




RADIO TEST REPORT


Test Report No. : 10941706S-C

Applicant : CASIO COMPUTER CO., LTD.
Type of Equipment : RF Module
Model No. : WSD-F10
FCC ID : BBQ-WSDF10
Test regulation : FCC Part 15 Subpart C: 2015
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. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

Date of test: October 28 to November 1, 2015

Representative test engineer: 
Kenichi Adachi
Engineer
Consumer Technology Division

Approved by: 
Toyokazu Imamura
Leader
Consumer Technology Division



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 There is no testing item of "Non-accreditation".

UL Japan, Inc.

Shonan EMC Lab.

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13-EM-F0429

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SECTION 1: Customer information

Company Name : CASIO COMPUTER CO., LTD.
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Telephone Number : +81-42-579-7249
Facsimile Number : +81-42-579-7744
Contact Person : Munetaka Seo

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

2.1 Identification of E.U.T.

Type of Equipment : RF Module
Model No. : WSD-F10
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.8 V (Battery), DC 5.0V (USB)
Receipt Date of Sample : October 27, 2015
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model: WSD-F10 (referred to as the EUT in this report) is a RF Module.

General Specification

Clock frequency(ies) in the system : 32.768 kHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2402 MHz - 2480 MHz (BTLE)
2412 MHz - 2462 MHz (WLAN)
Modulation : DSSS
Antenna type : Reverse L type
Antenna Gain : -6.55 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015

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

* Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 7. AC powerline Conducted Emission measurements IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	19.7 dB DC 3.8 V line 0.37156 MHz, N, QP	Complied	-
6 dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r03 IC: -	FCC: Section 15.247(a)(2) IC: RSS-247 5.2(1)	See data.	Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 DTS Meas Guidance v03r03 IC: RSS-Gen 6.12	FCC: Section 15.247(b)(3) IC: RSS-247 5.4(4)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 DTS Meas Guidance v03r03 IC: -	FCC: Section 15.247(e) IC: RSS-247 5.2(2)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v03r03 IC: RSS-Gen 6.13	FCC: Section 15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	1.8 dB Tx BT LE 2402 MHz 12010.000 MHz, AV, Horizontal Tx BT LE 2440 MHz 12200.000 MHz, AV, Vertical	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)

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

*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r03 12.2.7.

In case any questions arise about test procedure, ANSI C 63.10:2013 is also referred. (ANSI C63.10:2013 is Non-accreditation)

FCC Part 15.31 (e)

This EUT provides stable voltage(DC 1.35 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 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 6.6	IC: -	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 $k = 2$.
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Item	Frequency range	Uncertainty (+/-)		
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	3.6 dB	3.4 dB	3.4 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.7 dB	3.5 dB	3.5 dB
	30 MHz-300 MHz	4.9 dB	4.9 dB	4.7 dB
	300 MHz-1 GHz	5.0 dB	5.0 dB	4.8 dB
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	5.7 dB	5.7 dB	5.7 dB
	18 GHz-40 GHz	4.5 dB	4.3 dB	4.3 dB

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

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.

3.5 Test Location

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JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

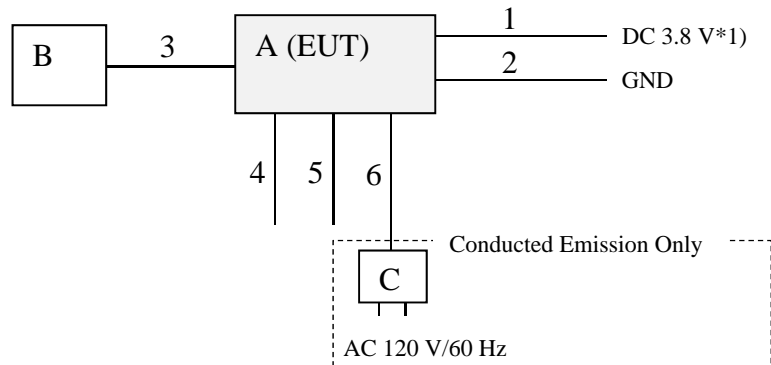
Test operating mode was determined as follows according to “Section 1 of 6 802.11 b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks*
Transmitting (Tx), IEEE 802.11b (11b)	2 Mbps, PN9
Transmitting (Tx), IEEE 802.11g (11g)	6 Mbps, PN9
Transmitting (Tx), IEEE 802.11n SISO 20 MHz BW (11n-20)	MCS 0, PN9
Transmitting (Tx), BT (Bluetooth) LE (Low energy)	PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*EUT has the power settings by the software as follows; - Power Setting: Fixed - Software: cmd.exe, ver5.12600.5512 This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission	Tx 11g	2462 MHz
	BT LE	2402 MHz 2440 MHz 2480 MHz
Spurious Emission (below 1 GHz)	Tx 11g	2462 MHz
	BT LE	2402 MHz 2440 MHz 2480 MHz
Spurious Emission (above 1 GHz)	Tx 11b	2412 MHz
	Tx 11g	2437 MHz
	Tx 11n-20	2462 MHz
	BT LE	2402 MHz 2440 MHz 2480 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	Tx 11b	2412 MHz
	Tx 11g	2437 MHz
	Tx 11n-20	2462 MHz
	BTLE	2402 MHz 2440 MHz 2480 MHz

4.2 Configuration and peripherals



*1) It is Open during Conducted Emission test with DC 5.0 V.

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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RF Module	WSD-F10	001 *1) 002 *2)	CASIO COMPUTER	EUT
B	LCD	-	-	CASIO COMPUTER	-
C	AC Adaptor	-	-	CASIO COMPUTER	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	0.3+1.5	Unshielded	Unshielded	-
2	DC	0.3+1.5	Unshielded	Unshielded	-
3	Signal	0.01	Unshielded	Unshielded	-
4	Signal	0.5	Unshielded	Unshielded	-
5	Signal	0.5	Unshielded	Unshielded	-
6	USB	0.5	Shielded	Shielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40 cm 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 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

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

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via DC power supply within a shielded room. The EUT via DC power supply 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 MHz – 30 MHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r03".

Below 1 GHz

EUT was placed on a platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

Above 1 GHz

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m 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 m and 4 m 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	30 MHz to 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *3)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: <u>12.2.5.2</u> RBW: 1 MHz, VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz
Test Distance	3m	4.45 m *1) (below 13 GHz), 1 m *2) (above 13 GHz)		4.45 m *1) (below 13 GHz), 1 m *2) (above 13 GHz)

*1) Distance Factor: $20 \times \log \left(\frac{3.0 \text{ m} + (1.5 \text{ m} - 0.05 \text{ m})}{3.0 \text{ m}} \right) = 3.4 \text{ dB}$

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

*3) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r03"

- 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.

Test Antenna	Frequency	Carrier	Spurious			
			30 MHz-1 GHz	1-13 GHz	13-18 GHz	18-26 GHz
Horizontal		X	X	X	X	X
Vertical		Y	Z	Z	Z	Z

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

Measurement range : 30 M - 26 GHz

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
6 dB Bandwidth	50 MHz or 10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3) *4)
Conducted Spurious Emission *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %.

*2) Reference data

*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r03".

*4) The test was not performed at RBW:3 kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3 kHz is less than the value of RBW:30 kHz and the test data met the limit with RBW:30 kHz.

*5) In the frequency range below 30 MHz, 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.

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: Test data

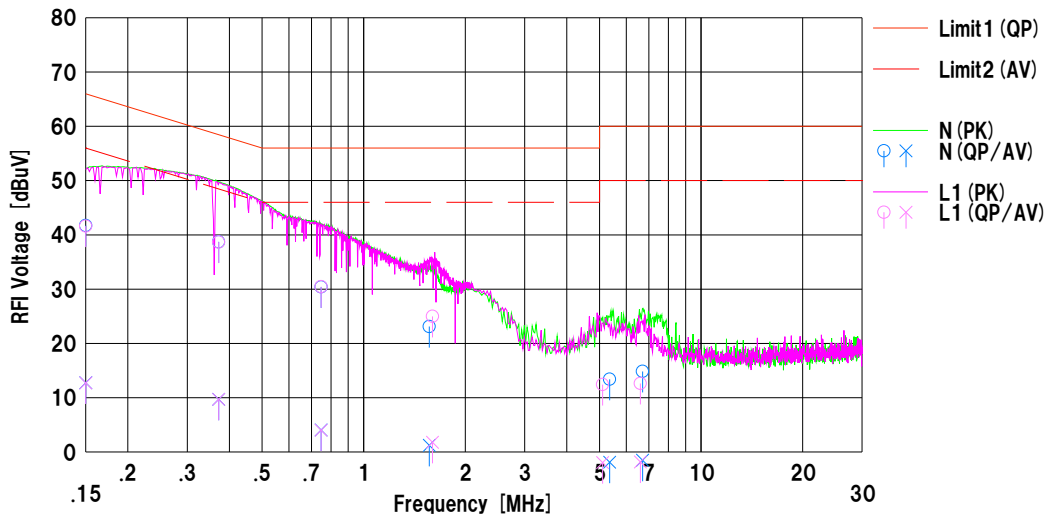
Conducted Emission
(DC 3.8 V line)
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/10/31

Mode : Tx. 11g, 2462 MHz
Power : AC 120 V / 60 Hz (EUT input:DC 3.8 V)
Temp./Humi. : 24 deg.C / 43 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kenichi Adachi



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	29.37	0.41	12.35	41.72	12.76	66.00	56.00	24.2	43.2	N	
2	0.37156	26.34	-2.66	12.37	38.71	9.71	58.47	48.47	19.7	38.7	N	
3	0.74826	18.00	-8.34	12.40	30.40	4.06	56.00	46.00	25.6	41.9	N	
4	1.56548	10.66	-11.23	12.45	23.11	1.22	56.00	46.00	32.8	44.7	N	
5	5.35786	0.72	-14.55	12.67	13.39	-1.88	60.00	50.00	46.6	51.8	N	
6	6.70964	2.12	-14.24	12.72	14.84	-1.52	60.00	50.00	45.1	51.5	N	
7	0.15000	29.25	0.38	12.35	41.60	12.73	66.00	56.00	24.4	43.2	L1	
8	0.37156	26.30	-2.67	12.37	38.67	9.70	58.47	48.47	19.8	38.7	L1	
9	0.74826	18.04	-8.38	12.40	30.44	4.02	56.00	46.00	25.5	41.9	L1	
10	1.59962	12.54	-10.67	12.45	24.99	1.78	56.00	46.00	31.0	44.2	L1	
11	5.10945	-0.22	-14.62	12.65	12.43	-1.97	60.00	50.00	47.5	51.9	L1	
12	6.60964	-0.10	-14.56	12.72	12.62	-1.84	60.00	50.00	47.3	51.8	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN=SLS-05 (US)

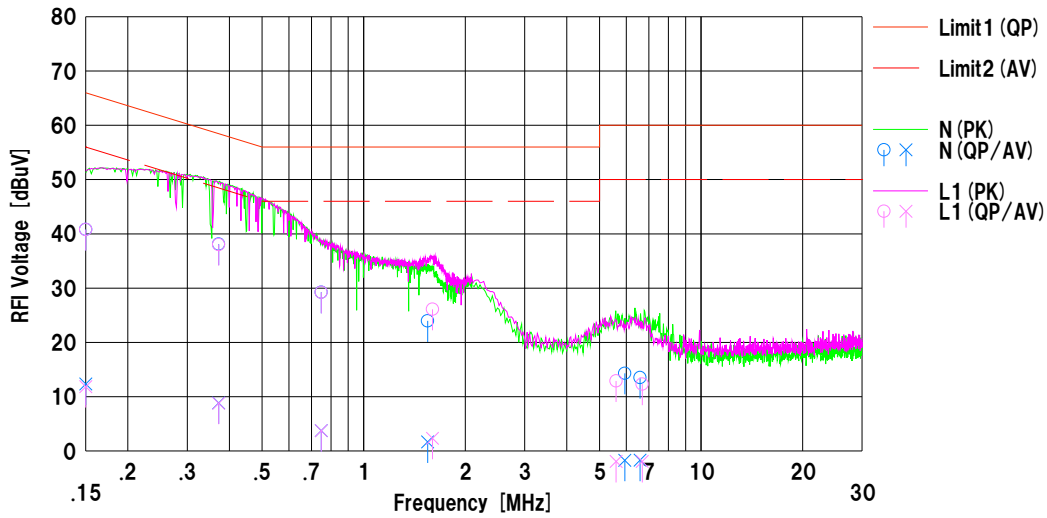
Conducted Emission
(DC 3.8 V line)
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/10/31

Mode : Tx, BLE, 2440 MHz
Power : AC 120 V / 60 Hz (EUT input:DC 3.8 V)
Temp./Humi. : 24 deg.C / 43 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kenichi Adachi



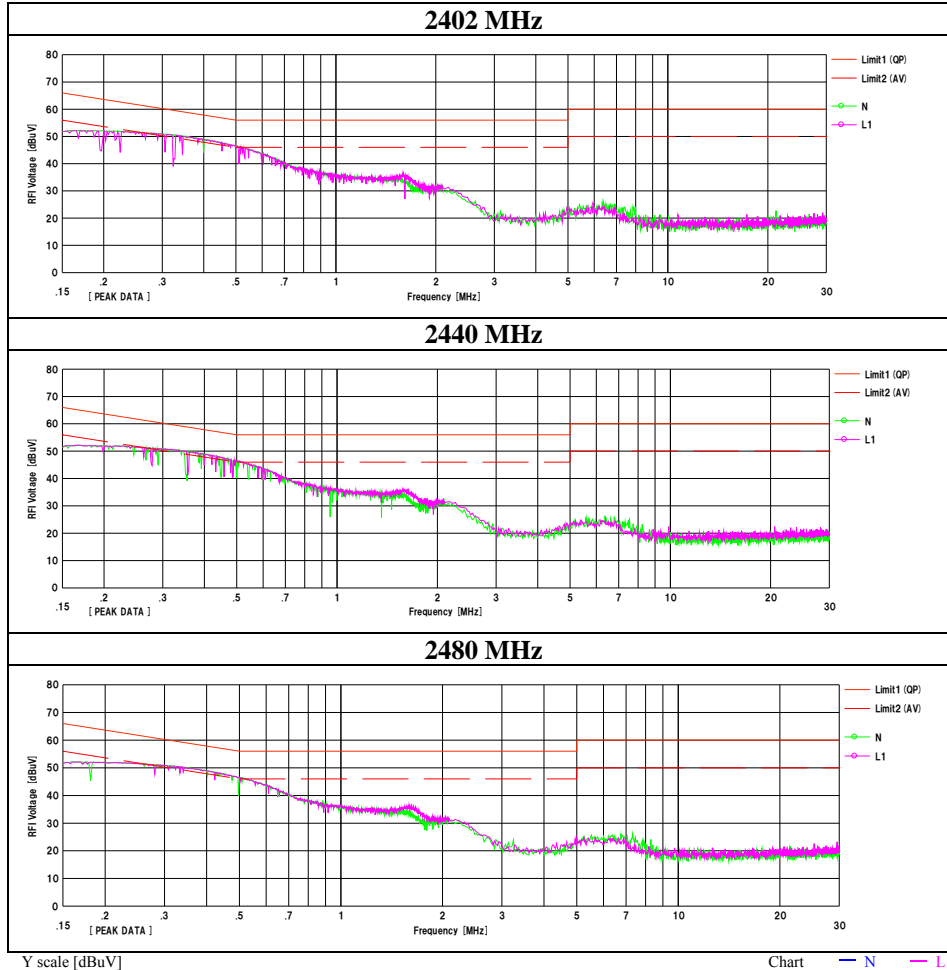
No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]	<QP> [dB]	<AV> [dB]		
1	0.15000	28.46	-0.02	12.35	40.81	12.33	66.00	56.00	25.1	43.6	N	
2	0.37178	25.74	-3.52	12.37	38.11	8.85	58.46	48.46	20.3	39.6	N	
3	0.74869	16.84	-8.65	12.40	29.24	3.75	56.00	46.00	26.7	42.2	N	
4	1.54757	11.52	-10.77	12.45	23.97	1.68	56.00	46.00	32.0	44.3	N	
5	5.94414	1.61	-14.40	12.69	14.30	-1.71	60.00	50.00	45.7	51.7	N	
6	6.59478	0.80	-14.41	12.72	13.52	-1.69	60.00	50.00	46.4	51.6	N	
7	0.15000	28.44	-0.50	12.35	40.79	11.85	66.00	56.00	25.2	44.1	L1	
8	0.37178	25.65	-3.58	12.37	38.02	8.79	58.46	48.46	20.4	39.6	L1	
9	0.74869	16.82	-8.68	12.40	29.22	3.72	56.00	46.00	26.7	42.2	L1	
10	1.59945	13.66	-10.12	12.45	26.11	2.33	56.00	46.00	29.8	43.6	L1	
11	5.59924	0.22	-14.60	12.67	12.89	-1.93	60.00	50.00	47.1	51.9	L1	
12	6.69474	-0.40	-14.64	12.72	12.32	-1.92	60.00	50.00	47.6	51.9	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN=SLS-05 (US)

Conducted Emission

(DC 3.8 V line)

Test place	Shonan EMC Lab. No.3 Shielded room
Report No.	10941706S-C
Date	October 31, 2015
Temperature / Humidity	24 deg. C / 43 % RH
Engineer	Kenichi Adachi
Mode	Tx BT LE



Y scale [dBuV]

Chart

— N — L

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Facsimile : +81 463 50 6401

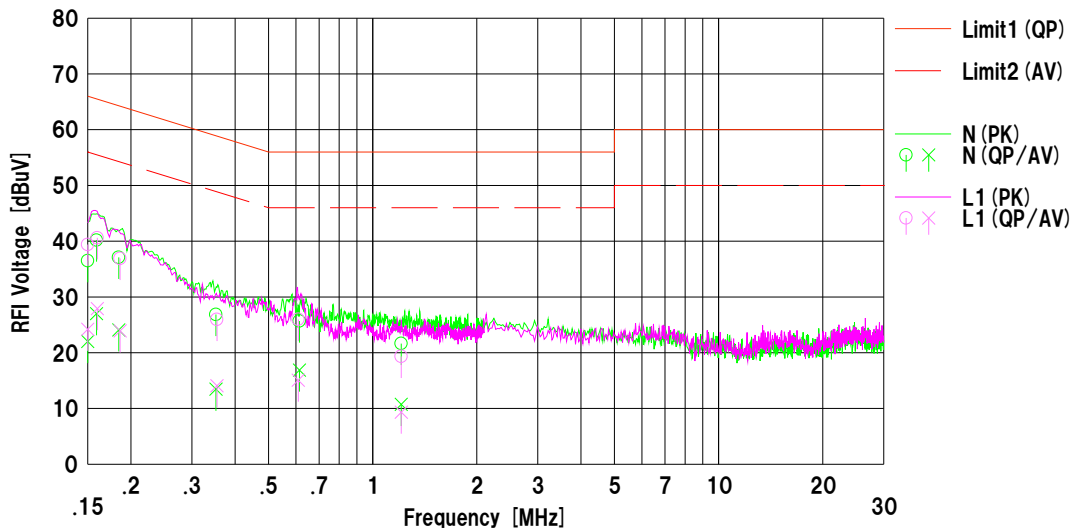
Conducted Emission
(DC 5.0 V line)
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/11/01

Mode : Tx, 11g, 2462 MHz
Power : DC 5 V (AC adapter input: AC 120 V / 60 Hz)
Temp./Humi. : 22 deg.C / 41 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<AV>		<QP>	<AV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	24.00	9.50	12.50	36.50	22.00	66.00	56.00	29.5	34.0	N	
2	0.15908	27.70	14.50	12.50	40.20	27.00	65.51	55.51	25.3	28.5	N	
3	0.18446	24.60	11.60	12.50	37.10	24.10	64.28	54.28	27.1	30.1	N	
4	0.35233	14.30	0.90	12.55	26.85	13.45	58.91	48.91	32.0	35.4	N	
5	0.61401	13.10	4.30	12.58	25.68	16.88	56.00	46.00	30.3	29.1	N	
6	1.20935	9.00	-1.90	12.63	21.63	10.73	56.00	46.00	34.3	35.2	N	
7	0.15001	26.90	11.70	12.50	39.40	24.20	66.00	56.00	26.6	31.8	L1	
8	0.15984	28.10	15.40	12.50	40.60	27.90	65.47	55.47	24.8	27.5	L1	
9	0.18614	24.40	11.40	12.51	36.91	23.91	64.21	54.21	27.3	30.3	L1	
10	0.35452	13.40	1.50	12.55	25.95	14.05	58.86	48.86	32.9	34.8	L1	
11	0.60922	13.40	2.50	12.58	25.98	15.08	56.00	46.00	30.0	30.9	L1	
12	1.20983	6.70	-3.30	12.63	19.33	9.33	56.00	46.00	36.6	36.6	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-02

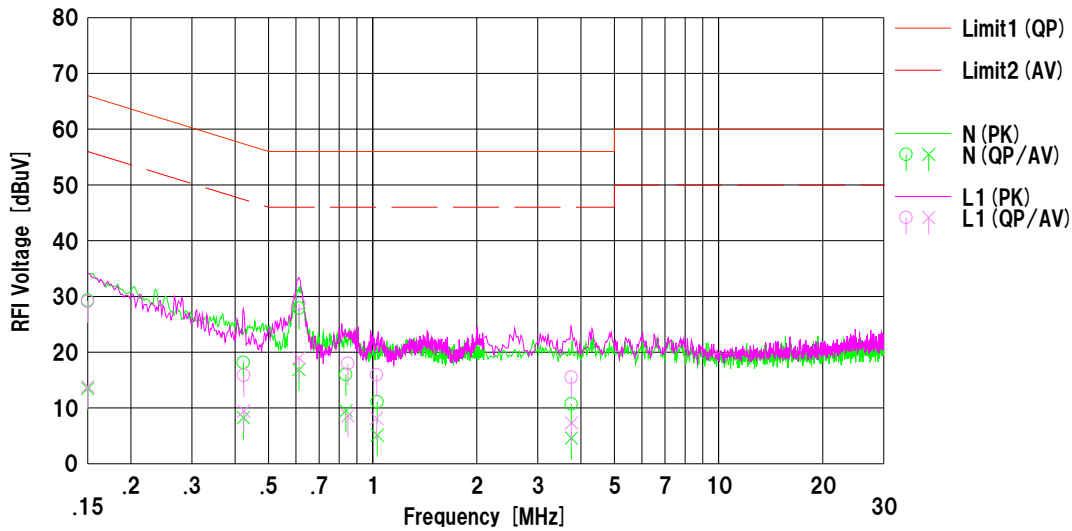
Conducted Emission
(DC 5.0 V line)
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/11/01

Mode : Tx, BLE, 2440 MHz
Power : DC 5 V (AC adapter input: AC 120 V / 60 Hz)
Temp./Humi. : 22 deg.C / 41 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa

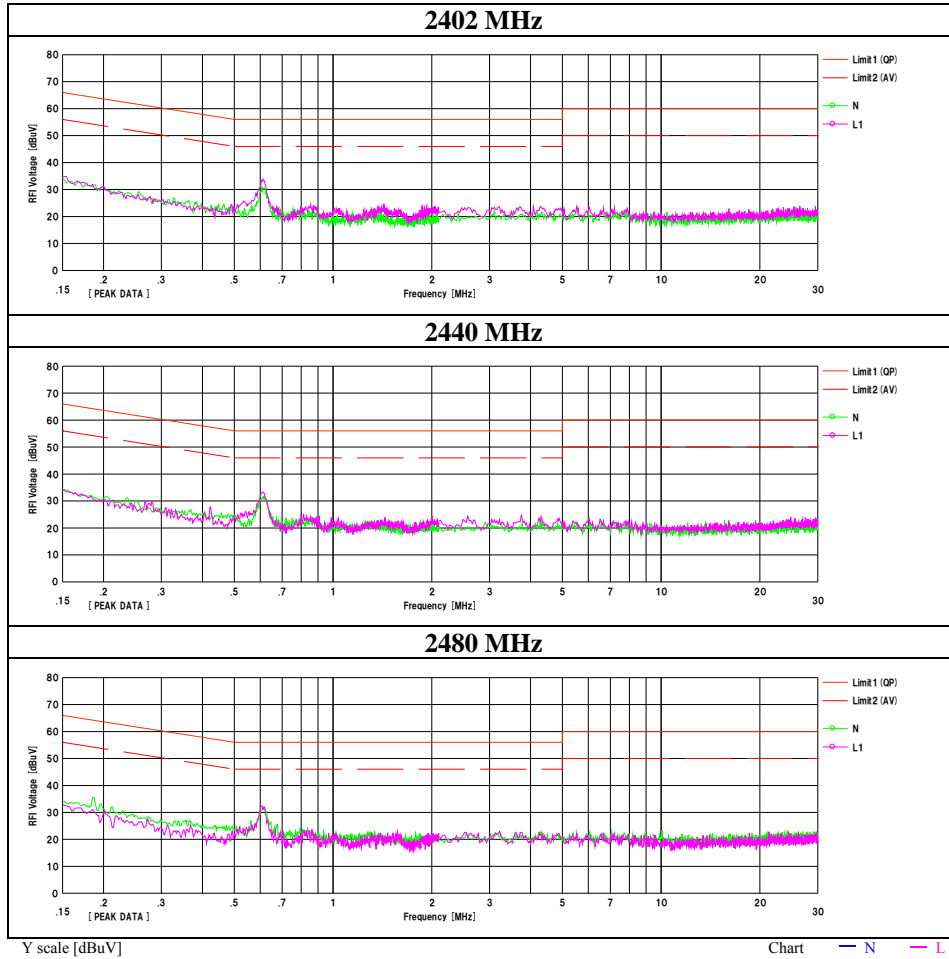


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]				
1	0.15001	16.80	1.00	12.50	29.30	13.50	66.00	56.00	36.7	42.5	N	
2	0.42288	5.60	-4.30	12.55	18.15	8.25	57.39	47.39	39.2	39.1	N	
3	0.61203	15.30	4.30	12.58	27.88	16.88	56.00	46.00	28.1	29.1	N	
4	0.83653	3.40	-3.10	12.59	15.99	9.49	56.00	46.00	40.0	36.5	N	
5	1.03082	-1.50	-7.50	12.61	11.11	5.11	56.00	46.00	44.8	40.8	N	
6	3.75201	-2.20	-8.30	12.90	10.70	4.60	56.00	46.00	45.3	41.4	N	
7	0.15001	16.60	1.30	12.50	29.10	13.80	66.00	56.00	36.9	42.2	L1	
8	0.42371	3.30	-3.10	12.55	15.85	9.45	57.38	47.38	41.5	37.9	L1	
9	0.61254	16.10	6.40	12.58	28.68	18.98	56.00	46.00	27.3	27.0	L1	
10	0.84846	5.40	-4.00	12.59	17.99	8.59	56.00	46.00	38.0	37.4	L1	
11	1.02662	3.30	-4.50	12.61	15.91	8.11	56.00	46.00	40.0	37.8	L1	
12	3.75332	2.60	-5.60	12.90	15.50	7.30	56.00	46.00	40.5	38.7	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-02

Conducted Emission (DC 5.0 V line)

Test place : Shonan EMC Lab. No.3 Shielded room
Report No. : 10941706S-C
Date : November 1, 2015
Temperature / Humidity : 22 deg. C / 41 % RH
Engineer : Yosuke Ishikawa
Mode : Tx BT LE

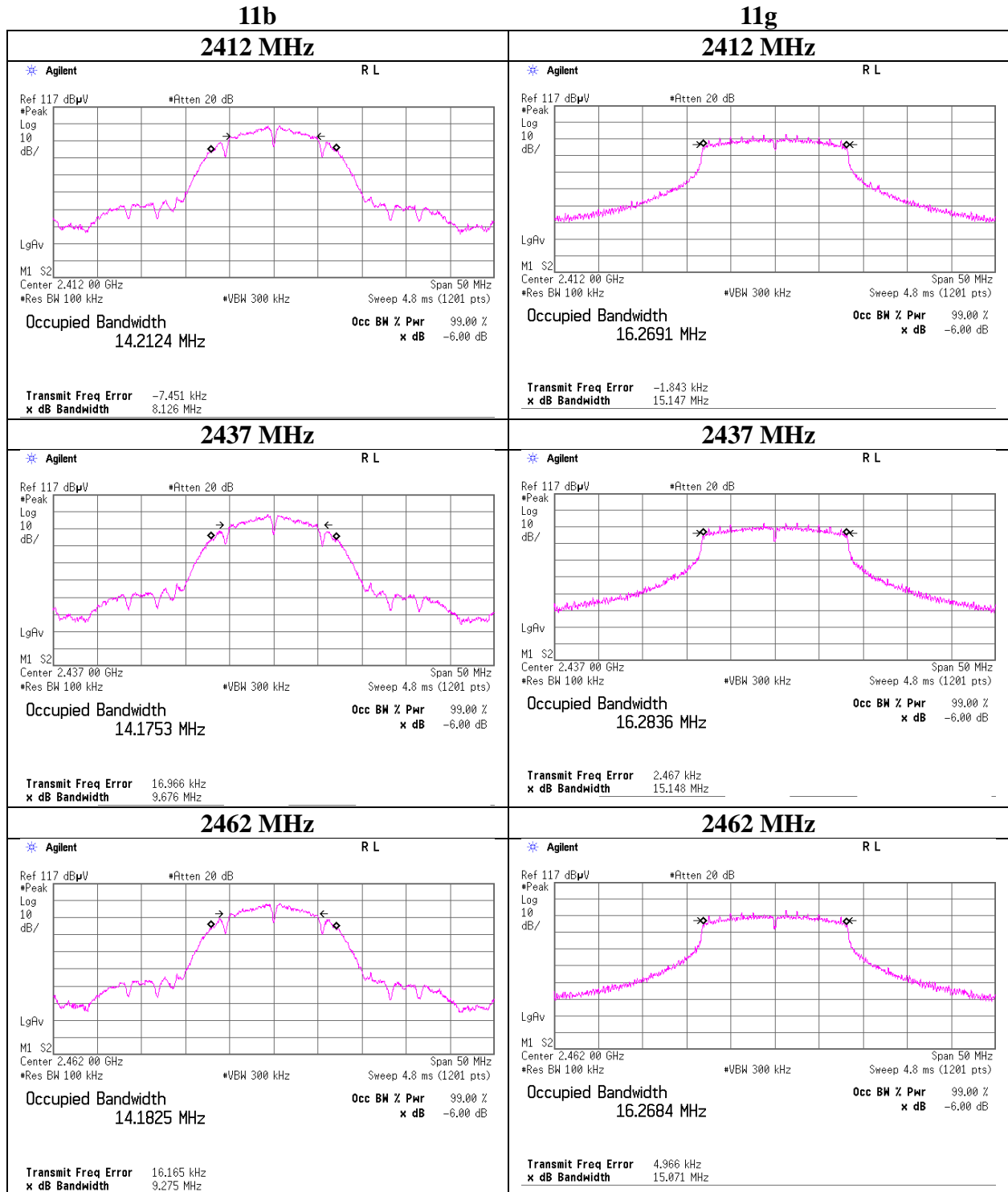


6dB Bandwidth

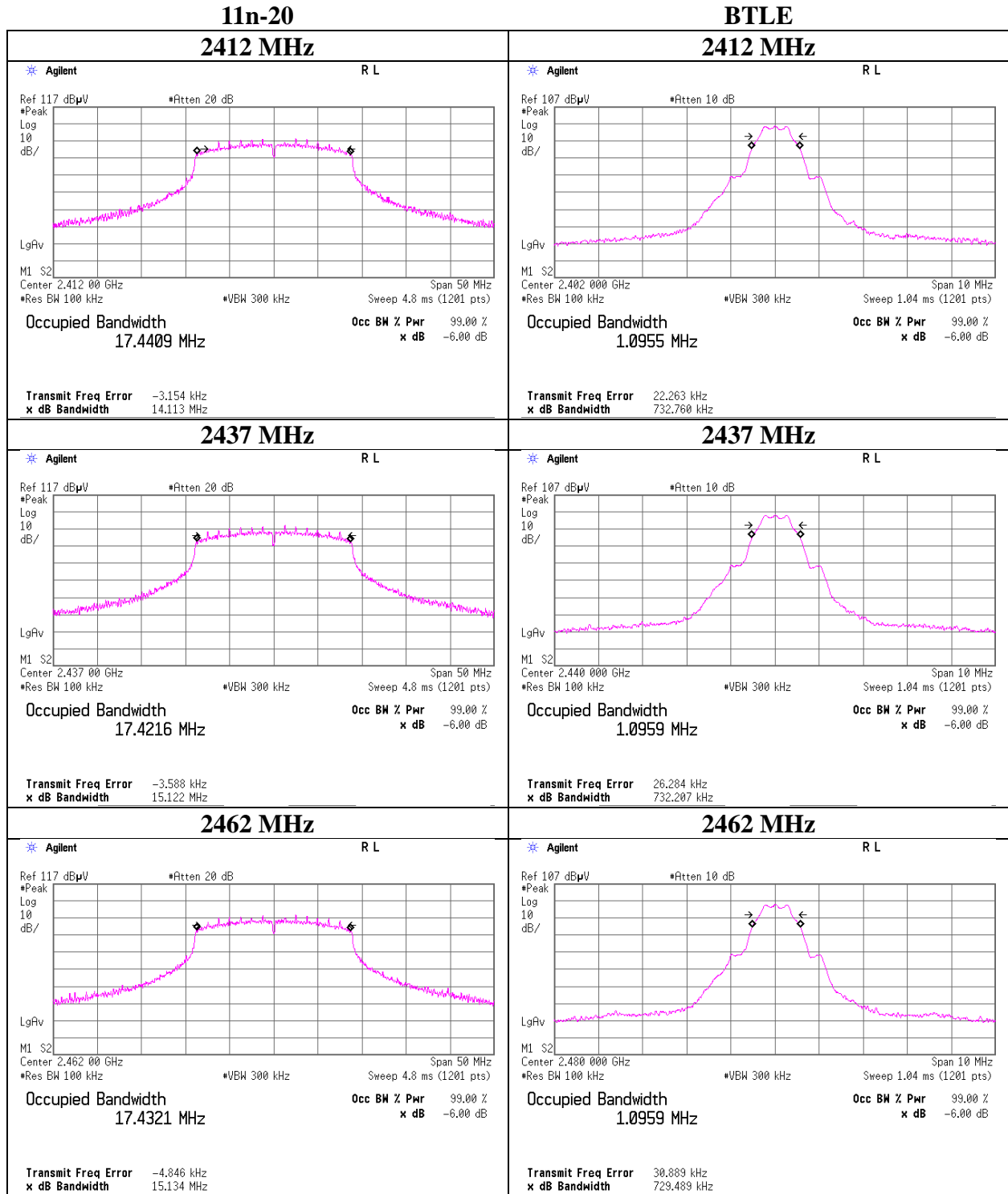
Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 10941706S-C
Date October 28, 2015
Temperature / Humidity 24 deg. C / 53 % RH
Engineer Tomohiro Hara
Mode Tx

Mode	Frequency [MHz]	6dB Bandwidth [MHz]	Limit [kHz]
11b	2412	8.126	> 500
	2437	9.676	> 500
	2462	9.275	> 500
11g	2412	15.147	> 500
	2437	15.148	> 500
	2462	15.071	> 500
11n-20	2412	14.113	> 500
	2437	15.122	> 500
	2462	15.134	> 500
BTLE	2402	0.733	> 500
	2440	0.732	> 500
	2480	0.729	> 500

6dB Bandwidth



6dB Bandwidth



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 10941706S-C
Date : October 28, 2015
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Tomohiro Hara
Mode : Tx 11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	9.06	0.89	9.93	19.88	97.27	30.00	1000	10.12
2437	9.21	0.89	9.93	20.03	100.69	30.00	1000	9.97
2462	9.34	0.89	9.93	20.16	103.75	30.00	1000	9.84

Sample Calculation:

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

*The equipment and cables were not used for factor 0 dB of the data sheets.

2437MHz

Rate [Mbps]	Reading [dBm]	Remark
1	9.03	
2	9.21	*
5.5	8.95	
11	9.18	

*: Worst Rate

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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	10941706S-C
Date	October 28, 2015
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Tomohiro Hara
Mode	Tx 11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.78	0.89	9.93	23.60	229.09	30.00	1000	6.40
2437	12.64	0.89	9.93	23.46	221.82	30.00	1000	6.54
2462	12.80	0.89	9.93	23.62	230.14	30.00	1000	6.38

Sample Calculation:

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

*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	12.64	*
9	12.49	
12	12.43	
18	12.24	
24	12.27	
36	11.98	
48	11.95	
54	11.92	

*: Worst Rate

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

Maximum Peak Output Power

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 10941706S-C
Date : October 28, 2015
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Tomohiro Hara
Mode : Tx 11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	12.30	0.89	9.93	23.12	205.12	30.00	1000	6.88
2437	12.39	0.89	9.93	23.21	209.41	30.00	1000	6.79
2462	12.44	0.89	9.93	23.26	211.84	30.00	1000	6.74

Sample Calculation:

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

*The equipment and cables were not used for factor 0.0 dB of the data sheets.

2437 MHz

MCS Number	Reading [dBm]	Remark
0	12.39	*
1	12.10	
2	11.85	
3	11.79	
4	11.86	
5	11.30	
6	11.46	
7	11.35	

* Worst MCS

* Worst Condition

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

Maximum Peak Output Power

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 10941706S-C
Date October 28, 2015
Temperature / Humidity 24 deg. C / 53 % RH
Engineer Tomohiro Hara
Mode Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2402	-10.97	0.89	9.93	-0.15	0.97	30.00	1000	30.15
2440	-11.20	0.89	9.93	-0.38	0.92	30.00	1000	30.38
2480	-11.47	0.90	9.93	-0.64	0.86	30.00	1000	30.64

Sample Calculation:

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

*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data)

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 10941706S-C
Date : October 28, 2015
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Tomohiro Hara
Mode : Tx

11b 5.5 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	6.46	0.89	9.93	17.28	53.46	0.23	17.51	56.36
2437	6.40	0.89	9.93	17.22	52.72	0.23	17.45	55.59
2462	6.65	0.89	9.93	17.47	55.85	0.23	17.70	58.88

11g 9 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	2.12	0.89	9.93	12.94	19.68	0.41	13.35	21.63
2437	2.20	0.89	9.93	13.02	20.04	0.41	13.43	22.03
2462	2.24	0.89	9.93	13.06	20.23	0.41	13.47	22.23

11n-20 MCS 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	1.60	0.89	9.93	12.42	17.46	0.29	12.71	18.66
2437	1.67	0.89	9.93	12.49	17.74	0.29	12.78	18.97
2462	1.69	0.89	9.93	12.51	17.82	0.29	12.80	19.05

BTLE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Frame power)		Duty factor [dB]	Result (Burst power)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-13.30	0.89	9.93	-2.48	0.56	1.78	-0.70	0.85
2437	-13.55	0.89	9.93	-2.73	0.53	1.78	-0.95	0.80
2462	-13.83	0.90	9.93	-3.00	0.50	1.78	-1.22	0.76

Sample Calculation:

Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuat

Result (Burst power) = Frame power + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data)

Test place : Shonan EMC Lab. No.1 Measurement Room
Report No. : 10941706S-C
Date : October 28, 2015
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Tomohiro Hara
Mode : Tx

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	6.44	0.04	6.48	
	2	6.50	0.08	6.58	
	5.5	6.40	0.23	6.63	*
	11	6.20	0.40	6.60	
11g	6	2.23	0.27	2.50	
	9	2.20	0.41	2.61	*
	12	2.05	0.53	2.58	
	18	1.75	0.73	2.48	
	24	1.60	0.98	2.58	
	36	1.13	1.37	2.50	
	48	0.77	1.72	2.49	
	54	0.60	1.81	2.41	

* Worst rate

Sample Calculation:

$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

2437 MHz

Mode	Rate MCS	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20	0	1.67	0.29	1.96	*
	1	1.37	0.57	1.94	
	2	1.06	0.76	1.82	
	3	0.80	1.02	1.82	
	4	0.52	1.31	1.83	
	5	0.18	1.68	1.86	
	6	0.10	1.78	1.88	
	7	-0.08	1.90	1.82	

* Worst rate

Sample Calculation:

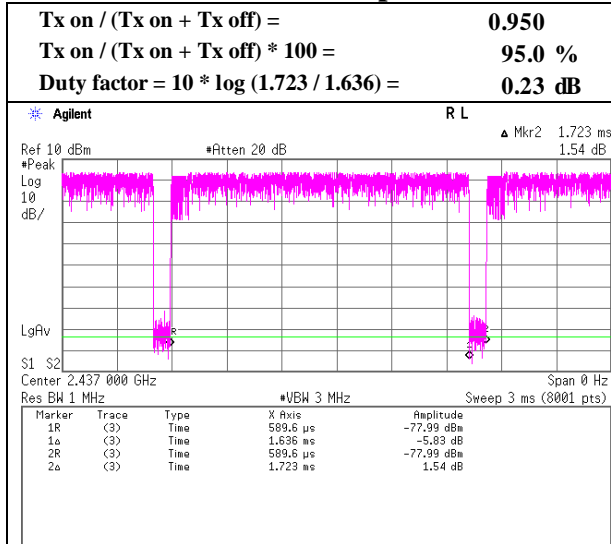
$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

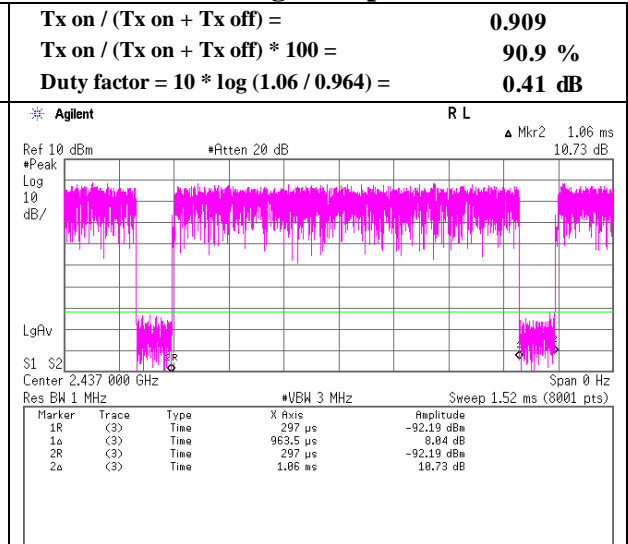
Burst rate confirmation
 (for Average output power)

Test place : Shonan EMC Lab. No.1 Measurement Room
 Report No. : 10941706S-C
 Date : October 28, 2015
 Temperature / Humidity : 24 deg. C / 53 % RH
 Engineer : Tomohiro Hara
 Mode : Tx

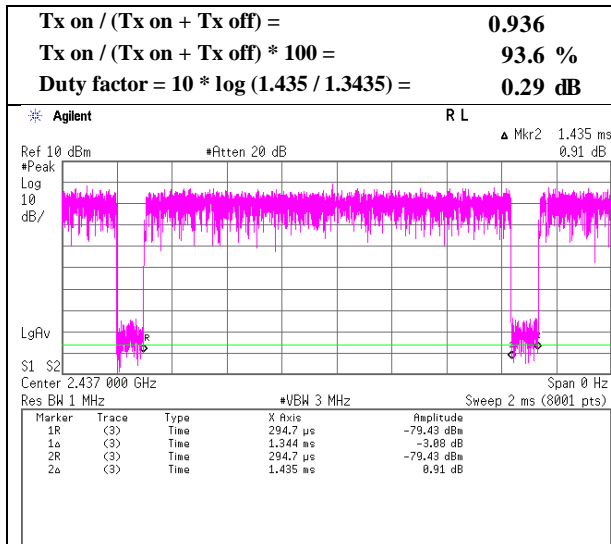
11b 5.5 Mbps



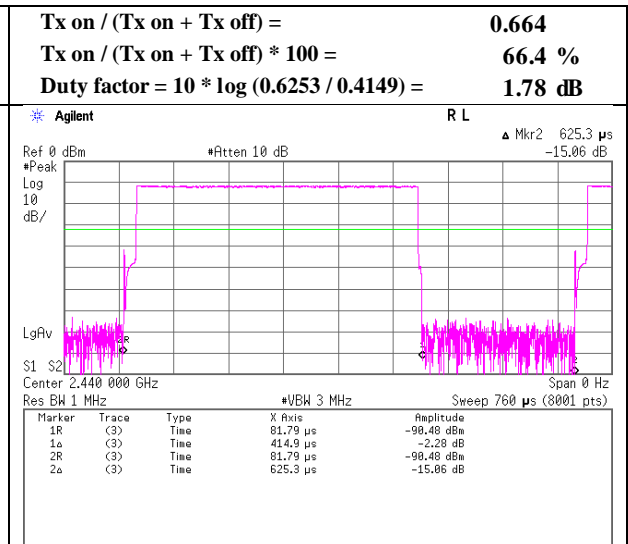
11g 9 Mbps



11n-20 MCS 0



BTLE

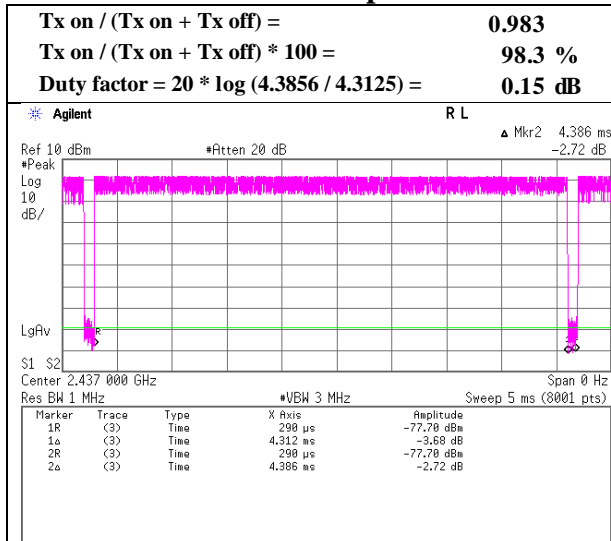


Burst rate confirmation

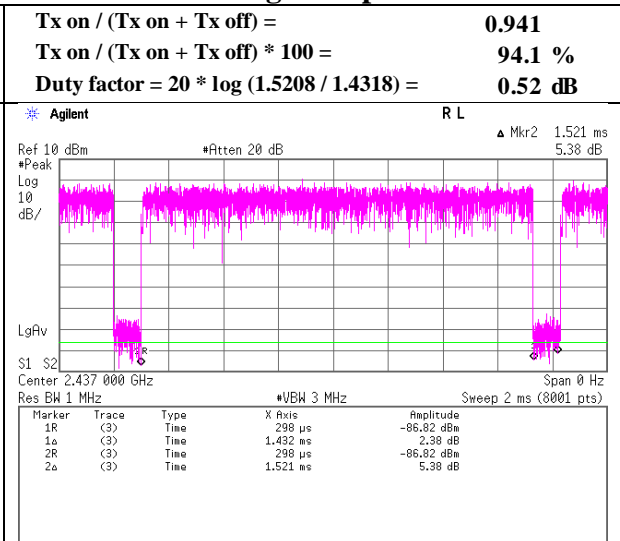
(for Spurious emission)

Test place : Shonan EMC Lab. No.1 Measurement Room
 Report No. : 10941706S-C
 Date : October 28, 2015
 Temperature / Humidity : 24 deg. C / 53 % RH
 Engineer : Tomohiro Hara
 Mode : Tx

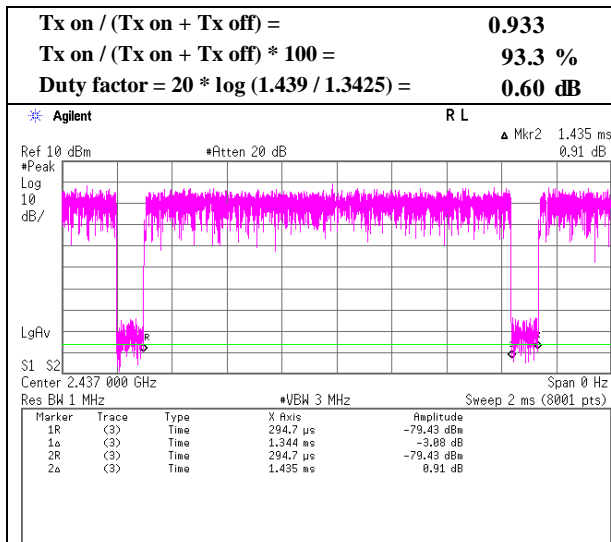
11b 2 Mbps



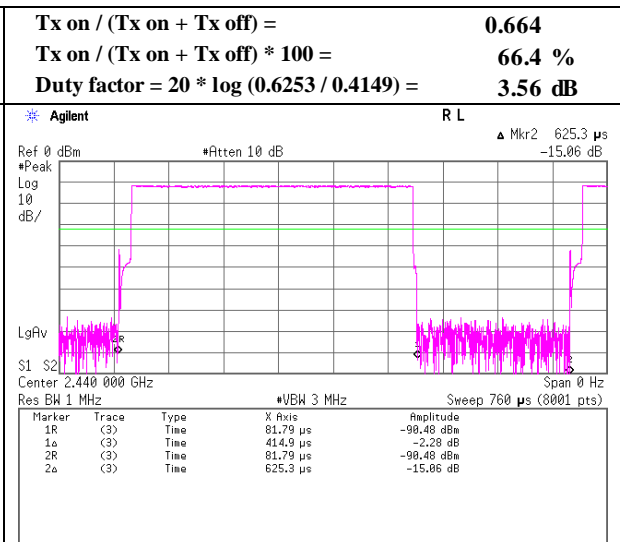
11g 6 Mbps



11n-20 MCS 0



BTLE



Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015 October 29, 2015
Temperature / Humidity : 24 deg. C / 53 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11b 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2383.839	PK	53.8	27.7	13.7	41.0	3.4	57.6	73.9	16.3	212	253	
Hori.	2390.000	PK	51.7	27.8	13.7	41.0	3.4	55.6	73.9	18.3	212	253	
Hori.	4824.000	PK	46.6	31.5	5.7	39.5	3.4	47.7	73.9	26.2	100	36	
Hori.	7236.000	PK	47.9	36.9	7.1	40.1	3.4	55.2	73.9	18.7	145	206	
Hori.	9648.000	PK	46.1	38.5	8.2	39.6	3.4	56.6	73.9	17.3	201	106	
Hori.	12060.000	PK	45.9	39.7	9.3	39.3	3.4	59.0	73.9	14.9	100	0	
Hori.	2383.839	AV	46.4	27.7	13.7	41.0	3.4	50.2	53.9	3.7	212	253	
Hori.	2390.000	AV	42.5	27.8	13.7	41.0	3.4	46.4	53.9	7.5	212	253	
Hori.	4824.000	AV	36.5	31.5	5.7	39.5	3.4	37.6	53.9	16.3	100	36	
Hori.	7236.000	AV	40.6	36.9	7.1	40.1	3.4	47.9	53.9	6.0	145	206	
Hori.	9648.000	AV	36.6	38.5	8.2	39.6	3.4	47.1	53.9	6.8	201	106	
Hori.	12060.000	AV	35.5	39.7	9.3	39.3	3.4	48.6	53.9	5.3	100	0	
Vert.	2383.839	PK	50.7	27.7	13.7	41.0	3.4	54.5	73.9	19.4	100	119	
Vert.	2390.000	PK	48.6	27.8	13.7	41.0	3.4	52.5	73.9	21.4	100	119	
Vert.	4824.000	PK	45.1	31.5	5.7	39.5	3.4	46.2	73.9	27.7	147	107	
Vert.	7236.000	PK	47.2	36.9	7.1	40.1	3.4	54.5	73.9	19.4	100	323	
Vert.	9648.000	PK	45.7	38.5	8.2	39.6	3.4	56.2	73.9	17.7	143	104	
Vert.	12060.000	PK	45.8	39.7	9.3	39.3	3.4	58.9	73.9	15.0	100	0	
Vert.	2383.839	AV	43.9	27.7	13.7	41.0	3.4	47.7	53.9	6.2	100	119	
Vert.	2390.000	AV	39.5	27.8	13.7	41.0	3.4	43.4	53.9	10.5	100	119	
Vert.	4824.000	AV	36.5	31.5	5.7	39.5	3.4	37.6	53.9	16.3	147	107	
Vert.	7236.000	AV	37.1	36.9	7.1	40.1	3.4	44.4	53.9	9.5	100	323	
Vert.	9648.000	AV	35.2	38.5	8.2	39.6	3.4	45.7	53.9	8.2	143	104	
Vert.	12060.000	AV	35.4	39.7	9.3	39.3	3.4	48.5	53.9	5.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	100.2	27.8	13.7	41.0	3.4	104.1	-	-	Carrier
Hori.	2397.443	PK	58.6	27.8	13.7	41.0	3.4	62.5	84.1	21.6	
Hori.	2400.000	PK	57.8	27.8	13.7	41.0	3.4	61.7	84.1	22.4	
Vert.	2412.000	PK	98.9	27.8	13.7	41.0	3.4	102.8	-	-	Carrier

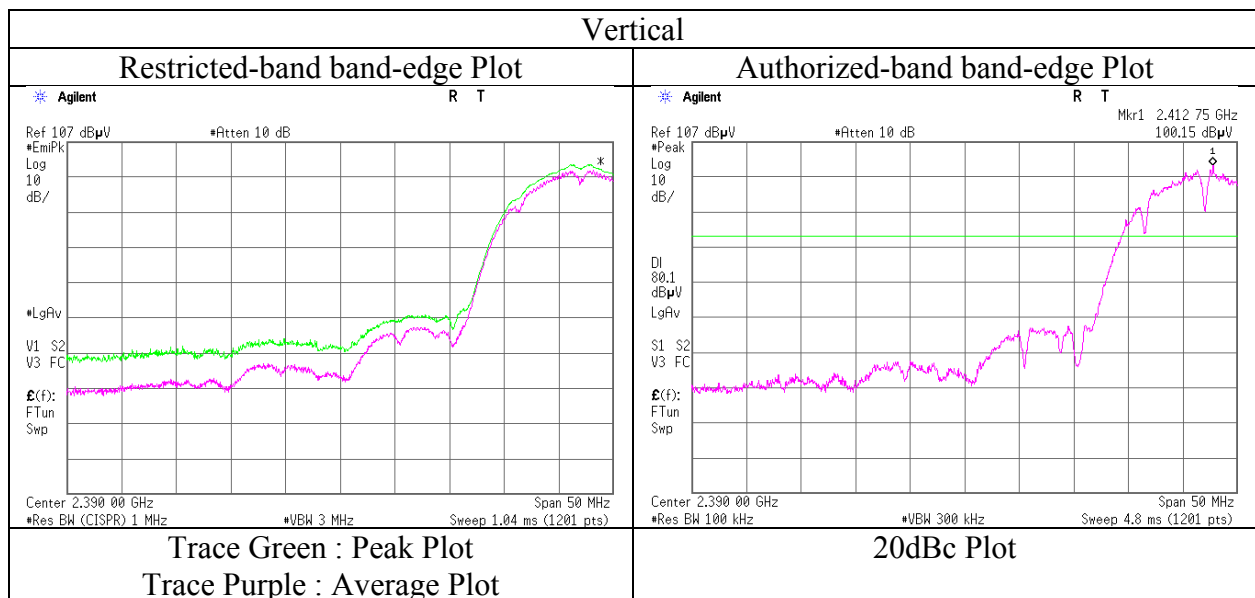
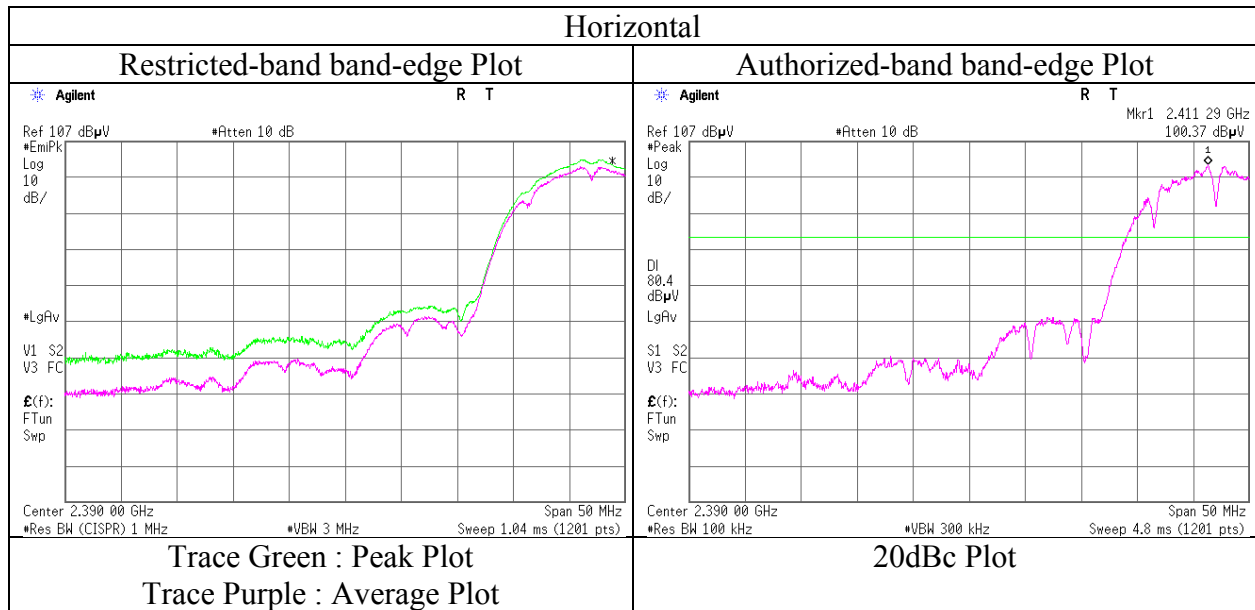
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Kenichi Adachi
Mode : Tx 11b 2412 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015 October 29, 2015
Temperature / Humidity : 24 deg. C / 53 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11b 2437 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	46.1	31.7	5.8	39.5	3.4	47.5	73.9	26.4	100	38	
Hori.	7311.000	PK	47.4	36.9	7.2	40.2	3.4	54.7	73.9	19.2	144	203	
Hori.	9748.000	PK	45.9	38.5	8.2	39.5	3.4	56.5	73.9	17.4	198	102	
Hori.	12185.000	PK	45.8	39.6	9.4	39.4	3.4	58.8	73.9	15.1	100	0	
Hori.	4874.000	AV	36.2	31.7	5.8	39.5	3.4	37.6	53.9	16.3	100	38	
Hori.	7311.000	AV	39.4	36.9	7.2	40.2	3.4	46.7	53.9	7.2	144	203	
Hori.	9748.000	AV	36.2	38.5	8.2	39.5	3.4	46.8	53.9	7.1	198	102	
Hori.	12185.000	AV	35.8	39.6	9.4	39.4	3.4	48.8	53.9	5.1	100	0	
Vert.	4874.000	PK	45.0	31.7	5.8	39.5	3.4	46.4	73.9	27.5	144	104	
Vert.	7311.000	PK	46.5	36.9	7.2	40.2	3.4	53.8	73.9	20.1	100	321	
Vert.	9748.000	PK	45.7	38.5	8.2	39.5	3.4	56.3	73.9	17.6	133	101	
Vert.	12185.000	PK	45.7	39.6	9.4	39.4	3.4	58.7	73.9	15.2	100	0	
Vert.	4874.000	AV	35.9	31.7	5.8	39.5	3.4	37.3	53.9	16.6	144	104	
Vert.	7311.000	AV	36.4	36.9	7.2	40.2	3.4	43.7	53.9	10.2	100	321	
Vert.	9748.000	AV	35.2	38.5	8.2	39.5	3.4	45.8	53.9	8.1	133	101	
Vert.	12185.000	AV	35.7	39.6	9.4	39.4	3.4	48.7	53.9	5.2	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.45 \text{ m} / 3.0 \text{ m}) = 3.4 \text{ dB}$

13 GHz - 40 GHz : $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

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Telephone : +81 463 50 6400

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Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015 October 29, 2015
Temperature / Humidity : 24 deg. C / 53 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11b 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.1	27.9	13.7	41.0	3.4	52.1	73.9	21.8	110	254	
Hori.	2490.997	PK	51.4	27.9	13.7	41.0	3.4	55.4	73.9	18.5	110	254	
Hori.	4924.000	PK	46.0	31.9	5.8	39.4	3.4	47.7	73.9	26.2	100	38	
Hori.	7386.000	PK	47.1	36.9	7.2	40.3	3.4	54.3	73.9	19.6	141	204	
Hori.	9848.000	PK	45.7	38.5	8.2	39.4	3.4	56.4	73.9	17.5	203	102	
Hori.	12310.000	PK	44.6	39.6	9.5	39.5	3.4	57.6	73.9	16.3	100	0	
Hori.	2483.500	AV	39.0	27.9	13.7	41.0	3.4	43.0	53.9	10.9	110	254	
Hori.	2490.997	AV	43.7	27.9	13.7	41.0	3.4	47.7	53.9	6.2	110	254	
Hori.	4924.000	AV	36.1	31.9	5.8	39.4	3.4	37.8	53.9	16.1	100	38	
Hori.	7386.000	AV	38.7	36.9	7.2	40.3	3.4	45.9	53.9	8.0	141	204	
Hori.	9848.000	AV	36.1	38.5	8.2	39.4	3.4	46.8	53.9	7.1	203	102	
Hori.	12310.000	AV	35.3	39.6	9.5	39.5	3.4	48.3	53.9	5.6	100	0	
Vert.	2483.500	PK	46.5	27.9	13.7	41.0	3.4	50.5	73.9	23.4	100	109	
Vert.	2490.997	PK	50.9	27.9	13.7	41.0	3.4	54.9	73.9	19.0	100	109	
Vert.	4924.000	PK	45.0	31.9	5.8	39.4	3.4	46.7	73.9	27.2	146	103	
Vert.	7386.000	PK	46.3	36.9	7.2	40.3	3.4	53.5	73.9	20.4	100	326	
Vert.	9848.000	PK	45.5	38.5	8.2	39.4	3.4	56.2	73.9	17.7	133	101	
Vert.	12310.000	PK	44.7	39.6	9.5	39.5	3.4	57.7	73.9	16.2	100	0	
Vert.	2483.500	AV	38.7	27.9	13.7	41.0	3.4	42.7	53.9	11.2	100	109	
Vert.	2490.997	AV	43.2	27.9	13.7	41.0	3.4	47.2	53.9	6.7	100	109	
Vert.	4924.000	AV	36.1	31.9	5.8	39.4	3.4	37.8	53.9	16.1	146	103	
Vert.	7386.000	AV	36.4	36.9	7.2	40.3	3.4	43.6	53.9	10.3	100	326	
Vert.	9848.000	AV	34.9	38.5	8.2	39.4	3.4	45.6	53.9	8.3	133	101	
Vert.	12310.000	AV	35.4	39.6	9.5	39.5	3.4	48.4	53.9	5.5	100	0	

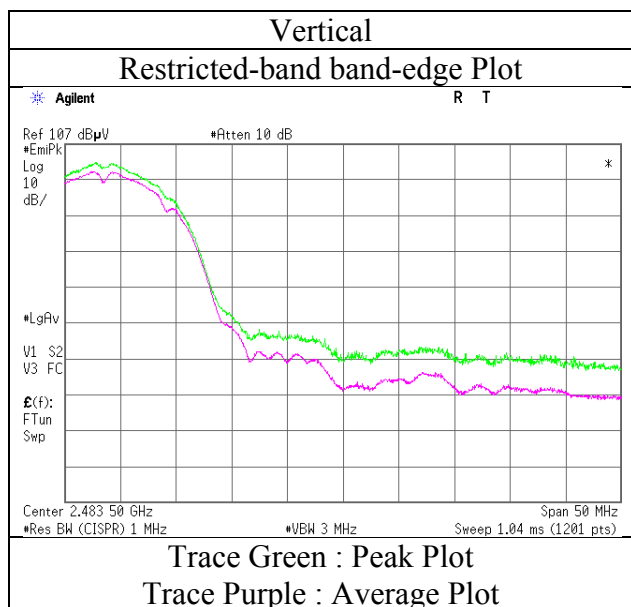
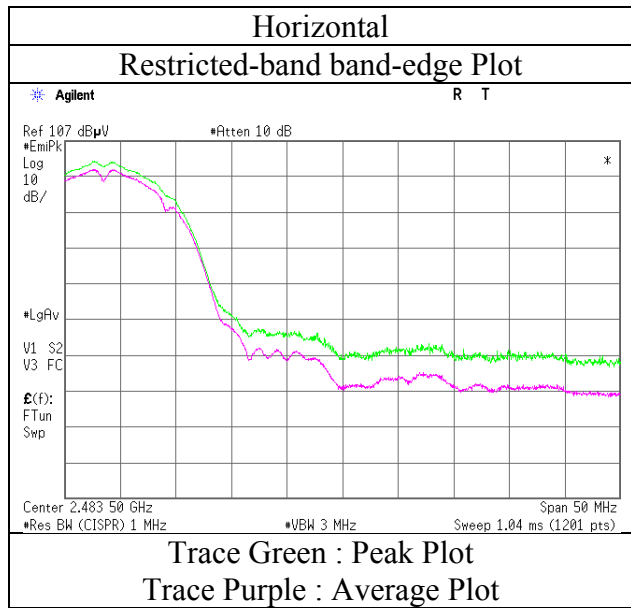
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015
Temperature / Humidity : 24 deg. C / 53 % RH
Engineer : Kenichi Adachi
Mode : Tx 11b 2462 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 30, 2015 October 29, 2015
Temperature / Humidity : 23 deg. C / 56 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11g 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	56.3	27.8	13.7	41.0	3.4	60.2	73.9	13.7	100	253	
Hori.	4824.000	PK	45.7	31.5	5.7	39.5	3.4	46.8	73.9	27.1	108	38	
Hori.	7236.000	PK	44.4	36.9	7.1	40.1	3.4	51.7	73.9	22.2	143	203	
Hori.	9648.000	PK	46.1	38.5	8.2	39.6	3.4	56.6	73.9	17.3	204	108	
Hori.	12060.000	PK	46.0	39.7	9.3	39.3	3.4	59.1	73.9	14.8	100	0	
Vert.	2390.000	PK	54.7	27.8	13.7	41.0	3.4	58.6	73.9	15.3	100	73	
Vert.	4824.000	PK	44.8	31.5	5.7	39.5	3.4	45.9	73.9	28.0	142	91	
Vert.	7236.000	PK	45.6	36.9	7.1	40.1	3.4	52.9	73.9	21.0	100	329	
Vert.	9648.000	PK	46.0	38.5	8.2	39.6	3.4	56.5	73.9	17.4	141	109	
Vert.	12060.000	PK	45.9	39.7	9.3	39.3	3.4	59.0	73.9	14.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	43.4	27.8	13.7	41.0	0.5	3.4	47.8	53.9	6.1	*1)
Hori.	4824.000	AV	35.9	31.5	5.7	39.5	0.5	3.4	37.5	53.9	16.4	
Hori.	7236.000	AV	36.0	36.9	7.1	40.1	0.5	3.4	43.8	53.9	10.1	
Hori.	9648.000	AV	36.1	38.5	8.2	39.6	0.5	3.4	47.1	53.9	6.8	
Hori.	12060.000	AV	35.6	39.7	9.3	39.3	0.5	3.4	49.2	53.9	4.7	
Vert.	2390.000	AV	43.0	27.8	13.7	41.0	0.5	3.4	47.4	53.9	6.5	*1)
Vert.	4824.000	AV	35.5	31.5	5.7	39.5	0.5	3.4	37.1	53.9	16.8	
Vert.	7236.000	AV	36.1	36.9	7.1	40.1	0.5	3.4	43.9	53.9	10.0	
Vert.	9648.000	AV	36.0	38.5	8.2	39.6	0.5	3.4	47.0	53.9	6.9	
Vert.	12060.000	AV	35.5	39.7	9.3	39.3	0.5	3.4	49.1	53.9	4.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	94.0	27.8	13.7	41.0	3.4	97.9	-	-	Carrier
Hori.	2400.000	PK	60.0	27.8	13.7	41.0	3.4	63.9	77.9	14.0	
Vert.	2412.000	PK	93.3	27.8	13.7	41.0	3.4	97.2	-	-	Carrier
Vert.	2400.000	PK	58.8	27.8	13.7	41.0	3.4	62.7	77.2	14.5	

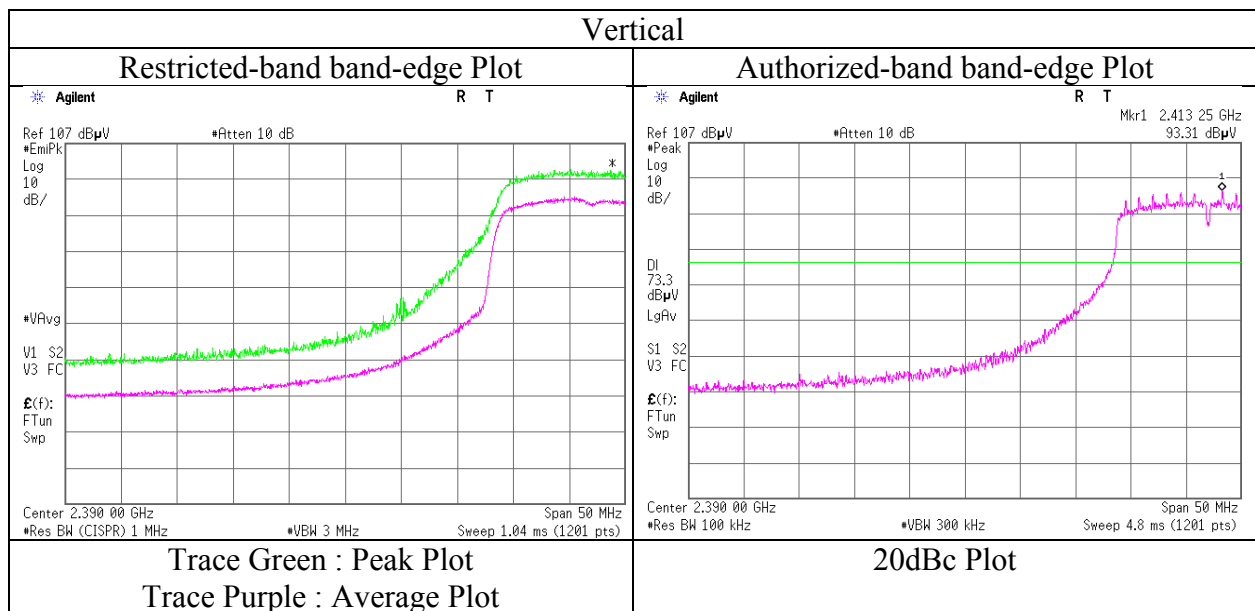
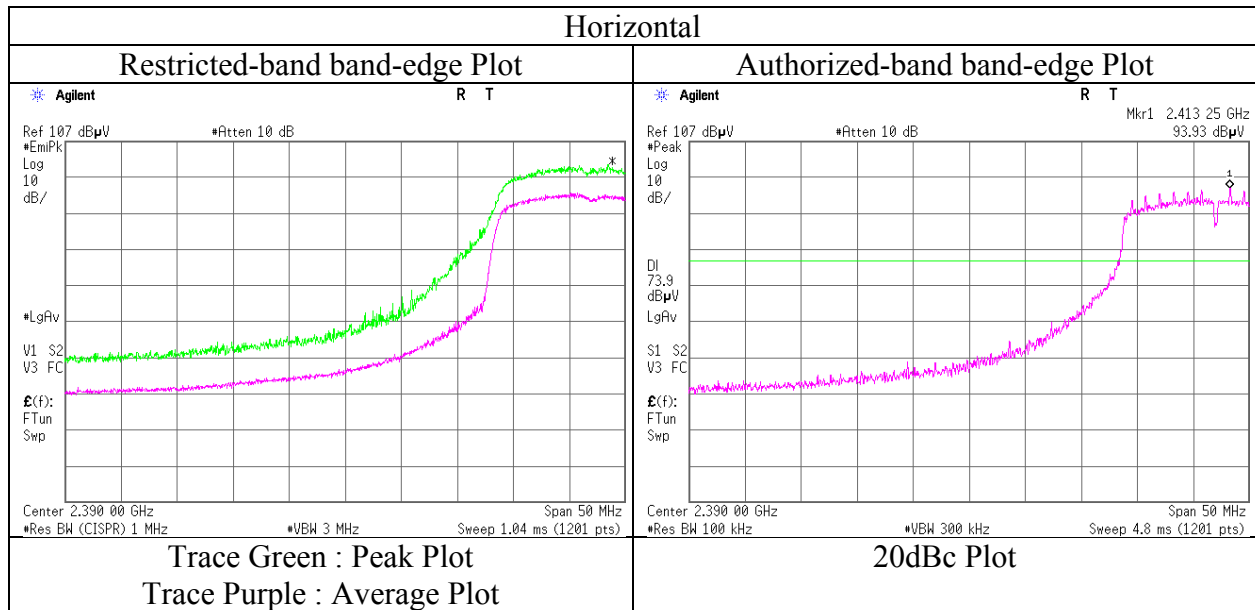
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
 Report No. : 10941706S-C
 Date : October 30, 2015
 Temperature / Humidity : 23 deg. C / 56 % RH
 Engineer : Kenichi Adachi
 Mode : Tx 11g 2412 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 30, 2015 October 29, 2015
Temperature / Humidity : 23 deg. C / 56 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11g 2437 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	45.6	31.7	5.8	39.5	3.4	47.0	73.9	26.9	106	36	
Hori.	7311.000	PK	45.0	36.9	7.2	40.2	3.4	52.3	73.9	21.6	141	202	
Hori.	9748.000	PK	45.0	38.5	8.2	39.5	3.4	55.6	73.9	18.3	201	107	
Hori.	12185.000	PK	45.7	39.6	9.4	39.4	3.4	58.7	73.9	15.2	100	0	
Vert.	4874.000	PK	44.9	31.7	5.8	39.5	3.4	46.3	73.9	27.6	143	94	
Vert.	7311.000	PK	45.3	36.9	7.2	40.2	3.4	52.6	73.9	21.3	100	331	
Vert.	9748.000	PK	45.1	38.5	8.2	39.5	3.4	55.7	73.9	18.2	139	106	
Vert.	12185.000	PK	45.8	39.6	9.4	39.4	3.4	58.8	73.9	15.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	35.8	31.7	5.8	39.5	0.5	3.4	37.7	53.9	16.2	
Hori.	7311.000	AV	36.1	36.9	7.2	40.2	0.5	3.4	43.9	53.9	10.0	
Hori.	9748.000	AV	35.5	38.5	8.2	39.5	0.5	3.4	46.6	53.9	7.3	
Hori.	12185.000	AV	35.9	39.6	9.4	39.4	0.5	3.4	49.4	53.9	4.5	
Vert.	4874.000	AV	35.5	31.7	5.8	39.5	0.5	3.4	37.4	53.9	16.5	
Vert.	7311.000	AV	36.0	36.9	7.2	40.2	0.5	3.4	43.8	53.9	10.1	
Vert.	9748.000	AV	35.6	38.5	8.2	39.5	0.5	3.4	46.7	53.9	7.2	
Vert.	12185.000	AV	35.8	39.6	9.4	39.4	0.5	3.4	49.3	53.9	4.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.4\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

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Telephone : +81 463 50 6400

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Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 29, 2015 October 30, 2015 October 29, 2015
Temperature / Humidity : 23 deg. C / 46 % RH 23 deg. C / 56 % RH 23 deg. C / 46 % RH
Engineer : Akira Sato Kenichi Adachi Akira Sato
 (30 MHz-1 GHz) (1-13 GHz) (13-26 GHz)
Mode : Tx 11g 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	162.004	QP	40.4	15.3	8.0	32.1	0.0	31.6	43.5	11.9	204	265	
Hori.	333.974	QP	24.4	14.8	8.8	31.9	0.0	16.1	46.0	29.9	100	96	
Hori.	743.628	QP	21.5	20.7	10.5	31.7	0.0	21.0	46.0	25.0	100	204	
Hori.	2483.500	PK	54.4	27.9	13.8	41.0	3.4	58.5	73.9	15.4	100	257	
Hori.	4924.000	PK	45.8	31.9	5.8	39.4	3.4	47.5	73.9	26.4	109	42	
Hori.	7386.000	PK	44.9	36.9	7.2	40.3	3.4	52.1	73.9	21.8	144	207	
Hori.	9848.000	PK	45.1	38.5	8.2	39.4	3.4	55.8	73.9	18.1	201	102	
Hori.	12310.000	PK	44.7	39.6	9.5	39.5	3.4	57.7	73.9	16.2	100	0	
Vert.	58.216	QP	24.5	8.2	6.8	32.1	0.0	7.4	40.0	32.6	100	21	
Vert.	162.003	QP	40.7	15.3	8.0	32.1	0.0	31.9	43.5	11.6	100	256	
Vert.	542.038	QP	21.6	18.4	9.7	31.9	0.0	17.8	46.0	28.2	100	353	
Vert.	621.349	QP	21.8	19.5	10.0	31.9	0.0	19.4	46.0	26.6	100	116	
Vert.	2483.500	PK	54.1	27.9	13.8	41.0	3.4	58.2	73.9	15.7	100	83	
Vert.	4924.000	PK	45.0	31.9	5.8	39.4	3.4	46.7	73.9	27.2	142	94	
Vert.	7386.000	PK	45.0	36.9	7.2	40.3	3.4	52.2	73.9	21.7	100	320	
Vert.	9848.000	PK	45.0	38.5	8.2	39.4	3.4	55.7	73.9	18.2	134	104	
Vert.	12310.000	PK	44.6	39.6	9.5	39.5	3.4	57.6	73.9	16.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.8	27.9	13.8	41.0	0.5	3.4	45.4	53.9	8.5	*1)
Hori.	4924.000	AV	35.9	31.9	5.8	39.4	0.5	3.4	38.1	53.9	15.8	
Hori.	7386.000	AV	35.7	36.9	7.2	40.3	0.5	3.4	43.4	53.9	10.5	
Hori.	9848.000	AV	34.9	38.5	8.2	39.4	0.5	3.4	46.1	53.9	7.8	
Hori.	12310.000	AV	35.5	39.6	9.5	39.5	0.5	3.4	49.0	53.9	4.9	
Vert.	2483.500	AV	40.5	27.9	13.8	41.0	0.5	3.4	45.1	53.9	8.8	*1)
Vert.	4924.000	AV	35.5	31.9	5.8	39.4	0.5	3.4	37.7	53.9	16.2	
Vert.	7386.000	AV	35.8	36.9	7.2	40.3	0.5	3.4	43.5	53.9	10.4	
Vert.	9848.000	AV	34.8	38.5	8.2	39.4	0.5	3.4	46.0	53.9	7.9	
Vert.	12310.000	AV	35.4	39.6	9.5	39.5	0.5	3.4	48.9	53.9	5.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

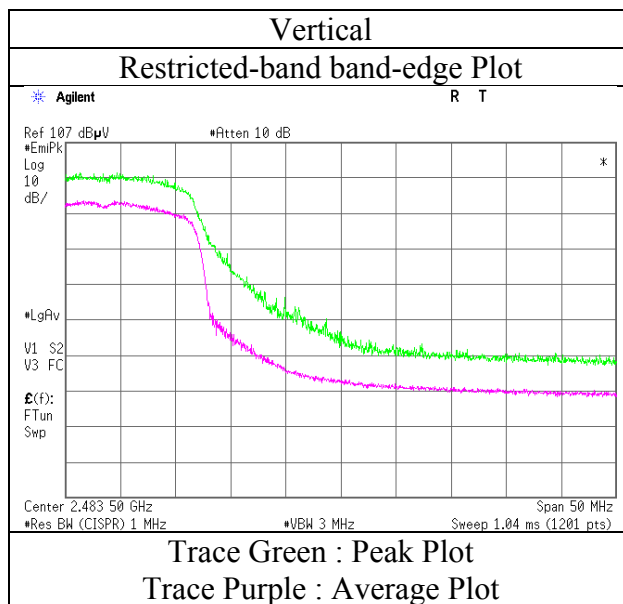
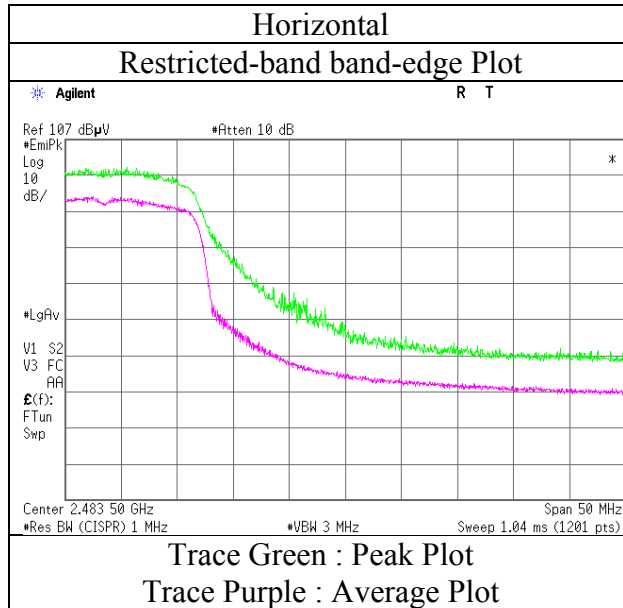
Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 30, 2015
Temperature / Humidity : 23 deg. C / 56 % RH
Engineer : Kenichi Adachi

Mode : Tx 11g 2462 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015 October 29, 2015
Temperature / Humidity : 24 deg. C / 53 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11n-20 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	56.2	27.8	13.7	41.0	3.4	60.1	73.9	13.8	113	251	
Hori.	4824.000	PK	45.1	31.5	5.7	39.5	3.4	46.2	73.9	27.7	100	37	
Hori.	7236.000	PK	45.2	36.9	7.1	40.1	3.4	52.5	73.9	21.4	134	205	
Hori.	9648.000	PK	45.1	38.5	8.2	39.6	3.4	55.6	73.9	18.3	201	37	
Hori.	12060.000	PK	45.9	39.7	9.3	39.3	3.4	59.0	73.9	14.9	100	0	
Vert.	2390.000	PK	55.4	27.8	13.7	41.0	3.4	59.3	73.9	14.6	100	101	
Vert.	4824.000	PK	45.0	31.5	5.7	39.5	3.4	46.1	73.9	27.8	146	116	
Vert.	7236.000	PK	44.6	36.9	7.1	40.1	3.4	51.9	73.9	22.0	100	329	
Vert.	9648.000	PK	45.0	38.5	8.2	39.6	3.4	55.5	73.9	18.4	132	102	
Vert.	12060.000	PK	45.8	39.7	9.3	39.3	3.4	58.9	73.9	15.0	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	41.0	27.8	13.7	41.0	0.6	3.4	45.5	53.9	8.4	*1)
Hori.	4824.000	AV	35.5	31.5	5.7	39.5	0.6	3.4	37.2	53.9	16.7	
Hori.	7236.000	AV	35.5	36.9	7.1	40.1	0.6	3.4	43.4	53.9	10.5	
Hori.	9648.000	AV	34.9	38.5	8.2	39.6	0.6	3.4	46.0	53.9	7.9	
Hori.	12060.000	AV	35.4	39.7	9.3	39.3	0.6	3.4	49.1	53.9	4.8	
Vert.	2390.000	AV	40.7	27.8	13.7	41.0	0.6	3.4	45.2	53.9	8.7	*1)
Vert.	4824.000	AV	35.3	31.5	5.7	39.5	0.6	3.4	37.0	53.9	16.9	
Vert.	7236.000	AV	35.9	36.9	7.1	40.1	0.6	3.4	43.8	53.9	10.1	
Vert.	9648.000	AV	34.7	38.5	8.2	39.6	0.6	3.4	45.8	53.9	8.1	
Vert.	12060.000	AV	35.5	39.7	9.3	39.3	0.6	3.4	49.2	53.9	4.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	93.0	27.8	13.7	41.0	3.4	96.9	-	-	Carrier
Hori.	2400.000	PK	58.2	27.8	13.7	41.0	3.4	62.1	76.9	14.8	
Vert.	2412.000	PK	91.4	27.8	13.7	41.0	3.4	95.3	-	-	Carrier
Vert.	2400.000	PK	57.4	27.8	13.7	41.0	3.4	61.3	75.2	13.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

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Shonan EMC Lab.

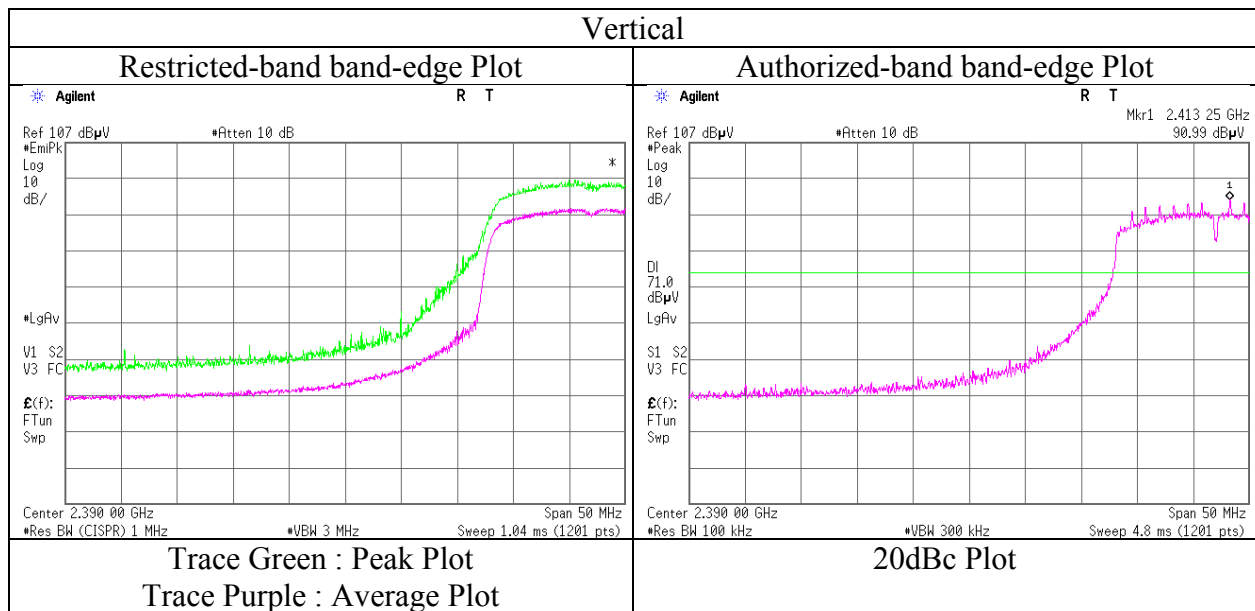
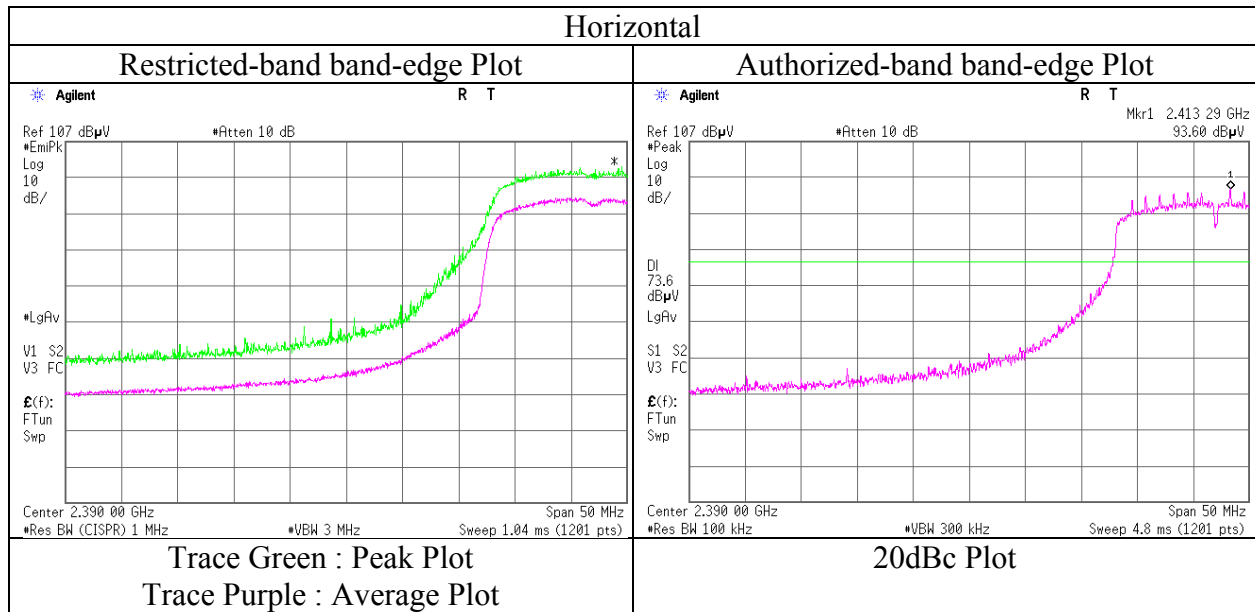
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10941706S-C
Date	October 28, 2015
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Kenichi Adachi
Mode	Tx 11n-20 2412 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015 October 29, 2015
Temperature / Humidity : 24 deg. C / 53 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11n-20 2437 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	45.2	31.7	5.8	39.5	3.4	46.6	73.9	27.3	100	34	
Hori.	7311.000	PK	45.0	36.9	7.2	40.2	3.4	52.3	73.9	21.6	132	206	
Hori.	9748.000	PK	45.2	38.5	8.2	39.5	3.4	55.8	73.9	18.1	192	104	
Hori.	12185.000	PK	45.7	39.6	9.4	39.4	3.4	58.7	73.9	15.2	100	0	
Vert.	4874.000	PK	45.0	31.7	5.8	39.5	3.4	46.4	73.9	27.5	142	114	
Vert.	7311.000	PK	44.9	36.9	7.2	40.2	3.4	52.2	73.9	21.7	100	331	
Vert.	9748.000	PK	45.0	38.5	8.2	39.5	3.4	55.6	73.9	18.3	136	102	
Vert.	12185.000	PK	45.6	39.6	9.4	39.4	3.4	58.6	73.9	15.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.45 \text{ m} / 3.0 \text{ m}) = 3.4 \text{ dB}$

13 GHz - 40 GHz : $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	35.6	31.7	5.8	39.5	0.6	3.4	37.6	53.9	16.3	
Hori.	7311.000	AV	35.6	36.9	7.2	40.2	0.6	3.4	43.5	53.9	10.4	
Hori.	9748.000	AV	35.2	38.5	8.2	39.5	0.6	3.4	46.4	53.9	7.5	
Hori.	12185.000	AV	35.8	39.6	9.4	39.4	0.6	3.4	49.4	53.9	4.5	
Vert.	4874.000	AV	35.4	31.7	5.8	39.5	0.6	3.4	37.4	53.9	16.5	
Vert.	7311.000	AV	35.6	36.9	7.2	40.2	0.6	3.4	43.5	53.9	10.4	
Vert.	9748.000	AV	35.1	38.5	8.2	39.5	0.6	3.4	46.3	53.9	7.6	
Vert.	12185.000	AV	35.7	39.6	9.4	39.4	0.6	3.4	49.3	53.9	4.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : $20\log(4.45 \text{ m} / 3.0 \text{ m}) = 3.4 \text{ dB}$

13 GHz - 40 GHz : $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

Duty factor refer to "Duty factor Calculation chart" sheet.

UL Japan, Inc.

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Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 28, 2015 October 29, 2015
Temperature / Humidity : 24 deg. C / 53 % RH 23 deg. C / 46 % RH
Engineer : Kenichi Adachi Akira Sato
 (1-13 GHz) (13-26 GHz)
Mode : Tx 11n-20 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	54.4	27.9	13.7	41.0	3.4	58.4	73.9	15.5	106	252	
Hori.	4924.000	PK	45.0	31.9	5.8	39.4	3.4	46.7	73.9	27.2	100	36	
Hori.	7386.000	PK	44.2	36.9	7.2	40.3	3.4	51.4	73.9	22.5	138	202	
Hori.	9848.000	PK	45.1	38.5	8.2	39.4	3.4	55.8	73.9	18.1	196	101	
Hori.	12310.000	PK	44.7	39.6	9.5	39.5	3.4	57.7	73.9	16.2	100	0	
Vert.	2483.500	PK	54.0	27.9	13.7	41.0	3.4	58.0	73.9	15.9	100	98	
Vert.	4924.000	PK	44.9	31.9	5.8	39.4	3.4	46.6	73.9	27.3	144	119	
Vert.	7386.000	PK	44.3	36.9	7.2	40.3	3.4	51.5	73.9	22.4	100	322	
Vert.	9848.000	PK	45.0	38.5	8.2	39.4	3.4	55.7	73.9	18.2	132	104	
Vert.	12310.000	PK	44.6	39.6	9.5	39.5	3.4	57.6	73.9	16.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.6	27.9	13.7	41.0	0.6	3.4	45.2	53.9	8.7	*1)
Hori.	4924.000	AV	35.4	31.9	5.8	39.4	0.6	3.4	37.7	53.9	16.2	
Hori.	7386.000	AV	35.6	36.9	7.2	40.3	0.6	3.4	43.4	53.9	10.5	
Hori.	9848.000	AV	34.9	38.5	8.2	39.4	0.6	3.4	46.2	53.9	7.7	
Hori.	12310.000	AV	35.4	39.6	9.5	39.5	0.6	3.4	49.0	53.9	4.9	
Vert.	2483.500	AV	40.3	27.9	13.7	41.0	0.6	3.4	44.9	53.9	9.0	*1)
Vert.	4924.000	AV	35.3	31.9	5.8	39.4	0.6	3.4	37.6	53.9	16.3	
Vert.	7386.000	AV	35.7	36.9	7.2	40.3	0.6	3.4	43.5	53.9	10.4	
Vert.	9848.000	AV	34.8	38.5	8.2	39.4	0.6	3.4	46.1	53.9	7.8	
Vert.	12310.000	AV	35.3	39.6	9.5	39.5	0.6	3.4	48.9	53.9	5.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

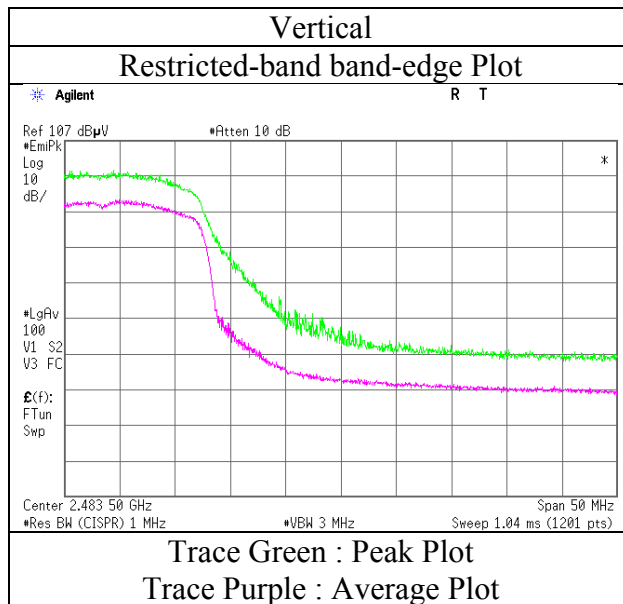
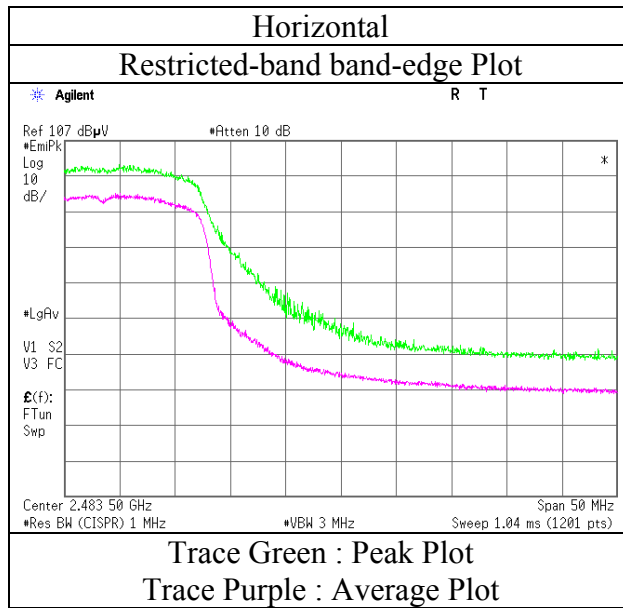
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10941706S-C
Date	October 28, 2015
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Kenichi Adachi
Mode	Tx 11n-20 2462 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 27, 2015 October 29, 2015
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 46 % RH
Engineer : Yasumasa Owaki Akira Sato
 (1-26 GHz) (30 MHz-1 GHz)
Mode : Tx BT LE 2402 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	162.042	QP	22.6	15.3	8.0	32.1	0.0	13.8	43.5	29.7	100	21	
Hori.	448.807	QP	29.8	17.1	9.3	31.9	0.0	24.3	46.0	21.7	235	347	
Hori.	620.281	QP	21.8	19.5	10.0	31.9	0.0	19.4	46.0	26.6	100	13	
Hori.	2390.000	PK	47.4	27.8	13.7	41.0	3.4	51.3	73.9	22.6	100	251	
Hori.	4804.000	PK	46.6	31.4	5.7	39.6	3.4	47.5	73.9	26.4	100	73	
Hori.	7206.000	PK	44.6	36.9	7.1	40.1	3.4	51.9	73.9	22.0	100	0	
Hori.	9608.000	PK	44.2	38.5	8.2	39.6	3.4	54.7	73.9	19.2	100	0	
Hori.	12010.000	PK	44.0	39.7	9.3	39.3	3.4	57.1	73.9	16.8	100	0	
Vert.	60.051	QP	26.3	7.7	6.7	32.1	0.0	8.6	40.0	31.4	100	3	
Vert.	61.549	QP	24.3	7.5	6.7	32.1	0.0	6.4	40.0	33.6	100	51	
Vert.	854.334	QP	21.3	21.8	10.8	31.2	0.0	22.7	46.0	23.3	100	335	
Vert.	2390.000	PK	45.7	27.8	13.7	41.0	3.4	49.6	73.9	24.3	132	53	
Vert.	4804.000	PK	46.0	31.4	5.7	39.6	3.4	46.9	73.9	27.0	100	355	
Vert.	7206.000	PK	45.0	36.9	7.1	40.1	3.4	52.3	73.9	21.6	100	0	
Vert.	9608.000	PK	44.7	38.5	8.2	39.6	3.4	55.2	73.9	18.7	100	0	
Vert.	12010.000	PK	44.7	39.7	9.3	39.3	3.4	57.8	73.9	16.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.9	27.8	13.7	41.0	3.6	3.4	44.4	53.9	9.5	*1)
Hori.	4804.000	AV	36.4	31.4	5.7	39.6	3.6	3.4	40.9	53.9	13.0	
Hori.	7206.000	AV	36.7	36.9	7.1	40.1	3.6	3.4	47.6	53.9	6.3	
Hori.	9608.000	AV	36.5	38.5	8.2	39.6	3.6	3.4	50.6	53.9	3.3	
Hori.	12010.000	AV	35.4	39.7	9.3	39.3	3.6	3.4	52.1	53.9	1.8	
Vert.	2390.000	AV	37.7	27.8	13.7	41.0	3.6	3.4	45.2	53.9	8.7	*1)
Vert.	4804.000	AV	36.8	31.4	5.7	39.6	3.6	3.4	41.3	53.9	12.6	
Vert.	7206.000	AV	37.0	36.9	7.1	40.1	3.6	3.4	47.9	53.9	6.0	
Vert.	9608.000	AV	36.1	38.5	8.2	39.6	3.6	3.4	50.2	53.9	3.7	
Vert.	12010.000	AV	35.2	39.7	9.3	39.3	3.6	3.4	51.9	53.9	2.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.9	27.8	13.7	41.0	3.4	94.8	-	-	
Hori.	2400.000	PK	38.8	27.8	13.7	41.0	3.4	42.7	74.8	32.1	
Vert.	2402.000	PK	90.3	27.8	13.7	41.0	3.4	94.2	-	-	
Vert.	2400.000	PK	37.0	27.8	13.7	41.0	3.4	40.9	74.2	33.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

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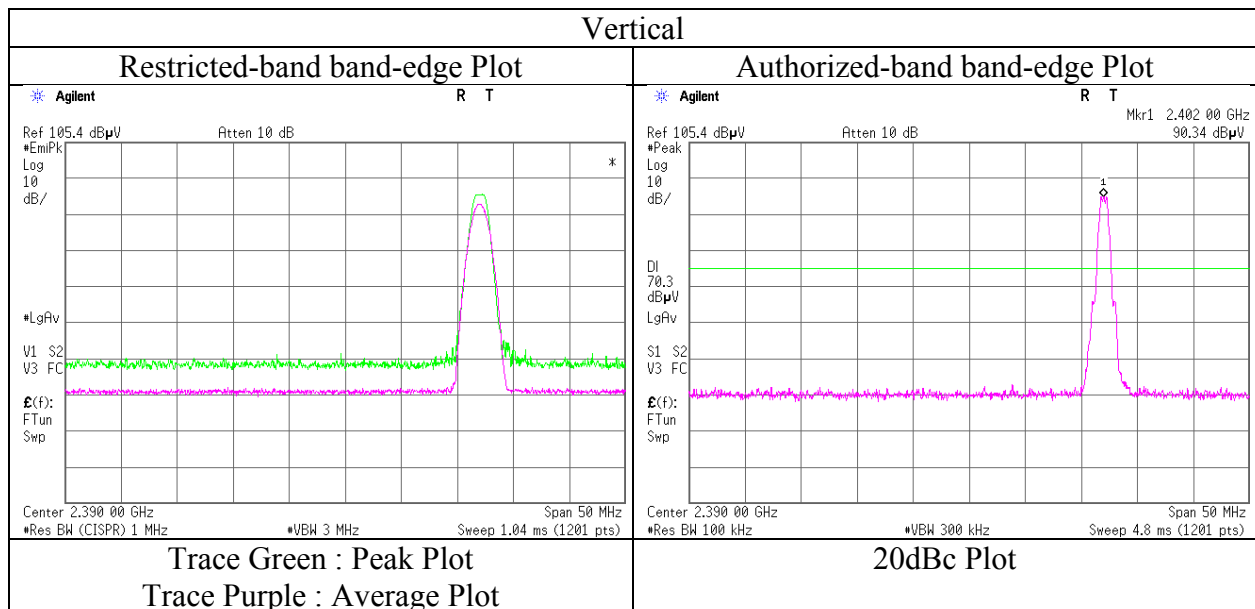
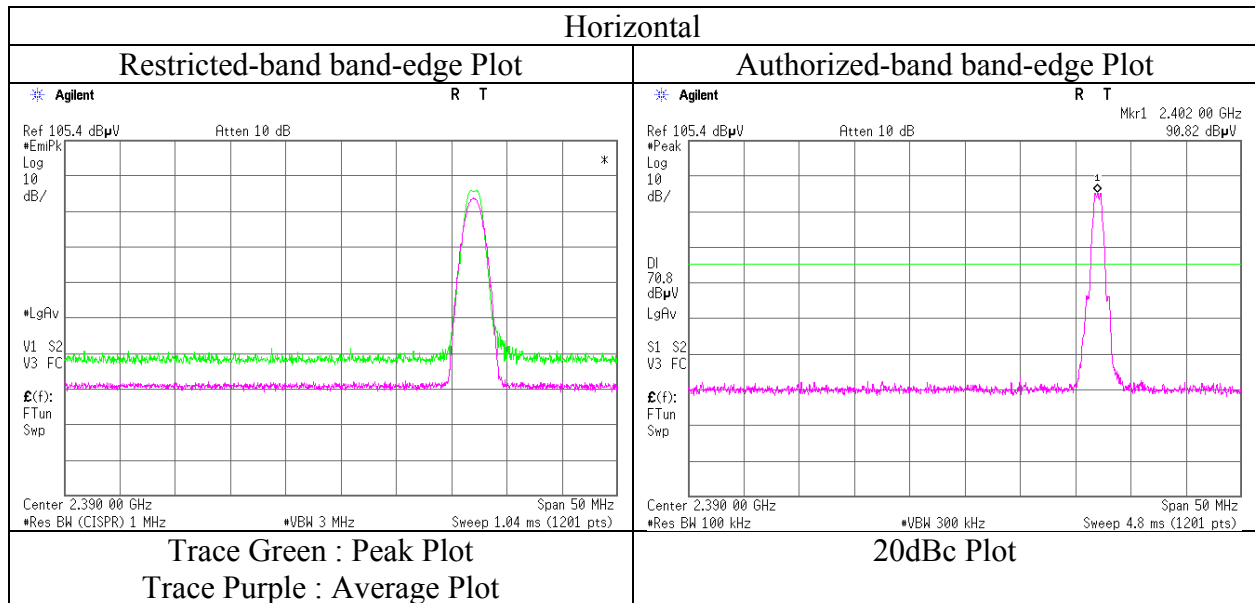
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 27, 2015
Temperature / Humidity : 23 deg. C / 39 % RH
Engineer : Yasumasa Owaki
Mode : Tx BT LE 2402 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 27, 2015 October 29, 2015
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 46 % RH
Engineer : Yasumasa Owaki Akira Sato
 (1-26 GHz) (30 MHz-1 GHz)
Mode : Tx BT LE 2440 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	180.894	QP	22.4	16.0	7.9	32.0	0.0	14.3	43.5	29.2	100	332	
Hori.	448.809	QP	25.8	17.1	9.3	31.9	0.0	20.3	46.0	25.7	100	246	
Hori.	647.589	QP	22.0	19.8	10.1	31.9	0.0	20.0	46.0	26.0	100	22	
Hori.	4880.000	PK	45.9	31.7	5.8	39.5	3.4	47.3	73.9	26.6	100	352	
Hori.	7320.000	PK	44.6	36.9	7.2	40.2	3.4	51.9	73.9	22.0	100	0	
Hori.	9760.000	PK	44.2	38.5	8.2	39.5	3.4	54.8	73.9	19.1	100	0	
Hori.	12200.000	PK	44.9	39.6	9.4	39.4	3.4	57.9	73.9	16.0	100	0	
Vert.	57.196	QP	24.5	8.5	6.8	32.1	0.0	7.7	40.0	32.3	100	67	
Vert.	60.048	QP	24.6	7.7	6.7	32.1	0.0	6.9	40.0	33.1	100	331	
Vert.	871.457	QP	21.2	22.1	10.9	31.1	0.0	23.1	46.0	22.9	100	313	
Vert.	4880.000	PK	46.1	31.7	5.8	39.5	3.4	47.5	73.9	26.4	100	101	
Vert.	7320.000	PK	45.0	36.9	7.2	40.2	3.4	52.3	73.9	21.6	100	0	
Vert.	9760.000	PK	44.8	38.5	8.2	39.5	3.4	55.4	73.9	18.5	100	0	
Vert.	12200.000	PK	44.6	39.6	9.4	39.4	3.4	57.6	73.9	16.3	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	36.9	31.7	5.8	39.5	3.6	3.4	41.9	53.9	12.0	
Hori.	7320.000	AV	35.9	36.9	7.2	40.2	3.6	3.4	46.8	53.9	7.1	
Hori.	9760.000	AV	35.4	38.5	8.2	39.5	3.6	3.4	49.6	53.9	4.3	
Hori.	12200.000	AV	35.3	39.6	9.4	39.4	3.6	3.4	51.9	53.9	2.0	
Vert.	4880.000	AV	36.3	31.7	5.8	39.5	3.6	3.4	41.3	53.9	12.6	
Vert.	7320.000	AV	36.5	36.9	7.2	40.2	3.6	3.4	47.4	53.9	6.5	
Vert.	9760.000	AV	36.1	38.5	8.2	39.5	3.6	3.4	50.3	53.9	3.6	
Vert.	12200.000	AV	35.5	39.6	9.4	39.4	3.6	3.4	52.1	53.9	1.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10941706S-C
Date : October 27, 2015 October 29, 2015
Temperature / Humidity : 23 deg. C / 39 % RH 23 deg. C / 46 % RH
Engineer : Yasumasa Owaki Akira Sato
 (1-26 GHz) (30 MHz-1 GHz)
Mode : Tx BT LE 2480 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	159.961	QP	23.9	15.2	8.0	32.1	0.0	15.0	43.5	28.5	100	327	
Hori.	331.942	QP	23.3	14.8	8.8	31.9	0.0	15.0	46.0	31.0	100	115	
Hori.	384.009	QP	29.4	16.1	9.1	31.9	0.0	22.7	46.0	23.3	100	296	
Hori.	416.949	QP	22.6	16.7	9.2	31.9	0.0	16.6	46.0	29.4	101	360	
Hori.	2483.500	PK	49.5	27.9	13.8	41.0	3.4	53.6	73.9	20.3	100	33	
Hori.	4960.000	PK	44.6	32.0	5.8	39.4	3.4	46.4	73.9	27.5	100	323	
Hori.	7440.000	PK	45.1	37.0	7.2	40.4	3.4	52.3	73.9	21.6	100	0	
Hori.	9920.000	PK	44.1	38.4	8.2	39.4	3.4	54.7	73.9	19.2	100	0	
Hori.	12400.000	PK	44.5	39.5	9.6	39.6	3.4	57.4	73.9	16.5	100	0	
Vert.	55.287	QP	23.3	9.1	6.9	32.1	0.0	7.2	40.0	32.8	100	133	
Vert.	60.042	QP	25.0	7.7	6.7	32.1	0.0	7.3	40.0	32.7	100	6	
Vert.	586.761	QP	21.7	19.0	9.9	31.9	0.0	18.7	46.0	27.3	100	43	
Vert.	2483.500	PK	48.8	27.9	13.8	41.0	3.4	52.9	73.9	21.0	173	116	
Vert.	4960.000	PK	45.3	32.0	5.8	39.4	3.4	47.1	73.9	26.8	100	321	
Vert.	7440.000	PK	44.7	37.0	7.2	40.4	3.4	51.9	73.9	22.0	100	0	
Vert.	9920.000	PK	45.0	38.4	8.2	39.4	3.4	55.6	73.9	18.3	100	0	
Vert.	12400.000	PK	45.6	39.5	9.6	39.6	3.4	58.5	73.9	15.4	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.2	27.9	13.8	41.0	3.6	3.4	45.9	53.9	8.0	*1)
Hori.	4960.000	AV	36.4	32.0	5.8	39.4	3.6	3.4	41.8	53.9	12.1	
Hori.	7440.000	AV	35.7	37.0	7.2	40.4	3.6	3.4	46.5	53.9	7.4	
Hori.	9920.000	AV	35.6	38.4	8.2	39.4	3.6	3.4	49.8	53.9	4.1	
Hori.	12400.000	AV	35.2	39.5	9.6	39.6	3.6	3.4	51.7	53.9	2.2	
Vert.	2483.500	AV	36.9	27.9	13.8	41.0	3.6	3.4	44.6	53.9	9.3	*1)
Vert.	4960.000	AV	35.8	32.0	5.8	39.4	3.6	3.4	41.2	53.9	12.7	
Vert.	7440.000	AV	35.9	37.0	7.2	40.4	3.6	3.4	46.7	53.9	7.2	
Vert.	9920.000	AV	35.2	38.4	8.2	39.4	3.6	3.4	49.4	53.9	4.5	
Vert.	12400.000	AV	35.0	39.5	9.6	39.6	3.6	3.4	51.5	53.9	2.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Duty factor + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(4.45 m / 3.0 m) = 3.4 dB

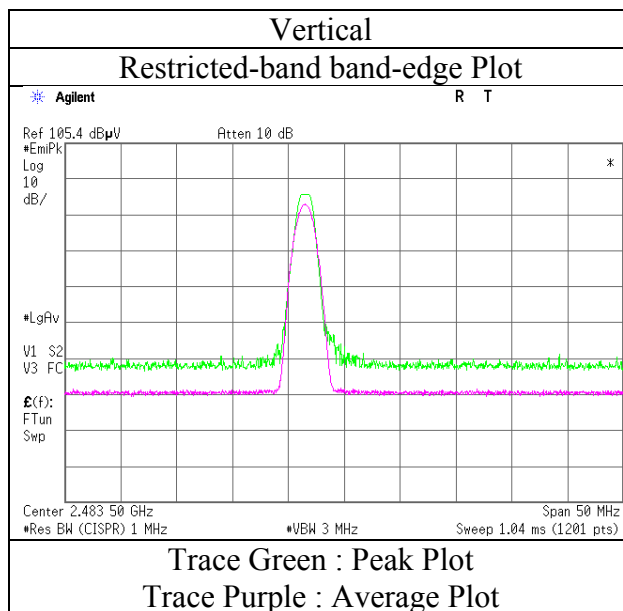
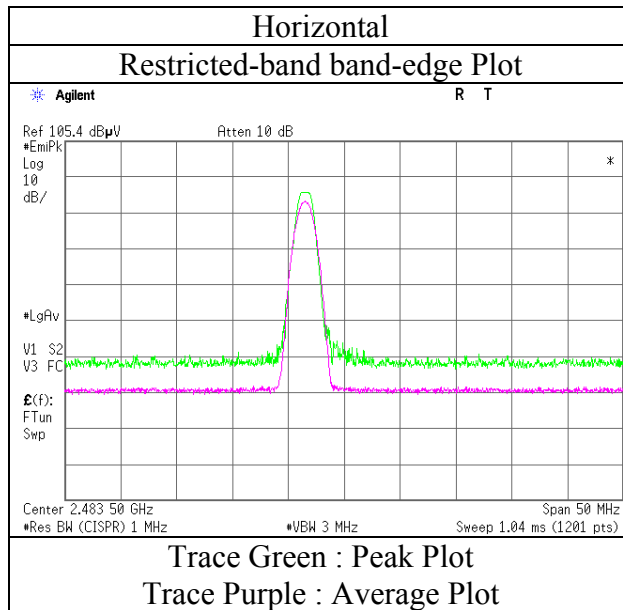
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.5 dB

Duty factor refer to "Duty factor Calculation chart" sheet.

*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

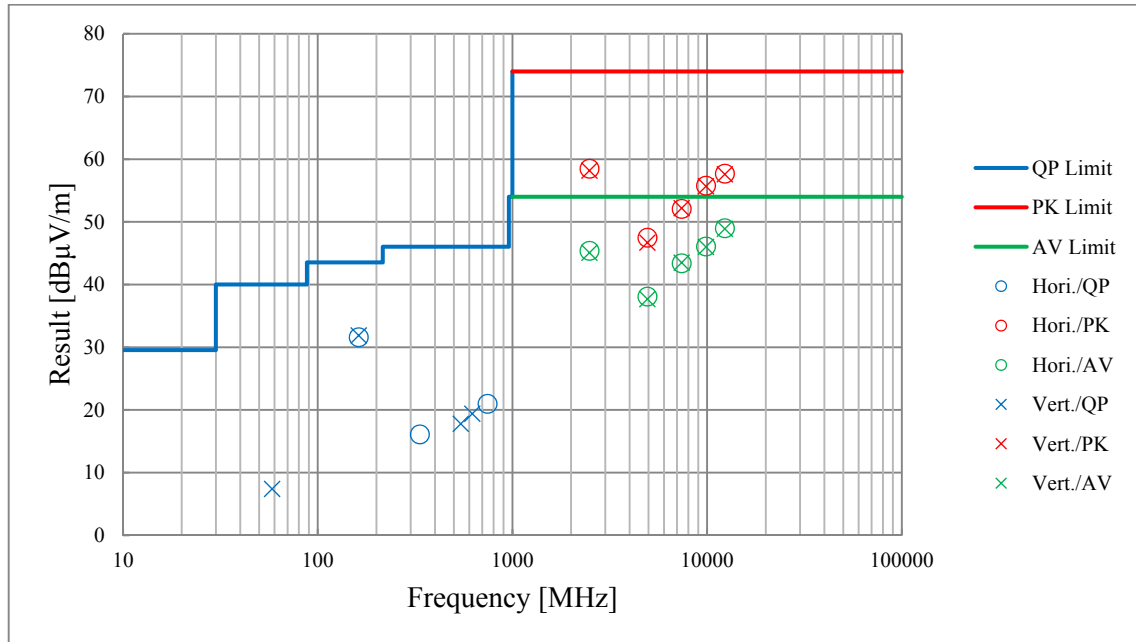
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10941706S-C
Date	October 27, 2015
Temperature / Humidity	23 deg. C / 39 % RH
Engineer	Yasumasa Owaki
Mode	Tx BT LE 2480 MHz



* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

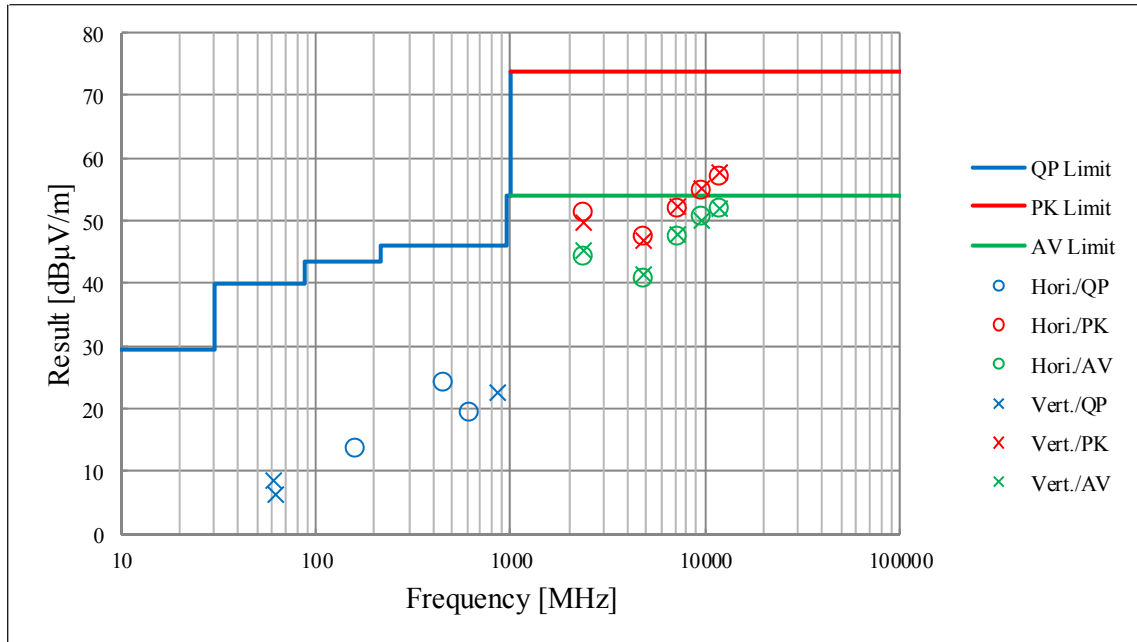
Test place Shonan EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10941706S-C
Date October 30, 2015
Temperature / Humidity 23 deg. C / 56 % RH
Engineer Kenichi Adachi
 (1-13 GHz)
Mode Tx 11g 2462 MHz



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission (Plot data, Worst case)

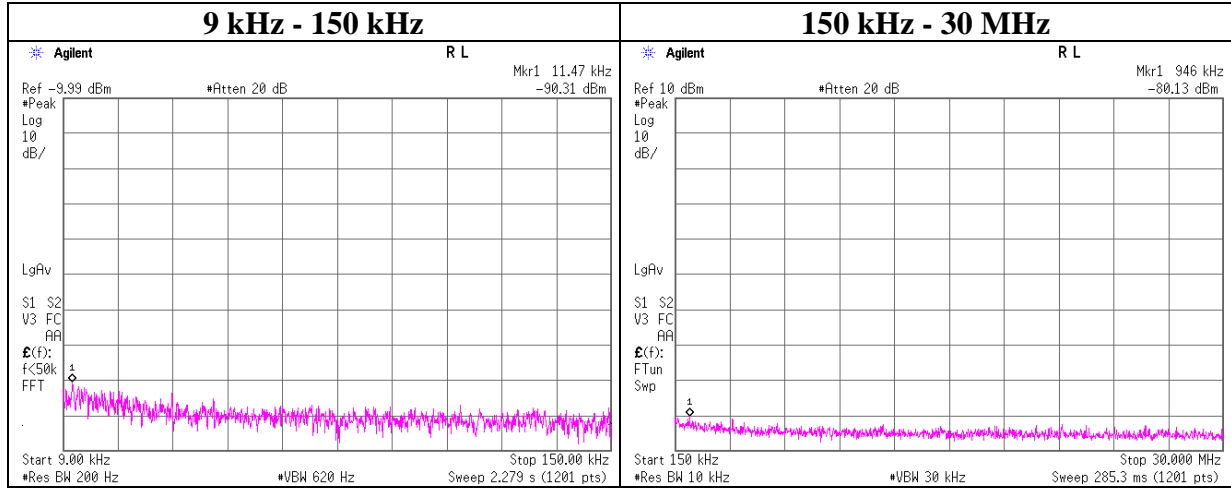
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10941706S-C	
Date	October 27, 2015	October 29, 2015
Temperature / Humidity	23 deg. C / 39 % RH	23 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Akira Sato
	(1-26 GHz)	(30 MHz-1 GHz)
Mode	Tx BT LE 2402 MHz	



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place : Shonan EMC Lab. No.1 Measurement Room
 Report No. : 10941706S-C
 Date : October 28, 2015
 Temperature / Humidity : 24 deg. C / 52 % RH
 Engineer : Tomohiro Hara
 Mode : Tx 11g 2462 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.47	-91.8	0.10	9.8	6.6	1	-75.3	300	6.0	-14.0	46.4	60.4	
946.00	-80.1	0.10	9.8	6.6	1	-63.6	30	6.0	17.6	28.0	10.4	

$E = \text{EIRP} - 20 \log(D) + \text{Ground bounce} + 104.8 \text{ [dBuV/m]}$
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$

Power Density

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 10941706S-C
Date October 28, 2015
Temperature / Humidity 24 deg. C / 53 % RH
Engineer Tomohiro Hara
Mode Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-14.54	0.89	9.93	-3.72	8.00	11.72
2437.00	-15.06	0.89	9.93	-4.24	8.00	12.24
2462.00	-14.37	0.89	9.93	-3.55	8.00	11.55

11g

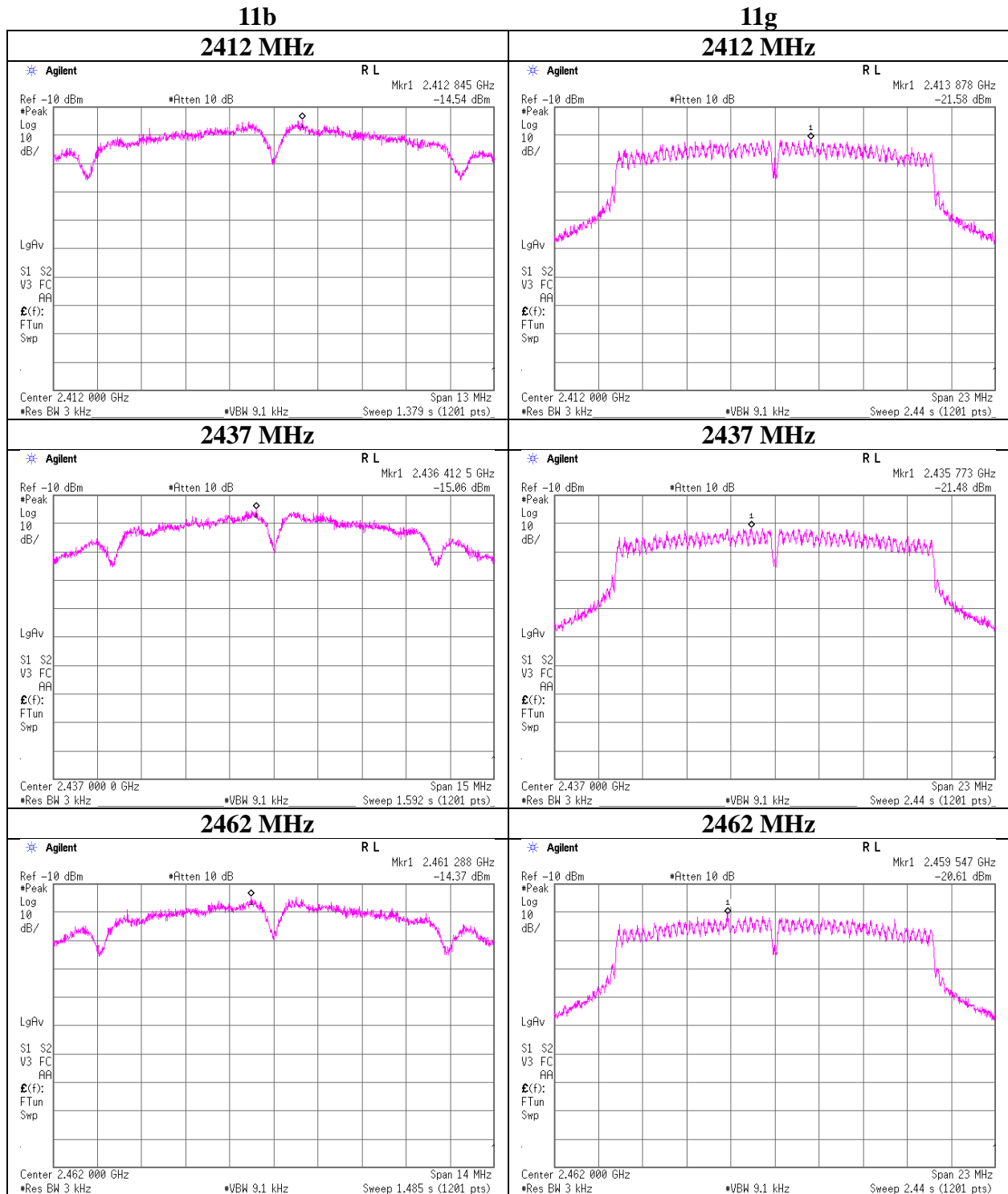
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-21.58	0.89	9.93	-10.76	8.00	18.76
2437.00	-21.48	0.89	9.93	-10.66	8.00	18.66
2462.00	-20.61	0.89	9.93	-9.79	8.00	17.79

Sample Calculation:

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

*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density



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Power Density

Test place Shonan EMC Lab. No.1 Measurement Room
Report No. 10941706S-C
Date October 28, 2015
Temperature / Humidity 24 deg. C / 53 % RH
Engineer Tomohiro Hara
Mode Tx

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-21.90	0.89	9.93	-11.08	0.08	8.00	19.08
2437.00	-22.59	0.89	9.93	-11.77	0.07	8.00	19.77
2462.00	-21.50	0.89	9.93	-10.68	0.09	8.00	18.68

BTLE

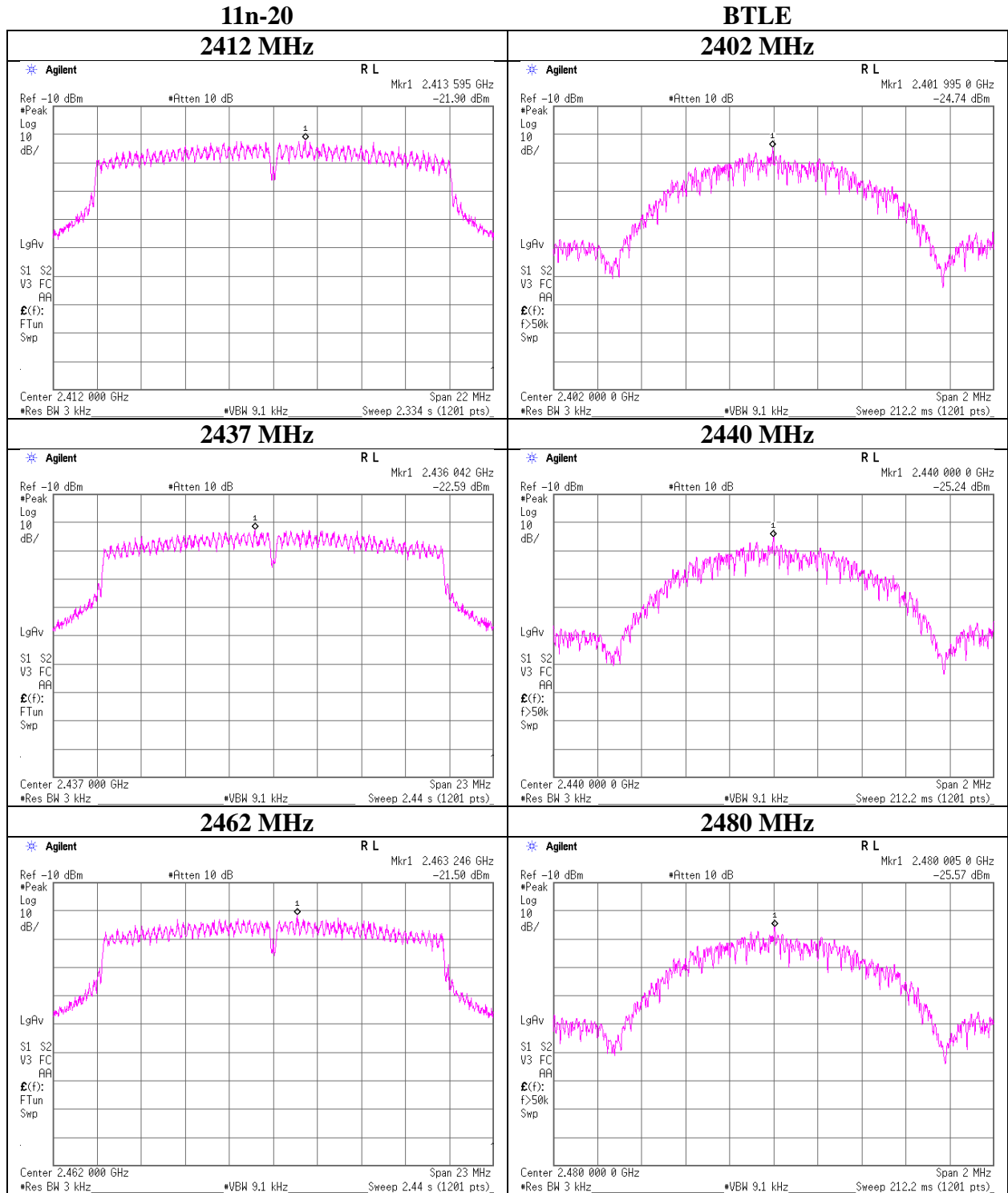
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit [dBm]	Margin [dB]
				[dBm]	[mW]		
2412.00	-24.74	0.89	9.93	-13.92	0.04	8.00	21.92
2437.00	-25.24	0.89	9.93	-14.42	0.04	8.00	22.42
2462.00	-25.57	0.90	9.93	-14.74	0.03	8.00	22.74

Sample Calculation:

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

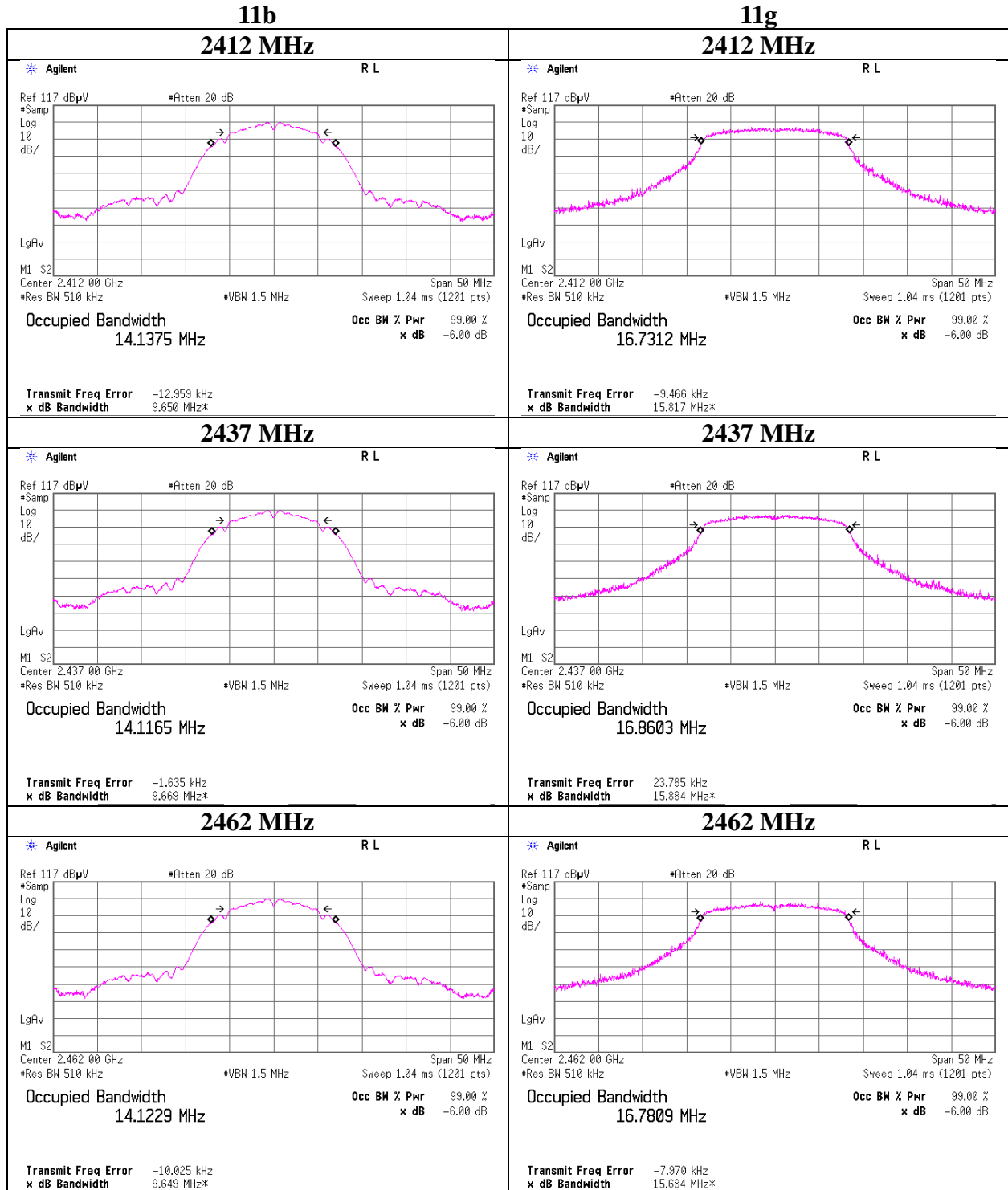
*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density



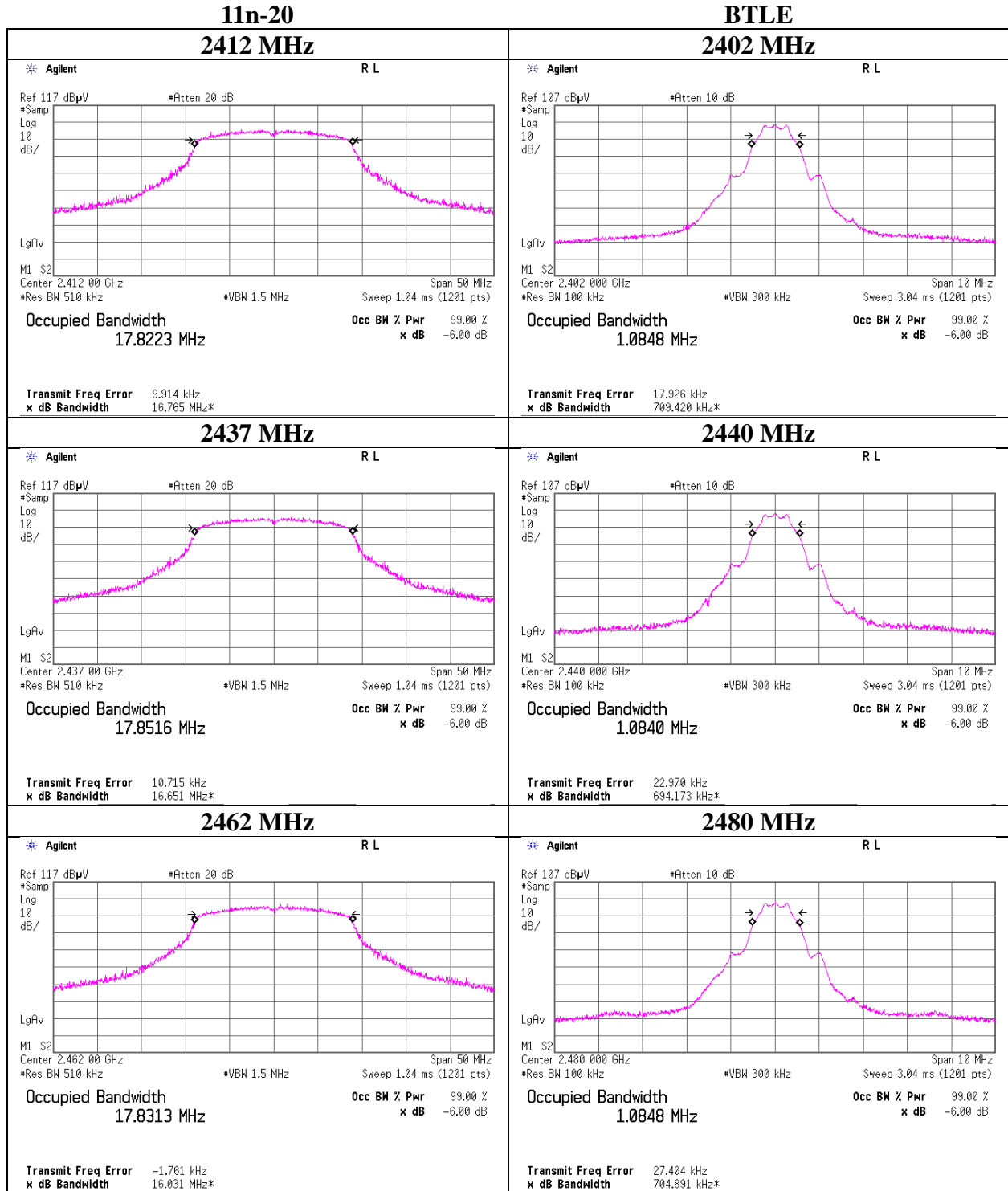
99% Occupied Bandwidth

Test place Report No. Date Temperature / Humidity Engineer Mode	Shonan EMC Lab. No.1 Measurement Room 10941706S-C October 28, 2015 24 deg. C / 53 % RH Tomohiro Hara Tx
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99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	10941706S-C
Date	October 28, 2015
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Tomohiro Hara
Mode	Tx



APPENDIX 2: Test instruments

Test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY461805 25	AT	2015/03/23 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2015/04/07 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2015/04/07 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2015/04/09 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2015/03/11 * 12
KTS-08	Digital Tester	SANWA	PC500	7019224	AT	2015/05/20 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2015/04/28 * 12
SAEC-03(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-03(SV SWR)	3	RE	2015/08/28 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2015/08/11 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-0 0	JUN-12-14- 018	RE	2015/06/08 * 12
SAT10-05	Attenuator(above1GH z)	Agilent	8493C-010	74864	RE	2014/11/21 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2014/11/21 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2015/05/27 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2015/05/19 * 12
SRENT-04	Spectrum Analyzer	KEYSIGHT	E4440A	MY461863 88	RE	2015/10/06 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY482501 06	RE	2015/03/26 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,M F)	-	RE, CE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2015/10/22 * 12
SJM-15	Measure	ASKUL	-	-	RE, CE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE, CE	2014/11/11 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2015/03/11 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2015/03/17 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2015/09/07 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NS A)	3	RE	2015/07/16 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2015/10/11 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108 A	UHALP 9108-A 0901	RE	2015/10/11 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2015/08/31 * 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 test**
 RE: Radiated Emission test
 AT: Antenna Terminal Conducted test

UL Japan, Inc.

Shonan EMC Lab.

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Test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SCC-C1/C2/C3 /C4/C5/C10/SR SE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suh ner/Suhner/Suhner/Su hner/TOYO	8D2W/12DSF A/141PE/141 PE/141PE/14 1PE/NS4906	-/0901-271(RF Selector)	RE	2015/04/17 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2015/02/18 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE, CE	2015/03/24 * 12
SCC-C9/C10/S RSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141 PE/NS4906	-/0901-271(RF Selector)	CE	2015/04/17 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2015/09/18 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2015/02/24 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2014/12/24 * 12
SLS-02	LISN	Rohde & Schwarz	ENV216	100512	CE	2015/02/24 * 12
SAT3-10	Attenuator	JFW	50HF-003N	-	CE	2015/08/31 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2014/11/21 * 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 test
RE: Radiated Emission test
AT: Antenna Terminal Conducted test**

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