



EMI TEST REPORT

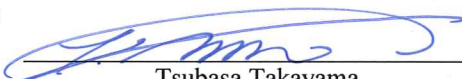
Test Report No. : 10272355H

Applicant : Panasonic Corporation
Type of Equipment : SMART RFU
Model No. : YEP0FX1509
Test regulation : FCC Part 15 Subpart B: 2014
FCC ID : ACJ932YEP0FX1509
Test Result : Complied


1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: March 26, 2014

Representative test engineer:


Tsubasa Takayama
Engineer
Consumer Technology Division

Approved by:


Motoya Imura
Engineer
Consumer Technology Division



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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Ise HQ EMC Lab.

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13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Radiated Emission	9
APPENDIX 1: Data of EMI test	10
Radiated Emission	10
APPENDIX 2: Test instruments	12
APPENDIX 3: Photographs of test setup.....	13
Radiated Emission	13
Worst Case Position (Horizontal: X-axis/ Vertical:Y-axis).....	14

SECTION 1: Customer information

Company Name : Panasonic Corporation
Address : 4261, Ikonobe-cho, Tsuzuki, Yokohama, 224-8520, Japan
Telephone Number : +81-45-939-1144
Facsimile Number : +81-45-939-1917
Contact Person : Masahiro Yoshii

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : SMART RFU
Model No. : YEP0FX1509
Serial No. : Refer to Clause 4.2
Rating : DC 4.63 to 5.10 V
Receipt Date of Sample : March 18, 2014
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model No: YEP0FX1509 is the SMART RFU.

Radio Specification

Radio Type : Receiver
Frequency of Operation : 433.92MHz
Crystal oscillator frequency : 84.644MHz
Local frequency : 423.22MHz
IF frequency : 10.7MHz
Modulation : FSK
Antenna type : Inverted F Sheet-metal Antenna
Antenna gain : -10dBi

FCC15.111(b)

The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached). Therefore, Radiated emission test was performed.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart B: 2014, final revised on March 6, 2014 and effective April 7, 2014

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

* The revision on March 6, 2014 does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2003 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 7.2.4	IC: RSS-Gen 7.2.4			
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	12.4dB 507.865MHz, QP Vertical	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.1			

*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

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

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

Radiated emission test(3m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

UL Japan, Inc. Ise HQ EMC Lab. *NVLAP Lab. code: 200572-0

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Test Mode	Remarks
Receiving mode	433.92MHz

*Tuning was confirmed to be locked on each mode by checking local oscillator frequency to be stable using a search-coil.

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4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a wooden platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The EUT was set on the edge of the tabletop. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 30MHz-300MHz (Biconical antenna) / 300MHz-1000MHz (Logperiodic antenna)
1000MHz - 2000MHz (Horn antenna)
Test distance : 3m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer. The radiated emission measurements were made with the following detector function of the test receiver and the Spectrum analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 3MHz AV *1): RBW:1MHz/VBW:10Hz

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

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

5.5 Test result

Summary of the test results: Pass

Date: March 26, 2014

Test engineer: Tsubasa Takayama

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APPENDIX 1: Data of EMI test

Radiated Emission
Below 1GHz

DATA OF RADIATED EMISSION TEST

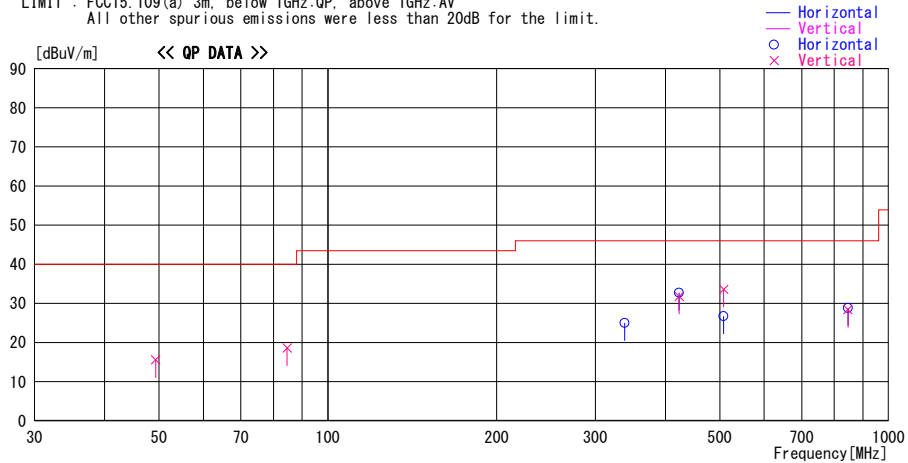
UL Japan, Inc. Ise HQ EMC Lab. No.3 Semi Anechoic Chamber
Date : 2014/03/26

Report No. : 10272355H

Temp./Humi. : 23deg. C / 40% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Rx 433.92MHz (Ver :Y-axis, Hor :Y-axis)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg.]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Gain [dB]						
49.350	29.3	QP	11.2	-24.9	15.6	3	100	Vert.	40.0	24.4
84.644	35.6	QP	7.2	-24.2	18.6	284	100	Vert.	40.0	21.4
338.500	31.2	QP	15.6	-21.8	25.0	238	211	Hori.	46.0	21.0
423.220	35.4	QP	17.7	-21.3	31.8	235	122	Vert.	46.0	14.2
423.220	36.3	QP	17.7	-21.3	32.7	265	100	Hori.	46.0	13.3
507.866	29.3	QP	18.2	-20.8	26.7	222	172	Hori.	46.0	19.3
846.440	24.9	QP	22.1	-18.2	28.8	281	102	Hori.	46.0	17.2
507.865	36.2	QP	18.2	-20.8	33.6	188	100	Vert.	46.0	12.4
846.440	24.5	QP	22.1	-18.2	28.4	182	100	Vert.	46.0	17.6

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

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission
Above 1GHz

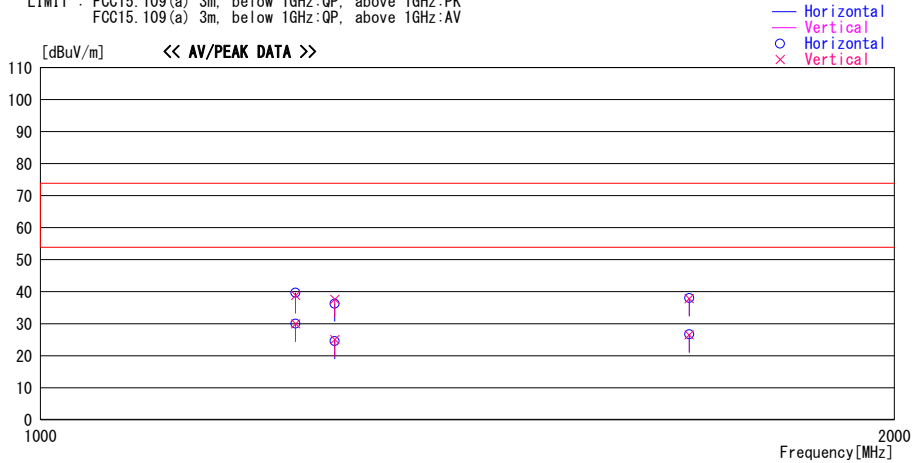
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise HQ EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2014/03/26

Report No. : 10272355H
Temp./Humi. : 23deg. C / 40% RH
Engineer : Tsubasa Takayama

Mode / Remarks : Rx 433.92MHz (Hor :Y-axis, Ver :Y-axis)

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		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Loss& Gain [dB]						
1229.995	38.2	AV	24.7	-32.9	30.0	128	100	Hori.	53.9	23.9
1229.995	47.0	PK	24.7	-32.9	38.8	126	100	Vert.	73.9	35.1
1229.995	38.2	AV	24.7	-32.9	30.0	126	100	Vert.	53.9	23.9
1229.995	47.9	PK	24.7	-32.9	39.7	128	100	Hori.	73.9	34.2
1269.660	45.4	PK	24.8	-32.6	37.6	182	102	Vert.	73.9	36.3
1269.660	32.9	AV	24.8	-32.6	25.1	182	102	Vert.	53.9	28.8
1269.660	32.4	AV	24.8	-32.6	24.6	124	111	Hori.	53.9	29.3
1269.660	44.0	PK	24.8	-32.6	36.2	124	111	Hori.	73.9	37.7
1692.880	31.7	AV	26.2	-31.4	26.5	221	112	Vert.	53.9	27.4
1692.880	43.0	PK	26.2	-31.4	37.8	221	112	Vert.	73.9	36.1
1692.880	31.9	AV	26.2	-31.4	26.7	192	100	Hori.	53.9	27.2
1692.880	43.2	PK	26.2	-31.4	38.0	192	100	Hori.	73.9	35.9

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

*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.

APPENDIX 2: Test instruments

EMI test equipment

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	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2013/11/11 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2013/05/17 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2013/09/27 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 12

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

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

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

Test Item:

RE: Radiated emission

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