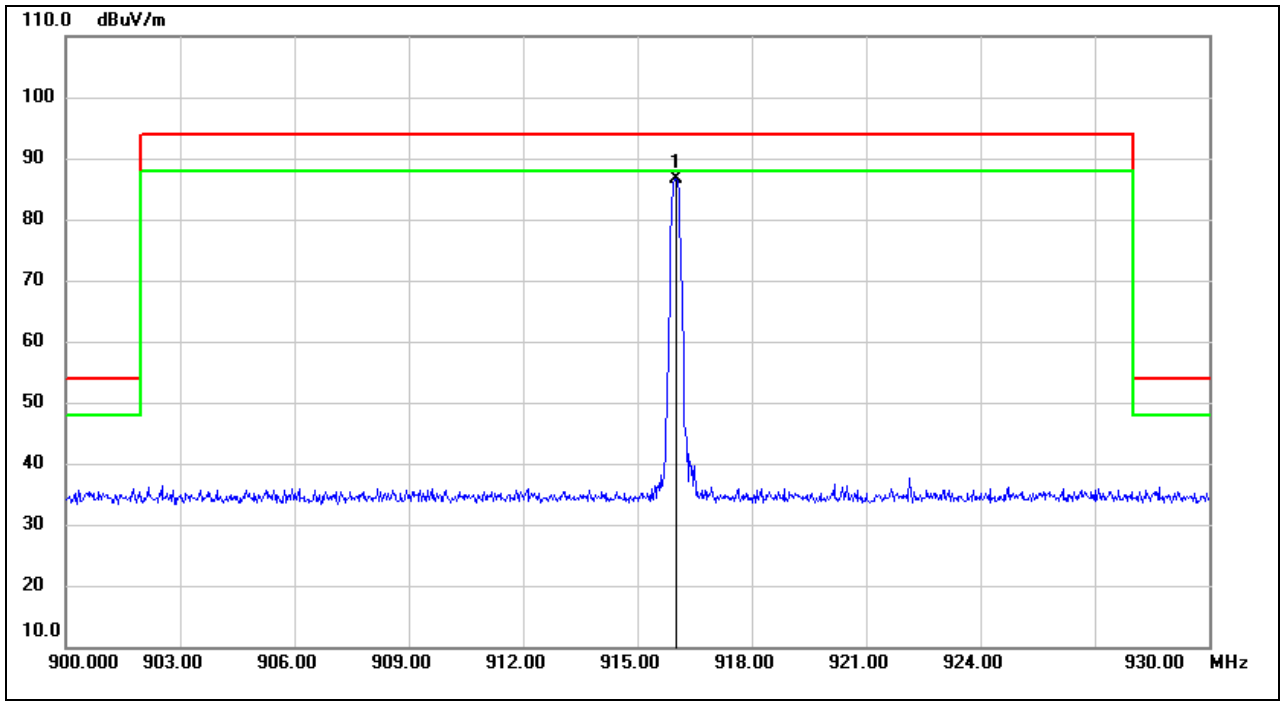
**FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, HORIZONTAL)**




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 916.0200 | 96.33 | -3.89 | 92.44 | 94.00 | -1.56 | 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 | 916.0200 | 90.51 | -3.89 | 86.62 | 94.00 | -7.38 | QP |

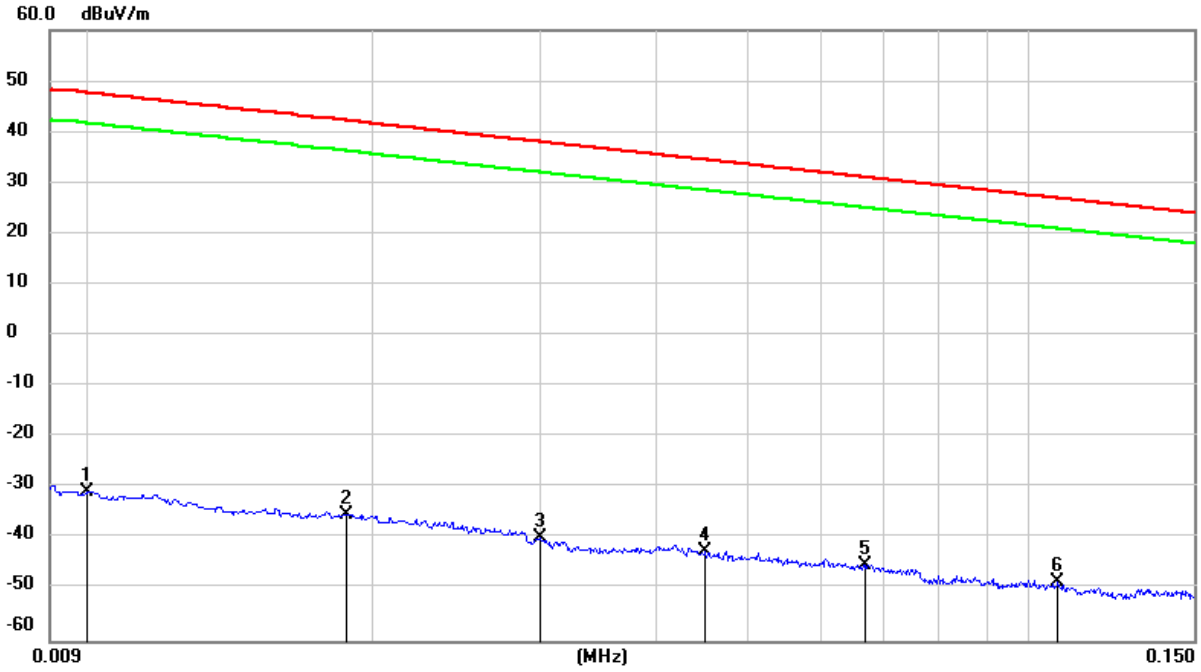
Note: 1. Measurement = Reading Level + Correct Factor.
2. QP detector.

## 8.3. SPURIOUS EMISSIONS BELOW 30M

**SPURIOUS EMISSIONS**

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

**9kHz~ 150kHz**




| No. | Frequency | Reading | Correct | FCC Result | FCC Limit | ISED Result | ISED Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dBuA/m) | (dBuA/m) | (dB) | |
| 1 | 0.0100 | 70.72 | -101.40 | -30.68 | 47.60 | -82.18 | -3.9 | -78.28 | peak |
| 2 | 0.0187 | 66.20 | -101.35 | -35.15 | 42.16 | -86.65 | -9.34 | -77.31 | peak |
| 3 | 0.0300 | 61.68 | -101.39 | -39.71 | 38.06 | -91.21 | -13.44 | -77.77 | peak |
| 4 | 0.0451 | 59.09 | -101.46 | -42.37 | 34.52 | -93.87 | -16.98 | -76.89 | peak |
| 5 | 0.0666 | 56.43 | -101.55 | -45.12 | 31.13 | -96.62 | -20.37 | -76.25 | peak |
| 6 | 0.1073 | 53.30 | -101.77 | -48.47 | 26.99 | -99.97 | -24.51 | -75.46 | peak |

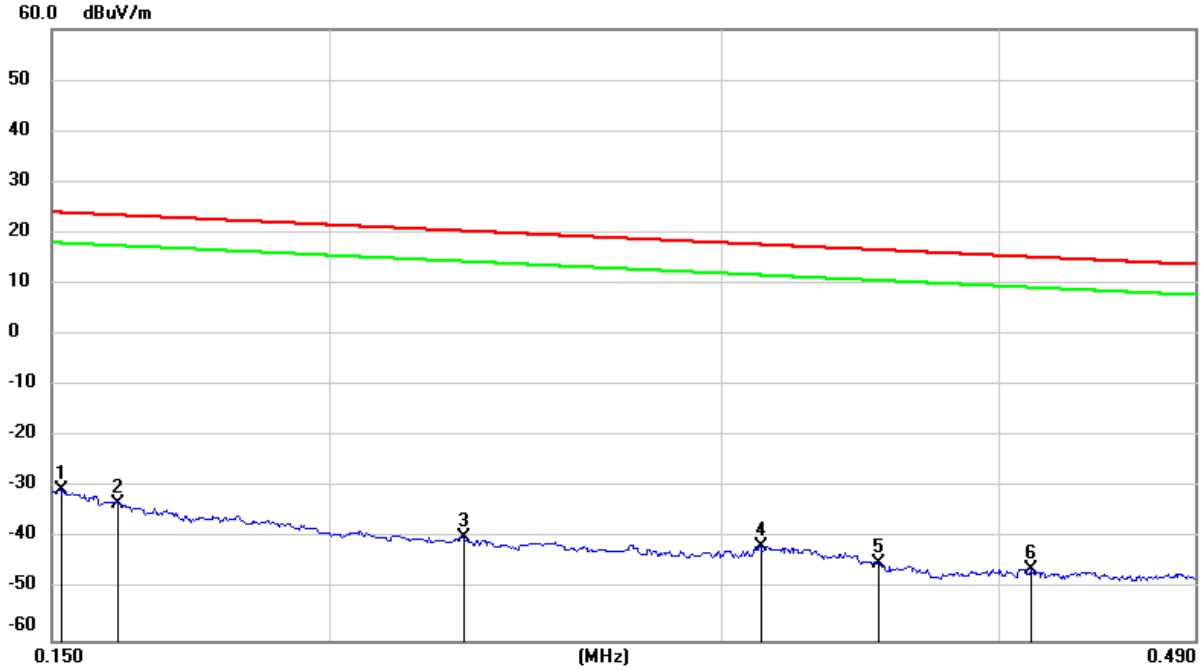
Note: 1. Measurement = Reading Level + Correct Factor.

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.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

**150kHz ~ 490kHz**




| No. | Frequency | Reading | Correct | FCC Result | FCC Limit | ISED Result | ISED Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dBuA/m) | (dBuA/m) | (dB) | |
| 1 | 0.1514 | 71.18 | -101.63 | -30.45 | 24.00 | -81.95 | -27.50 | -54.45 | peak |
| 2 | 0.1607 | 68.61 | -101.65 | -33.04 | 23.48 | -84.54 | -28.02 | -56.52 | peak |
| 3 | 0.2298 | 62.05 | -101.77 | -39.72 | 20.37 | -91.22 | -31.13 | -60.09 | peak |
| 4 | 0.3125 | 60.33 | -101.87 | -41.54 | 17.70 | -93.04 | -33.8 | -59.24 | peak |
| 5 | 0.3528 | 57.00 | -101.91 | -44.91 | 16.65 | -96.41 | -34.85 | -61.56 | peak |
| 6 | 0.4132 | 56.05 | -101.98 | -45.93 | 15.28 | -97.43 | -36.22 | -61.21 | peak |

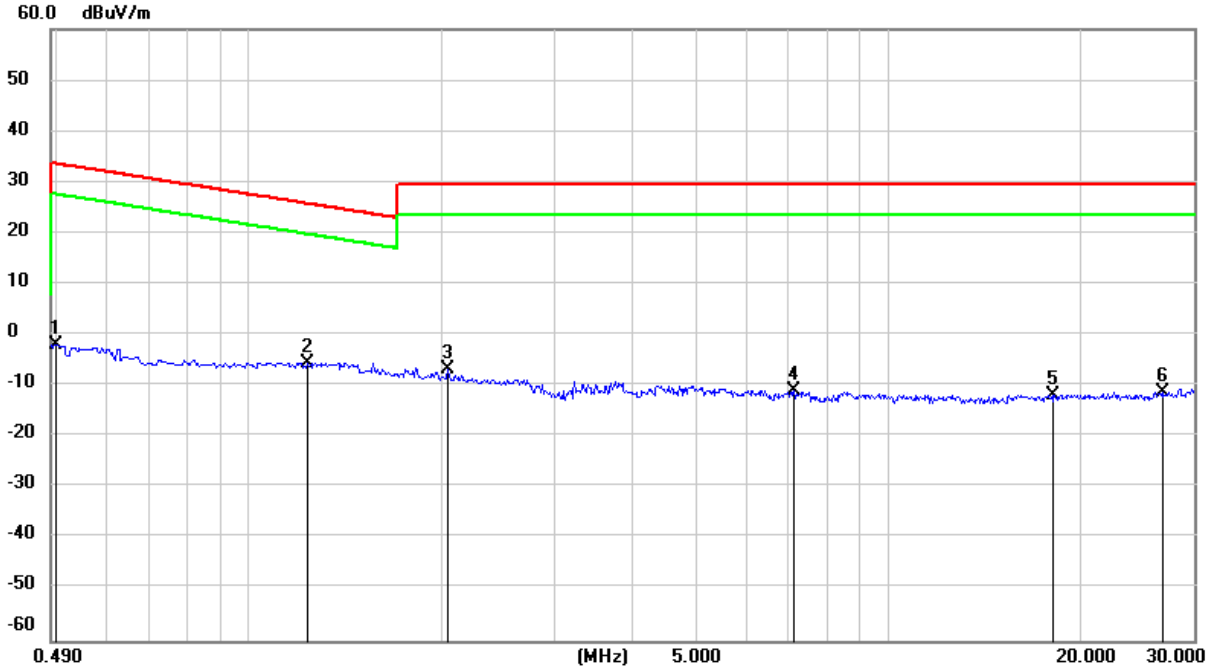
Note: 1. Measurement = Reading Level + Correct Factor.

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.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

**490kHz ~ 30MHz**




| No. | Frequency | Reading | Correct | FCC Result | FCC Limit | ISED Result | ISED Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dBuA/m) | (dBuA/m) | (dB) | |
| 1 | 0.5000 | 60.02 | -62.07 | -2.05 | 33.62 | -53.55 | -17.88 | -35.67 | peak |
| 2 | 1.2361 | 56.76 | -62.16 | -5.40 | 25.76 | -56.9 | -25.74 | -31.16 | peak |
| 3 | 2.0430 | 54.95 | -61.82 | -6.87 | 29.54 | -58.37 | -21.96 | -36.41 | peak |
| 4 | 7.1298 | 50.17 | -61.19 | -11.02 | 29.54 | -62.52 | -21.96 | -40.56 | peak |
| 5 | 18.0181 | 49.19 | -60.91 | -11.72 | 29.54 | -63.22 | -21.96 | -41.26 | peak |
| 6 | 26.8719 | 49.04 | -60.27 | -11.23 | 29.54 | -62.73 | -21.96 | -40.77 | 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.

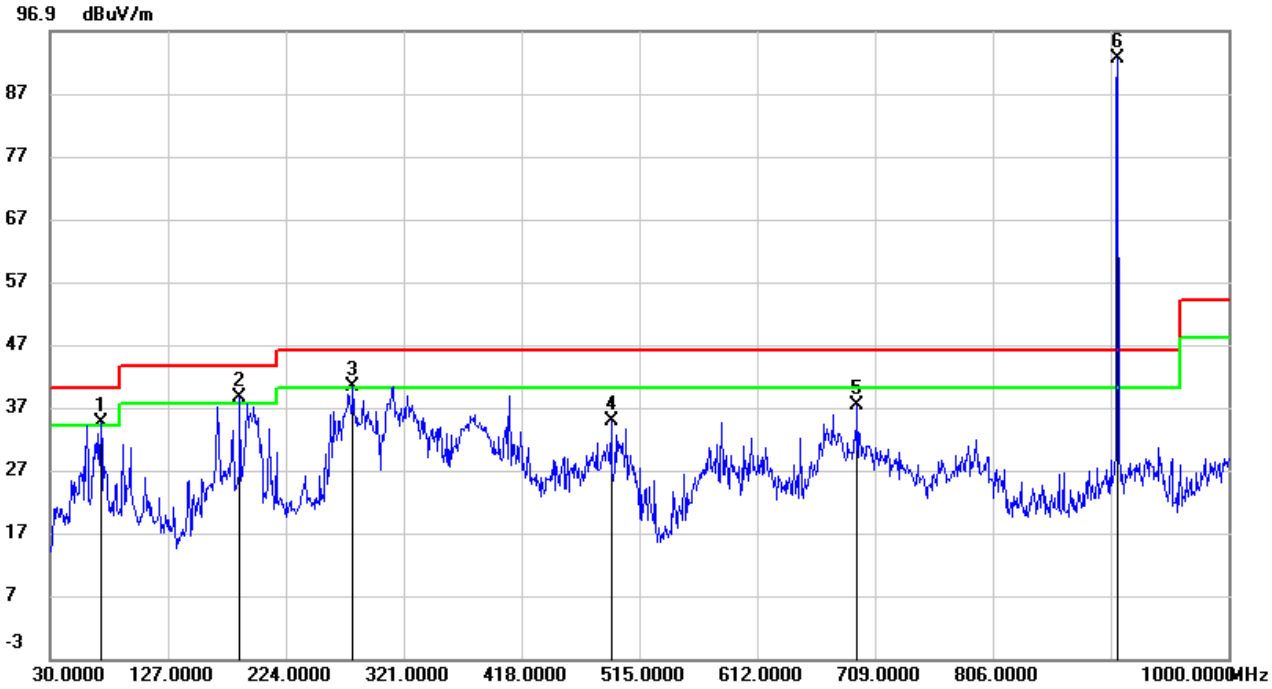
3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

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

## 8.4. SPURIOUS EMISSIONS BELOW 1 GHz

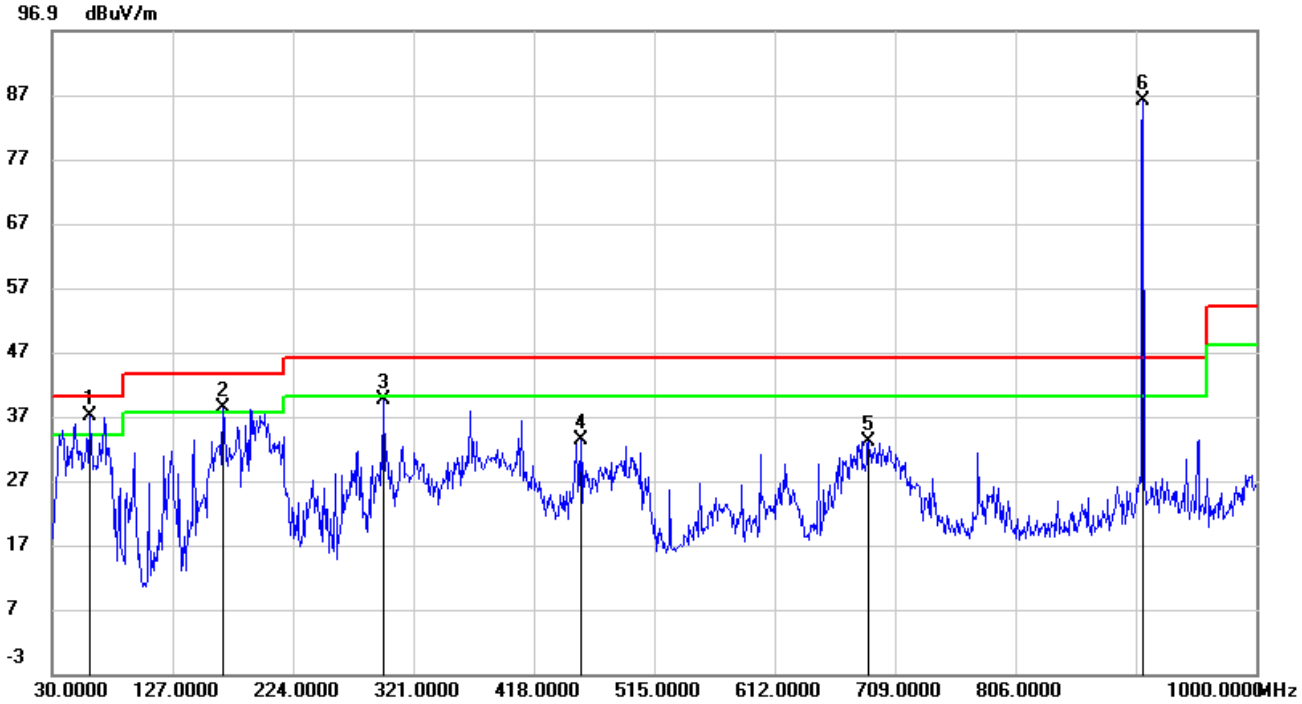
**SPURIOUS EMISSIONS BELOW 1GHZ (WORST-CASE LOW CHANNEL, HORIZONTAL)**




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 71.7100 | 54.68 | -20.27 | 34.41 | 40.00 | -5.59 | QP |
| 2 | 186.1700 | 55.27 | -16.62 | 38.65 | 43.50 | -4.85 | QP |
| 3 | 279.2900 | 55.29 | -14.90 | 40.39 | 46.00 | -5.61 | QP |
| 4 | 491.7200 | 45.42 | -10.63 | 34.79 | 46.00 | -11.21 | QP |
| 5 | 694.4500 | 43.97 | -6.73 | 37.24 | 46.00 | -8.76 | QP |
| 6 | 908.4200 | 96.62 | -3.99 | 92.63 | / | / | Fundamental |

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.
4. About the Fundamental emission test result please refer to section 8.2.

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



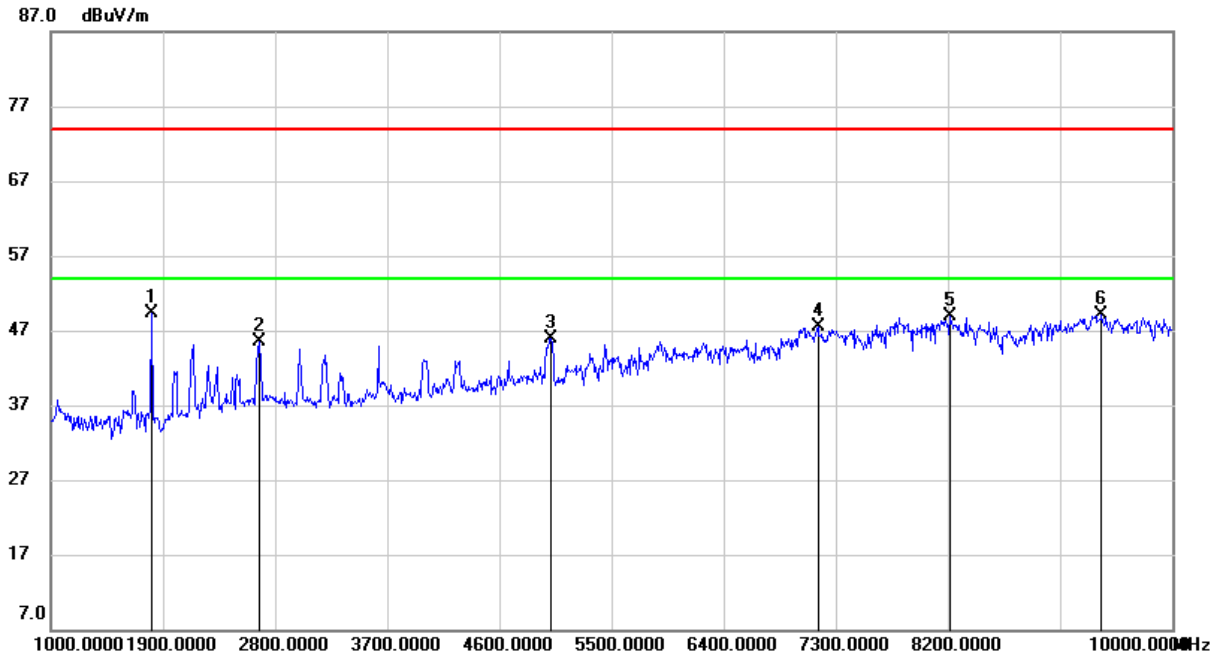

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 60.0700 | 56.43 | -19.46 | 36.97 | 40.00 | -3.03 | QP |
| 2 | 167.7400 | 55.34 | -17.14 | 38.20 | 43.50 | -5.30 | QP |
| 3 | 296.7500 | 53.58 | -14.04 | 39.54 | 46.00 | -6.46 | QP |
| 4 | 455.8300 | 44.73 | -11.42 | 33.31 | 46.00 | -12.69 | QP |
| 5 | 687.6599 | 40.04 | -6.90 | 33.14 | 46.00 | -12.86 | QP |
| 6 | 908.8200 | 89.91 | -3.98 | 85.93 | / | / | Fundamental |

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
4. About the Fundamental emission test result please refer to section 8.2.

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

## 8.5. SPURIOUS EMISSIONS 1 ~ 10GHz

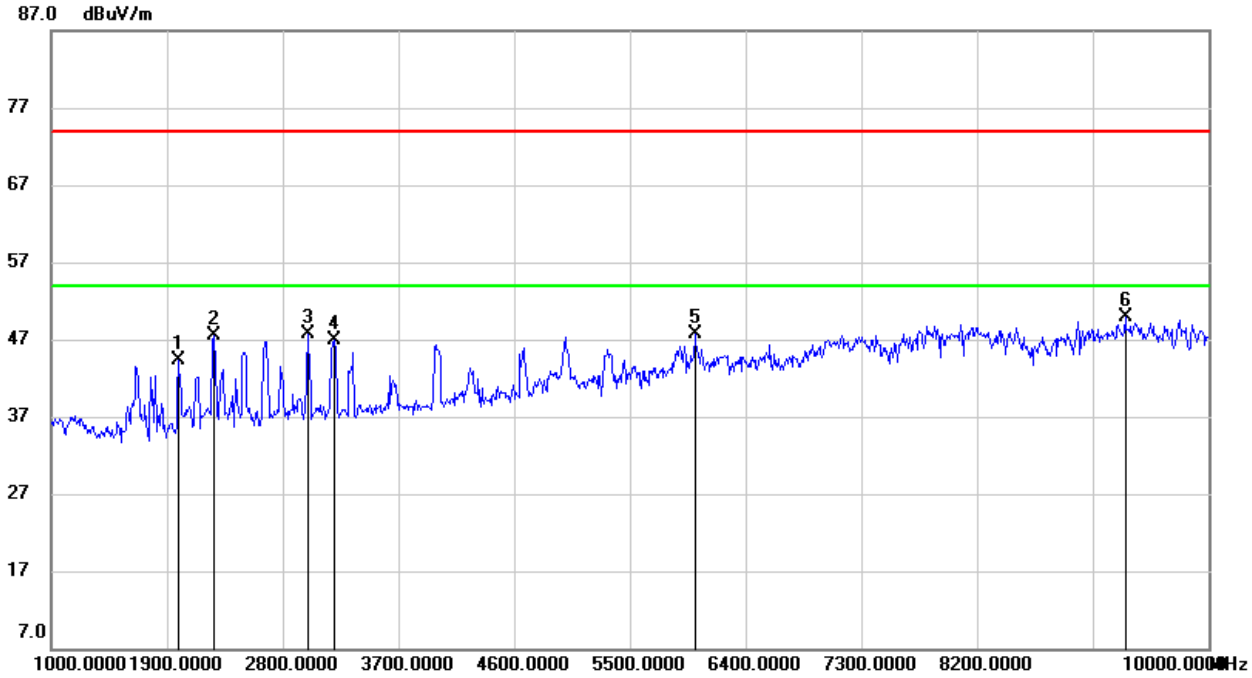
**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)**




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 1810.000 | 60.21 | -10.90 | 49.31 | 74.00 | -24.69 | peak |
| 2 | 2674.000 | 53.56 | -8.08 | 45.48 | 74.00 | -28.52 | peak |
| 3 | 5014.000 | 45.96 | -0.03 | 45.93 | 74.00 | -28.07 | peak |
| 4 | 7156.000 | 41.03 | 6.44 | 47.47 | 74.00 | -26.53 | peak |
| 5 | 8218.000 | 39.66 | 9.21 | 48.87 | 74.00 | -25.13 | peak |
| 6 | 9433.000 | 38.86 | 10.30 | 49.16 | 74.00 | -24.84 | 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.

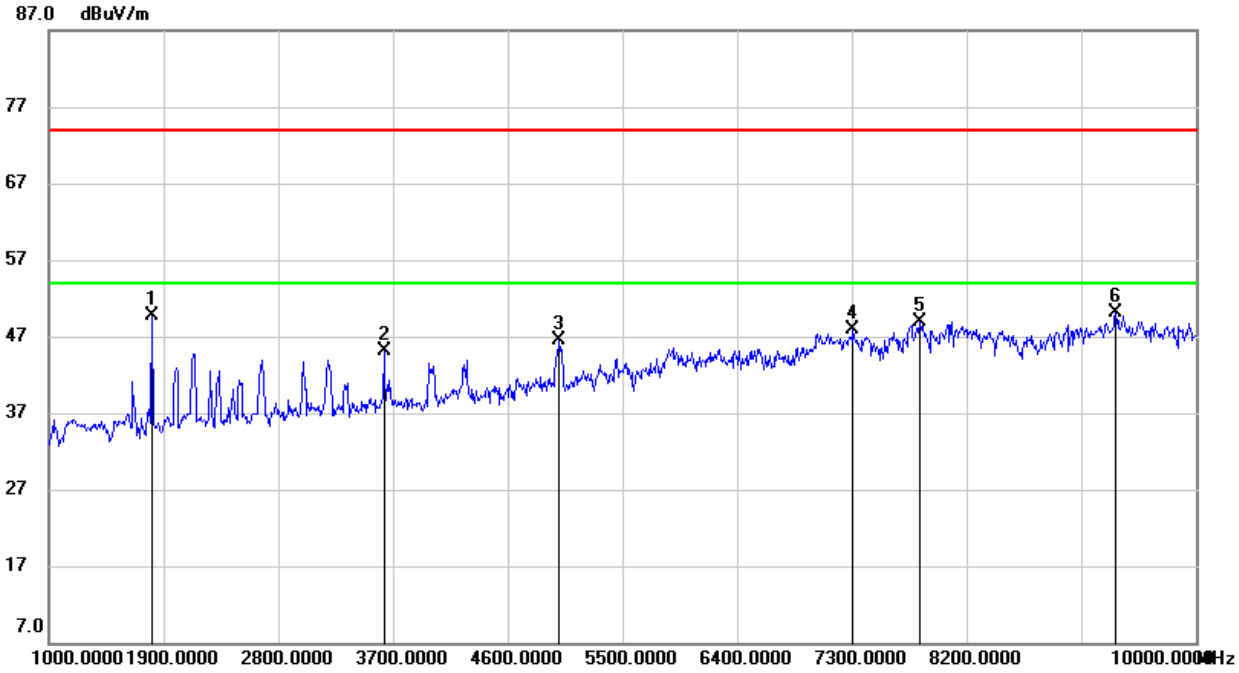
## HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 1990.000 | 55.10 | -10.86 | 44.24 | 74.00 | -29.76 | peak |
| 2 | 2260.000 | 57.06 | -9.63 | 47.43 | 74.00 | -26.57 | peak |
| 3 | 2998.000 | 53.97 | -6.27 | 47.70 | 74.00 | -26.30 | peak |
| 4 | 3196.000 | 52.81 | -5.96 | 46.85 | 74.00 | -27.15 | peak |
| 5 | 6004.000 | 44.43 | 3.30 | 47.73 | 74.00 | -26.27 | peak |
| 6 | 9352.000 | 39.88 | 10.00 | 49.88 | 74.00 | -24.12 | 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.

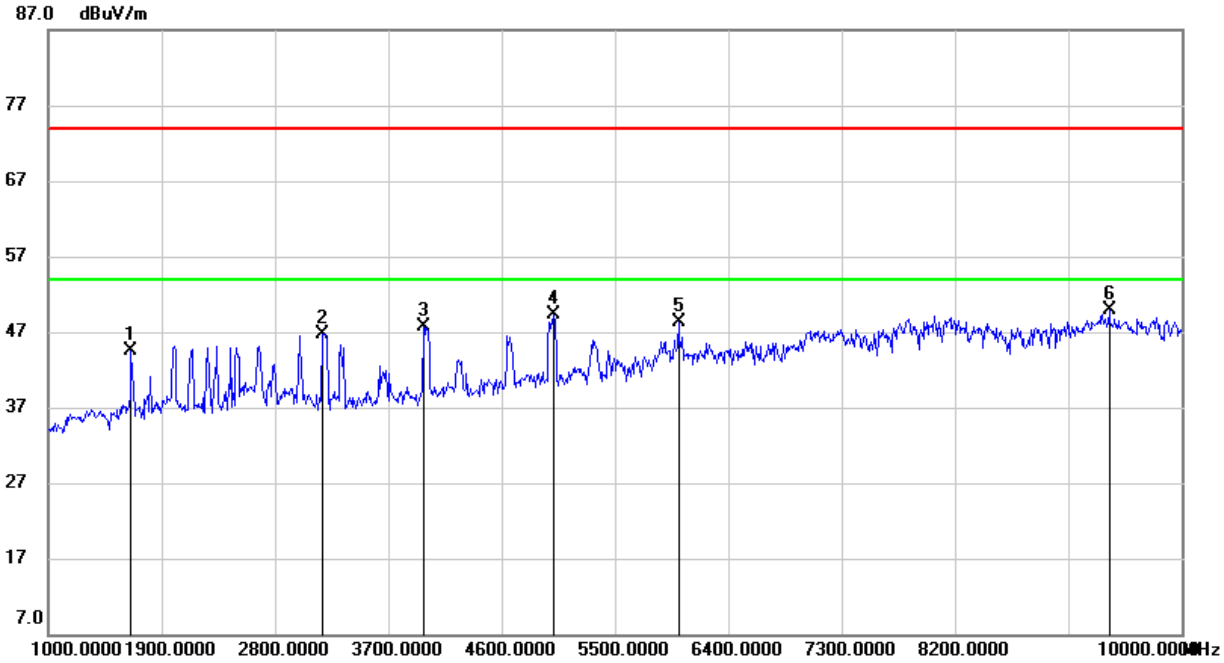
**HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)**




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 1810.000 | 60.51 | -10.90 | 49.61 | 74.00 | -24.39 | peak |
| 2 | 3628.000 | 49.66 | -4.63 | 45.03 | 74.00 | -28.97 | peak |
| 3 | 5005.000 | 46.61 | -0.04 | 46.57 | 74.00 | -27.43 | peak |
| 4 | 7309.000 | 40.96 | 6.91 | 47.87 | 74.00 | -26.13 | peak |
| 5 | 7831.000 | 40.58 | 8.39 | 48.97 | 74.00 | -25.03 | peak |
| 6 | 9370.000 | 40.06 | 10.10 | 50.16 | 74.00 | -23.84 | 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.

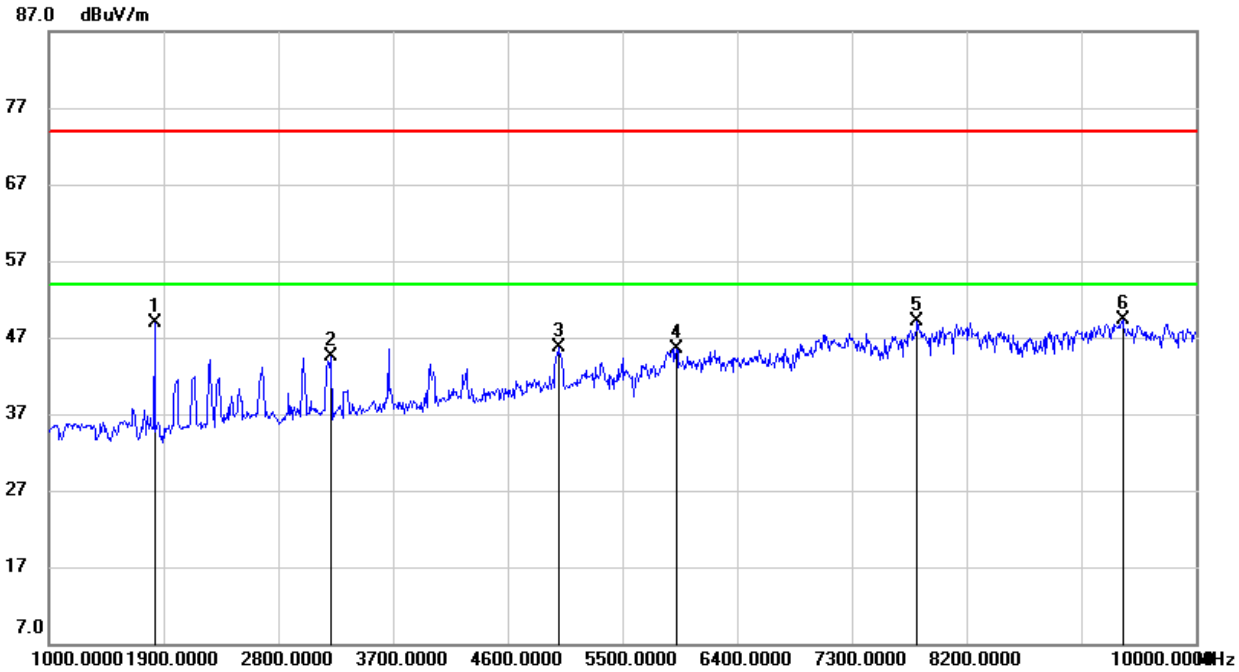
**HARMONICS AND SPURIOUS EMISSIONS (MIDDLE CHANNEL, VERTICAL)**




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 1657.000 | 56.59 | -12.10 | 44.49 | 74.00 | -29.51 | peak |
| 2 | 3178.000 | 52.64 | -5.91 | 46.73 | 74.00 | -27.27 | peak |
| 3 | 3979.000 | 51.80 | -4.10 | 47.70 | 74.00 | -26.30 | peak |
| 4 | 5014.000 | 49.43 | -0.03 | 49.40 | 74.00 | -24.60 | peak |
| 5 | 6004.000 | 45.10 | 3.30 | 48.40 | 74.00 | -25.60 | peak |
| 6 | 9424.000 | 39.61 | 10.28 | 49.89 | 74.00 | -24.11 | 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.

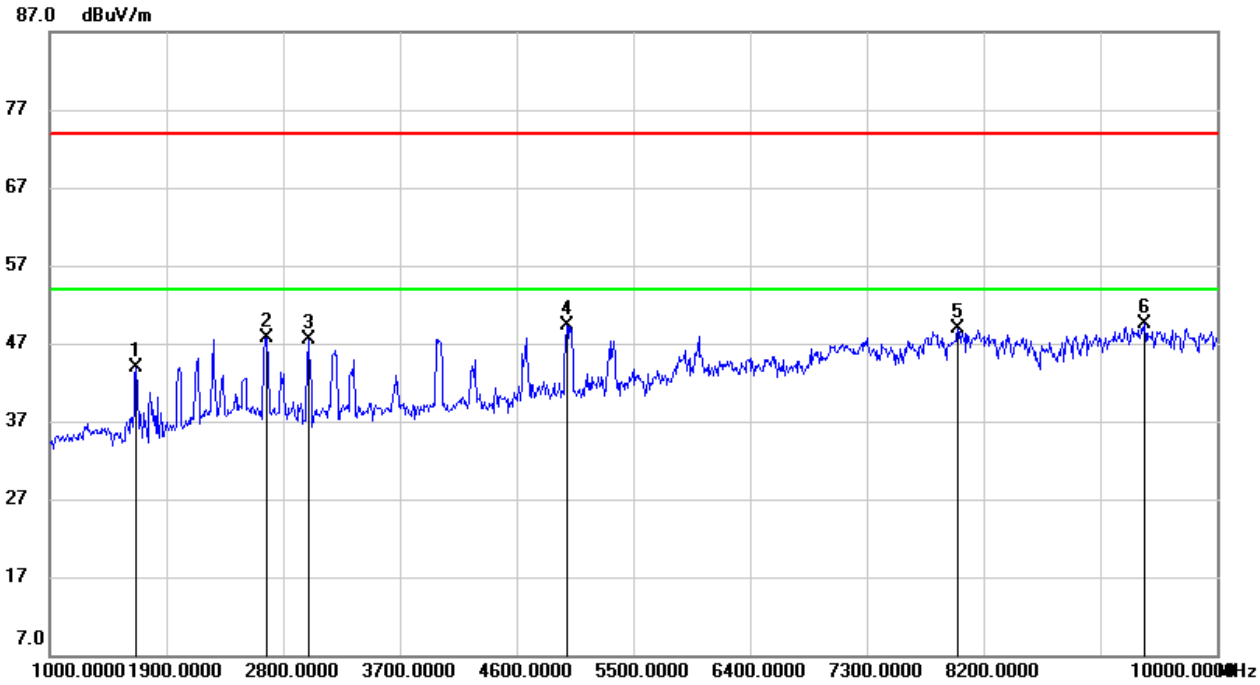
## HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)




| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 1828.000 | 59.71 | -10.88 | 48.83 | 74.00 | -25.17 | peak |
| 2 | 3214.000 | 50.44 | -5.93 | 44.51 | 74.00 | -29.49 | peak |
| 3 | 4996.000 | 45.77 | -0.09 | 45.68 | 74.00 | -28.32 | peak |
| 4 | 5923.000 | 41.10 | 4.50 | 45.60 | 74.00 | -28.40 | peak |
| 5 | 7813.000 | 40.61 | 8.49 | 49.10 | 74.00 | -24.90 | peak |
| 6 | 9424.000 | 39.02 | 10.28 | 49.30 | 74.00 | -24.70 | 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 | 1666.000 | 56.08 | -12.09 | 43.99 | 74.00 | -30.01 | peak |
| 2 | 2674.000 | 55.82 | -8.08 | 47.74 | 74.00 | -26.26 | peak |
| 3 | 2998.000 | 53.80 | -6.27 | 47.53 | 74.00 | -26.47 | peak |
| 4 | 4987.000 | 49.42 | -0.16 | 49.26 | 74.00 | -24.74 | peak |
| 5 | 8002.000 | 41.06 | 7.91 | 48.97 | 74.00 | -25.03 | peak |
| 6 | 9442.000 | 39.29 | 10.30 | 49.59 | 74.00 | -24.41 | 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. 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