



RADIO TEST REPORT

Test Report No. : 32DE0080-HO-01-B

Applicant : LOGICAL PRODUCT CORPORATION
Type of Equipment : LP-RF24DS-02
Model No. : LP-RF24DS-02
FCC ID : A4MLP-RF24DS-02
Test regulation : FCC Part 15 Subpart C: 2011
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 above regulation.
4. The test results in this 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: January 20 and 22, 2012

Representative test engineer:


Satofumi Matsuyama
Engineer of WiSE Japan,
UL Verification Service

Approved by:


Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service



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>

CONTENTS	PAGE
SECTION 1: Customer information.....	3
SECTION 2: Equipment under test (E.U.T.).....	3
SECTION 3: Test specification, procedures & results.....	4
SECTION 4: Operation of E.U.T. during testing.....	7
SECTION 5: Radiated Spurious Emission	9
SECTION 6: 6dB Bandwidth, 99% Occupied Bandwidth, Peak Power Density	11
SECTION 7: Maximum Peak Output Power	12
APPENDIX 1: Data of EMI test.....	13
6dB Bandwidth	13
Maximum Peak Output Power	15
Radiated Spurious Emission	16
Power Density	21
99%Occupied Bandwidth	23
APPENDIX 2: Test instruments	24
APPENDIX 3: Photographs of test setup	25
Radiated Spurious Emission	25
Worst Case Position (Horizontal: Z-axis/ Vertical:Z-axis).....	26

SECTION 1: Customer information

Company Name : LOGICAL PRODUCT CORPORATION
Address : NAKAHARA BLDG.2F 2-25-5 MATOBA MINAMI-KU 811-1314
FUKUOKA JAPAN
Telephone Number : +81-92-405-7603
Facsimile Number : +81-92-405-7604
Contact Person : YUICHIRO TANAKA

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

2.1 Identification of E.U.T.

Type of Equipment : LP-RF24DS-02
Model No. : LP-RF24DS-02
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC5.0V
Receipt Date of Sample : January 6, 2012
Country of Mass-production : Japan
Condition of EUT : Production 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

General Specification

Clock frequency(ies) in the system : RF IC: 32MHz, CPU: 16MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2405-2479MHz
Modulation : O-QPSK
Power Supply (radio part input) : DC3.3V
Antenna type : Inverted F Antenna
Antenna Gain : 3.3dBi

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2011, final revised on November 21, 2011 and effective December 21, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4	N/A	N/A*1)	-
6dB Bandwidth	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied	Radiated *2)
Maximum Peak Output Power	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Radiated *2)
Power Density	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Radiated *2)
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3	5.2dB 2400.000MHz, AV, Vert.	Complied	Radiated *2)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test is not applicable since the EUT does not have AC Mains.

*2) All tests were performed with Radiated emission since the EUT does not have Antenna terminal.

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC3.3V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore the equipment complies with the requirement of 15.203/212.

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	N/A	-	Radiated *1)
Receiver Spurious Emission	IC: RSS-Gen 4.10	IC: RSS-Gen 6	6.6dB 4880.094MHz, AV, Vert.	Complied	Radiated

*1) The test is not applicable since the EUT does not have Antenna terminal.

Other than above, 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	4.2dB	5.0dB	5.1dB	5.6dB	5.9dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	5.7dB	5.8dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	5.7dB	5.8dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	5.7dB	5.8dB	5.1dB	4.2dB

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

Power meter (+dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (+dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

Transmitter Radiated emission test (3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

Receiver Radiated emission test (3m)

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

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	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	4.75 x 5.4 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	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* 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.

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

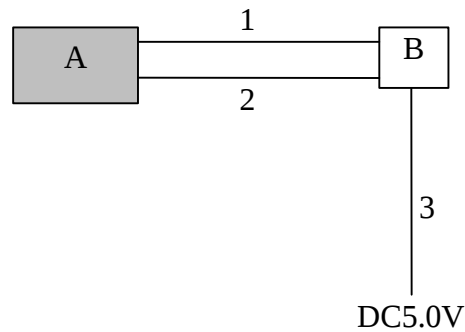
4.1 Operating Mode(s)

Mode	Remarks*
Transmitting mode (Tx)	-
Receiving mode (Rx)	-
*Transmitting duty was 100% on all tests.	
*Power of the EUT was set by the software as follows; Power settings: +5dBm Software: LP02NMS0B8091 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna	Tested frequency
Spurious Emission (Radiated)	Tx	1	2405MHz 2442MHz 2479MHz
	Rx	1	2442MHz
Maximum Peak Output Power 6dB Bandwidth Power Density 99% Occupied Bandwidth	Tx	1	2405MHz 2442MHz 2479MHz

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	LP-RF24DS-02	LP-RF24DS-02	003	LOGICAL PRODUCT CORPORATION	EUT
B	Jig Board	-	-	LOGICAL PRODUCT CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.2	Unshielded	Unshielded	-
2	Signal Cable	0.2	Unshielded	Unshielded	-
3	DC Cable	1.7	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 9kHz to 30MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., and 135 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : Above 30MHz

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 strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

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

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	From 9kHz to 150kHz	From 150kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz	
Instrument used	Spectrum Analyzer	Spectrum Analyzer	Test Receiver	Spectrum Analyzer	
Detector	PK	PK	QP	PK	AV
IF Bandwidth	200Hz	9.1kHz	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz
Test Distance	3m			3m (below 10GHz), 1m*1) (above 10GHz)	

*1) Distance Factor: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- 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.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 9kHz-26.5GHz

Test data : APPENDIX

Test result : Pass

UL Japan, Inc.

Head Office EMC Lab.

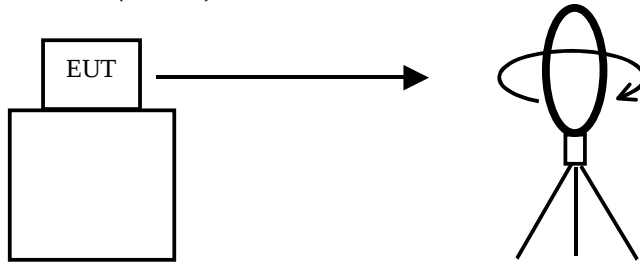
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

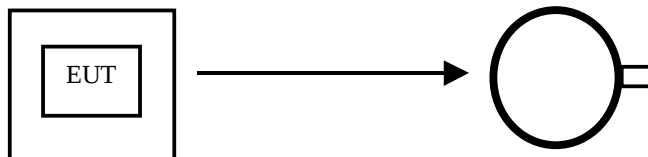
Facsimile : +81 596 24 8124

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

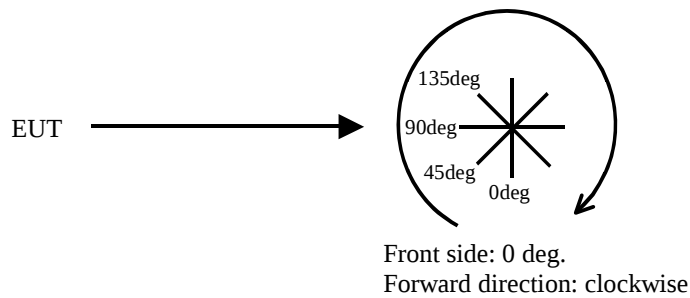


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



SECTION 6: 6dB Bandwidth, 99% Occupied Bandwidth, Peak Power Density

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	18MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Peak Power Density	3MHz	30kHz	100kHz	100sec	Peak	Max Hold	Spectrum Analyzer *1) *2)

*1) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

*2) The test was not performed at RBW:3kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:30kHz.

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass

SECTION 7: Maximum Peak Output Power

Test Procedure

- 1) EUT was placed on a platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength has been measured in semi anechoic chamber at a distance of 3m. The measuring antenna height was varied between 1 to 4m and the turn table was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization.
- 2) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height 0.8m as the EUT.
The Substitution Antenna was used Horn Antenna.
The Substitution Antenna was connected to the Signal Generator, and the polarized electromagnetic radiation of the Substitution Antenna was matched with the one of the measuring Antenna, which was set with the Signal Generator to the measured frequency in 1). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field strength is equal to the measured value in 1) by means of varying the measuring antenna height between 1 to 4m to obtain maximum receiving level.
Its Output power of Signal Generator was recorded.
- 3) Effective radiated power was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 2).
For the usage of the Antenna (Horn Antenna) except for the Half wave dipole Antenna (2.15dBi) for the Substitution Antenna, the Effective radiated power was calculated by compensating the finite difference in the Antenna gain of the Half wave dipole Antenna, and Substitution Antenna.

The test results are rounded off to one decimal place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass

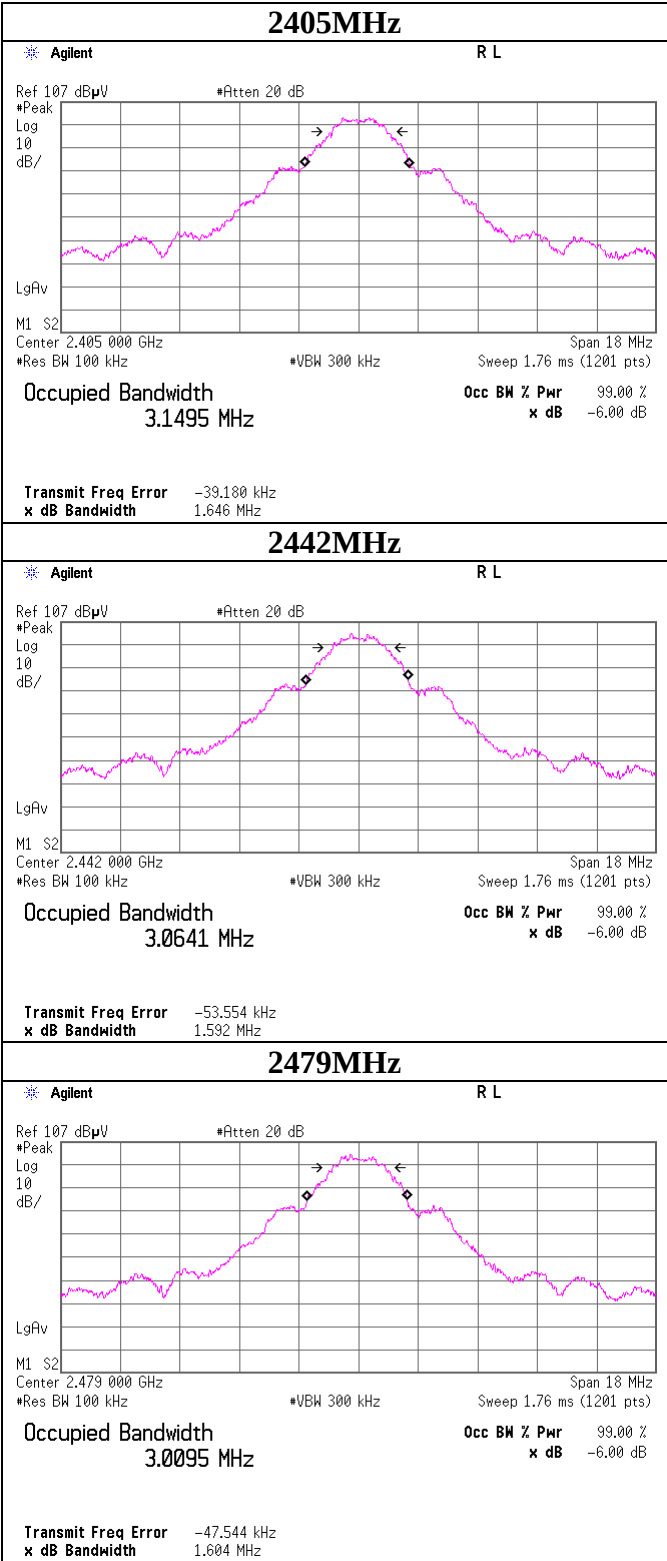
APPENDIX 1: Data of EMI test

6dB Bandwidth

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 32DE0080-HO-01
Date 01/20/2012
Temperature/ Humidity 23 deg. C / 46% RH
Engineer Satofumi Matsuyama
Mode Tx

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2405	1.646	>500
2442	1.592	>500
2479	1.604	>500

6dB Bandwidth



Maximum Peak Output Power

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32DE0080-HO-01
Date : 01/20/2012
Temperature/ Humidity : 23 deg. C / 46% RH
Engineer : Satofumi Matsuyama
Mode : Tx

Frequency [MHz]	Rx PM Reading [dBm]		Tx SG Reading [dBm]		Tx Cable Loss [dB]	Tx Ant. Gain [dBi]	Tx Ant. Atten. Loss [dB]	EIRP [dBm]		Horizontal		Vertical		Remarks
	HOR	VER	HOR	VER				Height [cm]	Turn Table [deg.]	Rx Ant. Height [cm]	Turn Table [deg.]			
2405.00	-2.84	-4.11	-1.2	-1.5	4.4	11.0	0.0	5.4	5.1	100	351	100	183	
2442.00	-2.40	-4.28	-0.8	-1.9	4.4	11.0	0.0	5.8	4.7	100	354	100	170	
2479.00	-2.58	-5.34	-0.9	-2.9	4.4	11.0	0.0	5.7	3.7	100	350	100	170	

Calculation EIRP = SG Reading - Tx Cable Loss + Tx Antenna Gain - Tx Antenna Attenuator Loss

Rx-ANTENNA : Biconical Antenna(30M-300MHz), Logperiodic Antenna(300M-1000MHz), Horn Antenna(1G-40GHz)

Tx-ANTENNA : 120MHz tuned Dipole Antenna(30M-120MHz), Dipole Antenna(120M-1000MHz), Horn Antenna(1G-40GHz)

Freq. [MHz]	EIRP (Worst) [dBm]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2405	5.40	3.30	2.10	1.62	30.00	1000	27.90
2442	5.80	3.30	2.50	1.78	30.00	1000	27.50
2479	5.70	3.30	2.40	1.74	30.00	1000	27.60

Sample Calculation:

Result = EIRP - Antenna Gain

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32DE0080-HO-01
Date : 1/20/2012 1/22/2012
Temperature/ Humidity : 23 deg. C / 46% RH 22 deg. C / 40% RH
Engineer : Satofumi Matsuyama Satofumi Matsuyama
(Above 1GHz) (Below 1GHz)
Mode : Tx 2405MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	64.000	QP	22.4	7.4	7.6	32.2	5.2	40.0	34.8	
Hori	128.000	QP	22.2	13.6	8.4	32.1	12.1	43.5	31.4	
Hori	256.000	QP	21.6	17.6	9.5	32.1	16.6	46.0	29.4	
Hori	416.000	QP	22.3	17.8	10.6	32.1	18.6	46.0	27.4	
Hori	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Hori	736.000	QP	23.6	22.6	12.4	32.1	26.5	46.0	19.5	
Hori	2390.000	PK	46.5	28.1	2.5	32.2	44.9	73.9	29.0	
Hori	2400.000	PK	58.2	28.1	2.5	32.2	56.6	73.9	17.3	
Hori	4810.000	PK	44.6	31.2	5.3	31.4	49.7	73.9	24.2	
Hori	7215.000	PK	43.5	35.6	6.1	32.4	52.8	73.9	21.1	
Hori	9620.000	PK	43.3	38.3	7.2	33.2	55.6	73.9	18.3	
Hori	24050.000	PK	46.0	38.8	-0.9	31.6	52.3	73.9	21.6	
Hori	2390.000	AV	34.8	28.1	2.5	32.2	33.2	53.9	20.7	
Hori	2400.000	AV	50.0	28.1	2.5	32.2	48.4	53.9	5.5	
Hori	4810.000	AV	36.8	31.2	5.3	31.4	41.9	53.9	12.0	
Hori	7215.000	AV	32.7	35.6	6.1	32.4	42.0	53.9	11.9	
Hori	9620.000	AV	30.6	38.3	7.2	33.2	42.9	53.9	11.0	
Hori	24050.000	AV	33.9	38.8	-0.9	31.6	40.2	53.9	13.7	
Vert	64.000	QP	22.4	7.4	7.6	32.2	5.2	40.0	34.8	
Vert	128.000	QP	22.2	13.6	8.4	32.1	12.1	43.5	31.4	
Vert	256.000	QP	21.6	17.6	9.5	32.1	16.6	46.0	29.4	
Vert	416.000	QP	21.9	17.8	10.6	32.1	18.2	46.0	27.8	
Vert	544.000	QP	21.9	19.7	11.3	32.1	20.8	46.0	25.2	
Vert	736.000	QP	23.0	22.6	12.4	32.1	25.9	46.0	20.1	
Vert	2390.000	PK	47.6	28.1	2.5	32.2	46.0	73.9	27.9	
Vert	2400.000	PK	58.3	28.1	2.5	32.2	56.7	73.9	17.2	
Vert	4810.000	PK	47.1	31.2	5.3	31.4	52.2	73.9	21.7	
Vert	7215.000	PK	46.3	35.6	6.1	32.4	55.6	73.9	18.3	
Vert	9620.000	PK	43.5	38.3	7.2	33.2	55.8	73.9	18.1	
Vert	24050.000	PK	45.9	38.8	-0.9	31.6	52.2	73.9	21.7	
Vert	2390.000	AV	35.4	28.1	2.5	32.2	33.8	53.9	20.1	
Vert	2400.000	AV	50.3	28.1	2.5	32.2	48.7	53.9	5.2	
Vert	4810.000	AV	39.9	31.2	5.3	31.4	45.0	53.9	8.9	
Vert	7215.000	AV	36.5	35.6	6.1	32.4	45.8	53.9	8.1	
Vert	9620.000	AV	30.6	38.3	7.2	33.2	42.9	53.9	11.0	
Vert	24050.000	AV	33.9	38.8	-0.9	31.6	40.2	53.9	13.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The 10th harmonic and Below 30MHz were not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 32DE0080-HO-01
Date 1/20/2012 1/22/2012
Temperature/ Humidity 23 deg. C / 46% RH 22 deg. C / 40% RH
Engineer Satofumi Matsuyama Satofumi Matsuyama
(Above 1GHz) (Below 1GHz)
Mode Tx 2442MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	64.000	QP	22.3	7.4	7.6	32.2	5.1	40.0	34.9	
Hori	128.000	QP	22.1	13.6	8.4	32.1	12.0	43.5	31.5	
Hori	256.000	QP	21.6	17.6	9.5	32.1	16.6	46.0	29.4	
Hori	416.000	QP	22.4	17.8	10.6	32.1	18.7	46.0	27.3	
Hori	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Hori	736.000	QP	23.6	22.6	12.4	32.1	26.5	46.0	19.5	
Hori	4884.000	PK	45.0	31.4	5.3	31.4	50.3	73.9	23.6	
Hori	7326.000	PK	42.1	35.7	6.2	32.5	51.5	73.9	22.4	
Hori	9768.000	PK	42.1	38.5	7.5	33.2	54.9	73.9	19.0	
Hori	24420.000	PK	47.5	38.6	-0.9	31.6	53.6	73.9	20.3	
Hori	4884.000	AV	37.3	31.4	5.3	31.4	42.6	53.9	11.3	
Hori	7326.000	AV	31.2	35.7	6.2	32.5	40.6	53.9	13.3	
Hori	9768.000	AV	30.2	38.5	7.5	33.2	43.0	53.9	10.9	
Hori	24420.000	AV	34.7	38.6	-0.9	31.6	40.8	53.9	13.1	
Vert	64.000	QP	22.4	7.4	7.6	32.2	5.2	40.0	34.8	
Vert	128.000	QP	22.1	13.6	8.4	32.1	12.0	43.5	31.5	
Vert	256.000	QP	21.5	17.6	9.5	32.1	16.5	46.0	29.5	
Vert	416.000	QP	21.6	17.8	10.6	32.1	17.9	46.0	28.1	
Vert	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Vert	736.000	QP	23.0	22.6	12.4	32.1	25.9	46.0	20.1	
Vert	4884.000	PK	47.7	31.4	5.3	31.4	53.0	73.9	20.9	
Vert	7326.000	PK	43.7	35.7	6.2	32.5	53.1	73.9	20.8	
Vert	9768.000	PK	41.5	38.5	7.5	33.2	54.3	73.9	19.6	
Vert	24420.000	PK	47.6	38.6	-0.9	31.6	53.7	73.9	20.2	
Vert	4884.000	AV	41.3	31.4	5.3	31.4	46.6	53.9	7.3	
Vert	7326.000	AV	33.9	35.7	6.2	32.5	43.3	53.9	10.6	
Vert	9768.000	AV	30.2	38.5	7.5	33.2	43.0	53.9	10.9	
Vert	24420.000	AV	34.7	38.6	-0.9	31.6	40.8	53.9	13.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The 10th harmonic and Below 30MHz were not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 32DE0080-HO-01
Date 1/20/2012 1/22/2012
Temperature/ Humidity 23 deg. C / 46% RH 22 deg. C / 40% RH
Engineer Satofumi Matsuyama Satofumi Matsuyama
(Above 1GHz) (Below 1GHz)
Mode Tx 2479MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	64.000	QP	22.3	7.4	7.6	32.2	5.1	40.0	34.9	
Hori	128.000	QP	22.1	13.6	8.4	32.1	12.0	43.5	31.5	
Hori	256.000	QP	21.6	17.6	9.5	32.1	16.6	46.0	29.4	
Hori	416.000	QP	22.3	17.8	10.6	32.1	18.6	46.0	27.4	
Hori	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Hori	736.000	QP	23.6	22.6	12.4	32.1	26.5	46.0	19.5	
Hori	2483.500	PK	59.0	28.5	2.6	32.2	57.9	73.9	16.0	
Hori	4958.000	PK	44.9	31.6	5.3	31.4	50.4	73.9	23.5	
Hori	7437.000	PK	42.8	35.8	6.2	32.5	52.3	73.9	21.6	
Hori	9916.000	PK	43.0	38.6	7.6	33.3	55.9	73.9	18.0	
Hori	24790.000	PK	47.8	38.5	-0.9	31.5	53.9	73.9	20.0	
Hori	2483.500	AV	49.3	28.5	2.6	32.2	48.2	53.9	5.7	
Hori	4958.000	AV	38.1	31.6	5.3	31.4	43.6	53.9	10.3	
Hori	7437.000	AV	30.6	35.8	6.2	32.5	40.1	53.9	13.8	
Hori	9916.000	AV	30.4	38.6	7.6	33.3	43.3	53.9	10.6	
Hori	24790.000	AV	35.4	38.5	-0.9	31.5	41.5	53.9	12.4	
Vert	64.000	QP	22.4	7.4	7.6	32.2	5.2	40.0	34.8	
Vert	128.000	QP	22.2	13.6	8.4	32.1	12.1	43.5	31.4	
Vert	256.000	QP	21.5	17.6	9.5	32.1	16.5	46.0	29.5	
Vert	416.000	QP	21.5	17.8	10.6	32.1	17.8	46.0	28.2	
Vert	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Vert	736.000	QP	23.0	22.6	12.4	32.1	25.9	46.0	20.1	
Vert	2483.500	PK	56.4	28.5	2.6	32.2	55.3	73.9	18.6	
Vert	4958.000	PK	48.2	31.6	5.3	31.4	53.7	73.9	20.2	
Vert	7437.000	PK	43.7	35.8	6.2	32.5	53.2	73.9	20.7	
Vert	9916.000	PK	43.2	38.6	7.6	33.3	56.1	73.9	17.8	
Vert	24790.000	PK	47.4	38.5	-0.9	31.5	53.5	73.9	20.4	
Vert	2483.500	AV	47.0	28.5	2.6	32.2	45.9	53.9	8.0	
Vert	4958.000	AV	42.3	31.6	5.3	31.4	47.8	53.9	6.1	
Vert	7437.000	AV	32.3	35.8	6.2	32.5	41.8	53.9	12.1	
Vert	9916.000	AV	30.4	38.6	7.6	33.3	43.3	53.9	10.6	
Vert	24790.000	AV	35.4	38.5	-0.9	31.5	41.5	53.9	12.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The 10th harmonic and Below 30MHz were not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32DE0080-HO-01
Date : 1/20/2012 1/22/2012
Temperature/ Humidity : 23 deg. C / 46% 22 deg. C / 40% RH
Engineer : Satofumi Matsuyama Satofumi Matsuyama
(1-10GHz) (Below 1GHz)
Mode : Rx 2442MHz

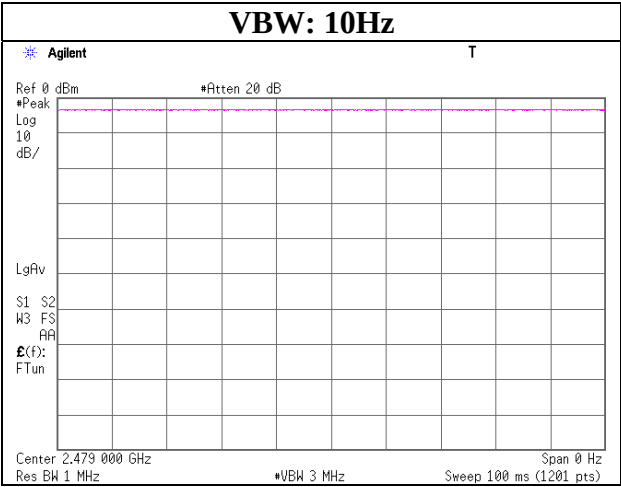
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	64.000	QP	22.3	7.4	7.6	32.2	5.1	40.0	34.9	
Hori	128.000	QP	22.1	13.6	8.4	32.1	12.0	43.5	31.5	
Hori	256.000	QP	21.5	17.6	9.5	32.1	16.5	46.0	29.5	
Hori	416.000	QP	21.9	17.8	10.6	32.1	18.2	46.0	27.8	
Hori	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Hori	736.000	QP	23.0	22.6	12.4	32.1	25.9	46.0	20.1	
Hori	2442.000	PK	42.9	28.3	2.5	32.2	41.5	73.9	32.4	
Hori	4880.029	PK	46.0	31.4	3.7	31.4	49.7	73.9	24.2	
Hori	2442.000	AV	30.7	28.3	2.5	32.2	29.3	53.9	24.6	
Hori	4880.029	AV	39.7	31.4	3.7	31.4	43.4	53.9	10.5	
Vert	64.000	QP	22.4	7.4	7.6	32.2	5.2	40.0	34.8	
Vert	128.000	QP	22.1	13.6	8.4	32.1	12.0	43.5	31.5	
Vert	256.000	QP	21.5	17.6	9.5	32.1	16.5	46.0	29.5	
Vert	416.000	QP	21.4	17.8	10.6	32.1	17.7	46.0	28.3	
Vert	544.000	QP	21.8	19.7	11.3	32.1	20.7	46.0	25.3	
Vert	736.000	QP	22.3	22.6	12.4	32.1	25.2	46.0	20.8	
Vert	2442.000	PK	42.1	28.3	2.5	32.2	40.7	73.9	33.2	
Vert	4880.094	PK	47.9	31.4	3.7	31.4	51.6	73.9	22.3	
Vert	2442.000	AV	30.7	28.3	2.5	32.2	29.3	53.9	24.6	
Vert	4880.094	AV	43.6	31.4	3.7	31.4	47.3	53.9	6.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*Below 30MHz was not seen so the result was its base noise level.

VBW (AV) Calculation



Power Density

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 32DE0080-HO-01
Date 1/20/2012
Temperature/ Humidity 23 deg. C / 46% RH
Engineer Satofumi Matsuyama
Mode Tx

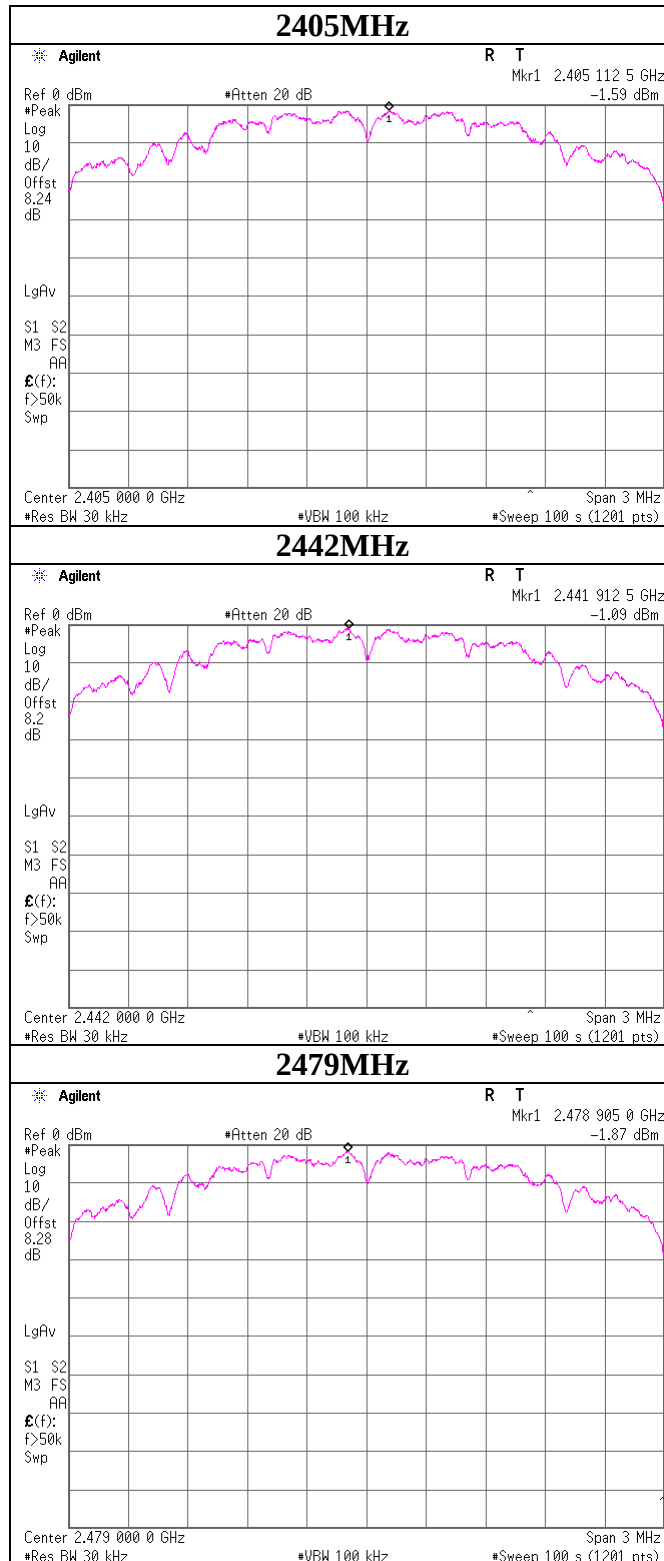
Freq.	Reading	Antenna Gain	Result	Limit	Margin
[MHz]	[dBm]	[dBi]	[dBm]	[dBm]	[dB]
2405.00	-1.59	3.30	-4.89	8.00	12.89
2442.00	-1.09	3.30	-4.39	8.00	12.39
2479.00	-1.87	3.30	-5.17	8.00	13.17

Sample Calculation:
Result = Reading - Antenna Gain

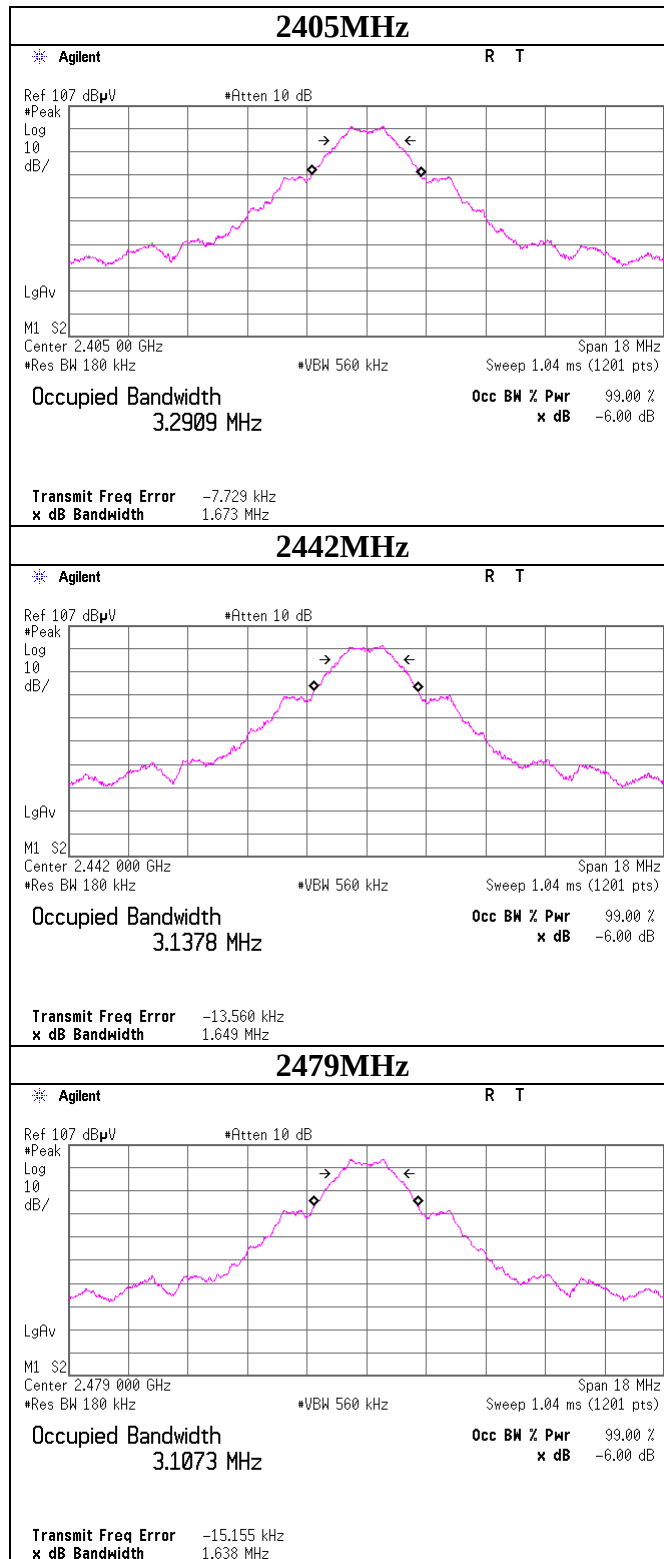
Freq.	EIRP (Worst)	Reading (Power Meter)	Offset	Remarks
[MHz]	[dBm]	[dBm]	[dB]	
2405.00	5.40	-2.84	8.24	
2442.00	5.80	-2.40	8.20	
2479.00	5.70	-2.58	8.28	

Sample Calculation:
Offset = EIRP - Reading

Power Density



99% Occupied Bandwidth



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-56	Microwave Cable	Suhner	SUCOFLEX104	270875/4(1m) / 284655(5m)	RE	2011/03/02 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2011/06/17 * 12
MHF-20	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCC	607	RE	2011/09/08 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2011/12/08 * 12
KSG-05	Signal Generator	Rohde & Schwarz	SMR40	100137	RE	2011/08/30 * 12
MCC-130	Microwave Cable(1-33GHz)	HUBER+SUHNER	SF103/11PC3.5-31/11PC3.5-31/8.0m	54308/3	RE	2012/01/05 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2011/05/23 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	RE	2011/09/12 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	RE	2011/09/12 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2011/10/19 * 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	2011/03/25 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 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	2011/07/04 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 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