# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CLASS B CERTIFICATION

| | |
|---|---|
| **Test report file number** | **: E028R-053** |
| **Applicant** | **: KTEC CO., LTD.** |
| **Address** | **: 186-3 Weonjong-Dong, Ojeong-Gu, Pucheon-City, Kyungki-Do, 421-200, Korea** |
| **Manufacturer** | **: KTEC CO., LTD.** |
| **Address** | **: 186-3 Weonjong-Dong, Ojeong-Gu, Pucheon-City, Kyungki-Do, 421-200, Korea** |
| **Type of Equipment** | **: Corded Optical Wheel Mouse** |
| **FCC ID** | **: PKVKTM-2112** |
| **Model name** | **: KTM-2112** |
| **Serial number** | **: N/A** |
| **Total page of Report** | **: 13 pages (including this page)** |
| **Date of Incoming** | **: August 22, 2002** |
| **Date of Issuing** | **: August 27, 2002** |

## SUMMARY

The equipment complies with the regulation; ***FCC CFR 47 PART 15 SUBPART B, Class B***.

This test report contains only the results of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by:

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ONETECH Corp.

Reviewed by:

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**EMC Testing Dept** : 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Si, Kyunggi-Do, 464-860, Korea. (TEL: +82-31-765-8289 FAX: +82-31-766-2904)

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# 1. VERIFICATION OF COMPLIANCE

APPLICANT : KTEC CO., LTD.
ADDRESS : 186-3 Weonjong-Dong, Ojeong-Gu, Pucheon-City, Kyungki-Do, 421-200, Korea
CONTACT PERSON : Heon-Yeon, Kim / Manager
TELEPHONE NO : +82-32-675-0861
FCC ID : PKVKTM-2112
MODEL NAME : KTM-2112
SERIAL NUMBER : N/A
DATE : August 27, 2002

| | |
|---|---|
| DEVICE TYPE | Peripheral Device for Class B Computing Device<br>- Unintentional Radiator |
| E.U.T. DESCRIPTION | Corded Optical Wheel Mouse |
| THIS REPORT CONCERNS | ORIGINAL GRANT |
| MEASUREMENT PROCEDURES | ANSI C63.4/2000 |
| TYPE OF EQUIPMENT TESTED | PRE-PRODUCTION |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED | CERTIFICATION |
| EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S) | FCC PART 15, SECTION 15.101 (Class B) |
| MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE | No |
| FINAL TEST WAS CONDUCTED ON | 3 METER OPEN AREA TEST SITE |

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.


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# 2. GENERAL INFORMATION

## 2.1 Product Description

The KTEC CO., LTD., Model KTM-2112 (referred to as the EUT in this report) is a Corded Optical Wheel Mouse, which is PS/2 connector type. Product specification described herein was obtained from product data sheet or user' s manual.

| | |
|---|---|
| CHASSIS TYPE | Plastic – Non coated |
| LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz) | 24.00 MHz on the main board |
| POWER REQUIREMENT | DC5V supplied from a PC |
| NUMBER OF LAYERS | 1 Layer |
| EXTERNAL CONNECTOR | PS/2 Port |

## Model Differences:

-. None

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

-. Original submittal only


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## 2.3 Test System Details

The model numbers for all the equipments that were used in the tested system is:

| Model | Manufacturer | FCC ID | Description | Connected to |
|---|---|---|---|---|
| KTM-2112 | KTEC CO., LTD. | PKVKTM-2112 | Corded Optical Wheel Mouse (EUT) | NOTEBOOK PC |
| PP01L | DELL COMPUTER | DoC | NOTEBOOK PC | - |
| ADP-70EB | DELTA ELEC. | N/A | AC/DC ADAPTER | NOTEBOOK PC |
| 2225C | HP | DSI6XU2225 | PRINTER | NOTEBOOK PC |
| 020-0470 | CARDINAL | GDE0196 | MODEM | NOTEBOOK PC |

## 2.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4/2000. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

## 2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Si, Kyunggi-Do, 464-080, Korea. Description details of test facilities were submitted to the Commission on January 18, 2002. (Registration Number: 92819)


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# 3. SYSTEM TEST CONFIGURATION

## 3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER | MODEL/PART NUMBER | FCC ID |
|---|---|---|---|
| MAIN BOARD | KTEC CO., LTD. | KTM-2112 | N/A |

## 3.2 EUT exercise Software

The EUT was connected to PS/2 port on the Note Book Computer for normal operation.

During the test, the EUT was operated as follows;

The windows program was designed to exercise the various system components in a manner similar to a typical use. This program was included into HOST. Once loaded, this program sequentially exercises each system component in turn. The sequence used is:(1) series of “H” characters are printed on the monitor until the screen is completely full, (2) copy series of “H” characters to mass storage device (if one is used), (3) print series of “H” characters to printer. The complete cycle takes about 20 seconds and is repeated continuously.

## 3.3 Cable Description

| | Power Cord Shielded (Y/N) | I/O cable Shielded (Y/N) | Length (M) |
|---|---|---|---|
| Corded Optical Wheel Mouse (EUT) | N/A | Y | 1.8 (D) |
| NOTEBOOK PC | N | Y | 1.5 (P), 1.8 (D) |
| AC/DC ADAPTOR | N | N/A | 1.5 (P) |
| MODEM | N | Y | 1.5 (P), 1.5 (D) |
| PRINTER | N | Y | 1.5 (P), 1.5 (D) |

* The marked “(P)” means the Power Cable and “(D)” means the Data Cable.


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## 3.4 Noise Suppression Parts on Cable

| | Ferrite Bead (Y/N) | Location | Metal Hood (Y/N) | Location |
|---|---|---|---|---|
| Corded Optical Wheel Mouse (EUT) | N | N/A | Y | EUT END |
| NOTEBOOK PC | - | - | - | - |
| AC/DC ADAPTER | Y | ADAPTOR END | Y | ADAPTOR END |
| MODEM | N | N/A | Y | BOTH END |
| PRINTER | N | N/A | Y | BOTH END |

## 3.5 Equipment Modifications

To achieve compliance to CLASS B levels, the following change(s) was made by ONETECH Corp. during compliance testing:

"There was no Modified items during EMI test"

## 3.6 Configuration of Test System

Line Conducted Test: The EUT was connected to PS/2 port on the NOTE PC and the power line of NOTE PC was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4/2000 7.2.3 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emission test was conducted using the procedure in ANSI C63.4/2000 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 3 meters open area test site.


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# 4. PRELIMINARY TEST

## 4.1 AC Power line Conducted Emission Test

During Preliminary Test, the following operating mode was investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Standby mode | |
| Continuously operation mode | X |

## 4.2 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Standby mode | |
| Continuously operation mode | X |


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## 5. FINAL RESULT OF MEASURMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level

### 5.1 Conducted Emission Test

Humidity Level : 49 % Temperature : 24 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.107

Type of Test : CLASS B

Result : PASSED BY –12.88 dB at 4.15 MHz

EUT : Corded Optical Wheel Mouse Date: August 23, 2002

Operating Condition : Continuously operation mode

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

| Power Line Conducted Emission | | | FCC CLASS B | |
|---|---|---|---|---|
| Frequency (MHz) | Amplitude (dBuV) | Conductor | Limit (dBuV) | Margin (dB) |
| 0.47 | 30.41 | HOT | 48.00 | -17.59 |
| 0.53 | 29.12 | HOT | 48.00 | -18.88 |
| 0.65 | 25.39 | HOT | 48.00 | -22.61 |
| 3.50 | 29.31 | NEUTRAL | 48.00 | -18.69 |
| 4.15 | 35.12 | NEUTRAL | 48.00 | -12.88 |
| 13.95 | 33.65 | HOT | 48.00 | -14.35 |
| 14.41 | 34.33 | NEUTRAL | 48.00 | -13.67 |
| 21.59 | 32.19 | HOT | 48.00 | -15.81 |

Line Conducted Emission Tabulated Data

**Tested by: Seung Hyun, Nam / Test Engineer**

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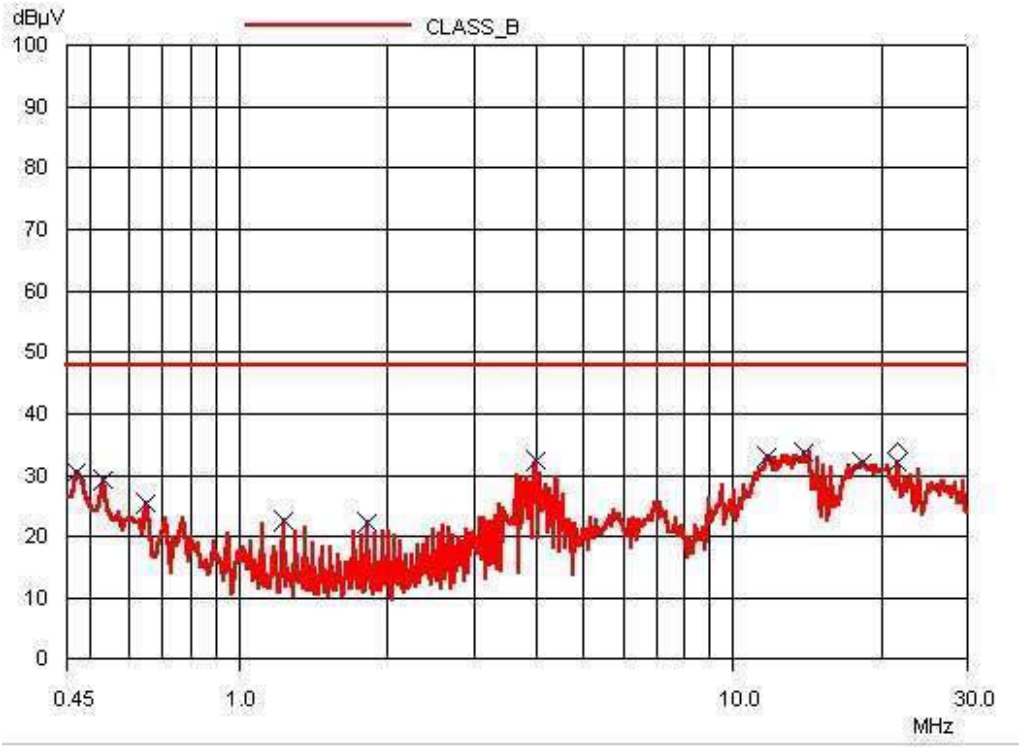
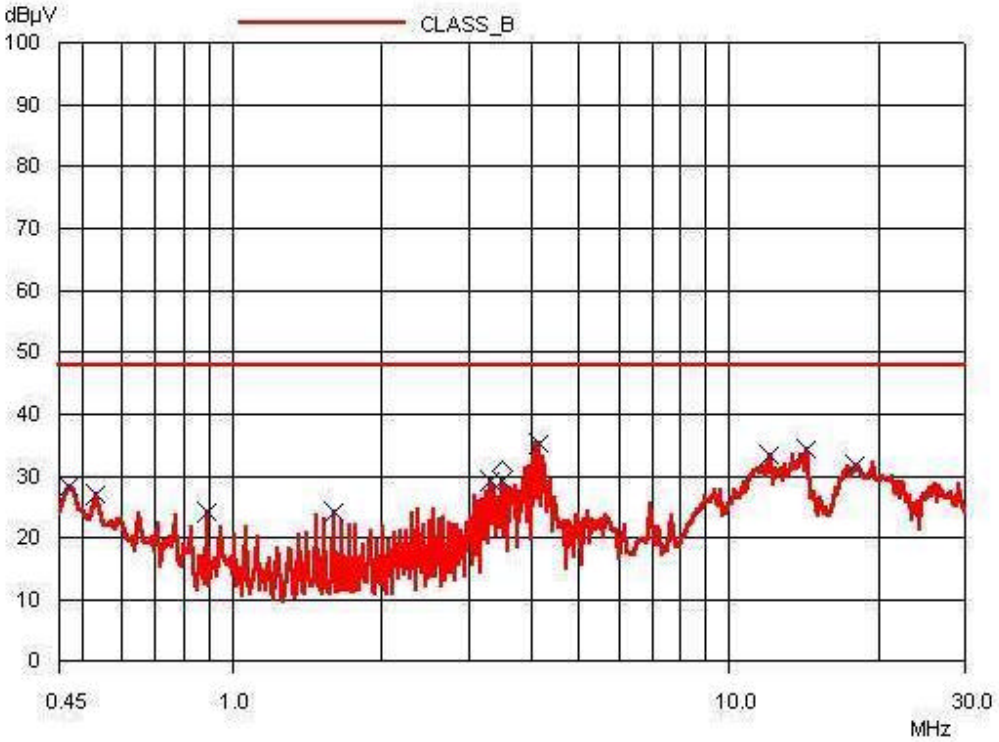



**HOT LINE**




**NEUTRAL LINE**



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## 5.2 Radiated Emission Test

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 49 % Temperature : 24 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.109

Type of Test : CLASS B

Result : PASSED BY –11.48 dB at 32.60 MHz

EUT : Corded Optical Wheel Mouse Date: August 23, 2002

Operating Condition : Continuously operation mode

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Distance : 3 Meter

| Radiated Emission | | Ant | Correction Factors | | Total | FCC CLASS B | |
|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | Pol. | Ant. (dBuV/m) | Cable (dB) | Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| 32.60 | 15.50 | V | 12.22 | 0.80 | 28.52 | 40.00 | -11.48 |
| 34.60 | 10.00 | V | 11.46 | 0.80 | 22.26 | 40.00 | -17.74 |
| 36.60 | 10.30 | V | 11.14 | 0.81 | 22.25 | 40.00 | -17.75 |
| 42.90 | 10.50 | V | 10.80 | 0.85 | 22.15 | 40.00 | -17.85 |
| 45.10 | 12.10 | V | 10.81 | 0.88 | 23.79 | 40.00 | -16.21 |
| 46.30 | 15.10 | V | 10.80 | 0.89 | 26.79 | 40.00 | -13.21 |
| 49.40 | 10.90 | V | 10.79 | 0.92 | 22.61 | 40.00 | -17.39 |
| 55.80 | 9.20 | V | 9.99 | 0.98 | 20.17 | 40.00 | -19.83 |
| 97.25 | 8.90 | V | 11.23 | 1.14 | 21.27 | 43.50 | -22.23 |
| 110.36 | 9.20 | V | 12.89 | 1.20 | 23.29 | 43.50 | -20.21 |
| 86.35 | 13.00 | H | 7.77 | 1.10 | 21.87 | 40.00 | -18.13 |

Radiated Emissions Tabulated Data

**Tested by : Seung Hyun, Nam / Test Engineer**



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## 6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

| | | |
|---|---|---|
| + | Meter reading | (dBuV) |
| + | Cable Loss | (dB) |
| + | Antenna Factor (Loss) | (dB/meter) |
| = | Corrected Reading | (dBuV/meter) |
| - | Specification Limit | (dBuV/meter) |
| = | dB Relative to Spec | (+/- dB) |


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## 7. LIST OF TEST EQUIPMENT

| No. | EQUIPMENTS | MFR. | MODEL | SER. NO. | LAST CAL | DUE CAL | USE |
|---|---|---|---|---|---|---|---|
| 1. | Test receiver | R/S | ESVS 10 | 827864/005 | OCT/01 | 12MONTH | ■ |
| 2. | Test receiver | R/S | ESHS10 | 834467/007 | APR/02 | 12MONTH | ■ |
| 3. | Spectrum analyzer | HP | 8568B | 3026A0226 | APR/02 | 12MONTH | ■ |
| 4. | RF preselector | HP | 85685A | 3107A01264 | APR/02 | 12MONTH | ■ |
| 5. | Quasi-Peak Adapter | HP | 85650A | 3107A01542 | APR/02 | 12MONTH | ■ |
| 6. | Dipole Antenna | EMCO | 3121C | 9107-745 | JUN/02 | 12MONTH | |
| 7. | Biconical antenna | EMCO | 3104C | 9109-4441<br>9109-4443<br>9109-4444 | APR/02 | 12MONTH | ■ |
| 8. | Log Periodic antenna | EMCO | 3146 | 9109-3213<br>9109-3214<br>9109-3217 | APR/02 | 12MONTH | ■ |
| 10. | Horn Antenna | EMCO | 3115 | 9509-4563 | MAR/02 | 12MONTH | |
| 11. | LISN | EMCO | 3825/2 | 9109-1867<br>9109-1869 | JUL/02 | 12MONTH | ■ |
| 12. | RF Amplifier | HP | 8447F | 3113A04554 | JUN/02 | N/A | |
| 13. | Spectrum Analyzer | HP | 8561E | 3350A00546 | SEP/01 | 12MONTH | ■ |
| 14. | Spectrum Analyzer | HP | 8591A | 3131A02312 | APR/02 | 12MONTH | |
| 15. | Computer System<br>Hard disk drive | HP | 98581C<br>9153C | 98543A<br>CMC762Z9153 | N/A<br>N/A | N/A<br>N/A | ■<br>■ |
| 16. | Plotter | HP | 7475A | 30052 22986 | N/A | N/A | ■ |
| 17. | Position Controller | EMCO | 1090 | 9107-1038 | N/A | N/A | ■ |
| 18. | Turn Table | EMCO | 1080-1.21 | 9109-1576 | N/A | N/A | ■ |
| 19. | Antenna Master | EMCO | 1070-1 | 9109-1624 | N/A | N/A | ■ |

* Remark ■ means used equipment.

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