



RADIO TEST REPORT


Test Report No. : 31EE0217-HO-01-A-R1

Applicant : DENSO CORPORATION
Type of Equipment : Smart Card Key
Model No. : 14CBA
Test regulation : FCC Part 15 Subpart C: 2010
FCC ID : HYQ14CBA
Test Result : Complied


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6. This report is a revised version of 31EE0217-HO-01-A. 31EE0217-HO-01-A is replaced with this report.

Date of test: February 7 to March 3, 2011

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SECTION 1: Customer information

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Contact Person : Mitsuru Nakagawa

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

2.1 Identification of E.U.T.

Type of Equipment : Smart Card Key
Model No. : 14CBA
Serial No. : Refer to Clause 4.2
Rating : DC 3.0V
Receipt Date of Sample : February 1, 2011
Country of Mass-production : Japan
Condition of EUT : Engineer prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

General Specification

Oscillator frequency : 8MHz (IC Clock)

Radio Specification

Frequency of Operation : 314.35 MHz / 312.10MHz*
Receiving frequency : 134.2kHz
Oscillator frequency : 33.6 MHz
Type of modulation : FSK(F1D)
Operating voltage (inner) : DC 3.0V
Antenna Type : Built-in type (Fixed)

*These two different frequencies are not emitted simultaneously. For one transmitting sequence which is triggered by 134.2kHz radio receiving signal, after one transmitting frequency stops, another frequency is not transmitted.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4	N/A	N/A*1)	-
Automatically Deactivate	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: -	FCC: Section 15.231(a)(2) ----- IC: RSS-210 A1.1.1	N/A	Complied	Radiated
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.8	FCC: Section 15.231(b) ----- IC: RSS-210 A1.1.2	25.0dB 312.100MHz, Horizontal, PK with Duty factor	Complied	Radiated
Electric Field Strength of Spurious Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.9	FCC: Section 15.205 Section 15.209 Section 15.231(b) ----- IC: RSS-210 A1.1.2, 2.5.1 RSS-Gen 7.2.5	15.2dB 2829.150MHz Horizontal, PK with Duty factor	Complied	Radiated
-20dB Bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: -	FCC: Section 15.231(c) ----- IC: Reference data	N/A	Complied	Radiated
Receiver Spurious Emissions	FCC: ANSI C63.4:2003 12. Measurement of unintentional radiators other than ITE IC: RSS-Gen 4.10	FCC: Section 15.109(a) Section 15.209 ----- IC: RSS-Gen 6(a) RSS-210 2.5.1, RSS-Gen 7.2.5	90.2dB 0.40260MHz,AV	Complied	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

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

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	N/A	N/A	Radiated

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test(3m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

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	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	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Data of EMI, Test instruments.

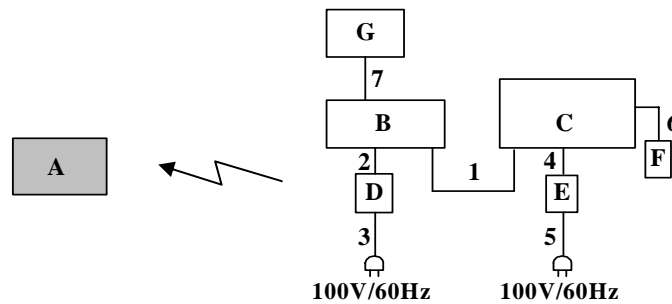
Refer to APPENDIX.

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

4.1 Operating Modes

Test Item	Mode
Automatically Deactivate *1) Duty Cycle *1)	Normal use mode, 312.10MHz Normal use mode, 314.35MHz
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth	Transmitting mode (Tx), 312.10MHz Transmitting mode (Tx), 314.35MHz
Receiver Spurious Emission *1)	Receiving 134.2kHz mode (Rx)
*1) The system was configured in typical fashion (as a customer would normally use it) for testing. * The software of this mode is the same as one of normal product, except that EUT continues to transmit when transmitter button is being pressed (For Normal use mode, the EUT transmits only when it receives 134.2kHz radio signal.) End users cannot change the settings of the output power of the product.	

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart Card Key	14CBA	001 *1) 003 *2)	DENSO CORPORATION	EUT
B	Jig	-	-	-	*2)
C	Laptop PC	PR04S	CN-03Y645-36521 -43C-0216	DELL	*2)
D	AC Adaptor	LSE0107A1236	-	LG	*2)
E	AC Adaptor	AA22850	CN-0T2357-16291 -438-043G	-	*2)
F	Mouse	NBMOP6	08060100002	-	*2)
G	Antenna	-	-	-	*2)

*1) Used for Transmitting mode

*2) Used for Normal use mode and Receiving 134.2kHz mode

List of cables used (Used for Normal use mode and Receiving 134.2kHz mode)

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB Cable	1.8	Shielded	Shielded	-
2	DC Cable	1.5	Unshielded	Unshielded	-
3	AC Cable	1.8	Unshielded	Unshielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	0.9	Unshielded	Unshielded	-
6	USB Cable	1.4	Shielded	Shielded	-
7	Antenna Cable	1.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m 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 was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 1.

[Transmitting mode]

The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3m. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength. The measurements were performed for both vertical and horizontal antenna polarization. The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

	Below or equal to 1GHz	Above 1GHz *1)
Detector Type	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	120kHz	PK: S/A:RBW 1MHz, VBW:3MHz

*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes 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. This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test with mechanical key was the worst case. Therefore the test with mechanical key was performed only.

NOTE: Mechanical key is made by other manufacturer.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 30MHz-3.2GHz
Test data : APPENDIX
Test result : Pass

[Receiving mode]

The Radiated Electric Field Strength has been measured on a 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 strength.

The measurements were performed for vertical polarization (antenna angle: 0deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 1000MHz at distance 3m

The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

	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

The worst case in receiving mode was confirmed with and without mechanical key, as a result, no difference was seen. Therefore the test with mechanical key was performed only.

NOTE: Mechanical key is made by other manufacturer.

* 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])

*The result is rounded off to the one decimal place, so some differences might be observed.

Measurement range : 9kHz-1000MHz

Test data : APPENDIX

Test result : Pass

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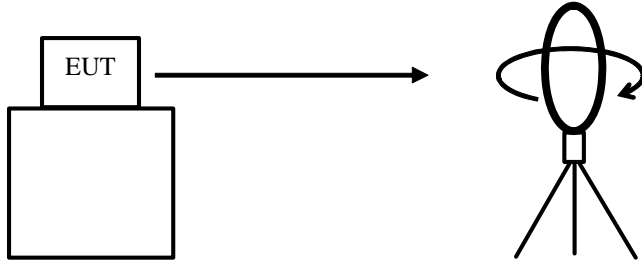
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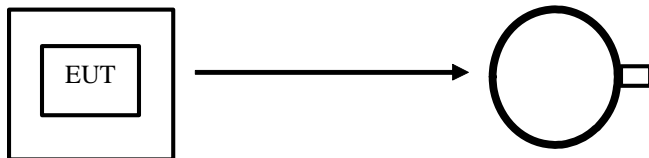
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)

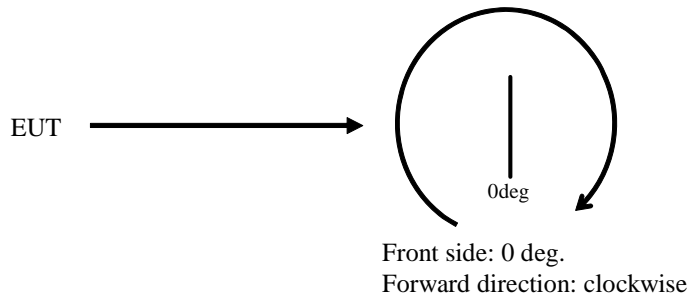


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



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SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX
Test result : Pass

SECTION 7: -20dB and 99% Occupied Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	1MHz	10kHz	30kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.

Test data : APPENDIX
Test result : Pass