



**FCC CFR47 PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

**FOR**

**RFID MODULE**

**MODEL NUMBER: RI14A**

**FCC ID: ACJ9TGRI14A**

**REPORT NUMBER: 10227857H-A-R1**

**ISSUE DATE: March 25, 2014**

*Prepared for*

**PANASONIC CORPORATION OF NORTH AMERICA  
ONE PANASONIC WAY, 4B-8  
SECAUCUS, NEW JERSEY, 07094, USA**

*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>

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	03/20/2014	Initial Issue	T. Hatakeda
1	03/25/2014	<ol style="list-style-type: none"><li>1. Page 5: Correction of typing error (from ANSI C63 10-2009 to ANSI C63 4-2003)</li><li>2. Page 13: Correction of test data</li><li>3. Page 17: Addition of test data</li><li>4. Page 27: Correction of typing error (from ANSI/TIA/EIA 603 Clause 2.3.1 and 2.3.2 to ANSI C63 4)</li></ol> <p>*This report is a revised version of 10227857H-A, which is replaced with this report.</p>	T. Hatakeda

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PANASONIC CORPORATION OF NORTH AMERICA  
ONE PANASONIC WAY, 4B-8  
SECAUCUS, NEW JERSEY, 07094, USA

**EUT DESCRIPTION:** RFID MODULE

**MODEL:** RI14A

**SERIAL NUMBER:** 2HTSA00252

**DATE TESTED:** February 28 and March 5, 2014

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 of WiSE Japan  
UL Verification Services  
UL Japan, Inc.

Keisuke Kawamura  
Engineer of WiSE Japan  
UL Verification Services  
UL Japan, Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, 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:

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

### 4.3. MEASUREMENT UNCERTAINTY

#### EMI

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

Test room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(±dB)				(1m*)(±dB)		(0.5m*)(±dB)
	9kHz -30MHz	30MHz - 300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

\*3m/1m/0.5m = Measurement distance

Frequency counter (+)	
Normal condition	Extreme condition
$7 \times 10^{-6}$	$9 \times 10^{-6}$

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an RFID module that is embedded inside Panasonic laptop model FZ-M1. The radio module is manufactured by NXP.

### 5.2. 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	18.6
13.56	Normal Mode Type B	18.6

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Loop antenna.

### 5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Regulation test EMVco\_loopback.exe

### 5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was inside the tablet PC, so all test were performed as regular normal position.

### 5.6. MODIFICATIONS

No modifications were made during testing.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Panasonic	FZ-M1	3KTSA00146	--
AC Adapter	Panasonic	CF-AA6373A	6373AM113800222B	D of C

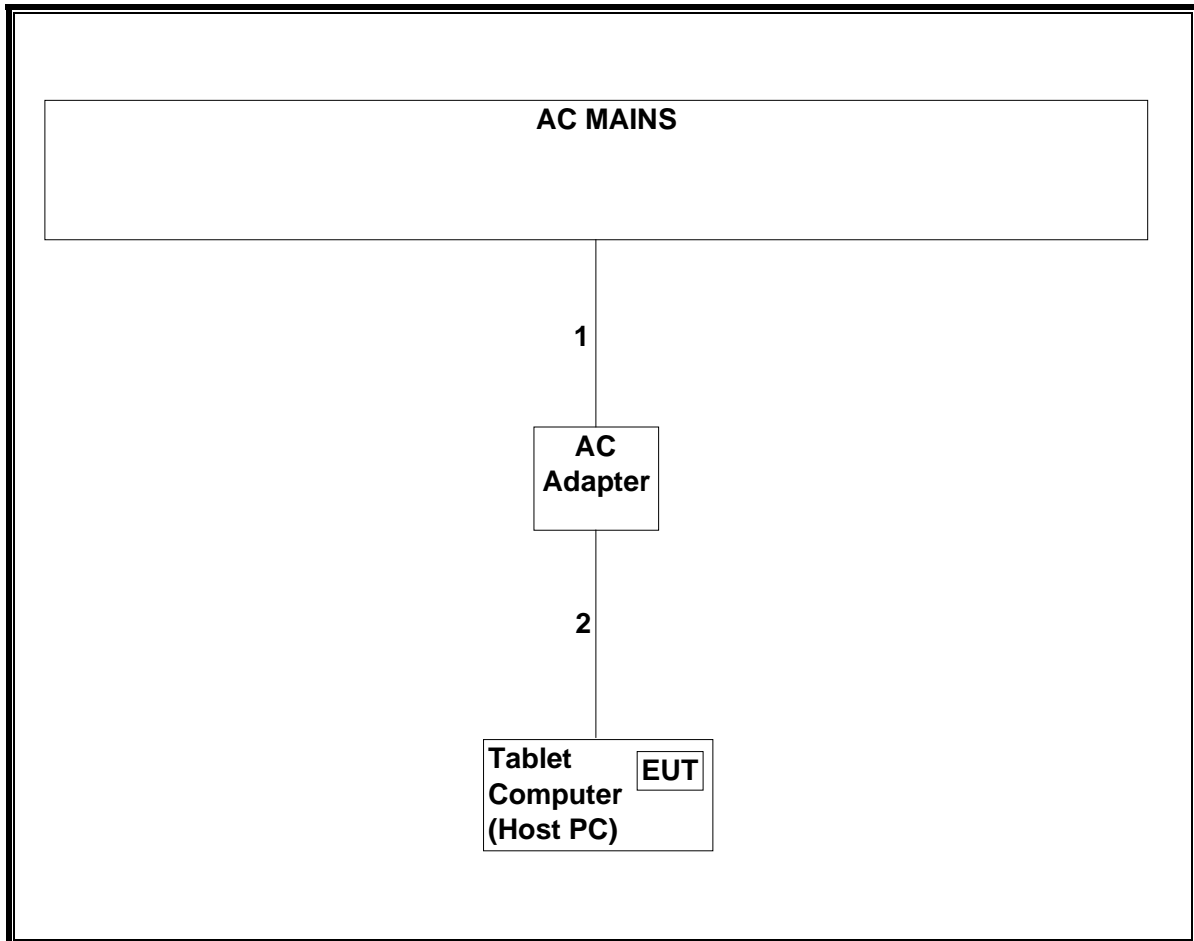
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Un-Shielded	1.80 m	N/A
2	DC	1	DC	Un-Shielded	1.80 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**



## 6. 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)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MRENT-112	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2013/10/04 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2013/11/26 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	CE	2014/02/20 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE	2014/01/27 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2014/01/20 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	RE/CE	2013/07/23 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2013/11/11 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2013/10/30 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2013/07/22 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	1401	FT	2014/02/20 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	FT	2013/08/23 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2013/08/07 * 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

## 7. RADIATED EMISSION TEST RESULTS

### 7.1. 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 C63.4

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.

**RESULTS**

**7.2. FUNDAMENTAL EMISSION**

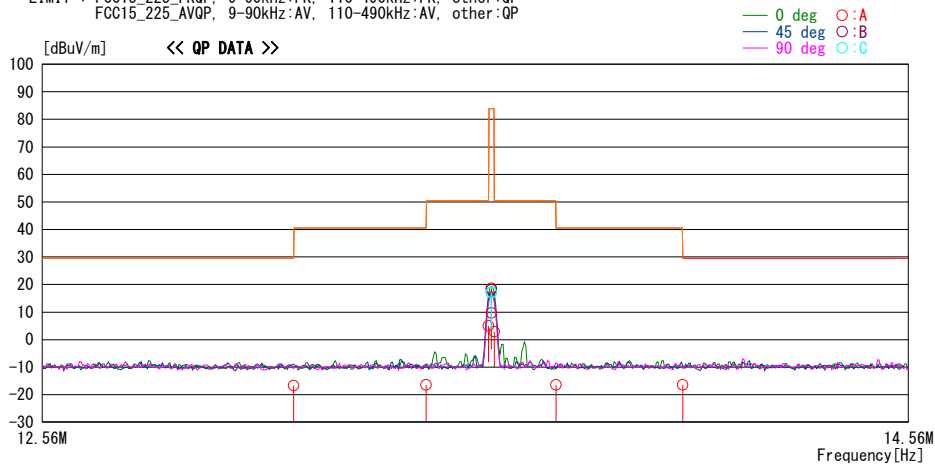
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./ Humi. : 24deg. C / 37% RH  
 Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz without Type A tag Worst axis Y

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	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	29.3	QP	19.7	-33.5	32.2	-16.7	29.5	46.2	0	A	180 Y
13.41000	29.4	QP	19.7	-33.4	32.2	-16.5	40.5	57.0	0	A	180 Y
13.55300	50.8	QP	19.7	-33.4	32.2	4.9	50.4	45.5	0	A	180 Y
13.56000	62.9	QP	19.7	-33.4	32.2	17.0	83.9	66.9	135	C	200 Y
13.56000	55.6	QP	19.7	-33.4	32.2	9.7	83.9	74.2	0	A	170 Y Hori
13.56000	64.5	QP	19.7	-33.4	32.2	18.6	83.9	65.3	0	A	180 Y
13.56000	64.0	QP	19.7	-33.4	32.2	18.1	83.9	65.8	45	B	328 Y
13.56000	63.0	QP	19.7	-33.4	32.2	17.1	83.9	66.8	90	C	250 Y
13.56700	48.8	QP	19.7	-33.4	32.2	2.9	50.4	47.5	0	A	180 Y
13.71000	29.4	QP	19.7	-33.4	32.2	-16.5	40.5	57.0	0	A	180 Y
14.01000	29.4	QP	19.7	-33.4	32.2	-16.5	29.5	46.0	0	A	180 Y

CHART: WITH FACTOR, ANT TYPE: LOOP, Except for the data below: adequate margin data below the limits  
 CALCULATION : RESULT[dBuV] = READING[dBuV] + ANT FACTOR[dB] + LOSS[dB] (CABLE + AT+ D. Factor)

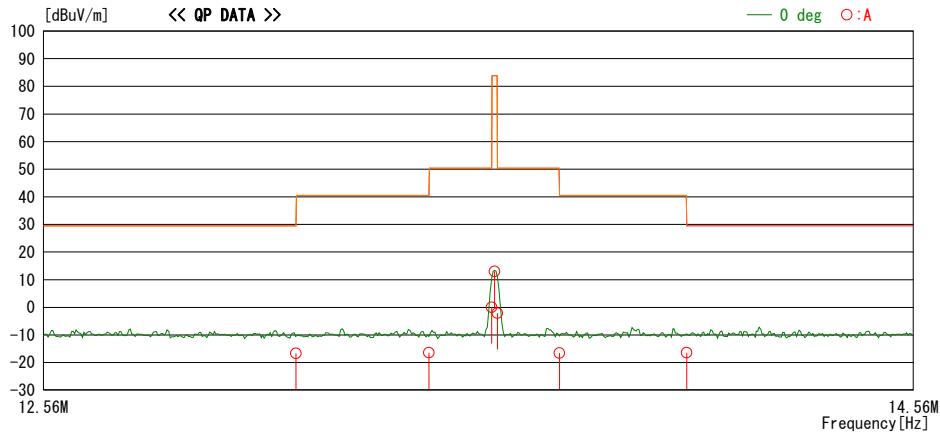
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/03/05

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./ Humi. : 24deg. C / 37% RH  
 Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz with Type A tag Worst axis Y

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	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	29.3	QP	19.7	-33.5	32.2	-16.7	29.5	46.2	0	A	180
13.41000	29.4	QP	19.7	-33.4	32.2	-16.5	40.5	57.0	0	A	180
13.55300	45.8	QP	19.7	-33.4	32.2	-0.1	50.4	50.5	0	A	180
13.56000	58.9	QP	19.7	-33.4	32.2	13.0	83.9	70.9	0	A	180
13.56700	43.8	QP	19.7	-33.4	32.2	-2.1	50.4	52.5	0	A	180
13.71000	29.3	QP	19.7	-33.4	32.2	-16.6	40.5	57.1	0	A	180
14.01000	29.4	QP	19.7	-33.4	32.2	-16.5	29.5	46.0	0	A	180

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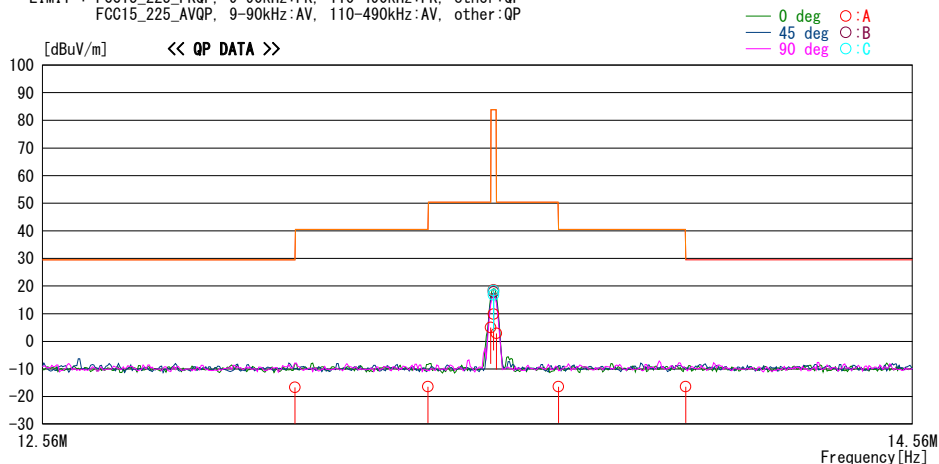
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13.56000	55.7	QP	19.7	-33.4	32.2	9.8	83.9	74.1	0	A	170 Y Hori
13.56000	64.5	QP	19.7	-33.4	32.2	18.6	83.9	65.3	0	A	180 Y
13.56000	63.7	QP	19.7	-33.4	32.2	17.8	83.9	66.1	45	B	345 Y
13.56000	62.6	QP	19.7	-33.4	32.2	16.7	83.9	67.2	90	C	240 Y
13.56700	48.7	QP	19.7	-33.4	32.2	2.8	50.4	47.6	0	A	180 Y
13.71000	29.5	QP	19.7	-33.4	32.2	-16.4	40.5	56.9	0	A	180 Y
14.01000	29.5	QP	19.7	-33.4	32.2	-16.4	29.5	45.9	0	A	180 Y

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

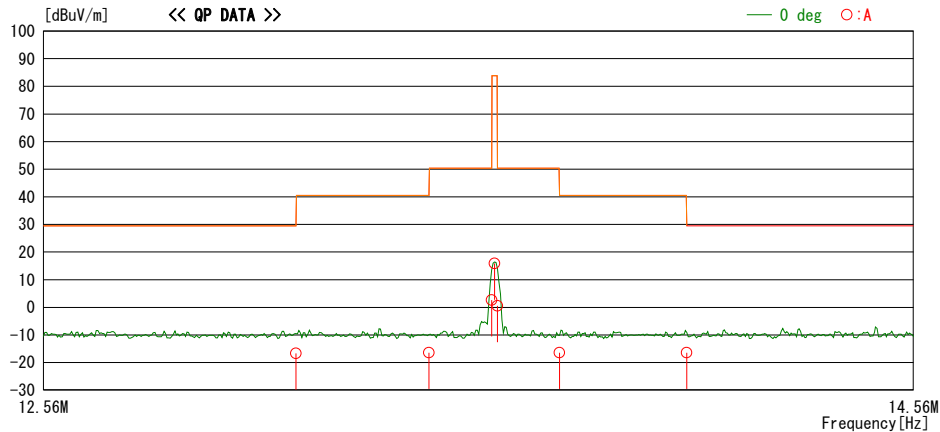
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13.41000	29.5	QP	19.7	-33.4	32.2	-16.4	40.5	56.9	0	A	180
13.55300	48.5	QP	19.7	-33.4	32.2	2.6	50.4	47.8	0	A	180
13.56000	61.7	QP	19.7	-33.4	32.2	15.8	83.9	68.1	0	A	180
13.56700	46.4	QP	19.7	-33.4	32.2	0.5	50.4	49.9	0	A	180
13.71000	29.4	QP	19.7	-33.4	32.2	-16.5	40.5	57.0	0	A	180
14.01000	29.4	QP	19.7	-33.4	32.2	-16.5	29.5	46.0	0	A	180

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

**Result of the fundamental emission at 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	64.5	19.7	6.6	32.2	-	58.6	-	-	without Type A tag
0	13.56000	QP	58.9	19.7	6.6	32.2	-	53.0	-	-	with Type A tag
0	13.56000	QP	64.5	19.7	6.6	32.2	-	58.6	-	-	without Type B tag
0	13.56000	QP	61.7	19.7	6.6	32.2	-	55.8	-	-	with Type B tag

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

### 7.3. SPURIOUS EMISSIONS (0.15 – 30 MHz)

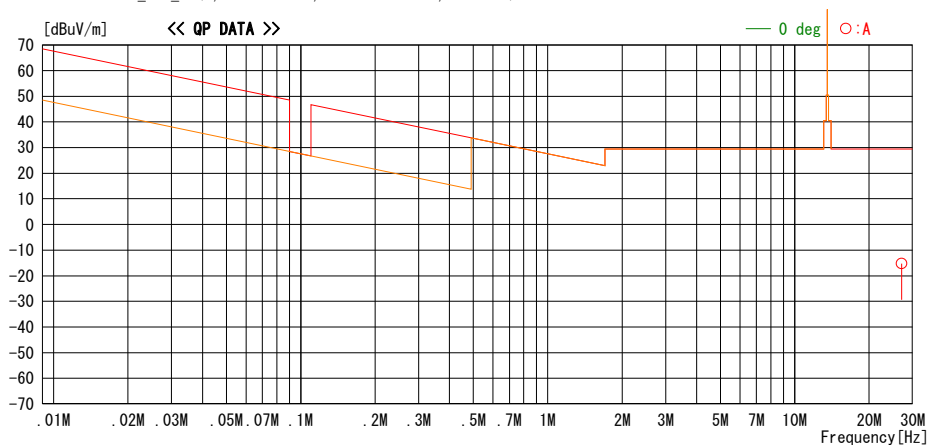
#### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/03/05

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp. / Humi. : 24deg. C / 37% RH  
 Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz without Type A tag Worst axis Y

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.4	QP	20.7	-33.2	32.2	-15.3	29.5	44.8	0	A	359

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

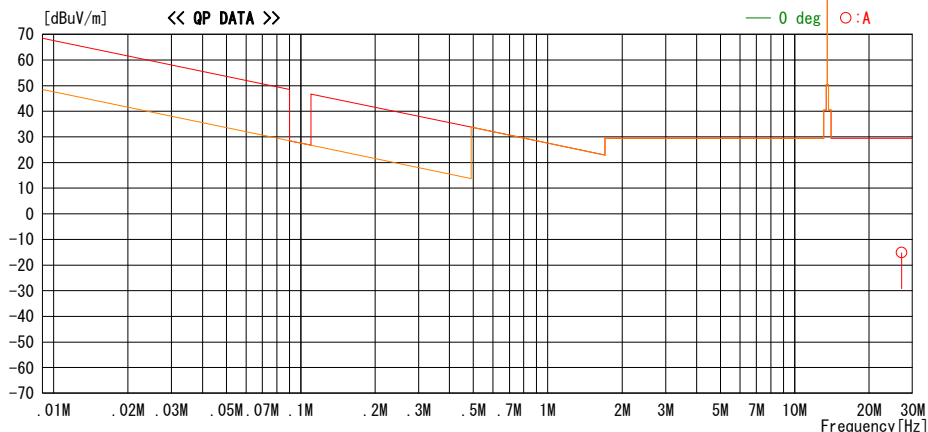
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/03/05

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./ Humi. : 24deg. C / 37% RH  
 Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz with Type A tag Worst axis Y

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	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	29.6	QP	20.7	-33.2	32.2	-15.1	29.5	44.6	0	A	359

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

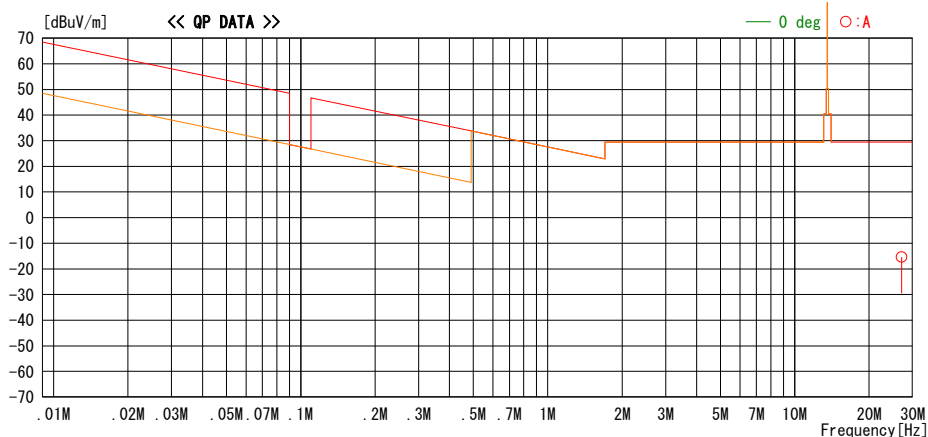
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/03/05

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./ Humi. : 24deg. C / 37% RH  
 Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz without Type B tag Worst axis Y

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	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	29.3	QP	20.7	-33.2	32.2	-15.4	29.5	44.9	0	A	359

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

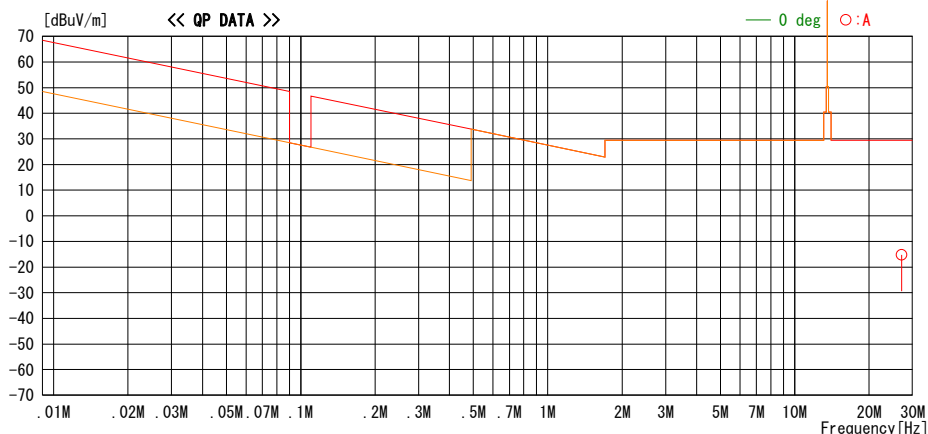
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/03/05

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./ Humi. : 24deg. C / 37% RH  
 Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz with Type B tag Worst axis Y

LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.4	QP	20.7	-33.2	32.2	-15.3	29.5	44.8	0	A	359

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

### 7.4. SPURIOUS EMISSION 30 TO 1000 MHz

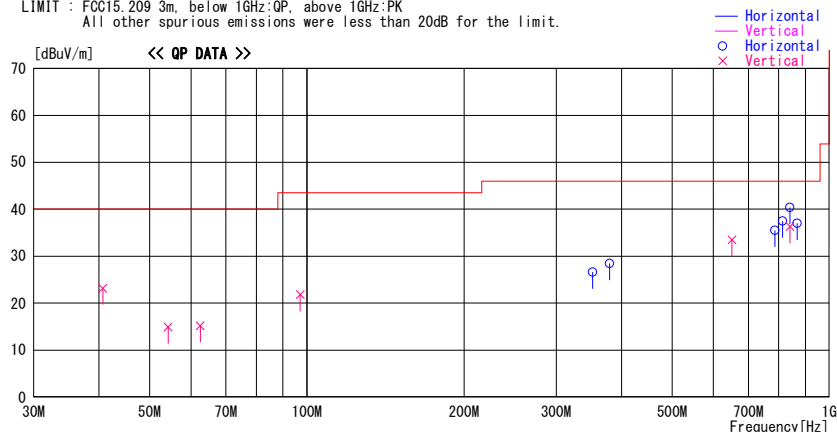
#### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber  
 Date : 2014/02/28

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 20deg. C / 47% RH  
 Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56 with Type A tag Worst axis\_Hori\_Vert\_X

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
40.679	33.8	QP	14.3	-24.9	23.2	293	102	Vert.	40.0	16.8	
54.239	29.9	QP	9.6	-24.6	14.9	0	100	Vert.	40.0	25.1	
62.498	32.2	QP	7.6	-24.6	15.2	298	104	Vert.	40.0	24.8	
97.050	36.3	QP	9.5	-24.0	21.8	260	100	Vert.	43.5	21.7	
352.554	32.3	QP	16.0	-21.7	26.6	208	100	Hori.	46.0	19.4	
379.674	33.0	QP	16.9	-21.5	28.4	13	237	Hori.	46.0	17.6	
650.869	33.6	QP	19.9	-20.0	33.5	124	100	Vert.	46.0	12.5	
786.471	32.5	QP	21.8	-18.8	35.5	141	100	Hori.	46.0	10.5	
813.590	33.9	QP	22.1	-18.5	37.5	145	103	Hori.	46.0	8.5	
840.706	32.4	QP	22.1	-18.2	36.3	321	148	Vert.	46.0	9.7	
840.706	36.5	QP	22.1	-18.2	40.4	172	100	Hori.	46.0	5.6	
867.826	32.7	QP	22.2	-17.9	37.0	192	100	Hori.	46.0	9.0	

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

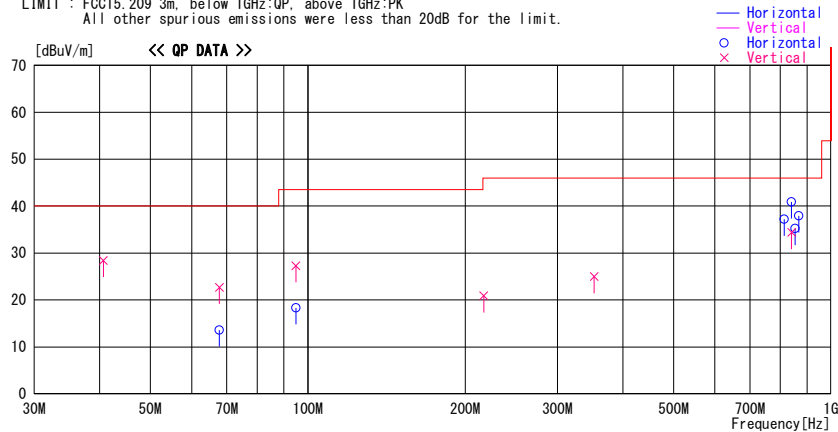
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/02/28

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 20deg. C / 47% RH  
 Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56 with Type B tag Worst axis\_Hori\_ Vert\_X

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
40.680	39.0	QP	14.3	-24.9	28.4	125	100	Vert.	40.0	11.6	
67.799	31.3	QP	6.8	-24.5	13.6	174	400	Hori.	40.0	26.4	
67.799	40.4	QP	6.8	-24.5	22.7	96	102	Vert.	40.0	17.3	
94.919	33.2	QP	9.1	-24.0	18.3	17	162	Hori.	43.5	25.2	
94.919	42.2	QP	9.1	-24.0	27.3	90	104	Vert.	43.5	16.2	
216.957	26.9	QP	16.8	-22.8	20.9	123	100	Vert.	46.0	25.1	
352.555	30.7	QP	16.0	-21.7	25.0	172	100	Vert.	46.0	21.0	
813.588	33.6	QP	22.1	-18.5	37.2	152	100	Hori.	46.0	8.8	
840.708	37.0	QP	22.1	-18.2	40.9	163	100	Hori.	46.0	5.1	
840.707	30.5	QP	22.1	-18.2	34.4	80	100	Vert.	46.0	11.6	
854.171	31.1	QP	22.1	-18.0	35.2	186	100	Hori.	46.0	10.8	
867.828	33.6	QP	22.2	-17.9	37.9	195	100	Hori.	46.0	8.1	

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

## 8. 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 $\mu$ 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 $\mu$ 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 C63.4

**RESULTS**

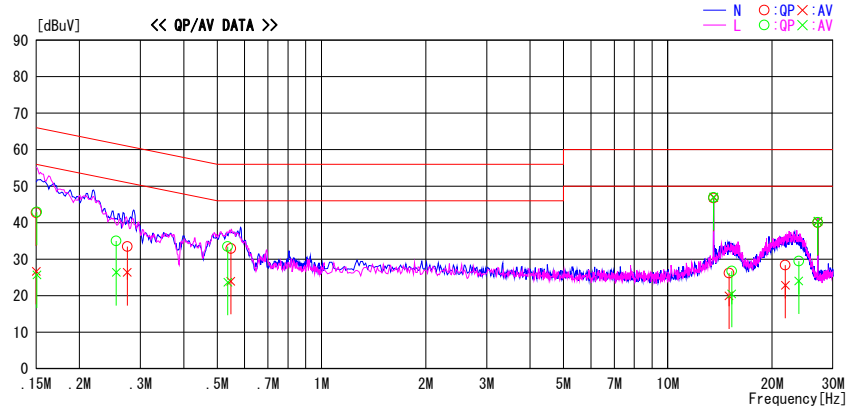
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber  
 Date : 2014/02/28

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 20deg. C / 47% RH  
 Engineer : Tomohisa Nakagawa

Mode / Remarks : 1x 13.56 with type A tag

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]		
0.15000	29.5	13.5	13.2	42.7	26.7	66.0	56.0	23.3	29.3	N	
0.27488	20.2	13.1	13.3	33.5	26.4	61.0	51.0	27.5	24.6	N	
0.54740	19.6	10.7	13.3	32.9	24.0	56.0	46.0	23.1	22.0	N	
13.56000	32.3	32.5	14.4	46.7	46.9	60.0	50.0	13.3	3.1	N	*Carrier
15.03100	11.8	5.6	14.4	26.2	20.0	60.0	50.0	33.8	30.0	N	
21.84520	13.7	8.2	14.7	28.4	22.9	60.0	50.0	31.6	27.1	N	
27.12000	25.0	25.3	15.0	40.0	40.3	60.0	50.0	20.0	9.7	N	
0.15065	29.7	12.5	13.2	42.9	25.7	66.0	56.0	23.1	30.3	L	
0.25543	21.7	13.1	13.3	35.0	26.4	61.6	51.6	26.6	25.2	L	
0.53582	20.2	10.4	13.3	33.5	23.7	56.0	46.0	22.5	22.3	L	
13.56000	32.5	32.7	14.4	46.9	47.1	60.0	50.0	13.1	2.9	L	*Carrier
15.28765	12.3	6.1	14.4	26.7	20.5	60.0	50.0	33.3	29.5	L	
23.86830	14.6	9.2	14.9	29.5	24.1	60.0	50.0	30.5	25.9	L	
27.12000	25.1	25.4	15.0	40.1	40.4	60.0	50.0	19.9	9.6	L	

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

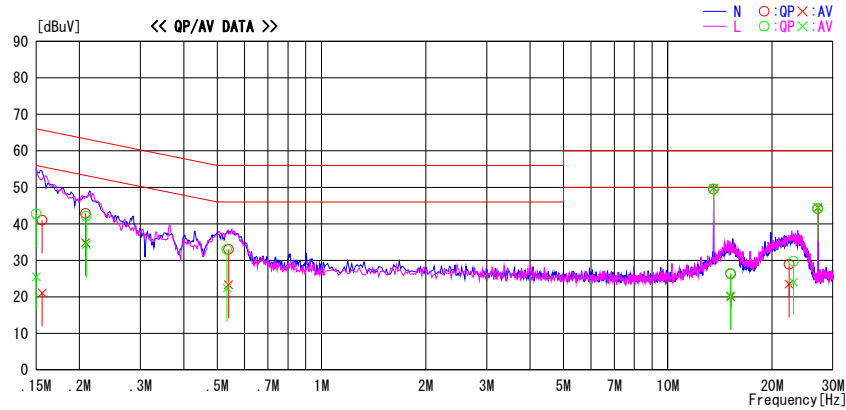
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2014/02/28

Report No. : 10227857H  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 20deg. C / 47% RH  
 Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56 with Type B tag

LIMIT : FCC15.207 QP  
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15613	27.8	7.9	13.2	41.0	21.1	65.7	55.7	24.7	34.6	N	
0.20830	29.5	21.6	13.3	42.8	34.9	63.3	53.3	20.5	18.4	N	
0.53925	19.7	10.0	13.3	33.0	23.3	56.0	46.0	23.0	22.7	N	
13.56000	35.1	35.4	14.4	49.5	49.8	60.0	50.0	10.5	0.2	N	*Carrier
15.19643	11.9	5.7	14.4	26.3	20.1	60.0	50.0	33.7	29.9	N	
22.38900	14.0	8.6	14.9	28.9	23.5	60.0	50.0	31.1	26.5	N	
27.12000	29.1	29.4	15.0	44.1	44.4	60.0	50.0	15.9	5.6	N	
0.15000	29.5	12.3	13.2	42.7	25.5	66.0	56.0	23.3	30.5	L	
0.20940	28.8	21.0	13.3	42.1	34.3	63.2	53.2	21.1	18.9	L	
0.53392	19.7	9.1	13.3	33.0	22.4	56.0	46.0	23.0	23.6	L	
13.56000	35.2	35.5	14.4	49.6	49.9	60.0	50.0	10.4	0.1	L	*Carrier
15.16301	12.1	6.0	14.4	26.5	20.4	60.0	50.0	33.5	29.6	L	
23.08278	14.8	9.2	14.9	29.7	24.1	60.0	50.0	30.3	25.9	L	
27.12000	29.2	29.5	15.0	44.2	44.5	60.0	50.0	15.8	5.5	L	

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

## 9. FREQUENCY STABILITY

### LIMIT

§15.225 (e) The 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 C63.4

**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	13.559802	-0.000198	-14.64	100.00	85.36
		on 2min.	13.559801	-0.000199	-14.71	100.00	85.29
		on 5min.	13.559800	-0.000200	-14.73	100.00	85.27
		on 10min.	13.559800	-0.000200	-14.76	100.00	85.24
	120V	Power on	13.559807	-0.000193	-14.21	100.00	85.79
		on 2min.	13.559806	-0.000194	-14.31	100.00	85.69
		on 5min.	13.559805	-0.000195	-14.40	100.00	85.60
		on 10min.	13.559803	-0.000197	-14.54	100.00	85.46
	102V	Power on	13.559803	-0.000197	-14.49	100.00	85.51
		on 2min.	13.559802	-0.000198	-14.59	100.00	85.41
		on 5min.	13.559801	-0.000199	-14.67	100.00	85.33
		on 10min.	13.559801	-0.000199	-14.70	100.00	85.30
50deg.C.	120V	Power on	13.559739	-0.000261	-19.22	100.00	80.78
		on 2min.	13.559742	-0.000258	-19.06	100.00	80.94
		on 5min.	13.559723	-0.000277	-20.41	100.00	79.59
		on 10min.	13.559720	-0.000280	-20.66	100.00	79.34
40deg.C.		Power on	13.559780	-0.000220	-16.19	100.00	83.81
		on 2min.	13.559769	-0.000231	-17.04	100.00	82.96
		on 5min.	13.559762	-0.000238	-17.59	100.00	82.41
		on 10min.	13.559756	-0.000244	-18.00	100.00	82.00
30deg.C.		Power on	13.559837	-0.000163	-12.01	100.00	87.99
		on 2min.	13.559818	-0.000182	-13.40	100.00	86.60
		on 5min.	13.559809	-0.000191	-14.10	100.00	85.90
		on 10min.	13.559807	-0.000193	-14.24	100.00	85.76
20deg.C.	Power on	13.559807	-0.000193	-14.21	100.00	85.79	
	on 2min.	13.559806	-0.000194	-14.31	100.00	85.69	
	on 5min.	13.559805	-0.000195	-14.40	100.00	85.60	
	on 10min.	13.559803	-0.000197	-14.54	100.00	85.46	
10deg.C.	Power on	13.559943	-0.000057	-4.19	100.00	95.81	
	on 2min.	13.559933	-0.000067	-4.93	100.00	95.07	
	on 5min.	13.559925	-0.000075	-5.50	100.00	94.50	
	on 10min.	13.559918	-0.000082	-6.02	100.00	93.98	
0deg.C.	Power on	13.559977	-0.000023	-1.66	100.00	98.34	
	on 2min.	13.559970	-0.000030	-2.25	100.00	97.75	
	on 5min.	13.559967	-0.000033	-2.41	100.00	97.59	
	on 10min.	13.559965	-0.000035	-2.62	100.00	97.38	
-10deg.C.	Power on	13.559991	-0.000009	-0.67	100.00	99.33	
	on 2min.	13.559988	-0.000012	-0.85	100.00	99.15	
	on 5min.	13.559988	-0.000012	-0.88	100.00	99.12	
	on 10min.	13.559988	-0.000012	-0.91	100.00	99.09	
-20deg.C.	Power on	13.559995	-0.000005	-0.34	100.00	99.66	
	on 2min.	13.559995	-0.000005	-0.36	100.00	99.64	
	on 5min.	13.559995	-0.000005	-0.36	100.00	99.64	
	on 10min.	13.559995	-0.000005	-0.36	100.00	99.64	
-30deg.C.	Power on	13.559995	-0.000005	-0.34	100.00	99.66	
	on 2min.	13.559995	-0.000005	-0.36	100.00	99.64	
	on 5min.	13.559995	-0.000005	-0.36	100.00	99.64	
	on 10min.	13.559995	-0.000005	-0.36	100.00	99.64	

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.