



RADIO TEST REPORT


Test Report No. : 10272354H-A

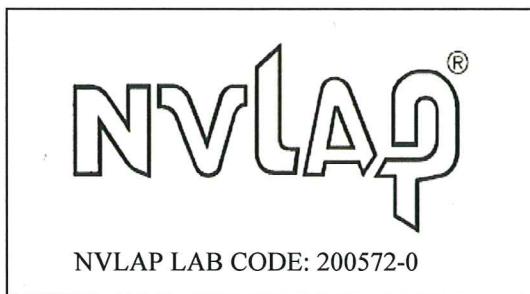
Applicant : **Panasonic Corporation**
Type of Equipment : **SMART FOB**
Model No. : **YEP0FX1510**
Test regulation : **FCC Part 15 Subpart C: 2014**
FCC ID : **ACJ932YEP0FX1510**
Test Result : **Complied**

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: March 25 and April 15, 2014

Representative test engineer: 
Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by: 
Motoya Imura
Engineer
Consumer Technology Division



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>

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SECTION 1: Customer information

Company Name : Panasonic Corporation
Address : 4261, Ikonobe-cho, Tsuzuki, Yokohama, 224-8520, Japan
Telephone Number : +81-45-939-1144
Facsimile Number : +81-45-939-1917
Contact Person : Masahiro Yoshii

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

2.1 Identification of E.U.T.

Type of Equipment : SMART FOB
Model No. : YEP0FX1510
Serial No. : Refer to Clause 4.2
Receipt Date of Sample : March 18, 2014
Country of Mass-production : Japan
Condition of EUT : Production 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: YEP0FX1510 is the SMART FOB.

General Specification

Clock frequency(ies) in the system : 13.56MHz (Crystal oscillator)
8MHz (CR)

Radio Specification

[Transmitter part]

Radio Type : Transmitter
Frequency of Operation : 433.92MHz
Modulation : FSK
Operating voltage (inner) : DC 3.0V
Method of Frequency Generation : PLL, Crystal oscillator
Antenna type : Loop antenna made by PWD pattern
Antenna Gain : -20dBi

[Receiver part]*

Radio Type : Receiver
Frequency of Operation : 125kHz
Modulation : ASK
Antenna Type : Ferrite Antenna (3 axes)
Method of Frequency Generation : None

* Receiver part was tested according to FCC Part 15 Subpart B standard. Please see UL Japan, Inc. Test Report No. 10272354H-B.

UL Japan, Inc.

Ise HQ EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on March 6, 2014 and effective April 7, 2014

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 March 6, 2014 does not affect the test specification applied to the EUT.

* The EUT complies with FCC Part 15 Subpart B: 2014, final revised on March 6, 2014 and effective April 7, 2014

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	0.6dB 433.920MHz Vertical 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	5.5dB 4339.200MHz 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

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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Ise HQ EMC Lab.

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

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3.3 Addition to standard

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	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Radiated emission test (3m)

[Electric Field Strength of Fundamental Emission]

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

[Electric Field Strength of Spurious Emission]

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

UL Japan, Inc.

Ise HQ EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Ise HQ EMC Lab. *NVLAP Lab. code: 200572-0

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

Telephone : +81 596 24 8999

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	-	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	4.8 x 4.6m	-

* 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.

UL Japan, Inc.

Ise HQ EMC Lab.

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

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

4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate	Normal use mode, 433.92MHz
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth Duty Cycle	Transmitting mode, 433.92MHz *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 transceiver button is being pressed (For Normal use mode, EUT stops when transceiver button is disengaged.) End users cannot change the settings of the output power of the product.	

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

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4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

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]

(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.

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 carrier level was 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 without mechanical key was the worst case. Therefore the test without mechanical key was performed only.

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

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 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

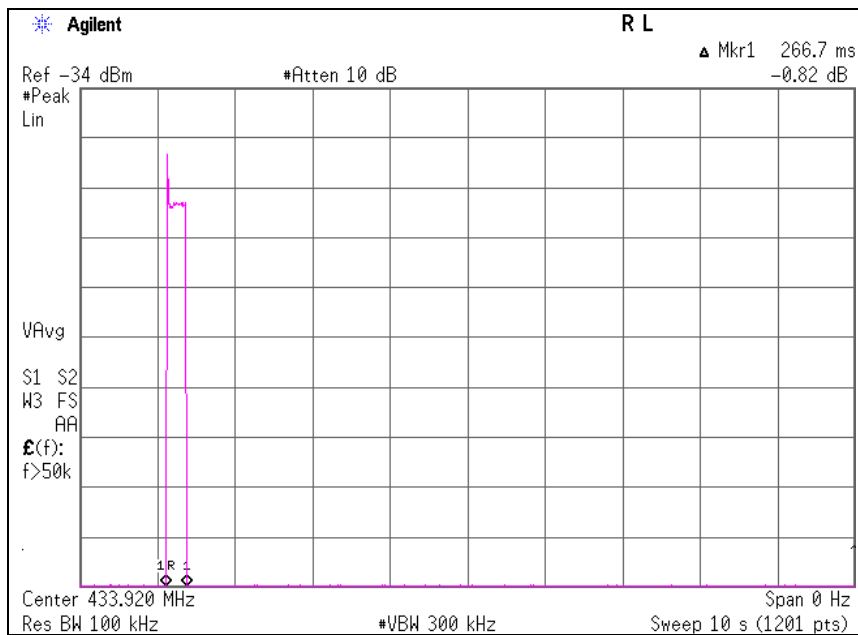
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Automatically deactivate

Test place Ise HQ EMC Lab. No.3 Measurement Room
 Report No. 10272354H
 Date 04/15/2014
 Temperature/ Humidity 23 deg. C / 31% RH
 Engineer Masatoshi Nishiguchi
 Mode Normal use mode 433.92MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.2667	5.00	Pass



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

Test place : Ise HQ EMC Lab. No.3 Measurement Room
Report No. : 10272354H
Date : 03/25/2014
Temperature/ Humidity : 22 deg.C / 34% RH
Engineer : Tsubasa Takayama
Mode : Transmitting mode 433.92MHz

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	
433.920	PK	81.5	81.8	17.6	9.3	28.5	-	79.9	80.2	100.8	20.9	20.6	Carrier
867.840	PK	41.7	39.2	22.0	11.0	28.0	-	46.7	44.2	80.8	34.1	36.6	Outside
1301.760	PK	50.1	52.8	25.8	3.5	35.4	-	44.0	46.7	73.9	29.9	27.2	Inside
1735.680	PK	45.9	47.8	26.9	3.1	35.0	-	40.9	42.8	80.8	39.9	38.0	Outside
2169.600	PK	55.2	51.6	27.3	3.1	34.8	-	50.8	47.2	80.8	30.0	33.6	Outside
2603.520	PK	56.1	58.7	27.1	3.3	34.6	-	51.9	54.5	80.8	28.9	26.3	Outside
3037.440	PK	50.8	53.1	28.0	3.4	34.4	-	47.8	50.1	80.8	33.0	30.7	Outside
3471.360	PK	47.1	47.8	29.1	3.7	34.0	-	45.9	46.6	80.8	34.9	34.2	Outside
3905.280	PK	47.0	47.1	30.1	4.0	33.7	-	47.4	47.5	73.9	26.5	26.4	Inside
4339.200	PK	47.1	46.1	30.9	4.2	33.8	-	48.4	47.4	73.9	25.5	26.5	Inside

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	
433.920	PK	81.5	81.8	17.6	9.3	28.5	0.0	79.9	80.2	80.8	0.9	0.6	Carrier
867.840	PK	41.7	39.2	22.0	11.0	28.0	0.0	46.7	44.2	60.8	14.1	16.6	Outside
1301.760	PK	50.1	52.8	25.8	3.5	35.4	0.0	44.0	46.7	53.9	9.9	7.2	Inside
1735.680	PK	45.9	47.8	26.9	3.1	35.0	0.0	40.9	42.8	60.8	19.9	18.0	Outside
2169.600	PK	55.2	51.6	27.3	3.1	34.8	0.0	50.8	47.2	60.8	10.0	13.6	Outside
2603.520	PK	56.1	58.7	27.1	3.3	34.6	0.0	51.9	54.5	60.8	8.9	6.3	Outside
3037.440	PK	50.8	53.1	28.0	3.4	34.4	0.0	47.8	50.1	60.8	13.0	10.7	Outside
3471.360	PK	47.1	47.8	29.1	3.7	34.0	0.0	45.9	46.6	60.8	14.9	14.2	Outside
3905.280	PK	47.0	47.1	30.1	4.0	33.7	0.0	47.4	47.5	53.9	6.5	6.4	Inside
4339.200	PK	47.1	46.1	30.9	4.2	33.8	0.0	48.4	47.4	53.9	5.5	6.5	Inside

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

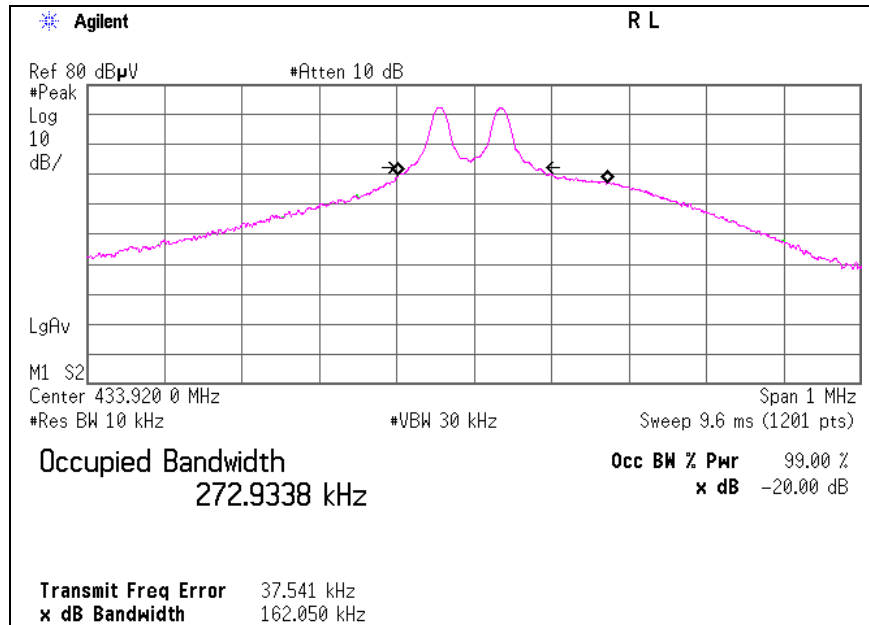
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

-20dB Bandwidth

Test place	Ise HQ EMC Lab. No.3 Measurement Room
Report No.	10272354H
Date	04/15/2014
Temperature/ Humidity	23 deg. C / 31% RH
Engineer	Masatoshi Nishiguchi
Mode	Transmitting mode 433.92MHz

Bandwidth Limit : Fundamental Frequency **433.92** MHz x 0.25% = 1084.80 kHz

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
162.05	1084.80	Pass



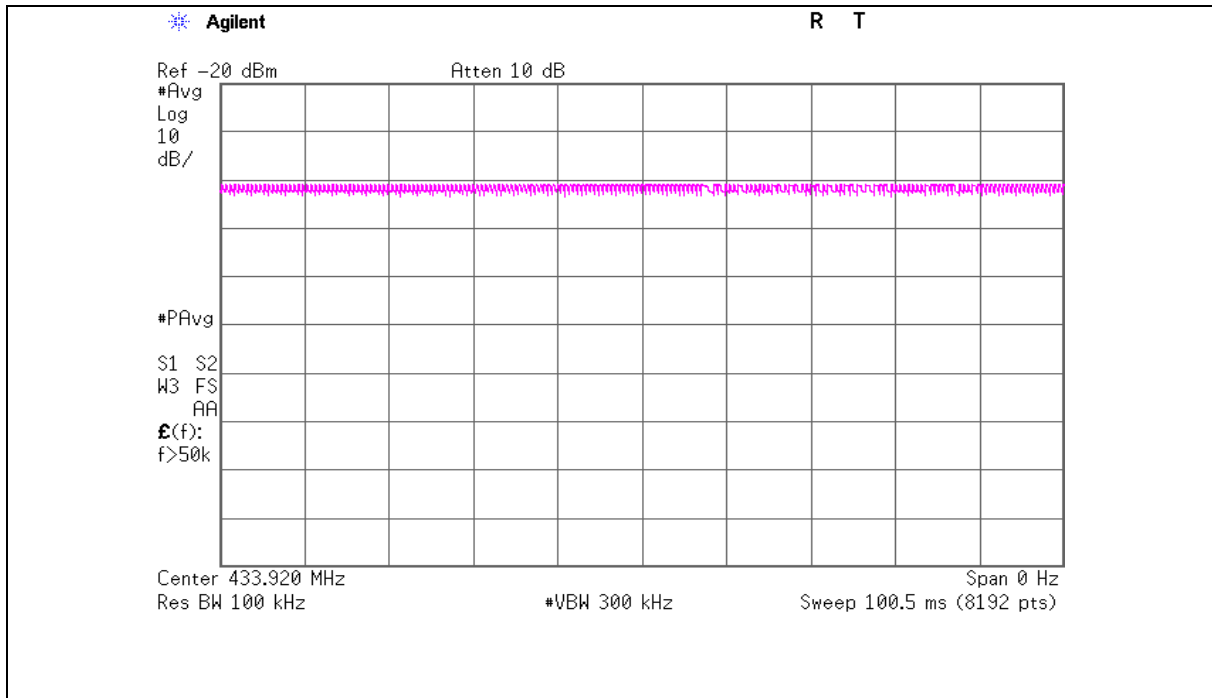
Duty Cycle

Test place	Ise HQ EMC Lab. No.3 Measurement Room
Report No.	10272354H
Date	03/25/2014
Temperature/ Humidity	22 deg.C / 34% RH
Engineer	Tsubasa Takayama
Mode	Transmitting mode 433.92MHz

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
100.00	100.00	1.00	0.0

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



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	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2013/06/14 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2013/06/11 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2013/10/13 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2013/10/13 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2013/11/26 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHF-27	High Pass Filter(1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	RE	2014/01/08 * 12
MOS-12	Thermo-Hygrometer	Custom	CTH-180	1201	RE	2014/01/14 * 12
MLPA-06	Loop Antenna	UL Japan	-	-	RE	Pre Check
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12

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, -20dB bandwidth, Automatically deactivate and Duty cycle tests

UL Japan, Inc.

Ise HQ EMC Lab.

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

Telephone : +81 596 24 8999

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