



# RADIO TEST REPORT

**Test Report No. : 32AE0084-HO-02-A-R1**

**Applicant** : MITSUBISHI ELECTRIC CORPORATION  
**Type of Equipment** : Rearseat Entertainment System  
**Model No.** : ED-B205-  
**FCC ID** : ZEYEDB2053AC13211  
**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.
6. This report is a revised version of 32AE0084-HO-02-A. 32AE0084-HO-02-A is replaced with this report.

**Date of test:** October 3 to 16, 2011

**Representative test engineer:**

*S. Matsuyama*

Satofumi Matsuyama  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

*S. Watanabe*

Shinya Watanabe  
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

<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information.....</b>	<b>3</b>
<b>SECTION 2: Equipment under test (E.U.T.).....</b>	<b>3</b>
<b>SECTION 3: Test specification, procedures &amp; results.....</b>	<b>4</b>
<b>SECTION 4: Operation of E.U.T. during testing.....</b>	<b>7</b>
<b>SECTION 5: Radiated Spurious Emission .....</b>	<b>9</b>
<b>SECTION 6: Antenna Terminal Conducted Tests.....</b>	<b>10</b>
<b>APPENDIX 1: Data of EMI test.....</b>	<b>11</b>
6dB Bandwidth .....	11
Maximum Peak Output Power .....	13
Radiated Spurious Emission .....	14
Conducted Spurious Emission .....	19
Conducted Emission Band Edge compliance .....	26
Power Density .....	27
99% Occupied Bandwidth .....	29
<b>APPENDIX 2: Test instruments .....</b>	<b>30</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>31</b>
Radiated Spurious Emission .....	31

## **SECTION 1: Customer information**

Company Name : MITSUBISHI ELECTRIC CORPORATION  
Address : 2-3-33 Miwa Sanda Hyogo 669-1513, Japan  
Telephone Number : +81-79-559-3942  
Facsimile Number : +81-79-559-3875  
Contact Person : Koji Yokoyama

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Rearseat Entertainment System  
Model No. : ED-B205-  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC12V (Vehicle Battery) / 0.7A  
Receipt Date of Sample : October 3, 2011  
Country of Mass-production : Japan  
Condition of EUT : Production model  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Feature of EUT: Audio/visual entertainment system for the 2nd row seat in a car.

### **General Specification**

Clock frequency(ies) in the system : RF MODULE: 22.576649MHz  
Video display processor IC: 20MHz, 27MHz  
CPU: 16MHz  
MCU : 12.5MHz

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 2403-2478MHz  
Modulation : MSK(Minimum Shift Keying)  
Power Supply (radio part input) : DC 3.0V  
Antenna type : Chip antenna (reflow type)  
Antenna Gain : -9.28dBi

---

**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 July 8, 2011 and effective August 8, 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	6.1dB 9772.000MHz, AV, Vert.	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 constantly provides voltage (DC3.0V) to RF Part through the regulator regardless of input voltage fluctuation (Car Battery), and provides voltage (DC1.7V) to the inside of RF part constantly through the regulator in RF part.

Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 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	10.0dB 950.001MHz, 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)	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	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	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 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

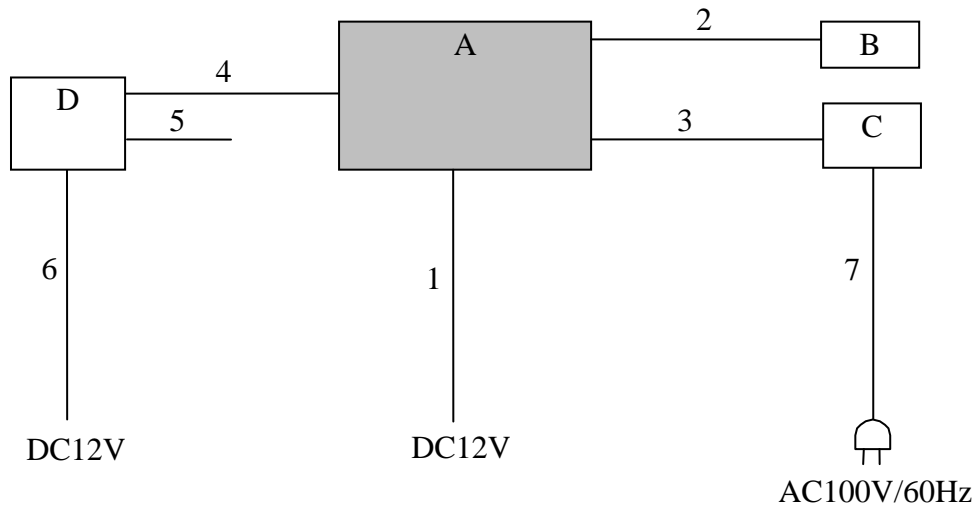
Refer to APPENDIX.

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

### **4.1 Operating Mode(s)**

Test Item	Operating Mode	Tested frequency
Spurious Emission	Tx	2403MHz 2443MHz 2478MHz
	Rx	2443MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	Tx	2403MHz 2443MHz 2478MHz
*Transmitting duty was 100% on all tests.		
*Power of the EUT was set by the software version as follows; Software Version: Ver.9.5 *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.		

## 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	Rearseat Entertainment System	ED-B205-	460 *1) 461 *2)	MITSUBISHI ELECTRIC CORPORATION	EUT
B	Headphone	LT-100	-	Panasonic	-
C	DVD Player	DV-600AV	HEKD013328LS	Pioneer	-
D	Fond unit	34W655	7177010013	MITSUBISHI ELECTRIC CORPORATION	-

\*1) Used for Spurious Emission test.

\*2) Used for Antenna terminal conducted test.

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Headphone Cable	3.0	Shielded	Shielded	-
3	AV Cable	2.0	Shielded	Shielded	-
4	Signal Cable	2.0	Unshielded	Unshielded	-
5	Signal Cable	2.0	Unshielded	Unshielded	-
6	DC Cable	2.0	Unshielded	Unshielded	-
7	AC Cable	1.8	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



## **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.

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	Below 1GHz	Above 1GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	PK	AV
IF Bandwidth	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:  $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

It is confirmed that the test was made on EUT at the normal use position and the tilted position.

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

## **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	20MHz	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	20MHz	30kHz	100kHz	667sec	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**

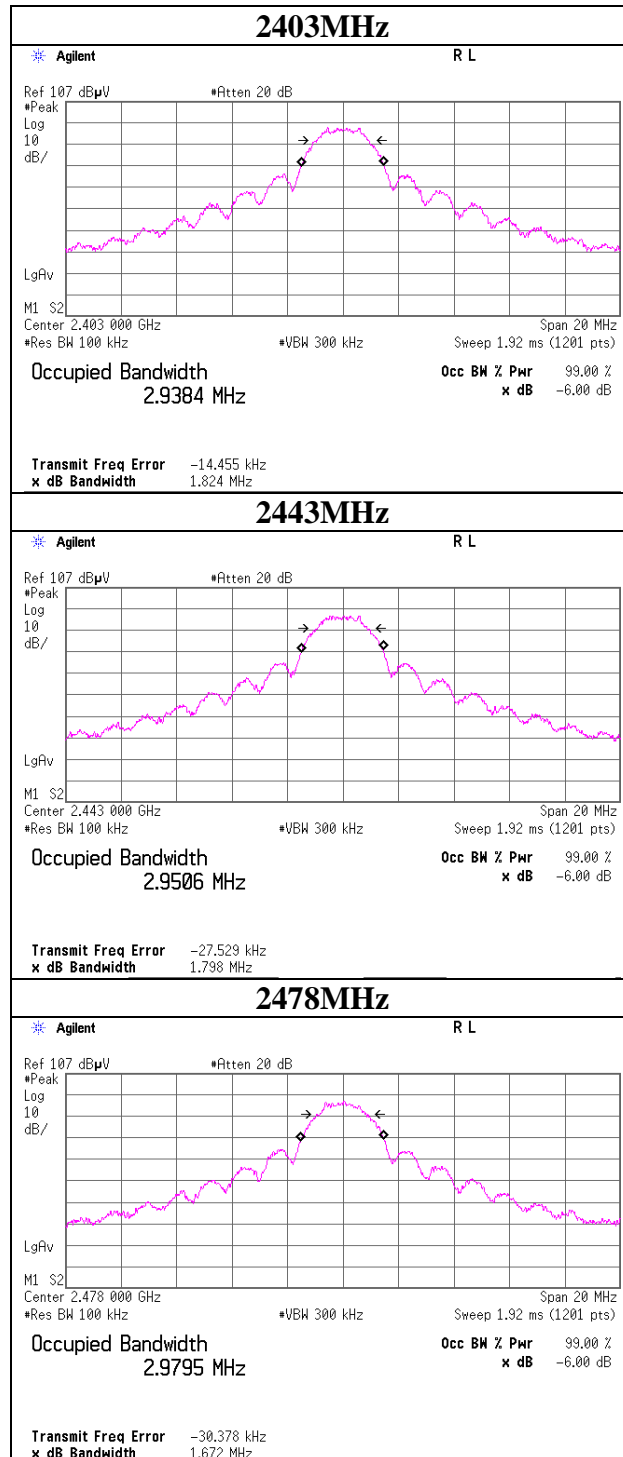
### **6dB Bandwidth**

Test place                      Head Office EMC Lab. No.11 Measurement Room  
Report No.                     32AE0084-HO-02  
Date                             10/04/2011  
Temperature/ Humidity       24 deg. C / 55% RH  
Engineer                       Hiroyuki Furutaka  
Mode                             Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2403	1.824	>500
2443	1.798	>500
2478	1.672	>500

## 6dB Bandwidth



### Maximum Peak Output Power

Test place                      Head Office EMC Lab. No.7 Measurement Room  
Report No.                     32AE0084-HO-01  
Date                            10/03/2011  
Temperature/ Humidity      23 deg. C / 49%RH  
Engineer                      Hiroyuki Furutaka  
Mode                            Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2403	-9.41	1.30	10.07	1.96	1.57	30.00	1000	28.04
2443	-9.59	1.33	10.07	1.81	1.52	30.00	1000	28.19
2478	-10.07	1.33	10.07	1.33	1.36	30.00	1000	28.67

Sample Calculation:

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

All comparizon were carried out on same frequency and measurement factors.

## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 32AE0084-HO-02  
Date : 10/16/2011  
Temperature/ Humidity : 23 deg. C / 56 % RH  
Engineer : Satofumi Matsuyama  
Mode : Tx 2403MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	37.782	QP	22.1	15.8	7.1	32.2	12.8	40.0	27.2	
Hori	144.863	QP	36.3	14.5	8.5	32.1	27.2	43.5	16.3	
Hori	250.002	QP	30.4	17.2	9.3	32.1	24.8	46.0	21.2	
Hori	349.998	QP	31.7	17.0	10.1	32.1	26.7	46.0	19.3	
Hori	850.003	QP	25.7	23.6	12.8	31.5	30.6	46.0	15.4	
Hori	950.002	QP	27.4	25.5	13.3	31.1	35.1	46.0	10.9	
Hori	2183.000	PK	39.4	27.2	2.4	32.3	36.7	73.9	37.2	NS
Hori	2390.000	PK	42.7	28.1	2.5	32.2	41.1	73.9	32.8	
Hori	2399.500	PK	54.2	28.1	2.5	32.2	52.6	73.9	21.3	
Hori	2400.000	PK	57.0	28.1	2.5	32.2	55.4	73.9	18.5	
Hori	2620.000	PK	38.2	28.6	2.6	32.1	37.3	73.9	36.6	
Hori	4806.000	PK	44.6	31.2	5.3	31.4	49.7	73.9	24.2	
Hori	7209.000	PK	42.1	35.6	6.1	32.4	51.4	73.9	22.5	NS
Hori	9612.000	PK	41.9	38.3	7.1	33.2	54.1	73.9	19.8	NS
Hori	24030.000	PK	45.0	38.5	-0.9	31.6	51.0	73.9	22.9	
Hori	2183.000	AV	26.1	27.2	2.4	32.3	23.4	53.9	30.5	NS
Hori	2390.000	AV	29.8	28.1	2.5	32.2	28.2	53.9	25.7	
Hori	2399.500	AV	44.7	28.1	2.5	32.2	43.1	53.9	10.8	
Hori	2400.000	AV	45.6	28.1	2.5	32.2	44.0	53.9	9.9	
Hori	2620.000	AV	24.6	28.6	2.6	32.1	23.7	53.9	30.2	
Hori	4806.000	AV	34.6	31.2	5.3	31.4	39.7	53.9	14.2	
Hori	7209.000	AV	31.3	35.6	6.1	32.4	40.6	53.9	13.3	NS
Hori	9612.000	AV	32.3	38.3	7.1	33.2	44.5	53.9	9.4	NS
Hori	24030.000	AV	34.0	38.5	-0.9	31.6	40.0	53.9	13.9	
Vert	37.806	QP	33.7	15.8	7.1	32.2	24.4	40.0	15.6	
Vert	126.001	QP	33.8	13.5	8.3	32.1	23.5	43.5	20.0	
Vert	249.999	QP	29.0	17.2	9.3	32.1	23.4	46.0	22.6	
Vert	349.998	QP	27.0	17.0	10.1	32.1	22.0	46.0	24.0	
Vert	850.004	QP	27.2	23.6	12.8	31.5	32.1	46.0	13.9	
Vert	950.003	QP	28.6	25.5	13.3	31.1	36.3	46.0	9.7	
Vert	2183.000	PK	39.0	27.2	2.4	32.3	36.3	73.9	37.6	NS
Vert	2390.000	PK	42.6	28.1	2.5	32.2	41.0	73.9	32.9	
Vert	2399.500	PK	55.9	28.1	2.5	32.2	54.3	73.9	19.6	
Vert	2400.000	PK	58.9	28.1	2.5	32.2	57.3	73.9	16.6	
Vert	2620.000	PK	38.3	28.6	2.6	32.1	37.4	73.9	36.5	
Vert	4806.000	PK	45.5	31.2	5.3	31.4	50.6	73.9	23.3	
Vert	7209.000	PK	41.5	35.6	6.1	32.4	50.8	73.9	23.1	NS
Vert	9612.000	PK	43.1	38.3	7.1	33.2	55.3	73.9	18.6	NS
Vert	24030.000	PK	45.2	38.5	-0.9	31.6	51.2	73.9	22.7	
Vert	2183.000	AV	26.0	27.2	2.4	32.3	23.3	53.9	30.6	NS
Vert	2390.000	AV	29.8	28.1	2.5	32.2	28.2	53.9	25.7	
Vert	2399.500	AV	46.3	28.1	2.5	32.2	44.7	53.9	9.2	
Vert	2400.000	AV	47.5	28.1	2.5	32.2	45.9	53.9	8.0	
Vert	2620.000	AV	24.6	28.6	2.6	32.1	23.7	53.9	30.2	
Vert	4806.000	AV	35.9	31.2	5.3	31.4	41.0	53.9	12.9	
Vert	7209.000	AV	31.3	35.6	6.1	32.4	40.6	53.9	13.3	NS
Vert	9612.000	AV	32.3	38.3	7.1	33.2	44.5	53.9	9.4	NS
Vert	24030.000	AV	34.0	38.5	-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

## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 32AE0084-HO-02  
Date : 10/16/2011  
Temperature/ Humidity : 23 deg. C / 56 % RH  
Engineer : Satofumi Matsuyama  
Mode : Tx 2443MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	37.802	QP	22.1	15.8	7.1	32.2	12.8	40.0	27.2	
Hori	144.123	QP	36.4	14.5	8.5	32.1	27.3	43.5	16.2	
Hori	250.000	QP	30.7	17.2	9.3	32.1	25.1	46.0	20.9	
Hori	350.001	QP	31.8	17.0	10.1	32.1	26.8	46.0	19.2	
Hori	850.002	QP	25.7	23.6	12.8	31.5	30.6	46.0	15.4	
Hori	950.001	QP	27.3	25.5	13.3	31.1	35.0	46.0	11.0	
Hori	2220.800	PK	41.5	27.3	2.4	32.3	38.9	73.9	35.0	
Hori	2667.000	PK	38.4	28.6	2.7	32.1	37.6	73.9	36.3	NS
Hori	4886.000	PK	40.3	31.4	5.3	31.4	45.6	73.9	28.3	NS
Hori	7329.000	PK	41.9	35.7	6.2	32.5	51.3	73.9	22.6	NS
Hori	9772.000	PK	42.7	38.5	7.3	33.2	55.3	73.9	18.6	NS
Hori	24430.000	PK	46.5	38.8	-0.9	31.6	52.8	73.9	21.1	
Hori	2220.800	AV	28.3	27.3	2.4	32.3	25.7	53.9	28.2	
Hori	2667.000	AV	24.7	28.6	2.7	32.1	23.9	53.9	30.0	NS
Hori	4886.000	AV	29.5	31.4	5.3	31.4	34.8	53.9	19.1	NS
Hori	7329.000	AV	30.6	35.7	6.2	32.5	40.0	53.9	13.9	NS
Hori	9772.000	AV	32.3	38.5	7.3	33.2	44.9	53.9	9.0	NS
Hori	24430.000	AV	35.1	38.8	-0.9	31.6	41.4	53.9	12.5	
Vert	37.805	QP	33.6	15.8	7.1	32.2	24.3	40.0	15.7	
Vert	126.002	QP	33.6	13.5	8.3	32.1	23.3	43.5	20.2	
Vert	249.999	QP	29.1	17.2	9.3	32.1	23.5	46.0	22.5	
Vert	350.002	QP	27.4	17.0	10.1	32.1	22.4	46.0	23.6	
Vert	850.002	QP	27.2	23.6	12.8	31.5	32.1	46.0	13.9	
Vert	950.002	QP	28.7	25.5	13.3	31.1	36.4	46.0	9.6	
Vert	2220.800	PK	39.5	27.3	2.4	32.3	36.9	73.9	37.0	NS
Vert	2667.000	PK	38.5	28.6	2.7	32.1	37.7	73.9	36.2	NS
Vert	4886.000	PK	40.4	31.4	5.3	31.4	45.7	73.9	28.2	NS
Vert	7329.000	PK	41.1	35.7	6.2	32.5	50.5	73.9	23.4	NS
Vert	9772.000	PK	45.4	38.5	7.3	33.2	58.0	73.9	15.9	
Vert	24430.000	PK	46.0	38.8	-0.9	31.6	52.3	73.9	21.6	
Vert	2220.800	AV	26.1	27.3	2.4	32.3	23.5	53.9	30.4	NS
Vert	2667.000	AV	24.7	28.6	2.7	32.1	23.9	53.9	30.0	NS
Vert	4886.000	AV	29.6	31.4	5.3	31.4	34.9	53.9	19.0	NS
Vert	7329.000	AV	30.6	35.7	6.2	32.5	40.0	53.9	13.9	NS
Vert	9772.000	AV	35.2	38.5	7.3	33.2	47.8	53.9	6.1	
Vert	24430.000	AV	35.1	38.8	-0.9	31.6	41.4	53.9	12.5	

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

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 32AE0084-HO-02  
Date : 10/16/2011  
Temperature/ Humidity : 23 deg. C / 56 % RH  
Engineer : Satofumi Matsuyama  
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	37.965	QP	22.1	15.7	7.1	32.2	12.7	40.0	27.3	
Hori	144.206	QP	34.9	14.5	8.5	32.1	25.8	43.5	17.7	
Hori	250.004	QP	32.4	17.2	9.3	32.1	26.8	46.0	19.2	
Hori	350.002	QP	31.8	17.0	10.1	32.1	26.8	46.0	19.2	
Hori	850.003	QP	25.6	23.6	12.8	31.5	30.5	46.0	15.5	
Hori	950.001	QP	27.0	25.5	13.3	31.1	34.7	46.0	11.3	
Hori	2253.000	PK	39.6	27.5	2.4	32.3	37.2	73.9	36.7	NS
Hori	2483.500	PK	49.8	28.5	2.6	32.2	48.7	73.9	25.2	
Hori	2483.830	PK	48.6	28.5	2.6	32.2	47.5	73.9	26.4	
Hori	2930.000	PK	38.6	28.6	2.8	32.0	38.0	73.9	35.9	NS
Hori	4956.000	PK	42.8	31.6	5.3	31.4	48.3	73.9	25.6	
Hori	7434.000	PK	42.5	35.8	6.2	32.5	52.0	73.9	21.9	NS
Hori	9912.000	PK	44.6	38.6	7.4	33.3	57.3	73.9	16.6	NS
Hori	24780.000	PK	46.4	39.0	-0.9	31.5	53.0	73.9	20.9	
Hori	2253.000	AV	26.3	27.5	2.4	32.3	23.9	53.9	30.0	NS
Hori	2483.500	AV	36.5	28.5	2.6	32.2	35.4	53.9	18.5	
Hori	2483.830	AV	36.3	28.5	2.6	32.2	35.2	53.9	18.7	
Hori	2930.000	AV	24.8	28.6	2.8	32.0	24.2	53.9	29.7	NS
Hori	4956.000	AV	31.2	31.6	5.3	31.4	36.7	53.9	17.2	
Hori	7434.000	AV	30.6	35.8	6.2	32.5	40.1	53.9	13.8	NS
Hori	9912.000	AV	32.0	38.6	7.4	33.3	44.7	53.9	9.2	NS
Hori	24780.000	AV	35.6	39.0	-0.9	31.5	42.2	53.9	11.7	
Vert	37.806	QP	33.5	15.8	7.1	32.2	24.2	40.0	15.8	
Vert	126.002	QP	33.7	13.5	8.3	32.1	23.4	43.5	20.1	
Vert	250.001	QP	28.8	17.2	9.3	32.1	23.2	46.0	22.8	
Vert	350.002	QP	26.9	17.0	10.1	32.1	21.9	46.0	24.1	
Vert	850.000	QP	26.9	23.6	12.8	31.5	31.8	46.0	14.2	
Vert	950.001	QP	28.4	25.5	13.3	31.1	36.1	46.0	9.9	
Vert	2253.000	PK	39.7	27.5	2.4	32.3	37.3	73.9	36.6	NS
Vert	2483.500	PK	48.3	28.5	2.6	32.2	47.2	73.9	26.7	
Vert	2483.830	PK	47.1	28.5	2.6	32.2	46.0	73.9	27.9	
Vert	2930.000	PK	38.7	28.6	2.8	32.0	38.1	73.9	35.8	NS
Vert	4956.000	PK	43.9	31.6	5.3	31.4	49.4	73.9	24.5	
Vert	7434.000	PK	42.7	35.8	6.2	32.5	52.2	73.9	21.7	NS
Vert	9912.000	PK	44.0	38.6	7.4	33.3	56.7	73.9	17.2	NS
Vert	24780.000	PK	47.2	39.0	-0.9	31.5	53.8	73.9	20.1	
Vert	2253.000	AV	26.3	27.5	2.4	32.3	23.9	53.9	30.0	NS
Vert	2483.500	AV	36.4	28.5	2.6	32.2	35.3	53.9	18.6	
Vert	2483.830	AV	36.0	28.5	2.6	32.2	34.9	53.9	19.0	
Vert	2930.000	AV	24.8	28.6	2.8	32.0	24.2	53.9	29.7	NS
Vert	4956.000	AV	33.7	31.6	5.3	31.4	39.2	53.9	14.7	
Vert	7434.000	AV	30.6	35.8	6.2	32.5	40.1	53.9	13.8	NS
Vert	9912.000	AV	32.0	38.6	7.4	33.3	44.7	53.9	9.2	NS
Vert	24780.000	AV	35.6	39.0	-0.9	31.5	42.2	53.9	11.7	

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

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 32AE0084-HO-02  
Date : 10/16/2011  
Temperature/ Humidity : 23 deg. C / 56 % RH  
Engineer : Satofumi Matsuyama  
Mode : Rx 2443MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	37.920	QP	22.1	15.7	7.1	32.2	12.7	40.0	27.3	
Hori	144.120	QP	34.4	14.5	8.5	32.1	25.3	43.5	18.2	
Hori	250.001	QP	32.9	17.2	9.3	32.1	27.3	46.0	18.7	
Hori	349.998	QP	31.7	17.0	10.1	32.1	26.7	46.0	19.3	
Hori	850.000	QP	25.6	23.6	12.8	31.5	30.5	46.0	15.5	
Hori	949.998	QP	27.2	25.5	13.2	31.1	34.8	46.0	11.2	
Hori	2118.617	PK	45.1	26.8	2.4	32.4	41.9	73.9	32.0	
Hori	2443.000	PK	42.5	28.3	2.5	32.2	41.1	73.9	32.8	NS
Hori	2118.617	AV	36.6	26.8	2.4	32.4	33.4	53.9	20.5	
Hori	2443.000	AV	30.6	28.3	2.5	32.2	29.2	53.9	24.7	NS
Vert	37.814	QP	33.1	15.8	7.1	32.2	23.8	40.0	16.2	
Vert	126.001	QP	33.7	13.5	8.3	32.1	23.4	43.5	20.1	
Vert	250.000	QP	29.0	17.2	9.3	32.1	23.4	46.0	22.6	
Vert	350.004	QP	27.3	17.0	10.1	32.1	22.3	46.0	23.7	
Vert	850.004	QP	27.1	23.6	12.8	31.5	32.0	46.0	14.0	
Vert	950.001	QP	28.3	25.5	13.3	31.1	36.0	46.0	10.0	
Vert	2118.630	PK	48.3	26.8	2.4	32.4	45.1	73.9	28.8	
Vert	2443.000	PK	41.7	28.3	2.5	32.2	40.3	73.9	33.6	NS
Vert	2118.630	AV	44.2	26.8	2.4	32.4	41.0	53.9	12.9	
Vert	2443.000	AV	30.6	28.3	2.5	32.2	29.2	53.9	24.7	NS

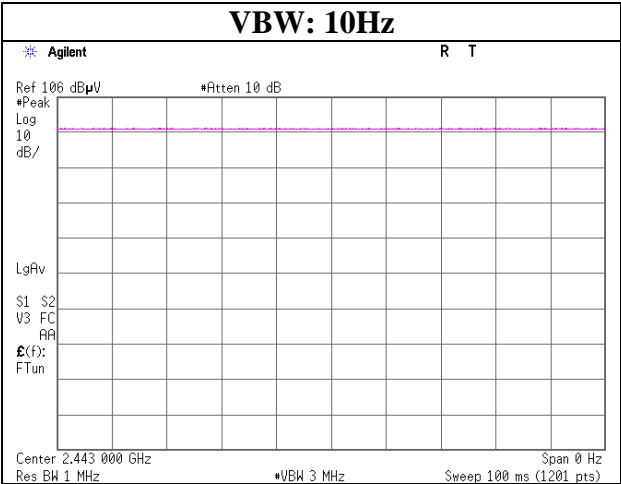
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*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.

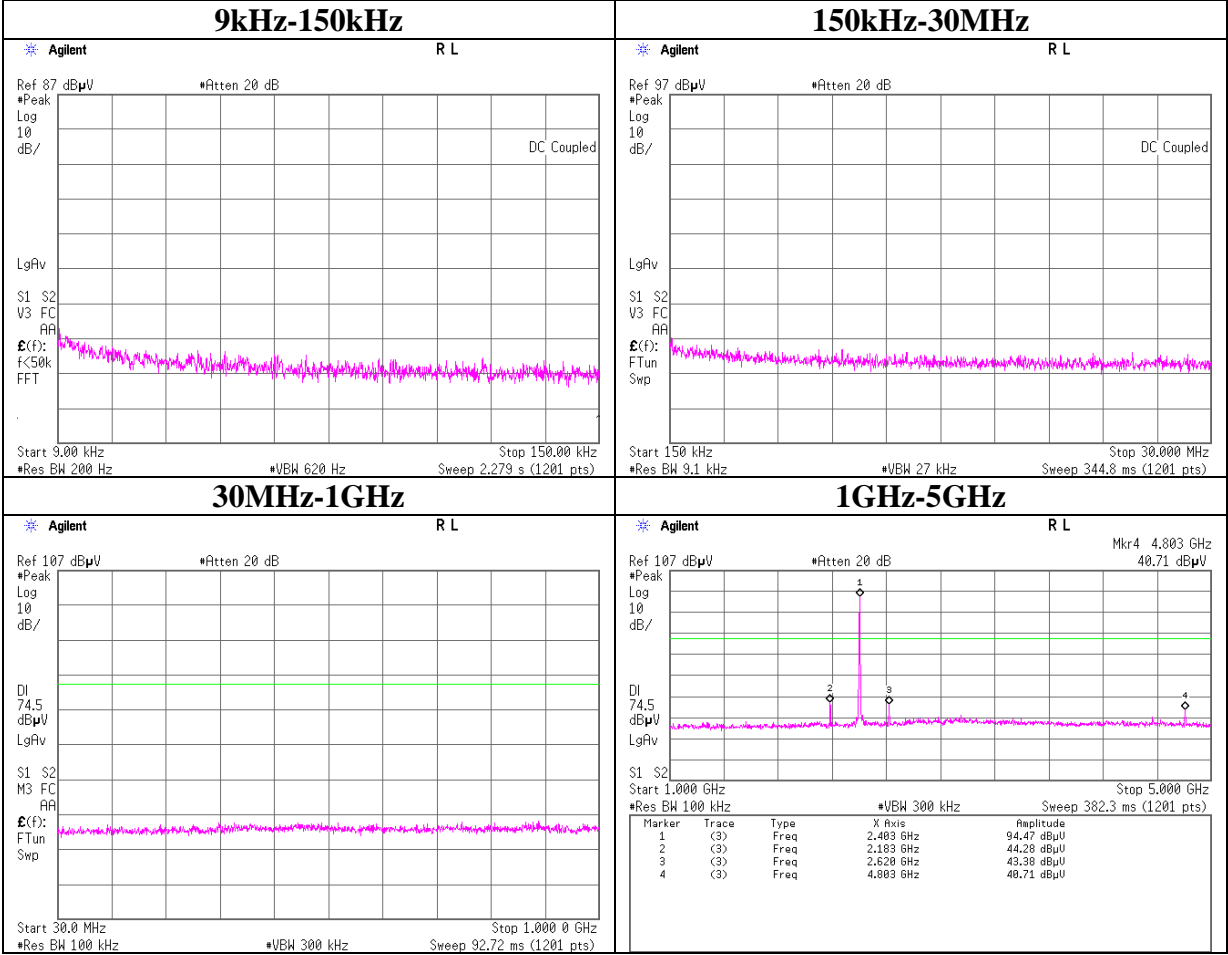
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

VBW (AV) Calculation



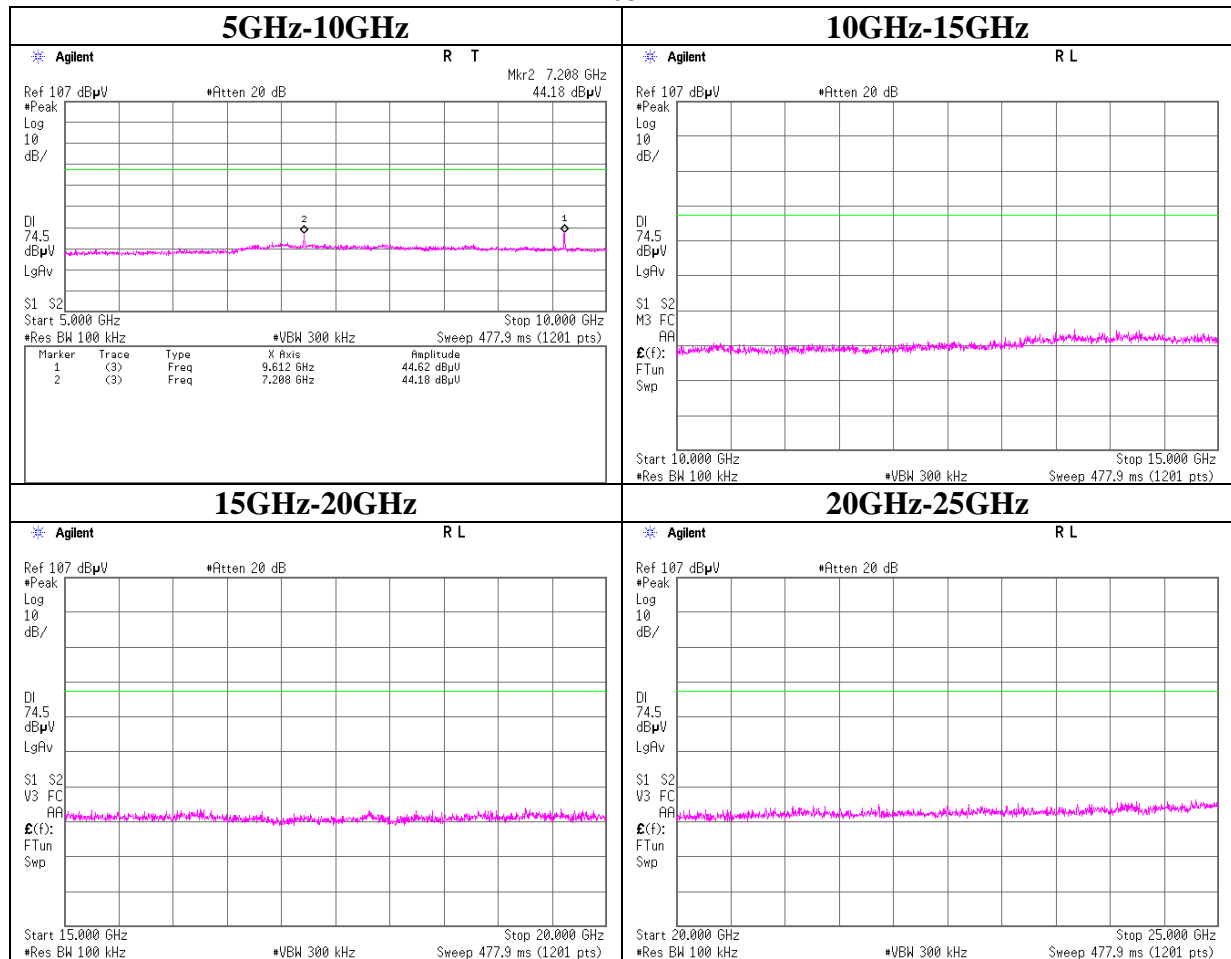
Conducted Spurious Emission

Tx 2403MHz



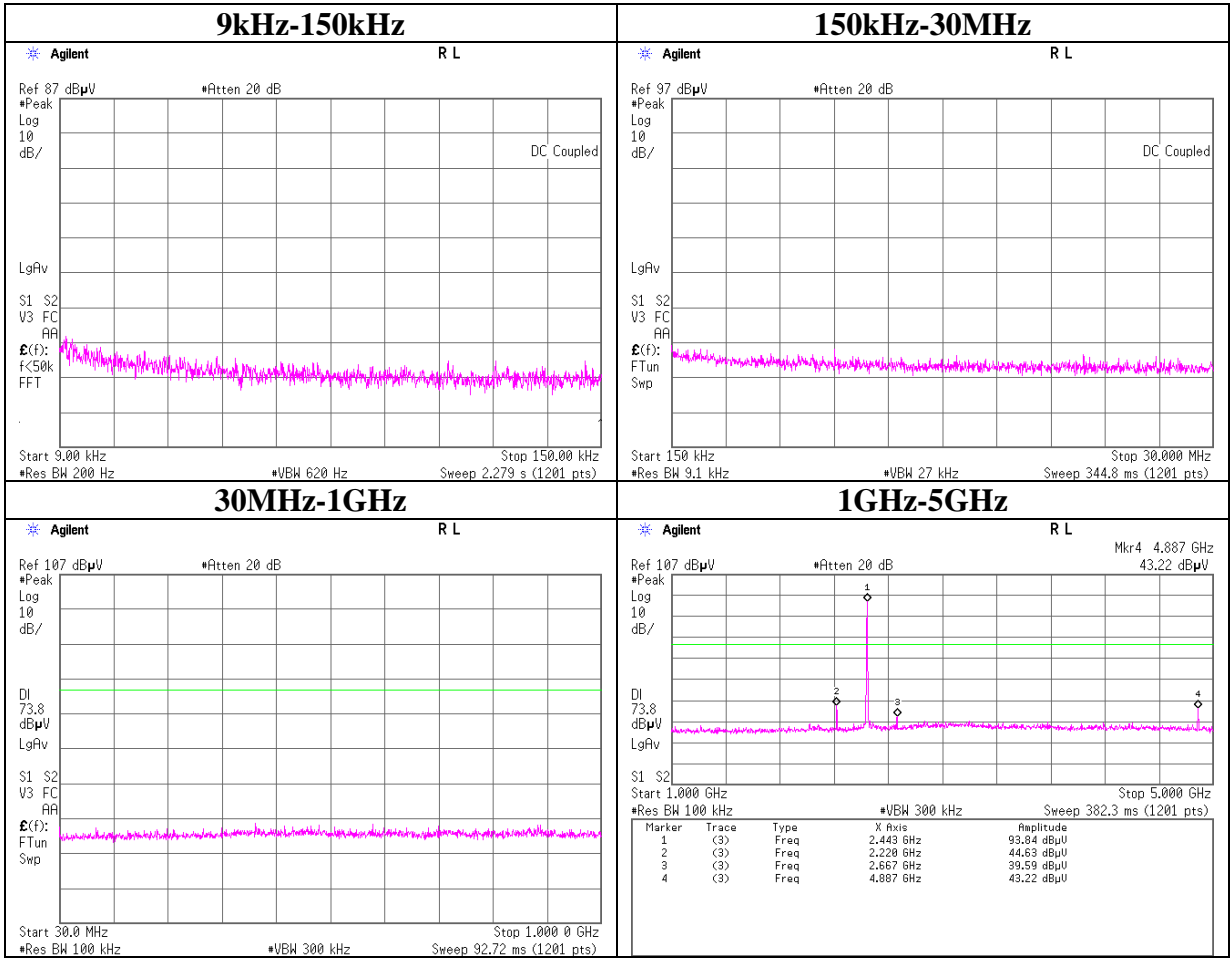
## Conducted Spurious Emission

### **Tx 2403MHz**



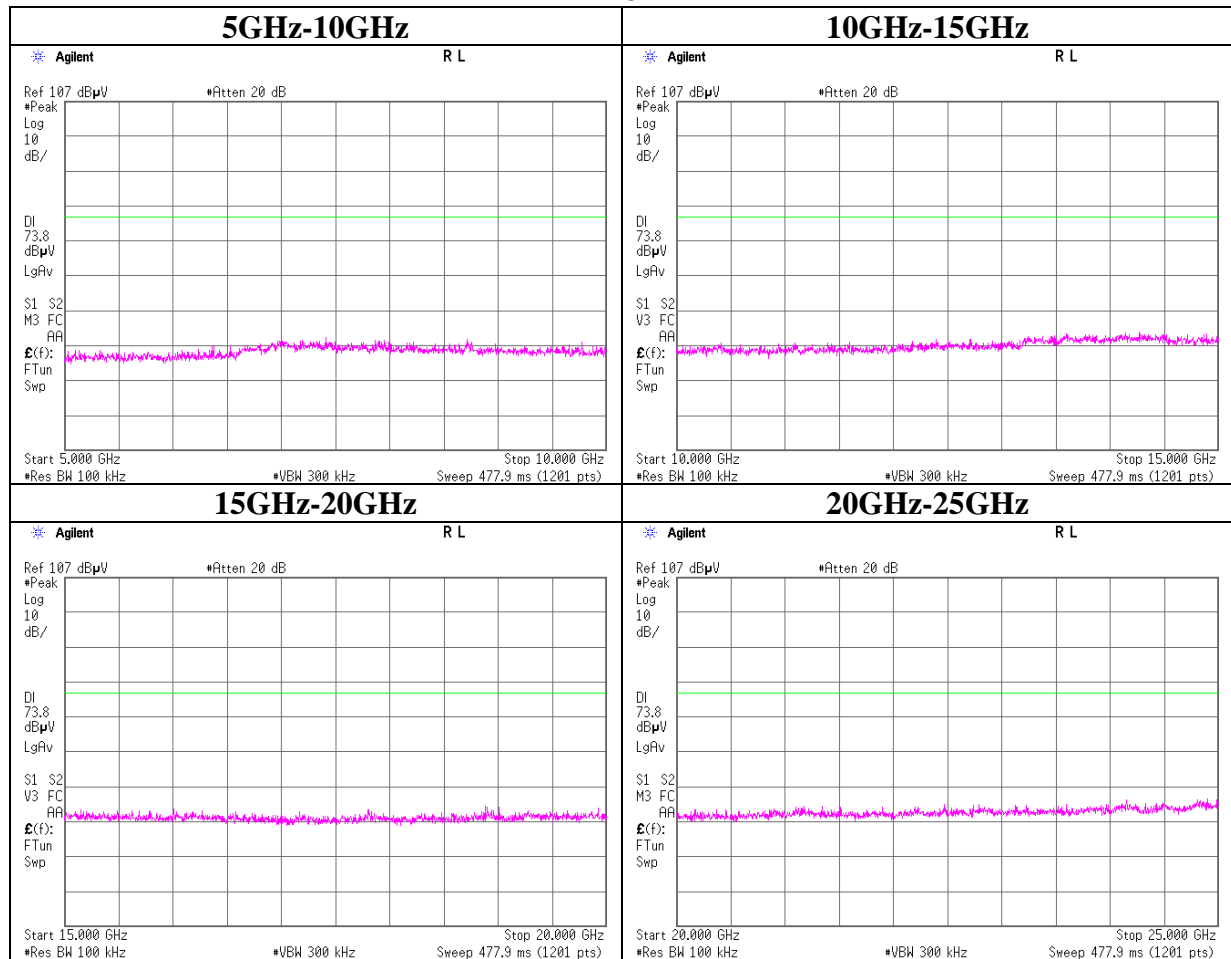
Conducted Spurious Emission

Tx 2443MHz



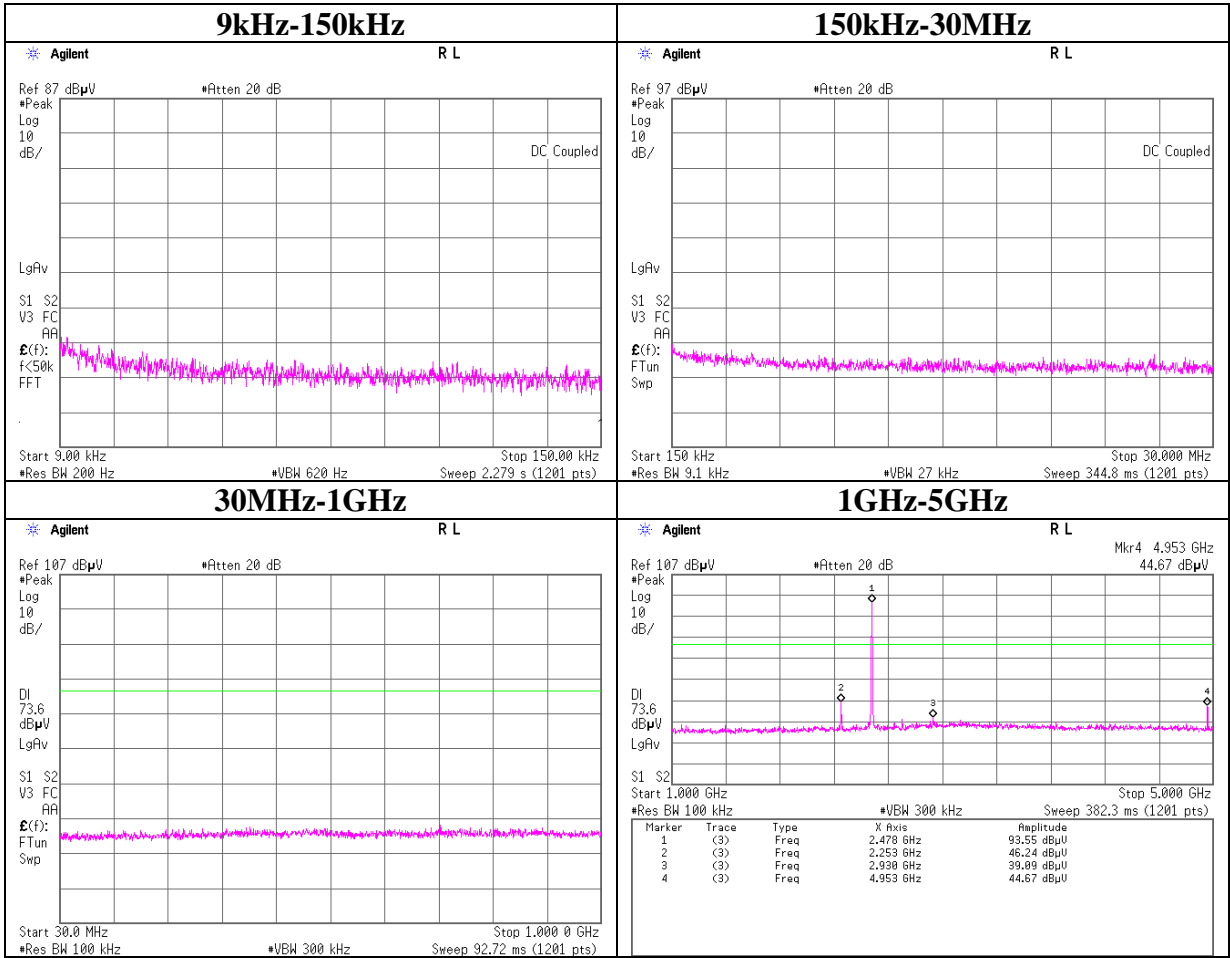
## Conducted Spurious Emission

### Tx 2443MHz



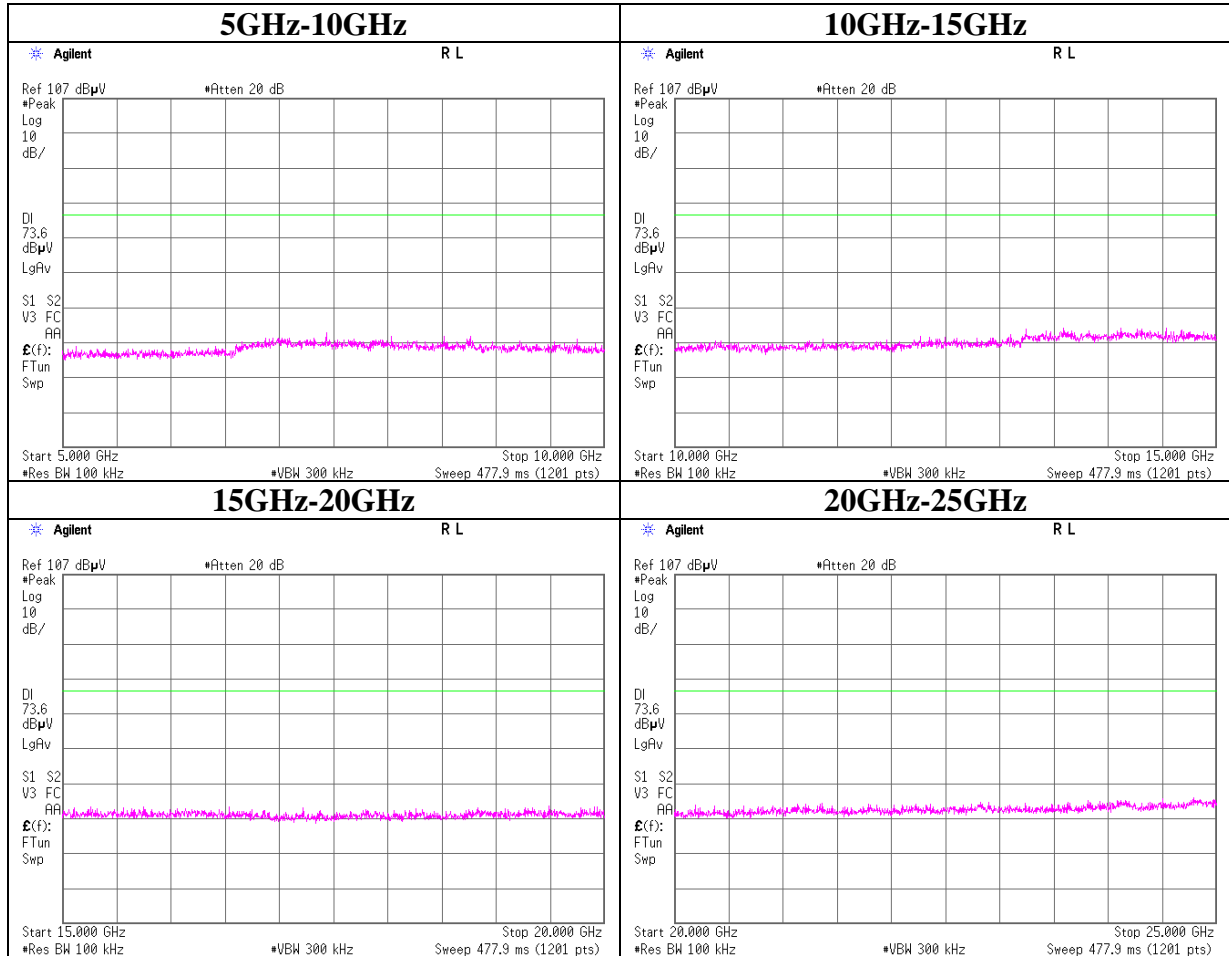
Conducted Spurious Emission

Tx 2478MHz



## Conducted Spurious Emission

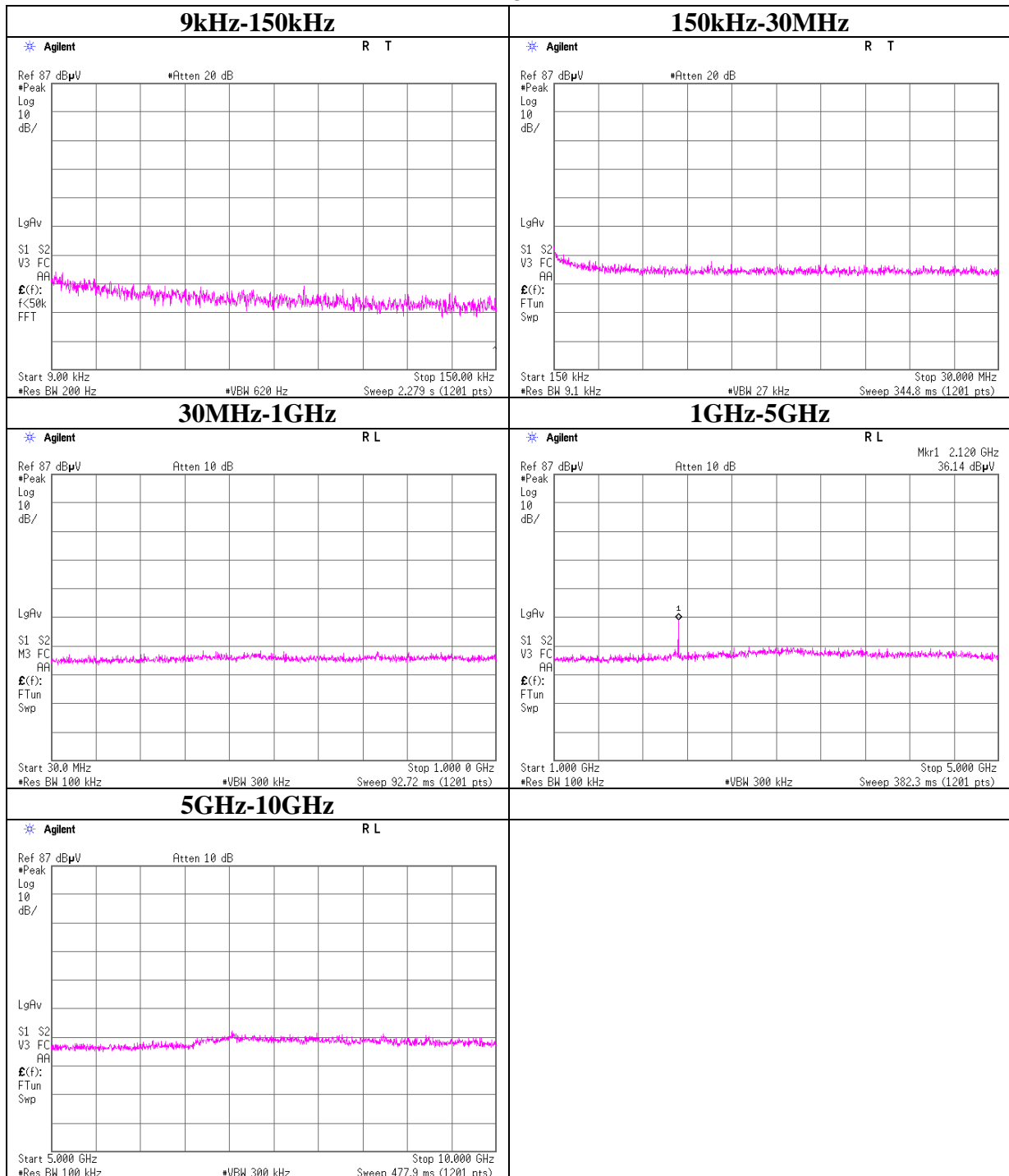
### **Tx 2478MHz**



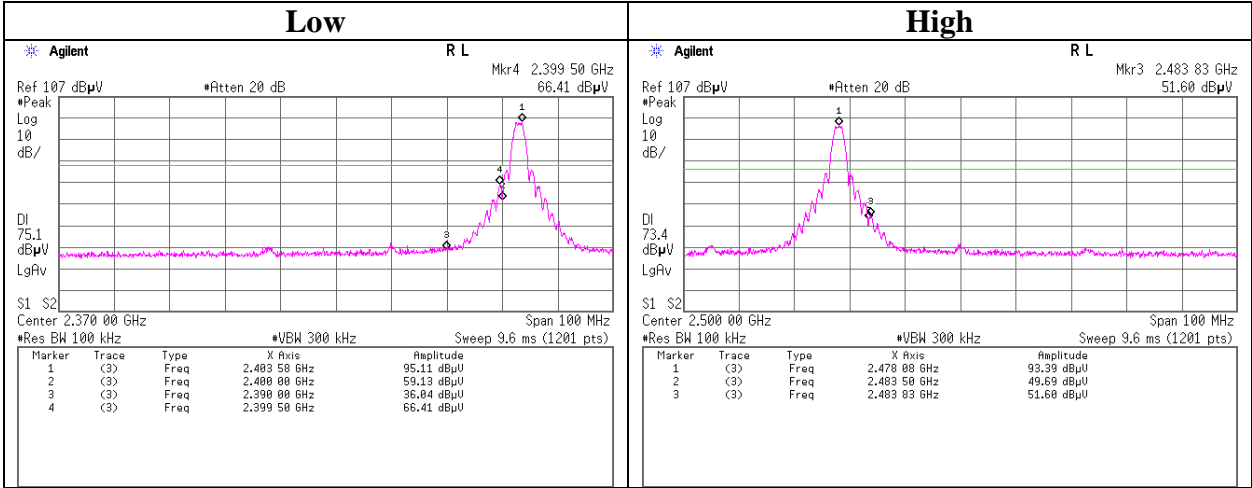


## Conducted Spurious Emission

### Rx 2443MHz



Conducted Emission Band Edge compliance



### **Power Density**

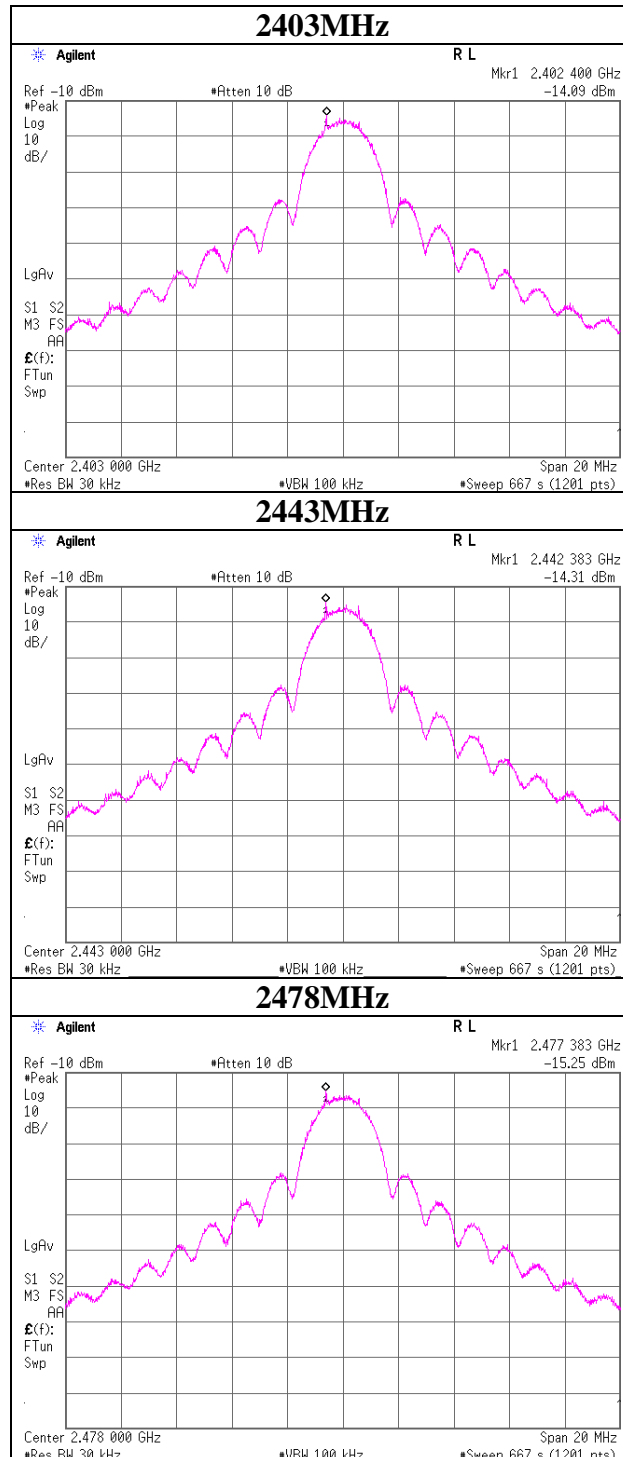
Test place                      Head Office EMC Lab. No.11 Measurement Room  
Report No.                     32AE0084-HO-02  
Date                            10/04/2011  
Temperature/ Humidity      24 deg. C / 55% RH  
Engineer                      Hiroyuki Furutaka  
Mode                            Tx

Freq.	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2403.00	-14.09	1.30	10.07	-2.72	8.00	10.72
2443.00	-14.31	1.33	10.07	-2.91	8.00	10.91
2478.00	-15.25	1.33	10.07	-3.85	8.00	11.85

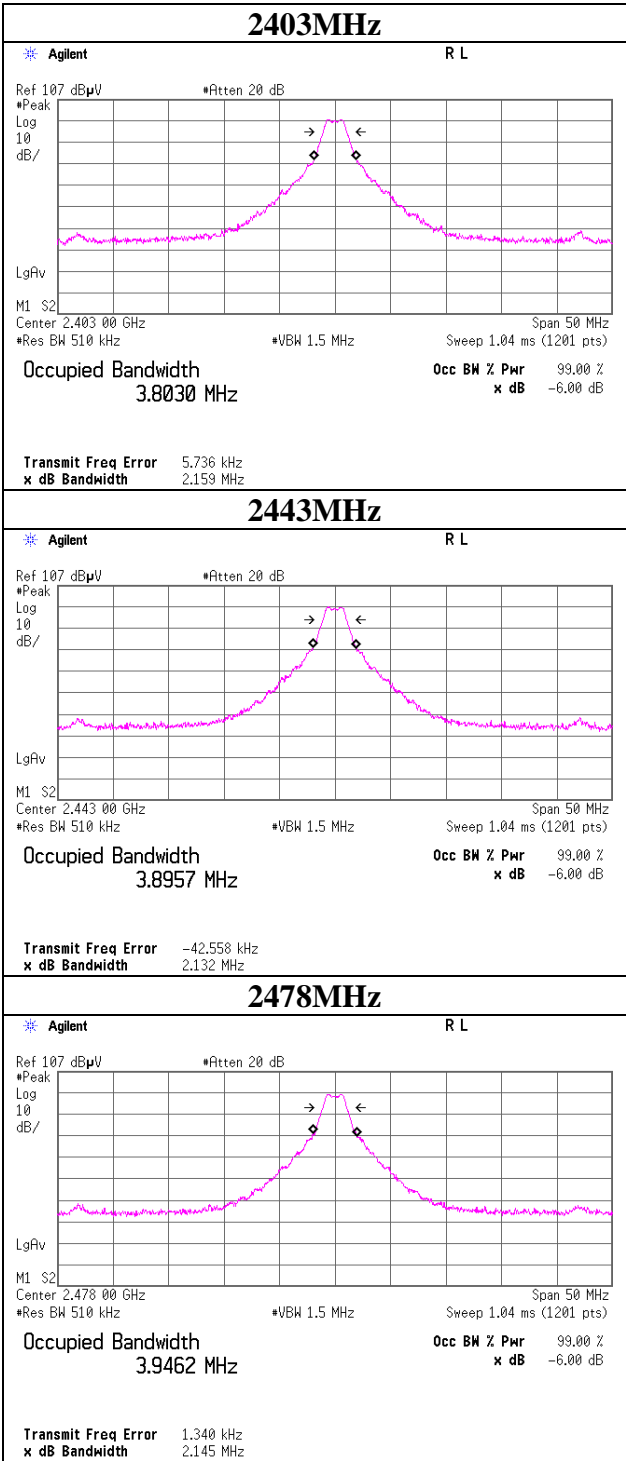
Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + 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)
MPM-12	Power Meter	Anritsu	ML2495A	0825002	AT	2011/08/09 * 12
MPSE-17	Power sensor	Anritsu	MA2411B	0738285	AT	2011/08/09 * 12
MCC-98	Microwave Cable 1G-40GHz	Schner	SUCOFLEX102	30819/2	AT	2011/05/27 * 12
MAT-20	Attenuator(10dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2011/01/06 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2010/12/13 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185820	AT	2011/06/30 * 12
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-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2010/11/18 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2011/04/15 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/08/17 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/08/17 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2011/03/25 * 12
MAT-51	Attenuator(6dB)	Weinschel	2	AS3557	RE	2011/01/14 * 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

**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**

**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**