# EMI TEST REPORT

## Test Report No. : 26LE0004-HO-C-1

| | | |
|---|---|---|
| **Applicant** | : | **Mitsubishi Electric Corporation<br>Himeji Works** |
| **Type of Equipment** | : | **KIPASS SYSTEM** |
| **Model No.** | : | **SKEB7A-01 (Smart Unit)** |
| **FCC ID** | : | **BGBF8T735SKEB7A01** |
| **Test standard** | : | **FCC Part 15 Subpart B Class B 2006** |
| **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 the above regulation.
4. The test results in this report are traceable to the national or international standards.

**Date of test:** August 22, 2006

**Tested by:** T. Shimada
Takumi Shimada
EMC Services

**Approved by :**
Naoki Sakamoto
Group Leader of EMC Services

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://ulapex.jp/emc/nvlap.htm

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## SECTION 1: Client information

| | | |
|---|---|---|
| Company Name | : | Mitsubishi Electric Corporation Himeji Works |
| Address | : | 840 Chiyoda-machi Himeji Hyogo, 670-8677 Japan |
| Telephone Number | : | +81-79-298-9143 |
| Facsimile Number | : | +81-79-298-8879 |
| Contact Person | : | Toshiaki Hata |

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

### 2.1 Identification of E.U.T.

| | | |
|---|---|---|
| Type of Equipment | : | KIPASS SYSTEM |
| Model No. | : | SKEB7A-01 (Smart Unit) |
| Serial No. | : | 2(Smart Unit) |
| Rating | : | DC12V |
| Country of Manufacture | : | Japan |
| Receipt Date of Sample | : | August 11, 2006 |
| Condition of EUT | : | Production Prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification of EUT | : | No modification by the test lab |

### 2.2 Product Description

Mitsubishi Electric Corporation Himeji Works Model No: SKEB7A-01 is the KIPASS SYSTEM.
The system is mainly used as a Smart Keyless Entry System for Motorcycles.
The clock frequency of EUT is 5 MHz, 10 MHz and 20MHz
[Smart Unit : SKEB7A-01]

LF Part

| | | |
|---|---|---|
| Equipment Type | : | Transmitter |
| Frequency band | : | 132.45kHz |
| Type of modulation | : | Pulse Position Mod. |
| Bandwidth | : | - |
| Frequency of operation | : | 132.45kHz |
| Other clock frequency | : | 10MHz, 32.768kHz |
| Antenna Type | : | Coil Antenna |
| Method of Frequency Generation | : | Synthesizer |
| Operating voltage (inner) | : | DC +5.0V |

UHF Part

| | | |
|---|---|---|
| Type of Receiver | : | Receiver |
| Frequency of operation | : | 315MHz |
| Other clock frequency | : | 10.178125MHz |
| Intermediate frequency | : | 10.7MHz |
| Antenna Type | : | Bar Antenna |
| Method of Frequency Generation | : | Crystal |
| Operating voltage (inner) | : | DC +5.0V |

The receiving antenna (of this EUT) is installed on KIPASS SYSTEM, which is unremovable. Therefore, this EUT complies with the requirement in section 15.111(b).

# SECTION 3: Test specification, procedures & results

### 3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2006
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

### 3.2 Procedures and results

| Item | Test Procedure | Limits | Deviation | Worst margin *0) | Result |
|---|---|---|---|---|---|
| Conducted emission | ANSI C63.4: 2003<br>7. AC powerline conducted emission measurements | Class B | N/A | N/A *1) | N/A |
| Radiated emission | ANSI C63.4: 2003<br>8. Radiated emission measurements | Class B | N/A | 21.8dB<br>912.900MHz,<br>Horizontal/Vertical | Complied |

*Note: UL Apex's EMI Work Procedure QPM05.
*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.
*1)The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

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

### 3.3 Uncertainty

Radiated Emission
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.59dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±4.62dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ±5.27dB.
The data listed in this test report has enough margin, more than the site margin.

### 3.4 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116 Facsimile: +81 596 24 8124

| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|---|---|---|---|---|---|
| No.1 semi-anechoic chamber | 313583 | IC4247A | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | Preparation room |
| No.2 semi-anechoic chamber | 655103 | IC4247A-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | IC4247A-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | IC4247A-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | - |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | N/A | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 2.0 x 2.0 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 5.4 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3 and No.4 semi-anechoic chambers and No.7 shielded room.

### 3.5 Test set up, Data of EMI, and Test instruments

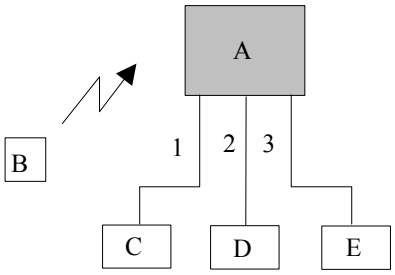
Refer to APPENDIX 1 to 3.

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

## 4.1 Operating modes

The mode is used : Receiving mode (315MHz)

## 4.2 Configuration and peripherals




*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

**Description of EUT and Support equipment**

| No | Item | Model number | Serial number | Manufacturer | Remark |
|---|---|---|---|---|---|
| A | Smart Unit | SKEB7A-01 | 2 | Mitsubishi Electric Corporation Himeji Works | EUT |
| B | Smart Transmitter | SKEB7A-02 | 4 | Mitsubishi Electric Corporation Himeji Works | - |
| C | Battery | STRIKER Ⅱ | A030402 | YUASA | - |
| D | REQ Switch | - | - | - | - |
| E | Answer Back Lamp | - | - | - | - |

**List of cables used**

| No. | Name | Length (m) | Shield | |
|---|---|---|---|---|
| | | | Cable | Connector |
| 1 | DC Cable | 0.9 | Unshielded | Unshielded |
| 2 | SW Cable | 0.9 | Unshielded | Unshielded |
| 3 | LAMP Cable | 0.9 | Unshielded | Unshielded |

# SECTION 5: Radiated Emission

## 5.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

## 5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 0.5m, raised 80cm above the conducting ground plane.
The EUT was set on the edge of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
A drawing of the set up is shown in the photos of APPENDIX 1.

## 5.3 Test conditions

Frequency range : 30MHz – 300MHz (Biconical antenna) / 300MHz – 1000MHz (Logperiodic antenna)
1000 – 2000MHz (Horn antenna)
Test distance : 3m
EUT position : Table top
EUT operation mode : Receiving mode

## 5.4 Test procedure

The height of the measuring varied between 1 and 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 with the Test Receiver, or the Spectrum Analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

| Frequency | Below 1GHz | Above 1GHz |
|---|---|---|
| Instrument used | Test Receiver | Spectrum Analyzer |
| IF Bandwidth | QP: BW 120kHz | PK: RBW:1MHz/VBW: 1MHz<br>AV: RBW:1MHz/VBW:10Hz |

## 5.5 Test result

Summary of the test results: Pass

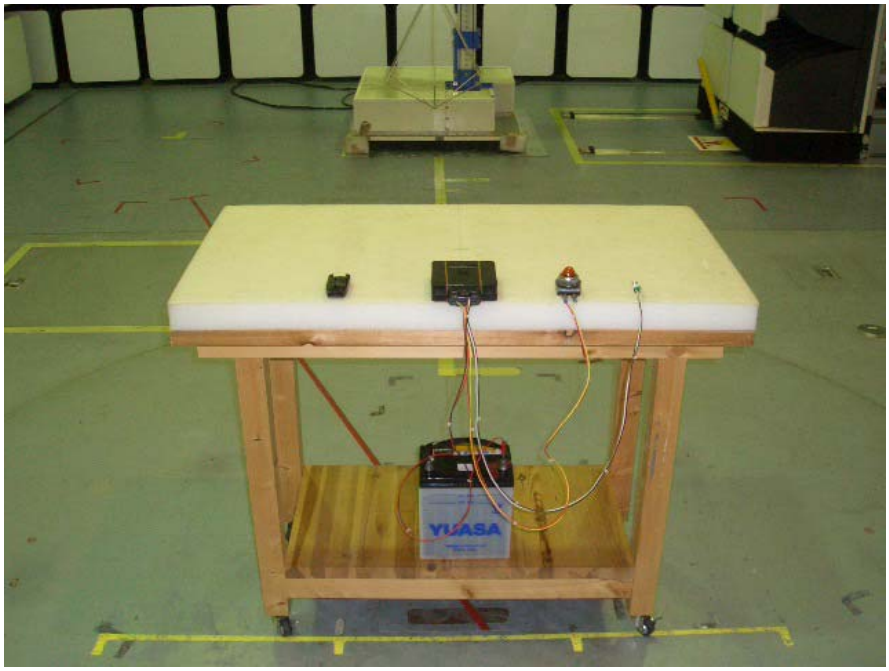
Date: August 22, 2006 Test engineer: Takumi Shimada

## APPENDIX 1: Photographs of test setup

### Radiated Emission

**Front**


**Rear**



# APPENDIX 2: Data of EMI test

## Radiated Emission(315MHz Receiving)

DATA OF RADIATED EMISSION TEST

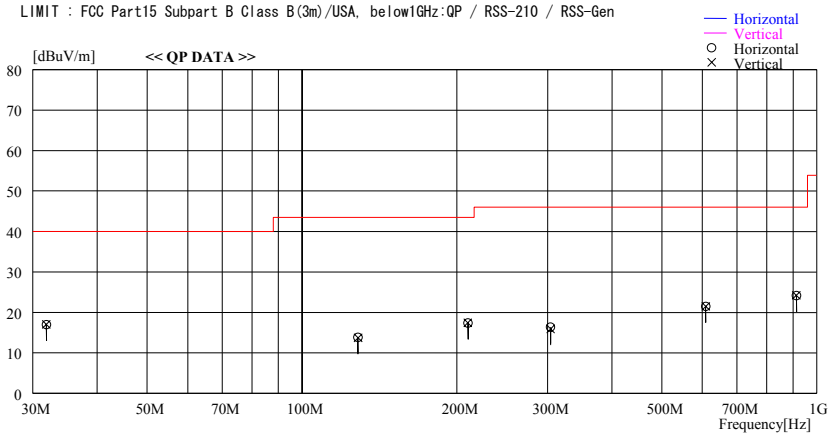
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/08/22 11:15:44

Company : Mitsubishi Electric Corp., Himeji Works
Kind of EUT : KIPASS SYSTEM
Model No. : SKEB7A-01
Serial No. : 2

Report No. : 26LE0004-HO
Power : DC 12V (Inner DC5.0V)
Temp./Humi. : 24deg.C. / 62%
Operator : Takumi Shimada

Mode / Remarks : Rx 315MHz MAX-Axis (X-axis)

LIMIT : FCC Part15 Subpart B Class B(3m)/USA, below1GHz:QP / RSS-210 / RSS-Gen




| Frequency | Reading | DET | Antenna Factor | Loss& Gain | Level | Polar. | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dBuV/m] | | [dBuV/m] | [dB] |
| 31.890 | 21.6 | QP | 17.4 | -22.0 | 17.0 | Hori. | 40.0 | 23.0 |
| 31.890 | 21.6 | QP | 17.4 | -22.0 | 17.0 | Vert. | 40.0 | 23.0 |
| 128.549 | 21.4 | QP | 13.3 | -20.9 | 13.8 | Hori. | 43.5 | 29.7 |
| 128.549 | 21.3 | QP | 13.3 | -20.9 | 13.7 | Vert. | 43.5 | 29.8 |
| 210.091 | 20.8 | QP | 16.7 | -20.1 | 17.4 | Hori. | 43.5 | 26.1 |
| 210.091 | 20.8 | QP | 16.7 | -20.1 | 17.4 | Vert. | 43.5 | 26.1 |
| 304.300 | 20.9 | QP | 14.3 | -18.9 | 16.3 | Hori. | 46.0 | 29.7 |
| 304.300 | 20.5 | QP | 14.3 | -18.9 | 15.9 | Vert. | 46.0 | 30.1 |
| 608.600 | 21.4 | QP | 19.3 | -19.2 | 21.5 | Vert. | 46.0 | 24.5 |
| 608.600 | 21.4 | QP | 19.3 | -19.2 | 21.5 | Hori. | 46.0 | 24.5 |
| 912.900 | 20.3 | QP | 21.2 | -17.3 | 24.2 | Vert. | 46.0 | 21.8 |
| 912.900 | 20.3 | QP | 21.2 | -17.3 | 24.2 | Hori. | 46.0 | 21.8 |

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP,30-300MHz BICONICAL,300MHz-1000MHz LOGPERIODIC,1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

# Radiated Emission(315MHz Receiving)

## DATA OF RADIATED EMISSION TEST

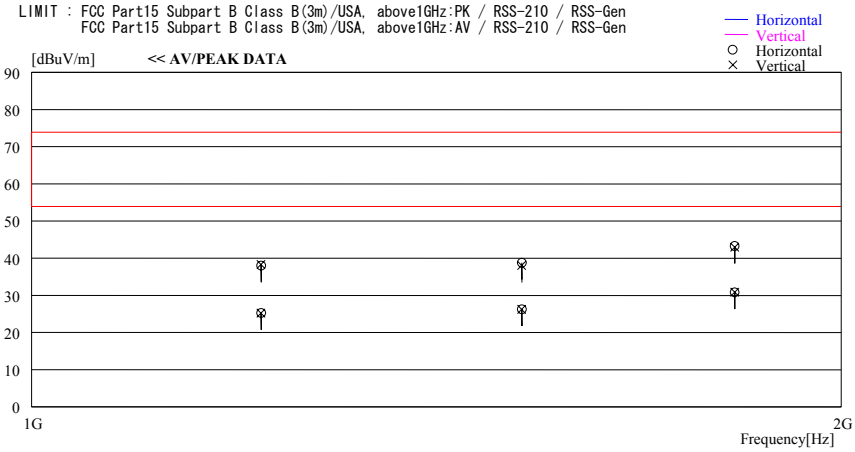
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/08/22 13:29:29

Company : Mitsubishi Electric Corp., Himeji Works
Kind of EUT : KIPASS SYSTEM
Model No. : SKEB7A-01
Serial No. : 2

Report No. : 26LE0004-HO
Power : DC 12V (Inner DC5.0V)
Temp./Humi. : 24deg.C. / 62%
Operator : Takumi Shimada

Mode / Remarks : Rx 315MHz MAX-Axis (X-axis)

LIMIT : FCC Part15 Subpart B Class B(3m)/USA, above1GHz:PK / RSS-210 / RSS-Gen
FCC Part15 Subpart B Class B(3m)/USA, above1GHz:AV / RSS-210 / RSS-Gen




| Frequency | Reading | DET | Antenna Factor | Loss& Gain | Level | Polar. | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dBuV/m] | | [dBuV/m] | [dB] |
| 1217.200 | 45.5 | PK | 23.4 | -30.8 | 38.1 | Hori. | 73.9 | 35.9 |
| 1217.200 | 45.7 | PK | 23.4 | -30.8 | 38.3 | Vert. | 73.9 | 35.6 |
| 1217.200 | 32.7 | AV | 23.4 | -30.8 | 25.3 | Hori. | 53.9 | 28.6 |
| 1217.200 | 32.7 | AV | 23.4 | -30.8 | 25.3 | Vert. | 53.9 | 28.6 |
| 1521.500 | 44.6 | PK | 24.4 | -30.2 | 38.8 | Hori. | 73.9 | 35.1 |
| 1521.500 | 43.8 | PK | 24.4 | -30.2 | 38.0 | Vert. | 73.9 | 35.9 |
| 1521.500 | 32.1 | AV | 24.4 | -30.2 | 26.3 | Hori. | 53.9 | 27.7 |
| 1521.500 | 32.1 | AV | 24.4 | -30.2 | 26.3 | Vert. | 53.9 | 27.7 |
| 1825.800 | 43.8 | PK | 29.0 | -29.5 | 43.3 | Hori. | 73.9 | 30.6 |
| 1825.800 | 43.5 | PK | 29.0 | -29.5 | 43.0 | Vert. | 73.9 | 30.9 |
| 1825.800 | 31.4 | AV | 29.0 | -29.5 | 30.9 | Hori. | 53.9 | 23.1 |
| 1825.800 | 31.3 | AV | 29.0 | -29.5 | 30.8 | Vert. | 53.9 | 23.1 |

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP,30-300MHz BICONICAL,300MHz-1000MHz LOGPERIODIC,1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

## APPENDIX 3: Test instruments

**EMI test equipment**

| Control No. | Instrument | Manufacturer | Model No | Test Item | Calibration Date * Interval(month) |
|---|---|---|---|---|---|
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | RE | 2005/10/10 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | RE | 2005/10/14 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | RE | 2006/02/23 * 12 |
| MAT-07 | Attenuator (6dB) | Weinschel Corp | 2 | RE | 2005/12/16 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | RE | 2005/09/07 * 12 |
| MHA-06 | Horn Antenna | Schwarzbeck | BBHA9120D | RE | 2006/01/09 * 12 |
| MCC-16 | Microwave Cable 1G-26.5GHz | Suhner | SUCOFLEX 104 | RE | 2006/02/02 * 12 |
| MCC-47 | Microwave Cable 1G-26.5GHz | Suhner | SUCOFLEX104 | RE | 2005/08/30 * 12 |
| MPA-10 | Pre Amplifier | Agilent | 8449B | RE | 2005/09/07 * 12 |
| MTR-03 | Test Receiver | Rohde & Schwarz | ESCI | RE | 2006/03/04 * 12 |
| MAEC-02 | Anechoic Chamber | TDK | Semi Anechoic Chamber 3m | RE | 2006/04/10 * 12 |
| MSTW-14 | EMI measurement program | TSJ | TEPTO-DV | RE | - |
| MOS-02 | Digital Humidity Indicator | N.T | NT-1800 | RE | 2004/11/25 * 24 |
| MSA-06 | Spectrum Analyzer | Agilent | E4407B | RE | 2006/05/24 * 12 |

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

**Test Item:**

**RE: Radiated emission**