



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

RFID MODULE

MODEL NUMBER: RI15A

FCC ID: ACJ9TGRI15A

REPORT NUMBER: 11290611H-A

ISSUE DATE: June 3, 2016

Prepared for

**PANASONIC CORPORATION OF NORTH AMERICA
Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490**

Prepared by

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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://www.ul.com/japan/jpn/pages/services/emc/abou/ut/mark1/index.jsp#nvlap>

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/03/2016	Initial Issue	T. Hatakeda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PANASONIC CORPORATION OF NORTH AMERICA
Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490

EUT DESCRIPTION: RFID MODULE

MODEL: RI15A

SERIAL NUMBER: 4JTSA00145

DATE TESTED: May 25 and June 3, 2016

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Pass

UL Japan, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Japan, Inc. By:

Tested By:



Takahiro Hatakeda
Leader
Consumer Technology Division



Satofumi Matsuyama
Engineer
Consumer Technology Division

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0
The full scope of accreditation can be viewed at
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT 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) ($\pm$ dB)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	2.9 dB

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

*Measurement distance

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)($\pm$ dB)		(10 m*)($\pm$ dB)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	4.9 dB	5.2 dB	4.9 dB	5.0 dB
Vertical	4.6 dB	5.9 dB	5.0 dB	5.0 dB

Radiated emission				
(3 m*)($\pm$ dB)	(1 m*)($\pm$ dB)	(0.5 m*)($\pm$ dB)	(10 m*)($\pm$ 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

* Measurement distance

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.

5. TEST PROCEDURE AND RESULTS

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods	Section 15.207	[QP] 12.6dB, 13.56000MHz, L	Complied	-
	<IC>RSS-Gen 8.8	<IC>RSS-Gen 8.8	[AV] 3.3dB, 13.56000MHz, L		
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods	Section 15.225(a)	73.9dB, 13.56000MHz, QP, 0deg.	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)	46.1dB, 14.01000MHz, QP, 0deg.	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)	8.7dB 40.680MHz, 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					

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is an RFID module that is embedded inside Panasonic PC model CF-20. The radio module is manufactured by NXP.

6.2. MAXIMUM TRANSMITTER FIELD STRENGTH

The field strength of the transmitter is as follows:

Frequency Range (MHz)	Mode	Output Power (dBuV/m @ 30m)
13.56	Normal Mode Type A	10.0
13.56	Normal Mode Type B	9.9

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Loop antenna.

6.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Regulation test EMVco_loopback.exe

6.5. WORST-CASE CONFIGURATION AND MODE

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

6.6. MODIFICATIONS

No modifications were made during testing.

6.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Personal Computer	Panasonic	CF-20	6DKSA00207	-
AC Adapter	Panasoinc	CF-AA6413C	6413CM315406148B	-
Tag board	-	-	-	-

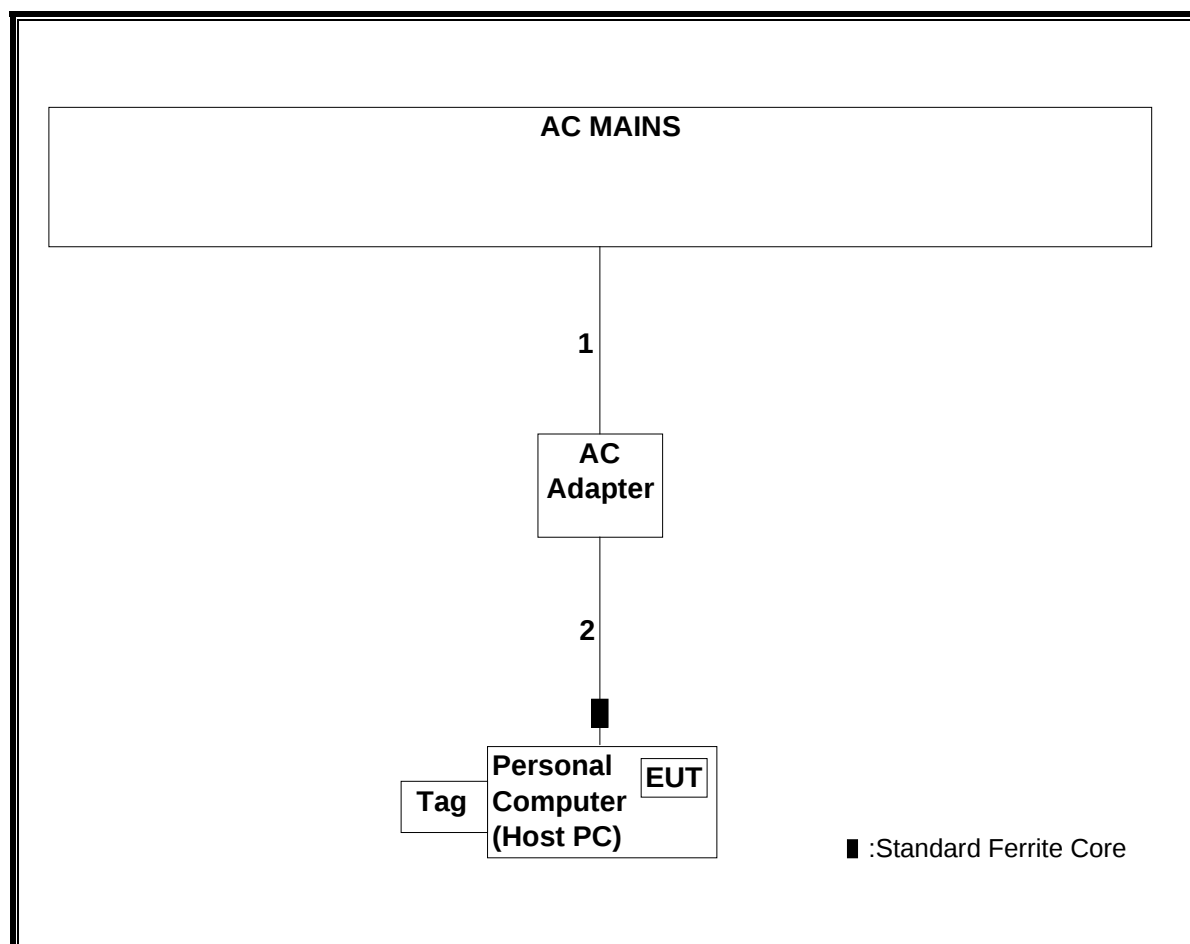
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-Sheilded	0.9 m	N/A
2	AC	1	AC	Un-Sheilded	1.9 m	N/A

TEST SETUP

The EUT is installed in a host tablet computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	FT	2015/08/02 * 12
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE/FT	2016/02/08 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2015/08/14 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE/CE	2015/09/19 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE/CE	2016/01/21 * 12
MJM-25	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE/CE	2015/06/08 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2015/11/02 * 12
MLA-20	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-189	RE	2016/01/30 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2015/11/10 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2015/09/29 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2016/02/25 * 12
MMM-03	Digital Tester	Fluke	FLUKE 26-3	78030621	RE	2015/08/19 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2015/10/24 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2015/06/24 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	/01068(Switcher)	RE	2015/09/29 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MLS-26	LISN(AMN)	Schwarzbeck	NSLK8127	8127-732	CE	2015/07/17 * 12
MTA-30	Terminator	TME	CT-01	-	CE	2016/01/15 * 12
MAT-64	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	CE	2015/07/01 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	CE	2016/01/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	CE	2016/02/24 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2015/10/11 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE	2015/07/10 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2016/02/08 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	CE	2015/08/19 * 12

The expiration date of the calibration is the end of the expired month.

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

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test Item:

CE: Conducted emission

RE: Radiated emission

FT: Frequency Tolerance

8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (uV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

TEST PROCEDURE

ANSI C63.10-2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 30 MHz to 1000 MHz.

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.

RESULTS

8.2. FUNDAMENTAL EMISSION and Spectrum Mask

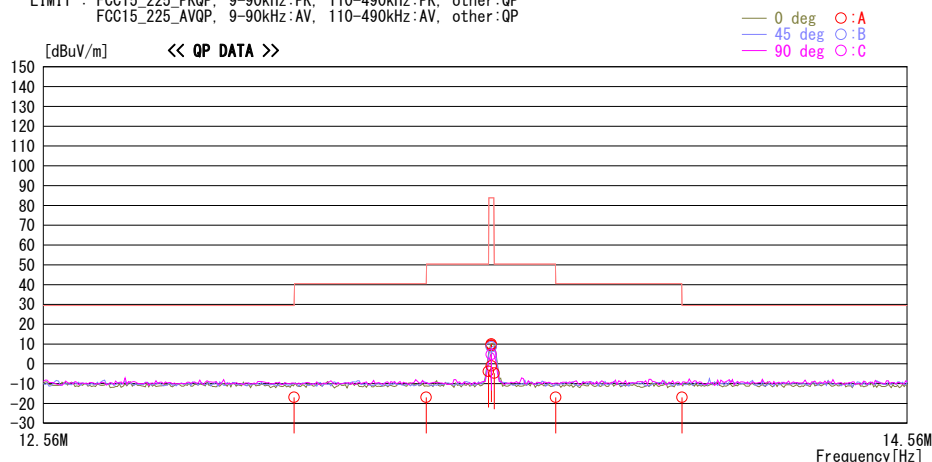
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./ Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Type A Card, Worst-axis(PC style, Y-axis)

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.1	QP	19.2	-32.8	32.3	-16.8	29.5	46.3	0	A	86
13.41000	29.1	QP	19.2	-32.8	32.3	-16.8	40.5	57.3	0	A	86
13.55300	42.1	QP	19.2	-32.8	32.3	-3.8	50.4	54.2	0	A	86
13.56000	55.9	QP	19.2	-32.8	32.3	10.0	83.9	73.9	0	A	86
13.56000	54.4	QP	19.2	-32.8	32.3	8.5	83.9	75.4	45	B	272
13.56000	50.7	QP	19.2	-32.8	32.3	4.8	83.9	79.1	90	C	157
13.56000	55.1	QP	19.2	-32.8	32.3	9.2	83.9	74.7	135	A	110
13.56000	55.4	QP	19.2	-32.8	32.3	9.5	83.9	74.4	180	A	83
13.56000	44.9	QP	19.2	-32.8	32.3	-1.0	83.9	84.9	0	A	85
13.56700	41.2	QP	19.2	-32.8	32.3	-4.7	50.4	55.1	0	A	86
13.71000	29.1	QP	19.2	-32.8	32.3	-16.8	40.5	57.3	0	A	86
14.01000	29.0	QP	19.2	-32.7	32.3	-16.8	29.5	46.3	0	A	86

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

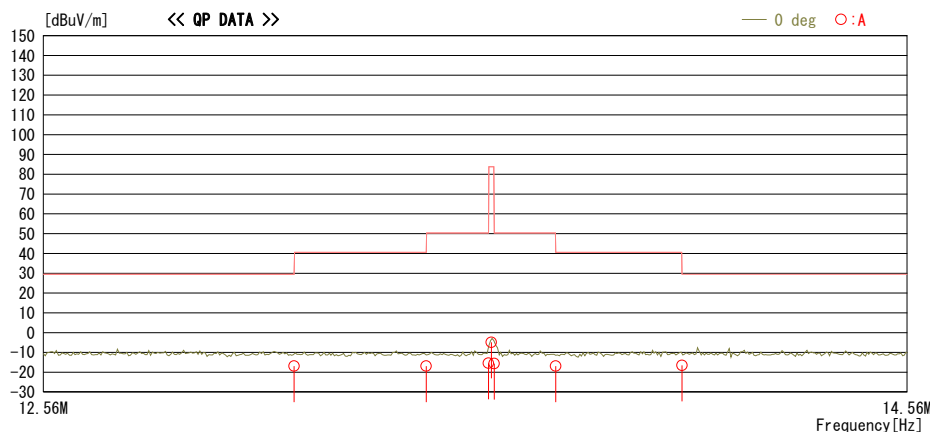
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Date : 2016/05/25

Report No. : 11290611H
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Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, with Type A Card, Worst-axis(PC style, Y-axis)

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.1	QP	19.2	-32.8	32.3	-16.8	29.5	46.3	0	A	240
13.41000	29.1	QP	19.2	-32.8	32.3	-16.8	40.5	57.3	0	A	240
13.55300	30.5	QP	19.2	-32.8	32.3	-15.4	50.4	65.8	0	A	240
13.56000	41.1	QP	19.2	-32.8	32.3	-4.8	83.9	88.7	0	A	240
13.56700	30.2	QP	19.2	-32.8	32.3	-15.7	50.4	66.1	0	A	240
13.71000	29.1	QP	19.2	-32.8	32.3	-16.8	40.5	57.3	0	A	240
14.01000	29.2	QP	19.2	-32.7	32.3	-16.6	29.5	46.1	0	A	240

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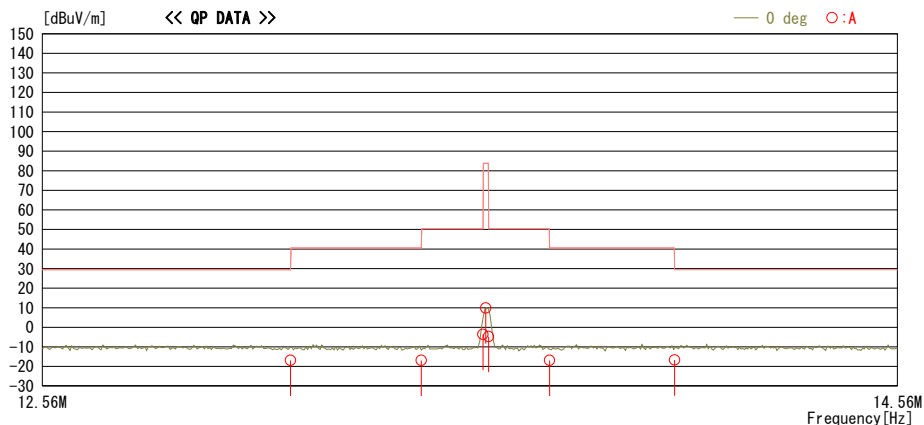
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Mode / Remarks : Tx 13.56MHz, without Type B Card, Worst-axis(PC style, Y-axis)

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



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13.55300	42.2	QP	19.2	-32.8	32.3	-3.7	50.4	54.1	0	A	86
13.56000	55.8	QP	19.2	-32.8	32.3	9.9	83.9	74.0	0	A	86
13.56700	41.2	QP	19.2	-32.8	32.3	-4.7	50.4	55.1	0	A	86
13.71000	29.1	QP	19.2	-32.8	32.3	-16.8	40.5	57.3	0	A	86
14.01000	29.1	QP	19.2	-32.7	32.3	-16.7	29.5	46.2	0	A	86

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CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN + D.FACTOR) - GAIN(AMP)

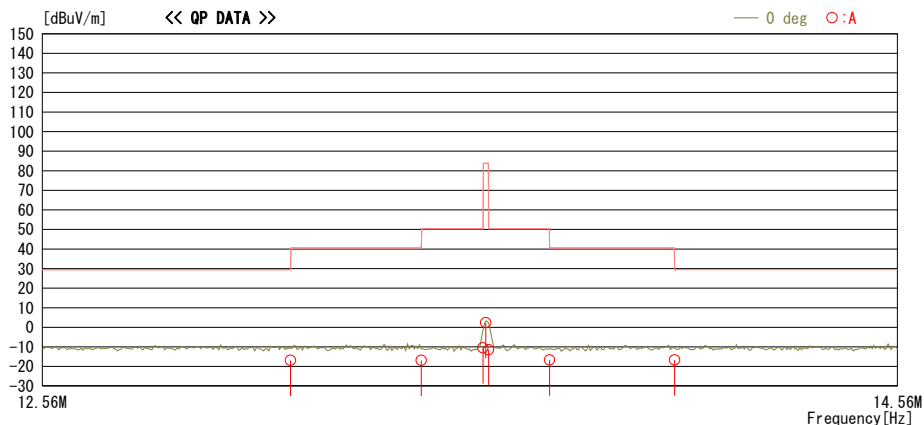
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Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.1	QP	19.2	-32.8	32.3	-16.8	29.5	46.3	0	A	347
13.41000	29.1	QP	19.2	-32.8	32.3	-16.8	40.5	57.3	0	A	347
13.55300	35.3	QP	19.2	-32.8	32.3	-10.6	50.4	61.0	0	A	347
13.56000	48.2	QP	19.2	-32.8	32.3	2.3	83.9	81.6	0	A	347
13.56700	34.4	QP	19.2	-32.8	32.3	-11.5	50.4	61.9	0	A	347
13.71000	29.2	QP	19.2	-32.8	32.3	-16.7	40.5	57.2	0	A	347
14.01000	29.1	QP	19.2	-32.7	32.3	-16.7	29.5	46.2	0	A	347

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

Result of the fundamental emission at 3m 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	55.9	19.2	7.2	32.3	-	50.0	-	-	without Type A tag
0	13.56000	QP	41.1	19.2	7.2	32.3	-	35.2	-	-	with Type A tag
0	13.56000	QP	55.8	19.2	7.2	32.3	-	49.9	-	-	without Type B tag
0	13.56000	QP	48.2	19.2	7.2	32.3	-	42.3	-	-	with Type B tag

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

8.3. SPURIOUS EMISSIONS (0.009 – 30 MHz)

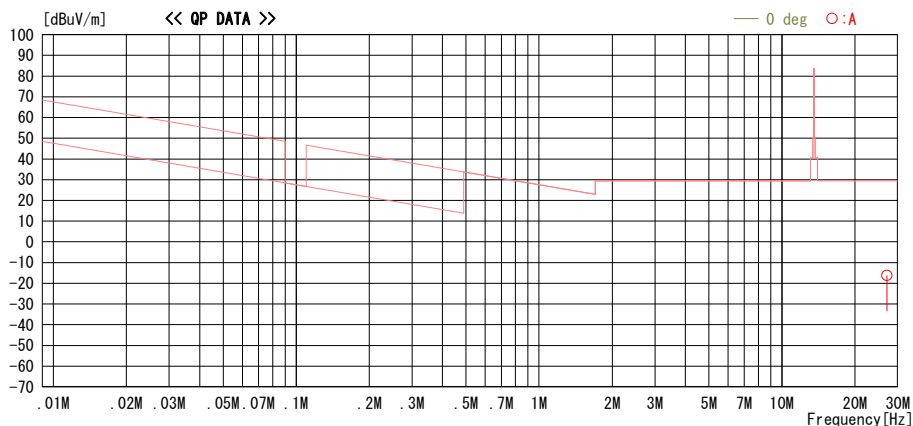
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./ Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Type A Card, Worst-axis(PC style, Y-axis)

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.0	QP	19.2	-32.2	32.3	-16.3	29.5	45.8	0	A	0

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

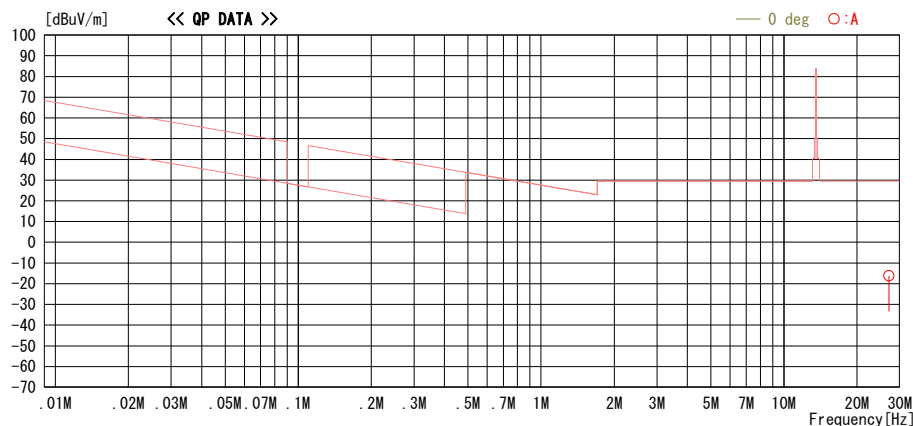
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./ Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, with Type A Card, Worst-axis(PC style, Y-axis)

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.0	QP	19.2	-32.2	32.3	-16.3	29.5	45.8	0	A	0

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

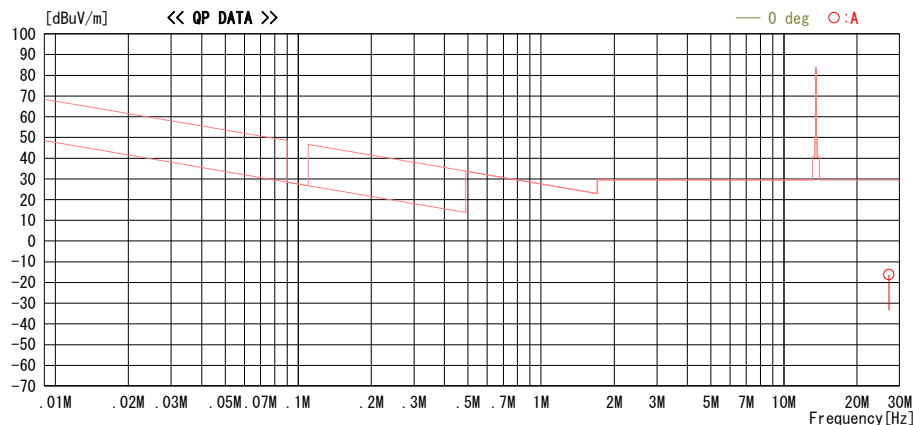
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./ Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Type B Card, Worst-axis(PC style, Y-axis)

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.0	QP	19.2	-32.2	32.3	-16.3	29.5	45.8	0	A	0

CHART: WITH FACTOR ANT TYPE: LOOP Excent for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN + D.FACTOR) - GAIN(AMP)

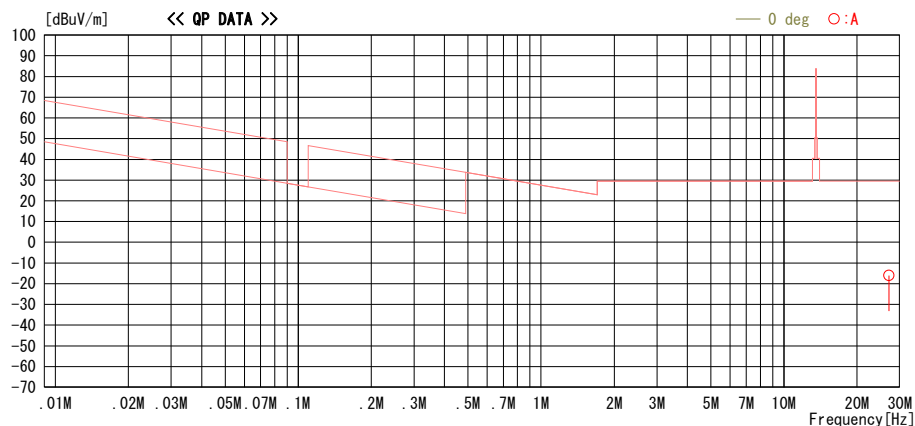
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./ Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, with Type B Card, Worst-axis(PC style, Y-axis)

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.2	QP	19.2	-32.2	32.3	-16.1	29.5	45.6	0	A	0

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

8.4. SPURIOUS EMISSION 30 TO 1000 MHz

DATA OF RADIATED EMISSION TEST

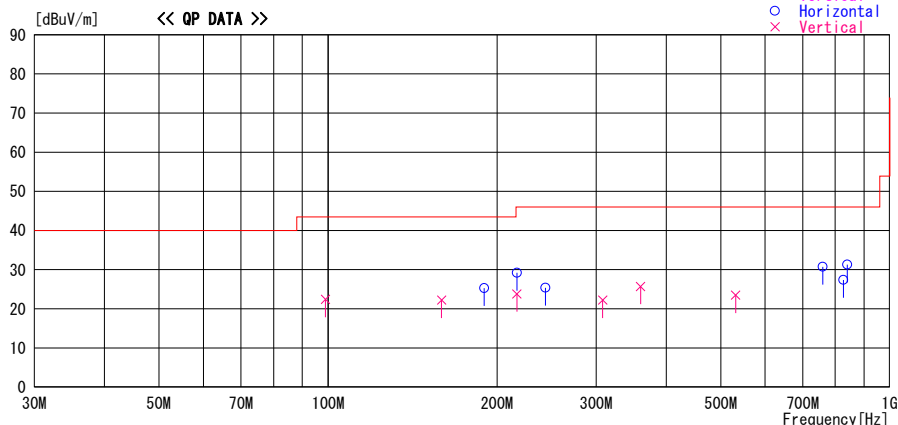
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Type A Card, Worst-axis(PC style, Hor:X Ver:X)

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

All other spurious emissions are less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
98.971	43.4	QP	9.8	-30.8	22.4	357	100	Vert.	43.5	21.1	
159.231	36.9	QP	15.2	-29.9	22.2	281	100	Vert.	43.5	21.3	
189.838	38.8	QP	16.1	-29.6	25.3	53	172	Hori.	43.5	18.2	
216.958	46.7	QP	11.8	-29.3	29.2	52	145	Hori.	46.0	16.8	
216.958	41.3	QP	11.8	-29.3	23.8	313	214	Vert.	46.0	22.2	
244.079	41.9	QP	12.4	-28.9	25.4	44	119	Hori.	46.0	20.6	
308.234	36.8	QP	13.6	-28.2	22.2	353	149	Vert.	46.0	23.8	
360.000	38.5	QP	14.8	-27.6	25.7	354	134	Vert.	46.0	20.3	
531.653	31.7	QP	18.0	-26.2	23.5	15	100	Vert.	46.0	22.5	
759.358	35.2	QP	20.4	-24.9	30.7	210	100	Hori.	46.0	15.3	
827.155	30.7	QP	21.1	-24.4	27.4	206	149	Hori.	46.0	18.6	
840.716	34.2	QP	21.3	-24.2	31.3	202	146	Hori.	46.0	14.7	

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

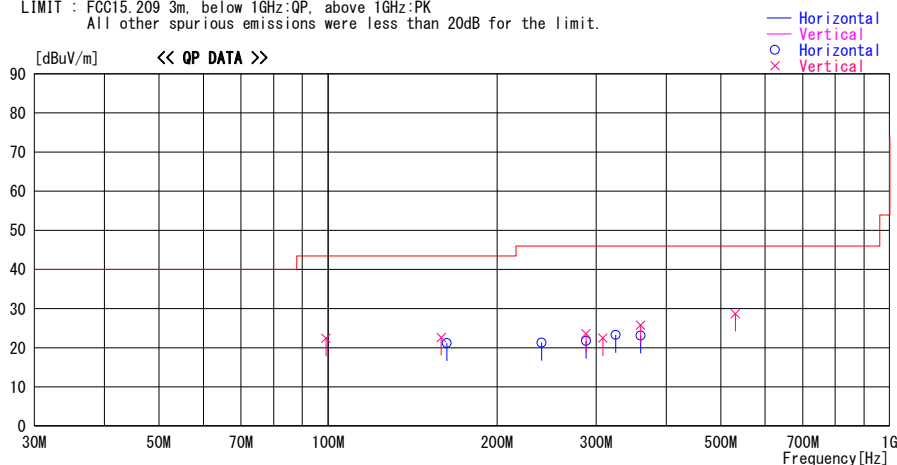
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, with Type A Card, Worst-axis(PC style, Hor:X Ver:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
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]	
99.141	43.4	QP	9.8	-30.8	22.4	351	100	Vert.	43.5	21.1	
159.022	37.4	QP	15.1	-29.9	22.6	290	100	Vert.	43.5	20.9	
162.759	35.8	QP	15.3	-29.9	21.2	227	179	Hori.	43.5	22.3	
239.998	38.0	QP	12.3	-29.0	21.3	356	117	Hori.	46.0	24.7	
287.997	36.9	QP	13.2	-28.4	21.7	78	118	Hori.	46.0	24.3	
288.000	38.8	QP	13.2	-28.4	23.6	348	156	Vert.	46.0	22.4	
308.451	37.1	QP	13.6	-28.2	22.5	9	161	Vert.	46.0	23.5	
324.998	37.3	QP	14.0	-28.0	23.3	80	100	Hori.	46.0	22.7	
359.994	38.6	QP	14.8	-27.6	25.8	13	136	Vert.	46.0	20.2	
359.999	35.9	QP	14.8	-27.6	23.1	96	100	Hori.	46.0	22.9	
531.019	36.9	QP	18.0	-26.2	28.7	0	100	Vert.	46.0	17.3	

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

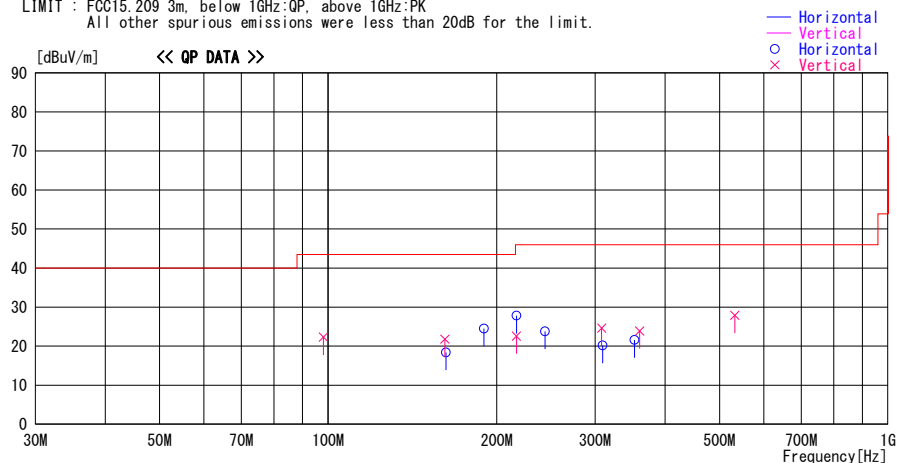
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz, without Type B Card, Worst-axis(PC style, Hor:X Ver:X)

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



Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
98.121	43.5	QP	9.6	-30.8	22.3	9	100	Vert.	43.5	21.2	
161.637	36.5	QP	15.2	-29.9	21.8	239	100	Vert.	43.5	21.7	
162.333	33.0	QP	15.3	-29.9	18.4	208	300	Hori.	43.5	25.1	
189.838	38.0	QP	16.1	-29.6	24.5	48	167	Hori.	43.5	19.0	
216.959	40.1	QP	11.8	-29.3	22.6	300	174	Vert.	46.0	23.4	
216.959	45.3	QP	11.8	-29.3	27.8	36	155	Hori.	46.0	18.2	
244.076	40.3	QP	12.4	-28.9	23.8	273	122	Hori.	46.0	22.2	
307.971	39.2	QP	13.6	-28.2	24.6	359	165	Vert.	46.0	21.4	
309.128	34.8	QP	13.6	-28.2	20.2	77	100	Hori.	46.0	25.8	
352.555	34.7	QP	14.6	-27.7	21.6	359	100	Hori.	46.0	24.4	
359.994	36.7	QP	14.8	-27.6	23.9	6	201	Vert.	46.0	22.1	
532.622	36.0	QP	18.1	-26.2	27.9	13	199	Vert.	46.0	18.1	

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

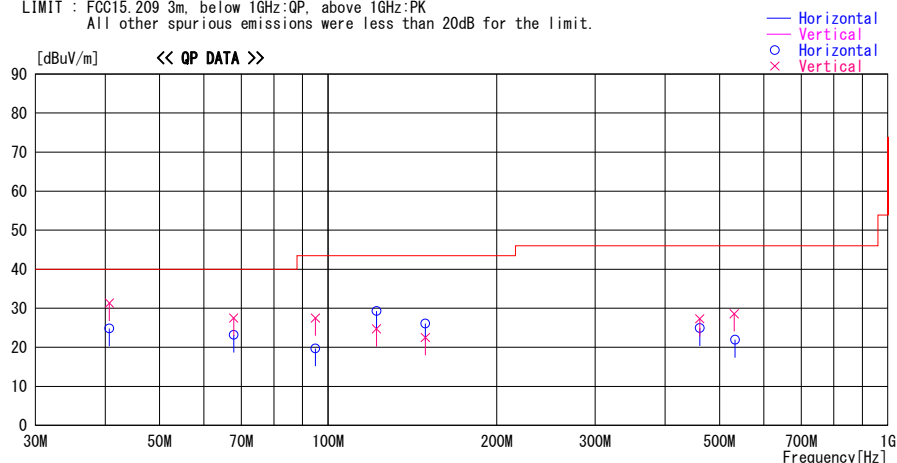
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz, with Type B Card, Worst-axis(PC style, Hor:X Ver:X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
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]	
40.679	42.3	QP	14.0	-31.5	24.8	302	246	Hori.	40.0	15.2	
40.680	48.8	QP	14.0	-31.5	31.3	251	100	Vert.	40.0	8.7	
67.800	47.9	QP	6.4	-31.1	23.2	0	228	Hori.	40.0	16.8	
67.800	52.2	QP	6.4	-31.1	27.5	249	100	Vert.	40.0	12.5	
94.910	41.3	QP	9.2	-30.8	19.7	359	100	Hori.	43.5	23.8	
94.919	49.1	QP	9.2	-30.8	27.5	234	100	Vert.	43.5	16.0	
122.037	46.8	QP	13.0	-30.5	29.3	180	265	Hori.	43.5	14.2	
122.038	42.2	QP	13.0	-30.5	24.7	38	100	Vert.	43.5	18.8	
149.158	41.5	QP	14.7	-30.1	26.1	182	281	Hori.	43.5	17.4	
149.185	37.8	QP	14.8	-30.1	22.5	92	100	Vert.	43.5	21.0	
461.033	34.7	QP	16.9	-26.7	24.9	268	226	Hori.	46.0	21.1	
461.036	37.1	QP	16.9	-26.7	27.3	16	100	Vert.	46.0	18.7	
531.275	36.8	QP	18.0	-26.2	28.6	1	100	Vert.	46.0	17.4	
533.158	30.0	QP	18.1	-26.2	21.9	0	200	Hori.	46.0	24.1	

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

9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

ANSI C63.10-2013

RESULTS

Modulation Type A without Card

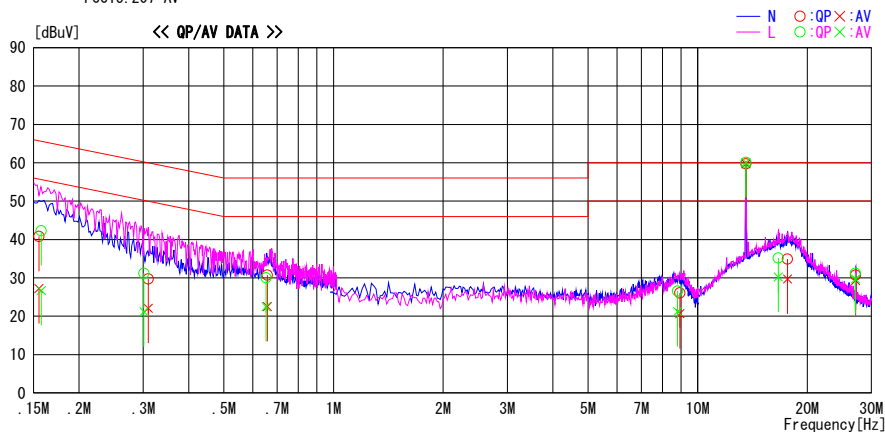
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No. 1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz without Type A Card with cradle

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15530	27.6	14.0	13.2	40.8	27.2	65.7	55.7	24.9	28.5	N	
0.15750	29.1	13.5	13.2	42.3	26.7	65.6	55.6	23.3	28.9	L	
0.30144	17.9	7.9	13.3	31.2	21.2	60.2	50.2	29.0	29.0	L	
0.65278	16.6	9.1	13.4	30.0	22.5	56.0	46.0	26.0	23.5	L	
0.30980	16.4	8.8	13.3	29.7	22.1	60.0	50.0	30.3	27.9	N	
0.65788	17.3	9.1	13.4	30.7	22.5	56.0	46.0	25.3	23.5	N	
8.80313	12.3	6.9	14.3	26.6	21.2	60.0	50.0	33.4	28.8	L	
8.93031	11.8	6.4	14.3	26.1	20.7	60.0	50.0	33.9	29.3	N	
13.56000	45.4	45.4	14.7	60.1	60.1	60.0	50.0	-	-	L	Refer to Page 32
13.56000	45.0	45.0	14.7	59.7	59.7	60.0	50.0	-	-	N	Refer to Page 32
16.63861	20.2	15.2	15.0	35.2	30.2	60.0	50.0	24.8	19.8	L	
27.11300	15.7	14.2	15.5	31.2	29.7	60.0	50.0	28.8	20.3	L	
17.64271	19.9	14.7	15.0	34.9	29.7	60.0	50.0	25.1	20.3	N	
27.12000	15.2	13.8	15.5	30.7	29.3	60.0	50.0	29.3	20.7	N	

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

Modulation Type A with Card

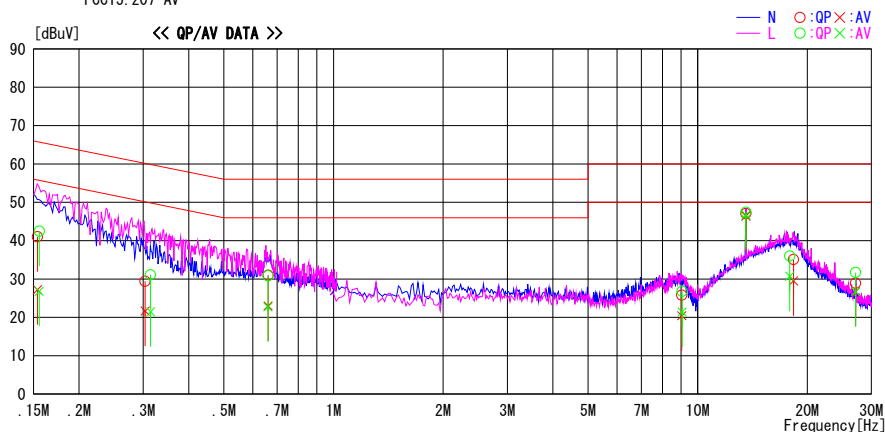
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz with Type A Card with cradle

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15388	27.8	14.0	13.2	41.0	27.2	65.8	55.8	24.8	28.6	N	
0.15554	29.3	13.6	13.2	42.5	26.8	65.7	55.7	23.2	28.9	L	
0.30385	16.1	8.4	13.3	29.4	21.7	60.1	50.1	30.7	28.4	N	
0.31457	17.8	8.2	13.3	31.1	21.5	59.8	49.8	28.7	28.3	L	
0.66059	17.4	9.3	13.4	30.8	22.7	56.0	46.0	25.2	23.3	L	
0.66103	17.6	9.6	13.4	31.0	23.0	56.0	46.0	25.0	23.0	N	
9.03375	11.5	6.1	14.3	25.8	20.4	60.0	50.0	34.2	29.6	N	
9.06656	12.5	7.1	14.3	26.8	21.4	60.0	50.0	33.2	28.6	L	
13.56000	32.7	32.0	14.7	47.4	46.7	60.0	50.0	12.6	3.3	L	
13.56000	32.4	31.7	14.7	47.1	46.4	60.0	50.0	12.9	3.6	N	
17.88561	21.0	15.7	15.0	36.0	30.7	60.0	50.0	24.0	19.3	L	
27.11900	16.2	11.2	15.5	31.7	26.7	60.0	50.0	28.3	23.3	L	
18.32148	20.0	14.4	15.1	35.1	29.5	60.0	50.0	24.9	20.5	N	
27.11880	13.4	11.2	15.5	28.9	26.7	60.0	50.0	31.1	23.3	N	

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

Modulation Type B with Card

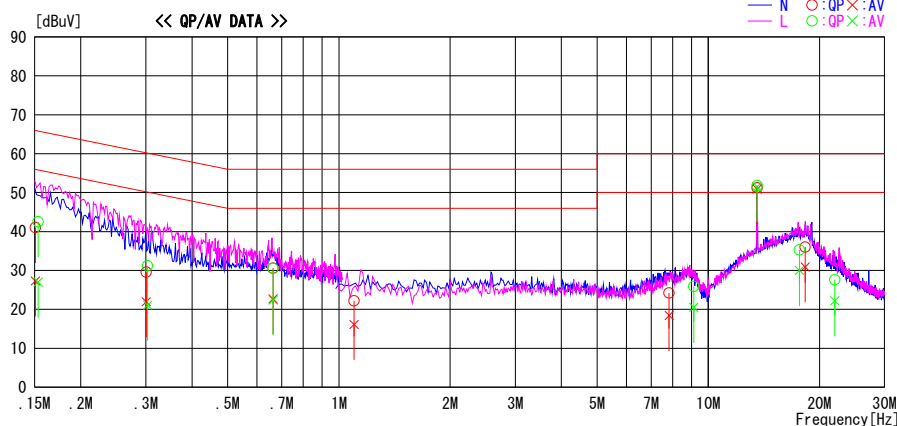
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz with Type B Card with cradle_報告用_2

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15081	27.8	14.1	13.2	41.0	27.3	66.0	56.0	25.0	28.7	N	
0.15335	29.3	13.8	13.2	42.5	27.0	65.8	55.8	23.3	28.8	L	
0.30096	16.3	8.7	13.3	29.6	22.0	60.2	50.2	30.6	28.2	N	
0.30346	17.9	7.8	13.3	31.2	21.1	60.1	50.1	28.9	29.0	L	
0.66330	17.2	9.3	13.4	30.6	22.7	56.0	46.0	25.4	23.3	N	
0.66343	17.1	9.0	13.4	30.5	22.4	56.0	46.0	25.5	23.6	L	
1.09881	8.8	2.7	13.4	22.2	16.1	56.0	46.0	33.8	29.9	N	
7.83100	10.0	4.2	14.2	24.2	18.4	60.0	50.0	35.8	31.6	N	
9.13150	11.6	6.2	14.3	25.9	20.5	60.0	50.0	34.1	29.5	L	
13.56000	37.1	36.8	14.7	51.8	51.5	60.0	50.0	-	-	L	Refer to Page 32
13.56000	36.5	36.2	14.7	51.2	50.9	60.0	50.0	-	-	N	Refer to Page 32
17.64000	20.3	15.0	15.0	35.3	30.0	60.0	50.0	24.7	20.0	L	
18.28700	20.9	15.8	15.1	36.0	30.9	60.0	50.0	24.0	19.1	N	
21.99250	12.4	7.0	15.2	27.6	22.2	60.0	50.0	32.4	27.8	L	

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

Modulation Type B without Card

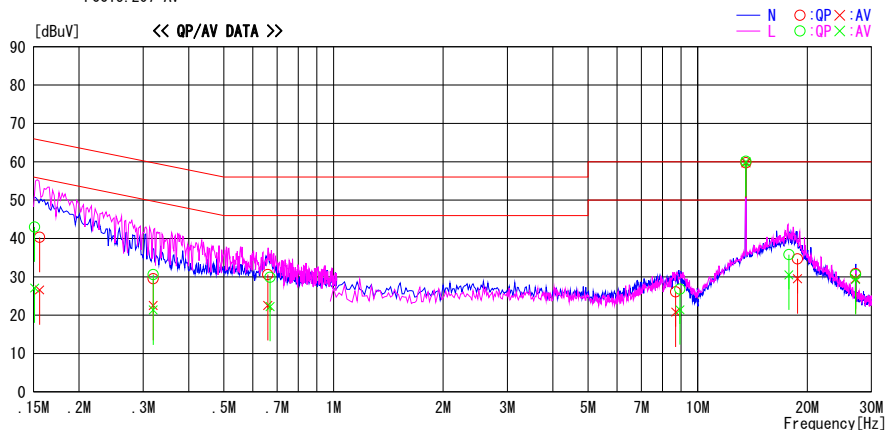
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2016/05/25

Report No. : 11290611H
Power : AC 120V / 60Hz
Temp./Humi. : 23deg. C / 47% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz without Type B Card with cradle

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15105	29.8	13.9	13.2	43.0	27.1	65.9	55.9	22.9	28.8	L	
0.15582	27.1	13.4	13.2	40.3	26.6	65.7	55.7	25.4	29.1	N	
0.31951	17.3	8.1	13.3	30.6	21.4	59.7	49.7	29.1	28.3	L	
0.31960	16.2	9.2	13.3	29.5	22.5	59.7	49.7	30.2	27.2	N	
0.65954	17.2	9.1	13.4	30.6	22.5	56.0	46.0	25.4	23.5	N	
0.66956	16.5	8.9	13.4	29.9	22.3	56.0	46.0	26.1	23.7	L	
8.70219	11.8	6.5	14.3	26.1	20.8	60.0	50.0	33.9	29.2	N	
8.93781	12.5	7.1	14.3	26.8	21.4	60.0	50.0	33.2	28.6	L	
13.56000	45.4	45.3	14.7	60.1	60.0	60.0	50.0	-	-	L	Refer to Page 32
13.56000	45.0	45.0	14.7	59.7	59.7	60.0	50.0	-	-	N	Refer to Page 32
17.79305	20.8	15.5	15.0	35.8	30.5	60.0	50.0	24.2	19.5	L	
27.12160	15.1	13.8	15.5	30.6	29.3	60.0	50.0	29.4	20.7	L	
18.78428	19.6	14.4	15.1	34.7	29.5	60.0	50.0	25.3	20.5	N	
27.11875	15.3	14.0	15.5	30.8	29.5	60.0	50.0	29.2	20.5	N	

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

RFID ANT Termination

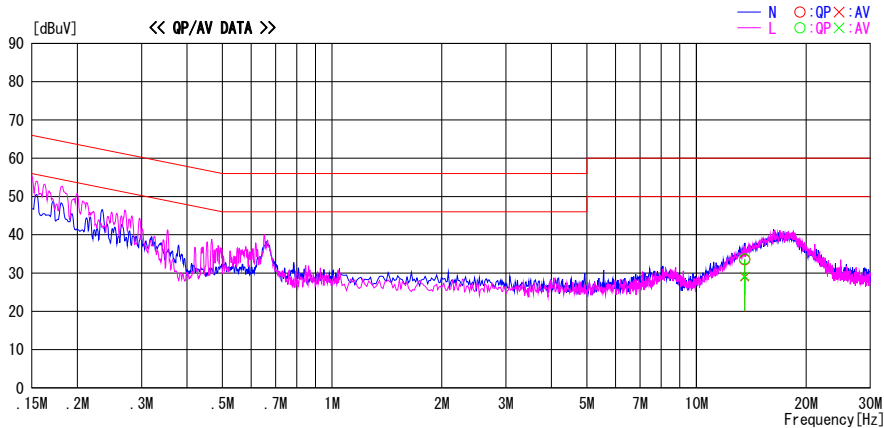
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 06/03/2016

Report No. : 11290611H
Power : AC120V / 60Hz
Temp./Humi. : 25deg. C / 49% RH
Engineer : Hiroyuki Furutaka

Mode / Remarks : Tx 13.56MHz RFID ANT Termination

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	19.0	14.5	14.5	33.5	29.0	60.0	50.0	26.5	21.0	N	
13.56000	19.2	14.7	14.5	33.7	29.2	60.0	50.0	26.3	20.8	L	

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

10. FREQUENCY STABILITY

LIMIT

§15.225 (e)

he frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST PROCEDURE

ANSI C63.10-2013

RESULTS

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	138V	Power on	13.559971	-0.000029	-2.14	100.00	97.86
		on 2min.	13.559962	-0.000038	-2.80	100.00	97.20
		on 5min.	13.559958	-0.000042	-3.10	100.00	96.90
		on 10min.	13.559954	-0.000046	-3.39	100.00	96.61
	120V	Power on	13.559957	-0.000043	-3.17	100.00	96.83
		on 2min.	13.559952	-0.000048	-3.54	100.00	96.46
		on 5min.	13.559950	-0.000050	-3.69	100.00	96.31
		on 10min.	13.559950	-0.000050	-3.69	100.00	96.31
	102V	Power on	13.559960	-0.000040	-2.95	100.00	97.05
		on 2min.	13.559954	-0.000046	-3.39	100.00	96.61
		on 5min.	13.559952	-0.000048	-3.54	100.00	96.46
		on 10min.	13.559951	-0.000049	-3.61	100.00	96.39
50deg.C.	120V	Power on	13.559809	-0.000191	-14.09	100.00	85.91
		on 2min.	13.559803	-0.000197	-14.53	100.00	85.47
		on 5min.	13.559800	-0.000200	-14.75	100.00	85.25
		on 10min.	13.559799	-0.000201	-14.82	100.00	85.18
40deg.C.		Power on	13.559857	-0.000143	-10.55	100.00	89.45
		on 2min.	13.559850	-0.000150	-11.06	100.00	88.94
		on 5min.	13.559848	-0.000152	-11.21	100.00	88.79
		on 10min.	13.559847	-0.000153	-11.28	100.00	88.72
30deg.C.		Power on	13.559918	-0.000082	-6.05	100.00	93.95
		on 2min.	13.559910	-0.000090	-6.64	100.00	93.36
		on 5min.	13.559906	-0.000094	-6.93	100.00	93.07
		on 10min.	13.559904	-0.000096	-7.08	100.00	92.92
20deg.C.		Power on	13.559957	-0.000043	-3.17	100.00	96.83
		on 2min.	13.559952	-0.000048	-3.54	100.00	96.46
		on 5min.	13.559950	-0.000050	-3.69	100.00	96.31
		on 10min.	13.559950	-0.000050	-3.69	100.00	96.31
10deg.C.		Power on	13.560021	0.000021	1.55	100.00	98.45
		on 2min.	13.560013	0.000013	0.96	100.00	99.04
		on 5min.	13.560010	0.000010	0.74	100.00	99.26
		on 10min.	13.560006	0.000006	0.44	100.00	99.56
0deg.C.		Power on	13.560059	0.000059	4.35	100.00	95.65
		on 2min.	13.560053	0.000053	3.91	100.00	96.09
		on 5min.	13.560050	0.000050	3.69	100.00	96.31
		on 10min.	13.560048	0.000048	3.54	100.00	96.46
-10deg.C.		Power on	13.560080	0.000080	5.90	100.00	94.10
		on 2min.	13.560078	0.000078	5.75	100.00	94.25
		on 5min.	13.560076	0.000076	5.60	100.00	94.40
		on 10min.	13.560074	0.000074	5.46	100.00	94.54
-20deg.C		Power on	13.560073	0.000073	5.38	100.00	94.62
		on 2min.	13.560077	0.000077	5.68	100.00	94.32
		on 5min.	13.560079	0.000079	5.83	100.00	94.17
		on 10min.	13.560080	0.000080	5.90	100.00	94.10
Limit :		13.56	13.56 MHz +/-0.01 % (+/- 100ppm) =		+/- 0.001356 MHz		

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

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

11. 20dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 20dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 20dB bandwidth function is utilized.

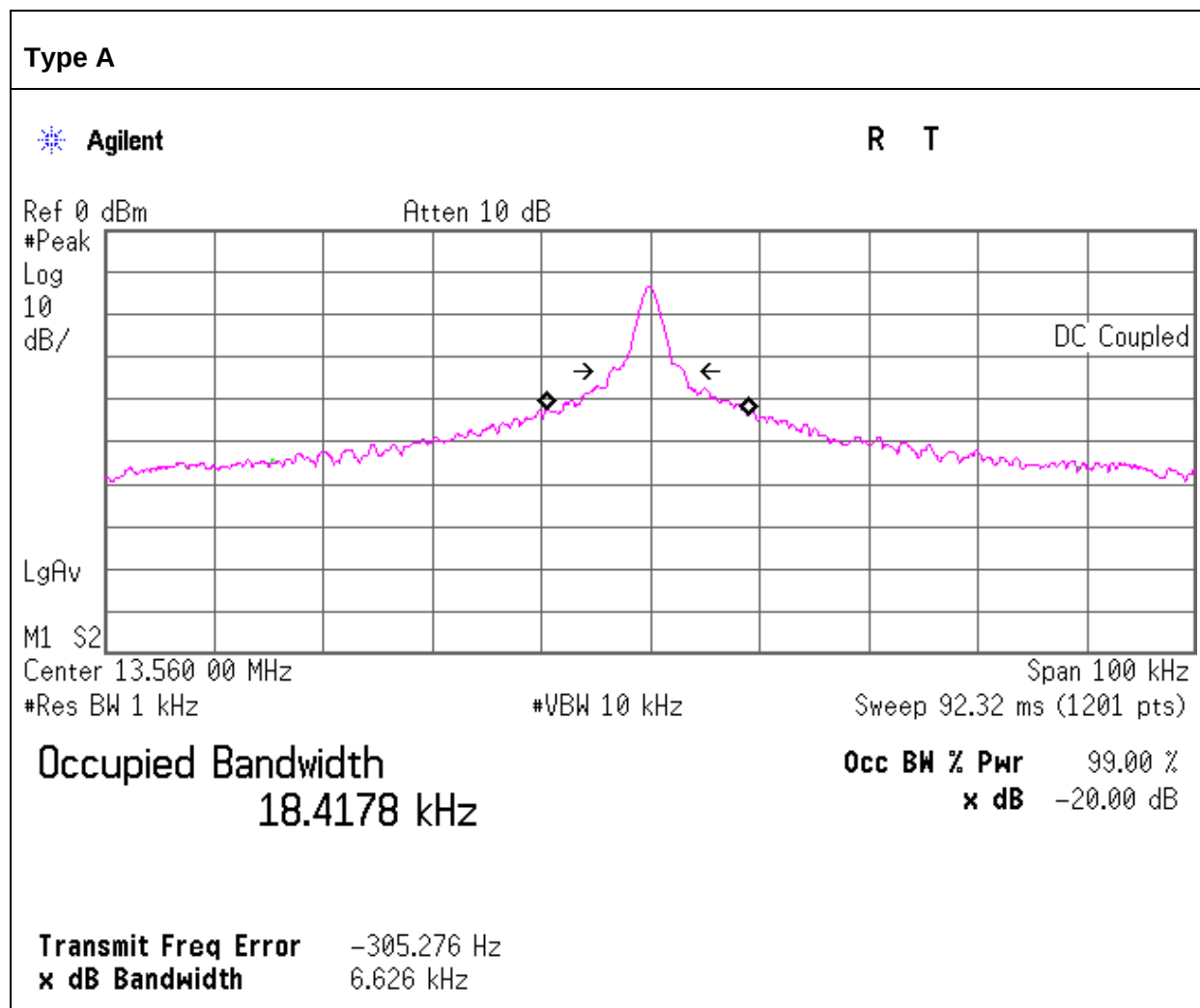
RESULTS

Frequency (MHz)	20dB Bandwidth (KHz)
13.56, Type A	6.63
13.56, Type B	6.73

20dB BANDWIDTH

Type A

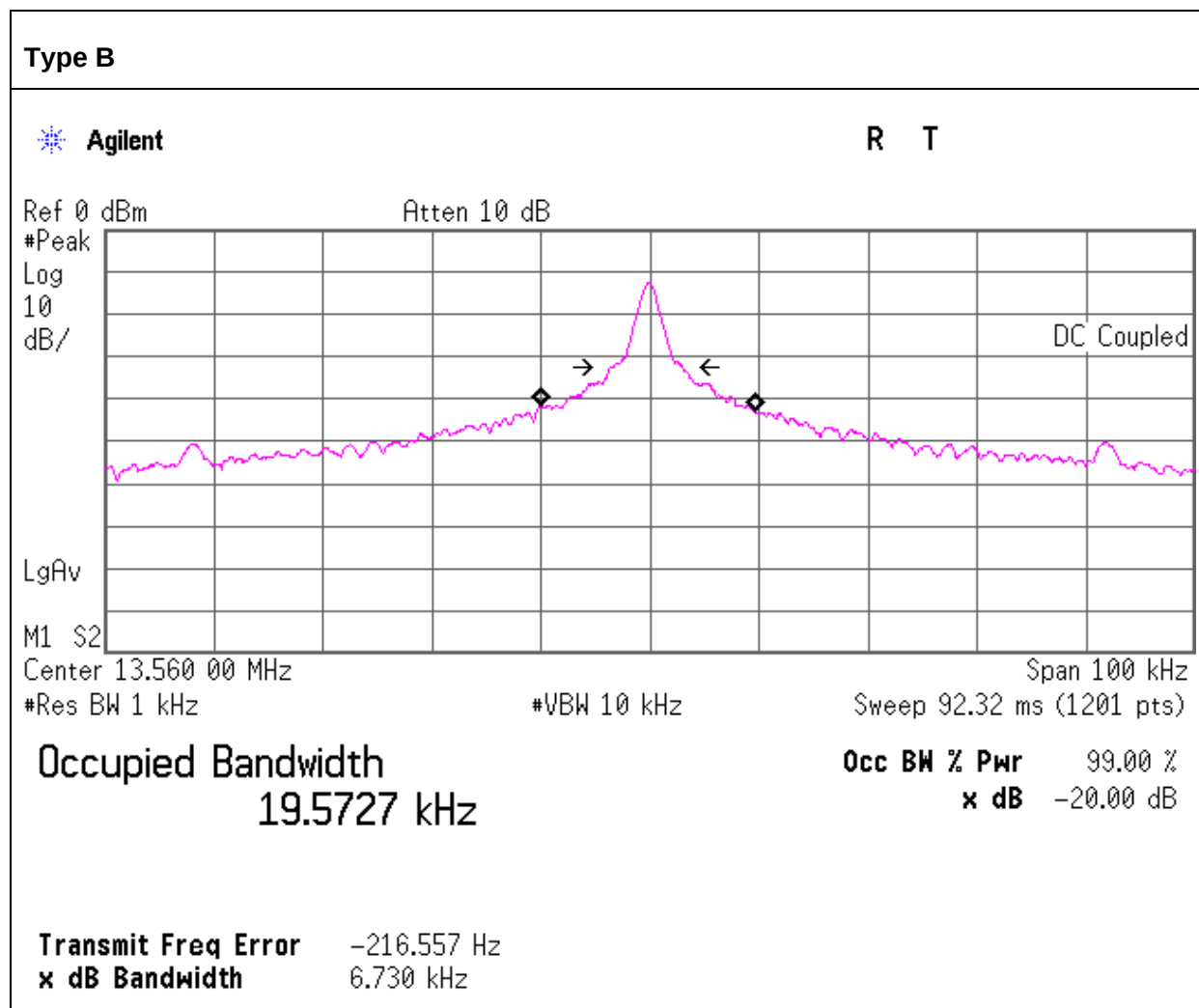
FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	6.63	18.42



20dB BANDWIDTH

Type B (With Tag)

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	6.73	19.57



12. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f , is in MHz.
2. A power density of 10 W/m² is equivalent to 1 mW/cm².
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mWc/m² by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

EIRP = E field at 30 m distance – 75.2

E field at 30 m distance = 10.0 dBuV/m

EIRP = 10.0 – 75.2 = -65.2 dBm = 0.000000301 mW this is less than 443mW based on section 4.3.1 of KDB447498 therefore this test is N/A.