



# **RADIO TEST REPORT**

**Test Report No. : 32KE0320-HO-01-A-R2**

**Applicant** : **DENSO CORPORATION**  
**Type of Equipment** : **Smart Card Key**  
**Model No.** : **14CBB**  
**Test regulation** : **FCC Part 15 Subpart C: 2012**  
**FCC ID** : **HYQ14CBB**  
**Test Result** : **Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 32KE0320-HO-01-A-R1. 32KE0320-HO-01-A-R1 is replaced with this report.

**Date of test:** July 9 to 23, 2012

**Representative test engineer:**

Motoya Imura  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

Shinya Watanabe  
Leader of WiSE Japan,  
UL Verification Service



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
<http://www.ul.com/japan/jpn/pages/services/emc/about/mar1/index.jsp#nvlap>

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13-EM-F0429

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## **SECTION 1: Customer information**

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number	:	+81-566-61-4721
Facsimile Number	:	+81-566-25-4792
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.	:	14CBB
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 3.0V
Receipt Date of Sample	:	July 5, 2012
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

### **2.2 Product Description**

Model No: 14CBB (referred to as the EUT in this report) is the Smart Card Key.

#### **General Specification**

Oscillator frequency	:	8MHz (IC Clock)
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#### **Radio Specification**

Radio Type	:	Transceiver
Frequency of Operation	:	312.10MHz / 314.35 MHz *
Modulation	:	FSK (F1D)
Power Supply (radio part input)	:	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. Only when a person with a key approaches a vehicle, this device receives a trigger (134.2kHz) and transmits one sequence automatically (one sequence is shown in (b) of "UHF transmission specification" of the application documents.), but not periodic transmission and also two frequencies are not transmitted continuously.

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

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2012, final revised on May 17, 2012 and effective June 18, 2012

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	16.9dB Horizontal PK with Duty factor (Tx 312.10MHz)	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	8.6dB 1560.500MHz Horizontal PK with Duty factor (Tx 312.10MHz)	Complied	Radiated
-20dB Bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators KDB 926416 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	90.1dB 0.40260MHz, AV	Complied	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *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	Complied	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	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	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**

<b>Test Item</b>	<b>Mode</b>
Automatically Deactivate *1)	Normal use mode, 312.10MHz
Duty Cycle *1)	Normal use mode, 314.35MHz
Electric Field Strength of Fundamental Emission	Transmitting mode (Tx), 312.10MHz
Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth	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.	

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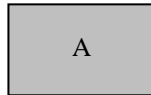
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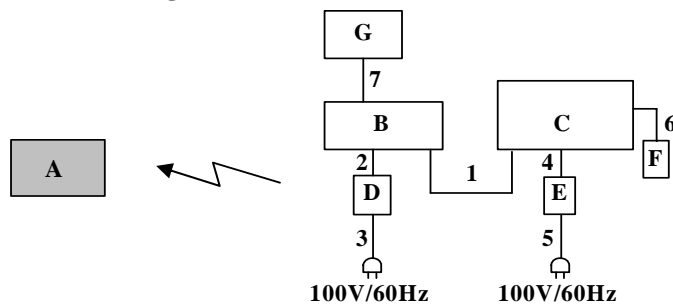
Facsimile : +81 596 24 8124

## 4.2 Configuration and peripherals

[Transmitting mode]



[ Normal use mode and Receiving 134.2kHz mode]



\* Test data was taken under worse case conditions.

### Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart Card Key	14CBB	001 *1) 002 *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

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, 1.0m by 1.5m, 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]**

#### **(Below 30MHz)**

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

#### **(Above 30MHz)**

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.

- 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. Noise levels of all the frequencies were measured at the position. 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.

### **Test Antennas are used as below;**

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

	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	Above 1GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200Hz	200Hz	9.1kHz	9.1kHz	120kHz	PK: S/A:RBW 1MHz, VBW:3MHz

Measurement range : 9kHz-3.2GHz  
Test data : APPENDIX  
Test result : Pass

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#### [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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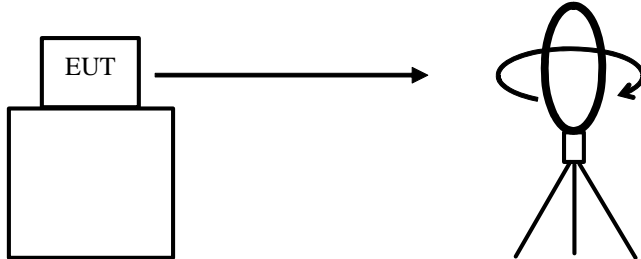
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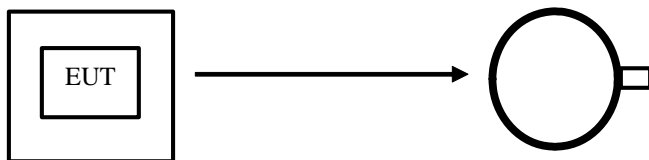
**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



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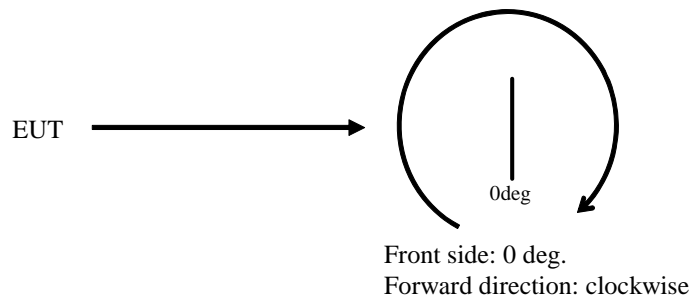
*Top View (Horizontal)*



Antenna was not rotated.

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*Top View (Vertical)*



## **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

## APPENDIX 1: Data of EMI test

### Automatically deactivate

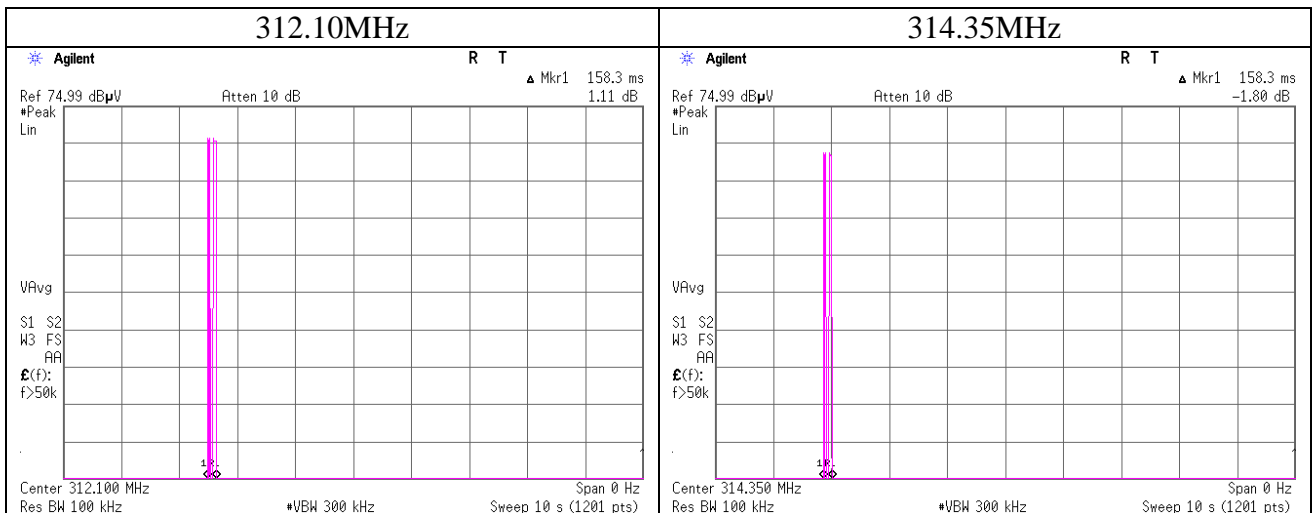
Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 32KE0320-HO-01  
Date 07/23/2012  
Temperature/ Humidity 25 deg.C / 54% RH  
Engineer Motoya Imura  
Mode Normal use mode

312.10MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.158	5.00	Pass

314.35MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.158	5.00	Pass



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

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Report No. 32KE0320-HO-01  
Date 07/09/2012 07/10/2012  
Temperature/ Humidity 25 deg. C / 59% RH 24 deg. C / 57% RH  
Engineer Satofumi Matsuyama Satofumi Matsuyama  
(Below 1GHz) (Above 1GHz)  
Mode Transmitting 312.10MHz

### QP or PK

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
312.100	PK	68.0	63.2	14.8	8.9	27.7	-	64.0	59.2	95.4	31.4	36.2	Carrier
624.200	PK	37.7	37.1	20.0	10.3	28.7	-	39.3	38.7	75.4	36.1	36.7	Outside
936.300	PK	37.7	37.0	22.6	11.4	27.8	-	43.9	43.2	75.4	31.5	32.2	Outside
1248.400	PK	52.7	53.4	25.6	1.6	35.7	-	44.2	44.9	75.4	31.2	30.5	Outside
1560.500	PK	58.0	57.2	26.4	1.8	35.4	-	50.8	50.0	73.9	23.1	23.9	Inside
1872.600	PK	46.4	46.8	27.0	2.0	35.1	-	40.3	40.7	75.4	35.1	34.7	Outside
2184.700	PK	52.5	50.8	27.3	2.1	34.9	-	47.0	45.3	75.4	28.4	30.1	Outside
2496.800	PK	45.8	45.5	27.5	2.3	34.8	-	40.8	40.5	73.9	33.1	33.4	Inside
2808.900	PK	49.0	47.3	28.1	2.4	34.7	-	44.8	43.1	73.9	29.1	30.8	Inside
3121.000	PK	48.0	47.9	28.7	2.6	34.5	-	44.8	44.7	75.4	30.6	30.7	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

### PK with Duty factor

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark
		Hor	Ver					Hor	Ver		Hor	Ver	
312.100	PK	68.0	63.2	14.8	8.9	27.7	-5.5	58.5	53.7	75.4	16.9	21.7	Carrier
624.200	PK	37.7	37.1	20.0	10.3	28.7	-5.5	33.8	33.2	55.4	21.6	22.2	Outside
936.300	PK	37.7	37.0	22.6	11.4	27.8	-5.5	38.4	37.7	55.4	17.0	17.7	Outside
1248.400	PK	52.7	53.4	25.6	1.6	35.7	-5.5	38.7	39.4	55.4	16.7	16.0	Outside
1560.500	PK	58.0	57.2	26.4	1.8	35.4	-5.5	45.3	44.5	53.9	8.6	9.4	Inside
1872.600	PK	46.4	46.8	27.0	2.0	35.1	-5.5	34.8	35.2	55.4	20.6	20.2	Outside
2184.700	PK	52.5	50.8	27.3	2.1	34.9	-5.5	41.5	39.8	55.4	13.9	15.6	Outside
2496.800	PK	45.8	45.5	27.5	2.3	34.8	-5.5	35.3	35.0	53.9	18.6	18.9	Inside
2808.900	PK	49.0	47.3	28.1	2.4	34.7	-5.5	39.3	37.6	53.9	14.6	16.3	Inside
3121.000	PK	48.0	47.9	28.7	2.6	34.5	-5.5	39.3	39.2	55.4	16.1	16.2	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*No signal detected at 9kHz - 30MHz.

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

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Report No. 32KE0320-HO-01  
Date 07/09/2012 07/10/2012  
Temperature/ Humidity 25 deg. C / 59% RH 24 deg. C / 57% RH  
Engineer Satofumi Matsuyama Satofumi Matsuyama  
(Below 1GHz) (Above 1GHz)  
Mode Transmitting 314.35MHz

### QP or PK

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
314.350	PK	67.9	62.9	14.9	8.9	27.7	-	64.0	59.0	95.5	31.5	36.5	Carrier
628.700	PK	37.7	36.9	20.1	10.3	28.7	-	39.4	38.6	75.5	36.1	36.9	Outside
943.050	PK	36.8	35.0	22.7	11.4	27.7	-	43.2	41.4	75.5	32.3	34.1	Outside
1257.400	PK	51.9	52.7	25.7	1.6	35.7	-	43.5	44.3	75.5	32.0	31.2	Outside
1571.750	PK	56.3	55.7	26.4	1.8	35.4	-	49.1	48.5	73.9	24.8	25.4	Inside
1886.100	PK	47.0	48.4	27.1	2.0	35.1	-	41.0	42.4	75.5	34.5	33.1	Outside
2200.450	PK	51.7	50.8	27.4	2.1	34.9	-	46.3	45.4	73.9	27.6	28.5	Inside
2514.800	PK	46.3	46.1	27.5	2.3	34.8	-	41.3	41.1	75.5	34.2	34.4	Outside
2829.150	PK	47.9	47.6	28.1	2.4	34.7	-	43.7	43.4	73.9	30.2	30.5	Inside
3143.500	PK	46.8	45.4	28.7	2.6	34.5	-	43.6	42.2	75.5	31.9	33.3	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

### PK with Duty factor

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark
		Hor	Ver					Hor	Ver		Hor	Ver	
314.350	PK	67.9	62.9	14.9	8.9	27.7	-5.5	58.5	53.5	75.5	17.0	22.0	Carrier
628.700	PK	37.7	36.9	20.1	10.3	28.7	-5.5	33.9	33.1	55.5	21.6	22.4	Outside
943.050	PK	36.8	35.0	22.7	11.4	27.7	-5.5	37.7	35.9	55.5	17.8	19.6	Outside
1257.400	PK	51.9	52.7	25.7	1.6	35.7	-5.5	38.0	38.8	55.5	17.5	16.7	Outside
1571.750	PK	56.3	55.7	26.4	1.8	35.4	-5.5	43.6	43.0	53.9	10.3	10.9	Inside
1886.100	PK	47.0	48.4	27.1	2.0	35.1	-5.5	35.5	36.9	55.5	20.0	18.6	Outside
2200.450	PK	51.7	50.8	27.4	2.1	34.9	-5.5	40.8	39.9	53.9	13.1	14.0	Inside
2514.800	PK	46.3	46.1	27.5	2.3	34.8	-5.5	35.8	35.6	55.5	19.7	19.9	Outside
2829.150	PK	47.9	47.6	28.1	2.4	34.7	-5.5	38.2	37.9	53.9	15.7	16.0	Inside
3143.500	PK	46.8	45.4	28.7	2.6	34.5	-5.5	38.1	36.7	55.5	17.4	18.8	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*No signal detected at 9kHz - 30MHz.

### **-20dB and 99% Occupied Bandwidth**

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Report No. 32KE0320-HO-01  
Date 07/10/2012  
Temperature/ Humidity 24 deg. C / 57% RH  
Engineer Satofumi Matsuyama  
Mode Transmitting 312.10MHz / 314.35MHz

Bandwidth Limit : Fundamental Frequency **312.10** MHz x 0.25% = 780.25 kHz

\* The above limit was calculated from more stringent nominal frequency.

\* Method of KDB 926416 for systems employing non sweeping frequencies was referred.

#### **312.10MHz**

-20dB Bandwidth [kHz]
71.29

#### **314.35MHz**

-20dB Bandwidth [kHz]
71.21

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
71.29+71.21=142.50	780.25	Pass

Bandwidth Limit : Fundamental Frequency **312.10** MHz x 0.25% = 780.25 kHz

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
62.48	780.25	Pass

Bandwidth Limit : Fundamental Frequency **314.35** MHz x 0.25% = 785.88 kHz

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
62.25	785.88	Pass

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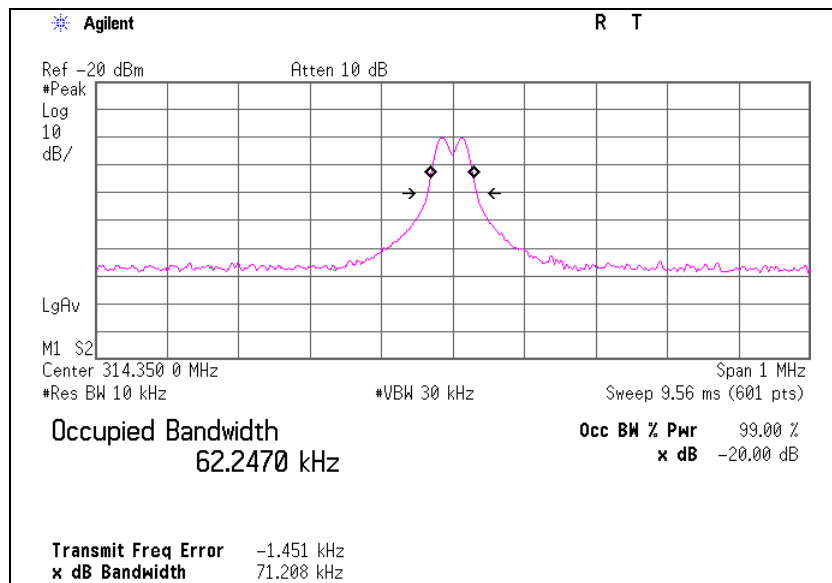
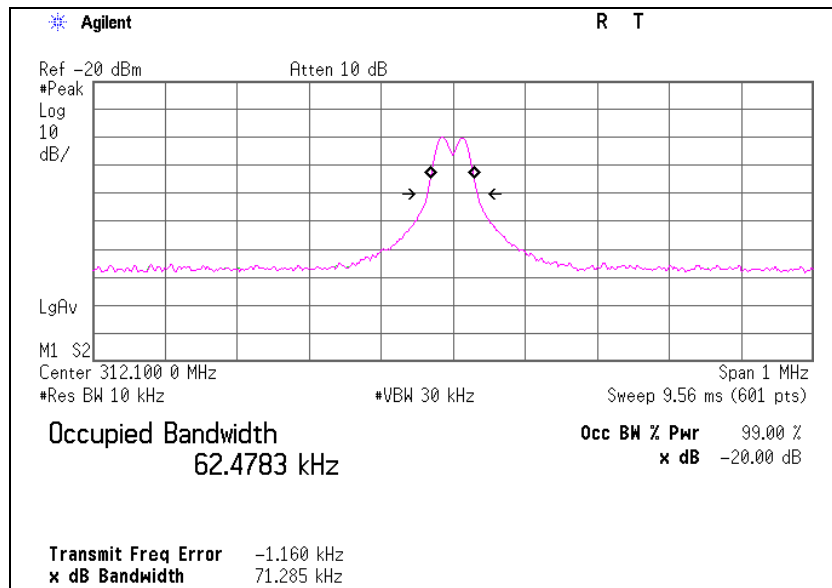
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### -20dB and 99% Occupied Bandwidth



## Duty Cycle

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	32KE0320-HO-01
Date	07/26/2012
Temperature/ Humidity	24 deg. C / 69% RH
Engineer	Shinya Watanabe
Mode	Normal use mode

312.10MHz

(pulse length)

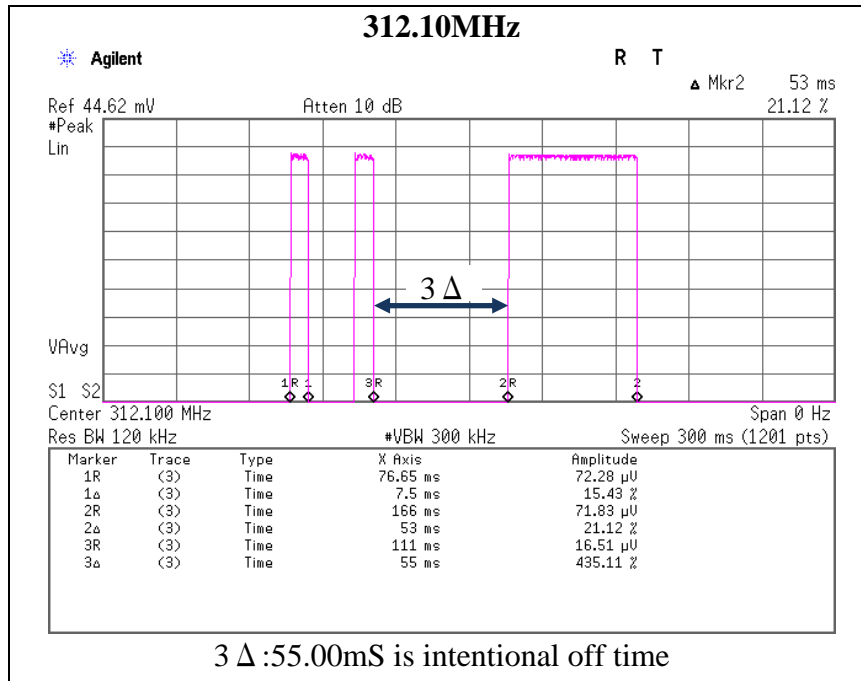
Type	[ms]
short pluse	7.50
long pulse	53.00

(duty)

ON time	Cycle	Duty	Duty
[ms]	[ms]	(On time/Cycle)	[dB]
53.00	100.00	0.53	-5.5

\*The sampled 100 msec was the worst case that is included in long pulse transmissions time + intentional off time(3 Δ).

\*Duty = 20log<sub>10</sub>(ON time/Cycle)



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## Duty Cycle

314.35MHz

(pulse length)

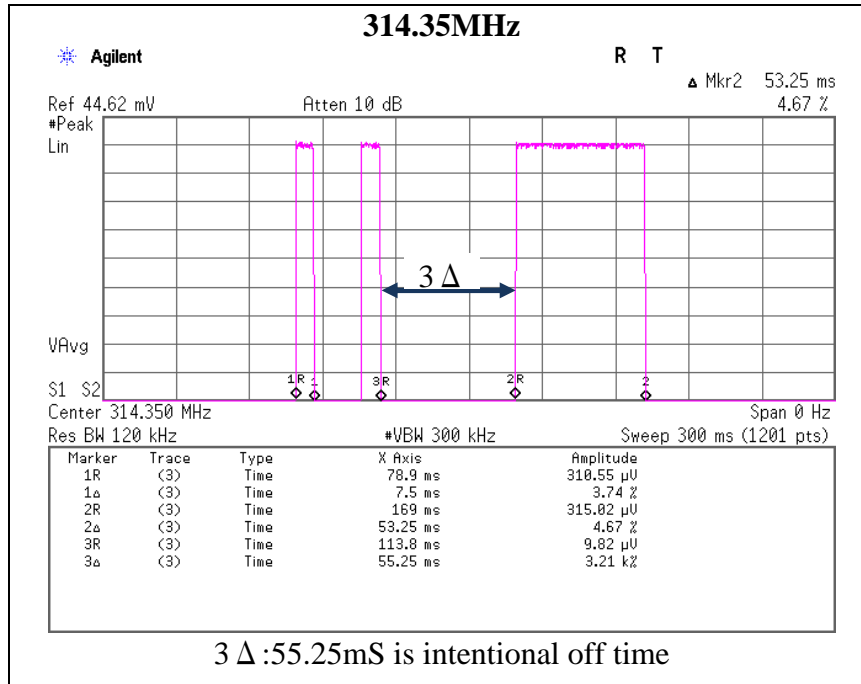
Type	[ms]
short pluse	7.50
long pulse	53.25

(duty)

ON time	Cycle	Duty	Duty
[ms]	[ms]	(On time/Cycle)	[dB]
53.25	100.00	0.53	-5.5

\*The sampled 100 msec was the worst case that is included in long pulse transmissions time + intentional off time(3 Δ).

\*Duty =  $20\log_{10}(\text{ON time/Cycle})$



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## APPENDIX 2: Test Instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2012/06/29 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2012/04/06 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2012/02/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2012/02/22 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2012/01/25 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2011/08/11 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	RE	2012/07/12 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MLPA-06	Loop Antenna	UL Japan	-	-	RE	Pre Check

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

#### Test Item:

RE: Radiated emission, 99% Occupied Bandwidth, -20dB bandwidth , Automatically deactivate and Duty cycle tests

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