RADIO TEST REPORT

Test Report No. : 11287959M-A-R1

Applicant	:	**Oki Data Corporation**
Type of Equipment	:	**Embedded RFID Read/Write System**
Model No.	:	**4465874A**
Test regulation	:	**FCC Part 15 Subpart C: 2016**
FCC ID	:	**B2K-4465874A**
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 covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. This report is a revised version of 11287959M-A. 11287959M-A is replaced with this report.

Date of test: July 19, 20, 25, 2016

Representative test operator:

Kazuhiro Ando
Engineer
Consumer Technology Division

Approved by :

Kenichi Suda
Manager
Consumer Technology Division

CERTIFICATE 1266.01

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

REVISION HISTORY

Original Test Report No.: 11287959M-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11287959M-A	Aug 9, 2016	-	-
1	11287959M-A-R1	Aug 18, 2016	P.9, P.10	Modification of configurations

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CONTENTS PAGE

SECTION 1: Customer information

Company Name	:	Oki Data Corporation
Address	:	3-1, Futaba-cho, Takasaki-city, Gunma-Pref 370-8585, Japan
Telephone Number	:	+81-27-328-6399
Facsimile Number	:	+81-27-328-6396
Contact Person	:	Hidetoshi Okazaki

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

2.1 Identification of E.U.T.

Type of Equipment	:	Embedded RFID Read/Write System
Model No.	:	4465874A
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 5 V, 0.2 W
Receipt Date of Sample	:	July 15, 2016
Country of Mass-production	:	Thailand
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: 4465874A (refer to as the EUT in this report) is an Embedded RFID Read/Write System which is built in a printer and is used for checking remaining amount of the toner.

General Specification

Clock frequency(ies) in the system	:	13.56 MHz

Radio Specification

Equipment Type	:	Transceiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK
Power Supply (inner)	:	DC 4.0 V
Antenna type	:	Printed Loop Coil
Antenna connector type	:	PH
Operation temperature range	:	0 deg. C. to +50 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 April 6, 2016.
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] 18.4 dB, 21.95792 MHz, L [AV] 13.3 dB, 21.95792 MHz, L	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)	91.0 dB, 13.56000 MHz, QP, 0 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)	44.7 dB, 14.01000 MHz, QP, 0 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)	14.6 dB 162.720 MHz, Horizontal, 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 4.0V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 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 15.203/212.

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	2.8 dB
Radiated emission (Measurement distance: 3 m)	0.009 MHz-30 MHz	2.7 dB
	30 MHz-1000 MHz	6.3 dB

Conducted emission test

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

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: (±) 7.9 x 10^-8

3.5 Test Location

UL Japan, Inc.
Kashima EMC Lab.
1614 Mushihata, Katori-shi, Chiba-ken, 289-0341 JAPAN
Telephone number : +81 478 88 6500
Facsimile number : +81 478 82 3373
A2LA Accreditation No. : 1266-01

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane/horizontal conducting plane (m)	Maximum measurement distance
No.1 Open site	IC 4659A-1	6.0 x 5.5 x 2.5	20 x 40	10 m
No.2 Open site	IC 4659A-2	4.4 x 4.4 x 2.15	18 x 20	10 m
No.5 Open site	IC 4659A-5	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	IC 4659A-1	5.4 x 4.5 x 2.3	-	-
No.2 Shielded room	IC 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	IC 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	IC 4659A-6	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	IC 4659A-10	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	IC 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	-	4.5 x 5.3 x 2.7	-	-

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 EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items except for Frequency tolerances	Transmitting and Receiving mode (with Tag, without Tag) • Modulation ASK10% • Data transfer rate 106kbps • 4ch serially transmitting (Continuous Transmitting with switching 4 antenna in order)	13.56MHz
Frequency tolerances	Transmitting Unmodulated	13.56MHz

The EUT has the power settings by the software as follows;
Power settings: High Power, Low Power *1)
Software : Emi-4Ch-1Tag AFE-TP7 v4.70

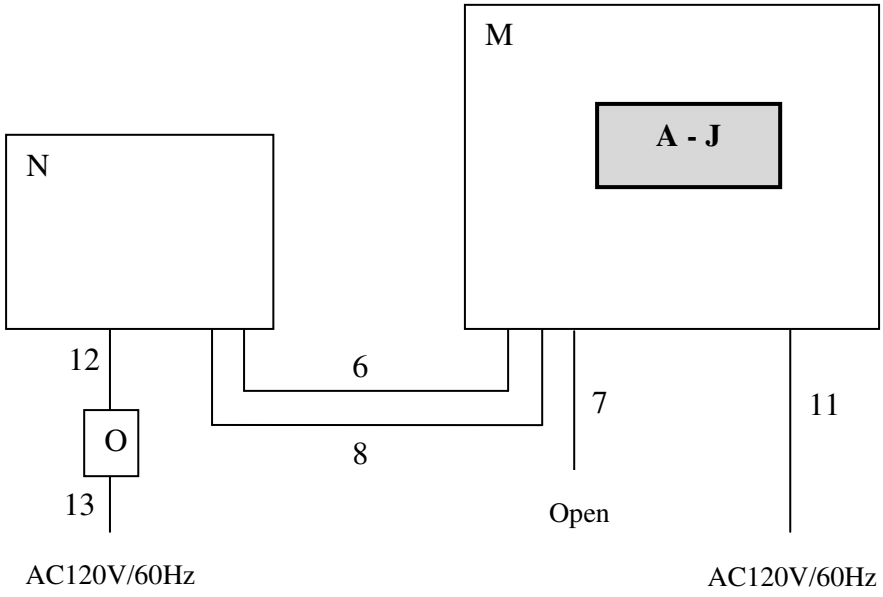
*1) There is Low Power setting for a security.
The Low Power setting test was performed only Electric Field Strength of Fundamental Emission.

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

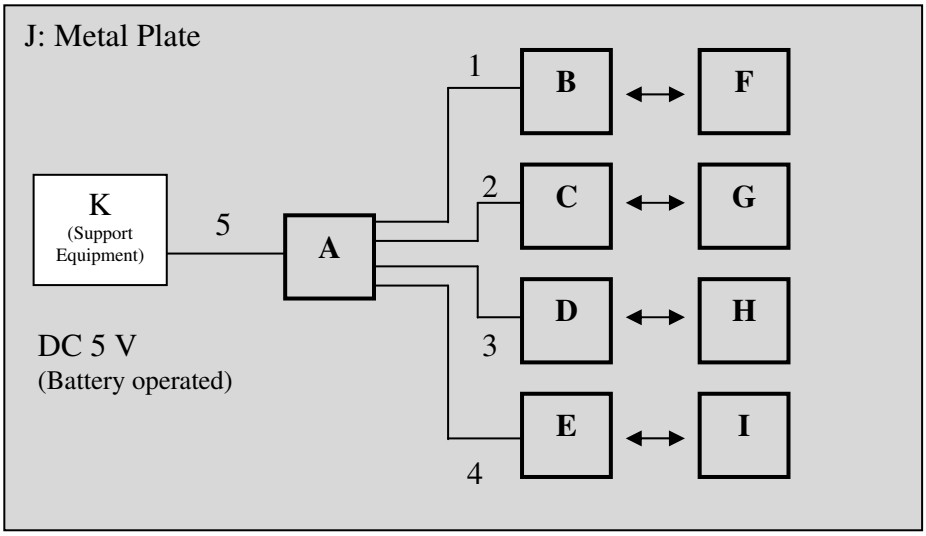
Frequency Tolerance:
Temperature : -20 deg. C to +50 deg. C Step 10 deg. C
Voltage : Normal Voltage DC 5.0 V
Maximum Voltage DC 5.75 V, Minimum Voltage DC 4.25 V (DC 5.0 V ±15 %)

4.2 Configuration and peripherals

Conducted Emissions

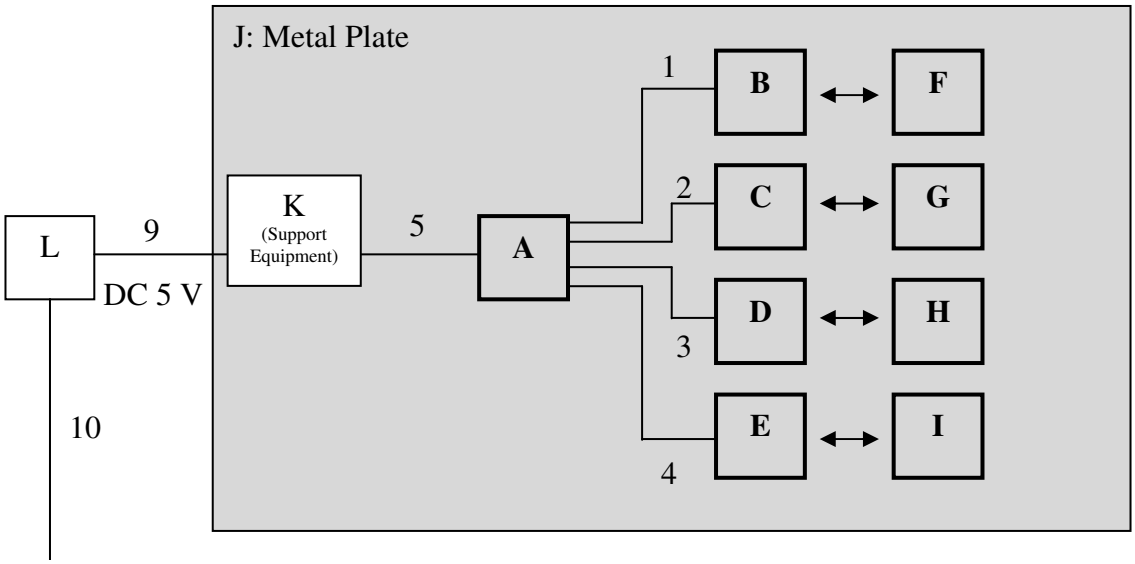


Radiated Emissions



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

Frequency stability Test condition



AC100V/50Hz

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RFID Module	4465874A	*1)	Oki Data Corporation	EUT
B-E	Antenna Unit	-	-	Oki Data Corporation	EUT
F-I	Tag	-	-	Oki Data Corporation	EUT Internal coil size: 15[mm]*20[mm] Internal coil turns: 13
J	Metal Plate	-	-	Oki Data Corporation	EUT
K	Micro-Computer for Test	None	None	Oki Data Corporation	Support equipment
L	DC Power Supply	PAD35-10L	1900700	KIKUSUI	-
M	Printer	N31193A	ALPHA20007A0	Oki Data Corporation	-
N	PC	3358-3VJ	LR-L593L	lenovo	-
O	AC Adapter	45N0121	11S45N0121Z1Z HXU27RA9U	lenovo	-

*1) WMM16270014: Conducted emission test, WMM16270008: Other tests

List of cables used

No.	Item	Length(m)	Shield		Remarks
			Cable	Connector	
1	Antenna cable 0	0.140	Unshielded	Unshielded	46407201YS
2	Antenna cable 1	0.075	Unshielded	Unshielded	46407201YS
3	Antenna cable 2	0.075	Unshielded	Unshielded	46407201YS
4	Antenna cable 3	0.140	Unshielded	Unshielded	46407201YS
5	Signal	0.907	Unshielded	Unshielded	-
6	USB	2.0	Shielded	Shielded	-
7	USB	2.0	Shielded	Shielded	-
8	LAN	3.0	Unshielded	Unshielded	-
9	DC	0.5	Unshielded	Unshielded	-
10	AC	3.0	Unshielded	Unshielded	DC Power Supply
11	AC	1.8	Unshielded	Unshielded	Printer
12	DC	1.7	Unshielded	Unshielded	AC Adapter
13	AC	0.8	Unshielded	Unshielded	AC Adapter

SECTION 5: Conducted emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

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 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 1 GHz
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 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 test was made on EUT at the normal use position.

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

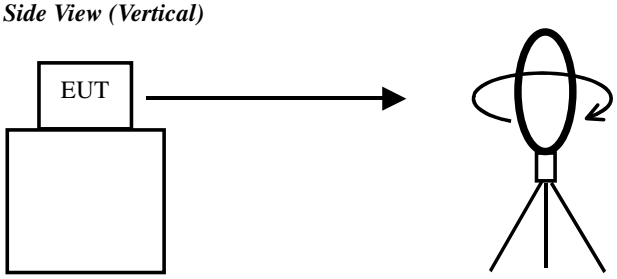
Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	50 kHz	1 kHz	3 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *2)	Spectrum Analyzer
Frequency Tolerance*3)	-	-	-	-	-	-	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 %.
*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.

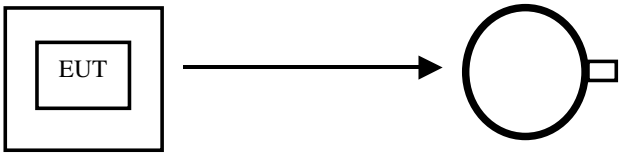
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

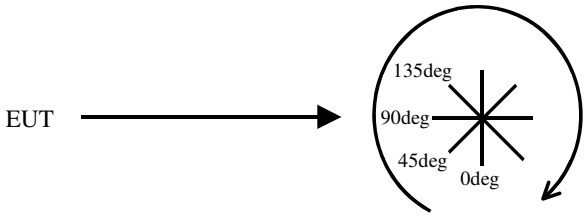


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

APPENDIX 1: Test data

Conducted emission

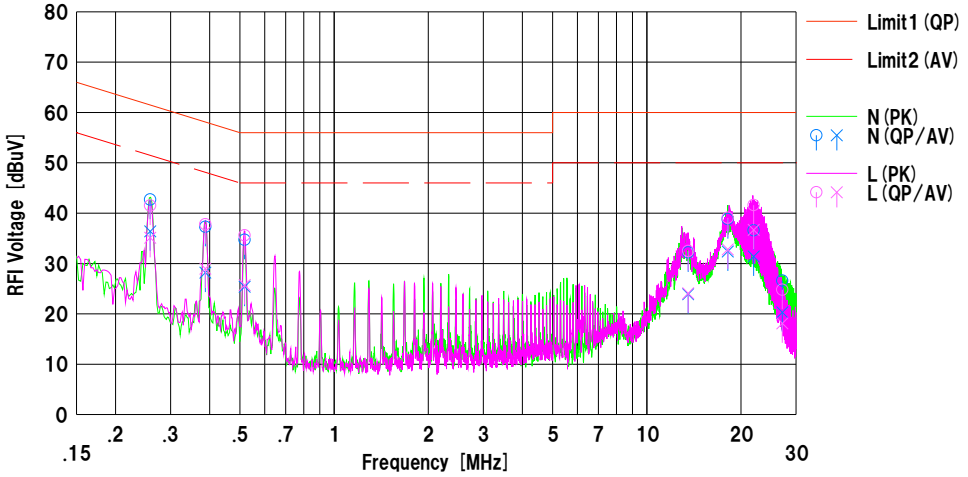
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/20

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V (Printer AC120V/60Hz)
Temp./Humi. : 23deg.C / 50%RH

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

Tested by : Kazuhiro Ando



No.	Freq.	Reading <QP>	Reading <AV>	C.Fac	Results <QP>	Results <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.25825	32.5	26.2	10.2	42.7	36.4	61.5	51.5	18.8	15.1	N	
2	0.38769	27.1	18.0	10.2	37.3	28.2	58.1	48.1	20.8	19.9	N	
3	0.51757	24.5	15.2	10.2	34.7	25.4	56.0	46.0	21.3	20.6	N	
4	13.56000	20.7	12.4	11.5	32.2	23.9	60.0	50.0	27.8	26.1	N	
5	18.15861	27.0	20.6	11.8	38.8	32.4	60.0	50.0	21.2	17.6	N	
6	21.95792	24.5	19.3	12.1	36.6	31.4	60.0	50.0	23.4	18.6	N	
7	27.12000	14.3	8.0	12.3	26.6	20.3	60.0	50.0	33.4	29.7	N	
8	0.25825	31.3	24.9	10.2	41.5	35.1	61.5	51.5	20.0	16.4	L	
9	0.38769	27.6	18.8	10.2	37.8	29.0	58.1	48.1	20.3	19.1	L	
10	0.51757	25.4	15.5	10.2	35.6	25.7	56.0	46.0	20.4	20.3	L	
11	13.56000	21.0	12.6	11.5	32.5	24.1	60.0	50.0	27.5	25.9	L	
12	18.15861	27.3	21.0	11.8	39.1	32.8	60.0	50.0	20.9	17.2	L	
13	21.95792	29.5	24.6	12.1	41.6	36.7	60.0	50.0	18.4	13.3	L	
14	27.12000	12.5	5.8	12.3	24.8	18.1	60.0	50.0	35.2	31.9	L	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN:CLS-07

Fundamental emission and Spectrum Mask

(with tag, High power)

DATA OF RADIATED EMISSION (below 30MHz) TEST

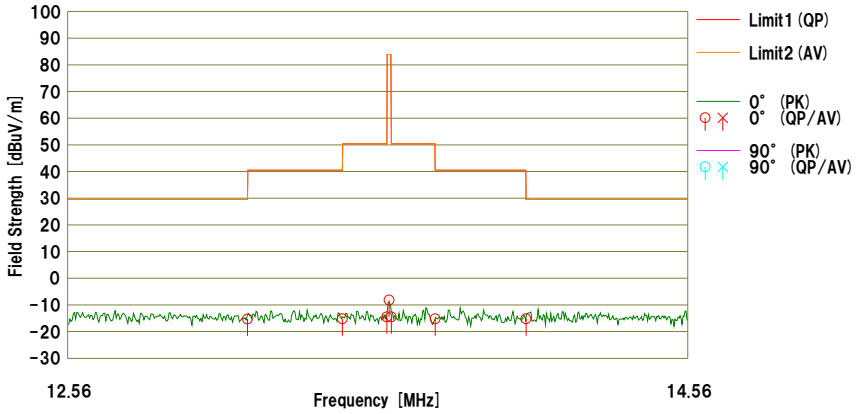
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/19

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 22deg.C / 60%RH

Remarks : with tag

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.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	13.11000	36.5	---	19.7	-39.2	32.3	-15.3	---	29.5	29.5	44.8	---	0°	58	
2	13.41000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	58	
3	13.55300	37.3	---	19.7	-39.2	32.3	-14.5	---	50.4	50.4	64.9	---	0°	58	
4	13.56000	43.6	---	19.7	-39.2	32.3	-8.2	---	83.9	83.9	92.1	---	0°	58	
5	13.56700	37.3	---	19.7	-39.2	32.3	-14.5	---	50.4	50.4	64.9	---	0°	58	
6	13.71000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	58	
7	14.01000	36.6	---	19.7	-39.2	32.3	-15.2	---	29.5	29.5	44.7	---	0°	58	

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	43.6	19.7	0.8	32.3	-	31.8	-	-	Fundamental

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

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Fundamental emission and Spectrum Mask

(without tag, High power)

DATA OF RADIATED EMISSION (below 30MHz) TEST

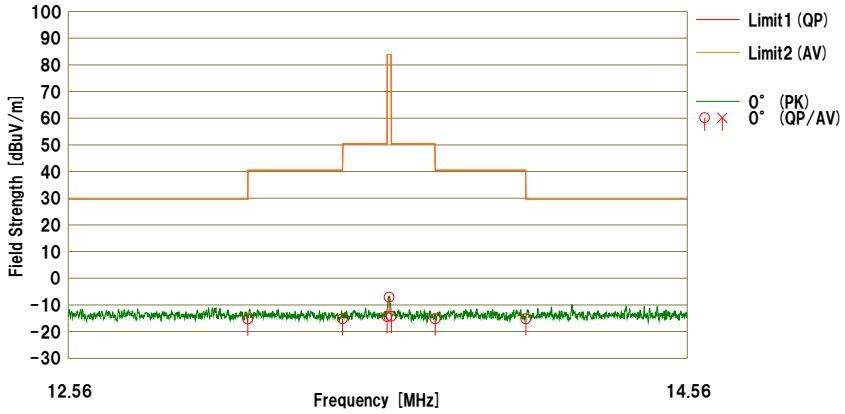
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/19

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag

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.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	13.11000	36.5	---	19.7	-39.2	32.3	-15.3	---	29.5	29.5	44.8	---	0°	65	
2	13.41000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	65	
3	13.55300	37.4	---	19.7	-39.2	32.3	-14.4	---	50.4	50.4	64.8	---	0°	65	
4	13.56000	44.7	---	19.7	-39.2	32.3	-7.1	---	83.9	83.9	91.0	---	0°	65	
5	13.56700	37.5	---	19.7	-39.2	32.3	-14.3	---	50.4	50.4	64.7	---	0°	65	
6	13.71000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	65	
7	14.01000	36.6	---	19.7	-39.2	32.3	-15.2	---	29.5	29.5	44.7	---	0°	65	

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	44.7	19.7	0.8	32.3	-	32.9	-	-	Fundamental

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

Fundamental emission and Spectrum Mask

(with tag, Low power)

DATA OF RADIATED EMISSION (below 30MHz) TEST

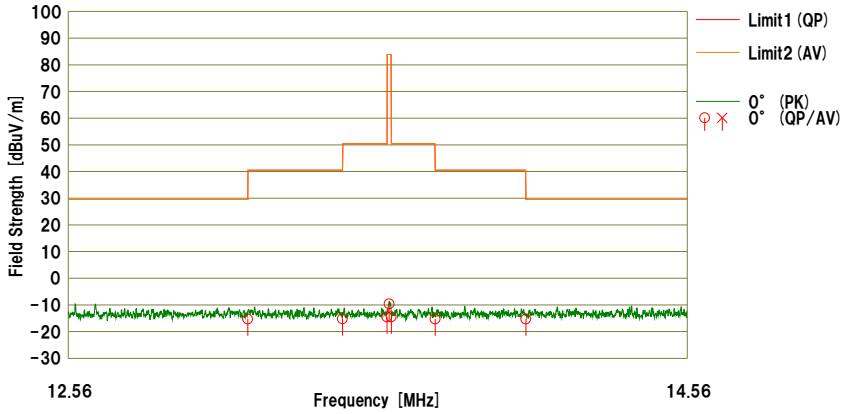
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/19

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 22deg.C / 60%RH

Remarks : with tag (Low Power mode)

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.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	13.11000	36.5	---	19.7	-39.2	32.3	-15.3	---	29.5	29.5	44.8	---	0°	60	
2	13.41000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	60	
3	13.55300	37.3	---	19.7	-39.2	32.3	-14.5	---	50.4	50.4	64.9	---	0°	60	
4	13.56000	42.2	---	19.7	-39.2	32.3	-9.6	---	83.9	83.9	93.5	---	0°	60	
5	13.56700	37.3	---	19.7	-39.2	32.3	-14.5	---	50.4	50.4	64.9	---	0°	60	
6	13.71000	36.5	---	19.7	-39.2	32.3	-15.3	---	40.5	40.5	55.8	---	0°	60	
7	14.01000	36.5	---	19.7	-39.2	32.3	-15.3	---	29.5	29.5	44.8	---	0°	60	

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	42.2	19.7	0.8	32.3	-	30.4	-	-	Fundamental

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

UL Japan, Inc.
Kashima EMC Lab.
1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan
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Fundamental emission and Spectrum Mask

(without tag, Low power)

DATA OF RADIATED EMISSION (below 30MHz) TEST

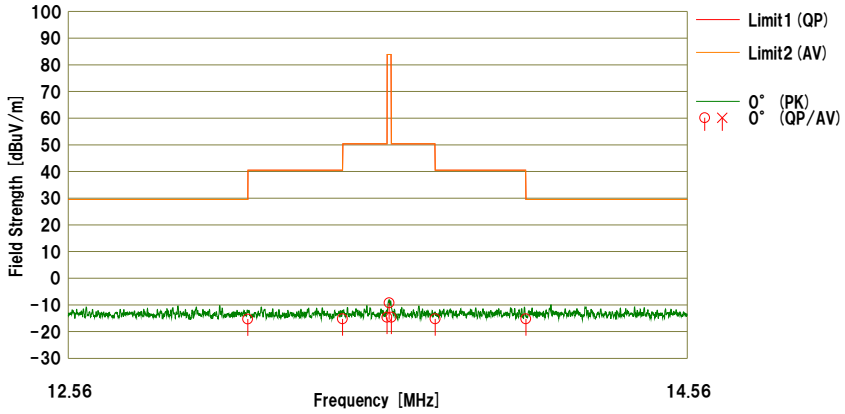
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/19

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag (Low Power mode)

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.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	13.11000	36.5	---	19.7	-39.2	32.3	-15.3	---	29.5	29.5	44.8	---	0°	65	
2	13.41000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	65	
3	13.55300	37.2	---	19.7	-39.2	32.3	-14.6	---	50.4	50.4	65.0	---	0°	65	
4	13.56000	42.6	---	19.7	-39.2	32.3	-9.2	---	83.9	83.9	93.1	---	0°	65	
5	13.56700	37.2	---	19.7	-39.2	32.3	-14.6	---	50.4	50.4	65.0	---	0°	65	
6	13.71000	36.6	---	19.7	-39.2	32.3	-15.2	---	40.5	40.5	55.7	---	0°	65	
7	14.01000	36.6	---	19.7	-39.2	32.3	-15.2	---	29.5	29.5	44.7	---	0°	65	

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	42.6	19.7	0.8	32.3	-	30.8	-	-	Fundamental

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

Spurious emission
(with tag)

DATA OF RADIATED EMISSION (below 30MHz) TEST

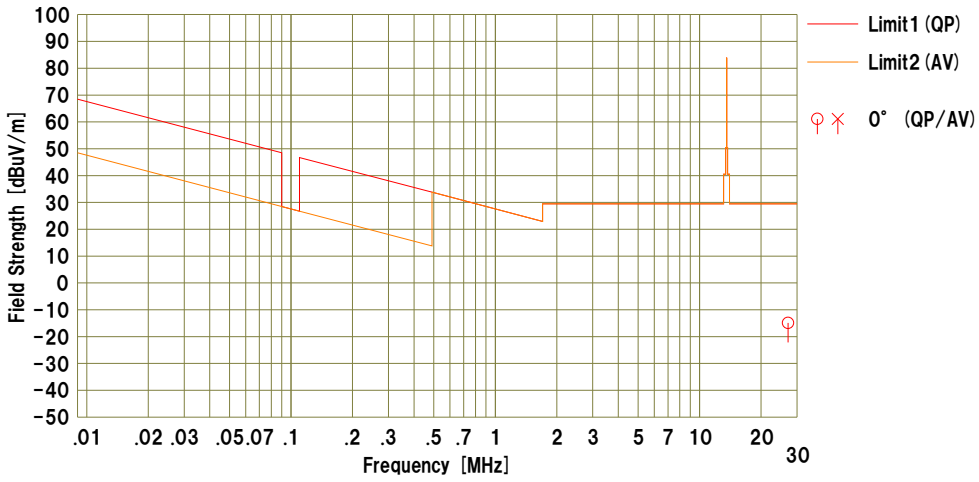
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/19

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 22deg.C / 60%RH

Remarks : with tag

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.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	27.12000	35.7	---	20.5	-38.8	32.3	-14.9	---	29.5	29.5	44.4	---	0°	58	Floor noise

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
(without tag)

DATA OF RADIATED EMISSION (below 30MHz) TEST

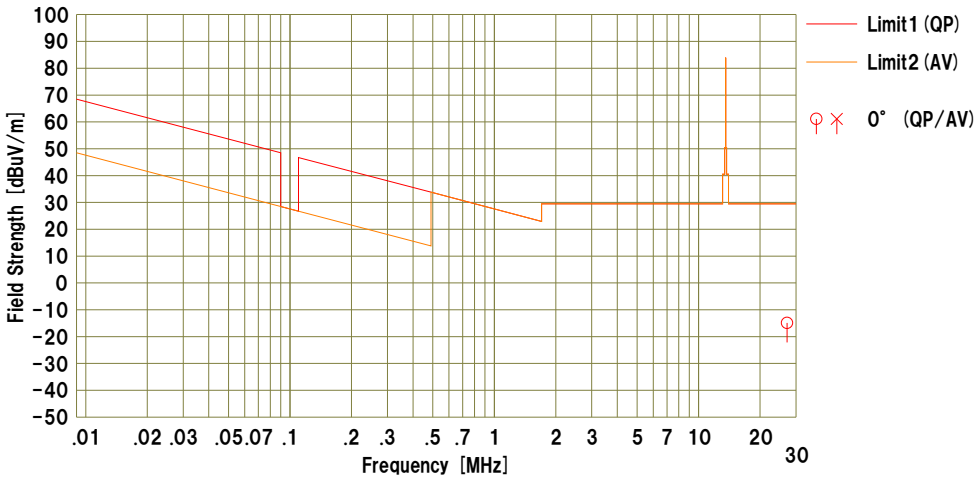
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/19

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 22deg.C / 60%RH

Remarks : without tag

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.	Reading <QP>	Reading <AV>	Ant.Fac	Loss	Gain	Result <QP>	Result <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Antenna	Table	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[deg]	
1	27.12000	35.7	---	20.5	-38.8	32.3	-14.9	---	29.5	29.5	44.4	---	0°	65	Floor noise

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
(with tag)

DATA OF RADIATED EMISSION TEST

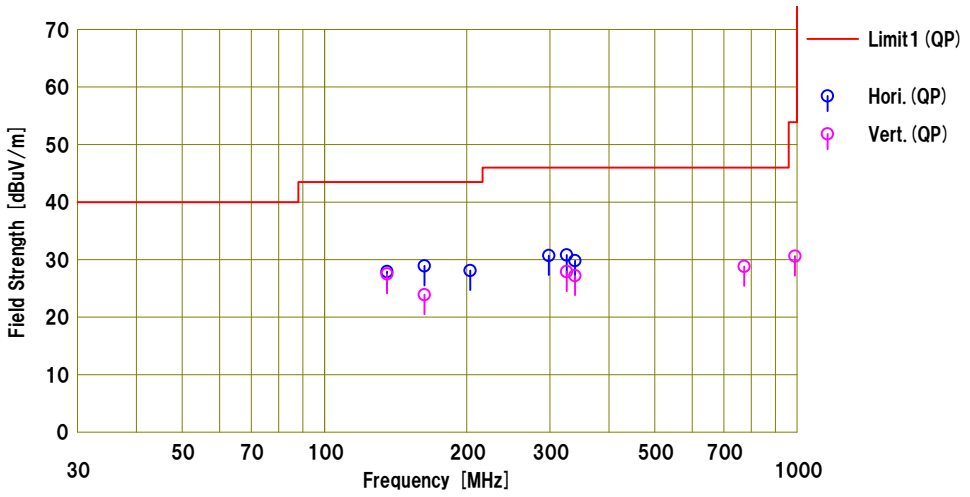
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/20

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 23deg.C / 50%RH

Remarks : with tag

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

Tested by : Kazuhiro Ando



No.	Freq.	Reading <QP>	Ant.Fac	Loss	Gain	Result <QP>	Limit <QP>	Margin <QP>	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]		
1	135.600	35.8	12.9	5.7	26.5	27.9	43.5	15.6	Hori.	213	206	HB	
2	162.720	35.9	13.4	6.0	26.4	28.9	43.5	14.6	Hori.	180	196	HB	
3	203.400	38.0	9.9	6.4	26.2	28.1	43.5	15.4	Hori.	165	200	HB	
4	298.320	35.8	13.5	7.4	26.0	30.7	46.0	15.3	Hori.	100	279	HB	
5	325.440	35.3	14.1	7.6	26.2	30.8	46.0	15.2	Hori.	100	263	HB	
6	339.000	34.0	14.2	7.8	26.2	29.8	46.0	16.2	Hori.	100	261	HB	
7	135.600	35.4	12.9	5.7	26.5	27.5	43.5	16.0	Vert.	100	283	HB	
8	162.720	30.9	13.4	6.0	26.4	23.9	43.5	19.6	Vert.	100	285	HB	
9	325.440	32.4	14.1	7.6	26.2	27.9	46.0	18.1	Vert.	176	314	HB	
10	339.000	31.4	14.2	7.8	26.2	27.2	46.0	18.8	Vert.	167	344	HB	
11	772.920	23.9	22.2	10.2	27.5	28.8	46.0	17.2	Vert.	137	40	HB	
12	989.880	22.0	24.2	11.4	27.0	30.6	53.9	23.3	Vert.	100	270	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
(without tag)

DATA OF RADIATED EMISSION TEST

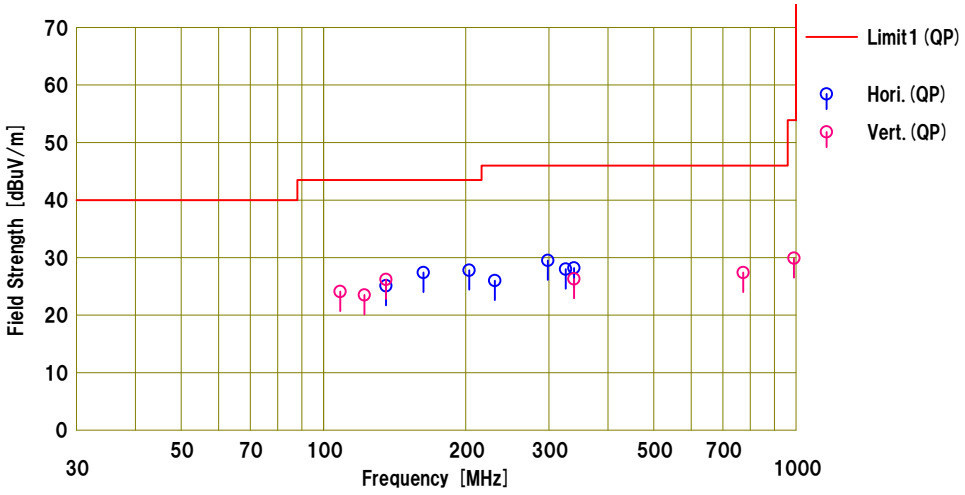
UL Japan, Inc. Kashima EMC Lab. No.10 Semi-Anechoic Chamber
Date : 2016/07/20

Mode : Transmitting and Receiving
Order No. : 11287959M
Power : DC 5V
Temp./Humi. : 23deg.C / 50%RH

Remarks : without tag

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

Tested by : Kazuhiro Ando



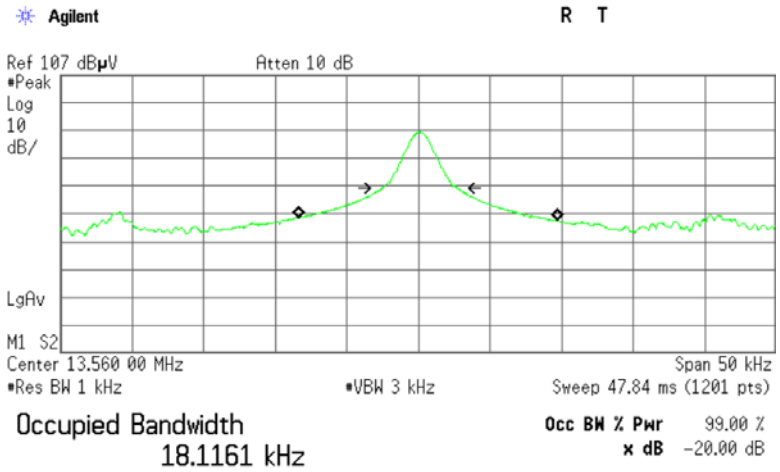
No.	Freq.	Reading <QP>	Ant.Fac	Loss	Gain	Result <QP>	Limit <QP>	Margin <QP>	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]		
1	135.600	33.0	12.9	5.7	26.5	25.1	43.5	18.4	Hori.	210	199	HB	
2	162.720	34.4	13.4	6.0	26.4	27.4	43.5	16.1	Hori.	193	10	HB	
3	203.400	37.7	9.9	6.4	26.2	27.8	43.5	15.7	Hori.	169	10	HB	
4	230.520	35.3	10.2	6.6	26.1	26.0	46.0	20.0	Hori.	148	198	HB	
5	298.320	34.6	13.5	7.4	26.0	29.5	46.0	16.5	Hori.	100	281	HB	
6	325.440	32.5	14.1	7.6	26.2	28.0	46.0	18.0	Hori.	100	264	HB	
7	339.000	32.4	14.2	7.8	26.2	28.2	46.0	17.8	Hori.	100	269	HB	
8	108.480	35.0	10.4	5.3	26.6	24.1	43.5	19.4	Vert.	100	267	HB	
9	122.040	32.9	11.7	5.5	26.6	23.5	43.5	20.0	Vert.	100	260	HB	
10	135.600	34.1	12.9	5.7	26.5	26.2	43.5	17.3	Vert.	100	268	HB	
11	339.000	30.5	14.2	7.8	26.2	26.3	46.0	19.7	Vert.	158	331	HB	
12	772.920	22.5	22.2	10.2	27.5	27.4	46.0	18.6	Vert.	151	10	HB	
13	989.880	21.3	24.2	11.4	27.0	29.9	53.9	24.0	Vert.	105	30	HB	

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

20dB Bandwidth and 99% Occupied Bandwidth

Test place	Kashima EMC Lab. No.2 measurement room
Report No.	11287959M
Date	07/25/2016
Temperature/ Humidity	24 deg. C / 52 % RH
Engineer	Kazuhiro Ando
Mode	Tx Mod on with Tag

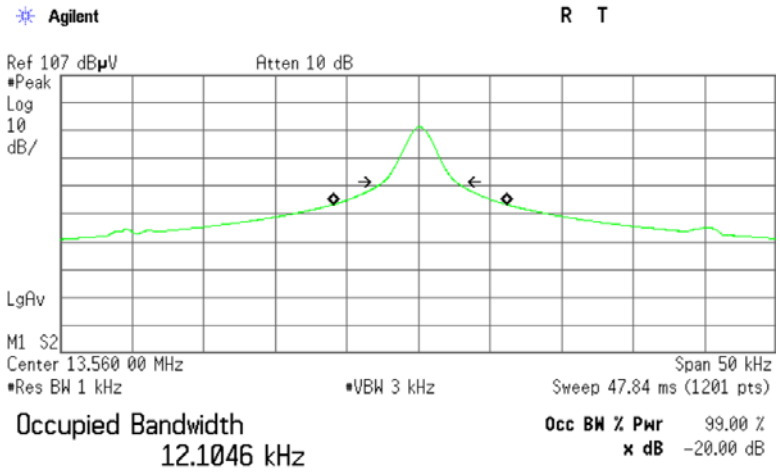
FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	5.16	18.12



20dB Bandwidth and 99% Occupied Bandwidth

Test place	Kashima EMC Lab. No.2 measurement room
Report No.	11287959M
Date	07/25/2016
Temperature/ Humidity	24 deg. C / 52 % RH
Engineer	Kazuhiro Ando
Mode	Tx Mod on without Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	5.18	12.10



Frequency Tolerance

Test place	Kashima EMC Lab. No.2 measurement room
Report No.	11287959M
Date	07/25/2016
Temperature/ Humidity	24 deg. C / 52 % RH
Engineer	Kazuhiro Ando
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	13.560084	0.000084	0.00062	6.2	0.01
		+ 2 min.	13.560085	0.000085	0.00063	6.3	0.01
		+ 5 min.	13.560085	0.000085	0.00063	6.3	0.01
		+ 10 min.	13.560085	0.000085	0.00063	6.3	0.01
40	5	Power on	13.560089	0.000089	0.00066	6.6	0.01
		+ 2 min.	13.560087	0.000087	0.00064	6.4	0.01
		+ 5 min.	13.560087	0.000087	0.00064	6.4	0.01
		+ 10 min.	13.560087	0.000087	0.00064	6.4	0.01
30	5	Power on	13.560100	0.000100	0.00074	7.4	0.01
		+ 2 min.	13.560099	0.000099	0.00073	7.3	0.01
		+ 5 min.	13.560098	0.000098	0.00072	7.2	0.01
		+ 10 min.	13.560098	0.000098	0.00072	7.2	0.01
20	5	Power on	13.560111	0.000111	0.00082	8.2	0.01
		+ 2 min.	13.560110	0.000110	0.00081	8.1	0.01
		+ 5 min.	13.560109	0.000109	0.00080	8.0	0.01
		+ 10 min.	13.560109	0.000109	0.00080	8.0	0.01
20	4.25	Power on	13.560112	0.000112	0.00083	8.3	0.01
	(5V -15%)	+ 2 min.	13.560111	0.000111	0.00082	8.2	0.01
		+ 5 min.	13.560110	0.000110	0.00081	8.1	0.01
		+ 10 min.	13.560110	0.000110	0.00081	8.1	0.01
20	5.75	Power on	13.560111	0.000111	0.00082	8.2	0.01
	(5V +15%)	+ 2 min.	13.560110	0.000110	0.00081	8.1	0.01
		+ 5 min.	13.560109	0.000109	0.00080	8.0	0.01
		+ 10 min.	13.560109	0.000109	0.00080	8.0	0.01
10	5	Power on	13.560115	0.000115	0.00085	8.5	0.01
		+ 2 min.	13.560114	0.000114	0.00084	8.4	0.01
		+ 5 min.	13.560114	0.000114	0.00084	8.4	0.01
		+ 10 min.	13.560114	0.000114	0.00084	8.4	0.01
0	5	Power on	13.560101	0.000101	0.00074	7.4	0.01
		+ 2 min.	13.560104	0.000104	0.00077	7.7	0.01
		+ 5 min.	13.560105	0.000105	0.00077	7.7	0.01
		+ 10 min.	13.560106	0.000106	0.00078	7.8	0.01
-10	5	Power on	13.560066	0.000066	0.00049	4.9	0.01
		+ 2 min.	13.560073	0.000073	0.00054	5.4	0.01
		+ 5 min.	13.560075	0.000075	0.00055	5.5	0.01
		+ 10 min.	13.560075	0.000075	0.00055	5.5	0.01
-20	5	Power on	13.559998	-0.000002	-0.00001	-0.1	0.01
		+ 2 min.	13.560010	0.000010	0.00007	0.7	0.01
		+ 5 min.	13.560013	0.000013	0.00010	1.0	0.01
		+ 10 min.	13.560013	0.000013	0.00010	1.0	0.01

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

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

APPENDIX 2: Test instruments

EMI test equipment

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	2015/08/28 * 12
CCC-M01	Coaxial Cable	FUJIKURA	3D2W	none	ME	2016/05/17 * 12
CAF-16	Pre-Amplifier	Sonoma Instrument	310N	325015	ME	2016/05/10 * 12
CLS-06	A.M.N.	Rohde & Schwarz	ESH3-Z5	838576/017	CE	2015/07/31 * 12
CLS-07	A.M.N.	Rohde & Schwarz	ESH3-Z5	844982/034	CE	2015/07/17 * 12
CAT10-26	10dB Fixed Atten.	Suhner	6810.01.A	none	CE	2015/07/17 * 12
CCC-S10-C(3/9/10/11/12)	Coaxial Cable	FUJIKURA,FUJIKURA,FUJIKURA,FUJIKURA,FUJIKURA	5D-2W,5D-2W,5D-2W,5D-2W,5D-2W,	-	ME/CE	2015/08/11 * 12
CTM-31	Terminator	Suhner	65_BNC-50-0-2/133_NE	none	CE	2015/11/19 * 12
CTR-09	Test Receiver	Agilent	N9038A	MY53290016 Version A.14.03	ME/CE/RE	2016/06/19 * 12
CBL-08	LOGBICON	Schwarzbeck	VULB 9168	343	RE	2015/11/15 * 12
CAT3-04	3dB Fixed Atten.	TAMAGAWA	UFA-01	none	RE	2015/09/03 * 12
CCC-S10-R(2/4/CATS-11/5/6/7/8/11/12)	Coaxial Cable	Fujikura,Fujikura,Agilent,Fujikura,Fujikura,Fujikura,Fuhjikura,Fujikura,Fujikura	5D-2W,5D-2W,8494A,5D-2W,5D-2W,5D-2W,5D-2W,5D-2W,5D-2W	MY41110200(Step Att)	RE	2015/08/11 * 12
CAF-08	Pre-Amplifier	Hewlett Packard	8447D	2944A09041	CE/RE	2015/08/11 * 12
CSCL-13	Ruler	Tajima	L19-55	none	CE/RE	2016/02/22 * 12
COS-10	Temperature & Humidity Indicator	HIOKI	3641/9680-50	090999895/090905406	CE/RE	2016/05/24 * 12
CTS-14	Digital Multimeter	FLUKE	115	994460954	CE/RE	2015/10/01 * 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	CE/RE	-
CMS-07	Near Field Probe	Langer	LF-R400	02-0815	FT	Pre Check
CCH-04	Temperature and Humidity Chamber	ESPEC	PL-1J	15004059	FT	2016/06/30 * 12
CFC-02	Frequency Counter	Agilent	53151A	US40511823	FT	2016/04/08 * 12
CTS-18	Digital Multimeter	FLUKE	87-3	85220051	FT	2015/10/01 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: CE: Conducted Emission
RE: Radiated Emission
FT: Frequency Tolerance
ME: Magnetic Emission