EMI TEST REPORT

Test Report No. : 24JE0011-HO-1

Applicant	:	**Mitsubishi Electric Corporation Himeji Works.**
Type of Equipment	:	**The Immobilizer System**
Model No.	:	**IMB111-01**
Test standard	:	**FCC Part 15 Subpart C Section 15.209, Section 15.205 : 2004**
FCC ID	:	**BGBX1T263IMB11101**
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: September 14 and 22, 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
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	:	Yosiharu Goto

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

2.1 Identification of E.U.T.

Type of Equipment	:	The Immobilizer System
Model No.	:	IMB111-01
Serial No.	:	20040909
Rating	:	DC12.0V(Car Battery)
Country of Manufacture	:	Japan
Receipt Date of Sample	:	September 13, 2004
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Model No: IMB111-01 (referred to as the EUT in this report) is the Immobilizer System.

Clock frequency	4MHz
Feature of EUT	The Immobilizer System for vehicle (anti-theft device)

Equipment Type		Transceiver
Frequency band	**Lower limit**	131.45kHz
	Upper limit	137.45kHz
Frequency of Operation		134.45kHz
Type of Modulation		FSK (Frequency Shift Keying)
Antenna Type		Inductive loop
Mode of Operation		Simplex
Power Supply		DC 5.0V (Transformed from DC 12V/Car Battery)
Operating temperature range		-40deg.C. to +80deg.C.

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
Loop Antenna (Tx section) is installed outside the vehicle's key cylinder and users cannot detach it from vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C : 2004

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.205 Restricted bands of operation : 2004
Section 15.209 Radiated emission limits, general requirements : 2004

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.209	Radiated	N/A	30.0dB, 134.72kHz, 0 deg., AV	Complied
2	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.205 FCC Section 15.209	Radiated	N/A	2.2dB, 160.351MHz, Horizontal	Complied
3	-26dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	N/A	Radiated	N/A	N/A	N/A

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

Uncertainty:

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.5dB(3m)/ ±4.7dB(10m).

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±5.2dB(3m)/ ±3.8dB(10m).

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

The result is within Head Office EMC lab's uncertainty.

*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	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	Radiated	N/A	N/A	Complied

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

	Listed date (for FCC)	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	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.

3.5 Test set up, Test instruments and Data of EMI

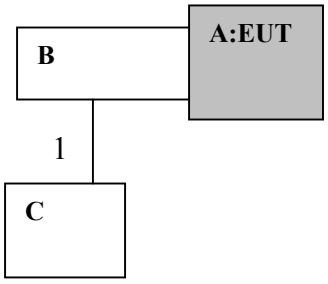
Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

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

4.2 Configuration and peripherals



* 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
A	Immobilizer	IMB111-01	20040909	Mitsubishi Electric Corporation	BGBX1T263IMB11101
B	Key Cylinder	-	-	Mitsubishi Electric Corporation	-
C	Car Battery	40B19L	-	YUASA	-

List of cables used

No.	Item	Length (m)	Shield	Backshell Material
1	DC cable	1.3	N	Polyvinyl chloride

SECTION 5: Radiated emission (Fundamental and Spurious Emission and –26dB Bandwidth)

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.

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 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

*This EUT is to be installed in vehicles. The antenna of EUT is installed outside the key cylinder, and the body of EUT is installed in the front part of vehicles. In the set-up configuration for the tests, the antenna and the body of EUT were set on three positions of X, Y, and Z axis respectively.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axis X, Y and Z, and the position that has the maximum noise was determined.
With the position, the noise levels of all the frequencies were measured.
* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)
[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])
[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

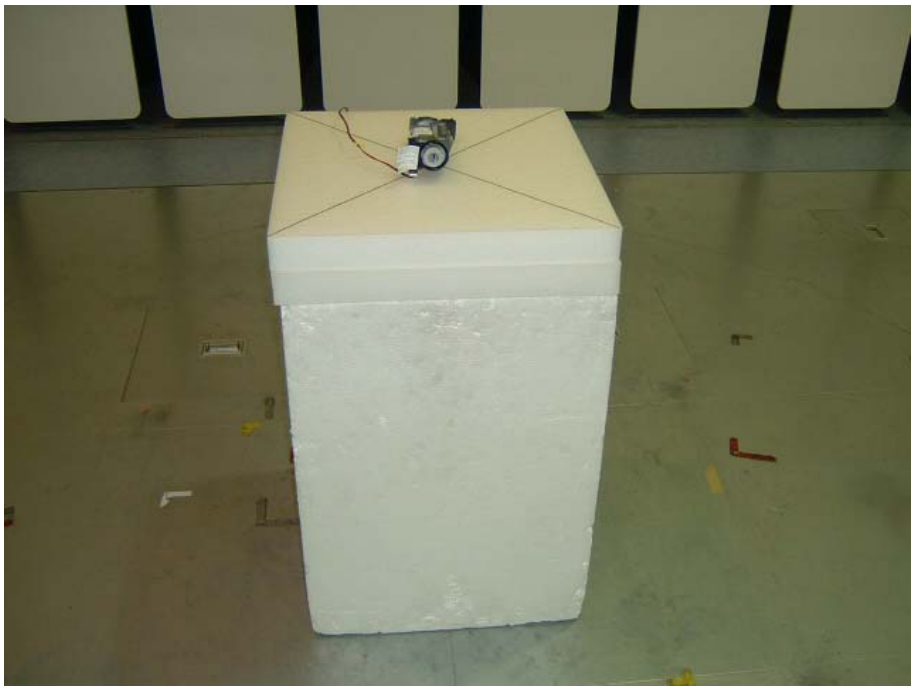
Test data : APPENDIX 3
Test result : Pass

Date: September 14 and 22, 2004 Test engineer: Mitsuru Fujimura

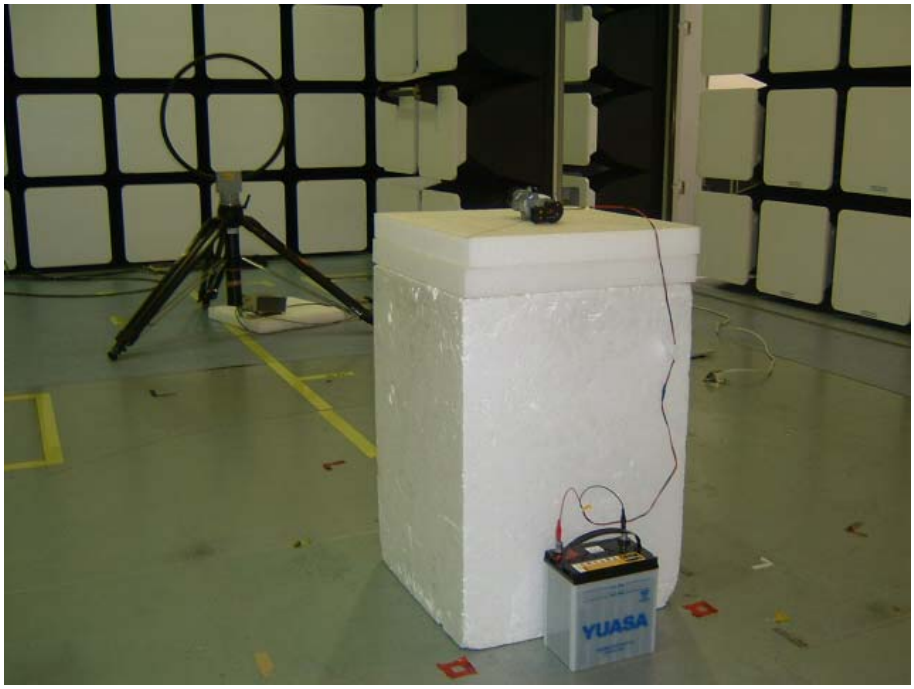
APPENDIX 1: Photographs of test setup

Spurious Emission (Radiated)

Front

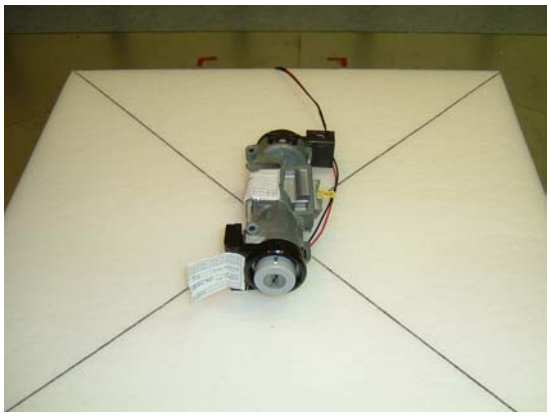


Rear



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

X-axis



Y-axis

Z-axis

UL Apex Co., Ltd.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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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	1,2,3,4,5	2004/04/12 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	1,2,3	2004/02/03 * 12
MRENT-09	Spectrum Analyzer	Advantest	R3273	1,2,3	2004/02/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	3	2004/02/24 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	3	2003/10/15 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	3	2003/10/15 * 12
MPA-06	Pre Amplifier	Hewlett Packard	8447D	3	2004/08/29 * 12
MPA-04	Pre Amplifier	Agilent	8447D	1,2,4,5	2004/05/25 * 12
MCC-13	Coaxial Cable	Fujikura/Agilent	-	1,2,4,5	2004/02/24 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	3	2003/12/16 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	1,2,3,4,5	2004/01/08 * 12
MCC-08	coaxial cable	-	-	1,2,3,4,5	2004/09/07 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	4,5	2004/06/12 * 12

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

Test Item:

Fundamental emission (134.2kHz) : 1
Spurious emission (9k-30MHz) : 2
Spurious emission (30M-1GHz) : 3
-26dB Bandwidth : 4
99% Occupied Bandwidth : 5

APPENDIX 3: Data of EMI test

Radiated emission (Fundamental and Spurious Emission)

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

Company	: Mitsubishi Electric Corporation Himeji Works	Report No.	: 24JE0011-HO
Equipment	: The Immobilizer System	Regulation	: FCC Part15C Section 15.209
Model	: IMB111-01	Test Distance	: 3m
Sample No.	: 20040909	Date	: 2004/9/14
Power	: DC 12.0V (Car battery)	Temperature	: 25deg.C
Mode	: Transmitting (134.45kHz)	Humidity	: 63%
FCC ID	: BGBX1T263IMB11101		
IC No.	: 662F-IMB11101	ENGINEER	: Mitsuru Fujimura
EUT Position	: X-axis (Max-axis)		

Frequency Rage : 9-90kHz & 110-490kHz / AV & PK DETECT(Test Receiver: BW 200Hz or 9kHz)
Other Frequency Rage : 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	134.72	0	PK	81.8	19.9	-	0.2	26.6	75.3	125.0	49.7
1	134.72	45	PK	80.0	19.9	-	0.2	26.6	73.5	125.0	51.5
1	134.72	90	PK	77.0	19.9	-	0.2	26.6	70.5	125.0	54.5
1	134.72	0	AV	81.5	19.9	-	0.2	26.6	75.0	105.0	30.0
2	269.42	0	PK	44.7	19.9	-	0.1	27.1	37.6	119.0	81.4
2	269.42	0	AV	34.1	19.9	-	0.1	27.1	27.0	99.0	72.0
3	404.00	0	PK	50.8	19.9	-	0.1	27.4	43.4	115.5	72.1
3	404.00	0	AV	47.3	19.9	-	0.1	27.4	39.9	95.5	55.6
4	538.88	0	QP	33.8	19.9	-	0.2	27.6	26.3	73.0	46.7
5	673.92	0	QP	39.4	19.8	-	0.2	27.8	31.6	71.0	39.4
6	808.32	0	QP	32.9	19.8	-	0.1	27.9	24.9	69.5	44.5
7	943.26	0	QP	40.7	19.8	-	0.2	27.9	32.8	68.1	35.3
8	1,077.76	0	QP	32.9	19.8	-	0.2	27.9	25.0	67.0	42.0
9	1,212.41	0	QP	38.2	19.8	-	0.2	27.9	30.3	65.9	35.6
10	1,347.20	0	QP	32.5	19.8	-	0.2	27.8	24.7	65.0	40.3

REMARKS
ANTENNA TYPE : 9kHz-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

DATA OF RADIATED EMISSION TEST

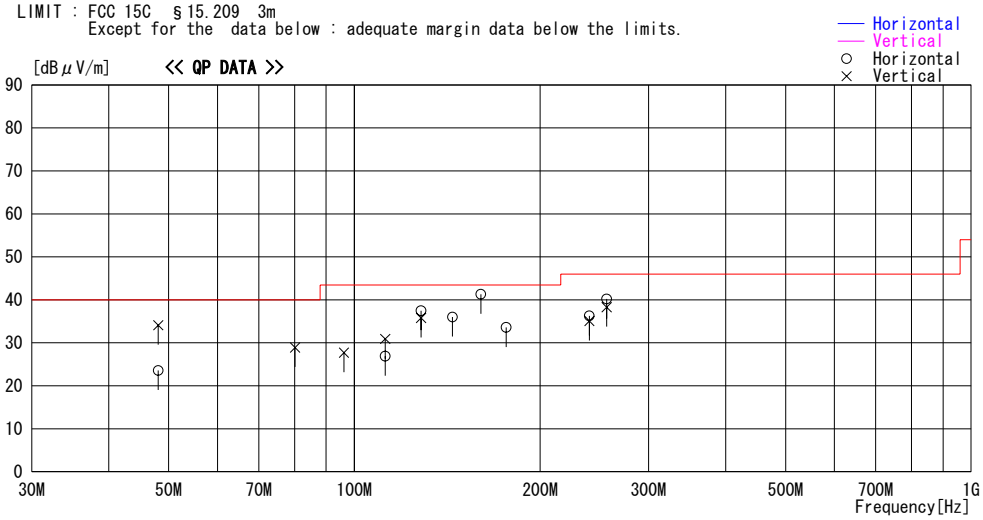
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber

Applicant : Mitsubishi Electric Corporation Hime
Kind of EUT : The Immobilizer System
Model No. : IMB111-01
Serial No. : 20040909

Report No. : 24JE0011-HO
Power : DC12V
Temp℃/Humi% : 25deg.C / 55%
Operator : Mitsuru Fujimura

Mode / Remarks : Transmitting (134.45kHz)

LIMIT : FCC 15C §15.209 3m
Except for the data below : adequate margin data below the limits.



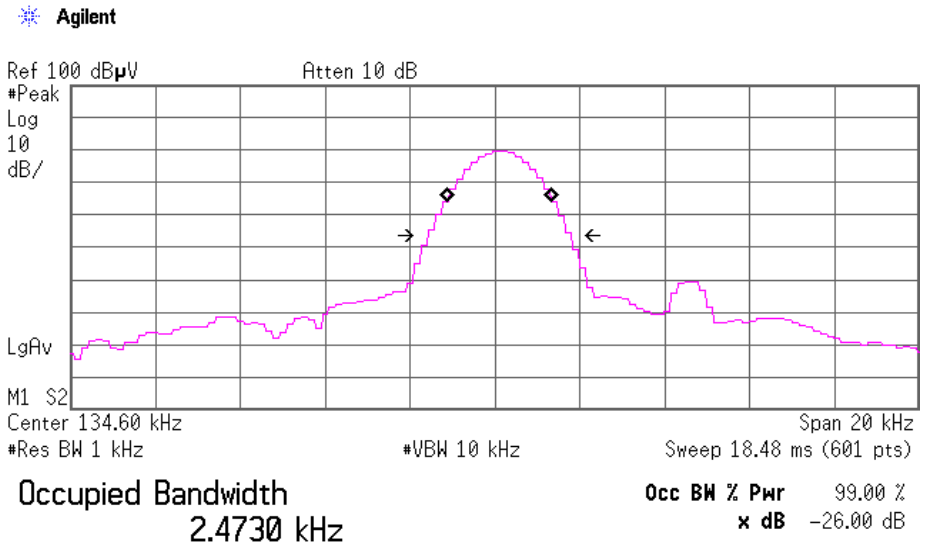
No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	48.101	33.8	10.8	6.7	27.7	23.6	40.0	16.4	213	275
2	112.226	35.2	11.9	7.3	27.5	26.9	43.5	16.6	272	266
3	128.277	44.0	13.5	7.4	27.4	37.5	43.5	6.0	143	105
4	144.296	41.6	14.3	7.5	27.4	36.0	43.5	7.5	214	105
5	160.351	45.8	15.2	7.6	27.3	41.3	43.5	2.2	135	115
6	176.350	37.1	16.0	7.7	27.2	33.6	43.5	9.9	165	121
7	240.487	37.8	17.3	8.1	26.9	36.3	46.0	9.7	140	62
8	256.521	41.0	17.8	8.2	26.8	40.2	46.0	5.8	134	261
----- Vertical ------										
9	48.100	44.3	10.8	6.7	27.7	34.1	40.0	5.9	100	360
10	80.178	43.1	6.3	7.1	27.6	28.9	40.0	11.1	100	169
11	96.212	38.8	9.3	7.2	27.6	27.7	43.5	15.8	100	180
12	112.249	39.2	11.9	7.3	27.5	30.9	43.5	12.6	100	178
13	128.264	42.3	13.5	7.4	27.4	35.8	43.5	7.7	100	120
14	240.511	36.6	17.3	8.1	26.9	35.1	46.0	10.9	100	293
15	256.534	39.1	17.8	8.2	26.8	38.3	46.0	7.7	100	306

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 and 99% Occupied Bandwidth

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

Company	: Mitsubishi Electric Corporation Himeji Works	Report No.	: 24JE0011-HO
Equipment	: The Immobilizer System	Regulation	: Reference data (-26dB) / RSS-210 (99% Occupied)
Model	: IMB111-01		
Sample No.	: 20040909	Test Distance	: -
Power	: DC 12.0V (Car battery)	Date	: 2004/ 9/22
Mode	: Transmitting (134.45kHz)	Temperature	: 23deg.C
FCC ID	: BGBX1T263IMB11101	Humidity	: 60%
IC No.	: 662F-IMB11101	ENGINEER	: Mitsuru Fujimura



-26dB Bandwidth	3.395 kHz
99% Occupied Bandwidth	2.473 kHz