



RADIO TEST REPORT

Test Report No. : 10482807H-A-R1

Applicant : KONICA MINOLTA, INC.
Type of Equipment : Authentication Unit
Model No. : AU-201S
Test regulation : FCC Part 15 Subpart C: 2015
FCC ID : UUA-A09N2
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
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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 10482807H-A. 10482807H-A is replaced with this report.

Date of test: December 19, 2014 to January 16, 2015

Representative test engineer:

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13-EM-F0429

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SECTION 1: Customer information

Company Name : KONICA MINOLTA, INC.
Address : 22-1 Honohara 3-chome, Toyokawa-shi, Aichi-ken, 442-8503 Japan
Telephone Number : +81-533-89-7019
Facsimile Number : +81-533-89-7979
Contact Person : Shingo Suzuki

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

2.1 Identification of E.U.T.

Type of Equipment : Authentication Unit
Model No. : AU-201S
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5V
Receipt Date of Sample : November 13, 2014
Country of Mass-production : Japan
Condition of EUT : Production model
Modification of EUT : No Modification by the test lab

2.2 Product description

Model No: AU-201S (referred to as the EUT in this report) is the Authentication Unit.

General Specification

Clock frequency(ies) in the system : 16MHz, 27.12MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 13.56MHz
Modulation : ASK
Power Supply (radio part input) : DC 4.4V

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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

* The revision on January 21, 2015 does not affect the test specification applied to the EUT.

* The EUT complies with FCC Part 15 Subpart B: 2015, final revised on January 21, 2015.

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 ----- <IC>RSS-Gen 8.8	Section 15.207 ----- <IC>RSS-Gen 8.8	[QP] 6.5dB 13.56000MHz [AV] 0.4dB 13.56000MHz	Complied	-
Electric Field Strength of Fundamental Emission	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC> RSS-Gen 6.4, 6.12	Section 15.225(a) ----- <IC>RSS-210 A2.6	48.5dB, 13.56000MHz, QP, 0deg.	Complied	Radiated
Spectrum Mask	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC>RSS-Gen 6.4, 6.13	Section 15.225(b)(c) ----- <IC> RSS-210 A2.6	28.9dB, 13.55300MHz, QP, 0deg.	Complied	Radiated
20dB Bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC>RSS-Gen 6.4, 6.13	Section15.209, Section 15.225 (d) ----- <IC>RSS-210 A2.6	2.2dB 54.240MHz, Horizontal, QP	Complied	Radiated
Frequency Tolerance	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC>RSS-Gen 6.11, 8.11	Section15.225(e) ----- <IC> RSS-210 A2.6	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)

This EUT provides stable voltage (DC 4.4V) constantly to RF part regardless of input voltage. 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 EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

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

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

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

Test 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 (3m)

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

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3.5 Test Location

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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used :

Mode	Remarks*
Transmitting mode (Tx)	With Tag / Without Tag
The EUT was operated in a manner similar to typical use during the tests.	

Test Item	Operating mode*
Conducted emission	Tx Mod on, with Tag (Type A) without Tag (Type B, FeliCa)
Electric Field Strength of Fundamental Emission, Spectrum Mask	Tx Mod on, without Tag (Type A, Type B, FeliCa)
20dB Bandwidth, 99% Occupied Bandwidth	Tx Mod on, without Tag (Type A, Type B, FeliCa)
Electric Field Strength of Spurious Emission	Tx Mod on, without Tag (Type A, Type B, FeliCa): below 30MHz with Tag (Type A, Type B, FeliCa): above 30MHz
Frequency Tolerance	Tx Mod off, without Tag

* 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 : Normal Voltage DC 5V

Maximum Voltage DC 5.75V, Minimum Voltage DC 4.25V (DC 5V $\pm$ 15%)

*This EUT provides stable voltage (DC 4.4V) constantly to RF Part regardless of input voltage

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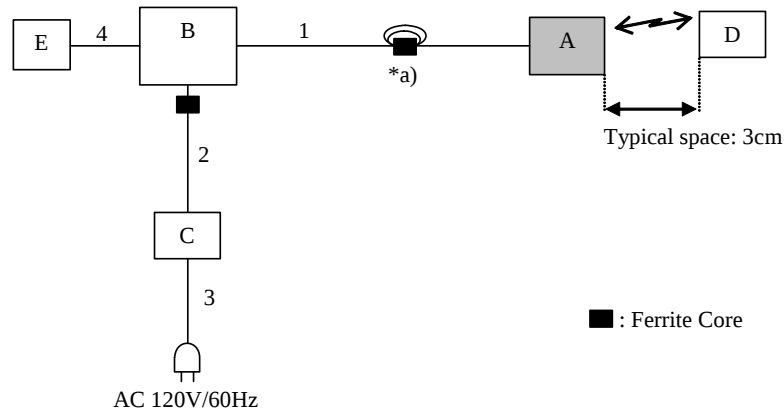
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4.2 Configuration and peripherals



* 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	Authentication Unit	AU-201S	146000107	KONICA MINOLTA, INC.	EUT
B	Laptop PC	CF-W5AWDAXS	7HKSA86870	Panasonic	-
C	AC Adapter	CF-AA6282A	628AM107619146A	Panasonic	-
D	Tag	Mifare	No.299	TMP	Type A
		TypeB Card	No.3	-	Type B
		RC-S860	No.41	SONY	FeliCa
E	Mouse	OW7751	520026409	DELL	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB Cable	1.5	Shielded	Shielded	*a)
2	DC Cable	1.8	Unshielded	Unshielded	-
3	AC Cable	0.9	Unshielded	Unshielded	-
4	USB Cable	1.8	Shielded	Shielded	-

<Notes for Ferrite core>

*a) 1 Ferrite Core, Model No. TFT-152613N (Manufacturer: Takeuchi Industries), 6cm from Item A, 3 turns

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SECTION 5: Conducted emission

5.1 Operating environment

Test place	: No.1 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	: See Clause 4.1

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

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

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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.

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 135deg.) 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
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: $40 \times \log(3m/300m) = -80dB$

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

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.

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

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

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SECTION 7: Other test

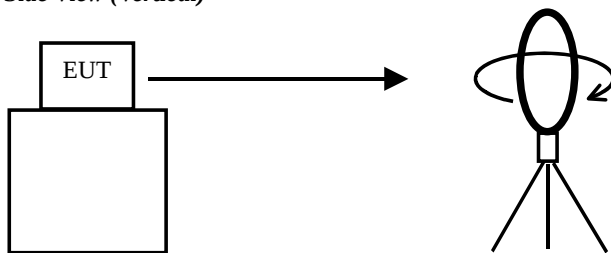
Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Spectrum Analyzer

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.

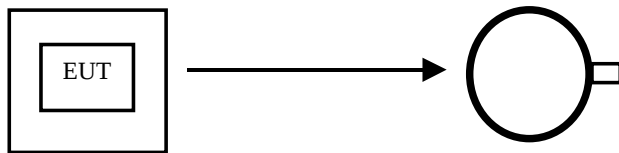
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

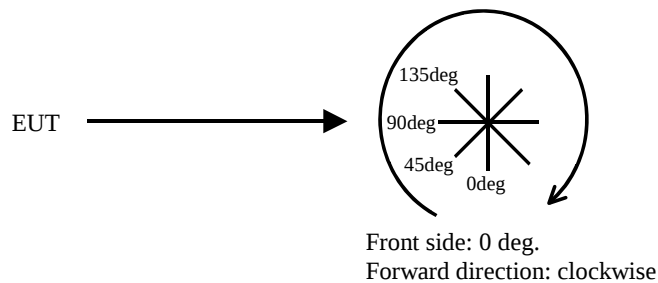


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



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APPENDIX 1: Data of EMI test

Conducted emission Type A

DATA OF CONDUCTED EMISSION TEST

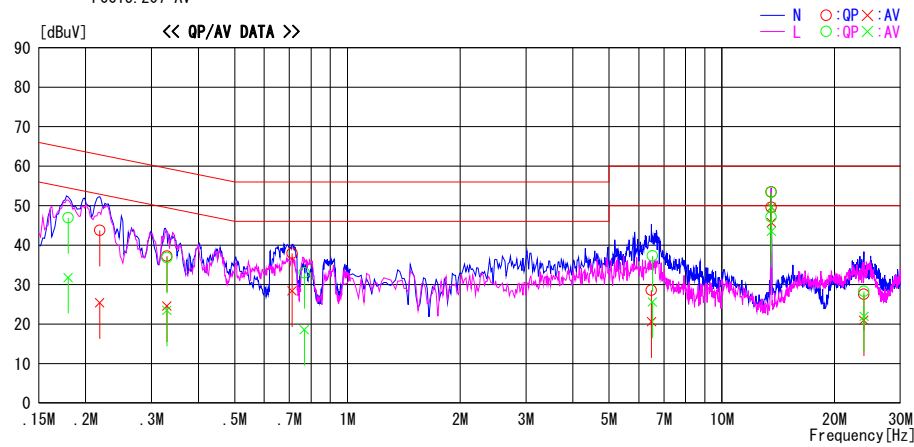
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/09

Report No. : 10482807H

Temp./Humi. : 22deg. C / 31% RH
Engineer : Keisuke Kawamura

Mode / Remarks : Tx 13.56MHz MOD On TypeA with Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.17964	33.7	18.6	13.2	46.9	31.8	64.5	54.5	17.6	22.7	L	
0.21800	30.4	12.1	13.3	43.7	25.4	62.9	52.9	19.2	27.5	N	
0.32958	23.9	11.3	13.3	37.2	24.6	59.5	49.5	22.3	24.9	N	
0.32958	23.5	10.2	13.3	36.8	23.5	59.5	49.5	22.7	26.0	L	
0.71141	24.5	15.0	13.4	37.9	28.4	56.0	46.0	18.1	17.6	N	
0.76720	19.6	5.2	13.4	33.0	18.6	56.0	46.0	23.0	27.4	L	
6.48746	14.5	6.5	14.1	28.6	20.6	60.0	50.0	31.4	29.4	N	
6.52381	23.2	11.5	14.1	37.3	25.6	60.0	50.0	22.7	24.4	L	
13.56000	38.8	34.9	14.7	53.5	49.6	60.0	50.0	6.5	0.4	N	
13.56000	38.7	34.8	14.7	53.4	49.5	60.0	50.0	6.6	0.5	L	
13.56000	34.9	31.0	14.7	49.6	45.7	60.0	50.0	10.4	4.3	N	Without Tag
13.56000	32.4	28.8	14.7	47.1	43.5	60.0	50.0	12.9	6.5	L	Without Tag
23.93271	12.2	5.6	15.4	27.6	21.0	60.0	50.0	32.4	29.0	N	
23.97289	12.9	6.6	15.4	28.3	22.0	60.0	50.0	31.7	28.0	L	

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

Conducted emission Type B

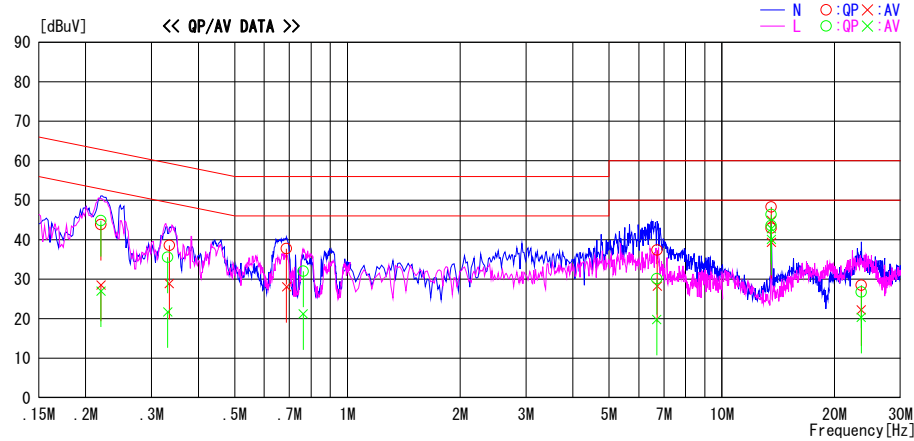
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/09

Report No. : 10482807H
Temp./Humi. : 22deg. C / 31% RH
Engineer : Keisuke Kawamura

Mode / Remarks : Tx 13.56MHz MOD On TypeB without Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.21974	30.5	15.2	13.3	43.8	28.5	62.8	52.8	19.0	24.3	N	
0.21974	31.5	13.7	13.3	44.8	27.0	62.8	52.8	18.0	25.8	L	
0.33132	22.3	8.4	13.3	35.6	21.7	59.4	49.4	23.8	27.7	L	
0.33481	25.3	15.6	13.3	38.6	28.9	59.3	49.3	20.7	20.4	N	
0.68769	24.3	14.7	13.4	37.7	28.1	56.0	46.0	18.3	17.9	N	
0.76257	18.6	7.8	13.4	32.0	21.2	56.0	46.0	24.0	24.8	L	
6.70051	15.9	5.6	14.2	30.1	19.8	60.0	50.0	29.9	30.2	L	
6.72375	23.2	14.0	14.2	37.4	28.2	60.0	50.0	22.6	21.8	N	
13.56000	31.7	28.1	14.7	46.4	42.8	60.0	50.0	13.6	7.2	L	
13.56000	33.6	30.2	14.7	48.3	44.9	60.0	50.0	11.7	5.1	N	
13.56000	28.2	24.6	14.7	42.9	39.3	60.0	50.0	17.1	10.7	N	With Tag
13.56000	28.9	25.4	14.7	43.6	40.1	60.0	50.0	16.4	9.9	L	With Tag
23.57109	13.1	6.8	15.4	28.5	22.2	60.0	50.0	31.5	27.8	N	
23.57109	11.3	4.9	15.4	26.7	20.3	60.0	50.0	33.3	29.7	L	

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

Conducted emission

FeliCa

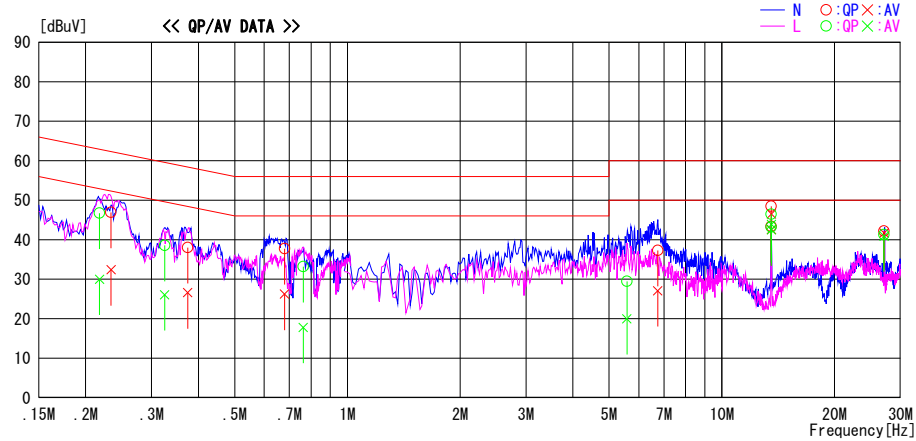
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/09

Report No. : 10482807H
Temp./Humi. : 22deg. C / 31% RH
Engineer : Keisuke Kawamura

Mode / Remarks : Tx 13.56MHz MOD On FeliCa without Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.21794	33.4	16.7	13.3	46.7	30.0	62.9	52.9	16.2	22.9	L	
0.23369	33.6	19.1	13.3	46.9	32.4	62.3	52.3	15.4	19.9	N	
0.32500	25.3	12.8	13.3	38.6	26.1	59.6	49.6	21.0	23.5	L	
0.37449	24.7	13.3	13.3	38.0	26.6	58.4	48.4	20.4	21.8	N	
0.67969	24.3	12.8	13.4	37.7	26.2	56.0	46.0	18.3	19.8	N	
0.76197	19.8	4.4	13.4	33.2	17.8	56.0	46.0	22.8	28.2	L	
5.57863	15.4	5.9	14.1	29.5	20.0	60.0	50.0	30.5	30.0	L	
6.74193	23.1	12.9	14.2	37.3	27.1	60.0	50.0	22.7	22.9	N	
13.56000	33.8	31.8	14.7	48.5	46.5	60.0	50.0	11.5	3.5	N	
13.56000	31.8	29.2	14.7	46.5	43.9	60.0	50.0	13.5	6.1	L	
13.56000	28.5	27.8	14.7	43.2	42.5	60.0	50.0	16.8	7.5	L	With Tag
13.56000	28.7	27.9	14.7	43.4	42.6	60.0	50.0	16.6	7.4	N	With Tag
27.12000	26.6	26.1	15.6	42.2	41.7	60.0	50.0	17.8	8.3	N	
27.12000	25.7	25.3	15.6	41.3	40.9	60.0	50.0	18.7	9.1	L	

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

Fundamental emission and Spectrum Mask Type A

DATA OF RADIATED EMISSION TEST

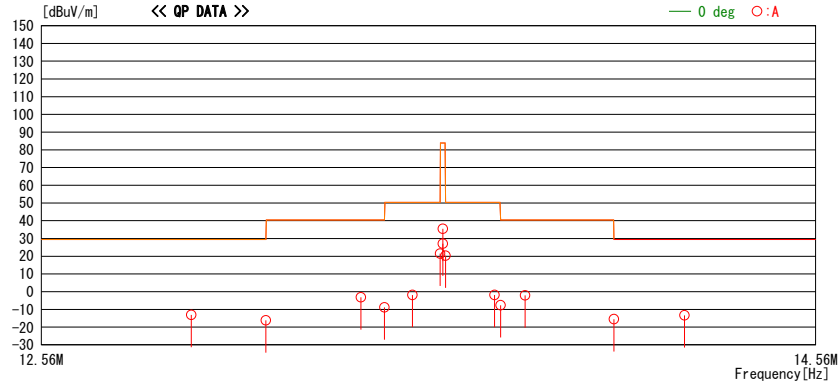
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/12/22

Report No. : 10482807H

Temp./ Humi. : 21deg. C / 38% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz Type A without Tag_Mask

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
12.92476	32.3	QP	19.5	-32.8	32.1	-13.1	29.5	42.6	0	A	193
13.11000	29.2	QP	19.5	-32.8	32.1	-16.2	29.5	45.7	0	A	193
13.34963	42.2	QP	19.4	-32.7	32.1	-3.2	40.5	43.7	0	A	193
13.41000	36.6	QP	19.4	-32.7	32.1	-8.8	40.5	49.3	0	A	193
13.48191	43.6	QP	19.4	-32.7	32.1	-1.8	50.4	52.2	0	A	193
13.55300	66.9	QP	19.4	-32.7	32.1	21.5	50.4	28.9	0	A	193
13.56000	80.8	QP	19.4	-32.7	32.1	35.4	83.9	48.5	0	A	193
13.56000	72.5	QP	19.4	-32.7	32.1	27.1	83.9	56.8	0	A	193 With Tag
13.56700	65.7	QP	19.4	-32.7	32.1	20.3	50.4	30.1	0	A	193
13.69435	43.5	QP	19.4	-32.7	32.1	-1.9	50.4	52.3	0	A	193
13.71000	37.7	QP	19.4	-32.7	32.1	-7.7	40.5	48.2	0	A	193
13.77451	43.3	QP	19.4	-32.7	32.1	-2.1	40.5	42.6	0	A	193
14.01000	30.0	QP	19.3	-32.7	32.1	-15.5	29.5	45.0	0	A	193
14.19939	32.2	QP	19.3	-32.7	32.1	-13.3	29.5	42.8	0	A	193

CHART: WITH FACTOR ANT TYPE: LOOP Except for the data below : adequate margin date 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	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	80.8	19.4	7.3	32.1	-	75.4	-	-	- Fundamental

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

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Fundamental emission and Spectrum Mask Type B

DATA OF RADIATED EMISSION TEST

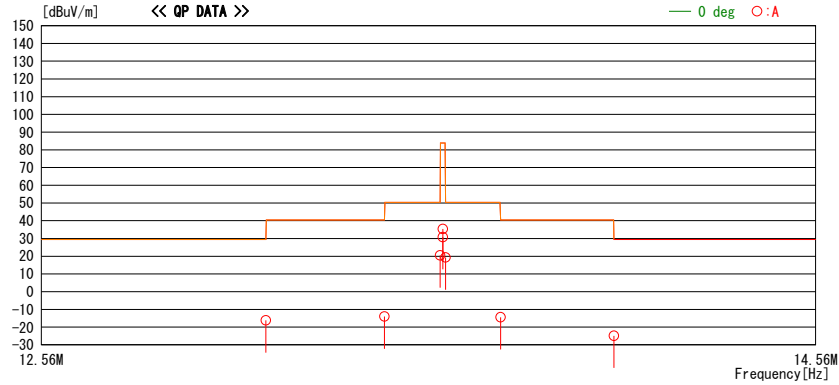
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/12/22

Report No. : 10482807H

Temp./ Humi. : 21deg. C / 38% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz Type B without Tag_Mask

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.2	QP	19.5	-32.8	32.1	-16.2	29.5	45.7	0	A	193
13.41000	31.4	QP	19.4	-32.7	32.1	-14.0	40.5	54.5	0	A	193
13.55300	65.9	QP	19.4	-32.7	32.1	20.5	50.4	29.9	0	A	193
13.56000	80.7	QP	19.4	-32.7	32.1	35.3	83.9	48.6	0	A	193
13.56000	76.2	QP	19.4	-32.7	32.1	30.8	83.9	53.1	0	A	193
13.56700	64.7	QP	19.4	-32.7	32.1	19.3	50.4	31.2	0	A	193
13.71000	31.0	QP	19.4	-32.7	32.1	-14.4	40.5	54.9	0	A	193
14.01000	20.7	QP	19.3	-32.7	32.1	-24.8	29.5	54.3	0	A	193

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	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	80.7	19.4	7.3	32.1	-	75.3	-	-	- Fundamental

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

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Fundamental emission and Spectrum Mask

FeliCa

DATA OF RADIATED EMISSION TEST

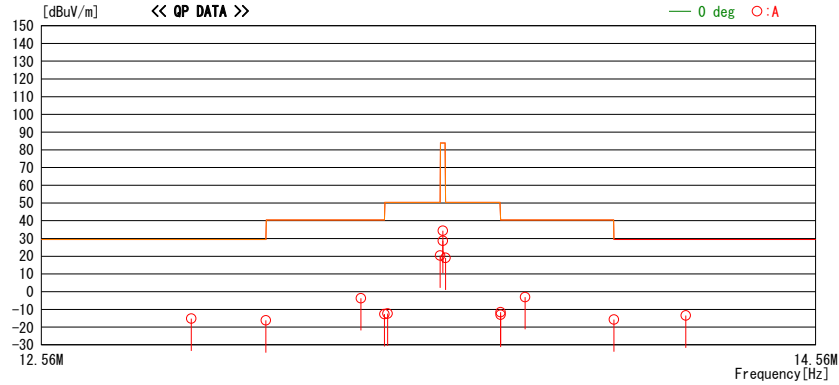
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2014/12/22

Report No. : 10482807H

Temp./ Humi. : 21deg. C / 38% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz FeliCa without Tag_Mask

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
12.92476	30.2	QP	19.5	-32.8	32.1	-15.2	29.5	44.7	0	A	195
13.11000	29.2	QP	19.5	-32.8	32.1	-16.2	29.5	45.7	0	A	195
13.34963	41.7	QP	19.4	-32.7	32.1	-3.7	40.5	44.2	0	A	195
13.41000	32.7	QP	19.4	-32.7	32.1	-12.7	40.5	53.2	0	A	195
13.41778	33.1	QP	19.4	-32.7	32.1	-12.3	50.4	62.7	0	A	195
13.55300	65.8	QP	19.4	-32.7	32.1	20.4	50.4	30.0	0	A	195
13.56000	79.8	QP	19.4	-32.7	32.1	34.4	83.9	49.5	0	A	195
13.56000	74.1	QP	19.4	-32.7	32.1	28.7	83.9	55.2	0	A	195 With Tag
13.56700	64.5	QP	19.4	-32.7	32.1	19.1	50.4	31.3	0	A	195
13.71000	32.4	QP	19.4	-32.7	32.1	-13.0	40.5	53.5	0	A	195
13.71038	33.8	QP	19.4	-32.7	32.1	-11.6	40.5	52.1	0	A	195
13.77451	42.4	QP	19.4	-32.7	32.1	-3.0	40.5	43.5	0	A	195
14.01000	29.8	QP	19.3	-32.7	32.1	-15.7	29.5	45.2	0	A	195
14.20340	32.1	QP	19.3	-32.7	32.1	-13.4	29.5	42.9	0	A	195

CHART: WITH FACTOR ANT TYPE: LOOP Except for the data below : adequate margin date 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	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	79.8	19.4	7.3	32.1	-	74.4	-	-	Fundamental

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

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Spurious emission Type B

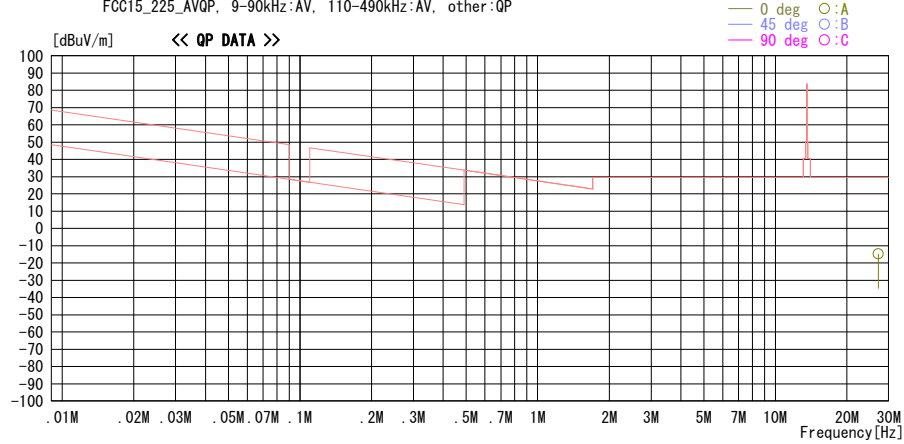
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/16

Report No. : 10482807H
Temp./ Humi. : 20deg. C / 38% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz axis Z TypeB 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.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.8	QP	19.7	-32.2	32.1	-14.8	29.5	44.3	0	A	

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

Spurious emission FeliCa

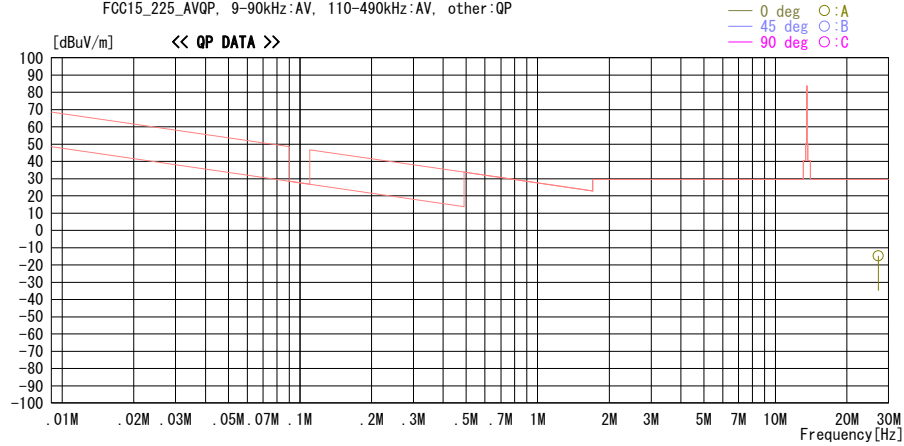
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/16

Report No. : 10482807H
Temp./ Humi. : 20deg. C / 38% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz axis Z FeliCa 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.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.8	QP	19.7	-32.2	32.1	-14.8	29.5	44.3	0	A	0

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

Spurious emission
Type A

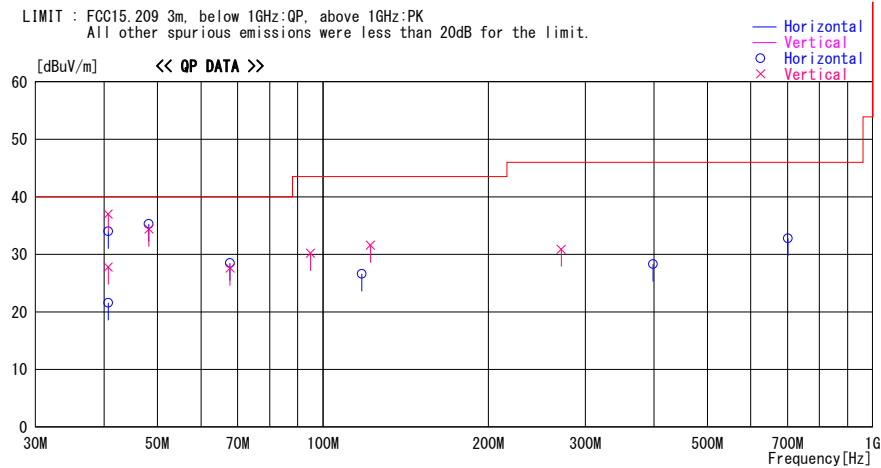
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2015/01/07

Report No. : 10482807H
Temp./Humi. : 21deg. C / 35% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz with TypeA Tag Worst Axis Hori X Vert 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		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	44.4	QP	14.2	-21.6	37.0	244	100	Vert.	40.0	3.0	
40.680	35.2	QP	14.2	-21.6	27.8	340	100	Vert.	40.0	12.2	without Tag
40.680	41.4	QP	14.2	-21.6	34.0	167	246	Hori.	40.0	6.0	
40.680	29.0	QP	14.2	-21.6	21.6	167	247	Hori.	40.0	18.4	without Tag
48.226	45.5	QP	11.3	-21.5	35.3	269	336	Hori.	40.0	4.7	
48.227	44.6	QP	11.3	-21.5	34.4	307	100	Vert.	40.0	5.6	
67.800	42.1	QP	6.7	-21.2	27.6	205	100	Vert.	40.0	12.4	
67.800	43.0	QP	6.7	-21.2	28.5	174	289	Hori.	40.0	11.5	
94.920	42.0	QP	9.1	-20.9	30.2	359	100	Vert.	43.5	13.3	
117.724	34.6	QP	12.6	-20.6	26.6	339	163	Hori.	43.5	16.9	
122.040	39.1	QP	13.0	-20.5	31.6	55	100	Vert.	43.5	11.9	
271.199	31.6	QP	18.2	-18.9	30.9	359	208	Vert.	46.0	15.1	
398.410	30.0	QP	17.5	-19.2	28.3	157	288	Hori.	46.0	17.7	
701.443	29.7	QP	20.7	-17.6	32.8	263	106	Hori.	46.0	13.2	

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))

Spurious emission
Type B

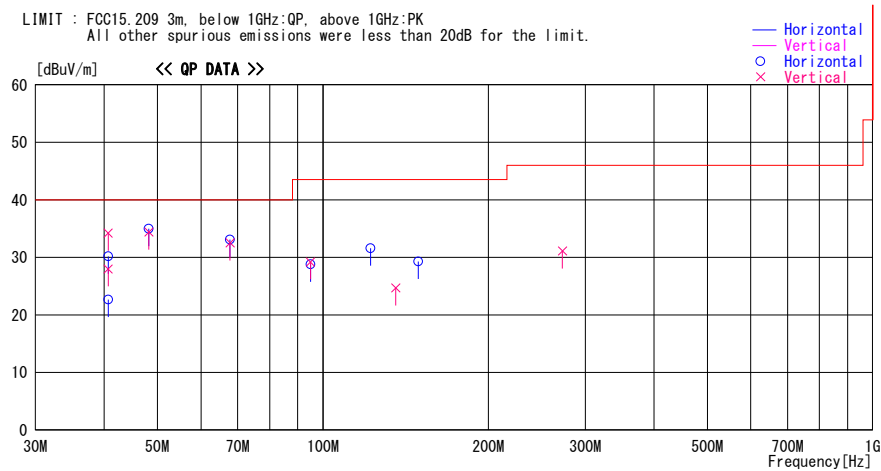
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2015/01/07

Report No. : 10482807H
Temp./Humi. : 21deg. C / 35% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz with TypeB Tag Worst Axis Hori X Vert 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		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	41.6	QP	14.2	-21.6	34.2	335	100	Vert.	40.0	5.8	
40.680	35.4	QP	14.2	-21.6	28.0	332	100	Vert.	40.0	12.0	without Tag
40.680	37.6	QP	14.2	-21.6	30.2	278	298	Hori.	40.0	9.8	
40.680	30.1	QP	14.2	-21.6	22.7	280	305	Hori.	40.0	17.3	without Tag
48.224	44.6	QP	11.3	-21.5	34.4	303	100	Vert.	40.0	5.6	
48.237	45.2	QP	11.3	-21.5	35.0	274	311	Hori.	40.0	5.0	
67.800	47.6	QP	6.7	-21.2	33.1	302	214	Hori.	40.0	6.9	
67.800	47.0	QP	6.7	-21.2	32.5	143	100	Vert.	40.0	7.5	
94.920	40.6	QP	9.1	-20.9	28.8	30	182	Hori.	43.5	14.7	
94.920	41.0	QP	9.1	-20.9	29.2	329	100	Vert.	43.5	14.3	
122.040	39.1	QP	13.0	-20.5	31.6	333	157	Hori.	43.5	11.9	
135.600	31.0	QP	14.1	-20.4	24.7	324	100	Vert.	43.5	18.8	
149.160	34.8	QP	14.8	-20.3	29.3	214	212	Hori.	43.5	14.2	
272.549	31.7	QP	18.3	-18.9	31.1	0	231	Vert.	46.0	14.9	

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))

Spurious emission FeliCa

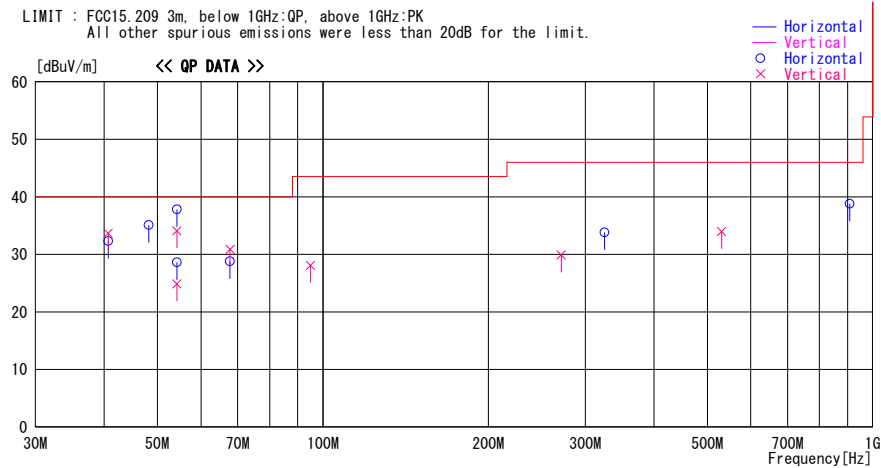
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2015/01/07

Report No. : 10482807H
Temp./Humi. : 21deg. C / 35% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz with FeliCa Tag Worst Axis Hori X Vert X

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



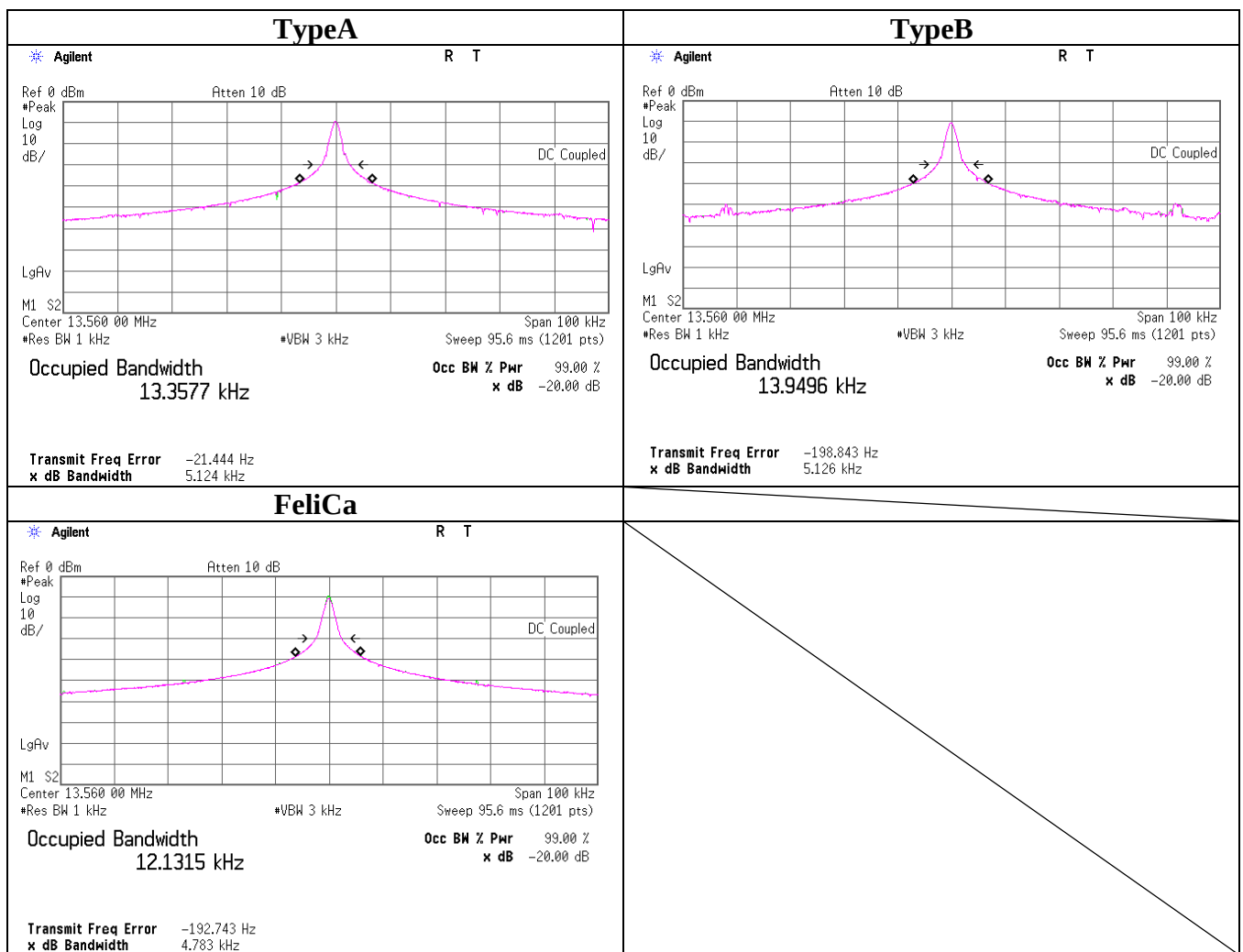
Frequency	Reading	DET	Antenna Factor	Loss & Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	39.7	QP	14.2	-21.6	32.3	112	242	Hori.	40.0	7.7	
40.680	41.1	QP	14.2	-21.6	33.7	325	100	Vert.	40.0	6.3	
48.232	45.3	QP	11.3	-21.5	35.1	267	303	Hori.	40.0	4.9	
54.240	49.9	QP	9.4	-21.5	37.8	60	389	Hori.	40.0	2.2	
54.240	40.7	QP	9.4	-21.5	28.6	279	385	Hori.	40.0	11.4	without Tag
54.240	46.2	QP	9.4	-21.5	34.1	120	100	Vert.	40.0	5.9	
54.240	37.0	QP	9.4	-21.5	24.9	320	100	Vert.	40.0	15.1	without Tag
67.800	43.3	QP	6.7	-21.2	28.8	316	400	Hori.	40.0	11.2	
67.800	45.4	QP	6.7	-21.2	30.9	155	100	Vert.	40.0	9.1	
94.920	39.9	QP	9.1	-20.9	28.1	349	100	Vert.	43.5	15.4	
271.199	30.6	QP	18.2	-18.9	29.9	0	217	Vert.	46.0	16.1	
325.433	37.3	QP	15.3	-18.8	33.8	167	100	Hori.	46.0	12.2	
530.999	33.9	QP	19.0	-18.9	34.0	277	100	Vert.	46.0	12.0	
908.507	32.1	QP	22.6	-15.9	38.8	68	100	Hori.	46.0	7.2	

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))

20dB Bandwidth and 99% Occupied Bandwidth

Test place : Ise EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 10482807H
Date : 12/22/2014
Temperature/ Humidity : 21 deg. C / 38% RH
Engineer : Tomohisa Nakagawa
Mode : Tx Mod on

Mode	FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
Type A	13.56	5.12	13.36
Type B	13.56	5.13	13.95
FeliCa	13.56	4.78	12.13



Frequency Tolerance

Test place : Ise EMC Lab. No.11 measurement room
Report No. : 10482807H
Date : 12/19/2014
Temperature/ Humidity : 24 deg. C / 30% RH
Engineer : Hironobu Ohnishi
Mode : Tx Mod off

Test condition Temp. [deg. C]	Voltage [V]	Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
					[%]	[ppm]	
50	5	Power on	13.559933	-0.000067	-0.00049	-4.9	0.01
		+ 2 min.	13.559924	-0.000076	-0.00056	-5.6	0.01
		+ 5 min.	13.559933	-0.000067	-0.00049	-4.9	0.01
		+ 10 min.	13.559961	-0.000039	-0.00029	-2.9	0.01
40	5	Power on	13.559967	-0.000033	-0.00024	-2.4	0.01
		+ 2 min.	13.559925	-0.000075	-0.00055	-5.5	0.01
		+ 5 min.	13.559926	-0.000074	-0.00055	-5.5	0.01
		+ 10 min.	13.559928	-0.000072	-0.00053	-5.3	0.01
30	5	Power on	13.560003	0.000003	0.00002	0.2	0.01
		+ 2 min.	13.559942	-0.000058	-0.00043	-4.3	0.01
		+ 5 min.	13.559931	-0.000069	-0.00051	-5.1	0.01
		+ 10 min.	13.559929	-0.000071	-0.00052	-5.2	0.01
20	5	Power on	13.560051	0.000051	0.00038	3.8	0.01
		+ 2 min.	13.559976	-0.000024	-0.00018	-1.8	0.01
		+ 5 min.	13.559959	-0.000041	-0.00030	-3.0	0.01
		+ 10 min.	13.559954	-0.000046	-0.00034	-3.4	0.01
20	4.25 (5V -15%)	Power on	13.560026	0.000026	0.00019	1.9	0.01
		+ 2 min.	13.559983	-0.000017	-0.00013	-1.3	0.01
		+ 5 min.	13.559975	-0.000025	-0.00018	-1.8	0.01
		+ 10 min.	13.559973	-0.000027	-0.00020	-2.0	0.01
20	5.75 (5V +15%)	Power on	13.560037	0.000037	0.00027	2.7	0.01
		+ 2 min.	13.559954	-0.000046	-0.00034	-3.4	0.01
		+ 5 min.	13.559941	-0.000059	-0.00044	-4.4	0.01
		+ 10 min.	13.559937	-0.000063	-0.00046	-4.6	0.01
10	5	Power on	13.560078	0.000078	0.00058	5.8	0.01
		+ 2 min.	13.560017	0.000017	0.00013	1.3	0.01
		+ 5 min.	13.559998	-0.000002	-0.00001	-0.1	0.01
		+ 10 min.	13.559992	-0.000008	-0.00006	-0.6	0.01
0	5	Power on	13.560104	0.000104	0.00077	7.7	0.01
		+ 2 min.	13.560061	0.000061	0.00045	4.5	0.01
		+ 5 min.	13.560042	0.000042	0.00031	3.1	0.01
		+ 10 min.	13.560035	0.000035	0.00026	2.6	0.01
-10	5	Power on	13.560107	0.000107	0.00079	7.9	0.01
		+ 2 min.	13.560092	0.000092	0.00068	6.8	0.01
		+ 5 min.	13.560076	0.000076	0.00056	5.6	0.01
		+ 10 min.	13.560074	0.000074	0.00055	5.5	0.01
-20	5	Power on	13.560078	0.000078	0.00058	5.8	0.01
		+ 2 min.	13.560109	0.000109	0.00080	8.0	0.01
		+ 5 min.	13.560103	0.000103	0.00076	7.6	0.01
		+ 10 min.	13.560101	0.000101	0.00074	7.4	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.

Frequency Tolerance was conducted with frequency counter function of spectrum analyzer.

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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)
MCH-06	Temperature and Humidity Chamber	Tabai Espec	PL-1KT	14007630	FT	2014/04/23 * 12
MMM-17	DIGITAL HiTESTER	Hioki	3805	070900530	FT	2014/01/22 * 12
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	FT	2014/10/17 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE/CE	2014/09/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE/CE	2014/02/20 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE/CE	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/CE	2014/09/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2014/03/14 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2014/11/20 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2014/11/12 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2014/06/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2014/11/11 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2014/09/26 * 12
MLS-25	LISN(AMN)	Schwarzbeck	NSLK8127	8127-731	CE	2014/07/09 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 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

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