RADIO TEST REPORT

Test Report No. : 10168692H-R1

Applicant	:	**FUJI MACHINE MFG.CO.,LTD.**
Type of Equipment	:	**Feeder**
Model No.	:	**Hexa Feeder**
Test regulation	:	**FCC Part 15 Subpart C: 2013**
FCC ID	:	**2ABSP-HEXA FEEDER**
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 10168692H. 10168692H is replaced with this report.

Date of test: January 25 to March 20, 2014

Representative test engineer:
Tsubasa Takayama
Engineer of WiSE Japan,
UL Verification Service

Approved by:
Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service

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

REVISION HISTORY

Original Test Report No.: 10168692H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10168692H	March 3, 2014	-	-
1	10168692H-R1	March 20, 2014	P.5	Correction of Worst margin
1	10168692H-R1	March 20, 2014	P.8	Correction of Frequency Tolerance voltage
1	10168692H-R1	March 20, 2014	P.22	Correction of test data

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SECTION 1: Customer information

Company Name	:	FUJI MACHINE MFG.CO.,LTD.
Address	:	19 Chausuyama, Yamamachi Chiryu, Aichi, 472-8686, Japan
Telephone Number	:	+81-566-81-8228
Facsimile Number	:	+81-566-81-8213
Contact Person	:	Motonori Kimura

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

2.1 Identification of E.U.T.

Type of Equipment	:	Feeder
Model No.	:	Hexa Feeder
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	January 23, 2014
Country of Mass-production	:	Japan
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

General Specification

Clock frequency(ies) in the system	:	13.56MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56MHz
Modulation	:	ASK
Power Supply (inner)	:	DC +1.8, +5.0V
Antenna type	:	Loop Antenna
Antenna Gain	:	-63dBi
Operating Temperature	:	+15 deg. C. -+35 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.225 : Operation within the band 13.110-14.010MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	[QP] 11.3dB, 13.56000MHz, N [AV] 3.2dB, 21.20269MHz, N	Complied	-
	<IC>RSS-Gen 7.2.2	<IC>RSS-Gen 7.2.2			
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(a)	94.8dB, 13.56000MHz, QP, 0deg.	Complied	Radiated
	<IC> RSS-Gen 4.8, 4.11	<IC>RSS-210 A2.6			
Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(b)(c)	45.5dB, 14.01000MHz, QP, 0deg.	Complied	Radiated
	<IC>RSS-Gen 4.9, 4.11	<IC> RSS-210 A2.6			
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.215(c)	See data	Complied	Radiated
	<IC> - *	<IC> - *			
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.209, Section 15.225 (d)	2.3dB 31.610MHz, Vertical, QP	Complied	Radiated
	<IC>RSS-Gen 4.9, 4.11	<IC>RSS-210 A2.6			
Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.225(e)	See data	Complied	Radiated
	<IC>RSS-Gen 4.7	<IC> RSS-210 A2.6			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

FCC 15.31 (e)
This EUT provides stable voltage (DC 1.8V and DC 5.0V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Conducted emission (±dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

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

Frequency counter (±)	
Normal condition	Extreme condition
7×10^{-6}	9×10^{-6}

Conducted emission test
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

Radiated emission test
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Head Office 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

	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	2.4 x 3.4m	-

* 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 set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used :

Mode	Remarks
RFID Transmitting (Tx) and Receiving (Rx) mode	with Tag 1 slog *1) with Tag 3 slots *2) without Tag 1 slot *3) without Tag 3 slots *3)
Unmodulated Transmitting (Tx) mode	1 slot *4)
The EUT was operated in a manner similar to typical use during the tests. The EUT Transmits and Receives at the same time and there is no receiving mode. *1) Radiated emission (Fundamental, Spurious Emission and Spectrum Musk), 20dB Bandwidth, 99% Occupied Bandwidth and Frequency Tolerance *2) Radiated emission (Fundamental, Spurious Emission and Spectrum Musk) *3) Conducted emission *4) Frequency Tolerance	

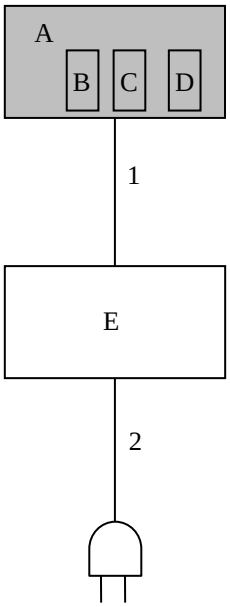
* As for Conducted emission and Radiated emission, the test data was compared between with Tag and without Tag, then tests were performed with worst case mode.
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -30deg.C to +50deg.C Step 10deg.C
Voltage : Normal Voltage AC 120V
Maximum Voltage DC 27.6V, Minimum Voltage DC 20.4V (DC 24V ±15%)
*This EUT provides stable voltage(DC 1.8V, DC 5.0V) constantly to RF Part regardless of input voltage

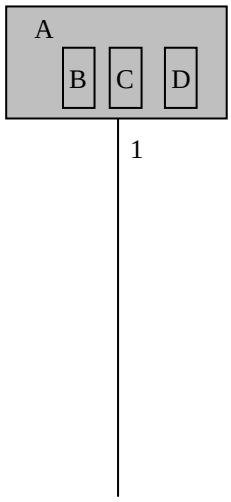
4.2 Configuration and peripherals

[Conducted emission]



AC 120 V/60Hz

[Radiated emission]



DC 24V

* 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	Feeder	Hexa Feeder	KTH08 000046	FUJI MACHINE MFG.CO.,LTD.	EUT
B	Cassette	Cassette	KTC08 000052	FUJI MACHINE MFG.CO.,LTD.	EUT
C	Cassette	Cassette	KTC08 000202	FUJI MACHINE MFG.CO.,LTD.	EUT
D	Cassette	Cassette	KTC08 000235	FUJI MACHINE MFG.CO.,LTD.	EUT
E	RATING OF MACHINE	AA875	FSU4000-01	FUJI MACHINE MFG.CO.,LTD.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC and signal Cable	5.0	Shielded	Shielded	-
2	AC Cable	2.9	Unshielded	Unshielded	-

SECTION 5: Conducted emission

5.1 Operating environment

Test place : No.2 semi anechoic chamber.
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment.
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a semi Anechoic Chamber.
Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 0.15MHz-30MHz
EUT position : Table top
EUT operation mode : Tx 13.56MHz without Tag

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber.
The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN).
An overview sweep with peak detection has been performed.
The measurements had been performed with a quasi-peak detector and if required, with an average detector.
The conducted emission measurements were made with the following detector function of the test receiver.
Detector Type : QP and CISPR AV
IF Bandwidth : 9kHz

5.5 Test result

Summary of the test results : Pass

SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask)

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, 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.
The height of the measuring antenna varied between 1 and 4m 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 (angle of loop antenna: 0deg., 45deg., 90deg., 135deg. and 180deg.) and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
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
Antenna Type	Loop	Biconical	Logperiodic

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

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

* FCC Part 15 Section 15.31 (f)(2) / IC RSS-Gen 4.11 (9kHz-30MHz)

$$9\text{kHz} - 490\text{kHz}\,[\text{Limit at 3m}] = [\text{Limit at 300m}] - 40\log\left(\frac{3}{300}\right)$$

$$490\text{kHz} - 30\text{MHz}[\text{Limit at 3m}] = [\text{Limit at 30m}] - 40\log\left(\frac{3}{30}\right)$$

Measurement range : **0.009M-1GHz**
Test data : **APPENDIX**
Test result : **Pass**

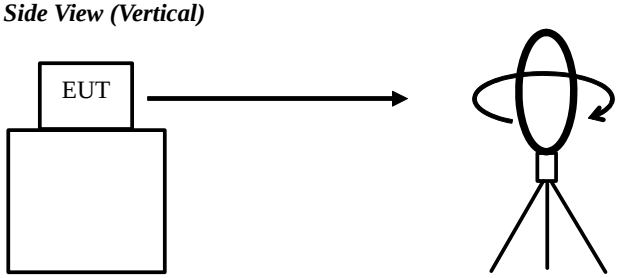
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	100kHz	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.							

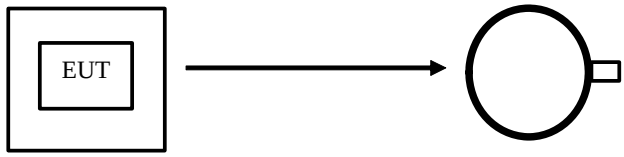
Test data : **APPENDIX**
Test result : **Pass**

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

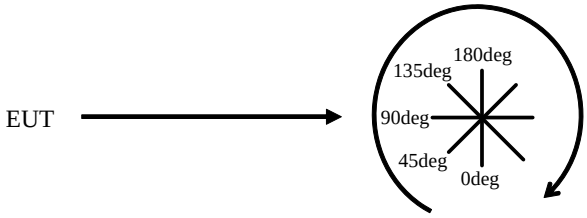


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

APPENDIX 1: Data of EMI test

Conducted emission

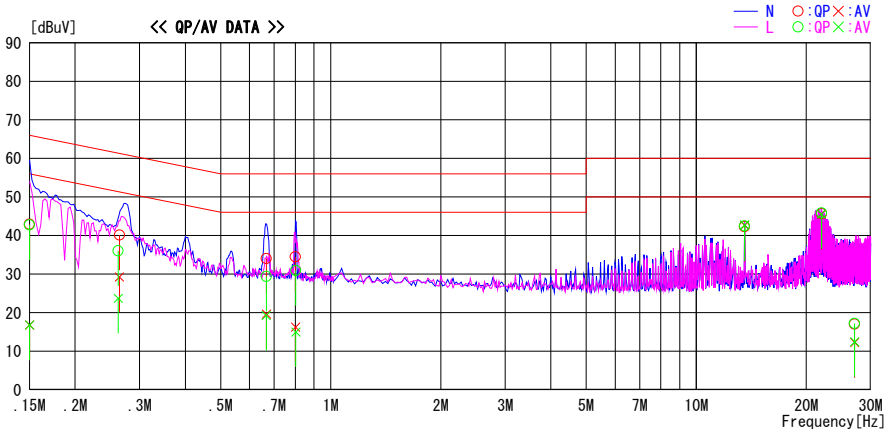
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/02/01

Report No. : 10168692H
Power : AC120V/60Hz
Temp./Humi. : 25deg. C / 25% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz without TAG 1slot

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15000	29.7	3.6	13.2	42.9	16.8	66.0	56.0	23.1	39.2	N
0.26418	26.9	16.1	13.2	40.1	29.3	61.3	51.3	21.2	22.1	N
0.66687	20.7	6.3	13.3	34.0	19.6	56.0	46.0	22.0	26.4	N
0.80130	21.1	2.9	13.3	34.4	16.2	56.0	46.0	21.6	29.8	N
13.56000	27.6	27.9	14.7	42.3	42.6	60.0	50.0	17.7	7.4	N
22.00324	30.4	30.3	15.2	45.6	45.5	60.0	50.0	14.4	4.5	N
27.12000	1.7	-3.1	15.3	17.0	12.2	60.0	50.0	43.0	37.8	N
0.15000	29.5	3.6	13.2	42.7	16.8	66.0	56.0	23.3	39.2	L
0.26220	22.8	10.5	13.2	36.0	23.7	61.4	51.4	25.4	27.7	L
0.66645	16.1	5.9	13.3	29.4	19.2	56.0	46.0	26.6	26.8	L
0.80250	17.6	1.7	13.3	30.9	15.0	56.0	46.0	25.1	31.0	L
13.56000	27.7	28.1	14.7	42.4	42.8	60.0	50.0	17.6	7.3	L
22.00400	30.7	30.4	15.2	45.9	45.6	60.0	50.0	14.1	4.4	L
27.12000	1.9	-2.8	15.3	17.2	12.5	60.0	50.0	42.8	37.5	L

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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

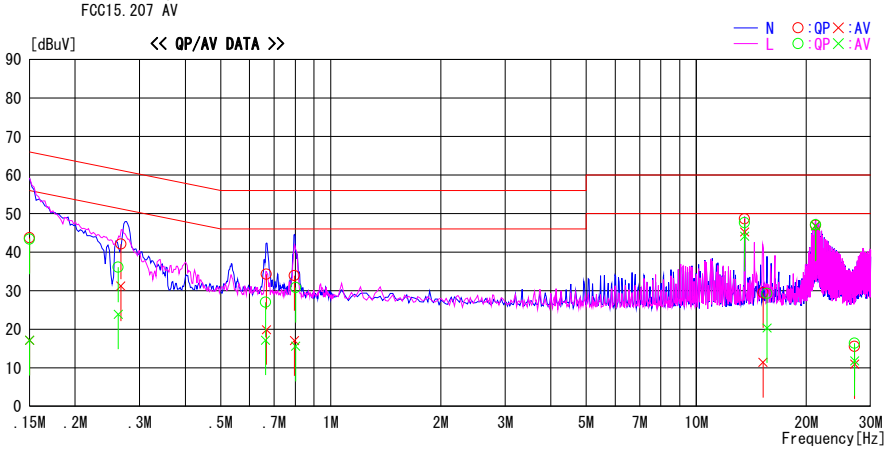
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/02/01

Report No. : 10168692H
Power : AC120V/60Hz
Temp./Humi. : 25deg. C / 25% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz without TAG 3slots

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15000	30.5	4.0	13.2	43.7	17.2	66.0	56.0	22.3	38.8	N
0.26654	28.9	18.0	13.2	42.1	31.2	61.2	51.2	19.1	20.0	N
0.66685	21.0	6.6	13.3	34.3	19.9	56.0	46.0	21.7	26.1	N
0.79597	20.6	3.7	13.3	33.9	17.0	56.0	46.0	22.1	29.0	N
13.56000	34.0	30.5	14.7	48.7	45.2	60.0	50.0	11.3	4.8	N
15.22339	14.7	-3.4	14.8	29.5	11.4	60.0	50.0	30.5	38.6	N
21.20269	31.9	31.7	15.1	47.0	46.8	60.0	50.0	13.0	3.2	N
0.15000	30.2	3.9	13.2	43.4	17.1	66.0	56.0	22.6	38.9	L
0.26215	22.9	10.7	13.2	36.1	23.9	61.4	51.4	25.3	27.5	L
0.66339	13.8	3.9	13.3	27.1	17.2	56.0	46.0	29.0	28.8	L
0.80157	17.5	2.3	13.3	30.8	15.6	56.0	46.0	25.2	30.4	L
13.56000	32.9	29.4	14.7	47.6	44.1	60.0	50.0	12.4	5.9	L
15.60860	14.5	5.6	14.8	29.3	20.4	60.0	50.0	30.7	29.6	L
21.20539	32.0	31.7	15.1	47.1	46.8	60.0	50.0	12.9	3.3	L
27.12000	0.3	-4.3	15.3	15.6	11.0	60.0	50.0	44.4	39.0	N
27.12000	1.1	-3.5	15.3	16.4	11.8	60.0	50.0	43.6	38.2	L

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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

Fundamental emission and Spectrum Mask

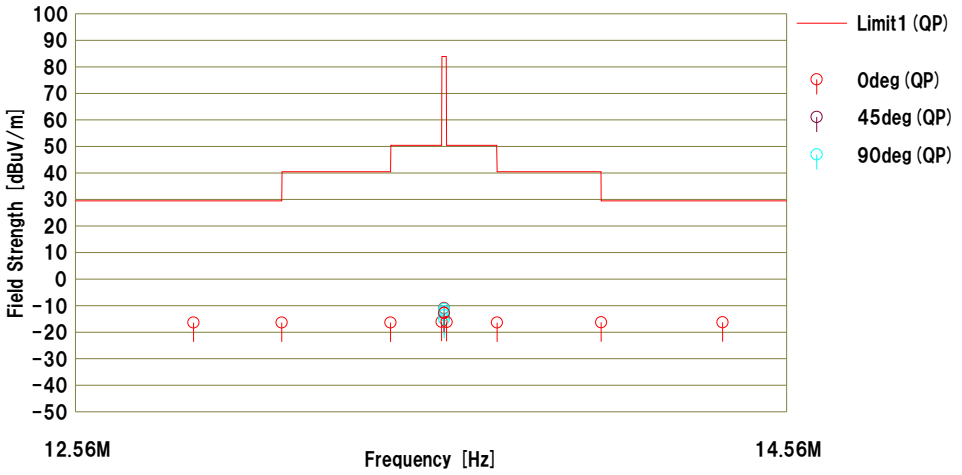
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/01/25

Report No. : 10168692H
Power : DC 24V
Temp./Humi. : 22deg. C / 40% RH
Engineer : Kazuya Yoshioka

Mode / Remarks : RFID Tx and Rx mode wih tag 1slot

Limit1 : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq.	Reading <QP>	Ant.Fac	Loss	Gain	Result <QP>	Limit <QP>	Margin <QP>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]		[deg]	
1	12.87200	29.0	19.7	-32.9	32.2	-16.4	29.5	45.9	0deg	82	
2	13.11000	29.0	19.7	-32.9	32.2	-16.4	29.5	45.9	0deg	82	
3	13.41000	28.9	19.7	-32.8	32.2	-16.4	40.5	56.9	0deg	82	
4	13.55300	29.2	19.7	-32.8	32.2	-16.1	50.4	66.5	0deg	82	
5	13.56000	32.7	19.7	-32.8	32.2	-12.6	83.9	96.5	45deg	55	
6	13.56000	30.2	19.7	-32.8	32.2	-15.1	83.9	99.0	90deg	0	
7	13.56000	34.4	19.7	-32.8	32.2	-10.9	83.9	94.8	0deg	82	
8	13.56000	31.7	19.7	-32.8	32.2	-13.6	83.9	97.5	90deg	75	Hori
9	13.56000	33.2	19.7	-32.8	32.2	-12.1	83.9	96.0	90deg	92	135deg
10	13.56000	34.1	19.7	-32.8	32.2	-11.2	83.9	95.1	90deg	75	180deg
11	13.56000	32.5	19.7	-32.8	32.2	-12.8	83.9	96.7	0deg	60	without tag
12	13.56700	29.1	19.7	-32.8	32.2	-16.2	50.4	66.6	0deg	82	
13	13.71000	28.9	19.7	-32.8	32.2	-16.4	40.5	56.9	0deg	82	
14	14.01000	29.0	19.7	-32.8	32.2	-16.3	29.5	45.8	0deg	82	
15	14.36800	29.0	19.7	-32.8	32.2	-16.3	29.5	45.8	0deg	82	

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

Fundamental emission and Spectrum Mask

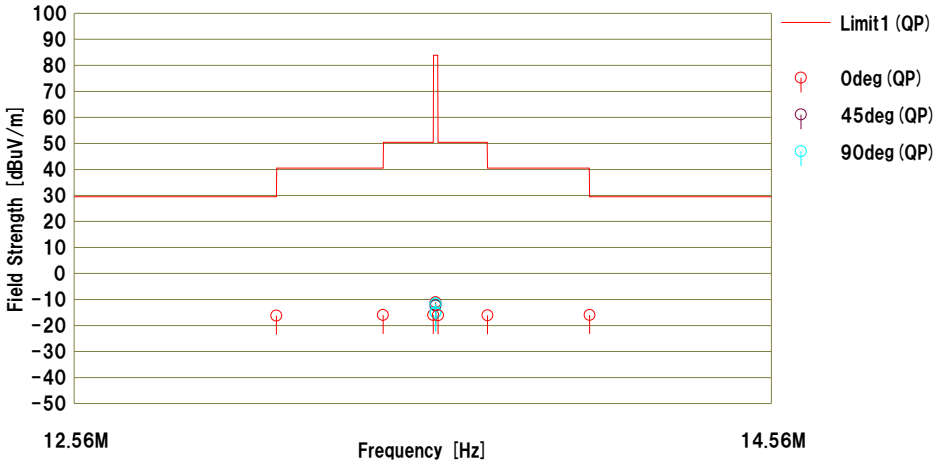
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/01/30

Report No. : 10168692H
Power : DC 24V
Temp./Humi. : 20deg. C / 34% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : RFID Tx and Rx mode wih tag, 3slots

Limit1 : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq.	Reading <QP>	Ant.Fac	Loss	Gain	Result <QP>	Limit <QP>	Margin <QP>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]		[deg]	
1	13.11000	29.1	19.7	-32.8	32.2	-16.2	29.5	45.7	0deg	67	
2	13.41000	29.2	19.7	-32.7	32.2	-16.0	40.5	56.5	0deg	67	
3	13.55300	29.2	19.7	-32.7	32.2	-16.0	50.4	66.4	0deg	67	
4	13.56000	32.7	19.7	-32.7	32.2	-12.5	83.9	96.4	90deg	73	135deg
5	13.56000	33.8	19.7	-32.7	32.2	-11.4	83.9	95.3	90deg	67	180deg
6	13.56000	30.4	19.7	-32.7	32.2	-14.8	83.9	98.7	90deg	287	Hori
7	13.56000	34.1	19.7	-32.7	32.2	-11.1	83.9	95.0	0deg	67	
8	13.56000	32.9	19.7	-32.7	32.2	-12.3	83.9	96.2	45deg	28	
9	13.56000	30.1	19.7	-32.7	32.2	-15.1	83.9	99.0	90deg	355	
10	13.56000	33.6	19.7	-32.7	32.2	-11.6	83.9	95.5	90deg	73	without Tag
11	13.56700	29.1	19.7	-32.7	32.2	-16.1	50.4	66.5	0deg	67	
12	13.71000	29.1	19.7	-32.7	32.2	-16.1	40.5	56.6	0deg	67	
13	14.01000	29.2	19.7	-32.7	32.2	-16.0	29.5	45.5	0deg	67	

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

Spurious emission

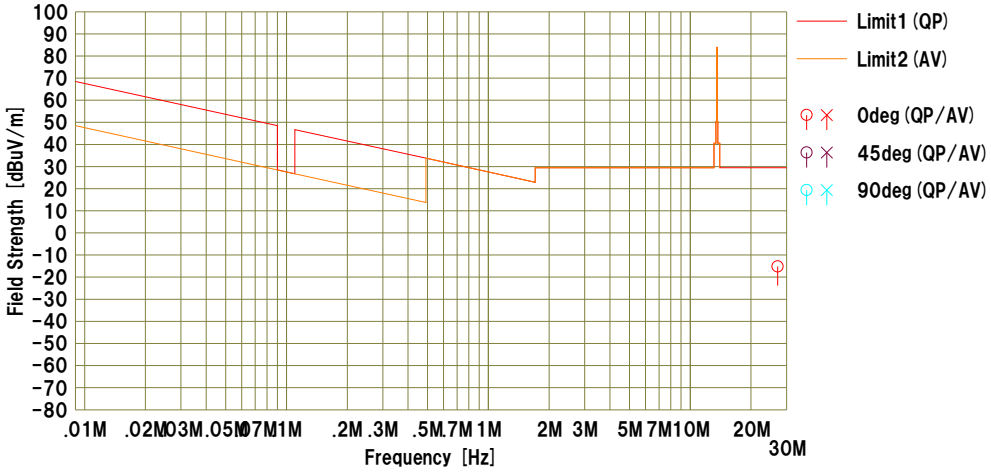
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/01/25

Report No. : 10168692H
Power : DC 24V
Temp./Humi. : 22deg. C / 40% RH
Engineer : Kazuya Yoshioka

Mode / Remarks : RFID Tx and Rx mode with tag 1slot

Limit1 : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
Limit2 : FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



No.	Freq.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	27.12000	28.6	---	20.7	-32.3	32.2	-15.2	---	29.5	---	44.7	---	0deg	0	

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

Spurious emission

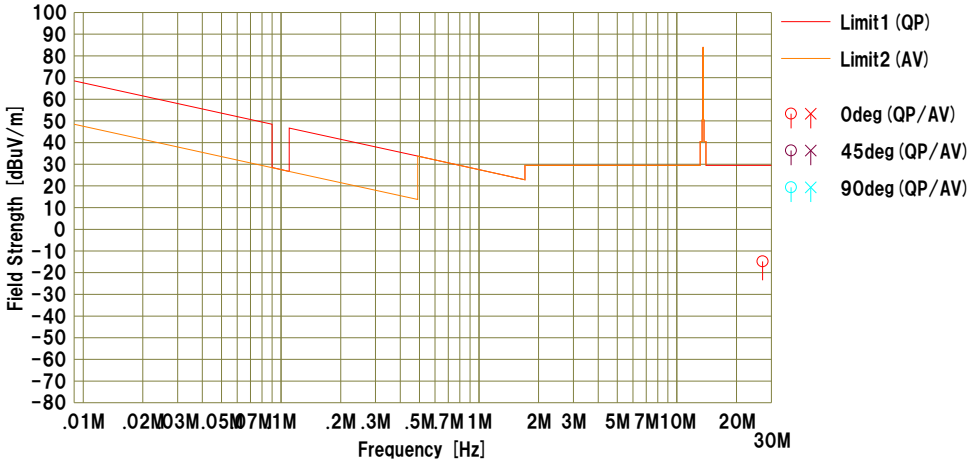
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/01/30

Report No. : 10168692H
Power : DC 24V
Temp./Humi. : 20deg. C / 34% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : RFID Tx and Rx mode wih tag, 3slots

Limit1 : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
Limit2 : FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



No.	Freq.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	27.12000	28.9	---	20.7	-32.2	32.2	-14.8	---	29.5	---	44.3	---	0deg	0	

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

Spurious emission

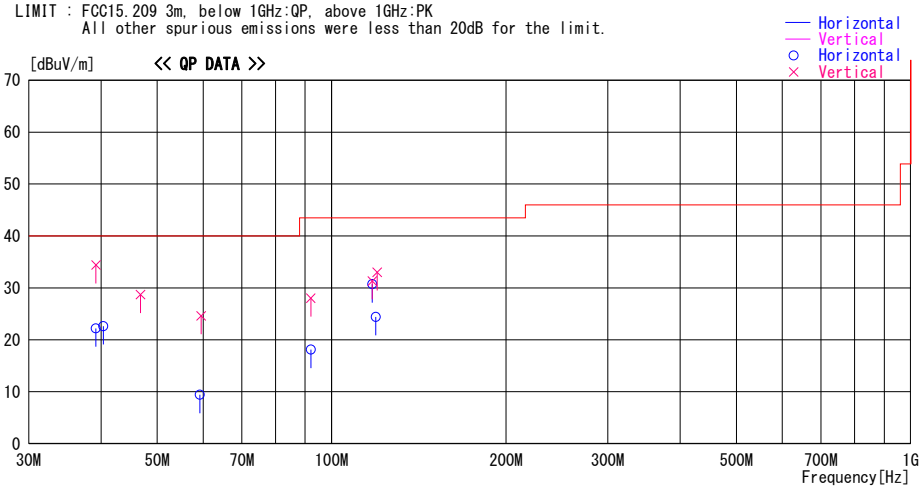
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/01/27

Report No. : 10168692H
Power : DC 24V
Temp./Humi. : 22deg.C / 30% RH
Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz with Tag 1 slot

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



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
39.180	29.2	QP	14.8	-21.8	22.2	229	302	Hori.	40.0	17.8	
39.180	41.4	QP	14.8	-21.8	34.4	119	100	Vert.	40.0	5.6	
40.352	29.9	QP	14.4	-21.7	22.6	281	237	Hori.	40.0	17.4	
46.774	38.2	QP	12.1	-21.6	28.7	304	100	Vert.	40.0	11.3	
59.218	23.1	QP	7.7	-21.4	9.4	77	109	Hori.	40.0	30.6	
59.543	38.4	QP	7.6	-21.4	24.6	338	100	Vert.	40.0	15.4	*1
92.070	30.4	QP	8.8	-21.1	18.1	89	316	Hori.	43.5	25.4	
92.070	40.3	QP	8.8	-21.1	28.0	0	100	Vert.	43.5	15.5	
117.531	39.1	QP	12.4	-20.8	30.7	100	165	Hori.	43.5	12.8	
117.560	39.7	QP	12.4	-20.8	31.3	67	100	Vert.	43.5	12.2	
119.279	32.6	QP	12.6	-20.8	24.4	292	201	Hori.	43.5	19.1	
119.871	41.2	QP	12.6	-20.8	33.0	79	100	Vert.	43.5	10.5	

*1: These are not radio noises.

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

Spurious emission

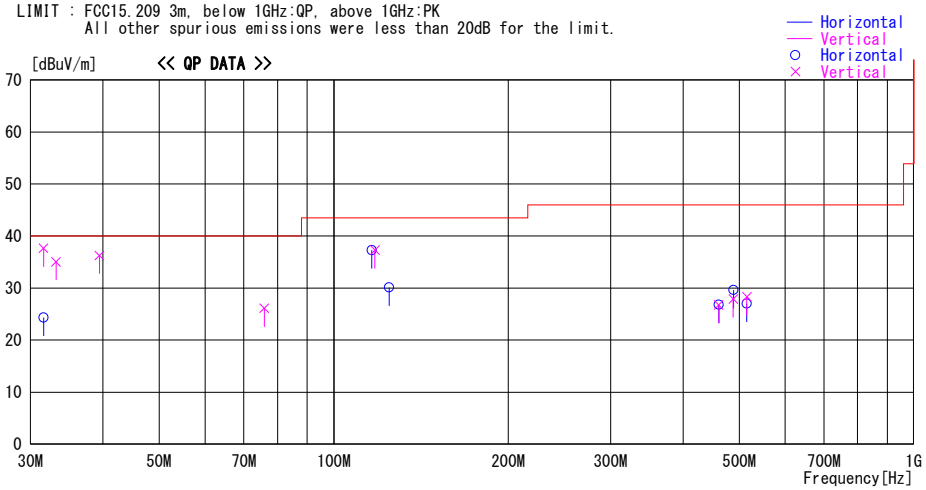
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/01/31

Report No. : 10168692H
Power : DC 24V
Temp./Humi. : 25deg. C / 25% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz with Tag 3slots

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]	
31.598	28.6	QP	17.7	-22.0	24.3	272	315	Hori.	40.0	15.7	*1
31.610	42.0	QP	17.7	-22.0	37.7	157	100	Vert.	40.0	2.3	
39.450	43.2	QP	14.8	-21.7	36.3	174	100	Vert.	40.0	3.8	
75.900	41.0	QP	6.4	-21.3	26.1	209	100	Vert.	40.0	13.9	
116.275	45.7	QP	12.4	-20.8	37.3	263	288	Hori.	43.5	6.2	
117.750	45.5	QP	12.6	-20.8	37.3	139	100	Vert.	43.5	6.2	
124.500	37.5	QP	13.2	-20.6	30.1	270	140	Hori.	43.5	13.4	
33.216	39.9	QP	17.0	-21.8	35.1	9	100	Vert.	40.0	5.0	
461.100	28.0	QP	17.8	-19.0	26.8	227	158	Hori.	46.0	19.2	
461.050	28.0	QP	17.8	-19.0	26.8	6	100	Vert.	46.0	19.2	
488.500	30.7	QP	18.0	-19.0	29.7	220	166	Hori.	46.0	16.3	
488.180	28.9	QP	18.0	-19.0	27.9	11	100	Vert.	46.0	18.1	
515.290	27.7	QP	18.3	-18.9	27.1	220	160	Hori.	46.0	19.0	
515.295	28.9	QP	18.3	-18.9	28.3	0	100	Vert.	46.0	17.7	

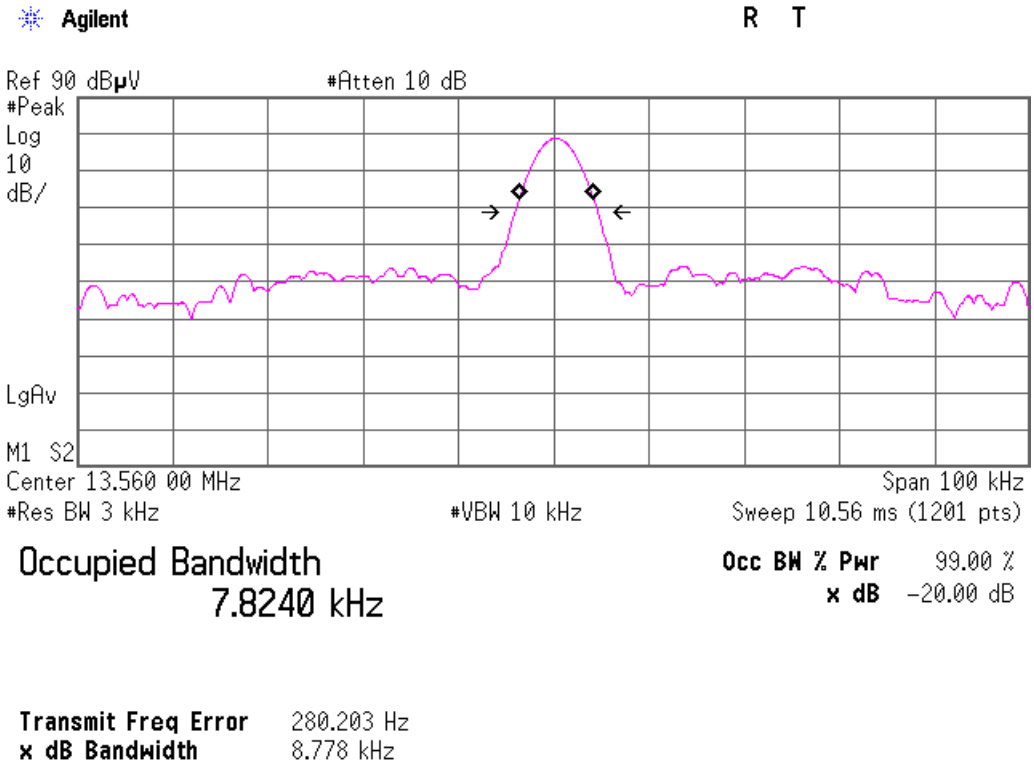
*1: These are not radio noises.

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

20dB Bandwidth and 99% Occupied Bandwidth

Test place	Head Office EMC Lab. No.11 measurement room
Report No.	10168692H
Date	01/31/2014
Temperature/ Humidity	20 deg. C / 51% RH
Engineer	Takumi Shimada
Mode	Tx Mod on with Tag 1slot

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	8.78	7.82



Frequency Tolerance

Test place	Head Office EMC Lab. No.11 measurement room	
Report No.	10168692H	
Date	01/31/2014	03/20/2014
Temperature/ Humidity	20 deg. C / 51% RH	22 deg. C / 32% RH
Engineer	Takumi Shimada	Takumi Shimada
Mode	Tx Mod off 1slot	Tx Mod off 1slot

Test Condition deg.C	Volts	Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	20.4V	Power on	13.56023195	0.00023195	17.11	100.00	82.89
		on 2min.	13.56020875	0.00020875	15.39	100.00	84.61
		on 5min.	13.56020742	0.00020742	15.30	100.00	84.70
		on 10min.	13.56020752	0.00020752	15.30	100.00	84.70
	24V	Power on	13.56023139	0.00023139	17.06	100.00	82.94
		on 2min.	13.56020780	0.00020780	15.32	100.00	84.68
		on 5min.	13.56020680	0.00020680	15.25	100.00	84.75
		on 10min.	13.56020616	0.00020616	15.20	100.00	84.80
	27.6V	Power on	13.56024010	0.00024010	17.71	100.00	82.29
		on 2min.	13.56020843	0.00020843	15.37	100.00	84.63
		on 5min.	13.56020750	0.00020750	15.30	100.00	84.70
		on 10min.	13.56020822	0.00020822	15.36	100.00	84.64
50deg.C.	24V	Power on	13.56017535	0.00017535	12.93	100.00	87.07
		on 2min.	13.56018385	0.00018385	13.56	100.00	86.44
		on 5min.	13.56018535	0.00018535	13.67	100.00	86.33
		on 10min.	13.56018761	0.00018761	13.84	100.00	86.16
40deg.C.		Power on	13.56018991	0.00018991	14.01	100.00	85.99
		on 2min.	13.56017308	0.00017308	12.76	100.00	87.24
		on 5min.	13.56017282	0.00017281	12.74	100.00	87.26
		on 10min.	13.56017254	0.00017254	12.72	100.00	87.28
30deg.C.		Power on	13.56020975	0.00020975	15.47	100.00	84.53
		on 2min.	13.56018236	0.00018236	13.45	100.00	86.55
		on 5min.	13.56018118	0.00018118	13.36	100.00	86.64
		on 10min.	13.56018099	0.00018099	13.35	100.00	86.65
20deg.C.		Power on	13.56023139	0.00023139	17.06	100.00	82.94
		on 2min.	13.56020780	0.00020780	15.32	100.00	84.68
		on 5min.	13.56020680	0.00020680	15.25	100.00	84.75
		on 10min.	13.56020616	0.00020616	15.20	100.00	84.80
10deg.C.		Power on	13.56029385	0.00029385	21.67	100.00	78.33
		on 2min.	13.56024084	0.00024084	17.76	100.00	82.24
		on 5min.	13.56023792	0.00023792	17.55	100.00	82.45
		on 10min.	13.56023791	0.00023791	17.55	100.00	82.45
0deg.C.		Power on	13.56032693	0.00032692	24.11	100.00	75.89
		on 2min.	13.56027925	0.00027925	20.59	100.00	79.41
		on 5min.	13.56027555	0.00027555	20.32	100.00	79.68
		on 10min.	13.56027529	0.00027529	20.30	100.00	79.70
-10deg.C.		Power on	13.56034242	0.00034242	25.25	100.00	74.75
		on 2min.	13.56031038	0.00031038	22.89	100.00	77.11
		on 5min.	13.56030958	0.00030958	22.83	100.00	77.17
		on 10min.	13.56030914	0.00030914	22.80	100.00	77.20
-20deg.C		Power on	13.56033683	0.00033683	24.84	100.00	75.16
		on 2min.	13.56033566	0.00033566	24.75	100.00	75.25
		on 5min.	13.56033446	0.00033446	24.67	100.00	75.33
		on 10min.	13.56033446	0.00033446	24.66	100.00	75.34
-30deg.C		Power on	13.56034745	0.00034745	25.62	100.00	74.38
		on 2min.	13.56033860	0.00033860	24.97	100.00	75.03
		on 5min.	13.56033869	0.00033869	24.98	100.00	75.02
		on 10min.	13.56033877	0.00033877	24.98	100.00	75.02

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

*The test was begun from 50 deg.C and the temperature was lowered each 10 deg.C.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2013/06/11 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2013/10/13 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2013/10/13 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2013/11/26 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 12
MRENT-112	Spectrum Analyzer	Agilent	E4440A	MY48250080	FT	2013/10/04 * 12
MCH-05	Temperature and Humidity Chamber	Tabai Espec	PL-1KP	14019569	FT	2013/05/16 * 12
MLPA-06	Loop Antenna	UL Japan	-	-	FT	Pre Check
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2013/12/17 * 12
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE,CE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE,CE	2013/11/25 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100300	RE,CE	2013/06/11 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE	2014/01/27 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	CE	2013/02/06 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
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	2013/02/26 * 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
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	2013/03/12 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 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: CE: Conducted Emission
RE: Radiated Emission
FT: Frequency Tolerance