



# RADIO TEST REPORT

Test Report No. : 32DE0356-HO-01-A-R1

**Applicant** : DENSO CORPORATION  
**Type of Equipment** : Remote Keyless Entry System (Transmitter)  
**Model No.** : 12BEL  
**Test regulation** : FCC Part 15 Subpart C: 2011  
**FCC ID** : HYQ12BEL  
**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 32DE0356-HO-01-A. 32DE0356-HO-01-A is replaced with this report.

**Date of test:** December 13, 2011 and January 07, 2012

**Representative test engineer:**

Shinya Watanabe  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

Takahiro Hatakeda  
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/mark1/index.jsp#nvlap>

**UL Japan, Inc.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

13-EM-F0429

**CONTENTS** **PAGE**

---

**SECTION 1: Customer information** ..... 3  
**SECTION 2: Equipment under test (E.U.T.)**..... 3  
**SECTION 3: Test specification, procedures & results**..... 4  
**SECTION 4: Operation of E.U.T. during testing**..... 7  
**SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)** 8  
**SECTION 6: Automatically deactivate** ..... 9  
**SECTION 7: -20dB and 99% Occupied Bandwidth** ..... 9  
**APPENDIX 1: Data of EMI test** ..... 10  
    Automatically deactivate.....10  
    Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission).....12  
    -20dB and 99% Occupied Bandwidth.....14  
    Duty Cycle .....16  
**APPENDIX 2: Test Instruments**..... 20  
**APPENDIX 3: Photographs of test setup**..... 21  
    Radiated emission .....21  
    Worst case position .....22

## **SECTION 1: Customer information**

Company Name : DENSO CORPORATION  
Address : 1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan  
Telephone Number : +81-566-61-7252  
Facsimile Number : +81-566-25-4837  
Contact Person : HIROMICHI HANAI

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Remote Keyless Entry System (Transmitter)  
Model No. : 12BEL  
Serial No. : Refer to Clause 4.2  
Rating : DC3.0V  
Receipt Date of Sample : December 6, 2011  
Country of Mass-production : Japan and United States of America  
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: 12BEL (referred to as the EUT in this report) is the Remote Keyless Entry System (Transmitter).  
- The EUT has variations of 4-button, 3-button and 2-button, and the test was performed with the representative 4-button.  
These variations do not affect RF performance.

### **General Specification**

Clock frequency(ies) in the system : 33.6MHz

### **Radio Specification**

Radio Type : Transmitter  
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)  
\* Every time buttons are pushed, the transmission channels are switched alternately and two Channels are not activated simultaneously.

---

## **UL Japan, Inc.**

### **Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2011, final revised on November 21, 2011 and effective December 21, 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)(1) ----- 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	10.8dB Horizontal PK with Duty Factor (Tx 314.35MHz)	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	4.7dB 1257.4MHz Vertical PK with Duty Factor (Tx 314.35MHz)	Complied	Radiated
-20dB Bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators KDB 926416 IC: -	FCC: Section 15.231€ ----- IC: Reference data	N/A	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.

**UL Japan, Inc.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

### 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 report meets the limits unless the uncertainty is taken into consideration.

**UL Japan, Inc.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

### 3.5 Test Location

UL Japan, Inc. 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

	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.

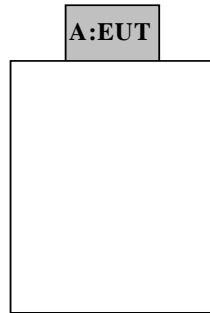
Refer to APPENDIX.

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

### **4.1 Operating Modes**

<b>Test Item*</b>	<b>Mode</b>
Automatically Deactivate	Normal use mode,312.10MHz
Duty Cycle	Normal use mode,314.35MHz
Electric Field Strength of Fundamental Emission	Transmitting mode (Tx) ,312.10MHz *1)
Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth	Transmitting mode (Tx) ,314.35MHz *1)
* The system was configured in typical fashion (as a customer would normally use it) for testing. *1) 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, EUT stops when transmitter button is being pressed.) 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**

<b>No.</b>	<b>Item</b>	<b>Model number</b>	<b>Serial number</b>	<b>Manufacturer</b>	<b>Remarks</b>
A	Remote Keyless Entry System (Transmitter)	12BEL	001 *1) 002 *2)	DENSO CORPORATION	EUT

\*1) Used for Transmitting mode

\*2) Used for Normal use mode

**UL Japan, Inc.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

**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.

\*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



## **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	820kHz	8.2kHz	27kHz	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%.

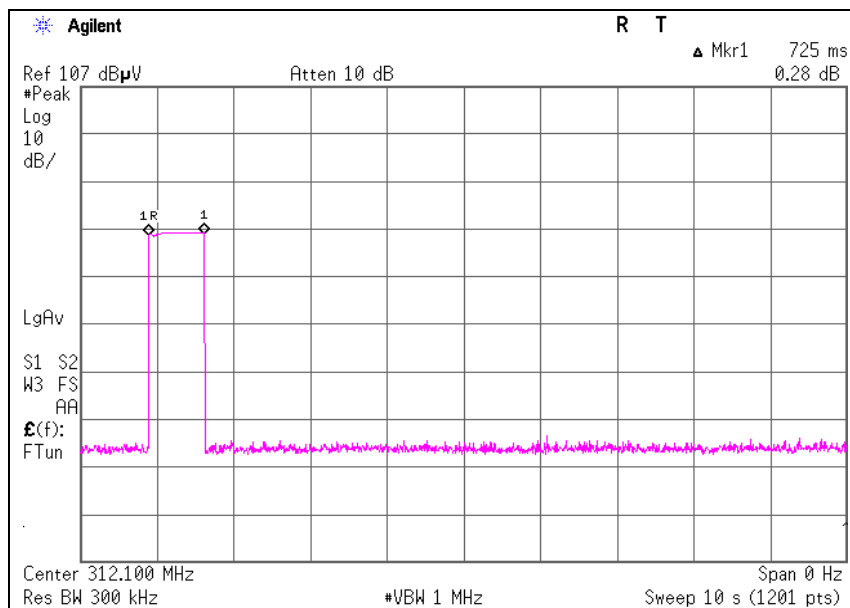
**Test data** : APPENDIX  
**Test result** : Pass

**APPENDIX 1: Data of EMI test**

**Automatically deactivate**

Test place : No.3 Semi Anechoic Chamber  
 Report No. : 32DE0356-HO-01  
 Date : 01/07/2012  
 Temperature/ Humidity : 22 deg. C / 31% RH  
 Engineer : Shinya Watanabe  
 Mode : Transmitting 312.10MHz

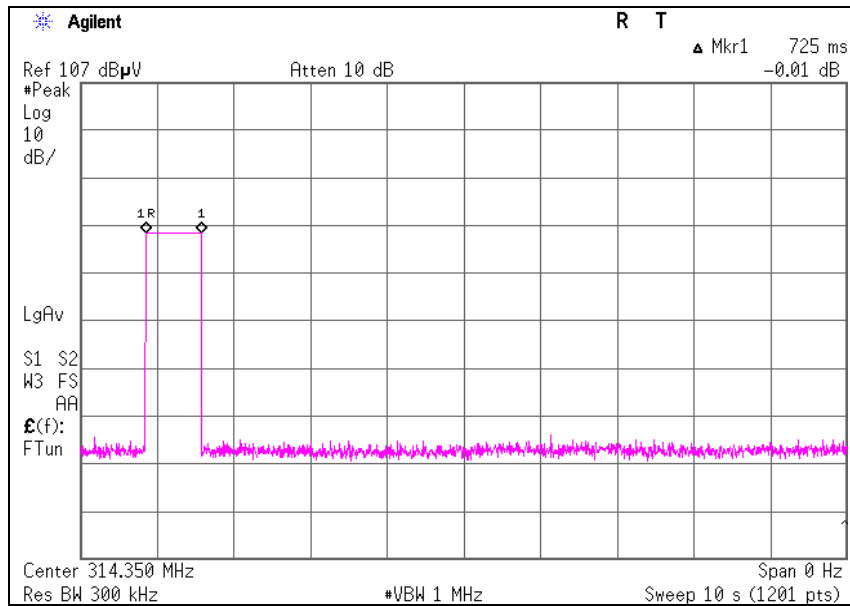
Time of Transmitting [sec]	Limit [sec]	Result
0.725	5.00	Pass



### Automatically deactivate

Test place	No.3 Semi Anechoic Chamber
Report No.	32DE0356-HO-01
Date	01/07/2012
Temperature/ Humidity	22 deg. C / 31% RH
Engineer	Shinya Watanabe
Mode	Transmitting 314.35MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.725	5.00	Pass



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

Test place : Head Office EMC Lab. No.2 / No.3 Semi Anechoic Chamber  
Report No. : 32DE0356-HO-01  
Date : 12/13/2011 / 01/07/2012  
Temperature/ Humidity : 21 deg. C / 31% RH / 22 deg. C / 31% RH  
Engineer : Shinya Watanabe  
Mode : Transmitting 312.10MHz

**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	74.0	70.6	14.8	8.8	27.7	-	69.9	66.5	95.4	25.5	28.9	Carrier
624.200	PK	28.6	28.4	20.0	10.3	28.7	-	30.2	30.0	75.4	45.2	45.4	Outside
936.300	PK	32.0	30.9	22.6	11.4	27.8	-	38.2	37.1	75.4	37.2	38.3	Outside
1248.400	PK	54.7	63.4	24.7	1.6	34.6	-	46.4	55.1	75.4	29.0	20.3	Outside
1560.500	PK	48.0	51.2	25.6	1.8	33.8	-	41.6	44.8	73.9	32.3	29.1	Inside
1872.600	PK	54.4	55.8	25.8	1.9	33.1	-	49.0	50.4	75.4	26.4	25.0	Outside
2184.700	PK	54.6	53.5	26.1	2.1	32.8	-	50.0	48.9	75.4	25.4	26.5	Outside
2496.800	PK	52.7	52.0	26.5	2.2	32.6	-	48.8	48.1	73.9	25.1	25.8	Inside
2808.900	PK	53.1	49.3	27.3	2.4	32.4	-	50.4	46.6	73.9	23.5	27.3	Inside
3121.000	PK	43.0	43.2	28.0	2.5	32.2	-	41.3	41.5	75.4	34.1	33.9	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	74.0	70.6	14.8	8.8	27.7	-5.6	64.3	60.9	75.4	11.1	14.5	Carrier
624.200	PK	28.6	28.4	20.0	10.3	28.7	-5.6	24.6	24.4	55.4	30.8	31.0	Outside
936.300	PK	32.0	30.9	22.6	11.4	27.8	-5.6	32.6	31.5	55.4	22.8	23.9	Outside
1248.400	PK	54.7	63.4	24.7	1.6	34.6	-5.6	40.8	49.5	55.4	14.6	5.9	Outside
1560.500	PK	48.0	51.2	25.6	1.8	33.8	-5.6	36.0	39.2	53.9	17.9	14.7	Inside
1872.600	PK	54.4	55.8	25.8	1.9	33.1	-5.6	43.4	44.8	55.4	12.0	10.6	Outside
2184.700	PK	54.6	53.5	26.1	2.1	32.8	-5.6	44.4	43.3	55.4	11.0	12.1	Outside
2496.800	PK	52.7	52.0	26.5	2.2	32.6	-5.6	43.2	42.5	53.9	10.7	11.4	Inside
2808.900	PK	53.1	49.3	27.3	2.4	32.4	-5.6	44.8	41.0	53.9	9.1	12.9	Inside
3121.000	PK	43.0	43.2	28.0	2.5	32.2	-5.6	35.7	35.9	55.4	19.7	19.5	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

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

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

\* The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and Duty cycle factor.

\* Duty Factor was calculated with the assumption of the worst condition in 100msec.

\* The noise measured with PK detect was pulse emission.

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

Test place : Head Office EMC Lab. No.2 / No.3 Semi Anechoic Chamber  
Report No. : 32DE0356-HO-01  
Date : 12/13/2011 / 01/07/2012  
Temperature/ Humidity : 21 deg. C / 31% RH / 22 deg. C / 31% RH  
Engineer : Shinya Watanabe  
Mode : Transmitting 314.35MHz

**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	74.1	70.7	14.9	8.9	27.7	-	70.2	66.8	95.5	25.3	28.7	Carrier
628.700	PK	28.5	28.7	20.1	10.3	28.7	-	30.2	30.4	75.5	45.3	45.1	Outside
943.050	PK	31.9	31.4	22.7	11.4	27.7	-	38.3	37.8	75.5	37.2	37.7	Outside
1257.400	PK	60.4	64.6	24.7	1.6	34.6	-	52.1	56.3	75.5	23.4	19.2	Outside
1571.750	PK	46.2	49.8	25.6	1.8	33.8	-	39.8	43.4	73.9	34.1	30.5	Inside
1886.100	PK	55.6	56.5	25.8	1.9	33.1	-	50.2	51.1	75.5	25.3	24.4	Outside
2200.450	PK	54.4	53.6	26.1	2.1	32.8	-	49.8	49.0	73.9	24.1	24.9	Inside
2514.800	PK	53.4	51.4	26.5	2.2	32.5	-	49.6	47.6	75.5	25.9	27.9	Outside
2829.150	PK	52.6	50.3	27.4	2.4	32.4	-	50.0	47.7	73.9	23.9	26.2	Inside
3143.500	PK	45.5	43.6	28.0	2.5	32.2	-	43.8	41.9	75.5	31.7	33.6	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	74.1	70.7	14.9	8.9	27.7	-5.5	64.7	61.3	75.5	10.8	14.2	Carrier
628.700	PK	28.5	28.7	20.1	10.3	28.7	-5.5	24.7	24.9	55.5	30.8	30.6	Outside
943.050	PK	31.9	31.4	22.7	11.4	27.7	-5.5	32.8	32.3	55.5	22.7	23.2	Outside
1257.400	PK	60.4	64.6	24.7	1.6	34.6	-5.5	46.6	50.8	55.5	8.9	4.7	Outside
1571.750	PK	46.2	49.8	25.6	1.8	33.8	-5.5	34.3	37.9	53.9	19.6	16.0	Inside
1886.100	PK	55.6	56.5	25.8	1.9	33.1	-5.5	44.7	45.6	55.5	10.8	9.9	Outside
2200.450	PK	54.4	53.6	26.1	2.1	32.8	-5.5	44.3	43.5	53.9	9.6	10.4	Inside
2514.800	PK	53.4	51.4	26.5	2.2	32.5	-5.5	44.1	42.1	55.5	11.4	13.4	Outside
2829.150	PK	52.6	50.3	27.4	2.4	32.4	-5.5	44.5	42.2	53.9	9.4	11.7	Inside
3143.500	PK	45.5	43.6	28.0	2.5	32.2	-5.5	38.3	36.4	55.5	17.2	19.1	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

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

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

- \* The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and Duty cycle factor.
- \* Duty Factor was calculated with the assumption of the worst condition in 100msec.
- \* The noise measured with PK detect was pulse emission.

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

Test place : No.3 Semi Anechoic Chamber  
 Report No. : 32DE0356-HO-01  
 Date : 01/07/2012  
 Temperature/ Humidity : 22 deg. C / 31% RH  
 Engineer : Shinya Watanabe  
 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]
85.56

**314.35MHz**

-20dB Bandwidth [kHz]
85.41

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
85.56+85.41=170.97	780.25	Pass

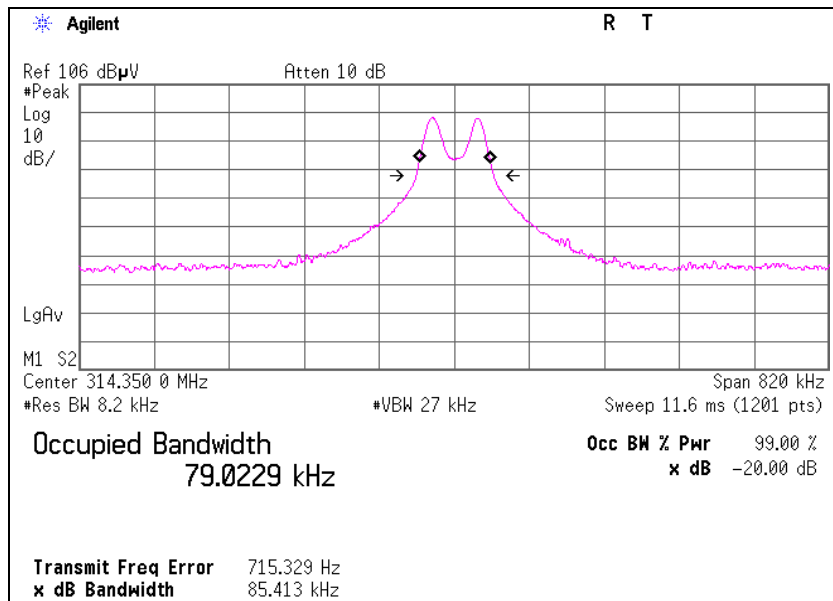
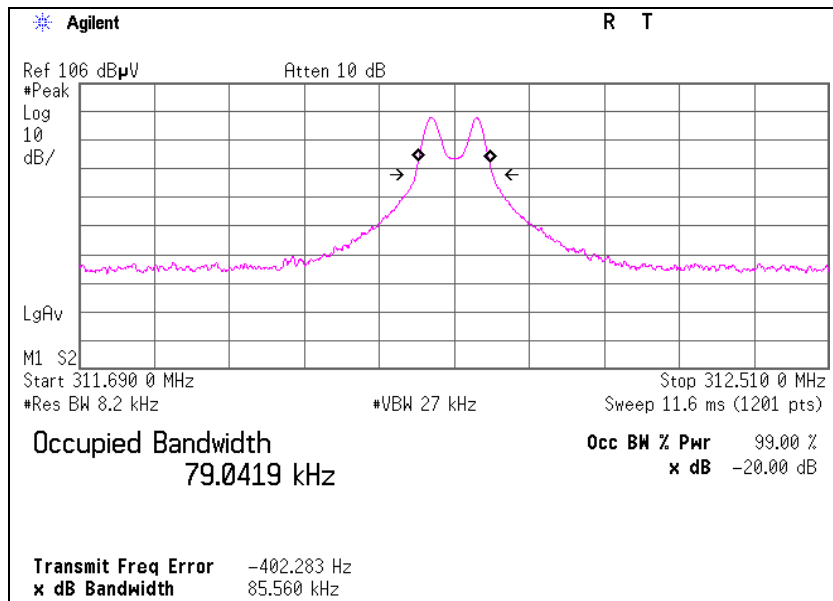
Bandwidth Limit : Fundamental Frequency      **312.10** MHz x 0.25% = 780.25 kHz

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
79.04	780.25	Pass

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

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
79.02	785.88	Pass

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



## Duty Cycle

Test place : No.3 Semi Anechoic Chamber  
 Report No. : 32DE0356-HO-01  
 Date : 01/07/2012  
 Temperature/ Humidity : 22 deg. C / 31% RH  
 Engineer : Shinya Watanabe  
 Mode : Transmitting 312.10MHz

Type	Times	ON time(One pulse) [ms]	ON time(in 50ms) [ms]	ON time(in 100ms) [ms]
A	51	0.370	18.870	37.740
B	10	0.720	7.200	14.400

\*1)ON time(in 100ms) = Times \* ON time(One pulse)

\*2)The train of pulses was exceeding 100msec, and that sampled 100msec was the worst case against the pulse train.

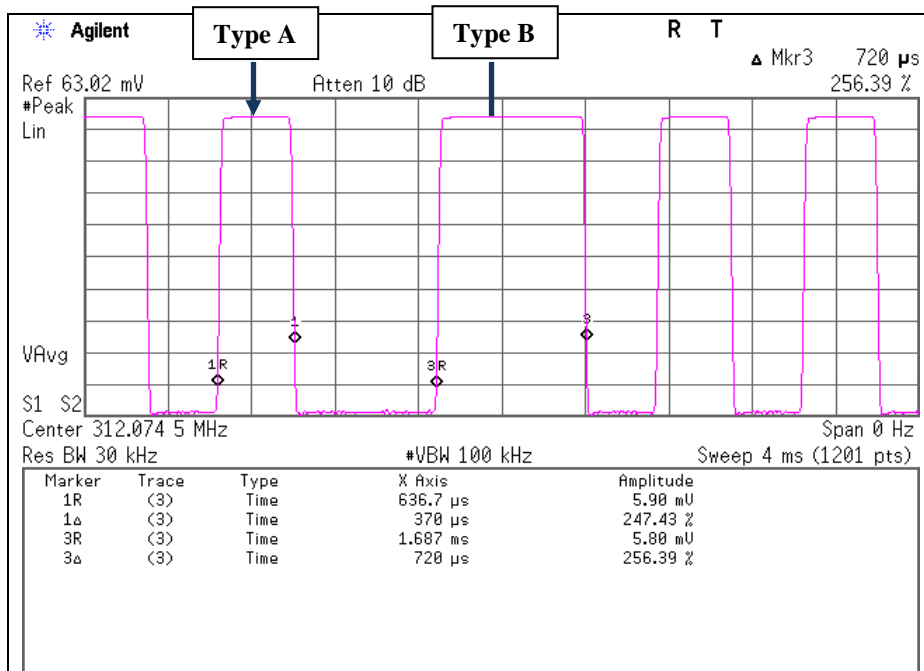
(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
52.140	100.00	0.5214	-5.66

\*3)ON time = Type A's ON time (in 100ms) + Type B's ON time (in 100ms)

\*4)Duty = 20log<sub>10</sub>(ON time/Cycle)

\*This is a reasonable actual measurement also from specification. Refer to "UHF transmission specification".



**UL Japan, Inc.**

**Head Office EMC Lab.**

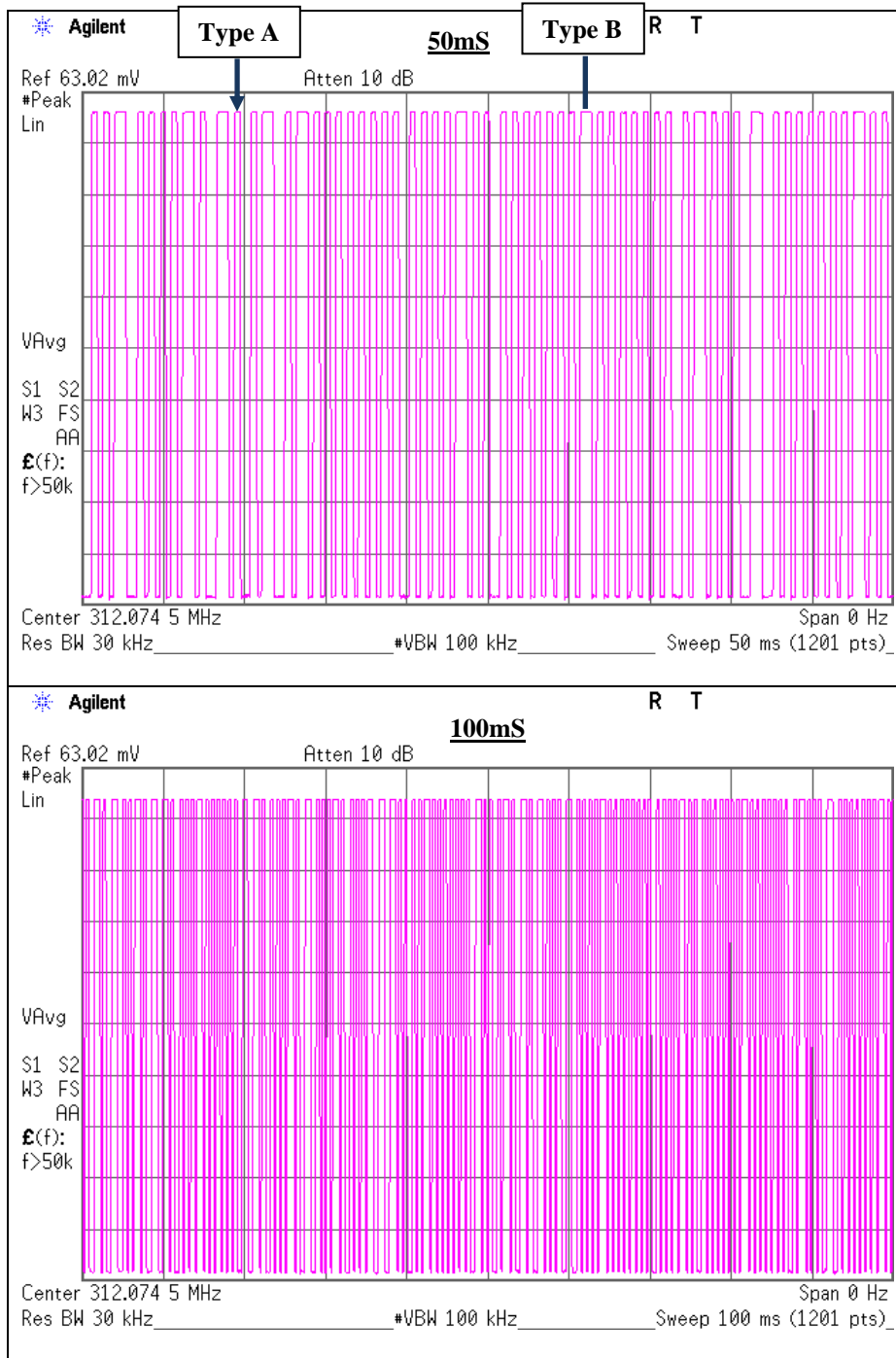
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124



### Duty Cycle



## Duty Cycle

Test place : No.3 Semi Anechoic Chamber  
Report No. : 32DE0356-HO-01  
Date : 01/07/2012  
Temperature/ Humidity : 22 deg. C / 31% RH  
Engineer : Shinya Watanabe  
Mode : Transmitting 314.35MHz

Type	Times	ON time(One pulse) [ms]	ON time(in 50ms) [ms]	ON time(in 100ms) [ms]
A	50	0.370	18.500	37.000
B	11	0.720	7.920	15.840

\*1)ON time(in 100ms) = Times \* ON time(One pulse)

\*2)The train of pulses was exceeding 100msec, and that sampled 100msec was the worst case against the pulse train.

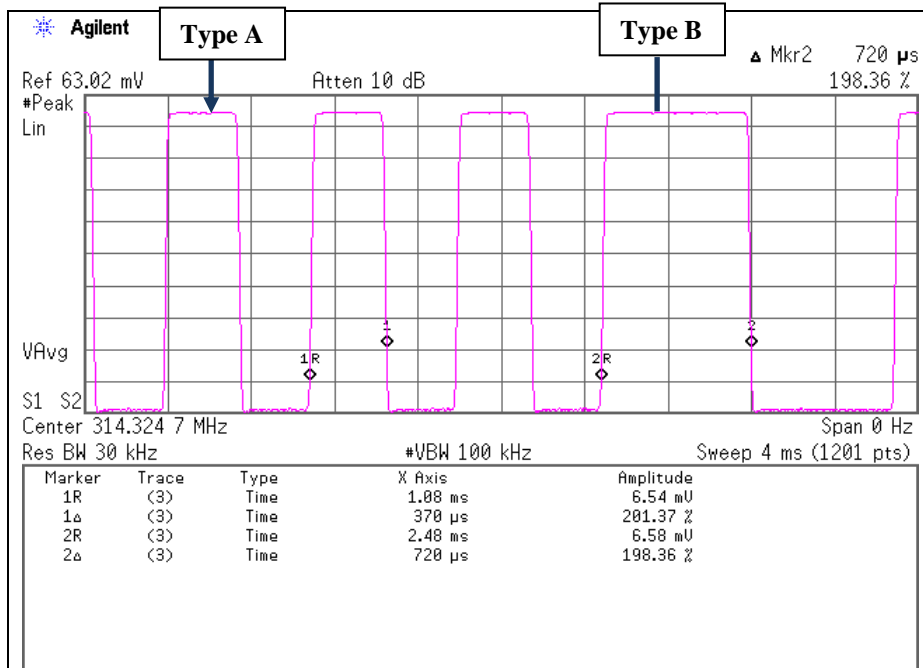
**(Total)**

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
52.840	100.00	0.5284	-5.54

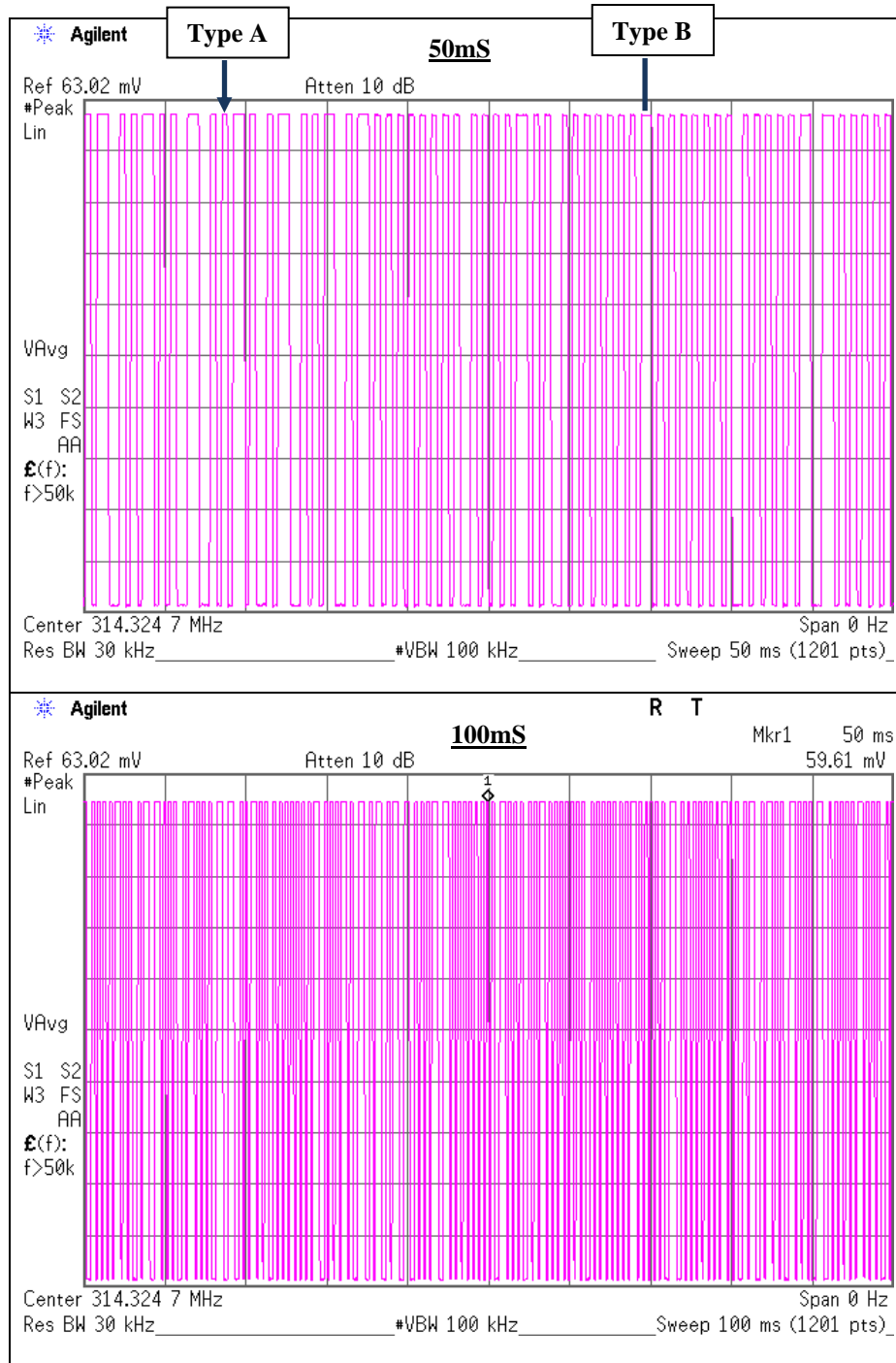
\*3)ON time = Type A's ON time (in 100ms) + Type B's ON time (in 100ms)

\*4)Duty = 20log<sub>10</sub>(ON time/Cycle)

\*This is a reasonable actual measurement also from specification. Refer to "UHF transmission specification".



### Duty Cycle



## **APPENDIX 2:Test Instruments**

### **EMI test equipment**

<b>Control No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Serial No</b>	<b>Test Item</b>	<b>Calibration Date * Interval(month)</b>
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2011/02/23 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2011/04/15 * 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	2011/02/18 * 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
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2011/02/22 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2011/05/23 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2011/09/07 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2011/03/10 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2011/02/15 * 12
MJM-15	Measure	KOMELON	KMC-36	-	RE	-
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**

---

**UL Japan, Inc.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124