EMI TEST REPORT

Test Report No. : 25LE0286-HO-1a

Applicant	:	**Mitsubishi Electric Corporation Himeji Works**
Type of Equipment	:	**Normal keyless system (Receiver)**
Model No.	:	**SKE125-01**
Test standard	:	**FCC Part 15 Subpart B 2005 Class B**
FCC ID	:	**BGBX1T412SKE12501**
Test Result	:	**Complied**

1. This test report shall not be reproduced except 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 test report are traceable to the national or international standards.

Date of test :
August 10, 2004

Tested by :
K. Adachi
Kenichi Adachi
EMC Service

Approved by :
Naoki Sakamoto
Group Leader of
EMC Service

A-Pex International Co., Ltd.
EMC Head Office Division.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

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SECTION 1: Client information

Company Name	:	Mitsubishi Electric Corporation Himeji Works
Address	:	840 CHIYODA-MACHI HIMEJI HYOUGO 670-8677 JAPAN
Telephone Number	:	+81-792-98-8896
Facsimile Number	:	+81-792-98-9262
Contact Person	:	Yoshiharu Goto

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

2.1 Identification of E.U.T.

Type of Equipment	:	Normal keyless system (Receiver)
Model No.	:	SKE125-01
Serial No.	:	1
Country of Manufacture	:	Japan
Receipt Date of Sample	:	August 2, 2004
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product description

Model No: SKE125-01 is a Receiver Normal keyless system.
The system is mainly used for locking and unlocking the doors of the vehicle.
The clock frequency of EUT is 8MHz.

Frequency of Operation	:	315MHz
Intermediate Frequency	:	10.7MHz
Type of Modulation	:	FSK
Emission Designation	:	F1D
Mode of operation	:	Simplex
Antenna Type	:	Mono Pole Antenna
Method of Frequency Generation	:	Crystal
Type of receiver	:	Super-heterodyne system

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

SECTION 3: Test specification, procedures and results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2005 Class B
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	ANSI C63.4: 2003 7. AC powerline conducted emission measurements	Class B	N/A	N/A*1)	N/A
Radiated emission	ANSI C63.4: 2003 8. Radiated emission measurements	Class B	N/A	18.1dB (132.496MHz, Horizontal)	Complied
*1) The test in not applicable since the EUT does not have AC Mains.					

3.3 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications, FCC Part15 Subpart B 2005 Class B.

3.4 Uncertainty

Radiated Emission
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.5dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±5.2dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ±6.6dB.
The data listed in this test report has enough margin.

3.5 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 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	846015	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 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 and No.2 semi-anechoic and No.3 shielded room.

3.6 Photographs of test setup, Test instruments and Data of EMI Test,

Refer to APPENDIX 1 to 3.

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

4.1 Operating modes

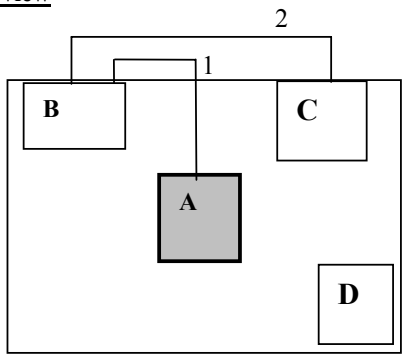
The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

Test sequence is used : Continuous Receiving of the conventional signals from the keyless transmitter.
*The test was performed with the same Receiving mode as the user would normally set.

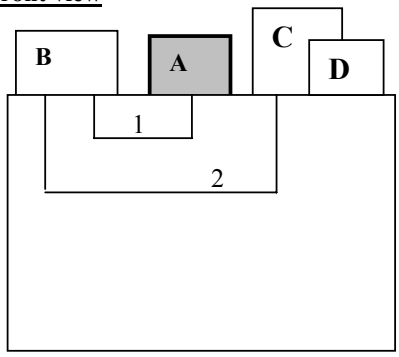
Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

Top view



Front view



*Cabling was 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	FCC ID/DOC/Others	Remark
A	Normal keyless system (Receiver)	SKE125-01	1	Mitsubishi Electric Corporation	BGBX1T412SKE12501	EUT
B	Checker	-	-	Mitsubishi Electric Corporation	-	-
C	Car Battery	40B19L	A30402	YUASA	-	-
D	Normal keyless system (Transmitter)	SKE125-01	1	Mitsubishi Electric Corporation	DoC	-

List of cables used

No.	Name	Length (m)	Shield	Backshell material
1	Signal cable	1.4	N	Polyvinyl Chloride
2	DC cable	1.0	N	Polyvinyl Chloride

SECTION 5: Radiated emission

5.1 Operating environment

The test was carried out in No.2 semi anechoic chamber.
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a platform of nominal size, 0.5m by 0.5m, raised 80cm above the conducting ground plane.
The EUT was set on the center 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 Radiated Electric Field Strength intensity has been measured on a semi anechoic chamber with a ground plane and at a distance of 3m.
Measurements were performed with a quasi-peak detector.
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 radiated emission measurements were made with the following detector function of the test receiver.

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

-The noise was measured at each position of all three axes X, Y and Z to compare the level, and the maximum noise level was recorded.
-The relative measurements were performed on the fundamental and the spurious emissions with each conduction of the key folded and the key set up. The key set-up condition was worse case under both the fundamental and the spurious emissions, we, therefore, tested while the key was set up. See the photograph.

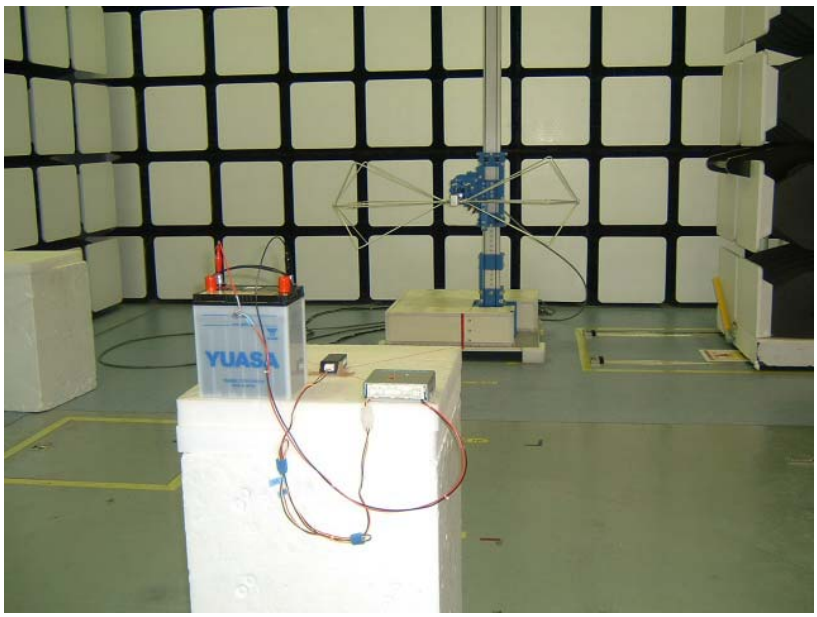
5.5 Results

Summary of the test results: Pass

Date: August 10, 2004 Test engineer: Kenichi Adachi

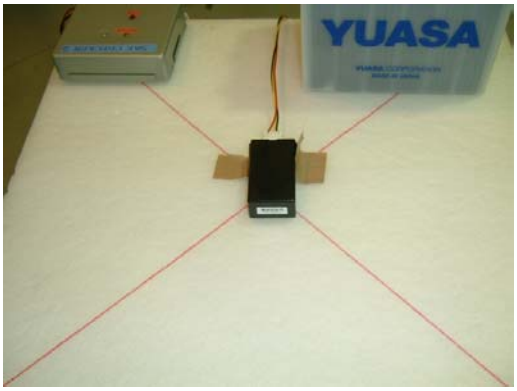
APPENDIX 1: Photographs of test setup

Radiated emission(Worst case position)(Receiver)

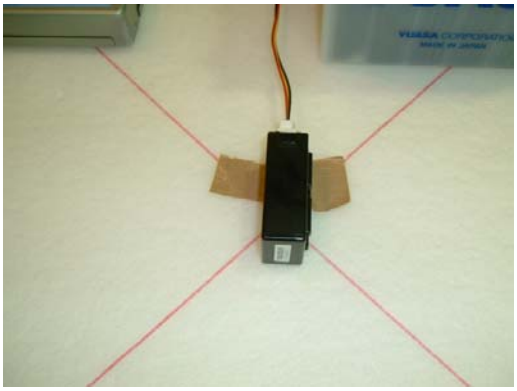


Worst Case Position (Horizontal : X-axis/ Vertical: Y-axis)

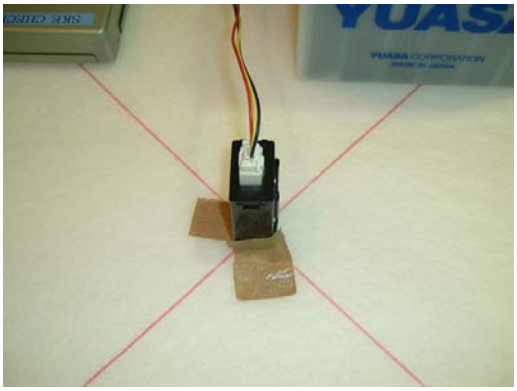
X-axis



Y-axis



Z-axis



APPENDIX 2: Test Instruments

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2004/04/12 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2004/02/03 * 12
MRENT-09	Spectrum Analyzer	Advantest	R3273	RE	2004/02/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2004/02/24 * 12
MPA-02	Pre Amplifier	Agilent	87405A	RE	2004/04/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2003/12/16 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/10/15 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/10/15 * 12
MCC-04	Microwave Cable	Storm	421-011	RE	2004/01/06 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2004/02/06 * 12
MCC-24	Microwave Cable	Storm	-	RE	2004/05/01 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2004/01/10 * 12
MCB-02	Car Battery	YUASA	40B19L	RE	Pre Check

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

RE: Radiated emission

APPENDIX 3: Data of EMI

Radiated Emission

DATA OF RADIATED EMISSION TEST

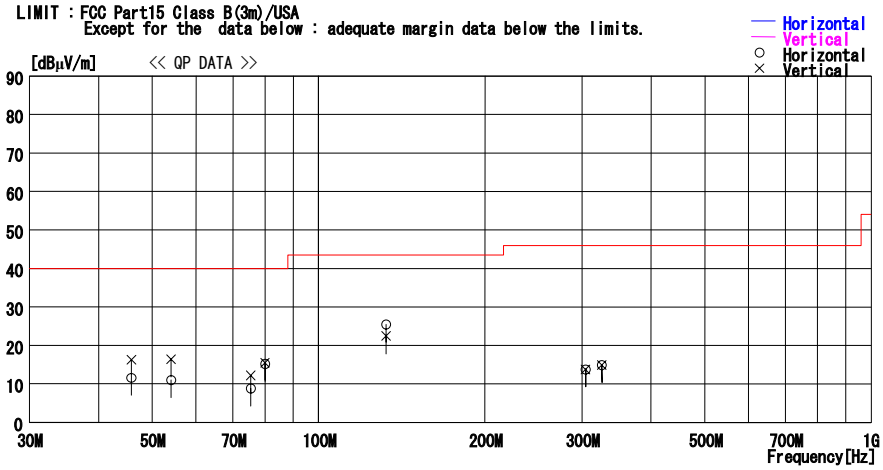
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/08/10 21:39:29

Applicant : Mitsubishi Electric Corporation
Kind of EUT : NORMAL KEYLESS SYSTEM
Model No. : SKE125-01 (Receiver)
Serial No. : 1

Report No. : 25LE0286-HO
Power : DC 12.0V
Temp./Humi. : 25 deg.C. / 63 %
Operator : Kenichi Adachi

Mode / Remarks: Receiving (315MHz) , EUT MAX-axis (Hor.:X-axis, Ver.:Y-axis)

LIMIT : FCC Part15 Class B(3m)/USA
Except for the data below : adequate margin data below the limits.



No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
—— Horizontal ——										
1	45.870	16.8	11.4	6.6	23.2	11.6	40.0	28.4	227	20
2	54.069	18.0	9.4	6.8	23.2	11.0	40.0	29.0	315	338
3	75.396	18.5	6.5	6.9	23.1	8.8	40.0	31.2	220	0
4	80.005	24.9	6.3	7.1	23.1	15.2	40.0	24.8	100	0
5	132.496	27.2	13.7	7.4	22.9	25.4	43.5	18.1	116	54
6	304.300	14.1	14.2	8.3	22.8	13.8	46.0	32.2	100	0
7	325.700	14.3	15.1	8.4	22.9	14.9	46.0	31.1	100	0
—— Vertical ——										
8	45.870	21.5	11.4	6.6	23.2	16.3	40.0	23.7	280	0
9	54.069	23.4	9.4	6.8	23.2	16.4	40.0	23.6	100	208
10	75.396	21.9	6.5	6.9	23.1	12.2	40.0	27.8	133	291
11	80.005	25.2	6.3	7.1	23.1	15.5	40.0	24.5	109	0
12	132.496	24.2	13.7	7.4	22.9	22.4	43.5	21.1	100	0
13	304.300	14.1	14.2	8.3	22.8	13.8	46.0	32.2	100	0
14	325.700	14.3	15.1	8.4	22.9	14.9	46.0	31.1	100	0

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)

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

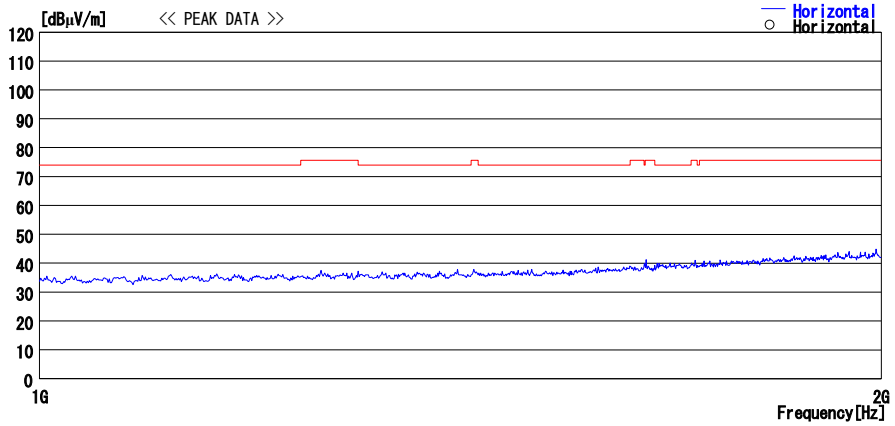
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/08/10 23:21:35

Applicant	: Mitsubishi Electric Corporation	Report No.	: 25LE0286-HO
Kind of EUT	: NORMAL KEYLESS SYSTEM	Power	: DC 12.0V
Model No.	: SKE125-01 (Receiver)	Temp./Humi.	: 24 deg.C. / 55 %
Serial No.	: 1	Operator	: Kenichi Adachi

Mode / Remarks: Receiving (315MHz) , EUT MAX-axis (Hor.:X-axis , Ver.:Y-axis)

LIMIT : FCC15C §15.231(b)&§15.209(a) (315MHz)Peak
Except for the data below : adequate margin data below the limits.



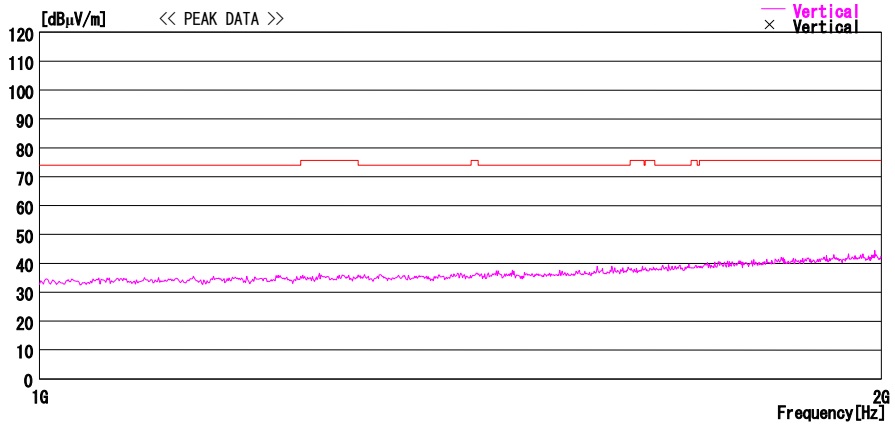


CHART:WITH FACTOR _ ANT TYPE : -30MHz LOOP,30-300MHz BICONICAL,300MHz-1000MHz LOGPERIODIC,1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)