

FCC Part 15  
EMI TEST REPORT  
of

E.U.T. : Wireless Video Transmitter  
MODEL : CRSKV2.4  
FCC ID. : OZB-CRSKV24

for

APPLICANT : CRS ELECTRONIC CO., LTD.  
ADDRESS : 12F, NO. 100, SEC. 1, HSIN TAI WU ROAD,  
HSICHI, TAIPEI HSIEN, TAIWAN, R.O.C.

Test Performed by

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Report Number : ET89R-03-070-01

# TEST REPORT CERTIFICATION

Applicant : CRS ELECTRONIC CO., LTD.  
12F, NO. 100, SEC. 1, HSIN TAI WU ROAD, HSICHI, TAIPEI HSIEN,  
TAIWAN, R.O.C.

Manufacturer : CRS ELECTRONIC CO., LTD.  
12F, NO. 100, SEC. 1, HSIN TAI WU ROAD, HSICHI, TAIPEI HSIEN,  
TAIWAN, R.O.C.

Description of EUT :  
a) Type of EUT : Wireless Video Transmitter  
b) Trade Name : CRS/TRENDMASTERS/BANDAI  
c) Model No. : CRSKV2.4  
d) Power Supply : DC 9V  
e) Working Frequency: 2400-2483 MHz

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C(1998)

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.  
2. The testing report shall not be reproduced expect in full, without the written approval of ETC.

Issued Date : APR. 25, 2000

Test Engineer : Tien Lu Liau  
( Tien Lu Liau )

Approve & Authorized Signer : Will Yauo  
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## 1 GENERAL INFORMATION

### 1.1 Product Description

- a) Type of EUT : Wireless Video Transmitter
- b) Trade Name : CRS/TRENDMASTERS/BANDAI
- c) Model No. : CRSKV2.4
- d) Power Supply : DC 9V

### 1.2 Characteristics of Device

Wireless Video Transmitter, using FM method for Audio/Video signal modulation. It has better signal to noise ratio than Amplitude Modulation. There are 2 channels relative to the following frequencies : CH 1 : 2432 MHz & CH 2 : 2462 MHz, this device is used for surveying environment situation or similar applications of Audio and Video signals transmission.

### 1.3 Modist List

The Side of RF Module use conductive copper tapes of improve grounding effect.

### 1.4 Test Methodology

For Wireless Video Transmitter, both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.4(1992). Other required measurements were illustrated in separate sections of this test report for details.

### 1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10 , 2000.

## 2 PROVISIONS APPLICABLE

### 2.1 Definition

**Unintentional radiator:**

A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

**Class A Digital Device:**

A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

**Class B Digital Device :**

A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business or industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

**Intentional radiator:**

A device that intentionally generates and emits radio frequency energy by radiation or induction.

## 2.2 Requirement for Compliance

### (1) Conducted Emission Requirement

For unintentional device, according to §15.107(a) Line Conducted Emission Limits is as following:

| Frequency<br>MHz | Emissions<br>•V | Emissions<br>dB•V |
|------------------|-----------------|-------------------|
| 0.45 - 30.0      | 250             | 48.0              |

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

### (2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency<br>MHz | Distance<br>Meters | Radiated<br>dB•V/m | Radiated<br>•V/m |
|------------------|--------------------|--------------------|------------------|
| 30 - 88          | 3                  | 40.0               | 100              |
| 88 - 216         | 3                  | 43.5               | 150              |
| 216 - 960        | 3                  | 46.0               | 200              |
| above 960        | 3                  | 54.0               | 500              |

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

For intentional radiator device, per §15.249(a), the field strength of emissions shall comply with the following :

| <b>Frequency<br/>MHz</b> | <b>Distance<br/>Meters</b> | <b>Fundamental</b> |             | <b>Harmonic</b> |             |
|--------------------------|----------------------------|--------------------|-------------|-----------------|-------------|
|                          |                            | <b>dB•V/m</b>      | <b>mV/m</b> | <b>dB•V/m</b>   | <b>•V/m</b> |
| 902 - 928                | 3                          | 94                 | 50          | 54              | 500         |
| 2400 - 2483.5            | 3                          | 94                 | 50          | 54              | 500         |
| 5725 - 5875              | 3                          | 94                 | 50          | 54              | 500         |
| 24000 - 24250            | 3                          | 108                | 250         | 68              | 2500        |

In accordance with §15.249(d), limits shown in above table are based on average limits for frequencies above 1000 MHz, and frequencies below 1000 MHz are based on quasi peak. However, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20 dB.

### **(3) Spurious in Out Band Requirement**

For intentional device, according to §15.249 (c), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits in §15.209.

### **(4) Antenna Requirement**

For intentional device, according to §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.

## 2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

| MHz               | MHz                   | MHz           | GHz         |
|-------------------|-----------------------|---------------|-------------|
| 0.090 - 0.110     | 16.42-16.423          | 399.9-410     | 4.5-5.25    |
| 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           | 2655-2900     | 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             | 3360-4400     | Above 38.6  |
| 13.36-13.41       |                       |               |             |

\*\* : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

## 2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## 2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

### 3 SYSTEM TEST CONFIGURATION

#### 3.1 Justification

All measurement were intentional to maximum the emissions from EUT by varying the connection cables, therefore, the test result is sure to meet the applicable requirement.

#### 3.2 Devices for Tested System

| Device                      | Manufacture              | Model / FCC ID.         | Description |
|-----------------------------|--------------------------|-------------------------|-------------|
| Wireless Video Transmitter* | CRS ELECTRONIC CO., LTD. | CRSKV2.4<br>OZB-CRSKV24 | ----        |

Remark “\*” means equipment under test.

## 4 RADIATED EMISSION MEASUREMENT

### 4.1 Applicable Standard

For intentional radiators, according to §15.249 (a), operation within the frequency band of 2.4 to 2.4835 GHz, the fundamental field strength shall not exceed 94 dBuV/m and the harmonics shall not exceed 54 dBuV/m. For out band emission except for harmonics shall be comply with §15.209 or at least attenuated by 50 dB below the level of the fundamental.

### 4.2 Measurement Procedure

1. Setup the configuration per figure 5 and 6 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

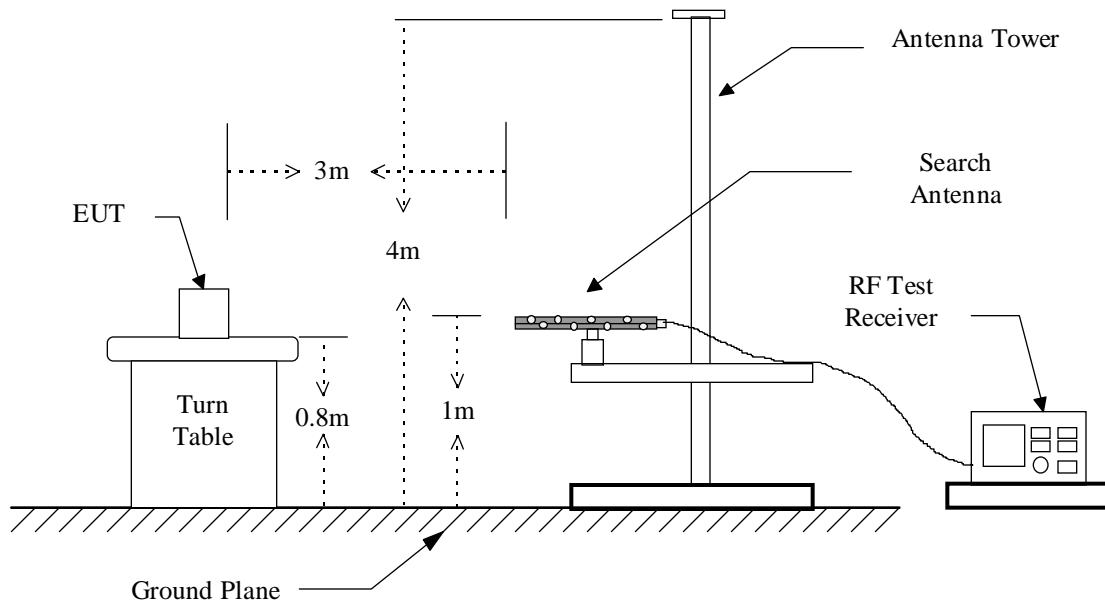
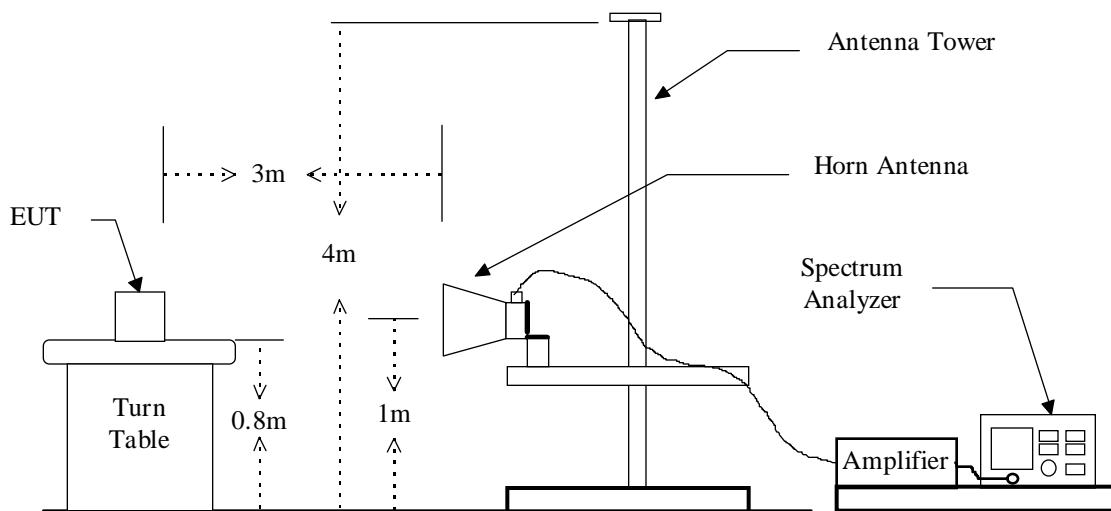


Figure 2 : Frequencies measured above 1 GHz configuration



### 4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

| Equipment                  | Manufacturer    | Model No. | Next Cal. Date |
|----------------------------|-----------------|-----------|----------------|
| Spectrum Analyzer          | Hewlett-Packard | 8568B     | 01/05/2001     |
| Pre-selector               | Hewlett-Packard | 85685A    | 01/10/2001     |
| Quasi Peak Detector        | Hewlett-Packard | 85650A    | 01/10/2001     |
| RF Test Receiver           | Rohde & Schwarz | ESVS 30   | 01/18/2001     |
| RF Test Receiver           | Rohde & Schwarz | ESBI      | 10/01/2000     |
| Log periodic Antenna       | EMCO            | 3146      | 11/03/2000     |
| Biconical Antenna          | EMCO            | 3110B     | 11/03/2000     |
| Horn Antenna               | EMCO            | 3115      | 05/11/2000     |
| Preamplifier               | Hewlett-Packard | 8449B     | 06/21/2000     |
| Preamplifier               | Hewlett-Packard | 8447D     | 09/19/2000     |
| Micro Wave EMI Test System | Hewlett-Packard | 84125C    | 01/25/2001     |

Measuring instrument setup in measured frequency band when specified detector function is used :

| Frequency Band (MHz) | Instrument        | Function   | Resolution bandwidth | Video Bandwidth |
|----------------------|-------------------|------------|----------------------|-----------------|
| 30 to 1000           | RF Test Receiver  | Quasi-Peak | 120 kHz              | N/A             |
|                      | Spectrum Analyzer | Peak       | 100 kHz              | 100 kHz         |
| Above 1000           | Spectrum Analyzer | Peak       | 1 MHz                | 1 MHz           |
|                      | Spectrum Analyzer | Average    | 1 MHz                | 300 Hz          |

## 4.4 Radiated Emission Data

### 4.4.1 Tx Portion

#### A. CH 1

Operation Mode : Transmitting

Fundamental Frequency : 2432 MHz

Test Date : APR. 01, 2000      Temperature : 20 °      Humidity : 70 %

| Frequency<br>(MHz) | Reading (dBuV) |      |      |      | Factor<br>(dB)<br>Corr. | Result @3m<br>(dBuV/m) |      | Limit @3m<br>(dBuV/m) |      | Margin<br>(dB) | Table<br>Deg.<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|----------------|------|------|------|-------------------------|------------------------|------|-----------------------|------|----------------|-------------------------|---------------------|
|                    | H              |      | V    |      |                         | Peak                   | Ave  | Peak                  | Ave  |                |                         |                     |
| 2432.430           | 71.0           | 70.4 | 69.6 | 67.6 | -3.0                    | 68.0                   | 67.4 | 94.0                  | 74.0 | -6.0           | 180                     | 1.50                |
| 4864.860           | 54.9           | 49.5 | 54.9 | 49.4 | 2.7                     | 57.6                   | 52.2 | 74.0                  | 54.0 | -1.8           | 90                      | 1.50                |
| 7297.290           | ---            | ---  | ---  | ---  | 5.9                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 9729.720           | ---            | ---  | ---  | ---  | 7.3                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 12162.150          | ---            | ---  | ---  | ---  | 9.3                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 14594.580          | ---            | ---  | ---  | ---  | 11.6                    | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 17027.010          | ---            | ---  | ---  | ---  | 12.9                    | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 19459.440          | ---            | ---  | ---  | ---  | 8.6                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 21891.870          | ---            | ---  | ---  | ---  | 9.9                     | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 24324.300          | ---            | ---  | ---  | ---  | 10.6                    | ---                    | ---  | 74.0                  | 54.0 | ---            | ---                     | ---                 |

Note :

1. Item of margin shown in above table refer to average limit.
2. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark “\*\*\*” means that Peak result is meet average limit.
3. Remark “---” means that the emissions level is too low to be measured.
4. Item “Margin” referred to Average limit while there is only peak result.

## B. CH 2

Operation Mode : Transmitting

Fundamental Frequency : 2462 MHz

Test Date : APR. 01, 2000      Temperature : 22 •      Humidity : 70 %

| Frequency<br>(MHz) | Reading (dBuV) |        |        |        | Factor<br>(dB)<br>Corr. | Result @3m<br>(dBuV/m) |        | Limit @3m<br>(dBuV/m) |      | Margin<br>(dB) | Table<br>Deg.<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|----------------|--------|--------|--------|-------------------------|------------------------|--------|-----------------------|------|----------------|-------------------------|---------------------|
|                    | H              |        | V      |        |                         | Peak                   | Ave    | Peak                  | Ave  |                |                         |                     |
| 2461.630 •         | 74.9 •         | 73.5 • | 68.0 • | 66.5 • | -2.8 •                  | 72.1 •                 | 70.7 • | 94.0                  | 74.0 | -3.3           | 180                     | 1.50                |
| 4923.260 •         | 55.2 •         | 49.4 • | 52.0 • | 45.8 • | 2.8 •                   | 58.0 •                 | 52.2 • | 74.0                  | 54.0 | -1.8           | 90                      | 1.50                |
| 7384.890 •         | ---            | ---    | ---    | ---    | 6.0 •                   | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 9846.520 •         | ---            | ---    | ---    | ---    | 7.3 •                   | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 12308.150 •        | ---            | ---    | ---    | ---    | 9.3 •                   | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 14769.780 •        | ---            | ---    | ---    | ---    | 11.5 •                  | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 17231.410 •        | ---            | ---    | ---    | ---    | 14.3 •                  | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 19693.040 •        | ---            | ---    | ---    | ---    | 8.5 •                   | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 22154.670 •        | ---            | ---    | ---    | ---    | 10.0 •                  | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |
| 24616.300 •        | ---            | ---    | ---    | ---    | 10.9 •                  | ---                    | ---    | 74.0                  | 54.0 | ---            | ---                     | ---                 |

Note :

1. Item of margin shown in above table refer to average limit.
2. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark “\*\*\*” means that Peak result is meet average limit.
3. Remark “---” means that the emissions level is too low to be measured.
4. Item “Margin” referred to Average limit while there is only peak result.

#### 4.4.2 Other Emissions

Operation Mode : Transmitting

Test Date : APR. 01, 2000 Temperature : 22 • Humidity: 70 %

| Frequency<br>(MHz) | Ant-Pol<br>H/V | Meter<br>Reading<br>(dBuV) | Corrected<br>Factor<br>(dB) | Result @3m<br>(dBuV/m) | Limit @3m<br>(dBuV/m) | Margin<br>(dB) | Table<br>Degree<br>(Deg.) | Ant.<br>High<br>(m) |
|--------------------|----------------|----------------------------|-----------------------------|------------------------|-----------------------|----------------|---------------------------|---------------------|
| 30.000 •           | H/V •          | ---                        | -9.8 •                      | ---                    | 40.0 •                | ---            | ---                       | ---                 |
| 50.000 •           | H/V •          | ---                        | -14.1 •                     | ---                    | 40.0 •                | ---            | ---                       | ---                 |
| 80.000 •           | H/V •          | ---                        | -15.0 •                     | ---                    | 40.0 •                | ---            | ---                       | ---                 |
| 150.000 •          | H/V •          | ---                        | -10.0 •                     | ---                    | 43.5 •                | ---            | ---                       | ---                 |
| 250.000 •          | H/V •          | ---                        | -3.9 •                      | ---                    | 46.0 •                | ---            | ---                       | ---                 |
| 350.000 •          | H/V •          | ---                        | -10.5 •                     | ---                    | 46.0 •                | ---            | ---                       | ---                 |

#### 4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

where Corrected Factor

$$= \text{Antenna FACTOR} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

#### 4.6 Photos of Radiation Measuring Setup

**Please see setup photos in Exhibit F.**

## 5 CONDUCTED EMISSION MEASUREMENT

### 5.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

## 6 ANTENNA REQUIREMENT

### 6.1 Standard Applicable

According to §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.

### 6.2 Antenna Construction

The antenna is permanently mounted on RF box, no consideration of replacement.

## 7 BAND EDGES MEASUREMENT

### 7.1 Standard Applicable

According to 15.249(c), out band emission except for harmonics shall be comply with §15.209 or at least attenuated by 50 dB below the level of the fundamental.

### 7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
4. Repeat above procedures until all measured frequencies were complete.

### 7.3 Measurement Equipment

| Equipment         | Manufacturer    | Model No. | Next Cal. Date |
|-------------------|-----------------|-----------|----------------|
| Spectrum Analyzer | AdvanTEST       | R3271     | 09/09/2000     |
| Plotter           | Hewlett-Packard | 7440A     | N/A            |

### 7.4 Measurement Data

*Note : Please see appendix 1 for Plotted Data*

**APPENDIX 1 : PLOTTED DATA FOR BAND EDGES EMISSION**

