

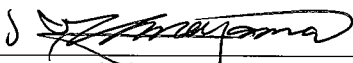
EMI TEST REPORT

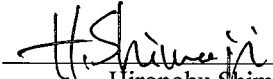
Test Report No. : 25BE0101-HO-4

Applicant : **DENSO CORPORATION**
Type of Equipment : **Remote Keyless Entry System (Receiver)**
Model No. : **13BZL**
Test standard : **FCC Part 15 Subpart B 2004 Class B**
Test Result : **Complied**

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

Date of test : September 18 and 19, 2004

Tested by : 
Hiroka Umeyama
EMC Service

Approved by : 
Hironobu Shimoji
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

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MF060b(10.04.03)

CONTENTS

	PAGE
SECTION 1: Client information.....	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures and results	4
SECTION 4: Operation of E.U.T. during testing.....	5
SECTION 5: Radiated emission	6
APPENDIX 1: Photographs of test setup.....	7
Radiated Emission	7
Radiated Emission(With Antenna)	8
Worst Case Position (Horizontal : X-axis/ Vertical: Y-axis).....	9
Worst Case Position : Antenna (Horizontal : normal use / Vertical: normal use).....	10
APPENDIX 2: Test Instruments.....	11
APPENDIX 3: Data of EMI	12

SECTION 1: Client information

Company Name : DENSO CORPORATION
Address : 1-1 Showa-cho Kariya-shi Aichi-ken 448-8661, Japan
Telephone Number : +81-566-61-2523
Facsimile Number : +81-566-25-4915
Contact Person : Toshifumi Shimoda

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

2.1 Identification of E.U.T.

Type of Equipment : Remote Keyless Entry System (Receiver)
Model No. : 13BZL
Serial No. : 004
Rating : DC 5V(Supplied from the other ECU)
Country of Manufacture : Japan
Receipt Date of Sample : September 18, 2004
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product description

DENSO CORPORATION, Model No: 13BZL is the Remote Keyless Entry System (Receiver).

Type of receiver : Super Heterodyne
Frequency of Operation : 314.35MHz
Local Oscillator Frequency : 40.63125MHz
Intermediate Frequency : 10.7MHz
Antenna Type : Built-in Type (Fixed)

SECTION 3: Test specification, procedures and results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2004 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 power line 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	17.6dB (1197.0MHz: Vertical)	Complied

*1) The test is not applicable since the EUT does not have AC Mains.

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

3.3 Uncertainty

Radiated Emission

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.5\text{dB}(3\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}(3\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 6.6\text{dB}$.

The data listed in this test report has enough margin.

3.4 Test location

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

No.1 semi anechoic chamber has been fully described in a report submitted to FCC office, and listed on February 01, 2002. (Registration number: No.1:313583 Industry Canada: No.1: IC4247)

No.2 semi anechoic chamber has been fully described in a report submitted to FCC office, and listed on June 05, 2002. (Registration number: No.2:846015 Industry Canada: No.2: IC4247-2)

*NVLAP Lab. code: 200572-0

Test room	Width x Depth x Height (m)	Size of reference ground plane(m)	Other rooms
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	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 shielded room	3.1 x 5.0 x 2.7m	N/A	-

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

Refer to APPENDIX 1 to 3

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

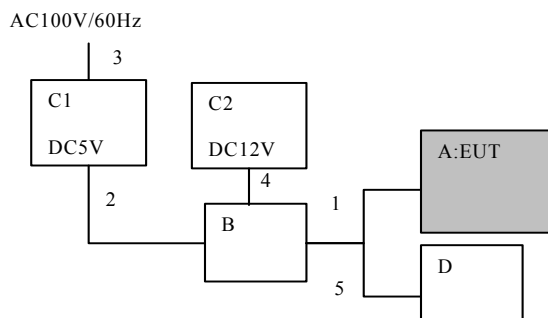
4.1 Operating modes

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 mode
*The test was made with the sample in the maximum receiving mode, without the transmitter.
*The representative antenna was used on the EUT during the tests.
The antenna which is equivalent to this representative antenna is to be connected to the EUT in actual use.

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	Sample number	Manufacturer	Remarks
A	Remote Keyless Entry System (Receiver)	13BZL	004	DENSO	EUT FCC ID : HYQ13BZL
B	Checker Bench	-	-	DENSO	-
C1	DC Power Supply	HK25A-5/A	0056W450	NEMIC-LAMBDA	-
C2	Car Battery	40B19L	A030402	YUASA	-
D	Glass Antenna	-	-	NIPPON SHEET GLASS	-

List of cables used

No.	Name	Length (m)	Shield	Backshell material	Remarks
1	Extended Harness	1.5	N	Polyvinyl Chloride	-
2	DC Harness	1.0	N	Polyvinyl Chloride	-
3	AC Power Cable	2.0	N	Polyvinyl Chloride	-
4	DC Harness	1.0	N	Polyvinyl Chloride	-
5	Extended Harness	1.5	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, 1m by 1.5m, 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 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 : Continuous 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.

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 the following detectors.

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

-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.

5.5 Results

Summary of the test results: Pass

Date: September 18 and 19, 2004

Test engineer: Hiroka Umeyama

UL Apex Co., Ltd.

Head Office EMC Lab.

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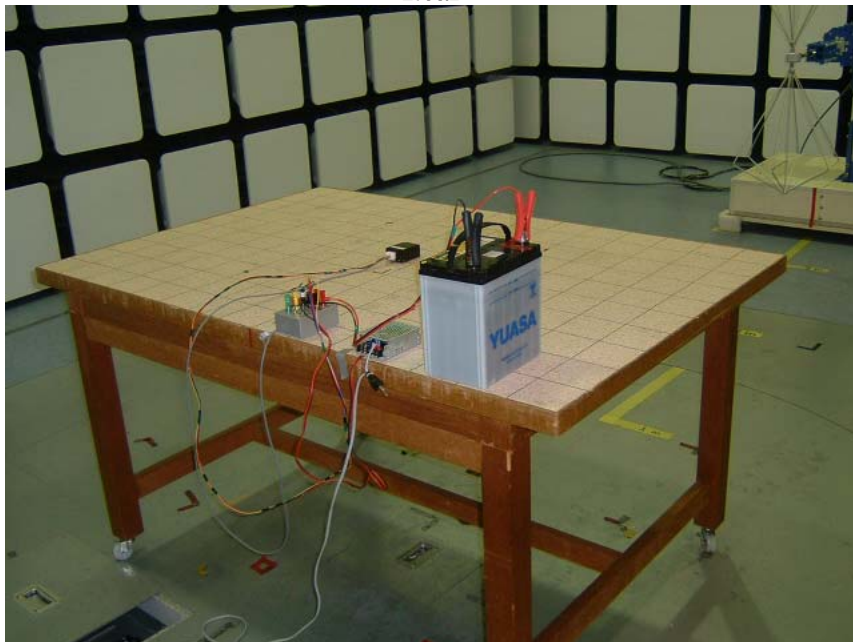
APPENDIX 1: Photographs of test setup

Radiated Emission

Front

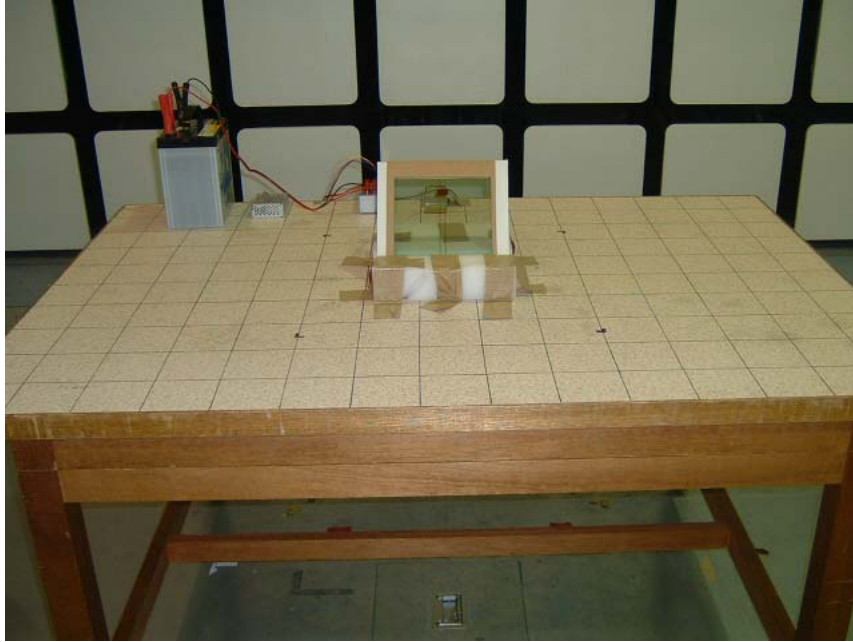


Rear

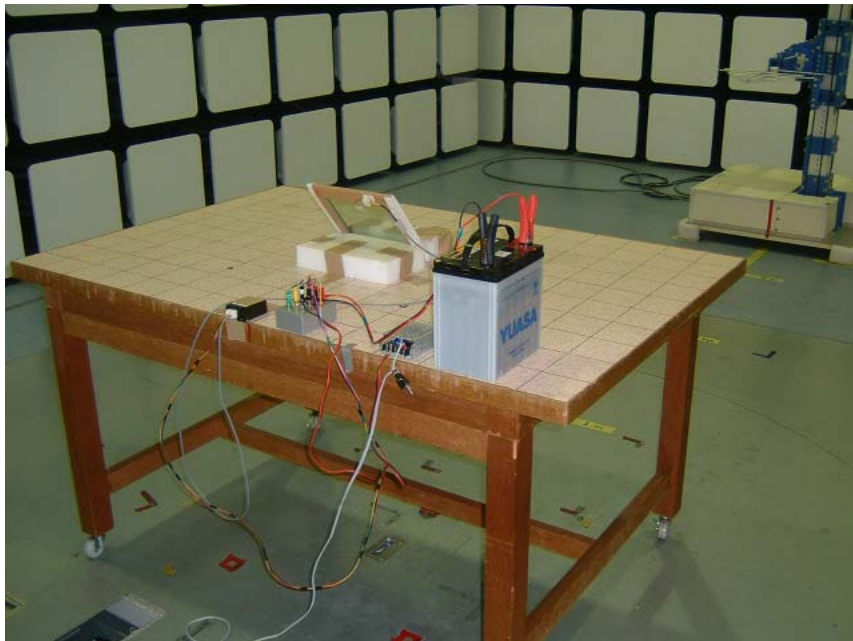


Radiated Emission(With Antenna)

Front



Rear



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

X-axis



Y-axis



Z-axis



Worst Case Position : Antenna (Horizontal : normal use / Vertical: normal use)

normal use



APPENDIX 2: Test Instruments

EMI 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
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/10/15 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/10/15 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2003/12/16 * 12
MPA-06	Pre Amplifier	Hewlett Packard	8447D	RE	2004/08/29 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2004/01/10 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2004/02/06 * 12
MCC-04	Microwave Cable	Storm	421-011	RE	2004/01/06 * 12
MCC-24	Microwave Cable	Suhner	SUCOFLEX104	RE	2004/08/26 * 12

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

DATA OF RADIATED EMISSION TEST

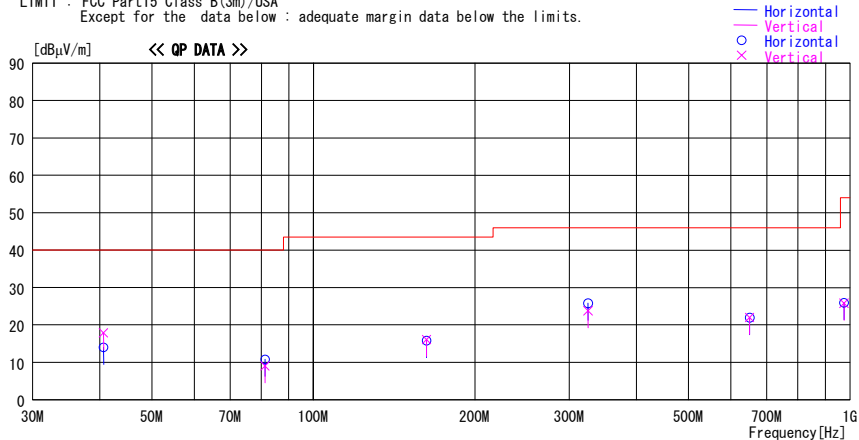
UL Apex Co., Ltd. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2004/09/18 13:20:08

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZL
Sample No. : 004
Report No. : 25BE0101-HO
Power : DC5.0V
Temp°C/Humi% : 24deg. C / 60%
Operator : Hiroka Umeyama

Mode / Remarks : Receiving HOR:X-Axis, VER:Y-Axis(MAX)

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	40.630	21.8	13.4	6.6	27.8	14.0	40.0	26.0	300	280
2	81.260	24.9	6.4	7.1	27.6	10.8	40.0	29.2	225	90
3	162.520	20.2	15.3	7.6	27.3	15.8	43.5	27.7	300	100
4	325.050	29.2	15.1	8.4	26.9	25.8	46.0	20.2	100	115
5	650.100	20.3	19.9	10.0	28.3	21.9	46.0	24.1	100	0
6	975.150	19.6	22.8	11.1	27.6	25.9	54.0	28.1	100	0
----- Vertical -----										
7	40.630	25.7	13.4	6.6	27.8	17.9	40.0	22.1	100	0
8	81.260	23.1	6.4	7.1	27.6	9.0	40.0	31.0	175	180
9	162.520	20.5	15.3	7.6	27.3	16.1	43.5	27.4	100	0
10	325.050	27.2	15.1	8.4	26.9	23.8	46.0	22.2	150	188
11	650.100	20.4	19.9	10.0	28.3	22.0	46.0	24.0	100	0
12	975.150	19.5	22.8	11.1	27.6	25.8	54.0	28.2	100	0

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

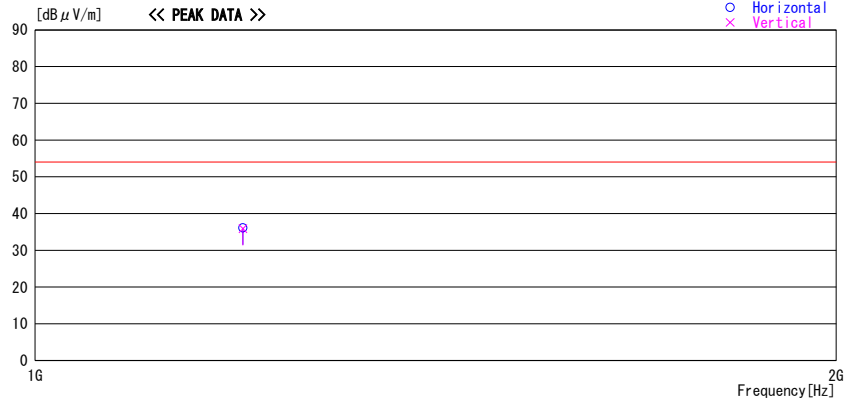
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/09/19 10:02:45

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZL
Sample No. : 004
Report No. : 25BE0101-HO
Power : DC5.0V
Temp°C/Humi% : 24deg.C / 60%
Operator : Hiroka Umeyama

Mode / Remarks : Receiving HOR:X-Axis, VER:Y-Axis (MAX)

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



No.	FREQ [MHz]	READING PK [dB μ V]	ANT FACTOR [dB/m]	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
				[dB]	[dB]	[dB μ V/m]	[dB μ V/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	1197.000	45.6	23.0	4.4	36.9	36.1	54.0	17.9	100	0
----- Vertical -----										
2	1197.000	45.4	23.0	4.4	36.9	35.9	54.0	18.1	100	0

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

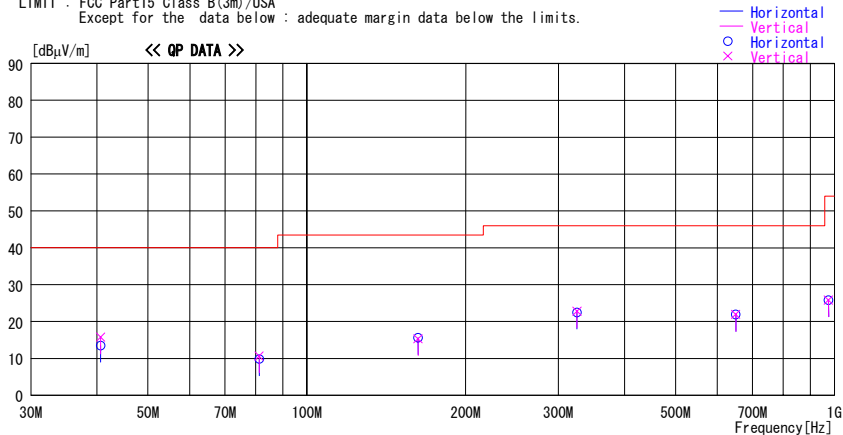
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2004/09/18 11:48:25

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZL
Sample No. : 004
Report No. : 25BE0101-HO
Power : DC5.0V
Temp°C/Humi% : 24deg. C / 60%
Operator : Hiroka Umeyama

Mode / Remarks : Receiving HOR:X-Axis, VER:Y-Axis (MAX) with Glass ANT. Normal

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	40.630	21.3	13.4	6.6	27.8	13.5	40.0	26.5	300	0
2	81.260	23.9	6.4	7.1	27.6	9.8	40.0	30.2	250	175
3	162.520	20.0	15.3	7.6	27.3	15.6	43.5	27.9	300	250
4	325.050	25.9	15.1	8.4	26.9	22.5	46.0	23.5	100	200
5	650.100	20.3	19.9	10.0	28.3	21.9	46.0	24.1	100	0
6	975.150	19.5	22.8	11.1	27.6	25.8	54.0	28.2	100	0
Vertical										
7	40.630	23.5	13.4	6.6	27.8	15.7	40.0	24.3	100	30
8	81.260	24.7	6.4	7.1	27.6	10.6	40.0	29.4	100	165
9	162.520	19.7	15.3	7.6	27.3	15.3	43.5	28.2	100	0
10	325.050	26.2	15.1	8.4	26.9	22.8	46.0	23.2	100	355
11	650.100	20.3	19.9	10.0	28.3	21.9	46.0	24.1	100	0
12	975.150	19.5	22.8	11.1	27.6	25.8	54.0	28.2	100	0

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

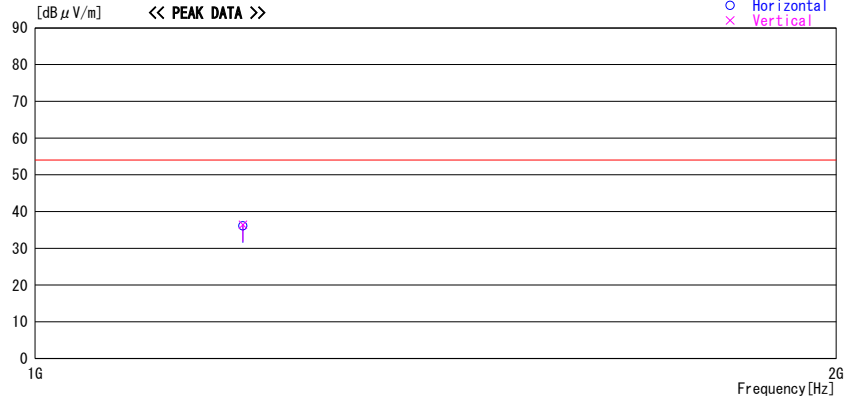
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/09/19 09:51:57

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZL
Sample No. : 004
Report No. : 25BE0101-HO
Power : DC5.0V
Temp°C/Humi% : 24deg. C / 60%
Operator : Hiroka Umeyama

Mode / Remarks : Receiving HOR:X-Axis, VER:Y-Axis (MAX) with Glass ANT. Normal

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



No.	FREQ [MHz]	READING PK [dB μ V]	ANT FACTOR [dB/m]	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
				[dB]	[dB]	[dB μ V/m]	[dB μ V/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	1197.000	45.6	23.0	4.4	36.9	36.1	54.0	17.9	100	0
----- Vertical -----										
2	1197.000	45.9	23.0	4.4	36.9	36.4	54.0	17.6	100	0

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