RADIO TEST REPORT

Test Report No. : 10662757H-R1

Applicant	:	**FUJI MACHINE MFG.CO.,LTD.**
Type of Equipment	:	**Unit**
Model No.	:	**FH1745 RFID Unit**
Test regulation	:	**FCC Part 15 Subpart C: 2015**
FCC ID	:	**2ABSPFH1745**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10662757H. 10662757H is replaced with this report.

Date of test: March 16 to April 17, 2015

Representative test engineer:

Hironobu Ohnishi
Engineer
Consumer Technology Division

Approved by:

Takayuki Shimada
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

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REVISION HISTORY

Original Test Report No.: 10662757H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10662757H	March 25, 2015	-	-
1	10662757H-R1	April 20, 2015	P.5	Correction of FCC 15.31 (e) sentence
1	10662757H-R1	April 20, 2015	P.18	Addition 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	:	Takashi Hirano

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

2.1 Identification of E.U.T.

Type of Equipment	:	Unit
Model No.	:	FH1745 RFID Unit
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	February 10, 2015
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 +1.8V, +3.3V
Antenna type	:	Loop Antenna
Antenna Gain	:	-63dBi
Operating Temperature	:	-20 deg. C. - +55 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2015, final revised on January 21, 2015
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 C63.4:2009 7. AC powerline conducted emission measurements	Section 15.207	[QP] 16.2dB [AV] 13.4dB 0.15170MHz, L / 0.15171MHz, N	Complied	Conducted
Electric Field Strength of Fundamental Emission	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.225(a)	99.0dB 13.56000MHz, QP	Complied	Radiated
Spectrum Mask	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.225(b)(c)	45.8dB 13.11000MHz, QP	Complied	Radiated
20dB Bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.215(c)	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.209, Section 15.225 (d)	20.5dB 45.750MHz, QP, Vertical	Complied	Radiated
Frequency Tolerance	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.225(e)	See data	Complied	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

FCC Part 15.31 (e)
The stable voltage (DC1.8V and 3.3V) was provided to the EUT during the tests.
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 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)	**Conducted emission (±dB)**
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.4dB
No.4	3.5dB

Test room (semi-anechoic chamber)	**Radiated emission (10m*)(±dB)**		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	4.2dB	5.3dB	4.9dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

*10m = Measurement distance

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	4.3dB	5.5dB	6.3dB	5.5dB	5.8dB	5.8dB	4.3dB
No.2	4.2dB	5.4dB	6.3dB	5.4dB	5.7dB	5.9dB	5.6dB
No.3	4.4dB	5.4dB	6.4dB	5.2dB	5.5dB	5.8dB	5.5dB
No.4	4.7dB	5.6dB	6.4dB	5.3dB	5.7dB	5.9dB	5.5dB

*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 test report has enough margin, more than the site margin.

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
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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 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	The EUT Transmits and Receives at the same time and there is no receiving mode.
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.	

Test Item	Operating mode*
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission Spectrum Mask 20dB Bandwidth 99% Occupied Bandwidth	Tx and Rx Mod on, without Tag
Frequency Tolerance	Tx Mod off

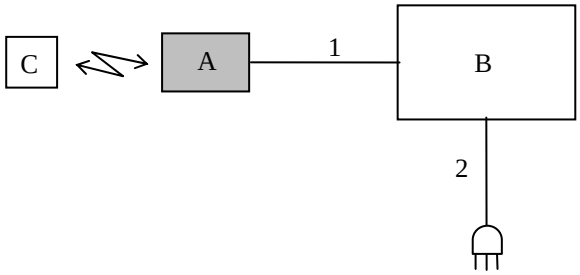
* After the comparison of the test data between with Tag and without Tag, the tests were performed with the worst case.

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

Frequency Tolerance:

Temperature : -20deg.C to +50deg.C Step 10deg.C
Voltage : Maximum Voltage DC 2.07V, Minimum Voltage DC 1.53V (DC 1.8V ±15%)
Maximum Voltage DC 3.795V, Minimum Voltage DC 2.805V (DC 3.3V ±15%)

4.2 Configuration and peripherals



* 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	Remark
A	Unit	FH1745 RFID Unit	140300014	FUJI MACHINE MFG.CO.,LTD.	EUT
B	Jig Box	-	-	FUJI MACHINE MFG.CO.,LTD.	-
C	Tag	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	FFC Cable	0.3	Unshielded	Unshielded	-
2	AC Cable	1.5	Unshielded	Unshielded	-

SECTION 5: Conducted emission

Test Procedure and conditions

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, including peripherals 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 a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)
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. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

Detector : QP and CISPR AV
Measurement range : 0.15-30MHz
Test data : APPENDIX
Test result : Pass

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

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: 0, 45, 90, 135 and 270deg.) 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.

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.

- The worst case was confirmed with and without a Tag, as a result, the test without a Tag was the worst case. Therefore the test without a Tag was only performed.

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

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%.							

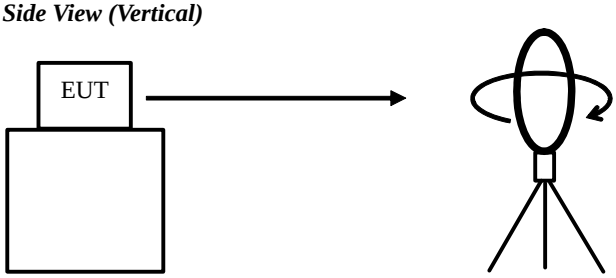
[Frequency Tolerance]
The power supply set to 100 % nominal setting, raise EUT operating temperature to 50 deg. C.
Record the frequency of the EUT.
Repeat measurements at each 10 deg. C decrement to -20 deg. C.

EUT power supply was varied between 85 % and 115 % of nominal and the frequency of the EUT was recorded when temperature is 20 deg. C.

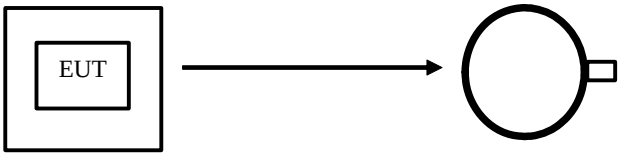
Test data : **APPENDIX**
Test result : **Pass**

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

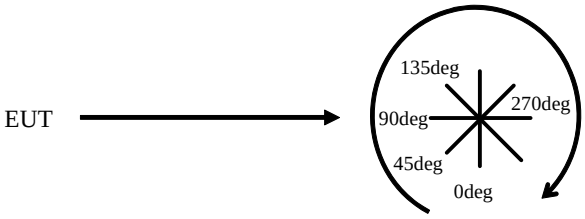


Top View (Horizontal)



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

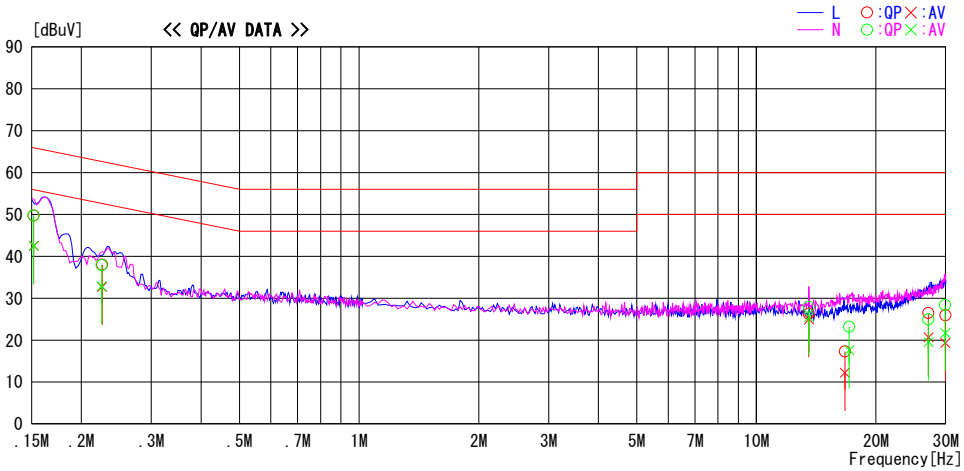
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/03/19

Report No. : 10662757H

Temp./Humi. : 21deg. C / 55% RH
Engineer : Takafumi Noguchi

Mode / Remarks : RFID Tx/Rx 13.56MHz without Tag

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]	
0.15170	36.5	29.3	13.2	49.7	42.5	65.9	55.9	16.2	13.4	L
0.22552	24.7	19.4	13.3	38.0	32.7	62.6	52.6	24.6	19.9	L
13.56000	12.1	10.8	14.2	26.3	25.0	60.0	50.0	33.7	25.0	L
16.70183	3.0	-2.1	14.3	17.3	12.2	60.0	50.0	42.7	37.8	L
27.12000	11.7	5.9	14.8	26.5	20.7	60.0	50.0	33.5	29.3	L
29.91936	11.0	4.4	14.9	25.9	19.3	60.0	50.0	34.1	30.7	L
0.15171	36.5	29.3	13.2	49.7	42.5	65.9	55.9	16.2	13.4	N
0.22504	24.6	19.6	13.3	37.9	32.9	62.6	52.6	24.7	19.7	N
13.56000	13.7	11.3	14.2	27.9	25.5	60.0	50.0	32.1	24.5	N
17.14075	8.9	3.3	14.3	23.2	17.6	60.0	50.0	36.8	32.4	N
27.12000	10.1	4.7	14.8	24.9	19.5	60.0	50.0	35.1	30.5	N
29.86600	13.5	6.8	14.9	28.4	21.7	60.0	50.0	31.6	28.3	N

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.

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION TEST

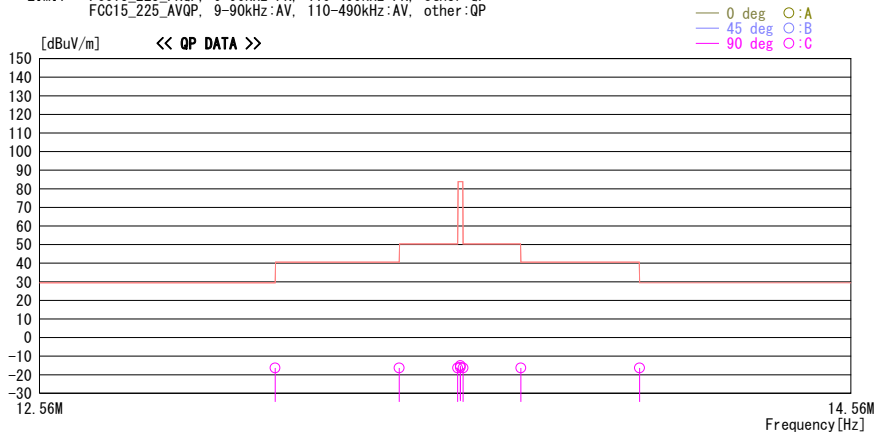
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/03/17

Report No. : 10662757H

Temp. / Humi. : 24deg. C / 52% RH
Engineer : Takumi Shimada

Mode / Remarks : RFID TX/RX 13.56MHz Y-axis without tag

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
13.11000	29.1	QP	19.5	-32.8	32.1	-16.3	29.5	45.8	90	C	105	
13.41000	29.0	QP	19.4	-32.7	32.1	-16.4	40.5	56.9	90	C	105	
13.55300	29.1	QP	19.4	-32.7	32.1	-16.3	50.4	66.7	90	C	105	
13.56000	29.5	QP	19.4	-32.7	32.1	-15.9	83.9	99.8	90	C	72	with tag
13.56000	30.3	QP	19.4	-32.7	32.1	-15.1	83.9	99.0	90	C	105	
13.56700	29.1	QP	19.4	-32.7	32.1	-16.3	50.4	66.7	90	C	105	
13.71000	29.1	QP	19.4	-32.7	32.1	-16.3	40.5	56.8	90	C	105	
14.01000	29.1	QP	19.3	-32.7	32.1	-16.4	29.5	45.9	90	C	105	

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS (CABLE + ATTEN. + D.FACTOR)-GAIN(AMP).

Result of the fundamental emission at 3m without Distance factor

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
90	13.56000	QP	30.3	19.4	7.3	32.1	-	24.9	-	-	Fundamental

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

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Spurious emission

DATA OF RADIATED EMISSION TEST

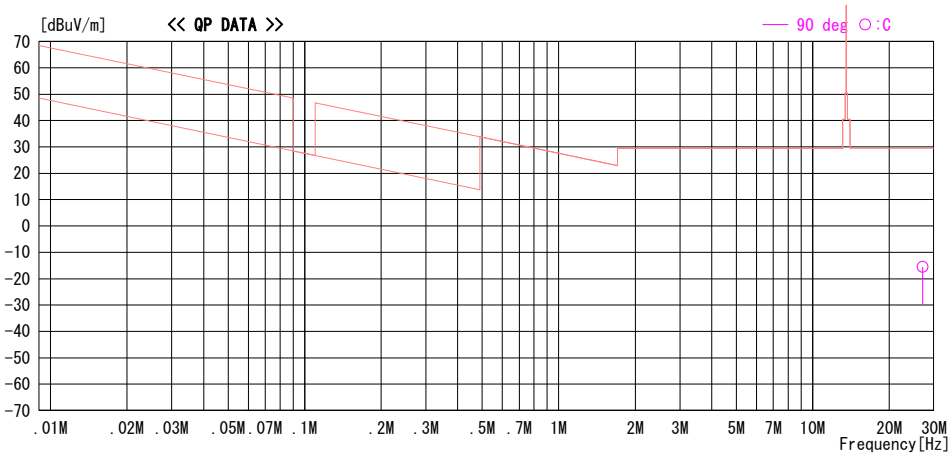
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/03/17

Report No. : 10662757H

Temp./ Humi. : 24deg. C / 52% RH
Engineer : Takumi Shimada

Mode / Remarks : RFID TX/RX 13.56MHz Y-axis without tag

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	29.0	QP	19.7	-32.2	32.1	-15.6	29.5	45.1	90	C	359	

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS (CABLE + ATTEN. + D.FACTOR)-GAIN(AMP).

Spurious emission

DATA OF RADIATED EMISSION TEST

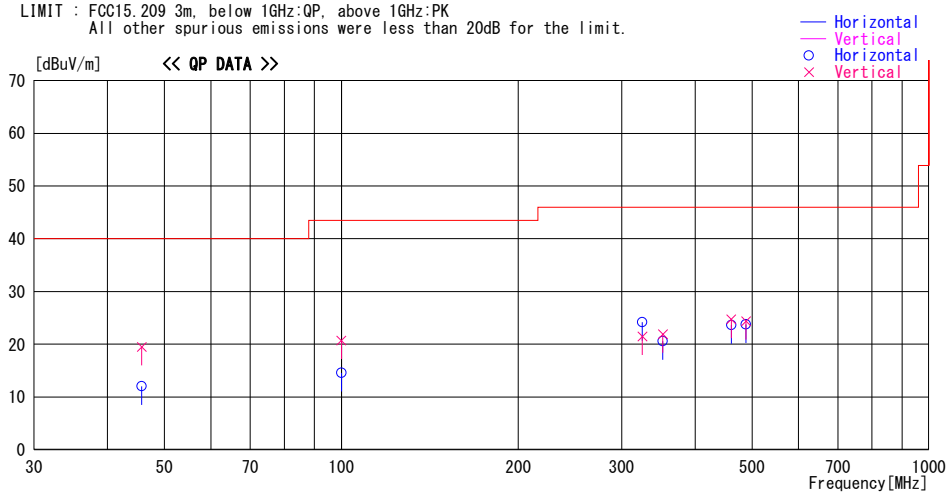
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/03/18

Report No. : 10662757H

Temp./Humi. : 20deg. C / 48% RH
Engineer : Takumi Shimada

Mode / Remarks : RFID Tx/Rx 13.56MHz without tag Worst axis(Hor:X,Ver:X)

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]	
45.750	24.9	QP	12.0	-24.9	12.0	220	400	Hori.	40.0	28.0	
45.750	32.4	QP	12.0	-24.9	19.5	150	100	Vert.	40.0	20.5	
100.000	28.8	QP	10.1	-24.3	14.6	25	223	Hori.	43.5	28.9	
100.000	34.9	QP	10.1	-24.3	20.7	133	138	Vert.	43.5	22.8	
325.440	30.6	QP	15.5	-21.9	24.2	154	100	Hori.	46.0	21.8	
325.440	27.9	QP	15.5	-21.9	21.5	88	151	Vert.	46.0	24.5	
352.560	27.3	QP	16.3	-21.7	21.9	287	162	Vert.	46.0	24.1	
352.560	26.0	QP	16.3	-21.7	20.6	252	100	Hori.	46.0	25.4	
461.040	27.9	QP	18.0	-21.2	24.7	217	133	Vert.	46.0	21.3	
461.040	26.8	QP	18.0	-21.2	23.6	37	100	Hori.	46.0	22.4	
488.160	27.3	QP	18.1	-21.0	24.4	209	117	Vert.	46.0	21.6	
488.160	26.7	QP	18.1	-21.0	23.8	28	100	Hori.	46.0	22.2	

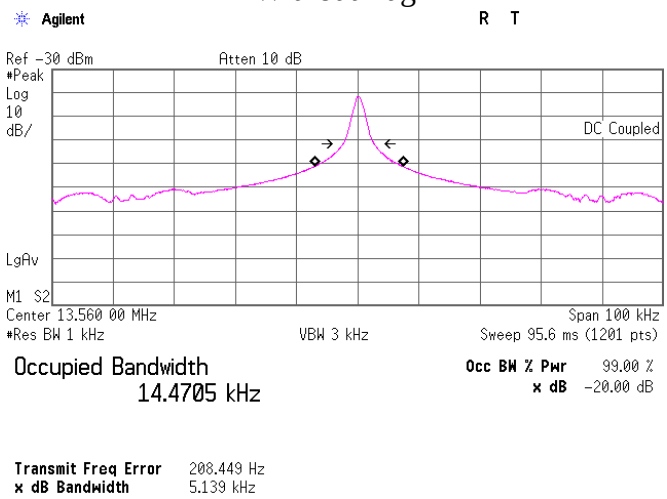
CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE + FILTER - GAIN(AMP))

20dB Bandwidth and 99% Occupied Bandwidth

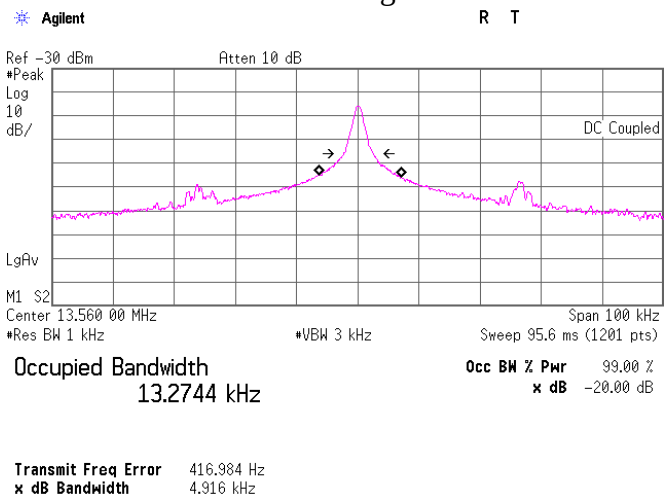
Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10662757H	
Date	03/18/2015	04/17/2015
Temperature/ Humidity	20 deg. C / 48% RH	24 deg. C / 31% RH
Engineer	Takumi Shimada	Takumi Shimada
Mode	Tx Mod on Without Tag	Tx Mod on With Tag

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	Without Tag	5.14	14.47
	With Tag	4.92	13.27

Without Tag



With Tag



Frequency Tolerance

Test place	Ise EMC Lab. No.6 measurement room
Report No.	10662757H
Date	03/18/2015
Temperature/ Humidity	24 deg. C / 41% RH
Engineer	Hironobu Ohnishi
Mode	Tx Mod off

Test condition			Tested	Measured	Frequency	Result		Limit
Temp.	Voltage	Voltage	timing	frequency	error			
[deg. C]	[V]	[V]		[MHz]	[MHz]	[%]	[ppm]	[+/- %]
50	3.3	1.8	Power on	13.560145	0.000145	0.00107	10.7	0.01
			+ 2 min.	13.560148	0.000148	0.00109	10.9	0.01
			+ 5 min.	13.560150	0.000150	0.00111	11.1	0.01
			+ 10 min.	13.560151	0.000151	0.00111	11.1	0.01
40	3.3	1.8	Power on	13.560155	0.000155	0.00114	11.4	0.01
			+ 2 min.	13.560149	0.000149	0.00110	11.0	0.01
			+ 5 min.	13.560148	0.000148	0.00109	10.9	0.01
			+ 10 min.	13.560148	0.000148	0.00109	10.9	0.01
30	3.3	1.8	Power on	13.560175	0.000175	0.00129	12.9	0.01
			+ 2 min.	13.560163	0.000163	0.00120	12.0	0.01
			+ 5 min.	13.560161	0.000161	0.00119	11.9	0.01
			+ 10 min.	13.560160	0.000160	0.00118	11.8	0.01
20	3.3	1.8	Power on	13.560197	0.000197	0.00145	14.5	0.01
			+ 2 min.	13.560186	0.000186	0.00137	13.7	0.01
			+ 5 min.	13.560183	0.000183	0.00135	13.5	0.01
			+ 10 min.	13.560182	0.000182	0.00134	13.4	0.01
20	2.805	1.53	Power on	13.560197	0.000197	0.00145	14.5	0.01
	(3.3V -15%)	(1.8V -15%)	+ 2 min.	13.560189	0.000189	0.00139	13.9	0.01
			+ 5 min.	13.560187	0.000187	0.00138	13.8	0.01
			+ 10 min.	13.560186	0.000186	0.00137	13.7	0.01
20	3.795	2.07	Power on	13.560192	0.000192	0.00142	14.2	0.01
	(3.3V +15%)	(1.8V +15%)	+ 2 min.	13.560180	0.000180	0.00133	13.3	0.01
			+ 5 min.	13.560177	0.000177	0.00131	13.1	0.01
			+ 10 min.	13.560176	0.000176	0.00130	13.0	0.01
10	3.3	1.8	Power on	13.560217	0.000217	0.00160	16.0	0.01
			+ 2 min.	13.560209	0.000209	0.00154	15.4	0.01
			+ 5 min.	13.560206	0.000206	0.00152	15.2	0.01
			+ 10 min.	13.560205	0.000205	0.00151	15.1	0.01
0	3.3	1.8	Power on	13.560224	0.000224	0.00165	16.5	0.01
			+ 2 min.	13.560222	0.000222	0.00164	16.4	0.01
			+ 5 min.	13.560221	0.000221	0.00163	16.3	0.01
			+ 10 min.	13.560221	0.000221	0.00163	16.3	0.01
-10	3.3	1.8	Power on	13.560208	0.000208	0.00153	15.3	0.01
			+ 2 min.	13.560222	0.000222	0.00164	16.4	0.01
			+ 5 min.	13.560224	0.000224	0.00165	16.5	0.01
			+ 10 min.	13.560224	0.000224	0.00165	16.5	0.01
-20	3.3	1.8	Power on	13.560174	0.000174	0.00128	12.8	0.01
			+ 2 min.	13.560198	0.000198	0.00146	14.6	0.01
			+ 5 min.	13.560209	0.000209	0.00154	15.4	0.01
			+ 10 min.	13.560205	0.000205	0.00151	15.1	0.01

Calculation formula: Frequency error = Measured frequency - Tested frequency
Result [%] = Frequency error / Tested frequency * 100

Tested frequency: 13.56 MHz
Limit (+/-): 0.01 % (+/- 100ppm)

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

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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	2014/09/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2015/01/13 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE, CE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2014/06/06 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2014/10/04 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2014/07/28 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/ 3D-2W(7.5m)/ RG400u(1.5m)/ RFM-E421(Switcher)	-/ 01068(Switcher)	RE	2014/09/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE, CE	2014/11/20 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	FT	2015/01/13 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2014/08/11 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	FT	2014/08/06 * 12
MMM-12	DIGITAL HiTESTER	Hioki	3805	060500120	FT	2015/02/05 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE, CE	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE, CE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE, CE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2014/04/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE	2014/07/10 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	CE	2014/07/14 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2014/06/06 * 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