



EMI TEST REPORT

Test Report No. : 11931255M-C-R1

Applicant : Fuji Xerox Co., Ltd.
Type of Equipment : RFID Module
Model No. : YRMBZF26
Test regulation : FCC Part 15 Subpart C: 2018
FCC ID : E46YRMBZF26
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. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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 11931255M-C. 11931255M-C is replaced with this report.

Date of test: November 17 – 24, 2017

**Representative
test operator:**

K. Ando

Kazuhiro Ando
Engineer
Consumer Technology Division

Approved by :

T. Yamashita

Tomoyuki Yamashita
Leader
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation"

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

REVISION HISTORY

Original Test Report No.: 11931255M-C

[illegible]

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SECTION 1: Customer information

Company Name	:	Fuji Xerox Co., Ltd.
Address	:	6-1, Minatomirai, Nishi-ku, Yokohama, Kanagawa 220-8668, Japan
Telephone Number	:	+81-45-755-8290
Contact Person	:	Satoshi Ogi

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

2.1 Identification of E.U.T.

Type of Equipment	:	RFID Module
Model No.	:	YRMBZF26
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5 V (Typical), DC 4.75 V to 5.25 V
Receipt Date of Sample	:	November 16, 2017
Country of Mass-production	:	JAPAN and Indonesia
Condition of EUT	:	Production prototype (Not for sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: YRMBZF26 (referred to as the EUT in this report) is an RFID Module.

Radio Specifications

[RFID]

Radio Type	:	Transmitter and Receiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK (transmission)
Antenna type	:	Loop Coil Antenna
Operating Temperature	:	0 deg.C to + 55 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 February 2, 2018 and effective March 5, 2018
 * The revisions made after testing date do 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 13.110-14.010 MHz.

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	11.3 dB, 13.56000 MHz, QP, N	Complied	-
	<ISED> RSS-Gen 8.8	<ISED> RSS-Gen 8.8	1.5 dB, 13.56000 MHz, AV, N		
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	70.1 dB, 13.56000 MHz, QP, 270 deg.	Complied	Radiated
	<ISED> RSS-Gen 6.4, 6.12	<ISED> RSS-210 B.6			
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods	Section 15.225(b)(c)	43.7 dB, 13.11000 MHz, QP, 270 deg.	Complied	Radiated
	<ISED> RSS-Gen 6.4, 6.13	<ISED> RSS-210 B.6			
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods	Section15.215(c)	See data	Complied	Radiated
	<ISED> -	<ISED> -			
Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.209, Section 15.225 (d)	6.3 dB 94.920 MHz, Vertical, QP	Complied	Radiated
	<ISED> RSS-Gen 6.4, 6.13	<ISED> RSS-210 B.6			
Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods	Section 15.225(e)	See data	Complied	Radiated
	<ISED> RSS-Gen 6.11, 8.11	<ISED> RSS-210 B.6			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

FCC Part 15.31 (e)

The RF module has its own regulator. The RF module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

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Telephone : +81 478 88 6500

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3.3 Addition to standard

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

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

3.4 Uncertainty

EMI

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

Test Items	Frequency range	Uncertainty(+/-)
Conducted emission (AC Mains) AMN	0.15 MHz - 30 MHz	2.4 dB
Radiated emission (Measurement distance: 3 m)	0.009 MHz - 30 MHz	3.0 dB
	30 MHz - 1000 MHz	5.8 dB

Conducted emission test

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

Radiated emission test

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

Frequency tolerance

Frequency Measurement uncertainty for this test was: ($\pm$) 7.9×10^{-8}

3.5 Test Location

UL Japan, Inc. Kashima EMC Lab.

1614 Mushihata, Katori-shi, Chiba-ken, 289-0341 JAPAN

Telephone: +81 478 88 6500, Facsimile: +81 478 82 3373

JAB Accreditation No.:RTL02610 / FCC Test Firm Registration Number: 910230

Test site	ISED Certification Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Open site	4659A-1	6.0 x 5.5 x 2.5	20 x 40	10 m
No.2 Open site	4659A-2	4.4 x 4.4 x 2.15	18 x 20	10 m
No.5 Open site	4659A-5	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	4659A-1	5.4 x 4.5 x 2.3	-	-
No.2 Shielded room	4659A-2	3.6 x 2.7 x 2.3	-	-
No.3 Shielded room	-	5.4 x 3.6 x 2.3	-	-
No.4 Shielded Room	-	6.1 x 6.1 x 3.1	-	-
No.5 Shielded Room	4659A-5	4.2 x 3.1 x 2.5	-	-
No.3 Fully Anechoic Chamber	-	7.0 x 3.5 x 3.5	-	-
No.6 Semi-anechoic Chamber	4659A-6	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	4659A-10	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	4659A-7	9.0 x 6.5 x 5.2	-	3 m
No.1 Measurement room	-	5.0 x 3.7 x 2.6	-	-
No.2 Measurement room	-	4.3 x 4.4 x 2.7	-	-
No.3 Measurement room	-	4.3 x 4.4 x 2.7	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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Kashima EMC Lab.

1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

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

4.1 Operating Mode(s)

The mode is used :

Mode	Remarks*
Transmitting mode (Tx)	The EUT Transmits and Receives at the same time and there is no receiving mode.
The EUT was operated in a manner similar to typical use during the tests.	

Test Item	Operating mode*
Conducted emission	RFID Communication, with Tag
Electric Field Strength of Fundamental Emission	RFID Communication, without Tag
Spectrum Mask	RFID Communication, without Tag
20 dB Bandwidth	Tx Mod on, with/without Tag
99 % OccupiedBandwidth	
Electric Field Strength of Spurious Emission	RFID Communication, with/without Tag
Frequency Tolerance	Tx Mod off

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

*The EUT have Antenna R and Antenna L and they do not perform simultaneous transmission. Therefore the antenna is used by switching.

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

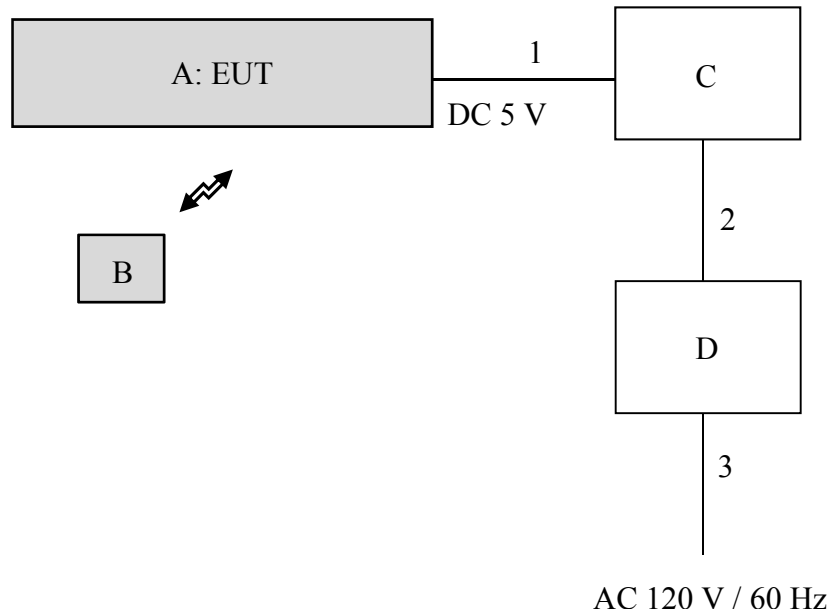
Frequency Tolerance:

Temperature : -20 deg. C to +50 deg. C, Step 10 deg. C

Voltage : Normal Voltage DC 5 V

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

4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RFID Module	YRMBZF26	CP2#001	Fuji Xerox Co., Ltd.	EUT
B	RFID Tag	HFD1-T	-	Fuji Xerox Co., Ltd.	EUT
C	JIG	-	-	Fuji Xerox Co., Ltd.	-
D	DC Power Supply	GSV3000	1303141419	DIAMOND ANTENNA	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	I/F	0.3	Unshielded	Unshielded	-
2	DC	0.6	Unshielded	Unshielded	-
3	AC	1.7	Unshielded	Unshielded	-

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Kashima EMC Lab.

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a wooden table of nominal size, 1.0 m by 2.0 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.

I/O cables that were connected to the peripherals. 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 Shielded room. 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 0.5 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 1GHz
Antenna Type	Loop	Hybrid

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

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushiata, Katori-shi, Chiba-ken, 289-0341 Japan

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Facsimile : +81 478 82 3373

SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	30 kHz	1 kHz	3 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 *2)	Spectrum Analyzer
Frequency Tolerance *3)	-	-	-	-	-	-	Frequency counter

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

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

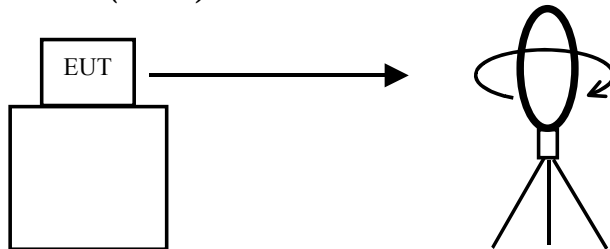
*3) The temperature test was started after the temperature stabilization time of 30 minutes.

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

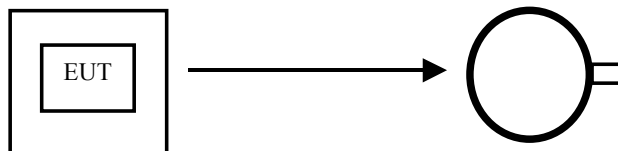
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

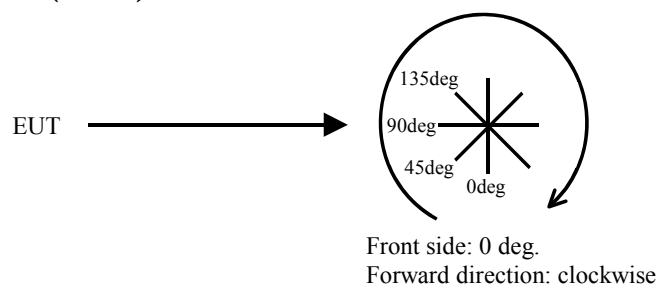


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



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APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

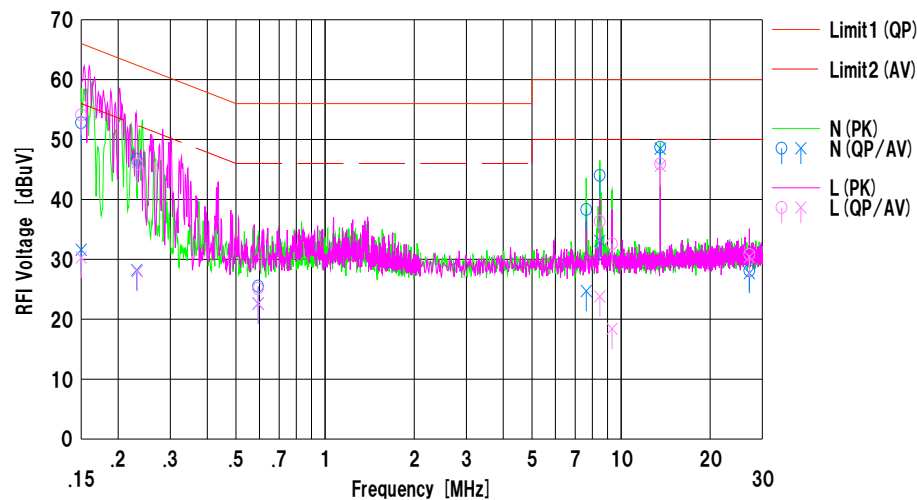
UL Japan, Inc. Kashima EMC Lab. No.5 Shielded Room
Date : 2017/11/23

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 25deg.C / 40%RH

Remarks : with tag, Antenna : L

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	42.6	21.4	10.2	52.8	31.6	66.0	56.0	13.2	24.4	N	
2	0.23120	36.5	18.0	10.2	46.7	28.2	62.4	52.4	15.7	24.2	N	
3	0.59424	15.3	12.4	10.2	25.5	22.6	56.0	46.0	30.5	23.4	N	
4	7.62882	27.5	13.9	10.8	38.3	24.7	60.0	50.0	21.7	25.3	N	
5	8.47491	33.2	22.3	10.8	44.0	33.1	60.0	50.0	16.0	16.9	N	
6	13.56000	37.5	37.3	11.2	48.7	48.5	60.0	50.0	11.3	1.5	N	
7	27.12000	16.1	15.7	12.0	28.1	27.7	60.0	50.0	31.9	22.3	N	
8	0.15000	43.9	20.1	10.2	54.1	30.3	66.0	56.0	11.9	25.7	L	
9	0.23204	35.7	17.8	10.2	45.9	28.0	62.4	52.4	16.5	24.4	L	
10	0.59416	14.9	12.4	10.2	25.1	22.6	56.0	46.0	30.9	23.4	L	
11	8.47520	25.5	13.0	10.8	36.3	23.8	60.0	50.0	23.7	26.2	L	
12	9.32529	21.7	7.5	10.9	32.6	18.4	60.0	50.0	27.4	31.6	L	
13	13.56000	34.7	34.4	11.2	45.9	45.6	60.0	50.0	14.1	4.4	L	
14	27.12000	18.8	18.4	12.0	30.8	30.4	60.0	50.0	29.2	19.6	L	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:CLS-11

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION (below 30MHz) TEST

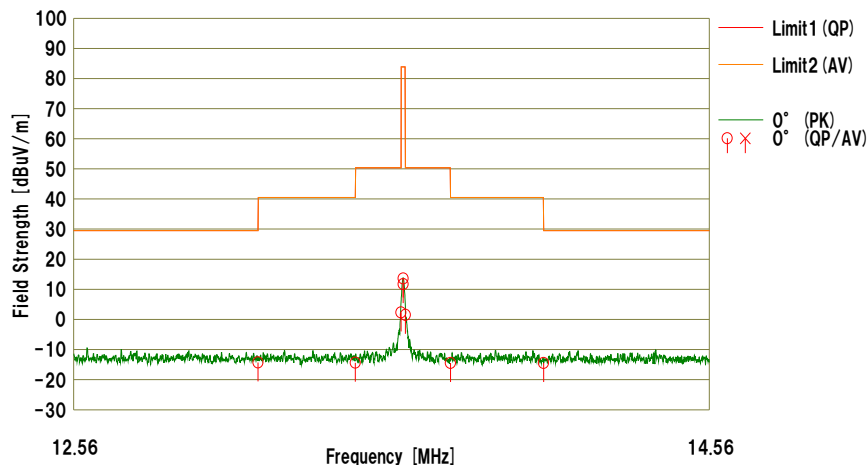
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2017/11/18

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 22deg.C / 43%RH

Remarks : EUT axis : Y, without tag, Antenna : R

Limit1 : FCC15.225_PKQP, 9-90kHz:PK, 110-490kHz:PK
Limit2 : FCC15.225_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Antenna	Table	Comment
		<QP> [dBuV]	<AV> [dBuV]				<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dB]	<AV> [dB]			
1	13.11000	31.4	---	19.6	-33.0	32.3	-14.3	---	29.5	29.5	43.8	---	0°	270	
2	13.41000	31.3	---	19.6	-33.0	32.3	-14.4	---	40.5	40.5	54.9	---	0°	270	
3	13.55000	48.1	---	19.5	-33.0	32.3	2.3	---	50.4	50.4	48.1	---	0°	270	
4	13.56000	59.4	---	19.5	-33.0	32.3	13.6	---	83.9	83.9	70.3	---	0°	270	
5	13.56000	57.5	---	19.5	-33.0	32.3	11.7	---	83.9	83.9	72.2	---	0°	270	
6	13.56700	47.3	---	19.5	-33.0	32.3	1.5	---	50.4	50.4	48.9	---	0°	270	
7	13.71000	31.3	---	19.5	-33.0	32.3	-14.5	---	40.5	40.5	55.0	---	0°	270	
8	14.01000	31.3	---	19.5	-33.0	32.3	-14.5	---	29.5	29.5	44.0	---	0°	270	

Calculation:Result [dBuV/m]=Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable) [dB] +D.Fac [dB] -Gain (AMP) [dB]
Ant.Type=LOOP:Loop Antenna

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	59.4	19.5	7.0	32.3	-	53.6	-	-	Fundamental

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

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION (below 30MHz) TEST

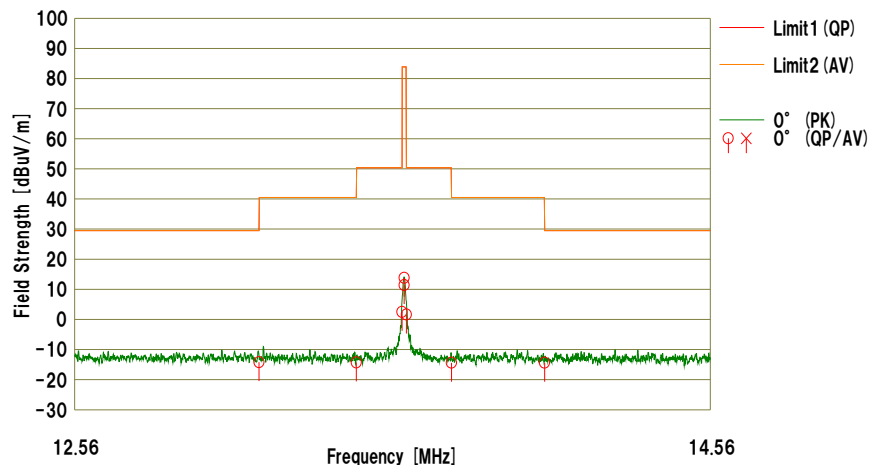
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2017/11/18

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 22deg.C / 43%RH

Remarks : EUT axis : Y, without tag, Antenna : L

Limit1 : FCC15.225_PKQP, 9-90kHz:PK, 110-490kHz:PK
Limit2 : FCC15.225_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Antenna	Table	Comment
		<QP> [dBuV]	<AV> [dBuV]				<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dB]	<AV> [dB]			
1	13.11000	31.5	---	19.6	-33.0	32.3	-14.2	---	29.5	29.5	43.7	---	0°	270	
2	13.41000	31.4	---	19.6	-33.0	32.3	-14.3	---	40.5	40.5	54.8	---	0°	270	
3	13.55000	48.3	---	19.5	-33.0	32.3	2.5	---	50.4	50.4	47.9	---	0°	270	
4	13.56000	59.6	---	19.5	-33.0	32.3	13.8	---	83.9	83.9	70.1	---	0°	270	
5	13.56000	57.2	---	19.5	-33.0	32.3	11.4	---	83.9	83.9	72.5	---	0°	270	
6	13.56700	47.4	---	19.5	-33.0	32.3	1.6	---	50.4	50.4	48.8	---	0°	270	
7	13.71000	31.4	---	19.5	-33.0	32.3	-14.4	---	40.5	40.5	54.9	---	0°	270	
8	14.01000	31.4	---	19.5	-33.0	32.3	-14.4	---	29.5	29.5	43.9	---	0°	270	

Calculation:Result [dBuV/m]=Reading [dBuV]+Ant.Fac [dB/m]+Loss (Cable) [dB]+D.Fac [dB]-Gain (AMP) [dB]
Ant.Type=LOOP:Loop Antenna

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	59.6	19.5	7.0	32.3	-	53.8	-	-	Fundamental

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

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

Spurious emission

DATA OF RADIATED EMISSION (below 30MHz) TEST

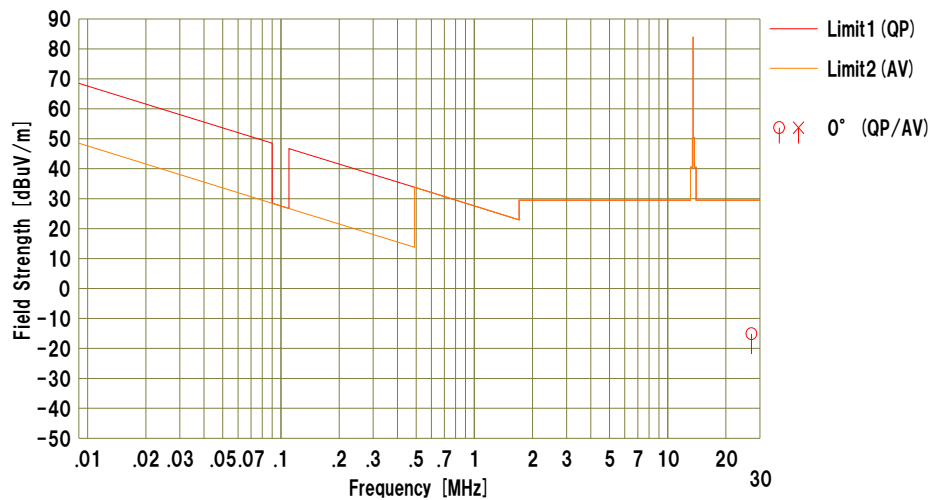
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2017/11/18

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 22deg.C / 43%RH

Remarks : EUT axis : Y, without tag, Antenna : R

Limit1 : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK
Limit2 : FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Antenna	Table	Comment
		<QP> [dBuV]	<AV> [dBuV]				<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dB]	<AV> [dB]			
1	27.12000	29.6	---	20.1	-32.5	32.3	-15.1	---	29.5	29.5	44.6	---	0°	0	

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]
Ant.Type=LOOP: Loop Antenna

Spurious emission

DATA OF RADIATED EMISSION (below 30MHz) TEST

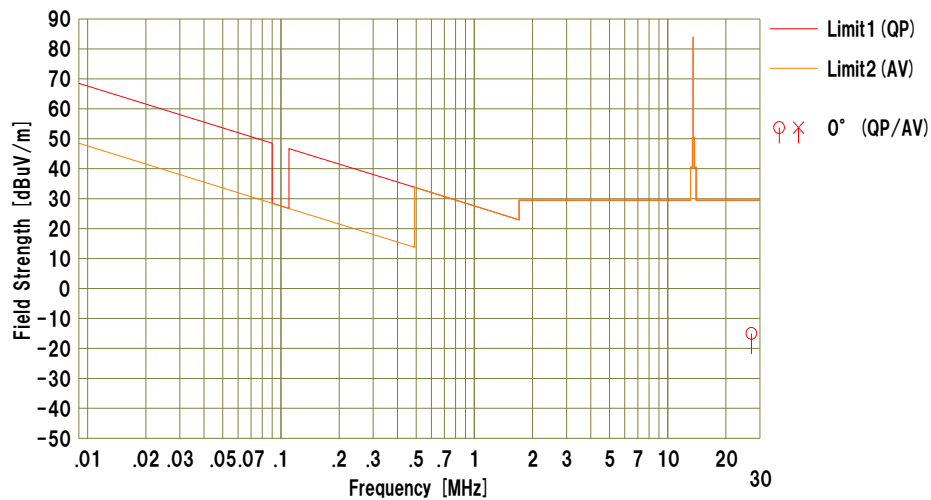
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2017/11/18

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 22deg.C / 43%RH

Remarks : EUT axis : Y, without tag, Antenna : L

Limit1 : FCC15.225.PKQP, 9-90kHz:PK, 110-490kHz:PK
Limit2 : FCC15.225.AVQP, 9-90kHz:AV, 110-490kHz:AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Antenna	Table	Comment
		<QP> [dBuV]	<AV> [dBuV]				<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dBuV/m]	<AV> [dBuV/m]	<QP> [dB]	<AV> [dB]			
1	27.12000	29.7	---	20.1	-32.5	32.3	-15.0	---	29.5	29.5	44.5	---	0°	0	

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable) [dB] + D.Fac [dB] - Gain (AMP) [dB]
Ant.Type=LOOP: Loop Antenna

Spurious emission

DATA OF RADIATED EMISSION TEST

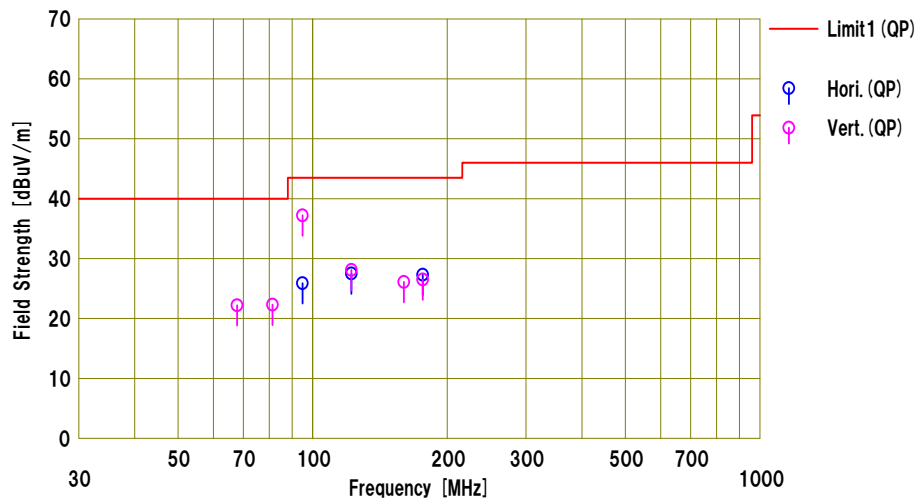
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2017/11/17

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 22deg.C / 48%RH

Remarks : EUT axis : Z, with tag, Antenna : R

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	94.920	39.3	8.1	5.2	26.7	25.9	43.5	17.6	Hori.	213	53	HB	
2	122.040	37.0	11.6	5.5	26.6	27.5	43.5	16.0	Hori.	251	36	HB	
3	176.280	35.1	12.4	6.2	26.4	27.3	43.5	16.2	Hori.	192	52	HB	
4	67.800	32.2	12.0	4.8	26.8	22.2	40.0	17.8	Vert.	100	139	HB	
5	81.360	35.3	8.7	5.0	26.7	22.3	40.0	17.7	Vert.	100	112	HB	
6	94.920	50.6	8.1	5.2	26.7	37.2	43.5	6.3	Vert.	100	120	HB	
7	122.040	37.6	11.6	5.5	26.6	28.1	43.5	15.4	Vert.	100	289	HB	
8	160.000	33.0	13.5	6.0	26.4	26.1	43.5	17.4	Vert.	100	125	HB	
9	176.280	34.3	12.4	6.2	26.4	26.5	43.5	17.0	Vert.	100	128	HB	

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable+ATT) [dB] - Gain (AMP) [dB]
Ant.Type=HB:Hybrid Antenna

Spurious emission

DATA OF RADIATED EMISSION TEST

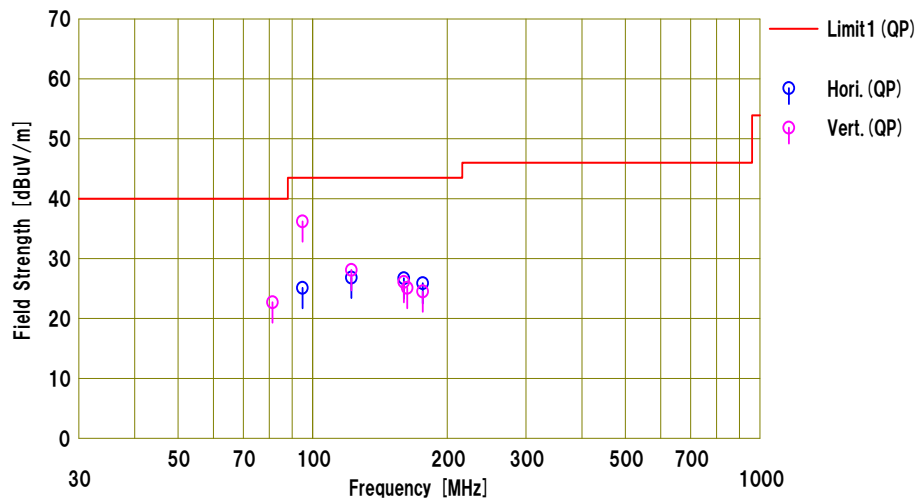
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2017/11/17

Mode : Transmitting mode (Tx)
Order No. : 11931255M
Power : DC 5V
Temp./Humi. : 22deg.C / 48%RH

Remarks : EUT axis : Z, with tag, Antenna : L

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV

Tested by : Kazuhiro Ando



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	94.920	38.5	8.1	5.2	26.7	25.1	43.5	18.4	Hori.	206	48	HB	
2	122.040	36.3	11.6	5.5	26.6	26.8	43.5	16.7	Hori.	256	226	HB	
3	160.000	33.6	13.5	6.0	26.4	26.7	43.5	16.8	Hori.	188	46	HB	
4	176.280	33.7	12.4	6.2	26.4	25.9	43.5	17.6	Hori.	181	45	HB	
5	81.360	35.7	8.7	5.0	26.7	22.7	40.0	17.3	Vert.	100	125	HB	
6	94.920	49.6	8.1	5.2	26.7	36.2	43.5	7.3	Vert.	100	128	HB	
7	122.040	37.6	11.6	5.5	26.6	28.1	43.5	15.4	Vert.	100	290	HB	
8	160.000	33.0	13.5	6.0	26.4	26.1	43.5	17.4	Vert.	100	101	HB	
9	162.720	32.1	13.4	6.0	26.4	25.1	43.5	18.4	Vert.	100	108	HB	
10	176.280	32.3	12.4	6.2	26.4	24.5	43.5	19.0	Vert.	100	260	HB	

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable+ATT) [dB] - Gain (AMP) [dB]
Ant.Type=HB: Hybrid Antenna

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan

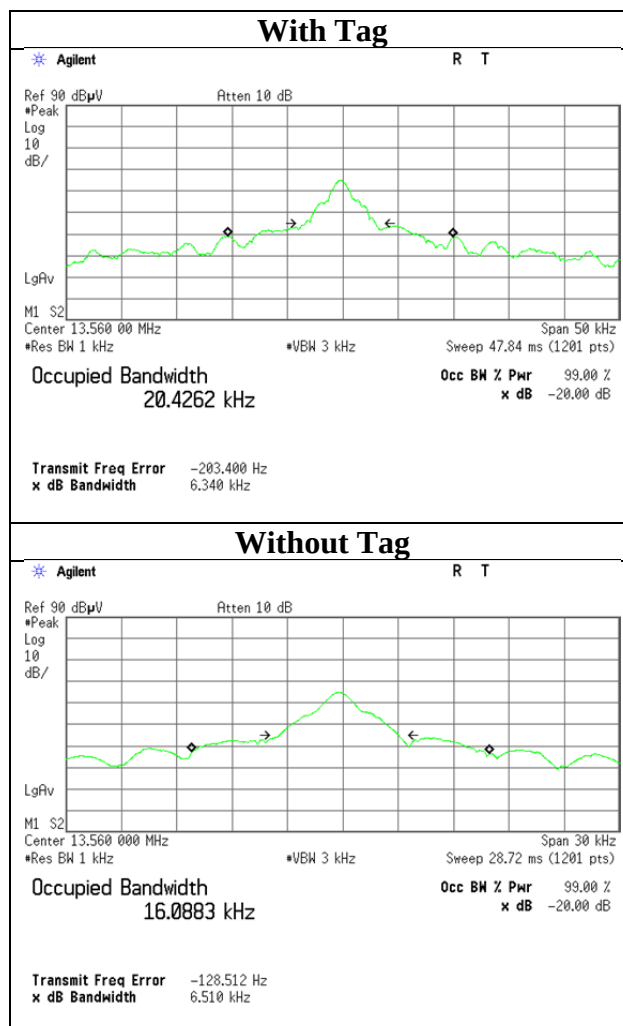
Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373

20dB Bandwidth and 99% Occupied Bandwidth

Report No.	11931255M-C
Test place	Kashima EMC Lab. No.2 measurement room
Date	11/24/2017
Temperature / Humidity	24 deg. C / 36 % RH
Engineer	Kazuhiro Ando
Mode	Tx Mod on

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	6.34	20.43
	Without Tag	6.51	16.09



Frequency Tolerance

Report No. 11931255M-C
Test place Kashima EMC Lab. No.2 measurement room
Date 11/24/2017
Temperature / Humidity 24 deg. C / 36 % RH
Engineer Kazuhiro Ando
Mode Tx Mod off

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
50	5	Power on	13.559785	-0.000215	-0.00159	-15.9	0.01
		+ 2 min.	13.559785	-0.000215	-0.00159	-15.9	0.01
		+ 5 min.	13.559785	-0.000215	-0.00159	-15.9	0.01
		+ 10 min.	13.559786	-0.000214	-0.00158	-15.8	0.01
40	5	Power on	13.559793	-0.000207	-0.00153	-15.3	0.01
		+ 2 min.	13.559790	-0.000210	-0.00155	-15.5	0.01
		+ 5 min.	13.559790	-0.000210	-0.00155	-15.5	0.01
		+ 10 min.	13.559790	-0.000210	-0.00155	-15.5	0.01
30	5	Power on	13.559807	-0.000193	-0.00142	-14.2	0.01
		+ 2 min.	13.559803	-0.000197	-0.00145	-14.5	0.01
		+ 5 min.	13.559803	-0.000197	-0.00145	-14.5	0.01
		+ 10 min.	13.559803	-0.000197	-0.00145	-14.5	0.01
20	5	Power on	13.559819	-0.000181	-0.00133	-13.3	0.01
		+ 2 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
		+ 5 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
		+ 10 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
20	4.25 (5V -15%)	Power on	13.559820	-0.000180	-0.00133	-13.3	0.01
		+ 2 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
		+ 5 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
		+ 10 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
20	5.75 (5V +15%)	Power on	13.559820	-0.000180	-0.00133	-13.3	0.01
		+ 2 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
		+ 5 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
		+ 10 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
10	5	Power on	13.559824	-0.000176	-0.00130	-13.0	0.01
		+ 2 min.	13.559823	-0.000177	-0.00131	-13.1	0.01
		+ 5 min.	13.559823	-0.000177	-0.00131	-13.1	0.01
		+ 10 min.	13.559823	-0.000177	-0.00131	-13.1	0.01
0	5	Power on	13.559812	-0.000188	-0.00139	-13.9	0.01
		+ 2 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
		+ 5 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
		+ 10 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
-10	5	Power on	13.559778	-0.000222	-0.00164	-16.4	0.01
		+ 2 min.	13.559789	-0.000211	-0.00156	-15.6	0.01
		+ 5 min.	13.559790	-0.000210	-0.00155	-15.5	0.01
		+ 10 min.	13.559790	-0.000210	-0.00155	-15.5	0.01
-20	5	Power on	13.559711	-0.000289	-0.00213	-21.3	0.01
		+ 2 min.	13.559732	-0.000268	-0.00198	-19.8	0.01
		+ 5 min.	13.559732	-0.000268	-0.00198	-19.8	0.01
		+ 10 min.	13.559733	-0.000267	-0.00197	-19.7	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)

APPENDIX 2: Test instruments

EMI Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KLP-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	827779/008	ME	2017/10/02 * 12
CCC-M01	Coaxial Cable	FUJIKURA	3D2W	none	ME	2017/05/19 * 12
CAF-16	Pre-Amplifier	Sonoma Instrument	310N	325015	ME	2017/05/19 * 12
CAT6-17	6dB Fixed Atten.	Suhner	6906.01.A	none	ME	2017/06/27 * 12
COTS-CEMI-02	EMI Software	TSJ	TEPTO-DV(RE,CE, MF,PE)	Ver, RE: 2.5.0131, CE: 2.5.0131, ME: 2.5.0129, PE: 2.5.0129	ME/RE/CE	-
CCC-S10-C(3/9/10/11/12)	Coaxial Cable	FUJIKURA,FUJIKURA,FUJIKURA,FUJIKURA	5D-2W,5D-2W,5D-2W,5D-2W,5D-2W,	-	ME	2017/08/25 * 12
CTR-09	Test Receiver	Agilent	N9038A	MY53290016 Version A.14.03	ME/RE	2017/06/27 * 12
CBL-08	LOGBICON	Schwarzbeck	VULB 9168	343	RE	2017/04/10 * 12
CAT3-04	3dB Fixed Atten.	TAMAGAWA	UFA-01	none	RE	2017/09/04 * 12
CCC-S10-R(2/4/CATS-11/5/6/7/8/11/12)	Coaxial Cable	Fujikura,Fujikura,Agilent,Fujikura,Fujikura,Fujikura,Fujikura,Fujikura	5D-2W,5D-2W,8494A,5D-2W,5D-2W,5D-2W,5D-2W,5D-2W,5D-2W	MY41110200(Step Att)	RE	2017/08/25 * 12
CAF-08	Pre-Amplifier	Hewlett Packard	8447D	2944A09041	RE	2017/08/25 * 12
CSCL-13	Ruler	Tajima	L19-55	none	ME/RE	-
COS-10	Temperature & Humidity Indicator	HIOKI	3641/9680-50	090999895/090905406	ME/RE	2017/05/16 * 12
CTS-14	Digital Multimeter	FLUKE	115	994460954	ME/RE	2017/10/02 * 12
CSA-07	Spectrum Analyzer	Agilent	E4448A	MY52490024 Version A.11.21	FT	2017/05/31 * 12
CFC-02	Frequency Counter	Agilent	53151A	US40511823	FT	2017/04/24 * 12
CCH-04	Temperature and Humidity Chamber	ESPEC	PL-1J	15004059	FT	2017/06/30 * 12
CTS-18	Digital Multimeter	FLUKE	87-3	85220051	FT	2017/09/11 * 12
COS-05	Temperature & Humidity Indicator	A&D	AD-5681	6975761	FT/CE	2017/07/20 * 12
CMS-07	Near Field Probe	Langer	LF-R400	02-0815	FT	Pre Check
CLS-11	A.M.N.	Rohde & Schwarz	ESH3-Z5	835239/022	CE	2017/07/13 * 12
CAT10-25	10dB Fixed Atten.	Suhner	6810.01.A	none	CE	2017/07/14 * 12
CCC-S5-C(2/9/10/11)	Coaxial Cable	Fujikura,Fujikura,Fujikura,Fujikura	5D-2W,5D-2W,5D-2W,5D-2W	-	CE	2017/07/25 * 12
CTR-06	Test Receiver	Rohde & Schwarz	ESCI	100107 Rev 4.32	CE	2017/09/27 * 12
CSCL-06	Ruler	Tajima	L19-55S	none	CE	-
CTS-09	Digital Multimeter	FLUKE	112	89790194	CE	2017/10/02 * 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,
ME: Magnetic Emission
RE: Radiated Emission
FT: Frequency Tolerance

UL Japan, Inc.

Kashima EMC Lab.

1614, Mushiata, Katori-shi, Chiba-ken, 289-0341 Japan

Telephone : +81 478 88 6500

Facsimile : +81 478 82 3373