

# **EMI TEST REPORT**

**Test Report No. : 23IE0015-HO-3**

**Applicant : TOHOKU ALPS CO., LTD**  
**AUTOMOTIVE PRODUCTS DIVISION**

**Type of Equipment : Hand Unit**

**Model No. : TFWB1U613**

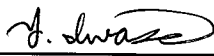
**FCC ID : NHVWBU613**

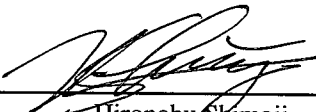
**Test standard : FCC Part15 Subpart C 15.231 and**  
**Subpart B 15.109**

**Test Result : Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

**Date of test : May 26 and 29, 2003**

**Tested by : **  
Yoshiaki Iwasa  
EMC Section

**Approved by: **  
Hironobu Shimoji  
Group leader of EMC Section

**UL Apex Co., Ltd.**

**Head Office EMC Lab.**

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MF060b(10.04.03)

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## **SECTION 1: Client information**

Company name : TOHOKU ALPS CO.,LTD  
AUTOMOTIVE PRODUCTS DIVISION  
Address : 6-3-36 Nakazato Furukawa-City Miyagi-pref 989-6181 JAPAN  
Telephone Number : +81 229 23 5111  
Facsimile Number : +81 229 22 3755  
Contact Person : Hideki Ueno

## **SECTION 2: Equipment under test (E.U.T.)**

Type of Equipment : Hand Unit

### **Tx section**

| Model No.                 | TFWB1U613 (Hand Unit)           | TFWD1U613(Control Unit)<br>*1) |
|---------------------------|---------------------------------|--------------------------------|
| Sample No.                | 1                               | 1                              |
| Number of Channel         | 1                               | 1                              |
| Frequency Characteristics | 315MHz                          | 125kHz                         |
| Modulation                | FSK                             | ASK                            |
| Information antenna       | Integral                        | Integral                       |
| Rating                    | DC3.0V Lithium Battery (CR2032) | DC 12.0V (Car battery)         |
| Country of Manufacture    | Japan                           | Japan                          |

### **Rx section**

| Model No.                  | TFWD1U613(Control Unit)<br>*1) | TFWB1U613 (Hand Unit)           |
|----------------------------|--------------------------------|---------------------------------|
| Sample No.                 | 1                              | 1                               |
| Type of Receiver           | Single Super Heterodyne        | Turned Radio Frequency Receiver |
| Receiving Frequency        | 315MHz                         | 125kHz                          |
| Local Oscillator Frequency | 322.825MHz                     | None                            |
| Intermediate Frequency     | 10.7MHz                        | None                            |
| Information antenna        | Integral                       | Integral                        |
| Rating                     | DC 12.0V (Car battery)         | DC3.0V Lithium Battery (CR2032) |

Country of Manufacture : Japan  
Receipt Date of Sample : May 7, 2003  
Condition of EUT : Production model

## **2.2 Product Description**

The control unit of the passive entry system is a transmitter of 125kHz and a receiver of 315MHz.  
The hand unit of passive entry system is a transmitter of 315MHz and a receiver of 125kHz.  
These units are the new type of keyless entry system which communicates with each other.

\*1) See reference our test report No. 23IE0015-HO-4.

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### **SECTION 3: Test specification, procedures and results**

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart C Intentional Radiators  
Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

Test Specification : FCC Part 15 Subpart B Section 15.109 Radiated emission limits  
Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart B Unintentional Radiators

#### **3.2 Methods & Procedures**

| No. | Item                                            | Test Procedure  | Specification                                                     | Remarks       |
|-----|-------------------------------------------------|-----------------|-------------------------------------------------------------------|---------------|
| 1   | Automatically deactivate                        | ANSI C63.4:2001 | FCC Section 15.231(a)(1)                                          | Radiated      |
| 2   | Electric Field Strength of Fundamental Emission | ANSI C63.4:2001 | FCC Section 15.231(b)                                             | Radiated      |
| 3   | Electric Field Strength of Spurious Emission    | ANSI C63.4:2001 | FCC Section 15.205<br>FCC Section 15.209<br>FCC Section 15.231(b) | Radiated      |
| 4   | -20dB Bandwidth                                 | ANSI C63.4:2001 | FCC Section 15.231(c)                                             | Radiated      |
| 5   | Radiated emission                               | ANSI C63.4:2001 | FCC Section 15.109(a)                                             | Radiated      |
| 6   | Conducted Emission                              | ANSI C63.4:2001 | FCC Section 15.107(a)<br>and 207                                  | AC Mains only |

\*These tests were performed without any deviations from test procedure except for additions or exclusions.

#### **3.3 Exclusion from standard**

| No. | Item               | Test Procedure  | Specification                    | Remarks |
|-----|--------------------|-----------------|----------------------------------|---------|
| 6   | Conducted Emission | ANSI C63.4:2001 | FCC Section 15.107(a)<br>and 207 | -       |

This test is not applicable since the EUT does not have AC power port.

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## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Modes**

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

The operating mode/system were as follows:

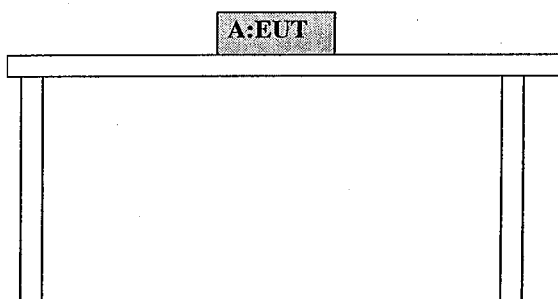
Operation mode is as follows;

- Transmitting mode
- Receiving mode

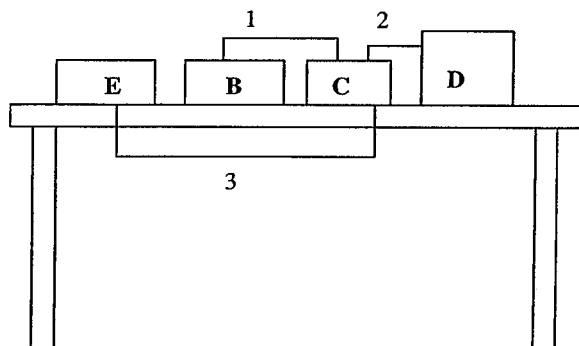
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

### **4.2 Configuration and peripherals**

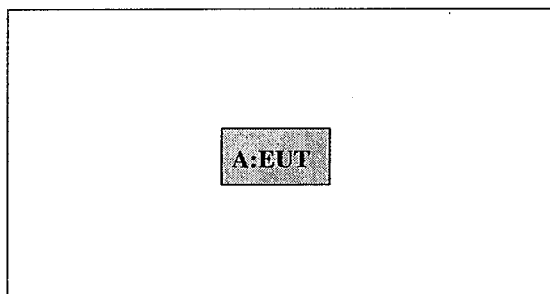
Front View (Hand Unit)



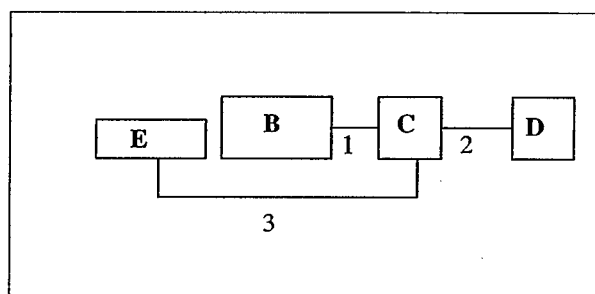
Front View (Control Unit)



Top View (Hand Unit)



Top View (Control Unit)



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(Hand Unit)

**Description of EUT**

| No. | Item      | Model number | Serial number | Manufacturer   | FCC ID    |
|-----|-----------|--------------|---------------|----------------|-----------|
| A   | Hand Unit | TFWB1U613    | 2             | TOHOKU<br>ALPS | NHVWBU613 |

(Control Unit)

**Description of EUT and Support Equipment**

| No. | Item         | Model number | Serial number | Manufacturer | FCC ID    |
|-----|--------------|--------------|---------------|--------------|-----------|
| B   | Control Unit | TFWD1U613    | 2             | TOHOKU ALPS  | NHVWBU613 |
| C   | Checker Box  | N/A          | N/A           | TOHOKU ALPS  | -         |
| D   | Car Battery  | 50B24L       | N/A           | YUASA        | -         |
| E   | Bar antenna  | -            | -             | -            | -         |

**List of cables used**

| No. | Name                    | Length (m) | Shield | Remark |
|-----|-------------------------|------------|--------|--------|
| 1   | Signal & DC Power Cable | 0.5        | N      | -      |
| 2   | DC Power Cable          | 0.5        | N      | -      |
| 3   | Antenna Cable           | 1.2        | N      | -      |

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**SECTION 5: Summary of test results****5.1 Test results**

| No. | Item                                            | Test Procedure  | Specification                                                     | Remarks  | Result   |
|-----|-------------------------------------------------|-----------------|-------------------------------------------------------------------|----------|----------|
| 1   | Automatically deactivate                        | ANSI C63.4:2001 | FCC Section 15.231(a)(1)                                          | Radiated | Complied |
| 2   | Electric Field Strength of Fundamental Emission | ANSI C63.4:2001 | FCC Section 15.231(b)                                             | Radiated | Complied |
| 3   | Electric Field Strength of Spurious Emission    | ANSI C63.4:2001 | FCC Section 15.205<br>FCC Section 15.209<br>FCC Section 15.231(b) | Radiated | Complied |
| 4   | -20dB Bandwidth                                 | ANSI C63.4:2001 | FCC Section 15.231(c)                                             | Radiated | Complied |
| 5   | Radiated emission                               | ANSI C63.4:2001 | FCC Section 15.109(a)                                             | Radiated | Complied |

**5.2 Confirmation**

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.231 and FCC Part 15 Subpart B Section 15.109(a)

**5.3 Uncertainty**Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is  $\pm 4.5\text{dB}$ .

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 5.2\text{dB}$ .

The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is  $\pm 6.6\text{dB}$ .

☐ The results is within Head Office EMC Lab's uncertainty.

☒ The data listed in this test report has enough margin.

**5.4 Test Location**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 and No.2 semi anechoic chambers.

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This site has been fully described in a report submitted to FCC office, and listed on February 01, 2002 / June 05, 2002 (Registration number: 313583 / 846015).

\*NVLAP Lab. code: 200572-0

**5.5 Photographs of test setup, Data of EMI Test and Test instruments**

Refer to Appendix 1 to 3.

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## **SECTION 6: Radiated emissions and -20dB Bandwidth and Automatically deactivate**

### **6.1 Operating environment**

The test was carried out in No.1 and No.2 semi anechoic chamber.

Temperature : See data  
Humidity : See data

#### **Test Procedure**

EUT was placed on a platform of nominal size, 1m by 1m, raised 80cm above the conducting ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The Radiated Electric Field Strength intensity has been measured on No.1 and No.2 semi anechoic chambers with a ground plane and at a distance of 3m.

The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The EUT was also previously checked at each position of three axes X, Y and Z to find the worst position. The position in which the maximum noise occurred was chosen to put into measurement. Worst cases are referred to following page.

It was operated under transmitting mode.

The radiated emission measurement were made with the following function of the test receiver and spectrum analyzer.

#### **315MHz Transmitting mode**

Measurement range : 30MHz to 1000MHz PK Detector, IF BW 120kHz (Test receiver)  
: 1GHz to 3.2GHz PK Detector, RBW 1MHz, VBW 1MHz(Spectrum analyzer)

Test data : 30MHz -3.2GHz : Page 14 (APPENDIX 3)

Test result : Pass

#### **125kHz Receiving mode**

Measurement range : 30MHz to 1000MHz CISPR QP Detector, IF BW 120kHz (Test receiver)

Test data : 30MHz -1000MHz : Page 15 (APPENDIX 3)

Test result : Pass

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## 6.2 -20dB Bandwidth (Reference data)

Bandwidth Limit: Fundamental Frequency  $315\text{MHz} \times 0.25\% = 787.5\text{kHz}$

| Bandwidth Limit | measurement data (20dB down)<br>Center Freq: 315MHz | Result |
|-----------------|-----------------------------------------------------|--------|
| -20dB Bandwidth | 79.96kHz                                            | Pass   |

Test data : Page 16 (APPENDIX 3)

## 6.3 Automatically deactivate

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

Test data : Page 16 (APPENDIX 3)

Test result : Pass ( 371.7ms)

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**UL Apex Co., Ltd.**

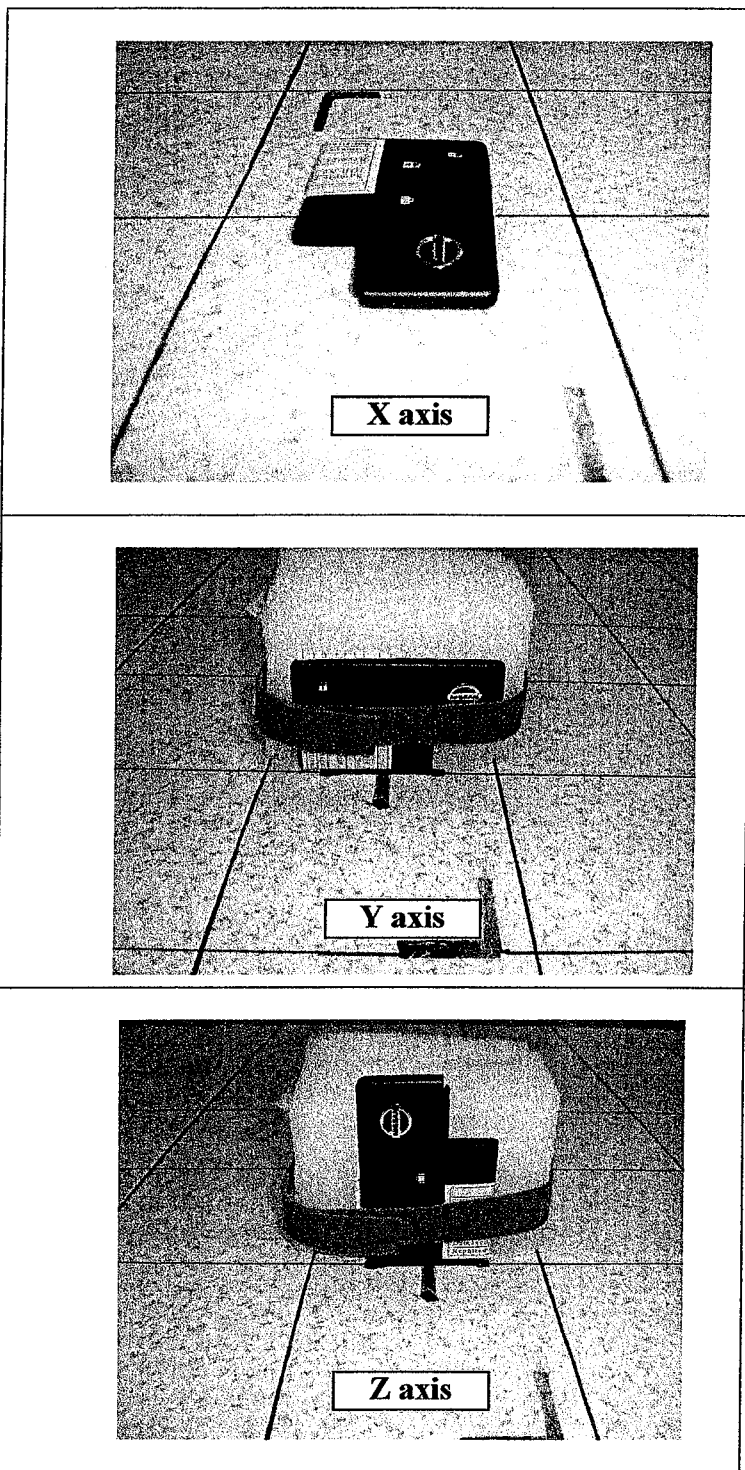
**Head Office EMC Lab.**

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**Pre check of worse-case position**



**Worse case X axis (Measurement Biconical antenna Polarization :Horizontal)  
And Worse case Z axis (Measurement Biconical antenna Polarization :Vertical)**

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## **Contents of Appendixes**

### **APPENDIX 1: Photographs of test setup**

Page 12 : Radiated emission

### **APPENDIX 2: Test instruments**

Page 13 : Test instruments

### **APPENDIX 3: Data of EMI test**

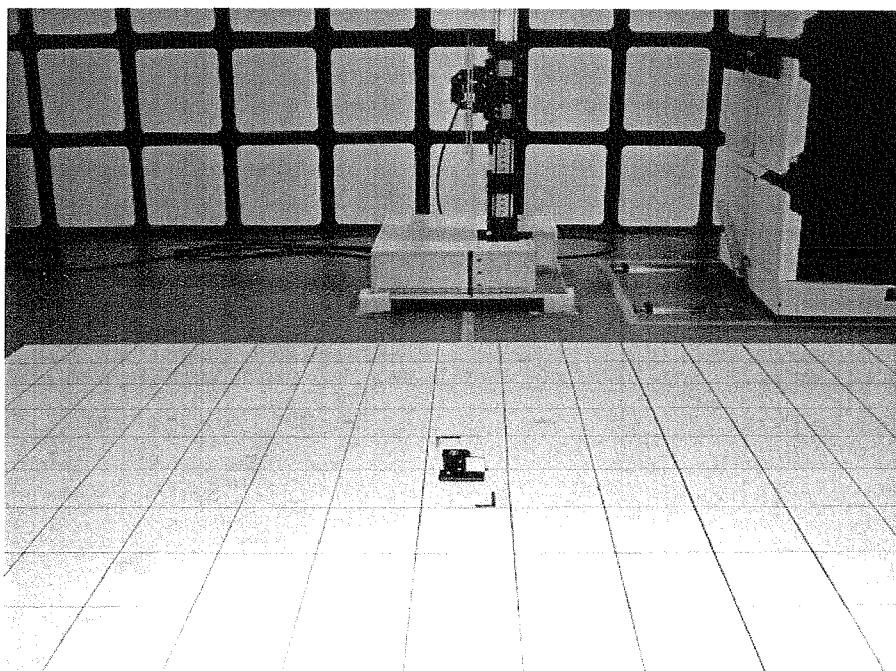
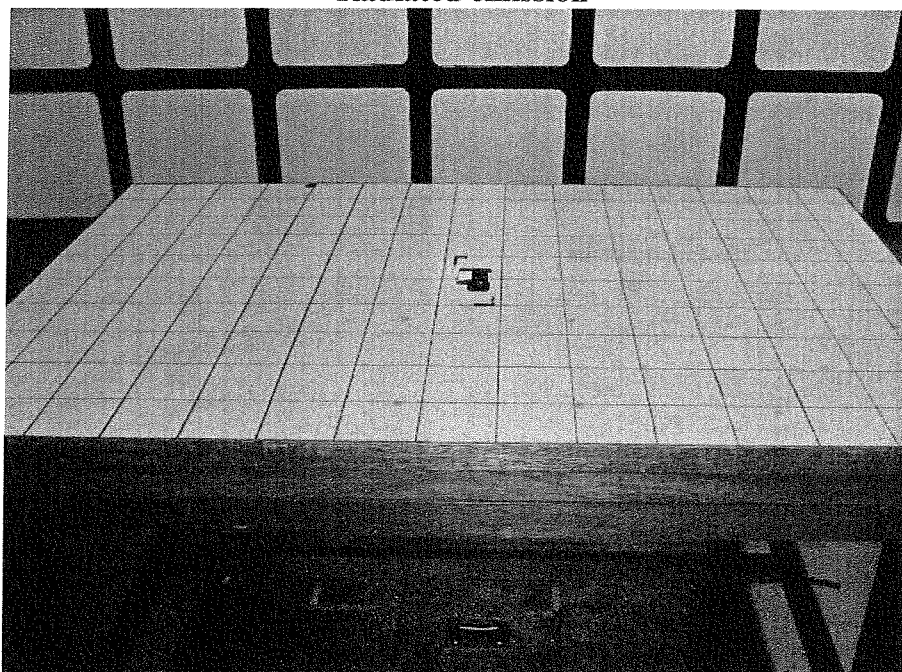
Page 14-15 : Radiated emissions (Radiated)

Page 16 : -20dB Bandwidth

Page 17 : Automatically deactivate

## **APPENDIX 1: Photographs of test setup**

**Radiated emission**



Test Report No : 23IE0032-HO 3

## APPENDIX 2

### Test Instruments

#### EMI test equipment

| Control No. | Instrument                 | Manufacturer     | Model No                                                                                                                                         | Test Item | Calibration Date *<br>Interval(month) |
|-------------|----------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------|
| MAEC-01     | Anechoic Chamber           | TDK              | Semi Anechoic Chamber 10m                                                                                                                        | RE / CE   | 2002/12/28 * 12                       |
| MAT-06      | Attenuator(6dB)            | Weinschel Corp   | 2                                                                                                                                                | RE        | 2002/12/24 * 12                       |
| MBA-01      | Biconical Antenna          | Schwarzbeck      | BBA9106                                                                                                                                          | RE        | 2002/10/16 * 12                       |
| MLA-01      | Logperiodic Antenna        | Schwarzbeck      | USLP9143                                                                                                                                         | RE/RS     | 2002/10/16 * 12                       |
| MOS-01      | Digital Humidity Indicator | N.T              | NT-1800                                                                                                                                          |           | 2002/12/10 * 12                       |
| MPA-02      | Pre Amplifier              | Agilent          | 87405A                                                                                                                                           | RE        | 2003/04/17 * 12                       |
| MTR-01      | Test Receiver              | Rohde & Schwarz  | ES140                                                                                                                                            | RE / CE   | 2002/11/01 * 12                       |
| MAEC-02     | Anechoic Chamber           | TDK              | Semi Anechoic Chamber 3m                                                                                                                         | RE / CE   | 2003/04/11 * 12                       |
| MAT-07      | Attenuator(6dB)            | Weinschel Corp   | 2                                                                                                                                                | RE        | 2002/12/24 * 12                       |
| MCC-12      | Coaxial Cable              | Fujikura/Agilent | MCC-12-01(8D-2W15m),MCC-12-02(5D-2W-0.7),MCC-12-03(5D-2W-0.8),MCC-12-04(5D-2W-1m),MCC-12-05(RF SW),MCC-12-06(RF SW),※ MCC-12-07(5D-2W-0.4m)5/8追加 | RE        | 2003/05/08 * 12                       |
| MCC-13      | Coaxial Cable              | Fujikura/Agilent | -                                                                                                                                                | CE        | 2003/05/08 * 12                       |
| MOS-02      | Digital Humidity Indicator | N.T              | NT-1800                                                                                                                                          | RE        | 2002/12/10 * 12                       |
| MPA-04      | Pre Amplifier              | Agilent          | 8447D                                                                                                                                            | RE        | 2003/03/13 * 12                       |
| MTR-02      | Test Receiver              | Rohde & Schwarz  | ESCS30                                                                                                                                           | RE/CE     | 2003/01/31 * 12                       |
| SA-07       | Spectrum Analyzer          | Advantest        | R3273                                                                                                                                            | RE / CE   | 2002/12/10 * 12                       |
| MBA-02      | Biconical Antenna          | Schwarzbeck      | BBA9106                                                                                                                                          | RE        | 2002/10/16 * 12                       |
| MLA-02      | Logperiodic Antenna        | Schwarzbeck      | USLP9143                                                                                                                                         | RE        | 2002/10/16 * 12                       |
| MLPA-01     | Loop Antenna               | Rohde & Schwarz  | HFH2-Z2                                                                                                                                          | RE        | 2002/12/13 * 12                       |
| MPSU-01     | Power Supply               | Rohde & Schwarz  | HZ-9                                                                                                                                             | EMI       | Pre Check                             |
| MCB-01      | Car Battery                | Panasonic        | B19L                                                                                                                                             | RE        | Pre Check                             |
|             |                            |                  |                                                                                                                                                  |           |                                       |
|             |                            |                  |                                                                                                                                                  |           |                                       |

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

CE: Conducted emission,

RE: Radiated emission,

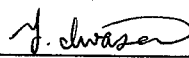
# DATA OF RADIATED EMISSIONS

UL APex Co., Ltd.

EMC HEAD OFFICE DIVISION No.1 SEMI ANECHOIC CHAMBER

COMPANY : TOHOKU ALPS CO., LTD.  
EQUIPMENT : Keyless Entry System (Hand Unit)  
MODEL : TFWB1U613  
S/N : 1  
FCC ID : NHVWBU613  
POWER : DC3.0V  
Mode : Transmitting

REPORT NO : 23IE0015-HO - 3  
REGULATION : Fcc Part15 Subpart C 231(b) / 205  
TEST DISTANCE : 3m  
DATE : 2003/05/26  
TEMPERATURE : 25°C  
HUMIDITY : 32%

  
ENGINEER : Yoshiaki Iwasa

Below 1GHz PK/QP DETECT (Test Receiver: BW 120kHz)

Above 1GHz PK/AV DETECT (Spectrum Analyzer : RBW 1MHz and VBW 1MHz)

| No. | FREQ<br>[MHz] | T/R READING : PK |          | ANT<br>Factor<br>[dB] | AMP<br>GAIN<br>[dB] | LOSS<br>[dB] | Duty<br>Factor<br>[dB] | RESULT   |          | Limit<br>[dBuV/m] | MARGIN |      |
|-----|---------------|------------------|----------|-----------------------|---------------------|--------------|------------------------|----------|----------|-------------------|--------|------|
|     |               | HOR              | VER      |                       |                     |              |                        | HOR      | VER      |                   | HOR    | VER  |
|     |               | [dBuV/m]         | [dBuV/m] |                       |                     |              |                        | [dBuV/m] | [dBuV/m] |                   | [dB]   | [dB] |
| 0   | 315.00        | 49.04            | 46.2     | 14.9                  | 26.8                | 8.5          | 0.0                    | 45.6     | 42.8     | 75.6              | 30.0   | 32.8 |

| No. | FREQ<br>[MHz] | T/R READING : QP |          | ANT<br>Factor<br>[dB] | AMP<br>GAIN<br>[dB] | LOSS<br>[dB] | Duty<br>Factor<br>[dB] | RESULT   |          | Limit<br>[dBuV/m] | MARGIN |      |
|-----|---------------|------------------|----------|-----------------------|---------------------|--------------|------------------------|----------|----------|-------------------|--------|------|
|     |               | HOR              | VER      |                       |                     |              |                        | HOR      | VER      |                   | HOR    | VER  |
|     |               | [dBuV/m]         | [dBuV/m] |                       |                     |              |                        | [dBuV/m] | [dBuV/m] |                   | [dB]   | [dB] |
| 1   | 630.00        | 27.7             | 23.3     | 19.8                  | 24.0                | 11.5         | 0.0                    | 35.0     | 30.6     | 55.6              | 20.6   | 25.1 |
| 2   | 945.00        | 21.6             | 17.6     | 22.7                  | 27.0                | 9.7          | 0.0                    | 27.0     | 23.0     | 55.6              | 28.6   | 32.6 |

| No. | FREQ<br>[MHz] | T/R READING : PK |          | ANT<br>Factor<br>[dB] | AMP<br>GAIN<br>[dB] | LOSS<br>[dB] | Duty<br>Factor<br>[dB] | RESULT   |          | Limit<br>[dBuV/m] | MARGIN |      |
|-----|---------------|------------------|----------|-----------------------|---------------------|--------------|------------------------|----------|----------|-------------------|--------|------|
|     |               | HOR              | VER      |                       |                     |              |                        | HOR      | VER      |                   | HOR    | VER  |
|     |               | [dBuV/m]         | [dBuV/m] |                       |                     |              |                        | [dBuV/m] | [dBuV/m] |                   | [dB]   | [dB] |
| 3   | 1259.83       | 48.8             | 50.2     | 25.2                  | 37.3                | 3.4          | 0.0                    | 40.1     | 41.5     | 75.6              | 35.5   | 34.1 |
| 4   | 1575.04       | 45.9             | 44.9     | 25.7                  | 37.1                | 3.7          | 0.0                    | 38.2     | 37.2     | 74.0              | 35.8   | 36.8 |
| 5   | 1889.94       | 43.4             | 44.4     | 26.3                  | 36.9                | 4.1          | 0.0                    | 36.9     | 37.9     | 75.6              | 38.7   | 37.7 |
| 6   | 2204.68       | 43.1             | 43.2     | 27.0                  | 36.8                | 4.7          | 0.0                    | 38.0     | 38.1     | 74.0              | 36.1   | 35.9 |
| 7   | 2519.88       | 44.8             | 43.9     | 27.7                  | 36.7                | 5.3          | 0.0                    | 41.1     | 40.2     | 75.6              | 34.5   | 35.4 |
| 8   | 2834.52       | 43.2             | 42.4     | 28.1                  | 36.8                | 5.8          | 0.0                    | 40.3     | 39.5     | 74.0              | 33.7   | 34.5 |
| 9   | 3150.25       | 43.3             | 42.5     | 28.4                  | 36.8                | 6.2          | 0.0                    | 41.1     | 40.3     | 75.6              | 34.5   | 35.4 |

| No. | FREQ<br>[MHz] | T/R READING : AV |          | ANT<br>Factor<br>[dB] | AMP<br>GAIN<br>[dB] | LOSS<br>[dB] | Duty<br>Factor<br>[dB] | RESULT   |          | Limit<br>[dBuV/m] | MARGIN |      |
|-----|---------------|------------------|----------|-----------------------|---------------------|--------------|------------------------|----------|----------|-------------------|--------|------|
|     |               | HOR              | VER      |                       |                     |              |                        | HOR      | VER      |                   | HOR    | VER  |
|     |               | [dBuV/m]         | [dBuV/m] |                       |                     |              |                        | [dBuV/m] | [dBuV/m] |                   | [dB]   | [dB] |
| 10  | 1260.05       | 38.5             | 40.2     | 25.2                  | 37.3                | 3.4          | 0.0                    | 29.8     | 31.6     | 55.6              | 25.8   | 24.1 |
| 11  | 1575.04       | 33.7             | 31.8     | 25.7                  | 37.1                | 3.7          | 0.0                    | 26.1     | 24.1     | 54.0              | 27.9   | 29.9 |
| 12  | 1889.94       | 30.3             | 30.3     | 26.3                  | 36.9                | 4.1          | 0.0                    | 23.8     | 23.8     | 55.6              | 31.8   | 31.8 |
| 13  | 2204.68       | 29.7             | 29.7     | 27.0                  | 36.8                | 4.7          | 0.0                    | 24.6     | 24.6     | 54.0              | 29.4   | 29.4 |
| 14  | 2519.88       | 32.3             | 30.6     | 27.7                  | 36.7                | 5.3          | 0.0                    | 28.6     | 26.9     | 55.6              | 27.0   | 28.7 |
| 15  | 2834.52       | 30.1             | 29.5     | 28.1                  | 36.8                | 5.8          | 0.0                    | 27.2     | 26.6     | 54.0              | 26.8   | 27.4 |
| 16  | 3150.25       | 29.4             | 29.5     | 28.4                  | 36.8                | 6.2          | 0.0                    | 27.2     | 27.3     | 55.6              | 28.4   | 28.3 |

## REMARKS

ANTENNA TYPE:30-300MHz Biconical / 300-1000MHz Logperiodic / 1-3.2GHz Horn

CALCULATION RESULT=Reading + ANT Factor - Amp Gain + LOSS (Cable+ ATTEN.)+Duty factor

\*Except for the above table : All other spurious emissions were less than 20dB for the limit.

\*The noise was measured at each position of all three axes X, Y and Z to compare the level, and the maximum noise.

# DATA OF RADIATION TEST

UL Apex Co., Ltd. Head Office EMC Lab.  
No.2 Semi Anechoic Chamber  
Report No. : 231E0015-H0- 3

Applicant : ALPS ELECTRIC CO., LTD (TOHOKU ALPS CO., LTD)  
Kind of Equipment : Keyless Entry system  
Model No. : TFWB1U613  
Serial No. : 2  
Power : DC 3V  
Mode : Rx  
Remarks : X-axis , FCC ID: NHVWBU613 , QP  
Date : 5/29/2003  
Test Distance : 3 m  
Temperature : 25 °C  
Humidity : 55 %  
Regulation : FCC Part15B. 109(a)

*Y. Iwasa*  
Engineer : Yoshiaki Iwasa

| No. | FREQ.<br>[MHz] | ANT<br>TYPE | READING             |                     | ANT<br>FACTOR<br>[dB/m] | AMP<br>GAIN<br>[dB] | CABLE<br>LOSS<br>[dB] | ATTEN.<br>[dB] | RESULT                |                       | LIMITS<br>[dB $\mu$ V/m] | MARGIN      |             |
|-----|----------------|-------------|---------------------|---------------------|-------------------------|---------------------|-----------------------|----------------|-----------------------|-----------------------|--------------------------|-------------|-------------|
|     |                |             | HOR<br>[dB $\mu$ V] | VER<br>[dB $\mu$ V] |                         |                     |                       |                | HOR<br>[dB $\mu$ V/m] | VER<br>[dB $\mu$ V/m] |                          | HOR<br>[dB] | VER<br>[dB] |
| 1.  | 48.00          | BB          | 20.3                | 20.4                | 11.7                    | 27.9                | 0.8                   | 6.0            | 10.9                  | 11.0                  | 40.0                     | 29.1        | 29.0        |
| 2.  | 60.00          | BB          | 23.3                | 24.8                | 8.2                     | 27.7                | 0.9                   | 6.0            | 10.7                  | 12.2                  | 40.0                     | 29.3        | 27.8        |
| 3.  | 90.00          | BB          | 20.0                | 20.0                | 7.7                     | 27.2                | 1.1                   | 6.1            | 7.7                   | 7.7                   | 43.5                     | 35.8        | 35.8        |
| 4.  | 217.00         | BB          | 19.1                | 19.1                | 16.5                    | 26.7                | 2.0                   | 6.0            | 16.9                  | 16.9                  | 46.0                     | 29.1        | 29.1        |
| 5.  | 434.00         | BB          | 20.1                | 20.1                | 17.7                    | 27.5                | 0.8                   | 6.2            | 17.3                  | 17.3                  | 46.0                     | 28.7        | 28.7        |
| 6.  | 867.84         | BB          | 21.0                | 21.0                | 21.8                    | 28.5                | 1.6                   | 6.1            | 22.0                  | 22.0                  | 46.0                     | 24.0        | 24.0        |

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

Except for the above table:adequate margin data below the limits.  
ANT.TYPE:30-300MHz Biconical, 300-1000MHz Logperiodic

# DATA OF -20dB BANDWIDTH

UL Apex Co., Ltd.

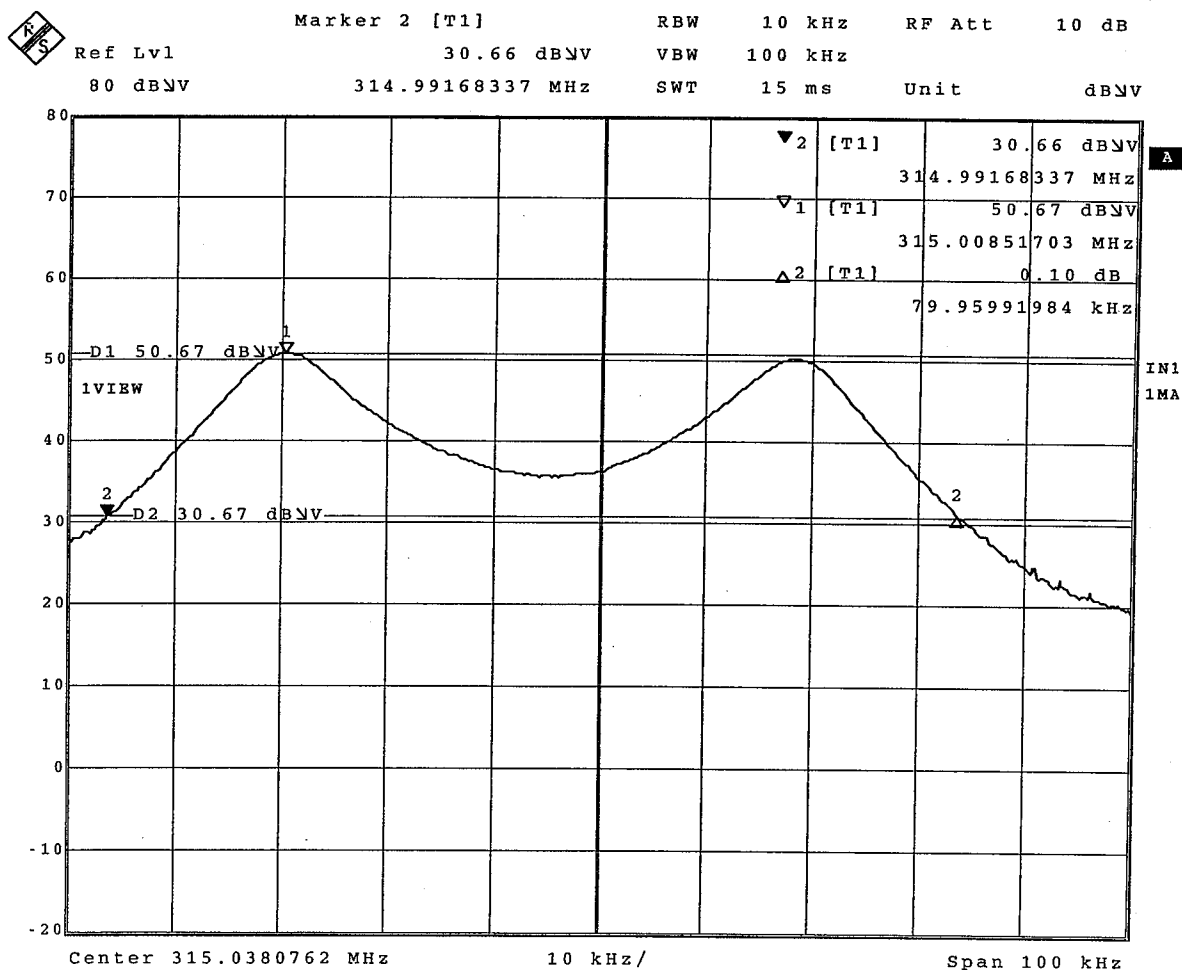
Head Office EMC Lab. No.1 Semi Anechoic Chamber

|                                                       |                                                |
|-------------------------------------------------------|------------------------------------------------|
| COMPANY : ALPS ELECTRIC CO.,LTD (TOHOKU ALPS CO.,LTD) | REPORT NO. : 23IE0015-HO- 3                    |
| EQUIPMENT : Hand Unit                                 | REGULATION : Fcc Part15 Subpart C 231(b) / 205 |
| MODEL : TFWB1U613                                     | TEST DISTANCE : 3 m                            |
| S/N : 1                                               | DATE : 05/26/2003                              |
| FCC ID : NHVWBU613                                    | TEMPERATURE : 25°C                             |
| POWER : DC 3V                                         | HUMIDITY : 52%                                 |
| MODE : Transmitting                                   |                                                |

*Y. Iwasa*  
Engineer : Yoshiaki Iwasa

Bandwidth Limit : Fundamental Frequency 315MHz X 0.25% = 787.5 kHz

| -20dB Bandwidth | Bandwidth Limit | Result |
|-----------------|-----------------|--------|
| [kHz]           | [kHz]           |        |
| 79.96           | 787.50          | Pass   |



Date: 26.MAY.2003 13:29:32

# DATA OF AUTOMATICALLY DEACTIVATE

UL Apex Co., Ltd.

Head Office EMC Lab. No.1 Semi Anechoic Chamber

|                                                       |                                                |
|-------------------------------------------------------|------------------------------------------------|
| COMPANY : ALPS ELECTRIC CO.,LTD (TOHOKU ALPS CO.,LTD) | REPORT NO : 23IE0015-HO-3                      |
| EQUIPMENT : Hand Unit                                 | REGULATION : Fcc Part15 Subpart C 231(b) / 205 |
| MODEL : TFWB1U613                                     | TEST DISTANCE : 3 m                            |
| S/N : 1                                               | DATE : 05/26/2003                              |
| FCC ID : NHVWBU613                                    | TEMPERATURE : 25°C                             |
| POWER : DC3.0V                                        | HUMIDITY : 52%                                 |
| Mode : Transmitting                                   |                                                |

*Y. Iwasa*

ENGINEER : Yoshiaki Iwasa

| Time of<br>Transmitting<br>[sec] | Limit<br>[sec] | Result |
|----------------------------------|----------------|--------|
| 0.37                             | 5.00           | Pass   |

