



# RADIO TEST REPORT

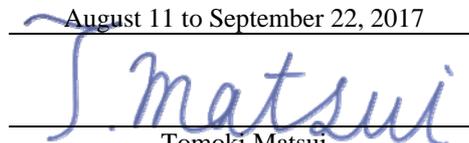
**Test Report No. : 11901173H-A-R1**

**Applicant** : ART Finex Co.,Ltd  
**Type of Equipment** : NFC Reader/Writer Module  
**Model No.** : ARI3000X/4670  
**Test regulation** : FCC Part 15 Subpart C: 2017  
**FCC ID** : 2AM8PARI3000X4670  
**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.
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 11901173H-A.

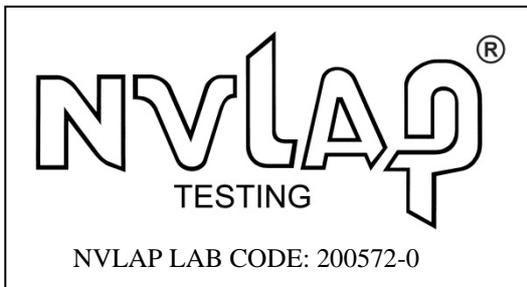
**Date of test:** August 11 to September 22, 2017

**Representative test engineer:**

  
Tomoki Matsui  
Engineer  
Consumer Technology Division

**Approved by:**

  
Satofumi Matsuyama  
Engineer  
Consumer Technology Division



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://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

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## **SECTION 1: Customer information**

[Applicant]

Company Name : ART Finex Co.,Ltd  
Address : 6-1-33,Kamikobatacho,Sabae, Fukui 916-0037 Japan  
Telephone Number : +81-778-54-8085  
Facsimile Number : +81-778-54-8092  
Contact Person : Toshikazu Kamei

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

Type of Equipment : NFC Reader/Writer Module  
Model No. : ARI3000X/4670  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.3 V  
Receipt Date of Sample : August 7, 2017  
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**

Model: ARI3000X/4670 (referred to as the EUT in this report) is the NFC Reader/Writer Module.

#### **General Specification**

Clock frequency(ies) in the system : 27.12 MHz

#### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 13.56 MHz  
Modulation : ASK  
Power Supply (radio part input) : DC 3.3 V  
Antenna type : Printed Loop Coil Pattern Antenna  
Operating Temperature : -20 deg. C to +70 deg. C

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### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on September 1, 2017 and effective October 2, 2017

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.225 Operation within the band 13.110-14.010 MHz.

\* The revision on September 1, 2017, does not affect the test specification applied to the EUT.

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### 3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods	Section 15.207	[QP] 11.4 dB 9.38470 MHz, L <Type A with Tag>	N/A	-
	<IC>RSS-Gen 8.8	<IC>RSS-Gen 8.8	[AV] 5.3 dB 24.00000 MHz, N <FeliCa with Tag, without Tag>		
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	55.1 dB, 13.56000 MHz, QP, 0 deg.	Complied	Radiated
	<IC> RSS-Gen 6.4, 6.12	<IC>RSS-210 B.6	< without Tag>		
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods	Section 15.225(b)(c)	29.9 dB, 12.71288 MHz, QP, 0 deg.	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC> RSS-210 B.6	<Type B with Tag>		
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods	Section15.215(c)	See data	Complied	Radiated
	<IC> -	<IC> -			
Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.209, Section 15.225 (d)	0.5 dB 203.403 MHz, Horizontal, QP	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC>RSS-210 B.6			
Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods	Section 15.225(e)	See data	Complied	Radiated
	<IC>RSS-Gen 6.11, 8.11	<IC> RSS-210 B.6			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422

#### FCC Part 15.31 (e)

The stable voltage (DC 3.3 V) was provided to the EUT during the tests.

Therefore, this EUT complies with the requirement.

However, the supply voltage was varied and tested at 85 % and 115 % of the nominal rated supply voltage during frequency tolerance test according to Section 15.225(e).

#### 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.

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### 3.4 Uncertainty

#### EMI

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

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 MHz to 0.15 MHz	3.1 dB
0.15 MHz to 30 MHz	2.5 dB

Test distance	Radiated emission (+/-)
	9 kHz to 30 MHz
3 m	3.8 dB
10 m	3.6 dB

\*Measurement distance

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz to 200 MHz	200 MHz to 1000 MHz	30 MHz to 200 MHz	200 MHz to 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz to 6 GHz	6 GHz to 18 GHz	10 GHz to 26.5 GHz	26.5 GHz to 40 GHz	1 GHz to 18 GHz
5.2 dB	5.5 dB	5.5 dB	5.4 dB	5.5 dB

\* Measurement distance

Antenna terminal test	Uncertainty (+/-)
Frequency error	
13.56 MHz	0.01541 ppm

#### Conducted emission test

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

#### Radiated emission test (3 m)

[Electric Field Strength of Fundamental Emission and Spectrum Mask]

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

[Electric Field Strength of Spurious Emission]

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 4.5m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15m	-
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, Test data, and Test instruments

Refer to APPENDIX.

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

### **4.1 Operating Modes**

The mode is used :

<b>Mode</b>	<b>Remarks*</b>
Transmitting mode (Tx) - TypeA - TypeB - FeliCa(212 kbps)	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.	

<b>Test Item</b>	<b>Operating mode*</b>
Conducted emission	Tx Mod on, with Tag Tx Mod on, without Tag Tx Mod on, Terminated *2)
Electric Field Strength of Fundamental Emission	Tx Mod on, with Tag Tx Mod on, without Tag
Spectrum Mask	Tx Mod on, with Tag Tx Mod on, without Tag
20 dB Bandwidth	Tx Mod on, with Tag
99 % Occupied Bandwidth	Tx Mod on, without Tag
Electric Field Strength of Spurious Emission	Tx Mod on, with Tag *1) Tx Mod on, without Tag
Frequency Tolerance	Tx Mod off

\*1) After the comparison of the test data among each type, the tests were performed with the worst case (Below 30 MHz; without Tag, Above 30 MHz; Type A (with Tag)).

\*2) 50 ohm termination was installed instead of the antenna.

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

Frequency Tolerance:

Temperature : -30 deg. C to +50 deg. C; Step 10 deg. C (-30deg.C: Reference)

Voltage : Normal Voltage DC 3.3 V

Maximum Voltage DC 3.795 V, Minimum Voltage DC 2.805 V (DC 3.3 V  $\pm$ 15 %)

\*This EUT provides stable voltage (DC 3.3 V) constantly to RF Part regardless of input voltage

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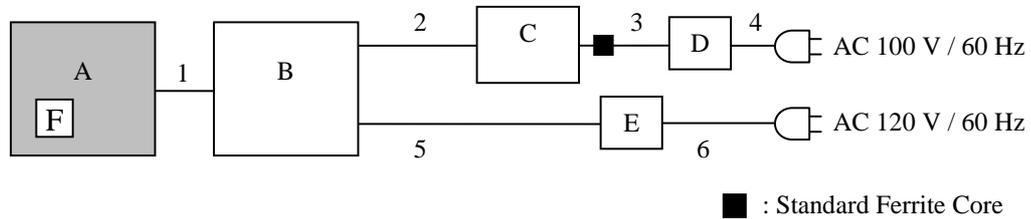
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## 4.2 Configuration and peripherals

[Conducted emission test]



\* Cabling and setup(s) 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	NFC Reader/Writer Module	ARI3000X/4670	7E17SE1	ART Finex Co.,Ltd	EUT
B	Jig	-	-	-	-
C	Laptop PC	CF-N8hWCDPS	OBKSA09704	Panasonic	-
D	AC Adapter	CF-AA6372B	6372BM09907 232B	Panasonic	-
E	DC Power Supply	PMC35-2A	13090501	KIKUSUI	-
F	Tag	NTAG203 WPP60	-	SMARTRAC	Type A
		-	-	Maxim Integrated	Type B
		-	-	E-Garde Incorporated	FeliCa

### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	0.2	Unshielded	Unshielded	-
2	USB Cable	2.0	Shielded	Shielded	-
3	DC Cable	1.1	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-
5	DC Cable	0.5	Unshielded	Unshielded	-
6	AC Cable	1.8	Unshielded	Unshielded	-

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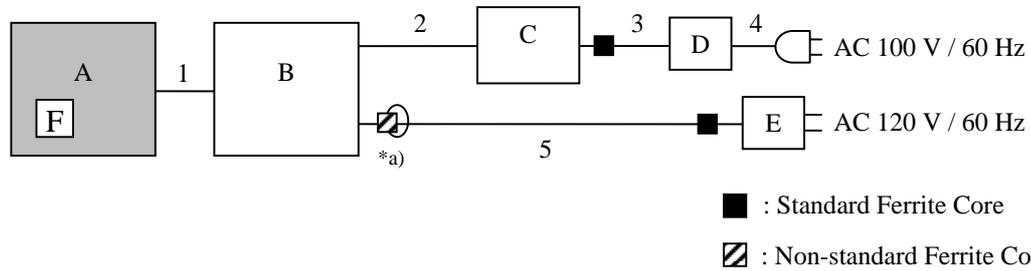
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[Other tests except for Conducted emission tests]



\* Cabling and setup(s) 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	NFC Reader/Writer Module	ARI3000X/4670	7E17SE1	ART Finex Co.,Ltd	EUT
B	Jig	-	-	-	-
C	Laptop PC	CF-N8hWCDPS	OBKSA09704	Panasonic	-
D	AC Adapter	CF-AA6372B	6372BM09907 232B	Panasonic	-
E	AC Adapter	STD-05015U	-	ADAPTER TECH	-
F	Tag	NTAG203 WPP60	-	SMARTRAC	Type A
		-	-	Maxim Integrated	Type B
		-	-	E-Garde Incorporated	FeliCa

**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	0.2	Unshielded	Unshielded	-
2	USB Cable	2.0	Shielded	Shielded	-
3	DC Cable	1.1	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-
5	DC Cable	1.2	Unshielded	Unshielded	-

<Notes for Ferrite cores>

\*a) 1 Ferrite Core, Model No. FAIR-RJITVO (Manufacturer: Fair-Rite), 3 cm from Item B, 2 turn

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## **SECTION 5: Conducted emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm 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 80 cm from any other grounded conducting surface. EUT was located 80 cm 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 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm 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.

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

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

Test Procedure

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

Frequency: From 9 kHz to 30 MHz

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 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

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

Frequency: From 30 MHz to 1 GHz

The measuring antenna height varied between 1 and 4 m 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 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

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

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

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

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 414788.

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

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

**SECTION 7: Other test**

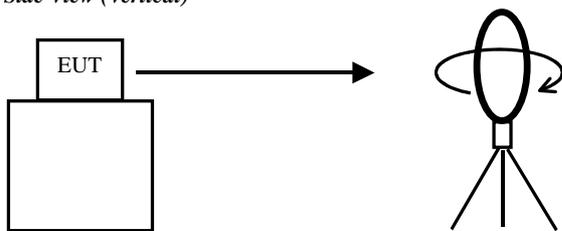
Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	Between 2.0 times and 5.0 times of the OBW	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Between 1.5 times and 5.0 times of the OBW	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter *1)

Peak hold was applied as Worst-case measurement.  
\*1) The measurement was performed with Marker Frequency Counter Function.

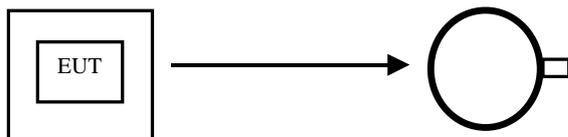
Test data : APPENDIX  
Test result : Pass

**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*

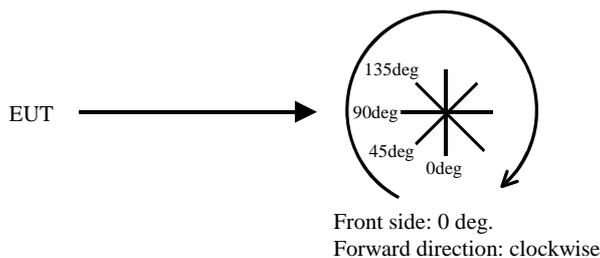


*Top View (Horizontal)*



Antenna was not rotated.

*Top View (Vertical)*



**APPENDIX 1: Test data**

**Conducted emission  
Type A (with Tag)**

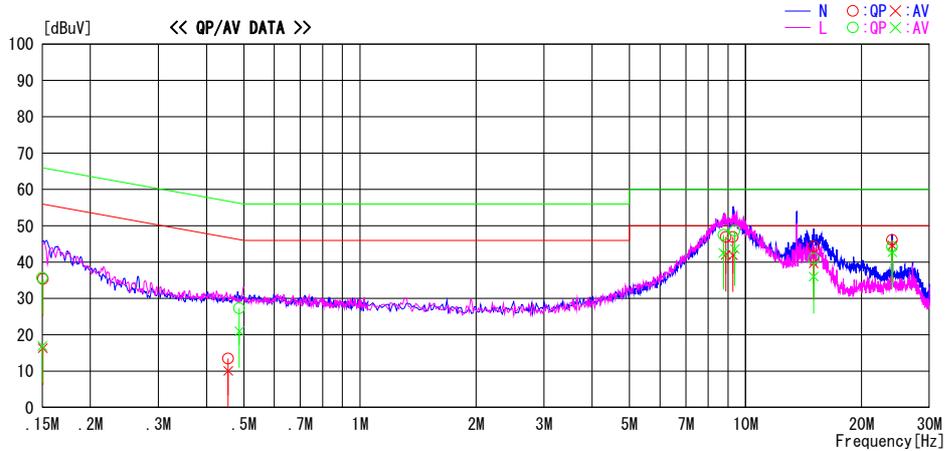
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2017/09/06

Report No. : 11901173H  
Temp./Humi. : 24deg. C / 61% RH  
Engineer : Ryota Yamanaka

Mode / Remarks : Tx 13.56 MHz Type A 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]		
0.15000	22.5	3.7	13.2	35.7	16.9	66.0	56.0	30.3	39.1	L	
0.15058	22.2	3.1	13.2	35.4	16.3	66.0	56.0	30.6	39.7	N	
0.45540	0.2	-3.1	13.2	13.4	10.1	56.8	46.8	43.4	36.7	N	
0.48631	14.1	7.8	13.2	27.3	21.0	56.2	46.2	28.9	25.2	L	
8.77164	33.4	28.4	14.1	47.5	42.5	60.0	50.0	12.5	7.5	L	
8.88743	32.8	27.9	14.1	46.9	42.0	60.0	50.0	13.1	8.0	N	
9.27577	32.8	27.8	14.1	46.9	41.9	60.0	50.0	13.1	8.1	N	
9.38470	34.5	29.5	14.1	48.6	43.6	60.0	50.0	11.4	6.4	L	
15.02315	29.8	25.2	14.5	44.3	39.7	60.0	50.0	15.7	10.3	N	
15.02500	26.4	21.5	14.5	40.9	36.0	60.0	50.0	19.1	14.0	L	
24.00000	31.1	29.6	15.0	46.1	44.6	60.0	50.0	13.9	5.4	N	
24.00050	29.2	27.7	15.0	44.2	42.7	60.0	50.0	15.8	7.3	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 (with Tag)**

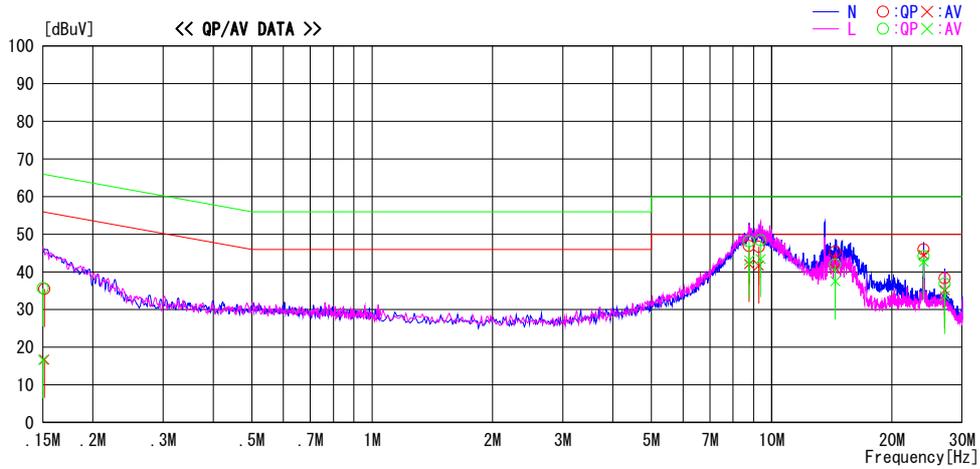
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2017/09/06

Report No. : 11901173H  
Temp./Humi. : 24deg. C / 61% RH  
Engineer : Ryota Yamanaka

Mode / Remarks : Tx 13.56 MHz Type B with Tag

LIMIT : FCC15.207 QP  
FCC15.207 AV



Frequency [MHz]	Reading_Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	22.5	3.4	13.2	35.7	16.6	66.0	56.0	30.3	39.4	L	
0.15117	22.3	3.5	13.2	35.5	16.7	65.9	55.9	30.4	39.2	N	
8.77912	34.0	29.0	14.1	48.1	43.1	60.0	50.0	11.9	6.9	L	
8.78117	32.8	28.0	14.1	46.9	42.1	60.0	50.0	13.1	7.9	N	
9.28895	32.6	27.6	14.1	46.7	41.7	60.0	50.0	13.3	8.3	N	
9.37741	34.3	29.3	14.1	48.4	43.4	60.0	50.0	11.6	6.6	L	
14.41610	31.0	26.5	14.4	45.4	40.9	60.0	50.0	14.6	9.1	N	
14.42081	27.5	23.1	14.4	41.9	37.5	60.0	50.0	18.1	12.5	L	
24.00055	29.2	27.7	15.0	44.2	42.7	60.0	50.0	15.8	7.3	L	
24.00083	31.0	29.5	15.0	46.0	44.5	60.0	50.0	14.0	5.5	N	
27.10749	23.2	20.0	15.1	38.3	35.1	60.0	50.0	21.7	14.9	N	
27.12056	21.8	18.5	15.1	36.9	33.6	60.0	50.0	23.1	16.4	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 (with Tag)**

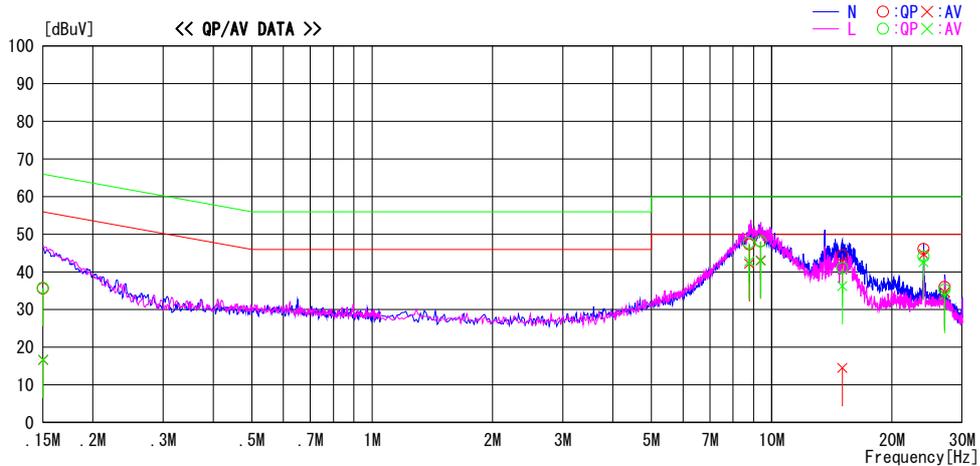
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2017/09/06

Report No. : 11901173H  
Temp./Humi. : 24deg. C / 61% RH  
Engineer : Ryota Yamanaka

Mode / Remarks : Tx 13.56 MHz FeliCa with Tag

LIMIT : FCC15.207 QP  
FCC15.207 AV



Frequency [MHz]	Reading_Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	22.4	3.4	13.2	35.6	16.6	66.0	56.0	30.4	39.4	N	
0.15000	22.6	3.5	13.2	35.8	16.7	66.0	56.0	30.2	39.3	L	
8.77601	33.6	28.7	14.1	47.7	42.8	60.0	50.0	12.3	7.2	L	
8.78506	33.2	28.1	14.1	47.3	42.2	60.0	50.0	12.7	7.8	N	
9.37862	34.0	29.0	14.1	48.1	43.1	60.0	50.0	11.9	6.9	N	
9.38775	34.0	28.8	14.1	48.1	42.9	60.0	50.0	11.9	7.1	L	
15.02263	29.9	0.0	14.5	44.4	14.5	60.0	50.0	15.6	35.5	N	
15.02430	26.5	21.7	14.5	41.0	36.2	60.0	50.0	19.0	13.8	L	
23.99933	29.1	27.6	15.0	44.1	42.6	60.0	50.0	15.9	7.4	L	
24.00000	31.1	29.7	15.0	46.1	44.7	60.0	50.0	13.9	5.3	N	
27.12063	20.2	18.8	15.1	35.3	33.9	60.0	50.0	24.7	16.1	L	
27.12206	20.9	19.5	15.1	36.0	34.6	60.0	50.0	24.0	15.4	N	

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 without Tag

### DATA OF CONDUCTED EMISSION TEST

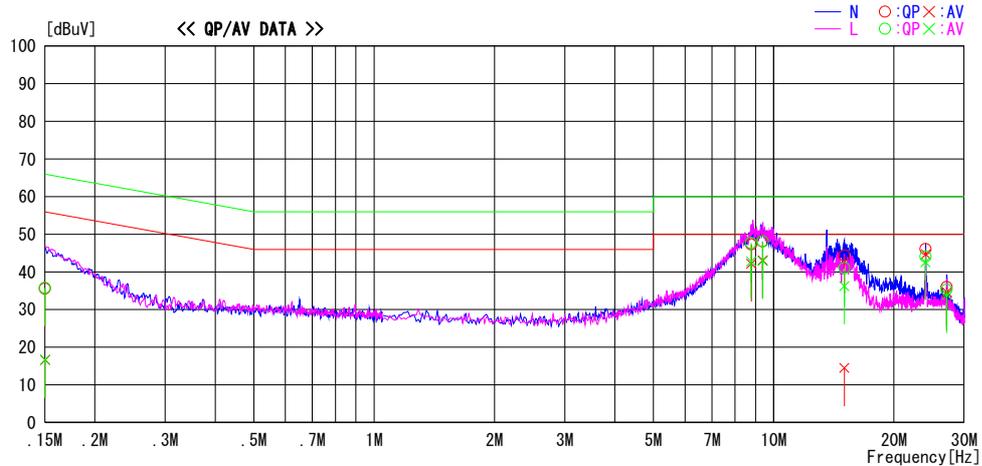
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2017/09/06

Report No. : 11901173H

Temp./Humi. : 24deg. C / 61% RH  
Engineer : Ryota Yamanaka

Mode / Remarks : Tx 13.56 MHz without Tag

LIMIT : FCC15.207 QP  
FCC15.207 AV



Frequency [MHz]	Reading_Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	22.4	3.4	13.2	35.6	16.6	66.0	56.0	30.4	39.4	N	
0.15000	22.6	3.5	13.2	35.8	16.7	66.0	56.0	30.2	39.3	L	
8.77601	33.6	28.7	14.1	47.7	42.8	60.0	50.0	12.3	7.2	L	
8.78506	33.2	28.1	14.1	47.3	42.2	60.0	50.0	12.7	7.8	N	
9.37862	34.0	29.0	14.1	48.1	43.1	60.0	50.0	11.9	6.9	N	
9.38775	34.0	28.8	14.1	48.1	42.9	60.0	50.0	11.9	7.1	L	
15.02263	29.9	0.0	14.5	44.4	14.5	60.0	50.0	15.6	35.5	N	
15.02430	26.5	21.7	14.5	41.0	36.2	60.0	50.0	19.0	13.8	L	
23.99933	29.1	27.6	15.0	44.1	42.6	60.0	50.0	15.9	7.4	L	
24.00000	31.1	29.7	15.0	46.1	44.7	60.0	50.0	13.9	5.3	N	
27.12063	20.2	18.8	15.1	35.3	33.9	60.0	50.0	24.7	16.1	L	
27.12206	20.9	19.5	15.1	36.0	34.6	60.0	50.0	24.0	15.4	N	

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 Terminated

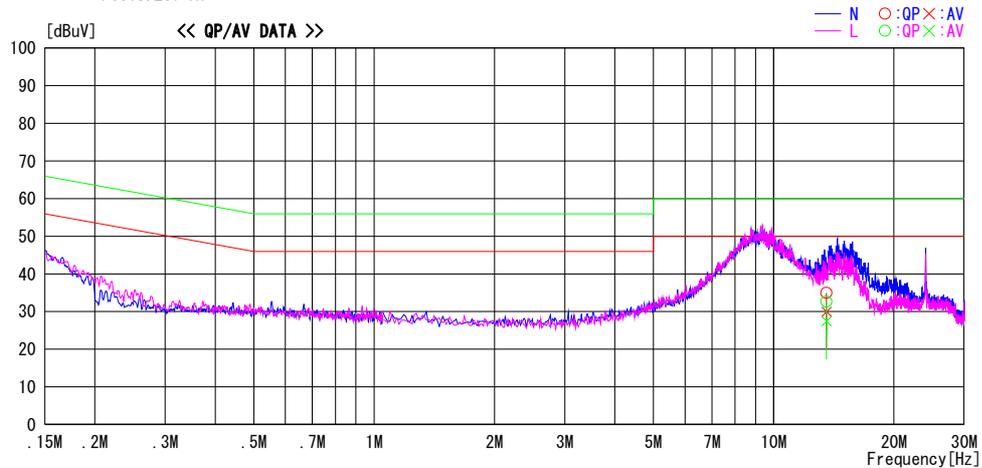
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2017/09/06

Report No. : 11901173H  
Temp./Humi. : 24deg. C / 61% RH  
Engineer : Ryota Yamanaka

Mode / Remarks : Tx 13.56 MHz Terminated

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]		
13.56000	20.6	15.6	14.4	35.0	30.0	60.0	50.0	25.0	20.0	N	
13.56000	18.2	13.0	14.4	32.6	27.4	60.0	50.0	27.4	22.6	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 (with Tag)

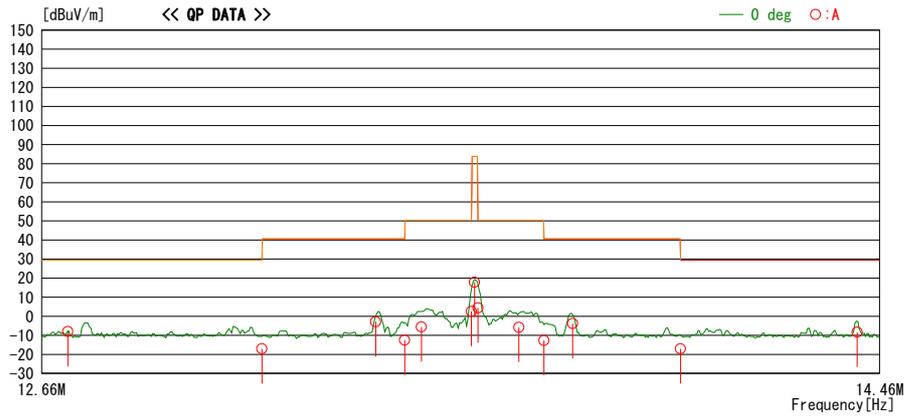
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2017/08/11

Report No. : 11901173H  
Temp. / Humi. : 24 deg. C / 57% RH  
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56 MHz Type A with Tag Worst Axis (Z-Axis)

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	Loss	Gain	Result	Limit	Margin	Antenna	Table		Comment
			[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]		
12.71239	38.1	QP	19.6	-33.4	32.3	-8.0	29.5	37.5	0	A	0	
13.11000	29.1	QP	19.4	-33.3	32.3	-17.1	29.5	46.6	0	A	0	
13.34856	43.3	QP	19.4	-33.3	32.3	-2.9	40.5	43.4	0	A	0	
13.41000	33.7	QP	19.4	-33.3	32.3	-12.5	40.5	53.0	0	A	0	
13.44607	40.5	QP	19.4	-33.3	32.3	-5.7	50.4	56.1	0	A	0	
13.55300	48.7	QP	19.4	-33.3	32.3	2.5	50.4	47.9	0	A	0	
13.56000	64.0	QP	19.4	-33.3	32.3	17.8	83.9	66.1	0	A	0	
13.56700	50.6	QP	19.4	-33.3	32.3	4.4	50.4	46.0	0	A	0	
13.65528	40.4	QP	19.4	-33.3	32.3	-5.8	50.4	56.2	0	A	0	
13.71000	33.5	QP	19.4	-33.3	32.3	-12.7	40.5	53.2	0	A	0	
13.77210	42.4	QP	19.4	-33.3	32.3	-3.8	40.5	44.3	0	A	0	
14.01000	29.1	QP	19.4	-33.3	32.3	-17.1	29.5	46.6	0	A	0	
14.40799	37.8	QP	19.4	-33.3	32.3	-8.4	29.5	37.9	0	A	0	

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

#### Result of the fundamental emission at 3 m 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	64.0	19.4	6.7	32.3	-	57.8	-	-	Fundamental

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

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## Fundamental emission and Spectrum Mask Type B (with Tag)

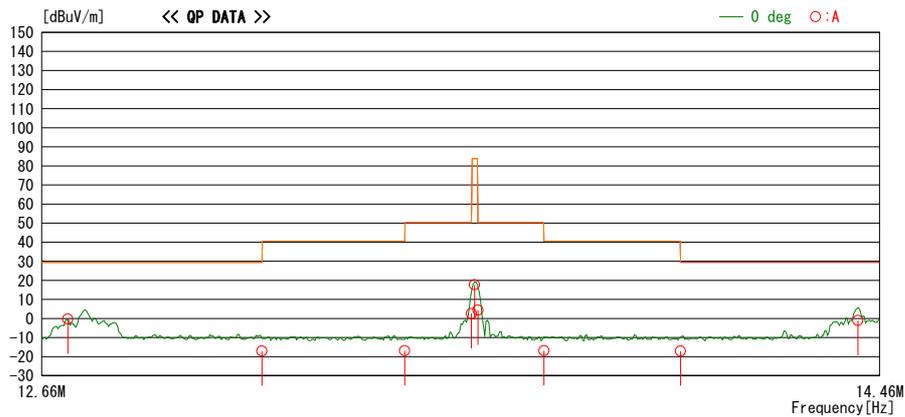
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2017/08/11

Report No. : 11901173H  
Temp./ Humi. : 24 deg.C / 57% RH  
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56 MHz Type B with Tag Worst Axis (Z-Axis)

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]	
12.71288	45.7	QP	19.6	-33.4	32.3	-0.4	29.5	29.9	0	A	0
13.11000	29.2	QP	19.4	-33.3	32.3	-17.0	29.5	46.5	0	A	0
13.41000	29.3	QP	19.4	-33.3	32.3	-16.9	40.5	57.4	0	A	0
13.55300	48.7	QP	19.4	-33.3	32.3	2.5	50.4	47.9	0	A	0
13.56000	63.9	QP	19.4	-33.3	32.3	17.7	83.9	66.2	0	A	0
13.56700	50.6	QP	19.4	-33.3	32.3	4.4	50.4	46.0	0	A	0
13.71000	29.4	QP	19.4	-33.3	32.3	-16.8	40.5	57.3	0	A	0
14.01000	29.2	QP	19.4	-33.3	32.3	-17.0	29.5	46.5	0	A	0
14.40915	45.2	QP	19.4	-33.3	32.3	-1.0	29.5	30.5	0	A	0

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

#### Result of the fundamental emission at 3 m without Distance factor

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	63.9	19.4	6.7	32.3	-	57.7	-	-	Fundamental

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

### UL Japan, Inc. Ise EMC Lab.

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## Fundamental emission and Spectrum Mask FeliCa (with Tag)

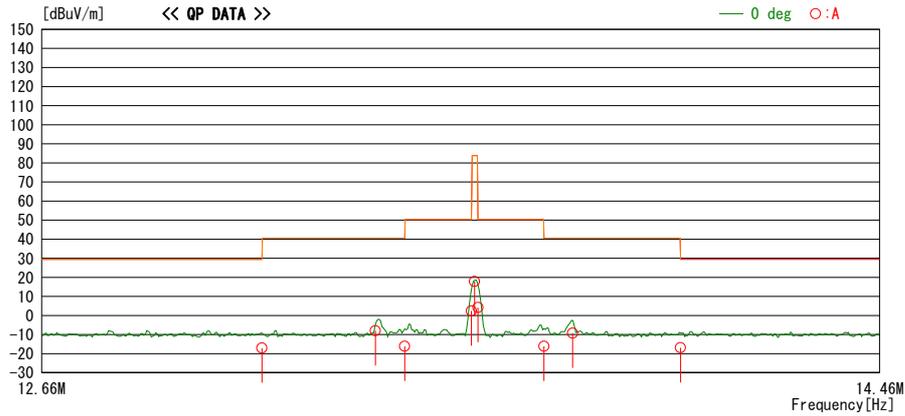
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2017/08/11

Report No. : 11901173H  
Temp./ Humi. : 24 deg.C / 57% RH  
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56 MHz FeliCa with Tag Worst Axis (Z-Axis)

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	29.1	QP	19.4	-33.3	32.3	-17.1	29.5	46.6	0	A	0
13.34842	38.2	QP	19.4	-33.3	32.3	-8.0	40.5	48.5	0	A	0
13.41000	30.1	QP	19.4	-33.3	32.3	-16.1	40.5	56.6	0	A	0
13.55300	48.5	QP	19.4	-33.3	32.3	2.3	50.4	48.1	0	A	0
13.56000	64.0	QP	19.4	-33.3	32.3	17.8	83.9	66.1	0	A	0
13.56700	50.4	QP	19.4	-33.3	32.3	4.2	50.4	46.2	0	A	0
13.71000	30.1	QP	19.4	-33.3	32.3	-16.1	40.5	56.6	0	A	0
13.77200	36.9	QP	19.4	-33.3	32.3	-9.3	40.5	49.8	0	A	0
14.01000	29.3	QP	19.4	-33.3	32.3	-16.9	29.5	46.4	0	A	0

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

#### Result of the fundamental emission at 3 m without Distance factor

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	64.0	19.4	6.7	32.3	-	57.8	-	-	Fundamental

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

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## Fundamental emission and Spectrum Mask without Tag

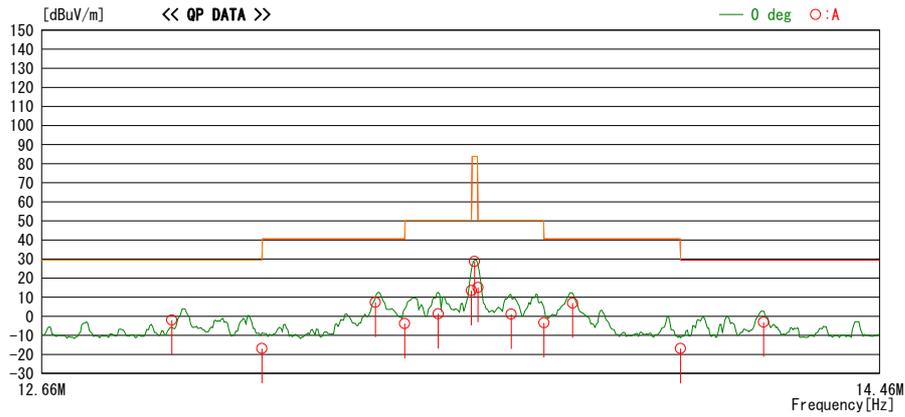
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2017/08/11

Report No. : 11901173H  
Temp. / Humi. : 24 deg. C / 57% RH  
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56 MHz without Tag Worst Axis (Z-Axis)

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	Loss	Gain	Result	Limit	Margin	Antenna	Table		Comment
			[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]		
12.92442	44.2	QP	19.5	-33.3	32.3	-1.9	29.5	31.4	0	A	0	
13.11000	29.4	QP	19.4	-33.3	32.3	-16.8	29.5	46.3	0	A	0	
13.34830	53.5	QP	19.4	-33.3	32.3	7.3	40.5	33.2	0	A	0	
13.41000	42.4	QP	19.4	-33.3	32.3	-3.8	40.5	44.3	0	A	0	
13.48207	47.5	QP	19.4	-33.3	32.3	1.3	50.4	49.1	0	A	0	
13.55300	59.6	QP	19.4	-33.3	32.3	13.4	50.4	37.0	0	A	0	
13.56000	75.0	QP	19.4	-33.3	32.3	28.8	83.9	55.1	0	A	0	
13.56700	61.3	QP	19.4	-33.3	32.3	15.1	50.4	35.3	0	A	0	
13.63904	47.3	QP	19.4	-33.3	32.3	1.1	50.4	49.3	0	A	0	
13.71000	42.7	QP	19.4	-33.3	32.3	-3.5	40.5	44.0	0	A	0	
13.77204	53.2	QP	19.4	-33.3	32.3	7.0	40.5	33.5	0	A	0	
14.01000	29.4	QP	19.4	-33.3	32.3	-16.8	29.5	46.3	0	A	0	
14.19557	43.1	QP	19.4	-33.3	32.3	-3.1	29.5	32.6	0	A	0	

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

#### Result of the fundamental emission at 3 m 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
0	13.56000	QP	75.0	19.4	6.7	32.3	-	68.8	-	-	Fundamental

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

**UL Japan, Inc.**  
**Ise EMC Lab.**

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**Spurious emission  
(Below 30 MHz)  
without Tag**

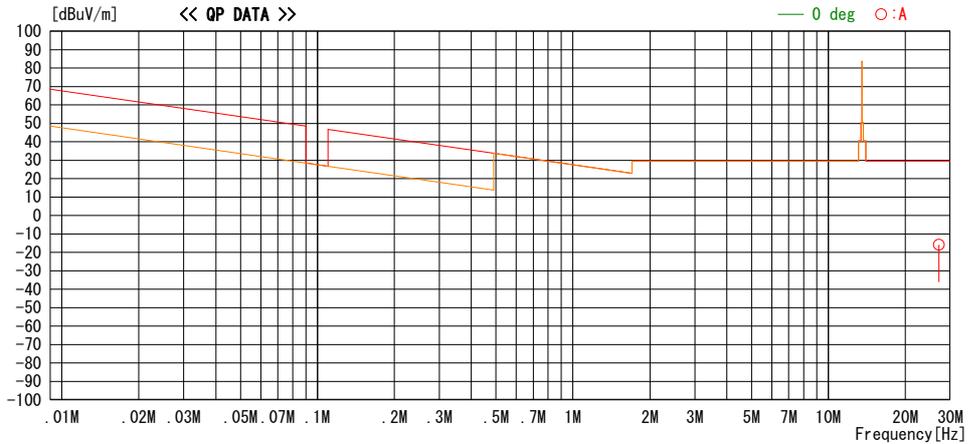
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2017/08/11

Report No. : 11901173H  
Temp. / Humi. : 24 deg. C / 57% RH  
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56 MHz without Tag Worst Axis (Z-Axis)

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	29.1	QP	20.3	-33.1	32.2	-15.9	29.5	45.4	0	A	0

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

**Spurious emission**  
**(Above 30 MHz)**  
**Type A (with Tag)**

**DATA OF RADIATED EMISSION TEST**

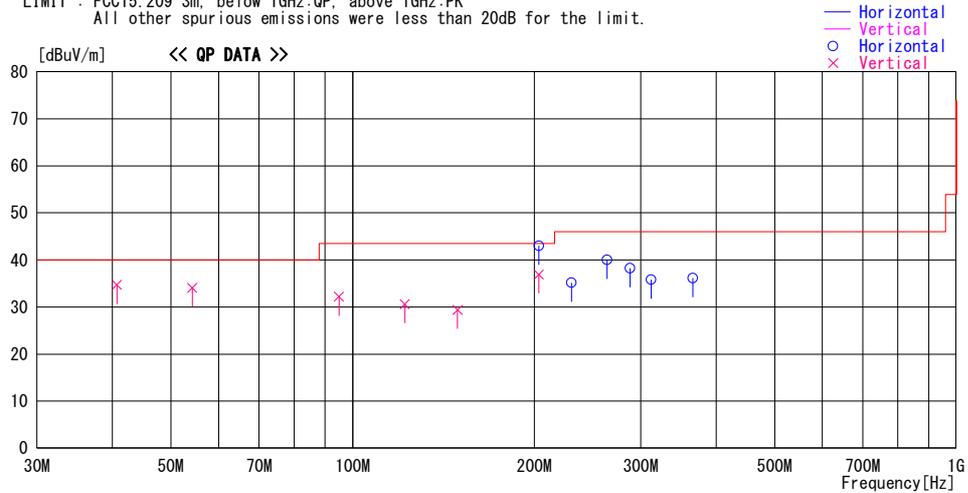
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2017/09/01

Report No. : 11901173H

Temp./Humi. : 24 deg. C / 44 % RH  
Engineer : Masafumi Niwa

Mode / Remarks : Tx 13.56 MHz Type A with Tag Worst Axis (Hori: Z, Vert: Z)

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



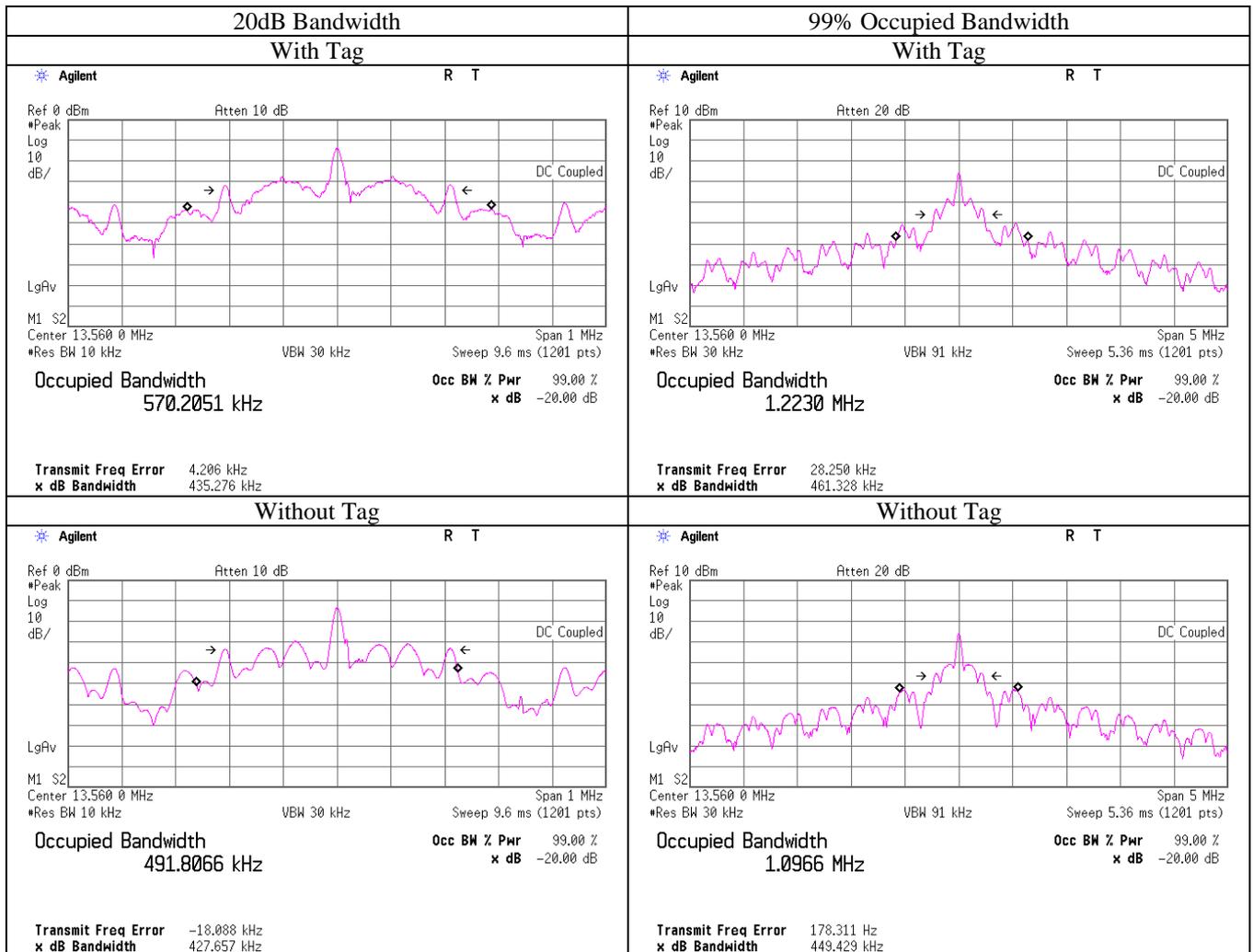
Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
40.680	45.6	QP	14.0	-24.9	34.7	93	100	Vert.	40.0	5.3	
54.241	49.5	QP	9.3	-24.7	34.1	246	100	Vert.	40.0	5.9	
94.922	47.1	QP	9.2	-24.1	32.2	36	100	Vert.	43.5	11.3	
122.042	41.4	QP	13.0	-23.8	30.6	27	100	Vert.	43.5	12.9	
149.162	37.8	QP	15.0	-23.4	29.4	341	100	Vert.	43.5	14.1	
203.403	48.3	QP	11.5	-22.9	36.9	95	100	Vert.	43.5	6.6	
203.403	54.4	QP	11.5	-22.9	43.0	359	182	Hori.	43.5	0.5	
230.524	46.0	QP	11.7	-22.5	35.2	359	166	Hori.	46.0	10.8	
264.001	50.0	QP	12.3	-22.3	40.0	16	114	Hori.	46.0	6.0	
288.001	47.3	QP	13.0	-22.1	38.2	9	100	Hori.	46.0	7.8	
312.001	44.0	QP	13.7	-21.9	35.8	22	100	Hori.	46.0	10.2	
366.126	42.6	QP	15.0	-21.5	36.1	201	100	Hori.	46.0	9.9	

CHART : WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN  
CALCULATION : RESULT = READING + ANT FACTOR + LOSS (CABLE + ATTEN) - GAIN (AMP)

## 20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 measurement room	
Report No.	11901173H	
Date	08/29/2017	09/22/2017
Temperature/ Humidity	24 deg. C / 56 % RH	24 deg. C / 54 % RH
Engineer	Tomoki Matsui	Tomoki Matsui
Mode	Tx Mod on TypeA	

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	435.28	1223.00
	Without Tag	427.66	1096.60



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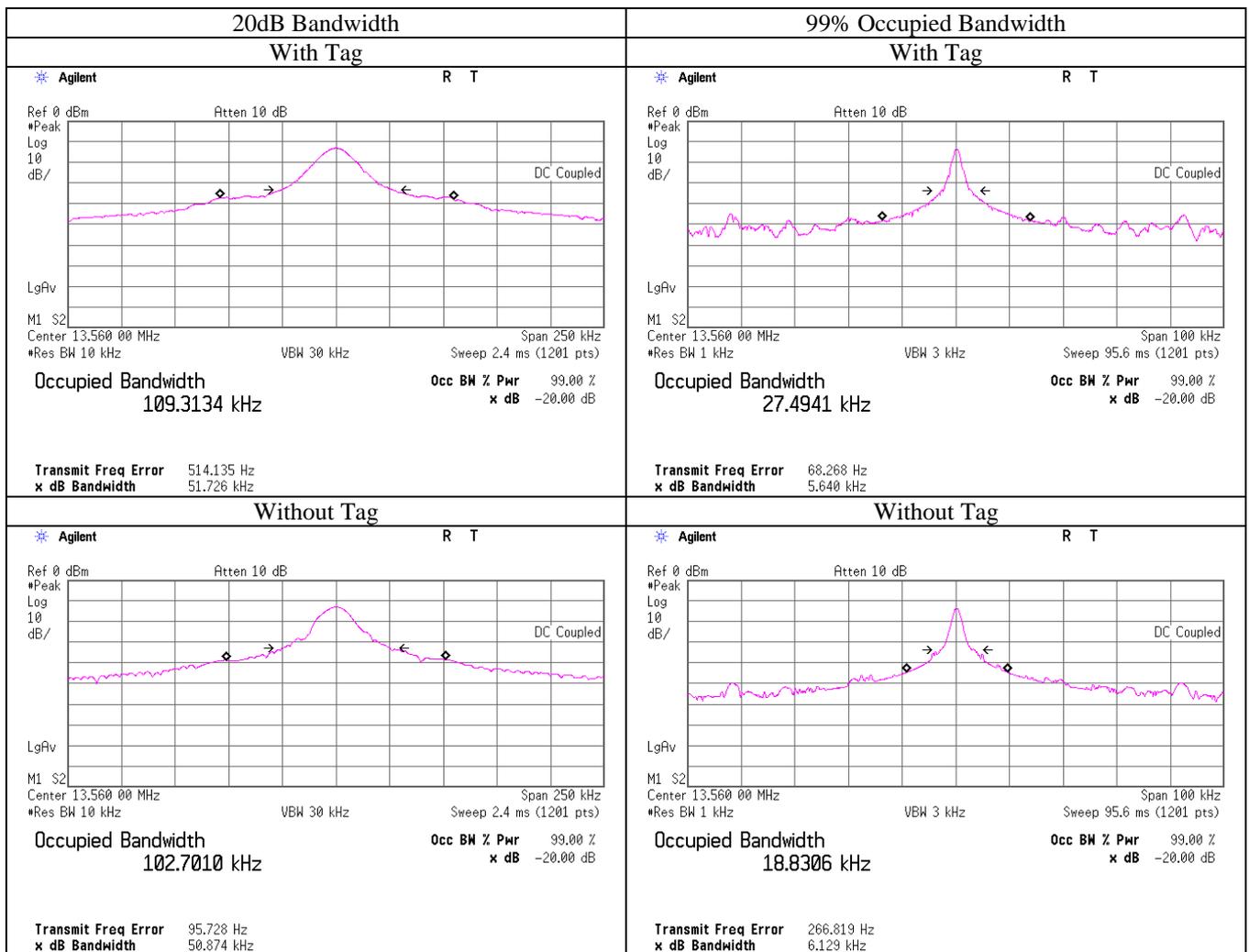
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## 20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 measurement room
Report No.	11901173H
Date	08/29/2017
Temperature/ Humidity	24 deg. C / 56 % RH
Engineer	Tomoki Matsui
Mode	Tx Mod on TypeB

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	51.73	27.49
	Without Tag	50.87	18.83



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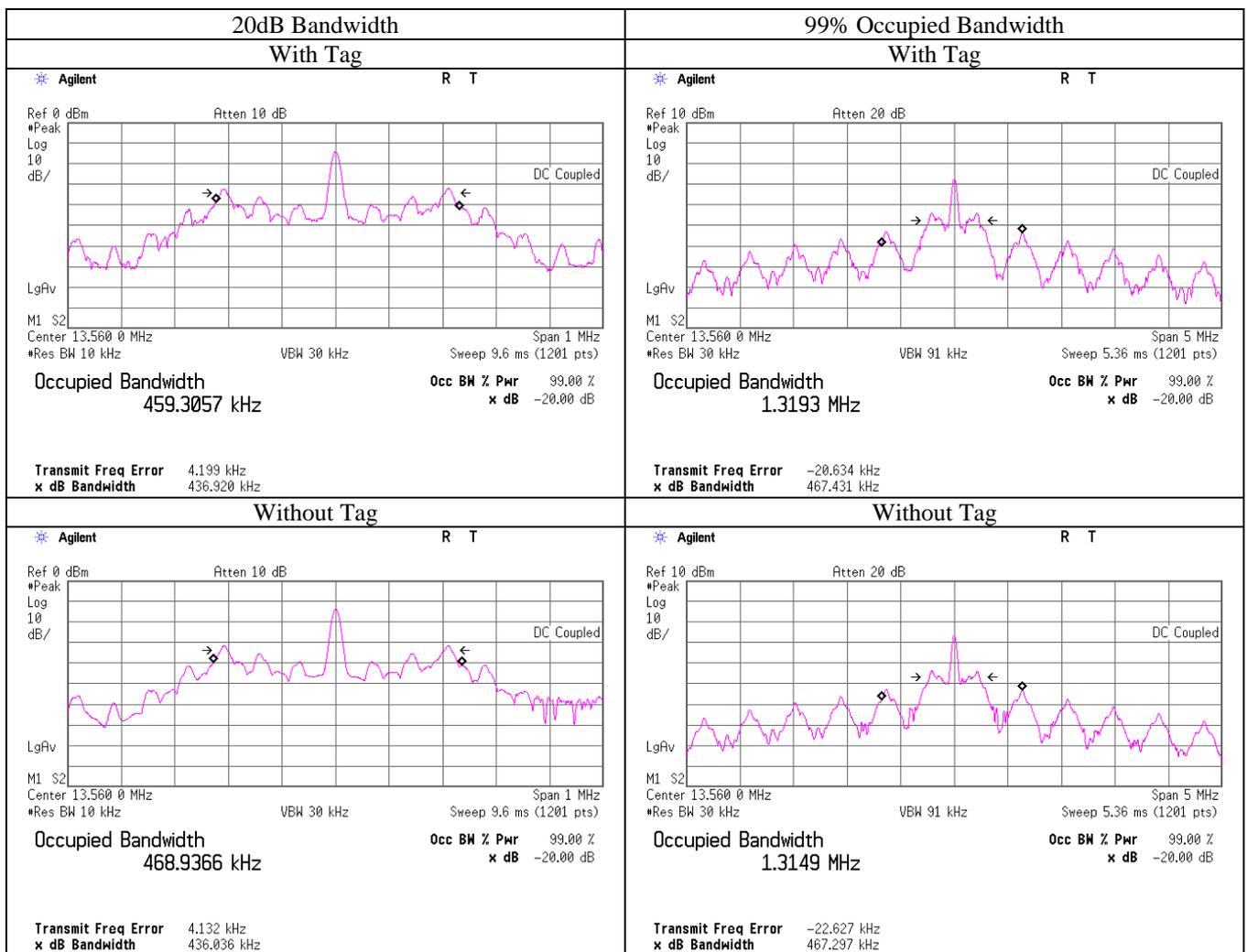
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Facsimile : +81 596 24 8124

## 20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.11 measurement room		
Report No.	11901173H		
Date	08/29/2017	09/22/2017	
Temperature/ Humidity	24 deg. C / 56 % RH	24 deg. C / 54 % RH	
Engineer	Tomoki Matsui	Tomoki Matsui	
Mode	Tx Mod on FeliCa		

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	436.92	1319.30
	Without Tag	436.04	1314.90



## Frequency Tolerance

Test place Ise EMC Lab. No.11 measurement room  
Report No. 11901173H  
Date 08/29/2017 09/06/2017  
Temperature/ Humidity 24 deg. C / 56 % RH 24 deg. C / 65 % RH  
Engineer Tomoki Matsui Shuichi Ohyama  
Mode Tx Mod off

Test condition Temp. [deg. C]	Voltage [V]	Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit [+/- %]
					[%]	[ppm]	
50	3.3	Power on	13.560161	0.000161	0.00119	11.9	0.01
		+ 2 min.	13.560159	0.000159	0.00118	11.8	0.01
		+ 5 min.	13.560161	0.000161	0.00119	11.9	0.01
		+ 10 min.	13.560163	0.000163	0.00120	12.0	0.01
40	3.3	Power on	13.560179	0.000179	0.00132	13.2	0.01
		+ 2 min.	13.560172	0.000172	0.00127	12.7	0.01
		+ 5 min.	13.560172	0.000172	0.00127	12.7	0.01
		+ 10 min.	13.560172	0.000172	0.00127	12.7	0.01
30	3.3	Power on	13.560211	0.000211	0.00156	15.6	0.01
		+ 2 min.	13.560201	0.000201	0.00149	14.9	0.01
		+ 5 min.	13.560199	0.000199	0.00147	14.7	0.01
		+ 10 min.	13.560198	0.000198	0.00146	14.6	0.01
20	3.3	Power on	13.560255	0.000255	0.00188	18.8	0.01
		+ 2 min.	13.560245	0.000244	0.00180	18.0	0.01
		+ 5 min.	13.560242	0.000242	0.00178	17.8	0.01
		+ 10 min.	13.560241	0.000241	0.00178	17.8	0.01
20	2.805 (3.3V -15%)	Power on	13.560193	0.000193	0.00142	14.2	0.01
		+ 2 min.	13.560191	0.000191	0.00141	14.1	0.01
		+ 5 min.	13.560190	0.000190	0.00140	14.0	0.01
		+ 10 min.	13.560190	0.000190	0.00140	14.0	0.01
20	3.795 (3.3V +15%)	Power on	13.560193	0.000192	0.00142	14.2	0.01
		+ 2 min.	13.560180	0.000180	0.00133	13.3	0.01
		+ 5 min.	13.560172	0.000172	0.00127	12.7	0.01
		+ 10 min.	13.560170	0.000170	0.00125	12.5	0.01
10	3.3	Power on	13.560300	0.000300	0.00221	22.1	0.01
		+ 2 min.	13.560286	0.000286	0.00211	21.1	0.01
		+ 5 min.	13.560283	0.000283	0.00208	20.8	0.01
		+ 10 min.	13.560282	0.000282	0.00208	20.8	0.01
0	3.3	Power on	13.560317	0.000317	0.00234	23.4	0.01
		+ 2 min.	13.560312	0.000312	0.00230	23.0	0.01
		+ 5 min.	13.560310	0.000310	0.00229	22.9	0.01
		+ 10 min.	13.560310	0.000310	0.00228	22.8	0.01
-10	3.3	Power on	13.560316	0.000316	0.00233	23.3	0.01
		+ 2 min.	13.560317	0.000317	0.00233	23.3	0.01
		+ 5 min.	13.560317	0.000317	0.00233	23.3	0.01
		+ 10 min.	13.560317	0.000317	0.00233	23.3	0.01
-20	3.3	Power on	13.560289	0.000288	0.00213	21.3	0.01
		+ 2 min.	13.560301	0.000301	0.00222	22.2	0.01
		+ 5 min.	13.560303	0.000303	0.00223	22.3	0.01
		+ 10 min.	13.560303	0.000303	0.00224	22.4	0.01
-30 *1)	3.3	Power on	13.560230	0.000230	0.00170	17.0	0.01
		+ 2 min.	13.560250	0.000250	0.00184	18.4	0.01
		+ 5 min.	13.560256	0.000256	0.00189	18.9	0.01
		+ 10 min.	13.560258	0.000258	0.00190	19.0	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.  
\*1) for IC application (RSS-Gen 6.11 requirement)

## 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	CE	2017/08/31 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	CE	2017/02/24 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/12/21 * 12
MTA-52	Terminator	TME	CT-01BP	-	CE	2016/12/01 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2017/07/24 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	CE	2016/11/10 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(AE)	2017/07/24 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	CE	2017/08/07 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2017/08/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	CE	2016/12/13 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2016/10/14 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2017/08/22 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2016/10/14 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	RE	2017/07/12 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2017/06/12 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/FT	2017/01/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2017/01/26 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2017/07/12 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2017/06/21 * 12
MSA-15	Spectrum Analyzer	Agilent	E4440A	MY46187105	FT	2016/10/13 * 12
MCH-06	Temperature and Humidity Chamber	Tabai Espec	PL-1KT	14007630	FT	2017/04/10 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2016/12/13 * 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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