FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

RFID MODULE

MODEL NUMBER: RI12A

FCC ID: ACJ9TGRI12A

REPORT NUMBER: 12J14383-1

ISSUE DATE: MAY 12, 2012

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 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	05/12/2012	Initial Issue	T. Lee

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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: RI12A

SERIAL NUMBER: 1DKSA00084 (CONDUCTED), 1DKSA00072 (RADIATED)

DATE TESTED: APRIL 30 TO MAY 3, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass

Compliance Certification Services (UL CCS) 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

TIM LEE
STAFF ENGINEER
UL CCS

Tested By:

THANH NGUYEN
EMC ENGINEER
UL CCS

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 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an RFID module that is embedded inside Panasonic laptop model CF-53mk2. 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	48.13
13.56	Normal Mode Type B	47.07

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.

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-53mk2	FM111MK2D1TS	--
AC Adapter	Panasoinc	CF-AA5713AM1	5713AM112105301A	D of C

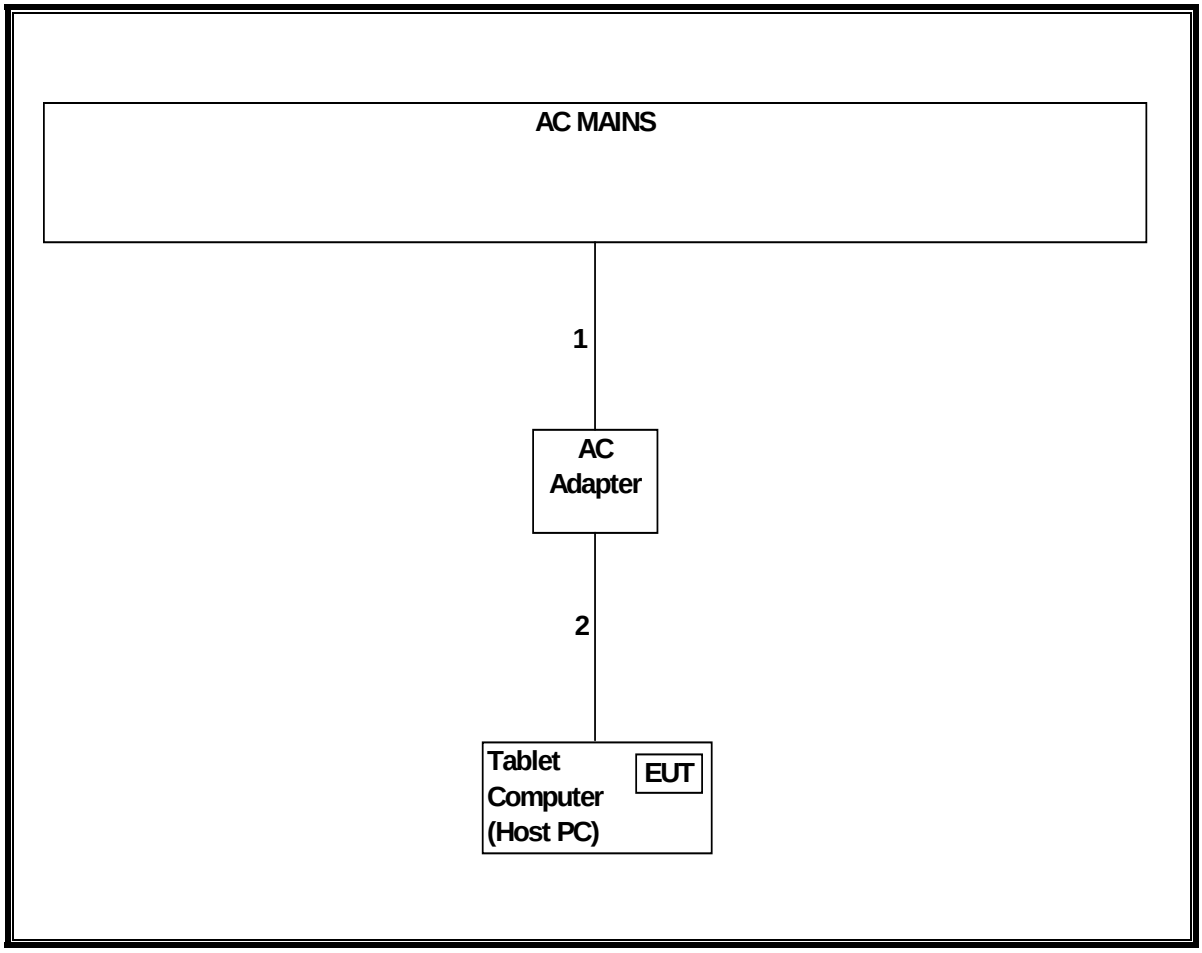
I/O CABLES

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

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Antenna, Loop, 5 MHz	EMCO	6511	N02337	03/04/12	03/04/13
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/11	07/12/12
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/11	06/29/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/27/11	12/30/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/14/11	07/14/12
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11	08/30/12
Spectrum Analyzer,9Khz- 40 GHz	Agilent / HP	8564E	C00961	03/30/12	03/30/13
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	06/08/11	06/05/13
LISN, 30 MHz	FCC	3115	N02625	08/16/11	11/10/12
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	04/20/12	10/20/12

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)

FCC Part 15, Subpart B & C **10 Meter Distance Measurement At Open Field**

Company: PANASONIC
Project #: 12J14383
Model #: RI12A
Tester: Thanh Nguyen
Date: 05/7/2012
Mode : Tx Type A

Frequency (MHz)	PK (dBu/V)	QP (dBu/V)	AV (dBuV)	AF dB/m	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
Loop Antenna Face On:												
13.56	56.66		N/A	10.56	-19.08	48.13	N/A	84.00	N/A	-35.9	N/A	10 m distance
27.12	28.32		N/A	9.046	-19.08	18.28	N/A	29.54	N/A	-11.3	N/A	10 m distance
												10 m distance
Loop Antenna Face Off:												
13.56	51.50		N/A	10.56	-19.08	42.97	N/A	84.00	N/A	-41.0	N/A	10 m distance
27.12	27.25		N/A	9.046	-19.08	17.21	N/A	29.54	N/A	-12.3	N/A	10 m distance

* No more emissions were found up to 30MHz

Note: The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.

P.K. = Peak
Q.P. = Quasi Peak Readings
A.F. = Antenna factor

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FCC Part 15, Subpart B & C **10 Meter Distance Measurement At Open Field**

Company: PANASONIC
Project #: 12J14383
Model #: RI12A
Tester: Thanh Nguyen
Date: 05/1/2012
Model : Tx Type B

Frequency (MHz)	PK (dBu/V)	QP (dBu/V)	AV (dBuV)	AF dB/m	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
Loop Antenna Face On:												
13.56	55.6		N/A	10.56	-19.08	47.07	N/A	84.00	N/A	-36.9	N/A	10m distance
27.12	28.37		N/A	9.046	-19.08	18.33	N/A	29.54	N/A	-11.2	N/A	10m distance
Loop Antenna Face Off:												
13.56	50.53		N/A	10.56	-19.08	42.00	N/A	84.00	N/A	-42.0	N/A	10m distance
27.12	27.17		N/A	9.046	-19.08	17.13	N/A	29.54	N/A	-12.4	N/A	10m distance

* No more emissions were found up to 30MHz

Note: The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.

P.K. = Peak
Q.P. = Quasi Peak Readings
A.F. = Antenna factor

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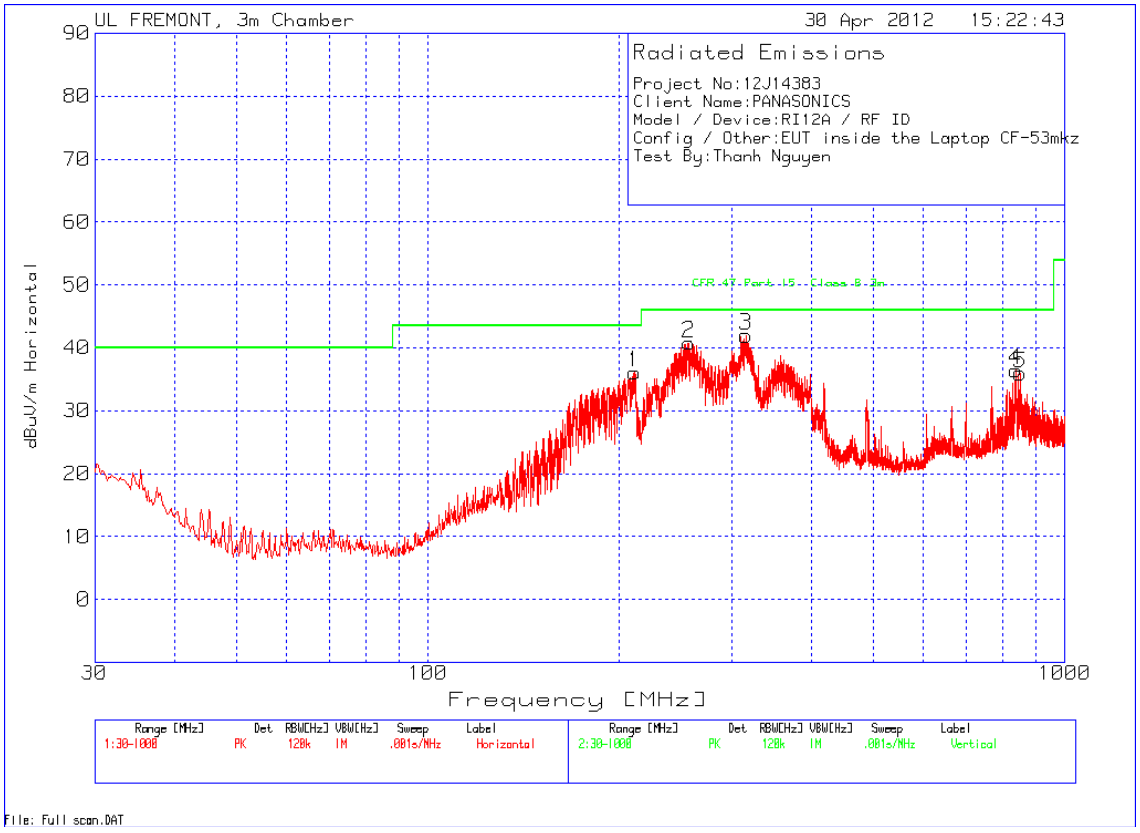
7.3. TX SPURIOUS EMISSION 30 TO 1000 MHz (HORIZONTAL)

HORIZONTAL PLOT

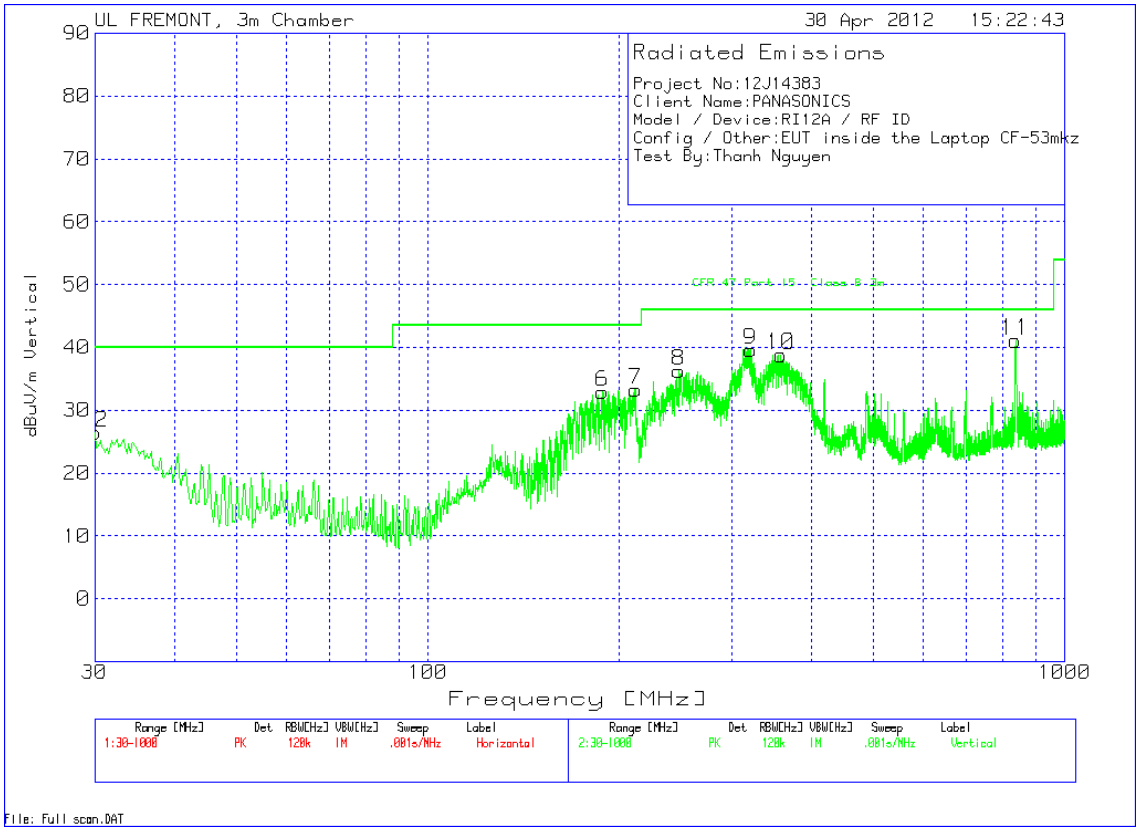


HORIZONTAL DATA

Project No:12J14383									
Client Name:PANASONICS									
Model / Device:RI12A / RF ID									
Config / Other:EUT inside the Laptop CF-53mkz									
Test By:Thanh Nguyen									
Range 1 30 - 1000MHz, Horizontal									
Test Freq. MHz	**Meter Reading dB(µV/m)**	**Detector**	**Pre-Amp Gain [dB] + Cable Loss dB**	**Antenna Factor (dB)**	**Corrected Reading dB(µV/m)**	**FCC Class B Limit**	**Margin dB**	**Height cm**	**Polarity V/H**
210.8573	51.87	PK	-26.1	10.3	36.07	43.5	-7.43	201	Horz
257.1863	54.79	PK	-25.8	11.8	40.79	46	-5.21	99	Horz
315.9213	53.99	PK	-25.7	13.7	41.99	46	-4.01	99	Horz
837.9456	37.98	PK	-23.2	21.7	36.48	46	-9.52	201	Horz
850.9333	37.37	PK	-23.2	21.8	35.97	46	-10.03	99	Horz

7.4. TX SPURIOUS EMISSION 30 TO 1000 MHz (VERTICAL)

VERTICAL PLOT



VERTICAL DATA

Project No:12J14383
Client Name:PANASONICS
Model / Device:RI12A / RF ID
Config / Other:EUT inside the Laptop CF-53mkz
Test By:Thanh Nguyen

Range 2 30 - 1000MHz, Vertical

Test Freq. MHz	Meter Reading dB(µV/m)	Detector	Pre-Amp Gain [dB] + Cable Loss dB	Antenna Factor (dB)	Corrected Reading dB(µV/m)	FCC Class B Limit	Margin dB	Height cm	Polarity V/H
187.7898	48.36	PK	-26.3	10.9	32.96	43.5	-10.54	201	Vert
211.8265	48.99	PK	-26.1	10.4	33.29	43.5	-10.21	201	Vert
247.8817	50.57	PK	-25.9	11.6	36.27	46	-9.73	201	Vert
321.3489	51.58	PK	-25.8	13.8	39.58	46	-6.42	201	Vert
358.761	49.62	PK	-25.5	14.7	38.82	46	-7.18	201	Vert
837.3641	42.8	PK	-23.3	21.6	41.1	46	-4.9	100	Vert
30	32.76	PK	-27.5	21.2	26.46	40	-13.54	100	Vert

7.5. TX SPURIOUS EMISSIONS ABOVE 1 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company:	**PANASONICS**
Project #:	**12J14383**
Date:	**4/30/2012**
Test Engineer:	**Thanh Nguyen**
Configuration:	**EUT inside the Laptop**
Mode:	**Radio wave RFID**

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B		T125; ARA 18-26GHz; S/N:1007	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.027	3.0	53.7	33.7	25.0	2.8	-37.8	0.0	0.0	43.7	23.7	74	54	-30.3	-30.3	V
1.330	3.0	50.9	33.2	25.9	3.2	-37.3	0.0	0.0	42.7	25.0	74	54	-31.3	-29.0	V
1.493	3.0	54.2	35.7	26.4	3.4	-37.1	0.0	0.0	47.0	28.5	74	54	-27.0	-25.5	V
1.787	3.0	56.6	34.3	27.4	3.8	-36.6	0.0	0.0	51.0	28.8	74	54	-23.0	-25.2	V
1.823	3.0	57.6	33.5	27.5	3.8	-36.6	0.0	0.0	52.3	28.2	74	54	-21.7	-25.8	V
2.000	3.0	57.6	34.6	28.0	4.0	-36.3	0.0	0.0	53.3	30.3	74	54	-20.7	-23.7	V
2.313	3.0	51.2	33.4	28.4	4.4	-35.8	0.0	0.0	48.2	30.4	74	54	-25.8	-23.6	V
1.043	3.0	50.8	33.7	25.0	2.8	-37.7	0.0	0.0	40.9	23.8	74	54	-33.1	-30.2	H
1.500	3.0	60.8	30.2	26.5	3.4	-37.1	0.0	0.0	53.6	23.0	74	54	-20.4	-31.0	H

No other emissions were detected above the noise floor.

Rev. 11.10.11

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.6. 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 50µH/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 (dBµV)	
	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

6 WORST EMISSIONS

Project No:12J14383
Client Name:PANASONICS
Model/Device:NFC Module
Test Volt/Freq:115VAC/60Hz
Test By:Thanh Nguyen

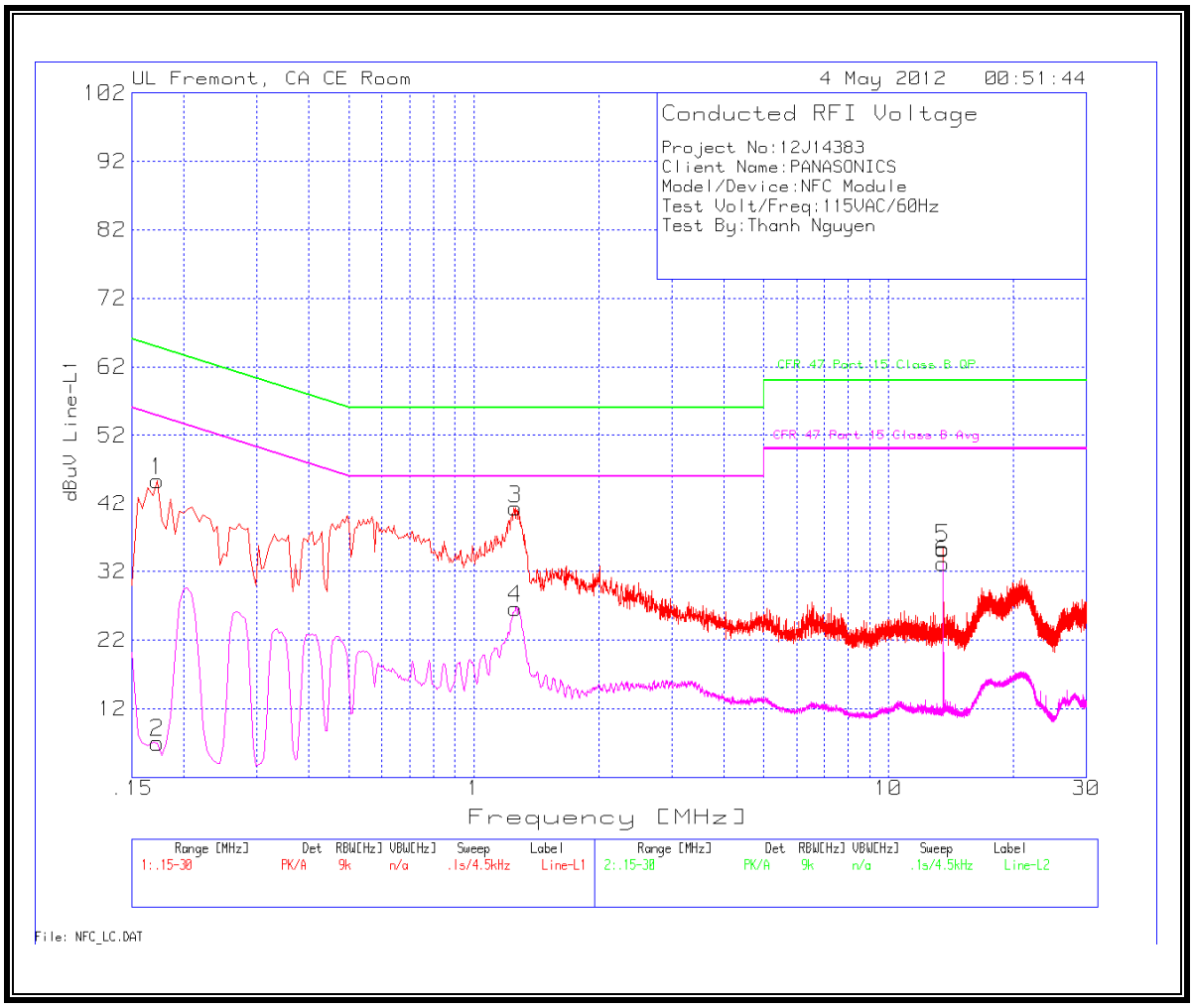
Line-L1 .15 - 30MHz

Test Freq. MHz	Meter Reading dB(µV)	Detector Type	LISN Factor dB	Path Loss (dB)	Corrected Reading dB(µV)	Class B Quasi-Peak Limit	Quasi-Peak Margin dB	Class B Average Limit dB(µV)	Average Margin dB
0.1725	45.23	PK	0.1	0	45.33	64.8	-19.47	54.8	
0.1725	6.92	Av	0.1	0	7.02	64.8	-57.78	54.8	-47.78
1.2615	41.05	PK	0.1	0.1	41.25	56	-14.75	46	
1.2615	26.46	Av	0.1	0.1	26.66	56	-29.34	46	-19.34
13.56	35	PK	0.2	0.2	35.4	60	-24.6	50	
13.56	32.76	Av	0.2	0.2	33.16	60	-26.84	50	-16.84

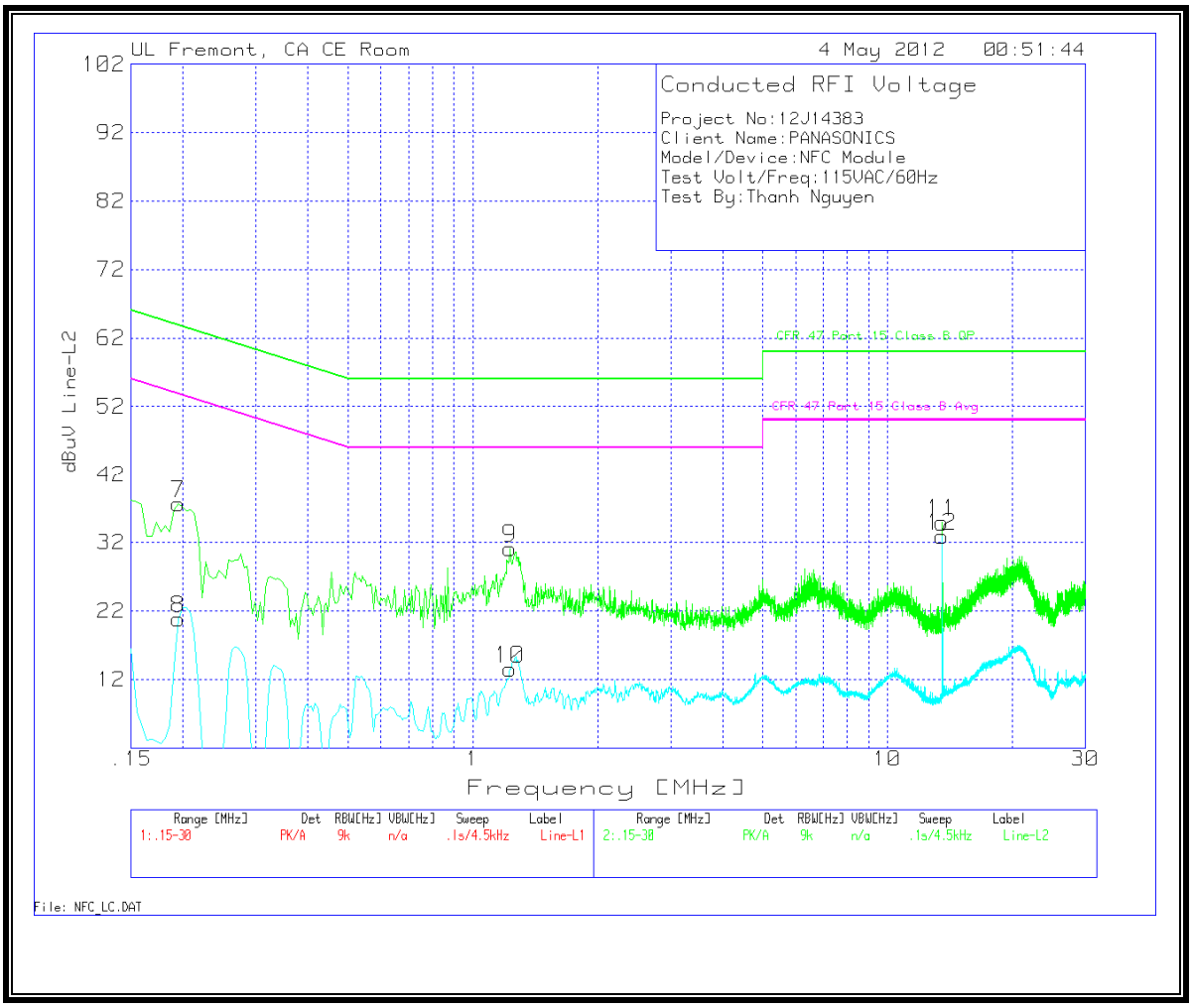
Line-L2 .15 - 30MHz

Test Freq. MHz	Meter Reading dB(µV)	Detector Type	LISN Factor dB	Path Loss (dB)	Corrected Reading dB(µV)	Class B Quasi-Peak Limit	Quasi-Peak Margin dB	Class B Average Limit dB(µV)	Average Margin dB
0.195	37.59	PK	0.1	0	37.69	63.8	-26.11	53.8	
0.195	20.68	Av	0.1	0	20.78	63.8	-43.02	53.8	-33.02
1.23	30.96	PK	0.1	0.1	31.16	56	-24.84	46	
1.23	13.34	Av	0.1	0.1	13.54	56	-42.46	46	-32.46
13.56	34.5	PK	0.2	0.2	34.9	60	-25.1	50	
13.56	32.48	Av	0.2	0.2	32.88	60	-27.12	50	-17.12

LINE 1 RESULTS



LINE 2 RESULTS



8. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±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 / ANSI C63.4:2009 Clause 2.3.1 and 2.3.2

RESULTS

Type A

Limit: ± 100 ppm = 135.601 kHz				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vac)	**Temperature (ºC)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
115	50	13.5599973	-0.07383	± 100
115	40	13.5602588	0.11898	± 100
115	30	13.5600677	-0.02195	± 100
115	***20***	***13.5600974***	***0.00000***	***± 100***
115	10	13.5601403	0.03164	± 100
115	0	13.5601743	0.05667	± 100
115	-10	13.5601905	0.06863	± 100
115	-20	13.5601927	0.07030	± 100
98.00	20	13.5600634	-0.02512	± 100
132	20	13.5600617	-0.02632	± 100

TYPE B:

Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vac)	**Temperature (ºC)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
115	50	13.5599679	-0.06757	± 100
115	40	13.5603130	0.18692	± 100
115	30	13.5603349	0.20307	± 100
115	***20***	***13.5600596***	***0.00000***	***± 100***
115	10	13.5600833	0.01752	± 100
115	0	13.5601399	0.05922	± 100
115	-10	13.5601801	0.08888	± 100
115	-20	13.5601919	0.09760	± 100
98.00	20	13.5600634	0.00279	± 100
132	20	13.5600617	0.00159	± 100