



## 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<br>314.35MHz<br>Horizontal | Complied |
| 3   | Electric Field Strength of Spurious Emission    | ANSI C63.4:2003 | Section 15.205<br>Section 15.209<br>Section 15.231(b) | N/A       | 8.1dB<br>943.02MHz<br>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):<br>2001<br>+ Amendment:2002<br>+ Amendment2:2003<br>+ Amendment3:2004 | RSS-210(issue 5):<br>2001<br>+ Amendment:2002<br>+ Amendment2:2003<br>+ 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.

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**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

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|                               | Listed date<br>(for NVLAP) | FCC<br>Registration<br>Number | IC<br>Registration<br>Number | Width x Depth x<br>Height (m) | Size of<br>reference ground<br>plane<br>(m) /<br>horizontal<br>conducting plane | Other<br>rooms      |
|-------------------------------|----------------------------|-------------------------------|------------------------------|-------------------------------|---------------------------------------------------------------------------------|---------------------|
| No.1 semi-anechoic<br>chamber | February 01,<br>2002       | 313583                        | IC4247                       | 19.2 x 11.2 x 7.7m            | 7.0 x 6.0m                                                                      | Preparation<br>room |
| No.2 semi-anechoic<br>chamber | June 05,<br>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<br>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.

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

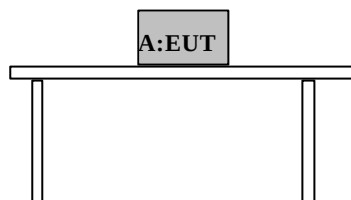
### 4.1 Operating modes

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)<br>002(Continuous) | DENSO        | HYQ14AAB |

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## 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<br>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**



## **APPENDIX 2:Test Instruments**

### **EMI test equipment**

| <b>Control No.</b> | <b>Instrument</b>   | <b>Manufacturer</b> | <b>Model No</b>          | <b>Test Item</b> | <b>Calibration Date *<br/>Interval(month)</b> |
|--------------------|---------------------|---------------------|--------------------------|------------------|-----------------------------------------------|
| 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 )

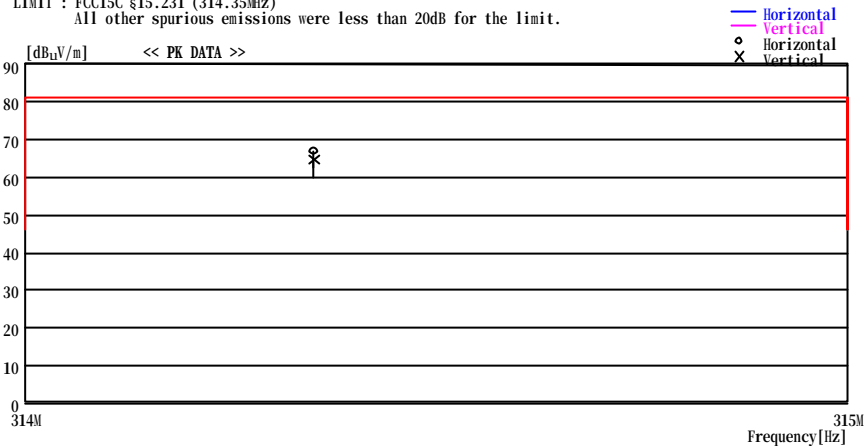
DATA OF RADIATED EMISSION TEST

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-H0  
Power : DC3.0V  
Temp°C/Humi% : 23 / 60  
Operator : Hiroka Umeyama

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

LIMIT : FCC15C s15.231 (314.35MHz)  
All other spurious emissions were less than 20dB for the limit.



| No.                    | FREQ<br>[MHz] | READING<br>[dBμV] | ANT<br>FACTOR<br>[dB/m] | LOSS<br>[dB] | GAIN<br>[dB] | RESULT<br>[dBμV/m] | LIMIT<br>[dBμV/m] | MARGIN<br>[dB] | ANTENNA<br>[cm] | TABLE<br>[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

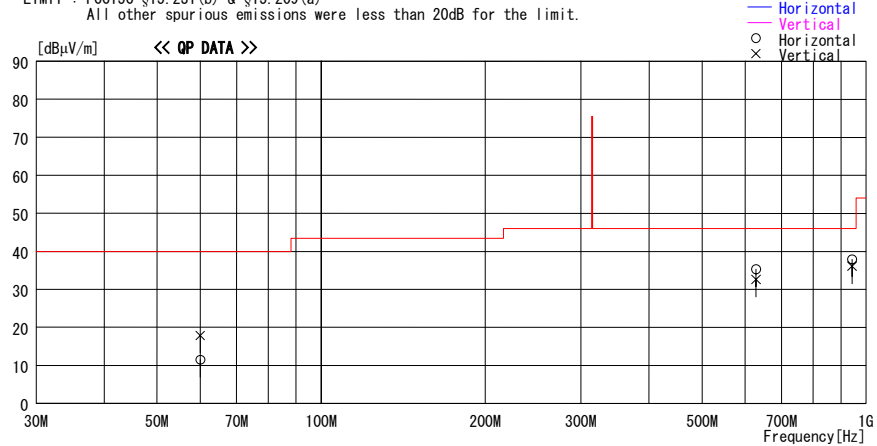
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2004/05/16 09:21:25

Applicant : DENSO CORPORATION  
Kind of EUT : Electronic Key  
Model No. : 14AAB  
Serial No. : 002

Report No. : 24IE0247-HO  
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<br>[MHz] | READING<br>QP<br>[dBμV] | ANT<br>FACTOR<br>[dB/m] | LOSS<br>[dB] | GAIN<br>[dB] | RESULT<br>[dBμV/m] | LIMIT<br>[dBμV/m] | MARGIN<br>[dB] | ANTENNA<br>[cm] | TABLE<br>[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.)



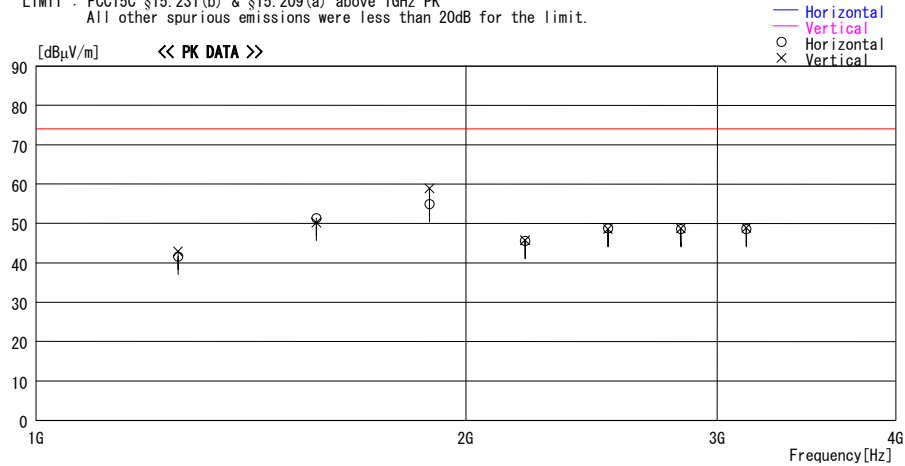
## DATA OF RADIATED EMISSION TEST

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-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<br>[MHz] | READING<br>PK<br>[dBμV] | ANT<br>FACTOR<br>[dB/m] | LOSS<br>[dB] | GAIN<br>[dB] | RESULT<br>[dBμV/m] | LIMIT<br>[dBμV/m] | MARGIN<br>[dB] | ANTENNA<br>[cm] | TABLE<br>[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

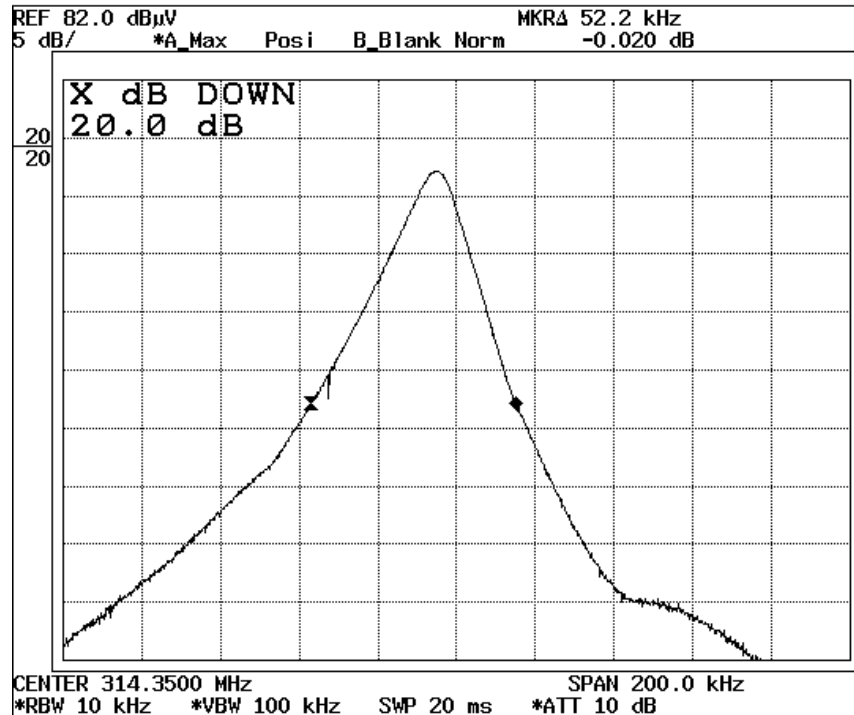
UL Apex Co., Ltd.  
Head Office EMC Lab. No.2 Semi Anechoic Chamber

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   |



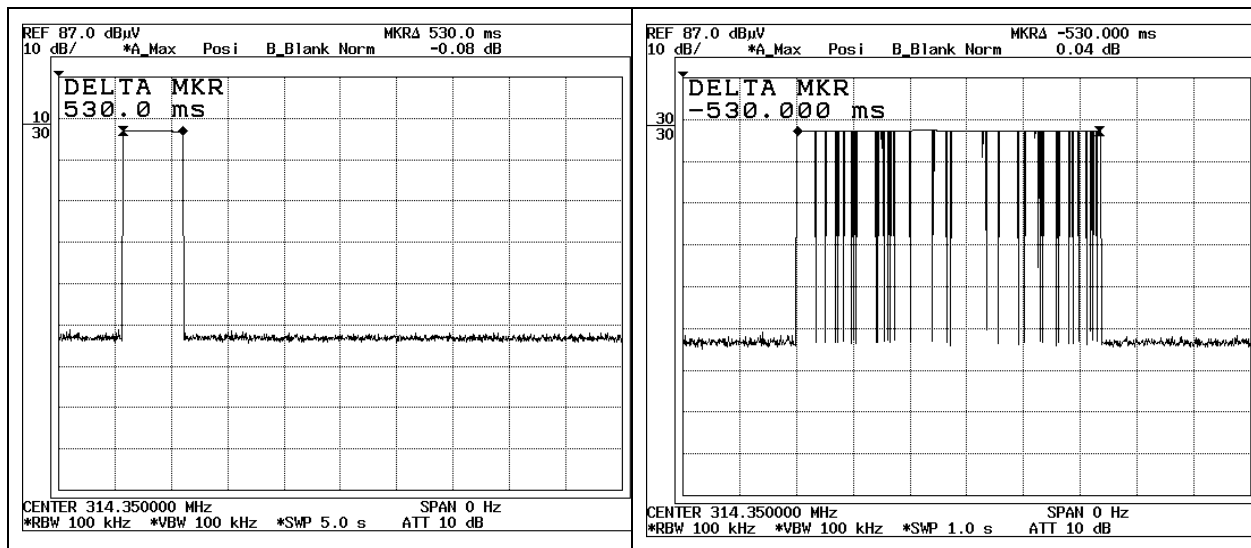
## Automatically deactivate

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<br>Transmitting<br>[sec] | Limit<br>[sec] | Result |
|----------------------------------|----------------|--------|
| 0.53                             | 5.00           | Pass   |



### 99%Occupied Bandwidth

