




RADIO TEST REPORT

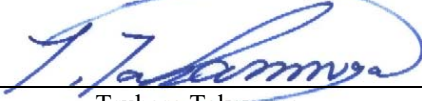
Test Report No. : 12548845H-A-R1

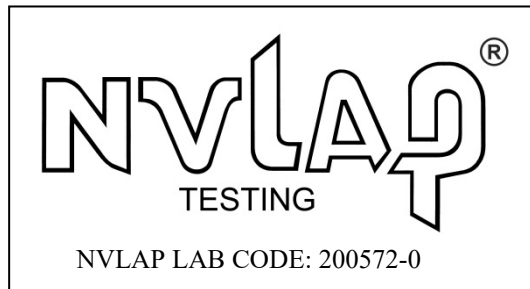
Applicant : silex technology, Inc.
Type of Equipment : SDIO Wireless Module
Model No. : SX-SDMAN
FCC ID : N6C-SDMAN
Test regulation : FCC Part 15 Subpart E: 2018
Test Result : Complied

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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 covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. 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.
8. This report is a revised version of 12548845H-A. 12548845H-A is replaced with this report.

Date of test: November 6 to 29, 2018

Representative test engineer: 
Yuta Moriya
Engineer
Consumer Technology Division

Approved by: 
Tsubasa Takayama
Leader
Consumer Technology Division



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REVISION HISTORY

Original Test Report No.: 12548845H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12548845H-A	December 10, 2018	-	-
1	12548845H-A-R1	December 12, 2018	P74, P75	Correction of photo of worst case position

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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 : DC3.3V
Receipt Date of Sample : October 29, 2018
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.

Radio Specification

Radio Type : Transceiver
Method of Frequency Generation : Synthesizer

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

	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz – 2462 MHz	2412 MHz -2462 MHz	5180 MHz - 5320 MHz 5500 MHz - 5580 MHz 5600 MHz - 5640 MHz *1) 5660 MHz - 5700 MHz 5745 MHz - 5825 MHz	2412 MHz - 2462 MHz 5180 MHz - 5320 MHz 5500 MHz - 5580 MHz 5600 MHz - 5640 MHz *1) 5660 MHz - 5700 MHz 5745 MHz - 5825 MHz	5190 MHz - 5310MHz 5510 MHz - 5550MHz 5590 MHz - 5630 MHz *1) 5670MHz 5755 MHz - 5795MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		
Channel spacing	5MHz		20MHz	<u>2.4GHz band</u> 5MHz <u>5GHz band</u> 20MHz	40MHz
Antenna type	Mini-Nanoblade antenna: Laird Technologies Stand Alone antenna: Molex				
Antenna Gain	Mini-Nanoblade antenna: 2.5dBi (2.4GHz), 4.8dBi (5GHz) Stand Alone antenna: 3.0dBi (2.4GHz), 4.6dBi (5GHz)				
Antenna Connector type	U.FL Alternative connector				

Specification of Bluetooth (Ver.4.0 + EDR)

Type of radio	Bluetooth
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Channel spacing	1MHz
Antenna type	Mini-Nanoblade antenna: Laird Technologies Stand Alone antenna: Molex
Antenna Gain	Mini-Nanoblade antenna: 2.5dBi (2.4GHz) Stand Alone antenna: 3.0dBi (2.4GHz)
Antenna Connector Type	U.FL Alternative connector

Specification of Low Energy (Ver.4.0 + EDR/LE Dual mode)

Type of radio	Low Energy
Frequency of Operation	2402-2480MHz
Type of Modulation	DSSS
Channel spacing	2MHz
Antenna type	Mini-Nanoblade antenna: Laird Technologies Stand Alone antenna: Molex
Antenna Gain	Mini-Nanoblade antenna: 2.5dBi (2.4GHz) Stand Alone antenna: 3.0dBi (2.4GHz)
Antenna Connector Type	U.FL Alternative connector

*This test report applies for Wireless LAN (IEEE802.11a/n-20/n-40).

*1) 5600 MHz -5640 MHz and 5590 MHz – 5630 MHz are applied for this test report.

Wireless LAN and Bluetooth do not transmit simultaneously.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E

Title : FCC 47CFR Part15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013	FCC: 15.407 (b) (6) / 15.207	QP 12.3 dB, 0.20162 MHz, L AV 11.0 dB, 0.54038 MHz, N	Complied	-
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
26 dB Emission Bandwidth	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)	See data	Complied	Conducted
	IC: -	IC: -			
Maximum Conducted Output Power	FCC: KDB Publication Number 789033	FCC: 15.407 (a) (1) (2) (3)		Complied	Conducted
	IC: -	IC: RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
Maximum Power Spectral Density	FCC: KDB Publication Number 789033	FCC : 15.407 (a) (1) (2) (3)		Complied	Conducted
	IC: -	IC: RSS-247 6.2.1.1 6.2.2.1 6.2.3.1 6.2.4.1			
Spurious Emission Restricted Band Edge	FCC: ANSI C63.10-2013 KDB Publication Number 789033	FCC: 15.407 (b), 15.205 and 15.209	2.1 dB 312.000 MHz, QP, Horizontal	Complied#	Conducted (< 30 MHz) / Radiated (> 30 MHz) *1)
	IC: -	IC: RSS-247 6.2.1.2 6.2.2.2 6.2.3.2 6.2.4.2			
6 dB Emission Bandwidth	FCC: ANSI C63.10-2013	FCC: 15.407 (e)	-	N/A	Conducted
	IC: -	IC: RSS-247 6.2.4.1			

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

* For DFS tests, please see the test report number 12548845H-B issued by UL Japan, Inc.

*1) Radiated test was selected over 30 MHz based on section FCC 15.407 (b) and KDB 789033 D02 G.3.b).

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC Part 15.31 (e)

The RF Module has own regulator. The RF Module is constantly provided voltage through own regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique antenna connector (U.FL). Therefore the equipment complies with the requirement of 15.203/212.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	RSS-Gen 6.7	IC: -	N/A	Complied	Conducted

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

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.
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Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.8 dB
	0.15 MHz to 30 MHz	3.4 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		(Vertical) 5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
		(Vertical) 6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		(Vertical) 4.9 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
		(Vertical) 5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB
10 m	1 GHz to 18 GHz	5.2 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
26 dB Emission Bandwidth / 6 dB Emission Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Conducted Output Power / Average Output Power	1.3 dB
Burst Rate	0.10 %
Maximum Power Spectral Density	2.7 dB
Spurious Emission (Conducted)	1.9 dB

3.5 Test Location

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 NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

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	3.1 x 5.0	-	-
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 x 2.0 m 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.

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 802.11a (11a)	24 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 3 (Long GI), PN9
IEEE 802.11n MIMO 40 MHz BW (11n-40)	MCS 3 (Long GI), PN9
*The worst antenna (Ant: 2) and condition was determined based on the test result of Maximum Conducted Output Power.	
*Power of the EUT was set by the software as follows; Power settings: 14 dBm Software: athtestcmd *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 Operation mode(s)

Test Item	Operating Mode	Tested Antenna port	Tested Frequency			
			Lower Band	Middle Band	Additional Band	Upper Band
Conducted emission Radiated Spurious Emission (Below 1 GHz) Conducted Spurious Emission	11n-20 Tx *1)	2 *2)	-	-	5640 MHz	-
26 dB Emission Bandwidth 99 % Occupied Bandwidth, Maximum Conducted Output Power, Maximum Power Spectral Density	11a Tx 11n-20 Tx	2 *2)	-	-	5600 MHz 5620 MHz 5640 MHz	-
	11n-40 Tx	2 *2)	-	-	5590 MHz 5630 MHz	-
Radiated Spurious Emission (Above 1 GHz)	11a Tx 11n-20 Tx	2 *2)	-	-	5600 MHz 5620 MHz 5640 MHz	-
	11n-40 Tx	2 *2)	-	-	5590 MHz 5630 MHz	-

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.

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

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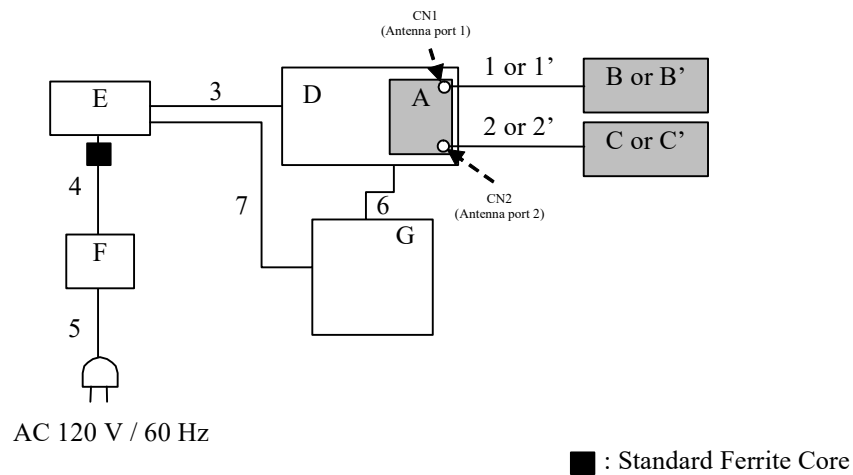
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4.2 Configuration and peripherals

For Conducted Emission and Radiated Emission tests



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SDIO Wireless Module	SX-SDMAN		silex technology, Inc.	EUT
B	Stand Alone antenna	47950 0001	001	Molex	EUT
B'	Mini-Nanoblade antenna	MAF94264	001	Laird	EUT
C	Stand Alone antenna	47950 0001	002	Molex	EUT
C'	Mini-Nanoblade antenna	MAF94264	002	Laird	EUT
D	Jig Board	-	-	silex technology, Inc.	-
E	Laptop PC	Latitude E6510	CFGY2A00	DELL	-
F	AC Adaptor	LA90PE0-01	CN-03T6XF-7161 5-1AK-0927-A01	DELL	
G	Jig Board	-	-	silex technology, Inc.	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable (for Stand Alone antenna)	0.1	Shielded	Shielded	-
1'	Antenna Cable (for Mini-Nanoblade antenna)	0.08	Shielded	Shielded	-
2	Antenna Cable (for Stand Alone antenna)	0.1	Shielded	Shielded	-
2'	Antenna Cable (for Mini-Nanoblade antenna)	0.08	Shielded	Shielded	-
3	USB Cable	0.8	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	0.9	Unshielded	Unshielded	-
6	DC Cable	0.9	Unshielded	Unshielded	-
7	USB Cable	1.0	Shielded	Shielded	-

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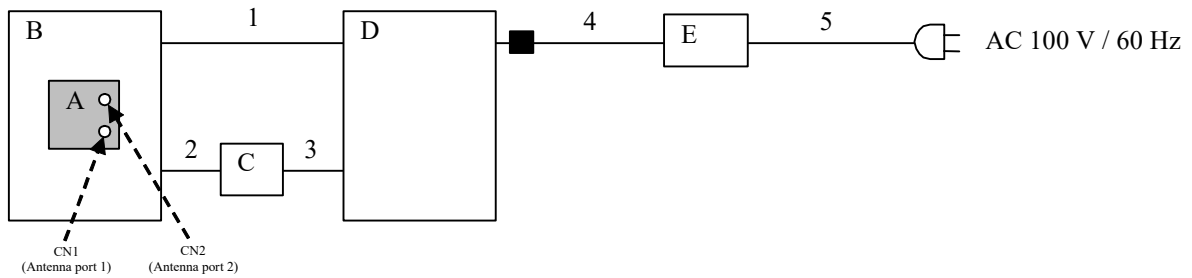
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For Antenna Terminal Conducted Tests



■ : Standard Ferrite Core

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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SDIO Wireless Module	SX-SDMAN	008092-50990A	silex technology, Inc.	EUT
B	Jig Board	-	-	silex technology, Inc.	-
C	Jig Board	-	-	silex technology, Inc.	-
D	Laptop PC	PC-VY25AFZ77	99023431A	NEC Personal products	-
E	AC Adaptor	ADP80	9605505LB	NEC Personal products	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	0.9	Shielded	Shielded	-
2	Signal + DC Cable	0.9	Unshielded	Unshielded	-
3	Signal Cable	1.1	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	1.8	Unshielded	Unshielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

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

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

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

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

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

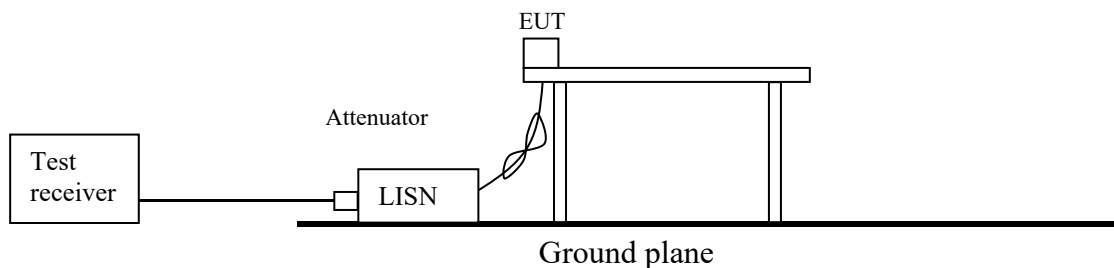
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

< Below 1GHz >

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.

< Above 1GHz >

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.

< Below 1GHz >

The result also satisfied with the general limits specified in section 15.209 (a).

< Above 1GHz >

Inside of restricted bands (Section 15.205):

Apply to limit in the Section 15.209 (a).

Outside of the restricted bands:

Apply to limit 68.2 dBuV/m, 3 m (-27 dBm e.i.r.p. *) in the Section 15.407 (b) (1) (2) (3).

Restricted band edge:

Apply to limit in the Section 15.209 (a).

Since this limit is severer than the limit of the inside of restricted bands.

*Electric field strength to e.i.r.p. conversion:

$$E = \frac{1000000 \sqrt{30P}}{3} \text{ (uV/m)} \quad :P \text{ is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

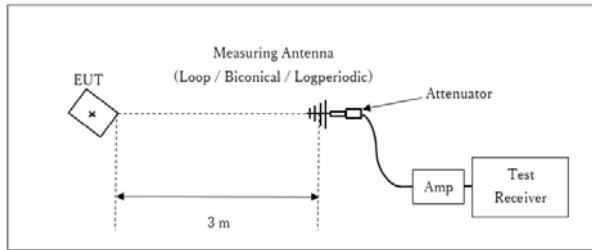
Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

Frequency	Below 1 GHz	Above 1 GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	Peak	Average
IF Bandwidth	BW: 120 kHz	RBW: 1 MHz VBW: 3 MHz	Method AD *1) 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.

*1) The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

Figure 2: Test Setup

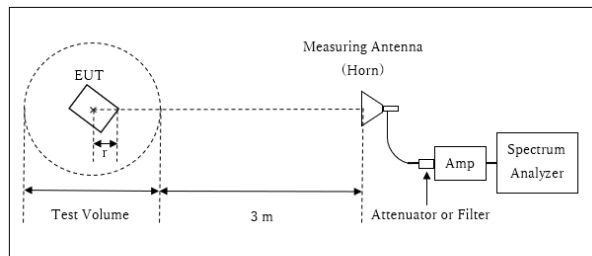
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



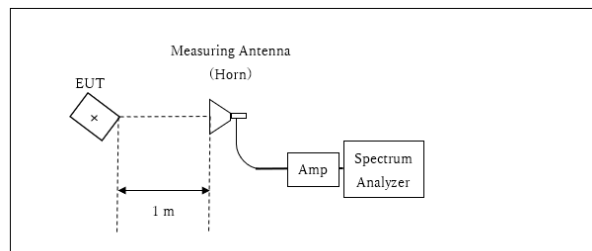
r : Radius of an outer periphery of EUT
 × : Center of turn table

Distance Factor: $20 \times \log(4.0 \text{ m} / 3.0 \text{ m}) = 2.5 \text{ dB}$
 * Test Distance: $(3 + \text{Test Volume} / 2) - r = 4.0 \text{ m}$

Test Volume : 2.0 m
 (Test Volume has been calibrated based on CISPR 16-1-4.)
 r = 0.0 m

* The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.

10 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$
 *Test Distance: 1 m

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

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

Measurement range : 30 MHz - 40 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used and Test method
26 dB Bandwidth	Enough to capture the emission	Close to 1 % of EBW	> RBW	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 % to 5 % of OBW	≥ 3 RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Conducted Output Power	-	-	-	Auto	Average	-	Power Meter (Sensor: 80 MHz BW) (Method PM)
Maximum Power Spectral Density	Encompass the entire EBW	1 MHz	≥ 3 RBW	Auto	RMS Power Averaging (200 times)	Clear Write	Spectrum Analyzer
Conducted Spurious Emission*2)	9 kHz – 150 kHz 150 kHz – 30 MHz	200 Hz 9.1 kHz	620 Hz 27 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

* The test method was also referred to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E".

*1) Peak hold was applied as Worst-case measurement.

*2) In the frequency range below 30 MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9 kHz-150 kHz: RBW = 200 Hz, 150 kHz-30 MHz: RBW = 9.1 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

UL Japan, Inc.

Ise EMC Lab.

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Telephone : +81 596 24 8999

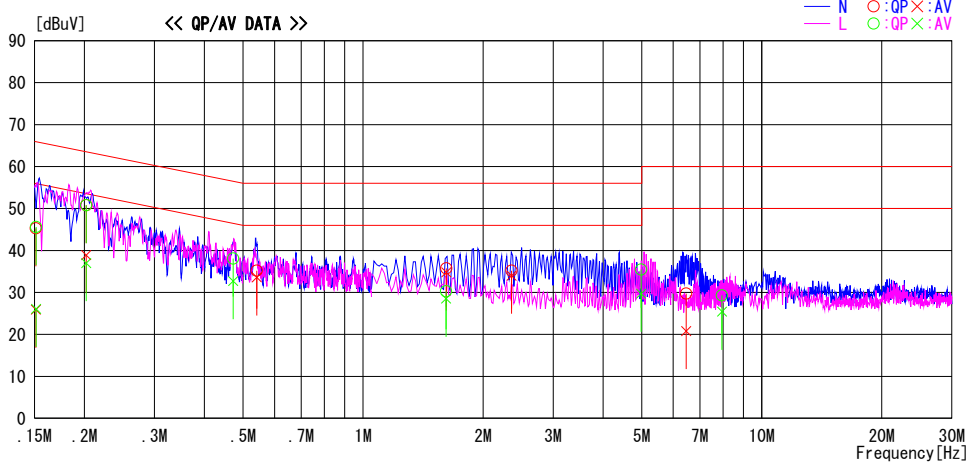
Facsimile : +81 596 24 8124

APPENDIX 1: Test data

Conducted Emission

Report No. 12548845H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date November 29, 2018
Temperature / Humidity 19 deg. C / 45 % RH
Engineer Takafumi Noguchi
Mode Tx 11n-20 5640MHz ANT port 2
Antenna: Mini-Nanoblade antenna

LIMIT : FCC15.207 QP
FCC15.207 AV



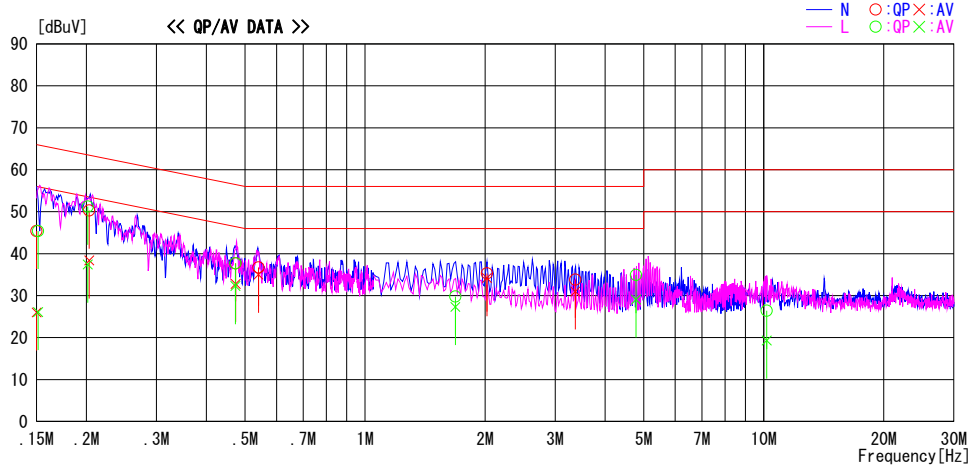
Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15121	32.1	12.7	13.2	45.3	25.9	65.9	55.9	20.6	30.0	N	
0.20220	37.6	25.7	13.2	50.8	38.9	63.5	53.5	12.7	14.6	N	
0.54161	21.9	20.3	13.3	35.2	33.6	56.0	46.0	20.8	12.4	N	
1.61741	22.2	21.3	13.5	35.7	34.8	56.0	46.0	20.3	11.2	N	
2.35805	21.6	20.4	13.6	35.2	34.0	56.0	46.0	20.8	12.0	N	
6.46723	15.7	6.8	14.0	29.7	20.8	60.0	50.0	30.3	29.2	N	
0.15140	32.4	12.9	13.2	45.6	26.1	65.9	55.9	20.3	29.8	L	
0.20220	37.6	23.8	13.2	50.8	37.0	63.5	53.5	12.7	16.5	L	
0.47247	24.8	19.4	13.3	38.1	32.7	56.5	46.5	18.4	13.8	L	
1.61564	16.8	15.0	13.5	30.3	28.5	56.0	46.0	25.7	17.5	L	
4.98308	21.5	15.8	13.9	35.4	29.7	56.0	46.0	20.6	16.3	L	
7.94892	15.3	11.4	14.0	29.3	25.4	60.0	50.0	30.7	24.6	L	

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

Conducted Emission

Report No. 12548845H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date November 29, 2018
Temperature / Humidity 19 deg. C / 45 % RH
Engineer Takafumi Noguchi
Mode Tx 11n-20 5640MHz ANT port 2
Antenna: Stand Alone antenna

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15012	32.2	12.8	13.2	45.4	26.0	66.0	56.0	20.6	30.0	N	
0.20344	37.1	25.2	13.2	50.3	38.4	63.5	53.5	13.2	15.1	N	
0.47365	24.4	19.5	13.3	37.7	32.8	56.4	46.4	18.7	13.6	N	
0.54038	23.4	21.7	13.3	36.7	35.0	56.0	46.0	19.3	11.0	N	
2.02088	21.8	20.7	13.5	35.3	34.2	56.0	46.0	20.7	11.8	N	
3.36873	20.1	17.3	13.7	33.8	31.0	56.0	46.0	22.2	15.0	N	
0.15142	32.2	12.9	13.2	45.4	26.1	65.9	55.9	20.5	29.8	L	
0.20162	38.0	24.2	13.2	51.2	37.4	63.5	53.5	12.3	16.1	L	
0.47286	24.4	19.0	13.3	37.7	32.3	56.5	46.5	18.8	14.2	L	
1.68472	16.3	13.8	13.5	29.8	27.3	56.0	46.0	26.2	18.7	L	
4.78509	21.1	15.3	13.8	34.9	29.1	56.0	46.0	21.1	16.9	L	
10.17584	12.3	5.2	14.1	26.4	19.3	60.0	50.0	33.6	30.7	L	

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

26 dB Emission Bandwidth and 99 % Occupied Bandwidth

Report No. 12548845H
Test place Ise EMC Lab. No.7 Shielded Room
Date November 7, 2018
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Yuta Moriya
Mode Tx

11a

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 2	5600	20.190	16712.0
	5620	20.341	16722.8
	5640	20.079	16705.1

11n-20

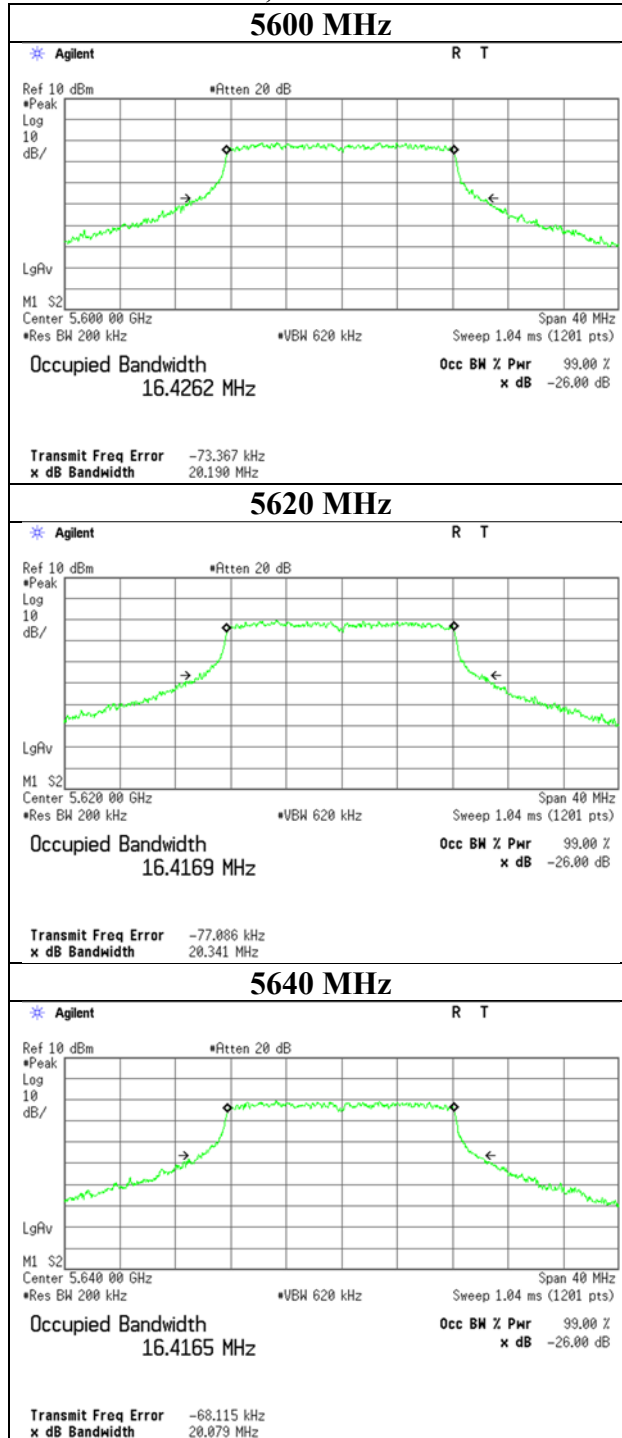
Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 2	5600	21.582	17891.0
	5620	21.704	17896.8
	5640	21.826	17903.0

11n-40

Antenna	Tested Frequency [MHz]	26 dB Emission Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]
Antenna 2	5590	41.718	36371.3
	5630	41.610	36398.0

26 dB Emission Bandwidth

11a, Antenna 2



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Ise EMC Lab.

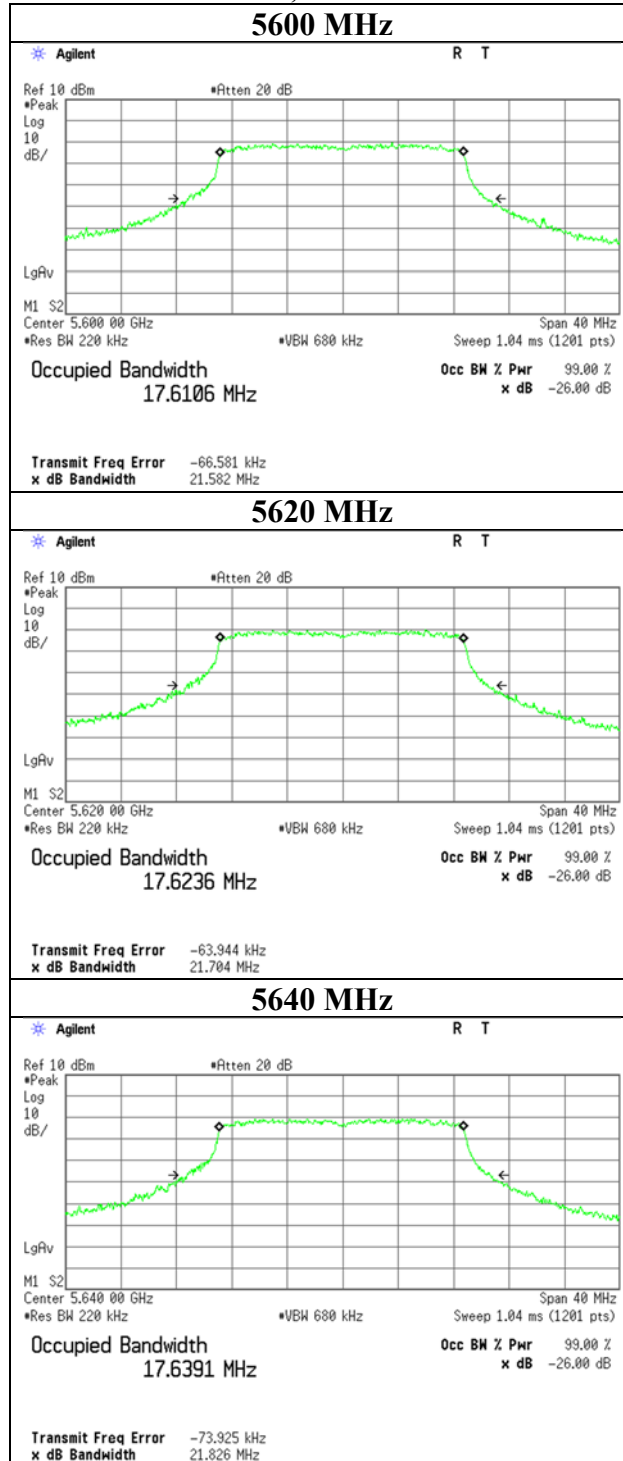
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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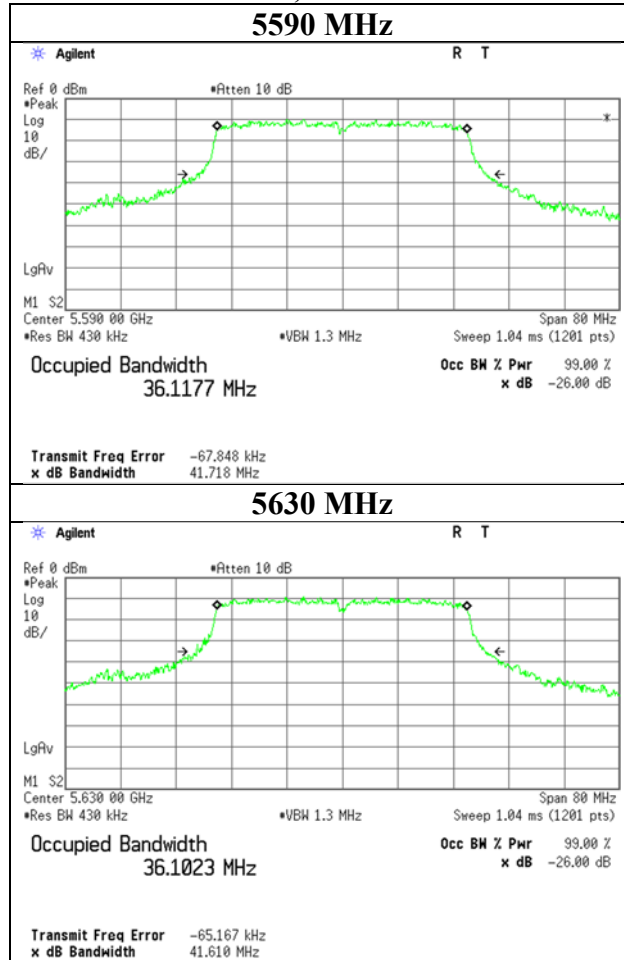
26 dB Emission Bandwidth

11n-20, Antenna 2



26 dB Emission Bandwidth

11n-40, Antenna 2



UL Japan, Inc.

Ise EMC Lab.

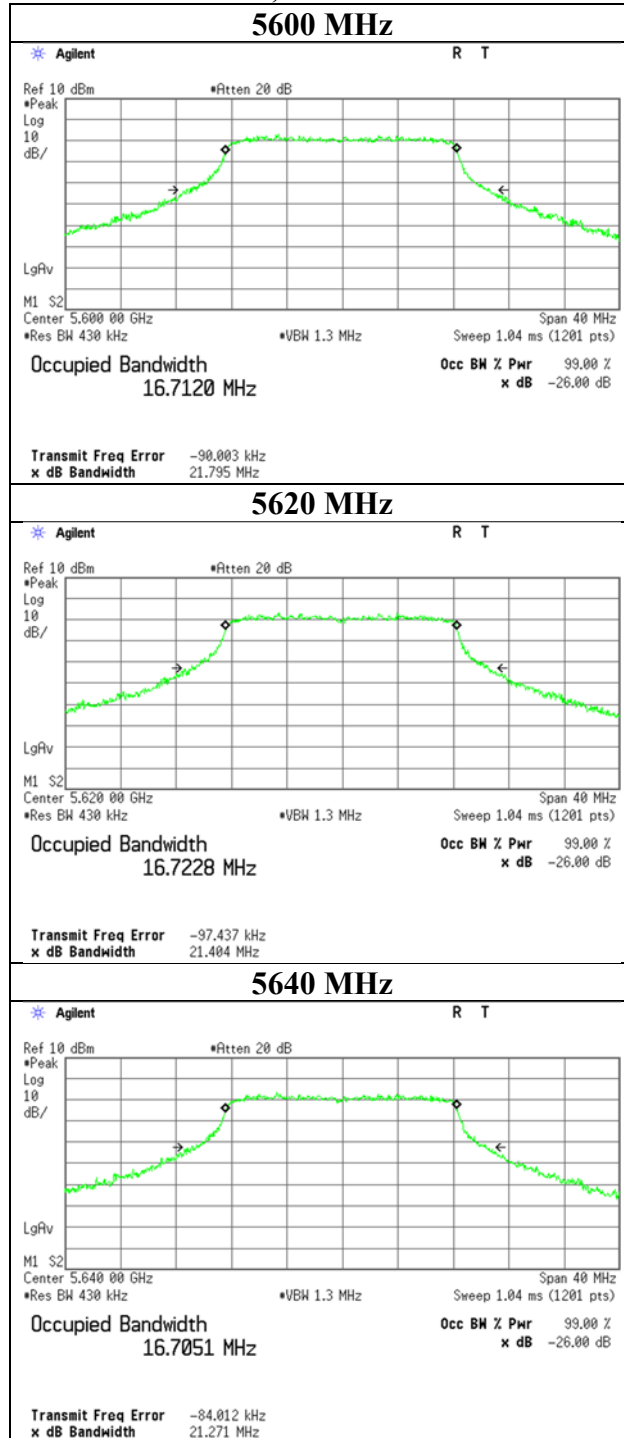
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99 % Occupied Bandwidth

11a, Antenna 2



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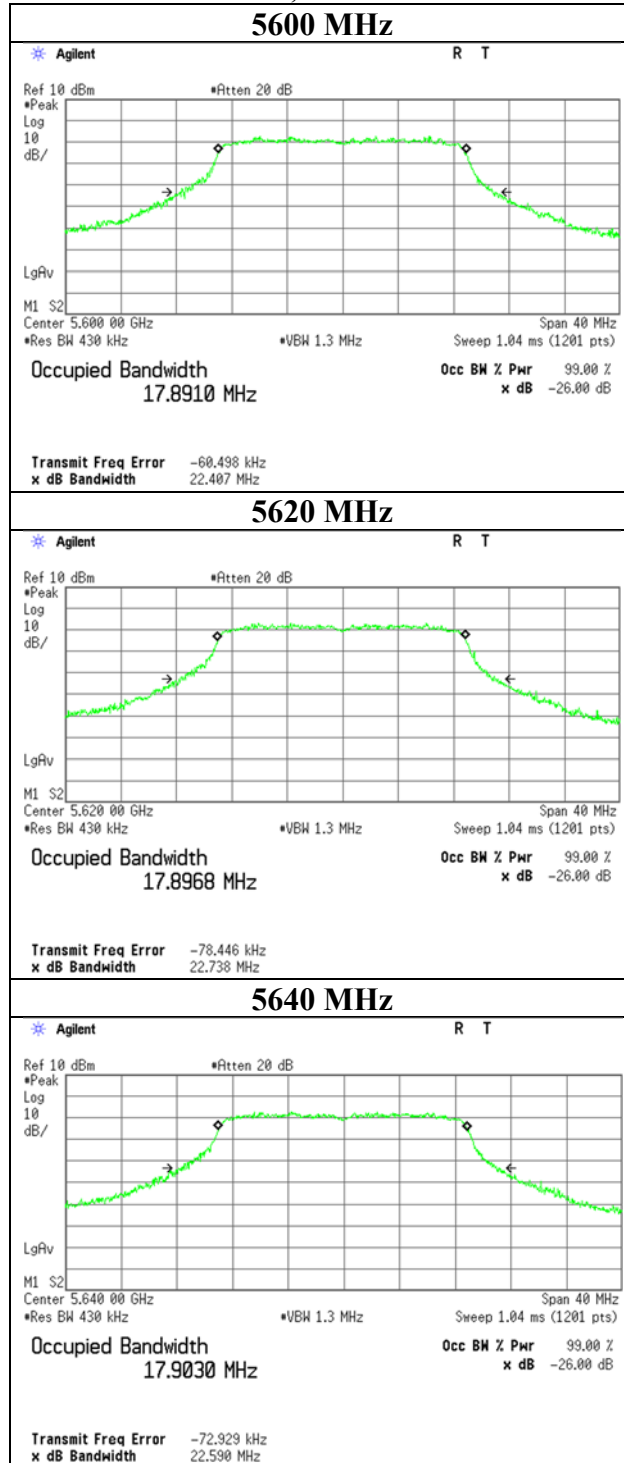
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Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99 % Occupied Bandwidth

11n-20, Antenna 2



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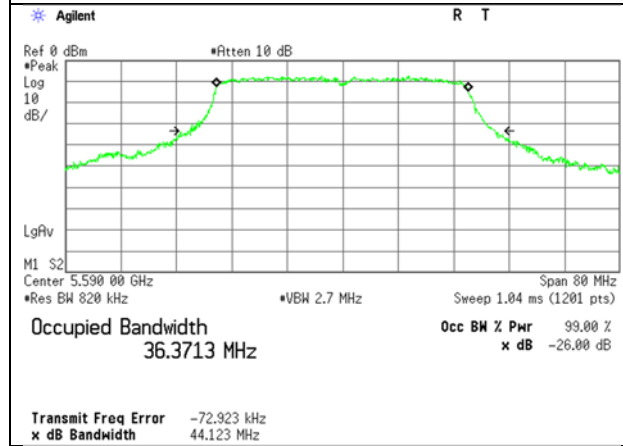
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

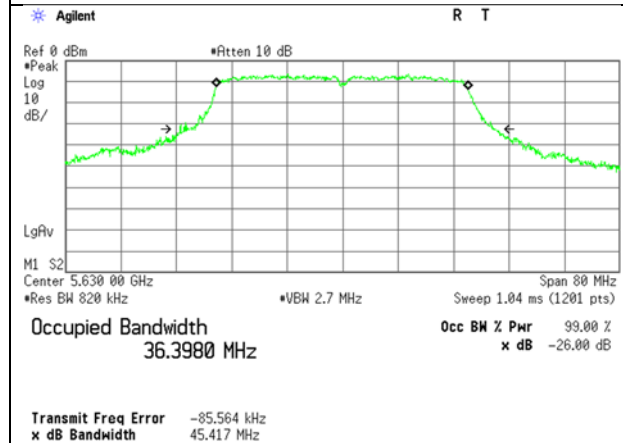
99 % Occupied Bandwidth

11n-40, Antenna 2

5590 MHz



5630 MHz



Maximum Conducted Output Power

Report No. 12548845H
Test place Ise EMC Lab. No.7 Shielded Room
Date November 7, 2018
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Yuta Moriya
Mode Tx

11a , Antenna 2

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power				e.i.r.p.			
								Result [dBm]	[mW]	Limit [dBm]	Margin [dB]	Result [dBm]	[mW]	Limit [dBm]	Margin [dB]
5600	-0.75	1.58	10.10	0.22	4.8	20.190	16.712	11.15	13.03	23.97	12.82	15.95	39.36	29.97	14.02
5620	-0.51	1.59	10.10	0.22	4.8	20.341	16.723	11.40	13.80	23.97	12.57	16.20	41.69	29.97	13.77
5640	-0.40	1.58	10.10	0.22	4.8	20.079	16.705	11.50	14.13	23.97	12.47	16.30	42.66	29.97	13.67

11n-20 , Antenna 2

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power				e.i.r.p.			
								Result [dBm]	[mW]	Limit [dBm]	Margin [dB]	Result [dBm]	[mW]	Limit [dBm]	Margin [dB]
5600	-0.57	1.58	10.10	0.25	4.8	21.582	17.891	11.36	13.68	23.97	12.61	16.16	41.30	29.97	13.81
5620	-0.17	1.59	10.10	0.25	4.8	21.704	17.897	11.77	15.03	23.97	12.20	16.57	45.39	29.97	13.40
5640	-0.05	1.58	10.10	0.25	4.8	21.826	17.903	11.88	15.42	23.97	12.09	16.68	46.56	29.97	13.29

11n-40 , Antenna 2

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	26 dB EBW (B for FCC) [MHz]	99% OBW (B for IC) [MHz]	Conducted Power				e.i.r.p.			
								Result [dBm]	[mW]	Limit [dBm]	Margin [dB]	Result [dBm]	[mW]	Limit [dBm]	Margin [dB]
5590	-0.90	1.58	10.10	0.48	4.8	41.718	36.371	11.26	13.37	23.97	12.71	16.06	40.36	29.97	13.91
5630	-0.49	1.59	10.10	0.48	4.8	41.610	36.398	11.68	14.72	23.97	12.29	16.48	44.46	29.97	13.49

Sample Calculation:

Conducted Power Result = Reading + Cable Loss + Atten. Loss + Duty Factor
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Maximum Conducted Output Power

Report No. 12548845H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 6, 2018
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Takumi Shimada
Mode Tx 11a

5620 MHz

Mode	Antenna	Rate Mbps	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11a	1	6	-2.51	0.05	-2.46	
		9	-2.51	0.08	-2.43	
		12	-2.54	0.11	-2.43	
		18	-2.49	0.16	-2.33	
		24	-2.54	0.22	-2.32	
		36	-4.25	0.31	-3.94	
		48	-4.70	0.41	-4.29	
	54	-6.31	0.45	-5.86		
	2	24	0.01	0.22	0.23	*

* 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.

Maximum Conducted Output Power

Report No. 12548845H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 6, 2018
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Takumi Shimada
Mode Tx 11n-20

5620 MHz

Mode	Antenna	MCS Number	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-20	1	0	-0.21	0.06	-0.15	
		1	-0.35	0.13	-0.22	
		2	-0.45	0.19	-0.26	
		3(Long)	-0.14	0.25	0.11	
		3(Short)	-0.18	0.25	0.07	
		4	-1.55	0.35	-1.20	
		5	-1.67	0.45	-1.22	
		6	-4.66	0.49	-4.17	
	7	-8.00	0.53	-7.47		
	2	3(Long)	0.25	0.25	0.50	*

* 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.

Maximum Conducted Output Power

Report No. 12548845H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 6, 2018
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Takumi Shimada
Mode Tx 11n-40

5630 MHz

Mode	Antenna	MCS Number	Reading (timed average) [dBm]	Duty factor [dB]	Burst power [dBm]	Remarks
11n-40	1	0	-0.94	0.14	-0.80	
		1	-1.00	0.27	-0.73	
		2	-1.12	0.38	-0.74	
		3(Long)	-0.89	0.48	-0.41	
		3(Short)	-0.91	0.48	-0.43	
		4	-2.41	0.66	-1.75	
		5	-2.55	0.73	-1.82	
		6	-5.47	0.84	-4.63	
	7	-8.94	0.92	-8.02		
	2	3(Long)	-0.34	0.48	0.14	*

* 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.

Average Output Power
(Reference data for RF Exposure)

Report No. 12548845H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 6, 2018
Temperature / Humidity 25 deg. C / 44 % RH
Engineer Takumi Shimada
Mode Tx

Antenna 2 / Mode: 11a

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5600	-0.33	0.95	10.10	10.72	11.80	0.05	10.77	11.94
5620	0.00	0.95	10.10	11.05	12.74	0.05	11.10	12.88
5640	0.01	0.95	10.10	11.06	12.76	0.05	11.11	12.91

Antenna 2 / Mode: 11n-20

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5600	-0.30	0.95	10.10	10.75	11.89	0.06	10.81	12.05
5620	0.15	0.95	10.10	11.20	13.18	0.06	11.26	13.37
5640	0.15	0.95	10.10	11.20	13.18	0.06	11.26	13.37

Antenna 2

Tested Frequency [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Timed average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
5590	-0.53	0.95	10.10	10.52	11.27	0.14	10.66	11.64
5630	-0.22	0.95	10.10	10.83	12.11	0.14	10.97	12.50

Sample Calculation:

Result (Timed average) = Reading + Cable Loss + Atten. Loss

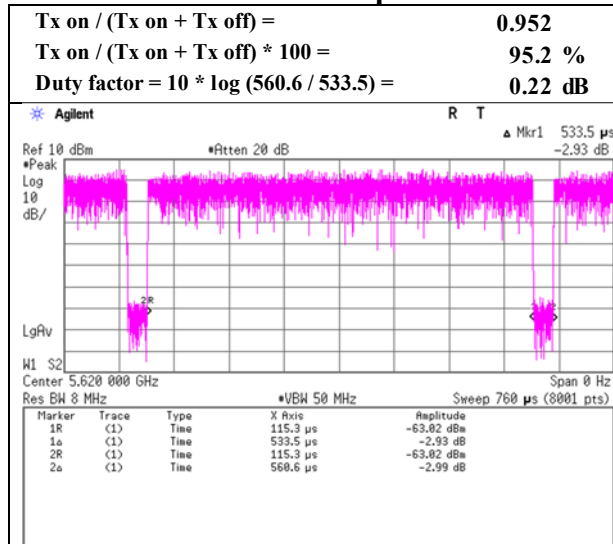
Result (Burst power average) = Time average + Duty factor

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

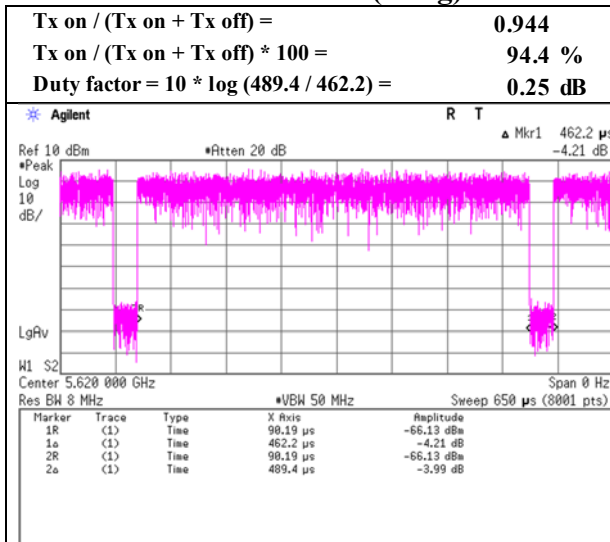
Burst rate confirmation

Report No. 12548845H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 6, 2018
Temperature / Humidity 23 deg. C / 55 % RH
Engineer Takumi Shimada
Mode Tx

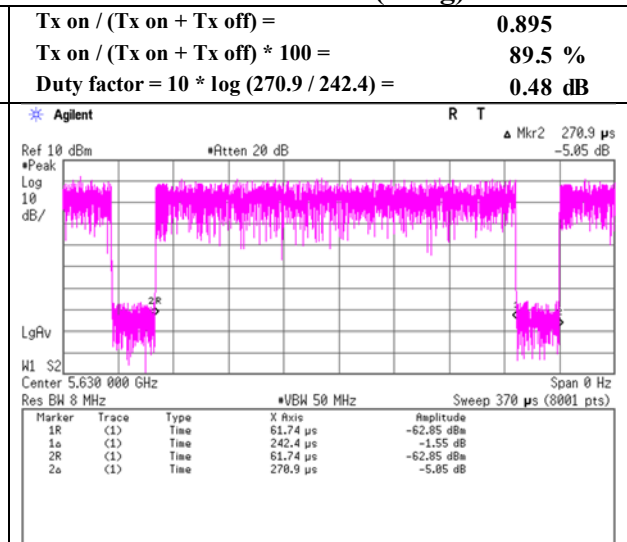
11a 24 Mbps



11n-20 MCS 3 (Long)



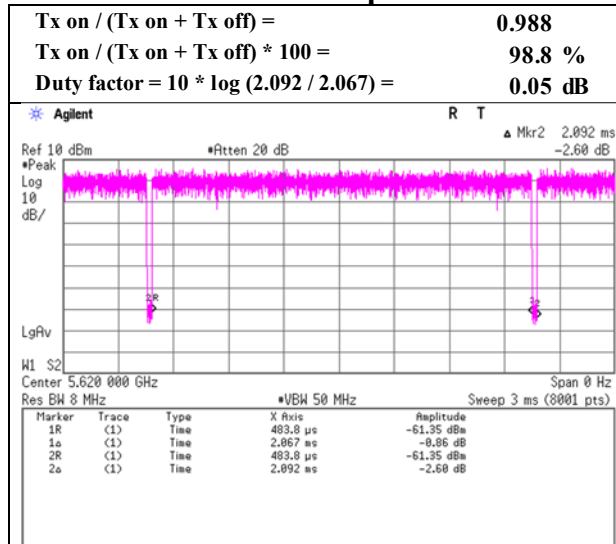
11n-40 MCS 3 (Long)



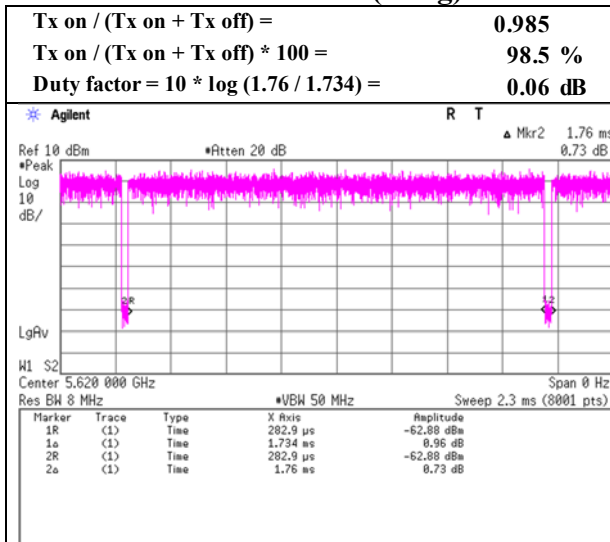
Burst rate confirmation

Report No. 12548845H
 Test place Ise EMC Lab. No.6 Measurement Room
 Date November 6, 2018
 Temperature / Humidity 23 deg. C / 55 % RH
 Engineer Takumi Shimada
 Mode Tx

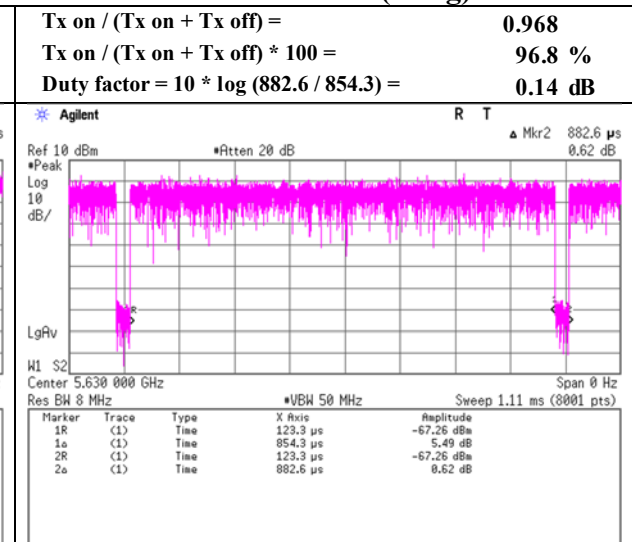
11a 6 Mbps



11n-20 MCS 0 (Long)



11n-40 MCS 0 (Long)



Maximum Power Spectral Density

Report No. 12548845H
Test place Ise EMC Lab. No.7 Shielded Room
Date November 7, 2018
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Yuta Moriya
Mode Tx

11a , Antenna 2

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm] /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm] /MHz]	Limit [dBm] /MHz]	Margin [dB]	Result [dBm] /MHz]	Limit [dBm] /MHz]	Margin [dB]
5600	-11.85	1.58	10.10	0.22	4.8	0.05	11.00	10.95	4.85	17.00	12.15
5620	-11.88	1.59	10.10	0.22	4.8	0.03	11.00	10.97	4.84	17.00	12.17
5640	-12.04	1.58	10.10	0.22	4.8	-0.14	11.00	11.14	4.66	17.00	12.34

11n-20 , Antenna 2

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm] /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm] /MHz]	Limit [dBm] /MHz]	Margin [dB]	Result [dBm] /MHz]	Limit [dBm] /MHz]	Margin [dB]
5600	-11.75	1.58	10.10	0.25	4.8	0.18	11.00	10.82	4.98	17.00	12.02
5620	-12.04	1.59	10.10	0.25	4.8	-0.10	11.00	11.10	4.70	17.00	12.30
5640	-10.83	1.58	10.10	0.25	4.8	1.10	11.00	9.90	5.90	17.00	11.10

11n-40 , Antenna 2

Applied limit: 15.407, mobile and portable client device

Tested Frequency [MHz]	PSD Reading [dBm] /MHz]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Antenna Gain [dBi]	PSD (Conducted)			PSD (e.i.r.p.)		
						Result [dBm] /MHz]	Limit [dBm] /MHz]	Margin [dB]	Result [dBm] /MHz]	Limit [dBm] /MHz]	Margin [dB]
5590	-15.07	1.58	10.10	0.48	4.8	-2.91	11.00	13.91	1.89	17.00	15.11
5630	-14.70	1.59	10.10	0.48	4.8	-2.53	11.00	13.53	2.27	17.00	14.73

Sample Calculation:

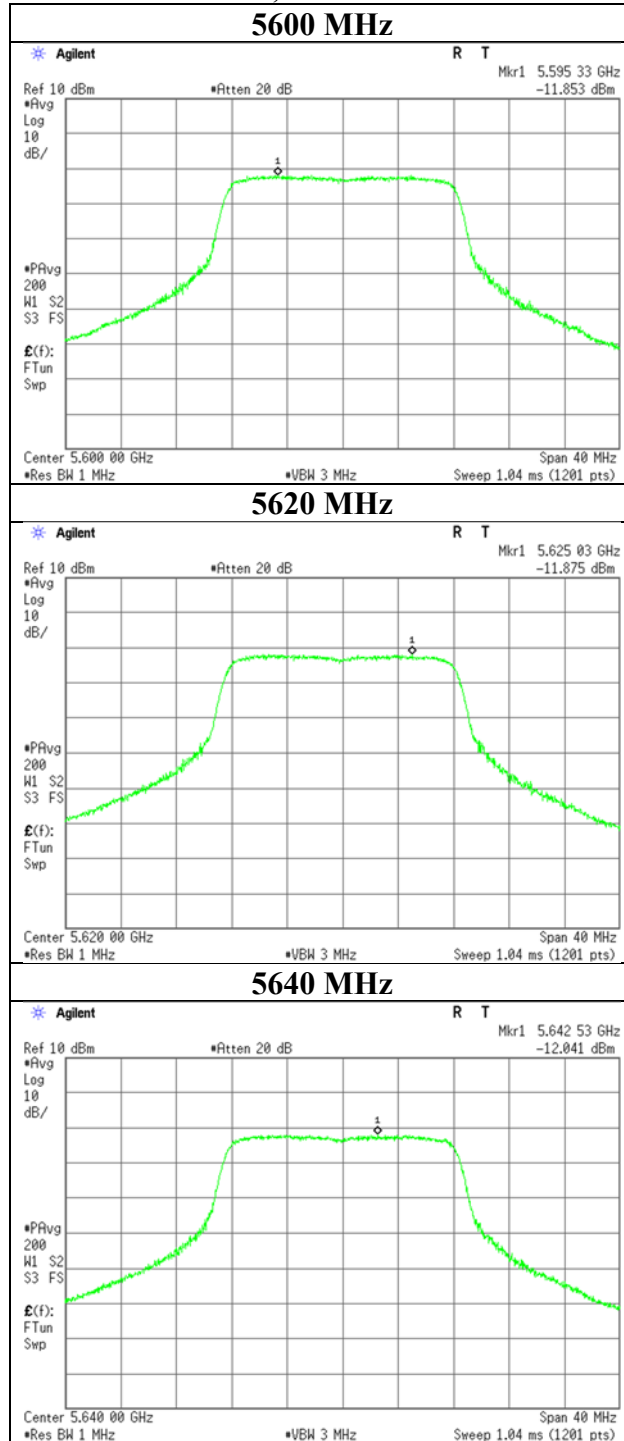
PSD: Power Spectral Density

PSD Result (Conducted) = Reading + Cable Loss + Atten. Loss + Duty Factor

PSD Result (e.i.r.p.) = Conducted PSD Result + Antenna Gain

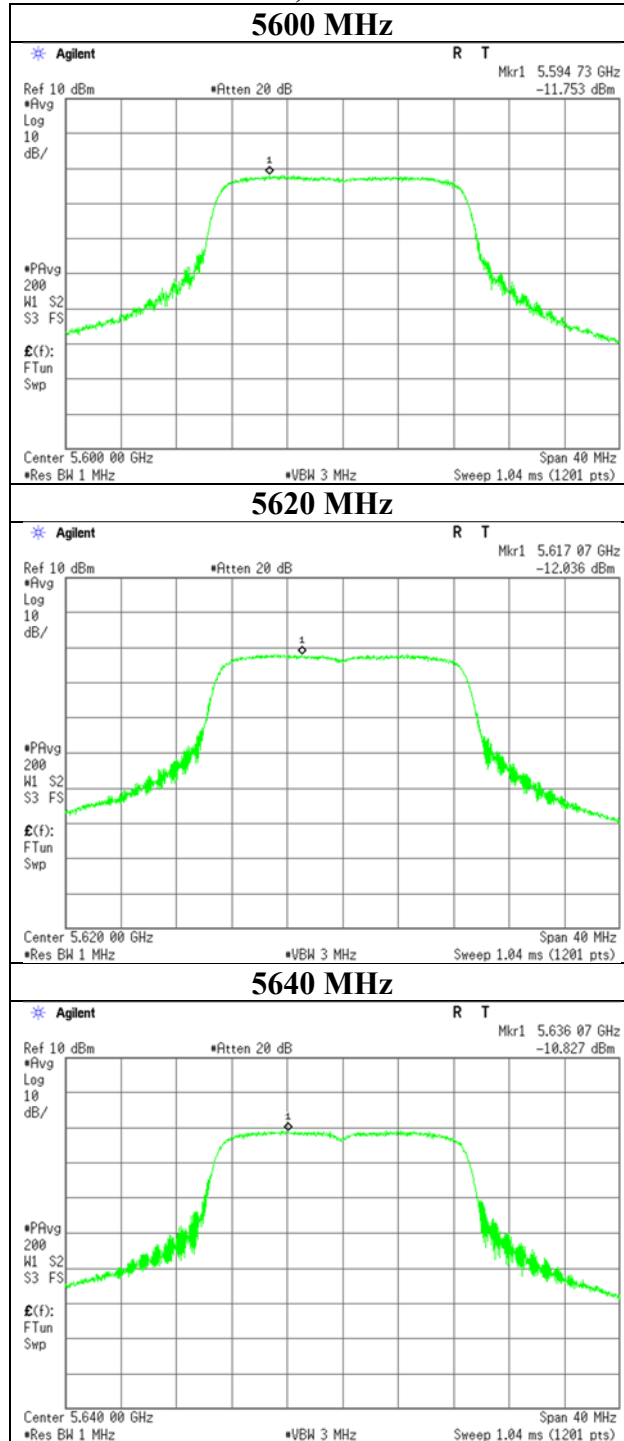
Maximum Power Spectral Density

11a , Antenna 2



Maximum Power Spectral Density

11n-20 , Antenna 2



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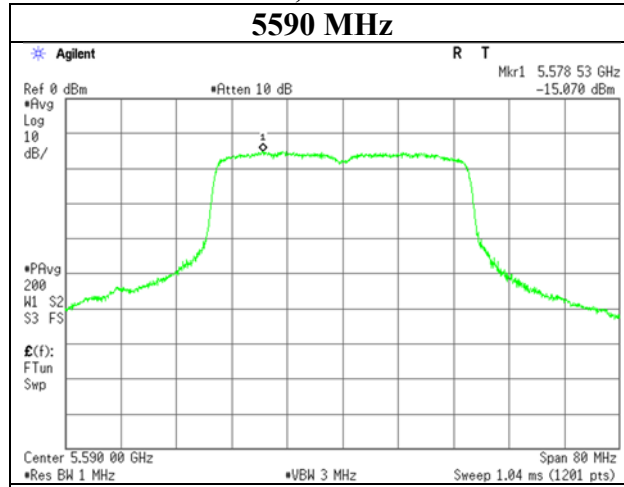
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

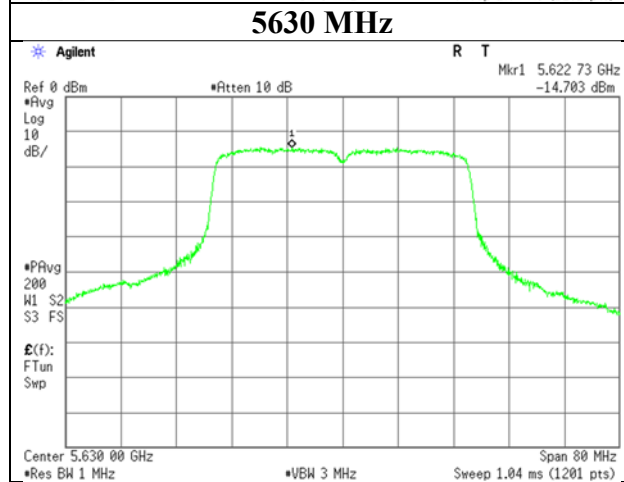
Maximum Power Spectral Density

11n-40 , Antenna 2

5590 MHz



5630 MHz



Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5600 MHz Antenna: Mini-Nanoblade antenna

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	5460.000	PK	41.8	31.7	6.6	31.8	-	48.3	73.9	25.6	
Hori	5470.000	PK	41.8	31.7	6.6	31.8	-	48.3	73.9	25.6	
Hori	11200.000	PK	46.3	39.7	-1.2	32.6	-	52.2	73.9	21.7	Floor noise
Hori	16800.000	PK	45.1	39.1	-0.4	32.0	-	51.8	73.9	22.1	Floor noise
Hori	22400.000	PK	47.3	38.6	-0.6	32.4	-	52.9	73.9	21.0	Floor noise
Hori	5460.000	AV	32.1	31.7	6.6	31.8	0.2	38.8	53.9	15.1	*1)
Hori	5470.000	AV	32.3	31.7	6.6	31.8	0.2	39.0	53.9	14.9	*1)
Hori	11200.000	AV	36.2	39.7	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Hori	16800.000	AV	36.4	39.1	-0.4	32.0	-	43.1	53.9	10.8	Floor noise
Hori	22400.000	AV	37.2	38.6	-0.6	32.4	-	42.8	53.9	11.1	Floor noise
Vert	5460.000	PK	41.7	31.7	6.6	31.8	-	48.2	73.9	25.7	
Vert	5470.000	PK	42.5	31.7	6.6	31.8	-	49.0	73.9	24.9	
Vert	11200.000	PK	47.8	39.7	-1.2	32.6	-	53.7	73.9	20.2	Floor noise
Vert	16800.000	PK	45.4	39.1	-0.4	32.0	-	52.1	73.9	21.8	Floor noise
Vert	22400.000	PK	47.0	38.6	-0.6	32.4	-	52.6	73.9	21.3	Floor noise
Vert	5460.000	AV	30.8	31.7	6.6	31.8	0.2	37.5	53.9	16.4	*1)
Vert	5470.000	AV	31.3	31.7	6.6	31.8	0.2	38.0	53.9	15.9	*1)
Vert	11200.000	AV	36.5	39.7	-1.2	32.6	-	42.4	53.9	11.5	Floor noise
Vert	16800.000	AV	35.7	39.1	-0.4	32.0	-	42.4	53.9	11.5	Floor noise
Vert	22400.000	AV	37.6	38.6	-0.6	32.4	-	43.2	53.9	10.7	Floor noise

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

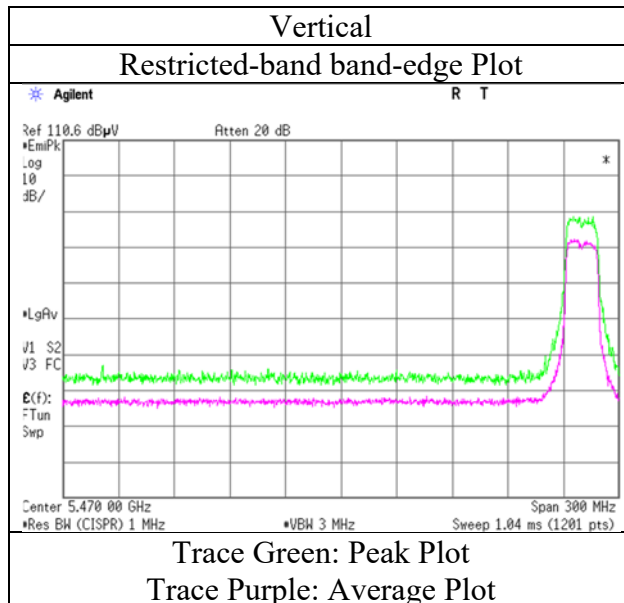
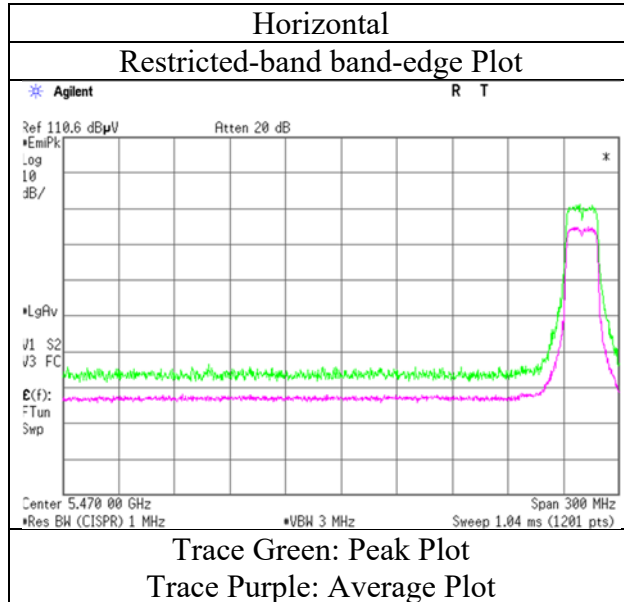
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11a 5600 MHz Antenna: Mini-Nanoblade antenna	



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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5620 MHz Antenna: Mini-Nanoblade antenna

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	11240.000	PK	46.7	39.7	-1.2	32.6	-	52.6	73.9	21.3	Floor noise
Hori	16860.000	PK	46.5	39.3	-0.3	32.0	-	53.5	73.9	20.4	Floor noise
Hori	22480.000	PK	47.5	38.7	-0.6	32.4	-	53.2	73.9	20.7	Floor noise
Hori	11240.000	AV	36.4	39.7	-1.2	32.6	-	42.3	53.9	11.6	Floor noise
Hori	16860.000	AV	36.2	39.3	-0.3	32.0	-	43.2	53.9	10.7	Floor noise
Hori	22480.000	AV	37.6	38.7	-0.6	32.4	-	43.3	53.9	10.6	Floor noise
Vert	11240.000	PK	47.0	39.7	-1.2	32.6	-	52.9	73.9	21.0	Floor noise
Vert	16860.000	PK	46.2	39.3	-0.3	32.0	-	53.2	73.9	20.7	Floor noise
Vert	22480.000	PK	47.1	38.7	-0.6	32.4	-	52.8	73.9	21.1	Floor noise
Vert	11240.000	AV	36.7	39.7	-1.2	32.6	-	42.6	53.9	11.3	Floor noise
Vert	16860.000	AV	36.5	39.3	-0.3	32.0	-	43.5	53.9	10.4	Floor noise
Vert	22480.000	AV	36.8	38.7	-0.6	32.4	-	42.5	53.9	11.4	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 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5640 MHz Antenna: Mini-Nanoblade antenna

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	5725.000	PK	42.1	32.1	6.6	31.8	-	49.0	73.9	24.9	
Hori	11280.000	PK	46.6	39.8	-1.2	32.6	-	52.6	73.9	21.3	Floor noise
Hori	16920.000	PK	46.2	39.5	-0.2	32.0	-	53.5	73.9	20.4	Floor noise
Hori	22560.000	PK	47.5	38.7	-0.6	32.5	-	53.1	73.9	20.8	Floor noise
Hori	5725.000	AV	32.0	32.1	6.6	31.8	0.2	39.1	53.9	14.8	*1)
Hori	11280.000	AV	37.3	39.8	-1.2	32.6	-	43.3	53.9	10.6	Floor noise
Hori	16920.000	AV	36.3	39.5	-0.2	32.0	-	43.6	53.9	10.3	Floor noise
Hori	22560.000	AV	37.4	38.7	-0.6	32.5	-	43.0	53.9	10.9	Floor noise
Vert	5725.000	PK	41.4	32.1	6.6	31.8	-	48.3	73.9	25.6	
Vert	11280.000	PK	46.7	39.8	-1.2	32.6	-	52.7	73.9	21.2	Floor noise
Vert	16920.000	PK	46.4	39.5	-0.2	32.0	-	53.7	73.9	20.2	Floor noise
Vert	22560.000	PK	47.3	38.7	-0.6	32.5	-	52.9	73.9	21.0	Floor noise
Vert	5725.000	AV	30.9	32.1	6.6	31.8	0.2	38.0	53.9	15.9	*1)
Vert	11280.000	AV	37.4	39.8	-1.2	32.6	-	43.4	53.9	10.5	Floor noise
Vert	16920.000	AV	36.5	39.5	-0.2	32.0	-	43.8	53.9	10.1	Floor noise
Vert	22560.000	AV	36.9	38.7	-0.6	32.5	-	42.5	53.9	11.4	Floor noise

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

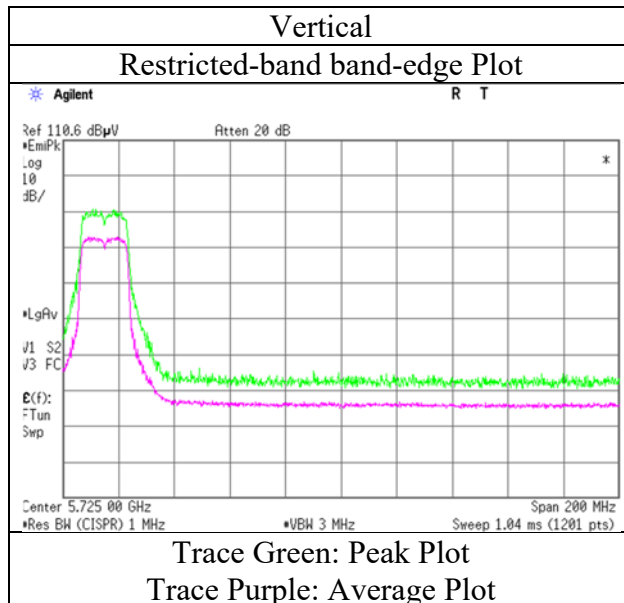
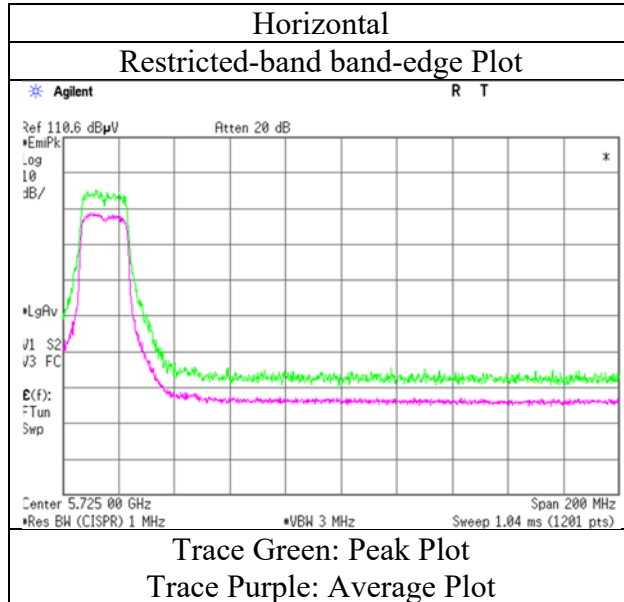
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 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

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11a 5640 MHz Antenna: Mini-Nanoblade antenna	



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

UL Japan, Inc.

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Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11n-20 5600 MHz Antenna: Mini-Nanoblade antenna

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	5460.000	PK	43.7	31.7	6.6	31.8	-	50.2	73.9	23.7	
Hori	5470.000	PK	41.6	31.7	6.6	31.8	-	48.1	73.9	25.8	
Hori	11200.000	PK	47.5	39.7	-1.2	32.6	-	53.4	73.9	20.5	Floor noise
Hori	16800.000	PK	46.5	39.1	-0.4	32.0	-	53.2	73.9	20.7	Floor noise
Hori	22400.000	PK	47.3	38.6	-0.6	32.4	-	52.9	73.9	21.0	Floor noise
Hori	5460.000	AV	34.2	31.7	6.6	31.8	0.3	41.0	53.9	13.0	*1)
Hori	5470.000	AV	33.9	31.7	6.6	31.8	0.3	40.7	53.9	13.3	*1)
Hori	11200.000	AV	37.4	39.7	-1.2	32.6	-	43.3	53.9	10.6	Floor noise
Hori	16800.000	AV	35.8	39.1	-0.4	32.0	-	42.5	53.9	11.4	Floor noise
Hori	22400.000	AV	36.7	38.6	-0.6	32.4	-	42.3	53.9	11.6	Floor noise
Vert	5460.000	PK	41.2	31.7	6.6	31.8	-	47.7	73.9	26.2	
Vert	5470.000	PK	40.7	31.7	6.6	31.8	-	47.2	73.9	26.7	
Vert	11200.000	PK	47.5	39.7	-1.2	32.6	-	53.4	73.9	20.5	Floor noise
Vert	16800.000	PK	46.6	39.1	-0.4	32.0	-	53.3	73.9	20.6	Floor noise
Vert	22400.000	PK	47.5	38.6	-0.6	32.4	-	53.1	73.9	20.8	Floor noise
Vert	5460.000	AV	32.9	31.7	6.6	31.8	0.3	39.7	53.9	14.3	*1)
Vert	5470.000	AV	32.7	31.7	6.6	31.8	0.3	39.5	53.9	14.5	*1)
Vert	11200.000	AV	37.6	39.7	-1.2	32.6	-	43.5	53.9	10.4	Floor noise
Vert	16800.000	AV	36.2	39.1	-0.4	32.0	-	42.9	53.9	11.0	Floor noise
Vert	22400.000	AV	37.0	38.6	-0.6	32.4	-	42.6	53.9	11.3	Floor noise

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

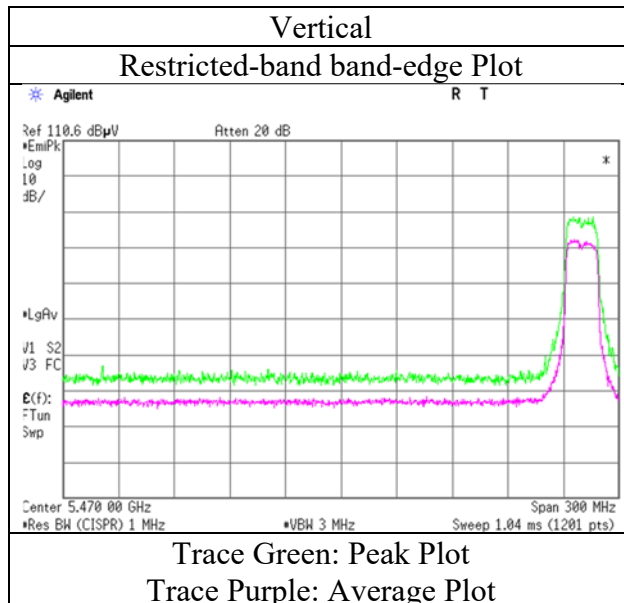
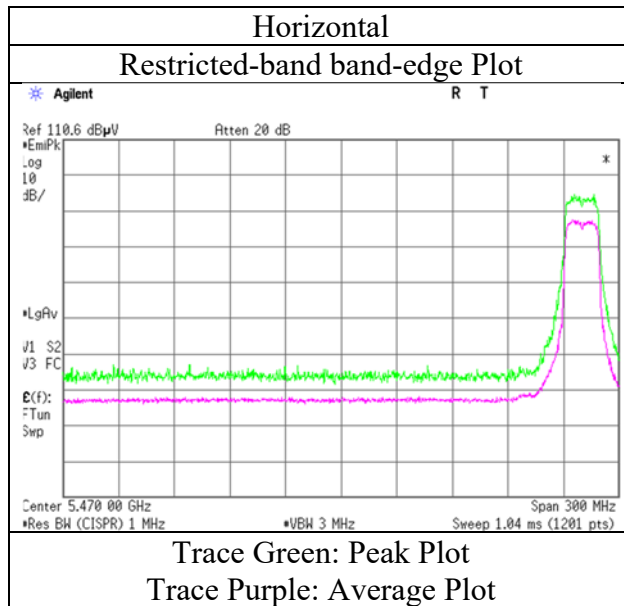
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 5600 MHz Antenna: Mini-Nanoblade antenna	



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

UL Japan, Inc.

Ise EMC Lab.

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Telephone : +81 596 24 8999

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Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11n-20 5620 MHz Antenna: Mini-Nanoblade antenna

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	11240.000	PK	46.6	39.7	-1.2	32.6	-	52.5	73.9	21.4	Floor noise
Hori	16860.000	PK	46.3	39.3	-0.3	32.0	-	53.3	73.9	20.6	Floor noise
Hori	22480.000	PK	47.0	38.7	-0.6	32.4	-	52.7	73.9	21.2	Floor noise
Hori	11240.000	AV	36.3	39.7	-1.2	32.6	-	42.2	53.9	11.7	Floor noise
Hori	16860.000	AV	36.0	39.3	-0.3	32.0	-	43.0	53.9	10.9	Floor noise
Hori	22480.000	AV	36.7	38.7	-0.6	32.4	-	42.4	53.9	11.5	Floor noise
Vert	11240.000	PK	46.7	39.7	-1.2	32.6	-	52.6	73.9	21.3	Floor noise
Vert	16860.000	PK	46.6	39.3	-0.3	32.0	-	53.6	73.9	20.3	Floor noise
Vert	22480.000	PK	47.5	38.7	-0.6	32.4	-	53.2	73.9	20.7	Floor noise
Vert	11240.000	AV	36.3	39.7	-1.2	32.6	-	42.2	53.9	11.7	Floor noise
Vert	16860.000	AV	36.2	39.3	-0.3	32.0	-	43.2	53.9	10.7	Floor noise
Vert	22480.000	AV	37.6	38.7	-0.6	32.4	-	43.3	53.9	10.6	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 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
(Below 1 GHz)
Mode Tx 11n-20 5640 MHz Antenna: Mini-Nanoblade antenna

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	71.986	QP	46.2	6.3	7.8	32.2	-	28.1	40.0	11.9	
Hori	76.554	QP	52.7	6.7	7.9	32.2	-	35.1	40.0	4.9	
Hori	95.998	QP	49.0	9.4	8.1	32.2	-	34.3	43.5	9.2	
Hori	288.000	QP	49.7	13.4	10.0	32.1	-	41.0	46.0	5.0	
Hori	312.000	QP	51.9	13.9	10.2	32.1	-	43.9	46.0	2.1	
Hori	822.884	QP	32.5	21.1	13.2	31.4	-	35.4	46.0	10.6	
Hori	5725.000	PK	41.8	32.1	6.6	31.8	-	48.7	73.9	25.2	
Hori	11280.000	PK	46.8	39.8	-1.2	32.6	-	52.8	73.9	21.1	Floor noise
Hori	16920.000	PK	46.3	39.5	-0.2	32.0	-	53.6	73.9	20.3	Floor noise
Hori	22560.000	PK	47.6	38.7	-0.6	32.5	-	53.2	73.9	20.7	Floor noise
Hori	5725.000	AV	31.7	32.1	6.6	31.8	0.3	38.9	53.9	15.1	*1)
Hori	11280.000	AV	36.9	39.8	-1.2	32.6	-	42.9	53.9	11.0	Floor noise
Hori	16920.000	AV	35.8	39.5	-0.2	32.0	-	43.1	53.9	10.8	Floor noise
Hori	22560.000	AV	37.6	38.7	-0.6	32.5	-	43.2	53.9	10.7	Floor noise
Vert	71.986	QP	49.8	6.3	7.8	32.2	-	31.7	40.0	8.3	
Vert	75.214	QP	54.9	6.5	7.9	32.2	-	37.1	40.0	2.9	
Vert	95.998	QP	44.8	9.4	8.1	32.2	-	30.1	43.5	13.4	
Vert	288.000	QP	43.6	13.4	10.0	32.1	-	34.9	46.0	11.1	
Vert	312.000	QP	45.2	13.9	10.2	32.1	-	37.2	46.0	8.8	
Vert	822.884	QP	29.6	21.1	13.2	31.4	-	32.5	46.0	13.5	
Vert	5725.000	PK	41.4	32.1	6.6	31.8	-	48.3	73.9	25.6	
Vert	11280.000	PK	46.6	39.8	-1.2	32.6	-	52.6	73.9	21.3	Floor noise
Vert	16920.000	PK	46.1	39.5	-0.2	32.0	-	53.4	73.9	20.5	Floor noise
Vert	22560.000	PK	47.3	38.7	-0.6	32.5	-	52.9	73.9	21.0	Floor noise
Vert	5725.000	AV	30.9	32.1	6.6	31.8	0.3	38.1	53.9	15.9	*1)
Vert	11280.000	AV	36.8	39.8	-1.2	32.6	-	42.8	53.9	11.1	Floor noise
Vert	16920.000	AV	35.7	39.5	-0.2	32.0	-	43.0	53.9	10.9	Floor noise
Vert	22560.000	AV	37.1	38.7	-0.6	32.5	-	42.7	53.9	11.2	Floor noise

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

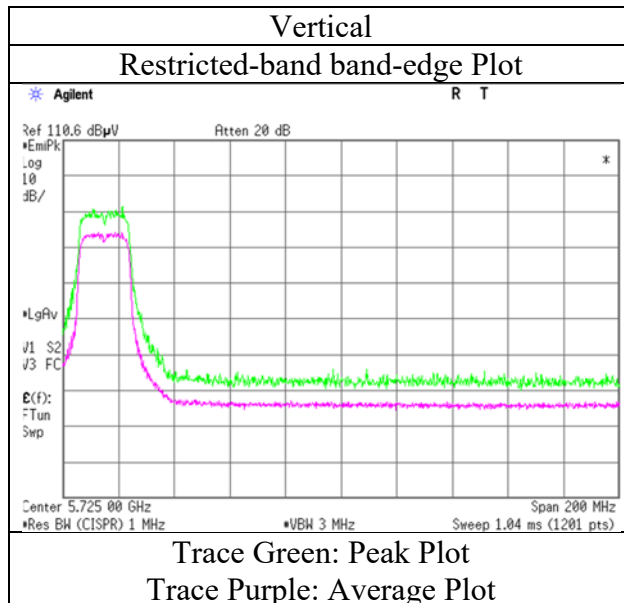
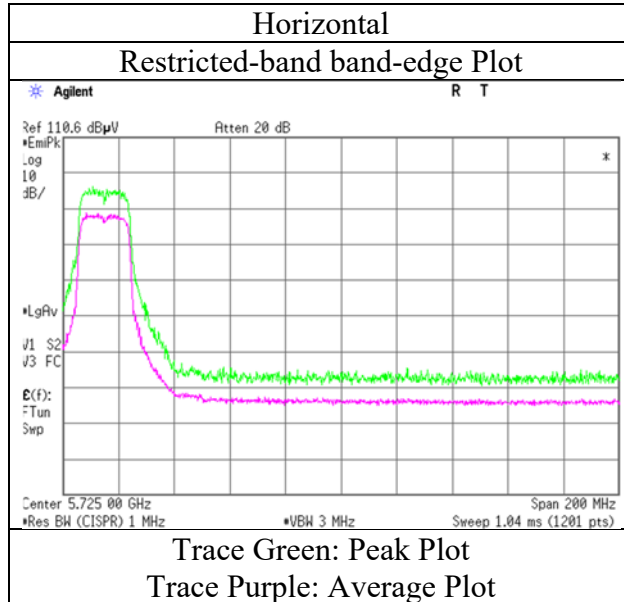
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 5640 MHz Antenna: Mini-Nanoblade antenna	



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

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Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(10 GHz – 26.5 GHz) (26.5 GHz – 40 GHz)
Mode Tx 11n-40 5590 MHz Antenna: Mini-Nanoblade antenna

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	5460.000	PK	43.7	31.7	6.6	31.8	-	50.2	73.9	23.7	
Hori	5470.000	PK	43.8	31.7	6.6	31.8	-	50.3	73.9	23.6	
Hori	11180.000	PK	46.5	39.7	-1.2	32.6	-	52.4	73.9	21.5	Floor noise
Hori	16770.000	PK	45.5	39.0	-0.4	32.0	-	52.1	73.9	21.8	Floor noise
Hori	22360.000	PK	47.4	38.6	-0.6	32.4	-	53.0	73.9	20.9	Floor noise
Hori	5460.000	AV	33.9	31.7	6.6	31.8	0.5	40.9	53.9	13.0	*1)
Hori	5470.000	AV	34.4	31.7	6.6	31.8	0.5	41.4	53.9	12.5	*1)
Hori	11180.000	AV	36.2	39.7	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Hori	16770.000	AV	35.3	39.0	-0.4	32.0	-	41.9	53.9	12.0	Floor noise
Hori	22360.000	AV	37.5	38.6	-0.6	32.4	-	43.1	53.9	10.8	Floor noise
Vert	5460.000	PK	41.2	31.7	6.6	31.8	-	47.7	73.9	26.2	
Vert	5470.000	PK	42.0	31.7	6.6	31.8	-	48.5	73.9	25.4	
Vert	11180.000	PK	46.6	39.7	-1.2	32.6	-	52.5	73.9	21.4	Floor noise
Vert	16770.000	PK	45.8	39.0	-0.4	32.0	-	52.4	73.9	21.5	Floor noise
Vert	22360.000	PK	47.1	38.6	-0.6	32.4	-	52.7	73.9	21.2	Floor noise
Vert	5460.000	AV	31.1	31.7	6.6	31.8	0.5	38.1	53.9	15.8	*1)
Vert	5470.000	AV	30.9	31.7	6.6	31.8	0.5	37.9	53.9	16.0	*1)
Vert	11180.000	AV	36.6	39.7	-1.2	32.6	-	42.5	53.9	11.4	Floor noise
Vert	16770.000	AV	35.7	39.0	-0.4	32.0	-	42.3	53.9	11.6	Floor noise
Vert	22360.000	AV	36.9	38.6	-0.6	32.4	-	42.5	53.9	11.4	Floor noise

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

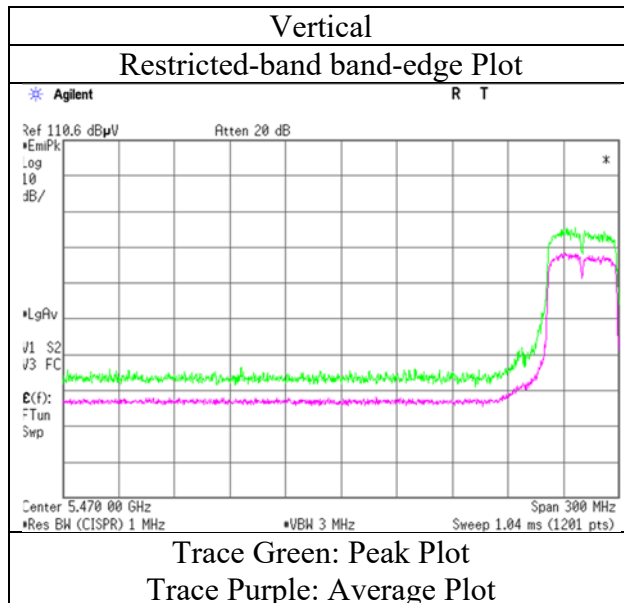
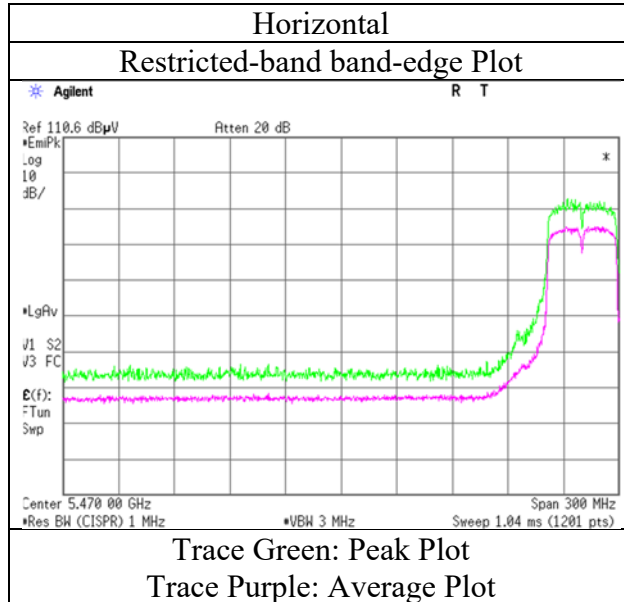
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
		(10 GHz – 26.5 GHz)
Mode	Tx 11n-40 5590 MHz Antenna: Mini-Nanoblade antenna	



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

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Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11n-40 5630 MHz Antenna: Mini-Nanoblade antenna

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	5725.000	PK	40.3	32.1	6.6	31.8	-	47.2	73.9	26.7	
Hori	11260.000	PK	47.0	39.8	-1.2	32.6	-	53.0	73.9	20.9	Floor noise
Hori	16890.000	PK	46.2	39.4	-0.3	32.0	-	53.3	73.9	20.6	Floor noise
Hori	22520.000	PK	47.6	38.7	-0.6	32.5	-	53.2	73.9	20.7	Floor noise
Hori	5725.000	AV	30.5	32.1	6.6	31.8	0.5	37.9	53.9	16.0	*1)
Hori	11260.000	AV	36.5	39.8	-1.2	32.6	-	42.5	53.9	11.4	Floor noise
Hori	16890.000	AV	35.7	39.4	-0.3	32.0	-	42.8	53.9	11.1	Floor noise
Hori	22520.000	AV	37.2	38.7	-0.6	32.5	-	42.8	53.9	11.1	Floor noise
Vert	5725.000	PK	40.1	32.1	6.6	31.8	-	47.0	73.9	26.9	
Vert	11260.000	PK	46.9	39.8	-1.2	32.6	-	52.9	73.9	21.0	Floor noise
Vert	16890.000	PK	46.3	39.4	-0.3	32.0	-	53.4	73.9	20.5	Floor noise
Vert	22520.000	PK	47.4	38.7	-0.6	32.5	-	53.0	73.9	20.9	Floor noise
Vert	5725.000	AV	30.6	32.1	6.6	31.8	0.5	38.0	53.9	15.9	*1)
Vert	11260.000	AV	36.1	39.8	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Vert	16890.000	AV	35.9	39.4	-0.3	32.0	-	43.0	53.9	10.9	Floor noise
Vert	22520.000	AV	36.8	38.7	-0.6	32.5	-	42.4	53.9	11.5	Floor noise

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

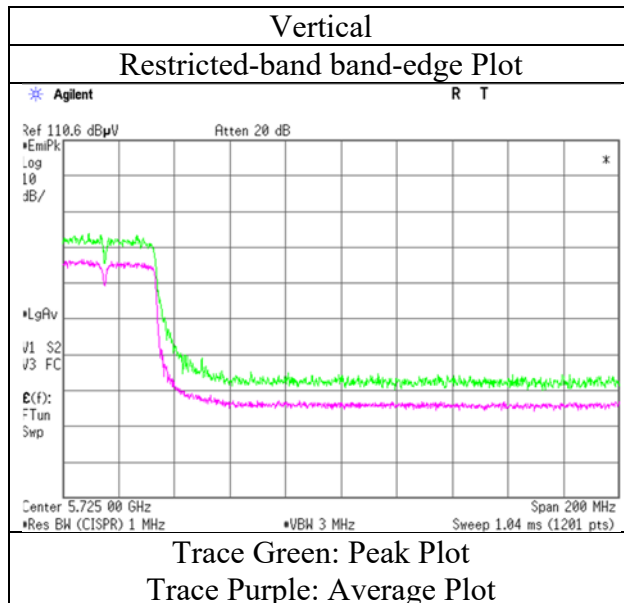
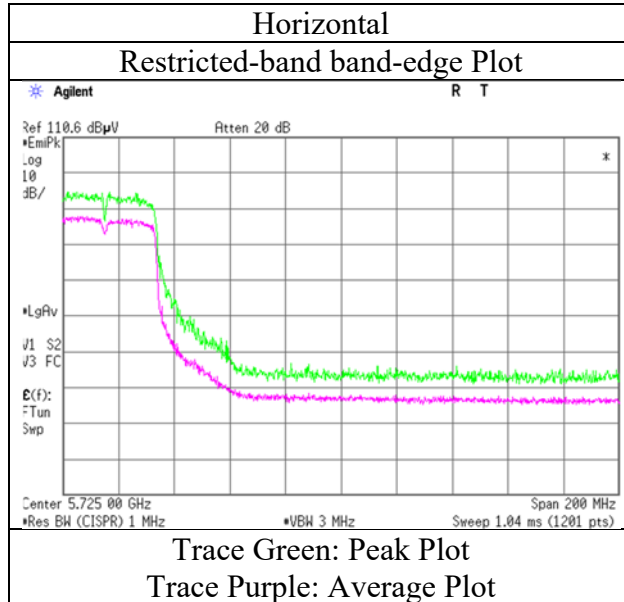
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 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

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-40 5630 MHz Antenna: Mini-Nanoblade antenna	



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

UL Japan, Inc.

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Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5600 MHz Antenna: Stand Alone antenna

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	5460.000	PK	45.4	31.7	6.6	31.8	-	51.9	73.9	22.0	
Hori	5470.000	PK	42.0	31.7	6.6	31.8	-	48.5	73.9	25.4	
Hori	11200.000	PK	46.6	39.7	-1.2	32.6	-	52.5	73.9	21.4	Floor noise
Hori	16800.000	PK	46.1	39.1	-0.4	32.0	-	52.8	73.9	21.1	Floor noise
Hori	22400.000	PK	47.6	38.6	-0.6	32.4	-	53.2	73.9	20.7	Floor noise
Hori	5460.000	AV	33.1	31.7	6.6	31.8	0.2	39.8	53.9	14.1	*1)
Hori	5470.000	AV	32.3	31.7	6.6	31.8	0.2	39.0	53.9	14.9	*1)
Hori	11200.000	AV	36.2	39.7	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Hori	16800.000	AV	36.0	39.1	-0.4	32.0	-	42.7	53.9	11.2	Floor noise
Hori	22400.000	AV	37.7	38.6	-0.6	32.4	-	43.3	53.9	10.6	Floor noise
Vert	5460.000	PK	41.4	31.7	6.6	31.8	-	47.9	73.9	26.0	
Vert	5470.000	PK	41.8	31.7	6.6	31.8	-	48.3	73.9	25.6	
Vert	11200.000	PK	46.8	39.7	-1.2	32.6	-	52.7	73.9	21.2	Floor noise
Vert	16800.000	PK	46.3	39.1	-0.4	32.0	-	53.0	73.9	20.9	Floor noise
Vert	22400.000	PK	47.3	38.6	-0.6	32.4	-	52.9	73.9	21.0	Floor noise
Vert	5460.000	AV	32.4	31.7	6.6	31.8	0.2	39.1	53.9	14.8	*1)
Vert	5470.000	AV	32.8	31.7	6.6	31.8	0.2	39.5	53.9	14.4	*1)
Vert	11200.000	AV	36.2	39.7	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Vert	16800.000	AV	36.3	39.1	-0.4	32.0	-	43.0	53.9	10.9	Floor noise
Vert	22400.000	AV	37.6	38.6	-0.6	32.4	-	43.2	53.9	10.7	Floor noise

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

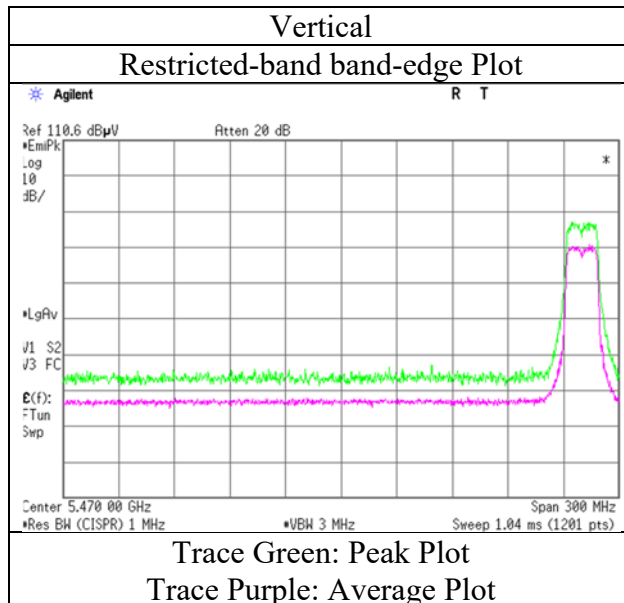
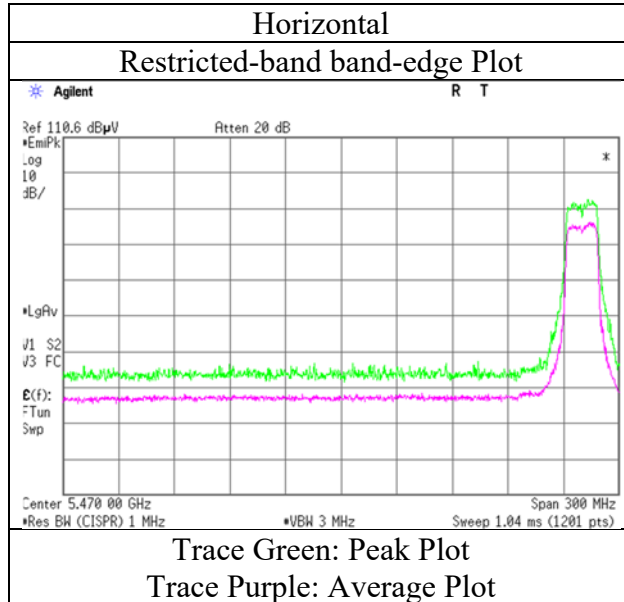
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11a 5600 MHz Antenna: Stand Alone antenna	



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

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5620 MHz Antenna: Stand Alone antenna

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	11240.000	PK	46.5	39.7	-1.2	32.6	-	52.4	73.9	21.5	Floor noise
Hori	16860.000	PK	46.2	39.3	-0.3	32.0	-	53.2	73.9	20.7	Floor noise
Hori	22480.000	PK	47.5	38.7	-0.6	32.4	-	53.2	73.9	20.7	Floor noise
Hori	11240.000	AV	36.2	39.7	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Hori	16860.000	AV	36.3	39.3	-0.3	32.0	-	43.3	53.9	10.6	Floor noise
Hori	22480.000	AV	38.7	38.7	-0.6	32.4	-	44.4	53.9	9.5	Floor noise
Vert	11240.000	PK	46.7	39.7	-1.2	32.6	-	52.6	73.9	21.3	Floor noise
Vert	16860.000	PK	46.4	39.3	-0.3	32.0	-	53.4	73.9	20.5	Floor noise
Vert	22480.000	PK	47.8	38.7	-0.6	32.4	-	53.5	73.9	20.4	Floor noise
Vert	11240.000	AV	36.3	39.7	-1.2	32.6	-	42.2	53.9	11.7	Floor noise
Vert	16860.000	AV	36.2	39.3	-0.3	32.0	-	43.2	53.9	10.7	Floor noise
Vert	22480.000	AV	39.1	38.7	-0.6	32.4	-	44.8	53.9	9.1	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 $20\log(4\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11a 5640 MHz Antenna: Stand Alone antenna

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	5725.000	PK	42.1	32.1	6.6	31.8	-	49.0	73.9	24.9	
Hori	11280.000	PK	46.4	39.8	-1.2	32.6	-	52.4	73.9	21.5	Floor noise
Hori	16920.000	PK	46.5	39.5	-0.2	32.0	-	53.8	73.9	20.1	Floor noise
Hori	22560.000	PK	47.7	38.7	-0.6	32.5	-	53.3	73.9	20.6	Floor noise
Hori	5725.000	AV	33.4	32.1	6.6	31.8	0.2	40.5	53.9	13.4	*1)
Hori	11280.000	AV	36.0	39.8	-1.2	32.6	-	42.0	53.9	11.9	Floor noise
Hori	16920.000	AV	36.2	39.5	-0.2	32.0	-	43.5	53.9	10.4	Floor noise
Hori	22560.000	AV	37.5	38.7	-0.6	32.5	-	43.1	53.9	10.8	Floor noise
Vert	5725.000	PK	41.7	32.1	6.6	31.8	-	48.6	73.9	25.3	
Vert	11280.000	PK	46.6	39.8	-1.2	32.6	-	52.6	73.9	21.3	Floor noise
Vert	16920.000	PK	46.3	39.5	-0.2	32.0	-	53.6	73.9	20.3	Floor noise
Vert	22560.000	PK	47.7	38.7	-0.6	32.5	-	53.3	73.9	20.6	Floor noise
Vert	5725.000	AV	32.6	32.1	6.6	31.8	0.2	39.7	53.9	14.2	*1)
Vert	11280.000	AV	36.1	39.8	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Vert	16920.000	AV	35.9	39.5	-0.2	32.0	-	43.2	53.9	10.7	Floor noise
Vert	22560.000	AV	37.4	38.7	-0.6	32.5	-	43.0	53.9	10.9	Floor noise

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

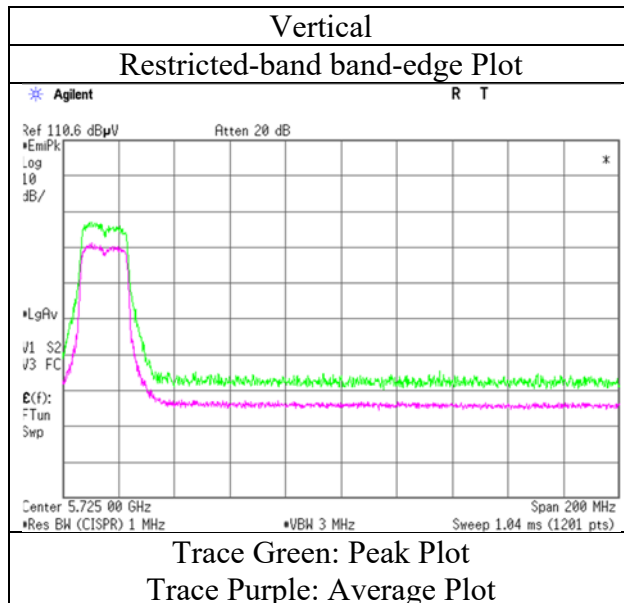
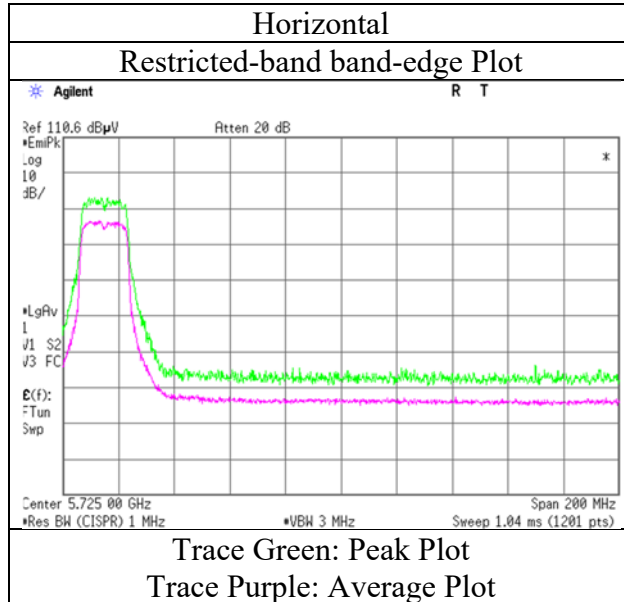
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 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

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11a 5640 MHz Antenna: Stand Alone antenna	



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

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Ise EMC Lab.

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Facsimile : +81 596 24 8124

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11n-20 5600 MHz Antenna: Stand Alone antenna

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	5460.000	PK	42.6	31.7	6.6	31.8	-	49.1	73.9	24.8	
Hori	5470.000	PK	41.1	31.7	6.6	31.8	-	47.6	73.9	26.3	
Hori	11200.000	PK	46.3	39.7	-1.2	32.6	-	52.2	73.9	21.7	Floor noise
Hori	16800.000	PK	46.2	39.1	-0.4	32.0	-	52.9	73.9	21.0	Floor noise
Hori	22400.000	PK	47.5	38.6	-0.6	32.4	-	53.1	73.9	20.8	Floor noise
Hori	5460.000	AV	31.3	31.7	6.6	31.8	0.3	38.1	53.9	15.9	*1)
Hori	5470.000	AV	30.9	31.7	6.6	31.8	0.3	37.7	53.9	16.3	*1)
Hori	11200.000	AV	36.3	39.7	-1.2	32.6	-	42.2	53.9	11.7	Floor noise
Hori	16800.000	AV	35.9	39.1	-0.4	32.0	-	42.6	53.9	11.3	Floor noise
Hori	22400.000	AV	37.2	38.6	-0.6	32.4	-	42.8	53.9	11.1	Floor noise
Vert	5460.000	PK	43.9	31.7	6.6	31.8	-	50.4	73.9	23.5	
Vert	5470.000	PK	42.9	31.7	6.6	31.8	-	49.4	73.9	24.5	
Vert	11200.000	PK	46.4	39.7	-1.2	32.6	-	52.3	73.9	21.6	Floor noise
Vert	16800.000	PK	45.7	39.1	-0.4	32.0	-	52.4	73.9	21.5	Floor noise
Vert	22400.000	PK	47.6	38.6	-0.6	32.4	-	53.2	73.9	20.7	Floor noise
Vert	5460.000	AV	32.7	31.7	6.6	31.8	0.3	39.5	53.9	14.5	*1)
Vert	5470.000	AV	32.1	31.7	6.6	31.8	0.3	38.9	53.9	15.1	*1)
Vert	11200.000	AV	36.1	39.7	-1.2	32.6	-	42.0	53.9	11.9	Floor noise
Vert	16800.000	AV	35.5	39.1	-0.4	32.0	-	42.2	53.9	11.7	Floor noise
Vert	22400.000	AV	37.6	38.6	-0.6	32.4	-	43.2	53.9	10.7	Floor noise

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

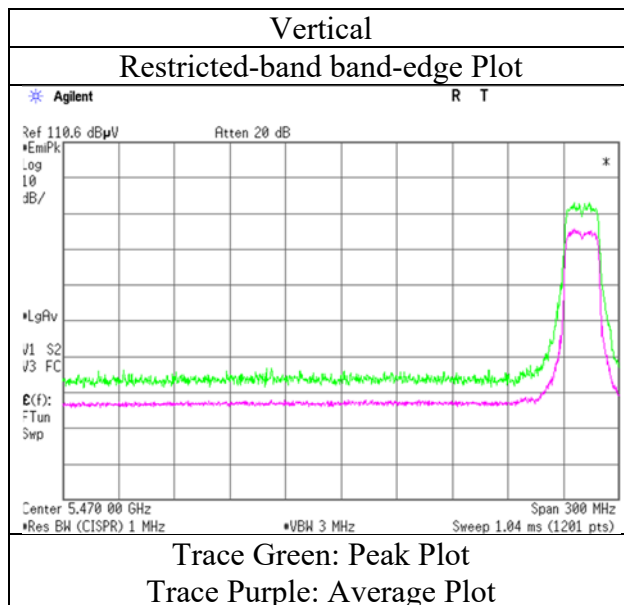
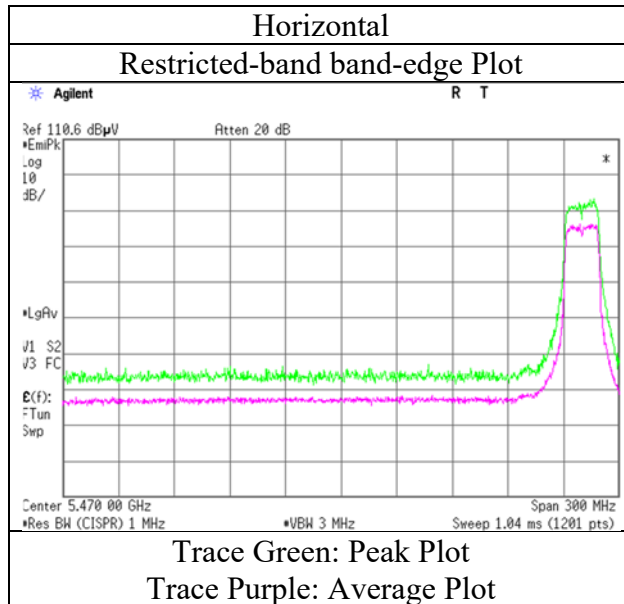
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.3
Date	November 8, 2018	November 9, 2018	November 14, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH	23 deg. C / 42 % RH
Engineer	Koji Yamamoto	Takumi Shimada	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)	(26.5 GHz - 40 GHz)
Mode	Tx 11n-20 5600 MHz Antenna: Stand Alone antenna		



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

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4
Date November 8, 2018 November 9, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH
Engineer Koji Yamamoto Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz)
Mode Tx 11n-20 5620 MHz Antenna: Stand Alone antenna

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	11240.000	PK	46.6	39.7	-1.2	32.6	-	52.5	73.9	21.4	Floor noise
Hori	16860.000	PK	46.3	39.3	-0.3	32.0	-	53.3	73.9	20.6	Floor noise
Hori	22480.000	PK	47.4	38.7	-0.6	32.4	-	53.1	73.9	20.8	Floor noise
Hori	11240.000	AV	36.4	39.7	-1.2	32.6	-	42.3	53.9	11.6	Floor noise
Hori	16860.000	AV	36.0	39.3	-0.3	32.0	-	43.0	53.9	10.9	Floor noise
Hori	22480.000	AV	37.4	38.7	-0.6	32.4	-	43.1	53.9	10.8	Floor noise
Vert	11240.000	PK	46.3	39.7	-1.2	32.6	-	52.2	73.9	21.7	Floor noise
Vert	16860.000	PK	46.2	39.3	-0.3	32.0	-	53.2	73.9	20.7	Floor noise
Vert	22480.000	PK	47.3	38.7	-0.6	32.4	-	53.0	73.9	20.9	Floor noise
Vert	11240.000	AV	35.9	39.7	-1.2	32.6	-	41.8	53.9	12.1	Floor noise
Vert	16860.000	AV	36.0	39.3	-0.3	32.0	-	43.0	53.9	10.9	Floor noise
Vert	22480.000	AV	36.9	38.7	-0.6	32.4	-	42.6	53.9	11.3	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 $20\log(4\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
(Below 1 GHz)
Mode Tx 11n-20 5640 MHz Antenna: Stand Alone antenna

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	71.933	QP	45.6	6.3	7.8	32.2	-	27.5	40.0	12.5	
Hori	76.467	QP	51.5	6.7	7.9	32.2	-	33.9	40.0	6.1	
Hori	95.998	QP	48.6	9.4	8.1	32.2	-	33.9	43.5	9.6	
Hori	288.000	QP	45.5	13.4	10.0	32.1	-	36.8	46.0	9.2	
Hori	312.000	QP	49.1	13.9	10.2	32.1	-	41.1	46.0	4.9	
Hori	822.884	QP	35.6	21.1	13.2	31.4	-	38.5	46.0	7.5	
Hori	5725.000	PK	41.8	32.1	6.6	31.8	-	48.7	73.9	25.2	
Hori	11280.000	PK	46.4	39.8	-1.2	32.6	-	52.4	73.9	21.5	Floor noise
Hori	16920.000	PK	46.2	39.5	-0.2	32.0	-	53.5	73.9	20.4	Floor noise
Hori	22560.000	PK	47.6	38.7	-0.6	32.5	-	53.2	73.9	20.7	Floor noise
Hori	5725.000	AV	31.6	32.1	6.6	31.8	0.3	38.8	53.9	15.2	*1)
Hori	11280.000	AV	36.1	39.8	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Hori	16920.000	AV	35.9	39.5	-0.2	32.0	-	43.2	53.9	10.7	Floor noise
Hori	22560.000	AV	37.7	38.7	-0.6	32.5	-	43.3	53.9	10.6	Floor noise
Vert	71.933	QP	48.6	6.3	7.8	32.2	-	30.5	40.0	9.5	
Vert	76.524	QP	53.3	6.7	7.9	32.2	-	35.7	40.0	4.3	
Vert	95.998	QP	44.9	9.4	8.1	32.2	-	30.2	43.5	13.3	
Vert	288.000	QP	43.7	13.4	10.0	32.1	-	35.0	46.0	11.0	
Vert	312.000	QP	45.3	13.9	10.2	32.1	-	37.3	46.0	8.7	
Vert	822.884	QP	30.6	21.1	13.2	31.4	-	33.5	46.0	12.5	
Vert	5725.000	PK	41.3	32.1	6.6	31.8	-	48.2	73.9	25.7	
Vert	11280.000	PK	46.5	39.8	-1.2	32.6	-	52.5	73.9	21.4	Floor noise
Vert	16920.000	PK	46.2	39.5	-0.2	32.0	-	53.5	73.9	20.4	Floor noise
Vert	22560.000	PK	47.3	38.7	-0.6	32.5	-	52.9	73.9	21.0	Floor noise
Vert	5725.000	AV	30.6	32.1	6.6	31.8	0.3	37.8	53.9	16.2	*1)
Vert	11280.000	AV	36.3	39.8	-1.2	32.6	-	42.3	53.9	11.6	Floor noise
Vert	16920.000	AV	35.8	39.5	-0.2	32.0	-	43.1	53.9	10.8	Floor noise
Vert	22560.000	AV	37.3	38.7	-0.6	32.5	-	42.9	53.9	11.0	Floor noise

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

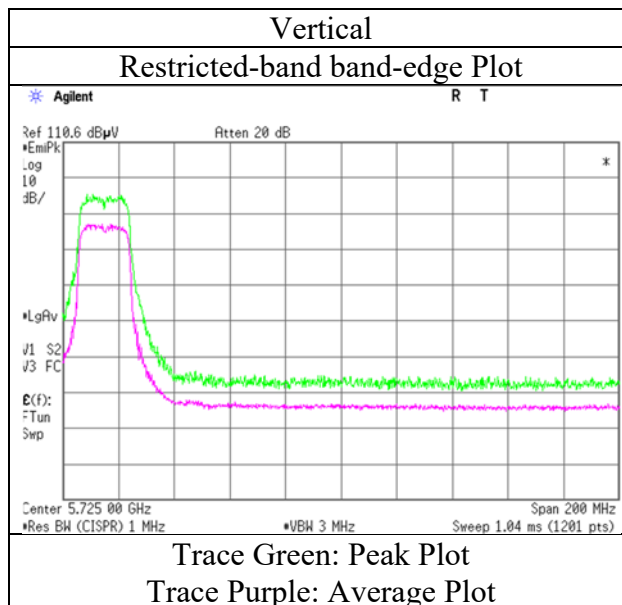
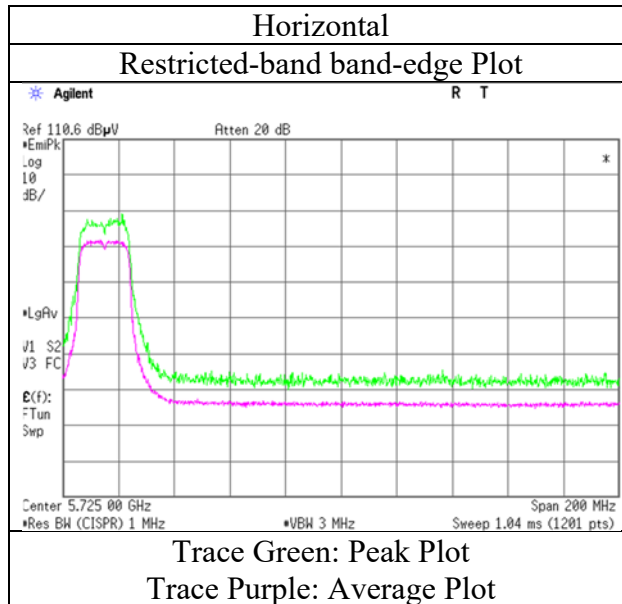
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-20 5640 MHz Antenna: Stand Alone antenna	



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

Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(10 GHz – 26.5 GHz) (26.5 GHz – 40 GHz)
Mode Tx 11n-40 5590 MHz Antenna: Stand Alone antenna

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	5460.000	PK	40.3	31.7	6.6	31.8	-	46.8	73.9	27.1	
Hori	5470.000	PK	41.5	31.7	6.6	31.8	-	48.0	73.9	25.9	
Hori	11180.000	PK	46.6	39.7	-1.2	32.6	-	52.5	73.9	21.4	Floor noise
Hori	16770.000	PK	46.2	39.0	-0.4	32.0	-	52.8	73.9	21.1	Floor noise
Hori	22360.000	PK	47.3	38.6	-0.6	32.4	-	52.9	73.9	21.0	Floor noise
Hori	5460.000	AV	31.1	31.7	6.6	31.8	0.5	38.1	53.9	15.8	*1)
Hori	5470.000	AV	30.9	31.7	6.6	31.8	0.5	37.9	53.9	16.0	*1)
Hori	11180.000	AV	36.3	39.7	-1.2	32.6	-	42.2	53.9	11.7	Floor noise
Hori	16770.000	AV	36.2	39.0	-0.4	32.0	-	42.8	53.9	11.1	Floor noise
Hori	22360.000	AV	36.8	38.6	-0.6	32.4	-	42.4	53.9	11.5	Floor noise
Vert	5460.000	PK	43.4	31.7	6.6	31.8	-	49.9	73.9	24.0	
Vert	5470.000	PK	43.2	31.7	6.6	31.8	-	49.7	73.9	24.2	
Vert	11180.000	PK	46.4	39.7	-1.2	32.6	-	52.3	73.9	21.6	Floor noise
Vert	16770.000	PK	46.3	39.0	-0.4	32.0	-	52.9	73.9	21.0	Floor noise
Vert	22360.000	PK	47.6	38.6	-0.6	32.4	-	53.2	73.9	20.7	Floor noise
Vert	5460.000	AV	32.0	31.7	6.6	31.8	0.5	39.0	53.9	14.9	*1)
Vert	5470.000	AV	32.2	31.7	6.6	31.8	0.5	39.2	53.9	14.7	*1)
Vert	11180.000	AV	36.2	39.7	-1.2	32.6	-	42.1	53.9	11.8	Floor noise
Vert	16770.000	AV	36.4	39.0	-0.4	32.0	-	43.0	53.9	10.9	Floor noise
Vert	22360.000	AV	37.2	38.6	-0.6	32.4	-	42.8	53.9	11.1	Floor noise

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

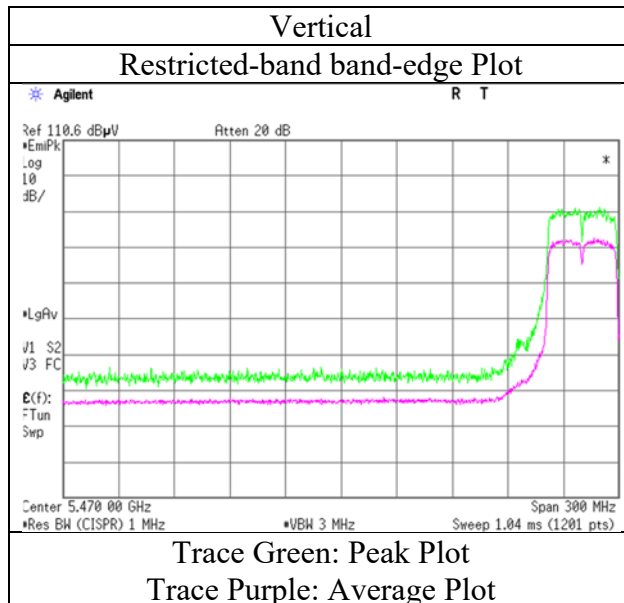
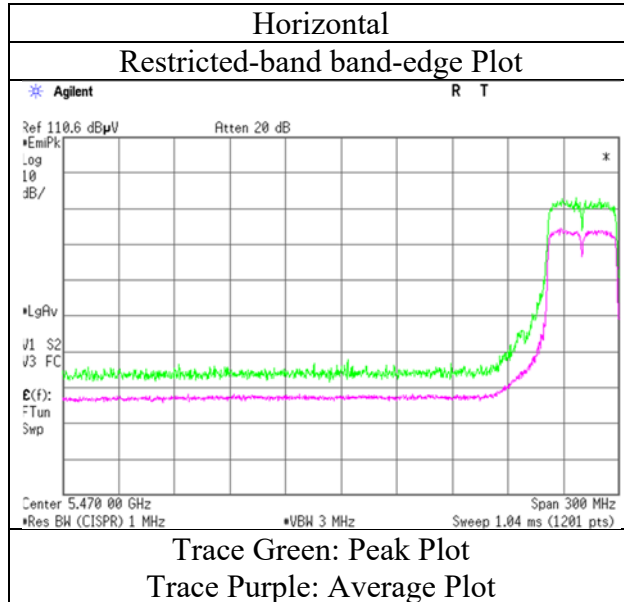
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz 20log(4 m / 3.0 m) = 2.5 dB
10 GHz - 40 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

Radiated Spurious Emission

Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz – 10 GHz)	(10 GHz – 26.5 GHz)
Mode	Tx 11n-40 5590 MHz Antenna: Stand Alone antenna	



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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.4 No.3
Date November 8, 2018 November 9, 2018 November 14, 2018
Temperature / Humidity 23 deg. C / 56 % RH 21 deg. C / 67 % RH 23 deg. C / 42 % RH
Engineer Koji Yamamoto Takumi Shimada Takumi Shimada
(1 GHz - 10 GHz) (10 GHz - 26.5 GHz) (26.5 GHz - 40 GHz)
Mode Tx 11n-40 5630 MHz Antenna: Stand Alone antenna

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	5725.000	PK	40.6	32.1	6.6	31.8	-	47.5	73.9	26.4	
Hori	11260.000	PK	46.7	39.8	-1.2	32.6	-	52.7	73.9	21.2	Floor noise
Hori	16890.000	PK	46.3	39.4	-0.3	32.0	-	53.4	73.9	20.5	Floor noise
Hori	22520.000	PK	47.5	38.7	-0.6	32.5	-	53.1	73.9	20.8	Floor noise
Hori	5725.000	AV	30.8	32.1	6.6	31.8	0.5	38.2	53.9	15.7	*1)
Hori	11260.000	AV	36.9	39.8	-1.2	32.6	-	42.9	53.9	11.0	Floor noise
Hori	16890.000	AV	36.5	39.4	-0.3	32.0	-	43.6	53.9	10.3	Floor noise
Hori	22520.000	AV	37.5	38.7	-0.6	32.5	-	43.1	53.9	10.8	Floor noise
Vert	5725.000	PK	40.8	32.1	6.6	31.8	-	47.7	73.9	26.2	
Vert	11260.000	PK	46.4	39.8	-1.2	32.6	-	52.4	73.9	21.5	Floor noise
Vert	16890.000	PK	45.9	39.4	-0.3	32.0	-	53.0	73.9	20.9	Floor noise
Vert	22520.000	PK	47.6	38.7	-0.6	32.5	-	53.2	73.9	20.7	Floor noise
Vert	5725.000	AV	30.4	32.1	6.6	31.8	0.5	37.8	53.9	16.1	*1)
Vert	11260.000	AV	36.5	39.8	-1.2	32.6	-	42.5	53.9	11.4	Floor noise
Vert	16890.000	AV	36.2	39.4	-0.3	32.0	-	43.3	53.9	10.6	Floor noise
Vert	22520.000	AV	37.5	38.7	-0.6	32.5	-	43.1	53.9	10.8	Floor noise

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

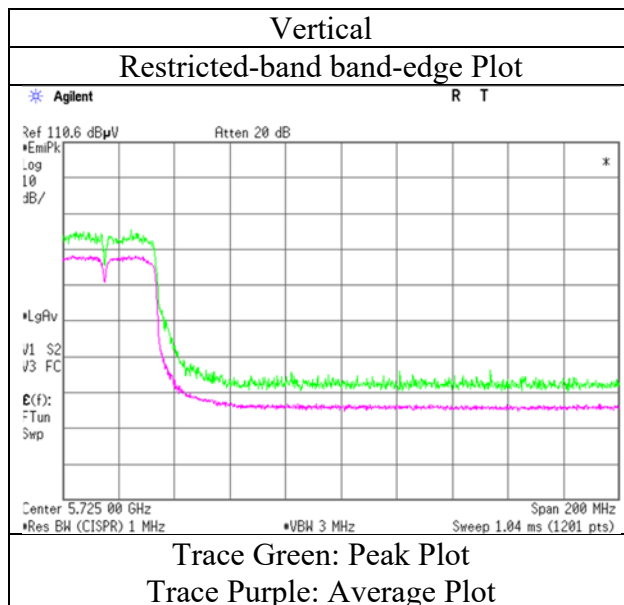
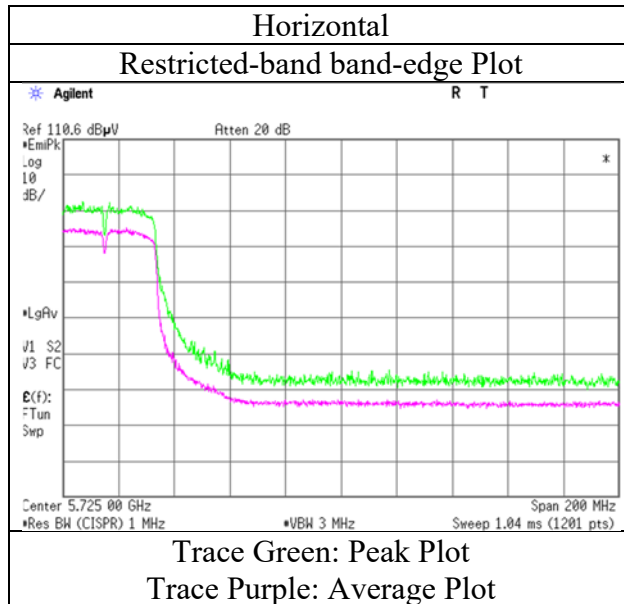
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(4\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
10 GHz - 40 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

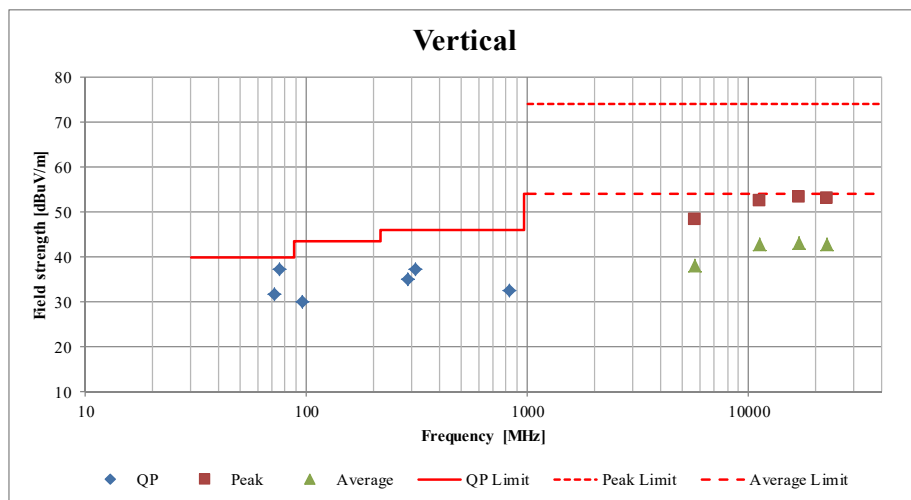
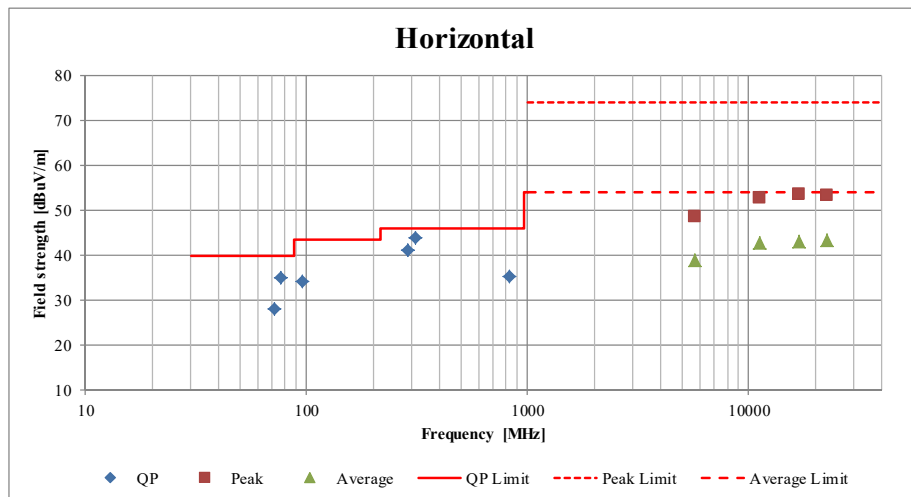
Report No.	12548845H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	November 8, 2018	November 9, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH
Engineer	Koji Yamamoto	Takumi Shimada
	(1 GHz - 10 GHz)	(10 GHz - 26.5 GHz)
Mode	Tx 11n-40 5630 MHz Antenna: Stand Alone antenna	



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

Radiated Spurious Emission (Plot data, Worst case)

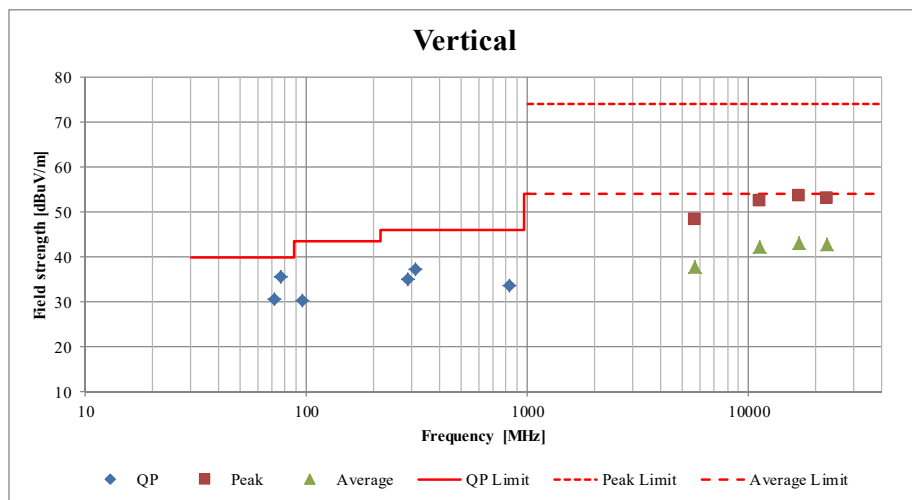
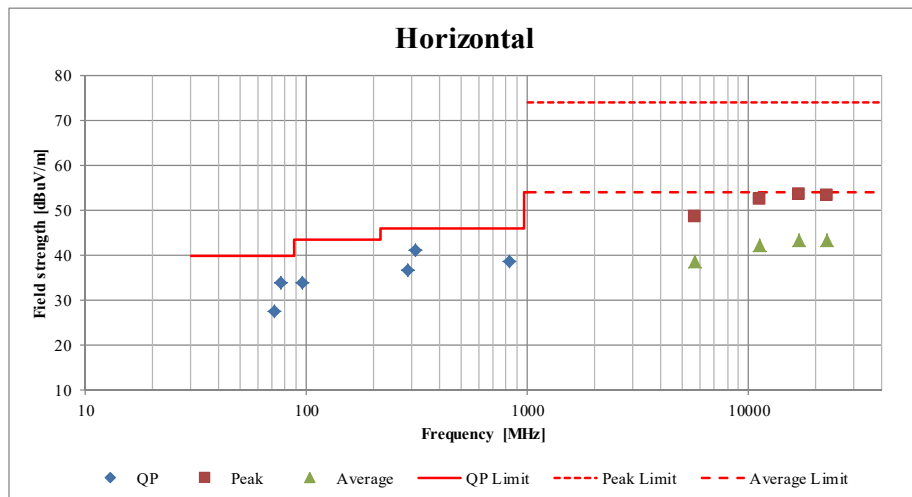
Report No.	12548845H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.3
Date	November 8, 2018	November 9, 2018	November 14, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH	23 deg. C / 42 % RH
Engineer	Koji Yamamoto (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 26.5 GHz)	Takumi Shimada (26.5 GHz - 40 GHz) (Below 1 GHz)
Mode	Tx 11n-20 5640 MHz Antenna: Mini-Nanoblade antenna		



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

Radiated Spurious Emission
(Plot data, Worst case)

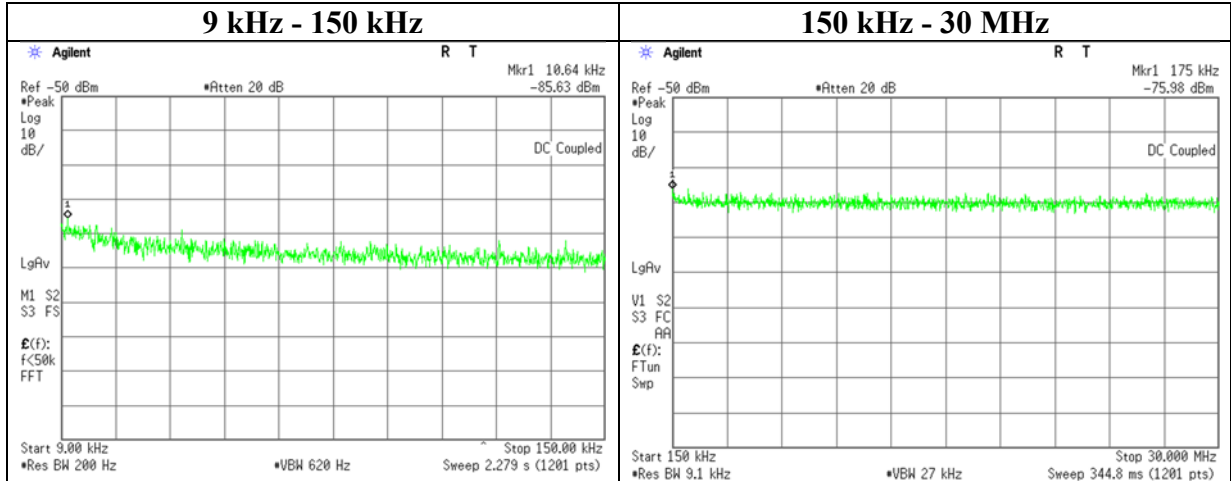
Report No.	12548845H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.3
Date	November 8, 2018	November 9, 2018	November 14, 2018
Temperature / Humidity	23 deg. C / 56 % RH	21 deg. C / 67 % RH	23 deg. C / 42 % RH
Engineer	Koji Yamamoto (1 GHz - 10 GHz)	Takumi Shimada (10 GHz - 26.5 GHz)	Takumi Shimada (26.5 GHz - 40 GHz) (Below 1 GHz)
Mode	Tx 11n-20 5640 MHz Antenna: Stand Alone antenna		



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

Conducted Spurious Emission

Report No. 12548845H
Test place Ise EMC Lab. No.7 Shielded Room
Date November 7, 2018
Temperature / Humidity 25 deg. C / 45 % RH
Engineer Yuta Moriya
Mode Tx 11n-20 5640 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator [dB]	Antenna Gain [dBi]	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.64	-85.6	0.02	9.8	4.8	-71.0	300	6.0	-9.7	47.0	56.7	
175.00	-76.0	0.02	9.8	4.8	-61.4	300	6.0	-0.1	22.7	22.8	

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

$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$$

APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
AT	141842	Power sensor	AGILENT	N1923A	MY54070003	08/21/2018	08/31/2019	12
AT	141901	Spectrum Analyzer	AGILENT	E4440A	MY48250080	10/04/2018	10/31/2019	12
AT	141334	Attenuator(10dB)	Suhner	6810.19.A	-	12/04/2017	12/31/2018	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	08/21/2018	08/31/2019	12
AT	141391	Microwave Cable	RS Pro	R-132G7210200CD	-	04/11/2018	04/30/2019	12
AT	141375	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	30817/2	05/11/2018	05/31/2019	12
AT	141395	Coaxial Cable	UL Japan	-	-	11/13/2018	11/30/2019	12
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/02/2018	11/30/2019	12
AT	141572	Thermo-Hygrometer	CUSTOM	CTH-201	3401	01/24/2018	01/31/2019	12
AT	141902	Spectrum Analyzer	AGILENT	E4440A	MY46187105	10/04/2018	10/31/2019	12
RE	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	11/08/2018	11/30/2019	12
RE	141517	Horn Antenna 26.5-40GHz	ETS LINDGREN	Oct-60	152399	06/08/2018	06/30/2019	12
RE	141588	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33 /8P / AMF-4F-2600	1871355 /1871328	09/21/2018	09/30/2019	12
RE	141227	Microwave Cable	Junkosha	MMX221- 00500DMSDMS	1502S305	03/12/2018	03/31/2019	12
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/04/2018	10/31/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	06/14/2018	06/30/2019	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	06/08/2018	06/30/2019	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	06/08/2018	06/30/2019	12
RE	141294	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	01/18/2018	01/31/2019	12
RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/07/2018	11/30/2019	12
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/06/2018	04/30/2019	12
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/24/2018	01/31/2019	12
RE	141276	Barometer	Sunoh	SBR121	1051	07/09/2018	07/31/2021	36
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	06/07/2018	06/30/2019	12
RE	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	03/13/2018	03/31/2019	12
RE	141417	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	05/07/2018	05/31/2019	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	06/04/2018	06/30/2019	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/18/2017	12/31/2018	12
RE	141323	Coaxial cable	UL Japan	-	-	07/03/2018	07/31/2019	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	06/04/2018	06/30/2019	12
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/06/2018	08/31/2019	12
RE	141884	Spectrum Analyzer	AGILENT	E4448A	MY44020357	11/02/2018	11/30/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	06/30/2020	24
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/27/2018	02/28/2019	12
CE	141556	Thermo-Hygrometer	CUSTOM	CTH-201	3	12/21/2017	12/31/2018	12
CE	142100	Vertical ground reference plane	UL Japan	-	-	-	-	-
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/24/2018	07/31/2019	12
CE	141247	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	12/19/2017	12/31/2018	12
CE	141222	Coaxial Cable	FUJIKURA	3D-2W(12m)/5D-2W (5m)/5D-2W(0.8m)/5	-	02/23/2018	02/28/2019	12
CE	142228	Measure	KOMELON	KMC-36	-	-	-	-
CE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/21/2018	08/31/2019	12

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*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

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

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

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

Test item:

CE: Conducted Emission

RE: Radiated Emission

AT: Antenna Terminal Conducted test