RADIO TEST REPORT

Test Report No. : 10003591H

Applicant	:	**DENSO CORPORATION**
Type of Equipment	:	**Remote Keyless Entry System (Transmitter)**
Model No.	:	**12BEW**
Test regulation	:	**FCC Part 15 Subpart C: 2012**
FCC ID	:	**HYQ12BEW**
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.

Date of test: January 30, 2013

Representative test engineer:

Shinya Watanabe
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Masanori Nishiyama
Manager 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

REVISION HISTORY

Original Test Report No.: 10003591H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10003591H	February 7, 2013	-	-

CONTENTS **PAGE**

SECTION 1: Customer information ····· **4**
SECTION 2: Equipment under test (E.U.T.) ····· **4**
SECTION 3: Test specification, procedures & results ····· **5**
SECTION 4: Operation of E.U.T. during testing ····· **8**
SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission) **9**
SECTION 6: Automatically deactivate ····· **10**
SECTION 7: -20dB and 99% Occupied Bandwidth ····· **10**
APPENDIX 1: Data of EMI test ····· **11**
Automatically deactivate 11
Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission) 12
-20dB and 99% Occupied Bandwidth 13
Duty Cycle 14
APPENDIX 2: Test Instruments ····· **16**
APPENDIX 3: Photographs of test setup ····· **17**
Radiated emission 17
Worst case position 18

SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number	:	+81-566-61-4723
Facsimile Number	:	+81-566-25-4837
Contact Person	:	TATSUO KOUNO

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.	:	12BEW
Serial No.	:	Refer to Clause 4.2
Rating	:	DC3.0V
Receipt Date of Sample	:	January 21, 2013
Country of Mass-production	:	Japan, United States of America, China
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: 12BEW (referred to as the EUT in this report) is the Remote Keyless Entry System (Transmitter).

General Specification

Clock frequency(ies) in the system	:	13.097917 MHz

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	314.35 MHz
Modulation	:	ASK (A1D)
Power Supply (radio part input)	:	DC 3.0V
Antenna type	:	Built-in type (Fixed)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 2013
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

* The revision on December 27, 2012 does not affect the test specification applied to the EUT.

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	**FCC:** Section 15.207	N/A	N/A *1)	-
	IC: RSS-Gen 7.2.4	**IC:** RSS-Gen 7.2.4			
Automatically Deactivate	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(a)(1)	N/A	Complied	Radiated
	IC: -	**IC:** RSS-210 A1.1.1			
Electric Field Strength of Fundamental Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(b)	11.3dB 314.350 MHz Horizontal Peak with Duty factor	Complied	Radiated
	IC: RSS-Gen 4.8	**IC:** RSS-210 A1.1.2			
Electric Field Strength of Spurious Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.205 Section 15.209 Section 15.231(b)	11.5dB 3143.5MHz Horizontal Peak with Duty factor	Complied	Radiated
	IC: RSS-Gen 4.9	**IC:** RSS-210 A1.1.2, 2.5.1 RSS-Gen 7.2.5			
-20dB Bandwidth	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(c)	N/A	Complied	Radiated
	IC: -	**IC:** Reference data			
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.

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	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.

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

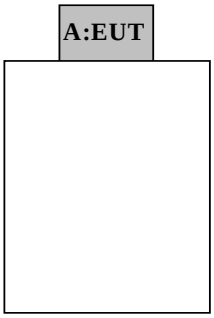
Refer to APPENDIX.

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

4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate Duty Cycle	Normal use mode, 314.35MHz
Electric Field Strength of Fundamental Emission 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

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Remote Keyless Entry System (Transmitter)	12BEW	001	DENSO CORPORATION	EUT

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 3.

(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

*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

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	500kHz	5.1kHz	16kHz	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%.							

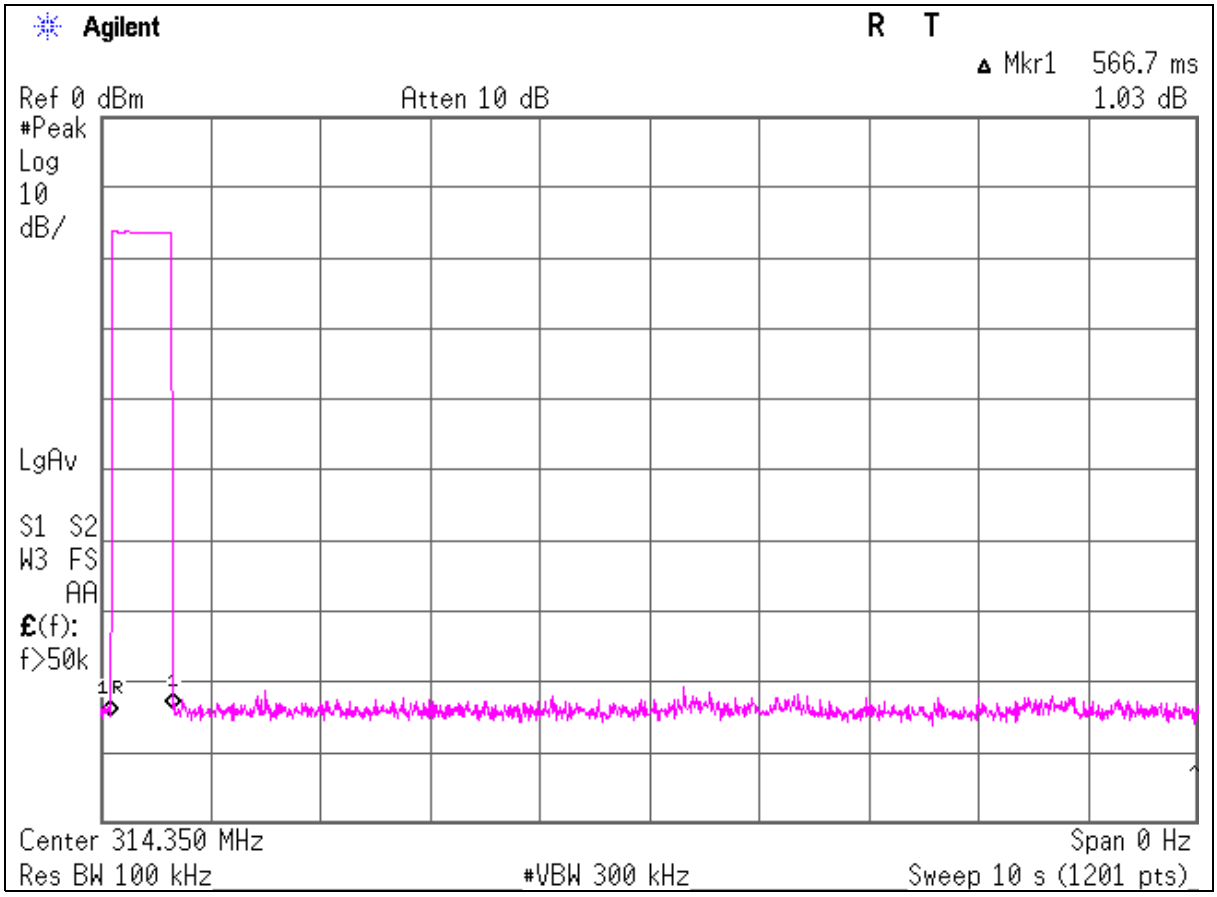
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Automatically deactivate

Test place	No.3 Semi Anechoic Chamber
Report No.	10003591H
Date	01/30/2013
Temperature/ Humidity	23 deg. C / 31% RH
Engineer	Shinya Watanabe
Mode	Normal use mode, 314.35MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.57	5.00	Pass



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

Test place	No.3 Semi Anechoic Chamber
Report No.	10003591H
Date	01/30/2013
Temperature/ Humidity	23 deg. C / 31% RH
Engineer	Shinya Watanabe
Mode	Normal use mode, 314.35MHz

PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark Inside or Outside
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m	Hor	Ver	of Restricted Bands
314.350	PK	77.2	73.3	15.0	10.1	32.1	-	70.2	66.3	95.5	25.3	29.2	Carrier
628.700	PK	NS	NS	19.6	12.2	32.0	-	-	-	75.5	-	-	Outside
943.050	PK	NS	NS	22.6	13.7	30.8	-	-	-	75.5	-	-	Outside
1257.400	PK	47.3	50.4	24.7	1.6	34.2	-	39.4	42.5	75.5	36.1	33.0	Outside
1571.750	PK	NS	NS	25.3	1.8	33.4	-	-	-	73.9	-	-	Inside
1886.100	PK	46.3	NS	25.8	2.0	32.8	-	41.3	-	75.5	34.2	-	Outside
2200.450	PK	45.0	45.0	26.8	2.2	32.5	-	41.5	41.5	73.9	32.4	32.4	Inside
2514.800	PK	49.9	48.5	27.8	2.3	32.3	-	47.7	46.3	75.5	27.8	29.2	Outside
2829.150	PK	48.0	47.3	28.7	2.5	32.2	-	47.0	46.3	73.9	26.9	27.6	Inside
3143.500	PK	50.5	48.4	29.0	2.6	32.1	-	50.0	47.9	75.5	25.5	27.6	Outside

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

PK with Duty factor

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m	Hor	Ver	
314.350	PK	77.2	73.3	15.0	10.1	32.1	-6.0	64.2	60.3	75.5	11.3	15.2	Carrier
628.700	PK	NS	NS	19.6	12.2	32.0	-6.0	-	-	55.5	-	-	Outside
943.050	PK	NS	NS	22.6	13.7	30.8	-6.0	-	-	55.5	-	-	Outside
1257.400	PK	47.3	50.4	24.7	1.6	34.2	-6.0	33.4	36.5	55.5	22.1	19.0	Outside
1571.750	PK	NS	NS	25.3	1.8	33.4	-6.0	-	-	53.9	-	-	Inside
1886.100	PK	46.3	NS	25.8	2.0	32.8	-6.0	35.3	-	55.5	20.2	-	Outside
2200.450	PK	45.0	45.0	26.8	2.2	32.5	-6.0	35.5	35.5	53.9	18.4	18.4	Inside
2514.800	PK	49.9	48.5	27.8	2.3	32.3	-6.0	41.7	40.3	55.5	13.8	15.2	Outside
2829.150	PK	48.0	47.3	28.7	2.5	32.2	-6.0	41.0	40.3	53.9	12.9	13.6	Inside
3143.500	PK	50.5	48.4	29.0	2.6	32.1	-6.0	44.0	41.9	55.5	11.5	13.6	Outside

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

*NS : No signal detected

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

* Duty Factor was calculated with the assumption of the worst condition in 100msec.
* The noise measured with PK detect was pulse emission.

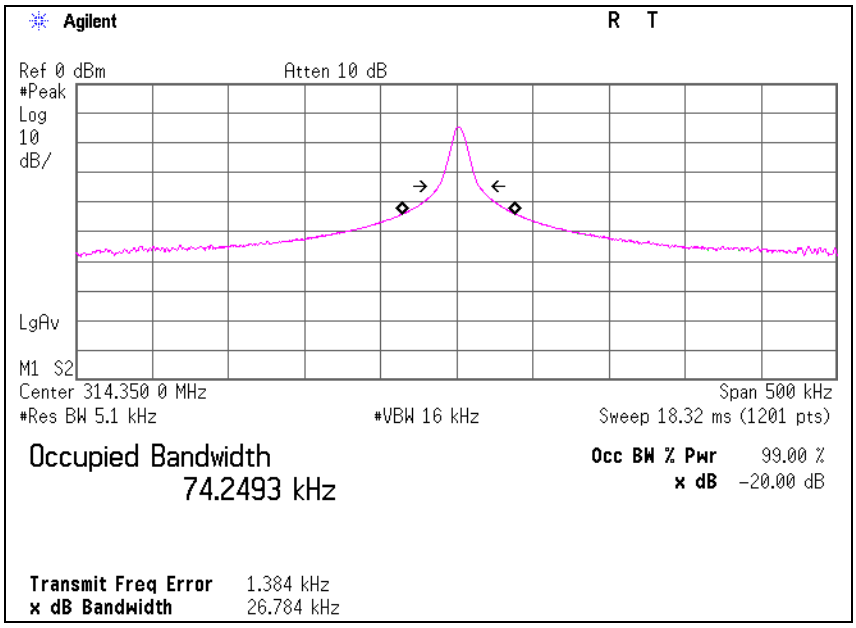
-20dB and 99% Occupied Bandwidth

Test place	No.3 Semi Anechoic Chamber
Report No.	10003591H
Date	01/30/2013
Temperature/ Humidity	23 deg. C / 31% RH
Engineer	Shinya Watanabe
Mode	Transmitting 314.35MHz

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

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
26.78	785.88	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
74.25	785.88	Pass



Duty Cycle

Test place	No.3 Semi Anechoic Chamber
Report No.	10003591H
Date	01/30/2013
Temperature/ Humidity	23 deg. C / 31% RH
Engineer	Shinya Watanabe
Mode	Normal use mode, 314.35MHz

Type	Times (in 100ms)	ON time(One pulse) [ms]	ON time(in 100ms) [ms]
A	18	1.406	25.308
B	35	0.711	24.885

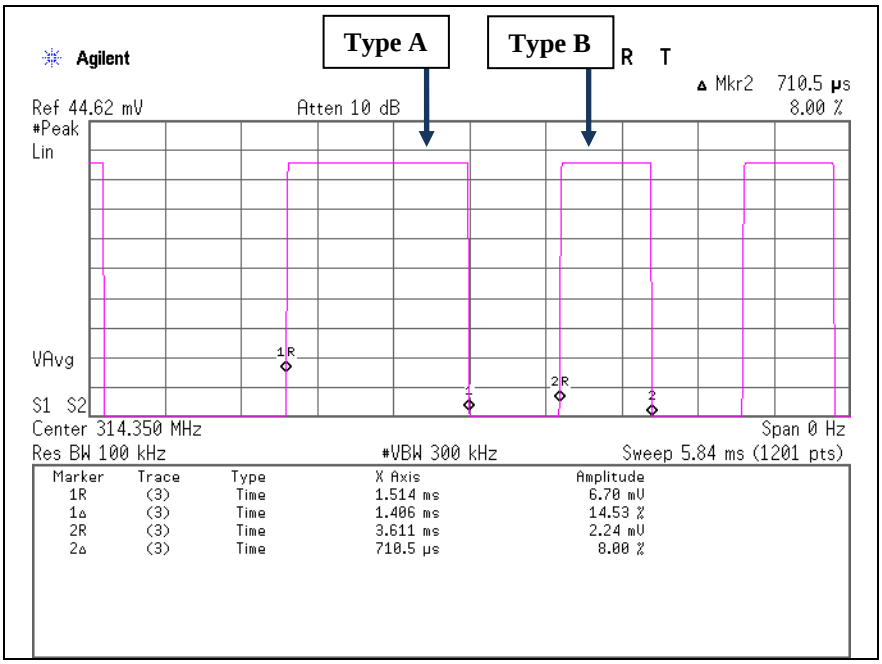
*1)ON time(in 100ms) = Times (in 100ms) * ON time(One pulse)
*2)The train of pulses was exceeding 100msec, and that sampled 100msec was the worst case against the pulse trai

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
50.193	100.00	0.5019	-5.99

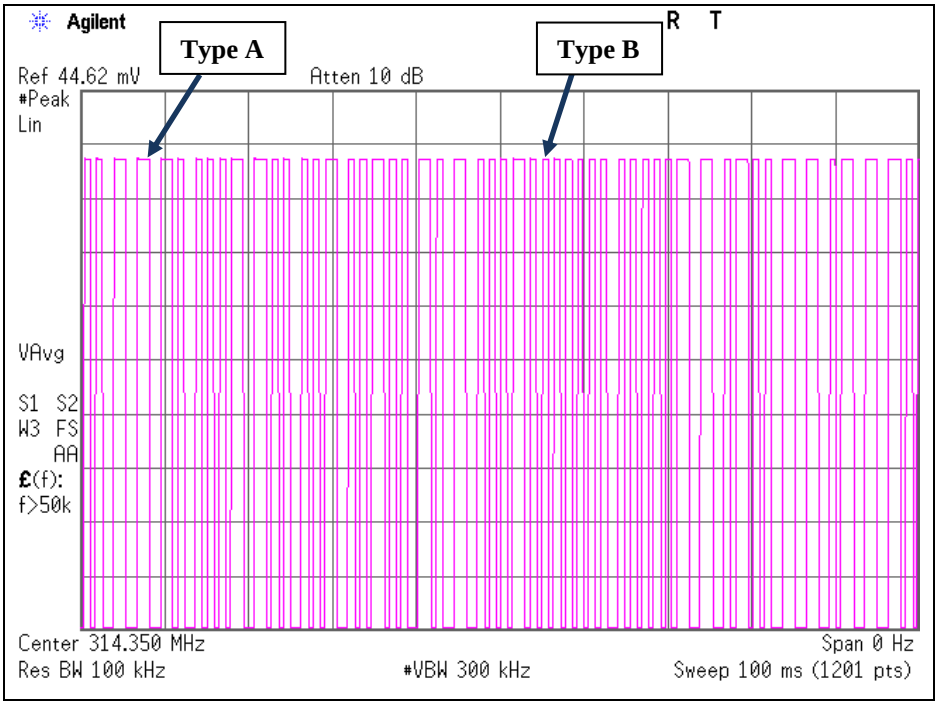
*3)ON time = Type A's ON time (in 100ms) + Type B's ON time (in 100ms)
*4)Duty = $20\log_{10}$(ON time/Cycle)

*This is a reasonable actual measurement also from specification. Refer to “UHF communication 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



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

APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2012/11/20 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2012/08/23 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2012/10/08 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2012/10/08 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2012/07/12 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2012/11/06 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2012/05/25 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2012/09/05 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2012/03/29 * 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