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# FCC RADIO TEST REPORT

| | |
|---|---|
| Applicant's company | **Chic Technology Corp** |
| Applicant Address | 16F, No. 150, Chien-1 Road, 235 Chung Ho City, Taipei Hsien, Taiwan, R.O.C. |
| FCC ID | **GV372242** |
| Manufacturer's company | **Chic Technology Corp** |
| Manufacturer Address | Xiwang Industrial Park, Tian Tang Wei, Feng Gang, Dongguan, Guangdong, China. |

| | |
|---|---|
| Product Name | PilotMouse Laser Wireless |
| Brand Name | Kensington |
| Model Name | 72242 |
| Test Rule Part(s) | 47 CFR FCC Part 15 Subpart C § 15.249 |
| Test Freq. Range | 2400 ~ 2483.5MHz |
| Receive Date | Jan. 10, 2006 |
| Test Date | Jan. 12, 2006 |
| Submission Type | Original Equipment |

## Statement

The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.
The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Lab Code: 200079-0

# Table of Contents

# History of This Test Report

Original Issue Date: Feb. 7, 2006

Report No.: FR592017-01

■ No additional attachment.

□ Additional attachment were issued as following record:

| Attachment No. | Issue Date | Description |
|---|---|---|
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# 1. CERTIFICATE OF COMPLIANCE

| | | |
|---|---|---|
| **Product Name** | : | **PilotMouse Laser Wireless** |
| **Brand Name** | : | **Kensington** |
| **Model Name** | : | **72242** |
| **Applicant** | : | **Chic Technology Corp** |
| **Test Rule Part(s)** | : | **47 CFR FCC Part 15 Subpart C § 15.249** |

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jan. 10, 2006 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

**Wayne Hsu / Supervisor**
Sporton International Inc.

# 2. SUMMARY OF THE TEST RESULT

| Applied Standard: 47 CFR FCC Part 15 Subpart C | | | | |
|---|---|---|---|---|
| **Part** | **Rule Section** | **Description of Test** | **Result** | **Under Limit** |
| 4.1 | 15.207 | AC Power Line Conducted Emissions | Complies | - |
| 4.2 | 15.249(a) | Field Strength of Fundamental Emissions | Complies | 30.25 dB |
| 4.3 | 15.215(c) | 20dB Spectrum Bandwidth | Complies | - |
| 4.4 | 15.249(a)/(d) | Radiated Emissions | Complies | 4.57 dB |
| 4.5 | 15.249(d) | Band Edge Emissions | Complies | 16.12 dB |
| 4.6 | 15.203 | Antenna Requirements | Complies | - |

| Test Items | Uncertainty | Remark |
|---|---|---|
| AC Power Line Conducted Emissions | ±2.26dB | Confidence levels of 95% |
| Field Strength of Fundamental Emissions | ±3.72dB | Confidence levels of 95% |
| 20dB Spectrum Bandwidth | ±6.25×10-7 | Confidence levels of 95% |
| Radiated Emissions/ Band Edge Emissions | ±3.72dB | Confidence levels of 95% |

# 3. GENERAL INFORMATION

## 3.1. Product Details

| Items | Description |
|---|---|
| Product Type | Low Power Communication Device |
| Radio Type | Intentional Transmitter |
| Power Type | 3V DC From Battery for Transmitter |
| Interface Type | NA |
| Modulation | GFSK |
| Frequency Range | 2400 ~ 2483.5MHz |
| Channel Band Width (99%) | 1.70 MHz |
| Max. Field Strength | 54.38dBuV/m at 3m (Average) |
| Carrier Frequencies | Please refer to section 3.3 |
| Antenna | Please refer to section 3.2 |

## 3.2. Table for Filed Antenna

| Ant. | Antenna Type | Connector | Gain (dBi) |
|---|---|---|---|
| 1 | Printed Antenna | NA | 0.00 |

## 3.3. Table for Carrier Frequencies

| Test Frequency | | |
|---|---|---|
| 2402 MHz | 2432 MHz | 2462 MHz |
| 2405 MHz | 2435 MHz | 2465 MHz |
| 2408 MHz | 2439 MHz | 2468 MHz |
| 2411 MHz | 2441 MHz | 2470 MHz |

## 3.4. Table for Test Modes

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items | Mode | Channel | Antenna |
|---|---|---|---|
| AC Power Line Conducted Emissions | Normal Use | - | 1 |
| Radiated Emissions 9kHz~1GHz | CTX of X Axis | 2435 MHz | 1 |
| Field Strength of Fundamental Emissions<br>Radiated Emissions 1GHz~10th Harmonic | CTX of X Axis | 2402 MHz<br>2435 MHz<br>2470 MHz | 1 |
| Band Edge Emissions | CTX of X Axis | 2402 MHz<br>2470 MHz | 1 |
| 20dB Spectrum Bandwidth | CTX | 2402 MHz<br>2435 MHz<br>2470 MHz | NA |

Note: CTX=continuously transmitting

## 3.5. Table for Testing Locations

| Test Site No. | Site Category | Location | FCC Reg. No. | IC File No. | VCCI Reg. No |
|---|---|---|---|---|---|
| 03CH03-HY | SAC | Hwa Ya | 101377 | IC 4088 | - |
| CO04-HY | Conduction | Hwa Ya | 101377 | IC 4088 | - |
| TH01-HY | OVEN Room | Hwa Ya | - | - | - |

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

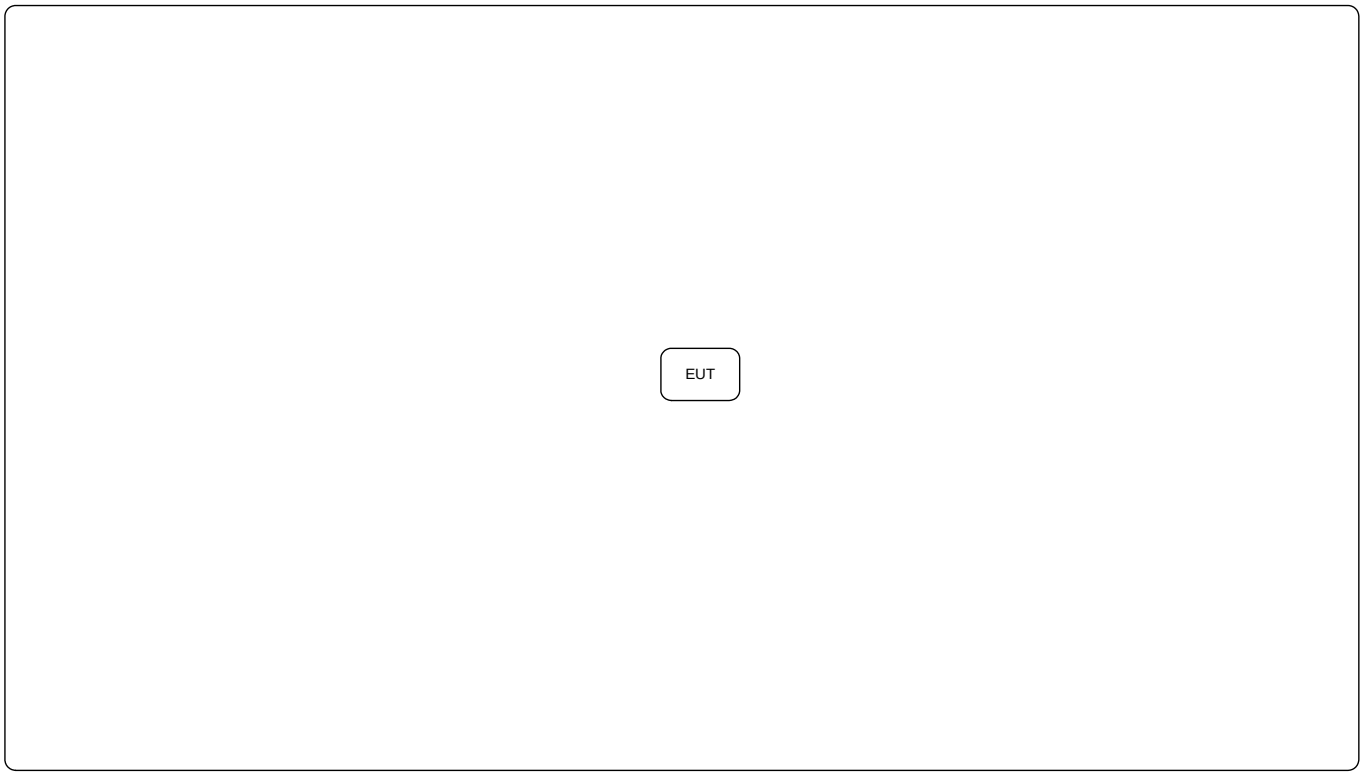
Please refer section 6 for Test Site Address.

## 3.6. Table for Supporting Units

| Support Unit | Brand | Model | FCC ID |
|---|---|---|---|
| Notebook | DELL | PP01L | DoC |
| Printer | EPSON | LQ-680 | DoC |
| Modem | ACEEX | DM-1414 | - |

## 3.7. Test Configurations

### 3.7.1. Radiation Emissions Test Configuration




### 3.7.2. AC Power Line Conduction Emissions Test Configuration

The transmitter is battery powered; there is no need to do this testing.

# 4. TEST RESULT

## 4.1. AC Power Line Conducted Emissions Measurement

### 4.1.1. Limit

For a Low-power Radio-frequency Device which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

| Frequency (MHz) | QP Limit (dBuV) | AV Limit (dBuV) |
|---|---|---|
| 0.15~0.5 | 66~56 | 56~46 |
| 0.5~5 | 56 | 46 |
| 5~30 | 60 | 50 |

### 4.1.2. Measuring Instruments and Setting

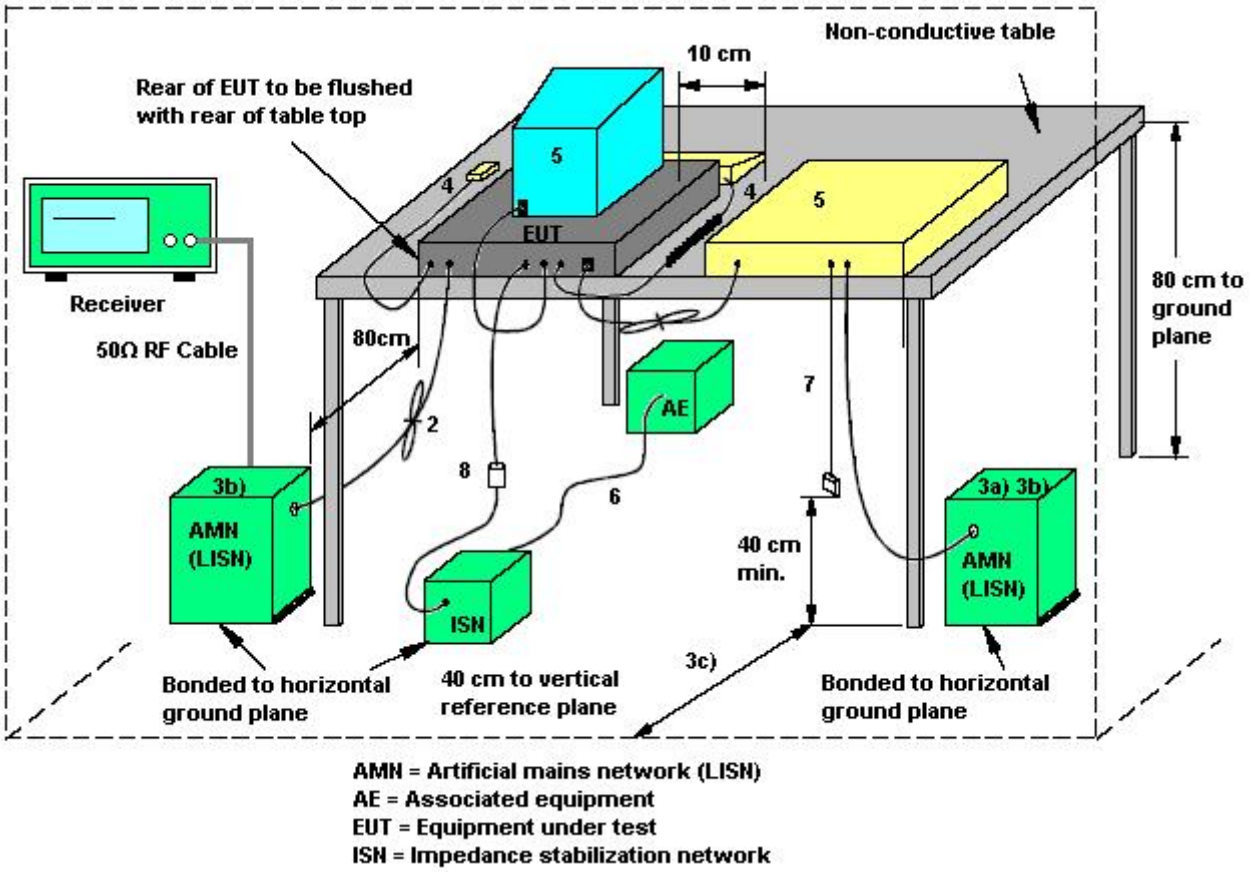
Please refer to section 5 in this report. The following table is the setting of the receiver.

| Receiver Parameters | Setting |
|---|---|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 KHz |

### 4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

## 4.1.4. Test Setup Layout




AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

1. If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
2. Excess mains cord shall be bundled in the centre or shortened to appropriate length.
3. EUT is connected to one artificial mains network (AMN). All AMNs and ISNs may alternatively be connected to a vertical reference plane or metal wall.
4. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
5. AMN and ISN are 80 cm from the EUT and at least 80 cm from other units and other metal planes.
6. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
7. Cables of hand operated devices, such as keyboards, mouses, etc. shall be placed as for normal usage.
8. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
9. I/O signal cable intended for external connection.
10. The end of the I/O signal cables which are not connected to an AE may be terminated, if required, using correct terminating impedance.
11. If used, the current probe shall be placed at 0,1 m from the ISN.

### 4.1.5. Test Deviation

There is no deviation with the original standard.

### 4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

### 4.1.7. Results of AC Power Line Conducted Emissions Measurement

The transmitter is battery powered; there is no need to do this testing.

## 4.2. Field Strength of Fundamental Emissions Measurement

### 4.2.1. Limit

The field strength of emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

| Frequency Band (MHz) | Fundamental Emissions Limit (dBuV/m) at 3m |
|---|---|
| 2400-2483.5 | 94 |
| 5725-5875 | 94 |

### 4.2.2. Measuring Instruments and Setting

Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

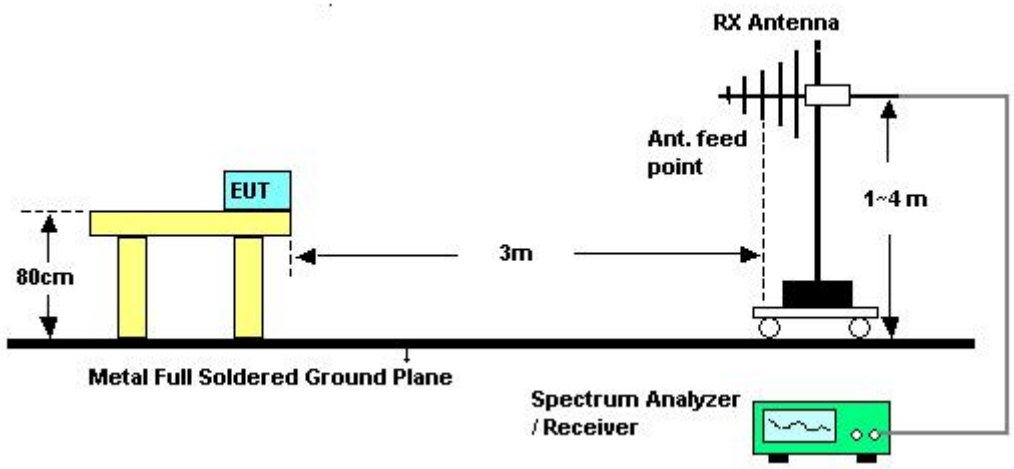
| Power Meter Parameter | Setting |
|---|---|
| Attenuation | Auto |
| RB | 1 MHz Peak / 1MHz Average |
| VB | 1 MHz Peak / 10Hz Average |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

### 4.2.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For Fundamental emissions, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the

field strength is at its maximum value.

### 4.2.4. Test Setup Layout




### 4.2.5. Test Deviation

There is no deviation with the original standard.

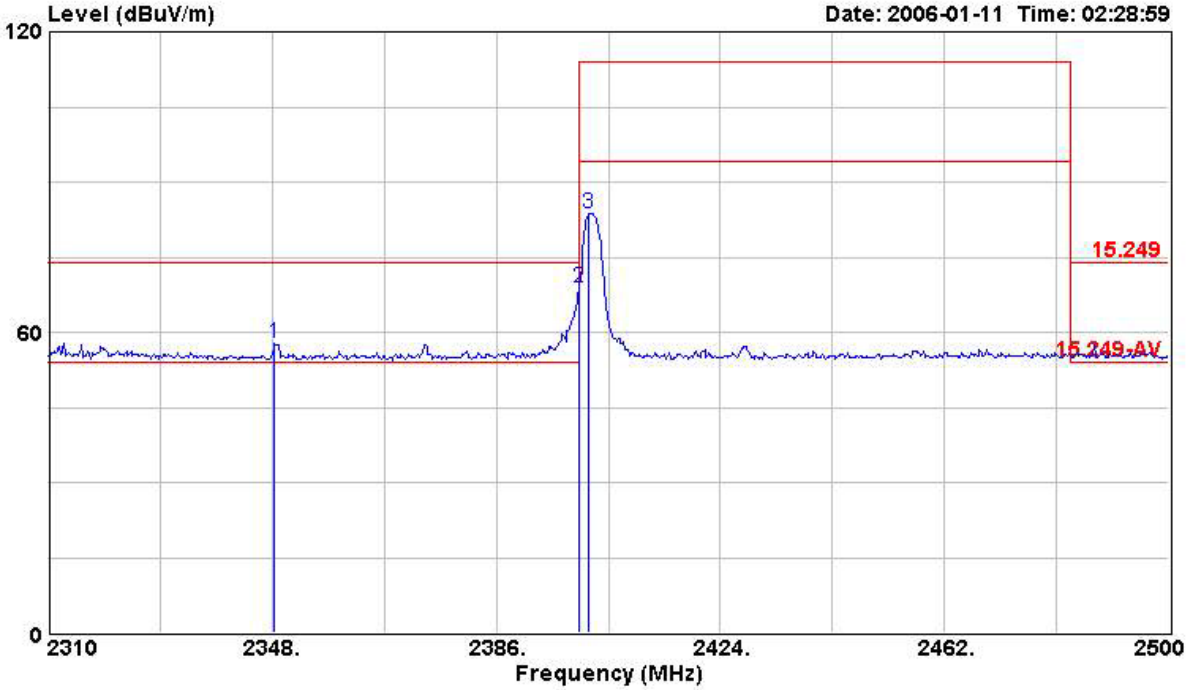
### 4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 4.2.7. Test Result of Field Strength of Fundamental Emissions

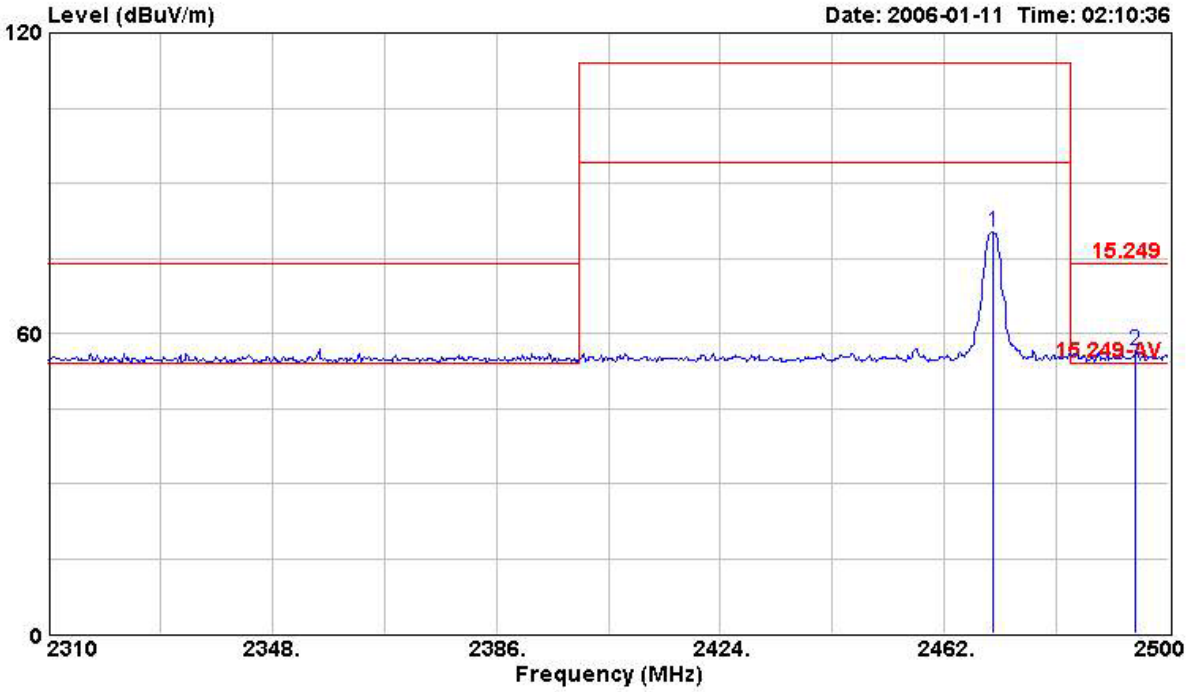
| Temperature | 25°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | X axis / 2402 MHz ; 2470 MHz |

***2402 MHz***




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 3 | 2401.770 | 83.75 | -30.25 | 52.73 | 114.00 | 2.81 | 28.21 | 0.00 | Peak | --- | --- |
| 3 | 2401.770 | 54.38 | -39.62 | 23.36 | 94.00 | 2.81 | 28.21 | 0.00 | Average | --- | --- |

*2470 MHz*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2470.170 | 80.15 | -33.85 | 48.97 | 114.00 | 2.84 | 28.34 | 0.00 | Peak | --- | --- |
| 1 | 2469.980 | 50.78 | -43.22 | 19.60 | 94.00 | 2.84 | 28.34 | 0.00 | Average | --- | --- |

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Receiving maximum fundamental emissions are Vertical Polarization / Horizontal Polarization.

## 4.3. 20dB Spectrum Bandwidth Measurement

### 4.3.1. Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (2400 ~ 2483.5MHz).

### 4.3.2. Measuring Instruments and Setting

Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

| Spectrum Parameters | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > 6dB Bandwidth |
| RB | 100 kHz |
| VB | 100 kHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

### 4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.

### 4.3.4. Test Setup Layout

### 4.3.5. Test Deviation

There is no deviation with the original standard.

### 4.3.6. EUT Operation during Test

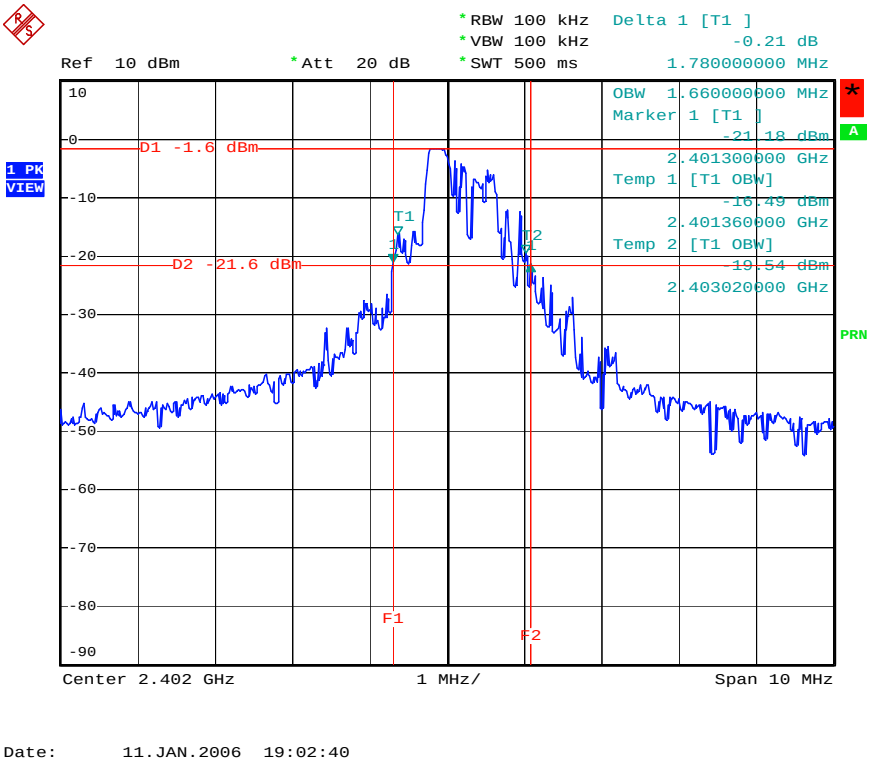
The EUT was programmed to be in continuously transmitting mode.

### 4.3.7. Test Result of 20dB Spectrum Bandwidth

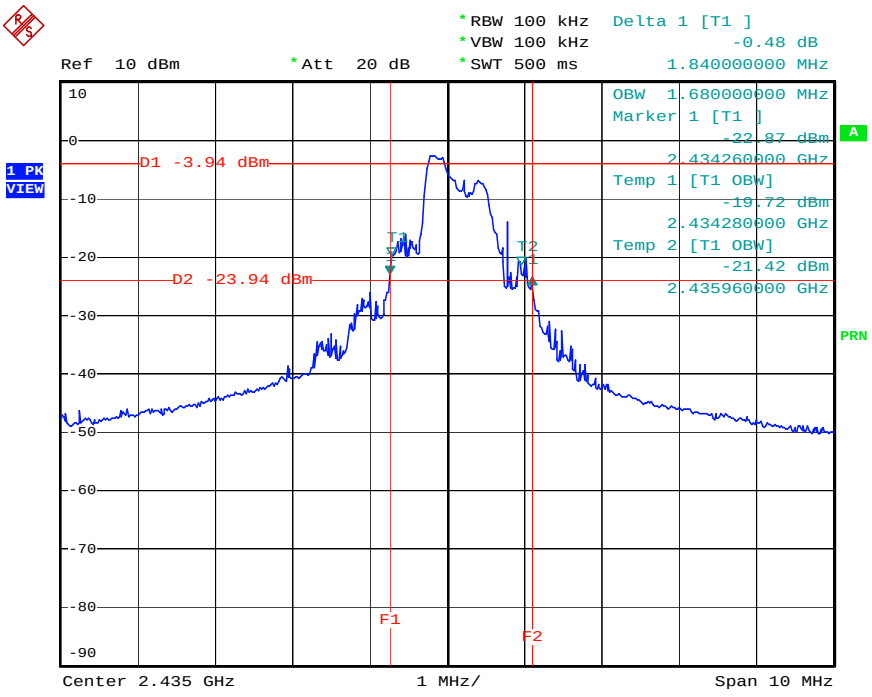
| Temperature | 28℃ | Humidity | 58% |
|---|---|---|---|
| Test Engineer | Eason Lu | Configurations | 2402 MHz / 2435 MHz / 2470 MHz |

| Frequency | 20dB BW (MHz) | 99% OBW (MHz) | Frequency range (MHz) $f_L$ > 2400MHz | Frequency range (MHz) $f_H$ < 2483.5MHz | Test Result |
|---|---|---|---|---|---|
| 2402 MHz | 1.78 | 1.66 | 2401.3000 | - | Complies |
| 2435 MHz | 1.84 | 1.68 | - | - | Complies |
| 2470 MHz | 1.72 | 1.70 | - | 2470.9800 | Complies |

**20 dB/99% Bandwidth Plot on 2402 MHz**



## 20 dB/99% Bandwidth Plot on 2435 MHz

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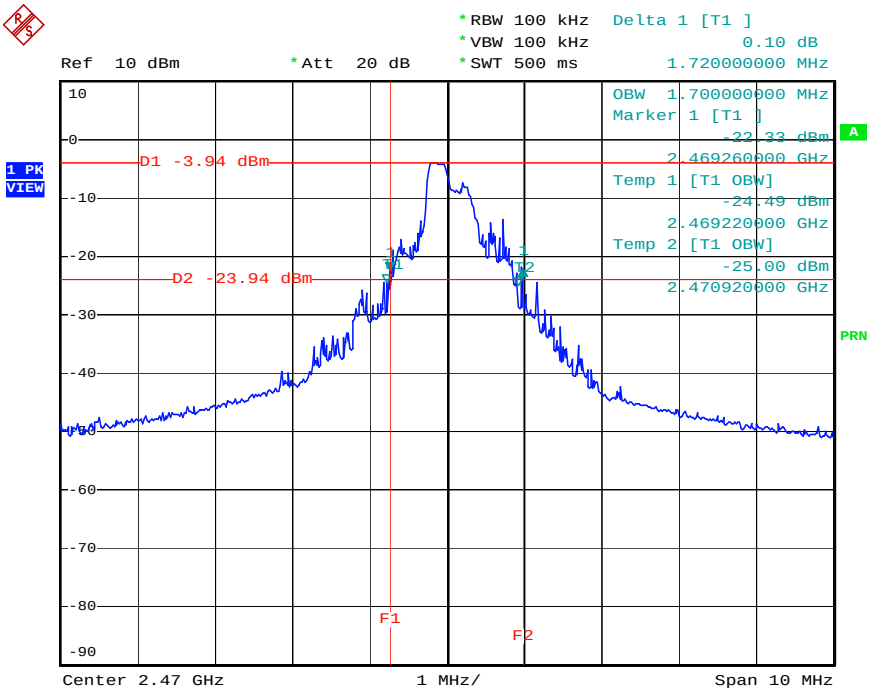
## 20 dB/99% Bandwidth Plot on 2470 MHz

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## 4.4. Radiated Emissions Measurement

### 4.4.1. Limit

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micorvolts/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 |

### 4.4.2. Measuring Instruments and Setting

Please refer to section 5 in this report. The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (other emission) | 100KHz / 100KHz for peak |

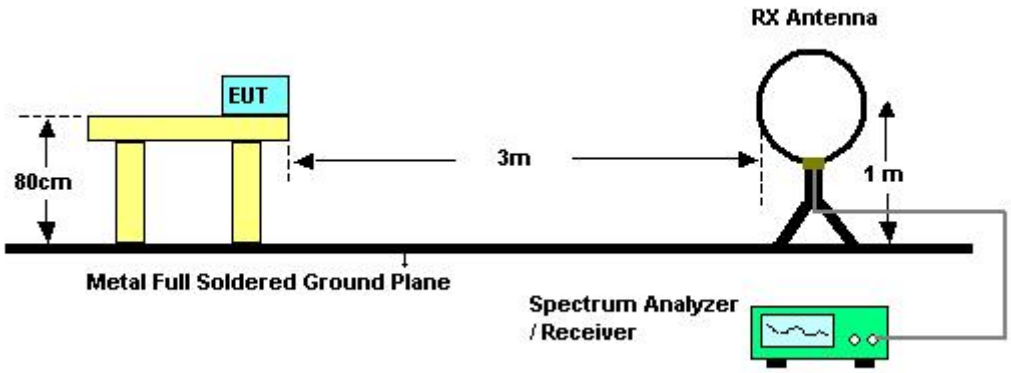
| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

### 4.4.3. Test Procedures

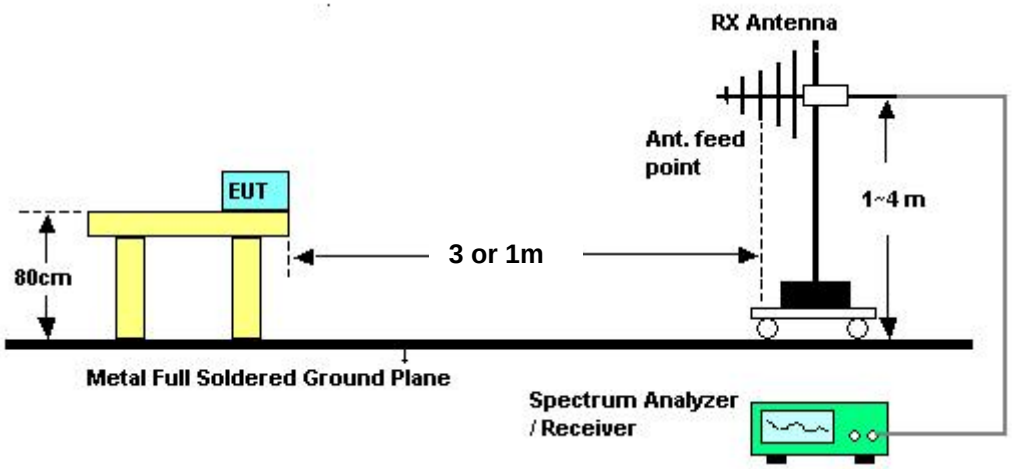
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

### 4.4.4. Test Setup Layout

**For radiated emissions below 30MHz**




**For radiated emissions above 30MHz**




Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

### 4.4.5. Test Deviation

There is no deviation with the original standard.

### 4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 4.4.7. Results of Radiated Emissions (9kHz~30MHz)

| Temperature | 25℃ | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | 2435 MHz |

| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Limit Line (dBuV) | Remark |
|---|---|---|---|---|
| - | - | - | - | See Note |

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

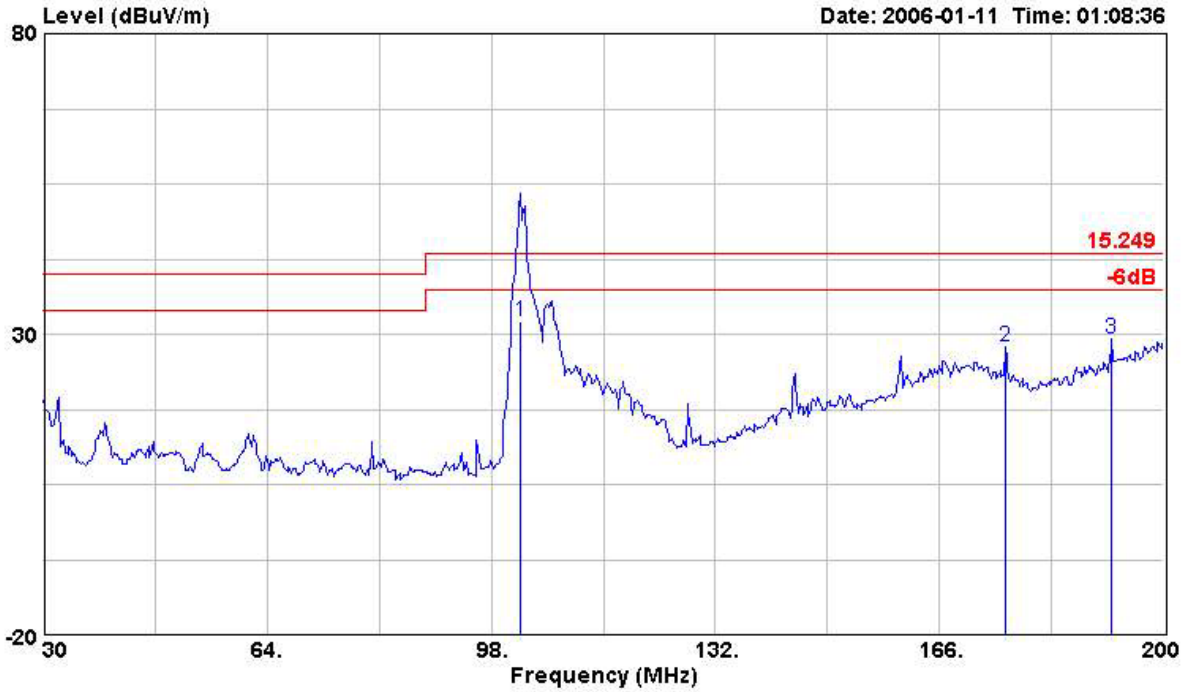
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

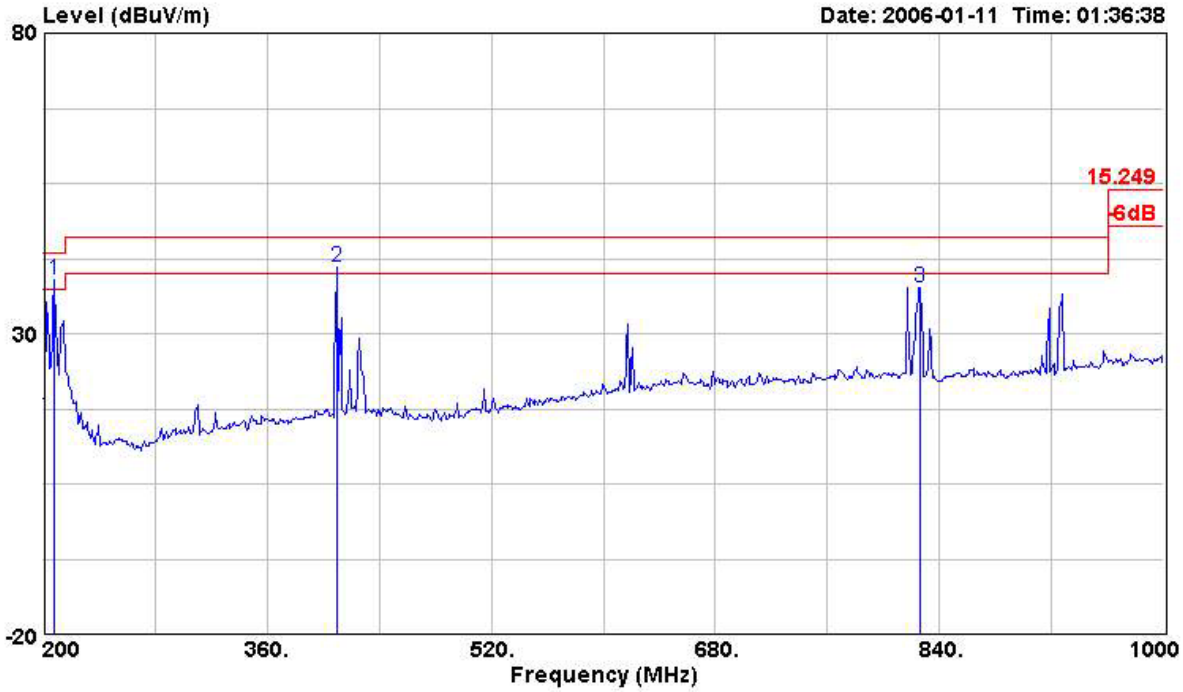
## 4.4.8. Results of Radiated Emissions (30MHz~1GHz)

| Temperature | 25°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | 2435 MHz |

*Horizontal*

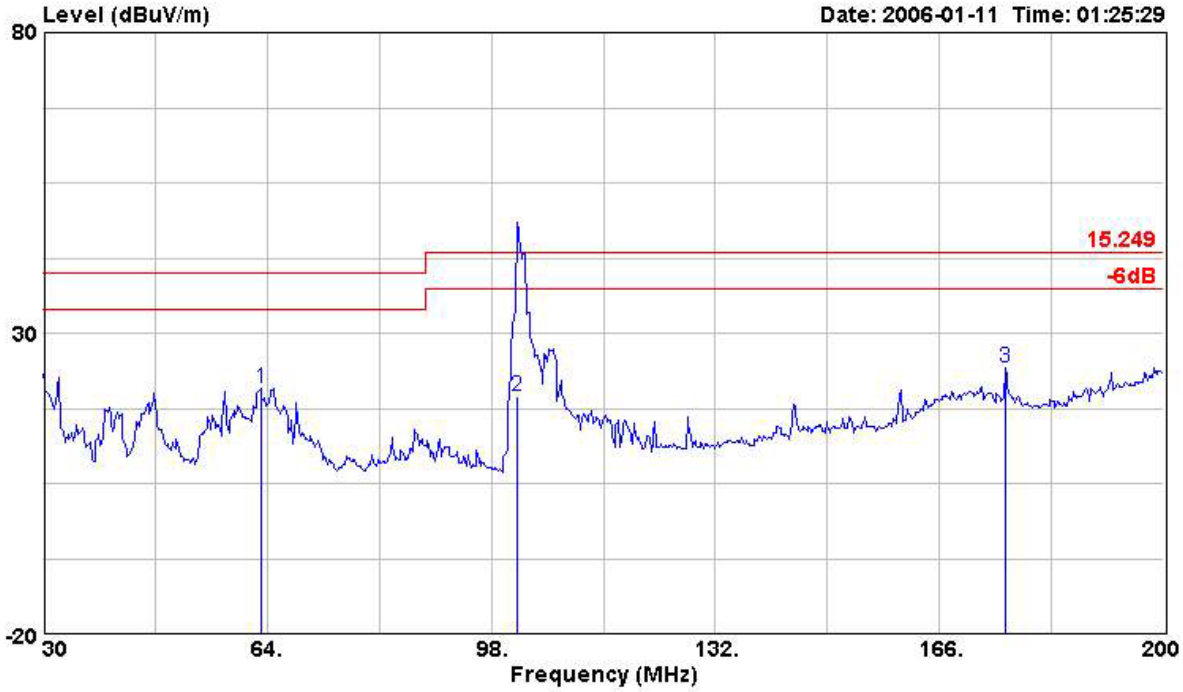



| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 @ | 102.420 | 32.18 | -11.32 | 51.07 | 43.50 | 2.36 | 9.33 | 30.58 | QP | --- | --- |
| 2 | 176.030 | 27.93 | -15.57 | 40.48 | 43.50 | 3.22 | 14.20 | 29.97 | Peak | --- | --- |
| 3 | 192.180 | 29.35 | -14.15 | 41.22 | 43.50 | 3.25 | 15.17 | 30.28 | Peak | --- | --- |

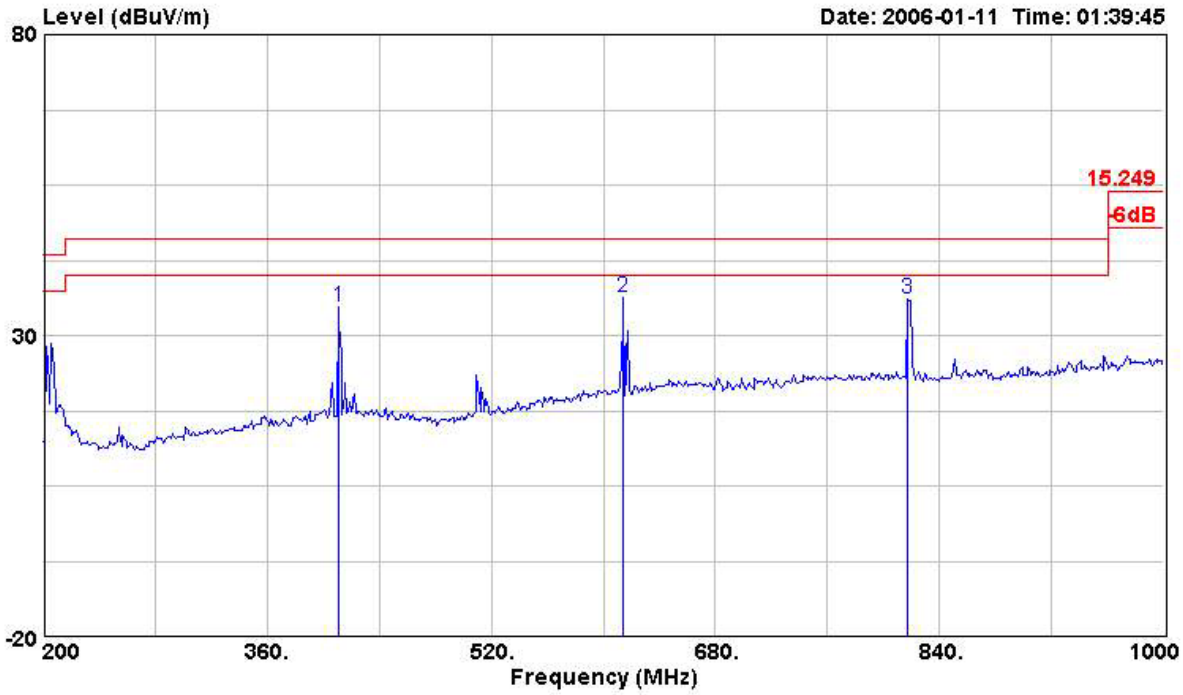



| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 @ | 208.000 | 38.93 | -4.57 | 50.90 | 43.50 | 3.09 | 15.56 | 30.63 | Peak | --- | --- |
| 2 @ | 409.600 | 41.10 | -4.90 | 50.75 | 46.00 | 4.52 | 16.72 | 30.89 | Peak | --- | --- |
| 3 @ | 826.400 | 37.68 | -8.32 | 40.30 | 46.00 | 6.00 | 21.85 | 30.47 | Peak | --- | --- |

*Vertical*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 62.980 | 20.79 | -19.21 | 38.77 | 40.00 | 2.22 | 10.29 | 30.49 | Peak | --- | --- |
| 2 | 101.910 | 19.39 | -24.11 | 38.36 | 43.50 | 2.36 | 9.25 | 30.58 | QP | --- | --- |
| 3 | 176.030 | 24.18 | -19.32 | 36.73 | 43.50 | 3.22 | 14.20 | 29.97 | Peak | --- | --- |




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 @ | 410.400 | 34.69 | -11.31 | 44.31 | 46.00 | 4.53 | 16.71 | 30.86 | Peak | --- | --- |
| 2 @ | 614.400 | 36.26 | -9.74 | 41.48 | 46.00 | 5.25 | 20.44 | 30.91 | Peak | --- | --- |
| 3 @ | 816.800 | 36.08 | -9.92 | 38.53 | 46.00 | 6.24 | 21.87 | 30.56 | Peak | --- | --- |

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

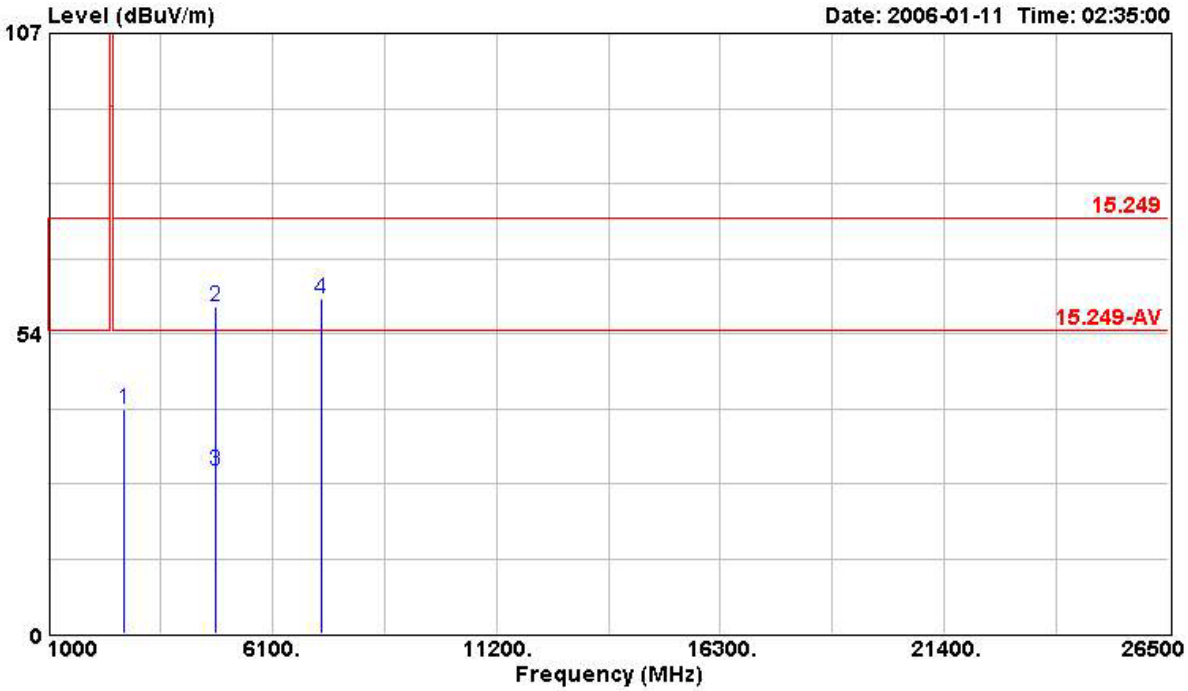
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

## 4.4.9. Results for Radiated Emissions (1GHz~10th Harmonic)

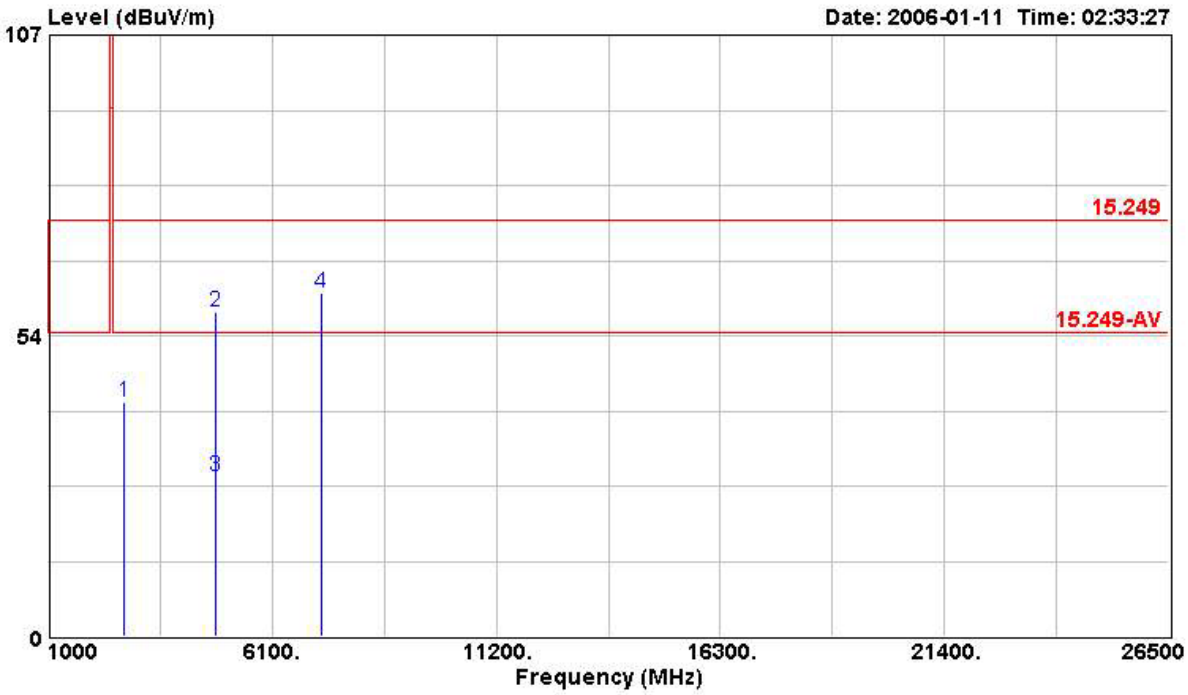
| Temperature | 25°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | 2402 MHz |

*Horizontal*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2718.000 | 40.13 | -33.87 | 40.97 | 74.00 | 3.01 | 29.14 | 32.99 | Peak | --- | --- |
| 2 | 4808.000 | 58.33 | -15.67 | 53.55 | 74.00 | 4.22 | 33.10 | 32.54 | PEAK | --- | --- |
| 3 | 4808.000 | 28.96 | -25.04 | 24.19 | 54.00 | 4.22 | 33.10 | 32.54 | Average | --- | --- |
| 4 | 7204.000 | 59.74 | -14.26 | 50.88 | 74.00 | 5.31 | 35.90 | 32.35 | PEAK | --- | --- |

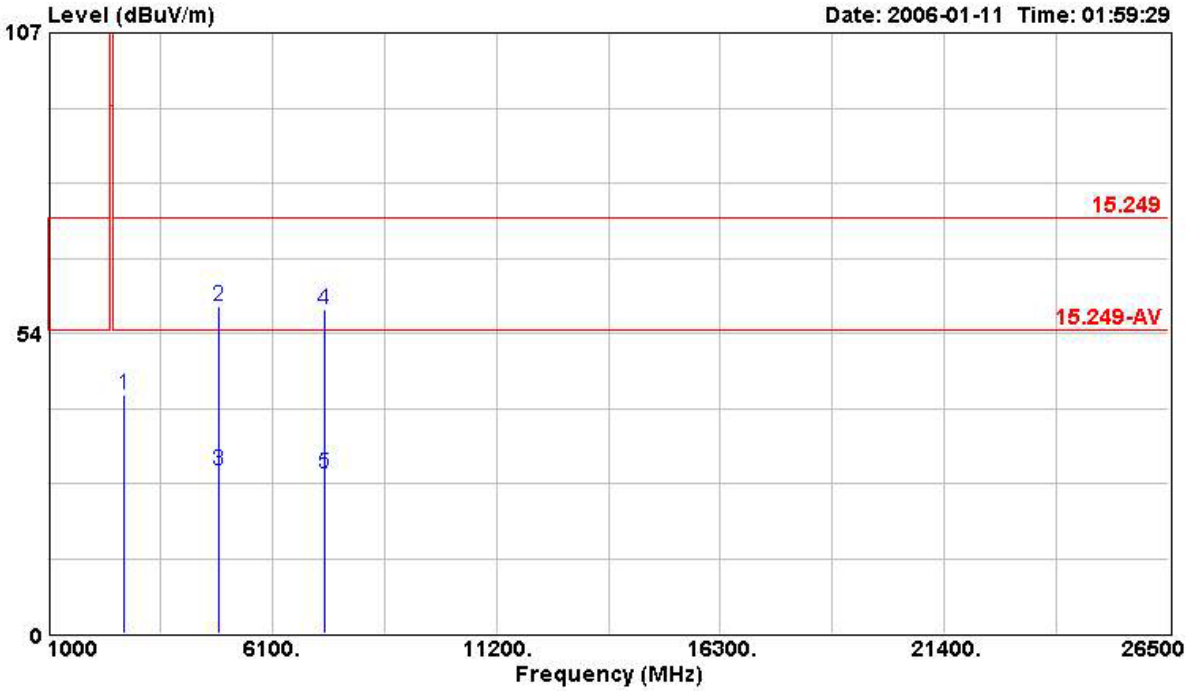
*Vertical*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2718.000 | 41.55 | -32.45 | 42.39 | 74.00 | 3.01 | 29.14 | 32.99 | Peak | --- | --- |
| 2 | 4804.000 | 57.76 | -16.24 | 52.98 | 74.00 | 4.22 | 33.10 | 32.54 | PEAK | --- | --- |
| 3 | 4804.000 | 28.39 | -25.61 | 23.62 | 54.00 | 4.22 | 33.10 | 32.54 | Average | --- | --- |
| 4 | 7204.000 | 61.00 | -13.00 | 52.14 | 74.00 | 5.31 | 35.90 | 32.35 | PEAK | --- | --- |

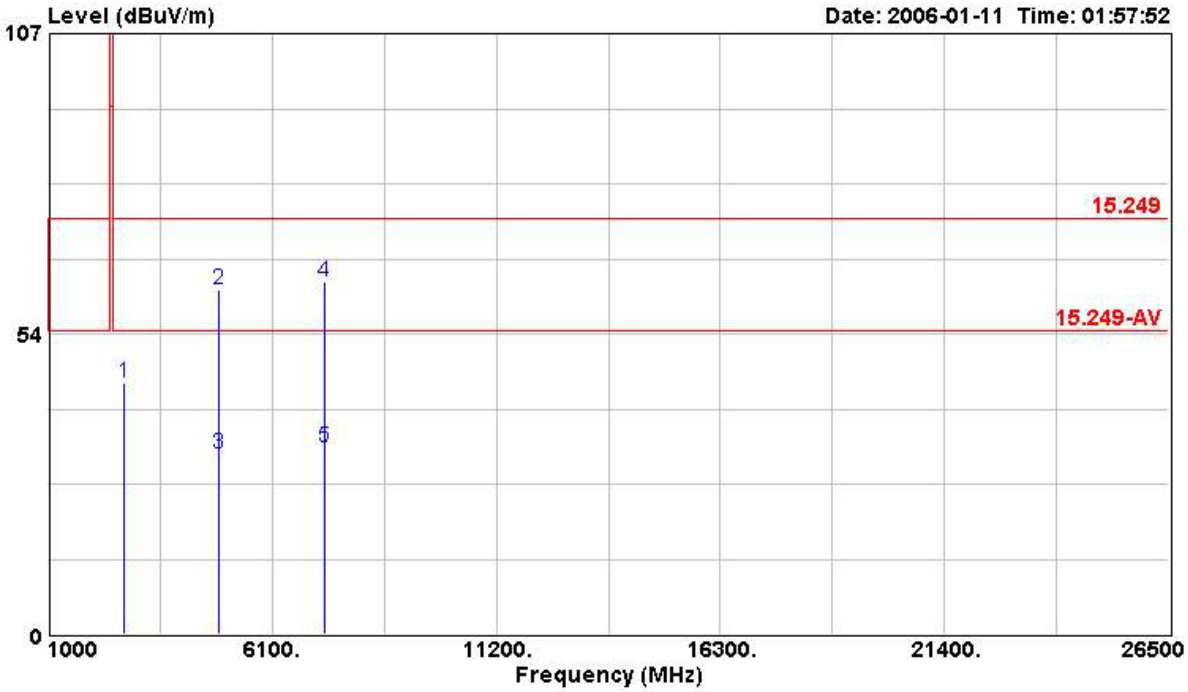
| Temperature | 25°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | 2435 MHz |

*Horizontal*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2718.000 | 42.67 | -31.33 | 43.51 | 74.00 | 3.01 | 29.14 | 32.99 | Peak | --- | --- |
| 2 | 4872.000 | 58.38 | -15.62 | 53.48 | 74.00 | 4.25 | 33.21 | 32.55 | PEAK | --- | --- |
| 3 | 4872.000 | 29.01 | -24.99 | 24.10 | 54.00 | 4.25 | 33.21 | 32.55 | Average | --- | --- |
| 4 | 7304.000 | 57.72 | -16.28 | 48.90 | 74.00 | 5.24 | 36.14 | 32.56 | PEAK | --- | --- |
| 5 | 7304.000 | 28.35 | -25.65 | 19.53 | 54.00 | 5.24 | 36.14 | 32.56 | Average | --- | --- |

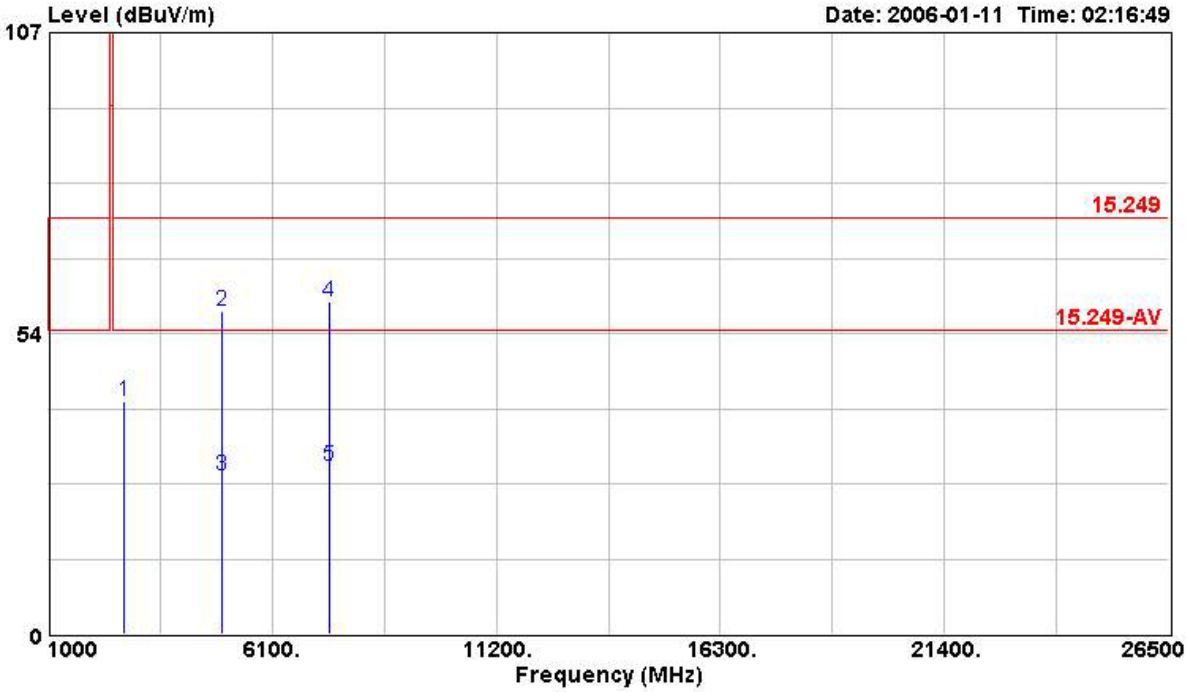
*Vertical*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2718.000 | 44.68 | -29.32 | 45.52 | 74.00 | 3.01 | 29.14 | 32.99 | Peak | --- | --- |
| 2 | 4872.000 | 61.38 | -12.62 | 56.48 | 74.00 | 4.25 | 33.21 | 32.55 | PEAK | --- | --- |
| 3 | 4872.000 | 32.01 | -21.99 | 27.10 | 54.00 | 4.25 | 33.21 | 32.55 | Average | --- | --- |
| 4 @ | 7304.000 | 62.69 | -11.31 | 53.87 | 74.00 | 5.24 | 36.14 | 32.56 | PEAK | --- | --- |
| 5 | 7304.000 | 33.32 | -20.68 | 24.50 | 54.00 | 5.24 | 36.14 | 32.56 | Average | --- | --- |

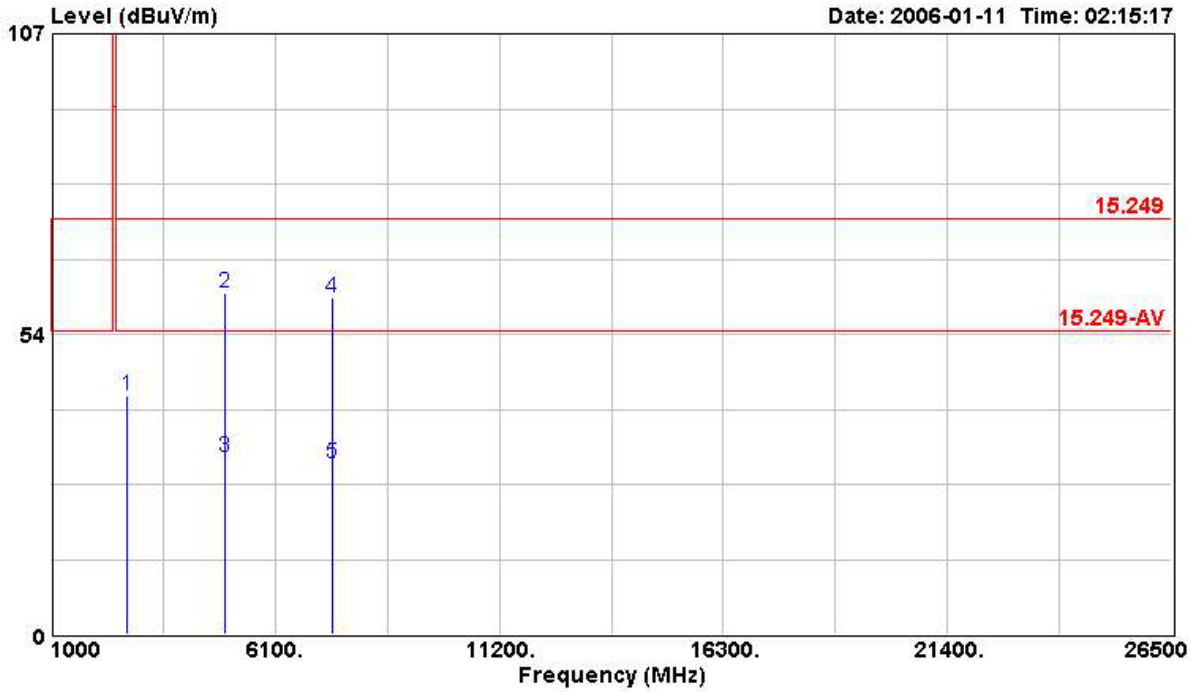
| Temperature | 25°C | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | 2470 MHz |

*Horizontal*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2718.000 | 41.43 | -32.57 | 42.27 | 74.00 | 3.01 | 29.14 | 32.99 | Peak | --- | --- |
| 2 | 4940.000 | 57.45 | -16.55 | 52.43 | 74.00 | 4.26 | 33.32 | 32.56 | PEAK | --- | --- |
| 3 | 4940.000 | 28.08 | -25.92 | 23.06 | 54.00 | 4.26 | 33.32 | 32.56 | Average | --- | --- |
| 4 | 7408.000 | 59.11 | -14.89 | 50.32 | 74.00 | 5.16 | 36.39 | 32.76 | PEAK | --- | --- |
| 5 | 7408.000 | 29.74 | -24.26 | 20.95 | 54.00 | 5.16 | 36.39 | 32.76 | Average | --- | --- |

*Vertical*




| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2718.000 | 42.48 | -31.52 | 43.32 | 74.00 | 3.01 | 29.14 | 32.99 | Peak | --- | --- |
| 2 | 4940.000 | 60.95 | -13.05 | 55.93 | 74.00 | 4.26 | 33.32 | 32.56 | PEAK | --- | --- |
| 3 | 4940.000 | 31.58 | -22.42 | 26.56 | 54.00 | 4.26 | 33.32 | 32.56 | Average | --- | --- |
| 4 | 7412.000 | 59.86 | -14.14 | 51.07 | 74.00 | 5.16 | 36.39 | 32.76 | PEAK | --- | --- |
| 5 | 7412.000 | 30.49 | -23.51 | 21.70 | 54.00 | 5.16 | 36.39 | 32.76 | Average | --- | --- |

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol.: V is Vertical Polarization ; H is Horizontal Polarization.

## 4.5. Band Edge Emissions Measurement

### 4.5.1. Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micorvolts/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 |

### 4.5.2. Measuring Instruments and Setting

Please refer to section 5 in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | 100 MHz |
| RB / VB (emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (other emission) | 100 KHz /100 KHz for Peak |

### 4.5.3. Test Procedures

1. The test procedure is the same as section 4.2.3, only the freqeuncy range investigated is limited to 2MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

### 4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.2.4.

### 4.5.5. Test Deviation

There is no deviation with the original standard.

### 4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 4.5.7. Test Result of Band Edge Emissions

| Temperature | 25℃ | Humidity | 56% |
|---|---|---|---|
| Test Engineer | Vic | Configurations | X axis |

***2402 MHz***

| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 1 | 2348.380 | 57.88 | -16.12 | 26.97 | 74.00 | 2.79 | 28.12 | 0.00 | Peak | --- | --- |
| 1 | 2348.380 | 28.51 | -25.49 | -2.40 | 54.00 | 2.79 | 28.12 | 0.00 | Average | --- | --- |

***2470 MHz***

| | Freq | Level | Over Limit | Read Level | Limit Line | Cable Loss | Antenna Factor | Preamp Factor | Remark | Table Pos | Ant Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV | dBuV/m | dB | dB/m | dB | | deg | cm |
| 2 | 2494.490 | 56.40 | -17.60 | 25.16 | 74.00 | 2.84 | 28.40 | 0.00 | Peak | --- | --- |
| 2 | 2494.490 | 27.03 | -26.97 | -4.21 | 54.00 | 2.84 | 28.40 | 0.00 | Average | --- | --- |

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Receiving maximum band edge emissions are Vertical Polarization / Horizontal Polarization.

## 4.6. Antenna Requirements

### 4.6.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### 4.6.2. Antenna Connector Construction

Please refer to section 3.2 in this test report, all antenna connectors comply with the requirements.

# 5. LIST OF MEASURING EQUIPMENTS

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 30 MHz - 1 GHz 3m | Jun. 16, 2005 | Radiation (03CH03-HY) |
| Amplifier | SCHAFFNER | CPA9231A | 3565 | 9 kHz - 2 GHz | Mar. 08, 2005 | Radiation (03CH03-HY) |
| Amplifier | Agilent | 8449B | 3008A02120 | 1 GHz - 26.5 GHz | May 31, 2005 | Radiation (03CH03-HY) |
| Spectrum Analyzer | R&S | FSP40 | 100004/040 | 9 kHZ - 40 GHz | Sep. 30, 2005 | Radiation (03CH03-HY) |
| Biconical Antenna | SCHWARZBECK | VHBB 9124 | 301 | 30 MHz - 200 MHz | Jul. 22, 2005 | Radiation (03CH03-HY) |
| Log Antenna | SCHWARZBECK | VUSLP 9111 | 221 | 200 MHz - 1 GHz | Jul. 22, 2005 | Radiation (03CH03-HY) |
| Horn Antenna | EMCO | 3115 | 6741 | 1 GHz - 18 GHz | Apr. 22, 2005 | Radiation (03CH03-HY) |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 30 MHz - 1 GHz | Feb. 22, 2005 | Radiation (03CH03-HY) |
| RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 1 GHz - 40 GHz | Dec.01, 2005 | Radiation (03CH03-HY) |
| Turn Table | HD | DS 420 | 420/650/00 | 0 - 360 degree | N/A | Radiation (03CH03-HY) |
| Antenna Mast | HD | MA 240 | 240/560/00 | 1 m - 4 m | N/A | Radiation (03CH03-HY) |
| Spectrum analyzer | R&S | FSP30 | 100023 | 9kHz ~ 30GHz | Nov. 26, 2005 | Conducted (TH01-HY) |
| Power meter | R&S | NRVS | 100444 | DC ~ 40GHz | Jul. 06, 2005 | Conducted (TH01-HY) |
| Power sensor | R&S | NRV-Z55 | 100049 | DC ~ 40GHz | Jul. 06, 2005 | Conducted (TH01-HY) |
| Power Sensor | R&S | NRV-Z32 | 100057 | 30MHz ~ 6GHz | Apr. 28, 2005 | Conducted (TH01-HY) |
| AC power source | HPC | HPA-500W | HPA-9100024 | AC 0 ~ 300V | Apr. 21, 2005 | Conducted (TH01-HY) |
| DC power source | G.W. | GPC-6030D | C671845 | DC 1V ~ 60V | Dec. 28, 2005 | Conducted (TH01-HY) |
| Temp. and Humidity Chamber | KSON | THS-C3L | 612 | N/A | Oct. 01, 2005 | Conducted (TH01-HY) |
| RF CABLE-1m | Jye Bao | RG142 | CB034-1m | 20MHz ~ 7GHz | Dec. 30, 2005 | Conducted (TH01-HY) |
| RF CABLE-2m | Jye Bao | RG142 | CB035-2m | 20MHz ~ 1GHz | Dec. 30, 2005 | Conducted (TH01-HY) |
| Oscilloscope | Tektronix | TDS1012 | CO38515 | 100MHz / 1GS/s | Apr. 15, 2005 | Conducted (TH01-HY) |
| Signal Generator | R&S | SMR40 | 100116 | 10MHz ~ 40GHz | Dec. 30, 2005 | Conducted (TH01-HY) |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Loop Antenna | R&S | HFH2-Z2 | 860004/001 | 9 kHz - 30 MHz | May 24, 2004* | Radiation (03CH03-HY) |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 15 GHz - 40 GHz | Jun. 09, 2004* | Radiation (03CH03-HY) |
| Data Generator | Tektronix | DG2030 | 063-2920-50 | 0.1Hz~400MHz | Jun. 02, 2005 | Conducted (TH01-HY) |

Note: Calibration Interval of instruments listed above is two year.

# 6. SPORTON COMPANY PROFILE

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test familial apart from ERSO. In 1988, one 3M and 10M/3M open area test site were setup and also obtained official accreditation from FCC, VCCI and NEMKO. In 1993, a Safety laboratory was founded and obtained accreditation from UL of USA, CSA of Canada and TUV (Rhineland & PS) of Germany. In 1995, one EMC lab, including EMI and EMS test facilities was setup. In 1997, SPORTON Group has provided financial expense to relocate the headquarter to Orient Scientific Park in Taipei Hsien to offer more comprehensive, more qualified and better service to local suppliers and manufactures. In 1999, Safety Group and Component Group were setup. In 2001, SPORTON has established 3M/10M chamber in Hwa Ya Technology Park.

## 6.1. Test Location

| | | |
|---|---|---|
| SHIJR | ADD | : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. |
| | TEL | : 02-2696-2468 |
| | FAX | : 02-2696-2255 |
| HWA YA | ADD | : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. |
| | TEL | : 03-327-3456 |
| | FAX | : 03-318-0055 |
| LINKOU | ADD | : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C |
| | TEL | : 02-2601-1640 |
| | FAX | : 02-2601-1695 |
| DUNGHU | ADD | : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. |
| | TEL | : 02-2631-4739 |
| | FAX | : 02-2631-9740 |
| JUNGHE | ADD | : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. |
| | TEL | : 02-8227-2020 |
| | FAX | : 02-8227-2626 |
| NEIHU | ADD | : 4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C. |
| | TEL | : 02-2794-8886 |
| | FAX | : 02-2794-9777 |
| JHUBEI | ADD | : No.8, Lane 728, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C. |
| | TEL | : 03-656-9065 |
| | FAX | : 03-656-9085 |

# 7. NVLAP CERTIFICATE OF ACCREDITATION

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

## Certificate of Accreditation to ISO/IEC 17025:1999

**NVLAP LAB CODE: 200079-0**

**Sporton International, Inc. Hwa Ya EMC Laboratory**
Tao Yuan Hsien 333
TAIWAN

*is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in NIST Handbook 150:2001 and all requirements of ISO/IEC 17025:1999.*
*Accreditation is granted for specific services, listed on the Scope of Accreditation, for:*

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

2006-01-01 through 2006-12-31
*Effective dates*

*For the National Institute of Standards and Technology*

# Appendix B. Test Photos

# 1. Photographs of Radiated Emissions Test Configuration

FRONT VIEW

REAR VIEW