



RADIO TEST REPORT

Test Report No. : 32DE0080-HO-01-A-R2

Applicant : LOGICAL PRODUCT CORPORATION
Type of Equipment : LP-RF24DS-01
Model No. : LP-RF24DS-01
FCC ID : A4MLP-RF24DS-01
Test regulation : FCC Part 15 Subpart C: 2012
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.
6. This report is a revised version of 32DE0080-HO-01-A-R1. 32DE0080-HO-01-A-R1 is replaced with this report.

Date of test: January 16 to February 7, 2012

Representative test engineer:


Takumi Shimada
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>

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

13-EM-F0429

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: Conducted Emission.....	10
SECTION 6: Radiated Spurious Emission	11
SECTION 7: Antenna Terminal Conducted Tests.....	12
APPENDIX 1: Data of EMI test.....	13
Conducted Emission	13
6dB Bandwidth	16
Maximum Peak Output Power	18
Radiated Spurious Emission	19
Conducted Spurious Emission	25
Conducted Emission Band Edge compliance	32
Power Density	33
99% Occupied Bandwidth	35
APPENDIX 2: Test instruments	36
APPENDIX 3: Photographs of test setup.....	37
Conducted Emission	37
Radiated Spurious Emission	38
Worst Case Position.....	39

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-01
Model No. : LP-RF24DS-01
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC5.0V / AC120V
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, 32.768kHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2405-2478MHz
Modulation : O-QPSK
Power Supply (radio part input) : DC 3.3V
Antenna type : ANT 1: 1/4 Wave Dipole Antenna
ANT 2: 1/4 Wave Dipole Antenna
Antenna Gain : ANT 1: 3.2dBi
ANT 2: 3.2dBi
Antenna Connector type : U. FL

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: 2012, final revised on February 1, 2012

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

*The revision on February 1, 2012 does not affect the test specification applied to the EUT.

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	QP 5.8dB, 0.21216MHz, L AV 5.5dB, 0.21212MHz, N	Complied	-
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	2.5dB 2483.500MHz, AV, Vert.	Complied	Conducted/ Radiated

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

* 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

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

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	-	Conducted
Receiver Spurious Emission	IC: RSS-Gen 4.10	IC: RSS-Gen 6	3.1dB 80.003MHz, QP, Vert.	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)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	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

Conducted Emission test

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

Radiated emission test(3m)

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

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

3.5 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. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: +5dBm Software: PN9LLPmotherUBA *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 / Conducted) Conducted Emission	Tx	1 *1)	2405MHz 2442MHz 2478MHz
	Rx	1 *1)	2442MHz
Maximum Peak Output Power	Tx	1, 2	2405MHz 2442MHz 2478MHz
6dB Bandwidth Power Density 99% Occupied Bandwidth	Tx	1 *1)	2405MHz 2442MHz 2478MHz
*1) ANT 1 was used for the test as a representative, because it had the highest power at Maximum Peak Output Power test.			

UL Japan, Inc.

Head Office EMC Lab.

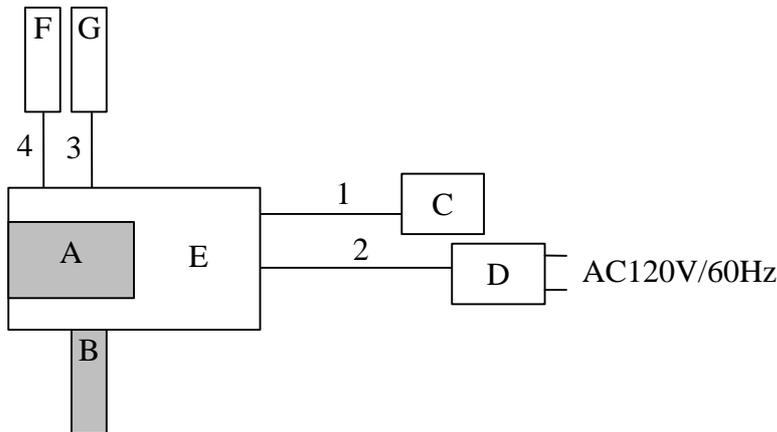
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

4.2 Configuration and peripherals

[Conducted emission test]



* 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-01	LP-RF24DS-01	001	LOGICAL PRODUCT CORPORATION	EUT
B	Antenna	W1027	003	LOGICAL PRODUCT CORPORATION	EUT
C	Jig Board	-	-	LOGICAL PRODUCT CORPORATION	-
D	AC Adaptor	NT24-1S0540	-	AKIZUKI DENSHI TSUSHO CO.,LTD.	-
E	Transceiving equipment	LP-RF24TR1	-	LOGICAL PRODUCT CORPORATION	-
F	Artificial resistance	-	-	-	-
G	Artificial resistance	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.2	Unshielded	Unshielded	-
2	DC Cable	1.6	Unshielded	Unshielded	-
3	Signal Cable	0.05	Unshielded	Unshielded	-
4	Signal Cable	0.05	Unshielded	Unshielded	-

UL Japan, Inc.

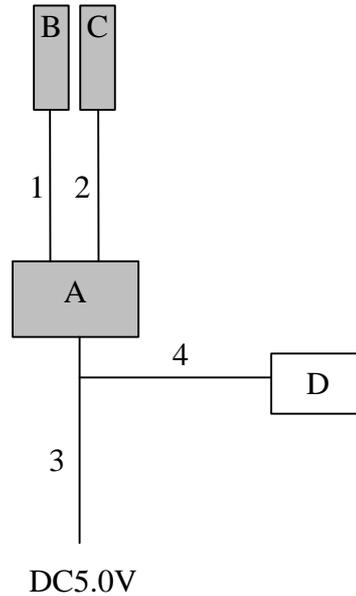
Head Office EMC Lab.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

[All tests except for Conducted emission test]



* 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-01	LP-RF24DS-01	001	LOGICAL PRODUCT CORPORATION	EUT
B	Antenna	W1027	001	LOGICAL PRODUCT CORPORATION	EUT
C	Antenna	W1027	002	LOGICAL PRODUCT CORPORATION	EUT
D	Jig Board	-	-	LOGICAL PRODUCT CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.1	Unshielded	Unshielded	-
2	Antenna Cable	0.1	Unshielded	Unshielded	-
3	DC Cable	1.7	Unshielded	Unshielded	-
4	Signal Cable	0.2	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector	: QP and AV
Measurement range	: 0.15-30MHz
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

SECTION 6: 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, 1.0m by 1.5m, 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 FCC15.205 / 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*2) (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 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

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 7: 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

Conducted Emission

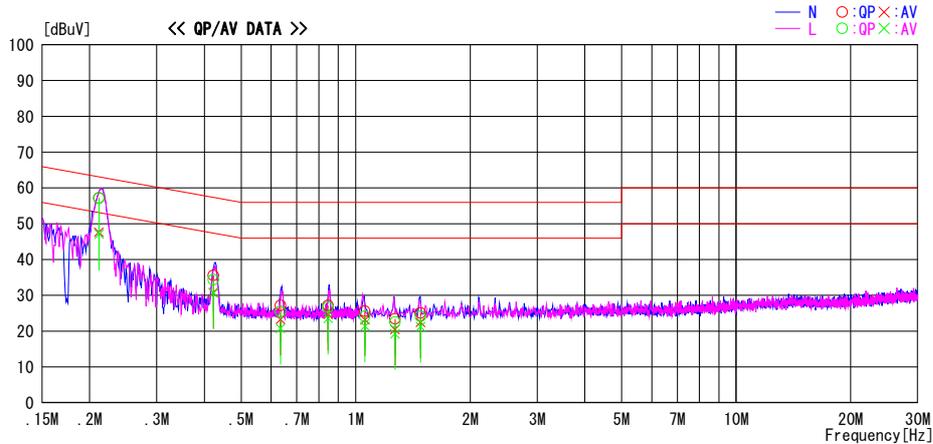
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/07

Report No. : 32DE0080-HO-01
Temp./Humi. : 22deg. C / 37% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 2442MHz

LIMIT : FCC15.207 QP
FCC15.207 AV

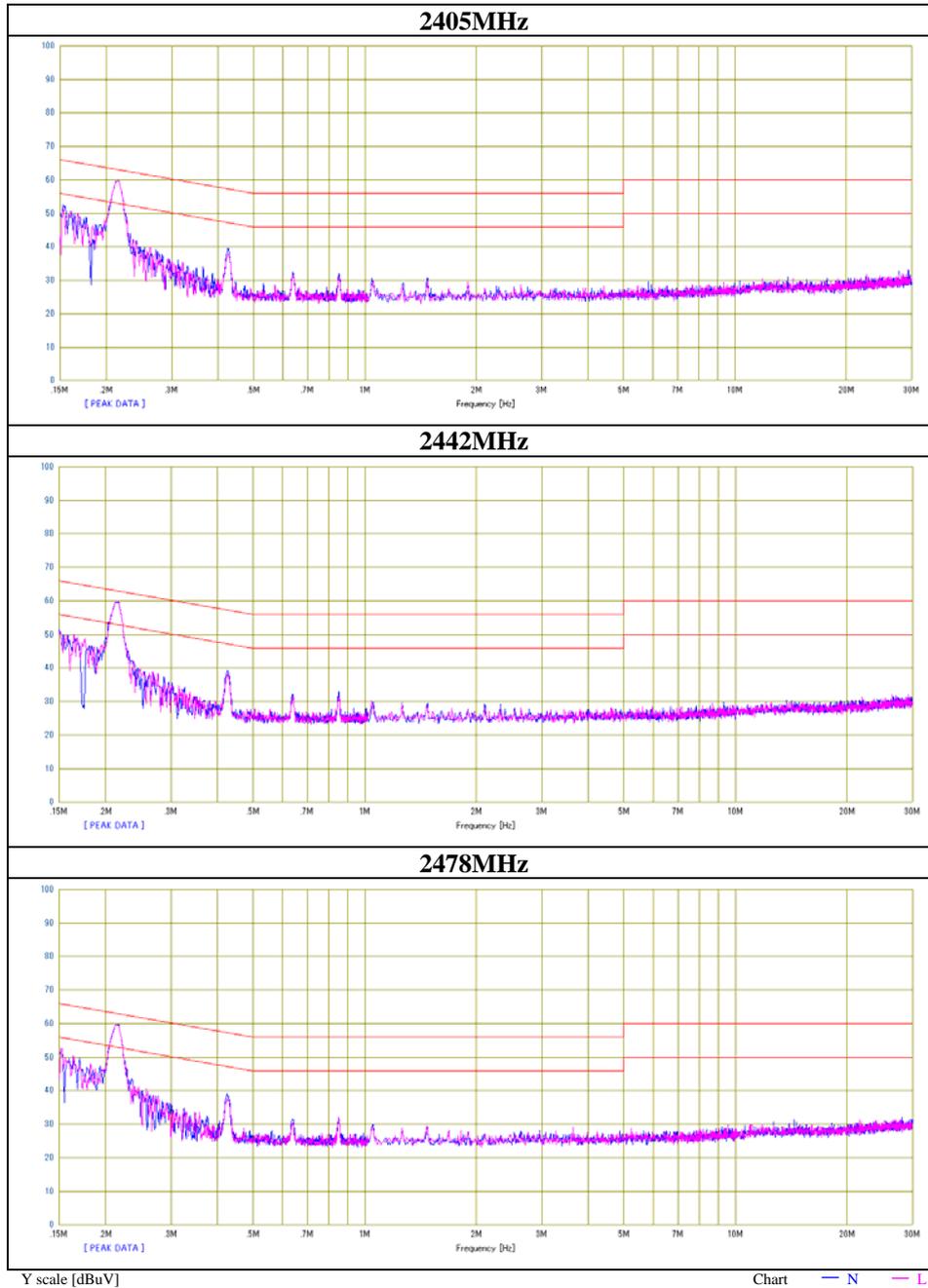


Frequency [MHz]	Reading		Level [dB]	Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]			QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.21140	43.8	34.2	13.4		57.2	47.6	63.2	53.2	6.0	5.6	N	
0.42296	22.2	17.4	13.4		35.6	30.8	57.4	47.4	21.8	16.6	N	
0.63454	13.8	9.9	13.4		27.2	23.3	56.0	46.0	28.8	22.7	N	
0.84628	13.7	11.2	13.5		27.2	24.7	56.0	46.0	28.8	21.3	N	
1.05776	12.0	9.6	13.6		25.6	23.2	56.0	46.0	30.4	22.8	N	
1.26929	9.8	6.9	13.6		23.4	20.5	56.0	46.0	32.6	25.5	N	
1.48092	11.5	8.9	13.6		25.1	22.5	56.0	46.0	30.9	23.5	N	
0.21160	43.8	33.7	13.4		57.2	47.1	63.1	53.1	5.9	6.0	L	
0.42311	21.0	17.3	13.4		34.4	30.7	57.4	47.4	23.0	16.7	L	
0.63476	12.1	7.4	13.4		25.5	20.8	56.0	46.0	30.5	25.2	L	
0.84624	13.2	10.1	13.5		26.7	23.6	56.0	46.0	29.3	22.4	L	
1.05778	10.6	7.8	13.6		24.2	21.4	56.0	46.0	31.8	24.6	L	
1.26932	8.9	5.7	13.6		22.5	19.3	56.0	46.0	33.5	26.7	L	
1.48092	10.6	7.7	13.6		24.2	21.3	56.0	46.0	31.8	24.7	L	

CHART:WITH FACTOR.PEAK hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

Conducted Emission

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	32DE0080-HO-01
Date	02/07/2012
Temperature/ Humidity	22 deg. C / 37% RH
Engineer	Hiroshi Kukita
Mode	Tx



Conducted Emission

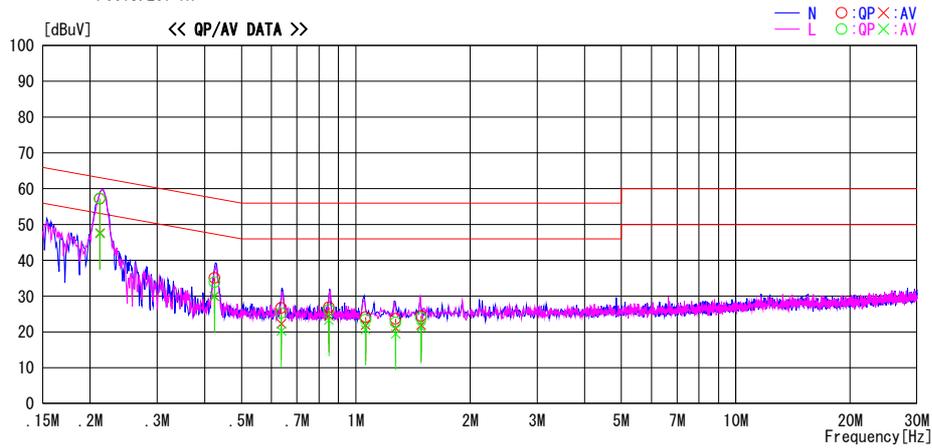
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2012/02/07

Report No. : 32DE0080-HO-01
 Temp./Humi. : 22deg. C / 37% RH
 Engineer : Hiroshi Kukita

Mode / Remarks : Rx 2442MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.21212	43.8	34.2	13.4	57.2	47.6	63.1	53.1	5.9	5.5	N	
0.42448	21.7	16.6	13.4	35.1	30.0	57.4	47.4	22.3	17.4	N	
0.63671	13.3	8.9	13.4	26.7	22.3	56.0	46.0	29.3	23.7	N	
0.84894	13.4	11.0	13.5	26.9	24.5	56.0	46.0	29.1	21.5	N	
1.06116	10.6	8.3	13.6	24.2	21.9	56.0	46.0	31.8	24.1	N	
1.27341	10.0	7.5	13.6	23.6	21.1	56.0	46.0	32.4	24.9	N	
1.48562	10.9	8.3	13.6	24.5	21.9	56.0	46.0	31.5	24.1	N	
0.21216	43.9	34.0	13.4	57.3	47.4	63.1	53.1	5.8	5.7	L	
0.42456	20.5	16.6	13.4	33.9	30.0	57.4	47.4	23.5	17.4	L	
0.63652	11.9	6.9	13.4	25.3	20.3	56.0	46.0	30.7	25.7	L	
0.84896	12.7	9.8	13.5	26.2	23.3	56.0	46.0	29.8	22.7	L	
1.06104	9.8	7.1	13.6	23.4	20.7	56.0	46.0	32.6	25.3	L	
1.27340	9.0	5.9	13.6	22.6	19.5	56.0	46.0	33.4	26.5	L	
1.48566	10.4	7.7	13.6	24.0	21.3	56.0	46.0	32.0	24.7	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F (LISN LOSS+ATT LOSS +CABLE LOSS)
 Except for the above table : adequate margin data below the limits.

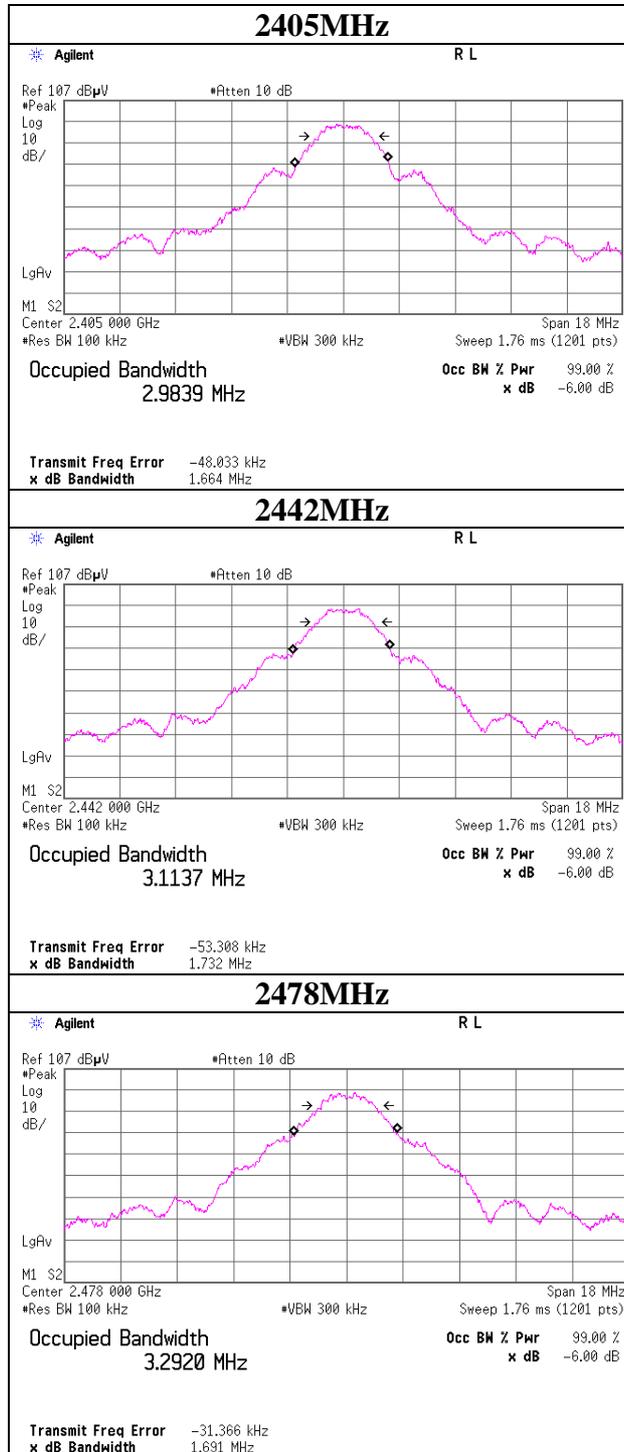
6dB Bandwidth
ANT 1

Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32DE0080-HO
Date 01/20/2012
Temperature/ Humidity 24 deg. C / 51% RH
Engineer Takayuki Shimada
Mode Tx

Antenna 1

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2405	1.664	>500
2442	1.732	>500
2478	1.691	>500

6dB Bandwidth ANT 1



Radiated Spurious Emission
ANT 1

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 32DE0080-HO
Date 01/17/2012 01/18/2012
Temperature/ Humidity 22 deg. C / 34% RH 22 deg. C / 32% RH
Engineer Takumi Shimada Takumi Shimada
(1-10GHz) (30-1000MHz, 10-26.5GHz)
Mode Tx 2478MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	80.003	QP	42.0	6.5	7.8	32.1	24.2	40.0	15.8	
Hori	96.004	QP	30.4	9.5	8.0	32.2	15.7	43.5	27.8	
Hori	128.001	QP	29.1	13.6	8.4	32.1	19.0	43.5	24.5	
Hori	240.003	QP	35.2	17.1	9.4	32.1	29.6	46.0	16.4	
Hori	256.004	QP	37.1	17.6	9.5	32.1	32.1	46.0	13.9	
Hori	320.008	QP	31.7	16.4	10.0	32.1	26.0	46.0	20.0	
Hori	2483.500	PK	55.4	28.5	2.6	32.2	54.3	73.9	19.6	
Hori	2538.143	PK	51.3	28.6	2.6	32.1	50.4	73.9	23.5	
Hori	4956.000	PK	49.7	31.6	4.3	31.4	54.2	73.9	19.7	
Hori	7434.000	PK	48.0	35.8	5.2	32.5	56.5	73.9	17.4	
Hori	9912.000	PK	42.8	38.6	6.0	33.3	54.1	73.9	19.8	
Hori	24780.000	PK	47.6	38.5	-0.9	31.5	53.7	73.9	20.2	
Hori	2483.500	AV	48.1	28.5	2.6	32.2	47.0	53.9	6.9	
Hori	2538.143	AV	43.9	28.6	2.6	32.1	43.0	53.9	11.0	
Hori	4956.000	AV	45.9	31.6	4.3	31.4	50.4	53.9	3.5	
Hori	7434.000	AV	37.9	35.8	5.2	32.5	46.4	53.9	7.5	
Hori	9912.000	AV	30.7	38.6	6.0	33.3	42.0	53.9	11.9	
Hori	24780.000	AV	35.6	38.5	-0.9	31.5	41.7	53.9	12.2	
Vert	80.004	QP	54.1	6.5	7.8	32.1	36.3	40.0	3.7	
Vert	96.004	QP	36.8	9.5	8.0	32.2	22.1	43.5	21.4	
Vert	128.002	QP	28.9	13.6	8.4	32.1	18.8	43.5	24.7	
Vert	240.004	QP	28.3	17.1	9.4	32.1	22.7	46.0	23.3	
Vert	256.005	QP	32.3	17.6	9.5	32.1	27.3	46.0	18.7	
Vert	320.009	QP	28.1	16.4	10.0	32.1	22.4	46.0	23.6	
Vert	2483.500	PK	58.7	28.5	2.6	32.2	57.6	73.9	16.3	
Vert	2538.167	PK	54.1	28.6	2.6	32.1	53.2	73.9	20.7	
Vert	4956.000	PK	47.4	31.6	4.3	31.4	51.9	73.9	22.0	
Vert	7434.000	PK	46.8	35.8	5.2	32.5	55.3	73.9	18.6	
Vert	9912.000	PK	42.2	38.6	6.0	33.3	53.5	73.9	20.4	
Vert	24780.000	PK	47.7	38.5	-0.9	31.5	53.8	73.9	20.1	
Vert	2483.500	AV	52.5	28.5	2.6	32.2	51.4	53.9	2.5	
Vert	2538.167	AV	46.6	28.6	2.6	32.1	45.7	53.9	8.2	
Vert	4956.000	AV	42.4	31.6	4.3	31.4	46.9	53.9	7.0	
Vert	7434.000	AV	36.7	35.8	5.2	32.5	45.2	53.9	8.7	
Vert	9912.000	AV	30.6	38.6	6.0	33.3	41.9	53.9	12.0	
Vert	24780.000	AV	35.6	38.5	-0.9	31.5	41.7	53.9	12.3	

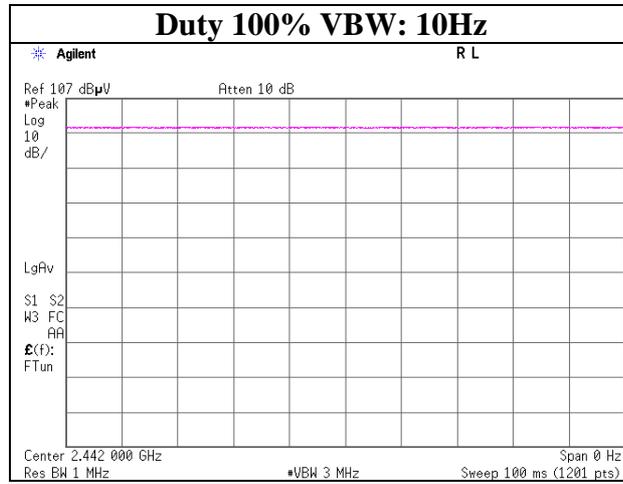
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*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.

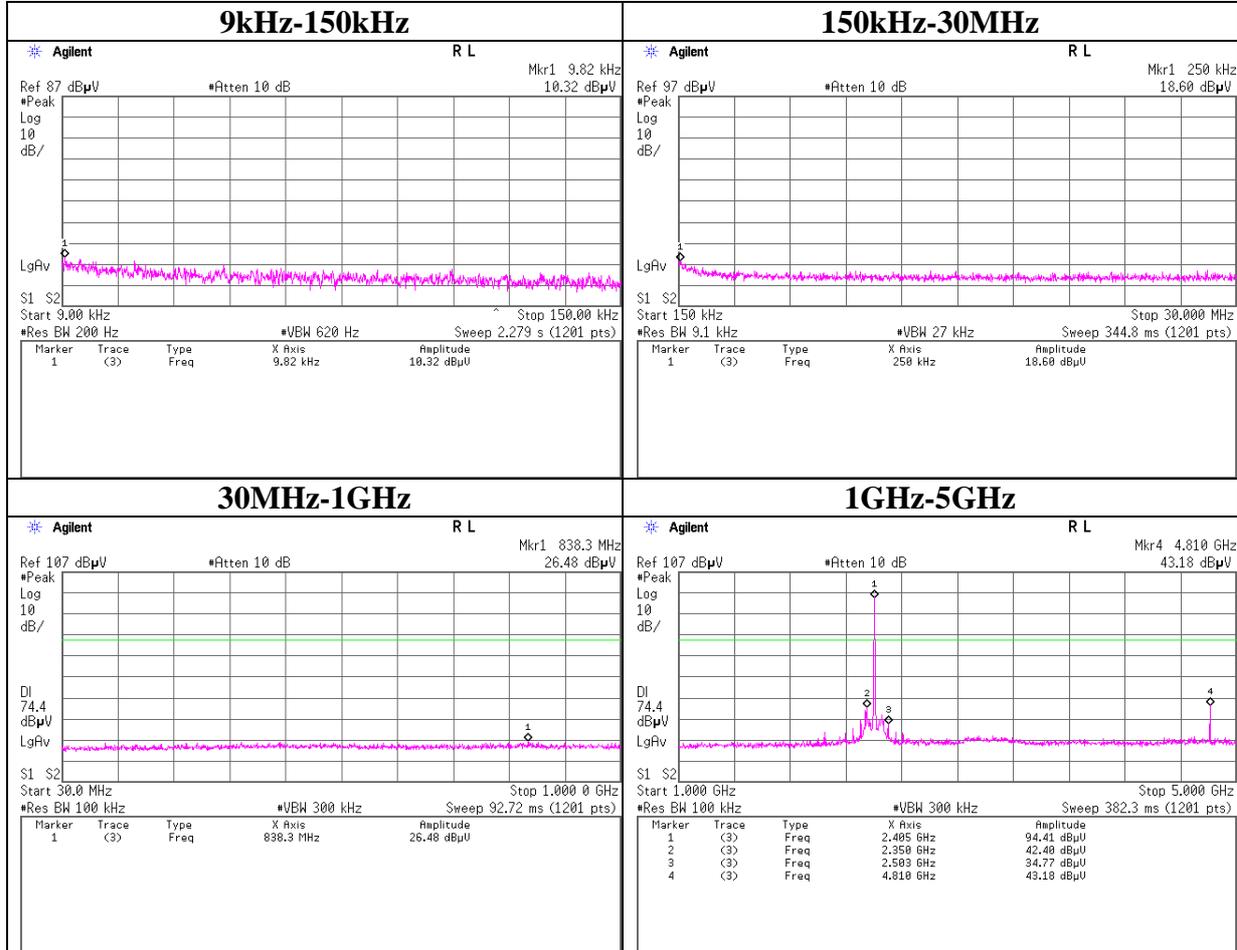
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

VBW (AV) Calculation
ANT 1



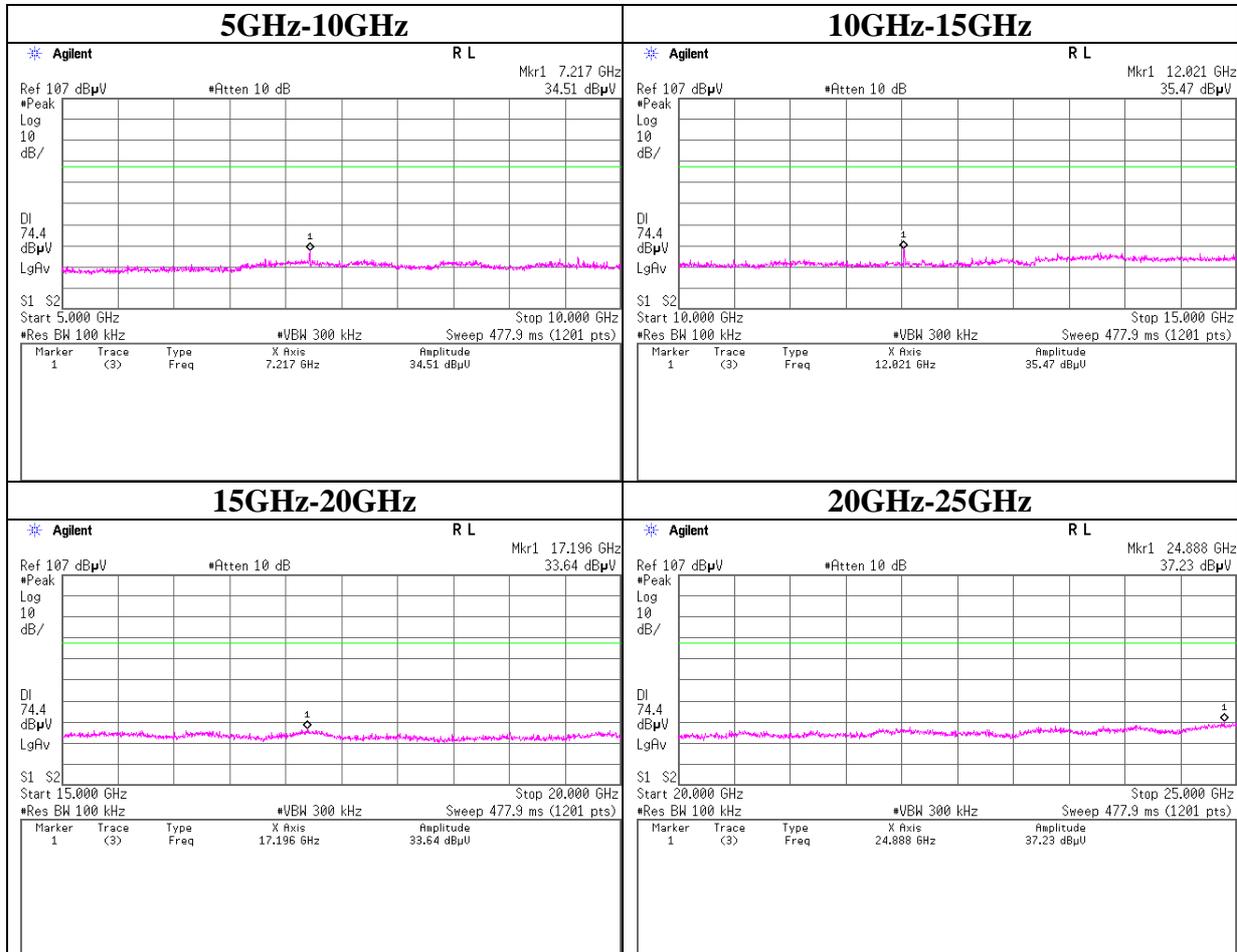
Conducted Spurious Emission
ANT 1

Tx 2405MHz



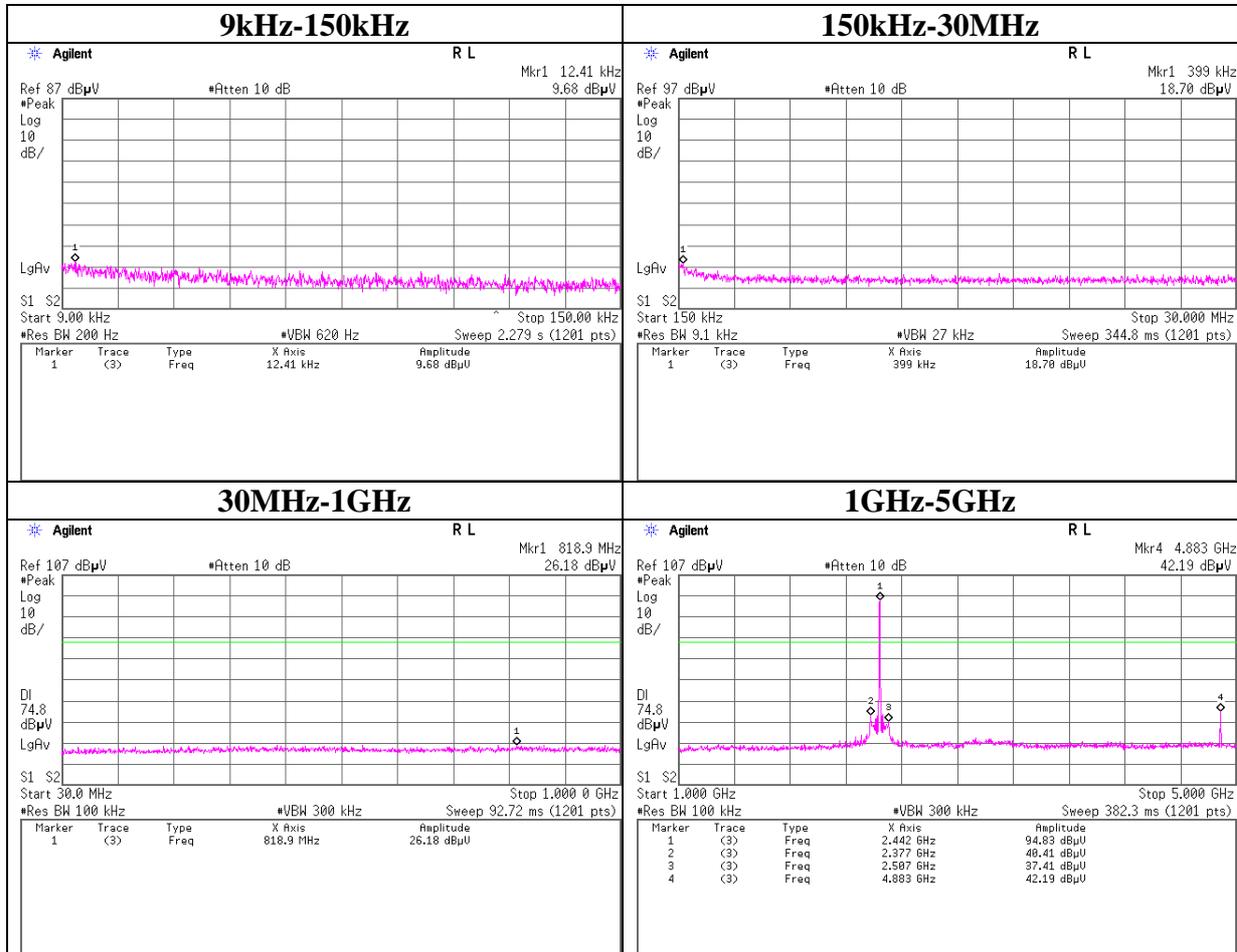
Conducted Spurious Emission
ANT 1

Tx 2405MHz



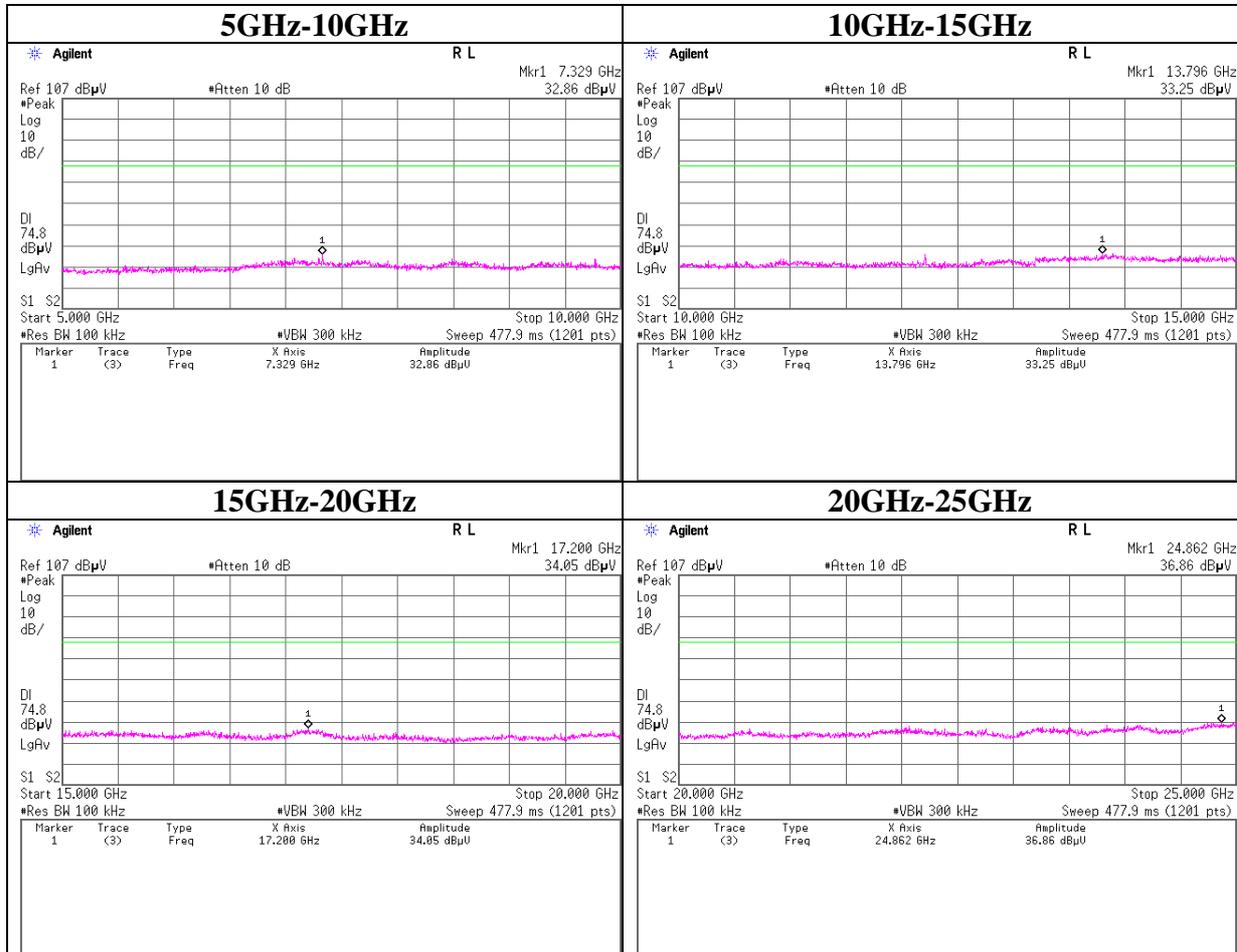
Conducted Spurious Emission
ANT 1

Tx 2442MHz



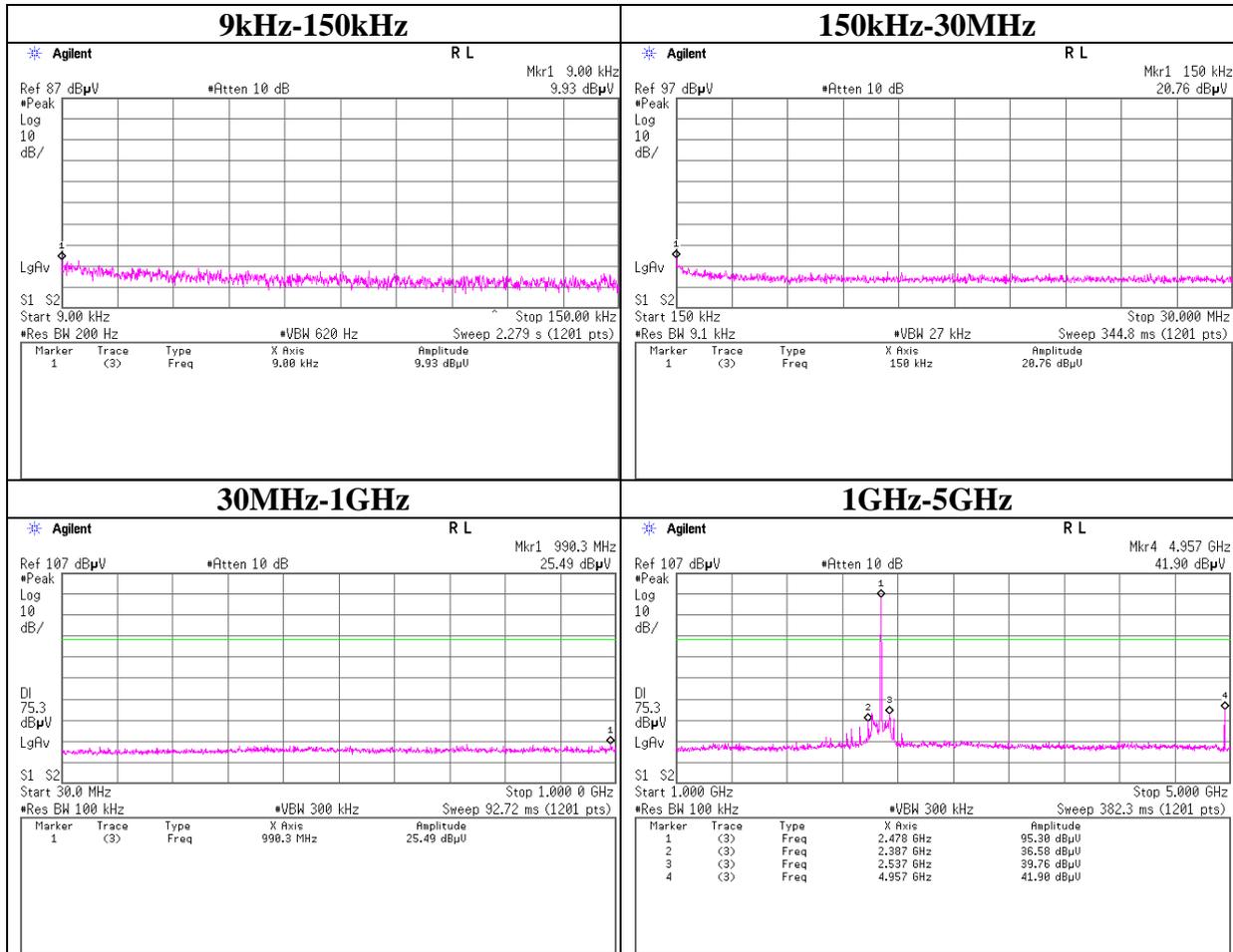
Conducted Spurious Emission
ANT 1

Tx 2442MHz



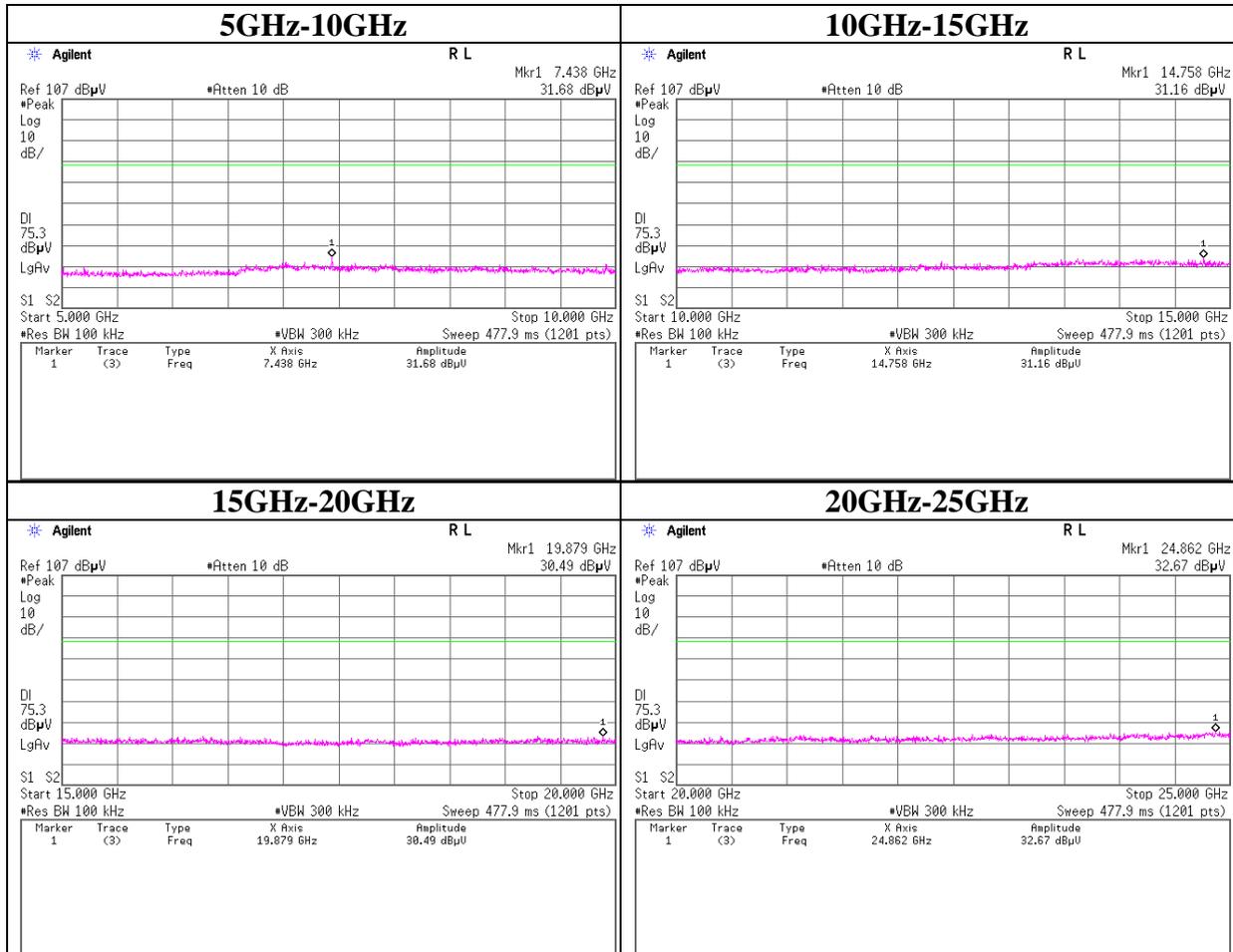
Conducted Spurious Emission
ANT 1

Tx 2478MHz



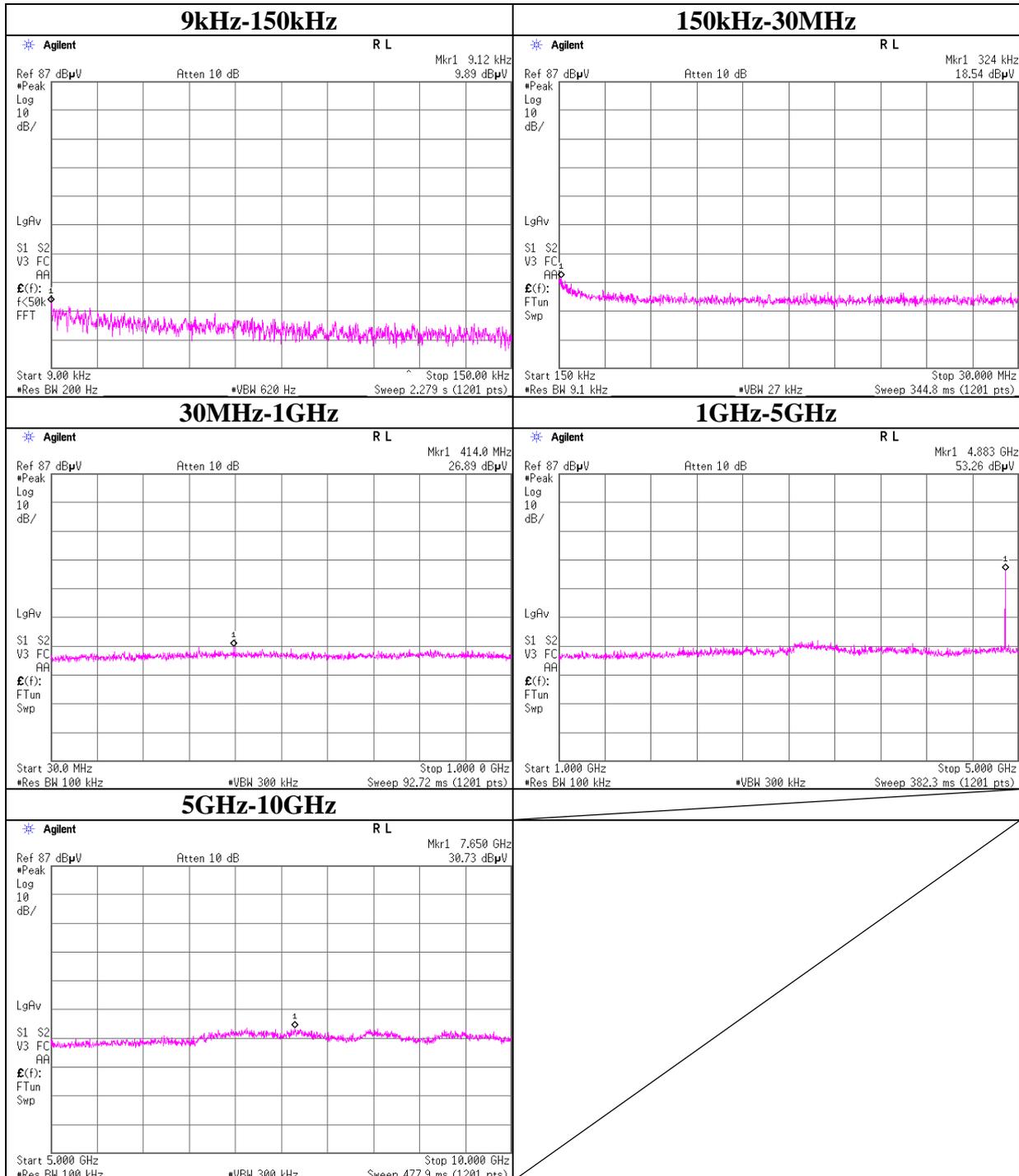
Conducted Spurious Emission
ANT 1

Tx 2478MHz



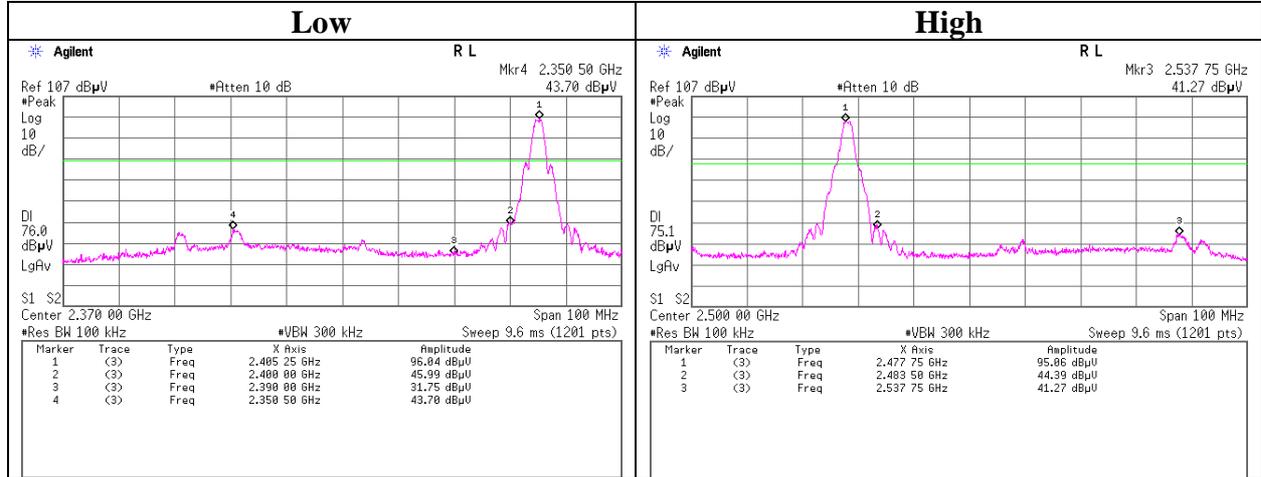
Conducted Spurious Emission
ANT 1

Rx 2442MHz



Conducted Emission Band Edge compliance
ANT 1

Tx



Power Density
ANT 1

Test place Head Office EMC Lab. No.11 Measurement Room
Report No. 32DE0080-HO
Date 01/20/2012
Temperature/ Humidity 24 deg. C / 51% RH
Engineer Takayuki Shimada
Mode Tx

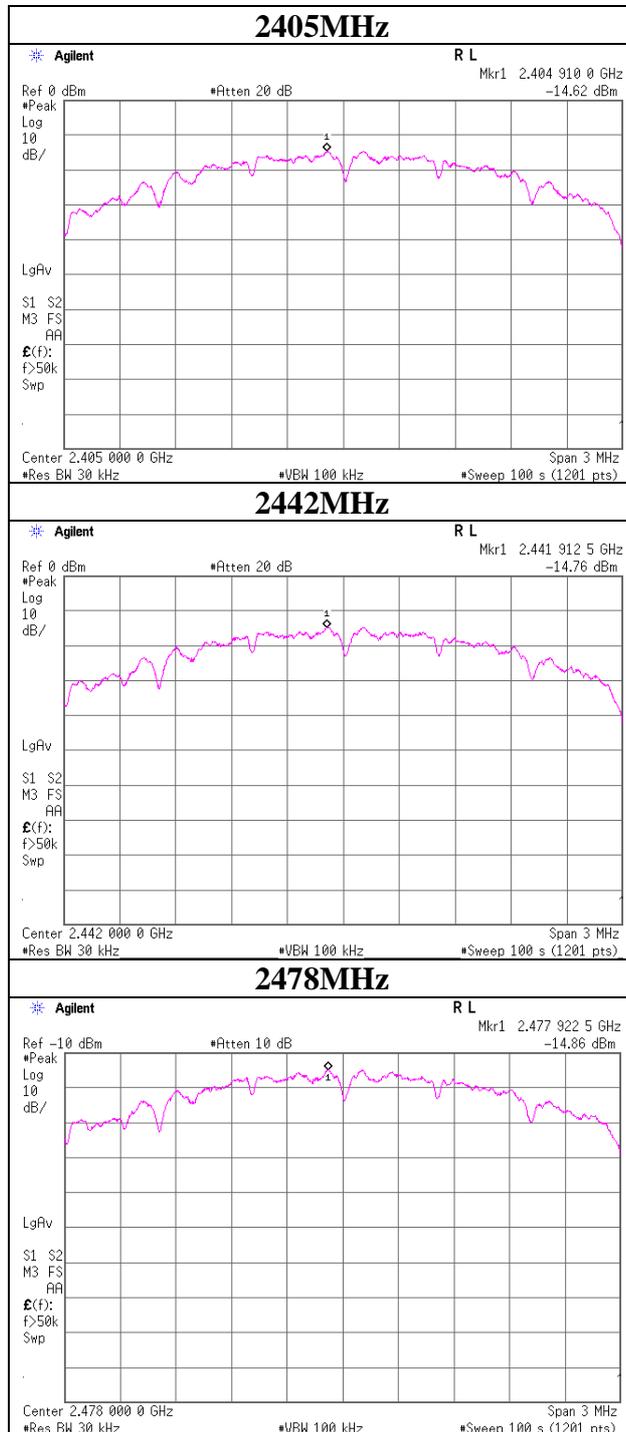
Antenna 1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2404.91	-14.62	0.77	10.07	-3.78	8.00	11.78
2441.91	-14.76	0.77	10.07	-3.92	8.00	11.92
2477.92	-14.86	0.78	10.07	-4.01	8.00	12.01

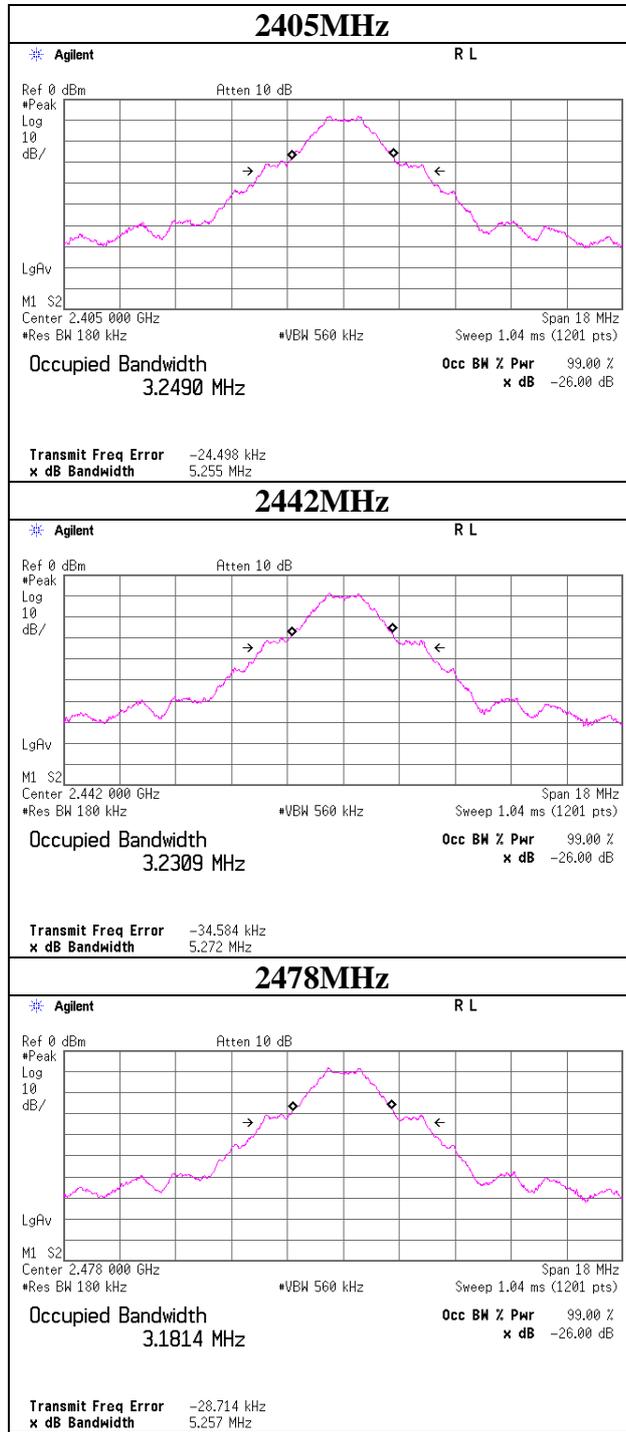
Sample Calculation:

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

Power Density
ANT 1



99%Occupied Bandwidth
ANT 1



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/CE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE/CE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE/CE	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
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	CE	2011/11/23 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT or AE)	2011/02/20 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/suciform141-PE(1m)/RFM-E121(Switcher)	-/04178	CE	2011/07/04 * 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: CE: Conducted Emission, RE: Radiated Emission, AT: Antenna Terminal Conducted test

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