



# RADIO TEST REPORT

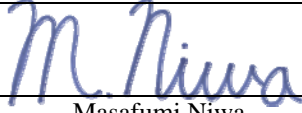
Test Report No. : 11776318H-A-R2

**Applicant** : OMRON Automotive Electronics Co. Ltd.  
**Type of Equipment** : ECU of Keyless Operation System  
**Model No.** : R328N  
**FCC ID** : OUCR328N  
**Test regulation** : FCC Part 15 Subpart C: 2017  
**Test Result** : Complied


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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)
7. This report is a revised version of 11776318H-A-R1.

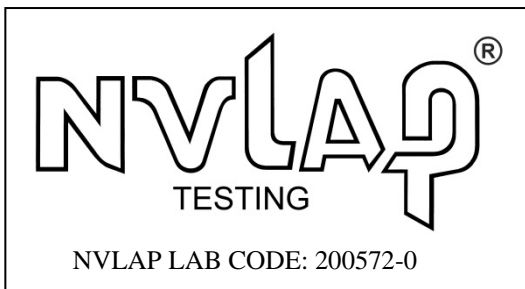
**Date of test:** June 14 to 20, 2017

**Representative test engineer:**

  
Masafumi Niwa  
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.  
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13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : OMRON Automotive Electronics Co. Ltd.  
Address : 6368 NENJOZAKA OKUSA KOMAKI AICHI, 485-0802 JAPAN  
Telephone Number : +81-568-78-6159  
Facsimile Number : +81-568-78-7659  
Contact Person : Takashi Betsui

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

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

Type of Equipment : ECU of Keyless Operation System  
Model No. : R328N  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 12.0 V  
Receipt Date of Sample : June 2, 2017  
Country of Mass-production : China  
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: R328N (referred to as the EUT in this report) is the ECU of Keyless Operation System.  
KOS apparatus consists of LF antenna for transmission and reception, UHF receiver, Base station (transmitting and receiving device for communication with a transponder), and Push Switch for Engine Start.

“Keyless operation system” (hereafter referred to as KOS) is a system to lock/unlock a door/trunk by pressing Lock/Unlock switch on each door (door entry function), and start up the engine without using an existing mechanical key (engine starter function), while holding the registered keyless operation key (hereafter referred to as FOB) in a pocket or bag.

In addition, the keyless entry function to lock/unlock doors by pressing a button on FOB, immobilizer function for anti-theft, and remote engine starter function to start up/ stop the engine by pressing a button of a separate transmitter (remote control engine starter), TPMS function which monitors the air pressure of a tire are also installed.

### **General Specification**

Clock frequency : 16.00 MHz (CPU)  
Battery : Car Battery (DC 12.0 V)  
Operating Voltage : DC 12.0 V

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KOS has the following radio specifications; UHF receiver, Base station (transmitting and receiving device for communication with a transponder), and Push Switch for Engine Start.

**UHF receiver\***

Equipment Type : Receiver  
Frequency of Operation : 315 MHz  
Local clock frequency : 21.948717 MHz  
Antenna Type : S-type Antenna  
Type of Modulation : FSK  
Method of Frequency Generation : Crystal oscillator

**Base station**

Equipment Type : Transceiver  
Frequency of Operation : 125 kHz  
Local clock frequency : 8 MHz  
Antenna Type : Ferrite Antenna  
Type of Modulation : ASK  
Method of Frequency Generation : Ceramic resonator

**Push Switch for Engine Start**

Equipment Type : Transmitter  
Frequency of Operation : 125 kHz  
Local clock frequency : 8 MHz  
Antenna Type : Coil Antenna  
Type of Modulation : ASK  
Method of Frequency generation : CPU Timer

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

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted Emission  
Section 15.209 Radiated emission limits, general requirements

\* The revision on June 14, 2017, does not affect the test specification applied to the EUT.

\* Also the EUT complies with FCC Part 15 Subpart B.

### **3.2 Procedures and results**

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 8.8	<FCC> Section 15.207 <IC> RSS-Gen 8.8	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.4, 6.12	<FCC> Section 15.209 <IC> RSS-210 4.4 RSS-Gen 8.9	Radiated	N/A	8.0 dB 0.12500 MHz 0 deg., PK with Duty factor (Antenna(DR))	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.4, 6.13	<FCC> Section 15.209 <IC> RSS-210 4.4 RSS-Gen 8.9	Radiated	N/A	12.3 dB 35.753 MHz, Vertical, QP (Push Start Switch)	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

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 is not the device that is designed to be connected to the public utility (AC) power line.

#### **FCC 15.31 (e)**

The EUT provides stable voltage (DC 5 V) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99 % Occupied Band Width	RSS-Gen 6.6	-	Radiated	N/A	N/A	N/A

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 distance	Radiated emission (+/-)
	9 kHz - 30 MHz
3 m	3.8 dB
10 m	3.7 dB

\*Measurement distance

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
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 test(3 m)

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

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### 3.5 Test Location

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	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.



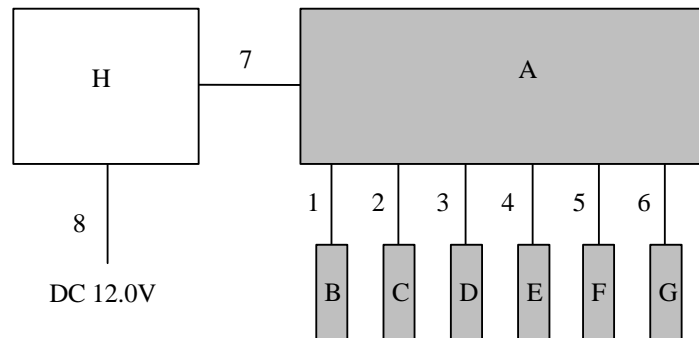
## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating Modes

Test mode	Remarks
Transmitting mode	-

Justification : The system was configured in typical fashion (as a user would normally use it) for testing.

### 4.2 Configuration and peripherals



\* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

\* The EUT does not transmit simultaneously from multiple antennas.

\* Antennas were evaluated with the worst duty respectively.

#### **Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remark
A	ECU	R328N	0337G800001	OMRON Automotive Electronics Co. Ltd.	EUT
B	LF Antenna (INF)	G8D-841M-ANT	K019717402	OMRON Automotive Electronics Co. Ltd.	EUT
C	LF Antenna (INR)	G8D-841M-ANT	K019717403	OMRON Automotive Electronics Co. Ltd.	EUT
D	LF Antenna (TG)	G8D-841M-ANT	K019717404	OMRON Automotive Electronics Co. Ltd.	EUT
E	LF Antenna (DR)	30-1CL	K01679902	Aisin Seiki Co., Ltd.	EUT
F	LF Antenna (AS)	30-1CR	K01679903	Aisin Seiki Co., Ltd.	EUT
G	Push Start Switch	CFT-M001	K260063002	OMRON Automotive Electronics Co. Ltd.	EUT
H	Switch Board	-	-	OMRON Automotive Electronics Co. Ltd.	-

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**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	1.5	Unshielded	Unshielded	-
2	Signal Cable	1.5	Unshielded	Unshielded	-
3	Signal Cable	1.5	Unshielded	Unshielded	-
4	Signal Cable	1.5	Unshielded	Unshielded	-
5	Signal Cable	1.5	Unshielded	Unshielded	-
6	Signal Cable	1.5	Unshielded	Unshielded	-
7	Signal Cable	1.5	Unshielded	Unshielded	-
8	DC Cable	2.3	Unshielded	Unshielded	-

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## **SECTION 5: Radiated emission (Fundamental and Spurious Emission)**

### **Test Procedure**

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.

Frequency : From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

\*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

The measuring antenna height varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The test was made with the detector (RBW / VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### **Test Antennas are used as below;**

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	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
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

\*1) Distance Factor:  $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

\*2) Distance Factor:  $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

As for the Transmitting mode of Push Start Switch, it was confirmed that there were no effect on test result regardless of with or without transponder.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

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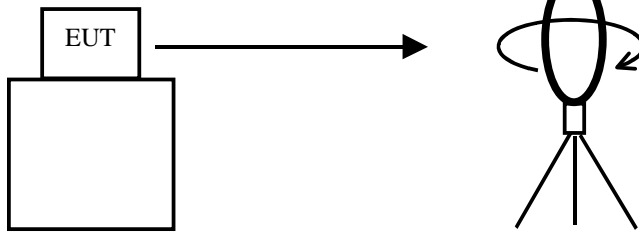
Measurement range : 9 kHz - 1 GHz  
Test data : APPENDIX 1  
Test result : Pass

Date: June 14, 2017  
June 19, 2017

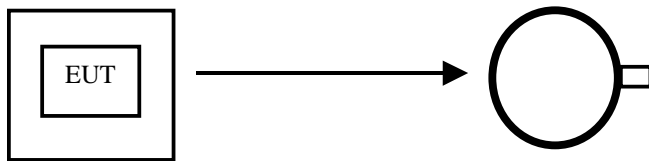
Test engineer: Masafumi Niwa  
Ken Fujita

**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*

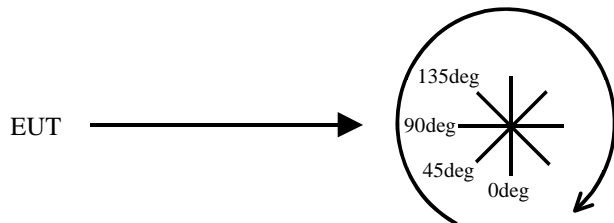


.....  
*Top View (Horizontal)*



Antenna was not rotated.

.....  
*Top View (Vertical)*



Front side: 0 deg.  
Forward direction: clockwise

## **SECTION 6: -26dB Bandwidth**

### **Test Procedure**

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

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	100 kHz	1 kHz	3 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1  
Test result : Pass

## **SECTION 7: 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
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 1  
Test result : Pass

## APPENDIX 1: Test data

### Radiated Emission below 30 MHz (Fundamental and Spurious Emission) Tx 125kHz Antenna(DR)

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 11776318H  
Date : 06/14/2017  
Temperature/ Humidity : 23 deg. C / 47 % RH  
Engineer : Masafumi Niwa  
Mode : Tx 125kHz Antenna(DR)

#### PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	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
0	0.12500	PK	103.8	19.7	-73.7	32.2	-	17.6	45.6	28.0	Fundamental
0	0.25000	PK	62.4	19.6	-73.7	32.2	-	-23.9	39.6	63.5	
0	0.37500	PK	61.0	19.6	-73.7	32.2	-	-25.3	36.1	61.4	
0	0.50000	QP	35.4	19.5	-33.7	32.1	-	-10.9	33.6	44.5	
0	0.62500	QP	53.0	19.5	-33.7	32.2	-	6.6	31.7	25.1	
0	0.75000	QP	31.5	19.5	-33.7	32.2	-	-14.9	30.1	45.0	
0	0.87500	QP	46.7	19.5	-33.6	32.2	-	0.4	28.7	28.3	
0	1.00000	QP	31.3	19.5	-33.6	32.2	-	-15.0	27.6	42.6	
0	1.12500	QP	43.1	19.5	-33.6	32.2	-	-3.2	26.5	29.7	
0	1.25000	QP	43.1	19.5	-33.6	32.2	-	-3.2	25.6	28.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

#### PK with Duty factor

Ant Deg [deg]	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
0	0.125	AV	103.8	19.7	-73.7	32.2	0.0	17.6	25.6	8.0	
0	0.250	AV	62.4	19.6	-73.7	32.2	0.0	-23.9	19.6	43.5	
0	0.375	AV	61.0	19.6	-73.7	32.2	0.0	-25.3	16.1	41.4	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

#### Result of the fundamental emission at 3m without Distance factor

#### PK or QP

Ant Deg [deg]	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
0	0.12500	PK	103.8	19.7	6.3	32.2	-	97.6	-	-	Fundamental

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

\* All spurious emissions lower than this result.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

\*After the Antenna(DR) and Antenna(AS) were compared, all the tests were performed only with Antenna(DR) as its result was the worst one.

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**Radiated Emission below 30 MHz (Fundamental and Spurious Emission)**  
**Tx 125kHz Antenna(TG)**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 11776318H  
Date : 06/14/2017  
Temperature/ Humidity : 23 deg. C / 47 % RH  
Engineer : Masafumi Niwa  
Mode : Tx 125kHz Antenna(TG)

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	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
0	0.12500	PK	99.9	19.7	-73.7	32.2	-	13.7	45.6	31.9	Fundamental
0	0.25000	PK	55.8	19.6	-73.7	32.2	-	-30.5	39.6	70.1	
0	0.37500	PK	51.0	19.6	-73.7	32.2	-	-35.3	36.1	71.4	
0	0.50000	QP	33.0	19.5	-33.7	32.1	-	-13.3	33.6	46.9	
0	0.62500	QP	37.6	19.5	-33.7	32.2	-	-8.8	31.7	40.5	
0	0.75000	QP	31.4	19.5	-33.7	32.2	-	-15.0	30.1	45.1	
0	0.87500	QP	34.0	19.5	-33.6	32.2	-	-12.3	28.7	41.0	
0	1.00000	QP	30.9	19.5	-33.6	32.2	-	-15.4	27.6	43.0	
0	1.12500	QP	32.4	19.5	-33.6	32.2	-	-13.9	26.5	40.4	
0	1.25000	QP	30.8	19.5	-33.6	32.2	-	-15.5	25.6	41.1	

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

**PK with Duty factor**

Ant Deg [deg]	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
0	0.125	AV	99.9	19.7	-73.7	32.2	0.0	13.7	25.6	11.9	
0	0.250	AV	55.8	19.6	-73.7	32.2	0.0	-30.5	19.6	50.1	
0	0.375	AV	51.0	19.6	-73.7	32.2	0.0	-35.3	16.1	51.4	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amprifier) + Duty factor \*

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

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	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
0	0.12500	PK	99.9	19.7	6.3	32.2	-	93.7	-	-	Fundamental

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

\* All spurious emissions lower than this result.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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**Radiated Emission below 30 MHz (Fundamental and Spurious Emission)**  
**Tx 125kHz Antenna(INF)**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 11776318H  
Date : 06/14/2017  
Temperature/ Humidity : 23 deg. C / 47 % RH  
Engineer : Masafumi Niwa  
Mode : Tx 125kHz Antenna(INF)

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	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
0	0.12500	PK	101.5	19.7	-73.7	32.2	-	15.3	45.6	30.3	Fundamental
0	0.25000	PK	58.2	19.6	-73.7	32.2	-	-28.1	39.6	67.7	
0	0.37500	PK	49.9	19.6	-73.7	32.2	-	-36.4	36.1	72.5	
0	0.50000	QP	32.5	19.5	-33.7	32.1	-	-13.8	33.6	47.4	
0	0.62500	QP	43.3	19.5	-33.7	32.2	-	-3.1	31.7	34.8	
0	0.75000	QP	31.3	19.5	-33.7	32.2	-	-15.1	30.1	45.2	
0	0.87500	QP	38.2	19.5	-33.6	32.2	-	-8.1	28.7	36.8	
0	1.00000	QP	31.0	19.5	-33.6	32.2	-	-15.3	27.6	42.9	
0	1.12500	QP	35.3	19.5	-33.6	32.2	-	-11.0	26.5	37.5	
0	1.25000	QP	30.9	19.5	-33.6	32.2	-	-15.4	25.6	41.0	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	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
0	0.125	AV	101.5	19.7	-73.7	32.2	0.0	15.3	25.6	10.3	
0	0.250	AV	58.2	19.6	-73.7	32.2	0.0	-28.1	19.6	47.7	
0	0.375	AV	49.9	19.6	-73.7	32.2	0.0	-36.4	16.1	52.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	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
0	0.12500	PK	101.5	19.7	6.3	32.2	-	95.3	-	-	Fundamental

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

\* All spurious emissions lower than this result.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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**Radiated Emission below 30 MHz (Fundamental and Spurious Emission)**  
**Tx 125kHz Antenna(INR)**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 11776318H  
Date : 06/14/2017  
Temperature/ Humidity : 23 deg. C / 47 % RH  
Engineer : Masafumi Niwa  
Mode : Tx 125kHz Antenna(INR)

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	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
0	0.12500	PK	100.3	19.7	-73.7	32.2	-	14.1	45.6	31.5	Fundamental
0	0.25000	PK	53.4	19.6	-73.7	32.2	-	-32.9	39.6	72.5	
0	0.37500	PK	49.4	19.6	-73.7	32.2	-	-36.9	36.1	73.0	
0	0.50000	QP	32.8	19.5	-33.7	32.1	-	-13.5	33.6	47.1	
0	0.62500	QP	37.7	19.5	-33.7	32.2	-	-8.7	31.7	40.4	
0	0.75000	QP	31.3	19.5	-33.7	32.2	-	-15.1	30.1	45.2	
0	0.87500	QP	34.1	19.5	-33.6	32.2	-	-12.2	28.7	40.9	
0	1.00000	QP	31.0	19.5	-33.6	32.2	-	-15.3	27.6	42.9	
0	1.12500	QP	32.5	19.5	-33.6	32.2	-	-13.8	26.5	40.3	
0	1.25000	QP	30.9	19.5	-33.6	32.2	-	-15.4	25.6	41.0	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	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
0	0.125	AV	100.3	19.7	-73.7	32.2	0.0	14.1	25.6	11.5	
0	0.250	AV	53.4	19.6	-73.7	32.2	0.0	-32.9	19.6	52.5	
0	0.375	AV	49.4	19.6	-73.7	32.2	0.0	-36.9	16.1	53.0	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	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
0	0.12500	PK	100.3	19.7	6.3	32.2	-	94.1	-	-	Fundamental

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

\* All spurious emissions lower than this result.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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**Radiated Emission below 30 MHz (Fundamental and Spurious Emission)**  
**Tx 125kHz Push Start Switch**

Test place : Ise EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 11776318H  
Date : 06/14/2017  
Temperature/ Humidity : 23 deg. C / 47 % RH  
Engineer : Masafumi Niwa  
Mode : Tx 125kHz Push Start Switch

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	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
0	0.12500	PK	90.3	19.7	-73.7	32.2	-	4.1	45.6	41.5	Fundamental
0	0.25000	PK	67.5	19.6	-73.7	32.2	-	-18.8	39.6	58.4	
0	0.37500	PK	54.2	19.6	-73.7	32.2	-	-32.1	36.1	68.2	
0	0.50000	QP	32.6	19.5	-33.7	32.1	-	-13.7	33.6	47.3	
0	0.62500	QP	42.9	19.5	-33.7	32.2	-	-3.5	31.7	35.2	
0	0.75000	QP	37.5	19.5	-33.7	32.2	-	-8.9	30.1	39.0	
0	0.87500	QP	38.1	19.5	-33.6	32.2	-	-8.2	28.7	36.9	
0	1.00000	QP	31.0	19.5	-33.6	32.2	-	-15.3	27.6	42.9	
0	1.12500	QP	35.0	19.5	-33.6	32.2	-	-11.3	26.5	37.8	
0	1.25000	QP	32.1	19.5	-33.6	32.2	-	-14.2	25.6	39.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	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
0	0.125	AV	90.3	19.7	-73.7	32.2	0.0	4.1	25.6	21.5	
0	0.250	AV	67.5	19.6	-73.7	32.2	0.0	-18.8	19.6	38.4	
0	0.375	AV	54.2	19.6	-73.7	32.2	0.0	-32.1	16.1	48.2	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor \*

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

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	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
0	0.12500	PK	90.3	19.7	6.3	32.2	-	84.1	-	-	Fundamental

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

\* All spurious emissions lower than this result.

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

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**Radiated Emission above 30MHz (Spurious Emission)**  
**Tx 125kHz Antenna(DR)**

**DATA OF RADIATED EMISSION TEST**

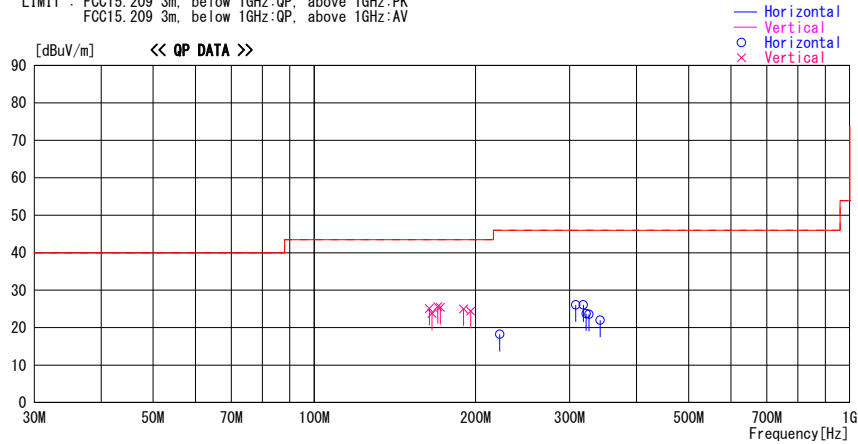
UL Japan, Inc. Ise Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2017/06/19

Order No. 11776318H

Temp./Humi. : 22 deg. C / 66 % RH  
Engineer : Ken Fujita

Mode / Remarks : Tx 125 kHz Antenna (DR) Worst axis (Ant Hori X Vert X , ECU Hori X Vert X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
163.998	32.6	QP	15.7	-23.2	25.1	173	100	Vert.	43.5	18.4	
165.998	31.2	QP	15.8	-23.2	23.8	353	105	Vert.	43.5	19.7	
169.998	32.8	QP	15.9	-23.1	25.6	4	100	Vert.	43.5	17.9	
171.998	32.5	QP	16.0	-23.1	25.4	6	108	Vert.	43.5	18.1	
189.998	31.6	QP	16.3	-22.9	25.0	22	100	Vert.	43.5	18.5	
195.997	30.9	QP	16.3	-22.8	24.4	17	102	Vert.	43.5	19.1	
221.997	29.3	QP	11.5	-22.6	18.2	92	100	Hori.	46.0	27.8	
307.997	34.4	QP	13.7	-22.0	26.1	289	100	Hori.	46.0	19.9	
317.996	34.1	QP	13.9	-21.9	26.1	142	110	Hori.	46.0	19.9	
321.997	31.6	QP	14.0	-21.9	23.7	127	100	Hori.	46.0	22.3	
325.996	31.4	QP	14.1	-21.9	23.6	143	137	Hori.	46.0	22.4	
341.997	29.3	QP	14.5	-21.8	22.0	125	146	Hori.	46.0	24.0	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz--:HORN  
CALCULATION:RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP))

\*After the Antenna(DR) and Antenna(AS) were compared, all the tests were performed only with Antenna(DR) as its result was the worst one.

**Radiated Emission above 30MHz (Spurious Emission)**  
**Tx 125kHz Antenna(TG)**

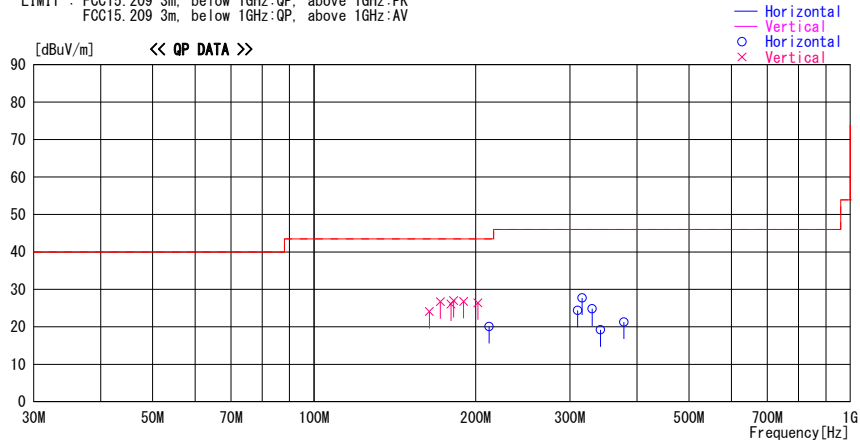
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2017/06/19

Order No. 11776318H  
Temp./Humi. : 22 deg. C / 66 % RH  
Engineer : Ken Fujita

Mode / Remarks : Tx 125 kHz Antenna(TG) Worst axis (Ant Hori X Vert X , ECU Hori X Vert X)

LIMIT : FCC15. 209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15. 209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
163.999	31.6	QP	15.7	-23.2	24.1	292	103	Vert.	43.5	19.4	
171.998	33.8	QP	16.0	-23.1	26.7	10	109	Vert.	43.5	16.8	
179.999	32.8	QP	16.3	-23.0	26.1	353	100	Vert.	43.5	17.4	
181.998	33.7	QP	16.3	-23.0	27.0	4	100	Vert.	43.5	16.5	
189.999	33.4	QP	16.3	-22.9	26.8	354	100	Vert.	43.5	16.7	
201.998	32.8	QP	16.4	-22.8	26.4	16	102	Vert.	43.5	17.1	
211.998	31.4	QP	11.4	-22.7	20.1	288	168	Hori.	43.5	23.4	
309.997	32.6	QP	13.8	-22.0	24.4	282	100	Hori.	46.0	21.6	
315.997	35.8	QP	13.9	-22.0	27.7	155	100	Hori.	46.0	18.3	
329.996	32.5	QP	14.2	-21.9	24.8	120	102	Hori.	46.0	21.2	
341.998	26.5	QP	14.5	-21.8	19.2	139	100	Hori.	46.0	26.8	
377.997	27.6	QP	15.3	-21.6	21.3	140	100	Hori.	46.0	24.7	

CHART:WITH FACTOR ANT TYPE: <30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN  
CALCULATION:RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE - GAIN(AMP))

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

**Radiated Emission above 30MHz (Spurious Emission)**  
**Tx 125kHz Antenna(INF)**

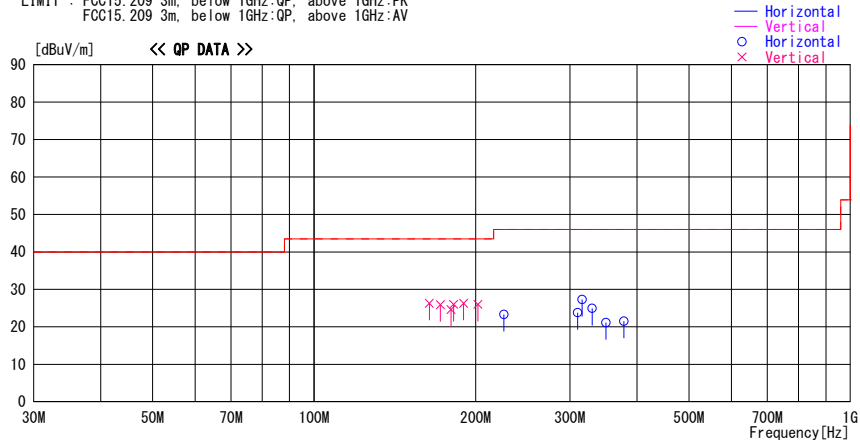
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2017/06/19

Order No. 11776318H  
Temp./Humi. : 22 deg. C / 66 % RH  
Engineer : Ken Fujita

Mode / Remarks : Tx 125 kHz Antenna(INF) Worst axis (Ant Hori X Vert X , ECU Hori X Vert X)

LIMIT : FCC15. 209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15. 209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
163.999	33.8	QP	15.7	-23.2	26.3	330	100	Vert.	43.5	17.2	
171.998	33.0	QP	16.0	-23.1	25.9	4	103	Vert.	43.5	17.6	
179.999	31.3	QP	16.3	-23.0	24.6	357	100	Vert.	43.5	18.9	
181.997	32.7	QP	16.3	-23.0	26.0	7	100	Vert.	43.5	17.5	
189.999	32.9	QP	16.3	-22.9	26.3	3	101	Vert.	43.5	17.2	
201.998	32.4	QP	16.4	-22.8	26.0	19	109	Vert.	43.5	17.5	
225.996	34.4	QP	11.5	-22.6	23.3	163	100	Hori.	46.0	22.7	
309.998	32.0	QP	13.8	-22.0	23.8	275	100	Hori.	46.0	22.2	
315.997	35.4	QP	13.9	-22.0	27.3	145	100	Hori.	46.0	18.7	
329.998	32.6	QP	14.2	-21.9	24.9	136	103	Hori.	46.0	21.1	
349.996	28.1	QP	14.7	-21.7	21.1	243	100	Hori.	46.0	24.9	
377.998	27.8	QP	15.3	-21.6	21.5	161	100	Hori.	46.0	24.5	

CHART:WITH FACTOR ANT TYPE: <30MHz: LOOP, 30-200MHz: BICONICAL, 200MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP))

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

**Radiated Emission above 30MHz (Spurious Emission)**  
**Tx 125kHz Antenna(INR)**

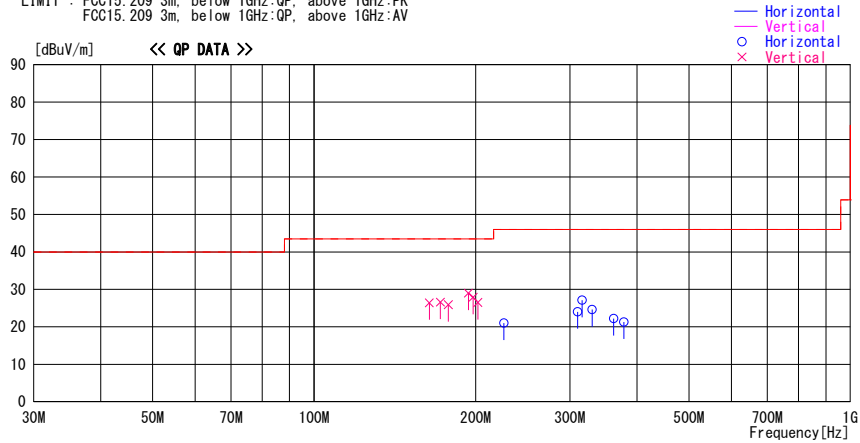
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2017/06/19

Order No. 11776318H  
Temp./Humi. : 22 deg. C / 66 % RH  
Engineer : Ken Fujita

Mode / Remarks : Tx 125 kHz Antenna(INR) Worst axis (Ant Hori X Vert X , ECU Hori X Vert X)

LIMIT : FCC15. 209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15. 209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
163.998	33.9	QP	15.7	-23.2	26.4	328	100	Vert.	43.5	17.1	
171.998	33.7	QP	16.0	-23.1	26.6	11	102	Vert.	43.5	16.9	
177.997	32.8	QP	16.2	-23.1	25.9	3	100	Vert.	43.5	17.6	
193.998	35.5	QP	16.3	-22.8	29.0	3	100	Vert.	43.5	14.5	
197.998	34.4	QP	16.3	-22.8	27.9	7	101	Vert.	43.5	15.6	
201.998	32.9	QP	16.4	-22.8	26.5	21	103	Vert.	43.5	17.0	
225.998	32.1	QP	11.5	-22.6	21.0	159	100	Hori.	46.0	25.0	
309.997	32.2	QP	13.8	-22.0	24.0	263	100	Hori.	46.0	22.0	
315.997	35.2	QP	13.9	-22.0	27.1	159	100	Hori.	46.0	18.9	
329.998	32.3	QP	14.2	-21.9	24.6	129	103	Hori.	46.0	21.4	
361.996	29.1	QP	14.9	-21.8	22.2	223	100	Hori.	46.0	23.8	
377.998	27.6	QP	15.3	-21.6	21.3	156	100	Hori.	46.0	24.7	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN  
CALCULATION:RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP))

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

**Radiated Emission above 30MHz (Spurious Emission)**  
**Tx 125kHz Push Start Switch**

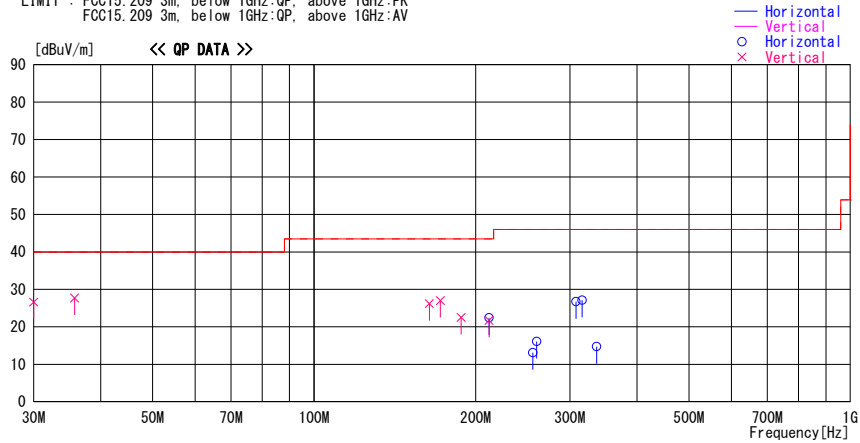
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2017/06/19

Order No. 11776318H  
Temp./Humi. : 22 deg. C / 66 % RH  
Engineer : Ken Fujita

Mode / Remarks : Tx 125 kHz Push Start Switch Worst axis (Ant Hori X Vert X , ECU Hori X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.209 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.002	34.3	QP	17.1	-24.8	26.6	258	100	Vert.	40.0	13.4	
35.753	36.8	QP	15.6	-24.7	27.7	290	110	Vert.	40.0	12.3	
163.998	33.7	QP	15.7	-23.2	26.2	180	100	Vert.	43.5	17.3	
171.999	34.1	QP	16.0	-23.1	27.0	167	100	Vert.	43.5	16.5	
187.999	29.2	QP	16.3	-23.0	22.5	165	100	Vert.	43.5	21.0	
211.998	33.0	QP	11.4	-22.7	21.7	4	100	Vert.	43.5	21.8	
211.998	33.7	QP	11.4	-22.7	22.4	301	165	Hori.	43.5	21.1	
255.774	23.5	QP	11.9	-22.3	13.1	305	100	Hori.	46.0	32.9	
259.974	26.3	QP	12.1	-22.3	16.1	299	102	Hori.	46.0	29.9	
307.996	35.0	QP	13.7	-22.0	26.7	287	100	Hori.	46.0	19.3	
315.996	35.2	QP	13.9	-22.0	27.1	279	100	Hori.	46.0	18.9	
336.287	22.1	QP	14.4	-21.8	14.7	300	100	Hori.	46.0	31.3	

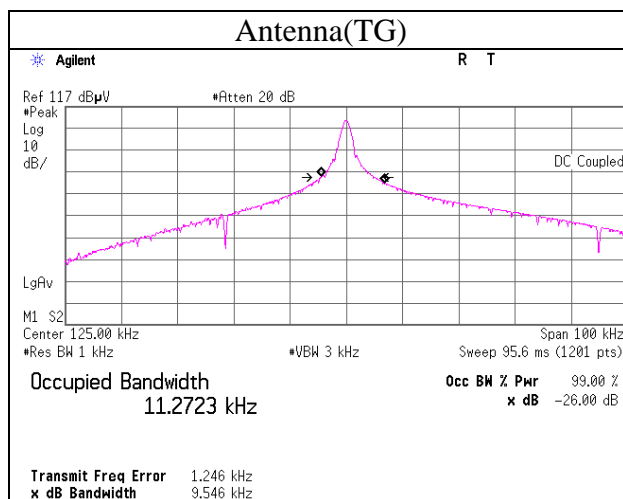
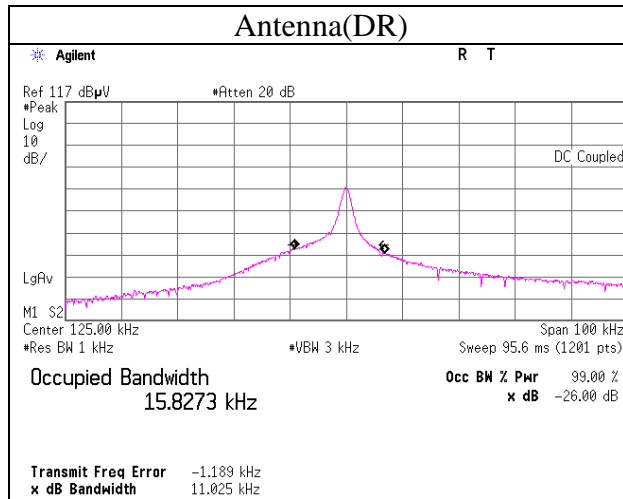
CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN  
CALCULATION:RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP))

\*The test result is rounded off to one or two decimal places, so some differences might be observed.

**-26dB Bandwidth and 99% Occupied Bandwidth**  
**Tx 125kHz Antenna(DR) / Antenna(TG)**

Test place : Ise EMC Lab. No.3 Measurement Room  
Order No. : 11776318H  
Date : 06/20/2017  
Temperature/ Humidity : 23 deg. C / 49 % RH  
Engineer : Tomoki Matsui  
Mode : Tx 125kHz

Mode	Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
Antenna(DR)	125	11.025	15.827
Antenna(TG)	125	9.546	11.272



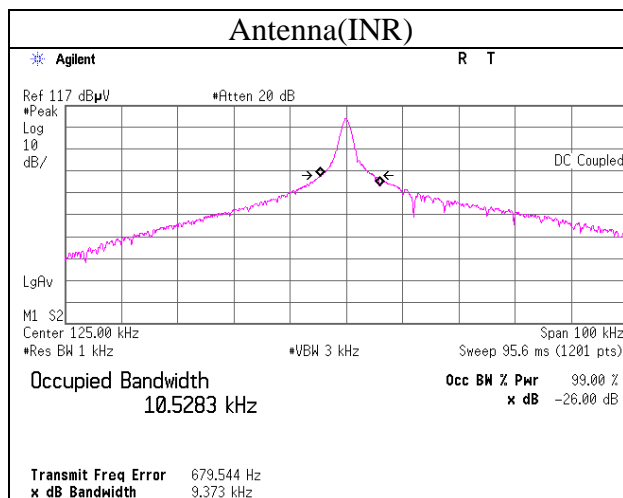
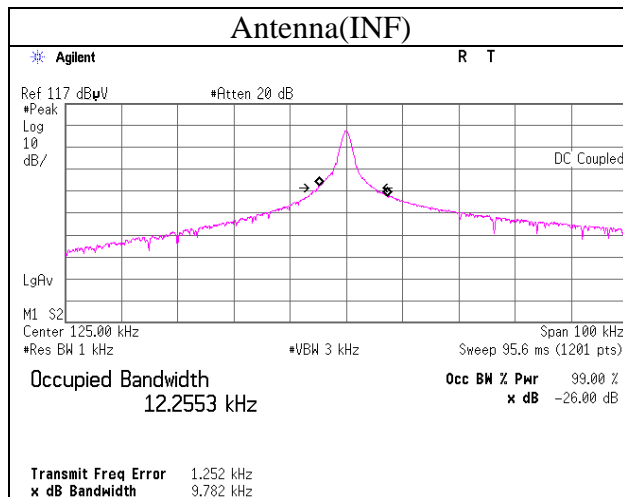
\*After the Antenna(DR) and Antenna(AS) were compared, all the tests were performed only with Antenna(DR) as its result was the worst one.



**-26dB Bandwidth and 99% Occupied Bandwidth**  
**Tx 125kHz Antenna(INF) / Antenna(INR)**

Test place : Ise EMC Lab. No.3 Measurement Room  
Order No. : 11776318H  
Date : 06/20/2017  
Temperature/ Humidity : 23 deg. C / 49 % RH  
Engineer : Tomoki Matsui  
Mode : Tx 125kHz

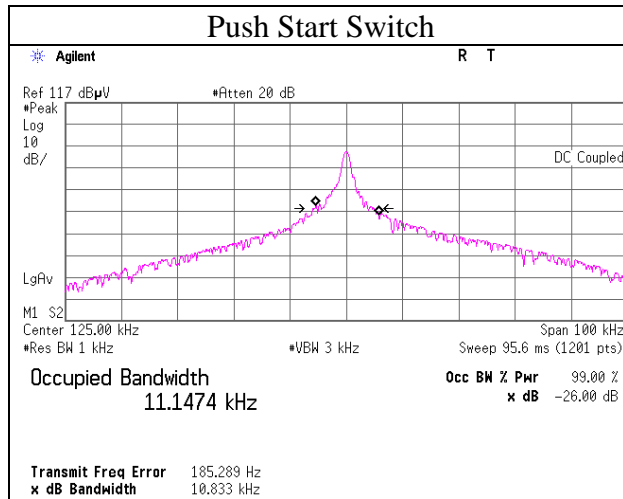
Mode	Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
Antenna(INF)	125	9.782	12.255
Antenna(INR)	125	9.373	10.528



**-26dB Bandwidth and 99% Occupied Bandwidth**  
**Tx 125kHz Push Start Switch**

Test place : Ise EMC Lab. No.3 Measurement Room  
Order No. : 11776318H  
Date : 06/20/2017  
Temperature/ Humidity : 23 deg. C / 49 % RH  
Engineer : Tomoki Matsui  
Mode : Tx 125kHz

Mode	Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
Antenna(PSS)	125	10.833	11.147



\*It was confirmed that there were no differences in the bandwidth of EUT regardless of with or without transponder.

## **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	2016/10/19 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2017/01/20 * 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	2017/01/12 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2016/10/14 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ sucoform141-PE(1m)/ RFM-E121(Switcher)	-/04178	RE	2016/07/20 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2017/06/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2017/03/27 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2017/01/19 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2016/11/23 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2017/01/26 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MAT-97	Attenuator	KEYSIGHT	8491A	MY52462282	RE	2016/10/31 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2016/06/17 * 12
MRENT-126	Spectrum Analyzer	KEYSIGHT	E4440A	MY46185516	RE	2016/07/01 * 12
MLPA-03	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: Spurious emission**

**UL Japan, Inc.**

**Ise EMC Lab.**

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