

# **EMI TEST REPORT**

**Test Report No. : 23EE0005-HO-2**

**Applicant** : TOHOKU ALPS CO., LTD  
CAR ELECTRONICS DIVISION

**Type of Equipment** : Passive Entry System

**Model No.** : TFWD1J441 (Control Unit)

**FCC ID** : NHVWDJ441

**Test standard** : FCC Part15 Subpart C 15.209 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 A-Pex International 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** : December 25, 2002

**Tested by** :   
Hiroka Umeyama  
EMC Head Office Division

**Approved by**:   
Horonobu Shimoji  
Group leader of EMC Head Office Division

## CONTENTS

|                                                              | <b>PAGE</b> |
|--------------------------------------------------------------|-------------|
| <b>SECTION 1: Client information</b>                         | <b>3</b>    |
| <b>SECTION 2: Equipment under test (E.U.T.)</b>              | <b>3</b>    |
| <b>SECTION 3: Test specification, procedures and results</b> | <b>4</b>    |
| <b>SECTION 4: Operation of E.U.T. during testing</b>         | <b>5</b>    |
| <b>SECTION 5: Summary of test results</b>                    | <b>7</b>    |
| <b>SECTION 6: Radiated emissions and -20dB Bandwidth</b>     | <b>8</b>    |
| <br>                                                         |             |
| <b>APPENDIX 1: Photographs of test setup</b>                 | <b>10</b>   |
| <b>APPENDIX 2: Test instruments</b>                          | <b>10</b>   |
| <b>APPENDIX 3: Data of EMI test</b>                          | <b>10</b>   |

## **SECTION 1: Client information**

Company name : TOHOKU ALPS CO., LTD CAR ELECTRONICS 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 : TOMOSUKE TAKATA

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

Type of Equipment : Passive Entry System

### **Tx section**

| Model No.                 | TFWB1J441 (Hand Unit)           | TFWD1J441 (Control Unit)<br>*1) |
|---------------------------|---------------------------------|---------------------------------|
| Sample No.                | 8                               | 3                               |
| Number of Channel         | 1                               | 1                               |
| Frequency Characteristics | 312.125MHz                      | 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.                  | TFWD1J441 (Control Unit)<br>*1) | TFWB1J441 (Hand Unit)           |
|----------------------------|---------------------------------|---------------------------------|
| Sample No.                 | 3                               | 4                               |
| Type of Receiver           | Single Super Heterodyne         | Turned Radio Frequency Receiver |
| Receiving Frequency        | 312.125 MHz                     | 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 : December 17, 2002  
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 312.125MHz.  
The hand unit of passive entry system is a transmitter of 312.125MHz 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. 23EE0005-HO-1.

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**EMC Head Office Division.**

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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 15.209 Radiated emission limits, general requirements.

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   | Electric Field Strength of Fundamental Emission | ANSI C63.4:2001 | FCC Section 15.209                       | Radiated      |
| 2   | Electric Field Strength of Spurious Emission    | ANSI C63.4:2001 | FCC Section 15.205<br>FCC Section 15.209 | Radiated      |
| 3   | -20dB Bandwidth                                 | ANSI C63.4:2001 | Reference data                           | -             |
| 4   | Radiated emission                               | ANSI C63.4:2001 | FCC Section 15.109(a)                    | Radiated      |
| 5   | 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 |
|-----|--------------------|-----------------|----------------------------------|---------|
| 5   | 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:

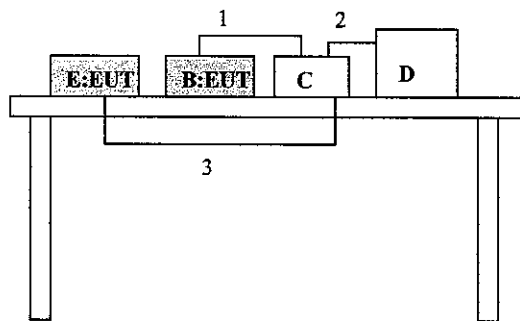
Operation mode is as follows;

- Transmitting mode
- Receiving mode

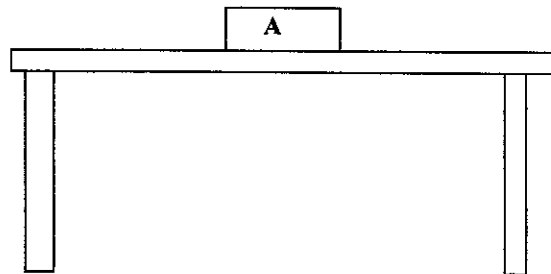
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

### **4.2 Configuration and peripherals**

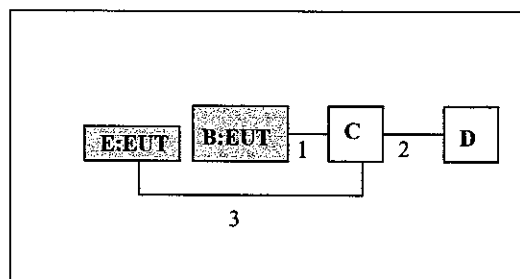
Front View (Control Unit)



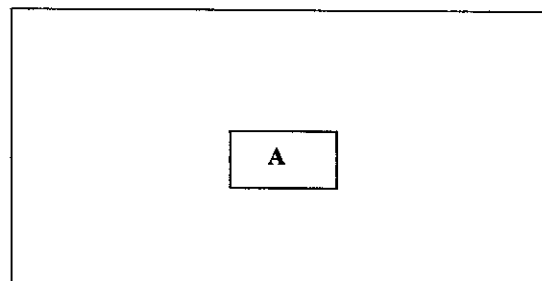
Front View (Hand Unit)



Top View (Control Unit)



Top View (Hand Unit)



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(Control Unit)

**Description of EUT and Support Equipment**

| No. | Item                                   | Model number | Serial number | Manufacturer      | FCC ID    |
|-----|----------------------------------------|--------------|---------------|-------------------|-----------|
| B   | Passive Entry System<br>(Control Unit) | TFWD1J441    | 3             | TOHOKU ALPS       | NHVWDJ441 |
| C   | Checker Box                            | N/A          | N/A           | OMRON Corporation | -         |
| D   | Car Battery                            | 50B24L       | N/A           | YUASA             | -         |
| E   | Bar antenna                            | TFWD1J441    | 3             | SUMIDA            | NHVWDJ441 |

**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      | -      |

(Hand Unit)

**Description of EUT**

| No. | Item                                | Model number | Serial number | Manufacturer   | FCC ID    |
|-----|-------------------------------------|--------------|---------------|----------------|-----------|
| A   | Passive Entry System<br>(Hand Unit) | TFWB1J441    | 8,4           | TOHOKU<br>ALPS | NHVWBJ441 |

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## **SECTION 5: Summary of test results**

### **5.1 Test results**

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

### **5.2 Confirmation**

A-Pex International Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.209 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 Loop Antenna is  $\pm 1.9\text{dB}$ .

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 data listed in this test report may exceed the test limit because it does not have enough margin.

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

### **5.4 Test Location**

A-Pex International Co., Ltd. EMC Head Office Division. 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**

### **6.1 Operating environment**

The test was carried out in 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.2 semi anechoic chamber 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(Hand) 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.

#### **125kHz Transmitting mode**

Measurement range : 9kHz to 90kHz AV/PK Detector, IF BW 200Hz (Test receiver)  
: 90kHz to 110kHz CISPR QP Detector, IF BW 200Hz (Test receiver)  
: 110kHz to 150kHz AV/PK Detector, IF BW 200Hz (Test receiver)  
: 150kHz to 490kHz AV/PK Detector, IF BW 10kHz (Test receiver)  
: 490kHz to 30MHz QP Detector, IF BW 10kHz (Test receiver)  
: 30MHz to 1000MHz CISPR QP Detector, IF BW 120kHz (Test receiver)

Test data : 30MHz -3.2GHz : Page 13-14 (APPENDIX 3)

Test result : Pass

#### **312.125MHz 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

### **6.2 -20dB Bandwidth (Reference data)**

Fundamental Frequency 125kHz:

Test data : Page 16 (APPENDIX 3)

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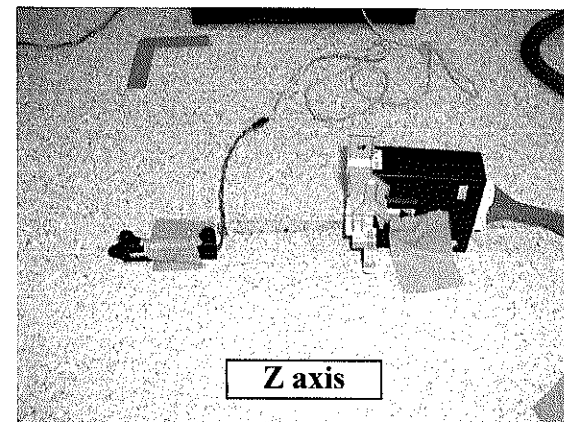
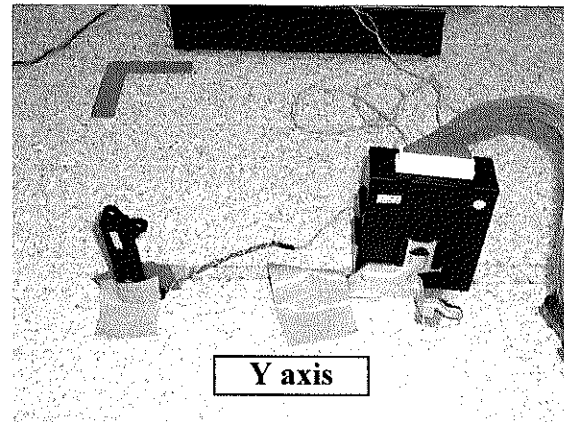
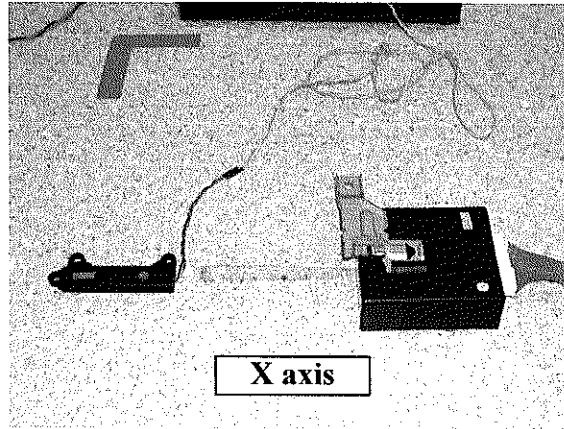
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**6.4 Pre check of worse-case position**



**Worse case Z axis (9kHz – 30MHz, Measurement Loop antenna angle: 0deg)**

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

Page 11 : Radiated emission

## **APPENDIX 2: Test instruments**

Page 12 : Test instruments

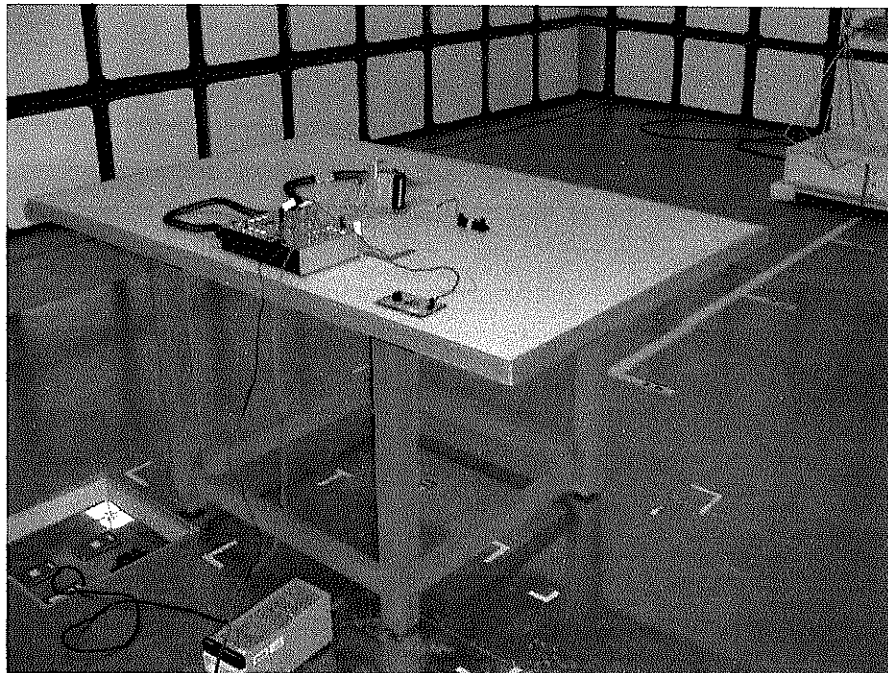
## **APPENDIX 3: Data of EMI test**

Page 13-15 : Radiated emissions (Radiated)

Page 16 : -20dB Bandwidth

**APPENDIX 1: Photographs of test setup**

**Radiated emission**



Test Report No : 23EE0005-HO-2

## 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        | 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                       |
| MCC-01      | Coaxial Cable       | Suhner/storm/Agilent/TS J | MCC-01-01(421-014-10m)<br>MCC-01-02(421-014-16m)<br>MCC-01-03(421-014-7.5m)<br>MCC-01-04(SF M86PE-15cm)<br>MCC-01-05(876 5C,RF SWITCHER SW1-A)<br>MCC-01-06(SF M141-15cm)<br>MCC-01-07(SF M141-15cm)<br>MCC-01-08(876 5C,RF SWITCHER SW2-A)<br>MCC-01-09(876 5C,RF SWITCHER SW3-A)<br>MCC-01-10(421-010-1m) | RE        | 2002/12/19 * 12                       |
| MLA-01      | Logperiodic Antenna | Schwarzbeck               | USLP9143                                                                                                                                                                                                                                                                                                    | RE        | 2002/10/16 * 12                       |
| MPA-02      | Pre Amplifier       | Agilent                   | 87405A                                                                                                                                                                                                                                                                                                      | RE        | 2002/12/26 * 12                       |
| MAEC-02     | Anechoic Chamber    | TDK                       | Semi Anechoic Chamber 3m                                                                                                                                                                                                                                                                                    | RE        | 2002/04/12 * 12                       |
| MAT-07      | Attenuator(6dB)     | Weinschel Corp            | 2                                                                                                                                                                                                                                                                                                           | RE        | 2002/12/24 * 12                       |
| MBA-03      | Biconical Antenna   | Schwarzbeck               | BBA9106                                                                                                                                                                                                                                                                                                     | RE        | 2002/05/02 * 12                       |
| MCC-12      | Coaxial Cable       | Fujikura/Agilent          | MCC-12-01(8D-2W-15m)<br>MCC-12-02(5D-2W-0.7m)<br>MCC-12-05(RF SW)<br>MCC-12-03(5D-2W-0.8m)<br>MCC-12-06(RF SW)<br>MCC-12-04(5D-2W-1m)                                                                                                                                                                       | RE        | 2002/05/09 * 12                       |
| MLA-03      | Logperiodic Antenna | Schwarzbeck               | USLP9143                                                                                                                                                                                                                                                                                                    | RE        | 2002/05/02 * 12                       |
| MPA-04      | Pre Amplifier       | Agilent                   | 8447D                                                                                                                                                                                                                                                                                                       | RE        | 2002/03/13 * 12                       |
| SA-07       | Spectrum Analyzer   | Advantest                 | R3273                                                                                                                                                                                                                                                                                                       | RE        | 2002/12/10 * 12                       |
| MTR-02      | Test Receiver       | Rohde & Schwarz           | ESCS30                                                                                                                                                                                                                                                                                                      | RE        | 2002/10/11 * 12                       |
| MHA-05      | Horn Antenna        | Schwarzbeck               | BBHA9120D                                                                                                                                                                                                                                                                                                   | RE        | 2003/01/11 * 12                       |
| MCC-05      | Microwave Cable     | Storm                     | 421-011                                                                                                                                                                                                                                                                                                     | RE        | 2003/01/14 * 12                       |
| MCC-06      | Microwave Cable     | Storm                     | 421-011                                                                                                                                                                                                                                                                                                     | RE        | 2003/01/14 * 12                       |
| MLPA-01     | Loop Antenna        | Rohde & Schwarz           | HFH2-Z2                                                                                                                                                                                                                                                                                                     | RE        | 2002/12/13 * 12                       |
| MCC-07      | coaxial cable       | -                         | -                                                                                                                                                                                                                                                                                                           | RE        | 2002/02/08 * 12                       |
| MCC-08      | coaxial cable       | -                         | -                                                                                                                                                                                                                                                                                                           | RE        | 2002/02/08 * 12                       |

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

Test Item:

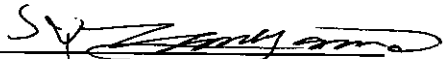
RE: Radiated emission

# Date of carrier and supurious emissions(9kHz to 30MHz)

A-Pex International Co., Ltd.  
Head office No.2 Semi Anechoic Chamber

Company : TOHOKU ALPS CO., LTD.  
Equipment : Passive Entry System (Control Unit)  
Model : TFWD1J441  
Sample No. : 3  
Power : DC12.0V  
Mode : Transmitting (125kHz)  
Temperature : 22deg.C  
Humidity : 37%

Report No. : 23EE0005-HO-2  
Regulation : FCC Part15C Section 15.209  
Test Distance : 3m  
Date : 2002/12/25  
FCC ID : NHVWDJ441

  
ENGINEER : Hiroka Umeyama

| No. | FREQ<br>[kHz] | Loop<br>Max<br>Angle<br>[deg] | detector | T/R               | ANT<br>Factor<br>[dB] | ATTEN<br>[dB] | CABLE<br>LOSS<br>[dB] | AMP<br>GAIN<br>[dB] | RESULT   | LIMIT    | MARGIN |
|-----|---------------|-------------------------------|----------|-------------------|-----------------------|---------------|-----------------------|---------------------|----------|----------|--------|
|     |               |                               | type     | READING<br>[dBuV] |                       |               |                       |                     | [dBuV/m] | [dBuV/m] | [dB]   |
| 1   | 125.00        | 0                             | PK       | 113.6             | 19.9                  | 0.0           | 0.3                   | 26.7                | 107.1    | 125.7    | 18.6   |
| 2   | 125.00        | 0                             | AV       | 95.2              | 19.9                  | 0.0           | 0.3                   | 26.7                | 88.7     | 105.7    | 17.0   |
| 3   | 250.00        | 0                             | PK       | 75.3              | 19.9                  | 0.0           | 0.6                   | 27.5                | 68.3     | 119.6    | 51.3   |
| 4   | 250.00        | 0                             | AV       | 52.7              | 19.9                  | 0.0           | 0.6                   | 27.5                | 45.7     | 99.6     | 53.9   |
| 5   | 375.00        | 0                             | PK       | 67.9              | 19.9                  | 0.0           | 0.7                   | 27.9                | 60.6     | 116.1    | 55.5   |
| 6   | 375.00        | 0                             | AV       | 50.7              | 19.9                  | 0.0           | 0.7                   | 27.9                | 43.4     | 96.1     | 52.7   |
| 7   | 500.00        | 0                             | QP       | 50.7              | 19.9                  | 0.0           | 0.5                   | 28.0                | 43.1     | 73.6     | 30.5   |
| 8   | 625.00        | 0                             | QP       | 52.6              | 19.9                  | 0.0           | 0.5                   | 28.0                | 45.0     | 71.7     | 26.7   |
| 9   | 750.00        | 0                             | QP       | 36.3              | 19.9                  | 0.0           | 0.5                   | 28.1                | 28.6     | 70.1     | 41.5   |
| 10  | 875.00        | 0                             | QP       | 47.1              | 19.9                  | 0.0           | 0.5                   | 28.1                | 39.4     | 68.8     | 29.4   |
| 11  | 1000.00       | 0                             | QP       | 33.9              | 19.8                  | 0.0           | 0.5                   | 28.1                | 26.1     | 67.6     | 41.5   |
| 12  | 1125.00       | 0                             | QP       | 42.6              | 19.8                  | 0.0           | 0.5                   | 28.1                | 34.8     | 66.6     | 31.8   |
| 13  | 1250.00       | 0                             | QP       | 33.5              | 19.8                  | 0.0           | 0.5                   | 28.1                | 25.7     | 65.7     | 40.0   |

## REMARKS

ANTENNA TYPE : 10kHz-30MHz (Loop Antenna)

CALCULATION: READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

For fundamental, the measured field strength was extrapolated to distance 300m, using the formula that field strength varies as the inverse distance square (40dB per decade of distance).

Sample calculation:

Peak:  $102.2\text{dBuV/m} - 40\log(300/3) = 102.2 - 80 = 22.2\text{dBuV/m}$  at 300m

Limits for fundamental (section 15.209(a))  $= 20\log(2400/125) + 20 = 45.7\text{dBuV/m}$

Average:  $76.7\text{dBuV/m} - 40\log(300/3) = 76.7 - 80 = -3.3\text{dBuV/m}$  at 300m

Limits for fundamental (section 15.209(a))  $= 20\log(2400/125) = 25.7\text{dBuV/m}$

Limit: (9kHz - 490kHz):  $2400/\text{Freq}$  (Converted dBuV/m) +  $40\log(300/3)$

Limit: (490kHz - 1.705MHz):  $24000/\text{Freq}$  (Converted dBuV/m) +  $40\log(30/3)$

Limit: (1.705MHz - 30MHz):  $30$  (Converted dBuV/m) +  $40\log(30/3)$

All other spurious emissions are more than 20dB below the limits.

# DATA OF RADIATION TEST

A-Pex International Co., Ltd.  
No.2 SEMI ANECHOIC CHAMBER  
Report No. : 23EE0005-H0 = 2

Applicant : Tohoku Alps Co., Ltd.  
Kind of Equipment : Passive Entry System  
Model No. : TFWB1J441  
Serial No. : 3  
Power : DC12V  
Mode : Receiving(125kHz)  
Remarks : FCC ID:NHVWDJ441 Detector:QP  
Date : 12/25/2002  
Test Distance : 3 m  
Temperature : 22 °C  
Humidity : 37 %  
Regulation : FCC Part15C § 15.209(a)

  
Engineer : Hiroka Umeyama

| 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 μV/m] | MARGIN      |             |
|-----|----------------|-------------|----------------|----------------|-------------------------|---------------------|-----------------------|----------------|------------------|------------------|---------------------|-------------|-------------|
|     |                |             | HOR<br>[dB μV] | VER<br>[dB μV] |                         |                     |                       |                | HOR<br>[dB μV/m] | VER<br>[dB μV/m] |                     | HOR<br>[dB] | VER<br>[dB] |
| 1.  | 30.00          | BB          | 34.0           | 38.5           | 18.8                    | 27.5                | 0.7                   | 5.8            | 31.8             | 36.3             | 40.0                | 8.2         | 3.7         |
| 2.  | 51.17          | BB          | 43.7           | 40.1           | 12.2                    | 27.4                | 0.8                   | 5.8            | 35.1             | 31.5             | 40.0                | 4.9         | 8.5         |
| 3.  | 82.00          | BB          | 32.0           | 38.3           | 8.0                     | 27.1                | 1.0                   | 5.8            | 19.7             | 26.0             | 40.0                | 20.3        | 14.0        |
| 4.  | 140.00         | BB          | 25.3           | 25.8           | 15.1                    | 26.5                | 1.3                   | 5.8            | 21.0             | 21.5             | 43.5                | 22.5        | 22.0        |
| 5.  | 155.00         | BB          | 28.6           | 26.4           | 15.3                    | 26.4                | 1.4                   | 5.8            | 24.7             | 22.5             | 43.5                | 18.8        | 21.0        |
| 6.  | 190.00         | BB          | 21.3           | 35.2           | 17.1                    | 26.1                | 1.6                   | 5.8            | 19.7             | 33.6             | 43.5                | 23.8        | 9.9         |
| 7.  | 218.00         | BB          | 29.3           | 24.6           | 17.7                    | 26.2                | 1.7                   | 5.8            | 28.3             | 23.6             | 46.0                | 17.7        | 22.4        |
| 8.  | 360.00         | BB          | 26.7           | 28.6           | 16.1                    | 26.7                | 2.3                   | 5.7            | 24.1             | 26.0             | 46.0                | 21.9        | 20.0        |
| 9.  | 409.80         | BB          | 25.2           | 21.1           | 17.4                    | 27.1                | 2.5                   | 5.8            | 23.8             | 19.7             | 46.0                | 22.2        | 26.3        |
| 10. | 509.00         | BB          | 23.0           | 22.4           | 18.6                    | 27.6                | 2.7                   | 5.8            | 22.5             | 21.9             | 46.0                | 23.5        | 24.1        |

CALCULATION: READING[dB μV] + ANT.FACTOR[dB/m] + CABLE LOSS[dB] - AMP.GAIN[dB] + ATTEN[dB].

All other spurious emissions were less than 20dB for the limit.

ANT.TYPE : 30-300MHz Biconical, 300-1000MHz Logperiodic, 1000MHz- Horn

# DATA OF RADIATION TEST

A-Pex International Co., Ltd.  
No.2 SEMI ANECHOIC CHAMBER  
Report No. : 23EE0005-H0- 2

Applicant : Tohoku Alps Co., Ltd.  
Kind of Equipment : Passive Entry System  
Model No. : TFWD1J441  
Serial No. : 3  
Power : DC12V  
Mode : Receiving(312.125MHz)  
Remarks : FCC ID:NHVWDJ441 Detector:QP  
Date : 12/25/2002  
Test Distance : 3 m  
Temperature : 22 °C  
Humidity : 37 %  
Regulation : FCC Part15B. 109(a)

Engineer :  Hiroka Umeyama

| 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 μ V/m] | MARGIN      |             |
|-----|----------------|-------------|-----------------|-----------------|-------------------------|---------------------|-----------------------|----------------|-------------------|-------------------|----------------------|-------------|-------------|
|     |                |             | HOR<br>[dB μ V] | VER<br>[dB μ V] |                         |                     |                       |                | HOR<br>[dB μ V/m] | VER<br>[dB μ V/m] |                      | HOR<br>[dB] | VER<br>[dB] |
| 1.  | 32.00          | BB          | 21.4            | 26.6            | 18.1                    | 27.5                | 0.7                   | 5.8            | 18.5              | 23.7              | 40.0                 | 21.5        | 16.3        |
| 2.  | 88.00          | BB          | 22.5            | 21.1            | 8.2                     | 27.0                | 1.1                   | 5.8            | 10.6              | 9.2               | 40.0                 | 29.4        | 30.8        |
| 3.  | 125.00         | BB          | 20.9            | 20.3            | 13.3                    | 26.7                | 1.2                   | 5.8            | 14.5              | 13.9              | 43.5                 | 29.0        | 29.6        |
| 4.  | 177.50         | BB          | 19.9            | 20.1            | 16.5                    | 26.2                | 1.5                   | 5.8            | 17.5              | 17.7              | 43.5                 | 26.0        | 25.8        |
| 5.  | 210.00         | BB          | 19.6            | 19.7            | 17.6                    | 26.2                | 1.7                   | 5.8            | 18.5              | 18.6              | 43.5                 | 25.0        | 24.9        |
| 6.  | 322.83         | BB          | 36.9            | 29.1            | 15.1                    | 26.3                | 2.1                   | 5.7            | 33.5              | 25.7              | 46.0                 | 12.5        | 20.3        |
| 7.  | 645.65         | BB          | 21.1            | 22.1            | 19.1                    | 27.7                | 3.3                   | 5.8            | 21.6              | 22.6              | 46.0                 | 24.4        | 23.4        |
| 8.  | 968.48         | BB          | 29.9            | 29.8            | 22.8                    | 27.0                | 4.0                   | 5.7            | 35.4              | 35.3              | 54.0                 | 18.6        | 18.7        |

CALCULATION:  $READING[dB \mu V] + ANT.FACTOR[dB/m] + CABLE LOSS[dB] - AMP.GAIN[dB] + ATTEN[dB]$ .

All other spurious emissions were less than 20dB for the limit.

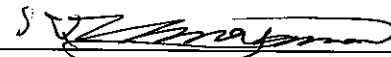
ANT.TYPE : 30-300MHz Biconical, 300-1000MHz Logperiodic, 1000MHz- Horn

# -20dB Bandwidth

A-Pex International Co., Ltd.  
Head office No.2 Semi Anechoic Chamber

Company : TOHOKU ALPS CO., LTD.  
Equipment : Passive Entry System (Control Unit)  
Model : TFWD1J441  
Sample No. : 3  
Power : DC12.0V  
Mode : Transmitting (125kHz)  
Temperature : 22deg.C  
Humidity : 37%

Report No. : 23EE0005-HO - 2  
Regulation : FCC Part15C Section 15.209  
Test Distance : 3m  
Date : 2002/12/25  
FCC ID : NHVWDJ441

  
ENGINEER : Hiroka Umeyama

