



RADIO TEST REPORT

Test Report No. : 11934178H-A-R1

Applicant : BROTHER INDUSTRIES, LTD.
Type of Equipment : NFC Module
Model No. : BRNF13M003
Test regulation : FCC Part 15 Subpart C: 2017
FCC ID : B3QBRNF13M003
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 11934178H-A. 11934178H-A is replaced with this report.

Date of test: August 29 to December 26, 2017

Representative test engineer:

T. Noguchi

Takafumi Noguchi
Engineer

Consumer Technology Division

Approved by:

Takayuki Shimada

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,
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11934178H-A

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SECTION 1: Customer information

Company Name : BROTHER INDUSTRIES, LTD.
Trade Name : brother
Address : 15-1, Naeshiro-cho, Mizuho-ku, Nagoya, Aichi 467-8561, Japan
Telephone Number : +81-52-824-2345
Facsimile Number : +81-52-824-4116
Contact Person : Keita Koyama

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

2.1 Identification of E.U.T.

Type of Equipment : NFC Module
Model No. : BRNF13M003
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.3 V
Receipt Date of Sample : August 28, 2017
Country of Mass-production : Philippines
Condition of EUT : Engineering 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 : 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 / DC 1.8 V
Antenna type : Printed Loop Coil Pattern Antenna
Operating Temperature : 0 deg. C. to +40 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 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 13.110-14.010MHz

* The revision on November 2, 2017, does not affect the test specification applied to the EUT.

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] 16.9 dB, 0.47045 MHz, N	Complied	-
	<IC>RSS-Gen 8.8	<IC>RSS-Gen 8.8	[AV] 15.3 dB, 0.46440 MHz, N		
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	57.5 dB, 13.56000 MHz, QP, 0 deg.	Complied	Radiated
	<IC> RSS-Gen 6.4, 6.12	<IC>RSS-210 B.6			
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods	Section 15.225(b)(c)	30.0 dB, 13.03018 MHz, QP, 0 deg.	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC> RSS-210 B.6			
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)	7.1 dB 216.964 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 15.31 (e)

This EUT provides stable voltage (DC 3.3 V / DC 1.8 V) constantly to RF Module regardless of input voltage. 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 15.203/212 Antenna requirement

It is impossible for end users to replace the antenna, because it is printed on the circuit board. Therefore the equipment complies with the requirement of 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 $k = 2$.

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

* 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)

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

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 :

Mode	Remarks
Transmitting mode (Tx 13.56 MHz) - TypeA - TypeB - FeliCa(212 kbps) - FeliCa(424 kbps) - ISO15693	With Tag Without Tag Antenna Terminated
The EUT was operated in a manner similar to typical use during the tests.	

Test Item	Operating mode	Type of tag
Conducted emission	Tx with Tag	All type
	Tx without Tag	All type
	Tx Antenna terminated	All type
Electric Field Strength of Fundamental Emission	Tx with Tag Tx without Tag	All type
Spectrum Mask	Tx with Tag *1)	All type
20dB Bandwidth	Tx with Tag	All type
99% Occupied Bandwidth	Tx without Tag	All type
Electric Field Strength of Spurious Emission	Tx with Tag *1)	All type
Frequency Tolerance	Un-modulated Tx	-

*1) This EUT has two modes which Tag is attached to the EUT or not. The worst case was confirmed with and without Tag. The test was performed with worst case each type of Tag.

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

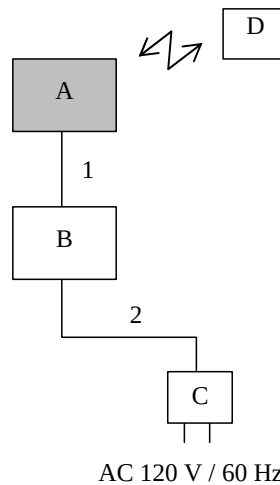
Frequency Tolerance:

Temperature : -30deg.C to +50deg.C Step 10deg.C (-30deg.C: Reference)
Voltage : Normal Voltage : DC 3.300 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 Module regardless of input voltage.

4.2 Configuration and peripherals

[Radiated emission (Below 30 MHz) and Frequency Tolerance tests]



Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	NFC Module	BRNF13M003	22	BROTHER INDUSTRIES, LTD.	EUT
B	Raspberry Pi 3	Model B V1.2	-	-	-
C	AC adapter	DSA-13PFC-05FUS	051250	RS Components Ltd	-
D	Tag	TypeA	-	Hitachi Chemical	-
		TypeB	-	-	-
		FeliCa 212kbps	-	Orange Tags	-
		FeliCa 424kbps	-	Orange Tags	-
		ISO15693	-	BROTHER INDUSTRIES, LTD.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal and Power Cable	0.25	Unshielded	Unshielded	-
2	DC Cable	1.50	Unshielded	Unshielded	-

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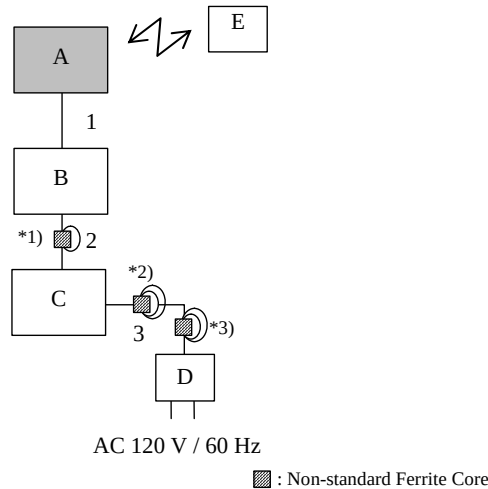
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[Conducted emission and Radiated emission (Above 30 MHz) tests]



*Cabling and setup were taken into consideration and test data was taken under worst case conditions.

<Notes for Ferrite cores>

No.	Model No.	Serial number	Manufacturer	Turn	Remark
*1)	GRFC-5	-	KITAGAWA INDUSTRIES CO.,LTD.	2 turn	3 cm from Item B 8 cm from Item C *Radiated emission only
*2)	GRFC-13	-	KITAGAWA INDUSTRIES CO.,LTD.	3 turn	5 cm from Item C 1 m from Item D *Radiated emission only
*3)	GRFC-10	-	KITAGAWA INDUSTRIES CO.,LTD.	3 turn	26 cm from Item C 80 cm from Item D *Radiated emission only

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	NFC Module	BRNF13M003	23 *1) 26 *2)	BROTHER INDUSTRIES, LTD.	EUT
B	Jig	-	-	-	-
C	Raspberry Pi 3	Model B V1.2	-	-	-
D	AC adapter	DSA-13PFC-05FUS	051250	RS Components Ltd	-
E	Tag	TypeA	-	Hitachi Chemical	-
		TypeB	-	-	-
		FeliCa 212kbps	-	Orange Tags	-
		FeliCa 424kbps	-	Orange Tags	-
		ISO15693	-	BROTHER INDUSTRIES, LTD.	-

*1) Used for Conducted emission (except for Antenna Terminated) and Radiated emission (Above 30 MHz) tests

*2) Used for Conducted emission (Antenna Terminated) test

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal and Power Cable	0.1	Unshielded	Unshielded	-
2	Signal and Power Cable	0.1	Unshielded	Unshielded	-
3	DC Cable	1.1	Unshielded	Unshielded	-

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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.

Detector	: QP and CISPR AV
Measurement range	: 0.15 MHz - 30 MHz
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, 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.

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.

Measurement range : 9 kHz - 1 GHz

Test data : APPENDIX 1

Test result : Pass

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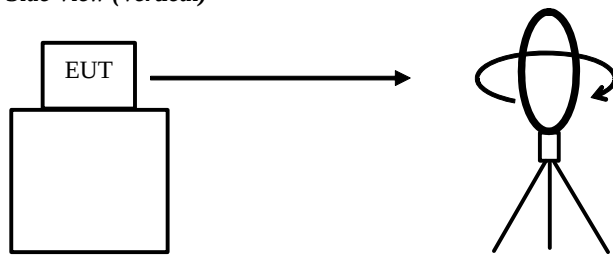
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	100 kHz, 500 kHz, 150 kHz, 1 MHz, 5 MHz	10 kHz, 20 kHz	30 kHz, 62 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter

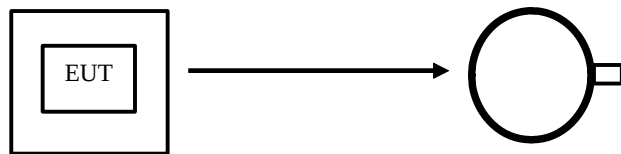
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.
Peak hold was applied as Worst-case measurement.

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

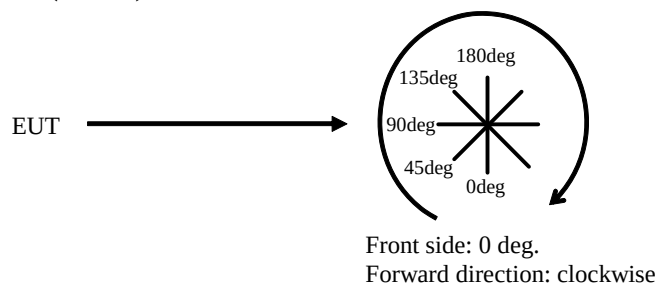


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



APPENDIX 1: Test data

Conducted emission TypeA without Tag

DATA OF CONDUCTED EMISSION TEST

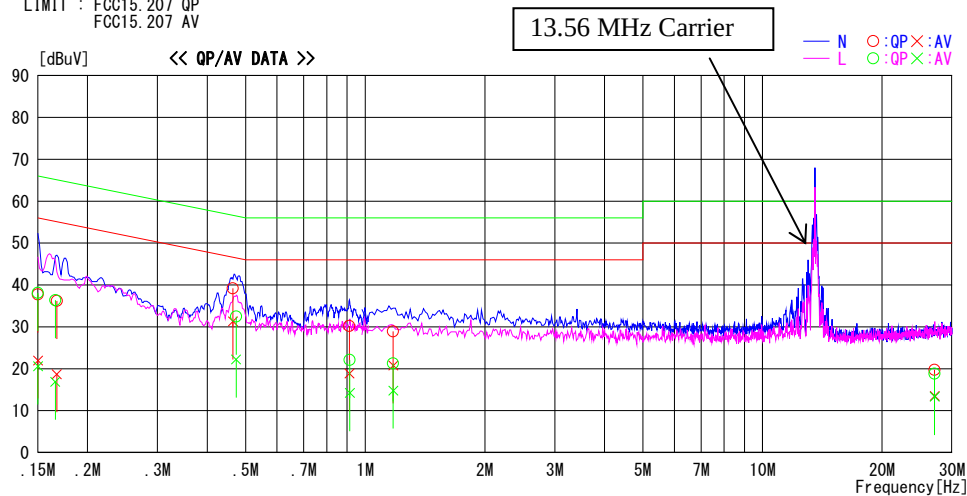
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation TypeA 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	24.4	8.7	13.3	37.7	22.0	66.0	56.0	28.3	34.0	N	
0.15000	24.8	7.3	13.3	38.1	20.6	66.0	56.0	27.9	35.4	L	
0.16595	23.1	3.6	13.3	36.4	16.9	65.2	55.2	28.8	38.3	L	
0.16740	22.9	5.4	13.3	36.2	18.7	65.1	55.1	28.9	36.4	N	
0.46440	25.8	17.9	13.4	39.2	31.3	56.6	46.6	17.4	15.3	N	
0.47335	19.1	8.8	13.4	32.5	22.2	56.5	46.5	24.0	24.3	L	
0.91270	16.8	5.5	13.4	30.2	18.9	56.0	46.0	25.8	27.1	N	
0.91415	8.7	0.8	13.4	22.1	14.2	56.0	46.0	33.9	31.8	L	
1.17652	15.5	7.4	13.4	28.9	20.8	56.0	46.0	27.1	25.2	N	
1.17652	7.9	1.4	13.4	21.3	14.8	56.0	46.0	34.7	31.2	L	
27.12000	2.2	-4.0	17.5	19.7	13.5	60.0	50.0	40.3	36.5	N	
27.12000	1.3	-4.2	17.5	18.8	13.3	60.0	50.0	41.2	36.7	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.

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

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Conducted emission TypeA with Tag

DATA OF CONDUCTED EMISSION TEST

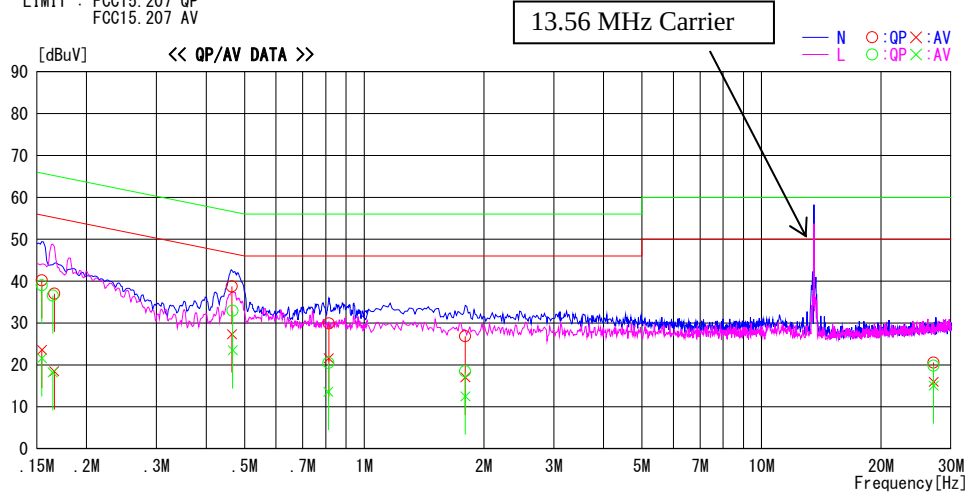
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Model / Remarks : Tx 13.56MHz Modulation TypeA 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]		
0.15435	26.9	10.3	13.3	40.2	23.6	65.8	55.8	25.6	32.2	N	
0.15435	25.7	8.3	13.3	39.0	21.6	65.8	55.8	26.8	34.2	L	
0.16450	23.3	4.9	13.3	36.6	18.2	65.2	55.2	28.6	37.0	L	
0.16595	23.7	5.2	13.3	37.0	18.5	65.2	55.2	28.2	36.7	N	
0.46465	25.3	13.9	13.4	38.7	27.3	56.6	46.6	17.9	19.3	N	
0.46642	19.5	10.1	13.4	32.9	23.5	56.6	46.6	23.7	23.1	L	
0.81265	7.1	0.2	13.4	20.5	13.6	56.0	46.0	35.5	32.4	L	
0.81410	16.5	8.2	13.4	29.9	21.6	56.0	46.0	26.1	24.4	N	
1.79630	13.2	3.5	13.6	26.8	17.1	56.0	46.0	29.2	28.9	N	
1.79630	4.9	-1.1	13.6	18.5	12.5	56.0	46.0	37.5	33.5	L	
27.12000	3.1	-1.5	17.5	20.6	16.0	60.0	50.0	39.4	34.0	N	
27.12000	2.3	-2.4	17.5	19.8	15.1	60.0	50.0	40.2	34.9	L	

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

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

Conducted emission TypeA Antenna Terminated

DATA OF CONDUCTED EMISSION TEST

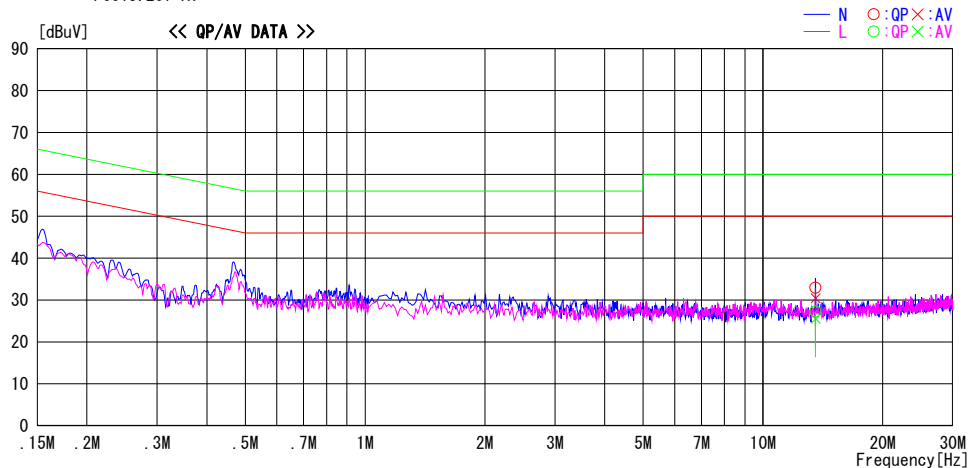
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/12

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Modulation TypeA Antenna Terminated

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]		
13.56000	17.7	15.2	15.2	32.9	30.4	60.0	50.0	27.1	19.6	N	
13.56000	12.1	10.3	15.2	27.3	25.5	60.0	50.0	32.7	24.5	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.

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

Conducted emission
TypeB without Tag

DATA OF CONDUCTED EMISSION TEST

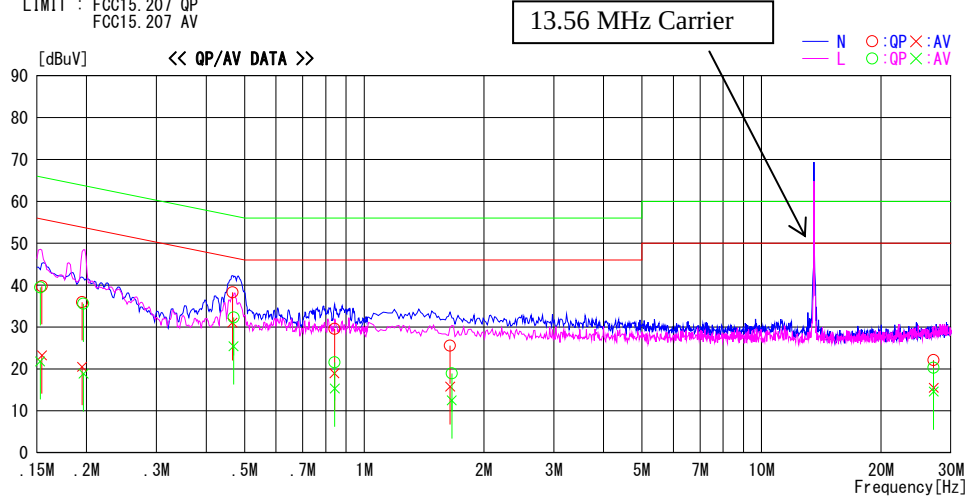
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Model / Remarks : Tx 13.56MHz Modulation TypeB 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]		
0.15290	26.2	8.5	13.3	39.5	21.8	65.8	55.8	26.3	34.0	L	
0.15435	26.4	9.9	13.3	39.7	23.2	65.8	55.8	26.1	32.6	N	
0.19495	22.6	7.2	13.3	35.9	20.5	63.8	53.8	27.9	33.3	N	
0.19640	22.3	5.6	13.3	35.6	18.9	63.8	53.8	28.2	34.9	L	
0.46610	24.9	17.7	13.4	38.3	31.1	56.6	46.6	18.3	15.5	N	
0.46900	18.9	12.0	13.4	32.3	25.4	56.5	46.5	24.2	21.1	L	
0.84165	16.2	5.6	13.4	29.6	19.0	56.0	46.0	26.4	27.0	N	
0.84310	8.2	1.9	13.4	21.6	15.3	56.0	46.0	34.4	30.7	L	
1.64513	12.0	2.2	13.6	25.6	15.8	56.0	46.0	30.4	30.2	N	
1.66025	5.3	-1.1	13.6	18.9	12.5	56.0	46.0	37.1	33.5	L	
27.12000	4.6	-2.0	17.5	22.1	15.5	60.0	50.0	37.9	34.5	N	
27.12000	2.8	-2.9	17.5	20.3	14.6	60.0	50.0	39.7	35.4	L	

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

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

Conducted emission
TypeB with Tag

DATA OF CONDUCTED EMISSION TEST

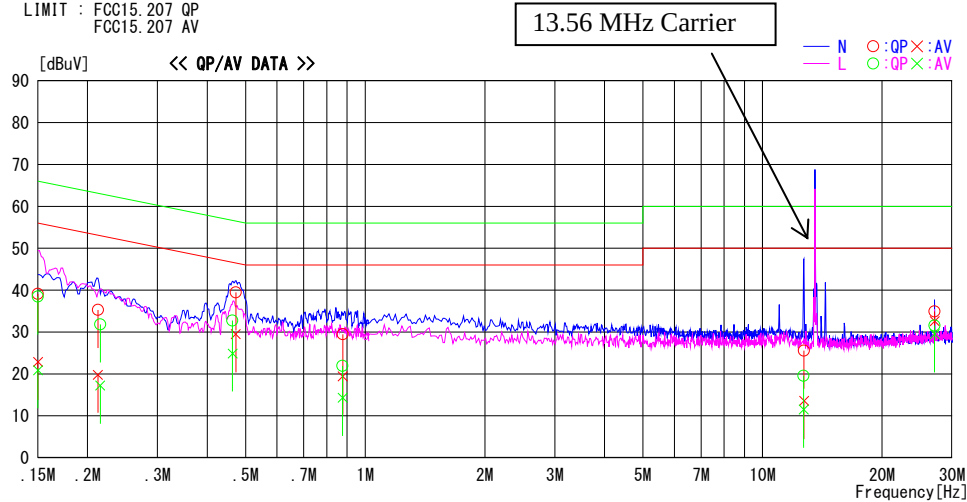
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Model / Remarks : Tx 13.56MHz Modulation TypeB 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	25.8	9.6	13.3	39.1	22.9	66.0	56.0	26.9	33.1	N	
0.15000	25.2	7.6	13.3	38.5	20.9	66.0	56.0	27.5	35.1	L	
0.21235	22.0	6.5	13.3	35.3	19.8	63.1	53.1	27.8	33.3	N	
0.21525	18.5	3.9	13.3	31.8	17.2	63.0	53.0	31.2	35.8	L	
0.46350	19.3	11.5	13.4	32.7	24.9	56.6	46.6	23.9	21.7	L	
0.47190	26.1	16.1	13.4	39.5	29.5	56.5	46.5	17.0	17.0	N	
0.87645	8.5	0.9	13.4	21.9	14.3	56.0	46.0	34.1	31.7	L	
0.87790	16.1	6.0	13.4	29.5	19.4	56.0	46.0	26.5	26.6	N	
12.69017	4.5	-3.6	15.1	19.6	11.5	60.0	50.0	40.4	38.5	L	
12.72359	10.5	-1.5	15.1	25.6	13.6	60.0	50.0	34.4	36.4	N	
27.12000	17.4	15.1	17.5	34.9	32.6	60.0	50.0	25.1	17.4	N	
27.12000	14.1	12.0	17.5	31.6	29.5	60.0	50.0	28.4	20.5	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.

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

Conducted emission TypeB Antenna Terminated

DATA OF CONDUCTED EMISSION TEST

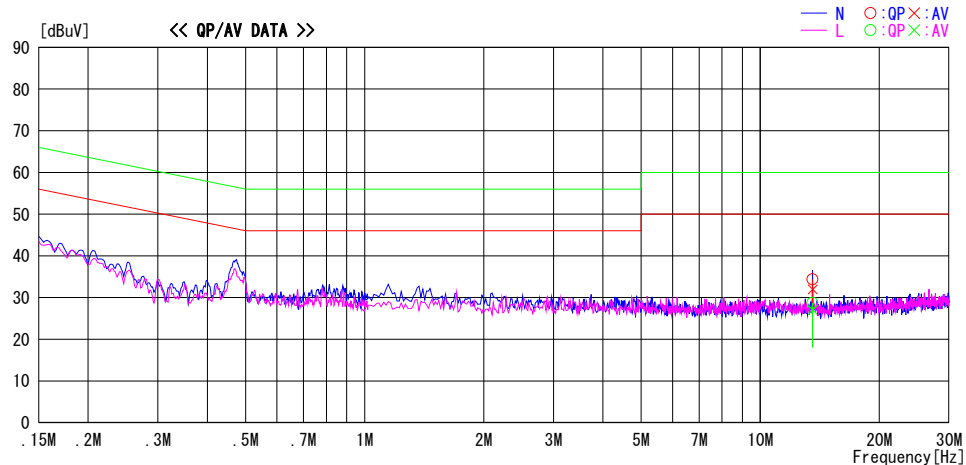
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/12

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Modulation TypeB Antenna 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	19.2	16.8	15.2	34.4	32.0	60.0	50.0	25.6	18.0	N	
13.56000	13.5	11.9	15.2	28.7	27.1	60.0	50.0	31.3	22.9	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.

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

Conducted emission
FeliCa(212 kbps) without Tag

DATA OF CONDUCTED EMISSION TEST

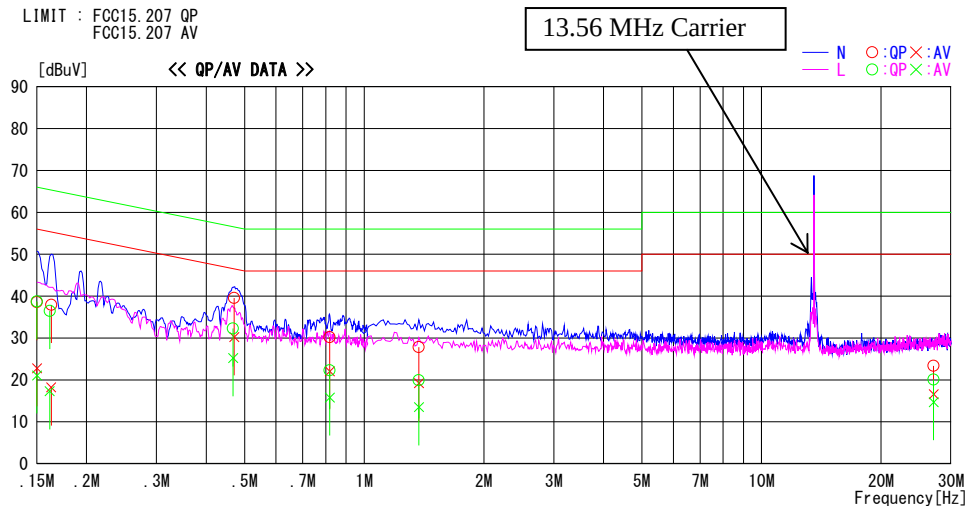
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Model / Remarks : Tx 13.56MHz Modulation FeliCa(212kbps) 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	25.3	9.5	13.3	38.6	22.8	66.0	56.0	27.4	33.2	N	
0.15000	25.4	7.8	13.3	38.7	21.1	66.0	56.0	27.3	34.9	L	
0.16160	23.2	4.0	13.3	36.5	17.3	65.4	55.4	28.9	38.1	L	
0.16305	24.6	4.9	13.3	37.9	18.2	65.3	55.3	27.4	37.1	N	
0.46755	18.9	11.8	13.4	32.3	25.2	56.6	46.6	24.3	21.4	L	
0.47045	26.2	16.8	13.4	39.6	30.2	56.5	46.5	16.9	16.3	N	
0.81845	16.8	8.7	13.4	30.2	22.1	56.0	46.0	25.8	23.9	N	
0.81845	8.9	2.4	13.4	22.3	15.8	56.0	46.0	33.7	30.2	L	
1.37303	14.3	5.7	13.5	27.8	19.2	56.0	46.0	28.2	26.8	N	
1.37303	6.4	0.0	13.5	19.9	13.5	56.0	46.0	36.1	32.5	L	
27.12000	5.9	-0.9	17.5	23.4	16.6	60.0	50.0	36.6	33.4	N	
27.12000	2.6	-2.8	17.5	20.1	14.7	60.0	50.0	39.9	35.3	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.

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

Conducted emission FeliCa(212 kbps) with Tag

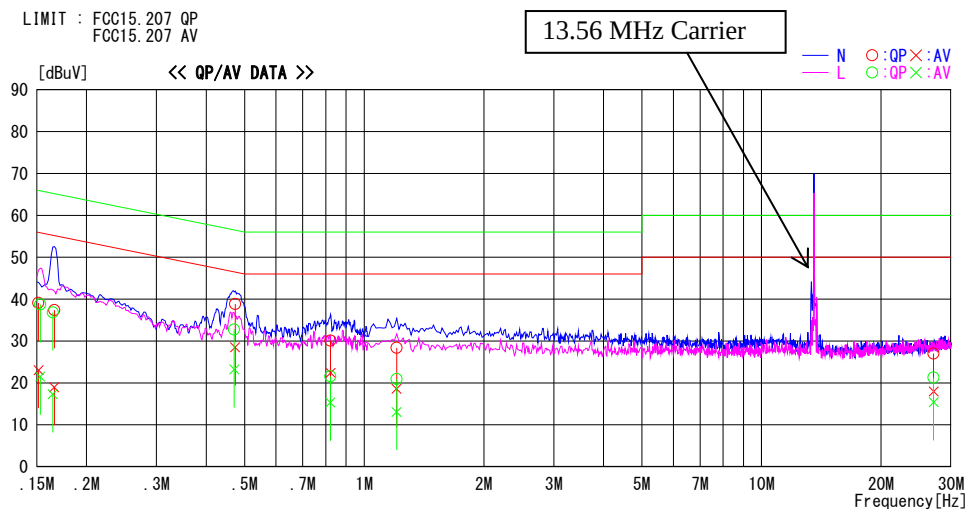
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H
Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation FeliCa(212kbps) 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]		
0.15145	25.8	9.8	13.3	39.1	23.1	65.9	55.9	26.8	32.8	N	
0.15290	25.4	8.2	13.3	38.7	21.5	65.8	55.8	27.1	34.3	L	
0.16450	23.5	4.0	13.3	36.8	17.3	65.2	55.2	28.4	37.9	L	
0.16595	24.1	5.7	13.3	37.4	19.0	65.2	55.2	27.8	36.2	N	
0.47045	19.3	9.8	13.4	32.7	23.2	56.5	46.5	23.8	23.3	L	
0.47335	25.4	15.1	13.4	38.8	28.5	56.5	46.5	17.7	18.0	N	
0.82135	8.2	1.9	13.4	21.6	15.3	56.0	46.0	34.4	30.7	L	
0.82280	16.7	9.0	13.4	30.1	22.4	56.0	46.0	25.9	23.6	N	
1.20675	15.0	5.2	13.4	28.4	18.6	56.0	46.0	27.6	27.4	N	
1.20675	7.5	-0.3	13.4	20.9	13.1	56.0	46.0	35.1	32.9	L	
27.12000	9.6	0.5	17.5	27.1	18.0	60.0	50.0	33.0	32.0	N	
27.12000	3.8	-2.1	17.5	21.3	15.4	60.0	50.0	38.7	34.6	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.

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

Conducted emission FeliCa(212 kbps) Antenna Terminated

DATA OF CONDUCTED EMISSION TEST

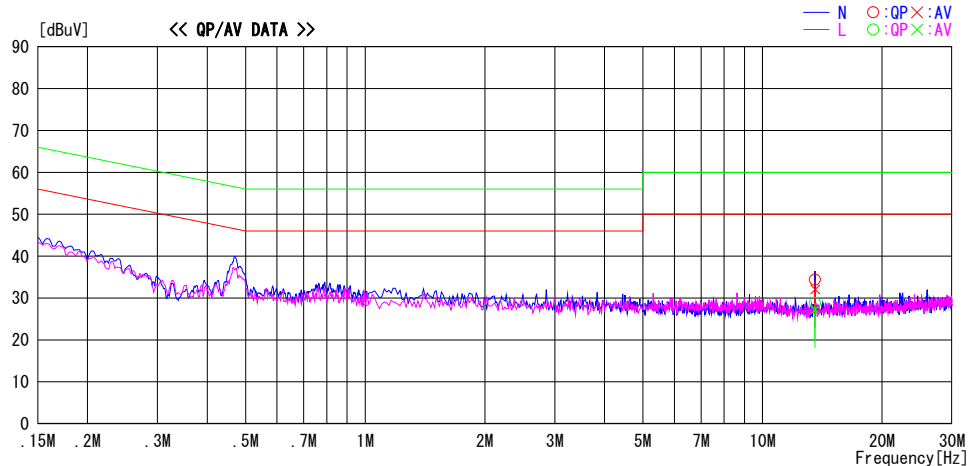
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/12

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Modulation FeliCa(212kbps) Antenna Terminated

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]		
13.56000	19.2	16.9	15.2	34.4	32.1	60.0	50.0	25.6	17.9	N	
13.56000	13.6	12.0	15.2	28.8	27.2	60.0	50.0	31.2	22.8	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.

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

Conducted emission FeliCa(424 kbps) without Tag

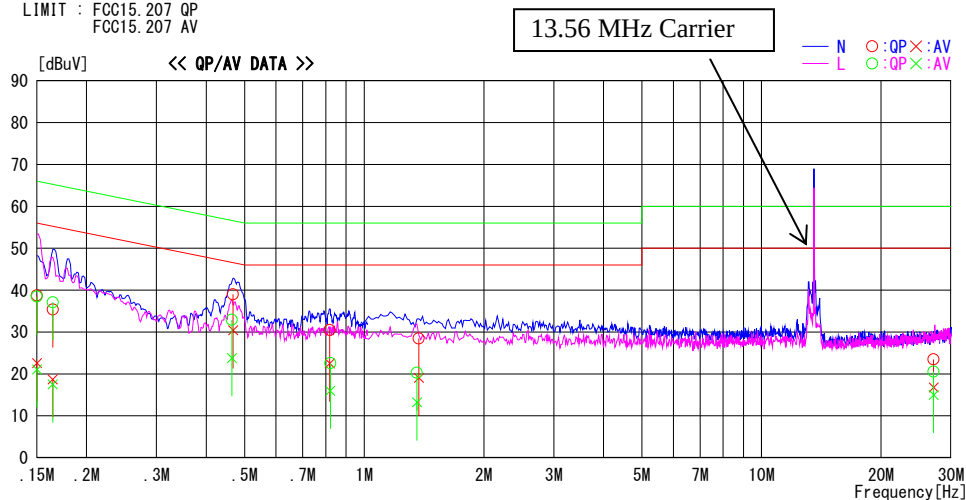
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H
Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Model / Remarks : Tx 13.56MHz Modulation FeliCa(424kbps) 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	25.4	9.3	13.3	38.7	22.6	66.0	56.0	27.3	33.4	N	
0.15000	25.2	7.8	13.3	38.5	21.1	66.0	56.0	27.5	34.9	L	
0.16450	22.1	5.4	13.3	35.4	18.7	65.2	55.2	29.8	36.5	N	
0.16450	23.8	4.2	13.3	37.1	17.5	65.2	55.2	28.1	37.7	L	
0.46465	19.5	10.4	13.4	32.9	23.8	56.6	46.6	23.7	22.8	L	
0.46755	25.6	17.0	13.4	39.0	30.4	56.6	46.6	17.6	16.2	N	
0.81845	17.1	9.1	13.4	30.5	22.5	56.0	46.0	25.5	23.5	N	
0.82135	9.2	2.6	13.4	22.6	16.0	56.0	46.0	33.4	30.0	L	
1.35792	6.8	-0.3	13.5	20.3	13.2	56.0	46.0	35.7	32.8	L	
1.37303	15.0	5.6	13.5	28.5	19.1	56.0	46.0	27.5	26.9	N	
27.12000	6.0	-0.7	17.5	23.5	16.8	60.0	50.0	36.5	33.2	N	
27.12000	3.1	-2.5	17.5	20.6	15.0	60.0	50.0	39.4	35.0	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.

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

Conducted emission FeliCa(424 kbps) with Tag

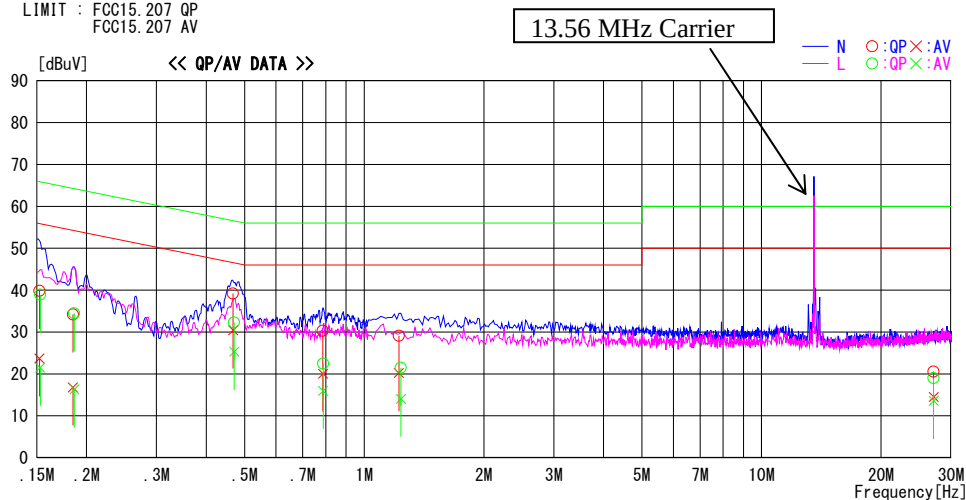
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H
Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Model / Remarks : Tx 13.56MHz Modulation FeliCa(424kbps) 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]		
0.15220	26.5	10.4	13.3	39.8	23.7	65.9	55.9	26.1	32.2	N	
0.15290	25.6	8.2	13.3	38.9	21.5	65.8	55.8	26.9	34.3	L	
0.18480	20.9	3.5	13.3	34.2	16.8	64.3	54.3	30.1	37.5	N	
0.18625	21.2	3.0	13.3	34.5	16.3	64.2	54.2	29.7	37.9	L	
0.46755	25.8	17.0	13.4	39.2	30.4	56.6	46.6	17.4	16.2	N	
0.47045	18.9	11.9	13.4	32.3	25.3	56.5	46.5	24.2	21.2	L	
0.78655	16.9	6.7	13.4	30.3	20.1	56.0	46.0	25.7	25.9	N	
0.78800	9.1	2.6	13.4	22.5	16.0	56.0	46.0	33.5	30.0	L	
1.22187	15.6	6.7	13.5	29.1	20.2	56.0	46.0	26.9	25.8	N	
1.23698	8.0	0.6	13.5	21.5	14.1	56.0	46.0	34.5	31.9	L	
27.12000	3.1	-3.0	17.5	20.6	14.5	60.0	50.0	39.4	35.5	N	
27.12000	1.5	-3.9	17.5	19.0	13.6	60.0	50.0	41.0	36.4	L	

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

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

Conducted emission FeliCa(424 kbps) Antenna Terminated

DATA OF CONDUCTED EMISSION TEST

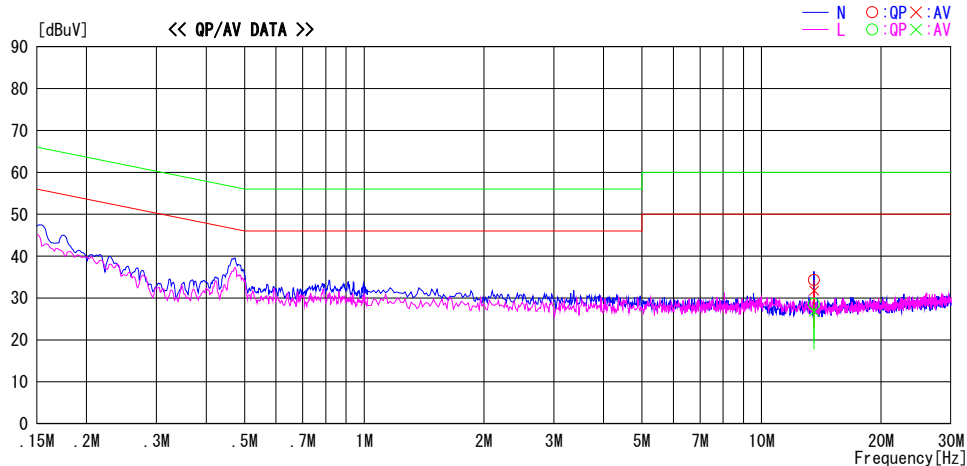
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/12

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Modulation FeliCa(424kbps) Antenna Terminated

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]		
13.56000	19.1	16.6	15.2	34.3	31.8	60.0	50.0	25.7	18.2	N	
13.56000	13.4	11.6	15.2	28.6	26.8	60.0	50.0	31.4	23.2	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.

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

Conducted emission
ISO15693 without Tag

DATA OF CONDUCTED EMISSION TEST

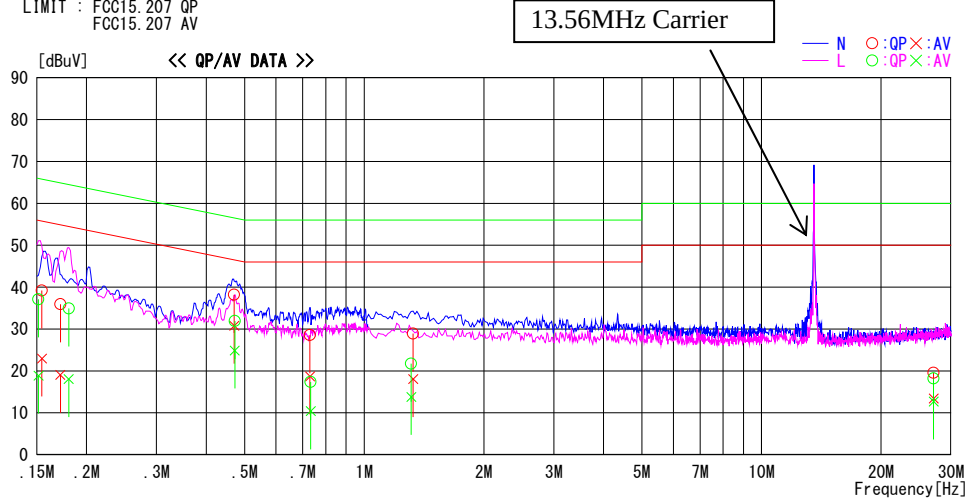
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation ISO15693 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]		
0.15145	23.8	5.6	13.3	37.1	18.9	65.9	55.9	28.8	37.0	L	
0.15435	25.9	9.7	13.3	39.2	23.0	65.8	55.8	26.6	32.8	N	
0.17190	22.6	5.8	13.3	35.9	19.1	64.9	54.9	29.0	35.8	N	
0.18045	21.6	4.8	13.3	34.9	18.1	64.5	54.5	29.6	36.4	L	
0.47045	24.8	17.4	13.4	38.2	30.8	56.5	46.5	18.3	15.7	N	
0.47190	18.5	11.5	13.4	31.9	24.9	56.5	46.5	24.6	21.6	L	
0.73000	15.2	5.3	13.4	28.6	18.7	56.0	46.0	27.4	27.3	N	
0.73290	4.0	-3.0	13.4	17.4	10.4	56.0	46.0	38.6	35.6	L	
1.31257	8.2	0.3	13.5	21.7	13.8	56.0	46.0	34.3	32.2	L	
1.32768	15.4	4.6	13.5	28.9	18.1	56.0	46.0	27.1	27.9	N	
27.12000	2.1	-4.1	17.5	19.6	13.4	60.0	50.0	40.4	36.6	N	
27.12000	0.7	-4.8	17.5	18.2	12.7	60.0	50.0	41.8	37.3	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.

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

Conducted emission
ISO15693 with Tag

DATA OF CONDUCTED EMISSION TEST

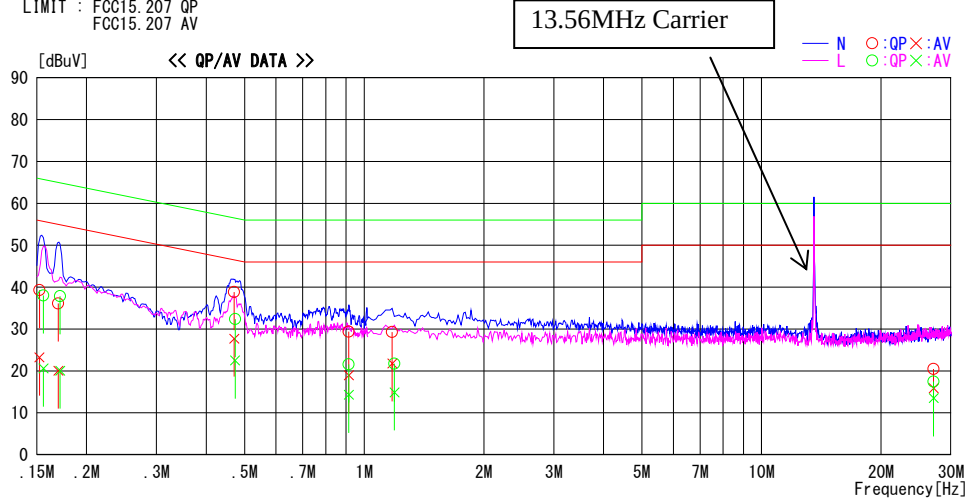
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation ISO 15693 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]		
0.15220	26.0	9.9	13.3	39.3	23.2	65.9	55.9	26.6	32.7	N	
0.15580	24.7	7.3	13.3	38.0	20.6	65.7	55.7	27.7	35.1	L	
0.16976	22.8	6.8	13.3	36.1	20.1	65.0	55.0	28.9	34.9	N	
0.17175	24.5	6.8	13.3	37.8	20.1	64.9	54.9	27.1	34.8	L	
0.47045	25.4	14.3	13.4	38.8	27.7	56.5	46.5	17.7	18.8	N	
0.47335	19.0	9.1	13.4	32.4	22.5	56.5	46.5	24.1	24.0	L	
0.91415	16.0	5.6	13.4	29.4	19.0	56.0	46.0	26.6	27.0	N	
0.91415	8.2	0.9	13.4	21.6	14.3	56.0	46.0	34.4	31.7	L	
1.17652	15.9	8.4	13.4	29.3	21.8	56.0	46.0	26.7	24.2	N	
1.19163	8.3	1.5	13.4	21.7	14.9	56.0	46.0	34.3	31.1	L	
27.12000	3.0	-1.6	17.5	20.5	15.9	60.0	50.0	39.5	34.1	N	
27.12000	0.0	-4.0	17.5	17.5	13.5	60.0	50.0	42.5	36.5	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.

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

Conducted emission ISO15693 Antenna Terminated

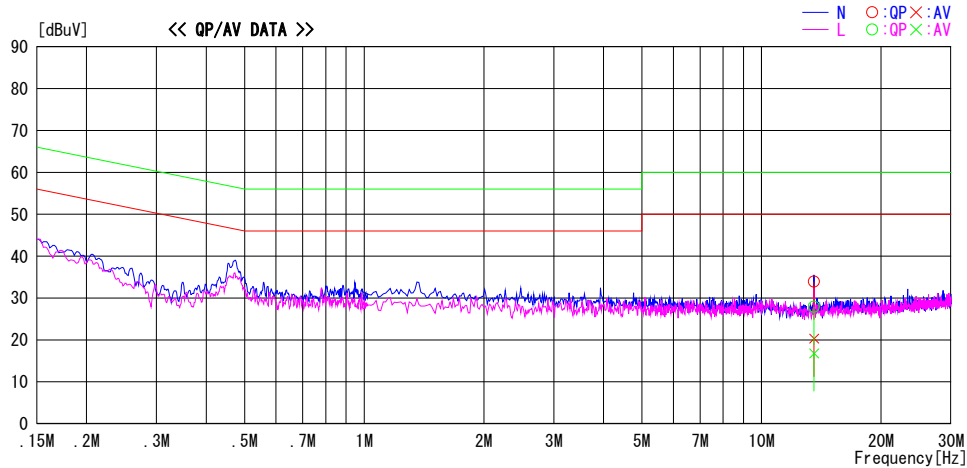
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/12

Report No. : 11934178H
Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz Modulation ISO15693 Antenna Terminated

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]		
13.56000	18.7	5.1	15.2	33.9	20.3	60.0	50.0	26.1	29.7	N	
13.56000	12.7	1.6	15.2	27.9	16.8	60.0	50.0	32.1	33.2	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.

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

Fundamental emission and Spectrum Mask TypeA with Tag

DATA OF RADIATED EMISSION TEST

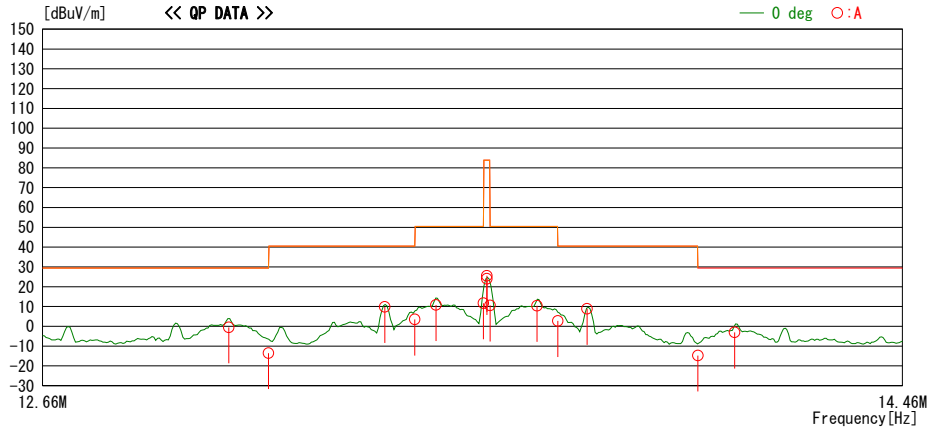
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp. / Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Type A Worst Axis Z with 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]	
13.03018	45.3	QP	19.5	-33.2	32.1	-0.5	29.5	30.0	0	A	359
13.11000	32.4	QP	19.4	-33.2	32.1	-13.5	29.5	43.0	0	A	359
13.34798	55.7	QP	19.4	-33.2	32.1	9.8	40.5	30.7	0	A	359
13.41000	49.4	QP	19.4	-33.2	32.1	3.5	40.5	37.0	0	A	359
13.45394	56.7	QP	19.4	-33.2	32.1	10.8	50.4	39.6	0	A	359
13.55300	57.6	QP	19.4	-33.2	32.1	11.7	50.4	38.7	0	A	359
13.56000	71.4	QP	19.4	-33.2	32.1	25.5	83.9	58.4	0	A	359
13.56000	69.9	QP	19.4	-33.2	32.1	24.0	83.9	59.9	0	A	359 without Type A
13.56700	56.5	QP	19.4	-33.2	32.1	10.6	50.4	39.8	0	A	359
13.66578	56.2	QP	19.4	-33.2	32.1	10.3	50.4	40.1	0	A	359
13.71000	48.6	QP	19.4	-33.2	32.1	2.7	40.5	37.8	0	A	359
13.77174	54.7	QP	19.4	-33.2	32.1	8.8	40.5	31.7	0	A	359
14.01000	31.2	QP	19.4	-33.2	32.1	-14.7	29.5	44.2	0	A	359
14.08955	42.8	QP	19.4	-33.2	32.1	-3.1	29.5	32.6	0	A	359

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 - GAIN(AMP)) + D. FACTOR

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	71.4	19.4	6.8	32.1	-	65.5	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask TypeB with Tag

DATA OF RADIATED EMISSION TEST

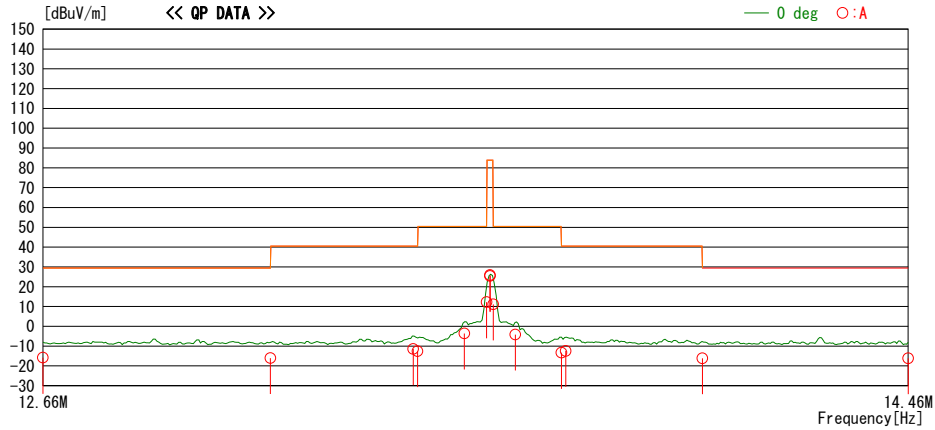
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Type B Worst Axis Z with 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]	
12.66000	29.9	QP	19.6	-33.2	32.1	-15.8	29.5	45.3	0	A	359
13.11000	29.9	QP	19.4	-33.2	32.1	-16.0	29.5	45.5	0	A	359
13.40096	34.4	QP	19.4	-33.2	32.1	-11.5	40.5	52.0	0	A	359
13.41000	33.4	QP	19.4	-33.2	32.1	-12.5	40.5	53.0	0	A	359
13.50688	42.3	QP	19.4	-33.2	32.1	-3.6	50.4	54.0	0	A	359
13.55300	58.1	QP	19.4	-33.2	32.1	12.2	50.4	38.2	0	A	359
13.56000	71.7	QP	19.4	-33.2	32.1	25.8	83.9	58.1	0	A	359
13.56000	71.3	QP	19.4	-33.2	32.1	25.4	83.9	58.5	0	A	359
13.56700	57.0	QP	19.4	-33.2	32.1	11.1	50.4	39.3	0	A	359
13.61284	41.8	QP	19.4	-33.2	32.1	-4.1	50.4	54.5	0	A	359
13.71000	32.6	QP	19.4	-33.2	32.1	-13.3	40.5	53.8	0	A	359
13.71876	33.5	QP	19.4	-33.2	32.1	-12.4	40.5	52.9	0	A	359
14.01000	29.8	QP	19.4	-33.2	32.1	-16.1	29.5	45.6	0	A	359
14.46000	29.8	QP	19.4	-33.2	32.1	-16.1	29.5	45.6	0	A	359

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 + ATTN - GAIN(AMP)) + D.FACTOR

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	71.7	19.4	6.8	32.1	-	65.8	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask FeliCa(212kbps) with Tag

DATA OF RADIATED EMISSION TEST

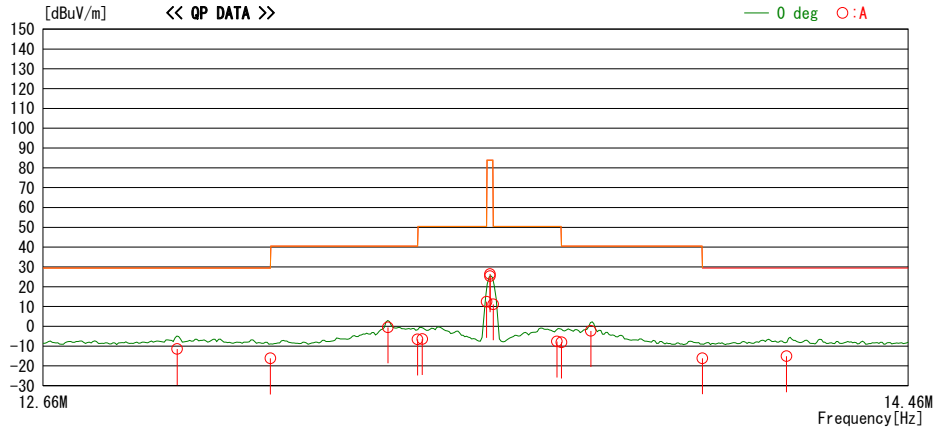
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Felica(212 kbps) Worst Axis Z with 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]	
12.92387	34.3	QP	19.5	-33.2	32.1	-11.5	29.5	41.0	0	A	359
13.11000	29.7	QP	19.4	-33.2	32.1	-16.2	29.5	45.7	0	A	359
13.34926	45.4	QP	19.4	-33.2	32.1	-0.5	40.5	41.0	0	A	359
13.41000	39.3	QP	19.4	-33.2	32.1	-6.6	40.5	47.1	0	A	359
13.41967	39.5	QP	19.4	-33.2	32.1	-6.4	50.4	56.8	0	A	359
13.55300	58.3	QP	19.4	-33.2	32.1	12.4	50.4	38.0	0	A	359
13.56000	72.3	QP	19.4	-33.2	32.1	26.4	83.9	57.5	0	A	359
13.56000	71.2	QP	19.4	-33.2	32.1	25.3	83.9	58.6	0	A	359
13.56700	57.1	QP	19.4	-33.2	32.1	11.2	50.4	39.2	0	A	359
13.70003	38.2	QP	19.4	-33.2	32.1	-7.7	50.4	58.1	0	A	359
13.71000	37.8	QP	19.4	-33.2	32.1	-8.1	40.5	48.6	0	A	359
13.77172	43.6	QP	19.4	-33.2	32.1	-2.3	40.5	42.8	0	A	359
14.01000	29.8	QP	19.4	-33.2	32.1	-16.1	29.5	45.6	0	A	359
14.19222	30.8	QP	19.4	-33.2	32.1	-15.1	29.5	44.6	0	A	359

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 - GAIN(AMP)) + D.FACTOR

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	72.3	19.4	6.8	32.1	-	66.4	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask FeliCa(424kbps) with Tag

DATA OF RADIATED EMISSION TEST

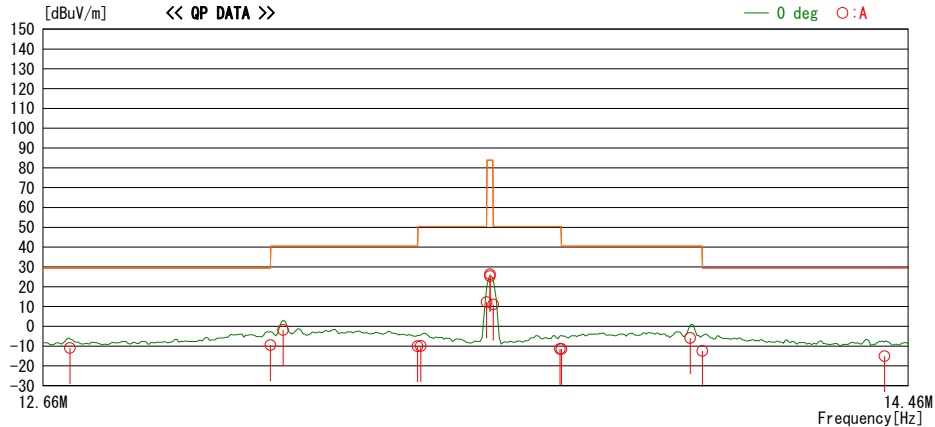
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Felica(424 kbps) Worst Axis Z with 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]	
12.71237	34.8	QP	19.6	-33.2	32.1	-10.9	29.5	40.4	0	A	359
13.11000	36.4	QP	19.4	-33.2	32.1	-9.5	29.5	39.0	0	A	359
13.13580	44.1	QP	19.4	-33.2	32.1	-1.8	40.5	42.3	0	A	359
13.41000	35.9	QP	19.4	-33.2	32.1	-10.0	40.5	50.5	0	A	359
13.41649	36.0	QP	19.4	-33.2	32.1	-9.9	50.4	60.3	0	A	359
13.55300	58.1	QP	19.4	-33.2	32.1	12.2	50.4	38.2	0	A	359
13.56000	72.2	QP	19.4	-33.2	32.1	26.3	83.9	57.6	0	A	359
13.56000	71.2	QP	19.4	-33.2	32.1	25.3	83.9	58.6	0	A	359
13.56700	56.9	QP	19.4	-33.2	32.1	11.0	50.4	39.4	0	A	359
13.70664	34.5	QP	19.4	-33.2	32.1	-11.4	50.4	61.8	0	A	359
13.71000	34.4	QP	19.4	-33.2	32.1	-11.5	40.5	52.0	0	A	359
13.98366	40.0	QP	19.4	-33.2	32.1	-5.9	40.5	46.4	0	A	359
14.01000	33.5	QP	19.4	-33.2	32.1	-12.4	29.5	41.9	0	A	359
14.40719	30.9	QP	19.4	-33.2	32.1	-15.0	29.5	44.5	0	A	359

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 - GAIN(AMP)) + D. FACTOR

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	72.2	19.4	6.8	32.1	-	66.3	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask ISO15693 with Tag

DATA OF RADIATED EMISSION TEST

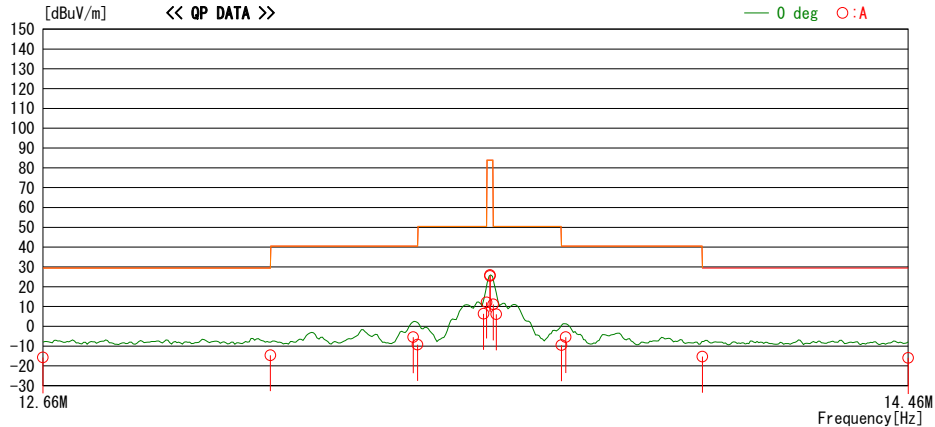
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation ISO 15693 Worst Axis Z with 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]	
12.66000	30.0	QP	19.6	-33.2	32.1	-15.7	29.5	45.2	0	A	359
13.11000	31.3	QP	19.4	-33.2	32.1	-14.6	29.5	44.1	0	A	359
13.40096	40.4	QP	19.4	-33.2	32.1	-5.5	40.5	46.0	0	A	359
13.41000	36.6	QP	19.4	-33.2	32.1	-9.3	40.5	49.8	0	A	359
13.54657	52.2	QP	19.4	-33.2	32.1	6.3	50.4	44.1	0	A	359
13.55300	58.0	QP	19.4	-33.2	32.1	12.1	50.4	38.3	0	A	359
13.56000	71.7	QP	19.4	-33.2	32.1	25.8	83.9	58.1	0	A	359
13.56000	71.3	QP	19.4	-33.2	32.1	25.4	83.9	58.5	0	A	359 without ISO15693
13.56700	57.0	QP	19.4	-33.2	32.1	11.1	50.4	39.3	0	A	359
13.57306	52.0	QP	19.4	-33.2	32.1	6.1	50.4	44.3	0	A	359
13.71000	36.4	QP	19.4	-33.2	32.1	-9.5	40.5	50.0	0	A	359
13.71876	40.5	QP	19.4	-33.2	32.1	-5.4	40.5	45.9	0	A	359
14.01000	30.6	QP	19.4	-33.2	32.1	-15.3	29.5	44.8	0	A	359
14.46000	30.0	QP	19.4	-33.2	32.1	-15.9	29.5	45.4	0	A	359

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 - GAIN(AMP)) + D. FACTOR

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	71.7	19.4	6.8	32.1	-	65.8	-	-	Fundamental

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

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Spurious emission
(Below 30 MHz)
TypeA with Tag

DATA OF RADIATED EMISSION TEST

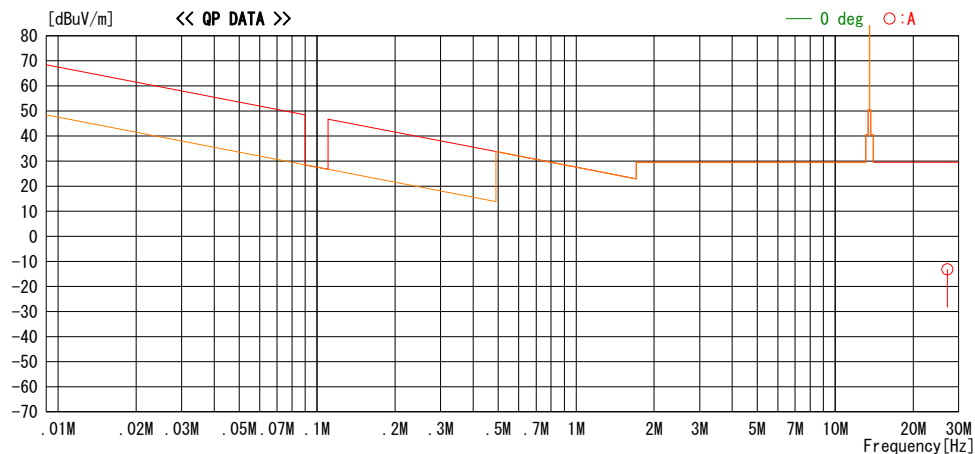
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Type A Worst Axis Z with 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	31.5	QP	20.3	-32.9	32.1	-13.2	29.5	42.7	0	A	359

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 + ATTN - GAIN (AMP)) + D.FACTOR

Spurious emission
(Below 30 MHz)
TypeB with Tag

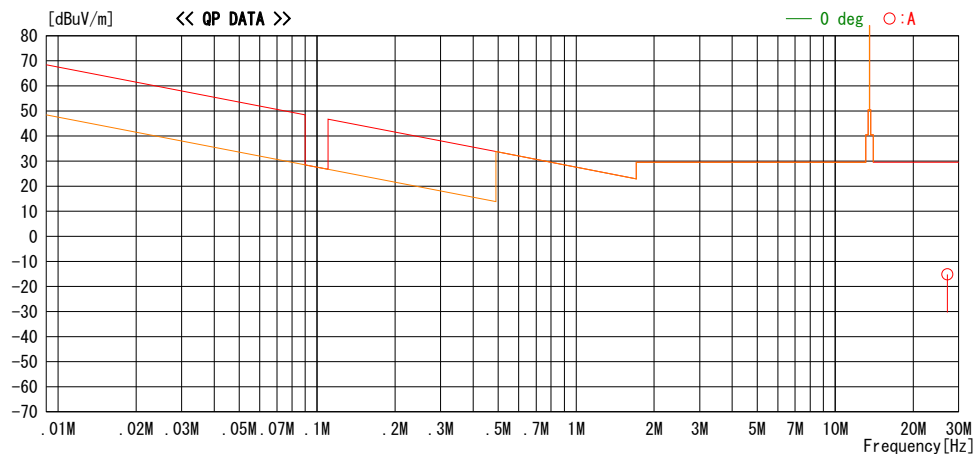
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H
Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Type B Worst Axis Z with 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	29.5	QP	20.3	-32.9	32.1	-15.2	29.5	44.7	0	A	359

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 - GAIN (AMP)) + D. FACTOR

Spurious emission
(Below 30 MHz)
FeliCa(212kbps) with Tag

DATA OF RADIATED EMISSION TEST

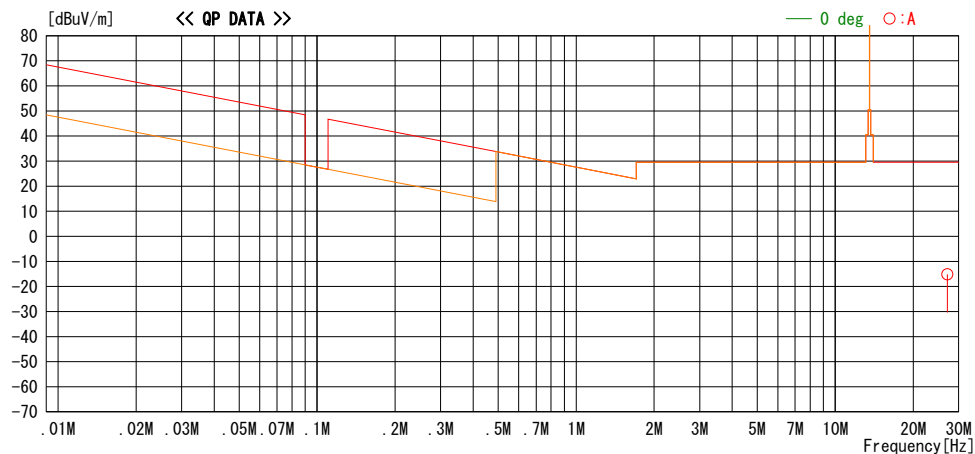
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Felica(212 kbps) Worst Axis Z with 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	29.5	QP	20.3	-32.9	32.1	-15.2	29.5	44.7	0	A	359

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 - GAIN(AMP)) + D. FACTOR

Spurious emission
(Below 30 MHz)
FeliCa(424kbps) with Tag

DATA OF RADIATED EMISSION TEST

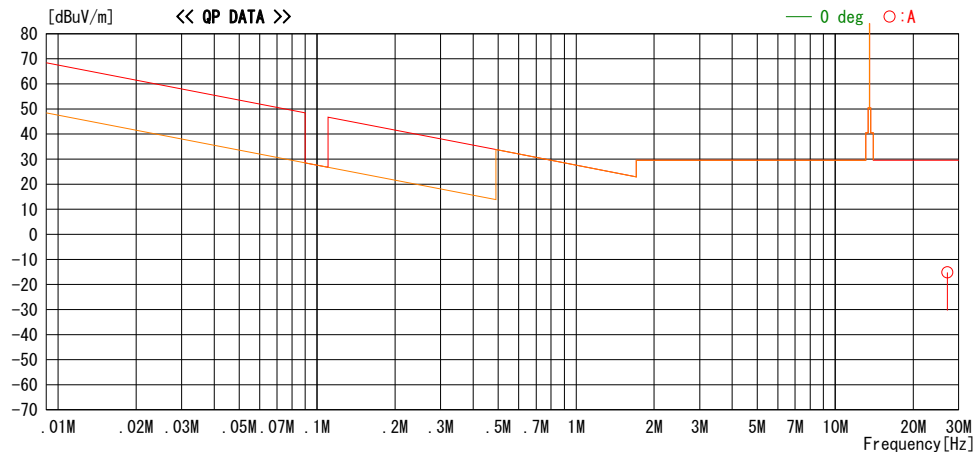
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H

Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation Felica(424 kbps) Worst Axis Z with 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	29.5	QP	20.3	-32.9	32.1	-15.2	29.5	44.7	0	A	359

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 + ATTN - GAIN(AMP)) + D. FACTOR

Spurious emission
(Below 30 MHz)
ISO15693 with Tag

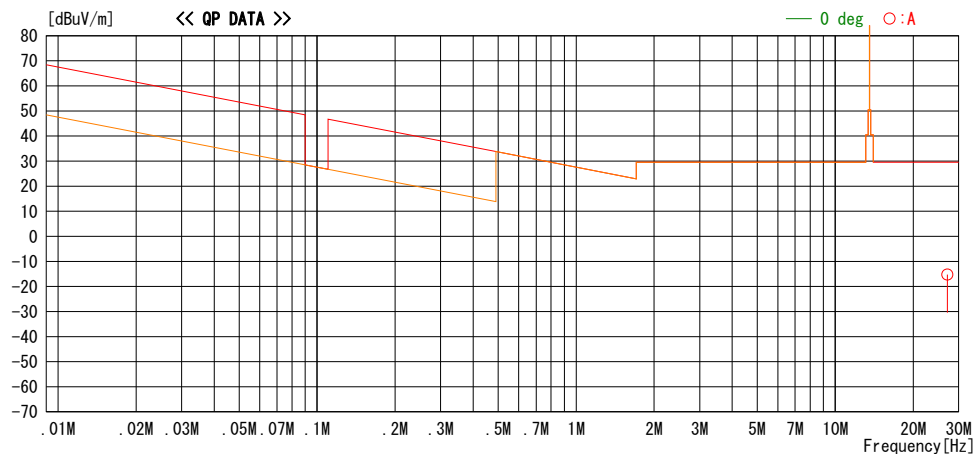
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/08/29

Report No. : 11934178H
Temp./ Humi. : 23 deg.C / 69% RH
Engineer : Takafumi Noguchi

Mode / Remarks : Tx 13.56MHz Modulation ISO 15693 Worst Axis Z with 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	29.4	QP	20.3	-32.9	32.1	-15.3	29.5	44.8	0	A	359

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 + ATTN - GAIN(AMP)) + D.FACTOR

Spurious emission
(Above 30 MHz)
TypeA with Tag

DATA OF RADIATED EMISSION TEST

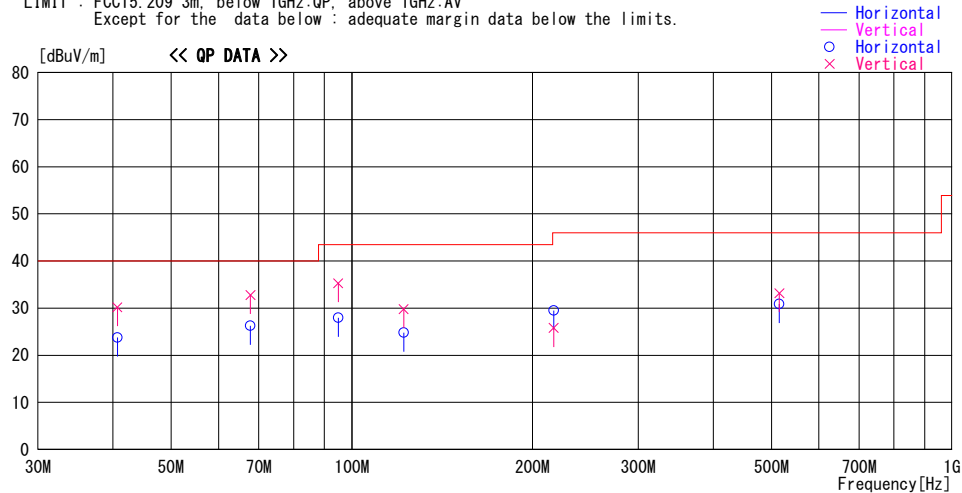
UL Japan, Inc. Ise EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

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

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
40.680	34.7	QP	14.0	-24.9	23.8	352	319	Hori.	40.0	16.2	
40.680	41.1	QP	14.0	-24.9	30.2	84	100	Vert.	40.0	9.8	
67.800	44.4	QP	6.4	-24.5	26.3	0	270	Hori.	40.0	13.7	
67.800	50.9	QP	6.4	-24.5	32.8	80	100	Vert.	40.0	7.2	
94.920	42.9	QP	9.2	-24.1	28.0	156	302	Hori.	43.5	15.5	
94.920	50.2	QP	9.2	-24.1	35.3	92	100	Vert.	43.5	8.2	
122.040	35.6	QP	13.0	-23.8	24.8	209	268	Hori.	43.5	18.7	
122.040	40.6	QP	13.0	-23.8	29.8	81	100	Vert.	43.5	13.7	
216.960	40.7	QP	11.6	-22.8	29.5	228	148	Hori.	46.0	16.5	
216.960	37.0	QP	11.6	-22.8	25.8	169	225	Vert.	46.0	20.2	
515.280	33.6	QP	17.9	-20.6	30.9	220	198	Hori.	46.0	15.1	
515.280	35.9	QP	17.9	-20.6	33.2	206	100	Vert.	46.0	12.8	

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

Spurious emission
(Above 30 MHz)
TypeB with Tag

DATA OF RADIATED EMISSION TEST

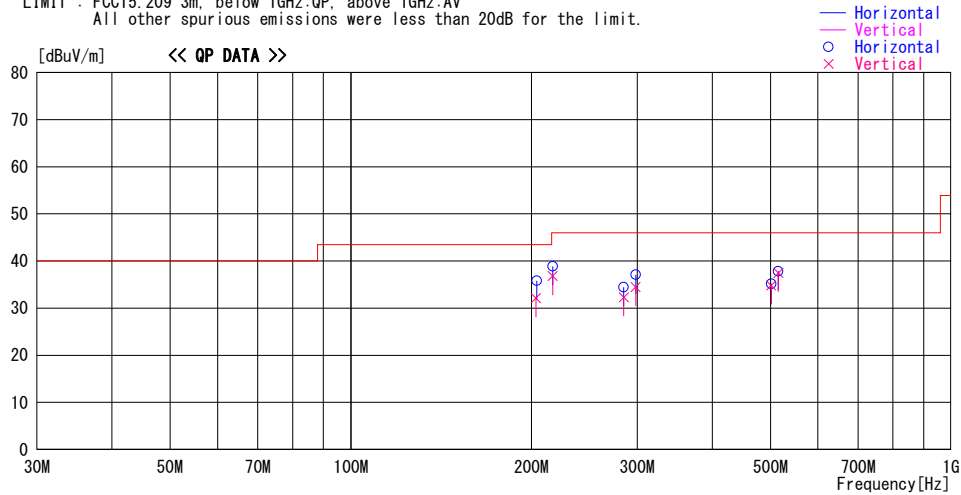
UL Japan, Inc. Ise EMC Lab. No. 4 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 25 deg. C / 43 % RH
Engineer : Hiroyuki Furutaka

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

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV
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	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
204.000	47.2	QP	11.5	-22.9	35.8	75	161	Hori.	43.5	7.7	
203.396	43.5	QP	11.5	-22.9	32.1	42	100	Vert.	43.5	11.4	
216.964	50.1	QP	11.6	-22.8	38.9	67	141	Hori.	46.0	7.1	
216.958	48.0	QP	11.6	-22.8	36.8	193	183	Vert.	46.0	9.2	
298.316	45.7	QP	13.4	-22.0	37.1	75	100	Hori.	46.0	8.9	
284.756	41.5	QP	12.9	-22.1	32.3	205	173	Vert.	46.0	13.7	
501.714	38.1	QP	17.7	-20.6	35.2	86	100	Hori.	46.0	10.8	
298.316	43.1	QP	13.4	-22.0	34.5	194	155	Vert.	46.0	11.5	
284.760	43.6	QP	12.9	-22.1	34.4	82	100	Hori.	46.0	11.6	
501.712	37.7	QP	17.7	-20.6	34.8	34	100	Vert.	46.0	11.2	
515.280	40.5	QP	17.9	-20.6	37.8	94	181	Hori.	46.0	8.2	
515.272	40.2	QP	17.9	-20.6	37.5	276	100	Vert.	46.0	8.5	

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

Spurious emission
(Above 30 MHz)
FeliCa(212 kbps) with Tag

DATA OF RADIATED EMISSION TEST

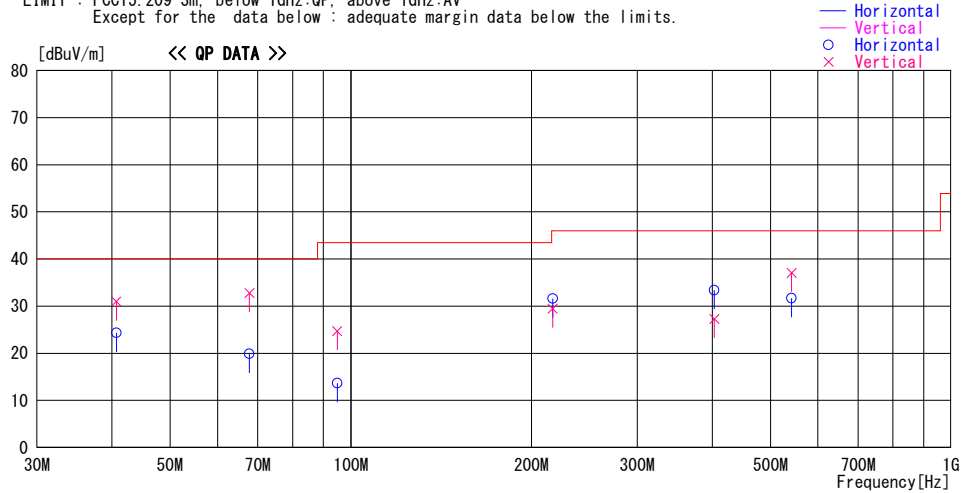
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation Felica(212 kbps) with Tag Worst Axis (Hori: Z, Vert: Z)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV
Except for the data below : adequate margin data below the limits.



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	35.2	QP	14.0	-24.9	24.3	166	328	Hori.	40.0	15.7	
40.680	41.9	QP	14.0	-24.9	31.0	72	100	Vert.	40.0	9.0	
67.800	38.0	QP	6.4	-24.5	19.9	4	265	Hori.	40.0	20.1	
67.800	50.9	QP	6.4	-24.5	32.8	80	100	Vert.	40.0	7.2	
94.920	28.6	QP	9.2	-24.1	13.7	115	315	Hori.	43.5	29.8	
94.920	39.6	QP	9.2	-24.1	24.7	99	100	Vert.	43.5	18.8	
216.960	42.8	QP	11.6	-22.8	31.6	220	132	Hori.	46.0	14.4	
216.960	40.7	QP	11.6	-22.8	29.5	165	214	Vert.	46.0	16.5	
403.192	39.0	QP	15.7	-21.3	33.4	26	100	Hori.	46.0	12.6	
403.192	32.9	QP	15.7	-21.3	27.3	142	100	Vert.	46.0	18.7	
542.400	33.8	QP	18.3	-20.4	31.7	14	175	Hori.	46.0	14.3	
542.400	39.2	QP	18.3	-20.4	37.1	174	100	Vert.	46.0	8.9	

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

Spurious emission
(Above 30 MHz)
FeliCa(424 kbps) with Tag

DATA OF RADIATED EMISSION TEST

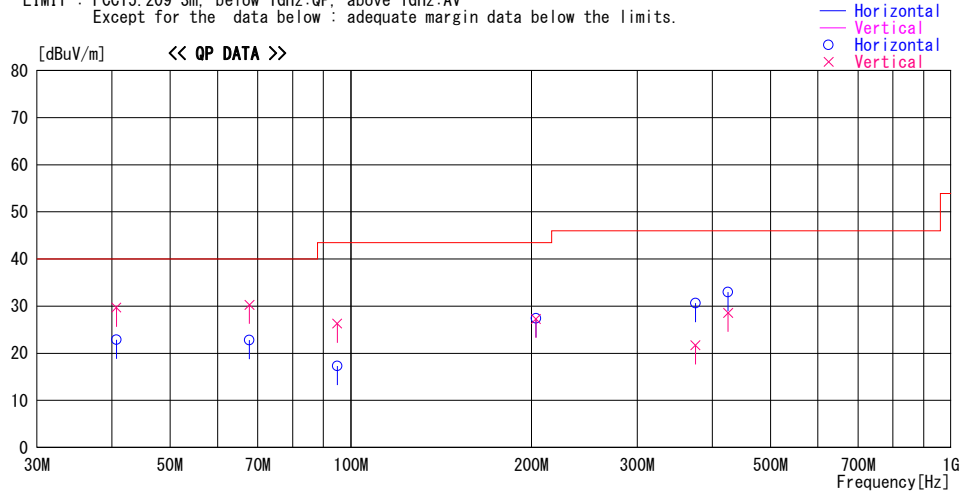
UL Japan, Inc. Ise EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation Felica(424 kbps) with Tag Worst Axis (Hori: Z, Vert: Z)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
40.680	33.8	QP	14.0	-24.9	22.9	196	333	Hori.	40.0	17.1	
40.680	40.6	QP	14.0	-24.9	29.7	91	100	Vert.	40.0	10.3	
67.800	40.9	QP	6.4	-24.5	22.8	1	280	Hori.	40.0	17.2	
67.800	48.4	QP	6.4	-24.5	30.3	102	100	Vert.	40.0	9.7	
94.920	32.2	QP	9.2	-24.1	17.3	162	167	Hori.	43.5	26.2	
94.920	41.2	QP	9.2	-24.1	26.3	85	100	Vert.	43.5	17.2	
203.400	38.8	QP	11.5	-22.9	27.4	77	104	Hori.	43.5	16.1	
203.400	38.7	QP	11.5	-22.9	27.3	106	102	Vert.	43.5	16.2	
375.000	36.9	QP	15.2	-21.5	30.6	34	100	Hori.	46.0	15.4	
375.000	28.0	QP	15.2	-21.5	21.7	142	100	Vert.	46.0	24.3	
425.000	37.9	QP	16.2	-21.1	33.0	29	100	Hori.	46.0	13.0	
425.000	33.5	QP	16.2	-21.1	28.6	164	128	Vert.	46.0	17.4	

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

Spurious emission
(Above 30 MHz)
ISO15693 with Tag

DATA OF RADIATED EMISSION TEST

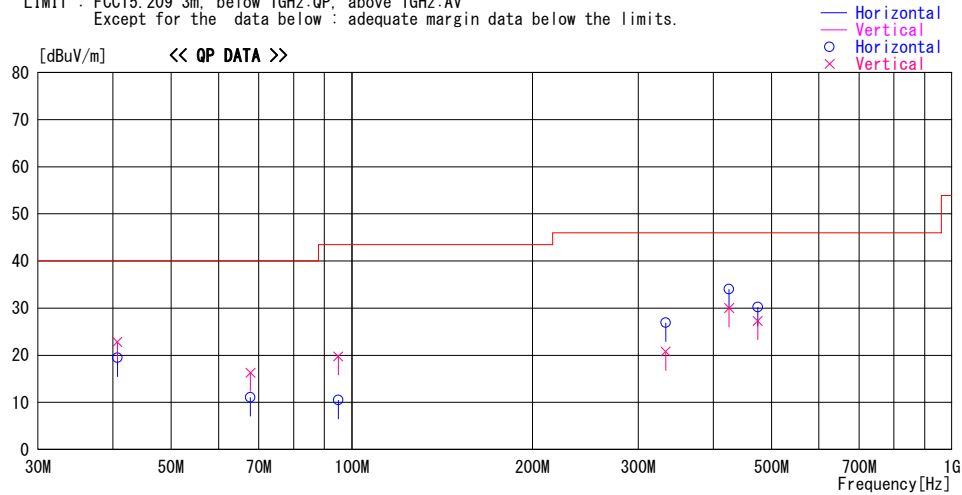
UL Japan, Inc. Ise EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2017/09/10

Report No. : 11934178H

Temp./Humi. : 26 deg. C / 66 % RH
Engineer : Yuta Moriya

Mode / Remarks : Tx 13.56MHz Modulation ISO 15693 with Tag Worst Axis (Hori: Z, Vert: Z)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV
Except for the data below : adequate margin data below the limits.



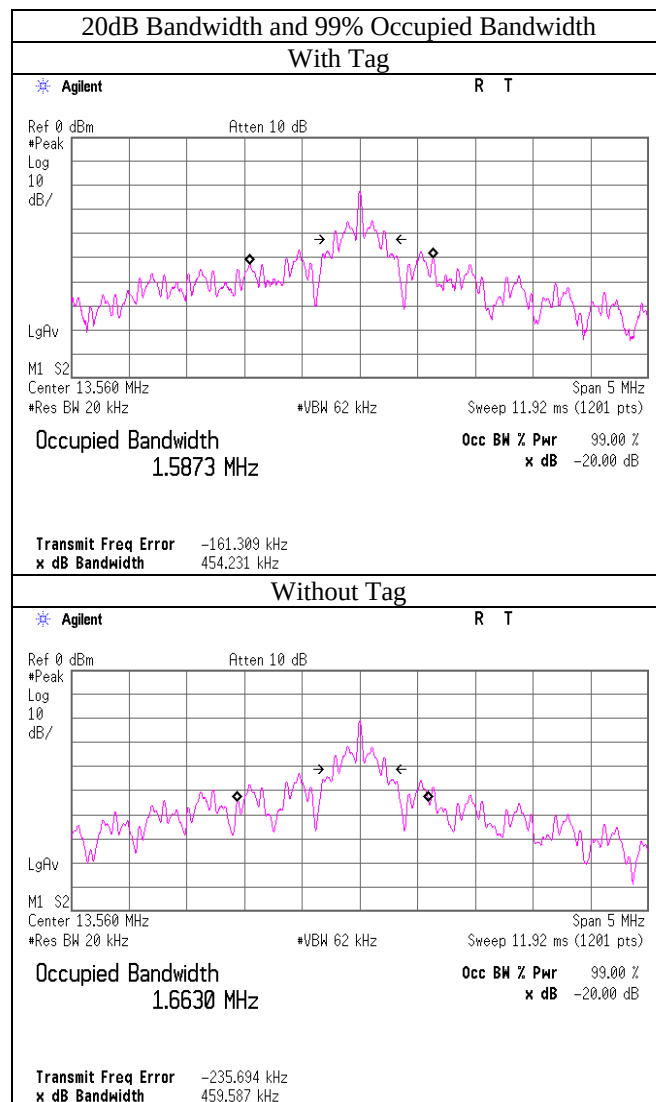
Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.680	30.4	QP	14.0	-24.9	19.5	202	307	Hori.	40.0	20.5	
40.680	33.7	QP	14.0	-24.9	22.8	268	103	Vert.	40.0	17.2	
67.800	29.2	QP	6.4	-24.5	11.1	0	241	Hori.	40.0	28.9	
67.800	34.4	QP	6.4	-24.5	16.3	85	100	Vert.	40.0	23.7	
94.920	25.4	QP	9.2	-24.1	10.5	110	311	Hori.	43.5	33.0	
94.920	34.7	QP	9.2	-24.1	19.8	57	100	Vert.	43.5	23.7	
333.300	34.5	QP	14.2	-21.8	26.9	359	100	Hori.	46.0	19.1	
333.300	28.4	QP	14.2	-21.8	20.8	158	100	Vert.	46.0	25.2	
474.600	33.8	QP	17.2	-20.8	30.2	10	215	Hori.	46.0	15.8	
474.600	30.9	QP	17.2	-20.8	27.3	27	104	Vert.	46.0	18.7	
425.000	38.9	QP	16.2	-21.1	34.0	31	100	Hori.	46.0	12.0	
425.000	34.9	QP	16.2	-21.1	30.0	151	120	Vert.	46.0	16.0	

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

20dB Bandwidth and 99% Occupied Bandwidth TypeA

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11934178H
Date	12/26/2017
Temperature/ Humidity	24 deg. C / 24 % RH
Engineer	Yuta Moriya
Mode	Tx Mod on (Type A)

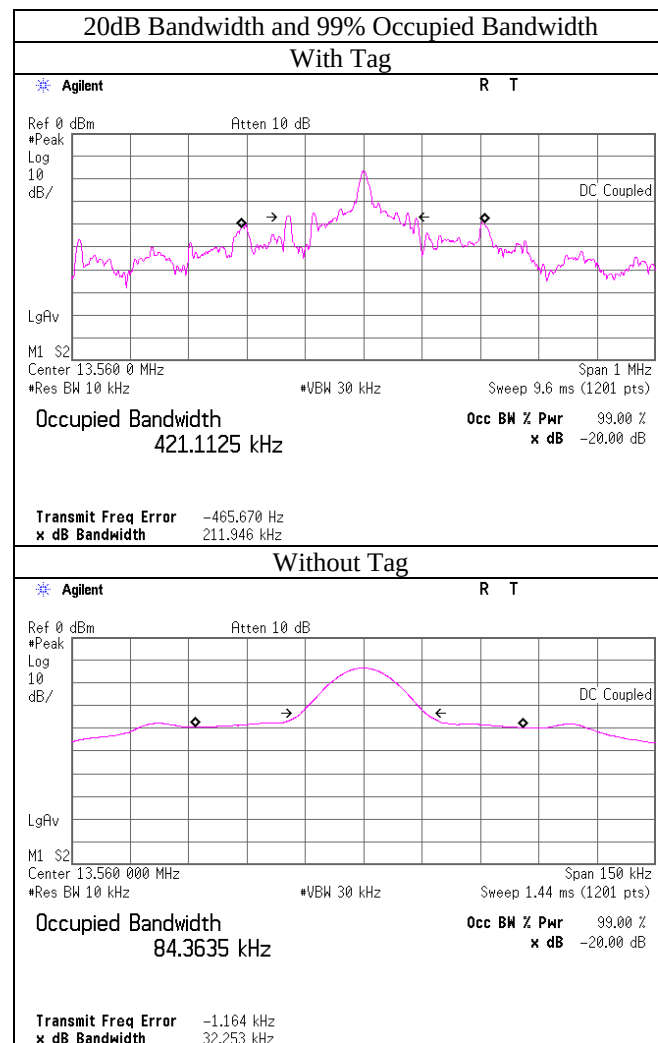
FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	454.23	1587.30
	Without Tag	459.59	1663.00



20dB Bandwidth and 99% Occupied Bandwidth TypeB

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11934178H
Date	08/31/2017
Temperature/ Humidity	25 deg. C / 49 % RH
Engineer	Takumi Shimada
Mode	Tx Mod on (Type B)

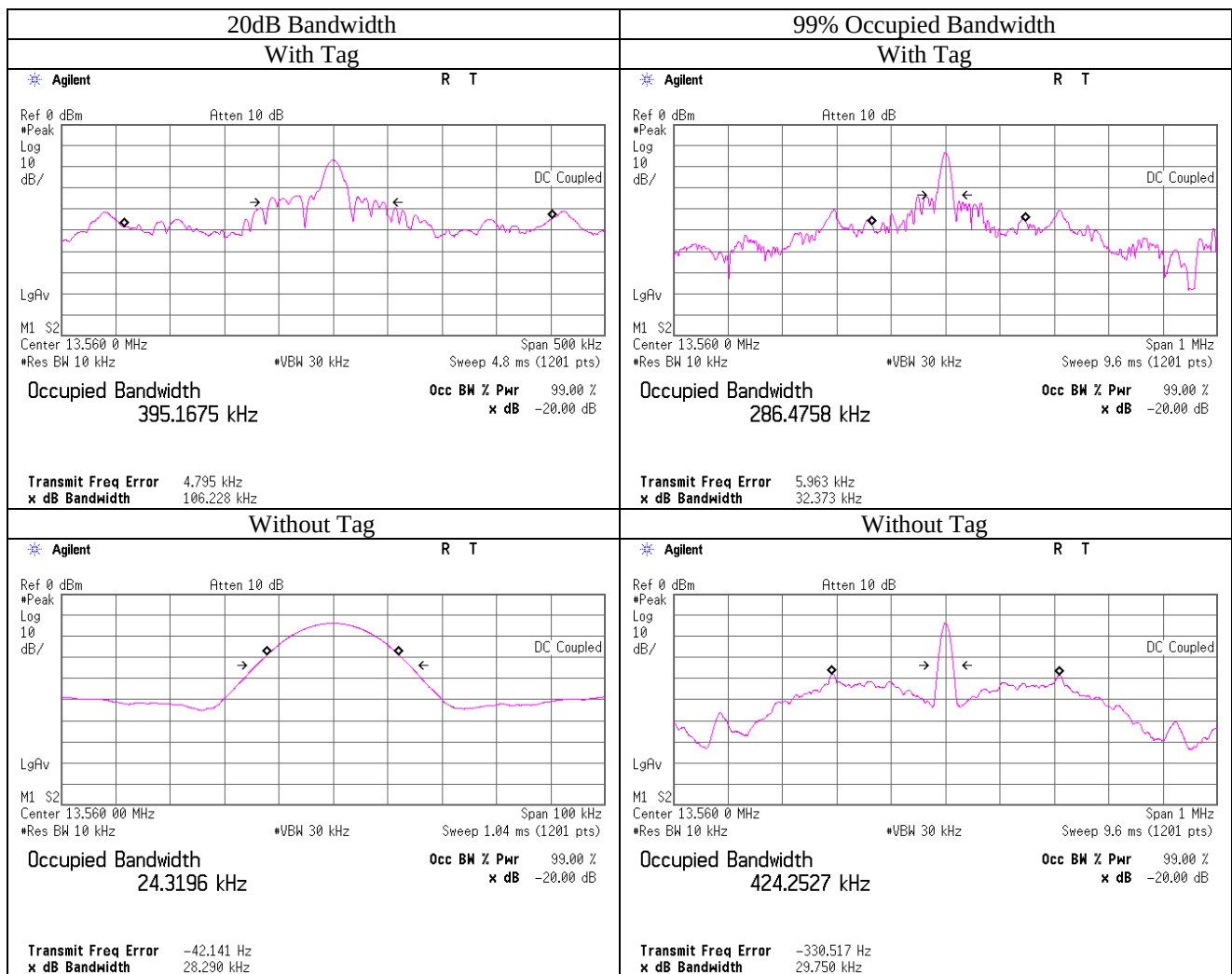
FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	211.95	421.11
	Without Tag	32.25	84.36



20dB Bandwidth and 99% Occupied Bandwidth FeliCa(212 kbps)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11934178H
Date	08/31/2017
Temperature/ Humidity	25 deg. C / 49 % RH
Engineer	Takumi Shimada
Mode	Tx Mod on (FeliCa(212 kbps))

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	106.23	286.48
	Without Tag	28.29	424.25



UL Japan, Inc.

Ise EMC Lab.

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

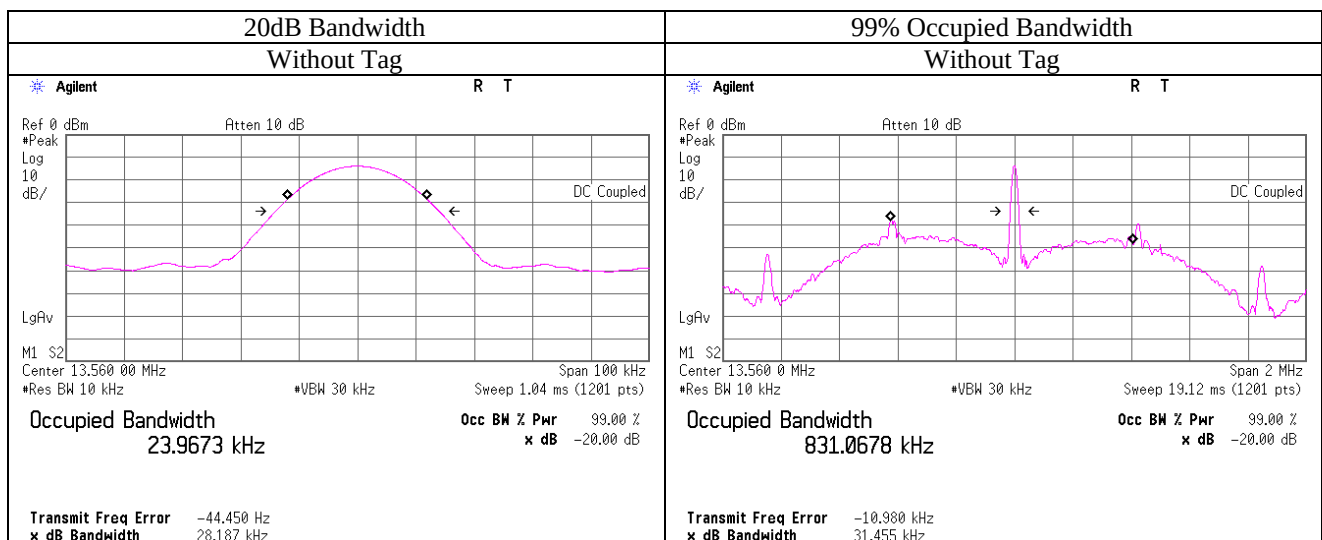
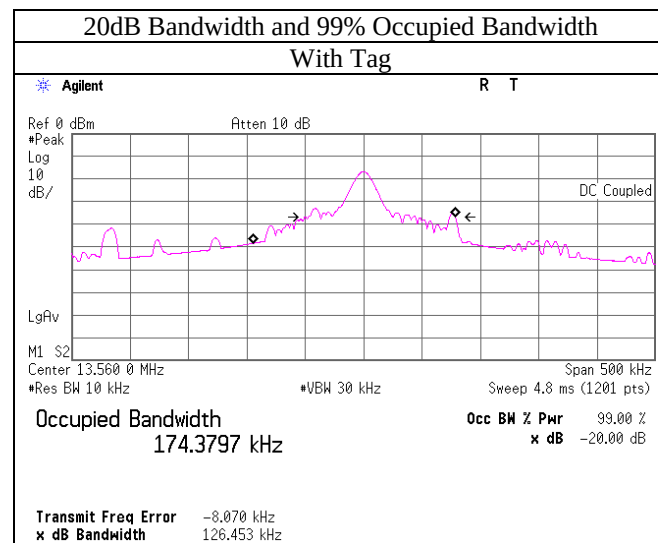
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

20dB Bandwidth and 99% Occupied Bandwidth FeliCa(424 kbps)

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11934178H
Date	08/31/2017
Temperature/ Humidity	25 deg. C / 49 % RH
Engineer	Takumi Shimada
Mode	Tx Mod on (FeliCa(424 kbps))

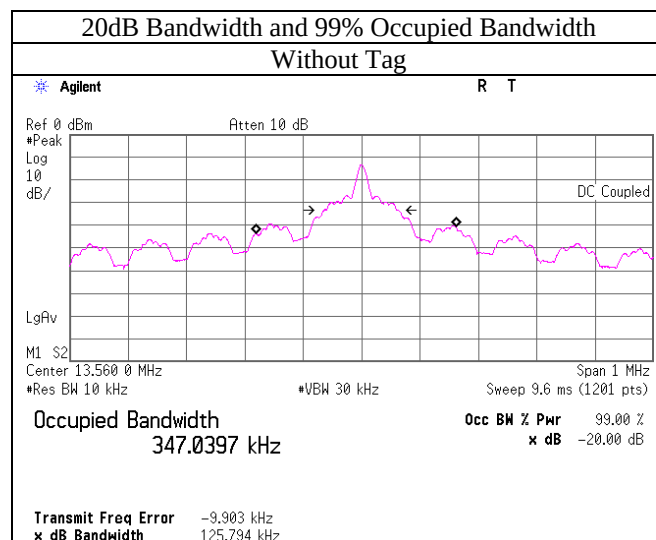
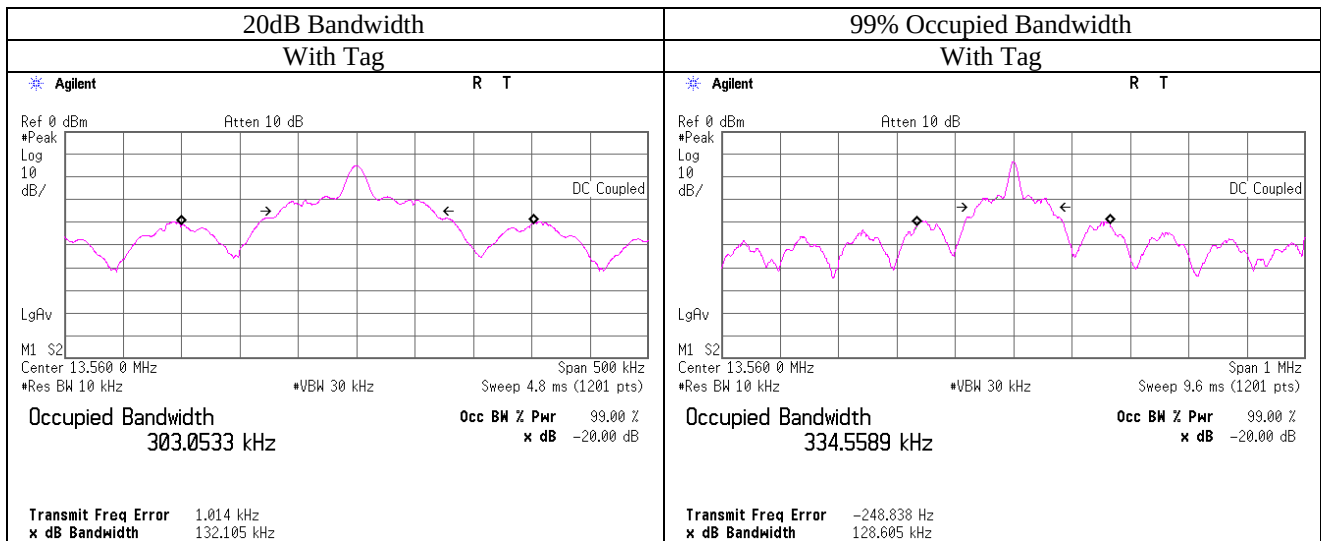
FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	126.45	174.38
	Without Tag	28.19	831.07



20dB Bandwidth and 99% Occupied Bandwidth ISO15693

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	11934178H
Date	08/31/2017
Temperature/ Humidity	25 deg. C / 49 % RH
Engineer	Takumi Shimada
Mode	Tx Mod on (ISO15693)

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	132.11	334.56
	Without Tag	125.79	347.04



Frequency Tolerance

Test place : Ise EMC Lab. No.11 measurement room
Report No. : 11934178H
Date : 08/30/2017 08/31/2017
Temperature/ Humidity : 25 deg. C / 42 % RH 25 deg. C / 49 % RH
Engineer : Takafumi Noguchi Takumi Shimada
Mode : Tx 13.56MHz CW Without Tag

Test condition Temp. [deg. C]	Voltage [V]	Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result [%]	[ppm]	Limit [+/- %]
50	3.3	Power on	13.559840	-0.000160	-0.00118	-11.8	0.01
		+ 2 min.	13.559842	-0.000159	-0.00117	-11.7	0.01
		+ 5 min.	13.559843	-0.000157	-0.00116	-11.6	0.01
		+ 10 min.	13.559842	-0.000158	-0.00117	-11.7	0.01
40	3.3	Power on	13.559844	-0.000156	-0.00115	-11.5	0.01
		+ 2 min.	13.559842	-0.000158	-0.00117	-11.7	0.01
		+ 5 min.	13.559842	-0.000158	-0.00117	-11.7	0.01
		+ 10 min.	13.559842	-0.000158	-0.00117	-11.7	0.01
30	3.3	Power on	13.559856	-0.000144	-0.00106	-10.6	0.01
		+ 2 min.	13.559855	-0.000145	-0.00107	-10.7	0.01
		+ 5 min.	13.559856	-0.000145	-0.00107	-10.7	0.01
		+ 10 min.	13.559856	-0.000145	-0.00107	-10.7	0.01
20	3.3	Power on	13.559876	-0.000124	-0.00091	-9.1	0.01
		+ 2 min.	13.559976	-0.000025	-0.00018	-1.8	0.01
		+ 5 min.	13.559876	-0.000125	-0.00092	-9.2	0.01
		+ 10 min.	13.559875	-0.000125	-0.00092	-9.2	0.01
20	2.805 (3.3V -15%)	Power on	13.559891	-0.000109	-0.00080	-8.0	0.01
		+ 2 min.	13.559876	-0.000124	-0.00092	-9.2	0.01
		+ 5 min.	13.559873	-0.000127	-0.00093	-9.3	0.01
		+ 10 min.	13.559872	-0.000128	-0.00094	-9.4	0.01
20	3.795 (3.3V +15%)	Power on	13.559869	-0.000131	-0.00097	-9.7	0.01
		+ 2 min.	13.559863	-0.000137	-0.00101	-10.1	0.01
		+ 5 min.	13.559859	-0.000141	-0.00104	-10.4	0.01
		+ 10 min.	13.559858	-0.000142	-0.00105	-10.5	0.01
10	3.3	Power on	13.559897	-0.000103	-0.00076	-7.6	0.01
		+ 2 min.	13.559896	-0.000104	-0.00076	-7.6	0.01
		+ 5 min.	13.559896	-0.000104	-0.00077	-7.7	0.01
		+ 10 min.	13.559896	-0.000104	-0.00076	-7.6	0.01
0	3.3	Power on	13.559893	-0.000107	-0.00079	-7.9	0.01
		+ 2 min.	13.559894	-0.000106	-0.00078	-7.8	0.01
		+ 5 min.	13.559894	-0.000106	-0.00078	-7.8	0.01
		+ 10 min.	13.559894	-0.000106	-0.00078	-7.8	0.01
-10	3.3	Power on	13.559871	-0.000129	-0.00096	-9.6	0.01
		+ 2 min.	13.559872	-0.000128	-0.00094	-9.4	0.01
		+ 5 min.	13.559873	-0.000127	-0.00094	-9.4	0.01
		+ 10 min.	13.559873	-0.000127	-0.00094	-9.4	0.01
-20	3.3	Power on	13.559804	-0.000196	-0.00144	-14.4	0.01
		+ 2 min.	13.559819	-0.000181	-0.00133	-13.3	0.01
		+ 5 min.	13.559820	-0.000180	-0.00133	-13.3	0.01
		+ 10 min.	13.559820	-0.000180	-0.00133	-13.3	0.01
-30	3.3	Power on	13.559730	-0.000270	-0.00199	-19.9	0.01
		+ 2 min.	13.559729	-0.000271	-0.00200	-20.0	0.01
		+ 5 min.	13.559728	-0.000272	-0.00201	-20.1	0.01
		+ 10 min.	13.559728	-0.000272	-0.00201	-20.1	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.

*As for the range of specification operating temperature, the test was performed with required temperature range on Frequency Tolerance.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2017/07/20 * 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	2017/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/12/24 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(EUT)	2017/07/24 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2016/10/20 * 12 *1)
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE/CE	2017/06/21 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2017/08/22 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12 *1)
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
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/CE	2017/01/19 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/19 * 12 *1)
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2017/01/20 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2017/01/12 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2016/10/14 * 12 *1)
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/ 421-010(1m)/sucoform141- PE(1m)/RFM-E121(Switcher)	-/04178	RE	2017/07/26 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2017/06/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2017/03/27 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2017/01/19 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2017/11/07 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2016/12/13 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2017/06/21 * 12
MCH-06	Temperature and Humidity Chamber	Tabai Espec	PL-1KT	14007630	FT	2017/04/10 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	FT	Pre Check

*1) This test equipment was used for the tests before the expiration date of the calibration.

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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