RADIO TEST REPORT

Test Report No. : 11050639H-A

Applicant	:	**Murata Manufacturing Co., Ltd.**
Type of Equipment	:	**HF RFID Reader/Writer**
Model No.	:	**LXRFZZHAAA-026**
Test regulation	:	**FCC Part 15 Subpart C: 2015**
FCC ID	:	**VPYLXRF026**
Test Result	:	**Complied**

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

Date of test: December 10, 2015 to January 6, 2015

Representative test engineer:
T. matsui
Tomoki Matsui
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP®
NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

REVISION HISTORY

Original Test Report No.: 11050639H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11050639H-A	January 26, 2015	-	-

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	Murata Manufacturing Co., Ltd.
Address	:	1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	:	+81-75-955-6736
Facsimile Number	:	+81-75-955-7332
Contact Person	:	Youichi Saito

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

2.1 Identification of E.U.T.

Type of Equipment	:	HF RFID Reader/Writer
Model No.	:	LXRFZZHAAA-026
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5.0 V (VDD) DC 1.8 to 5.0 V (VIO)
Receipt Date of Sample	:	December 7, 2015
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

General Specification

Clock frequency(ies) in the system	:	27.12 MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK
Power Supply (inner)	:	DC 4.6 V
Antenna type	:	Loop Antenna
Operating Temperature	:	-25 deg. C. - +60 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2015, final revised on November 23, 2015 *Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.225 : Operation within the band 13.110-14.010MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods	Section 15.207	[QP] 15.4 dB 0.19564 MHz, L [AV] 7.9 dB 27.11984 MHz, N	Complied	-
	<IC>RSS-Gen 8.8	<IC>RSS-Gen 8.8			
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	50.1 dB, 13.56000 MHz, QP, 90 deg.	Complied	Radiated
	<IC> RSS-Gen 6.4, 6.12	<IC>RSS-210 A2.6			
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods	Section 15.225(b)(c)	27.3 dB, 14.36231 MHz, QP, 90 deg.	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC> RSS-210 A2.6			
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)	7.7 dB 33.889 MHz, Vertical, QP	Complied	Radiated
	<IC>RSS-Gen 6.4, 6.13	<IC>RSS-210 A2.6			
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 A2.6			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

FCC Part 15.31 (e)
This EUT provides stable voltage (DC 4.6 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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) (±dB)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	2.9 dB

Test distance	Radiated emission (±dB)
	9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

*Measurement distance

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(±dB)		(10 m*)(±dB)	
	30 – 300 MHz	300 – 1000MHz	30 – 300 MHz	300 – 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(±dB)		(1 m*)(±dB)	(0.5 m*)(±dB)	(10 m*)(±dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

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

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

Radiated emission test (3 m)
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

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

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

3.6 Test set up, 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) -FeliCa (212kbps) -FeliCa (424kbps) -ISO 14443a (106kbps) -ISO 14443a (212kbps) -ISO 14443a (424kbps) -ISO 14443a (848kbps) -ISO 15693 (6.62kbps) -ISO 15693 (26.48kbps)	With Tag Without Tag
The EUT was operated in a manner similar to typical use during the tests.	

Test Item	Operating mode*1)
Conducted emission	Tx Mod on
Conducted emission (Antenna terminal)	Tx Mod on
Electric Field Strength of Fundamental Emission	Tx Mod on
Spectrum Mask	Tx Mod on
20 dB Bandwidth 99 % OccupiedBandwidth	Tx Mod on
Electric Field Strength of Spurious Emission	Tx Mod on
Frequency Tolerance	Tx Mod off

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

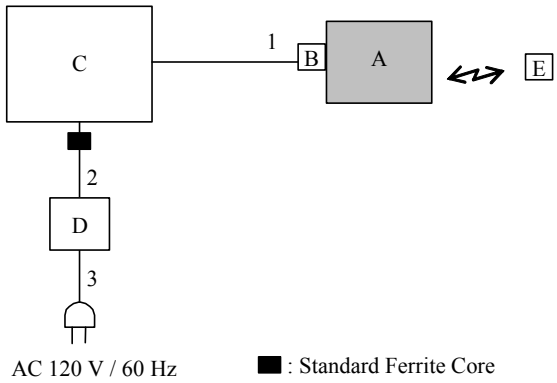
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -20deg.C to +50deg.C Step 10deg.C
Voltage : Normal Voltage : DC 5 V
Maximum Voltage : DC 5.75 V
Minimum Voltage : DC 4.25 V
(DC 5 V ±15 %)

*This EUT provides stable voltage (DC 4.6 V) constantly to RF Module regardless of input voltage.

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	HF RFID Reader/Writer	LXRFZZHAAA-026	PL2X4751-2	Murata Manufacturing Co., Ltd.	EUT
B	USB-SDI conversion board	-	-	Murata Manufacturing Co., Ltd.	-
C	Laptop PC	CF-N9KWCJPS	0JKSA21577	Panasonic	-
D	AC Adapter	CF-AA6402AM1	6402AM111921184A	Panasonic	-
E	RFID Tag (ISO 15693)	LXMS33HCNG-134	0001	Murata Manufacturing Co., Ltd.	-
	RFID Tag (ISO 14443a)	P2LX4912	0001	Murata Manufacturing Co., Ltd.	
	RFID Tag (FeliCa)	RC-S712	0001	SONY	

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB Cable	0.8	Shielded	Shielded	-
2	DC Cable	1.1	Unshielded	Unshielded	-
3	AC Cable	0.9	Unshielded	Unshielded	-

SECTION 5: Conducted emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 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, 0.5 m by 1.0 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: 90 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 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

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	Above 1 GHz	
Instrument used	Test Receiver					Spectrum Analyzer	
Detector	PK / AV	QP	PK / AV	QP	QP	PK	AV
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m	3 m	3 m

*1) Distance Factor: 40 x log (3 m / 300 m) = -80 dB
*2) Distance Factor: 40 x log (3 m / 30 m) = -40 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 937606.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.
However test results were confirmed to pass against standard limit.

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The 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

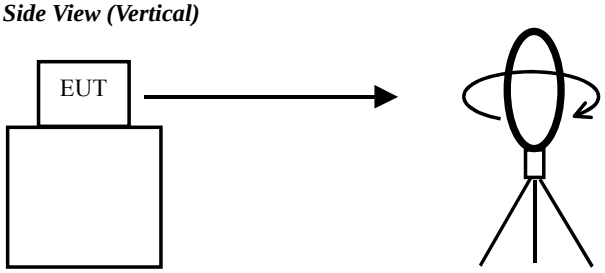
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth 99 % Occupied Bandwidth	50kHz	1 kHz	3 kHz	Auto	Sample	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter
*1) Peak hold was applied as Worst-case measurement.							

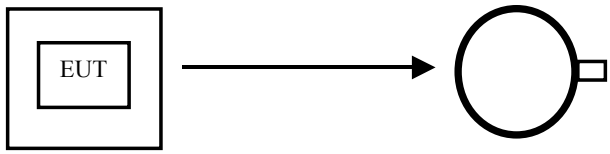
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

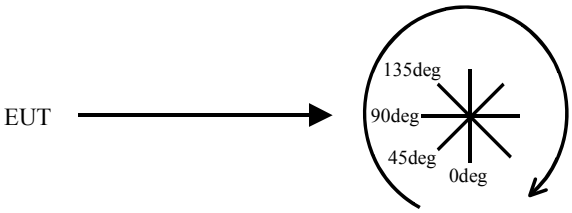


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

APPENDIX 1: Test data

Conducted emission
FeliCa(212kbps)

DATA OF CONDUCTED EMISSION TEST

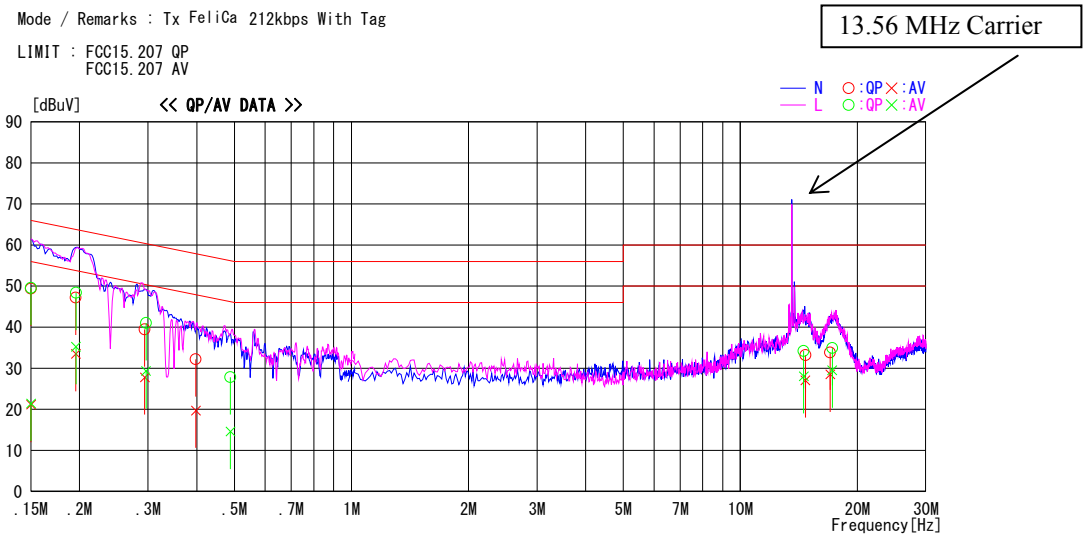
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx FeliCa 212kbps With Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	36.2	7.9	13.2	49.4	21.1	66.0	56.0	16.6	34.9	N	
0.19550	34.0	20.3	13.2	47.2	33.5	63.8	53.8	16.6	20.3	N	
0.29424	26.3	14.6	13.2	39.5	27.8	60.4	50.4	20.9	22.6	N	
0.39800	18.9	6.4	13.3	32.2	19.7	57.9	47.9	25.7	28.2	N	
14.70306	18.9	12.8	14.3	33.2	27.1	60.0	50.0	26.8	22.9	N	
17.01000	19.4	14.1	14.4	33.8	28.5	60.0	50.0	26.2	21.5	N	
0.15000	36.4	8.2	13.2	49.6	21.4	66.0	56.0	16.4	34.6	L	
0.19564	35.2	22.0	13.2	48.4	35.2	63.8	53.8	15.4	18.6	L	
0.29632	27.8	16.1	13.2	41.0	29.3	60.3	50.3	19.3	21.0	L	
0.48852	14.5	1.3	13.3	27.8	14.6	56.2	46.2	28.4	31.6	L	
14.55408	20.0	13.9	14.2	34.2	28.1	60.0	50.0	25.8	21.9	L	
17.23382	20.5	15.1	14.4	34.9	29.5	60.0	50.0	25.1	20.5	L	

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

Conducted emission
FeliCa(212kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

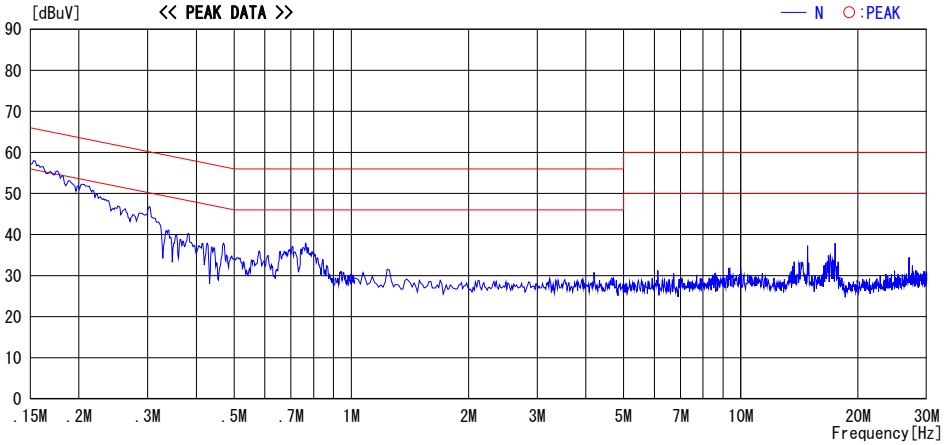
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx FeliCa 212kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



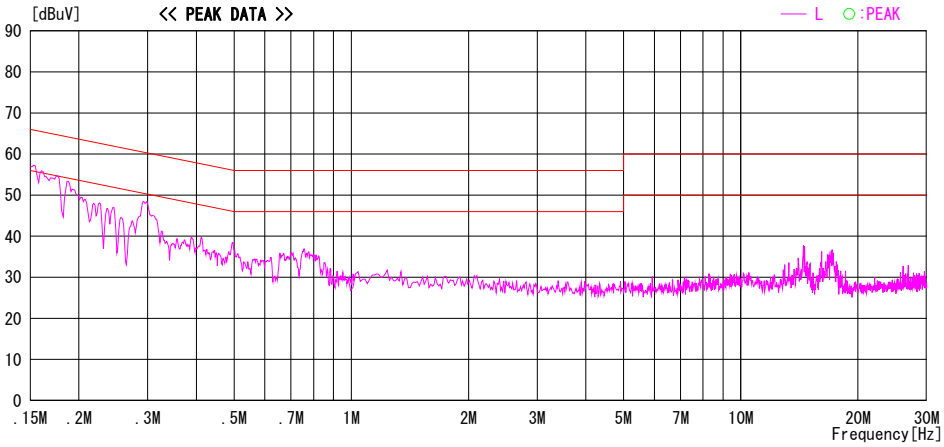


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

***It was confirmed that average limit was satisfied with peak detection.**

UL Japan, Inc.
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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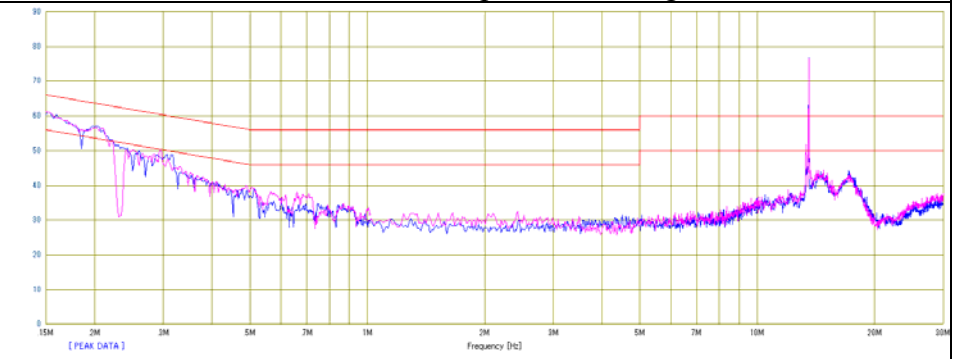
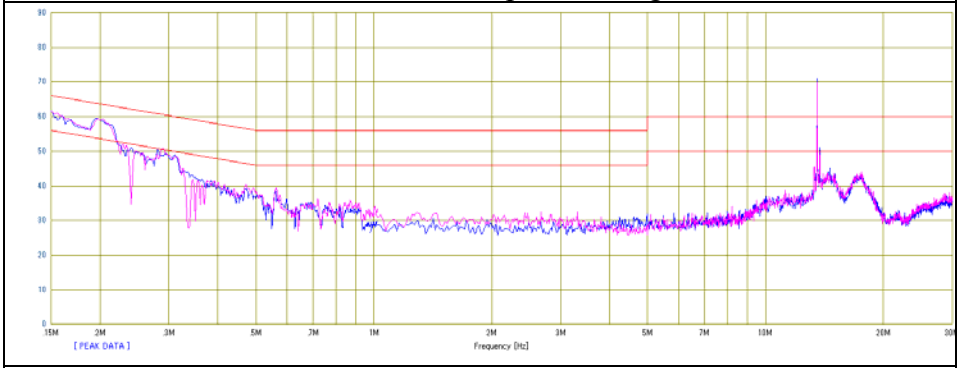
Conducted emission
FeliCa(212kbps)

Tx Felica 212kbps Without Tag



Tx Felica 212kbps With Tag



Conducted emission
FeliCa(424kbps)

DATA OF CONDUCTED EMISSION TEST

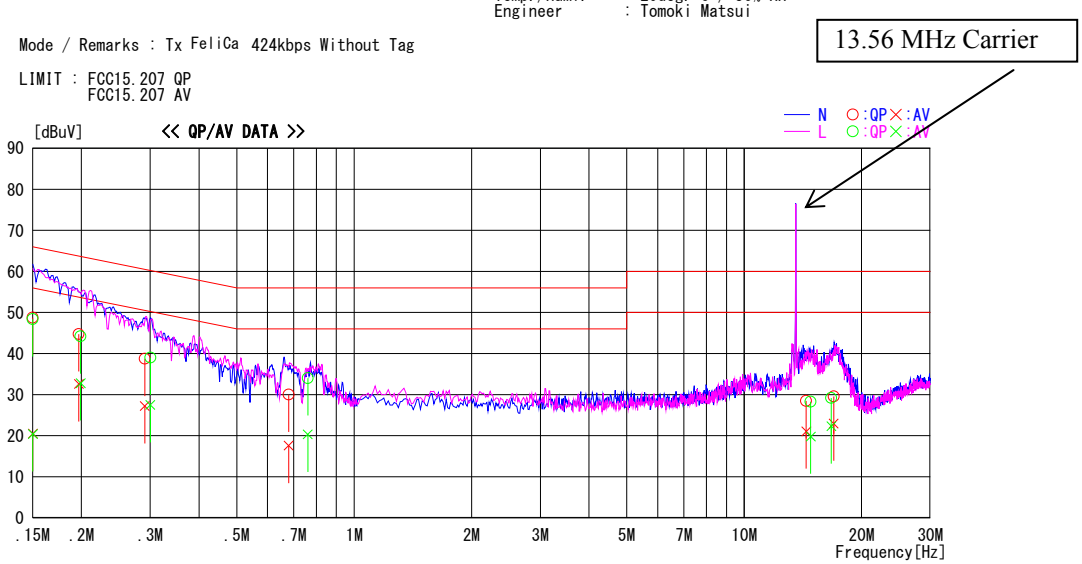
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx FeliCa 424kbps Without Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	35.5	7.3	13.2	48.7	20.5	66.0	56.0	17.3	35.5	N	
0.19675	31.5	19.4	13.2	44.7	32.6	63.7	53.7	19.0	21.1	N	
0.29060	25.5	14.0	13.2	38.7	27.2	60.5	50.5	21.8	23.3	N	
0.67950	16.7	4.3	13.3	30.0	17.6	56.0	46.0	26.0	28.4	N	
14.41560	14.3	6.9	14.2	28.5	21.1	60.0	50.0	31.5	28.9	N	
16.95400	15.2	8.6	14.4	29.6	23.0	60.0	50.0	30.4	27.0	N	
0.15000	35.2	7.2	13.2	48.4	20.4	66.0	56.0	17.6	35.6	L	
0.19900	31.0	19.6	13.2	44.2	32.8	63.7	53.7	19.5	20.9	L	
0.30040	25.7	14.2	13.3	39.0	27.5	60.2	50.2	21.2	22.7	L	
0.76070	20.6	6.9	13.4	34.0	20.3	56.0	46.0	22.0	25.7	L	
14.80400	14.0	5.5	14.3	28.3	19.8	60.0	50.0	31.7	30.2	L	
16.72000	14.8	7.9	14.4	29.2	22.3	60.0	50.0	30.8	27.7	L	

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

Conducted emission
FeliCa(424kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

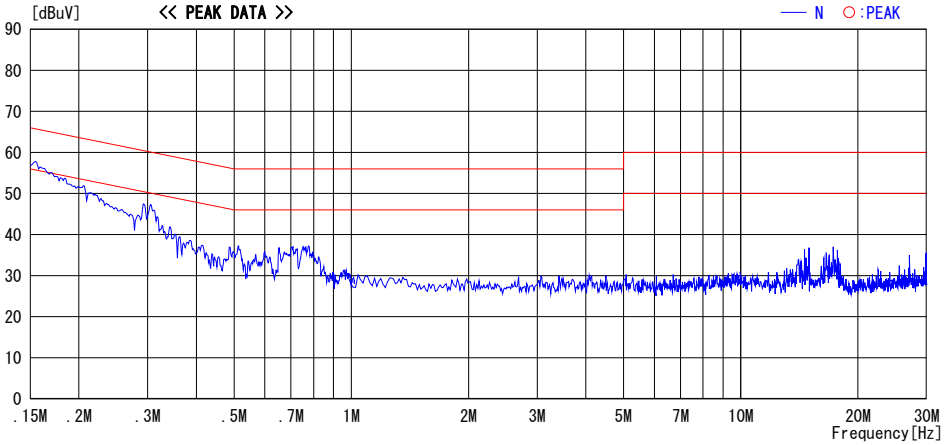
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx FeliCa 424kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



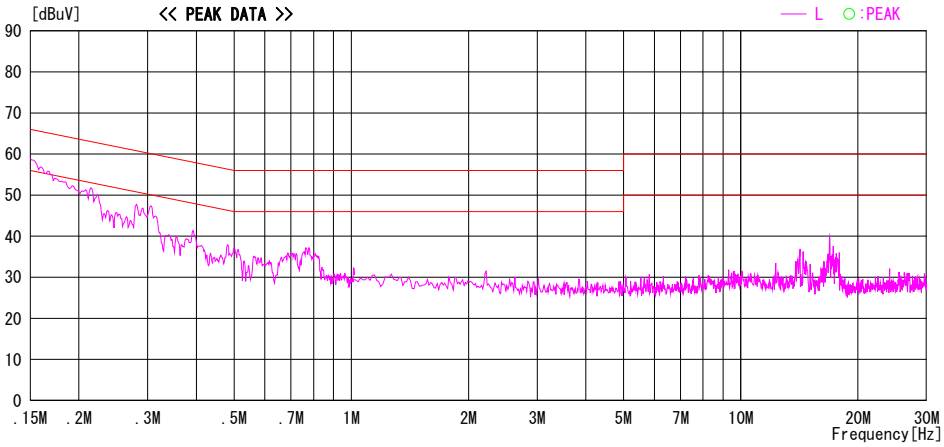


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

***It was confirmed that average limit was satisfied with peak detection.**

UL Japan, Inc.
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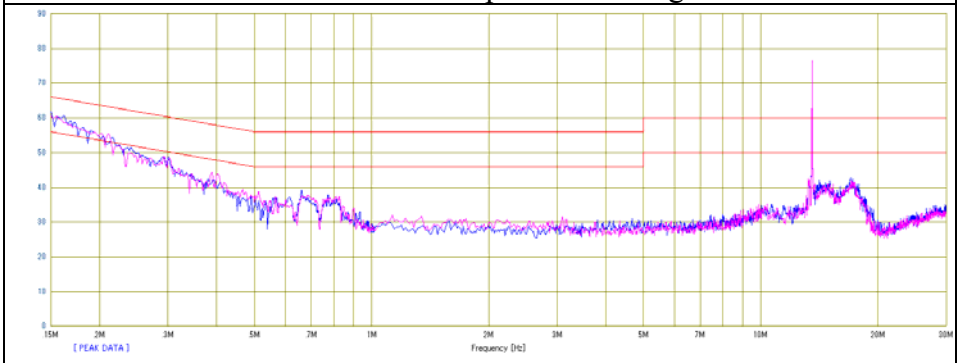
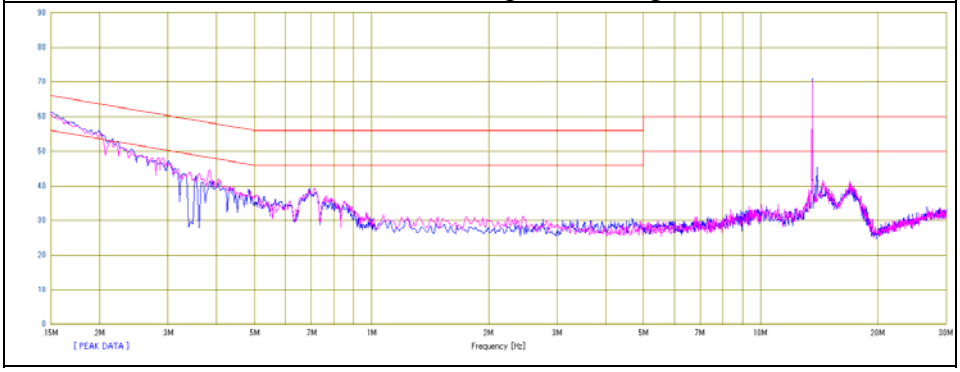
Conducted emission
FeliCa(424kbps)

Tx Felica 424kbps Without Tag



Tx Felica 424kbps With Tag



Conducted emission
ISO14443a(106kbps)

DATA OF CONDUCTED EMISSION TEST

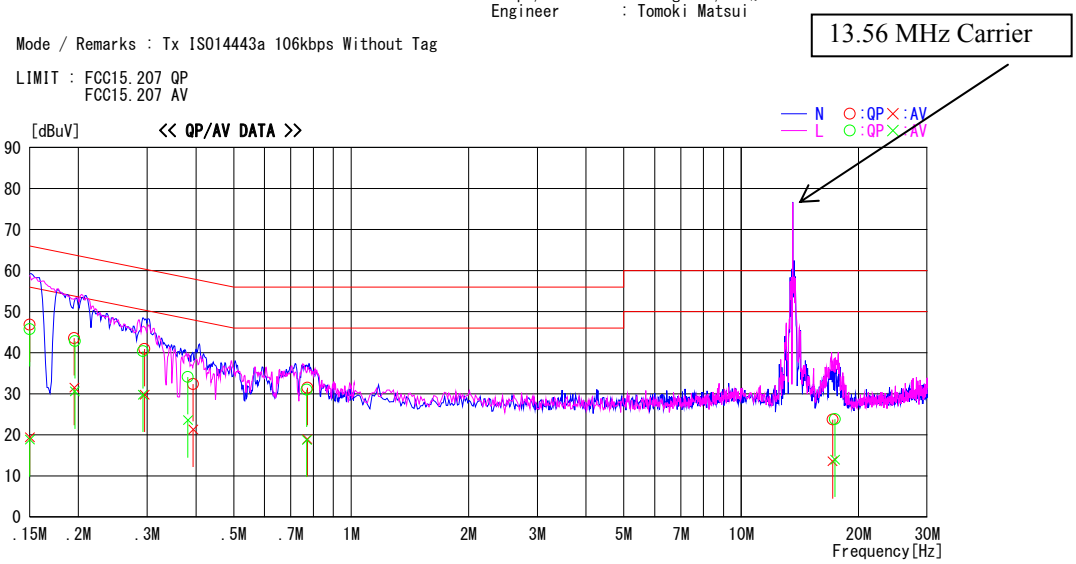
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 106kbps Without Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	33.6	6.2	13.2	46.8	19.4	66.0	56.0	19.2	36.6	N	
0.19520	30.4	18.3	13.2	43.6	31.5	63.8	53.8	20.2	22.3	N	
0.29557	27.7	16.6	13.2	40.9	29.8	60.4	50.4	19.5	20.6	N	
0.39360	19.1	8.0	13.3	32.4	21.3	58.0	48.0	25.6	26.7	N	
0.77260	18.1	5.6	13.4	31.5	19.0	56.0	46.0	24.5	27.0	N	
17.15640	9.3	-0.8	14.4	23.7	13.6	60.0	50.0	36.3	36.4	N	
0.15000	32.5	5.7	13.2	45.7	18.9	66.0	56.0	20.3	37.1	L	
0.19570	29.6	17.4	13.2	42.8	30.6	63.8	53.8	21.0	23.2	L	
0.29260	27.2	16.6	13.2	40.4	29.8	60.5	50.5	20.1	20.7	L	
0.38180	20.8	10.3	13.3	34.1	23.6	58.2	48.2	24.1	24.6	L	
0.76940	17.6	5.4	13.4	31.0	18.8	56.0	46.0	25.0	27.2	L	
17.40800	9.4	-0.4	14.4	23.8	14.0	60.0	50.0	36.2	36.0	L	

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

Conducted emission
ISO14443a(106kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

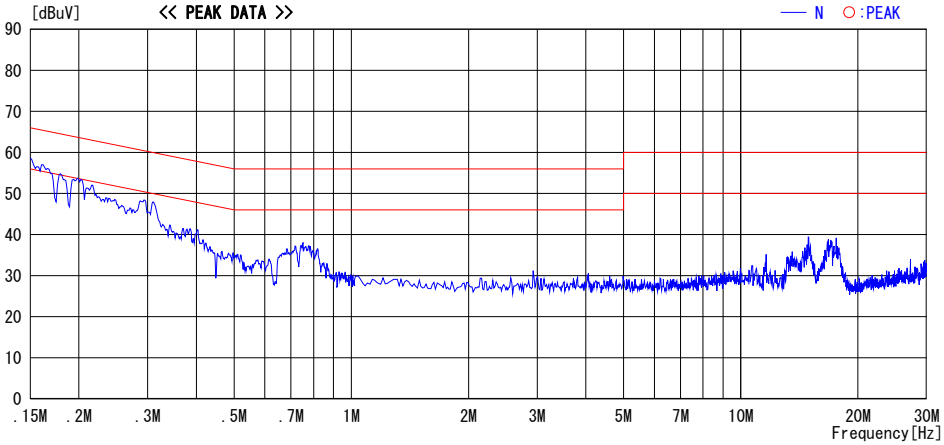
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 106kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



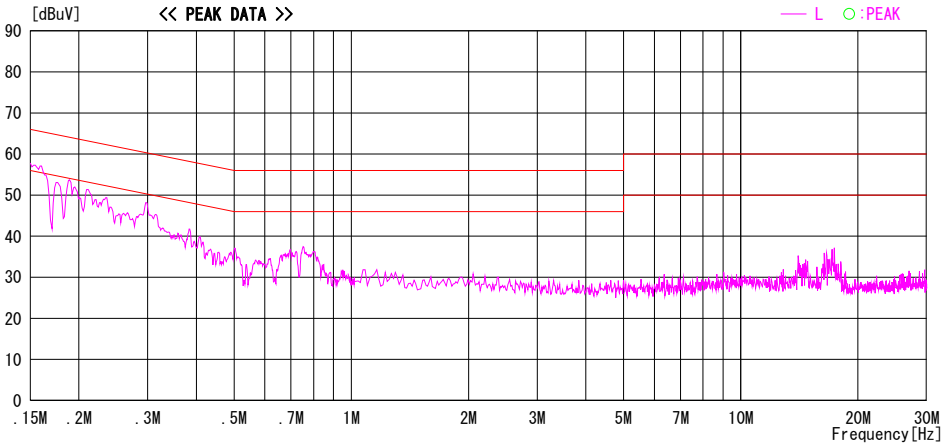


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

***It was confirmed that average limit was satisfied with peak detection.**

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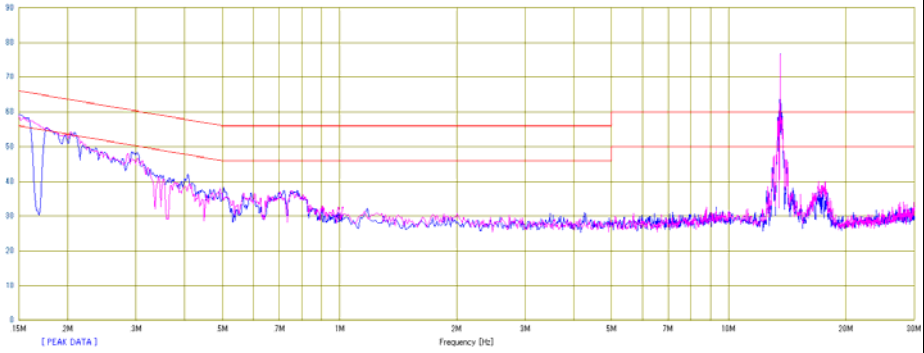
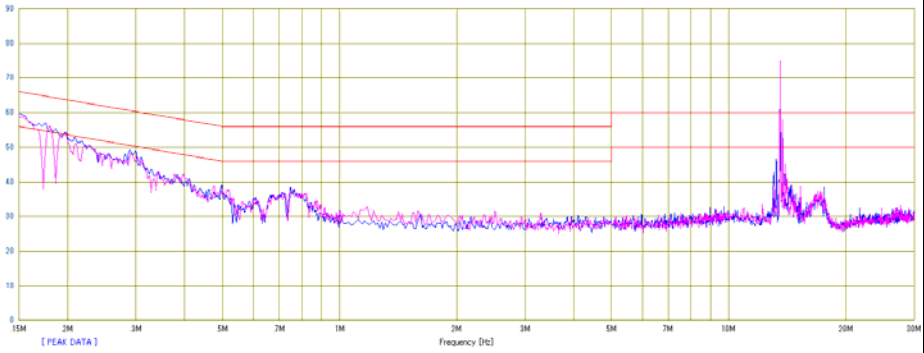
Facsimile : +81 596 24 8124

Conducted emission
ISO14443a(106kbps)

Tx ISO14443a 106kbps Without Tag



Tx ISO14443a 106kbps With Tag



Conducted emission
ISO14443a(212kbps)

DATA OF CONDUCTED EMISSION TEST

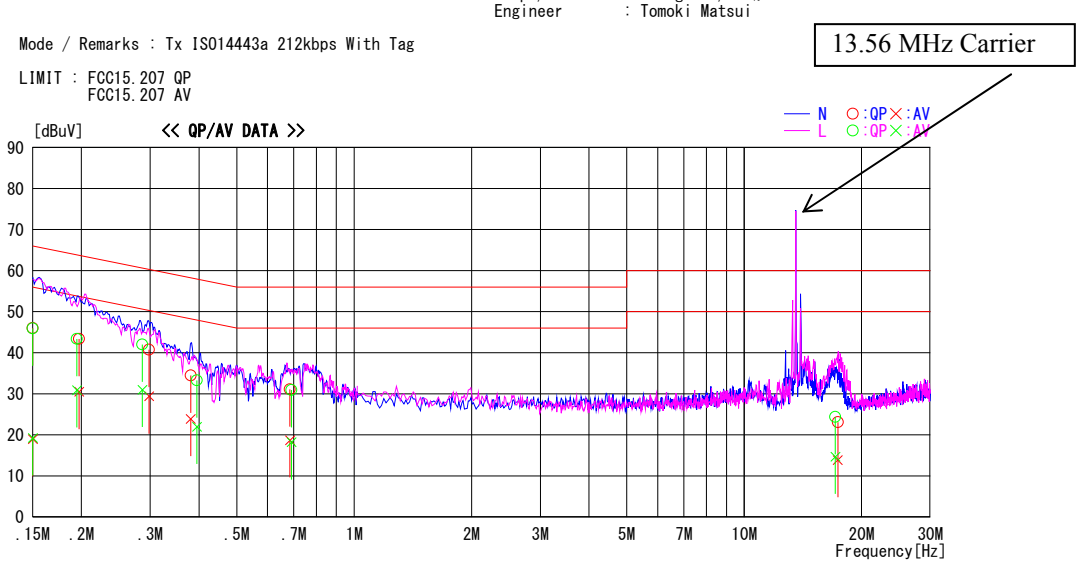
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 212kbps With Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	32.8	5.8	13.2	46.0	19.0	66.0	56.0	20.0	37.0	N	
0.19720	30.2	17.3	13.2	43.4	30.5	63.7	53.7	20.3	23.2	N	
0.29812	27.5	16.2	13.2	40.7	29.4	60.3	50.3	19.6	20.9	N	
0.38100	21.2	10.6	13.3	34.5	23.9	58.3	48.3	23.8	24.4	N	
0.68460	17.8	5.4	13.3	31.1	18.7	56.0	46.0	24.9	27.3	N	
17.37100	8.7	-0.5	14.4	23.1	13.9	60.0	50.0	36.9	36.1	N	
0.15000	32.7	6.0	13.2	45.9	19.2	66.0	56.0	20.1	36.8	L	
0.19460	30.2	17.7	13.2	43.4	30.9	63.8	53.8	20.4	22.9	L	
0.28648	28.8	17.8	13.2	42.0	31.0	60.6	50.6	18.6	19.6	L	
0.39550	20.0	8.7	13.3	33.3	22.0	57.9	47.9	24.6	25.9	L	
0.69120	17.6	4.9	13.3	30.9	18.2	56.0	46.0	25.1	27.8	L	
17.13200	10.0	0.3	14.4	24.4	14.7	60.0	50.0	35.6	35.3	L	

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

Conducted emission
ISO14443a(212kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

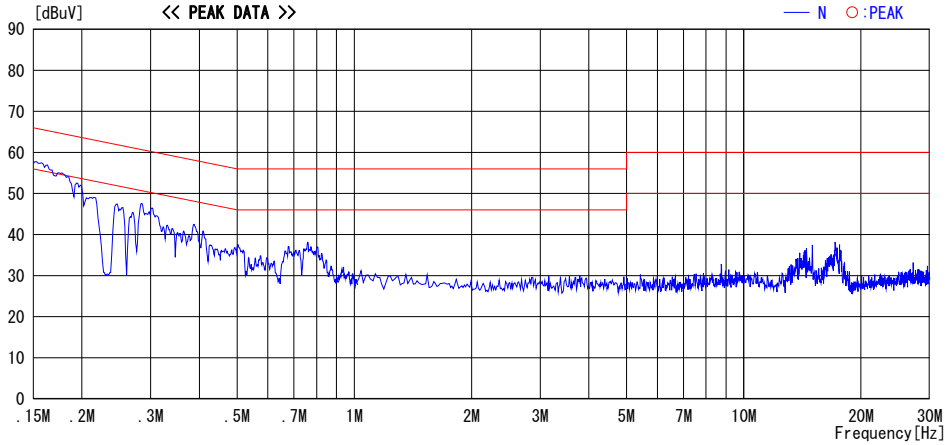
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 212kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



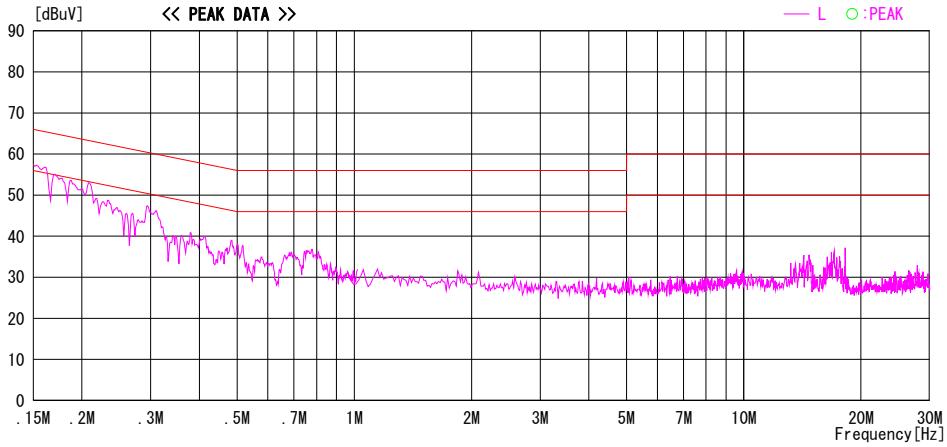
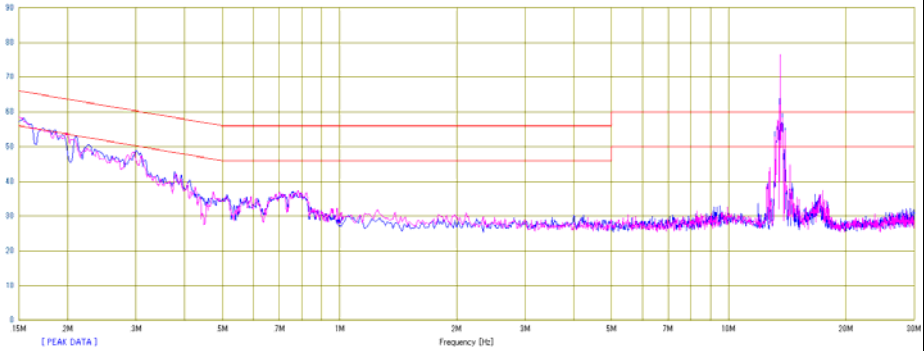


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

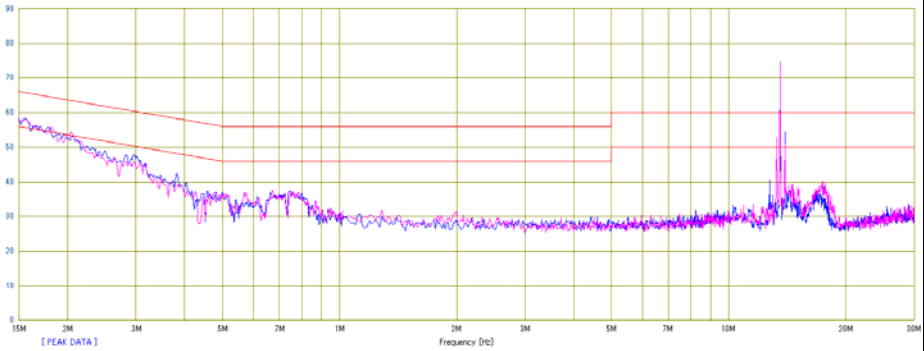
***It was confirmed that average limit was satisfied with peak detection.**

Conducted emission
ISO14443a(212kbps)

Tx ISO14443a 212kbps Without Tag



Tx ISO14443a 212kbps With Tag



Conducted emission
ISO14443a(424kbps)

DATA OF CONDUCTED EMISSION TEST

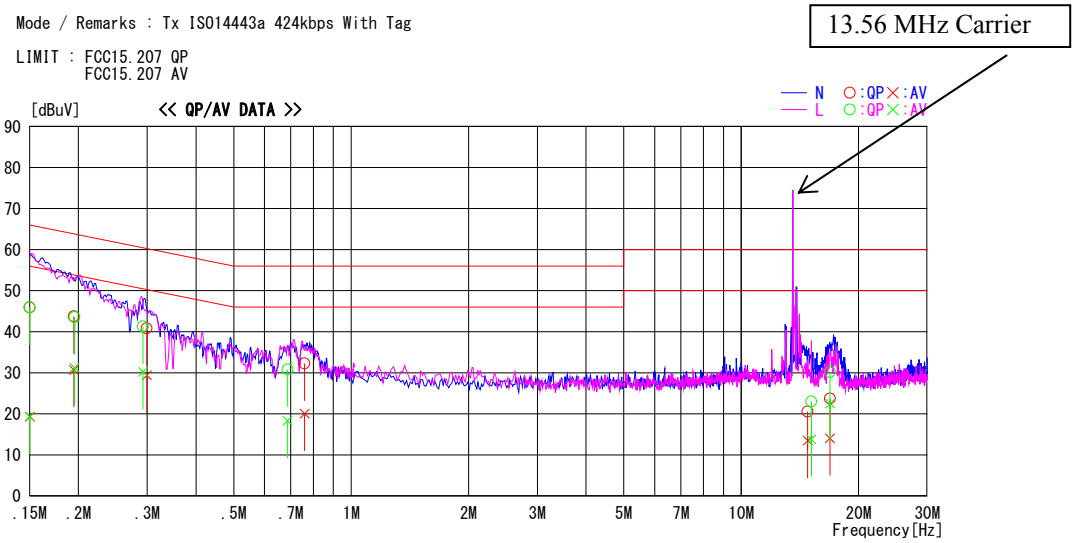
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 424kbps With Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	32.7	6.1	13.2	45.9	19.3	66.0	56.0	20.1	36.7	N	
0.19466	30.5	17.5	13.2	43.7	30.7	63.8	53.8	20.1	23.1	N	
0.29928	27.6	16.2	13.2	40.8	29.4	60.3	50.3	19.5	20.9	N	
0.75960	18.9	6.7	13.4	32.3	20.1	56.0	46.0	23.7	25.9	N	
14.81700	6.3	-0.8	14.3	20.6	13.5	60.0	50.0	39.4	36.5	N	
16.88600	9.3	-0.3	14.4	23.7	14.1	60.0	50.0	36.3	35.9	N	
0.15000	32.7	6.1	13.2	45.9	19.3	66.0	56.0	20.1	36.7	L	
0.19530	30.4	18.0	13.2	43.6	31.2	63.8	53.8	20.2	22.6	L	
0.29290	28.1	17.0	13.2	41.3	30.2	60.4	50.4	19.1	20.2	L	
0.68730	17.5	5.0	13.3	30.8	18.3	56.0	46.0	25.2	27.7	L	
15.12399	8.7	-0.5	14.3	23.0	13.8	60.0	50.0	37.0	36.2	L	
16.90000	15.8	8.1	14.4	30.2	22.5	60.0	50.0	29.8	27.5	L	

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

Conducted emission
ISO14443a(424kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

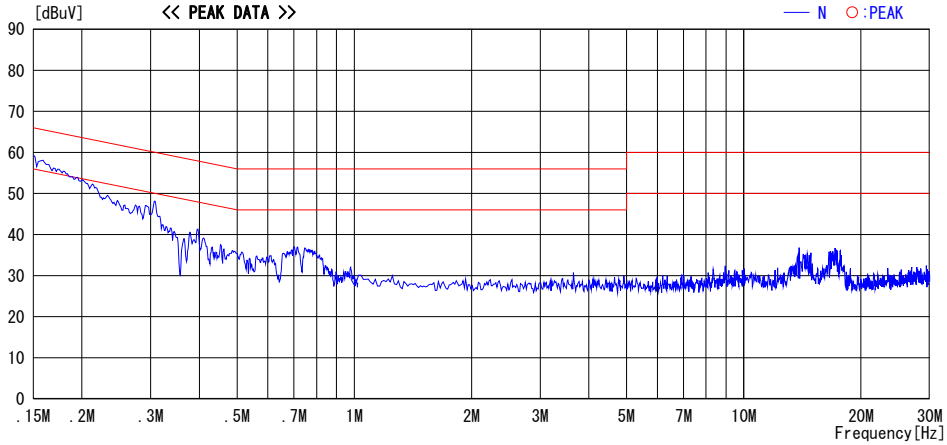
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 424kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



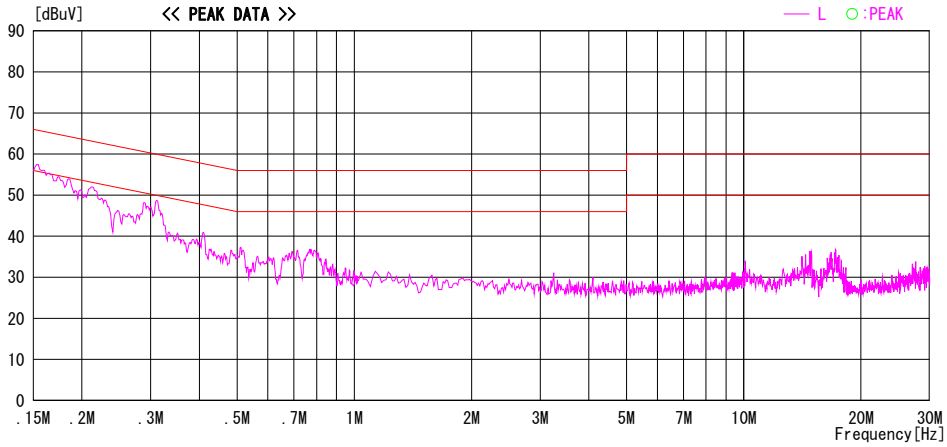


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

***It was confirmed that average limit was satisfied with peak detection.**

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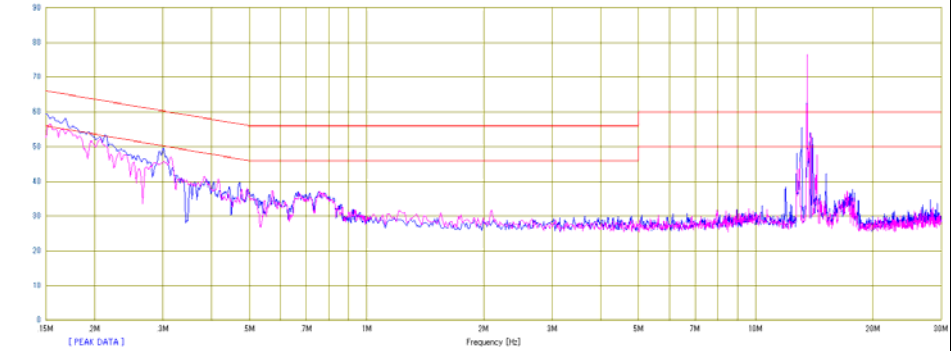
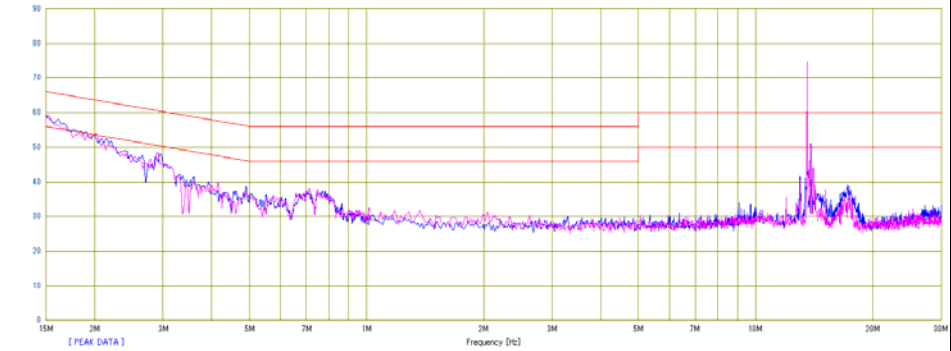
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Conducted emission
ISO14443a(424kbps)

Tx ISO14443a 424kbps Without Tag



Tx ISO14443a 424kbps With Tag



Conducted emission
ISO14443a(848kbps)

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

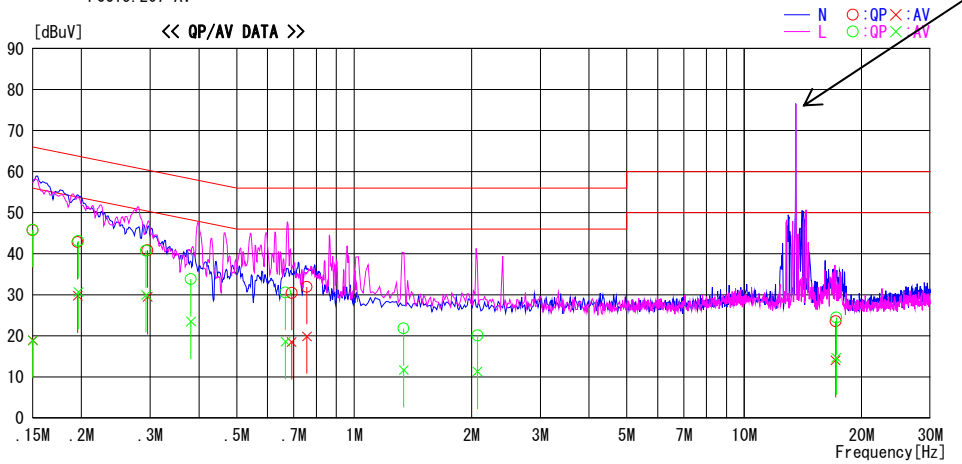
Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 848kbps Without Tag

LIMIT : FCC15.207 QP
FCC15.207 AV

13.56 MHz Carrier



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	32.6	5.7	13.2	45.8	18.9	66.0	56.0	20.2	37.1	L	
0.15000	32.5	5.8	13.2	45.7	19.0	66.0	56.0	20.3	37.0	N	
0.19550	29.6	16.6	13.2	42.8	29.8	63.8	53.8	21.0	24.0	N	
0.19650	29.9	17.5	13.2	43.1	30.7	63.8	53.8	20.7	23.1	L	
0.29280	27.5	16.8	13.2	40.7	30.0	60.4	50.4	19.7	20.4	L	
0.29530	27.6	16.3	13.2	40.8	29.5	60.4	50.4	19.6	20.9	N	
0.38180	20.5	10.2	13.3	33.8	23.5	58.2	48.2	24.4	24.7	L	
0.66680	17.3	5.3	13.3	30.6	18.6	56.0	46.0	25.4	27.4	L	
0.69200	17.2	5.2	13.3	30.5	18.5	56.0	46.0	25.5	27.5	N	
0.75600	18.5	6.5	13.4	31.9	19.9	56.0	46.0	24.1	26.1	N	
1.33900	8.3	-1.8	13.5	21.8	11.7	56.0	46.0	34.2	34.3	L	
2.07100	6.6	-2.2	13.5	20.1	11.3	56.0	46.0	35.9	34.7	L	
17.14600	9.2	-0.3	14.4	23.6	14.1	60.0	50.0	36.4	35.9	N	
17.22600	10.1	0.3	14.4	24.5	14.7	60.0	50.0	35.5	35.3	L	

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

Conducted emission
ISO14443a(848kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

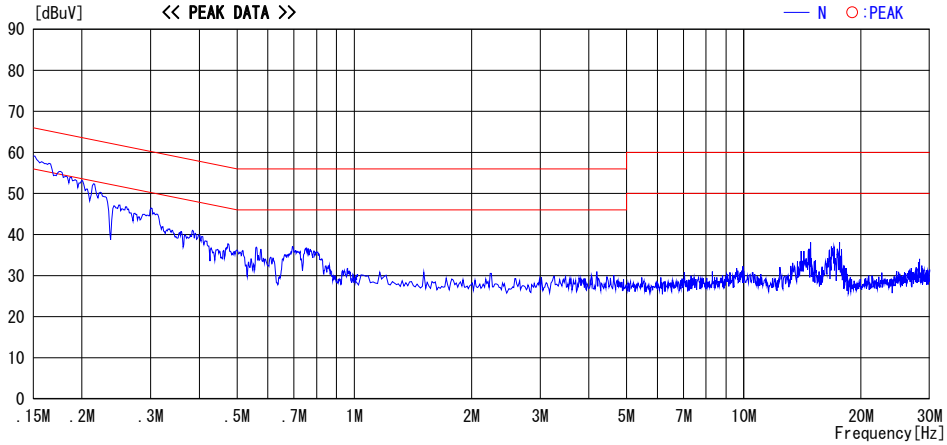
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO14443a 848kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



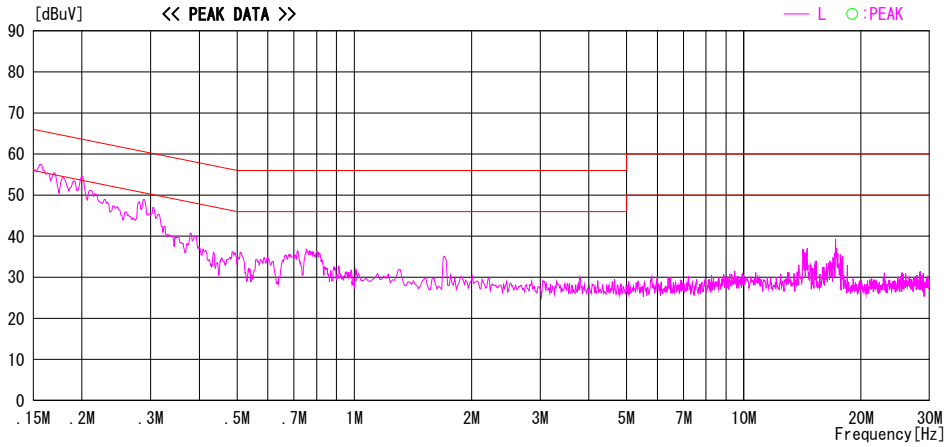


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

***It was confirmed that average limit was satisfied with peak detection.**

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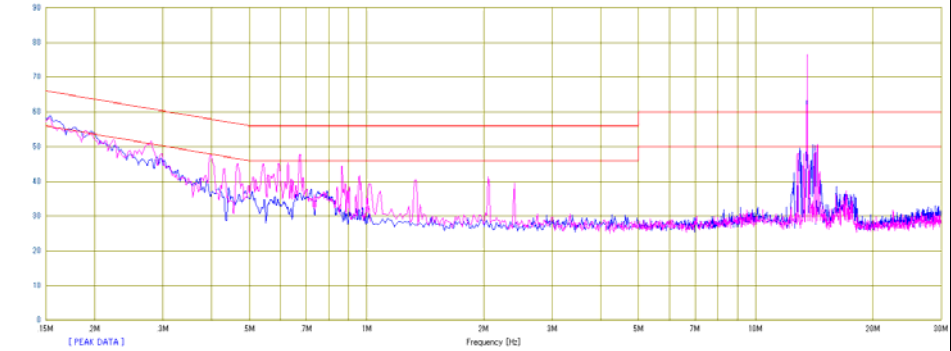
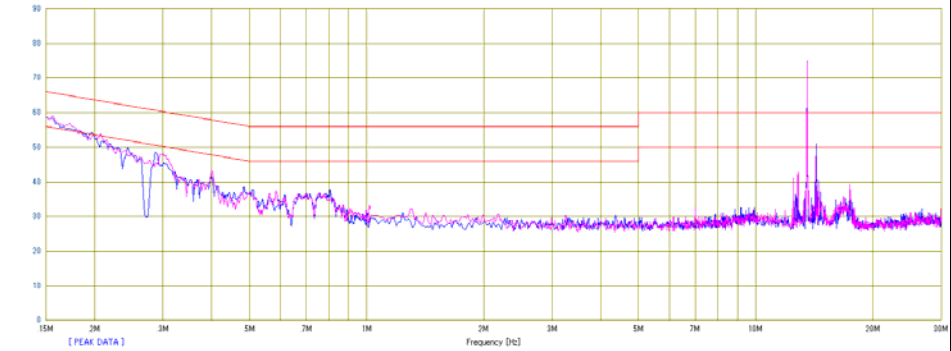
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Conducted emission
ISO14443a(848kbps)

Tx ISO14443a 848kbps Without Tag



Tx ISO14443a 848kbps With Tag



Conducted emission
ISO15693(6.62kbps)

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

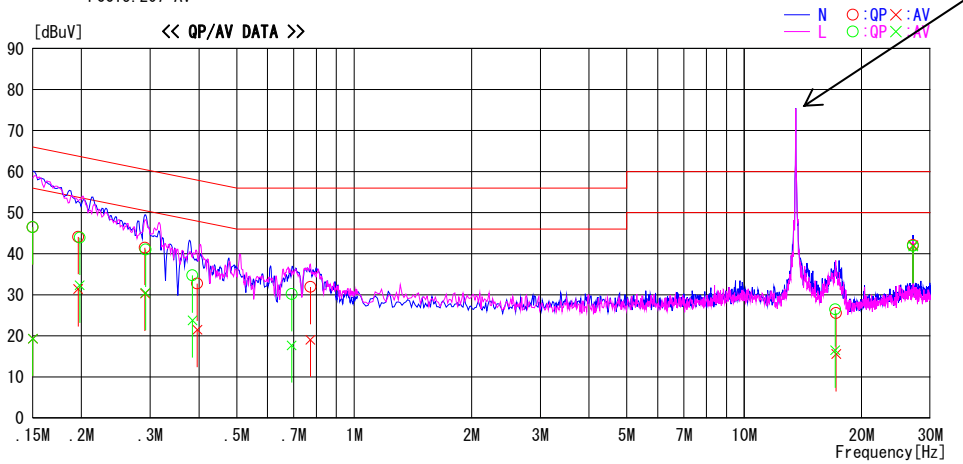
Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO15693 6.62kbps With Tag

LIMIT : FCC15.207 QP
FCC15.207 AV

13.56 MHz Carrier



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	33.3	6.1	13.2	46.5	19.3	66.0	56.0	19.5	36.7	N	
0.19620	30.9	18.2	13.2	44.1	31.4	63.8	53.8	19.7	22.4	N	
0.29090	28.3	17.1	13.2	41.5	30.3	60.5	50.5	19.0	20.2	N	
0.39600	19.4	8.2	13.3	32.7	21.5	57.9	47.9	25.2	26.4	N	
0.77200	18.5	5.7	13.4	31.9	19.1	56.0	46.0	24.1	26.9	N	
17.21060	11.2	1.2	14.4	25.6	15.6	60.0	50.0	34.4	34.4	N	
27.11984	27.3	27.3	14.8	42.1	42.1	60.0	50.0	17.9	7.9	N	
0.15000	33.3	6.1	13.2	46.5	19.3	66.0	56.0	19.5	36.7	L	
0.19792	30.7	19.1	13.2	43.9	32.3	63.7	53.7	19.8	21.4	L	
0.29180	27.8	17.3	13.2	41.0	30.5	60.5	50.5	19.5	20.0	L	
0.38510	21.4	10.5	13.3	34.7	23.8	58.2	48.2	23.5	24.4	L	
0.69200	16.9	4.4	13.3	30.2	17.7	56.0	46.0	25.8	28.3	L	
17.11300	12.1	2.1	14.4	26.5	16.5	60.0	50.0	33.5	33.5	L	
27.11984	27.1	27.0	14.8	41.9	41.8	60.0	50.0	18.1	8.2	L	

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

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Conducted emission
ISO15693(6.62kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

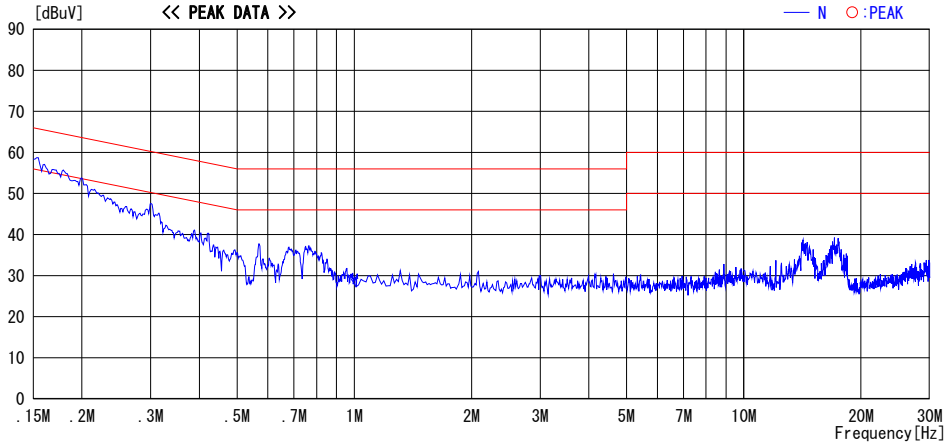
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO15693 6.62kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



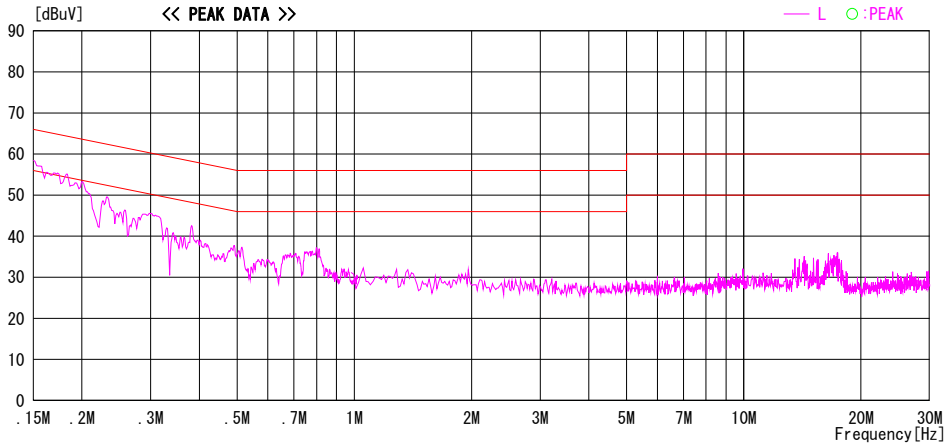


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

***It was confirmed that average limit was satisfied with peak detection.**

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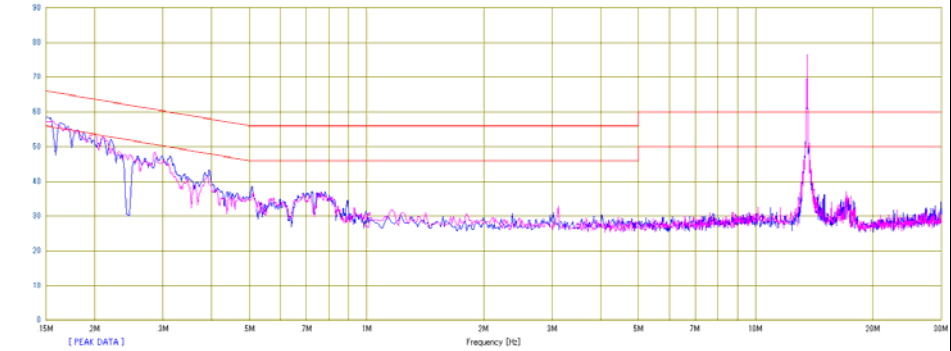
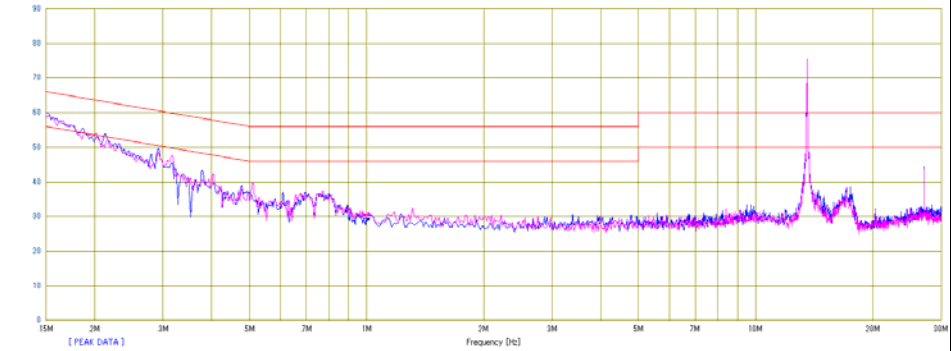
Conducted emission
ISO15693(6.62kbps)

Tx ISO15693 6.62kbps Without Tag



Tx ISO15693 6.62kbps With Tag



Conducted emission
ISO15693(26.48kbps)

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

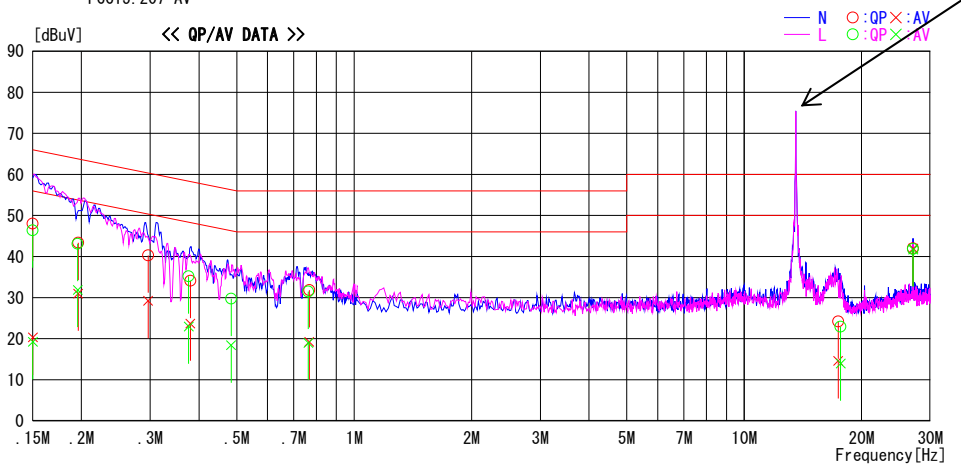
Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO15693 26.48kbps With Tag

LIMIT : FCC15.207 QP
FCC15.207 AV

13.56 MHz Carrier



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	34.8	7.1	13.2	48.0	20.3	66.0	56.0	18.0	35.7	N	
0.19612	30.2	17.8	13.2	43.4	31.0	63.8	53.8	20.4	22.8	N	
0.29630	27.1	16.0	13.2	40.3	29.2	60.3	50.3	20.0	21.1	N	
0.38040	20.8	10.4	13.3	34.1	23.7	58.3	48.3	24.2	24.6	N	
0.76700	18.4	5.8	13.4	31.8	19.2	56.0	46.0	24.2	26.8	N	
17.42600	9.8	0.2	14.4	24.2	14.6	60.0	50.0	35.8	35.4	N	
27.11998	27.2	27.2	14.8	42.0	42.0	60.0	50.0	18.0	8.0	N	
0.15000	33.2	6.0	13.2	46.4	19.2	66.0	56.0	19.6	36.8	L	
0.19550	29.9	18.7	13.2	43.1	31.9	63.8	53.8	20.7	21.9	L	
0.37667	21.9	9.7	13.3	35.2	23.0	58.4	48.4	23.2	25.4	L	
0.48380	16.4	5.1	13.3	29.7	18.4	56.3	46.3	26.6	27.9	L	
0.76320	18.1	5.6	13.4	31.5	19.0	56.0	46.0	24.5	27.0	L	
17.67180	8.5	-0.4	14.4	22.9	14.0	60.0	50.0	37.1	36.0	L	
27.11998	27.0	26.9	14.8	41.8	41.7	60.0	50.0	18.2	8.3	L	

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

Conducted emission
ISO15693(26.48kbps)
(Antenna Terminal)

DATA OF CONDUCTED EMISSION TEST

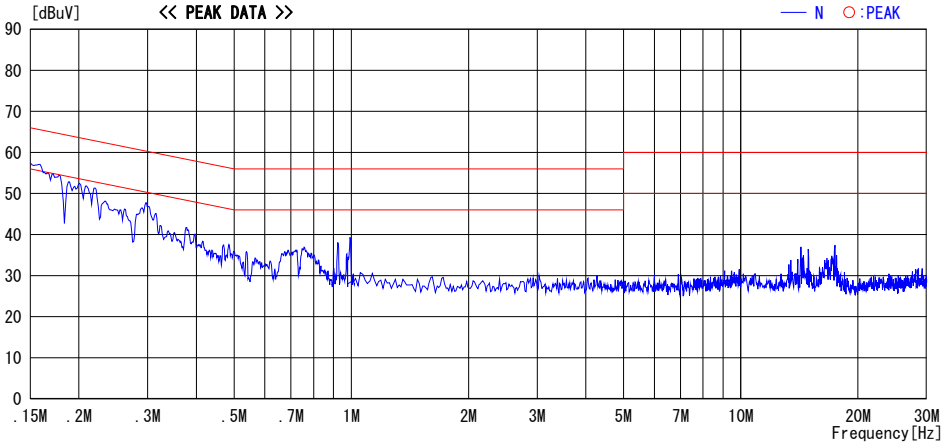
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/01/06

Report No. : 11050639H

Temp./Humi. : 20deg. C / 36% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx ISO15693 26.48kbps

LIMIT : FCC15.207 QP
FCC15.207 AV



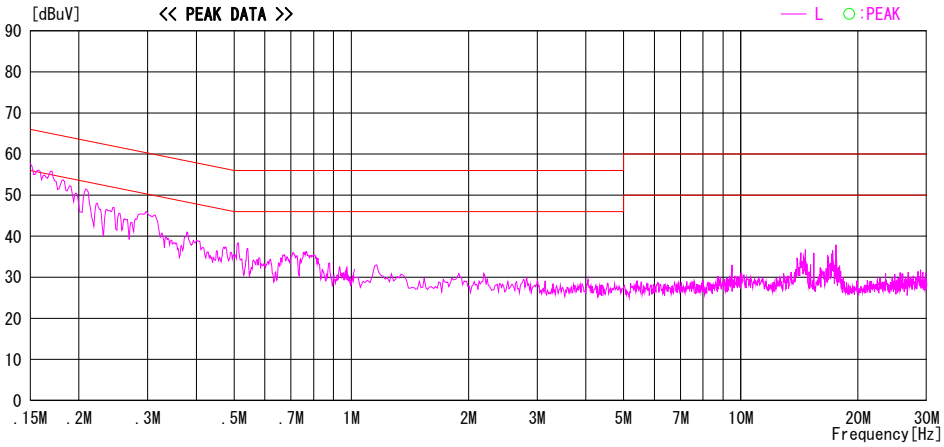
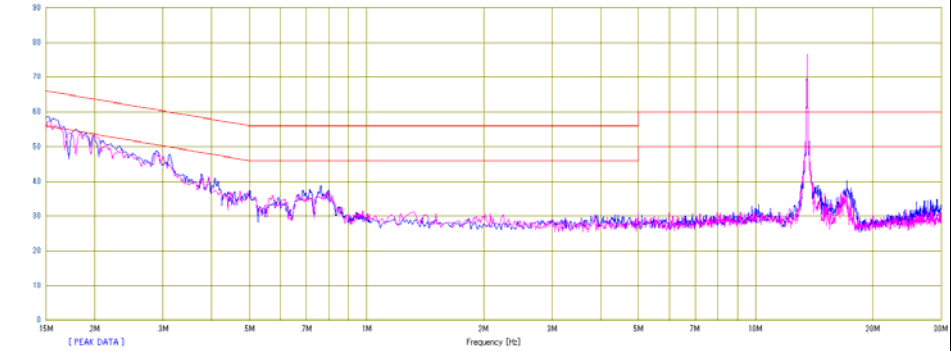


CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATT + CABLE)
Except for the above table : adequate margin data below the limits.

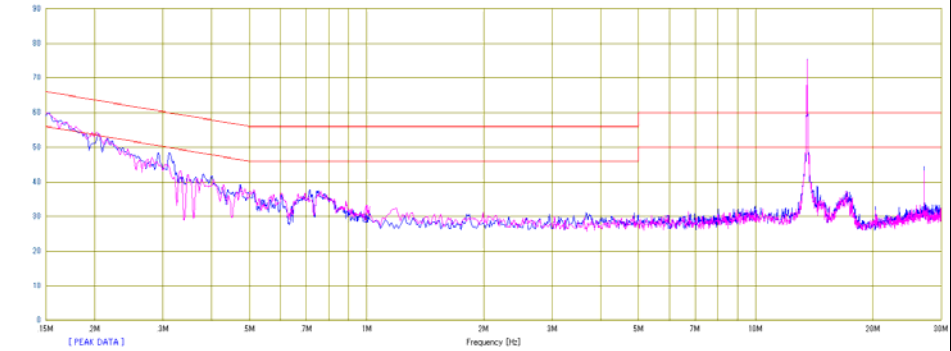
***It was confirmed that average limit was satisfied with peak detection.**

Conducted emission
ISO15693(26.48kbps)

Tx ISO15693 26.48kbps Without Tag



Tx ISO15693 26.48kbps With Tag



Fundamental emission and Spectrum Mask
FeliCa(212kbps)

DATA OF RADIATED EMISSION TEST

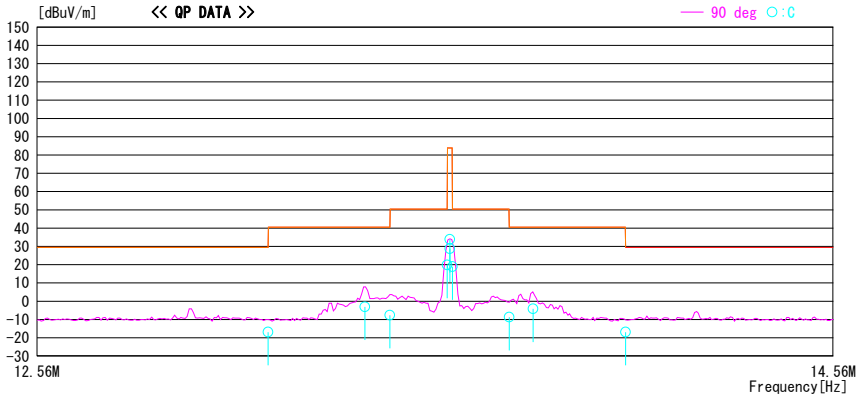
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz FeliCa(212kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
13.11000	29.7	QP	19.2	-33.4	32.3	-16.8	29.5	46.3	90	C	242	
13.34804	43.4	QP	19.2	-33.4	32.3	-3.1	40.5	43.6	90	C	242	
13.41000	38.8	QP	19.2	-33.4	32.3	-7.7	40.5	48.2	90	C	242	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	242	
13.56000	80.3	QP	19.2	-33.4	32.3	33.8	83.9	50.1	90	C	242	
13.56000	75.2	QP	19.2	-33.4	32.3	28.7	83.9	55.2	90	C	246	with tag
13.56700	65.4	QP	19.2	-33.4	32.3	18.9	50.4	31.5	90	C	242	
13.71000	37.8	QP	19.2	-33.4	32.3	-8.7	40.5	49.2	90	C	242	
13.77138	42.4	QP	19.2	-33.4	32.3	-4.1	40.5	44.6	90	C	242	
14.01000	29.7	QP	19.2	-33.4	32.3	-16.8	29.5	46.3	90	C	242	

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.**+ 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
90	13.56000	QP	80.3	19.2	6.6	32.3	-	73.8	-	-	Fundamental

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

Fundamental emission and Spectrum Mask
FeliCa(424kbps)

DATA OF RADIATED EMISSION TEST

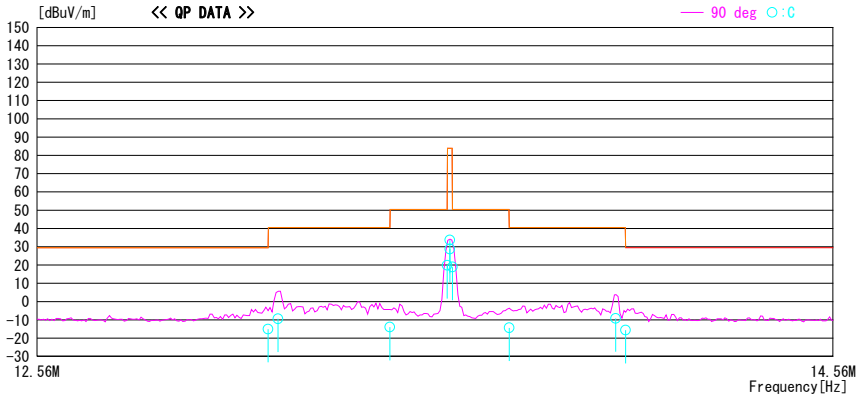
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz FeliCa(424kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
13.11000	31.4	QP	19.2	-33.4	32.3	-15.1	29.5	44.6	90	C	245	
13.13493	37.1	QP	19.2	-33.4	32.3	-9.4	40.5	49.9	90	C	245	
13.41000	32.6	QP	19.2	-33.4	32.3	-13.9	40.5	54.4	90	C	245	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	245	
13.56000	75.3	QP	19.2	-33.4	32.3	28.8	83.9	55.1	90	C	258	with tag
13.56000	80.2	QP	19.2	-33.4	32.3	33.7	83.9	50.2	90	C	245	
13.56700	65.4	QP	19.2	-33.4	32.3	18.9	50.4	31.5	90	C	245	
13.71000	32.2	QP	19.2	-33.4	32.3	-14.3	40.5	54.8	90	C	245	
13.98371	37.2	QP	19.2	-33.4	32.3	-9.3	40.5	49.8	90	C	245	
14.01000	30.9	QP	19.2	-33.4	32.3	-15.6	29.5	45.1	90	C	245	

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.+ 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
90	13.56000	QP	80.2	19.2	6.6	32.3	-	73.7	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask
ISO14443a(106kbps)

DATA OF RADIATED EMISSION TEST

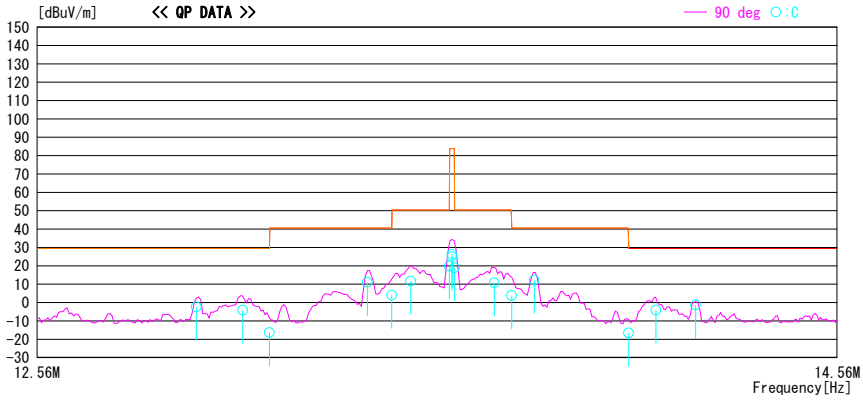
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/10

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz ISO14443a(106kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
12.93488	44.1	QP	19.2	-33.4	32.3	-2.4	29.5	31.9	90	C	248	
13.04582	42.4	QP	19.2	-33.4	32.3	-4.1	29.5	33.6	90	C	248	
13.11000	30.2	QP	19.2	-33.4	32.3	-16.3	29.5	45.8	90	C	248	
13.35010	57.7	QP	19.2	-33.4	32.3	11.2	40.5	29.3	90	C	248	
13.41000	50.5	QP	19.2	-33.4	32.3	4.0	40.5	36.5	90	C	248	
13.45702	58.2	QP	19.2	-33.4	32.3	11.7	50.4	38.7	90	C	248	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	248	
13.56000	71.5	QP	19.2	-33.4	32.3	25.0	83.9	58.9	90	C	268	with tag
13.56000	72.7	QP	19.2	-33.4	32.3	26.2	83.9	57.7	90	C	248	
13.56700	65.4	QP	19.2	-33.4	32.3	18.9	50.4	31.5	90	C	248	
13.66643	57.2	QP	19.2	-33.4	32.3	10.7	50.4	39.7	90	C	248	
13.71000	50.4	QP	19.2	-33.4	32.3	3.9	40.5	36.6	90	C	248	
13.76767	58.7	QP	19.2	-33.4	32.3	12.2	40.5	28.3	90	C	248	
14.01000	29.9	QP	19.2	-33.4	32.3	-16.6	29.5	46.1	90	C	248	
14.08015	42.4	QP	19.2	-33.4	32.3	-4.1	29.5	33.6	90	C	248	
14.18444	45.3	QP	19.2	-33.4	32.3	-1.2	29.5	30.7	90	C	248	

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.+ 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
90	13.56000	QP	72.7	19.2	6.6	32.3	-	66.2	-	-	Fundamental

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

Fundamental emission and Spectrum Mask
ISO14443a(212kbps)

DATA OF RADIATED EMISSION TEST

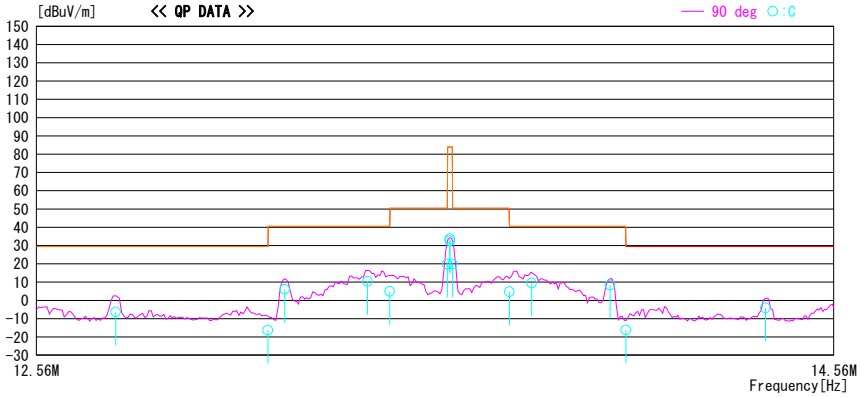
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz ISO14443a(212kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
12.74630	40.1	QP	19.3	-33.4	32.3	-6.3	29.5	35.8	90	C	237	
13.11000	30.1	QP	19.2	-33.4	32.3	-16.4	29.5	45.9	90	C	237	
13.15153	52.6	QP	19.2	-33.4	32.3	6.1	40.5	34.4	90	C	237	
13.35492	56.8	QP	19.2	-33.4	32.3	10.3	40.5	30.2	90	C	237	
13.41000	51.5	QP	19.2	-33.4	32.3	5.0	40.5	35.5	90	C	237	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	237	
13.56000	79.0	QP	19.2	-33.4	32.3	32.5	83.9	51.4	90	C	243	with tag
13.56000	80.2	QP	19.2	-33.4	32.3	33.7	83.9	50.2	90	C	237	
13.56700	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	237	
13.71000	51.3	QP	19.2	-33.4	32.3	4.8	40.5	35.7	90	C	237	
13.76652	55.9	QP	19.2	-33.4	32.3	9.4	40.5	31.1	90	C	237	
13.96836	54.9	QP	19.2	-33.4	32.3	8.4	40.5	32.1	90	C	237	
14.01000	30.3	QP	19.2	-33.4	32.3	-16.2	29.5	45.7	90	C	237	
14.37622	42.4	QP	19.2	-33.4	32.3	-4.1	29.5	33.6	90	C	237	

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.+ 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
90	13.56000	QP	80.2	19.2	6.6	32.3	-	73.7	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask
ISO14443a(424kbps)

DATA OF RADIATED EMISSION TEST

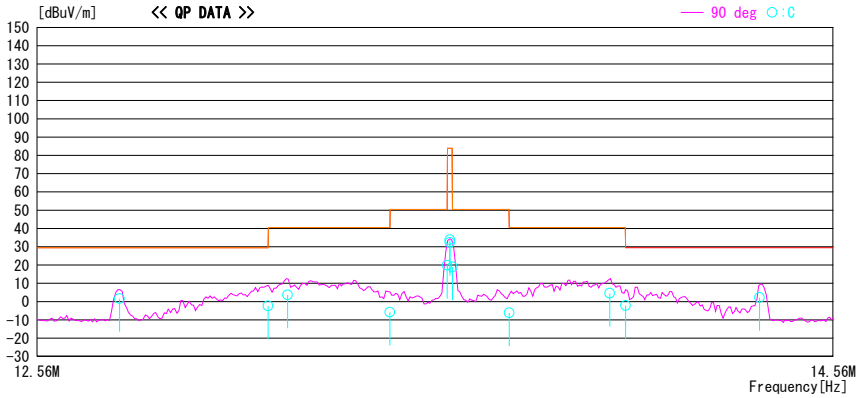
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz ISO14443a(424kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
12.75420	48.1	QP	19.3	-33.4	32.3	1.7	29.5	27.8	90	C	248	
13.11000	44.2	QP	19.2	-33.4	32.3	-2.3	29.5	31.8	90	C	248	
13.15820	50.2	QP	19.2	-33.4	32.3	3.7	40.5	36.8	90	C	248	
13.41000	40.7	QP	19.2	-33.4	32.3	-5.8	40.5	46.3	90	C	248	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	248	
13.56000	80.3	QP	19.2	-33.4	32.3	33.8	83.9	50.1	90	C	248	
13.56000	78.9	QP	19.2	-33.4	32.3	32.4	83.9	51.5	90	C	252	with tag
13.56700	65.5	QP	19.2	-33.4	32.3	19.0	50.4	31.4	90	C	248	
13.71000	40.3	QP	19.2	-33.4	32.3	-6.2	40.5	46.7	90	C	248	
13.96821	51.0	QP	19.2	-33.4	32.3	4.5	40.5	36.0	90	C	248	
14.01000	44.4	QP	19.2	-33.4	32.3	-2.1	29.5	31.6	90	C	248	
14.36231	48.7	QP	19.2	-33.4	32.3	2.2	29.5	27.3	90	C	248	

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.**+ 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
90	13.56000	QP	80.3	19.2	6.6	32.3	-	73.8	-	-	Fundamental

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

Fundamental emission and Spectrum Mask
ISO14443a(848kbps)

DATA OF RADIATED EMISSION TEST

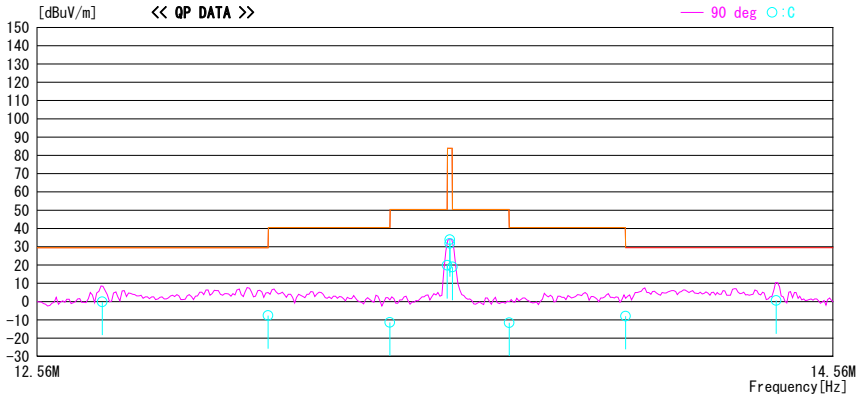
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz ISO14443a(848kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
12.71322	46.2	QP	19.3	-33.4	32.3	-0.2	29.5	29.7	90	C	254	
13.11000	38.8	QP	19.2	-33.4	32.3	-7.7	29.5	37.2	90	C	254	
13.41000	35.0	QP	19.2	-33.4	32.3	-11.5	40.5	52.0	90	C	254	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	254	
13.56000	78.3	QP	19.2	-33.4	32.3	31.8	83.9	52.1	90	C	254	with tag
13.56000	80.3	QP	19.2	-33.4	32.3	33.8	83.9	50.1	90	C	254	
13.56700	65.4	QP	19.2	-33.4	32.3	18.9	50.4	31.5	90	C	254	
13.71000	34.8	QP	19.2	-33.4	32.3	-11.7	40.5	52.2	90	C	254	
14.01000	38.6	QP	19.2	-33.4	32.3	-7.9	29.5	37.4	90	C	254	
14.40634	47.2	QP	19.1	-33.4	32.3	0.6	29.5	28.9	90	C	254	

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.+ 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
90	13.56000	QP	80.3	19.2	6.6	32.3	-	73.8	-	-	Fundamental

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

Fundamental emission and Spectrum Mask
ISO15693(6.62kbps)

DATA OF RADIATED EMISSION TEST

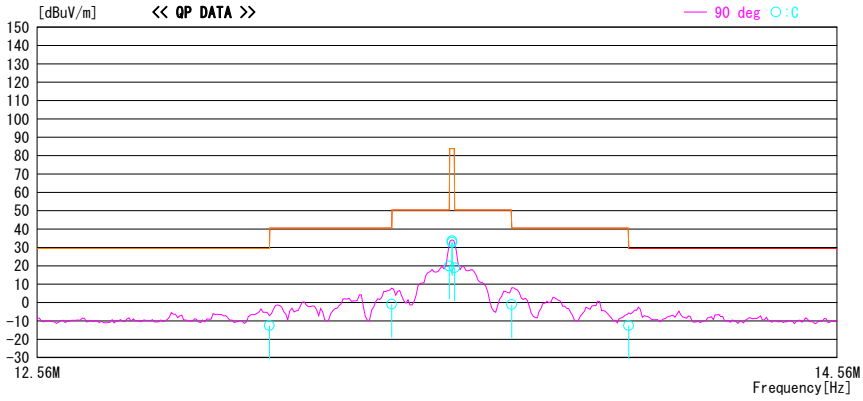
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz ISO15693(6.62kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
13.11000	33.9	QP	19.2	-33.4	32.3	-12.6	29.5	42.1	90	C	255	
13.41000	45.6	QP	19.2	-33.4	32.3	-0.9	40.5	41.4	90	C	255	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	255	
13.56000	80.2	QP	19.2	-33.4	32.3	33.7	83.9	50.2	90	C	255	
13.56000	79.2	QP	19.2	-33.4	32.3	32.7	83.9	51.2	90	C	254	with tag
13.56700	65.4	QP	19.2	-33.4	32.3	18.9	50.4	31.5	90	C	255	
13.71000	45.5	QP	19.2	-33.4	32.3	-1.0	40.5	41.5	90	C	255	
14.01000	33.9	QP	19.2	-33.4	32.3	-12.6	29.5	42.1	90	C	255	

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.+ 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
90	13.56000	QP	80.2	19.2	6.6	32.3	-	73.7	-	-	Fundamental

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

Fundamental emission and Spectrum Mask
ISO15693(26.48kbps)

DATA OF RADIATED EMISSION TEST

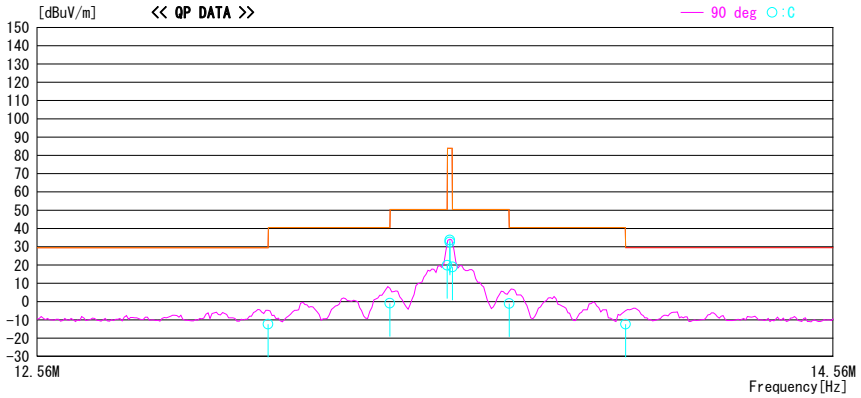
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp. / Humi. : 22deg.C / 40%
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz ISO15693(26.48kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
13.11000	34.1	QP	19.2	-33.4	32.3	-12.4	29.5	41.9	90	C	249	
13.41000	45.6	QP	19.2	-33.4	32.3	-0.9	40.5	41.4	90	C	249	
13.55300	66.3	QP	19.2	-33.4	32.3	19.8	50.4	30.6	90	C	249	
13.56000	80.2	QP	19.2	-33.4	32.3	33.7	83.9	50.2	90	C	249	
13.56000	79.1	QP	19.2	-33.4	32.3	32.6	83.9	51.3	90	C	261	with tag
13.56700	65.4	QP	19.2	-33.4	32.3	18.9	50.4	31.5	90	C	249	
13.71000	45.5	QP	19.2	-33.4	32.3	-1.0	40.5	41.5	90	C	249	
14.01000	34.1	QP	19.2	-33.4	32.3	-12.4	29.5	41.9	90	C	249	

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.+ 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
90	13.56000	QP	80.2	19.2	6.6	32.3	-	73.7	-	-	Fundamental

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

Spurious emission
FeliCa(212kbps)

DATA OF RADIATED EMISSION TEST

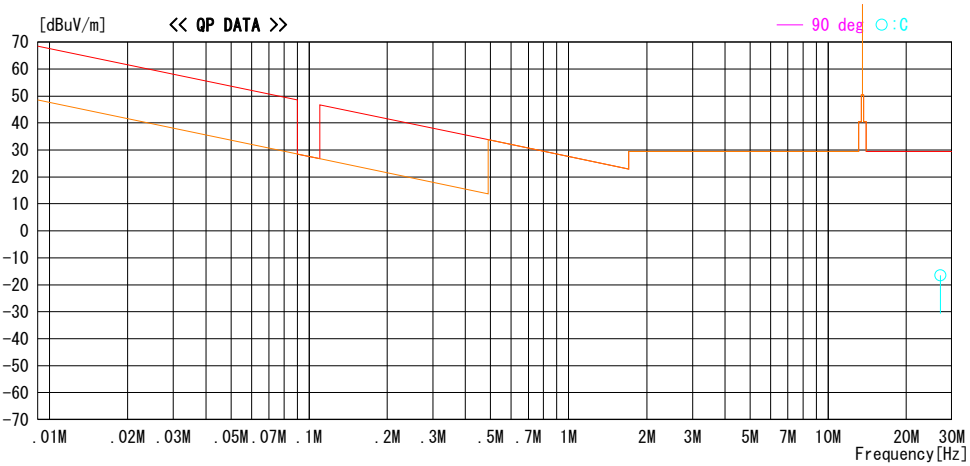
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Tsubasa Takayama

Mode / Remarks : Tx 13.56MHz FeliCa(212kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	29.7	QP	19.2	-33.1	32.3	-16.5	29.5	46.0	90	C	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.+ D. FACTOR)

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Spurious emission
FeliCa(424kbps)

DATA OF RADIATED EMISSION TEST

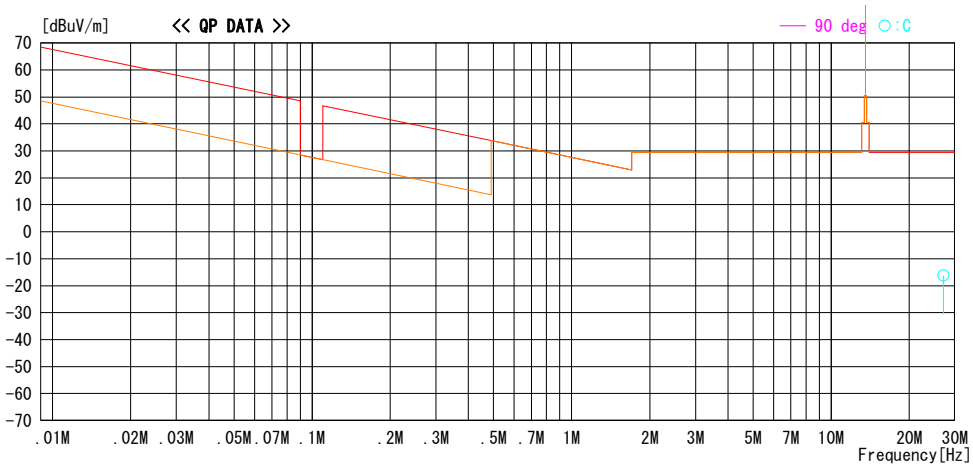
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Takayama

Mode / Remarks : Tx 13.56MHz FeliCa(424kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	30.0	QP	19.2	-33.1	32.3	-16.2	29.5	45.7	90	C	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.+ D. FACTOR)

Spurious emission
ISO14443a(106kbps)

DATA OF RADIATED EMISSION TEST

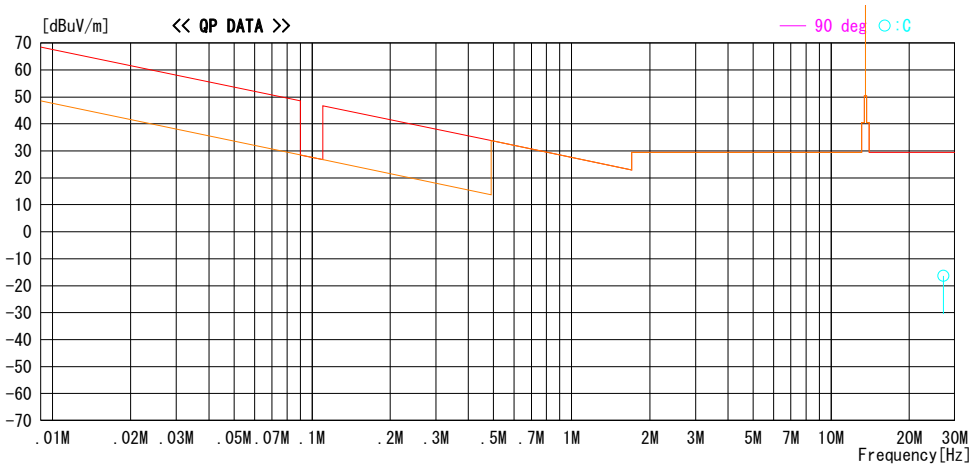
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Iakayama

Mode / Remarks : Tx 13.56MHz ISO14443a(106kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	29.8	QP	19.2	-33.1	32.3	-16.4	29.5	45.9	90	C	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.+ D. FACTOR)

Spurious emission
ISO14443a(212kbps)

DATA OF RADIATED EMISSION TEST

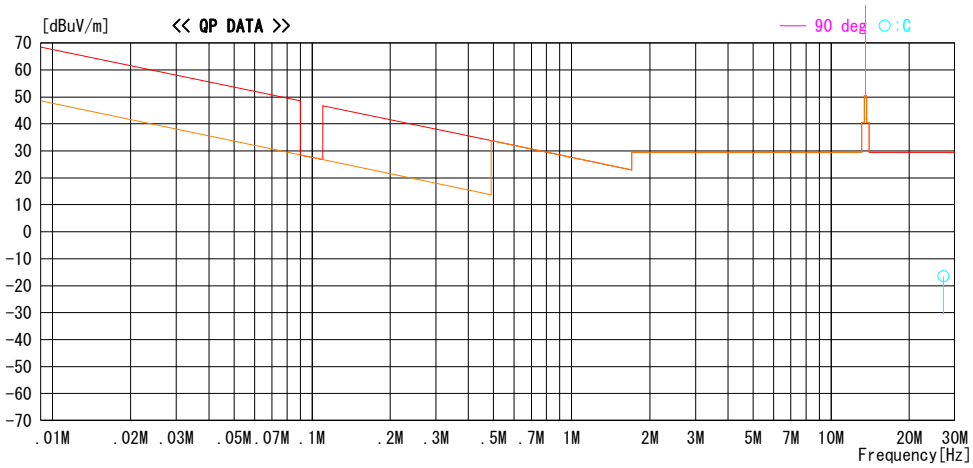
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Iakayama

Mode / Remarks : Tx 13.56MHz ISO14443a(212kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.10000	29.7	QP	19.2	-33.1	32.3	-16.5	29.5	46.0	90	C	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.+ D. FACTOR)

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Spurious emission
ISO14443a(424kbps)

DATA OF RADIATED EMISSION TEST

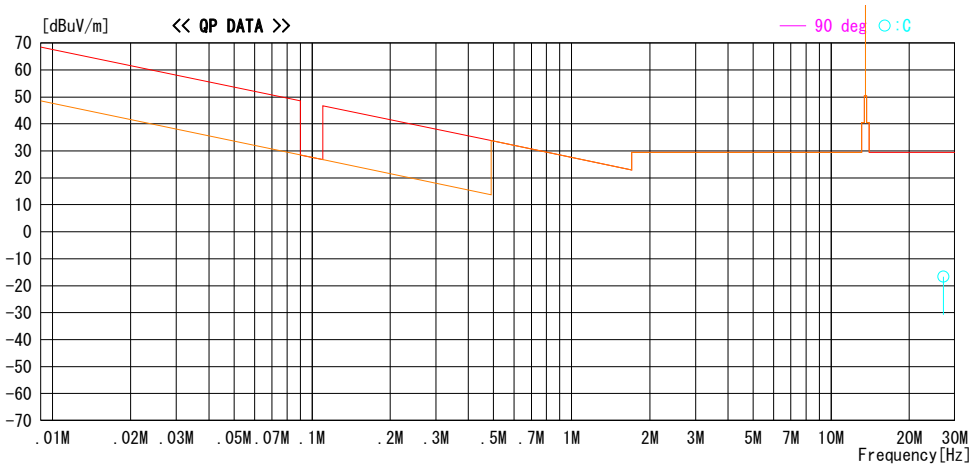
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Iakayama

Mode / Remarks : Tx 13.56MHz ISO14443a(424kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.10000	29.6	QP	19.2	-33.1	32.3	-16.6	29.5	46.1	90	C	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.+ D. FACTOR)

Spurious emission
ISO14443a(848kbps)

DATA OF RADIATED EMISSION TEST

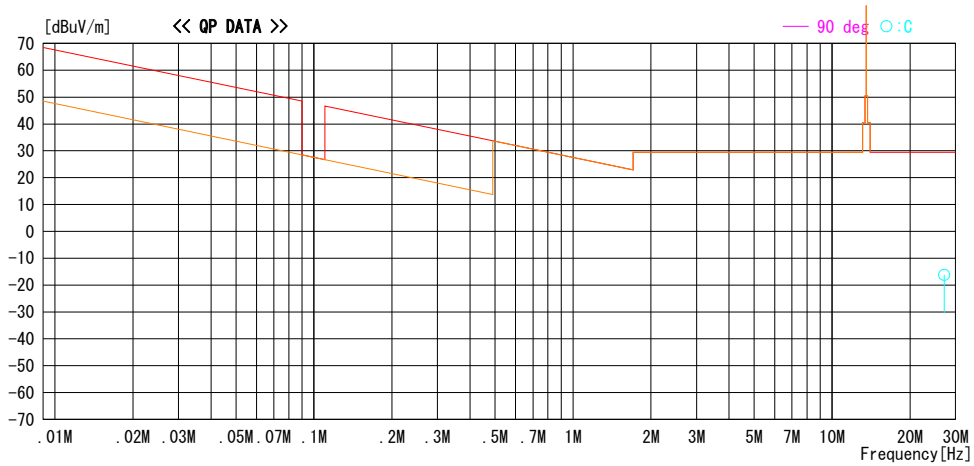
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Iakayama

Mode / Remarks : Tx 13.56MHz ISO14443a(848kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	30.0	QP	19.2	-33.1	32.3	-16.2	29.5	45.7	90	C	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.+ D. FACTOR)

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Spurious emission
ISO15693(6.62kbps)

DATA OF RADIATED EMISSION TEST

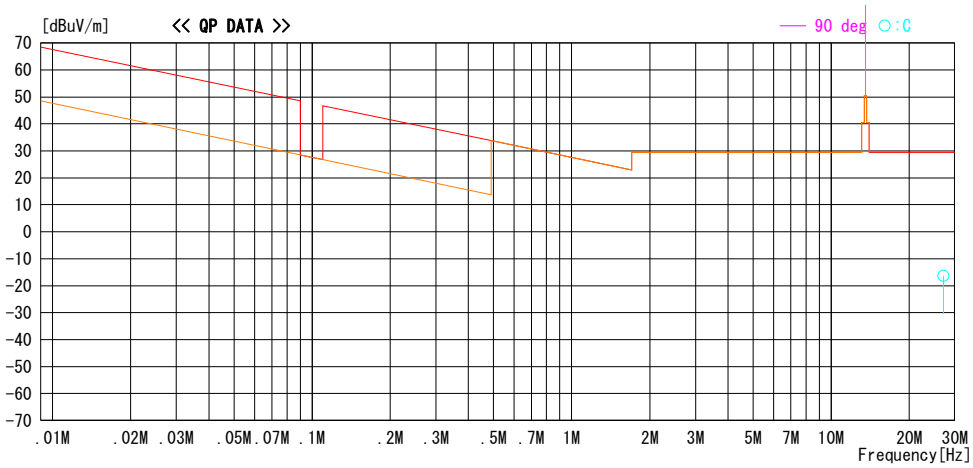
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Iakayama

Mode / Remarks : Tx 13.56MHz ISO15693(6.62kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.10000	29.8	QP	19.2	-33.1	32.3	-16.4	29.5	45.9	90	C	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.+ D. FACTOR)

Spurious emission
ISO15693(26.48kbps)

DATA OF RADIATED EMISSION TEST

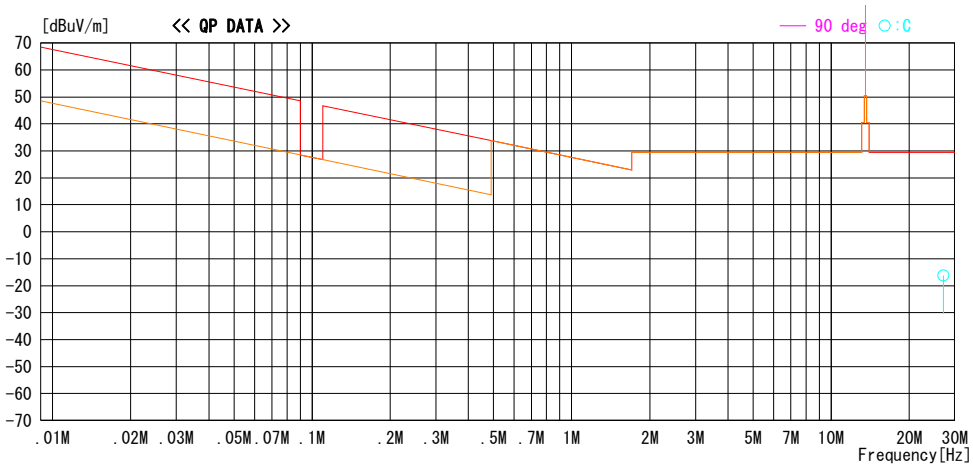
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/11

Report No. : 11050639H

Temp./ Humi. : 22 deg. C / 40 % RH
Engineer : Isubasa Iakayama

Mode / Remarks : Tx 13.56MHz ISO15693(26.48kbps) Without Tag Worst Axis Y

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	29.9	QP	19.2	-33.1	32.3	-16.3	29.5	45.8	90	C	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.+ D. FACTOR)

Spurious emission

DATA OF RADIATED EMISSION TEST

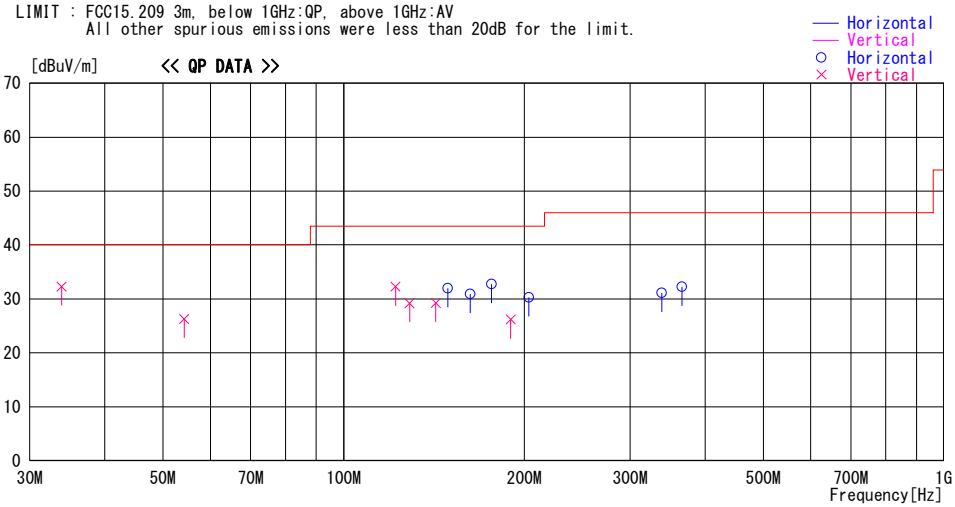
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/12/24

Report No. : 11050639H

Temp./Humi. : 23deg.C. / 60% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz ISO15693(6.62kbps) With Tag Worst Axis (Hori:X,Vert:Z)

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

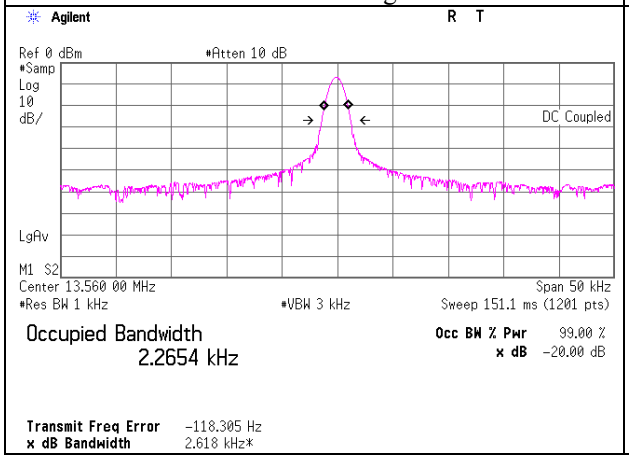
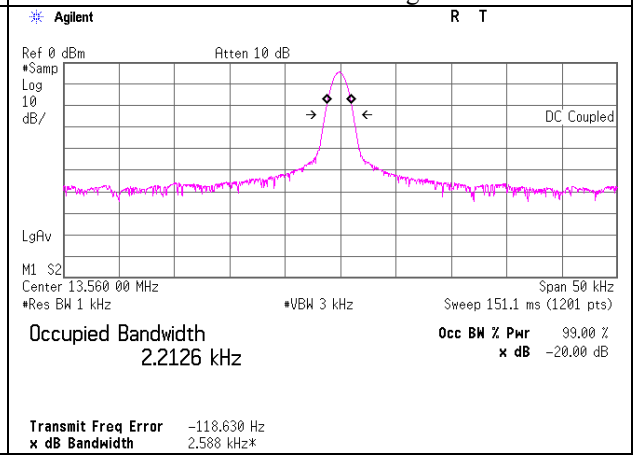


Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
33.889	41.2	QP	16.0	-24.9	32.3	296	100	Vert.	40.0	7.7	
54.230	41.5	QP	9.3	-24.5	26.3	198	100	Vert.	40.0	13.7	
122.026	42.9	QP	13.0	-23.6	32.3	260	100	Vert.	43.5	11.2	
128.810	39.2	QP	13.6	-23.6	29.2	240	100	Vert.	43.5	14.3	
142.366	38.1	QP	14.6	-23.4	29.3	242	100	Vert.	43.5	14.3	
189.826	32.8	QP	16.2	-22.8	26.2	287	100	Vert.	43.5	17.3	
149.157	40.3	QP	14.9	-23.3	31.9	204	256	Hori.	43.5	11.6	
162.565	38.6	QP	15.4	-23.1	30.9	186	196	Hori.	43.5	12.6	
176.268	39.9	QP	15.9	-23.0	32.8	174	193	Hori.	43.5	10.7	
203.390	36.5	QP	16.5	-22.7	30.3	179	166	Hori.	43.5	13.3	
338.984	34.8	QP	17.9	-21.6	31.1	23	100	Hori.	46.0	14.9	
366.107	35.7	QP	18.1	-21.5	32.3	5	100	Hori.	46.0	13.7	

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

20dB Bandwidth and 99% Occupied Bandwidth

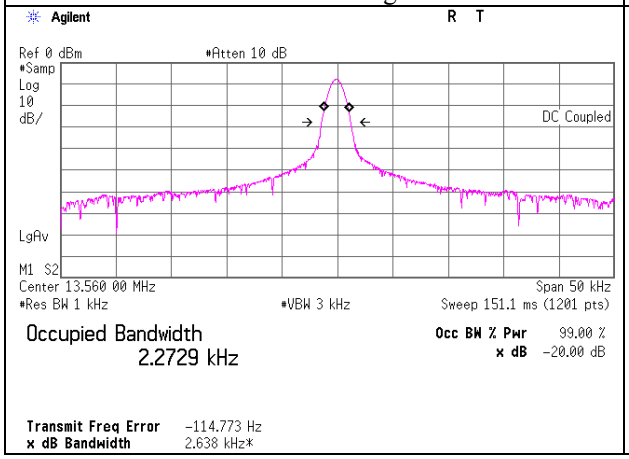
Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on FeliCa 212kbps

With Tag	Without Tag
	

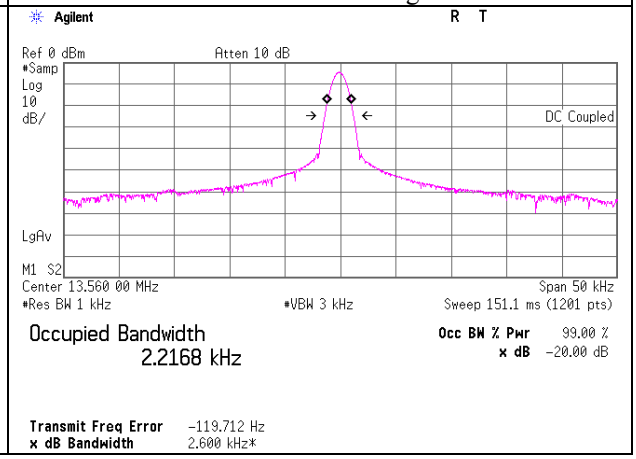
20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on FeliCa 424kbps

With Tag



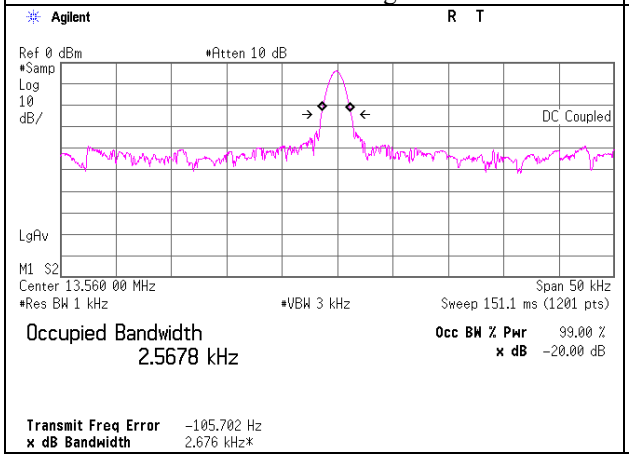
Without Tag



20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on ISO14443a 106kbps

With Tag



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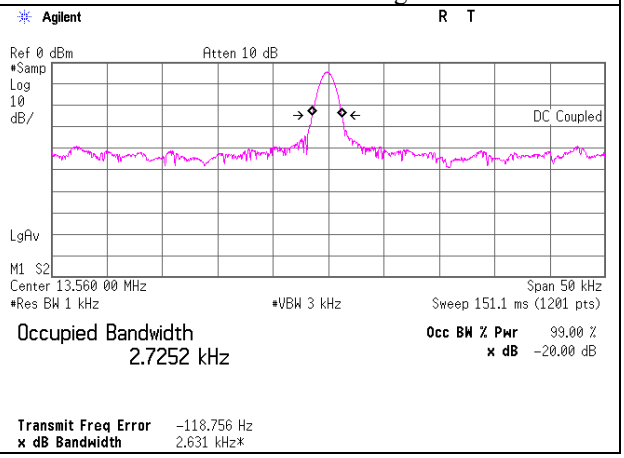
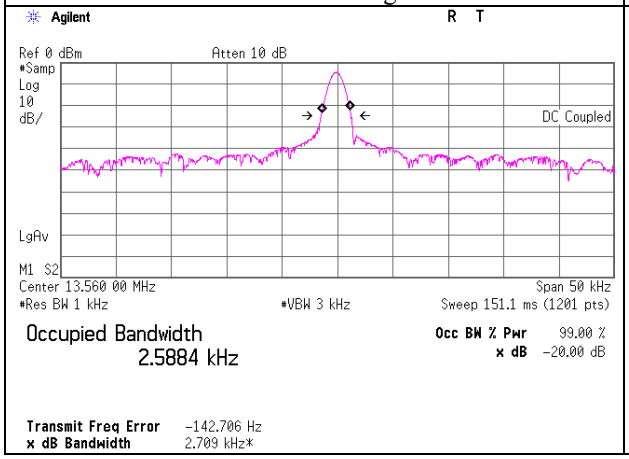


20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on ISO14443a 212kbps

With Tag



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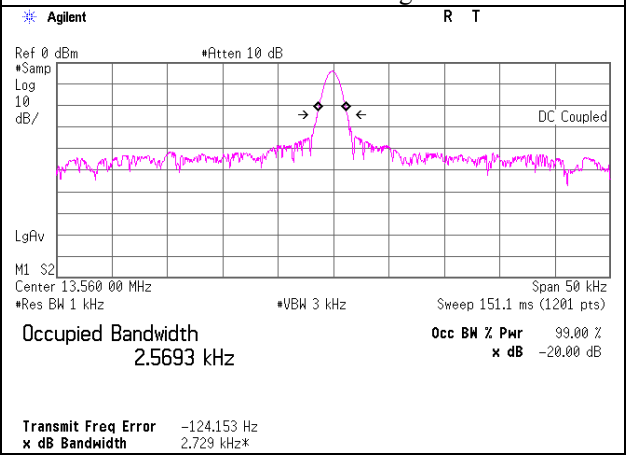
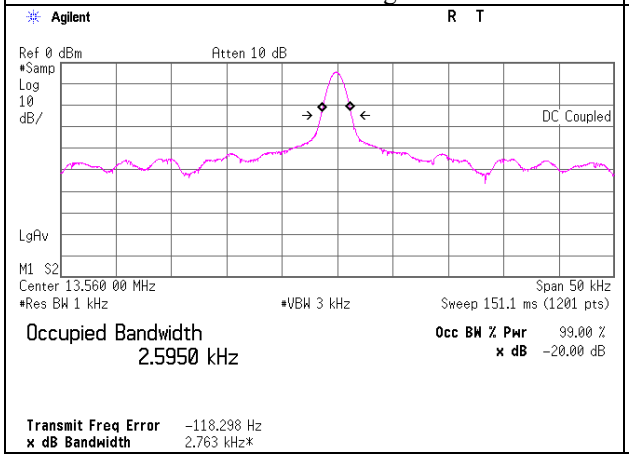


20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on ISO14443a 424kbps

With Tag



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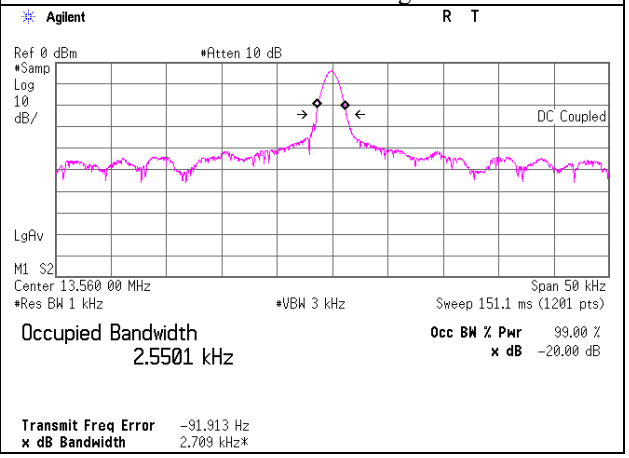
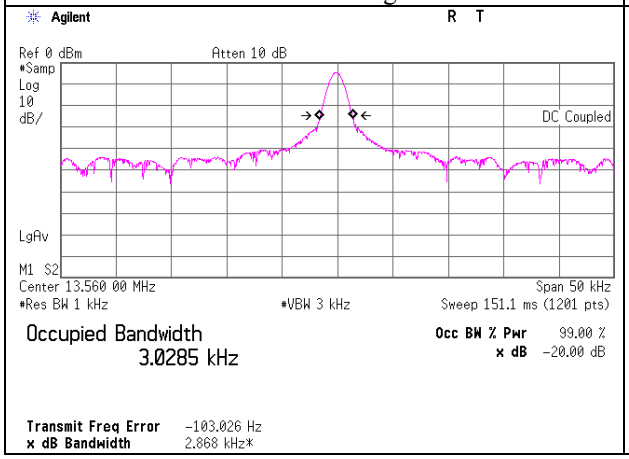


20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on ISO14443a 848kbps

With Tag



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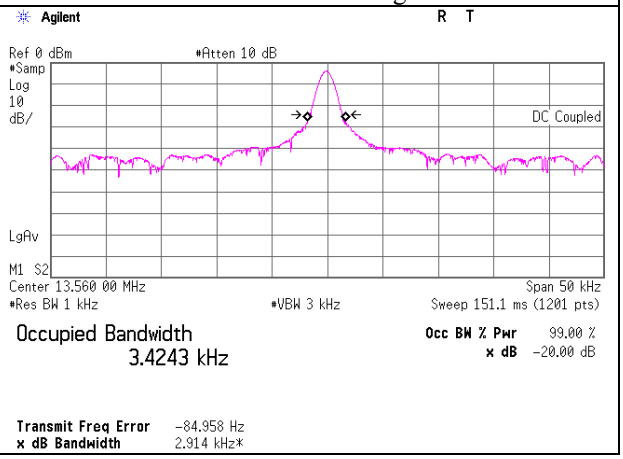
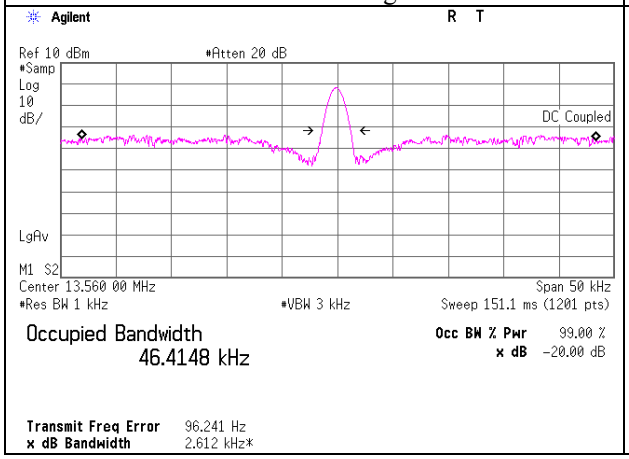


20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on ISO15693 6.62kbps

With Tag



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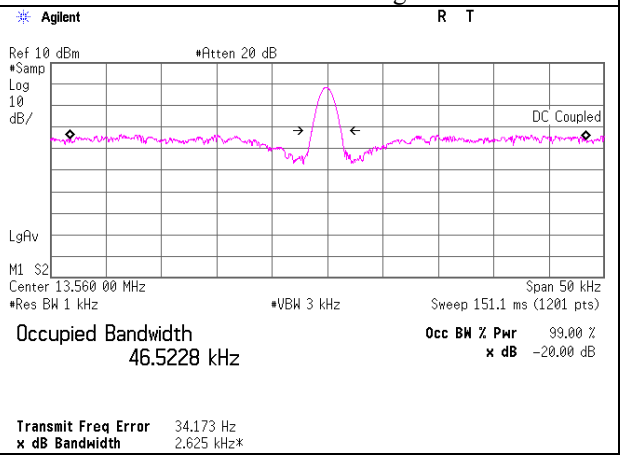
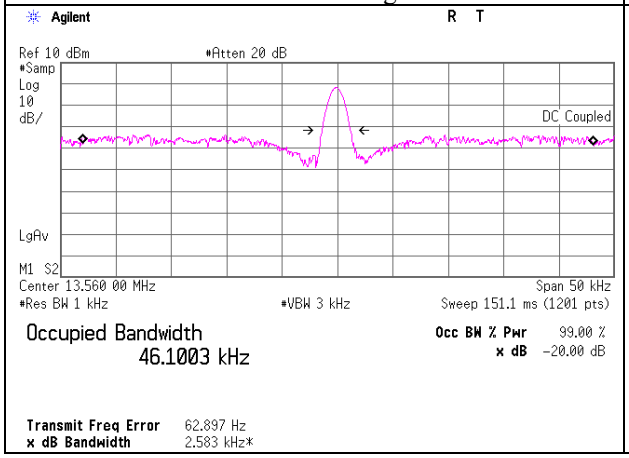


20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.6 Measurement room
Report No.	11050639H
Date	12/22/2015
Temperature/ Humidity	23 deg. C / 41 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod on ISO15693 26.48kbps

With Tag



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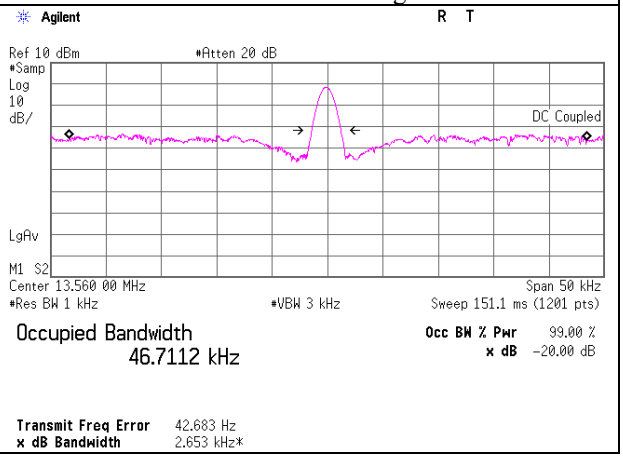

Frequency Tolerance

Test place	Ise EMC Lab. No.6 measurement room
Report No.	11050639
Date	12/22/2015
Temperature/ Humidity	24 deg. C / 36 % RH
Engineer	Tsubasa Takayama
Mode	Tx Mod off

Test condition		Tested	Measured	Frequency	Result		Limit
Temp.	Voltage	timing	frequency	error			
[deg. C]	[V]		[MHz]	[MHz]	[%]	[ppm]	[+/- %]
50	5	Power on	13.559842	-0.000158	-0.00116	-11.6	0.01
		+ 2 min.	13.559842	-0.000158	-0.00116	-11.6	0.01
		+ 5 min.	13.559843	-0.000157	-0.00116	-11.6	0.01
		+ 10 min.	13.559843	-0.000157	-0.00116	-11.6	0.01
40	5	Power on	13.559851	-0.000149	-0.00110	-11.0	0.01
		+ 2 min.	13.559850	-0.000150	-0.00110	-11.0	0.01
		+ 5 min.	13.559850	-0.000150	-0.00110	-11.0	0.01
		+ 10 min.	13.559850	-0.000150	-0.00110	-11.0	0.01
30	5	Power on	13.559896	-0.000104	-0.00077	-7.7	0.01
		+ 2 min.	13.559896	-0.000104	-0.00077	-7.7	0.01
		+ 5 min.	13.559855	-0.000145	-0.00107	-10.7	0.01
		+ 10 min.	13.559896	-0.000105	-0.00077	-7.7	0.01
20	5	Power on	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 2 min.	13.559922	-0.000079	-0.00058	-5.8	0.01
		+ 5 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 10 min.	13.559923	-0.000077	-0.00057	-5.7	0.01
20	4.25 (5V -15%)	Power on	13.559922	-0.000079	-0.00058	-5.8	0.01
		+ 2 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 5 min.	13.559922	-0.000078	-0.00058	-5.8	0.01
		+ 10 min.	13.559922	-0.000078	-0.00058	-5.8	0.01
20	5.75 (5V +15%)	Power on	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 2 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 5 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 10 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
10	5	Power on	13.559922	-0.000078	-0.00058	-5.8	0.01
		+ 2 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 5 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
		+ 10 min.	13.559921	-0.000079	-0.00058	-5.8	0.01
0	5	Power on	13.559944	-0.000056	-0.00041	-4.1	0.01
		+ 2 min.	13.559943	-0.000057	-0.00042	-4.2	0.01
		+ 5 min.	13.559943	-0.000057	-0.00042	-4.2	0.01
		+ 10 min.	13.559943	-0.000057	-0.00042	-4.2	0.01
-10	5	Power on	13.559945	-0.000055	-0.00040	-4.0	0.01
		+ 2 min.	13.559946	-0.000054	-0.00040	-4.0	0.01
		+ 5 min.	13.559946	-0.000054	-0.00040	-4.0	0.01
		+ 10 min.	13.559946	-0.000054	-0.00040	-4.0	0.01
-20	5	Power on	13.559908	-0.000092	-0.00068	-6.8	0.01
		+ 2 min.	13.559912	-0.000088	-0.00065	-6.5	0.01
		+ 5 min.	13.559913	-0.000087	-0.00064	-6.4	0.01
		+ 10 min.	13.559913	-0.000087	-0.00064	-6.4	0.01

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

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

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

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2015/01/13 * 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/AT	2015/06/02 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2015/09/02 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2015/10/24 * 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/CE	2015/07/02 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2015/06/24 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2015/01/16 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2015/11/28 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2015/11/03 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2015/01/16 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2015/07/10 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	AT	2015/10/07 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	AT	2015/08/02 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	AT	2015/01/13 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	AT	2015/08/14 * 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

AT: Antenna Terminal Conducted Emission and Frequency Tolerance