



RADIO TEST REPORT

Test Report No. : 32DE0080-HO-01-C-R1

Applicant : LOGICAL PRODUCT CORPORATION
Type of Equipment : LP-RF24DS-03
Model No. : LP-RF24DS-03
FCC ID : A4MLP-RF24DS-03
Test regulation : FCC Part 15 Subpart C: 2011
Test Result : Complied

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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.
6. This report is a revised version of 32DE0080-HO-01-C. 32DE0080-HO-01-C is replaced with this report.

Date of test: January 6 to 26, 2012

Representative test engineer:

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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: Antenna Terminal Conducted Tests.....	10
APPENDIX 1: Data of EMI test.....	11
6dB Bandwidth	11
Maximum Peak Output Power	13
Radiated Spurious Emission	14
Conducted Spurious Emission	26
Conducted Emission Band Edge compliance	33
Power Density	34
99% Occupied Bandwidth	36
APPENDIX 2: Test instruments	37
APPENDIX 3: Photographs of test setup	38
Radiated Spurious Emission	38
Worst Case Position	40

SECTION 1: Customer information

Company Name : LOGICAL PRODUCT CORPORATION
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Contact Person : YUICHIRO TANAKA

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

2.1 Identification of E.U.T.

Type of Equipment : LP-RF24DS-03
Model No. : LP-RF24DS-03
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC3.3V
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 (CPU): 32MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2405-2479MHz
Modulation : O-QPSK
Power Supply (radio part input) : DC 3.3V
Antenna type : ANT 1: Inverted F Antenna
ANT 2: 1/4 Wave Dipole Antenna
Antenna Gain : ANT 1: 2.0dBi
ANT 2: 3.2dBi
Antenna Connector type : ANT 1: -
ANT 2: U. FL

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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	Conducted
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	Conducted
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	Conducted
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	0.9dB 7326.000MHz, AV, Vert. ANT 1	Complied	Conducted/ Radiated

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.

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

FCC 15.31 (e)

The EUT is constantly provided with stable voltage (DC3.3V) from external regulator, it provides stable voltage to RF Module.

Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

ANT1: 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.

ANT2: The EUT has a unique coupling/antenna connector (U. FL). Therefore the equipment complies with the requirement of 15.203.

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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	-	Conducted
Receiver Spurious Emission	IC: RSS-Gen 4.10	IC: RSS-Gen 6	2.4dB 4884.025MHz, AV, Hori., ANT 2	Complied	Radiated

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

Radiated emission test (3m)

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

3.5 Test Location

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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	4.75 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: +4.5dBm Software: 11122701-hammer	
*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, 2	2405MHz 2442MHz 2479MHz
	Rx	1, 2	2442MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth Spurious Emission (Conducted)	Tx	2 *1)	2405MHz 2442MHz 2479MHz
*1) ANT 2 was used for the test as a representative, because it had the same circuit of antenna connection port.			

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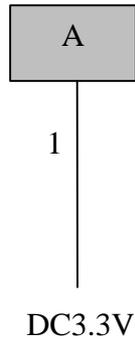
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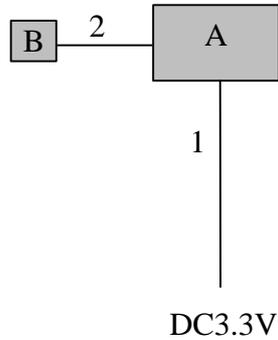
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4.2 Configuration and peripherals
[ANT 1]



[ANT 2]



* 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-03	LP-RF24DS-03	001 *1) 002 *2)	LOGICAL PRODUCT CORPORATION	EUT
B	Antenna	W1027	001	LOGICAL PRODUCT CORPORATION	EUT

*1) Used for Radiated emission test of ANT 1.

*2) Used for all tests except for Radiated emission test of ANT 1.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.7	Unshielded	Unshielded	-
2	Antenna Cable	0.09	Shielded	Shielded	-

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 Section 15.247".

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.

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

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC 15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *1)	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz)		3m (below 10GHz), 1m*3) (above 10GHz)

*1) The test was performed with VBW 10Hz since the EUT had no intervals during which the transmitter was off (see Appendix).

*2) 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 and tilted position of external antenna 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 : 30M-26.5GHz
Test data : APPENDIX
Test result : Pass

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SECTION 6: Antenna Terminal Conducted Tests

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
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	3MHz	30kHz	100kHz	100sec	Peak	Max Hold	Spectrum Analyzer *1) *2)
Conducted Spurious Emission *3)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
	30MHz to 25GHz (Less or equal to 5GHz)	100kHz	300kHz				

*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.

*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

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

Test data : APPENDIX
Test result : Pass

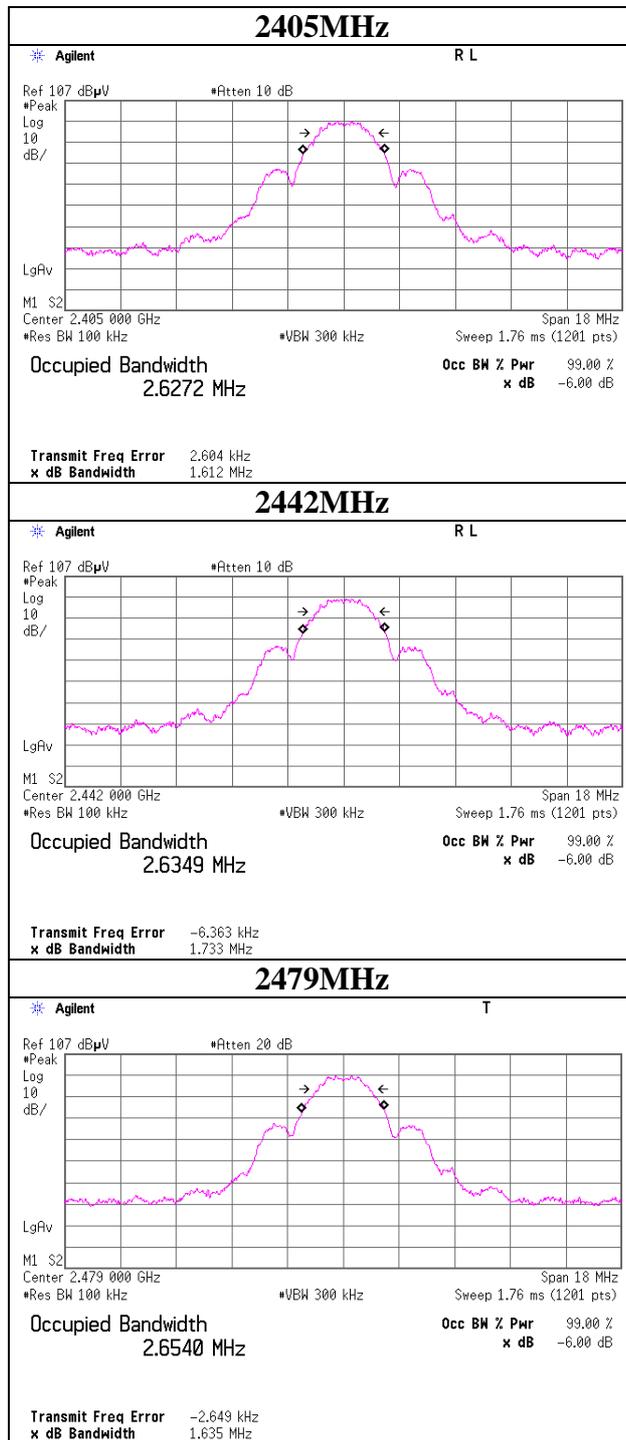
APPENDIX 1: Data of EMI test

6dB Bandwidth

Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32DE0080-HO-01
Date 01/06/2012 01/26/2012
Temperature/ Humidity 24 deg. C / 41% RH 23 deg. C / 43% RH
Engineer Takayuki Shimada Hiroshi Kukita
Mode Tx

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2405	1.612	>500
2442	1.733	>500
2479	1.635	>500

6dB Bandwidth



Maximum Peak Output Power

Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32DE0080-HO-01
Date 01/06/2012 01/26/2012
Temperature/ Humidity 24 deg. C / 41% RH 23 deg. C / 43% RH
Engineer Takayuki Shimada Hiroshi Kukita
Mode Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2405	-6.09	0.77	10.07	4.75	2.99	30.00	1000	25.25
2442	-6.39	0.77	10.07	4.45	2.79	30.00	1000	25.55
2479	-6.98	0.78	10.07	3.87	2.44	30.00	1000	26.13

Sample Calculation:

Result = Reading + Cable Loss (including the cable) + Attenuator

Radiated Spurious Emission
ANT 1

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32DE0080-HO-01
Date : 01/18/2012
Temperature/ Humidity : 22 deg. C / 32% RH
Engineer : Takumi Shimada
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	22.8	7.4	7.6	32.2	5.6	40.0	34.4	
Hori	128.000	QP	22.5	13.6	8.4	32.1	12.4	43.5	31.1	
Hori	256.000	QP	22.0	17.6	9.5	32.1	17.0	46.0	29.0	
Hori	320.000	QP	22.1	16.4	10.0	32.1	16.4	46.0	29.6	
Hori	480.000	QP	22.2	18.7	11.0	32.1	19.8	46.0	26.2	
Hori	640.000	QP	22.5	21.2	11.9	32.2	23.4	46.0	22.6	
Hori	2390.000	PK	43.3	28.1	2.5	32.2	41.7	73.9	32.2	
Hori	2400.000	PK	50.1	28.1	2.5	32.2	48.5	73.9	25.4	
Hori	4810.000	PK	47.1	31.2	4.4	31.4	51.3	73.9	22.6	
Hori	7215.000	PK	63.2	35.6	5.1	32.4	71.5	-	-	See 20dBc Data Sheet
Hori	9620.000	PK	42.7	38.3	5.9	33.2	53.7	73.9	20.2	
Hori	24050.000	PK	47.1	38.8	-0.9	31.6	53.4	73.9	20.5	
Hori	2390.000	AV	30.9	28.1	2.5	32.2	29.3	53.9	24.6	
Hori	2400.000	AV	40.3	28.1	2.5	32.2	38.7	53.9	15.2	
Hori	4810.000	AV	41.7	31.2	4.4	31.4	45.9	53.9	8.0	
Hori	7215.000	AV	56.0	35.6	5.1	32.4	64.3	-	-	See 20dBc Data Sheet
Hori	9620.000	AV	30.4	38.3	5.9	33.2	41.4	53.9	12.5	
Hori	24050.000	AV	33.7	38.8	-0.9	31.6	40.0	53.9	13.9	
Vert	64.000	QP	22.8	7.4	7.6	32.2	5.6	40.0	34.4	
Vert	128.000	QP	22.5	13.6	8.4	32.1	12.4	43.5	31.1	
Vert	256.000	QP	22.0	17.6	9.5	32.1	17.0	46.0	29.0	
Vert	320.000	QP	22.1	16.4	10.0	32.1	16.4	46.0	29.6	
Vert	480.000	QP	22.1	18.7	11.0	32.1	19.7	46.0	26.3	
Vert	640.000	QP	22.4	21.2	11.9	32.2	23.3	46.0	22.7	
Vert	2390.000	PK	43.9	28.1	2.5	32.2	42.3	73.9	31.6	
Vert	2400.000	PK	51.5	28.1	2.5	32.2	49.9	73.9	24.1	
Vert	4810.000	PK	47.8	31.2	4.4	31.4	52.0	73.9	21.9	
Vert	7215.000	PK	60.5	35.6	5.1	32.4	68.8	-	-	See 20dBc Data Sheet
Vert	9620.000	PK	41.9	38.3	5.9	33.2	52.9	73.9	21.0	
Vert	24050.000	PK	47.0	38.8	-0.9	31.6	53.3	73.9	20.6	
Vert	2390.000	AV	32.0	28.1	2.5	32.2	30.4	53.9	23.5	
Vert	2400.000	AV	42.2	28.1	2.5	32.2	40.6	53.9	13.3	
Vert	4810.000	AV	42.5	31.2	4.4	31.4	46.7	53.9	7.2	
Vert	7215.000	AV	53.3	35.6	5.1	32.4	61.6	-	-	See 20dBc Data Sheet
Vert	9620.000	AV	30.3	38.3	5.9	33.2	41.3	53.9	12.6	
Vert	24050.000	AV	33.7	38.8	-0.9	31.6	40.0	53.9	13.9	

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 was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
 26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission
ANT 2

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	444.010	QP	24.3	18.2	10.8	32.1	21.2	46.0	24.8	
Hori	504.003	QP	30.2	19.0	11.1	32.1	28.2	46.0	17.8	
Hori	508.003	QP	29.6	19.1	11.1	32.1	27.7	46.0	18.3	
Hori	512.002	QP	31.7	19.2	11.2	32.1	30.0	46.0	16.0	
Hori	544.002	QP	31.4	19.7	11.3	32.1	30.3	46.0	15.7	
Hori	628.003	QP	27.8	21.0	11.8	32.2	28.4	46.0	17.6	
Hori	2390.000	PK	50.9	28.1	2.5	32.2	49.3	73.9	24.6	
Hori	2400.000	PK	58.4	28.1	2.5	32.2	56.8	73.9	17.1	
Hori	4810.000	PK	50.4	31.2	5.3	31.4	55.5	73.9	18.4	
Hori	7215.000	PK	49.7	35.6	6.1	32.4	59.0	73.9	14.9	
Hori	9620.000	PK	42.8	38.3	7.2	33.2	55.1	73.9	18.8	
Hori	24050.000	PK	46.3	38.8	-0.9	31.6	52.6	73.9	21.3	
Hori	2390.000	AV	38.2	28.1	2.5	32.2	36.6	53.9	17.3	
Hori	2400.000	AV	48.6	28.1	2.5	32.2	47.0	53.9	6.9	
Hori	4810.000	AV	44.1	31.2	5.3	31.4	49.2	53.9	4.7	
Hori	7215.000	AV	41.8	35.6	6.1	32.4	51.1	53.9	2.8	
Hori	9620.000	AV	30.3	38.3	7.2	33.2	42.6	53.9	11.3	
Hori	24050.000	AV	33.9	38.8	-0.9	31.6	40.2	53.9	13.7	
Vert	444.014	QP	29.3	18.2	10.8	32.1	26.2	46.0	19.8	
Vert	504.002	QP	37.6	19.0	11.1	32.1	35.6	46.0	10.4	
Vert	508.003	QP	38.7	19.1	11.1	32.1	36.8	46.0	9.2	
Vert	512.002	QP	36.7	19.2	11.2	32.1	35.0	46.0	11.0	
Vert	544.002	QP	33.4	19.7	11.3	32.1	32.3	46.0	13.7	
Vert	628.003	QP	30.0	21.0	11.8	32.2	30.6	46.0	15.4	
Vert	2390.000	PK	49.6	28.1	2.5	32.2	48.0	73.9	25.9	
Vert	2400.000	PK	57.5	28.1	2.5	32.2	55.9	73.9	18.0	
Vert	4810.000	PK	46.8	31.2	5.3	31.4	51.9	73.9	22.0	
Vert	7215.000	PK	44.3	35.6	6.1	32.4	53.6	73.9	20.3	
Vert	9620.000	PK	43.0	38.3	7.2	33.2	55.3	73.9	18.6	
Vert	24050.000	PK	45.5	38.8	-0.9	31.6	51.8	73.9	22.1	
Vert	2390.000	AV	36.7	28.1	2.5	32.2	35.1	53.9	18.8	
Vert	2400.000	AV	47.6	28.1	2.5	32.2	46.0	53.9	7.9	
Vert	4810.000	AV	40.0	31.2	5.3	31.4	45.1	53.9	8.8	
Vert	7215.000	AV	34.6	35.6	6.1	32.4	43.9	53.9	10.0	
Vert	9620.000	AV	30.3	38.3	7.2	33.2	42.6	53.9	11.3	
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 was 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
ANT 2

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	448.002	QP	28.2	18.3	10.8	32.1	25.2	46.0	20.8	
Hori	504.003	QP	29.4	19.0	11.1	32.1	27.4	46.0	18.6	
Hori	508.001	QP	29.3	19.1	11.1	32.1	27.4	46.0	18.6	
Hori	512.002	QP	28.4	19.2	11.2	32.1	26.7	46.0	19.3	
Hori	544.003	QP	30.3	19.7	11.3	32.1	29.2	46.0	16.8	
Hori	632.002	QP	28.0	21.1	11.8	32.2	28.7	46.0	17.3	
Hori	2483.500	PK	59.0	28.5	2.6	32.2	57.9	73.9	16.0	
Hori	4958.000	PK	50.8	31.6	5.3	31.4	56.3	73.9	17.6	
Hori	7437.000	PK	47.9	35.8	6.2	32.5	57.4	73.9	16.5	
Hori	9916.000	PK	42.4	38.6	7.6	33.3	55.3	73.9	18.6	
Hori	24790.000	PK	47.2	38.5	-0.9	31.5	53.3	73.9	20.6	
Hori	2483.500	AV	46.6	28.5	2.6	32.2	45.5	53.9	8.4	
Hori	4958.000	AV	46.4	31.6	5.3	31.4	51.9	53.9	2.0	
Hori	7437.000	AV	39.2	35.8	6.2	32.5	48.7	53.9	5.2	
Hori	9916.000	AV	31.1	38.6	7.6	33.3	44.0	53.9	9.9	
Hori	24790.000	AV	35.6	38.5	-0.9	31.5	41.7	53.9	12.2	
Vert	448.002	QP	30.3	18.3	10.8	32.1	27.3	46.0	18.7	
Vert	504.003	QP	38.6	19.0	11.1	32.1	36.6	46.0	9.4	
Vert	508.001	QP	39.8	19.1	11.1	32.1	37.9	46.0	8.1	
Vert	512.002	QP	37.9	19.2	11.2	32.1	36.2	46.0	9.8	
Vert	544.000	QP	33.9	19.7	11.3	32.1	32.8	46.0	13.2	
Vert	632.002	QP	30.6	21.1	11.8	32.2	31.3	46.0	14.7	
Vert	2483.500	PK	58.5	28.5	2.6	32.2	57.4	73.9	16.5	
Vert	4958.000	PK	48.2	31.6	5.3	31.4	53.7	73.9	20.2	
Vert	7437.000	PK	42.3	35.8	6.2	32.5	51.8	73.9	22.1	
Vert	9916.000	PK	42.2	38.6	7.6	33.3	55.1	73.9	18.8	
Vert	24790.000	PK	46.9	38.5	-0.9	31.5	53.0	73.9	20.9	
Vert	2483.500	AV	45.6	28.5	2.6	32.2	44.5	53.9	9.4	
Vert	4958.000	AV	40.9	31.6	5.3	31.4	46.4	53.9	7.5	
Vert	7437.000	AV	31.7	35.8	6.2	32.5	41.2	53.9	12.7	
Vert	9916.000	AV	31.1	38.6	7.6	33.3	44.0	53.9	9.9	
Vert	24790.000	AV	35.6	38.5	-0.9	31.5	41.7	53.9	12.2	

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 was 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
Reference data of minimum power setting
(ANT 1 Power setting -10dBm)

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32DE0080-HO-01
Date : 01/26/2012
Temperature/ Humidity : 23 deg. C / 35% RH
Engineer : Tomohisa Nakagawa
Mode : Tx 2405MHz,2442MHz 2479MHz
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	2390.000	PK	43.0	28.1	2.5	32.2	41.4	73.9	32.5	
Hori	2400.000	PK	45.6	28.1	2.5	32.2	44.0	73.9	29.9	
Hori	2390.000	AV	30.2	28.1	2.5	32.2	28.6	53.9	25.3	
Hori	2400.000	AV	32.8	28.1	2.5	32.2	31.2	53.9	22.7	
Vert	2390.000	PK	44.5	28.1	2.5	32.2	42.9	73.9	31.0	
Vert	2400.000	PK	45.4	28.1	2.5	32.2	43.8	73.9	30.1	
Vert	2390.000	AV	30.7	28.1	2.5	32.2	29.1	53.9	24.8	
Vert	2400.000	AV	32.7	28.1	2.5	32.2	31.1	53.9	22.8	

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

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	4884.000	PK	46.7	31.4	4.3	31.4	51.0	73.9	22.9	
Hori	7326.000	PK	42.0	35.7	5.2	32.5	50.4	73.9	23.5	
Hori	9768.000	PK	43.5	38.5	6.0	33.2	54.8	73.9	19.1	
Hori	24420.000	PK	46.6	38.6	-0.9	31.6	52.7	73.9	21.2	
Hori	4884.000	AV	41.8	31.4	4.3	31.4	46.1	53.9	7.8	
Hori	7326.000	AV	29.9	35.7	5.2	32.5	38.3	53.9	15.6	
Hori	9768.000	AV	31.1	38.5	6.0	33.2	42.4	53.9	11.5	
Hori	24420.000	AV	34.6	38.6	-0.9	31.6	40.7	53.9	13.2	
Vert	4884.000	PK	46.9	31.4	4.3	31.4	51.2	73.9	22.7	
Vert	7326.000	PK	42.3	35.7	5.2	32.5	50.7	73.9	23.2	
Vert	9768.000	PK	42.7	38.5	6.0	33.2	54.0	73.9	19.9	
Vert	24420.000	PK	46.9	38.6	-0.9	31.6	53.0	73.9	20.9	
Vert	4884.000	AV	41.7	31.4	4.3	31.4	46.0	53.9	7.9	
Vert	7326.000	AV	29.7	35.7	5.2	32.5	38.1	53.9	15.8	
Vert	9768.000	AV	30.2	38.5	6.0	33.2	41.5	53.9	12.4	
Vert	24420.000	AV	34.6	38.6	-0.9	31.6	40.7	53.9	13.2	

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

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	2483.500	PK	44.1	28.5	2.6	32.2	43.0	73.9	30.9	
Hori	2483.500	AV	31.7	28.5	2.6	32.2	30.6	53.9	23.3	
Vert	2483.500	PK	45.0	28.5	2.6	32.2	43.9	73.9	30.0	
Vert	2483.500	AV	31.6	28.5	2.6	32.2	30.5	53.9	23.4	

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

Radiated Spurious Emission
Reference data of minimum power setting
(ANT 2 Power setting -10dBm)

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 32DE0080-HO-01
Date : 01/26/2012
Temperature/ Humidity : 23 deg. C / 35% RH
Engineer : Tomohisa Nakagawa

Mode : Tx 2405MHz,2442MHz 2479MHz
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	2390.000	PK	42.6	28.1	2.5	32.2	41.0	73.9	32.9	
Hori	2400.000	PK	47.0	28.1	2.5	32.2	45.4	73.9	28.5	
Hori	2390.000	AV	30.6	28.1	2.5	32.2	29.0	53.9	24.9	
Hori	2400.000	AV	34.9	28.1	2.5	32.2	33.3	53.9	20.6	
Vert	2390.000	PK	44.3	28.1	2.5	32.2	42.7	73.9	31.2	
Vert	2400.000	PK	45.9	28.1	2.5	32.2	44.3	73.9	29.6	
Vert	2390.000	AV	30.4	28.1	2.5	32.2	28.8	53.9	25.1	
Vert	2400.000	AV	33.5	28.1	2.5	32.2	31.9	53.9	22.0	

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

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	468.002	QP	27.0	18.6	10.9	32.1	24.3	46.0	21.7	
Hori	544.025	QP	22.5	19.7	11.3	32.1	21.3	46.0	24.7	
Hori	4884.000	PK	45.2	31.4	4.3	31.4	49.5	73.9	24.4	
Hori	4884.000	PK	38.7	31.4	4.3	31.4	43.0	73.9	30.9	
Hori	7326.000	PK	42.5	35.7	5.2	32.5	50.9	73.9	23.0	
Hori	7326.000	PK	29.8	35.7	5.2	32.5	38.2	73.9	35.7	
Hori	9768.000	PK	42.6	38.5	6.0	33.2	53.9	73.9	20.0	
Hori	9768.000	PK	30.2	38.5	6.0	33.2	41.5	73.9	32.4	
Hori	24402.000	PK	46.7	38.6	-0.9	31.6	52.8	73.9	21.1	
Hori	24402.000	AV	34.7	38.6	-0.9	31.6	40.8	53.9	13.1	
Vert	468.002	QP	26.0	18.6	10.9	32.1	23.3	46.0	22.7	
Vert	544.025	QP	30.4	19.7	11.3	32.1	29.2	46.0	16.8	
Vert	4884.000	PK	46.7	31.4	3.7	31.4	50.4	73.9	23.5	
Vert	4884.000	PK	42.5	31.4	3.7	31.4	46.2	73.9	27.7	
Vert	7326.000	PK	41.8	35.7	4.7	32.5	49.7	73.9	24.2	
Vert	7326.000	PK	29.8	35.7	4.7	32.5	37.7	73.9	36.2	
Vert	9768.000	PK	42.3	38.5	5.3	33.2	52.9	73.9	21.0	
Vert	9768.000	PK	30.3	38.5	5.3	33.2	40.9	73.9	33.0	
Vert	24402.000	PK	46.9	38.6	-0.9	31.6	53.0	73.9	20.9	
Vert	24402.000	AV	34.8	38.6	-0.9	31.6	40.9	53.9	13.0	

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

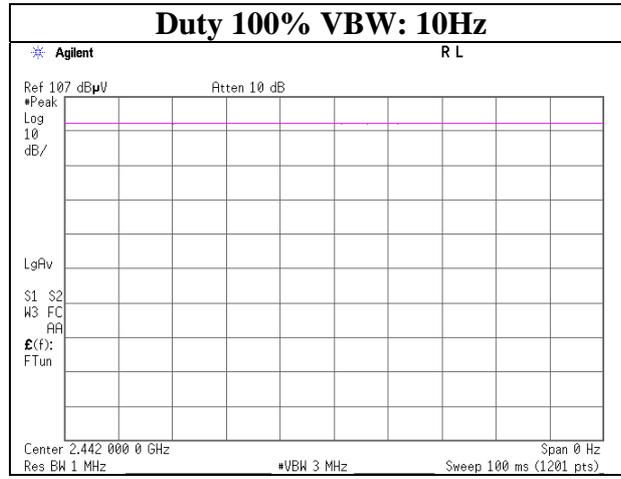
Tx 2479MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	47.2	28.5	2.6	32.2	46.1	73.9	27.8	
Hori	2483.500	AV	35.1	28.5	2.6	32.2	34.0	53.9	19.9	
Vert	2483.500	PK	46.5	28.5	2.6	32.2	45.4	73.9	28.5	
Vert	2483.500	AV	34.8	28.5	2.6	32.2	33.7	53.9	20.2	

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

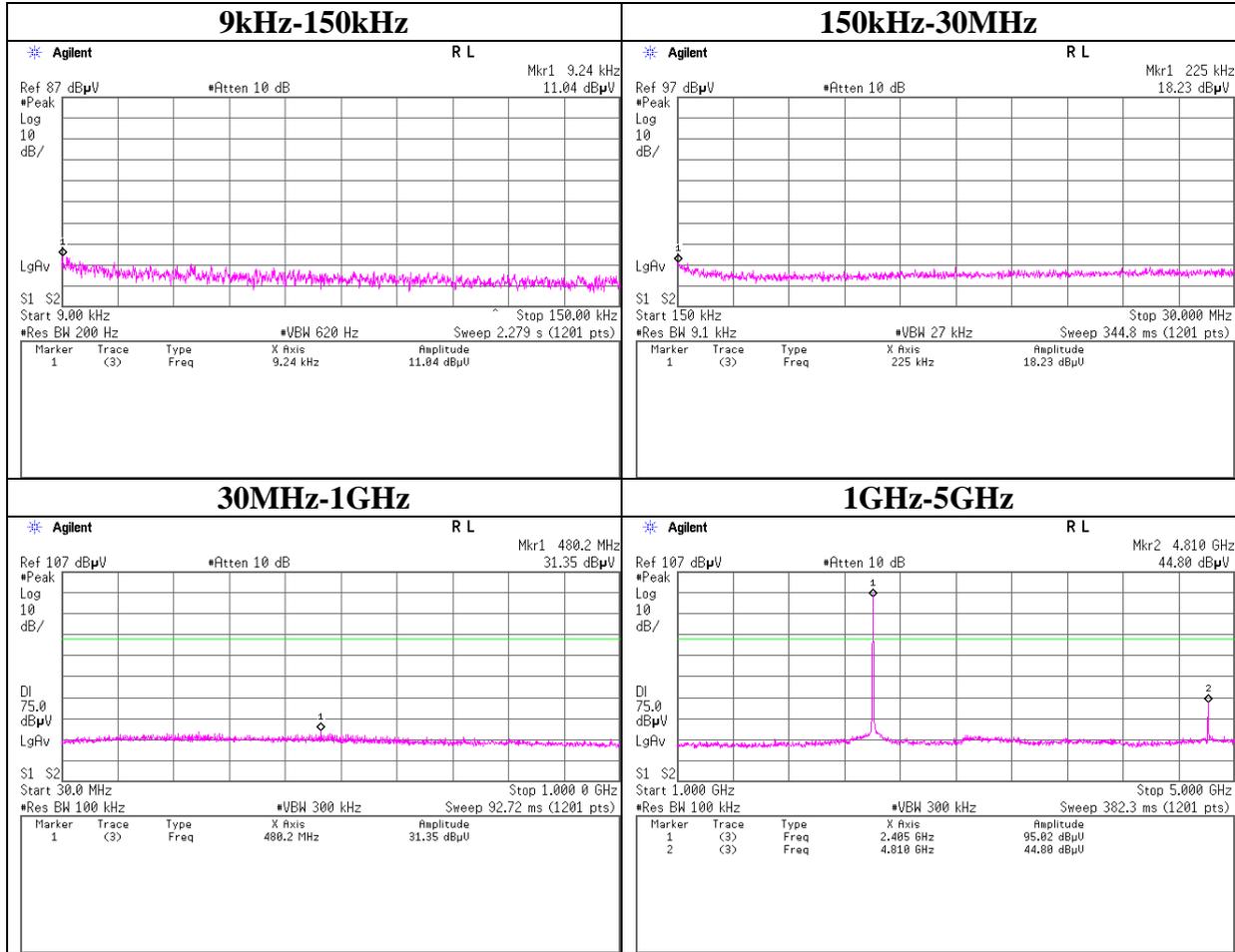
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

VBW (AV) Calculation



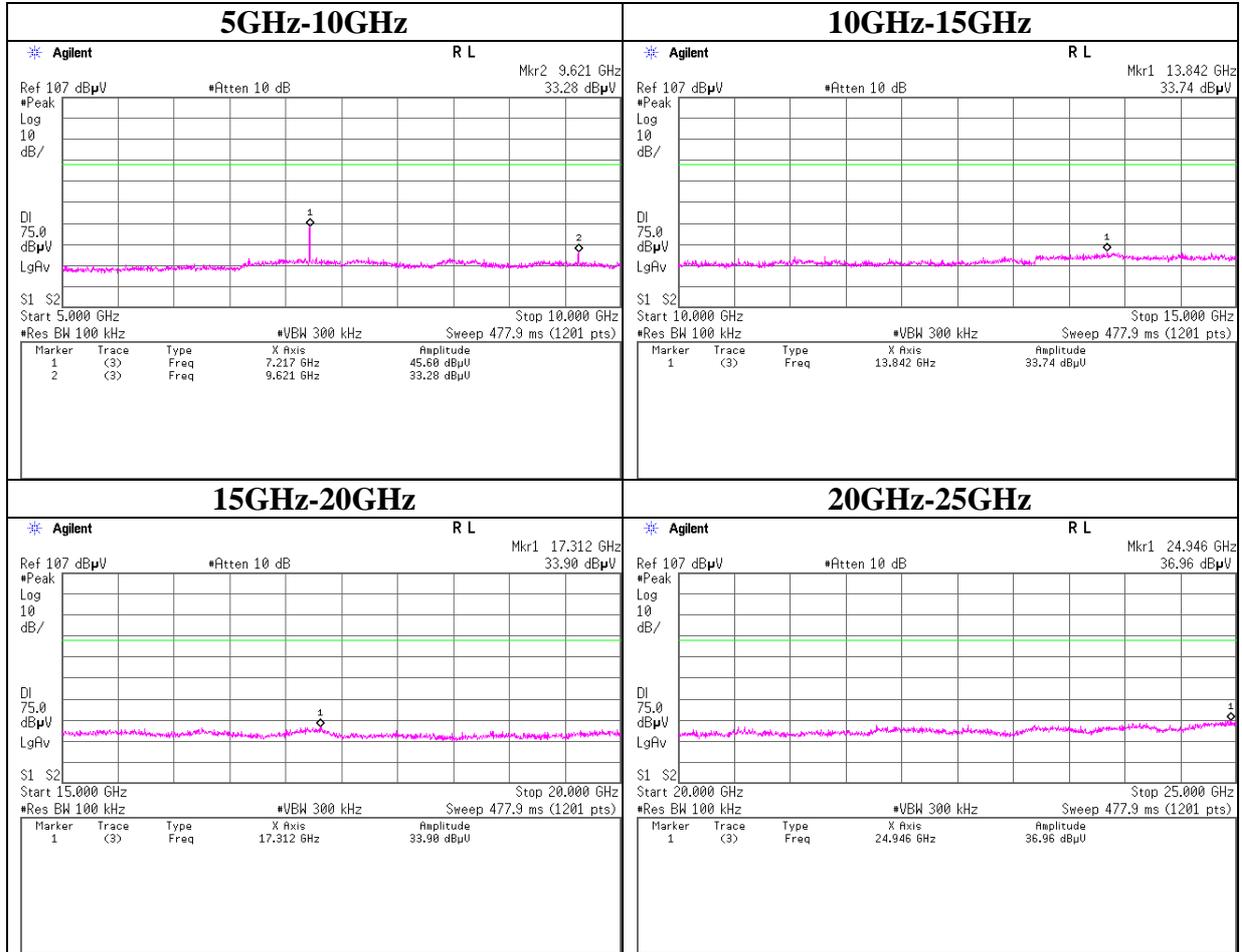
Conducted Spurious Emission

Tx 2405MHz



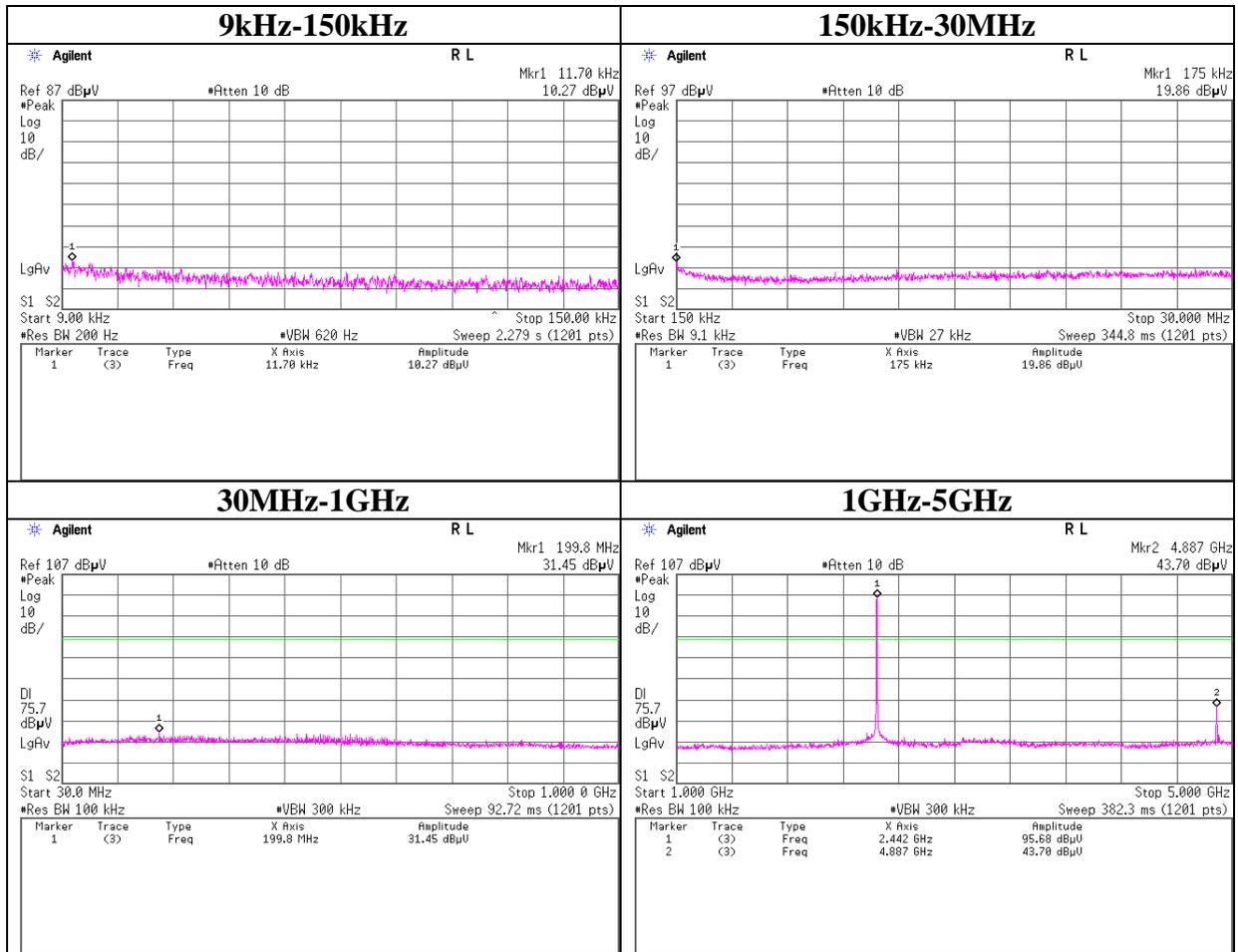
Conducted Spurious Emission

Tx 2405MHz



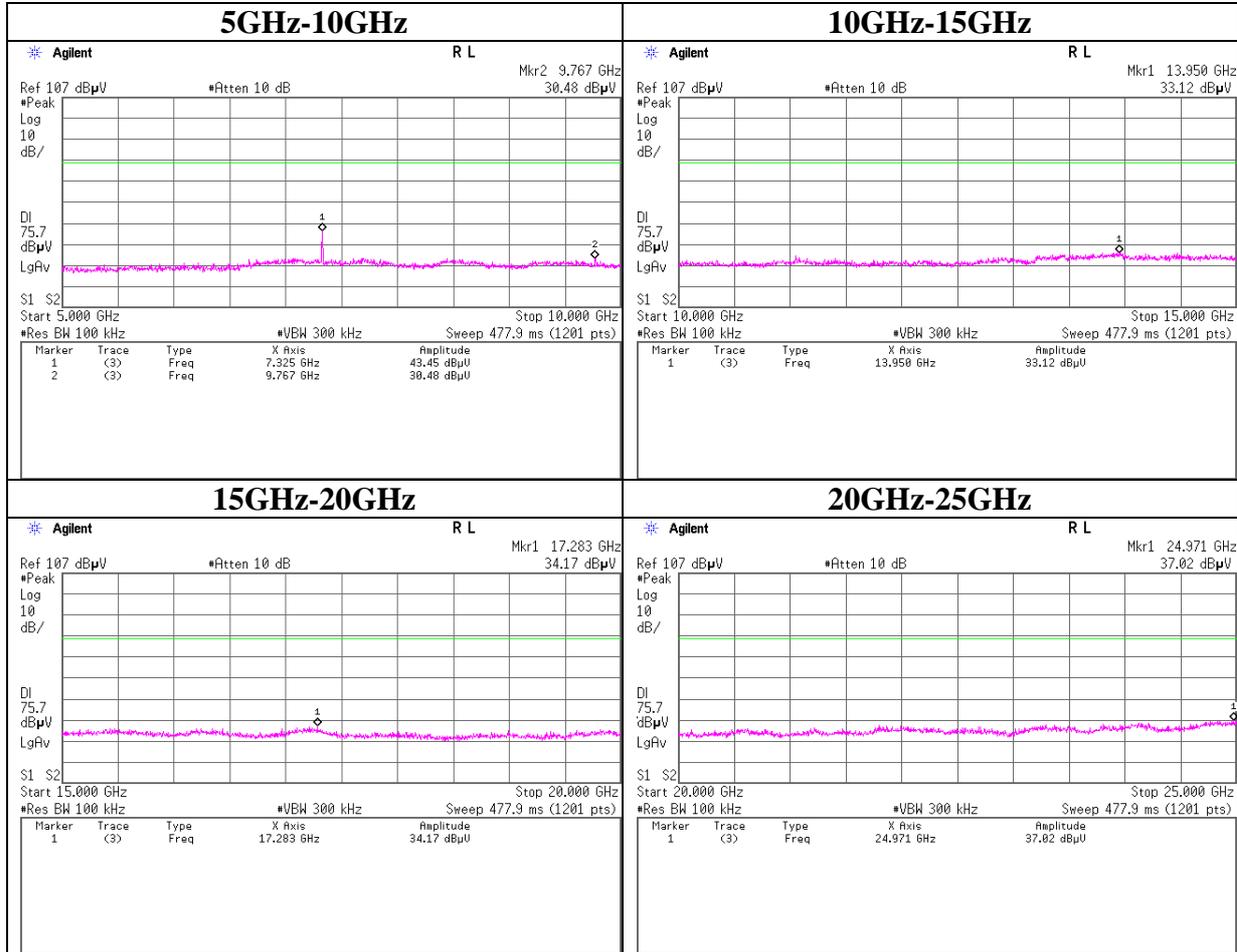
Conducted Spurious Emission

Tx 2442MHz



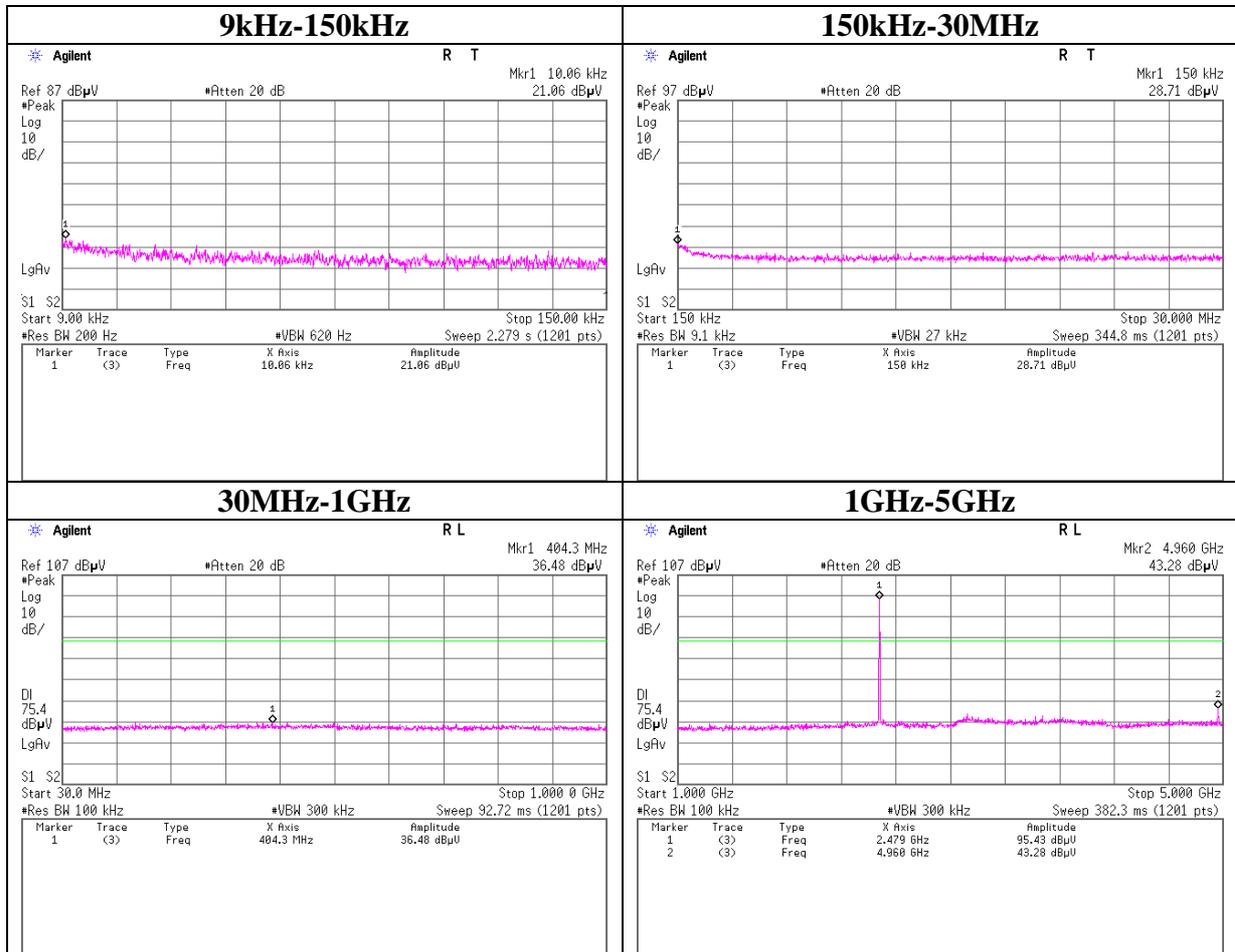
Conducted Spurious Emission

Tx 2442MHz



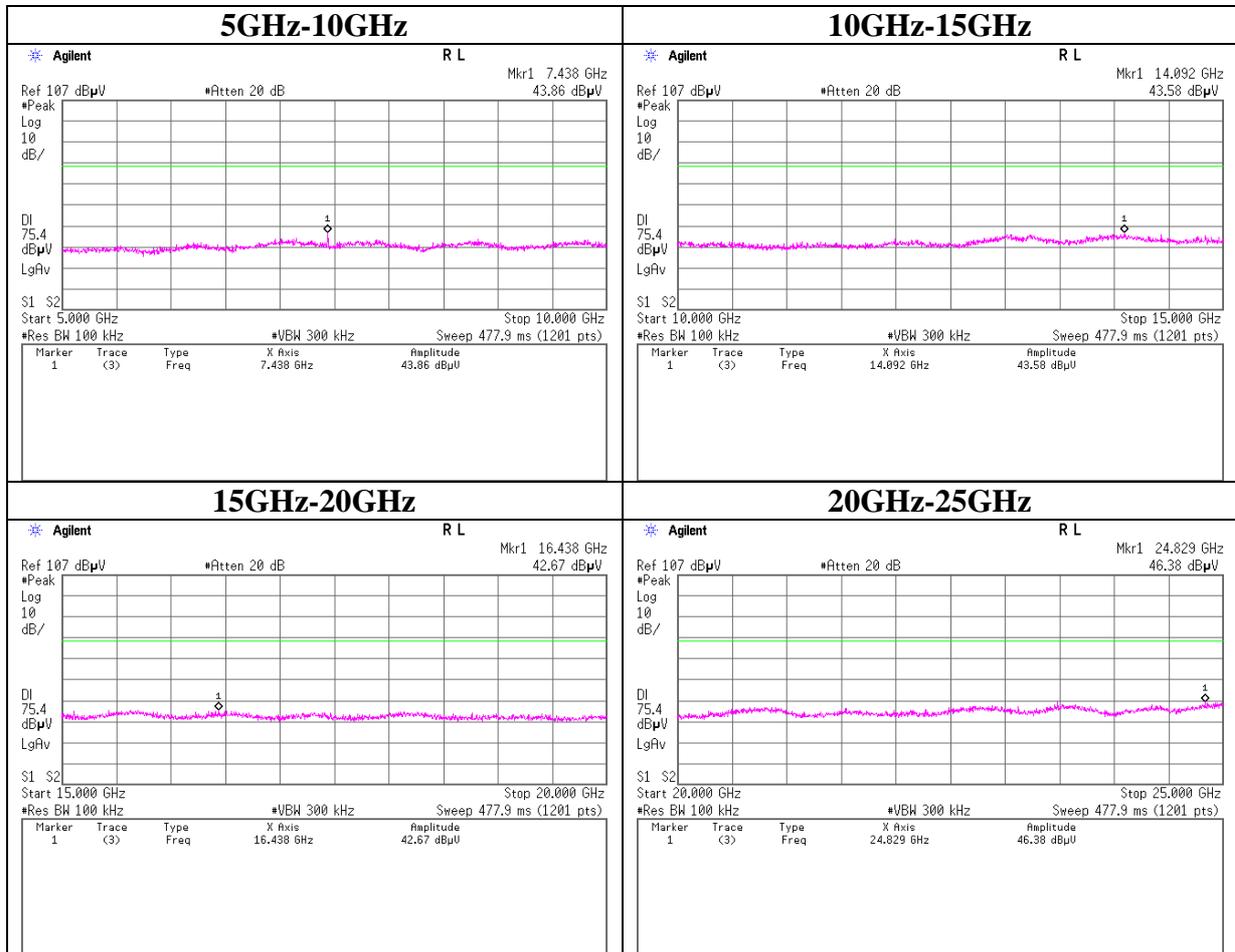
Conducted Spurious Emission

Tx 2479MHz



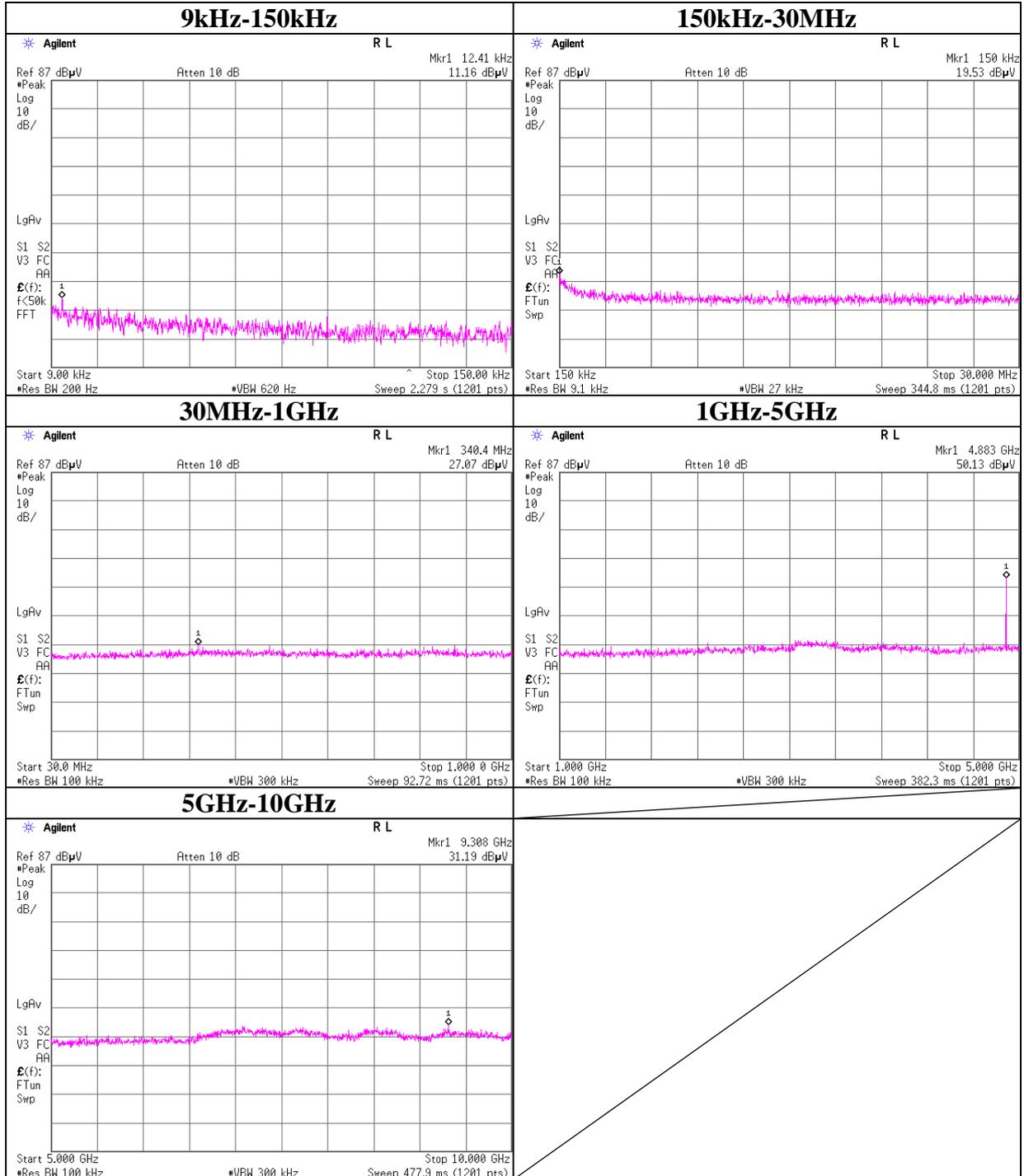
Conducted Spurious Emission

Tx 2479MHz



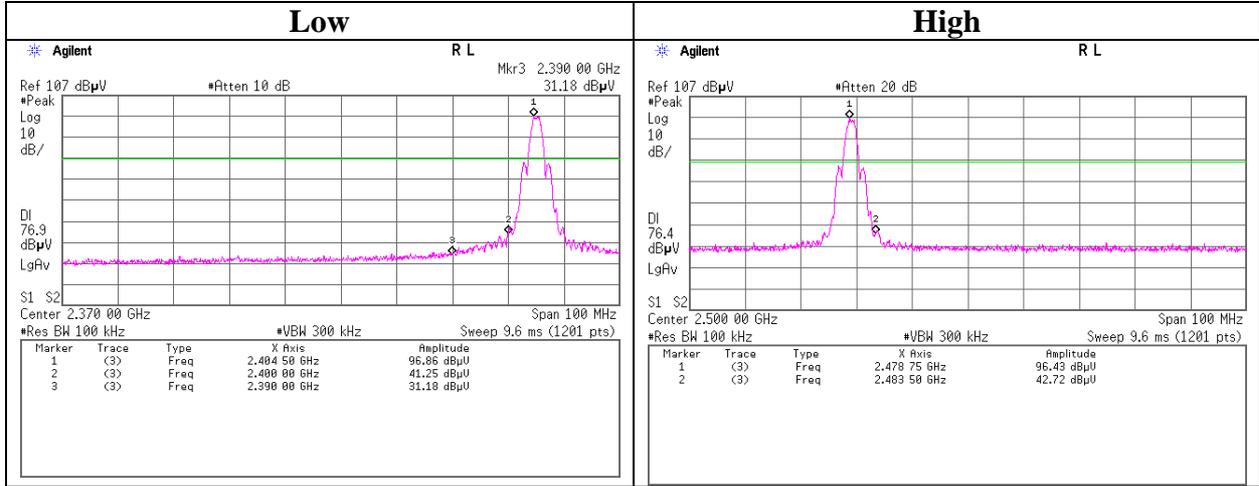
Conducted Spurious Emission

Rx 2442MHz



Conducted Emission Band Edge compliance

Tx



Power Density

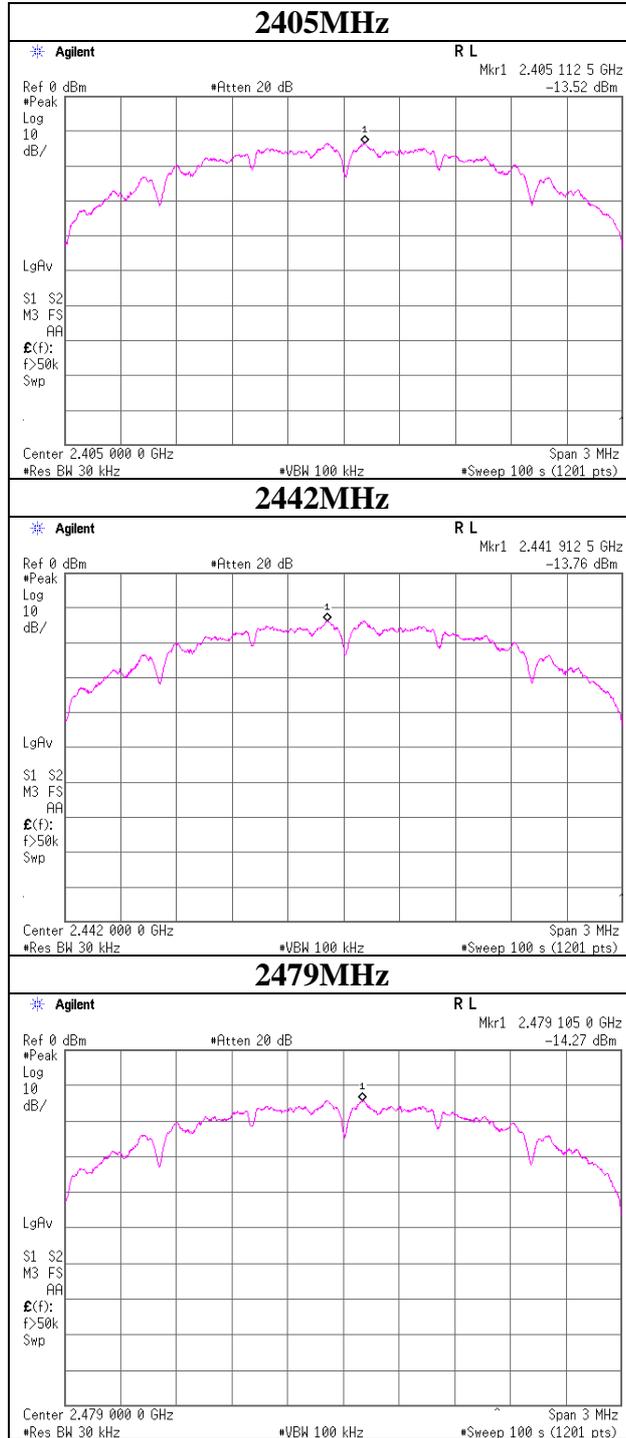
Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32DE0080-HO-01
Date 01/06/2012 01/26/2012
Temperature/ Humidity 24 deg. C / 41% RH 23 deg. C / 43% RH
Engineer Takayuki Shimada Hiroshi Kukita
Mode Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2405.00	-13.52	0.77	10.07	-2.68	8.00	10.68
2442.00	-13.76	0.77	10.07	-2.92	8.00	10.92
2479.00	-14.27	0.78	10.07	-3.42	8.00	11.42

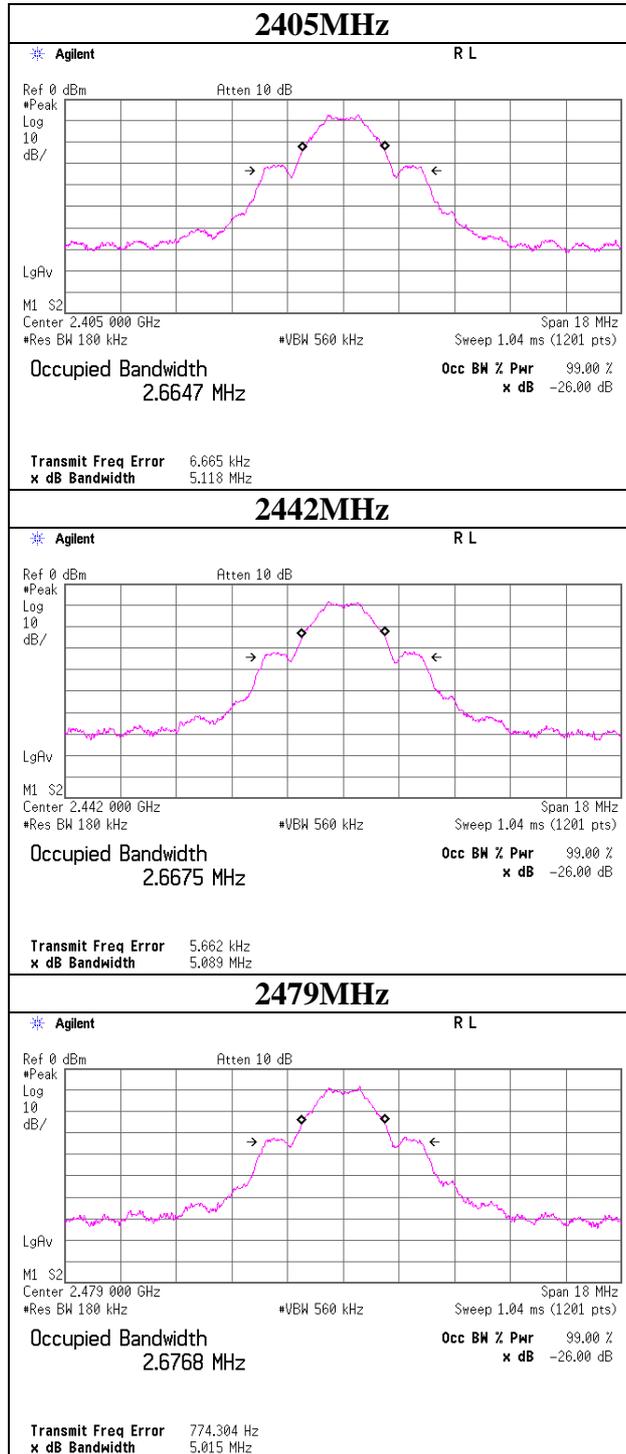
Sample Calculation:

Result = Reading + Cable Loss (including the cable) + Attenuator

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)
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2011/12/09 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2011/11/23 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2011/09/12 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2011/09/12 * 12
MAT-20	Attenuator(10dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2012/01/12 * 12
MCC-105	Microwave Cable	Hirose Electric	U.FL-2LP-066J1-A(200)	-	AT	2011/06/24 * 12
MOTS-MATM	Antenna Terminal Measurement Software	UL Japan	-	-	AT	-
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
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-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 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-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2011/05/16 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	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
AT: Antenna Terminal Conducted test