



# RADIO TEST REPORT

**Test Report No. : 10075507H-F**

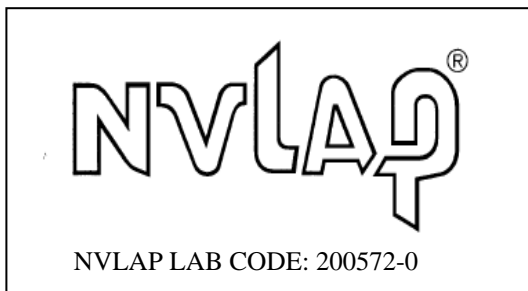
**Applicant** : FUJITSU TEN LIMITED  
**Type of Equipment** : Car Audio  
**Model No.** : FT0056A  
**FCC ID** : BABFT0056A  
**Test regulation** : FCC Part 15 Subpart C: 2013  
\*WLAN part  
**Test Result** : Complied

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

**Date of test:** October 8 to 17, 2013

**Representative test engineer:** H. Kukita  
Hiroshi Kukita  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:** T. Hatakeda  
Takahiro Hatakeda  
Leader of WiSE Japan,  
UL Verification Service



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation. \*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>



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## **SECTION 1: Customer information**

Company Name : FUJITSU TEN LIMITED  
Address : 2-28, Goshō-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 JAPAN  
Telephone Number : +81-78-682-2159  
Facsimile Number : +81-78-671-7160  
Contact Person : YO SHOTATSU

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

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

Type of Equipment : Car Audio  
Model No. : FT0056A  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 12.0V  
Rated range : DC 10.0 to 16.0V  
Receipt Date of Sample : October 7, 2013  
Country of Mass-production : China, Spain  
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 : 625MHz

#### **Radio Specification**

##### **[WLAN (IEEE802.11b/g/n-20)]**

Radio Type : Transceiver  
Frequency of Operation : 2412-2462MHz  
Modulation : DSSS / OFDM  
Power Supply (radio part input) : DC 3.3V  
Antenna type : Multilayer Chip Antenna  
Antenna Gain : -5.7dBi (MAX)

##### **[Bluetooth (Ver. 3.0 with EDR function)]**

Radio Type : Transceiver  
Frequency of Operation : 2402-2480MHz  
Modulation : FHSS  
Power Supply (radio part input) : DC 3.3V  
Antenna type : Multilayer Chip Antenna  
Antenna Gain : -5.7dBi (MAX)

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**[GPS]**

Radio Type : Receiver  
Frequency of Operation : 1575.42MHz  
Modulation : DSS  
Power Supply (radio part input) : DC 3.3V  
Antenna type : Antenna ASSY with LNA  
Antenna Gain : 30dBi

\*The model: FT0056A has a variant model.

In this report, FT0056A is described as variation 1, and the variant model as variation 2.

The difference between two models is a design of the front panel and assembly plant only.

The radio specification is identical between two models. Therefore, only spurious emission test was performed with both Variation 1 and 2.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013

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 September 30, 2013 does not affect the test specification applied to the EUT.

\* The EUT complies with FCC Part 15 Subpart B: 2013, final revised on September 30, 2013 and effective October 30, 2013.

### **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 for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- 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 for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3		[Variation 1] 3.9dB 9748.000MHz, AV Vert./Hori. 9848.000MHz, AV, Hori [Variation 2] 1.1dB 687.262MHz, QP, Ver.	Complied

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 is not the device that is designed to be connected to the public utility (AC) power line.

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

#### **FCC 15.31 (e)**

The EUT is a battery-operated device and test was performed with the full-charged battery. 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.

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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

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	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Power meter (+dB)	
Below 1GHz	Above 1GHz
0.7dB	1.5dB

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	
1.5dB	1.7dB	2.8dB	2.8dB	2.9dB	2.6dB

#### Radiated emission test(3m)

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

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### 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	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 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.

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

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

Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

<b>Mode</b>	<b>Remarks*</b>
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	48Mbps, PN9
IEEE 802.11n 20MHz BW (11n-20)	MCS 4, PN9
*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: Same as production model Software: Diag. mode(Wi-Fi Auth mode) *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)

<b>Test Item</b>	<b>Operating Mode</b>	<b>Tested frequency</b>
6dB Bandwidth	11b Tx	2412MHz
Maximum Peak Output Power	11g Tx	2437MHz
Power Density	11n-20 Tx	2462MHz
99% Occupied Bandwidth		
Average Output Power		
Spurious Emission (Radiated above 1GHz)	11b Tx 11g Tx *1)	2412MHz 2437MHz 2462MHz
Spurious Emission (Band Edge)	11b Tx 11g Tx 11n-20 Tx	2412MHz 2462MHz
Spurious Emission (Radiated below 1 GHz)	11g Tx *2)	2462MHz
Spurious Emission (Conducted)		
*1) Since the 11g and 11n-20 has the same modulation, test was performed on 11g Tx mode which had the higher antenna conducted power. *2) The mode was tested as a representative, because it had the highest power at antenna terminal test.		

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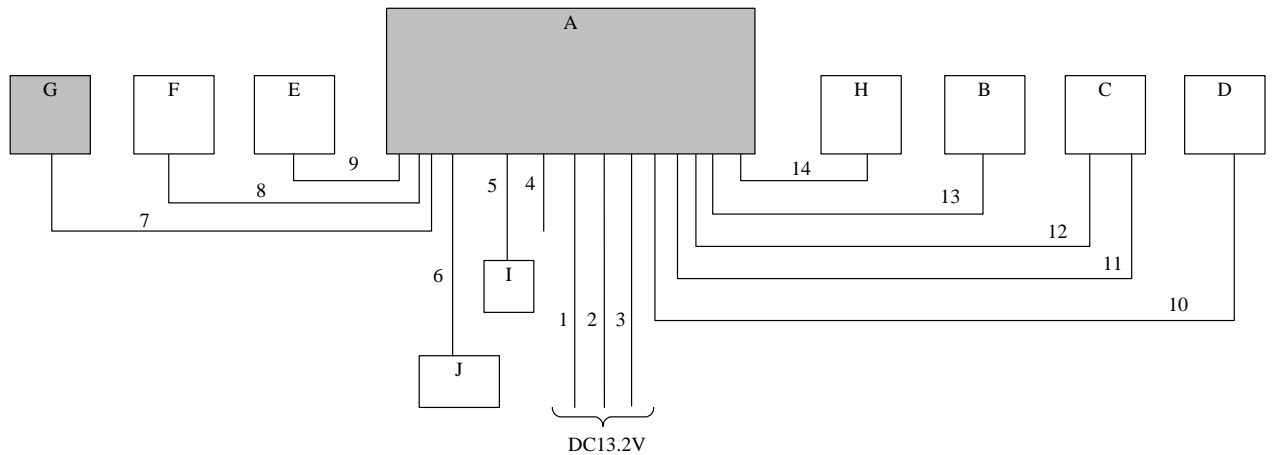
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## 4.2 Configuration and peripherals



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

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio	FT0056A (Variation 1)	2	FUJITSU TEN	EUT
		FT0056A (Variation 2)	4		
B	Dummy Load	GH40W	-	JRM	-
C	Dummy Load	GH30W	-	JRM	4ohm x 2
D	USB Memory	JET Flash	13728529430618	FUJITSU TEN	-
E	USB Memory	JET Flash	13728529430618	FUJITSU TEN	-
F	MIC ASSY	39180-T8VA- 12010-M1	00107	FUJITSU TEN	-
G	GPS Antenna	-	11870116	FUJITSU TEN	EUT
H	Dummy Load	G30W	-	JRM	-
I	Dummy Load	HP909D	63745	HP	-
J	Dummy Load	-	-	FUJITSU TEN	-

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Battery Cable	3.6	Unshielded	Unshielded	-
2	ACC Cable	3.6	Unshielded	Unshielded	-
3	GND Cable	3.6	Unshielded	Unshielded	-
4	I/O Cable	0.2	Unshielded	Unshielded	-
5	DUB Antenna Cable	0.2	Shielded	Shielded	-
6	FM Antenna Cable	0.25	Shielded	Shielded	-
7	GPS Cable	4.8	Shielded	Shielded	-
8	MIC ASSY Cable	0.5	Unshielded	Unshielded	-
9	USB Cable	1.0	Shielded	Shielded	-
10	USB Cable	1.0	Shielded	Shielded	-
11	FR SP Cable	0.5	Unshielded	Unshielded	-
12	FL SP Cable	0.5	Unshielded	Unshielded	-
13	RL SP Cable	0.3	Unshielded	Unshielded	-
14	RR SP Cable	0.3	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".

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 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 *2)	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Average Power Method: <u>WLAN: 12.2.5.1</u> RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m *1) (above 10GHz)		3m (below 10GHz), 1m *1) (above 10GHz)

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

\*2) Average Power Measurement was performed based on 6.0 & 12.2.5 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"

The test was made on EUT at the normal use 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

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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	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*1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/Average *2)	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3kHz	9.1kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
*1) The measurement was performed with Max Hold since the duty cycle was not 100%.							
*2)Reference data							
*3) Section 10.2 Method PKPSD (peak PSD) of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".							
*4) 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 low enough 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

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## APPENDIX 1: Data of EMI test

### 6dB Bandwidth

Test place Head Office EMC Lab. No.11 Measurement Room  
Report No. 10075507H  
Date 10/08/2013  
Temperature/ Humidity 24 deg. C / 52% RH  
Engineer Hiroshi Kukita  
Mode Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	9.301	>500
2437	9.801	>500
2462	10.117	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.520	>500
2437	16.501	>500
2462	16.514	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	17.747	>500
2437	17.731	>500
2462	17.739	>500

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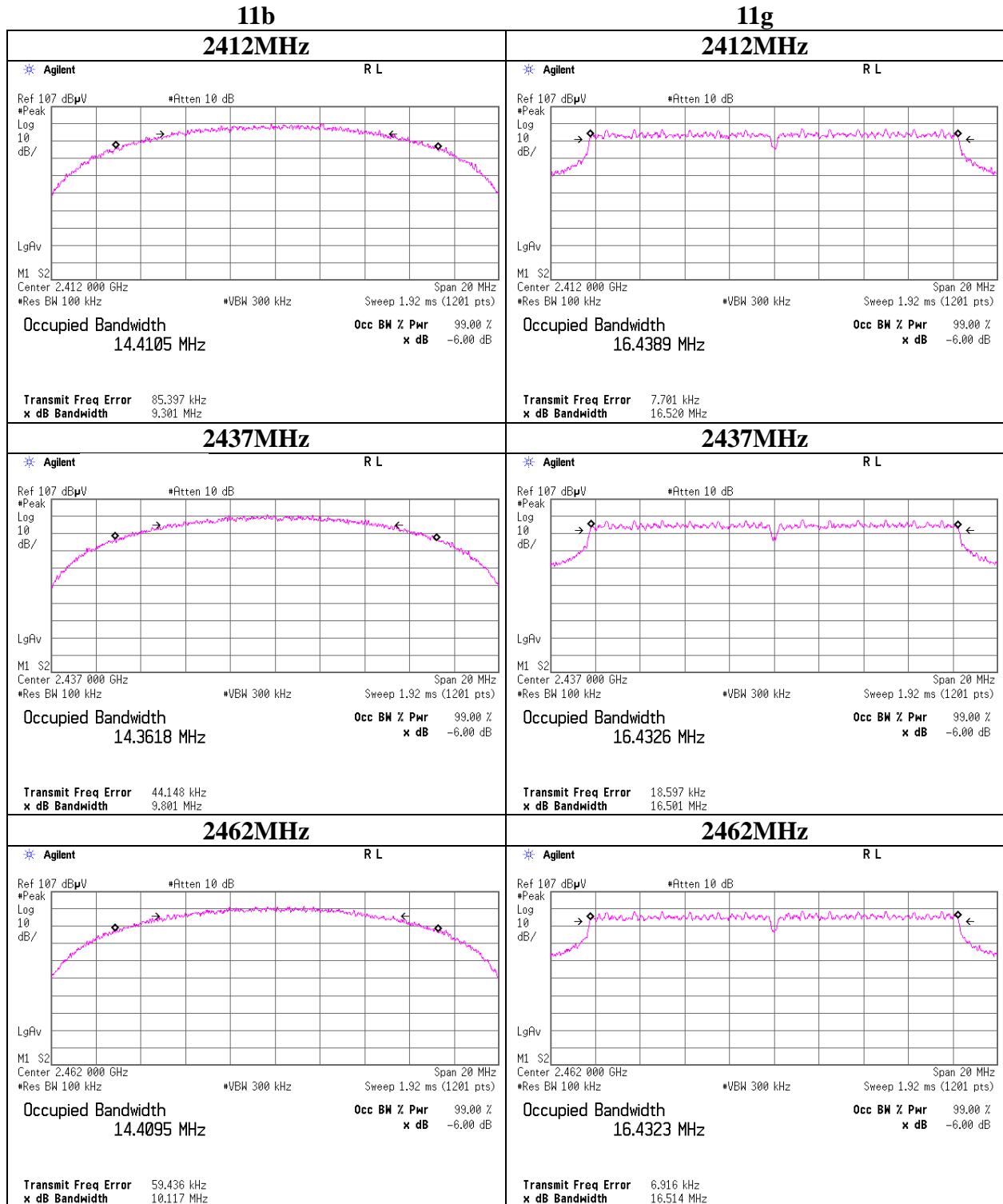
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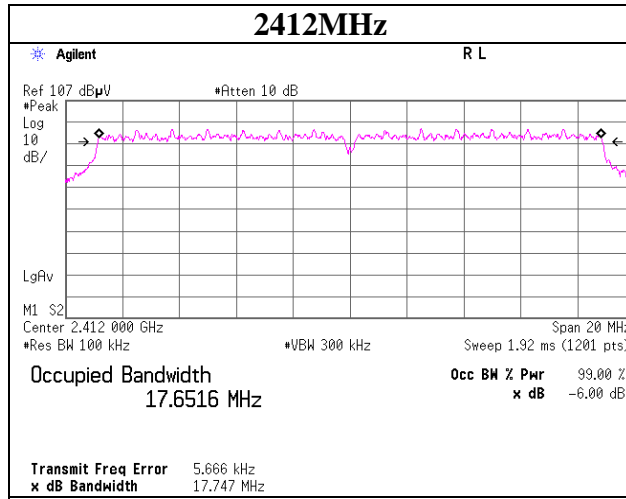
**6dB Bandwidth**



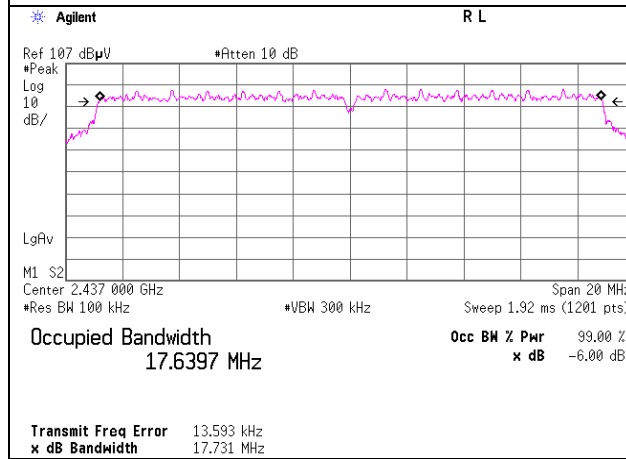
## 6dB Bandwidth

**11n-20**

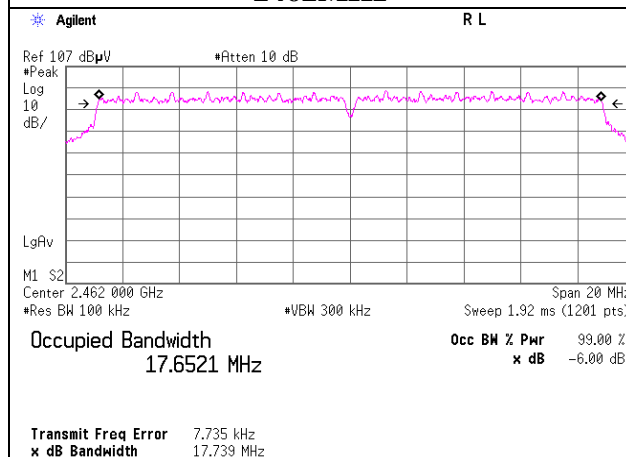
**2412MHz**



**2437MHz**



**2462MHz**



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### Maximum Peak Output Power

Test place	Head Office EMC Lab. No.11 Measurement Room
Report No.	10075507H
Date	10/08/2013
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Hiroshi Kukita
Mode	11b / 11g Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	0.53	2.29	10.08	12.90	19.50	30.00	1000	17.10
2437	1.49	2.30	10.08	13.87	24.38	30.00	1000	16.13
2462	2.17	2.30	10.08	14.55	28.51	30.00	1000	15.45

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	9.02	2.29	10.08	21.39	137.72	30.00	1000	8.61
2437	9.75	2.30	10.08	22.13	163.31	30.00	1000	7.87
2462	9.87	2.30	10.08	22.25	167.88	30.00	1000	7.75

Sample Calculation:

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

11b, 2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	1.28	
2	1.38	
5.5	1.36	
11	1.49	*

11g, 2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	9.09	
9	9.05	
12	8.44	
18	8.39	
24	9.01	
36	9.50	
48	9.75	*
54	9.55	

\*: Worst Rate

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

**UL Japan, Inc.**

**Head Office EMC Lab.**

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### Maximum Peak Output Power

Test place	Head Office EMC Lab. No.11 Measurement Room
Report No.	10075507H
Date	10/08/2013
Temperature/ Humidity	24 deg. C / 52% RH
Engineer	Hiroshi Kukita
Mode	11n-20 Tx

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	8.62	2.29	10.08	20.99	125.60	30.00	1000	9.01
2437	9.48	2.30	10.08	21.86	153.46	30.00	1000	8.14
2462	9.84	2.30	10.08	22.22	166.72	30.00	1000	7.78

Sample Calculation:

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

11n-20, 2437MHz

Rate [MCS]	Guard Interval	Reading [dBm]	Remark
0	Long	9.05	
1	Long	8.44	
2	Long	8.61	
3	Long	9.18	
4	Long	9.48	*
5	Long	9.03	
6	Long	9.06	
7	Long	8.55	
0	Shrot	9.06	
1	Shrot	8.21	
2	Shrot	8.26	
3	Shrot	9.43	
4	Shrot	9.39	
5	Shrot	8.90	
6	Shrot	8.57	
7	Shrot	8.24	

\*: Worst Rate

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

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## Radiated Spurious Emission Variation 1

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/11/2013 10/17/2013  
Temperature/ Humidity 23 deg. C / 67% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2412MHz

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	3.1	32.4	41.8	73.9	32.1	
Hori.	3145.653	PK	45.2	29.1	3.6	32.0	45.9	73.9	28.0	
Hori.	4824.000	PK	41.4	30.5	5.3	31.4	45.8	73.9	28.1	
Hori.	7236.000	PK	42.7	35.8	6.7	32.3	52.9	73.9	21.0	
Hori.	9648.000	PK	44.4	39.1	7.3	33.0	57.8	73.9	16.1	
Vert.	2390.000	PK	42.9	28.1	3.1	32.4	41.7	73.9	32.2	
Vert.	3145.635	PK	46.4	29.1	3.6	32.0	47.1	73.9	26.8	
Vert.	4824.000	PK	42.0	30.5	5.3	31.4	46.4	73.9	27.5	
Vert.	7236.000	PK	42.8	35.8	6.7	32.3	53.0	73.9	20.9	
Vert.	9648.000	PK	45.9	39.1	7.3	33.0	59.3	73.9	14.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.0	28.1	3.1	32.4	0.2	33.0	53.9	20.9	Not Out of band emission
Hori.	3145.653	AV	37.9	29.1	3.6	32.0	-	38.6	53.9	15.3	
Hori.	4824.000	AV	32.8	30.5	5.3	31.4	0.2	37.4	53.9	16.5	
Hori.	7236.000	AV	34.3	35.8	6.7	32.3	0.2	44.7	53.9	9.2	
Hori.	9648.000	AV	35.6	39.1	7.3	33.0	0.2	49.1	53.9	4.8	
Vert.	2390.000	AV	34.6	28.1	3.1	32.4	0.2	33.5	53.9	20.4	Not Out of band emission
Vert.	3145.635	AV	40.3	29.1	3.6	32.0	-	41.0	53.9	12.9	
Vert.	4824.000	AV	32.5	30.5	5.3	31.4	0.2	37.1	53.9	16.8	
Vert.	7236.000	AV	34.0	35.8	6.7	32.3	0.2	44.4	53.9	9.5	
Vert.	9648.000	AV	36.1	39.1	7.3	33.0	0.2	49.6	53.9	4.3	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	86.5	28.2	3.1	32.4	85.4	-	-	
Hori.	2400.000	PK	38.0	28.2	3.1	32.4	36.9	65.4	28.5	
Vert.	2412.000	PK	89.8	28.2	3.1	32.4	88.7	-	-	
Vert.	2400.000	PK	40.6	28.2	3.1	32.4	39.5	68.7	29.2	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

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**Radiated Spurious Emission**  
**Variation 1**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/11/2013 10/17/2013  
Temperature/ Humidity 23 deg. C / 67% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.635	PK	45.0	29.1	3.6	32.0	45.7	73.9	28.2	
Hori.	4874.000	PK	41.2	30.6	5.3	31.4	45.7	73.9	28.2	
Hori.	7311.000	PK	42.2	35.9	6.8	32.4	52.5	73.9	21.4	
Hori.	9748.000	PK	45.1	39.4	7.3	33.0	58.8	73.9	15.1	
Vert.	3145.635	PK	46.9	29.1	3.6	32.0	47.6	73.9	26.3	
Vert.	4874.000	PK	43.3	30.6	5.3	31.4	47.8	73.9	26.1	
Vert.	7311.000	PK	43.3	35.9	6.8	32.4	53.6	73.9	20.3	
Vert.	9748.000	PK	44.4	39.4	7.3	33.0	58.1	73.9	15.8	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.635	AV	38.0	29.1	3.6	32.0	-	38.7	53.9	15.2	
Hori.	4874.000	AV	32.1	30.6	5.3	31.4	0.2	36.8	53.9	17.1	
Hori.	7311.000	AV	33.4	35.9	6.8	32.4	0.2	43.8	53.9	10.1	
Hori.	9748.000	AV	35.2	39.4	7.3	33.0	0.2	49.1	53.9	4.8	
Vert.	3145.635	AV	41.6	29.1	3.6	32.0	-	42.3	53.9	11.6	
Vert.	4874.000	AV	32.7	30.6	5.3	31.4	0.2	37.3	53.9	16.6	
Vert.	7311.000	AV	33.9	35.9	6.8	32.4	0.2	44.4	53.9	9.5	
Vert.	9748.000	AV	35.7	39.4	7.3	33.0	0.2	49.6	53.9	4.3	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Radiated Spurious Emission**  
**Variation 1**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/11/2013 10/17/2013  
Temperature/ Humidity 23 deg. C / 67% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2462MHz

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	44.5	28.4	3.1	32.3	43.7	73.9	30.2	
Hori.	3145.600	PK	45.2	29.1	3.6	32.0	45.9	73.9	28.0	
Hori.	4924.000	PK	42.5	30.7	5.3	31.4	47.1	73.9	26.8	
Hori.	7386.000	PK	41.8	36.1	6.7	32.4	52.2	73.9	21.7	
Hori.	9848.000	PK	44.2	39.6	7.4	33.1	58.1	73.9	15.8	
Vert.	2483.500	PK	43.5	28.4	3.1	32.3	42.7	73.9	31.2	
Vert.	3145.663	PK	45.9	29.1	3.6	32.0	46.6	73.9	27.3	
Vert.	4924.000	PK	42.0	30.7	5.3	31.4	46.6	73.9	27.3	
Vert.	7386.000	PK	42.9	36.1	6.7	32.4	53.3	73.9	20.6	
Vert.	9848.000	PK	45.0	39.6	7.4	33.1	58.9	73.9	15.0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	36.4	28.4	3.1	32.3	0.2	35.7	53.9	18.2	Not Out of band emission
Hori.	3145.600	AV	39.1	29.1	3.6	32.0	-	39.8	53.9	14.1	
Hori.	4924.000	AV	33.8	30.7	5.3	31.4	0.2	38.6	53.9	15.3	
Hori.	7386.000	AV	32.8	36.1	6.7	32.4	0.2	43.3	53.9	10.6	
Hori.	9848.000	AV	35.4	39.6	7.4	33.1	0.2	49.5	53.9	4.4	
Vert.	2483.500	AV	35.1	28.4	3.1	32.3	0.2	34.5	53.9	19.4	Not Out of band emission
Vert.	3145.663	AV	40.0	29.1	3.6	32.0	-	40.7	53.9	13.2	
Vert.	4924.000	AV	33.4	30.7	5.3	31.4	0.2	38.2	53.9	15.7	
Vert.	7386.000	AV	33.7	36.1	6.7	32.4	0.2	44.3	53.9	9.6	
Vert.	9848.000	AV	34.9	39.6	7.4	33.1	0.2	48.9	53.9	5.0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

## Radiated Spurious Emission Variation 1

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/11/2013 10/17/2013  
Temperature/ Humidity 23 deg. C / 67% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11g Tx 2412MHz

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	45.3	28.1	3.1	32.4	44.1	73.9	29.8	
Hori.	3145.653	PK	45.2	29.1	3.6	32.0	45.9	73.9	28.0	
Hori.	4824.000	PK	40.9	30.5	5.3	31.4	45.3	73.9	28.6	
Hori.	7236.000	PK	41.6	35.8	6.7	32.3	51.8	73.9	22.1	
Hori.	9648.000	PK	43.1	39.1	7.3	33.0	56.5	73.9	17.4	
Vert.	2390.000	PK	46.8	28.1	3.1	32.4	45.6	73.9	28.3	
Vert.	3145.635	PK	46.3	29.1	3.6	32.0	47.0	73.9	26.9	
Vert.	4824.000	PK	42.2	30.5	5.3	31.4	46.6	73.9	27.3	
Vert.	7236.000	PK	43.6	35.8	6.7	32.3	53.8	73.9	20.1	
Vert.	9648.000	PK	46.1	39.1	7.3	33.0	59.5	73.9	14.4	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	35.7	28.1	3.1	32.4	0.9	35.4	53.9	18.5	Not Out of Band emission
Hori.	3145.653	AV	37.9	29.1	3.6	32.0	-	38.7	53.9	15.2	
Hori.	4824.000	AV	31.9	30.5	5.3	31.4	0.9	37.2	53.9	16.7	
Hori.	7236.000	AV	34.3	35.8	6.7	32.3	0.9	45.4	53.9	8.5	
Hori.	9648.000	AV	35.3	39.1	7.3	33.0	0.9	49.6	53.9	4.3	
Vert.	2390.000	AV	36.6	28.1	3.1	32.4	0.9	36.3	53.9	17.6	Not Out of Band emission
Vert.	3145.635	AV	40.1	29.1	3.6	32.0	-	40.8	53.9	13.1	
Vert.	4824.000	AV	32.7	30.5	5.3	31.4	0.9	38.0	53.9	15.9	
Vert.	7236.000	AV	34.1	35.8	6.7	32.3	0.9	45.2	53.9	8.7	
Vert.	9648.000	AV	35.4	39.1	7.3	33.0	0.9	49.7	53.9	4.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	84.4	28.2	3.1	32.4	83.3	-	-	
Hori.	2400.000	PK	52.7	28.2	3.1	32.4	51.6	63.3	11.7	
Vert.	2412.000	PK	85.8	28.2	3.1	32.4	84.7	-	-	
Vert.	2400.000	PK	54.7	28.2	3.1	32.4	53.6	64.7	11.1	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

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## Radiated Spurious Emission Variation 1

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/11/2013 10/17/2013  
Temperature/ Humidity 23 deg. C / 67% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11g Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.694	PK	44.4	29.1	3.6	32.0	45.1	73.9	28.8	
Hori.	4874.000	PK	41.7	30.6	5.3	31.4	46.2	73.9	27.7	
Hori.	7311.000	PK	42.2	35.9	6.8	32.4	52.5	73.9	21.4	
Hori.	9748.000	PK	44.2	39.4	7.3	33.0	57.9	73.9	16.0	
Vert.	3145.635	PK	46.9	29.1	3.6	32.0	47.6	73.9	26.3	
Vert.	4874.000	PK	43.5	30.6	5.3	31.4	48.0	73.9	25.9	
Vert.	7311.000	PK	42.8	35.9	6.8	32.4	53.1	73.9	20.8	
Vert.	9748.000	PK	44.0	39.4	7.3	33.0	57.7	73.9	16.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz :  $20\log(3.0m/1.0m) = 9.5dB$

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.694	AV	37.3	29.1	3.6	32.0	-	38.0	53.9	15.9	
Hori.	4874.000	AV	32.6	30.6	5.3	31.4	0.9	38.1	53.9	15.8	
Hori.	7311.000	AV	34.1	35.9	6.8	32.4	0.9	45.3	53.9	8.6	
Hori.	9748.000	AV	35.4	39.4	7.3	33.0	0.9	50.0	53.9	3.9	
Vert.	3145.635	AV	42.1	29.1	3.6	32.0	-	42.8	53.9	11.1	
Vert.	4874.000	AV	34.0	30.6	5.3	31.4	0.9	39.4	53.9	14.5	
Vert.	7311.000	AV	34.1	35.9	6.8	32.4	0.9	45.4	53.9	8.5	
Vert.	9748.000	AV	35.4	39.4	7.3	33.0	0.9	50.0	53.9	3.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz :  $20\log(3.0m/1.0m) = 9.5dB$

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## Radiated Spurious Emission Variation 1

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/11/2013 10/15/2013 10/17/2013  
Temperature/ Humidity 23 deg. C / 67% RH 22 deg. C / 53% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Hiroshi Kukita Tsubasa Takayama  
(1-10GHz) (30-1000MHz) (10-26.5GHz)  
Mode 11g Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	60.001	QP	35.2	7.9	7.5	32.2	18.4	40.0	21.6	
Hori.	72.000	QP	47.2	6.5	7.7	32.2	29.2	40.0	10.8	
Hori.	199.906	QP	42.5	16.6	9.1	32.1	36.1	43.5	7.4	
Hori.	255.999	QP	31.8	17.6	9.5	32.1	26.8	46.0	19.2	
Hori.	480.013	QP	38.7	18.0	11.0	32.0	35.7	46.0	10.3	
Hori.	614.120	QP	33.8	19.6	11.8	32.1	33.1	46.0	12.9	
Hori.	687.260	QP	32.0	20.1	12.2	32.2	32.1	46.0	13.9	
Hori.	2483.500	PK	57.0	28.4	3.1	32.3	56.2	73.9	17.7	
Hori.	3145.600	PK	45.0	29.1	3.6	32.0	45.7	73.9	28.2	
Hori.	4924.000	PK	40.9	30.7	5.3	31.4	45.5	73.9	28.4	
Hori.	7386.000	PK	42.7	36.1	6.7	32.4	53.1	73.9	20.8	
Hori.	9848.000	PK	44.3	39.6	7.4	33.1	58.2	73.9	15.7	
Vert.	60.002	QP	44.7	7.9	7.5	32.2	27.9	40.0	12.1	
Vert.	72.002	QP	43.0	6.5	7.7	32.2	25.0	40.0	15.0	
Vert.	199.906	QP	44.5	16.6	9.1	32.1	38.1	43.5	5.4	
Vert.	255.998	QP	39.8	17.6	9.5	32.1	34.8	46.0	11.2	
Vert.	480.014	QP	35.7	18.0	11.0	32.0	32.7	46.0	13.3	
Vert.	614.119	QP	36.8	19.6	11.8	32.1	36.1	46.0	9.9	
Vert.	687.262	QP	40.4	20.1	12.2	32.2	40.5	46.0	5.5	
Vert.	2483.500	PK	50.9	28.4	3.1	32.3	50.1	73.9	23.8	
Vert.	3145.584	PK	45.6	29.1	3.6	32.0	46.3	73.9	27.6	
Vert.	4924.000	PK	41.4	30.7	5.3	31.4	46.0	73.9	27.9	
Vert.	7386.000	PK	43.6	36.1	6.7	32.4	54.0	73.9	19.9	
Vert.	9848.000	PK	43.4	39.6	7.4	33.1	57.3	73.9	16.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	45.7	28.4	3.1	32.3	0.9	45.8	53.9	8.1	Not Out of band emission
Hori.	3145.600	AV	38.6	29.1	3.6	32.0	-	39.3	53.9	14.6	
Hori.	4924.000	AV	32.3	30.7	5.3	31.4	0.9	37.8	53.9	16.1	
Hori.	7386.000	AV	32.9	36.1	6.7	32.4	0.9	44.2	53.9	9.7	
Hori.	9848.000	AV	35.2	39.6	7.4	33.1	0.9	50.0	53.9	3.9	
Vert.	2483.500	AV	39.6	28.4	3.1	32.3	0.9	39.7	53.9	14.2	Not Out of band emission
Vert.	3145.584	AV	39.9	29.1	3.6	32.0	-	40.6	53.9	13.3	
Vert.	4924.000	AV	32.8	30.7	5.3	31.4	0.9	38.4	53.9	15.5	
Vert.	7386.000	AV	33.7	36.1	6.7	32.4	0.9	45.0	53.9	8.9	
Vert.	9848.000	AV	35.1	39.6	7.4	33.1	0.9	50.0	53.9	3.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB



**Radiated Spurious Emission**  
**Variation 1**

Test place : Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 10075507H  
Date : 10/11/2013  
Temperature/ Humidity : 23 deg. C / 67% RH  
Engineer : Takumi Shimada  
(Band Edge)  
Mode : 11n-20 Tx 2412MHz

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	46.7	28.1	3.1	32.4	45.5	73.9	28.4	
Vert.	2390.000	PK	50.5	28.1	3.1	32.4	49.3	73.9	24.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.9	28.1	3.1	32.4	0.4	36.1	53.9	17.8	Not Out of Band emission
Vert.	2390.000	AV	39.2	28.1	3.1	32.4	0.4	38.4	53.9	15.5	Not Out of Band emission

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet (RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	84.1	28.2	3.1	32.4	83.0	-	-	
Hori.	2400.000	PK	52.2	28.2	3.1	32.4	51.1	63.0	11.9	
Vert.	2412.000	PK	86.5	28.2	3.1	32.4	85.4	-	-	
Vert.	2400.000	PK	56.0	28.2	3.1	32.4	54.9	65.4	10.5	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

**Radiated Spurious Emission**  
**Variation 1**

Test place : Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 10075507H  
Date : 10/11/2013  
Temperature/ Humidity : 23 deg. C / 67% RH  
Engineer : Takumi Shimada  
(Band Edge)  
Mode : 11n-20 Tx 2462MHz

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	59.4	28.4	3.1	32.3	58.6	73.9	15.3	
Vert.	2483.500	PK	58.6	28.4	3.1	32.3	57.8	73.9	16.1	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	48.3	28.4	3.1	32.3	0.4	47.9	53.9	6.0	Not Out of band emission
Vert.	2483.500	AV	47.6	28.4	3.1	32.3	0.4	47.2	53.9	6.7	Not Out of band emission

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

## Radiated Spurious Emission Variation 2

Test place : Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 10075507H  
Date : 10/10/2013  
Temperature/ Humidity : 22 deg. C / 62% RH      24 deg. C / 56% RH  
Engineer : Takumi Shimada      Tsubasa Takayama  
(1-10GHz)      (10-26.5GHz)  
Mode : 11b Tx 2412MHz

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	42.0	28.1	3.1	32.4	40.8	73.9	33.1	
Hori.	3145.792	PK	46.0	29.1	3.6	32.0	46.7	73.9	27.2	
Hori.	4824.000	PK	41.4	30.5	5.3	31.4	45.8	73.9	28.1	
Hori.	7236.000	PK	42.4	35.8	6.7	32.3	52.6	73.9	21.3	
Hori.	9648.000	PK	44.8	39.1	7.3	33.0	58.2	73.9	15.7	
Vert.	2390.000	PK	42.5	28.1	3.1	32.4	41.3	73.9	32.6	
Vert.	3145.792	PK	46.1	29.1	3.6	32.0	46.8	73.9	27.1	
Vert.	4824.000	PK	40.7	30.5	5.3	31.4	45.1	73.9	28.8	
Vert.	7236.000	PK	43.7	35.8	6.7	32.3	53.9	73.9	20.0	
Vert.	9648.000	PK	46.3	39.1	7.3	33.0	59.7	73.9	14.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.2	28.1	3.1	32.4	0.2	33.2	53.9	20.7	Not Out of Band emission
Hori.	3145.792	AV	40.3	29.1	3.6	32.0	-	41.0	53.9	12.9	
Hori.	4824.000	AV	32.7	30.5	5.3	31.4	0.2	37.3	53.9	16.6	
Hori.	7236.000	AV	34.1	35.8	6.7	32.3	0.2	44.5	53.9	9.4	
Hori.	9648.000	AV	36.1	39.1	7.3	33.0	0.2	49.7	53.9	4.2	
Vert.	2390.000	AV	34.4	28.1	3.1	32.4	0.2	33.4	53.9	20.5	
Vert.	3145.792	AV	41.3	29.1	3.6	32.0	-	42.0	53.9	11.9	
Vert.	4824.000	AV	32.6	30.5	5.3	31.4	0.2	37.2	53.9	16.7	
Vert.	7236.000	AV	34.0	35.8	6.7	32.3	0.2	44.4	53.9	9.5	
Vert.	9648.000	AV	36.1	39.1	7.3	33.0	0.2	49.7	53.9	4.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.5	28.2	3.1	32.4	88.4	-	-	
Hori.	2400.000	PK	38.1	28.2	3.1	32.4	37.0	68.4	31.4	
Vert.	2412.000	PK	90.3	28.2	3.1	32.4	89.2	-	-	
Vert.	2400.000	PK	39.2	28.2	3.1	32.4	38.1	69.2	31.1	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

**Radiated Spurious Emission**  
**Variation 2**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/10/2013 10/17/2013  
Temperature/ Humidity 22 deg. C / 62% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.710	PK	46.1	29.1	3.6	32.0	46.8	73.9	27.1	
Hori.	4874.000	PK	42.2	30.6	5.3	31.4	46.7	73.9	27.2	
Hori.	7311.000	PK	43.3	35.9	6.8	32.4	53.6	73.9	20.3	
Hori.	9748.000	PK	44.0	39.4	7.3	33.0	57.7	73.9	16.2	
Vert.	3145.710	PK	46.3	29.1	3.6	32.0	47.0	73.9	26.9	
Vert.	4874.000	PK	41.0	30.6	5.3	31.4	45.5	73.9	28.4	
Vert.	7311.000	PK	43.4	35.9	6.8	32.4	53.7	73.9	20.2	
Vert.	9748.000	PK	44.8	39.4	7.3	33.0	58.5	73.9	15.4	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.710	AV	40.9	29.1	3.6	32.0	-	41.6	53.9	12.3	
Hori.	4874.000	AV	32.9	30.6	5.3	31.4	0.2	37.6	53.9	16.3	
Hori.	7311.000	AV	34.0	35.9	6.8	32.4	0.2	44.5	53.9	9.4	
Hori.	9748.000	AV	35.7	39.4	7.3	33.0	0.2	49.6	53.9	4.3	
Vert.	3145.710	AV	39.0	29.1	3.6	32.0	-	39.7	53.9	14.2	
Vert.	4874.000	AV	32.8	30.6	5.3	31.4	0.2	37.5	53.9	16.4	
Vert.	7311.000	AV	34.1	35.9	6.8	32.4	0.2	44.5	53.9	9.4	
Vert.	9748.000	AV	35.7	39.4	7.3	33.0	0.2	49.5	53.9	4.4	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Radiated Spurious Emission**  
**Variation 2**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/10/2013 10/17/2013  
Temperature/ Humidity 22 deg. C / 62% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2462MHz

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	45.2	28.4	3.1	32.3	44.4	73.9	29.5	
Hori.	3145.600	PK	46.0	29.1	3.6	32.0	46.7	73.9	27.2	
Hori.	4924.000	PK	41.4	30.7	5.3	31.4	46.0	73.9	27.9	
Hori.	7386.000	PK	42.2	36.1	6.7	32.4	52.6	73.9	21.3	
Hori.	9848.000	PK	45.1	39.6	7.4	33.1	59.0	73.9	14.9	
Vert.	2483.500	PK	44.4	28.4	3.1	32.3	43.6	73.9	30.3	
Vert.	3145.600	PK	46.6	29.1	3.6	32.0	47.3	73.9	26.6	
Vert.	4924.000	PK	42.4	30.7	5.3	31.4	47.0	73.9	26.9	
Vert.	7386.000	PK	41.9	36.1	6.7	32.4	52.3	73.9	21.6	
Vert.	9848.000	PK	44.4	39.6	7.4	33.1	58.3	73.9	15.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	36.0	28.4	3.1	32.3	0.2	35.4	53.9	18.5	Not Out of band emission
Hori.	3145.600	AV	39.5	29.1	3.6	32.0	-	40.2	53.9	13.7	
Hori.	4924.000	AV	32.5	30.7	5.3	31.4	0.2	37.3	53.9	16.6	
Hori.	7386.000	AV	33.4	36.1	6.7	32.4	0.2	44.0	53.9	9.9	
Hori.	9848.000	AV	35.5	39.6	7.4	33.1	0.2	49.6	53.9	4.3	
Vert.	2483.500	AV	35.7	28.4	3.1	32.3	0.2	35.0	53.9	18.9	Not Out of band emission
Vert.	3145.600	AV	41.1	29.1	3.6	32.0	-	41.8	53.9	12.1	
Vert.	4924.000	AV	32.3	30.7	5.3	31.4	0.2	37.1	53.9	16.8	
Vert.	7386.000	AV	33.7	36.1	6.7	32.4	0.2	44.3	53.9	9.6	
Vert.	9848.000	AV	35.7	39.6	7.4	33.1	0.2	49.7	53.9	4.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Radiated Spurious Emission**  
**Variation 2**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/10/2013 10/17/2013  
Temperature/ Humidity 22 deg. C / 62% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11g Tx 2412MHz

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	47.9	28.1	3.1	32.4	46.7	73.9	27.2	
Hori.	3145.792	PK	45.9	29.1	3.6	32.0	46.6	73.9	27.3	
Hori.	4824.000	PK	41.1	30.5	4.6	31.4	44.8	73.9	29.1	
Hori.	7236.000	PK	42.5	35.8	5.8	32.3	51.8	73.9	22.1	
Hori.	9648.000	PK	44.8	39.1	6.8	33.0	57.7	73.9	16.2	
Vert.	2390.000	PK	45.4	28.1	3.1	32.4	44.2	73.9	29.7	
Vert.	3145.574	PK	46.6	29.1	3.6	32.0	47.3	73.9	26.6	
Vert.	4824.000	PK	41.3	30.5	5.3	31.4	45.7	73.9	28.2	
Vert.	7236.000	PK	43.7	35.8	6.7	32.3	53.9	73.9	20.0	
Vert.	9648.000	PK	45.6	39.1	7.3	33.0	59.0	73.9	14.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.0	28.1	3.1	32.4	0.9	35.7	53.9	18.2	Not Out of Band emission
Hori.	3145.792	AV	40.9	29.1	3.6	32.0	-	41.6	53.9	12.3	
Hori.	4824.000	AV	32.7	30.5	4.6	31.4	0.9	37.3	53.9	16.6	
Hori.	7236.000	AV	34.3	35.8	5.8	32.3	0.9	44.5	53.9	9.4	
Hori.	9648.000	AV	35.6	39.1	6.8	33.0	0.9	49.4	53.9	4.5	
Vert.	2390.000	AV	35.2	28.1	3.1	32.4	0.9	34.9	53.9	19.0	Not Out of Band emission
Vert.	3145.574	AV	40.5	29.1	3.6	32.0	-	41.2	53.9	12.7	
Vert.	4824.000	AV	32.4	30.5	5.3	31.4	0.9	37.7	53.9	16.2	
Vert.	7236.000	AV	34.0	35.8	6.7	32.3	0.9	45.1	53.9	8.8	
Vert.	9648.000	AV	35.6	39.1	7.3	33.0	0.9	49.9	53.9	4.0	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet (RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	86.3	28.2	3.1	32.4	85.2	-	-	
Hori.	2400.000	PK	54.1	28.2	3.1	32.4	53.0	65.2	12.2	
Vert.	2412.000	PK	87.2	28.2	3.1	32.4	86.1	-	-	
Vert.	2400.000	PK	52.7	28.2	3.1	32.4	51.6	66.1	14.5	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

**Radiated Spurious Emission**  
**Variation 2**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/10/2013 10/17/2013  
Temperature/ Humidity 22 deg. C / 62% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Tsubasa Takayama  
(1-10GHz) (10-26.5GHz)  
Mode 11g Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.710	PK	45.8	29.1	3.6	32.0	46.5	73.9	27.4	
Hori.	4874.000	PK	41.9	30.6	5.3	31.4	46.4	73.9	27.5	
Hori.	7311.000	PK	43.0	35.9	6.8	32.4	53.3	73.9	20.6	
Hori.	9748.000	PK	44.3	39.4	7.3	33.0	58.0	73.9	15.9	
Vert.	3145.710	PK	46.7	29.1	3.6	32.0	47.4	73.9	26.5	
Vert.	4874.000	PK	41.2	30.6	5.3	31.4	45.7	73.9	28.2	
Vert.	7311.000	PK	41.9	35.9	6.8	32.4	52.2	73.9	21.7	
Vert.	9748.000	PK	44.3	39.4	7.3	33.0	58.0	73.9	15.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	3145.710	AV	40.5	29.1	3.6	32.0	-	41.2	53.9	12.7	
Hori.	4874.000	AV	32.7	30.6	5.3	31.4	0.9	38.1	53.9	15.8	
Hori.	7311.000	AV	34.2	35.9	6.8	32.4	0.9	45.4	53.9	8.5	
Hori.	9748.000	AV	35.8	39.4	7.3	33.0	0.9	50.4	53.9	3.5	
Vert.	3145.710	AV	41.9	29.1	3.6	32.0	-	42.6	53.9	11.3	
Vert.	4874.000	AV	32.7	30.6	5.3	31.4	0.9	38.1	53.9	15.8	
Vert.	7311.000	AV	34.2	35.9	6.8	32.4	0.9	45.4	53.9	8.5	
Vert.	9748.000	AV	35.4	39.4	7.3	33.0	0.9	50.0	53.9	3.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

## Radiated Spurious Emission Variation 2

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/10/2013 10/15/2013 10/17/2013  
Temperature/ Humidity 22 deg. C / 62% RH 22 deg. C / 53% RH 24 deg. C / 56% RH  
Engineer Takumi Shimada Hiroshi Kukita Tsubasa Takayama  
(1-10GHz) (Below 1GHz) (10-26.5GHz)  
Mode 11g Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	60.001	QP	35.8	7.9	7.5	32.2	19.0	40.0	21.0	
Hori.	72.000	QP	47.7	6.5	7.7	32.2	29.7	40.0	10.3	
Hori.	199.907	QP	43.3	16.6	9.1	32.1	36.9	43.5	6.6	
Hori.	447.999	QP	36.8	0.0	10.8	32.0	15.6	46.0	30.4	
Hori.	469.619	QP	34.3	17.9	11.0	32.0	31.2	46.0	14.8	
Hori.	480.013	QP	38.8	18.0	11.0	32.0	35.8	46.0	10.2	
Hori.	687.269	QP	40.3	20.1	12.2	32.2	40.4	46.0	5.6	
Hori.	2483.500	PK	52.7	28.4	3.1	32.3	51.9	73.9	22.0	
Hori.	3145.600	PK	46.4	29.1	3.6	32.0	47.1	73.9	26.8	
Hori.	4924.000	PK	40.9	30.7	5.3	31.4	45.5	73.9	28.4	
Hori.	7386.000	PK	42.0	36.1	6.7	32.4	52.4	73.9	21.5	
Hori.	9848.000	PK	44.4	39.6	7.4	33.1	58.3	73.9	15.6	
Vert.	60.002	QP	45.6	7.9	7.5	32.2	28.8	40.0	11.2	
Vert.	72.002	QP	42.0	6.5	7.7	32.2	24.0	40.0	16.0	
Vert.	199.907	QP	39.7	16.6	9.1	32.1	33.3	43.5	10.2	
Vert.	447.999	QP	38.0	0.0	10.8	32.0	16.8	46.0	29.2	
Vert.	469.620	QP	39.1	17.9	11.0	32.0	36.0	46.0	10.0	
Vert.	480.012	QP	36.0	18.0	11.0	32.0	33.0	46.0	13.0	
Vert.	687.262	QP	44.8	20.1	12.2	32.2	44.9	46.0	1.1	
Vert.	2483.500	PK	57.2	28.4	3.1	32.3	56.4	73.9	17.5	
Vert.	3145.600	PK	46.4	29.1	3.6	32.0	47.1	73.9	26.8	
Vert.	4924.000	PK	41.0	30.7	5.3	31.4	45.6	73.9	28.3	
Vert.	7386.000	PK	42.1	36.1	6.7	32.4	52.5	73.9	21.4	
Vert.	9848.000	PK	43.8	39.6	7.4	33.1	57.7	73.9	16.2	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	41.4	28.4	3.1	32.3	0.9	41.5	53.9	12.4	Not Out of band emission
Hori.	3145.600	AV	40.5	29.1	3.6	32.0	-	41.2	53.9	12.7	
Hori.	4924.000	AV	32.6	30.7	5.3	31.4	0.9	38.1	53.9	15.8	
Hori.	7386.000	AV	33.9	36.1	6.7	32.4	0.9	45.3	53.9	8.6	
Hori.	9848.000	AV	35.3	39.6	7.4	33.1	0.9	50.1	53.9	3.8	
Vert.	2483.500	AV	45.6	28.4	3.1	32.3	0.9	45.7	53.9	8.2	Not Out of band emission
Vert.	3145.600	AV	40.5	29.1	3.6	32.0	-	41.3	53.9	12.6	
Vert.	4924.000	AV	32.5	30.7	5.3	31.4	0.9	38.1	53.9	15.8	
Vert.	7386.000	AV	33.5	36.1	6.7	32.4	0.9	44.8	53.9	9.1	
Vert.	9848.000	AV	35.5	39.6	7.4	33.1	0.9	50.3	53.9	3.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**UL Japan, Inc.**

**Head Office EMC Lab.**

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**Radiated Spurious Emission**  
**Variation 2**

Test place : Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 10075507H  
Date : 10/10/2013  
Temperature/ Humidity : 22 deg. C / 62% RH  
Engineer : Motoya Imura  
(Band Edge)  
Mode : 11n-20 Tx 2412MHz

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	49.9	28.1	3.1	32.4	48.7	73.9	25.2	
Vert.	2390.000	PK	49.2	28.1	3.1	32.4	48.0	73.9	25.9	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	38.6	28.1	3.1	32.4	0.4	37.8	53.9	16.1	Not Out of Band emission
Vert.	2390.000	AV	38.0	28.1	3.1	32.4	0.4	37.2	53.9	16.7	Not Out of Band emission

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet (RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	87.1	28.2	3.1	32.4	86.0	-	-	
Hori.	2400.000	PK	56.4	28.2	3.1	32.4	55.3	66.0	10.7	
Vert.	2412.000	PK	87.3	28.2	3.1	32.4	86.2	-	-	
Vert.	2400.000	PK	57.1	28.2	3.1	32.4	56.0	66.2	10.2	

Result = Reading + Ant.Fac. + Loss(Cable+Attenuator+Filter) - Gain(Amplifier)

**Radiated Spurious Emission**  
**Variation 2**

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 10075507H  
Date 10/10/2013  
Temperature/ Humidity 22 deg. C / 62% RH  
Engineer Motoya Imura  
(Band Edge)  
Mode 11n-20 Tx 2462MHz

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	56.0	28.4	3.1	32.3	55.2	73.9	18.7	
Vert.	2483.500	PK	56.1	28.4	3.1	32.3	55.3	73.9	18.6	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)  
Distance factor : 15GHz -40GHz :  $20\log(3.0m/1.0m) = 9.5dB$

**Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	43.6	28.4	3.1	32.3	0.4	43.2	53.9	10.7	Not Out of band emission
Vert.	2483.500	AV	44.3	28.4	3.1	32.3	0.4	43.9	53.9	10.0	Not Out of band emission

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Duty factor  
Distance factor : 15GHz -40GHz :  $20\log(3.0m/1.0m) = 9.5dB$

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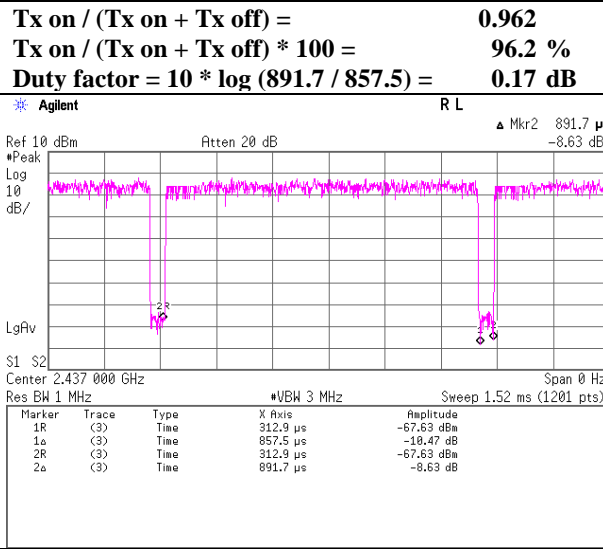
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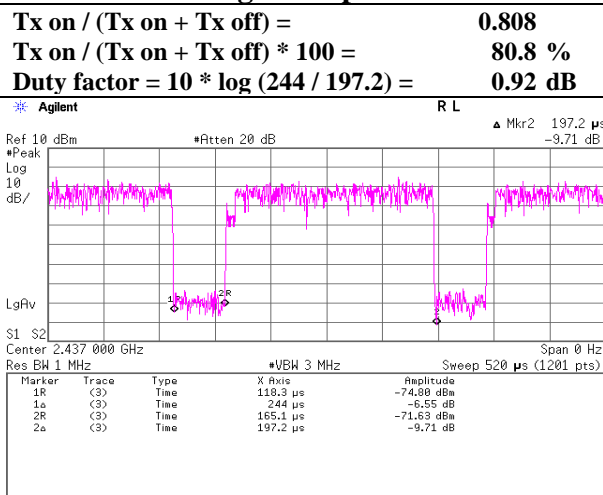
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## Burst rate confirmation

### 11b 11Mbps



### 11g 12Mbps



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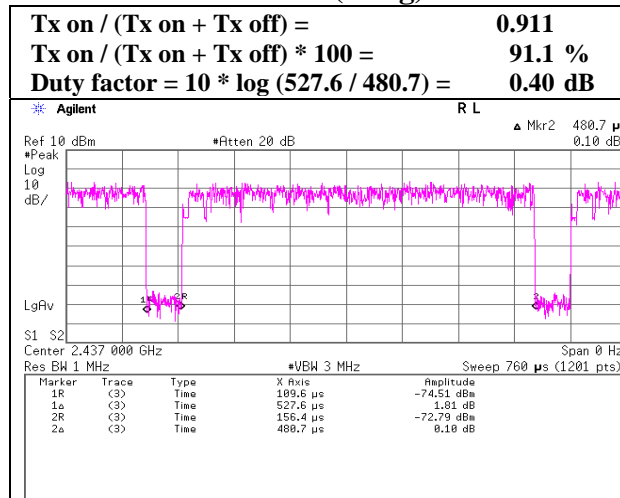
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## Burst rate confirmation

### 11n MCS4(Long)



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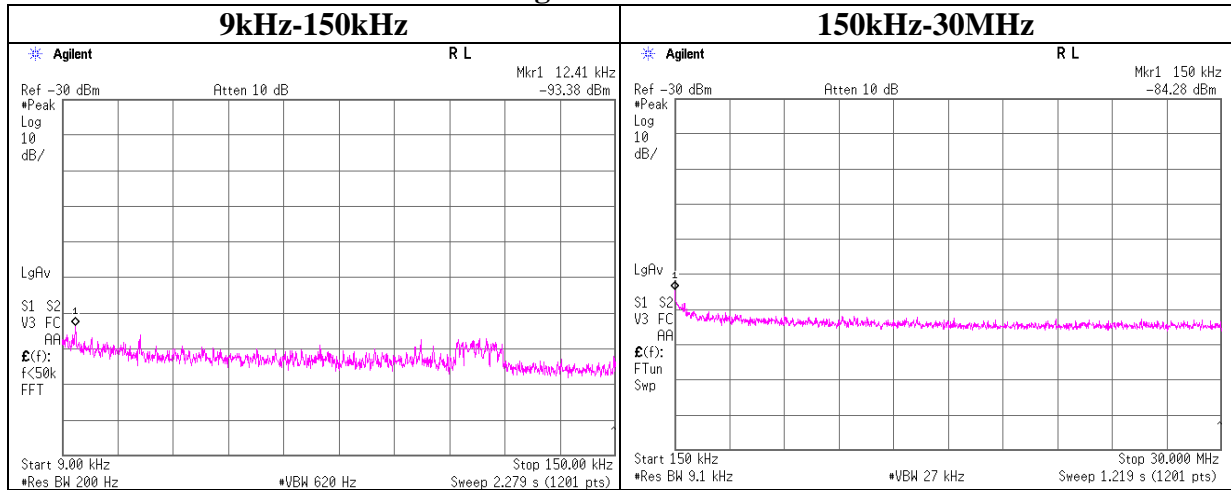
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## Conducted Spurious Emission

**11g Tx 2462MHz**



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
13.58	-93.4	1.01	9.9	2.0	-80.5	300.0	6.0	-19.3	44.9
150	-84.3	1.01	9.9	2.0	-71.4	30.0	6.0	9.8	29.5

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$

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### Power Density

Test place Head Office EMC Lab. No.11 shielded room  
Report No. 10075507H  
Date 10/10/2013  
Temperature/ Humidity 25deg. C / 70% RH  
Engineer Yutaka Yoshida  
Mode 11b Tx / 11g Tx / 11n-20 Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-24.61	2.29	10.08	-12.24	8.00	20.24
2437.00	-23.65	2.30	10.08	-11.27	8.00	19.27
2462.00	-23.17	2.30	10.08	-10.79	8.00	18.79

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.73	2.29	10.08	-14.36	8.00	22.36
2437.00	-25.83	2.30	10.08	-13.45	8.00	21.45
2462.00	-25.24	2.30	10.08	-12.86	8.00	20.86

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.44	2.29	10.08	-14.07	8.00	22.07
2437.00	-25.77	2.30	10.08	-13.39	8.00	21.39
2462.00	-25.27	2.30	10.08	-12.89	8.00	20.89

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

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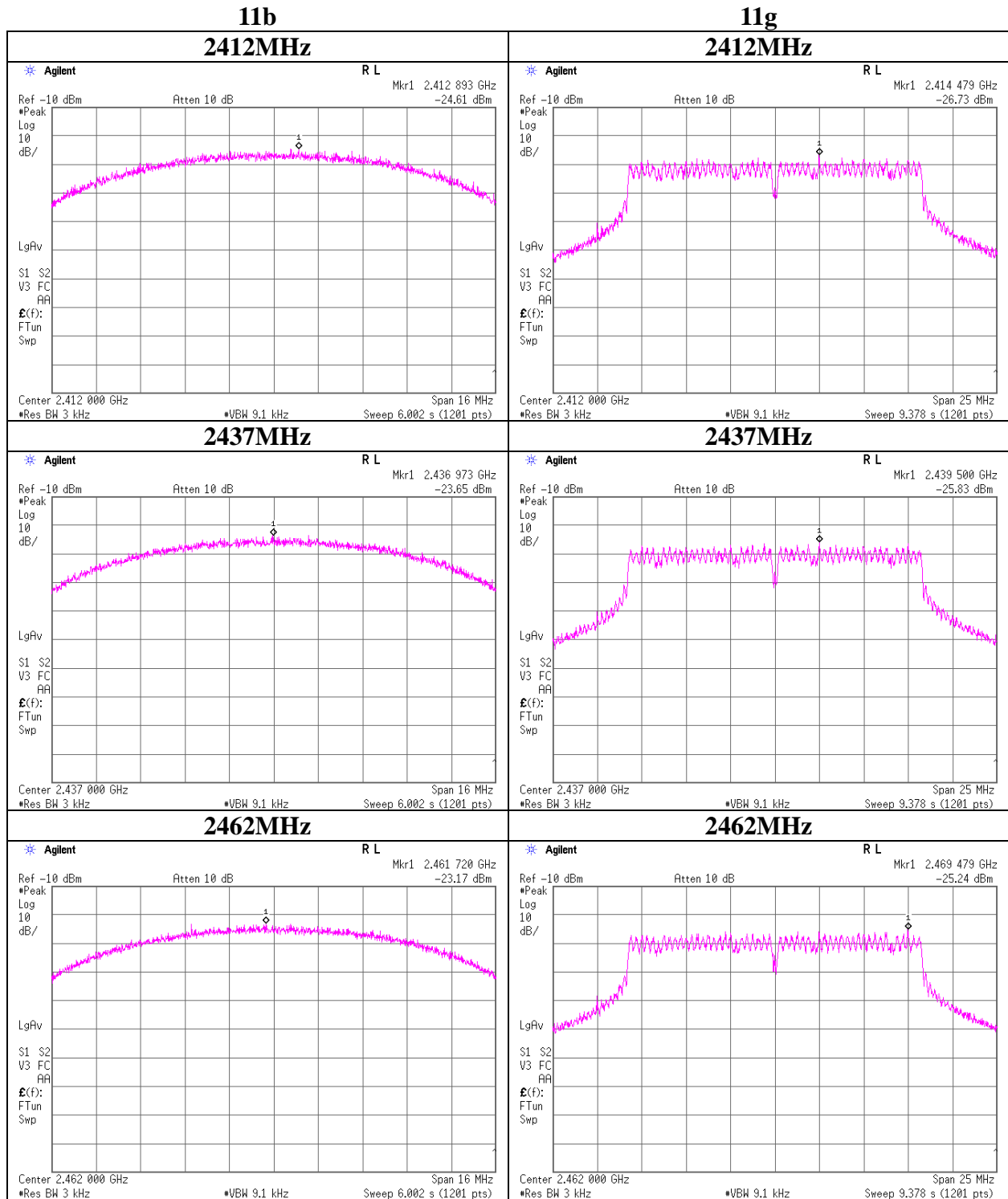
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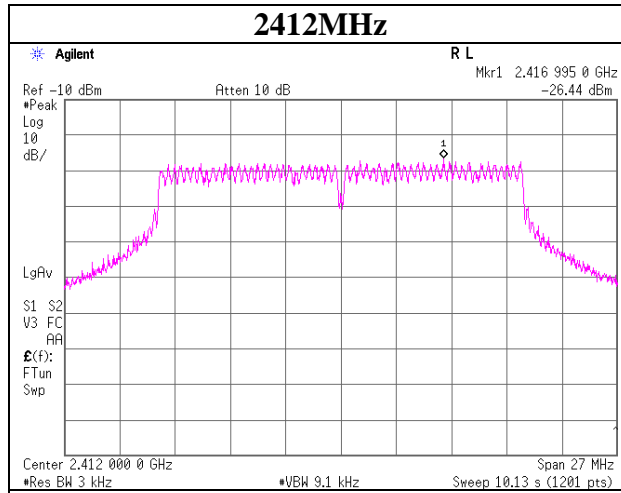
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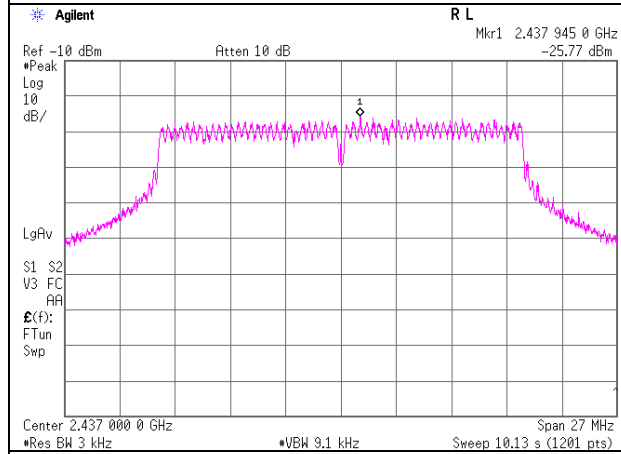
## Power Density

11n-20

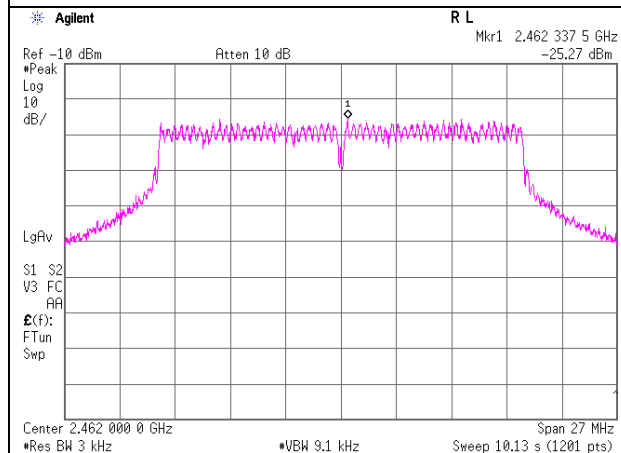
2412MHz



2437MHz



2462MHz



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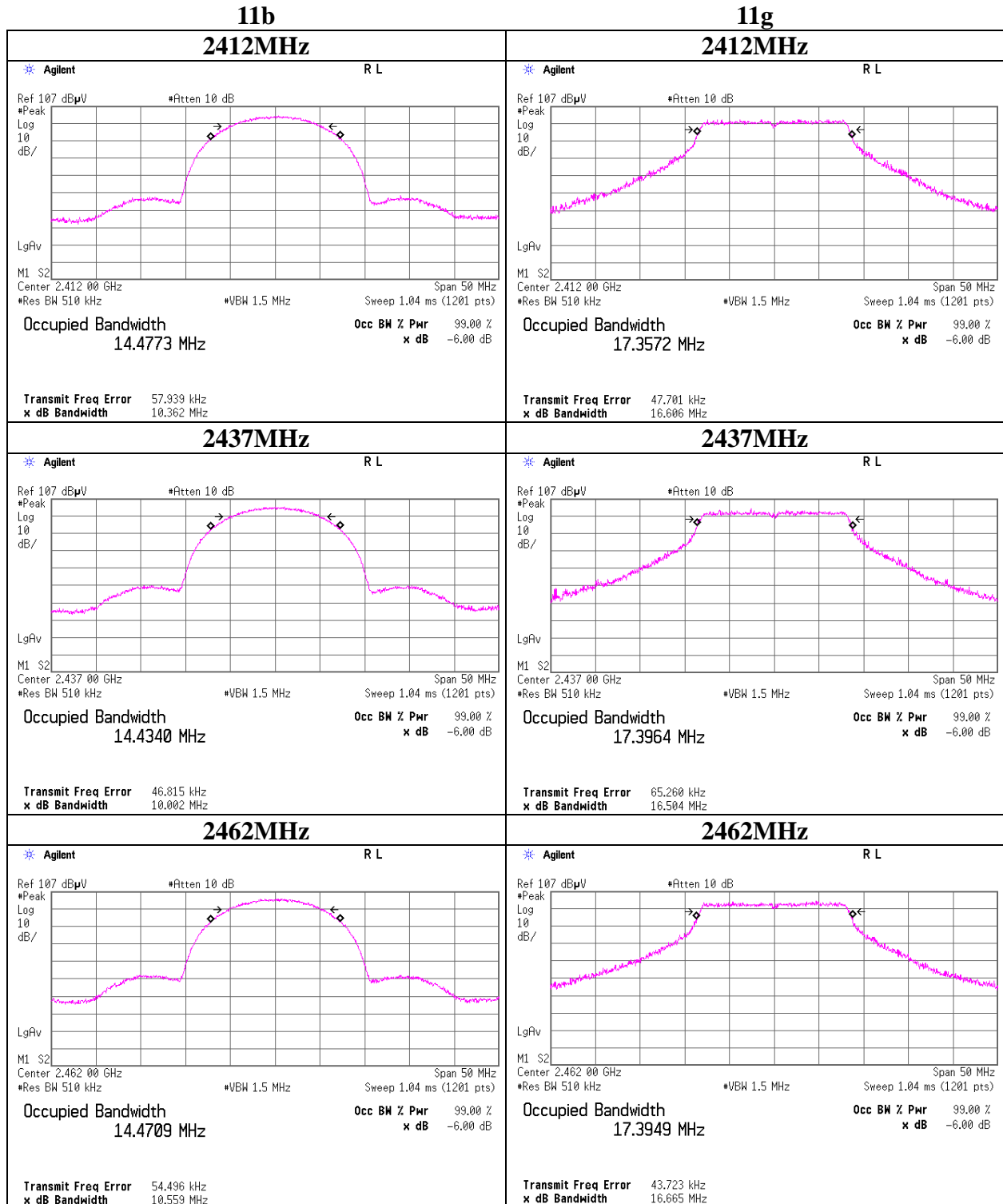
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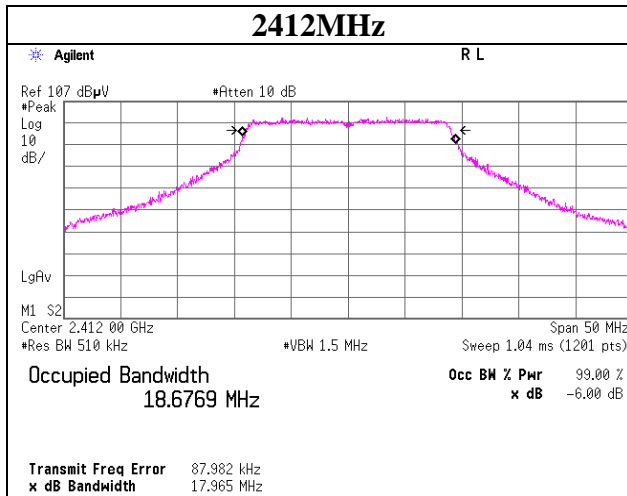
**99%Occupied Bandwidth**



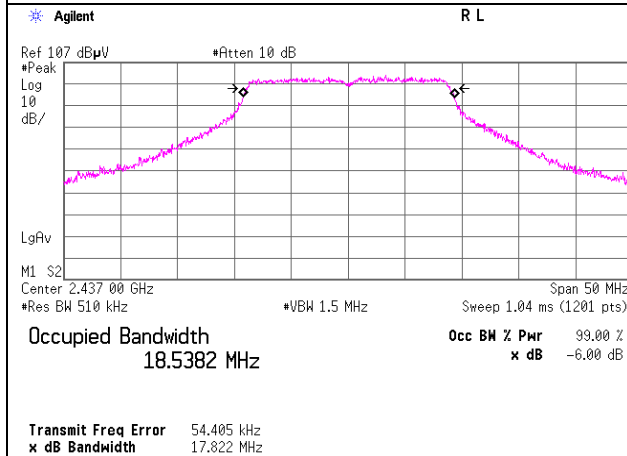
## 99% Occupied Bandwidth

**11n-20**

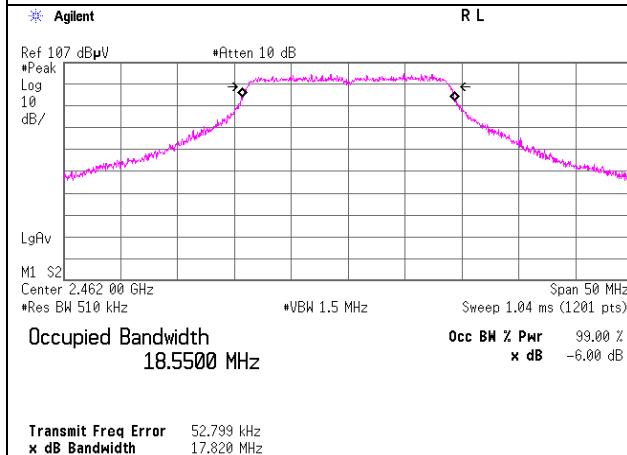
**2412MHz**



**2437MHz**



**2462MHz**



## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MBM-12	Barometer	Sunoh	SBR121	873	AT	2012/02/20 * 36
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	AT	2012/12/25 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	AT	2012/11/20 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2013/04/17 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2013/03/21 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2012/10/08 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2012/10/08 * 12
MCC-64	Coaxial Cable	UL Japan	-	-	AT	2013/03/22 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2012/11/06 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2013/04/03 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2013/05/17 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2013/09/27 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2013/03/12 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2013/09/01 * 12
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2012/11/21 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2012/10/08 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2012/10/08 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 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.**

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