



**FCC CFR47 PART 15 SUBPART C  
CERTIFICATION TEST REPORT**

**FOR**

**RFID MODULE**

**MODEL NUMBER: RI15A**

**FCC ID: ACJ9TGRI15A**

**REPORT NUMBER: 10773679H-A-R1**

**ISSUE DATE: June 3, 2015**

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

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**NVLAP<sup>®</sup>**

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/about/mark1/index.jsp#nvlap>

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	06/02/2015	Initial Issue	T. Hatakeda
1	06/03/2015	1. Addition of 20dB BANDWIDTH test data  *This report is a revised version of 10773679H-A, which is replaced with this report.	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:** RI15A

**SERIAL NUMBER:** 4JTSA00145

**DATE TESTED:** May 21 and 22, 2015

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

Shinya Watanabe  
Engineer  
Consumer Technology Division

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## 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	3.4dB
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	4.3dB	5.5dB	6.3dB	5.5dB	5.8dB	5.8dB	4.3dB
No.2	4.2dB	5.4dB	6.3dB	5.4dB	5.7dB	5.9dB	5.6dB
No.3	4.4dB	5.4dB	6.4dB	5.2dB	5.5dB	5.8dB	5.5dB
No.4	4.7dB	5.6dB	6.4dB	5.3dB	5.7dB	5.9dB	5.5dB

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

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

## 5. TEST PROCEDURE AND RESULTS

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements ----- <IC>RSS-Gen 8.8	Section 15.207 ----- <IC>RSS-Gen 8.8	[QP] 12.9dB, 13.56000MHz, N [AV] 2.9dB, 13.56000MHz, N	Complied	-
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 6.4, 6.12	Section 15.225(a) ----- <IC>RSS-210 A2.6	66.0dB, 13.56000MHz, QP, 0deg.	Complied	Radiated
Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 6.4, 6.13	Section 15.225(b)(c) ----- <IC> RSS-210 A2.6	46.3dB, 14.01000MHz, QP, 0deg. 13.11000MHz, QP, 0deg.	Complied	Radiated
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 6.4, 6.13	Section15.209, Section 15.225 (d) ----- <IC>RSS-210 A2.6	10.9dB 40.680MHz, Vertical, QP	Complied	Radiated
Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 6.11, 8.11	Section15.225(e) ----- <IC> RSS-210 A2.6	See data	Complied	Radiated
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 Tablet model FZ-G1. 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	17.9
13.56	Normal Mode Type B	17.1

### 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 Tablet 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
Tablet Computer	Panasonic	FZ-G1	4JTSA00145	-
AC Adapter	Panasonic	CF-AA6413C M3	6413CM314Y00168A	-

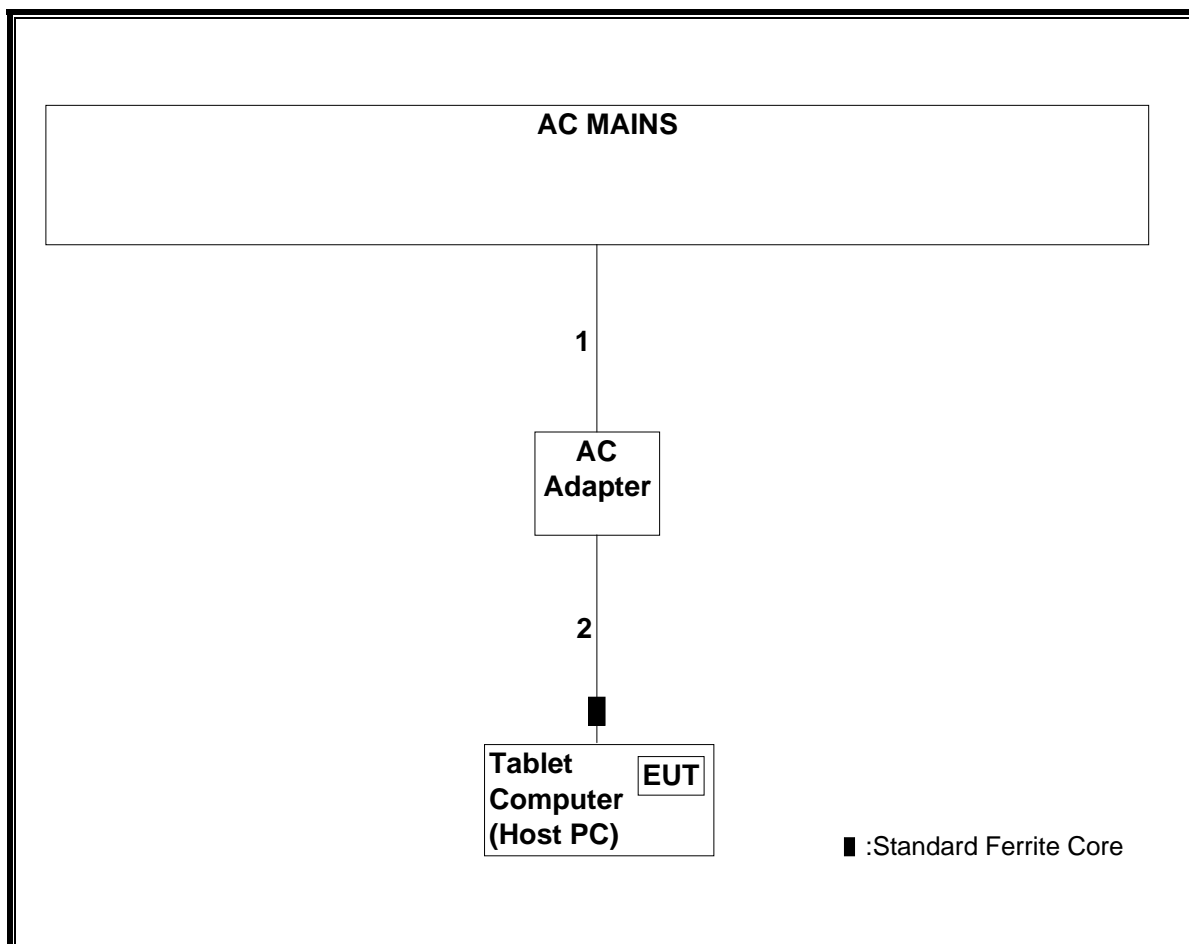
### I/O CABLES

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	0.95 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)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE/CE	2015/03/09 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2014/08/19 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2014/10/04 * 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	2014/07/14 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2014/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE	2014/07/10 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MCH-05	Temperature and Humidity Chamber	Tabai Espec	PL-1KP	14019569	FT	2015/04/29 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2014/08/11 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2014/12/22 * 12
MTW-09	Torque wrench	HUBER+SUHNER	74 Z-0-0-21	72676	RE	2015/03/05 * 36
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2014/10/17 * 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 C63.4

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.

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**

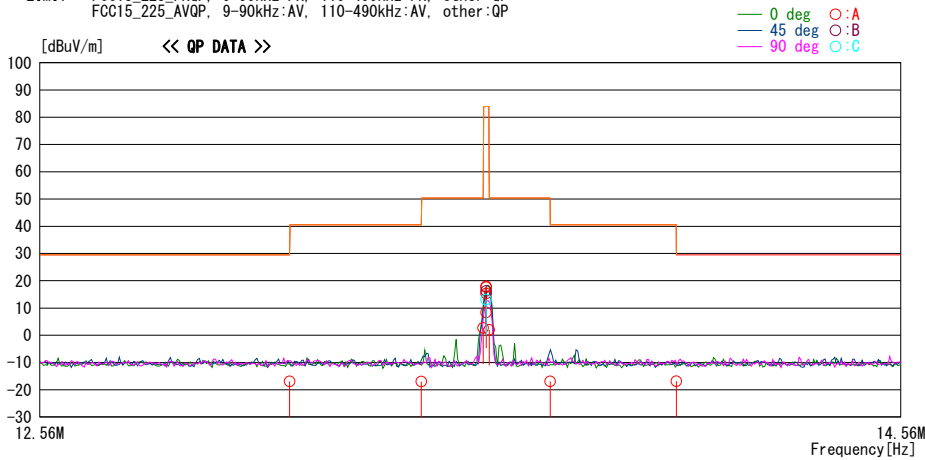
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./ Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

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	29.4	QP	19.5	-33.5	32.3	-16.9	29.5	46.4	0	A	0
13.41000	29.4	QP	19.4	-33.5	32.3	-17.0	40.5	57.5	0	A	0
13.55300	49.1	QP	19.4	-33.5	32.3	2.7	50.4	47.7	0	A	0
13.56000	64.2	QP	19.4	-33.4	32.3	17.9	83.9	66.0	0	A	0
13.56000	62.6	QP	19.4	-33.4	32.3	16.3	83.9	67.6	45	B	341
13.56000	59.4	QP	19.4	-33.4	32.3	13.1	83.9	70.8	90	C	274
13.56000	61.6	QP	19.4	-33.4	32.3	15.3	83.9	68.6	135	A	211
13.56000	63.9	QP	19.4	-33.4	32.3	17.6	83.9	66.3	180	A	0
13.56000	54.7	QP	19.4	-33.4	32.3	8.4	83.9	75.5	0	A	0 Loop:Hori.
13.56700	48.3	QP	19.4	-33.4	32.3	2.0	50.4	48.4	0	A	0
13.71000	29.4	QP	19.4	-33.4	32.3	-16.9	40.5	57.4	0	A	0
14.01000	29.6	QP	19.3	-33.4	32.3	-16.8	29.5	46.3	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)

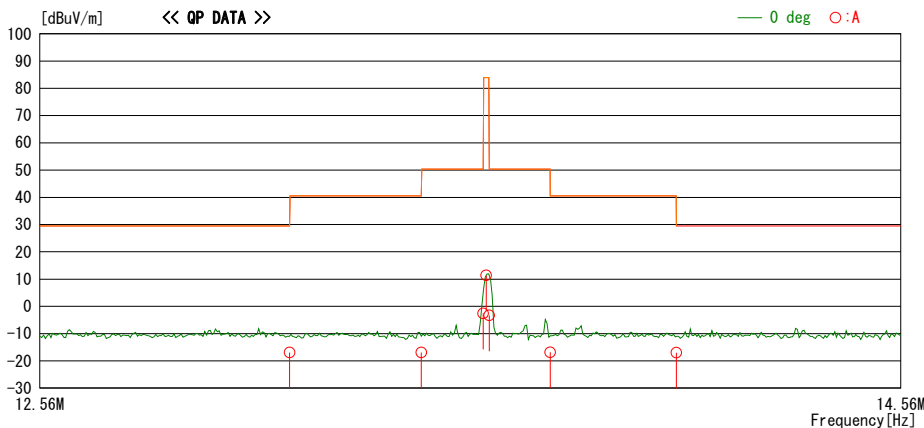
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Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./ Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

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	29.4	QP	19.5	-33.5	32.3	-16.9	29.5	46.4	0	A	191
13.41000	29.5	QP	19.4	-33.5	32.3	-16.9	40.5	57.4	0	A	191
13.55300	43.8	QP	19.4	-33.5	32.3	-2.6	50.4	53.0	0	A	191
13.56000	57.7	QP	19.4	-33.4	32.3	11.4	83.9	72.5	0	A	191
13.56700	43.0	QP	19.4	-33.4	32.3	-3.3	50.4	53.7	0	A	191
13.71000	29.5	QP	19.4	-33.4	32.3	-16.8	40.5	57.3	0	A	191
14.01000	29.4	QP	19.3	-33.4	32.3	-17.0	29.5	46.5	0	A	191

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)

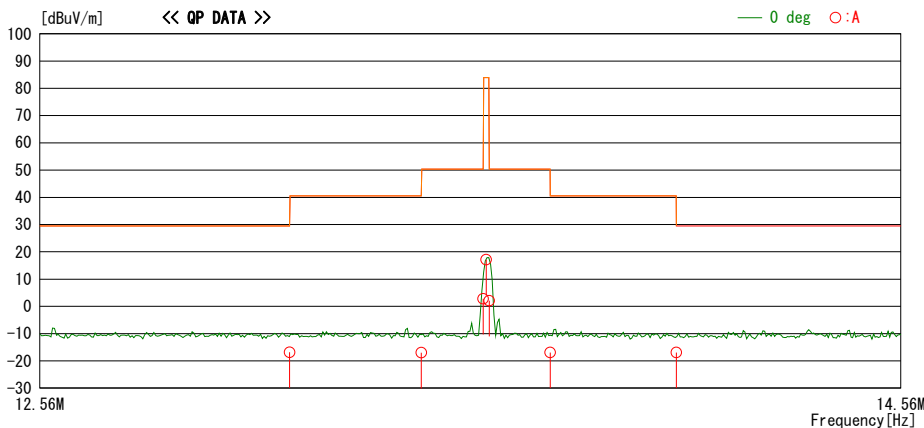
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LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



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13.56000	63.4	QP	19.4	-33.4	32.3	17.1	83.9	66.8	0	A	0
13.56700	48.4	QP	19.4	-33.4	32.3	2.1	50.4	48.3	0	A	0
13.71000	29.4	QP	19.4	-33.4	32.3	-16.9	40.5	57.4	0	A	0
14.01000	29.5	QP	19.3	-33.4	32.3	-16.9	29.5	46.4	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)

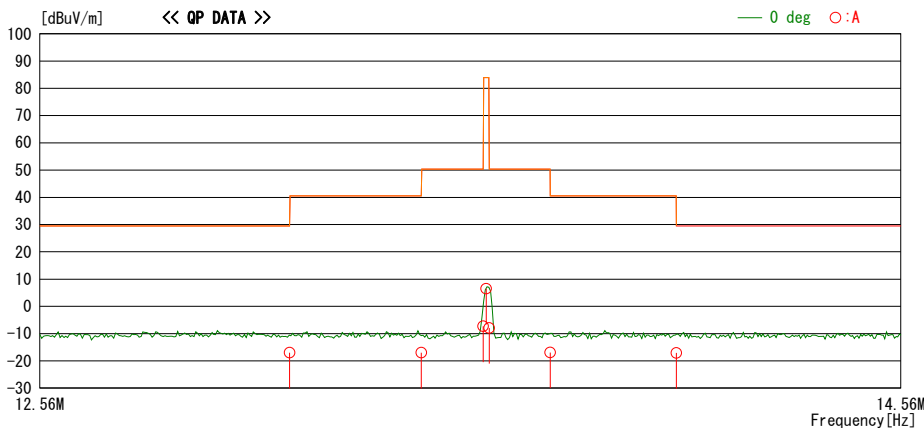
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LIMIT : FCC15\_225\_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP  
 FCC15\_225\_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



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	19.5	-33.5	32.3	-17.0	29.5	46.5	0	A	156
13.41000	29.4	QP	19.4	-33.5	32.3	-17.0	40.5	57.5	0	A	156
13.55300	39.1	QP	19.4	-33.5	32.3	-7.3	50.4	57.7	0	A	156
13.56000	52.8	QP	19.4	-33.4	32.3	6.5	83.9	77.4	0	A	156
13.56700	38.4	QP	19.4	-33.4	32.3	-7.9	50.4	58.3	0	A	156
13.71000	29.4	QP	19.4	-33.4	32.3	-16.9	40.5	57.4	0	A	156
14.01000	29.3	QP	19.3	-33.4	32.3	-17.1	29.5	46.6	0	A	156

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	64.2	19.4	6.6	32.3	-	57.9	-	-	without Type A tag
0	13.56000	QP	57.7	19.4	6.6	32.3	-	51.4	-	-	with Type A tag
0	13.56000	QP	63.4	19.4	6.6	32.3	-	57.1	-	-	without Type B tag
0	13.56000	QP	52.8	19.4	6.6	32.3	-	46.5	-	-	with Type B tag

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

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

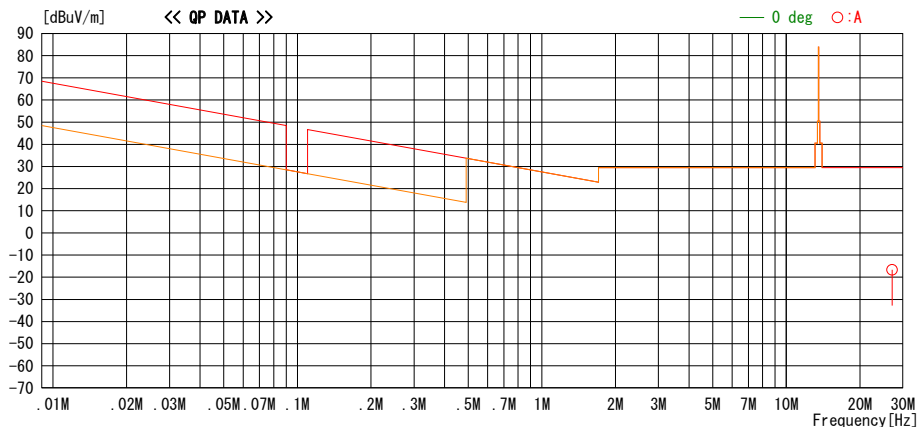
#### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./ Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

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	29.0	QP	19.7	-33.2	32.2	-16.7	29.5	46.2	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)

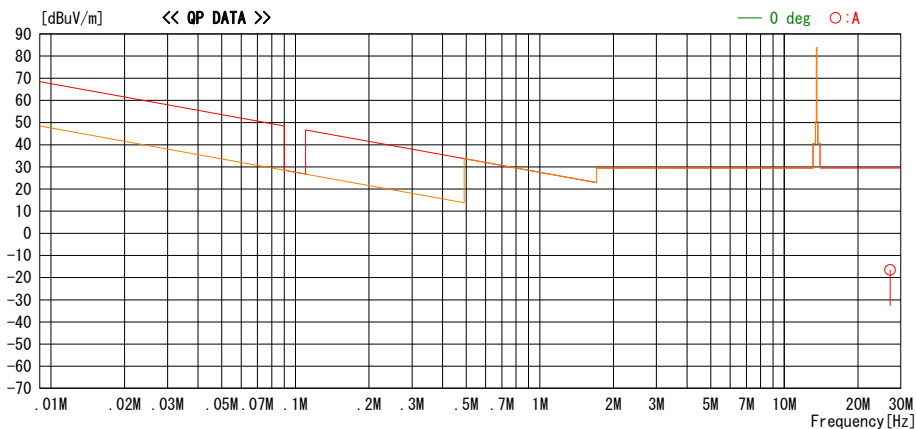
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./ Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

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	29.1	QP	19.7	-33.2	32.2	-16.6	29.5	46.1	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)

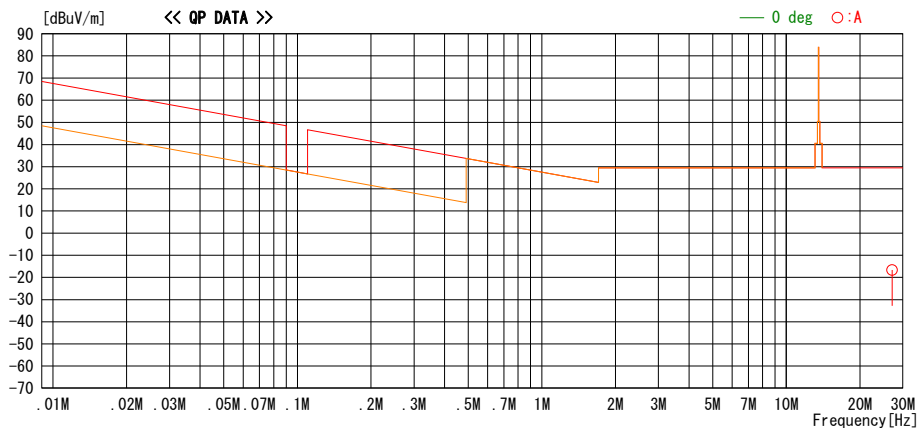
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./ Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

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	29.0	QP	19.7	-33.2	32.2	-16.7	29.5	46.2	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)

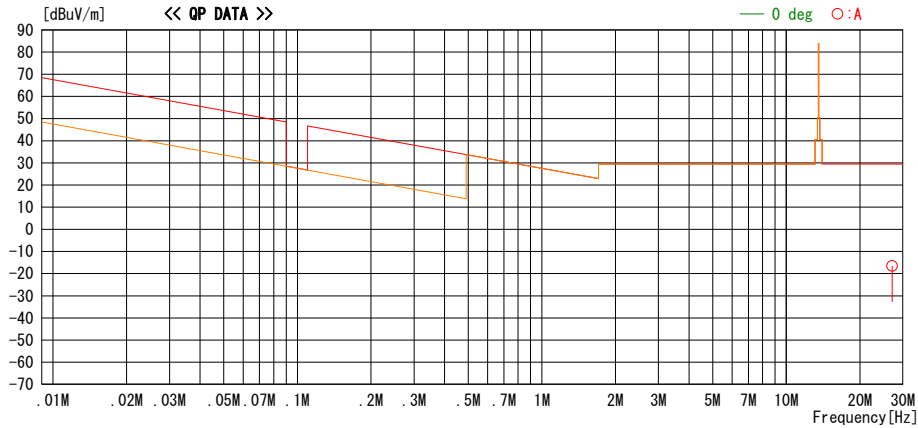
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp. / Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

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	29.1	QP	19.7	-33.2	32.2	-16.6	29.5	46.1	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

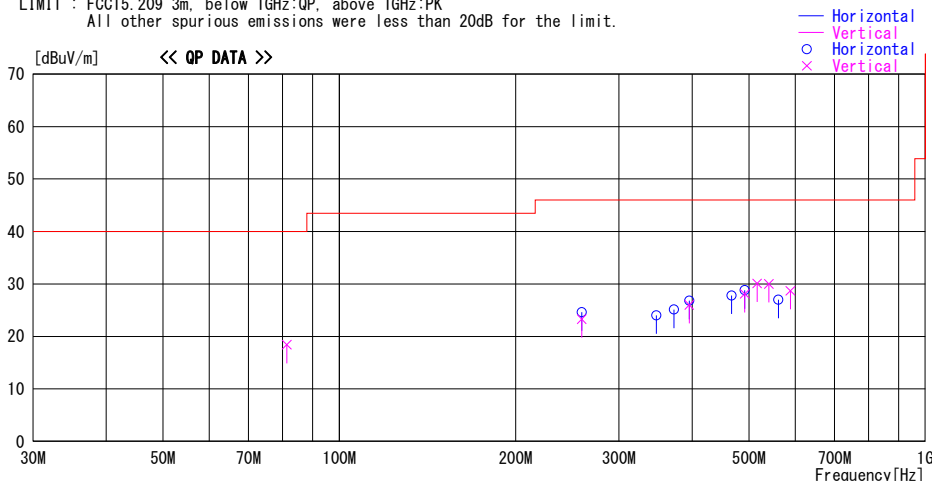
UL Japan, Inc. Ise EMC Lab. No. 3 Semi Anechoic Chamber  
 Date : 2015/05/21 16:41:11

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz without Type A Tag

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	Angle	Height	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]							
81.348	35.6	QP	7.0	-24.2	18.4	260	100	Vert.	40.0	21.6	
259.211	29.4	QP	17.7	-22.5	24.6	297	100	Hori.	46.0	21.4	
259.200	28.1	QP	17.7	-22.5	23.3	0	271	Vert.	46.0	22.7	
347.683	29.6	QP	16.1	-21.7	24.0	0	100	Hori.	46.0	22.0	
372.308	29.9	QP	16.8	-21.6	25.1	0	100	Hori.	46.0	20.9	
395.356	30.7	QP	17.5	-21.4	26.8	17	209	Hori.	46.0	19.2	
395.357	29.9	QP	17.5	-21.4	26.0	338	128	Vert.	46.0	20.0	
467.347	30.8	QP	18.0	-21.0	27.8	0	154	Hori.	46.0	18.2	
491.680	31.6	QP	18.1	-20.9	28.8	18	148	Hori.	46.0	17.2	
491.701	30.9	QP	18.1	-20.9	28.1	4	100	Vert.	46.0	17.9	
516.307	32.5	QP	18.4	-20.8	30.1	348	100	Vert.	46.0	15.9	
540.642	32.0	QP	18.7	-20.7	30.0	0	100	Vert.	46.0	16.0	
561.600	28.6	QP	19.0	-20.6	27.0	33	137	Hori.	46.0	19.0	
588.314	29.8	QP	19.3	-20.4	28.7	340	100	Vert.	46.0	17.3	

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

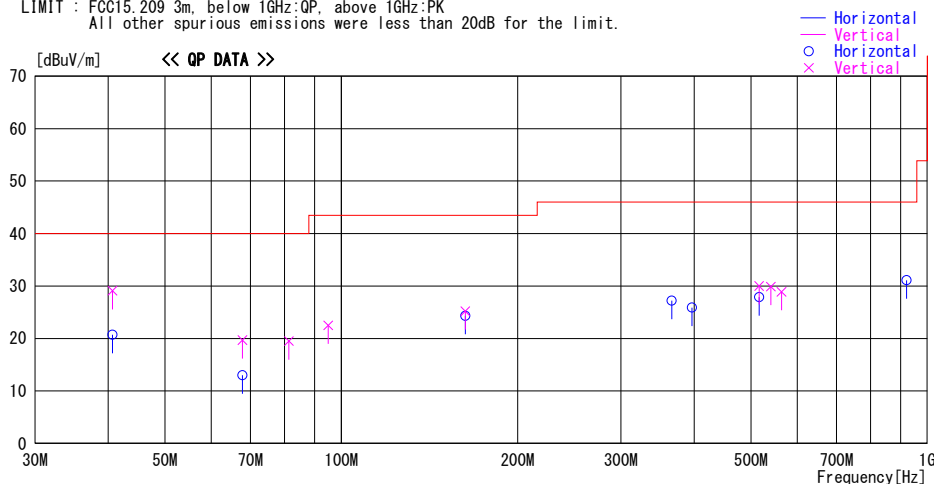
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21 19:30:15

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz with Type A Tag

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	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain					[dBuV/m]	[dB]	
40.680	31.6	QP	14.1	-25.0	20.7	183	264	Hori.	40.0	19.3	
40.680	40.0	QP	14.1	-25.0	29.1	104	100	Vert.	40.0	10.9	
67.800	31.1	QP	6.4	-24.5	13.0	210	302	Hori.	40.0	27.0	
67.800	37.8	QP	6.4	-24.5	19.7	308	100	Vert.	40.0	20.3	
81.360	36.7	QP	7.0	-24.2	19.5	235	100	Vert.	40.0	20.5	
94.920	37.4	QP	9.3	-24.2	22.5	252	100	Vert.	43.5	21.0	
162.720	32.2	QP	15.6	-23.5	24.3	90	186	Hori.	43.5	19.2	
162.720	33.1	QP	15.6	-23.5	25.2	44	100	Vert.	43.5	18.3	
366.123	32.1	QP	16.7	-21.6	27.2	183	100	Hori.	46.0	18.8	
396.653	29.8	QP	17.5	-21.4	25.9	26	220	Hori.	46.0	20.1	
516.329	30.3	QP	18.4	-20.8	27.9	13	146	Hori.	46.0	18.1	
516.309	32.4	QP	18.4	-20.8	30.0	342	100	Vert.	46.0	16.0	
540.642	31.9	QP	18.7	-20.7	29.9	0	100	Vert.	46.0	16.1	
563.702	30.5	QP	19.0	-20.6	28.9	350	100	Vert.	46.0	17.1	
922.078	26.0	QP	22.7	-17.6	31.1	139	165	Hori.	46.0	14.9	

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

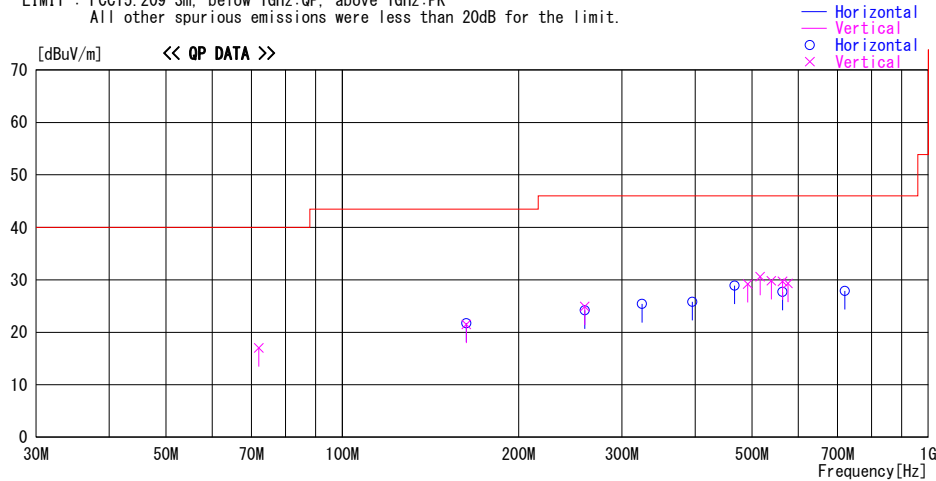
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21 20:22:16

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz without Type B Tag

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	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
72.009	35.1	QP	6.3	-24.4	17.0	261	100	Vert.	40.0	23.0	
162.720	29.6	QP	15.6	-23.5	21.7	100	194	Hori.	43.5	21.8	
162.720	29.4	QP	15.6	-23.5	21.5	38	100	Vert.	43.5	22.0	
259.198	29.0	QP	17.7	-22.5	24.2	241	130	Hori.	46.0	21.8	
259.198	29.7	QP	17.7	-22.5	24.9	336	100	Vert.	46.0	21.1	
324.644	31.8	QP	15.5	-21.9	25.4	0	100	Hori.	46.0	20.6	
395.354	29.7	QP	17.5	-21.4	25.8	359	218	Hori.	46.0	20.2	
467.344	31.9	QP	18.0	-21.0	28.9	22	162	Hori.	46.0	17.1	
491.680	32.0	QP	18.1	-20.9	29.2	18	100	Vert.	46.0	16.8	
516.314	33.0	QP	18.4	-20.8	30.6	342	100	Vert.	46.0	15.4	
539.345	31.8	QP	18.7	-20.7	29.8	0	100	Vert.	46.0	16.2	
563.682	29.3	QP	19.0	-20.6	27.7	340	144	Hori.	46.0	18.3	
563.690	31.3	QP	19.0	-20.6	29.7	352	100	Vert.	46.0	16.3	
576.005	30.6	QP	19.2	-20.5	29.3	356	100	Vert.	46.0	16.7	
719.992	26.8	QP	20.8	-19.7	27.9	302	100	Hori.	46.0	18.1	

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

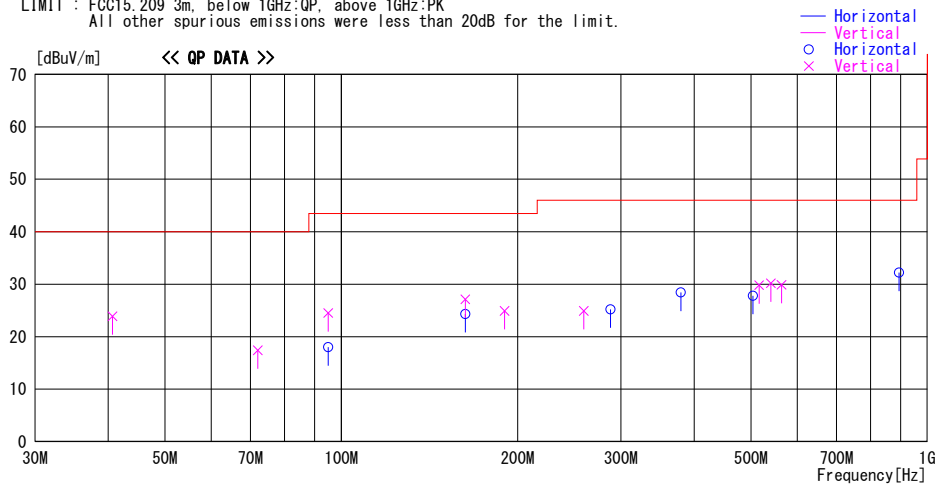
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21 21:01:00

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz with Type B Tag

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	34.8	QP	14.1	-25.0	23.9	9	100	Vert.	40.0	16.1	
72.000	35.5	QP	6.3	-24.4	17.4	280	100	Vert.	40.0	22.6	
94.920	39.4	QP	9.3	-24.2	24.5	197	100	Vert.	43.5	19.0	
94.920	32.9	QP	9.3	-24.2	18.0	359	203	Hori.	43.5	25.5	
162.720	35.0	QP	15.6	-23.5	27.1	48	100	Vert.	43.5	16.4	
162.720	32.2	QP	15.6	-23.5	24.3	320	192	Hori.	43.5	19.2	
189.840	31.6	QP	16.4	-23.1	24.9	48	100	Vert.	43.5	18.6	
259.208	29.7	QP	17.7	-22.5	24.9	347	100	Vert.	46.0	21.1	
288.000	28.2	QP	19.2	-22.2	25.2	184	100	Hori.	46.0	20.8	
379.679	32.9	QP	17.0	-21.5	28.4	198	100	Hori.	46.0	17.6	
504.000	30.5	QP	18.2	-20.9	27.8	352	139	Hori.	46.0	18.2	
516.292	32.2	QP	18.4	-20.8	29.8	344	100	Vert.	46.0	16.2	
540.644	32.2	QP	18.7	-20.7	30.2	351	100	Vert.	46.0	15.8	
563.661	31.5	QP	19.0	-20.6	29.9	359	100	Vert.	46.0	16.1	
894.964	27.6	QP	22.4	-17.8	32.2	154	100	Hori.	46.0	13.8	

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

## 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 $\mu$ 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**

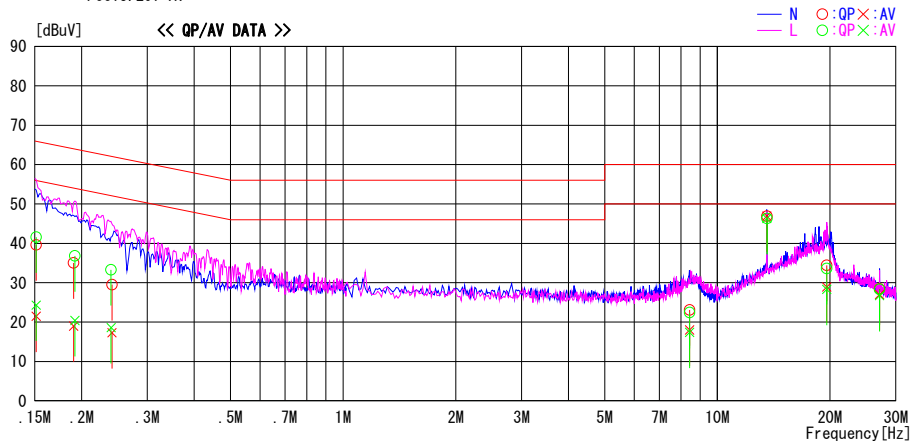
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz without Type A 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]		
0.15145	26.4	8.3	13.2	39.6	21.5	65.9	55.9	26.3	34.4	N	
0.19060	21.8	5.8	13.2	35.0	19.0	64.0	54.0	29.0	35.0	N	
0.24135	16.2	4.0	13.3	29.5	17.3	62.0	52.0	32.5	34.7	N	
8.43253	9.3	4.2	13.8	23.1	18.0	60.0	50.0	36.9	32.0	N	
13.56000	32.7	32.7	14.2	46.9	46.9	60.0	50.0	13.1	3.1	N	*Carrier
19.60744	20.0	14.5	14.4	34.4	28.9	60.0	50.0	25.6	21.1	N	
27.12000	13.6	12.2	14.8	28.4	27.0	60.0	50.0	31.6	23.0	N	
0.15145	28.4	11.1	13.2	41.6	24.3	65.9	55.9	24.3	31.6	L	
0.19205	23.6	7.2	13.2	36.8	20.4	63.9	53.9	27.1	33.5	L	
0.23990	20.0	5.3	13.3	33.3	18.6	62.1	52.1	28.8	33.5	L	
8.43253	8.6	3.6	13.8	22.4	17.4	60.0	50.0	37.6	32.6	L	
13.56000	32.1	32.1	14.2	46.3	46.3	60.0	50.0	13.7	3.7	L	*Carrier
19.60744	19.2	13.9	14.4	33.6	28.3	60.0	50.0	26.4	21.7	L	
27.12000	13.5	11.9	14.8	28.3	26.7	60.0	50.0	31.7	23.3	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.

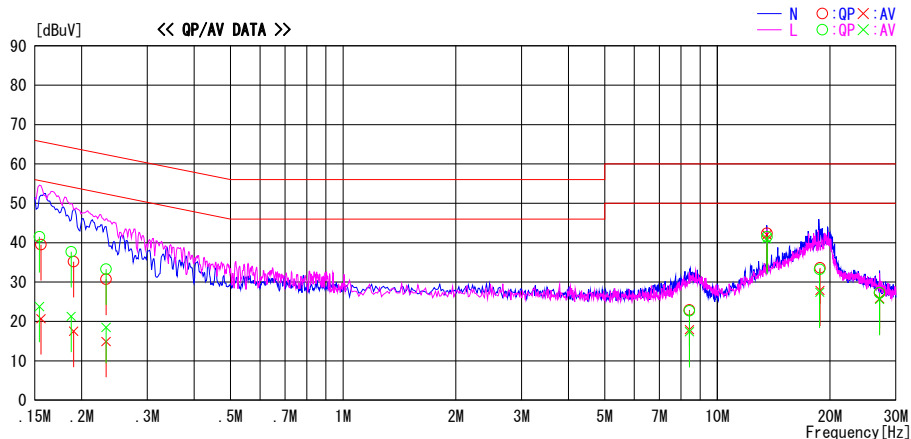
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz with Type A 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]		
0.15580	26.3	7.5	13.2	39.5	20.7	65.7	55.7	26.2	35.0	N	
0.19060	22.0	4.3	13.2	35.2	17.5	64.0	54.0	28.8	36.5	N	
0.23265	17.4	1.6	13.3	30.7	14.9	62.4	52.4	31.7	37.5	N	
8.41741	9.1	4.1	13.8	22.9	17.9	60.0	50.0	37.1	32.1	N	
13.56000	28.2	27.8	14.2	42.4	42.0	60.0	50.0	17.6	8.0	N	*Carrier
18.80544	19.2	13.5	14.4	33.6	27.9	60.0	50.0	26.4	22.1	N	
27.12000	12.5	11.0	14.8	27.3	25.8	60.0	50.0	32.7	24.2	N	
0.15435	28.3	10.6	13.2	41.5	23.8	65.8	55.8	24.3	32.0	L	
0.18770	24.5	8.1	13.2	37.7	21.3	64.1	54.1	26.4	32.8	L	
0.23265	20.0	5.2	13.3	33.3	18.5	62.4	52.4	29.1	33.9	L	
8.41741	8.9	3.6	13.8	22.7	17.4	60.0	50.0	37.3	32.6	L	
13.56000	27.3	26.9	14.2	41.5	41.1	60.0	50.0	18.5	8.9	L	*Carrier
18.77202	18.8	13.0	14.4	33.2	27.4	60.0	50.0	26.8	22.6	L	
27.12000	12.5	10.8	14.8	27.3	25.6	60.0	50.0	32.7	24.4	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.

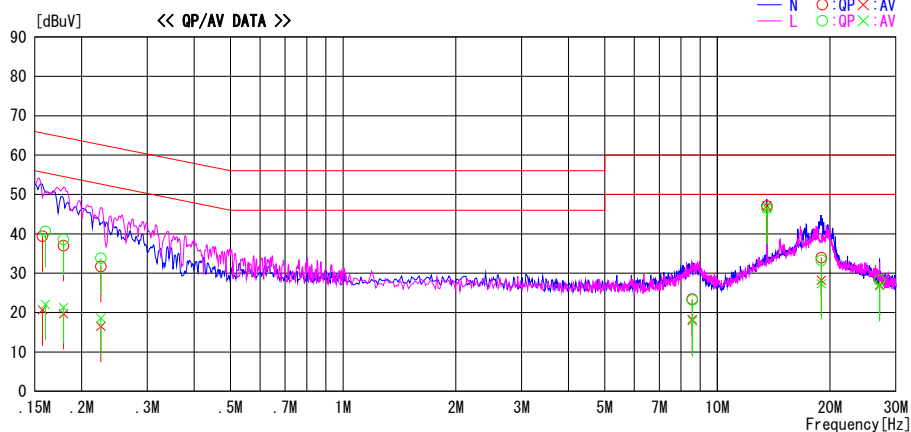
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz without Type B 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]		
0.15725	26.2	7.5	13.2	39.4	20.7	65.6	55.6	26.2	34.9	N	
0.17900	23.8	6.5	13.2	37.0	19.7	64.5	54.5	27.5	34.8	N	
0.22540	18.4	3.2	13.3	31.7	16.5	62.6	52.6	30.9	36.1	N	
8.56858	9.5	4.3	13.9	23.4	18.2	60.0	50.0	36.6	31.8	N	
13.56000	32.9	32.9	14.2	47.1	47.1	60.0	50.0	12.9	2.9	N	*Carrier
18.97252	19.5	13.8	14.4	33.9	28.2	60.0	50.0	26.1	21.8	N	
27.12000	13.5	12.2	14.8	28.3	27.0	60.0	50.0	31.7	23.0	N	
0.16015	27.4	8.9	13.2	40.6	22.1	65.5	55.5	24.9	33.4	L	
0.17900	25.4	8.1	13.2	38.6	21.3	64.5	54.5	25.9	33.2	L	
0.22540	20.5	5.3	13.3	33.8	18.6	62.6	52.6	28.8	34.0	L	
8.58370	9.3	4.0	13.9	23.2	17.9	60.0	50.0	36.8	32.1	L	
13.56000	32.3	32.3	14.2	46.5	46.5	60.0	50.0	13.5	3.5	L	*Carrier
18.97252	18.9	12.9	14.4	33.3	27.3	60.0	50.0	26.7	22.7	L	
27.12000	13.4	12.0	14.8	28.2	26.8	60.0	50.0	31.8	23.2	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.

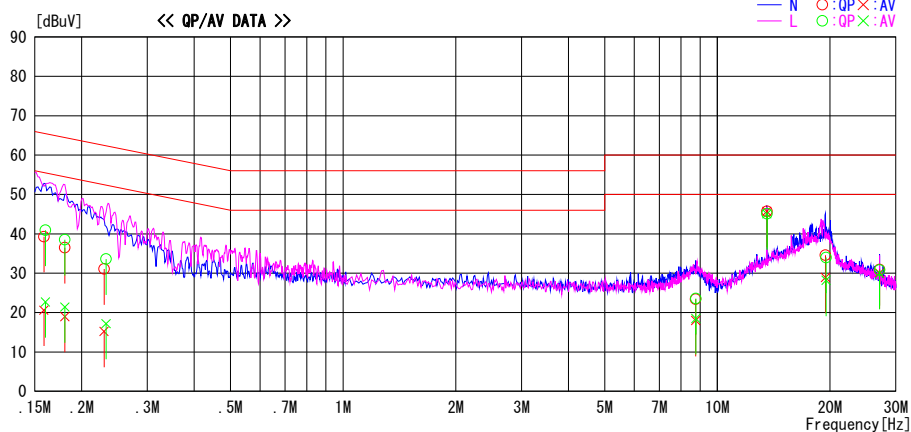
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Date : 2015/05/21

Report No. : 10773679H  
 Power : AC120V / 60Hz  
 Temp./Humi. : 22deg. C / 50% RH  
 Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz with Type B 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]		
0.15870	26.1	7.4	13.2	39.3	20.6	65.5	55.5	26.2	34.9	N	
0.18045	23.3	5.8	13.2	36.5	19.0	64.5	54.5	28.0	35.5	N	
0.22975	17.8	1.9	13.3	31.1	15.2	62.5	52.5	31.4	37.3	N	
8.74998	9.5	4.1	13.9	23.4	18.0	60.0	50.0	36.6	32.0	N	
13.56000	31.5	31.5	14.2	45.7	45.7	60.0	50.0	14.3	4.3	N	*Carrier
19.44036	20.2	14.5	14.4	34.6	28.9	60.0	50.0	25.4	21.1	N	
27.12000	16.1	15.3	14.8	30.9	30.1	60.0	50.0	29.1	19.9	N	
0.16015	27.7	9.5	13.2	40.9	22.7	65.5	55.5	24.6	32.8	L	
0.18045	25.3	8.2	13.2	38.5	21.4	64.5	54.5	26.0	33.1	L	
0.23265	20.3	3.9	13.3	33.6	17.2	62.4	52.4	28.8	35.2	L	
8.76510	9.7	4.6	13.9	23.6	18.5	60.0	50.0	36.4	31.5	L	
13.56000	30.9	30.9	14.2	45.1	45.1	60.0	50.0	14.9	4.9	L	*Carrier
19.50719	19.6	13.8	14.4	34.0	28.2	60.0	50.0	26.0	21.8	L	
27.12000	16.0	15.1	14.8	30.8	29.9	60.0	50.0	29.2	20.1	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)

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	13.560355	0.000355	26.18	100.00	73.82
		on 2min.	13.560348	0.000348	25.66	100.00	74.34
		on 5min.	13.560343	0.000343	25.29	100.00	74.71
		on 10min.	13.560394	0.000394	29.06	100.00	70.94
	120V	Power on	13.559923	-0.000077	-5.68	100.00	94.32
		on 2min.	13.559919	-0.000081	-5.97	100.00	94.03
		on 5min.	13.559915	-0.000085	-6.27	100.00	93.73
		on 10min.	13.559913	-0.000087	-6.42	100.00	93.58
	102V	Power on	13.559937	-0.000063	-4.65	100.00	95.35
		on 2min.	13.559924	-0.000076	-5.60	100.00	94.40
		on 5min.	13.559916	-0.000084	-6.19	100.00	93.81
		on 10min.	13.559915	-0.000085	-6.27	100.00	93.73
50deg.C.	120V	Power on	13.559872	-0.000128	-9.44	100.00	90.56
		on 2min.	13.559838	-0.000162	-11.95	100.00	88.05
		on 5min.	13.559823	-0.000177	-13.05	100.00	86.95
		on 10min.	13.559820	-0.000180	-13.27	100.00	86.73
40deg.C.	120V	Power on	13.559923	-0.000077	-5.68	100.00	94.32
		on 2min.	13.559871	-0.000129	-9.51	100.00	90.49
		on 5min.	13.559860	-0.000140	-10.32	100.00	89.68
		on 10min.	13.559848	-0.000152	-11.21	100.00	88.79
30deg.C.	120V	Power on	13.559971	-0.000029	-2.14	100.00	97.86
		on 2min.	13.559938	-0.000062	-4.57	100.00	95.43
		on 5min.	13.559924	-0.000076	-5.60	100.00	94.40
		on 10min.	13.559911	-0.000089	-6.56	100.00	93.44
20deg.C.	120V	Power on	13.560026	0.000026	1.92	100.00	98.08
		on 2min.	13.560000	0.000000	0.00	100.00	100.00
		on 5min.	13.559987	-0.000013	-0.96	100.00	99.04
		on 10min.	13.559980	-0.000020	-1.47	100.00	98.53
10deg.C.	120V	Power on	13.560013	0.000013	0.96	100.00	99.04
		on 2min.	13.560006	0.000006	0.44	100.00	99.56
		on 5min.	13.560175	0.000175	12.91	100.00	87.09
		on 10min.	13.560173	0.000173	12.76	100.00	87.24
0deg.C.	120V	Power on	13.560083	0.000083	6.12	100.00	93.88
		on 2min.	13.560071	0.000071	5.24	100.00	94.76
		on 5min.	13.560251	0.000251	18.51	100.00	81.49
		on 10min.	13.560245	0.000245	18.07	100.00	81.93
-10deg.C.	120V	Power on	13.560160	0.000160	11.80	100.00	88.20
		on 2min.	13.560151	0.000151	11.14	100.00	88.86
		on 5min.	13.560269	0.000269	19.84	100.00	80.16
		on 10min.	13.560313	0.000313	23.08	100.00	76.92
-20deg.C	120V	Power on	13.560182	0.000182	13.42	100.00	86.58
		on 2min.	13.560175	0.000175	12.91	100.00	87.09
		on 5min.	13.560328	0.000328	24.19	100.00	75.81
		on 10min.	13.560171	0.000171	12.61	100.00	87.39

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.

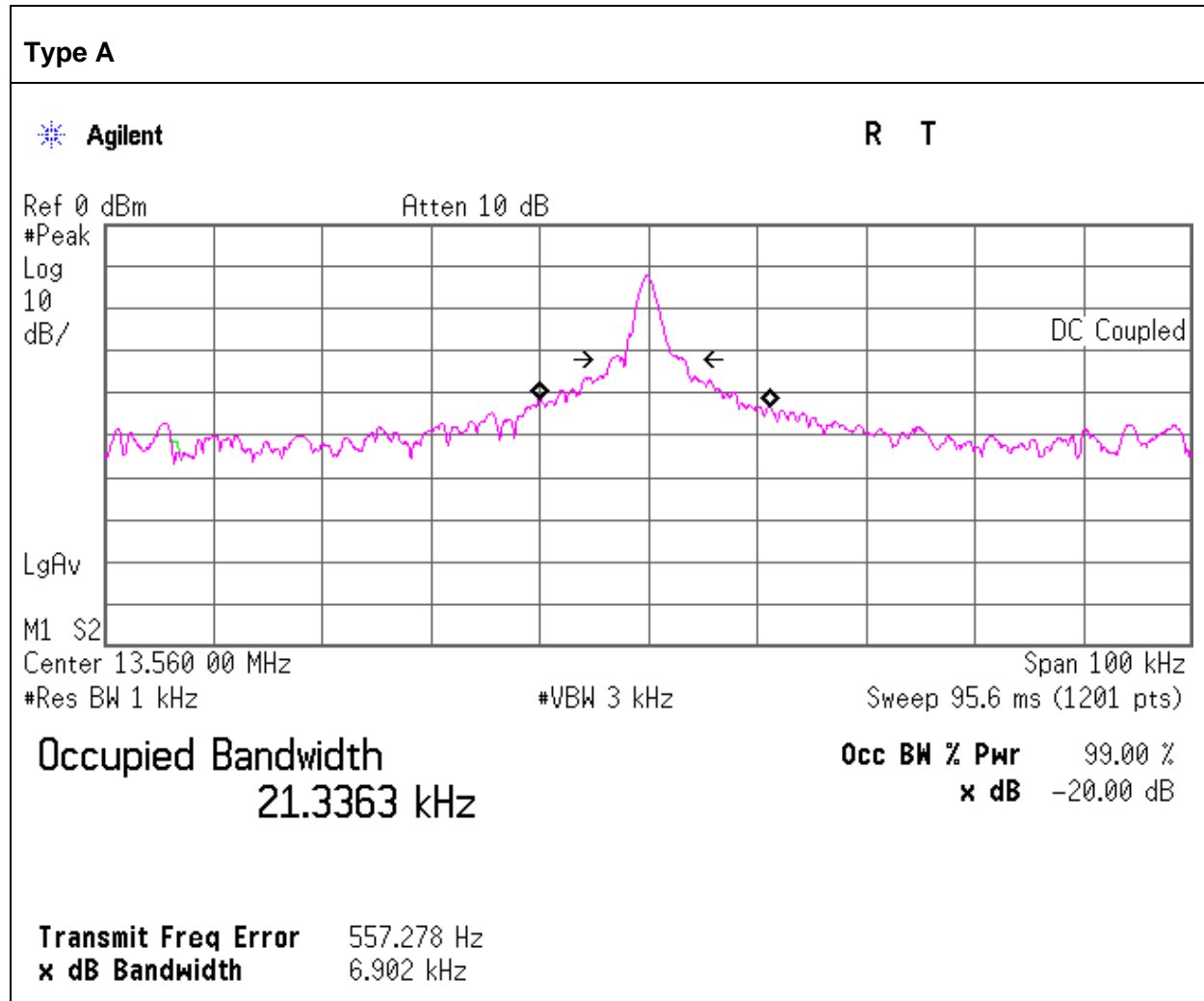
### RESULTS

Frequency (MHz)	20dB Bandwidth (KHz)
13.56, Type A	6.902
13.56, Type B	6.036

**20dB BANDWIDTH**

Type A

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	6.90	21.34



**20dB BANDWIDTH**

Type B (With Tag)

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	6.04	20.41

