



RADIO TEST REPORT

Test Report No. : 32KE0186-HO-01

Applicant : SCALAR CORPORATION
Type of Equipment : AirChip
Model No. : AC-1
FCC ID : YIJAIRCHIP
Test regulation : FCC Part 15 Subpart C: 2012
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: June 27 to 29, 2012

Representative test engineer:


Takumi Shimada

Engineer of WiSE Japan,
UL Verification Service

Approved by:



Masanori Nishiyama
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>

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13-EM-F0429

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SECTION 1: Customer information

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160-0023
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Contact Person : Uneoka Toshitaka

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

2.1 Identification of E.U.T.

Type of Equipment : AirChip
Model No. : AC-1
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC3.3V
Receipt Date of Sample : June 27, 2012
Country of Mass-production : Japan
Condition of EUT : Production model
Modification of EUT : No Modification by the test lab

2.2 Product Description

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2412-2462MHz
Modulation : DSSS
Power Supply (radio part input) : DC1.8V
Antenna type : Chip Multilayer Antenna
Antenna Gain : 2.0dBi

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2012, final revised on May 17, 2012 and effective June 18, 2012

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4	QP 14.0dB, 4.99999MHz, L AV 13.4dB, 4.99999MHz, L	Complied	-
6dB Bandwidth	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)		Complied	Conducted
Power Density	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3	4.1dB 4874.000MHz, AV, Hori.	Complied	Conducted/ Radiated

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

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

FCC 15.31 (e)

The RF Module has its own regulator.

The stable voltage (DC1.8V) is constantly provided to the RF Module through the regulator regardless of input voltage.

FCC Part 15.203/212 Antenna requirement

It is impossible for end users to replace the antenna, because it is permanently attached to the modular transmitter as it is chip multilayer antenna.

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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)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.6dB
No.3	3.6dB
No.4	3.6dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

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

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

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

Conducted Emission test

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

Radiated emission test(3m)

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

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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	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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

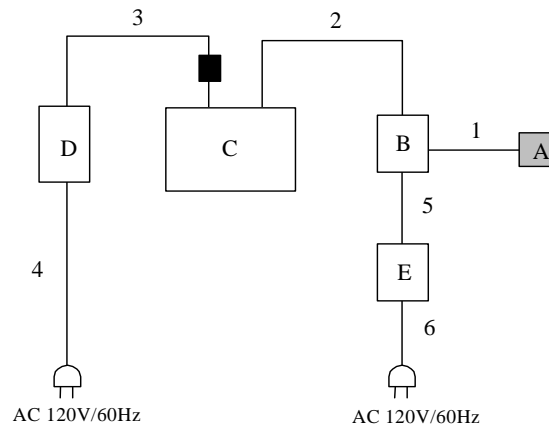
4.1 Operating Mode(s)

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
*Transmitting duty was 100% on all tests. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 8 Software: s2w-2_2_2-app1.bi, s2w-2_2_2-app2.bin, WFW-REL-2_0_16.bin *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.	

*Details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	11b Tx	2412MHz
Spurious Emission		2437MHz
6dB Bandwidth		2462MHz
Maximum Peak Output Power		
Power Density		
99% Occupied Bandwidth		

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	AirChip	AC-1	001 for AT* 002 for RE*/CE*	SCALAR CORPORATION	EUT
B	Jig Board	-	-	SCALAR CORPORATION	-
C	Laptop PC	1952-E69	L3-KY149 07/04	Lenovo	-
D	AC Adaptor	92P1160	11S92P1160Z1ZB GH77W6YJ	Lenovo	-
E	DC Power Supply	PMC35-2A	13090501	KIKUSUI	Used for CE* only

*AT: Antenna Terminal Conducted test, RE: Radiated Emission, CE: Conducted Emission

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC&Signal Cable	0.15	Unshielded	Unshielded	-
2	USB Cable	1.0	Shielded	Shielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	1.0	Unshielded	Unshielded	-
5	DC Cable	0.2	Unshielded	Unshielded	Used for CE* only
6	AC Cable	1.8	Unshielded	Unshielded	Used for CE* only

* CE: Conducted Emission

SECTION 5: Conducted Emission

Test Procedure and conditions

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

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

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

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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector	: QP and AV
Measurement range	: 0.15-30MHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Radiated Spurious Emission

Test Procedure

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

EUT was placed on a urethane platform of nominal size, 1.5m 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

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

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

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

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

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

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

Measurement range	: 30M-26.5GHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	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

Conducted Emission

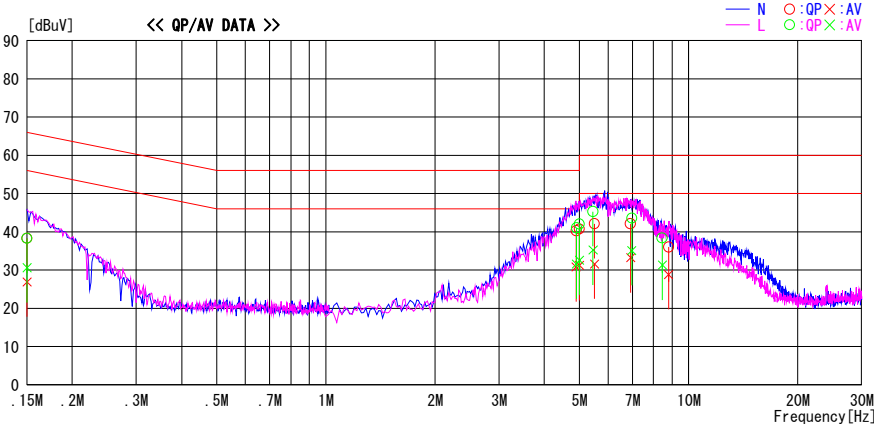
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/06/29

Report No. : 32KE0186-HO-01
Temp./Humi. : 24deg. C / 61% RH
Engineer : Takumi Shimada

Mode / Remarks : WLAN 11b Hch(2462MHz)

LIMIT : FCC15.207 QP
FCC15.207 AV

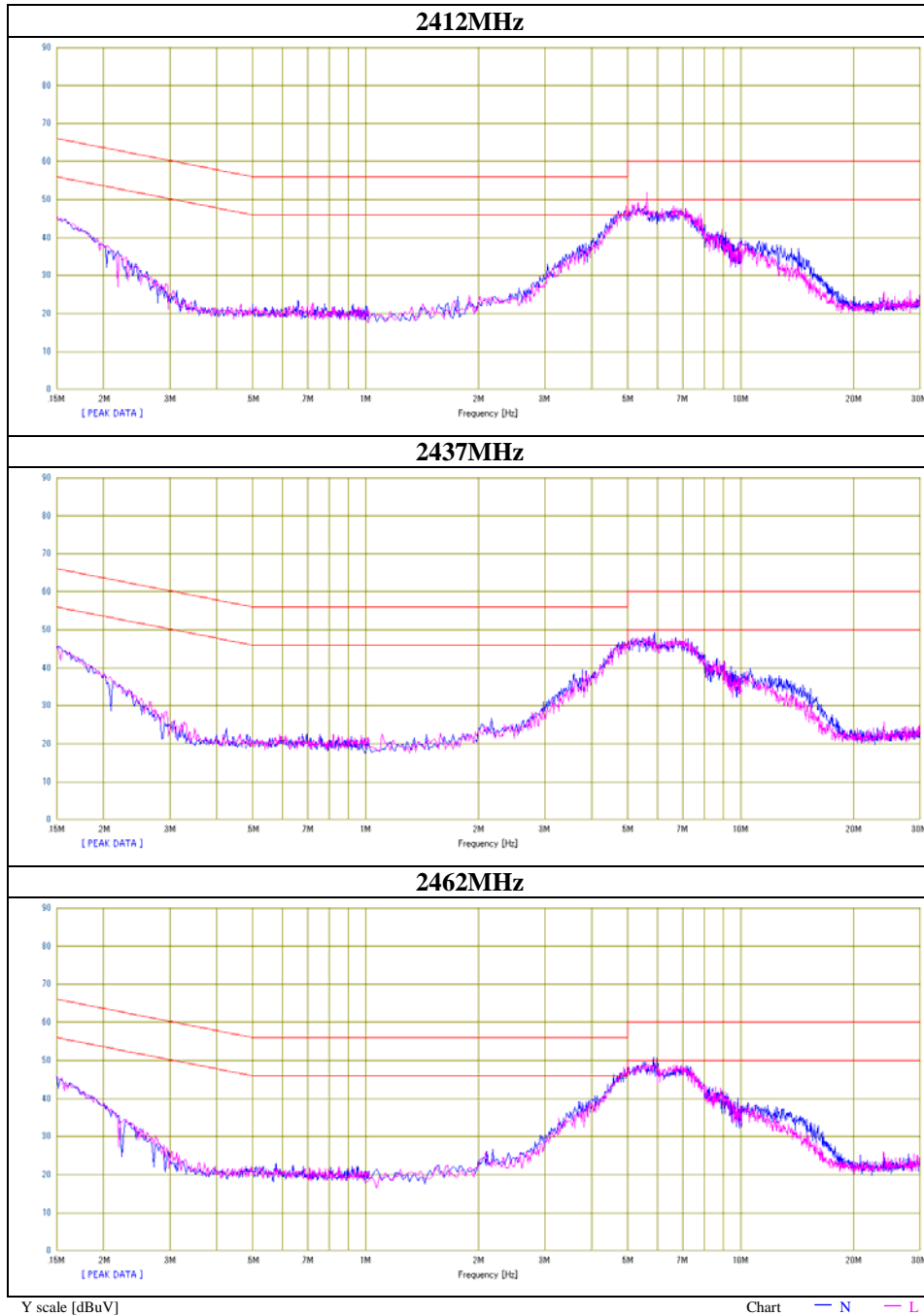


Frequency	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP	AV		QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	25.0	13.6	13.3	38.3	26.9	66.0	56.0	27.7	29.1	N	
0.15000	25.0	17.3	13.3	38.3	30.6	66.0	56.0	27.7	25.4	L	
4.89740	26.6	17.1	13.7	40.3	30.8	56.0	46.0	15.7	15.2	N	
4.90600	27.3	17.9	13.7	41.0	31.6	56.0	46.0	15.0	14.4	L	
4.99999	27.0	17.5	13.7	40.7	31.2	56.0	46.0	15.3	14.8	N	
4.99999	28.3	18.9	13.7	42.0	32.6	56.0	46.0	14.0	13.4	L	
5.44900	31.5	21.4	13.8	45.3	35.2	60.0	50.0	14.7	14.8	L	
5.50100	28.3	17.8	13.8	42.1	31.6	60.0	50.0	17.9	18.4	N	
6.91900	28.2	19.3	13.9	42.1	33.2	60.0	50.0	17.9	16.8	N	
6.96800	29.7	21.2	13.9	43.6	35.1	60.0	50.0	16.4	14.9	L	
8.45700	24.4	17.3	14.0	38.4	31.3	60.0	50.0	21.6	18.7	L	
8.81200	22.0	14.8	14.0	36.0	28.8	60.0	50.0	24.0	21.2	N	

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

Conducted Emission

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No.	32KE0186-HO-01
Date	06/28/2012
Temperature/ Humidity	24 deg.C./ 61%
Engineer	Takumi Shimada
Mode	11b Tx



6dB Bandwidth

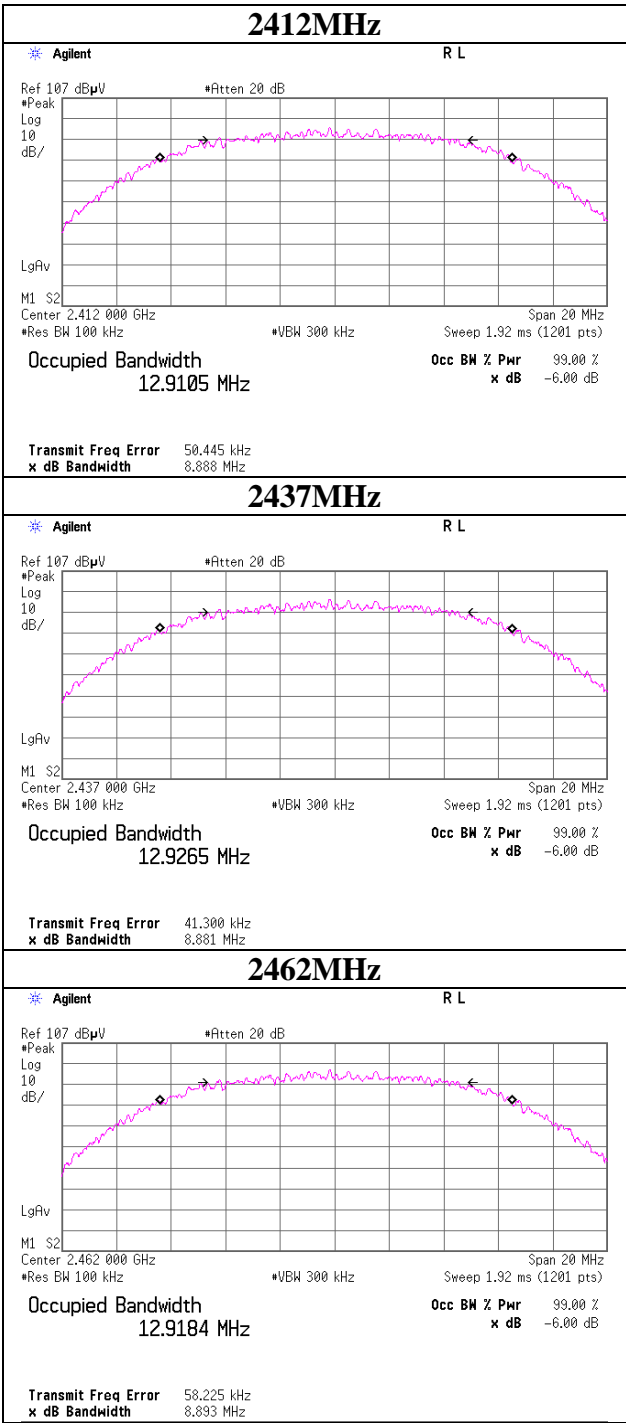
Test place Head Office EMC Lab. No.4 Measurement Room
Report No. 32KE0186-HO-01
Date 06/27/2012
Temperature/ Humidity 23 deg.C./ 59%
Engineer Takumi Shimda
Mode Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	8.888	>500
2437	8.881	>500
2462	8.893	>500

6dB Bandwidth

11b



Maximum Peak Output Power

Test place	Head Office EMC Lab. No.3 Measurement Room
Report No.	32KE0186-HO-01
Date	06/27/2012
Temperature/ Humidity	24 deg.C./ 55%
Engineer	Takayuki Shimada
Mode	11b Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-2.48	1.34	10.07	8.93	7.82	30.00	1000	21.07
2437	-1.84	1.34	10.07	9.57	9.06	30.00	1000	20.43
2462	-1.31	1.35	10.07	10.11	10.26	30.00	1000	19.89

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	-1.99	
2	-2.04	
5.5	-2.27	
11	-1.84	*

*: Worst Rate

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

Radiated Spurious Emission

Test place : Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 32KE0186-HO-01
Date : 06/27/2012
Temperature/ Humidity : 23 deg. C / 59% RH
Engineer : Takumi Shimada
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	66.501	QP	43.1	7.1	7.7	32.2	25.7	40.0	14.3	
Hori	176.001	QP	35.8	16.0	9.0	32.2	28.6	43.5	14.9	
Hori	288.139	QP	39.7	19.3	9.9	32.1	36.8	46.0	9.2	
Hori	312.126	QP	38.7	14.8	10.0	32.1	31.4	46.0	14.6	
Hori	336.003	QP	39.9	15.6	10.2	32.1	33.6	46.0	12.4	
Hori	999.503	QP	31.2	23.4	13.9	30.5	38.0	53.9	15.9	
Hori	2390.000	PK	43.0	27.4	2.2	32.4	40.2	73.9	33.7	
Hori	4824.000	PK	47.0	31.7	4.7	31.4	52.0	73.9	21.9	
Hori	7236.000	PK	43.8	36.3	5.6	32.4	53.3	73.9	20.6	
Hori	9648.000	PK	43.3	38.2	6.7	33.0	55.2	73.9	18.7	
Hori	2390.000	AV	32.2	27.4	2.2	32.4	29.4	53.9	24.5	
Hori	4824.000	AV	42.7	31.7	4.7	31.4	47.7	53.9	6.2	
Hori	7236.000	AV	33.4	36.3	5.6	32.4	42.9	53.9	11.0	
Hori	9648.000	AV	31.9	38.2	6.7	33.0	43.8	53.9	10.1	
Vert	66.505	QP	44.2	7.1	7.7	32.2	26.8	40.0	13.2	
Vert	176.004	QP	36.3	16.0	9.0	32.2	29.1	43.5	14.4	
Vert	288.224	QP	30.8	19.3	9.9	32.1	27.9	46.0	18.1	
Vert	312.063	QP	31.4	14.8	10.0	32.1	24.1	46.0	21.9	
Vert	336.002	QP	36.5	15.6	10.2	32.1	30.2	46.0	15.8	
Vert	999.495	QP	34.3	23.4	13.9	30.5	41.1	53.9	12.8	
Vert	2390.000	PK	42.4	27.4	2.2	32.4	39.6	73.9	34.3	
Vert	4824.000	PK	46.0	31.7	4.7	31.4	51.0	73.9	23.0	
Vert	7236.000	PK	44.0	36.3	5.6	32.4	53.5	73.9	20.4	
Vert	9648.000	PK	44.1	38.2	6.7	33.0	56.0	73.9	18.0	
Vert	2390.000	AV	30.4	27.4	2.2	32.4	27.6	53.9	26.3	
Vert	4824.000	AV	41.6	31.7	4.7	31.4	46.6	53.9	7.3	
Vert	7236.000	AV	33.9	36.3	5.6	32.4	43.4	53.9	10.5	
Vert	9648.000	AV	34.7	38.2	6.7	33.0	46.6	53.9	7.3	

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

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

*The 10th harmonic was not seen so the result was its base noise level.

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	91.8	27.5	2.2	32.4	89.1	-	-	Carrier
Hori	2397.580	PK	39.4	27.4	2.2	32.4	36.6	69.1	32.5	
Hori	2400.000	PK	37.3	27.4	2.2	32.4	34.5	69.1	34.6	
Vert	2412.000	PK	92.7	27.5	2.2	32.4	90.0	-	-	Carrier
Vert	2397.580	PK	38.1	27.4	2.2	32.4	35.3	70.0	34.7	
Vert	2400.000	PK	36.2	27.4	2.2	32.4	33.4	70.0	36.6	

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 32KE0186-HO-01
Date 06/27/2012
Temperature/ Humidity 23 deg. C / 59% RH
Engineer Takumi Shimada
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	66.502	QP	43.2	7.1	7.7	32.2	25.8	40.0	14.2	
Hori	176.000	QP	35.7	16.0	9.0	32.2	28.5	43.5	15.0	
Hori	288.011	QP	39.9	19.3	9.9	32.1	37.0	46.0	9.0	
Hori	312.178	QP	38.2	14.8	10.1	32.1	31.0	46.0	15.0	
Hori	336.003	QP	40.3	15.6	10.2	32.1	34.0	46.0	12.0	
Hori	999.533	QP	31.0	23.4	13.9	30.5	37.8	53.9	16.1	
Hori	4874.000	PK	47.9	31.9	4.7	31.4	53.1	73.9	20.8	
Hori	7311.000	PK	43.9	36.5	5.6	32.5	53.5	73.9	20.4	
Hori	9748.000	PK	41.9	38.3	6.7	33.0	53.9	73.9	20.0	
Hori	4874.000	AV	44.6	31.9	4.7	31.4	49.8	53.9	4.1	
Hori	7311.000	AV	32.4	36.5	5.6	32.5	42.0	53.9	11.9	
Hori	9748.000	AV	31.4	38.3	6.7	33.0	43.4	53.9	10.5	
Vert	66.507	QP	44.5	7.1	7.7	32.2	27.1	40.0	12.9	
Vert	176.002	QP	36.7	16.0	9.0	32.2	29.5	43.5	14.0	
Vert	288.284	QP	31.4	19.3	9.9	32.1	28.5	46.0	17.5	
Vert	312.032	QP	31.1	14.8	10.0	32.1	23.8	46.0	22.2	
Vert	336.007	QP	36.8	15.6	10.2	32.1	30.5	46.0	15.5	
Vert	999.531	QP	34.5	23.4	13.9	30.5	41.3	53.9	12.6	
Vert	4874.000	PK	47.6	31.9	4.7	31.4	52.8	73.9	21.1	
Vert	7311.000	PK	43.0	36.5	5.6	32.5	52.6	73.9	21.3	
Vert	9748.000	PK	44.1	38.3	6.7	33.0	56.1	73.9	17.8	
Vert	4874.000	AV	44.1	31.9	4.7	31.4	49.3	53.9	4.6	
Vert	7311.000	AV	32.4	36.5	5.6	32.5	42.0	53.9	11.9	
Vert	9748.000	AV	35.6	38.3	6.7	33.0	47.6	53.9	6.3	

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

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

*The 10th harmonic was not seen so the result was its base noise level.

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

Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 32KE0186-HO-01
Date 06/27/2012
Temperature/ Humidity 23 deg. C / 59% RH
Engineer Takumi Shimada
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	66.504	QP	42.6	7.1	7.7	32.2	25.2	40.0	14.8	
Hori	175.998	QP	35.3	16.0	9.0	32.2	28.1	43.5	15.4	
Hori	288.008	QP	40.5	19.3	9.9	32.1	37.6	46.0	8.4	
Hori	312.290	QP	38.8	14.8	10.1	32.1	31.6	46.0	14.4	
Hori	336.002	QP	40.8	15.6	10.2	32.1	34.5	46.0	11.5	
Hori	999.526	QP	30.9	23.4	13.9	30.5	37.7	53.9	16.2	
Hori	2483.500	PK	43.6	27.7	2.2	32.3	41.2	73.9	32.7	
Hori	2489.080	PK	42.1	27.7	2.2	32.3	39.7	73.9	34.2	
Hori	4924.000	PK	48.9	32.1	4.6	31.4	54.2	73.9	19.8	
Hori	7386.000	PK	43.3	36.6	5.6	32.5	53.0	73.9	20.9	
Hori	9848.000	PK	43.4	38.5	6.7	33.1	55.5	73.9	18.4	
Hori	2483.500	AV	33.2	27.7	2.2	32.3	30.8	53.9	23.1	
Hori	2489.080	AV	32.2	27.7	2.2	32.3	29.8	53.9	24.1	
Hori	4924.000	AV	43.5	32.1	4.6	31.4	48.8	53.9	5.1	
Hori	7386.000	AV	32.4	36.6	5.6	32.5	42.1	53.9	11.8	
Hori	9848.000	AV	34.6	38.5	6.7	33.1	46.7	53.9	7.2	
Vert	66.498	QP	44.6	7.1	7.7	32.2	27.2	40.0	12.8	
Vert	176.002	QP	37.1	16.0	9.0	32.2	29.9	43.5	13.6	
Vert	288.363	QP	31.7	19.3	9.9	32.1	28.8	46.0	17.2	
Vert	311.987	QP	31.3	14.8	10.0	32.1	24.0	46.0	22.0	
Vert	336.008	QP	37.0	15.6	10.2	32.1	30.7	46.0	15.3	
Vert	999.552	QP	34.9	23.4	13.9	30.5	41.7	53.9	12.2	
Vert	2483.500	PK	44.8	27.7	2.2	32.3	42.4	73.9	31.5	
Vert	2489.080	PK	44.6	27.7	2.2	32.3	42.2	73.9	31.7	
Vert	4924.000	PK	47.7	32.1	4.6	31.4	53.0	73.9	20.9	
Vert	7386.000	PK	43.6	36.6	5.6	32.5	53.3	73.9	20.6	
Vert	9848.000	PK	43.4	38.5	6.7	33.1	55.5	73.9	18.4	
Vert	2483.500	AV	34.0	27.7	2.2	32.3	31.6	53.9	22.3	
Vert	2489.080	AV	31.4	27.7	2.2	32.3	29.0	53.9	24.9	
Vert	4924.000	AV	43.5	32.1	4.6	31.4	48.8	53.9	5.1	
Vert	7386.000	AV	33.1	36.6	5.6	32.5	42.8	53.9	11.1	
Vert	9848.000	AV	33.5	38.5	6.7	33.1	45.6	53.9	8.3	

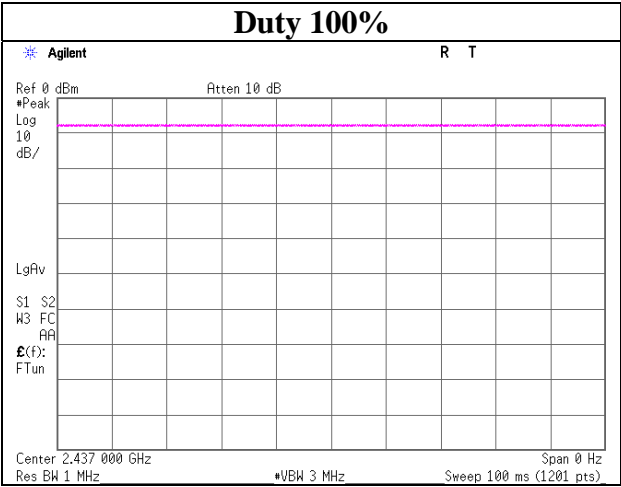
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

*The 10th harmonic was not seen so the result was its base noise level.

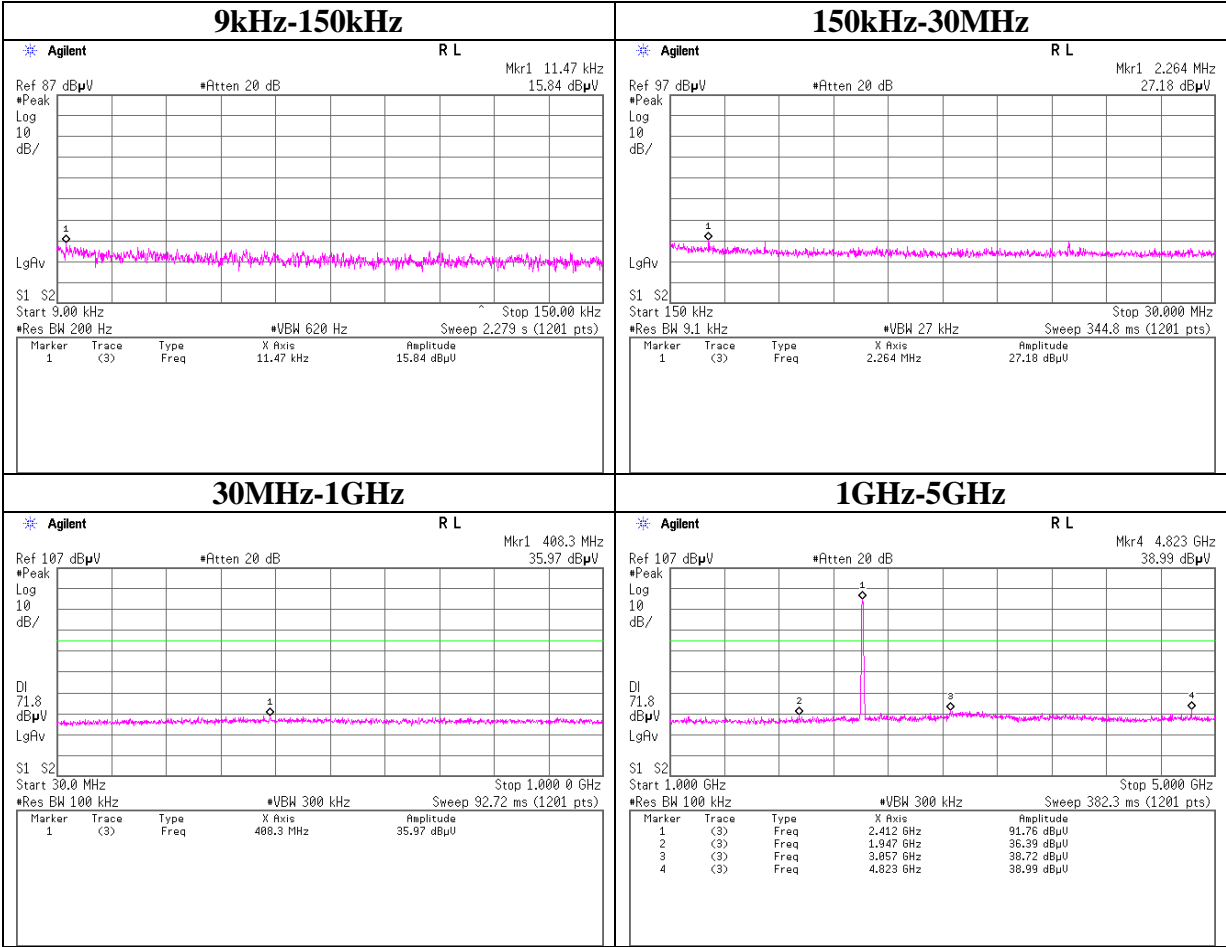
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Burst rate confirmation



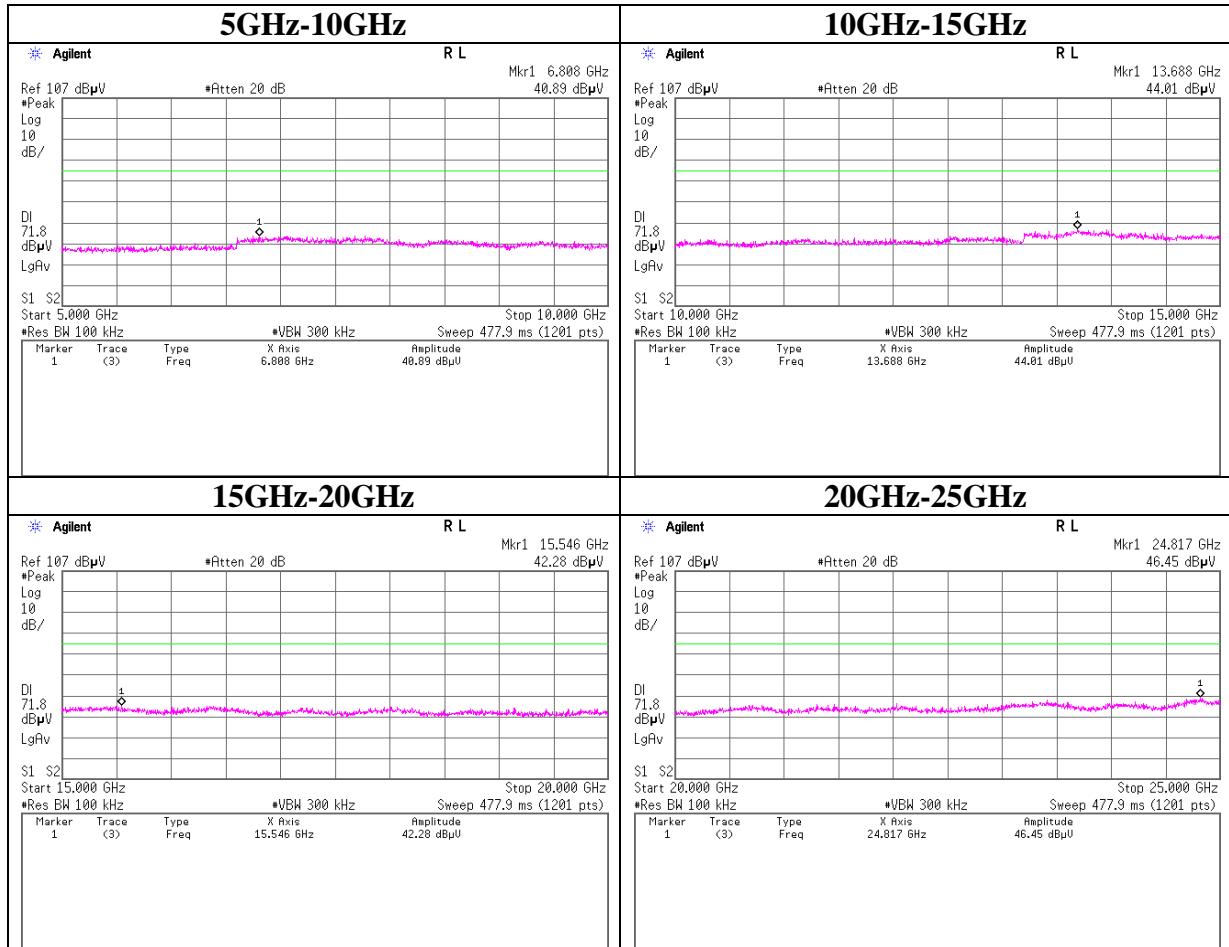
Conducted Spurious Emission

11b Tx 2412MHz



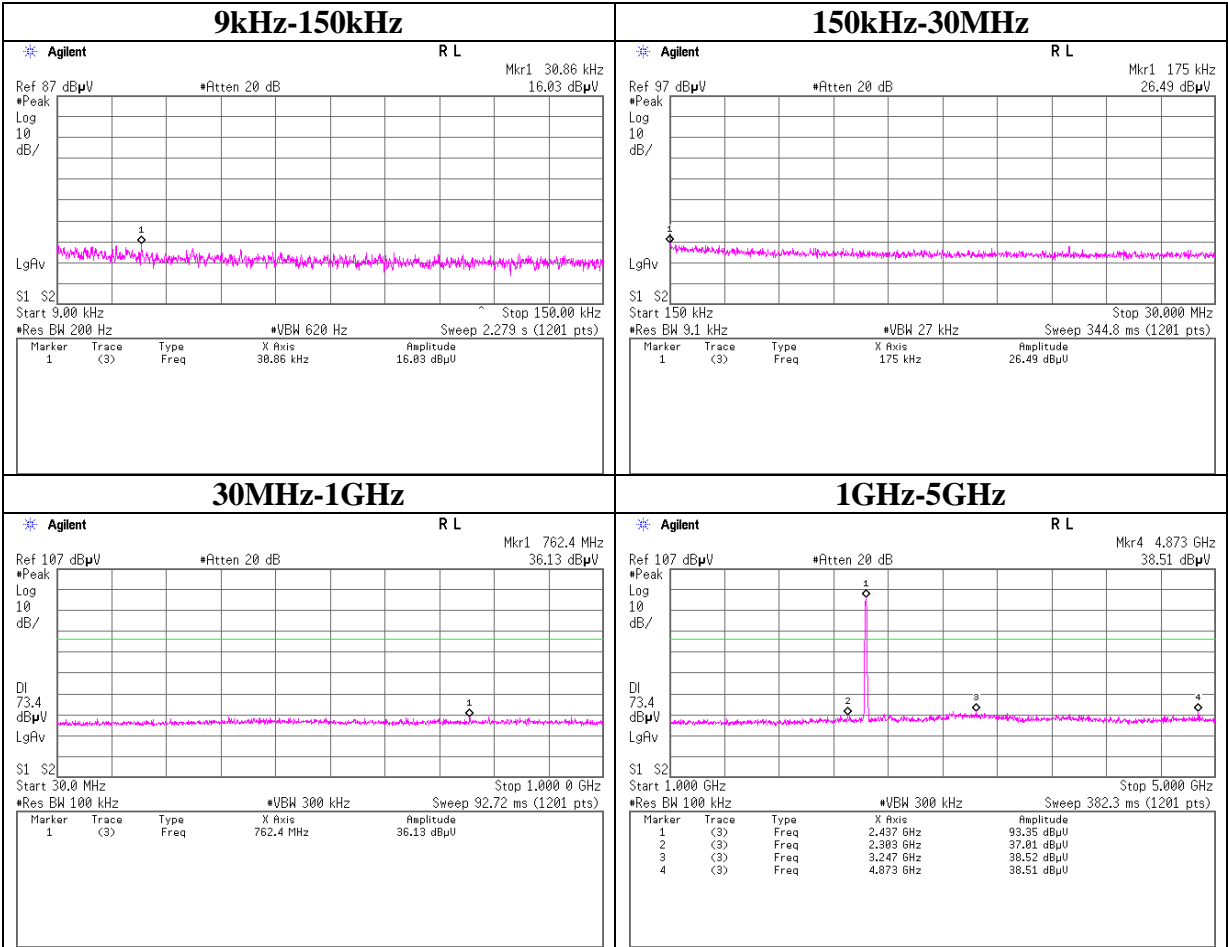
Conducted Spurious Emission

11b Tx 2412MHz



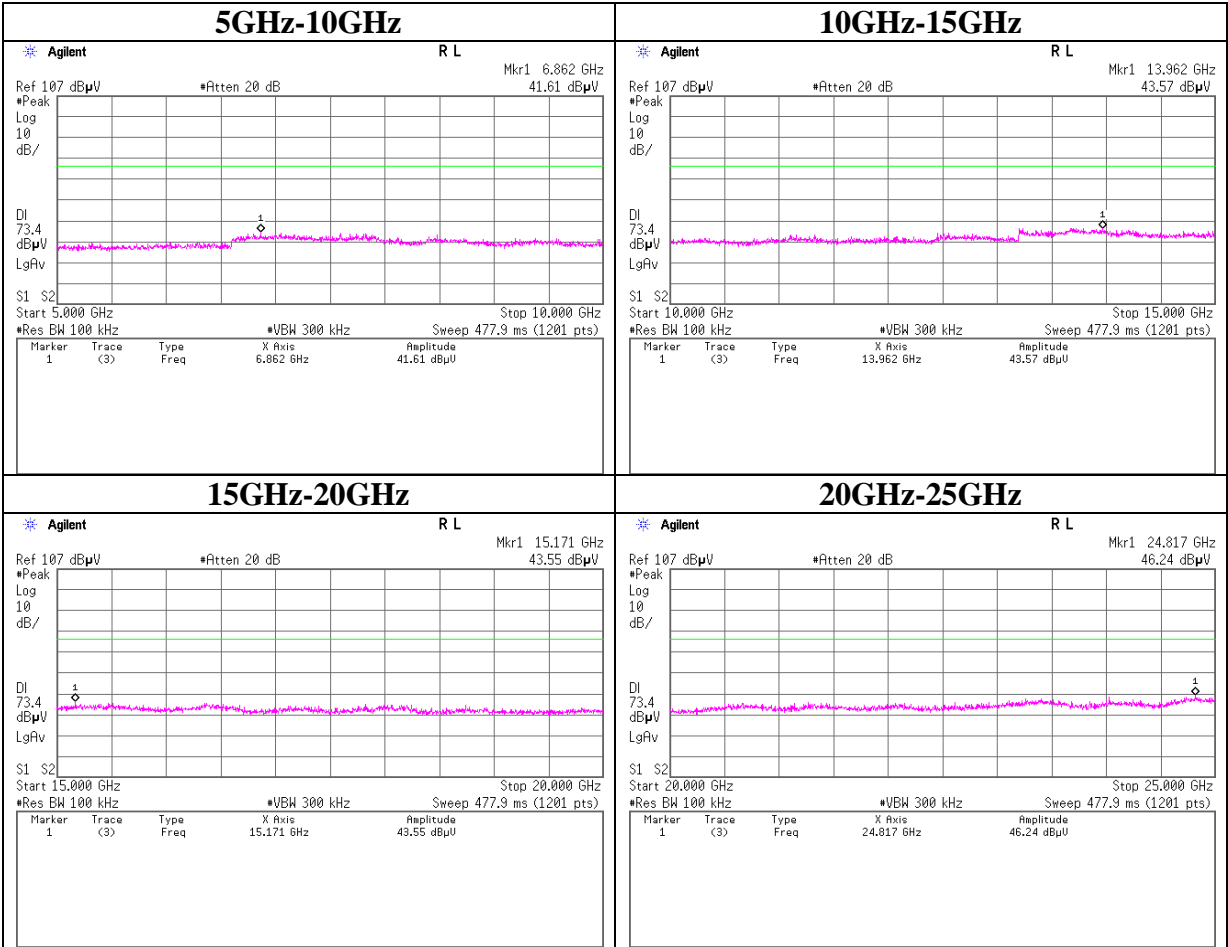
Conducted Spurious Emission

11b Tx 2437MHz



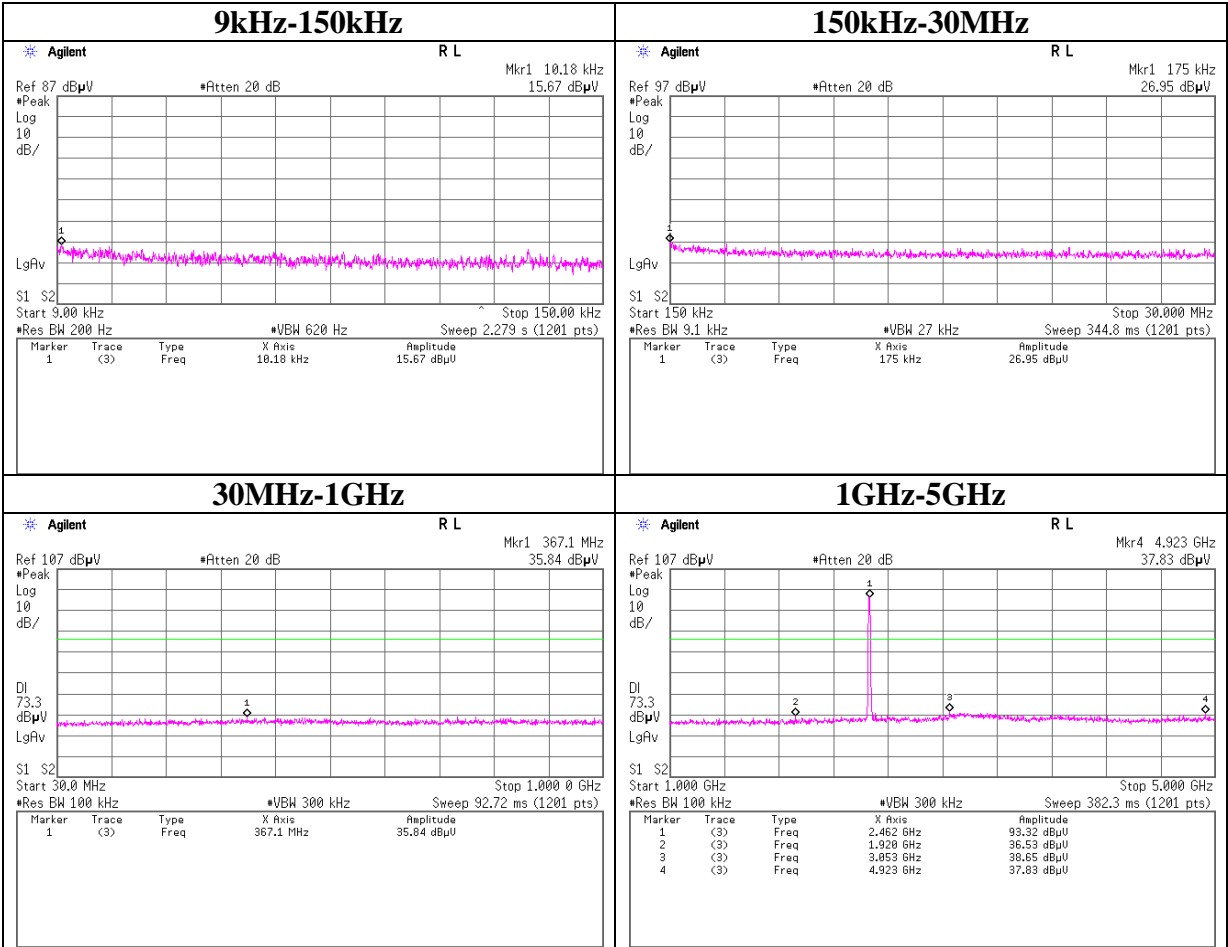
Conducted Spurious Emission

11b Tx 2437MHz



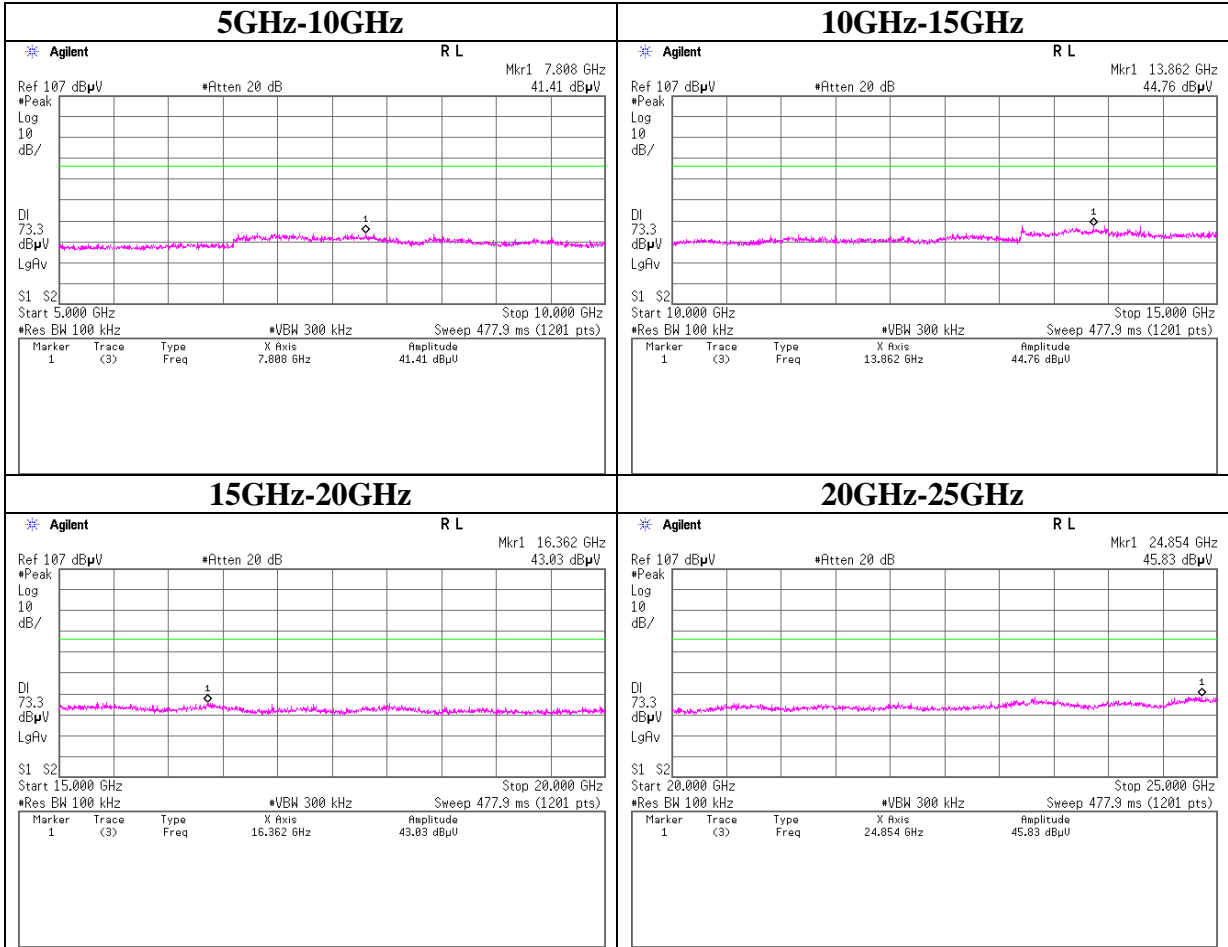
Conducted Spurious Emission

11b Tx 2462MHz



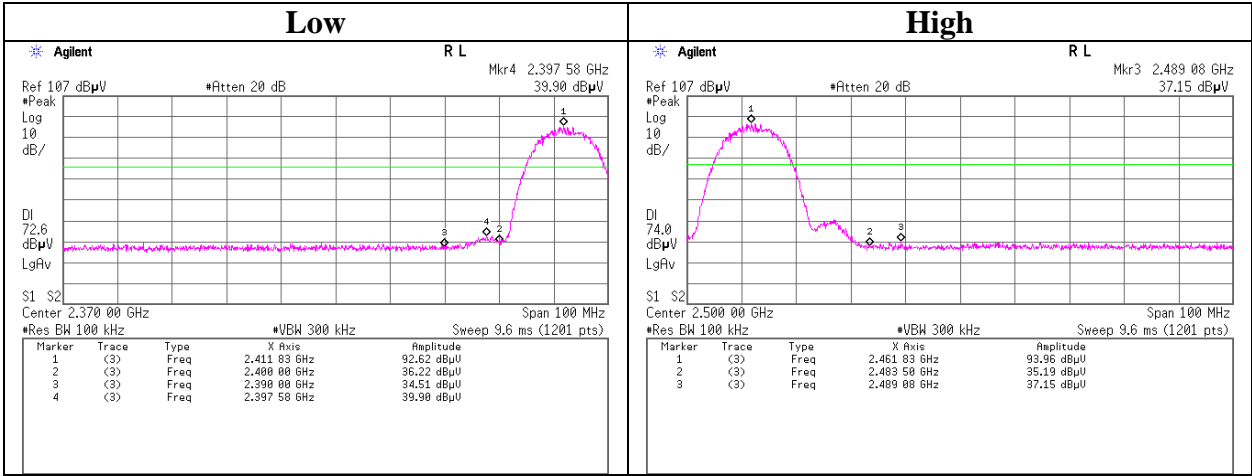
Conducted Spurious Emission

11b Tx 2462MHz



Conducted Emission Band Edge compliance

11b Tx



Power Density

Test place Head Office EMC Lab. No.4 Measurement Room
Report No. 32KE0186-HO-01
Date 06/27/2012
Temperature/ Humidity 23 deg.C./ 59%
Engineer Takumi Shimda
Mode 11b Tx

11b

Freq.	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.00	-19.46	1.34	10.07	-8.05	8.00	16.05
2437.00	-18.90	1.34	10.07	-7.49	8.00	15.49
2462.00	-18.23	1.35	10.07	-6.81	8.00	14.81

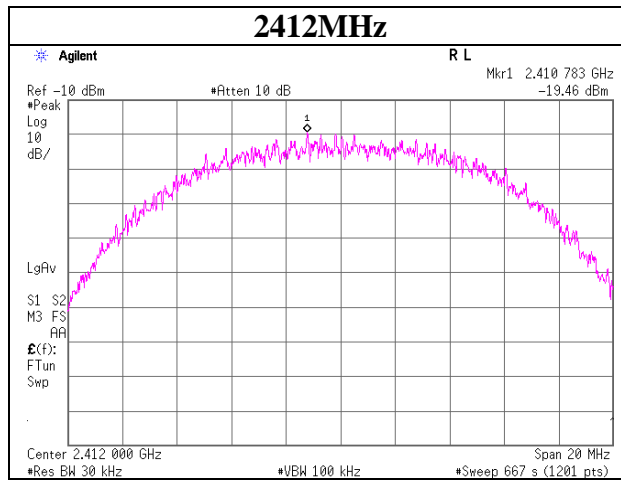
Sample Calculation:

Result = Reading + Cable Loss + Attenuator

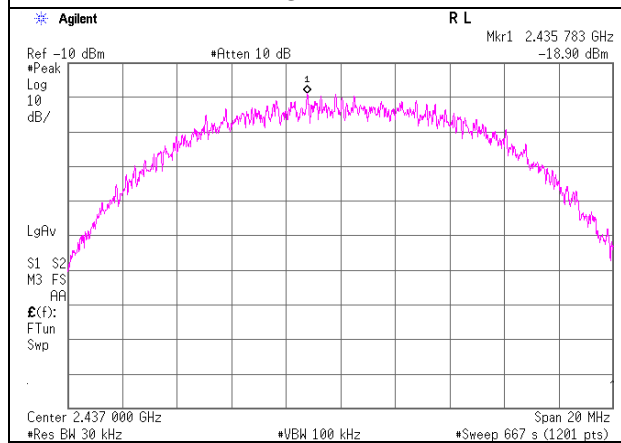
Power Density

11b

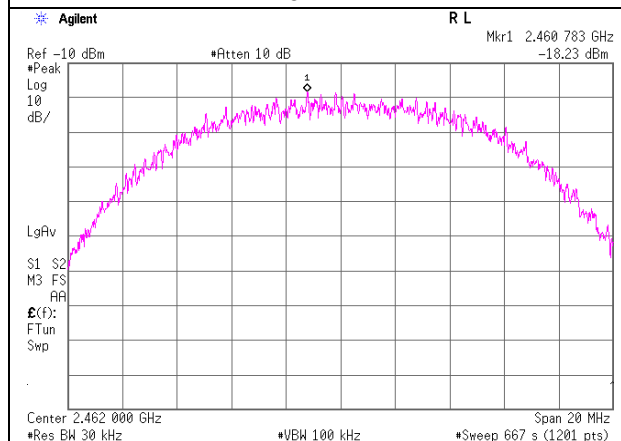
2412MHz



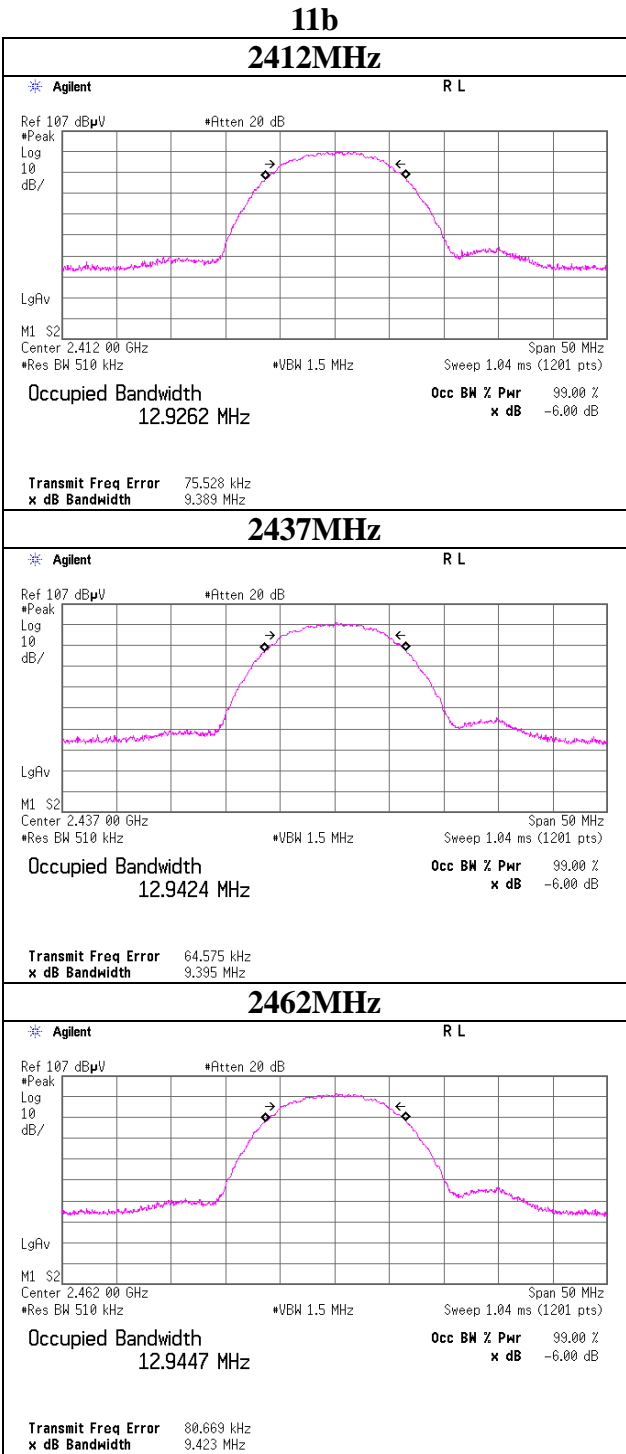
2437MHz



2462MHz



99%Occupied Bandwidth



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	AT/CE	2012/02/06 * 12
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	AT	2012/02/03 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2011/09/12 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2011/09/12 * 12
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2011/10/28 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2012/03/27 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE	
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2012/02/03 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2012/04/05 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2011/10/15 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2011/10/15 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2011/07/15 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2012/05/25 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2011/09/07 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2012/03/29 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2012/05/21 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	CE	2012/02/29 * 12
MJM-07	Measure	PROMART	SEN1955	-	CE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	CE	2011/11/23 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2012/02/06 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(AE)	2012/02/09 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2012/01/11 * 12
MAT-67	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	CE	2011/07/04 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	CE	2011/08/11 * 12
MDPS-03	DC Power Supply	Kikusui	PMC35-2A	13090501	CE	Pre Check

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: CE: Conducted Emission, RE: Radiated Emission, AT: Antenna Terminal Conducted test

UL Japan, Inc.

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