



EMI TEST REPORT

Test Report No. : 24HE0210-HO-1

Applicant : **DENSO CORPORATION**

Type of Equipment : **Remote Keyless Entry System (Receiver)**

Model No. : **13BZH**

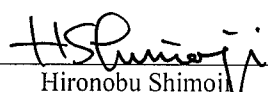
Test standard : **FCC Part 15 Subpart B 2003 Class B**

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 : April 27 and May 16, 2004

Tested by : 
Hiroka Umeyama
EMC Service

Approved by : 
Hironobu Shimoji
Group Leader of
EMC Service

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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.	:	13BZH
Serial No.	:	002
Rating	:	DC 5V(Supplied from the other ECU)
Country of Manufacture	:	Japan
Receipt Date of Sample	:	April 27, 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: 13BZH 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)

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Head Office EMC Lab.

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Telephone : +81 596 24 8116

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SECTION 3: Test specification, procedures and results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2003 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: 2001	Class B	N/A	N/A*1)	N/A
Radiated emission	ANSI C63.4: 2001	Class B	N/A	15.1dB (1199.75MHz: Vertical)	Complied
*1) The test in not applicable since the EUT does not have AC Mains. Note: UL Apex's EMI Work procedures No. QPM05					

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 2003 Class B.

3.4 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.

3.5 Test location

UL Apex Co., Ltd. Head Office EMC Lab.
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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	-

3.6 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

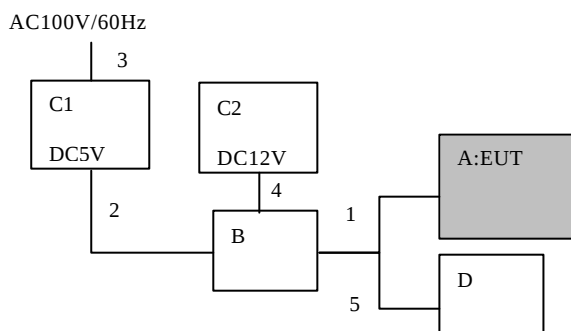
The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

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)	13BZH	002	DENSO	EUT FCC ID : HYQ13BZH
B	Checker Bench	-	-	DENSO	-
C1	DC Power Supply	PMC35-2A	13090501	KIKUSUI	-
C2	Car Battery	B19L	161001C	Panasonic	-
D	Trunk Antenna	-	-	DENSO	-

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	with ferrite core
3	AC Power Cable	2.0	N	Polyvinyl Chloride	
4	DC Harness	1.0	N	Polyvinyl Chloride	with ferrite core
5	Extended Harness	1.5	N	Polyvinyl Chloride	

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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: April 27 and May 16, 2004

Test engineer: Hiroka Umeyama

UL Apex Co., Ltd.

Head Office EMC Lab.

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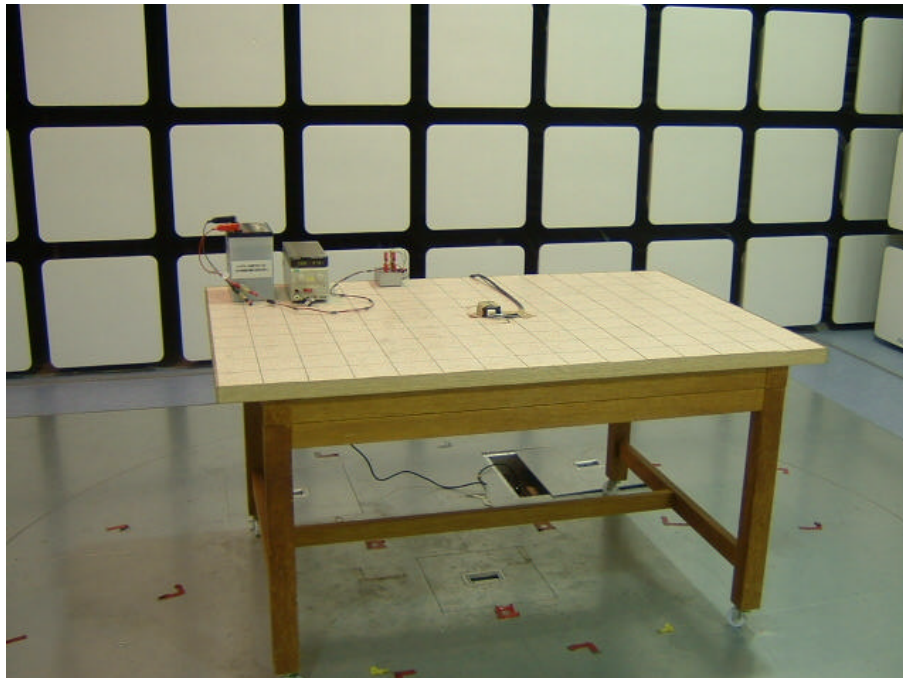
Telephone : +81 596 24 8116

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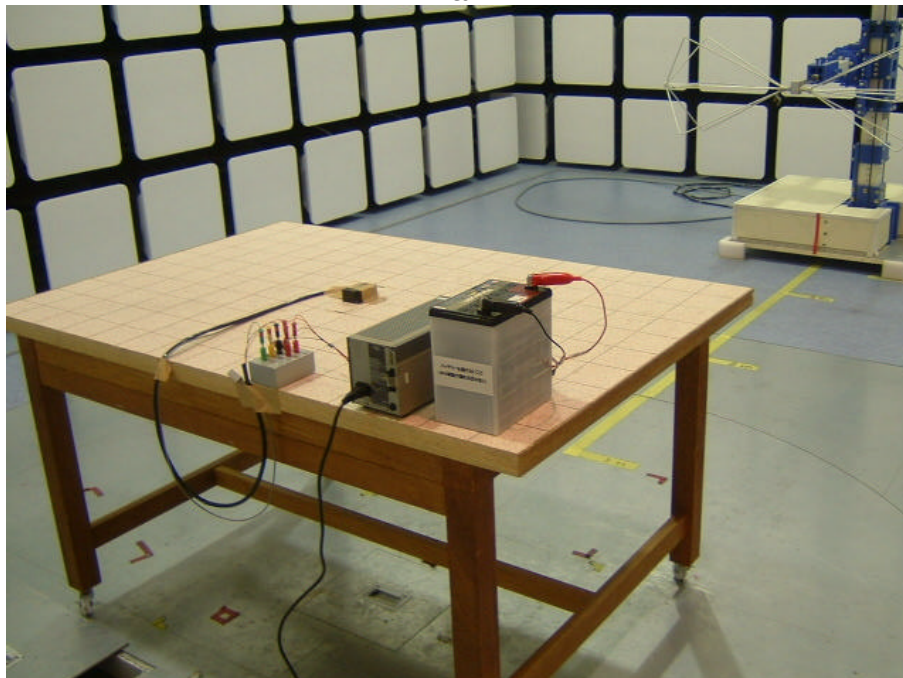
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APPENDIX 1: Photographs of test setup

**Radiated Emission
Front**



Rear



Radiated Emission(With Antenna)
Front



Rear

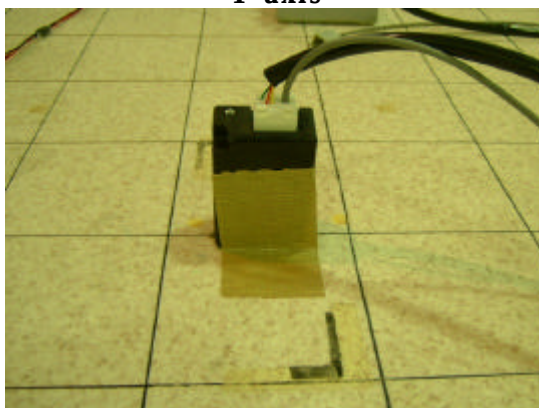


Worst Case Position (Horizontal : X-axis/ Vertical: X-axis)

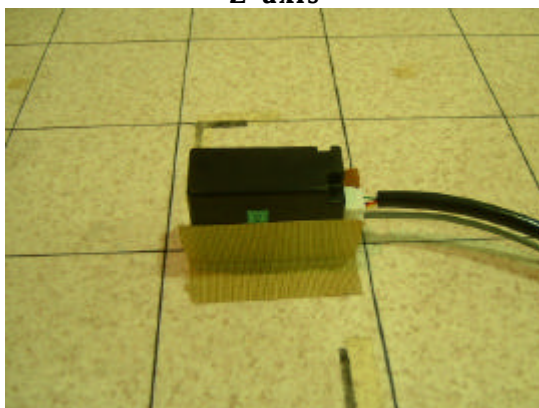
X-axis



Y-axis



Z-axis



APPENDIX 2: Test Instruments

EMI Test Instruments (April 27, 2004)

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
MRENT-06	Spectrum Analyzer	Advantest	R3273	RE	2003/10/31 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2004/02/03 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2004/02/24 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/04/28 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/04/28 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2003/12/16 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2004/03/08 * 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	Storm	-	RE	2003/04/30 * 12

EMI Test Instruments (May 16, 2004)

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
MRENT-09	Spectrum Analyzer	Advantest	R3273	RE	2004/02/18 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2004/02/03 * 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-04	Pre Amplifier	Agilent	8447D	RE	2004/05/25 * 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	Storm	-	RE	2004/05/01 * 12

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

Test Item :

RE: Radiated emission

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APPENDIX 3: Data of EMI

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/04/27 10:24:23

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZH
Serial No. : 002
Report No. : 24HE0210-HO
Power : DC5V
Temp /Humi% : 47 / 60%
Operator : Hiroka Umeyama

Mode / Remarks : Receiving X-Axis(MAX)

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

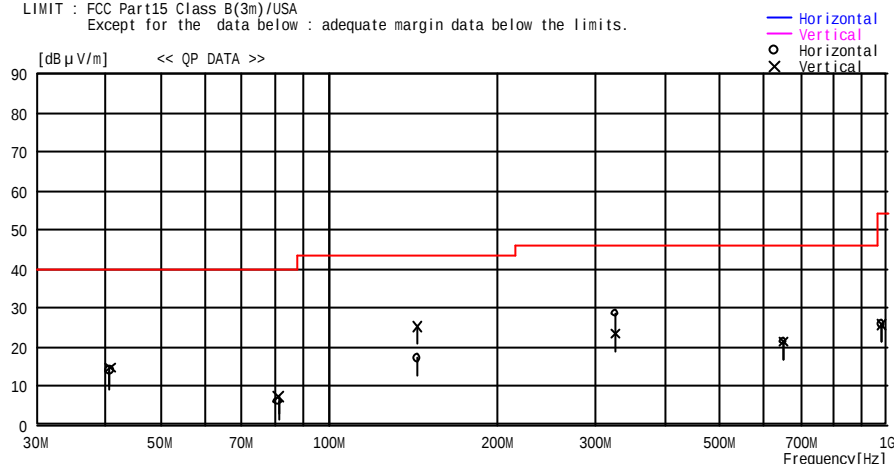


CHART:WITH FACTOR ANT TYPE : -30MHz LOOP,30-300MHz BICONICAL,300MHz-1000MHz LOGPERIODIC,1000MHz- HORN
CALCULATION : READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - AMP.GAIN

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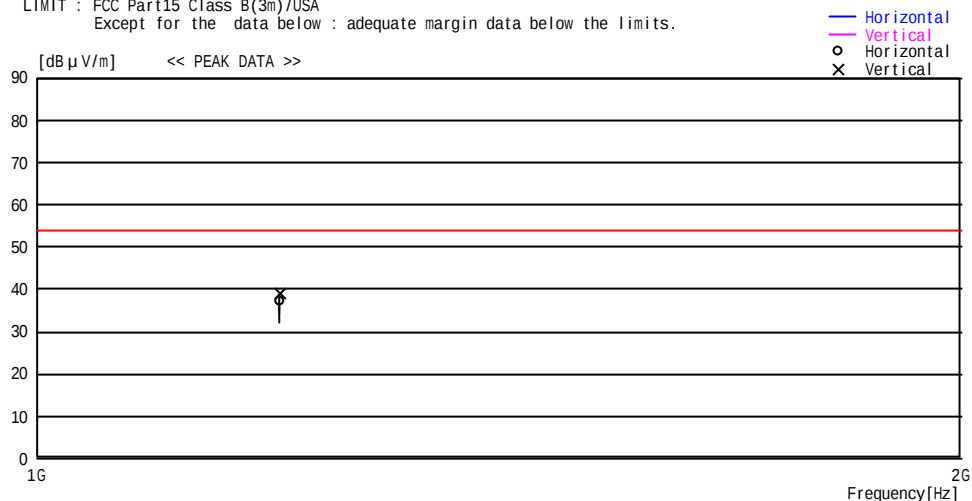
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/04/27 18:27:37

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZH
Serial No. : 002
Report No. : 24HE0210-HO
Power : DC5V
Temp /Humi% : 47 / 60%
Operator : Hiroka Umeyama

Mode / Remarks : Receiving X-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 [dB]	GAIN [dB]	RESULT [dB μ V/m]	LIMIT [dB μ V/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1199.750	46.5	23.0	4.3	36.9	36.9	54.0	17.1	100	122
----- Vertical -----										
2	1199.750	48.5	23.0	4.3	36.9	38.9	54.0	15.1	100	122

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 : 2004/05/16 17:49:13

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZH
Serial No. : 002
Report No. : 24hE0210-HO
Power : DC3.0V
Temp /Humi% : 23 / 60
Operator : Hiroka Umeyama

Mode / Remarks: Receiving X-axis(MAX) with Trunk ANT.

LIMIT : FCC Part15 Class B(3m)/USA

Except for the data below : adequate margin data below the limits.

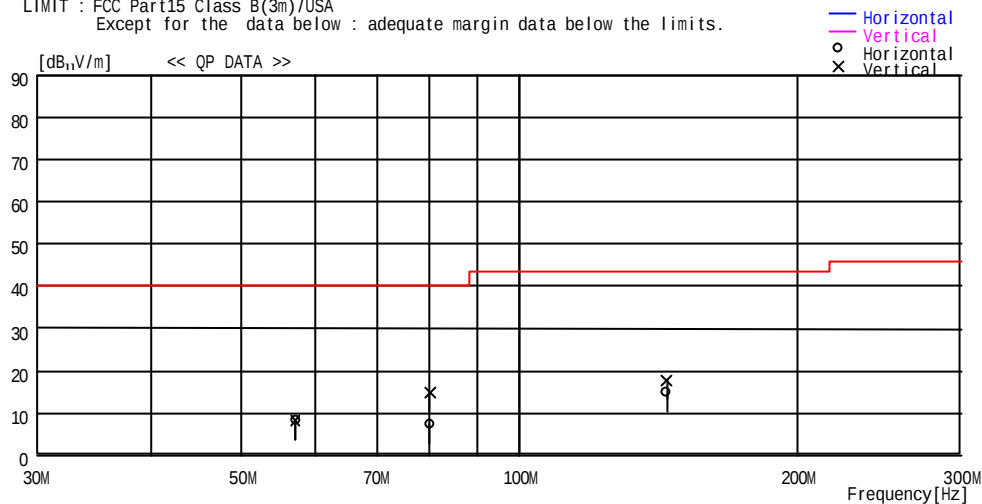


CHART:WITH FACTOR ANT TYPE : -30MHz LOOP,30-300MHz BICONICAL,300MHz-1000MHz LOGPERIODIC,1000MHz- HORN
CALCULATION : READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP.)

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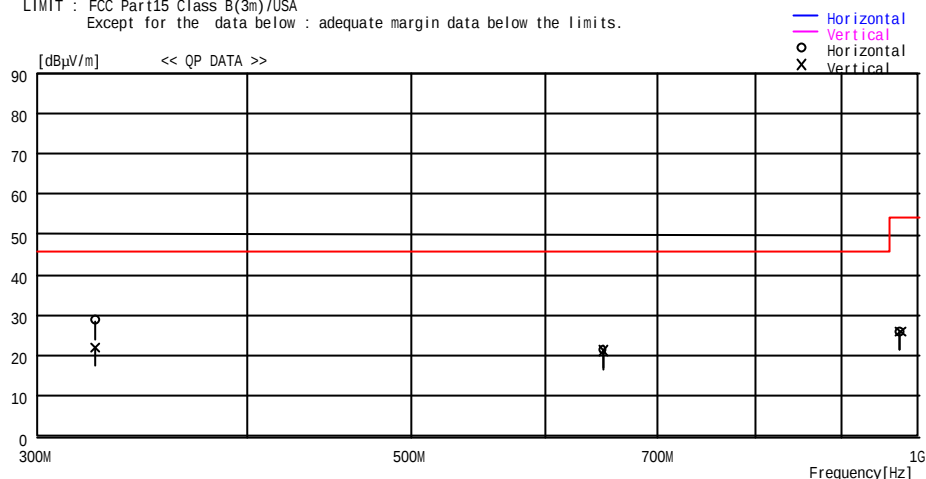
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/05/16 17:17:21

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZH
Serial No. : 002
Report No. : 24hE0210-H0
Power : DC3.0V
Temp /Humi% : 23 / 60
Operator : Hiroka Umeyama

Mode / Remarks : Receiving X-axis(MAX) with Trunk ANT.

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	325.050	32.1	15.1	8.5	27.1	28.6	46.0	17.4	100	200
2	650.100	20.1	19.9	9.9	28.6	21.3	46.0	24.7	100	0
3	975.150	20.2	22.8	10.9	28.0	25.9	54.0	28.1	100	0
----- Vertical -----										
4	325.050	25.5	15.1	8.5	27.1	22.0	46.0	24.0	150	150
5	650.100	20.2	19.9	9.9	28.6	21.4	46.0	24.6	100	0
6	975.150	20.2	22.8	10.9	28.0	25.9	54.0	28.1	100	0

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

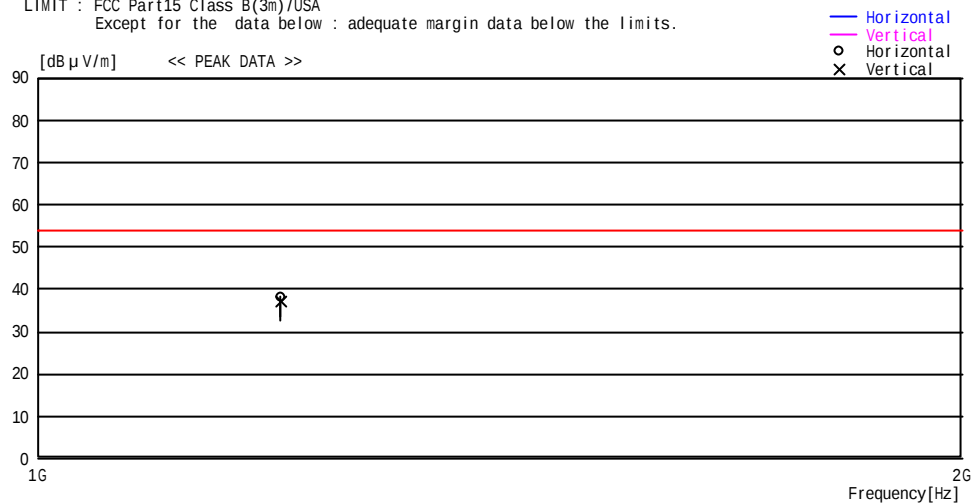
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/05/16 15:01:56

Applicant : DENSO CORPORATION
Kind of EUT : Remote Keyless Entry System:Receiver
Model No. : 13BZH
Serial No. : 002
Report No. : 24hE0210-HO
Power : DC3.0V
Temp /Humi% : 23 / 60
Operator : Hiroka Umeyama

Mode / Remarks : Receiving X-axis(MAX) with Trunk ANT.

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 [dB]	GAIN [dB]	RESULT [dB μ V/m]	LIMIT [dB μ V/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1199.750	47.6	23.0	4.4	36.9	38.1	54.0	15.9	100	0
----- Vertical -----										
2	1199.750	46.8	23.0	4.4	36.9	37.3	54.0	16.7	100	0

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