



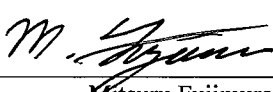
EMI TEST REPORT

Test Report No. : 24LE0318-HO-1

Applicant : Mitsubishi Electric Corporation Himeji Works
Type of Equipment : The Immobilizer System
Model No. : IMB111-02
Test standard : FCC Part 15 Subpart C : 2004
Section 15.209
FCC ID : BGBX1T262IMB11102
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.

Date of test : August 24 and September 4, 2004

Tested by : 
Mitsuru Fujimura
EMC Service

Approved by : 
Naoki Sakamoto
Group Leader of EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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MF060b(10.04.03)

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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 : The Immobilizer System
Model No. : IMB111-02
Serial No. : 1
Country of Manufacture : Japan
Receipt Date of Sample : August 20, 2004
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Model No: IMB111-02 (referred to as the EUT in this report) is the Immobilizer System.

Clock frequency	4MHz (CPU)
Feature of EUT	The immobilizer system for vehicle (anti-theft device)

Equipment Type	Transceiver
Frequency of Operation	134.45kHz
Type of Modulation	FSK (Frequency Shift Keying)
Antenna Type	Inductive loop
Antenna Connector Type	N/A
Mode of Operation	Simplex
Power Supply	DC 5.0V (Transformed from DC 12V/Car Battery)

FCC 15.31 (e)

The power supply of this EUT is transformed to DC 5V and provides stable voltage (DC5.0V) constantly to Radio part. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C : 2004

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.209 Radiated emission limits, general requirements

3.2 Procedures and results

1) FCC Part15 Subpart C : 2004

No.	Item	Test Procedure	Specification	Remarks	Worst margin	Result
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003	FCC Section 15.209	Radiated	26.6dB AV 134.97kHz	Complied
2	Electric Field Strength of Spurious Emission	ANSI C63.4:2003	FCC Section 15.205 FCC Section 15.209	Radiated	12.2dB QP 55.037MHz Vertical	Complied
3	Conducted Emission	ANSI C63.4:2003	FCC Section 15.207(a)	AC Mains only*1)	N/A	N/A

Note: UL Apex's EMI Work procedures No. QPM05

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

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

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	RSS210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	Radiated	N/A	N/A	N/A
2	-26dB Bandwidth	ANSI C63.4:2003	Reference data	Radiated	N/A	N/A	N/A

3.4 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is ± 1.8 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.5 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 5.2 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is ± 6.6 dB.

The data listed in this test report has enough margin.

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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

	Listed date (for FCC)	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	February 01, 2002	313583	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	June 05, 2002	846015	IC4247-2	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 Test set up, Test instruments and Data of EMI

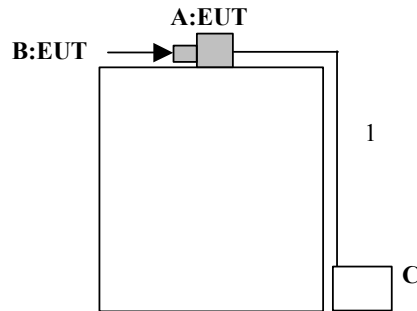
Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

The sequence is used : Continuous transmitting mode
*It generates a radio and receives the information from the transponder.

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and Support Equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	The Immobilizer System	IMB111-02	1	Mitsubishi Electric Corporation Himeji Works	BGBX1T262IMB11102
B	Transponder Key	-	-	Mitsubishi Electric Corporation Himeji Works	-
C	Car Battery	50B24L	N/A	YUASA	-

List of cables used

No.	Name	Length (m)	Shield	Remark
1	DC Cable	1.5	N	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

5.1 Operating environment

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

Temperature : See data
Humidity : See data

Test Procedure

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 and on No.2 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg., 45deg. and 90deg.

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height was 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.

Measurements were performed with a QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

With the position, the noise levels of all the frequencies was measured.

* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]=[Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz[Limit at 3m]=[Limit at 30m]-40log (3[m]/30[m])

5.2 Results

Summary of the test results: Pass

Date: August 24 and September 4, 2004

Tested by: Mitsuru Fujimura

UL Apex Co., Ltd.

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APPENDIX 1: Photographs of test setup

Radiated emission

(Worst case position: Horizontal/ Vertical: X-axis)

Front



Rear



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APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE/ME	2004/04/12 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE/ME	2004/02/03 * 12
MRENT-09	Spectrum Analyzer	Advantest	R3273	RE/ME	2004/02/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2004/02/24 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE/ME	2004/05/25 * 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-13	Coaxial Cable	Fujikura/Agilent	-	ME	2004/02/24 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	ME	2004/01/08 * 12
MCC-08	coaxial cable	-	-	ME	2004/01/26 * 12

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

Test Item:

RE: Radiated emission

ME: Radiated Magnetic Field Strength 9kHz – 30MHz

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APPENDIX 3: Data of EMI test

Radiated Emission

UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

Company : Mitsubishi Electric Corporation Himeji Works
Equipment : The Immobilizer System
Model : IMB111-02
Sample No. : 1
Power : DC 12.0V (Car battery)
Mode : Transmitting (134.45kHz)
FCC ID : BGBX1T262IMB11102
IC No. : 662F-IMB11102
EUT Position : X-axis

Report No. : 24LE0318-HO
Regulation : FCC Part15C Section 15.209
Test Distance : 3m
Date : 2004/9/4
Temperature : 25deg.C
Humidity : 67%

ENGINEER : Mitsuru Fujimura

Frequency Range : 9-90kHz & 110-490kHz / AV & PK DETECT(Test Receiver: BW 200Hz or 9kHz)

Other Frequency Range : 490kHz-30MHz QP DETECT(Test Receiver: BW 9kHz)

No.	FREQ [kHz]	Loop Max Angle [deg]	T/R detector type	T/R READING [dBuV]	ANT Factor [dB/m]	ATTEN (not used) [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]
1	134.97	0	PK	85.2	19.9	-	0.1	26.6	78.6	125.0	46.4
1	134.97	45	PK	83.2	19.9	-	0.1	26.6	76.6	125.0	48.4
1	134.97	90	PK	80.5	19.9	-	0.1	26.6	73.9	125.0	51.1
1	134.97	0	AV	85.0	19.9	-	0.1	26.6	78.4	105.0	26.6
2	269.94	0	PK	46.0	19.9	-	0.1	27.1	38.9	119.0	80.1
2	269.94	0	AV	37.7	19.9	-	0.1	27.1	30.6	99.0	68.4
3	404.91	0	PK	52.5	19.9	-	0.1	27.4	45.1	115.5	70.4
3	404.91	0	AV	50.0	19.9	-	0.1	27.4	42.6	95.5	52.9
4	539.88	0	QP	34.9	19.9	-	0.2	27.6	27.4	73.0	45.6
5	674.85	0	QP	42.8	19.8	-	0.2	27.8	35.0	71.0	36.0
6	809.82	0	QP	34.5	19.8	-	0.1	27.9	26.5	69.4	42.9
7	944.79	0	QP	43.6	19.8	-	0.2	27.9	35.7	68.1	32.4
8	1079.76	0	QP	33.7	19.8	-	0.2	27.9	25.8	66.9	41.1
9	1214.73	0	QP	40.2	19.8	-	0.2	27.8	32.4	65.9	33.5
10	1349.70	0	QP	32.8	19.8	-	0.2	27.8	25.0	65.0	40.0

REMARKS

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

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

* The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.

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

Used Equipment: MLPA-01, MPA-04, MCC-(08+13),MTR-02

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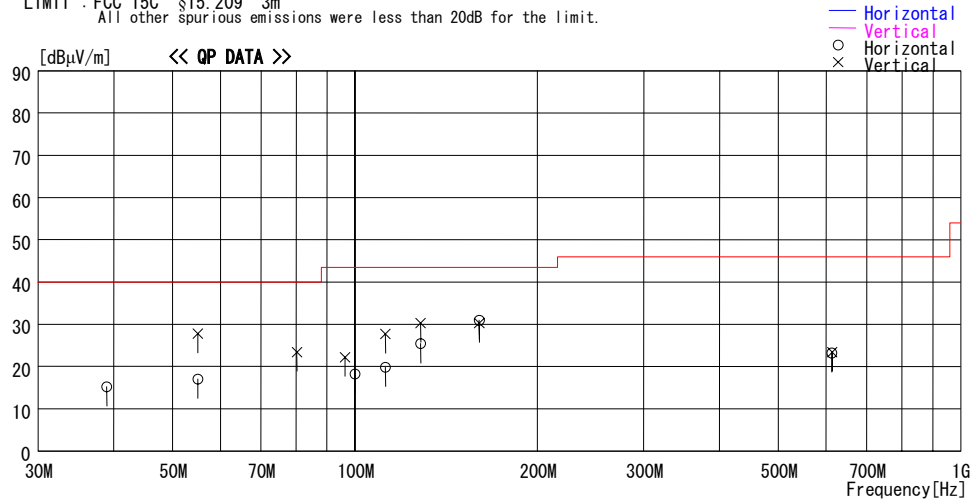
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber

Applicant : Mitsubishi Electric Corporation Hime
Kind of EUT : The Immobilizer System
Model No. : IMB111-02
Serial No. : No.1
Report No. : 24LE0318-HO
Power : DC12V
Temp°C/Humi% : 25deg.C / 59%
Operator : Mitsuru Fujimura

Mode / Remarks: Transmitting (134.45kHz)

LIMIT : FCC 15C §15.209 3m
All other spurious emissions were less than 20dB for the limit.



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	38.944	22.1	14.3	6.6	27.8	15.2	40.0	24.8	100	0
2	55.045	28.6	9.2	6.8	27.6	17.0	40.0	23.0	400	272
3	100.008	28.8	10.2	7.2	28.0	18.2	43.5	25.3	100	180
4	112.373	28.3	11.9	7.3	27.7	19.8	43.5	23.7	290	126
5	128.423	32.2	13.5	7.4	27.7	25.4	43.5	18.1	151	130
6	160.530	36.0	15.2	7.6	27.8	31.0	43.5	12.5	128	121
7	612.998	22.5	19.7	9.9	28.9	23.2	46.0	22.8	100	0
----- Vertical -----										
8	55.037	39.4	9.2	6.8	27.6	27.8	40.0	12.2	100	0
9	80.264	37.8	6.3	7.1	27.8	23.4	40.0	16.6	100	169
10	96.321	33.3	9.3	7.2	27.6	22.2	43.5	21.3	100	180
11	112.369	36.2	11.9	7.3	27.7	27.7	43.5	15.8	100	181
12	128.421	37.1	13.5	7.4	27.7	30.3	43.5	13.2	100	138
13	160.516	35.3	15.2	7.6	27.8	30.3	43.5	13.2	100	138
14	614.085	22.7	19.7	9.9	28.9	23.4	46.0	22.6	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)

-26dB bandwidth

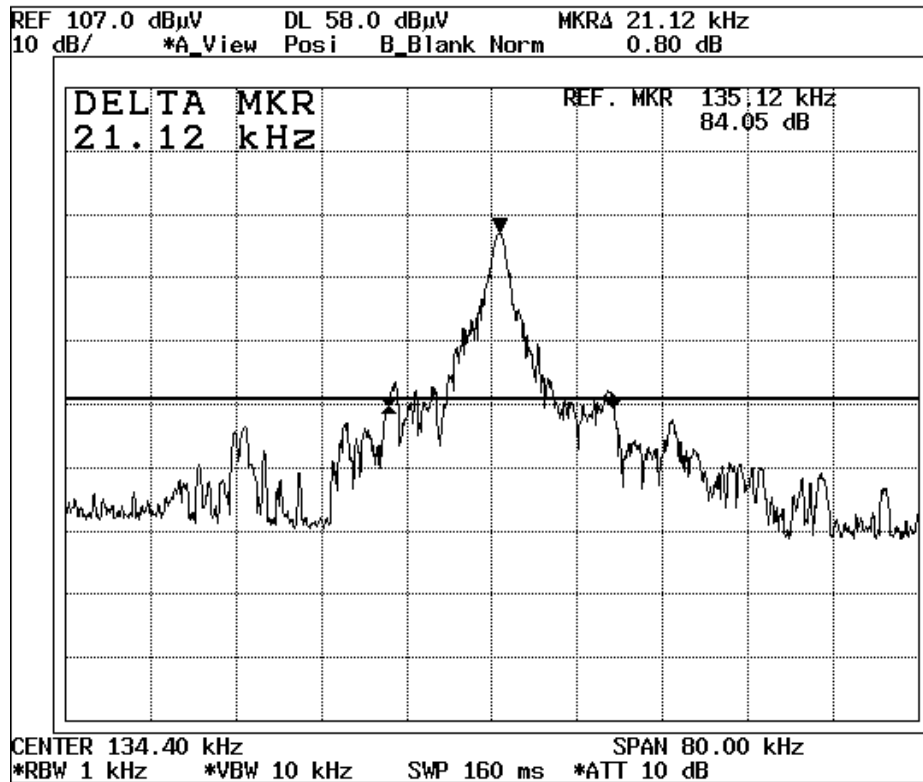
UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

Company : Mitsubishi Electric Corporation Himeji Works
Equipment : The Immobilizer System
Model : IMB111-02
Sample No. : 1
Power : DC 12.0V (Car battery)
Mode : Transmitting (134.45kHz)
FCC ID : BGBX1T262IMB11102
IC No. : 662F-IMB11102

Report No. : 24LE0318-HO
Regulation : Reference data
Test Distance : -
Date : 2004/9/4
Temperature : 25deg.C
Humidity : 67%

ENGINEER : Mitsuru Fujimura

-26dB Bandwidth
[kHz]
21.12



99% Occupied Bandwidth

UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

Company : Mitsubishi Electric Corporation Himeji Works
Equipment : The Immobilizer System
Model : IMB111-02
Sample No. : 1
Power : DC 12.0V (Car battery)
Mode : Transmitting (134.45kHz)
FCC ID : BGBX1T262IMB11102
IC No. : 662F-IMB11102

Report No. : 24LE0318-HO
Regulation : RSS-210
Test Distance : -
Date : 2004/9/4
Temperature : 25deg.C
Humidity : 67%

ENGINEER : Mitsuru Fujimura

99% Occupied Bandwidth
[kHz]
19.52

