



CFR 47 FCC PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

2 button remote controller, 3 button remote controller

MODEL NUMBER: C88-HM71, C88-HM55

FCC ID: 2A1LYC88HM55

REPORT NUMBER: 4788783181.1-4

ISSUE DATE: May 14, 2019

Prepared for

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Revision History

| Rev. | Issue Date | Revisions | Revised By |
|------|------------|---------------|------------|
| V0 | 05/14/2019 | Initial Issue | |



| Summary of Test Results | | | |
|-------------------------|---------------------|-----------------------------------------|--------------|
| Clause | Test Items | FCC Rules | Test Results |
| 1 | Transmitter Timeout | CFR 47 FCC 15.231 (a) (1) | PASS |
| 2 | 20dB Bandwidth | CFR 47 FCC 15.231 (c) | PASS |
| 3 | Radiated emission | CFR 47 FCC 15.231 (b)/ 15.205/15.209 | PASS |
| 4 | Antenna Requirement | FCC Part 15.203 | PASS |



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: JM Sunflower Ltd.

Address: 7/F Goldsland Building, 22-26 Minden Avenue, Tsim Sha Tsui, Kowloon, Hong Kong

Manufacturer Information

Company Name: JM Sunflower Ltd.

Address: 7/F Goldsland Building, 22-26 Minden Avenue, Tsim Sha Tsui, Kowloon, Hong Kong

EUT Description

EUT Name: 2 button remote controller, 3 button remote controller

Model: C88-HM71, C88-HM55

Brand Name: /

Sample Status: Normal

Sample ID: 1951742

Sample Received Date: March 18, 2019

Date of Tested: March 22, 2019 ~ May 14, 2019

| APPLICABLE STANDARDS | |
|------------------------------|--------------|
| STANDARD | TEST RESULTS |
| CFR 47 FCC PART 15 SUBPART C | PASS |

Tested By:

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Checked By:

Shawn Wen
Laboratory Leader



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, CFR 47 FCC Part 2, CFR 47 FCC Part 15 and KDB414788 D01 Radiated Test Site v01r01.

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>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 Delcaration 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.</p> <p>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
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.
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 recognize 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 |
|---------------------------------------------------------------------------|-------------------------------------------|
| Conduction emission | 3.62dB |
| Radiation Emission test(include Fundamental emission) (9kHz-30MHz) | 2.2dB |
| Radiation Emission test(include Fundamental emission) (30MHz-1GHz) | 4.00dB |
| Radiation Emission test (1GHz to 26GHz)(include Fundamental emission) | 5.78dB (1GHz-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

| | |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Name | 2 button remote controller, 3 button remote controller |
| EUT Description | The EUT is controller. |
| Model | C88-HM71, C88-HM55 |
| Model Difference | C88-HM71 is a 2 button remote controller, C88-HM55 is a 3 button remote controller, C88-HM71 and C88-HM55 are the same except for the button quantity, pre-test had been done for both C88-HM71 and C88-HM55, only the worst data(C88-HM55's data) recorded in the report. |
| Operation Frequency | 433.92MHz |
| Modulation Type | ASK |
| Battery | DC 3.0V |

5.2. TEST CHANNEL CONFIGURATION

| Test Mode | Frequency |
|-----------|-----------|
| ASK | 433.92MHz |

5.3. TEST ENVIRONMENT

| Environment Parameter | Selected Values During Tests | |
|-----------------------|------------------------------|-----------|
| Relative Humidity | 55 ~ 65% | |
| Atmospheric Pressure: | 1025Pa | |
| Temperature | TN | 23 ~ 28°C |
| Voltage : | VL | / |
| | VN | DC 3.0V |
| | VH | / |

Note: VL= Lower Extreme Test Voltage

VN= Nominal Voltage, DC 3V via Battery

VH= Upper Extreme Test Voltage

TN= Normal Temperature



5.4. DESCRIPTION OF AVAILABLE ANTENNAS

| Frequency (MHz) | Antenna Type | Antenna Gain (dBi) |
|-----------------|--------------|--------------------|
| 433.92 | PCB antenna | 0 |

5.5. WORST-CASE CONFIGURATIONS

| Mode |
|------|
| ASK |



5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| Item | Equipment | Brand Name | Model Name | P/N |
|------|-----------|------------|------------|-----|
| 1 | / | / | / | / |

I/O CABLES

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

ACCESSORY

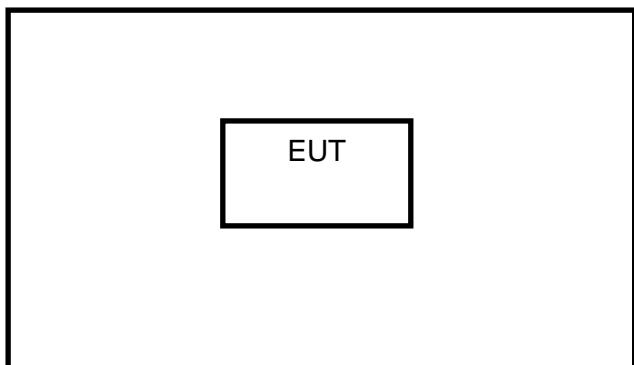
| Item | Accessory | Brand Name | Model Name | Description |
|------|-----------|------------|------------|-------------|
| 1 | / | / | / | / |

TEST SETUP

A fully charged battery was used for all tests.

The test sample can be into a transmission mode through the power on.

SETUP DIAGRAM FOR TEST





5.7. MEASURING INSTRUMENT AND SOFTWARE USED

| 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.18,2018 | Aug.18,2021 |
| <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.17, 2019 | Jan.17,2022 |
| Software | | | | | | |
| Used | Description | | Manufacturer | Name | | Version |
| <input checked="" type="checkbox"/> | Test Software for Radiated disturbance | | Farad | EZ-EMC | | Ver. UL-3A1 |
| Other instruments | | | | | | |
| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
| <input checked="" type="checkbox"/> | Spectrum Analyzer | Keysight | N9020A | MY49100060 | Dec.10,2018 | Dec.10,2019 |

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

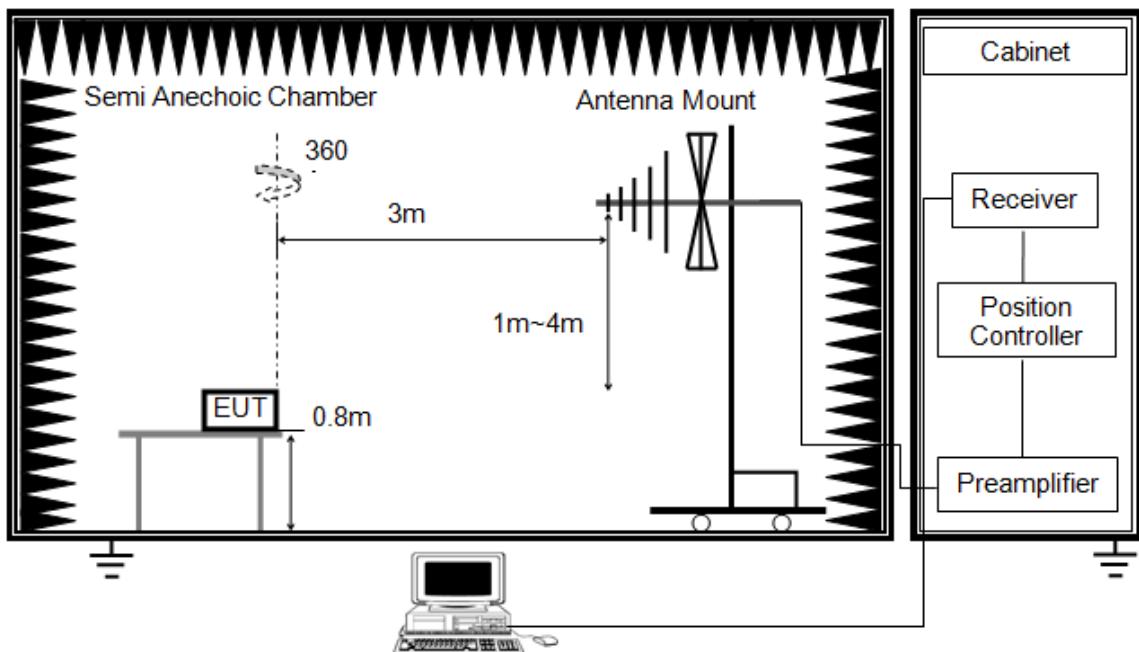
LIMITS

None; for reporting purposes only

PROCEDURE

| | |
|-------------------|-------------------------|
| FCC Reference: | CFR 47 Part 15.35(c) |
| Test Method Used: | ANSI C63.10 Section 7.5 |

TEST SETUP



- a. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
- b. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- c. Sweep Time is at least a 100 ms.
- d. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- e. Measure the maximum time duration of one single pulse.

**TEST ENVIRONMENT**

| | | | |
|---------------------|--------|-------------------|---------|
| Temperature | 23.4°C | Relative Humidity | 64% |
| Atmosphere Pressure | 101kPa | Test Voltage | DC 3.0V |

RESULTS

| | On Time (ms) | Times | Ton (ms) | Total Ton times (ms) |
|-------|-----------------|-------|-------------|-------------------------|
| Ton 1 | 0.50 | 13 | 6.50 | 22.10 |
| Ton 2 | 1.30 | 12 | 15.6 | |

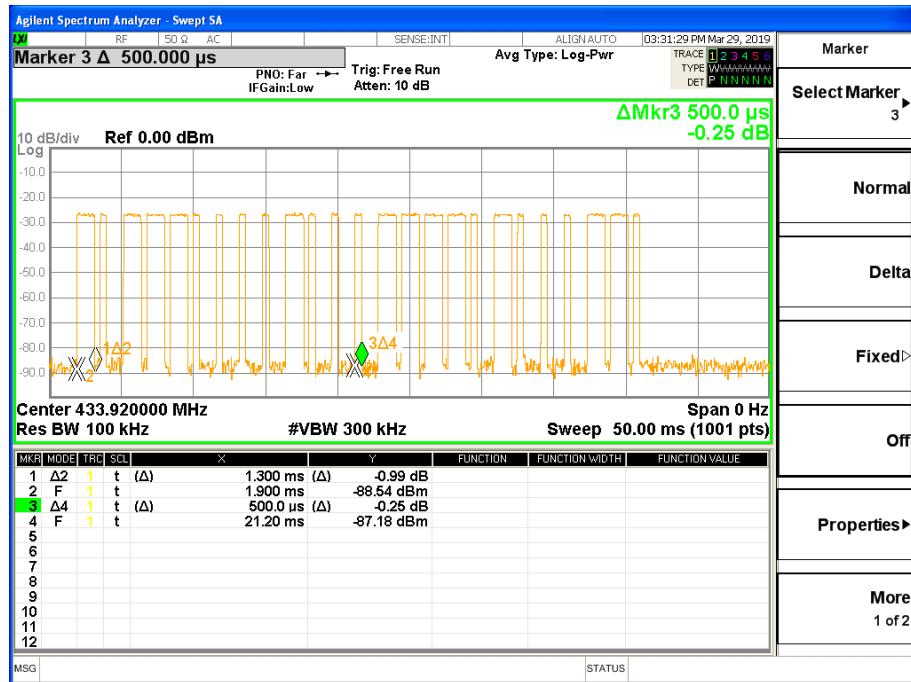
Note: Total Ton times= Ton1*15+Ton2*10

| Total Ton times (ms) | Period (ms) | Duty Cycle (Linear) | Duty Cycle Correction Factor |
|-------------------------|----------------|------------------------|---------------------------------|
| 22.10 | 50.20 | 0.44 | -7.13 |

Note: Duty Cycle Correction Factor=20log(x).

Where: x is Duty Cycle

Ton



Period



Note: All test mode has been tested, only the worst data record in the report.

6.2. TRANSMITTER TIMEOUT

LIMITS

CFR 47 Part 15.231(a):

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

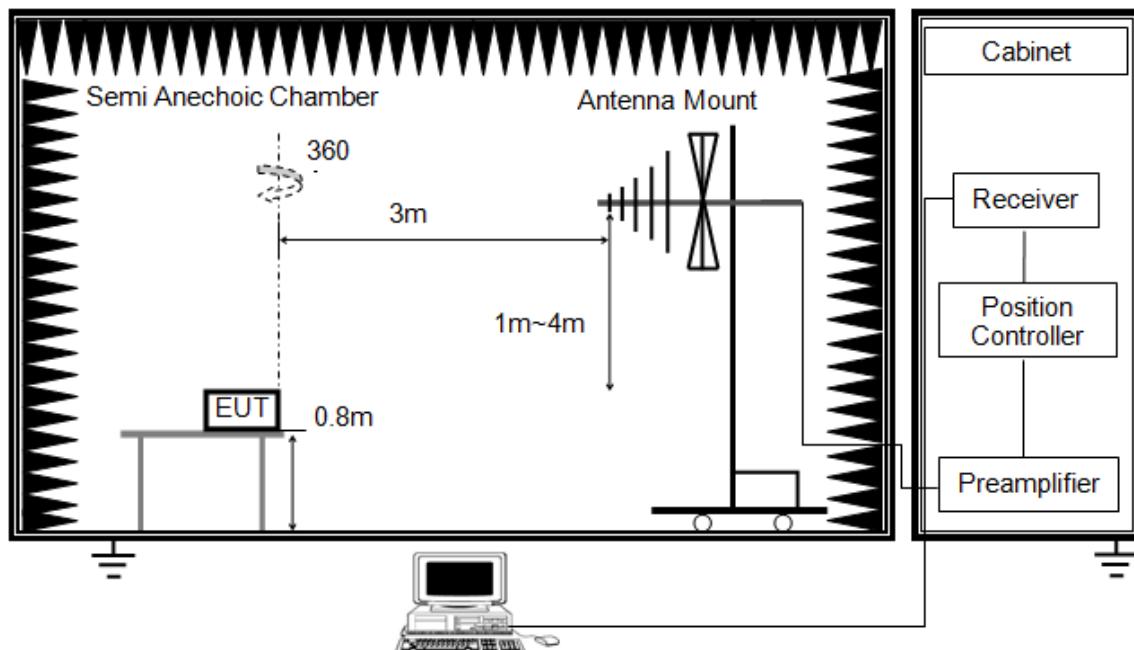
CFR 47 Part 15.231(e):

Devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

TEST PROCEDURE

| | |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC Reference: | CFR 47 Part 15.231(a) |
| Test Method Used: | The EUT transmitter was activated and monitored using a spectrum analyser for a period of 10 seconds. |
| FCC Reference: | CFR 47 FCC Part 15.231(e) |
| Test Method Used: | The duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds. |

TEST SETUP



For CFR 47 Part 15.231(a):

- a. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
- b. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- c. Set Sweep Time to 10 s.
- d. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- e. Measure the maximum time duration of one single pulse.

For CFR 47 Part 15.231(e):

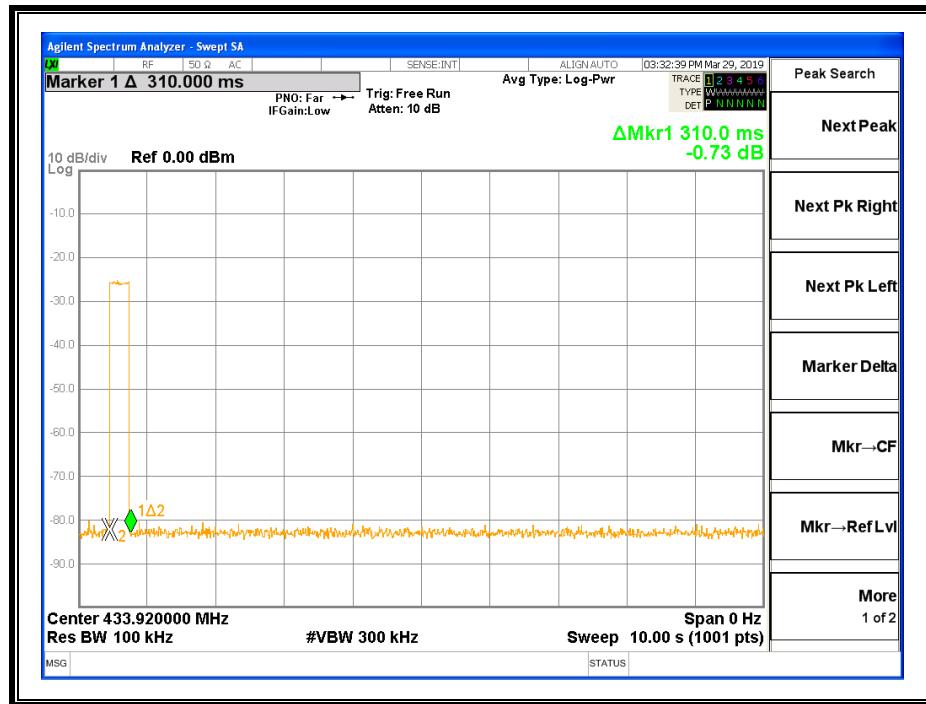
- a. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
- b. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- c. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- d. Measure the maximum time duration of one single pulse.

TEST ENVIRONMENT

| | | | |
|---------------------|--------|-------------------|---------|
| Temperature | 23.4°C | Relative Humidity | 64% |
| Atmosphere Pressure | 101kPa | Test Voltage | DC 3.0V |

RESULTS

| Manually transmitting mode | | | |
|--------------------------------|--------------------|---------------------|--------|
| Deactivation Time (seconds) | Limit (seconds) | Margin (seconds) | Result |
| 0.31 | 5.000 | 4.69 | PASS |



Note: All the modes has been tested, only the worst data record in the report.

6.3. 20dB BANDWIDTH

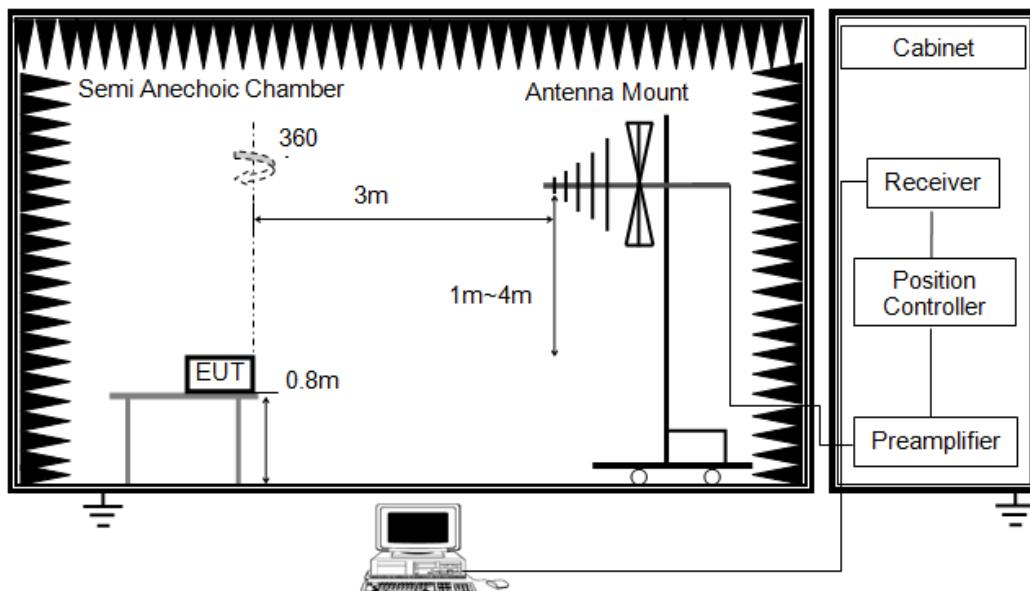
LIMITS

1. The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.
2. The limit has been calculated as: $0.0025 * 433.92 \text{ MHz} = 1.0848 \text{ MHz}$

TEST PROCEDURE

| | |
|-------------------|---------------------------|
| FCC Reference: | CFR 47 Part 15.231(c) |
| Test Method Used: | ANSI C63.10 Section 6.9.2 |

TEST SETUP



1. 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.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower
4. Set the spectrum analyzer in the following setting as:

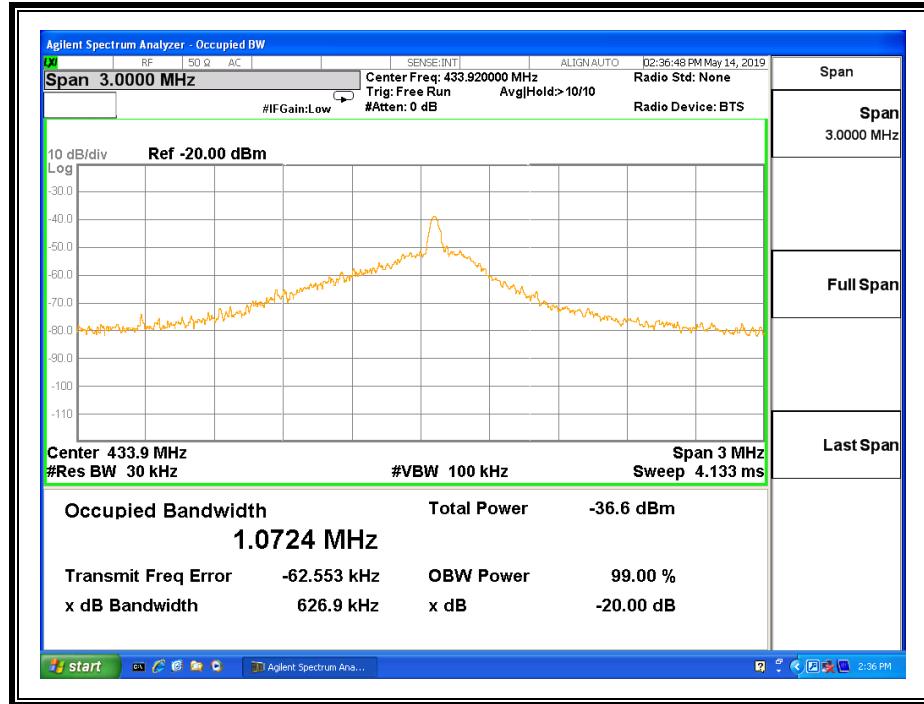
The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.

TEST ENVIRONMENT

| | | | |
|---------------------|--------|-------------------|---------|
| Temperature | 23.4°C | Relative Humidity | 64% |
| Atmosphere Pressure | 101kPa | Test Voltage | DC 3.0V |

RESULTS

| Transmitter 20 dB Bandwidth (MHz) | Limit (MHz) | Result |
|-----------------------------------|-------------|--------|
| 0.6269 | 1.0848 | Pass |



Note: All test mode has been tested, only the worst data record in the report.

6.4. RADIATED EMISSION

LIMITS

1. In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

| Fundamental frequency (MHz) | Field strength of fundamental (microvolts/meter) | Field strength of spurious emissions (microvolts/meter) |
|-----------------------------|--------------------------------------------------|---------------------------------------------------------|
| 40.66-40.70 | 2,250 | 225 |
| 70-130 | 1,250 | 125 |
| 130-174 | ¹ 1,250 to 3,750 | ¹ 125 to 375 |
| 174-260 | 3,750 | 375 |
| 260-470 | ¹ 3,750 to 12,500 | ¹ 375 to 1,250 |
| Above 470 | 12,500 | 1,250 |

Note:

1. To obtain the average limit at the test frequency the values given in the table of FCC part 15.231(b) have to be linear interpolated and then converted to dB μ V/m. The limit at 260 MHz is 3750 μ V/m and at 470 MHz it is 12500 μ V/m. Limit at 433.92 MHz is calculated as shown in ANSI C63.10 Section 7.6.2:

$$\text{Limit } [\mu\text{V/m}] = \text{Limlower} + \Delta F \left[(\text{Limupper} - \text{Limlower}) / (f_{\text{upper}} - f_{\text{lower}}) \right]$$

where $\Delta F = f_c - f_{\text{lower}} = 433.92 - 260 = 173.92$

$$\begin{aligned} \text{Limit} &= 3750 + 173.92 * [(12500 - 3750) / (470 - 260)] \\ &= 3750 + 173.92 * [8750 / 210] \\ &= 10996.7 \mu\text{V/m} \end{aligned}$$

$$\begin{aligned} \text{dB}\mu\text{V/m} &= 20 * \log (\mu\text{V/m}) \\ &= 20 * \log (10996.7) \end{aligned}$$

$$\text{Average Limit at } 433.92 \text{ MHz} = 80.8 \text{ dB}\mu\text{V/m}$$

2. If the average limit is specified for the EUT, the peak limit is 20 dB above the average limit as specified in FCC 15.35 (b)

2. Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| 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 |
| Above 960 | 500 | 3 |

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

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).

Note: (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.

Restricted bands of operation

| MHz | MHz | MHz | GHz |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| ¹ 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | (²) |
| 13.36-13.41 | | | |

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

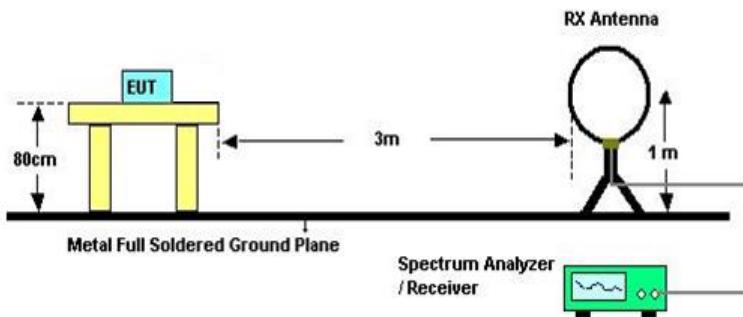
²Above 38.6c

TEST PROCEDURE

| | |
|-------------------|----------------------------------|
| FCC Reference: | CFR 47 Parts 15.231(b) / 15.209 |
| Test Method Used: | ANSI C63.10 Sections 6.3 and 6.5 |

TEST SETUP

Below 30MHz

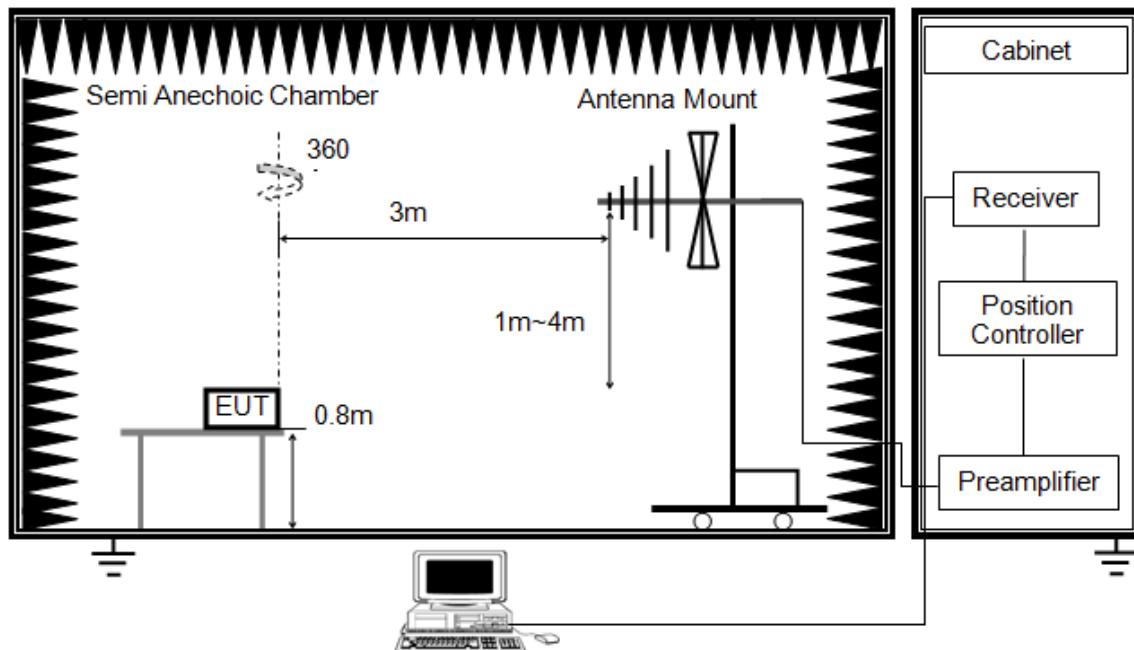


The setting of the spectrum analyser

| | |
|----------|------------------------------------------------------------|
| 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 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. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
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 and average 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 and average detector and reported.
7. Although these tests were performed other than open field sites, adequate comparison measurements were confirmed against 30m open field sites. 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

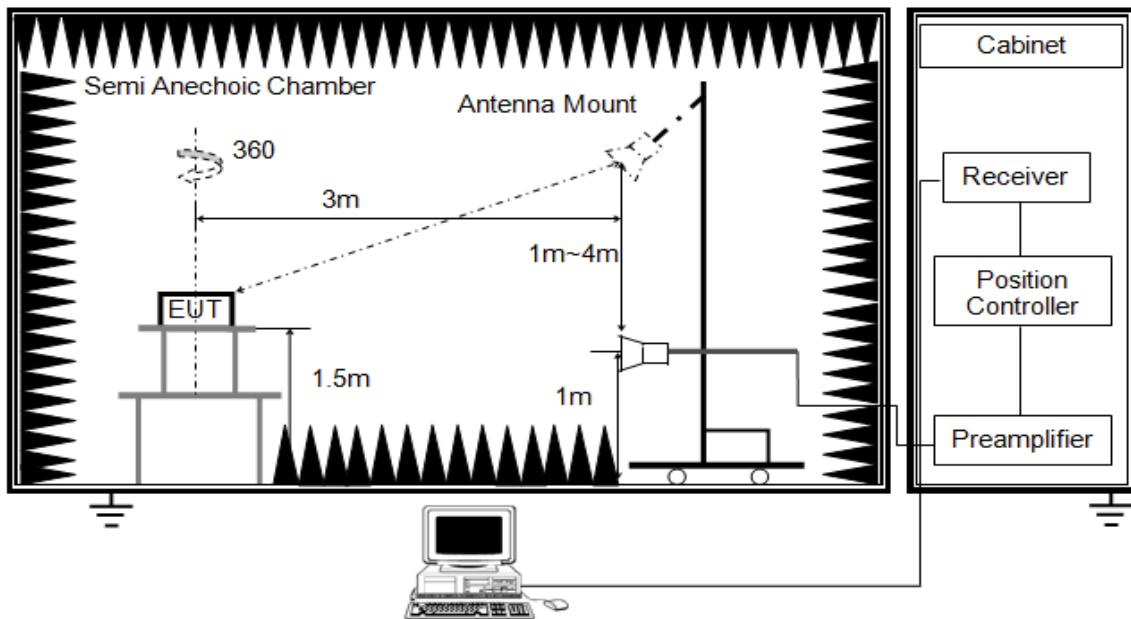


The setting of the spectrum analyser

| | |
|----------|----------|
| 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 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. 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.

ABOVE 1G



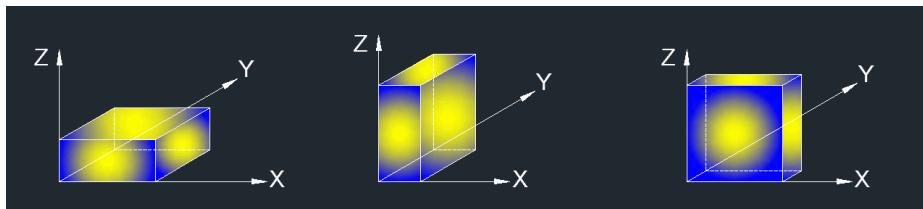
| | |
|----------|--------------------------------|
| RBW | 1M |
| VBW | 3M |
| Sweep | Auto |
| Detector | Peak For Average see note 6 |
| Trace | Max hold |

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. Average Value=Peak Value + Duty Correction Factor

For the Duty Cycle and Correction Factor please refer to clause 6.1.ON TIME AND DUTY CYCLE.

RESULTS

X axis, Y axis, Z axis positions:



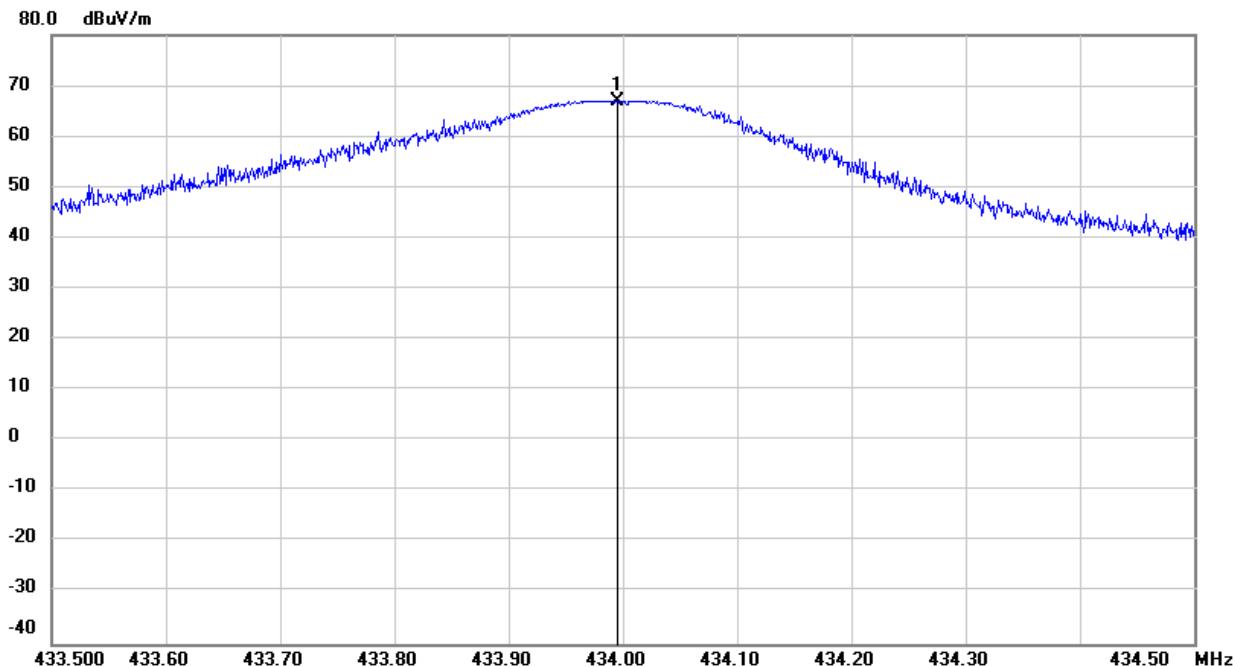
Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

TEST ENVIRONMENT

| | | | |
|---------------------|--------|-------------------|---------|
| Temperature | 22.6°C | Relative Humidity | 66% |
| Atmosphere Pressure | 101kPa | Test Voltage | DC 3.0V |

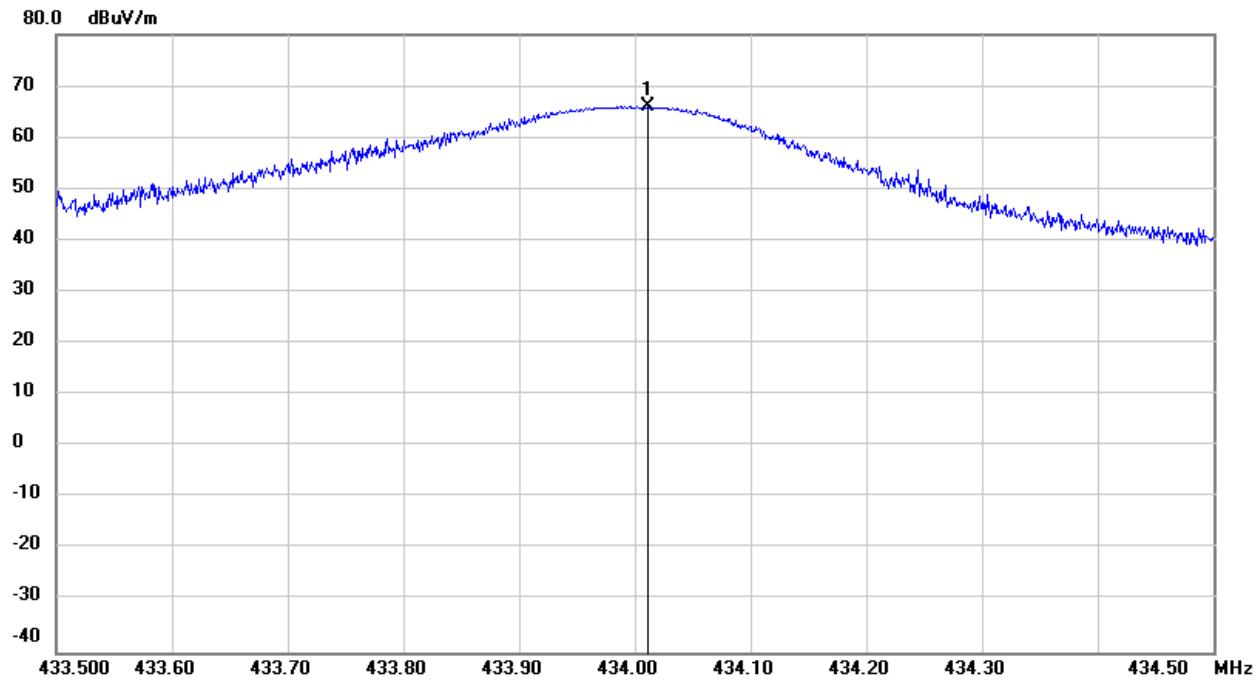
6.4.1. FUNDAMENTAL FIELD STRENGTH

HORIZONTAL



| Frequency (MHz) | Reading (dB _{UV} /m) | Correct dB/m | Peak Result (dB _{UV} /m) | Average Result (dB _{UV} /m) | Limit (dB _{UV} /m) | Margin (dB) | Remark |
|--------------------|----------------------------------|-----------------|-----------------------------------------|--------------------------------------------|--------------------------------|----------------|---------|
| 433.9950 | 78.70 | -11.69 | 67.01 | / | 100.80 | -33.79 | peak |
| 433.9950 | 78.70 | -11.69 | / | 59.88 | 80.80 | -20.92 | Average |

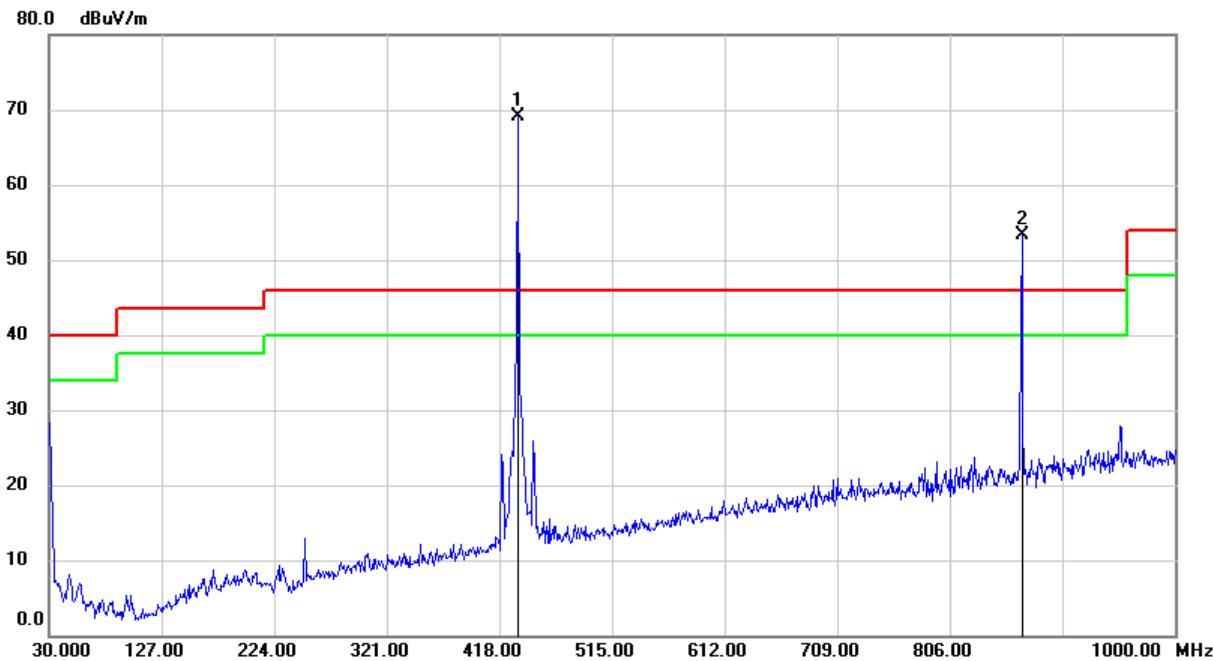
Note: 1. Peak Result = Reading+ Correct Factor
2. Average Result= Peak Result+ Duty Correction Factor

VERTICAL

| Frequency (MHz) | Reading (dB _{UV} /m) | Correct dB/m | Peak Result (dB _{UV} /m) | Average Result (dB _{UV} /m) | Limit (dB _{UV} /m) | Margin (dB) | Remark |
|--------------------|----------------------------------|-----------------|-----------------------------------------|--------------------------------------------|--------------------------------|----------------|---------|
| 434.0110 | 77.70 | -11.69 | 66.01 | / | 100.80 | -34.79 | peak |
| 433.9279 | 76.97 | -11.69 | / | 58.88 | 80.80 | -21.92 | Average |

Note: 1. Peak Result = Reading+ Correct Factor
2. Average Result= Peak Result+ Duty Correction Factor

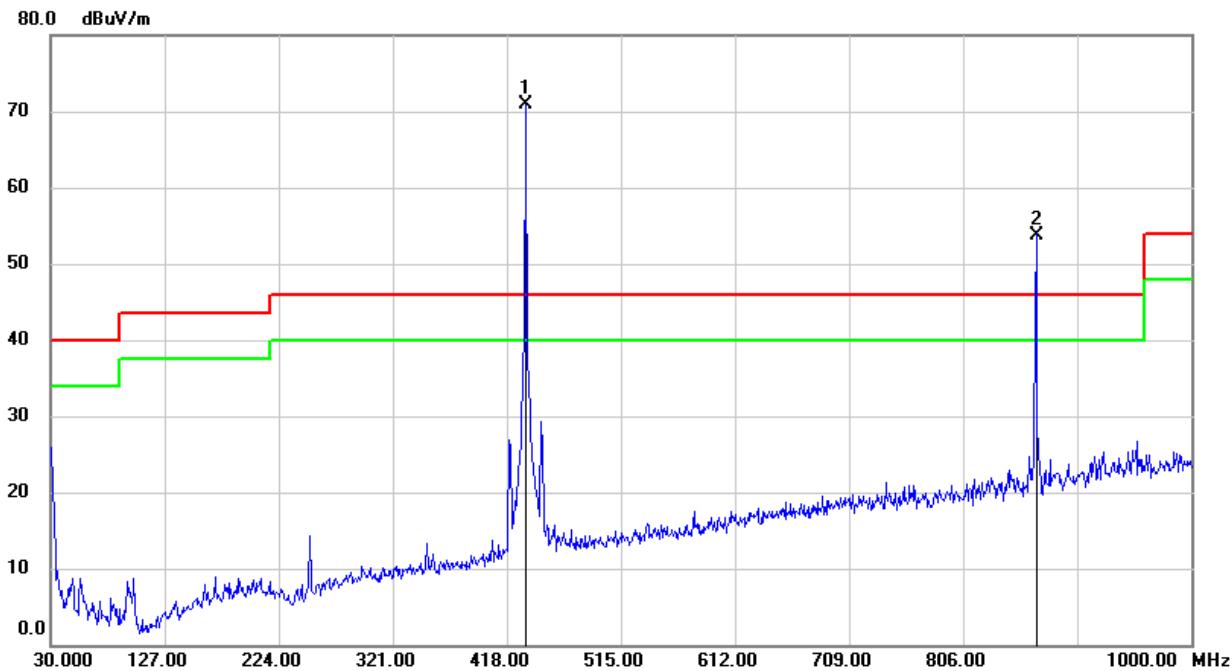
6.4.2. SPURIOUS EMISSIONS BELOW 1G

SPURIOUS EMISSIONS (HORIZONTAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Peak Result (dBuV/m) | Average Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|----------------------------|-------------------------------|-------------------|----------------|---------|
| 1 | 433.52 | 80.78 | -11.69 | 69.09 | / | 100.80 | -31.71 | Peak |
| / | / | / | / | / | 61.96 | 80.80 | -18.84 | Average |
| 2 | 868.08 | 57.86 | -4.48 | 53.38 | / | 80.80 | -27.42 | Peak |
| / | / | / | / | / | 46.25 | 60.80 | -14.55 | Average |

Note:

1. Result Level = Read Level + Correct Factor.
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. Mark 1 is the fundamental frequency, Mark 2 is 2th harmonic.
5. Peak Result = Reading Level + Correct Factor.
6. Average Result = Peak Result + Duty Correction Factor.

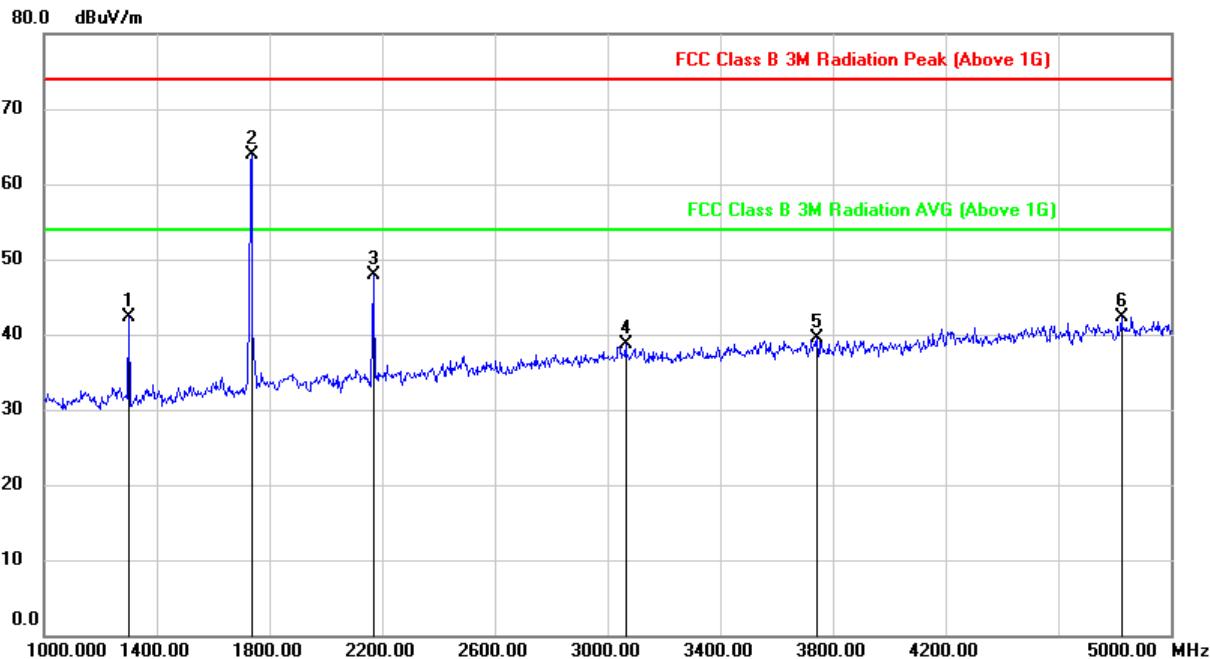
SPURIOUS EMISSIONS (VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Peak Result (dBuV/m) | Average Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------|----------------------------|-------------------------------|-------------------|----------------|---------|
| 1 | 433.52 | 82.69 | -11.69 | 71.00 | / | 100.80 | -29.80 | Peak |
| / | / | / | / | / | 63.87 | 80.80 | -16.93 | Average |
| 2 | 868.08 | 58.28 | -4.48 | 53.8 | / | 80.80 | -27.00 | Peak |
| / | / | / | / | / | 46.67 | 60.80 | -14.13 | Average |

Note:

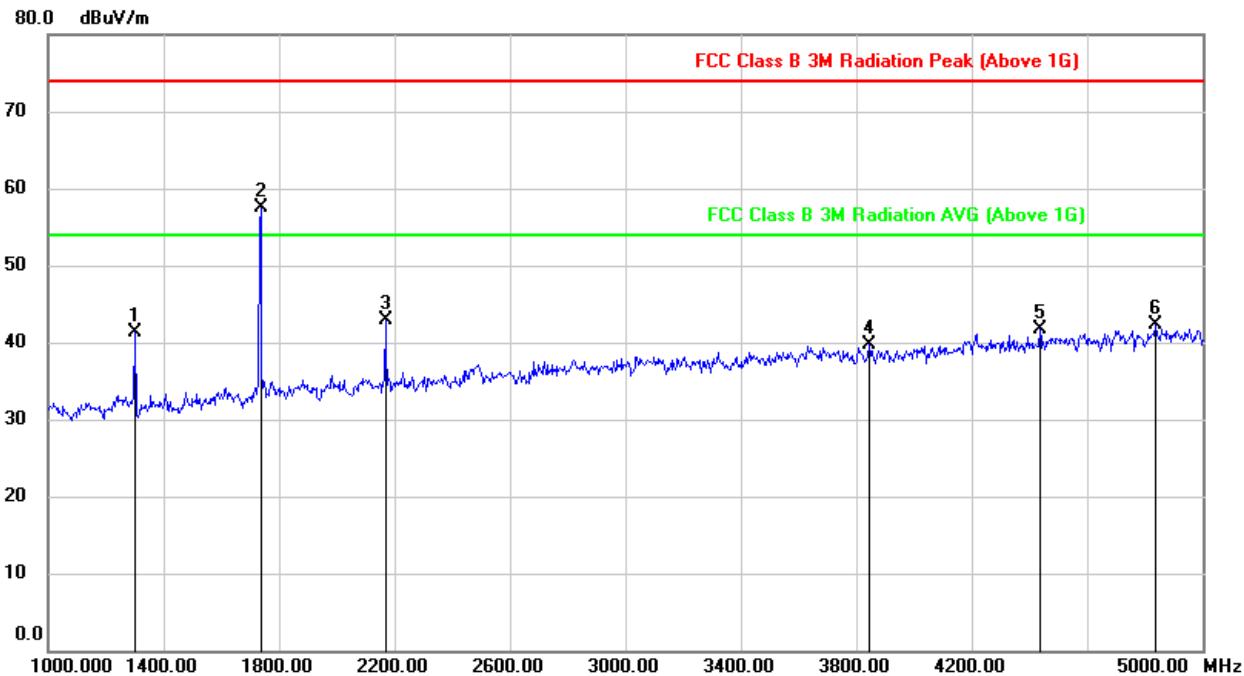
1. Result Level = Read Level + Correct Factor.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.
4. Mark 1 is the fundamental frequency, Mark 2 is 2th harmonic.
5. Peak Result = Reading Level + Correct Factor.
6. Average Result = Peak Result + Duty Correction Factor.

6.4.3. SPURIOUS EMISSIONS ABOVE 1G

HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)

| No. | Frequency (MHz) | Reading (dBuV/m) | Correct dB/m | P-Result (dBuV/m) | A-Result dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------------------|--------------------|---------------------|-----------------|----------------------|---------------------|-------------------|----------------|---------|
| 1(3 rd harmonic) | 1300.000 | 55.42 | -13.13 | 42.29 | / | 80.80 | -38.51 | Peak |
| 2(4 th harmonic) | 1736.000 | 75.46 | -11.61 | 63.85 | / | 80.80 | -16.95 | Peak |
| / | / | / | / | / | 56.72 | 60.80 | -4.08 | Average |
| 3(5 th harmonic) | 2168.000 | 57.91 | -9.94 | 47.97 | / | 80.80 | -32.83 | Peak |
| 4 | 3064.000 | 44.54 | -5.86 | 38.68 | / | 74.00 | -35.32 | Peak |
| 5 | 3744.000 | 43.65 | -4.12 | 39.53 | / | 74.00 | -34.47 | Peak |
| 6 | 4824.000 | 43.27 | -0.92 | 42.35 | / | 74.00 | -31.65 | Peak |

Note: 1. Peak Result = Reading Level + Correct Factor.
 2. Average Result = Peak Result + Duty Correction Factor.
 3. No burst found in Restricted bands.
 4. If Peak Result complies with AVG limit, AVG Result is deemed to comply with AVG limit.

HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)

| No. | Frequency (MHz) | Reading (dBuV/m) | Correct dB/m | P-Result (dBuV/m) | A-Result dBuV/m | Limit (dBuV/m) | Margin (dB) | Remark |
|-----------------------------|-----------------|------------------|--------------|-------------------|-----------------|----------------|-------------|---------|
| 1(3 rd harmonic) | 1300.000 | 54.47 | -13.13 | 41.34 | / | 80.80 | -39.46 | Peak |
| 2(4 th harmonic) | 1736.000 | 69.11 | -11.61 | 57.50 | / | 80.80 | -23.30 | Peak |
| / | / | / | / | / | 50.37 | 60.80 | -10.43 | Average |
| 3(5 th harmonic) | 2168.000 | 52.78 | -9.94 | 42.84 | / | 80.80 | -37.96 | Peak |
| 4 | 3844.000 | 43.96 | -4.19 | 39.77 | / | 74.00 | -34.23 | Peak |
| 5 | 4436.000 | 44.31 | -2.69 | 41.62 | / | 74.00 | -32.38 | Peak |
| 6 | 4836.000 | 43.11 | -0.90 | 42.21 | / | 74.00 | -31.79 | Peak |

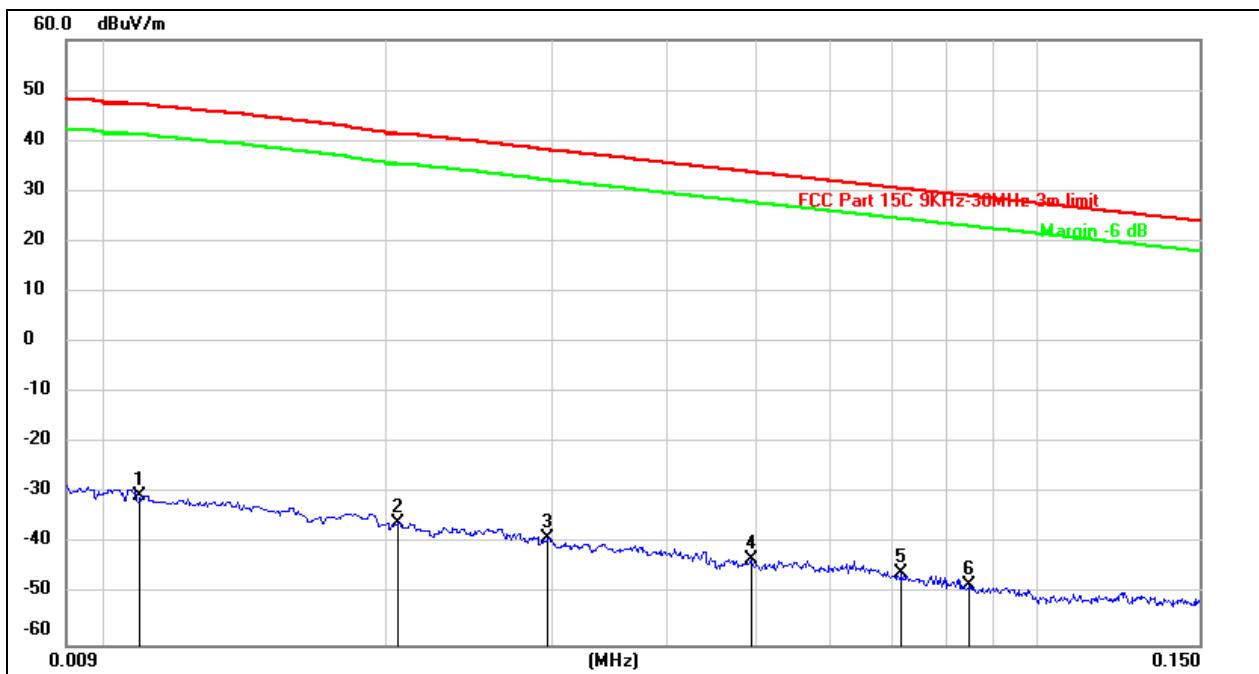
Note: 1. Peak Result = Reading Level + Correct Factor.
 2. Average Result = Peak Result + Duty Correction Factor.
 3. No burst found in Restricted bands.
 4. If Peak Result complies with AVG limit, AVG Result is deemed to comply with AVG limit.

Note: All the modes has been tested, only the worst data record in the report.

6.4.4. SPURIOUS EMISSIONS BELOW 30M

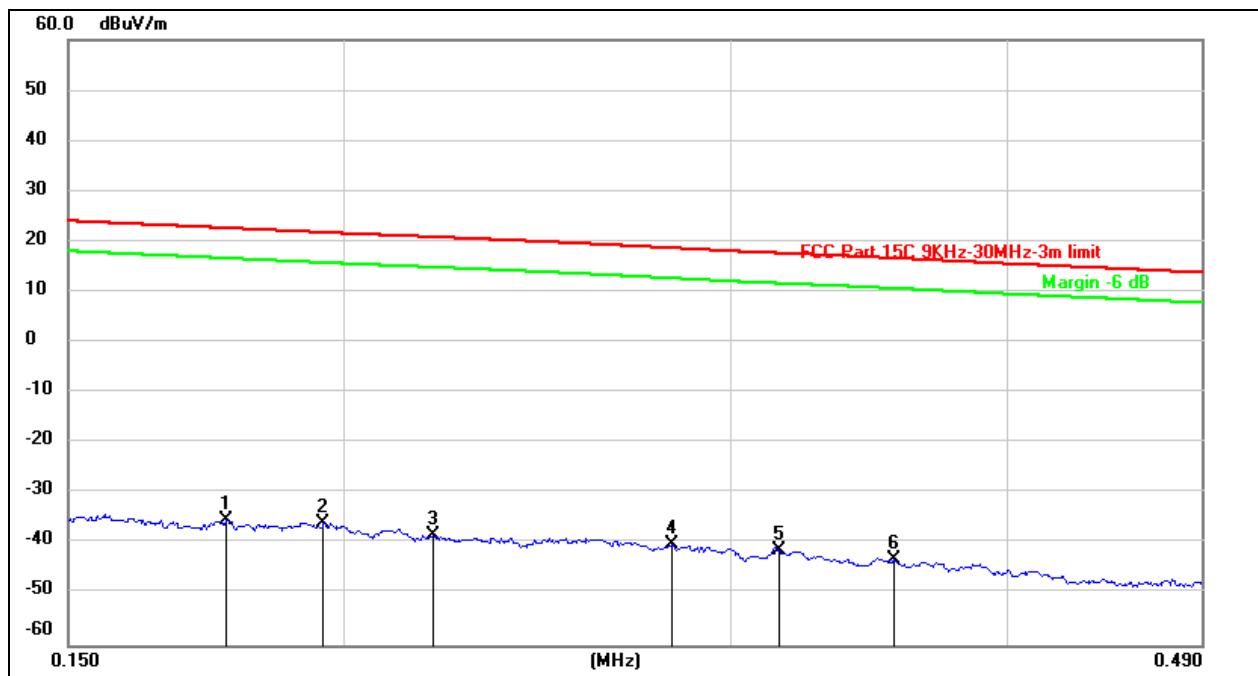
SPURIOUS EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9kHz~ 150kHz



| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 0.0108 | 70.91 | -101.39 | -30.48 | 47.12 | -77.60 | peak |
| 2 | 0.0205 | 65.47 | -101.35 | -35.88 | 41.40 | -77.28 | peak |
| 3 | 0.0298 | 62.50 | -101.39 | -38.89 | 38.13 | -77.02 | peak |
| 4 | 0.0492 | 58.36 | -101.47 | -43.11 | 33.78 | -76.89 | peak |
| 5 | 0.0714 | 55.91 | -101.57 | -45.66 | 30.54 | -76.20 | peak |
| 6 | 0.0849 | 53.51 | -101.67 | -48.16 | 29.04 | -77.20 | peak |

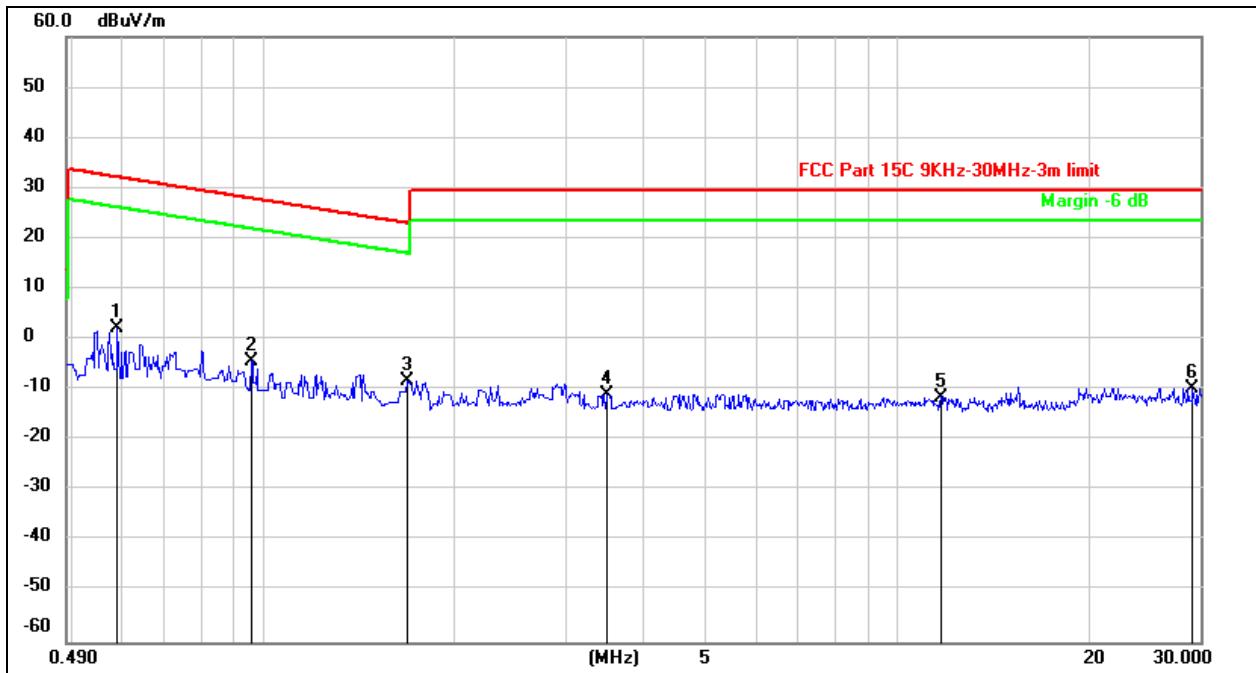
Note: 1. Measurement = Reading Level + Correct Factor.
 2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
 3. All 3 polarizations(Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

0.15MHz~ 0.49MHz

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 0.1768 | 66.55 | -101.68 | -35.13 | 22.66 | -57.79 | peak |
| 2 | 0.1958 | 65.98 | -101.71 | -35.73 | 21.77 | -57.50 | peak |
| 3 | 0.2197 | 63.48 | -101.75 | -38.27 | 20.89 | -59.16 | peak |
| 4 | 0.2816 | 61.67 | -101.83 | -40.16 | 18.71 | -58.87 | peak |
| 5 | 0.3150 | 60.66 | -101.87 | -41.21 | 17.68 | -58.89 | peak |
| 6 | 0.3553 | 58.72 | -101.91 | -43.19 | 16.68 | -59.87 | 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.

0.49MHz ~ 30MHz

| No. | Frequency (MHz) | Reading (dBuV) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------|-----------------|----------------|-------------|--------|
| 1 | 0.5897 | 64.30 | -62.08 | 2.22 | 32.20 | -29.98 | peak |
| 2 | 0.9582 | 57.93 | -62.24 | -4.31 | 27.98 | -32.29 | peak |
| 3 | 1.6834 | 53.63 | -61.96 | -8.33 | 23.08 | -31.41 | peak |
| 4 | 3.4735 | 50.64 | -61.46 | -10.82 | 29.54 | -40.36 | peak |
| 5 | 11.7332 | 49.48 | -60.88 | -11.40 | 29.54 | -40.94 | peak |
| 6 | 29.2327 | 50.42 | -60.04 | -9.62 | 29.54 | -39.16 | 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 has been tested, only the worst data record in the report.

7. 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.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies

END OF REPORT