



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

RFID MODULE

MODEL NUMBER: RI12B

FCC ID: ACJ9TGRI12B

REPORT NUMBER: 33BE0241-HO-A

ISSUE DATE: OCTOBER 18, 2012

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

Prepared by
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The NVLAP logo, featuring the letters 'NVLAP' in a stylized, outlined font, with a registered trademark symbol (®) to the upper right of the 'P'.

NVLAP

NVLAP LAB CODE: 200572-0

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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	10/18/2012	Initial Issue	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: RI12B

SERIAL NUMBER: 2HTSA00252

DATE TESTED: OCTOBER 3 to 5, 2012

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.



Tomotaka Sasagawa
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 C63.10-2009, 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	3.6dB
No.3	3.6dB
No.4	3.6dB

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	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an RFID module that is embedded inside Panasonic laptop model CF-C2. 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	24.5
13.56	Normal Mode Type B	24.4

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, Version 1.0

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was inside the laptop, so all test were performed as regular normal position. Fundamental emission test was performed without tag. Other tests were performed with tag.

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	CF-C2	2HTSA00252	--
AC Adapter	Panasonic	CFAA6413CM1	ES575	D of C

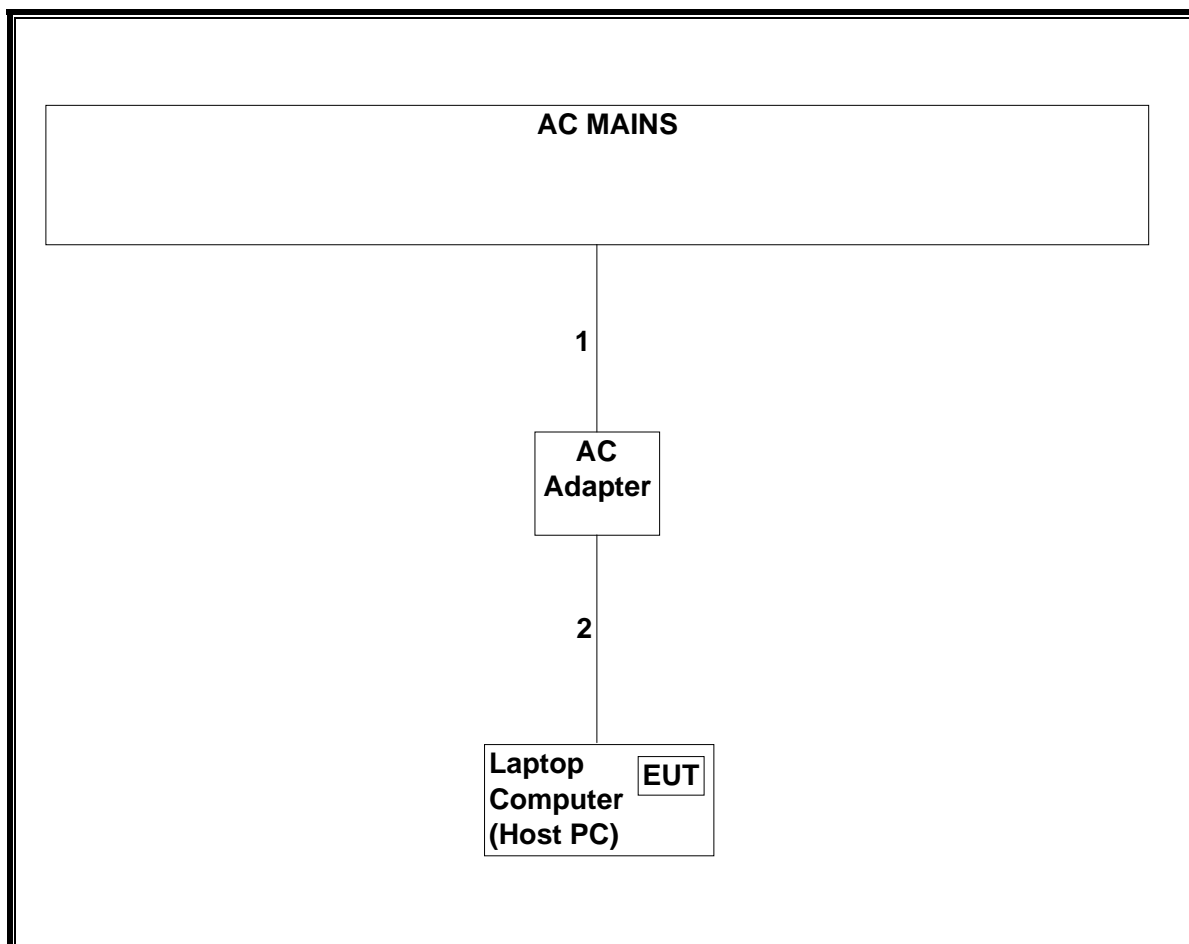
I/O CABLES

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 laptop 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)
MOS-04	Digital Humidity Indicator	N.T	NT-1800	MOS04	FT	2012/02/06 * 12
MCH-06	Temperature and Humidity Chamber	Tabai Espec	PL-1KT	14007630	FT	2012/04/20 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	FT	2012/02/03 * 12
MCC-31	Coaxial cable	UL Japan	-	-	FT	Pre Check
MLPA-03	Loop Antenna	UL Japan	-	-	FT	Pre Check
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEM1	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2012/04/05 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ sucoform141-PE(1m)/ RFM-E121(Switcher)	-/04178	RE	2012/07/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2012/03/05 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/11/16 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/11/16 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2012/06/01 * 12
AT-38	Attenuator	Anritsu	MP721B	6200961025	RE	2011/12/08 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2012/08/17 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1203S212(1m)/ 1204S062(5m)	RE	2012/04/23 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2012/03/28 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2012/02/06 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2012/01/11 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ sucoform141-PE(1m)/ RFM-E121(Switcher)	-/04178	CE	2012/07/12 * 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 AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

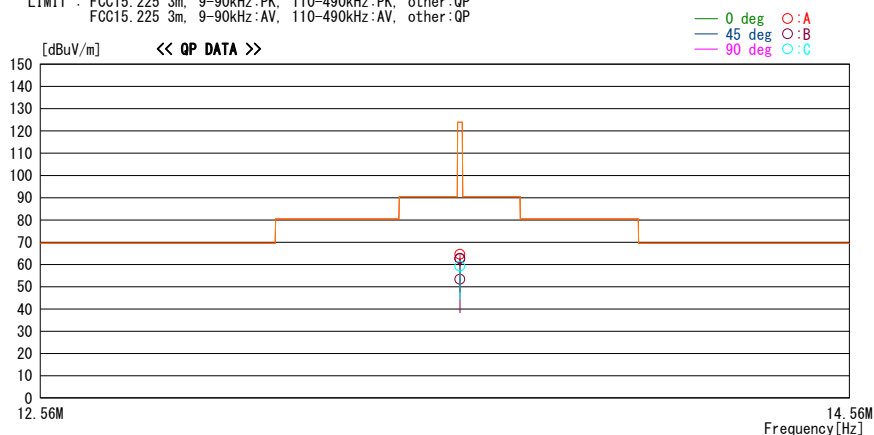
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2012/10/04

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp. / Humi. : 23 deg.C / 58% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeA / Without Tag

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15.225 3m, 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]	
13.56000	71.0	QP	18.9	6.7	32.1	64.5	123.9	59.4	0	A	0
13.56000	69.2	QP	18.9	6.7	32.1	62.7	123.9	61.2	45	B	11
13.56000	65.8	QP	18.9	6.7	32.1	59.3	123.9	64.6	90	C	276
13.56000	69.1	QP	18.9	6.7	32.1	62.6	123.9	61.3	135	B	0
13.56000	59.9	QP	18.9	6.7	32.1	53.4	123.9	70.5	0	B	0 LOOP-ANT:HOR

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.) - GAIN (AMP.)

*Limit of 30m distance was converted to the one of 3m.

DATA OF RADIATED EMISSION TEST

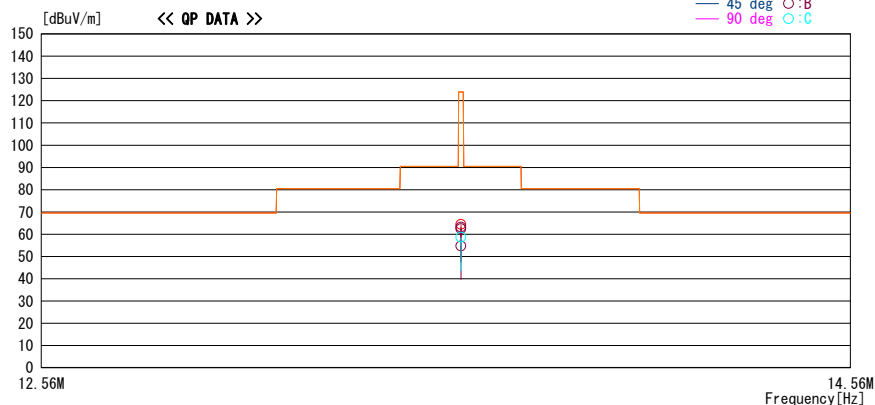
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 Power : AC 120V / 60Hz
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Mode / Remarks : Transmitting(Tx and Rx) / TypeB / Without Tag

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other:QP

— 0 deg ○:A
 — 45 deg ○:B
 — 90 deg ○:C



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]	
13.56000	70.9	QP	18.9	6.7	32.1	64.4	123.9	59.5	0	A	15
13.56000	69.7	QP	18.9	6.7	32.1	63.2	123.9	60.7	45	B	341
13.56000	65.1	QP	18.9	6.7	32.1	58.6	123.9	65.3	90	C	276
13.56000	69.0	QP	18.9	6.7	32.1	62.5	123.9	61.4	135	B	233
13.56000	61.2	QP	18.9	6.7	32.1	54.7	123.9	69.2	0	B	341

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DATA OF RADIATED EMISSION TEST

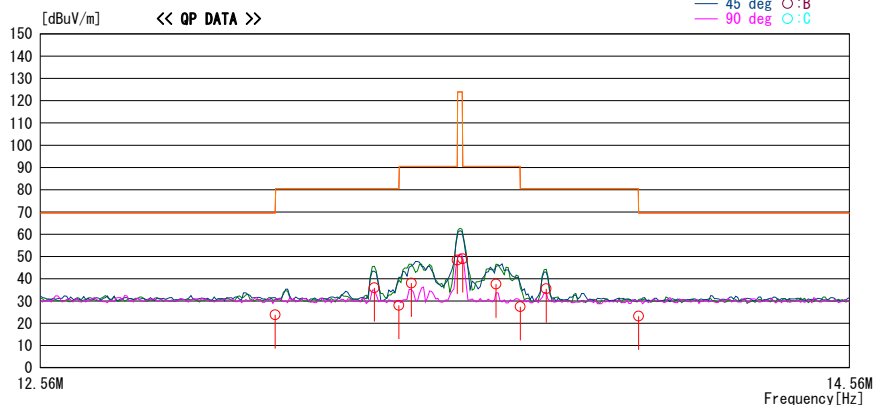
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Mode / Remarks : Transmitting(Tx and Rx) / TypeA / With Tag

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 FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other:QP

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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	29.8	QP	19.1	7.2	32.3	23.8	69.5	45.7	0	A	359
13.35002	42.3	QP	19.0	6.7	32.1	35.9	80.5	44.6	0	A	359
13.41000	34.5	QP	19.0	6.7	32.1	28.1	80.5	52.4	0	A	359
13.44002	44.5	QP	19.0	6.7	32.1	38.1	90.4	52.3	0	A	359
13.55300	54.9	QP	18.9	6.7	32.1	48.4	90.4	42.0	0	A	359
13.56700	55.4	QP	18.9	6.7	32.1	48.9	90.4	41.5	0	A	359
13.65003	44.1	QP	18.9	6.7	32.1	37.6	90.4	52.8	0	A	359
13.71000	33.9	QP	18.9	6.7	32.1	27.4	80.5	53.1	0	A	359
13.77503	41.9	QP	18.9	6.7	32.1	35.4	80.5	45.1	0	A	359
14.01000	29.8	QP	18.8	6.7	32.1	23.2	69.5	46.3	0	A	359

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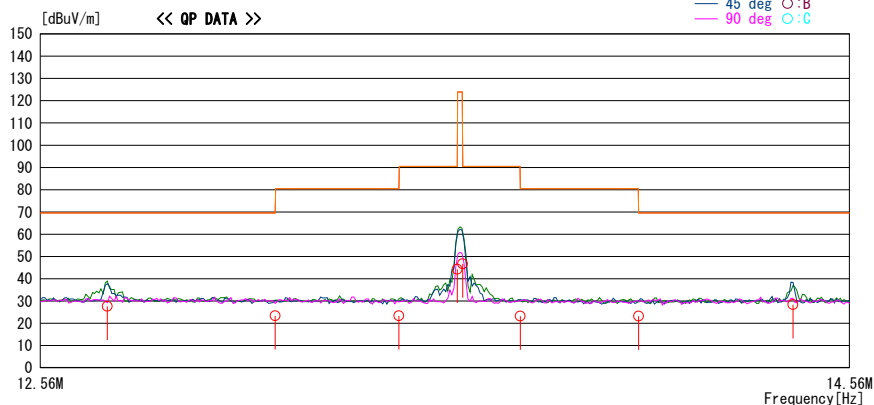
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Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit*	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
12.71500	33.4	QP	19.3	7.2	32.3	27.6	69.5	41.9	0	A	359
13.11000	29.4	QP	19.1	7.2	32.3	23.4	69.5	46.1	0	A	359
13.41000	29.5	QP	19.0	7.2	32.3	23.4	80.5	57.1	0	A	359
13.55300	50.4	QP	18.9	7.2	32.3	44.2	90.4	46.2	0	A	359
13.56700	52.9	QP	18.9	7.2	32.3	46.7	90.4	43.7	0	A	359
13.71000	29.4	QP	18.9	7.2	32.3	23.2	80.5	57.3	0	A	359
14.01000	29.5	QP	18.8	7.2	32.3	23.2	69.5	46.3	0	A	359
14.41004	34.5	QP	18.8	7.3	32.3	28.3	69.5	41.2	0	A	359

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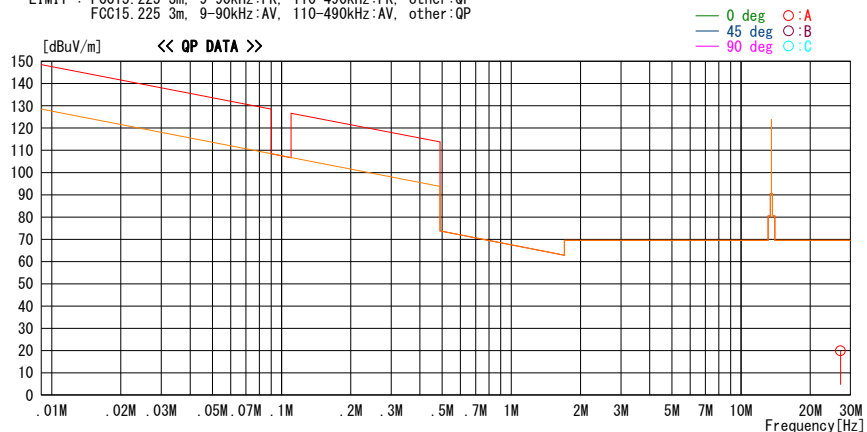
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Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit*	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.0	QP	18.9	4.0	32.0	19.9	69.5	49.6	0	A	356

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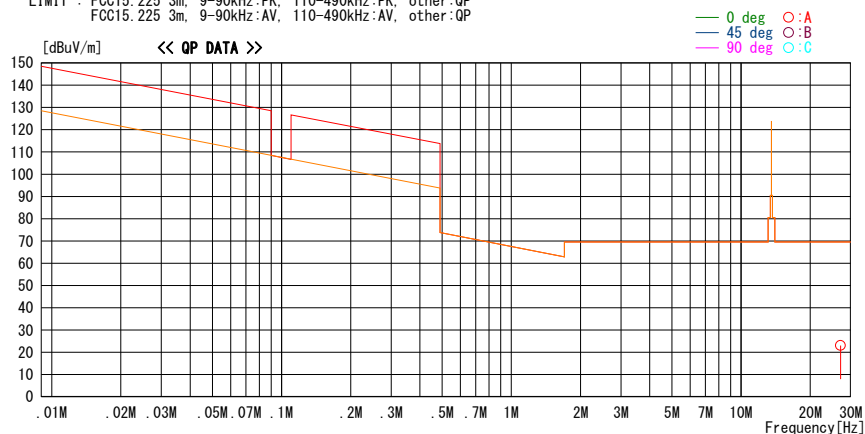
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 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeB / With Tag

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15.225 3m, 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	28.5	QP	18.9	7.8	32.2	23.0	69.5	46.5	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.) - GAIN (AMP.)

*Limit of 30m distance was converted to the one of 3m.

7.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

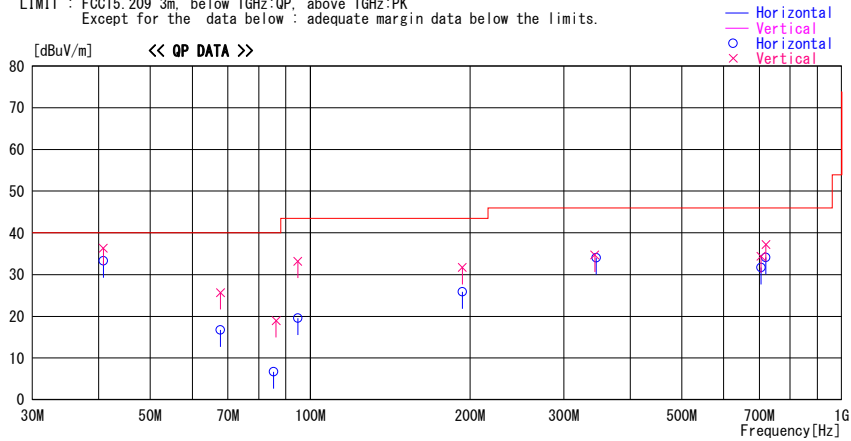
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 23deg. C / 58% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeA / with Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
 Except for the data below : adequate margin data below the limits.



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]							
40.800	43.5	QP	14.5	-24.7	33.3	0	100	Hori.	40.0	6.7	
40.800	46.5	QP	14.5	-24.7	36.3	96	100	Vert.	40.0	3.7	
67.800	34.2	QP	6.9	-24.4	16.7	342	100	Hori.	40.0	23.3	
67.800	43.2	QP	6.9	-24.4	25.7	86	100	Vert.	40.0	14.3	
85.350	23.4	QP	7.5	-24.2	6.7	73	100	Hori.	40.0	33.3	
86.250	35.6	QP	7.6	-24.2	19.0	194	100	Vert.	40.0	21.0	
94.800	34.5	QP	9.2	-24.1	19.6	350	100	Hori.	43.5	23.9	
94.800	48.1	QP	9.2	-24.1	33.2	267	100	Vert.	43.5	10.3	
193.349	32.4	QP	16.5	-23.0	25.9	117	100	Hori.	43.5	17.6	
193.349	38.2	QP	16.5	-23.0	31.7	221	100	Vert.	43.5	11.8	
343.166	40.0	QP	16.8	-22.1	34.7	294	100	Vert.	46.0	11.3	
345.500	39.3	QP	16.8	-22.1	34.0	47	100	Hori.	46.0	12.0	
704.835	29.8	QP	22.1	-20.2	31.7	222	100	Hori.	46.0	14.3	
704.835	32.5	QP	22.1	-20.2	34.4	277	100	Vert.	46.0	11.6	
720.002	31.9	QP	22.3	-20.1	34.1	37	100	Hori.	46.0	11.9	
720.002	35.0	QP	22.3	-20.1	37.2	17	100	Vert.	46.0	8.8	

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

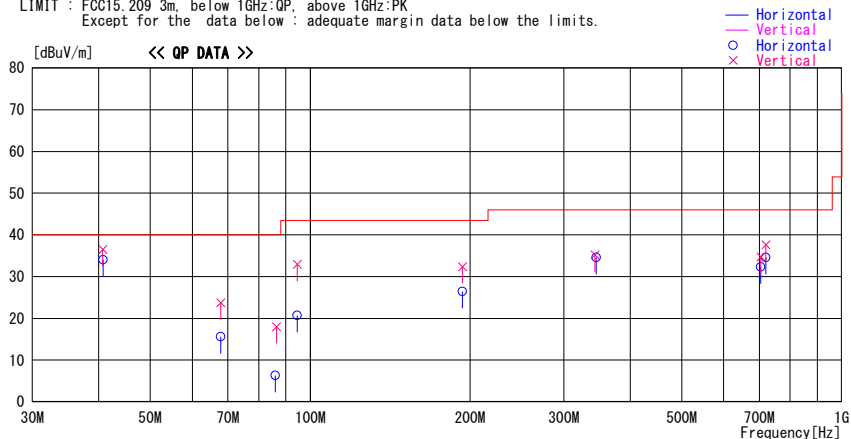
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 23deg. C / 58% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Ix and Rx) / TypeB / with Tag

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
 Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
40.742	44.2	QP	14.5	-24.7	34.0	0	100	Hori.	40.0	6.0	
40.728	46.7	QP	14.5	-24.7	36.5	96	100	Vert.	40.0	3.5	
67.847	33.1	QP	6.9	-24.4	15.6	342	100	Hori.	40.0	24.4	
67.884	41.2	QP	6.9	-24.4	23.7	86	100	Vert.	40.0	16.3	
85.999	22.9	QP	7.6	-24.2	6.3	73	100	Hori.	40.0	33.7	
86.413	34.5	QP	7.7	-24.2	18.0	194	100	Vert.	40.0	22.0	
94.512	35.6	QP	9.2	-24.1	20.7	350	100	Hori.	43.5	22.8	
94.574	47.8	QP	9.2	-24.1	32.9	267	100	Vert.	43.5	10.6	
193.410	32.9	QP	16.5	-23.0	26.4	117	100	Hori.	43.5	17.1	
193.421	38.9	QP	16.5	-23.0	32.4	221	100	Vert.	43.5	11.1	
343.321	40.5	QP	16.8	-22.1	35.2	294	100	Vert.	46.0	10.8	
345.321	39.9	QP	16.8	-22.1	34.6	47	100	Hori.	46.0	11.4	
704.421	30.4	QP	22.1	-20.2	32.3	222	100	Hori.	46.0	13.7	
704.231	32.8	QP	22.1	-20.2	34.7	277	100	Vert.	46.0	11.3	
720.321	32.4	QP	22.3	-20.1	34.6	37	100	Hori.	46.0	11.4	
720.098	35.4	QP	22.3	-20.1	37.6	17	100	Vert.	46.0	8.4	

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

7.4. TX SPURIOUS EMISSIONS ABOVE 1 GHz

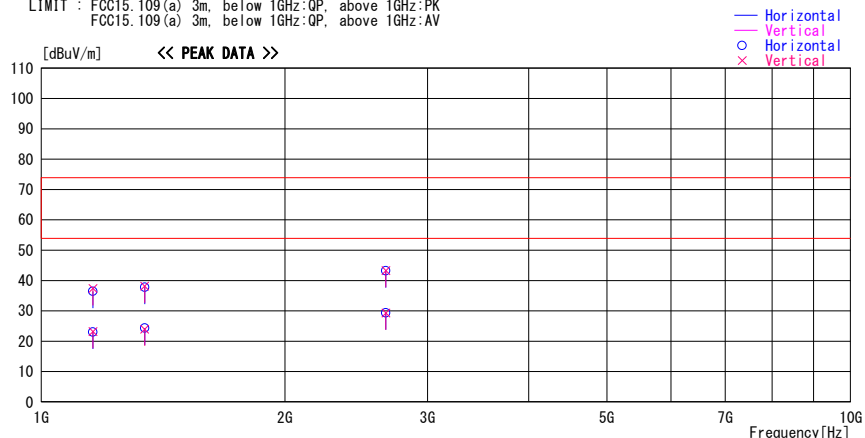
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 23deg. C / 58% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeA / with Tag

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
 FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1158.334	44.3	PK	24.8	-32.6	36.5	0	100	Hori.	73.9	37.4	
1158.334	45.2	PK	24.8	-32.6	37.4	0	100	Vert.	73.9	36.5	
1158.334	30.8	PK	24.8	-32.6	23.0	0	100	Hori.	73.9	50.9	
1158.334	31.0	PK	24.8	-32.6	23.2	0	100	Vert.	73.9	50.7	
1342.002	44.7	PK	25.1	-32.0	37.8	0	100	Hori.	73.9	36.1	
1342.002	45.1	PK	25.1	-32.0	38.2	0	100	Vert.	73.9	35.7	
1342.002	31.2	PK	25.1	-32.0	24.3	0	100	Hori.	73.9	49.6	
1342.002	30.9	PK	25.1	-32.0	24.0	0	100	Vert.	73.9	49.9	
2665.665	44.9	PK	27.9	-29.6	43.2	0	100	Hori.	73.9	30.7	
2665.665	45.0	PK	27.9	-29.6	43.3	0	100	Vert.	73.9	30.6	
2665.665	31.1	PK	27.9	-29.6	29.4	0	100	Hori.	73.9	44.5	
2665.665	31.0	PK	27.9	-29.6	29.3	0	100	Vert.	73.9	44.6	

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

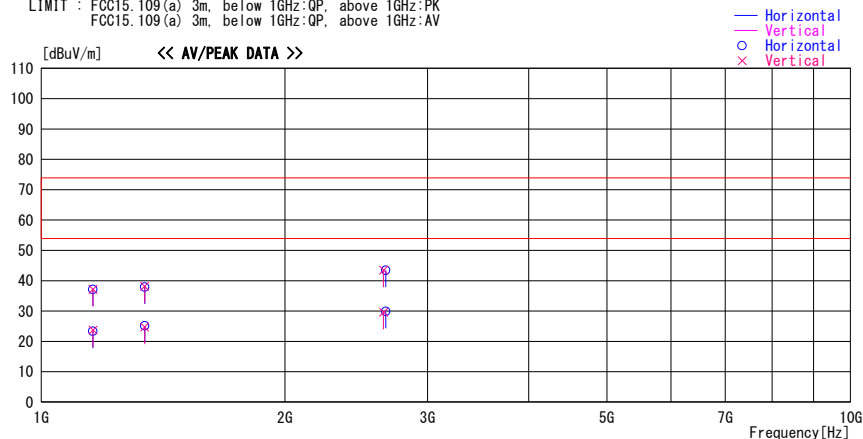
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 23deg. C / 58% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeB / with Tag

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
 FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
1158.334	44.9	PK	24.8	-32.6	37.1	0	100	Hori.	73.9	-36.8	
1158.334	45.0	PK	24.8	-32.6	37.2	0	100	Vert.	73.9	-36.7	
1158.334	31.2	AV	24.8	-32.6	23.4	0	100	Hori.	53.9	-30.5	
1158.334	31.5	AV	24.8	-32.6	23.7	0	100	Vert.	53.9	-30.2	
1342.002	44.8	PK	25.1	-32.0	37.9	0	100	Hori.	73.9	-36.0	
1342.002	45.1	PK	25.1	-32.0	38.2	0	100	Vert.	73.9	-35.7	
1342.002	32.0	AV	25.1	-32.0	25.1	0	100	Hori.	53.9	-28.8	
1342.002	31.6	AV	25.1	-32.0	24.7	0	100	Vert.	53.9	-29.2	
2646.666	45.3	PK	27.8	-29.6	43.5	0	100	Vert.	73.9	-30.4	
2646.666	31.4	AV	27.8	-29.6	29.6	0	100	Vert.	53.9	-24.3	
2665.665	45.2	PK	27.9	-29.6	43.5	0	100	Hori.	73.9	-30.4	
2665.665	31.6	AV	27.9	-29.6	29.9	0	100	Hori.	53.9	-24.0	

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

7.5. 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 C63.4

RESULTS

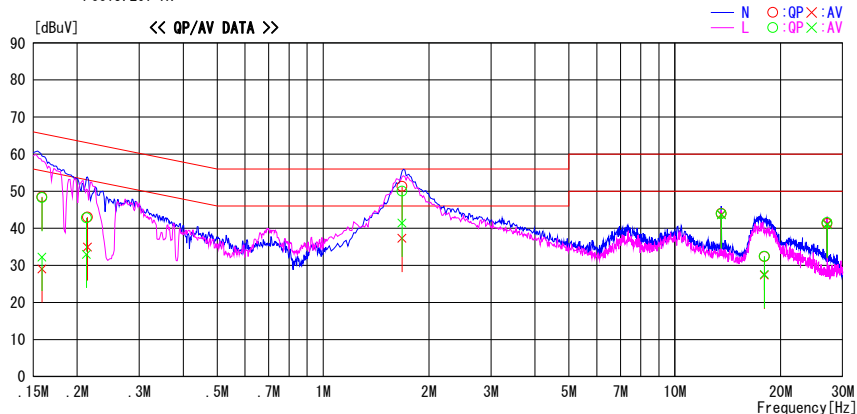
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
 Date : 2012/10/05

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 22deg. C / 52% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeA / With 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	35.2	15.8	13.3	48.5	29.1	65.5	55.5	17.0	26.4	N	
0.21380	29.7	21.7	13.3	43.0	35.0	63.1	53.1	20.1	18.1	N	
1.67537	37.8	23.8	13.5	51.3	37.3	56.0	46.0	4.7	8.7	N	
13.55901	29.5	29.3	14.5	44.0	43.8	60.0	50.0	16.0	6.2	N	
17.97002	17.7	12.7	14.7	32.4	27.4	60.0	50.0	27.6	22.6	N	
27.12621	26.2	26.1	15.1	41.3	41.2	60.0	50.0	18.7	8.8	N	
0.15870	35.0	18.9	13.3	48.3	32.2	65.5	55.5	17.2	23.3	L	
0.21235	29.5	19.7	13.3	42.8	33.0	63.1	53.1	20.3	20.1	L	
1.67537	36.5	27.9	13.5	50.0	41.4	56.0	46.0	6.0	4.6	L	
13.55901	29.4	29.1	14.5	43.9	43.6	60.0	50.0	16.1	6.4	L	
17.97002	17.8	12.9	14.7	32.5	27.6	60.0	50.0	27.5	22.4	L	
27.12621	26.5	25.9	15.1	41.6	41.0	60.0	50.0	18.4	9.0	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.

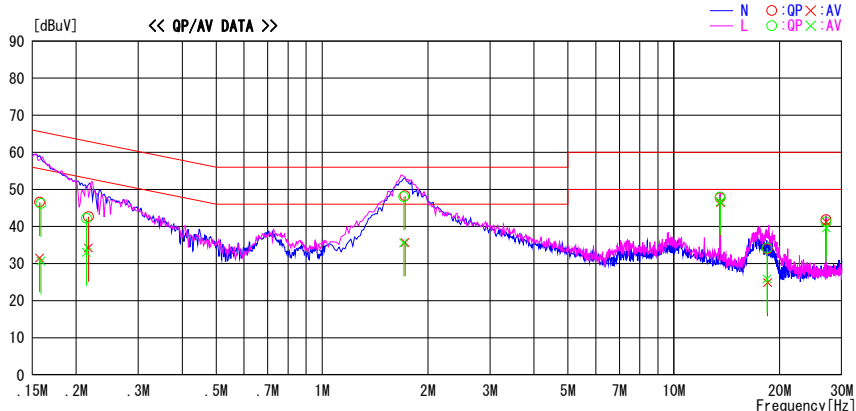
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber
 Date : 2012/10/05

Report No. : 33BE0241-HO
 Power : AC 120V / 60Hz
 Temp./Humi. : 22deg. C / 52% RH
 Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) / TypeB / With 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]		
0.15725	33.3	18.2	13.3	46.6	31.5	65.6	55.6	19.1	24.1	N	
0.21670	29.3	20.9	13.3	42.6	34.2	62.9	52.9	20.3	18.7	N	
1.72072	34.8	22.2	13.5	48.3	35.7	56.0	46.0	7.7	10.3	N	
13.55901	33.3	31.9	14.5	47.8	46.4	60.0	50.0	12.2	3.6	N	
18.47127	19.2	10.2	14.7	33.9	24.9	60.0	50.0	26.1	25.1	N	
27.12621	26.7	26.1	15.1	41.8	41.2	60.0	50.0	18.2	8.8	N	
0.15870	32.9	17.4	13.3	46.2	30.7	65.5	55.5	19.3	24.8	L	
0.21380	28.9	19.8	13.3	42.2	33.1	63.1	53.1	20.9	20.0	L	
1.70560	34.5	22.1	13.5	48.0	35.6	56.0	46.0	8.0	10.4	L	
13.55901	33.4	32.2	14.5	47.9	46.7	60.0	50.0	12.1	3.3	L	
18.40444	19.5	11.2	14.7	34.2	25.9	60.0	50.0	25.8	24.1	L	
27.12621	26.1	24.5	15.1	41.2	39.6	60.0	50.0	18.8	10.4	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.

8. 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 / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

Test Condition deg.C	Volts	Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	102V	Power on	13.5601581	0.0001581	11.66	100.00	88.34
		on 2min.	13.5601444	0.0001444	10.65	100.00	89.35
		on 5min.	13.5601370	0.0001370	10.10	100.00	89.90
		on 10min.	13.5601363	0.0001363	10.05	100.00	89.95
	120V	Power on	13.5601500	0.0001500	11.06	100.00	88.94
		on 2min.	13.5601454	0.0001454	10.72	100.00	89.28
		on 5min.	13.5601373	0.0001373	10.13	100.00	89.87
		on 10min.	13.5601362	0.0001362	10.05	100.00	89.95
	138V	Power on	13.5601555	0.0001555	11.47	100.00	88.53
		on 2min.	13.5601441	0.0001441	10.63	100.00	89.37
		on 5min.	13.5601376	0.0001376	10.15	100.00	89.85
		on 10min.	13.5601363	0.0001363	10.05	100.00	89.95
50deg.C.	120V	Power on	13.5601091	0.0001091	8.05	100.00	91.95
		on 2min.	13.5601094	0.0001094	8.07	100.00	91.93
		on 5min.	13.5601116	0.0001116	8.23	100.00	91.77
		on 10min.	13.5601136	0.0001136	8.37	100.00	91.63
40deg.C.		Power on	13.5601111	0.0001111	8.19	100.00	91.81
		on 2min.	13.5601082	0.0001082	7.98	100.00	92.02
		on 5min.	13.5601086	0.0001086	8.01	100.00	91.99
		on 10min.	13.5601087	0.0001087	8.01	100.00	91.99
30deg.C.		Power on	13.5601245	0.0001245	9.18	100.00	90.82
		on 2min.	13.5601157	0.0001157	8.53	100.00	91.47
		on 5min.	13.5601148	0.0001148	8.46	100.00	91.54
		on 10min.	13.5601151	0.0001151	8.49	100.00	91.51
20deg.C.	Power on	13.5601495	0.0001495	11.03	100.00	88.97	
	on 2min.	13.5601325	0.0001325	9.77	100.00	90.23	
	on 5min.	13.5601312	0.0001312	9.67	100.00	90.33	
	on 10min.	13.5601326	0.0001326	9.78	100.00	90.22	
10deg.C.	Power on	13.5601763	0.0001763	13.00	100.00	87.00	
	on 2min.	13.5601638	0.0001638	12.08	100.00	87.92	
	on 5min.	13.5601593	0.0001593	11.75	100.00	88.25	
	on 10min.	13.5601572	0.0001572	11.59	100.00	88.41	
0deg.C.	Power on	13.5601913	0.0001913	14.11	100.00	85.89	
	on 2min.	13.5601855	0.0001855	13.68	100.00	86.32	
	on 5min.	13.5601767	0.0001767	13.03	100.00	86.97	
	on 10min.	13.5601770	0.0001770	13.05	100.00	86.95	
-10deg.C.	Power on	13.5601961	0.0001961	14.46	100.00	85.54	
	on 2min.	13.5601925	0.0001925	14.19	100.00	85.81	
	on 5min.	13.5601920	0.0001920	14.16	100.00	85.84	
	on 10min.	13.5601924	0.0001924	14.19	100.00	85.81	
-20deg.C	Power on	13.5601864	0.0001864	13.74	100.00	86.26	
	on 2min.	13.5601957	0.0001957	14.43	100.00	85.57	
	on 5min.	13.5601958	0.0001958	14.44	100.00	85.56	
	on 10min.	13.5601956	0.0001956	14.43	100.00	85.57	

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