




RADIO TEST REPORT

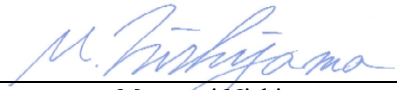
Test Report No. : 10017505H-A-R3

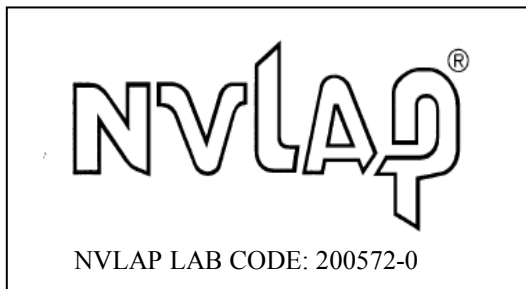
Applicant : Sony Computer Entertainment Inc.
Type of Equipment : Development Kit (for PlayStation®4)
Model No. : DUH-D1000AA
FCC ID : AK8DUTD1000
Test regulation : FCC Part 15 Subpart C: 2012
*WLAN/Bluetooth(LE) Part
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 10017505H-A-R2. 10017505H-A-R2 is replaced with this report.

Date of test: June 4 to 12, 2013

Representative test engineer: 
Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by: 
Masanori Nishiyama
Manager 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	Sony Computer Entertainment Inc.
Brand Name	SONY
Address	1-7-1 Konan, Minato-ku, Tokyo, 108-0075 Japan
Telephone Number	+81-3-6748-6333
Facsimile Number	+81-3-6748-6383
Contact Person	Kiyoto Sasaki

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

2.1 Identification of E.U.T.

Type of Equipment	Development Kit (for PlayStation®4)
Model No	DUH-D1000AA
Serial No	20689DD2A5A3 for Antenna Terminal Conducted test 3200020 for Conducted Emission and Radiated Emission tests
Country of Manufacture	Japan
Receipt Date of Sample	June 3, 2013
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

DUH-D1000AA is the Development Kit (for PlayStation®4).

Product Specification

Maximum clock frequency in the system	2.75GHz
Operating Temperature	5-35 deg. C
Power Supply	AC100-240V, 50Hz/60Hz
Size	370 x 118 x 226 mm
Weight	Approx. 6kg

Radio Specification

WLAN (IEEE802.11b/g/n-20/n-40)

Equipment Type	Transceiver
Frequency of Operation	2412-2462MHz (IEEE802.11b/g/n-20) 2422-2452MHz (IEEE802.11n-40)
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20MHz & 5MHz (IEEE802.11b/g/n-20) 40MHz & 5MHz (IEEE802.11n-40)
Method of frequency generation	Synthesizer
Power Supply (inner)	DC3.3V/1.8V
Antenna Type	PIFA (Antenna A/B)
Antenna Gain: G _{ANT}	2.0dBi (Antenna A/B)
Directional Gain	5.0dBi (Antenna A/B)

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Bluetooth (BDR/EDR)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Bandwidth & Channel spacing	1MHz & 1MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC3.3V/1.8V
Antenna Type	PIFA
Antenna Gain	2.0dBi (peak)

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	1MHz & 2MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC3.3V/1.8V
Antenna Type	PIFA
Antenna Gain	2.0 dBi (peak)

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 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

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 10.4dB, 0.97579MHz, N 0.97594MHz, L 0.97224MHz, L AV 4.9dB, 0.54043MHz, N 0.54148MHz, L	Complied	-
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	2.1dB 7320MHz, AV, Horizontal	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)

This EUT provides stable voltage(DC3.3/1.8V) constantly to RF Part regardless of input voltage. 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)	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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	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

Conducted Emission test

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

Radiated emission test

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	-	-	8.8 x 4.6 x 2.8m	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.

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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 802.11 a/b/g/n testing Managing Complex regulatory Approvals-" of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	24Mbps, PN9
IEEE 802.11n MIMO 20MHz BW (11n-20)	MCS5, PN9
IEEE 802.11n MIMO 40MHz BW (11n-40)	MCS4, PN9
Bluetooth (BT) LE (Low Energy)	Maximum Packet Size, PN9
<p>*Transmitting duty was 100% on all of WLAN tests. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) *WLAN antennas (Antenna A and B) transmit simultaneously. Bluetooth Antenna also transmits simultaneously with WLAN antennas, and the antennas are not common. There is no correlation between WLAN antennas and Bluetooth antenna.</p> <p>*Power of the EUT was set by the software as follows; Power settings: WLAN 9dBm Bluetooth (LE) Same as production model Software: COpro_DOS_Labtool_Ver1.0.8.24 *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.</p>	

*Details of Operating mode for WLAN

Test Item	Operating Mode	Used Antenna	Tested frequency
Conducted Emission Spurious Emission (Conducted)	11n-40 Tx *1)	Antenna A+B	2437MHz
6dB Bandwidth 99% Occupied Bandwidth	11b Tx	Antenna A or Antenna B *2)	2412MHz
	11g Tx		2437MHz
	11n-20 Tx		2462MHz
	11n-40 Tx	Antenna A or Antenna B *2)	2422MHz 2437MHz 2452MHz
Maximum Peak Output Power Power Density	11b Tx	Antenna A	2412MHz
	11g Tx	Antenna B	2437MHz
	11n-20 Tx		2462MHz
	11n-40 Tx	Antenna A Antenna B	2422MHz 2437MHz 2452MHz
Spurious Emission (Radiated)	11b Tx	Antenna A+B	2412MHz
	11g Tx		2437MHz
	11n-20 Tx		2462MHz
	11n-40 Tx	Antenna A+B	2422MHz 2437MHz 2452MHz
<p>*1) The mode was tested as a representative, because it had the highest power at antenna terminal test. *2) Antenna A or B which had the worst data at Maximum Peak Output Power was used for the test.</p>			

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*Details of Operating mode for BT LE

Test Item	Operating Mode	Tested frequency
Conducted Emission	BT LE	2402MHz
6dB Bandwidth		2440MHz
Maximum Peak Output Power		2480MHz
Power Density		
99% Occupied Bandwidth		
Spurious Emission		

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4.2 Configuration and peripherals

This page has been submitted for a separate exhibit.

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 CISPR 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 "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, 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 *1)	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 Trace: Free Run Detector: Power Averaging (RMS) <u>BT(LE): 12.2.5.2</u> RBW: 1MHz VBW: 3MHz Trace: Free Run Detector: Power Averaging (RMS) Duty factor was added to the results.	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m *2) (above 10GHz)		3m (below 10GHz), 1m *2) (above 10GHz)

*1) 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)"

*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 and Y axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

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

SECTION 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 40MHz 3MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	50MHz 100MHz 3MHz	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	14.4MHz, 24MHz, 24.7MHz, 25.5MHz, 54.1MHz, 54.3MHz 1.2MHz	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer *1)
Conducted Spurious Emission *2)	9kHz to 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1kHz	27kHz				
*1) 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)". *2) 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**

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APPENDIX 1: Data of EMI test

Conducted Emission

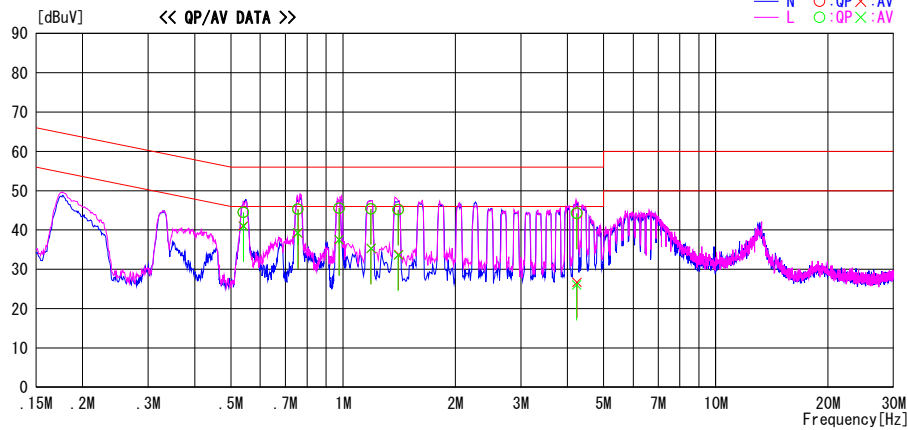
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
 Date : 2013/06/09

Report No. : 10017505H
 Temp./Humi. : 23deg. C / 54% RH
 Engineer : Takumi Shimada

Mode / Remarks : WLAN 11n-40 2437MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.54043	31.2	27.8	13.3	44.5	41.1	56.0	46.0	11.5	4.9	N	
0.75681	31.9	25.8	13.4	45.3	39.2	56.0	46.0	10.7	6.8	N	
0.97579	32.2	24.1	13.4	45.6	37.5	56.0	46.0	10.4	8.5	N	
1.18910	32.0	21.9	13.4	45.4	35.3	56.0	46.0	10.6	10.7	N	
1.40882	31.7	20.3	13.5	45.2	33.8	56.0	46.0	10.8	12.2	N	
4.24156	30.5	13.0	13.7	44.2	26.7	56.0	46.0	11.8	19.3	N	
0.54068	31.2	27.7	13.3	44.5	41.0	56.0	46.0	11.5	5.0	L	
0.75560	31.9	25.9	13.4	45.3	39.3	56.0	46.0	10.7	6.7	L	
0.97594	32.2	24.1	13.4	45.6	37.5	56.0	46.0	10.4	8.5	L	
1.18895	32.0	21.9	13.4	45.4	35.3	56.0	46.0	10.6	10.7	L	
1.40650	31.6	20.1	13.5	45.1	33.6	56.0	46.0	10.9	12.4	L	
4.23175	30.6	12.4	13.7	44.3	26.1	56.0	46.0	11.7	19.9	L	

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

Conducted Emission

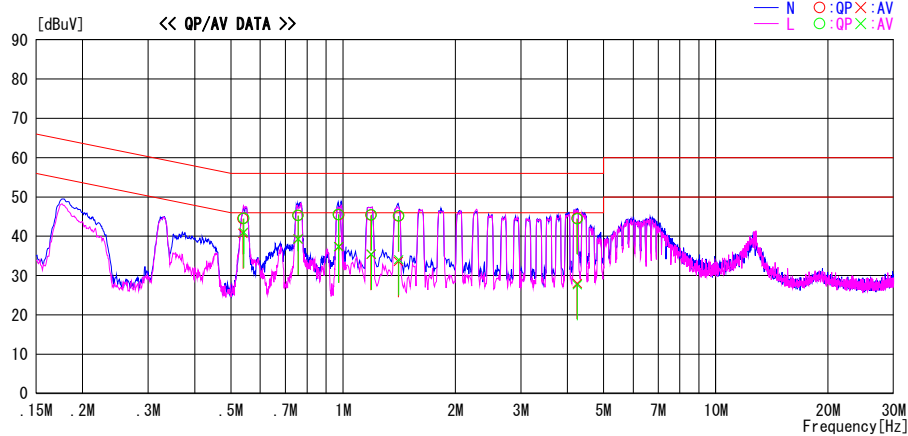
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber
 Date : 2013/06/09

Report No. : 10017505H
 Temp./Humi. : 23deg. C / 54% RH
 Engineer : Takumi Shimada

Mode / Remarks : BT LE 2480MHz

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.53910	31.2	27.5	13.3	44.5	40.8	56.0	46.0	11.5	5.2	N	
0.75718	31.9	25.9	13.4	45.3	39.3	56.0	46.0	10.7	6.7	N	
0.97447	32.1	23.9	13.4	45.5	37.3	56.0	46.0	10.5	8.7	N	
1.18913	32.0	22.0	13.4	45.4	35.4	56.0	46.0	10.6	10.6	N	
1.40760	31.6	20.1	13.5	45.1	33.6	56.0	46.0	10.9	12.4	N	
4.24898	30.9	14.3	13.7	44.6	28.0	56.0	46.0	11.4	18.0	N	
0.54148	31.3	27.8	13.3	44.6	41.1	56.0	46.0	11.4	4.9	L	
0.75832	31.9	25.9	13.4	45.3	39.3	56.0	46.0	10.7	6.7	L	
0.97224	32.2	23.9	13.4	45.6	37.3	56.0	46.0	10.4	8.7	L	
1.18982	32.0	22.0	13.5	45.5	35.5	56.0	46.0	10.5	10.5	L	
1.41131	31.7	20.6	13.5	45.2	34.1	56.0	46.0	10.8	11.9	L	
4.25011	30.7	14.0	13.7	44.4	27.7	56.0	46.0	11.6	18.3	L	

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

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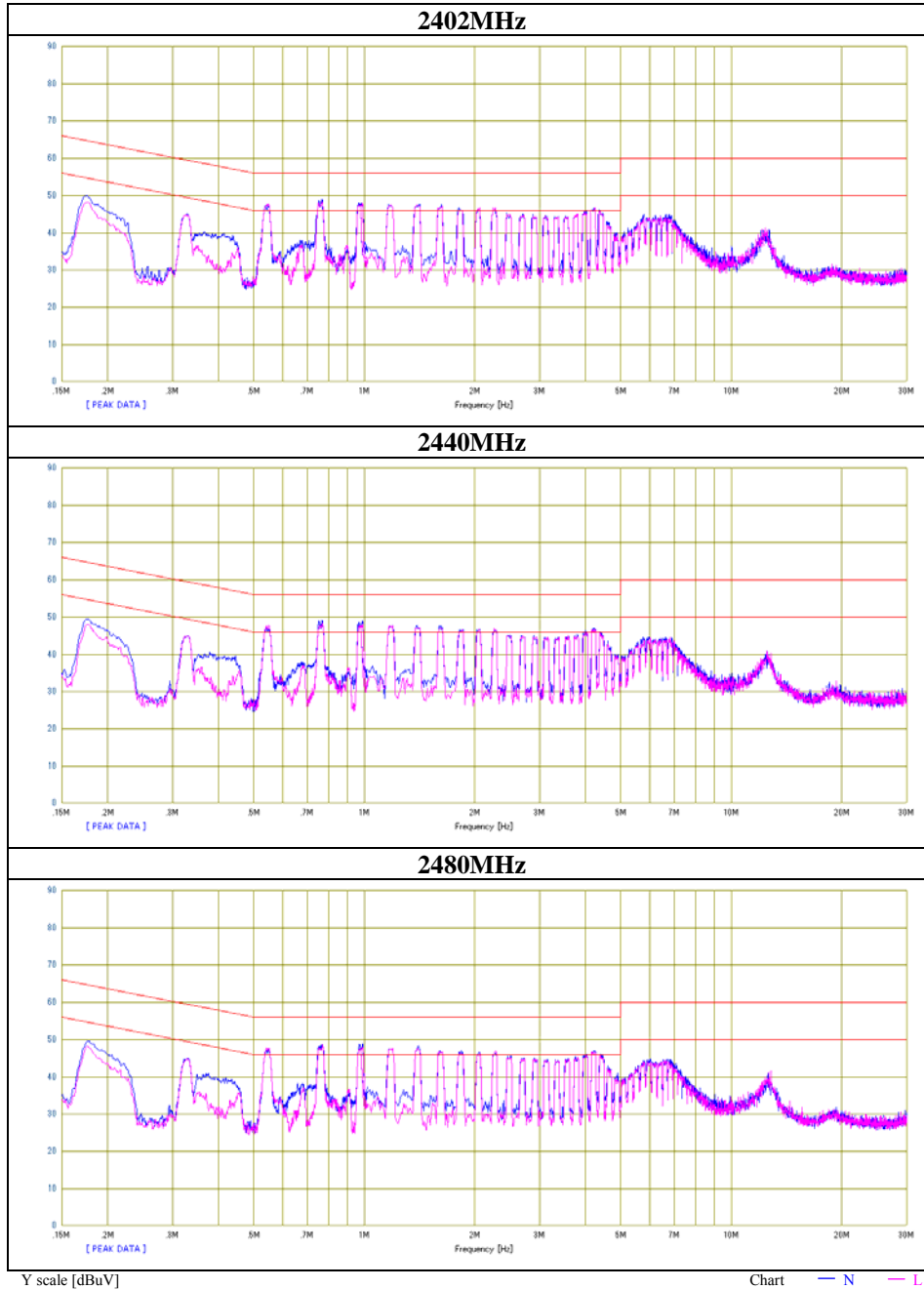
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Conducted Emission

Test place	Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10017505H
Date	06/09/2013
Temperature/ Humidity	23deg. C / 54% RH
Engineer	Takumi Shimada
Mode	BT LE



6dB Bandwidth

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 10017505H
Date 06/06/2013
Temperature/ Humidity 25 deg. C / 57% RH
Engineer Takumi Shimada
Mode WLAN Tx

11b

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	9.549	>500
2437	9.557	>500
2462	9.554	>500

11g

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.454	>500
2437	16.461	>500
2462	16.451	>500

11n-20

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2412	16.938	>500
2437	16.938	>500
2462	16.926	>500

11n-40

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2422	35.985	>500
2437	35.931	>500
2452	36.001	>500

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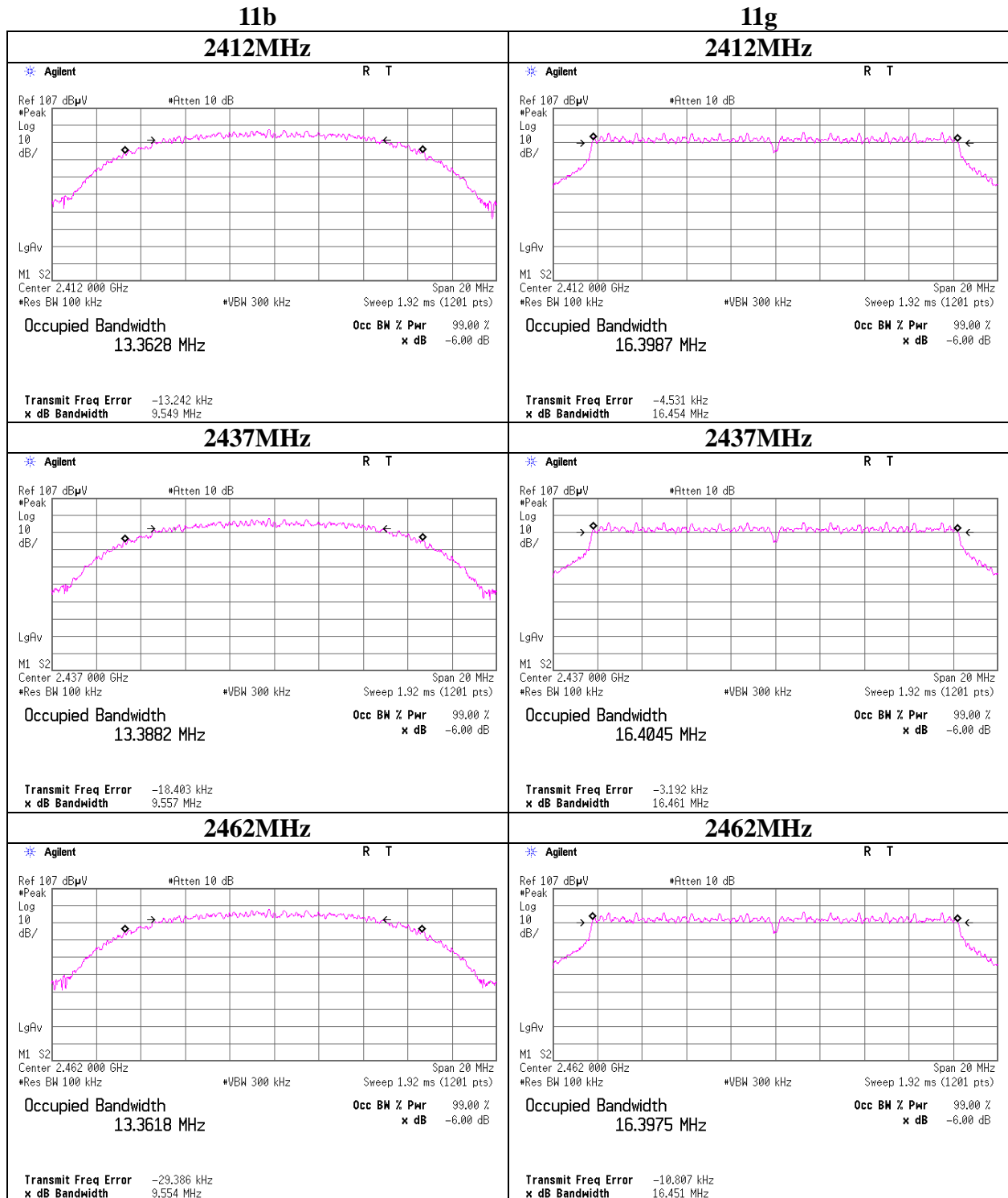
Head Office EMC Lab.

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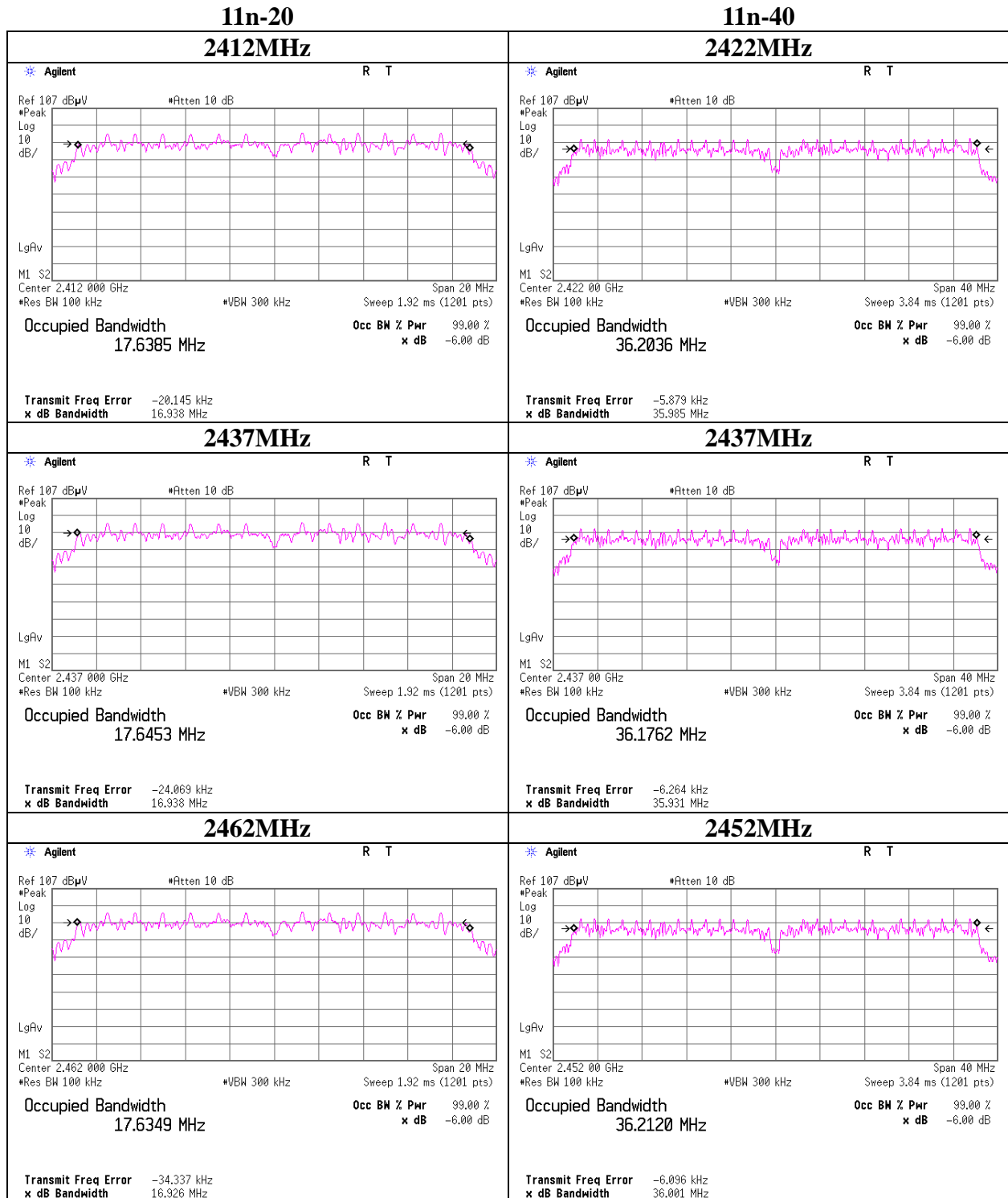
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6dB Bandwidth



6dB Bandwidth



6dB Bandwidth

Test place : Head Office EMC Lab. No.6 Measurement Room
Report No. : 10017505H
Date : 06/06/2013
Temperature/ Humidity : 25 deg. C / 57% RH
Engineer : Takumi Shimada
Mode : BT LE

Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
2402	0.767	>500
2440	0.771	>500
2480	0.767	>500

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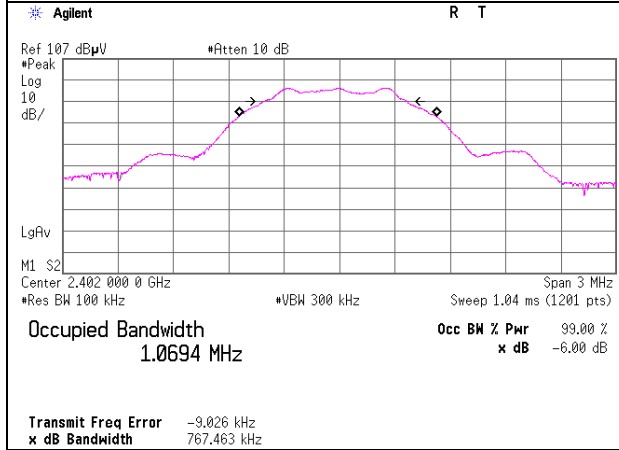
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Facsimile : +81 596 24 8124

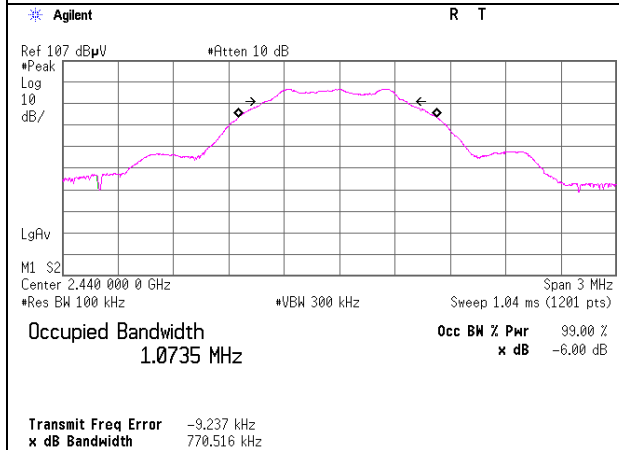
6dB Bandwidth

BT LE

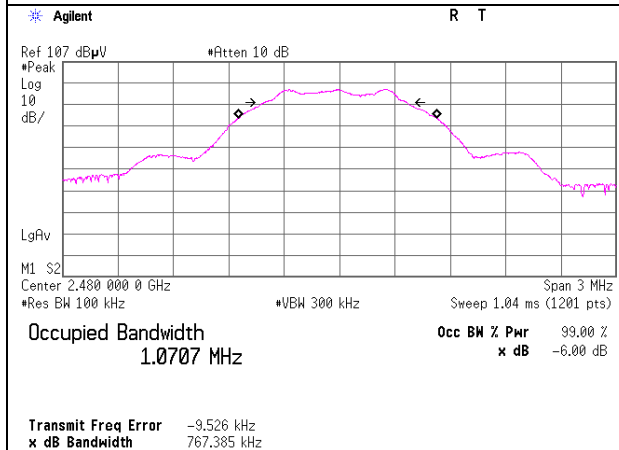
2402MHz



2440MHz



2480MHz



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Maximum Peak Output Power

Test place : Head Office EMC Lab. No.6 Measurement Room
Report No. : 10017505H
Date : 06/04/2013
Temperature/ Humidity : 23 deg. C / 48% RH
Engineer : Takayuki Shimada
Mode : 11b Tx

Antenna A + B

Freq. [MHz]	Antenna A Result [mW]	Antenna B Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	12.47	13.12	14.08	25.60	30.00	1000	15.92
2437	13.09	15.70	14.59	28.80	30.00	1000	15.41
2462	12.22	14.52	14.27	26.74	30.00	1000	15.73

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-1.13	2.08	10.01	10.96	12.47	30.00	1000	19.04
2437	-0.92	2.08	10.01	11.17	13.09	30.00	1000	18.83
2462	-1.23	2.09	10.01	10.87	12.22	30.00	1000	19.13

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	-0.91	2.08	10.01	11.18	13.12	30.00	1000	18.82
2437	-0.13	2.08	10.01	11.96	15.70	30.00	1000	18.04
2462	-0.48	2.09	10.01	11.62	14.52	30.00	1000	18.38

Sample Calculation:

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

Rate [Mbps]	Antenna A Reading		Antenna B Reading		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
1	-0.89	0.815	-0.19	0.957	2.48	1.772	
2	-0.93	0.807	-0.15	0.966	2.49	1.773	
5.5	-0.95	0.804	-0.16	0.964	2.47	1.767	
11	-0.92	0.809	-0.13	0.971	2.50	1.780	*

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Maximum Peak Output Power

Test place : Head Office EMC Lab. No.6 Measurement Room
 Report No. : 10017505H
 Date : 06/04/2013
 Temperature/ Humidity : 23 deg. C / 48% RH
 Engineer : Takayuki Shimada
 Mode : 11g Tx

Antenna A + B

Freq. [MHz]	Antenna A Result [mW]	Antenna B Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	70.15	82.79	21.85	152.94	30.00	1000	8.15
2437	72.28	85.90	21.99	158.18	30.00	1000	8.01
2462	76.21	87.30	22.14	163.51	30.00	1000	7.86

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.37	2.08	10.01	18.46	70.15	30.00	1000	11.54
2437	6.50	2.08	10.01	18.59	72.28	30.00	1000	11.41
2462	6.72	2.09	10.01	18.82	76.21	30.00	1000	11.18

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	7.09	2.08	10.01	19.18	82.79	30.00	1000	10.82
2437	7.25	2.08	10.01	19.34	85.90	30.00	1000	10.66
2462	7.31	2.09	10.01	19.41	87.30	30.00	1000	10.59

Sample Calculation:

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

Rate [Mbps]	Antenna A Reading		Antenna B Reading		Total Reading Power		Remark [dB]
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
6	6.10	4.07	7.15	5.19	9.67	9.26	
9	5.45	3.51	6.21	4.18	8.86	7.69	
12	6.06	4.04	6.84	4.83	9.48	8.87	
18	5.35	3.43	6.17	4.14	8.79	7.57	
24	6.50	4.47	7.25	5.31	9.90	9.78	*
36	6.12	4.09	6.95	4.95	9.57	9.05	
48	5.45	3.51	6.38	4.35	8.95	7.85	
54	5.85	3.85	6.78	4.76	9.35	8.61	

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Maximum Peak Output Power

Test place : Head Office EMC Lab. No.6 Measurement Room
Report No. : 10017505H
Date : 06/04/2013
Temperature/ Humidity : 23 deg. C / 48% RH
Engineer : Takayuki Shimada
Mode : 11n-20 Tx

Antenna A + B

Freq. [MHz]	Antenna A Result [mW]	Antenna B Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2412	59.84	65.16	20.97	125.00	30.00	1000	9.03
2437	62.81	86.10	21.73	148.91	30.00	1000	8.27
2462	66.37	77.62	21.58	144.00	30.00	1000	8.42

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.68	2.08	10.01	17.77	59.84	30.00	1000	12.23
2437	5.89	2.08	10.01	17.98	62.81	30.00	1000	12.02
2462	6.12	2.09	10.01	18.22	66.37	30.00	1000	11.78

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	6.05	2.08	10.01	18.14	65.16	30.00	1000	11.86
2437	7.26	2.08	10.01	19.35	86.10	30.00	1000	10.65
2462	6.80	2.09	10.01	18.90	77.62	30.00	1000	11.10

Sample Calculation:

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

MCS Number	Antenna A Reading		Antenna B Reading		Total Reading Power		Remark
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
0	5.90	3.89	6.30	4.27	9.11	8.16	
1	5.86	3.85	7.08	5.11	9.52	8.96	
2	5.84	3.84	6.77	4.75	9.34	8.59	
3	5.84	3.84	6.80	4.79	9.36	8.62	
4	5.89	3.88	7.11	5.14	9.55	9.02	
5	5.89	3.88	7.26	5.32	9.64	9.20	*
6	5.91	3.90	6.72	4.70	9.34	8.60	
7	5.91	3.90	6.74	4.72	9.36	8.62	
8	5.92	3.91	6.70	4.68	9.34	8.59	
9	5.94	3.93	6.66	4.63	9.33	8.56	
10	5.97	3.95	6.67	4.65	9.34	8.60	
11	6.10	4.07	6.73	4.71	9.44	8.78	
12	6.11	4.08	6.76	4.74	9.46	8.83	
13	5.94	3.93	6.65	4.62	9.32	8.55	
14	5.98	3.96	6.67	4.65	9.35	8.61	
15	5.97	3.95	6.70	4.68	9.36	8.63	

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Maximum Peak Output Power

Test place : Head Office EMC Lab. No.6 Measurement Room
Report No. : 10017505H
Date : 06/04/2013
Temperature/ Humidity : 23 deg. C / 48% RH
Engineer : Takayuki Shimada
Mode : 11n-40 Tx

Antenna A + B

Freq. [MHz]	Antenna A Result [mW]	Antenna B Result [mW]	Result		Limit		Margin [dB]
			[dBm]	[mW]	[dBm]	[mW]	
2422	110.92	110.41	23.45	221.33	30.00	1000	6.55
2437	129.42	119.12	23.95	248.54	30.00	1000	6.05
2452	118.03	112.20	23.62	230.23	30.00	1000	6.38

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2422	8.36	2.08	10.01	20.45	110.92	30.00	1000	9.55
2437	9.03	2.08	10.01	21.12	129.42	30.00	1000	8.88
2452	8.62	2.09	10.01	20.72	118.03	30.00	1000	9.28

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2422	8.34	2.08	10.01	20.43	110.41	30.00	1000	9.57
2437	8.67	2.08	10.01	20.76	119.12	30.00	1000	9.24
2452	8.40	2.09	10.01	20.50	112.20	30.00	1000	9.50

Sample Calculation:

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

MCS Number	Antenna A Reading		Antenna B Reading		Total Reading Power		Remark
	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
0	6.40	4.37	7.22	5.27	9.84	9.64	
1	6.87	4.86	7.55	5.69	10.23	10.55	
2	4.83	3.04	5.66	3.68	8.28	6.72	
3	5.05	3.20	5.90	3.89	8.51	7.09	
4	9.03	8.00	8.67	7.36	11.86	15.36	*
5	8.25	6.68	8.52	7.11	11.40	13.80	
6	8.41	6.93	8.31	6.78	11.37	13.71	
7	8.31	6.78	8.19	6.59	11.26	13.37	
8	7.51	5.64	7.82	6.05	10.68	11.69	
9	5.73	3.74	6.50	4.47	9.14	8.21	
10	7.37	5.46	7.00	5.01	10.20	10.47	
11	8.76	7.52	7.40	5.50	11.14	13.01	
12	8.36	6.85	5.70	3.72	10.24	10.57	
13	8.35	6.84	6.28	4.25	10.45	11.09	
14	8.32	6.79	7.38	5.47	10.89	12.26	
15	8.35	6.84	6.73	4.71	10.63	11.55	

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Maximum Peak Output Power

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 10017505H
Date 06/05/2013
Temperature/ Humidity 25 deg. C / 53% RH
Engineer Takumi Shimada
Mode BT LE Tx

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-12.41	2.07	10.01	-0.33	0.93	30.00	1000	30.33
2440	-11.89	2.08	10.01	0.20	1.05	30.00	1000	29.80
2480	-11.68	2.09	10.01	0.42	1.10	30.00	1000	29.58

Sample Calculation:

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(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	48.8	28.2	2.3	32.4	46.9	73.9	27.0	
Hori	4824.000	PK	41.5	30.5	4.8	31.4	45.4	73.9	28.5	
Hori	7236.000	PK	41.2	35.8	5.6	32.3	50.3	73.9	23.6	
Hori	9648.000	PK	42.5	39.1	6.4	33.0	55.0	73.9	18.9	
Hori	2390.000	AV	39.1	28.2	2.3	32.4	37.2	53.9	16.7	
Hori	4824.000	AV	33.7	30.5	4.8	31.4	37.6	53.9	16.3	
Hori	7236.000	AV	34.9	35.8	5.6	32.3	44.0	53.9	9.9	
Hori	9648.000	AV	35.0	39.1	6.4	33.0	47.5	53.9	6.4	
Vert	2390.000	PK	46.4	28.2	2.3	32.4	44.5	73.9	29.4	
Vert	4824.000	PK	40.6	30.5	4.8	31.4	44.5	73.9	29.4	
Vert	7236.000	PK	41.3	35.8	5.6	32.3	50.4	73.9	23.5	
Vert	9648.000	PK	42.1	39.1	6.4	33.0	54.6	73.9	19.3	
Vert	2390.000	AV	38.3	28.2	2.3	32.4	36.4	53.9	17.5	
Vert	4824.000	AV	33.5	30.5	4.8	31.4	37.4	53.9	16.5	
Vert	7236.000	AV	35.0	35.8	5.6	32.3	44.1	53.9	9.8	
Vert	9648.000	AV	35.0	39.1	6.4	33.0	47.5	53.9	6.4	

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

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	98.4	28.2	2.3	32.4	96.5	-	-	Carrier
Hori	2400.000	PK	52.6	28.2	2.3	32.4	50.7	76.5	25.8	
Vert	2412.000	PK	95.2	28.2	2.3	32.4	93.3	-	-	Carrier
Vert	2400.000	PK	47.4	28.2	2.3	32.4	45.5	73.3	27.8	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(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	4874.000	PK	43.4	30.6	4.7	31.4	47.3	73.9	26.6	
Hori	7311.000	PK	42.6	35.9	5.6	32.4	51.7	73.9	22.2	
Hori	9748.000	PK	42.5	39.4	6.4	33.0	55.3	73.9	18.6	
Hori	4874.000	AV	34.2	30.6	4.7	31.4	38.1	53.9	15.8	
Hori	7311.000	AV	35.2	35.9	5.6	32.4	44.3	53.9	9.6	
Hori	9748.000	AV	35.0	39.4	6.4	33.0	47.8	53.9	6.1	
Vert	4874.000	PK	41.6	30.6	4.7	31.4	45.5	73.9	28.4	
Vert	7311.000	PK	42.5	35.9	5.6	32.4	51.6	73.9	22.3	
Vert	9748.000	PK	42.7	39.4	6.4	33.0	55.5	73.9	18.4	
Vert	4874.000	AV	32.3	30.6	4.7	31.4	36.2	53.9	17.7	
Vert	7311.000	AV	33.6	35.9	5.6	32.4	42.7	53.9	11.2	
Vert	9748.000	AV	35.1	39.4	6.4	33.0	47.9	53.9	6.0	

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 $20\log(3.0m/1.0m)= 9.5dB$
26.5GHz-40GHz $20\log(3.0m/0.5m)=15.6dB$

UL Japan, Inc.

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Radiated Spurious Emission

Test place	Head Office EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10017505H	
Date	06/11/2013	06/12/2013
Temperature/ Humidity	24 deg. C / 60% RH	23 deg. C / 63% RH
Engineer	Takumi Shimada	Takumi Shimada
	(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	51.9	28.4	2.3	32.3	50.3	73.9	23.6	
Hori	4924.000	PK	43.3	30.7	4.7	31.4	47.3	73.9	26.6	
Hori	7386.000	PK	43.0	36.1	5.6	32.4	52.3	73.9	21.6	
Hori	9848.000	PK	42.7	39.6	6.4	33.1	55.6	73.9	18.3	
Hori	2483.500	AV	36.9	28.4	2.3	32.3	35.3	53.9	18.6	
Hori	4924.000	AV	35.2	30.7	4.7	31.4	39.2	53.9	14.7	
Hori	7386.000	AV	35.4	36.1	5.6	32.4	44.7	53.9	9.2	
Hori	9848.000	AV	35.2	39.6	6.4	33.1	48.1	53.9	5.8	
Vert	2483.500	PK	48.3	28.4	2.3	32.3	46.7	73.9	27.2	
Vert	4924.000	PK	43.6	30.7	4.7	31.4	47.6	73.9	26.3	
Vert	7386.000	PK	42.4	36.1	5.6	32.4	51.7	73.9	22.2	
Vert	9848.000	PK	41.5	39.6	6.4	33.1	54.4	73.9	19.5	
Vert	2483.500	AV	40.9	28.4	2.3	32.3	39.3	53.9	14.6	
Vert	4924.000	AV	34.0	30.7	4.7	31.4	38.0	53.9	15.9	
Vert	7386.000	AV	34.0	36.1	5.6	32.4	43.3	53.9	10.6	
Vert	9848.000	AV	35.3	39.6	6.4	33.1	48.2	53.9	5.7	

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

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

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

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(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	55.3	28.2	2.3	32.4	53.4	73.9	20.6	
Hori	4824.000	PK	41.2	30.5	4.8	31.4	45.1	73.9	28.8	
Hori	7236.000	PK	41.6	35.8	5.6	32.3	50.7	73.9	23.2	
Hori	9648.000	PK	42.4	39.1	6.4	33.0	54.9	73.9	19.0	
Hori	2390.000	AV	47.4	28.2	2.3	32.4	45.5	53.9	8.4	
Hori	4824.000	AV	33.4	30.5	4.8	31.4	37.3	53.9	16.6	
Hori	7236.000	AV	35.2	35.8	5.6	32.3	44.3	53.9	9.6	
Hori	9648.000	AV	35.2	39.1	6.4	33.0	47.7	53.9	6.2	
Vert	2390.000	PK	53.0	28.2	2.3	32.4	51.1	73.9	22.9	
Vert	4824.000	PK	41.3	30.5	4.8	31.4	45.2	73.9	28.7	
Vert	7236.000	PK	41.3	35.8	5.6	32.3	50.4	73.9	23.5	
Vert	9648.000	PK	42.3	39.1	6.4	33.0	54.8	73.9	19.1	
Vert	2390.000	AV	38.3	28.2	2.3	32.4	36.4	53.9	17.5	
Vert	4824.000	AV	34.0	30.5	4.8	31.4	37.9	53.9	16.0	
Vert	7236.000	AV	35.2	35.8	5.6	32.3	44.3	53.9	9.6	
Vert	9648.000	AV	34.9	39.1	6.4	33.0	47.4	53.9	6.5	

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

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

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

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

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	101.6	28.2	2.3	32.4	99.7	-	-	Carrier
Hori	2400.000	PK	54.4	28.2	2.3	32.4	52.5	79.7	27.2	
Vert	2412.000	PK	97.9	28.2	2.3	32.4	96.0	-	-	Carrier
Vert	2400.000	PK	57.0	28.2	2.3	32.4	55.1	76.0	20.9	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(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	4874.000	PK	42.0	30.6	4.7	31.4	45.9	73.9	28.0	
Hori	7311.000	PK	42.5	35.9	5.6	32.4	51.6	73.9	22.3	
Hori	9748.000	PK	42.7	39.4	6.4	33.0	55.5	73.9	18.4	
Hori	4874.000	AV	33.8	30.6	4.7	31.4	37.7	53.9	16.2	
Hori	7311.000	AV	34.8	35.9	5.6	32.4	43.9	53.9	10.0	
Hori	9748.000	AV	35.1	39.4	6.4	33.0	47.9	53.9	6.0	
Vert	4874.000	PK	41.9	30.6	4.7	31.4	45.8	73.9	28.1	
Vert	7311.000	PK	42.4	35.9	5.6	32.4	51.5	73.9	22.4	
Vert	9748.000	PK	42.9	39.4	6.4	33.0	55.7	73.9	18.2	
Vert	4874.000	AV	32.1	30.6	4.7	31.4	36.0	53.9	17.9	
Vert	7311.000	AV	33.8	35.9	5.6	32.4	42.9	53.9	11.0	
Vert	9748.000	AV	35.0	39.4	6.4	33.0	47.8	53.9	6.1	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(1-10GHz) (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	2483.500	PK	51.7	28.4	2.3	32.3	50.1	73.9	23.8	
Hori	4924.000	PK	42.3	30.7	4.7	31.4	46.3	73.9	27.6	
Hori	7386.000	PK	43.2	36.1	5.6	32.4	52.5	73.9	21.4	
Hori	9848.000	PK	42.5	39.6	6.4	33.1	55.4	73.9	18.5	
Hori	2483.500	AV	43.5	28.4	2.3	32.3	41.9	53.9	12.0	
Hori	4924.000	AV	34.0	30.7	4.7	31.4	38.0	53.9	15.9	
Hori	7386.000	AV	33.8	36.1	5.6	32.4	43.1	53.9	10.8	
Hori	9848.000	AV	35.1	39.6	6.4	33.1	48.0	53.9	5.9	
Vert	2483.500	PK	52.4	28.4	2.3	32.3	50.8	73.9	23.1	
Vert	4924.000	PK	41.7	30.7	4.7	31.4	45.7	73.9	28.2	
Vert	7386.000	PK	43.0	36.1	5.6	32.4	52.3	73.9	21.6	
Vert	9848.000	PK	41.9	39.6	6.4	33.1	54.8	73.9	19.1	
Vert	2483.500	AV	45.4	28.4	2.3	32.3	43.8	53.9	10.1	
Vert	4924.000	AV	33.8	30.7	4.7	31.4	37.8	53.9	16.2	
Vert	7386.000	AV	35.3	36.1	5.6	32.4	44.6	53.9	9.3	
Vert	9848.000	AV	35.1	39.6	6.4	33.1	48.0	53.9	5.9	

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

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

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

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013
Temperature/ Humidity 24 deg. C / 60% RH
Engineer Takumi Shimada
(1-10GHz)
Mode 11n-20 Tx

2412MHz Band edge

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	56.6	28.2	2.3	32.4	54.7	73.9	19.2	
Hori	2390.000	AV	50.0	28.2	2.3	32.4	48.1	53.9	5.8	
Vert	2390.000	PK	52.3	28.2	2.3	32.4	50.4	73.9	23.5	
Vert	2390.000	AV	45.1	28.2	2.3	32.4	43.2	53.9	10.7	

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

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

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

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

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	100.0	28.2	2.3	32.4	98.1	-	-	Carrier
Hori	2400.000	PK	58.0	28.2	2.3	32.4	56.1	78.1	22.0	
Vert	2412.000	PK	95.1	28.2	2.3	32.4	93.2	-	-	Carrier
Vert	2400.000	PK	54.4	28.2	2.3	32.4	52.5	73.2	20.7	

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

2462MHz Band edge

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	53.4	28.4	2.3	32.3	51.8	73.9	22.1	
Hori	2483.500	AV	44.1	28.4	2.3	32.3	42.5	53.9	11.4	
Vert	2483.500	PK	53.3	28.4	2.3	32.3	51.7	73.9	22.2	
Vert	2483.500	AV	46.3	28.4	2.3	32.3	44.7	53.9	9.2	

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

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

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

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(1-10GHz) (10-26.5GHz)
Mode 11n-40 Tx 2422MHz

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	59.1	28.2	2.3	32.4	57.2	73.9	16.7	
Hori	4824.000	PK	41.6	30.5	4.8	31.4	45.5	73.9	28.4	
Hori	7236.000	PK	41.9	35.8	5.6	32.3	51.0	73.9	22.9	
Hori	9648.000	PK	43.2	39.1	6.4	33.0	55.7	73.9	18.2	
Hori	2390.000	AV	51.4	28.2	2.3	32.4	49.5	53.9	4.4	
Hori	4824.000	AV	33.5	30.5	4.8	31.4	37.4	53.9	16.5	
Hori	7236.000	AV	34.8	35.8	5.6	32.3	43.9	53.9	10.0	
Hori	9648.000	AV	35.2	39.1	6.4	33.0	47.7	53.9	6.2	
Vert	2390.000	PK	57.6	28.2	2.3	32.4	55.7	73.9	18.2	
Vert	4844.000	PK	41.2	30.6	4.7	31.4	45.1	73.9	28.8	
Vert	7266.000	PK	41.8	35.9	5.6	32.4	50.9	73.9	23.0	
Vert	9688.000	PK	42.0	39.2	6.4	33.0	54.6	73.9	19.3	
Vert	2390.000	AV	51.2	28.2	2.3	32.4	49.3	53.9	4.6	
Vert	4844.000	AV	33.7	30.6	4.7	31.4	37.6	53.9	16.3	
Vert	7266.000	AV	35.0	35.9	5.6	32.4	44.1	53.9	9.8	
Vert	9688.000	AV	35.0	39.2	6.4	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

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	2422.000	PK	95.9	28.3	2.3	32.3	94.2	-	-	Carrier
Hori	2400.000	PK	57.5	28.2	2.3	32.4	55.6	74.2	18.6	
Vert	2422.000	PK	94.6	28.3	2.3	32.3	92.9	-	-	Carrier
Vert	2400.000	PK	53.6	28.2	2.3	32.4	51.7	72.9	21.2	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(1-10GHz) (30-1000MHz and 10-26.5GHz)
Mode 11n-40 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	45.222	QP	29.0	12.2	7.3	32.1	16.4	40.0	23.6	
Hori	101.850	QP	47.8	10.4	8.1	32.1	34.2	43.5	9.3	
Hori	148.504	QP	40.1	14.9	8.6	32.1	31.5	43.5	12.0	
Hori	718.768	QP	36.9	20.6	12.4	32.0	37.9	46.0	8.1	
Hori	742.505	QP	38.0	21.0	12.6	31.9	39.7	46.0	6.3	
Hori	890.980	QP	32.4	22.1	13.3	31.0	36.8	46.0	9.2	
Hori	4874.000	PK	41.2	30.6	4.7	31.4	45.1	73.9	28.8	
Hori	7311.000	PK	42.9	35.9	5.6	32.4	52.0	73.9	21.9	
Hori	9748.000	PK	42.4	39.4	6.4	33.0	55.2	73.9	18.7	
Hori	4874.000	AV	33.8	30.6	4.7	31.4	37.7	53.9	16.2	
Hori	7311.000	AV	35.2	35.9	5.6	32.4	44.3	53.9	9.6	
Hori	9748.000	AV	35.0	39.4	6.4	33.0	47.8	53.9	6.1	
Vert	41.638	QP	39.5	13.8	7.2	32.2	28.3	40.0	11.7	
Vert	104.358	QP	46.2	10.8	8.1	32.1	33.0	43.5	10.5	
Vert	148.497	QP	42.7	14.9	8.6	32.1	34.1	43.5	9.4	
Vert	718.771	QP	32.5	20.6	12.4	32.0	33.5	46.0	12.5	
Vert	742.504	QP	35.6	21.0	12.6	31.9	37.3	46.0	8.7	
Vert	890.996	QP	31.5	22.1	13.3	31.0	35.9	46.0	10.1	
Vert	4874.000	PK	40.9	30.6	4.7	31.4	44.8	73.9	29.2	
Vert	7311.000	PK	41.8	35.9	5.6	32.4	50.9	73.9	23.0	
Vert	9748.000	PK	42.4	39.4	6.4	33.0	55.2	73.9	18.7	
Vert	4874.000	AV	33.9	30.6	4.7	31.4	37.8	53.9	16.1	
Vert	7311.000	AV	35.2	35.9	5.6	32.4	44.3	53.9	9.6	
Vert	9748.000	AV	35.1	39.4	6.4	33.0	47.9	53.9	6.0	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/11/2013 06/12/2013
Temperature/ Humidity 24 deg. C / 60% RH 23 deg. C / 63% RH
Engineer Takumi Shimada Takumi Shimada
(1-10GHz) (10-26.5GHz)
Mode 11n-40 Tx 2452MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4904.000	PK	41.7	30.6	4.7	31.4	45.6	73.9	28.3	
Hori	7356.000	PK	41.8	36.0	5.6	32.4	51.0	73.9	22.9	
Hori	9808.000	PK	42.2	39.5	6.4	33.1	55.0	73.9	18.9	
Hori	4904.000	AV	33.8	30.6	4.7	31.4	37.7	53.9	16.2	
Hori	7356.000	AV	34.8	36.0	5.6	32.4	44.0	53.9	9.9	
Hori	9808.000	AV	35.3	39.5	6.4	33.1	48.1	53.9	5.8	
Vert	4924.000	PK	41.7	30.7	4.7	31.4	45.7	73.9	28.2	
Vert	7386.000	PK	43.0	36.1	5.6	32.4	52.3	73.9	21.6	
Vert	9848.000	PK	42.5	39.6	6.4	33.1	55.4	73.9	18.5	
Vert	4924.000	AV	33.6	30.7	4.7	31.4	37.6	53.9	16.3	
Vert	7386.000	AV	35.0	36.1	5.6	32.4	44.3	53.9	9.6	
Vert	9848.000	AV	35.3	39.6	6.4	33.1	48.2	53.9	5.7	

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

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

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

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

Marker-Delta Method Data Sheet (RBW:30kHz)

FREQ [MHz]	Field strength of band-edge*		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	RESULT [dBuV/m]		Limit AV [dBuV/m]	MARGIN [dB]	
	HOR	VER					HOR	VER		HOR	VER
2483.5	59.4	53.6	26.5	32.6	2.6	0.0	55.9	50.1	73.9	18.0	23.8
2483.5	54.2	48.7	26.5	32.6	2.6	0.0	50.7	45.2	53.9	3.2	8.7

*Field Strength of band-edge
Spectrum Analyzer Reading

Step	Fundamental(2452MHz)	Polarity	Hor [dBuV]			Ver [dBuV]			
			Detector	PK	AV(RMS)	PK	PK	AV(RMS)	PK
Step 1)	Fundamental(2452MHz)		1MHz	103.4	98.2	-	100.7	95.8	-
Step 2)	Fundamental(2452MHz)		30kHz	-	-	94.5	-	-	92.0
	Band-edge(2483.5MHz)		30kHz	-	-	50.5	-	-	44.9
	Amplitude delta *1		-	-	-	44.0	-	-	47.1
Step 3)	Field strength of band-edge *2		-	59.4	54.2	-	53.6	48.7	-

*1 Amplitude delta = Fundamental(RBW:30kHz) - Band-edge(RBW:30kHz)

*2 Field strength of band-edge = Fundamental(RBW:1MHz) - Amplitude delta

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/12/2013 06/12/2013
Temperature/ Humidity 23 deg. C / 63% RH 23 deg. C / 63% RH
Engineer Takayuki Shimada Takumi Shimada
(1-26.5GHz) (30-1000MHz)
Mode BT LE Tx 2402MHz

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	45.293	QP	29.0	12.1	7.3	32.1	-	16.3	40.0	23.7	
Hori	101.745	QP	45.9	10.3	8.1	32.1	-	32.2	43.5	11.3	
Hori	148.503	QP	40.0	14.9	8.6	32.1	-	31.4	43.5	12.1	
Hori	718.762	QP	36.5	20.6	12.4	32.0	-	37.5	46.0	8.5	
Hori	742.473	QP	37.4	21.0	12.6	31.9	-	39.1	46.0	6.9	
Hori	890.972	QP	31.5	22.1	13.3	31.0	-	35.9	46.0	10.1	
Hori	2390.000	PK	45.9	28.2	2.3	32.4	-	44.0	73.9	29.9	
Hori	4804.000	PK	41.4	30.5	4.8	31.4	-	45.3	73.9	28.6	
Hori	9608.000	PK	42.6	39.0	6.4	33.0	-	55.0	73.9	18.9	
Hori	2390.000	AV	36.8	28.2	2.3	32.4	-	34.9	53.9	19.0	
Hori	4804.000	AV	32.3	30.5	4.8	31.4	1.98	38.2	53.9	15.7	
Hori	9608.000	AV	33.6	39.0	6.4	33.0	1.98	48.0	53.9	5.9	
Vert	41.601	QP	39.4	13.8	7.2	32.2	-	28.2	40.0	11.8	
Vert	104.339	QP	45.3	10.7	8.1	32.1	-	32.0	43.5	11.5	
Vert	148.501	QP	42.9	14.9	8.6	32.1	-	34.3	43.5	9.2	
Vert	718.762	QP	32.6	20.6	12.4	32.0	-	33.6	46.0	12.4	
Vert	742.474	QP	33.9	21.0	12.6	31.9	-	35.6	46.0	10.4	
Vert	890.973	QP	30.9	22.1	13.3	31.0	-	35.3	46.0	10.7	
Vert	2390.000	PK	50.4	28.2	2.3	32.4	-	48.5	73.9	25.4	
Vert	4804.000	PK	41.3	30.5	4.8	31.4	-	45.2	73.9	28.7	
Vert	9608.000	PK	42.4	39.0	6.4	33.0	-	54.8	73.9	19.1	
Vert	2390.000	AV	38.2	28.2	2.3	32.4	-	36.3	53.9	17.6	
Vert	4804.000	AV	32.4	30.5	4.8	31.4	1.98	38.3	53.9	15.6	
Vert	9608.000	AV	33.6	39.0	6.4	33.0	1.98	48.0	53.9	5.9	

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

*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

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	2402.000	PK	103.9	28.2	2.3	32.4	102.0	-	-	Carrier
Hori	2400.000	PK	60.1	28.2	2.3	32.4	58.2	82.0	23.8	
Hori	7206.000	PK	41.1	35.8	5.6	32.3	50.2	82.0	31.8	
Vert	2402.000	PK	102.1	28.2	2.3	32.4	100.2	-	-	Carrier
Vert	2400.000	PK	58.6	28.2	2.3	32.4	56.7	80.2	23.5	
Vert	7206.000	PK	43.0	35.8	5.6	32.3	52.1	80.2	28.1	

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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/12/2013 06/12/2013
Temperature/ Humidity 23 deg. C / 63% RH 23 deg. C / 63% RH
Engineer Takayuki Shimada Takumi Shimada
(1-26.5GHz) (30-1000MHz)
Mode BT LE Tx 2440MHz

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	45.285	QP	28.7	12.1	7.3	32.1	-	16.0	40.0	24.0	
Hori	101.731	QP	46.1	10.3	8.1	32.1	-	32.4	43.5	11.1	
Hori	148.501	QP	39.8	14.9	8.6	32.1	-	31.2	43.5	12.3	
Hori	718.762	QP	36.6	20.6	12.4	32.0	-	37.6	46.0	8.4	
Hori	742.473	QP	37.3	21.0	12.6	31.9	-	39.0	46.0	7.0	
Hori	890.971	QP	31.8	22.1	13.3	31.0	-	36.2	46.0	9.8	
Hori	4880.000	PK	41.2	30.6	4.7	31.4	-	45.1	73.9	28.8	
Hori	7320.000	PK	48.2	36.0	5.6	32.4	-	57.4	73.9	16.5	
Hori	9760.000	PK	42.7	39.4	6.4	33.0	-	55.5	73.9	18.4	
Hori	4880.000	AV	32.6	30.6	4.7	31.4	1.98	38.5	53.9	15.4	
Hori	7320.000	AV	40.6	36.0	5.6	32.4	1.98	51.8	53.9	2.1	
Hori	9760.000	AV	33.6	39.4	6.4	33.0	1.98	48.4	53.9	5.5	
Vert	41.548	QP	39.9	13.8	7.2	32.2	-	28.7	40.0	11.3	
Vert	104.319	QP	44.9	10.7	8.1	32.1	-	31.6	43.5	11.9	
Vert	148.502	QP	43.0	14.9	8.6	32.1	-	34.4	43.5	9.1	
Vert	718.763	QP	32.2	20.6	12.4	32.0	-	33.2	46.0	12.8	
Vert	742.472	QP	34.1	21.0	12.6	31.9	-	35.8	46.0	10.2	
Vert	890.973	QP	30.8	22.1	13.3	31.0	-	35.2	46.0	10.8	
Vert	4880.000	PK	41.3	30.6	4.7	31.4	-	45.2	73.9	28.7	
Vert	7320.000	PK	47.2	36.0	5.6	32.4	-	56.4	73.9	17.5	
Vert	9760.000	PK	42.6	39.4	6.4	33.0	-	55.4	73.9	18.5	
Vert	4880.000	AV	32.7	30.6	4.7	31.4	1.98	38.6	53.9	15.3	
Vert	7320.000	AV	39.6	36.0	5.6	32.4	1.98	50.8	53.9	3.1	
Vert	9760.000	AV	33.6	39.4	6.4	33.0	1.98	48.4	53.9	5.5	

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

*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

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Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10017505H
Date 06/12/2013 06/12/2013
Temperature/ Humidity 23 deg. C / 63% RH 23 deg. C / 63% RH
Engineer Takayuki Shimada Takumi Shimada
(1-26.5GHz) (30-1000MHz)
Mode BT LE Tx 2480MHz

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	45.225	QP	28.9	12.2	7.3	32.1	-	16.3	40.0	23.7	
Hori	101.733	QP	46.4	10.3	8.1	32.1	-	32.7	43.5	10.8	
Hori	148.503	QP	39.5	14.9	8.6	32.1	-	30.9	43.5	12.6	
Hori	718.763	QP	36.8	20.6	12.4	32.0	-	37.8	46.0	8.2	
Hori	742.474	QP	36.8	21.0	12.6	31.9	-	38.5	46.0	7.5	
Hori	890.971	QP	31.7	22.1	13.3	31.0	-	36.1	46.0	9.9	
Hori	2483.500	PK	71.1	28.4	2.3	32.3	-	69.5	73.9	4.4	
Hori	4960.000	PK	42.2	30.7	4.7	31.4	-	46.2	73.9	27.7	
Hori	7440.000	PK	47.3	36.2	5.6	32.4	-	56.7	73.9	17.2	
Hori	9920.000	PK	43.1	39.8	6.4	33.1	-	56.2	73.9	17.7	
Hori	2483.500	AV	43.9	28.4	2.3	32.3	-	42.3	53.9	11.6	
Hori	4960.000	AV	32.5	30.7	4.7	31.4	1.98	38.5	53.9	15.4	
Hori	7440.000	AV	38.6	36.2	5.6	32.4	1.98	50.0	53.9	3.9	
Hori	9920.000	AV	34.2	39.8	6.4	33.1	1.98	49.3	53.9	4.6	
Vert	41.563	QP	39.9	13.8	7.2	32.2	-	28.7	40.0	11.3	
Vert	104.338	QP	45.3	10.7	8.1	32.1	-	32.0	43.5	11.5	
Vert	148.501	QP	43.2	14.9	8.6	32.1	-	34.6	43.5	8.9	
Vert	718.763	QP	32.9	20.6	12.4	32.0	-	33.9	46.0	12.1	
Vert	742.473	QP	34.8	21.0	12.6	31.9	-	36.5	46.0	9.5	
Vert	890.972	QP	30.5	22.1	13.3	31.0	-	34.9	46.0	11.1	
Vert	2483.500	PK	69.4	28.4	2.3	32.3	-	67.8	73.9	6.1	
Vert	4960.000	PK	42.0	30.7	4.7	31.4	-	46.0	73.9	27.9	
Vert	7440.000	PK	46.8	36.2	5.6	32.4	-	56.2	73.9	17.7	
Vert	9920.000	PK	43.2	39.8	6.4	33.1	-	56.3	73.9	17.6	
Vert	2483.500	AV	42.7	28.4	2.3	32.3	-	41.1	53.9	12.8	
Vert	4960.000	AV	32.4	30.7	4.7	31.4	1.98	38.4	53.9	15.5	
Vert	7440.000	AV	38.8	36.2	5.6	32.4	1.98	50.2	53.9	3.7	
Vert	9920.000	AV	34.2	39.8	6.4	33.1	1.98	49.3	53.9	4.6	

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

*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

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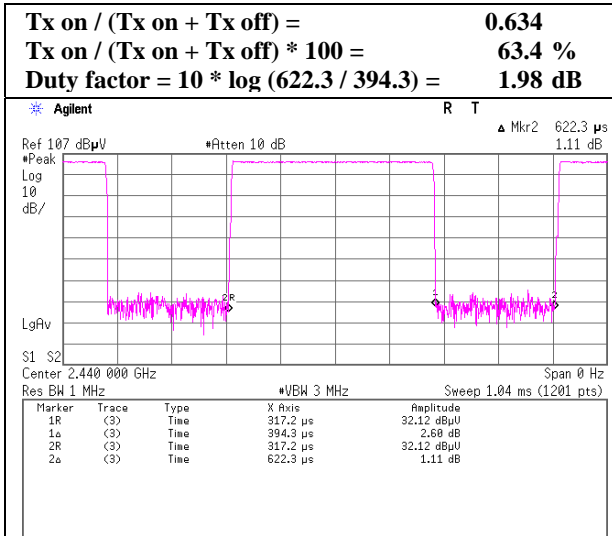
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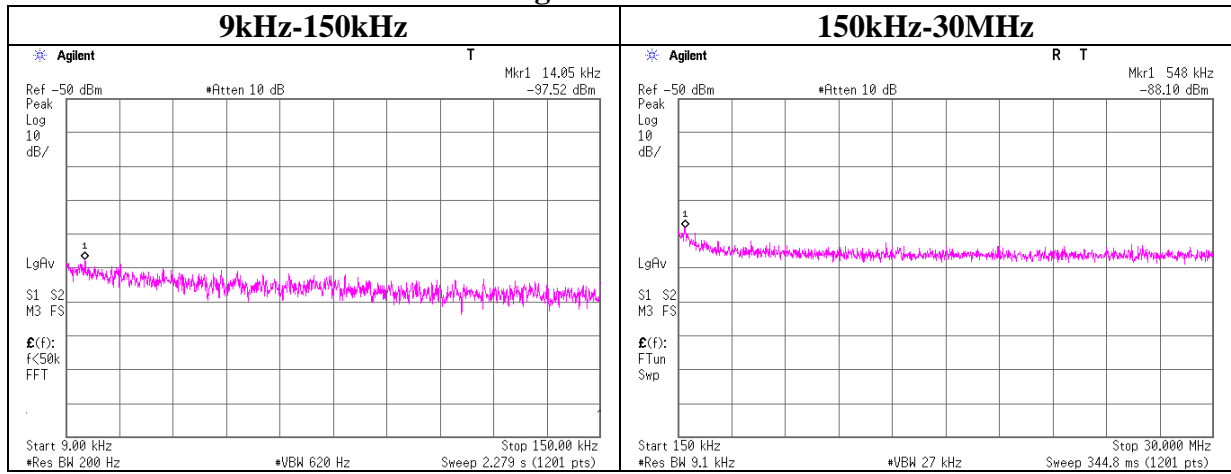
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Burst rate confirmation
BT LE



Conducted Spurious Emission

11g Tx 2462MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]
14.05	-97.5	0.81	10.0	2.0	2	-81.7	300.0	6.0	-20.4	44.7
548	-88.1	0.81	10.0	2.0	2	-72.3	300.0	6.0	-11.0	12.8

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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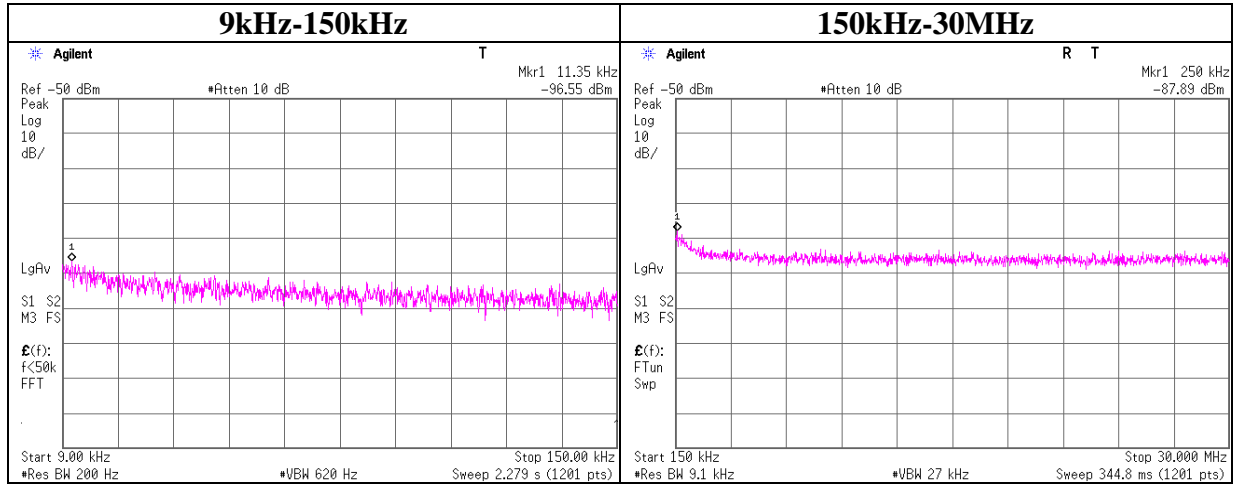
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Conducted Spurious Emission

BT LE Tx 2402MHz



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]
11.35	-96.6	0.81	10.0	2.0	-83.7	300.0	6.0	-22.5	46.5
250	-87.9	0.81	10.0	2.0	-75.1	300.0	6.0	-13.8	19.6

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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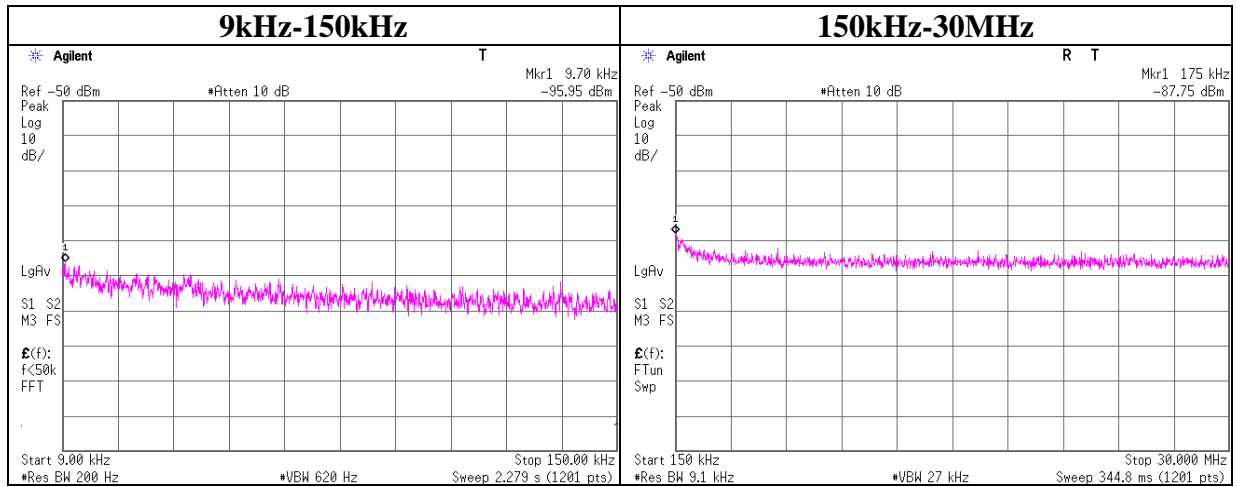
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Conducted Spurious Emission

BT LE Tx 2440MHz



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]
9.70	-96.0	0.81	10.0	2.0	-83.1	300.0	6.0	-21.9	47.9
175	-87.8	0.81	10.0	2.0	-74.9	300.0	6.0	-13.7	22.7

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

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

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Head Office EMC Lab.

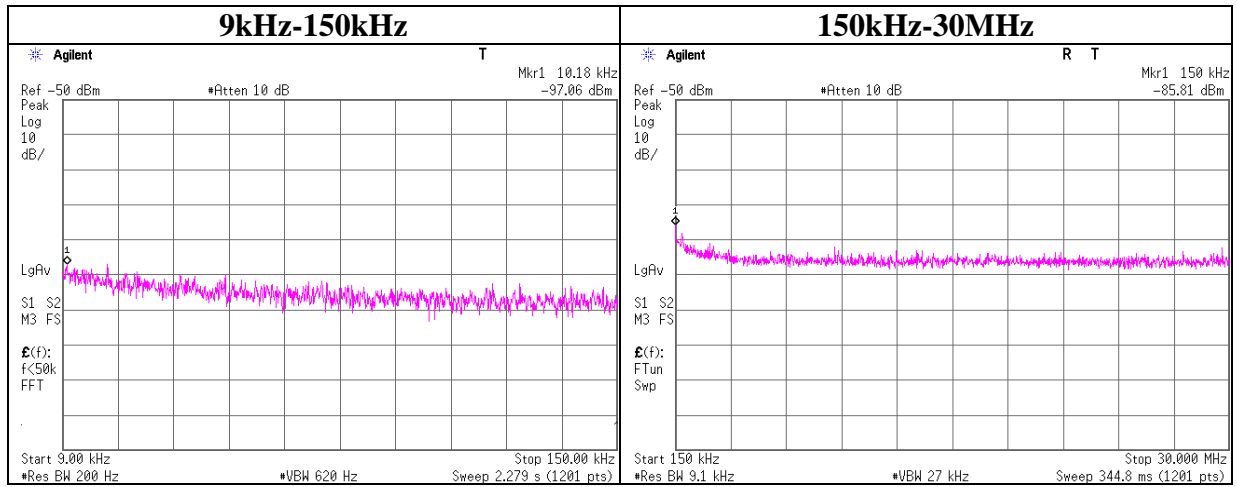
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Conducted Spurious Emission

BT LE Tx 2440MHz



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]
10.18	-97.1	0.81	10.0	2.0	-84.3	300.0	6.0	-23.0	47.4
150	-85.8	0.81	10.0	2.0	-73.0	300.0	6.0	-11.7	24.1

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

UL Japan, Inc.

Head Office EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Power Density

Test place : Head Office EMC Lab. No.6 Measurement Room
 Report No. : 10017505H
 Date : 06/06/2013
 Temperature/ Humidity : 25 deg. C / 57% RH
 Engineer : Takumi Shimada
 Mode : 11b Tx

Antenna A + B

Freq. [MHz]	Antenna A	Antenna B	Result		Limit [dBm]	Margin [dB]
	Result [mW]	Result [mW]	[dBm]	[mW]		
2412.00	0.030	0.032	-12.07	0.062	8.00	20.07
2437.00	0.032	0.038	-11.52	0.070	8.00	19.52
2462.00	0.030	0.035	-11.92	0.064	8.00	19.92

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-27.32	2.08	10.01	-15.23	0.030	8.00	23.23
2437.00	-26.98	2.08	10.01	-14.89	0.032	8.00	22.89
2462.00	-27.37	2.09	10.01	-15.27	0.030	8.00	23.27

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-27.03	2.08	10.01	-14.94	0.032	8.00	22.94
2437.00	-26.29	2.08	10.01	-14.20	0.038	8.00	22.20
2462.00	-26.71	2.09	10.01	-14.61	0.035	8.00	22.61

Sample Calculation:

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

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Power Density

Test place : Head Office EMC Lab. No.6 Measurement Room
Report No. : 10017505H
Date : 06/06/2013
Temperature/ Humidity : 25 deg. C / 57% RH
Engineer : Takumi Shimada
Mode : 11g Tx

Antenna A + B

Freq. [MHz]	Antenna A	Antenna B	Result		Limit [dBm]	Margin [dB]
	Result [mW]	Result [mW]	[dBm]	[mW]		
2412.00	0.146	0.216	-4.41	0.362	8.00	12.41
2437.00	0.141	0.218	-4.45	0.359	8.00	12.45
2462.00	0.145	0.205	-4.56	0.350	8.00	12.56

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-20.44	2.08	10.01	-8.35	0.146	8.00	16.35
2437.00	-20.60	2.08	10.01	-8.51	0.141	8.00	16.51
2462.00	-20.48	2.09	10.01	-8.38	0.145	8.00	16.38

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-18.74	2.08	10.01	-6.65	0.216	8.00	14.65
2437.00	-18.70	2.08	10.01	-6.61	0.218	8.00	14.61
2462.00	-18.98	2.09	10.01	-6.88	0.205	8.00	14.88

Sample Calculation:

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

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Power Density

Test place : Head Office EMC Lab. No.6 Measurement Room
Report No. : 10017505H
Date : 06/06/2013
Temperature/ Humidity : 25 deg. C / 57% RH
Engineer : Takumi Shimada
Mode : 11n-20 Tx

Antenna A + B

Freq. [MHz]	Antenna A	Antenna B	Result		Limit [dBm]	Margin [dB]
	Result [mW]	Result [mW]	[dBm]	[mW]		
2412.00	0.133	0.181	-5.03	0.314	8.00	13.03
2437.00	0.155	0.216	-4.31	0.370	8.00	12.31
2462.00	0.127	0.187	-5.03	0.314	8.00	13.03

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-20.86	2.08	10.01	-8.77	0.133	8.00	16.77
2437.00	-20.20	2.08	10.01	-8.11	0.155	8.00	16.11
2462.00	-21.06	2.09	10.01	-8.96	0.127	8.00	16.96

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-19.51	2.08	10.01	-7.42	0.181	8.00	15.42
2437.00	-18.75	2.08	10.01	-6.66	0.216	8.00	14.66
2462.00	-19.38	2.09	10.01	-7.28	0.187	8.00	15.28

Sample Calculation:

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

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Power Density

Test place : Head Office EMC Lab. No.6 Measurement Room
 Report No. : 10017505H
 Date : 06/06/2013
 Temperature/ Humidity : 25 deg. C / 57% RH
 Engineer : Takumi Shimada
 Mode : 11n-40 Tx

Antenna A + B

Freq. [MHz]	Antenna A	Antenna B	Result		Limit [dBm]	Margin [dB]
	Result [mW]	Result [mW]	[dBm]	[mW]		
2422.00	0.112	0.152	-5.79	0.264	8.00	13.79
2437.00	0.124	0.149	-5.63	0.274	8.00	13.63
2452.00	0.128	0.154	-5.51	0.281	8.00	13.51

Sample Calculation:

Result = Antenna A + B

Antenna A

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2422.00	-21.59	2.08	10.01	-9.50	0.112	8.00	17.50
2437.00	-21.14	2.08	10.01	-9.05	0.124	8.00	17.05
2452.00	-21.04	2.09	10.01	-8.94	0.128	8.00	16.94

Antenna B

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2422.00	-20.28	2.08	10.01	-8.19	0.152	8.00	16.19
2437.00	-20.35	2.08	10.01	-8.26	0.149	8.00	16.26
2452.00	-20.23	2.09	10.01	-8.13	0.154	8.00	16.13

Sample Calculation:

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

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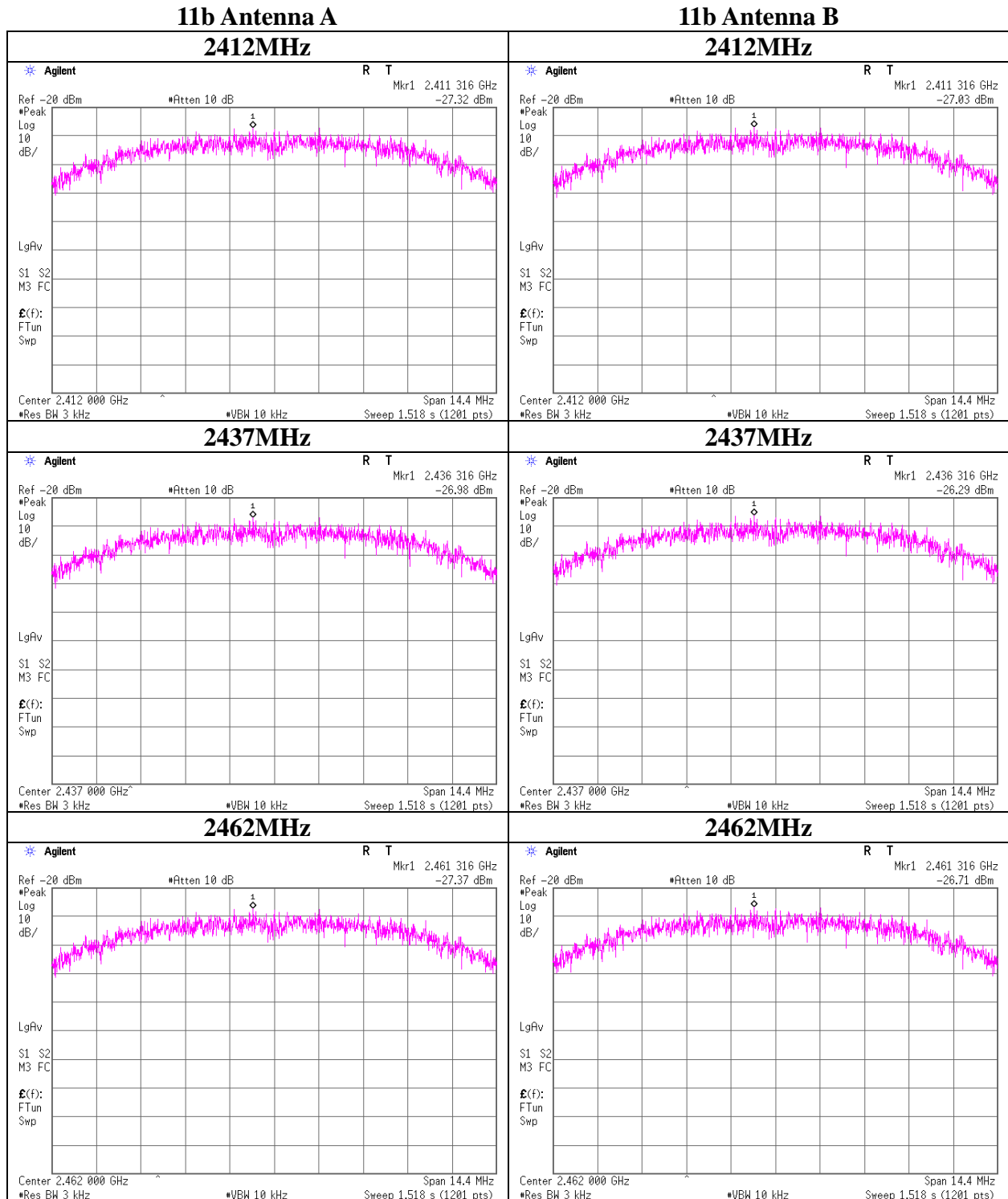
Head Office EMC Lab.

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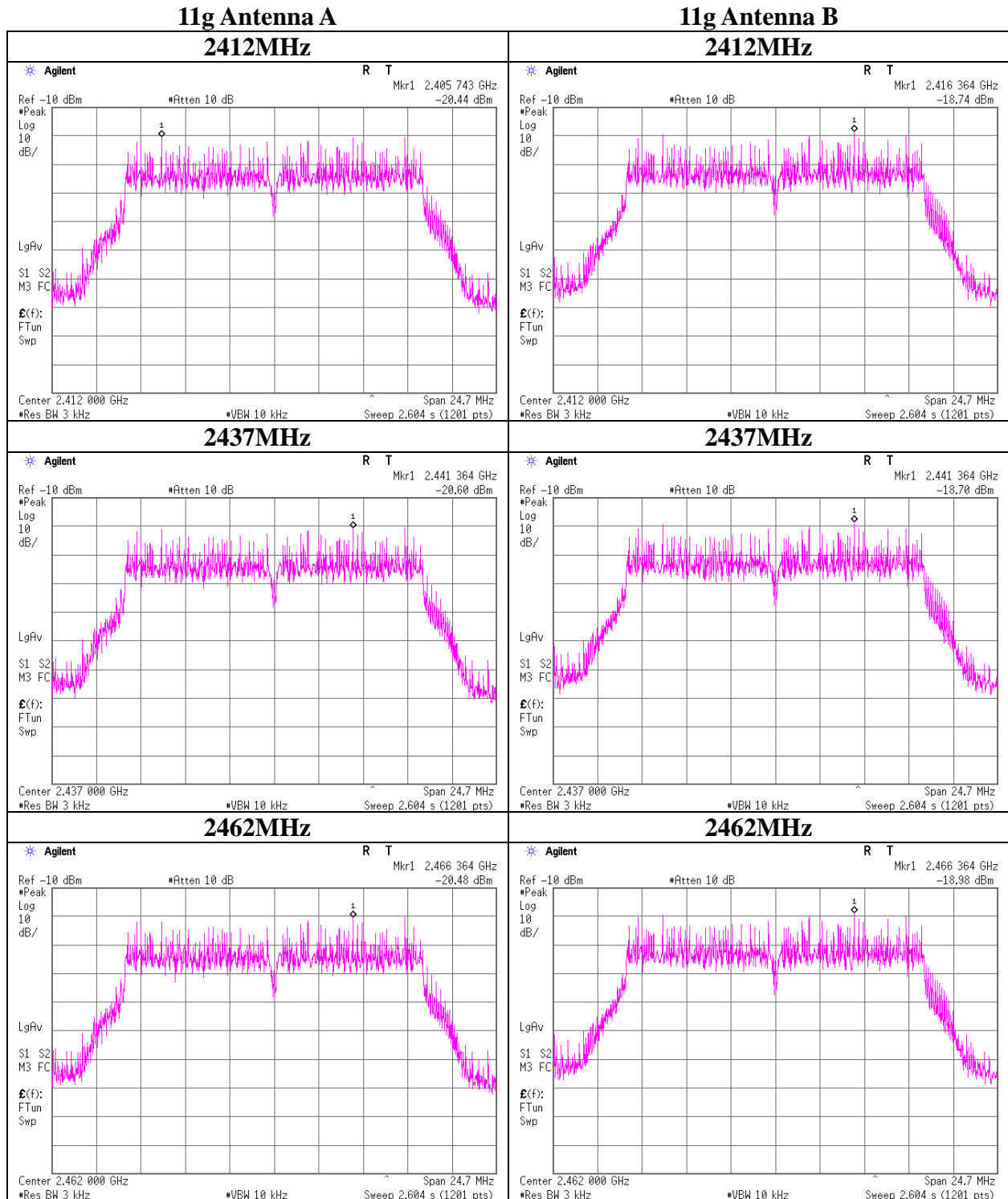
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Power Density



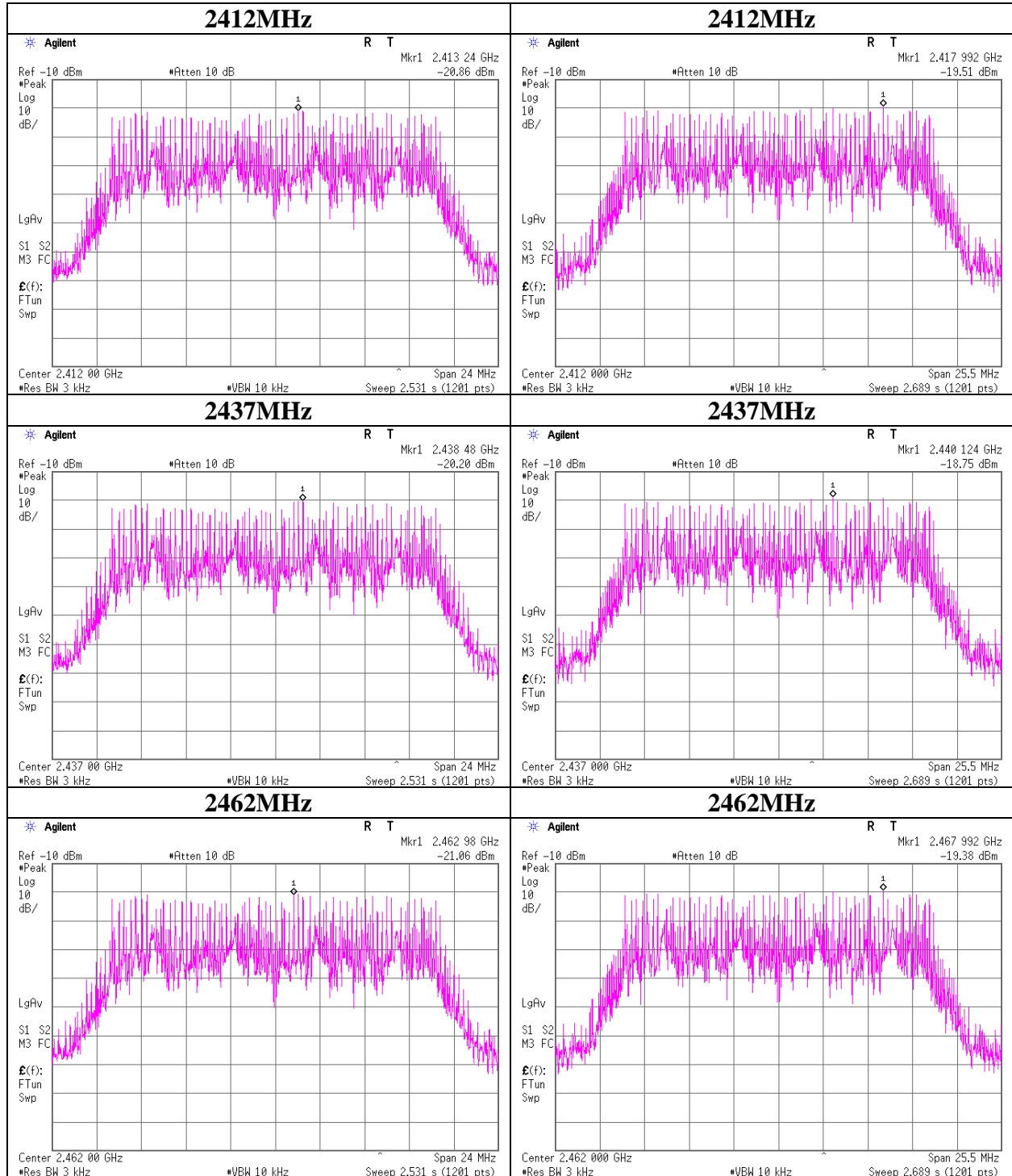
Power Density



Power Density

11n-20 Antenna A

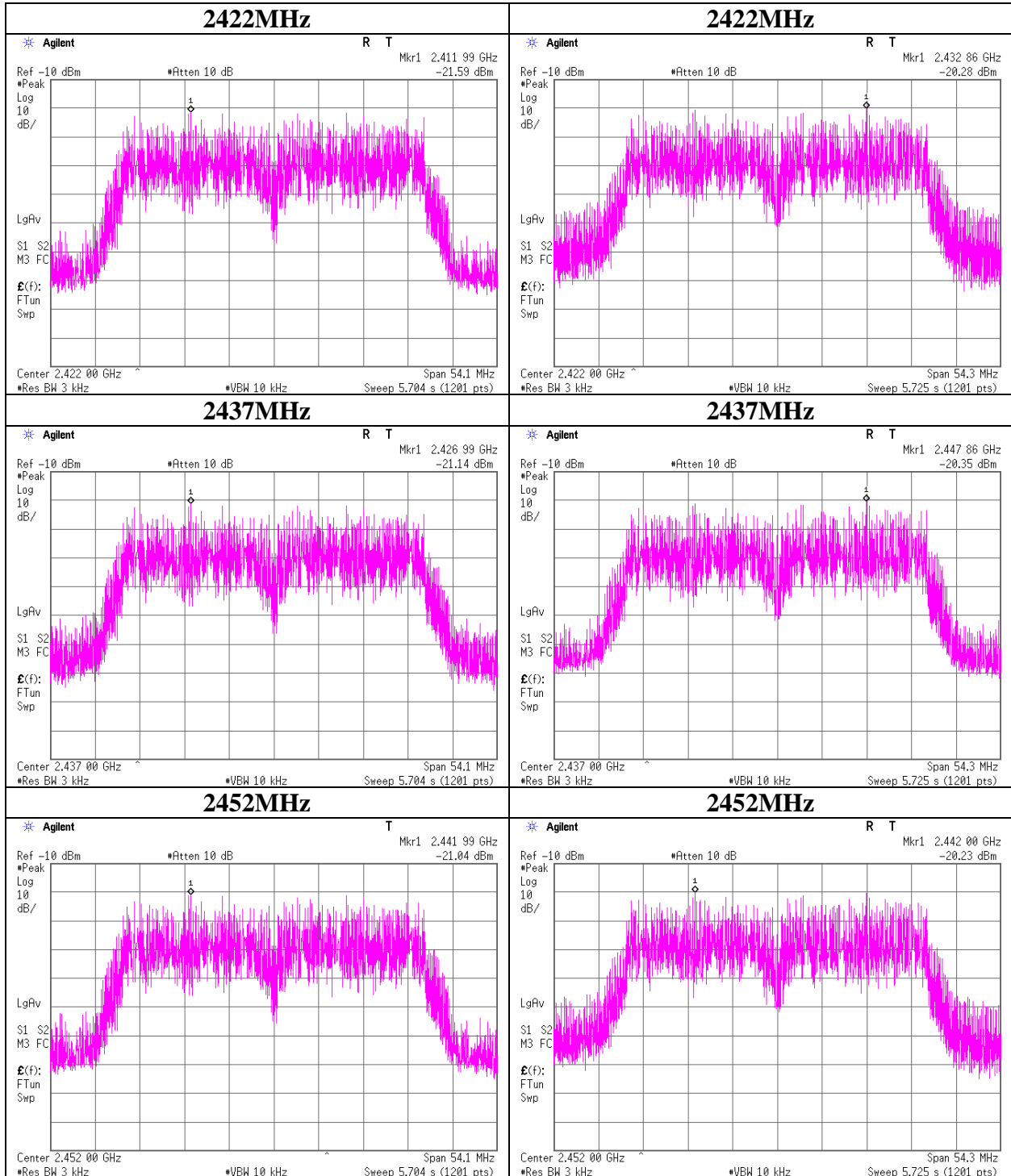
11n-20 Antenna B



Power Density

11n-40 Antenna A

11n-40 Antenna B



Power Density

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 10017505H
Date 06/06/2013
Temperature/ Humidity 25 deg. C / 57% RH
Engineer Takumi Shimada
Mode BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-28.01	2.07	10.01	-15.93	0.03	8.00	23.93
2437.00	-27.50	2.08	10.01	-15.41	0.03	8.00	23.41
2462.00	-27.30	2.09	10.01	-15.20	0.03	8.00	23.20

Sample Calculation:

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

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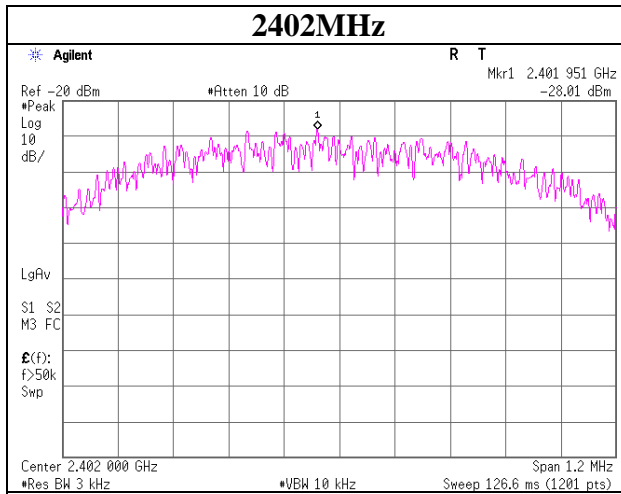
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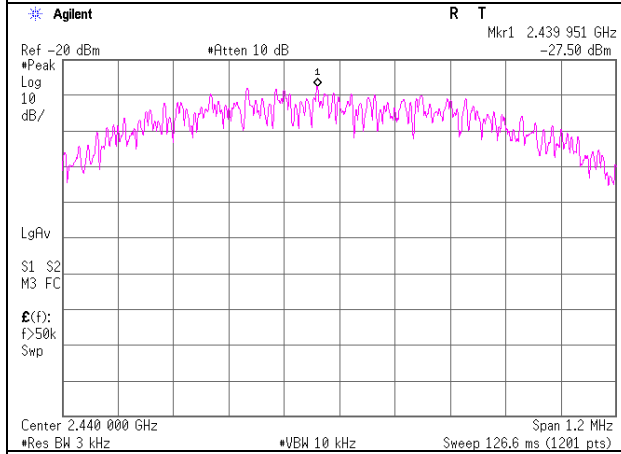
Power Density

BT LE

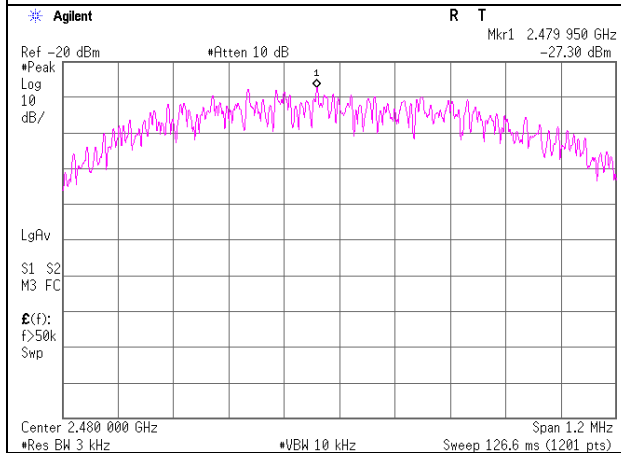
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2440MHz



2480MHz



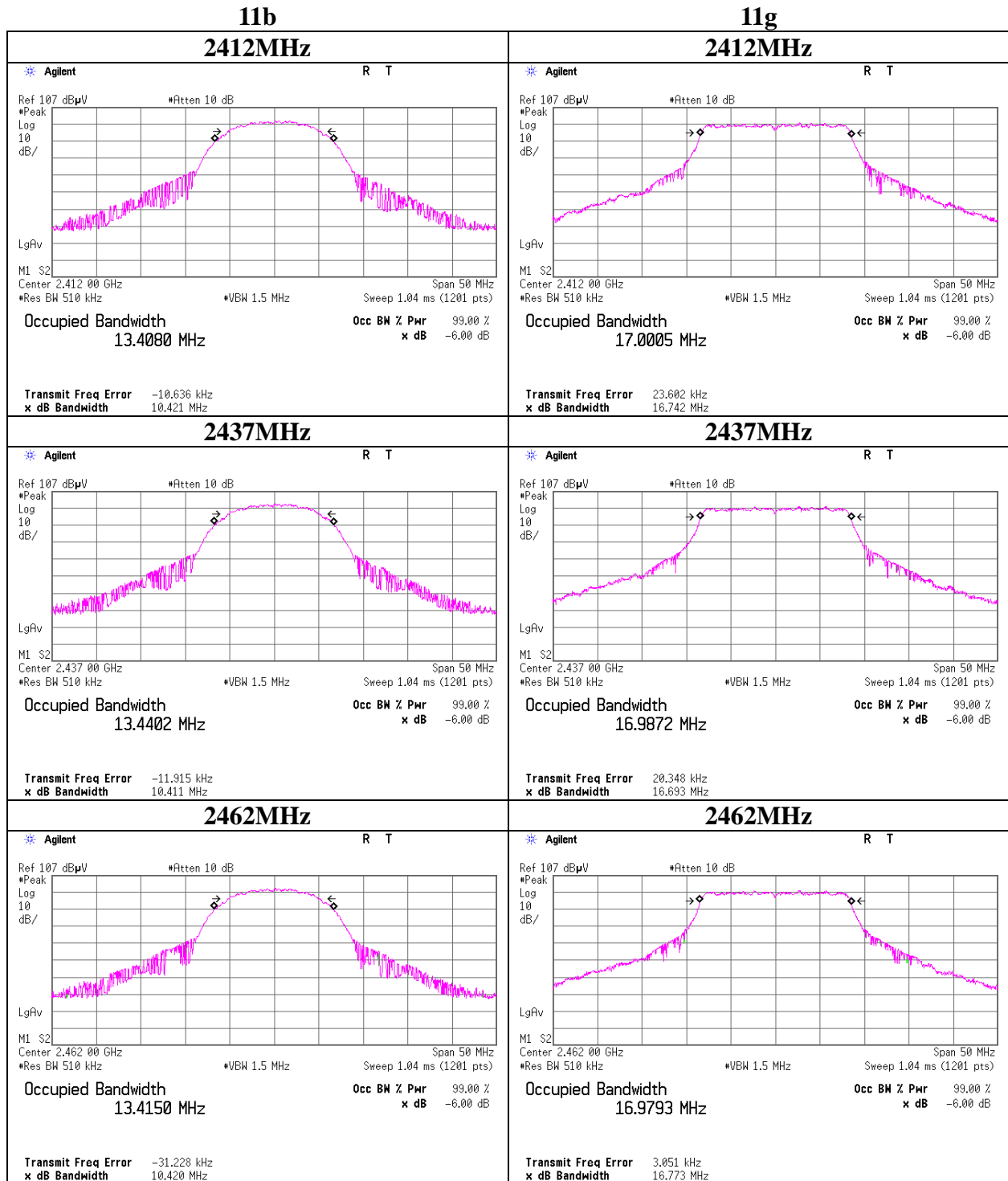
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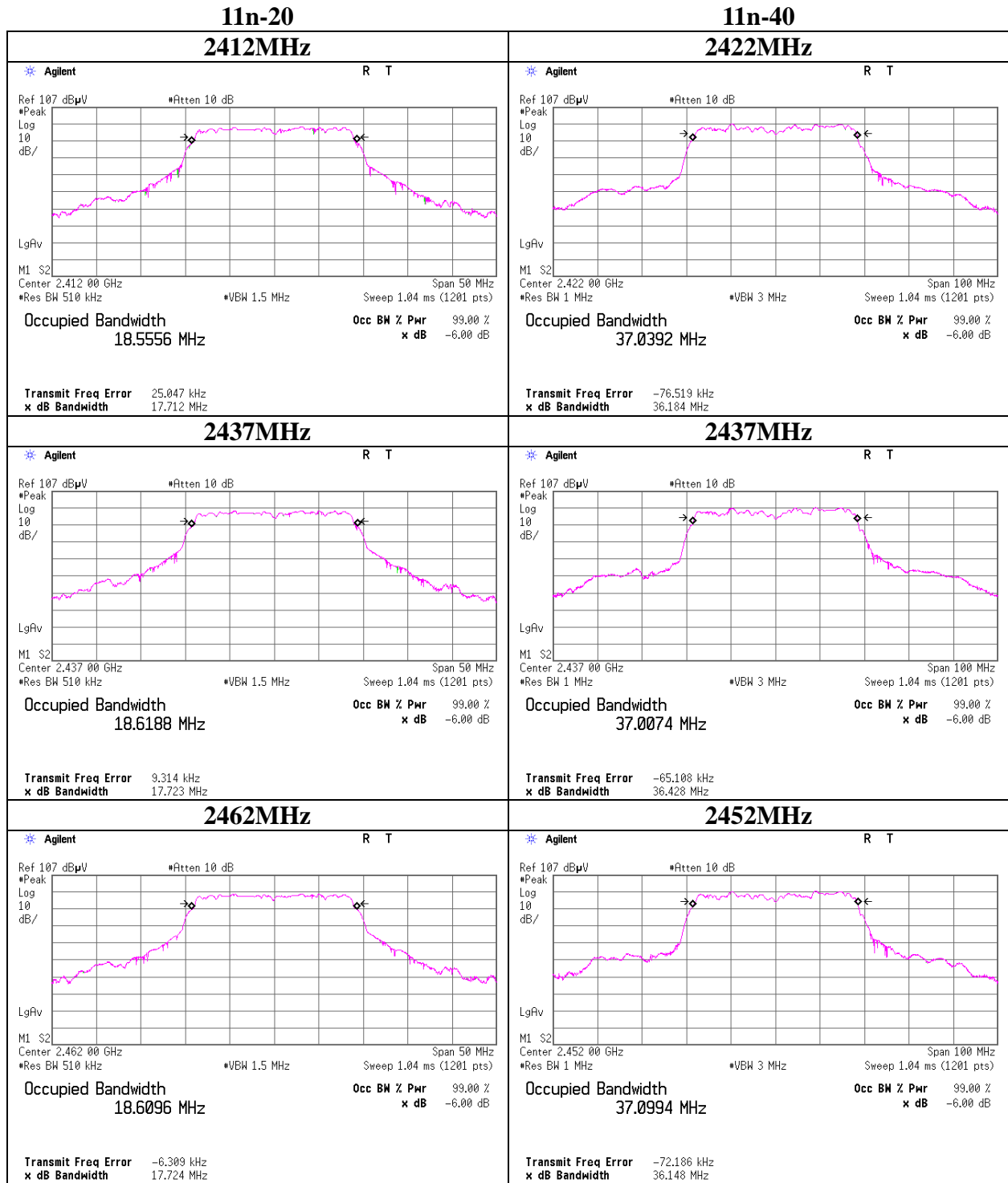
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99% Occupied Bandwidth



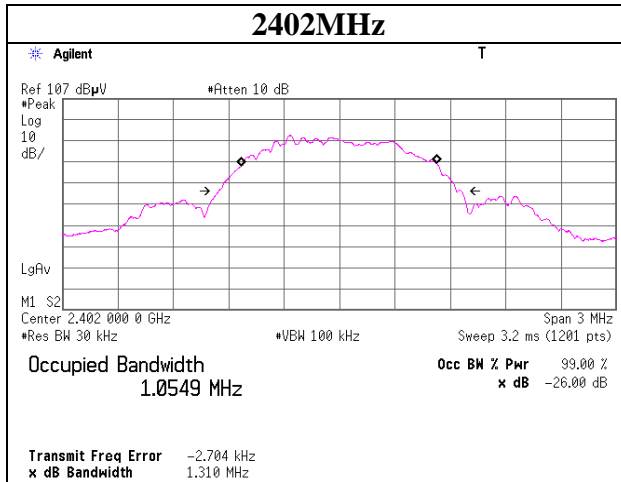
99% Occupied Bandwidth



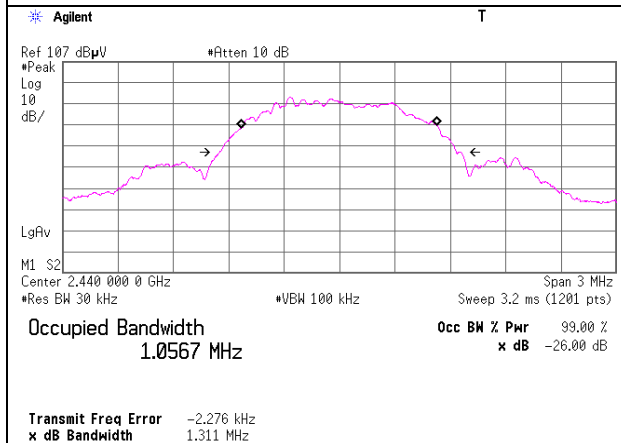
99% Occupied Bandwidth

BT LE

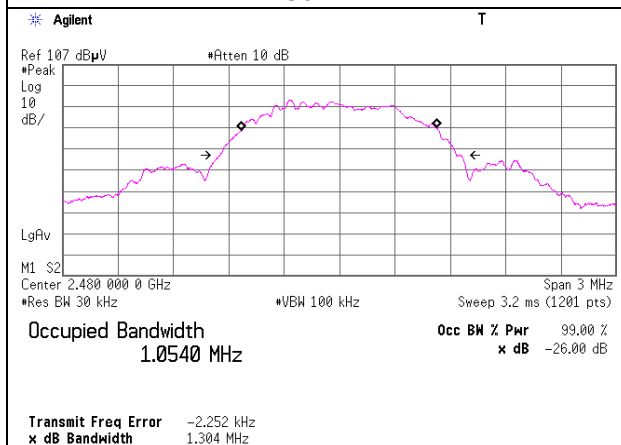
2402MHz



2440MHz



2480MHz



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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2013/04/03 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2013/03/21 * 12
MCC-67	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28635/2	AT	2013/04/16 * 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
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	AT	2013/02/26 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	CE/RE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	CE/RE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	CE/RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	CE/RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	CE	2012/11/21 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	CE/RE	2012/08/23 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(EUT)	2013/01/07 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(AE)	2013/01/07 * 12
MTA-30	Terminator	TME	CT-01	-	CE	2013/01/10 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2012/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/22 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2012/11/20 * 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	2012/09/05 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2013/03/12 * 12
MHA-16	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	RE	2013/05/17 * 12
MCC-76	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278967/4	RE	2012/12/24 * 12
MHF-19	High Pass Filter 3.5-18.0GHz	TOKIMEC	TF323DCA	602	RE	2012/09/12 * 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	2012/07/12 * 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: CE: Conducted Emission, RE: Radiated Emission, AT: Antenna Terminal Conducted test

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