



RADIO TEST REPORT

Test Report No. : 11500589S-A-R2

Applicant : Panasonic Corporation
Type of Equipment : BD Player
Model No. : AT1608
FCC ID : ACJ932AT1608
Test regulation : FCC Part 15 Subpart C: 2016
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)
7. This report is a revised version of 11500589S-A-R1. 11500589S-A-R1 is replaced with this report.

Date of test: October 21 to November 14, 2016

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Consumer Technology Division



- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
 There is no testing item of "Non-accreditation".

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Panasonic Corporation
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Telephone Number : +81-50-3689-6569
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Contact Person : Yuichi Kanbe

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

2.1 Identification of E.U.T.

Type of Equipment : BD Player
Model No. : AT1608
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 13.2 V
Receipt Date of Sample : October 8, 2016
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: AT1608 (referred to as the EUT in this report) is a BD Player.

General Specification

Clock frequency(ies) in the system : 4.718 MHz, 48 MHz, 74.25 MHz, 100 MHz, 666.67 MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 2412 MHz - 2462 MHz
Modulation : DSSS, OFDM
Power Supply (radio part input) : DC 3.3 V
Antenna type : Dipole Antenna
Antenna Gain : 4.45 dBi

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

* The revision on November 14, 2016, 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 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	-	-	*1)
6dB Bandwidth	FCC: KDB 558074 D01 DTS Meas Guidance v03r05 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 v03r05 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 v03r05 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 v03r05 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	6.1 dB 2390.00 MHz, AV, Horizontal Tx 2412 MHz IEEE 802.11g	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					
*1) The test is not applicable since the EUT does not have AC port.					
*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v03r05 12.2.7.					

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC 3.3 V).
Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the 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 6.6	IC: -	N/A	-	Conducted

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

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	No. 4 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 dB	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 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 %

Radiated emission test

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

3.5 Test Location

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)

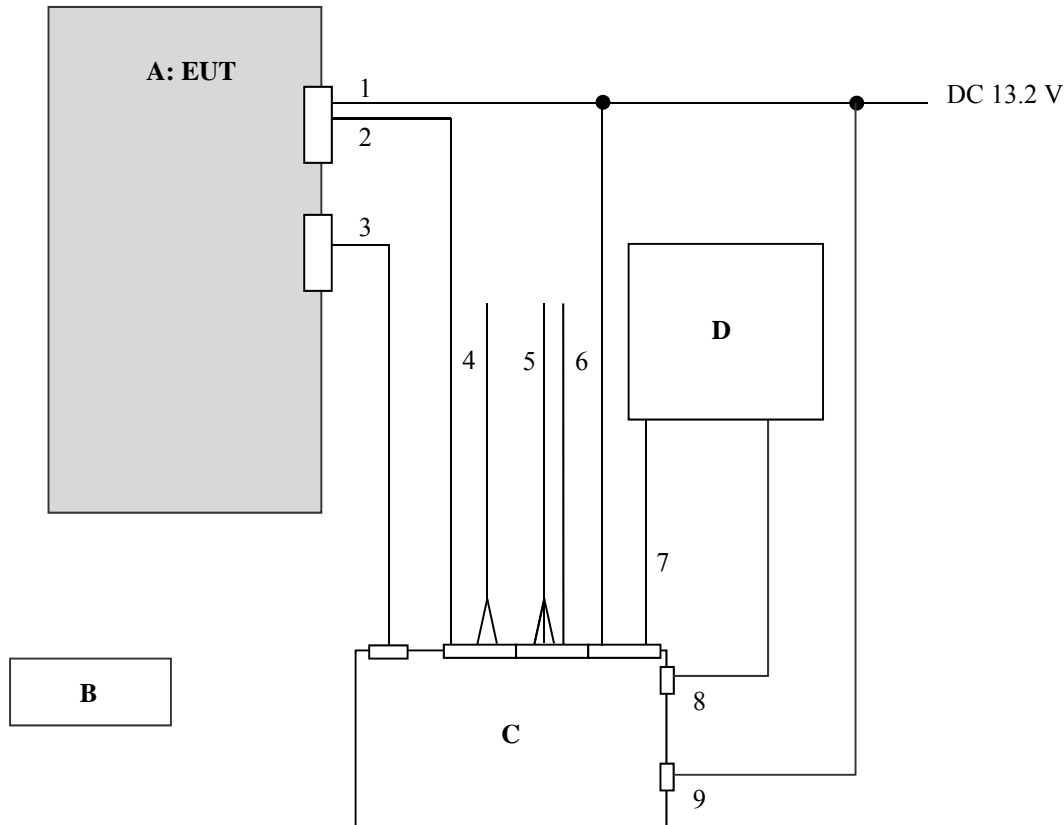
Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks *1)
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	36 Mbps, PN9
IEEE 802.11n (11n-20)	MCS 4, PN9
*1) The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b: 15 dBm, 11g: 11 dBm (2412 MHz, 2462 MHz), 13 dBm (2417 MHz to 2457 MHz), 11n: 11 dBm (2412 MHz, 2462 MHz), 12 dBm (2417 MHz to 2457 MHz) Software: WIFI Diag ver. 3.36 *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
Spurious Emission (above 1 GHz)	11b Tx	2412 MHz
6dB Bandwidth	11g Tx	2437 MHz
Maximum Peak Output Power	11n-20 Tx	2462 MHz
Power Density		
99% Occupied Bandwidth		
Restricted Band Edges	11b Tx	2412 MHz
		2462 MHz
	11g Tx	2412 MHz, 2417 MHz
	11n-20 Tx	2457 MHz, 2462 MHz
Spurious Emission (below 1 GHz)	11g Tx	2437 MHz

4.2 Configuration and peripherals



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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	BD Player	AT1608	C1S-027 *1) C1S-024 *2)	Panasonic	EUT
B	Remote controller	-	8010022A	Panasonic	-
C	ECU	SB-ECU	17-ECU-2S-052	Panasonic	-
D	Display	SB-DISP	200B-1S-145	Panasonic	-

*1) Used for Antenna Terminal conducted test

*2) Used for Radiated Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC mains	0.1+2.0	Unshielded	Unshielded	-
2	AVC-LAN & Analog Audio	2.0	Unshielded	Unshielded	-
3	HDMI	2.0	Shielded	Shielded	-
4	Headphone	2.0	Shielded	Shielded	-
5	RCA Cable	2.0	Shielded	Shielded	-
6	AVC-LAN & Analog Audio for Left Display	2.0	Unshielded	Unshielded	-
7	AVC-LAN & Analog Audio for Right Display	2.0	Unshielded	Unshielded	-
8	Digital Video (GVIF)	2.0	Shielded	Shielded	-
9	WAKEUP	2.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "558074 D01 DTS Meas Guidance v03r05".

[For below 1 GHz]

EUT was placed on a platform of nominal size, 1.0 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 Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For 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 absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 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: 300kHz
Test Distance	3 m	3.9 m *1) (1 GHz – 13 GHz), 1 m *2) (13 GHz – 26.5 GHz)		3.9 m *1) (1 GHz – 13 GHz), 1 m *2) (13 GHz – 26.5 GHz)

*1) Distance Factor: $20 \times \log(3.9 \text{ m} / 3.0 \text{ m}) = 2.28 \text{ dB}$

*2) Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

*3) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v03r05"

The carrier level and noise levels were confirmed at angle of 0 deg. to 10 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (0 deg.) that has the maximum noise.

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

Measurement range : 30 MHz - 26.5 GHz

Test data : APPENDIX

Test result : Pass

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SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	50 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 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *5)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	10 kHz	30 kHz				
*1) Peak hold was applied as Worst-case measurement. *2) Reference data *3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v03r05". *4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)							

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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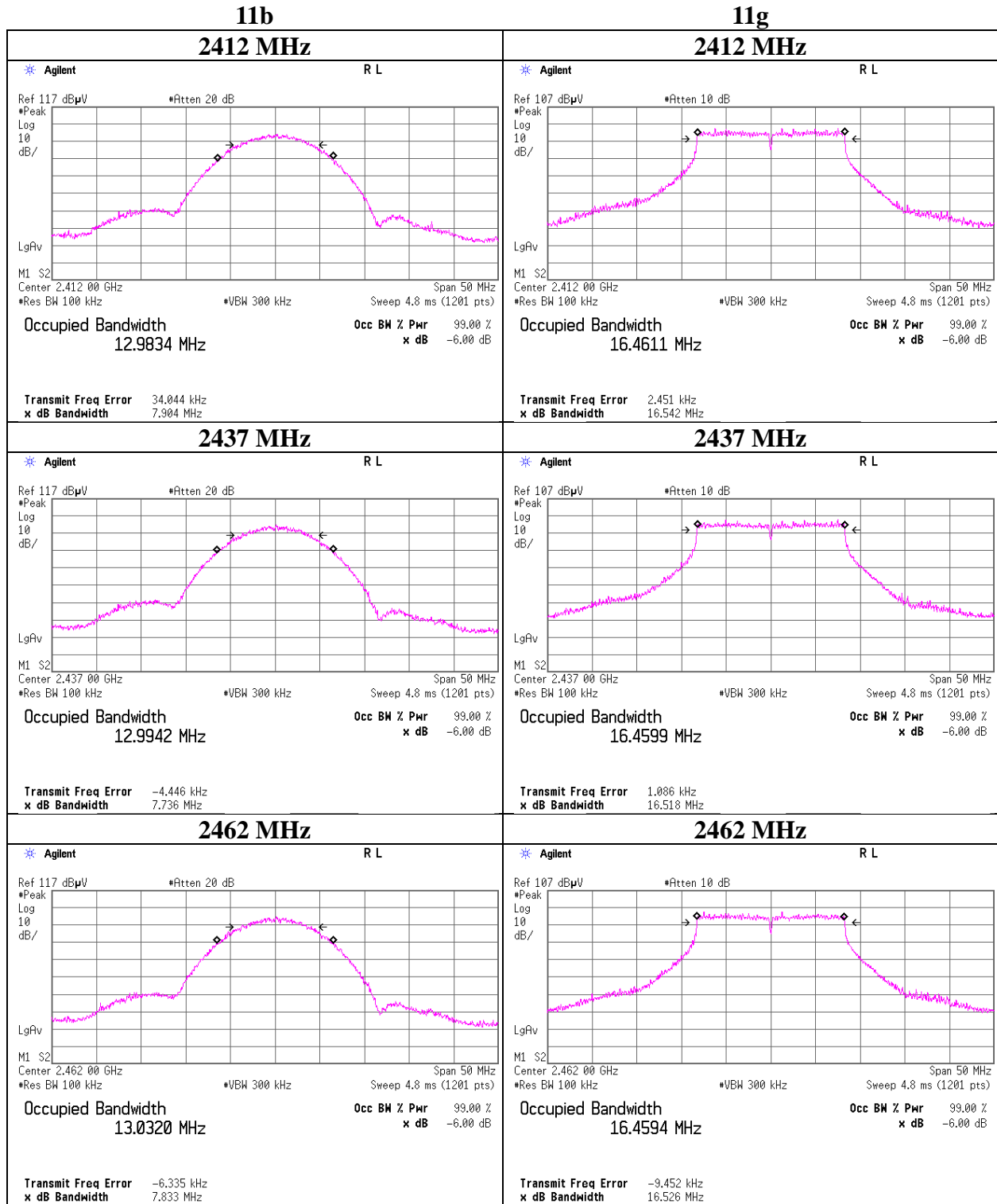
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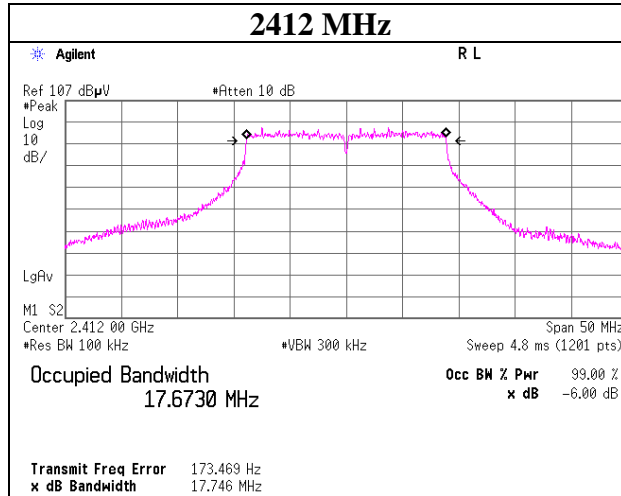
6dB Bandwidth



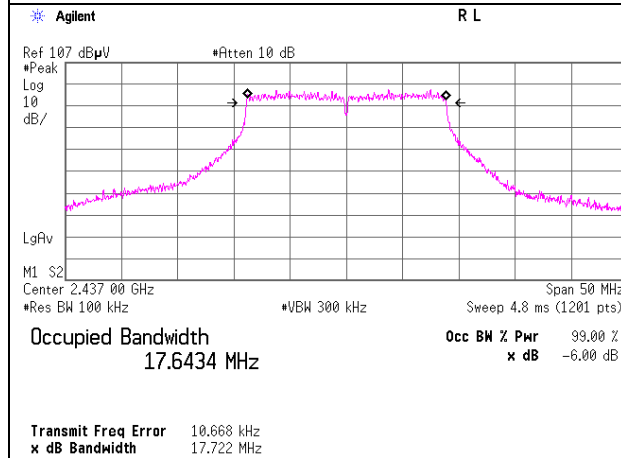
6dB Bandwidth

11n-20

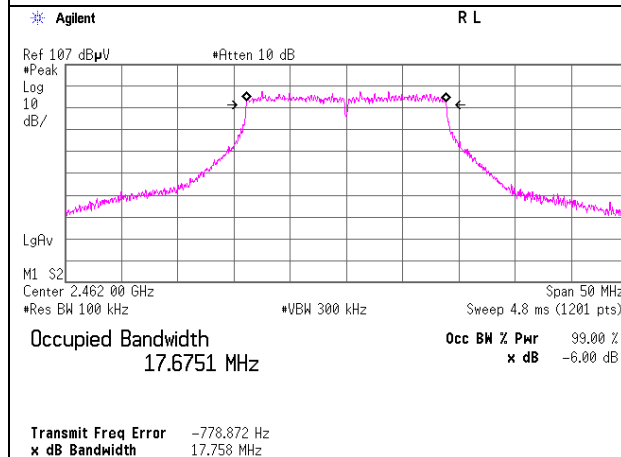
2412 MHz



2437 MHz



2462 MHz



Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11500589S-A-R2
Date : October 21, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	5.20	1.72	10.01	16.93	49.32	30.00	1000	13.07
2437	5.40	1.72	10.01	17.13	51.64	30.00	1000	12.87
2462	5.38	1.73	10.01	17.12	51.52	30.00	1000	12.88

Sample Calculation:

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

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	5.10	
2	5.34	
5.5	5.36	
11	5.40	*

*: Worst Rate

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

Maximum Peak Output Power

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11500589S-A-R2
Date : October 21, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx 11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]	
2412	9.34	1.72	9.67	20.73	118.30	30.00	1000	9.27
2437	10.24	1.71	10.01	21.96	157.04	30.00	1000	8.04
2462	9.38	1.73	9.67	20.78	119.67	30.00	1000	9.22

Sample Calculation:

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

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
6	6.64	
9	6.70	
12	6.71	
18	6.88	
24	10.12	
36	10.24	*
48	9.96	
54	10.17	

*: Worst Rate

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

Average Output Power
(Reference data for RF Exposure)

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11500589S-A-R2
Date : October 21, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

11b 11 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	2.74	1.72	10.01	14.47	27.99	0.03	14.50	28.18
2437	3.06	1.72	10.01	14.79	30.13	0.03	14.82	30.34
2462	2.86	1.73	10.01	14.60	28.84	0.03	14.63	29.04

11g 36 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-1.27	1.72	9.67	10.12	10.28	0.10	10.22	10.52
2437	0.56	1.71	10.01	12.28	16.90	0.10	12.38	17.30
2462	-1.34	1.73	9.67	10.06	10.14	0.10	10.16	10.38

11n-20 MCS 1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-1.21	1.72	9.67	10.18	10.42	0.11	10.29	10.69
2437	-0.45	1.71	10.01	11.27	13.40	0.11	11.38	13.74
2462	-1.05	1.73	9.67	10.35	10.84	0.11	10.46	11.12

Sample Calculation:

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

Result (Burst power average) = Time average + Duty factor

Average Output Power
(Reference data for RF Exposure)

Test place : Shonan EMC Lab. No.5 Shielded Room
Report No. : 11500589S-A-R2
Date : October 21, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Hiroyuki Morikawa
Mode : Tx

2437 MHz

Mode	Rate Mbps	Reading [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11b	1	2.55	0.00	2.55	
	2	2.86	0.00	2.86	
	5.5	2.93	0.01	2.94	
	11	3.06	0.03	3.09	*
11g	6	0.14	0.02	0.16	
	9	0.12	0.02	0.14	
	12	0.15	0.04	0.19	
	18	0.11	0.05	0.16	
	24	0.54	0.07	0.61	
	36	0.56	0.09	0.65	*
	48	0.47	0.13	0.60	
54	0.44	0.16	0.60		

* 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	-1.00	0.02	-0.98	
	1	-0.99	0.04	-0.95	
	2	-1.04	0.06	-0.98	
	3	-0.51	0.07	-0.44	
	4	-0.45	0.11	-0.34	*
	5	-0.57	0.15	-0.42	
	6	-0.56	0.17	-0.39	
	7	-0.59	0.19	-0.40	

* Worst rate

Sample Calculation:

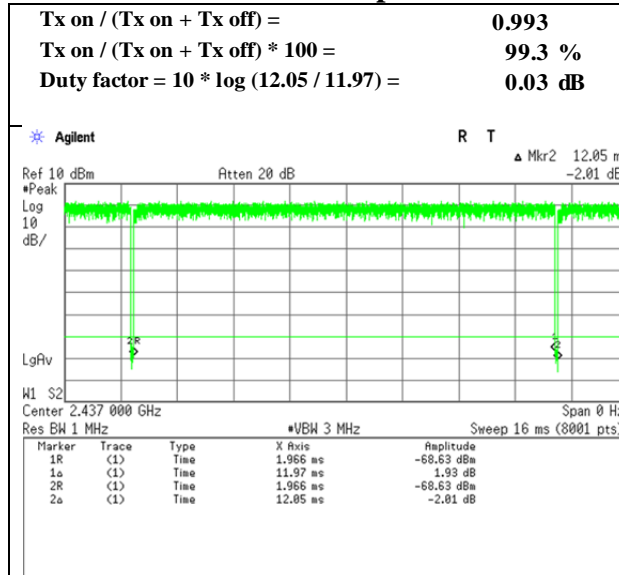
$$\text{Burst power} = \text{Reading (timed average)} + \text{Duty factor}$$

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

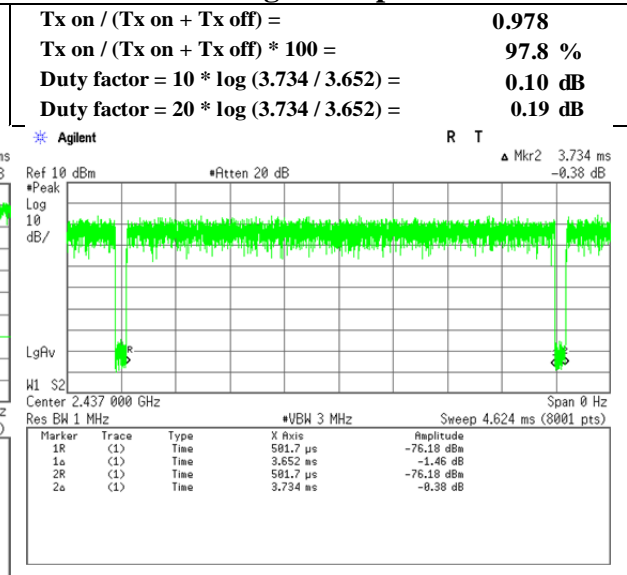
Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11500589S-A-R2
Date	October 21, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx

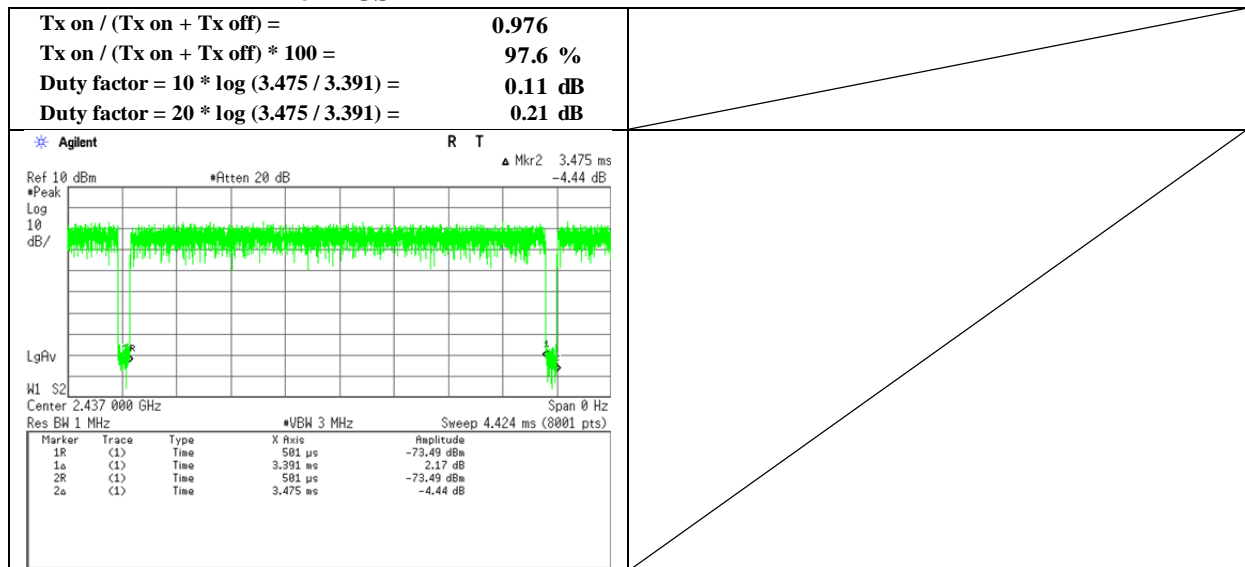
11b 11 Mbps



11g 36 Mbps



11n-20 MCS 4



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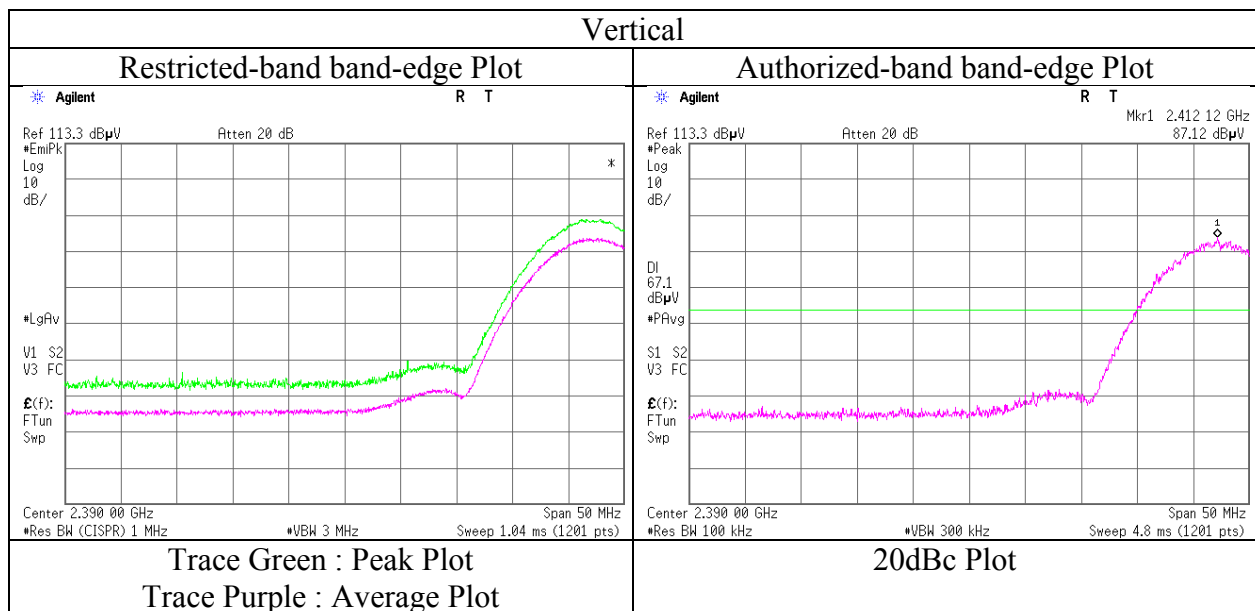
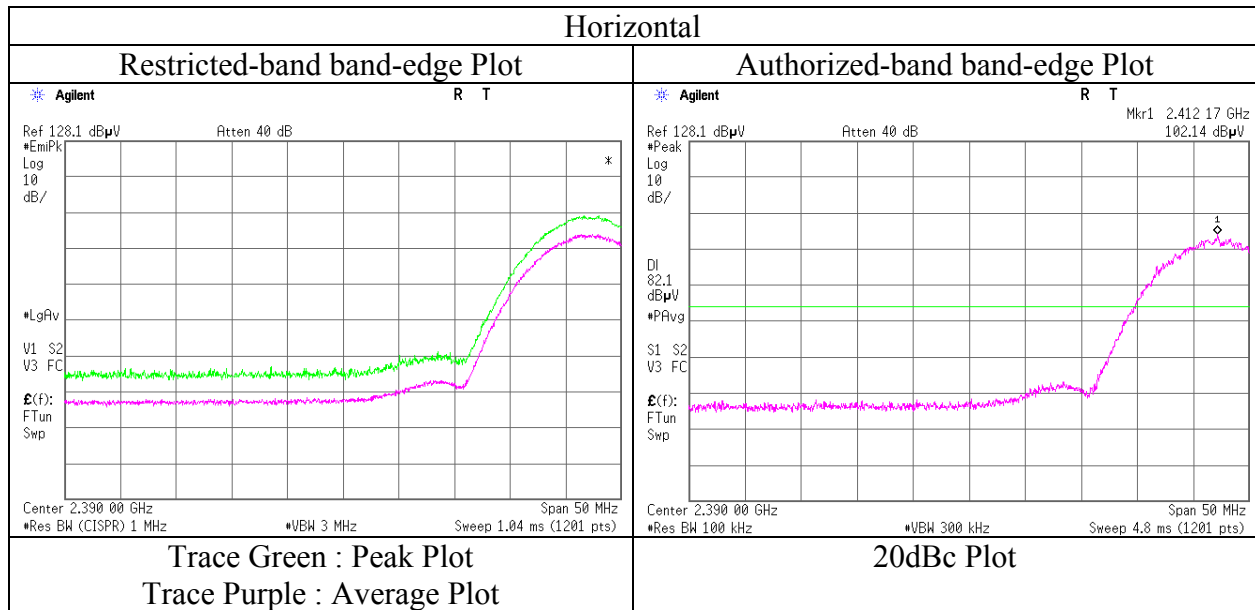
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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11500589S-A-R2
Date	October 27, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shinichi Takano (1 GHz -2.8 GHz)
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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 26, 2016 October 27, 2016 November 14, 2016
Temperature / Humidity : 21 deg. C / 55 % RH 24 deg. C / 46 % RH 25 deg. C / 44 % RH
Engineer : Hikaru Shirasawa Shinichi Takano Hikaru Shirasawa
 (13 GHz -26.5 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 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.	1056.257	PK	52.82	24.51	12.46	40.84	2.28	51.23	73.90	22.6	159	211	
Hori.	1787.486	PK	50.71	25.50	13.20	40.75	2.28	50.94	73.90	22.9	132	162	
Hori.	3110.988	PK	51.83	28.54	5.47	41.04	2.28	47.08	73.90	26.8	195	151	
Hori.	3555.571	PK	53.97	28.77	5.57	41.36	2.28	49.23	73.90	24.6	216	120	
Hori.	4874.000	PK	47.30	31.27	6.01	41.40	2.28	45.46	73.90	28.4	100	0	
Hori.	7311.000	PK	46.58	36.39	7.40	41.23	2.28	51.42	73.90	22.4	100	0	
Hori.	9748.000	PK	45.23	38.33	8.23	40.42	2.28	53.65	73.90	20.2	148	28	
Hori.	12185.000	PK	45.29	39.12	9.44	39.80	2.28	56.33	73.90	17.5	150	0	
Hori.	1056.257	AV	44.52	24.51	12.46	40.84	2.28	42.93	53.90	10.9	159	211	
Hori.	1787.486	AV	42.49	25.50	13.20	40.75	2.28	42.72	53.90	11.1	132	162	
Hori.	3110.988	AV	40.01	28.54	5.47	41.04	2.28	35.26	53.90	18.6	195	151	
Hori.	3555.571	AV	41.51	28.77	5.57	41.36	2.28	36.77	53.90	17.1	216	120	
Hori.	4874.000	AV	37.40	31.27	6.01	41.40	2.28	35.56	53.90	18.3	100	0	
Hori.	7311.000	AV	36.95	36.39	7.40	41.23	2.28	41.79	53.90	12.1	100	0	
Hori.	9748.000	AV	36.17	38.33	8.23	40.42	2.28	44.59	53.90	9.3	148	28	
Hori.	12185.000	AV	35.63	39.12	9.44	39.80	2.28	46.67	53.90	7.2	150	0	
Vert.	1056.251	PK	51.50	24.51	12.46	40.84	2.28	49.91	73.90	23.9	137	15	
Vert.	1137.509	PK	53.70	24.59	12.54	40.83	2.28	52.28	73.90	21.6	138	330	
Vert.	1381.272	PK	51.93	24.83	12.81	40.79	2.28	51.06	73.90	22.8	148	51	
Vert.	1868.770	PK	50.51	25.66	13.28	40.74	2.28	50.99	73.90	22.9	172	344	
Vert.	3111.009	PK	55.70	28.54	5.47	41.04	2.28	50.95	73.90	22.9	152	161	
Vert.	3575.019	PK	53.72	28.81	5.58	41.38	2.28	49.01	73.90	24.8	210	29	
Vert.	4874.000	PK	46.79	31.27	6.01	41.40	2.28	44.95	73.90	28.9	150	359	
Vert.	7311.000	PK	46.56	36.39	7.40	41.23	2.28	51.40	73.90	22.5	150	0	
Vert.	9748.000	PK	44.75	38.33	8.23	40.42	2.28	53.17	73.90	20.7	161	7	
Vert.	12185.000	PK	45.65	39.12	9.44	39.80	2.28	56.69	73.90	17.2	100	0	
Vert.	1056.251	AV	43.98	24.51	12.46	40.84	2.28	42.39	53.90	11.5	137	15	
Vert.	1137.509	AV	46.06	24.59	12.54	40.83	2.28	44.64	53.90	9.2	138	330	
Vert.	1381.272	AV	43.55	24.83	12.81	40.79	2.28	42.68	53.90	11.2	148	51	
Vert.	1868.770	AV	42.21	25.66	13.28	40.74	2.28	42.69	53.90	11.2	172	344	
Vert.	3111.009	AV	42.81	28.54	5.47	41.04	2.28	38.06	53.90	15.8	152	161	
Vert.	3575.019	AV	45.87	28.81	5.58	41.38	2.28	41.16	53.90	12.7	210	29	
Vert.	4874.000	AV	37.77	31.27	6.01	41.40	2.28	35.93	53.90	17.9	150	359	
Vert.	7311.000	AV	36.90	36.39	7.40	41.23	2.28	41.74	53.90	12.1	150	0	
Vert.	9748.000	AV	36.36	38.33	8.23	40.42	2.28	44.78	53.90	9.1	161	7	
Vert.	12185.000	AV	35.94	39.12	9.44	39.80	2.28	46.98	53.90	6.9	100	0	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 26, 2016 October 27, 2016 November 14, 2016
Temperature / Humidity : 21 deg. C / 55 % RH 24 deg. C / 46 % RH 25 deg. C / 44 % RH
Engineer : Hikaru Shirasawa Shinichi Takano Hikaru Shirasawa
 (13 GHz -26.5 GHz) (1 GHz -2.8 GHz) (2.8 GHz -13 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.	1056.248	PK	51.82	24.51	12.46	40.84	2.28	50.23	73.90	23.6	158	211	
Hori.	1787.479	PK	50.96	25.50	13.20	40.75	2.28	51.19	73.90	22.7	159	158	
Hori.	2031.216	PK	49.13	26.01	13.43	40.73	2.28	50.12	73.90	23.7	163	42	
Hori.	2483.500	PK	50.96	27.52	13.86	40.69	2.28	53.93	73.90	19.9	162	353	
Hori.	3111.059	PK	53.46	28.54	5.47	41.04	2.28	48.71	73.90	25.1	236	160	
Hori.	3555.584	PK	52.92	28.77	5.57	41.36	2.28	48.18	73.90	25.7	222	115	
Hori.	4924.000	PK	47.19	31.37	6.04	41.30	2.28	45.58	73.90	28.3	150	0	
Hori.	7386.000	PK	46.85	36.50	7.45	41.31	2.28	51.77	73.90	22.1	150	359	
Hori.	9848.000	PK	45.03	38.48	8.31	40.36	2.28	53.74	73.90	20.1	147	27	
Hori.	12310.000	PK	45.75	39.11	9.53	39.75	2.28	56.92	73.90	16.9	150	0	
Hori.	1056.248	AV	44.46	24.51	12.46	40.84	2.28	42.87	53.90	11.0	158	211	
Hori.	1787.479	AV	42.73	25.50	13.20	40.75	2.28	42.96	53.90	10.9	159	158	
Hori.	2031.216	AV	40.67	26.01	13.43	40.73	2.28	41.66	53.90	12.2	163	42	
Hori.	2483.500	AV	41.87	27.52	13.86	40.69	2.28	44.84	53.90	9.0	162	353	
Hori.	3111.059	AV	40.26	28.54	5.47	41.04	2.28	35.51	53.90	18.3	236	160	
Hori.	3555.584	AV	41.13	28.77	5.57	41.36	2.28	36.39	53.90	17.5	222	115	
Hori.	4924.000	AV	37.52	31.37	6.04	41.30	2.28	35.91	53.90	17.9	150	0	
Hori.	7386.000	AV	37.19	36.50	7.45	41.31	2.28	42.11	53.90	11.8	150	359	
Hori.	9848.000	AV	36.30	38.48	8.31	40.36	2.28	45.01	53.90	8.8	147	27	
Hori.	12310.000	AV	35.87	39.11	9.53	39.75	2.28	47.04	53.90	6.8	150	0	
Vert.	1137.481	PK	53.20	24.59	12.54	40.83	2.28	51.78	73.90	22.1	155	357	
Vert.	1381.256	PK	52.10	24.83	12.81	40.79	2.28	51.23	73.90	22.6	142	50	
Vert.	1868.917	PK	49.31	25.66	13.28	40.74	2.28	49.79	73.90	24.1	131	32	
Vert.	2275.008	PK	49.58	26.83	13.66	40.71	2.28	51.64	73.90	22.2	133	346	
Vert.	2483.500	PK	45.97	27.52	13.86	40.69	2.28	48.94	73.90	24.9	159	321	
Vert.	3110.889	PK	55.54	28.54	5.47	41.04	2.28	50.79	73.90	23.1	223	163	
Vert.	3575.048	PK	53.46	28.81	5.58	41.38	2.28	48.75	73.90	25.1	214	24	
Vert.	4924.000	PK	47.54	31.37	6.04	41.30	2.28	45.93	73.90	27.9	150	359	
Vert.	7386.000	PK	46.89	36.50	7.45	41.31	2.28	51.81	73.90	22.0	150	0	
Vert.	9848.000	PK	44.96	38.48	8.31	40.36	2.28	53.67	73.90	20.2	150	19	
Vert.	12310.000	PK	45.44	39.11	9.53	39.75	2.28	56.61	73.90	17.2	150	359	
Vert.	1137.481	AV	45.14	24.59	12.54	40.83	2.28	43.72	53.90	10.1	155	357	
Vert.	1381.256	AV	44.23	24.83	12.81	40.79	2.28	43.36	53.90	10.5	142	50	
Vert.	1868.917	AV	40.55	25.66	13.28	40.74	2.28	41.03	53.90	12.8	131	32	
Vert.	2275.008	AV	41.15	26.83	13.66	40.71	2.28	43.21	53.90	10.6	133	346	
Vert.	2483.500	AV	37.03	27.52	13.86	40.69	2.28	40.00	53.90	13.9	159	321	
Vert.	3110.889	AV	43.82	28.54	5.47	41.04	2.28	39.07	53.90	14.8	223	163	
Vert.	3575.048	AV	45.59	28.81	5.58	41.38	2.28	40.88	53.90	13.0	214	24	
Vert.	4924.000	AV	37.74	31.37	6.04	41.30	2.28	36.13	53.90	17.7	150	359	
Vert.	7386.000	AV	37.19	36.50	7.45	41.31	2.28	42.11	53.90	11.7	150	0	
Vert.	9848.000	AV	36.12	38.48	8.31	40.36	2.28	44.83	53.90	9.0	150	19	
Vert.	12310.000	AV	35.77	39.11	9.53	39.75	2.28	46.94	53.90	6.9	150	359	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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Shonan EMC Lab.

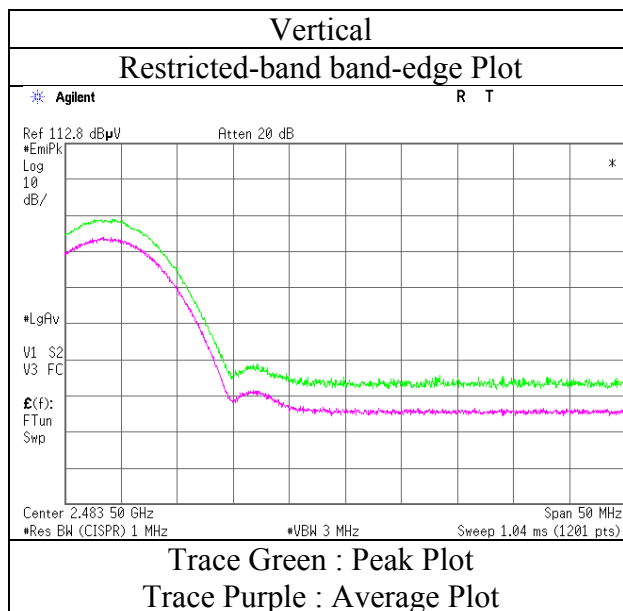
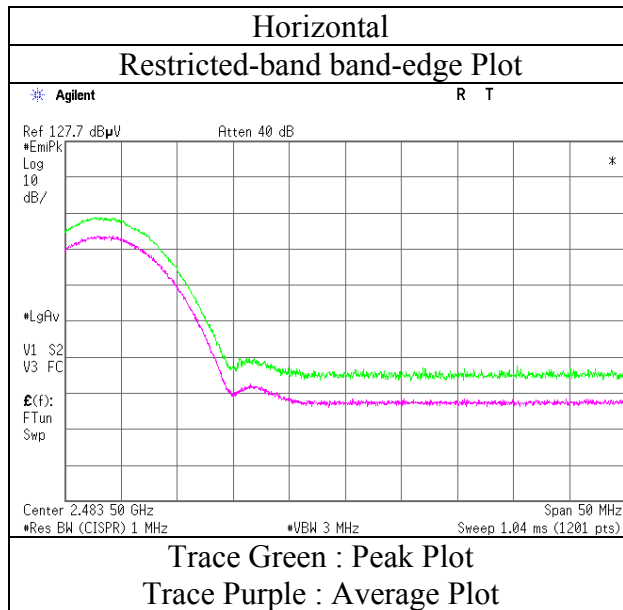
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11500589S-A-R2
Date	October 27, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shinichi Takano (1 GHz -2.8 GHz)
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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 25, 2016 October 26, 2016 October 27, 2016
Temperature / Humidity : 20 deg. C / 38 % RH 21 deg. C / 55 % RH 24 deg. C / 46 % RH
Engineer : Yasumasa Owaki Hikaru Shirasawa Shinichi Takano
 (2.8 GHz -13 GHz) (13 GHz -26.5 GHz) (1 GHz -2.8 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.	1056.275	PK	52.38	24.51	12.46	40.84	2.28	50.79	73.90	23.1	162	212	
Hori.	1381.266	PK	51.43	24.83	12.81	40.79	2.28	50.56	73.90	23.3	200	355	
Hori.	1787.600	PK	51.13	25.50	13.20	40.75	2.28	51.36	73.90	22.5	169	164	
Hori.	2390.000	PK	57.85	27.21	13.77	40.70	2.28	60.41	73.90	13.4	150	0	
Hori.	4824.000	PK	46.24	31.17	6.00	41.50	2.28	44.19	73.90	29.7	100	0	
Hori.	7236.000	PK	46.01	36.29	7.34	41.16	2.28	50.76	73.90	23.1	100	0	
Hori.	9648.000	PK	44.60	38.19	8.16	40.47	2.28	52.76	73.90	21.1	136	7	
Hori.	12060.000	PK	43.49	39.14	9.34	39.85	2.28	54.40	73.90	19.5	100	0	
Hori.	1056.275	AV	46.61	24.51	12.46	40.84	2.28	45.02	53.90	8.8	162	212	
Hori.	1381.266	AV	44.01	24.83	12.81	40.79	2.28	43.14	53.90	10.7	200	355	
Hori.	1787.600	AV	43.55	25.50	13.20	40.75	2.28	43.78	53.90	10.1	169	164	
Vert.	1137.417	PK	52.70	24.59	12.54	40.83	2.28	51.28	73.90	22.6	192	14	
Vert.	1381.266	PK	52.28	24.83	12.81	40.79	2.28	51.41	73.90	22.4	173	48	
Vert.	1787.467	PK	52.21	25.50	13.20	40.75	2.28	52.44	73.90	21.4	189	349	
Vert.	1868.783	PK	50.41	25.66	13.28	40.74	2.28	50.89	73.90	23.0	181	348	
Vert.	2390.000	PK	50.01	27.21	13.77	40.70	2.28	52.57	73.90	21.3	178	322	
Vert.	3111.090	PK	56.94	28.54	5.47	41.04	2.28	52.19	73.90	21.7	209	157	
Vert.	4824.000	PK	46.44	31.17	6.00	41.50	2.28	44.39	73.90	29.5	100	0	
Vert.	7236.000	PK	46.00	36.29	7.34	41.16	2.28	50.75	73.90	23.1	100	0	
Vert.	9648.000	PK	44.68	38.19	8.16	40.47	2.28	52.84	73.90	21.0	137	10	
Vert.	12060.000	PK	42.61	39.14	9.34	39.85	2.28	53.52	73.90	20.3	100	0	
Vert.	1137.417	AV	45.88	24.59	12.54	40.83	2.28	44.46	53.90	9.4	192	14	
Vert.	1381.266	AV	45.34	24.83	12.81	40.79	2.28	44.47	53.90	9.4	173	48	
Vert.	1787.467	AV	45.34	25.50	13.20	40.75	2.28	45.57	53.90	8.3	189	349	
Vert.	1868.783	AV	43.22	25.66	13.28	40.74	2.28	43.70	53.90	10.2	181	348	
Vert.	3111.090	AV	43.86	28.54	5.47	41.04	2.28	39.11	53.90	14.7	209	157	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.	2390.000	AV	45.04	27.21	13.77	40.70	0.19	2.28	47.79	53.90	6.1	*1)
Hori.	4824.000	AV	37.78	31.17	6.00	41.50	0.19	2.28	35.92	53.90	18.0	
Hori.	7236.000	AV	36.47	36.29	7.34	41.16	0.19	2.28	41.41	53.90	12.5	
Hori.	9648.000	AV	36.60	38.19	8.16	40.47	0.19	2.28	44.95	53.90	9.0	
Hori.	12060.000	AV	34.37	39.14	9.34	39.85	0.19	2.28	45.47	53.90	8.4	
Vert.	2390.000	AV	38.90	27.21	13.77	40.70	0.19	2.28	41.65	53.90	12.3	*1)
Vert.	4824.000	AV	37.90	31.17	6.00	41.50	0.19	2.28	36.04	53.90	17.9	
Vert.	7236.000	AV	36.26	36.29	7.34	41.16	0.19	2.28	41.20	53.90	12.7	
Vert.	9648.000	AV	36.29	38.19	8.16	40.47	0.19	2.28	44.64	53.90	9.3	
Vert.	12060.000	AV	34.26	39.14	9.34	39.85	0.19	2.28	45.36	53.90	8.5	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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	94.44	27.29	13.79	40.70	2.28	97.10	-	-	Carrier
Hori.	2400.000	PK	60.13	27.25	13.78	40.70	2.28	62.74	77.10	14.4	
Vert.	2412.000	PK	78.88	27.29	13.79	40.70	2.28	81.54	-	-	Carrier
Vert.	2400.000	PK	46.39	27.25	13.78	40.70	2.28	49.00	61.54	12.5	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

UL Japan, Inc.

Shonan EMC Lab.

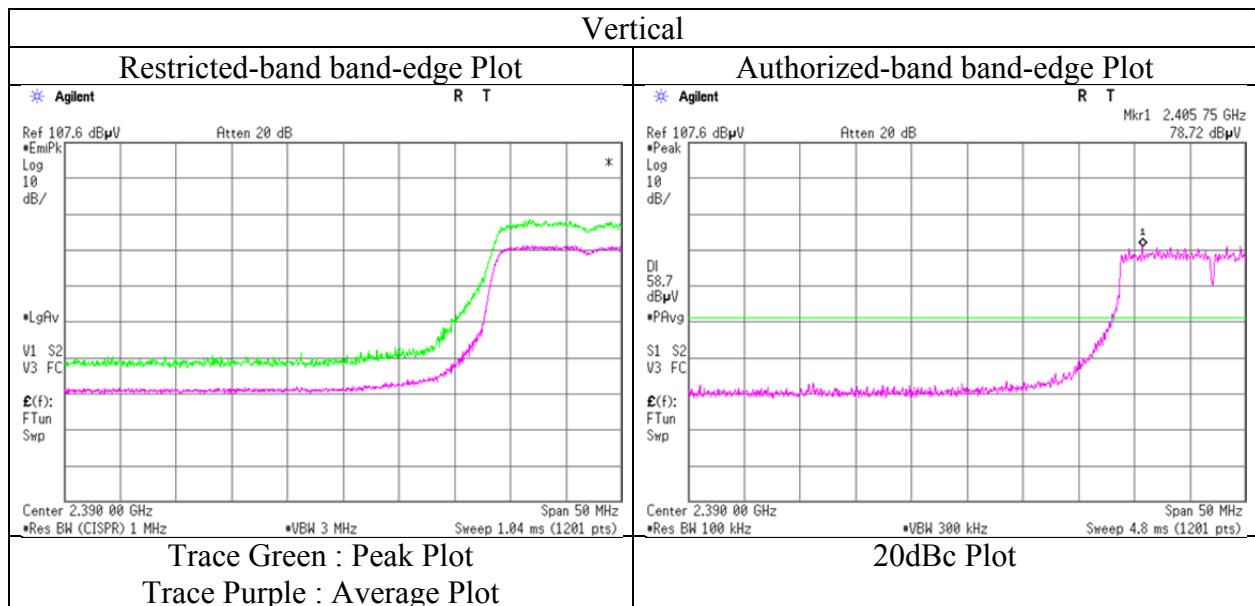
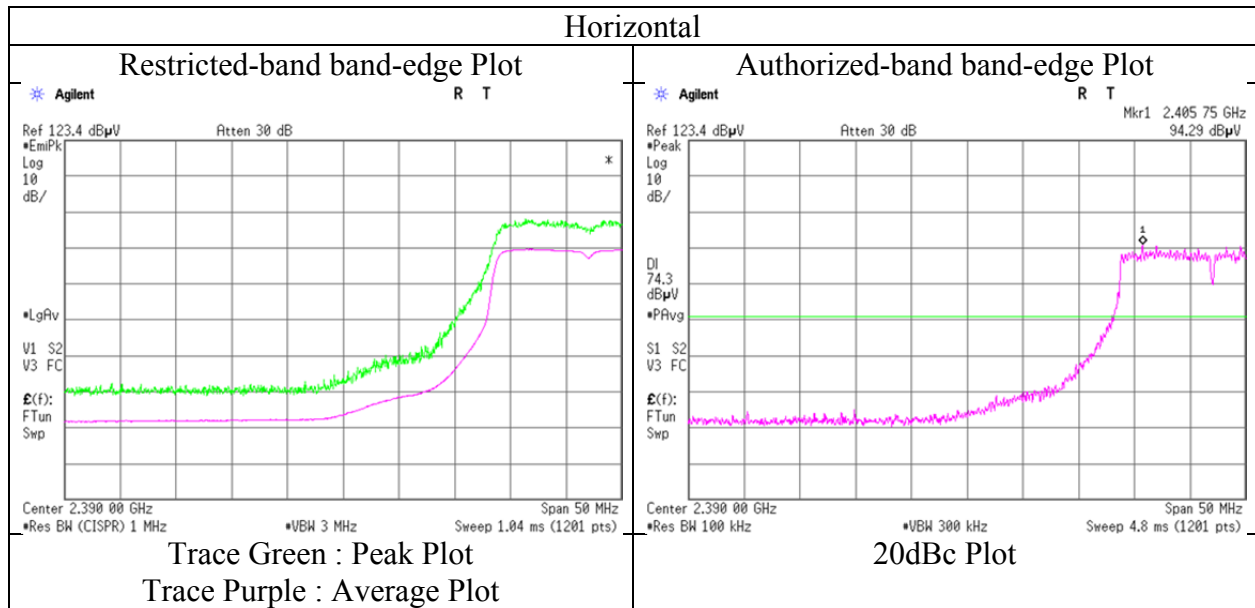
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11500589S-A-R2
Date	October 27, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shiro Kobayashi (1 GHz -2.8 GHz)
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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11g 2417 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	56.18	27.21	13.77	40.70	2.28	58.74	73.90	15.1	194	1	
Vert.	2390.000	PK	46.74	27.21	13.77	40.70	2.28	49.30	73.90	24.6	147	48	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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	43.14	27.21	13.77	40.70	0.19	2.28	45.89	53.90	8.0	*1)
Vert.	2390.000	AV	36.21	27.21	13.77	40.70	0.19	2.28	38.96	53.90	14.9	*1)

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(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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.	2417.000	PK	96.11	27.30	13.80	40.70	2.28	98.79	-	-	Carrier
Hori.	2400.000	PK	56.73	27.25	13.78	40.70	2.28	59.34	78.79	19.5	
Vert.	2417.000	PK	79.32	27.30	13.80	40.70	2.28	82.00	-	-	Carrier
Vert.	2400.000	PK	41.45	27.25	13.78	40.70	2.28	44.06	62.00	17.9	

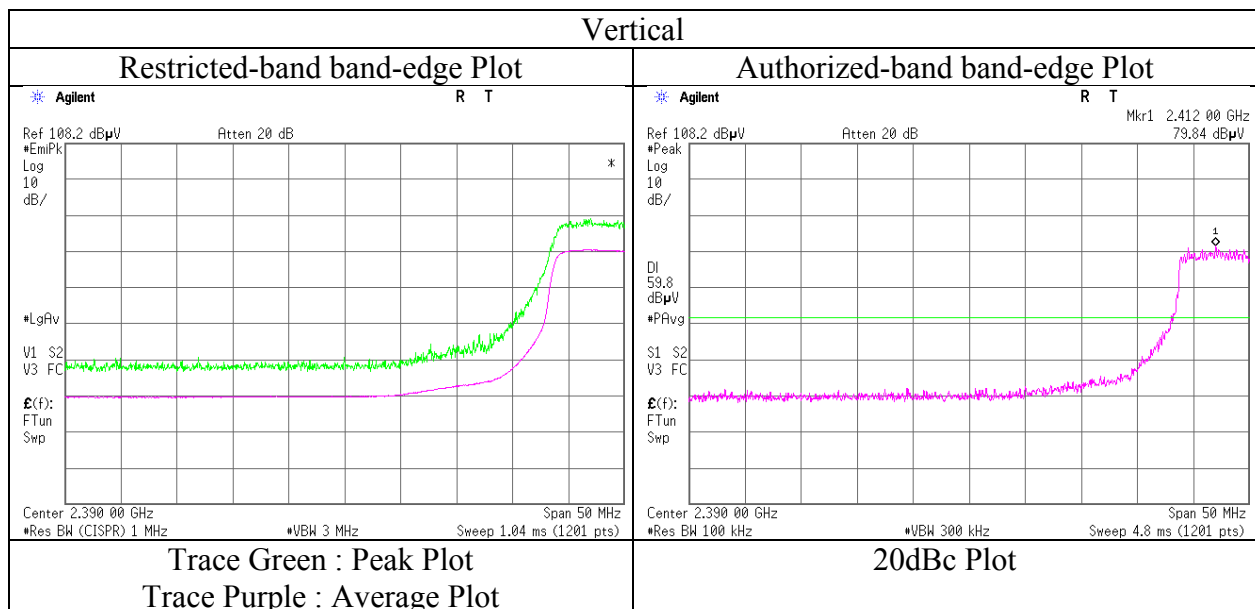
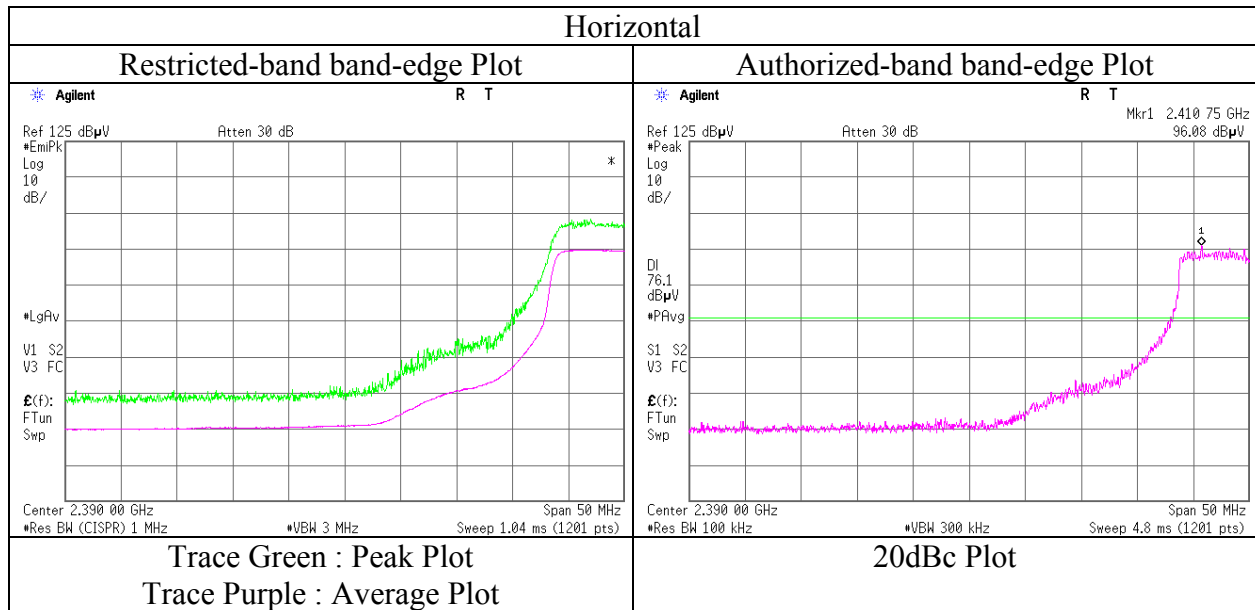
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11500589S-A-R2
Date	October 27, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shinichi Takano
	(1 GHz -2.8 GHz)
Mode	Tx 11g 2417 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11g 2457 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	56.95	27.52	13.86	40.69	2.28	59.92	73.90	13.9	119	353	
Vert.	2483.500	PK	47.36	27.52	13.86	40.69	2.28	50.33	73.90	23.5	142	218	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.	2483.500	AV	42.19	27.52	13.86	40.69	0.19	2.28	45.35	53.90	8.6	*1)
Vert.	2483.500	AV	35.89	27.52	13.86	40.69	0.19	2.28	39.05	53.90	14.9	*1)

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

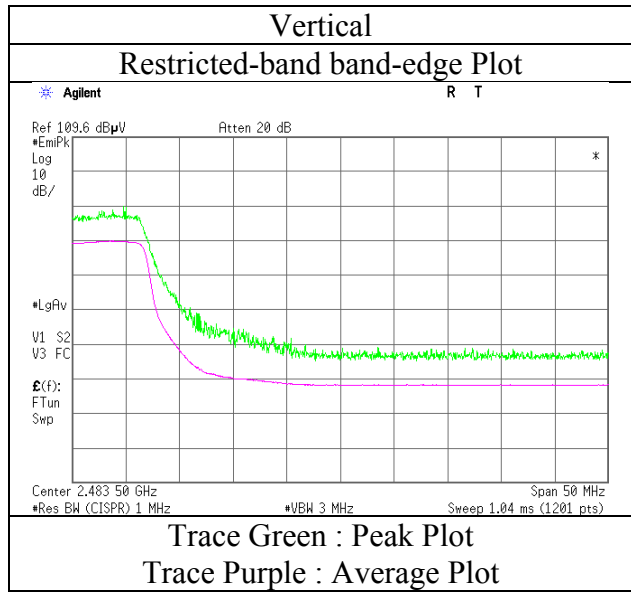
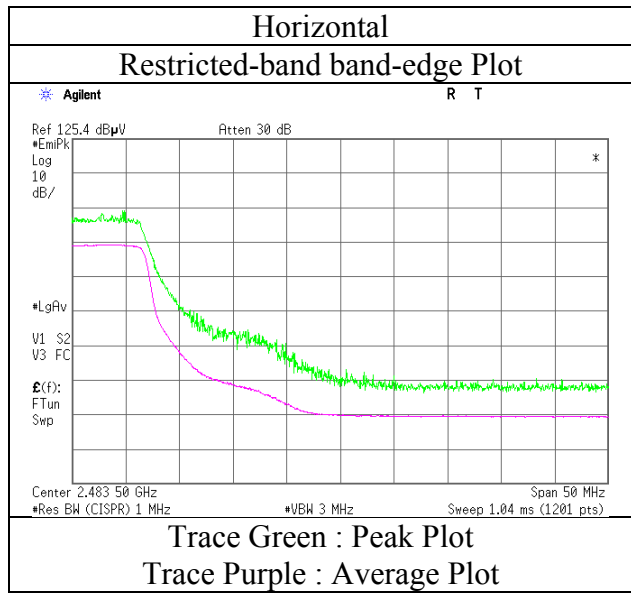
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11g 2457 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 25, 2016 October 26, 2016 October 27, 2016
Temperature / Humidity : 20 deg. C / 38 % RH 21 deg. C / 55 % RH 24 deg. C / 46 % RH
Engineer : Yasumasa Owaki Hikaru Shirasawa Shinichi Takano
 (2.8 GHz -13 GHz) (13 GHz -26.5 GHz) (1 GHz -2.8 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.	1056.300	PK	52.81	24.51	12.46	40.84	2.28	51.22	73.90	22.6	164	204	
Hori.	1381.300	PK	51.08	24.83	12.81	40.79	2.28	50.21	73.90	23.6	149	45	
Hori.	1787.630	PK	50.66	25.50	13.20	40.75	2.28	50.89	73.90	23.0	129	151	
Hori.	2483.500	PK	58.35	27.52	13.86	40.69	2.28	61.32	73.90	12.5	118	0	
Hori.	4924.000	PK	46.73	31.37	6.04	41.30	2.28	45.12	73.90	28.7	100	0	
Hori.	7386.000	PK	45.17	36.50	7.45	41.31	2.28	50.09	73.90	23.8	100	0	
Hori.	9848.000	PK	44.54	38.48	8.31	40.36	2.28	53.25	73.90	20.6	109	45	
Hori.	12310.000	PK	45.20	39.11	9.53	39.75	2.28	56.37	73.90	17.5	100	0	
Hori.	1056.300	AV	47.11	24.51	12.46	40.84	2.28	45.52	53.90	8.3	164	204	
Hori.	1381.300	AV	43.85	24.83	12.81	40.79	2.28	42.98	53.90	10.9	149	45	
Hori.	1787.630	AV	43.49	25.50	13.20	40.75	2.28	43.72	53.90	10.1	129	151	
Vert.	1056.292	PK	52.52	24.51	12.46	40.84	2.28	50.93	73.90	22.9	132	16	
Vert.	1137.525	PK	53.22	24.59	12.54	40.83	2.28	51.80	73.90	22.1	123	333	
Vert.	1381.283	PK	52.55	24.83	12.81	40.79	2.28	51.68	73.90	22.2	140	38	
Vert.	1462.525	PK	50.75	24.90	12.89	40.78	2.28	50.04	73.90	23.8	143	38	
Vert.	1787.475	PK	52.02	25.50	13.20	40.75	2.28	52.25	73.90	21.6	198	351	
Vert.	2483.500	PK	46.24	27.52	13.86	40.69	2.28	49.21	73.90	24.6	163	332	
Vert.	3110.932	PK	56.51	28.54	5.47	41.04	2.28	51.76	73.90	22.1	214	158	
Vert.	3555.603	PK	53.53	28.77	5.57	41.36	2.28	48.79	73.90	25.1	161	190	
Vert.	4924.000	PK	47.02	31.37	6.04	41.30	2.28	45.41	73.90	28.4	100	0	
Vert.	7386.000	PK	46.33	36.50	7.45	41.31	2.28	51.25	73.90	22.6	100	0	
Vert.	9848.000	PK	43.69	38.48	8.31	40.36	2.28	52.40	73.90	21.5	114	329	
Vert.	12310.000	PK	44.03	39.11	9.53	39.75	2.28	55.20	73.90	18.7	100	0	
Vert.	1056.292	AV	45.97	24.51	12.46	40.84	2.28	44.38	53.90	9.5	132	16	
Vert.	1137.525	AV	46.52	24.59	12.54	40.83	2.28	45.10	53.90	8.8	123	333	
Vert.	1381.283	AV	45.70	24.83	12.81	40.79	2.28	44.83	53.90	9.0	140	38	
Vert.	1462.525	AV	43.86	24.90	12.89	40.78	2.28	43.15	53.90	10.7	143	38	
Vert.	1787.475	AV	44.91	25.50	13.20	40.75	2.28	45.14	53.90	8.7	198	351	
Vert.	3110.932	AV	44.08	28.54	5.47	41.04	2.28	39.33	53.90	14.5	214	158	
Vert.	3555.603	AV	41.06	28.77	5.57	41.36	2.28	36.32	53.90	17.5	161	190	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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	40.37	27.52	13.86	40.69	0.19	2.28	43.53	53.90	10.4	*1)
Hori.	4924.000	AV	37.54	31.37	6.04	41.30	0.19	2.28	36.12	53.90	17.8	
Hori.	7386.000	AV	36.50	36.50	7.45	41.31	0.19	2.28	41.61	53.90	12.3	
Hori.	9848.000	AV	36.05	38.48	8.31	40.36	0.19	2.28	44.95	53.90	9.0	
Hori.	12310.000	AV	34.53	39.11	9.53	39.75	0.19	2.28	45.89	53.90	8.0	
Vert.	2483.500	AV	38.25	27.52	13.86	40.69	0.19	2.28	41.41	53.90	12.5	*1)
Vert.	4924.000	AV	37.75	31.37	6.04	41.30	0.19	2.28	36.33	53.90	17.6	
Vert.	7386.000	AV	36.58	36.50	7.45	41.31	0.19	2.28	41.69	53.90	12.2	
Vert.	9848.000	AV	36.09	38.48	8.31	40.36	0.19	2.28	44.99	53.90	8.9	
Vert.	12310.000	AV	34.68	39.11	9.53	39.75	0.19	2.28	46.04	53.90	7.9	

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(3.9 m / 3.0 m) = 2.28 dB

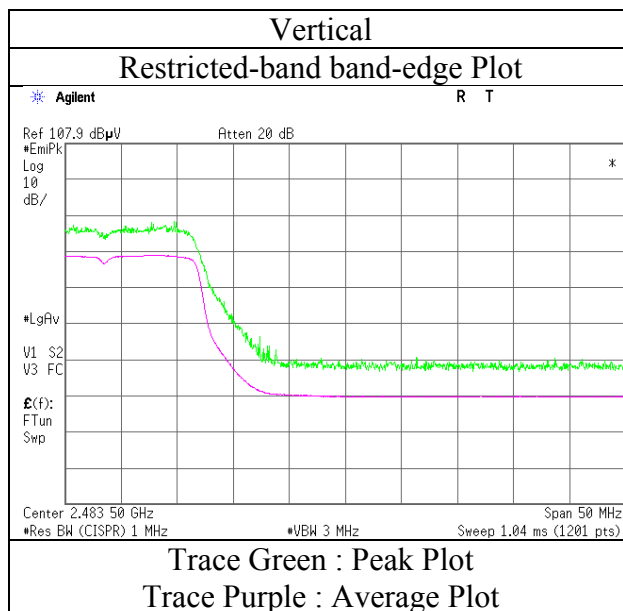
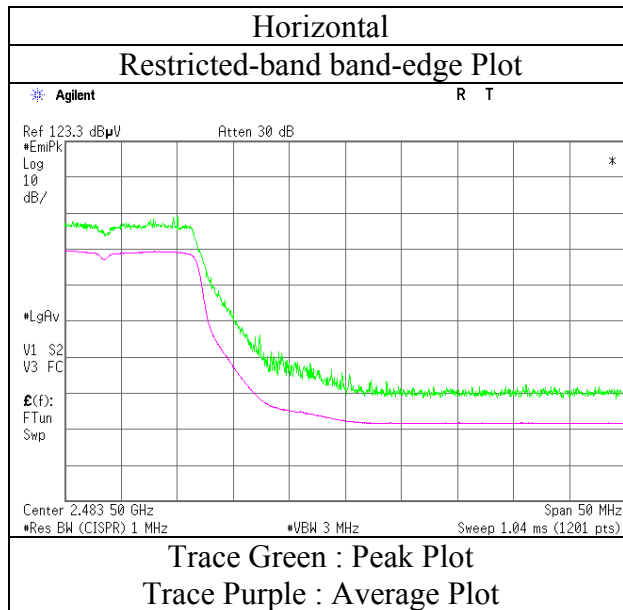
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 25, 2016 October 26, 2016 October 27, 2016
Temperature / Humidity : 20 deg. C / 38 % RH 21 deg. C / 55 % RH 24 deg. C / 46 % RH
Engineer : Yasumasa Owaki Hikaru Shirasawa Shinichi Takano
 (2.8 GHz -13 GHz) (13 GHz -26.5 GHz) (1 GHz -2.8 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.	1056.275	PK	53.02	24.51	12.46	40.84	2.28	51.43	73.90	22.4	144	201	
Hori.	1787.525	PK	51.06	25.50	13.20	40.75	2.28	51.29	73.90	22.6	158	157	
Hori.	2390.000	PK	58.75	27.21	13.77	40.70	2.28	61.31	73.90	12.5	189	5	
Hori.	4824.000	PK	47.37	31.17	6.00	41.50	2.28	45.32	73.90	28.5	100	0	
Hori.	7236.000	PK	45.27	36.29	7.34	41.16	2.28	50.02	73.90	23.8	100	0	
Hori.	9648.000	PK	44.19	38.19	8.16	40.47	2.28	52.35	73.90	21.5	151	8	
Hori.	12060.000	PK	44.28	39.14	9.34	39.85	2.28	55.19	73.90	18.7	100	0	
Hori.	1056.275	AV	47.67	24.51	12.46	40.84	2.28	46.08	53.90	7.8	144	201	
Hori.	1787.525	AV	44.43	25.50	13.20	40.75	2.28	44.66	53.90	9.2	158	157	
Vert.	1137.483	PK	52.56	24.59	12.54	40.83	2.28	51.14	73.90	22.7	184	349	
Vert.	1381.250	PK	51.64	24.83	12.81	40.79	2.28	50.77	73.90	23.1	139	44	
Vert.	1868.733	PK	50.17	25.66	13.28	40.74	2.28	50.65	73.90	23.2	165	5	
Vert.	2390.000	PK	47.50	27.21	13.77	40.70	2.28	50.06	73.90	23.8	146	47	
Vert.	3087.539	PK	49.69	28.53	5.47	41.02	2.28	44.95	73.90	28.9	160	3	
Vert.	3412.579	PK	50.79	28.63	5.53	41.24	2.28	45.99	73.90	27.9	154	331	
Vert.	4824.000	PK	45.85	31.17	6.00	41.50	2.28	43.80	73.90	30.1	100	0	
Vert.	7236.000	PK	45.44	36.29	7.34	41.16	2.28	50.19	73.90	23.7	100	0	
Vert.	9648.000	PK	44.02	38.19	8.16	40.47	2.28	52.18	73.90	21.7	181	9	
Vert.	12060.000	PK	42.28	39.14	9.34	39.85	2.28	53.19	73.90	20.7	100	0	
Vert.	1137.483	AV	45.23	24.59	12.54	40.83	2.28	43.81	53.90	10.0	184	349	
Vert.	1381.250	AV	45.26	24.83	12.81	40.79	2.28	44.39	53.90	9.5	139	44	
Vert.	1868.733	AV	42.64	25.66	13.28	40.74	2.28	43.12	53.90	10.7	165	5	
Vert.	3087.539	AV	41.08	28.53	5.47	41.02	2.28	36.34	53.90	17.5	160	3	
Vert.	3412.579	AV	42.80	28.63	5.53	41.24	2.28	38.00	53.90	15.9	154	331	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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	44.53	27.21	13.77	40.70	0.21	2.28	47.30	53.90	6.6	*1)
Hori.	4824.000	AV	37.85	31.17	6.00	41.50	0.21	2.28	36.01	53.90	17.9	
Hori.	7236.000	AV	36.40	36.29	7.34	41.16	0.21	2.28	41.36	53.90	12.5	
Hori.	9648.000	AV	36.44	38.19	8.16	40.47	0.21	2.28	44.81	53.90	9.1	
Hori.	12060.000	AV	34.36	39.14	9.34	39.85	0.21	2.28	45.48	53.90	8.4	
Vert.	2390.000	AV	36.80	27.21	13.77	40.70	0.21	2.28	39.57	53.90	14.3	*1)
Vert.	4824.000	AV	37.95	31.17	6.00	41.50	0.21	2.28	36.11	53.90	17.8	
Vert.	7236.000	AV	36.55	36.29	7.34	41.16	0.21	2.28	41.51	53.90	12.4	
Vert.	9648.000	AV	36.51	38.19	8.16	40.47	0.21	2.28	44.88	53.90	9.0	
Vert.	12060.000	AV	34.46	39.14	9.34	39.85	0.21	2.28	45.58	53.90	8.3	

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(3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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	94.45	27.29	13.79	40.70	2.28	97.11	-	-	Carrier
Hori.	2400.000	PK	60.46	27.25	13.78	40.70	2.28	63.07	77.11	14.0	
Vert.	2412.000	PK	78.54	27.29	13.79	40.70	2.28	81.20	-	-	Carrier
Vert.	2400.000	PK	46.67	27.25	13.78	40.70	2.28	49.28	61.20	11.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

UL Japan, Inc.

Shonan EMC Lab.

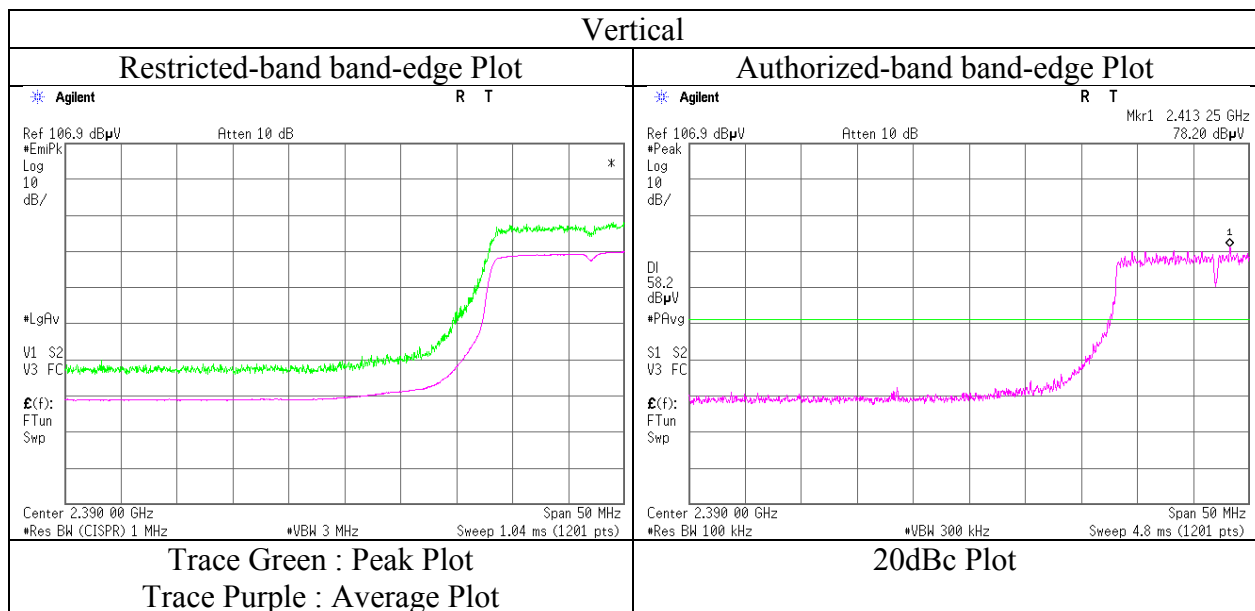
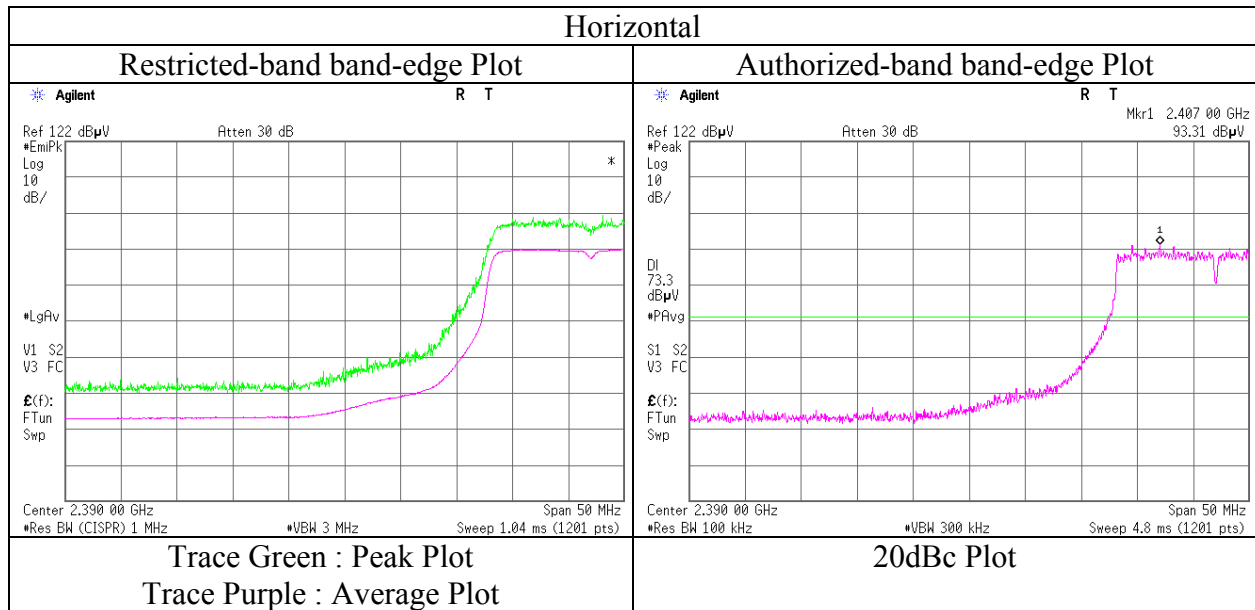
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11500589S-A-R2
Date	October 27, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shinichi Takano (1 GHz -2.8 GHz)
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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11n-20 2417 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	52.89	27.21	13.77	40.70	2.28	55.45	73.90	18.4	146	1	
Vert.	2390.000	PK	45.91	27.21	13.77	40.70	2.28	48.47	73.90	25.4	143	222	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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	41.15	27.21	13.77	40.70	0.21	2.28	43.92	53.90	10.0	*1)
Vert.	2390.000	AV	36.99	27.21	13.77	40.70	0.21	2.28	39.76	53.90	14.1	*1)

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(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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.	2417.000	PK	95.52	27.30	13.80	40.70	2.28	98.20	-	-	Carrier
Hori.	2400.000	PK	53.46	27.25	13.78	40.70	2.28	56.07	78.20	22.1	
Vert.	2417.000	PK	79.01	27.30	13.80	40.70	2.28	81.69	-	-	Carrier
Vert.	2400.000	PK	40.45	27.25	13.78	40.70	2.28	43.06	61.69	18.6	

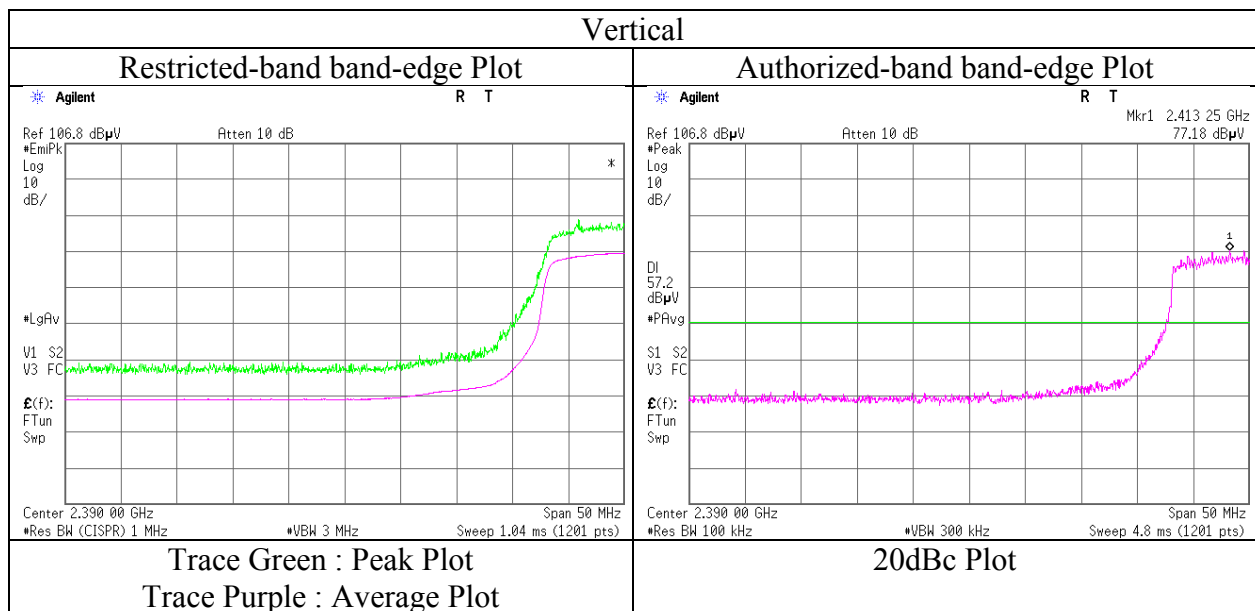
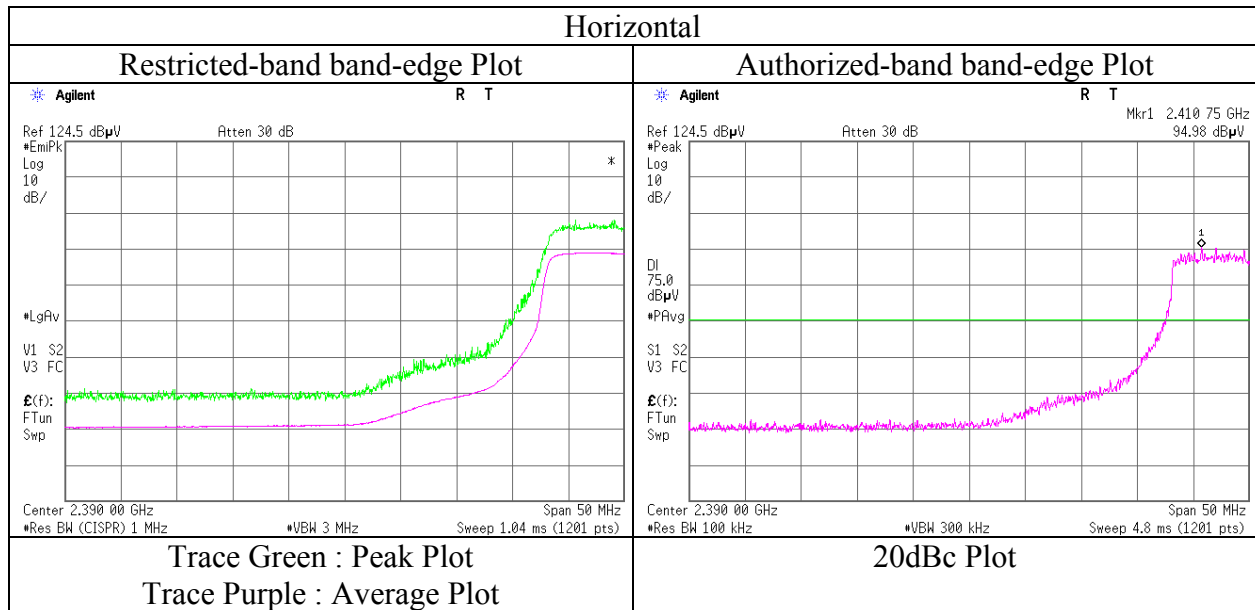
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission (Reference Plot for band-edge)

Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No.	11500589S-A-R2
Date	October 27, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Shinichi Takano (1 GHz -2.8 GHz)
Mode	Tx 11n-20 2417 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11n-20 2457 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	55.99	27.52	13.86	40.69	2.28	58.96	73.90	14.9	137	359	
Vert.	2483.500	PK	45.80	27.52	13.86	40.69	2.28	48.77	73.90	25.1	137	216	

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.	2483.500	AV	39.56	27.52	13.86	40.69	0.21	2.28	42.74	53.90	11.2	*1)
Vert.	2483.500	AV	35.56	27.52	13.86	40.69	0.21	2.28	38.74	53.90	15.2	*1)

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

Distance factor : 1 GHz - 13 GHz : $20\log(3.9\text{ m} / 3.0\text{ m}) = 2.28\text{ dB}$

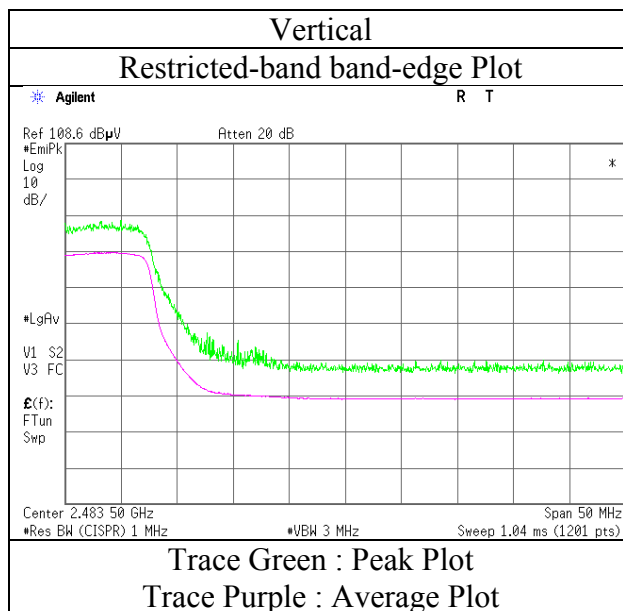
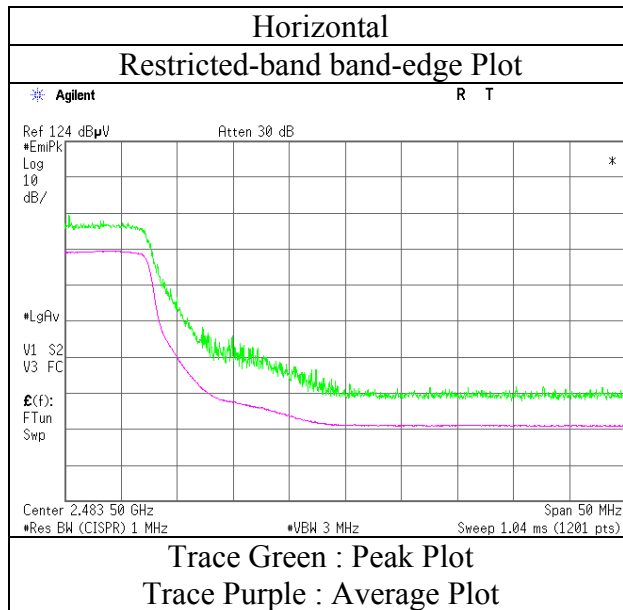
13 GHz - 40 GHz : $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.54\text{ dB}$

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.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11n-20 2457 MHz



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

Radiated Spurious Emission

Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 25, 2016 October 26, 2016 October 27, 2016
Temperature / Humidity : 20 deg. C / 38 % RH 21 deg. C / 55 % RH 24 deg. C / 46 % RH
Engineer : Yasumasa Owaki Hikaru Shirasawa Shinichi Takano
 (2.8 GHz -13 GHz) (13 GHz -26.5 GHz) (1 GHz -2.8 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.	1056.318	PK	52.80	24.51	12.46	40.84	2.28	51.21	73.90	22.6	185	202	
Hori.	2483.500	PK	59.71	27.52	13.86	40.69	2.28	62.68	73.90	11.2	153	3	
Hori.	4924.000	PK	47.26	31.37	6.04	41.30	2.28	45.65	73.90	28.2	100	0	
Hori.	7386.000	PK	45.12	36.50	7.45	41.31	2.28	50.04	73.90	23.8	100	0	
Hori.	9848.000	PK	44.10	38.48	8.31	40.36	2.28	52.81	73.90	21.0	220	6	
Hori.	12310.000	PK	42.53	39.11	9.53	39.75	2.28	53.70	73.90	20.2	100	0	
Hori.	1056.318	AV	45.74	24.51	12.46	40.84	2.28	44.15	53.90	9.7	185	202	
Vert.	1056.296	PK	53.02	24.51	12.46	40.84	2.28	51.43	73.90	22.4	138	11	
Vert.	1137.493	PK	52.12	24.59	12.54	40.83	2.28	50.70	73.90	23.2	178	355	
Vert.	1381.261	PK	51.58	24.83	12.81	40.79	2.28	50.71	73.90	23.1	147	60	
Vert.	1462.502	PK	50.78	24.90	12.89	40.78	2.28	50.07	73.90	23.8	138	46	
Vert.	2483.500	PK	46.44	27.52	13.86	40.69	2.28	49.41	73.90	24.5	143	219	
Vert.	3111.093	PK	57.21	28.54	5.47	41.04	2.28	52.46	73.90	21.4	213	158	
Vert.	4924.000	PK	45.85	31.37	6.04	41.30	2.28	44.24	73.90	29.6	100	0	
Vert.	7386.000	PK	45.44	36.50	7.45	41.31	2.28	50.36	73.90	23.5	100	0	
Vert.	9848.000	PK	44.74	38.48	8.31	40.36	2.28	53.45	73.90	20.4	119	330	
Vert.	12310.000	PK	43.93	39.11	9.53	39.75	2.28	55.10	73.90	18.8	100	0	
Vert.	1056.296	AV	43.27	24.51	12.46	40.84	2.28	41.68	53.90	12.2	138	11	
Vert.	1137.493	AV	43.45	24.59	12.54	40.83	2.28	42.03	53.90	11.8	178	355	
Vert.	1381.261	AV	42.86	24.83	12.81	40.79	2.28	41.99	53.90	11.9	147	60	
Vert.	1462.502	AV	42.49	24.90	12.89	40.78	2.28	41.78	53.90	12.1	138	46	
Vert.	3111.093	AV	43.75	28.54	5.47	41.04	2.28	39.00	53.90	14.9	213	158	

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

Distance factor : 1 GHz - 13 GHz : 20log(3.9 m / 3.0 m) = 2.28 dB

13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 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	43.91	27.52	13.86	40.69	0.21	2.28	47.09	53.90	6.8	*1)
Hori.	4924.000	AV	37.66	31.37	6.04	41.30	0.21	2.28	36.26	53.90	17.6	
Hori.	7386.000	AV	36.70	36.50	7.45	41.31	0.21	2.28	41.83	53.90	12.1	
Hori.	9848.000	AV	36.20	38.48	8.31	40.36	0.21	2.28	45.12	53.90	8.8	
Hori.	12310.000	AV	34.73	39.11	9.53	39.75	0.21	2.28	46.11	53.90	7.8	
Vert.	2483.500	AV	36.92	27.52	13.86	40.69	0.21	2.28	40.10	53.90	13.8	*1)
Vert.	4924.000	AV	38.13	31.37	6.04	41.30	0.21	2.28	36.73	53.90	17.2	
Vert.	7386.000	AV	36.77	36.50	7.45	41.31	0.21	2.28	41.90	53.90	12.0	
Vert.	9848.000	AV	35.84	38.48	8.31	40.36	0.21	2.28	44.76	53.90	9.1	
Vert.	12310.000	AV	34.79	39.11	9.53	39.75	0.21	2.28	46.17	53.90	7.7	

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(3.9 m / 3.0 m) = 2.28 dB

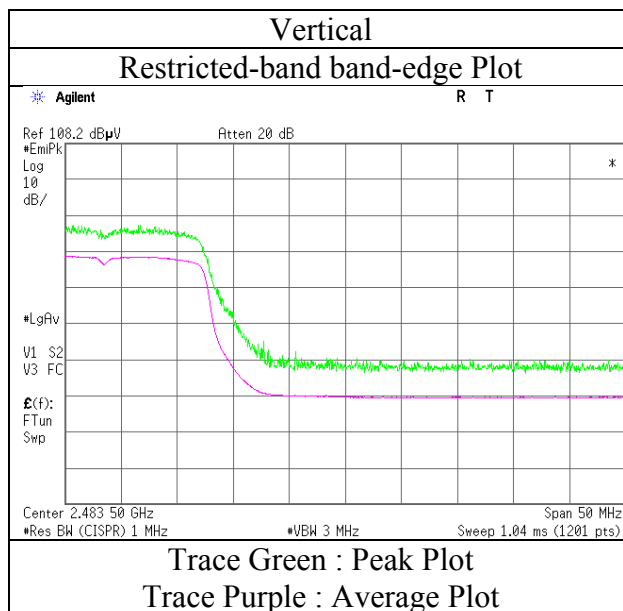
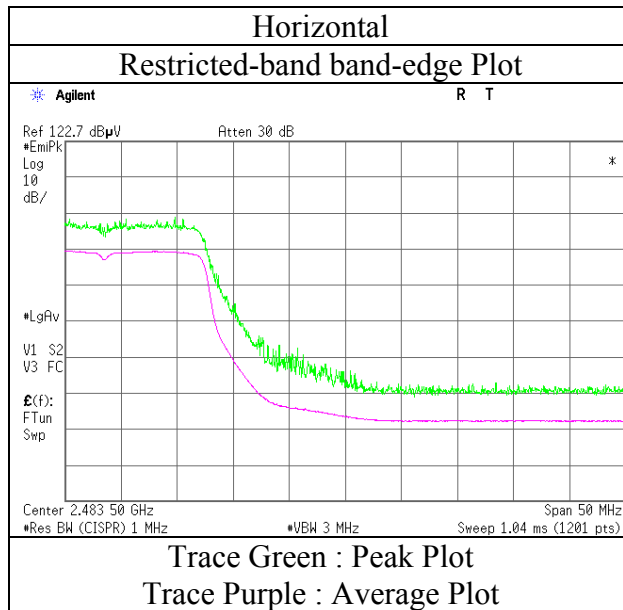
13 GHz - 40 GHz : 20log(1.0 m / 3.0 m) = -9.54 dB

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)

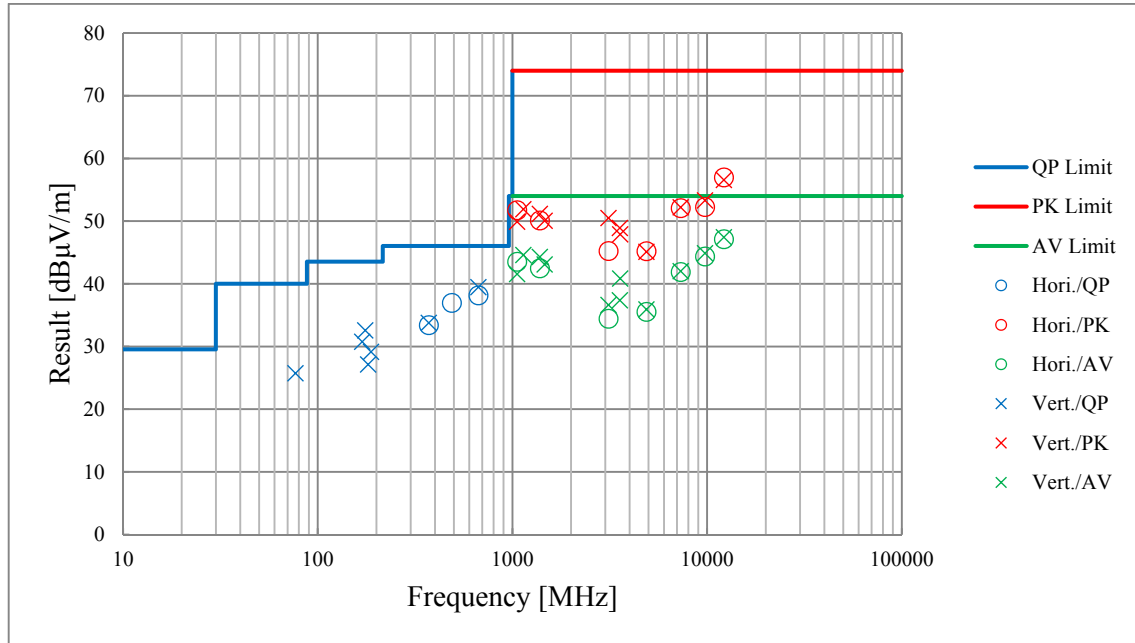
Test place : Shonan EMC Lab. No.1 Semi Anechoic Chamber
Report No. : 11500589S-A-R2
Date : October 27, 2016
Temperature / Humidity : 24 deg. C / 46 % RH
Engineer : Shinichi Takano
(1 GHz -2.8 GHz)
Mode : Tx 11n-20 2462 MHz



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

Radiated Spurious Emission (Plot data, Worst case)

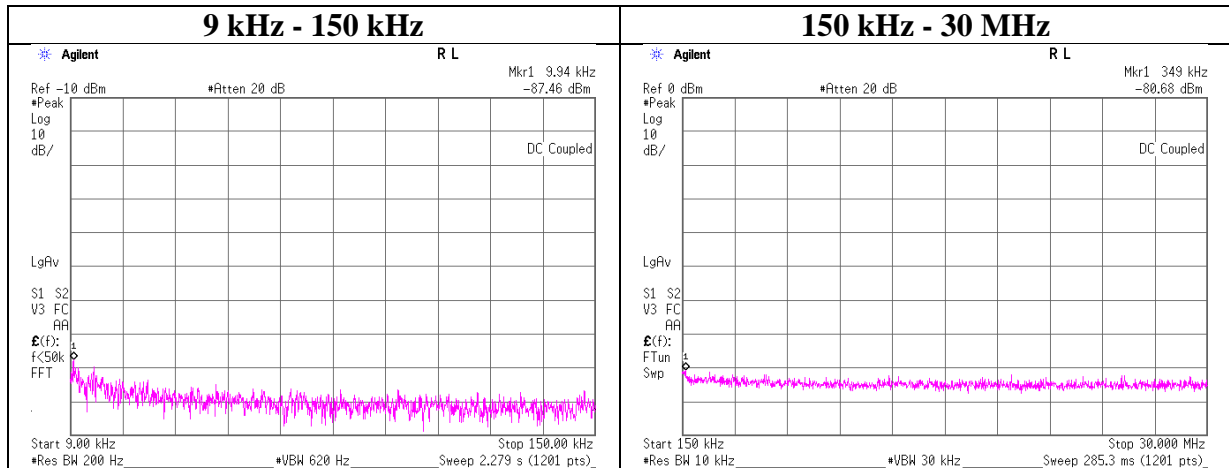
Test place	Shonan EMC Lab. No.1 Semi Anechoic Chamber		
Report No.	11500589S-A-R2		
Date	October 26, 2016	October 27, 2016	November 14, 2016
Temperature / Humidity	21 deg. C / 55 % RH	24 deg. C / 46 % RH	25 deg. C / 44 % RH
Engineer	Hikaru Shirasawa (13 GHz -26.5 GHz)	Shinichi Takano (1 GHz -2.8 GHz)	Hikaru Shirasawa (2.8 GHz -13 GHz) (30 MHz-1000 MHz)
Mode	Tx 11g 2437 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.6 Shielded Room
Report No.	11500589S-A-R2
Date	November 14, 2016
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Shinichi Takano
Mode	Tx 11g 2437 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
9.94	-87.5	0.02	9.9	4.5	1	-73.1	300	6.0	-11.8	47.6	59.4	
349.00	-80.7	0.02	9.9	4.5	1	-66.3	300	6.0	-5.0	16.7	21.7	

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

$$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator Loss} + \text{Antenna Gain} + 10 * \log(N)$$

Power Density

Test place Shonan EMC Lab. No.5, 6 Shielded Room
Report No. 11500589S-A-R2
Date October 21, 2016 November 14, 2016
Temperature / Humidity 24 deg. C / 46 % RH 24 deg. C / 47 % RH
Engineer Hiroyuki Morikawa Shinichi Takano
(No.5 Shield room) (No.6 Shield room)
Mode Tx

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-10.25	1.72	10.01	1.48	8.00	6.52
2437.00	-10.14	1.72	10.01	1.59	8.00	6.41
2462.00	-10.32	1.73	10.01	1.43	8.00	6.58

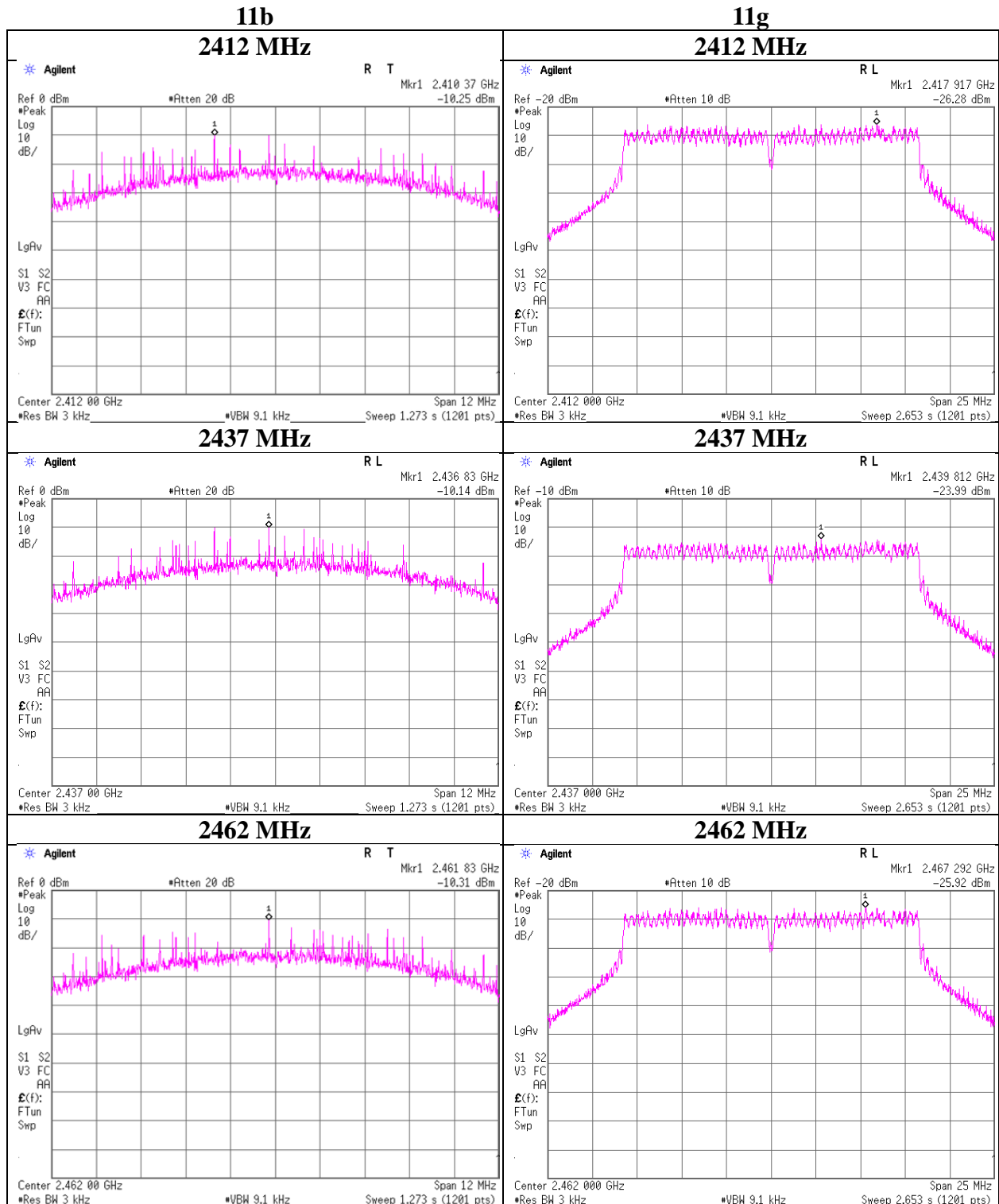
11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.29	1.72	9.67	-14.90	8.00	22.90
2437.00	-23.99	1.71	10.01	-12.27	8.00	20.27
2462.00	-25.92	1.73	9.67	-14.52	8.00	22.52

Sample Calculation:

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

Power Density



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Power Density

Test place Shonan EMC Lab. No.5 Shielded Room
Report No. 11500589S-A-R2
Date October 21, 2016
Temperature / Humidity 24 deg. C / 46 % RH
Engineer Hiroyuki Morikawa
Mode Tx

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-26.39	1.72	9.67	-15.00	8.00	23.00
2437.00	-24.94	1.71	10.01	-13.22	8.00	21.22
2462.00	-25.32	1.73	9.67	-13.92	8.00	21.92

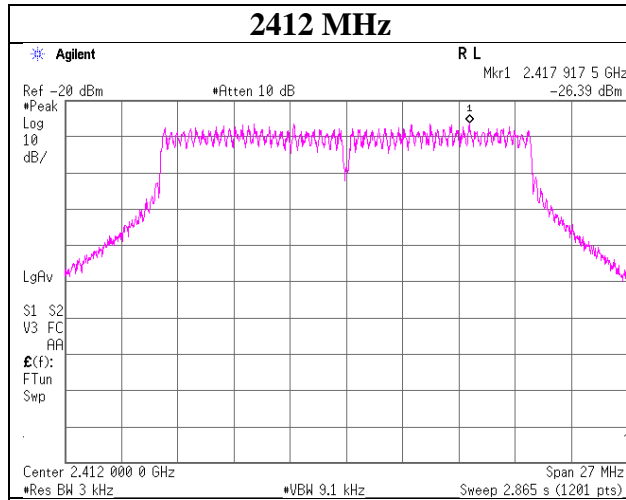
Sample Calculation:

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

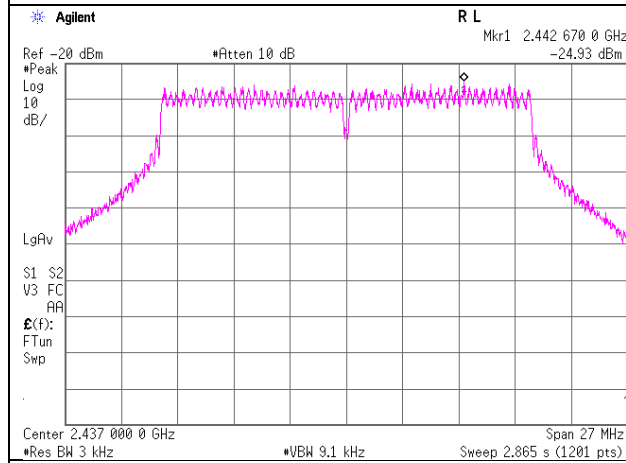
Power Density

11n-20

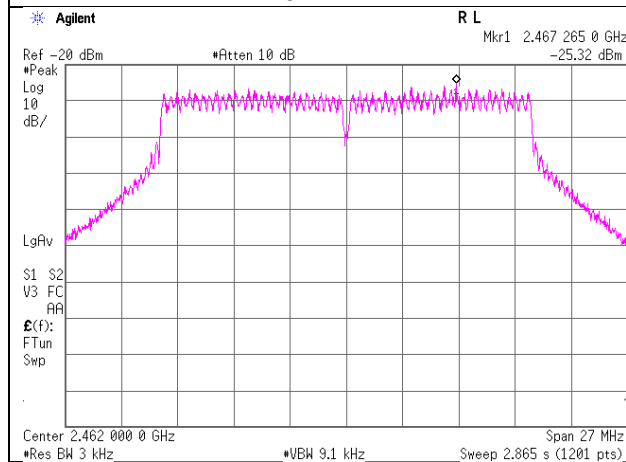
2412 MHz



2437 MHz



2462 MHz



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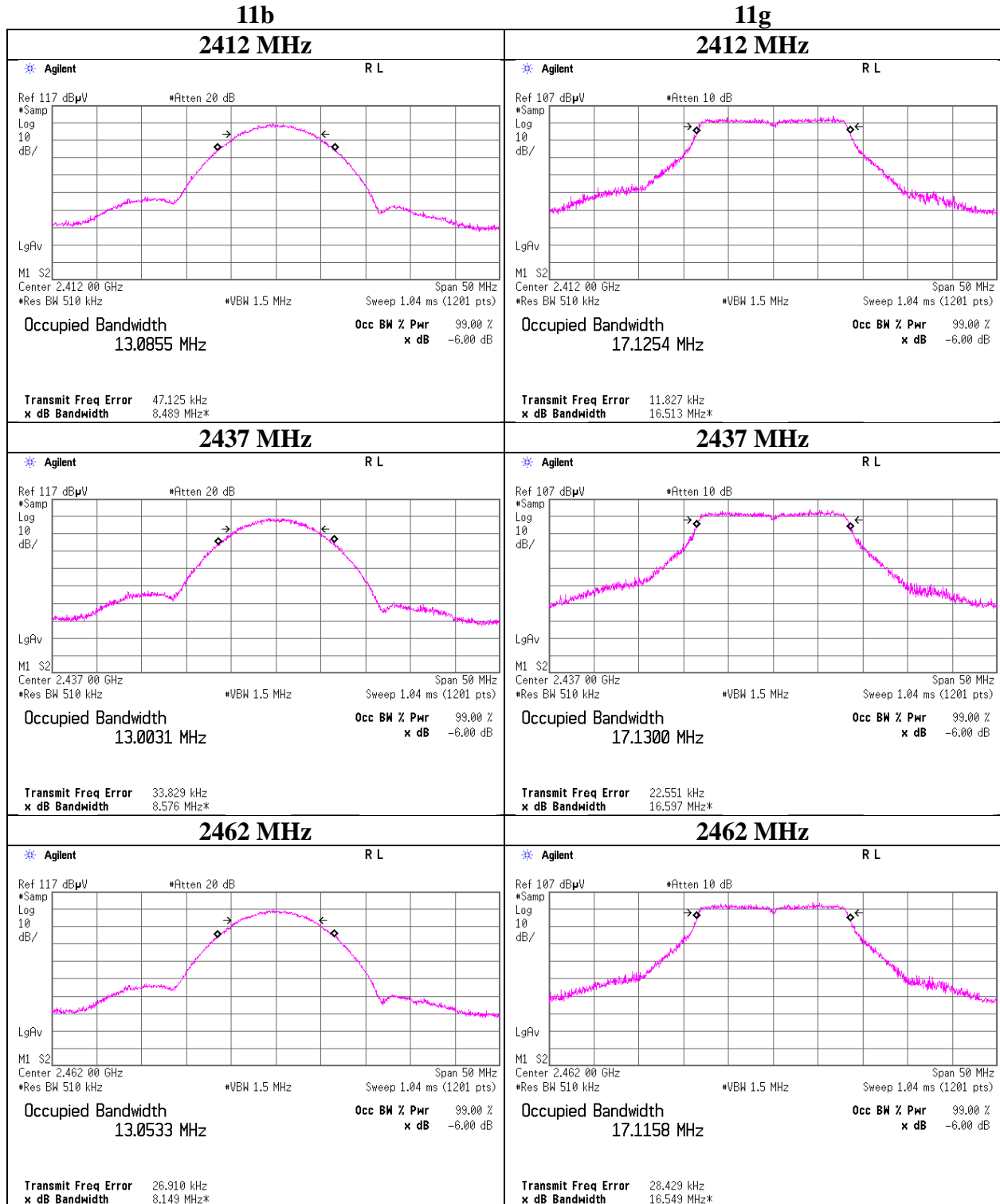
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

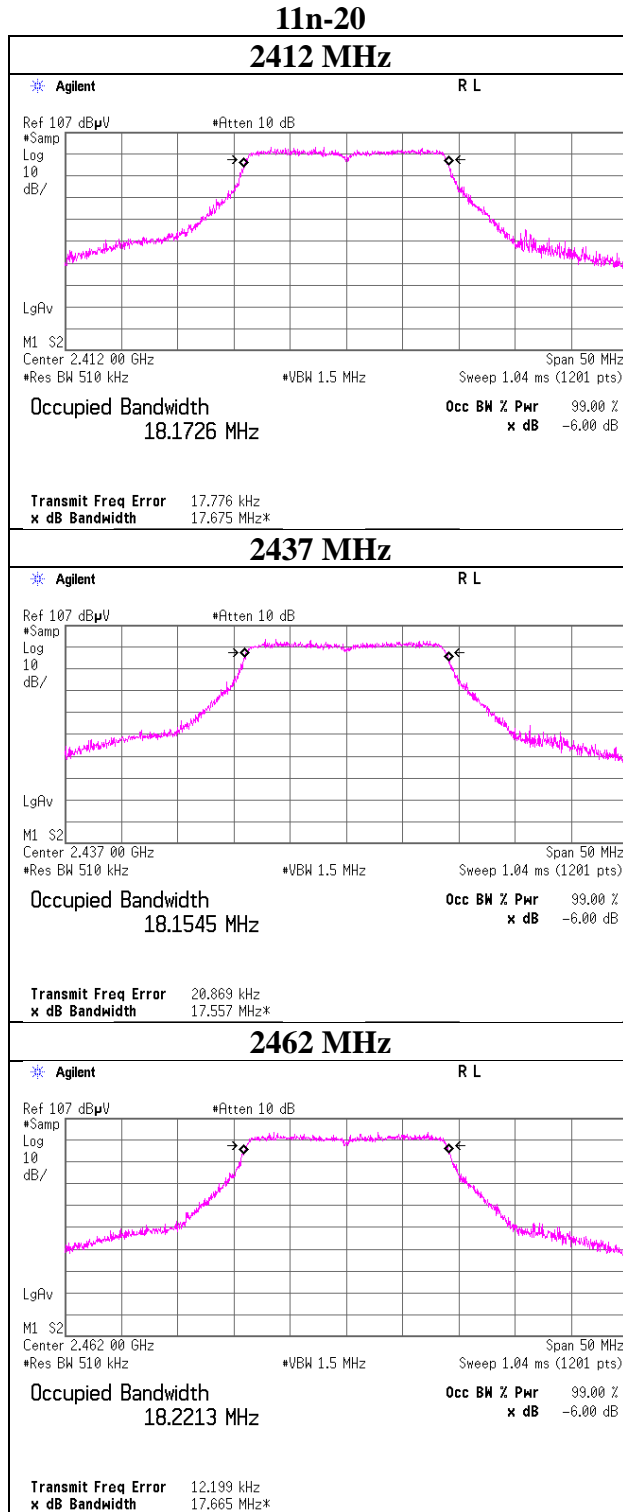
99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5, 6 Shielded Room	
Report No.	11500589S-A-R2	
Date	October 21, 2016	November 14, 2016
Temperature / Humidity	24 deg. C / 46 % RH	24 deg. C / 47 % RH
Engineer	Hiroyuki Morikawa (No.5 Shielded Room)	Shinichi Takano (No.6 Shielded Room)
Mode	Tx	



99% Occupied Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	11500589S-A-R2
Date	October 21, 2016
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Hiroyuki Morikawa
Mode	Tx



UL Japan, Inc.

Shonan EMC Lab.

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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2016/03/22 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2016/06/14 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2016/05/11 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2016/08/09 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2016/10/12 * 12
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2016/02/08 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(SVS WR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVS WR)	1	RE	2016/07/24 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE ,CE,RFI,MF)	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2016/10/17 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2015/11/16 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2016/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2016/03/23 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2016/03/08 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-0100 0KMSKMS	-	RE	2016/04/18 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2015/11/06 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE, AT	2016/11/07 * 12
SRENT-08	Spectrum Analyzer	Agilent	E4448A	MY50180019	RE	2016/10/24 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2016/09/26 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2016/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2016/04/04 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2016/03/23 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2016/11/07 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2015/12/07 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	AT	2016/10/17 * 12
SRENT-09	Spectrum Analyzer	Agilent	E4440A	MY46186392	RE, AT	2016/11/01 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2016/04/01 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2016/04/01 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2016/03/23 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	AT	2016/10/12 * 12
STS-06	Digital Hitester	Hioki	3805-50	080997830	AT	2016/03/22 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2016/02/19 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2015/12/18 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2016/08/04 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2016/10/15 * 12
SCC-A1/A3/A5 /A7/A8/A13/SR SE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-269(RF Selector)	RE	2016/04/22 * 12
SCC-A2/A4/A6 /A7/A8/A13/SR SE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA /141PE/141PE/ 141PE/141PE/ NS4906	-/0901-269(RF Selector)	RE	2016/04/22 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2016/01/30 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2016/10/12 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2016/07/14 * 12

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

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

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

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

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