RADIO TEST REPORT

Test Report No. : 10291830H-B-R2

Applicant	:	**DENSO CORPORATION**
Type of Equipment	:	**Passive Entry Passive Start System (LF Transmitter)**
Model No.	:	**U2NB0**
FCC ID	:	**HYQU2NB0**
Test regulation	:	**FCC Part 15 Subpart C: 2014**
Test Result	:	**Complied**

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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.
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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 10291830H-B-R1. 10291830H-B-R1 is replaced with this report.

Date of test: May 20 to June 9, 2014

Representative test engineer:
Shinya Watanabe
Engineer
Consumer Technology Division

Approved by:
Takashi Nakazawa
Leader
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.
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http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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REVISION HISTORY

Original Test Report No.: 10291830H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10291830H-B	December 1, 2014	-	-
1	10291830H-B-R1	December 16, 2014	P. 13	Correction of Duty factor value of PK with Duty factor ; From -4.0 to -3.9
1	10291830H-B-R1	December 16, 2014	P. 14	Correction of Duty factor value of PK with Duty factor ; From -3.9 to -4.0
1	10291830H-B-R1	December 16, 2014	P. 8, 9, 13, 16, 19, 22, 26, 29 (for Original report)	Deletion of configuration, data, and photo about Ant1.
2	10291830H-B-R2	January 14, 2015	P. 8	Correction of note.

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SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number	:	+81-566-61-5234
Facsimile Number	:	+81-566-25-4837
Contact Person	:	Akihiro Taguchi

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

2.1 Identification of E.U.T.

Type of Equipment	:	Passive Entry Passive Start System (LF Transmitter)
Model No.	:	U2NB0
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	April 24, 2014
Country of Mass-production	:	United states of America and 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: U2NB0 (referred to as the EUT in this report) is the Passive Entry Passive Start System (LF Transmitter).

General Specification

Clock frequency(ies) in the system	:	MPU: 4MHz

Radio Specification

[Transmitter part]

Radio Type	:	LF Transmitter
Frequency of Operation	:	125kHz
Oscillation circuit	:	Ceramic resonator
Oscillator frequency	:	8MHz
Modulation	:	OOK
Power Supply (inner)	:	DC 12.0V
Antenna type	:	Ant1: External Antenna Ant2: External Antenna Ant3: External Antenna Ant4: External Antenna Ant5: External Antenna Ant6: External Antenna *The EUT does not transmit simultaneously from mutiple antennas.
Antenna specification	:	Ferrite antenna coil
Transmitting out put current	:	50mA - 1000mA [End user cannot control output current since it is fixed depending on each system]

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2014, final revised on December 23, 2014
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 December 23, 2014 does not affect the test specification applied to the EUT.

FCC 15.31 (e)
This test was performed with the New Battery (DC 12V) and the constant voltage was supplied to this EUT during the tests. 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <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 C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 6.4, 6.12	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 8.9	Radiated	N/A	14.3dB 0.12500MHz 0 deg. PK with Duty factor (Ant4)	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 6.4, 6.13	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 8.9	Radiated	N/A	10.5dB 192.321MHz, Vertical, QP (Ant3)	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <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.

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 room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Radiated emission test(3m)

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

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 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

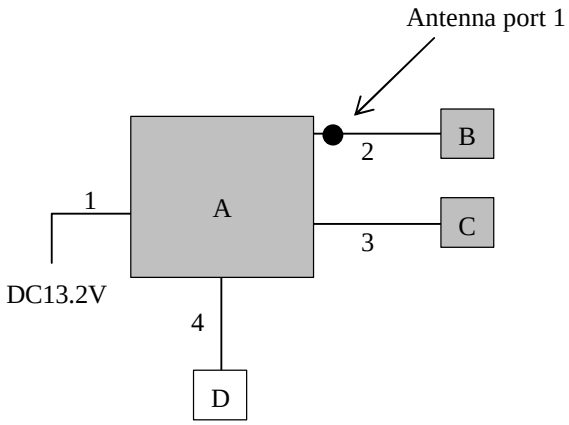
4.1 Operating Modes

Mode	Remarks
(1)Transmitting mode (Tx) Ant3 Output current 1000mA	Antenna port impedance 0Ω
(2)Transmitting mode (Tx) Ant4 Output current 1000mA	Antenna port impedance 0Ω

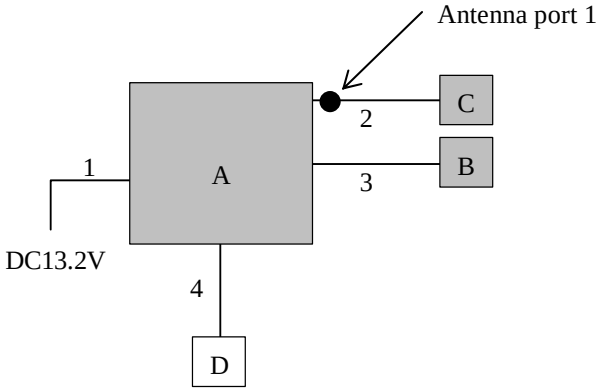
*For reference, fundamental level was measured with output current 50mA.

4.2 Configuration and peripherals

[For Ant3 evaluation]



[For Ant4 evaluation]



* The types of antenna ports are all identical.
* The test was performed with the worst antenna port impedance (0Ω).
* Two types of antennas are connected to this system.
* Since the continuous transmission for tests could be created with one port only, two antennas evaluation was performed by replacing two antennas to the port (antenna port 1).
* This transmitting timing is worse than that of normal use mode which six antennas are used.
* It was deemed no difference by connection antenna numbers, as it was confirmed to add some antennas.
* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Passive Entry Passive Start System (LF Transmitter)	U2NB0	1114 0370 0050 0710	DENSO CORPORATION	EUT
B	Ant3	Normal-L	01	DENSO CORPORATION	EUT
C	Ant4	Hi-L	01	DENSO CORPORATION	EUT
D	Evaluation Bench	-	-	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	Antenna Cable	3.0	Unshielded	Unshielded	-
3	Antenna Cable	3.0	Unshielded	Unshielded	-
4	Signal Cable	3.0	Unshielded	Unshielded	-

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure
EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 9kHz to 30MHz
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: 0deg., 45deg., 90deg., and 135 deg.) and horizontal polarization.
*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 1GHz
The measuring antenna height varied between 1 and 4m 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 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz	
Instrument used	Test Receiver					Spectrum Analyzer	
Detector	PK/AV	QP	PK/AV	QP	QP	PK	AV
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz
Test Distance	3m *1)	3m *1)	3m *1)	3m *2)	3m	3m	3m

*1) Distance Factor: 40 x log (3m/300m) = -80dB
*2) Distance Factor: 40 x log (3m/30m) = -40dB

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 937606.

- 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.

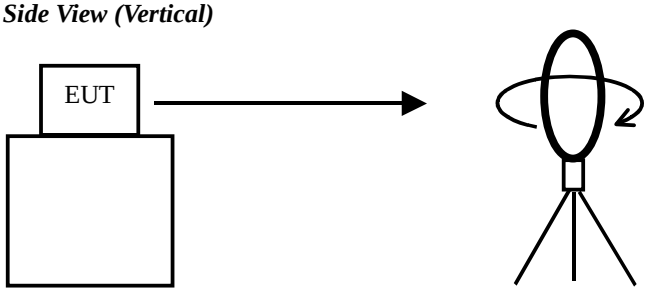
The test results and limit are rounded off to one decimal place, so some differences might be observed.

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

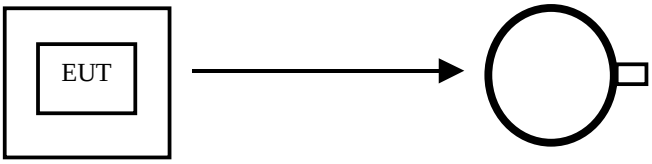
Date: May 20, 22, and 23, 2014 Test engineer: Satofumi Matsuyama
June 9, 2014 Shinya Watanabe

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

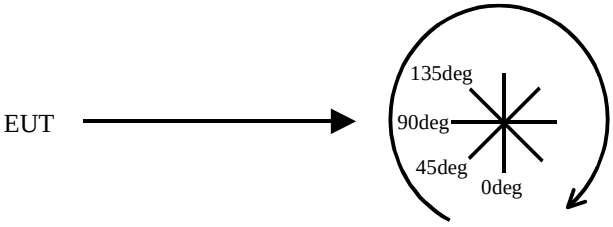


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26dB Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	200kHz	2kHz	6.2kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 99% Occupied Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.							

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Ant3

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10291830H
Date	05/22/2014
Temperature/ Humidity	24 deg.C / 38% RH
Engineer	Satofumi Matsuyama
Mode	Tx

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	78.8	19.5	-53.0	32.3	-	13.0	45.6	32.6	Fundamental
0	0.12500	PK	72.5	19.5	-53.0	32.3	-	6.7	45.6	32.6	50mA
0	0.25000	PK	54.3	19.3	-52.9	32.2	-	-11.5	39.6	51.1	
0	0.37500	PK	51.4	19.5	-52.9	32.2	-	-14.2	36.1	50.3	
0	0.50000	QP	33.7	19.5	-12.9	32.2	-	8.1	33.6	25.5	
0	0.62500	QP	33.0	19.3	-12.8	32.2	-	7.3	31.7	24.4	
0	0.75000	QP	32.3	19.4	-12.8	32.2	-	6.7	30.1	23.4	
0	0.87500	QP	32.1	19.6	-12.8	32.2	-	6.7	28.7	22.0	
0	1.00000	QP	31.9	19.6	-12.8	32.2	-	6.5	27.6	21.1	
0	1.12500	QP	31.8	19.6	-12.8	32.2	-	6.4	26.5	20.1	
0	1.25000	QP	31.6	19.6	-12.7	32.2	-	6.3	25.6	19.3	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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	PK	78.8	19.5	-53.0	32.3	-3.9	9.1	25.6	16.5	
0	0.250	PK	54.3	19.3	-52.9	32.2	-3.9	-15.4	19.6	35.0	
0	0.375	PK	51.4	19.5	-52.9	32.2	-3.9	-18.1	16.1	34.2	

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

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

Result of the fundamental emission at 10m 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]	Remark
0	0.12500	PK	78.8	19.5	6.1	32.3	-	72.1	Fundamental

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

* All spurious emissions lower than this result.

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Ant4

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10291830H
Date	05/22/2014
Temperature/ Humidity	24 deg.C / 38% RH
Engineer	Satofumi Matsuyama
Mode	Tx

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	81.1	19.5	-53.0	32.3	-	15.3	45.6	30.3	Fundamental
0	0.12500	PK	78.2	19.3	-52.9	32.2	-	12.4	39.6	27.2	50mA
0	0.25000	PK	44.8	19.3	-52.9	32.2	-	-21.0	39.6	60.6	
0	0.37500	PK	41.3	19.5	-52.9	32.2	-	-24.3	36.1	60.4	
0	0.50000	QP	34.3	19.5	-12.9	32.2	-	8.7	33.6	24.9	
0	0.62500	QP	33.7	19.3	-12.8	32.2	-	8.0	31.7	23.7	
0	0.75000	QP	33.4	19.4	-12.8	32.2	-	7.8	30.1	22.3	
0	0.87500	QP	33.0	19.6	-12.8	32.2	-	7.6	28.7	21.1	
0	1.00000	QP	32.7	19.6	-12.8	32.2	-	7.3	27.6	20.3	
0	1.12500	QP	32.6	19.6	-12.8	32.2	-	7.2	26.5	19.3	
0	1.25000	QP	32.4	19.6	-12.7	32.2	-	7.1	25.6	18.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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	81.1	19.5	-53.0	32.3	-4.0	11.3	25.6	14.3	
0	0.250	AV	44.8	19.3	-52.9	32.2	-4.0	-25.0	19.6	44.6	
0	0.375	AV	41.3	19.5	-52.9	32.2	-4.0	-28.3	16.1	44.4	

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

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

Result of the fundamental emission at 10m 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]	Remark
0	0.12500	PK	81.1	19.5	6.1	32.3	-	74.4	Fundamental

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

* All spurious emissions lower than this result.

Radiated Emission above 30MHz (Spurious Emission)

Ant3

DATA OF RADIATED EMISSION TEST

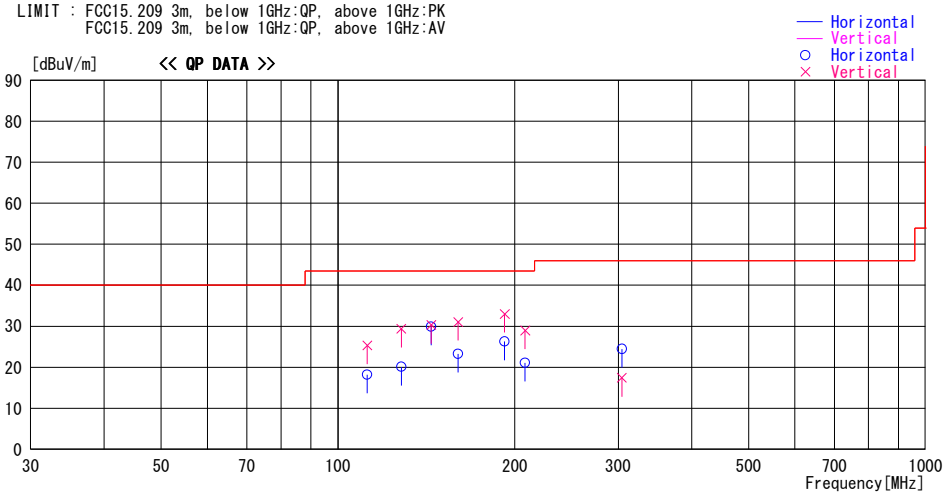
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/05/20

Report No. : 10291830H

Temp./Humi. : 26deg. C / 48% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 125kHz, LF Power 1000mA, Ant3, Worst-axis (Ant H: Z V: X, UPE H: X V: 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 Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
112.187	37.3	QP	11.9	-23.9	25.3	289	100	Vert.	43.5	18.2	
112.211	30.2	QP	11.9	-23.9	18.2	215	142	Hori.	43.5	25.3	
128.211	30.2	QP	13.6	-23.7	20.1	230	137	Hori.	43.5	23.4	
128.212	39.5	QP	13.6	-23.7	29.4	96	100	Vert.	43.5	14.1	
144.241	39.2	QP	14.7	-23.6	30.3	288	100	Vert.	43.5	13.2	
144.243	38.8	QP	14.7	-23.6	29.9	350	229	Hori.	43.5	13.6	
160.263	39.1	QP	15.4	-23.4	31.1	277	100	Vert.	43.5	12.4	
160.267	31.3	QP	15.4	-23.4	23.3	163	292	Hori.	43.5	20.2	
192.318	32.9	QP	16.4	-23.0	26.3	117	173	Hori.	43.5	17.2	
192.321	39.6	QP	16.4	-23.0	33.0	67	100	Vert.	43.5	10.5	
208.336	27.3	QP	16.7	-22.9	21.1	334	164	Hori.	43.5	22.4	
208.344	35.2	QP	16.7	-22.9	29.0	121	100	Vert.	43.5	14.5	
304.505	32.1	QP	14.3	-21.9	24.5	188	157	Hori.	46.0	21.5	
304.506	25.0	QP	14.3	-21.9	17.4	330	152	Vert.	46.0	28.6	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE+ATTEN. – GAIN (AMP))

Radiated Emission above 30MHz (Spurious Emission)

Ant4

DATA OF RADIATED EMISSION TEST

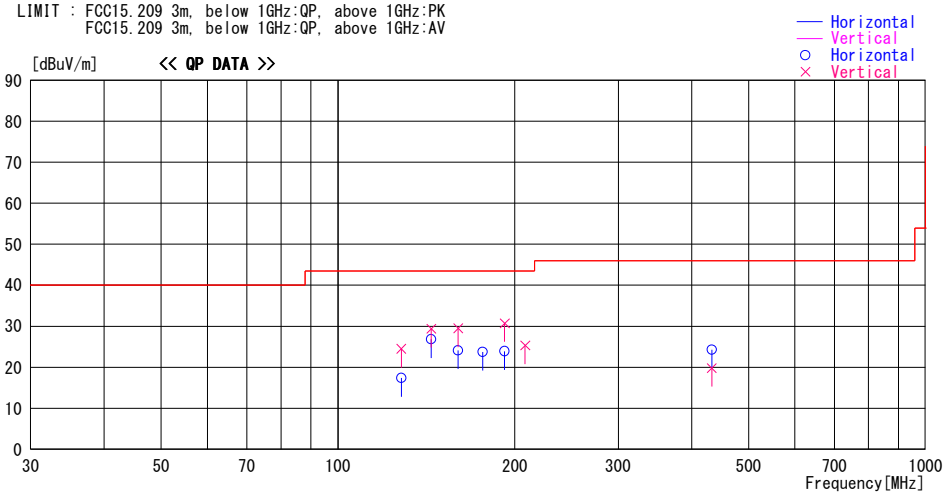
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/05/20

Report No. : 10291830H

Temp./Humi. : 26deg. C / 48% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 125kHz, LF Power 1000mA, Ant4, Worst-axis (Ant H: X V: X, UPE H: X V: X)

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



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
128.208	34.6	QP	13.6	-23.7	24.5	93	100	Vert.	43.5	19.0	
128.209	27.5	QP	13.6	-23.7	17.4	143	267	Hori.	43.5	26.1	
144.229	38.3	QP	14.7	-23.6	29.4	304	100	Vert.	43.5	14.1	
144.231	35.7	QP	14.7	-23.6	26.8	355	228	Hori.	43.5	16.7	
160.253	37.5	QP	15.4	-23.4	29.5	274	100	Vert.	43.5	14.0	
160.254	32.1	QP	15.4	-23.4	24.1	354	278	Hori.	43.5	19.4	
176.279	30.9	QP	16.0	-23.2	23.7	24	283	Hori.	43.5	19.8	
192.303	30.5	QP	16.4	-23.0	23.9	133	169	Hori.	43.5	19.6	
192.308	37.3	QP	16.4	-23.0	30.7	116	100	Vert.	43.5	12.8	
208.333	31.5	QP	16.7	-22.9	25.3	122	100	Vert.	43.5	18.2	
432.690	27.8	QP	17.7	-21.2	24.3	199	100	Hori.	46.0	21.7	
432.691	23.3	QP	17.7	-21.2	19.8	87	100	Vert.	46.0	26.2	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP 30-300MHz:BICONICAL 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE+ATTEN. – GAIN (AMP))

Duty Cycle

(Total calculation_Ant3)

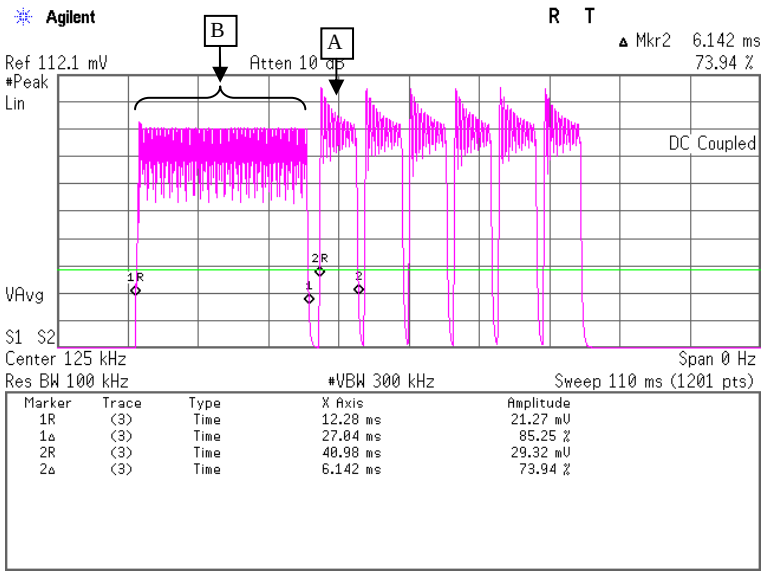
Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10291830H
Date	06/09/2014
Temperature/ Humidity	20 deg. C / 56 % RH
Engineer	Masatoshi Nishiguchi
Mode	Normal Transmitting mode (Ant3)

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
63.892	100.00	0.6389	-3.89

ON time[ms] = B+(A*6)
=27.04+(6.142*6)
Duty = $20\log_{10}$(ON time/Cycle)

* "Timing of transmission" of the application documents was referred, since Intentional off time was unrealizable in measurement circumstance.



Duty Cycle

(Total calculation_Ant4)

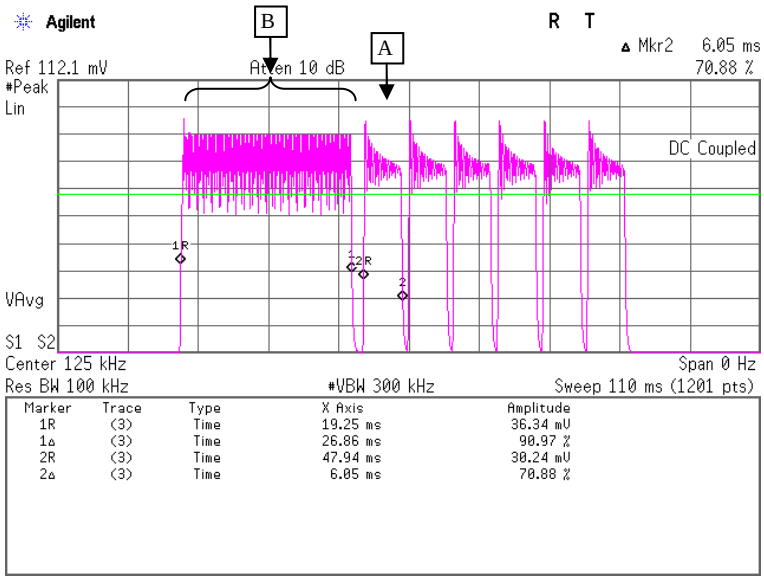
Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10291830H
Date	06/09/2014
Temperature/ Humidity	20 deg. C / 56 % RH
Engineer	Masatoshi Nishiguchi
Mode	Normal Transmitting mode (Ant4)

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
63.220	100.00	0.6322	-3.98

ON time[ms] = B+(A*6)
=26.86+(6.06*6)
Duty = $20\log_{10}$(ON time/Cycle)

* "Timing of transmission" of the application documents was referred, since Intentional off time was unrealizable in measurement circumstance.

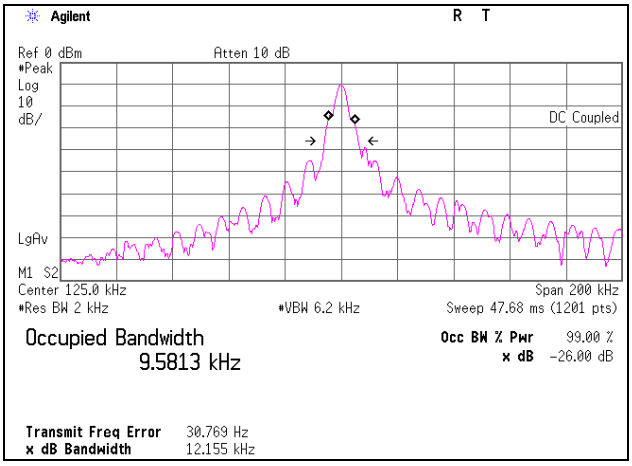


-26dB Bandwidth and 99% Occupied Bandwidth

Ant3

Report No.	10291830H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	06/09/2014
Temperature / Humidity	20 deg. C / 56 % RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125 kHz Ant3

-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
12.155	9.5813

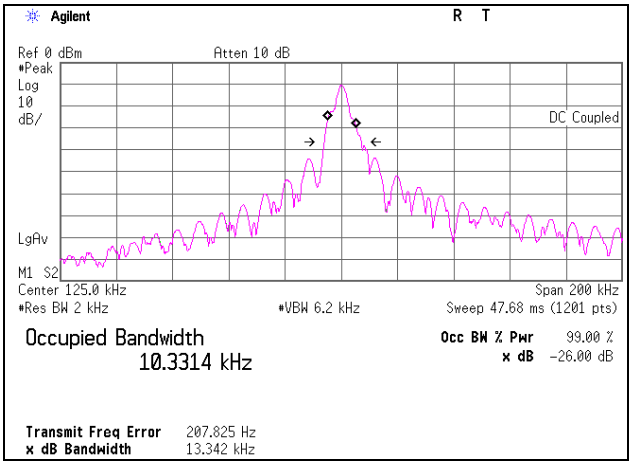


-26dB Bandwidth and 99% Occupied Bandwidth

Ant4

Report No.	10291830H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	06/09/2014
Temperature / Humidity	20 deg. C / 56 % RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125 kHz Ant4

-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.342	10.3314



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2013/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2014/02/20 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2013/06/07 * 12
LP-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	829425/014	RE	2014/02/25 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	RE	2014/03/28 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/ 3D-2W(7.5m)/ RG400u(1.5m)/ RFM-E421(Switcher)	- /01068(Switcher)	RE	2013/09/12 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2013/11/26 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2013/11/24 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2013/11/24 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/ TSJ	-	-	RE	2013/09/12 * 12
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2013/11/11 * 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: Radiated emission