



# EMI TEST REPORT

Test Report No. : 24IE0247-HO-1

Applicant : DENSO CORPORATION  
Type of Equipment : Electronic Key  
Model No. : 14AAB  
Test standard : FCC Part 15 Subpart C :2003  
Section 15.209, Section 15.231  
FCC ID : HYQ14AAB  
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:

May 16 and 17, 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

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MF060b(10.04.03)

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C :2003  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.231 Periodic operation in the band 40.66 - 40.70MHz  
and above 70MHz  
Section 15.209 Radiated emission limits, general requirements

### **3.2 Procedures and results**

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Automatically Deactivate	ANSI C63.4:2003	Section 15.231(a)(1)	N/A	-	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003	Section 15.231(b)	N/A	14.5dB 314.35MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2003	Section 15.205 Section 15.209 Section 15.231(b)	N/A	8.1dB 943.02MHz Horizontal	Complied
4	-20dB Bandwidth	ANSI C63.4:2003	Section 15.231(c)	N/A	-	Complied

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

### **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	Conducted	N/A	N/A	N/A

### **3.4 Confirmation**

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications  
FCC Part 15 Subpart C : 2003 Section 15.209, Section 15.231.

### **3.5 Uncertainty**

#### Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is  $\pm 4.5$ dB.  
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 5.2$ dB.  
The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is  $\pm 6.6$ dB.  
The data listed in this test report has enough margin.

**UL Apex Co., Ltd.**

**Head Office EMC Lab.**

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### 3.6 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 NVLAP)	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 measurement room.

### 3.7 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

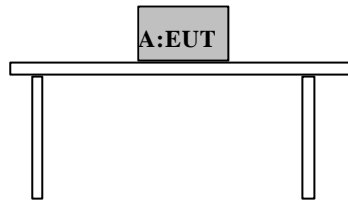
### 4.1 Operating modes

The EUT was operating in a manner similar to typical useduring the tests .

The mode is used :       Transmitting mode  
                                  Continuous : Electric Field Strength of Fundamental and Spurious Emission Test  
                                  Normal: Other Test

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

### 4.2 Configuration and peripherals



\* Test data was taken under worse case conditions.

#### Description of EUT

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Electronic Key	14AAB	001(Normal) 002(Continuous)	DENSO	HYQ14AAB

## SECTION 5: Radiated emission (Fundamental and Spurious Emission)

### 5.1 Operating environment

Test place : No.2 semi anechoic chamber  
Temperature : See data  
Humidity : See data

### 5.2 Test configuration

EUT was placed on a platform of table size (1m x 1.5m x 0.8m) on 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-3200MHz  
Test distance : 3m  
EUT position : Tabletop  
EUT operation mode : Transmitting

### 5.4 Test procedure

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 with the Test Receiver or the Spectrum Analyzer.

Frequency	Below 1GHz (Spurious )	Below 1GHz (Fundamental)	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer	Spectrum Analyzer
IF Bandwidth	QP: BW 120kHz	PK(BW:120kHz) – Duty Factor	PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz

The carrier level and spurious emission levels were confirmed at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

### 5.5 Test result

Summary of the test results: Pass

Date: May 16,2004

Tested by: Hiroka Umeyama

**APPENDIX 1: Photographs of test setup**

**Radiated emission(Worst case position)**

**Front**



**Rear**





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

**X-axis**



**Y-axis**



**Z-axis**



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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	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
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
MPA-02	Pre Amplifier	Agilent	87405A	RE	2004/04/16 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2004/01/10 * 12
MCC-04	Microwave Cable	Storm	421-011	RE	2004/01/06 * 12
MCC-24	Microwave Cable	Storm	-	RE	2004/05/01 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2004/02/06 * 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 test**

**Radiated Emission (Electric Field Strength of Fundamental )**

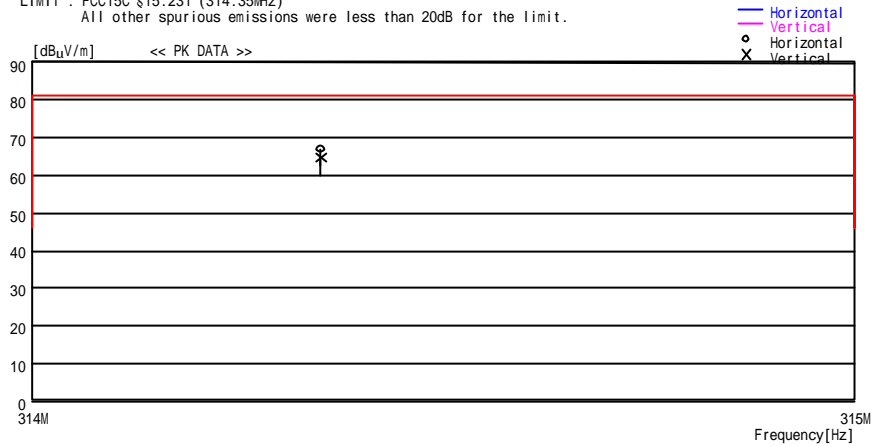
**DATA OF RADIATED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2004/05/16 09:21:25

Applicant : DENSO CORPORATION  
 Kind of EUT : Electronic Key  
 Model No. : 14AAB  
 Serial No. : 002  
 Report No. : 24IE0247-HO  
 Power : DC3.0V  
 Temp /Humi% : 23 / 60  
 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting X(HOR) and Y(VER)-axis

LIMIT : FCC15C §15.231 (314.35MHz)  
 All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING [dBuV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	314.350	65.1*	14.6	8.4	27.1	61.0	75.5	14.5	100	72
----- Vertical -----										
2	314.350	62.7*	14.6	8.4	27.1	58.6	75.5	16.9	220	80

\*READING = S/A READING(PK) - DutyFactor:6 (DutyCycle50%)

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

## Radiated Emission (Electric Field Strength of Spurious Emission)

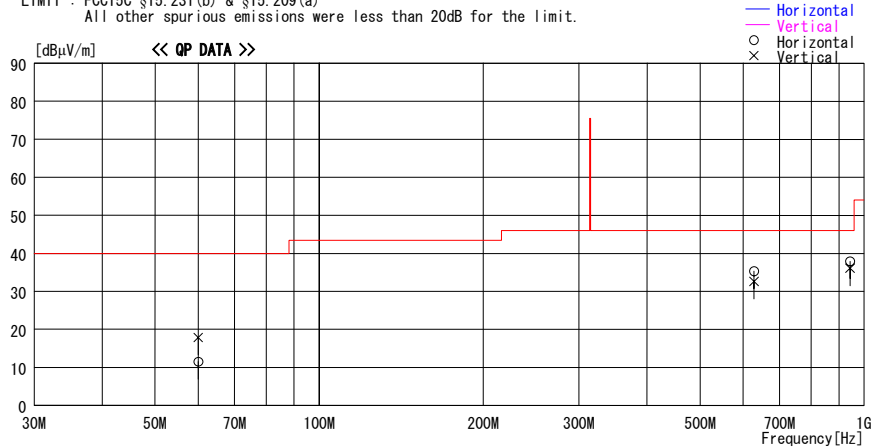
### DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2004/05/16 09:21:25

Applicant : DENSO CORPORATION  
Kind of EUT : Electronic Key  
Model No. : 14AAB  
Serial No. : 002  
Report No. : 24IE0247-H0  
Power : DC3.0V  
Temp°C/Humi% : 23 / 60  
Operator : Hiroka Umeyama

Mode / Remarks : Transmitting X(HOR) and Y(VER)-axis

LIMIT : FCC15C §15.231(b) & §15.209(a)  
All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING OP [dBµV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	60.000	24.0	8.1	6.8	27.4	11.5	40.0	28.5	100	0
2	628.680	34.4	19.7	9.8	28.6	35.3	46.0	10.7	155	210
3	943.020	32.9	22.2	10.9	28.1	37.9	46.0	8.1	125	275
----- Vertical -----										
4	60.000	30.4	8.1	6.8	27.4	17.9	40.0	22.1	100	0
5	628.680	31.7	19.7	9.8	28.6	32.6	46.0	13.4	100	25
6	943.020	31.1	22.2	10.9	28.1	36.1	46.0	9.9	130	95

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

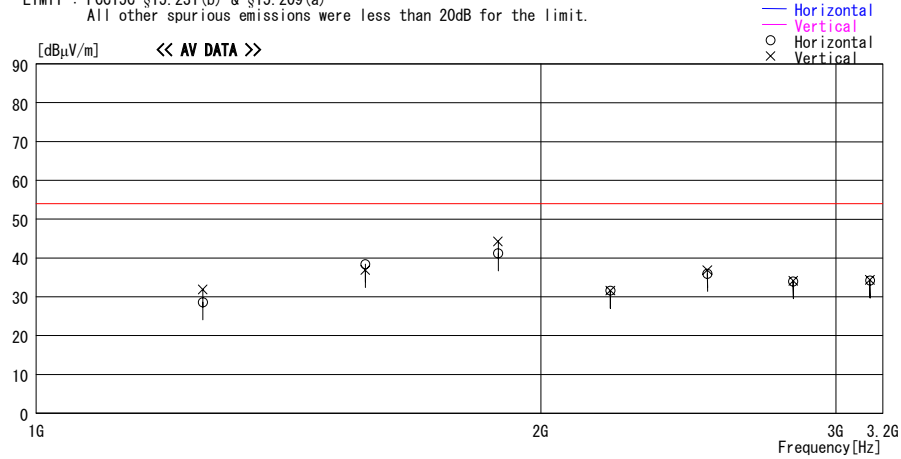
### DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2004/05/16 11:16:34

Applicant : DENSO CORPORATION  
Kind of EUT : Electronic Key  
Model No. : 14AAB  
Serial No. : 002  
Report No. : 24IE0247-H0  
Power : DC3.0V  
Temp/C/Humi% : 23 / 60  
Operator : Hiroka Umeyama

Mode / Remarks : Transmitting X(HOR) and Y(VER) -axis Detector:AV

LIMIT : FCC15C §15.231(b) & §15.209(a)  
All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING AV [dBµV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1257.400	37.7	23.2	4.5	36.8	28.6	54.0	25.4	100	300
2	1571.750	44.9	25.0	5.0	36.5	38.4	54.0	15.6	100	0
3	1886.100	43.2	28.8	5.6	36.4	41.2	54.0	12.8	100	0
4	2200.450	31.3	30.5	6.1	36.3	31.6	54.0	22.4	100	0
5	2514.800	34.6	31.0	6.5	36.2	35.9	54.0	18.1	200	0
6	2829.150	31.5	31.9	7.0	36.4	34.0	54.0	20.0	100	0
7	3143.500	31.2	32.0	7.4	36.4	34.2	54.0	19.8	100	0
----- Vertical -----										
8	1257.400	41.0	23.2	4.5	36.8	31.9	54.0	22.1	100	90
9	1571.750	43.4	25.0	5.0	36.5	36.9	54.0	17.1	120	60
10	1886.100	46.3	28.8	5.6	36.4	44.3	54.0	9.7	100	0
11	2200.450	31.3	30.5	6.1	36.3	31.6	54.0	22.4	100	0
12	2514.800	35.6	31.0	6.5	36.2	36.9	54.0	17.1	180	0
13	2829.150	31.6	31.9	7.0	36.4	34.1	54.0	19.9	100	0
14	3143.400	31.3	32.0	7.4	36.4	34.3	54.0	19.7	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.)

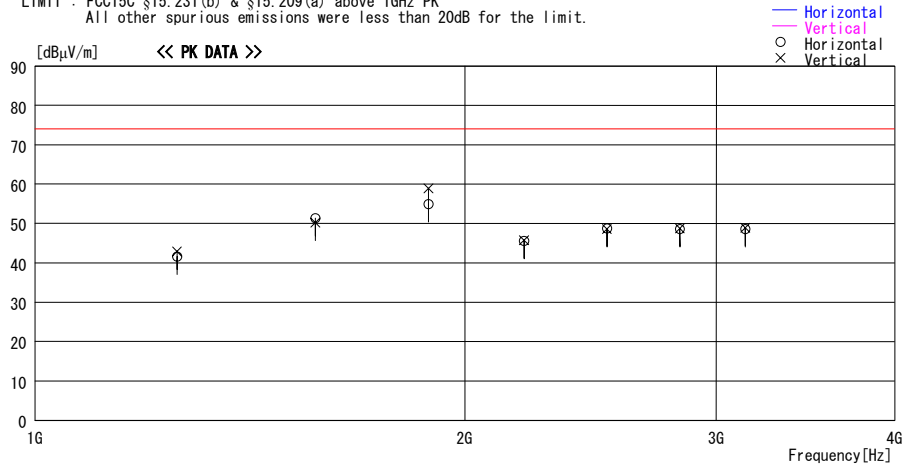
### DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2004/05/16 11:16:34

Applicant : DENSO CORPORATION  
Kind of EUT : Electronic Key  
Model No. : 14AAB  
Serial No. : 002  
Report No. : 24IE0247-HO  
Power : DC3.0V  
Temp°C/Humi% : 23 / 60  
Operator : Hiroka Umeyama

Mode / Remarks : Transmitting X(HOR) and Y(VER) -axis Detector:PK

LIMIT : FCC15C §15.231(b) & §15.209(a) above 1GHz PK  
All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING PK [dBµV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1257.400	50.7	23.2	4.5	36.8	41.6	74.0	32.4	100	300
2	1571.750	57.9	25.0	5.0	36.5	51.4	74.0	22.6	100	0
3	1886.100	56.9	28.8	5.6	36.4	54.9	74.0	19.1	100	0
4	2200.450	45.3	30.5	6.1	36.3	45.6	74.0	28.4	100	0
5	2514.800	47.4	31.0	6.5	36.2	48.7	74.0	25.3	200	0
6	2829.150	46.1	31.9	7.0	36.4	48.6	74.0	25.4	100	0
7	3143.500	45.6	32.0	7.4	36.4	48.6	74.0	25.4	100	0
----- Vertical -----										
8	1257.400	52.0	23.2	4.5	36.8	42.9	74.0	31.1	100	90
9	1571.750	56.7	25.0	5.0	36.5	50.2	74.0	23.8	120	60
10	1886.100	60.9	28.8	5.6	36.4	58.9	74.0	15.1	100	0
11	2200.450	45.4	30.5	6.1	36.3	45.7	74.0	28.3	100	0
12	2514.800	47.3	31.0	6.5	36.2	48.6	74.0	25.4	180	0
13	2829.150	46.2	31.9	7.0	36.4	48.7	74.0	25.3	100	0
14	3143.500	45.9	32.0	7.4	36.4	48.9	74.0	25.1	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.)

### -20dB Bandwidth

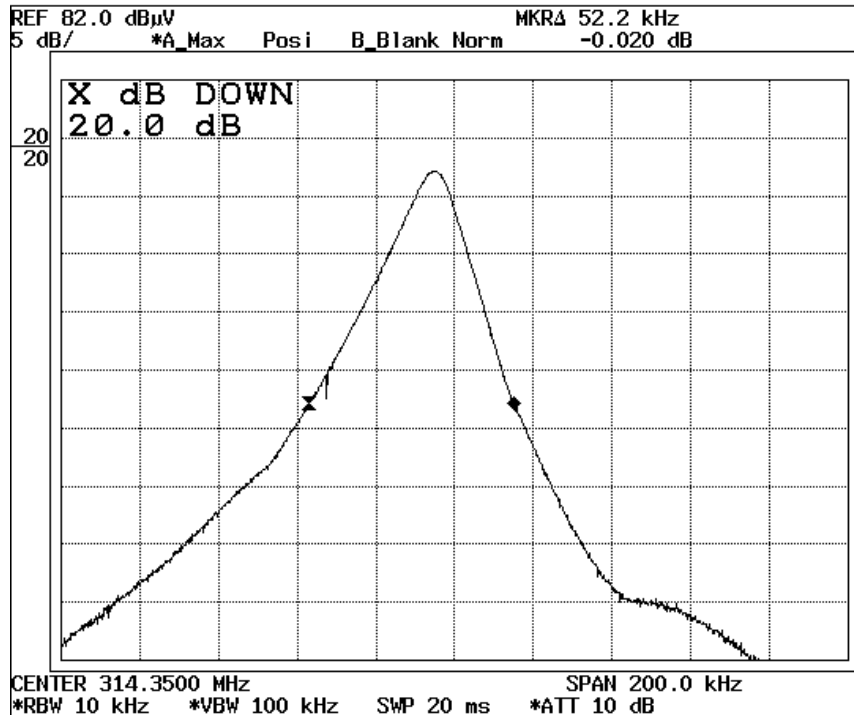
UL Apex Co., Ltd.  
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : DENSO CORPORATION  
EQUIPMENT : Electronic key  
MODEL : 14AAB  
S/N : 001  
POWER : DC3.0V  
Mode : Transmitting

REPORT NO : 24IE0247-HO  
REGULATION : FCC Part15 Subpart C 231(c)  
TEST DISTANCE : -  
DATE : 05/17/2004  
TEMPERATURE : 23°C  
HUMIDITY : 60%  
ENGINEER : Hiroka Umeyama

Bandwidth Limit : Fundamental Frequency 314.35MHz X 0.25% = 785.875 kHz

-20dB Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
52.20	785.88	Pass



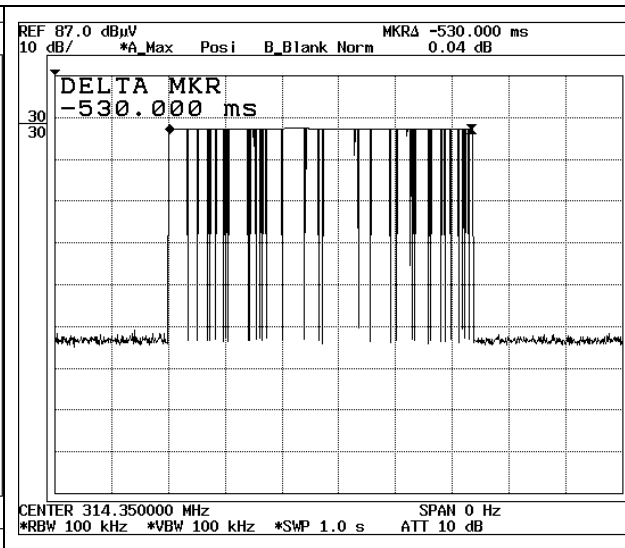
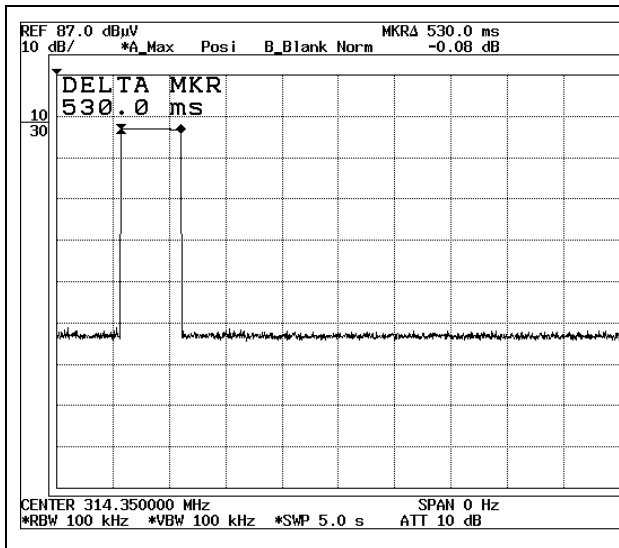
**Automatically deactivate**

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

COMPANY : DENSO CORPORATION  
 EQUIPMENT : Electronic key  
 MODEL : 14AAB  
 S/N : 001  
 POWER : DC3.0V  
 Mode : Transmitting

REPORT NO : 24IE0247-HO  
 REGULATION : FCC Part15 Subpart C 231(a)  
 TEST DISTANCE : -  
 DATE : 05/17/2004  
 TEMPERATURE : 23°C  
 HUMIDITY : 60%  
 ENGINEER : Hiroka Umeyama

Time of Transmitting [sec]	Limit [sec]	Result
0.53	5.00	Pass





**99% Occupied Bandwidth**

