




# RADIO TEST REPORT

Test Report No. : 11157756H

**Applicant** : DENSO CORPORATION  
**Type of Equipment** : Electronic Key  
**Model No.** : 14FGH  
**Test regulation** : FCC Part 15 Subpart C: 2015  
**FCC ID** : HYQ14FGH  
**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:** February 14, 2016

**Representative test engineer:**   
Takumi Shimada  
Engineer  
Consumer Technology Division

**Approved by:**   
Motoya Imura  
Engineer  
Consumer Technology Division



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

**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

13-EM-F0429



<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 .....	16
<b>APPENDIX 2: Test Instruments</b> .....	<b>18</b>
<b>APPENDIX 3: Photographs of test setup</b> .....	<b>19</b>
Radiated emission .....	19
Worst case position .....	21

---

**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 1: Customer information**

Company Name : DENSO CORPORATION  
Address : 1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan  
Telephone Number : +81-566-61-5242  
Facsimile Number : +81-566-25-4837  
Contact Person : MASAYUKI YAMAMOTO

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

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

Type of Equipment : Electronic Key  
Model No. : 14FGH  
Serial No. : Refer to Clause 4.2  
Rating : DC 3.0 V  
Receipt Date of Sample : Febraury 11, 2016  
Country of Mass-production : Japan  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model No: 14FGH (referred to as the EUT in this report) is the Electronic Key.

Radio Type : Transceiver  
Frequency of Operation : 315.10 MHz / 314.35 MHz\*  
Clock frequency(ies) in the system : 8 MHz (IC Clock)  
18.37 MHz crystal (RF)  
Modulation : FSK (F1D)  
Power Supply (radio part input) : DC 3.0 V  
Type of Battery : One lithium battery  
Antenna type : Built-in type (Fixed)  
Receiving frequency of Operation : 134.2 kHz \*1)

\* These two different frequencies are not emitted simultaneously.

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

\* Original model: 14FGH has Variation models which have 4 buttons and 3 buttons.

They are completely identical in RF characteristics.

The test was performed with 4 buttons type as representative.

---

## **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**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015  
\*Some parts are effective on and after December 17, 2015 or December 23, 2015.  
The revision does not affect the test specification applied to the EUT.

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**

<b>Item</b>	<b>Test Procedure</b>	<b>Specification</b>	<b>Worst margin</b>	<b>Results</b>	<b>Remarks</b>
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 A1.1.1			
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(b)	5.4 dB Horizontal, PK (PK with Duty factor) (Tx 315.10 MHz)	Complied	Radiated
	IC: RSS-Gen 6.12	IC: RSS-210 A1.1.2			
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)	8.2 dB 3151.000 MHz Horizontal PK (PK with Duty factor) (Tx 315.10 MHz)	Complied	Radiated
	IC: RSS-Gen 6.13	IC: RSS-210 A1.1.2, 2.5.1 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 test was performed with the New Battery (DC 3.0 V) 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.**

**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 A1.1.3	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*)(+dB)		(10 m*)(+dB)	
	30 – 300 MHz	300 – 1000MHz	30 – 300 MHz	300 – 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

#### Radiated emission test (3 m)

[Electric Field Strength of Fundamental Emission]

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

[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 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.

## UL Japan, Inc. Ise EMC Lab.

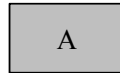
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
Telephone : +81 596 24 8999  
Facsimile : +81 596 24 8124

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

### **4.1 Operating Modes**

<b>Test Item</b>	<b>Mode</b>
Automatically Deactivate	Normal use mode, 315.10 MHz Normal use mode, 314.35 MHz
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth	Transmitting mode (Tx), 315.10 MHz *1) Transmitting mode (Tx), 314.35 MHz *1)
<p>* 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, the EUT transmits when it receives 134.2 kHz radio signal and transmitter button is being pressed.)  End users cannot change the settings of the output power of the product.</p>	

### **4.2 Configuration and peripherals**



\* Setup was taken into consideration and 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	Electronic Key	14FGH	001 *1) 002 *2)	DENSO CORPORATION	EUT

\*1) Used for Normal use mode.

\*2) Used for Transmitting mode.

**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, 0.5 m by 1.0 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 300 MHz	300 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.

This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test with mechanical key was the worst case. Therefore the test with mechanical key was performed only.

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

**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

Measurement range : 9 kHz - 3.2 GHz  
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: -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 *1)	Max Hold *1)	Spectrum Analyzer

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.  
Peak hold was applied as Worst-case measurement.

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

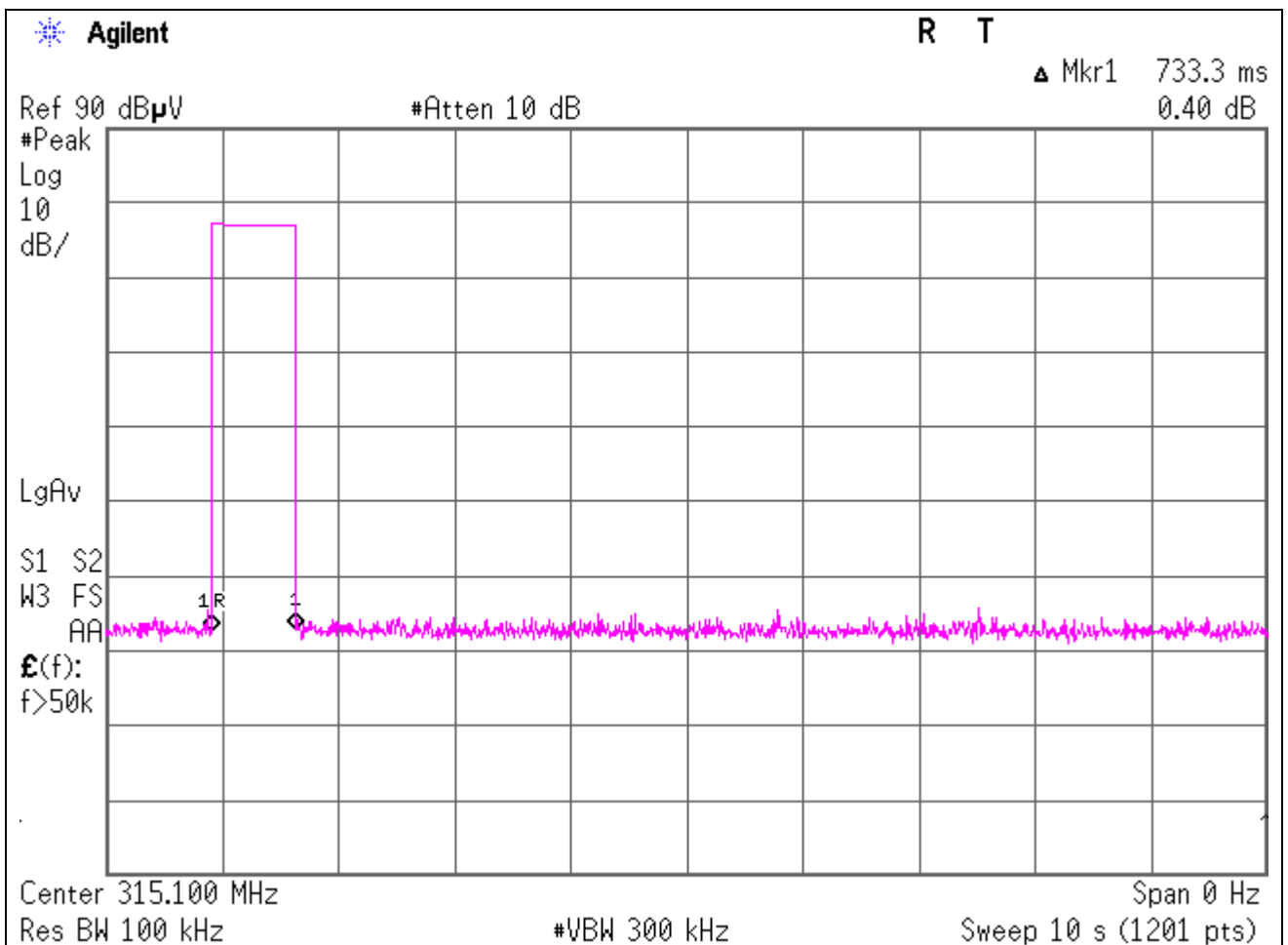
Facsimile : +81 596 24 8124

**APPENDIX 1: Test data**

**Automatically deactivate**  
**315.10 MHz**

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11157756H
Date	02/14/2016
Temperature/ Humidity	21 deg. C / 56% RH
Engineer	Takumi Shimada
Mode	Normal use mode 315.10 MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.7333	5.00	Pass



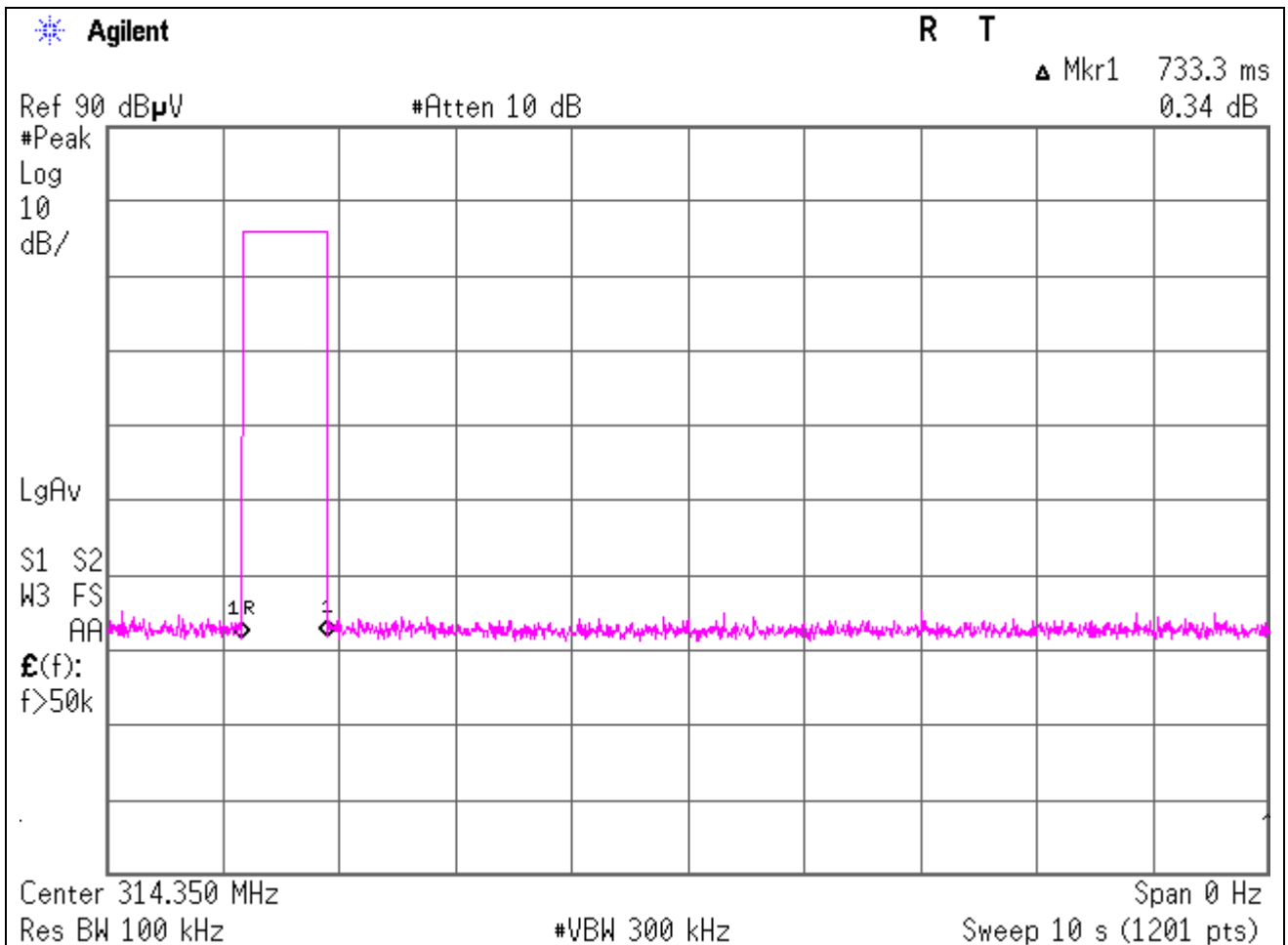
**UL Japan, Inc.**  
**Ise EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN  
 Telephone : +81 596 24 8999  
 Facsimile : +81 596 24 8124

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

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11157756H  
Date 02/14/2016  
Temperature/ Humidity 21 deg. C / 56% RH  
Engineer Takumi Shimada  
Mode Normal use mode, 314.35 MHz

Time of Transmitting [sec]	Limit [sec]	Result
0.7333	5.00	Pass



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

Test place : Ise EMC Lab.  
Semi Anechoic Chamber : No.3  
Report No. : 11157756H  
Date : 02/14/2016  
Temperature/ Humidity : 21 deg. C / 56% RH  
Engineer : Takumi Shimada  
Mode : Transmitting mode (Tx), 315.10 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	
315.100	PK	77.1	73.0	15.0	10.1	32.0	-	70.2	66.1	95.6	25.4	29.5	Carrier
630.200	PK	28.2	29.9	19.7	11.9	32.1	-	27.7	29.4	75.6	47.9	46.2	Outside
945.300	PK	27.5	27.8	22.8	13.5	30.8	-	33.0	33.3	75.6	42.6	42.3	Outside
1260.400	PK	43.0	43.6	24.5	5.5	33.9	-	39.1	39.7	75.6	36.5	35.9	Outside
1575.500	PK	44.0	43.2	25.5	5.7	33.2	-	42.0	41.2	73.9	31.9	32.7	Inside
1890.600	PK	43.1	42.7	26.3	5.9	32.6	-	42.7	42.3	75.6	32.9	33.3	Outside
2205.700	PK	42.8	42.5	26.7	6.1	32.2	-	43.4	43.1	73.9	30.5	30.8	Inside
2520.800	PK	43.1	42.7	27.0	6.2	31.9	-	44.4	44.0	75.6	31.2	31.6	Outside
2835.900	PK	42.4	42.2	27.9	6.4	31.7	-	45.0	44.8	73.9	28.9	29.1	Inside
3151.000	PK	43.7	43.0	28.6	6.6	31.5	-	47.4	46.7	75.6	28.2	28.9	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - 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	
315.100	PK	77.1	73.0	15.0	10.1	32.0	0.0	70.2	66.1	75.6	5.4	9.5	Carrier
630.200	PK	28.2	29.9	19.7	11.9	32.1	0.0	27.7	29.4	55.6	27.9	26.2	Outside
945.300	PK	27.5	27.8	22.8	13.5	30.8	0.0	33.0	33.3	55.6	22.6	22.3	Outside
1260.400	PK	43.0	43.6	24.5	5.5	33.9	0.0	39.1	39.7	55.6	16.5	15.9	Outside
1575.500	PK	44.0	43.2	25.5	5.7	33.2	0.0	42.0	41.2	53.9	11.9	12.7	Inside
1890.600	PK	43.1	42.7	26.3	5.9	32.6	0.0	42.7	42.3	55.6	12.9	13.3	Outside
2205.700	PK	42.8	42.5	26.7	6.1	32.2	0.0	43.4	43.1	53.9	10.5	10.8	Inside
2520.800	PK	43.1	42.7	27.0	6.2	31.9	0.0	44.4	44.0	55.6	11.2	11.6	Outside
2835.900	PK	42.4	42.2	27.9	6.4	31.7	0.0	45.0	44.8	53.9	8.9	9.1	Inside
3151.000	PK	43.7	43.0	28.6	6.6	31.5	0.0	47.4	46.7	55.6	8.2	8.9	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor (Refer to Duty factor)

\*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**

Test place : Ise EMC Lab.  
Semi Anechoic Chamber : No.3  
Report No. : 11157756H  
Date : 02/14/2016  
Temperature/ Humidity : 21 deg. C / 56% RH  
Engineer : Takumi Shimada  
Mode : Transmitting mode (Tx), 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	76.3	71.6	15.0	10.0	32.0	-	69.3	64.6	95.5	26.2	30.9	Carrier
628.700	PK	28.4	28.5	19.7	11.9	32.1	-	27.9	28.0	75.5	47.6	47.5	Outside
943.050	PK	27.2	27.1	22.8	13.5	30.8	-	32.7	32.6	75.5	42.8	42.9	Outside
1257.400	PK	43.3	43.1	24.4	5.5	33.9	-	39.3	39.1	75.5	36.2	36.4	Outside
1571.750	PK	43.4	42.5	25.5	5.7	33.2	-	41.4	40.5	73.9	32.5	33.4	Inside
1886.100	PK	42.9	42.5	26.3	5.9	32.6	-	42.5	42.1	75.5	33.0	33.4	Outside
2200.450	PK	42.4	42.5	26.7	6.0	32.2	-	42.9	43.0	73.9	31.0	30.9	Inside
2514.800	PK	42.4	42.6	27.0	6.2	31.9	-	43.7	43.9	75.5	31.8	31.6	Outside
2829.150	PK	43.0	42.4	27.9	6.4	31.7	-	45.6	45.0	73.9	28.3	28.9	Inside
3143.500	PK	42.9	42.6	28.6	6.6	31.5	-	46.6	46.3	75.5	28.9	29.2	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - 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	76.3	71.6	15.0	10.0	32.0	0.0	69.3	64.6	75.5	6.2	10.9	Carrier
628.700	PK	28.4	28.5	19.7	11.9	32.1	0.0	27.9	28.0	55.5	27.6	27.5	Outside
943.050	PK	27.2	27.1	22.8	13.5	30.8	0.0	32.7	32.6	55.5	22.8	22.9	Outside
1257.400	PK	43.3	43.1	24.4	5.5	33.9	0.0	39.3	39.1	55.5	16.2	16.4	Outside
1571.750	PK	43.4	42.5	25.5	5.7	33.2	0.0	41.4	40.5	53.9	12.5	13.4	Inside
1886.100	PK	42.9	42.5	26.3	5.9	32.6	0.0	42.5	42.1	55.5	13.0	13.4	Outside
2200.450	PK	42.4	42.5	26.7	6.0	32.2	0.0	42.9	43.0	53.9	11.0	10.9	Inside
2514.800	PK	42.4	42.6	27.0	6.2	31.9	0.0	43.7	43.9	55.5	11.8	11.6	Outside
2829.150	PK	43.0	42.4	27.9	6.4	31.7	0.0	45.6	45.0	53.9	8.3	8.9	Inside
3143.500	PK	42.9	42.6	28.6	6.6	31.5	0.0	46.6	46.3	55.5	8.9	9.2	Outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor (Refer to Duty factor)

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

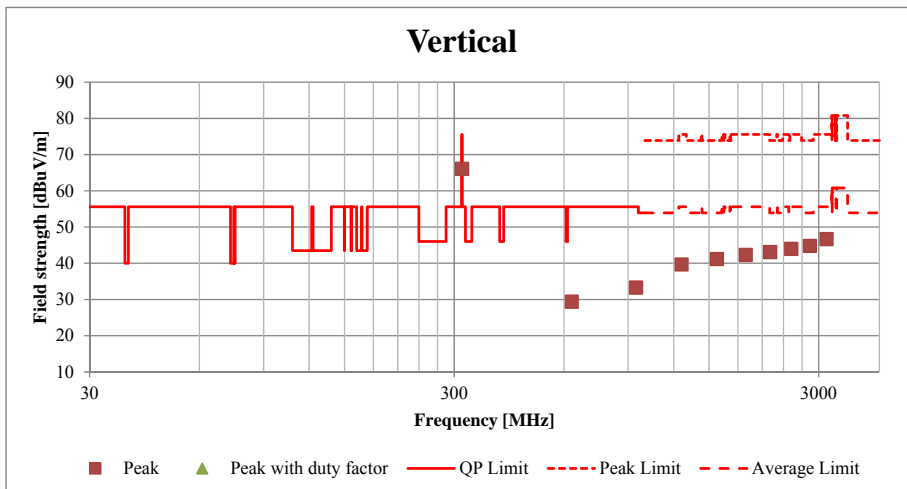
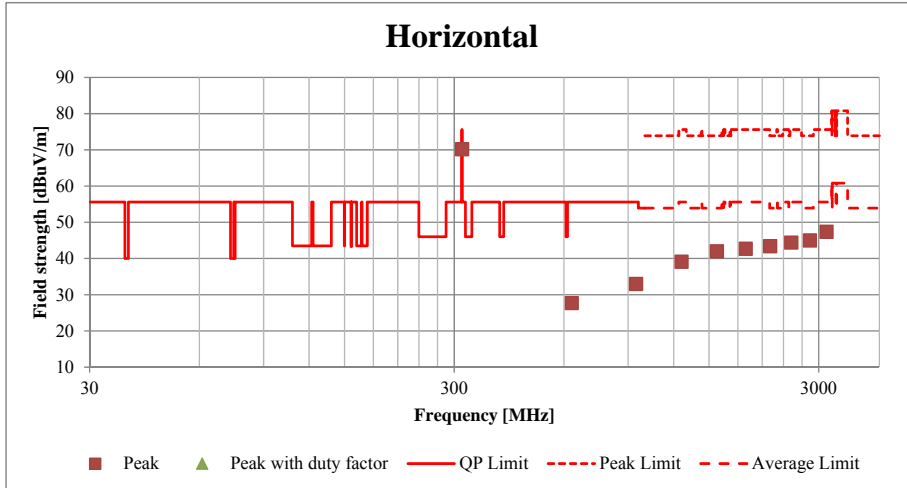
Since the peak emission result satisfied the average limit, duty factor was omitted.  
Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

**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 Spurious Emission**  
**(Plot data, Worst case)**

Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Report No. 11157756H  
Date 02/14/2016  
Temperature/ Humidity 21 deg. C / 56% RH  
Engineer Takumi Shimada  
Mode Transmitting mode (Tx), 314.35 MHz



\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

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

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11157756H
Date	02/14/2016
Temperature/ Humidity	21 deg. C / 56% RH
Engineer	Takumi Shimada
Mode	Transmitting mode (Tx)

Bandwidth Limit : Fundamental Frequency      **314.35** MHz x 0.25% =    785.88    kHz  
\* The above limit was calculated from more stringent nominal frequency.  
\* Method of KDB 926416 for systems employing non sweeping frequencies was referred.

**315.10MHz**

-20dB Bandwidth [kHz]
37.17

**314.35MHz**

-20dB Bandwidth [kHz]
37.15

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
37.17+37.15=74.32	785.88	Pass

Bandwidth Limit : Fundamental Frequency      **315.10** MHz x 0.25% =    787.75    kHz

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
36.47	787.75	Pass

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

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
36.37	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

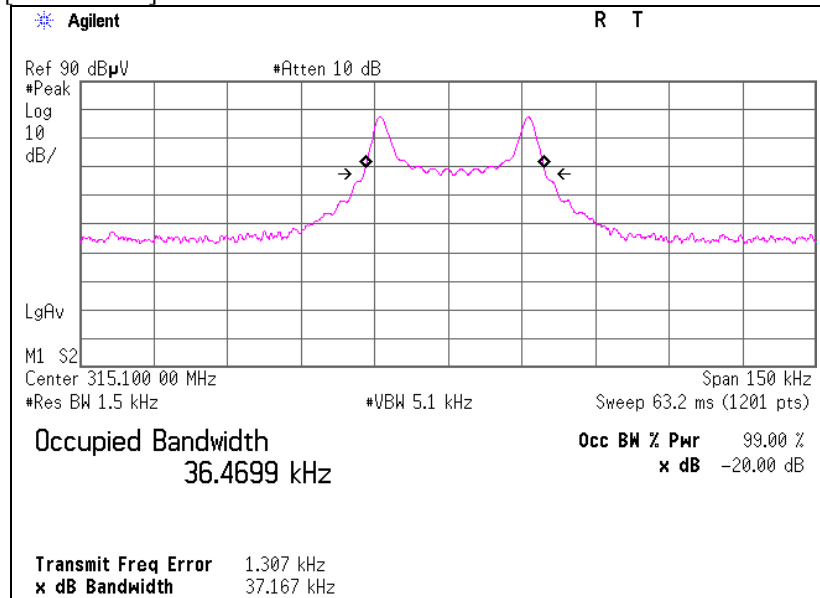
Facsimile : +81 596 24 8124



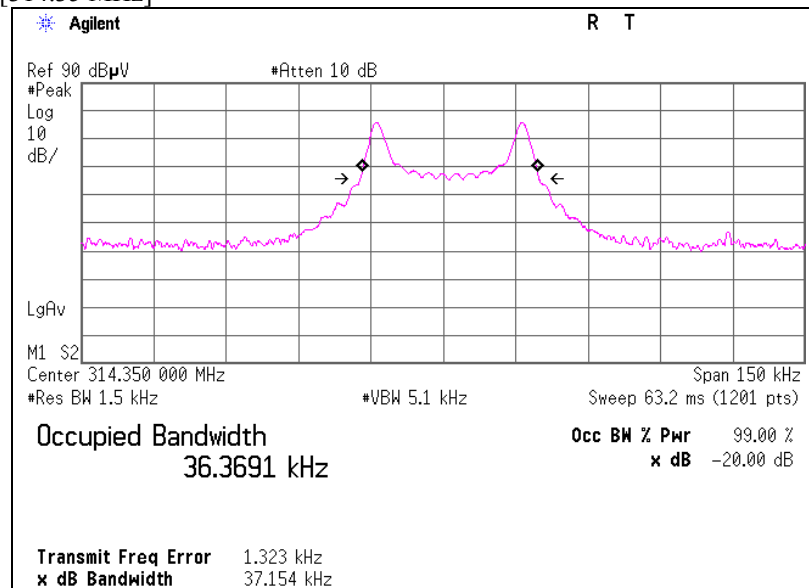
**-20dB and 99% Occupied Bandwidth**  
**315.10 MHz / 314.35 MHz**

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11157756H
Date	02/14/2016
Temperature/ Humidity	21 deg. C / 56% RH
Engineer	Takumi Shimada
Mode	Transmitting mode (Tx)

[315.10 MHz]



[314.35 MHz]



## **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-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 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	2015/05/18 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2015/09/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2015/10/11 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2015/03/19 * 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, -20dB bandwidth, Automatically deactivate and Duty cycle 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