



# RADIO TEST REPORT

**Test Report No. : 11393861H**

**Applicant** : TOKAI RIKA CO., LTD.  
**Type of Equipment** : Smart Key Box  
**Model No.** : B2K2K2L  
**Test regulation** : FCC Part 15 Subpart C: 2016  
**FCC ID** : MOZB2K2K2L  
**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 test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

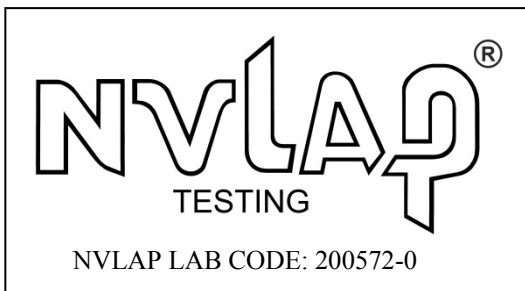
**Date of test:** August 4 and 27, 2016

**Representative test engineer:**

Shinya Watanabe  
Engineer  
Consumer Technology Division

**Approved by:**  
**Date of test:**

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://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)



<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information</b> .....	<b>4</b>
<b>SECTION 2: Equipment under test (E.U.T.)</b> .....	<b>4</b>
<b>SECTION 3: Test specification, procedures &amp; results</b> .....	<b>5</b>
<b>SECTION 4: Operation of E.U.T. during testing</b> .....	<b>8</b>
<b>SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)</b> 9	
<b>SECTION 6: Automatically deactivate</b> .....	<b>10</b>
<b>SECTION 7: -20 dB and 99 % Occupied Bandwidth</b> .....	<b>10</b>
<b>APPENDIX 1: Test data</b> .....	<b>11</b>
Automatically deactivate .....	11
Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission) .....	13
-20dB and 99% Occupied Bandwidth .....	17
<b>APPENDIX 2: Test Instruments</b> .....	<b>19</b>
<b>APPENDIX 3: Photographs of test setup</b> .....	<b>20</b>
Radiated emission .....	20
Worst case position .....	21

## **SECTION 1: Customer information**

Company Name : TOKAI RIKA CO., LTD  
Address : 3-260 Toyota, Oguchi-cho, Niwa-gun, Aichi-ken, 480-0195 Japan  
Telephone Number : +81-587-95-7042  
Facsimile Number : +81-587-95-7449  
Contact Person : Masaki Hayashi

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

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

Type of Equipment : Smart Key Box  
Model No. : B2K2K2L  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 12.0 V  
Receipt Date of Sample : August 3, 2016  
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: B2K2K2L (referred to as the EUT in this report) is the Smart Key Box.

#### **General Specification**

Clock frequencies in the system : 8 MHz, 16 MHz

#### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : Channel1: 314.35MHz  
Channel2: 312.10MHz  
Modulation : FSK  
Method of Frequency Generation : Crystal  
Antenna Type : Pattern Antenna, 3D Antenna  
Operating Temperature Range : -20 to +60 deg. C  
Operating Voltage Range : DC 8 to 16 V  
Receiving frequency of Operation : 134.2 kHz \*1)

\*1) The test of receiver part was performed separately from this test report, and the conformability is confirmed.

#### **[Bluetooth Version 4.0]**

Frequency of Operation : 2402 - 2480MHz  
Type of Modulation : GFSK

\* The BLE module is a FCC certificated module made by MITSUMI ELECTRIC CO., LTD. Model number: WML-C75 (FCC ID: POO-WC75).

---

**UL Japan, Inc.**

**Ise 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**

Test Specification : FCC Part 15 Subpart C  
FCC part 15 final revised on April 6, 2016.

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 C63.10:2013 6 Standard test methods	FCC: Section 15.207	N/A	N/A *1)	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Automatically Deactivate	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(a)(1)	N/A	Complied	Radiated
	IC: -	IC: RSS-210 A1.1			
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(b)	11.1 dB 314.35 MHz Horizontal PK with Duty Factor	Complied	Radiated
	IC: RSS-Gen 6.12	IC: RSS-210 A1.2			
Electric Field Strength of Spurious Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.205 Section 15.209 Section 15.231(b)	5.7 dB 3143.500 MHz Horizontal PK with Duty Factor	Complied	Radiated
	IC: RSS-Gen 6.13	IC: RSS-210 A1.2, 4.4 RSS-Gen 8.9			
-20dB Bandwidth	FCC: ANSI C63.10:2013 6 Standard test methods	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 Part 15.31 (e)**

This EUT provides stable voltage (DC 3.3 V) constantly to RF Module regardless of input voltage. Therefore, this 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.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	IC: RSS-Gen 6.6	IC: RSS-210 A1.3	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  $k = 2$ .

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

\* Measurement distance

#### Radiated emission test(3 m)

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

**UL Japan, Inc.**

**Ise 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 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

	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	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	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	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	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	4.0 x 4.5 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 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 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 Test data, Test instruments, and Test set up.

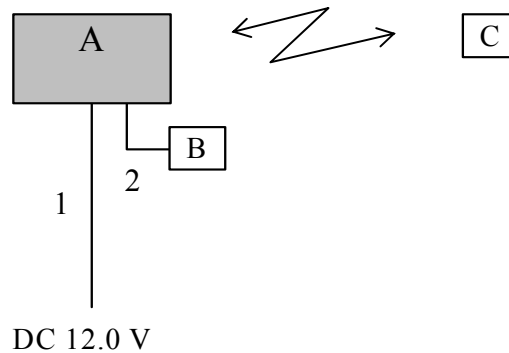
Refer to APPENDIX.

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

### 4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate	Normal use mode
Electric Field Strength of Fundamental Emission	Transmitting mode *1)
Electric Field Strength of Spurious Emission	Transmitting mode under BLE communication
-20 dB & 99 % Occupied Bandwidth	Transmitting mode
* The system was configured in typical fashion (as a user would normally use it) for testing.	
*1) End users cannot change the settings of the output power of the product.	

### 4.2 Configuration and peripherals



\*Item: iPhone was set on the corner in the anechoic chamber.  
\* Test data was taken under worse case conditions.

#### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart Key Box	B2K2K2L	001 *1) 002 *2)	TOKAI RIKA CO., LTD	EUT
B	Control Switch	-	-	-	-
C	iPhone	ME334J/A	F18M2MNQFFDR	Apple	-

\*1) Used for Normal use mode only.

\*2) Used for Transmitting mode only.

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	4.5	Unshielded	Unshielded	-
2	Signal Cable	0.1	Unshielded	Unshielded	-

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



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

**Test Procedure and conditions**

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

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.

**[Transmitting mode]**

**(Below 30 MHz)**

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

**(Above 30 MHz)**

The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3 m.

The measuring antenna height was varied between 1 and 4 m 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 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.1 kHz	9.1 kHz	120 kHz	PK: S/A: RBW 1 MHz, VBW: 3 MHz

- 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.

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

**Measurement range : 9 kHz - 3.2 GHz**

**Test data : APPENDIX**

**Test result : Pass**

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

### **Test Procedure**

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	150 kHz	1.5 kHz	5.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer

Peak hold was applied as Worst-case measurement.

---

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

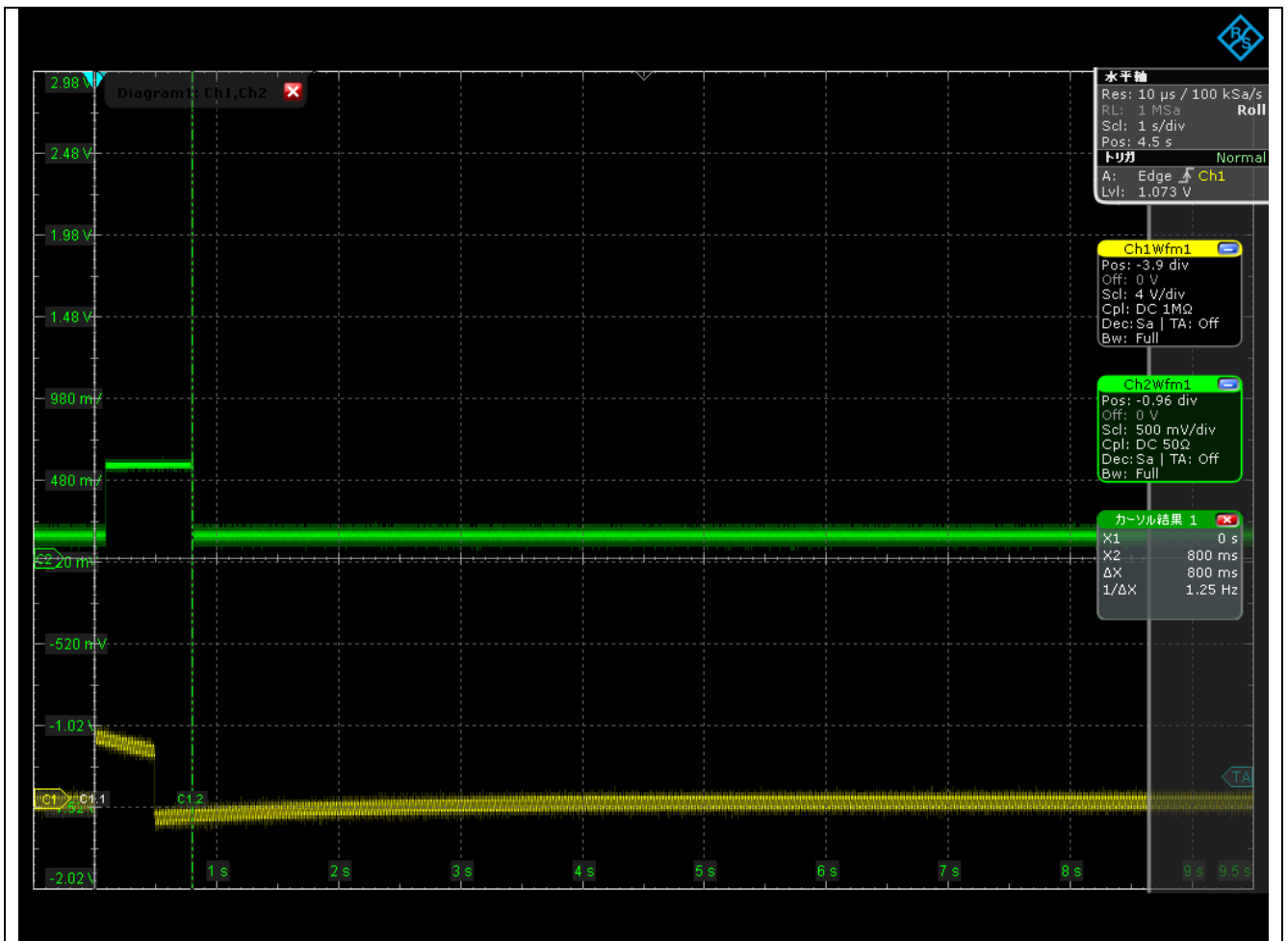
Facsimile : +81 596 24 8124

**APPENDIX 1: Test data**

**Automatically deactivate**  
**312.10 MHz**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 11393861H  
Date : 08/27/2016  
Temperature/ Humidity : 24 deg. C / 66 % RH  
Engineer : Shinya Watanabe  
Mode : Normal use mode 312.10 MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.80	5.00	Pass

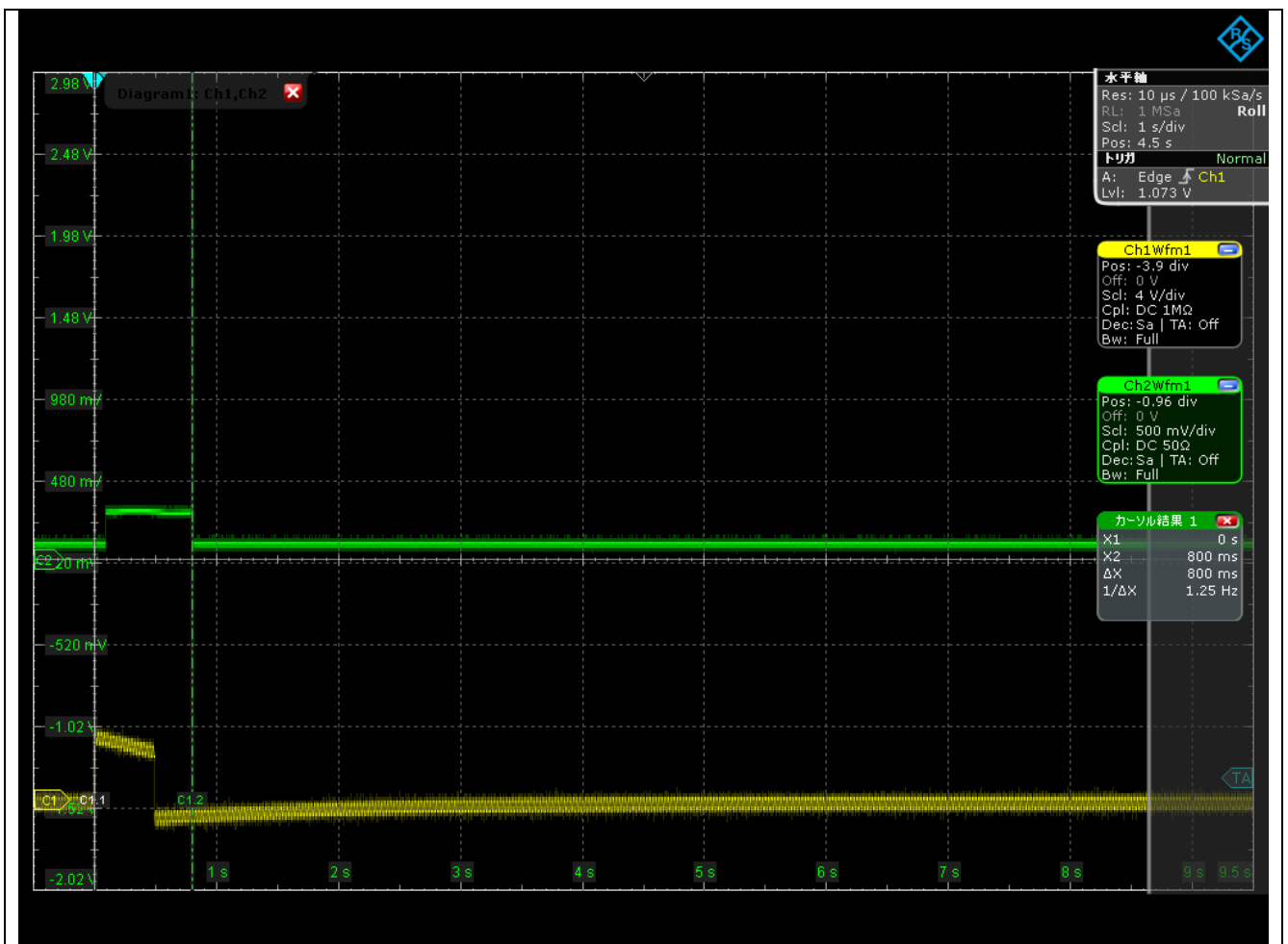


Green line : Detected video of Tx signal  
Yellow line : Activation trigger signal of Tx part

**Automatically deactivate**  
**314.35 MHz**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 11393861H  
Date : 08/27/2016  
Temperature/ Humidity : 24 deg. C / 66 % RH  
Engineer : Shinya Watanabe  
Mode : Normal use mode 314.35 MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.80	5.00	Pass



Green line : Detected video of Tx signal  
Yellow line : Activation trigger signal of Tx part

**Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)**  
**314.35 MHz**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 11393861H  
Date : 08/04/2016  
Temperature/ Humidity : 23 deg. C / 69 % RH  
Engineer : Shinya Watanabe  
Mode : Transmitting mode 314.35 MHz

**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	72.6	68.9	13.8	9.9	31.9	-	64.4	60.7	95.5	31.1	34.8	Carrier
628.700	PK	31.2	30.2	19.3	11.7	32.2	-	30.0	29.0	75.5	45.5	46.5	Outside
943.050	PK	33.5	33.5	22.1	13.2	30.9	-	37.9	37.9	75.5	37.6	37.6	Outside
1257.400	PK	NS	NS	-	-	-	-	-	-	75.5	-	-	Outside
1571.750	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
1886.100	PK	NS	NS	-	-	-	-	-	-	75.5	-	-	Outside
2200.450	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
2514.800	PK	44.3	45.0	28.1	6.2	32.1	-	46.5	47.2	75.5	29.0	28.3	Outside
2829.150	PK	44.8	43.8	28.2	6.3	32.0	-	47.3	46.3	73.9	26.6	27.6	Inside
3143.500	PK	46.4	44.4	28.4	6.5	31.8	-	49.5	47.5	75.5	26.0	28.0	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Distance factor) - 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	72.6	68.9	13.8	9.9	31.9	0.0	64.4	60.7	75.5	11.1	14.8	Carrier
628.700	PK	31.2	30.2	19.3	11.7	32.2	0.0	30.0	29.0	55.5	25.5	26.5	Outside
943.050	PK	33.5	33.5	22.1	13.2	30.9	0.0	37.9	37.9	55.5	17.6	17.6	Outside
1257.400	PK	NS	NS	-	-	-	0.0	-	-	55.5	-	-	Outside
1571.750	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
1886.100	PK	NS	NS	-	-	-	0.0	-	-	55.5	-	-	Outside
2200.450	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
2514.800	PK	44.3	45.0	28.1	6.2	32.1	0.0	46.5	47.2	55.5	9.0	8.3	Outside
2829.150	PK	44.8	43.8	28.2	6.3	32.0	0.0	47.3	46.3	53.9	6.6	7.6	Inside
3143.500	PK	46.4	44.4	28.4	6.5	31.8	0.0	49.5	47.5	55.5	6.0	8.0	Outside

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

NS:No signal detected

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

Sample calculation:

Result of PK = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier) + Duty factor

For above 1GHz : Distance Factor:  $20 \times \log(4.5 \text{ m}/3.0 \text{ m}) = 3.52 \text{ dB}$

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

Since the peak emission result satisfied the average limit, duty factor was omitted.

Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)**  
**314.35 MHz under BLE communication**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 11393861H  
Date : 08/04/2016  
Temperature/ Humidity : 23 deg. C / 69 % RH  
Engineer : Shinya Watanabe  
Mode : Transmitting mode 314.35 MHz under BLE communication

**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	72.5	68.8	13.8	9.9	31.9	-	64.3	60.6	95.5	31.2	34.9	Carrier
628.700	PK	31.2	30.3	19.3	11.7	32.2	-	30.0	29.1	75.5	45.5	46.4	Outside
943.050	PK	33.2	33.5	22.1	13.2	30.9	-	37.6	37.9	75.5	37.9	37.6	Outside
1257.400	PK	NS	NS	-	-	-	-	-	-	75.5	-	-	Outside
1571.750	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
1886.100	PK	NS	NS	-	-	-	-	-	-	75.5	-	-	Outside
2200.450	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
2514.800	PK	44.7	44.8	28.1	6.2	32.1	-	46.9	47.0	75.5	28.6	28.5	Outside
2829.150	PK	44.5	44.2	28.2	6.3	32.0	-	47.0	46.7	73.9	26.9	27.2	Inside
3143.500	PK	46.7	44.5	28.4	6.5	31.8	-	49.8	47.6	75.5	25.7	27.9	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Distance factor) - 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	72.5	68.8	13.8	9.9	31.9	0.0	64.3	60.6	75.5	11.2	14.9	Carrier
628.700	PK	31.2	30.3	19.3	11.7	32.2	0.0	30.0	29.1	55.5	25.5	26.4	Outside
943.050	PK	33.2	33.5	22.1	13.2	30.9	0.0	37.6	37.9	55.5	17.9	17.6	Outside
1257.400	PK	NS	NS	-	-	-	0.0	-	-	55.5	-	-	Outside
1571.750	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
1886.100	PK	NS	NS	-	-	-	0.0	-	-	55.5	-	-	Outside
2200.450	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
2514.800	PK	44.7	44.8	28.1	6.2	32.1	0.0	46.9	47.0	55.5	8.6	8.5	Outside
2829.150	PK	44.5	44.2	28.2	6.3	32.0	0.0	47.0	46.7	53.9	6.9	7.2	Inside
3143.500	PK	46.7	44.5	28.4	6.5	31.8	0.0	49.8	47.6	55.5	5.7	7.9	Outside

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

NS:No signal detected

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

Sample calculation:

Result of PK = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier) + Duty factor

For above 1GHz : Distance Factor:  $20 \times \log(4.5 \text{ m}/3.0 \text{ m}) = 3.52 \text{ dB}$

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

Since the peak emission result satisfied the average limit, duty factor was omitted.

Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)**  
**312.10 MHz**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 11393861H  
Date : 08/04/2016  
Temperature/ Humidity : 23 deg. C / 69 % RH  
Engineer : Shinya Watanabe  
Mode : Transmitting mode 312.10 MHz

**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	70.9	68.2	13.7	9.9	31.9	-	62.6	59.9	95.4	32.8	35.5	Carrier
624.200	PK	31.2	30.9	19.2	11.7	32.2	-	29.9	29.6	75.4	45.5	45.8	Outside
936.300	PK	33.5	32.3	22.0	13.2	31.0	-	37.7	36.5	75.4	37.7	38.9	Outside
1248.400	PK	NS	NS	-	-	-	-	-	-	75.4	-	-	Outside
1560.500	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
1872.600	PK	NS	NS	-	-	-	-	-	-	75.4	-	-	Outside
2184.700	PK	NS	NS	-	-	-	-	-	-	75.4	-	-	Outside
2496.800	PK	44.2	45.3	28.1	6.2	32.1	-	46.4	47.5	73.9	27.5	26.4	Inside
2808.900	PK	45.1	44.4	28.2	6.3	32.0	-	47.6	46.9	73.9	26.3	27.0	Inside
3121.000	PK	46.0	43.7	28.4	6.5	31.9	-	49.0	46.7	75.4	26.4	28.7	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Distance factor) - 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	70.9	68.2	13.7	9.9	31.9	0.0	62.6	59.9	75.4	12.8	15.5	Carrier
624.200	PK	31.2	30.9	19.2	11.7	32.2	0.0	29.9	29.6	55.4	25.5	25.8	Outside
936.300	PK	33.5	32.3	22.0	13.2	31.0	0.0	37.7	36.5	55.4	17.7	18.9	Outside
1248.400	PK	NS	NS	-	-	-	0.0	-	-	55.4	-	-	Outside
1560.500	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
1872.600	PK	NS	NS	-	-	-	0.0	-	-	55.4	-	-	Outside
2184.700	PK	NS	NS	-	-	-	0.0	-	-	55.4	-	-	Outside
2496.800	PK	44.2	45.3	28.1	6.2	32.1	0.0	46.4	47.5	53.9	7.5	6.4	Inside
2808.900	PK	45.1	44.4	28.2	6.3	32.0	0.0	47.6	46.9	53.9	6.3	7.0	Inside
3121.000	PK	46.0	43.7	28.4	6.5	31.9	0.0	49.0	46.7	55.4	6.4	8.7	Outside

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

NS:No signal detected

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

Sample calculation:

Result of PK = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier) + Duty factor

For above 1GHz : Distance Factor:  $20 \times \log(4.5 \text{ m}/3.0 \text{ m}) = 3.52 \text{ dB}$

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

Since the peak emission result satisfied the average limit, duty factor was omitted.

Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)**  
**312.10 MHz under BLE communication**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 11393861H  
Date : 08/04/2016  
Temperature/ Humidity : 23 deg. C / 69 % RH  
Engineer : Shinya Watanabe  
Mode : Transmitting mode 312.10 MHz under BLE communication

**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	71.0	68.1	13.7	9.9	31.9	-	62.7	59.8	95.4	32.7	35.6	Carrier
624.200	PK	31.3	30.9	19.2	11.7	32.2	-	30.0	29.6	75.4	45.4	45.8	Outside
936.300	PK	33.5	32.1	22.0	13.2	31.0	-	37.7	36.3	75.4	37.7	39.1	Outside
1248.400	PK	NS	NS	-	-	-	-	-	-	75.4	-	-	Outside
1560.500	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
1872.600	PK	NS	NS	-	-	-	-	-	-	75.4	-	-	Outside
2184.700	PK	NS	NS	-	-	-	-	-	-	75.4	-	-	Outside
2496.800	PK	44.4	45.0	28.1	6.2	32.1	-	46.6	47.2	73.9	27.3	26.7	Inside
2808.900	PK	45.2	44.3	28.2	6.3	32.0	-	47.7	46.8	73.9	26.2	27.1	Inside
3121.000	PK	46.3	44.0	28.4	6.5	31.9	-	49.3	47.0	75.4	26.1	28.4	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Distance factor) - 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	71.0	68.1	13.7	9.9	31.9	0.0	62.7	59.8	75.4	12.7	15.6	Carrier
624.200	PK	31.3	30.9	19.2	11.7	32.2	0.0	30.0	29.6	55.4	25.4	25.8	Outside
936.300	PK	33.5	32.1	22.0	13.2	31.0	0.0	37.7	36.3	55.4	17.7	19.1	Outside
1248.400	PK	NS	NS	-	-	-	0.0	-	-	55.4	-	-	Outside
1560.500	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
1872.600	PK	NS	NS	-	-	-	0.0	-	-	55.4	-	-	Outside
2184.700	PK	NS	NS	-	-	-	0.0	-	-	55.4	-	-	Outside
2496.800	PK	44.4	45.0	28.1	6.2	32.1	0.0	46.6	47.2	53.9	7.3	6.7	Inside
2808.900	PK	45.2	44.3	28.2	6.3	32.0	0.0	47.7	46.8	53.9	6.2	7.1	Inside
3121.000	PK	46.3	44.0	28.4	6.5	31.9	0.0	49.3	47.0	55.4	6.1	8.4	Outside

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

NS:No signal detected

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

Sample calculation:

Result of PK = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss (Cable + Attenuator +Distance factor) - Gain (Amplifier) + Duty factor

For above 1GHz : Distance Factor:  $20 \times \log(4.5 \text{ m}/3.0 \text{ m}) = 3.52 \text{ dB}$

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

Since the peak emission result satisfied the average limit, duty factor was omitted.

Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



**-20dB and 99% Occupied Bandwidth**  
**312.10 MHz / 314.35 MHz**

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11393861H
Date	08/27/2016
Temperature/ Humidity	24 deg. C / 66 % RH
Engineer	Shinya Watanabe
Mode	Transmitting mode 312.10 MHz / 314.35 MHz

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]
38.51

**314.35MHz**

-20dB Bandwidth [kHz]
39.77

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
38.51+39.77=78.28	780.25	Pass

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

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
43.14	780.25	Pass

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

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
44.88	785.88	Pass

**UL Japan, Inc.**

**Ise EMC Lab.**

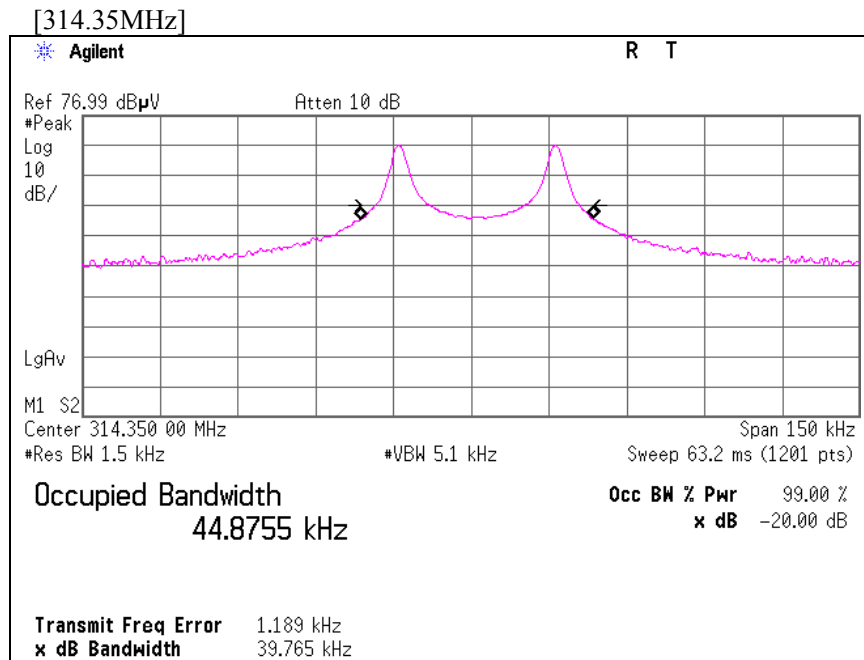
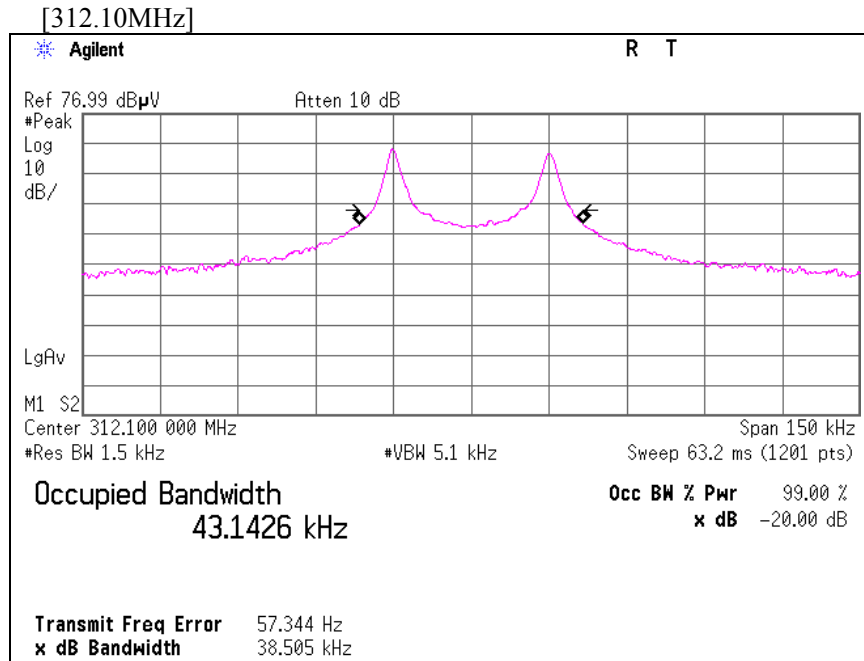
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

**-20dB and 99% Occupied Bandwidth**  
**312.10 MHz / 314.35 MHz**

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11393861H
Date	08/27/2016
Temperature/ Humidity	24 deg. C / 66 % RH
Engineer	Shinya Watanabe
Mode	Transmitting mode 312.10 MHz / 314.35 MHz



## APPENDIX 2: Test Instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2016/01/29 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2016/01/30 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2016/03/18 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2015/10/07 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
OSC-01	Digital Oscilloscope	Rohde & Schwarz	RTO1004	200355	RE	2016/08/12 * 12
MLPA-07	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, -20 dB bandwidth, and Automatically deactivate tests**

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124