



RADIO TEST REPORT

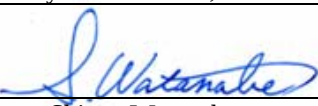
Test Report No. : 10327700H-R1

Applicant : Toyota Motor Corporation
Type of Equipment : Smart LF Oscillator
Model No. : TS-9TY
FCC ID : NI4TS-9TY
Test regulation : FCC Part 15 Subpart C: 2014
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 report is a revised version of 10327700H. 10327700H is replaced with this report.

Date of test: May 30 to June 17, 2014

Representative test engineer:


Shinya Watanabe
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://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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

REVISION HISTORY

Original Test Report No.: 10327700H

[illegible]

CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Radiated emission (Fundamental and Spurious Emission).....	9
SECTION 6: -26dB Bandwidth.....	11
SECTION 7: 99% Occupied Bandwidth.....	11
APPENDIX 1: Data of EMI test.....	12
Radiated Emission below 30MHz (Fundamental and Spurious Emission)	12
Radiated Emission above 30MHz	14
-26dB Bandwidth and 99% Occupied Bandwidth	16
APPENDIX 2: Test instruments	17
APPENDIX 3: Photographs of test setup	18
Radiated Emission.....	18
Worst Case Position	19

SECTION 1: Customer information

Company Name	:	Toyota Motor Corporation
Address	:	1, Toyota-Cho, Toyota, Aichi, 471-8572 Japan
Telephone Number	:	+81-565-94-1006
Facsimile Number	:	+81-565-94-1162
Contact Person	:	Hiroki Okada

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

2.1 Identification of E.U.T.

Type of Equipment	:	Smart LF Oscillator
Model No.	:	TS-9TY
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0V
Receipt Date of Sample	:	May 29, 2014
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

Smart LF Oscillator, model: TS-9TY is a transmitter that is installed in a motor vehicle and is used as part of Smart System.

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	134.2kHz
Modulation	:	ASK
Method of Frequency Generation	:	Crystal
Antenna type	:	Coil Antenna

Smart LF Oscillator (model: TS-9TY) consists of the following parts:

- Computer Assy, Smart Key (ECU)
- D seat Antenna
- P seat Antenna
- Extra1 Antenna
- Extra2 Antenna
- Extra3 Antenna
- Back Door Antenna

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: 2014, final revised on May 1, 2014 and effective June 2, 2014

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

* The revision on May 1, 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 7.2.4	<FCC> Section 15.207 <IC> RSS-Gen 7.2.4	-	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 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	1.2dB 0.134MHz 0 deg. PK with Duty factor <Extra Antenna>	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	11.3dB 55.666MHz, Vertical <Extra Antenna>	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.

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

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	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 report meets the limits unless the uncertainty is taken into consideration.

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 Data of EMI, 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

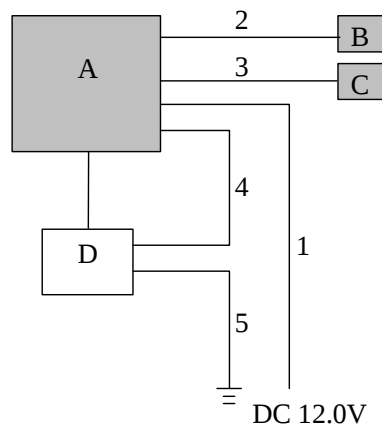
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : Transmitting mode (Tx) 134.2kHz
*The EUT does not transmit simultaneously from multiple antennas.

Justification : The system was configured in typical fashion (as a customer 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 test was performed with the representative component which constitute a system.
* During testing, transmitting antenna was fixed to one of two antennas(B,C), and the test was conducted with the worst duty.
Also, the number of connected antennas was no difference within this confirmation, although it was confirmed that some antennas would be added.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Computer Assy, Smart Key (ECU)	TS-9TY	003	-	EUT
B	D seat Antenna	-	19 1	-	EUT
C	Extra Antenna	-	00432	-	EUT
D	SW Box	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Antenna Cable	2.0	Unshielded	Unshielded	-
3	Antenna Cable	2.0	Unshielded	Unshielded	-
4	Signal Cable	2.0	Unshielded	Unshielded	-
5	Ground Cable	2.0	Unshielded	Unshielded	-

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No 1 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

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., 135 deg. and 180deg.) and horizontal polarization.

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

Frequency : From 30MHz to 1GHz at distance 3m

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.

Measurements were performed with a QP and PK detector.

The radiated emission measurements were made with the following detector function of the test receiver.

	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
Detector Type	PK	QP	PK	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz
Distance factor *1)	-80dB	-80dB	-80dB	-40dB	-

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

-40dB = $40 \times \log (3\text{m}/30\text{m})$

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

With the position, the noise levels of all the frequencies were measured.

Test data : **APPENDIX 1**

Test result : **Pass**

Date: May 30, 2014
May 31, 2014

Test engineer: Shinya Watanabe
Masatoshi Nishiguchi

UL Japan, Inc.

Ise EMC Lab.

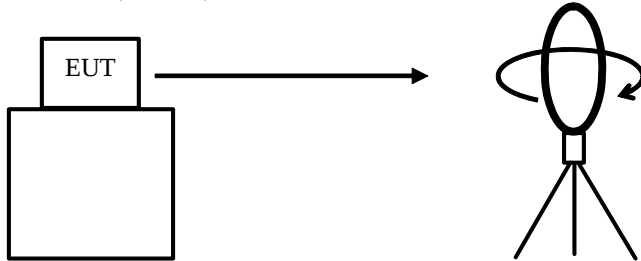
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

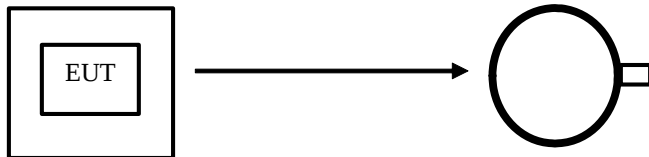
Facsimile : +81 596 24 8124

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

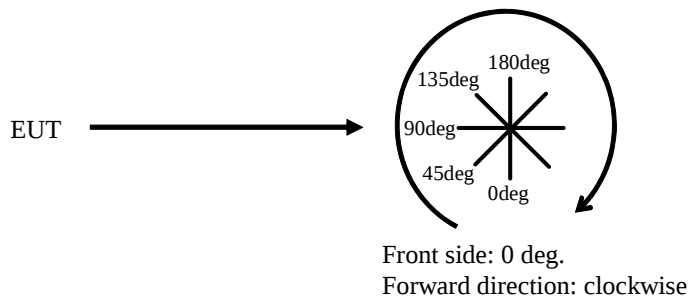


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



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	100kHz	1kHz	3kHz	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

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: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

D seat Antenna

Test place : Ise EMC Lab. No.1 Semi Anechoic Chamber
Order No. : 10327700H
Date : 05/31/2014
Temperature/ Humidity : 23 deg. C / 60% RH
Engineer : Masatoshi Nishiguchi
Mode : Tx 134.2kHz

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	0.13420	PK	99.2	20.0	-74.0	32.3	-	12.9	45.0	32.1	Fundamental
0	0.26840	PK	58.1	19.9	-73.9	32.2	-	-28.1	39.0	67.1	
0	0.40260	PK	48.5	19.8	-73.9	32.2	-	-37.8	35.5	73.3	
0	0.53680	QP	36.6	19.8	-33.9	32.2	-	-9.7	33.0	42.7	
0	0.67100	QP	33.1	19.8	-33.8	32.2	-	-13.1	31.1	44.2	
0	0.80520	QP	33.7	19.8	-33.8	32.2	-	-12.5	29.5	42.0	
0	0.93940	QP	32.0	19.8	-33.8	32.2	-	-14.2	28.1	42.3	
0	1.07360	QP	32.0	19.8	-33.8	32.2	-	-14.2	26.9	41.1	
0	1.20780	QP	31.2	19.8	-33.8	32.2	-	-15.0	25.9	40.9	
0	1.34200	QP	31.2	19.8	-33.7	32.2	-	-14.9	25.0	39.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + 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	0.134	PK	99.2	20.0	-74.0	32.3	0.0	12.9	25.0	12.1	
0	0.268	PK	58.1	19.9	-73.9	32.2	0.0	-28.1	19.0	47.1	
0	0.403	PK	48.5	19.8	-73.9	32.2	0.0	-37.8	15.5	53.3	

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

* Since the peak emission result satisfied the average limit, the peak emission result with Duty Factor was calculated as Duty 100%.

PK or QP (Result of the fundamental emission at 3m without Distance 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
0.000	0.134	PK	99.2	20.0	6	32.3	-	92.9	-	-	Fundamental

* All spurious emissions lower than this result.

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 below 30MHz (Fundamental and Spurious Emission)

Extra Antenna

Test place : Ise EMC Lab. No.1 Semi Anechoic Chamber
Order No. : 10327700H
Date : 05/31/2014
Temperature/ Humidity : 23 deg. C / 60% RH
Engineer : Masatoshi Nishiguchi
Mode : Tx 134.2kHz

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	0.13420	PK	77.8	20.0	-74.0	0.0	-	23.8	45.0	21.2	Fundamental
0	0.26840	PK	23.3	19.9	-73.9	0.0	-	-30.7	39.0	69.7	
0	0.40260	PK	16.8	19.8	-73.9	0.0	-	-37.3	35.5	72.8	
0	0.53680	QP	7.9	19.8	-33.9	0.0	-	-6.2	33.0	39.2	
0	0.67100	QP	6.9	19.8	-33.8	0.0	-	-7.1	31.1	38.2	
0	0.80520	QP	6.5	19.8	-33.8	0.0	-	-7.5	29.5	37.0	
0	0.93940	QP	5.9	19.8	-33.8	0.0	-	-8.1	28.1	36.2	
0	1.07360	QP	5.8	19.8	-33.8	0.0	-	-8.2	26.9	35.1	
0	1.20780	QP	5.3	19.8	-33.8	0.0	-	-8.7	25.9	34.6	
0	1.34200	QP	5.1	19.8	-33.7	0.0	-	-8.8	25.0	33.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor)

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	0.134	PK	77.8	20.0	-74.0	0.0	0.0	23.8	25.0	1.2	
0	0.268	PK	23.3	19.9	-73.9	0.0	0.0	-30.7	19.0	49.7	
0	0.403	PK	16.8	19.8	-73.9	0.0	0.0	-37.3	15.5	52.8	

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

* Since the peak emission result satisfied the average limit, the peak emission result with Duty Factor was calculated as Duty 100%.

PK or QP (Result of the fundamental emission at 3m without Distance 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
0.000	0.134	PK	77.8	20.0	6	0.0	-	103.8	-	-	Fundamental

* All spurious emissions lower than this result.

* Gain 0.0dB shows that the pre amplifier was not used to avoid the influence of carrier power.
The pre amplifier used for carrier frequency measurement was not saturated.

*The test result is rounded off to one or two decimal places, 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

Radiated Emission above 30MHz

DATA OF RADIATED EMISSION TEST

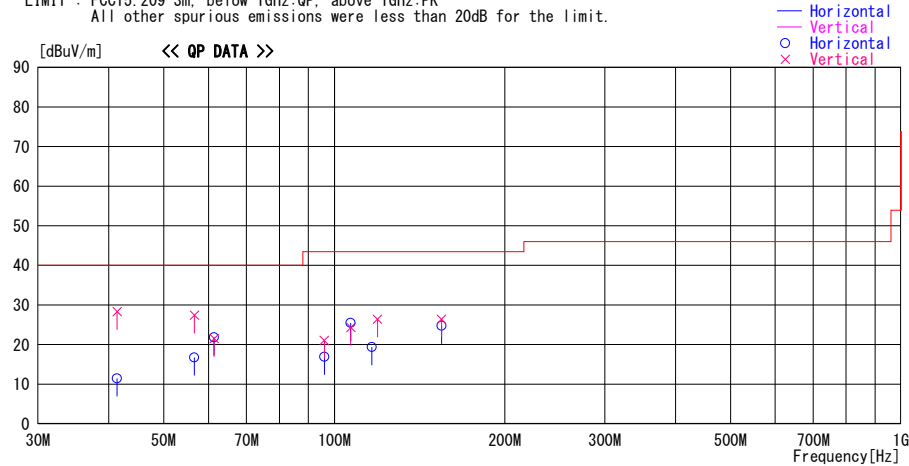
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/05/30

Report No. : 10327700H

Temp./Humi. : 24deg. C / 62% RH
Engineer : Shinya Watanabe

Mode / Remarks : Tx 134.2kHz D seat Antenna

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
41.373	29.0	QP	13.7	-31.2	11.5	0	100	Hori.	40.0	28.5	
41.373	45.8	QP	13.7	-31.2	28.3	136	100	Vert.	40.0	11.7	
56.654	38.8	QP	8.8	-30.9	16.7	171	289	Hori.	40.0	23.3	
56.654	49.5	QP	8.8	-30.9	27.4	99	100	Vert.	40.0	12.6	
61.383	45.0	QP	7.7	-30.9	21.8	171	348	Hori.	40.0	18.2	
61.383	44.7	QP	7.7	-30.9	21.5	98	100	Vert.	40.0	18.5	
96.012	37.9	QP	9.4	-30.4	16.9	165	324	Hori.	43.5	26.6	
96.012	42.1	QP	9.4	-30.4	21.1	80	100	Vert.	43.5	22.4	
106.875	44.7	QP	11.1	-30.3	25.5	0	278	Hori.	43.5	18.0	
106.875	43.5	QP	11.1	-30.3	24.3	164	100	Vert.	43.5	19.2	
116.436	37.3	QP	12.4	-30.3	19.4	0	230	Hori.	43.5	24.1	
119.227	43.8	QP	12.8	-30.2	26.4	159	100	Vert.	43.5	17.1	
154.606	39.4	QP	15.1	-29.8	24.7	64	178	Hori.	43.5	18.8	
154.606	41.1	QP	15.1	-29.8	26.4	136	100	Vert.	43.5	17.1	

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))

*The test result is rounded off to one or two decimal places, 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

Radiated Emission above 30MHz

DATA OF RADIATED EMISSION TEST

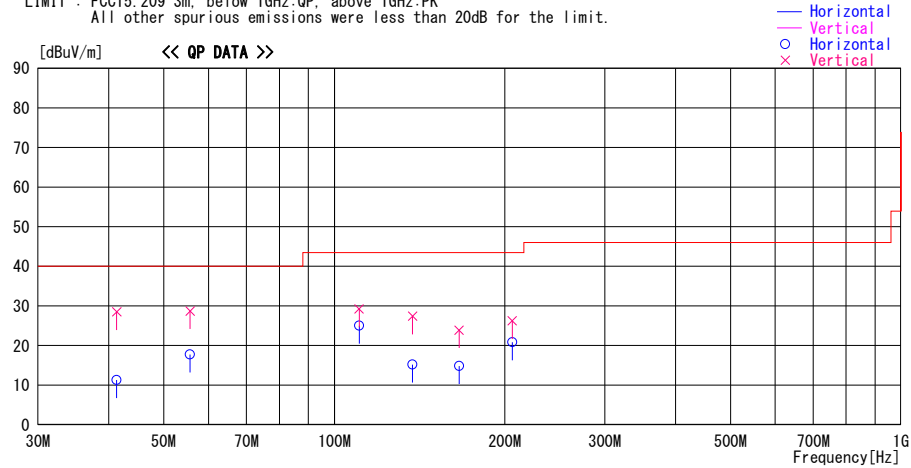
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/05/30

Report No. : 10327700H

Temp./Humi. : 24deg. C / 62% RH
Engineer : Shinya Watanabe

Mode / Remarks : Tx 134.2kHz Extra Antenna

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



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]	
41.300	28.8	QP	13.7	-31.2	11.3	0	100	Hori.	40.0	28.7	
41.300	46.0	QP	13.7	-31.2	28.5	81	100	Vert.	40.0	11.5	
55.666	39.5	QP	9.1	-30.9	17.7	154	360	Hori.	40.0	22.3	
55.666	50.5	QP	9.1	-30.9	28.7	196	100	Vert.	40.0	11.3	
110.676	43.6	QP	11.6	-30.2	25.0	0	197	Hori.	43.5	18.5	
110.676	47.8	QP	11.6	-30.2	29.2	132	100	Vert.	43.5	14.3	
137.429	30.9	QP	14.3	-30.0	15.2	61	313	Hori.	43.5	28.3	
137.429	43.1	QP	14.3	-30.0	27.4	88	100	Vert.	43.5	16.1	
165.996	29.0	QP	15.6	-29.8	14.8	0	308	Hori.	43.5	28.7	
165.996	38.1	QP	15.6	-29.8	23.9	126	100	Vert.	43.5	19.6	
206.145	33.8	QP	16.5	-29.5	20.8	177	276	Hori.	43.5	22.7	
206.145	39.2	QP	16.5	-29.5	26.2	198	100	Vert.	43.5	17.3	

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))

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

UL Japan, Inc.

Ise EMC Lab.

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

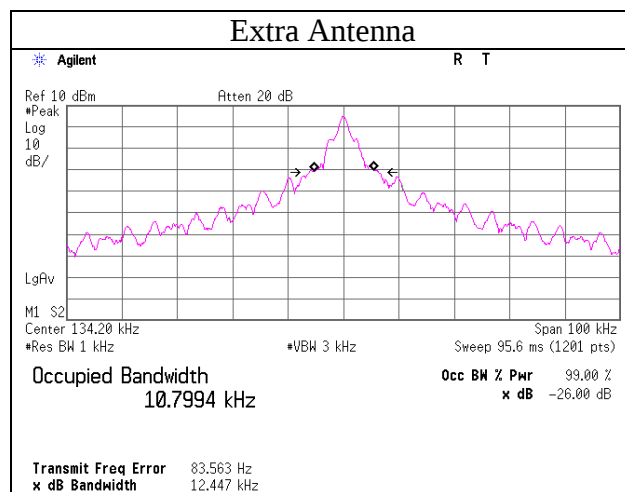
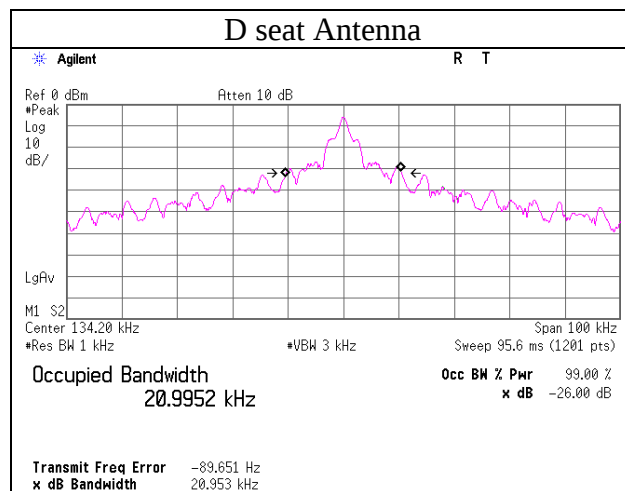
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

-26dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10327700H
Date	05/31/2014
Temperature/ Humidity	23 deg. C / 60% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 134.2kHz

Mode	Frequency [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
D seat Antenna	134.2	20.953	20.995
Extra Antenna	134.2	12.447	10.799



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
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2013/11/24 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2013/11/24 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2013/11/26 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/T SJ	-	-	RE	2013/09/12 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2014/02/17 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2013/10/30 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2013/07/22 * 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
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2013/11/25 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:

RE: Spurious emission

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