



RADIO TEST REPORT

Test Report No. : 11925908H-A-R1

Applicant : silex technology, Inc.
Type of Equipment : SDIO Wireless Module
Model No. : SX-SDMAN
FCC ID : N6C-SDMAN
Test regulation : FCC Part 15 Subpart C: 2017
Class II Permissive Change
*WLAN(2.4 GHz) part
(Radiated Spurious Emission test only)
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This 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 11925908H-A.

Date of test: August 30 and September 4, 2017

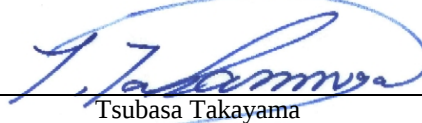
Representative test engineer:


Takumi Shimada

Engineer

Consumer Technology Division

Approved by:


Tsubasa Takayama

Engineer

Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11925908H-A

[illegible]

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SECTION 1: Customer information

Company Name	:	silex technology, Inc.
Address	:	2-3-1 Hikaridai, Seika-cho, Kyoto 619-0237, Japan
Telephone Number	:	+81-774-98-3878
Facsimile Number	:	+81-774-98-3758
Contact Person	:	Toshiro Kometani

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

2.1 Identification of E.U.T.

Type of Equipment	:	SDIO Wireless Module
Model No.	:	SX-SDMAN
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.3 V
Receipt Date of Sample	:	August 24, 2017
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: SX-SDMAN (referred to as the EUT in this report) is a SDIO Wireless Module.

General Specification

Clock frequency(ies) in the system	:	26 MHz
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Radio Specification

Radio Type : Transceiver
Method of Frequency Generation : Synthesizer
Power Supply (inner) : DC 1.2 V

Specification of Wireless LAN (IEEE802.11b/g/a/n-20/n-40)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz to 2462 MHz	2412 MHz to 2462 MHz	5180 MHz to 5320 MHz, 5500 MHz to 5580MHz, 5660 MHz to 5700MHz, 5745 MHz to 5825 MHz	2412 MHz to 2462 MHz, 5180 MHz to 5320 MHz, 5500 MHz to 5580 MHz, 5660 MHz to 5700 MHz, 5745 MHz to 5825 MHz	5190 MHz to 5310 MHz, 5510 MHz to 5550 MHz, 5670MHz, 5755 MHz to 5795MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		
Channel spacing	5 MHz		20 MHz	<u>2.4 GHz band</u> 5 MHz <u>5 GHz band</u> 20 MHz	40 MHz
Antenna type	Embedded antenna				
Antenna Gain	2.4 GHz : 1.65 dBi (including cable loss), 5 GHz : 1.67 dBi (including cable loss)				
Antenna Connector type	MHF				

*This test report applies for Wireless LAN (2.4 GHz Band).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on September 1, 2017 and effective October 2, 2017

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

* The revision on September 20, 2017, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 DTS Meas Guidance v04	FCC: Section15.247(d)	2.5 dB 2390 MHz, Horizontal, AV	Complied	Radiated (above 30 MHz) *1)
	IC: RSS-Gen 6.13	IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

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 v04 12.2.7.

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

FCC 15.31 (e)

The RF Module has own regulator.

The RF Module is constantly provided voltage through own regulator regardless of input voltage (DC 3.3 V).

Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique antenna connector (MHF).

Therefore the equipment complies with the requirement of 15.203/212.

3.3 Addition to standard

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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Polarity	Radiated emission (Below 1 GHz)			
	(3 m*) (+/-)		(10 m*) (+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*) (+/-)		(1 m*) (+/-)		(10 m*) (+/-)
1 GHz - 6 GHz	6 GHz - 18 GHz	10 GHz - 26.5 GHz	26.5 GHz - 40 GHz	1 GHz - 18 GHz
5.2 dB	5.5 dB	5.5 dB	5.4 dB	5.5 dB

*Measurement distance

Radiated emission test

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

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
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Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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

4.1 Operating Mode(s)

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

Mode	Remarks*
IEEE 802.11b (11b)	5.5 Mbps (Long GI), PN9
IEEE 802.11g (11g)	24 Mbps (Long GI), PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 3 (Long GI), PN9
*Transmitting duty was close to 100% on all tests.	
*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 settings: 11b (5.5 Mbps, Long GI): 2412 MHz: 13.0 dBm, 2437 MHz: 13.0 dBm, 2462 MHz: 13.0 dBm 11g (24 Mbps, Long GI): 2412 MHz: 8.0 dBm, 2437 MHz: 13.0 dBm, 2462 MHz: 8.5 dBm 11n-20 (2.4 GHz Band, MCS 3, Long GI): 2412 MHz: 7.0 dBm, 2437 MHz: 12.0 dBm, 2462 MHz: 7.5 dBm Software: Atheros Radio Test (ART) - Revision 0.2 BUILD #33 ART_11n - Customer Version (ANWI BUILD) *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)

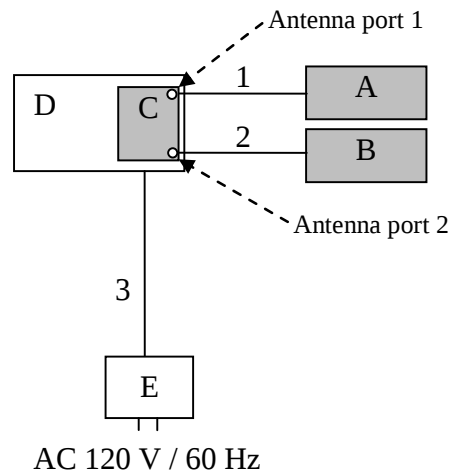
Test Item	Operating Mode	Tested Antenna	Tested frequency
Spurious Emission	11b Tx 11g Tx	1 *1)	2412 MHz 2437 MHz 2462 MHz
	11n-20 Tx	1 *1) *2)	2412 MHz 2462 MHz

*1) After the comparison between Antenna port 1 and Antenna port 2, test was performed with the antenna that had higher power as a representative.

*2) 11n-20 was performed only band-edge test.

4.2 Configuration and peripherals

Radiated Spurious Emission (Below 1GHz)



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

** The test was performed with the module that as normal assumed implementation conditions.

The use of a jig does not influence on the test result.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Antenna	PW2-ANT	001	SATO CORPORATION	EUT
B	Antenna	PW2-ANT	002	SATO CORPORATION	EUT
C	SDIO Wireless Module	SX-SDMAN	0080925099DC	silex technology, Inc.	EUT
D	Jig Board	PX02535XA	SX05315	silex technology, Inc.	-
E	AC Adaptor	US115-05	C08-0259307	UNIFIVE	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.2	Shielded	Shielded	-
2	Antenna Cable	0.2	Shielded	Shielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-

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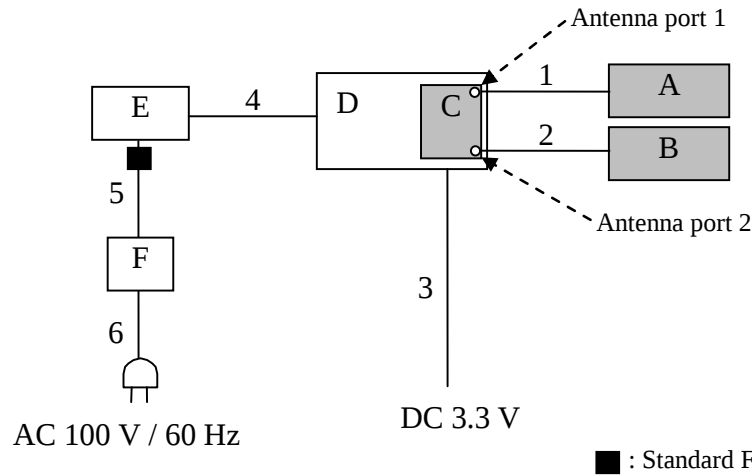
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Radiated Spurious Emission (Above 1GHz)



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

** The test was performed with the module that as normal assumed implementation conditions.

The use of a jig does not influence on the test result.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Antenna	PW2-ANT	001	SATO CORPORATION	EUT
B	Antenna	PW2-ANT	002	SATO CORPORATION	EUT
C	SDIO Wireless Module	SX-SDMAN	008092757904	silex technology, Inc.	EUT
D	Jig Board	PX04532XA	SX05315	silex technology, Inc.	-
E	Laptop PC	Latitude E6510	CFGY2A00	DELL	-
F	AC Adaptor	LA90PE0-01	CN-03T6XF-7161 5-1AK-0927-A01	DELL	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.2	Shielded	Shielded	-
2	Antenna Cable	0.2	Shielded	Shielded	-
3	DC Cable	2.5	Unshielded	Unshielded	-
4	SD Card slot Cable	0.3	Unshielded	Unshielded	-
5	DC Cable	1.8	Unshielded	Unshielded	-
6	AC Cable	0.9	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 "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. 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 200 MHz	200 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 *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	Average Power Method: RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300kHz
Test Distance	3 m	4.45 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)		4.45 m *2) (1 GHz - 10 GHz), 1 m *3) (10 GHz - 26.5 GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

*2) Distance Factor: $20 \times \log(4.45 \text{ m} / 3.0 \text{ m}) = 3.43 \text{ dB}$

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

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

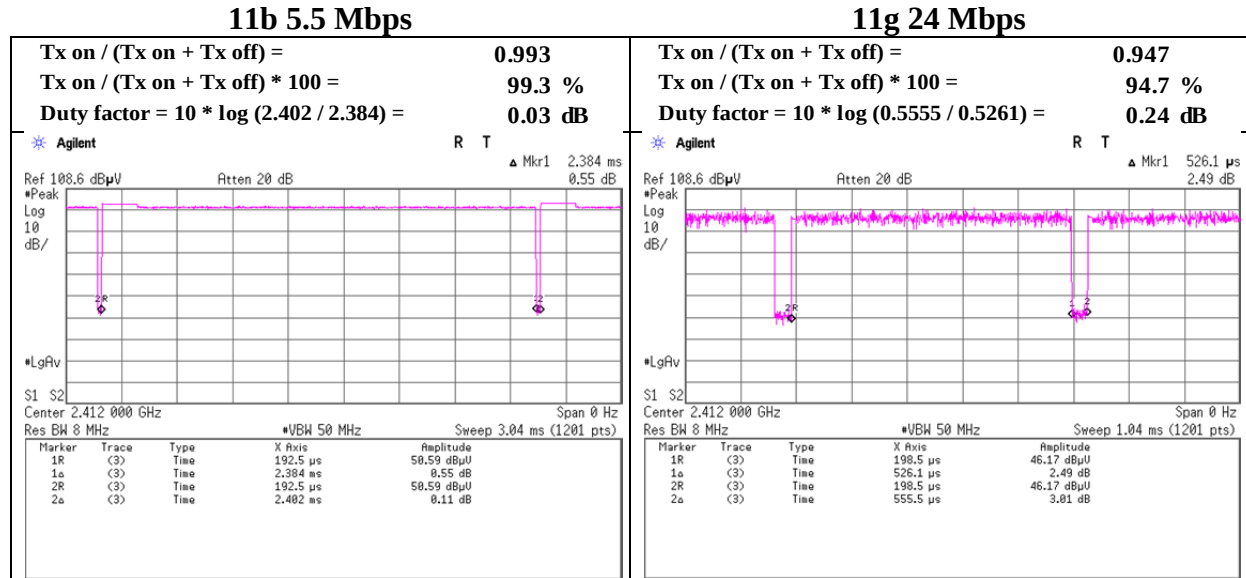
The test results and limit are rounded off to one decimal place, so some differences might be observed.

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

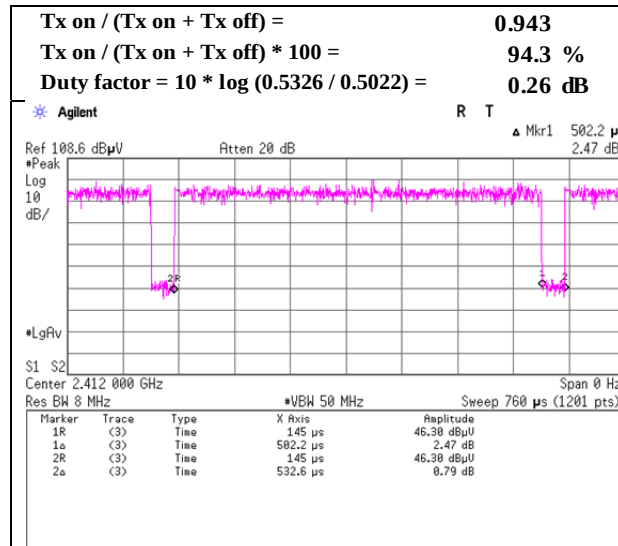
APPENDIX 1: Test data

Burst rate confirmation

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 11925908H
Date : September 4, 2017
Temperature / Humidity : 23 deg. C / 54 % RH
Engineer : Shuichi Ohyama
Mode : Tx



11n-20 MCS 3



* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

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Radiated Spurious Emission

Report No.	11925908H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	August 30, 2017	September 4, 2017
Temperature / Humidity	22 deg. C / 59 % RH	23 deg. C / 53 % RH
Engineer	Tomohisa Nakagawa	Takumi Shimada
	10 GHz - 26.5 GHz	1 GHz - 10 GHz
Mode	Tx 11b 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	46.6	27.7	6.7	32.4	-	48.6	73.9	25.3	
Hori	4824.000	PK	40.8	31.7	8.9	31.4	-	50.0	73.9	23.9	
Hori	7236.000	PK	41.5	36.1	10.3	32.1	-	55.8	73.9	18.1	Floor noise
Hori	9648.000	PK	41.8	38.6	10.9	32.9	-	58.4	73.9	15.5	Floor noise
Hori	2390.000	AV	38.8	27.7	6.7	32.4	-	40.8	53.9	13.1	
Hori	4824.000	AV	29.5	31.7	8.9	31.4	-	38.7	53.9	15.2	
Hori	7236.000	AV	30.6	36.1	10.3	32.1	-	44.9	53.9	9.0	Floor noise
Hori	9648.000	AV	31.1	38.6	10.9	32.9	-	47.7	53.9	6.2	Floor noise
Vert	2390.000	PK	47.3	27.7	6.7	32.4	-	49.3	73.9	24.6	
Vert	4824.000	PK	41.9	31.7	8.9	31.4	-	51.1	73.9	22.8	
Vert	7236.000	PK	41.6	36.1	10.3	32.1	-	55.9	73.9	18.0	Floor noise
Vert	9648.000	PK	42.1	38.6	10.9	32.9	-	58.7	73.9	15.2	Floor noise
Vert	2390.000	AV	36.6	27.7	6.7	32.4	-	38.6	53.9	15.3	
Vert	4824.000	AV	29.7	31.7	8.9	31.4	-	38.9	53.9	15.0	
Vert	7236.000	AV	30.7	36.1	10.3	32.1	-	45.0	53.9	8.9	Floor noise
Vert	9648.000	AV	31.2	38.6	10.9	32.9	-	47.8	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	100.3	27.7	6.8	32.4	102.4	-	-	Carrier
Hori	2397.000	PK	64.2	27.7	6.8	32.4	66.3	82.4	16.1	
Hori	2400.000	PK	62.0	27.7	6.8	32.4	64.1	82.4	18.3	
Vert	2412.000	PK	100.8	27.7	6.8	32.4	102.9	-	-	Carrier
Vert	2397.000	PK	62.1	27.7	6.8	32.4	64.2	82.9	18.7	
Vert	2400.000	PK	59.3	27.7	6.8	32.4	61.4	82.9	21.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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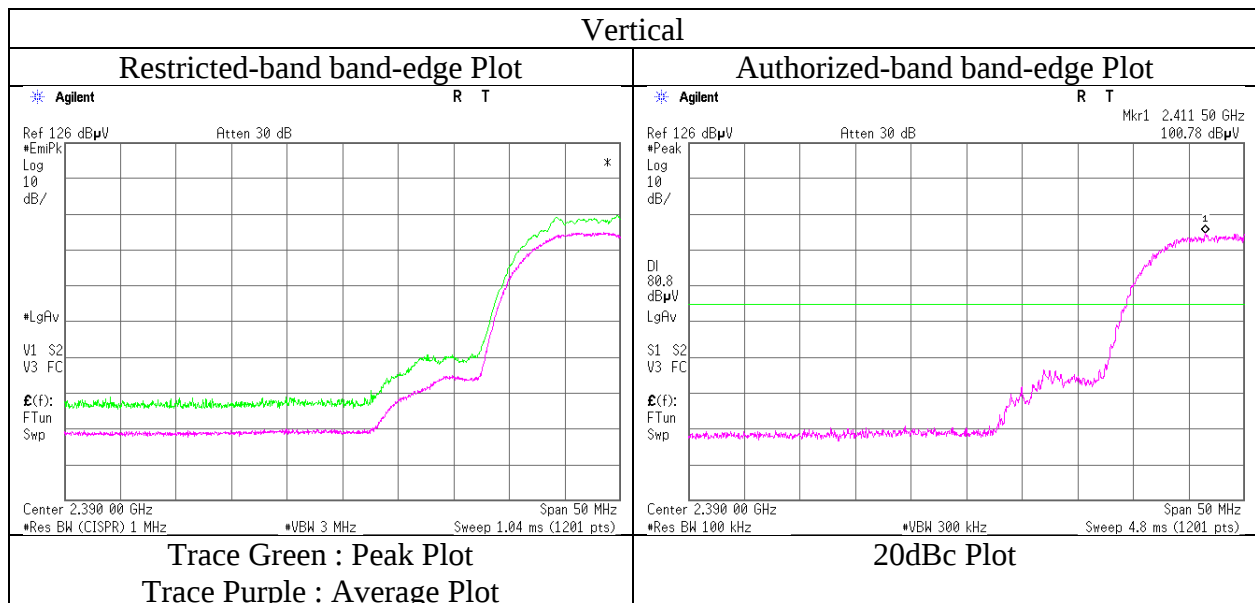
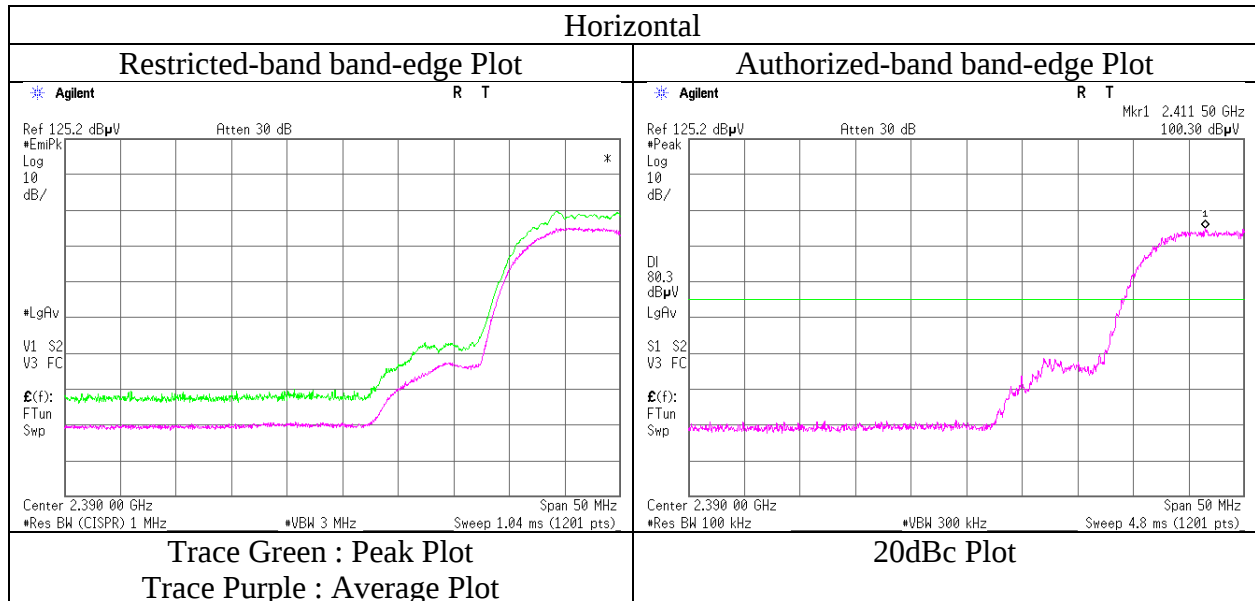
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Takumi Shimada
	1 GHz - 10 GHz
Mode	Tx 11b 2412 MHz



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

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Radiated Spurious Emission

Report No.	11925908H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	August 30, 2017	September 4, 2017
Temperature / Humidity	22 deg. C / 59 % RH	23 deg. C / 53 % RH
Engineer	Tomohisa Nakagawa	Takumi Shimada
	10 GHz - 26.5 GHz	1 GHz - 10 GHz
Mode	Tx 11b 2437 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	4874.000	PK	42.6	31.9	8.9	31.4	-	52.0	73.9	21.9	
Hori	7311.000	PK	40.4	36.2	10.3	32.2	-	54.7	73.9	19.2	Floor noise
Hori	9748.000	PK	41.9	38.7	11.0	33.0	-	58.6	73.9	15.3	Floor noise
Hori	4874.000	AV	32.6	31.9	8.9	31.4	-	42.0	53.9	11.9	
Hori	7311.000	AV	32.5	36.2	10.3	32.2	-	46.8	53.9	7.1	Floor noise
Hori	9748.000	AV	30.9	38.7	11.0	33.0	-	47.6	53.9	6.3	Floor noise
Vert	4874.000	PK	43.5	31.9	8.9	31.4	-	52.9	73.9	21.0	
Vert	7311.000	PK	40.1	36.2	10.3	32.2	-	54.4	73.9	19.5	Floor noise
Vert	9748.000	PK	41.3	38.7	11.0	33.0	-	58.0	73.9	15.9	Floor noise
Vert	4874.000	AV	33.8	31.9	8.9	31.4	-	43.2	53.9	10.7	
Vert	7311.000	AV	32.7	36.2	10.3	32.2	-	47.0	53.9	6.9	Floor noise
Vert	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor:	1 GHz - 10 GHz	$20\log(4.45 \text{ m} / 3.0 \text{ m}) = 3.43 \text{ dB}$
	10 GHz - 26.5 GHz	$20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

Radiated Spurious Emission

Report No.	11925908H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	August 30, 2017	September 4, 2017
Temperature / Humidity	22 deg. C / 59 % RH	23 deg. C / 53 % RH
Engineer	Tomohisa Nakagawa	Takumi Shimada
	10 GHz - 26.5 GHz	1 GHz - 10 GHz
Mode	Tx 11b 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	47.5	27.8	6.8	32.4	-	49.7	73.9	24.2	
Hori	4924.000	PK	41.7	32.0	9.0	31.3	-	51.4	73.9	22.5	
Hori	7386.000	PK	41.1	36.3	10.2	32.2	-	55.4	73.9	18.5	Floor noise
Hori	9848.000	PK	41.7	38.8	11.0	33.0	-	58.5	73.9	15.4	Floor noise
Hori	2483.500	AV	36.2	27.8	6.8	32.4	-	38.4	53.9	15.5	
Hori	4924.000	AV	29.5	32.0	9.0	31.3	-	39.2	53.9	14.7	
Hori	7386.000	AV	31.2	36.3	10.2	32.2	-	45.5	53.9	8.4	Floor noise
Hori	9848.000	AV	31.0	38.8	11.0	33.0	-	47.8	53.9	6.1	Floor noise
Vert	2483.500	PK	49.3	27.8	6.8	32.4	-	51.5	73.9	22.4	
Vert	4924.000	PK	41.4	32.0	9.0	31.3	-	51.1	73.9	22.8	
Vert	7386.000	PK	42.3	36.3	10.2	32.2	-	56.6	73.9	17.3	Floor noise
Vert	9848.000	PK	41.2	38.8	11.0	33.0	-	58.0	73.9	15.9	Floor noise
Vert	2483.500	AV	40.2	27.8	6.8	32.4	-	42.4	53.9	11.5	
Vert	4924.000	AV	29.8	32.0	9.0	31.3	-	39.5	53.9	14.4	
Vert	7386.000	AV	31.0	36.3	10.2	32.2	-	45.3	53.9	8.6	Floor noise
Vert	9848.000	AV	30.9	38.8	11.0	33.0	-	47.7	53.9	6.2	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 20log (4.45 m / 3.0 m) = 3.43 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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Ise EMC Lab.

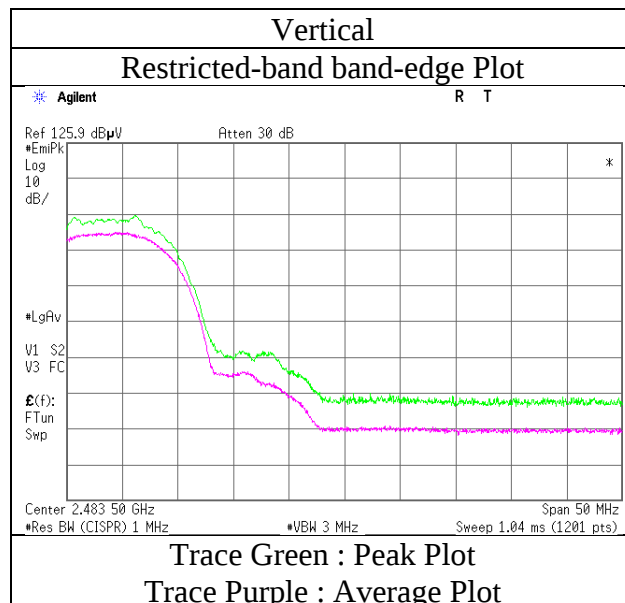
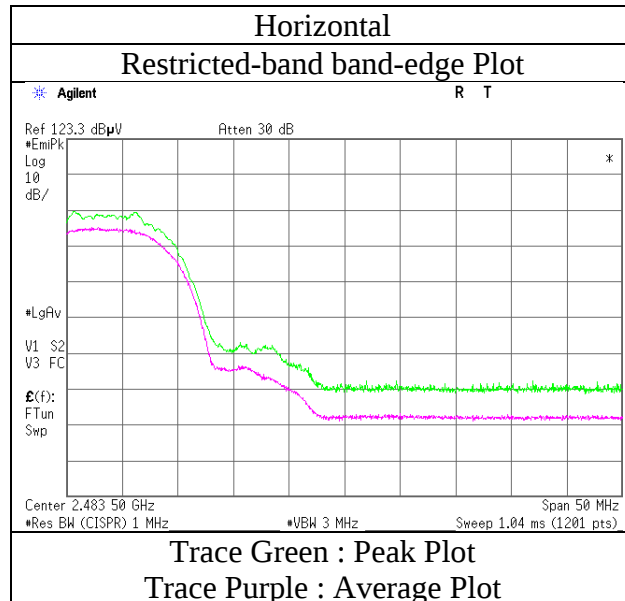
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Takumi Shimada
	1 GHz - 10 GHz
Mode	Tx 11b 2462 MHz



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

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Radiated Spurious Emission

Report No.	11925908H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	August 30, 2017	September 4, 2017
Temperature / Humidity	22 deg. C / 59 % RH	23 deg. C / 54 % RH
Engineer	Tomohisa Nakagawa	Shuichi Ohyama
	10 GHz - 26.5 GHz	1 GHz - 10 GHz
Mode	Tx 11g 2412 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	65.2	27.7	6.7	32.4	-	67.2	73.9	6.7	
Hori	4824.000	PK	38.2	31.7	8.9	31.4	-	47.4	73.9	26.5	Floor noise
Hori	7236.000	PK	41.7	36.1	10.3	32.1	-	56.0	73.9	17.9	Floor noise
Hori	9648.000	PK	42.2	38.6	10.9	32.9	-	58.8	73.9	15.1	Floor noise
Hori	2390.000	AV	49.2	27.7	6.7	32.4	0.2	51.4	53.9	2.5	*1)
Hori	4824.000	AV	30.5	31.7	8.9	31.4	-	39.7	53.9	14.2	Floor noise
Hori	7236.000	AV	31.2	36.1	10.3	32.1	-	45.5	53.9	8.4	Floor noise
Hori	9648.000	AV	31.1	38.6	10.9	32.9	-	47.7	53.9	6.2	Floor noise
Vert	2390.000	PK	63.8	27.7	6.7	32.4	-	65.8	73.9	8.1	
Vert	4824.000	PK	38.3	31.7	8.9	31.4	-	47.5	73.9	26.4	Floor noise
Vert	7236.000	PK	41.4	36.1	10.3	32.1	-	55.7	73.9	18.2	Floor noise
Vert	9648.000	PK	42.3	38.6	10.9	32.9	-	58.9	73.9	15.0	Floor noise
Vert	2390.000	AV	48.0	27.7	6.7	32.4	0.2	50.2	53.9	3.7	*1)
Vert	4824.000	AV	30.4	31.7	8.9	31.4	-	39.6	53.9	14.3	Floor noise
Vert	7236.000	AV	31.0	36.1	10.3	32.1	-	45.3	53.9	8.6	Floor noise
Vert	9648.000	AV	31.0	38.6	10.9	32.9	-	47.6	53.9	6.3	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.43\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

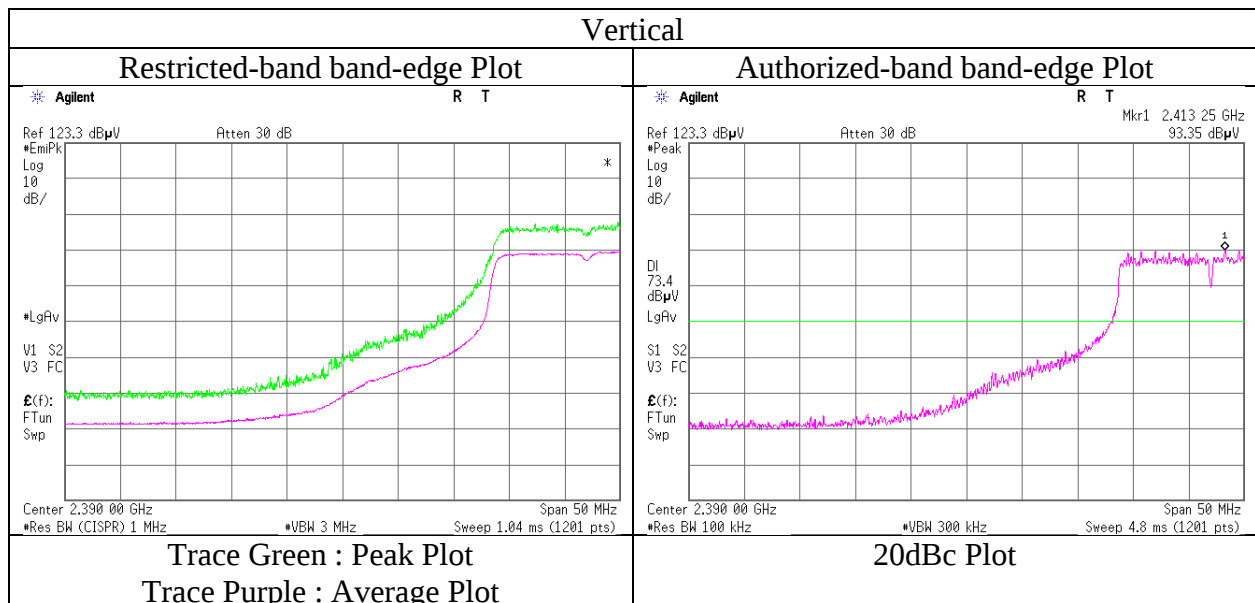
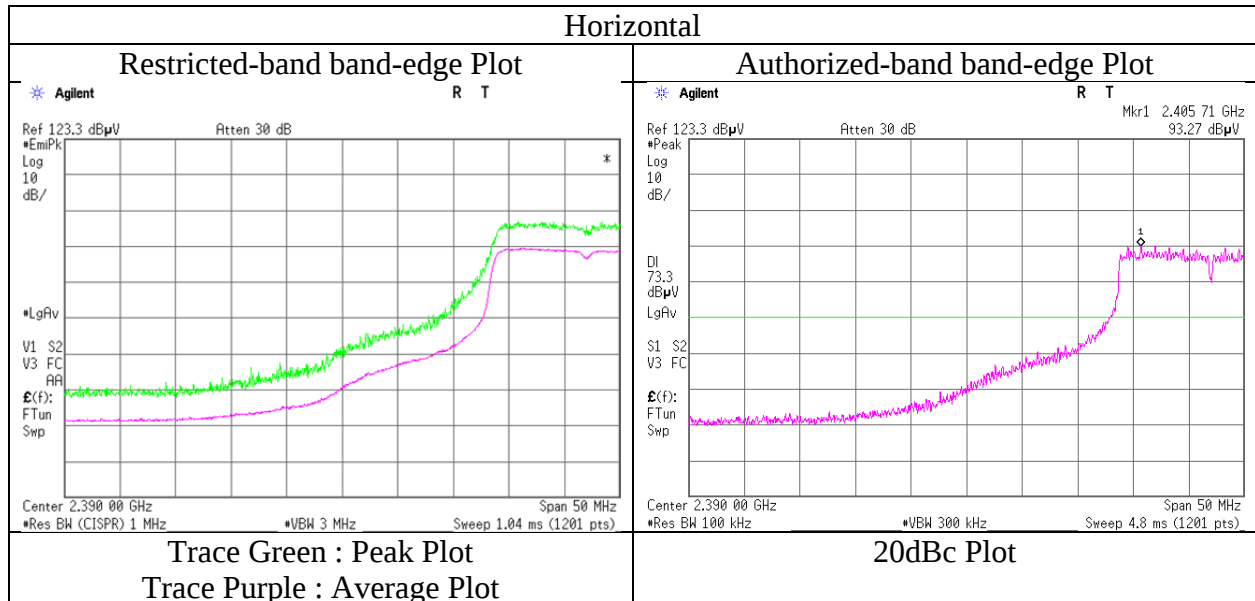
20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	93.3	27.7	6.8	32.4	95.4	-	-	Carrier
Hori	2400.000	PK	65.1	27.7	6.8	32.4	67.2	75.4	8.2	
Vert	2412.000	PK	93.4	27.7	6.8	32.4	95.5	-	-	Carrier
Vert	2400.000	PK	64.4	27.7	6.8	32.4	66.5	75.5	9.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Shuichi Ohyama
	1 GHz - 10 GHz
Mode	Tx 11g 2412 MHz



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

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Radiated Spurious Emission

Report No.	11925908H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	August 30, 2017	September 4, 2017
Temperature / Humidity	22 deg. C / 59 % RH	23 deg. C / 54 % RH
Engineer	Tomohisa Nakagawa	Shuichi Ohyama
	Below 1 GHz,	1 GHz - 10 GHz
	10 GHz - 26.5 GHz	
Mode	Tx 11g 2437 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	41.924	QP	26.2	13.4	6.9	28.2	-	18.3	40.0	21.7	
Hori	299.399	QP	40.3	13.4	8.8	27.2	-	35.3	46.0	10.7	
Hori	310.792	QP	37.2	13.7	8.9	27.2	-	32.6	46.0	13.4	
Hori	349.997	QP	43.2	14.7	9.3	27.5	-	39.7	46.0	6.3	
Hori	400.001	QP	38.6	15.7	9.4	27.8	-	35.9	46.0	10.1	
Hori	650.502	QP	37.4	19.4	10.3	27.8	-	39.3	46.0	6.7	
Hori	4874.000	PK	40.2	31.9	8.9	31.4	-	49.6	73.9	24.3	Floor noise
Hori	7311.000	PK	42.3	36.2	10.3	32.2	-	56.6	73.9	17.3	Floor noise
Hori	9748.000	PK	41.2	38.7	11.0	33.0	-	57.9	73.9	16.0	Floor noise
Hori	4874.000	AV	32.1	31.9	8.9	31.4	-	41.5	53.9	12.4	Floor noise
Hori	7311.000	AV	33.2	36.2	10.3	32.2	-	47.5	53.9	6.4	Floor noise
Hori	9748.000	AV	31.0	38.7	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	42.794	QP	40.1	13.1	6.9	28.2	-	31.9	40.0	8.1	
Vert	55.598	QP	41.2	8.9	7.0	28.1	-	29.0	40.0	11.0	
Vert	283.367	QP	30.0	12.9	8.7	27.1	-	24.5	46.0	21.5	
Vert	302.606	QP	29.2	13.5	8.9	27.2	-	24.4	46.0	21.6	
Vert	405.211	QP	23.4	15.9	9.4	27.8	-	20.9	46.0	25.1	
Vert	645.693	QP	28.4	19.4	10.3	27.8	-	30.3	46.0	15.7	
Vert	4874.000	PK	40.7	31.9	8.9	31.4	-	50.1	73.9	23.8	Floor noise
Vert	7311.000	PK	42.0	36.2	10.3	32.2	-	56.3	73.9	17.6	Floor noise
Vert	9748.000	PK	41.3	38.7	11.0	33.0	-	58.0	73.9	15.9	Floor noise
Vert	4874.000	AV	32.2	31.9	8.9	31.4	-	41.6	53.9	12.3	Floor noise
Vert	7311.000	AV	33.2	36.2	10.3	32.2	-	47.5	53.9	6.4	Floor noise
Vert	9748.000	AV	31.1	38.7	11.0	33.0	-	47.8	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

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

Distance factor: 1 GHz - 10 GHz 20log (4.45 m / 3.0 m) = 3.43 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	11925908H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.2	No.3
Date	August 30, 2017	September 4, 2017
Temperature / Humidity	22 deg. C / 59 % RH	23 deg. C / 54 % RH
Engineer	Tomohisa Nakagawa	Shuichi Ohyama
	10 GHz - 26.5 GHz	1 GHz - 10 GHz
Mode	Tx 11g 2462 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	61.7	27.8	6.8	32.4	-	63.9	73.9	10.0	
Hori	4924.000	PK	40.5	32.0	9.0	31.3	-	50.2	73.9	23.7	Floor noise
Hori	7386.000	PK	42.7	36.3	10.2	32.2	-	57.0	73.9	16.9	Floor noise
Hori	9848.000	PK	42.2	38.8	11.0	33.0	-	59.0	73.9	14.9	Floor noise
Hori	2483.500	AV	48.9	27.8	6.8	32.4	0.2	51.3	53.9	2.6	*1)
Hori	4924.000	AV	29.4	32.0	8.2	31.3	-	38.3	53.9	15.6	Floor noise
Hori	7386.000	AV	31.7	36.3	10.2	32.2	-	46.0	53.9	7.9	Floor noise
Hori	9848.000	AV	30.9	38.8	11.0	33.0	-	47.7	53.9	6.2	Floor noise
Vert	2483.500	PK	59.9	27.8	6.8	32.4	-	62.1	73.9	11.8	
Vert	4924.000	PK	40.7	32.0	8.2	31.3	-	49.6	73.9	24.3	Floor noise
Vert	7386.000	PK	42.0	36.3	10.2	32.2	-	56.3	73.9	17.6	Floor noise
Vert	9848.000	PK	41.9	38.8	11.0	33.0	-	58.7	73.9	15.2	Floor noise
Vert	2483.500	AV	47.2	27.8	6.8	32.4	0.2	49.6	53.9	4.3	*1)
Vert	4924.000	AV	30.0	32.0	9.0	31.3	-	39.7	53.9	14.2	Floor noise
Vert	7386.000	AV	32.2	36.3	10.2	32.2	-	46.5	53.9	7.4	Floor noise
Vert	9848.000	AV	31.0	38.8	11.0	33.0	-	47.8	53.9	6.1	Floor noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

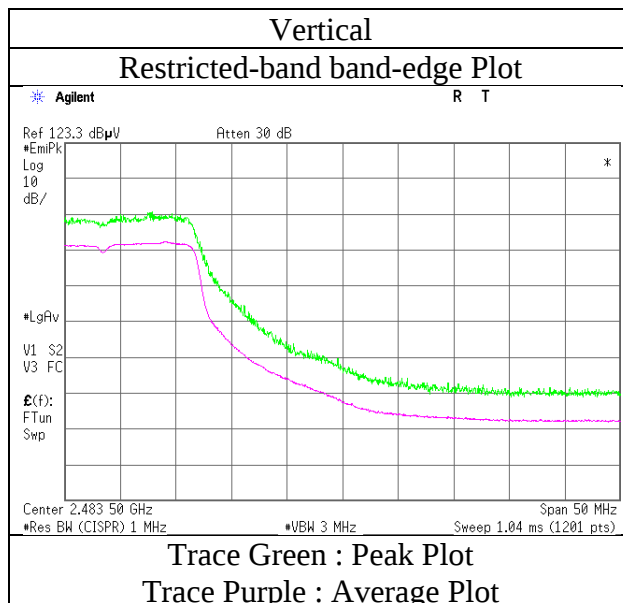
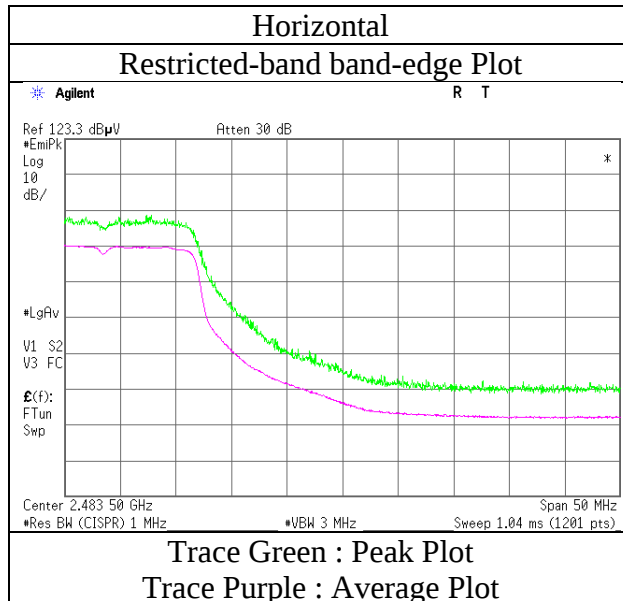
Distance factor: 1 GHz - 10 GHz $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.43\text{ dB}$

10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Shuichi Ohyama
	1 GHz - 10 GHz
Mode	Tx 11g 2462 MHz



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

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Radiated Spurious Emission

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Shuichi Ohyama
	1 GHz - 10 GHz
Mode	Tx 11n-20 2412 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2390.000	PK	64.2	27.7	6.7	32.4	-	66.2	73.9	7.7	
Hori	2390.000	AV	49.1	27.7	6.7	32.4	0.3	51.4	53.9	2.5	*1)
Vert	2390.000	PK	64.8	27.7	6.7	32.4	-	66.8	73.9	7.1	
Vert	2390.000	AV	47.9	27.7	6.7	32.4	0.3	50.2	53.9	3.7	*1)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

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

Distance factor: 1 GHz - 10 GHz $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.43\text{ dB}$
 10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	93.1	27.7	6.8	32.4	95.2	-	-	Carrier
Hori	2400.000	PK	63.8	27.7	6.8	32.4	65.9	75.2	9.3	
Vert	2412.000	PK	93.0	27.7	6.8	32.4	95.1	-	-	Carrier
Vert	2400.000	PK	63.8	27.7	6.8	32.4	65.9	75.1	9.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

UL Japan, Inc.

Ise EMC Lab.

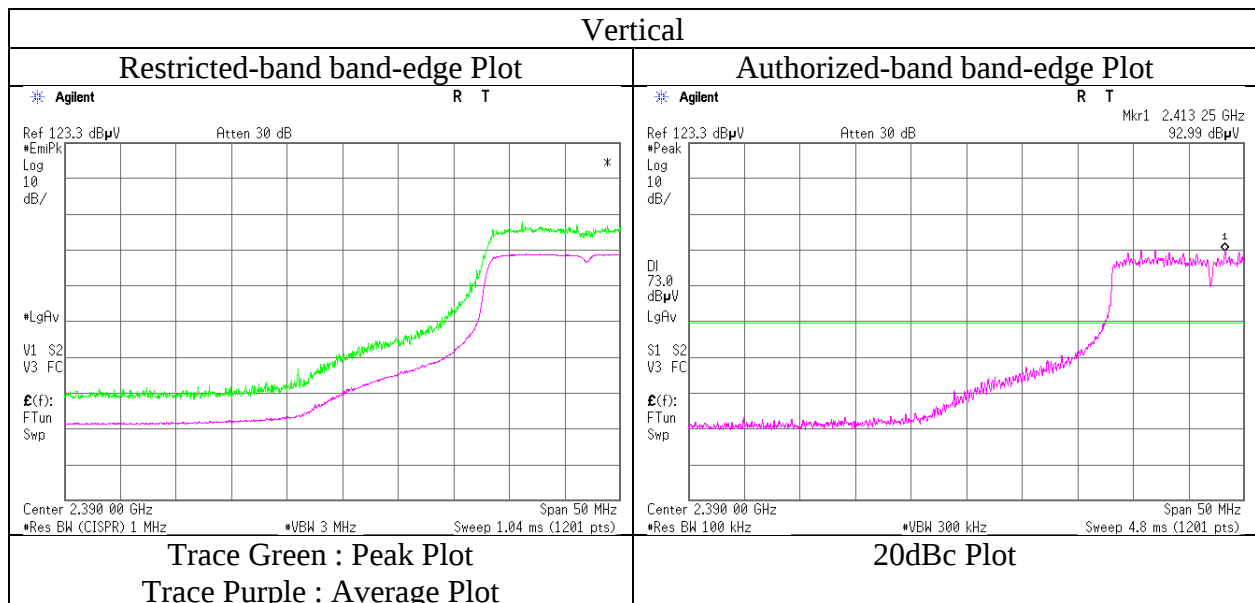
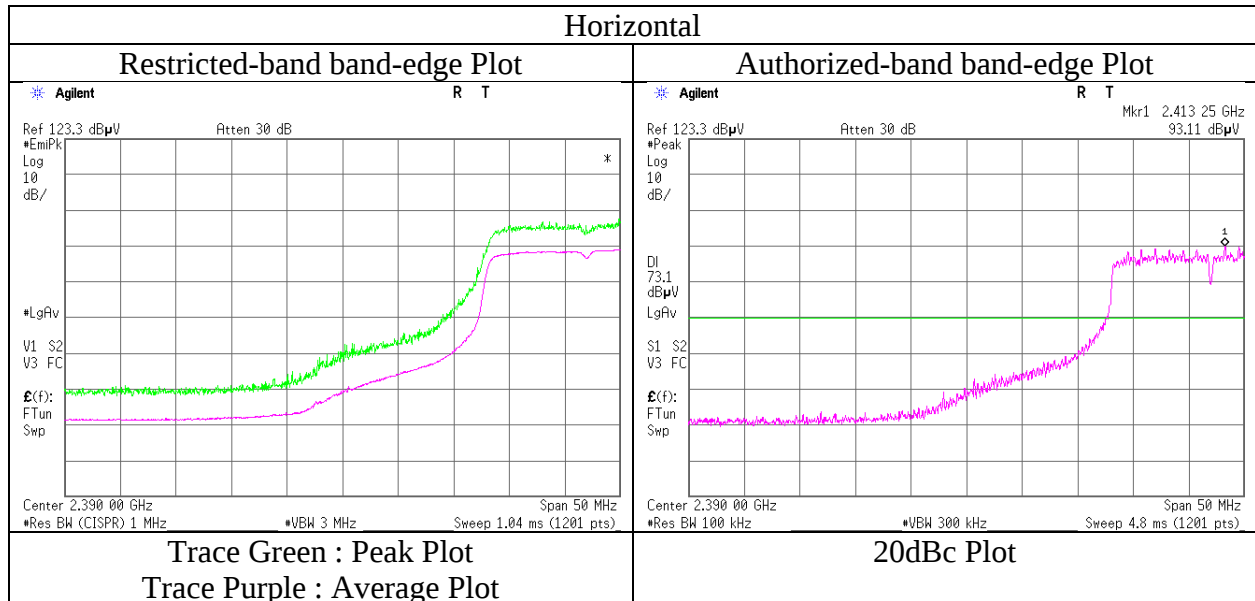
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Shuichi Ohyama
	1 GHz - 10 GHz
Mode	Tx 11n-20 2412 MHz



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

Radiated Spurious Emission

Report No. 11925908H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date September 4, 2017
Temperature / Humidity 23 deg. C / 54 % RH
Engineer Shuichi Ohyama
1 GHz - 10 GHz
Mode Tx 11n-20 2462 MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	58.2	27.8	6.8	32.4	-	60.4	73.9	13.5	
Hori	2483.500	AV	46.4	27.8	6.8	32.4	0.3	48.9	53.9	5.0	*1)
Vert	2483.500	PK	58.8	27.8	6.8	32.4	-	61.0	73.9	12.9	
Vert	2483.500	AV	46.2	27.8	6.8	32.4	0.3	48.7	53.9	5.2	*1)

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier) + Duty factor

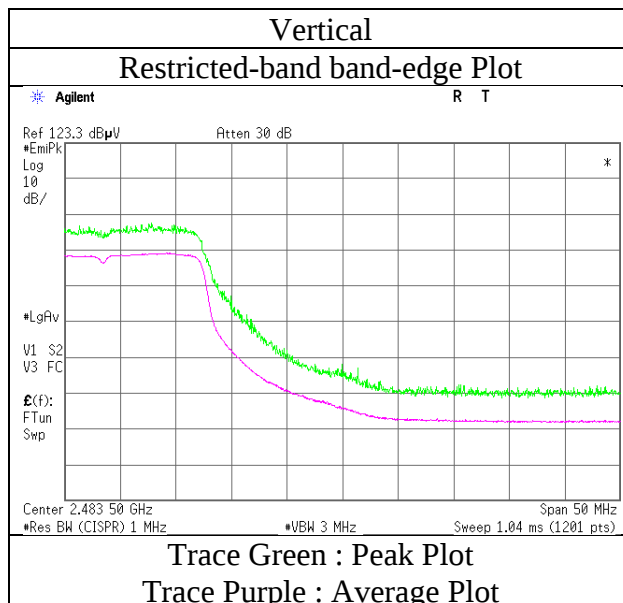
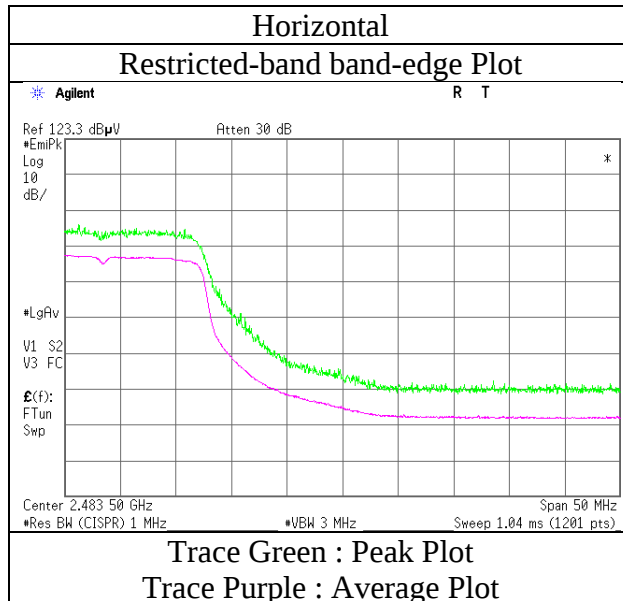
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4.45\text{ m} / 3.0\text{ m}) = 3.43\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

*1) Not Out of Band emission(Leakage Power)

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	11925908H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	September 4, 2017
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Shuichi Ohyama
	1 GHz - 10 GHz
Mode	Tx 11n-20 2462 MHz



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

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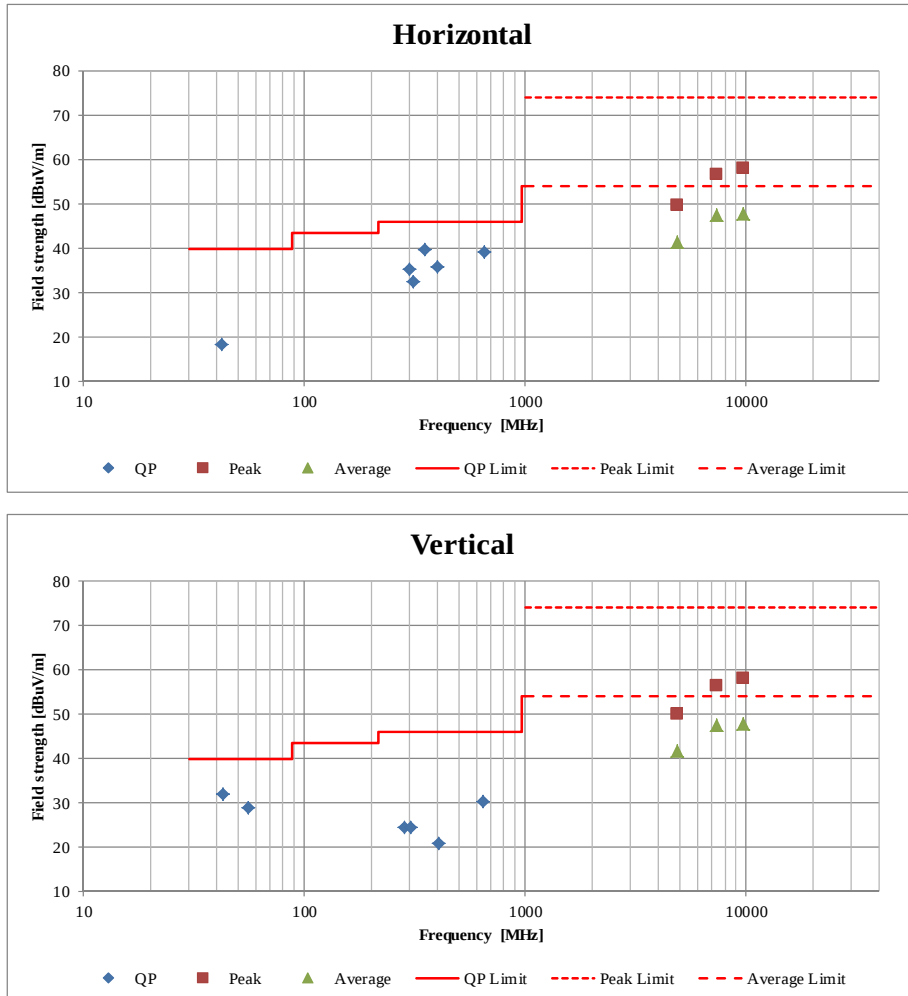
Facsimile : +81 596 24 8124

Radiated Spurious Emission (Plot data, Worst case)

Report No.
Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

11925908H
Ise EMC Lab.
No.2
August 30, 2017
22 deg. C / 59 % RH
Tomohisa Nakagawa
Below 1 GHz, 10 GHz - 26.5 GHz
Tx 11g 2437 MHz

No.3
September 4, 2017
23 deg. C / 53 % RH
Takumi Shimada
1 GHz - 10 GHz



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

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APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12 *1)
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/12/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2016/11/10 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2017/08/21 * 12
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2016/09/29 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/01/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2017/02/24 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2016/11/28 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2017/08/07 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2017/02/24 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2017/08/04 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2017/02/24 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2017/06/21 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2017/05/22 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2017/03/21 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2016/09/21 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 12

***1) This test equipment was used for the tests before the expiration date of the calibration.**

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

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