

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT PRIAVTE  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT**

*OF*

**Wireless Mouse & Receiver**

**Model No.: HM-001**

**Brand Name: Best Wise**

**FCC ID: Q4T-16177123**

**Report No: 030056-R-ID**

**Issue Date: June 10, 2003**

*Prepared for*

**BESTWISE GLOBAL Limited**  
7F, No. 15, Sec. 2, Tiding Boulevard, NeiHu,  
Taipei, Taiwan, R.O.C.

*Prepared by*

**C&C LABORATORY, CO., LTD.**  
No. 81-1, Lane 210, Bade Rd. 2,  
Luchu Hsiang, Taoyuan Hsien, Taiwan.



TEL: 886-3-3240332

FAX: 886-3-3245235

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C&C Laboratory, Co., Ltd.**

## VERIFICATION OF COMPLIANCE

|                             |   |
|-----------------------------|---|
| <b>Applicant:</b>           | BESTWISE GLOBAL Limited<br>7F, No. 15, Sec. 2, Tiding Boulevard, NeiHu,<br>Taipei, Taiwan, R.O.C. |
| <b>Product Description:</b> | Wireless Mouse & Receiver   |
| <b>Brand Name:</b>          | Best Wise   |
| <b>Model No.:</b>           | HM-001  |
| <b>Serial Number:</b>       | N/A   |
| <b>File Number:</b>         | 030056-R-ID   |
| <b>Date of Test:</b>        | Apr. 30, 2003   |

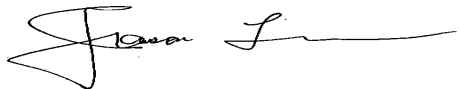
### We hereby certify that:

The above equipment was tested by C&C Laboratory Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (1992) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.227.

The test results of this report relate only to the tested sample identified in this report.

*Approved By*

*Review By*



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*Jonson Lee / Director*

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*Susan Su / Section Manager*

C&C Laboratory Co., Ltd.

C&C Laboratory Co., Ltd.

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## 1. GENERAL INFORMATION

### 1.1 Product Description

The BESTWISE GLOBAL Limited Model: HM-001 (referred to as the EUT in this report) is a short range, lower power, Wireless Mouse & Receiver designed as an " Input Device". It is designed by way of utilizing the FSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 27.045 MHz, one channel.
- B). Modulation: Frequency Shifting Key (FSK) Modulation
- C). Antenna Designation: A permanent fixed antenna, which is built-In, designed as an indispensable part of the EUT.
- D). Power Supply: 3 Vdc by AAA \*2 battery.

### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: Q4T-16177123 filing to comply with Section 15.227 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a DoC procedure.

### 1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance 3 meters.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of C&C Laboratory, Co., Ltd. No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R.O.C.. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 1992 and CISPR 22/EN 55022 requirements.

### 1.5 Special Accessories

Not available for this EUT intended for grant.

### 1.6 Equipment Modifications

Not available for this EUT intended for grant.

## **2. System Test Configuration**

### **2.1 EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### **2.2 EUT Exercise**

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

### **2.3 Test Procedure**

#### **2.3.1 Conducted Emissions (Not apply in the report)**

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

#### **2.3.2 Radiated Emissions**

The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

## 2.4 Limitation

### (1) Conducted Emission (Not applicable in this report)

According to section 15.207(a) Conducted Emission Limits is as following.

| Frequency range<br>MHz  | Limits<br>dB(uV) |          |
|---|------------------|----------|
|   | Quasi-peak       | Average  |
| 0.15 to 0.50  | 66 to 56         | 56 to 46 |
| 0.50 to 5   | 56               | 46       |
| 5 to 30   | 60               | 50       |
| Note  |                  |          |
| 1.The lower limit shall apply at the transition frequencies   |                  |          |
| 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. |                  |          |

### (2) Radiated Emission

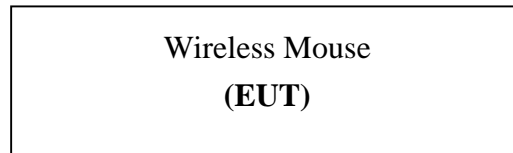
- The field strength of any emission within this band (section 15.227 frequency between 26.96MHz -27.28MHz) shall not exceed 10000 micro volts/meter at 3 meters. (80dB $\mu$ V at 3m) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.
- The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209(Intentional Radiators general limit).as below.

| Frequency<br>(MHz) | Field strength<br>$\mu$ V/m | Distance(m) | Field strength at 3m<br>dB $\mu$ V/m |
|--------------------|-----------------------------|-------------|--------------------------------------|
| 1.705-30           | 30                          | 30          | 69.54                                |
| 30-88              | 100                         | 3           | 40                                   |
| 88-216             | 150                         | 3           | 43.5                                 |
| 216-960            | 200                         | 3           | 46                                   |
| Above 960          | 500                         | 3           | 54                                   |

- Remark:
- Emission level in dBuV/m=20 log (uV/m)
  - Measurement was performed at an antenna to the closed point of EUT distance of 3 meters.
  - Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205
  - Emission spurious frequency which appearing within the Restricted Bands specified in provision of §15.205, then the general radiated emission limits in § 15.209 apply.

## 2.5 Configuration of Tested System

**Fig. 2-1 Configuration of Tested System**



**Table 2-1 Equipment Used in Tested System**

| Item | Equipment | Mfr/Brand | Model/Type No. | FCC ID | Series No. | Remark |
|------|-----------|-----------|----------------|--------|------------|--------|
|      | N/A       | N/A       | N/A            | N/A    | N/A        | N/A    |

*Note: Unless otherwise denoted as EUT in "Remark" column, device(s) used in tested system is a support equipment.*

### 3. Summary Of Test Results

| FCC Rules | Description Of Test | Result    |
|-----------|---------------------|-----------|
| § 15.207  | Conducted Emission  | N/A       |
| § 15.227  | Radiated Emission   | Compliant |
| § 15.227  | 26 dB Bandwidth     | Compliant |

### 4. Description of test modes

The EUT (Wireless Mouse) has been tested under normal operating condition.

The EUT stay in continuous transmitting mode. The Frequency 27.045MHz are chosen for testing.



## 5. Conducted Emissions Test

(Not applicable in this report)

### 5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### 5.2 Test SET-UP (Block Diagram of Configuration)

N/A

### 5.3 Measurement Equipment Used:

| Conducted Emission Test Site # 3 |      |              |               |            |            |
|----------------------------------|------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE                   | MFR  | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| EMI Test Receiver                | R&S  | ESCS30       | 847793/012    | 12/21/2002 | 12/20/2003 |
| LISN                             | R&S  | ESH2-Z5      | 843285/010    | 12/16/2002 | 12/15/2003 |
| LISN                             | EMCO | 3825/2       | 9003-1628     | 07/26/2002 | 07/25/2003 |

### 5.4 Measurement Result:

N/A

### 5.5 Conducted Measurement Photos:

N/A

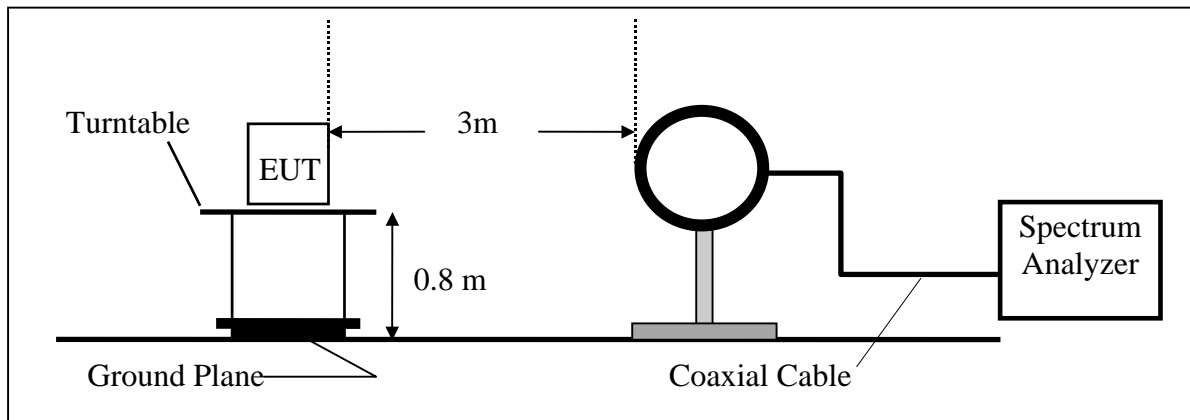
## **6. Radiated Emission Test**

### **6.1 Measurement Procedure**

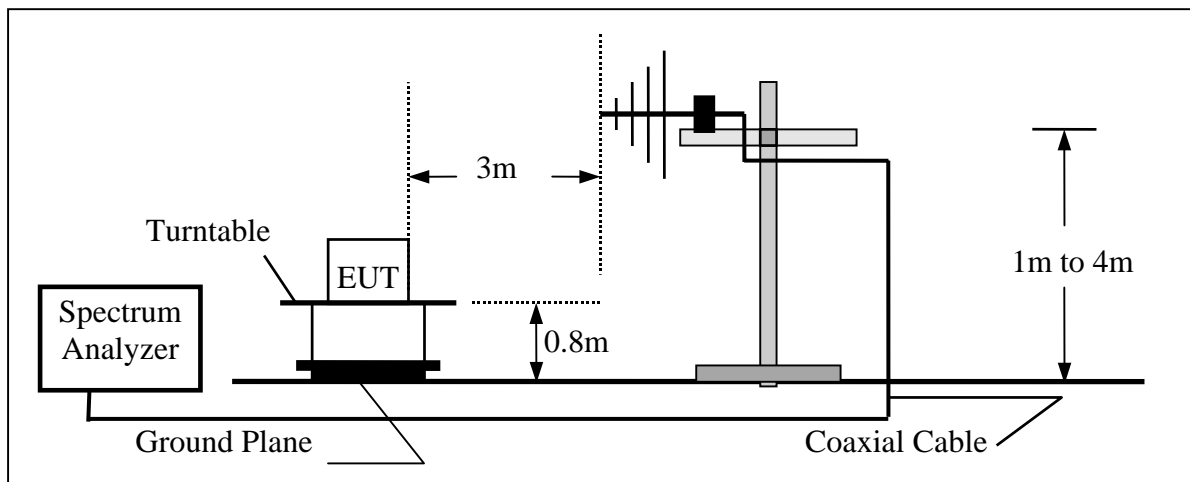
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

## 6.2 Test SET-UP (Block Diagram of Configuration)

### (A) Radiated Emission Test Set-Up, Frequency Below 30MHz



### (B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



### 6.3 Measurement Equipment Used:

| Open Area Test Site # 3 |            |              |               |            |            |
|-------------------------|------------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE          | MFR        | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer       | ADVANTEST  | R3261A       | N/A           | N/A        | N/A        |
| EMI Test Receiver       | R&S        | ESVS20       | 838804/004    | 01/09/2003 | 01/08/2004 |
| Pre-Amplifier           | HP         | 8447D        | 2944A09173    | 03/03/2003 | 03/02/2004 |
| Bilog Antenna           | SCHWAZBECK | VULB9163     | 145           | 07/06/2002 | 07/05/2003 |
| Turn Table              | EMCO       | 2081-1.21    | 9709-1885     | N.C.R      | N.C.R      |
| Antenna Tower           | EMCO       | 2075-2       | 9707-2060     | N.C.R      | N.C.R      |
| Controller              | EMCO       | 2090         | 9709-1256     | N.C.R      | N.C.R      |
| RF Switch               | ANRITSU    | MP59B        | M53867        | N.C.R      | N.C.R      |
| Site NSA                | C&C        | N/A          | N/A           | 09/07/2002 | 09/06/2003 |
| Loop Antenna            | ARA        | PLA-1030/B   | 1027          | 01/21/2003 | 01/20/2004 |

### 6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

|       |                        |  |
|-------|------------------------|--|
| Where | FS = Field Strength    | CL = Cable Attenuation Factor (Cable Loss) |
|       | RA = Reading Amplitude | AG = Amplifier Gain                        |
|       | AF = Antenna Factor    |  |

## 6.5 Measurement Result

|                        |                   |           |     |            |               |
|------------------------|-------------------|-----------|-----|------------|---------------|
| Operation Mode:        | Transmitting Mode |           |     | Test Date: | Apr. 30, 2003 |
| Fundamental Frequency: | 27.045 MHz        |           |     | Test By:   | Jim           |
| Temperature:           | 26°C              | Humidity: | 68% | Pol:       | Vertical      |

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | DetectorMode<br>(PK/AV) | Reading<br>(dBuV) | Ant./CL/<br>Amp. CF(dB) | Actual FS<br>(dBuV/m) | Limit3m<br>(dBuV/m) | Safe Margin<br>(dB) | Note |
|----------------|-----------------|-------------------------|-------------------|-------------------------|-----------------------|---------------------|---------------------|------|
| 27.048         | V               | Peak                    | 36.14             | 4.12                    | 40.26                 | 80.00               | -39.74              | F    |
| 40.260         | V               | Peak                    | 20.88             | 14.62                   | 35.50                 | 40.00               | -4.50               | H    |
| 54.300         | V               | Peak                    | 15.34             | 14.61                   | 29.95                 | 40.00               | -10.05              | H    |
| 67.800         | V               | Peak                    | 18.08             | 10.86                   | 28.94                 | 40.00               | -11.06              | H    |
| 81.300         | V               | Peak                    | 24.90             | 9.85                    | 34.75                 | 40.00               | -5.25               | H    |
| 94.300         | V               | Peak                    | 10.26             | 13.07                   | 23.33                 | 43.50               | -20.17              | H    |
| 108.300        | V               | Peak                    | 12.54             | 13.07                   | 25.61                 | 43.50               | -17.89              | H    |
| 121.800        | V               | Peak                    | 12.62             | 11.51                   | 24.13                 | 43.50               | -19.37              | H    |
| 135.300        | V               | Peak                    | 10.28             | 11.03                   | 21.31                 | 43.50               | -22.19              | H    |
| 148.800        | V               | Peak                    | 17.76             | 11.09                   | 28.85                 | 43.50               | -14.65              | H    |
| 162.300        | V               | Peak                    | 24.19             | 11.56                   | 35.75                 | 43.50               | -7.75               | H    |
| 175.800        | V               | Peak                    | 25.23             | 12.60                   | 37.83                 | 43.50               | -5.67               | H    |
| 189.300        | V               | Peak                    | 16.14             | 13.86                   | 30.00                 | 43.50               | -13.50              | H    |

Note:

- (1) Measuring frequencies from 25 MHz to the 1GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

## 6.6 Measurement Result

|                        |                   |           |            |               |            |
|------------------------|-------------------|-----------|------------|---------------|------------|
| Operation Mode:        | Transmitting Mode |           | Test Date: | Apr. 30, 2003 |            |
| Fundamental Frequency: | 27.045 MHz        |           | Test By:   | Jim           |            |
| Temperature:           | 26°C              | Humidity: | 68%        | Pol:          | Horizontal |

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | DetectorMode<br>(PK/AV) | Reading<br>(dBuV) | Ant./CL/<br>Amp. CF(dB) | Actual FS<br>(dBuV/m) | Limit3m<br>(dBuV/m) | Safe Margin<br>(dB) | Note |
|----------------|-----------------|-------------------------|-------------------|-------------------------|-----------------------|---------------------|---------------------|------|
| 27.048         | H               | Peak                    | 42.32             | 4.12                    | 46.44                 | 80.00               | -33.56              | F    |
| 32.160         | H               | Peak                    | 20.11             | 12.97                   | 33.08                 | 40.00               | -6.92               | H    |
| 40.260         | H               | Peak                    | 17.83             | 14.62                   | 32.45                 | 40.00               | -7.55               | H    |
| 54.300         | H               | Peak                    | 22.73             | 14.61                   | 37.34                 | 40.00               | -2.66               | H    |
| 67.800         | H               | Peak                    | 25.50             | 10.86                   | 36.36                 | 40.00               | -3.64               | H    |
| 81.300         | H               | Peak                    | 27.00             | 9.85                    | 36.85                 | 40.00               | -3.15               | H    |
| 94.800         | H               | Peak                    | 20.21             | 13.07                   | 33.28                 | 43.50               | -10.22              | H    |
| 108.300        | H               | Peak                    | 19.08             | 13.07                   | 32.15                 | 43.50               | -11.35              | H    |
| 148.800        | H               | Peak                    | 19.04             | 11.09                   | 30.13                 | 43.50               | -13.37              | H    |
| 162.300        | H               | Peak                    | 23.26             | 11.56                   | 34.82                 | 43.50               | -8.68               | H    |
| 175.800        | H               | Peak                    | 26.28             | 12.60                   | 38.88                 | 43.50               | -4.62               | H    |
| 189.300        | H               | Peak                    | 18.90             | 13.86                   | 32.76                 | 43.50               | -10.74              | H    |

Note:

- (1) Measuring frequencies from 25 MHz to the 1GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

## **7. Occupied Bandwidth**

### **7.1 Measurement Procedure**

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW,VBW= 10KHz, Span =100KHz.
4. Set SPA Max hold. Mark peak, -26dB.

### **7.2 Test SET-UP (Block Diagram of Configuration)**

Same as 4.2 Radiated Emission Measurement.

### **7.3 Measurement Equipment Used:**

Same as 4.2 Radiated Emission Measurement.

### **7.4 Measurement Results:**

26dB bandwidth = 32.500 kHz

Refer to attached data chart.

## 26dB Band Width Test Data

